



16th Meeting of the International Committee on
Global Navigation Satellite Systems



International GNSS Monitoring and Assessment System— status and update

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System Status

01

System Status

iGMAS-international GNSS Monitoring and Assessment System

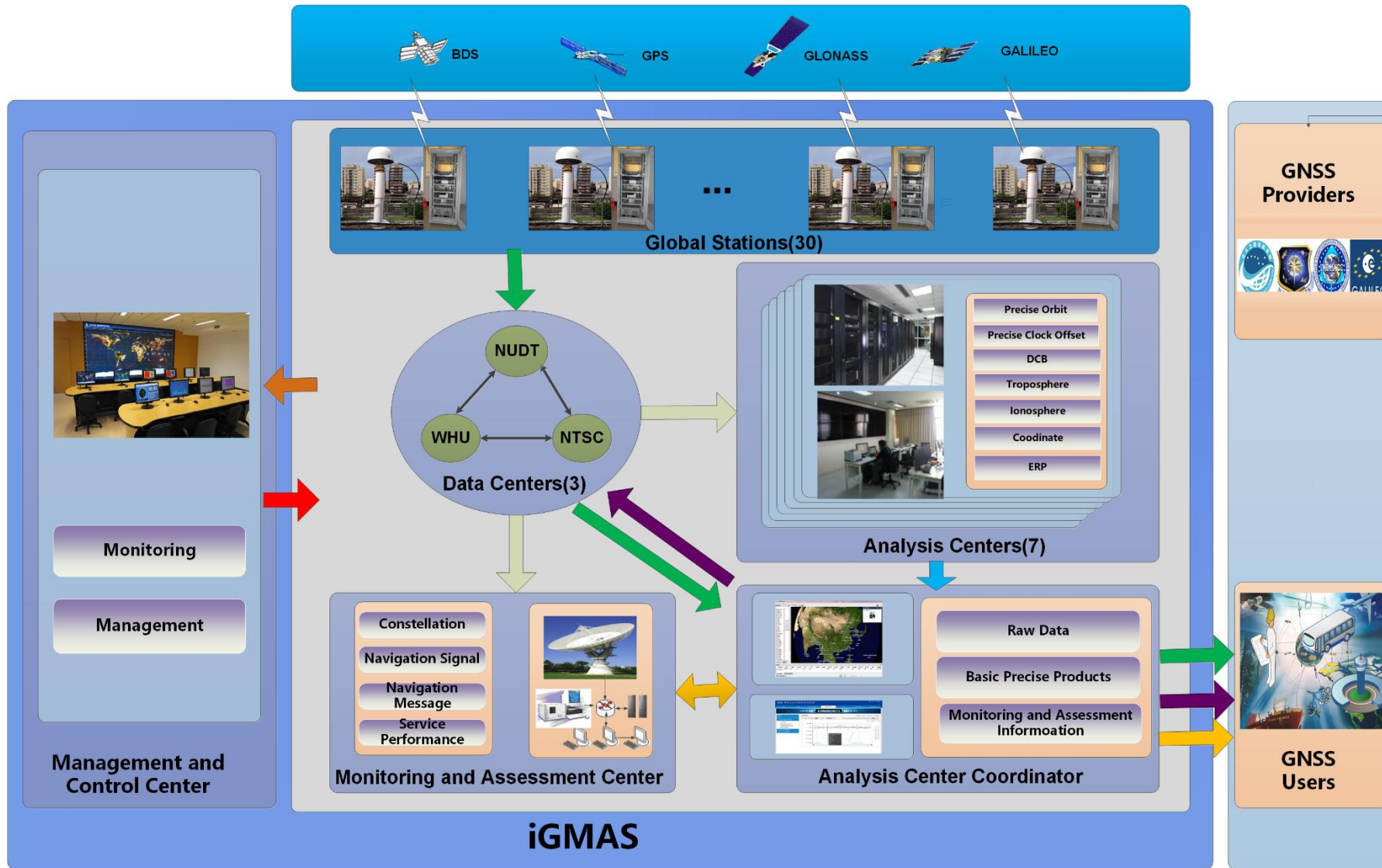
- In response to ICG IGMA initiative
- Evaluate performance of multi-GNSS, providing data support for GNSS providers and global users
- Build multi-GNSS monitoring infrastructure
 - Tracking network
 - Data centers
 - Analysis centers
 - ...

Call for participation !

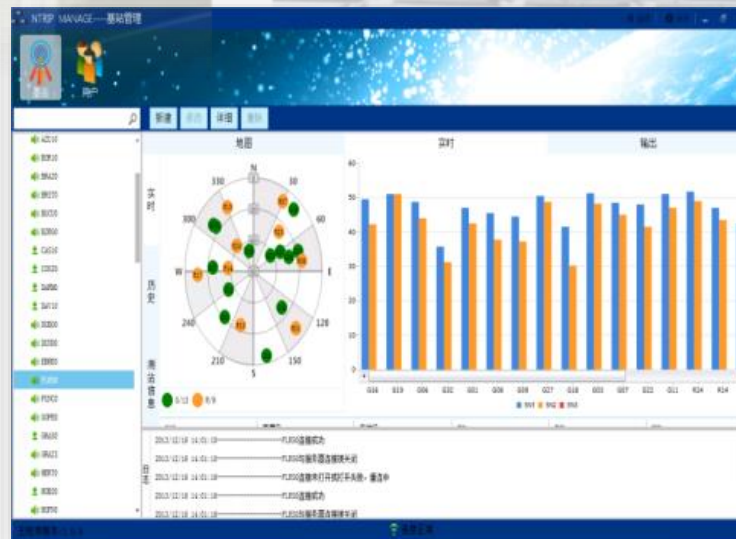
System Status



System Status



System Status

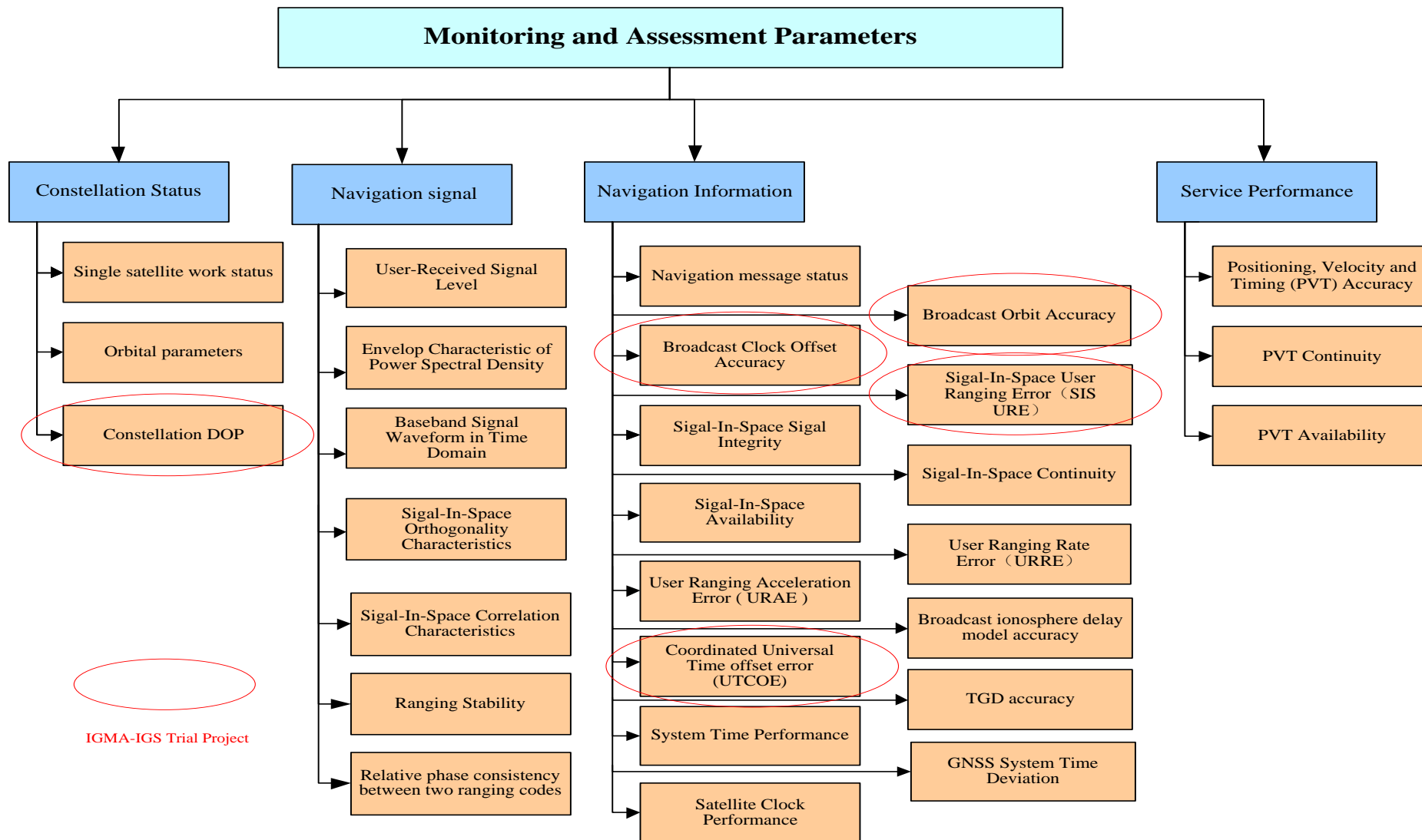


国际GNSS监测评估系统
International GNSS Monitoring & Assessment System

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国际上第一个覆盖四大导航系统的检测设施
The first international navigation systems covering the four testing facilities

System Status



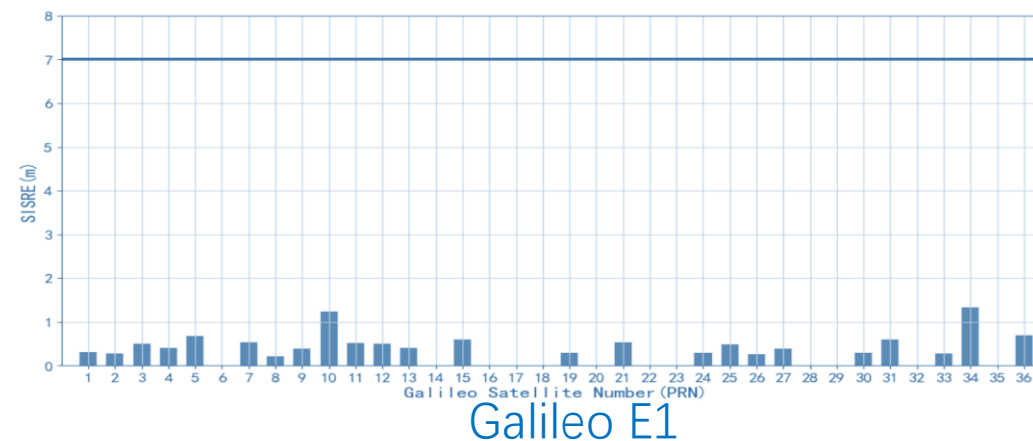
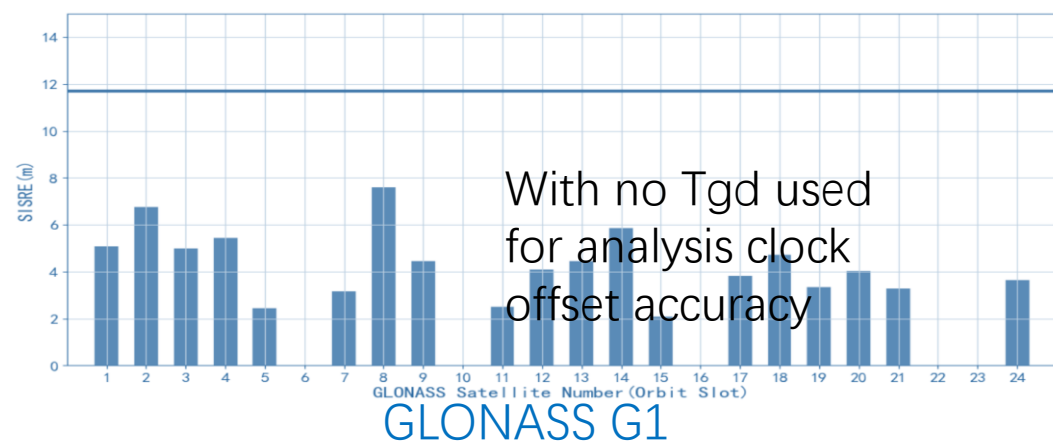
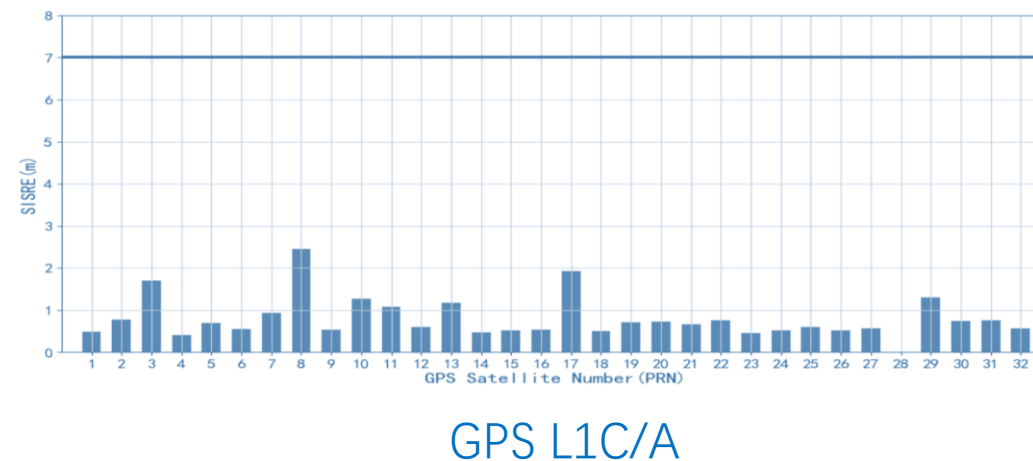
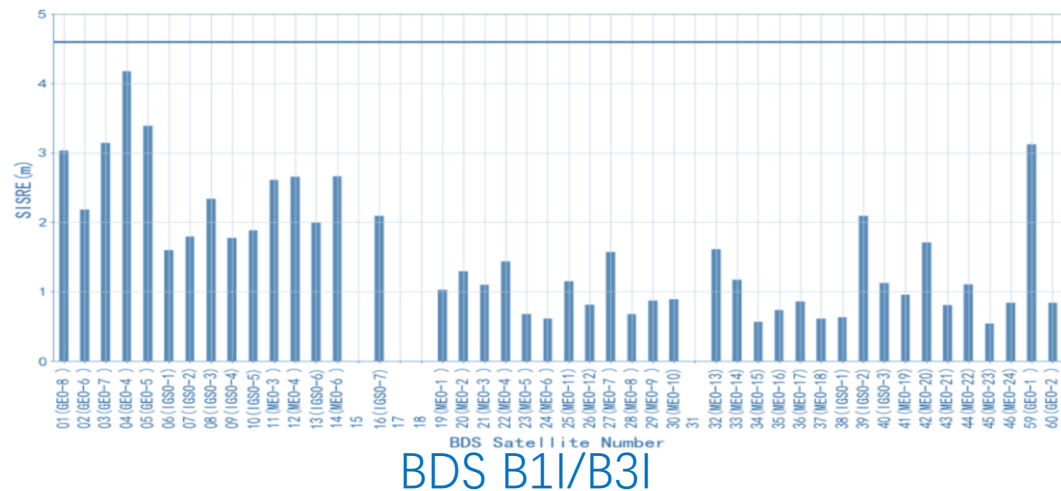
System Status

Continuously track and evaluate performance of multi-GNSS:

- Signal-in-space ranging error
- Signal-in-space continuity
- Signal-in-space availability
- UTCOE
- Positioning accuracy (Single/Dual frequency Standard Positioning using pseudorange)
- ...

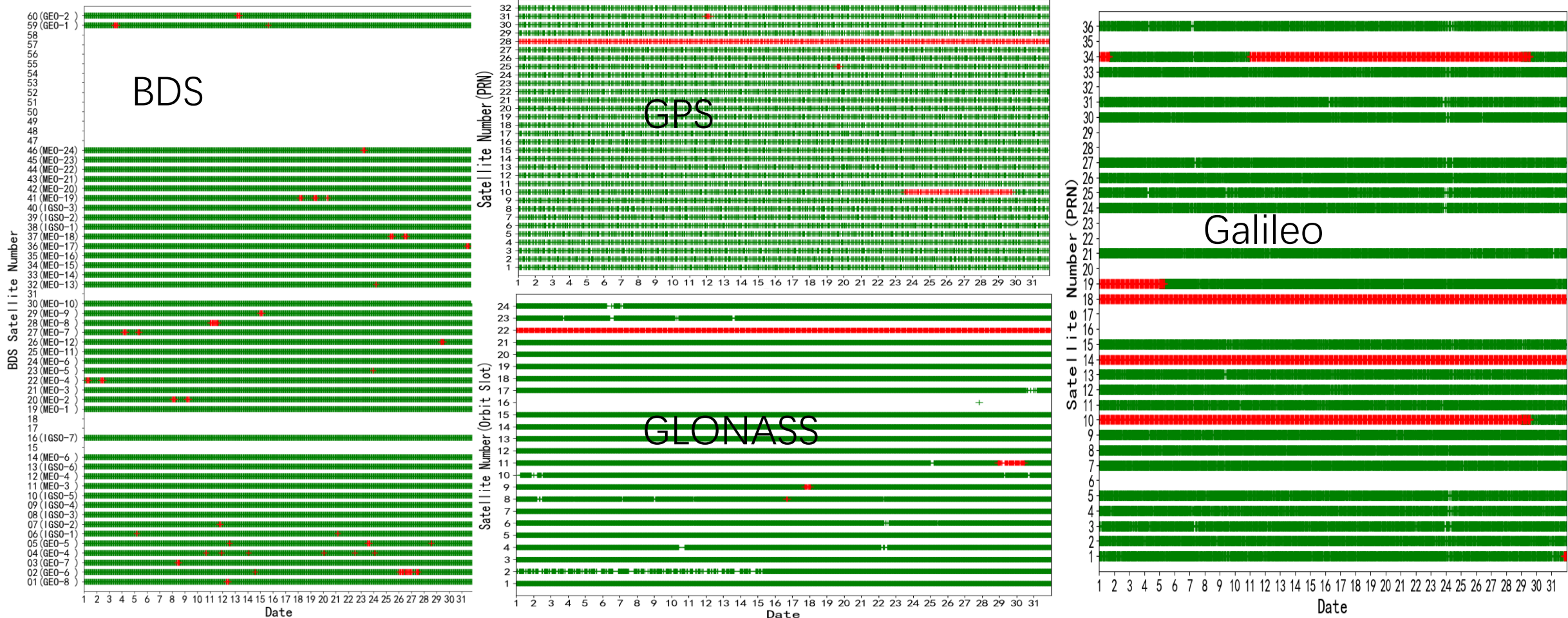
System Status

SISRE (95%) for BDS/GPS/GLONASS/Galileo, 2022 August



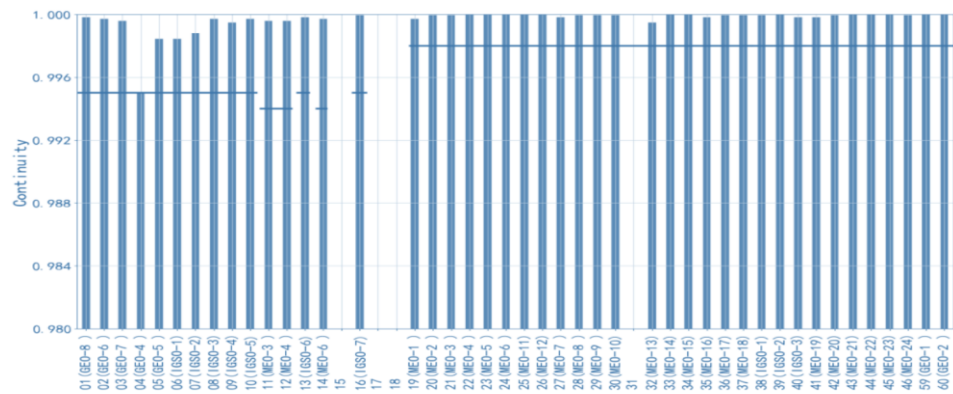
System Status

Health information of BDS/GPS/GLONASS/Galileo, 2022 August

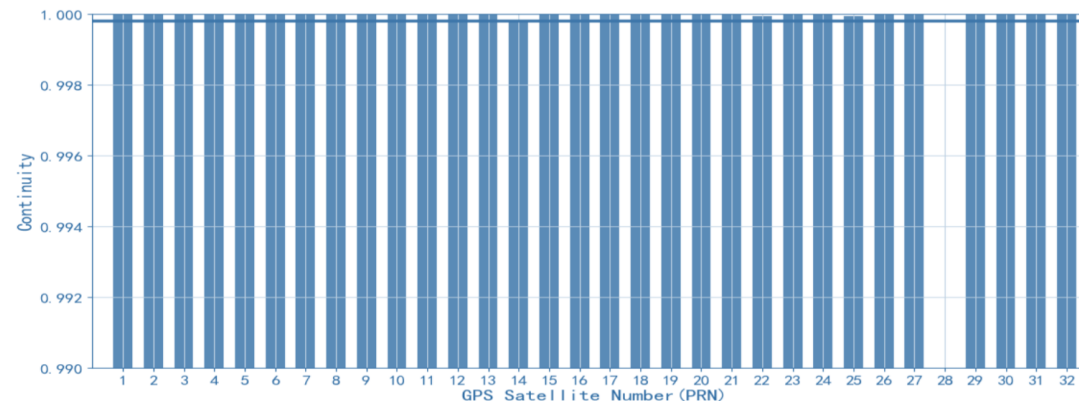


System Status

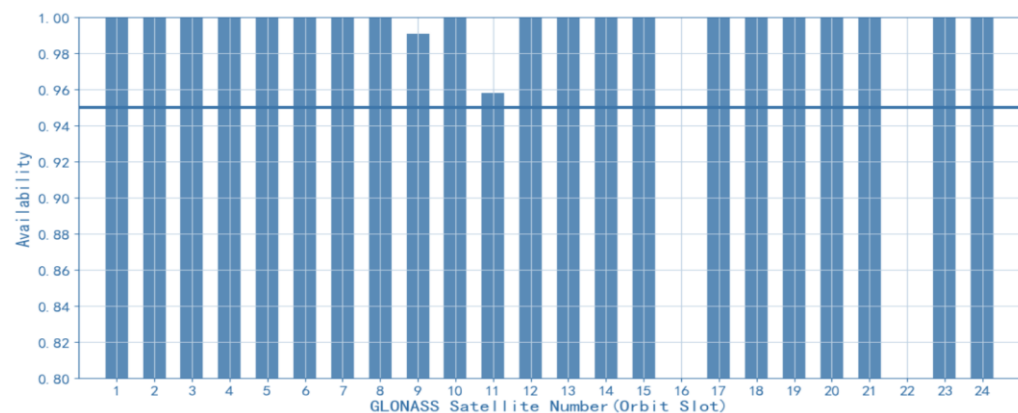
SIS continuity of BDS/GPS/GLONASS/Galileo, 2022 August



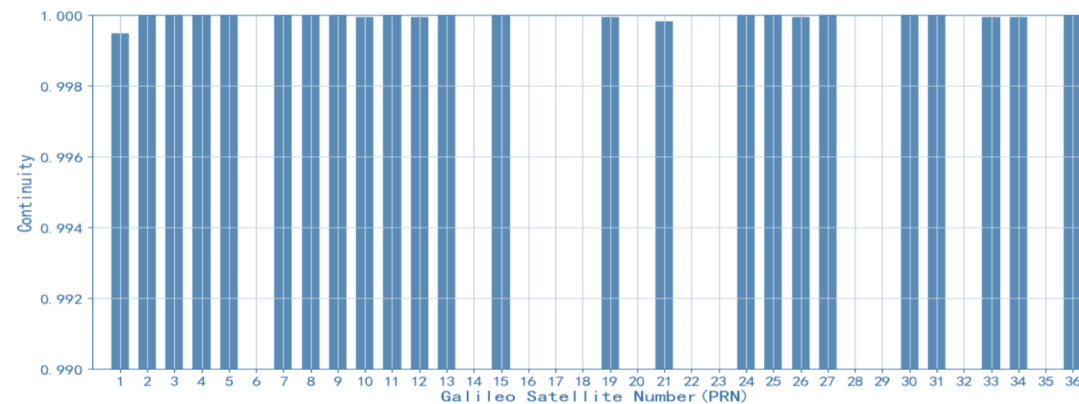
BDS B1I/B3I



GPS L1C/A



GLONASS G1

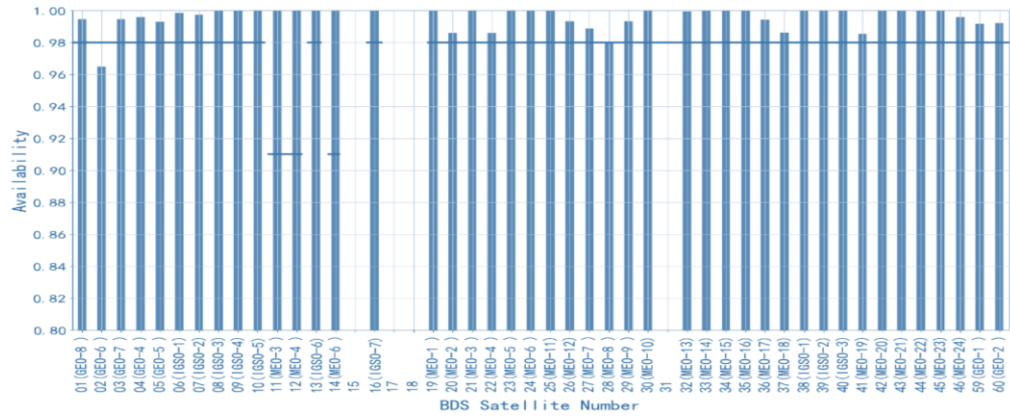


Galileo E1

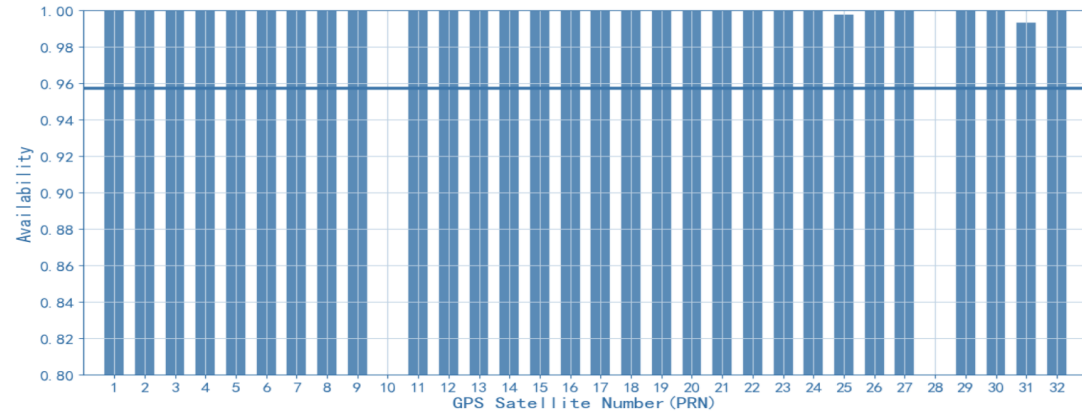
System Status



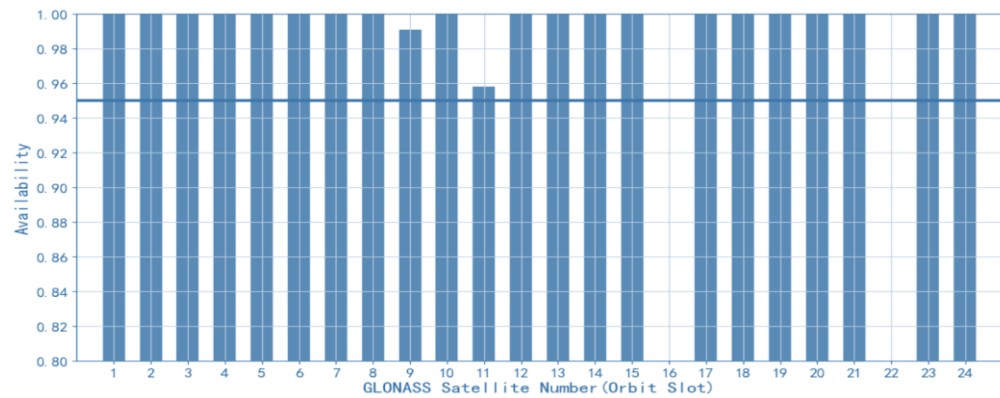
SIS availability of BDS/GPS/GLONASS/Galileo, 2022 August



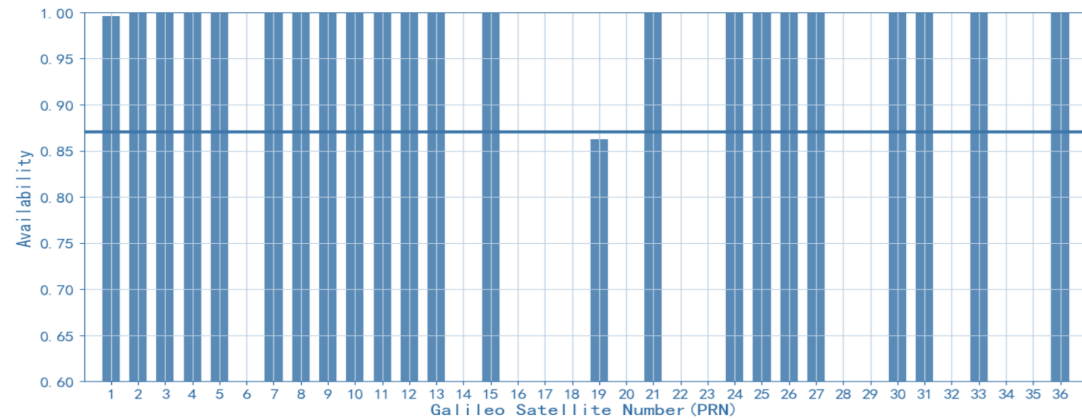
BDS B1I/B3I



GPS L1C/A



GLONASS G1

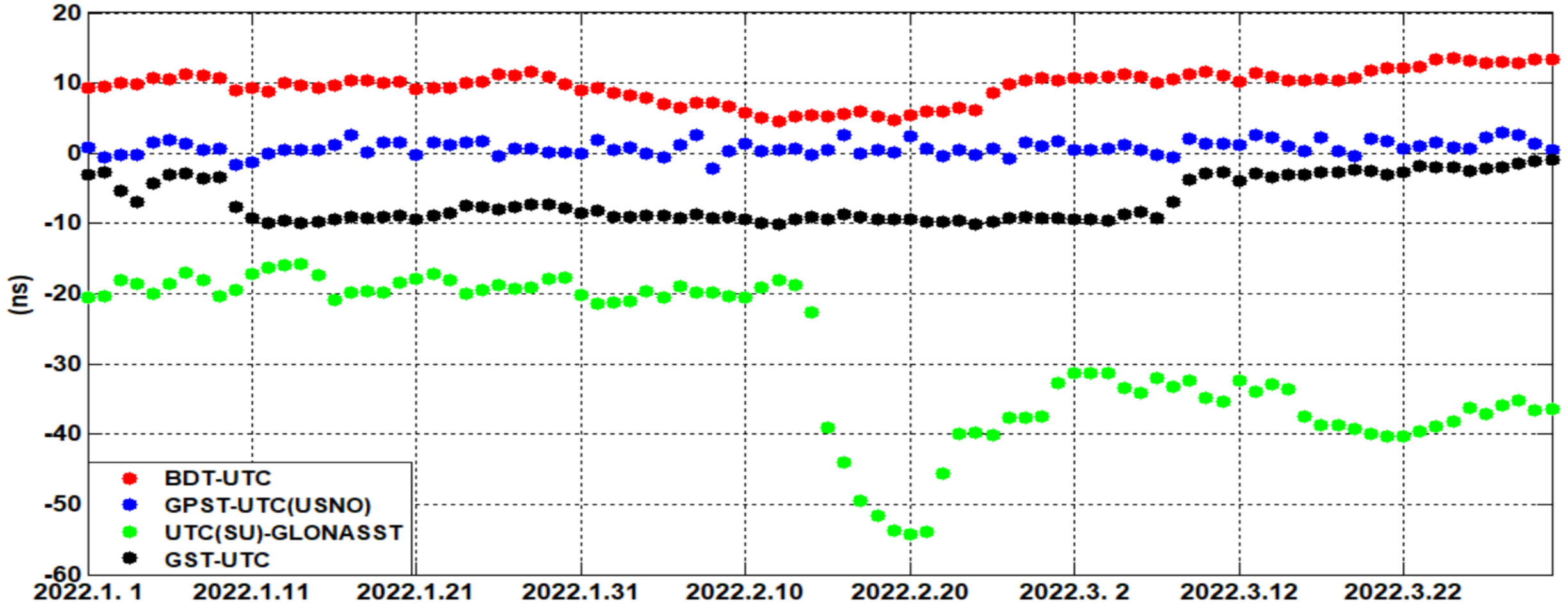


Galileo E1

System Status

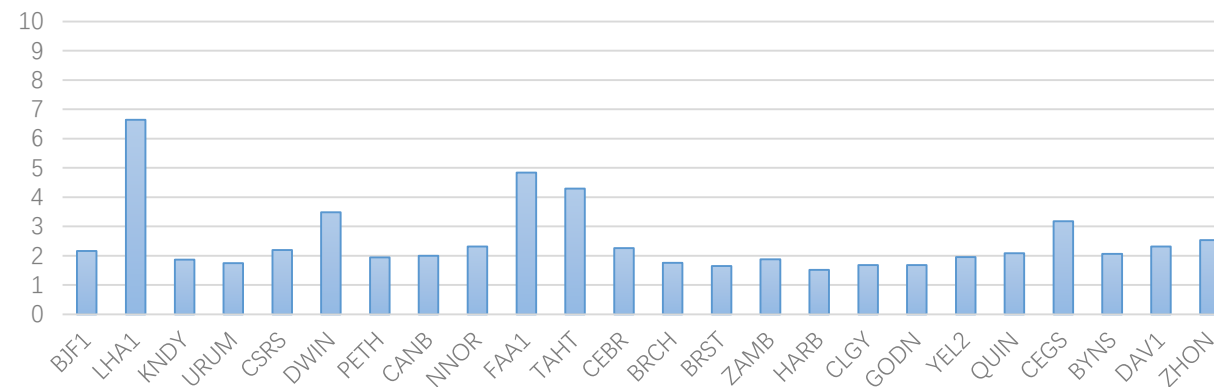
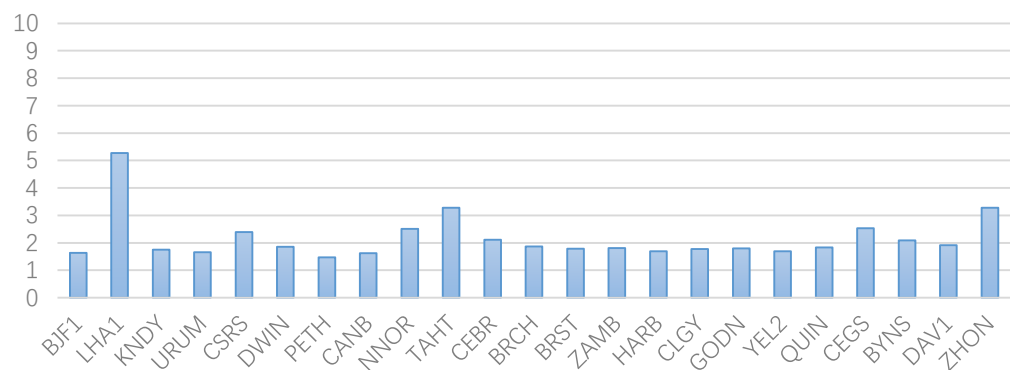


UTC OE of BDS/GPS/GLONASS/Galileo

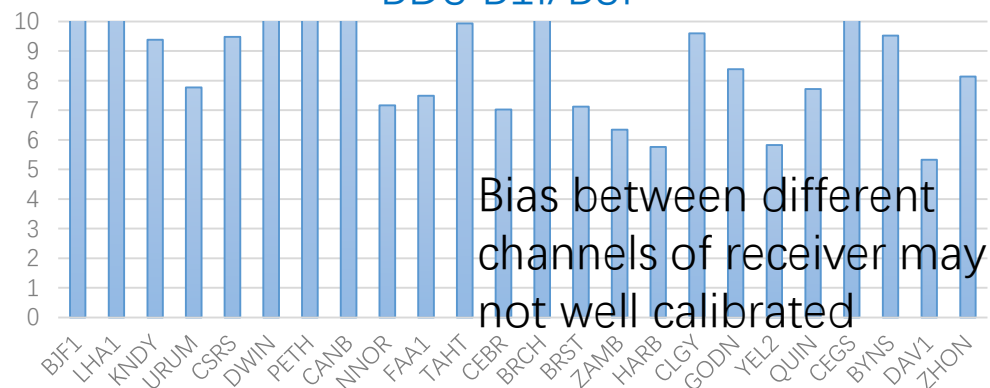


System Status

“Standard” positioning accuracy of BDS/GPS/GLONASS/Galileo, 2022 August

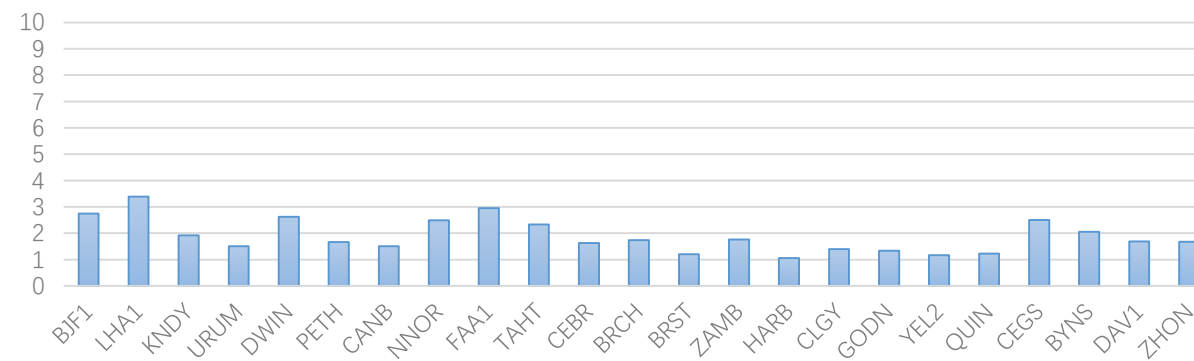


BDS B1I/B3I



GLONASS G1

GPS L1C/A



Galileo E1



Lasted Update

02

Lasted Update

- BDS and Galileo provide “build in” new services:
 - BDS PPP (PPP-B2b) , SBAS - BDSBAS-B1C (SF), BDSBAS-B2a(DFMC)
 - Galileo HAS (E6-B)

Lasted Update

- iGMAS tracking BDS PPP-B2b signal and evaluate its performance:
 - Define format for logging PPP-B2b navigation message(orbit/clock/tgd correction for BDS/GPS)
 - Evaluate performance of Signal-in-space accuracy of PPP-B2b (after correcting the B1C/B2a broadcast ephemeris using PPP-B2b navigation message)
 - Evaluate performance of PPP using PPP-B2b broadcast navigation message

Lasted Update

Format for logging BDS PPP-B2b message in text mode

A.1 BDS-3 PPP-B2b卫星轨道改正数及用户测距精度文件示例

3.01		ORBCCorr		20210131 170000 UTC		RINEX VERSION / TYPE	
DataProcessor	CETC54	20210131 170000 UTC	PGM / RUN BY / DATE				
ORBCCorr DATA of VERSION 3.01 FORMAT.		COMMENT					
2021	1	31	17	0	0.0000000	BDT	TIME OF FIRST OBS END OF HEADER
C21	59	2021 01 31 17 00 39	11	1	-0.0048	0.0000	-0.0448 0.3000
C23	59	2021 01 31 17 00 39	12	4	0.0096	0.0000	-0.0512 0.3000
C25	59	2021 01 31 17 00 39	12	2	-0.0192	-0.0320	-0.0896 0.3000
C27	59	2021 01 31 17 00 39	12	4	-0.0080	0.0704	0.0320 0.3000
C28	59	2021 01 31 17 00 39	12	0	-0.0288	-0.0128	0.0000 0.3000
C33	59	2021 01 31 17 00 39	12	2	-0.0112	-0.0768	0.0768 0.3000
C37	59	2021 01 31 17 00 39	12	6	-0.0320	0.0064	0.0192 0.3000
C38	59	2021 01 31 17 00 39	12	2	0.0000	0.0512	0.0320 0.3000
C40	59	2021 01 31 17 00 39	12	0	0.0080	0.0000	-0.0320 0.3000
C42	59	2021 01 31 17 00 39	12	2	-0.0432	-0.0384	0.0000 0.3000
C43	59	2021 01 31 17 00 39	12	4	-0.0112	0.0000	-0.0832 0.3000
C46	59	2021 01 31 17 00 39	12	2	0.0256	-0.0640	0.0704 0.3000
G01	59	2021 01 31 17 00 39	28	6	0.1744	0.7872	0.2496 0.3000
G03	59	2021 01 31 17 00 39	103	3	0.1680	0.3136	0.4864 0.3000
G07	59	2021 01 31 17 00 39	41	1	0.6976	0.6400	-0.5824 0.3000
G08	59	2021 01 31 17 00 39	48	3	0.3440	-2.2528	-0.9920 0.3000
G11	59	2021 01 31 17 00 39	14	1	-0.2752	-0.4480	-0.1536 0.3000
G13	59	2021 01 31 17 00 39	99	5	-0.1952	-0.2176	-1.0304 0.3000
G15	59	2021 01 31 17 00 39	132	3	0.7472	0.6976	0.8000 0.3000
G17	59	2021 01 31 17 00 39	112	5	1.0144	-1.7152	1.2992 0.3000
G19	59	2021 01 31 17 00 39	100	3	0.9616	-0.6464	0.6400 0.3000
G22	59	2021 01 31 17 00 39	94	3	0.7616	0.7424	0.3712 0.3000
G28	59	2021 01 31 17 00 39	66	6	-0.2800	-0.0320	0.0256 0.3000
G30	59	2021 01 31 17 00 39	16	2	0.3168	0.2176	-0.4992 0.3000
C21	59	2021 01 31 17 00 87	12	2	-0.0048	0.0000	-0.0256 0.3000
C23	59	2021 01 31 17 00 87	12	4	0.0096	0.0000	-0.0512 0.3000
C25	59	2021 01 31 17 00 87	12	2	-0.0192	-0.0320	-0.0896 0.3000
C27	59	2021 01 31 17 00 87	12	4	-0.0080	0.0704	0.0320 0.3000
C28	59	2021 01 31 17 00 87	12	0	-0.0288	-0.0128	0.0000 0.3000
C33	59	2021 01 31 17 00 87	12	2	-0.0112	-0.0768	0.0768 0.3000
C37	59	2021 01 31 17 00 87	12	6	-0.0320	0.0128	0.0192 0.3000
C38	59	2021 01 31 17 00 87	12	2	0.0000	0.0512	0.0320 0.3000
C40	59	2021 01 31 17 00 87	12	0	0.0080	0.0000	-0.0320 0.3000
C42	59	2021 01 31 17 00 87	12	2	-0.0432	-0.0320	0.0000 0.3000
C43	59	2021 01 31 17 00 87	12	4	-0.0112	0.0064	-0.0832 0.3000
C46	59	2021 01 31 17 00 87	12	2	0.0256	-0.0640	0.0704 0.3000
G01	59	2021 01 31 17 00 87	28	6	0.1856	0.7680	0.2560 0.3000
G03	59	2021 01 31 17 00 87	103	3	0.1632	0.2816	0.5120 0.3000

A.2 BDS-3 PPP-B2b钟差改正数文件示例

3.01		CLKCCorr		20210131 170000 UTC		RINEX VERSION / TYPE	
DataProcessor	CETC54	20210131 170000 UTC	PGM / RUN BY / DATE				
CLKCCorr DATA of VERSION 3.01 FORMAT.		COMMENT					
2021	1	31	17	0	0.0000000	BDT	TIME OF FIRST OBS END OF HEADER
C21	59	2021 01 31 17 00 28	0	0	-0.8320		
C23	59	2021 01 31 17 00 28	1	1	-0.8208		
C25	59	2021 01 31 17 00 28	3	3	-1.2288		
C27	59	2021 01 31 17 00 28	1	1	-0.7024		
C28	59	2021 01 31 17 00 28	3	3	-0.3296		
C33	59	2021 01 31 17 00 28	7	7	-0.3808		
C37	59	2021 01 31 17 00 28	1	1	0.1040		
C38	59	2021 01 31 17 00 28	5	5	-0.4640		
C40	59	2021 01 31 17 00 28	1	1	-0.0464		
C42	59	2021 01 31 17 00 28	7	7	-0.2256		
C43	59	2021 01 31 17 00 28	1	1	-0.8208		
C46	59	2021 01 31 17 00 28	3	3	-1.0048		
G01	59	2021 01 31 17 00 28	1	1	-0.9888		
G03	59	2021 01 31 17 00 28	5	5	-1.3520		
G07	59	2021 01 31 17 00 28	2	2	-1.7152		
G08	59	2021 01 31 17 00 28	0	0	0.1504		
G11	59	2021 01 31 17 00 28	0	0	-0.2800		
G13	59	2021 01 31 17 00 28	4	4	-0.6352		
G15	59	2021 01 31 17 00 28	2	2	0.4272		
G17	59	2021 01 31 17 00 28	4	4	0.7152		
G19	59	2021 01 31 17 00 28	2	2	3.0176		
G22	59	2021 01 31 17 00 28	2	2	2.5472		
G28	59	2021 01 31 17 00 28	5	5	-0.1984		
G30	59	2021 01 31 17 00 28	1	1	0.2528		
C21	59	2021 01 31 17 00 34	0	0	-0.8320		
C23	59	2021 01 31 17 00 34	1	1	-0.8128		
C25	59	2021 01 31 17 00 34	3	3	-1.2272		
C27	59	2021 01 31 17 00 34	1	1	-0.7024		
C28	59	2021 01 31 17 00 34	3	3	-0.3280		
C33	59	2021 01 31 17 00 34	7	7	-0.3792		
C37	59	2021 01 31 17 00 34	1	1	0.1072		
C38	59	2021 01 31 17 00 34	5	5	-0.4624		
C40	59	2021 01 31 17 00 34	1	1	-0.0448		
C42	59	2021 01 31 17 00 34	7	7	-0.2240		
C43	59	2021 01 31 17 00 34	1	1	-0.8176		
C46	59	2021 01 31 17 00 34	3	3	-1.0048		
G01	59	2021 01 31 17 00 34	1	1	-0.9872		
G03	59	2021 01 31 17 00 34	5	5	-1.3536		

A.2 BDS-3 PPP-B2b码间偏差改正数文件示例

3.01		DCBCCorr		20210131 170000 UTC		RINEX VERSION / TYPE	
DataProcessor	CETC54	20210131 170000 UTC	PGM / RUN BY / DATE				
DCBCCorr DATA of VERSION 3.01 FORMAT.		COMMENT					
2021	1	31	17	0	0.0000000	BDT	TIME OF FIRST OBS END OF HEADER
C21	59	2021 01 31 17 00 39	0	0	4.3350		
C21	59	2021 01 31 17 00 39	1	1	5.2530		
C21	59	2021 01 31 17 00 39	2	2	5.3040		
C21	59	2021 01 31 17 00 39	4	4	-2.1420		
C21	59	2021 01 31 17 00 39	5	5	-1.1220		
C21	59	2021 01 31 17 00 39	7	7	-0.8160		
C21	59	2021 01 31 17 00 39	8	8	-0.5950		
C21	59	2021 01 31 17 00 39	12	12	0.0000		
C23	59	2021 01 31 17 00 39	0	0	7.5650		
C23	59	2021 01 31 17 00 39	1	1	7.4800		
C23	59	2021 01 31 17 00 39	2	2	7.7010		
C23	59	2021 01 31 17 00 39	4	4	-2.6350		
C23	59	2021 01 31 17 00 39	5	5	-1.8700		
C23	59	2021 01 31 17 00 39	7	7	-1.6830		
C23	59	2021 01 31 17 00 39	8	8	-1.1900		
C23	59	2021 01 31 17 00 39	12	12	0.0000		
C25	59	2021 01 31 17 00 39	0	0	0.3400		
C25	59	2021 01 31 17 00 39	1	1	0.4760		
C25	59	2021 01 31 17 00 39	2	2	0.5610		
C25	59	2021 01 31 17 00 39	4	4	-5.9160		
C25	59	2021 01 31 17 00 39	5	5	-5.1510		
C25	59	2021 01 31 17 00 39	7	7	-4.6750		
C25	59	2021 01 31 17 00 39	8	8	-4.1650		
C25	59	2021 01 31 17 00 39	12	12	0.0000		
C27	59	2021 01 31 17 00 39	0	0	-1.3090		
C27	59	2021 01 31 17 00 39	1	1	-0.5270		
C27	59	2021 01 31 17 00 39	2	2	-0.5100		
C27	59	2021 01 31 17 00 39	4	4	-5.7460		
C27	59	2021 01 31 17 00 39	5	5	-4.9980		
C27	59	2021 01 31 17 00 39	7	7	-4.5900		
C27	59	2021 01 31 17 00 39	8	8	-4.0970		
C27	59	2021 01 31 17 00 39	12	12	0.0000		
C28	59	2021 01 31 17 00 39	0	0	-1.0880		
C28	59	2021 01 31 17 00 39	1	1	-0.8840		
C28	59	2021 01 31 17 00 39	2	2	-0.7140		
C28	59	2021 01 31 17 00 39	4	4	-5.7630		
C28	59	2021 01 31 17 00 39	5	5	-5.0150		
C28	59	2021 01 31 17 00 39	7	7	-4.2160		
C28	59	2021 01 31 17 00 39	8	8	-3.7400		
C28	59	2021 01 31 17 00 39	12	12	0.0000		

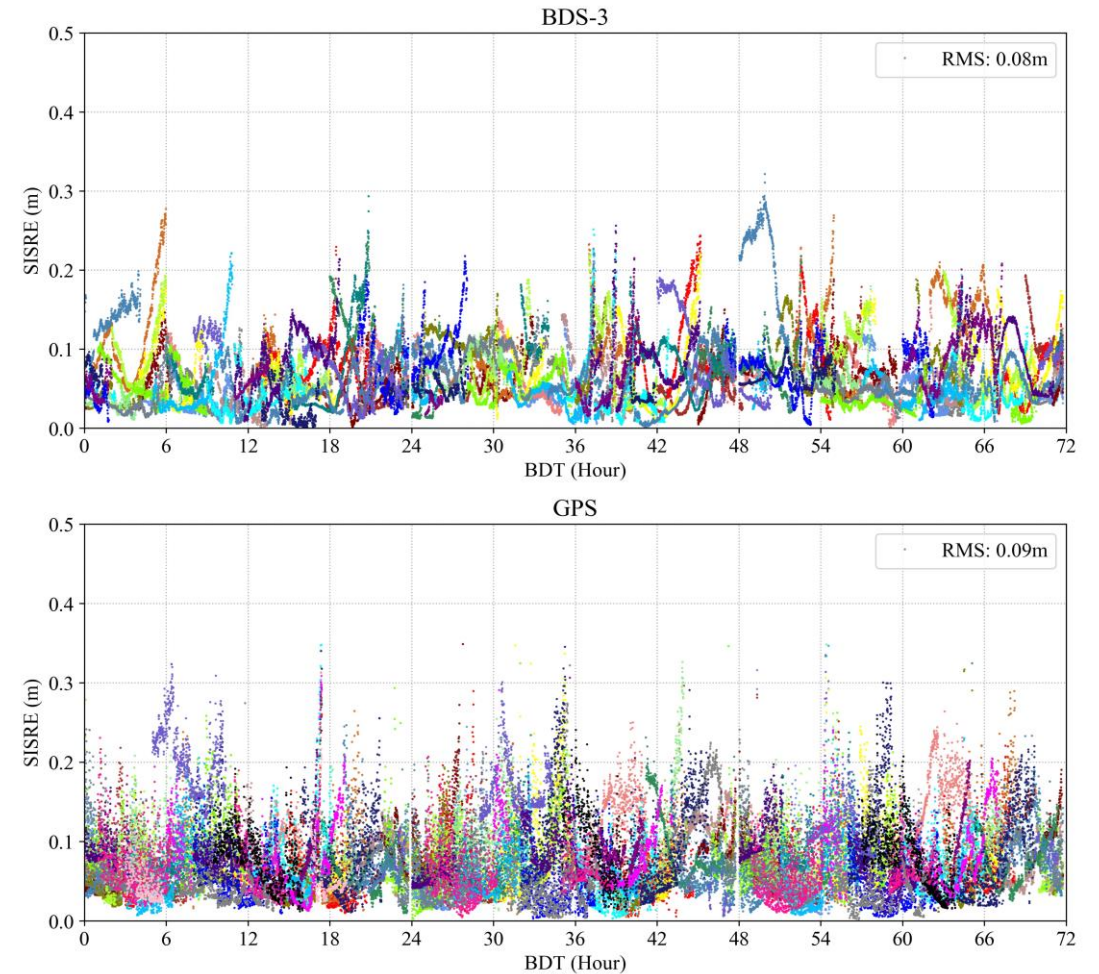
Lasted Update



SIS Accuracy for BDS PPP-B2b

SAT	dR (m)	dA (m)	dC (m)	dCLK (ns)	SISRE(m)
C19	0.03	0.18	0.13	0.16	0.06
C20	0.03	0.15	0.13	0.19	0.05
C21	0.04	0.19	0.15	0.14	0.06
C22	0.04	0.18	0.16	0.14	0.06
C23	0.05	0.13	0.21	0.13	0.07
C24	0.05	0.13	0.20	0.17	0.07
C25	0.06	0.13	0.21	0.11	0.07
C26	0.07	0.18	0.13	0.17	0.09
C27	0.10	0.25	0.18	0.16	0.11
C28	0.06	0.20	0.21	0.13	0.07
C29	0.07	0.15	0.15	0.17	0.08
C30	0.07	0.13	0.20	0.16	0.09
C32	0.03	0.14	0.15	0.15	0.05
C33	0.03	0.22	0.20	0.10	0.06
C34	0.08	0.14	0.14	0.13	0.10
C35	0.09	0.16	0.11	0.11	0.09
C36	0.03	0.11	0.11	0.15	0.06
C37	0.03	0.12	0.15	0.12	0.05
C38	0.16	0.21	0.31	0.25	0.17
C39	0.19	0.21	0.31	0.25	0.21
C40	0.08	0.30	0.20	0.16	0.09
C41	0.04	0.21	0.17	0.19	0.06
C42	0.02	0.21	0.18	0.10	0.06
C43	0.08	0.17	0.17	0.15	0.09
C44	0.09	0.14	0.13	0.10	0.09
C45	0.09	0.14	0.13	0.13	0.10
C46	0.06	0.22	0.09	0.10	0.08
mean	0.06	0.17	0.17	0.14	0.08

SAT	dR (m)	dA (m)	dC (m)	dCLK (ns)	SISRE(m)
G01	0.09	0.25	0.11	0.17	0.10
G02	0.03	0.19	0.08	0.17	0.07
G03	0.06	0.27	0.18	0.16	0.09
G04	0.11	0.27	0.28	0.13	0.12
G05	0.03	0.22	0.17	0.28	0.10
G06	0.07	0.27	0.20	0.18	0.09
G07	0.05	0.16	0.08	0.20	0.08
G08	0.08	0.19	0.08	0.18	0.10
G09	0.04	0.09	0.25	0.13	0.07
G10	0.03	0.26	0.21	0.24	0.09
G11	0.07	0.23	0.14	0.14	0.09
G12	0.07	0.25	0.18	0.21	0.10
G13	0.08	0.24	0.15	0.23	0.11
G14	0.05	0.20	0.18	0.18	0.08
G15	0.06	0.32	0.15	0.21	0.10
G16	0.04	0.16	0.10	0.20	0.08
G18	0.06	0.14	0.10	0.16	0.07
G19	0.05	0.25	0.15	0.23	0.09
G20	0.04	0.20	0.13	0.23	0.08
G21	0.07	0.24	0.19	0.38	0.13
G22	0.04	0.12	0.05	0.22	0.07
G24	0.07	0.83	0.29	0.21	0.16
G25	0.05	0.33	0.22	0.15	0.09
G26	0.07	0.19	0.08	0.11	0.08
G27	0.09	0.20	0.13	0.16	0.10
G29	0.04	0.13	0.20	0.16	0.07
G30	0.03	0.19	0.11	0.18	0.06
G31	0.07	0.27	0.17	0.14	0.09
G32	0.03	0.12	0.05	0.15	0.05
mean	0.06	0.23	0.15	0.19	0.09



Lasted Update



PPP Accuracy for BDS PPP-B2b

SITE	LOCATION	BDS-PPP			BDS&GPS-PPP		
		H/m	V/m	Conv. Time/min	H/m	V/m	Conv. Time/min
BJF1	Beijing	0.15	0.20	10.7	0.11	0.16	10.8
CHU1	Changchun	0.22	0.33	20.1	0.11	0.21	13.5
GUA1	Wulumuqi	0.16	0.25	11.5	0.12	0.17	11.2
KUN1	Kunming	0.17	0.23	12.2	0.15	0.22	10.4
LHA1	Lasa	0.18	0.28	16.5	0.13	0.18	9.7
SHA1	Shanghai	0.13	0.25	19.3	0.11	0.20	10.6
WUH1	Wuhan	0.20	0.21	13.3	0.13	0.17	10.3
XIA1	Xi'an	0.21	0.31	13.2	0.17	0.21	9.5
mean		0.18	0.26	14.6	0.13	0.19	10.9



Summary

03

Summary



- Continuously track and evaluating performance of multi-GNSS
- Contribute to update the capability of tracking new signals – BDS PPP/SBAS, Galileo HAS, QZSS, NavIC...

The background features a central globe of Earth with visible continents and oceans. It is surrounded by several concentric, elliptical orbits in light blue and green. Numerous satellite icons, depicted as small rectangular boxes with solar panels, are positioned along these orbits, representing a global satellite network. The entire scene is set against a solid dark blue background.

Thank you !

<http://www.igmas.org>