

Contents

Part I BDS/GNSS Navigation Applications

1 Accuracy Assessment of the Doppler Frequency and Pseudorange Model Based on GPS/LEO Radio Occultation	3
Xian-Sheng Xu, Yan Liu, Ye Li and Xu Xu	
2 Application of BeiDou Navigation Satellite System on Attitude Determination for Chinese Space Station	13
Sihao Zhao, Cai Huang, Xin Qi and Mingquan Lu	
3 Feasibility Analysis of High-Precision Deformation Monitoring Using BeiDou Navigation Satellite System	27
Ruijie Xi, Yugang Xiao, Xingwei Liu and Kaihua Wang	
4 Analysis on Velocity Measurement Precision of High Dynamic GPS Receiver Carrier Tracking Loop	35
Xudong Liu, Guangjun Liu, Qiang Li and Haiying Luo	
5 Theoretical Study of Bare Soil Parameters' Effects on GPS Multipath Observables	45
Xuerui Wu, Shuanggen Jin and Ye Li	
6 Satellite-Ground TT&C United Scheduling Methods of GNSS Constellation Based on Nodes Constraint	55
Li Jing, Zhang Tianjiao and Ye Gangqiang	
7 Realization of Real Time Kinematic Positioning Software Based on Kalman Filter	67
Dangwei Wang and Yi Lai	

8	Analysis of BeiDou Satellite Orbit Prediction Based on ERP Prediction Errors Impact	77
	Xiusong Ye, Hai Guo, Jie Yang, Chao Li and Canyou Liu	
9	The Repeatability Test of BDS Baseline Processing	85
	Yanguo Liu, Jinzhong Bei, Dehai Li, Hu Wang and Xiaying Wang	
10	A System Developed for Monitoring and Analyzing Dynamic Changes of GNSS Precipitable Water Vapor and Its Application	95
	Li Li, Zhimin Yuan, Ping Luo, Jun Shen, Sichun Long, Liya Zhang and Zongli Jiang	
11	Multifunctional Satellite Navigation and Communication Mast Antenna Based on Mobile Platform.	107
	Jia Zhang, Ximing Liang and Haiguang Zhang	
12	Optimal Satellite Selecting Algorithm in GPS/BDS Navigation System and Its Implementation	117
	Zhuoxi Ma, Li Yang, Xiaolin Jia, Dan Zhang and Shuai Liu	
13	An Improved Method to Accelerate the Convergence of PPP-RTK with Sparse CORS Stations' Augmentation	129
	Shoujian Zhang, Jiancheng Li and Lei Zhao	
14	Research on GEO Satellite Global Monitoring and Control Based on BeiDou Navigation Satellite System.	141
	Yue Zhao, Xianqing Yi, Zhenwei Hou and Tao Zhong	
15	The Optimal Distribution Strategy of BeiDou Monitoring Stations for GEO Precise Orbit Determination.	153
	Longping Zhang, Yamin Dang, Shuqiang Xue, Hu Wang, Shouzhou Gu and Chuanyang Wang	
16	Analysis and Comparison of Non-coherent and Differential Acquisition Integration Strategies	163
	Dandan Zeng, Songlin Ou, Jinhai Li, Jinhai Sun, Yuepeng Yan and Haofeng Li	
17	A New Method Based on QSE Processing for Interferometric GNSS-R Ocean Altimetry	177
	Chenghui Yu, Chundi Xiu, Weiqiang Li and Dongkai Yang	

18	Analysis of GNSS Signals with Application to Lunar Navigation	187
	Xiaoliang Wang, Longlong Li, Xingyuan Han, Yansong Meng and Lin Wu	
19	Experiment and Result of Precise Kinematic Orbit Determination for LEO Satellite	195
	Rengui Ruan, Laiping Feng and Xianbing Wu	
20	A GNSS Anti-spoofing Method Based on the Cooperation of Multiple Techniques	205
	Huiqi Tao, Hong Li and Mingquan Lu	
21	Based on Singular Spectrum Analysis in the Study of GPS Time Series Analysis	217
	Ronghai Qiu, Yingyan Cheng, Hu Wang and Xiaoming Wang	
22	Initial Performance Assessment of BDS Real-Time Relative Positioning with Triple-Frequency Observations	227
	Min Wang, Hongzhou Cai, Jun Liu and Anmin Zeng	
23	Unified Estimation Model of Multi-system Biases Including BDS/GPS/GLONASS/Galileo	241
	Changhui Xu, Hu Wang, Yamin Dang, Hao Chen and Longping Zhang	
24	The Study on Ocean Ice Intensity Surveyed by GNSS-R Signal on the Coast	251
	Fuyang Ke, Fangyuan Chen and Yunchang Cao	
25	Research on Tracking Technology of High Sensitive BD Signals	261
	Zheng Zhao and Li Li	
26	Characteristic Analysis for Regional Traffic Data Using Random Matrix Theory	273
	Haichun Liu, Changchun Pan, Genke Yang, Chunxia Zhang and Robert C. Qiu	
27	Impact Analysis of Differential Code Biases of GPS Satellites on the Kinematic Precise Point Positioning	283
	Shoujian Zhang and Lei Zhao	

Part II BDS/GNSS Test and Assessment Technology

28 Performance Improvements of Combined Satellites Navigation System with System Time Offset.	293
Longxia Xu, Ye Ren, Xiaohui Li and Dandan Li	
29 Modeling and Multi-state Analysis for Availability of a Navigation Monitor Network	305
Zhuopeng Yang, Feng Xue, Jinjing Wang and Heng Zheng	
30 A GNSS Multipath Detecting Method Based on Antenna Arrays.	319
Min Li, Wei Zhao, Liang Yuan and Qinli Liu	
31 Reliability Allocation Method of Satellite Navigation System Based on Dynamic Simulation	331
Heng Zheng, Haisheng Li, Chang Li, En Xue, Zhuopeng Yang and Peipei Gong	
32 A Study on Measuring Channel Bias in GNSS Receiver	343
Hailong Chen, Wen Li, Xin Liu and Wenhai Jiao	
33 The Development, Test and Application of New Technology on Beidou/GPS Dual-Mode Pseudolites	353
Xingli Gan, Baoguo Yu, Lei Chao and Shi Liu	
34 Study on Judgment Method of Signal Correlation Performance Based on Complex Correlation Vector.	365
Ying Wang, Zhe Su, Yansong Meng and Xiaoxia Tao	
35 The Analysis of GNSS SIS Accuracy	375
Shuai Liu, Xiaolin Jia and Zhuoxi Ma	
36 BeiDou Satellite Multipath Characteristics Research-From the “Micro” Parameters Point of View	387
Xin Chen, Xiaoran Fang, Yuze Wang, Yanhong Kou, Le Cai, Peilin Liu and Wenxian Yu	
37 Analysis and Evaluation Method of Multiple-Access Interference in Navigation Satellite Communication System	403
Chenglong He and Baoguo Yu	
38 Research Progress on TWSTFT Mobile Calibration Station	415
Guoyong Wang, Ya Liu, Xiaohui Li and Chen Shi	

39	Analysis of BeiDou Signals on the Accuracy of Common-View Time Transfer	425
	MeiJun Guo, Hua Lu, Yun Xiao, YiJun Mo and XiaoGang Liu	
40	Assessment of BDS Signal-in-Space Accuracy and Standard Positioning Performance During 2013 and 2014	437
	Gucang Chen, Zhigang Hu, Guangxing Wang, Guo Chen, Zhaoying Liu and Qile Zhao	
41	Design and Implementation of Distributed Simulation Testbed for GNSS Experimentation	455
	Long Yang, Yufei Yang and Jinping Chen	
42	High Precision and Difference Measurement of Inter-element Amplitude and Phase Bias Errors Based on Channel Multiplexing	467
	Ke Zhang, Huaming Chen, Xiangwei Zhu and Guangfu Sun	
43	A High-Precision and Flexible Array Antenna Signal Simulator Based on VFD Filter	479
	Hai Sha, Han Mu and Hui Zhang	
44	New Generation Signal Structure Evaluation System for GNSS	491
	Jianlei Yang, Tian Jin, Zhigang Huang and Honglei Qin	
45	Research of Satellite Receiver Anti-replay Attack Techniques	503
	Mengjiang Liu, Zhixin Deng and Li Jun	
46	Detect Techniques and Test Analysis on Navigation Signal Code Correlation Peak	517
	Xiaochao Feng, Yongheng Fu, Lei Gong and Jiancheng Liu	
47	Research on Time Synchronization Method of Ground-Based Navigation System	529
	Xiye Guo, Yongbin Zhou and Jun Yang	
48	BDS/GPS Stochastic Model Refinement and Assessment Using Satellite Elevation Angle and SNR	537
	Yan Li, Huang Dingfa, Li Meng and Zhu Dongwei	

Part III BDS/GNSS User Terminal Technology

49	A GLONASS Navigation Data Verification Algorithm Under High Bit-error Rates	553
	Jian Hu, Aishui Rao, Long Zhang and Yimei Sun	
50	The Design and Implementation of an Acquisition Scheme for Weak GNSS Signal	563
	Linfeng Zhang, Hairong Guo, Chong Zheng and Haibo He	
51	Adaptive Notch Filter Design Based on Krylov Subspace	575
	Zhaoliang Duan, Guangwei Fan and Yi Luo	
52	A Novel High Dynamic Carrier Tracking Algorithm Based on the Gaussian Particle Filter	587
	Qize Chen, Gengmin Li and Ao Peng	
53	Research on the Mast Antenna System for Communications Compounds Satellite Navigation	599
	Haiguang Zhang, Ximing Liang and Jia Zhang	
54	Research on the Satellite Navigation Independent Compound Receiving and Transmitting Array Concept	611
	Ximing Liang, Haiguang Zhang and Jia Zhang	
55	A Framework of Mathematic Model and Performance Evaluation for Conjoint GNSS Spoofing Detection	635
	Dingbo Yuan, Hong Li and Mingquan Lu	
56	A Near-Far Effect Mitigation Method of Pseudolites Based on Array Signal	647
	Libin Shen, Lixin Li, Huisheng Zhang and Tao Bao	
57	A Fast Positioning Method for Hot Start in GNSS Receiver	657
	Xiaohui Ba, Shidong Luo, Haiyang Liu, Qing Yuan, Yun Wang and Jie Chen	
58	A New Iterative Method for Multipath Mitigation	667
	Yan Gao, Wei Li, Jinli Li, Hongliang Qu and Xiang Shi	
59	An Improved Practical Anti-jamming Technique for GNSS Receivers Based ADP in Frequency Domain	677
	Tianqiao Zhang, Yao Wang, Yang Gao and Hongbing Wang	

60	A Robust Dynamic Satellite-Searching Algorithm for Multi-constellation GNSS Receivers	695
	Hengwei Zhou, Zheng Yao and Mingquan Lu	
61	A High-Dynamic Null-Widen GNSS Anti-jamming Algorithm Based on Reduced-Dimension Space-Time Adaptive Processing	707
	Lu Ge, Dan Lu, Wenyi Wang, Lu Wang, Qiongqiong Jia and Renbiao Wu	
62	Interference Suppression with L1-Norm Constraint for Satellite Navigation Systems.	717
	Wenyi Wang, Qingrong Du, Renbiao Wu, Dan Lu, Lu Wang and Qiongqiong Jia	
63	A Spoofing Mitigation Algorithm Based on Subspace Projection for GNSS Receiver	727
	Lei Chen, Shuai Han, Weixiao Meng and Zijun Gong	
64	A Quick A-BDS Location Method Based on Characteristics of GEO Satellite and Ridge Estimate.	739
	Shourang Jing, Wenxiang Liu, Ling Yong and Guangfu Sun	
65	Feasibility Analysis of GNSS Multi-constellation Positioning for Lunar Spacecraft	749
	Lei Chen, Yangbo Huang, Wenxiang Liu and Gang Ou	
66	Spoofing Interference Suppression for GNSS Based on Estimating Steering Vectors	765
	Yaotian Zhang, Lu Wang, Wenyi Wang, Dan Lu, Qiongqiong Jia and Renbiao Wu	
67	Satellite Navigation Anti-jamming Algorithm Based on Extended Array	773
	Fusheng Li, Wenyi Wang, Dan Lu, Lu Wang, Qiongqiong Jia and Renbiao Wu	
68	Performance Assessment of Signal Quality Monitoring Based GNSS Spoofing Detection Techniques	783
	Yichen Yang, Hong Li and Mingquan Lu	
69	Robust SFAP Anti-jamming Algorithm Based on Generalized Sidelobe Cancellation.	795
	Long Liu, Zhaolin Zhang and Ling Wang	

**70 Research on the BDS Inter-Satellite-Type Carrier
Phase Bias Introduced by Different NH Code
Sign Conventions 805**
Zuohu Li, Hailing Wu, Liduan Wang and Hui Liu

71 A Position Calibration Algorithm of Antenna Arrays 817
Jiachi Wang and Zhongjun Chen

**72 Performance Analysis of a Dual-Frequency Software-Defined
BeiDou Receiver with B1 and B2 Signals 827**
M. Zahidul H. Bhuiyan, Stefan Söderholm, Sarang Thombre,
Laura Ruotsalainen and Heidi Kuusniemi