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HB9JAW`s Dish Show

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Editorial

Dear DUBUS Reader!

Here is the second issue for 2003. We hope that you will like it. Any feedback is always very welcome!

In this issue you will find the results of this year`s European EME Contest. Conditions and participation were quite nice although there is still a lack of activity from the USA. We would like to know from the US OPs if there is any specific reason for this?

I want to thank Wolfgang, DJ8ES, who is our new editor for the Tropo column, for delivering really improved pages.

A big "thank you" also goes to Harm, DK3BU and Detlev, DK2HD, for making translations from technical articles in this issue. We also want to thank HA8ET, DL3HRT, DG3DA and W3SZ who are the authors of this issue`s major articles.

Please keep sending your reports, articles and information. DUBUS needs these contributions.

A special future DUBUS project will be the collection of ALL 2m-TEP-QSOs that have ever happened, worldwide, into a database. For example we need the log of SV1AB (SK) etc. Is anyone interested in taking part as a coordinator? We hope that simulation software for 2m-TEP paths could be one result of this project.

The DUBUS 2m transatlantic beacon project is in progress: We expect VP9DUB on the air from Bermuda on 144.300 MHz this summer. TNX to all sponsors, especially to Dithmar, DF7KF! As a result of the discussion in last DUBUS issue the QRG of the French 2m transatlantic beacon may be changed to 144.200 MHz +/-.

Have a nice summer with a lot of Sporadic-E, MS-bursts, Rainscatter, FAI, Tropo etc....

Vy 73 from Joe, DL8HCZ / CT1HZE
and the DUBUS team!

Liebe DUBUS Leser!

Hier ist nun die zweite Ausgabe für das Jahr 2003. Wir hoffen, dass sie gefällt und würden uns über Resonanz freuen.

In dieser Ausgabe findet sich auch das Ergebnis des diesjährigen Europäischen EME Contests. Bedingungen und Aktivität waren recht gut. Allerdings fehlten nach wie vor die U.S.-Stationen. Wir fragen uns, ob es dafür wohl einen besonderen Grund geben mag?

Ein Dankeschön geht an unseren neuen Tropo-Redakteur Wolfgang, DJ8ES, der diese Rubrik schnell stark verbessert hat.

Ebenfalls eine dickes Dankeschön geht an Harm, DK3BU, und Detlev, DK2HD, die umfangreiche Übersetzungsarbeiten für diese Ausgabe geleistet haben. Ein Dankeschön geht auch an HA8ET, DL3HRT, DG3DA und W3SZ, den Autoren der „großen" Artikel dieser Ausgabe.

Bitte senden Sie uns weiter Berichte, Artikel und Informationen. Nur so kann die DUBUS lesenswert bleiben.

Ein neues DUBUS-Projekt wird die Sammlung sämtlicher weltweit bisher gelaufenen 2m-TEP-QSOs sein, um daraus eine Datenbank zu erstellen. Z.B. wäre es wichtig, das Log von SV1AB (SK) zu bekommen. Mitarbeiter für dieses Projekt werden gesucht. Wir hoffen, dass als Ergebnis dieser Arbeit vielleicht einmal ein Simulationsprogramm für 2m-TEP-Pfade entsteht.

Das DUBUS-Projekt für eine 2m Transatlantik-Bake geht voran: Wir erwarten, dass VP9DUB auf Bermuda noch in diesem Sommer auf 144.300 MHz qrv wird. Ein Dank geht an alle Sponsoren, besonders Dithmar, DF7KF! Die Diskussion über die 2m-Transatlantik-Baken in der letzten Ausgabe hat zur Folge gehabt, dass die QRG der französischen Transatlantik-Bake eventuell auf 144.200 MHz +/- verlegt werden könnte.

Wir wünschen einen schönen Sommer mit viel Sporadic-E, MS-Bursts, Regenscatter, FAI, Tropo etc...

Vy 73 von Joachim, DL8HCZ / CT1HZE
und vom ganzen DUBUS-Team!

Simulation with ANSOFT Serenade SV8.5 and 8.7

Transmission Line Diplexer for 435/145 MHz (Part I)

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1. INTRODUCTION

Unfortunately, the continuation of Rainer Bertelsmeier's (DJ9BV) superb reviewer about ANSOFT Serenade SV8.5 [1] won't come out, so in the next example I briefly present the application of the linear simulator through the designing of a 435/145 MHz microstrip diplexer.

In the first part I determine the approximate values of the filter-elements with the help of the Student version, secondly I optimalize the circuit and do the layout by means of the full version. Then I compare the measured results of the complete circuit and the characteristics of the simulator.

2. PRECEDENTS

A few years ago I set myself to present a simplified diplexer filter-designing for HAMs [2], [3]. I planned the filters of the diplexer with free working demos and low cost softwares. (HP: AppCAD, ARRL: SVCfilt, MICROSIM: DesignLab Evaluation 7.1, ACCEL: Tango PCB Eval.) These programs are unable to work properly with the Microstrip Rectangular Spiral Inductors. That's why after the theoretical inductors and capacitors values measurings they had to be modified to a little degree.

The diplexer is constructed on a double-sided PCB. The rectangular spiral inductors are printed on the PCB to make the construction reproducible. Up to 10…15 W usable ordinary types 1206, 63 V ceramic chip capacitors. The diplexer fits into one of usual tinned iron boxes (74 x 55.5 x 30 mm). „Do it yourself" kits are available.

I presented the results of the diplexer in reference [4]. Many HAMs asked me to develop an easily reproducible diplexer, which useable up to at least 50 W. The problem is easy to solve with modern RF-CAD softwares, but the purchase of the necessary RF chip capacitors (e.g. ATC-100) in small quantity is very complicated and relatively expensive. That's why I carried out the designing with distributed microstrip elements instead of lumped elements filters, and I did it without tuning capacitors.

The interaction of the ordinary diplexers' HP-LP filters was presented with MICROSIM DesignLab simulator in [2] and [3]. Now I examine this problem with Serenade SV8.5. The simulation was completed with ideal filters and without defining the elements of the filters. The schematic of the HP-LP diplexer topology is shown in Figure 1. CLPF: Chebyshev Low Pass Filter and CHPF: Chebyshev High Pass Filter from the Elements Library of the simulator (sometimes it is necessary to use the RES elements for the proper operating, R > 1 M•). Figure 2 shows the result a rectangular graph of the HP-LP filter's (insertion loss, stopband attenuation and input match -return loss- responses).

You can see the unfavorable return loss values of the common port on the channel frequencies. The reason is the interaction of the two 50 • filters. That's why the filters of diplexers need to be designed on the basis of special requirements, because the ordinary 50 • filters are not suitable for this purpose.

3. BACKGROUND

A diplexer circuit is basically a frequency multiplexer that splits a single channel carrying many frequencies into two channels carrying fewer frequencies. The block diagram in Figure 3 shows the typical contiguous diplexer circuit. The diplexer is formed by paralleling singly terminated low pass and high pass filters. This results in an input impedance which is nearly constant at 50 □ over a broad frequency range. A two channel version is called a diplexer, a three channel- triplexer, etc. If the adjacent passbands of each channel "cross-over" at a level of about -3db the device is called a "contiguous" multiplexer (diplexer). The design of all filters is based on a low pass filter with that shape of response. This low pass filter is called the low pass prototype and the values of elements in that filter are called the prototype "G" values. The values are normalized to 1 □ input impedance and a cutoff frequency of 1 radian/sec. The approach is to base the design on the singly terminated normalized low pass filter of Figure 4.

Filter impedances of the properly dimensioned diplexer meet the terms given in Table 1 on the channel frequencies. You can see the detailed designing of contiguous singly terminated HP-LP diplexer filters designed by Sereande Design Suite in reference [5] (download from WEB-site of the author).

	F1 = 145 MHz	F2 = 435 MHz
Z1 (common port)	Z0	Z0
Z2 (HP)	•	Z0
Z3 (LP)	Z0	•

Table 1.

Filter impedances on the channel frequencies (Z0 = 50 Ω)

FILTER DESIGNING

I tested several well-known microstrip filters in the HP-LP diplexer, but the dimensions were very large because of the low channel frequencies. So I use elliptic band pass - band stop (BP-BS) transmission line filters optimized by Serenade SV8.5 [6] instead of filter designer softwares. The designing is based on lumped LC circuits. Using the Kuroda-Levy transformation, the equivalent circuit is obtained (Figure 5.). All the transmission lines of the BP filter showed in Figure 6 are quarter wavelength. The ideal (electrical) transmission lines (TRL) are parameterized as ZL, ZC (characteristic impedances), E (electrical length in degrees) and F (frequency = 435 MHz). ZC is an ideal open ended line. The proper isolation of the input and the output, and the necessary transformations are carried out by two serial impedance inverters. For the sake of the proper construction of the layout: ZMIN = 18 □, and ZMAX = 110 □. The middle values of the VAR block on Figure 6 show the results of the optimalization. Figure 7 shows the characteristics of the BP filter. In spite of simple construction these characteristics meet the expectations.

The schematic of the BS filter differs from the one of the BP filter in having used shorted stub instead of open stub. According to this I had to invert the ZL and the ZC TRLs. The two diplexers configured of the connection of the two separately optimalized filters can be seen on Figure 8. All line elements are 90 degrees long. I kept the two original variable blocks (VAR) for the sake of clearer comprehension.

You can see on Figure 9 that the return loss (S11) value changed unfavourably on 145 MHz channel frequency after having connected the two filters. The two VAR blocks were integrated before the optimalization on the electrical schematic of the diplexer on Figure 10. It is deducible from the optimalized values that the values of the high characteristic impedances TRLs should be increased. Too narrow lines would cause reproduction problems on the layout. The lower impedance ratio degrades the stopband performance, even so the characteristics of the diplexer are superb (Figure 11).

After having determined the electrical lengths I defined the physical sizes of the TRLs with the help of "Transmission Lines" in "Tools". I designed the diplexer on a double sided FR-4 substrat 59 MIL thick (Figure 12). The relative dielectric constant of this material varies from 4.3 to 4.8 depending on the resin content and the frequency. On F = 435 MHz: ER = 4.5 and TAND = 0.015 values are suitable according to the measurements (see on Part 2). I designed the physical schematic of the BP-BS diplexer on the basis of TRL synthesis (Figure 13).

The transmission and reflection performances of the diplexer are shown in Figure 14. Because of the physical models the insertion loss in the band pass (on 435 MHz) S21 was approximately 0.6 dB, and on 145 MHz it was only 0.3 dB (S31). On 435 MHz the minimum value of the return loss (S11) shifted towards lower frequencies. The reason is that the required discontinuities (step in impedance, tee junctions, cross junctions) are missing in the student version.

The presented process is suitable for approximate designing of microstrip filters and diplexers, and examining the characteristics of TRLs, but more accurate simulation can be carried out by only the full version of Serenade.

(to be continued in next issue)

Simulation mit ANSOFT Serenade SV8.5 und 8.7

Transmission Line Diplexer für 435/145 MHz (Teil I)

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1. Einführung

Leider kann die Weiterführung von Rainer Bertelsmeier's (DJ9BV) erstklassiger Betrachtung über ANSOFT Serenade SV8.5 [1] nicht erscheinen; Ich werde im folgenden Beispiel die lineare Simulation anhand des Designs eines 435/145 MHz Microstrip-Diplexers erläutern.

Im ersten Teil ermittele ich die ungefähren Werte der Filterelemente mit Hilfe der Studentenversion, folgen wird die Optimierung der Schaltung sowie die Realisierung des Designs anhand der Vollversion der Software. Zum Schluß werde ich die gemessenen Parameter eines Aufbaus mit der Simulation vergleichen und diskutieren.

2. PRIORITÄTEN

Vor einigen Jahren wollte ich eine einfache Dimensionierungsrichtlinie für Diplexerfilter für Funkamateure vorstellen [2], [3]. Ich entwickelte diese Filter mit frei erhältlichen Demos und low cost Programmen. (HP: AppCAD, ARRL: SVCfilt, MICROSIM: DesignLab Evaluation 7.1, ACCEL: Tango PCB Eval.) Diese Programme können spiralförmige Microstripspulen mit rechtwinkliger Apertur nicht simulieren. Die ermittelten Daten für Kondensatoren und Induktivitäten mußten nachträglich korrigiert werden.

Der Diplexer entstand auf auf einer doppelseitig kaschierten Platine. Für gute Reproduzierbarkeit sind die Induktivitäten als spiralförmige Spulen auf dem Print angeordnet. Bis ca. 10...15 W Leistung sind keramische Chip-Kondensatoren des Typs 1206, 63 V verwendbar. Der Diplexer paßt in ein handelsübliches Weißblechgehäuse (74 x 55.5 x 30 mm). „Do it yourself" Bausätze sind erhältlich.

Ich stellte die Ergebnisse in [4] vor. Viele Funkfreunde baten mich, einen leicht zu reproduzierenden, bis mindestens 50W Leistung verwendbaren Diplexer zu entwickeln. Diese Aufgabe ist mittels moderner RF-Cad-Software leicht zu erschlagen, nur die erforderlichen Chip-Kondensatoren (z.B. ATC-100) sind in kleinen Mengen teuer und schwer zu beschaffen. Daher führte ich die Schaltung mit Microstrip- statt diskreten Elementen ohne Verwendung von Abgleichkondensatoren aus.

Die gegenseitge Beeinflussung der Hoch- und Tiefpaßfilter des einfachen Diplexers wurde mit MICROSIM DesignLab untersucht und in [2] und [3] vorgestellt. Gegenwärtig behandle ich dieses Problem mittels Serenade SV8.5. Die Simulation wurde mit idealen Filtern und ohne Definition der Filterelemente durchgeführt. Die Schaltung des Hochpaß-Tiefpaß Diplexeraufbaus ist aus Bild 1 zu ersehen. CLPF: Chebyshev Tiefpaßfilter und CHPF: Chebyshev Hochpaßfilter aus der Bauteilebibliothek des Simulators (manchmal sind Widerstandselemente RES für schlüssige Ergebnisse einzufügen, R > 1 MOhm). Bild 2 zeigt in rechtwinkligem Graphen die Daten der HP-LP Filter (Einfügedämpfung, Sperrdämpfung sowie Eingangsanpassung bzw. -return loss-).

Man erkennt die ungünstigen Werte der Eingangsanpassung des gemeinsamen Ports für die Durchlaßfrequenzen. Grund ist die gegenseitige Beeinflussung der beiden Filter in 50 Ohm-Technik. Diplexerfilter sind nach speziellen Regeln zu entwerfen; Übliche 50 Ohm-Filter sind hier unbrauchbar.

3. GRUNDSÄTZLICHES

Ein Diplexer ist ein Frequenz-Multiplexer, der einen mehrere Frequenzen beinhaltenden Zweig in zwei Zweige mit weniger Frequenzen aufspaltet. Das Blockschaltbild, Bild 3, zeigt den typischen Aufbau eines Diplexers. Er entsteht durch Parallelschaltung einseitig abgeschlossener Tief- und Hochpaßfilter. Das Ergebnis ist eine breitbandige, gute Anpassung an 50 Ohm. Die Zweiwege Ausführung wird Diplexer, die Dreiwege Ausführung Triplexer genannt, usw.. Wenn die sich die Durchlaßbereiche der Filter im -3dB-Punkt kreuzen, nennt man das Bauteil einen „contiguous" (berührenden) Multiplexer (Diplexer). Alle Filter werden aus einem Tiefpaßfilter bestimmter Charakteristik abgeleitet. Dies ist ein Tiefpaß-Prototyp, dessen Elemente Prototyp „G" genannt werden. Seine Eingangsimpedanz wird auf 1 Ohm, die Eckfrequenzen auf 1 rad/sec normiert. Ziel ist, die gesamte Schaltung aus dem einseitig abgeschlossenen, normalisierten Tiefpaß zu entwickeln (Bild 4).

Die Filterimpedanzen des richtig dimensionierten Diplexers innerhalb der Übertragungsbänder genügen den Zuordnungen der Tabelle 1. Das Design dieser Filter mit Serenade Desing Suite ist detailliert in [5] dargestellt (Download von der WEB-Seite des Autors).

	F1 = 145 MHz	F2 = 435 MHz
Z1 (common port)	Z0	Z0
Z2 (HP)	∞	Z0
Z3 (LP)	Z0	∞

Table 1.

Filterimpedanzen in den Übertragungsbändern (Z0 = 50 Ω)

FILTER DESIGN

Ich habe einige bekannte Microstripfilter im Diplexer getestet, die Abmessungen waren aufgrund der niedrigen Betriebsfrequenzen jedoch sehr groß. Ich bin zur Verwendung mit Serenade SV8.5 optimierter elliptischer Bandpaß-Bandsperrfilter über gegangen [6]. Das Design basiert auf diskreten LC-Schaltungen. Mit Hilfe der Kuroda-Levy Umwandlung erreicht man die äquivalente Schaltung aus Leitungselementen (Bild 5). Alle Leitungsstücke in Bild 6 sind Lambda/4 lang. Die Parameter der (elektrisch) idealen Leitungen (TRL) sind ZL, ZC (charakteristische Impedanz), E (elektr. Länge in Grad) und F (Frequenz = 435 MHz). ZC ist eine ideale, am Ende offene Leitung. Saubere Isolation sowie die notwendigen Transformationen werden mit zwei seriellen Impedanzumwandlern durchgeführt. Für ein funktionierendes Layout wird gesetzt: ZMIN = 18 Ohm, ZMAX = 110 Ohm. Die mittleren Werte des VAR Blocks in Bild 6 zeigen die Ergebnisse der Optimierung. Bild 7 zeigt die Charakteristik der Bandpaßfilter. Trotz einfacher Konstruktion entsprechen diese Werte den Erwartungen. Die Schaltung der Bandsperre unterscheidet sich durch die Verwendung kurzgeschlossener anstatt offener Stubs von der des Bandpaßfilters. Entsprechend mußten die ZL und ZC TRLs invertiert werden. Die aus der Verbindung der beiden einzeln optimierten Filter entstandenen Diplexer sind in Bild 8 zu sehen. Alle Leitungsstücke sind 90 Grad lang. Wegen besserer Vergleichbarkeit bleiben die beiden originalen VAR-Blocks erhalten.

Aus Bild 9 geht hervor, daß die Eingangsanpassung S11 nach der Zusammenfügung beider Filter bei 145 MHz ungünstige Werte annimmt. Die beiden VAR-Blocks wurden vor der Optimierung in das Schaltbild des Diplexers (Bild10) eingefügt. Aus den optimierten Werten ist zu folgern, daß die Impedanzen der hochohmigen Leitungsstücke erhöht werden sollten. Zu schmale Leitungen würden jedoch Probleme beim Fertigen des Layouts nach sich ziehen. Das geringere Impedanzverhältnis verschlechtert die Sperrdämpfung, trotzdem sind die Werte des Diplexers hervorragend (Bild 11).

Nach der Ermittlung der Leitungslängen definierte ich die physikalischen Längen mit Hilfe von „Transmissionlines" in „Tools". Ich wählte doppelseitig kaschiertes FR-4 mit 59 mil Substratstärke (Bild 12). Die Dielektizitätskonstante dieses Materials liegt in Abhängigkeit von Harzgehalt und der Frequenz zwischen 4,3 und 4,8. Bei F = 435 MHz ergeben ER = 4.5 and TAND = 0.015 mit den Messungen vergleichbare Ergebnisse (siehe Teil 2). Das Design des entgültigen Diplexer-Layouts entstand auf Basis der TRL-Synthese (Bild 13).

Die Übertragungs- und Anpassungseigenschaften des Diplexers sind aus Bild 14 zu ersehen. Die Einfügedämpfung im Durchlaßbereich (bei 435 MHz) S21 ist ca. 0,6 dB, bei 145 MHz nur ca. 0,3 dB (S31). Bei 435 MHz rutscht der Punkt optimaler Anpassung zu niedrigen Frequenzen. Grund ist die in der Studentenversion fehlende Simulationsmöglichkeit von Impedanzsprüngen, Verzweigungen und Kreuzungspunkten.

Der dargestellte Weg ist brauchbar für Entwicklungen von Microstripfiltern und –diplexern und die Untersuchung der Eigenschaften von TRLs mit geringer Genauigkeit. Präzise Simulation ist jedoch nur mit Hilfe der Vollversion von Serenade möglich.

(Fortsetzung im nächten Heft)

(TNX an Harm, DK3BU, für die Übersetzung!)

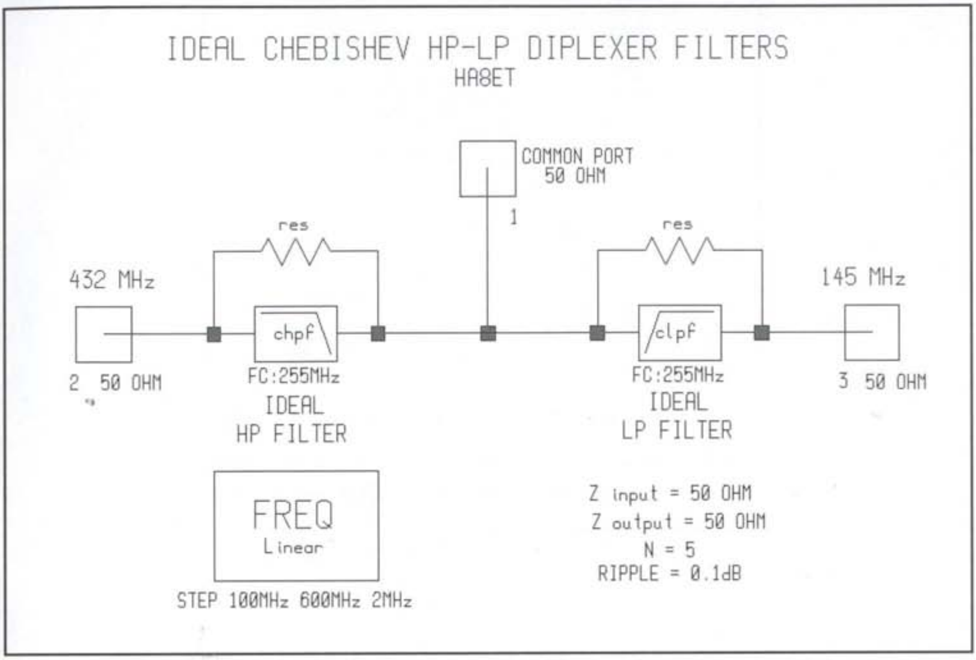

Figure 1. 50 Ω input-output impedance HP-LP filter schematic

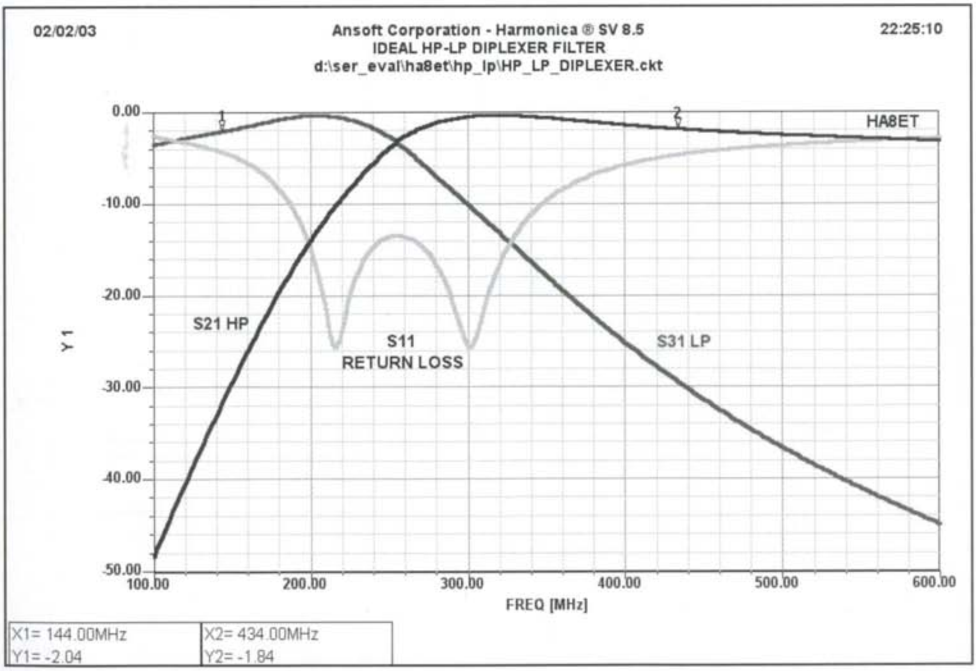

Figure 2. Rectangular graph of the "normal" HP-LP filter's

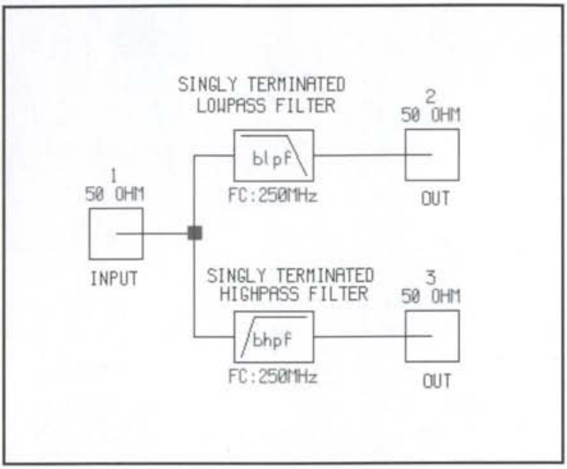

Figure 3. A typical Butterworth HP-LP diplexer circuit

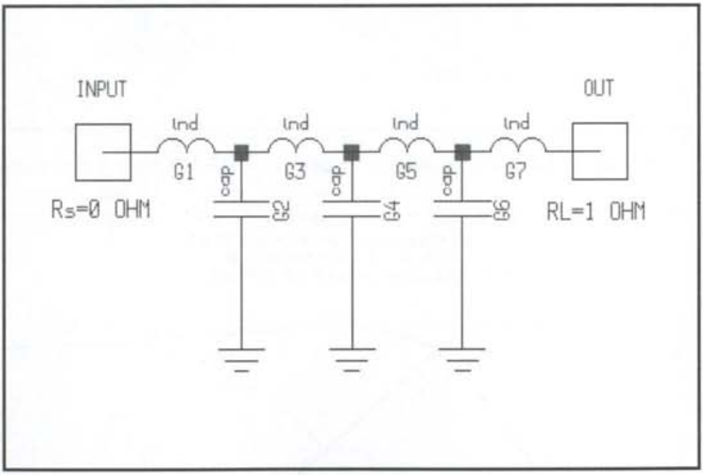

Figure 4. Singly terminated, normalised 7th order low pass filter

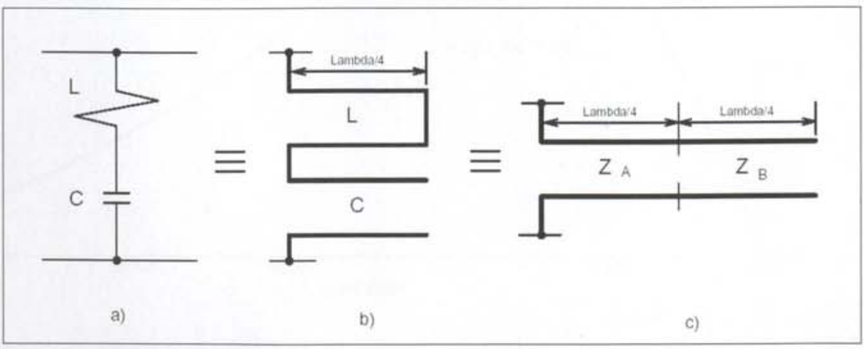

Figure 5. Lumped LC (a), microwave equivalent circuit (b), Kuroda-Levy transformation (c)

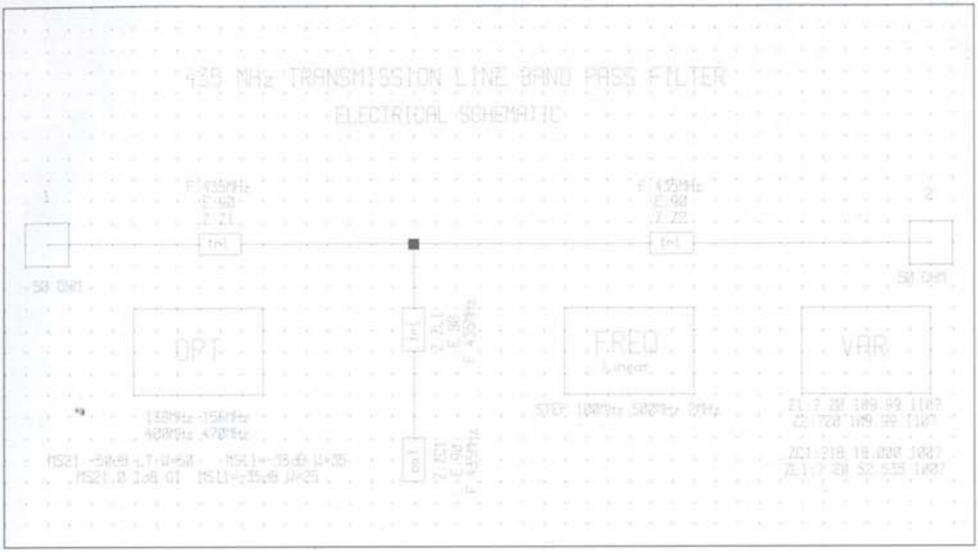

Figure 6. 435 MHz transmission line BP filter

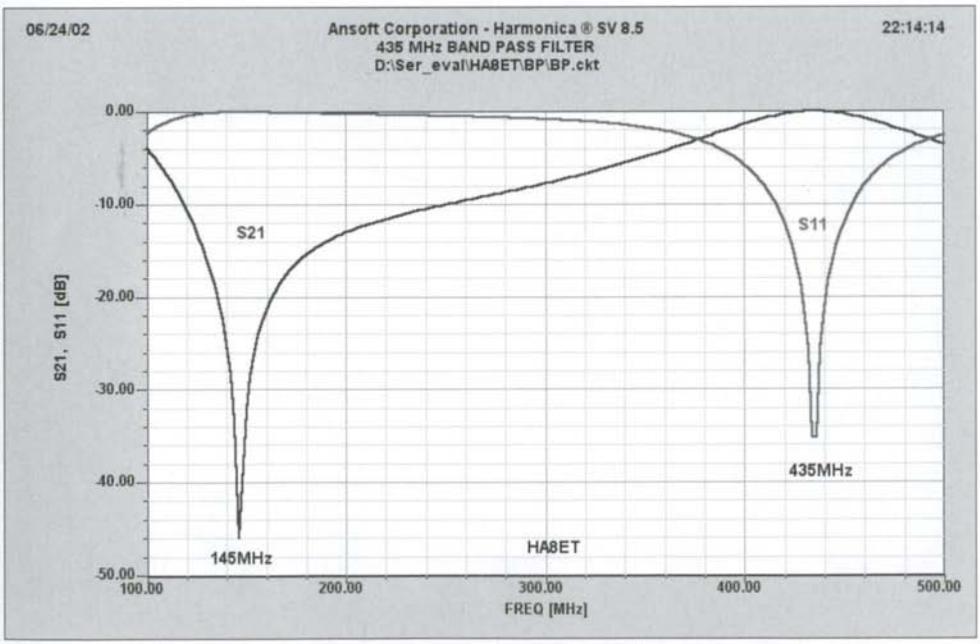

Figure 7. Stopband attenuation and return loss of the BP filter

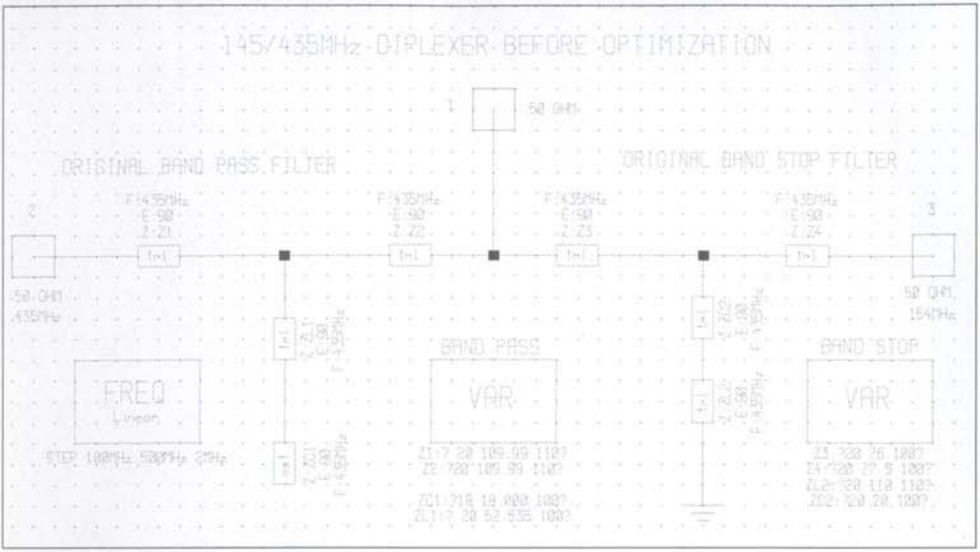

Figure 8. The schematic of the original BP-BS diplexer before optimization

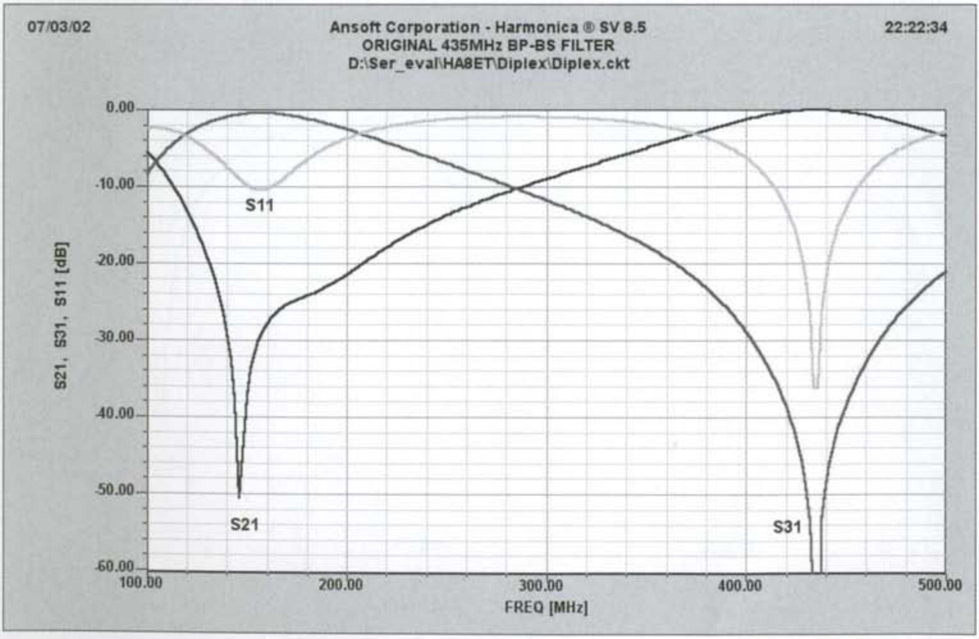

Figure 9. Rectangular plot for the original BP-BS diplexer before optimization

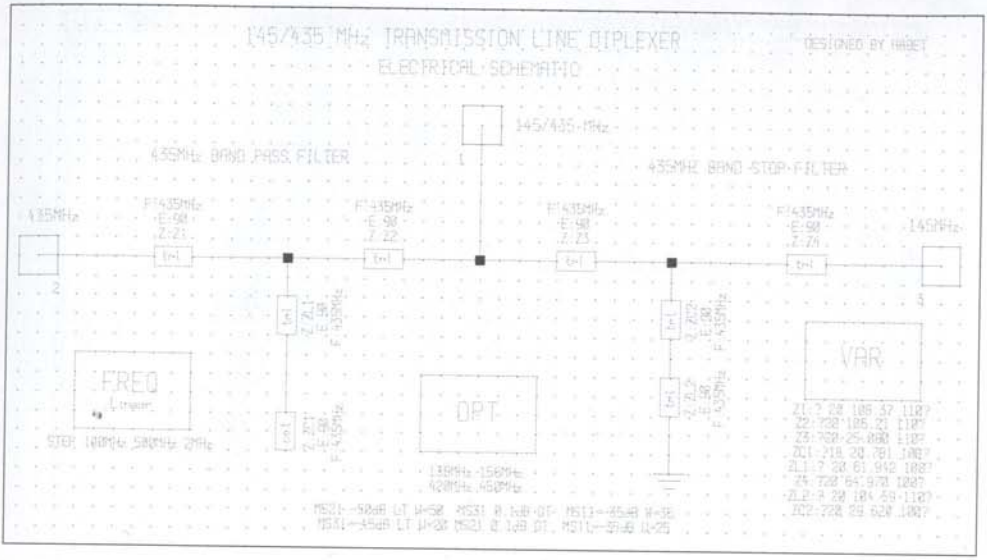

Figure 10. The schematic of the BP-BS diplexer after optimization

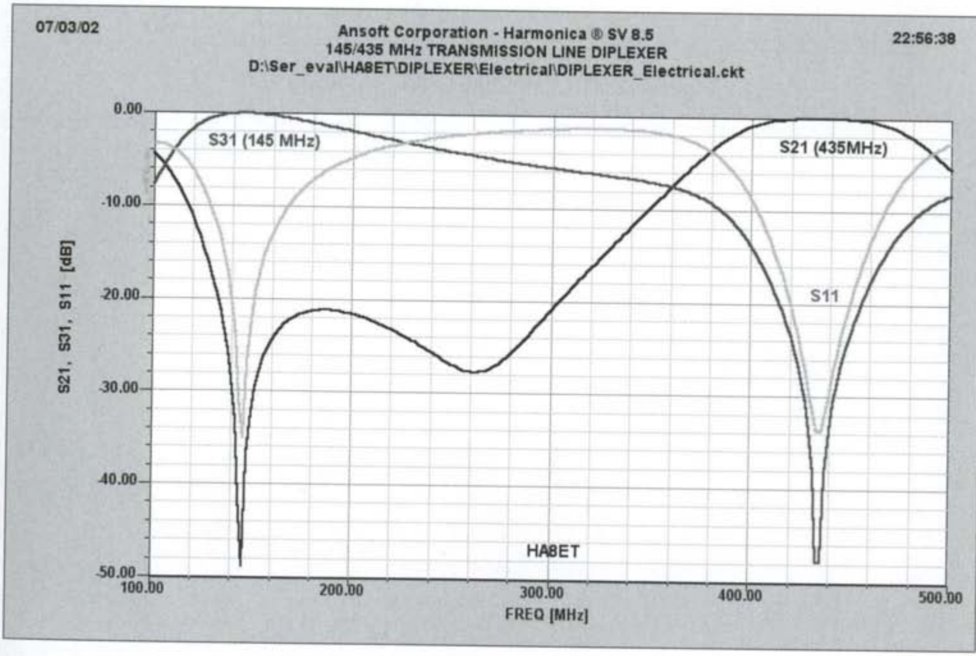

Figure 11. Rectangular Plot for the BP-BS diplexer after optimization

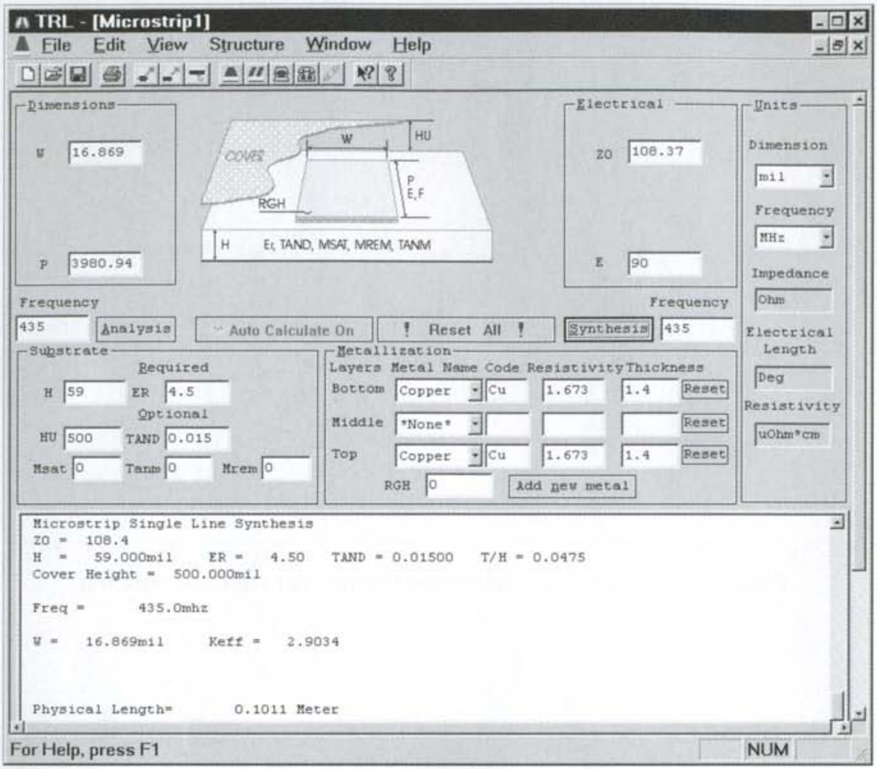

Figure 12. TRL: Microstrip line shynthesis

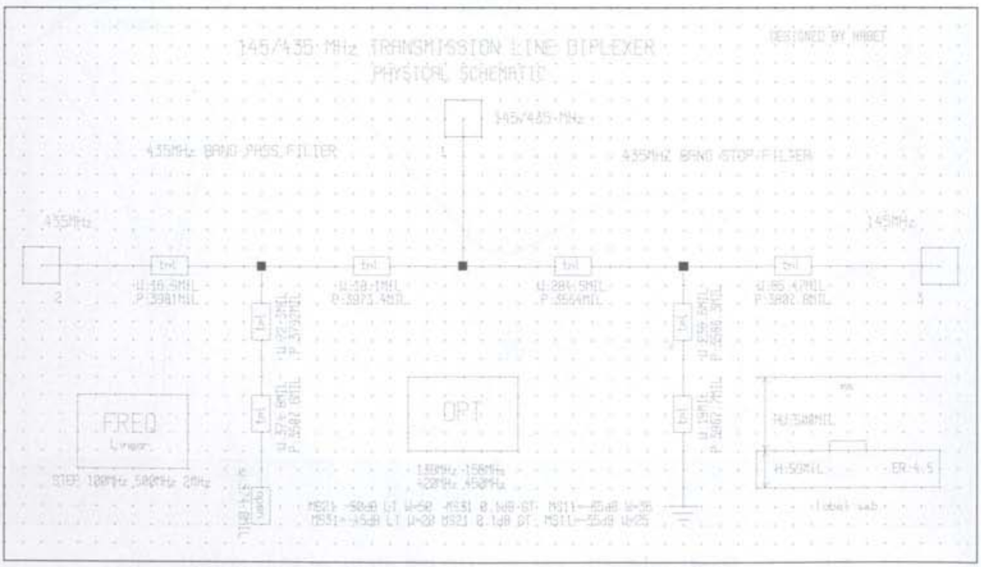

Figure 13. Physical schematic of the BP-BS diplexer

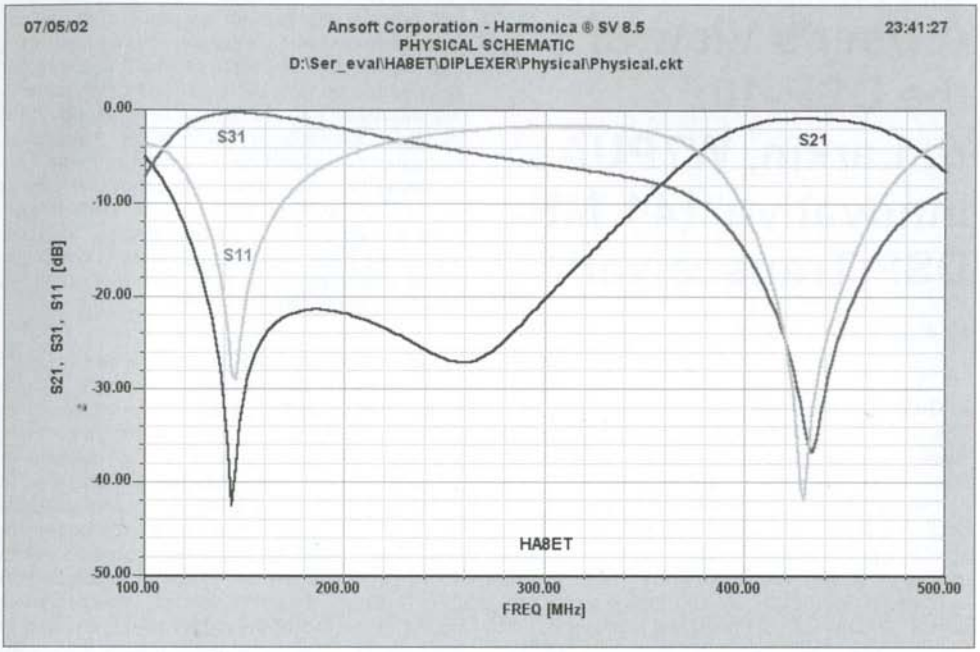

Figure 14. Rectangular Plot of the diplexer after electrical-physical conversion

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A User's View of the DSP-10: B. Larkin, W7PUAs Innovative 144 MHz DSP Transceiver

by Roger Rehr, W3SZ

I. Overview

The DSP-10 is a dedicated 2-meter amateur radio 'weak signal' multimode transceiver designed by Bob Larkin, W7PUA. Bob's description of this hardware/software combination and the schematic diagrams and notes necessary to build it from scratch were contained in QST magazine for September, October, and November, 1999 . This 'software defined radio' is more than a signal processor. It provides not only signal processing, and the traditional CW, SSB, and FM modes, but also entirely new digital modes of communication using long-term integration and FSK techniques that allow communications at signal levels that would be impossibly low with standard techniques. The DSP-10 is different from Linrad, Spectran, Hamview, DSP-Blaster, and other 'familiar' signal processing software in several ways . First, the DSP-10 is a complete transceiver, with all the hardware necessary to receive and generate signals in the 144 MHz Amateur band. Secondly, the DSP-10 uses an Analog Devices EZ-Kit Lite to do the DSP processing rather than a sound card; it connects to a PC via a serial port and just makes use of the PC for control and display; the EZ-Kit Lite does all of the computational chores.

The DSP-10 software can also be used without the RF hardware, as an audio DSP processor, using just the Analog Devices EZ-Kit Lite evaluation board (see below). Or, it can be used with an external homebrew front-end, functioning as the final IF of a homebrew receiver. I have done this at W3SZ with just a couple of TUF-1H's and computer-controlled oscillators to make a very nice receiver that covers from below the AM Broadcast band to the 432 MHz band. The hardware I used with the DSP-10 software in this manner was very similar to what I use with Linrad.

II. DSP-10 Display and Software Features

Whether used with or without the DSP-10 RF hardware, Bob's DSP-10 software has an excellent waterfall display with adjustable gain, adjustable baseline, and adjustable signal averaging (see Figure 1). The palette of waterfall colors can be adjusted as well, but unlike the other parameters discussed here, which can be changed on the fly while operating by typing a few keystrokes, changing the palette requires changing the configuration file. The visualized bandwidth can be set to 1200, 2400 or 4800 Hz. The DSP-10 software has an excellent spectral display, also with adjustable gain, adjustable baseline, adjustable signal averaging, and 1200, 2400 or 4800 Hz visualized bandwidth.

In Figure 1 you can see the spectral display at the top right of the display, with the waterfall display below. These displays share the same frequency calibration. At the time this snapshot was taken, the DSP-10 was receiving a CW beacon at 144.284070 MHz. You can see that the spectral width of the display is 2400 Hz for this example, and that the beacon is about 40 dB above the noise floor. Although the spectral scale is set for 10 dB per division here, this can be changed to 5, 2, or 1 dB per division if desired. You can see a cursor at the top of the signal peak produced by the beacon. This cursor automatically follows the maximum signal detected within the display range, and the level of this signal is displayed as 'Signal Level' in dBm just beneath the main frequency readout and the horizontal bar graph of signal strength on the upper left portion of the screen. Beneath the 'Signal Level' indication is the frequency of the automatically detected peak signal, in Hz. This value corresponds to the frequency calibration markers for the spectral and waterfall displays. Below the waterfall display are indicators for the relative signal levels of both the A/D and the D/A converters, and at the lower right corner on the same line the signal strength displayed (35.32 dB) represents the average power level of the spectral display. This bottom line of the display can be changed to show the DSP status data, Moon data (Azimuth, Elevation, Doppler shift, and relative signal level), Sun data (Azimuth and Elevation), or left blank if desired. On the left of the screen, below the frequency readout and signal level indicators are some of the user-defined parameters, which can be set as noted above with various keystroke combinations which are for the most part intuitive and easily learned. In addition, a command summary sheet is available for download from Bob Larkin's website at http://www.proaxis.com/~boblark/dsp10cmd.pdf.

These user-adjustable parameters include the contrast and brightness of the waterfall display, microphone gain, CW speed (for transmit only), transmit power, and mode. When the mode is

CW, the first number displayed to the right of 'Mode' represents the amplitude of the CW sidetone, and the second number represents the frequency of the CW offset. The frequency of the CW sidetone tracks the frequency of the CW offset. Modes currently implemented include CW, SSB (USB and LSB), FM, and four 'new' modes LHL7, PUA43, EME2, and LTI that will be discussed in a section below. Below this are the values of the RIT, a designation of what audio filter is selected, the status of the LMS denoiser, and the status of the binaural delay. The DSP-10's DSP audio processing provides 200, 300, and 450 Hz bandwidth filters at center frequency of 600 Hz, a 600 Hz bandwidth filter at center frequency of 700 Hz, and a 300 Hz bandwidth filter at a center frequency of 800 Hz. In addition there are a sin(f)/f matched filter for 12 wpm CW, two SSB filters (250 to 2500 Hz and 200 to 2900 Hz), and a design-your-own filter too. The LMS noise reduction can be activated and its adaptation gain adjusted with a couple of keystrokes. The decay rate and the delay line length, which are less likely to need adjustment, are adjustable from within the configuration file. The LMS auto-notch can be activated or defeated with a few keystrokes. Unfortunately the automatic notch filter frequency is not manually adjustable, so it will very effectively eliminate the desired CW signals when activated. The final parameter displays in this screen column are for the number of spectral averages per displayed point, the type of windowing function (none, Tukey25, Hamming, or BH-92), AF and RF receive gain, ACG status and level, and Automatic Display Correction (essentially AGC for the waterfall display). Much more information regarding the capabilities and operation of the DSP-10 software is available from Bob Larkin's website, the URL of which is given below. Once on that web page, go to the links for "V2.0 'read me' notes" and "V1.6 'read me' notes" for this information.

III. Getting Started

The DSP-10 software is free and can be downloaded from Bob Larkin's web site at
http://www.proaxis.com/~boblark/dsp10.htm.
It runs only under true DOS mode and does not run in a DOS Window. Bob's web site has a wealth of information regarding the DSP-10 including but not limited to pdf file copies of the original QST articles, a link to the Analog Devices web page (they make the EZ-Kit Lite and it can be purchased from their website), a parts list that makes ordering the parts for the project a simple matter, an assembly manual with numerous helpful hints, the most recent version of the software, corrections and improvements to previous documents, and links to web pages with diagnostics software and hints on how to get the DSP-10 up and running in best form. Although I built my first DSP-10 by individually ordering parts based upon the information on Bob's website and found doing so to be straightforward, I subsequently purchased two DSP-10 kits from TAPR (http://www.tapr.org/). TAPR has periodically made kits available with all parts except for the EZ-Kit Lite, and this further simplifies the parts procurement process and reduces costs thru economies of scale. Check their website for details on the next kit run. Unfortunately, the EZ-Kit Lite, originally Analog Devices Part ADDS-21XX-EZLITE, is now part number ADDS-2181-EZLITE, and the price has risen several fold. I purchased mine from Newark Electronics in 1999 and then again in early 2001, when the price was $94.70. As of 02/15/2003 the board can be purchased directly from Analog Devices for $245.00 plus shipping, or from Newark Electronics for $346.95 plus shipping, as well as from other vendors. Recently several amateur-designed alternatives to the EZ-Kit Lite have begun to surface. Peter Rhodes, G3XJP, has designed the PIC-A-STAR, which is an HF transceiver based on the EZ-Kit Lite. As a part of this project he has designed and built a homebrew replacement for the EZ-Kit Lite that would be suitable for use with the DSP-10 with a few changes to the DSP-10 software. Bob Larkin has indicated that he plans to make the necessary software changes, and Bob does not anticipate any problems with this approach. Peter's PIC-A-STAR design has been running in RadCom for the last 7 months , and is about 1/3 of the way through, according to Peter. The article includes the PCB artwork, components lists, schematics, etc., as well as a description of how to complete the construction with just 'domestic kitchen resources', as Peter puts it. Lyle Johnson, KK7P, is also putting together a DSP module that may replace the EZ-Kit Lite. Details will be on his web page. Finally, DH6IAL and DC9UP are also working on a substitute for the EZ-Kit Lite. They will post an announcement to the DSP-10 mailing list when details are finalized.

Setting up the audio version of the DSP-10, without the RF hardware, is a piece of cake. You just plug the audio output of your rig into the input of the EZLITE, plug your headphones into the output of the EZLITE, connect a serial cable from your computer to the EZLITE, and fire up the software. It's just as easy as this if you are using your own external RF front-end instead of a commercial rig. Building the complete DSP-10 computer-controlled 144 MHz transceiver as described in the September, October, and November1999 issues of QST takes some time but it is not difficult, although the design does make use of surface mount technology. I built a DSP-10 144 MHz transceiver in early 2000 and have found it to be superb as a microwave IF. The ability to spot those weak signals that are up to 4 kHz off frequency at 2304 MHz and above is critical in the microwave contests, and this radio really does that superbly. I have also used the DSP-10 144 MHz transceiver as a 144 MHz weak signal receiver, and I have used it on 144 MHz EME. For weak signal 144 MHz terrestrial use in a noisy urban location its somewhat limited dynamic range is at times problematic, as it can be overloaded when there are strong local signals present. The ARRL lab rated its IP3 at -21 dBm. The limitation in dynamic range is I think probably a reflection of the limited dynamic range of the EZLITE. The EZLITE is based on the ADSP-2100 Series of DSP Microcomputers. These are 16 bit fixed-point processors, and the Codec used in the EZLITE is the AD1847 which has probably just12-13 bits of usable dynamic range although it is a 16 bit device. I believe the dynamic range limitation is in these components and not in the analog RF front end. The DSP-10 uses a MAR-6 as the first RF amplifier, and this device has an IP3 of +14 dBm. Although it is followed by a MAR-3 before the first TUF-1 Mixer and the crystal filter, I don't think these analog components are the factor limiting dynamic range.

IV. DSP-10 Hardware

The DSP-10 144 MHz transceiver hardware is described in detail in the original QST articles. This information is also available on Bob Larkin's web site , and also on the CD that is a part of the ARRL publication Experimental Methods in RF Design . The text of the latter publication discusses in some detail the rudiments of the DSP-10 software, as well. The basic hardware design is that of a dual conversion receiver, with the first LO at 124.3 to 128.4 MHz, giving a first IF of 19.665 MHz, and the second LO at 19.680 MHz, giving a second IF of 15 KHz which is then coupled to the EZ-Kit Lite for DSP signal processing. Coarse 5 KHz tuning steps are provided by the first LO synthesizer, and fine 1 Hz steps are provided by the DSP software. The DSP software uses quadrature mixing for SSB and an arc tangent detector for FM. The DSP-10 communicates with the DOS PC via a serial port operating at 9600 baud.

The signal path from the antenna and a block diagram of the hardware are shown in Figure 2. The received signal coming from the antenna sees a PIN diode T/R switch, and then a 143-149 MHz bandpass filter. RF amplification is then provided by MAR-6 and MAR-3 MMIC's, as noted above. Another PIN diode T/R switch is then followed by a Cohn-type 143-149 MHz bandpass filter. This is followed by the TUF-1 first mixer, which is in turn followed by a four-pole 19.665 MHz crystal filter and then the second mixer, also a TUF-1. This is followed by a low-pass filter with a cutoff of around 28 KHz, and then a low noise amplifier before the signal is sent to the EZ-Kit Lite. All further processing occurs on this DSP board.

For transmit, the signal path is essentially reversed. The EZ-Kit Lite generates the signal at a frequency of 15 KHz. This is then amplified and after passing through a T/R switch is mixed with the second LO at the second mixer to generate a 19.665 MHz signal, which passes through the four-pole 19.665 crystal filter and is converted to 144 MHz at the first mixer. The transmit signal is then passed through the Cohn bandpass filter, amplified by a MAR-6 and then a MAR-4 and then a 2N5109. It is finally low-pass filtered, and then passes thru the T/R switch adjacent to the antenna connector.

The DSP-10 144 MHz Transceiver requires 13.6 V at 0.75 A maximum (operating voltage range is 10.6-16 V). It covers 144-148 MHz. The receiver noise floor as measured by the ARRL lab with 450 Hz filter is -136.8 dBm. The second-order intercept point with 66 and 72 MHz inputs is +69 dBm. The third-order intercept point (IP3), as noted above, is -21 dBm. IF rejection is 127 dB, and image rejection is 125 dB. Maximum output power is 40 mW. These and other specifications are given in the final DSP-10 QST article from November, 1999. The June, 2000 issue of QST contains another article by W7PUA describing the construction of an amplifier that increases the power of the DSP-10 to 8 watts.

V. Practical Experience with the DSP-10

Before describing the very original and unique automated detection and decoding features of the DSP-10 I'd like to share my experiences using it for CW operation during the September 2000 Italian EME Contest. The equipment setup I used for these tests was as follows. The antenna system was a 2 x 2 stack of M2 2MXP20's with separate receive lines for Horizontal and Vertical Polarity. There were dual ARR 144 MHz preamps on the tower, close to the power dividers. The feed lines (LMR600UF to the bottom of the tower, and then 7/8 inch hardline to the operating position) were connected to an EME grade relay in the shack so I could switch polarity with a flick of a switch, or monitor both H and V on two different receivers. For the receiver comparison testing I kept this relay in place, and hooked a two way power divider after it to split the receive signal into two paths, one path to the SSB Electronics LT2S Mk II / K2 combination, and one to the RF version of the DSP-10. Because I have more than 20 dB of preamp gain on the tower, and significantly less feedline loss than this, this signal splitting didn't produce any noticeable signal degradation. I had the audio from both combinations fed into a professional audio mixer (Sampson) with good RF shielding, and then fed the output from the mixer into a computer running DSP Blaster, directly to another set of headphones, and also to another computer running Spectran for visual assessment of the received signal (spectrum and waterfall displays).

What I found during the Italian EME contest was that I found stations more easily and I found listening to them and copying them more comfortable on the DSP-10 hardware than with my SSB Electronics LT2S Mk II / Elecraft K2 combination, whether I was running the LT2S/K2 with no DSP, with DSP-blaster, with the AUDIO version of DSP-10, or with Spectran. I think this relates primarily to the fact that the implementation of binaural receive on the DSP-10 is superb. There were signals I essentially couldn't appreciate with the binaural mode deactivated on the DSP-10, that just popped out of the background noise when I turned it on (I normally run with it on, and turned it off just to try to figure out why the DSP-10 receiver seemed so 'hot', so what actually happened was that signals that were easy copy became lost in the mud when I turned off the binaural). Also, the quality of the signal when received through the DSP-10 144 MHz transceiver just seems better than when the audio DSP-10 is tacked onto the end of the audio chain after the Elecraft K2. Thirdly, the very slow tuning rate of the DSP-10 (10 Hz at a time by keystroke, not with an infinitesimal rotation of a knob) was a real advantage with the weak signals, especially since they could be seen on the display and 'dialed in' using the computer keyboard until they were centered at 600 Hz on the screen, right at the center of the DSP filter. Finally, I think the mast mounted preamps likely eliminated any effect of the better MDS the transverter/K2 combination might have compared with the DSP-10, and evened the score in this regard. I had previously compared the K2 with the IC-735 as IF, and the K2 won hands down; I think the K2 is a very, very good IF rig, but I liked the DSP-10 better during this test.

For the first night of the first leg of the ARRL EME Contest 2000 I had very different band conditions than during the Italian EME contest. For the ARRL Contest I was greeted with a noisy night with lots of pulse-type noise, ideal to test the K2's noise blanker. I also got a night with a lot of local activity, and this combination made some things very clear. The equipment setup was as described for the Italian EME Contest, but because of the different band conditions, what I found when I compared receivers was significantly different in some respects than what I reported for the Italian contest, when noise and interference conditions were rather quiet. First of all, there are some 1.5 KW stations within a few miles of me, and the DSP-10 overloaded when they were transmitting at times when I was in their line of sight to the moon and it was low. In contrast, the K2 / Transverter was really only bothered close in, frequency-wise, and then I could still work through the noise. Having the K2's noise blanker on did increase the problems with local QRM, as is the case with any noise blanker I've ever tried, but I could still work with the NB on. In contrast, I just had to shut the DSP-10 down when the locals were transmitting. Second, with the severe pulse-type noise present here on first night of the first leg of the ARRL EME Contest, the LMS noise reduction on the DSP-10 just didn't take out the noise sufficiently. This is not surprising, as when the pulse noise is very bad here, NO LMS algorithm I've ever used is sufficient. It takes a good noise blanker plus LMS (or just Linrad) to do the job! During the periods where the pulse noise was absent, the DSP-10 was a joy to use. As I noted before, it is very comfortable to listen to and with the binaural implementation Bob Larkin has put into it, it really pulls the signals out of the mud. During the quiet periods I really preferred it to the K2/Transverter combination, but again it couldn't be used when the pulse noise or very strong local QRM was present.

Thirdly, I have a lot of birdies here at W3SZ. Frequently they were close in to the station I was trying to copy. Here the use of the K2/Transverter fed into the computer running DSP-Blaster was again superior, as I could either make the filter very narrow, or turn on the adaptive notch DSP Blaster provides (it is VERY sharp and narrow), or both and eliminate the offending carrier. The DSP-10's adaptive notch filter frequency cannot be manually adjusted, and so it removes the desired CW signal along with interference, making it unhelpful for this application. Additionally, at the time of this test the filter options of the DSP-10 were more limited than they are now (see filter details elsewhere in this article). I did try running one computer with the DSP-10 144 MHz transceiver and feeding the DSP-10 receive audio to another computer running DSP-Blaster to make use of DSP-Blaster's adaptive notch filter. This accomplished removal of the birdies as well.

Fourth, on the VERY weak stations, it was helpful to be able to play with the filter parameters on DSP Blaster. I found that for the really weak stations I could only copy them with the K2/Transverter/DSP Blaster combination. With the DSP-10 software I had available at that time, the center frequency of the filter was limited to 600 Hz, and the only bandwidths available were 200 and 450 Hz. Now (2/15/2003) the DSP-10 software permits one to design an additional filter, and the bandwidth and center frequency choices are expanded as noted above, and I suspect this operational superiority of the K2/transverter combination would be eliminated or at least diminished as a result.

To summarize the use of the DSP-10 144 MHz transceiver for weak signal use with human psychoacoustic detection and decoding, it does a very good job for weak signal work except under conditions of high noise and strong signal interference. It should be excellent most anywhere for use as a microwave IF rig, and is very good on 144 MHz as a primary weak signal transceiver unless the environment is one of very high noise level or very strong local signals, or both. Unfortunately, this is my current environment much of the time.

VI. 'New' Modes Available with the DSP-10

What REALLY sets the DSP-10 hardware/software combination apart from the competition are the very innovative "new" modes that Bob Larkin designed into the software. These "automated" weak signal modes are named EME-2, PUA43, LHL-7, and LTI . By using long-term integration techniques and narrow bandwidths they allow signal detection and communication at received signal levels far below those ordinarily required . Therefore, they provide the promise of successful communications using power levels significantly below those previously required, or with antenna installations taking substantially less space than heretofore required, or both. Additionally, they provide tools for accurately assessing system performance, and for exploring unique modes of propagation or marginal signal paths. These modes open up a whole new area for active Amateur experimentation and exploration, and provide yet another arena where we can contribute importantly to the scientific body of knowledge.

These modes can be accomplished only when the unit is used to communicate with other DSP-10 units, and they place stringent requirements on frequency accuracy and stability, and correct timing. Frequency accuracy and stability must be on the order of 0.5-1 Hz AT THE OPERATING FREQUENCY (which may not be 144 MHz if the DSP-10 is used as an IF rig) when 2.3 Hz bin size is selected. Timing of the two stations must be within 50-100 milliseconds (30 milliseconds is preferred). These requirements pretty much mandate the use of GPS-controlled oscillators for frequency control, and GPS or other NIST-Standardized timekeeping at both ends of the attempted contact.

I have been successful using, for frequency control, either a Rb-controlled oscillator (Efratom FRS) or a GPS-disciplined oscillator (either Brooks Shera's homebrew unit or a surplus HP Z3801A). See K8CU's website for an excellent first look at the Z3801A, with many very helpful details (http://www.realhamradio.com/GPS_Frequency_Standard.htm). These units are available from Buy Legacy for $249.00 as of 2/15/2003. The units are listed on their website with many details at http://www.buylegacy.com/ . See Brooks' website at http://www.rt66.com/~shera/index_fs.htm for details on his fine unit. I've had good results with either GPS or internet-controlled timekeeping. If, like me, you don't have network access on the DOS machine you use for DSP-10, getting the timing accuracy from the GPS or internet-controlled clock into the DSP-10 machine at the 30 millisecond level can be a bit tedious!

EME-2 is a mode for determining system performance and path conditions. A typical screen for this mode is shown in figure 2. In this mode the DSP-10 transmits a CW pulse for 2 seconds. There is a delay of 2.6 seconds from the START of the transmitted pulse to allow for pulse travel, followed by a 2 second receive period. (The actual pulse travel time will vary from about 2.4 seconds at perigee to about 2.7 seconds at apogee). The cycle then repeats (every 5 seconds) for as long as desired, and the DSP-10 averages the received signal to gain the 'square root of n' increase in signal-to-noise ratio obtained with n >1. An averaged spectrum is displayed in yellow in the 'standard' DSP-10 spectrum display area. With this technique Bob W7PUA has detected well defined EME echoes at 144 MHz using 5 watts of transmit power and a 4 x 12 element yagi array! EME Doppler correction is automatically applied by the software. The software can introduce a random frequency shift with each cycle, to minimize the effects of any birdies that are present by 'smearing' them over many bins. A maximum range of spread of 200 Hz is a good starting point for this parameter. The software will automatically identify in CW periodically, to meet FCC requirements. For this mode the timing requirements are relaxed, since the same station is transmitting and receiving, but the timing should still be within about 20 seconds for 144 MHz work or 2 seconds for 1296 MHz work so that the Doppler correction calculations are adequate. Bin width is set to 2.3, 4.6 or 9.2 Hz by setting the Spectrum Analysis Width (SpecAnl Width) parameter to 1200, 2400, or 4800 Hz, respectively. The EME-2 mode will provide an estimate of the returned signal strength, and is thus an excellent way to initially characterize and then follow the performance of one's EME system over time.

The second "automated mode" is PUA43, so named because Bob W7PUA created it, and because there are 43 defined characters in the PUA43 code: the letters A-Z, the numerals 0-9, Space, Period, the comma, the forward slash, the pound sign, the question mark, and the Dollar sign. The pound sign is defined as "message received" and the Dollar sign is used to shift the meaning of the following character. This mode is the mode generally used for two-way low power level EME communications, and is the direct antecedent of JT44. With PUA43, message lengths of 14 or 28 symbols can be selected. The mode transmits for one minute out of each 2 minute transmit/receive cycle, and receives for the other minute. Each symbol is sent for 2 seconds, so if a 14 character message length is selected, the message is repeated during the second half of the minute-long transmit period, giving an immediate 1.5 dB signal-to-noise advantage over the 28 character-length mode. At the end of each transmit minute a 4 second CW ID is inserted. In this mode each character is represented by one of 43 defined frequency bins. Within the received spectrum, every fourth receive bin is used for one of these 43 character tones, with guard bins adjacent to each tone bin used to allow for spectral broadening and frequency errors. Noise is estimated by measuring the level of the second-adjacent bins on either side of each tone bin. A pseudo-random frequency spread is again used to reduce the effects of birdies. The shift for each transmit period is taken from a lookup table that defines a value of the shift function for every minute of the day. Doppler corrections can again be automatically applied, and the pulse transit delay (2.6 seconds is again used) is applied automatically. The frequency accuracy of the transmit/receive system should be kept to within 0.5, 1.0, or 2.0 Hz AT THE OPERATING FREQUENCY depending upon the bin width, which is a function of the Spectrum Analysis Width, as noted above. The software uses a message estimation algorithm to estimate the received message based upon the previously received data. A black-colored character in a message estimation box means the estimate has a low confidence level for that character, a beige character indicates a medium level of confidence, and a white-colored character means a high confidence level has been achieved. It is possible to adjust the quality level required for achieving a particular result with this display, by using the "Quality Ratio" parameter. With this mode Bob W7PUA and his brother Beb W7SLB have completed a two-way EME contact on 144 MHz using single yagis and 150 watts transmitter power at each end. Ernie W7LHL and Larry W7SZ completed an EME contact on 1296 MHz with TVRO dishes and 5 watts of transmit power at each end with this mode. These same amateurs also completed an EME contact on 10 GHz using the TVRO antennas and 5 watts transmit power at W7LHL and 15 watts transmit power at W7SZ. The details of these exploits are at:
http://www.proaxis.com/~boblark/wksig1.htm.

The third DSP-10 automated mode is LHL-7. This is essentially an FSK-based Morse code method with much greater tolerance for frequency errors than PUA43. It can be used with either human or automatic decoding. Dots are sent at 750 Hz tone frequency, dashes at 900 Hz, end of character at 600 Hz, and "times two" at 1050 Hz, "times three" at 1200 Hz, "times four" at 1350 Hz, and "times five" at 1500 Hz. Thus "e" would be 750 Hz, 600 Hz. The numeral "5" would be 750 Hz, 1500 Hz, 600 Hz. Each tone can be sent for either 2, 4, 10, 20, or 60 seconds. Automatic Morse ID can be sent periodically. Automatic Doppler correction can be applied. Timing requirements are relaxed slightly due to the potentially longer pulse lengths, but must still be within the range for adequate automatic Doppler correction. There is substantial flexibility in the parameter selections available for this mode, and they are spelled out very nicely in the file Readme20.txt, available on Bob W7PUA's website (listed above). This is the only DSP-10 mode that I have not used and tested.

The fourth and currently the last automatic mode available in the DSP-10 hardware/software package is the LTI, or Long Term Integration mode. This mode is able to detect signals in the range of -180 to -190 dBm. Such signals are on the order of 30-40 dB below audibility with a 'normal' receiver. This mode operates much like EME-2, with alternating transmit and receive periods, but the transmit and receive cycle lengths are adjustable variables, and either CW or a continuous tone can be transmitted, with automatic CW ID possible as well. Both frequency randomization and automatic Doppler correction for EME can be used if desired. There is no practical limit on the number of transmit/receive cycles or signal averages that can be used, as long as adequate frequency stability is maintained. For very weak signals the number of signal averages can be extended into the thousands. There is a 'noise blanker' function that will discard the data from a given period if the noise in the noise-measurement bins for that period exceeds the running average of the noise by 'x' dB. This mode is most useful for determining path performance between two stations, and for exploring the possibility of a link between two sites where conditions are expected to be at most marginal. It is an excellent experimental propagational tool.

The DSP-10 can, for experimental purposes such as testing the robustness of the automated techniques, generate transmit signals with known amounts of Gaussian white noise added to the signal. Scrl-F6 puts one into the Setup menu for this feature.

VII. Summary

The DSP-10 is an innovative 'Software Defined Radio' that functions as a Weak-Signal 144 MHz Transceiver, and that can be built from scratch by Amateurs who are reasonably competent in standard construction techniques. It can be used directly on 144 MHz, or as an IF for higher frequency work. Although it functions very well when used with conventional modes such as CW, SSB, and FM, its most exciting feature is the availability of the new modes EME-2, PUA43, LHL-7, and LTI. Through the use of long-term integration and very narrow bandwidths these modes allow for successful communications at receive signal levels far below those required for communications using conventional techniques. With a large number of DSP-10's coming on line as a result of several very successful kitting projects by TAPR, there should be ample opportunity for Amateurs to communicate and experiment using this unique and powerful transceiver designed by Bob Larkin, W7PUA.

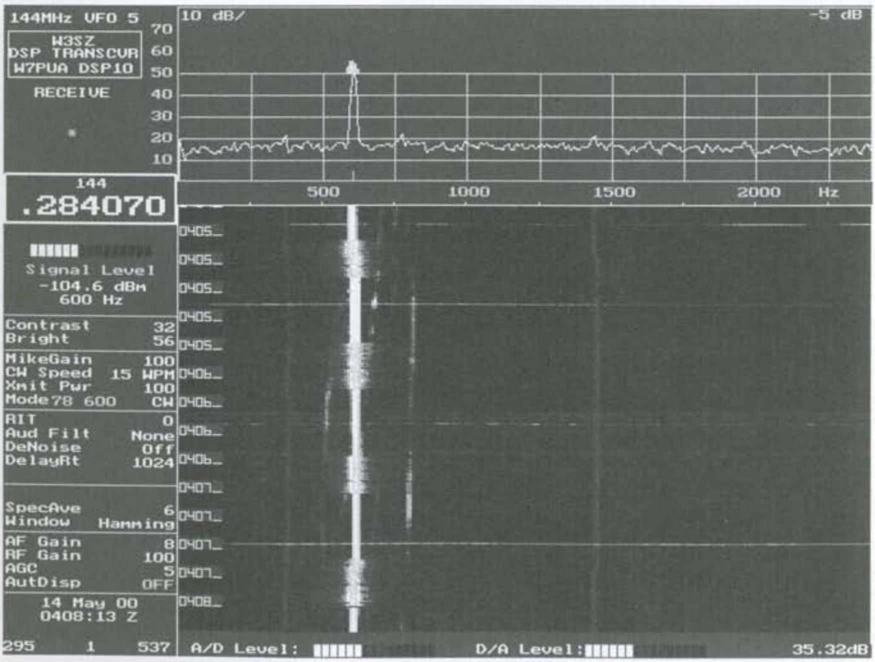

Figure 1: DSP-10 screen showing the W3CCX 2 meter beacon. Across the top of the screen is the spectrum display. Labels on the spectrum include relative signal strength in dB (shown vertically on the left of the spectrum display), and frequency (shown horizontally along the bottom of the spectrum). Baseline level (-5 dB) is shown at the upper right corner of the display. The W3CCX signal peak is easily seen at 600 Hz. Below the spectrum display the waterfall shows a tracing of the beacon signal over time. To the left of the waterfall is the time axis label. Below the waterfall is a display showing the signal levels relative to saturation in the A/D and D/A converters. At the lower right corner of the display, adjacent to the D/A Level Meter, is the current average received power level. To the left of the spectrum display are displays of some DSP-10 operating parameters. We can see that we are in receive mode, that the VFO is set to 144.284070 MHz, and that the signal peak has a level of -104.6 dBm and is centered at 600 Hz. Next are indicators of the settings for display contrast and brightness, mic gain, CW speed, transmit power, and mode (CW). The mode display also tells us that the CW frequency offset is set to 600 Hz. Then we see that RIT, Audio Filter, and Denoiser are off, and that the binaural delay is set at 1024. Next we see that 6 signals are averaged for each spectrum display and waterfall line, and that a Hamming windowing function is being used. The values for audio gain, RF gain, AGC, and automatic display (essentially AGC for the spectrum display) are shown next. At the very bottom of the display on the left we see the date and time and a line containing 3 numbers showing the status of the serial port and the FFT scale factor.

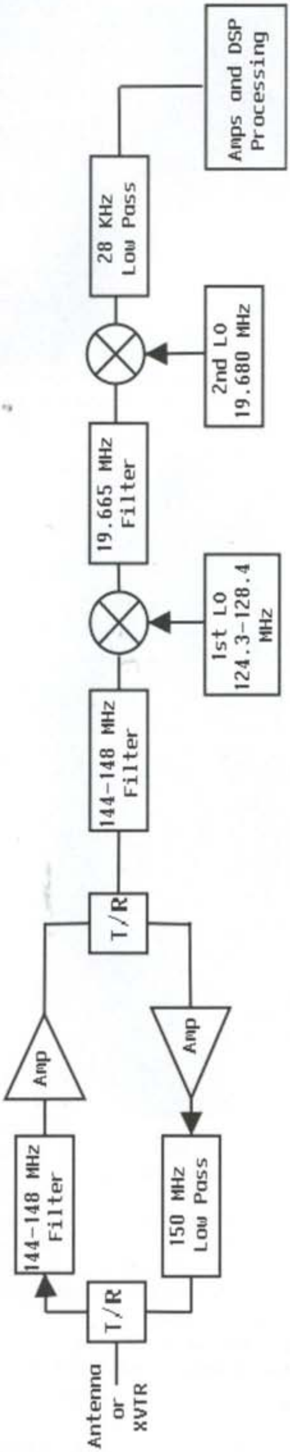

Figure 2. (left) This is a block diagram of Bob Larkin W7PUA's DSP-10 144 MHz Transceiver hardware. See the text and references for details.

Figure 3. This is a screen taken with DSP-10 running in mode EME-2. Transmit power is 150 watts. The yellow-line spectrum tracing at the top of the screen shows a clearly defined echo from this low power EME signal. No signal is apparent in the single-signal spectrum shown in white immediately below the averaged yellow-line spectrum. Labels on the frequency spectrum include relative signal strength in dB, vertically on the left of the spectrum and frequency horizontally along the bottom of the spectrum. Baseline level (8dB) and bin width in Hz (2.3) are shown at the upper right display corner. Below the spectrum display the waterfall shows intermittently a barely visible signal. To the left of the waterfall is the time axis label. To the right is the "Alt-A" parameter box. It shows that 144 points have been averaged and that this has improved signal-to-noise ratio by 10.8 dB. 290K is indicated to be the assumed noise temperature. The S+N/N ratio of the center bin is 0.954, and the bin is centered at 323 Hz. Center bin signal strength is estimated to be -176.4 dBm. Next the S+N/N ratios of the 10 bins above and below the center frequency bin are shown. We then see that EME Doppler Correction is turned on, as is random frequency spread, (42 Hz). To the left of the spectrum display we that we have set the VFO to 144.105.000 MHz, but that 144.104.762 is the actual received frequency due to the offsets associated with Doppler Correction and frequency stir. Setup parameters for the DSP-10 transmitter are then listed. These are labeled and self-explanatory. Below the waterfall the EME Doppler correction parameters are displayed. (See also back cover of this issue!)

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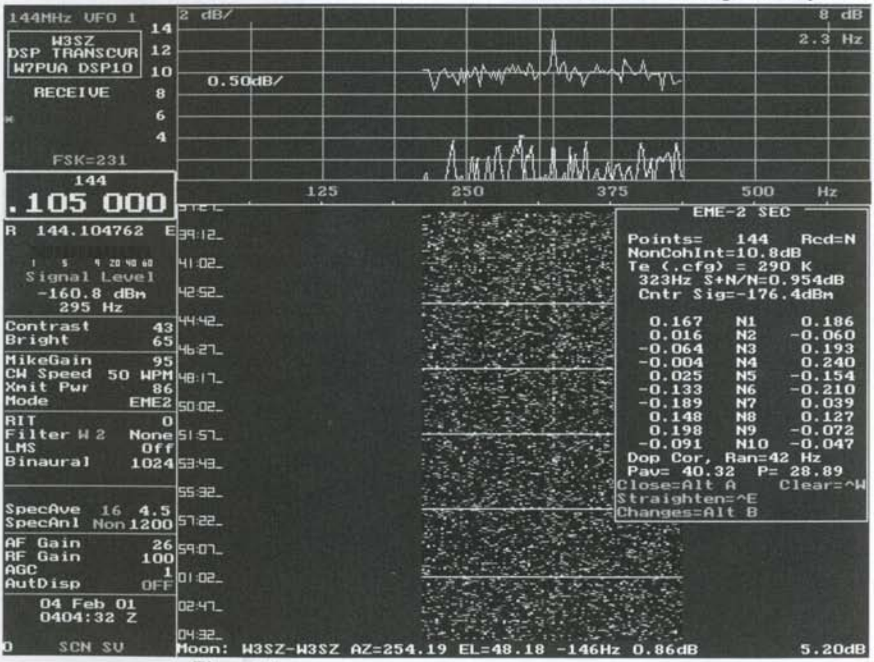

Figure 3

About the Author

W3SZ, Roger Rehr was first licensed in 1968 as WN3JYM. He has held his current call since 1997. His main interests in Amateur Radio are in VHF/UHF/Microwave work, and specifically in weak signal work and 144 MHz EME. He spends most of his radio time building and playing with equipment and the rest using it for monitoring, 'testing' new things, and operating, usually CW or the digital modes.

His work has nothing to do with the world of electronics [except that EVERYTHING these days is electronic]. He works as a Cardiologist in his home town of Reading, Pennsylvania, doing the usual clinical work. During the 1980's he did basic and clinical research in Cardiac NMR, but does none of that now. He is married and has a wonderful and understanding wife and three dear children. He has succeeded in interesting none of them in radio, although he continues to try valiantly.

The picture shows him in his shack in front the a rack with some of the equipment he uses, at the end of a contest weekend with no sleep for a couple of days. Hence the 'goofy look', he says.

He says questions on Linrad or the DSP-10 or whatever are always welcome!

Please visit his website at www.qsl.net/w3sz or his DSP webpage at www.qsl.net/w3sz/start.htm.

Der DSP-10 aus Sicht eines Benutzers: Bob Larkins, W7PUA, innovativer 144 MHz DSP-Transceiver

von Roger Rehr, W3SZ

I. Übersicht

Der DSP-10 ist ein von Bob Larkin, W7PUA liebevoll entwickelter 2-Meter Amateurfunk Multimode Transceiver für "schwache Signale". Bob's Beschreibung dieser Hardware/Software Kombination und die Schaltbilder und Hinweise zum Nachbau erschienen in den Ausgaben September, Oktober und November 1999 des QST Magazins. Dieses 'Software basierende Radio' ist mehr als ein Signalprozessor. Es ermöglicht nicht nur Signalverarbeitung mit den üblichen Betriebsarten CW, SSB und FM, sondern es bietet völlig neue digitale Betriebsarten der Kommunikation unter Verwendung von Langzeitintegration und FSK Techniken, die Verbindungen bei Signalpegeln ermöglichen, bei denen mit üblichen Techniken kein Betrieb mehr möglich wäre. Der DSP-10 unterscheidet sich von Linrad, Spectran, Hamview, DSP-Blaster und anderer bekannter Signalprozessor Software in vielerlei Hinsicht. Zunächst ist der DSP-10 ein vollständiger Transceiver mit der ganzen notwendigen Hardware, um Signale im 144 MHz Amateurband zu empfangen und zu erzeugen. Zweitens verwendet der DSP-10 ein EZ-Kit Lite von Analog Devices für die Signalverarbeitung anstatt einer Sound Karte; es wird über die serielle Schnittstelle mit dem PC verbunden und benutzt den PC zur Steuerung und Anzeige; das EZ-Kit Lite verrichtet die Rechenarbeit.

Die DSP-10 Software kann auch ohne HF-Hardware wie ein Audio DSP Prozessor benutzt werden, einfach durch die Verwendung des EZ-Kit Lite von Analog Devices (siehe unten). Es kann aber auch mit einem externen Eigenbau-Gerät verwendet werden und ist dabei die letzte ZF Stufe des Eigenbau-Receivers. Ich habe dies mit ein paar TUF-1H's und Computer gesteuerten Oszillatoren gemacht und damit einen sehr schönen Receiver gebaut, der einen Bereich beginnend beim Mittelwellenrundfunk bis zum 70 cm Band umfasst. Die Hardware, die ich mit der DSP-10 Software auf diese Art benutzte, war dem sehr ähnlich was ich mit Linrad verwende.

II. Die Anzeige des DSP-10 und Eigenschaften der Software

Ob die DSP-10 HF Hardware nun benutzt wird oder nicht, Bob's DSP-10 Software hat eine ausgezeichnete Wasserfallanzeige mit einstellbarer Verstärkung, einstellbarer Grundlinie und einstellbarer Signalmittelung (vgl. Bild 1). Die Farbpalette der Wasserfallanzeige kann auch eingestellt werden, allerdings erfordert die Änderung der Palette ein Bearbeiten der Konfigurationsdatei, während sich die anderen beschriebenen Parameter während des Betriebs mit ein paar Tastenklicks ändern lassen. Die angezeigte Bandbreite lässt sich auf 1200, 2400 oder 4800 Hz einstellen. Die DSP-10 Software hat eine ausgezeichnete Spektrumsanzeige, ebenso mit einstellbarer Verstärkung, einstellbarer Grundlinie, einstellbarer Signalmittelung und wählbaren Bandbreiten von 1200, 2400 oder 4800 Hz.

In Bild 1 sieht man die Spektrumsanzeige in der oberen rechten Ecke des Bildes mit der Wasserfallanzeige darunter. Diese Anzeigen gehören zur gleichen Frequenzkalibrierung. Zu der Zeit, als die Bildschirmaufnahme gemacht wurde, empfing der DSP-10 eine CW Bake bei 144.284070 MHz. Man sieht, dass die Bandbreite der Anzeige auf 2400 Hz in diesem Beispiel eingestellt wurde, und dass die Bake etwa 40 dB über dem Grundrauschen liegt. Obwohl die Skala der Spektralanzeige hier auf 10 dB pro Einheit eingestellt ist, kann sie bei Bedarf auf 5, 2 oder 1 dB pro Einheit gestellt werden. Man erkennt einen Marker auf der Spitze des von der Bake erzeugten Signals. Dieser Marker folgt dem Maximum des detektierten Signals innerhalb des Anzeigebereichs, und der Pegel dieses Signals wird als 'Signal Level' in dBm unterhalb der Hauptfrequenzanzeige und des horizontalen Balkendiagramms der Signalstärke in dem oberen linken Teil des Schirms angezeigt. Unterhalb der Signalpegelanzeige steht die Frequenz des automatisch detektierten Spitzensignals in Hz. Dieser Wert entspricht den Frequenz-Kalibriermarkern für die Spektrums- und die Wasserfallanzeige. Unterhalb der Wasserfallanzeige sind Anzeigen für die relativen Signalpegel der A/D- und der D/A Wandler. In der unteren rechten Ecke gibt die auf der gleichen Zeile angezeigte Signalstärke (35.32 dB) den mittleren Leistungspegel der Spektrumsanzeige an. Der Inhalt dieser unteren Anzeigezeile kann geändert werden, um DSP-Status-Daten, Mond-Daten (Azimut, Elevation, Dopplerverschiebung und relativer Signalpegel), Sonnen-Daten (Azimut und Elevation) oder wahlweise ein leeres Feld anzuzeigen. Links am Bildschirm unter der Frequenzanzeige und den Signalpegel-Anzeigen befinden sich einige benutzerdefinierte Parameter, die wie oben erwähnt mit einigen Tastenkombinationen gesetzt werden können, wobei die Kombinationen meist intuitiv sind und leicht gelernt werden können. Ein Kommando-Übersichtsblatt ist zusätzlich verfügbar und kann von Bob Larkin's Website herunter geladen werden:
www.proaxis.com/~boblark/dsp10cmd.pdf

Die benutzerdefinierten Parameter sind u.a. Kontrast, Helligkeit der Wasserfallanzeige, Mikrofonverstärkung, CW-Geschwindigkeit (nur beim Senden), Sendeleistung und Betriebsart. In der Betriebsart CW bestimmt die erste Zahl, die rechts neben 'Mode' angezeigt wird, die Amplitude des CW-Seitentons, und die zweite Zahl bestimmt die Frequenz der CW-Ablage. Die Frequenz des CW-Seitentons folgt der Frequenz der CW-Ablage. Die gegenwärtig implementierten Betriebsarten sind CW, SSB (USB und LSB), FM und vier neue Betriebsarten LHL7, PUA43, EME2 und LTI, die weiter unten beschrieben werden. Unterhalb dieser Anzeigen stehen die Werte der RIT, eine Kennung, welches Audiofilter gewählt ist, der Status des LMS-Rauschfilters und der Status der binauralen Verzögerung. Der DSP Audioprozessor des DSP-10 bietet 200-, 300- und 450-Hz-Bandbreitenfilter bei einer Mittenfrequenz von 600 Hz, ein 600-Hz-Filter bei einer Mittenfrequenz von 700 Hz und ein 300-Hz-Filter bei einer Mittenfrequenz von 800 Hz. Zusätzlich gibt es ein sin(f)/f Matched-Filter für 12 wpm CW, zwei SSB-Filter (250 Hz bis 2500 Hz und 200 Hz bis 2900 Hz) und auch ein selbst definierbares Filter. Die LMS Rauschreduktion kann aktiviert und die angepasste Verstärkung mit ein paar Tastenklicks eingestellt werden. Die Anstiegszeiten und die Länge der Verzögerungsleitung müssen nur selten eingestellt werden und können über die Konfigurationsdatei geändert werden. Das automatische LMS-Notchfilter kann über die Tastatur leicht ein- und ausgeschaltet werden. Leider kann die Frequenz des automatischen Notchfilters nicht von Hand geändert werden, so dass es im aktivierten Zustand sehr wirkungsvoll das gewünschte CW Signal unterdrückt. Die übrigen angezeigten Parameter in dieser Bildschirmspalte sind die Anzahl der spektralen Mittelungen pro angezeigtem Frequenzpunkt, der Typ der Fensterfunktion (keine, Tukey25, Hamming oder BH-92), Audio- und HF- Verstärkung bei Empfang, der AGC-Status und Pegel, und die automatische Anzeigekorrektur (notwendige AGC für die Wasserfalldarstellung). Viel mehr Informationen, die die Möglichkeiten und die Bedienung der DSP-10 Software betreffen, ist auf Bob Larkin Website zu bekommen, deren URL unten angegeben ist. Auf dieser Website findet man diese Informationen unter den Links "V2.0 'read me' notes" und "V1.6 'read me' notes".

III. Ein Einstieg

Die DSP-10 Software ist frei verfügbar und kann von Bob Larkins Website heruntergeladen werden unter: http://www.proaxis.com/~boblark/dsp10.htm Sie läuft nur unter reinem DOS und nicht in einem DOS Fenster. Bobs Website hat eine Fülle von Informationen über den DSP-10 einschließlich der Kopien des Original QST Artikels im PDF-Format, ein Link zur Website von Analog Devices (sie stellen das EZ-Kit Lite her und bieten es zum Online-Verkauf an), eine Stückliste, die es leicht macht, Bauteile für das Projekt zu bestellen, eine Bauanleitung mit zahlreichen hilfreichen Hinweisen, die neueste Version der Software, Korrekturen und Verbesserungen zu früheren Beschreibungen und schließlich Links zu Webseiten mit Diagnosesoftware und Hinweisen, wie man den DSP-10 zum Laufen bringt und optimiert. Obwohl ich meinen DSP-10 durch Bestellung sämtlicher Bauteile nach den Informationen auf Bobs Website selbst gebaut habe und dies auf Anhieb auch funktioniert hat, habe ich danach zwei DSP-10 Kits von TAPR (http://www.tapr.org/) gekauft. TAPR bietet zeitweise Bausätze mit sämtlichen Teilen an, ausgenommen das EZ-Kit Lite. Dies vereinfacht die Bauteilbeschaffung und spart Kosten durch Mengeneinkauf. Auf ihrer Webseite sollte man nach dem nächsten Angebot schauen. Leider hat das EZ-Kit Lite jetzt die Teilenummer ADDS-2181-EZLITE (Original Analog Devices Teil ADDS-21XX-EZLITE) und der Preis ist um einiges gestiegen. Ich kaufte mein Kit 1999 von Newark Electronics und nochmals Anfang 2001 zu einem Preis von $94,70. Seit dem 15.2.2003 kann das Kit von Analog Devices zum Preis von $245,00 zuzüglich Versandkosten oder von Newark Elelctronics oder anderen Lieferanten für $346,95 zuzüglich Versandkosten gekauft werden. Seit kurzem erscheinen einige von Amateuren entwickelte Alternativen zum EZ-Kit Lite. Peter Rhodes, G3XJP hat den PIC-A-STAR, ein auf dem EZ-Kit Lite basierenden Kurzwellentransceiver entwickelt. Als Teil dieses Projektes hat er eine Eigenbauversion des EZ-Kit Lite entwickelt und gebaut, die mit ein paar Änderungen in der DSP-10 Software zur Verwendung mit dem DSP-10 geeignet ist. Bob Larkin hat angedeutet, dass er plant, die notwendigen Softwareänderungen durchzuführen, und Bob sieht keine Probleme mit dieser Lösung. Peters PIC-A-STAR-Design läuft seit 7 Monaten in der RadCom und ist nach Peters Aussage zu 1/3 abgeschlossen. Der Artikel beinhaltet das Platinenlayout, die Stückliste, die Schaltpläne, u.s.w., sowie eine Beschreibung, wie der Bau mit einfachen 'haushaltsüblichen Werkzeugen' – wie Peter sagt – vollendet werden kann. Lyle Johnson, KK7P, baut ebenso ein DSP-Modul, welches das EZ-Kit Lite ersetzen könnte. Details hierzu findet man auf seiner Website. Schließlich arbeiten auch DH6IAL und DC9UP an einem EZ-Kit-Lite-Ersatz. Sie werden über die DSP-10 Mailing Liste bekannt geben, wenn die Entwicklungsarbeiten beendet sind.

Die Audio-Version des DSP-10 ohne HF-Hardware in Betrieb zu nehmen, ist ein Kinderspiel. Man stöpselt nur den Audioausgang des Funkgerätes in den Eingang des EZLITE, schließt den Kopfhörer am Ausgang des EZLITE an, verbindet ein serielles Kabel mit dem Computer und startet die Software. Es ist genauso einfach, einen externen Selbstbau-HF-Transceiver anstatt eines kommerziellen Gerätes zu benutzen. Der Bau des vollständigen computer-gesteuerten DSP-10 144 MHz Transceivers, wie er in den oben genannten Ausgaben der QST beschrieben wurde, dauert seine Zeit, ist aber nicht schwierig, obwohl das Design SMD-Technologie verwendet. Ich baute einen DSP-10 144-MHz-Transceiver Anfang 2000 und fand ihn vorzüglich geeignet als ZF-Nachsetzer für die Mikrowellenbänder. Die Möglichkeit, jene schwachen Signale auszusondern, die eine Ablage von bis zu 4 kHz von der Frequenz 2304 MHz und höher hatten, ist entscheidend in Mikrowellen- Kontesten, und dieses Radio hat seine Aufgabe vorzüglich gemeistert. Ich habe den DSP-10 144 –MHz-Transceiver auch als Empfänger für schwache Signale und für 144-MHz-EME verwendet. Bei schwachen 144-MHz-Signalen im terrestrischen Einsatz in gestörter urbaner Umgebung ist der etwas eingeschränkte Dynamikbereich ein Problem. Der Empfänger kann durch starke lokale Signale zugestopft werden. Das ARRL-Labor bestimmte den IP3 mit –21 dBm. Die Einschränkung des Dynamikbereichs spiegelt nach meiner Meinung wahrscheinlich die begrenzte Dynamik des EZLITE wieder. Der EZLITE basiert auf der ADSP-2100 Serie von DSP-Mikrocontrollern. Diese sind 16-bit-Festkomma-Prozessoren und der im EZLITE benutzte Codec ist der AD1847, der wahrscheinlich nur 12 bis 13 Bit nn nutzbarem Dynamikbereich hat, obwohl es ein 16 Bit Baustein ist. Ich denke daher, dass die Einschränkung des Dynamikbereiches in diesen Komponenten begründet liegt und nicht im analogen HF-Teil. Der DSP-10 verwendet einen MAR-6-Verstärker als erste Stufe. Dieses Bauteil hat einen IP3 von +14 dBm. Obwohl danach ein MAR-

3 vor dem ersten TUF-1 Mischer und dem Quarzfilter folgt, denke ich nicht, dass diese Bauteile der begrenzende Faktor in der Dynamik sind.

IV. Die DSP-10 Hardware

Die DSP-10-144-MHz-Transceiver-Hardware wird ausführlich in den originalen QST-Artikeln beschrieben. Diese Information ist auch auf Bob Larkins Website verfügbar und befindet sich auf der CD, die Teil der ARRL-Veröffentlichung 'Experimental Methods in RF Design' ist. Der Text dieser Veröffentlichung beschreibt auch detaillierter die Grundlagen der DSP-10 Software. Das grundsätzliche Hardware-Design des DSP-10 ist ein Empfänger mit zweifacher Umsetzung, wobei der erste LO bei 124,3 bis 128,4 MHz liegt, was eine ZF von 19,665 MHz ergibt, und der zweite LO bei 19,680 MHz liegt, was eine zweite ZF von 15 kHz ergibt, die dann zum EZ-Kit Lite zur Signalverarbeitung führt. Grobe 5 kHz Abstimmschritte werden durch den ersten LO-Synthesizer ermöglicht und feine 1 Hz Schritte lassen sich mit der DSP-Software einstellen. Die DSP-Software verwendet Quadraturmischung für SSB und einen Arcustangens-Detektor für FM. Der DSP-10 kommuniziert mit dem DOS-PC über die serielle Schnittstelle bei 9600 Baud.

Den Signalpfad von der Antenne und das Blockschaltbild der Hardware zeigt Bild 2. Das von der Antenne empfangene Signal sieht einen PIN-Dioden Sende/Empfangs-Umschalter und danach ein 143-149-MHz-Bandpassfilter. Die HF-Verstärkung wird durch MAR-6 und MAR-3 MMICs -wie bereits erwähnt- sichergestellt. Einem weiteren PIN-Dioden Sende/Empfangs-Umschalter folgt ein 143-149 MHz Cohn-Bandpassfilter. Diesem folgt ein TUF-1 als erster Mischer, wonach ein 4-poliges 19,665 MHz Quarzfilter folgt. Als zweiter Mischer danach wiederum ein TUF-1. Diesem folgt ein Tiefpassfilter mit einer Grenzfrequenz von etwa 28 kHz und danach ein rauscharmer Verstärker, bevor das Signal zum EZ-Kit Lite gelangt. Jede weitere Signalverarbeitung erfolgt auf der DSP-Platine.

Sendeseitig ist der Signalpfad entgegengesetzt. Das EZ-Kit Lite erzeugt ein Signal bei einer Frequenz von 15 kHz. Dieses wird verstärkt und nach Durchlaufen des Sende/Empfangs-Umschalters mit dem zweiten LO im zweiten Mischer zu einem 19,665 MHz Signal gemischt. Dieses gelangt durch das 19,665 MHz 4-polige Filter und wird im ersten Mischer in ein 144 MHz Signal konvertiert. Das Sendesignal passiert das Cohn-Bandpassfilter und wird danach mit einem MAR-6, dann einem MAR-4 und schließlich einem 2N5109 verstärkt. Nach Filterung mit einem Tiefpass gelangt das Signal über den Sende/Empfangs-Umschalter an den Antennenstecker.

Der DSP-10 144 MHz Transceiver benötigt 13,6 V bei max. 0,75 A (die Versorgungsspannung reicht von 10,6-16 V). Er umfasst den Bereich 144-148 MHz. Der Empfängerrauschpegel wurde vom ARRL Labor bei einem 450 Hz Filter mit –136,8 dBm gemessen. Der Interceptpunkt zweiter Ordnung beträgt +69 dBm bei Eingangssignalen von 66 MHz und 72 MHz. Der Interceptpunkt dritter Ordnung (IP3) beträgt, wie erwähnt, -21 dBm. Die ZF-Unterdrückung ist 127 dB und die Spiegelfrequenzunterdrückung ist 125 dB. Die maximale Ausgangsleistung beträgt 40 mW. Diese und weitere Spezifikationen wurden im abschließenden QST-Artikel von November 1999 angegeben. Die Juni 2000 Ausgabe der QST enthält einen weiteren Artikel von W7PUA, der den Bau eines Verstärkers beschreibt, der die Ausgangsleistung des DSP-10 auf 8 Watt erhöht.

V. Praktische Erfahrungen mit d. DSP-10

Bevor die äußerst einzigartige automatische Signaldetektion und die Dekodierungseigenschaften des DSP-10 beschrieben werden, möchte ich meine Erfahrungen im CW Betrieb während des im September 2000 durchgeführten italienischen EME Kontests beschreiben Die Ausrüstung, die ich für diese Test benutzte, ist wie folgt: Das Antennensystem waren 2 x 2 gestockte M2 2MXP20s mit getrennten Empfangspfaden für vertikale und horizontale Polarisation. Es befanden sich duale ARR 144 MHz Vorverstärker auf dem Mast nahe bei den Leistungsteilern. Die Zuführungen (LMR600UF zum unteren Ende des Masts und danach 7/8 Inch Festmantelkabel zum Shack) wurden mit einem speziellen EME-Relais im Shack verbunden, so dass ich die Polarität schnell umschalten konnte oder beide H- und V- Polarisationen an zwei getrennten Empfängern gleichzeitig überwachen konnte. Für den Empfängertest behielt ich das Relais an dieser Stelle und montierte einen Zwei-Wege Leistungsteiler danach, um das Empfangssignal in zwei Wege aufzuteilen. Ein Pfad ging an die SSB Electronics LT2S Mk II / K2 Kombination und der andere an die HF-Version des DSP-10. Weil ich mehr als 20 dB Gewinn durch den Vorverstärker am Mast habe und wesentlich weniger Leistungsverluste, bewirkt diese Signalaufteilung keine nennenswerte Signalschwächung. Die Audio-Signale beider Kombinationen hatte ich einem professionellen Mischpult (Sampson) mit guter HF-Schirmung zugeführt und dann das Ausgangssignal des Mischpults einem Computer mit dem Programm DSP-Blaster zugeführt und daran Kopfhörer angeschlossen, und weiterhin an einen anderen Computer mit dem Programm Spectran zur visuellen Anzeige des Signals (Spektrum und Wasserfallanzeige).

Was ich während des italienischen EME-Kontests herausfand war, dass ich Stationen einfach entdeckte, und ich fand es angenehmer, diese mit der DSP-10 Hardware zu hören und aufzunehmen als mit meiner SSB Electronics LT2S Mk II / Elecraft K2 Kombination, unabhängig davon ob der LT2S/K2 ohne DSP, mit DSP Blaster, mit der AUDIO-Version des DSP-10 oder mit Spectran lief. Ich denke, dies spiegelt hauptsächlich die Tatsache wieder, dass die Implementierung des binauralen Empfangs im DSP-10 hervorragend gelungen ist. Es gab Signale, die ich bei abgeschaltetem binauralen Modus im DSP-10 kaum wahrnehmen konnte, die aber aus dem Grundrauschen auftauchten als ich den Modus einschaltete (normalerweise läuft der DSP-10 mit diesem Modus und ich schalte ihn nur aus, um herauszufinden, warum der DSP-10 Empfänger so 'heiß' ist; was dabei wirklich passiert ist, dass Signale, die leicht aufzunehmen sind, sich im Rauschsumpf verlieren, sobald der binaurale Modus ausgeschaltet wird). Ebenso scheint die Qualität des Empfangssignals besser zu sein, wenn das Signal mit dem DSP-10 144 MHz Empfänger aufgenommen wird, als wenn der Audio DSP-10 am Ausgang des Elecraft K2 angeschlossen wird. Drittens sind die sehr feinen Abstimmschritte des DSP-10 (10 Hz pro Tastendruck, nicht mit einer unendlich feinen Drehung eines Knopfes) ein wirklicher Vorteil bei schwachen Signalen, besonders da sie auf dem Bildschirm beobachtet und mit der Computer Tastatur eingegeben werden können bis sie bei 600 Hz auf dem Schirm in der Mitte des DSP Filters zentriert sind. Schließlich eliminiert der am Mast montierte Vorverstärker jeden möglichen Vorteil der MDS Transverter K2 Kombination gegenüber dem DSP-10 und stellt beide in dieser Hinsicht gleich. Ich hatte zuvor den K2 mit dem IC-735 als ZF verglichen und der K2 hat haushoch gewonnen. Ich glaube, der K2 ist ein sehr, sehr gutes Funkgerät, aber ich zog den DSP-10 während dieses Kontests vor.

Während der ersten Nacht des ARRL-EME-Kontests 2000 hatte ich völlig andere Bandverhältnisse als beim italienischen EME-Kontest. Beim ARRL-Kontest wurde mir eine verrauschte Nacht mit einer Menge von pulsähnlichen Störungen beschert, die ideal war, den Noise Blanker des K2 zu testen. Ich bekam auch eine Nacht mit vielen örtlichen Störungen, und diese Kombination verdeutlichte einiges. Die Ausrüstung war wie beim italienischen EME Kontest, aber bedingt durch die anderen Bandverhältnisse fand ich beim Vergleich der Empfänger etwas wirklich anderes heraus, als was ich beim italienischen EME Kontest gesagt habe, als die Bedingungen betreffend Rauschen und Interferenzen ziemlich ruhig waren. Zunächst gab es einige 1,5 kW Stationen in einem Umkreis von einigen Kilometern und der DSP-10 wurde zugestopft als sie sendeten, während ich in ihrer Sichtlinie zum Mond lag und der Mond niedrig stand. Im Gegensatz dazu wurde der K2 / Transverter nur bei frequenzmäßiger Nähe etwas beeinflusst und ich konnte trotz der Störungen arbeiten. Der eingeschaltete Noise Blanker des K2 ließ das Problem mit den lokalen Störungen ansteigen, so wie es bei jedem Noise Blanker war, den ich je versucht habe, aber ich konnte dennoch mit eingeschaltetem Noise Blanker arbeiten. Den DSP-10 musste ich dagegen ausschalten, als die Nachbarstationen sendeten. Zweitens, als die starken pulsähnlichen Störungen in der ersten Nacht des ARRL-EME-Kontests auftauchten, konnte die LMS-Rauschreduktion des DSP-10 die Störungen nicht ausreichend entfernen. Dies ist nicht überraschend, da KEINER der LMS-Algorithmen, die ich je verwendet habe, ausreicht bei den hier herrschenden Störungen. Man benötigt hierzu einen guten Noise Blanker und zusätzlich LMS (oder wenigstens Linrad)! Während der Zeiten ohne Pulsstörungen, war es eine Wonne, den DSP-10 zu benutzen. Wie ich bereits erwähnt habe, ist es sehr angenehm, mit der binauralen Implementierung zu hören. Bob Larkin hat sie implementiert und sie holt die Signale aus dem Rauschsumpf. Während ruhiger Abschnitte zog ich sie der K2/Transceiver Kombination vor, aber sie konnte wie gesagt bei pulsartigen Störungen oder sehr starkem lokalen QRM nicht benutzt werden.
Drittens habe ich hier in der Nähe einige starke Stationen. Sie sind häufig nahe der Station, die ich aufzunehmen versuche. Hier ist die Verwendung des K2/Transverters mit Anschluss an den Computer mit der DSP-Blaster Software wiederum überlegen, da ich entweder die Filter sehr schmal einstellen kann, oder ich schalte das adaptive Notch Filter ein, das der DSP Blaster anbietet (es ist SEHR scharf und schmal), oder ich benutze beides und schalte so den störenden Träger aus. Das adaptive Notch Filter des DSP-10 kann nicht eingestellt werden und so entfernt es das gewünschte CW Signal zusammen mit dem Störer und macht es unbrauchbar für diesen Anwendungsfall. Außerdem waren die Filteroptionen des DSP-10 zum Zeitpunkt des Tests beschränkter als sie es jetzt sind (siehe Details zu den Filtern an anderer Stelle in diesem Artikel). Ich versuchte, den DSP-10 144 MHz Transceiver an einen Computer anzuschließen und das Audio Empfangssignal des DSP-10 an einen weiteren Computer anzuschließen, um das adaptive Notch Filter des DSP-Blasters nutzen zu können. Damit ließen sich die Störungen der starken Stationen ebenso ausschalten.

Viertens war es bei SEHR schwachen Stationen sehr hilfreich, mit den Filterparametern des DSP-Blasters zu spielen. Ich fand heraus, dass ich wirklich sehr schwache Stationen nur mit der K2/Transverter/DSP Blaster Kombination aufnehmen konnte. Mit der DSP-10 Software, die ich zu der Zeit zur Verfügung hatte, war die Mittenfrequenz des Filters auf 600 Hz beschränkt und die verfügbaren Bandbreiten waren 200 und 450 Hz. Jetzt (15.2.2003) erlaubt es die DSP-10 Software, ein zusätzliches Filter zu erstellen und die Wahl von Mittenfrequenz und Bandbreite ist, wie erwähnt, erweitert. Ich nehme an, dass damit die operationelle Überlegenheit der K2/Transverter Kombination damit eliminiert oder wenigstens verringert ist.

Zusammengefasst lässt sich sagen, dass der DSP-10 144 MHz Transceiver mit seiner menschlich psychoakustischen Detektion und Dekodierung bei schwachen Signalen ohne starke Störungen und Interferenzen eine sehr gute Arbeit leistet. Er ist damit ausgezeichnet als Mikrowellentransceiver und sehr gut bei 144 MHz als Transceiver für schwache Signale einsetzbar, sofern die Umgebung frei ist von sehr hohen Rauschpegeln und sehr starken Signalen, oder beiden. Unglücklicherweise ist gerade dies zur Zeit meine Betriebsumgebung.

VI. 'Neue' verfügbare Modes im DSP-10

Was die DSP-10 Hardware/Software Kombination von seinen Mitbewerbern WIRKLICH unterscheidet sind die sehr innovativen "neuen" Modes, die Bob Larkin in die Software implementiert hat. Diese "automatischen" Schwachsignal-Modes heißen EME-2, PUA43, LHL-7 und LTI. Durch die Anwendung von Langzeit-Integrationstechniken und schmalen Bandbreiten erlauben sie die Signaldetektion und die Kommunikation bei Empfangspegeln, die weit unter den üblichen Werten liegen. Deshalb versprechen sie erfolgreiche Verbindungen mit Leistungen, die deutlich unter denen liegen, die zuvor notwendig waren, oder mit Antennenanlagen, die wesentlich weniger Platz beanspruchen als früher notwendig war, oder mit beidem. Zusätzlich stellen sie Werkzeuge zur Feinabstimmung der Systemleistung und zum Erforschen einzigartiger Ausbreitungsmoden oder schwacher Signalpfade bereit. Diese Modes eröffnen ein neues Feld für aktive Amateur-Experimente und Erforschungen und stellen ein Gebiet dar, auf dem wir entscheidend zum wissenschaftlichen Fortschritt beitragen können.

Diese Modes können nur angewandt werden, wenn das verwendete Gerät mit anderen DSP-10 Geräten Verbindung aufnimmt und strenge Forderungen bezüglich Frequenzgenauigkeit und Frequenzstabilität, sowie Zeitverhalten erfüllt werden. Die Frequenzgenauigkeit und –stabilität muss in der Größe von 0,5-1 Hz bei der Betriebsfrequenz liegen (was nicht 144 MHz bedeuten muss, falls der DSP-10 als ZF-Gerät eingesetzt wird), wenn ein Frequenzabstand von 2,3 Hz verwendet wird. Die Zeitkonstanz zwischen zwei Stationen muss im Bereich 50-100 ms liegen (30 ms sind wünschenswert). Diese Forderungen rufen nach einem GPS-gesteuerten Oszillator oder einer anderen Art der Zeitsteuerung auf beiden Seiten der erstrebten Verbindung.

Ich habe erfolgreich sowohl einen Rubidium gesteuerten Oszillator (Efratom FRS) als auch einen GPS-gesteuerten Oszillator (entweder Broks Shera's Eigenbau oder einen HP Z3801A) eingesetzt. Auf K8CUs Website erhält man eine vorzügliche Übersicht zum Z3801A mit vielen hilfreichen Details
(www.realhamradio.com/GPS_Frequency_Standard.htm).
Diese Oszillatoren sind bei Buy Legacy für $249,00 erhältlich. (Stand 15.2.2003). Sie werden auf ihrer Website mit vielen Details beschrieben: http://www.buylegacy.com/ .
Auf Brooks Website unter
http://www.rt66.com/~shera/index_fs.htm erhält man Informationen über seine vorzüglichen Oszillatoren. Ich hatte gute Ergebnisse mit GPS und Internet gesteuerter Zeitbasis. Falls Sie, wie ich, keinen Netzwerkzugang an ihrem DOS Computer haben, wo Sie DSP-10 einsetzen, wird es sehr schwierig werden, die Zeitbasis von einer GPS oder Internet gesteuerten Uhr in den DSP-10 bei einer Genauigkeit von 30 ms zu bekommen.

EME-2 ist ein Modus, um die Systemperformance und die Ausbreitungsbedingungen zu ermitteln. Eine typische Anzeige für diesen Mode ist in Bild 2 dargestellt. In diesem Modus sendet der DSP-10 einen CW Puls mit 2 Sekunden Länge. Einer 2,6 Sekunden Verzögerung, die es dem Puls erlaubt, sich auszubreiten, folgt eine 2 Sekunden Empfangszeit. (Die tatsächliche Laufzeit des Pulses variiert von etwa 2,4 Sekunden im Perigäum bis etwa 2,7 Sekunden im Apogäum). Der Zyklus wiederholt sich (etwa alle 5 Sekunden) so lange wie gewünscht, und der DSP-10 mittelt das empfangene Signal, um den 'Wurzel aus n' Anstieg des Signal-Rausch-Abstands bei n>1 zu verstärken. Ein gemitteltes Spektrum wird in der Standard DSP-10 Spektrumanzeige in gelb dargestellt. Mit Hilfe dieser Technik hat Bob W7PUA bestimmte EME-Echos bei 144 MHz und 5 Watt Sendeleistung und einer 4 x 12 Element Yagi Gruppe aufgenommen! Die EME-Doppler-Korrektur wird durch die Software automatisch durchgeführt. Die Software kann einen zufälligen Frequenzversatz mit jedem Zyklus einfügen, um den Einfluss von starken Stationen zu minimieren, indem sie über das Spektrum 'verschmiert' werden. Ein maximaler Bereich von 200 Hz ist ein guter Startpunkt für diesen Parameter. Die Software identifiziert sich automatisch in CW, um die Lizenzbedingungen zu erfüllen. In diesem Mode sind die Zeitgenauigkeitsanforderungen nicht so streng, da dieselbe Station sendet und empfängt, aber die Zeitbasis sollte innerhalb von 20 Sekunden bei 144 MHz und innerhalb von 2 Sekunden innerhalb bei 1296 MHz konstant sein, damit die Doppler Korrekturberechnung funktioniert. Der Frequenzabstand wird auf 2,3, 4,6 oder 9,2 Hz eingestellt, indem der Parameter 'Spectrum Analysis Width (SpecAnl Width)' auf 1200, 2400 oder 4800 Hz gesetzt wird. Der EME-2 Mode bietet eine Abschätzung der empfangenen Signalstärke an und ist auf diese Weise hervorragend geeignet, das EME-System erstmalig zu charakterisieren und seine Performance über die Zeit zu überwachen.

Der zweite "automatische Modus" ist PUA43. Er ist so genannt, weil Bob W7PUA ihn so genannt hat und weil in dem PUA43 Code 43 Zeichen definiert sind: Die Buchstaben A-Z, die Zahlen 0-9, das Leerzeichen, der Punkt, das Komma, der Schräger, das Pfund-Zeichen, das Fragezeichen und das Dollar-Zeichen. Das Pfund-Zeichen ist definiert als "Nachricht empfangen" und das Dollar-Zeichen wird benutzt, um die Bedeutung der folgenden Zeichen zu ändern. Dieser Modus wird allgemein benutzt für Zwei-Weg-EME-Verbindungen bei geringer Leistung und ist der direkte Nachfolger von JT44. Bei PUA43 können Nachrichtenlängen von 14 oder 28 Zeichen ausgewählt werden. In jedem 2 minütigen Sende/Empfangszyklus sendet der Modus eine Minute lang und empfängt während der anderer Minute. Jedes Symbol wird 2 Sekunden lang gesendet, so dass wenn eine Nachrichtenlänge von 14 Zeichen gewählt wird, die Nachricht während der zweiten Hälfte der 1 minütigen Übertragungszeit wiederholt wird. Dies bringt einen Vorteil von 1,5 dB im Signal-Rausch-Abstand gegenüber dem 28 Zeichen Nachrichten Modus. Am Ende jeder Sendeminute werden 4 Sekunden einer CW Kennung eingefügt. In diesem Modus wird jedes Zeichen durch eine von 43 vordefinierten Frequenzen repräsentiert. Innerhalb des Empfangsspektrums wird jedes vierte empfangene Zeichen mit einem dieser 43 Zeichentöne und seinen Nachbartönen verwendet, um eine Spektrumsaufweitung und Frequenzfehler zu berücksichtigen. Das Rauschen wird durch Messung der Pegel der übernächsten Nachbarn auf beiden Seiten des Zeichentons ermittelt. Eine pseudozufällige Frequenzverbreiterung wird wiederum benutzt, um den Einfluss starker Störer zu unterdrücken. Die Verschiebung in jeder Sendeperiode wird einer Look-Up Tabelle entnommen, die einen Wert der Verschiebung für jede Minute des Tages definiert. Doppler Korrekturen können wieder automatisch angewendet werden und die Pulssendeverzögerung (es werden wieder 2,6 Sekunden verwendet) ist automatisch aktiviert. Die Frequenzgenauigkeit sollte innerhalb von 0,5, 1,0 oder 2,0 Hz BEI DER BETRIEBSFREQUENZ liegen und hängt von der Zeichenlänge ab, die – wie oben erwähnt -

wiederum von der Schrittweite der Spektrumanalyse bestimmt wird. Die Software benutzt einen Nachrichtenabschätzungsalgorithmus, um die Nachricht anhand der bereits empfangenen Daten abzuschätzen. Ein in dem Nachrichtenabschätzungsfeld schwarz hinterlegtes Zeichen bedeutet eine Abschätzung mit geringer Güte, ein beige hinterlegtes Zeichen bedeutet mittlere Güte und ein weiß hinterlegtes Zeichen bedeutet, dass ein hoher Gütepegel erreicht wurde. Es ist möglich, den für ein bestimmtes Ergebnis in der Anzeige benötigten Güte Wert durch Verändern des "Qualtiy Ratio" Parameters einzustellen. Mit diesem Modus haben Bob W7PUA und sein Bruder Beb W7SLB eine zweitägige 144 MHz EME Verbindung mit einfachen Yagis und 150 Watt Sendeleistung auf jeder Seite aufrecht erhalten. Ernie W7LHL und Larry W7SZ erzielten eine EME Verbindung auf 1296 MHz mit TVRO Schüsseln und 5 Watt Sendeleistung auf jeder Seite in diesem Modus. Eben diesen Amateuren gelang eine 10 GHz EME Verbindung mit TVRO Antennen und 5 Watt Sendeleistung bei W7LHL und 15 Watt Sendeleistung bei W7SZ. Die Details dieser Heldentaten stehen unter: http://www.proaxis.com/~boblark/wksig1.htm.

Der dritte automatische DSP-10 Modus ist LHL-7. Dies ist im wesentlichen ein FSK-basiertes Morse Code Verfahren mit sehr viel größerer Toleranz gegenüber Frequenzfehlern als PUA43. Es kann zusammen mit menschlicher oder automatischer Detektion verwendet werden. Punkte werden als 750 Hz Töne gesendet, Striche als 900 Hz Töne, das Zeichenende Zeichen mit 600 Hz, "mal zwei" mit 1050 Hz, "mal drei" mit 1200 Hz, "mal vier" mit 1350 Hz und "mal fünf" mit 1500 Hz. Damit wäre ein "e" 750 Hz, 600 Hz. Die Zahl "5" wäre 750 Hz, 1500 Hz, 600 Hz. Jeder Ton kann 2, 4 , 10, 20 oder 60 Sekunden lang gesendet werden. Die automatische Morse-Kennung kann periodisch gesendet werden. Eine automatische Doppler-Korrektur kann aktiviert werden. Die Zeitgenauigkeitsanforderungen sind wegen der möglicherweise größeren Pulslängen etwas unkritischer, müssen aber innerhalb eines Bereiches liegen, so dass die automatische Dopplerkorrektur funktioniert. Es gibt eine beträchtliche Flexibilität in der Wahl der Parameter in diesem Modus und sie werden sehr übersichtlich in der Datei Readme20.txt beschrieben, die auf Bobs W7PUA Website steht. Dies ist der einzige DSP-10 Modus, den ich nicht verwendet und geprüft habe.

Der vierte und zur Zeit letzte automatische Modus in dem DSP-10 Hardware/Software Paket ist LTI, oder Langzeit-Integrations Modus. Dieser Modus ermöglicht es, Signale in einem Bereich von –180 bis –190 dBm zu detektieren. Solche Signale liegen in der Größenordnung von 30-40 dB unterhalb der Hörbarkeitsgrenze 'normaler' Empfänger. Dieser Modus arbeitet sehr ähnlich dem EME-2 Modus mit abwechselnden Sende- und Empfangszyklen, aber die Sende- und Empfangszykluslänge sind veränderbare Variablen, und entweder CW oder ein Dauerton, auch mit automatischer CW Kennung, können gesendet werden. Sowohl Frequenzsprungverfahren und automatische Dopplerkorrektur für EME können bei Bedarf verwendet werden. Es gibt keine praktische Grenze bezüglich der Anzahl der Sende/Empfangszyklen oder Signalmittelungen solange eine hinreichende Frequenzstabilität gewährleistet ist. Bei sehr schwachen Signalen kann die Anzahl der Signalmittelungen auf Tausende ausgedehnt werden. Es gibt eine 'Noise Blanker' Funktion, die die Daten für eine bestimmte Zeit ungültig macht, wenn das Rauschen in den Rausch-Messzeichen für diese Dauer das laufende Mittel des Rauschens um 'x' dB überschreitet. Dieser Modus ist am besten zu gebrauchen, um die Ausbreitungspfad-Performance zwischen zwei Stationen zu bestimmen und um die Möglichkeit einer Verbindung zwischen zwei Stationen zu erforschen, wenn die Ausbreitungsbedingungen äußerst schwach sind. Er ist ein ausgezeichnetes experimentelles Ausbreitungshilfsmittel.
Für experimentelle Zwecke, wie das Testen der Robustheit automatischer Verfahren, kann der DSP-10 Sendesignale mit einem bekannten Anteil an weißem Rauschen zusätzlich zum Signal erzeugen. Scrl-F6 bringt einen in das Setup Menü zu diesem Feature.

VII. Zusammenfassung

Der DSP-10 ist ein innovatives 'Software definiertes Radio', das als 144-MHz-Transceiver für schwache Signale arbeitet, und es kann aus dem Nichts von Amateuren aufgebaut werden, die in Standard-Aufbautechniken hinreichende Erfahrung besitzen. Es kann direkt bei 144 MHz verwendet werden oder man benutzt es als ZF beim Betrieb auf höheren Bändern. Obwohl es schon sehr gut in den bekannten Modes wie CW, SSB und FM funktioniert, sind seine aufregendsten Features die Verfügbarkeit der neuen Modes EME-2, PUA43, LHL-7 und LTI. Durch die Anwendung von Langzeitintegration und sehr schmaler Bandbreiten erlauben diese Modes erfolgreiche Verbindungen bei Empfangspegeln, die weit unter denen liegen, die mit konventioneller Technik benötigt werden. Mit einer großen Zahl von DSP-10 Besitzern, die aufgrund vielfältiger und sehr erfolgreicher Bausatz-Projekte von TAPR QRV werden, sollten sich für Funkamateure weite Möglichkeiten ergeben, mit diesem einzigartigen und leistungsstarken Transceiver von Bob Larkin, W7PUA zu kommunizieren und zu experimentieren.

Bild 1: Der DSP-10 Bildschirm zeigt die W3CCX 2 m Bake. Am oberen Ende des Schirms befindet sich die Spektrumsanzeige. Die Achsenbeschriftung des Spektrums sind die relative Signalstärke (an der vertikalen Achse links an der Spektrumsanzeige) und die Frequenz (an der horizontalen Achse unterhalb des Spektrums). Der Wert der Grundlinie (-5 dB) wird an der oberen rechten Ecke des Bildes angezeigt. Die W3CCX Signalspitze ist bei 600 Hz leicht zu erkennen. Unterhalb der Spektrumsanzeige zeigt der Wasserfall die Spur des Bakensignals über der Zeit. Links des Wasserfalls ist die Beschriftung der Zeitachse. Unterhalb des Wasserfalls zeigt eine Anzeige die relative Signalstärke der A/D- und D/A-Konverter bezogen auf ihren Sättigungswert. In der rechten unteren Ecke des Bildschirms neben der D/A-Pegelanzeige wird der augenblickliche mittlere empfangene Leistungspegel dargestellt. Links von der Spektrumsanzeige werden einige DSP-10 Betriebsparameter angegeben. Man erkennt, dass man sich im Empfangsmodus befindet, dass der VFO auf

144,284070 MHz eingestellt ist, und dass die Signalspitze einen Pegel von –104,6 dBm besitzt und bei 600 Hz liegt. Daneben sind Anzeigen für Bildschirm-Kontrast und Helligkeit, Mikrofonverstärkung, CW-Geschwindigkeit, Sendeleistung und Betriebsart (CW). Die Modusanzeige weist darauf hin, dass der CW-Frequenzversatz 600 Hz beträgt. Weiterhin erkennt man, dass RIT, Audiofilter und Rauschunterdrückung aus sind, und dass die binaurale Verzögerung auf 1024 gesetzt ist. Dann sieht man, dass 6 Abtastungen für die Spektrumsanzeige und die Wasserfalllinie gemittelt werden, und dass die Hamming-Fensterfunktion benutzt wird. Die Werte der Audioverstärkung, AGC und automatischer Anzeige (im wesentlichen die AGC für die Spektrumsanzeige) werden als nächstes gezeigt. Am unteren Rand des Bildschirms sieht man links Datum und Uhrzeit und eine Zeile mit 3 Zahlen, die den Status der seriellen Schnittstelle und den FFT-Skalierungsfaktor angeben.

Bild 2: Dies ist ein Blockschaltbild der Hardware von Bob Larkins DSP-10 144 MHz Transceiver. Die Details sind im Text und in den Verweisen beschrieben.

Bild 3: Dies ist eine Bildschirmaufnahme vom DSP-10 im EME-2 Modus. Die Sendeleistung beträgt 150 Watt. Das gelb gezeichnete Spektrum am oberen Rand des Schirms zeigt ein eindeutiges Echo von einem EME-Signal geringer Leistung. Es ist kein Signal in dem weiß gezeichneten Einzel-Spektrum erkennbar, das unter dem gemittelten gelben Spektrum liegt. Die Beschriftung des Frequenzspektrums bedeutet die relative Signalstärke in dB an der vertikalen Achse und die Frequenz an der horizontalen Achse. Der Grundlinienpegel (8 dB) und der Frequenzabstand in Hz (2,3) sind in der oberen rechten Ecke gezeigt. Unterhalb des Spektrums zeigt der Wasserfall ein unterbrochenes, kaum sichtbares Signal. Links vom Wasserfall ist die Zeitachsenbeschriftung. Rechts ist das "Alt-A" Parameter-Fenster. Es zeigt, dass 144 Punkte gemittelt wurden und dass dieses das Signal-Rausch-Verhältnis (S/N) um 10,8 dB verbessert hat. Die angezeigten 290K stellen die angenommene Rauschtemperatur dar. Das S/N Verhältnis des mittleren Frequenzpunktes ist 0,954 und die Frequenz ist zentriert auf 323 Hz. Die Signalstärke des mittleren Frequenzpunktes wird mit –176,4 dBm angegeben. Dann werden die S/N Verhältnisse der jeweils 10 benachbarten Frequenzpunkte angezeigt. Man erkennt weiterhin, dass die EME-Doppler-Korrektur eingeschaltet ist, sowie die zufällige Frequenzverbreiterung (42 Hz). In der linken Hälfte der Anzeige sehen wir, dass der VFO auf 144,105000 MHz eingestellt ist, dass aber die aktuelle Empfangsfrequenz wegen Frequenzversatz durch Doppler-Korrektur und Frequenzjittern 144,104762 MHz beträgt. Die Betriebsparameter sind als nächstes aufgeführt. Diese sind gekennzeichnet und selbsterklärend. Unterhalb des Wasserfalls sind die EME-Doppler Korrektur-Parameter angezeigt.

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3 Siehe Leif Asbrink's Linrad Home Page unter sk7do.te.hik.se/~sm5bsz/linuxdsp/linrad.htm

4 Siehe eine Diskussion unter der URL www.qsl.net/w3sz/w3szdspnew.htm

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7 Siehe Lyle Johnson's Web Seite unter http://www.fidalgo.net/~wa7gxd/dsp.html

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Über den Autor

W3SZ, Roger Rehr, erhielt seine erste Amaterufunklizenz 1968 als WN3JYM. Er trägt sein heutiges Rufzeichen seit 1997. Seine Hauptinteressen im Amateurfunk gelten der VHF/UHF/Mikrowellen- Arbeit, besonders auf dem Gebiet des Empfangs schwacher Signale und 144 MHz EME. Er verbringt seine überwiegende Zeit mit dem Bau und dem Ausprobieren von Geräten und die restliche Zeit mit Überwachen und Beobachten, dem 'Erkunden' neuer Dinge, und dem Betrieb meist in CW oder in digitalen Betriebsarten.

Sein QRL hat mit der Welt der Elektronik nichts zu tun [abgesehen davon, dass heute das elektronische Zeitalter ist]. Er arbeitet als ein Kardiologe in seiner Heimatstadt Reading, Pennsylvania in einer Klinik. Während der 80er Jahre arbeitete er in der Grundlagen- und klinischen Forschung in für Herz-NMR, aber heute macht er nichts mehr auf diesem Gebiet.

Er ist verheiratet, hat eine wunderbare und verständnisvolle Frau und drei liebevolle Kinder. Er hat es geschafft, keinen von ihnen für Amateurfunk zu interessieren, obwohl er es weiterhin engagiert versucht.

Das Bild zeigt ihn in seinem Shack vor einem Rack mit einigen Geräten seiner Ausrüstung am Ende eines schlaflosen Wochenend-Kontests. Er sagt, er habe deshalbe einen etwas 'dämlichen Blick'. Er sagt, er freue sich über jede Frage zu Linrad, DSP-10 oder was auch immer.

Besuchen Sie seine Website unter www.qsl.net/w3sz oder seine DSP Webseite unter www.qsl.net/w3sz/start.htm.

SAM – Simple Aurora Monitor

- ein Weg zu mehr Aurora QSOs

von Karsten Hansky, DL3HRT
und Dirk Langenbach, DG3DA

Auslöser für das SAM-Projekt war Karstens Ärger über mehrere verpasste Aurora-Öffnungen. Sein QTH befindet sich in JO61AB (51°N), so dass die Zahl der nutzbaren Aurora-Öffnungen sehr begrenzt ist. Daher ist es ärgerlich, wenn man auf dem 2m-Band erzählt bekommt, dass es am Abend vorher eine tolle Aurora-Öffnung über mehrere Stunden gegeben hat. Umso schlimmer, wenn man an besagtem Abend sogar zu Hause war. Vielleicht hätte man den PC doch einschalten sollen um ins DX-Cluster zu schauen? Das daraus resultierende, an den meisten Tagen erfolglose, Pendeln zwischen Wohnzimmer und Shack hätte die XYL allerdings kaum erfreut. Was also tun?

Um eine Radio-Aurora nicht zu verpassen, gibt es zwei grundsätzliche Wege. Entweder ist man vorgewarnt oder man muss die Aurora-Öffnung in Echtzeit erkennen. In die letzte Kategorie fallen die Beobachtung des Magnetometers von DK0WCY, des DX-Clusters, spezieller Aurora-Baken (z.B. SK4MPI auf 144,412MHz), die Bandbeobachtung, oder der Anruf eines Funkfreundes.

Weitere Informationsquellen sind kurzfristige Funkwetterprognosen, sowie das Internet mit diversen Datenquellen. Eine gute Zusammenfassung bietet der Arbeitskreis „Atmosphärische Erscheinungen" des VdS (Vereinigung der Sternfreunde e.V.), der unter
http://www.meteoros.de/polar/polwarn.htm eine sehr übersichtliche Zusammenstellung verschiedener Datenquellen bietet.

Dabei ist besonders der ACE-Satellit hervorzuheben. Es handelt sich dabei um einen Satelliten, der in einem Abstand von etwa 1.5 Millionen km von der Erde in Richtung Sonne positioniert ist und verschiedene Komponenten des Sonnenwindes misst. Diese Daten werden zeitnah frei zur Verfügung gestellt (http://sec.noaa.gov/ace). Es sind gestellt (http://sec.noaa.gov/ace). Es sind besonders die Instrumente EPAM und SWEPAM von Interesse. Wenn eine Schockfront am ACE-Satelliten eintrifft, dann dauert es 40 bis 60 Minuten, bis diese die Erde erreicht.

Im Polarlichtforum (http://www.meteoros.de/forum.htm) ist eine Vielzahl von Polarlichtbeobachtern mit fundiertem Hintergrundwissen und vielen Erfahrungen zu finden, so dass man in der Regel schon 1-2 Tage vor möglichen Auroraereignissen gewarnt wird, wobei nicht jede Warnung tatsächlich zu einem Ereignis führt.

Alle angegebenen Informationsquellen erfordern eine ständige Überwachung der Daten und gerade das wollte Karsten vermeiden.

Als Lösung bietet sich die Messung des Erdmagnetfeldes an. Eine eintreffende Schockfront führt zu Wechselwirkungen der eintreffenden Teilchen mit der Ionosphäre. Ist diese Wechselwirkung stark genug, resultiert daraus eine Verschiebung der Aurora-Ovale in Richtung Süden mit entsprechenden Radio-Aurora-Öffnungen. Gleichzeitig sind Störungen des Erdmagnetfeldes zu beobachten. Aus der Stärke dieser Störungen ist die Wahrscheinlichkeit für Radio-Aurora am jeweiligen Standort ableitbar.

Das Erdmagnetfeld ist ein komplexes dreidimensionales Gebilde. Es werden drei Magnetfeldkomponenten unterschieden:

- X-Komponente (Nord-Süd-Richtung)
- Y-Komponente (Ost-West-Richtung)
- Z-Komponente (senkrecht auf X- und Z-Komponente "oben - unten")

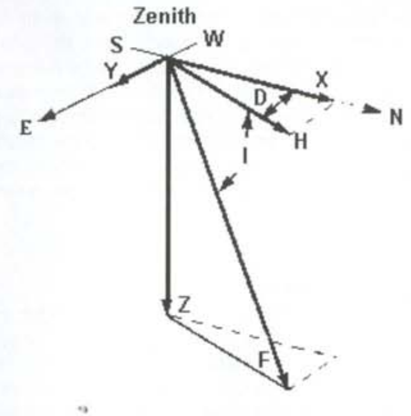
Häufig werden bei kommerziellen Magnetometern an Stelle der X-, Y- und Z-Komponenten die Messwerte für horizontale Intensität (H) und magnetische Deklination (D) angegeben. Einen sehr schönen Überblick über die Zusammenhänge zwischen den verschiedenen Magnetfeldvektoren, sowie die zu erwartenden Absolutwerte in Europa gibt Abb. 1:

Zur Messung des Erdmagnetfeldes werden Magnetometer verwendet. Diese messen die Stärke des magnetischen Flusses, wobei in der Regel die Einheit „nT" (nano Tesla) verwendet wird. Für Deutschland liegen die Absolutwerte der drei Magnetfeldkomponenten in folgender Größenordnung:

- X-Komponente: ca. 18.000nT,
- Y-Komponente: ca. 200-400nT,
- Z-Komponente: ca. 45.000nT.

Zur Bewertung der geomagnetischen Aktivität wurde der sogenannte Dreistunden-K-Index eingeführt. Dabei handelt es sich um eine logarithmische Größe, die ein Maß für die Schwankungen des Magnetfeldes innerhalb einer dreistündigen Periode ist.

Für geographische Breiten um 51° (Höhe Leipzig) ist ab K=5 mit einer schwachen Radio-Aurora und ab K=6 mit einer starken Radio-Aurora zu rechnen. Ab K=6 sind auch Polarlichtsichtungen möglich, sofern man sich an einem dunklen Beobachtungsplatz ohne Beeinträchtigung durch Streulicht befindet.



X = North-South Intensity
Y = East-West Intensity
Z = Vertical Intensity

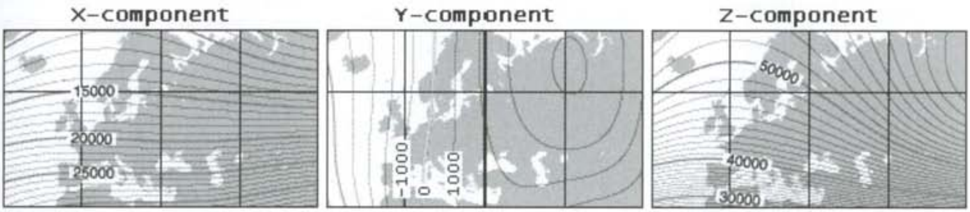
H = Total horizontal Intensity
= $\mathrm{sqrt}(X^2 + Y^2)$

D = Declination angle
= $\arctan(Y / X)$

F = Total intensity
= $\mathrm{sqrt}(X^2 + Y^2 + Z^2)$

I = Inclination angle
= $\arctan(Z / H)$

Bx = delta X
By = delta Y
Bz = delta Z
Bt = delta F



For X (Bx) goes:
The lower the value,
the more intense
the Aurora

For Y (By) goes:
The larger the deviation, +
or -, the more intense
the Aurora

For Z (Bz) goes:
The higher the value,
the more intense
the Aurora

Abb. / Fig. 1

Die Graphik wurde von Peter – PA1SIX zusammengestellt.

Sources / Quellen: http://geomag.usgs.gov/models.html http://geomag.usgs.gov/dod.html

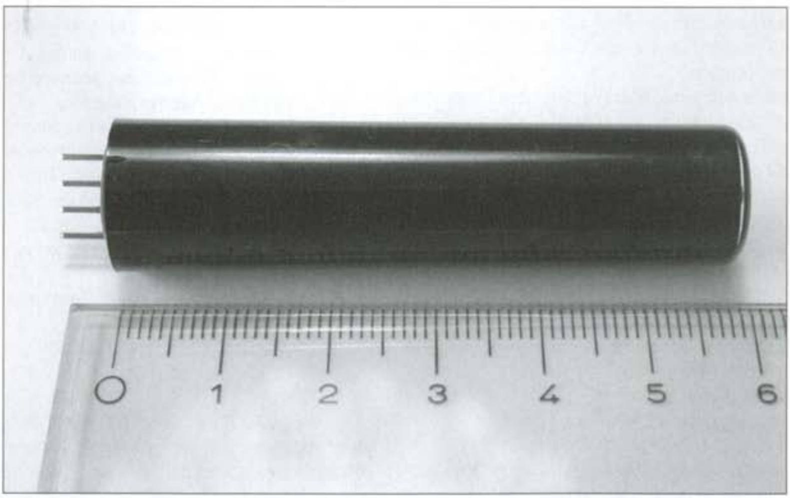


Abb. / Fig. 2 FGM-3 Sensor

Ein Magnetometer zur Radio-Aurora-Erkennung sollte folgende Anforderungen erfüllen:

- kontinuierliche Messung des magnetischen Flusses einer oder mehrerer Komponenten des Erdmagnetfeldes,
- Messwertauflösung im Bereich von 1-2nT,
- Bestimmung des K-Indexes,
- Alarmfunktion bei Überschreitung eines vorgegebenen K-Indexes (z.B. K > 5),
- autonomer Betrieb ohne PC.

Damit war das Ziel klar – ein eigenes Magnetometer musste her.

Tabelle 1 gibt die K-Index-Grenzen für die geographische Breite von 50°.

K-Index	Schwankungsbreite des Magnetfeldes [nT]
0	0 .. 5
1	6 .. 0
2	11 .. 19
3	20 .. 39
4	40 .. 69
5	**70 .. 119**
6	**120 .. 199**
7	**200 .. 329**
8	**330 .. 499**
9	**> 500**

Messung des Erdmagnetfeldes

Es gibt verschiedene Möglichkeiten die Stärke des magnetischen Flusses zu messen. Dies reicht von einfachen mechanischen Varianten bis hin zu elektronischen Sensoren. Dabei werden verschiedenartigste physikalische Effekte genutzt. Die handelsüblichen preiswerten Kompasssensoren sind leider zu unempfindlich.

Eine Recherche im Internet führte zur britischen Firma Speake & Co. Ltd. Diese stellt mit der FGM-Serie sehr preisgünstige Fluxgate-Sensoren her, die für Messungen des Erdmagnetfeldes gut geeignet sind. Speziell der FGM-3 Sensor ist für diese Anwendung prädestiniert. Er zeichnet sich durch folgende technische Daten aus [1]:

- Messbereich ca. +/- 50.000nT, damit zur Messung aller Komponenten des Erdmagnetfeldes geeignet,
- Nichtlinearität < 5.5% über den gesamten Messbereich, Auflösung 1-2nT,
- Ausgabe der Messwerte als TTL-Signal, damit sind große Kabellängen möglich (>40m)
- Betriebsspannung 5V,
- Stromaufnahme < 10mA,

Die Anfänge des SAM-Projektes liegen im Winter 2000/2001. Karsten hatte den ersten FGM-3 Sensor von Bill Speake erhalten (Abb. 2) und dachte darüber nach, wie die Auswertung der Sensordaten zu bewerkstelligen ist. Der Zufall wollte es, dass Dirk zur selben Zeit Hardwarekomponenten für die Firma entwickelte, in der Karsten arbeitet. Das erste Treffen ergab eine Übereinstimmung der Hobbys und es dauerte nicht lange, dann war die Idee für ein mikrocontrollergesteuertes Magnetometer geboren. Dirk entwickelte die Schaltung und Karsten baute den ersten Prototypen auf. Dieser lieferte im September 2001 die ersten Messwerte. Ein Name für das Gerät war auch schnell gefunden – SAM (Simple Aurora Monitor).

SAM-Die Schaltung

Messgröße ist die Frequenz, die der Fluxgate-Sensor als flussproportionales TTL-Signal ausgibt. Der Messbereich von +/-50.000nT wird in ein Rechtecksignal von ca. 30kHz bis 140kHz umgesetzt. Es bietet sich eine digitale Weiterverarbeitung des Signals mittels Microcontroller an, der, verglichen mit diskreter TTL-Schaltungstechnik, eine hohe Flexibilität bei geringem Bauteileaufwand gewährleistet.. Weiterhin soll die Messgröße als analoger Spannungswert und in digitaler Form über eine RS232-Schnittstelle ausgegeben werden.

Um das Ganze ohne PC betreiben zu können, sind eine Anzeige und eine kleine Tastatur erforderlich. Zur Signalisierung der Überschreitung einer programmierbaren Alarmschwelle wird ein Relaiskontakt verwendet. Um ein externes Schaltsignal auszuwerten, wurde ein potentialfreier Schalteingang (Optokoppler) vorgesehen. Nach Festlegung dieser Eckpunkte entstand nachfolgendes Blockschaltbild. (Abb. 3)

Der Microcontroller

Der zu verwendende Microcontroller sollte folgende Kriterien erfüllen:

- o Internes Code-Flash
  - o Softwareentwicklung und spätere Updates werden vereinfacht,
  - o ein externes EPROM entfällt
- o Internes RAM (Bauteileersparnis),
- o Internes EEPROM zur permanenten Speicherung von Konfigurationsparametern,
- o Serielle Schnittstelle zur Anbindung an einen PC,
- o Analogausgänge zur Ausgabe der Messwerte (U/t-Schreiber, LED-Zeile, Messgerät..),
- o Zählereingang zur Messung des Sensorsignals,
- o Digitalports für LC-Display, Tastatur usw.,
- o Verfügbarkeit (Lieferzeiten, keine exotischen Typen),
- o Entwicklungsumgebung (Programmiergerät, Programmierung in C),
- o „vernünftige“ Bauform“ (kein SMD, besser DIL oder PLCC-Gehäuse).

Die Wahl fiel auf den Controller PIC16F877 (MICROCHIP), der, abgesehen von den geforderten Analogausgängen, alle Kriterien erfüllt. Statt der Analogausgänge besitzt er jedoch zwei PWM-Ausgänge (10Bit) aus denen sich ohne großen schaltungstechnischen Aufwand ein Analogsignal gewinnen lässt.

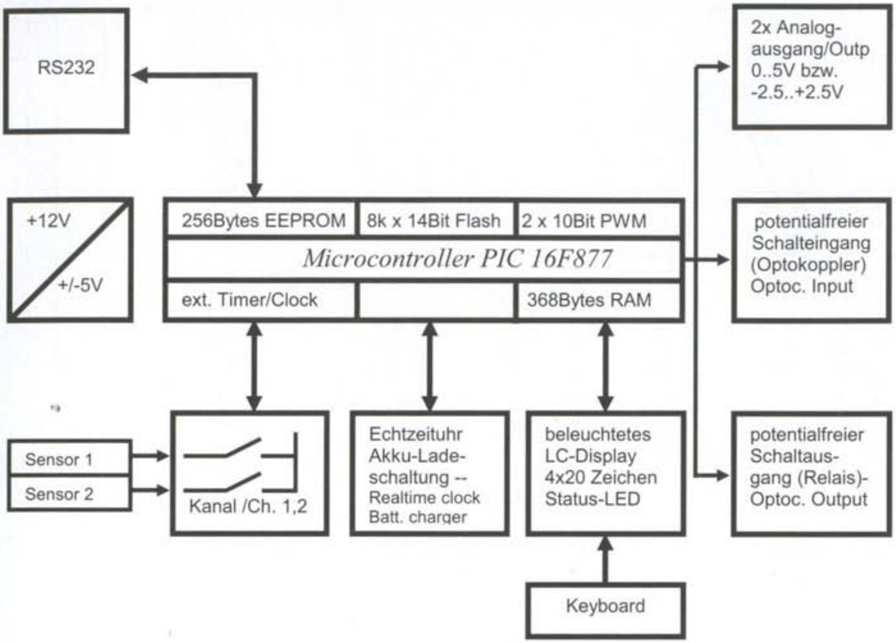


Abb. / Fig. 3 Blockschaltbild

Mit 8 kByte Flash-Speicher für den Programmcode, 368 Byte RAM und einem internen 256Byte EEPROM ist der Controller für unsere Anwendung ausreichend dimensioniert. Die Ports des PIC16F877 sind in der Lage, eine LED oder ein Relais direkt zu treiben, was weitere externe Hardware überflüssig macht. Die Programmierung des Controllers ist denkbar einfach. Mittels eines Programmiergerätes wird einmalig ein Bootloader in die oberen 256 Bytes des 8 kByte Flashs geladen. Danach lässt sich die Firmware auf einfachste Weise mittels eines kleinen Tools (Windows9x/Windows XP) über die serielle Schnittstelle in den Controller laden. Ein brauchbarer C-Compiler und Erfahrungen mit diesem Controllertyp waren vorhanden, so dass dem Einsatz des 16F877 nichts im Wege stand. Abb. 4 zeigt den Stromlaufplan der SAM-Elektronik.

Die Versorgungsspannungen

SAM arbeitet mit einer 12 V DC-Versorgung, wobei von der Schaltung ein Spannungsbereich von 10 VDC – 18 VDC toleriert wird. Aus dieser Eingangsbruttospannung werden die intern benötigten Spannungen gewonnen: der 5V-Festspannungsregler IC3 liefert die „digitalen" 5V für den Controller IC8, die Echtzeituhr IC9, das vierfach-NAND IC7 und das LC-Display. Die Ladungspumpe IC1 erzeugt aus der Bruttoeingangsspannung eine gleich große negative Spannung, die durch den nachfolgenden 100mA-Festspannungsregler 79L05 (IC2) auf einen geregelte –5V-Pegel gebracht wird. Diese negative Spannung ist für den Betrieb des Operationsverstärkers LM324 (IC5) erforderlich. Als positive Versorgungsspannung des Operationsverstärkers wird die 12V-Eingangsspannung verwendet. Die 5V-Versorgung des Fluxgate-Sensors wird separat erzeugt (IC4). Dies ist notwendig, da Betriebsspannungsschwankungen, selbst wenn diese im zweistelligen mV-Bereich liegen, die Ausgangsfrequenz des Sensors beeinflussen.

Die Messwerterfassung

Hierzu wird ein 16-bit-Zähler des Microcontrollers verwendet. Dieser wird in Abhängigkeit von einer Zeitbasis (1s-Takt), die durch einen Hardwaretimer des Controllers realisiert ist, ausgelesen. Aus dem Ergebnis wird die anliegende Frequenz bestimmt und aus dieser wiederum der magnetische Fluss berechnet. Da ein zweiter Messkanal für einen weiteren Fluxgate-Sensor geplant war, werden beide Sensoren über eine einfache Logik, die ein 74HCT00 (IC6) übernimmt, abwechselnd auf den Controllereingang geschaltet. Die Umschaltung erfolgt über Pin 18 des Controllers (SENS_UM).

Die serielle Schnittstelle

SAM besitzt eine serielle Schnittstelle (IC7), die zwei Aufgaben erfüllt:

-Laden der Inbetriebnahmesoftware und der Firmware in den Controller. Bei einem Softwareupdate muss kein EPROM gewechselt werden.

-Verbindung zu einem PC, damit die Messergebnisse weiterverarbeitet werden können. Diese werden mit einem Zeitstempel versehen und zyklisch über die Schnittstelle ausgegeben. Die Auswertesoftware SAM_View unter WIN9X sorgt für die Umsetzung in eine aussagekräftige Grafik.

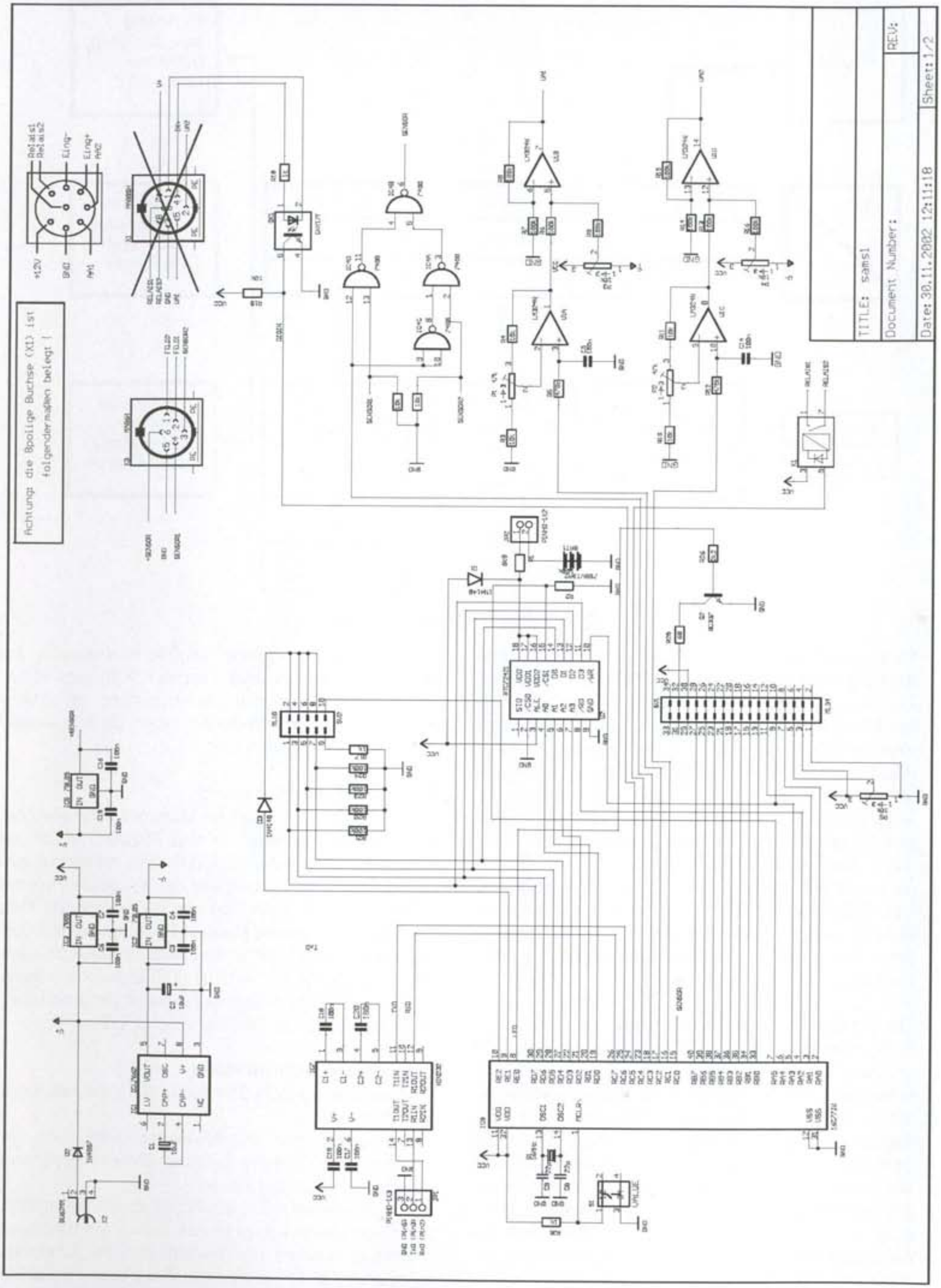


Abb. /Fig. 4 Stromlaufplan der SAM-Elektronik / Circuit Diagram

Abb. / Fig. 5

Abb. / Fig. 6

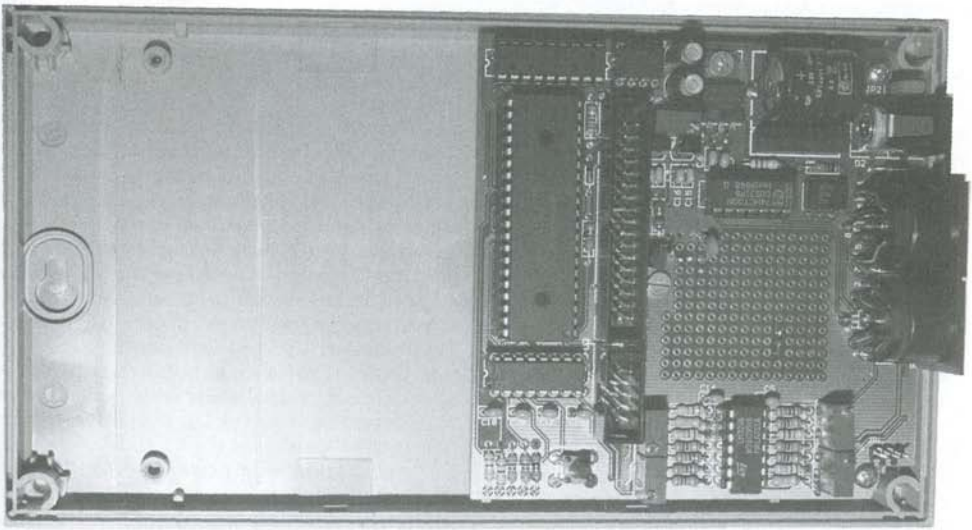


Abb. / Fig. 7

Die Echtzeituhr

Eine eigene akkugepufferte Echtzeituhr (IC9), die Uhrzeit und Datum liefert, sorgt dafür, dass jeder Messwert mit einem Zeitstempel versehen wird. Das Stellen der Uhr erfolgt über die serielle Schnittstelle mit Hilfe der Parametrierungssoftware SAM_Ini.

Die Anzeige und die Tastatur

Die Anzeige der Messwerte erfolgt über ein hintergrundbeleuchtetes, 4-zeiliges LC-Display mit 20 Zeichen pro Zeile. Diese Displaygröße war notwendig, um die Messwerte zweier Sensoren komfortabel anzeigen zu können.
Zur Bedienung sind vier Tasten vorgesehen, die z.Z. mit folgenden Funktionen belegt sind: Kommandomodus, Kalibriermodus, Reset und Beleuchtung / Alarmstummschaltung. Die LCD-Beleuchtung bleibt entweder permanent eingeschaltet oder sie schaltet sich automatisch aus, wenn für eine Dauer von einigen Sekunden keine Taste gedrückt wurde. Zusätzlich zum LC-Display besitzt SAM eine rote Alarm-LED, welche die Überschreitung einer parametrierbaren Alarmschwelle signalisiert.

Die Analogausgänge

Für den Fall, dass eine externe Anzeige, wie z.B. ein U/t-Schreiber, analoges Zeigerinstrument, LED-Zeile o.ä. angeschlossen werden soll, besitzt SAM zwei Analogausgänge, einen für jeden Sensor. Die Ansteuerung durch den PIC erfolgt mittels PWM / Spannungswandlung. Hierzu dienen die RC-Kombinationen an den nichtinvertierenden Eingängen (IC5A, IC5C) des LM324. Mit P1/P2 wird jeweils die Amplitude des Ausgangssignals bestimmt, der jeweils nachgeschaltete Operationsverstärker erlaubt mit P3/P4 die Addition eines konstanten Offsets. Dadurch können bei Bedarf nullpunktsymmetrische Ausgangsspannungen realisiert werden, z.B. –2.5V..+2.5V.

Der Relaisausgang

Zur externen Alarmmeldung wurde ein Relais K1 vorgesehen, das, wie die LED, einen Alarm signalisiert. Dem Benutzer steht es frei, dort eine Hupe, Lampe oder ähnliches anzuschließen. Ein akustischer Alarm ist z.B. dann sinnvoll, wenn der OM geweckt werden möchte oder gerade nicht im Shack ist.

Der Optokopplereingang

SAM besitzt einen Optokopplereingang OK1. Über diesen Eingang kann die laufende Messung eingefroren werden. Dies kann notwendig sein, wenn Sendebetrieb durchgeführt wird. Die HF könnte SAM beeinflussen und zu Fehlmessungen führen.

Anschlüsse

Als Schnittstelle nach außen dienen drei Steckverbindungen:
- eine 8-polige DIN-Buchse mit den Relaiskontakten, dem Optokopplereingang und den Analogausgängen
- die RS232-Schnittstelle (9-poliger DSUB Stecker)
- eine 6-polige DIN-Buchse zum Anschluss von zwei Sensoren (Signal und Sensorversorgung 5V DC)

Aufbau des Geräts

Bei der praktischen Ausführung von SAM waren wiederum einige praxisbezogene Eckpunkte zu beachten:
- o handliches Format und Minimierung der mechanischen Arbeiten am Gehäuse
- o Leiterplatte in guter Qualität mit Bestückungsdruck
- o gute Dokumentation, Offenlegung der Schaltpläne, Erstellung einer Bauanleitung

Das Gehäuse

Da ein LC-Display verwendet wird, war es naheliegend, ein Gehäuse mit einem passenden Ausbruch zu wählen. Ein kleines Pultgehäuse von BOPLA (EG-2060PD - 200mm x 110mm x 65mm) ist gut geeignet, der Displayausbruch besitzt die richtige Größe, Befestigungsdome sind ebenfalls an den richtigen Positionen vorhanden. An der Kopfseite befindet sich eine herausnehmbare Kunststoffplatte, die mit einfachen Mitteln bearbeitet werden kann (3 Bohrungen für die beiden DIN-Buchsen und die Versorgungsbuchsen, ein Ausbruch für den D-SUB-Stecker der seriellen Schnittstelle). Etwas mehr Aufwand bereitet der Einbau der Tastatur. Mittels einer Bohrschablone sind 5 Bohrungen passgenau im Deckel des Gehäuses anzubringen. Alle Arbeiten lassen sich jedoch mit einer Bohrmaschine und einer kleinen Feile erledigen (Abb. 5 und Abb. 6).

Die Leiterkarte

Nach Festlegung der Gehäusemaße konnte das Layout der Leiterkarte erstellt werden. Die doppelseitige, durchkontaktierte Leiterkarte ist mit Lötstopplack und Bestückungsdruck versehen und nach dem gängigen Industriestandard gefertigt. Die Kosten hierfür sind etwas höher als bei einer einfachen Leiterkarte, die Nachbausicherheit nimmt aber enorm zu. Die Durchkontaktierungen nehmen auch ein mehrmaliges Ein- und Auslöten der Bauteile nicht übel. Es werden nur bedrahtete Bauteile verwendet, um die Lötarbeiten für den Anfänger zu vereinfachen.
Abb. 7 zeigt die eingebaute Leiterkarte. Im unteren Teil der Leiterkarte befinden sich der Microcontroller, die Echtzeituhr und die serielle Schnittstelle. Darüber, auf der linken Seite, sind die Spannungsaufbereitung, der Akku sowie der Optokoppler und das Relais zu erkennen. Am rechten Rand liegen die Analogausgänge (Operationsverstärker, Widerstände und Potis). Oben befinden sich die DIN-Buchsen und die Versorgungsbuchse. Ein kleines Wrap-Feld in der Mitte der Leiterkarte ist für eigene Erweiterungen, z.B. eine Temperaturregelung, vorgesehen. Die untere Gehäusehälfte ist noch ungenutzt. Geplant ist, dort einen Datenlogger unterzubringen, der es ermöglicht, die Messwerte über einen längeren Zeitraum zu speichern. Dies ist dann sinnvoll, wenn SAM nicht permanent mit einem PC verbunden ist.
Die Tastaturleiterkarte ist im Deckel des Gehäuses untergebracht. Abb. 8 zeigt das montierte LC-Display mit der darunterliegenden Tastaturkarte. Das LCD wird über ein 35-poliges Flachbandkabel, die Tastaturkarte mit einem 10-poligen Flachbandkabel in Schneidklemmtechnik mit der Controllerkarte im Gehäuseunterteil verbunden.

Arbeitsaufwand

Erfahrungsgemäß sollte für den kompletten elektrischen und mechanischen Aufbau ein ungestörtes Wochenende eingeplant werden. Liegen Erfahrungen im Löten vor und hat man schon des Öfteren ein Gehäuse bearbeitet, geht die Arbeit natürlich schneller von der Hand. In drei bis vier Stunden ist SAM dann einsatzbereit. Der Ungeübte sollte sich in jedem Fall an die Beschreibung der Baumappe auf der SAM-Homepage halten. Dort findet man auch Bohrschablonen für die Bearbeitung des Gehäuses.

Die Inbetriebnahme

Nach dem Aufbau der Elektronik und der Überprüfung der Versorgungsspannungen gemäß der Baumappe kann die Elektronik getestet werden. Hierzu ist eine „Inbetriebnahmesoftware" erforderlich, die von der SAM-Homepage heruntergeladen und anschließend über die serielle Schnittstelle in den Controller geladen werden kann. Dazu befindet sich ein kleines Bootloaderprogramm im Flash des PIC-Controllers, das die Kommunikation und das Ablegen der Software im Flash übernimmt. Eine ausführliche Beschreibung hierzu befindet sich in der Baumappe. Falls jemand einen Controller von uns bekommt, so ist die Inbetriebnahmesoftware bereits aufgespielt.

Die Inbetriebnahmesoftware gestattet es, über das LCD bedienergeführt, folgende Hardwarefunktionen zu testen:

- Tastatur
- serielle Schnittstelle
- Echtzeituhr
- Relaisausgang
- Steuereingang
- Analogausgänge
- Grundinitialisierung des EEPROM

Nach bestandenem Test und der Grundinitialisierung des EEPROM kann der FGM-3 Sensor angeschlossen werden. Anschließend wird die Firmware, die ebenfalls auf der SAM-Homepage verfügbar ist, in den PIC geladen. SAM ist betriebsbereit.

SAM-Firmware

Die SAM-Firmware V3.3 verfügt über folgende Funktionen:

- Auswertung von einem oder zwei FGM-3 Sensoren,
- Bestimmung der Messwerte im 1s-Intervall,
- Median-Filterung der Messwerte zur Ausblendung kurzer Störimpulse,
- Bestimmung eines 3-stündigen K-Indexes,
- Ausgabe der Messwerte auf beleuchtetes LCD-Dis play, RS232-Schnittstelle sowie zwei Analogaus gänge,
- Parametrierbarkeit über RS232-Schnittstelle,
- Abfrage von vier Tastern zur Auslösung spezieller Programmfunktionen,
- Bestimmung und Anzeige des 10-minütigen Trends der Messwerte, getrennt für jeden Sensor.

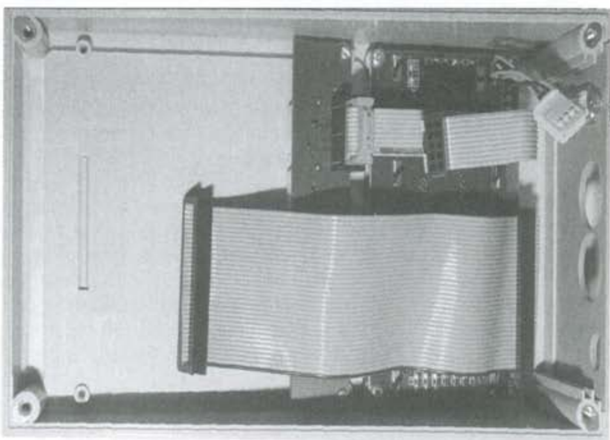
SAM-Tools

Die SAM-Tools beinhalten mehrere Windows-Programme zur komfortablen Handhabung von SAM. Sie enthalten neben einem Tool zur Parametrierung der Firmware auch Programme zur Aufzeichnung und Weiterverarbeitung und Visualisierung der Messwerte auf einem PC.

Damit besteht die Möglichkeit, SAM neben dem stand-alone Betrieb auch in Verbindung mit einem PC zu nutzen und die Magnetogramme sogar im Internet zur Verfügung zu stellen.

Die SAM-Tools werden durch eine Hilfedatei ergänzt, die nicht nur Hilfestellung zu den Programmen liefert, sondern auch zu SAM im Allgemeinen. Die SAM-Tools sind Freeware und stehen in der jeweils aktuellen Version auf der SAM-Homepage zur Verfügung. Die Beispiele in Abb. 9 und 10 wurden mit SAM_View erzeugt.

Abb. / Fig. 8



Erreichte Ergebnisse

Das Hauptziel wurde erreicht - es gibt keine verpassten Aurora-Öffnungen mehr. Karstens Logbuch wurde im letzten Jahr mit einer Reihe von Aurora-QSOs gefüllt. SAM dient als Indikator für mögliche Aurora-Öffnungen. Wenn Alarm ausgelöst wird, werden die herkömmlichen Informationsquellen (DX-Cluster, Internet usw.) genutzt, um lokale Störungen auszuschließen.

SAM wurde bisher in über 70 Exemplaren nachgebaut. Lutz Schenk betreibt unter: http://www.sam-europe.de die offizielle SAM-Homepage. Dort befinden sich die wichtigsten Unterlagen (Baumappe, Software usw.), sowie eine Reihe von Online-Magnetogrammen. Dank Peter, PA1SIX, gibt es eine hervorragende englische Version der Baubeschreibung mit vielen Fotos. Diese sind eine sehr gute Ergänzung zur deutschen Baumappe.

Alain (ON4KST) hat uns einen eigenen Chat zur Verfügung gestellt (http://www.on4kst.be/chatsam/start.php). Einen Überblick über einen Teil der SAM-Installationen geben die SAM-Forumkarten (http://www.forumkarten.de.vu) des Polarlichtforums (http://www.meteoros.de/forum.htm).

Unter http://de.groups.yahoo.com/group/Magmeter/ ist eine Newsgroup zum SAM-Projekt zu finden.

Die erreichte Messgenauigkeit hat unsere Erwartungen erfüllt und teilweise sogar übertroffen. Abb. 9 zeigt vier Messkurven der Y-Komponente, die während des schwachen Magnetsturmes vom 18. August 2002 aufgezeichnet wurden. Dabei sind drei Messkurven von SAM-Betreibern an unterschiedlichen Standorten der Messkurve des geomagnetischen Observatoriums „Magnetsrode" (Uni Braunschweig) gegenübergestellt. Aus Gründen der Übersichtlichkeit wurden die Kurven gegeneinander verschoben. Die qualitative Übereinstimmung der SAM-Kurven untereinander, aber auch mit der Kurve aus „Magnetsrode" ist deutlich sichtbar. Für die zu verzeichnende Abweichung der SAM-Kurven sind vor allem die Temperaturdrift, sowie die nicht exakte Ausrichtung der Sensoren verantwortlich, zu einem gewissen Anteil natürlich auch die unterschiedlichen Standorte der Magnetometer. Der schwache Peak in Karstens Kurve gegen 15:20 UTC wurde durch ein eisernes Gartentor verursacht. In allen drei Fällen wurde der FGM-3 Sensor ohne zusätzliche Temperaturisolation vergraben.

SAM kann als stand-alone Gerät seinem Besitzer helfen, mögliche Aurora-Öffnungen rechtzeitig zu erkennen. SAM kann aber noch mehr. Durch den Vergleich verschiedener Magnetogramme von verschiedenen Standorten ist es möglich, sich ein umfassendes Bild vom Erdmagnetfeld quasi in Echtzeit zu machen. Das geht weit über das hinaus, was die europäischen geomagnetischen Observatorien (Magnetsrode, Kiruna, usw.) derzeit leisten. Wenn Daten aus ganz Europa zur Verfügung zu stehen, hat man eine ausgezeichnete Basis, um Ausbreitungsphänomene wie Radio-Aurora detailliert zu untersuchen und zu verstehen - ein Stück mehr Experimentalcharakter in unserem Hobby.

Ein Anfang ist mit den Online-Magnetogrammen auf der SAM-Homepage gemacht. Es gibt aber noch sehr viel zu tun. Jetzt müssen die vorliegenden Daten sinnvoll miteinander verknüpft werden. Jeder ist eingeladen, mitzuhelfen.

Magnetometerpraxis

Wie wird der Sensor installiert?

Der Sensor muss in möglichst großem Abstand von magnetischen Störfeldern installiert werden. Dabei sind sowohl Wechselfelder (Elektronik, Elektroinstallation) als auch Gleichfelder (Eisenteile, PKW) zu beachten. Ortsfeste Metallteile (Gittermasten usw.), sind dabei weniger kritisch. Kurzzeitige Störeinflüsse (vorbeifahrende PKW) werden von der Software herausgefiltert. Eine Installation des Sensors außerhalb des Gebäudes ist vorzuziehen, jedoch nicht unbedingt erforderlich.

Sendebetrieb erzeugt Magnetfelder, die sich auf den Sensor auswirken können. Wellenlänge, Sendeleistung, Winkeldämpfung, Abstand zwischen Antenne und Sensor usw. sind dabei die bestimmenden Parameter. Karsten erzeugt mit 10mW Ausgangsleistung an einem Vertikalstrahler auf 14MHz einen „Magnetsturm" mit K=9 (Abstand Antenne – Sensor 10m), während mit 100Watt und 16.4dB auf 144MHz überhaupt keine Beeinflussung des Sensors feststellbar ist (Abstand Antenne – Sensor 20m, große Winkeldämpfung).

Um derartige Störungen zu unterdrücken, verfügt SAM über einen Optokopplereingang. Solange eine Spannung (z.B. 12V) an diesem Eingang anliegt, wird die Messung deaktiviert. Es bietet sich somit an, den Eingang über eine Elektronik mit der PTT des Transceivers zu verbinden.

Hauptproblem der FGM-3 Sensoren ist die temperaturabhängige Drift der Messwerte. Deshalb ist darauf zu achten, dass die Temperatur am Sensor möglichst konstant ist bzw. sich möglichst langsam ändert.

Eine einfache Lösung zur Verlangsamung der Temperaturdrift der Sensoren besteht im Vergraben. Dabei ist der Sensor vor eindringender Feuchtigkeit zu schützen. Eine Tiefe von 80cm ist ein guter Kompromiss zwischen Temperaturisolation und Arbeitsaufwand. Das Sensorkabel sollte die letzten 2m bereits in der Endtiefe verlegt werden, da es selbst ein guter Wärmeleiter ist. Diese Variante hat sich seit zwei Jahren gut bewährt. Die Sensorsignale sind stabil und die Temperaturdrift liegt bei maximal 30nT/Tag.

Wenn die Möglichkeit des Vergrabens nicht besteht, dann muss ein höherer Aufwand bei der Temperaturisolation des Sensors betrieben werden. Es kann sowohl mit einem heißen, als auch mit einem kalten Thermostaten gearbeitet werden. Im Falle eines heißen Thermostaten ist darauf zu achten, dass der Heizstrom die Messwerte des Sensors nicht beeinflusst.

Kellerräume eignen sich ebenfalls gut zur Installation des Sensors, da sie selten begangen werden und es keine schnellen Temperaturschwankungen gibt. Eine entsprechend isolierte Sensorbox (z.B. kleines Glasaquarium mit Styropor ausgekleidet) kann ebenfalls sehr gute Ergebnisse liefern.

Wenn der Sensor im Haus betrieben wird, ist natürlich mit stärkeren Störeinflüssen zu rechnen (Elektroinstallation, bewegte Metallteile, Fernseher, Staubsauger usw.). Im Falle eines Alarmes sollte dieser durch Nutzung anderer Informationsquellen bestätigt werde.

Welche Magnetfeldkomponente(n) sollte(n) gemessen werden?

Diese Frage ist schwer zu beantworten. Manche Polarlichtbeobachter messen die X- und die Z-Komponente, da aus dem Verhalten der Z-Komponente Rückschlüsse auf die Ausdehnung des Polarlichtovals möglich sind. Bei Magnetstürmen sind die Schwankungen der X-Komponente in vielen Fällen größer als die der Y-Komponente. Es gibt allerdings auch Gegenbeispiele. Für den Amateurfunkeinsatz empfehlen wir bei der Verwendung von zwei Sensoren die Messung von X- und Y-Komponente. Bei Verwendung nur eines Sensors sind X- und Y-Komponente als gleichrangig zu betrachten.

Zur Ausrichtung des Sensors zur Messung der verschiedenen Magnetfeldkomponenten gelten folgende Regeln:

- X-Komponente: Sensor in Nord-Süd-Richtung; Anschlussstifte Richtung Süd,
- Y-Komponente: Sensor in Ost-West-Richtung; Anschlussstifte Richtung West,
- Z-Komponente: Sensor senkrecht; Anschlussstifte nach unten.

Praxisbeispiele

Karsten verwendet in JO61AB folgende Installation:

SAM

1x FGM-3 Sensor in Ost-West Richtung zur Messung der Y-Komponente. Der Sensor wurde im Garten in ca. 80cm Tiefe vergraben. Die Kabellänge zwischen Sensor und Auswerteelektronik liegt bei 40m.

Stationsausrüstung

IC-910H mit etwa 100Watt Ausgangsleistung. Das Antennensystem besteht aus 2x9-Element-Langyagi (5m Boomlänge). Beide Antennen sind im Abstand von 3m vertikal gestockt. Damit liegt die Strahlungsleistung bei knapp unter 3kW EIRP. Zusätzlich wird ein rauscharmer GAsFet-Vorverstärker verwendet.

1. Praxisbeispiel Magnetsturm am 24. November 2001

Als Karsten morgens vor dem Frühstück auf das SAM-Display schaute, wurde ein K-Index von K=6 angezeigt. Prompt wurde das Frühstück verschoben und die Station eingeschaltet. Außer Rauschen war auf dem 2m-Band nichts zu hören, im DX-Cluster lagen auch keine Meldungen vor.

Mehr aus Spaß rief Karsten um 06:55UTC CQ A. 06:57UTC antwortete SM6CQU aus JO67EE (681km) mit typischem Aurora-Sound und es konnten 55A/56A-Rapporte ausgetauscht werden. Karsten rief noch für etwa 20 Minuten CQ A, ohne einen weiteren Anruf zu bekommen. SM6CQU tat das Gleiche, wahrscheinlich auch umsonst.

Beide Stationen waren an diesem Morgen alleine auf dem 2m-Band. Dabei hätten bestimmt viele Logbuchseiten gefüllt werden können. Als Karsten am Nachmittag nach Hause kam, war die Radio-Aurora immer noch im Gange. Zwischen 13:56 UTC und 15:42 UTC konnten folgende Stationen geloggt werden:

SM6FBQ – JO67BQ – 736km
SP4MPB – KO03GS – 650km
RA3LE – KO64AR – 1.396km
SM6OPX – JO58RG – 802km
SP8UFT – KO11JI – 749km
PA0RDY – JO22KJ – 515km
G4DEZ – JO03AE – 851km

2. Praxisbeispiel IARU-Region 1 – 144MHz Contest 07.-08. September 2002

Während des Contests kam es zu einem Magnetsturm mit einer ausgeprägten Radio-Aurora. Abb. 10 zeigt den Verlauf der Y-Komponente des Erdmagnetfeldes im Zeitraum vom 07. bis 08. September 2002. Der Beginn des Magnetsturmes am 07. September wurde durch einen sogenannten „sudden impulse" gegen 17:00 UTC markiert. Die starken Schwankungen des magnetischen Flusses führten schnell zu einer Radio-Aurora auf 144 MHz. Karsten konnte im Verlaufe des Contests trotz starker Pileups folgende Stationen über Radio-Aurora loggen:

17:53 – GM4ZUK/p – IO86RW – 1.151km
17:55 – LA3BO – JO59CD – 906km
17:57 – SM6X – JO68SF – 802km
18:00 – SM7WT – JO65QQ – 522km
18:12 – OZ6OL/p – JO55WE – 459km
18:20 – GM3WOJ – IO77WS – 1.279km
18:46 – LA2PHA – JO38IB – 850km
18:52 – G8T – JO01KJ – 777km
19:18 – SK6HD – JO68SD – 793km
20:00 – SK7MW – JO65MJ – 486km
20:33 – G4LOH – IO94IA – 958km

Der K-Index der Y-Komponente erreichte in der Spitze K=6. Die Radio-Aurora trat in mehreren Schüben auf. Es wurden QSOs zwischen schwedischen und ungarischen Stationen beobachtet. Aus dem Schwarzwald sind Verbindungen bis Finnland getätigt worden. In Deutschland wurde gleichzeitig schwaches Polarlicht gesichtet. Trotzdem ist der Magnetsturm als relativ moderates Ereignis einzuordnen.

Die Stärke einer Radio-Aurora ist abhängig von der Höhe der Momentanschwankung des magnetischen Flusses. Diese Abhängigkeit wird durch einen Vergleich der QSO-Zeiten mit dem Magnetogramm in Abb. 10 deutlich. Aus eigener Erfahrung ist Radio-Aurora ab einem K-Index von K=5 und höher zu erwarten. Für visuelle Polarlichtsichtungen sollte der K-Index bei mindestens K=6 liegen. Diese Aussagen gelten für Karstens Standort auf 51.04°N, da die geographische Breite des Beobachters eine entscheidende Rolle spielt. In Norddeutschland gelegene Stationen sind dabei begünstigt und können bereits bei einem kleineren K-Index von der Aurora-Ausbreitung profitieren. Stationen aus Süddeutschland brauchen schon mindestens K=6 - K=7, um eine Radio-Aurora nutzen zu können.

Während des Magnetsturmes vom 22. Oktober 2001 erreichte der K-Index K=9. Dadurch waren Funkverbindungen bis nach Südeuropa möglich (JN35 und südlicher). Gleichzeitig waren prachtvolle Polarlichter zu sehen. Wer zu diesem Datum keine Aurora-QSOs im Log findet, der hat die Öffnung einfach verpasst...

Kosten und Bezugsquellen

Die Gesamtkosten für SAM liegen zur Zeit bei ca. 150..180 Euro, je nach Bezugsquelle. In der Baumappe befindet sich eine Tabelle mit Bestellnummern der Bauteile (Conrad, Reichelt usw.). Es hat sich bewährt, einige der Komponenten als Sammelbestellung zu kaufen. Dies gilt speziell für die Sensoren, bei einer Abnahmemenge von 25 Stück liegen die Kosten bei 32 Euro pro Sensor. Gleiches gilt für die Leiterkarte, die nur in größeren Stückzahlen aufgelegt werden kann und dann 15 Euro kostet. Karsten und Dirk sammeln die Bestellungen und ordern, wenn eine ausreichende Stückzahl erreicht ist, die entsprechenden Bauteile. Da sich in der Vergangenheit die Bauteilebeschaffung im Ausland als kritisch erwiesen hat, besteht die Möglichkeit, daß Karsten und Dirk in solchen Fällen Komplettbausätze zusammenstellen.

Wer über keinen Internetzugang verfügt kann von uns eine CD mit der Baumappe im PDF-Format und der SAM-Software anfordern (DL – 4,- Euro, Europa – 5,- Euro).

Literatur:

[1] Speake & Co. Ltd; Datenblatt der FGM-Sensoren.

Linkliste:

http://www.sam-europe.de - SAM-Homepage
http://www.on4kst.be/chatsam/start.php -SAM-Chat ON4KST
http://de.groups.yahoo.com/group/Magmeter/ - SAM-Yahoo-Group
http://www.qsl.net/dl3hrt - Karstens Homepage
http://www.meteoros.de/polar/polwarn.htm - Polarlichtwarnseite des Arbeitskreises „Atmosphärische Erscheinungen" des VdS
http://www.meteoros.de/forum.htm - Polarlichtforum des Arbeitskreises „Atmosphärische Erscheinungen" des VdS
http://www.forumkarten.de.vu - Übersicht über installierte SAMs, sowie Standorte der Polarlichtbeobachter
www.tu-bs.de/institute/geophysik/dienste/mrode/daten_de.html Echtzeitdaten des Observatoriums „Magnetsrode"
http://sec.noaa.gov/ace/ - Homepage des ACE-Satelliten
http://geomag.usgs.gov/models.html - Ausführliche Informationen zum Erdmagnetfeld
http://geomag.usgs.gov/dod.html

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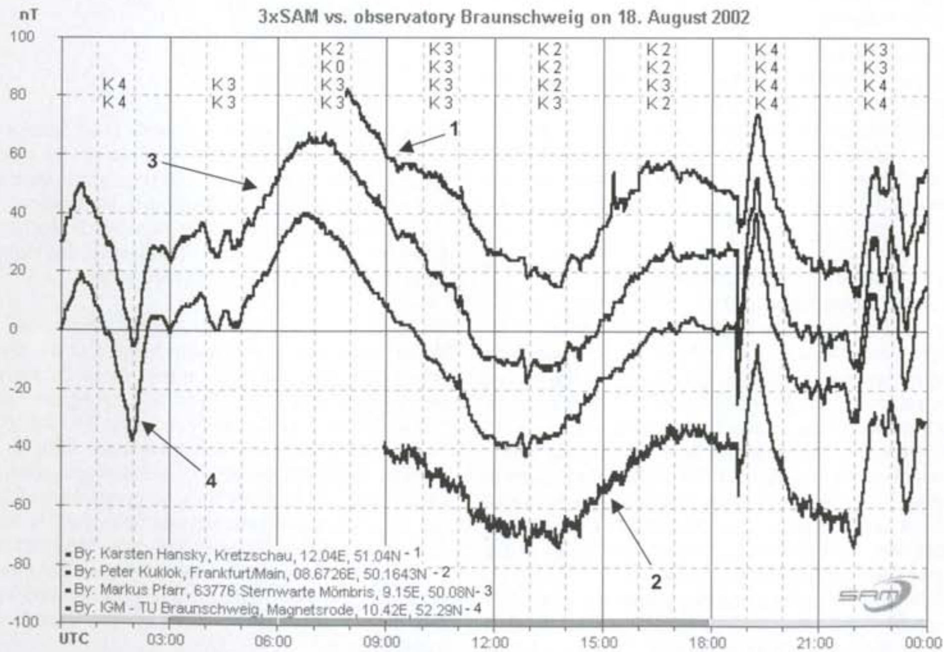


Abb. / Fig. 9

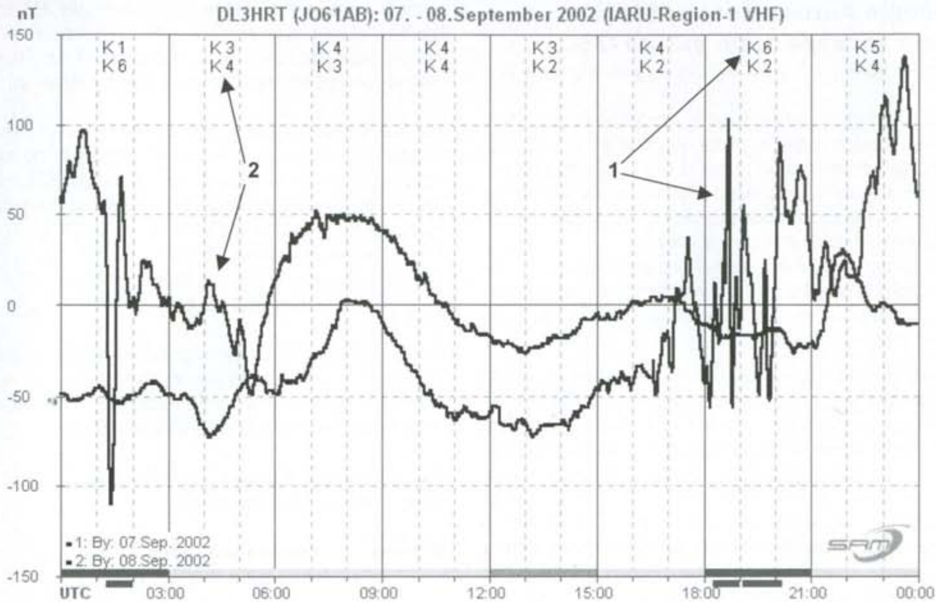
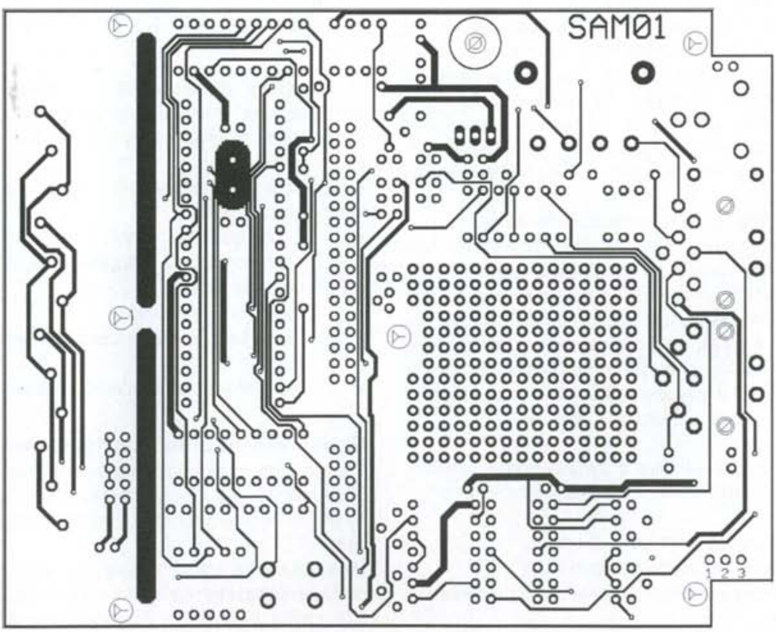


Abb. / Fig. 10

Anhang / Appendix

- Layout of the PCB (only one side here for giving an impression, complete professional layouts are supplied with the documentation from the authors and on their webpage!)



Simple Aurora Monitor (SAM) – How to make more aurora QSOs

Karsten Hansky – DL3HRT and Dirk Langenbach – DG3DA

The SAM project was triggered by Karsten annoyance about several missed aurora openings. His location is in JO61AB (51.04N). Therefore the number of aurora openings is fairly limited. It is annoying to hear on 144Mhc what a great aurora opening over several hours appeared the evening before. Especially if you were at home at that time.

Maybe you should switch on the computer to monitor the DX-cluster? The resulting traffic between living room and shack is unsuccessful in most cases and will not please the XYL. So what to do?

There exist two different ways not to miss an aurora opening. Either you are warned or you have to recognize auroral propagation in real time. The latter includes monitoring the DX-cluster, aurora beacons (for example SK4MPI on 144.412 Mhc) and the magnetometer of DK0WCY, vhf band observation or the telephone call of another radio amateur. Further sources are propagation forecasts and the internet with a wide variety of data. A very useful survey of different sources is provided under http://www.meteoros.de/polar/polwarn.htm by the working group „Atmospheric phenomenons" of the VdS (association of German stargazers). The most important source is the ACE satellite. This satellite is located in a distance of 1.5 million km from the earth towards the sun and measures different components of the solar wind. These data are available semi real time (http://sec.noaa.gov/ace). The most interesting instruments are EPAM and SWEPAM. When a shock front is detected by the ACE satellite it lasts 40 to 60 minutes until it arrives at the earths.

A large number of experienced aurora observers can be found in the corresponding internet forum (http://www.meteoros.de/forum.htm). Usually warnings of larger magnetic storms appear 1-2 days before the event, although not every warning leads to a magnetic storm.

All data sources join one characteristic – they require continuous monitoring and that is just the thing that Karsten was trying to avoid.

The obvious thing would be to measure the earths magnetic field. The particles of an incoming shock front interact with the earths ionosphere. If this interaction exceeds a certain extend it results in a movement of the auroral oval towards south with corresponding radio aurora openings. Fluctuations in the earths magnetic field can be observed at the same time. In the opposite, given the current degree of magnetic field fluctuations it is possible to determine the probability of radio aurora at a particular location in real time.

The earths magnetic field has a complex three-dimensional structure. It consists of three different magnetic components:

- x-component (north-south-direction)
- y-component (east-west-direction)
- z-component (perpendicular to x- and z- compo nents)

In many cases commercial magnetometers use horizontal inteHsity (h) and magnetic declination (D) instead of x-, y- and z-components. A very good overview about the different magnetic vectors and absolute values in Europe gives fig. 1.

The earths magnetic filed is measured by means of magnetometers. These devices determine the strange of the magnetic flux. The unit of measurement is usually "nT" (nano Tesla). The range of the absolute values of the three magnetic components in DL is the following:

- x-component: app. 18.000nT,
- y-component: app. 200-400nT,
- z-component: app. 45.000nT.

For the evaluation of the geomagnetic activity the so called three-hour K-index was introduced. The K-index is a logarithmic characteristic number which quantifies the fluctuations of the earths magnetic field within a three-hour period.

Table 1 shows K-Index limits for the geographical latitude of 50N.

K-Index	Fluctuation range of magnetic flux [nT]
0	0 .. 5
1	6 .. 0
2	11 .. 19
3	20 .. 39
4	40 .. 69
5	**70 .. 119**
6	**120 .. 199**
7	**200 .. 329**
8	**330 .. 499**
9	**> 500**

At geographical latitudes of 51N (Leipzig) weak radio aurora can be expected at K=5 and strong radio aurora at K=6 and higher. Visual observations are possible at K=6 and higher under dark sky.

A magnetometer for radio aurora recognition should meet the following requirements:

- continuous measurement of magnetic flux of one or more components of the earths magnetic field,
- resolution of 1-2nT,
- determination of K-Index,
- alarm function when exceeding a predefined K-limit (f.e. K > 5),
- autonomous operation without personal computer.

Measurement of the earths magnetic field

There exist many different methods to measure the strength of the magnetic flux. This includes simple mechanic methods as well as electronic sensors. A variety of physical effects is used.

Unfortunately the common cheap compass sensors turned out to be not sensitive enough for our purpose. Internet investigations lead to the British company Speake & Co. Ltd. They produce with their FGM-series fluxgate sensors at a very reasonable price which are very suitable for the measurement of the earths magnetic field. Especially the FGM-3 sensor is predestined for that purpose.

It has the following technical data [1]:

- measuring range app. +/- 50.000nT, therefore suited for the measurement of all magnetic components,
- non-linearity < 5.5% over the whole range, resolu tion 1-2nT,
- measurement output as TTL-signal, large cable length possible (>40m),
- supply voltage 5V,
- supply current 10mA,

The SAM project origins in winter 2000/2001. Karsten just got the first FGM-3 sensor from Bill Speake (fig. 2) and thought over the evaluation of the sensor data. At the same time Dirk developed hardware components for the company where Karsten was employed. The first meeting showed identical hobbies and very soon the idea of a microcontroller based magnetometer was born. Dirk developed the circuit diagram and Karsten built up the first prototype. It delivered the first magnetic flux data in September 2001. A name for the device was found very quickly – SAM (Simple Aurora Monitor).

SAM-Circuitry

The TTL-level frequency generated by the fluxgate sensor which is directly proportional to the magnetic flux is measured. The FGM-3 range of +/- 50000nT is transformed to a square wave signal of 30kHz.. 150kHz. It is obvious to use a microcontroller for further digital data processing. That means more flexibility and a smaller amount of external components compared to a TTL-solution. Furthermore we decided to provide flux-proportional voltage outputs and a RS232 interface. For using the device without a PC, a display and a small keyboard are necessary. An additional relay is used to signalise the alarm state. An optocoupled digital input is implemented to detect an external signal. The following block diagram was created after defining these guidelines :

The Microcontroller

The microcontroller should meet the following requirements:
-internal code flash
-software development and software updates become very easy,
-no need for external EPROM
-internal RAM (saves external components),
-internal EEPROM for non volatile storage of configuration parameters,
-serial port for PC connection and data logging,
-analogue output of measured data (voltmeter, pen-recorder etc.),
-counter-input for the output-signal of the FGM3-sensor,
-I/O ports for LCD-display, keyboard, etc.,
-availability of components (lead times, no exotic types),
-development environment (programming tools, compiler),
-common components (no SMD, but DIL or PLCC).

A PIC16F877 (MICROCHIP) was chosen which meets all these requirements except the analogue outputs. It provides two programmable 10bit PWM-outputs instead which can produce the desired analogue signals by means of few external components.
Internal 8 Kbytes flash-memory for program-code, 368 bytes RAM and 256 bytes internal EEPROM are sufficient for our application. The ports of this controller are able to drive LED´s or relays making external drivers obsolete.
Programming of the controller is a piece of cake: only once a programming device is used for transferring a boot loader software into the upper 256 bytes of the flash-memory. Afterwards the firmware can be downloaded from the PC (Windows 9x, Windows XP) via the RS232 terminal of the controller. An existing C-compiler and sufficient experience with this compiler formed a good basis to use this controller.
Fig. 4 shows the schematic .

Power supply

SAM needs a 12V DC supply, which can vary in the range of 10...18V DC. From this voltage all other internal voltages are derived: IC3, a three-terminal 5V regulator produces the supply voltage for the digital components: controller IC8, RTC IC9, NAND IC7 and the LCD-display. DC/DC-converter IC1 converts the 12V DC supply voltage into a –12V voltage which is regulated to –5V by IC2, a –5V/100mA three-terminal regulator. This negative voltage is used as negative supply for the LM324 (IC5). The positive supply of IC5 is directly connected to 12V DC The supply voltage of the fluxgate-sensor is a little bit tricky: a very stable supply is necessary, little variations will affect the output-frequency of the FGM-3. Therefore we used a separate three-terminal regulator (IC4).

Reading sensor data

For this purpose the internal 16bit counter of the microcontroller is used. An internal timer generates an interrupt interval of 1s for reading the value of the 16bit counter. From this reading the magnetic flux is calculated. To apply a second sensor, a simple TTL-logic is implemented (IC6) for alternated switching the two sensor signals counter input of the controller. Pin 18 (SENS_UM) of the microcontroller switches between both sensor channels.

The serial interface

SAM´s serial RS232 interface (IC7) provides different functionality:

- downloading the starting up software and the firmware into the code flash of the controller. For firmware updates no EPROM has to be changed.
- PC connection for external data processing. SAM sends measured values with a leading timestamp to the PC. Under Win9x/XP the visualisation-tool SAM_VIEW converts this data stream into a magnetogram.

The real-time clock

SAM has its own battery-powered RTC (IC9) which provides date and time for the timestamp of the data records. The RTC can be adjusted via RS232 by means of the parameterisation software SAM_Ini

Display and keyboard

Measured data are displayed by a back-illuminated LCD-display with 4 lines and 20 characters per line. This display size is required to show the data in a comfortable way, especially when the optional second sensor is used.

Four pushbuttons are installed to select the following menus: command-mode, calibration-mode, software-reset and display illumination/alarm suppression. Display illumination has two different modes: either it is switched on permanently or it is switched on when a push-button is pressed. In this case it will light for a few seconds, then it is deactivated until the next pushbutton is pressed. In addition there is a red LED to signal the exceeding of an adjustable alarm level.

Analogue outputs

In case of using external meters or analysers, SAM provides two analogue outputs, one for each channel. The analogue signals are derived from the PIC PWM outputs. The PWM-signals pass the low pass filters on the non-inverting inputs of the LM324 (IC5A, IC5C). P1/P2 are used for adjusting the amplitude of the output signal, P3/P4 are used to add a constant offset to generate bipolar output signals, e.g.-2.5V..+2.5V.

Relay output

In addition to the alarm-LED a relay K1 is implemented to signalise alarms to external devices like a buzzer or an indicator lamp. A buzzer is useful when the operator is sleeping or when he is outside of his shack.

Optocoupler input

SAM's optocoupled input (OK1) is used for freezing the current measurement. This can be necessary when strong RF fields are present. RF can affect the FGM-3 sensor. Erroneous measurements are the result.

Connectors

SAM has three interface connectors:

- 8-pole female connector with relay-, optocoupler and analogue output pins,
- RS232 interface (9-pole DSUB connector),
- 6-pole female connector for connecting two fluxgate-sensors (power, GND and signal).

Assembly

When developing SAM, we paid special attention to the following points:

- a handy format of the housing and a minimum of mechanical machining,
- high quality double sided PCB with position print,
- detailed documentation, publication of the schemat ics, compiling a construction manual.

The enclosure

Because a LCD-display is used it is obvious to use an enclosure with a hole where the display does fit. We choose an industrial enclosure (BOPLA EG-2060PD - 200mm x 110mm x 65mm). This enclosure is particularly suitable because the display opening has the optimum size, the screws fasteners are in the right position. At the top it has an easy to machine plastic-plate for the supply-, interface- and sensor-connectors. Installing the keyboard requires some more effort. But using a drilling-jig makes it easy. For all mechanical work only a drilling machine and a small file is needed (fig.5 and fig.6).

The PCB

After choosing the enclosure the PCB layout was designed. The double sided PCB has a solder mask and a position print for the components (industrial standard). This makes the PCB more expensive than a typical „kit-PCB" but simplifies the assembly. The solder pads will resist repeated soldering of the components. To simplify the assembly for the beginner only standard components are used (no SMD).

Fig. 7 shows the PCB implemented in the enclosure. In the lower part the microcontroller, the RTC and the RS232 interface are to be seen. On the left side the power-supply, the battery, the optocoupler and the relay are arranged. The circuitry of the analogue outputs is located on the right side. At the top the connectors are placed. For own add-ons, e.g. a circuit for a temperature regulation of a hot thermostat etc., a small field with solder pads is implemented. The lower area of the enclosure is not used yet. It is planed to use this area for a data logger to store SAM data when it is operating stand alone.

The keyboard PCB is mounted in the cover of the enclosure. Fig. 8 shows the mounted LCD and keyboard. The keyboard and the display are connected to the controller board via a 10-pole and a 34-pole ribbon cable.

Time-investment

According to our experiences you should allow one weekend for the complete assembly. If you are experienced in soldering and mechanical work you will finish your SAM much quicker. After 3 to 4 hours SAM will be ready for operation. It is recommended to read the manual carefully or to get some hints from the SAM homepage.

Starting up

After completing the electronics and checking the voltages according to the manual the kit is ready for initial tests. The starting up software is available at the SAM homepage. It has to be downloaded via RS232 from the PC into the controller. To make this easy, a small bootloader software in the flash area of the controller manages the communication and transfer of the software into the internal code flash. For a detailed description have a look into the manual. When you order the controller from Karsten or Dirk, the starting up software is already programmed.

The starting up software allows to check the following hardware functions. Each step and its result is displayed on the LCD:

- keyboard
- serial interface
- real-time clock
- relay output
- optocoupled input
- analogue outputs
- initialising of the internal EEPROM

When all these tests are passed and the EEPROM is initialised the FGM-3 sensor can be connected. The last step is to download the firmware into the controller. SAM is ready for operation!

SAM Firmware

The SAM firmware has the following features:

- evaluation of one or two FGM-3 sensors,
- measurement of magnetic flux in 1second interval,
- median-filter to suppress short time interferences,
- determination of the three-hour K-index,
- measurement output on LCD-display with backlight, RS232-interface and two analogue outputs,
- parameterisation via RS232-interface,
- four keys to trigger different functions,
- determination and display of 10-minute trend for each sensor.

SAM Tools

The SAM tools contain a set of Windows programs for comfortable parameterisation, logging, data processing and visualisation of the measured data on a personal computer. Besides stand alone operation it exists the possibility by connecting SAM to a personal computer to generate magnetograms which can be made available to the amateur radio community via the internet. The SAM tools are completed by a help file which does not only contain information about the programs but also many useful information about SAM and magnetic field measurements. The SAM tools can be downloaded as freeware from the SAM homepage. The magnetograms in fig. 9 and fig. 10 were created using SAM_View.

Results

We reached our main goal. There are no more missed radio aurora openings. Karstens log filled up with a number of aurora QSOs last year. SAM serves as indicator for possible radio aurora openings. When alarm is triggered the common data sources (DX-cluster, Internet etc.) are used to exclude possible local influences.

More than 70 SAMs were build up to now. Lutz Schenk runs under http://www.sam-europe.de the official SAM homepage. All important information (building plan, software etc.) and a number of online magnetograms can be found there. Thanks Peter (PA1SIX) exists an excellent English version of the building plan. Alain (ON4KST) provided us with an own chat (http://www.on4kst.be/chatsam/start.php). An overview about a part of the SAM installations show the maps under http://www.forumkarten.de.vu.

Under http://de.groups.yahoo.com/group/Magmeter/ exists a SAM newsgroup.

The achieved measurement accuracy met our expectations or is even better. Fig. 9 shows four different curves of the y-component during the weak magnetic storm on 18. August 2002. There are three curves from SAM users at different locations compared to the curve of the geomagnetic observatory "Magnetsrode" (University Braunschweig). The curves a shifted against each other for better visualization. The correspondence of the curves is obvious. The differences are caused by temperature drift, incorrect positioning of the sensors and of courses to a certain extend by the different locations of the magnetometers. The weak peak in Karstens curve at 15:20 UTC was caused by an iron garden gate. The FGM-3 sensor was buried without additional temperature isolation in all three cases.

SAM helps his owner as stand alone device to detect the possibility of radio aurora openings. But SAM can even more. By comparing different magnetograms from different locations it is possible to get a complete overview of the earths magnetic field in real time. This is much more than the European observatories (Magnetsrode, Kiruna etc.) do at the moment. If data from whole Europe are available we have an excellent basis to investigate and understand such propagation phenomena like radio aurora better as we do today.

The online magnetograms on the SAM homepage just mark the beginning. There is still much work to do to process and combine the available data. everybody is invited to take part in this interesting work.

Magnetometer Practice

How to install the sensor?

The sensor should be installed as far as possible away from magnetic sources. This includes alternating fields (electronic devices, electric installation etc.) as well as continuous fields (iron pieces, cars etc.). Stationary iron pieces (lattice towers) are not that critical. Short term influences like passing cars will be filtered by the firmware. Outdoor installation should be preferred but is not absolutely necessary.

Transmitting generates magnetic fields which can influence the sensor. Wave length, transmitting power, antenna characteristics and distance between antenna and sensor are the key parameters. Karsten generates with 10 milliwatts output to a vertical antenna on 14Mhc a "magnetic storm" with K=9 (distance antenna – sensor = 10m) while 100 watts and 16.4dB$_i$ on 144 Mhc do not influence the sensor at all (distance antenna – sensor 20m).

To suppress transmitting interferences SAM contains a digital optocoupler input. If a voltage (12V) is applied to this input measurement is deactivated. It is recommended to connect it via a small electronic circuit to the transceivers PTT-line in case of interferences.

Main problem of the FGM-3 sensors is their temperature dependency. It is necessary to maintain almost constant or at least slowly changing temperature at the sensor. The most simple solution to slow down temperature changes is to bury the sensor. The sensor has to be protected against moisture. A depth of about 80 cm is a good compromise between temperature isolation and amount of work involved. The sensor cable should be buried in the same depth the last 2 metres before the sensor because it is a very good heat conductor itself. This installation proved itself over two years. Sensor signals are stable and temperatur drift is reduced to app. 30nT per day.

If there is no possibility to bury the sensor some more effort is necessary to achieve a good temperature isolation. One can work with hot as well as with cold thermostats. In case of a hot thermostat the heating current has to be taken into account because it can influence the measurements. Cellars are very good suited for sensor installation because they are not frequently inspected and temperature changes are slow. A good foam-insulated sensor box can perform very well.

When using the sensor indoors the possibility of interferences increases (electric installation, moving iron pieces, TV-sets, vacuum cleaners etc.). In case of alarm one should prove geomagnetic activity by means of other data sources.

Which magnetic field component(s) should be measured?

This question is difficult to answer. Some aurora observes measure x- und z-component because the behaviour of the z-component allows predictions about the extension of the auroral oval. Fluctuations of x-component are higher as fluctuation of y-component in many cases when magnetic storms are in progress. There exist many examples to prove the opposite though. For amateur radio purposes we recommend to measure x- and y-component in case of a two sensor setup. If only one sensor is used x- and y-component can be considered as equal.

For sensor positioning the following rules apply:

- X-component: sensor in north-south-direction; connectors towards south,
- Y-component: sensor in east-west-direction; connectors towards west,
- Z-component: sensor in vertical direction; connectors downside.

Examples

Karsten in JO61AB uses the following installation:

SAM

1x FGM-3 sensor in east-west direction to measure y-component of the magnetic field. The sensor was buried in the backyard in 80cm depth. The cable length between sensor and electronic box exceeds 40m.

Equipment

IC-910H with about 100 watt output. 2x9-element long yagi (5m boom). Both antennas are stacked vertically with 3m distance. EIRP is just below 3 kW. In addition a low noise GAsFet-preamplifier is used.

1st Example: Magnetic Storm at 24. November 2001

When Karsten had a look on the display just before breakfast it show a K-index K=6. Prompt breakfast was put off and the station was switched on. Apart from noise there was no signal on 144 MHc. The DX-cluster showed no aurora announcements as well.

Nevertheless Karsten just for fun called CQ A at 06:55 UTC. SM6CQU answered with typical aurora sound from JO67EE (681km) at 07:57 UTC. 55A/56A reports could be changed. Karsten continued CQing for 20 minutes without any further reply. SM6CQU did the same, probably unsuccessfully as well.

Both stations were the only ones on 144Mhc that morning although certainly many log sheets could have been filled. When Karsten came home in the afternoon the radio aurora was still in progress. Between 13:56 UTC and 15:42 UTC he logged the following stations.

SM6FBQ – JO67BQ – 736km
SP4MPB – KO03GS – 650km
RA3LE – KO64AR – 1.396km
SM6OPX – JO58RG – 802km
SP8UFT – KO11JI – 749km
PA0RDY – JO22KJ – 515km
G4DEZ – JO03AE – 851km

2nd Example: IARU-Region 1 – 144 MHz Contest 07.-08. September 2002

A magnetic storm accompanied by a strong radio aurora appeared during the contest. Fig. 10 shows the y-component of the magnetic field in the period of 07. – 08. September 2002. The magnetic storm started with a so called sudden impulse at 17:00 UTC. The heavy fluctuations of the magnetic flux culminated very quickly in a strong radio aurora on 144Mhc. Despite the strong pile ups Karsten was able to log the following stations:

17:53 – GM4ZUK/p – IO86RW – 1.151km
17:55 – LA3BO – JO59CD – 906km
17:57 – SM6X – JO68SF – 802km
18:00 – SM7WT – JO65QQ – 522km
18:12 – OZ6OL/p – JO55WE – 459km
18:20 – GM3WOJ – IO77WS – 1.279km
18:46 – LA2PHA – JO38IB – 850km
18:52 – G8T – JO01KJ – 777km
19:18 – SK6HD – JO68SD – 793km
20:00 – SK7MW – JO65MJ – 486km
20:33 – G4LOH – IO94IA – 958km

The K-index of the y-component reached K=6. Radio aurora appeared in several phases. Karsten monitored contacts between SM and HA stations. Contacts were reported between southern DL and OH. Week visual aurora was observed in DL simultaneously. Nevertheless this event was classified as a moderate one.

The strength of a radio aurora depends on the present fluctuations of the magnetic flux. This dependence is clearly shown by the comparison of QSO times vs. magnetogram in fig. 10. Based on own experiences radio aurora can be expected at K-index K=5 and higher. For visual observations the K-index should reach at least K=6. These statements are valid for Karstens location at 51.04N because the geographical latitude is the key factor. Stations in northern DL are favoured and can use auroral propagation even at lower K-indexes. Stations in southern DL need K=6 – K=7 to profit from radio aurora.

During the magnetic storm at 22. October 2001 the K-index reached K=9. Contacts were reported down to southern Europe (JN35 and below). Wonderful visible aurora was observed in DL. If someone does not find aurora QSOs in his log for that date he just missed that opening...

Costs and supply sources

The overall costs amount to 150 - 180 Euro, depending on the supply source. At the end of the building plan exists a table with part numbers (Conrad, Reichelt etc.).
It is useful to order some parts as collective order. This applies especially for the sensors. At order volumes of 25 pieces the costs amount to 32 Euro per sensor. The same applies to the circuit board which can be ordered in larger quantities only and amounts to 15 Euro. Karsten and Dirk accumulate orders until a sufficient number is reached. It turned out to be a problem to get certain parts outside Germany sometimes. In this case Karsten and Dirk offer to assemble complete kits.
For those who do not have internet access we offer to send a CD with construction manual in PDF-Format and SAM software (DL 4,- Euro, Europe 5,- Euro).

Literature, Links & Adresses: (see above)

Appendix: Stückliste / Parts List

Bezeichnung	Wert	Lieferant	Best.-Nr.
Sensor	FGM-3	DL3HRT/DG3DA	
Leiterkarte	100mm x 125mm	DL3HRT/DG3DA	
BAT1	NiCd-Akku 3.6V/65mAh	Reichelt	3GP-60
C1	Elko 10uF/100V	Reichelt	RAD 10/63
C2	Elko 10uF/100V	Reichelt	RAD 10/63
C3	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C4	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C5	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C6	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C7	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C8	Keramik-Kondensator 22pF	Reichelt	KERKO 22p
C9	Keramik-Kondensator 22pF	Reichelt	KERKO 22p
C14	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C15	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C16	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C17	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C18	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C19	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
C20	Keramik-Vielsch.Kondensator 100nF	Reichelt	Z5U-2,5 100N
D1	Diode 1N4148	Reichelt	1N4148
D2	Diode 1N4001..4007	Reichelt	1N4007
D3	Diode 1N4148	Reichelt	1N4148
D4	LED 3mm rot	Reichelt	LED 3MM RT
IC1	Schaltregler ICL7662	Reichelt	ICL7662 CPA
IC2	Spanunngsregler 79L05 -5V/100mA	Reichelt	uA79L05
IC3	Spannungsregler 7805 +5V/1A	Reichelt	uA7805
IC4	NAND-Gatter 74HCT00	Reichelt	74HCT00
IC5	Spannungsregler 78L05 +5V/100mA	Reichelt	uA78L05
IC7	RS232-Pegelwandler HIN232	Reichelt	MAX232CPE
IC9	Microcontroller PIC16F877	ReicheltPIC16F877-20L	
JP1	3-polige Stiftleiste RM=2.54mm		
JP2	2-polige Stiftleiste RM=2.54mm		
K1	Reed-Relais 5V	Reichelt	SIL 7271-D 5V
OK1	Optokoppler CNY17F	Reichelt	CNY 17/I
P1	Spindeltrimmer 47k	Bürklin	65E8422
P2	Spindeltrimmer 47k	Bürklin	65E8422
P3	Spindeltrimmer 10k	Bürklin	65E8418
P4	Spindeltrimmer 10k	Bürklin	65E8418
P5	Spindeltrimmer 10k	Bürklin	65E8418
Q1	Quarz 16MHz / HC49U-V	Reichelt	16-HC49U-S
Q2	Transistor BC337 o.ä.	Reichelt	BC337-25
R1	Widerstand 6k8 / 0.25W	Reichelt	Metall 6,8k
R2	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R3	Widerstand 10k / 0.25W	Reichelt	Metall 10k
R4	Widerstand 10k / 0.25W R	eichelt	Metall 10k
R5	Widerstand 470k / 0.25W	Reichelt	Metall 470k
R6	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R7	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R8	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R9	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R10	Widerstand 10k / 0.25W	Reichelt	Metall 10k
R11	Widerstand 10k / 0.25W	Reichelt	Metall 10k
R12	Widerstand 470k / 0.25W	Reichelt	Metall 470k
R13	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R14	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R15	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R16	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R17	Widerstand 1k / 0.25W	Reichelt	Metall 1k
R18	Widerstand 1k / 0.25W	Reichelt	Metall 1k
R19	Widerstand 10k / 0.25W	Reichelt	Metall 10k
R20	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R21	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R22	Widerstand 10k / 0.25W	Reichelt	Metall 10k
R23	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R24	Widerstand 100k / 0.25W	Reichelt	Metall 100k
R25	Widerstand 68R / 0.25W	Reichelt	Metall 68
R26	Widerstand 2k2k / 0.25W	Reichelt	Metall 2,2k
R27	Widerstand 10k / 0.25W	Reichelt	Metall 10k
R31	Widerstand 1k / 0.25W	Reichelt	Metall 1k
S1	Resettaster	Reichelt	PHAP 3301
LCD-Wannenstecker	Wannenstiftleiste 34pol	Reichelt	WSL34G
SV1	Wannenstiftleiste 34pol	Reichelt	WSL34G
SV2	Wannenstiftleiste 10pol	Reichelt	WSL10G
SV3	Wannenstiftleiste 10pol	Reichelt	WSL10G
TA1	Taster RAFI 15R	Bürklin	13G4122
TA2	Taster RAFI 15R	Bürklin	13G4122
TA3	Taster RAFI 15R	Bürklin	13G4122
TA4	Taster RAFI 15R	Bürklin	13G4122
U1	Operationsverstärker LM324	Reichelt	LM324DIL
U2	Echtzeituhr RTC72421	Reichelt	RTC72421
X1	DIN-Print-Buchse 8pol.	Bürklin	70F567
X2	Netzteilbuchse	Bürklin	40F140
X3	DIN-Print-Buchse 6pol.	Bürklin	70F565
X4	DIN-Stecker 8pol.	Bürklin	70F251
X5	DIN-Stecker 6pol	Bürklin	70F242
	Pfostenverbinder 10pol	Reichelt	PFL 10
	Pfostenverbinder 10pol	Reichelt	PFL 10
	Pfostenvebinder 34pol	Reichelt	PFL34
	Pfostenvebinder 34pol	Reichelt	PFL34
FBK1	Flachbandkabel 34pol ca 15cm		
FBK2	Flachbandkabel 10pol ca 15cm		
LC-Display	4x20Zeichen, beleuchtet	Conrad	187275-62
Steckernetzteil	12VDC/1A		

Microwave Parts

Henning Weddig, DK5LV

New MMIC multipliers for 10 GHz

Now there are integrated multipliers available for the GHz-range which can be used as an alternative to multipliers consisting of discrete tuned stages. MMIC:s with an output at 10 GHz and multiplication factors from 4 to 16 are manufactured by Hittite Microwave Corporation.

HMC444LP4 is one of these devices, which takes a signal at something like 1240 to 1400 MHz and multiplies it with a factor of 8 to deliver 9.9 to 11.2 GHz according to the specificatios. Input power is specified at -15 to 5 dBm for an output power of 3 to 6 dBm. Power supply is 5 V.

The evaluation board for this device was tested, which resulted in some measured values a little different from those in the data sheet.

It seemed to be driven into saturation at an input level of approx 0 dBm.

Output power peaked at 10.6 GHz and 4 dBm. The unwanted seventh and nineth harmonic of the input frequency were then -38 and -42 dBc. Second harmonic only -17 dBc though.

At 9.7 GHz, output power was 1.5 dBm and nearest unwanted signal -34 dBc.

Above 11 GHz power dropped fast. At 11448 MHz (which is useful for 24 and 47 GHz transverters) power was less than -1 dBm. At 10224 MHz, however, something like 3 dBm was aquired, which could be enough to drive a mixer directly.

Note that these devices are very small and therefore tricky to solder!

For more information, see:

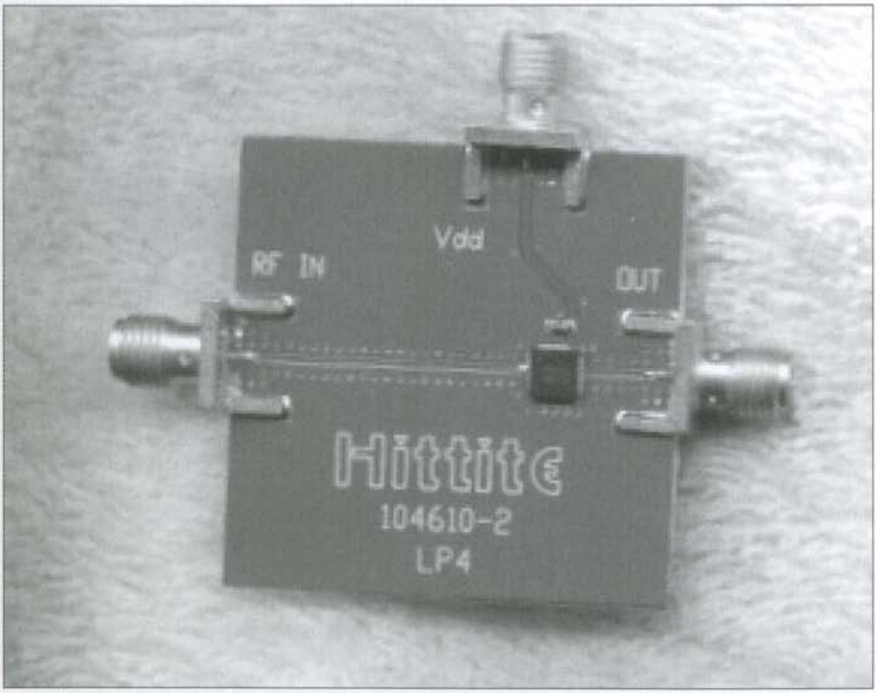
[1] "Active Multipliers and Dividers to Simplify Synthesizers", Microwave Journal 11/2002

[2] Hittite website: http://www.hittite.com

Daniel Uppström / SM6VFZ

In Germany there is now a representative for Hittite:

Volker Schulz, Isarstrasse 1,
D-83026 Rosaenheim
Phone 0049 8031 97654
Email: schulz@hittite.com



Microwave Europe

Editor: Simon Lewis, GM4PLM

On Microwave from Italy, I6:

Cesare, I6XCK, sent a nice report from the I6-OPs for 2002. The group is qrv portable from JN63QM.

I6XCK's rig: 1,4m dish, TWT 5 to 40 W out, total system NF 1,1 dB. He has wkd 52 squares on 10 GHz. During this year's season he will often be qrv in the afternoons and go portable as he his now retired.

I6XCK, JN63QM,

wkd Rainscatter SSB on10 GHz:

01-06-2002: 11.00 S51ZO JN86DR, 12.27 OE3WOG/6 JN77TQ, 12.37 OM3LQ JN88OI,
12.36 OM1GX JN88OI, 12.46 OE5VRL/5 JN78DK, 12.57 DD7MH JN68HD,
13.04 OE3WRA JN77HX, 13.07 DL3MBG JN67JX, 13.50 OK2ZZ JN89BO,
14.48 HA1YA JN87GF, OE3XXA JN88CH.
20-06-2002 17.20 DL6NCI JO50VI, 17.25 DB6NI JO50VI.
06-07-2002 16.39 OM3LQ JN88OI, 17.31 S51ZO JN86DR, 1750 OE5VRL/5 JN78DK,
19.41 OE8MI/8 JN66UO, 17.35 HA1YA JN87GF.
21-07-2002: OK2ZZ JN89BO, 15.00 OE8MI/8 JN66UO, 15.44 DC8EC JN57UX,
24-07-2002: OE5VRL/5 JN78DK.
25-07-2002: 7.10 S51ZO JN86DR
31-07-2002: 14.50 OE8MI JN76AM, 14.58 OE8TPK JN76AM, 16.15 OK2DL JN89BO, 16.55 DL3MBG JN67JX, 17.50 S51ZO JN86DR.
04-08-2002: 14.15 OE5VRL JN66PS, 15.25 OK2KZR JN89BO.
12-08-2002: 15.40 S51ZO JN86DR.
23-08-2002: 13.55 I1TEX JN35SA, 14.15 I1CPN JN34VI.
24-08-2002: 13.25 OE5VRL JN78DK, S51JN JN65UM.
25-08-2002: 14.30 OK2KZR JN89BO.
09-09-2002: 17.15 DL3MBG JN67JX.

IW6CVN, Francesco, wkd on 10 GHz (5 to 20 Watt, 1 m dish), JN63QM:

06-07-2002			
16.18	S50C	JN76JG	59S 59S
16.42	OM3LQ	JN88OI	59S 59S
17.26	S51ZO	JN86DR	59S 59S
17.37	HA1VHF	JN87GF	5S 55S
17.46	OE8VRL/5	JN78DK	55S 55S
13-07-2002			
14.57	OE8MI/P	JN66UO	59S 59S
15.02	OE8MI/P	JN66UO	59S 59S FM
21-07-2002			
15.52	DK9MN	JN58TC	59S 59S
6.05	DC8EC	JN57UX	59S 59S
31-07-2002			
15.36	OE5VRL	JN78DK	59S 59S
15.57	I3ZHN/3	JN65EP	59S 59S
16.01	DL3MBG	JN67JX	59S 59S
16.07	OK1JK	JO60OK	57S 57S
16.13	OK2DL	JN89DO	55S 55S
17.50	S51ZO	JN86DR	59S 59S
17.55	OE8MI	JN66WP	59S 59S
20-08-2002			
15.50	OE8MI/P	JN66UO	59+S 59+S
15.55	OE8MI/P	JN66UO	59+30S 59+30S FM
15.58	OE8MI/P	JN66UO	59S 59S FM
17.30	HA1YA	JN87GF	59+S 59+S
17.50	HA1YA	JN87GF	59+30S 59+30S FM
22-08-2002			
14.05	I1CPN	JN35SA	59S 59S
14.25	I1TEX	JN34VI	59S 59S
24-08-2002			
14.38	OE5VRL/5	JN78DK	59+S 59+S
25-08-2002			
14.43	OK2KZR	JN89BO	59S 59S
14.58	OE8MI/P	JN66UO	59S 59S
15.03	OE8MI/P	JN66UO	59S 59S
15.25	S51JN	JN65UM	59S 59S
15.36	OK1AIY/P	JO70 SQ	55S 55S

IW6ATU, Guido,
wkd on 5.7 GHz (5 w, 1.2 m dish) in SSB:

16.06.02				
1244 OE3WOG/6	59012	58002	JN77TQ	495km
1248 OE3XXA	59013	55006	JN88CH	576
1307 OE5VRL/5	59014	59007	JN78DK	551
1444 HA1YA	59019	59002	JN87GF	481
1455 OK2ZZ	59020	51005	JN89BO	708
1534 S51ZO	59021	55005	JN86DR	424

73 de I6XCK, Cesare cesare.bontempi@tin.it
IW6CVN, Francesco iw6cvn@libero.it
IW6ATU, Guido microwave@tin.it

I6XCK and IW6CVN in JN63QM

Microwave USA
Editor: Kent Britain, WA5VJB

This has certainly been a spring of microwave records in the US with 3 records changing hands 8 times!

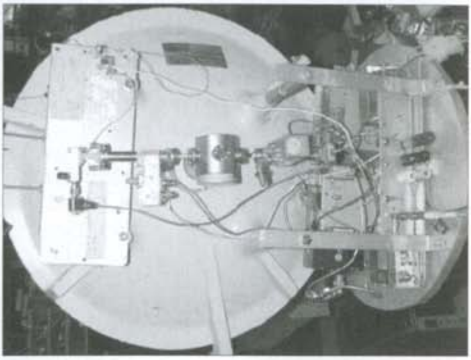
On **120 GHz** the teams of W0EOM-KF6KVG and WA1ZMS-W4WWQ-KA4YNO traded the 120 GHz record between the East coast and the West coast several times. It all started when the WA1ZMS team beat the 11.6 km 1999 record extending it to 12.79 km on 10 March., but later the W0EOM got around to announcing they are beaten their own record with a 16.5 km QSO on 7 March. Taking advantage of a cold front with cold dry air, the WA1ZMS team then extended the record to 20.6 km on 11 March. Back to California and W0EOM pushed their equipment out to 28.4 km. on the 29th of March. Back to the East coast and on the 2nd of April, the WA1ZMS team using a new bias system that changed the mixer DC bias between TX and RX, pushed the record out to 30.056 km So 5 Record QSO's in only 4 weeks. What is next? Well, the California team has several paths that are 3000-4000 m ASL. Maybe they with find a few more dB in that thin mountain air. I don't expect the records to end here!

After talking about 120 GHz, it's hard to come down to only **9 and 13 cm**, but taking advantage of a spring warm front, K5VH just west of Austin, Texas EM00 worked WA8TTM (Florida EL98dp) on both 9 and 13 cm 13, April for new 9 and 13 cm tropo records of 1593.6 km.
They tried for nearly an hour on 3 cm, but there may have been problems with the 3 cm gear.
But records are meant to be broken, 40 minutes later W5LUA (EM13QC) worked K0VXM (EL98) at just over 1610 km to get his 13 cm tropo record back.

I would like to invite everyone to the **2003 Microwave Update Conference.**
This year it will be hosted by NU7Z and K7ND in Seattle Washington 25.-28. of September.
For more information please visit:
www.microwaveupdate.org

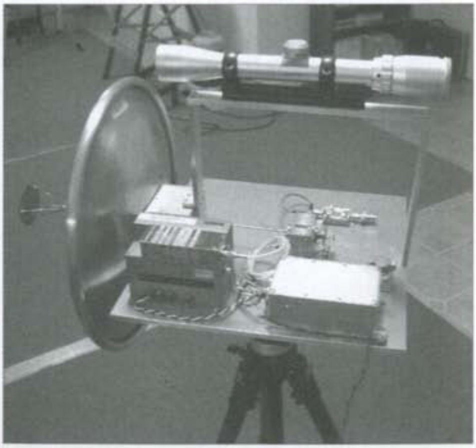
73, Kent

W0EOM´s station:
The dish is an 18" in precision with Cassegrain feed and a 70 GHzz horn. This is used for 76 thru 140 GHz.
Harmonic mixers -Hughes- are used on both tx and rx. tx lineup is 10 MHz / 100 MHz / 10 Ghz/ 40 / 120.000 Ghz.
For RX it is 10/100/13.3 GHz / 39.9 / 119.7 GHz



W0EOM`s 120 GHz station

WA1ZMS`s 120 GHz station



REF/DUBUS-EME-Contest 2003, by F6HYE

Results 144 MHz

Place	Call	Points	QSO (+Sked)	Multi	Pwr	OP
1	I2FAK	442900	103	43	QRO	SIN
2	F3VS	415800	99	42	QRO	MUL
3	RU1AA	347800	94	37	QRO	SIN
4	I3DLI	319200	84	38	QRO	SIN
5	IK1FJI	145600	52	28	QRO	SIN
6	SV1BTR	136800	57	24	QRO	SIN
7	HB9Q	120000	50	24	QRO	SIN
8	LZ2US	103500	45	23	QRP	SIN
9	SP2OFW	98900	43	23	QRO	SIN
10	RN6MT	76000	38	20	QRO	SIN
11	SM2CEW	73500	35	21	QRO	SIN
12	PA2CHR	64800	36	18	QRO	SIN
13	S53J	62000	31	20	QRO	MUL
14	UA4AQL	61200	34	18	QRP	SIN
15	UA4AAV	49600	31	16	QRO	SIN
16	JL1ZCG	40500	27	15	QRO	SIN
17	LZ1DP	35000	25	14	QRO	SIN
18	OZ4MM	31500	21	15	QRO	SIN
19	UX3LV	28800	24	12	QRO	SIN
20	JH5FOQ	28000	20	14	QRO	SIN
21	I3EVK	27300	21	13	QRO	SIN
21	RN6BN	27300	21	13	QRO	MUL
23	WB9UWA	26000	20	13	QRO	SIN
23	YO2AMU	26000	20	13	QRP	SIN
25	RA4AOR	22000	20	11	QRO	SIN
26	DM2BHG	20900	19	11	QRO	SIN
27	JH2COZ	19000	19	10	QRO	SIN
28	YU7BCL	18000	15	12	QRP	MUL
29	9A9B	17600	16	11	QRO	SIN
30	RW3WR	17000	17	10	QRP	SIN
31	PA3CWI	16500	15	11	QRO	SIN
32	F6HVK	15300	17	9	QRP	SIN
33	SK0UX	14000	14	10	QRO	MUL
34	EA3DXU	13000	13	10	QRO	SIN
35	RA3QTT	10500	15	7	QRP	SIN
36	S51ZO	8000	10	8	QRO	MUL
37	DF2ZC	7840	11 (+2)	7	QRO	SIN
38	F8DO	7320	12 (+2)	6	QRP	SIN
39	SP7DCS	7000	10	7	QRP	SIN
40	W0VD	4500	9	5	QRO	SIN
41	WA6PY	3000	6	5	QRP	SIN
41	G3LTF	3000	6	5	QRP	SIN
43	SM5CUI	2000	5	4	QRP	SIN
44	UR5LX	900	3	3	QRO	SIN
45	JF4TGO/8	100	1	1	QRP	SIN

Results 432 MHz

1	F6KHM	207900	63	33	QRO	MUL
2	HB9Q	198400	64	31	QRO	SIN
3	OZ4MM	179800	58	31	QRO	SIN
4	UA3PTW	139500	45	31	QRO	SIN
5	G3LTF	119600	46	26	QRP	SIN
6	F2TU	102500	41	25	QRO	SIN
7	VK3UM	96800	44	22	QRO	SIN
8	G4RGK	75900	33	23	QRO	SIN
9	SM2CEW	70000	35	20	QRO	SIN
10	JA6AHB	64000	32	20	QRO	SIN
11	S52CW	55100	29	19	QRP	SIN
12	SM3AKW	45000	25	18	QRO	SIN
13	OZ6OL	44200	26	17	QRP	SIN
14	DJ3FI	41400	23	18	QRP	SIN
15	HB9JAW	32000	20	16	QRO	SIN
16	EA3DXU	31500	21	15	QRP	SIN
17	SP6JLW	22400	16	14	QRP	MUL
18	PA2CHR	15600	13	12	QRP	SIN
19	IN3AGI	11000	11	10	QRO	SIN
19	UT3LL	11000	11	10	QRP	SIN
21	KE2N	8800	11	8	QRO	SIN
22	YO2IS	7200	9	8	QRP	SIN
23	S53J	5600	8	7	QRO	MUL
24	SK0CC	4900	7	7	QRP	MUL
25	JA2TY	4000	8	5	QRO	SIN
26	S51ZO	900	3	3	QRO	MUL
27	DL7UDA	400	2	2	QRP	SIN

Results 1296 MHz

1	F2TU	117000	45	26	QRO	SIN
2	G4CCH	115000	46	25	QRO	SIN
3	OZ4MM	108000	45	24	QRO	SIN
4	HB9BBD	105800	46	23	QRO	SIN
5	G3LTF	101200	44	23	QRO	SIN
6	K5JL	100800	42	24	QRO	SIN
7	F6KHM	92400	42	22	QRO	MUL
8	HB9Q	90200	41	22	QRO	SIN
9	ZS6AXT	76000	38	20	QRP	SIN
9	SM3AKW	76000	38	20	QRO	SIN
11	HB9JAW	64000	32	20	QRO	SIN
12	OZ6OL	59400	33	18	QRO	SIN
13	JA6AHB	50400	28	18	QRO	SIN
14	DL1MYK	49300	29	17	QRO	SIN
15	WA6PY	32000	20	16	QRP	SIN
16	IK3COJ	27300	21	13	QRP	SIN
17	SM2CEW	25200	21	12	QRO	SIN
18	N2UO	23400	18	13	QRP	SIN
19	DK0ZAB	16000	16	10	QRO	SIN
20	HA5SHF	13500	15	9	QRP	MUL
21	SM5CFS	10400	13	8	QRP	SIN
22	SM0NKZ	400	2	2	QRP	SIN
23	JH1EFA	200	2	1	QRP	SIN

Results 2300 MHz

1	OE9XXI	18200	14	13 SIN
2	F2TU	14300	13	11 SIN
3	OZ4MM	9000	10	9 SIN
4	G3LTF	8100	9	9 SIN
5	ZS6AXT	6400	8	8 SIN
6	SM3AKW	3000	6	5 SIN
7	IK2RTI	1600	4	4 SIN
8	JA4BLC	100	1	1 SIN

Results 5700 MHz

1	F2TU	2500	5	5 SIN
2	IK2RTI	400	2	2 SIN
2	ZS6AXT	400	2	2 SIN

Results 10 GHz

1	F6KSX	5400	9	6 MUL
2	DL0EF	4800	8	6 MUL
2	F2TU	4800	8	6 SIN
4	I5PPE	3500	7	5 MUL
5	F1BLL	2400	3 (+3)	4 SIN
6	IK2RTI	900	3	3 SIN

Results multiband

1	HB9Q	1193500	155	77 QRO	SIN
2	OZ4MM	1137600	134	79 QRO	SIN
3	F2TU	1007400	112	73 QRO	SIN
4	G3LTF	718200	105	63 QRO	SIN
5	F6KHM	577500	105	55 QRO	MUL
6	SM2CEW	482300	91	53 QRO	SIN
7	SM3AKW	322500	69	43 QRO	SIN
8	JA6AHB	228000	60	38 QRO	SIN
9	OZ6OL	206500	59	35 QRO	SIN
10	HB9JAW	187200	52	36 QRO	SIN
11	ZS6AXT	174000	48	30 QRP	SIN
12	PA2CHR	147000	49	30 QRO	SIN
13	S53J	105300	39	27 QRO	MUL
14	EA3DXU	85000	34	25 QRO	SIN
15	WA6PY	54600	26	21 QRP	SIN
16	S51ZO	14300	13	11 QRO	MUL
17	IK2RTI	10800	9	9	SIN

Class winners are underlined.

No real great changes this year in the top positions for monoband: I2FAK on 2m, F6KHM on 70cm, F2TU on 23cm, OE9XXI on 13cm, F2TU on 6cm and F6KSX on 6cm. The multiband winner is HB9Q, closely followed by OZ4MM. Participation similar to last year's (112 vs 113). Congratulations to the winners and thanks to all for participation. F6HYE

DJ3FI (70): Good WX, low pathloss, high rotation, best reports from stations with changed polarization.

DL7UDA (70): I was QRV from saturday 1730 for 8 hours only. Heared were HB9SV, HB9JAW, K1FO and DL9KR not so strong as usual. Sunday morning I found a broken connection at one antenna feed. So I was happy to made the 2 qso´s with only 3 antennas and my old GI7B amplifier with 300 W.

G4CCH (23): Conditions were good over the whole weekend. Activity was lower than last year, especially from the US. Less countries/states active, sunday was painfully hard work... Missed: JA6CZD, DJ9YW, DM3UH, VE7BBG & W7BBM.

HB9BBD (23): The contest was primarily fun on the first day. 40 QSO is a good pay for one day. Sunday was particularly painful as usually. Not only many regulars were missing - the Dubus contest primarily seems to be a European event. Conditions were good. My echoes returned 59+15dB at all times. My preamps seem to work well for those who use them.

HB9JAW (70, 23): Because of business commitments I have been able to be QRV for only 7 hours. I did the first large activity on 1296 and this without anything going wrong. I enjoyed it very much. What an interesting band! wow. I added 24 new initials. Much better activity than in the ARRL contest. I did enjoy this contest very much.
Thanks to all who called and I replyed. Sorry for them I did not hear, maybe next time. ps: "I am still looking for Kapton or Mica 20x20cm and 0.15mm thick!"

HB9Q (2m, 70, 23): We could only operate limited hours, 11h on 144, 11h on 1296 and 14h on 432.
Nevertheless we had a great time. We had a few technical problems, as always, but we are happy to report, that we could improve RX on all three bands. And we still see much room for improvement. Conditions seemed to be fair to good. Participation seems to grow every year! We also believe that your mode splitting the bands on the activity days is the right way to generate more QSO's and more fun! We will be on next year again, hopefully with more time to spend off the moon! Many thanks for your effort !

I2FAK (2m): Very hard to run the full time with so low activity.

IN3AGI (70 : It was my first Dubus contest and it was a real pleasure !

KE2N (70): Conditions and activity seemed to be not that good. But this is a new QTH for me and maybe not all the bugs are out yet.

RA4AOR (2m): I am very pleased with the given competitions! I would like to note high activity of the participants REF-DUBUS Contest. But I hope, that next time organizers of competitions together complete rule (situation) of competitions, and also results.

DL1YMK

I3DLI

N2UO (23): My operating time was limited but I managed to work 18 stations. There were a few stations heard but not worked. My all-homebrew system performed very well, and also found conditions to be good. I fixed a receiver problem a few days before the contest and that improved my RX sensitivity by at least 4 dB. Now I can hear my echoes very well all the time. My results are better than during the ARRL contest, mainly because I am running more power and there was more activity. (WX was fine this time in EU). I look forward to working the contest again next year, maybe with more operating time. I will certainly try to work JA's

OZ6OL (70, 23): Surprise to work so many on 70cm with my "tropo PA" with only a single 4CX250B and 1.4dB cable loss to the feed on my 5m dish. The feed is 2 dipoles 200 Ohms with UT141 balun each and stacked with coax combiner. The sun noise flux 110 is 14 dB. Preamp MGF1302, cavity direct at the feed combiner and coax relay.

SM3AKW (70, 23, 13): poor activity so maybe time to reduce it to 24 hours each section ?? Poor contest result this year!! Many stns not taking part.

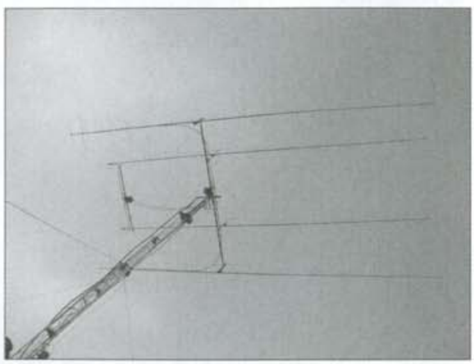
WA6PY (2m, 23): I had very limited time to operate in the contest this year, but it was great pleasure to participate.

YO2IS (70): Was glad to pass the 710 QSO mark on 70cm EME. Mostly vertical condx, never hrd DL9KR so weak ! Activity was quite low on 70cm. This was my 7th European-DUBUS contest.

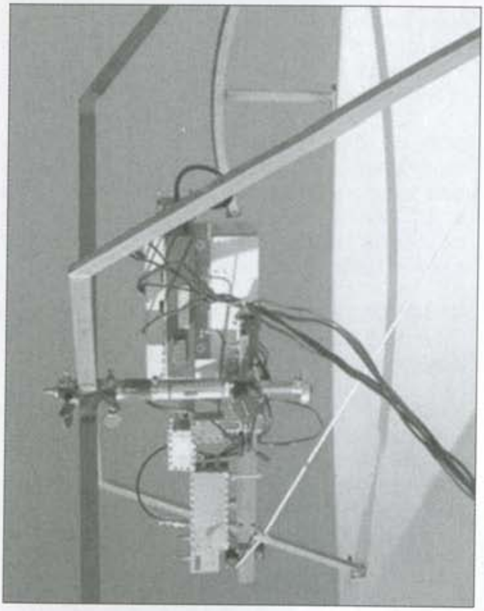
WB9UWA (2m): Line noise was a big problem. Conditions in the Ionosphere were pretty variable causing weak signals much of the time in my area.

ZS6AXT (23, 13, 6): Conditions and weather here were mostly good to very good. Very poor attendance by N. A. and JA stations, even many Eu stations did not appear. Especially the higher bands had just few stations. Pitty, since the structure of this Contest is much better than that of the ARRL EME Contest. My moon window was much shorter, thus I missed few stations from the west. Thanks to the organizers.

(See the 2m and 70cm+up EME sections in this issue for some more comments!)



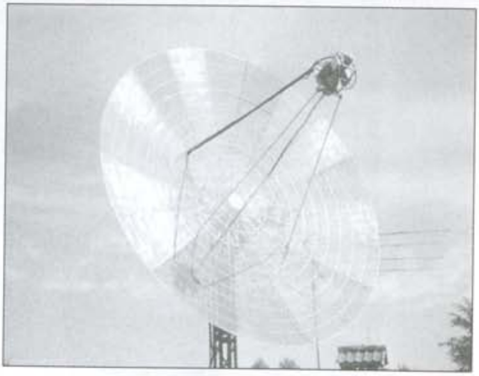
EA3DXU



I5PPE

I5PPE and IK5WJD

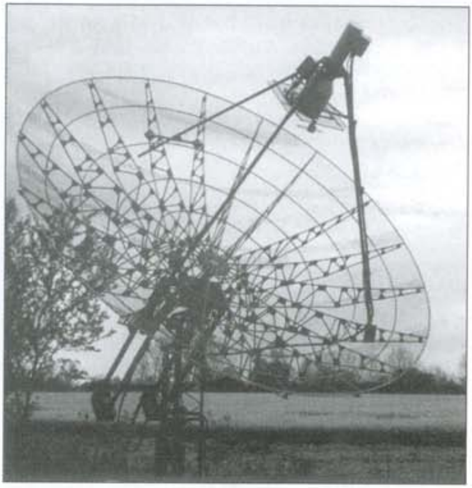
IK1FJI



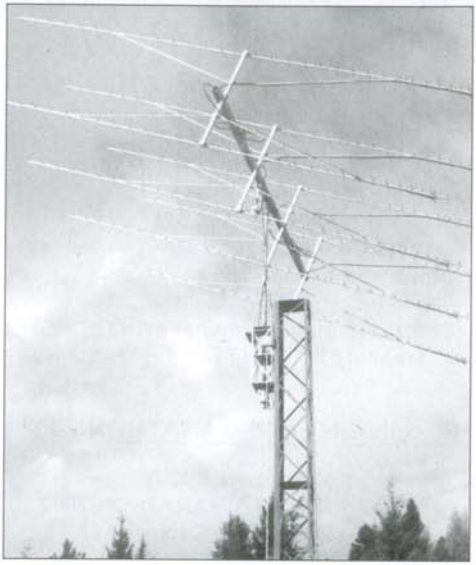
IK2RTI

N2UO

N2UO Shack

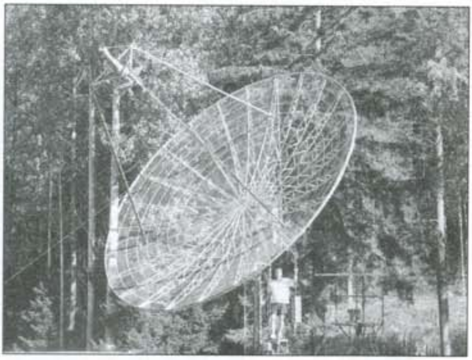


OZ6OL



IN3AGI

IN3AGI 70cm PA



SM2CEW

2-m-EME News

Editor:Heinz Borde, DM2BHG
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- **Results EME ARI MARATHON 2002**
- **Around 2-m-EME**
- **REF - DUBUS-Contest 2003**
- **ARI EME Contest 2003**
- **News and information's**
- **Once there was a chat about...**

(Chats of common interest in INTERNET)

- **Treasury INTERNET**

Results EME ARI MARATHON 2002

FINAL RESULTS
W. W. EME A.R.I. MARATHON 2002
144 MHz QRO - Category 1A

Call	N. QSO	P. DXCC	Final Score	
I2FAK	708	47	3.327.600	*
HB9Q	218	35	763.000	*
I3DLI	128	33	422.400	*
I2DDR	124	29	359.600	

144 MHz QRP - Category 2A

Call	N. QSO	P. DXCC	Final Score	
S53J	106	27	286.200	*
YO4FRJ	93	30	279.000	*
I2RV	66	23	151.800	*
IK1UWL	51	19	96.900	
9A9B	44	17	74.800	
JA9BOH	28	10	28.000	

Around 2-m-EME

PA2DWH: Last night (Apr.14) made a new attempt with the I0JXX yagi. I had a sked with Bill W0PT and completed VERY easy QSO in 15 minutes on CW. Rest of the time got wasted on trying to work W7FG on JT44. Surely there is something wrong in my programm, as I could hear Gary loud and clear but my JT44-screen stayed almost empty! At the same time, Gary decoded almost every of my transmssions..

Well, I enjoyed it again and I now decided to make a manual mounting spot in my garden for the I0JXX beam, so that I can put it up temporarely during special weekends. My XYL and neighbours kept on emphasising the temporarity...

I will put pictures on my website soon so you will understand

VK2KU EME QSOs in April:

12 April: OK1VVP CW #57

13 April: ZS6ALE CW (second try - easy qso) #58, new country; PA3CMC CW (second try, 1-yagi station) #59

14 April: DK3BU JT44 #60;

GW4DGU JT44 (1-yagi station) #61, new country

15 April:CT1DMK JT44 #62, new country.

The 2m- results from the R/U-stn April:

RU1AA - had initials W4ZRZ, RN6BN, DF9RJ, SK0UX, (DA0FFO), SV3KH, (DF2CQ), G3LTF, (DK0ED), WA6NIA, KL6M, UY5HF and RV9JD #491.

RA3QTT - can finish RN6BN, UX3LV, UA4AAV, ZS6ALE and with JT44 DF2ZC. Contest 15 QSOs

RV3IG - wkd SP2OFW and ?

RW3PF - new stn - SP2OFW, EA2AGZ an RW3WR #103. Contest 9 QSOs

RA4AOR - had initials with ZS6ALE and RN6BN.

UA4ALU - added RN6BN and OK1VVP.

UA4AQL - send this initials: N1BUG, RN6BN, W0EKZ, SM2CKR, IZ1BPN,(DF2CQ) and (DK0ED).

He wkd in JT44 with PA1GYS and F1AFJ.

RN6BN - worked abt 20 QSOs before elevation system going defect.

UR5LX - had new RN6BN, SM2CKR and DF2CQ.

UX3LV - wkd new N5BLZ, RA3QTT, PA2CHR, SV1BTR, OK1MS, I3DLI, SM2CKR,IK1FJI, PA0JMV, IK2DDR, DF2CQ, EA2AGZ, RW3WR, WB9UWA, UA4AQL, K9MRI and DM2BHG. Contest 24 QSOs

DA0FFO: special call for celebration of 750 years city Frankfurt (O).DK3WG: I send QSL for all QSOs via the Bureau, you don't need to send direct to me, when you are a club member): RN6BN, SP2OFW, SV1BTR, UA4AQL, SK0UX, JL1ZCG, YO2AMU, LZ1DP,I2FAK, RU1AA, F1FLA, F3VS, LZ2US, RN6MT, I2RV, F9HS, OZ4MM, RW3WR, RA4AOR, N5BLZ (? hi), IK2DDR, YU7BCL, PA0JMV, S53J, F6HVK, UA4AAV, I3DLI, OK1IA, PA2CHR and KC4VI. New initials for me were RN6BN and F6HVK.

DM2BHG: the funny site of EME: Jim , WB9UWA, reported: > March 15> 0025utc DM2BHG 12db sn. CW. He was calling CQ on my sked frequency 44.139 during my sked time with ON7RB. Roland later told me he was unavailable for the sked.. Here is the whole story:

I was calling CQ in JT44 on 144.139. On my fftdsp I noticed a carrier that came and went . You know: JT44 on SSB-USB and the receiver as wide open as a door. Then I found out, it was a CW signal. Now imagine how to change operating mode with an IC746: sideband changes, bandwith changes, you have to modify the settings of your rig. It took a bit, but finally we made it in CW. Tnx Jim for your patience

K6PF: I was QRV for quite a while on May 10th running skeds & trying to work stations on random during the contest in between skeds. Think it was a successful day for this QRP station. Here's a summary:

0000z - ON7UC - sked & nothing heard

0033z - RU1AA – RO (sent) / O(rcv'd). Completed on random, tx & rx - Vpolarity

0044z - I2FAK - RO/O. Completed on random, tx & rx - H pol

0104z - F3VS - RO/O. Completed on random, tx & rx - H pol

0114z - KB8RQ - RO/O. Completed on random, tx & rx - Hpol

0136z - N5BLZ - RO/O. Completed on random, tx & rx - H pol

0520z - VK2FLR - sked & nothing heard

0540z - VK2KU - sked, terrible birdies, I only detected Guy &

he said he sent O's
2112z - LZ2US - O/RO. COMPLETED on random for initial #154. Vy glad to work Marko.
2130z - RN6MT - sked with huge birdies, nothing heard
2200z - RW3PF - sked with huge birdies, nothing heard
2219z - HB9Q - RO/O. Completed on random, tx & rx - V pol
2230z - Z30B - sked with birdies, nil both sides
2309z - IK1FJI - RO/O. Completed on random, tx & rx - V pol
2330z - DD0VF - sked but nil both sides
So, quite a few QSO's on random including one new initial. My x-pol yagis continue to prove the benefit of having x-pol.

K6PF: Here's a summary of my skeds & random contacts during May 11 & 12:
May 11: 0017z - I3DLI - RO(sent)/O(rcv'd). Completed on random, tx & rx – V polarity
0030z - ON7UC - sked & nothing heard
0158z - WB9UWA - O/RO. Completed on random, tx & rx - V pol
0300z - KL6M - sked, not completed. Could only detect his presence
0552z - VK2KU - O/RO. COMPLETED for initial #155, DXCC #33 & WAC #5. Vy glad to complete this QSO with Guy but it was long (over 60 minutes) & difficult on both sides (more difficult on my side, hi, hi). Tnx Guy. Tx & Rx - H pol.
0714z - VK2FLR - sked & nothing heard
2230z - RN6MT - sked & nothing heard. Gena may not hv bn QRV since we completed a QSO on May 9th.
2324z - SV1BTR - RO/O. Completed on random, tx & rx - H pol
2340z - W0HP - O/RO. Completed on random. Fred answered my CQ. Tx & rx - H pol.
May 12: 0100z - F5LRL - sked & nothing heard
0230z - LU7DZ - sked & nothing heard
0426z - KL6M - RO/O. COMPLETED for initial #156. This was another long (over 60 minute) sked that was vy difficult on both sides to complete. Tnx Mike. Tx - H & rx - H&V pol.
0708z - VK2FLR - sked & nothing heard
I only need to work LU7DZ yet to earn WAC on 2m eme while still operating QRP. Help Eduardo!!!

REF-DUBUS- EME Contest 2003

LZ2US: This is my contest result.Total 17 hours of operation and 45 random contacts. So I've missed the american window first night...... Conditions were excellent most of the time. It was rainy in my QTH during the whole weekend, non stop. May be it was a reason for some less quality reception. Equipment: all home brew, antenna 4xKLM17LBX since 1987..........with open wire phasing lines made from aluminium, all joints with no soldering........never checked during these 17 years. In fact I saw very low "contest speed": 45 QSO for 17 hours, it is about 2,65 QSO (average) per hour.......hi. RU1AA, RN6BN, JL1ZCG, SP2OFW, OK1MS, I3DLI, DL1EJA, DK3BU, F1FLA, YO4FRJ, S53J, DA0FFO, PA2CHR, I2RV, I2FAK, F6HVK, RA1ZC, 9A9B, LZ1DP, SK0UX, HB9Q, F3VS, SM2CEW, RN6MT, JH2COZ, UA4AQL, UA4AAV, YU7BCL, OZ4MM, YU1IO, JH5FOQ, SV3KH, S52LM, I3EVK, UA9SL, OK1VVP, OH1FF, SV1BTR, UY5HF, N1BUG, YO2AMU, RW3WR, W5UN, IK1FJI, WA6PY.

SV1BTR was active during Dubus eme contest on 144 MHz and I would like to thank all that called me, worked or not, for their preseverence. Conditions were mixed, Saturday signals were unstable and fading fast, echoes almost non-existent, on Sunday good echoes but for 2.5 hrs at moonrise and for 4.5 hrs at moonset faced 1-way propagation, resulting in rx lockout for me, and as such i missed a lot of stations calling me. All in all i had lot's of fun, as usual, in a fine contest. Wish we had more..... Worked 59 cw qso's, all on random. 2 dup, so total of 57 contacts of which 13 new stations which brings me to a total of #272 cw eme initials. RX is constantly improving, primarily due to the uwa low sidelobe yagis, despite the bad qrm problems i have to face, living in a city of 5 million people. Below is a list of stations worked, # being new initials: i2fak, ru1aa, w5un, rn6bn#, i3dli, da0ffo, lz1dp, dl5mae, jh5foq, f1fla, f3vs, dk3bu, dl1eja, hb9q, jr3rex, jh2coz, ok1ms, jn1cso, df2zc, jl1zcg, sv3kh#, s53j, pa2chr, ua4aav, 9a9b#, sk0ux#, yo4frj, yo2amu, oz4mm#, sm2cew, sm2ckr#, sp2ofw, ux3lv, ua4aql, ik2ddr, ea3dxu, dm2bhg, rn6mt, n5blz, wb9uwa, pa0cis#, k9mri, ut5er, oh3aww#, ra4aor#, la2ab#, sm3pwm#, f6hvk, dk0ed#, pa0jmv, pa3cwi, s51zo, ik1fji, i3evk, lz2us, f8do, w4zrz# .

DM2BHG: These year I was able to participate for about 6 hours in the REF-DUBUS contest. I made 19 QSO´s, what is a rather good result from my point of view. The most productive time for me was between 00:00 and 01:00 on the 13th of April. The number of QSO's per hour was 7 QSO's. 5 QSO's where done by calling CQ and two by hunting around That's not bed for a four yagi station, I believe. These year there was no detected signal, where I couldn't find out the callsign. These is the result of a job of years, upgrading the station. My first EME-contact was done in 1987.
Today I run a antenna system consisting of 4 x WX 228 (5wl). I run two RX cables to the station. At the mast head I have 2 home made LNA's MGF 1302, DJ9BV design. In front of my IC 746 I have another 2 LNA's and a polarity shifting system that allows, to adopt continuously to all possible polarities. Behind my IC 746 I run a AUDIO DSP (by JE3HHT). This DSP includes a "Week Signal CW " mode, that outstands all other DSP's I have ever tested. The only missing improvement of my station is to adopt to FARADAY during TX. The device is ready, but not yet implemented. It is a device to change polarity in 45° steps. I think, that will help for the next contest to reduce the "only QRZ answers" and to overcome one way propagations.

SP2OFW: Hello in contest i maded 43 qso :IK1FJI, I2FAK, JL1ZCG, LZ2US, DA0FFO, RN6BN, DK3BU, RU1AA, I3DLI, DL1EJA, JH5FOQ, S53J, F1FLA, PA2CHR, SM2CEW, HB9Q, F3VS, SV1BTR, DF2CQ, RW3PF, SM2CKR, N5BLZ, DM2BHG, NT0V, W5UN, WB9UWA, OK1MS, K9MRI, KL7X, JN1CSO, LZ1DP, JH2COZ, 7J6CCU, YO4FRJ, OZ4MM, DL7FF, RN6MT, F6HVK, PA0JMV, UA4AQL, RW3WR, N1BUG, WA6PY

N1BUG: I had been QRT from 2m EME almost one year and still have much work to do before the new array will be up. So I put up a single long yagi to play around with this contest. It is a modified CushCraft 4218XL, now 20 elements on a 11.5m boom. Power is about 1.5 kW. I do NOT claim the extended 4218XL design is a good one, but I guess it works well enough for me. Well, it has been a FUN weekend! All activity was on CW. I do not have the capability to run JT44 at this time. New initials (some before contest and some during) were SP2OFW #606, UA4AQL #607, RN6BN #608, YO4FRJ #609, and JN1CSO #610.

19 contest QSO's. I lost a few stations when I had to go out and move the antenna at bad moments. Sorry guys! This is a "quick and dirty" setup and the antenna is aimed by hand. I also have a gap in operating times because the roof of my house gets in the way, so I lose about 3 to 4 hours each night. Best QSO (and big surprise!!) was PA0JMV on RANDOM. FB signals on the single yagi Joop! Most amazing thing: hearing my own echoes on the 12th and again on the 13th. Not just once or twice on a libration peak, but hearing them quite consistently for 15 to 20 minutes each occurrence. This was a BIG surprise, as I was not expecting to hear any trace of an echo with a single yagi! I think it might be possible to QSO another single yagi station without using ground gain. It would have to be a long yagi and lots of power.

I had guests (WA1JMM and WA1PBR) drop in during the last hours of the contest. Ben, WA1PBR stayed until the end and was able to hear the single yagi echoes. Thank you everyone for a fun weekend. I will continue to be QRV with the single yagi in the coming months and will try **VERY** hard to get the new, bigger array up this summer!!!!

SP7DCS: After a crash of antenna last autumn I wanted to rebuild a part of system and participate in contest. To Saturday's morning I managed to put up 2 x heavy damaged 21 el. H/V yagis. Of course just before contest it occured that a one coax connector in array is out of order and I have to replace it. Of course my antenna had not any rotor ! So every half an hour I had to go 60m to antenna and point it to the moon manualy - it took about 10 minutes and of course I had not any proof that my antenna is well pointed hi... Moreover due to problems with TX coax it was QRP - only about 400w in antennas. I made first qso at 15:00 UTC. I worked (all first pass): F3VS, I2FAK, I3DLI, RU1AA, OK1MS, HB9Q, DF2CQ #, IK1FJI, UA4AAV, N5BLZ. I heard : I2RV, SV1BTR, JN1CSO, F1FLA, DM2BHG, SV3KX YO4FRJ, LZ2US, WB9UWA, SM2CEW, SM2CKR, PA2CHR, OK1IA. The signals were strong but I weren't heard becouse of low power. At the beginning of second pass my preamp got broken. After a repair, I tried to hear for some time but cound not work anybody.. I enjoyed the contest and hope to work next month.

JH2COZ: Worked 19 QSOs and 2 new initils. The condx was unstable and one way propagation for a long time. I heard CQ calling from PA2CHR very well, but no response from him during my window.

12-Apr. JN1CSO RN6BN(#274) I3DLI HB9Q SV1BTR F3VS DF2ZC F1FLA I2FAK
hrd: n1bug da0ffo# ua9sl? dl5mae yo2amu oz4mm# dl1eja lz1dp s53j
13-Apr. LZ2US OH3AWW UA4AAV RN6MT RU1AA RA4AOR UA4AQL SP2OFW DK0ED(#275) 7J6CCU hrd: yo4frj ok1ms pa2chr i3evk jh5foq jr3rex...

RN6BN: here is RN6BN's log for Dubud EME. All that we have time to produce before elevation part of antenna has been crashed...

RN6BN will be back on EME approximately in month.

2003-04-12 EA3DXU, I2FAK, W5UN, WB9UWA, DL1EJA, RA4AOR, UA4AAV, RU1AA, RN6MT, DA0FFO, JL1ZCG, LZ2US, SV1BTR, JH2COZ, JN1CSO, LZ1DP, SK0UX, YO2AMU, SP2OFW, HB9Q

I3DLI: Also this test is over. I'm still recovering from that fatigue and amusement.First of all, I need to thank all the old and new EME friends for the contact we made. Conditions seems to be different from one site from another around the world, as seen per some activity reports. Apart from the very difficult local operating conditions starting the Contest, due to the high wind and heavy rain here, I'd say that the propagation was fair to poor during the entire contest time. Own echos were of faint to medium strenght; very rarely I received strong ones. It is evident that fixed, single polarization antennas cannot help too much against Faraday. Back to the operating facets: I apologize with those three stations I wasn't able to dig out from the noise. I missed a dozen of usually easy stations, so I must revise my test strategy next time. I'm very happy to have made nine more Initials and to have broken the 500th Init. so far. The new ones are: OH1FF, DF2CQ, RW3WR, G3LTF, W4ZRZ, DA0FFO, #500, DK0ED, DF9RJ, UY5HF. My results:85 Valid Random QSOs - 37 Multipliers.

YO2AMU: I found the conditions very poor! Wind all the time moving my poor rotator +/- 30 degrees. The elastic connexion to avoid the breackdown of the rotator was in use! One hand on the keyer, another on the rotator command knob! I must think to achive a "Prosistel" PST 61 to work again!

12.04.2003: I2FAK, RN6BN, DA0FFO #, RU1AA, SM2CEW, I3DLI, HB9Q, F1FLA, F3VS, PA2CHR, OK1MS, SV1BTR, W5UN, IK1FJI - Congratulations for your excellent receiving system!!! YU7BCL, N5BLZ - always having ears for QRP !

13.04.2003:OZ4MM #, OZ1HNE, YU1IO, LZ2US, Lost my QSO with WB9UWA due the high QRN! NO OTHER STATIONS HEARD ! Total of 20 EME qso!

ARI EME Contest 2003

IK1FJI: I found very good condx all the time i was on. Due qrl and others things, i was qrv about half contest time, but ENJOY VERY MUCH THE CONTEST. I have these new init: DK0BV, IK1UWL, LA2AB, SK6EI, S53BP, SV3KH, PA0OOM #502. I USE ALWAYS THE FOUR 19XXX 12METERS SO CAT D IN ARI TEST. TOTAL OF 52 STATIONS (1 DUPE) ALL RANDOM. THANKS TO ALL FOR PARTICIPATION.

IK2DDR: the Italian eme contest is over and i was really happy to participate with my new 4x19 LLY antenna. Unfortunately i wasn't active full time, as programmed. I was active on firsts moon pass, at the beginning of contest, at 00:00 z, on saturday 10th, with the moon on its set at 12° of elevation, till 4°, where it disappear for me, due mountains.There i worked 5 stations. On second moon pass i lost about all windows, till around my moonset, with the moon at 30° of elevation, except for a short one half an hour, waiting my dinner. I was very active on sunday 11, where i was on in most of the time, till about one hour before the end of contest. At least i worked 40 stations on Italians Cat. C (antennas leght till 40 m, i have 4x 7,75 m boom)My new antenna performance, can't be calculated only on the number of worked stations, because i wasn't active full time, but on the quality of what i heard, during my contest activity.

I was really amazed on see that also low signals, around 5-6 db s/n were easily heard. I can tell you that this antenna is refreshing my eme enthusiasm. Thank you to all stations for qso and their patience. For those stations that heard without work me, i hope to be much more lucky on next time.

Your report on what you heard from me, is very appreciated.

JN1CSO: Worked 28 QSOs and 4 new stations. All random QSOs. Results: RN6MT, LZ2US, SV1BTR, F1FLA, OK1MS, I2FAK, PA0JMV, I3DLI, I2RV, I3EVK, 9A9B, RU1AA, DF0BV#, G3ZIG, F3VS, IK1UWL # 8, DF2ZC, YO4FRJ, KC4VI, KL6M#, ES6RQ#, UA4AQL, PA0OOM, LZ1DP, JA9BOH, DK3WG, IK2DDR, IK1FJI

F8DO: I was only present for 5 h because familial QRM...hi worked 15 stations. Not QRV twice during JA window.

Conditions bad with USA good first hours 10 and 11 and Sunday evening Polar not stable. Outstanding sigs from RU1AA KB8RQ F3VS F1FLA I3DLI. Lot of fun anyway: I2FAK, RU1AA, I3DLI, I2RV, RN6MT, OK1MS, F3VS, WB9UWA, KB8RQ, OZ1HNE, N5BLZ, F1FLA, LZ2US, SV1BTR, DF0BV. My apologies to Adrian YO4FRJ for not complete QSO and S52LM.

Heard and called W0HP 10 May

Hrd K6PF with SM3PWM in QSO LU7DZ with F1FLA 11 May

KB8RQ: We had bad storms and high winds this week end. I was only able to be on about 4 hours. I worked 40 stations and four new ones. New stations were RA3AQ, YO3DMU, SV3KH, SK6EI. This was the first test for my new 24 modified 2SA13's. I feel it is doing everything I expected and maybe better. Just wished mother nature would have let me tested it all week end. Hope everybody had fun in the contest.

DD0VF: i was qrv a few hours during the US window on both days. wkd random: I2FAK 16dB s/n but problem with birdies on low elevation IK2DDR 10dB s/n at CQ and 7dB s/n while we made the QSO fb rx Franco!

I3DLI 12dB s/n fb, i called only once and Paolo got me F1FLA 12db s/n LZ2US 10dB s/n quite easy QSO, i am happy for #102 Marko!

-missed RU1AA and F3VS because of strong birdies -KB8RQ was quite weak (much better with 8 antennas in my mind)

-W5UN not hrd -called also WB9UWA and SV1BTR

SV1BTR: Would like to thank everyone for the fine ARI contest. Organisers and participants.

Conditions were less than average compared to previous contests down here, with long periods of 1-way and lockout for me.Worked 45 qso's, 2 dup, 9 Italian stations.

44 qso's on random and 1 on sked.

5 new initials for a cw total of #277 and 1 new dxcc (GW).

Smallest station worked was GW4DGU running single yagi 3.4 WL and 600w, so i am extremely happy we made it! I apologise to all of those who called & called but i only got few letters of their call, i missed stations which i normally work . A total of 12-14 stations was missed. Pse keep in mind that for the last 10 yeas i do eme i still live in Athens, a city of 5 million people with tremendous qrm problems, totally unsuitable for eme work.

For me is like a miracle that i have worked >1150 - 2m & 70cm - eme qso's the last 10 years, from here. Here is the list of stations worked:

GW4DGU # JN1CSO I2FAK RU1AA I3DLI (dup) F3VS LZ2US OK1MS G3ZIG SP2OFW S52LM IK1UWL # DF0BV # (dup) DF2ZC JH2COZ IK7EZN # F1FLA IK1FJI DA0ED # IK2DDR YO2AMU HB9Q WB9UWA W0HP LZ1DP DK3WG KB8RQ YO4FRJ 9A9B I3EVK OZ1HNE ES6RQ JH5FOQ I2RV I1ANP PA3CSG # F9HS RN6MT K0GU UR5LX F8DO LU7DZ K6PF.

F9HS: During the 6 hours spent only 15 qso achieved random including 4 italian stations.

K6PF: During the Italian EME contest on 144 MHz, I worked 12 stations on random & 1 on sked. Total score is 193 points. Not sure of the category for my x-pol yagis but think it's category D. Stations worked on random (# is new initial): RU1AA, I2FAK, F3VS, KB8RQ, N5BLZ, LZ2US(#), HB9Q, IK1FJI, I3DLI, WB9UWA, SV1BTR, W0HP, VK2KU (#) - worked on sked

F1FLA: I didn't find the good conditions. The Sunday was even worse and the reduced activity. I called of very very numerous times without answer... Nearly no US stations.

SP7DCS: I worked with 11stations only random on 10 may (3 Italian stations and new # with SP2OFW). Total score is 173 points. Thanks all for qso. Full list qso is on my page. I hope to see You via moon in next contest

News and information

ARRL EME CONTEST 2003 (by VE7BQH)

It is that time of year when we should recommend our choices for the two weekends for the 2003 ARRL International EME Contest. This year should not be too controversial as good moon conditions coupled with high declination happen on the same weekends for a change: October 18/19, November 15/16. These dates also do not conflict with the European Terrestrial Contest. Please send me an E Mail with YOUR recommendations for the 2003 ARRL International EME Contest. I will publish the results on MOON-NET as well as forward the results to Joel Harrison at the ARRL.

ARRL OPERATING AWARDS AND JT-44 (by Joel Harrison, Joel Harrison, W5ZN,ARRL First Vice President)

During the past several months, there has been considerable discussion about ARRL operating awards and how they apply to EME contacts. Specifically, how do new modes like JT-44 factor in to the recognition of operating achievement.

Ever since the inception of the WAS and DXCC programs, contacts have been accepted for all modes of operation. As time progressed and radio amateurs achieved award levels with specific modes, interest was tweaked to recognize those specific achievements. Thus the creation of specific mode awards, i.e. CW DXCC, Phone WAS, RTTY DXCC, etc., with the original award becoming known as the "Mixed" award to include all operating modes.

New operating modes are not only healthy, but imperative for the amateur radio service. Without continuing innovation, we would still be using modes no longer in use even in amateur radio, but more importantly, we would be extinct. At the heart of the most recent debate is how to properly recognize someone for years of hard work, discipline and dedication toward a specific goal when new modes, hardware, or software become available and make the task a little easier. It is our sincere desire that you would embrace new technologies, for after all, that is what made amateur radio what it is today! Radio amateurs that are attracted into a new operating arena like EME because of something new like JT-44 are in effect "novices" to EME activity in general, just as I was when I first became interested in EME many years ago before there was ever a JT-44, DSP software, or even a preamp with a noise figure like we see today.

I was welcomed by a long list of "old timers", they were my Elmer's. I was able to learn all the things required to be successful on EME and it has been the most enjoyable and rewarding thing I've been involved in as a radio amateur. The hard work and dedication of those who have spent countless hours in pursuit of an operating achievement should be recognized for their effort, however, our wish is that new modes and technologies would be embraced as they are developed. The operating award possibilities for recognition are quite numerous. If someone chooses to reach a particular level on a specific mode like CW, for example, then an operating award can be issued for such.

As far as the "Mixed" awards are concerned, the League will continue the long standing tradition of the mixed award by including all available operating modes, including JT-44, in that category.

DK0ED: I (DL5MAE) was operating DK0ED during the DUBUS EME Contest. This is a special callsign for 775years celebration of the City of Erding. You can achieve a NICE diploma, info: www.ov-erding.de

DL-stations need 15 points

EU stations need 9 points

DX stations need 5 points

Points: Normal club members of OV Erding C25 count 1 point Clubstations count 3 points (DA0ED-DK0ED-DF0BV-DK0IG-DL0DYW- DL0BRM). No restricitions on bands, modes etc. Please just send a list of QSOs to Otto, DK6CQ@darc.de

No QSL are required! The diploma is FREE of costs, ONLY the postage mail you have to pay for (2 Euro for DL, 3 US-Dollar or 3 Euro or 2 IRCs for stations outside DL). Have fun!!!! So far active stations from our club were:

DA0ED (3 points) - DF0BV (3 points) - DF2CQ (1 point) - DK0ED (3 points) - DL5MAE (1 point)

CALLSIGN.TXT (by W7GJ):

With the advent of the various WSJT transmisson modes (JT44, WSJT, JT6M), it seems many of the stations active on meteor scatter and/or UHF DXing are now also capable of working EME (at least with larger stations). So, the capabilities of WSJT users have expanded greatly, and the line separating various VHF/UHF groups and interests has become blurred".

The file CALLSIGN.TXT is used by the WSJT applications to automatically enter the other station's grid locator. With this information, the WSJT programs automatically display distance, azimuth, beam heading, and other functions.

CALLSIGN.TXT was originally included with WSJT programs to support HSMS stations, but now it is clear that the WSJT program options are also enjoying widespread acceptance and use among weak signal operators and EME'ers. Various databases of active VHF/UHF operators around the world contain grid square information for active stations with specific interests. In order to expand ist usefulness to the the wide range of WSJT users, and the functions in WSJT that utilize the CALLSIGN.TXT file, a new expanded file has been prepared. Just download the file below and unzip it into your WSJT folder. It is in a text file format so you can correct/add/modify your personal version, using a text editor such as WORDPAD, or other types of database programs (PC File, EXCEL, etc.). It is not currently anticipated that I will be able to maintain this data base here. However, I will post the most current version that I am using on my website. I believe this particular file is certainly a good starting point for users. Information on this file follows:

CALLSIGN.TXT

THIS VERSION WAS PREPARED BY W7GJ IN APRIL, 2003, FOR USE WITH UPCOMING TRACKER AND WSJT ROGRAMS. IT COMBINES DATA FROM:

AA1YN'S VHF AND UP REGISTRY

DL8EBW'S VHF and MS/WSJT database

DL4EBY'S 432 AND UP EME DIRECTORY

W5LBT'S EME DIRECTORY

INFORMATION FROM W7GJ FILES REGARDING STATIONS CAPABLE OF EME

WITH THE JT44 MODE ORIGNAL ENTRIES IN THE FILE THAT CAME PACKAGED WITH WSJT RECORD FORMAT: CALLSIGN (7), LOCATOR (6), SPACE1(2), STATE (2), SPACE2 (2) FIRST NAME (7), SPACE3 (2), EMAIL (25)

Since this data is a consolidation of information from other sources, no guarantee is offered regarding the accuracy of the information in this file. It is provided independently and is not endorsed by WSJT or K1JT.

TRACKER VERSION 7

In addition to being very useful for use with WSJT modes,

CALLSIGN.TXT will also be used by the new Visual Basic version of my new TRACKER moontracking program, which is currently under development. In the meantime, the DOS version of TRACKER has also been modified to utilize CALLSIGN.TXT (and include automatic callsign and grid locator lookup features). Please refer to the included README.TXT file for more setup information and new program features. Both CALLSIGN.TXT and TRACKER version 7 are available as self extracting files on my software download page:
http://www.bigskyspaces.com/w7gj/tracker.htm

Info: new stn **RN6BN** from KN95LC, 16x 16el LY (8.3m-boom), GU35B

Preamp (by PA1BVM): Some time ago I build a Pre-Amp for 144 Mc with a ATF54143 based on design by YU1AW My pre-amp was never tested on noise figure etc etc just used to replace MGF1302 design. I was surfing the pages of YU1AW (a good source of information !!) and found a modification on the orginal pre-amp design. Not sure if people here on this reflector have build something with an ATF 54143 but you better check the pages of YU1AW:
www.qsl.net/yu1aw/atf54143eng.htm
things could be improved. I did not discover potential higher noise figures because I do not have the test equipment to measure it.

N0YVM: I just stumbled onto this website which is intended to support discussion of digital modes. They have a JT44 forum in case anyone here is interested. They also have a bunch of other ones, too, FWIW. There aren't a ton of people over there, yet, so you have a good chance of getting in on the ground floor! :) Oh, yeah, might want to put in the name of the website.... http://www.digitalmodes.org

SP2OFW: Hello friends i have my web page:
http://sp2ofw.w.interia.pl/sp2ofw.htm

K7XQ: Just a note I had a bad failure of my sequencer that connects virtually all of the EME preamps and power amplifier controls on all the EME bands. It caused several fatal preamp failures as well. I tried to troubleshoot the sequencer for over 6 hours with no luck. Looks like it maybe unrepairable so I will be QRT on 144, 432 and 1296 until further notice.

EA6VQ: The WEB site of the EME skeds on-line has been moved to a new, faster and banner-free server. The new URL is http://www.vhfdx.net/emeskeds
Please update your bookmarks and links!

EME CONFERENCE 2004 (by N2UO):
The web page of the 11th International EME Conference to be held in New Jersey in 2004 can be found at the following URL: www.qsl.net/eme2004
The date was changed to August 6, 7, 8 2004 after the survey we conducted. The results were more than 20:1 in favor of the new date. If you visited the page in the past, make sure you use your "refresh" or "update" button in your browser in order to get the latest version of the page.

LINRAD (by SM5BSZ): I have tested the final prototypes and uploaded some more performance data on the the individual units as well as data for the 70MHz input of the entire system including RX2500 and Delta44. The RX70 and RX10700 units will soon be in production, I have a prototype for the RX144 unit on the lab bench and I will start laying the board for it soon. The ham.te.hik.se server is closed. My home page has moved to
http://antennspecialisten.se/~sm5bsz/index.htm
and the converter descriptions are at:
http://antennspecialisten.se/~sm5bsz/linuxdsp/rxiq/opt2500.htm
http://antennspecialisten.se/~sm5bsz/linuxdsp/rx10700/rx10700.htm
http://antennspecialisten.se/~sm5bsz/linuxdsp/rx70/rx70.htm

SM5BSZ: The ham.te.hik.se server is closed. My home page has moved to http://antennspecialisten.se/~sm5bsz/index.htm

9A9B: Few weeks ago, after more than one year of hard work, finally, I have finished my new WEB page:"9A9B Hardware Page"
www.geocities.com/branimir_9a9b/hardware\hardware.html

Once there was a chat about... (Chats of common interest in INTERNET)

JT44-LOGGER:-PA1GYS asks: Hallo everyone, I am looking for the jt44 logger. Where can i find this logger.
WB9UWA: Hi Gys and others. This logger is for JT44 and CW EME. It is very fast and sports private chats as well as public chats:
http://client.sigmachat.com/sc.pl?id=35076
This is the traditional JT44 only EME logger. It by contrast is very slow but has some nice features.
http://www.chris.org/cgi-bin/jt44eme

-IC746: WA3LTB asks:Anyone here using an Icom IC746 for EME and weak signal work on 144 mhz? Just picked one up and have found receive on 144 mhz is terrible compared to older 2mtr xcvr I had been using. I wonder if external pre-amps and other improvements will be enough to bring this rig up to par or is it a lost cause?
PA1BMV: Using one here for about 4 months and very pleased with it ...Previous I used a FT-225 RD + mutec front-end couple of " tips": the build in pre amps for 144 are quite noisy so I never use them I only use a mast -mount pre-amp (MGF 1302 style). Made two modifications... I separated the RX / TX line...m y RX / TX relay is in the mast , two cables running down. and one more problem is freq. stability .. but can be "solved" in covering X-tal compartment with some isolating material ...or get the special "option". I have not added any extra filter yet, quite pleased with the DSP filtering

as provided. The only "real" problem is the indication on the display switching from SSB to CW (no change in freq.) and specially if you are used to a Yeasu set ... If you are getting more info on "upgrades" on the RX please let me know Was thinking here to " by-pass" first RX stages of the IC-746.

-Best RX setup?

what would be " best" set-up for optimal performance of RX (144 Mc)

> antenna >>> bandfilter >>>preamp >>>20 meter coax >>> rx-section radio > or >

> antenna >>>pre- amp>>>bandfilter>>>20 meter coax >>>rx-section radio

SM5BSZ writes: I would suggest:

antenna >>> bandfilter1 >>>preamp >>>bandfilter2 >>>RF amp >>>20 meter coax >>> rx-section radio

bandfilter1 is there to reduce 88-100MHz QRM. This filter will work together with the input selectivity of the preamp and it allows a much wider input circuit of the preamp itself. Place it at a distance away from the preamp where the impedance at 100MHz is high (if bandfilter1 is a parallel resonator at 144 MHz.) Use two stubs, one that shorts 100MHz and another that compensates for the impedance error at 144 MHz.

If bandfilter1 comes at the antenna side of the antenna relay, very good! It could reject interference you might transmit but it will not affect the 144 MHz signal at all. You may also use a fairly short shorted stub (works as an inductor) and tune it to 144 MHz with a longer open stub (capacitor) Use thick enough coax to make losses negligible at 144.

If there is no IMD problem in the preamplifier, just skip bandfilter1 ;)You want minimum gain in preamp 1 to make dynamic range large. Without the RF amp you need more gain in the preamp to overcome the coax losses. It is a good idea to reduce the gain of the input circuitry of the rx-section radio for a noise figure somewhere around 8 to 10 dB. This way the noise floor of the radio may be lowered by a much larger amount than the noise figure. If you go from 3 dB to 8 dB for the NF, the gain would be decreased by about 10dB if the input stage of the radio has NF=2dB. You only need 5dB more gain in RF amp to make up for the NF loss so you have gained 5dB dynamic range for the radio section. As a general rule:With the preamplifier on you want nearly all the noise to come from the preamp. With the preamplifier off, you want nearly all the noise to come from the first stage after the mixer (the IMD limiting stage)

And PA2DWH: The signal-noise ratio is at its best at the antenna plug. Anything we do behind that, makes it worse...So what we have to do is to limit the worsening of the s/n ratio as much as we can. That means we must focus on the preamplifier first before apllying bandfilters that worsen the s/n ratio. So best is your option 2. With an ATF54143 preamp you can achieve easely +4 dBm IIP3 and that will do in most cases, but be aware of the mixerstages or any other amps in the sequence before and after the mixer, as these can still be screwed up by large signals (local Novices on FM hi!).

-Phasing lines (KE7NR):

I have always used equal length odd 1/2 wavelengths for phasing lines. Easy to do with 4 antennas!

I'm working on a larger array and, for mechanical reasons, it would be very advantages to use unequal lengths of odd 1/2 wavelengths for phasing lines.

Is there a huge penalty for using different length 1/2 wavelength sections for phasing lines? I'm talking a difference of maybe 3 1/2 wavelengths. I would think at some point the difference would become a problem, but, where is that?

SM5BSZ answers:

If you have correctly working baluns it does not matter at all what cable lengths you use as long as the antennas are fed in the same phase. You can save a lot of cable in a big array by deviating from the conventional arrangement like SM5FRH has done in his big array.

If the shortest cable length is X, all other cables have to be X + N*wl/2. VERY important, if N is odd, the antenna has to be turned upside down to add one more 180 degree phase shift on top of the 180 degrees you get from an odd number of half waves. You may also route a cable to the feedpoint of one antenna, then continue from the feedpoint N*wl/2 with another cable to the next antenna. You then get Z/2 at the first feedpoint but you may save a lot of cable in a big system. Z/2 is easily transformed to Z*2 with a quarter wave line and then connecting two in parallel will restore Z. There are many more perfectly correct ways to feed a yagi array:)You have to be able to measure the phase shift which is very easy. A T-connector and some means for measuring attenuation.If the phase shift is correct at 144.000, it will have an error at other frequencies. If you really want the antenna to work all the way up to 144.4MHz (0.3%) you have to keep the difference in cable length below about 10wl for a phase error of less than 10 degrees. You might see a small gain loss if the phase error is above 30 degrees or so.Extra cable in the antenna will always add attenuation, I suggest you try to keep cable lengths at the absolute minimum.

Treasury INTERNET

-www.qsl.net./mmhamsoft
Software DSP by JH3HHT

-www.barberdsp.com
Audio DSP-system

-www.bigskyspaces.com/w7gj/tracker.htm
CALLSIGN.txt for WSJT

-www.qsl.net/yu1aw/atf54143eng.htm
Preamp.

-www.digitalmodes.org
JT44 – forum

-www.vhfdx.net/emeskeds
EME-sked WEB site

http://antennspecialisten.se/~sm5bsz/index.htm Homepage SM5BSZ (LINRAD etc.)

www.bigskyspaces.com/w7gj/longyagi.htm
rope yagi

EME News

Editor: Bernd Wilde, DL7APV

Intro

ARRL EME contest 2003

This year should not be to controversial as good moon conditions coupled with high declination happen on the same weekends for a change: October 18/19, November 15/16. These dates are also do not conflict with the European Terrestrial Contest. The dates will be confirmed shortly.

The ARRL has not yet decided HOW the awards for Digital Modes will be implemented.

432 MHz

SOME new ones are qrv:

FY5DG (GJ35) French Guiana QRV on EME 432 is looking for sked. Please contact via E mail. 73 CHRIS. Conditions: 4x DJ9BV -8.5 WL- .35 dB NF- PA 700w

New station wkd KJ7F is **KI0LE**: EN36US, 4X19 ELE 450W. full elevation, near Duluth, MN Bryce

M0EME: new to EME, is working toward 70cm EME. He only has a small garden to work in.

G0LEM: Ross is working towards getting 70cm EME.

KM5A: (432) all cables in and antenna system is about ready.

W6TE will be QRV; 8 x 432-13WL's , LA-70 1.5 KW.

9H1PA: 2 yagis ready for 70cm.. not tuned up yet.. 2x26 8.5lambda.. BV optimized

DJ5NV: is now no longer on 70cm EME and going to try for 23cm EME .Guenter.

S53J wkd in DUBUS contest : 15.03. K1FO, 16.03. HB9JAW #, OZ4MM, F6KHM #, UA3PTW #, HB9Q, SM2CEW #, OE9ERC #. S53J JN75EV, FT847, RX: MGF1303, TX: GS 23B, ANT : 4X2M9WL. Any sked is welcome. 73 Joze op S53J

EA3DXU reports: Moderate activity on DUBUS contest, best conditions was on 16 March from 01 to 03.30 UTC, lots of easy QSO´s, great signals on the band and good activity, finally 21 QSO all random 15 / 3, K4QI, KIFO, WA4NJP, VK3UM, DL9KR, HB9Q, HB9SV, G3LTF, F6KHM, OZ4MM, UA3PTW, F2TU, 16 / 3 : OE9ERC, K0RZ, G4RGK, KL6M, DJ6MB, N9AB, DF3RU, VK4AFL, JA6AHB. Heard/called SM3AKW, DJ3FI, HB9JAW, ON5OF, S52CW. Rig :**2 x 38 el M2** + GS23B. 73 de Josep EA3DXU

HB9JAW reports DUBUS contest: I have been on only 2 hours due to buisness activitys. Conditions seemed very good. Echos very strong at times. Europe nearly all the time on H and US on V polaritation. Wkd : F6KHM #, OZ6OL #, DL9KR, UA3PTW, OE5EYM, G4RGK, HB9SV, OE9ERC #, G3LTF, OZ4MM #, N9AB, DJ3FI, RA3LE, S52CW, SM3AKW #, WB0GGM #, VE6TA, K4QI #, WA4NJP #,
S53J #. Then right at the end my PS of final stage gave up and forced me to QRT So far 20 QSO's I had a lot of fun last night and I impressed some friends off mine with EME. It seemed like I have been working on HF. Everything was there and all very strong. **This contest much better activity then in the ARRL contest**! 73 de Michel HB9JAW

VK3UM reports: Conditions in DUBUS contest seemed quite stable and only minimal Libration fading during my Moon rise on both days. Polarisation was about 45 degrees into Europe for the most part on 15th but very pronounced 90 degrees shift on the 16th. There were short periods of deep fading but these seemed rare. Overall, although there was solar activity and Aurora evident on HF, 70 cms was for me, about "normal to good." Activity was very good into Europe, unfortunately the same could not be said for the USA where there was only one station on for both days of my Moon rise. I managed to work 3 new Stations during the period. Although activity was very much down into the USA (and that is not an over statement!) I managed more QSO's and multipliers than last year. Final score. 44 x 22 (operating time about 5 hours total) 15TH March 2003
UA3PTW, KL6M, SM3AKW, RA3LE, UT3LL, DL7APV, OZ4MM, F2TU, SP6JLW, VK4AFL, DL4KG, DJ6MB, HB9Q, DL9KR, SM2BYA, OK2BDQ, PA3CSG, DJ3FI, S52CW, F6KHM, OZ6OL, OE3JPC, OE5JFL, DF3RU, G4RGK, I5CTE, 1N3AGI, EA3DXU, G4ALH, PA2CHR, DL8OBU, DK3WG, 16th March 2003: JH6AHB, JR9NNC, SK0CC, DF9RJ, PA0BAT, F6HYE, G3LTF, G3LQR, SM2CEW, ON5OF, DL2OM, YU1EV. 73 Doug VK3UM

S52CW reports : Here is the list of stations I managed to work in DUBUS contest. I think conditions were quite good, but I had some problems with high winds from time to time. So I apologise to those few stations that called but we didn't make it. I am open for sked at any time.
29 stations worked: K4QI, K1FO, UA3PTW, F6KHM, F2TU, G3LTF, G4RGK, YU1EV, VK3UM, VK4AFL, HB9Q, PA3CSG, DL9KR, OZ4MM, SM3AKW, OE5EYM, OE9ERC, WA4NJP, HB9JAW, K0RZ, K9KFR, ON5OF, KL6M, DF3RU, JA6AHB, JR9NWC, JA2TY, SM2CEW, DJ3FI. 73 de Uros, S52CW (8 x 7.7 dj9bv & Gs35b)

DL9KR 70cm update (WSJT):
I think that the wise comments on behalf of Joel W5ZN are acceptable and should settle the discussion about the inclusion of "modern" modes into the certification of mixed modes. "Modern" modes won't be hampered and and the efforts of those who stick with the rough (dinosaur type) modes can be certificated separately as usual.
In the DUBUS contest (March) I could only be on for 4 hours on Saturday and worked 34 stations without any initial.
However, intials were **DF9RJ** #775 and **KI0LE** #776 (RST559) on April-12. Despite poor conditions which obvi-

ously suffered from the aftermath of an aurora, activity seemed to recover last weekend.

On May-10 the following intials were worked: DL0AO #777 (this is a club call, operator indeed DJ5RE but @ a different site, to my knowledge 4xFT & 600w, contact via DJ5RE).

On Sunday, May-11, I tested my echoes in preparation for the USA window when somebody tuned up below my echoes. That station started to call me and I nearly fell off my chair when I heard DL9KR de **FY5DG** (RST559). This QSO understandably made my weekend as #778/DXCC85. Chris was putting in stable and very readable sigs. I guess this is the second appearance of FY on 432 after FY7YS back in the mid seventies just prior to my start-up. That will give many guys a chance to work South America after PY5ZBU's QSY to 23cm. Best of luck & 73! Jan.

432 & up (net) news

The 70cm-result from the R/U-stn

March:

RA3LE wkd new OE9ERC and K9KFR.

UA3PTW wkd new initials OE9ERC, YU1EV and S51ZO #122. contest 46 QSOs x 31 Multi

UA9FAD wkd F6KHM #, HB9Q, OZ4MM and UA3PTW in contest.

April:

RA3LE wkd initial #179 with KJ7F.

May:

UA3PTW wkd in April K6JEY and in May DL0AO #123.

DK3WG is glad to work fb QSO in sked with K6JEY o/o #394. 73, gl via moon Jurgen, DK3WG

23cm

First 23cm EME QSO /m !

16 Febr. 03 DJ9YW wkd on sked VE7BBG; Cor used a 2,3m dish and 120W. They used JT44. For both ops the first JT44 qso. Heinrich was interested to find out how small a station could be to work him. He build a 5m Yagi with 19,7dBd Gain. Bodo, DL3OCH was ready to test this. To avoid tropo signals they used a distance of 500km. Bodo used a IC706 + 100w transverter. Cable was 4,3m aircom plus without preamp. Signals were about -27dB.

3A/DL3OCH/m 23cm EME

Bodo took this equipm. at his SW-DXpedition to 3A. So they could make **first QSO 23cm DL-3A**. DJ9YW 4,5m dish circular 360W at feed. NF 0,48dB. 3A/DL3OCH 5m Yagi 19,7dBd, 83W at feed. NF 2,9dB; (-3dB because of hor. Pol.!)

EME with such a tiny rig. DJ9YW is open for more tests/Skeds.

It should do : 100w at feed (perigee) 1x Yagi 5m (~20dBd) or 2Yagi's 3m (je ~18dBd) or dish 1,5m circular(1,8m linear). Requests to DJ9YW@t-online.de 73 de Heinrich, DJ9YW

HB9BBD reports about the **SSB contest**: 15.2.03

I0UGB	SSB	55	56
F2TU	SSB	54	56
OZ6OL	SSB	55	55
G3LTF	SSB	57	57
F6KHM	SSB	58	58
HA5SHF	SSB	52	57
HB9Q	SSB	58	58
IK2MMB	SSB	57	57
IK3COJ	SSB	52	55
DL1YMK	SSB	52	57
F6CGJ	SSB	58	58
DJ9YW	SSB	55	56
GW3XYW	SSB	56	57
ZS6AXT	SSB	579	57
G4CCH	SSB	58	58
LX1DB	SSB	59	59
HB9BHU	SSB	57	58
JA6CZD	CW/SSB	569	55
OE9ERC	SSB	58	58
OE5EYM	SSB	57	56
N2UO	SSB	54	55
W2UHI	SSB	57	55
OE9XXI	SSB	59	57
K2UYH	SSB	57	57
KU4F	SSB	56	57
K0YW	SSB	58	58
K5JL	SSB	58	59
W7BBM	CW/SSB	557	55
K9KFR	SSB	56	57
WA6PY	SSB	55	56
W5LUA	SSB	56	57
DF4PV	SSB	57	59
K7QX	CW/SSB	529	54

Total of 63x12=756

POWER IN SHACK 2400W

ANT 10M DISH, f/D O.5 GAIN 40dB (www.hb9bbd.ch)

RX NF SYSTEM 0.4dB, TX CABLE LOSS 1.2 Db

LOCATOR JN47EE. Tnx fer Info Dominique

UT3LL will be qrv on 23cm. He finished 2.4m dish with the OK1DFC septum feed. PA ~ 400W on TH-308, LNA ~0.5dB NF 73! de UT3LL, Valery

OZ9AAR reports: I finished installing my feedhorn in the 8M dish. After some hours work, I thought, why not try to connect the cables to my transverter, and see if there is at least some noise to be heard. I then realized that the moon was close to my workplatform in azimuth, so I moved the dish to the moon. WOW, I heard A LOT of signals.
Well, I made a SIMPLE sequencer, a few bananaplugs, and finally decided to try and call some of the big guns. So I worked HB9Q, HB9BBD, OZ4MM, F2TU and G4CCH. Also heard many stations, including OZ6OL, IK1MMB, OH2DG,HB9SV and OE9ERC. I called a few of those, but did only get QRZ back..This was all done using **7 W at the feedhorn** !!! The dual 2C39 cavity sitting here from VE1ALQ, this is going to drive my TH327 cavity from HB9BBD, then echoes should improve. Regards, Carsten OZ9AAR

HB9JAW reports : I finished improving my RX system. (not the best yet, Sunnoise is still not there where it should be) on the 11th I worked:
W5LUA 559/559 #, DF4PV 559/569, K0YW 559/579#, DF4PV 55/55 SSB
on the 12th:
G3LTF 559/569 #, OH2DG 559/559 #, JA6AHB 559/559 #, G4CCH 559/579, PA3CSG 569/569 #, DJ9YW 559/559 #, HB9BBD 589/599 # AND 57/59 SSB, F6KHM 57/57 #, F2TU 55/55 #, OK1CA 559/559 #, DF3RU 559/559 #, HB9SV 599/589 AND 57/57, OE9ERC 57/57 #, IK2MMB 569/579, OZ6OL 559/559, IK3COJ 559/559 #, G3LQR 559/559 #, SM3AKW 559/579 #, VE6TA 539/579 #, N2IQ 579/589 #, N2UO 539/549 #, K5JL 589/599 #, OZ4MM 579/579 #, K5GW 579/589 #, W2UHI 559/559 #, SM2CEW 559/569 #, HB9Q 589/559, DF4PV 579/579, WA4NJP 0/0 #, DL1YMK 449/549 #,
Sunday 13th added: ZS6AXT 559/569, SM5CFS 0/R0 #
Sunday night I went to my station after work at about 20ut. I called with some breaks but what a desapointing evening 2 Qso's in over 2 hours. At 23.gmt I turned my station off and went to sleep.....hi
I worked 32 Qso's in the contest and 27 new initials.
I would like to thank all how called me and where passioned enough to wait. 23cm is shurely a very fascination band. 73 to all de Michel www.qsl.net/hb9jaw

10GHz

I5PPE + IK5WJD Contest Story

About 15 minutes after the TWT warming-up and some CQ-CQ-CQ to testing our echoes, a great lightning flashed very very close to us. The crack of thunder was terrible and terrific. The main electric power went out for about 20 minutes. When it returned we founded roasted a big 12 DC supply, but fortunately, was dead only this one.
As beginning was in perfect coherence with Murphy's law...ok ??
In the first afternoon, began a strong wind from West, ever-increasing wind....which set dangerously the parabolich dish swinging. Because nothing heard and any stations was present, we decided to rotate the dish face down to ground to expose it to minimal surface to wind.
As second check of Murphy's law was faultless....ok ??
Finally, in the high noon of Staurday, lowering the wind, we tried to retracking the moon and heard the strong signal of F1BLL,... good start. After a nice CW qso with F1BLL, we have heard him also in SSB with an impressive signal. We have tested our own echoes with a very good readability, however we decided to utilize the SPECTRAN software to have some photos on the video display of transmitted dashes, thin and clean, and received dashes, large and scattered around 30 Hz due to libration effect, but anyway clear.
We have worked (7) seven stations: F1BLL, G4NNS and IK2RTI (three new contacts), F6KSX, OK1UWA, DL2LAC, F2TU (already contacted). Called but not worked, DL0EF, OK1KIR (?).

I5PPE + IK5WJD 10GHz dish

I5PPE + IK5WJD some details of horiz. drive

During the afternoon and evening Sunday 13th April, except for F6KSX, we have nothing heard,
nobody else, unless during our activity.
We regret to notice the poor activity of Europeans 10 GHz stations (perhaps about 10 ??) and absence of USA Stations.excepted that during our activity. Best 73 de Alex IK5WJD & Pietro I5PPE

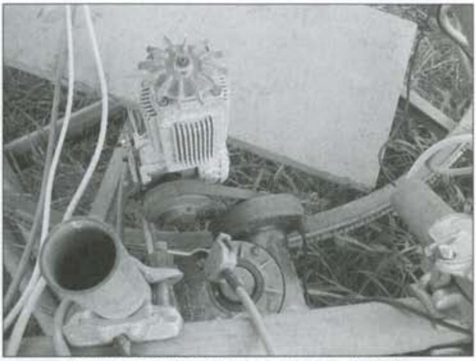
I5PPE + IK5WJD dish in park position

I5PPE + IK5WJD some more details on horizontal drive

Call Used = **I5PPE** Locator: JN53NS
I5PPE - 10 GHz Toscana EME Team
(Alex IK5WJD & Pietro I5PPE)
e-mail: ikcsq@tin.it, e-mail: pipesa@tin.it

12.04.03 I5PPE Result

Worked	Sent	Rcvd	Multi	Pts
F1BLL	5-6-9	O-R	F	100
G4NNS	O-R	O-R	G	100
F6KSX	O-R	O-R	--	100
OK1UWA	5-5-9	5-5-9	OK	100
DL2LAC	O-R	O-R	DL	100
F2TU	O-R	O-R	--	100
IK2RTI	O-R	O-R	I	100
QSO = 7			**5**	**700**
Score = 5 x 700 = 3500				



I5PPE + IK5WJD some more details on elevation drive

The **F6KSX** EME group was active during the second part (dubus contest) on 10 GHz.
The activity was good only during the Saturday evening. Any QSO on Sunday. We did not heard any US station ? And yet, all the conditions were right. All the QSO was made on random activity (no sked!!!) with good reports. We wish to thank all the active stations. K2UYH wrote in the last NL :"Activity definitely peaked on 10 GHz, but I think we need a separate contest for the microwave EME to truly boost the turn out on these bands". We hope he will be heard by ARRL. Perhaps, we will have the 10 GHz and Up on only 1 WE (separate will be perfect) and a rewarded random activity !!! About the European contest, reward the random activity on all the band, please... The signals are good and don't justify any sked. Cat : multi operators. Operators : F6DLA, F6ECX, F6HGQ
QSO, Date, Time, Callsign, Report sent, Report received
1 12/04/2003 18:45 I5PPE O O
2 12/04/2003 18:58 OK1UWA 539 559
3 12/04/2003 19:12 DL2LAC O O
4 12/04/2003 19:53 F2TU O O
5 12/04/2003 20:55 DL0EF O O
6 12/04/2003 21:05 G4NNS M O
7 12/04/2003 21:13 F1BLL 559 O
8 12/04/2003 22:00 IK2RTI O O
9 12/04/2003 22:30 CT1DMK O O
Results : 9 Callsigns * 6 DXCC * 100 = 5400 points.
The station : 3.3 m dish with vertical polar. and automatic tracking with F1EHN EME System, 50 W TWT amp. / 40 W at

horn, 0.7 dB NF, Transverter 10GHz / 28 MHz (with IRMixer), TS 440s & TS 120 modified.
We received about 15.6 dB of excess sun noise and 1.8 dB for the excess moon noise.
Best 73. For the F6KSX group , J-Jacques F1EHN
http://www.nitehawk.com/rasmit/f1ehn.html

EME A.R.I. MARATHON 2002

432 MHz QRO Category 1B			
Call	N.QSO	P. DXCC	Final Score
HB9Q	149	28	417.200
S52CW	69	18	124.200
JH4JLV	40	12	48.000
JA4BLC	26	14	36.400
432 MHz QRP – Category 2B			
Call	N. QSO	P. DXCC	Final Score
UT3LL	66	16	105.600
JA9BOH	16	8	12.800
IN3KLQ	6	6	3.600
S53J	1	2	200
1296 MHz QRO – Category 1C			
Call	N. QSO	P. DXCC	Final Score
HB9Q	122	23	280.600
JA5LUZ	32	16	51.200
1296 MHz QRP – Category 2C			
Call	N. QSO	P. DXCC	Final Score
IK2MMB	149	19	283.100
IK3COJ	97	15	145.500
2304 MHz			
Call	N. QSO	P. DXCC	Final Score
JA4BLC	14	10	14.000
5760 MHz			
Call	N. QSO	P. DXCC	Final Score
CT1DMK	5	3	1.500
I6PNN	3	3	900
10 GHz			
Call	N. QSO	P. DXCC	Final Score
I5PPE	27	10	27.000
CT1DMK	15	7	10.500

The prizes were given on the 27th of April 2003 during the E.M.E. meeting in Lido di Camaiore (Lucca). Many thanks to all the foreign stations that took party.
mailto:iw0bet@amsat.org>iw0bet@amsat.org
EME MANAGER A.R.I. MARATHON
73' de IW0BET Giovanni
http://www.iw0bet.3000.it>www.iw0bet.3000.it

Expeditions

3B8/ON4AME back home, got no license! They got a licence now for 70cm EME from HI, **Dominican republic**.

The **JW/SM2BYA** operation: Update: The earliest opportunity seems to be the November ARRL contest weekend.

EME-TOPLIST

Call	Small	Sqr	DX CC	US-States	WAC	WAS	Initials #
144 MHz							
I2FAK	540	64	122	50	1988	1993	1241
CT1DMK	143	0	41	0	--	--	148
DM2BHG	140	26	40	28	--	--	221
YO2AMU	132	18	44	20	2001	--	167
UA3PTW	129	25	33	20	--	--	165
OK1DIG	125	28	37	25	--	--	155
DD0VF	92	23	33	19	--	--	101
RW3PF	86	22	23	11	--	--	91
OK1IA	12	5	11	0	--	--	12
OK1MS	0	58	103	50	1982	1992	812
432 MHz							
DL9KR	391	53	83	50	1978	1987	768
DJ6MB	298	42	62	44	1984	--	355
OK1KIR	254	45	63	44	1982	--	359
DL7APV	168	31	38	42	1984	--	220
OE9ERC	128	26	33	28	1993	--	168
UA3PTW	103	26	30	22	2002	--	117
S52CW	90	26	27	22	--	--	106
UT3LL	82	25	21	20	--	--	82
OK1CA	71	24	26	22	1996	--	121
CT1DMK	61	0	19	0	--	--	64
OK1DFC	39	17	19	11	--	--	42
OK2BDQ	29	14	16	7	--	--	32
RW3PF	9	5	8	2	--	--	9
1296 MHz							
OE9ERC	160	31	38	22	1993	--	146
OK1KIR	148	32	39	28	1989	--	190
DJ9YW	124	29	38	23	1998	--	143
CT1DMK	96	0	24	0	--	--	102
OK1DFC	78	23	32	15	1999	--	98
OK1CA	76	26	26	19	--	--	108
OK1UWA	12	10	11	5	--	--	22
2300 MHz							
OE9ERC	49	16	22	9	--	--	54
OK1KIR	39	13	19	10	--	--	41
OK1CA	19	11	15	2	--	--	20
OK1UWA	11	7	10	1	--	--	12
3400 MHz							
OK1CA	1	1	1	1	--	--	1
5760 MHz							
OE9ERC	21	12	15	3	--	--	24
OK1KIR	16	10	12	3	--	--	17
CT1DMK	15	0	10	0	--	--	16
10368 MHz							
OK1UWA	24	10	14	3	--	--	25
OK1KIR	19	9	13	2	--	--	21
CT1DMK	19	0	9	0	--	--	20
OE9ERC	11	8	7	3	--	--	11
OK1CA	7	4	5	1	--	--	8

73 Bernd DL7APV

FAI News

Reports, Info, Theory

Editor: Dom Dehays, F6DRO
f6dro@aol.com

More about northern QSOs via FAI

In the last column, we showed that FAI qso's were possible from PA0, demonstrating that the extent of FAI propagation is not limited to southern Europe. I got more reports, this time from French stations in the Paris area, a place were many F operators think that FAI is not possible. They are wrong.

At least two stations from the JN18 area (F6FLV, F6DKW) reported having worked FAI QSOs.

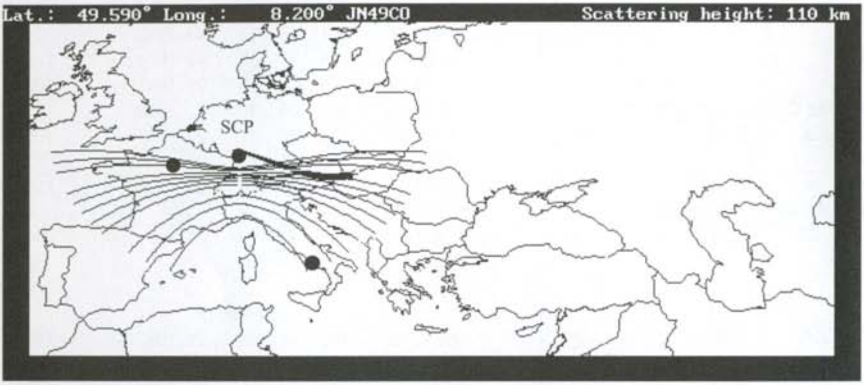
Most of the time it occured during late evening, and they have got Es on 2m in the afternoon.

You can see on the picture a qso between IC8FAX and F6FLV on 16 July 1997. But this is not the only date. Some other qsos using the same scatterer (JN49) took place, for example on 10 July 1993, and it is quite common.

On the same day IC8FAX also worked stations from IN88 and IN78, probably from the same scatterer. He heard OE3JPC as well. So you guys in the north, don't desperate and please look for FAI.

When you will read this column, the FAI season will be there, so I hope I will get bunches of reports from you.

Tnx to F6FLV and IC8FAX for their logs extracts.

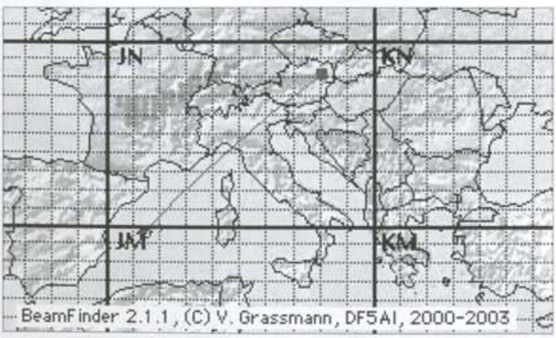


FAI on the Edge

Austria to Balearic Islands

Volker Grassmann, DF5AI

In this column, FAI opportunities are shown which might encourage radio amateurs to conduct unusual dx propagation tests.



FAI scatter volumes (dot marks) corresponding to the path OE – EA6.

Please contact the author at feedback@df5ai.net or, alternatively, visit the www.df5ai.net webpage if a detailed analysis of antenna headings, target areas and scatter volumes is required in serious propagation tests.

Tropo Reports

2m, 70cm and up

Editor: Wolfgang Schneider, DJ8ES
DJ8ES@t-online.de

Lieber DUBUS-Leser(innen),
nachträglich nochmals vielen Dank für die aktive Unterstützung mit Tropo-Informationen. Ich hatte mir den Einstieg als Redakteur für den Bereich Tropo Reports schwieriger vorgestellt.

Wie aus den aufgeführten Berichten deutlich hervorgeht, haben wir doch eine gewisse Aktivität auf den VHF-, UHF- und SHF-Bändern zu verzeichnen. Gerade DX-Funkverkehr macht doch immer wieder Spaß. Auf ein gutes Tropo-Jahr 2003.

Dear Readers,
thank you very much for the active co-operation. I think starting as an editor for the tropo reports had to become more difficult.

As you can see in the reports there is a lot of activity at the vhf-, uhf- and shf-frequencies. Specielly dx-contacts are funny. Hope for a good tropo year in 2003.

2m

DK3WG (JO72GI) wkd on 19/03/03:

18:42 GM4IXC/p	59/59	IO85RU	1175 km
18:47 GM4WLL/p	42/59	IO85JU	1215 km
18:54 G4LOH	59/59	IO94EA	1088 km
19:27 G7ANV	57/59	IO95CH	1116 km
19:42 G8LZG	58/59	IO93SR	1010 km

tnx fr info Jürgen

DK0ALK, JN38TD, wkd (>700km):

01/03/2003 14:40	DK5LO	JO54DF	702km
01/03/2003 14:45	DJ9MT	JO54EG	708km
01/03/2003 15:12	DL0VV	JO54VC	724km
01/03/2003 15:13	DL0BWS	JO64EB	737km
01/03/2003 15:54	DF0TEC/P	JO73CF	731km
01/03/2003 16:14	DC2LF	JO54KF	714km
01/03/2003 17:46	DL5LM	JO44SR	744km
01/03/2003 19:17	OM3KEE	JN88UU	747km
01/03/2003 20:36	DL8VU	JO54EG	708km
02/03/2003 06:17	DL9EE	JO54DF	702km
02/03/2003 07:15	DB7LN	JO44VL	721km
02/03/2003 11:09	SK7MW	JO65MJ	888km
02/03/2003 12:21	OZ/DL0IZ/P	JO45GD	781km

rig: 30W, 2x16el yagi, tnx fr info Mike

PA5DD, JO22FE, wkd (>700km):

17/03/03 21:10	GI4SNA	IO64XM	762km
19/03/03 16:22	GM6VXB	IO97AQ	753km
19/03/03 20:02	GM0OYT	IO87WD	712km
04/05/03 19:28	LA6K	JP43BH	1264km
06/05/03 19:05	LA1T	JO59FB	855km

tnx fr info Uffe

OZ1IEP, JO55XU, wkd (>700km):

17/02/2003 19:14	GM0EFT	IO86PL	909km
17/02/2003 19:22	G8GXP	IO93FQ	897km
01/03/2003 16:42	ON1LPA	JO20XO	707km
02/03/2003 07:19	ON1DBQ/P	JO20MV	716km
02/03/2003 07:22	ON4ARF	JO10MV	807km
02/03/2003 13:31	DL0AO	JN59WK	713km
04/03/2003 18:07	ON4PS/P	JO20KQ	742km
04/03/2003 18:24	ON1AEN	JO10VW	768km
04/03/2003 19:30	PA5KM	JO11WL	720km
04/03/2003 20:26	ON4ARF	JO10MV	807km
04/03/2003 20:58	SK3MF	JP92FW	868km
18/03/2003 21:07	EI3GE	IO63XD	1196km
18/03/2003 21:10	GW4DRR	IO73SH	1092km
18/03/2003 21:14	GM4WLL/P	IO85JU	944km
18/03/2003 21:25	G4EHD	IO93BS	914km
18/03/2003 21:38	G4LOH	IO94IA	869km
01/04/2003 17:10	ON1AEN	JO10VW	768km
01/04/2003 17:41	DB8KJ	JO30CM	705km
01/04/2003 18:22	DF9RJ	JN68GS	788km
01/04/2003 18:57	ON1LPA	JO20XO	707km
01/04/2003 19:06	DK5RQ	JN68BV	774km
06/05/2003 17:04	ON1AEN	JO10VW	768km
06/05/2003 17:14	ON1LPA	JO20XO	707km
06/05/2003 17:36	G4SWX	JO02PB	814km
06/05/2003 18:24	DK5RQ	JN68BV	774km
06/05/2003 18:27	DG6RB	JN69WK	725km
06/05/2003 18:50	OK1XJF	JN79HP	713km
06/05/2003 18:54	DF9RJ	JN68GS	788km
06/05/2003 18:55	DL3RBH	JN68HJ	830km
06/05/2003 19:48	PA5KM	JO11WL	720km

tnx fr info Carl

OZ/DL0IZ/p, JO45GD, wkd (>700km):

01/03/2003 16:46	OK1ORU	JN69UO	708km
01/03/2003 18:37	SN6W	JO80FQ	725km
01/03/2003 19:42	OL3Y	JN69JJ	701km
01/03/2003 21:08	DK0ES	JN48TN	736km
02/03/2003 00:25	DK0PX	JN48JC	783km
02/03/2003 11:14	DJ2IE	JN48FT	704km
02/03/2003 11:59	F6KUP/P	JN29PD	703km
02/03/2003 12:22	DK0ALK	JN38TD	781km
04/03/2003 18:59	SM5OMZ	JO89RK	716km

rig: IC-275H + PA 3cx1500A, 4x 4el + 2x 16el

DK0GR/p, JO30JF, wkd (>700km):

03/05/2003 19:49	SK7JM	JO65TM	746km
04/05/2003 04:49	OE8HBQ/8	JN76KO	720km
04/05/2003 06:16	IK5AE/5	JN54JD	741km

rig: 750W, 4x17el, 620mASL, tnx fr info Holger

70cm

IW2DVK, JN45MQ, wkd:

01/03/2003 14:16	IK0VWO	JN62LH	489km
01/03/2003 15:09	I0JXX	JN61GV	507km
01/03/2003 16:29	DL0NS	JO30EM	573km
02/03/2003 08:24	S57C	JN76PB	486km
02/03/2003 09:40	S51ZO	JN86DR	570km
02/03/2003 10:05	DK4VW	JO40IT	571km
03/05/2003 14:59	IK0VWO	JN62LH	489km
03/05/2003 16:33	I0JXX	JN61GV	507km
03/05/2003 17:39	S57C	JN76PB	486km
04/05/2003 08:48	DK4VW	JO40IT	571km
04/05/2003 09:18	ON4ANT	JO20AR	672km
04/05/2003 12:55	IT9MZB/IT9	JM67LX	917km

rig: IC821H, MGF1302, GI7b, 4x21FT
tnx fr info Roberto

OZ1IEP, JO55XU, wkd on 11.03.2003:

18:00	PA5DD	56 / 56	JO22IC	631km
18:05	PA1TK	55 / 53	JO22IJ	608km
18:10	PE1RLF	55 / 53	JO32CG	547km
18:11	PA5KM	55 / 57	JO11WL	720km
18:45	DB6NT	55 / 57	JO50VJ	607km
18:50	DL2OM	54 / 52	JO30SN	657km
19:03	SL0ZS	52 / 51	JO89XJ	531km
19:04	SK0CT	51 / 55	JO99BM	548km
19:23	DG7NBE/P	41/ 51	JO40XI	626km
19:35	DJ6JJ	52 / 51	JO31LG	607km
19:39	OK1VT	55 / 55	JN79IX	678km
20:12	SK4AO	53 / 55	JP70TO	570km
20:15	SM4L	51 / 55	JP70WS	592km
20:20	OH0JFP	41 / 51	KP00AB	667km
21:02	SM0FZH	57 / 57	JO99HI	555km

19.03.2003:

21:39	G1XWD	59/59	JO03CI	805km

08.04.2003:

17:09	PA5DD	55/55	JO22IC	631km
17:29	PA5KM	51/55	JO11WL	720km
18:07	OH0JFP	51/51	KP00AB	667km
18:53	PI4DEC	52/55	JO21IT	654km
18:55	PA3FQX	54/55	JO21IT	654km
19:40	PA0PLY	57/51	JO22IH	615km
20:44	SM3BEI	51/51	JP81NG	672km

13.05.2003:

17:02	PA5DD	54/54	JO22IC	631km
17:26	DK1FG	59/58	JN59OP	692km
17:47	DB6NT	56/55	JO50VJ	607km
20:01	OH0JFP	56/56	KP00AB	667km
20:04	SM3BEI	53/51	JP81NG	672km

tnx fr info Carl

OZ/DL0IZ/p, JO45GD, wkd (>500km):

01/03/2003 15:23	DL0GTH/P	JO50RK	559km
01/03/2003 16:05	DF1JM	JO30FQ	515km
01/03/2003 17:58	DK0WM	JO61CA	520km
01/03/2003 18:57	DF0MTL	JO60OM	602km
01/03/2003 19:57	DH1NAX	JO50RK	559km
02/03/2003 11:20	ON4BBF	JO11VA	557km

rig: IC-910 + PA 300W, 2x 20el yagi

DK0ALK, JN38TD, wkd (>500km):

01/03/2003 16:45	PA3EXV	JO32KQ	508km
01/03/2003 16:57	DJ9KH/P	JO42OX	549km
01/03/2003 19:17	PI4GN	JO33II	583km
01/03/2003 19:42	OK1KKD	JO60WD	506km
02/03/2003 12:02	PA6C	JO33FB	553km
02/03/2003 13:52	OL2R	JN89BO	643km

tnx fr info Mike

DK0GR/p, JO30JF, wkd on 04/05/2003:

08:11	OK1KZE	53/59	JN79FX	548km
09:49	OE5D	51/53	JN68PC	529km
10:51	OE3XUA	51/55	JN77XX	713km
12:13	G3LTF	55/55	IO91GG	592km

rig: 300W, 21el Yagi, 620 mASL, tnx fr info Holger

G3XDY, JO02OB, wkd (>700km)

11/02/2003	SK7MW	JO65MJ	860km
17/02/2003	SM6VSZ	JO67FA	909km
02/03/2003	DLØGTH/P	JO50RK	735km

tnx fr info John

OZ1FF, JO45BO, wkd:

18/03/2003 19:11	PA5DD	JO22IC	449km
18/03/2003 19:23	LA2Z	JO59EJ	442km
18/03/2003 19:58	SMØFZH	JO99HI	752km
18/03/2003 20:11	GM8BDX	IO85TP	658km
18/03/2003 20:28	G3XDY	JOØ2OB	600km
18/03/2003 20:30	GØNX/P	JOØ1KK	666km
18/03/2003 20:39	G4DEZ	JOØ3AE	588km
18/03/2003 21:45	PAØWWM	JO22FE	449km
15/04/2003 17:13	G3LQR	JOØ2QF	579km
15/04/2003 17:15	PAØWWM	JO22FE	449km
15/04/2003 17:20	PA3AWJ	JO21GW	471km
15/04/2003 17:23	PA5DD	JO22IC	449km
15/04/2003 18:19	DJ2QV	JO31PF	489km
15/04/2003 18:35	G4DDK	JOØ2PA	599km
15/04/2003 18:52	GM4OGI	IO85DX	740km
15/04/2003 19:35	G4DEZ	JOØ3AE	588km
15/04/2003 19:38	G4BYV	JOØ2LQ	568km
15/04/2003 19:40	G3XDY	JOØ2OB	600km
15/04/2003 19:48	GØOLX/P	JOØ1KK	666km
16/04/2003 20:34	G4DEZ	JOØ3AE	588km
16/04/2003 20:43	G3ZEZ	JOØ1NT	624km
16/04/2003 20:48	G6JHR	JOØ1FK	686km

tnx fr info Kjeld

PA5DD, JO22FE, wkd (>600km):

14/01/03	18:02	OZ1IEP	JO55XU	633km
14/01/03	18:03	SK7MW	JO65MJ	660km
02/02/03	10:52	F4CKV	JN16NM	630km
11/02/03	18:09	OZ1IEP	JO55XU	633km
11/02/03	18:15	SK7MW	JO65MJ	660km
02/03/03	11:36	DK0OG	JN68GI	696km

11/03/03	18:00	OZ1IEP	JO55XU	633km
11/03/03	18:00	SK7MW	JO65MJ	660km
11/03/03	18:03	OZ8ZS	JO55RT	606km
18/03/03	20:08	GM0EFT	IO86PL	684km
19/03/03	16:18	GM6VXB	IO97AQ	753km
19/03/03	17:42	LA4YGA	JO48AE	710km
19/03/03	20:51	LA3FV	JO59BC	851km
08/04/03	17:05	SK7MW	JO65MJ	660km
08/04/03	17:09	OZ1IEP	JO55XU	633km
08/04/03	17:10	OZ8ZS	JO55RT	606km
08/04/03	18:05	OZ2PBS	JO55XJ	602km

tnx fr info Uffe

23cm + up

G3XDY, JO02OB, wkd

23cm (>700km)

25/02/2003 SM7ECM (JO65)
18/03/2003 SK7MW (JO65), SM7ECM (JO65)
19/03/2003 SM6ESG (JO67), OZ7IS (JO65)
20/03/2003 DGØRG (JO62)

13cm (>600km)

25/02/2003 SK7MW (JO65), SM7ECM (JO65)
19/03/2003 SM6ESG (JO67)
20/03/2003 DGØRG (JO62)
25/03/2003 OZ1FF (JO45)
15/04/2003 OZ1FF (JO45)

9cm (>500km)

16/03/2003 DL3YEE (JO42), DF9QX (JO42)
19/03/2003 DL3YEE (JO42)
20/03/2003 DGØRG (JO62)
30/03/2003 DL3YEE (JO42)
03/05/2003 DL3YEE (JO42)

6cm (>500km)

25/02/2003 SM7ECM (JO65)
16/03/2003 DL3YEE (JO42), DF9QX (JO42)
19/03/2003 SM6ESG (JO67)
30/03/2003 DL3YEE (JO42)

3cm (>500km)

25/02/2003 SM7ECM (JO65)
16/03/2003 OZ5BZ (JO45)
19/03/2003 SM6ESG (JO67)
22/03/2003 OZ1CTZ (JO46)
30/03/2003 DL3YEE (JO42)
15/04/2003 OZ1FF (JO45)
17/04/2003 OZ1FF (JO45) and also heard the beacon DB0GHZ first time from its new location on Helgoland (JO34WE, 10.368,810 MHz)
tnx fr info John

OZ1FF, JO45BO, wkd:

13cm (>300km)

25/02/2003	18:02	SK7MW	JO65MJ	310km
25/02/2003	18:14	SM6ESG	JO67CC	302km
25/02/2003	19:03	SM7ECM	JO65NQ	314km
01/03/2003	18:42	PA6C	JO33FB	302km
01/03/2003	20:03	SK7MW	JO65MJ	310km
25/03/2003	18:02	PAØWWM	JO22FE	449km
25/03/2003	18:05	PA5DD	JO22IC	449km
25/03/2003	18:21	SM6ESG	JO67CC	302km
25/03/2003	19:35	SK7MW	JO65MJ	310km
25/03/2003	20:48	G3XDY	JOØ2OB	600km
25/03/2003	21:20	G3LQR	JOØ2QF	579km
25/03/2003	21:30	SM7ECM	JO65NQ	314km
15/04/2003	19:43	G3XDY	JOØ2OB	600km
16/04/2003	20:56	G3ZEZ	JOØ1NT	624km
16/04/2003	21:02	G4BYV	JOØ2LQ	568km
22/04/2003	17:51	PA3CEG	JO33FB	302km
22/04/2003	17:57	PAØWWM	JO22FE	449km
22/04/2003	18:09	PA5DD	JO22IC	449km
22/04/2003	19:25	SM6ESG	JO67CC	302km
22/04/2003	20:30	SK7MW	JO65MJ	310km
22/04/2003	20:31	SM7ECM	JO65NQ	314km

3cm (>300km)

25/02/2003	18:18	SM6ESG	JO67CC	302km
25/02/2003	20:47	PA3CEG	JO33FB	302km
25/02/2003	21:29	SM7ECM	JO65NQ	314km
01/03/2003	18:44	PA6C	JO33FB	302km
25/03/2003	18:22	SM6ESG	JO67CC	302km
25/03/2003	19:21	G4DDK	JOØ2PA	599km
25/03/2003	19:36	SK7MW	JO65MJ	310km
25/03/2003	20:10	PAØWWM	JO22FE	449km
25/03/2003	20:12	PA5DD	JO22IC	449km
25/03/2003	21:33	SM7ECM	JO65NQ	314km
15/04/2003	19:46	G3XDY	JOØ2OB	600km
16/04/2003	21:07	G4BYV	JOØ2LQ	568km
17/04/2003	21:15	G3XDY	JOØ2OB	600km
22/04/2003	17:52	PA3CEG	JO33FB	302km
22/04/2003	18:03	PAØWWM	JO22FE	449km
22/04/2003	19:35	SM6ESG	JO67CC	302km
22/04/2003	20:27	SK7MW	JO65MJ	310km
22/04/2003	20:33	SM7ECM	JO65NQ	314km

tnx fr info Kjeld

PA5DD, JO22FE, wkd Jan – May ´03

23cm (>300km):

OZ2LD JO54TU 552km, SK7MW JO65MJ 660km, SM7ECM JO65NQ 681km, OZ9KY JO45VX 545km, DK0NA JO50TI 520km, DL0GTH/P JO50RK 505km, DF0MTL JO60OM 617km, DL6NAA JO50VF 537km, DF0TEC/P JO73CF 654km, GD4GNH IO74QD 662km, GD0EMG IO74QD 662km, DH9NFM JO50RF 515km, OK2KKW JO60JJ 594km, DF0YY JO62GD 536km, G8XVJ IO83RJ 508km, OK1KIM JO60RN 632km, DK2GR JN59IE 533km, DF0MTL JO60OM 617km.

13cm (>300km):

OZ1FF JO45BO 451km, G3MEH IO91QS 366km, G4BRK IO91DP 442km, GD4GNH IO74QD 662km, SK7MW JO65MJ 660km, SM7ECM JO65NQ 681km, DG5FEB/p JO40PL 367km, DF0YY JO62GD 536km.

9cm (>200km):
G3XDY (JO02OB), DF9QX (JO42HD), DG1KJG (JO30NT), DL3YEE (JO42GE).

6cm (>200km):
G3XDY (JO02OB), DF9QX (JO42HD), DG1KJG (JO30NT), DL3YEE (JO42GE), G3PHO/p (JO03AD).

3cm (>200km):
G3XDY (JO02OB), G3PHO/P (JO03AD), G4DDK (JO02PA), DF9QX (JO42HD), DH8AG (JO31RL), DL0NS (JO30EM), DL4FBN (JO30WC), G3LQR (JO02QF), OZ1FF (JO45BO), G4DDK (JO02PA), DG1KJG (JO30NT), DL3YEE (JO42GE), G4EAT (JO01HR), F5HRY (JN18EQ), ON5PX (JO20AI), ON7YK/P (JO20XL).

1,5cm:
PA0WWM (JO22FE), PA6NL (JO21BX), PA0EZ (JO22OF), PI4ZLD (JO11WM), PA3AWJ (JO21WM), PA6C (JO33FB).
tnx fr info Uffe

Last Minute:

On Saturday afternoon (17. May) there was an interessting opening to UK during the G-test on 2m. Many stations were qrv. Myself, I made contacts in the 700 km range during that opening. The dx-cluster announced dx-qso´s in the range of 1000km. Hope to get your logs to print in the next issue of dubus.

Personality – OZ1IEP

DUBUS wants to introduce active DXers from Europe and overseas. Today: OZ1IEP

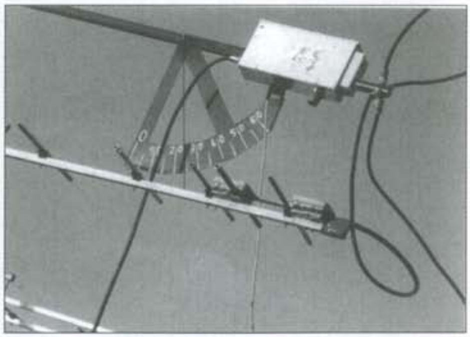
OM Carl Halkier (OZ1IEP) is one of the most active DXers in northern Europe. He is qrv in tropo scatter and other modes on 144 MHz and 432 MHz and also on HF and 6m. The foto shows Carl in his shack during the NAC (Northern Activity Contest) on 144MHz.

Carl actually worked on 2m 343 squares (53 dxcc) and on 70cm 138 squares (28 dxcc). For details see the top list list in DUBUS.

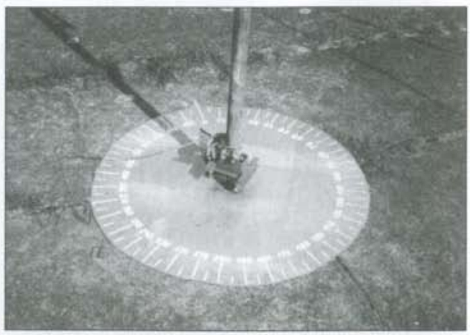
Equipment on 2m:
YAESU FT-736r with muTek front end, Antenna 2*11 ele flexayagis, mhp145 PRE-amp NF 0.48dB PA Henry Radio 2002-A 800 watts

and on 70cm:
YAESU FT-736r with muTek front end, Antenna 2*23 ele. Flexayagi + SP7000,PRE-amp NF is 0.8dB, PA 500 watts (DanAmps).

EME - Appendix



DL7UDA`s Elevation control



DL7UDA`s Azimuth control

6m News

Reports, Expeditions, Infos

Editor: Joachim Kraft, DL8HCZ

6m-Logbook from DL (Day, Month, UTC):

March to May 2003

26.2. 2250 Aurora from N-DL + PA: GB3LER/B
1.3. 1440 Es from S-DL: 5N6NDP JK30, QSL via IK5JAN
3.3. 1310 TEP from W+S-DL: ZS6TWB/B
4.3. 1420 TEP from S+M-DL: TR0A/B
8.3. 1640 Es from S-DL: 5U7JB, JK13 QSL via ON5NT
18.3. 1650 F2/Es from S-DL: 5N6NDP/9 JK30
31.3. 1430-1830 Aurora from N+M-DL: GM, ES, SM
6.4. 1245-1315 TEP from S+NW-DL: ZS6WB, ZS6DN/B KG44
14.4. 1650 TEP+Es from S-DL: LU7WW FE77
16.4. 1329 VK9XI, OH29, claims to have worked DJ1XL and at 1347z DL1INT. Both calls are not issued in DL and VK3OT, the OP of VK9XI, states that the DJ1XL QSO may have been DJ3TF AND LZ1XL together. Discussions result in the cancellation of both QSOs. Also almost 100 dupe QSOs on 6m were cancelled from the log according to VK3OT. VK9XI worked into SV, I, 9A, F, EA, LZ.
17.4. 1545 TEP+Es: CT1EEB, IN50, is the first ever station from Europe who works into Antarctica with **EM1U (FC74)**. During this opening EM1U wkd only 2 stations from CT + hrd SV1DH.
19.4. 1510-1530 TEP from all DL: 9J2BO
1600-1730 from S-DL: 7Q7RM + SIX, Z22JE
1940-2005 TEP+Es from S-DL: PY1RO + PY1VOY GG87, PY2AXT + XB GG66
23.4. 1610-1945 TEP + Es from S-DL: V51/ZS6JOX JH62, 7Q7SIX, 9J2KC KH47, Z22JE KH52
27.4. 1415 Es from S-DL: 5N9NDP/9 JK30rm
28.4. 1835-1915 TEP + Es from S-DL: PY5CC, PY1VOY + PY1RO GG87
29.4. 2125 TEP from S-DL: ZD8VHF/B II22
6.5. 1705- TEP from S- + NW-DL: 7Q7SIX/B
7.5. 1615-1700 TEP from S- + NW-DL: 7Q7SIX/B
12.5. 1930-2000 TEP + Es from S-DL: PU2WDX GG66, PY2VY, PY1VOY GG87, PY1RO, PY5CC
13.5. 1800-1845 TEP+Es from all DL: PY5CC
1840 PY5CC wkd 4U1ITU!
19.5. 17-18 TEP+Es from all DL: PY5CC
20.5. 19-21 TEP+Es from DL: PY5CC, PY1RO, PY3ISO GG40
From EA/CT/F/G Multi-Es to W1,2,3,4, VE1

Expeditions and News:

IM69: EH4DQR/p is qrv on 6m until July 1st

JP83: SM3XRJ is qrv on 6m from this rare square

/MM: PA3HEN/MM is qrv again since mid May travelling between OH and 4X. QRG: 50.140 MHz.
/MM: G0KZG/MM, Andy plans to be qrv again on 6m from October during a trip from CT to PY.

KM73 OD5/OK1MU is qrv on 6m until the end of July and will go back to OK.

KP37/38 The OH8K group plans to activate these squares also on 6m during Perseids.

5T Mauretania: 5T5SN is qrv on 6m with 10 W and 4 Ele. From June 29th to July 7th DL8YHR etc. will be qrv with QRO on 6m as 5T6M. 50.110 / QSY 50.130.

9L Sierra Leone: 9L1BTB is new and qrv on 6m.

C3 Andorra: ON4ANT did not get a licence and the trip was cancelled or postponed.

CY9, St. Paul: From July 24th to August 2nd there will be qrv CY9A also on 6m. QSL via N5VL.

JW .Svalbard: JW5RIA is qrv again on 6m from KQ26. He will still there until August.

KQ38: JW0PK will be qrv on 6m from July 1st to August 1st on 6m.

PJ Bonaire: PJ2/PA2VST is qrv from 28.7.-11.8.

S9 Sao Tome: S9TX (ex S92TX) ist qrv on 6m now for about 1 year with 100w + 5 ele Yagi. Loc. JJ30. QSL via W7KNT

TN Congo: CT3HK is qrv on 6m as TN3S for 1 year. QSL via Madeira Team, P.O. Box 19, P-9001-901 Funchal, Madeira Isl., Portugal

UR Ukraine: UR5DDX is a new station in **KN18.**

V2 Antigua: WB8XX is qrv on 6m June 10th - 16th.

VK9X/C Christmas/Cocos: A group from DL will be qrv in October also on 6m.

VP9 Bermuda: From June 13th - 16th N0JK/VP9 is qrv on 6m with 100w + 5 ele. QRG: 50.102. -
W3CMP/VP9 is qrv on 6m from June 27th to July 5th on 6m with QRO and 9 ele.

VQ9 Chagos: VK9LA is qrv on 6m for one year.

YA Afghanistan: G4KUX is qrv until spring 2004 on 6m as YA4F from Kabul, MM44ON. -
N4SIX got a licence now and is qrv on 6m.

XV Vietnam: XV9DT is qrv for some years from Hanoi also on 6m. OL20.

YI Iraq: YI/ON6TT, S53R etc are qrv and 6m operations may start any time.

Beacons qrv

ET3VSC (soon ET3BN), 50.035, KJ99JA, QRV
LZ2CM/B, 50045, KN13ne, 0,5 W, GP, 1550m asl
YU1EO/B, 50045, KN04ml, 1 w, GP, is QRV now.

6m Digital Meteor-Scatter at 4U1ITU
by F6IRF

6 meters band MS activity

Until recently and despite the fact that this band is far the best ham-band for this sport, the Meteor Scatter activity had remained quite low on the 50Mhz band. Many reasons may explain this low interest:

- most of the locators within the theoretical 2200kms limit can be contacted easily during E sporadic season
- power, frequency, mode, antenna limitations in several EU countries
- relative complexity of HSCW and non availability of free-ware user-friendly software for this mode.
- relative inefficiency of HSCW, this mode requiring quite high ERP
- relative complexity of MS procedure, and time required to complete a QSO
- low activity not allowing random traffic outside major meteor showers

The JT6M revolution

In March 2003 Joseph Taylor, K1JT, Nobel prize of physics in 1993 (*), introduced JT6M as part of his WSJT freeware digital package (WSJT= Weak Signal by Joe Taylor). This new mode optimized for MS on 6m approaches the Shannon's theoretical limit in terms of required S/N versus transmission speed. The mode has been designed to transmit short messages within meteor bursts of about one second duration, a length typical for the 6m band. The signal required is just around minus 10dB S/N in 2.5kHz bandwidth for a single burst, and even lower if several repetitions of the same message are received. This represents about 10dB improvement compared to modes available earlier like HSCW and FSK441 (147cps or 8820lpm - optimized for typical 100ms bursts on 2m) This new mode really opened new horizons for MS with small antenna systems and limited ERP, and for almost permanent activity on the 6m band (365/365d 24/24h).

(*) With Russell Hulse and a students team , Joseph Taylor constructed a sensitive radio telescope (using, among other things, chicken wire, telephone poles and government surplus parts). They used it for work leading to the discovery of a celestial oddity called a binary pulsar, and won the 1993 Nobel Prize in physics. In an autobiography available online Joe is confessing that one of two reference books he had at that time was the ARRL Handbook...

The problems and the solutions

4U1ITU is far from being the ideal place for VHF low signal traffic. High level of noise, high number of computer birdies, poor take-off angle in many directions, and high demand for the "new one" (risks of chaotic pile-ups) had been identified as potential problems right from the start. As I wanted to give priority to "random" and because it was difficult to give a clear RX frequency in advance, I decided to use a "split" procedure inspired by the traditional "MS CW random" method - In accordance with IARU San-Marino conf. bandplan I selected 50260 as TX frequency, and if required the RX frequency would be indicated in the CQ sequence by a single letter from A=1 to Z=26 (i.e. CQC 4U1ITU meaning QSX-3up). The procedure worked extremely well, with 2 exceptions:

- during a couple of hours, I got a strong broadband QRM extending from 260 to 300... Solved the problem by the indicating the split in clear in the CQ (CQ 4U1ITU QSX305)
- Had forgotten about frequency limitation in EA (authorized only below 50.200) ... I also used the same a/m method indicating the RX frequency in clear, so the EA stations could transmit in their legal portion of the band.

The operation

Initially planned as a 6 hours punctual operation Saturday of Easter, the great success and high demand for 4U1ITU as a "new one" convinced me to extend the operation. The success has been so high within the European 6m community that the number of stations equipped for this mode more than doubled after the first weekend. The UKSMG forum where I had posted the initial project for the operation beated all frequentation records, as well as the ON4KST EU-6m chat, where took place the contacts coordination for the non-random contacts. QSO's with 67 different stations in 21DXCC entities have been completed in approximately 24 hours of effective traffic (including the preliminary tests). This include 2 FSK441 QSO's (when reflections were too short for JT6M and signal strong enough), and 1 JT44 QSO with ZS6WB (F2 /TEP - JT44 is the EME dedicated mode of WSJT). The MS ODX is with OH2TP at nearly 2000kms (beyond my expectations as 2000kms requires a theoretical take-off angle of approx. 1deg). In addition to the WSJT activity and thanks to a few short E's openings (E's season started earlier than expected), a total of 275 stations in 32 DXCC entities have been able to contact 4U1ITU on 6m during those 2 weeks. A few conventional CW MS-QSO's have also been made during the peak of the Lyrids shower; a few ones completed on a single long burst.

Last but not least...

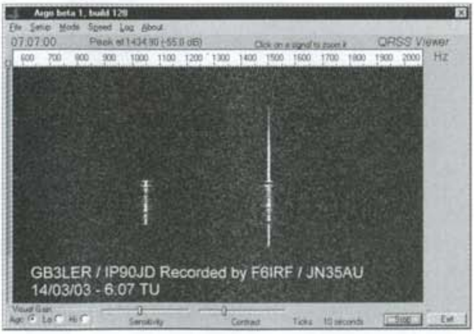
- Thanks to Joe, K1JT for his work around WSJT, and for his marks of interest for this operation http://pulsar.princeton.edu/~joe/K1JT/
- Thanks to OH5IY http://www.sci.fi/~oh5iy/ for his extensive work on meteor-scatter
- Thanks to F5IQA and F6HYE for their logistic support
- Thanks to the United Kingdom Six Meters Group (www.uksmg.org) for the forum and announcement facilities (you can find more details on this operation by going to the usksmg forum, topic digital on 6, 4U1ITU activity)
- Thanks to ON4KST (http://on4kst.com) for the 6m-chat facilities
- Thanks to all operators who waked-up early and had sometimes to wait for a few hours to get their turn.

Hope this operation can be renewed from time to time and can help to maintain some life on the band during the low solar activity years. With the same "6m anytime" objective, I also hope that the success of this operation and the lessons learned will encourage EU DX-peditioners to use MS-digital during quiet periods.

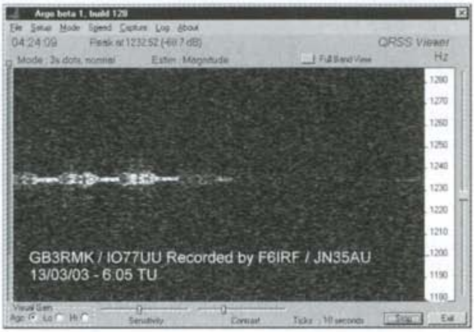
See you soon on 6m from 4U1ITU, Patrick, F6IRF
Complete log is now available on the 4U1ITU homepage
http://life.itu.int/radioclub/

Close view at the 4U1ITU antennas, western horizon

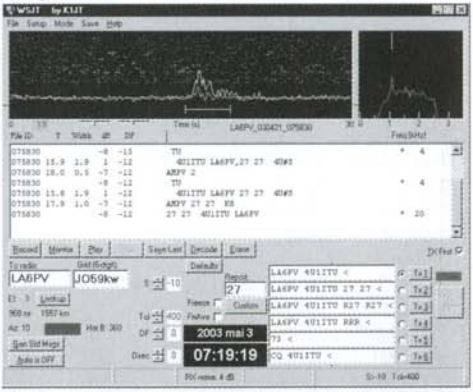
GB3LER: Audiogram of a 25s meteor burst from the 6m Shetland Islands Beacon (modulation F1 - 30W in a dipole), recorded from home at 1700kms. Taking into account the low ERP of the beacon, this kind of burst is quite rare (just a few each day for a given location at ideal distance), but it allows completion of a conventional CW QSO, like the one we did with LA8AJA. On 6m the typical burst duration is 1 to 2 seconds at a typical rate of approx 20 per hour in the morning outside major showers.



GB3RMK: A 1'30 exceptional burst from the GB3RMK Scottisch beacon (near Inverness). The capture of such a burst required 1 week permanent recording of the beacon frequency. It requires the meteor size to be somewhat over average, the trail to be perpendicular to the line joining the 2 stations and approximately half way. Note that the time of day is nearly the same as the previous one, and corresponds to the sunrise period, when the probability of getting such phenomenas is higher (discovered later that it may also corresponds to the beginning of a minor metor shower called Virginids)



LA6PV: WSJT screen capture from the recording done during the qso with LA6PV. This is a typical 1.9" burst with fast fading.



F6IRF operating 4U1ITU

Aurora Reports

Editor: Stefan Heck, LA0BY

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Dear Readers!

From now on we will include a plot showing the solar activity over the last three months. It can be found on the internet at the URL http://dxlc.com/solar/. The Planetary A Index gives a good indication of when there have been Aurora conditions. Experience has shown that readings above 20 suggests there was Aurora at least down to a latitude of about 53°. Vy 73, Stefan (LA0BY)

DJ8ES in JO43SX wkd on 144 MHz:

2003-02-02

1540	SM1CIO	JO97HR	55A	59A	703km
1548	SM4HFI	JP70TO	59A	58A	821km
1552	ES6RQ	KO38WA	59A	59A	1220km
1556	G4HGI	IO83PL	57A	55A	806km
1607	SM5CUI	JO89WW	59A	57A	832km
1613	SM5CKG	JO78MJ	57A	57A	597km
1757	GM4VVX	IO78TA	57A	57A	972km
1810	LA4OGA	JO59LX	57A	55A	672km
1814	SM4RPP	JO79HH	59A	56A	669km
1827	GM3WKZ	IO88CN	57A	56A	965km
1850	SM7EOI	JO86FP	57A	57A	528km

2003-02-04

1955	SK4BX	JO79OF	55A	52A	678km
2007	LA2Z	JO59EJ	55A	55A	604km
2012	SK4AO	JP70TX	55A	55A	858km

Tnx fer info, Wolfgang!

DK3WG in JO72GI wkd on 144 MHz:

2003-03-17

1510	LA8WF	JO59GV	57A	56A
1522	SM5EFP	JO79WJ	57A	57A
1528	LA7VH	JO59EK	57A	58A
1535	OH2NY	KP20CM	54A	57A
1539	SM0LQB	JO89XK	56A	55A
1540	OH2BHP	KP10LL	54A	55A
1544	YL3AG	KO26AW	44A	55A
1549	SM6OPX	JO58RJ	55A	55A
1553	OH5LK	KP30ON	55A	56A
1603	LA3BO	JO59CD	56A	56A

2003-03-31

1524	GM3WOJ	IO77WS	55A	55A
1528	SM0LCB	JO89XI	56A	55A
1530	SM5DYC	JO89UW	55A	55A
1533	OH1LT	KP00XO	54A	55A
1537	SM5EFP	JO79WJ	57A	58A
1541	RZ1AP	KO49VW	57A	59A
1542	SM6CTQ	JO78FM	57A	59A
1546	LA5KA		54A	53A
1548	ES5QA	KO38JJ	57A	57A
1556	YL3AG	KO26AW	56A	56A

1559	SM4BGV	JO69HP	57A	59A
1609	LA4OGA	JO59LX	57A	59A

Tnx fer report, Jürgen!

LA0BY in JO59IX/FW wkd on 144 MHz:

2003-03-04

1835	SM3VAC	JP83VA	55A	55A		505 km
1836	OH5LK	KP30ON	56A	55A		910 km
1841	SM3RWZ	JP82MI	54A	55A		430 km
2006	SM2CKR	KP03DQ	55A	55A		649 km
2136	OH3AA	KP21GA	55A	55A	40	765 km
2138	OH6FV	KO19RX	55A	55A	40	708 km
2148	OH6QR	KP22BN	53A	53A	40	771 km
2153	OH6HFX	KP14RA	55A	55A	40	801 km
2155	OH6PA	KP02PL	54A	54A	40	630 km
2159	SM3AKW	JP92AO	55A	55A	40	488 km
2207	ES5PC	KO38HJ	55A	55A	50	921 km

2003-03-27

1637	DK1KR	JØ53HW	59A	59A	30	667 km
1638	DL1SUN	JO53PN	57A	59A	30	711 km
1706	DL8DBU	JO43AA	55A	54A	20	783 km

2003-03-29

1617	GM3WOJ	IO77WS	55A	55A	340	871 km
1734	G4DEZ	JO03AE	54A	55A	350	983 km
1739	SP1CNV	JO84CF	55A	57A	30	723 km
2315	DJ1CW	JO42AU	52A	55A	10	801 km

2003-03-31

1500	DL8MKG	JO52NU	55A	55A	30	789 km
1502	DJ6TK	JO53FG	53A	55A	30	741 km
1507	G4DEZ	JO03AE	55A	59A	350	983 km
1512	DG7TG	JO43SV	57A	55A	20	674 km

2003-04-01

1703	OH5LK	KP30ON	55A	55A		910 km
1705	SM3VAC	JP83VA	55A	55A		505 km
1711	OH6QR	KP22BN	54A	55A		771 km
1744	ES2WX	KO29JN	55A	55A		788 km
1854	OH3AA	KP21GA	55A	55A		765 km
1908	OH3BHL	KP10RR	55A	55A		705 km

2003-04-30

1545	ES2RJ	KO29JN	52A	55A	10	802 km
1548	DL1UU	JO62SP	57A	55A	30	833 km
1554	PD0RFU	JO32LS	56A	55A	10	825 km
1556	DL7FF	JO62TJ	54A	55A	30	861 km

2003-05-06

1637	LA6K	JP33VC	57A	57A		380 km
1646	OH6HFX	KP14RA	55A	55A	20	801 km
1649	OH1NOR	KP00XL	53A	53A	20	623 km
1701	OH5LK	KP30ON	57A	56A		910 km
1705	ES2WX	KO29JN	55A	57A		788 km
1714	SM3VAC	JP83VA	59A	59A		505 km
1718	SM3AKW	JP92AO	59A	59A		488 km
1719	DK1KO	JO53CT	59A	58A		686 km
1742	OH6QR	KP22BN	53A	53A		771 km
1751	OH3BHL	KP10RR	54A	55A		705 km

LA6K in JP43BH/JP33VC wkd on 144 MHz:

2003-05-02 (from JP43BH)

1519	OH6MAZ	KP21	55A	55A	35°

1527	SK4MPI	JP70	52A	hrd	35°
1530	LA2VHF	JP53	52A	hrd	35°

2003-05-05 (from JP33VC)

1600	OH5LK	KP30	57A	59A	30°
1602	SK4MPI	JP70	59A	hrd	45°
1608	OH3KLJ	KP21	57A	57A	40°
1614	SM4ATA	JO79	57A	59A	35°
1626	SM0LCB	JO89	57A	59A	35°
1639	LA6HL	JO28	57A	57A	35°
1641	OZ2TF	JO46	59A	59A	40°
2124	SK4MPI	JP70	59A	hrd	45°
2137	RX1AS	KO59	41A	hrd	45°
2152	LA8WF	JO59	33A	55A	35°

2003-05-06 (from JP33VC)

1453	RL1P	KO49	57A	55A	40°
1457	SM5EFP	JO79	59A	58A	40°
1458	OH6PA	KP02	57A	59A	35°
1504	SM3RWZ	JP82	59A	55A	35°
1507	OH6KTL	KP02	59A	55A	35°
1509	ES2RJ	KO29	59A	59A	35°
1513	OH1NOR	KP00	57A	55A	35°
1515	ES2WX	KO29	59A	59A	35°
1525	SK2VHF	JP94	55A	hrd	35°
1526	LA2VHF	JP53	59A	hrd	35°
1526	LA4VHF	JP20	57A	hrd	35°
1530	OH6GDX	KP02	57A	57A	35°
1536	OH5LK	KP30	59A	59A	35°
1541	SM6CLU	JO68	59A	59A	40°
1551	OH5GDN	KP30	55A	52A	40°
1558	SM6CMU	JO57	57A	57A	40°
1558	OH6MTE	KP02	59A	59A	40°
1600	ES2NA	KO29	57A	55A	40°
1607	LA1K	JP53	59A	59A	40°
1611	SM4BDQ	JP80	59A	59A	40°
1618	SM0LQB	JO89	55A	57A	40°
1626	OZ1BEF	JO46	57A	57A	40°
1629	LA8AJA	JP50	55A	55A	40°
1631	ES6RQ	KO28	55A	55A	40°
1634	SK0CT	JO89	57A	57A	35°
1637	LA0BY	JO59	57A	59A	35°
1641	SK2AT	KP03	55A	52A	35°
1650	OH6HFX	KP14	57A	55A	35°
1654	SM3SPG/0	JO89	59A	59A	35°
1659	SM6RME	JO78	55A	55A	35°
1702	SM4ATA	JO79	57A	59A	35°
1704	SK6HD	JO68	59A	59A	35°
1705	LA8WF	JO59	57A	59A	35°
1707	SM3AKW	JP92	59A	59A	35°
1708	SM5DFF	JO88	58A	59A	35°
1709	SM0LQB	JO89	55A	55A	35°
1710	SM6FOV	JO78	57A	55A	35°
1712	SM7EOI	JO86	57A	55A	35°
1714	SM4BDQ	JP80	59A	59A	35°
1715	SK5CG	JP80	59A	59A	35°
1716	OH6MTE	KP02	59A	59A	35°
1717	ES2DF	KO29	55A	55A	35°
1718	SM5EPC	JP90	57A	59A	35°
1720	SM3UFF	JP80	59A	59A	35°
1722	SM6VAO	JO67	59A	59A	35°
1723	SM3LDP	JP82	55A	55A	35°
1725	OH6QR	KP22	59A	59A	35°
1726	SM3BEI	JP81	59A	59A	35°
1726	LA0BY	JO59	55A	55A	35°
1728	SM6C	JO78	55A	55A	40°
1729	SM3KYH	JP82	55A	57A	40°
1731	SM1PYO	JO97	55A	57A	40°
1732	SM3TRV	JP82	55A	55A	40°
1733	SM4RPP	JO79	56A	55A	40°
1736	SM6X	JO68	55A	55A	40°
1738	SK6EI	JO78	55A	59A	40°
1742	LA2Z	JO59	55A	59A	40°
1744	SK6DK	JO67	55A	55A	40°
1750	OZ9KY	JO45	55A	57A	40°
1751	LA1T	JO59	59A	59A	40°
1754	SK3BP	JP81	55A	52A	40°
1821	SM3VAC	JP83	55A	59A	40°
1946	SM2ILF	KP04	57A	59A	30°
1949	SK2AZ	KP05	55A	55A	25°
1957	SM2DXH	KP03	55A	55A	25°
2300	SK2VHF	JP94	59A	hrd	25°
2301	LA2VHF	JP53	59A	hrd	25°
2303	SK4MPI	JP70	59A	hrd	25°
2304	LA8WF	JO59	59A	59A	20°

Tnx fer report, Per-Einar!

OH2NY in KP20CM wkd on 144 MHz:

2003-03-03

DK3BU	JO33NO	57A	55A	1281 km
OZ9PP	JO47UA	55A	56A	919 km
RW3PF	KO93CD	55A	59A	1177 km
YL2HA	KO26CV	56A	56A	403 km
SM7OUK	JO65HA	54A	55A	917 km
SM3RWZ	JP82MI	59A	59A	431 km

2003-03-10

LA7XK	JP50MA	57A	55A	730 km
SM7ALC	JO65RL	59A	59A	846 km
SM6NET	JO68IB	59A	57A	709 km
OZ9PP	JO47UA	55A	55A	919 km
SM2UVK	KP03DT	55A	56A	420 km

2003-03-17

UA4UK	LO14MA	57A	55A	1335 km
RA3LE	KO64AR	59A	59A	796 km
DK3WG	JO72GI	57A	54A	1085 km
SP1CNV	JO84CF	59A	53A	849 km
SM6OPX	JO58RG	57A	56A	765 km
SM6NZV	JO57XK	57A	55A	782 km
SM1NJC	JO97DO	58A	55A	470 km

2003-03-27

GM4VVX	IO78TA	55A	54A	1640 km

2003-03-29

SM6OPX	JO58RG	57A	57A	765 km
DL9MS	JO54WC	55A	55A	1028 km
LA7VH	JO59EK	59A	59A	780 km
G4LOH	IO94EA	59A	55A	1704 km
SM4RPP	JO79HH	59A	55A	552 km
SK6DK	JO67EH	55A	54A	768 km

2003-03-30				
SM7DVF	JO76PU	58A	57A	658 km
LA8WF	JO59GV	56A	56A	759 km
2003-03-31				
RW3TI	LO16WG	55A	55A	1238 km
RA3NM	LO07MS	55A	57A	1008 km
EW6DX	KO45JL	59A	59A	623 km
RW3IG	KO87OE	59A	59A	835 km
DL9GRE	JO64QB	55A	57A	969 km
OZ2TF	JO46PE	58A	55A	962 km
SM6QTC	JO78FM	56A	57A	594 km
SM4SJY	JP70OC	57A	58A	499 km
SM1DVV	JO97CE	57A	59A	507 km

Tnx fer report, Juha! Please include time in UTC.

OZ/DL0IZ/p in JO45GD wkd on 144 MHz:

2003-03-03					
1731	OH1HSC	KP10CO	55A	55A	1007km
1749	LA5KJA	JP50IV	55A	55A	652km
1817	OH5LK	KP30ON	55A	55A	1251km

Tnx fer info, Wolfgang!

PA5DD in JO22IC wkd on 144 MHz:

2003-02-02					
1525	ES6RQ	KO28WA	56A	55A	1493 km
1541	SM4HFI	JP70TO	55A	55A	1159 km
1544	LA4CQ	JP20QL	55A	33A	934 km
1547	SM4BDQ	JP80FG	56A	57A	1162 km
1552	SM7EOI	JO86FP	57A	57A	913 km
1835	SM4RPP	JO79HH	56A	57A	1014 km
1843	GM3WKZ	IO88CN	58A	58A	896 km
1850	MM0CEZ	IO75XU	53A	43A	707 km
2003-02-04					
1848	SK4BX	JO79OF	52A	52A	1030 km
1901	GM4VVX	IO78TA	55A	57A	875 km
2003-03-17					
1536	LA8WF	JO59GV	53A	55A	940 km
2003-03-31					
1545	SM5CUI	JO89WW	55A	55A	1193 km
2003-05-06					
1809	LA2AB	JO59FV	55A	55A	938 km

Tnx fer report, Uffe!

RK3AF in KO85 wkd on 144 MHz:

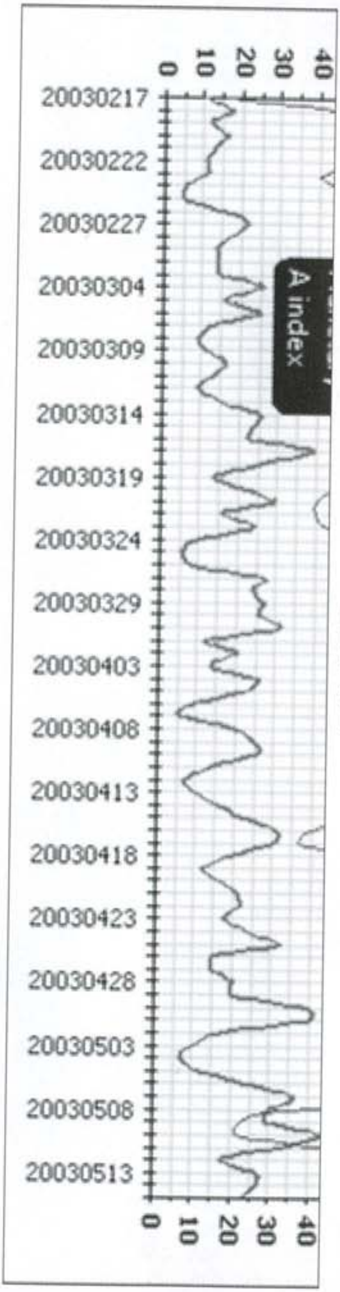
2003-03-06				
1419	OH5LK	KP30ON	59A	57A
2003-03-17				
1445	OH3BYZ	KO21UA	56A	56A
1449	OH2NY	KP20CM	59A	59A
2003-03-31				
1451	RX1AS	KO59FX	59A	59A
1507	SM4IVE	JO79SD	59A	52A
1519	OH1LT	KP00XO	57A	57A
1523	OH3BYZ	KP21UA	57A	56A
1531	SM5EFP	JO79WJ	55A	55A

Tnx fer report, Dima!

LA0BY in JO59IX wkd on 432 MHz:

1708	SK4BX	JO79OF	55A	55A	266 km

One hour Aurora during NAC, but no other stations hrd!



Planetary A Index Feb. 17th to May 14th

Reports of SK4MPI/B, JP70, via Aurora on 2m:

Date	Time	from area
22.02.	1430-1505	SM2 (KP15), OH6 (KP02)
26.02.	1740	UA1 (KO59)
27.02.	1300-1315	OH6 (KP02), OH5 (KP30)
27.02.	2010	OZ (JO55)
28.02.	1235-1935	OH6 (KP02), UA1 (KO59), SM0, N-DL (JO33)
01.03.	2120	OH6 (KP02)
02.03.	1305	SM2 (KP15)
02.03.	1822-1940	SM2 (KP15), OH6 (KP02)
03.03.	1533-1800	UA1, SM0, OH6, N-DL,
04.03.	1150-1535	OH5 (KP30), N-DL, OH6, OZ
05.03.	1533	OH1
06.03.	1312-1435	OH6 (KP02), N-DL (JO53)
06.03.	2215	SM0
07.03.	2030	UA1 (KO59)
08.03.	1715-1800	SM0, OH6
09.03.	2008	OH6 (KP02)
10.03.	1300-1550	OH6 (KP02), SM2
11.03.	1917	OH6 (KP02)
14.03.	1849	SM2 (KP15)
15.03.	1655-1705	SM2 (KP15), G (IO94)
16.03.	1220-2140	OH5 (KP30), OH6, G, N-DL, PA, LY
17.03.	1300-1630	OH3, OH6, N-DL, SP2, PA, G
17.03.	2100-2400	LY, N-DL (JO33)
18.03.	0000-0040	SP2 (JO93, PA (JO22)
18.03.	1320-1420	OH6, N-DL, LY
20.03.	1220-2310	SM2, OH5, OH6, G, UA1, N-DL
27.03.	1615-1715	N-DL, SM0, PA
28.03.	1823-2230	OH6, N-DL, G (IO92)
29.03.	1400-2220	UA1, SM2, GM, G, SP2, N-DL
30.03.	1415-1630	G, N-DL, UA1, OH6
30.03.	2040-2220	N-DL, G (IO94)
31.03.	1305-1715	G, N-DL, SP2, OH6, UA3
01.04.	0140	SM6
01.04.	0400	OH4
02.04.	1200	OH6
05.04.	1250-1615	OH2, 6, 5, UA1
05.04.	2125	SM0
08.04.	1320-1530	SM2, OH6
10.04.	1610-1640	G, OH2, SM0
11.04.	1545	OH5
11.04.	2320	N-DL
12.04.	1445	SM2
14.04.	1315-1430	OH6, LA (JP61), UA1 (KO59)
16.04.	1540	UA1 (KO59)
17.04.	1425-1700	UA1 (KO59)
20.04.	1730	OH6
21.04.	1800	OH5 (KP30)
22.04.	1200	OH5 (KP30)
22.04.	1625	OH4 (KP21)
23.04.	1520	UA1 (KO59)
24.04.	1400-1420	UA1 (KO59), OH5 (KP30)
29.04.	1413	UA1 (KO59)
29.04.	1730-1910	N-DL
29.04.	2145	UA1 (KO59)
29.04.	2330-2400	SP2 (JO93), UA1
30.04.	0245	UA1 (KP50)
30.04.	1530-2300	N-DL:, GM, OH, SM, OZ, PA, LY
01.05.	1345-1415	OH4 (KP21), SP2 (JO93)
02.05.	2113	SM2
05.05.	1639	OH6
05.05.	2100	UA1 (KO59)
06.05.	1240-2300	UA1, N-DL:, LA, OZ, SP2
07.05.	1115	LA4 (JP33)
07.05.	1330-1745	UA1 (KO59), LA (JP50) SM2
08.05.	1220-2115	LA (JP33), UA1 (KO49), N-DL, PA
09.05.	1100-1145	OH3 (KP21), LA (JP33), UA1 (KO59)
09.05.	2143	SM0
10.05.	0100-0730	SM0, OH4, LY, UA3, OH6, SM2
11.05.	2120	UA1 (KO59)
12.05.	1235-1240	OH6 (KP02), UA1 (KO59)
13.05.	1345	OH5 (KP30

at this time SK4MPI`s PA went QRT and we have to switch to LA2VHF:

LA2VHF (JP53)

15.05.	1300-1415	OH5 (KP30), OH6 (KP02
15.05.	1800	OH5 (KP30)
21.05.	1400-1800	OH6 (KP02)

From May 22nd SK4MPI was was qrv again:

22.05.	1350-1600	OH6 (KP02), N-DL (JO53)

First FAI in 2003

The first good FAI opening was reported on May 19th. Always there seem to be the same stations involved....

UT5JCW, KN64SN, wkd 2m FAI on May 19th:
1934 IC8FAX JN70CN 33F 33F CW 1640
2040 IK0BZY JN61GW 33F 33F CW 1720
2056 IC8FAX JN70CN 54F 52F CW 1640

Please send your FAI-reports to F6DRO, tnx!

Sporadic E

144 MHz – Reports 2003

Editor Norbert Göttsche
DL8LAQ@gmx.de

<u>All QSOs with "59 59" reports unless otherwise noted, hrd = also with 59, times UT</u>

May 4th, 2003 First 2m-Es in 2003

PA6C, JO33FB, wkd
0740 LZ1KWT KN13AS, 0753 YT1WV JN94PI

May 11th, 2003

DF0BV, JN58, wkd
1423 UTC UR5GPT KN76BQ

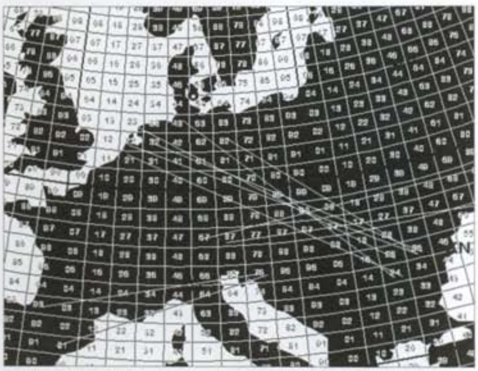
PE1GNP, JO31IX, wkd
1426 YO4GJH KN35XG

DL8EBW, JO31NF, hrd
1430 YO4GJH KN35

DF0WD, JO42, wkd
1435 YO4GJH KN35

DL3JIN, JO60, wkd
1436 YO4GJH KN35

DL7FF, JO62, wkd
1438 YO3DMU KN34BU



Map 2m Es 11.5.2003 (tnx to DK5YA)

May 19th, 2003

DK2CF, JO41GG, wkd:
1740 LZ3GM KN32

DK8ZJ, JO54AG, wkd:
17.13 LZ2FO KN13kx (hrd 5 min. +40)
17.18 LZ2HM KN12qp
17.19 LZ3CQ KN12pq
after this nil til 18.15 (QRT)

DL6BF, JO32QI, wkd/hrd:
17.30 LZ2FO 59 KN13 hrd
17.32 LZ3GM KN32RL wkd
17.33 LZ2PI hrd
17.33 LZ2HM hrd
17.48 LZ3NY KN12QQ wkd

DL8EBW, JO31NF, wkd/hrd:
1730 LZ2QA KN43 wkd
1741 LZ3GM KN32 52 hrd only
1742 LZ2PI KN23 52 hrd only
1750 LZ2FO KN12 55 hrd only
Again too short openings and signal strengh - G was working into LZ as well and also the LZs worked EA5/6 in same time with DL opening!

EB3DYS, JN11CK, wkd:
15.40 LZ3GM KN32LR
15.43 LZ2CC KN32JG

EA6VQ, JM19HN, wkd:
18:21 LZ1ZX KN32IO

F1JRD, JN13wo, wkd
1555 LZ1KP KN22, LZ1AG KN22.
Very short opening, both 59+
Nobody heard in south of france working Es.

G4HGI, IO83PL, wkd
1805 LZ2FO KN13
1807 LZ2ZY KN13
1808 LZ5UV KN12
1809 YU1EV KN04
1813 LZ1ZP KN22ID
1815 YZ1KU KN04

IS0CAK, JM49MB, wkd:
1650 LZ2HM KN12qp 1267 km
1650 LZ3GM KN32 1559 km
1650 LZ3CQ KN12pq 1261 km

LZ3GM, KN32RL, wkd

1540 EB3DYS	JN11CK	2083km
1650 IS0CAK	JM49MB	
1730 DL6BF	JO32	1886+-
1732 PA1GYS	JO22WW	1977
1733 DF7VX	JO41	1712+-
1733 PE1FEI	JO22	2007+-
1735 PA3DOL	JO22	2007+-
1738 DF7VO	JO32MF	1871
1739 PD1ANQ	JO31EW	1897
1739 DH3YAK	JO31RS	1822
1739 DK2CF	JO41GG	1730
1739 PD1AIQ	JO22RM	1981
1740 PA2CHR	JO22XA	1927
1753 ON4LN	JO20IN	1947

LZ1ZP, KN22ID, wkd:
15.48 - 15.55: IZ5FKK JN53, F1JRD JN13, F1EYB JN23, IK5OEA JN53
18.06 - 18.19: G4LOH IO94, PA2DWH JO22, G8GXP IO93, PA3BIY JO22, PA3DYS J021, DM1HD JO31, PA4EL JO21, G3LQR JO02, GW4VBM IO83 (New DXCC #50), G4GHI IO83.

LZ3NY, KN12QQ, wkd:

1749 PA3CEG	JO33FB
1749 PA9RX	JO32MT
1809 G4LOH	IO94EA
1811 PA0WWM	JO22FE
1812 G8GXP	IO93FQ
1814 PA3BIY	JO22EB

ON1IM, JO11UB, wkd

1808 YU7EW	KN03
1811 YU7BCL	KN05
1814 LZ2FO 55 57	KN13

PA5KM, JO11WL, wkd
1812 YU7EW KN05HP

PD2DB, JO22MD, wkd
1934 LZ2QA 55 55 KN43EK 1981km
1950 LZ2FO 55 55 KN13KX 1959 km

UT5JCW, KN64SN, wkd:

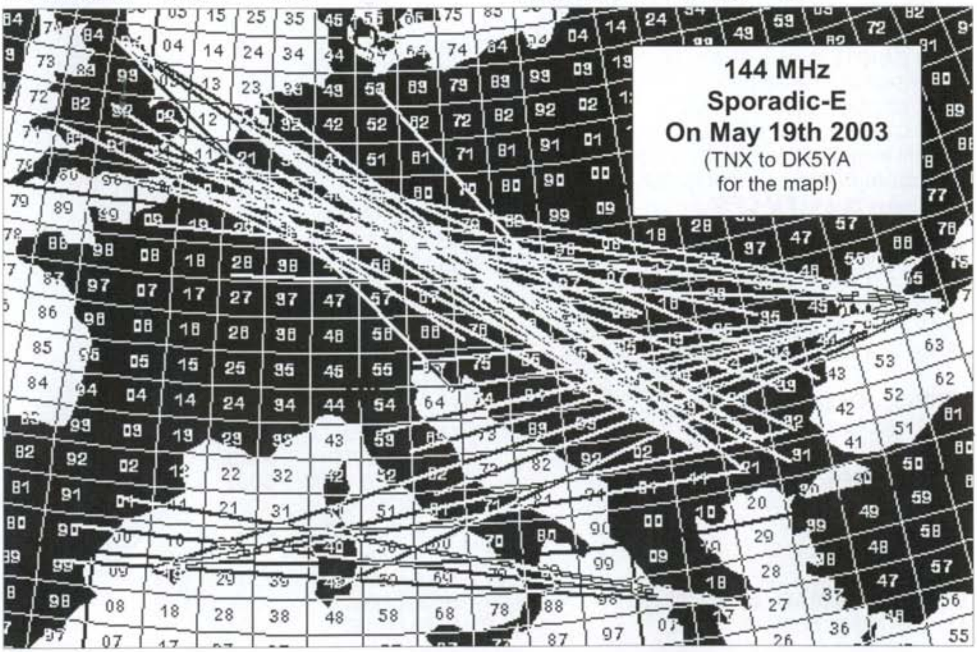
1547 IZ5FKK	JN53GU	1828 km
1552 S54G	JN65TM	1564
1724 DL5FDP	JN49LP	1934
1724 DK1FUN	JN49ME	1922
1725 ON1MER	JO10QO	2341
1727 DL8GP	JN39LH	2074
1727 F1UBN	JO00	2505+-
1728 DO3VG	JN39GV	2110
1728 F1MPQ	JN09SG	2466
1728 DH3VE	JN39LL	2075
1730 F5PEJ	JN09XT	2437
1930 IS0GQX	JM49OH	2086

May 20th, 2003

CT1EKD, IM58JR, wkd: 1715-1820
EB8BTV, EA8BPX, F0DJK JN15AG, F5VHX JN04FT, F4BNJ IN93MP, F5ADT IN94, F1BPK JN03AX, F1MOZ IN93RS, F1OMQ JN25, F5SPA JN04 1817, DF1GL JN47, DH0GDE JN31TS, EA8TA IL18RI

CT1FAK, IN50QO, wkd:

17:07 F1JRD	JN13WO	1082
17:18 IK1EGC	JN35	1382+-
17:18 IZ2AAL	JN45OP	1547
17:18 IW2NOR	JN45ON	1545
17:19 IK2GSO	JN45NP	1541
17:20 IK2YXK	JN45OP	1547
17:20 IW2DVK	JN45MQ	1536
17:37 IW2HAJ	JN45NO	1540
17:38 IK2DUV	JN45KO	1521
17:39 IW2LC	JN45OL	1543
17:39 I1LSN	JN45AN	1458
17:39 IZ1ERW	JN45AM	1456
17:39 IK2DDR	JN55QN	1709


144 MHz Sporadic-E On May 19th 2003 (TNX to DK5YA for the map!)

17:39 IW3QTG	JN65	1836+-
17:39 IV3DXW	JN65QQ	1865
17:39 S52LM	JN65TX	1889
17:45 S55OO	JN76HD	1969
17:46 IK2ABJ	JN45RH	1557
17:46 S55KK	JN76HB	1967
17:46 IW2BSQ	JN45OL	1543
17:46 IK1ZOF	JN35UB	1418
17:46 S51WI	JN75CS	1930
17:46 S51AT	JN75GW	1958
17:53 IQ2CJ	JN45ON	1545
17:57 HB9TIH	JN46	
17:57 OE8FNK	JN66TR	1906
17:57 HB9OAB	JN46ME	1552

DD3DJ, JO31OL, wkd:
16:02 EA7IT IM87XI
16:07 EB7NK IM86RQ
Rig: X6000 (3-band omni) 100W PEP

DF1GL, JN47CO, wkd:
16:01 EA7HBP IM76mg 1665 km
16:55 EB8BTV IL18qi 3051 km
17:23 CT1EKD IM58ml 1725 km
17:38 CT1EXR IM57pd 1811 km
17:40 CT1EAT IM68da 1679 km
17:44 EA4LU IM68tv 1527 km

DK5YA, JN49NX, wkd:
16:02 EA7AJ IM87cs
16:04 EA7HBP IM67
16:16 EA4EHI IM68tv
17:42 EB8BTV IL18qi (booming, 30 mins S9+)
17:51 CT1EAT IM68da
17:58 EA4CTF IM89at
18:00 EA4LU IM68tv
18:02 EA1AK/7 IM66
18:04 CT1EXR 59 52 IM57pd
hrd mni more EA/EA9 and CT's incl. several in FM
Was called twice by another EA8(AJ?) and missed him always due to FM-QRM.

DK5RQ, JN68BV, wkd:
16:04 EA7HBP IM67MG 2008km
16:05 EB8BTV IL18QI 3348km
16:12 EA4EHI IM68TV 1845km
16:16 CT1DIZ IM58KP 2041km

DK6AS, JO52JJ, wkd:
17:59 EA1AK/7 IM66

DL0UL, JN48, wkd:
1614 EA7HBP IM67MQ
1736 CT1EXK IM57
1738 EB8BTV IL18QI

DL1GGT, JN58AO, wkd:
1612 EA7HBP IM67
1721 CT1CPC IM68
1732 CT1EXR IM57
1726 EA8BTV IL18QI 3204km!
1743 CT1EAT IM68
1800 EA4LU IM68

DL3JIN, JO60LX, wkd:
16:05 EA1AK/7 IM66

DL6BF JO32QI, hrd/wkd:

1544 EA7DUD	hrd	IM76sr
1606 EA7IT	wkd	IM87xi
1606 EA7AGX	hrd	IM76
1607 EA7HBP	hrd	IM76mg
1611 EB7BMT	wkd	IM86
1736 EA7RM	wkd	IM87cs
1742 EB7HAF	wkd	IM76sr
1743 EA7AJ	wkd	IM87cs
1748 EA7ERP	wkd	IM87ee
1806 EA7AJ	wkd	IM87cs

Terrible static rain S5-9 during the whole opening.

DL6WU, JN49HT, wkd:
17:51 EB8BTV IL18QI
18:04 EA8BPX IL18SK

EA1AK/7, IM66VP, wkd:

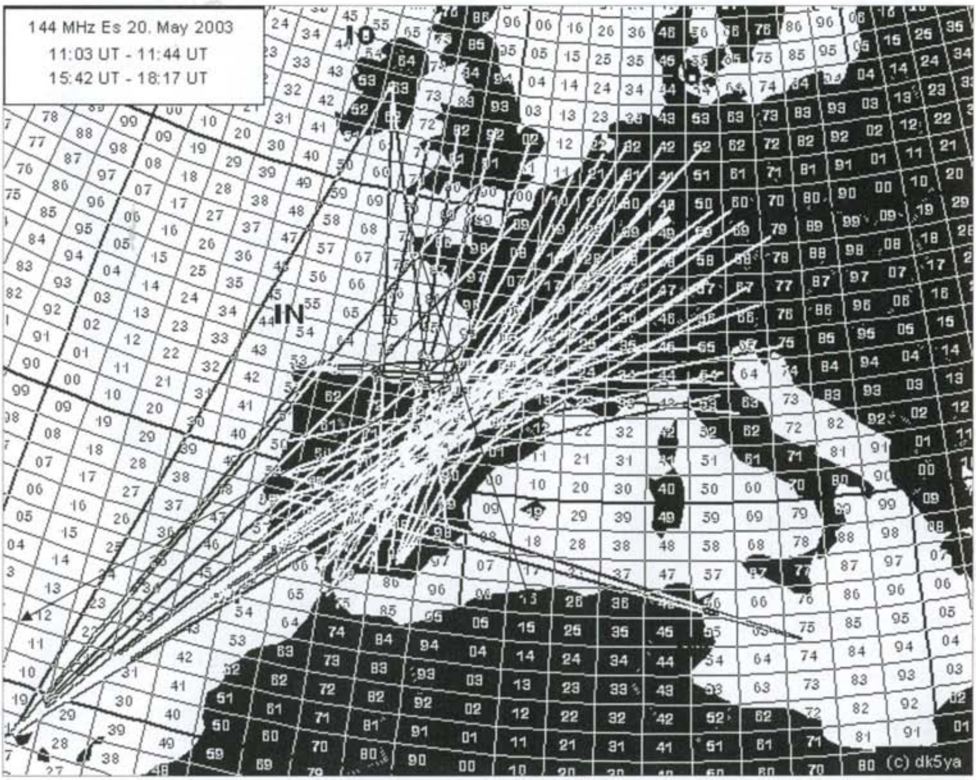
15:42 DK8VS	JN39
15:54 DF2ZC	JO30
15:55 DH1NFL	JO50
15:56 DF8IK	JO30
15:57 DK3EE	JO41
15:59 DJ2NR	JO50
16:05 DL3JIN	JO60
16:06 DG2GEV	JN48
16:10 DJ2QV	JO31
16:10 DL8YHR	JO41
16:14 DG0WJ	JO60
16:15 DJ2QV	JO31
16:15 DB4ET	JO31
16:16 DH2DAM	JO31
16:17 DL1KDA	JO30
16:17 DF0WD	JO42
16:18 DK1VC	JO31
16:19 DL5YEE	JO42
16:19 DF0OL	JO41
17:21 G3WZT	IO90
17:40 DL6WU	JN49
17:43 DL8GP	JN39
17:51 DJ8ZJ	JO32
17:53 F5SVD	JN29
17:55 DL2FDL/M	JO32
17:55 G4EAT	JO01
17:56 DL1EAP	JO31
17:58 DK6AS	JO52
18:00 DM1HD	JO31
18:00 DB8KJ	JO30
18:00 DB4ET	JO31

18:00	DC9YC	JO31
18:01	DC6IA	JO30
18:01	DB2KA	JO30
18:01	DL8ET	??
18:02	DF7KF	JO30
18:02	ON4KRI	JO20
18:02	DB5KN	JO31
18:03	DK5YA	JN49
18:03	DK5DQ	JO31
18:03	DK5WO	JO30
18:04	DL7OK	JO31
18:04	DL2YFT	JO31
18:04	DJ6JJ	JO31
18:04	DK3DS	JO31
18:07	DO9PL	JO31

At the end of the opening I had a wonderful pile-up!. It is my first really big opening, because I am relatively new to VHF. 73 de Nacho

EB8BTV, IL18QI, wkd:

16:00	DK5RQ	JN68
16:00	OK1TEH	JO70 (ODX 3562 Km)
16:00	OK1MZM	JN69
16:10	HB3YBQ	JN47
16:11	DJ5TC	JN58
1615	CT1EKD	IM59 tropo qso
16:15	DH1NFL	JO50
16:35	F6DKW	JN18
16:44	F6FYA	JN07
16:46	F1OOG	JN08
16:48	F5DCQ	
16:50	G7RAU	IO90
16:51	F1OMQ	JN25
16:52	DF1GL	JN47
16:55	F5HLY	JN08
16:55	F5RRT	JN25
16:55	F1ARQ	
16:59	F1ORL	JN08
17:10	F0DSJ	JN17
17:17	F1BZG	JN07
17:17	IK2YXK	JN45
17:17	IZ2ALL	QSO NC
17:17	IZ1BPN	QSO NC
17:20	F5GHP	IN96
17:27	HB9DFG	JN37
17:30	F5JNX	JN37
17:35	OK1FFD	JO60
17:37	DL0UL	JN48
17:39	DH0GHU	JN38
17:39	DK5YA	JN49
17:39	DL1SDN	JN48
17:39	DH0GDE	JN37
17:44	OK1ZTZ	JO60
17:45	F6FXU	JN37



17:45 DL6NAA JO50
17:45 DJ2NR JO50
17:46 DK2EA JO50
17:46 DL0HF JO50
17:46 F1TRE JN37
17:46 DL1GNM JN38
17:50 DL6WU JN49
17:50 DB5WC JN49
17:52 DK1FUN JN49
17:52 DK1FJ
17:55 DF9IC JN68
17:56 F6FXU JN37
17:56 DL1GGT JN58
17:56 DK1FG JN59
17:56 DL0AR JO50
17:56 DL5FDP JN49
17:56 DK1FUN JN49
17:56 DL2JAN JN49
17:59 OK1FFD JO60
17:59 DL3UP JN48
17:59 DB9IZ JN49
18:00 DF6IY JN48
18:00 DH1NVM JO50
18:00 DH1NAR JO50
18:05 DB9UH JN49
20:40 EB1EWE IN53 Tropo qso
Time is more or less 5 minutes, because I had no time to look the watch, hi,hi. Many thank to the people who called me and sorry for the NC qsos. For me swl reports would be very interesting, so if you have heard me, please let me know.
73 & DX DX DX EB8BTV, eb8btv@ure.es
(EB8BTV was heard also from HA (3700km))

F6FHP, IN94TR, wkd:
17:00 EB8BTV heard very weak
17:08 CT1DRB IM58LP *
17:11 CT1FRZ IM58 *
17:11 CT1DIZ IM58KP* and F on backscatter!
17:38 CT3HF 58/55 IM12OP
* wkd with 6° elevation

F8DBF, IN78RI, wkd:
17:18 EB7HAF IM76SR 1292km, hrd EA7DUD 55
18:01 7X0AD JM16JR 1423 km 59+
What a surprise! Thanks for new one Enrique.
Also hrd 7X2RF but QSO not completed.

G7RAU, IO90IR, wkd:
17:54 EA9AI IM75IV
16:50 EB8BTV IL18

HB9AA, JN36BK, wkd:
17:34 EA3ADW/P 52 51 JN11nv
17:40 EA4LU IM68

IV3DXW, JN65QQ, wkd:
1712 CT1EAT IM68DA 1939km
1734 CT1ANO IN51RE 1837
1745 CT1FAK IN50QO 1870
1746 CT2HSO IN61CC 1783

OE8FNK, JN66TR, wkd:
15:51 CT1DIZ 55 59 IM58KR 2050 km

OK1MZM, JN69PR, wkd:
15:56 EA7HBP IM76MG 2095 km
16:07 EB8BTV IL18QI 3466 km !
17:47 EA4LU IM68TV 1963 km
17:58 CT1EAT IM68DA 2114 km

ON1IM, JO11UB, wkd:
17:19-18:08 CT1EAT hrd 5/2, EA7RZ IM86, EA7BMT IM86, EA5DIT hrd, EA9AI IM75, EA7RZ hrd, EA9MH hrd, EA7HFA IM76, EA7AJ IM87.

ON4KHG, JO10XO, wkd:
17:55 UTC EA7RZ IM86. Rig: 3W & 11 ele.

PA3BIY, JO22EB, wkd:
16.20 EA7ERP IM87EE
17.40 EA7RZ IM86SR
17.42 EA7BMT IM86SU
17.56 EA9MH IM85MH

PD2DB, JO22MD, wkd:
17:50 EA7ERP IM87EE 1795
17:56 EB7HAF IM76SR 1869
17:57 EA7DUD IM76SR 1869
19:44 EA7RZ IM86SU 1798
19:55 EA9MH IM85NG 1978
20:02 EB7BQI IM76SR 1869

7X0AD, JM16JR, wkd (1 QSO only!)
18:02 F8DBI IN78RI 1423km

May 22nd , 2003
HA1FV, JN87JJ, wkd:
09:25 UR5GIM KN76cl
DK5RQ, JN68BV, wkd:
09:47 UR5GIM KN76CL
DL5ROB, JN68HG, wkd:
09:30 UR5GIM 59 59
LZ1AG, KN22ID, wkd:
10:22 SP2HNF JO94FK
OE5MPL, JN78CJ, wkd:
09:35 UR5GIM KN76cl 1514km
SM6CMU, JO57XK, wkd:
10:28 YO3DMU KN34 and other YO`s

Sporadic-E forecast for Europe
Werfried, OE8FNK, started a Sporadic-E forcast with quite some success. The sporadic-E forecast is available at www.qsl.net/oe8fnk www.vhfdx.de and www.meteorscatter.netmonitor.htm

Meteor-Scatter

Reports

Norbert Göttsche, DL8LAQ@gmx.de

LA6K VHF-Expedition nach West-Norwegen JP43/JP33

Schon die Flüge (3 Hin- und 3 Rückflüge) waren beschwerlicher als unsere bisherigen Trips in diverse südeuropäische Länder und dann noch dieses fiese, nasse, kalte Wetter....
Aber wem schreib ich das - Norwegen Fans wissen wohl zu gut wie es Anfang Mai dort aussieht! Endlich, nach 7 Std Gesamtflugdauer angekommen, empfing uns (DH3YAK und DL8EBW) Geir, LA4XGA in Kristiansund (JP33) von wo es am nächsten Morgen nach JP43BH mit 2 Fähren weiterging. Inzwischen gesellten sich Per (LA7DFA) und seine Frau Lisbeth zu uns und so erreichten wir gegen 14 Uhr unser Ziel, die Insel Smöla, Locator JP43BH, und unsere Unterkunft, das Haus von John LA9WBA. Seit der Landung hatten wir die Sonne nicht mehr gesehen und ein Schneeschauer jagte den anderen, zu aller Freude, denn Antennenaufbau im Schneetreiben kommt besonders gut - also schnell die 12el Cuedee (die restlichen 3el lagen irgendwo bei Geir in der Garage ;-)) aufgebaut und schnell ins etwas wärmere Hausinnere (immerhin 7°C). Nach Verdrahtung der Station lief dann auch erstmal alles reibungslos und die ersten MS-Entusiasten konnten ein neues Square buchen. JP43 war immerhin 2. gesuchtestes skandinavisches Großfeld, wovon wir aber nach 2 Tagen anhand der Pileups nichts mehr merkten. OK, das QTH hatte ca 2-3 Grad Elevation Richtung Süden, aber daran hat es wohl nicht gelegen. Wir kamen zur Einsicht (und das nach 5 Tagen durchgehender Aktivität und 2 gestorbenen Röhren-PAs), daß wohl die MS-Gemeinde merklich schrumpft und der neue Digitalfunk (WSJT) mehr und mehr Einzug auch bei älteren MS-Kämpfern gefunden hat (so gab es u.a. kaum HSCW-Random-QSOs!). Wir verließen am 05.05. Smöla mit ca. 40 kompletten MS-QSOs im Log und einem Aurora-QSO, wobei OH6MAZ uns darauf noch per SMS hingewiesen hatte – er hatte Glück, denn die Aurora dauerte nur 10min! Dank an dieser Stelle für die Überlassung seinen Grundstückes an John, LA9WBA, und natürlich an unsere Begleitung in Form von Per, LA7DFA und seiner Frau, welche sich um das 6m-Band und die komplette Informationspolitik auf der Homepage kümmerten. Am 05.05. abends wurden wir dann von Geir´s (LA4XGA) Frau Ingrid so richtig mit warmen Speisen verwöhnt und konnten uns so noch, nach dem Aufbau von WSJT in seinem Shack, auch aus JP33VC melden. Hier kamen noch ca. komplette 20 MS-QSOs, sowie ca. 60 Aurora-QSOs vor und im NAC-Kontest zustande (alles mit nur max. 130W), bevor wir am 07.05. wieder unsere 3 Heimflüge antraten.
Die Tage in Norwegen gingen um wie im Flug und gerne denken wir an unsere Gastgeber zurück, die versuchen werden, diese doch immer noch selten Großfelder auch in Zukunft in die Luft zu bringen - sowohl in Aurora als auch in MS! Erneut auch vielen Dank an Ingrid und Geir, ohne die diese Reise sicherlich nicht so angenehm verlaufen wäre.
Auf Wiederhören für all die daheim gebliebenen von einem der nächsten Trips (dann wahrscheinlich in Begleitung von LA4XGA und definitiv Richtung Süden!)
73 de DH3YAK, Winfried und DL8EBW, Guido
VHF-DX-Gruppe DL-West

02-05-2003 JP43BH

1410-1426 DJ9YE JO43 R27 27 11 11 1,0 HSCW C-Rnd
1602-1637 DF0WD JO42 R27 R27 5 8 1,5 HSCW C-Rnd
1652-1722 DJ2QV JO31 R27 27 3 1 1.0 HSCW NC-Rnd *1
1725-1809 PA3DZL JO21 R29 26 13 14 1.5 HSCW C-Rnd
1838-1848 DL5WG JO52 R28 27 2 1 2.0 HSCW C-Rnd
1942-2002 DC9YC JO31 27 R27 11 3 0.4 FSK441 C-Rnd
2003-2022 DK7BY JO33 R27 26 6 1 0.4 FSK441 C-Rnd
2059-2120 DL1RNW JO62 R27 26 3 1 0.3 FSK441 C-Rnd
2150-2158 GW8IZR IO73 R27 27 4 2 0.6 FSK441 C-Rnd
2158-2217 PE1OPK JO23 R27 26 4 5 0.4 FSK441 C-Rnd
2218-2234 ON4AVJ JO11 R27 27 8 6 0.5 FSK441 C-Rnd

03-05-2003 JP43BH

0352-0417 DF2ZC JO30 R26 27 4 7 1.0 HSCW C-Rnd *SC
0439-0509 RX1AS KO59 R28 27 17 mni 2.0 HSCW C-Rnd
0510-0527 RL1P KO49 R39 27 6 mni 22(!) HSCW C-Rnd *3
0530-0600 DL5ME JO52 39 - 1 - 16(!) HSCW NC-Rnd *4
0800-0900 IV3HWT JN65 26 - 1 - 0.8 HSCW NC
0900-1000 HB9FAP JN47 R26 26 16 9 12(!) HSCW NC *5
1000-1100 I2FAK JN45 R26 26 2 5 1.0 HSCW NC *5
1100-1200 S51AT JN75 26 - 1 - 0.5 HSCW NC *5
1200-1208 SM2CEW KP15 R28 27 5 mni 2.0 HSCW C *6
1556-1606 DL4DWA JO61 R27 27 5 - 0.6 FSK441 C-Rnd
1608-1619 DL5WG JO52 R27 27 3 - 0.2 FSK441 C-Rnd
1801-1819 DG2BCP JO43 R27 26 7 2 0.3 FSK441 C-Rnd
1859-1930 DK3BU JO33 - - 3 4 0.2 FSK441 NC
2100-2200 OE3MWS JN88 26 - 1 - 0.3 FSK441 NC

04-05-2003 JP43BH

0307-0327 DF8IK JO30 R27 26 14 12 1.5 HSCW C-Rnd
0330-0341 HB9FAP JN47 R26 26 5 4 1.0 HSCW C-Rnd
0358-0419 DL8GP JN39 26 R27 7 8 2.0 HSCW C-Rnd
0430-0447 DL5ME JO52 R26 27 5 13 0.7 HSCW C-Rnd
0528-0548 DL3YEL JO41 R27 27 6 4 1.0 HSCW C-Rnd
0600-0625 G7RAU IO90 26 R28 7 10 13(!) SSB(!) C
0630-0644 DG6JF/P JO33 R27 27 5 - 0.3 FSK441 C-Rnd
0800-0850 DL5MCG JN58 R26 27 5 7 3.0 HSCW C
0927-0937 ES2RJ KO29 R27 27 5 - 0.3 FSK441 C-Rnd
0937-0943 ES2WX KO29 R27 27 4 - 0.5 FSK441 C-Rnd
1000-1047 DF1CF JN57 26 R27 11 22 0.5 HSCW C
1100-1108 G3IMV IO91 R27 27 10 7 2.0 HSCW C
1200-1222 ON7UC JO11 27 R27 13 24 1.0 HSCW C
1225-1232 G4YTL IO92 R27 27 9 2 2.0 HSCW C
1746-1805 PE1HWO JO21 26 - 3 - 0.3 FSK441 NC-Rnd
1806-1840 DL8BDU JO43 R27 26 3 - 0.3 FSK441 NC-Rnd
1913-1931 PA5DD JO22 R26 27 11 mni 0.5 FSK441 C-Rnd
1931-1935 G4ZHI IO91 R27 27 4 - 0.9 FSK441 C-Rnd
1940-2020 OZ1IEP JO55 27 R26 5 - 0.4 FSK441 C-Rnd
2022-2040 DL6BF JO32 R27 26 5 - 0.4 FSK441 C-Rnd
2100-2200 HA6NQ JN98 26 - 1 1 0.5 HSCW NC

05-05-2003 JP43BH
0349-0401 DJ2QV JO31 R27 27 6 1 0.6 FSK441 C-Rnd
0410-0429 PA1BVM JO21 R27 27 6 3 0.6 FSK441 C-Rnd
0435-0440 ON4AVJ JO11 R28 26 4 4 0.6 FSK441 C-Rnd
0442-0500 OZ1LPR JO44 28 - 2 2 0.4 FSK441 NC-Rnd
0528-0556 PE1GNP JO31 26 27 4 4 0.3 FSK441 C-Rnd
0900-1000 S53VV JN65 26 26 1 - 0.6 HSCW NC

05-05-2003 JP33VC
1952-2003 DC9YC JO31 26 R26 8 - 0.8 FSK441 C-Rnd
2015-2107 DL4DWA JO61 R27 26 6 - 0.6 FSK441 C-Rnd
2108-2115 DL5WG JO52 R27 27 5 3 0.6 FSK441 C-Rnd

06-05-2003 JP33VC
0300-0312 RX1AS KO59 28 R27 16 mni 3.0 HSCW C
0315-0335 RL1X KO59 R28 27 8 mni 4.0 HSCW C-Rnd
0340-0414 RL1P KO49 R27 27 5 mni 2.0 HSCW C-Rnd *7
0435-0500 DF8IK JO30 R27 26 7 mni 4.0 FSK441 C-Rnd
0500-0505 DF2ZC JO30 R27 26 8 mni 5.0 FSK441 C-Rnd
0507-0516 OZ1IEP JO55 R27 R26 7 - 2.0 FSK441 C-Rnd
0520-0545 OZ1LPR JO44 27 - mni mni 0,7 FSK441 NC-Rnd
0554-0600 DJ9YE JO43 R27 27 7 1 1.0 FSK441 C-Rnd
0633-0643 DL6BF JO32 R27 26 7 - 3.0 FSK441 C-Rnd
0655-0703 DK9TF JO31 R27 26 4 1 0.5 FSK441 C-Rnd
0700-0720 PE1HWO JO21 R27 26 7 - 20(!)FSK441 C-Rnd
0810-0834 OZ1LPR JO44 R27 27 10 6 0.5 FSK441 C-Rnd
0840-0900 RU3ACE KO95 27 - 2 - 0.5 FSK441 NC-Rnd

07-05-2003 JP33VC
0307-0326 DL8BDU JO43 R27 R26 5 - 0.5 FSK441 C-Rnd
0338-0341 DG2BCP JO43 R27 26 4 - 0.8 FSK441 C-Rnd
0523-0536 OK2BRD JN99 27 R26 3 - 0.5 FSK441 C-Rnd
0558-0615 SM1BSA JO97 27 R27 5 mni 0.4 FSK441 C-Rnd

REM: *SC : Sidescatter-QSO (antenna beaming to QTF given in our propose)
*1 only one periode reflections from you Maik?
*3 sri, nice break,but no chance from my side to tx slowspeed
*4 QSO NC - only 1 burst Mario, sorry
*5 sri, stress with the powerlinear - was running 150W only! after the qso to G4YTL the amp quit finaly - so all was worked with solide state after 04-05-03 13UT
*6 easy QSO for such short distance and also a bit IONO (3-5db)
*7 sorry. big thunderstorm and much qrn in these qsos!

JP43BH: Operator:s LA4XGA, LA7DFA+XYL Lisbeth, LA9WBA, DH3YAK, DL8EBW
RX/TX : Yaesu FT847, 144MHz 12 el CueDee PA: GS35B / 2x4CX250 (after 04-05-03 13UT we ran solide state 150W pa) DTR-MS tape recorder (made by DF7KF) and Notebook with OH5IYs MS-Soft or K1JT Software (WSJT)

JP33VC: Operator: LA4XGA, DH3YAK, DL8EBW
RX/TX : Yaesu FT225RD, 144MHz 17 el homemade+solide state 150W pa DTR-MS tape recorder (made by DF7KF) and Notebook with OH5IYs MS-Soft or K1JT Software (WSJT)

The LA6K team, (from left to right): LA6XGA, Geir – DL8EBW, Guy, LA7DFA, Per-Einar, DH3YAK, Winfried

QTH JP43

LA6K Shack in JP43
Left DL8EBW, right DH3YAK.
(Look at DL8EBW`s 2m-DX antenna on his head...)

Meteor Shower Calendar

by Guido Jünkersfeld, DL8EBW

Juli to August 2003

Name	Date	Max.	ZHR	RA	DEC	v (km/s)	Source
24-Vulpeculids	30.06.-13.07.	4.-7.07.	var.	303	+24		BMS50
pi-Sagittariids	02.07.-19.07.	6.-10.07.	9	285	-21		BMS50
Caprocornids	04.06.-02.08.	08.07.	10	311	-14		BMS50
kappa-Aurigids	03.07.-17.07.	10.07.	20	094	+28		BMS50
Pegasids	07.07.-13.07.	10.07.	3	340	+15	70	IMO03
alpha-Oriionids	**09.07.-15.07.**	**12.07.**	**50**	**087**	**+12**		**BMS50 *1**
nu-Geminids	**09.07.-18.07.**	**12.07.**	**60**	**098**	**+21**		**BMS50 *1**
lambda-Geminids	**04.07.-29.04.**	**12.07.**	**30**	**110**	**+15**		**BMS50 *1**
beta-Cancrids	**09.07.-15.07.**	**12.07.**	**20**	**122**	**+13**		**BMS50 *1**
July Phoenicid	**10.07.-16.07.**	**13.07.**	**var.**	**032**	**-48**	**47**	**IMO03 *1**
beta-Capricornids	10.07.-25.07.	15.07.	14	314	-14		BMS50
sigma-Cassiopeids	12.07.-21.08.	15.07.	7	002	+56		BMS50
Pisces Austrinids	15.07.-10.08.	28.07.	5	341	-30	35	IMO03
S.Delta Aquarids	**12.07.-19.08.**	**28.07.**	**20**	**339**	**-16**	**41**	**IMO03 *2**
a-Capricornids	03.07.-15.08.	30.07.	4	307	-10	23	IMO03
gamma-Pegasids	12.07.-15.09.	1.-10.08.	10	005	+11		BMS50
S.iota-Aquarids	25.07.-15.08.	04.08.	2	334	-15	34	IMO03
Aquar-Capricornids	11.07.-15.08.	06.08.	11	327	-11		BMS50
N.delta-Aquarids	15.07.-25.08.	09.08.	4	335	-05	42	IMO03
delta-Cassiopeids	20.07.-12.08.	10.08.	10	018	+59		BMS50
Perseids	**17.07.-24.08.**	**13.08.**	**110**	**046**	**+58**	**59**	**IMO03 *3**
upsilon-Pegasids	01.08.-17.08.	12.08.	10	350	+19		BMS50
kappa-Cygnids	03.08.-25.08.	18.08.	3	286	+59	25	IMO03
N.iota-Aquarids	11.08.-31.08.	20.08.	3	327	-06	31	IMO03
gamma-Leonids	14.08.-12.09.	25.08.	low	155	+20		IMO03
alpha-Aurigids	25.08.-05.09.	01.09.	10	084	+42	66	IMO03
alpha-Hydrids	01.09.-02.09.	01.09.	9	030	-62		BMS50
epsilon-Perseids	21.08.-16.09.	3.-7.09.	10	062	+37		BMS50
pi-Cetids	28.08.-10.09.	05.09.	8	051	-16		BMS50
delta-Aurigids	05.09.-10.10.	09.09.	6	060	+47	64	IMO03
kappa-Aquarids	08.09.-10.10.	21.09.	3	339	-02		5IY97
Piscids	01.09.-30.09.	20.09.	3	005	-01	26	IMO03
Sextantids	09.09.-09.10.	27.09.	med.	152	0		IMO03

Kommentare: *1: In der Zeit um den 12.-13. Juli werden auch in diesem Jahr wieder sehr viele, allerdings kleinere Partikel die Erde treffen. Sie sind speziell geeignet für MS-Versuche über Standard Distanzen (1300-1500 km) in FSK441 oder HSCW. – Good Shower for up to 1500 km QSOs.

*2: Ein kleiner, aber auf große Distanzen, sehr effektiver Schauer. So gelangen dort in den letzten Jahren sehr oft QSOs zwischen 2000-2300km, bei denen man sich vorher nicht den großen Erfolg ausgerechnet hatte! (u.a. arbeitete DL8EBW sein MS-ODX mit TF/LA6HL IP26!). -Small Shower, but good for 2300km.

*3: Die Perseiden oder auch Laurentiustränen. Sicherlich einer der attraktivsten MS-Schauer, da es im Maximum (erwartet in den frühen Morgenstunden des 13ten) immer wieder zu langen Bursts kommen kann, die speziell die SSB MS Entusiasten aufhorchen lassen - die Empfehlung: lieber ein SSB One BURST QSO als eine Reflexion in CW und der Partner wird nicht wieder gehört! – Very attractive shower, maximum 2003 is expected in the early morning of August 13th (for EU). My hint: Better one single burst SSB-QSO than hearing a long burst in CW and no QSO. (DL8EBW)

Legend / Erklärungen: ZHR: Numer of meteors per hour during the maximum

More explanations see DUBUS 4/2002, page 89.

New Products

Editor: Joachim Kraft, DL8HCZ

New Transverters from DB6NT

Kuhne electronic (DB6NT) presented shortly 2 new transverters, 2m + 70cm with 10m IF.

I was lucky to test both for some days. On the SW side my old TR7 was used (with +30dBm IP3)

Receiver:

Due to the low gain of the transverter my first impression was a very quiet band. Even with the preamps on I could not detect any inter-modulation. A little outside of a big city (only some commercial carriers around 420MHz), it´s of course a very subjective test. During a tropo contest some more loud signals were present on the bands and the transverters showed no weakness. The frequency accuracy was <+/-50 Hz. The low phase noise of the oszillator allows to hear beacons close to the strong local beacon (or carriers). Very helpful on 2m.

Transmitter:

The main point on the TX side is the ALC (ad-justed to 20/25W Pmax.) combined with an Amplifier which is good for 50W. These both points are responsible for the very clean TX-Signal. The big heat sink becomes not very warm even in contest operation. Adjusting the TX power of the SW-Tranceiver is easily done by a poti inside. On the 28Mhz side is no relay, TX in and RX out are on different cynch jacks.

Switching:

The transverters have a TX/RX Relay inside, what can be disabled very easy by connecting one cable inside to another connector. So a direct antenna line can be used as well as a 2 cable solution, when having the preamp at the masthead.

Different DC-contacts from an internal DC-Relay can handle the TX/RX Relay at the mast-head or supply the external preamp.

Case:

A lot of free room in the case give the chance to add a filter or other accesories inside. The low weight and little dimensions make it good for portabel operation. The design is well made and the eye has fun as well.

Round about 2 very nice transverters. Only the price will keep the number of interested HAMs limited.

This short report is of course very subjective, but it was really fun to test both transverters.

Short technical data for both:

TX input 28MHz: 1mW to 50mW

output 20/25W (limited by internal ALC !!)

RX NF < 1dB, IP3 > +25dBm, Gain 10/15 dB

144-146MHz, 432-434MHz (Oscar optional)

For further infos have a look on DB6NTs homepage. (www.db6nt.de)

73 de Bernd, DL7APV

New 70cm transverter from DB6NT

New book: Microwave Projects

A new book was supposed to be published by the RSGB in May 2003. Editor is Andy Barter, G8ATD.

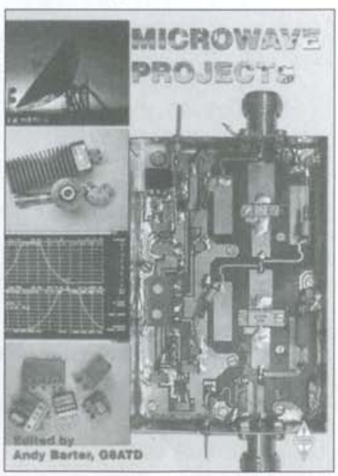
The contents of the book is:

1 Signal Sources
- 144MHz transceiver
- Microtransmitter for L band

2 Transverters
- Building blocks for a 23cm transverter
- 10GHz Transverter from Surplus Qualcomm OmniTracks Units
- A "building block" 5750MHz transverter design

3 Power Amplifiers
- GH Quad linear amplifier for 23cm
- A 10 watt power amplifier for the 13cm band using GaAs technology
- A 13cm power amplifier using a GaAs MMIC
- Amplifier for 47GHz using chip technology

4 Test Equipment
- A sensitive thermal power meter
- A grid dip meter
- A SINAD meter
- A ÷ 10 5GHz pre divider



- Made to measure directional couplers
- A ÷ 10 10GHz prescaler using state-of-the-art ICs

5 Design
- Modern design of band pass filters made from coupled lines
- Using TRL85 for synthesis and analysis of microwave problems

News & Comments

Editor: Joachim Kraft, DL8HCZ
info@DUBUS.de

VK – Africa Trophy
Indian Ocean Trophy on 144-148MHz

Don, VK6HK, advised the VK6 Council recently that a small group of individuals were working on setting up an "Indian Ocean Trophy" to be awarded to the first stations completing a two way contact from Australia to the African continent via tropospheric propagation in the 144-148 MHz band, i.e. not involving satellite, repeater or EME modes. The trophy would be similar in principle to the "Brendan Trophy" offered by the Irish Amateur organisation for a contact across the Atlantic.
A suitable body was sought to administer the award when rules and an actual trophy were settled. Council agreed in principle to the concept that the VK6 Division could provide such administration. (Source: QNEWS, March 23rd 2003)

DD7MH closing production

According to his website, DD7NH, Hans Reichl, is closing down his production and distribution service for ringfeeds, helixfeeds and filters for the bands from 23cm to 10 GHz in 2004. He has a stand at this years Ham-Radio in Friedrichshafen and the UKW-Tagung in Weinheim. Info: h.reichl@t-online.de

New Swedish Distance Record on 47 GHz

On March 24th at 1931 LT, SK0CT operated by SM0EPO in JO89XJ and SM0DFP in JO89VL broke the old distance record of 1200m that was made on March 22nd in Karlsborg between SM5QA/6 and SK0CT/6. When using Maidenhead grids, the new distance record is 14 km. When using a topographical map and a ruler, it is about 10,37 km, give or take a few meters. Signal reports exchanged were 59/59. However, due to narrow beams, they had to search for about 20 minutes before suddenly signals were heard and fine tune the antenna directions and elevations could be done. Once antennas were aligned, the signal was very good. The stability of the oscillators was good enough for SSB. Both QTH were their ordinary locations, no portable operation this time. The path has optical line of sight.
SM0EPO and SM0DFP

Balloon Mission with 2m/70cm

For July 5th around 09:45 UTC there is planned the start of a balloon with amateur radio equipment on 2m in southern Germany (Meiningen, JO50EN, 450m a.s.l.). There will be a beacon with the call DF0AIS on 145.200 MHz with 0.2 Watt (vertical) transmitting data (GPS, temperature, voltage) in AX.25 and 1200Bd AFSK. Reaching altitudes of 1000m and more a transponder with the following QRGs will be switched on: Uplink: 435.075-435.125, LSB/CW
Downlink: 145.925-145.875 USB/CW (inverting).
Power 100mW at GP antennas. (Info DG1CMZ)

Black Sea 2M VHF FM Contest

This contest takes place from July 26th 11z to July 27th 11z in FM on QRG 145.225 to 145.800 MHz in the Black Sea Region (Turkey, Georgia, Russia, Ukrain, Moldova, Romania and Bulgaria). The contest is organized from the Trabzon Division of Turkish Radio Amateur Club (TRAC), info: TA7KA@qsl.net and www.qsl.net/ta7ka/contest/

IJsselmeercontest 2003

The Dutch IJsselmeercontest will take place on June 14th from 08-15 UTC on 10 GHz and up.

W6JKV`s 6m BBQ 2003

The 17th annual W6JKV SIX Meter Bar-B-Q takes place on September 17th. If you really love six meters, please join us for the best of all 6 meter meetings with hams from every continent and 20 or so USA states. You can't beat the price or the quality of the b-b-q, mexican food, drinks, pop corn, and live entertainment. We attract many of the people who do expeditions and the top eme guys from 2 and 6 meters. jimmy@treybig.com from Jimmy, W6JKV

Seigy 2003

CJ2003 took place in Seigy, center France, 80 km east of Tours, and about 200 km south of Paris, on the 5th and 6th of April. This meeting is not only a flee-market but gives the possibility to all the French VHF/UHF and microwave enthusiastics to meet each year, to share their experiences and to debate on technical aspects and trafic on these bands through conferences, proceedings and demonstrations. Each year, noise figure measurements can be done on preamps.
This meeting is organised by F5FLN, F5JCB and F6ETI.
CJ2004 will take place on 17th and 18th of april`2004.
Website: http://www.ref-union.org/cj (tnx F6ETI/F6HYE !)

EK6AD SK

EK6AD, ex UG6AD, (LN20) beacame a silent key. QSLs are available via LZ2DF: Minco Petkoff, P.O. Box 25, 5600 Troyan, Bulgaria. Email: lz2df@mail.bg

F9FT Silent key

We have the deep sadness to tell you the death of Marc F9FT. Marc was a pioneer for EME and manufacturer of the famous Tonna 9 yagi el in the earlier sixties and then the 16 el. He was a passionate person by antennas and Ham hobby till end of his life. We lost a friend and a great OM. You can send e-mail to his son F5SE and the family at:
Franck@cbsky.net. Marc we never forget you! Marius, F8DO

MS-Database Update

An updated version of DL8EBW`s MS-Database is available since the end of May. Please check: /www.dl8ebw.de/

Beacons

24 GHz Beacon QRGs Change

According to last years IARU region 1 confernce in San Marino the QRGs of all beacons on 24 GHz have to be changed.

All beacon QRGs have to QSY exactly 144 MHz down in frequency. The change should be completed by Jan 1st 2004.

Transatlantic Beacon Project: VP9DUB beacon in progress

Regarding the announcement in DUBUS issue 1/2003 we have not got too much feedback. Obviously there seems to be little interest in 2m-TEP propagation and 2m transatlantic observations.

Anyway thanks to the phantastic help from Dithmar, DF7KF, with equipment, transport etc it will be possible to erect a new 2m transatlantic beacon with the call VP9DUB om Bermuda Island (Loc. FM72) very soon. The beacon will have a yagi beaming toward Europe and some 80 watts output. QRG will be 144.300 MHz.

There will be also a 6m beacon with the same call on 50.027 MHz. Power 10 watts RF to a loop antenna.

The coordination on the island is managed by Ed, VP9ED and Chris, W3CMP, who is bringing parts for the beacon to VP9 in the end of June.

So keep fingers crossed that everything works and we will have the beacon running in July!

Many thanks to all who are involved, especially DF7KF; VP9GE and W3CMP! (DL8HCZ)

IV3A with new callsign

The 2m beacon IV3A has got the new callsign IQ3MF in spring 2003. QRG is 144.429 MHz, 4 W ERP to 2 x turnstile.

DB0GHZ now in JO34

The 10 GHz beacon DB0GHZ has changed the QTH from JO43 (Hamburg) to JO34WE (Helgoland Island) in April 2003. QRG is 10368.810 MHz. The beacon was heard already via RS from many stations (who have not yet wkd this square).

LZ2CM/B qrv on 6m

LZ2CM/B is a new 6m beacon from KN13NE that became qrv in May 2003. QRG: 50.045 MHz, 0.5w, GP ant, 1550 m a.s.l.

OE8XGQ and OE8XXQ beacons QRV

Since April there is a new OE-beacon qrv on 6cm:
OE8XGQ 5760.860 MHz +-, JN66WQ, 1W, 10dB, Omni. –
From the same QTH there is also qrv:
OE8XGQ, 10368.856 MHz, 1W, 10dB, Omni.
A 23cm beacon is also planned with 2 W on 1296.800 MHz.
Also qrv is:
OE8XXQ 10368.815 MHz, JN66UO, 1W, 10dB, Omni.

I8EMG beacons qrv

Since October 2002 there are 2 new beacons:
I8EMG/B, 10368,180 MHz, JM89BJ, 20W ERP, Horn 20 db, 310°, 1400 m a.s.l., A1.
I8EMG/B, 24192,180 MHz, JM89BJ, 20W ERP, Horn 23 db, 310°, 1400 m a.s.l., A1. (info from I8EMG. Tnx Franco!)

VQ9X qrv on 6m

The beacon VQ9X, Loc. MI62, running 10 watts into a vertical, became qrv im March 2003 and was heard already many times from Italy and Greece.

C6AFP qrv again

The 6m beacon C6AFP on 50.062 MHz is qrv again now from C6AGN's QTH in FL16. 1 Watt out to a Ringo vertical.

GB3WSX new 4m beacon proposed

GB3WSX on 70.006 MHz, IO80QW, 20 watts, 7 ele yagi, was announced to become qrv this summer.

JW5SIX and JW9SIX qrv now

As announced the new 6m beacons JW5SIX (50.046, KQ26) and JW9SIX (50.049, JQ94) became in the end of March.

GB3LER qrv again on 6m

The Shetland beacon GB3LER, IP90, is qrv again on 50.065 MHz since March 2003.

GB3BUX QRT

The GB3BUX (50.000 + 70.000 MHz) beacons are QRT for a longer period for maintainance.

Expeditions

10 GHz: OZ1DOQ/p – JO55

Uffe, PA5DD, will be qrv for a few days in the timeframe from August 5th to 23rd on 10 GHz from JO55SW. Rig: 10 W and 60cm dish. Talkback on 432.350 MHz.

2m/6m: OH8K – KP38 / KP37

The OH8K group will be qrv for 2m and 6m Meteor-Scatter during Perseids as follows: August 9th to 11th from KP38 and August 11th to 13th from KP37.

2m/6m: OH8K – KP53 / KP54

The OH8K group will be qrv for 2m and 6m Meteor-Scatter from June 7th to 10th with 2 stations:
OH8K from KP53DX on 144.147 CW + .353 FSK
OH6JW, KP54DA, 144.174 CW + .394 FSK.
There is only one 6m QRG: 50.178 MHz.

2m: RK1B – KP79

RU1AS is qrv on 2m via MS (FSK, random only) from June 5th to 9th. QRG: 144.381 MHz. May be also some HSCW on 144.123 MHz. QSL for this operation via OH5LID.

2m: OH5LID – KP51AT

OH5LID is qrv on 2m via MS (FSK, random only) from June 7th to 10th. QRG: 144.388 MHz, Tropo: 144.300 + 432.220.

2m: EA7/DJ4UF/p – IM96

Eckart, EA7/DJ4UF/p plans to be qrv again on 2m via FSK MS in November with more power.

2m: SV/DL5MAE - KM27 (KM28 cancelled)

Until June 7th SV/DL5MAE was expected to be qrv on 144 MHz MS HSCW random on 144.082 MHz.

2m: GM/DH7FB – IO66
GM/DH7FB will be qrv from June 15th to 20th on 2m via MS. HSCW on 144.148 and FSK on 144.355. Rig: 2 x 9 ele and 300w. Skeds dh7fb@web.de

2m: IQ8IB/IB0 + I5TWK/IB0 – JN60
From June 6 th/22UT to June 8 th /12UT there will be qrv a DXpedition from JN60 (Ponza Island, 100m asl) on 144MHz via HSCW and WSJT-MS. Callsigns: IQ8IB/IB0 (IBTIQ8IB) or I5TWK/IB0 (IBTI5TWK). QRGs: 144.168 MHz ±2kHz HSCW random; 144.088 MHz HSCW sked, 144.300 MHz SSB random, 144.050 MHz CW random. IB0 first, speed 2000 lpm HSCW, 2.5min periods. Rig: 200 Watts, 11/13ele yagi.
Info: cspano@inwind.it

2m/6m: 5T6M – IK28
From June 28th to July 7th DL8YHR will be qrv from 5T5SN's QTH with the call 5T6M on 6m and 2m via EME and Sporadic-E (hopefully). Rig on 2m 2 x 17 Ele and 750 Watt, on 6m 6M7JHV and 1 KW. QSL via ON4ANT. www.dl8yhr.de

2m: OH6/SM4XDJ – KP13/14
OH6/SM4XDJ plans to be qrv from KP13 or KP14 (depending on demand) on 2m for the NA Contest on July 1st. Possibly also 2m FSK operation.

6m/2m/70cm: ED1ONS – IN52
From July 25th to 27th there will be qrv a group from Ons Ilsand with the call ED1ONS (IN52) on 6m, 2m and 70cm.

2m: ZB2/G0NFA – IM76
ZB2/G0NFA plans to be qrv again for 2 days for MS on 2m during the Perseids.

2m/6m: LA/DK5KK + DL2NUD – JQ90 etc.
DK5KK und DL2NUD will be qrv from northern LA from June 5th for about 3 weeks. They will activate several northern squares (e.g. JQ90) on 2m via MS (HSCW + FSK) and also on 6m.

2m/6m: IM0/IZ5FKK – JN41
IM0/IZ5FKK will be qrv 2m and 6m from July 10th – 18th

2m/6m/10GHz: PA6FI/MM – JO12
PA3HEN, PA2DWH + DL1EJA will be qrv again as PA6FI/MM on August 16th/17th from JO12 on 2m, 6m, 10 GHz and possibly other microwave bands.

2m/6m: PA3HEN/MM
Theo, PA3HEN/MM, was qrv again starting on May 17th from KO08, JO85 on his way to 4X (KM72). He is still active now on 50.140 and 144.300 MHz.

2m/6m: SX9G - KM24
A group from Greece is qrv as SX9G from June 4th to 15th from Gavdos Island, KM24, on 6m and 2m for Sporadic-E with good equipment.

GU6AJE/MM
Mike, who has settled on a new QTH as G6AJE, writes that he expects to be qrv /MM again on 2m/6m not before October. So probably no chance for Es on 6m/2m this time.

2m: EA8/DL6FAW – IL18
Well known 2m-contester DL6FAW, Norbert, has moved to La Palma Island and expects his own EA8-call soon. He is active on 2m from IL18BP.

LA/SM6CMU
ILA/SM6CMU, Ingo, will be qrv again on 6m/2m in the second half of July from rare squares in the Lofoten area.

JW on 70cm EME
SM2BYA still plans to become qrv on 70cm EME from Svalbard with the big EISCAT dish for 2 days. Earliest date given now ist Oct./Nov., may be in the contest.

HI – Dom. Republik on EME
ON4ANT etc. plan a 70cm and possibly 2m-EME activity. HI8ROX may be equipped for EME by this group.

Bermuda on 2m and 6m
From June 13th to 16th there will be N0JK/VP9 qrv on 6m and 2m. From June 27th to July 5th there will be W3CMP/VP9 qrv on 2m and 6m with QRO and long yagis antennas. Chris is very interested in 2m transatlantic attempts toward Europe and is looking for partners. W3CMP@aol.com

4U1ITU – 4U1WRC
F6IRF is qrv again on June 21st/22nd on 6m for the contest. There will be also a lot of activity as 4U1WRC on several band due to the World Radio Conference in Geneva from June 9th to July 7th.

2m/6m: CY9 - St. Paul
There will be an expedition on 2m and 6m qrv from July 24th to August 2nd. Call CY9A.

2m/70cm/23cm: HB0/DG3XA – JN47
From July 3rd to 7th a group from DL is qrv as HB0/DG3XA on 2m/70cm723cm incl. IARU contest.

No 2m transatlantic attempt this year
DK5DQ informs us that there will be no 2m transatlantic attempt (EA1 – VO1) this year in August. May be next year.

HB9MM: Digital modes weekend
On 12./13. July a group of Hams from the club HB9MM will be QRV in digital modes (PSK31, MT63, MFSK, etc) on 144.138 and 432.088 MHz from the "Dent de Vaulion" (JN36EQ), 1400 m asl. Time: Saturday f14h to 21h and Sunday f7h to 11h (UT). More info will be available on http://membres.lycos.fr/hb9tjm/mode_sp.htm or via mail: HB9TJM@yahoo.fr.

2m: IK0BZY – JM76 + JM67
IK0BZY will be qrv from IT9 on 2m HSCW, SSB + FSK-MS from June 25th tto July 4th.

Redaktionsschluss für Aktivitätsberichte und redaktionelle Beiträge für DUBUS 3/2003 ist der 20. August 2003.
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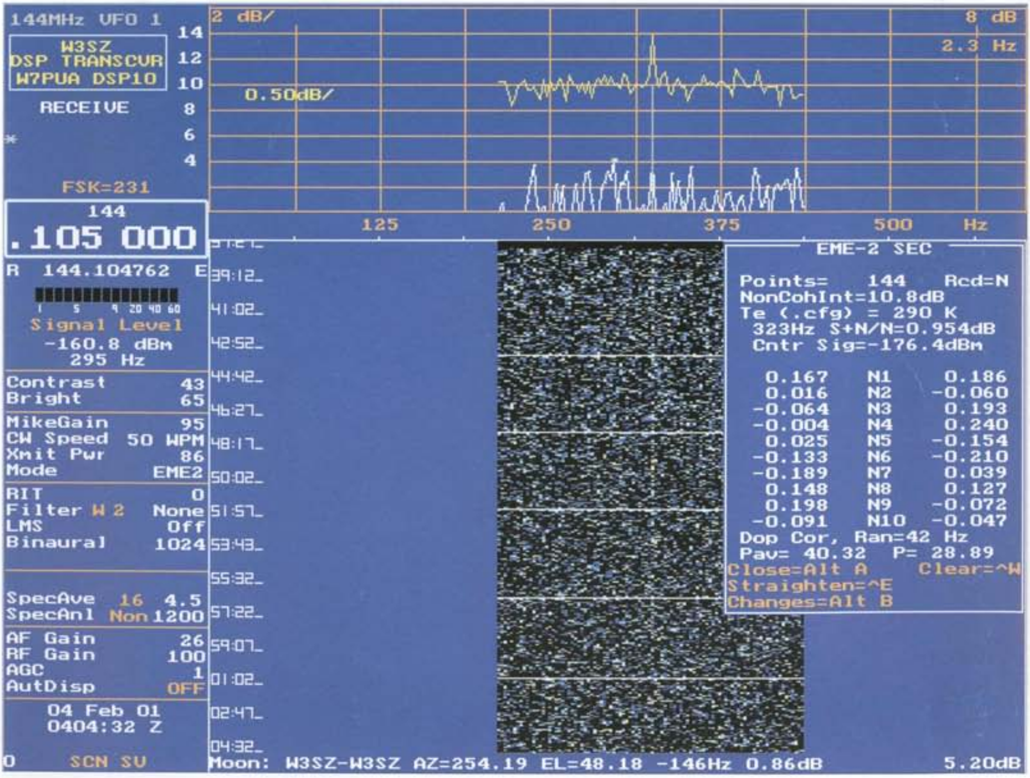
Reviewed in this issue:

W7PUA`s DSP 10 - by W3SZ



Screenshot – W7PUA DSP 10 (Fig. 3)