

A89-53705 Acoustic pulse propagation during induced acoustic coflow interaction in fiber-optic waveguides (Rasprostraneniye akusticheskikh impul'sov pri poputnom vyzhdenom akusticheskoy zaimodeistvii v volokonnykh svetovodakh). A. I. GURINOVICH, V. V. ZOSIMOV, L. M. LIAMSHV, and A. V. PANASIUK, *Akademiia Nauk SSSR, Izvestiia, Seriya Fizicheskaya* (ISSN 0367-6765), Vol. 53, Aug. 1989, pp. 1520-1523. 9 Refs.

The objective of the study was to develop and analyze alternative methods of the formation of femtosecond solitons from picosecond N-soliton pulses. The approach used here is based on the idea that, by feeding superposed multisoliton and perturbation pulses into a fiber-optic waveguide, it is possible to stimulate the pulse decomposition process and thus separate a soliton of minimum duration. The discussion focuses on the optimal characteristics of the perturbation pulse and the ratio of the induced and spontaneous decomposition lengths.

A89-46431 Fiber-optic Fabry-Perot interferometers with single-mode and graded-index lightguides (Volokonnye inetrferometry Fabri-Pero na odnomodovykh i gradientnykh svetovodakh). D. V. BARANOV, I. V. ZHURLOVA, S. K. ISAEV, L. S. KORNENKO, and A. A. SACHKOV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 16, May 1989, pp. 1064-1067. 10 Refs.

A simple technique for the mass production of fiber-optic Fabry-Perot interferometers featuring high resolving power and a spectrum scanning period of the order of dozens of microsec is described. Experimental results are presented on the transverse structure of radiation at the waveguide output before and after mirror deposition.

A89-46424 Mode structure of the Stokes components of forward SRS in optical fibers (Modovaia struktura stoksovykh komponent poputnogo VKR v opticheskikh voloknakh). E. A. KUZIN, M. A. MAKSIUTENKO, V. I. MARAKHONOV, and V. V. SPIRIN, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 16, May 1989, pp. 1026-1031. 9 Refs.

The mode structure of the Stokes components in multimode SiO₂:GeO₂ glass and capillary optical fibers was studied experimentally. It is shown that the prevailing amplification of the fundamental mode in graded-index glass fibers results in an anomalous reduction of the thresholds of the higher-order Stokes components and in their propagation only in the fundamental mode of the fiber. The complex ring structure of the far-field Stokes wave in step-index glass fibers is connected with the possibility of the matching of the group velocities of the pump and the scattered wave in nonideal step-index fibers.

A89-40770 The effective compression of high-energy laser pulses in fiber-grating compressors (Effektivnoe szhatie vysokoenergetichnykh lazernykh impul'sov v volokonno-reshetochnykh kompresso-rakh). E. M. DIANOV, L. M. IVANOV, P. V. MAMYSHEV, and A. M. PROKHOROV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 16, Feb. 1989, pp. 298-300. 12 Refs.

A simple theoretical model describing the joint action of phase self-modulation and nonlinear birefringence on laser pulse propagation along an optical waveguide is proposed. The use of these two effects makes it possible to effectively compress the high-energy laser pulses whose energy exceeds the energies which can be achieved under pulse compression in conventional schemes by three orders of magnitude.

A89-49342 Tunable picosecond and femtosecond sources of quasi-CW laser radiation based on fiber-optic converters (Perestraivaemye piko- i femtosekundnye istochniki kvazinepreryvnogo lazernogo izlucheniia na baze volokonno-opticheskikh konvertorov). S. A. AKHMANOV, D. N. DOVCHENKO, N. I. ZHELUDEV, A. V. SIMONOV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 16, April 1989, pp. 649-651. 5 Refs.

Results are presented on the development of a new family of completely solid-state frequency-tunable CW laser sources that emit in the picosecond and femtosecond bands. The laser sources are based on the principle of nonlinear frequency conversion and dispersive compression of the spectral continuum radiation.

A89-44993 Middle-infrared chalcogenide glass fibers with losses lower than 100 dB/km. E. M. DIANOV, V. G. PLOTNICHENKO, G. G. DEVIATYKH, M. F. CHURBANOV, and I. V. SKRIPACHEV, (Eidgenossische Technische Hochschule Zuerich, International Conference on Infrared Physics, 4th, Zurich, Switzerland, Aug. 22-26, 1988) *Infrared Physics* (ISSN 0020-0891), Vol. 29, May 1989, pp. 303-307. 17 Refs.

The preparation and optical and mechanical characteristics of As(0.4)S(0.6), As(0.35)Se(0.65), and Ge(0.05)As(0.38)Se(0.57) glass fibers are reported. The fibers were prepared by the crucible method, as described by Vasiliev et al. (1988) and characterized experimentally in terms of optical losses as a function of wavelength, weak absorption, and photoinduced absorption. Fibers of diameter 400 microns and length 10-50 m are found to have mean bending strength of 500-700 MPa and minimum optical losses of 44-46 dB/km at 2.45-2.55 microns (AsS), 76-80 dB/km near 4 microns (AsSe), and 98 dB/km at 2.7 microns (GeAsSe).

A89-42639 Spectral-modulation characteristics of injection lasers with selective resonators for application in fiber-optic communication systems (Spektral'no-modulatsionnye kharakteristiki inzhetsionnykh lazerov s selektivnymi rezonatorami dlia VOLS). K. B. DE-DUSHENKO and S. A. EGOROV, *Radiotekhnika* (ISSN 0033-8486), April 1989, pp. 78-80. 9 Refs.

The paper presents an experimental study of the spectral characteristics of semiconductor injection lasers with a short internal resonator and an external dispersion resonator in the case of deep pulse modulation. Experiments were performed on a stripe-contact double-heterostructure GaAlAs laser, emitting at 0.88 micron. It is shown that the use of internal and external resonators leads to a narrowing of the lasing band of the semiconductor laser in the case of pulse modulation.

A89-35560 Fiber-optic systems for distributing and processing antenna-array signals (Review) (Volokonno-opticheskie sistemy raspredeleniia i obrabotki signalov antennykh reshetok /Obzor/). A. N. BRATCHIKOV and A. I. GRINEV, *Radioelektronika* (ISSN 0021-3470), Vol. 32, Feb. 1989, pp. 19-31. 50 Refs.

The current status and future prospects of the use of fiber-optic and integrated-optics system for distributing and processing antenna array signals are considered. Particular attention is given to systems of amplitude-phase calibration, distributed-feedback systems, optical processors for phased-array antenna beam formation, a fiber-optic channel with intensity modulation, a receiving array with combined modulation, and an array with digital modulation.

Japanese Aerospace Literature This month: *Satellite Communications*

A91-21274 Japanese terrestrial and satellite broadcasting technology - Present and future. EIICHI SAWABE, *Space Communications* (ISSN 0924-8625), Vol. 8, Dec. 1990, pp. 31-35. 12 Refs.

In status rainfall events, the effects of ice depolarization are evaluated using the CS-2 beacon signal and X-band radar observations. Although the ice effects described in terms of the deviation from theoretical rain depolarization show a large variation according to the rain height, net ice depolarizations deduced above this height are relatively constant.

A91-14153 Multibeam system applications and impact on satellite communications. MAKOTO KAWAI and KENJI NAKAYA, IAF 41st International Astronautical Congress, Dresden, Federal Republic of Germany, Oct. 6-12, 1990. 6 pp. 7 Refs. (IAF Paper 90-458).

This paper describes the system concept of a millimeter-wave personal satellite communications system for the first decade of the 21st century. Using millimeter-wave frequency bands and an onboard processor with baseband switching, an advanced satellite communications system can be built. Subscribers will access the satellite directly from ultrasmall earth stations, like the portable terminals used in existing cellular systems. Efficient channel assignment and routing will be done onboard the satellite, and subscribers can use the system at a reasonable charge for personnel. With the conventional satellite system advantages of coverage and flexibility, this system will offer very convenient communications services that can be utilized for various applications.

A90-34027 14/12-GHz-band satellite communication services. KUNIHIO HAYASHI, KIYOAKI NAGAKI, and YASUO MORI, *NTT Review* (ISSN 0915-2334), Vol. 2, Jan. 1990, pp. 44-52. 13 Refs.

An analysis is presented of the traffic performance of a variable-channel-per-burst (VCPB) satellite-switched time-division multiple access (SS-TDMA) that dynamically reconfigures traffic bursts. An SS-TDMA system with an onboard baseband switch is used as the VCPB application system. Bursts are assigned to each earth station one-by-one. Idle channels of other bursts are transferred to a burst having an insufficient number of idle channels by reconfiguration on a call-by-call basis. The VCPB is suited to SS-TDMA systems with relatively few earth stations. VCPB traffic performance depends on the reconfiguration strategy. The effects on traffic performance caused by reallocating idle channels to all bursts in every reconfiguration are described. Reconfiguration probability, defined as the ratio of the number of calls connected by reconfiguration to the total number of calls, is the most important factor in VCPB system traffic performance and can be reduced by reallocation. An approximate formula for the reconfiguration probability from the loss probability of fixed-channel-per-burst (FCPB) TDMA weighted by the binomial distribution for the number of channels in each burst is derived. The approximate reconfiguration probability is close to that of the simulation using reallocation. Reconfiguration process delay time deteriorates channel utilization efficiency. The reconfiguration probability decrease caused by reallocation increases channel utilization efficiency.

A91-22808 Configuration and performance of optical modulator/demodulator for optical intersatellite communications. KOJI YASUKAWA, KOJI GOTO, KANSHIRO KASHIKI, KEN'ICHI ARAKI, MASARU NAGAI et al., *Proceedings of the Free-space laser communication technologies II Meeting*, Los Angeles, CA, Jan. 15-17, 1990 (A91-22776 08-17). Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, pp. 348-354. 7 Refs.

The configuration and specifications of an optical IM/DD modulator/demodulator (modem) developed for optical intersatellite communications are described. The modem's performance was verified for the case of a commercially available high-power laser diode (LD). It was found that the modulator could modulate the high-power LD whose average output was 100 mW, at the bit rate of 360 Mbit/sec. Less than 1.0 dB degradation was measured to obtain the bit error rate of 10 to the -6th at this bit rate.

A91-14046 Engineering Test Satellite-VI and future applications. K. NAKAMARU, S. TANAKA, H. KITAHARA, T. KATAGI, T. AKAEDA et al., IAF 41st International Astronautical Congress, Dresden, Federal Republic of Germany, Oct. 6-12, 1990. 10 pp. 7 Refs. (IAF Paper 90-455).

The major design features, technologies employed, and current development status of ETS-VI are discussed. Among the main objectives are the establishment of a 2-ton-class three-axis-stabilized spacecraft bus technology, confirmation of the launch capability of the H-II rocket, and on-orbit experiments and tests of the measurement equipment. Emphasis is placed on the spacecraft configuration, module design, payload mass and mounting area, lightweight structure, electrical power, attitude control accuracy, and telemetry and command channels. The ETS-VI mission payloads consist of six communications payloads and five bus experimental payloads. A development schedule extending into 1993 is presented, and the proposed areas of enhancement such as the adoption of Ni-H2 batteries, power supply to the ion engines from the batteries, and the reduction of the total mass structure by installing the propulsion system in the bus module are covered.

A90-51359 Double-hop networks using VSATs for the Intelsat system. TOSHIO MIZUNO, MITSUO NOHARA, FUMIO WATANABE, YOSHIO TAKEUCHI, and TERUHIKO HONDA, *Conference Record of the GLOBECOM '89—IEEE Global Telecommunications Conference and Exhibition*, Vol. 3, Dallas, TX, Nov. 27-30, 1989, (A90-51301 23-32). New York, Institute of Electrical and Electronics Engineers, Inc., 1989, pp. 1723-1728. Research sponsored by INTELSAT. 6 Refs.

The authors describe a method of integrating non-hierarchical satellite communication systems into hierarchical ISDN networks (integrated services digital network). The configurations of a satellite-terrestrial integrated network are classified into four basic forms. A new application of subscriber/transit integrated communication networks that combines the basic forms is proposed. With a new concept called virtual transit switching these networks can realize farthest-end routing without modifying the existing call control scheme for terrestrial networks. An ISDN-oriented, satellite dedicated network based on this concept is also proposed. It is confirmed by network cost evaluation that a satellite-terrestrial integrated network is more desirable than independent terrestrial or satellite communication networks.

A90-51325 Development of a concatenated Reed-Solomon/Viterbi FEC combined modem and its field test via 14/11 GHz satellite (forward error correction). T. FUJINO, Y. MORITANI, M. MIYAKE, K. MURAKAMI, A. SHIBUYA et al., *Conference Record of the GLOBECOM '89—IEEE Global Telecommunications Conference and Exhibition*, Vol. 2, Dallas, TX, Nov. 27-30, 1989, (A90-51301 23-32). New York, Institute of Electrical and Electronics Engineers, Inc., 1989, pp. 1080-1087. 19 Refs.

The development of a concatenated FEC (forward error correcting) codec and its associating PSK (phase shift keying) modem aimed at low-bit-rate satellite communications use are discussed, and their performance in a field test at the 14-GHz/11-GHz band using an INTELSAT-V satellite is assessed. The FEC codec consists of a convolutional encoder with a Viterbi decoder for inner coding and a Reed-Solomon encoder with a Euclid decoder for outer coding. A coding gain of 7.5 dB was achieved at a bit error rate (BER) of 10⁻⁶ relative to the uncoded performance, and virtually error-free transmission was achieved at a carrier/noise (C/N) ratio of 0 dB. Some tests were conducted to transmit a voice signal and G3- and G4-facsimile signals, which revealed that the qualities of both received facsimile signals were highly dependent on the event error probabilities rather than the BERs. It is concluded that the developed FEC combined modem is useful for reliable data transmission in the low C/N ratio environment.

A90-25618 Mission models and their transponders for future international satellite communications. Y. KOISHI, K. MIMURA, T. TAKAHASHI, S. KUROKI, and M. SHIGEHARA, AIAA Technical Papers, 13th International Communication Satellite Systems Conference and Exhibit, Part 1, Los Angeles, CA, Mar. 11-15, 1990, (A90-25601 09-32). Washington, DC, American Institute of Aeronautics and Astronautics, 1990, pp. 135-142. 10 Refs.

The configurations and electrical characteristics of two low-profile, lightweight, small, electrically scanning airborne phased-array antennas are presented. One of the antennas is a microstrip array antenna and the other is a cross-slot array antenna. The active feed system of a phased-array antenna and multipath fading due to sea surface reflection in aeronautical satellite communications are examined.

A91-22787 Fine pointing mechanism using multi-layered piezoelectric actuator for optical ISL system. K. SHIRATAMA, T. HAMURO, Y. OHGUSHI, M. SHIMIZU, H. ARIKAWA et al., *Proceedings of the Free-space laser communication technologies II Meeting*, Los Angeles, CA, Jan. 15-17, 1990 (A91-22776 08-17). Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, pp. 117-128. 6 Refs.

An optical satellite communication system is being developed for performing basic optical communications experiments aboard the Japanese ETS-VI satellite to be launched in 1993. This paper describes the experimental plan and the present status of the communication system. The optical communication payload is described, including basic data and block diagrams.

A90-47886 TDMA equipment for DYANET. SHUZO KATO, MASAHIRO MORIKURA, SHUJI KUBOTA, KIYOSHI ENOMOTO, and MASAHIRO UMEHIRA, *NTT Review* (ISSN 0915-2334), Vol. 2, May 1990, pp. 47-54. 11 Refs.

The time division multiple access (TDMA) system and TDMA equipment for the Dynamic Channel Assigning and Routing Satellite Aided Digital Networks (DYANET) are described and it is shown that LSIC- and IC- implementation makes it possible to reduce hardware size of TDMA equipment to 1/5 of conventional size and to enhance the reliability of this equipment. It is noted that these LSICs and ICs are widely applicable to various types of TDMA equipment, including major units such as synchronization, modem, and terrestrial interface. Six different kinds of LSICs are used to implement the major functions of a synchronization unit; four kinds of MICs, four kinds of HICs, and three kinds of LSICs are used to implement a burst modem; and a terrestrial interface module is also implemented with an LSIC.

A90-47885 RF equipment for DYANET. TAKEO INOUE, TAKAYA SAITO, and YOTARO UMEDA, *NTT Review* (ISSN 0915-2334), Vol. 2, May 1990, pp. 41-46. 8 Refs.

This paper proposes a 4-reflector type double torus antenna for simultaneous dual-satellite accessing earth stations, and describes the reflector system design and characteristics of the DYANET earth station antenna. The dual-beam earth station antenna has been developed by using newly developed reflector system design techniques and mechanical studies. Measured data confirms that the 4-reflector type double torus antenna can be used for the DYANET earth station.

A90-47883 Satellite channel control unit for DYANET. HIROSHI NAKASHIMA, BUNZO NISHIMOTO, MASAYOSHI NAKAYAMA, and YASUO ARAI, *NTT Review* (ISSN 0915-2334), Vol. 2, May 1990, pp. 27-34. 8 Refs.

Two IF-band (1 GHz) amplifier ICs and 1/64 frequency divider (FD)/phase frequency comparator (PFC) IC have been developed for satellite transponders. The amplifier ICs are designed using a parallel feedback technique and fabricated using 0.8-micron gate length GaAs MESFET process. An IF band controllable-gain amplifier IC with 22-38 dB gain and less than 5 dB noise figure, and a limiting amplifier IC with 35 dB gain and less than 0.3 degree/dB phase deviation are realized. An 1/64 FD/PFC IC is designed and fabricated using high-speed dynamic frequency divider configuration and Si bipolar process with 9 GHz cut-off frequency. A 7.5 GHz operation is achieved. The newly developed ICs are installed in transponders in the ETS-VI satellite that is scheduled to be launched in 1993.

A90-43434 The study of ionospheric phase delay measured by the carrier from GPS satellite. EIJI KAWAI, ICHIRO MURATA, and FUJINOBU TAKAHASHI, *Communications Research Laboratory, Review* (ISSN 0914-9279), Vol. 36, March 1990, pp. 39-43. 7 Refs.

To measure the influences of the ionosphere on satellite communications and precise satellite measurements, it is necessary to observe the total electron content (TEC) through the ionosphere. This paper describes the results of two-frequency-carrier-phase delay measurements of radio waves from the Global Positioning System (GPS). The phase difference between the two frequencies (1.6 and 1.2 GHz) is proportional to TEC along the line of sight to the GPS. The measurements were performed at the Earthquake Research Institute of Tokyo University. The precision of this method is shown to be about 1000 times higher than that of conventional group-delay methods, making it possible to measure even small ionospheric disturbances.

A90-25636 Experimental millimeter-wave satellite communications system. YOSHIKI SUZUKI, MASAOKI SHIMADA, YOSHINORI ARI-MOTO, TADASHI SHIOMI, SUSUMU KITAZUME et al., AIAA Technical Papers, 13th International Communication Satellite Systems Conference and Exhibit, Part 1, Los Angeles, CA, Mar. 11-15, 1990, (A90-25601 09-32). Washington, DC, American Institute of Aeronautics and Astronautics, 1990, pp. 295-301. 8 Refs. (AIAA Paper 90-0805).

This paper describes the configuration and characteristics of the multibeam antenna flight model for the Engineering Test Satellite, which is scheduled to be launched in 1993. The thirteen-beam and five-beam antennas for 30/20-GHz-band fixed and 2.6/2.5-GHz-band mobile communication system, respectively, have been newly developed. The following key technologies to be developed are presented: (1) large, light-weight and deployable antennas, (2) Ka-band frequency reuse in alternate beams through use of a cluster-type horn, (3) shared use of a reflector for two frequency bands, and (4) a high-accuracy antenna pointing control system.

A90-42936 A 30 GHz MMIC receiver for satellite transponders. HARUHIKO KATO, TAKASHI OHIRA, FUMINORI ISHITSUKA, TSUNEO TOKUMITSU, YUICHI KIHATA et al., *IEEE Transactions on Microwave Theory and Techniques* (ISSN 0018-9480), Vol. 38, July 1990, pp. 896-903. 14 Refs.

The development of 30-GHz-band monolithic microwave integrated circuits (MMICs) and multichip MMIC modules (low-noise amplifier and frequency converters) is reported. A 30-GHz-band full-MMIC receiver for satellite transponders was successfully constructed using the MMIC modules, and the performance of the full-MMIC receiver is evaluated. Test results verify its successful performance as a satellite receiver system. Particular attention is given to the design and performance of (1) the MMICs (a two-stage amplifier, an image rejection mixer, and a frequency multiplier), (2) multichip-type MMIC modules (a 30-GHz-band low-noise amplifier module with 30 dB gain and 8.2 dB noise figure, and an image-rejection frequency converter with a 10 dB conversion loss and an 18 dB image rejection ratio), and (3) the full-MMIC receiver, which weighs 1/6 as much as a conventional hybrid integrated circuit.

A90-37975 A flat panel antenna with two-layer structure for satellite broadcasting reception. TAKAO MURATA and KENJI OHMARU, *NHK Laboratories Note* (ISSN 0027-657X), No. 374, Dec. 1989, 11 pp. 7 Refs.

Technical aspects of flat-panel antennas for DBS reception, namely increasing the bandwidth and decreasing the feeder loss, are studied. In particular, the feeder loss related to substrate thickness is calculated, and it is shown that there is an optimum substrate thickness for which the sum of the conductor loss and the radiation loss is a minimum. A two-layer structure is proposed for constructing low-loss, wideband flat panel antennas. An experimental 512-element flat panel antenna with a two-layer structure is found to achieve a gain of 34 dBi (60 percent antenna efficiency). This antenna is expected to be developed for vehicle antennas incorporating active devices for mobile reception.

A90-25695 A study of land mobile satellite communication systems in the geostationary platform area. M. KOHMURA, Y. OTSU, K. MIYASAKA, and H. UDA, *AIAA Technical Papers*, 13th International Communication Satellite Systems Conference and Exhibit, Part 2, Los Angeles, CA, Mar. 11-15, 1990, (A90-25601 09-32). Washington, DC, American Institute of Aeronautics and Astronautics, 1990, pp. 790-797. 22 Refs. (AIAA Paper 90-0876).

The design concept of a land mobile communication (LMC) network for Japan, based on a multiple-beam GEO platform to be launched early in the 21st century, is discussed. The market for LMC services is assessed; the LMC frequency-reuse requirements for the major Japanese metropolitan areas are estimated; and particular attention is given to recent advances in multibeam antennas and transponders, LMC network configurations, LMC terminals, propagation and modulation coding, and the possible inclusion of hardware for mm-wave communication and direct broadcasting on the platform. The payload weight and power requirements for a dedicated LMC platform are estimated as 1100 kg and 2.5 kW; the values for the multiple-use platform are 2000 kg and 10-13 kW, respectively.

A90-20102 Application of moment technique in performance analysis of coded 8-PSK over hard-limited satellite channels in the presence of interference and noise. NYMPHA JAYAMANNE, SHINSAKU MORI, IKUO OKA, *Institute of Electronics, Information and Communication Engineers, Transactions* (ISSN 0913-574X), Vol. E72, Oct. 1989, pp. 1119-1126. 17 Refs.

This paper presents an analytical approach to the error performance of trellis coded 8-PSK with Viterbi decoding, over a hard-limited (HL) satellite channel. A sequence independent TCM composed of a convolutional code of rate 2/3 and constraint length 3 combined with 8-PSK is treated. The channel is considered to be disturbed by up-link and down-link cochannel interference (CCI) apart from both up-link and down-link noise. For the non-Gaussian characteristics of the received signal due to the nonlinearity and CCI, the moments of path metric are employed in the analysis. The first event error probability is obtained by the moments with the aid of the Gram-Charlier expansion without the knowledge of the actual probability density function of the metric related to the non-Gaussian characteristics. The bit error probability is derived through the transfer function method. Numerical results of coded 8-PSK are presented for both hard-limited satellite channels and linear terrestrial channels with a comparison to uncoded QPSK.

A90-17829 Optimization of frequency assignment. TAKESHI MIZUIKE, YASUHIKO ITO, *IEEE Transactions on Communications* (ISSN 0090-6778), Vol. 37, Oct. 1989, pp. 1031-1041. 20 Refs.

A systematic method of determining carrier frequency assignment is proposed to minimize the cochannel interference in satellite communication systems. For the mathematical treatment of the problem, discrete positioning of carriers is introduced to avoid the nonlinear expression inherent in interference evaluation. The proposed method converts this nonlinear problem into the well-known assignment problem and enables the development of an algorithm based on the branch-and-bound method. Extended models of the proposed method are presented for practical application. To demonstrate the effectiveness of the method, computation results are shown for two typical problems. In both of the examples, cochannel interference is significantly reduced as the result of optimization of frequency assignment.

A90-25705 Experimental intersatellite data relay and tracking system for ETS-VI. MASATO TANAKA, HIROSHI KITAHARA, CHIKARA HARADA, and TONEO KAWANISHI, *AIAA Technical Papers*, 13th International Communication Satellite Systems Conference and Exhibit, Part 2, Los Angeles, CA, Mar. 11-15, 1990, (A90-25601 09-32). Washington, DC, American Institute of Aeronautics and Astronautics, 1990, pp. 878-885. 13 Refs. (AIAA Paper 90-0887).

An intersatellite data-relay and tracking system will play important roles in future space activities in Japan. Accordingly, NASDA has been studying the Japanese Data Relay and Tracking Satellite System (DRTSS), and is now developing onboard equipment to perform fundamental experiments on the system using ETS-VI, which will be launched in 1993. This paper describes the configurations and characteristics of the experimental system.

A90-25687 A 38-GHz on-board solid-state power amplifier for millimeter wave satellite communication. YOSHIHIKO ASANO, NAOFUMI OKUBO, MASAFUMI SHIGAKI, MASAOKI SHIMADA, YOSHIKI SUZUKI et al., *AIAA Technical Papers*, 13th International Communication Satellite Systems Conference and Exhibit, Part 2, Los Angeles, CA, Mar. 11-15, 1990, (A90-25601 09-32). Washington, DC, American Institute of Aeronautics and Astronautics, 1990, pp. 741-746. 5 Refs. (AIAA Paper 90-0867).

A millimeter-wave on-board solid-state power amplifier is described. This amplifier delivers 0.5 W saturated output power in the 38 GHz band. The amplifier consists of ten stages, each composed of a monolithic GaAs IC. For high gain in the millimeter-wave band, 0.25-micron gate-length HEMTs are used in the first and second stages. At the output of the amplifier, a waveguide hybrid circuit combines two hybrid ICs, each composed of two stages. The younger stage is composed of two MESFET cells with a total gate width of 1200 microns. The other stage is composed of four MESFET cells with a total gate width of 1600 microns.

A90-23201 Development of a new type of beam-steerable earth station antenna—Offset Spherical Antenna. FUMIO WATANABE, *Space Communications* (ISSN 0167-9368), Vol. 7, Dec. 1989, pp. 3-10. 9 Refs.

The Offset Spherical Antenna, a beam-steerable earth station antenna, is introduced. The architecture and configuration of the antenna are described. The antenna is compared to other types of multibeam and/or beam-steerable antennas. The Offset Spherical Antenna consists of a feed subsystem, a spherical main reflector, and two subreflectors with special and unique curved profiles. The antenna's beam-steering capability is independent of the main reflector. Also, the antenna has multibeam-forming capability and the ability to achieve low side lobe performance. The design parameters for Intelsat's Standard A, C, and E-3 earth station antennas are given and results are presented from experiments with a model antenna with a gain of 60 dBi.

A90-22141 Routing and filtering in the ETS-V transponder for mobile communication experiments. K. KONDO, Y. HASHIMOTO, and T. IDE, *International Journal of Satellite Communications* (ISSN 0737-2884), Vol. 7, Oct.-Nov. 1989, pp. 315-319. 6 Refs.

The onboard orbit calculation and tracking system of the S-band intersatellite communication equipment (SIC) for Japan's Engineering Test Satellite-VI to be launched in 1992, is presented. The SIC provides a multibeam phased array antenna with 54 phase shifters for beam pointing. The beams are directed to any desired user satellites automatically by controlling 54 phase shifters according to results of onboard orbit calculations by an onboard microprocessor. Because accurate onboard beam pointing is required in intersatellite communications, this paper describes a method of onboard orbit calculation and estimations of beam-pointing errors caused by using the system, considering perturbations.

A90-16796 Equipment system for S-band inter-satellite communication using ETS-VI. SHIGERU OKUBO, TAKEO ITOH, YOSHIKI SUZUKI, MASATO TANAKA, HIROSHI KITAHARA, *Japan Society for Aeronautical and Space Sciences Journal* (ISSN 0021-4663), Vol. 37, No. 428, 1989, pp. 424-429. 9 Refs.

The S-band intersatellite communication system for Japan's Engineering Test Satellite VI (ETS-VI), to be launched in 1992, is presented. The S-band intersatellite communication (SIC) system provides a multibeam array antenna with 19 microstrip antenna elements. The SIC has compatibility with NASA's S-band multiple-access system for TDRSS. The SIC provides an on-board microprocessor for directing the beams to any desired user satellite and on-board beam forming networks.

A89-54928 Gigahertz-band high-gain GaAs monolithic amplifiers using parallel feedback technique. NOBORU ISHIHARA, HIROYUKI KIKUCHI, MAMORU OHARA, *IEEE Journal of Solid-State Circuits* (ISSN 0018-9200), Vol. 24, Aug. 1989, pp. 962-968. 11 Refs.

A high-gain multistage amplifier design technique is described. As countermeasures against FET drawbacks, the drain conductance dispersion was modeled and the dc parallel feedback was applied against process variations. Based on these and further feedback techniques, a limiting amplifier and a gain-controllable amplifier for satellite communication systems were designed and fabricated utilizing an 0.8-micron gate-length ion-implanted GaAs MESFET process. Moreover, their packages were developed considering stability conditions. A 45-dB 0.1-3.5-GHz limiting amplifier and a 22-38-dB 0.1-2.5-GHz gain-controllable amplifier were developed.