

A88-28329 Techniques for the provision of the appropriate thermal regime for the Venera probes in the Venus atmosphere (Metody obespecheniia teplovogo rezhima avtomaticheskikh mezhplanetnykh stantsii 'Venera' v atmosfere planety). I. A. ZELENOV, A. F. KLISHIN, V. M. KOVTUNENKO, and A. F. SHABARCHIN, *Kosmicheskie Issledovaniia* (ISSN 0023-4206), Vol. 26, Jan.-Feb. 1988, pp. 33-36.

The system that provides for the appropriate thermal regime for the second-generation Venera probes includes: (1) heat shielding for descent in the aerodynamic braking mode and (2) heat insulation during atmospheric descent and on the planetary surface. This paper examines the basic principles behind the provision of the thermal regime, with emphasis on techniques for providing for external heat insulation. A methodology for calculating the thermal regime is described, and calculation results are presented.

A88-43612 A numerical method for calculating turbulent flows and heat transfer in the engines of flight vehicles (Chislennyi metod rascheta turbulentnykh tekhnii i teploobmena v dvigatel'nykh letatel'nykh apparatov). A. M. LIPANOV, I. F. KISAROV, and I. G. KLIUCHNIKOV, *Aviatsionnaia Tekhnika* (ISSN 0579-2975), no. 1, 1988, pp. 49-53.

A method is developed for the numerical modeling of turbulent flows of a viscous compressible gas and heat transfer in flight vehicle engines in the stationary operation region. The method, which uses finite difference calculations, makes it possible to evaluate the effect of the geometrical dimensions of the engine and rotation speed on the flow and heat transfer parameters. Results of calculations are presented for two engine configurations.

A88-39566 Results on the reduction of the level of discharge phenomena in the near-satellite plasma on the Aureole-3 satellite (Nekotorye rezul'taty snizheniia urovnia razriadnykh iavlenii v okolosputnikovoi plazme na sputnike 'Oreol-3'). I. U. I. GAL'PERIN, V. A. GLADYSHEV, A. I. KOZLOV, and O. A. MOLCHANOV, *Kosmicheskie Issledovaniia* (ISSN 0023-4206), Vol. 26, Mar.-Apr. 1988, pp. 279-288. 34 Refs.

Multicomponent measurements of the low-frequency demodulated signals were measured and their polarization was evaluated in an effort to improve the EMC of the ARCAD-3 instrumentation and to reduce the level of discharge processes in the plasma near the Aureole-3 satellite. Discharge phenomena in the plasma are considered as a noise-generation factor. Particular consideration is given to the contribution of the metallization and equipotentialization of the outer surfaces of the satellite (particularly the solar-array surfaces) to reducing the level of discharge processes.

A88-28330 Thermal regime of Venera-type probes in the interplanetary trajectory (Teplovoi rezhim avtomaticheskikh mezhplanetnykh stantsii tipa 'Venera' na traektorii pereleta). V. V. BOGDANOV and M. M. IAKUBOVICH, *Kosmicheskie Issledovaniia* (ISSN 0023-4206), Vol. 26, Jan.-Feb. 1988, pp. 37-40.

In their flight to Venus the Venera probes are subject to increasing solar radiative heat flux whose density varies from 1460 W/sq m (at the beginning of the trajectory) to 2700 W/sq m (at the end). This paper presents data which permit a rational design of active, semipassive, and passive thermal control systems for the Venera probes. These systems provide for the appropriate thermal regimes for hermetically sealed chambers, separated units, and external units in the interplanetary flight segment.

Japanese Aerospace Literature This month: Aircraft/Spacecraft Systems

A89-18736 Experimental personal satellite communications system using millimeter-wave for Asia-Oceanian region. SHUNKICHI ISOBE, YOSHINORI ARIMOTO, YOSHIKI SUZUKI, SHIGETOSHI YOSHIMOTO, MASAZUMI NISHIDA et al., *Communications Research Laboratory Journal* (ISSN 0914-9260), Vol. 35, July 1988, pp. 209-224. 12 Refs.

The millimeter-wave satellite communication system for the Asia-Oceanian region is discussed. The concept of the personal satellite communication system is studied using inexpensive and simple small earth stations. The rain margin or link availability is calculated to determine the possibility of using the millimeter-wave in the Asia-Oceanian region. Transmission rates, channel capacity, and parameters of the on-board equipment and earth stations are examined and an example system configuration is presented. Plans for experiments using the Engineering Test Satellite-VI are given.

A89-26756 Novel control channel quality improvement in satellite communication systems employing high coding gain FEC (forward error correction). MASAHIRO MORIKURA, SHUJI KUBOTA, KIYOSHI ENOMOTO, and SHUZO KATO, IN: *GLOBECOM '88 - IEEE Global Telecommunications Conference and Exhibition*, Hollywood, FL, Nov. 28-Dec. 1, 1988, Conference Record. Vol. 1 (A89-26753 10-32). New York, Institute of Electrical and Electronics Engineers, Inc., 1988, pp. 136-140. 6 Refs.

The authors propose a novel control channel quality improvement scheme for satellite communication systems using a majority decision method over convolutional coding and Viterbi decoding channels. To improve majority decision performance, which is degraded by burst errors due to Viterbi decoding in conventional serial transmission methods, a parallel transmission method is proposed. The performance of the parallel and serial transmission methods has been analyzed, and experiments have been carried out using rate-1/2 convolutional encoding and Viterbi decoding (constraint length 4 and 7). It is shown that the parallel transmission method has about 1010 times lower block-error performance at $P_e = 1 \times 10^{-4}$ than the conventional method.

A89-26745 Low cost multi-channel GPS receiver. RYOBUN TACHITA, KEN IKEDA, AKIO TERANISHI, JOHN H. PAINTER, and PHILIP S. NOE, IN: *PLANS '88 - IEEE Position Location and Navigation Symposium*, Orlando, FL, Nov. 29-Dec. 2, 1988, Record (A89-26701 10-17). New York, Institute of Electrical and Electronics Engineers, Inc., 1988, pp. 455-460.

An investigation was conducted on compact, multichannel GPS (Global Positioning System) receivers. The code generator and correlation equipment were simplified, attempting to avoid downgrading the properties possessed by multichannel receivers as much as possible, and the error-increasing factors caused by such modification were examined. As a means of simplifying the receiver hardware, phases with a unit of 1/8 chip were established in the code generator. Each channel was provided with a circuit for determining correlation, and the phase differences of the carrier and the code were measured by time division. It was confirmed that sufficient accuracy of measurement can be obtained even if such simplification is carried out.

A89-19949 CAD/CAM/CAE application for design of LE-7 LOX/LH2 turbopump - CADLEX system. AKIRA OKAYASU, TOYOHICO OHTA, SHOGO WARASHINA, TOSHIHIDE OHKI, YUKIE TAKOH et al., *Ishikawajima-Harima Engineering Review* (ISSN 0578-7904), Vol. 28, July 1988, pp. 231-235.

This paper introduces the CAD/CAM/CAE system applied to designing the LE-7 LOX/LH2 turbopump. LE-7 is the first stage engine that has been developing for the H-II rocket. CADLEX meeting with the production engineering section and the aerospace engineering system group was held to design the system suited for LE-7 development. Subsequently, application of the CAD/CAM/CAE system started and several interface and mesh-generation programs have been developed. The CADEGA system, developed for the V2500 fan jet engine, was employed to produce CAD drawing. The 3D design models were made with CATIA and passed to CAM actively to assure accuracy and to decrease production cost. As a result, with CAD/CAM/CAE application, the design period was shortened and cost were down 50 percent compared with the old system.

A88-36451 On-board baseband processor for regenerative SS/TDMA system operating with digital intersatellite links. HIDEYUKI SHINONAGA, GUNKICHI SATOH, and MICHIOHISA OHKAWA, IN: *GLOBECOM '87 - Global Telecommunications Conference*, Tokyo, Japan, Nov. 15-18, 1987, Conference Record. Vol. 2 (A88-36401 14-32). New York, Institute of Electrical and Electronics Engineers, Inc., 1987, pp. 930-936. 11 Refs.

A regenerative SS/TDMA (satellite-switched time-division multiple-access) system which is operating with digital intersatellite links (ISLs) is proposed, and detailed descriptions are given of the required onboard baseband processor. The proposed system does not impose any modifications on the current INTELSAT TDMA traffic terminals, yet provides significant advantages in transmission characteristics and geographical connectivity. A proof-of-concept model of the processor is developed. Power consumption, mass, and volume is estimated for the LSI implementation assuming current technologies.

A88-22605 Evaluation method of polynomial models' prediction performance for random clock error. MICHITAKA KOSAKA, *Journal of Guidance, Control, and Dynamics* (ISSN 0731-5090), Vol. 10, Nov.-Dec. 1987, pp. 523-527. 5 Refs.

In satellite navigation systems such as the Global Positioning System, clock error is one of the major sources of error in precise pointing. In order to remove clock error, it is modeled as a second-order polynomial and the clock-error correction parameters are sent to users. However, a random clock error cannot be modeled as a second-order polynomial. Therefore, the time discrepancies due to random clock error must be taken into consideration for precise pointing. This paper proposes an analytical computation method for estimating the random clock error in the current system which makes use of the Allan variance characteristics of random clock error without random clock realization and a lot of simulation studies. Moreover, a numerical example based on the proposed method shows that the first-order polynomial model is better for predicting a random clock error than the second-order polynomial.

A88-28974 Geostationary tether satellite system and its application to communications systems. TETSUO YASAKA and TAKESHI HATSUDA, *IEEE Transactions on Aerospace and Electronic Systems* (ISSN 0018-9251), Vol. 24, Jan. 1988, pp. 68-75. 11 Refs.

The geostationary tether satellite system expands the geostationary orbit resource from a one-dimensional arc into a two-dimensional disk. The tethered satellites, each several thousand kilometers apart and aligned along the local vertical, are stabilized at the altitude of the geosynchronous orbital speed. When this system is applied to communications systems, it is estimated that the number of satellites can be increased as much as 13 times and the communication capacity can be increased more than 17 times, compared with a conventional geostationary satellite orbit system.

A89-20806 Receiving and processing system for meteorological satellite (NOAA). HIDEKI MUROTA, MASAYA NAKAYAMA, MASARU KITSUREGAWA, and MIKIO TAKAGI, IN: *Proceedings of the 8th Asian Conference on Remote Sensing*, Jakarta, Indonesia, Oct. 22-27, 1987, (A89-20751 07-43). Bogor, Indonesia, EXSA International, 1987, pp. H-12-1 to H-12-7. 9 Refs.

The Cartridge Library System archival system, a secondary storage system that can be operated and accessed directly by the host computer, is described as well as the organization of the data management system for the NOAA images and the quick look image. NOAA data are written in EBCDIC-code. The error rate and the missing line are recorded using binary fixed-point representation.

A89-20790 MOS-1 data processing in Tokai Space Center. YOSHI-AKI MATSUMAE, TSUKASA HOSOMURA, HARUHI SA SHIMODA, TOSHIBUMI SAKATA, and KIYONARI FUKUE, IN: *Proceedings of the 8th Asian Conference on Remote Sensing*, Jakarta, Indonesia, Oct. 22-27, 1987, (A89-20751 07-43). Bogor, Indonesia, EXSA International, 1987, pp. F-1-1 to F-1-7.

Data processing facilities at the Tokai (Japan) University Space Information Center are described, focusing on processing techniques for Marine Observation Satellite (MOS-1) data. The features of the MOS-1 receiving system are discussed, including the antenna and control unit, station operation, image and data processing units, archives, and image analysis system. Diagrams of the system and examples of processed imagery are presented.

A89-18735 A feasibility study of rain radar for the Tropical Rainfall Measuring Mission. VI - A case study of rain radar system. KEN'ICHI OKAMOTO, JUN AWAKA, and TOSHIKI KOZU, *Communications Research Laboratory Journal* (ISSN 0914-9260), Vol. 35, July 1988, pp. 183-208.

A case study of the rain radar system for the Tropical Rainfall Measuring Mission has been conducted, considering pulse compression radar versus conventional type radar, active array radar with solid state power amplifiers versus passive array radar with TWTAs, and various antenna types. The characteristic parameters, power consumptions, weights, and sizes of six different cases are presented. It is found that the most suitable candidate for the mission is the nonpulse compression active array radar with planar array.

A89-17819 Multibeam satellite communications system for fixed and mobile communications experiments. MAKOTO KAWAI, MASAYOSHI TANAKA, ISAO OHTOMO, and MAKOTO NAKAMURA, 39th IAF International Astronautical Congress, Bangalore, India, Oct. 8-15, 1988. 8 pp. 11 Refs. (IAF Paper 88-428).

Multibeam satellite communications technology is one of the most important technologies for improving system economy and transmission capacity for satellite communications. Multibeam satellite communications experiments are planned to be conducted using Engineering Test Satellite-VI (ETS-VI), which is expected to be launched in 1992. This paper describes the configuration and characteristics of the experimental systems for fixed and mobile satellite communications.

A88-47899 Functional programming for the telegram analysis problem. YUJI SUGIYAMA, KOJI TORII, and TADAO KASAMI, *Institute of Electronics, Information and Communication Engineers, Transactions* (ISSN 0913-574X), Vol. E71, May 1988, pp. 523-529. 11 Refs.

The telegram analysis problem posed by Henderson and Snowdon (1972) has been repeatedly taken into account. This paper adds yet another contribution to this problem. A rigorous specification method is proposed, and the way in which programs can be derived from it are discussed. This method is a functional programming by which procedural programs can be easily derived from a formal specification in the form of an abstract sequential machine. The method has been applied to sorting, file handlers and high-level data-link control procedures.

A88-14859 Summary on computer network experiments in CS-2 pilot program. HIROKO TAKAHASHI, KAZUHIKO HASHIMOTO, SHIGETOSHI YOSHIMOTO, and TOSHIO CHOH, *Radio Research Laboratory Review* (ISSN 0033-801X), Vol. 33, no. 4, March 1987, pp. 23-44. 19 Refs.

Many types of experiments on digital communications by satellite were performed as part of the pilot project. Particular attention was given to protocol performance, file transfer, integrated digital communication, and operations using mobile earth stations. The protocol parameters suitable for efficient satellite communication were determined for low and medium data transmission speeds (less than or equal to 48 kbps).

A89-26776 Study on hybrid multibeam satellite communication system with cross frequency bands. MAKOTO KAWAI, EIICHI OGAWA, and YUICHI TANIGUCHI, IN: *GLOBECOM '88 - IEEE Global Telecommunications Conference and Exhibition*, Hollywood, FL, Nov. 28-Dec. 1, 1988, Conference Record. Vol. 3 (A89-26753 10-32). New York, Institute of Electrical and Electronics Engineers, Inc., 1988, pp. 1752-1756. 8 Refs.

The authors propose a combination of high-frequency multibeam and low-frequency single-beam systems to cope with the problem of high rainfall outage. The proposed system is called a cross-band hybrid multibeam (CHM) system. The performance of this system is evaluated with respect to rainfall outage and traffic, and a network control scheme is discussed. It is concluded that the use of this system can reduce trunk transmission network costs and enhance reliability.

A88-13086 An overview of space and aircraft navigation. TATSU-KICHI KOSHIO, *Japan Society for Aeronautical and Space Sciences Journal* (ISSN 0021-4663), Vol. 35, no. 396, 1987, pp. 2-8. 12 Refs.

Recent developments connected with the utilization of navigation satellites for the GPS and for air traffic control are reviewed. Consideration is given to the airspace management system and to the operating principles of STAR GPS. The future prospects of navigation satellites are assessed.

A89-17772 Experimental optical navigation and guidance for Muses-A. T. NISHIMURA, K. NINOMIYA, T. ICHIKAWA, K. NOGUCHI, T. NAMERA et al., 39th IAF International Astronautical Congress, Bangalore, India, Oct. 8-15, 1988. 9 pp. (IAF Paper 88-329).

To establish the high accuracy optical navigation technologies for the future deep space scientific programs, an optical navigation and guidance experiment is planned for the lunar swingby orbit spacecraft (Muses-A). For the purpose of this experiment, a solid state optical navigation sensor (ONS) is developed to detect the moon and stars to determine the moon's direction in the inertial frame with an accuracy of better than one arc-minute. According to the numerical simulation, the ONS data contribute well to enhance the orbit determination capability of the radiometric tracking system.

A89-17815 Design evaluation and environment model for NASDA space operations and data system. K. MATSUMOTO, M. KUSANAGI, and T. YAMAWAKI, 39th IAF International Astronautical Congress, Bangalore, India, Oct. 8-15, 1988. 12 pp. (IAF Paper 88-418).

NASDA's space operations and data system (SODS), a next generation overall ground network system, is discussed in detail. A pilot plant of SODS, called DEEM (design evaluation and environment model), for the construction of an experimental data relay and tracking satellite system and Japanese experimental module is described. The DEEM will be located at the Tsukuba Space Center.

A89-17293 The architecture of a multi-vector processor system, VPP. ATSUSHI INOUE and AKIRA MAEDA, *Parallel Computing* (International Conference on Vector and Parallel Processors in Computational Science, 3rd, Liverpool, England, Aug. 25-28, 1987) (ISSN 0167-8191), Vol. 8, Oct. 1988, pp. 185-193. 5 Refs.

The VPP system is a multi-vector processor system which mainly aims at effective satellite image processing. It consists of up to 64 element processors (PUs), an S-D loop network, and an image memory. The PUs can execute flexible vector processing by a new vector access method, 'Index-set'. The S-D loop network achieves high-speed and contention-free data transfer among the PUs. With these components, a new method for parallel processing, 'Processor Pipeline', can be realized on the VPP system.

A89-17055 On-board digital signal processing technologies for present and future SCPC systems. SHUZO KATO, KOHICHI OHTANI, TAKEHURU KOHRI, MASAHIRO MORIKURA, MASAHIRO UMEHIRA et al., *International Journal of Satellite Communications* (ISSN 0737-2884), Vol. 6, July-Sept. 1988, pp. 289-300. 38 Refs.

This paper surveys trends in digital and analog ICs and LSICs, including radiation hardness performance. An optimal selection of devices and suitable architectures for SCPC multicarrier demodulators is discussed. The results show good and clear guidelines for device and architecture selection for on-board signal processing at the present time and toward the year 2000. It is shown that, for on-board SCPC multicarrier demodulation, a transmultiplexer type channel divider and digital common demodulator has a good performance with a medium number of channels for regeneration.

A89-16336 Automatic generation of equations of motion from graphic input of vibration model - A system for two-dimensional vibrations of multibody systems. KEIICHI MARUYAMA and TAKAFUMI FUJITA, *JSME International Journal Series III* (ISSN 0914-8825), Vol. 31, June 1988, pp. 400-408.

An automatic generation system of equations of motion was developed for two-dimensional vibrations of multibody systems. The system is written in Smalltalk-80, a language featuring a user-friendly interface for the graphic input of a vibration model; it allows users to make a variety of configurations of a vibration model on the display by choosing the vibration model elements listed in the menu with a pointing device. This language is applicable to extensive models of two-dimensional vibrations of multibody systems which contain various constraints and nonlinear elements.