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The Ultimate

241GHz Transverter

Communications

DUBUS

die zweisprachige Zeitschrift für den Schmalband-DX-Amateur auf UKW von 50MHZ bis 241GHz. Geschrieben von aktiven UKW-Amateuren für aktive UKW-Amateure.

DUBUS

Entirely devoted to DX-ing on VHF/UHF and Microwaves (50MHz...241GHz). Fully bilingual and written by active radio amateurs for active radio amateurs.

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Inhalt/Contents

Redaktion/Editorial Staff

Technical Reports, Microwave Parts:	Rainer Bertelsmeier, DJ9BV, Gluecksburger Str. 20, D-22769 Hamburg
Hints&Kinks:	Gerold Bächle, DF5GX, Elberfelder Str. 12, D-10555 Berlin
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Technical Reports

Editor: Rainer Bertelsmeier, DJ9BV

Transverter for 145 & 241GHz

Michael Kuhne, DB6NT

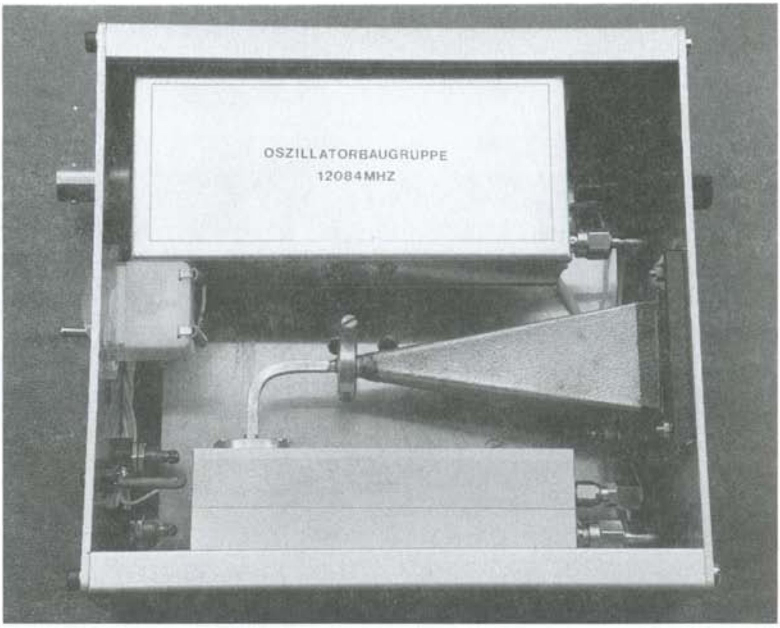
Kurzfassung: Ein einfacher Transverter basierend auf einem Harmonic-Mischer mit einer GaAs Beamlead Diode erlaubt den experimentellen Betrieb auf den beiden obersten mm-Bändern, die Amateuren zur Verfügung stehen. Das gleiche Konzept hat sich bereits bei 47 und 76GHz Transvertern bewährt. Eine geeignete Antennenkonstruktion und einfache Meßmittel werden beschrieben.

Abstract: A simple transverter based on the proven subharmonic-mixer concept with a GaAs-beamlead diode can provide experimental operation on the the top mm-bands of the amateur allocation, i.e. on both 145 and 245GHz. A suitable dual band antenna construction and measurement techniques are described.

Einführung

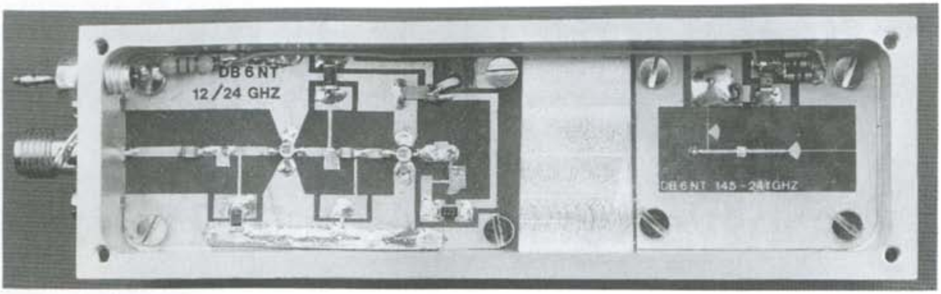
Die Transverter sind eine Abwandlung der 47GHz #2 Schaltung. Der Mischer wird bei 145GHz mit der 6. Harmonischen der LO betrieben, bei 241GHz mit der 10. Harmonischen. Die Mischerschaltung für diese Bänder unterscheidet sich nur

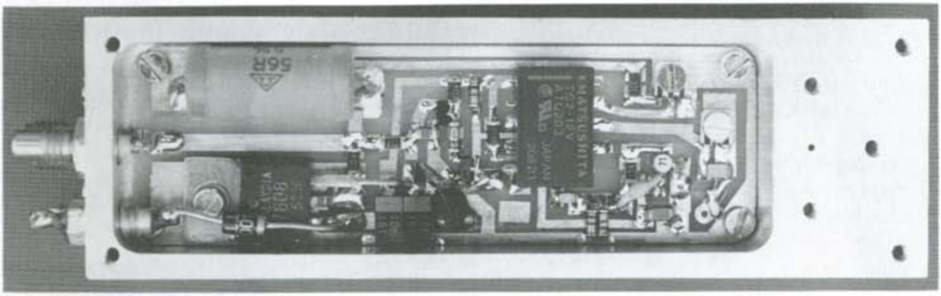
145 GHz Transverter mit eingebauter Hornantenne



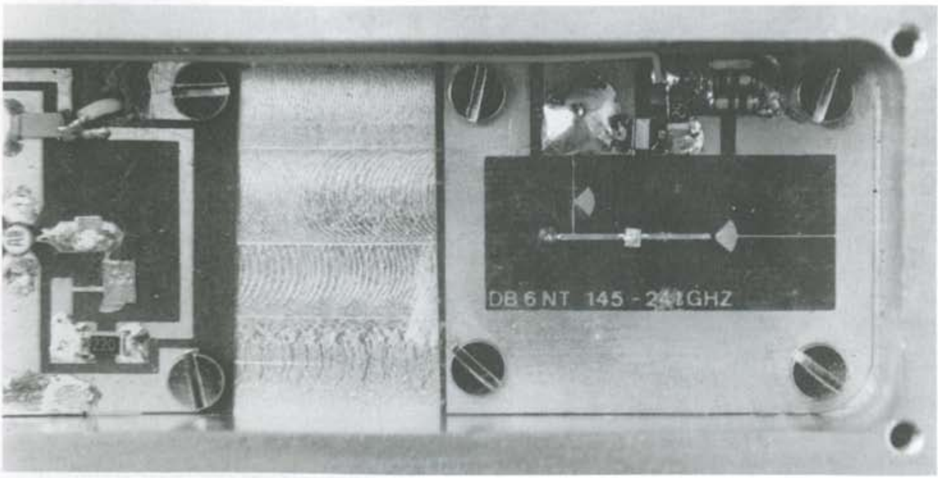
145/241GHZ Station

145/241GHZ Transverter (Top View)

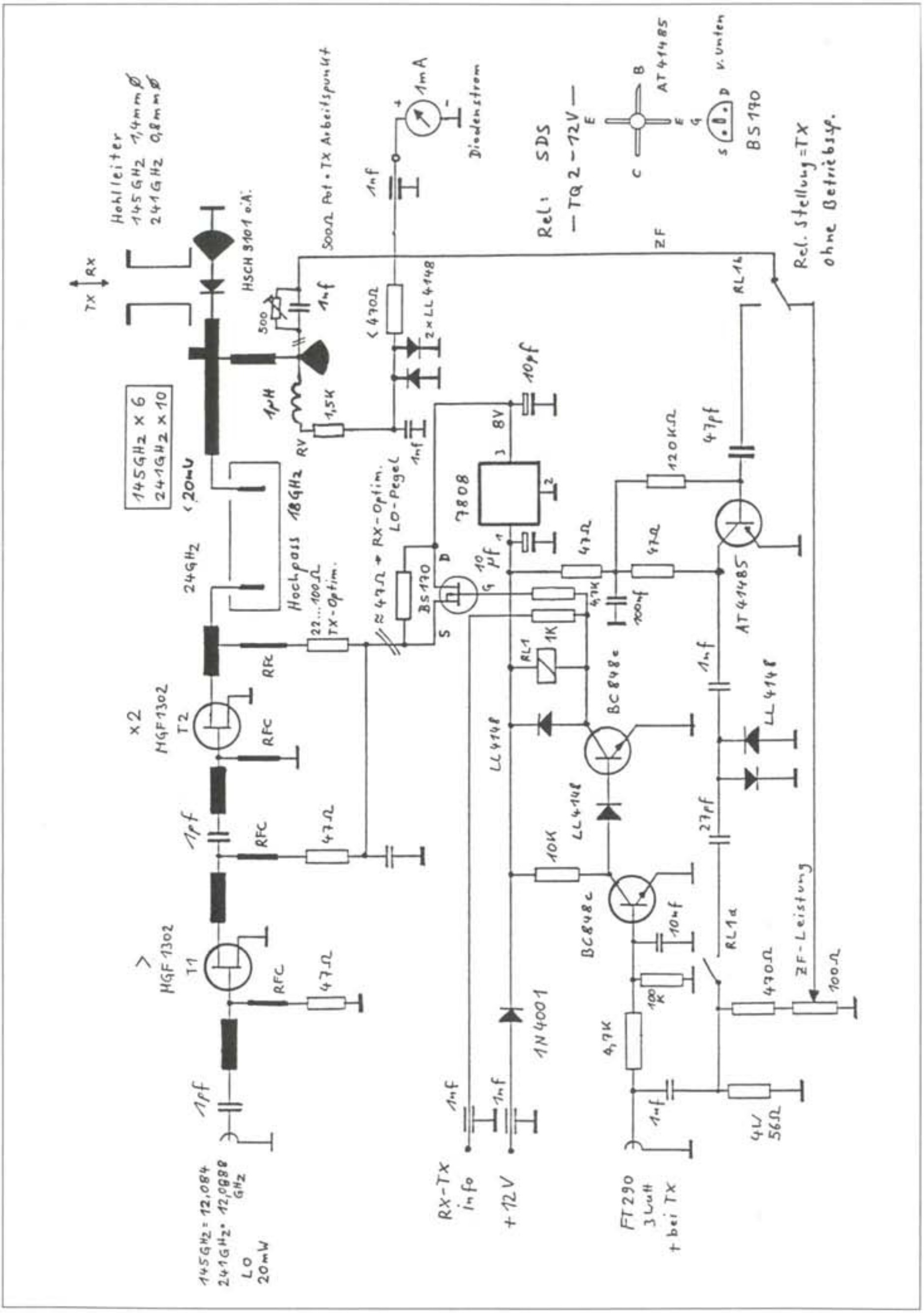




145/241GHZ Transverter (Bottom View)

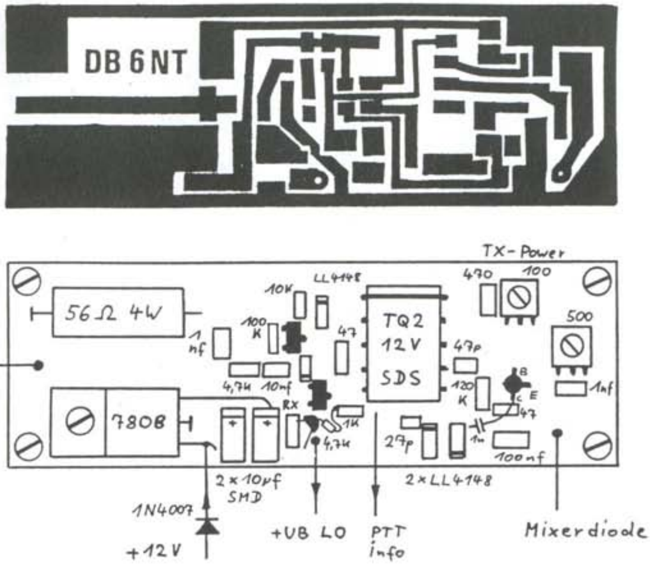


145/241GHZ Station



Bild/Figure 1: 145/241GHz Transverter Circuit

Bild/Figure 2: IF-Board Parts Layout



durch die masseseitige Freiätzung der Leiterplatte sowie des Rundhohlleiterdurchmessers zur Ankopplung an die Antenne. Der Hohlleiter ist in Form einer Bohrung in das Alugehäuse realisiert, dessen Cut-off dicht unter der Betriebsfrequenz liegt und somit eine Unterdrückung niederfrequenter Signale gewährleistet. Die Mischerdiode ist direkt über dem Hohlleiter auf einer 0,125mm starken Teflonleiterplatte angeordnet. Diese vereinfacht den mechanischen Aufbau und umgeht aufwendige Mikromechanik.

Zum Betrieb können zwei Transverter mit um die ZF-Versetzte LO arbeiten und somit im Sendefall die Mischdämpfung (ca.10dB) zu sparen. Dabei ist nur Betrieb in CW durch Tasten der LO möglich. Die Ausgangsleistung ist aufgrund der Oberwellenmischung extrem klein und die Rauschzahl denkbar schlecht. Dennoch wurden auf 145GHz mit diesen Geräten 3 km überbrückt. Die Schaltung soll einen ersten Einstieg in die Bänder ermöglichen und zu weiteren Verbesserungen und Versuchen ermutigen.

Der Transverter besteht aus zwei Baugruppen: einerseits die 12GHz Frequenzaufbereitung (ca. 20mW), andererseits der Transverter mit LO-Verdoppler, Harmonicmixer und ZF-Beschaltung. Die Schaltung wird in ein Alugehäuse mit entsprechenden Ausfräsungen für Leiterplatten und Hohlleiter eingebaut. Die Dimensionierung der Schaltung erlaubt den direkten Betrieb mit 2m-Geräten wie IC202 oder FT290 (max. 3W).

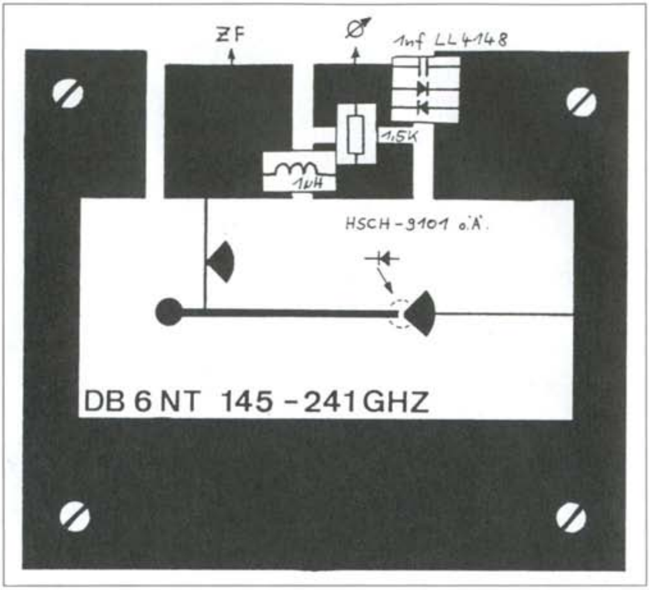
Aufbau und Abgleich

Das vom LO kommende Signal wird über eine Verstärkerstufe T1 dem Verdoppler T2 zugeführt. Danach steht eine Frequenz von 24GHz mit einer Leistung von max. 20mW zu Verfügung, die im Empfangsbetrieb zurückgeregelt wird. Das LO-Signal gelangt danach über einen Hohlleiterhochpass auf den Harmonicmixer. Der Hochpass ist als Ausfräsung im Alugehäuse realisiert und unterdrückt noch vorhandene 12GHz Anteile.

Vor dem Einbau der Mixerleiterplatte ist ein Abgleich der Verdopplerstufe notwendig. Dazu wird über ein Semi-Rigid-Kabel anstelle der Mixerplatine das Signal auf ein geeignetes Powermeter gekoppelt. Somit ist es möglich durch Anbringen von Abstimmfähnchen die Stufen zu optimieren. Um gute Massekontaktierung zu erreichen, wird die Mixerleiterplatte mit Silberleitkleber bestrichen und danach in das Gehäuse geschraubt.

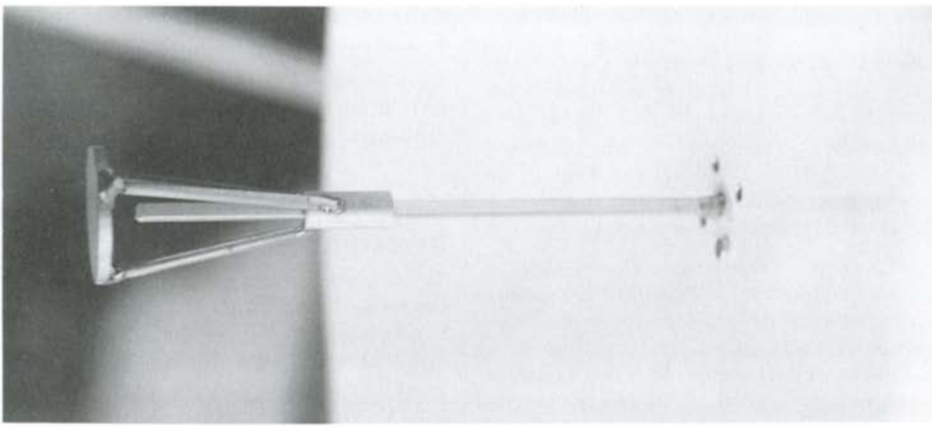
Die RX-TX Umschaltung sowie der ZF-Verstärker ist auf einer SMD-Leiterplatte untergebracht, die auf der anderen Seite der Transverters eingebaut wird. Mit zwei Bohrungen durch das Gehäuse wird Betriebsspannung und ZF auf die HF-Leiterplatten geführt. Die RX-TX Umschaltung ist für ein IC202 oder FT290 ausgelegt. (+ bei TX auf Innenleiter. IC202 umrüsten! DUBUS 2/91). Das TX-Dämpfungsglied ist für 3W ausgelegt, kann aber auch an kleinere Steuerleistungen angepasst werden.

Bild/Figure 3: 145/241GHz Mixer Parts Layout



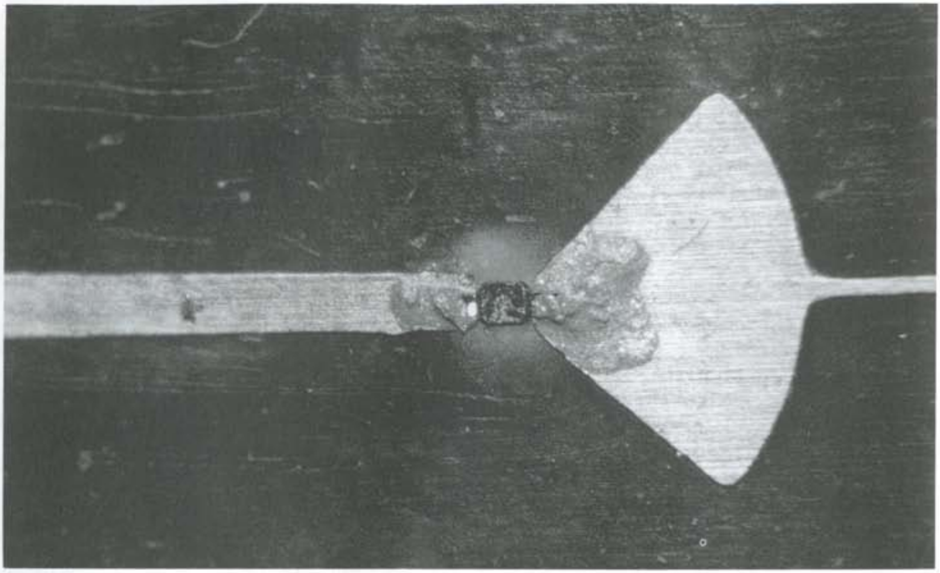
Der Einbau der Beam-Lead-Diode erfolgt durch Einkleben mit Silberleitkleber H20S. Diese Arbeit ist nur unter dem Mikroskop möglich. Dazu werden zunächst die Kontaktflächen der Leiterbahnen mit Kleber bestrichen. Die Diode wird mittels eines feuchten Zahnstochers aus der Verpackung genommen und in den Leitkleber gedrückt. Goldfläche der Diodenanschlüsse zu Leiterplatte. Die Anschlüsse müssen mit Kleber umfangen sein um ein späteres Ablösen der Dioden zu vermeiden. Nach dem Aushärten (3h bei 100°C) kann die Kontaktierung mit dem Diodentester überprüft werden.

Der Abgleich des Mischers geschieht durch Anbringen eines Kupferfähnchens oder Leitklebertupfers zwischen LO-Einkopplung und Diode, sowie durch Einstellen der optimalen ZF-Ansteuer-



Cassegrain Feed

Bild/Figure 4: Beam Lead Diode



leistung durch das 100Ω Poti. Der DC-Arbeitspunkt wird einem 500Ω Poti in der ZF-Zuleitung optimiert. Diese Abgleicharbeiten sollten wechselseitig am Spektrumanalysator erfolgen (DUBUS 2/92 Seite 14).

Wird der Transverter am Transceiver angeschlossen, muß eine Rauschzunahme zu hören sein. Durch Ein- und Ausschalten der LO ergibt sich eine deutliche Rauschänderung. Der Abgleich auf beste Rauschzahl erfolgt durch Einstellen der optimalen LO-Steuerleistung für den Mischer. Dazu wird ein 250Ω Potentiometer zwischen Drain und Source des BS170 gelötet und durch Abgleich mit einer Bake der beste Wert ermittelt. Danach kann ein Festwiderstand eingebaut werden.

Zur Kontrolle des Mischerstroms kann ein kleines Messwerk (1mA) in die Frontplatte des Gerätes eingebaut werden. Durch Umschalten des Transverters auf Sendebetrieb sowie durch Ansteuerung mit 144MHz kann eine Stromänderung beobachtet werden.

Als Rechteckhohlleiter bietet sich der industriell gebräuchliche WR5 an. Er kann auf beiden Bändern noch verwendet werden und ermöglicht den Aufbau einer Zweibandantenne. In Verbindung mit einem 25cm Parabolspiegels der Firma PROCOM kann eine gute Antenne realisiert werden. Aufgrund ihres hohen Gewinnes und des dadurch geringen Öffnungswinkels ist eine Visiereinrichtung unerläßlich. Kleine, preiswerte Zielfernrohre 4x15 (40 DM) haben sich schon vielfach bewährt.

Mein besonderer Dank gilt OM **Max Münich, DJ1CR,** für die Unterstützung zur Realisierung der Baugruppen.

English Version

Introduction

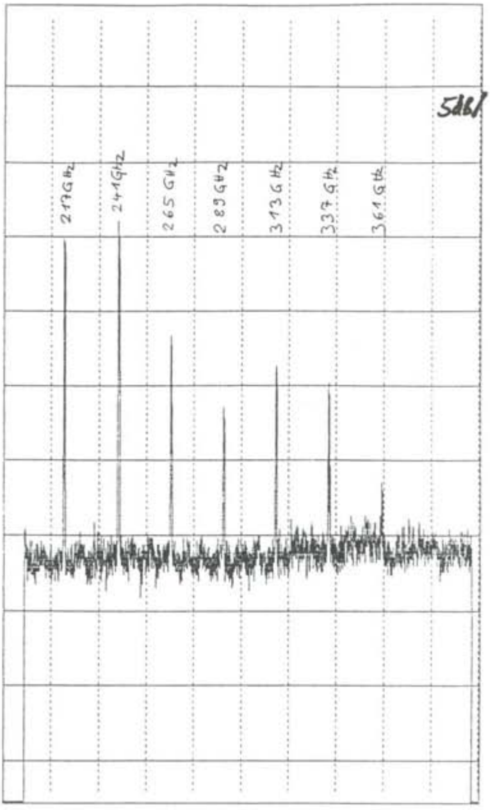
The transverters are basically a modification of the successful 47GHz circuit in [1]. The 145GHZ mixer is a 6th harmonic and the 245GHz mixer is a 10th harmonic mixer. The only difference between the mixers are different circular waveguides and a different etched pattern on the ground side of the PCB. The waveguide is a hole in the aluminium box and operates just above cutoff, to serve as a highpass filter for subharmonics. The mixer diode is fitted directly above the waveguide hole onto the 0.125mm thick TFE-PCB.

For transmitting one possibility is to generate two LO-frequencies offset by the IF-frequency. This is useful for CW only, but has 10dB more output power, when keying the LO.

In real transverter mode the output power is very low and the noise figure is quite high because of the high order harmonic mixing. Nevertheless it was possible to achieve a distance of 3km on 145GHz and 1km on 241GHz. This simple circuit is intended as a starter for those who are interested in the two ultimate amateur mm bands.

The transverter is compromised of two modules. The first is the LO-module with an output of 20mW on 12GHz. The second is the mixer with integrated LO-doubler on 24GHz and the IF-circuit. The cicuit is mounted in a machined aluminium box.

Bild/Figure 5: 241GHz Output Spectrum



Alignment

First the LO-doubler has to be aligned. A powermeter is coupled to the output via a short piece of semirigid. Tuning is performed by applying small tuning stubs made from copper foil.

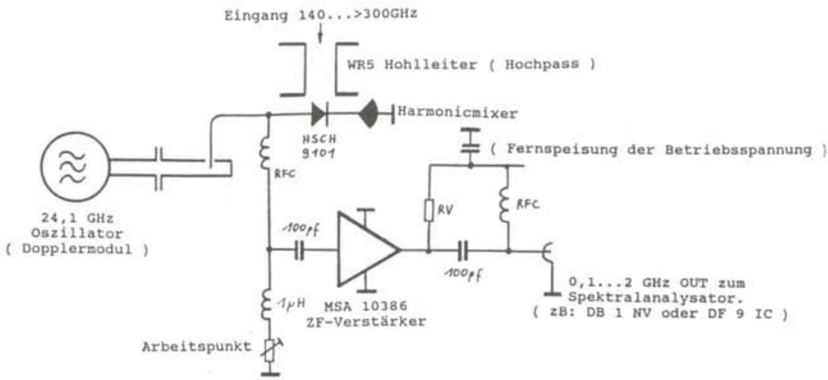
After applying some silver epoxy cement to the ground side of the mixer board it is fastened with screws in the box. The IF-board is mounted to the opposite side of the box. Supply voltage and IF are passed through small holes. T/R-switching is good for a FT-290 or a modified IC-202 (sse DUBUS 2/91). The attenuator for the 144MHz transmit signal is good for 3W.

The next step is the mounting of the beam-lead diodes. Viewing the board through a microscope you have to put some silver epoxy cement H20S to the track on the PCB. Then pick up the diode from the package with a wet toothpick (Put Isopropyl on it) and apply it into prepared piece of the track. The gold plated ends of the diode are facing the track! Take care that the ends of the diode are completely covered by the silver paste. When the epoxy cement has hardened (3h at 100°C) check the connection with an Ohmmeter.

Tune mixer with small stubs between LO-port and diode. Adjust for optimum IF-drive power with the 100Ω pot. Matching to the waveguide can be done with M5 screw. A spectrum analyzer is a valuable tool at this stage (See DUBUS 2/92, pp.14 or look at Fig.6.

Connect transverter to a 144MHz transceiver. Verify the noise increase by switching the LO. The best noise figure can be found by optimizing the LO power. This is done by bridging the BS170

Bild/Figure 6: Mixer for Spectrum Analysis



Bestimmung der Ausgangsfrequenz:

LO = f Osz. x Harmonic

f ZF = f Eingang - LO

Beispiel für f in 145152 MHz	24100	x	6	=	144600 MHz
	145152	-	144600	=	552 MHz ZF
Beispiel für f in 241920 MHz	24100	x	10	=	241000 MHz
	241920	-	241000	=	920 MHz ZF

with a pot, tuning and subsequent exchange to a fixed resistor.

For checking the mixer current a small 1mA meter can be fitted to the frontplate of the transverter.

As a rectangular waveguide you can use the industry standard WR5. It's usable on both 145 and 241GHz. This means that you can construct a dual band feedhorn, which can be mounted into a 25cm parabol from PROCOM. Because of the small aperture and the subsequent high gain of the antenna an aiming facility, for instance a telescope 4X15 is useful.

I have to thank **OM Max Münich, DJ1CR,** for the kind support of this special project.

References

[1] M. Kuhne, DB6NT, "47GHZ Transverter '2", DUBUS 1/1994, pp.49-63

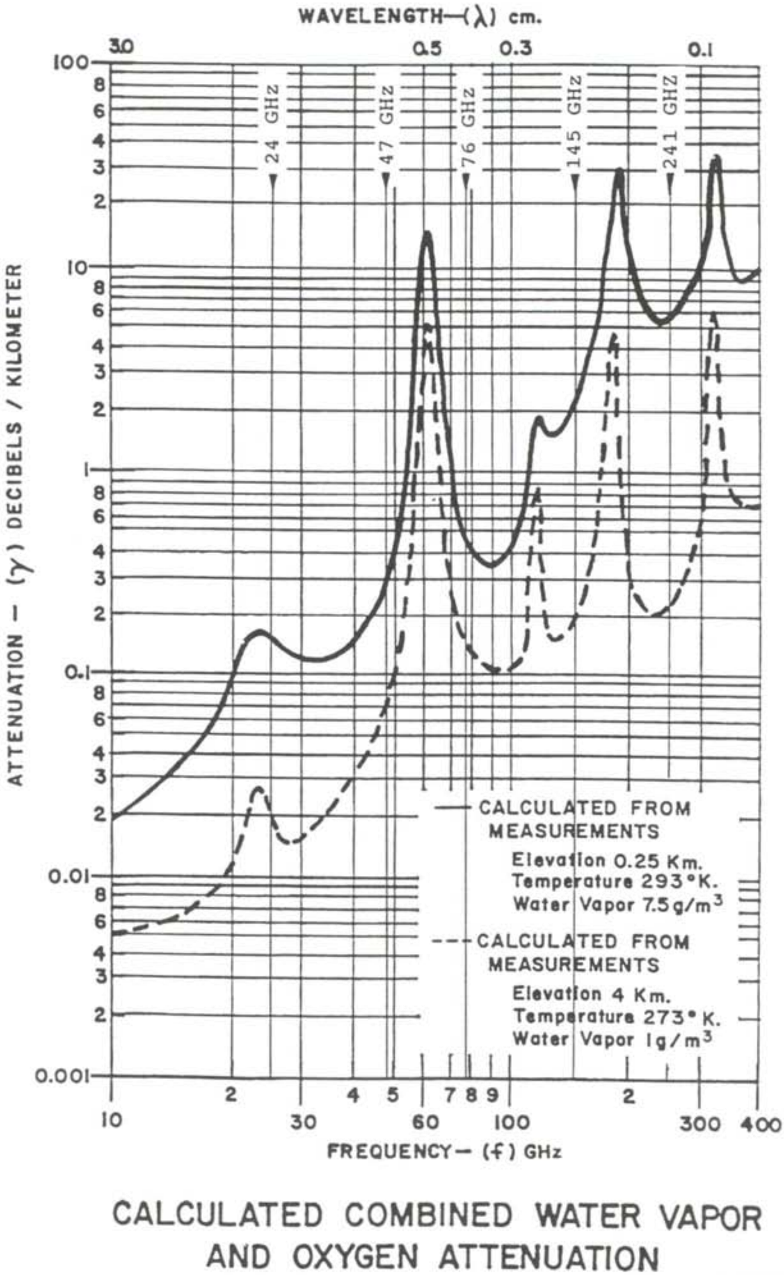
[2] M. Kuhne, DB6NT, "LO für 24 und 47 GHz". DUBUS 4/1990

Teile/Parts

Beam-Lead Diode HSCH-9101 Hewlett Packard durch Firma: BFI Tel: 089/3195135

Leiterplatten/PCB: M.Kuhne, Birkenweg 15, 95119 NAILA

Alugehäuse/Box: Hubert Krause DG 1 KBF, Berghagen 60, 53773 HENNEF



Bild/Figure 7: Water Vapor and Oxygen Attenuation

Reference

REFERENCE TABLE OF RIGID RECTANGULAR WAVEGUIDE DATA AND FITTINGS

	3	2300	0.32-0.49	0.32-0.49	0.256	116.84	246-348	.040-.027	290	Alum.			2300	23.000 11.500	0.020	23.376 11.876	.020 0.188	
	4	2100	0.35-0.53	0.35-0.53	0.281	106.68	205-290	.046-.031	291	Alum.			2100	21.000 10.500	0.020	21.376 10.876	.020 0.188	
	5	1800	0.41-0.62	0.41-0.62	0.328	91.44	150-213	.058-.039	201	Alum.			1800	18.000 9.000	0.020	18.250 9250	.020 0.125	
	6	1500	0.49-0.75	0.49-0.75	0.393	76.20	104-148	.076-.051	202	Alum.			1500	15.000 7.500	0.015	15.350 7.750	.015 0.125	
	8	1150	0.64-0.98	0.64-0.96	0.513	58.40	61.5-87.1	.113-.076	203	Alum.			1150	11.500 5.750	0.015	11.750 6.000	.015 0.125	
	9	975	0.76-1.15	0.75-1.12	0.605	49.53	44.2-62.6	.145-.098	204	Alum.			975	9.750 4.875	0.010	10.000 5.125	.010 0.125	
	12	770	0.96-1.46	0.96-1.45	0.766	39.12	27.6-39.1	.206-.140	205	Alum.			770	7.700 3.850	0.010	7.950 4.100	.010 0.125	
L	14	650	1.14-1.73	1.12-1.70	0.908	33.02	19.6-27.8	.317-.214 .266-.180	69 103	Brass Alum.		417A* 418A*	650	6.500 3.250	0.010	6.660 3.410	.010 0.080	
	18	510	1.45-2.20	1.45-2.20	1.157	25.91	12.09-17.1	.456-.309 .382-.259	337 338	Brass Alum.			510	5.100 2.550	0.010	5.260 2.710	.010 0.080	
W	22	430	1.72-2.61	1.70-2.60	1.372	21.84	8.6-12.2	.588-.399 .494-.334	104 105	Brass Alum.		435A* 437A*	430	4.300 2.150	0.008	4.460 2.310	.008 0.080	
	26	340	2.17-3.30	2.20-3.30	1.736	17.27	5.4-7.6	.837-.567 .702-.475	112 113	Brass Alum.		553* 554*	340	3.400 1.700	0.005	3.560 1.860	.005 0.080	
S	32	284	2.60-3.95	2.60-3.95	2.078	14.43	3.5-5.0	1.136-.777 .953-.652	48 75	Brass Alum.	54B 585A	53 584	284	2.840 1.340	0.005	3.000 1.500	.005 0.080	
	40	229	3.22-4.90	3.30-4.90	2.577	11.63	2.44-3.46	1.514-1.026 1.270-.860	340 341	Brass Alum.			229	2.290 1.145	0.005	2.418 1.273	.005 0.064	
C	48	187	3.94-5.99	3.95-5.85	3.152	9.510	1.52-2.15	2.140-1.467 1.795-1.231	49 95	Brass Alum.	148C 406B	149A 407	187	1.872 0.872	0.005	2.000 1.000	.005 0.064	
	58	159	4.64-7.05	4.90-7.05	3.711	8.078	1.17-1.66	2.617-1.773 2.195-1.487	343 344	Brass Alum.			159	1.590 0.795	0.004	1.718 0.923	.004 0.064	
	70	137	5.38-8.17	5.85-8.20	4.301	6.970	0.79-1.12	3.470-2.390 2.910-2.004	50 106	Brass Alum.	343B 440B	344 441	137	1.372 0.622	0.004	1.500 0.750	.004 0.064	
X_L	84	112	6.58-10.00	7.05-10.00	5.259	5.700	0.52-0.73	4.761-3.292 3.993-2.761	51 68	Brass Alum.	52B 137B	51 138	112	1.122 0.497	0.004	1.250 0.625	.004 0.064	
		102	(7.23)-(11.0)	7.00-11.0	5.785	5.182	0.48-0.68	5.093-3.450 4.272-2.894	320 –	Brass Alum.	1494	1493	102	1.020 0.510	0.003	1.148 0.638	.003 0.064	
X_S	100	90	8.20-12.5	8.20-12.40	6.557	4.572	0.33-0.47	6.614-4.570 5.547-3.833	52 67	Brass Alum.	40B 136B	39 135	90	0.900 0.400	0.003	1.000 0.500	0.003 0.050	10
	120	75	9.84-15.0	10.00-15.00	7.868	3.810	0.26-0.34	8.078-5.472 6.775-4.590	346 347	Brass Alum.			75	0.750 0.375	0.0003	0.850 0.475	0.003 0.050	
K_U	140	62	11.9-18.0	12.4-18.0	9.486	3.160	0.18-0.25	10.696-7.246 8.971-6.077 6.762-4.581	91 349 107	Brass Alum. Silver	541A – –	419 – 	62	0.622 0.311	0.002	0.702 0.391	0.003 0.040	
	180	51	14.5-22.0	15.0-22.0	11.574	2.590	0.12-0.17	14.406-9.759 12.082-8.185	352 351	Brass Alum.			51	0.510 0.255	0.0025	0.590 0.335	0.003 0.040	
K	220	42	17.6-26.7	18.0-26.5	14.047	2.137	0.066-0.094	22.042-15.464 18.487-12.970 13.936-9.778	53 121 66	Brass Alum. Silver	596A 598A –	595 597 –	42	0.420 0.170	0.0020	0.500 0.250	0.003 0.040	24
	260	34	21.7-33.0	22.0-33.0	17.328	1.730	0.053-0.076	26.465-17.928 22.197-15.036	354 355	Brass Alum.			34	0.340 0.170	0.0020	0.420 0.250	0.003 0.040	
K_A	320	28	26.4-40.1	26.5-40.0	21.08	1.422	0.036-0.051	35.413-23.989 29.701-20.120 22.381-15.168	271 – 96	Brass Alum. Silver	600A –	599 –	28	0.280 0.140	0.0015	0.360 0.220	0.002 0.040	
Q	400	22	33.0-50.1	33.0-50.0	26.34	1.138	0.023-0.033	49.491-33.526 41.508-28.119 31.292-21.198	272 – 97	Brass Alum. Silver		383 –	22	0.224 0.112	0.0010	0.304 0.192	0.002 0.040	
	500	19	39.3-59.7	40.0-60.0	31.36	0.956	0.016-0.023	64.367-43.603 40.697-27.569	358	Brass Silver		1529*	19	0.188 0.094	0.0010	0.268 0.174	0.002 0.040	47
V	620	15	49.9-75.8	50.0-75.0	39.86	0.752	0.010-0.144	92.152-62.425 58.265-39.470	273 98	Brass Silver		385	15	0.148 0.074	0.0010	0.228 0.154	0.002 0.040	
	740	12	60.5-92.0	60.0-90.0	48.35	0.620	0.0069-0.0098	123.128-83.409 77.851-52.737	274 99	Brass Silver		387	12	0.122 0.061	0.0005	0.202 0.141	0.002 0.040	76
	900	10	73.8-112	75.0-110.0	59.01	0.508	0.0046-0.0066	165.920-112.397 104.906-71.065	359	Brass Silver		1528*	10	0.100 0.050	0.0005	0.180 0.130	0.002 0.040	
	1200	8	92.3-140	90.0-140.0	73.6	0.406	0.0030-0.0042	146.611-99.317	278	Silver		1527*	8	0.0800 0.0400	0.0003	0.120 0.080	0.001 0.020	
	1400	7	113-173	110.0-170.0	90.9	0.330	0.0019-0.0028	200.185-135.609	276	Silver		1525*	7	0.0650 0.0325	0.00025	0.105 0.073	0.001 0.020	145
	1800	5	145-220	140.00-220.0	115.7	0.259	0.0012-0.0017	288.036-195.120	275	Silver		1524*	5	0.0510 0.0255	0.00025	0.091 0.066	0.001 0.020	
	2200	4	172-261	170.0-260.0	137.3	0.218	0.00086-0.00122	372.048-252.032	277	Silver		1526*	4	0.0430 0.0215	0.00020	0.083 0.062	0.001 0.020	241
	2600	3	220-335	220.0-325.0	176.2	0.170	0.00054-0.00076	529.155-358.459		Silver			3	0.0340 0.0170	0.00020	0.156 dia	0.001	

Note 1: True theoretical values at 1 atmos. dry air at 20 C, no safety factor included

*Contact Flange

Bild/Figure 8: Waveguide for mm Frequencies

24GHz Leistungsverstärker

(24GHz Power Amplifier)

Erich Zimmermann, HB9MIN

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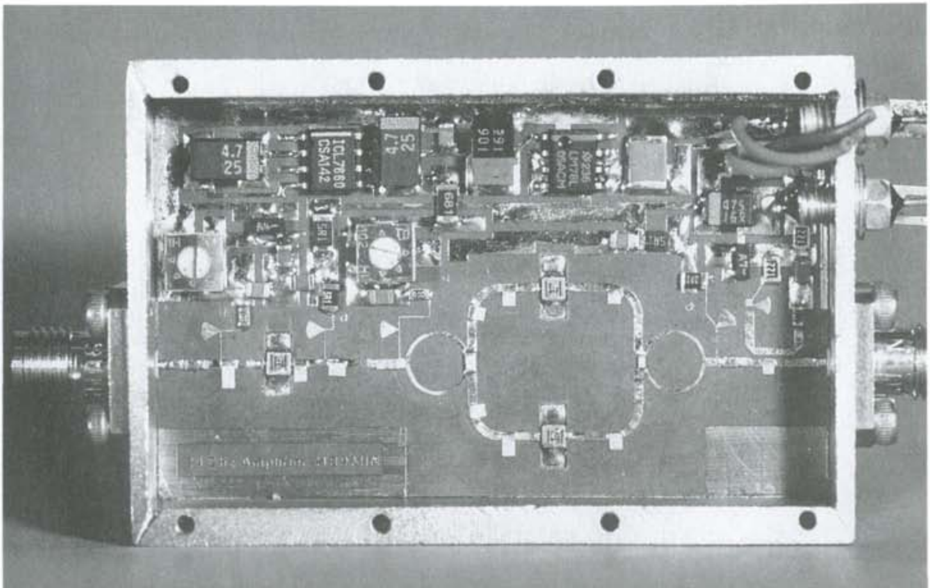
Kurzfassung: Der 24GHz Leistungsverstärker ist zweistufig und benutzt in der Endstufe zwei über Wilkinson-Teiler gekoppelte Fujitsu FLR026H GaAs-FET's. Die Ausgangsleistung beträgt 200mW bei 2dB Kompression. Die Verstärkung ist 12dB bei 20dBm Ausgangsleistung.

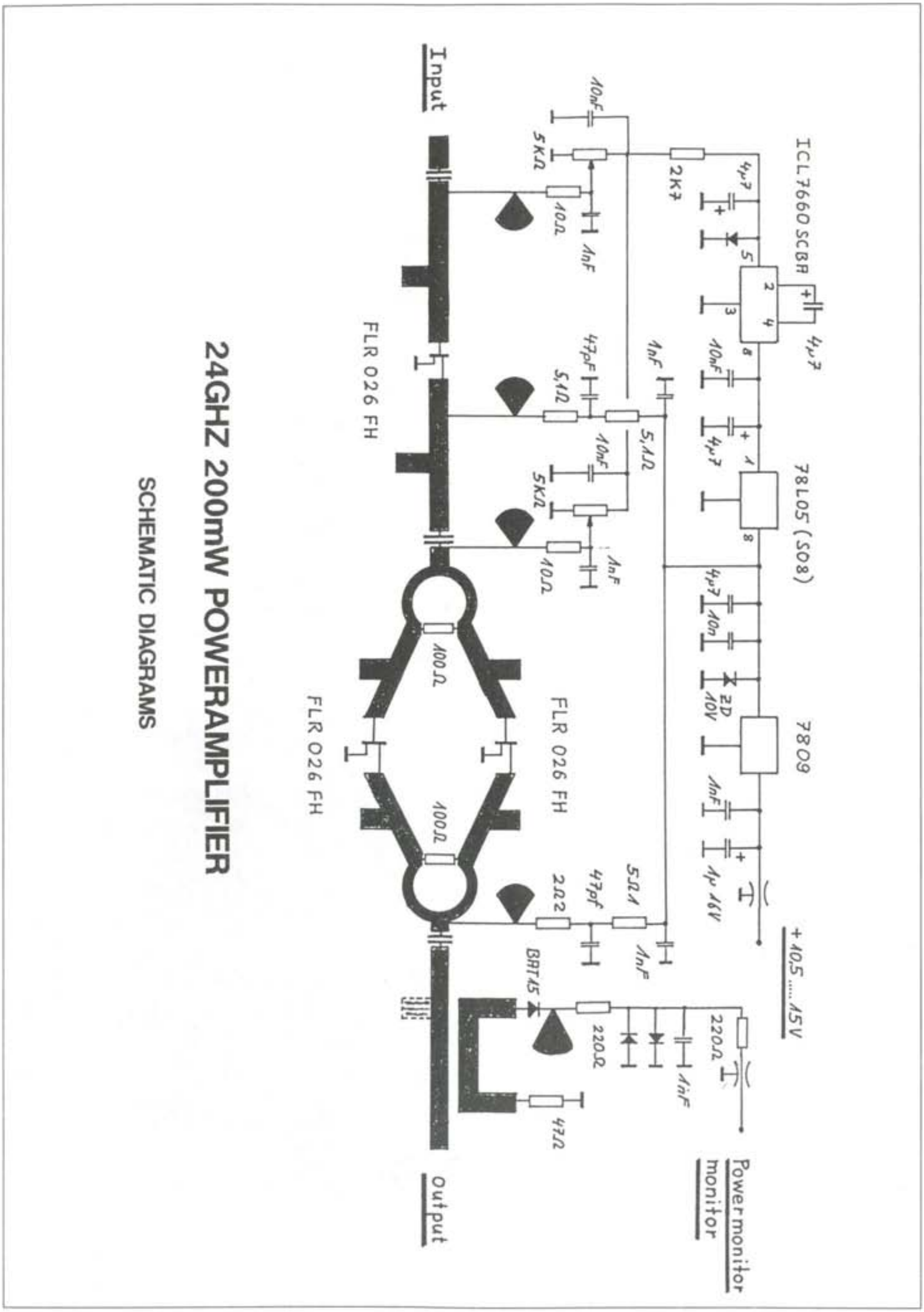
Abstract: The 24GHz power amplifier is a two-stage design. It uses two Fujitsu FLR026H GaAs-FETs coupled with Wilkinson-combiners in the final. The output power is 200mW at 2dB compression. Gain is 12dB at 20dBm output.

Einführung

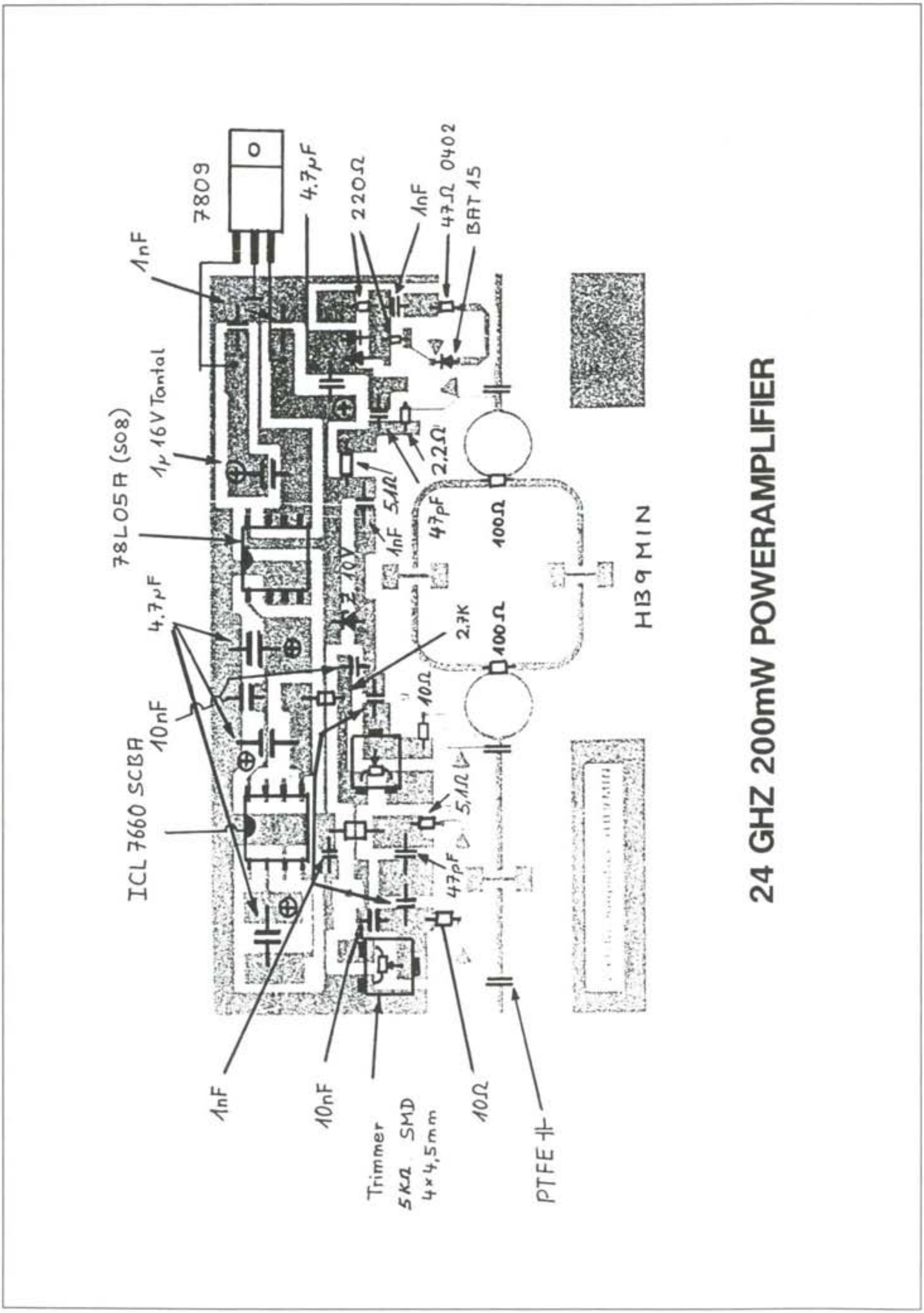
Seit den ersten Veröffentlichungen über 24 GHz SSB Baugruppen von DB 6 NT und HB 9 MIN sind mehrere Jahre vergangen. Viele Amateure haben sich an den Bau eines Transverters gewagt. Die ersten erfolgreichen QSO's haben dazu ermutigt, die Stationen zu verbessern. Der Verfasser untersuchte GaAs FET's verschiedener Hersteller auf ihre Eignung als 24 GHz Leistungsverstärker. So gelang es schon 1988, mit zwei HMF0314 eine



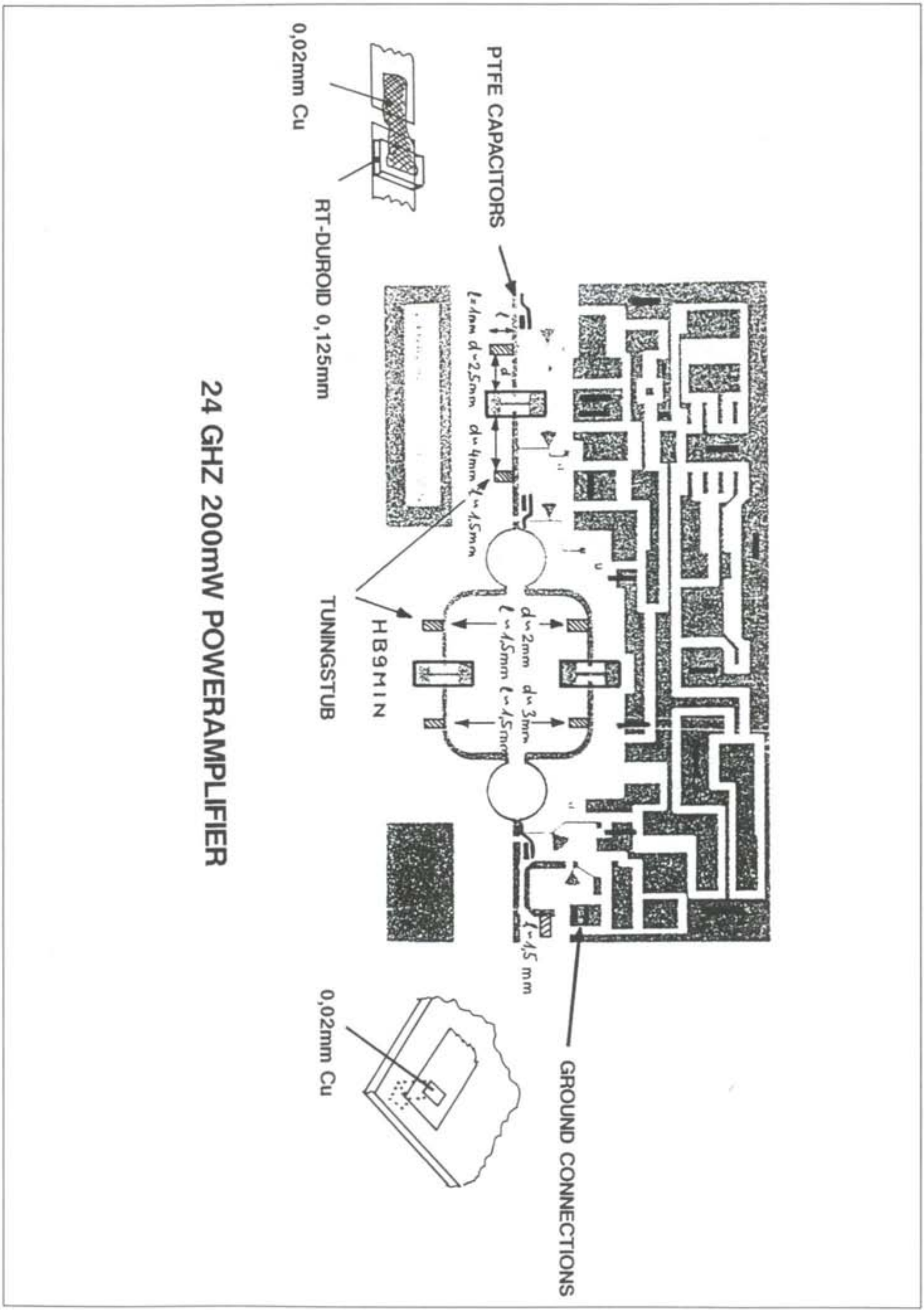
Figure/Abb. 1: 24GHz Power Amplifier



Figure/Abb. 2: Circuit Diagram



Figure/Abb. 3: Parts Layout



Figure/Abb. 4: Constructional Details

21 dBm (120 mw) Parallel-Endstufe zu realisieren, die jahrelang zuverlässig funktionierte.

Das Interesse war groß, die Leistung weiter zu erhöhen. Mit zwei GaAs FET (Chipcarrier) von MSC wurde eine 0,5 W Endstufe mit 11 dB Gain realisiert. Leider hat Siemens die MSC verkauft, worauf die GaAs FET Fertigung eingestellt wurde.

An dieser Stelle wird nun eine zweistufige 200mW Parallel-Endstufe beschrieben, bei der gehäuste FET's vom Typ FLR 026 FH zum Einsatz kommen. Dieser Verstärker hat sich beim 396 km QSO zwischen DH6FAE und HB9MIN bereits bewährt. Der Nachbau ist nur denjenigen empfohlen, die im Abgleich von 24GHz Verstärkern Erfahrung haben. Eine in der Frequenz einstellbare 24GHz Quelle mit regelbarer Ausgangsleistung und ein Powermeter sind notwendig!

Introduction

Some years have been passed since the first publications about 24GHZ SSB-modules by DB6NT and HB9MIN. The next logical step was to provide enough power.

The first trial was a power amplifier with two HMF0314, which provided an output power of 21dBm. The next project was a 500mW power amplifier with two chip GaAs-FETs from MSC. Since MSC has been sold by Siemens these FETs are discontinued.

The current version is compromised of three FLR026FH GaAs FETs from Fujitsu and provides about 200mW output. It has been successfully used during the record QSO between DH6FAE/P and HB9MIN/P. Sufficient measurement equipment and some experiencies in constructing GHz-equipment are needed to build this amplifier.

Schaltung

Der gesamte Verstärker samt Spannungsversorgung ist auf 0,25 mm RT 5870 Duroid realisiert. Anpaßelemente sind nicht geätzt, um den Aufbau mit verschiedenen GaAs FET's zu ermöglichen. Um geätzte Anpaßelemente auf 24 GHz einsetzen zu können, sind überall die gleichen Elemente, Trennkonclensatoren, Sourcedurchkontaktierungen und Verarbeitungsmethoden erforderlich, was bei Amateuraufbauten schwierig ist. Der Abgleich geschieht durch Verschieben von Stub's. Das Eingangssignal von 13 dBm wird mit dem FLR026FH auf 19 dBm verstärkt. Ein Wilkinsonteiler, dessen Ausgänge voneinander entkoppelt sind, teilt das Signal gleichphasig auf die zwei Transistoren auf. Hier wird es in zwei identischen Stufen mit dem FLR026FH auf 20dBm verstärkt. Da Gate und Drain beider FET's galvanisch verbunden sind, sollten sie annähernd gleichen IDSS haben. Die Signale beider GaAs FET Verstärker werden im Wilkinsonkoppier addiert, so dass 200 mW Ausgangsleistung zur Verfügung steht. Die Verstärkung und Leistung sind abhängig vom guten Aufbau und Abgleich. Da alles gewissen Streuungen und Toleranzen unterliegt, dürften mindestens 190 mW bei 10 dB Verstärkung erreicht werden. Der Richtkoppler am Ausgang koppelt einen kleinen Teil der Leistung aus, die in der Diode gleichgerichtet wird. Ein Instrument dient zur Kontrolle der Ausgangsleistung. Die Stromversorgung besteht aus einem LM 7885 oder LM 7809 Spannungsregler für die Drainversorgung und dem ICL 7660, weicher die negative Gatevorspannung erzeugt. Die Speisespannungszuführungen sind aufwendig mit Widerständen und Kondensatoren entkoppelt, um Instabilitäten bei tieferen Frequenzen entgegenzuwirken.

Circuit Description

The amplifier is constructed in microstripline technique on a 0.25mm thick TFE-board (Duroid RT 5870). Matching elements are not printed to allow for different FETs. Instead tuning is provided by soldering small stubs on the input and output striplines.

The first stage with a FLR026FH has a gain of 6dB at an input signal of 13dBm. A subsequent Wilkinson hybrid splits the power for two identical final stages with FLR026FHs. The output power is added in second wilkinson hybrid. Select the *IDSS* of the FETs for similar values, because there is a DC-connection between the two FETs. After the combiner an output power of 200mW can be expected. At the output line there is a directional coupler for monitoring the output power. The supply voltage is regulated by a fixed voltage regulator LM7809. Negative bias voltage is provided by an ICL7660. Careful decoupling of the DC-lines cares for troublefree operation.

Konstruktion

Um den Aufbau zu vereinfachen und die Abmessungen zu verringern ist die Spannungsversorgung mit SMD-Bauteilen auf demselben Print realisiert worden. Als Substrat dient 0,25 mm RT 5870 von Rogers, mit den Abmessungen 31 x 53 mm.

1. Mit Skalpell und Metallmaßstab Substrat in das Gehäuse passend zuschneiden. Die GaAs FET's benötigen im Print drei 2,0 x 4 mm große Aussparungen, wo sie direkt auf den Gehäuseboden gelötet werden. Durchkontaktierungen herstellen, in dem das Duroid vorsichtig mit dem Skalpell geschlitzt wird. Danach werden die vorverzinnten ca. 2 mm breiten, 0,05 mm dünnen Kupferbändchen durchgesteckt, beidseitig umgebogen, auf 0,5 mm Länge gekürzt und flachgedrückt (kleinen Stempel herstellen, leichter Hammerschlag!) anschließend mit wenig Lötzinn sauber verlöten.
2. Die 2 x 4 mm grosse Fläche im Gehäuse, wo die FET's später eingelötet werden, dünn vorverzinnen. Zum Einkleben der Leiterplatte ins Gehäuse ist es wichtig, die Printrückseite und das Gehäuse mit Nitroverdünner von Kolophonium und anderen Verschmutzungen zu reinigen.
3. Die Printrückseite mit einer dünnen Schicht (0,2 mm) Leitkleber Epotek H 31 bestreichen. Print unter ständigem Druck mittels eines Stempels ins Gehäuse pressen. Auf einer Wärmeplatte bei 150"C während 40 Min. aushärten lassen. Die Fläche, wo die FET's eingelötet werden, von Leitkleber befreien.
4. Bestücken der Spannungsversorgung, 24 GHz Koppelkondensatoren, Detektordiode usw.
5. Prüfen der Versorgungsspannungen und zwar an den Punkten, wo die FET's eingelötet werden. Kontrolle der Koppelkondensatoren. Regelbereich der -Ug Poti's testen.
6. Speisung entfernen. ESD-Schutzmaßnahmen vorkehren. D.h. Verstärker, Lötkolben, Operator auf gleiches Potential bringen. Anschlußfahnen am Gate und Drain auf 0,3 mm kürzen. Source Anschlüsse satt am Gehäuse abschneiden. FET plazieren, zuerst Gate und Drain anlöten. Gehäuse auf ca. 150°C vorwärmen und vorsichtig die Sourceanschlüsse beidseitig mit dem Gehäuseboden verlöten. Nach dem Abkühlen, mit Nitroverdünner reinigen und mit Preßluft ausblasen.

Construction

The nominal size of the PCB is 31x53mm. It's made from Duroid RT 5870.

1. Trim PCB to fit into the box. Small rectangular holes of 2x4mm size have to be cut for the FETs. Contact through with 2mm wide stripes of 0.05mm copper foil.

2. Mark the areas in the box, where the FETs are to be mounted. Tin them with your soldering iron. Clean the PCB before mounting.

3. Apply epoxy cement EpoTek H31 to the back side of the PCB. During the hardening time of about 40 minutes press the PCB into the box with a tool. The box should have a temperature of 150°C during this process (Put it on a hotplate). Afterwards clean the mounting areas for the FETs.

4. Fit all parts to the PCB except the FETs.

5. Check the supply voltages and the variation of the gate voltage.

6. Cut gate and drain leads of the FETs to 0.3mm and cut source legs directly at the package. Put FETs into position, solder drain and gate legs. heat box to 150°C (hotplate) and solder source terminals to the bottom of the box. During this process ESD countermeasures should be guaranteed, i.e. take care that everything (device, box, soldering iron and operator) are on the same potential.

Abgleich

1. Stromversorgung anschliessen. Mit dem zugehörigen Potmeter die Drainströme von T, auf 70 mA, sowie T2 + 3 auf 140 mA einstellen. Danach Wattmeter anschliessen. Verstärker mit ca. 13 dBm ansteuern. Vorbereitete Stubs an den im Schema eingezeichneten Stellen plazieren und abwechslungsweise, durch Verändern von Länge und Position, auf maximale Leistung optimieren. Unter ständiger Kontrolle der Ausgangsleistung Stub sorgfältig mit wenig Lötzinn anlöten. Nun sollte die Ausgangsleistung, je nach Transistoren, min. 190 mW betragen. Bei Instabilitäten, bedingt durch Gehäuseresonanzen,

schafft auf dem Gehäusedeckel angeklebtes Absorbermaterial Abhilfe.

2. Am Powermonitorausgang sollten bei Pout=23 dBm einige µA fließen. Um den Strom zu erhöhen, kann die Auskoppelleitung mittels einer Fahne hin zur 50Ω Leitung verbreitert werden.

Alignment

1. Apply supply voltage. Set drain current of each FET to 70mA. Connect powermeter and drive (13dBm). Apply stubs at indicated positions and optimize their lengths and positions to maximum output power. Finally solder them carefully. In case of instability apply some absorber material to the lid of the box.

2. The power monitor terminal should provide some µA of current.

Meßwerte

Meßwerte bei f = 24.2 GHz

P_{in} [dBm]	P_{out} [dBm]	Gain [dB]
8	20	12
10	22	12
13	23	10

$P_{out}(Sat)$: >23dBm
Linear Gain: 12dB
DC-Arbeitspunkt:

V_{DS} = 8V V_{GS} = -1V
T1: I_{DS} ≈ 60% of I_{DSS}
T2,3 I_{DS} ≈ 60% of I_{DSS}

Stromaufnahme ohne HF: 200mA
Speisespannung: 10,8 ... 15v

Results

Results at f = 24.2 GHz, see table above.

$P_{out}(Sat)$: >23dBm
Linear Gain: 12dB
Bias:

V_{DS} = 8V V_{GS} = -1V
T1: I_{DS} ≈ 60% of I_{DSS}
T2,3 I_{DS} ≈ 60% of I_{DSS}

DC-Current without drive: 200 MA
Supply voltage: 10,8 ... 15v

Teile/Parts

GaAs FET: Treiber und Endstufe mit FLR 026 FH, zu beziehen bei: Melatronik Nachrichtentechnik D-8044 Unterschleißheim, Tel. 089/3104076

Koppel C's: Es eignen sich am besten selbst hergestellte 0,7 x 1,5 mm große Plättchen aus 0,125 mm RT-Duroid. Zur Not gehen auch SMD Chip Kondensatoren der Größe 0603 mit 0,5pf Kapazität.
Homemade from 0.7x1.5mm RT-Duroid, 0.125mm thick.

SMA Buchsen: Flanschbuchsen mit vorstehendem Dielektrikum und Stripline Übergang.
Microstrip Launcher

Detector Diode: Low Barrier Diode BAT 15. Am besten ist es Beam lead's einzusetzten. Für BAT 15 im Micropill-Gehäuse ist etwas mehr Leistung auszukoppeln.
Siemens BAT15

Weitere Bauteile: Der LM 7885 oder 7809 ist im TO 220 Gehäuse. Der ICL 7660 und 7805 im 508 SMD Gehäuse. Die andern Komponenten sind SMD Bauteile, die auf dem Markt erhältlich sind. Widerstände und Keramikkondensatoren haben die Größe 0603 oder 0805.
LM7809 in TO-220 package. ICL7660, LM7805 ind 508 SMD-package. SMD parts in size 0805 or 0603.

Leiterplatte/PCB: Kann beim Verfasser bezogen werden.
From the author.

Leistungsverstärker für 13cm

(Power Amplifier for 13cm)

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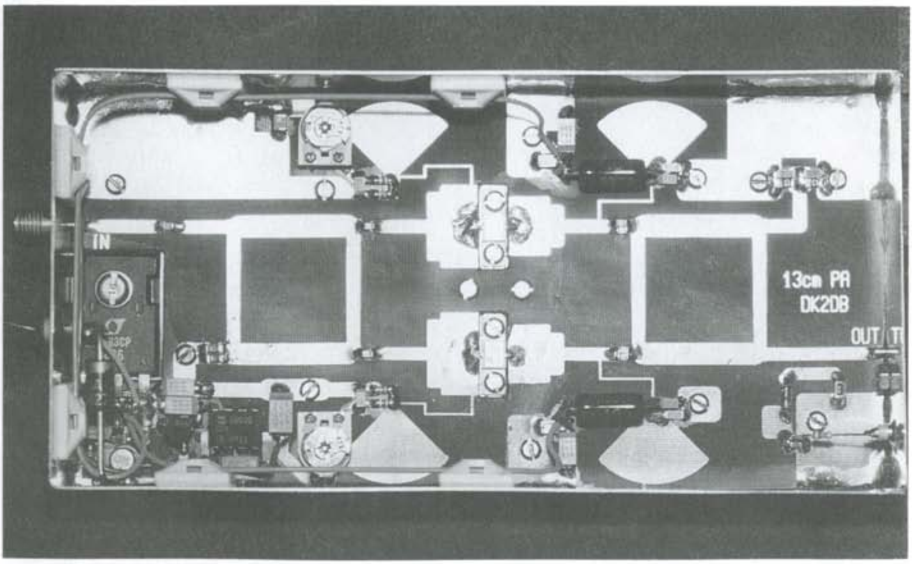
Kurzfassung: Durch Einsatz zwei preiswerter GaAs-FET's MGF-0905 wird eine Ausgangsleistung von 8...11W bei 1dB Kompression und 8,5dB Verstärkung erreicht. Die Betriebsspannung ist 12...14V bei max. 2,5A Strom. Der Aufbau erfolgt in Microstripline-Technik.

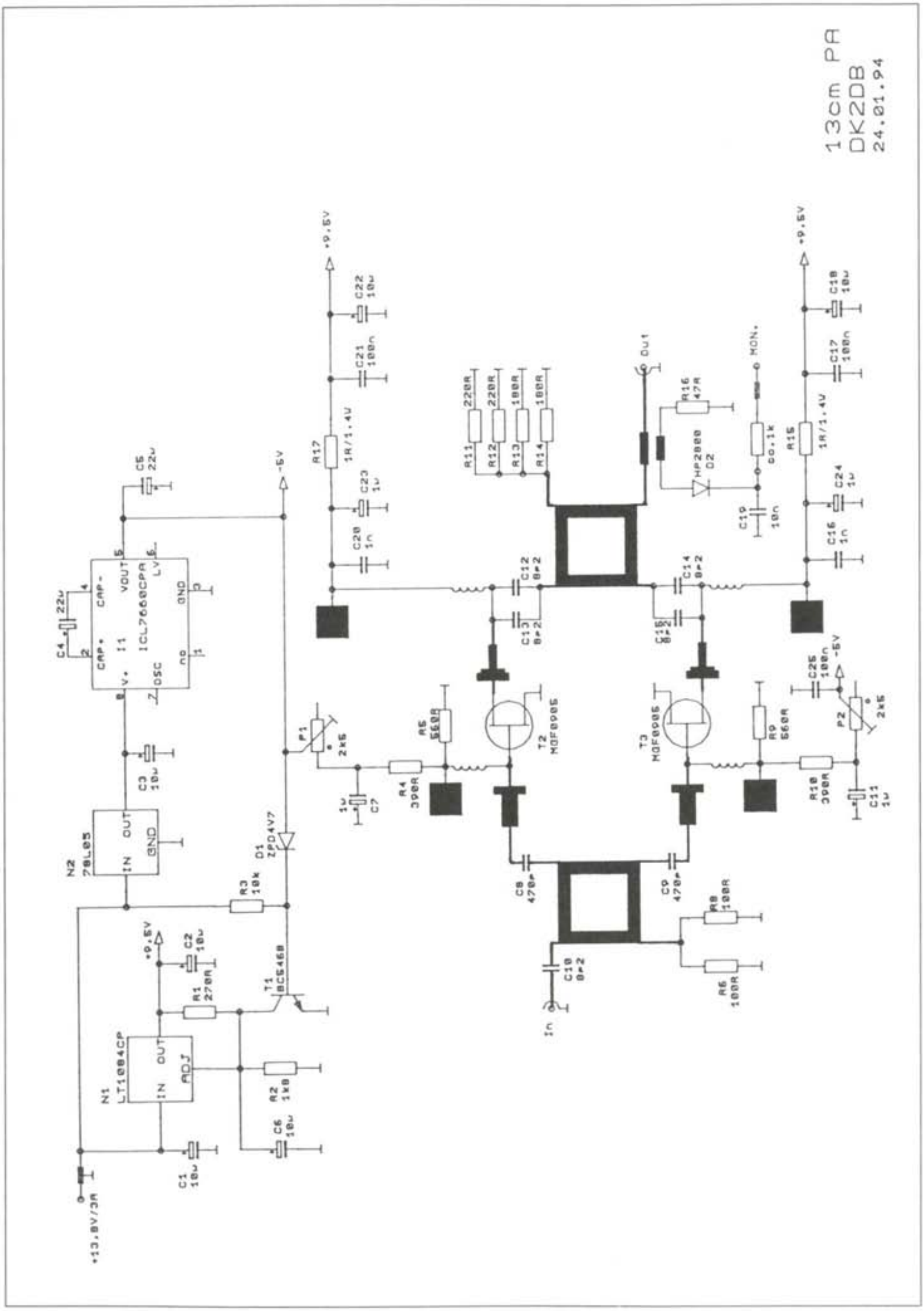
Abstract: Two Low-Cost GaAs-FETs MGF-0905 provide an output power of 8...11W at 1db compression and at a gain of 8.5dB. The construction is lightweight, small and in micro-stripline. Supply voltage is 12...14V at maximum 2.5A current.

Einführung

Durch die Entwicklung des neuen 13cm-Transverters von DB6NT und der bei mir bereits vorhandenen 9cm Endstufe [1] mit ca. 10 Watt Ausgangsleistung mit den Leistungs-FETs MGF0905 entstand der Wunsch, für den 13cm-Transverter ebenfalls eine PA mit dieser Leistung zu benutzen. Nach Rücksprache mit DB6NT, der selbst keine PA entwickeln wollte, wurden von mir zusammen mit DF5SL einige Versuche mit dem wesentlich teureren und theoretisch leistungsfähigeren Tran-



13cm Power Amplifier



Figure/Abb. 1: Circuit Diagram

sistor MGF0906 gemacht. Leider macht der Transistor im Gegensatz zu den Datenblattangaben nicht wesentlich mehr Leistung und auch nicht mehr Verstärkung als der MGF0905. Deshalb wurde der Gedanke, diesen Transistor einzusetzen, verworfen.

Aufbauend auf der Idee der 9cm PA wurde ein Entwurf mit 2 Transistoren MGF0905 gemacht, bei dem die Hybridkoppler und die Ein- und Ausgangsanpassungswerte neu berechnet wurden. Für den Aufbau ist ein Teil der Baubeschreibung von [1] im Einverständnis von DB6NT hier nochmals wiedergegeben.

Schaltung

Am Ausgang des Verstärkers befindet sich ein Richtkoppler mit einer Schottkydiode, um die abgegebene Leistung an einem Drehspulinstrument jederzeit kontrollieren zu können (Abb. 2)

Die Versorgungsspannung der Endstufe liegt bei 11V bis max. 15V bei einer Stromaufnahme von ca. 2,5 A. Diese Eingangsspannung wird mit einem Low-Drop Spannungsregler LT1084CP auf ca. 9,5 V stabilisiert.

Der Spannungsinverter ICL 7660 versorgt die Baugruppe mit negativer Gatevorspannung. Diese wird mit einem Transistor überwacht, um bei Ausfall die Drainspannung zurückzuregeln und somit den Strom zu begrenzen.

Konstruktion

Der mechanische Aufbau ist Bild 5 zu entnehmen. Dies ist, wie oben erwähnt, von [1] übernommen.

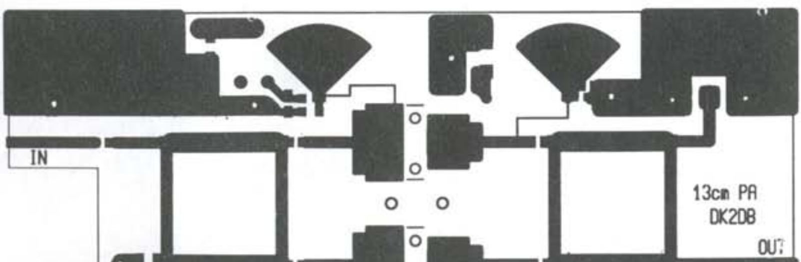
Die Teflonleiterplatte wird mittels M2-Schrauben auf eine 6mm(!) starke Aluplatte montiert, die als mechanischer Träger und als Kühlkörper fungiert.

Die Leiterplatte sollte an den vorgesehenen Massestellen oben und unten mit dem Weißblechgehäuse verlötet werden.

Bei dieser Einbaumethode muß allerdings die Aluplatte mit einer großen Fase versehen werden. Selbstverständlich kann auch die Methode mittels Silberleitlack wie in [1] beschrieben verwendet werden. Für die Funktion der Endstufe hat dies keine Auswirkung.

Auf jeden Fall ist auf eine gute Kontaktierung an den Einbaustellen der Transistoren und an den SMA-Buchsen zu achten.

Die 6mm starke Trägerplatte hat die gleichen Abmessungen wie die Standard-Weißblechgehäuse. Sie werden mit M 2,5 Schrauben an den Stirnflächen miteinander verbunden.



Figure/Abb. 2: PCB

Der Spannungsregler muß isoliert eingebaut werden, entweder mit einer Glimmerscheibe oder mit einer entsprechend anderen Kunststoffscheibe mit Wärmeleitpaste (z.B. SILPAD o.ä.)

Da die Eingangsimpedanz der verwendeten Transistoren sehr niederohmig ist, sollten die GATE-Anschlußfähnchen auf kürzestem Wege zur Leiterplatte geführt werden. Der HF-mäßig beste Einbau würde sich beim Einbau in eine "Einfräsung" der Transistoren in die Aluplatte ergeben, was aber eine gute mechanische Werkstatt voraussetzt. Eine andere sichere Art ist es, die GATE-Beinchen mit ca. 3-4mm breiten Messingplättchen zu verbreitern. Mit dieser Verbreiterung und "gutem" Anlöten ist eine Verstärkungserhöhung von ca. 1dB zu erreichen.

Die Montage des Bausteins sollte auf einem zusätzlichen Kühlkörper oder auf einer Gehäuserückwand erfolgen. Bei ATV-Anwendung sollte dieser Kühlkörper nicht zu klein gewählt werden!

Abgleich

Der einzustellende Ruhestrom kann indirekt an den 1Ω Widerständen gemessen werden, als guter Kompromiß zwischen Linearität und Wirkungsgrad sind ca. 600-700mA pro Stufe einzustellen.

Durch eventuelles Anbringen kleiner Abstimmfähnchen können Bauteiletoleranzen ausgeglichen und somit die maximale Leistung erreicht werden.

Meßwerte

Die erreichten Leistungswerte sind den Abb. 6 und 7 zu entnehmen.

Die Verstärkung ist ca. 8 dB bei 1dB Kompression, d.h. bei Ansteuerung mit ca. 1,6 W aus dem 13cm Transverter sind mit ca. 10W Ausgangsleistung zu rechnen.

Die Ausgangsleistung (Abb. 6) beträgt bei den besten Exemplaren 10,5dBW (=11W) bei 1dB Kompression, dürfte aber immer über 9dBW(=8W) liegen.

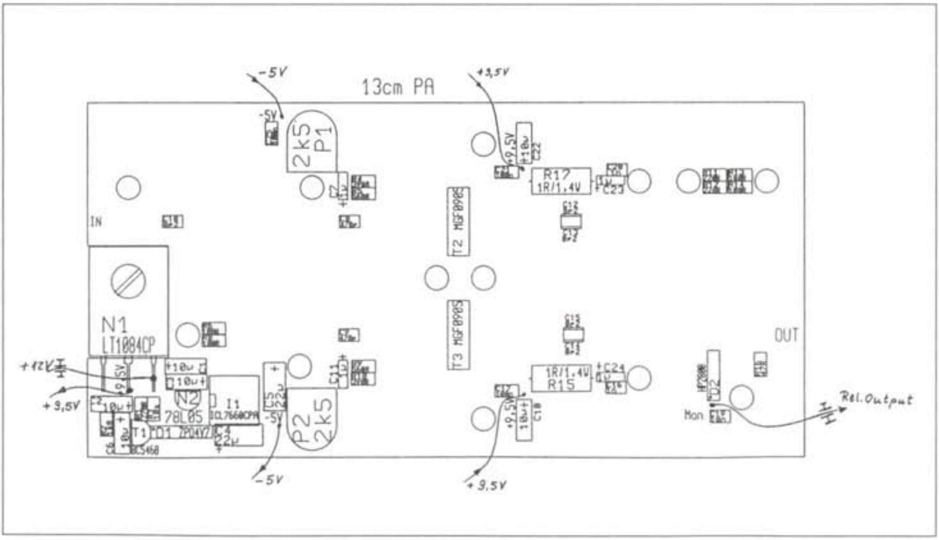
Die PA ist ziemlich breitbandig (Abb. 7) und hat eine gute Eingangsrückflußdämpfung von besser als 20dB.

Die Schaltung arbeitet sehr stabil. Schwingneigungen wurden nicht festgestellt.

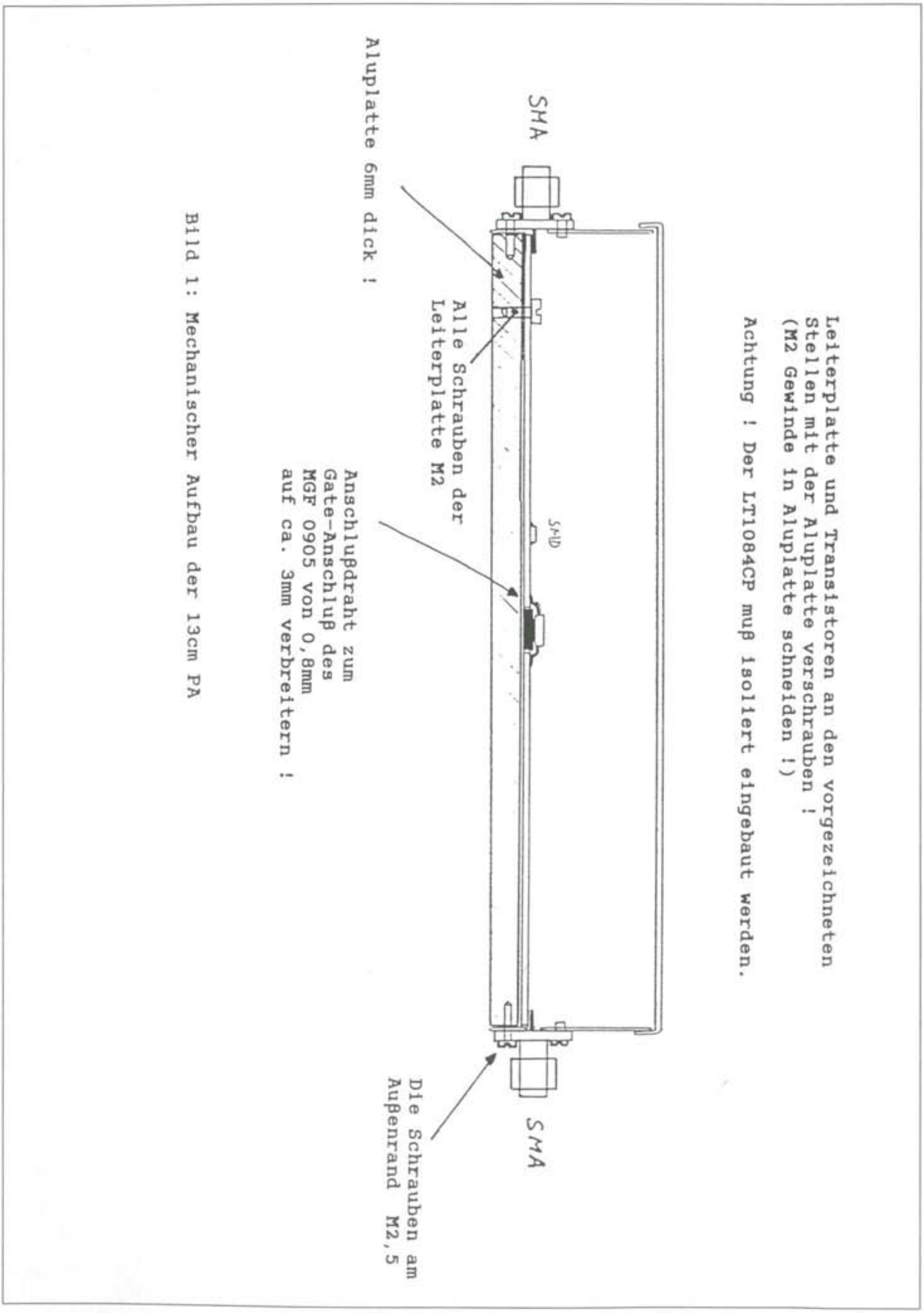
English Version

Introduction

After publication of the new 13cm Transverter by DB6NT ([5]) there was a need for a small 10W

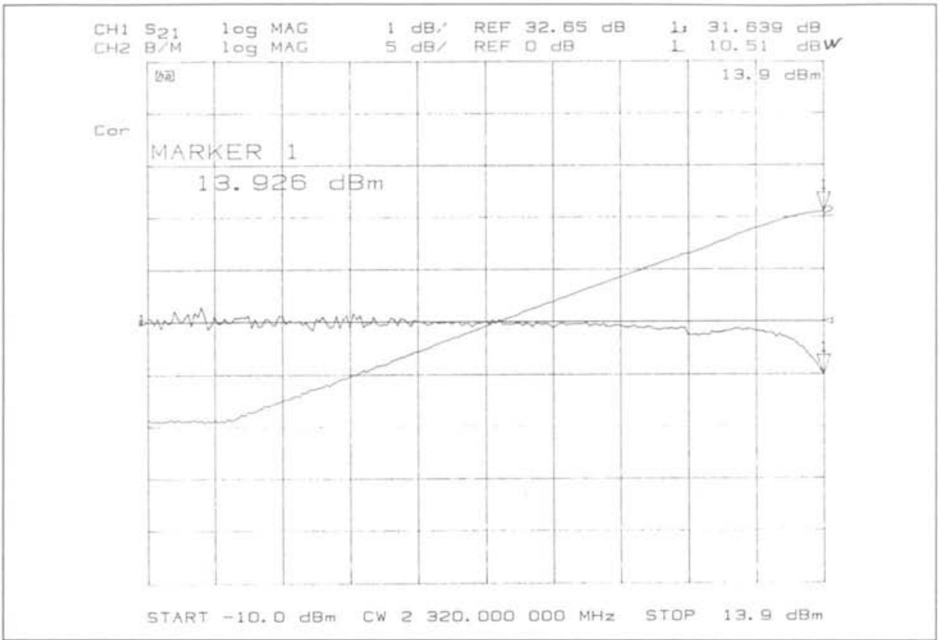


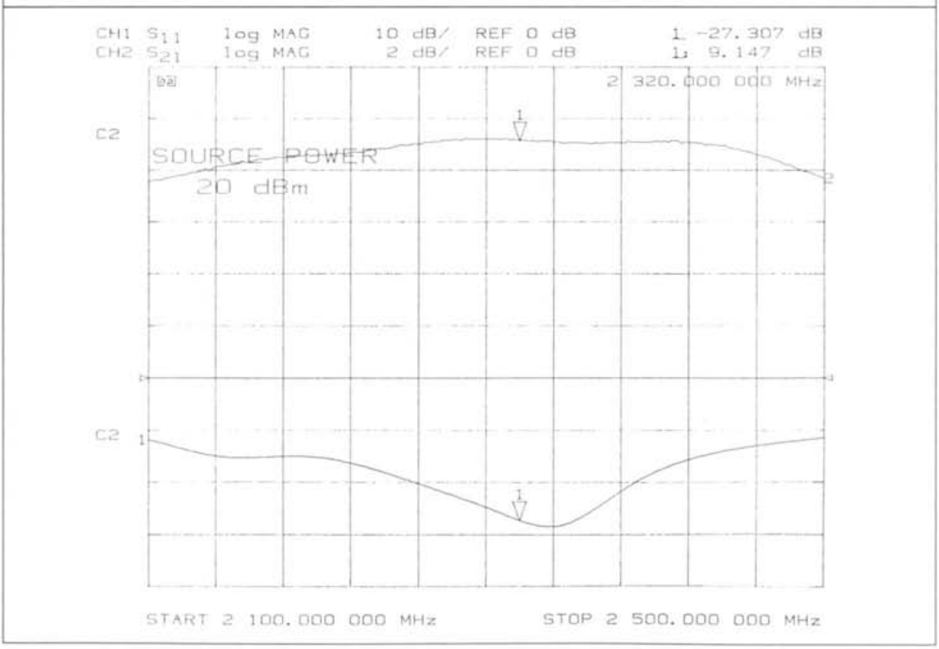
Figure/Abb. 3: Parts Layout



Figure/Abb. 4: Mechanical Construction

Figure/Abb. 5: Gain Compression





Figure/Abb. 6: Gain and Input Return Loss at Pin=100mW

power amplifier with sufficient gain as a companion. Some experiments together with DF5SL showed, that the more expensive FET MGF-0906 provided the same gain and and only slightly more output power than the cheaper MGF-0905.

Circuit Description

Patterned after the design of a 9cm power amplifier by DB6NT ([1]) two identical stages equipped with a MGF-0905 are coupled with 90° branch couplers. A directional coupler in the output microstripline and a HP2800 RF-detector provide means for monitoring the output power. The power supply is constructed around the low-drop-regulator LT1084CP. The inverter ICL7660 provides the negative voltage for the gate bias. Transistor T1 provides a fail-safe circuit in case of failure of bias voltage.

Construction

The PCB is shown in figure 3 and the parts layout can be seen from figure 4. Mount the PCB with M2 screws onto a 6mm thick plate made from aluminium. This plate is the mechanical carrier and a heat spreader for a larger secondary cooler. The secondary cooler should provide a thermal resistance of less than 1.5K/W, because with full output power 25 watts! have to be dissipated. A standard tinplate box is mounted around the heat spreader.

The transistors are not mounted into nuts but on the flat surface of the heat spreader. This eases mechanical construction of the box but the leads of the FETs have to be soldered onto the PCB via small brass spacers to achieve the necessary clearance.

Alignment

A bias current of 700mA per transistor is optimum. This can be measured as a voltage across the 1Ω drain resistors. Small tuning stubs at the hybrids may improve power output and gain.

Results

Fig. 6 shows gain compression versus power output. Gain is 8dB at 1dB compression and output power can be 10.5dBW (=11W) with good transistors. It should be better than 9dBW(=8W). Saturation power is always in excess of 10W. An output of 1.6W at the transverter output can be amplified to around 10W with this PA.

The amplifier is broad band (Fig. 7) and has good input return loss of better than 20dB. The electrical stability is excellent.

Literatur/References

[1] M. Kuhne, DB6NT, "Powerfet-Verstärker für das 9cm Band", DUBUS TECHNIKIII, pp.194-203

[2] MITSHUBISHI Semiconductors, "GaAs FIELD EFFECT TRANSISTOR, 1991

[3] DJ5XA, "Dimensionierung eines Stripline-Ringhybrids", UKW-Berichte 4/1975, Seite 214

[4] DJ9XN, "Dimensionierung von Streifenleitungskreisen in Mikrostrip-Technik", UKW-Berichte 11/1971, Seite 206 ff

[5] M. Kuhne, DB6NT, "Linear Transverter for 13cm", DUBUS 3/1193, pp.10-21

Teile/Parts

Platinen und Bausätze sind exklusiv bei Eisch-Electronic, Abt-Ulrich-Str. 16, 89079 Ulm-Gögglingen, zu erhalten. **Für alle evtl. anderweitig vertriebenen Platinen hat der Verfasser keine Einwilligung gegeben!**

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Danksagung/Acknowledgement

Mein Dank gilt Richard, DF5SL für die ersten Aufbauten und die ersten Tests, Henning, DF9IC für das Nachrechnen der Hybridkoppler nach ersten Schwierigkeiten und bei meinem Freund Robert (ohne Lizenz) für die Erstellung des Layouts.

I have to thank Richard, DF5SL, for the prototypes and tests, Henning, DF9IC, for checking the design of the branch couplers, and my friend Robert for doing the layout.

Table/Tabelle 1: Parts List

Pos.	Anzahl	Bezeichnung/Description	Teil-Nr./Part-No.
1	4	SMD-Tantal Bauform A 1µF/16V	C7,C11,C23,C24
2	6	SMD-Tantal Bauform C 10µF/16V	C1,C2,C3,C6,C18,C22
3	2	SMD-Tantal Bauform D 22µF/16V	C4,C5
4	5	SMD-Keramik Cs 0805 8,2pF	C10,C12,C13,C14,C15
5	2	SMD-Keramik Cs 0805 470pF	C8,C9
6	2	SMD-Keramik Cs 0805 1nF	C16,C20
7	1	SMD-Keramik C 0805 10nF	C19
8	3	SMD-Keramik Cs 1206 100nF	C17,C21,C25
9	1	SMD-Widerstand 1206 270Ω	R1
10	1	SMD-Widerstand 1206 1,8kΩ	R2
11	1	SMD-Widerstand 1206 10kΩ	R3
12	2	SMD-Widerstände 1206 390Ω	R4,R10
13	2	SMD-Widerstände 1206 560Ω	R5,R9
14	2	SMD-Widerstände 1206 100Ω	R6,R8
15	2	SMD-Widerstände 1206 180Ω	R13,R14
16	2	SMD-Widerstände 1206 220Ω	R11,R12
17	1	SMD-Widerstand 1206 47Ω	R16
18	2	4Watt-Widerstände RWM 4 1Ω	R15,R17
19	1	Zenerdiode W ZPD 4,7	D1
20	1	Schottkydiode HP 2800	D2
21	2	Potentiometer VA05H 2,5kΩ	P1,P2
22	1	Spannungsregler LT 1084 CP	N1
23	1	SILPAD für Pos. 22	
24	1	Spannungsregler 78L05	N2
25	1	Spannungsinverter ICL7660	I1
26	1	Transistor BC 546B o.ä.	T1
27	2	GaAs-FETs MGF 0905	T2,T3
28	1	Transzorbdiode 16 V als Übersp.Schutz (nicht im Schaltbild eingezeichnet)	
29	1	PTFE Platine nach DK2DB, $\varepsilon_r = 2.5$, 0,79mm	PCB
30	1	Schubert-Gehäuse 74*148*30mm	
31	1	6mm ALU-Platte ins Gehäuse eingepaßt	
32	2	SMA-Vierlochbuchsen	
33	2	Durchführungskondensatoren 1nF	
34	Diverse	Schrauben M2, M2,5....	

Modern 10GHz Transverter System (Part IV)

C. Suckling, G3WDG & P. Suckling, G4KGC

The final part of this series of articles on the high performance 10GHz transverter system covers the practical construction of the units. With the exception of the G3WDG007 1W PA, the construction of all units is nearly the same, so the general method is described first, followed by the G3WDG007. For technical descriptions and tuning up details, please refer to the earlier articles in the series.

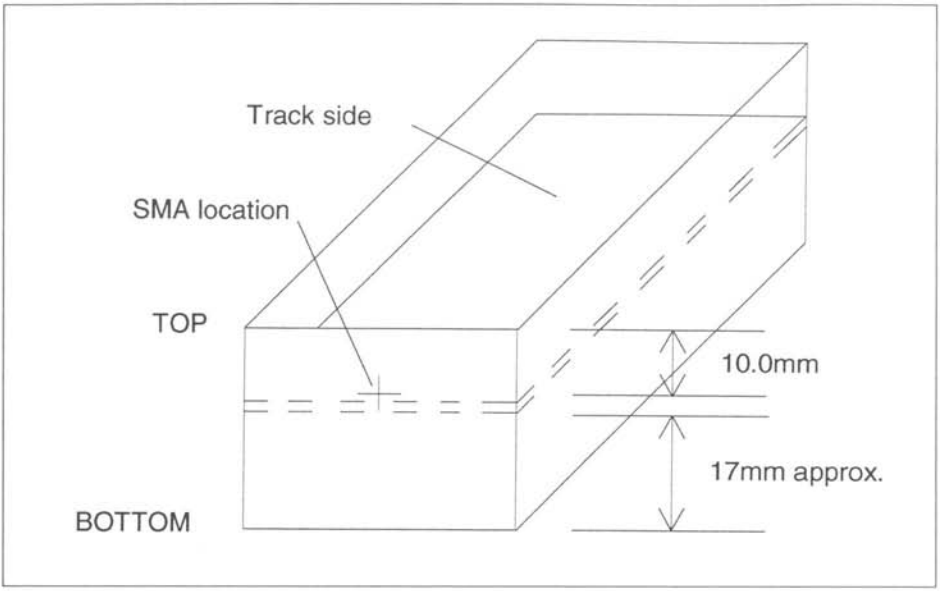
Box and RF PCB preparation

1. Assemble the tinplate box, by placing the side sections in the lids. If necessary, bend the sidewalls to give a good fit with the lids. With the box still all together, solder the outside seams as far as can be done (without soldering to the lids!).
2. Remove the lids and solder up all box seams inside and out.
3. Trim pcb to fit box. Generally pcbs are supplied slightly oversize and need a small amount of filing to fit the box. The board should be made a tight fit in the box. Remove any rough edges from the board which could interfere with later soldering. Identify the TOP side of the box, by reftting the pcb in the box and noting the side of the box from which the circuit pattern can be seen. This is defined as the TOP of the box. This is shown in Fig 1.
4. Test compatibility of solder to be used with the plating on the pcb. The boards are supplied with a thin plating of tin, which should solder easily. If this is not the case, it is best to remove the tin plate using a pcb cleaning rubber or light abrasive material to get back to bare clean copper. It is a good idea anyway to pre-tin the areas of the board where the FETs are soldered to make sure that there will be no problems later on with fitting the FETs.
5. Scribe a line 10mm from the top edge of the box, as centreline for SMA centre connector pins. Mark out position of center connector pin, to align with pcb tracks.
6. Drill holes 1.5mm diameter for all SMA connector centre pins.
7. Mark out positions of connector mounting holes using connector as a marking out jig.
8. Drill connector mounting holes 2mm dia, enlarge hole for centre pin to 3.3mm dia. Deburr using a drill on both sides. It is difficult to reach the inside of the holes with small boxes but it can be done. Filing is not recommended, as areas where the tin plating is inevitably scratched off will be difficult to solder to.
9. Assemble connectors to box with M2 screws and nuts.
10. Reassemble pcb into box and check alignment of connector pins to tracks. Check also the distance between the pcb groundplane and the bottom of the box. This should be about 17mm. Remove pcb. Cut connector pins to extend approx 1mm into box.
11. Solder connectors to box all round using sufficient heat so that the solder flows well and when cool remove fixings. The use of two soldering irons can help! Note: Stainless steel SMA connectors cannot be soldered, and are therefore not recommended.
12. Drill and deburr holes in the box for feedthrough capacitors for power connection(s). If desired, drill a 1mm hole nearby, to allow a pin to be fitted for the ground connection.

RF PCB Pre-assembly

1. Fit supplied pins into holes in PCB where grounding is required with head of pins on the circuit pattern side. Solder pins to ground-

Bild/Figure 1: Location of PCB in Box



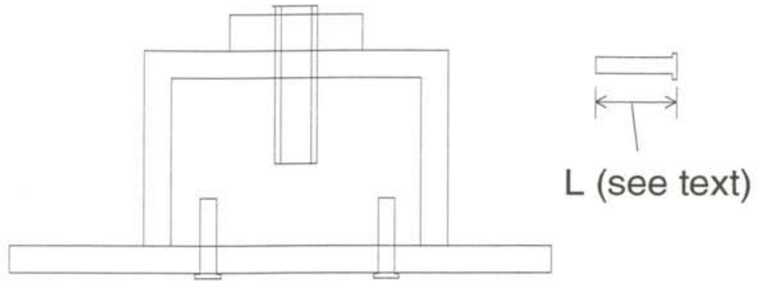
plane side. This is best done by applying solder and soldering iron to the pin and flowing the solder down to the groundplane. Do not solder to the heads of the pins on the circuit pattern side. Trim the pins with sidecutters after soldering.

2. If filters are used, fit the pins to the three locating holes for each filter on the board, with the pin heads this time on the groundplane side. Before soldering the pins to the circuit side (NOT to the groundplane) check that the filter fits properly between the pins, flat on the groundplane. If this is not the case, file the pin head(s) until this is achieved. It is very important that the filter sits flat on the board and does not sit up on any of the pins.
3. If applicable, solder the cavities in position. Various means can be used for this, including preheating the cavity on a hotplate so that it is sufficiently hot to act as its own soldering iron, using a large soldering iron or irons, or making a copper heat transfer piece with an M4 thread on one end from a piece of copper rod which is screwed into the top of the cavity and heated with a flame. Whatever method is used, it is very important to get a good joint between the cavity and the groundplane, all round the base of the cavity. If the hotplate method is used, be sure to get the cavity hot enough, or the joint may "freeze" before the operation is complete! Also, take care that the filter is located flat on the board, as noted above in 2).
4. Complete the operation by fitting the probe pins through the holes in the circuit pattern. The pins should be cut approximately to length with cutters and filed to final length. Vernier calipers should be used to check the pin length (total length is quoted in the relevant module descriptions). Aim for +0.1/ -0 mm accuracy, measurement with a ruler is NOT good enough!! The pins should be pushed fully home before soldering. Details of the cavity filter arrangement are shown in Fig. 2.

Assembling the PCB into the box

1. Reassemble the pcb into the box from the bottom side, and push it up against the RF connector pins. Try to get the board "square" in the box, not tilted to any great extent. Tack solder the groundplane in the four corners and recheck the RF input/output tracks are still touching the connector pins.

Bild/Figure 2: Section Through cavity Filter



2. Solder all round the groundplane to the box walls. Two soldering irons may be helpful here also. Make especially sure there is a good joint where the connector are located. This is necessary to ensure a proper low inductance ground path from connector to pcb. In some cases (G3WDG002) it may be necessary to apply the soldering iron to the outside of the box in the region of the filters as access is a little difficult owing to the proximity of the filter(s).
3. Fit and solder feedthrough capacitor(s) for power connections, and box grounding pin (if used).

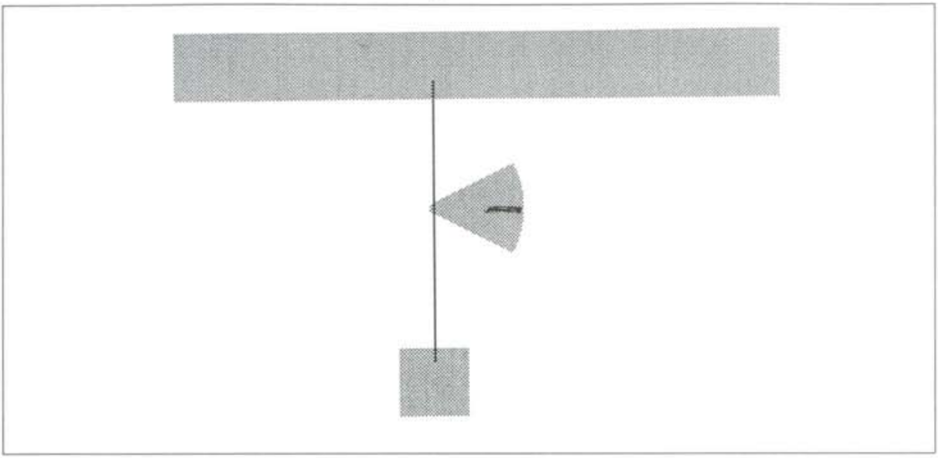
Fitting components to PCB

1. Fit wire inductors. If wire is provided in the kit, remove the green insulation. This wire does not require to be pretinned. If wire is not provided, cut to length and tin both ends. Then solder the wire by the most direct route (usually at 90 degrees to the RF track), pressing it down to make sure it is flat to the board. When soldering to the triangular stubs, the wire should be located just at the tip of the stub as shown in Fig 3.
2. Fit chip components as decribed in Appendix 1. In some cases it is necessary to mount one end of the chip on a pin head, where the layout dictates this.
3. Fit any wire ended components required (on RF side and/or on groundplane side as specified).
4. Build and test the G4FRE023 regulator board. In some cases the parts for this are provided in the kit. If not, either wire-ended or surface mount components can be used (the pcb provided will accept both). If wire-ended parts are provided, these are mounted "surface mount" style on the pcb.
5. Mount the regulator board in the lower part of the box. Regulators with metal tabs can be fitted to the box either by soldering or with a screw and nut.
6. Apply power to the module, and test that positive and negative voltages are present on the RF tracks where the FETs are to be fitted.

Fitting the GaAs FETs / mixer diode

The method used to fit the GaAs FETs is decribed in Appendix 2. Before this is done, however, some preparations need to be made to avoid potential damage to the device(s) from static discharge and/or soldering iron leakage. In the case of normal GaAs FETs, it is often possible to get away with no precautions at all and not experience any problems. With HEMTs and (expensive) power devices this philosophy needs to be reexamined. HEMTs (used in the G3WDG004 LNA) are much more susceptible to damage and this is usually not apparent in its DC characteristics, often a disappointingly high noise figure is the only observable

Bild/Figure 3: Arrangement of Wire Inductors



consequence. With power devices, the reason for care is self-evident. Where devices are supplied as part of kits, the use of these devices is entirely at the constructor's risk. The Microwave Committee Components Service cannot replace damaged devices free-of-charge!!

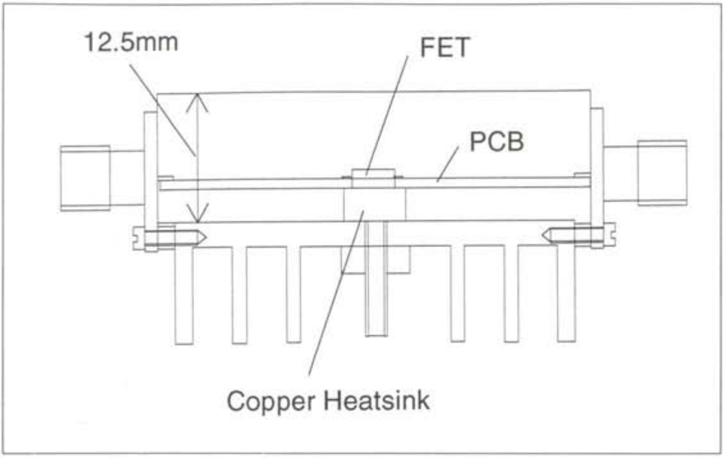
Damage from electrostatic discharge (ESD) is avoided by never allowing the possibility of the sensitive device having a different potential to any object it touches, including yourself. A simple static-free workstation should be made, such as a sheet of metal to which a wire is attached. The free end of the wire is joined to either a proprietary anti-static wristband worn at all times, or to some form of homemade body contact (such as a wire wrapped round a ring). For safety reasons it is recommended NOT to earth the workstation, and to use a high value resistor eg 100k ohms in series with the wire if using a homemade body contact. The device may than be safely unwrapped and placed on the worksurface. Source leads are cut short next using sharp sidecutters. If the sidecutters are of the type with insulated handles, touch the metal part of the cutters before allowing them to touch the device leads. At all times keep the device in your fingers, held in metal tweezers or on the worksurface. Dropping the device at this stage anywhere off the workstation is not recommended!

The last stage in the construction of all units is the installation of the GaAs devices. The module should be otherwise complete and tested for correct voltages at the ends of the lines where the device is to be connected. With no power applied to the module, place it on the metal worksurface and connect a wire between the worksurface and the module box. Next. arrange some form of connection between the soldering iron bit and the worksurface, separate from the mains earth. Check that even when hot, there is a low resistance path from the soldering iron tip and the worksurface. It is also worth checking that there is no leakage in the iron by measuring resistance between the tip and the heater connections of the iron, with the iron cold and hot. The device may then be placed in position and its source leads soldered as described elsewhere in this booklet. It is important to avoid touching the gate and drain leads with the iron during this operation. Before soldering the gate and drain the iron should be completely unplugged (retaining the tip-worksurface connection of course).

One assembled into the circuit, devices should be safe. However if for any reason soldering operations are required in the future, be sure to repeat the precautions. The authors have damaged devices in the course of developing modules when soldering in tuning stubs and forgetting to connect the iron-worksurface link, and/or unplugging the iron. Some irons claim to have an ESD connection - we would not trust this!

G3WDG007 PA Construction Notes

Bild/Figure 4: Sectional View of G3WDG007



1. Cut the 7750 box side sections using tinsnips or careful sawing so that when the sides are assembled the box height is 12.5 to 13mm (not including lids), as shown in Fig. 4. Straighten up bent edges with pliers. For neatness of appearance, the original clean edges will be located to be the TOP of the box.
2. Follow steps 1-11 above for box and RF PCB preparation, noting that in the G3WDG007 the connectors are mounted **diagonally**, with two mounting holes either side of hole for centre pin, and one above. Also note the bottom of box to groundplane distance is not 17mm.
3. Cut hole in centre of board. Make sure FET fits neatly in the hole with no significant slop. Make sure groundplane is flat after this operation.
4. Make a dummy package out of .125" (3mm) or so thick aluminium sheet, with holes aligning with holes in package. Dimensions of the dummy package are given in Fig.5. Screw dummy package to copper heatsink and locate heatsink on groundplane side of pcb, ensuring it is squarely in place. Dummy package should fit into previously made hole in pcb.
5. Solder heatsink to groundplane with good sized iron (eg 45W). Recommended to apply iron to side of stud and use stud itself as the soldering iron. Solder all 4 sides to groundplane. Do not get any solder on surface which mates with Al heatsink. If this occurs, scrape off to leave a flat surface. When cool, remove dummy and ensure top of heatsink where FET is to be fitted is clean and flat.
6. Cut hole in centre of bottom lid to allow clearance to copper heatsink.
7. Cut or file bottom lid to allow clearance to SMA connectors.
8. Fit grounding pins to pcb and solder. Heads on circuit side, as usual. NO pins are fitted to power connection holes (see later).
9. Fit pcb to box squarely and make sure RF tracks are fully up next to connector spills. Solder groundplane to box all round. Solder tracks to connector centre pins.
10. Drill 4mm dia hole in centre of Al heatsink to allow thread of copper heatsink to pass through.
11. Place bottom lid on top of Al heatsink and pass threaded part of copper heatsink through 4mm hole and fit washer and nut to threads of copper heatsink to hold in place. Align assembly square and tighten locknut. Depending on construction tolerances, the pcb may bend slightly as the nut is tightened. This is normal and should not be of concern!
12. Very carefully, drill two 2mm dia holes approx 10mm either side of hole for copper heatsink through Al heasink and bottom lid as shown in Fig. 6. Take care not to damage pcb as drill breaks through! Remove nut and washer, and remove amplifier assembly, leaving bottom lid in place. Fix bottom lid to heatsink with M2 screws and nuts.
13. Fit power wires from groundplane side through holes in pcb for gate and drain supplies. Solder two wires for grounding near

where the gate and drain power wires pass through the board. Leave wires trailing.

14. Drill 4mm hole through bottom lid and heatsink to allow power wires to pass through. Hole should be located near where wires emerge from pcb. Deburr hole and if possible sleeve to prevent wires chafing later on causing shorts.
15. Thread bias wires through hole and refit amplifier assembly to heatsink. Tighten heatsink nut to full torque.
16. For maximum strength, it is recommended to clamp commectors to Al heatsink using M2 screws as shown in Fig. 7. Drill through the bottom connector fixing hole into the heatsink, 1.6mm dia. to depth of 5-6mm. Tap hole M2. Make a bush to bridge gap between connector body and heatsink with 2mm through hole. The gap can be bridged with two thicknesses of 1.6mm epoxy pcb material for example (a small amount of filing down may be necessary).
17. Fit remaining RF components to pcb (see Appendix 1 and 2).
18. Build and test DC power board. Note supply voltage to regulator should be 11V min for proper operation. Connect power board to amplifier and check for correct voltages where FET is to be connected. Adjust pot on regulator board to set -1.0V at gate.
19. Remove power and fit FET. Screw package down evenly and tightly. Poor contact between FET flange and copper heatsing will result in overheating and reduced lifetime! Gate and drain leads should be bent to fit at the ends of the tracks as shown in Appendix 2.
20. File or cut the top lid to clear the connector bodies.
21. Apply power and set drain current to 300mA by adjusting gate bias pot on power supply board.
22. Connect a well-matched load to the output before applying drive. Up to 230mW should be safe. Overdrive is indicated by a noticeable DROP in drain current (up to 20-30mA drop from initial value is probably OK). If a power meter is available to monitor output, the drive can be increased until the output saturates.
23. **Be careful to observe the usual safety precautions to avoid RF hazards, eg do not look down the waveguide with the power on. Read the Safety chapter in the RSGB Microwave Handbook for more information. Do not operate the amplifier into poorly matched loads. Observe tx/rx sequencing to prevent this during switching. Make sure you have enough isolation in the T/R relay to avoid damage to any sensitive preamps etc.**

Appendix 1 - Fitting chip components

To fit chip components across two circuit tracks or pads, the following procedure should be adopted. Refer to Fig. 8 .

1. Lightly tin one of the tracks or pads. Silver loaded solder is recommended, and is supplied in some of the kits.
2. Locate the chip component and reflow the solder on the tinned track to make a preliminary joint.
3. Solder the other end of the chip to the track to make a good fillet.
4. Resolder the other end of the chip using a little fresh solder.

Note that the standard chip capacitors are mounted flat on the board as shown in the figure. Mounting them at 90 degrees will cause extra series inductance and may result in reduced performance, instability etc. The 2.2pF ATC capacitors are mounted with the (tiny) lettering on the top (visible) side. It is recommended to mount resistors with the code letters visible, should later debugging prove necessary!

Some form of optical aid is recommended unless your eyesight is exceptional! A bench magnifier (some have inbuilt extra lighting) can be useful, although we prefer to use a headband binocular magnifier. A good pair of tweezers is essential. Chip components are hard to find on the average shack floor and can fly an amazing distance if they jump out of the tweezers!

Appendix 2 - fitting FETs

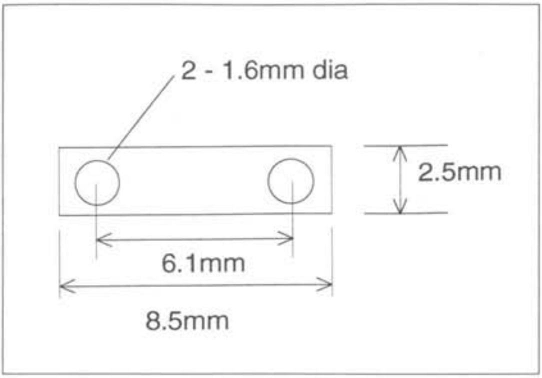
Assembly of the FETs on to the RF PCB is a two stage operation. Firstly, it is necessary to trim the source leads of the FETs, so that when located in position, about half the heads of the grounding pins are visible. The reason for cutting the leads so short is to help prevent dry joints here which can have a significant bad effect on the gain and noise figure of the device. The exception of course is the

MGF2430A, which has a flange source connection and requires no modification. When cutting the leads, please observe the static precautions decribed above.

To solder a FET in position, lightly tin one of the source grounding pins, and making sure the device is the right was round, tack the device in position by reflowing the solder on the grounding pin. Aim to have the FET mounted FLAT on the grounding pins not sitting up on a bump of solder, to equalise and minimise the lengths of drain and gate leads which go down to the tracks.

For the reflowing operation, it is best to apply the soldering iron to the side of the pin head and not to the lead of the FET, to minimise the possibility of a dry joint. Use the same technique to solder the other source lead, applying solder to the point where the cut source lead touches the top of the grounding pin, not to the soldering iron or top of the source lead. Next, remake the original joint in the same way, using a little fresh solder. Finally bend the gate and drain leads down to the board as close as possible to the body of the FET as possible, as shown in Fig. 9. The inductance of this short lead is built in to the design, and longer (diagonal style) connections will cause detuning. Another way of describing this is to ensure that the soldered joint is made at the end of the track, not some distance away from the FET. In the G3WDG004, minimum source inductance and tightly controlled gate and drain inductances are achieved by recessing the source ground pins into the PCB, so that the device sits flat on the board. The PCB is supplied with the pins already fitted.

Bild/Figure 5: Details of Dummy Package



Deutsche Version

Der letzte Teil beschreibt, wie man die einzelnen Module des Systems aufbaut. Mit Ausnahme des G3WDG007 ist der Aufbau der anderen Module sehr ähnlich.

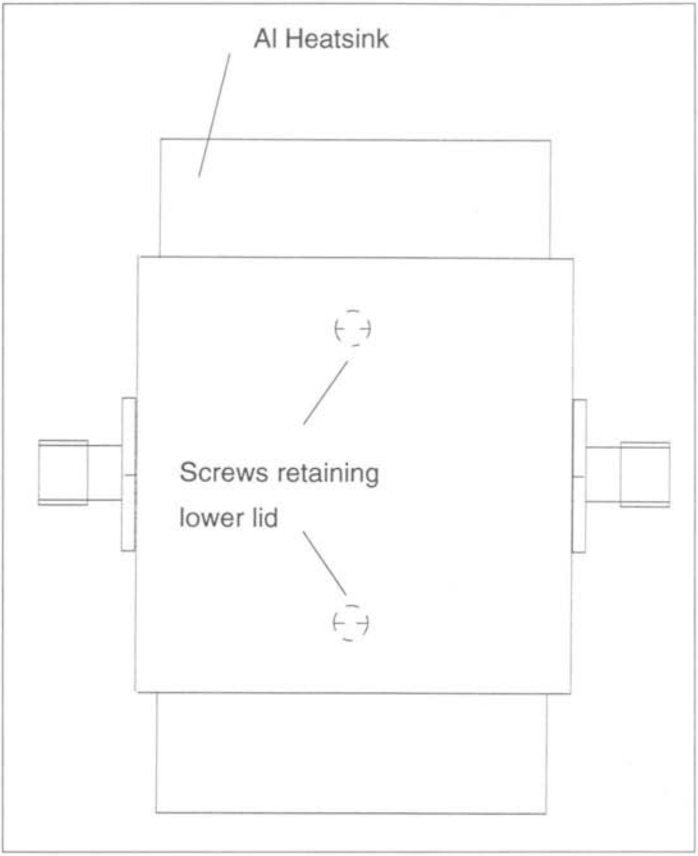
Vorbereitung der Platinen und der Gehäuse

1. Das Gehäuse wird vorbereitet, in dem man die Seitenwände in die Deckel setzt und von außen verlötet, ohne die Deckel anzulöten.
2. Deckel entfernen und außen und innen verlöten
3. Platine passend zuschneiden. Nach Abb.1 wird 'Oben' als die Seite des Gehäuses festgelegt, von der man aus die geätzte Seite der Platine sehen kann.
4. Die Verträglichkeit des Lötzinns mit der verzinnten Oberfläche der Platine sollte vorher geprüft werden. Die Stellen, an denen die FET's aufgebracht werden, sollten vorverzinnt werden.
5. Mit einem Filzstift wird eine Linie 10mm von der Gehäuseoberkante gezogen. Sie dient als Markierung für die SMA-Buchsen, deren Löcher so angezeichnet werden, daß der Mittelpin mittig auf die Stripline paßt.
6. Für die SMA-Buchsen werden 1,5mm Löcher gebohrt.
7. Die Befestigungslöcher der SMA-Buchsen werden mit einer Buchse als Dummy angerissen.
8. Für die Befestigungslöcher werden 2mm und für den Mittelleiter 3,3mm Löcher gebohrt. Die Löcher müssen von beiden Seiten entgratet werden.
9. Buchsen mit M2 Schrauben befestigen.
10. Platine in das Gehäuse legen. Die Mittelleiter sollten genau auf den Striplines aufliegen und der Abstand der Platine vom unteren Rand sollte 17mm betragen. Platine entfernen und Innenleiter der SMA-Buchsen auf 1mm kürzen.
11. Buchsen auf das Gehäuse löten. Das geht nicht für Buchsen aus Stahl!
12. Löcher für Durchführungskondensatoren bohren.

HF-Platinen Vorbereitung

1. Die mitgelieferten Vero-Pins als Durchkontaktierung benutzen. Die Köpfe sind auf der geätzten Seite. Die Pins nur auf der Masseseite anlöten
2. Falls Filter benutzt werden, werden die Veropins von der Lötseite her gelötet. Das Filter muß flach aufsitzten, andernfalls sind die Pins abzufeilen.
3. Die Filter sind dann einzulöten. Man wärmt die Filter mit einer heißen Platte oder einem großem Lötkolben vor. Sie müssen rundherum sauber verlötet sein
4. Die Koppelpins werden zum Schluß eingelötet. Die Eintauchtiefe sollte auf +0.1/-0mm genau sein.

Bild/Figure 6: Top View of G3WDG007



Einlöten der Platinen

1. Die Platine wird von der Unterseite in das gehäuse gelegt, bis sie auf den Mittelleitern der SMA-Buchsen aufliegt. Die Platine wird justiert und an den 4 Ecken von der Masseseite festgelötet.
2. Die Masseseite rundherum verlöten.
3. Durchführungskondensatoren einbauen und verlöten.

Bestücken der Komponenten

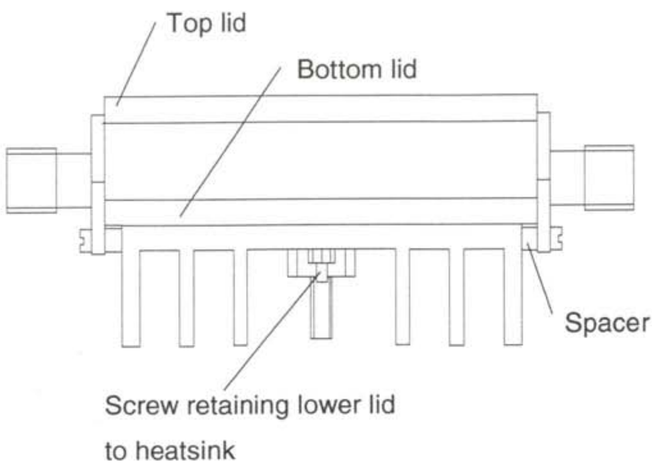
1. Alle Induktivitäten bestücken. Falls es Wirewrap-Draht mit Isolation ist, die Isolation entfernen. Den Draht flach auf die Platine in 90° Winkel zur Stripline löten. Dreieckige Stubs sollten nur an der Spitze angelötet werden. (Abb. 3).
2. Chip-Bauteile wie in Appendix 1 beschrieben bestücken.
3. Alle bedrahteten Bauteile bestücken.
4. Die G4FRE023 Reglerplatine bauen und testen.
5. Die Reglerplatine auf der Unterseite anbringen. Regler IC's mit Kühlfahnen anschrauben oder anlöten.
6. Spannung anlegen und die Spannungen auf den Gate- und Drain-Striplines prüfen.

GaAs FET's/Dioden bestücken

Nach Anhang 2 die FET's bestücken. HEMT's und Power FETs sind empfindlich gegen Statik. Fehler an HEMT's zeigen sich oft nur in einer schlechten Rauschzahl, obwohl der Gleichstrom Arbeitspunkt in Ordnung ist.

Um ESD-Schäden zu verhindern, muß man einen statikfreien Arbeitsplatz einrichten. Dazu dient eine Metallplatte, die mittels eines Armbandes mit dem Körper verbunden ist. Auf dieser Platte kann man den FET auspacken, mit der Pinzette anfassen und z.B. Beinchen abschneiden.

Bild/Figure 7: Side View of G3WDG007

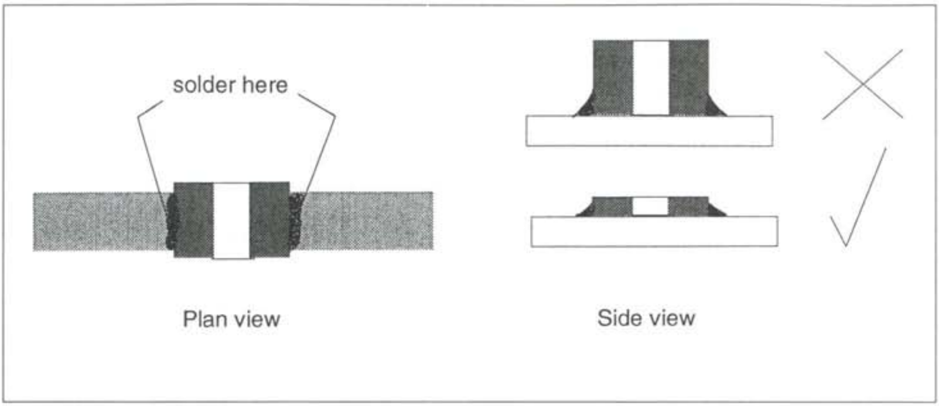


Beim Einlöten in die fertige Platine wird diese ebenfalls mit der Arbeitsplatte galvanisch verbunden. Der Lötkolben wird mit der Lötspitze ebenfalls verbunden. Auch sollte der Lötkolben keinen Übergangswiderstand zwischen Heizelement und Spitze haben (Mit dem Ohmmeter prüfen!). Zuerst die Source-beine anlöten, dann Drain und dann Gate. Erhöhte Sicherheit besteht dann, wenn man während des Lötens die Speisespannung abschaltet. Selbst bei eingebauten GaAs-FET kann es beim Auflöten von Stubs zu unerwünschten Entladungen kommen.

Aufbauhinweise für G3WDG007

1. Das Gehäuse 7750 wird wie in Abb4. vorbereitet.
2. Die obigen Hinweise für die Vorbereitung des Gehäuses und der Platine werden ausgeführt. Die SMA-Buchsen werden wegen der niedrigeren Höhe diagonal angebracht.
3. In die Mitte der Platine ein Loch schneiden, in das der FET genau hineinpaßt.
4. Ein Dummy-FET wie in Abb. 5 anfertigen. Dummy auf Kühlkörper aufschrauben und Platine passen auflegen.
5. Der Cu-Kühlkörper wird auf die Masseseite aufgelötet. Die Auflage auf den Al-Kühlkörper muß sauber bleiben.
6. Loch in den Gehäuseboden schneiden
7. Gehäuseboden anfeilen, um Platz für die SMA-Buchsen zu lassen.
8. Durchkontaktierungen einlöten
9. Platine einlegen, rundherum verlöten und zuletzt die SMA-Mittelleiter anlöten.
10. 4mm Loch in Al-Kühlkörper bohren, damit die Schraube vom Cu-Kühlkörper durchpaßt.
11. Bodendeckel auf den Al-Kühlkörper auflegen und Cu-Kühlkörper anschrauben.
12. Wie in Abb. 6 zwei 2mm Löcher durch Bodendeckel und Al-Kühlkörper bohren. Platine nicht beschädigen. Platine mit Cu-Kühlkörper losschrauben und den Bodendeckel mit 2mm Schrauben befestigen.
13. Betriebsspannungsleitungen durch Bohrungen einfügen.
14. 4mm Loch durch Kühlkörper bohren, damit Leitungen durchpassen.
15. Platine wieder montieren, nachdem die Leitungen durchgesteckt sind.
16. Für bessere mechanische Stabilität kann man die SMA-Buchsen noch an den Al-Kühlkörper mit 2mm Schrauben befestigen.
17. Verbleibende HF-Komponenten bestücken.
18. Regulator-Platine bauen und testen. Danach einbauen und Gate-Spannung auf -1V setzen.
19. FET bestücken und einlöten. Achte auf guten mechanischen Kontakt mit dem Kühlkörper. Gate- und Drain Anschlüsse sollten nach Anhang 2 bearbeitet werden.
20. Deckel passend machen und aufsetzen.

Bild/Figure 8: Fitting Chip Components



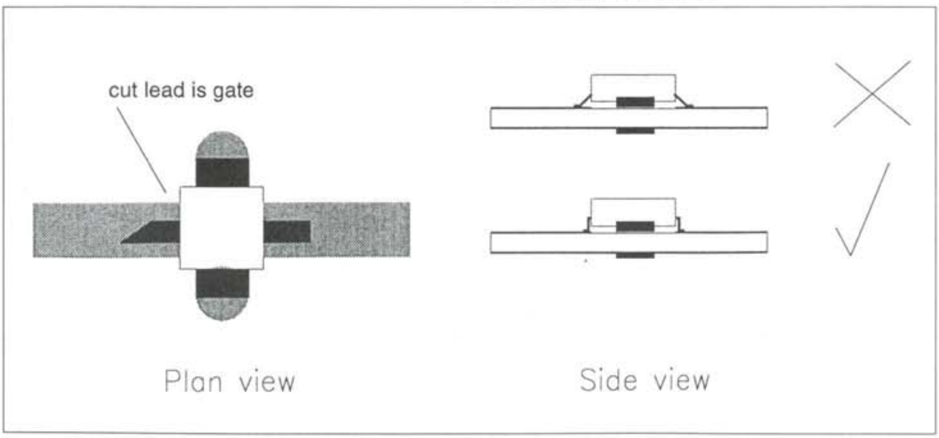
21. Spannung anlegen und einen Strom von 300mA einstellen.
22. 50 Ohm Abschuß am Ausgang anschließen oder ein Leistungsmesser. Bis zu 230mW darf die Steuerleistung betragen. Übersteuerung erkennt man am Stromabfall (max 30mA!).
23. **Sicherheitsvorkehrungen für Mikrowellen-Ausrüstung beachten. Nicht in einen offenen Hohlleiter schauen. Keine schlecht angepaßte Antenne benutzen. Notfalls Isolator verwenden. Hochwertiges T/R-Relais verwenden, damit der Vorverstärker heil bleibt.**

Anhang 1 - Bestücken von SMD-Komponenten

Um Chip Bauteile zu montieren, sollen laut Abb. 8 folgende Hinweise beachtet werden.

1. Eine Leiterbahn verzinnne. Silberhaltiges Lot verwenden.
2. Bauteil plazieren und eine Seite anlöten.
3. Andere Seite anlöten
4. Erste Seite nachlöten

Standard Chip Komponenten werden flach auf die Platine gelötet. ATC-Chips werden mit der Beschriftung nach oben eingebaut. Eine beleuchtete Lupe ist wichtig für genaues Arbeiten. Gute Pinzetten sind wichtig. Zum Andrücken kann man Streichhölzer verwenden.



Bild/Figure 9: Fitting Fets

Angang 2 - Bestücken der FETs

Source Beine kürzen. Das ist wichtig um kurze Masseverbindungen zu gewährleisten. Beim Schneiden der Beinchen ESD-Vorkehrungen treffen. beim Einlöten die Erdstifte verzinnen.

Beim Einlöten die Massepins verzinnen, den Fet mit den Source-Beinen direkt auf die Massepins auflöten. Gate und Drain Beine werden auf die Platine gebogen und dann verlöten (Abb. 9). Die Induktivität ist im Design berücksichtigt.

Beim G3WDG004 sind die Massepins versenkt, so daß der HEMT flach auf der Platine aufsitzt. Die Platine aus dem Kit hat die Massepins bereits bestückt.

Parts

Kits of components for all these modules are available from:

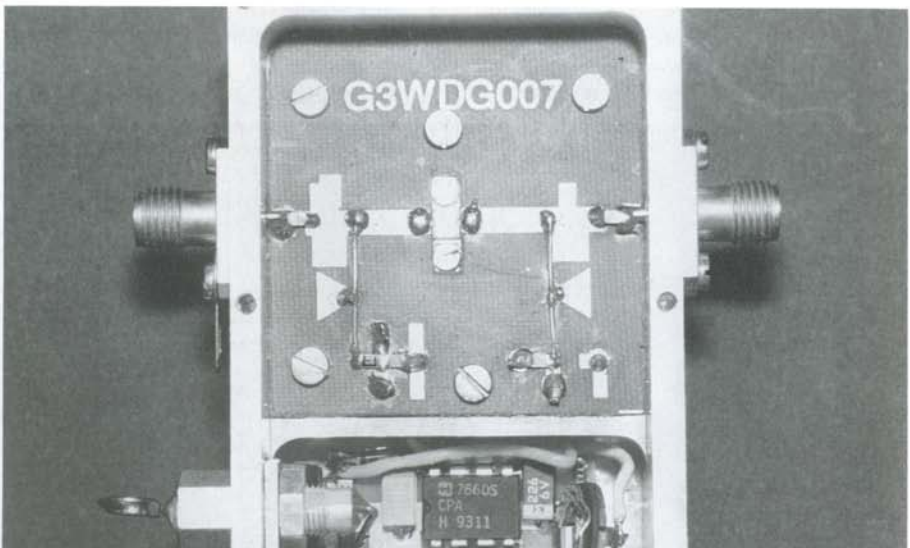
Microwave Committee Components Service,
Petra Suckling, G4KGC
314A Newton Road, Rushden,
Northants, NN10 0SY, U.K.
Tel +44 933 411446

Orders from Europe add 5% for postage and packing. Eurocheques are welcome. Please note that cheques and Eurocheques should be **payable to Mrs. P. Suckling and issued in £.**

Teile

Teilesätze für alle Module gibt es bei der obigen Adresse. Frau Petra Suckling spricht Deutsch!

Bitte beachten: Auf allen Schecks muß **Mrs. P. Suckling** explizit als Empfänger eingetragen sein!



DD1XFs Style of G3WDG007

30W Linear on 23cm

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Abstract: Two Mitsubishi M57762 linear modules can be combined with SAGE Wireline® to achieve a linear ouput of 30W when driven by a small 1W transverter.

Kurzfassung: Zwei Mitsubishi M57762 Leistungsmodule können, mit einer SAGE Wireline® kombiniert, eine Ausgangsleistung von 30W erreichen, wenn sie von einem 1W Transverter angesteuert werden.

Introduction

For my new 23 cm transverter (by DB6NT and DF9LN, refer to 1) I needed a new final amplifier stage. As I already had bought two modules (Mitsubishi M57762) a couple of years ago to be operated in parallel, the selection was quite obvious. In addition, one of them was already in operation for years without any problem though quite mistreated occasionally (oops, no antenna!). So the literature was studied, which revealed several options.

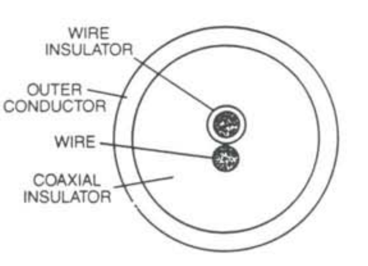
The UHF Unterlage [2] suggests several types of power splitters to combine two of these 23cm modules, but the constructions are quite bulky and were no partner for the tiny transverter.

The DL1YBL design [3] uses small pieces of 75 Ohm coax (quarter wave) to construct the power splitters. The exact length of the pieces of coax is fairly critical and though the amplifiers are decoupled, any power reflected from load (antenna) or amplifiers will reach the source. However I was pleased by his simple and effective air borne construction.

After some puzzling I finally rediscovered the Sage Wireline® as I read a microwaves magazine. The Dutch representative was so kind to send me the required design data [4] and even some samples. These kind of products were already described back in 1982 in UHF Unterlage Teil III and in 1984 by DL1GBH [5], but as far as I know, no detailed amateur application was reported ever since.

Sage Wireline®, what it is ...

Sage Wireline® looks like ordinary semi-rigid coax from the outside but it has two twisted wires inside, isolated from each other. The main inner isolation consists of PTFE ("teflon"). Refer to figure 1. A quarter wavelength of the line (e.g. HC1 and JC1) behaves as a three dB coupler (or power combiner/divider). The phase difference between the two outputs is about 90 degrees at a bandwidth of an octave. A highly appreciated feature is the isolation between the two outputs and the input. Any signal power reflected from an output will not reach the originating input but the fourth connection: the "isolated output". If this connection is properly terminated with 50 ohms the result is that the original input will be isolated from the two outputs. Refer to figure 2.



Figure/Abb. 1: Wireline

The useful frequency range of Sage wireline® is about from under 100 to above 3000 MHz but in principal there is no limit. The average power is about 200 Watts maximum for JC line which seems sufficient for most amateur applications.

Apart from HC1 and JC1 line there also exists a more broadband version (named HC2 and JC2) which has a coupling factor of 2,65 dB, but it will not be further described here.

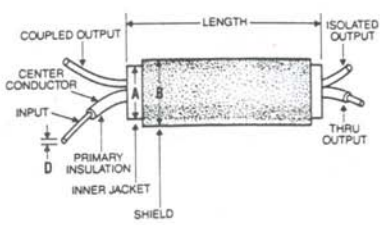
Finally, Sage also delivers Wirepac, a more rigid version of Wireline and only available cut-to-length. It can handle much more power, but it is considerable more expensive and as a consequence is not very suitable for amateur use.

... and what you can do with it.

Before discussing my application it might be interesting to get familiar with some of the other applications of Sage Wireline.

If you cut a piece shorter than a quarter wavelength, you obtain a directional coupler. The coupling factor is determined by the electrical length at the operating frequency. For example, a piece of 19 mm (shield length) behaves as a 30 dB coupler at 50 MHz, to be used as a power monitor in an antenna line. A piece of 21 mm is a 20 dB coupler for two metres. This indicates that it is not very well possible to construct broadband couplers with a factor much higher than 3 dB.

Three-dB couplers, however, are most versatile. Low-loss, well-matched DC blocks can be made of it by shorting the opposite side of each wire to ground and using the other side as input/output. These couplers can also be used in mixers and diplexers and, of course, to operate two 50 ohms gain blocks in parallel.



Figure/Abb. 2: Wireline

In Sage's documentation you can find a complete set of formula's to calculate the required length for a given application. They also provide a "Wireline and Wirepac parameter calculator" which is an extremely useful and time saving tool.

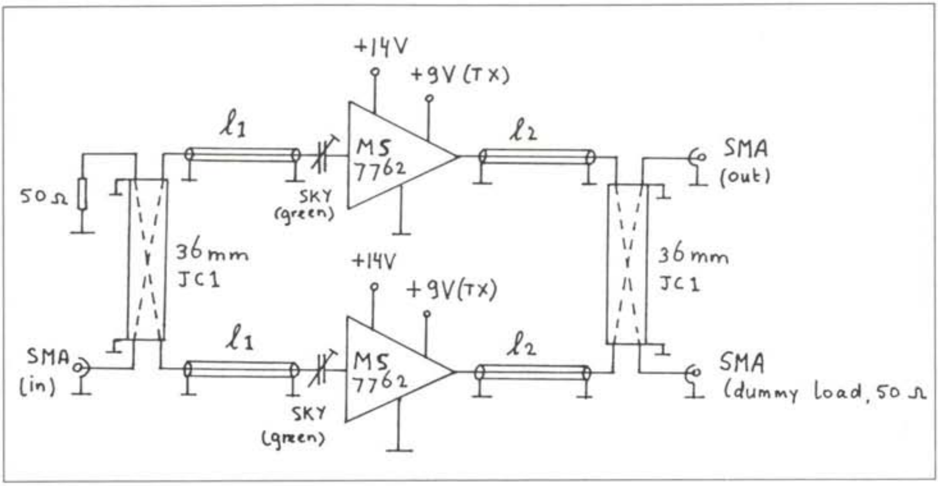
The "30 Watts on 23" amplifier.

The amplifier I designed is shown in figure 3. As the precise circuit around the M 57762 module is uncritical (as long as you take care of proper decoupling, grounding and use short lead length) it has only been drawn schematically. Details can be found in [2] and [3] as well as in the module's datasheet. Both the amplifiers are built inside one standard metal box (111*74*30 mm) as described by DL1YBL.

One of the reasons I strongly recommend to use JC1 line in stead of HC1 is its robustness, i.e. larger diameter (3.7 mm versus 2.7 mm) and thicker wires (0.5 resp. 0.3 mm). Anyway, it is a delicate procedure to cut the line, to remove the copper shield at both ends (with a small pipe cutter e.g. model 103 of Ridgid) then to remove the teflon inner jacket with a scalpel and to remove the primary insulation of one of the wires.

The 23 cm couplers are 36 mm long (shield length) and soldered inside the box between the two modules at the sidewall. Three SMA connectors are mounted directly at the end of the couplers: one for the input, one for the output and one for the output dummy load. The input dummy load consists of a small pill shaped 50 ohms load good thru 12 GHz, because it rested in my junk box. Two 100 ohms chip resistors soldered in parallel will perform equally well. The dummy at the output will absorb all power if the antenna is disconnected, so use the big one at this place. Alternatively you can also use a 50 ohms RF power resistor screwed on the heatsink.

The precise length of the 50 ohm coax lines L1 and L2 is uncritical: as short as possible is fine. However, use exactly the same length for both the



Figure/Abb. 3: Circuit Diagram

input lines L1 and the output lines L2! L1 need not be equal to L2. Be sure to ground both ends of the lines.

It is an advantage to make both basic amplifier circuits exactly identical and to test them in advance before tying them up to the rest of the circuit (take notes: currents, power gain, input power etc.). Then insert L1 and L2 and the trimmers (Sky green). Apply a limited amount of power (some 50 mW) and observe output power. Maximise with trimmers. It should now be possible to get about the gain of a single amplifier again. In my case I measured a power gain of 18.7 dB with about 15 W output. With some more input power it is an easy job to get 30 Watts out.

The return loss at the input is measured as 14 dB (VSWR = 1.5). The datasheet specifies VSWR = 1.2 maximum at 300 MHz. It is not so easy to compare these figures because of the difference in frequency. However, good RF construction practices are strongly recommended. The insertion loss (specified as 0.3 dB maximum) could hardly be measured.

At 30 watts out the amplifier draws about 7 A at 13,8 V. This requires adequate heatsinking! Fellow amateurs report a clean linear signal which is in agreement with the curves from DL1YBL. Don't attempt to run more power in SSB as the signal will be heavily distorted (broad). However, in a non-linear mode, 40 Watts can be squeezed out of the amplifier.

5. Conclusion.

When the hardware work is finished it is a matter of hours to complete the power amplifier. It is uncomplicated to work with these Wireline couplers yet they are very robust. The cost is several DM per cm, however connectorized couplers are much more expensive and tend to be bulky. A second amplifier has been build by a friend and works equally well.

Whether or not the 3+ dB cost is well worth the 3 dB increase of output power is for the reader to decide. Anyway, it was a nice technical experience.

Deutsche Version

Einführung

Für meinen neuen 23cm Transverter ([1]) brauchte ich einen Leistungsverstärker. Die Entscheidung fiel auf die Mitsubishi M57762 Module, von denen zwei gekoppelt werden sollten, um ca. 30W Ausgangsleistung zu erreichen. Einfache Parallellschaltung wurde als Methode verworfen.

In der UHF-Unterlage ([2]) fand ich Koppler, die allerdings mechanisch zu unförmig waren.

In einem Artikel von DL1YBL ([3]) werden Viertelwellen-Koppler mit 75Ω Leitungen beschrieben. Obwohl die Verstärker entkoppelt sind, werden jedoch keine Reflexionen absorbiert.

Nach einigem Grübeln entdeckte ich die SAGE Wireline® wieder, mit der man 90° Hybride bauen kann.

Zwar wurden diese schon früher beschrieben (UHF-Unterlage III, 1982 und von DL1GBH in [5]), aber eine Anwendung zur Kopplung von Leistungsverstärkern habe ich nicht gefunden.

Funktion der Sage Wireline®

Sage Wireline® besteht aus zwei verdrillten Leitungen eingebettet in ein Semirigid ähnliches Kabel mit Teflon-Isolation und festem Außenmantel. Eine Viertelwellenlänge wirkt wie ein 3dB Koppler mit 90° Phasenunterschied zwischen den Ausgängen. Die Bandbreite ist etwa eine Oktave. Die Ausgänge sind entkoppelt. Leistung, die von einem der Ausgänge reflektiert wird, wird in einem Abschlußwiderstand verbraucht, falls beide Ausgänge die gleiche Fehlanpassung aufweisen.

Der Frequenzbereich der Sage Wireline® beträgt ca. 100MHz...3000MHz. Die Dauerleistung beträgt 200W für die Type JC.

Anwendungen

Eine weitere Anwendung der Sage Wireline® sind Richtkoppler. Diese entstehen, wenn man die Länge kleiner als eine Viertelwellenlänge macht. Z.B hat man bei einer Länge von 19mm einen 30dB Koppler für 50MHz und bei 21mm Länge einen 20dB Koppler für 2m.

Die Hauptanwendung besteht jedoch in 3dB Kopplern, die zur Realisierung von gekoppelten Verstärkern benutzt werden.

Sage liefert eine ausführliche Dokumentation, um alle möglichen Anwendungsfälle zu berechnen.

30W, 23cm Leistungsverstärker

Das Schaltbild ist aus Abb.3 zu entnehmen. Details über die Konstruktion der einzelnen Stufen können den Publikationen in [2] und [3] entnommen werden.

Als Sage Wireline® Typ wird die Variante JC1 benutzt, da sie wesentlich stabiler und einfacher zu verarbeiten ist. Bei der Abisolation des Mantels und der inneren Drähte muß größte Sorgfalt aufgewendet werden.

Die 23cm Koppler sind 36mm lang (Länge des Kupfermantels) und werden zwischen die Verstärker an eine Seitenwand gelötet.. Drei SMA-Buchsen werden direkt auf das Ende des Koppler gelötet. Eine dient als Eingang, die zweite als Ausgang und die dritte als Anschluß für die Ausgangs-Termination von 50Ω. Als Eingangs-Termination kann man zwei parallel geschaltete 100ΩChip-Widerstände nehmen. Die Ausgangslast muß 25W vertragen können, da sie die gesamte Leistung aufnimmt, falls die Antenne abgezogen wird.

Die Länge der 50Ω-Leitungen L1 und L2 ist unkritisch, ihre Länge muß nur jeweils gleich sein.

Es macht Sinn, die Einzel-Verstärker identisch zu bauen und vorher zu testen. Nach dem Einbau wird ca. 50mW Steuerleistung angelegt und die Trimmer am Eingang auf maximale Summenleistung abgestimmt. Die Verstärkung der Doppelstufe sollte genauso groß wie die der Einzelstufe sein. Ich habe eine Verstärkung von 18,7dB bei 15W Ausgangsleistung gemessen. Bei einer Steuerleistung von 1W kann man 30W Ausgangsleistung erreichen.

Die Eingangsrückflußdämpfung ist 14dB (VSWR=1,5). Die Einfügedämpfung ist kleiner als 0,3dB.

Bei 30W ziehen die Verstärker 7A bei 13,8V. Der Kühlkörper darf nicht zu klein sein. Das Signal wird als sauber beurteilt. Mehr als 30W sollten nicht in SSB gemacht werden. Wenn man die Leistung ausquetscht, kann man 40W in CW erreichen.

Schlußbemerkung

Der Verstärker kann in wenigen Stunden aufgebaut werden, wenn man mal die Einzel-Verstärker fertig hat. Die Kosten für die Sage Wireline® betragen wenige DM pro cm, so daß die Gesamtkosten im Vergleich zu kommerziellen Kopplern sehr gering sind.

6. Acknowlegdements

I have to thank the Dutch representative (Semi Dice International, Wormerveer) for providing me with some samples.

7. Literatur

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3.Joachim Berns (DL1YBL), "Linearverstärker für das 24/23 cm Band mit dem Modul M57762", UKW Berichte 4/88.

4.Sage Laboratories Inc, "Designers Guide to Wireline & Wirepac".

5.Harald Braubach (DL1GBH), "Richtkoppler - massgeschneidert", UKW Berichte 3/84.

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DL6WU Yagis for 23cm

Rainer Bertelsmeier, DJ9BV

Introduction

Yagi antennas are a good alternative to dishes on 23cm for tropo work. Günter Hoch, DL6WU, was the first, who proved the feasibility of long Yagis on 23cm in his pioneering article ([1]) in 1982. Today also several commercial Yagis are available. Tonna was the first company to discover Yagi antenna design on 23cm. After several years delay some American companies (KLM, AEA and M^2) followed this line recently by 'rediscovering' the Yagi for 23cm.

For the home constructor, the design by DL6WU is a premium choice. These Yagis are unequaled in terms of gain, pattern, match and broad band performance. If properly built, they outperform any commercial counterpart and also those ubiquitous loop Yagis. They are cheap (Cost is less than DM 50,- per antenna) and made from easily available material.

Einführung

Yagis eignen sich als gute Alternative zu Spiegeln für Tropo auf 23cm. Es gibt inzwischen auch einige kommerzielle Produkte. Die erste Firma, die Yagis herausbrachte, war TONNA. Inzwischen sind auch andere Firmen wie KLM, AEA, HAG und M^2 auf den Zug aufgesprungen.

Wenn man selbst bauen kann, eignet sich das bereits vor 12 Jahren veröffentlichte DL6WU Design hervorragend. Diese Antennen sind unerreicht in den Eigenschaften Gewinn, Diagrammgüte und Breitbandigkeit. Sie sind bei geeigneter Konstruktion jeder kommerziellen Yagi und vor allen Dingen Loop-Yagis überlegen.

Design

To construct a Yagi on 23cm on a 15mm boom with 4mm diameter elements and non insulated element mount you need a robust and dimension tolerant basic design. Element lengths are very critical on 1296 and shortening factor is 67% of boom diameter, i.e. 10mm for a 15mm boom. Elements have a thickness of 0.017 wavelengths and the boom diameter is 0.065 wavelengths. This corresponds to a 135mm diameter boom with 36mm thick elements for an equivalent 144MHz Yagi! This is the reason why TONNA didn't tackle this problem but instead mounted the elements of their 23cm Yagis on those somewhat curious plastic holders.

The DL6WU design has all the necessary features to guarantee a successful construction: By virtue of its logarithmic element profile it's broad band with built in safety factor for mechanical tolerances and bad weather, it provides high gain, low sidelobe pattern and good match to 50 ohms. Gain

Table 1: Yagi Electrical Performance Data @ 1296MHz

Length [mm]	Length [λ]	Gain [dBD]	3dB Angle φ_E	3dB Angle φ_H	Stack-Hori [mm]	Stack-Verti [mm]
1945	8.4	16.6	21.2	21.6	625	615
2497	11	17.5	20.5	20.8	650	640
2957	13	18.1	19.3	19.6	690	680
4061	17	19.1	17.0	17.3	780	770
5993	26	20.3	14.7	14.9	900	890

Gain-Bandwidth (-1dB): 1265-1355MHz, Gain peak at 1315 MHz
VSWR: < 1.2:1 (1.1:1 typ. @ 1296MHz)

Mechanical Data of 1296MHz[3] Yagis

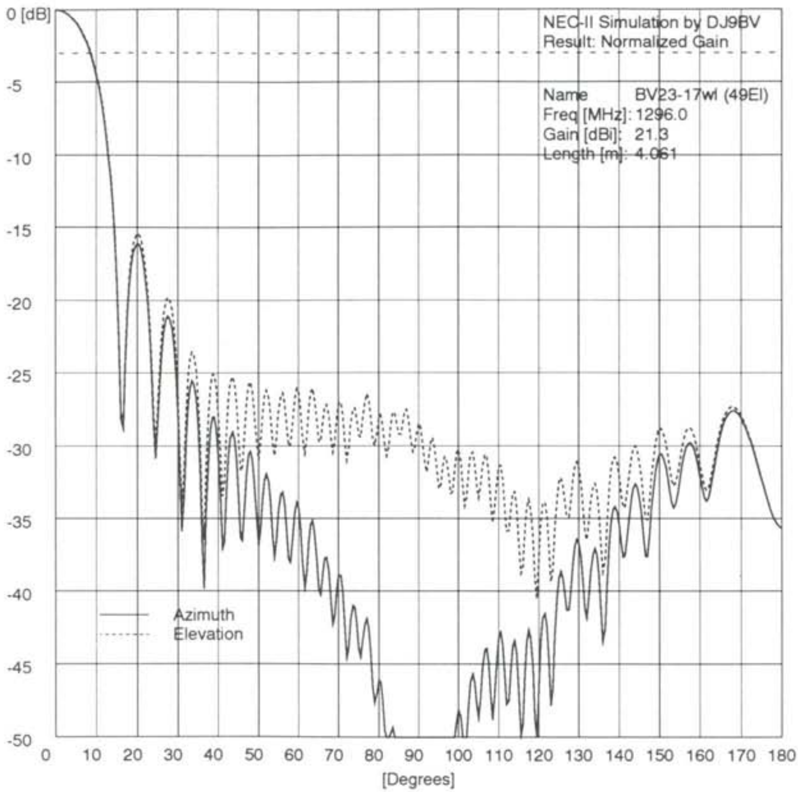
Element	Position[1] [mm]	Length[2] [mm] for 4mm El. & 15mm Boom
R	0	120
DE	50	120
D1	68	106
D2	110	104.5
D3	160	103
D4	218	101.5
D5	283	100
D6	353	99
D7	426	98
D8	502	97
D9-10	582, 665	96
D11-12	751, 841	95
D13-15	933, 1025, 1117	94
D16-18	1209, 1301, 1393	93
D19-21	1485, 1577, 1669	92
D22-24	1761, 1853, **1945 (8.4λ)**	91
D25-28	2037, 2129, 2221, 2313	90
D29-32	2405, **2497 (11λ)**, 2589, 2681	89
D33-37	2773, 2865, **2957 (13λ)**, 3049, 3141	88
D38-43	3233, 3325, 3417, 3509, 3601, 3693	87
D44-50	3785, 3877, 3989, **4061 (17λ)**, 4153, 4245, 4337	86
D51-D58	4429, 4521, 4613, 4705, 4797, 4889, 4981, 5073	85
D59-D68	5165, 5257, 5349, 5441, 5533, 5625, 5717, 5809, 5901, **5993**	84

[1] Positions must be accurate to +-0.5mm
[2] Length must be accurate to +-0.3mm
[3] To lower operating frequency to the 1240...1280MHz Band (Satellite, ATV, Packet), all elements have to be lengthened by 2mm. See Fig. 5 for gain characteristic.

peak for 1296MHz design is at 1315 MHz. The antenna works very well from 1270 to 1310 MHz. Because this antenna is a modular design it can be cut to any length from 0.5m to >6m. Electrical data for boom lengths ranging from 2m to 6m with associated gains of 16.6 to 20.3 dBD are given in Table 1.

Computer optimisation was not applied to the basic design. First, at the time of first construction (1983) no computer simulation for Yagis had been available. Today a redesign with the aid of CAD-software makes no sense, because the variety of amateur programs like MININEC, ELNEC, YAGIMAX, YO etc. cannot simulate this type of 'thick' element Yagis satisfactorily. This has been shown in ([2]). The only program, which can simulate this type of antenna with sufficient accuracy is NEC-II and its direct descendants. But even then an improvement is questionable, because optimisation means trading gain for bandwidth. But bandwidth is urgently needed for a 23cm Yagi to

Figure/Abb. 1: 17wl (4m) Yagi/NEC-II Simulation



function under all environmental conditions. Conclusion: Even in its 12th year the DL6WU Yagi design is still going strong.

Design

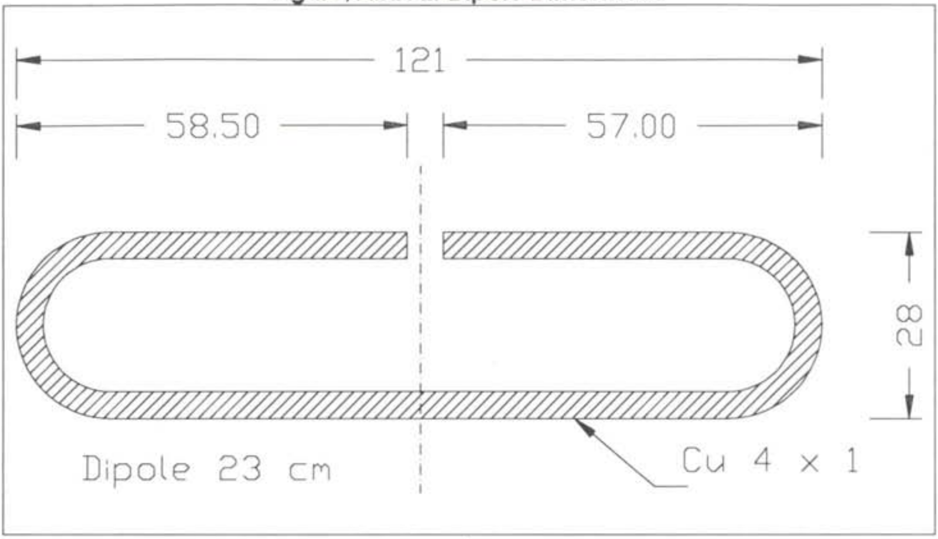
Die ersten Yagis wurden schon 1983 gebaut. Sie wurden direkt nach der Beschreibung von DL6WU konstruiert ([1]). Nur der Boomdurchmesser und die Konstruktion des Faltdipols wurden geändert. Seitdem sind Hunderte von diesen Antennen erfolgreich nachgebaut worden.

Die Antennen sind für Längen von 2m bis 6m spezifiziert. Dabei sind die Gewinne zwischen 16,6 und 20,3 dBD möglich. Ansonsten kann die Yagi an jeder Stelle abgeschnitten werden. Das modulare Design läßt dieses zu.

Construction

The antennas described below were first built in 1983 following the DL6WU design ([1]). Only the boom diameter has been changed to 15mm and a special folded dipole with a semirigid balun has been constructed. Since then hundreds of these antennas have been built by amateurs all with

Figure/Abb. 2: Dipole Dimensions



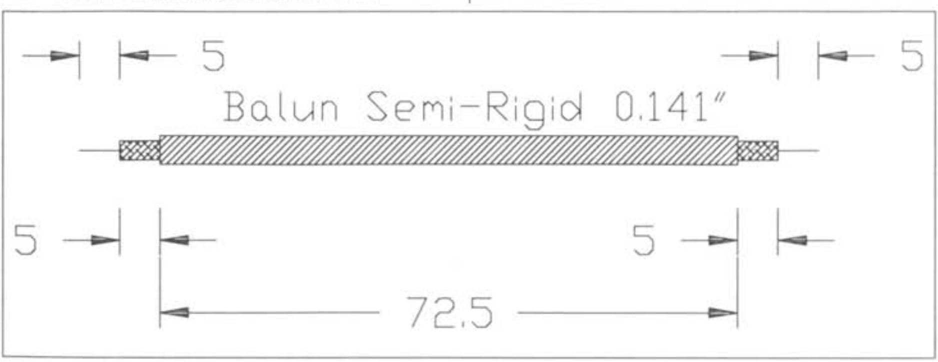
excellent results. Because of not ending inquiries about the constructional data a publication seems to make sense.

Non insulated element mounting requires protection against corrosion. If the element looses contact to boom severe detuning will be the consequence. Two component paint for aluminium (i.e. BRILLUX 853 epoxy paint) should be used.

Mechanical Data

- Boom-Length: 2-6m (8.4λ-26λ)
- Boom-Diameter: 15mm
- Element lengths include correction of 11mm for indicated boom diameter
- Element-Diameter: 4mm, made from AlMgSi1 standard aluminium rods
- Dipole: 4mm Diameter, 121mm long (See Figures 2,3,4,7)
- Element-Mounting: Non insulated through boom: Drill a hole of 3.9mm diameter and hit element through the boom to achieve a tight fit.
- Anti-Corrosion Coating with two component Paint: For example Brillux 853 two component paint for aluminium

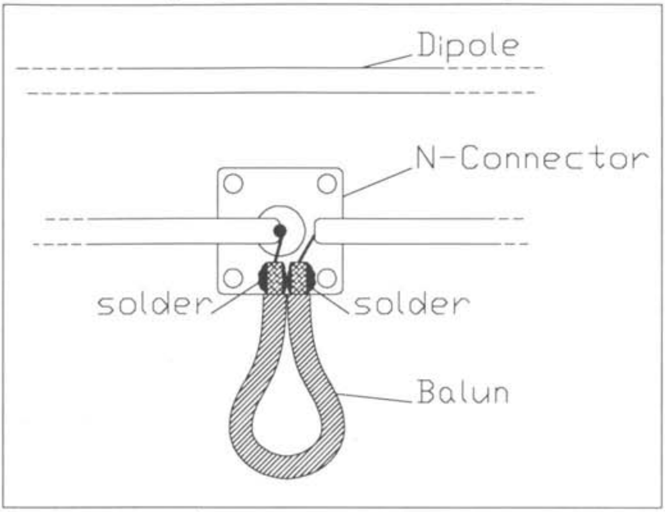
The first antenna with a normal folded dipole had a VSWR of 1.4:1. Together with DC3XY we de-



Figure/Abb. 3: Semirigid Balun

veloped a dipole construction by experiments which gives a VSWR of less than 1.1:1 on 1296. The main departure from theory was to lengthen the dipole and to shorten the balun in semirigid UT-141. A wise decision is to use a hermetic N-connector, which does not allow water getting into the inner line.

Figure/Abb. 4: Balun Assembly

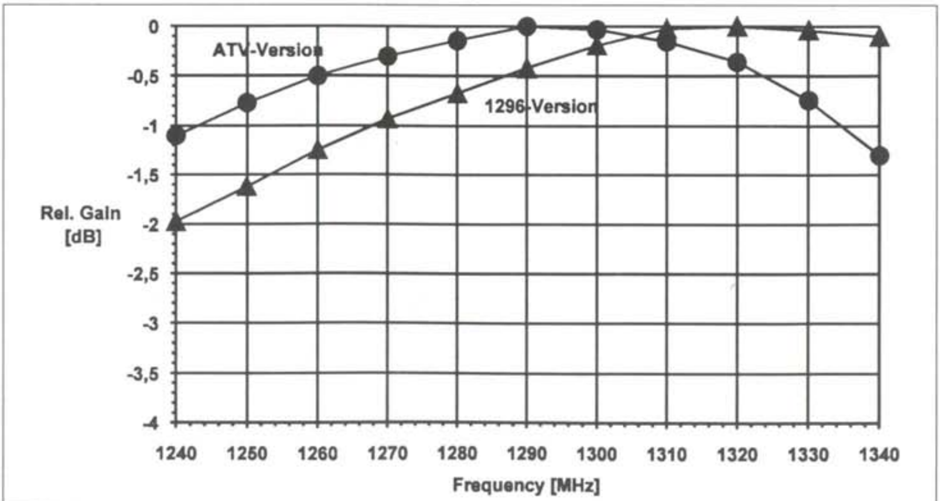


Konstruktion

Die Montage der Elemente mit 4mm Durchmesser erfolgt galvanisch leitend durch den Boom. Daher muß die Antenne durch einen Anstrich mit Zweikomponenten Farbe gegen Korrosion geschützt werden. Für die N-Buchse wird eine hermetische Ausführung empfohlen. Damit ist das Problem der Abdichtung zuverlässig gelöst.

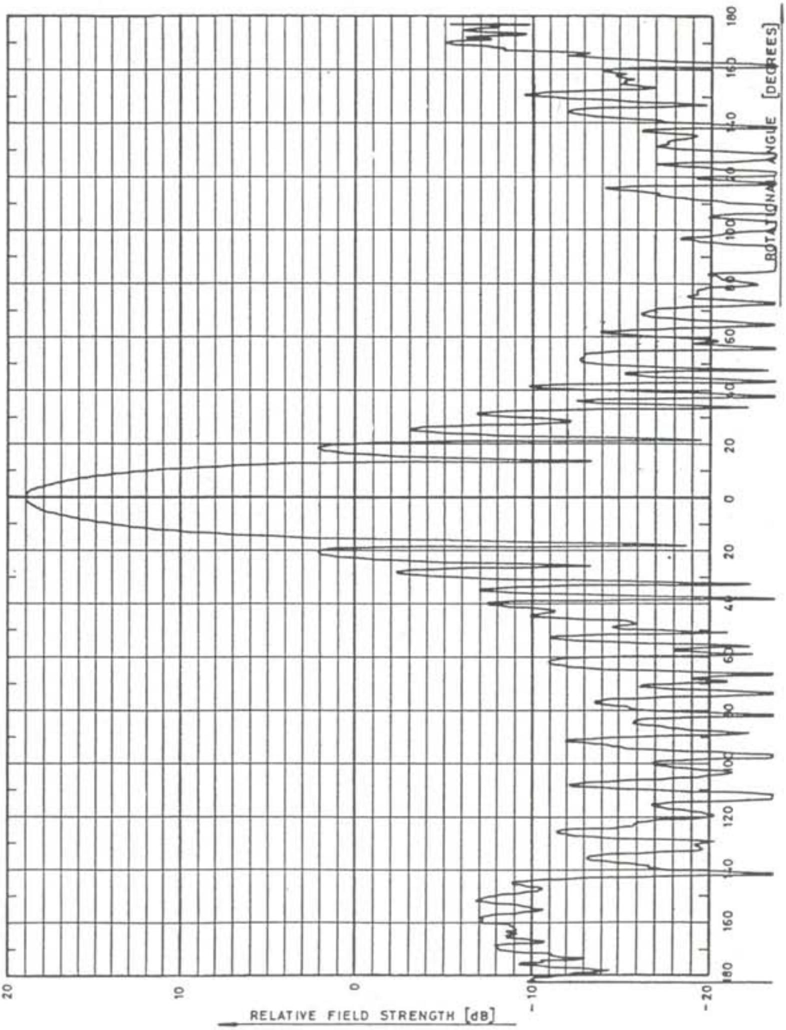
Mechanische Daten:

- Boom-Länge: 2-6m (8,4λ-26λ)
- Boom-Durchmesser: 15mm
- Element Längen schließen Boom-Korrektur ein.
- Element-Durchmesser: 4mm, aus AlMgSi1 Aluminium Stangen
- Dipol: 4mm Durchmesser, 121mm lang (Siehe Abb. 2,3,4,7)
- Element-Montage: Nichtisoliert durch den Boom: Loch mit 3,9mm Bohrer bohren und die Elemente mittels Schlaghülse und Hammer durchschlagen.



Figure/Abb. 5: Gain versus Frequency

RADIATION PATTERN MEASUREMENT			
ANTENNA TYPE: 48 El 17λ 4m		MEASUREMENT RESULTS	
FREQUENCY: 6WU		MEASUREMENT PLANE:	E
MANUFACTURER:		MEASUREMENT FREQ:	1296
OWNER: DJ9BV		GAIN (dBd):	19,0
STATED SPECIFICATIONS BY MANUFACTURER:		3 dB - BEAMWIDTH:	
GAIN (dBd):	3 dB-BEAMWIDTH:	F/B RATIO:	
F/B RATIO:	MAX. SWR:	SWR AT MEAS. FREQ.:	



HASLEV, JUNE 1985

Figure/Abb. 6: 17wl (4m) Yagi/Measurement

- Korrosionsschutz mit Zweikomponentenfarbe: Brillux 853 Epoxy Farbe für Aluminium

Measurements

During the Scandinavian VHF/UHF meeting in Haslev/Denmark in 1985 pattern and gain were measured with good results: 18.3 dBD for the 3m version and 19.1 dBD for the 4m version. Patterns are excellent with low sidelobes and extremely high F/B ratio (see Figure 6). Four of 4m long Yagis provide marginal EME performance on 23cm in spite of the 3dB polarisation loss. This has been demonstrated by DL3YEE and others.

Electrical performance data can be seen from table1. Data is calculated by NEC-II software and is in very good agreement with the measurement data. For good bad weather performance the gain maximum is designed for 1315 MHz for a dry antenna (Fig. 5). During rain the gain peak may go down to 1300 MHz. In either case the antenna will function in tenths of a dB of the optimum gain. For low band work (Satellite, ATV, Packet) longer elements (See Box Mechanical Data and Fig. 5) provide optimum performance.

Meßwerte

1985 wurden während des Skandinavischen VHF/UHF Meetings in Haslev/Dänemark die Antennen vermessen. Der gemessene Gewinn beträgt 18,3 dBD für die 3m lange Version und 19,1 dBD für die 4m lange Version. Außerdem konnte das ausgezeichnete Diagramm gemessen werden (Abb. 6). Mit vier von 4m langen Yagis ist man bedingt EME-tauglich, obwohl man 3dB Polarisationsverlust hat. Das wurde von DL3YEE und anderen gezeigt.

Die elektrischen Eigenschaften sind aus Tabelle 1 ersichtlich. Die Daten wurden mittels NEC-II simuliert und stimmen im Fall der 3m und 4m Version ausgezeichnet mit den gemessenen Daten überein. Zur Sicherheit gegen Nässe auf den Elementen sind die Antennen für ein Gewinnmaximum bei 1315 MHz dimensioniert (Abb. 5). Auf 1296 MHz fällt der Gewinn bei trockener Antenne nur wenige Zehntel ab. Ist die Antenne naß, rutscht das Gewinnmaximum auf 1300 MHz, so daß eine große Unempfindlichkeit gegen schlechtes Wetter gewährleistet ist. Um 2mm längere Elemente erlauben optimalen Betrieb von 1240-1280MHz für Packet etc. (Siehe Box Mechanical Data und Abb. 5).

Parts/Teile

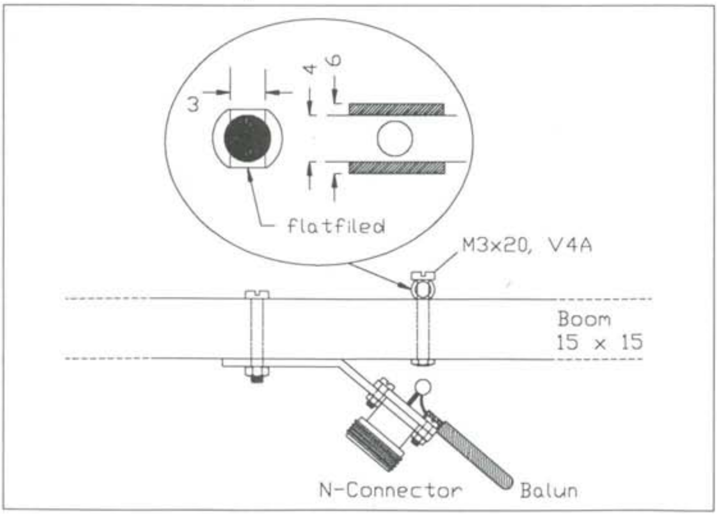
Special Parts, dipole assemblies and ready made Yagis are available from Rainer Jäger, DC3XY, Breslauer Str.4, D-25479 Ellerau. Phone: ++49 (0)4106-73430.

Teile, fertige Dipole und komplette Antennen sind bei obiger Adresse erhältlich.

References

[1] Günter Hoch, DL6WU, "Extrem Lange Yagi-Antennen", UKW-Berichte 1/1982, pp.3-11

[2] R. Bertelsmeier, DJ9BV, G. Hoch, DL6WU, "Yagi Simulation: CAD-Software for Evaluation and Development", DUBUS 3/1992, pp.42-66.



Figure/Abb. 7: Dipole Assembly

Hints & Kinks

Editor: Gerold Bächle, DF5GX

Timer for T/R-Function

DK2FT, Dr. Jochen Berlemann

Dieser Timer sorgt für einen ordnungsgemäßen Ablauf der Schaltfunktionen in PA und Vorverstärker bei der Sende-/Empfangs-Umschaltung.

Ohne einen solchen kontrollierten Ablauf können der Vorverstärker und das Antennen-Relais durch die zu früh eingeschaltete PA zerstört werden.

Nach Aktivierung der PTT-Taste des Transverters oder Transceivers wird das Ansprechen des Relais 2 um eine von 15 ...100 ms einstellbare Zeit verzögert (siehe Zeitdiagramm und Poti P2 in der Schaltung).

Nach Loslassen der PTT-Taste wird der Abfall von Relais 1 um eine einstellbare Zeit von 15 ... 100 ms verzögert (P1). Die Relais können nach den speziellen Gegebenheiten der Station verdrahtet werden.

Normalerweise wird mit Rel.1 das Antennen-Relais und der Vorverstärker geschaltet (bei Ga As - Vorverstärkern sollte die Versorgungsspannung +UB auch beim Senden anliegen, da diese Verstärker dann ca. 10 dB umempfindlicher gegen Zerstörung durch die Sendeleistung sind).

Rel.2 schaltet die PA - PTT und/oder andere Sende-Funktionen.

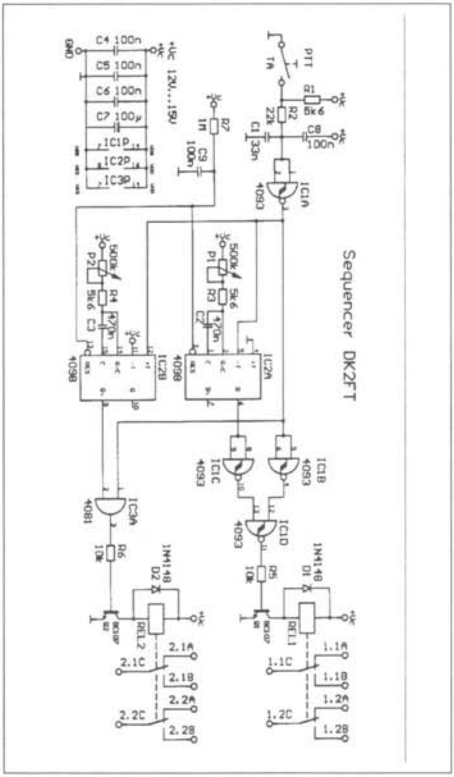
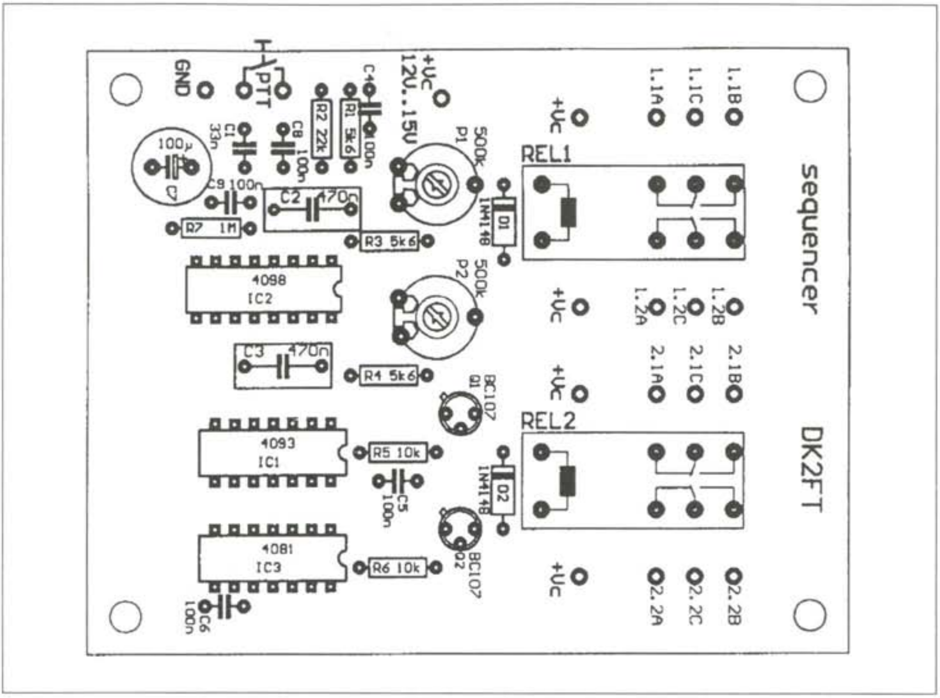


Abb. / Fig. 1

Abb. / Fig. 2



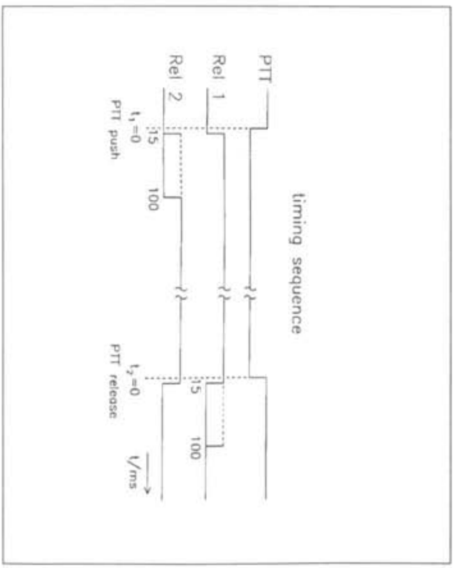


Abb. / Fig. 3

This small circuit takes care of proper timing-sequence of PA and preamp during PTT-operation. The preamp and antenna relay may otherwise be damaged if transmitting-power is applied to early.

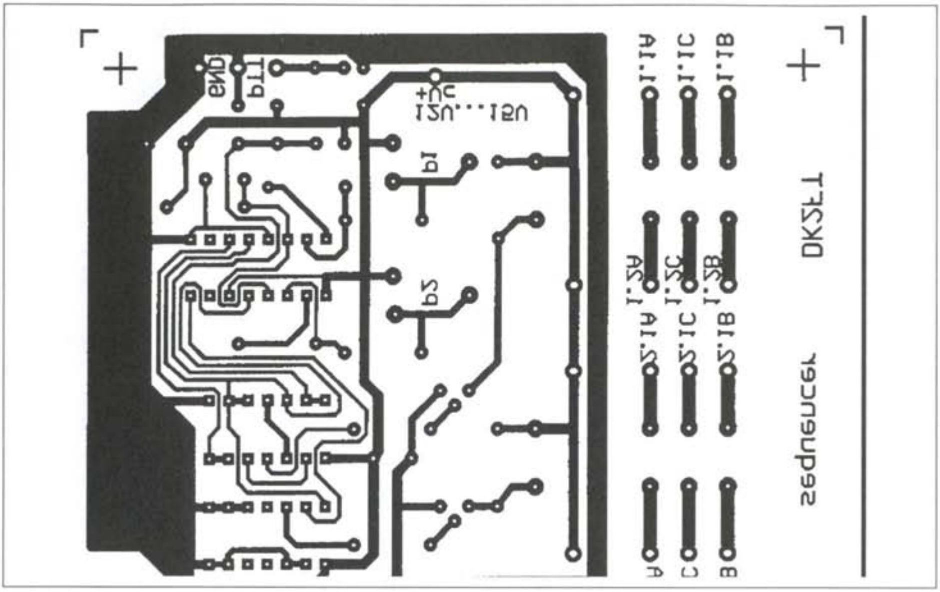
After activating PTT of transceiver or transverter Rel.2 is delayed by an adjustable time of 15 ... 100 ms (see timing sequence and P2 in circuit). After releasing PTT Rel.1 is delayed by an adjustable time of 15 ... 100 ms (P1).

The relays may be wired according to the special requirements of the station.

Rel.1 should be connected to all antenna-relays and probably preamp supply voltage (Ga As - preamps should remain connected to + UB during 'Transmit' because they are then about 10 dB more insensitive to overload by transmitting- power).

Rel.2 should be connected to PA-PTT and/or other transmission-activating functions.

Abb. / Fig. 4



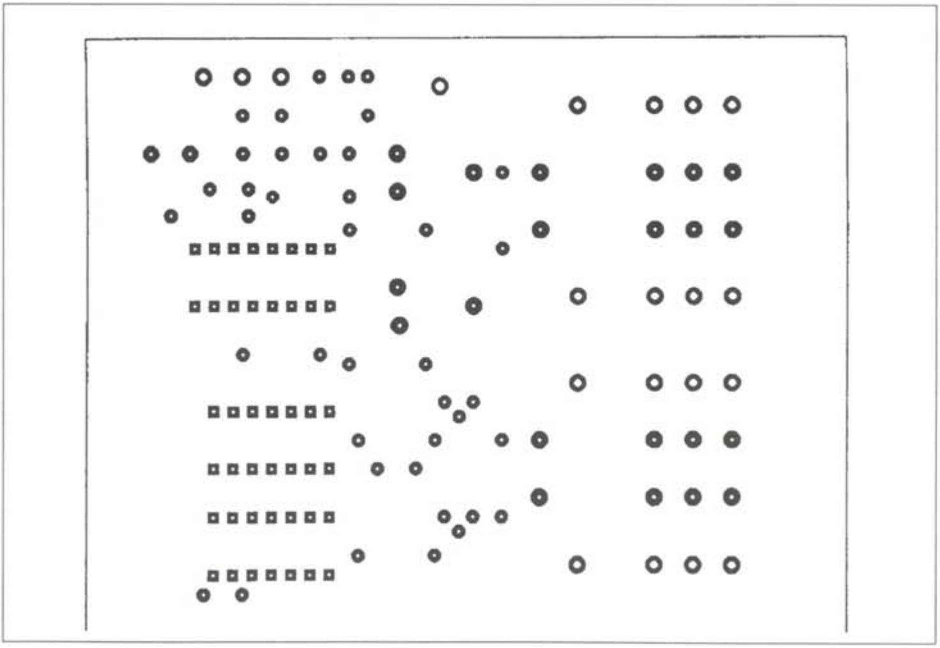


Abb. / Fig. 5

EME TRACKING AID USING LUNAR THERMAL NOISE ON 13

Stuart Jones, GW3XYW

INTEGRATION OF "DICKE" NOISE SWITCHING SYSTEM WITH THE G4COM ALIGNMENT AID TO CHECK EME TRACKING USING LUNAR THERMAL NOISE ON 13 CMS

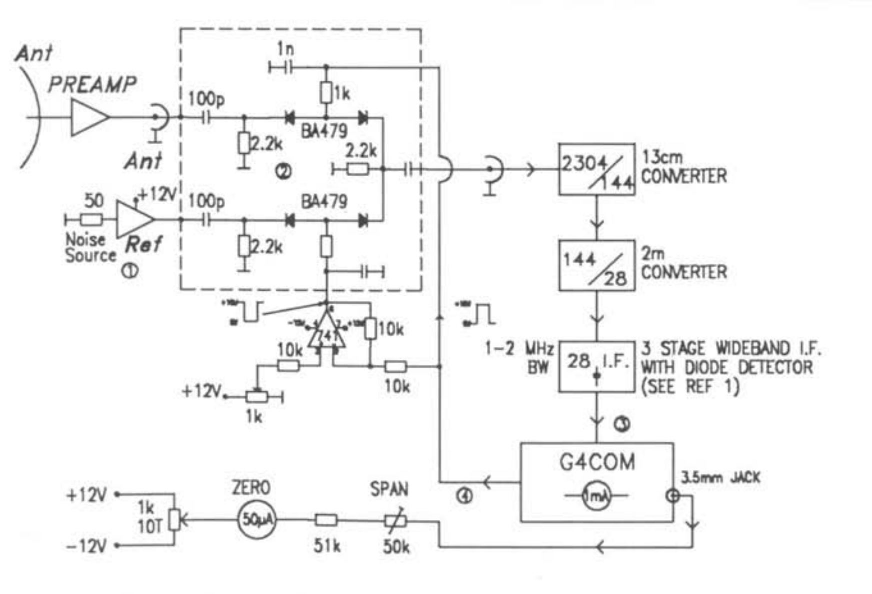
Having been qrv on EME for many years on 70 and 23 cms, I decided to qsy to 13 cms. However it was found that antenna tracking was much more critical.

Small discrepancies were seen between sun and moontracking software, also small differences between the mechanical and electrical axis of the dish were apparent.

Therefore, the only precise way of setting accurate tracking is by monitoring signals off the moon itself.

With a 22 ft (6.7M) dish it was just possible to see a small but repeatable noise increase over cold sky on the 'S' meter (A fraction of a db). This was too small to enable accurate tracking checks and amateur signals are transient and suffer from libration fading.

Abb./Fig.6 : "DICKE" NOISE SWITCHING SYSTEM



Lunar thermal noise is consistent and steady (no qsb), but at too low level for use with normal detection methods.

Since the Moon is a wide-band thermal radio source, I decided to try the "Radio Astronomy" approach and use the "Dicke" method (Ref 1) which continuously compares antenna signal against a fixed noise reference. This ratio is amplified and detected using a synchronous rectifier. Receiver noise, gain and zero drift are therefore largely nulled out. Since the intention here ist not to resolve CW or SSB the signal integration time constant (T) can be extended up to 10 secs. This together with a wider bandwidth (B) increases sensitivity proportionally to $\sqrt{BT}$.

Use of a G4COM "Alignment Aid" minimised the amount of construction required (Ref 2&3).

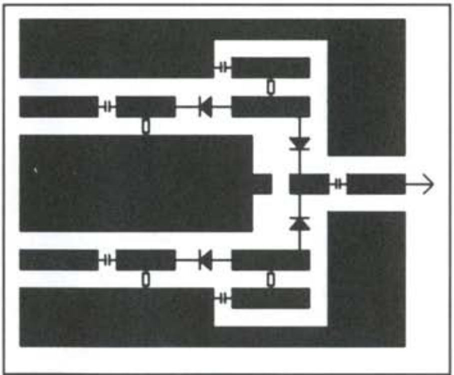


Abb./Fig. 7 : PIN DIODE SWITCH

The REF/ANT switch was constructed using 50 stripline technique and 1/16" glass epoxy p.c.b. (see drawing).

A spare 2m converter was used to downconvert the 144Mhz o/p of the 13cms transverter to 28 Mhz.

An extension meter was fitted on the G4COM o/p in order to increase the sensitivity and connect zero and span controls. This was done via a 3.5mm jack plug so that the original use of the Alignment Aid was not compromised.

Results: With cold sky set to zero, a reading of 60% fsd (30 A) can be obtained when the dish points at the Moon. This is a useful level for checking tracking accuracy. A good signal could also be obtained from the Crab Nebula. At 3500 light years this is my best receive DX HI!

NOTES:

1) "Spare" Preamp required to equalise noise levels.

2) Ant/Ref Diode switch operates at 30Hz switching rate.

3) Detected noise from wideband IF fed to G4COM Alignment Aid

4) Original noise diode drive used to operate Ant/Ref switch.

References

Ref 1:
"Wireless World", Feb 1978, p26, "A BASIC RADIO TELESCOPE", J.R.Smith

Ref 2:
"Radio Communication", Jan 1976, p36, " A VHF ALIGNMENT AID", G4COM

Ref 3:
"Microwave Manual", Vol 2 p10...39, "A VHF ALIGNMENT AID", G4COM.

Microwave Parts

Editor: Rainer Bertelsmeier, DJ9BV

New Microwave Substrates from Rogers

TMM ® Temperature Stable Microwave Composite Circuit Board Materials

TMM ® Temperature Stable Microwave Laminates are ceramic thermoset polymer composites designed for high reliability stripline and microstrip applications. TMM laminates are available in a wide range of dielectric constants and cladding options.

The electrical and mechanical properties of TMM laminates combine many of the benefits of both ceramic and traditional PTFE microwave circuit laminates, without requiring the specialized production techniques common to these materials. TMM laminates do not require a sodium napthanate treatment prior to electroless plating.

An exceptionally low thermal coefficient of dielectric constant, typically less than 30 ppm per degree C, results in consistent electrical performance over broad temperature ranges.

TMM laminates have isotropic coefficients of thermal expansion, very closely matched to copper, allowing for production of high reliability plated through holes, and low etch shrinkage values. Furthermore, the thermal conductivity of TMM laminates is approximately twice that of traditional PTFE/ceramic laminates, facilitating heat removal.

TMM laminates are based on thermoset resins, and do not soften when heated. As a result, wire bonding of component leads to circuit traces can be performed without concerns of pad lifting or substrate deformation.

TMM laminates combine many of the desirable features of ceramic substrates with the ease of soft substrate processing techniques. TMM temperature stable microwave laminates are available clad with 1/8 oz/ft² to 2 oz/ft² electrodeposited copper foil, or bonded directly to brass or aluminum plates. Substrate thicknesses of 0.015" to 0.500" and greater are available. The base substrate is resistant to all etchants and solvents used in printed circuit production. Consequently, all common PWB processes can be used to produce TMM microwave laminates.

Type	Dielektrizitätskonstante	Verlustfaktor	Füllung
RT/duroid® 5880	2,20 +/- 0,02	0,0009	Mikroglasfaser
RT/duroid® 5870	2,33 +/- 0,02	0,0012	Mikroglasfaser
Ultralam® 2000	2,50 +/- 0,04	0,0019	Glasgewebe
RT/duroid® 6002	2,94 +/- 0,04	0,0012	Keramik
RO 3003®	3.00 +/- 0,04	0,0013	Keramik
RT/duroid® 6006	6,15 +/- 0,15	0,0019	Keramik
RT/duroid® 6010	10,2 +/- 0,25 10,5 +/- 0,25 10,8 +/- 0,25	0,0024	Keramik
TMM®-3	3,27 +/- 0,02	0,0016	Keramik
TMM®-4	4,50 +/- 0,05	0,0017	Keramik
TMM®-6	6,00 +/- 0,08	0,0018	Keramik
TMM®-10	9,20 +/- 0,23	0,0017	Keramik

Zum Vergleich: Epoxyglas FR-4 mit DK = 5,00 und VF = 0,0350
Al_2O_3 (99 %) mit DK = 9,90 und VF = 0,0002

Die Werte gelten für Messungen bei 10 GHz.

ROGERS

TMM® Temperature Stable Microwave Laminate

PROPERTY	METHOD	CONDITION	UNITS	DIRECTION	TYPICAL VALUES TMM 3	TMM 4	TMM 6	TMM 10
Dielectric Constant ε_r	IPC-TM-650 Method 2.5.5.5	10GHz	--	Z	3.27 ±0.016	4.50 ±0.045	6.00 ±0.080	9.20 ±0.230
Thermal Cofficient of ε_r	IPC-TM-650 Method 2.5.5.5	-55 to +125°C			+37	--	-11	-38
Dissipation Factor	ASTM D2520B	3 GHz	--	X,Y	0.0016	0.0017	0.0018	0.0017
Insulation Resistance	ASTM D257	C96/60/95	Gohm		>2000	>2000	>2000	>2000
Volume Resistivity			Mohm•cm		$3X10^9$	$6X10^8$	$1X10^8$	$2X10^7$
Surface Resistivity			Mohm		$>9X10^9$	$1X10^9$	$1X10^9$	$4X10^7$
Copper Peel Strength	IPC-TM-650 Method 2.4.8	After Solder Float 1 oz.EDC	lb/inch	X,Y	3.0	3.0	3.0	3.0
Flexural Strength	ASTM D790	A	kpsi	X,Y	16.53	15.91	15.02	13.62
Flexural Modulus	ASTM D790	A	Mpsi	X,Y	1.72	1.76	1.75	1.79
Impact, Notched Izod	ASTM D256A		ft-lb/in	X,Y	0.33	0.36	0.42	0.43
Water Absorption(2X2") 3.18mm (0.125") thk 0.1.27mm (0.050") thk	ASTM D570	D48/50	%	--	0.06 0.12	0.07 0.18	0.06 0.20	0.09 0.20
Specific Gravity	ASTM D792	A	--	--	1.78	2.07	2.37	2.77
Specific Heat	Calculated	A	J/g/K		0.87	0.83	0.78	0.74
Thermal Conductivity	ASTM F433	25°C	W/m/K	Z	0.68	0.70	0.70	0.73
Thermal Expansion	ASTM D3386	0 to 140°C	ppm/K	X,Y Z	16 20	14 20	16 20	16 20

NOTES
ASTM D3386 corresponds to IPC TM 650 method 2.4.4.1. Thermal Conductivity and Thermal Expansion values for TMM 4 and TMM 6 are estimates.

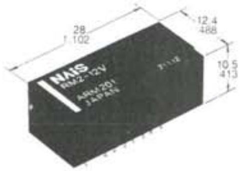
ROGERS

Rogers Corporation
Microwave and Circuit Materials Division, 100 S. Roosevelt Avenue, Chandler, AZ 85226 602 961-1382 FAX: 602 961-4533

Revised 4/27/93
6736-043-10.0-AH

RM Relavs bv Matsushita

NAiS Matsushita Automation Controls	**HIGH FREQUENCY SIGNAL (4 GHz) SWITCHABLE**	**RM-RELAYS**



mm inch

- **Excellent high frequency characteristics**
  Isolation: 40 dB or more (at 4 GHz)
  Insertion loss: 1.0 dB or less (at 4 GHz)
  V.S.W.R. : 1.5 or less (at 4 GHz)
- **High sensitivity in small size**
  Size: 28.0×12.4×10.5 mm 1.102×.488×.413 inch
  Nominal operating power: 360 mW (single side stable type)
- **Sealed construction for automatic cleaning**
- **Latching types are also available**

SPECIFICATIONS

Contact

Arrangement		2 Form C
Initial contact resistance, max. (By HP4328A)		100 mΩ
Rating	Nominal switching capacity	0.01 A 24 V DC 10 W (at 1.2 GHz, Z_0 = 50 Ω system)
High frequency characteristics (50 Ω system)	Isolation	Min. 40 dB (at 4 GHz)
	Insertion loss	Max. 1.0 dB (at 4 GHz)
	V.S.W.R.	Max. 1.5 (at 4 GHz)
Expected life (min. operations)	Mechanical	5×10^6
	Electrical (at 20 cpm)	3×10^5 (0.01 A 24 V DC) 1×10^5 (10W at 1.2 GHz, Z_0 = 50 Ω system)

Coil (at 25°C, 68°F)

	Nominal operating power
Single side stable	360 mW
1 coil latching	250 mW
2 coil latching	500 mW

Characteristics

Max. operating speed (at rated load)		20 cpm
Initial insulation resistance, min.		100 MΩ at 500 V DC
Initial breakdown voltage	Between open contacts	500 Vrms for 1 min.
	Between contact and coil	1,000 Vrms for 1 min.
	Between contact and earth	500 Vrms for 1 min.
Operate time (at nominal voltage)		Approx. 6 msec. (without bounce)
Release time (at nominal voltage)		Approx. 3 msec. (without bounce)
Temperature rise (max.)		60 deg. with nominal coil voltage across coil and rated contact current
Shock resistance	Functional	Min. 10 G
	Destructive	Min. 100 G
Vibration resistance	Functional	10 to 55 Hz at double amplitude of 1.5 mm
	Destructive	10 to 55 Hz at double amplitude of 2 mm
Ambient temperature		–40°C to +60°C –40°F to +140°F (No freezing below 0°C)
Unit weight		Approx. 7 g .247 oz

TYPICAL APPLICATIONS

- Audio visual equipment
- Communication equipment
- Measuring equipment

ORDERING INFORMATION

Ex. RM 2 — L2 — 24V

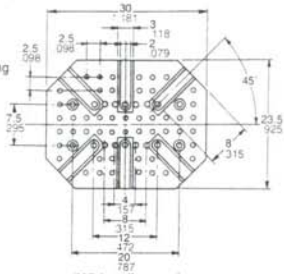
Contact arrangement	Operating function	Coil voltage (DC)
2: 2 Form C	Nil: Single side stable L: 1 coil latching L2: 2 coil latching	3, 4.5, 5, 6, 9, 12, 24 V

Note: Standard packing; Carton: 20 pcs. Case: 200 pcs.

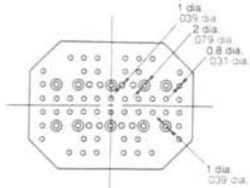
DATA

1. High frequency characteristics
Sample: RM2-12V
Measuring method: 50 Ω system measuring

mm inch



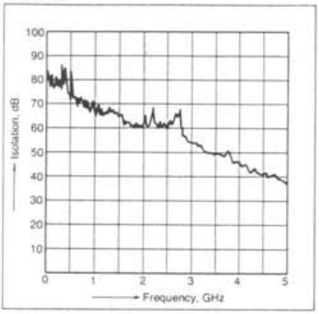
(Wiring diagram)



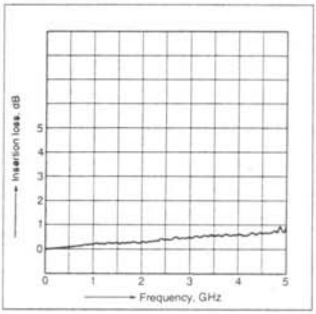
PC board
- Double-sided through hole
- Material: Glass-PTFE

Tolerance: ±0.1 ±.004

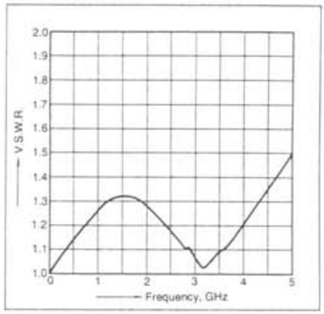
• Isolation



• Insertion loss



• V.S.W.R.

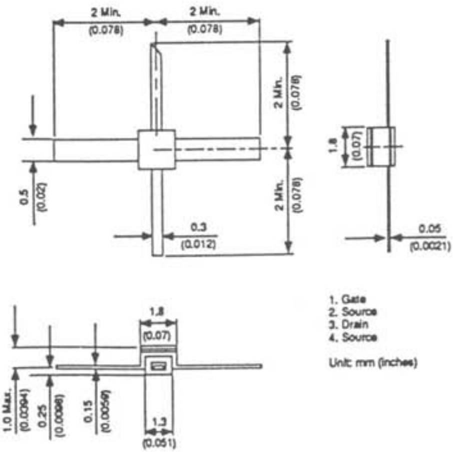


FUJITSU K-Band Power GaAs FET

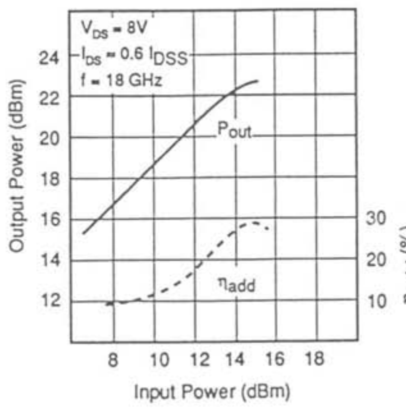
FLR026FH

K-Band Power GaAs FETs

FUJITSU



OUTPUT POWER vs. INPUT POWER



ABSOLUTE MAXIMUM RATINGS (Ambient Temperature Ta = 25° C)

Item	Symbol	Condition	Rating	Unit
Drain-Source Voltage	V_{DS}		12	V
Gate-Source Voltage	V_{GS}		-3	V
Total Power Dissipation	P_T	Tc=25°C	1.88	W
Storage Temperature	T_{stg}		-65 to +175	°C
Channel Temperature	T_{ch}		175	°C

Fujitsu recommends the following conditions for the reliable operation of GaAs FETs:

1. The drain - source operating voltage (V_{DS}) should not exceed 10 volts.
2. The forward and reverse gate currents should not exceed 0.5 and -0.1 mA respectively with gate resistance of 2000Ω.

ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta = 25° C.)

Item	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	I_{DSS}	V_{DS} = 3V, V_{GS} = 0V	-	120	180	mA
Transconductance	g_m	V_{DS} = 3V, I_{DS} = 65mA	-	50	-	mS
Pinch-off Voltage	V_P	V_{DS} = 3V, I_{DS} = 5mA	-1.0	-2.0	-3.5	V
Gate -Source Breakdown Voltage	V_{GSO}	I_{GS} = -5μA	-3	-	-	V
Output Power at 1dB G.C.P.	P_{1dB}	V_{DS} = 8V, I_{DS}= 0.6 I_{DSS} (Typ.), f = 18 GHz	22	23	-	dBm
Power Gain at 1dB G.C.P.	G_{1dB}		7.0	8.0	-	dB
Power added Efficiency	η_{add}		-	29	-	%
Thermal Resistance	R_{th}	Channel to Case	-	100	120	°C/W

CASE STYLE: FH

G.C.P: Gain Compression Point

Philips Semiconductors — Product specification

T

UHF push-pull power MOS transistor

BLF548

FEATURES

- High power gain
- Easy power control
- Gold metallization ensures excellent reliability
- Good thermal stability
- Designed for broadband operation.

DESCRIPTION

The BLF548 is a silicon n-channel enhancement mode vertical D-MOS push-pull transistor, intended for communications transmitters in the UHF range with a nominal supply voltage of 28 V.

The transistor has a 4-lead balanced flange envelope, with two ceramic caps. The flange is the source connection.

PINNING - SOT262A2

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a push-pull common-source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
c.w. class-B	500	28	150	> 10	> 50

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

PIN CONFIGURATION

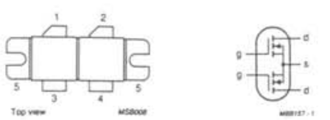
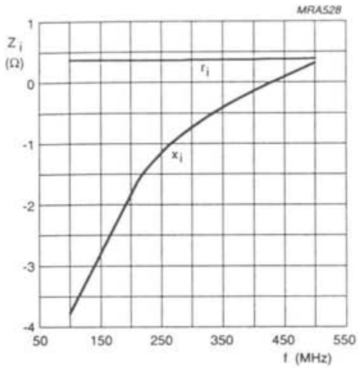


Fig.1 Simplified outline and symbol.

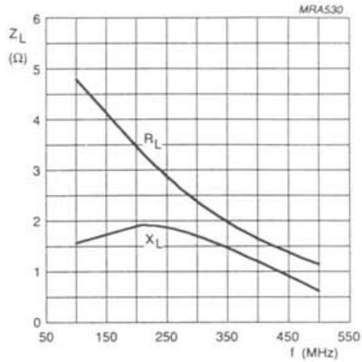
UHF push-pull power MOS transistor

BLF548



Class-B operation; V_{DS} = 28 V; I_{DQ} = 160 mA (per section); P_L = 150 W (total device).

Fig.13 Input impedance as a function of frequency (series components), typical values per section.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 160 mA (per section); P_L = 150 W (total device).

Fig.14 Load impedance as a function of frequency (series components), typical values per section.

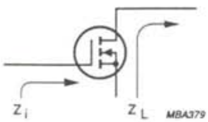
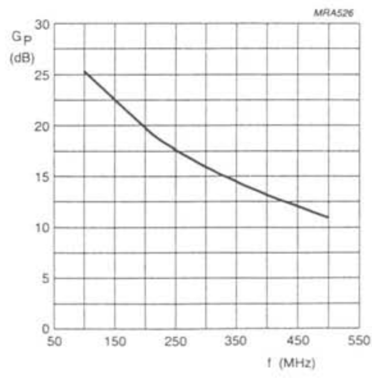


Fig.15 Definition of MOS impedance.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 160 mA (per section); P_L = 150 W (total device).

Fig.16 Power gain as a function of frequency, typical values per section.

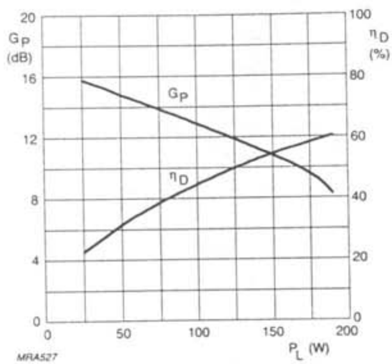
UHF push-pull power MOS transistor

BLF548

APPLICATION INFORMATION

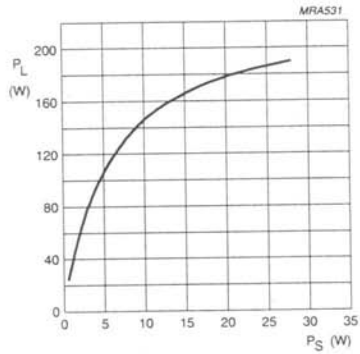
T_h = 25 °C; $R_{th\ mb-h}$ = 0.15 K/W, unless otherwise specified.
RF performance in a common-source push-pull test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
c.w. class-B	500	28	2 x 160	150	> 10 typ. 11	> 50 typ. 55



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 160 mA; f = 500 MHz; Z_L = 1.1 + j0.6 Ω (per section).

Fig.9 Power gain and efficiency as functions of load power, typical values.



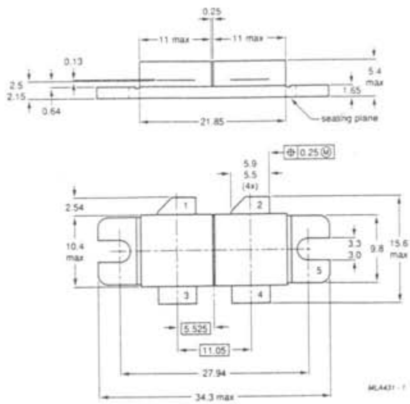
Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 x 160 mA; f = 500 MHz; Z_L = 1.1 + j0.6 Ω (per section).

Fig.10 Load power as a function of drive power, typical values.

Ruggedness in class-B operation

The BLF548 is capable of withstanding a load mismatch corresponding to VSWR = 10 through all phases under the following conditions:

V_{DS} = 28 V; f = 500 MHz at rated output power.



Computer News

Editor: Hellmuth Fischer, DF7VX

Das CAD Programm RULE

Fast jeder professionelle Elektroniker, aber auch der Elektronik Homebrewer (Konstrukteur, Bastler ?) hat schon einmal vor dem Problem gestanden, die von Ihm entwickelte Schaltung nicht in konventioneller freier Verdrahtung zu realisieren. Zwei oder mehr andere Möglichkeiten bieten sich dafür an. In diesem Artikel soll es hauptsächlich um die nahezu profimäßige Erstellung einer Leiterplatte (auch gern Printplatte genannt) mit PC-Hilfe gehen. Das es garnicht so einfach ist, ein optimales Platinenlayout zu entwerfen, kann man sehr schnell feststellen. Nur eine jahrelange Routine hilft hier erfolgreich weiter. Das Problem des Platinen Layout Entwurfs steigt mit der Anzahl der Bauelemte und der sogenannten Packungsdichte. Gerade diese beiden Schwerpunkte erfordern auch im Amateurbereich heute schon sehr häufig doppelseitige Leiterbahnführungen. Die bisherige Methoden, Entwurf auf einer Rasterfolie mit Bleistift und Radiergummi und die anschließende Realisierung mit der Hilfe von Anreibesymbolen für Leiterbahnen und Lötpunkte tritt mehr und mehr in den Hintergrund. Es lag also nahe, daß über kurz oder lang der Rechner mit entsprechender CAD Software diese Aufgabe übernimmt. Nun gibt es in der Zwischenzeit ein sehr reichhaltiges Angebot der unterschiedlichsten Software mit einer gewaltigen Preisspanne um dieses Problem zu lösen.

Da es nach meiner Auffassung gerade im Amateurbereich in vielen Fällen um den Entwurf von Analogschaltungen (NF/HF/UHF) geht, galt mein Augenmerk besonders einer Software die diesen Anforderungen gerecht wird.

Ein Autorouter wie in den großen CAD Packeten vorhanden ist gerade für solche Anwendungen völlig ungeeignet. Das heißt, mein Aufmerksamkeit galt zunächst einmal einem einfachen sowie wirkungsvollen interaktivem Layoutprogramm (Editor).

Auf der Suche nach einem leistungsfähigen und gleichzeitig preiswertem Layoutprogramm stieß ich vor einigen Jahren auf das Programm mit dem Namen "RULE".

Eine leicht zu bedienende Grafische Benutzeroberfläche ist heute als Standard auch bei den preiswerten Programmen vorhanden. Diese erleichtert die Arbeit ganz erheblich.

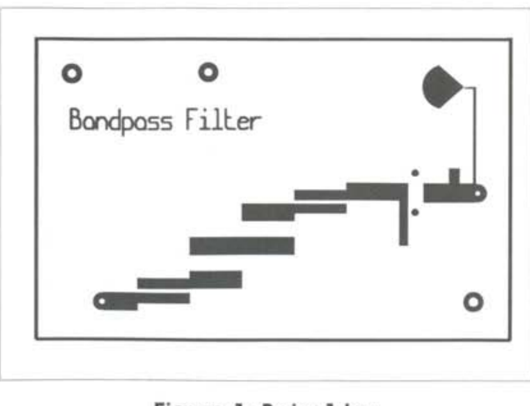
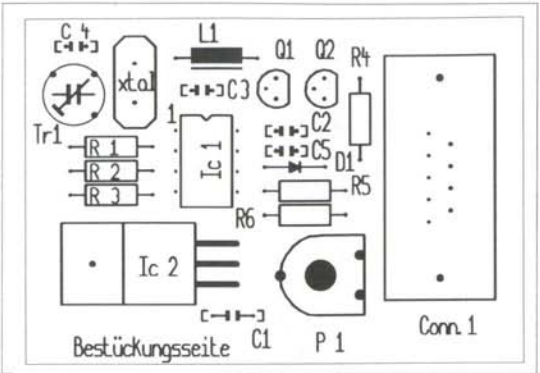


Figure 1: Beisp1.lay

Eine grosse Bauteilebibliothek, die auch SMD und sogenannte Spezial Teile enthält gehört heute auch bei den Low Cost Versionen zum Lieferumfang. Wie und Was läßt sich nun damit anfangen? Nach der Installation (Festplatte) und einem Minimalstudium des Handbuchs kann es losgehen.

Maximal 16 Ebenen und eine Platinengröße von 23 x 23 cm sind möglich. Beliebig geformte Lötpunkte (hilft bei einem Mikrowellen Design) sowie beliebig breite Leiterbahnen neben ausgefüllten Rechtecken und Dreiecken sind überaus hilfreiche Funktionen die sogar in viel kostspieligerer Software fehlt (Beispiel 1). Leider ist es mir noch nicht gelungen abgerundete Leiter-

Figure 2: Beisp2.lay



bahnecken zu konstruieren, aber das ist das bisher einzige kleine Handicap. Durch die Möglichkeit der unterschiedlichen Nutzung von bis zu 16 Lagen (Layern) wird dem Anwender sehr schnell klar, daß man mit diesem CAD Programm auch noch andere Dinge als NUR Printplattenentwürfe herstellen kann. Hier sei hervorzuheben, daß es realtiv einfach ist, auch Schaltungen oder andere technische Zeichnungen am Bildschirm zu entwerfen und dann auszudrucken. Diese zum Beispiel bei einem Schaltbild und einem Bestückungsplan (siehe Beispiele 2 und 3). In einem Schaltbild erforderliche Bauteile, wie Widerstände, Kondensatoren, Transistoren usw. können über eine Export Funktion in einer zu erstellenden Bibliothek abgespeichert werden. Damit hat man nun die Möglickeit bei weiteren Schaltbildern diese "Bauteile" wieder über eine Importfunktion hervor zu holen und im Schaltplan zu plazieren.

Teure Software wie z.b. ORCAD zur Herstellung von Schaltbildern ist damit dann nicht unbedingt erforderlich. Ein einschaltbares Winkelsystem und ein frei definierbares Raster (mm / inch-zoll) mit einer max. Auflösung von 0.005mm sowie Kopieren, Drehen, Spiegeln, Verschieben, Löschen und Ändern, Autopan und die Nutzung der PC-Maus sind weitere Hilfmittel die eine Layoutentwicklung sehr wirkungsvoll vereinfachen. Nicht zu vergessen die Beschriftung auch in Kupfer (Beispiel 4) oder auch das Anbringen von Passmarken wie sie bei doppelseitigen Prints sehr hilfreich sind, sind Bestandteil des Programms. Etwas was man sehr schnell zu schätzen lernt, ist die Möglichkeit, alle Befehle nicht nur aus den Menues, sondern auch über die Tastatur eingeben zu können (Anfangsbuchstaben). Rule arbeitet wie schon zu Beginn erwähnt, nach dem Layerprinzip. Mit dieser Methode kann man einzelne Arbeitslagen erstellen, die dann übereinandergelegt betrachtet und auch ausgedruckt werden können. Angezeigt werden diese unterschiedlichen Layer durch verschiedene Farben. Man hat so den Vorteil, daß man die gesamte Platine mit Bauteilen, Beschriftungen, Montagematerial und Anmerkungen sowie Texte entwerfen kann. Bei der Ausgabe des Layouts kann man den Maßstab sowie das Ausgabegerät (z.b. Laserdrucker oder mit einer Zusatzsoftware auch Gerberfiles etc.) und natürlich den oder die entsprechenden Layer wählen. Bohrdaten und Lötstopmasken lassen sich mit der vorhandenen Version allerdings nicht anfertigen. Bei einem Platinen Einzelstück ist dieses auch nicht erforderlich. Ein großes Plus ist der Laserdruckertreiber, denn auf diesem Weg ist es möglich, mit der Hilfe sogenannter Overheadfolien direkt eine nutzbare Folie zur Belichtung von fotobeschichtetem Platinen- material herzustellen. Eine andere, nicht zu unterschätzende Funktion läßt den Export auch von Bauteilekonfigurationen in die Bibliothek zu. Als Beispiel kann man hier die unterschiedlichen Neosidspulen, die Helixfilter von Componex oder auch Transformatoren anführen. Natürlich besteht auch die Möglichkeit "richtige" HF-Platinen - das heißt die Oberseite besitzt eine durchgehende

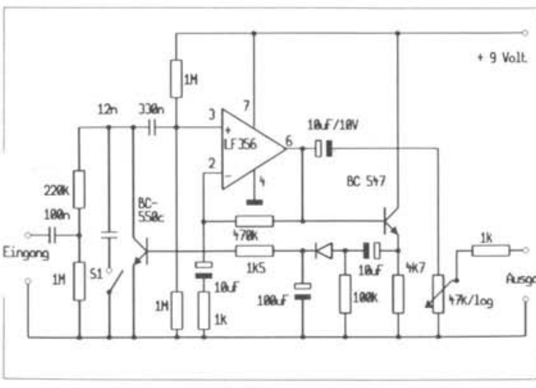


Figure 3: Beisp3.lay

Kupferfläche mit entsprechenden freizuätzenden Inseln, zu konstruieren (siehe Beispiel 5). In der bisher üblichen Klebe-/Anreibetechnik war dieses besonders zeitintensiv und von eventuellen Änderungen will ich garnicht reden. Diese Möglichkeit fand man zu der Zeit als ich diese Software bekam nicht einmal in den großen kommerziellen Layoutprogrammen.

RULE 2.0 ist nach meiner Auffassung ein Spitzenprogramm, daß nach sehr kurzer Einarbeitungszeit überraschend gute Ergebnisse liefert. Für den sogenannten Low Cost Preis von DM 129.- erhält man ein Programm das mehr hergibt als man auf den ersten Blick vermutet. Die Software läuft fast auf jedem Rechner. Sinnvoll ist aber ein 386er mit 40 MHz und einer VGA Karte. Ein virtuelles Laufwerk beschleunigt die Erstellung des Druckfiles.

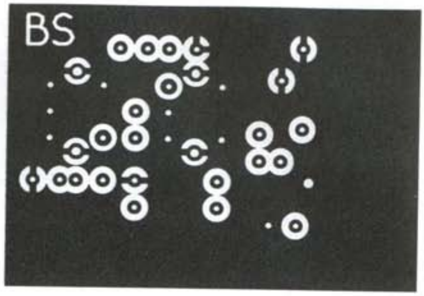


Figure 4: Beisp4.lay

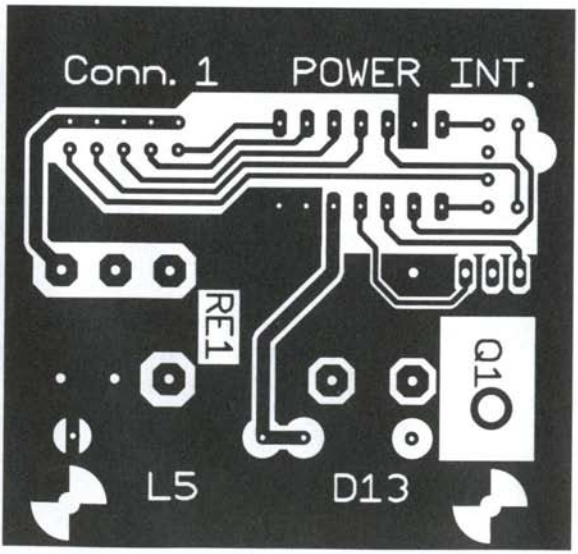


Figure 5: Beisp5.lay

Microwave Europe

Editor: John Sørensen, OZ1IPU

1296 MHz:

PA0BAT JO31FX wkd: 27.10.93 OK2BLE + OK2BFH JN99. OK1FFD/p JO60 OK1IBL JO60. DK0NA JO50. 31.10.93 F1EZQ JN27. 1.11.93 DK9MN JN58. DB5ML JN58. F5DED/p JN18. DK0OG JN68. Tks fer info Gerard.

DL8BDU JO43AA wkd: 7.3.93 DH3NAN JO50. 1.5.93 DH3NAN JO50. DL0UL/p JN48. DF0YY/p JO62. ON5UM JO21. 2.5.93 DL3ZBA/p JO40. 27.4.93 G4IDR JO02. G3XDY JO02. G3ZEZ JO01. G0JDL JO02. 4.6.93 G3XDY JO02 5.6.93 DL3IAS JN49. ON5OF/p JO30. G3XDY JO02. G3ZEZ JO01. SM7ECM JO65. OZ1KLU JO46. SM7UHF JO65. G8VLL JO02. 6.6.93 DL5KVA/p JO74. DG9NBT JN49. 15.6.93 OZ2OE JO45. 30.6.93 G4NBR IO92. G4BYV JO02. 29.10.93. OK1AGE/p JO70. OK1FFD JO60. OK1IBL JO60. 30.10.93 SM6FHZ JO57. OK1VEI JO70. 31.10.93 SM6ESG JO67. OZ8VO JO56. 21.11.93 DG5NEX JN49. DG9NBT JN49. DB8NU JN49. DK2GR JN59. Rig: PA.75W. 1,2m Dish. Tks fer info Klaus.

2320 MHz:

PA0BAT JO31FX wkd: 1.11.93 DK9MN JN58. 5.3.94 DF0RB JO51. DF0CI JO51. Tks fer info Gerard.

SP9EWU JO90NH wkd: 22.01.94 OK2BLE JN99 first SP-OK. 5.3.94 OK2BFH JN99. OK2KFM JN99. SP9FG JN99 first SP-SP. SP9KGG/a JN99. Tks fer info Wojciech.

I6CXB in JN63ro / 1.5m Dish

LA5QEA in JP99nq

3400 MHz:

PA0BAT JO31FX wkd: 19.8.93 DK1PZ JO41. 27.10.93 DK0NA JO50. 5.3.94 PA3DIJ JO33. Tks fer info Gerard.

5760 MHz

PA0BAT JO31FX wkd: 19.8.93 DK1PZ JO41. 27.10.93 DK0NA JO50. 5.3.94 DF0CI JO51. DJ6TA JO30. Tks fer info Gerard.

10368 MHz

PA0BAT JO31FX wkd: 30.9.93 DL3NQ JN49 RS. 27.10.93 DK0NA JO50. PA3DIJ JO33. Tks fer info Gerard.

S51WI wkd in contests from JN75aq, -as, -fo:

XX Contest Lario 1993 Date : 04.04.1993 QTH: JN75AQ 09:05 I4VXH/4 59 59 SSB JN64AN 201km, 09:26 S51JN 59 59 SSB JN65UM 32km, 09:45 IK4OMN 55 55 SSB JN64FC 216km, 10:02 I3OPW 59 59 SSB JN65CL 144km, 10:30 IW6AEG 53 52 SSB JN63RO 236km, 10:36 I6XCK/6 59 55 SSB JN63TN 238km, 10:48 IW4BNT/4 59 59 SSB JN54OK 262km, 10:53 IW4BTJ/4 51 51 SSB JN54OK 262km, 12:20 OE8MI/8 53 55 SSB JN66UO 105km,

MAJ 93-VHF, UHF, SHF Date: 1/2.5.1993 QTH: JN75AS 17:02 IW4BTJ/4 59 59 SSB JN54OK 267km, 18:25 OE8MI/8 53 51 SSB JN66UO 96km, 19:45 IK4OMN 59 59 SSB JN64FC 223km, 19:58 I3ZH 59 59 SSB JN55VM 177km, 08:03 I3DRE/IV3 59 59 SSB JN66SE 60km, 08:05 IV3FDO/IV3 59 59 SSB JN66SE 60km, 08:06 IK3NOK/3 59 59 SSB JN66EA 132km, 08:44 I4BER/4 59 59 SSB JN54IG 310km, 08:52 I3ZJL/3 59 59 SSB JN55ST 194km, 09:43 I6XCK/6 59 59 SSB JN63QO 246km, 09:45 IW6AEG 55 55 SSB JN63RO 245km, 10:13 IV3DEW/IV3 59 59 SSB JN65QQ 53km, 10:14 I1LEP/IV3 59 59 SSB JN65QQ 53km,

ALPE ADRIA UHF/SHF 1993 Date: 20.06.1993 QTH: JN75FO 07:07 S51JN/p 59 59 SSB JN75AS 37km, 07:12 I6XCK/6 59 59 SSB JN63TN 236km, 07:52 S53UAN 59 59 SSB JN65XV 51km, 08:27 IW4BNT/4 59 59 SSB JN54JD 331km, 08:49 IV3DEW/IV3 59 59 SSB JN65VR 54km, 09:09 I3ZH/3 59 59 SSB JN55TW 223km, 09:12 IV3BJR/IV3 59 59 SSB JN66GC 158km, 09:20 OE8MI/8 59 59 SSB JN66WQ 128km, 09:34 IK4DCO/4 59 59 SSB JN63FW 243km, 10:16 IK4OMN 59 59 SSB JN64FC 229km, 10:36 I4QIG/4 59 59 SSB JN54QF 287km, 11:50 I4BER/4 59 59 SSB JN54IG 330km, 12:04 9A2EY 59 59 SSB JN75XV 121km, 12:14 I3OPW 59 59 SSB JN65CL 176km, 13:32 I3ZJL 55 55 SSB JN55QR 240km,

S5 JULIJSKO V/U/SHF Date: 4/5.07.1993 QTH: JN75FO 14:01 IW6AEG 59 59 SSB JN63RO 236km, 14:13 IK4OMN 59 59 SSB JN64FC 229km, 14:33 OE8MI/8 59 59 SSB JN66WQ 128km, 15:35 IK1LUT/1 55 55 SSB JN35TL 532km, 16:30 S59CST 59 59 SSB JN65XM 40km, 06:29 IK2LNT 59 59 SSB JN54IX 301km, 06:36 I4JCS 59 59 SSB JN54KV 291km, 06:48 I4CHY/4 59 59 SSB JN54OK 286km, 07:11 IK3NWV/3 59 59 SSB JN55VU 209km, 07:26 I4BER/6 59 59 SSB JN63GN 273km, 07:28 I6XCK/6 59 59 SSB JN62OW 313km, 07:39 9A2EY 59 59 SSB JN75XV 121km, 08:26 I3DRE/3 59 59 SSB JN65AW 191km, 08:30 I4VXH/4 59 59 SSB JN64AN 222km, 08:42 I3ZJL/3 59 59 SSB JN55PS 247km, 08:45 IV3FDO/IV3 59 59 SSB JN66SE 96km, 09:49 IV3BJR/p 59 59 SSB JN65KV 127km, 11:11 IV3DEW 59 59 SSB JN65WP 46km, 13:17 I2MUT/2 55 55 SSB JN55EU 318km,

Field day ferragosto Date: 15.08.1993 QTH: JN75AQ 07:05 I3OPW/3 59 59 SSB JN63AW 250km, 07:14 IW4BJT/4 59 59 SSB JN54JF 303km, 07:18 IK4OMN 59 59 SSB JN64FC 216km, 07:23 I3ZH/3 59 59 SSB JN55TT 188km, 07:48 I3DRE/IV3 59 59 SSB JN66SE 68km, 07:53 I4XCC 59 59 SSB JN63GV 232km, 08:34 IK4NMF 59 59 SSB JN54SM 235km, 09:04 IV3DEW/IV3 59 59 SSB JN66NH 99km, 09:46 I4BER/4 59 59 SSB JN54IG 306km, 10:15 IK0HWJ/6 55 55 SSB JN72AC 398km, 11:13 I4QIG/4 55 55 SSB JN54PD 276km, 13:48 I6XCK/6 59 59 SSB JN63QP 233km, 14:26 IK1LUT/1 55 51 SSB JN35TL 499km, 15:45 IW6AEG 59 59 SSB JN63RO 236km, 16:15 I4JCS/3 55 55 SSB JN55PL 215km,

News

HB9MIN is now QRV from /p QTH in JN37OE Asl 1300m. on 10/24 GHz because of the rising activity on 24 GHz. Ant: 1,2m. dish, Gain on 10GHz 38dB, Gain on 24GHz 45dB TX: Hughes TWT Amp. Pout 36dBm=4W. RX: FHX13LG/ FHX14LG WG input, PM HEMT NF.1,5 dB Gain 31 dB. Skeds: HB9MIN E. Zimmermann, Hauptstrasse 141, CH 4585 Biezwil Tel. 0041/32815013

LA7QM Arvid JP89TF and LA5QEA Ralf JP99MQ is QRV from nord Norway on 10GHz/p and is looking for skeds thay are QRV on Packet via LA3T Tromso BBS.

I6CXB ex. IW6AEG Fabio JN63RO is now QRV with 10W on 10GHz and is interested in skeds Tel. 0039/ 71883719.

73 John OZ1IPU

Microwave: World Firsts and World Records

Band [GHz]	World First QSO			World Record		
	Date	Calls	QRB [km]	Date	Calls	QRB [km]
10	6.V.1946	W2JRM-W2JN	3.3	18.7.1983	EA9/I0SNY-I0YLI/IE9	1666
24	14.IX.1975	G3BNL/P-G3EEZ/p	150	3.II.1993	HB9MIN/p-DH6FAE/p	396
47	3.X.1984	HB9AMH-HB9MIN	1	15.IX.1992	HB9MIN/p-HB9MIO/p	166
76	30.XII.1985	HB9MIN-HB9AGE	0.5	30.IV.1992	DB6NT/p-Y24IN/p	38
145	12.VII.1992	DB6NT/p-DL1JIN/p	1	2.V.1993	WA1MBA-WB2BYW	3.6
241	23.V.1993	DB6NT/p-DL1JIN/p	0.1	30.VI.1993	OZ/DB6NT-OZ/DF9LN	0.5

If you have an update or correction, please write to:
John Sørensen, OZ1IPU, Rosenvej 49, DK-9300 Sæby, Denmark.

Microwave Japan

Editor: Toshihiko Takamizawa, JE1AAH

This month, I would like to introduce Japanese EME scene. The manuscript for this month was written by JA4BLC and translated by JE1AAH.

EME in Japan

It is not easy to understand being few EME activity in Japan for many EME enthusiasts reading DUBUS although there are 1.3 million amateur radio stations equipped with world leading high-tech electronics equipment and devices. However, more than 90% of the stations are NO-code licensed and their interest is to communicate within small group using very useful small FM handy/mobile transceiver like CB radio. They are not interested in CW, overseas DX, terrestrial DX as well. Probably, it is no more than 10% of amateurs being interested in technical part of Ham life including home made of equipment.

According to above reasons, using another point of view which assumes 10,000 stations in Far-east island, 100s of EME stations could be understood by readers. Another issue which we have to overcome is to obtain adequate RF power legally from government. We need three licenses to establish EME stations. One is operator license, one is station license and last one is special license for EME using more than 100W at VHF/UHF because normal power limit above 144MHz is only 50W. JA4BLC needed three years to get 100W EME license for 2.4GHz. EMEer should have very strong will to overcome those hurdles.

On the other hand, since several very enthusiastic pioneer stations had overcome and made first EME QSO in 1975, EME station in Japan has been getting increased little bit step by step. Recent interests of those stations are multi-band operation and trying 2.4GHz band and above.

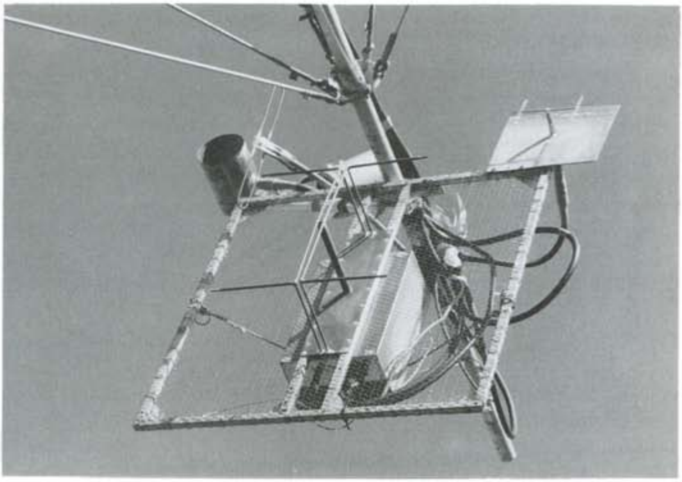
Late coming Japanese EMEer would be trying to get higher band near future, I believe.

Band information

50MHz

Since 1992, 500W has been legally licensed. But it is very strange that EME operation is not allowed for 50MHz yet. There are several big guns for F2 propagation and terrestrial DX. Those stations have a capability for EME. Rumor says somebody has heard his echo, or made EME contacts already!?

JH3EAO 4.8m Dish, QRV on 432 & 1296MHz



JA4BLC Triband Feed: 70&23cm Dual Dipole / 13cm Horn

144MHz

Since 1975, there has been EME activity on 144MHz. First contact was made by JA6DR with W6PO on August 1975. Special hi-power 500W has been licensed legally from EME foundation year. The most serious problem for 144 is non-amateur activity using easy-to-get ham radio transceiver. They are truckers, taxi drivers, un-cover stations etc. Also Licensed Amateur (strange word it is, but I dare say) does not comply with mode and usage allocation. Those illegal usage makes a big interference for EME activity. They ignore EME gourd band, of course. However, recent big gun activities, W5UN and VE3ONT, have knocked and inspired MS and Satellite stations being interested in EME. WAC and VUCC have been reported.

432MHz

Since 1975, there has been EME activity on this band, too. First contact was made by JA1VDV with WA6LET on February 1975. Like 144MHz, 500W has also been licensed legally by special EME request. In Japan, 430MHz is the most preferable band for EME due to space or room for antenna. Since land cost is VERY expensive, especially in down town, smaller antenna is preferable. This band has the same trouble as 144MHz has which is illegal usage by un-licensed person. Serious trouble exists in west Japan area especially in OSAKA, KOBE and KYOTO. As those FM stations operate 20KHz separation, odd number frequency operation(010, 030, 050, 070 and 090KHz) would be nice to reduce QRM. WAC and VUCC have been reported.

1296MHz

First QSO was made in 1984 by JA4BRS with OE9XXI. However, legal limit for this band is still only 10W. It is possible to run EME by 10W but only limited stations with BIG antenna can do it. Although it has been promoted to get hi-power license for EME for many years, government does not like to allow 500W for amateurs*.

I think this band is the best band in Japan for EME by considering many issues, house/land cost, FM QRM and low cosmic noise etc. Last year, mode and usage allocation has been established for this band, too. In this allocation, EME is clearly stated at around 1296MHz. I expect and hope EME will be legally licensed one day near future.

2400MHz

We Japanese amateur lost 2300 to 2400MHz allocation several years ago. Now 2400 to 2450MHz is only allocated for us. Legal limit of RF is ONLY 1W. However, very special license of 100W for

* *JE1AAH comments: The reason is that air navigation support system frequency is allocated just below ham band.*

EME has been allowed to me, JA4BLC in 1992 and made first QSO in 1993 with OE9XXI. Now I have been trying to make QSO with WB5LUA. I have clearly heard his echo, but my one could not ......! Need trying. 100W license is only allowed between 2424.0MHz and 2424.5MHz. It is expected JH3EAO will be licensed soon.

5600MHz and UP

These frequency's legal limit is only 1W, too. However, few group has started preparation for EME having been inspired by W and European microwave EME successes. As obtaining hi-power GaAs FET and low noise device is not a problem for us, the biggest issue to overcome must be obtaining a special license for EME and hi-power from the government.

Active EMEer list in Japan by JA4BLC

Herewith the list only for the station being licensed 100W and up. Please remind that there are many lower power stations trying to get EME using 10 to 50W within their legal limit without special hi-power license.

144MHz

Call	Power	Date of licensed
7K3LGC	100	93/11
JH1WLK	100	93/11
JA2JRJ	500	94/01
JA4BLC	500	88/09
JA4LKB	500	93/05
JA5YJS	500	93/12
JA8IAD	100	92/11
JA9BOH	500	78/08
JA9EYI	500	87/11

432MHz

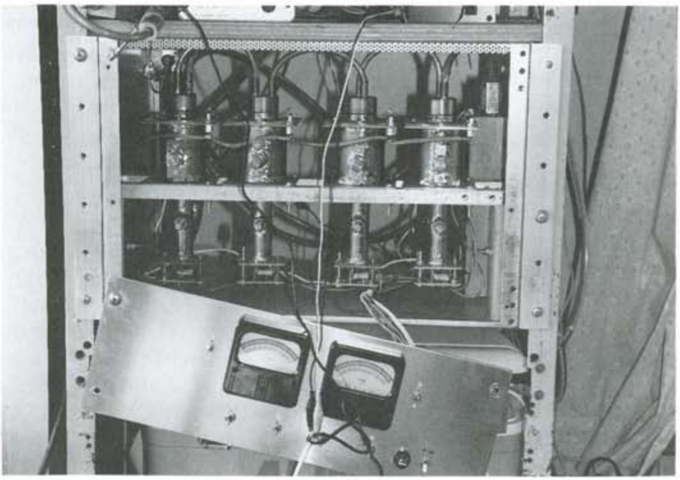
JA0IXX	500	92/04
JH1MOM	100	92/10
JH1WLK	100	93/11
JH1XUJ	500	90/09
JA2JRJ	500	88/03
JA2KRW	500	92/11
JA3IAF	500	84/05
JH3EAO	500	93/10
JO3RNL	500	92/??
JA4BLC	500	81/06
JA4LKB	500	88/06
JH4JLV	500	92/11
JR4AEP	500	84/06
JA5OVU	500	94/01
JA5YJS	500	93/12
JA6AHB	500	77/01
JA6CZD	500	76/12
JA7UIQ	500	83/08
JA9BOH	500	78/08

2400MHz

JA4BLC	100	94/01

Remark to last issue:

The single board 10GHz transverter shown has been developed by 7N1OXG and will be published in one the next issues.



JA4BLC 13cm PA

EME News

Editor: Bernd Wilde, DL7APV

Intro: The ARRL contestdates are fixed. From the **ARRL EME** Contest Manager : Attention EME Enthusiasts, the dates for the ARRL International EME Competition has been set for the weekends of October 29-30 and November 26-27, 1994. The complete rules and dates will appear in September QST. Please do what you can to help spread the word. Thanks; 73, Billy. Billy Lunt, KR1R, Voice: 203-666-1541, Contest Manager, FAX: 203-665-7531, American Radio Relay League, ARRL BBS: 203-666-0578, 225 Main Street, BBS Uploads: 203-665-0090, Newington, CT 06111, Internet: blunt@arrl.org. Send ARRL Contest Entries via: contest@arrl.org. This is the best solution for the europeans and prevents trouble because of the major VHF/UHF contests at the beginning of oct&nov.

50MHz

I5MXX wkd : 12.09.93 WA4NJP, 19.09. OH2BC, 09.10. WA4NJP, 10.10. K6MYC, K6QXY, 06.11. W6JKV, 07.11. OH2BC, W7HAH (single yagi!!), 03.01.94 SM7BAE (1 yagi!). rig 4x9el 2wl, qrg 50.161 MHz, Fax for skeds ++39 572 950092. tnx fer info Marzio

144MHz

DJ5RE (JN59wi) wkd : SM5MIX s(4-y), K5GW r, OE5JFL r, LA8YB r, OE5EYM r, KB8RQ r, AF9Y r, K2GAL r, SM5BSZ r, K2RTH r, OH7PI s, IK1MTZ r #20. His new adr: Thomas Höppe, Blumenstr.5, 92245 Kümmersbruck, Tel:++ 9621-74944. tnx fer info Tom

DL2IAN wkd : 26.02.1994 23.00-23.32 UTC SM7BAE O/O. Skeds via PR to DB0GE.SAR.GER.EU or to Thomas Schenk, Hintergasse 9 76865 Rohrbach/Pfalz.RIG: 100 W to 2 x 17 el.F9FT full Elevation. tnx fer info Thomas

DL8OBU wkd: #1 VE7BQH 09.01.93 r, #2 N1BUG 07.02.93 r, #3 W5UN r, #4 SM2CEW, #5 W4ZD 02.04.93, #6 I2FAK 04.04.93 r, #7 LA8YB 30.04.93 r, #8 IK3MAC 01.05.93 r, #9 UZ2FWA r, #10 AF9Y 28.05.93 r, #11 K5GW r, #12 SM5MIX 29.05.93 r, #13 IK2EAD, #14 KB8RQ r, #15 SM5FRH 30.05.93 r, #16 PA0JMV 26.06.93, #17 K2GAL 20.08.93 r, #18 OK1MS 21.08.93, #19 DL8DAT r, #20 PA/DJ9BV r, #21 WB5LBT 11.09.93 r, #22 LZ2US 09.10.93 r, #23 SM5BSZ 10.10.93 r, #24 OE5JFL r, #25 K1MNS, #26 VE3ONT r, #27 AA4FQ 07.11.93, #28 IK1MTZ 02.12.93 r, #29 I5JUX 04.12.93 r, #30 S57TW 30.01.94 r, #31 HB9CRQ 27.02.94 r, #32 DK9OY, #33 PA2CHR r, #34 OZ9AAR 22.03.94, #35 UT5ER 26.03.94, #36 JL1ZCG r, #37 WA3HMK 27.03.94, #38 DL5MAE r, #39 PE1DAB r, #40 IW5AVM. rig: 4x11el Tonna, 650 W Hf, SSB-SP2, TS 790. He will go qrt on 2m-EME Sept.1994. Skeds: welcome on VHF-Net and EME-Net. tnx fer info Jürgen (tnx fr disk! red)

EA6VQ : After some months being QRT he is back on 144 MHz EME with a new antenna array of 8x17 2M-5WL, PA with 3CX800A7 and 0.3 dB NF preamp. He is very interested in any sked, even with small stations. He will QRV on weekends from Friday evening to Sunday afternoon UTC and can be reached on the EME net and also in the European VHF net. tnx fer info Gabriel

F6IRF wkd : 450 qso at only 10 weekends in '93 incl. following initials Jan: SM6CMU, RB5AO, DL3IAE, IK4DCX, EA6VQ, IK2EAD, WA2GSX, SM4POB, N8ITP, DL7AKA, UB3EE, IK1FJI, Feb: EA3ADW, GM4AFF, K2LME, K6AAW, HB9JAW, N6OC, G4PIQ, SM5BSZ, NR5K, WB2OYC, N8DJB, FR5DN, March: CX9BT, Aug: IK2DDR, K9BCT, K8BHZ, OO4ANT, Sept.: N5JHV, K2TXB, IK0FEC, G4XBF, Oct. PA3EPD, PA0CIS, DL7MAT, DL6WT, VE3ONT, DL0UMK, Nov.: N0XX, RA3YCR, F5HRY, UZ9CC, LZ1DP, 9A2MK,

EME-TOPLIST

144MHz

Call	small	SQR	DXCC	States	WAS	WAC
I2FAK	380	50	78	50	1993	1988
HB9CRQ	344	51	80	49	--	1987
DL3BWW	333	46	72	50	1992	1983
UA9FAD	320	37	53	35	--	Yes
PA0JMV	251	44	64	50	1993	1988
F6IRF	171	29	41	32	--	Yes
UA3TCF	145	0	30	0	--	--
UZ3FWA	114	0	28	0	--	--
RA3YCR	109	0	33	24	--	--
RA3LE	94	0	0	0	--	--
DK9ZY	89	23	24	16	--	yes
EA6VQ	84	22	26	0		
LA0BY	83	27	29	20	--	--
SM0PYP	76	19	28	15	--	--
SP5EFO	74	21	28	13		
UV1AS	52	0	21	0	--	--
UA9XEA	49	0	20	0	--	--
SP5CJT	44	14	17	11	--	--
DL7AKA	32	14	12	10	--	--
DL7UTS	29	10	13	10	--	--
IK5OIY	19	13	9	5	--	--
F5HRY	14	0	6	7		
DL5DAT	11	6	6	3	--	--
UA3MAS	11	0	5	0	--	--
DL3YEE	4	2	4	0	--	--
HB9DFG	3	3	2	2	--	--
UA6LGH	2	0	1	0	--	--
DL8EBW	1	1	1	0		

432MHz

Call	small	SQR	DXCC	States	WAS	WAC
DL9KR	325	47	73	50	1987	1978
SM0PYP	290	40	50	42	--	1989
OK1KIR	214	38	55	43	--	1982
DJ6MB	203	33	53	36	--	1984
DL3BWW	196	36	51	38	--	1991
RA3YCR	187	0	46	33	--	
UA6LGH	163	0	38	0	--	
UA9FAD	120	24	34	26	--	--
YO2IS	99	19	31	21		
SP5CJT	94	24	28	26	--	--
OE9XXI	93	27	29	23	--	1983
RA3LE	92	0	0	0	--	
DL3YEE	86	22	31	15	--	--
UA3TCF	30	0	11	0	--	
UA9XEA	23	0	11	0	--	
HB9CRQ	20	13	12	9	--	--

1296MHz

Call	small	SQR	DXCC	States	WAS	WAC
OE9XXI	143	27	33	22	--	1989
SM0PYP	100	21	26	15	--	1989
OK1KIR	90	24	28	17	--	1989
EA6/DF5JJ	42	15	17	0		
OE9FKI	42	8	17	9	--	--
HB9BBD	24	12	11	3		
DF5JJ	13	0	7	0		
DL3YEE	9	6	6	1	--	--

2300MHz

Call	small	SQR	DXCC	States	WAS	WAC
OE9XXI	34	13	15	9	--	--
OK1KIR	24	9	11	8	--	--
SM0PYP	21	9	11	7	--	--
OE9FKI	3	3	3	1	--	--

10368MHz

Call	small	SQR	DXCC	States	WAS	WAC
G3WDG	6	-	5	2	--	--
G4KGC	4	-	3	2	--	--
OK1KIR	2	2	2	1	--	--

PA3BZO, DL1MHA, DL4DTU, DL9MHG, HB9DLU, DL1HYZ, (for 107x38 at ARRL), Dec.: 9A1CCY, W9IP/2, UT5ER, DF9UX, 9H1BT, EI4DQ, K2RTH/4. Patrick found condx due REF contest quite good; but not much activity from US. He will change to 432 but it seems reasonable to continue on 144 for a while. tnx fer info Patrick

HB9CRQ wkd : in Feb VK5EK (PF95gt), JW8YB (JQ78), OZ9AAR, XE2/N6XQ (DL29), LA7DFA, DL8OBU and DH0YAZ #610. tnx fer info Dan I2FAK wkd : new initials HB0/HB9QQ, DL6NAA, W9IP, IN3MTA, DL4DTU, HL9UH, DL9MHG, DL7MAT, G4HWA, DL0UMK, N0XX, JE1BMJ, JA9RNR; VE3ONT, UB5EQA, DL1HYZ, S51ZO, UZ9CXM, K2QE, WA4CHA, W2PGC, W9QXP, EA8/ON5FF, N2IQU, OM3KMY, JA2JRJ, UT5ER, DL3YEE, 9H1PA, G6CW/p, F5JFT, F5HRY, DK2FT, W9HLY, DK6JU, DL4UTS, UC2OEU, SV1BTR, K2RTH/4, IK0RNL, N0AKC, KL7FB, DL0WA, W2CRS, K1GJM, WG7N, W7FHI, UR3EE, UT8AL, XE2/N6XQ (DM field), 7K3LGC, VE7BEE, WA9KRT, VP2MGW, DL2RMC, OH2BAP, VE3KDH, VK5EK, UT4EQ, JW8YB, DF9UX, DL1DUN, XE2/N6QX (DL field), K5ZXE and IW5CNS #693!. tnx fer info Franco

JL1ZCG wkd : 19.02.94 IK2DDR, PE1AGJ, DJ9CZ, I4XCC #, OK2VMD #, DL9MHG, REF:

19.03. VE1BVL, W5UN, 7K3LGC, SM5FRH, G4SWX, DL3BWW, SM5BSZ, SM5MIX, #F3VS, SM2CEW, PA3EPD, #F1JZG, DJ3WA, 20.03. K2GAL, K2RTH, WA2GSX, WA4CHA, LA8YB, #PA3CMG, SM6CMU, DL5MAE, I4XCC, FR5DN, PA0JMV, DK6JU, #EI4DQ, #F9HS, #JE1BMJ, LZ2US #192, hrd: JA4BLC, JA2JRJ, UN8BT, condx were bad for most time and big gun activity as well, beside trouble from mobile invaders on 144.020. Strongest signals in the contest were W5UN&SM5FRH, SM5MIX ran after but SM5BSZ was as strong as them. QSL address : JL1ZCG NAKAYOSHI QRP CLUB, 4-8 ASANO-CHO,KAWASAKI-KU, KAWASAKI-CITY,KANAGAWA, 210 JAPAN. tnx fer info Susumu Awaya JR4ENY/1

LU7DZ: is back on 2m EME. He moved to Cordoba and will but back up again his 4x14 ELE Yagis and running 800watts New Locator is FF78UJ Adress as followed LU7DZ Eduardo Van Ooteghem Aconcagua 125 VGB 5194 Cordoba Argentina / South America. He should be ready by April or may he told me, so keep your ears stick to the moon. He is not taking skeds yet. tnx fer info

UT5EC (KN78mk) wkd : 09.10.93 W5UN 0/0, K5GW 0/0, DL8DAT 0/0, SM5FRH 0/0, KB8RQ 0/0. 10.10.93 VE3ONT 569/539, I2FAK 0/0, LA8YB 0/0. 06.11.93 JL1ZCG 0/0, SM7BAE 0/0, AA4FQ 0/0, SM5BSZ 0/0, KB4WTC 0/0, G4SWX 0/0, SM2CKR 0/0, S51WV 0/0, SM2CEW 0/0, SM5MIX 0/0. 07.11.93 K2GAL 0/0, HB9CRQ 0/0, F5JTA 0/0. 04.12.93 DL3BWW 0/0, IK3MAC 0/0, K2GAL 0/0. 29.01.94 IW5AVM 0/0, 04.04.93 DL7MAT 0/0, UA6BDC 0/0, S57TW 0/0, OH7PI 0/0. 29.05.93 SM5MIX 0/0, SM2CKR 0/0, ON7EH 0/0. 07.08.93- WB5LBT 0/0. 09.10.93 SM5FRH 0/0, LZ2US 0/0, AA4FQ 0/0, KB8RQ 569/549, W5UN 0/0, I2FAK 0/0, K5GW 569/569, HB9CRQ- 0/0. 31.12.93 K5GW 559/549, K2GAL 549/339, SM5BSZ 0/0. 01.01.94 IK3MAC 0/0. 02.01.94 SM5MIX 549/0, JL1ZCG 0/0, I4CXX 0/439. # 128. RIG: 4x17FT, 1.2kW - GS35B, AP320 0.6dB NF.

144 MHz News

call changes RB5LGX = UR5LX, RB5EC = UT5EC, UB5VJF = UT5VF, RB5PA=UT1PA, UB4LL = UR4LL,

432 MHz

DF6NA (JN49xs) wkd : 01.01.94 UT5EC #, 02.01.94 PA3CSG, SM0PYP, K2UYH, 26.02.94 DF3RU, 27.02.94 hrd W2UHI/W2PGC, 19.03.94 9M2BV #, VE1ALQ # (tnx QSL), K0RZ, W7FN # (tnx QSL) 26.03.94 EA3UM #, SM2CEW (tnx QSL), hrd JA5OVU 27.03.94 KD4LT, F1FO, JA2KRW # (tnx QSL), UR5LX hrd G4RGK 16.04.94 F1JZG # (QTH-LOC ?), N4GJV, K0RZ, hrd G4ALH, SM0PYP, SM2CEW, I5MPK, G4RGK 17.04.94 JL1ZCG, EA5CJ #, VK5MC #, JA2JRJ #, DL9KR, K1FO, W2UHI #, hrd JA2KRW, JA9BOH, HL9UH, DL6WU, F1??H He still need following QSL's : JL1ZCG, OH2PO, N2IQU, SM4IVE, F1FEN, UT5DL, 9M8WB, UT5EC PSE allways send QSL for initial contact - that's HAM-spirit ! rig IC 471H, 2 x 3CX800 (N7ART), Preamp DJ9BV 4 x 30el 6WU on pneumatic mast max. 9m above roof abt. 20m AIRCOM-cable. tnx fer info Rainer

DK3FB wkd: 19.02.94 F6HYE, 17.04. F1JZG, DL9KR, 23.04. I5MPK, N4GJV, EA3UM, 24.04. SM4IVE. all random. tnx fer info Ruediger

DL8OBU wkd: #1 VE3ONT 06.11.93 r, #2 SM4IVE r, #3 DL9KR r. Stn : 4x21el Tonna, 250 W Hf, SSB-SP70 + TS 790. He will be qrv on 70cm-EME from Sept'94 permanently with 4x35el/DJ9BV and homebrew PA with YL1050. (just working well, but no reservetube!). If anyone has a YL1050 for a nice price, pse info via VHF-Net or phone 049-5132-94100). Skeds: After ant is up on VHF-Net. tnx fer info Jürgen

G3SEK wkd: the February and March SWs seemed to have very poor activity. In Feb he worked only F6HYE (559/559), I2COR (559/559), G3HUL (339/339), DL9NDD (449/529) and I5MPK (449/549). Judging by the signal reports, condx were not too bad except for Faraday. In March, conditions were poor as well as activity low, at least during daytime on Saturday. If he hadn't been able to hear sun noise, and also heard a few weak stations on sked just after moonrise, He surely have been tearing the equipment apart to look for a fault. He worked EA5CJ (O/O) #201 on sked with 90deg of Farday, but the sked with HA1YA saw his signal go from O down to nothing in the course of 30 minutes, so he wasn't surprised to hear nothing from IW5AVM on the sked immediately afterwards. On the other hand, what few signals he heard from the USA were good: VE1ALQ was strong and consistent, and the sked with W2UHI went straight through (549/419) #202, followed by K5JL (549/539); but nothing from KB8ZW. After working G3HUL (339/449) with 35deg of Faraday, he heard HA1YA calling CQ and worked him (O/O) #203 with no Faraday at all. A little later worked UT5DL (449/449) and SM0PYP (449/449), again with no significant Faraday - all very puzzling! One more QSO this month, on Friday 25 March: I5TDJ (339/449, vertical) #204. Conditions for the REF contest were terrible - the Ap index was higher than his QSO total! Polarization here was 60-90deg rotated for most of the weekend, which was actually quite good for Eu-NA QSOs with horizontal polarization at both ends. Many stations were heard quite well when working F1JZG and the other big guns, but didn't stay around to tune for weaker CQ calls.The contest log was JA4BLC (449/449), SM0PYP (449/449), F1JZG (559/559)#, DL3BWW (O/O), ON5OF (O/O), EA3UM (O/339), OK1CA (339/559), EA5CJ (O/O), F6CGJ (449/449), F2TU (O/O), EA2LU (339/449), VE1BVL (O/O)#, ON4KNG (449/439), IK6EIW (O/O)#, IW5AVM (O/O)#, I2COR (449/449), K1FO (449/449), SM2CEW (559/449), G3HUL(339/339), OE5JFL(559/559), ZS6AXT (O/O), VE1ALQ (449/449), K0RZ (449/449), N4GJV (559/559), S51ZO (O/O), DL9KR (559/559), 9M2BV (O/O)# sked, IN3HER (O/O), VK5MC (O/O) and I5MPK (559/559) for a total of 29100x15. On the post-skeds weekend also KB8ZW (339/339)#.tnx fer info Ian

UT5EC (ex RB5EC) KN78mm wkd : 01.05.93 JA4BLC 339/0, DL3BWW 549/539, UT5DL 339/439, F6HYEE 559/559, DL9NDD 549/559, F1FHI 569/559, PA3CSG - 439/449, I2COR 549/559, F1EHQ 339/339, F6CGJ 549/449, UT5UAS 439/549, DL9KR 579/569, OH2PO 559/439, N4GJV 559/559, K2UYH 559/559. 02.05.93 RB5PA 0/0, JL1ZCG 559/0, PA3CSG 559/439, DK0TU 0/0. 29.05.93 JA2BOH 339/439, DL9EBL M/4?9 NC, DL6WU M/0, SM0PYP 449/449, ZS6AXT 439/559, DL3YEE 0/0. 30.05.93 OK1KIR 449/449, RA3YCR 449/439. 26.06.93 KD4LT 559/559, K0RZ 339/449. 27.06.93 I5TDJ M/M. 10.10.93 OH2PO 0/0, DL9KR 559/559, N2IQU 449/449. 06.11.93- VE3ONT 559/0, K2UYH 549/0,, SM4IVE 579/549, KB4WM 0/0, RB5LGX 549/0, F5MZN 449/549, DL3BWW 449/439. 07.11.93 - ON5OF 0/0, F5EHQ 0/0, OE5JFL 569/569, F8SQ 0/0, EA3UM - 439/439, G3SEK 439/449, OK1KIR 0/0, WA3FFC 0/0. 01.01.94 - I5MPK 0/529, DL6NA 0/0, DL3BWW 549/539. 29.01.94 DF3RU - 549/449, JA2JRJ 0/0, VK3UM 539/459, OK1KIR 0/449, HB9SV - 539/449, OK1CA 0/0, IW5AVM 0/429. # 66. RIG: 8x27BV, 1kW - GS35B, MGF1302 - 14dB. Address: Valery Petrushenko, P.box 214, Dniepropetrovsk-59, 320059, UKRAINE. Packet-radio: UT5EC @@

YO2IS wkd : 16/17.04.94 12.35 F1JZG O/M, N4GJV 559/449, NIL : UT5UAS, WA6BJE, UA9XEA, 17.04.94 12.30 9M2BV O/O, 13.22 DL9KR 569/559 loud as usual!, 14.30 ON4KNG O/-, CWNR: I5MPK 559, HRD: JA6AHB, K1FO, DF6NA NIL: UT5EC, IK6EIW, KB3PD, N0IS. He found condx were normal, activity low and weather nice. tnx fer info Szigy

Netnews 432&up

HL9UH will be qrt at 12.06.94, UB5EQH has a new call : UT4EQ,

1296 MHz

CX9BT wkd his first initials with his 3m TVRO dish and 120w at IMU feed: VE3ONT, OE9ERC and OE9XXI. All antennas are down now. TZhe new 6.7m dish will be installed as fast as possible. tnx fer info Manuel

EA6/DF5JJ wkd : 14.08.93 ZS6AXT, AA6WI, IN3HER, 15.08. SM0PYP, OE9ERC, F1ANH, G3LTF, KN6DD; 11.09. OH2DG, ZS6AXT, F1ANH, OE9XXI, AA6WI, 12.09. JR4BRS, OE9XXI, IN3HER, OH2AXH, OE5JFL, IK3COJ, K2UYH, LA8LF, AA6WI, 08.10. ZS6AXT, 09.10. F1ANH, G3LTF, ZS6AXT, SM6CKU, OE9XXI, SM4DHN, F5PL, LA8LF, OE9ERC, EA3UM, DL9EBL, F2TU, AA6WI, SM2CEW, K2UYH, 10.10. OE5JFL, IN3HER. (sri, letzte mal übersehen, red) tnx fer info Peter

OE9XXI wkd : 11.02. PA3DIJ O/O #155 (1.9m dish 250w), 19/10.02. N8DJB O/O #, AA4TJ 449/579, WA7BBM O/O #, G4CCH 33/44, WA4NJP 33/55, HL5QO nil, 26/27.02. W3KWH O/O # (1,5m dish 150w), I6QGA 559/549, DK2GR O/- (2yagi 400w), IK3HHG 449/559 #

DUBUS BBS:

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- **Speed: up to 16800/ARQ/V42bis. Speed of calling modem will be recognized automatically.**
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  - **Technical Software**
  - **EME Skeds Database for 144&432&up**
  - **EME Sked Utilities (Programs)**
  - **EME Contest Results (REF & ARRL)**
  - **European Contest Schedules**
  - **10GHz Active Station List**
  - **European Beacon List**
  - **432&up EME adress list**
- **Access as guest or registered user. You become a registered user after a few days when answering the questions for new users.**
- **Box-Operator: DL7APV or DL4EBY**
- **Software Maintainance: DL4EBY**

PE1DAB sends the sked database 2m&up from the K4PKV mailbox always in time (Every Monday) from stateside. mny tnx !!!

(3.2m dish 150w), HB9BBD 549/599+44/55, I0UGB 32/53, IK3HHG 33/54, and SV1OE 43/54. 19&/20.03. F5PL 559/569, ZS6AXT 549/569, OZ7UHF 549/569, F1ANH 569/569, F6CGJ 559/569, G4CCH 449/549, JH3EAO 449/559, EA/DF5JJ 559/559, HB9BHU 549/569, I2COR 559/559, SM0PYP 569/579, SM4DHN 569/569, N2IQU 559/589, LA8LF 549/589, VE1BVL 439/559, AA4TJ 449/579, AA6WI 559/569, F2TU 559/559, WA4NJP 549/569, OK1KIR 559/569, EA3UM 559/569, K2UYH 559/569, PA3CSG 549/579, VE4MA 559/569, KN6DD 449/559, N8DJB 439/539, VE6TA 439/439, OH2AXH 43/55, F5PL dup, OZ4MM 54/56, I0UGB 33/53, F6CGJ 55/56 dup, I6PNN 44/55, SM0PYP 55/58 dup, SV1OE 54/44, F2TU 44/54dup, I4COR 33/55 #160, KB2AH 55/56, G4CCH 43/55 dup, OE9ERC 56/56, AA6WI 54/53 dup, HB9BHU 44/55 for a contest total of 37x18. hrd were LX1DB&HB9SV. tnx fer info Peter

OZ4MM wkd : with his new 10m dish and W2IMU Horn and 6Watt in oct.93 OE9XXI, OE5JFL and VE3ONT. In Jan 94 with more power following initials : LA8LF, OH2AXH, AA6WI, WA4NJP, W7GBI, HB9BBD, I6QGA, HB9BHU, OZ7UHF, AA4TJ, F5PL, SV1OE, VE1BVL, EA6/DF5JJ, KB2AH, PA3CSG, VE6TA #69. rig 10m dish f/D 0.5+W2IMU Horn, TH308 -4dB cable loss, preamp MGF1412+1302 SM0PYP. tnx fer info Stig

10 GHz

DF7FJ wkd :16.04.94 OK1KIR O/O, IK4CHY O/O, ON6JZ O/O, WA7CJO O/O, WA5VJB O/O, VE7CLD M/M; improved rig: Adrew 4,5m dish, 25w, Feed standart linear, optional circular, Hemt preamp DL2GSG, sun 17dB, moon 2,8dB noise. skeds wanted : T work 49 7836 50237, F work 49 7836 50190, T home 49 7832 3884. tnx fer info Joe

VE7CLD wkd : 23.01.94 WA7CJO O/M (first EME qso ever!), 27.01. G3WDG M/M. Two skeds with SM4DHN failed because of wx problems in sweden. Günter's station consists of a 3.6m dish (12 sections) extended to 5m with mesh for lower frequencies. Beam with 0.5, scalar feed (modified from DF7FJ) horizontal. TX 20w TWTA, transverter DB6NT, RX HEMT (FHX04LG) 0.8dB. Transverter, antenna relay, TWTA and power supply are mounted at the focal point of the dish. Günter measures 14.5 dB of sun noise, 1.2-1.5 dB of Moon noise and about 4dB of ground noise; what gives him a system noise figure of about 1.2 dB. The tracking is made manual, following F1EHN programm. Skeds are welcome Phone : ++ 604 874 8037. His window is resticted by trees, houses and his own tower. Günter thanks DJ7FJ, DL2GSG, VE7BBG, VE7FYC and VE7BPE for their help. tnx fer info Günter

Comment from *G8SJP* about VE3ONT on 10GHz:

The Toronto VHF Society (VE3ONT) is beginning to make plans for EME operations using the 46 m (150') dish at

Algonquin Park later this year. We have been discussing the possibility of trying EME on 10 GHz. The dish is figured to at least 12 GHz, and is adequately steerable. The question is this: is there any point to using such a big dish at 10 GHz for EME? One argument says "yes, the gain will be humungous." Another argument says "no, the high gain of the dish will under- illuminate the Moon so there is no *real* monster gain." I subscribe to the latter point of view. It seems to me that an antenna beamwidth of the Moon's diameter doesn't benefit the overall link budget. By this argument, 10GHz EME is optimum with a dish about 4m in diameter (beamwidth about 0.5 degrees, the apparent width of the Moon). The 46 m dish will be no better than a 4 m dish. So... am I correct?

A few (amateur) thoughts regarding VE3ONT using the 46m Algonquin Park dish on 10GHz eme (is a 46m dish too big for use on 10GHz?): Only about 7% of the radio waves that hit the Moon's surface are reflected back towards Earth, in part due to the less than 100% reflectivity of the Moon's surface, but *mainly* because of geometry (reflection from a sphere). Professional radar experiments in the past have identified the area from which more than 50% of the Earth-bound energy is reflected; at the centre of the Moon's face and having a radius of only 160Km... At an average Earth-Moon distance of 386000Km this area subtends an angle of less than 0.05 degrees! Anyway, the point is that the ideal eme antenna would probably have a beamwidth much less than the angle subtended by the whole Moon's diameter (i.e. less than 0.5 degrees). In practice, the ideal must be modified by aiming accuracy, so that the reflecting region always appears within the antenna's 3dB beamwidth... Reducing the beamwidth to significantly less than 0.05 degrees would probably be detrimental if the other station is illuminating a larger region (as would be the case for VE3ONT's qso partners).

So what about a 46m dish at 10GHz?

Estimated beamwidth = 0.046 degrees: This figure is very close to the angle required for complete illumination of the "50% region". Is the aiming accuracy of the dish good enough... I don't know, but if it is it's an impressive piece of machinery!

Estimated gain = 71dB at 55% efficiency: Assuming a link path loss of about 289dB at 10GHz, 71dB gain is right on the margin for contacts between a 1 Watt TX + 1dB noise figure RX at VE3ONT and a typical 0.2 Watt + 1dB RX + 60cm dish at the other end. Pretty amazing, huh?

Despite the fact that the potential 71dB antenna gain is not likely to be fully met in this application, it must still be worth a go... a few qso's are guaranteed with the better equipped stations, and there is the tantalising prospect of contacts with very small stations indeed. The biggest problem might be trying to deal with the -30KHz..0..+30KHz doppler on those old IC202s! tnx fer comment Mark (op G8MBI, 2m eme, now qrt), PS..and, yes, I am qrv 10GHz!

Comment from Jukka OH6DD

Is 46m dish any better than a 4m dish on 10 GHz EME ?10 GHz EME with a big dish has been tried before. In June 1987 OH2TI, RC of Helsinki University of Technology, together with OH2AV, RC of Nokia Corporation, put a serious effort to make the first ever 10 GHz EME contact with Goliardo Tomasetti, I4BER. Antennas used were 14m and 32m radio-telescopes in Helsinki and Bologna, respectively. At OH2TI, we had a 8W TWT while I4BER was running 1W. The result was a one-way QSO. I4BER heard us with a good signal but we didn't copy him. We had started, due to some delays in Bologna, well behind schedule and run soon out of time. At the same time we figured out that we had been listening him on a wrong frequency, Goliardo called us to tell that he had to go QRT. The radioastronomers wanted to have their antenna back to real research. Well, I thought that's exactly what we were doing ... ;-) With some more time available it might has well been a two-way contact. Unfortunately, we never got a second chance because it turned out to be impossible to find a common time slot during the next months, both antennas being in intensive research use. A few months after our experiment we lost the 10 GHz EME band in Finland to "paying customers". So, that was the end of it.As we all know, the W5s and W7s made the first ever 10 GHz EME QSO on Aug 1988, about a year after our test. This year it looks like we will get the band back (10.368 - 10.370 GHz), so who knows what will happen. So, what kind of signals did we experience ? Well, our own echoes were strong and solid. Every single dash and dot was returned unchanged off the moon (for more than 30 mins). The signal was clean, not distorted like some of the Ws with smaller dishes have reported. Maybe this was due to the narrow beamwidth (0.17 degrees). It is hard to estimate the S/N but I would say it was around 10 dB. Theoretically our echoes should have been (with the NF 4.2 dB Rx) about 20 dB above noise. To refresh my memory I just listened the two tapes again. The first one contains OH2TI's echoes recorded by myself. The other one contains our echoes recorded by I4BER. On both tapes the signal is clean and solid. The rapid libration fading is there but it's not bad. On 432 MHz I have got used to much worse (with OH2PO's 16m dish, 3 deg bw).A quick calculation shows that with same power and same Rx but a 4m dish our own echoes would have been 1 dB below the noise ! A 4m dish has a beamwidth of about 0.5 degrees, so this clearly proves that it pays off to have bigger antenna on transmit. In the case of VE3ONT things get trickier because a 46m dish has a much smaller beamwidth (0.05 deg) than the apparent moon diameter and a small dish has a beamwidth equal to or larger than 0.5 degrees. This is why VE3ONT will suffer from over 200 K moon temperature while the small station has cold sky behind the moon, and thus benefits on receive. Does VE3ONT's big gain compensate the lost reflection area ? It seems to me that the optimum beamwidth is smaller than 0.5 degrees. How much smaller, I am not sure. I4BER was hearing his echoes clearly with 1W (68 dB, 0.07 deg).Assuming that the NF of his Rx was about the same than ours (I recall it was better), I4BER should have heard us 7 dB better than we heard our own echoes, providing the under illumination effect was neglible. The tapes are hard to compare because mine was recorded with audiofilter on and the other tape was recorded without one. I would say however that the signal is clearly stronger on my tape. Also, providing the under illumination didn't exist, I4BER should have heard his own echoes about 25 dB above noise with his 1W ! I don't think that was the case.As a conclusion I would say the optimum antenna for 10 GHz EME is propably something between 4m and 14m (0.5 and 0.17 deg), propably closer to first one. tnx fer comment Jukka

Last

Not many photos are arrived, let them come., Hopefully I can make some qso's on 432 next weekend with my old array from my new qth.

73 Bernd DL7APV

Active Station List for 432 MHz by DL7APV/Part I

Call	WW	Name	Adress	City(Zip Code)	Telefon	Antenna	KW
Israel							
4X1IF	KM72	Ralph Rosenbaum	17 Shalom Street	Ra'anana 43561	972-52-987831	4-32el FO	1.2
Mauritania							
5T5JC	IL30am	Erich Jauch	PO Box 51	Atar, Rep. Islamic of Mauritania		2-21el	.15
Malaysia							
9M2BV	OJ30ud	Mart Sakalov	4-10-5 Tivoli Villas	Jalan Medang Tandok 59100, Bangar K.L., Malaysia		4-22el FO	1
Botswana							
A22BW	KG38su	Lothar Schmidke	Box 772	Francis Town Botswana		8x26 el y	.5
Germany							
DF3RU	JN59ul	Karl Schmidt	D-92278 Illschwang, Moerswinkel 1		49-9666-328	16-KR y	1.5
DF6NA	JN49	Rainer Allraun	Trautgnauer	D-97074 Würzburg	49-931-86315	16-19el WU	0.8
DF8LC	JO53gx	Lothar Beyer		D-23623 Lebatz	49-4525-3589	2-y	0.5
DF9CY	JO54	Christoph Petermann	Buschheckenweg 22	D-24229 Krusendorf	49-4308-1012	4-24 el WU	1
DF9OX	JO42	André Klingenberg	Rundestr. 10	D-31234 Edemissen		4-21el FT	.7
DF9QX	JO42hd	Matthias Cantow	Elisabethstr.32	D-32120 Hiddenhausen	49-5221-66606	4-29el BV	1.2
DH3NAN	JO52nc	Matthias Bohl	Hoehstr.14	D-96242 Sonnefeld	49-9266-329	8-y	0.3
DH9SAV	JN48	Chriss G. Schurr	Wölderlinstr. 50	D-7050 Waiblinger 7		4-26el KR	1
DJ5MN	JN58wh	Bernhard Dobler	Breslauer Str. 7	D-85435 Erding	49 8122 7585	1-21el FT	1.5
DJ6MB	JO30	Uwe Mützelfeldt	Dorotheenstr.129	D-53111 Bonn	49-228-655289	16-7.7wl BV	1.5
DJ7FJ	JN48ag	Josef Fehrenbach	Schlattstr. 1	D-77716 Haslach		8y	1.3
DJ9BV	JO43xn	Rainer Bertelsmeier	Glücksburgerstr.20	D-22769 Hamburg 50	49-40-8503316	4-11wl BV	1.4
DK0NHF	JO62JR	c/o Bernd Swatzina	Nordhoferstr.8	D-16833 Nordhof		4x21el FT	.5
DK0OG	JN68	via DF7RG, Georg Kieswimmer, Hölderlinstr. 7		D-84513 Töging		4y	.5
DK0TU	JO62PM	Gerold Bächle (DF5GX), Elberfelderstr. 12		D-10555 Berlin 21	49-30-3932956	8-19el WU	0.75
DK1PZ	JO41th	Heinz Januscheit	Am Ellenborn 1	D-35460 Staufenberg	49-5543-710	4-21el FTmod	1
DK2DB	JN48	Ewald Göbel	Wingertgasse 20	D-76228 Karlsruhe	49-721-45326	4-28el WU	0.3
DK3BU	JO33no	Harm Kowalczik	Neuseedeicherweg 1	D-26506 Norden	49-4931-8537	16-24el y	1.5
DK3FB	JO31td	Rüdiger Rohr	Rothenstein 39	D-58540 Meinerzhagen	49-2354-12808	4-20el WU	1.5
DK4JN	JN39	A Neidenhoff	Lichtenvoorderstr.14 Box 2350	D-41564 Kaarst 2		8-21el	.8
DK8VS	JN39nf	Werner Heydt	Tälchenberg 36	D-66131 Ensheim		6-21el FTmod	.75
DL2CJ	JO50	Alfred Mainka	Talstr.10	D-97618 Heustreu		8-KR	1
DL2NO	JO43	Wolfgang Künning	Grazerstr. 51-57	D-27568 Bremerhaven	49-4714-4750	4-y	0.3
DL3BWW	JO72gi	Jürgen Fiedler	P.O. Box 531	D-15205 Frankfurt/Oder	49-335-540 282	16-7.7wl BV	1
DL3YEE	JO42ge	Klaus Dreelshage	Schützenstr. 4	D-32257 Bünde	49-5223-5398	8-35el BV	0.7
DL4MEA	JN58jd	Günter Köllner	Riedweg 10	D-86853 Langerringen	49-8232-8451	2-26el	.8
DL5YET	exJO41	Markus Toppmöller	Auf dem Knüll 17	D-33333 Gutersich	49-524125146	4-33el BV	.7
DL6LAU	JO54cj	Carsten Esch	Dorfstr. 7	D-24235 Laboe		8-33el	.5
DL6WU	JN49	Günter Hoch	Gersprenzweg 24	D-64297 Darmstadt-Eberstadt	49-6151-56505	6-30 el WU	1
DL7MAT	JN58vf	Albert Schlaffer	PO Box 1241	D-85586 Poing		8-21el FT	1.5
DL8OBU	JO42	Jürgen Kaufer	Vor den Gärten 26	D-31275 Lehrte-Ahlten		4-21el FT	.3
DL8SCL	JN48	Georg Thomas	Mühlwiesenstr.18	D-72555 Metzingen	49-7123-35783	4-21el FT	0.2
DL9EBL	JN69	Karl Schotz	Preuenstr.7	D-46149 Oberhausen 11	h:49-208-666682	12m dish	1.5
DL9KR	JO40de	Jan Bruinier	Wittemannstr.29	D-65527 Niedernhausen	49-6127-2754	16-KR y	1.5
DL9NDD	JN59kn	Günter Kollmer	Bambergerstr. 65	D-91074 Herzogenaurach	49-9132-60871	4-13wl BV	1.5
Spain							
EA2AGZ	IN91	Nicolas Garcia Vera	Doz. 12 14	E-50500 Zaragoza		1-y	.3
EA2LU	IN92et	Jorge R. Daglio/Accunzi, M.Iridarren 2-5.B		E-31008 Tamplona		4-31el HG	1
EA3DXU	JN11cm	José Maria Prat Parella	Avda Onze de Setiembre 60	E-08130 Santa Perpetua de Mogoda		2-38 M2	.7
EA3EHQ	JN01hr	Josep M. Parramona Mas, Ad. Santa Creu		E-25139 Menarguens		2-38el	.4
EA3PL	JN11bl	Vicente Estruch	Tamarit 185 1-1	E-08011 Barcelona		4-y	1
EA3UM	JN01	Magin C. Biosca	Casamithana Biosca, Avda 317 No 27, E-08860 Castelldefels Barcelona			7m dish	1
EA5CJ	IM99tl	Jacinto Vellaescusa Hernandez, POB 2347		E-46014 Valencia		8-30el KLM	
EA6/DF5JJ	JM19mu	Peter Cerveny	C/.Garriga 12	E-07460 Pollenca Mallorca	34 71 53 1426	4-33el 9BV	1.2
France							
F1ANH&F6EMT	IN98fg	Jean P. Lecarpentior, Le Haut Bignonnet		F-35490 Gahard	33-94-55-64-94	8m dish	0.8
F1CNE	JN28	Denis Deccooman	7 Rue des Coquelicots	F-51000 Chalon sur Marne			
F1EAN	JN06cp	Jean Suire	3 Route De Lhic	F-86170 Cisse		4-bv yagi	.3
F1EHQ	JN15cx	Flavio Robles	9 Rue Corot	F-23200 Aubusson		6m dish	.3
F1ELL	JN18cx	Robert Monceau	24 Rue du Vercors	F-95100 Argenteuil	33-3982-6691	8m dish	3.5
F1FEN	JN25jc	Gilles Poulenard	16 Digue du Doux	F-07300 Tournon sur Rhone		16-21el FT	1
F2TU	JN38lg	Philip Pierrat	BP 42	F-88102 Saint Die	33-29-56-12-36	6m dish	1

F5FHI	IN97gd	Jean-Pierre Maidon	La He's	F-44120 Vertou	33-40-057015	16-26el KR	1
F5MZN	IN87bu	Oliver Le Cam	Ciolex 38 BP11	F-29910 Tregunc		4-26el BV	1.2
F6CGJ	IN78	Louis Noblet	Coat Laeron	F-29290 Milizac		8m dish	1
F8ZW	JN38	Jean Paul Spindler	Le Rebgarten Quatzenheim	F-67117 Ittenheim		16-21el y	1
F9FT	JN29ag	Marc Tonna	134 Blvd Dauphinot	F-51100 Reims	33-26070047	16-21el FT	1
FD1SGT	IN87jg	Chris Martin	Grande Rue	F-56680 Plouhinec	33-97367486	4-BV y	1
FF1OLW&F1HRY	JN18,	Henri Biraud	16 Boileau	F-92120 Nontrouge		8-21el FT	1
Polynesia							
FO4NK	BH52	Alaine Salic	(P.O.Box 21024 Popeete French Polynesia), SP 91381 France (Mail Address)			4-21El FT	.4
Reunion							
FR5DN	LG78ss	Felippe Mondon	20 Rue De L'Eglise	F-9725 Les Avirons, Reunion Island		16-21el FT	.2
England							
G0BPU	JO02	Michael R. Johnson	23 Camden Road	Ipswich, IP3 8JW		4-24el FO	1
G0GMB	JO01	M. B. Baker	25 Pentlands, Hilltop,	Stony Stratford, Bucks MK11 2AF		2-23el	.15
G0RRJ	IO91fe	Dave Cox	19 Exbury Way	Andover Hampshire SP10 3UH		6-14el FO r	.25
G1GEY	IO94fw	Don Stoker	6 Beech Grove Springwell Vlg.	Gateshead Tyne & Wear NE97RE	44-91-4163683	2-21el FT	.8
G3HUL	JO02pp	Doug Mallet	45 Crown Rd, New Costessey Norwich Norfolk NR5 OES		44-603-743646	16-y	1
G3LQR	JO02qf	Simon Freeman	West Farm, Cransford Woodbridge Suffolk IP13 9PQ		44-728-78493	8-y	.8
G3SEK	IO91	Ian White	52 Abingdon Road, Drayton Abingdon Oxon OX14 4HP		44-235-531559	12-y LR	1
G3XGS	JO01	G.H. Inns	8 upr Holt St. Earls Colne	Colchester Essex		4-y	
G4ALH	IO90	Rob Scaife	Heyside Dodpitts Corner NWbrdge, Is.of Wight PO 41 OTN		44-983-78716	6-7.7wl BV	.3
G4CCH	IO93	Howard Ling	8 Spa Hill Kirton in Lindsey	Gainsborough Lincs DN21 4NE	44-652-64897	2.4m dish	.65
G4ERG	IO93sr	Peter Etheridge	42 Wascana Close Anlaby Park Rd, South Hull Humberside HU4 7BX			4-7.7wl BV	.5
G4FRE	JO01kk	Dave Robinson	48 Penryn Road	Kesgrave Suffolk IP5 7LB	44-473-624825		
G4FUF	JO01gn	Keith Naylor	66 Stansfield RD	Bentfleet Essex	44-268-751417	8-21el FT	.4
G4GCM	IO90	Bob Henshaw	18 Holgarth Close, Woodley Romsey Hants SO51 7TF		44-794-522046	8-21el FT	1
G4KQW	IO91	Ian Lamb	19 Newbury Road	Newbury RG24 ONA		8-19FT	1.5
G4RGK	IO91	Dave Dibley	Brigadoon Bolter End	High Wycombe Bucks HP14 3LU	44-494-881654	8-21el FTmod	.8
G4RNL	IO83	Don Hooper	P.O.Box 141	Warrington Cheshire		4-21el FT	.7
G4VIX	JO01	Dave Bartlett	80 Burnway, Hornchurch	Essex, RM11 3SG		4y FO	1
Scotland							
GM0ONN	IO87	Ian Barnetson	18 Ardivot Place	Lossiemouth	44-034381-4623	2-21el	.4
GM3JFG	IO77xr	Ian McHardy	Beech Tree Cottage	Navity Gromarty Ross-Shire IV1 8XY,		4-21el	.4
Wales							
GW3XYW	IO71xr	D. Stuart Jones	22 Alltiago Rd., Pontardulais Swansea, W Glamorgan SA4 1HU		44-792-882292	6.7m dish rot.pol.	.8
Switzerland							
HB9CVD	JN36cd	Philippe Breguet	Rte de la Gare 49	CH-2017 Boudry		4-y	1
HB9HLM	JN36kw	André Breguet	Gare 49	CH-2017 Boudry		4y BV	1
HB9SV	JN45lv	Enrico Ravarelli		CH-6865 Tremona/Ti		8m dish	.8
Italy							
I2COR	JN55bb	Luigi Zorzino	Piazza Roma 27	I-26100 Cremona		7.5m dish	.9
I5CTE	JN53xg	Piero Baldelli Rubes	Via Giordani 6	I-50121 Firenze		4-26el yagi	.65
I5MPK	JN53	Piero Moncini	Via Zizzolo 10/B	I-51016 Montocatini/PT		10m dish & 24y	1
I5TDJ	JN53	Piero Moroni	Via Emanuele 43	I-50134 Firenze	55-473984	4-19el y	.8
I6PNN	JN72gl	Marco Patregnani	Contrada Macchiano 46	I-65015 Monte Silvano PE		4-26el yagi	.7
I6QGA	JN63	Gabriele Priori	Via Tamburini 12	I-60023 Collemarino Di Ancona		4m dish	.6
I7FNW	JN81gd	N. Ferrara	Via S. Caterina Seminario 3	I-Bari		8y	.35
IK1HWG	JN44ds	Deltetto Maurizio	Via Cavour 1	I-4050 San Marzano Oliveto Asti	39-141-856365	4-21el FT	1
IK1MTZ	JN35ub	Diego Sibona	Strada del Cresto 31	I-10132 Torino		8-23el FTmod	1
IK2EAD	JN55ej	Romeo Gargioni	Via Lizzera 18	I-25018 Montichiari Brescia		16-33el yagi	1
IK2OFO	JN45	Pirovano Roberto	Via Trieste 69	I-20010 Santo Stefano Ticino	39-02-97270721	4-21el FT	1
IK4DCO	JN64gb	Paolo Lunedei	Via A Gramsci 6	I-47040 Veruchio Forli		4-26el yagi	1.5
IK4DCX	JN64	Marco Giannini	Via dell Edera 4	I-47037 Rimini		8x21el FT	.4
IK4JOC	JN54wn	Claudio Feletti	Via Raffaelo Sanzio 10	I-48021 Lavezzola		4-25el y	.35
IK4NMF	JN54sm	Fausto Coletti	Via Olmo 24	I-40054 Budrio	39-51-802887	8-21el FT	.7
IK5WJD exIW5ABE	JN53ps,	Alex Giusti	Via Romanelli 54	I-50011 Firenze	39-55621260	4-26el BV	1
IK6EIW	JN63rj	Stefano Magnarello	Via G. Marconi 48	I-62010 Montefano		8x21el FT	1
IN3HER	JN56	Raimund Eisenstecken	Oberdorf 99	I-39040 Vahrn	39-472-32396	5m dish	.4
IW4ADT	JN54	Augusta Pancaidi	Via Daganni 32	I-40137 Bologna		9m dish	.9
IW5AVM	JN52ns	Marco Parmaggiani	P.O. Box 6	I-58100 Grosseto		8-25el y	1
Japan							
JA0EIV	PM97	Takao Nishiyama	Kuwayama	Gosen City Niigata		4-KR y	.4
JA0IXX	PM86xg	Fumiaki Akahane	6-12-5 Arigasaki	Matsumoto-City Nagano 390		4-3wl y	.4
JA0LKH	PM85xl	Tsuneyoshi Uchiyma	1419 Kamihisakata	Iida Nagano 395-12		4-21el FT	1.2
JA1YWX	PM95	Univ.of Tokyo ARC	7-3-1 Hongo Bunko	Tokyo 113		8-31el y	.1
JA2JRJ	PM84mw,	Tetsuro Okamoto	3-61, 5-Chome, Koike-Cho	Takahama City, 444-13 Aichi	81-0556-53-0041	6m dish	1
JA2KRW	PM85ne	Aoyama Tokuichi	6-9 Hachimanda	Seto City, Aichi 489		4-21 RIW	.6
JA2ODV	PM94ex	Koutarou Hagiwara	2-4-21, Miniami -ABE	Shizuoka-city 420		32-15el	.1
JA2XQR	PM85	Katsumi Yoshida	18 Higashioonuma	Shimoyana(V) Higashikamo(GUN) Aichi 444-32		6m dish	
JA3IAF	PM74	Yoshifumi Tone	368 Nyukawa Kudoyama-Cho	ITO-GU Wakayama-Pref.	81-73654-2323	16-15el y	.8
JA4BLC	PM65nm	Yoshiro Mataka	20-12 Nanpeidai	Matsue-City, 690 Japan	81-852-24-0889	6m dish	.8
JA5NNS	PM63	Sachi Shirikata	336 Aidai-Syukusya, 4-3-1 Higashi, -Nagatio, Matsuyama City, Ehime 791			4-21el	.05
JA5OVU	PM74	Tom Atsusi Tatomi	Nishibun, Kamiita-Cho, Itano-Gun, Tokushima, 771-13			8-27el	1

JA6AHB	PM51kj	Toshio Tanaka	Chikkoh-hommachi 2-3-1009	Hakata-ku, Fukuoka-city, 812 Japan		7m dish	.5
JA6CZD	PM53fm	Shichiro Mori	975 Kokubumachi	Kurume-City Fukuoka	81-942-21-4872	7m dish	1
JA6ZHR	PM53	Hisao Tsukamoto	Kyo machi	Kurume-City Fukuoka	81-942-35-1226	8.2m dish	
JA7UIQ	QM09xl	Hiromitsu Hitzabayashi	12-8 Kawamukai	Yamada Town Iwate 028-13		2-23el CT	1
JA8ERE	QN02qx	Mikio Terui	Sapporo-City	Hokkaido 005		16y RIW	.05
JA8FLY	QN03sc	Hisamicki Kobayashi	18-3 Higashinopporo-cho	Ebetsu-City Hokkaido 069		4-33el FO	
JA8PL	QN03	Masa Sato	7-12 Hatusamu	Nishi-ku Sapporo City 063		3.6m dish	.4
JA9BOH	PM86fa	Kimio Maegawa	67-9 Shimo Asojima	Ohno City Fukui 912	81-7796-65927	8-20el WU V	.6
JF3HUC	PM74ux	Yoshitaka Takahashi	1-172 Kitafukunisi Cho3	Chome Nisikyoku Oe Kyoto	81-75-331-8065	8-19el y	.6
JH1MOM	PM95ts	Kazy Yagasaki	3-32-306 Kitamachi-5	Nerima-ku Tokyo 179	81-3-3931-5529	4-7.3wl	.8
JH1OFX	PM85sm	Shigeru Ohsawa	2749 Sanda	Atsugi-City Kanagawa Pref.	81-462-41-0099	8.2m dish	.5
JH2CFD	PM85	Shigeru Hayashi	1-53-1 Yamate-cho	Minokamo city Gifu 505		8-27el	.13
JH4JLV	PM54la	Kazuhiko Shimanaga	21-19 Chofumatuodaminami,	Shimonoseki-city, Yamagushi Japan 752,	81-832-45-3934	6-24el y	1
JH7PAV	QM07di	Motoji Yoshita	4 Kita, Kawata, Mihota-machi,	Koriyama-City, Fukushima 963-01		8-21 FO	.2
JL1ZCG	PM95um	c/o Yun Katoh	2-21-1 Kakino Kizako	Meguro Tokyo 152		8-8.7wl y	1.5
JN3ITM	PM75ql	Yashaki Adachti	4F1 Kuyiama Buil Hama 364	Maizuru-city Kyoto 625		4-25el y	1
JR4AEP	PM65rh	Kenichi Watanabe	1-13 Nishimochida-Cho	Matsue-City Shimane 690	81-852-23-2481	16-RIW y	.8
Norway							
LA3WU	JP20qh	Ingebrigt Lunde	Nottveitlia 18	N-5045 Skjoldtun	47-5-137564	8-32el BV	1
LA8AE	JO59cc	Ole Kval jr.	Makeveien 26	N-3200 Sandefjord		4-21el FT	1.1
LA8LF	JO59br	Anders Thorrud	Jerpeveien 20	N-3030 Drammen	47-3-884083	16-15el FO R	1.5
Argentinia							
LU7DZ	GF05ok	Eduardo van Ooteghem	L.M. Drago 2524 Adelina 1607	Buenos Aires	54-1-766-8931	8-y	.8
Luxembourg							
LX1DB	JN29	Willy Bauer	12 Rue Batty Weber	L-5254 Sandweiler	++358012	9.1m dish	1
Bulgaria							
LZ2AR	KN13sf	Boris Borisov	Georgi Dimitrov 78 v B	3000 Vratsa		4-33el FO	.5
Austria							
OE3JPC	JN88eb	Johannes Pichler	Johann Siegmaiergasse 5	A-2361Laxenburg		2x19 FT	1
OE3OBC	JN88	Othmar Bibaric	Bisambergerstr. 16/6	A-2100 Korneuberg		16-y	1
OE5EFM	JN78	Wolfgang Fuchs	Raiffeisenstr.17	A-4210 Gallneukirchen		8-26el y	1
OE5JFL	JN68rl	Hannes Fasching	Josef-Hayndstr.21	A-5280 Braunau		8.5m dish	1
OE5VHL	JN68	Walter Haslinger	Am Kirchenberg 12	A-4770 Andorf		6m dish	.7
OE6XHF	JN76	VHF UHF SHF Club VUSC,	Sausal 50	A-8444 St. Andrä/Hoch	43-3456-3685	4-13wl BV	.6
OE9ERC	JN47vl	Erich Rupprechter	Bregenzerstr.27	A-6922 Wolfurt	43-5574-79771	8m dish	2
OE9HHV	JN47	Hubert Hämmerle	Im Horn 27	A-6850 Dornbirn		8-19el y	.5
OE9XXI	JN47vl	Peter Riml(OE9PMJ)	Markstr.35	A-6971 Hard	43-5574-35330	9m dish	.8
Finland							
OH2AXH	KP20ok	Pertti Hohtio	(Honkala) Kaskela	SF-04220 Kerava		8-21el y	.25
OH2BNH	KP20lg	Pasi Huumo	Onkikuja 6a	SF-00780 Helsinki		4-21 FT	.2
OH2DG	KP30ck	Eino Metsamaki	Niittykatu 3	SF-07900 Loviisa	358-15-535693	16-21el y	.8
OH2PO	KP10xh	Matti Rougiainen	Talvia	SF-08100 Lohja		16m dish	.1
OH3LWP	KP11wk	Ari Vaisanen	Morikka	SF-33720 Tampere		2 FO y	.4
OH6NVQ	KP13ip	Tomas Tallkvist	Högbackavägan 22	SF-68600 Jakobstad	358-67-7235-366	4y	.2
Slovakia							
OK1CA	JO70gm	F. Strihavka	Kuttelwascherova 921	19800 Praha 9		10m dish	.3
OK1KIR	JN79	Antonin Jelinek(OK1DAI),	U Dobrenskych 5/271	110 00 Praha 1	42-2-2659605	5.5m dish L	.8
Belgium							
ON4KNG	JO20	Peter Nagy	Rue Heideken 56	B-1080 Brussels	32-2-426 37 92	4-11wl BVopt	.36
Denmark							
OZ1HNE	JO57	Jorgen Christiansen	Ulldallsvej 5	DK-9300 Saeby		4-38el BV	1.5
OZ7UHF	JO65er	c/o Soeren Pedersen, OZ1FTU,	Sennepshaven 87, 1.tv.	DK-2730 Herlev		7.6m dish	1
Netherland							
PA0AVS	JO22	A.N. Vroom	Steynlaan 83	NL-3701 ED Zeist		28ft Feed Horn	1
PA3CSG	JO21	G.H.M. Stams	Ittervoorterweg 60	NL-6017 BZ Thorn		DISH	1.5
PA3DZL	JO21hm	Jac de Bruyn	Dorpsstraat 11-13	NL-4711 ND Sint-Willebrord		8-21el FT	1
Brasilia							
PY5ZBU	GG54	Dr. D.W. Murden (G3MWM),	Araucaria DX Group, PO Box 37,	CEP 80001-970, Curitiba	5541-341-1405	4y	.18
Slovenia							
S51ZO	JN86dr	Herman Joze	Lendavska 37c	69000 Murska Sobota, Slovenia		8-28el BV	.5
S57QM	JN76	Tone Krajnc	Drozanjska 19	68290 Sevnica Slovenija		16-15el	.6
Sweden							
SM0PYP	JO89xg	Paul Chominski	Haradsvagen 200	S-141-71 Huddinge	46-8-883741	7.6m dish	1
SM2CEW	KP15cr	Peter Sundberg	Person 8811	S-95190 Lulea	46-92070025	8m dish	1
SM3AKW	JP92ao	Karl G. Mohlin	Harnon Notsand 1	S-87193 Harnosand	46-611-79020	16-21el	1
SM4DHN	JP60vp	Lars-Bertil Karlsson	PL 7111	S-68300 Hagfors	46-563-26061	6m dish	1
SM4IVE	JO79sd	Lars Petersson	Talby Smegarden	S-71594 Odensbacken	46-19-450223	13m dish	1.5
SM6CKU	JO67	Bengt-Arne Jockert	Allatorp 1446	S-43033 Fjeras	46-300-44389	8m dish L	1
SM6CWM	JO67	Ingemar Hermansson	Lingonvaegen 11	S-44003 Floda		4-y	1
SM6EUP	JO57xq	Hans Pousette	Andra Langgatan 4 C	S-41303 Gothenburg	46-31-140818	4-43el JR	.8
Poland							
SP5CJT	KO02od	Mike Chominski	P.O. Box 135	PL-00-961 Warsaw 42	22-322700	8-24el KR	.25
SP6AZT	JO81	Zbigniew Malik	ul Olowiana 6/4	PL-53434 Wroclaw 47		4 y	.5

SP6GWN/6 JO80		Henry Miniach c/o SP6JLW, Wodna 4/7		PL-57300 Klodzko		4 y	.5
Russia							
RA3LE	KO64ar	Valeri Zygankow	Gubenko 2A kw 42	Smolensk, Russia 214006		8-y	1
RA3YCR	KO73dh	Viktor Belewandew	Post-Box 78	Bryansk, Russia 241012		8-26el KR	1
RA6AAB	KN94wr	Vlad Baharew	Post-Box 42	Belorechensk, Russia 352600		4-25el y	.8
RW3RW	LO02rw	Valerij Butisov	Goreloje	Tambovskaja Obl, Russia 393000		4-21el FT	.3
UA3TCF	LO26iu	Alexandr Baryshow	Posewnaja 1A kw 17	Nizhni Novgorod, Russia 603009		8-14el y	.5
UA3TIE	LO16xg	via UZ3TXB, Oleg Achitow, Post-Box 73		N. Novgorod, Russia 603000		4-21el FT	1
UA4API	LO20qc	Victor Adushev	Leonova 7-29	Kamyshin, Volgogradskaja Obl, Russ. 403805,		4-26el FO	1
UA4NM	LO48up	Vladimir Suvorou	Post-Box 850	Kirov, Russia 610030		8 FT y	.5
UA6LGH	KN97lf	Viktor Bagrintsev	Koshevogo 32	Taganrog, Russia 347927		16-KR y	.8
UA9APH	LO93li	Sergej Podlipian	Post-Box 165	Magnitogorsk, Russia 455050		6m dish	.3
UA9FAD	LO88da	Viktor Kotelva	Plekhanov 52 kw 51	Perm, Russia 614081 (qsl mgr DL3BWW)		8-16el y	1
UA9XEA	LP63vm	Sergej Omeljanenko	Post-Box 44	Uchta-12, Komi, Russia 169400		8-WU y	.8
Ukraine							
UR4LL(exUB4LL)		KO80ad, Alex Gavva	Terechkova 5/9	Zolochev, Kharkov Obl, Ukraine 312220		4-FO y	.8
UR5LX (RB5LGX)		KO70wk, Sergej Lysenko,	Zolochev Reg.	Iwaschki, Kharkov Obl, Ukraine 312211		10.7m dish	1.5
UT1PA (RB5PA)		KO21fc, Alexandr Moroz,	Mira 14	Turijsk, Wolynskaja Obl, Ukraine 264970		4-7m y	.2
UT5DL	KN18ep	W.P. (Slava) Baranov	Post-Box 98	Uzhgorod, Ukraine 294018		8-27el 7.7wl BV	.8
UT5EC (RB5EC)		KN78lm, Valerij Petrushenko, P.O. Box 214		Dniepropetrovsk 320059 Ukraine		8-BV	1
UT5UAS	KO50gk	Alexandr Karabinovich	Organisatorskaja 4/1 kw1	Kiev-35, Ukraine 252035		6m dish	.4
UT7VF (UB5VJF)		KN68mq, Victor Maslov, Rudneva Str. 4-2, Alexandria 6, Kirovogradskaya Obl., 317926, Ukraine				4y KR	.15
Canada							
VE1ALQ	FN65	Darrell Ward	Box 576 Grand Bay	New Brunswick EOG 1WO	(506)738-2734	6-y	1.4
VE1BVL	FN96	John M. Currie	RR3 Site 8 Complex 32 Box2532,	Sydney Cape Bretton NS B1P 6G5,	(902)562-7405	6-22el FO	.5
VE2FUT	FN35	Stuart Truba	2217 Place Dynastie	St.Lazare Quebec JOP IVO	(514)455-1337	4-29el yagis	1
VE2XX	FN25wk	Stuart Truba	2217 Place Dynastie	St. Lazare, Quebec J0P 1V0	(514)455-1337	4-29el	1
VE3CRU	FN03	Hans Peters	Box 6286 Stn "A"	Toronto Ontario M5W 1P3		8-31el y	1.2
VE6AFO	DO31ac	Ken Oelke	7136 Temple drive NE	Calgary Alberta T1Y 4E7		8-25el FO R	.6
VE6JW&VE6EME		DO33gn, Jack Williams	P.O. Box 17	Namao Alberta T0A 2N0	(403)973-6413	8-25el FO	1
VE6TA	DO31ah	Grant Furnald	PO Box 3455	Airdrie, Alberta, T4B 2B7	(403)948-7555	4-y.horiz.only	.12
Australia							
VK1VP	QF44nr	Edwin Penikis	5 Westgarth Street	O'Connor 2601	(616)2496348	4-20el WU	.25
VK3UM	QF22pg	Doug McArthur	30 Rolloway Rise, Chirnside Park 3116	Victoria Australia	(613)726-4484	8-7.7wl 9BV	1.6
VK5MC	QF02ej	Chris Skeer	Heatherleigh Via	Millicent 5280 So.Australia	61-087-359014	6m dish L	1
USA							
AA4TJ	FM08sc	Bill Lakatosh	735 Yorkshire Road	Earlysville VA 22936	(804)978-4853	8-19el RIW	1
AF1T	FN43ed	Dale Clement	123 North Main St. Apt 3C	Concord (BOW) NH 03301	(603)224-9319	4-19el RIW	.5
AL7JM	BP51	Mike Bennet	12303 Woodward Dr.	Anchorage AL 99516	(907)345-3486	8-22el FO	.4
K0DAS	EN43	Rod Blocksome	690 Eastview Dr.	Robins, IA 52328	(319)393-8022	8-RIW y	.75
K0MVJ	EN36	Roger Magnuson	5809 Hwy. 194	Duluth MN 55811	(218)729-6576	4-19el RIW	.35
K0RZ	DM79jx	Bill McCaa	P.O. Box 3214	Boulder, CO 80307	(303)499-1936	8-22el FO	1.5
K1FO	FN31qj	Steve Powlishen	816 Summer Hill Rd	Madison, CT 06443	(203)421-4836	24-15 FO L/R	1.5
K1MNS	FN42iv	Larry Blouin	#52 Warner Hill Rd.RFD5	Derry, NH 03038	(603)432-5866	8.7m dish	1.5
K1RQG	FN54	Joe Demaso	HCR 78 Box 56	Bucksport, ME 04416	(207)469-3492	4-31el WU	1
K1RSA	FN43tp	Harry White	135 Running Hill Road	Scarborough, ME 04074	(207)772-1413	4-31el JR	1.5
K2OS	FN13	Frank Pollino	149 Whittier Road	Rochester, NY 14624	(716)594-0502	4-24el y	1.5
K2UYH	FN20of	Allen Katz	1621 Old trenton Road	Trenton, NJ 08691	(609)443-3184	8.7m dish LR	1
K3EAV	FN10	William Blazina jr	RD 3 Box 219M	Huntingdon, PA 16652	(814)643-5264	7.3m dish	.8
K3LFO	FM19	Jim Erickson	3933 london Bridge Rd.	Sykesville MD 21784	(301)549-1041	8-19el RIW	1.2
K4PKV	EM95	Dick Hattaway	450 Ridgeview Dr.	Mocksville, NC 27028	(704)634-3751	16-KR y	1
K4QIF	FM07	Rusty Holshouser	Rt 4 Box 206H	Lynchburg, VA 24503		7.3m dish LR	1.5
K5AZU	EM40	Ray May	Box 43	Natalbanmy, LA 70451	(504)345-2643	9.1m dish	1.5
K5JL	EM15	Jay G. Liebmann	2224 Morgan Road N.E.	Piedmont, OK 73078	(405)373-3758	8.5m dish	1.5
K5WXN	DM61	Dan Hunt	10904 Middledale	El Paso, TX 79934	(915)821-7209	12-21el RIW	1
K6HXW	CM95ed	Mike Goshay	636 Printz Road	Arroyo Grande, CA 93420	(805)489-8300	4-13el M2	.7
K7WUP	DM48	Shirl Powell	P.O.Box 213-1050 East, 900 North,	Spring City, UT 84662	(801)462-3309	6m dish	.1
K8RAY	EN82	Ray Kashubosky	23404 Larkshire Drive	Farmington Hills, MI 48024	(313)477-4323	4-24el FO	.25
K8WW	EN91	Dave Vore	5481 Columbia Road	Medina, OH 44256	(216)722-1503	16-19el RIW	1.5
K9KFR	EN71gg	Robert Johnson	3580 E. 600 N.	Columbia City, IN 46725	(219)691-3743	7.3m dish	1.5
KA9LNV	EM79bf	Edward Krome	1023 Goldfinch Rd.	Columbus, IN 47203	(812)379-9433	2-19el	.2
KB0HH	EM07	Gary Gerber	511 S. Lincoln	Anthony, KS 67003	(316)842-5079	9.1m dish	.8
KB2AH	FN20	Tom Dinyovsky	405 Union Lane	Brielle, NJ 08730	(908)223-8124	7.3m dish	1
KB3PD&KA3WSZ		FM29, Rick Phillips	402 Durso Drive	Newark, DE 19711	(302)737-7966	24-11el LR	.7
KB4WM	EM63	John Howard	P.O. Box 473	Childersburg, AL 35044	(205)378-6416	24-15el FO R	1.5
KB8RQ	EN80ad	Gary L. Crabtree	1129 Kiser Lake Road	St Paris, OH 43072-9785	(513)663-5455	8-39el M2	1.5
KB8ZW	EN91ij	Bill Takacs	16724 Snyder Road	Chagrin Falls, OH 44023	(216)543-4991	16-14el FO R	.8
KC6PEF	DM03	Alex Bojarski	2161 Gale Avenue	Long Beach, CA 90810	(213)432-3702	2-31el FO	1
KD0GS	DN70	Gerald Sharp	2125 Frontier Street	Longmont, CO 80501	(303)776-1600	4-30el KLM	.7
KD4LT	EM81cg	Clyde Scott jr	293 JC Saunders Road	Moultrie, GA 31768		9.75 m dish	1.5
KD6R	DM13ni	Gene Powers	P.O. Bx 42	Palomar Mtn., CA 92060	(619)742-3374	8.5m dish	1.5
KN6DD	DM03	Alex Bojarski	2161 Gale Avenue	Long Beach, CA 90810	(310)432 3702	4.8m dish	1
KU4F	EL89	Thom Cockram	6210 N.W. 128th Street	Gainsville, FL 32606	(904)332-5206	13.4m dish LR	.6

N0IS	EM48	Bob Sluder	5531 Cherryview Lane	St. Louis, MO 63128	(314)892-4434	8-23el FO	1
N2IQU	FN13	Mark Gummer	7463 Canton Street	Baldwinsville, NY 13027	(315)635-9310	8.7m dish	1.5
N4GJV	EM95	Ron Barlow	14245 Cool Springs Road	Cleveland, NC 27013	(704)278-2880	16-21el KR	1
N5QGH	EM13qc	Bryan Ward	2375 Forest Grove Estates Rd.	Allen, TX 75002	(214)542-6817	7.3m dish L/R	1
N6OVP	CM87	David La Spina	24 Parkview Circle	Corte Madera, CA 94925	(415)927-7614	4-22el FO	.75
N7ART	CN94	Russell L. Miller	12041 Peninsula Dr.	Crooked River Ranch, OR 97760	(503)548 1221	7m dish LR	1.5
N7DB	CN85	Dave Bernhardt	15871 SE 322nd Avenue	Boring OR 97009		9.1m dish	.6
N8AXA	EM79up	Axel Russo	P.O. Box 20401	Dayton, OH 45420		4-24el cc	.9
N8DJB	EN81fj	Craig Henderson	C.A.T.S. 7368 SR 105	Pemberville, OH 43450	(419)352-4456	4-31el y	.3
N9AB	EN52	Andrew Bachler	28571 N. Lemon Road	Mundelein, IL 60060	(708)566-0594	16-18elQuagi	1.5
N9KC	EN52	Louis A. Eckert	403 Fairlawn Drive	Round Lake Park, IL 60073	(708)742-2045	1-y	1
NC1I	FN32	Frank Potts	65 Hastings Road	Southwick, MA 01077	(413)569-0314	48-15el FO L/R	1.5
NU7Z	CN87rt	Rick Beatty	23115 84th Avenue West	Edmonds, WA 98026	(206)775-9196	6.7m dish LR	.75
W0HHE	DM79	Al Lorenz	4410 West Vassar Avenue	Denver, CO 80219	(303)935-0540	4-32el KLM	1
W0KJY	DN70km	Jim Starkey	3845 Capitol Drive	Ft. Collins, CO 80526	(303)226-0669	4-32el FO	1
W0SD	EN13	Ed Gray	RT.2 Box 151	Salem, SD 57058	(605)425-2354	9.7m dish LR	.8
W1ZX/3	FM18	Willy Mank	Hwy. 228 Box 144D	Waldorf, MD 20603	(301)645-5584	7.3m dish L	1.5
W2CNS	FN13	Robert Nezilek	7272 High View Trail	Victor, NY 14564		6-25el-FO	.065
W2CRS/0	DM78lx	Douglass M. Allen	P.O. Box 5646	Woodland Park, Co 80866	(719)687-3549	4-M2	.5
W2PGC	FN20or	Nels (sam) Samuelson	47 Therin Drive	Hamburg, NY 14075	(716)649-7795	12-22el FO	1
W2UHI	EN73ai	Frank Lumney	6275 West 124th Street	Grant 49327	(616)834-8016	4-22el FO	.4
W2WD	FN20tp	Warren Butler	2305 Morse Avenue	Scotch Plains, NJ 07076	(201)233-4460	1-25el y	1
W3VH	FN32hg	Rolfe Tessem	P.O.Box 793	Great Barrington, MA 01230	(413)528-5966	4-25el FO	1.5
W4ODW	EM60	Gene (Ronald E.)? Monk,	103 Keller Court	Niceville, FL 32578	(904)678-3179	16-14el FO R	1
W4RDI	EL96bq	Don Carlson	16307 Horizon Road	N Ft. Meyers, FL 33917	(813)543-8432	16-14 rear mt. + pol	.2
W5RCI	EM44uf	Rex Turner	303 Third Street	Marks, MS 38646	(601)326-8870	16-19el RIW	1
W7CI	DM41	Steve Wagner	2833 Oriole Drive	Sierra Vista, AZ 85635	(602)458-6946	10.5m dish	.7
W7FN	CN88	Don Roberts	5880 S. Pioneer Park Place	Langley, WA 98260	(206)321-4615	7.3m dish LR	1
W7GBI	DM43	Charles Justinak	7045 N. 69th Place	Scottsdale, AZ 85253	(602)948-6106	7.3m dish LR	1.5
W7HAH	DN26	Francis D. Shepard	471 Groff Lane	Stevensville, MT 59870	(406)777-2136	12-24el FO	1
W7ID	DN13	Jeff Bishop	1914 Penninger Drive	Boise, ID 83709	(208)323-9267	4-30el KLMmod	.6
W7XU	EN13	Arlis Thompson	Rt.1 Box 52	Colton, SD 57018			
W7ZRC	DN13	Rod Greene	11322 Hollandale Drive	Boise, ID 83709	(208)376-8136	4-33el FO	.8
W8IDU	EN83	Arthur Martin	731 S Fitch Road	Carsonville, MI 48441	(517)479-6890	8-19el RIW	.7
W8TN	EM98cw	Clark Stewart	104 Henrietta Street	Ravenwood, WV 26164	(304)273-4680	4-25el FO	1.2
W9IP/2	FN24ko	Mike Owen	21 Maple Street	Canton, NY 13617	(315)379-9669	16-19el RIW	1
WA2FUZ	FN22xi	John Fandl	HCR # 1 Box 9F	Surprise, NY 12176	(518)966-8654	8-19el y	1.5
WA3FFC	FN01	Scott Mathewson	RFD 2 Box 262	Brookvile, PA 15825	(814)849-7830	8-24el FO	.7
WA4LBT	EM95	William Pearson	206 Forest Dr.	Locust, NC 28097		6-RIW y	.6
WA4NJP	EM84	Ray Rector jr	3493 Holly Springs Road	Gillesville, GA 30543	(404)536-5420	9.1m dish	.7
WA4OFS	EL98	Harry Conowal	2007 Peachtree Bvd.	St. Cloud, FL 34769	(407)892-5731	8-22el FO	1.2
WA4ZTK	EM85	John W. Kmet	2148 Ridgecrest Drive	Maryville, TN 37801	(615)984-4190	6m dish LR	.5
WA5ETV	EM15	Gary McCormik	2804 N. Meridian	Oklahoma City, OK 73107	(405)946-2898	9.1m dish	1
WA6BJE	DM13	Jim Day	1939 Tradewinds Lane	Newport Beach, CA 92660	(714)642-7323	8-25el FO	1.5
WA6KBL	CM97ag	Jeffrey Pawlan	14908 Sandy Lane	San Jose, CA 95124	(408)371-0256	4-13wl M2	.85
WA7BBM	DM42	John Molloy	5625 W. Molloy Rd.	Tuscon, AZ 85705	(602)743-7028	12.1m dish	1
WA7CJO	DM33	Jim Vogler	2540 E Heatherbrue Dr.	Phoenix, AZ 85016	(602)954-0541	5m dish	1.5
WA8HTL	EN82kn	Jack Ancona	3033 Albany Dr.	Sterling Hts, MI 48310	(313)264-2813	4-25 FO	.8
WA8VPD	EN82	Robert Thomas	20530 Kentfield Street	Detroit, MI 48219	(313)534-0310	4-28el JR	.5
WA9FWD	EN53	John Stefl	2540 N. 128th St.	Brookfield, WI 53005	(414)797-9508	16-13el L/R	1.5
WB0DRL	EM18	Pete Sias/Dean Lewis	831 South Powers Road	Salina, KS 67401	(913)823-1119	8.5m dish LR	1.5
WB0GGM	EN34	John Schaefer	Rt 1 Box 71	Montgomery, MN 56069	(612)364-5633	4-24el y	.1
WB0TEM	EN12	Marc Thorsen	331 Dakota St.	Akron, IA 51001	(712)568-2901	10m dish LR	1
WB2VVV	FN21	Chris Fagas	68 Kinderkamack Road	Park Ridge, NJ 07656	(201)930-1583	2-21el FT	.4
WB3CZG	FN21	Ray Carley	R.D.1 Rt.1 167	Brackney, PA 18812		4-32FO	.9
WB5LUA&N5QGH	EM13qc,	Al&Bryan Ward,	2375 Forest Grove Eatates Rd,	Allen, TX 75002	(214)542-6817	7.5m dish LR	1
WD0CJM	EN25fh	Dave Odden	RR 3 Box 196a	Benson, 56215	(612)843-3060	8.5m dish	1
Mexico							
XE1XA	EK09	Max Bachi	Seminario No.16	Lomas de la Herradura 10DF	52 5 294-3095	4.8m dish	.6
Rumania							
YO2IS	KN05ps	Süli Iulius	Str. Iasi 1	R-1900 Timisoara	40-61-37981	4-32el BV	.8
New Zealand							
ZL3AAD	RE66	Graham Alderson	Priors Road	R.D.1 Rangiora 8254	502-37251	7.5 m dish	1
Republic of South Africa							
ZS6AXT	KG33vv	Ivo Chladek	Box 3093	Kenmare Krugersdorp 1745	27-11-664-7883	5m dish H	.4

Tropo News

Editor: Joachim Kraft, DL8HCZ

2m > 700 km

DF0CB, (Op: DJ2XS etc.) JO43WJ wkd VHF-Kontest 5./6. March 94 600km: F1SDR JN37SO 664, F1DZF JN38RA 621, DG4MHJ/P JN57WU 632, OE9EMW JN47VL, OE5HSN JN68PC 635, G4UGV JO01EH 685, G4CRA/P JO01IT 643, HB9SUL JN47PH 677, F5KHZ/P JO00WA 666, HB9W/P JN47IK 667, OE5XXL JN78DJ 636, G4ZAP JO01KK 647, OK1KWP/P JN79SB 622, DL0TV/P JN47KQ 638, DG1MGO JN57VR 644, OE1XTU/5 JN78BB 663, OE5YPO JN78AD 652, DG9MEE JN58IA 600, HB9RDE JN37VN 665, G4DSP/P JO03CE 642, F6KSL JN28QJ 639, G4WFR JO01OV 607, G4PIQ JO01MU 620, G4VIX/P JO01PU 604. HB9PME/P JN46RX 714, HB9STY/P JN36KH 816, F6KOB JN08UX 751, HB9BI JN36QR 762, F5RTS/P JN27JJ 757, F1CUA JN18KR 712km. tnx fr info, Matthias!

DL8BDU, JO43AA, wkd 700km: 30.10.93 08.15 SM6RTM JO78BJ 708, 08.28 SM5MIX JO78JG 720, 08.31 SM5EFP JO79WJ 857, 14.01 SM5LXA JO78SI 755. Rig: FT221R, PA 350W, 2X15 Element, VV DJ9BV, 23m a.g.l. tnx fr info, Klaus!

DL8EBW, DL66a / JO31NF wkd 2m: 01.01.94 1818 DK0OG JN68GI. 30.01.94 1120 DK7RC JN69II. 01.03.94 2118 OZ9EDR JO55UL. 08.03.94 2123 EB1DSD IN63QN 57 / 59 1336 km, 2213 F6BIO IN98OS, 2257 EA1CJT IN63HP 51 / 51 1374 km, 2316 F6APE IN97QI. 09.03.94 0005 F1IRQ IN96PT, 1740 F1MKG/m JN19AB, 1958 DD0VF JO61WB, 2014 DG3HWO JO61DQ. 11.03.94 1940 DL7ULM JO62SN. DL8EBW RIG : FT726R MOD CF300 , 11 EL DL6WU , MGF1302 , 350 W (4CX250B) SKEDS ARE VY WELCOME VIA VHFNET ,OR PR (BBS DK0MWX), OR TEL.+202/781170

70cm > 500km

DG9NBT, JN49WS, EJ20e, wkd: 08.01.94 IK4DCX JN64GA 670. 05.02.94 I4JED/P JN54OK 601, IW4BET/4 JN54PG 620, IW5BZJ/6 JN63GN 719. 08.02.94 OZ9EDR JO55UL 646. 25.02.94 HA1YA JN87GF 566. 26.02.94 OE3JPC JN88EB 510. 05/06.03.94 DL0HU/P JO44OJ 516, G1DSP/P JO03CE 769, G4VIX/P JO01PU 645, G6SPS/P JO01IT 682, S5/IV3DVB JN65WW 519, IW4AOT/4 JN54OK 601, OZ1DLD JO45QJ 626, OZ6HY JO45WA 583. 12.04.94 OZ9EDR JO55UL 646, OZ7AMG JO65HO 674, OZ7HVI JO65FP 675. TROPO-SKEDS for 2m - 13cm are welcome via DG9NBT DB0GV. tks fr info, Martin!

DL8BDU, JO43, wkd 500km: 01.05.93 DL0UL/P 15.21 JN48UO 505. 02.05.93 HB9WM/P 09.43 JN37SG 640, G3CKR/P 10.58 IO93AD 667. 02.10.93 DL0UL/P 14.57 JN48UO 505, HB9FX/P 15.26 JN37RF 645, DL1MBV 15.56 JN57UX 617, F6KIM/P 14.42 JN38AJ 533, DJ1SR 19.01 JN48VF 547, DK0PX 20.16 JN48JC 549, HB9BA/p 21.50 JN37SG 640, F6HPP/P 21.55 JN19PG 532. 03.10.93 DK1KC/P 08.05 JN58QH 573, DL8MEJ/P 08.12 JN58FI 546, G8XVJ/P 12.58 IO93AD 667. 10.10.93 DB5ML 16.38 JN58TA 610. 29.10.93 OK1AGE/P 15.20 JO70UR 584, G4RGK 17.13 IO91ON 621, G6RAF 18.05 IO92QP 583, SM6CMU 21.03 JO57XK, SM6SIF 21.09 JO67GW 615. 30.10.93 SM6CEN 14.21 JO57XO 566. 31.10.93 SM6ESG 07.48 JO67CC 525, F6GCT 17.35 JN18NT 581, F1CYB 18.32 JN17XT 647, F5ZO 20.50 JN08XL 661, F6APE 21.06 IN97QI 880, F6DBB 21.18 IN96NS 942. 04.11.93 DL4MDQ 19.09 JN58RQ 538. 21.11.93 DG1MHY 10.20 JN58WH 581, DJ5MN 10.22 581. 05.03.94 G3KPV 14.38 IO91LK 642, G6SPS/P 14.52 JO01IT 515, DB5ML 19.25 JN58TA 610, DG2MIN/P 20.03 JN57UT 634, DL4MEA 21.20 JN58JD 575. 06.03.94 F6CBH 07.40 JN19TH 514, DJ3JJ 08.59 JN48VF 547, DJ5MN/p 09.20 JN68DG 607, DJ1MV 09.23 JN58WG 593, G1DSP/P 11.38 JO03CE 523, OK1VPZ 13.07 JO70FD 546. Rig: FT790R, PA 300W, 8X20 Element, VV DJ9BV, 23m a.g.l. tnx fr info, Klaus!

Meteor Scatter

Editor: Norbert Göttsche, DL8LAQ

9A1EZA Meteor Scatter Event

This year Radio Club Ludbreg 9A1EZA (IG54f, JN86HG) celebrates 40th Anniversary. Since for the last 15 years Meteor Scatter on 144 MHz has been one of our very favorite modes of VHF operation, we have decided to organize an event for European MS community and give away some awards. The event takes place from July 29th, which is the celebration day, till August 15th 1994.

For completed QSO with 9A1EZA on July 29th each station gets a 40th Anniversary QSL card. We will be QRV on CW random and VHF NET. Station who during the mentioned period completes the highest number of MS QSOs, CW or SSB, including one with 9A1EZA, gets a special 40th Anniversary plaque (very limited edition). If two staions have the same number of contacts, winner is the one with better QRB to 9A1EZA.

Please, submit 9A1EZA MS Event sheet not later than August 31st 1994 to: Radio Club Ludbreg 9A1EZA P.O.Box 9 42230 Ludbreg Croatia The sheet should contain your name and address, Locator and info on your equipment; list of worked stations with date and time, call sign, reports, mode (CW/SSB) and Locator (if known).

9A1EZA Shack

Some facts about MS activity from 9A1EZA: We have started with MS attempts in autumn 1979, but first QSO was completed in 1980. Equipment was: FT221R, PA 70W output, antenna 2 x 10 ele Delta Loop. IG (JN86) square used to be very wanted one in those days and we were quite busy right from the start working many PA, G and DL stations. In 1983 we have activated IC square during the Perseids working from IC04j with a small station: TR-9130, 17W output and 16 ele Yagi and succeeded to complete 32 CW QSOs. In 1986 has our request to get a license to operate from Greece unfortunately been rejected by authorities. For the last several years we have been using the following equipment: FT-736R, PA 2 x 4CX250B, 3SK97 preamp and antenna 4 x 15 ele Cue Dee 35m above the ground. During the last 15 years of operation we have more than 600 completed QSOs, both CW and SSB and worked a lot of new squares by this mode of operation,

9A1EZA Antenna

paying mainly more attention to the quality, i.e. new squares and long distance, rather than quantity.

We do hope that MS operators all over Europe will find this Event interesting and participate actively contributing in this way to our Anniversary. Best 73 and Good Reflections 9A1EZA

DL8EBW (DL66a / JO31NF) wkd via MS on 144 MHz:

931213	0020	0046	UA1C	KO58BR	27	R27	15	mni	1	C random #441
931217	0500	0522	LA4XGA	JP3VC	R26	26	10	16	1.5	C *1
931224	0500	0542	LA4XGA	JP33VC	R27	29	12	26	1	C *1
931231	0500	0536	LA4XGA	JP33VC	R26	26	11	29	0.5	C *1
940104	0000	0110	YZ7UN	KN05FI	27	R28	mni	mni	22	C
940104	0200	0240	SV1BTR	KM17VX	-	-	1	1	0.5	NC 1975km
940104	0242	0252	IW5AVM	JN52NS	R27	27	mni	mni	20	C SSB
940104	0300	0400	LA5TFA	JP99LQ	-	-	-	3	-	NC 2143km
940107	0500	0532	LA4XGA	JP33VC	27	R27	6	26	1	C *1
940109	0100	0141	US5WU	KO20DI	26	R26	5	10	1	C
940114	0500	0525	LA4XGA	JP33VC	R26	27	10	24	1	C *1
940121	0500	0526	LA4XGA	JP33VC	R26	26	6	21	2	C *1
940127	0500	0522	LA4XGA	JP33VC	R27	26	10	11	1	C *1
940127	0523	0555	LA7DFA	JP33VC	26	R28	5	5	1	C r
940204	0500	0547	LA4XGA	JP33VC	R27	R49	9	18	0.5	C *1
940211	0500	0531	LA4XGA	JP33VC	R27	26	11	11	6	C *1
940218	0500	0522	LA4XGA	JP33VC	27	R27	6	8	4	C *1
940225	0500	0547	LA4XGA	JP33VC	R26	26	10	21	0.5	C *1
940226	0600	0641	IK0BZY	JN61GW	R27	27	8	29	1.5	C
940304	0500	0540	LA4XGA	JP33VC	27	R27	12	23	1	C *1
940311	0500	0530	LA4XGA	JP33VC	26	-	3	6	0.5	NC *1 QRN NIL:

940103 Tailend with YO8BSE - sri he used ***wrong MS-procedure !***

940103 YO5BWD KN36,

940219 Sidescattertest DL3MGL JN58

*1 Regular sked to Geir (1320km) to test MS-condx. The conditions during the Quadrantids were quite poor this year! The maximum felt into Radiantsminimum (around 18 UT). 95 will be better, hi

F/DL8EBW/p (JN28TV) wkd via MS on 144 MHz:

940325	2300	2400	UC2SMM	53	-	-	1	-	6(!)	NC
940326	0200	0300	EB3WH	01	-	-	-	1	-	NC
940326	0300	0400	SM6KJX	67	-	-	1	3	0.3	NC
940326	0500	0600	LA4XGA	93	-	-	-	2	-	NC
940326	0800	0845	IK0BZY	61	27	R27	11	28	1	C
940326	2100	2210	LA4XGA	33	R27	26	5	2	0.8	C
940326	2210	2300	OH2BNH	20	27	R27	3	4	1.5	C
940326	2300	2400	UT5ER	78	-	-	1	1	0.3	NC *1
940327	0000	0100	OH2BAP	20	26	26	5	4	0.5	NC
940327	0400	0500	EA6VQ	19	27	R27	23	10	0.5	C
940327	0500	0535	EA3DXU	11	27	R27	9	6	1	C
940327	0547	0638	EA4LY	80	26	R27	10	mni	1	C

NIL: OZ4VV, US5WU, DL9GJW, OH5IY, LA7DFA, S59F, IN3TWX, OE6IWG. Remarks: *1 nearly 2100 km! Thanks for your report, Guido.

LA0BY/p trip to JQ90JA (144 MHz MS):

930709	2200	2305	LA1K	JP53	27	26	mni	mni	1	C
	2305	2335	LA4XGA	JP33	27	27	mni	mni	1	C

930710	0700	0745	UV1AS	KO59	27	27	mni	mni	8	C
	0800	0850	LA8OW	JP50	26	26	17	13	1	C
	0900	0948	UZ2FWA	KO04	27	27	16	12	4	C
	1015		GM4IPK	IO99	529	439	Auroral-E		-	C
	1027		GM4YXI	IO87	529	529	Auroral-E		-	C
	1410		GM4IPK	IO99	559	539	Auroral-E		-	C
	1550		OH5IY	KP30	529	529	Auroral-E		-	C
	1600		OH7PI/4	KP42	419	429	Auroral-E		-	C
	1627		GB3LER	IP90	419	-	Auroral-E		-	Beacon
	1635		SK6HD	JO68	319	-	Auroral-E		-	NC
	1656		LA2AB	JO59	529	529	Auroral-E		-	C
	2200	2240	SM7FWZ	JO77	27	26	mni	mni	4	C
930711	0300	0405	DK9OY	JO52	27	26	7	10	2	C
	0500	0550	PA3BIY	JO22	27	-	1	-	-	NC
	0600	0650	DL7AKA	JO62	26	27	6	6	4	C
	0650		GM4IPK	IO99	539	539	Auroral-E		-	C
	0700	0730	SK6HD	JO68	27	27	6	16	2	C
	0730	0800	SM4RNA		27	27	14	12	5	C r
	0850		SK4MPI	JP70	519	-	Auroral-E		-	Beacon
	0910		GB3LER	IP9	419	-	Auroral-E		-	Beacon

On this trip to the beautiful (but lonely) island of Rebbensoy I was accompanied by Asgeir, LA8UGA (one of the LA1K gang). We used a FT225RD, solid state PA 200W RF and a 16-ele-F9FT-yagi. Besides MS we enjoyed extremely long lasting propagation via Auroral-E (or Ionoscatter ?). Also a single Tropo QSO with SM2CEW was made.

SM/DF9PY/p trip to KP07FU (144 MHz MS):

931208	2200	2300	LA4XGA	JP33	26	27	4	10	-	NC
931210	2100	2220	DK9OY	JO52	26	27	5	5	-	NC
	2220	2245	DL5DTA	JO61	-	-	1	-	-	NC
931211	0900	0940	LA4XGA	JP33	27	27	12	20	0.5	C
	0940	1103	LA7DFA	JP33	26	28	14	14	0.5	C
	2055	2115	GM4IPK	IO99	27	29	8	5	2	C
931212	0300	0335	DK9OY	JO52	26	27	17	3	2	C
	0335	0408	DJ1JD	JO52	26	26	7	7	2	C
	0435	0505	DF8LC	JO53	26	26	9	5	1	C random
	0505	0540	DC7UT	JO42	27	26	13	18	1	C slow spd
	0600	0705	DL5DTA	JO61	26	26	2	6	3	C
	0750	0835	DL7UTS	JO62	26	26	11	6	1	C random

The activity was joined and supported by Assar, SM2LTA. At this time of the year (-15deg. C and 50 cm snow) we were happy to be housed in a heated little cottage near the ore-mining town Kiruna. The equipment was an IC-275E, 8877-PA, masthead preamp and 4 x 17-ele-CUEDEE-yagi on a 15 m tower. Due to other obligations we had to terminate the operation before the peak of the Geminid-shower.

This time I have included the Auroral-E QSO's in the MS reports. Otherwise they might not be published since a separate Auroral-E or ionoscatter column does not exist in DUBUS. Due to job and house projects I reached in 1993 the minimum of my VHF activity. Hope I will find more time next year - there are still many rare squares around. 73, Stefan. Stefan Heck, LA0BY, Floyvegen 25, N-9020 Tromsdalen, +47-776-35144. Thanks for your report, Stefan.

LA6K/p 144 MHz Meteorscatter operation from JP43GB

LA4XGA and LA7DFA were QRV from Smoela Island the 21st and 22nd of April 1994. We borrowed 220 Vac from LA9BWA's cottage. We soon discovered that it was a big demand for JP43, and well ahead of departure the sked list was full. Friday afternoon we went to Smoela. The trip took about 3 hours, including two ferries. LA6K/p operated from a tent, with space for the equipment and two chairs. When the equipment was assembled we started to listen for beacons, and copied DL0PR and SK4MPI. DL0PR was copied on MS, and SK4MPI on MS and Tropo. At 2100 UTC we had the first sked, and both operators were anxious to see how well conditions was for MS. We started at 2100: "G4APA LA6K" at 1000lpm, and when we switched over to receive we soon copied loud signals. G4APA was actually peaking 9+20dB. After completing the QSO, we worked G0CUZ on random. Late in the evening the conditions was getting worse, and it was getting cold. Both of us sat in sleepingbags to keep the temperature to an acceptable level. In the morning we worked many stations on random. At the most we copied 3 stations simultanosly. LA6K went QRT at 0930 UTC, later than expected and with good reflections until 0900 UTC. The QTH on Smoela was a really good one for MS, and we will (hopefully) soon activate JP43GB and other squares on MS. 73 de Geir & Per

LA6K/p (JP43GB) wkd via MS on 144 MHz:

940421	2100	2116	G4APA	R29	R26	4sec	C 9+20dB
	2116	2155	G0CUZ	26	R27	0.5sec	C random
	2200	2300	DH6JT	R26	26	0.4sec	C
	2300	2330	GM4YXI	R27	R27	-	C
940422	0000		IK1PAG	-	-	-	NIL
	0100	0155	DL3YEL	R26	27	1sec	NC Sorry!
	0200		HA8CE	-	-	-	NIL
	0300	0330	G0GMS	R26	26	1sec	C
	0400	0425	G0LBK	R27	R26	1sec	C 28 Bursts
	0430	0452	GM0HUO	R27	27	1sec	C tailend G0LBK
	0500		HB9JAW	-	-	-	NIL
	0512	0527	DL7UME	R27	27	1sec	C random

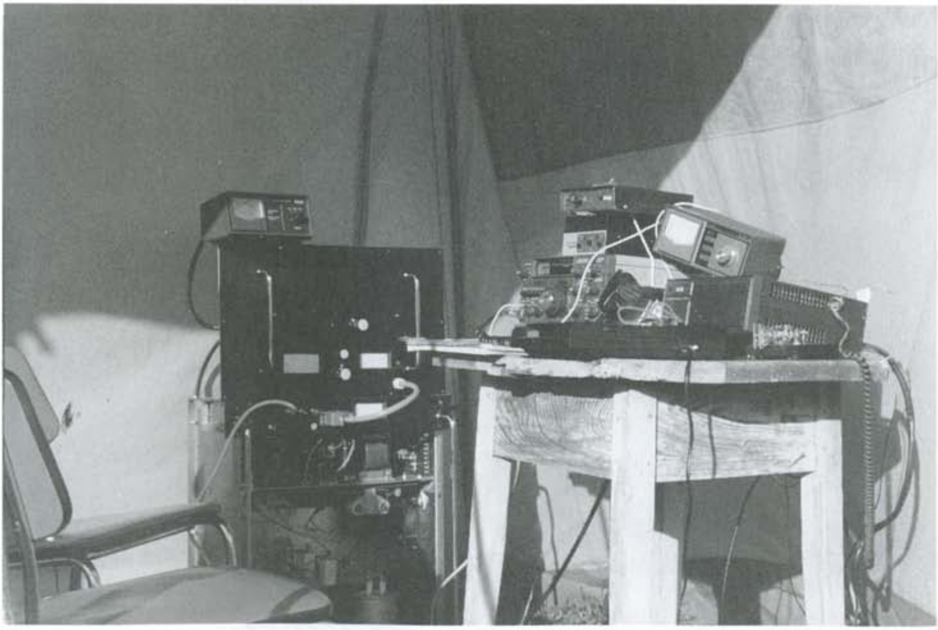
LA6K/P Takeoff South l. to r. LA4XGA, LA7DFA, LA9WBA

0532	0600	ON4GG	R27	R27	1sec	C random
0600		UZ3TXB	-	-	-	NIL
0617	0640	PA3FJY	R27	27	-	C random Pileup!
0641	0647	ON4ANT	R27	27	1sec	C random
0647	0700	DL7UTS	27	-	-	C random
0700		DL9NDD	-	-	-	NIL
0715	0747	DL1EAP	27	R26	-	C tailend
0747	0807	DL3IAE	R27	R27	15sec	C random
0810	0831	DL7AKA	27	R37	2sec	C random
0831	0847	PA3BIY	R27	27	1sec	C random
0857	0922	DH2OAA	27	R27	1sec	C random

Equipment: 17 ele Yagi and 300W output. Thanks for your report, Geir (LA4XGA)

MS-Address-List (changes)

DJ3MY	JO58QD FI67d	Christian Dobmeier, Nelkenstr.5, 82110 Germering, ++898416619, 4x17ele, 200W, PR DB0AAB.#BAY.DEU.EU
F9HS	JN03GL AD43a	Claude Dagoneau, Moncassin, F-32300 Mirande, 13ele, 60W, CW+SSB
F6CRP	IN96KE ZG65g	Denis Auquebon, 30 rue des mûriers, F-17140 Lagord, ++46674052, SSB only
DD0VF	JO61VB GL79c	Steffen Minack, Polenzstr. 3, 01277 Dresden, ++351-2329379 QRL, SSB only, Skeds via DL5DTA
PA2TAB	JO32GF DM63b	Arie Baltes, R.Visscherhof 2, 7471 NH Goor, ++547071682, SSB/CW 1500lpm, QRV on 6, 2 & 4m-X-Band



LA6K/P Equipment

Aurora News

Editor: Edmund Ramm, DK3UZ

DH6JT (DL34b) wkd via Aurora on 144MHz in CW:

940403							
1614	SM5BSZ	IT44e	55a 55a 350	vln dk fr info, Thorsten			

DL8BDU (EN71f) wkd via Aurora on 144MHz in CW:

931118							
1845	SK4MPI	HU46d	55a B 0	1928	SM6QW	GS30a	55a 55a 340
	GB3LER	ZU65f	55a B 0	1938	LA8SJ	FT24g	53a 57a 340
940205							
1628	SM3JGG	HV50e	41a 52a 0	1727	SM6OPX	FS58f	51a 52a 10
1639	LA5WGA	FT22h	55a 55a 20	1733	GM0GMD	YQ61g	51a 53a 15
1643	LA8ZIA	FT67d	41a 52a 0	1740	SM5MIX	HT54d	52a 52a 30
940206							
0041	SM5BSZ	IT44e	59a 59a 0	1527	SM6VAO	GR31a	59a 52a 30
0044	YL2MB	KR10b	42a 53a 0	1530	UA3XEH	RM73f	57a 57a 45
0059	OH2BNH	MU55d	53a 57a 0	1536	SM7SRC	IR14e	59a 59a 40
0124	SM0FMT	IT50j	58a 52a 0	1539	DK2AR	EM79a	59a 57a 40
0131	LA9BM	DU32f	59a 59a 0	1612	GM4KFD	ZR32f	59a 58a 20
1433	DL9GJW	FO80a	41a 44a	1620	DL9QB	EO49a	52a 52a 50
940310							
1549	GM3JFG	XR30b	53a 57a 15	1609	LA2RZ	CU47b	31a 55a 0
940311				1518	SM7FWZ	HR22j	52a 53a 30
1514	SM5GHD	IS34g	53a 53a 10	vln dk fr info, Klaus			

DL8EBW (DL66a) wkd via Aurora on 144MHz in CW:

940221				1744	OZ2ST	EP39j	57a 55a 35
1710	G1GEY	ZO03g	52a 54a 30	1751	G4YHF	ZM39c	52a 53a 30
1718	G3UTS	ZO12h	57a 57a 20	hrd also YL2MB/a in KR again!			
940222				0055	DL3LBK	FO41e	57a 55a 50
0039	GM4CXM	XP09g	57a 58a 40	0108	OZ3GW	FQ21a	55a 53a 355
0041	G4PIQ	AL26h	57a 57a 35	0112	SP1JVG	IO45b	57a 57a 345
0050	G4WKN	ZM57f	57a 57a 20	0115	OZ1CLL	GP27c	57a 57a 25
no more activity in that night - DL0PR all the time 55a!							
940307				1855	OZ6OL	GP42e	57a 55a 30
1711	GM4CXM	XP09g	55a 55a 10	vln dk fr info, Guido			

UA3TCF (WQ14a) wkd via Aurora on 144MHz in CW:

940307

1522	UA3MAS	TR16j	57a	55a	0
1523	UA3MHJ	SR08b	55a	55a	340
1537	UA1TFU	QS40e	57a	55a	0
1539	RX1AS	PT03h	56a	56a	0
1543	OH4LJL	NV31f	54a	55a	0
1545	OH5KAY	OV73b	58a	59a	0
1555	UA1WAM	PQ53b	59a	59a	330
1559	SM4RNA	HU49e	58a	57a	330
1601	SM4HFI	HU39h	54a	54a	330
1708	UA3XES	RN13h	59a	58a	330
1713	UA1WCF	PP24b	55a	57a	330
1716	SM5MIX	HS54d	55a	53a	330
1724	UA1WAY	PQ53b	56a	59a	330

спасибо за инфо Алекс!

UT5EC ex RB5EC **(RI36f)** wkd via Aurora on 144MHz in CW:

940206

1600	SM5MIX	HS66g	33a	52a	330
1615	RA3YCR	RN52f	59a	hrd	330

спасибо за инфо!

UT5ER ex RB5EF **(RI22b)** wkd via Aurora on 144MHz in CW:

940206

1420	UA1WAM	PL53b	55a	55a	350
1549	UA3DHC	TQ72g	59a	57a	350
1552	SM5MIX	HS54d	59a	59a	350
1557	RA3YCR	RN52f	59a	59a	350
1600	OZ1CLL	GP23c	59a	55a	350
1615	OZ6OL	GP42e	57a	55a	335
1625	DL9GKA	GN08b	57a	57a	335
1658	UA3T		57a	56a	10

Until 1750 cld RA3LE (59a), but no reply

спасибо за инфо Аркадьι!

70cm 70cm 70cm 70cm 70cm 70cm 70cm 70cm

DL8BDU (EN71f) wkd via Aurora on 432MHz in CW:

940206

1450	OZ1DOQ	GP24f	55a	54a	30
1452	SM5CTV	IS32g	55a	55a	30
1454	SM6CEN	FR40b	55a	56a	30
1500	G4PIQ	AL16h	41a	52a	
1503	PA0WWM	CM63g	55a	55a	45
1513	SM6BZC	GR72h	51a	55a	30
1518	GM0HBK	XR71a	52a	55a	10
1549	LA8AK	DS80b	41a	53a	30
1557	SM5EFP	HT50e	51a	56a	30
1559	LA3DV	ET20e	52a	55a	30
1626	DL1SUN	FN38h	52a	55a	55
1635	LA3UU	FT12f	55a	56a	20
1657	SM4RPP	HT54g	53a	52a	30

vln dk fr info, Klaus

Please submit your Aurora reports preferably in machine-readable form. You may do so using the following **magnetic media:**

5 1/4" or 8" FM/MFM CP/M disk (please specify logical format).
5 1/4" 360K MS-DOS, 3 1/2" 720K TOS or MS-DOS (please no HD coating).

Further you can report to me by **Email:** dk3uz@iSYS-hh.hanse.de

or via **Packet Radio:** DK3UZ @ DB0HHT.#HH.GER.EU

vy 73 Eddi

News & Comments

Editor: Klaus Tiedemann, DL4EBY

The story of

The Nordic Activity Contests

It all started in Sweden back in 1958. On the first Tuesday evening every month, an informal contest was carried out. Mainly on 144 MHz but with 432 MHz included for those able to work on that *top band*!

In the following years, Denmark, Finland and Norway all joined the Swedish on this evening. In the 4-5 hours of the contest, 20 stations worked would be a good score, then.

The activity slowly gained in popularity and in 1965 a seperate 432 MHz contest on the first wednesday every month was established. As the number of amateurs grew, so did the activity and the usage of the microwave bands. In 1977, 1296MHz was included in the UHF activity contest.

The activity contests run simultaneously in all the Nordic countries, the rules for these cumulative contests are identical and every year a national winner of each class (as well as # 2 & 3) receives an award. The rules have changed somewhat over the years but the basic idea remains the same: A monthly cumulative contest of a short duration worked from home (generally!).

[Regarding the continuity, some of the Skandinavian mobile/portable stations participating, make more activity than home stations! The Editor.]

In 1985 microwave activity had reached a level where it could bear an activity contest of its own on the first monday evening every month including all microwave bands available.

Around this time, we decided to try to promote the Nordic Activity Contest by establishing an open class for non-Nordic stations. (In 1993 more than 20 stations participated in the open classes!

[..and there are more just giving points. Despite the fun of taking part in the Scandinavian activity contests - what would it be nice, if the number of Skandinavian participants in German and/or IARU contests would reach just even half of that... The Editor.])

After 50 MHz was opened to the Nordic amateurs an activity contest for that band was established in 1991. The activity Contests were then placed on all tuesdays throughout the month. The 144 MHz contest remained on the first tuesday of the month where it now continues in its **38th year** !

Finally it should be said that the activity contest can be quite active indeed! On several occasions, QSO counts in the order of around 400 (!) have been worked in the 4 hours of the 144 MHz *activity* contest ! vy 73 de OZ7IS

Nordic Activity Contest 1994, Open Class

EDR hereby invites all amateur radio stations outside Denmark, Finland, Norway, Sweden and Aland to participate in the Nordic activity contest.

Sections:

- 144 MHz, 1st tuesday every month
- 432 MHz, 2nd tuesday every month
- Microwave, 3rd tuesday every month
- 50 MHz, 4th tuesday every month

Time:

- 18-22 UTC October-March,
- 17-21 UTC April-September

Contacts: All operation in accordance with IARU Region I bandplans.

Logs must contain contacts with at least two (2) different locator squares (JO65, JO66, etc.), or at least three (3) different stations in same locator square, from the above mentioned countries.

Any stations outside the Nordic countries may be worked, and will also count. No contacts via active repeaters or EME are allowed.

Reports: RS(T) and Locator, eg. *549 JO55WW.* No QSO number is needed!

Scoring:

- 50 MHz and 144 MHz: 1 point/km (max. 2000) + 500 bonus points / locator wkd
- 432 MHz:1 point/Km (max 2000) + 300 bonus points / locator worked
- Microwave: 1 point/Km times band multiplier (max 2000) + 100 bonus points / locator worked, regardless of band.

Band mutipliers:

- 1.3 GHz * 1
- 2.3 GHz * 2
- 5.7 GHz * 3
- 10 GHz * 4
- 24 GHz * 5 (etc.)

Logsheets: Standard A4, Region I, with the following columns: Date, Time, Call, RS(T) sent, RS(T) received, locator, points, (multiplier/band), and an empty column (REM). In microwave sections, an additional column for the band being used.

A **summary sheet** is required, containing: Own call, name, address, section, own locator, number of QSOs, number of squares and total points. Please also note the ODX with station & locator.

Winners: In the annual result only the nine best contests are evaluated. The first 3 stations in each section, and the best in each country will receive the EDR contest award.

Results: Log must be received no later than 2 weeks after the contest at EDR VHF contest manager: Bent Poulsen, OZ1EYN, Lupinvej 15, DK-3650 Olstykke, Denmark.

VII Symposium in Orvieto, October 9 and 10, 1993

Among several meetings every year, organized with participation of Italian and foreign radio amateurs, the symposium in Orvieto is exclusive experimental (compared to other meetings), the one and only in Italy until now. It is organized by the local section of the Associazione Radioamatori Italiani, represented by its president I0FHZ, and with participation of ITELCO, a company specialized in broadcasting, with a certain number of radio amateurs among the employees.

The Orvietan radio amateurs have created an excellent logistic organization which makes the two days' stay for the guests very pleasant.

ITELCO (thanks for collaboration of its technicians) made its experience and instruments available for all the folowing tests:

- Measurement of gain and return loss of home-made antennas, utilizing type HL023-465-8716-50 Rhode & Schwarz antennas as samples (for comparison purposes) and an HP 8752A or 8711A network analyzer;
- Measurement of frequency-level curves, insertion loss, and standing wave ratio on passive devices (filters, etc.), using an Advantest R3361A spectrum analyzer with a tracking generator and a Rhode & Schwarz ZRB2 VSWR bridge;
- Measurement of the noise factor and associated gain of preamplifiers and converters, using an HP 8970B noise-gain analyzer with an HP 346B noise source with the help of precision attenuators and/or circulators to obtain absolute measurements.

All the measurements are made at 144, 432, 1296 MHz, whereas for the noise figure and associated gain the frequency field can be extended above 1296 MHz, utilizing converters with noted characteristics.

For the next symposium, which will take place on July 16-17 1994, it has been decided to add intermodulation measurements for the evaluation of the dynamic range on some preamplifiers chosen by the jury among those in competition, using two Rhode & Schwarz generators and an HP 8560E spectrum analyzer.

The ITELCO group of amateurs is committed to present some preamplifiers for 144 and 1296 MHz with technical solutions already used in the professional field and applied to amateur radio use. These preamplifiers will use the magnetic reaction techniques (ferrite transformer) for 144 MHz and the wide band matching technique for the use of GaAs-FETs at 1296 MHz, to obtain an elevated stability factor and a stable noise factor even in the presence of a reactive load both in the antenna (source) and in the following stage (load).

[Find the list of 1993 preamplifier measurements at the end; the antenna results are not shown here, since there is no info about the design used, which makes it difficult for the reader to compare. The editor.]

The program for July 16/17, 1994:

16th, 08:00 Measurements of antennas in competition

16th, 13:30 Free lunch "in the field"

16th Simultaneous preamplifier (conv.) and antenna tests in the afternoon

17th, 08:30 More time for preamplifier /intermodulation tests

17th, 11:30 Beginning of technical report presentation

17th, 13:30 Lunch and awarding of prizes

To participate in the antenna contest, the antennas must be built with a minimum boom length of two lambda for 144 MHz, four lambda for 432 MHz and six lambda for 1296 MHz. Moreover, the construction characteristics must arrive by June 30, 1994, to I0FHZ, P.O.Box 3, I-05018 Orvieto (TR), Italy. Antennas, whose characteristics were not received, may be measured, too, depending on the time left at the end.

PreAmp tests, Orvieto 1993 - **144 MHz**			
Call	**Device**	**NF**	**Gain [dB]**
I8CVS	MGF1801	0.24	23.93
I2GAH	MGF4317	0.50	21.09
I2SG	MGF4317	0.60	18.40
I2CFR	CF300	0.65	25.46
I5UES	MGF1302	0.71	18.66
IK8TWM	CF300	0.77	31.16
I2FHW	3SK97	0.78	18.64
IW0QIH	BF988	0.81	26.00
IW0QIH	BF988	0.83	28.88
IK5UAL	BF988	0.83	25.10
IK0NHC	BF988	0.84	28.27
IK5FJW	BF988	0.85	26.92
IW5BHU	MGF1302	0.87	18.61
IN3OTD	CF300	0.88	20.48
I5YDI	MGF1302	0.91	17.47
I0LVA	MGF1802	0.95	12.93
IK5UAL	MGF1302	0.98	17.30
I2FHW	MGF1502	1.12	10.41
I1ANP	MGF1302	1.14	18.92
I5OUL	BF988	1.22	17.10
IK0NHC	MGF1202	1.26	21.14
I5XUZ	MGF1302	1.61	16.49
IK8TWM	BF981	2.15	26.16
I0JKT	MGF1302	2.37	27.07

PreAmp tests, Orvieto 1993 - **432 MHz**			
Call	**Device**	**NF**	**Gain [dB]**
I8CVS	MGF1302	0.28	22.00
I8CVS	2SK571	0.47	19.50
IK8BGG	MGF1302	0.49	18.60
I5CTE	MGF1302	0.51	18.70
I5TDJ	n.d.	0.53	18.30
IK2CFR	MGF1403	0.66	18.20
I0LVA	MGF1502	0.72	15.94
IK2CFR	CF300	1.03	16.00
I2PTE	3SK97	1.83	16.03
I0JKT	MGF1302	3.38	13.50

PreAmp tests, Orvieto 1993 - **1296 MHz**			
Call	**Device**	**NF**	**Gain [dB]**
I6PNN	MGF4914	0.35	14.50
IW4BLG	MGF1302	0.58	14.43
IK0FQQ	MGF1302	1.16	14.99
I0LVA	MGF1502 +CF300	1.74	23.62
I6PNN	MGF1425	2.56	6.84
I0JKT	MGF1302	3.52	19.85

LA0BY, Stefan, writes:

Korrektur zu der letzten veröffentlichten Bakenliste, a correction to the last beacon list: The frequency of **LA7SIX** is **50.051 MHz**.

Ergänzungen, supplements (SM0KAK): Since the beginning of May 1994 **ES6SIX** has moved to **50.073 MHz**.

- Call ES0UHF
- QRG 432.835 MHz
- LOC KO18CW
- QTH Hiiumaa Island, K?pu lighthouse
- Antenna +1.5 dBd OMNI
- Polarisation Horizontal
- QRV 24 hours
- Power 50 W out (50 W ERP)
- Mode A1A
- Elevation 105 m asl, 45 m agl
- Keeper ES0NW Ivo SWL
- Reports to ES0NW, Ivo
- Comissioning ES0IC
- Construction SM0OUG, SM0KAK, SM0DFP
- Support SM0FMT, SM0LKE, SM3BEI, SK0CT, thanks!!
- Future plans To increase antenna gain abt 3dB

The QTH is the same as used by ES0SM 1992. The QTH is uufb! Sea horizon in all directions except from NE to SE (ufb take off into all directions).

MS-Expedition to KQ00

LA0BY and LA5TFA are planning to activate **KQ00BC** from the evening of **June 10** to the afternoon of **June 12**. The location has excellent take-off to the main areas of VHF activity. Operation shall be on 144 MHz using **LA0BY/p** and on 50 MHz using **LA5TFA/p**. The equipment will be 2 x 17-Ele-F9FT-Yagi and 200 W RF on 144 MHz and a 4-Ele-Yagi and 20 W RF on 50 MHz. The preferred mode of operation will be CW-MS and Aurora-E on 144 MHz and Sporadic-E or Aurora-E on 50 MHz.

The meteorscatter sked and random frequency is **144.155 MHz**. LA0BY/p is always starting the first 2.5 min (CW) or 1 min (SSB) period. CW speed is 1000 lpm, number "0" is abreviated to "T" and "9" to "N". The "/" is not keyed. The final rogers in SSB tests might be transmitted in slow speed CW. The sked times may be exceeded by up to 15 min if required to complete a QSO. Skeds for 144 MHz MS may be arranged in the VHF Net on 14.345 MHz or in advance through E-Mail (stefan@eiscat.no).

Random calls are encouraged and are welcome after reception of CQ. The square may be transmitted in the CQ call, for example CQ ME LATBY CQ ME LATBY. Special attention will be paid to Aurora-E or other unusual propagation. Whenever such propagation is monitored, one should not hesitate to interupt ongoing meteor-scatter communication. QSL via bureau to DF9PY or direct to Stefan Heck, LA0BY, Floyvegen 25, N-9020 Tromsdalen, Norway.

SP9EWU, Wojtek writes:

A group of VHFers from SP9 is going to activate KO10 square during the perseids meteor shower 1994. This is planned from August 11 to August 14, and operation will be meteor scatter on 144 MHz (and may be on 50 MHz), tropo on 144 and 432 MHz (and perhaps 1296, 2320 MHz, too).

Callsign will be **SP9PRO/7** and locator **KO10AT**. MS-skeds will be arranged on the VHF-Net (14.345 MHz) by SP9EWU at the beginning of August. Vy 73! Wojtek.

GM4AFF, Stewart, writes:

GM4AFF, GJ4ZUK, G4VXE and GW4LXO are hoping to be QRV between 12 - 23 June 1994 from Jersey on 2m EME. No prior skeds please. Stewart, GM4AFF

Nordic VHF/UHF/SHF Meeting 1994

Also in this year the Nordic VHF/UHF/SHF Meeting will take place in Denmark instead of Norway as scheduled. **Date is 10th to 12th of June**. Location is the 'Jydske Handvaerker Skole' in Hadsten, Skovvej 30, Denmark. Hadsten is about 24km north of Aarhus. Organizers are Soeren, OZ1FTU, and OZ9RU. Program is 'The same Procedure as every year': Diskussions, Lectures, Measurements, Grill & Barbecue, Ham-Dinner etc.

You are welcome to send the text of your reports and articles, especially **EME News**, **Hints & Kinks** and **News & Comments** via electronic mail or Packet radio or disk - thanks.

- EMail (Internet): klaus@netmbx@netmbx.de
- Packet Radio: DL4EBY@DB0GR.DEU.EU

73s, Klaus.

DUBUS Top List

Editor: Norbert Goettsche, DL8LAQ

DUBUS 50 MHz Top List

NR	CALL	WW	EU	WK	TR	AU	MS	ES	F2
1	PA0RDY	JO22	CM	569	725	1617	1597	****	16320
2	G4IGO	IO80	YK	568	505	1308	2528	6938	16199
3	ON4KST	JO20	CK	536	652	1415	1509	7920	16498
4	ON4ANT	JO20	CK	527	710	1757	1695	7243	16547
5	ON4GG	JO20	CK	505	710	1757	1695	7243	16547
6	DL7QY	JN59	FJ	499	741	1665	2186	6900	16353
7	G6HKM	JO01	AL	456	347	1883	780	5674	16112
8	SM6CMU	JO57	FR	424	762	1452	1642	5922	0
9	F1GTU	JN05	AF	418	699	815	1421	3268	16400
10	DL8HCZ	JO53	FN	412	365	1250	1356	3350	0
11	PA3FYM	JO22	CM	375	1238	2019	0	****	16373
12	PA2TAB	JO32	DM	354	610	1370	1809	5797	15339
13	I4XCC	JN63	GD	352	492	0	1427	3349	18627
14	DL9GU	JN49	EJ	327	721	450	0	8500	15625
15	DL7ARM	JO62	GM	315	909	1189	1245	8324	15817
16	F8OP	JN26	CG	314	631	1023	1369	5508	13547
17	OK1IBL	JO60	GK	266	577	1265	1350	6920	11500
18	OK1DDO	JO60	GK	254	620	1423	1340	6100	13300
19	DL3YEE	JO42	EM	235	540	1056	1300	2700	13053
20	DL8LAQ	JO43	EN	228	0	0	0	0	0
21	G6LEU	IO70	XK	214	700	750	0	0	0
22	DL5BBL	JO42	EM	199	414	1008	0	3165	5863
23	OK1FFD	JO60	GK	195	550	1247	0	6060	13300
24	9A2EY	JN85	IF	182	438	0	0	0	0
25	DL8EBW	JO31	DL	169	247	1050	1150	5800	13300
26	DL7YS	JO62	GM	166	342	461	0	3547	8767
27	SP5EFO	KO02	KM	147	0	0	0	0	0
28	DL5IO	JN49	EJ	119	113	340	900	3100	12995
29	OK1VBN	JN78	HI	110	0	0	0	0	0
30	IN3TWX	JN56	FG	95	396	0	0	1890	8100
31	I2FUM	JN45	EF	90	137	0	0	2023	0
32	PA0RLS	JO22	CM	44	80	0	0	1500	0
33	DJ8ES	JO43	EN	40	1105	0	0	2100	0
34	OK1DKS	JO70	HK	28	1012	0	0	1710	5102
35	HB9MIO/P	JN37	DH	6	463	0	0	1101	0

DUBUS 144 MHz Top List

NR	CALL	WW	EU	WK	TR	AU	MS	ES
1	DL3BWW	JO72	HM	619	2243	2034	2295	2782
2	DL8HCZ	JO53	FN	554	1615	1976	2096	3527
3	PA0RDY	JO22	CM	539	1582	1979	2272	2819
4	SM6CMU	JO57	FR	534	1760	1928	2280	2540
5	SM6AFH	JO66	GQ	531	1730	1554	2010	2330
6	PA3BIY	JO22	CM	520	1550	2026	2205	3143
7	OH5LK	KP30	NU	517	1962	2041	2235	2891
8	DF8LC	JO53	FN	514	2105	2045	2202	3291
9	DK9OY	JO52	FM	493	1651	1943	2208	2434
10	OE3JPC	JN88	II	468	1584	1821	2128	2769
11	I2FAK	JN45	EF	464	1750	1508	2405	2995
12	DL8EBW	JO31	DL	444	1454	1918	2029	2214
13	DL2NWK	JO63	GN	441	1819	1956	1991	2251
14	DL8LAQ	JO43	EN	433	1376	1806	1934	3302
15	DL7UTS	JO62	GM	430	1516	1379	2057	2312
16	DL5BCU	JO43	EN	421	1479	1928	2010	2538
17	I4XCC	JN63	GD	402	1177	1803	2275	3084
18	PA3FOC	JO21	CL	400	1373	2010	2142	2179
19	DL5DTA	JO61	GL	399	1344	1578	1907	2057
20	SP5EFO	KO02	KM	392	1702	1982	2010	2626
21	F8OP	JN26	CG	389	1228	1196	2028	2720
22	F5FHI	IN97	ZH	355	1739	2051	2183	2735
23	OE3OKS	JN87	IH	349	1441	1273	1867	2788
24	DL3AMA	JO51	FL	346	1785	1803	1925	2075
25	ON4ANT	JO20	CJ	342	1420	1965	2124	2725
26	ON4GG	JO20	CK	330	1420	1965	2124	2124
27	G3LQR	JO02	AM	329	1776	2031	0	2406
28	DL7YS	JO62	GM	328	1512	1528	1826	2136
29	F6DKW	JN18	BI	320	1519	1602	2051	2755
30	S53CAB	JN76	HG	319	1463	1530	2233	3356
31	OK1DKS	JO70	HK	319	1230	1308	0	3530
32	PA0RLS	JO22	CM	311	1350	1890	1890	2832
33	SP3MFI	JO91	JL	307	1697	1632	1802	2617
34	SP9HWY	JO90	JK	303	1698	1928	0	2532
35	DL8OBU	JO42	EM	297	1483	1866	1733	2159
36	SP6GWB	JO80	IK	291	1780	1581	1875	2437
37	IW1AZJ	JN35	DF	291	1105	1188	1904	2780
38	DK0OG	JN68	GI	290	1708	1722	2125	3320
39	UA3DHC	KO96	TQ	289	1766	1891	2180	2429
40	F1FIH	JN23	CD	286	1305	999	1723	2934
41	IN3TWX	JN56	FG	283	1100	0	1609	1750
42	SP2JXN	JO94	JO	274	1650	1690	0	2634
43	OK1FFD	JO60	GK	270	1388	1720	1937	2154
44	G4IGO	IO80	YK	268	2761	1917	1903	2827
45	PA0WWM	JO22	CM	266	1303	1839	1997	2212
46	DB6BX	JO32	DM	265	1534	1541	1921	2059
47	UA4NM	LO48	YS	265	1215	1850	2510	2290
48	OZ1IPU	JO57	FR	261	1387	1187	1566	2452
49	OK1HAG	JN79	HJ	260	1441	1749	1909	3463
50	DK2BJ	JO30	DK	258	1476	1924	0	2205
51	OK1IBL	JO60	GK	255	1438	1463	1750	3398
52	F6CKZ	JN09	AJ	250	1552	1330	1725	3407
53	DJ6LV	JO31	DL	250	1268	1880	1822	3130

54	F5HRY	JN18	BI	248	1239	1695	2038	2758
55	DD0BI	JO33	DN	246	1565	1018	1102	2362
56	G6HKM	JO01	AL	241	1304	1555	1660	2269
57	F5JRX	JN25	CF	237	1598	1187	1616	2301
58	UV6AKO	KN84	SE	237	1155	960	2017	2567
59	ON4KST	JO20	CK	233	1435	1612	0	2383
60	DG1BA	JO43	EN	232	1674	1280	1588	2239
61	DK1VI	JN49	EJ	227	1148	1107	1604	3131
62	F1GTU	JN05	AF	225	1650	967	1934	2400
63	RB5GU	KN66	QG	222	1877	1446	1930	2617
64	OK1VBN	JN78	HI	217	1578	1682	1915	2209
65	DL5BBL	JO42	EM	212	1416	1290	0	2028
66	UB2GA	KN66	QG	205	1830	0	2010	1940
67	UY5HF	KN66	QG	200	1750	0	1820	2032
68	HB9DFG	JN37	DH	196	1284	1299	0	2302
69	DC6DY	JO31	DL	194	1416	1045	1914	2292
70	F5PAU	IN88	YI	192	1630	0	0	2425
71	DL8AAV	JO52	FM	185	1236	1127	0	2144
72	S59AM	JN65	GF	184	1377	0	1945	1788
73	OK1DDO	JO60	GK	179	1329	1500	1720	2418
74	HB9MIO/P	JN37	DH	176	1316	975	0	2183
75	OE5VRL/5	JN78	HI	175	1665	1573	1990	1949
76	G6LEU	IO70	XK	173	2620	750	0	2403
77	DL3YEE	JO42	EM	172	1574	1450	1480	2106
78	PA2TAB	JO32	DM	170	1302	1094	1875	2183
79	HB9AOF	JN36	DG	170	1201	670	1675	2166
80	DG0CR/P	JO50	FK	169	1279	1530	0	2010
81	DK9RL	JN69	GJ	168	1311	1513	0	3316
82	IK1LGV	JN44	EE	163	1466	0	1613	1890
83	SP9FG	JN99	JJ	157	1647	1283	0	1698
84	DL0UL/P	JN48	EI	147	1026	0	0	2019
85	DJ6XV	JO31	DL	139	1337	961	0	2007
86	DG5NEX	JN49	EJ	132	1234	0	1333	1941
87	DG9NBT	JN49	EJ	128	1363	0	1333	1527
88	DL3NAW	JN59	FJ	120	1019	0	1961	1237
89	DL0SP/P	JO62	GM	108	1315	785	0	1608
90	DK0PX	JN48	EI	98	847	0	1815	1649
91	DJ8ES	JO43	EN	93	1306	0	0	1856
92	DL3IAS	JN49	EJ	85	988	1123	0	1209
93	DB8NU	JN49	EJ	71	867	0	0	0
94	9A2EY	JN75	HF	64	707	0	0	0

DUBUS 432 MHz Top List

NR	CALL	WW	EU	WK	TR	AU	MS	ES
1	DJ9BV	JO43	EN	219	2154	1863	1440	0
2	PA0RDY	JO22	CM	201	1979	1807	1376	0
3	G3LQR	JO02	AM	198	2031	1613	0	0
4	DL3BWW	JO72	HM	191	1547	1494	0	0
5	PA0EZ	JO22	CM	186	1787	1445	0	0
6	PA0WWM	JO22	CM	185	1547	1836	0	0
7	F5FHI	IN97	ZH	184	1892	1280	1530	0
8	DL8QS	JO43	EN	180	1513	1513	0	0
9	DL7QY	JN59	FJ	173	1640	1848	1292	0
10	F6DKW	JN18	BI	160	1519	0	0	0
11	DB6BX	JO32	DM	155	1550	662	0	0
12	DB6NT/A	JO50	FK	151	1823	0	0	0
13	PA3DIJ	JO33	DN	148	2116	1010	0	0
14	DF8LC	JO53	FN	143	1615	1361	0	0
15	DH3NAN	JO50	FK	142	1437	1008	0	0
16	SP6GWB	JO80	IK	141	1780	759	0	0
17	OK1KIR/P	JO60	GK	129	1773	0	0	0
18	SP9FG	JN99	JJ	129	1660	0	0	0
19	DL3YEE	JO42	EM	128	1574	1728	0	0
20	OH5LK	KP30	NU	124	1386	1196	0	0
21	SM7ECM	JO65	GP	124	1344	1068	0	0
22	G6HKM	JO01	AL	118	1289	281	0	0
23	OE5VRL/5	JN78	HI	116	1522	948	0	0
24	DL4VCG	JN39	DJ	115	1335	0	0	0
25	G6RAF	IO92	ZM	113	1730	0	0	0
26	OZ1IPU	JO57	FR	113	1387	0	0	0
27	DL7UTS	JO62	GM	109	1507	772	0	0
28	HB9MIN/P	JN37	DH	109	1300	0	0	0
29	DJ6XV	JO31	DL	109	1128	976	0	0
30	SM6CMU	JO57	FR	108	1641	670	0	0
31	SM6AFH	JO66	GQ	108	1315	1200	0	0
32	DL6BCT	JO43	EN	107	1152	0	0	0
33	F5PAU	IN88	YI	101	1630	0	0	0
34	UA3DHC	KO96	TQ	101	1596	1009	0	0
35	PA0BAT	JO31	DL	101	1301	0	0	0
36	SP9HWY	JO90	JK	98	1398	1306	0	0
37	OK1DKS/P	JO60	GK	98	1118	0	0	0
38	DL0UL/P	JN48	EI	97	1238	0	0	0
39	RB5GU	KN66	QG	94	1877	0	0	0
40	DL2NWK	JO63	GN	92	1636	590	0	0
41	G4LRT	IO92	ZM	90	1394	410	0	0
42	DG9NBT	JN49	EJ	90	1187	0	0	0
43	ON4GG	JO20	CK	87	1258	0	0	0
44	DG5NEX	JN49	EJ	87	1187	0	0	0
45	DK9RL	JN69	GJ	87	1185	0	0	0
46	SP5EFO	KO02	KM	87	1120	1705	0	0
47	DD0BI	JO33	DN	85	1259	0	0	0
48	ON4ANT	JO20	CK	85	1099	0	0	0
49	UY5HF	KN66	QG	84	1670	0	0	0
50	DK1VI	JN49	EJ	84	1125	870	0	0
51	DK0OG	JN68	GI	83	1351	745	0	0
52	DL5BCU	JO43	EN	83	1188	766	0	0
53	F5HRY	JN18	BI	82	1222	583	0	0
54	DG0CR/P	JO50	FK	82	1048	759	0	0
55	HB9AOF	JN36	DG	82	926	0	0	0
56	DC6DY	JO31	DL	82	888	0	0	0
57	DF1EQ	JO31	DL	80	1249	0	0	0
58	F1GTU	JN05	AF	75	1114	0	0	0
59	HB9MIO/P	JN37	DH	75	1096	0	0	0
60	OK1FFD	JO60	GK	72	1339	0	0	0
61	F6CKZ	JN09	AJ	72	1038	0	0	0
62	UB2GA	KN66	QG	70	1790	0	0	0
63	OE3JPC	JN88	II	69	1000	1450	0	0
64	S53CAB	JN76	HG	67	817	0	0	0
65	DL0SP/P	JO62	GM	64	909	0	0	0

66	G6LEU	IO70	XK	63	1400	0	0	0
67	DJ8ES	JO43	EN	63	1025	0	0	0
68	F5JRX	JN25	CF	62	1070	0	0	0
69	DL8AAV	JO52	FM	62	914	0	0	0
70	DB8NU	JN49	EJ	55	691	0	0	0
71	OK1VBN	JN78	HI	53	737	753	0	0
72	DK0PX	JN48	EI	51	1168	0	0	0
73	DL5BBL	JO42	EM	51	841	722	0	0
74	OK1IBL	JO60	GK	48	1285	0	0	0
75	I2FUM/2	JN44	EE	47	875	0	0	0
76	9A2EY	JN75	HF	41	588	0	0	0
77	OK1HAG	JN79	HJ	29	584	682	0	0
78	SP2JXN	JO94	JO	27	1149	0	0	0

Regeln/Rules

Die **DUBUS TOP-List** veröffentlicht regelmäßig Eigenangaben von UKW-Amateuren über die Zahl der von Ihnen gearbeiteten Felder auf den UKW-Bändern. Für die Topliste zählt nur ein QTH und ein Rufzeichen (Kann ein Portabel Standort sein). Gültig sind alle Felder weltweit. Nur terrestrische Verbindungen zählen. EME-Verbindungen werden in einer eigenen TOP-Liste erfaßt, die der Redakteur für die EME-News verwaltet. Verbindungen über Satelliten und Relais zählen nicht. Die Liste wird in regelmäßigen Abständen veröffentlicht. Verwenden Sie den Vordruck und berichten Sie Ihren Felder-Stand entweder an DL8LAQ oder für Nur-EME an DL7APV. Um die Zahl der Einträge immer aktuell zu halten, wird jeder Eintrag pro Band nur dann weiter veröffentlicht, wenn er mindestens einmal pro Jahr von dem Rufzeichen-Inhaber durch Einsenden des untenstehenden Formblatts auf den neuesten Stand gebracht wurde. Nach Ablauf der Frist wird jeder Eintrag automatisch gelöscht.

DUBUS TOP-List publishes unconfirmed claims of squares worked by VHF/UHF-operators. Only one call sign or one QTH (may be portable) can be used for these claims. Only QSO's via terrestric propagation are valid for this TOP-List. EME-Standings (EME-QSO's only) should be reported to the EME-News editor. QSO's via satellites and relais are not valid. The TOP-List will be published regularly. Please report your standings to DL8LAQ or for EME-ONLY to DL7APV. To have a clear picture of competition and activity each claim one each single band has to be updated at least once a year. Otherwise this entry will be deleted automatically.

DUBUS Announcements

Printing Bugs

DUBUS 1/1994, P. 41:

In the article'Tetrode Power on 432 MHz' by N7ART the dimension of the cathode flange should not read 4-17/32" but **3-25/32" (96mm)**.

Im Artikel 'Tetrode Power on 432 MHz' von N7ART ist der Durchmesser der Kathodenplatte nicht 4-27/32" sondern 3-25/32"(96mm).

DUBUS 3/1993, p.51:

In the article 'Open Feed Systems for 432MHz Arrays' by DJ9BV the following sentences '...This transforms to 200Ω and results in 100Ω combined impedance for two pairs in one 4 Yagi array. A balun 100Ω:50Ω ist fitted in the center...' should read: **This transforms to 400Ω and results in 200Ω combined impedance for two pairs in one 4 Yagi array. A balun 200Ω:50Ω ist fitted in the center.**

Im Artikel 'Open Feed Systems for 432MHz Arrays' von DJ9BVmüssen die folgenden Sätze '...Dann hat man am Summenpunkt der Paare 100Ω Impedanz. Diese wird durch $\frac{5}{4}\lambda$ or $\frac{7}{4}\lambda$ Stücke von 200Ω-Leitungen (Bild 2) auf 200Ω transformiert. Das ergibt dann durch Parallelschaltung am Summenpunkt wieder 100Ω. Ein 100Ω:50Ω Balun (Bild 6) ergibt dann 50Ω unsymmetrisch...' ersetzt werden durch: **Dann hat man am Summenpunkt der Paare 100Ω Impedanz. Diese wird durch $\frac{5}{4}\lambda$ or $\frac{7}{4}\lambda$ Stücke von 200Ω-Leitungen (Bild 2) auf 400Ω transformiert. Das ergibt dann durch Parallelschaltung am Summenpunkt wieder 200Ω. Ein 200Ω:50Ω Balun (Bild 6) ergibt dann 50Ω unsymmetrisch.**

DUBUS 1296 MHz Top List

NR	CALL	WW	EUWK	ODX
1	F5FHI	IN97 ZH	115	1538
2	PA0RDY	JO22 CM	115	1286
3	PA0EZ	JO22 CM	115	1261
4	F6DKW	JN18 BI	115	1215
5	PA0WWM	JO22 CM	111	1298
6	G3LQR	JO02 AM	106	1274
7	DB6NT/A	JO50 FK	105	1243
8	OK1KIR/P	JO60 GK	88	1208
9	DL7QY	JN59 FJ	86	1261
10	SP6GWB	JO80 IK	84	1580
11	F5PAU	IN88 YI	83	1630
12	OE5VRL/5	JN78 HI	83	1522
13	DB6BX	JO32 DM	80	1052
14	PA3DIJ	JO33 DN	78	939
15	G6LEU	IO70 XK	74	2620
16	PA0BAT	JO31 DL	73	1014
17	SM7ECM	JO65 GP	70	1322
18	OZ1IPU	JO57 FR	70	1096
19	DL4VCG	JN39 DJ	70	838
20	DL3YEE	JO42 EM	69	1136
21	OK1AIY/P	JO70 HK	66	1490
22	HB9RG	JN47 EH	66	920
23	DF1EQ	JO31 DL	65	908
24	G4LRT	IO92 ZM	62	1152
25	HB9AOF	JN36 DG	61	920
26	HB9MIO/P	JN37 DH	60	945
27	G6HKM	JO01 AL	58	1193
28	DG5NEX	JN49 EJ	58	1060
29	DL0UL/P	JN48 EI	58	962
30	DG9NBT	JN49 EJ	57	1016
31	DH3NAN	JO50 FK	56	1143
32	DG0CR/P	JO50 FK	55	1048
33	DL9GU	JN49 EJ	54	900
34	DC8UG	JO30 DK	54	900
35	DJ6XV	JO31 DL	53	946
36	DL3NQ	JN49 EJ	51	920
37	DB8NU	JN49 EJ	49	1016
38	SP9FG	JN99 JJ	48	1492
39	OK1DKS/P	JO60 GK	46	1207
40	DK0OG	JN68 GI	43	901
41	DB1BX	JO32 DM	41	895
42	F5HRY	JN18 BI	41	664
43	DC6DY	JO31 DL	39	865
44	F6CGB	JN18 BI	38	700
45	F1GTU	JN05 AF	36	896
46	ON4GG	JO20 CK	35	934
47	OE3JPC	JN88 II	33	702
48	ON4ANT	JO20 CK	32	914
49	I0LVA	JN62 GC	31	1152
50	DF6VB	JO31 DL	31	722
51	UB2GA	KN66 QG	30	820
52	I2FUM/2	JN44 EE	30	779
53	DL3IAS	JN49 EJ	29	769
54	DK9RL	JN69 GJ	27	891
55	DK0PX	JN48 EI	27	725
56	S53CAB	JN76 HG	27	626
57	RB5GU	KN66 QG	25	680
58	OZ8VO	JO56 FQ	24	951
59	DJ8ES	JO43 EN	22	682
60	OH5LK	KP30 NU	17	1349
61	DK1VI	JN49 EJ	15	424
62	9A2EY	JN75 HF	14	395
63	OK1VBN	JN78 HI	12	307
64	UA6LGH	KN97 TH	9	464
65	DL0SP/P	JO62 GM	9	347
66	UY5HF	KN66 QG	6	520

DUBUS 2320 MHz Top List

NR	CALL	WW	EUWK	ODX
1	PA0EZ	JO22 CM	70	962
2	PA0RDY	JO22 CM	59	831
3	DB6NT/A	JO50 FK	55	1119
4	PA0WWM	JO22 CM	53	851
5	G3LQR	JO02 AM	52	1006
6	OK1KIR/P	JO60 GK	48	1115
7	DL7QY	JN59 FJ	47	1018
8	PA3DIJ	JO33 DN	42	727
9	OK1AIY/P	JO70 HK	39	1296
10	F5FHI	IN97 ZH	37	1017
11	PA0BAT	JO31 DL	36	923
12	DC8UG	JO30 DK	35	900
13	DF1EQ	JO31 DL	33	678
14	OE5VRL/5	JN78 HI	32	1289
15	OZ1IPU	JO57 FR	29	1028
16	DL9GU	JN49 EJ	29	877
17	DL3NQ	JN49 EJ	28	890
18	G4LRT	IO92 ZM	27	1022
19	DG0CR/P	JO50 FK	26	962
20	SM7ECM	JO65 GP	25	877
21	DL4VCG	JN39 DJ	25	668
22	I0LVA	JN62 GC	23	612
23	HB9MIO/P	JN37 DH	21	694
24	DL0UL/P	JN48 EI	21	493
25	DL3YEE	JO42 EM	19	911
26	DB1BX	JO32 DM	18	525
27	DK0PX	JN48 EI	17	566
28	DB8NU	JN49 EJ	17	428
29	DG5NEX	JN49 EJ	15	465
30	DF6VB	JO31 DL	15	414
31	DG9NBT	JN49 EJ	14	465
32	OK1DKS/P	JO60 GK	13	504
33	DK0OG	JN68 GI	13	412
34	DJ6XV	JO31 DL	11	396
35	I2FUM/2	JN44 EE	10	354
36	DL3IAS	JN49 EJ	9	445
37	DJ8ES	JO43 EN	7	682
38	F1GTU	JN05 AF	7	313
39	F5HRY	JN18 BI	5	539
40	S53CAB	JN76 HG	5	346
41	DF2CA/P	JN57 FH	3	206
42	9A2EY	JN75 HF	2	96
43	OK1VBN	JN78 HI	1	6

DUBUS 3400 MHz Top List

NR	CALL	WW	EUWK	ODX
1	DB6NT/A	JO50 FK	27	738
2	PA0EZ	JO22 CM	23	636
3	G3LQR	JO02 AM	16	924
4	PA0WWM	JO22 CM	16	435
5	DL3NQ	JN49 EJ	15	637
6	DL7QY	JN59 FJ	15	565
7	DF1EQ	JO31 DL	13	532
8	PA0BAT	JO31 DL	13	469
9	DC8UG	JO30 DK	12	724
10	PA0RDY	JO22 CM	12	445
11	DB1BX	JO32 DM	9	425
12	DL0UL/P	JN48 EI	9	239
13	DK0PX	JN48 EI	6	528
14	DL4VCG	JN39 DJ	6	339
15	G4LRT	IO92 ZM	5	421
16	DJ8ES	JO43 EN	4	578
17	DJ6XV	JO31 DL	3	396
18	DK0OG	JN68 GI	2	78
19	DF2CA/P	JN57 FH	2	24

DUBUS 5700 MHz Top List

NR	CALL	WW	EUWK	ODX
1	DB6NT/A	JO50 FK	25	880
2	PA0EZ	JO22 CM	24	835
3	SM7ECM	JO65 GP	23	857
4	HB9MIO/P	JN37 DH	21	694
5	G3LQR	JO02 AM	20	949
6	OZ1IPU	JO57 FR	15	805
7	OK1KIR/P	JO60 GK	13	362
8	PA0BAT	JO31 DL	12	601
9	DL3NQ	JN49 EJ	12	318
10	DL0UL/P	JN48 EI	11	266
11	DC8UG	JO30 DK	10	724
12	DL7QY	JN59 FJ	10	565
13	HB9MIN/P	JN37 DH	8	286
14	S51WI	JN75 HF	7	532
15	PA0WWM	JO22 CM	7	422
16	OK1AIY/P	JO70 HK	6	693
17	I2FUM/2	JN45 EE	6	201
18	DF1EQ	JO31 DL	5	461
19	DK0PX	JN48 EI	5	324
20	DB1BX	JO32 DM	5	150
21	DG0CR/P	JO50 FK	4	304
22	DL4VCG	JN39 DJ	3	339
23	F6CGB	JN18 BI	2	407
24	F6CGB/P	JN24 CE	2	375
25	DJ6XV	JO31 DL	2	144
26	DK0OG	JN68 GI	2	78

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DUBUS 10 GHz Top List

NR	CALL	WW		EUWK	ODX
1	PA0EZ	JO22	CM	40	835
2	HB9MIN/P	JN37	DH	35	939
3	G3WDG	IO92	ZM	31	1008
4	G3LQR	JO02	AM	30	924
5	SM7ECM	JO65	GP	29	857
6	DB6NT/A	JO50	FK	28	692
7	I0LVA	JN62	GC	24	850
8	F6DKW	JN18	BI	23	695
9	HB9RG	JN47	EH	23	607
10	G4KGC	IO92	ZM	22	769
11	HB9MIO/P	JN37	DH	22	694
12	OE5VRL/5	JN78	HI	22	549
13	PA0BAT	JO31	DL	19	601
14	OK1KIR/P	JO60	GK	19	419
15	OZ1IPU	JO57	FR	18	941
16	PA0WWM	JO22	CM	18	589
17	DL3YEE	JO42	EM	17	551
18	DK0PX	JN48	EI	17	419
19	DK4GD/P	JN48	EI	17	411
20	DL0UL/P	JN57	EI	17	363
21	DL3NQ	JN49	EJ	16	478
22	S51WI	JN75	HF	15	532
23	DL7QY	JN59	FJ	15	492
24	DL4VCG	JN39	DJ	12	360
25	DB1BX	JO32	DM	11	465
26	OK1AIY/P	JO70	HK	10	736
27	DC8UG	JO30	DK	9	492
28	I4XCC	JN63	GD	8	426
29	F6CGB	JN18	BI	6	677
30	DK0OG	JN68	GI	6	130
31	DF6VB	JO31	DL	5	162
32	DJ6XV	JO31	DL	5	144
33	F6CGB/P	JN12	BC	4	823
34	9A2EY	JN75	HF	4	374
35	DG0CR/P	JO50	FK	4	283
36	PA3DIJ	JO33	DN	4	195
37	DF1EQ	JO31	DL	4	181
38	S53CAB	JN76	HG	4	176
39	G4LRT	IO92	ZM	3	103
40	F5HRY	JN18	BI	2	410

DUBUS 24 GHz Top List

NR	CALL	WW		EUWK	ODX
1	HB9MIN/P	JN37	DH	9	396
2	HB9MIO/P	JN37	DH	8	172
3	DF2CA/P	JN58	FI	5	142
4	DK4GD/P	JN48	EI	4	184
5	DF6VB/P	JO31	DL	4	104
6	DB6NT/A	JO50	FK	4	95
7	DK0PX	JN48	EI	3	99
8	DF1EQ/P	JO31	DL	2	133
9	DL3NQ	JN49	EJ	2	112
10	OK1AIY/P	JO70	HK	2	95
11	DG0CR/P	JO50	FK	2	52
12	DC0DA/P	JO32	DL	1	104
13	F6CGB/P	JN37	DH	1	74
14	OZ1IPU	JO57	FR	1	55
15	DB1BX	JO32	DM	1	37
16	DL4VCG	JN39	DJ	1	9
17	G3LQR	JO02	AM	1	2

DUBUS 47 GHz Top List

NR	CALL	WW		EUWK	ODX
1	HB9MIO/P	JN37	DH	4	166
2	HB9MIN/P	JN37	DH	4	166
3	DF2CA/P_	JN58	FI	4	15
4	DK4GD/P	JN47	EH	2	80
5	DF6VB/P	JO31	DL	2	69
6	DC0DA/P	JO31	DL	2	69
7	DF2CA/P	JO60	GK	2	59
8	DB6NT/A	JO50	FK	2	59

DUBUS 76 GHz Top List

NR	CALL	WW		EUWK	ODX
1	DF2CA/P	JO50	FK	4	4
2	DB6NT/A	JO50	FK	1	37
3	DF6VB/P	JO50	FK	1	18
4	DC0DA/P	JO50	FK	1	18
5	HB9MIN/P	JN37	DH	1	1

DUBUS 145 GHz Top List

NR	CALL	WW		EUWK	ODX
1	DB6NT/OZ	JO57	FR	1	3
2	DB6NT/A	JO60	GK	1	1

DUBUS 241Hz Top List

NR	CALL	WW		EUWK	ODX
1	DB6NT/OZ	JO57	FR	1	0