Activity report of NICT/Kashima VLBI group

NICT Kashima Space Technology Center

Space-Time Standards Laboratory

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Members of NICT/Kashima VLBI Group

Family, Given Name	Activities, Charges
Sekido Mamoru	Group Leader, VLBI observation for Frequency Link, IVS session operation with 11m stations.
Kawai Eiji	Maintaining Kashima 34m, Kashima 11m, and Koganei 11m VLBI stations. IVS session operation with Kas34m.
Takefuji Kazuhiro	Correlator development, Signal processing.
Ujihara Hideki	Development of Broadband Feed
Tsutsumi Masanori	Computer/Network maintenance Hardware maintenance support
Hasegawa Shingo	IVS/AOV operation support: Data conversion and data transfer. Maintenance support
Miyauchi Yuka	Software development
Kondo Tetsuro (SHAO)	K5/VSSP software correlator maintenance/updating. Bandwidth Synthesis
Shinotsuka Kumiko	Secretary for administrative support.



Participation to IVS, AOV sessions

	Kas34	Kb	Kas11	K1	Kog11	Kg
	IVS	AOV	IVS	AOV	IVS	AOV
1	RD1701	16	CRF98	13	T2117	13
2	RD1702	17	T2116		CRF99	
3	T2126	18	T2117		T2118	
4	R1779		CRF100		T2119	
5	R1780		CRF101		CRF102	
6	R1782		R1802		APSG40	
7	T2117		APSG40		CRF103	
8	R1787		R1806		T2120	
9	R1788		R1808		APSG41	
10	T2120		T2120		T2121	
11	AUA029		R1810			
12	T2122		APSG41			
13			T2121			
14			C1701-14			

	Kas34	Kb	Kas11	K1	Kog11	Kg
	IVS	AOV	IVS	AOV	IVS	AOV
1	T2123	19	T2123	20	APSG42	20
2	R1870	28	CRF105	23	T2124	23
3	R1871	29	CRF106	24	T2125	26
4	R1872		APSG42	26	APSG42	
5	R1873		T2125		CRF107	
6	T2129		T2126		T2126	
7			APSG43		APSG43	
8			T2127		CRF108	
9			CRF104		T2128	
10					CRF109	
11					T2129	

Trouble and Shooting

Kashima34m

Issue	Description			
Damage of back up structure of main reflector due to corrosion.	Repair work has conducted for the period from May-Sep. 2018. Some part of steel square pipes were cut&replaced. Degradation of surface accuracy has been recovered by holography measurement and reflector panel adjustment.			
Maintenance of AZ/EL drive motor & breaks	During summer, maintenance works has made for two of four AZ drive motors. Break-release switch signal does not return properly from of AZ#2 drive sometimes. Since it causes loss of observation in automated start of experiments, we stopped sensing of the break-release signal, tentative counter measure. We ordered new breaks for replace.			
Wave-guide switch for cold-load is broken for X-band.	We are planning repair.			
22GHz receiver temperature is extremely high by unknown reason.	We need investigation			

Trouble and Shooting

Kashima11m

Issue	Description
Antenna Control Unit (ACU) was broken in Aug. 2018.	Az Encored data cannot be obtained, then Encoder power supply circuit in ACU must be broken. Thunder storm is suspected to be the cause Spare ACU did remain, then antenna is recovered by replacement of ACU.

Koganei 11m No particular problem

Technology Development: Broadband VLBI System GALA-V



NICT(Kashima 34m)





 τ_{21} τ_{23}

- Broadband (3-14GHz) ->VGOS Compatible
 - Precise (~1psec) delay observable is available
 - Using closure delay for transportable Small antenna
 - Using Large antenna for SNR booster
 - Deformation/scale dependent delay of large antenna is eliminated.

34m Antenna Main Reflector backup structure

For safety reason, repair work of corrosion damage at backup structure has been urgent issue.

Repair work period: May-Sep. 2018

damaged steel pipe.

- Some part of steel pipes had to be cut & replaced.
- Precision of reflector height might be changed.

 \Rightarrow Reflector panel adjustment is necessary!







Issue in reflector adjustment

Reflector panel adjustment mechanism exists in Kashima 34m antenna. However it has never been used for a long time after the construction.

They are fixed by nut to avoid unintended changes. We had to work for

- Removing painting on the bolt
- Releasing nut.
- Cleaning the groove of the bolts and lubrication.



Surface flatness measurement by Holography

Beam pattern(Complex) Fourie Transformation
EM field distribution on the reference plane of antenna

Complex (amplitude, Phase) Beam pattern of 34m antenna was measured by using satellite signal.

Resolution: λ /W =0.8m W=1.7deg. Angular width

Reference antenna: 1.6m diameter Receiver: wideband NINJA-feed for 34m and reference 1.6m. Radio source: JCSAT-3A at AZ,EL=(200.87 deg, 46.241 deg) Frequency: 12.15GHz, V-pol Sampling :16MHz-4bit sampling Processing: Zero baseline Correlation processing.



Surface flatness measurement by Holography

Broad signal can be used for correlation





Reference Antenna is prepared by recycling use of 1.6m dish used for former GALA-V

Measurement data: Complex Beam pattern







Measurement just after the backup structure repair work (9th Sep. 2018)



Additional deformations were occurred by the repair work in the summer of 2018.



Thank you for attention.