

Radioastronomical Tools and Techniques

N.S.Kardashev

and

S.A.Dagkesamanskii



CONTENTS

Preface	ix
List of Contributors	xi
Abbreviations	xvii
 <i>Part I</i>	
SPACE PROJECTS	1
New Orbit and New Possibilities of the Radioastron Project N. S. KARDASHEV, B. B. KREISMAN, and Yu. N. PONOMAREV	3
Multi-frequency Reception Method for Radio Images Synthesis in the Radioastron Project V. V. ANDREYANOV, A. V. BIRIUKOV, V. I. VASIL'KOV, B. Z. KANEVSKY, N. S. KARDASHEV, S. F. LIKHACHEV, and A. A. CHUPRIKOV	17
Determination and Analysis of Phase Requirements for the SVLBI Radioastron V. V. ANDREYANOV	27
Experimental Investigations of On-board Multi-frequency Antenna Feed for the Radioastron Project V. N. DIKY, D. V. DIKY, V. D. STARIKOV, A. V. BIRIUKOV, B. Z. KANEVSKY, and A. V. KOVALENKO	33
Cooling Devices of Low-noise Amplifiers of SRT A. G. TRUBNIKOV	41
Radiative Cooling of Large Space Telescope Structures I. S. VINOGRADOV	49
On-board Frequency Supporting System of the Scientific Complex of Orbital Interferometer in the Radioastron Project A. V. BIRIUKOV	57
The Study of Deformation of the Reflecting Surface of a Space Radio Telescope of a Short-wave Band Yu. A. ALEKSANDROV, A. N. KOTIK, N. V. MYSHONKOVA, and S. D. FEDORCHUK	69
Highly Sensitive Reception Complex Designed for Ground VLBI Observations at Wavelengths of 92, 18, 6, and 1.35 cm B. Z. KANEVSKY, A. I. SMIRNOV, R. D. DAGKESAMANSKY, B. K. IZVEKOV, A. V. KOVALENKO, V. A. SAMODUROV, and I. A. SUBAEV	73
Low-frequency VLBI Network for Supporting the Radioastron Project K. G. BELOUSOV, I. A. GIRIN, A. F. DEMENT'EV, O. B. DRONOVA, B. N. LIPATOV, S. F. LIKHACHEV, I. E. MOLOTOV, A. V. CHIBISOV, and A. A. CHUPRIKOV	79

Digital Data Processing in the Radioastron Project K. G. BELOUSOV and S. F. LIKHACHEV	95
The Millimetron Project N. S. KARDASHEV, V. V. ANDREYANOV, V. D. GROMOV, V. I. BUYAKAS, [A. S. GVAMICHAVA], A. N. KOTIK, V. G. KURT, G. S. LAZAREVA, E. N. MIRONOVA, N. V. MYSHONKOVA, V. I. SLYSH, [A. G. TRUBNIKOV], I. S. VINOGRADOV, V. F. TROITSKY, D. T. PURYAEV and V. I. USYUKIN	111
The Millimetron Project: the Unit of High-precision Deployment of a Space Mirror V. I. BUYAKAS and A. G. RYBAKOVA	127
The Submillimetron Project V. D. GROMOV, N. S. KARDASHEV, V. G. KURT, E. N. MIRONOVA and [A. G. TRUBNIKOV]	141
VLBI Observations of Sources of Maser Radiation by a Ground–space Interferometer V. I. SLYSH, B. Z. KANEVSKY, A. I. SMIRNOV, M. V. POPOV, A. V. KOVALENKO, B. A. POPERECHENKO, Yu. N. GORSHENKOV, V. G. GRACHEV, and S. N. TSAREV	159
Part II	
GRUNDBASED RADIO TELESCOPES, TOOLS AND TECHNIQUES	169
Reconstruction of the BSA LPI Radio Telescope for the Range of 109 to 113 MHz S. M. KUTUZOV, Yu. I. AZARENKO, I. A. ALEKSEEV, V. V. IVANOVA, V. A. IZVEKOVA, V. M. KARPOV, V. I. KOSTROMIN, A. S. KUTUZOV, and G. A. LATYSHEV	171
On the Tracking System in the BSA LPI Radio Telescope S. M. KUTUZOV, A. M. KIRYUSHA, Yu. I. AZARENKO, V. M. KARPOV, V. I. KOSTROMIN, V. V. IVANOVA, V. A. IZVEKOVA, D. I. TKACHENKO, Yu. N. MUS'KIN, and V. M. CHMIL	187
A New Technique for Phasing a Receiving Antenna Array Experimentally Tested on Two Sections of the E–W Antenna of DKR-1000 Radio Telescope Yu. I. AZARENKO, L. D. BAKHRAKH, V. A. IZVEKOVA, V. I. KOSTROMIN, S. M. KUTUZOV, G. A. LATYSHEV, N. V. POVARENKO, and S. N. STEPANENKO	193
Structural and Calculated Scheme for Modernization of the Power Frame of the RT/32 Reflector at PRAO ASC LPI Yu. A. ALEXANDROV, A. A. BORISOV, and A. A. PARSHCHIKOV	199
On the Use of Lens Antennae in Radio Astronomy R. D. DAGKESAMANSKY, N. S. KARDASHEV, and S. M. KUTUZOV	207
Multi-frequency Radio-astronomical System on the Kalyazin Radio Telescope TNA-1500 of SDB at MPEI Yu. P. ILYASOV, B. A. POPERECHENKO, and V. V. ORESHKO	213

Cooled Solid State Millimeter Wave Band Receivers of the LPI RT-22 V. V. KRASNOV	231
The Wide-band Receiver of an 8 mm Waveband for Observations in Continuum V. A. GUSEV, V. V. KRASNOV, S. V. LOGVINENKO, and G. T. SMIRNOV	245
Some Methods of Improvement of a Signal of a Voltage Controlled Generator Yu. I. ALEKSEEV	249
Set of Routines for Automated Design of Radio Astronomy Equipment I. P. EFIMOVA	253
Multichannel Spectrum Analyzer for Observation of Pulsars at a Frequency of 1415 MHz I. A. ALEKSEEV, Yu. I. ALEKSEEV, V. I. KASEKO, and L. N. PODLIPNAYA	257
Receiver with a High Time Resolution for Studying Pulsars V. I. KASEKO, I. A. ALEKSEEV, and Yu. I. ALEKSEEV	263
The Pulsar Complex of the Lebedev Physical Institute for the 600 MHz Band on the TNA-1500 Radio Telescope of the SDO MEI in Kalyazin Yu. P. ILYASOV, V. V. ORESHKO, and O. V. DOROSHENKO	267
Coherent Dedispersor for Observation of Pulsars A. D. SKULACHEV, V. A. SOGLASNOV, N. D'AMICO, S. MONTEBUGNOLI, A. MACCAFERRI, and A. CATTANI	277
Instrumental Errors of Pulsar Timing. The AS-600/160 Complex V. V. ORESHKO	283
Gravitational Perturbations as a Source of Timing Noise A. E. RODIN	293
Data Acquisition System for the VLBI Recording System S2 B. K. IZVEKOV, B. Z. KANEVSKY, V. I. KASEKO, A. V. KOVALENKO, K. A. LAPAEV, S. V. LOGVINENKO, L. N. PODLIPNAYA, and A. G. SOIN	299
Frequency Synthesizer for the Range of 150–200 MHz for Very Long Baseline Radio Interferometer Based on the RT-22 Radio Telescope V. I. KASEKO and L. N. PODLIPNAYA	307
Highly Stable Source of UHF-Local Oscillator Power and the System of Noise and Phase Control for Multi-frequency VLBI Emission Receivers B. Z. KANEVSKY, A. I. SMIRNOV, M. V. GURVICH, and G. V. TURUSIN	313
Automated System of Radio Astronomical Observations on the BSA and DKR-1000 (East–West) Radio Telescopes K. A. LAPAEV	317
Data Acquisition System of the Radio Telescope TNA 1500 (RT 64) A. D. SKULACHEV, M. B. POPOV, V. A. SOGLASNOV, B. Z. KANEVSKY, Yu. P. ILYASOV, V. V. ORESHKO, and B. A. POPERECHENKO	323
Computer Network for Acquisition and Processing of Radio Astronomy Data at PRAO ASC of the Lebedev Physical Institute V. V. KITAEV, E. A. ISAEV, V. D. PUGACHEV, and K.A. LAPAEV	331

Integrated System of Information Support of Radio Astronomy Investigations at PRAO ASC of the Lebedev Physical Institute V. V. KITAEV, M. A. KITAEVA, and V. D. PUGACHEV	339
Dataware of Coordinate-Time Investigations of Pulsars A. E. AVRAMENKO, A. N. BELIKOV, O. B. DLUZHNEVSKAYA, O. V. DOROSHENKO, Yu. P. ILYASOV, and V. A. POTAPOV	347
Large-scale Perturbations in the Interplanetary Plasma: Investigation Technique, Equipment, and Results V. I. VLASOV, V. I. SHISHOV, B. K. IZVEKOV, E. A. ISAEV, S. M. KUTUZOV, A. G. SOIN, Yu. I. AZARENKOV, B. I. IVANOV, V. I. KOSTROMIN, I. G. MAZURIN, N. S. SOLOMIN, and S. P. SURINOV	355
Method of Competitive Merging and Its Application for Processing of Radio Astronomy Data V. A. SAMODUROV	385
Synthesis of VLBI Images Using the Regularization Methods S. F. LIKHACHEV	397
<i>Subject Index</i>	403