Status report of Shanghai VLBI stations

Shanghai Astronomical Observatory

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The 2nd General Meeting of the AOV is held in Kobe, July 31 – August 1, 2017.

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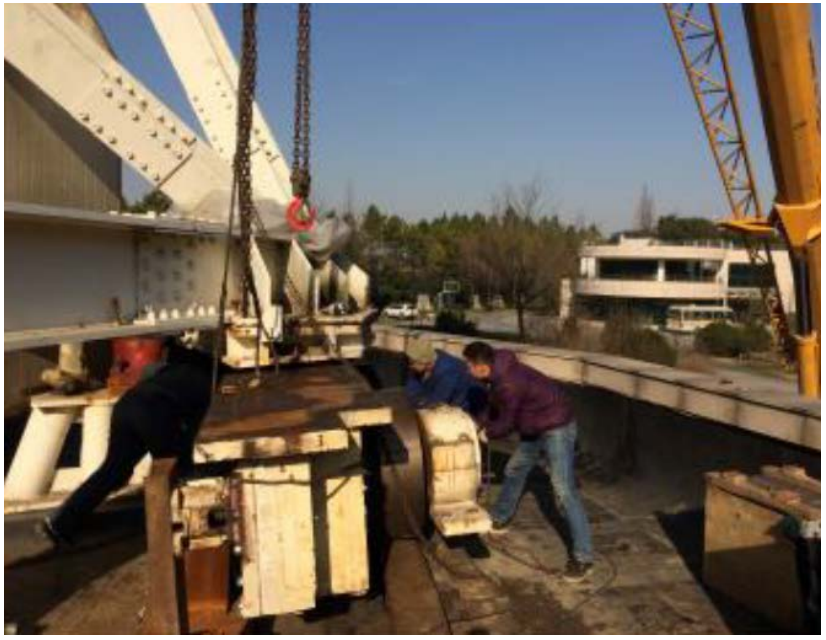
Parameter performance with 25m (Sh)

Waveband	L	S	C1	C2	X	Ku
Wavelength（cm）	18	13	6	5	3.6	2.5/2
Freq.（GHz）	1.60 ~1.74	2.15 ~2.45	4.60 ~5.10	5.975 ~6.825	8.2～9.0	12.0 ~13.0
LO（MHz）	2300	1600	4200	5900	8100	—
Polarization	LCP/RCP					
Type	room temp.	room temp.	cryogenic	room temp.	cryogenic	room temp.
Efficiency %	42	42	50	41	32	—
Tsys	150K	200K	50K	100K	60K	—
SEFD(Jy)	1400		730	1000	900	—

Recent Maintenance I with 25m



Recent Maintenance II with 25m

1. 2015.11.26 ~ 2016.2.13

Replaced the rail & the gear box

2. 2016.11 ~ 2016.12

Structure reinforcement

& Spray paint

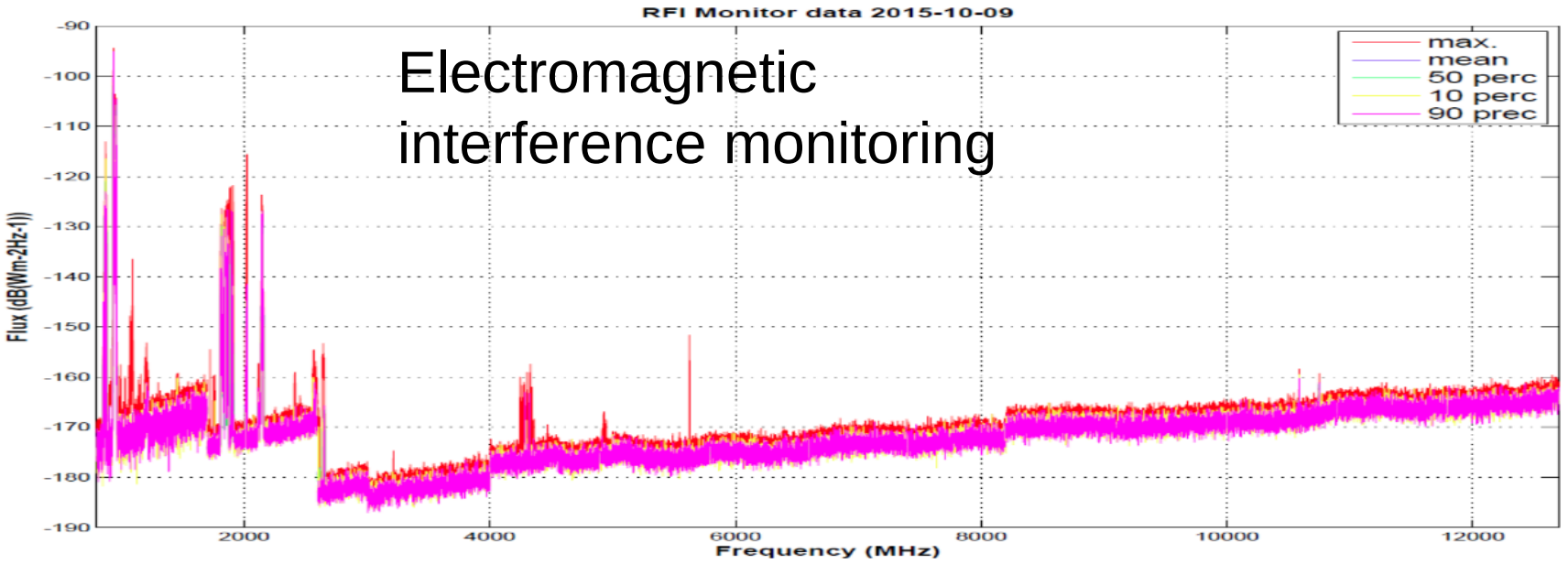
RFI Monitor with 25m

Built in 2015

0.8-12.7GHz； continuous rotation；

Horizontal & Vertical polarization；

maximum speed of revolution: 12°/s。



Parameter performance with 65m (T6)

Band	L	S	C	X	Ku	K	Ka	Q
Wavelength(cm)	21/18	13	6/5	3.6	2.5/2	1.35	0.9	0.7
Freqrange (GHz)	1.33-1.73	2.2-2.3	4-8	8.2-9.0	12.0-18	18-26.5	30-34	35-50
Side band	LSB	USB	USB	USB	USB	USB	USB	USB
Polarization	Dual Circ	Dual Circ	Dual Circ	Dual Circ	Dual Circ	Dual Circ	Dual Circ	Dual Circ
Pcal function	Yes	Yes	Yes	Yes	Yes	No	No	No
Tsys(K)	26	33	20	32	27	40	55	70
LO(GHz)	2.27	2	tuning	8.1	tuning	tuning	tuning	tuning
Effeciency（%）	65	62	65	65	62	55	53	54

Terminal with Tianma 65m

- DIBAS: Single-dish observations

  (For Pulsar and Spectral line)
- DBBC2: IVS & EVN observations

  4IFs * 512MHz (increase 2 IF)

  Bandwidth 0.5\1\2\4\8\16 MHz
- CDAS: CVN observations

  4IFs * 512MHz

  Bandwidth 0.5\1\2\4\8\16\32 MHz

Terminal with Tianma 65m

Statistics of experiments with Shanghai stations in 2016 & 2017

Session Name	2016 (SH)	2017 (SH)	2016 (T6)	2017 (T6)
AOV	3	4 (6)	1	2
APSG	2	2	0	0
AUA-AST	1	1	1	0
IVS-R1	15	19	0	0
IVS-T2	2	2	0	0
IVS-R&D	3	1	2	3
Total	26	29	4	5
IVS-INT3	10	10	0	0

Sessions observed status

CODE	DATE	STATIONS	DUR (hr)	CORR
AOV010	2016.7.27	Sh & T6	24	SHAO
AOV011	2016.9.20	Sh	24	GSI
AOV012	2016.10.12	Sh	24	SHAO
AOV014	2017.3.21	Sh	24	SHAO
AOV015	2017.4.11	Sh	24	GSI
AOV016	2017.6.20	T6	24	SHAO

AOV013 – sh cancelled due to antenna maintenance
(Jan. 16. 2017)

AOV016 – sh cancelled due to conflict with EVN ToO
(Jun. 20. 2017)

Shanghai VGOS Station

Shanghai VGOS Station

Shanghai VLBI correlator

- VLBI tracking of spacecraft in China's Lunar Exploration Project
- Determination of positions of Chinese stations

VLBI data processing center at Seshan campus

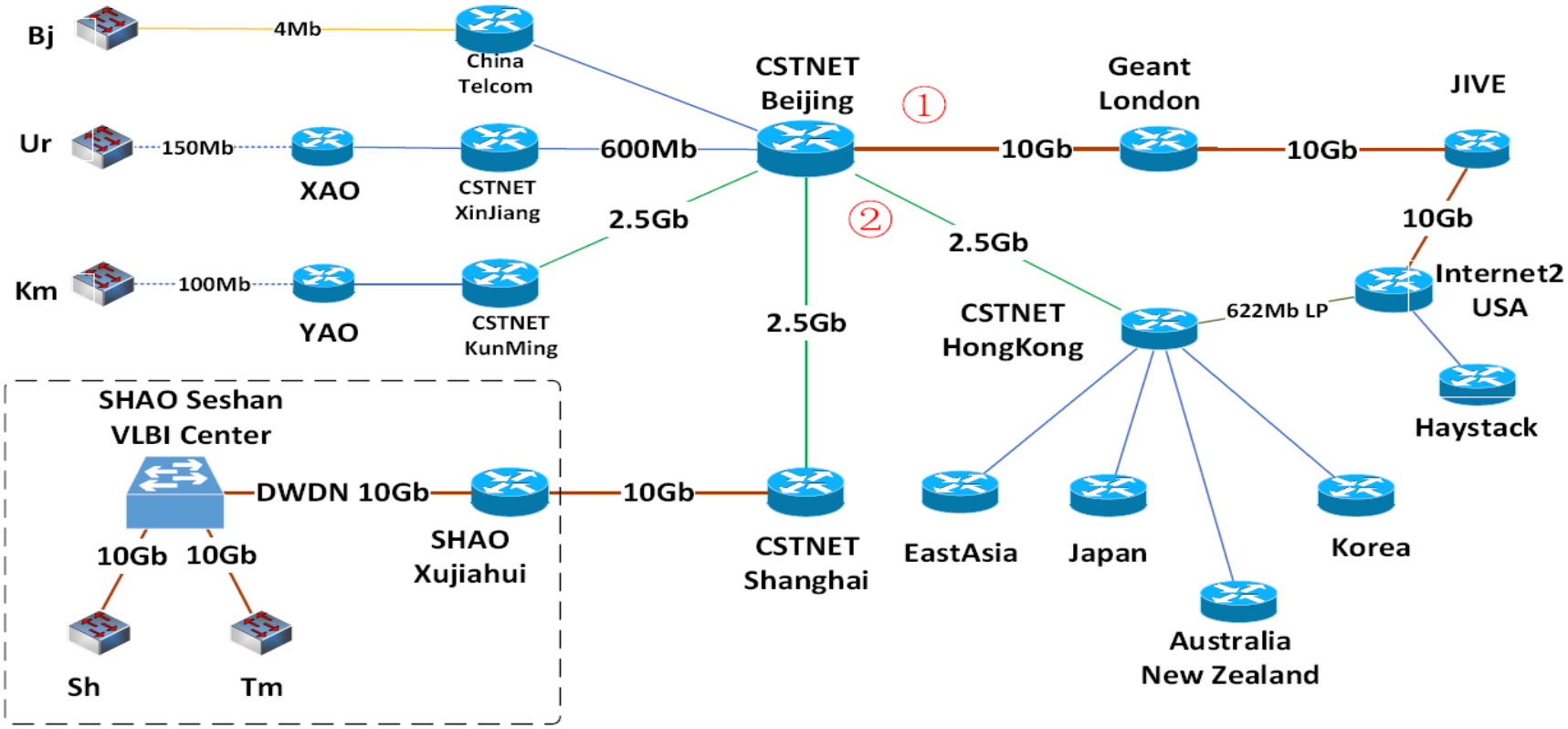
DiFX platform at SHAO, 2014 Dec

Features of the DiFX cluster system

Software	
	DiFX2.2/2.3/**2.4.1**, HOPS3.8/3.10/**3.12** etc.
Hardware	
Head nodes	**2 head nodes**, *20 CPU, each head node manages 10 computing nodes*
Computing nodes	**400 cores**, *20 computing nodes, 20 CPU each node, Intel Xeon E5-2660 v3 2.6GHz, 64GB RAM.*
Networks	**56Gb infiniband** *network for cluster and RAID, 10Gb/1Gb Ethernet for cluster, RAID and Mark5.*
Storage system	**432 TB**, *RAID 6 and parallel file system.*
Mark5	**6 units**, *2 Mark5A, 2 Mark5B, 2Mark5B+*

E-VLBI connection

- Via CSTNET(Chinese Science&Technology Network, CAS)
- IPv6 supported in CVN



E-VLBI connection

Country	Institutes	Network B/W	To/From Shanghai
Germany	Bonn MPRiFR	900Mb/s	800Mb/s
Japan	NICT	10Gb/s	1Gb/s
Japan	GSI	10Gb/s	1Gb/s
South Korea	NGII	1Gb/s	800Mb/s
Italy	IRA	10Gb/s	800Mb/s
South Africa	Hartebeesthoek	10Gb/s	550Mb/s
Australia	University of Tasmania	10Gb/s	800Mb/s
New Zealand	Auckland University of Technology	10Gb/s	800Mb/s
Brazil	IPNE	1Gb/s	200Mb/s
Netherlands	JIVE	10Gb/s	1Gb+/s
Russia	IAA	1Gb/s	500Mb/s
USA	Haystack	1Gb/s	600Mb/s
Malaysia	University of Malaya	100Mb/s	90Mb/s

Work load at our DiFX platform

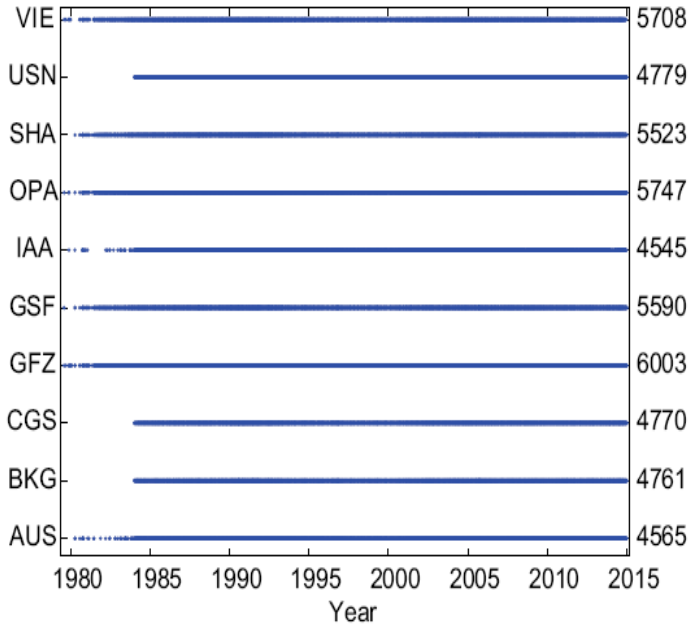
	CVN	Joint	IVS
2015	10 Continuum, Pulsar, Geodesy	10 EAVN(FT), Astrometry	10 AOV, APSG, CRF
2016	20 T6 Rx test, Continuum, Geodesy	8 EAVN(FT), FT, Astrometry	26 AOV, APSG, AUA, AUG, CRDS, CRF, R&D
2017	Astrometry, Geodesy, Pulsar	EAVN, FT	32 AOV, APSG, AUA, CRDS, CRF, R&D

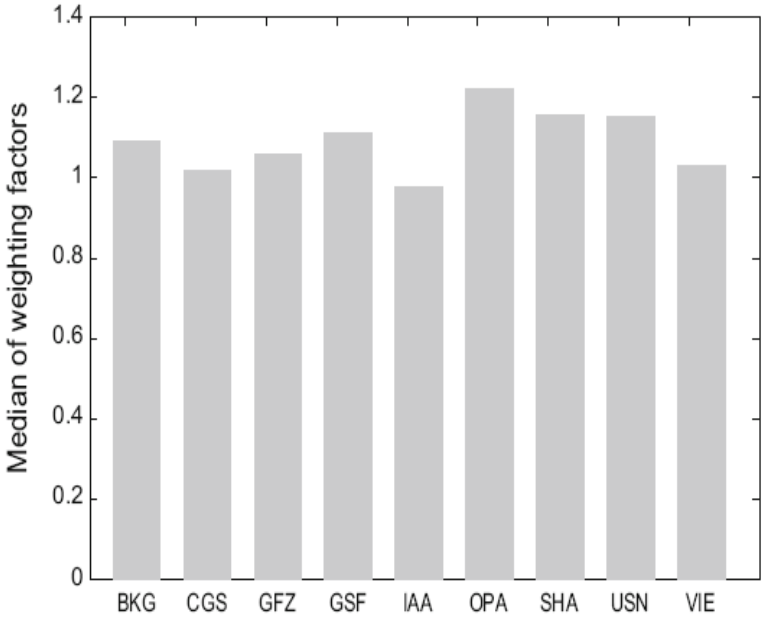
Geodetic data correlation at SHAO

- IVS observing sessions
  - R&D, AOV, APSG, CRF, CRDS, AUSTRAL
- Domestic sessions
  - CN-GEO
- geodetic sessions correlated
  - 2015: 11(IVS)+5(domestic) sessions
  - 2016: 28(IVS)+4(domestic) sessions
  - 2017: 32(IVS)+4(domestic) sessions

Recent activities at IVS SHAO Analysis Center

- **contribute to ITRF2014**



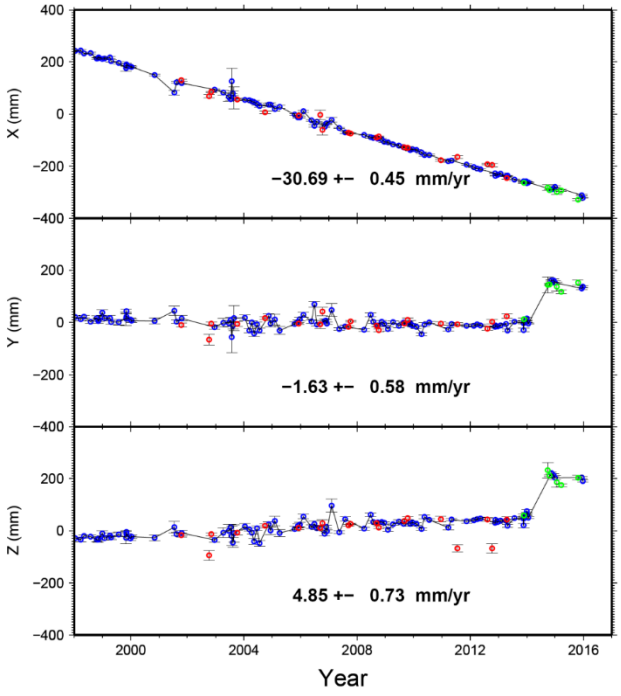


(Bachmann et al. 2016)

Recent activities at IVS SHAO Analysis Center

- **Full data analysis of CVN domestic sessions**

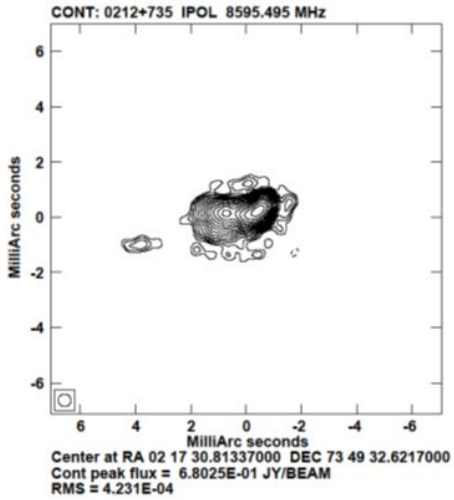
✓ SHAO AC is in charge of the full data analysis of CVN domestic sessions with a network of 6-7 Chinese stations



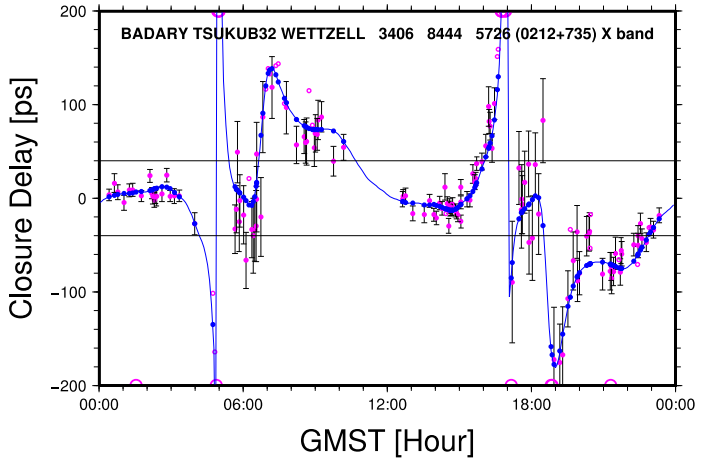
The variation in UR station due to the antenna maintenance in2014 was detected both by IVS data (blue dots) and CVN sessions (green dots)

Recent activities at IVS SHAO Analysis Center

☐ Source Structure effects



Source image determined from phase



structure effects based on image

Outlook

- 1. The preliminary test & test run of VGOS station
- 2. Sheshan25m & Tianma 65m will keep the current number of observations
- 3. For future VGOS data processing requirements, the hardware platform will upgrade accordingly, but processor operators need to increase

Thank you for your attention!

谢谢！