

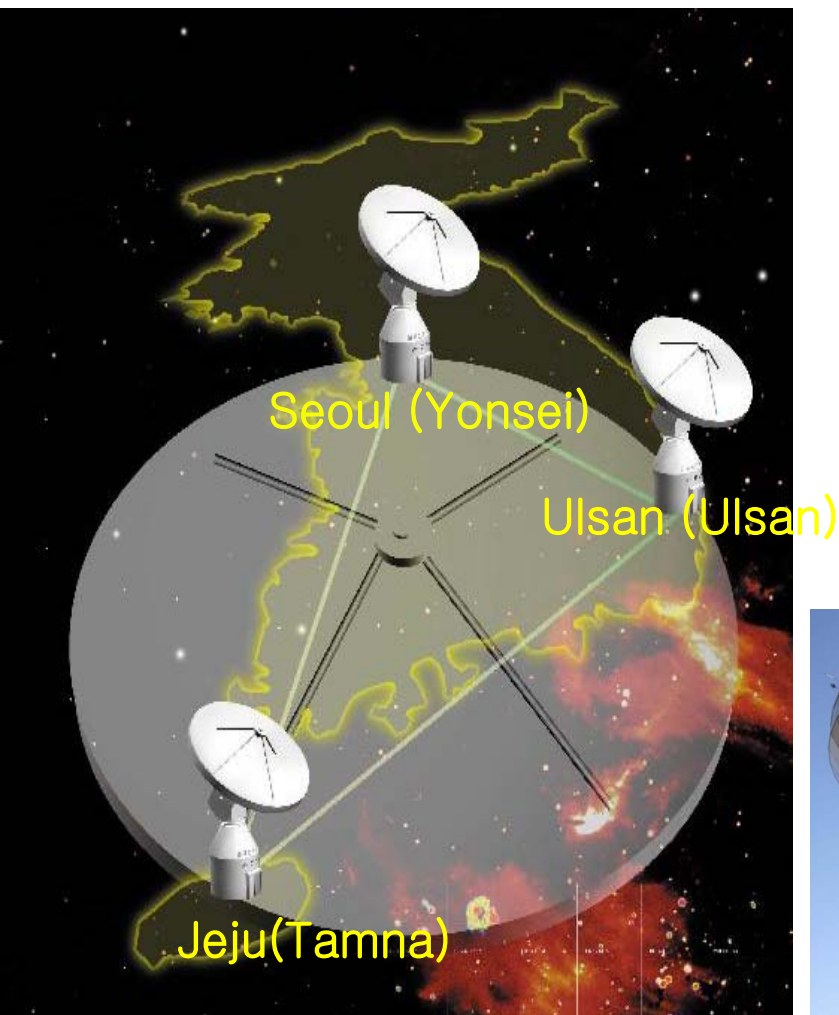
KVN システムの現状及び 今後の予定

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and KVN staffs

Korea Astronomy and Space Science Institute

2009/09/02

Overview of KVN



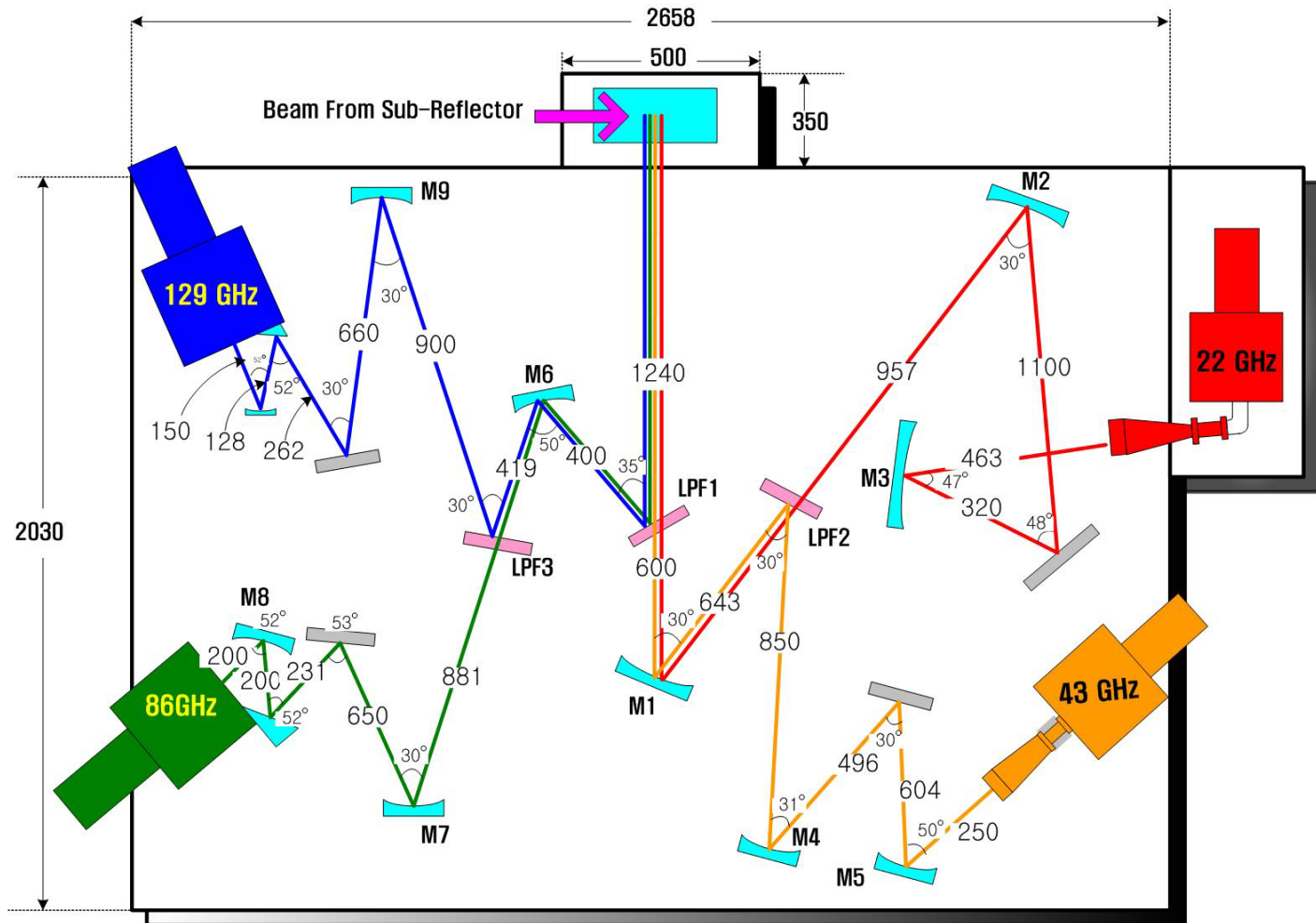
- 2001 ~ 2011(?)
- 3 stations with 21m radio telescopes
 - Cassegrain type
- 22,43,86 and 129GHz band Receiver
 - Simultaneous observation of four bands
 - first proposed in the world
- Digital DAS system has been completed
- Correlators will be completed in 2010
- Millimeter-wave VLBI Astronomy
- The first KVN user's meeting (2009/8)



Receivers and their test results

Quasi-optical circuit for Multi-band receivers

KVN Multi-Channel Receiver Optical Bench



Performance of 22GHz and 43GHz band Receivers

➤ Receiver Noise temperatures

- 22GHz : 35K
- 43GHz : 60K(90K)

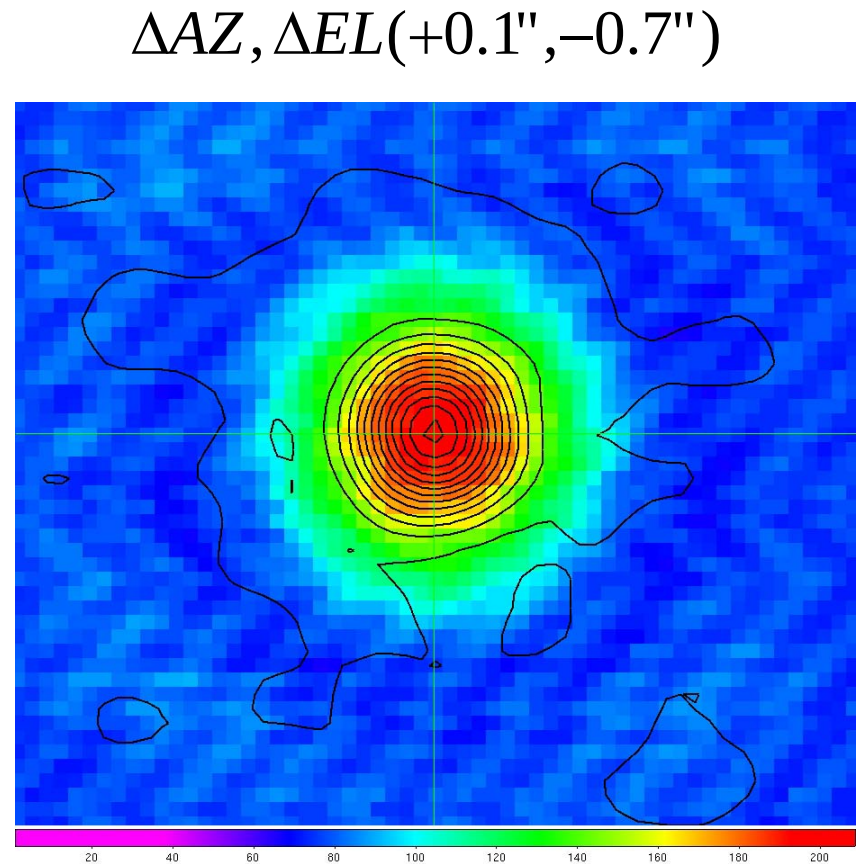
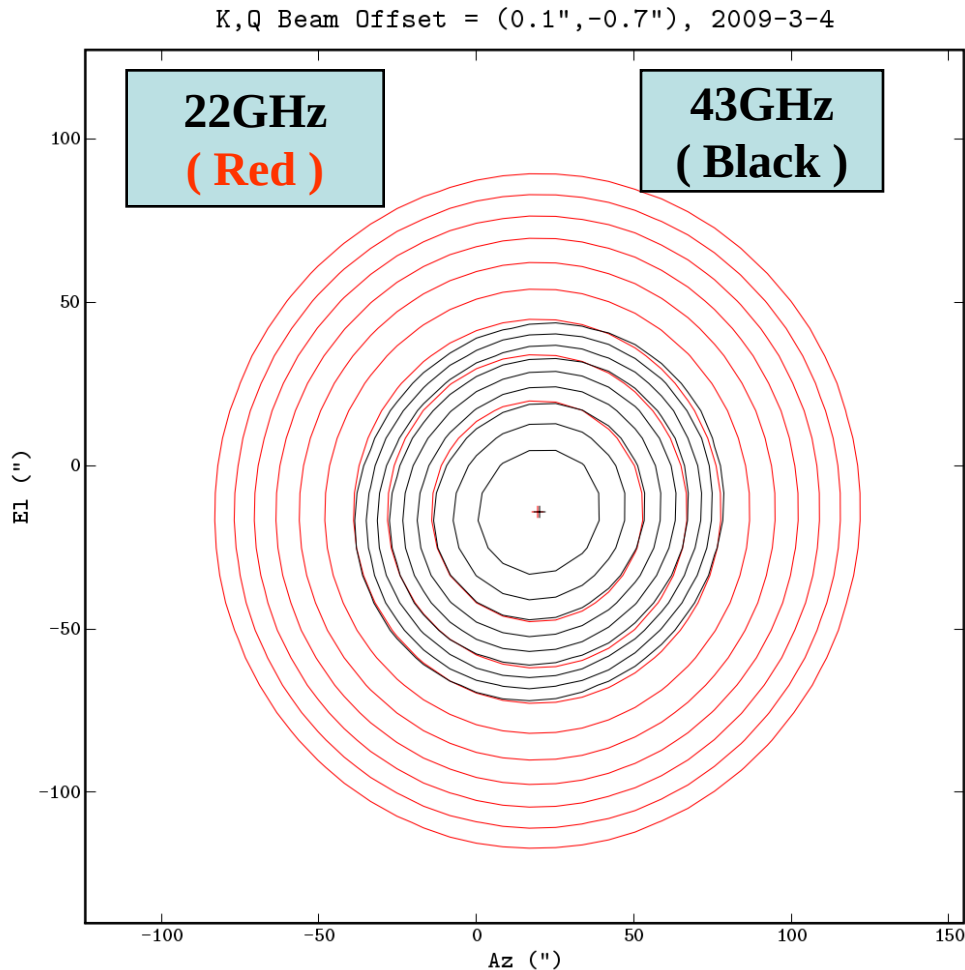
➤ Amplitude stability ($\Delta G / G$)

- 22GHz : 2×10^{-4}
- 43GHz : 4×10^{-4}

➤ Phase Stability

- Not measured

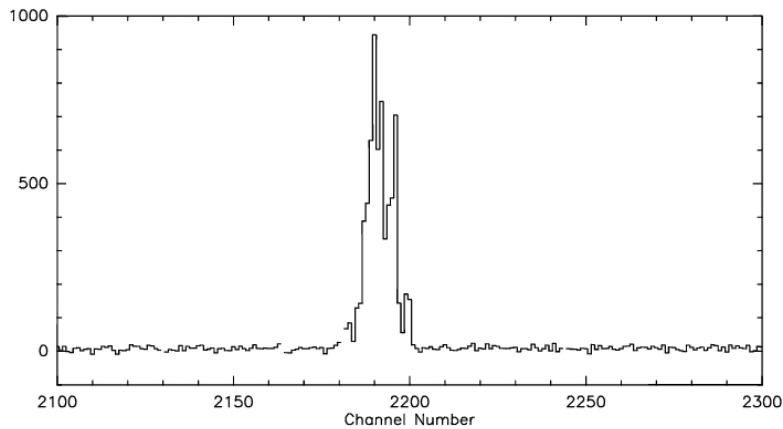
The Pointing offset between 22GHz and 43GHz band at Jupiter



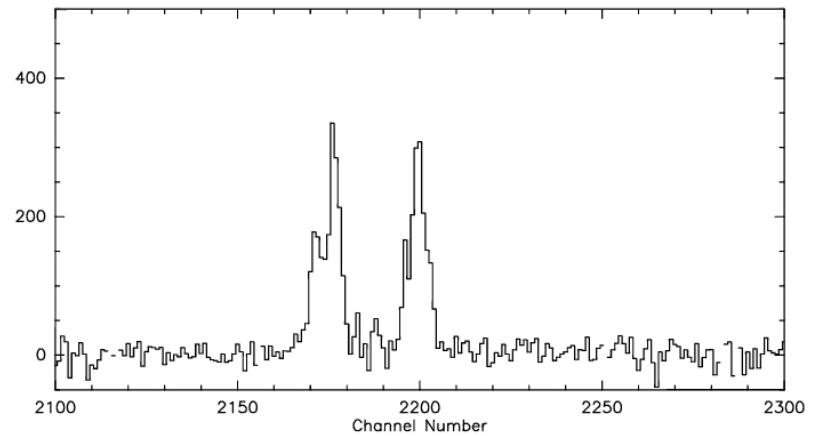
Orion-KL

H₂O and SiO Maser Line

7571; 1 ORION KL 22.235 KYS21M 1 0.0 0.0 Ho 7571



7574; 1 ORION KL 43.122 KYS21M 4 0.0 0.0 Ho 7574



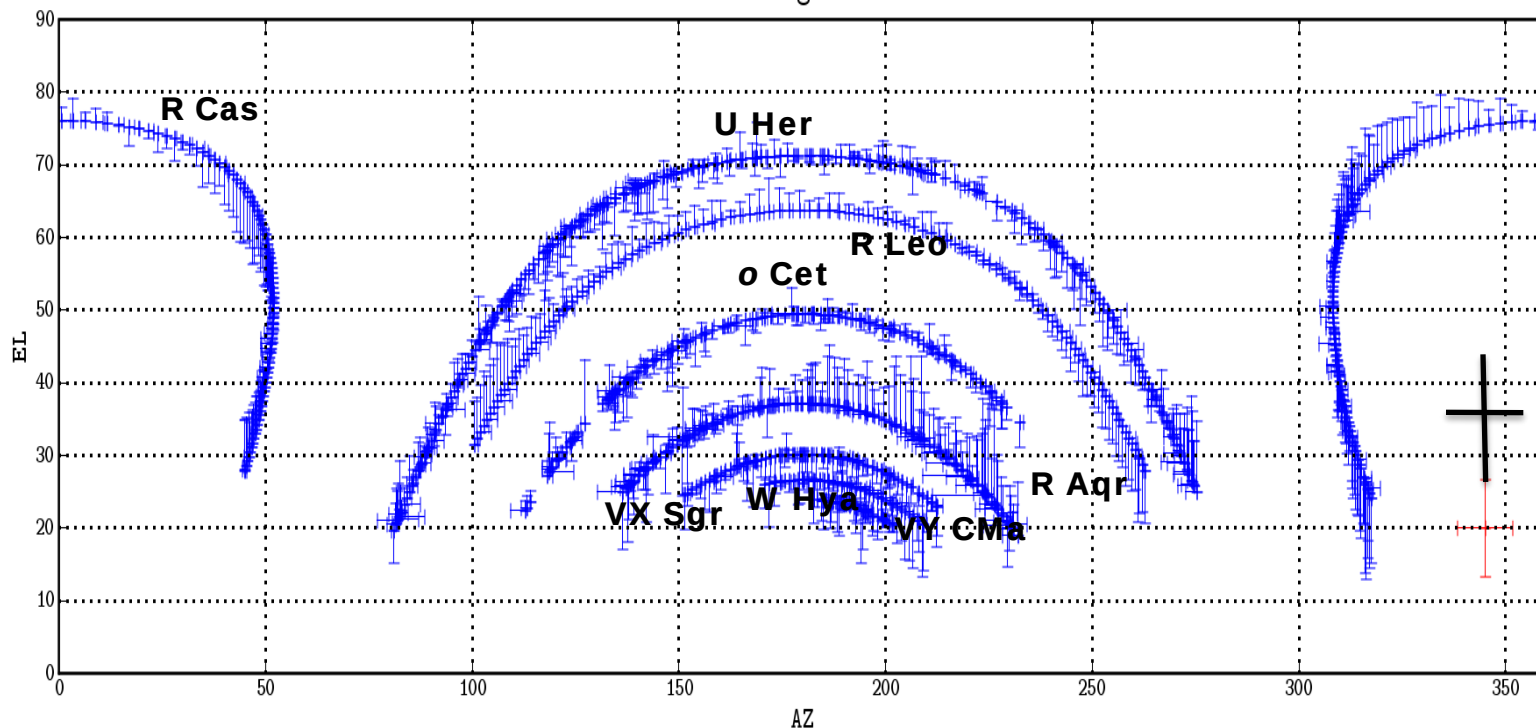
Simultaneous Observation Results !!!!!
on October 28th 2008

Pointing model – KVN YS(Q_band)

- Epoch: 31 Mar – 3 Apr, 2009
- Target: R Cas, U Her, R Leo, o Cet, R Aqr, VX Sgr, W Hya, VY CMa
- Results: AZ rms = 2.16", EL rms = 3.97"

Observed offsets of KVN Yonsei in 2009-04: Black cross 13 arcsec

Residual of Model Fitting : Red Cross = 13 arcsec

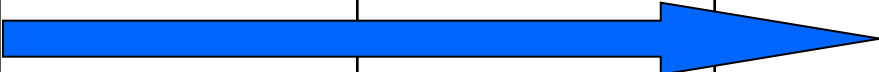
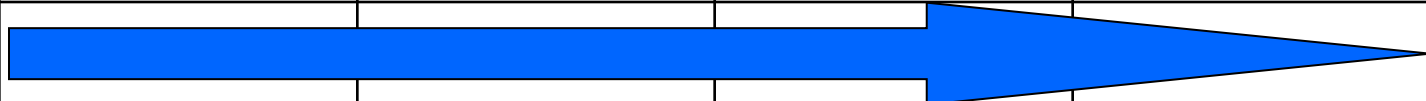
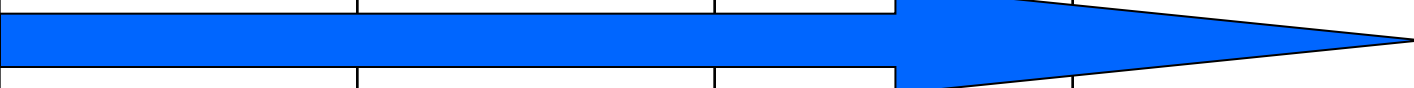


- Aperture efficiencies

	Efficiency (%)	EL (°)	Remark	T_B^* (K)
Aperture efficiencies at 22GHz				
Venus	68(70)	30	LPF2	505+-25**
Aperture efficiencies at 43GHz				
Venus	68.8(70)	32	LPF2	450+-32
Aperture efficiencies at 100GHz				
Venus	51	40		

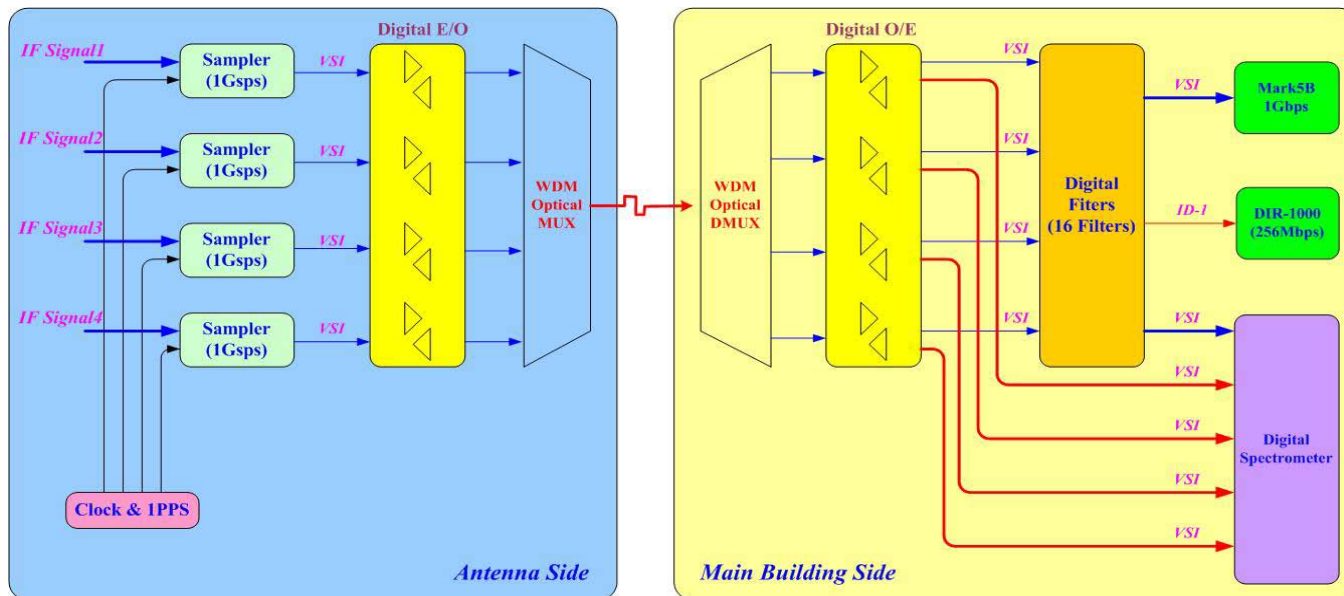
- Pointing accuracy
and Aperture efficiency at 100GHz
 - 4 arcsec
 - 50 %

Timeline for system development

	2008	2009	2010	2011
Optics 86/129G				
22GHz			- Yonsei, Ulsan局完成 - Tamna局：09年10月予定	
43GHz				
86GHz				
			Yonsei	Ulsan / Tamna
129GHz				
			Yonsei	Ulsan / Tamna
Phase cal. System				

DAS (Data Acquisition System)

- 4 channels Analog Inputs(750MHz/500MHz IFs of 22, 43, 86, 129GHz)
- 4 channels 2Gbps(500MHz) samplers
- 1Gbps recorder (MK5B)
- 256MHz, 128MHz, 64MHz, 32MHz, 16MHz and 8MHz
- 500MHz 4 channels digital spectrometers
 - single antenna observation mode
- It has been completed for 3 stations



Digital Filter mode

Mode	Band Width [MHz]	Output Streams	Bits/Sample	Output Data Rate [Mbps]	Output Clock Speed [MHz]
1	256	1	2	1024	32
2	128	2	2	1024	32
3	64	4	2	1024	32
4	32	8	2	1024	32
5	16	16	2	1024	32
6	8	16	2	512	16
7	64/128	2/1	2	1024	32
8	32/64/128	2/1/1	2	1024	32
9	32/128	4/1	2	1024	32
10	16/32/128	2/3/1	2	1024	32

Digital Spectrometer Mode

1. Wide band mode

- 512MHz X 4 bands (22,43,86,129GHz) @4096ch.

2. Narrow band mode

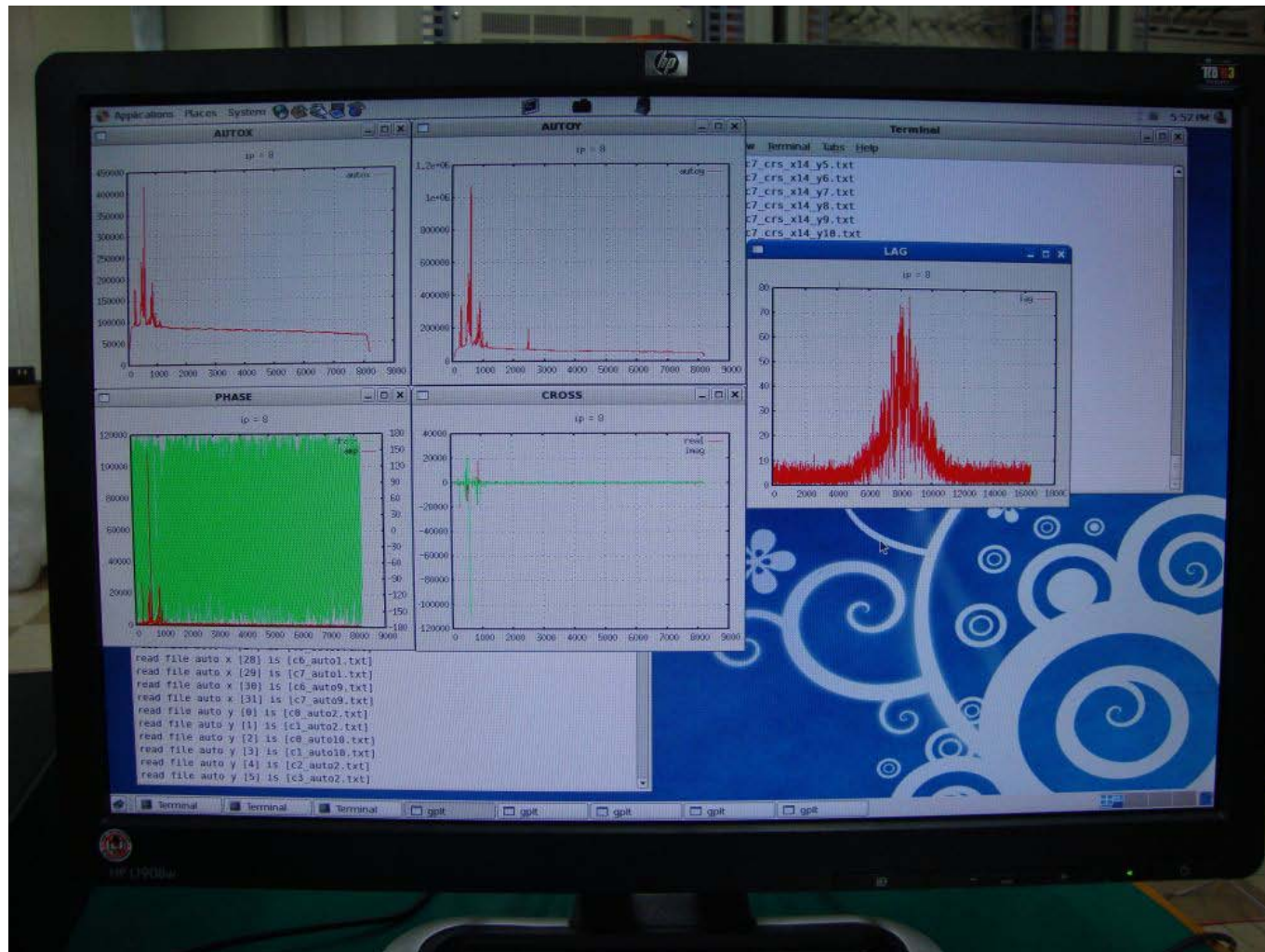
- 256MHz, 128MHz, 64MHz, 32MHz, 16MHz, 8MHz

Correlator 開発日程

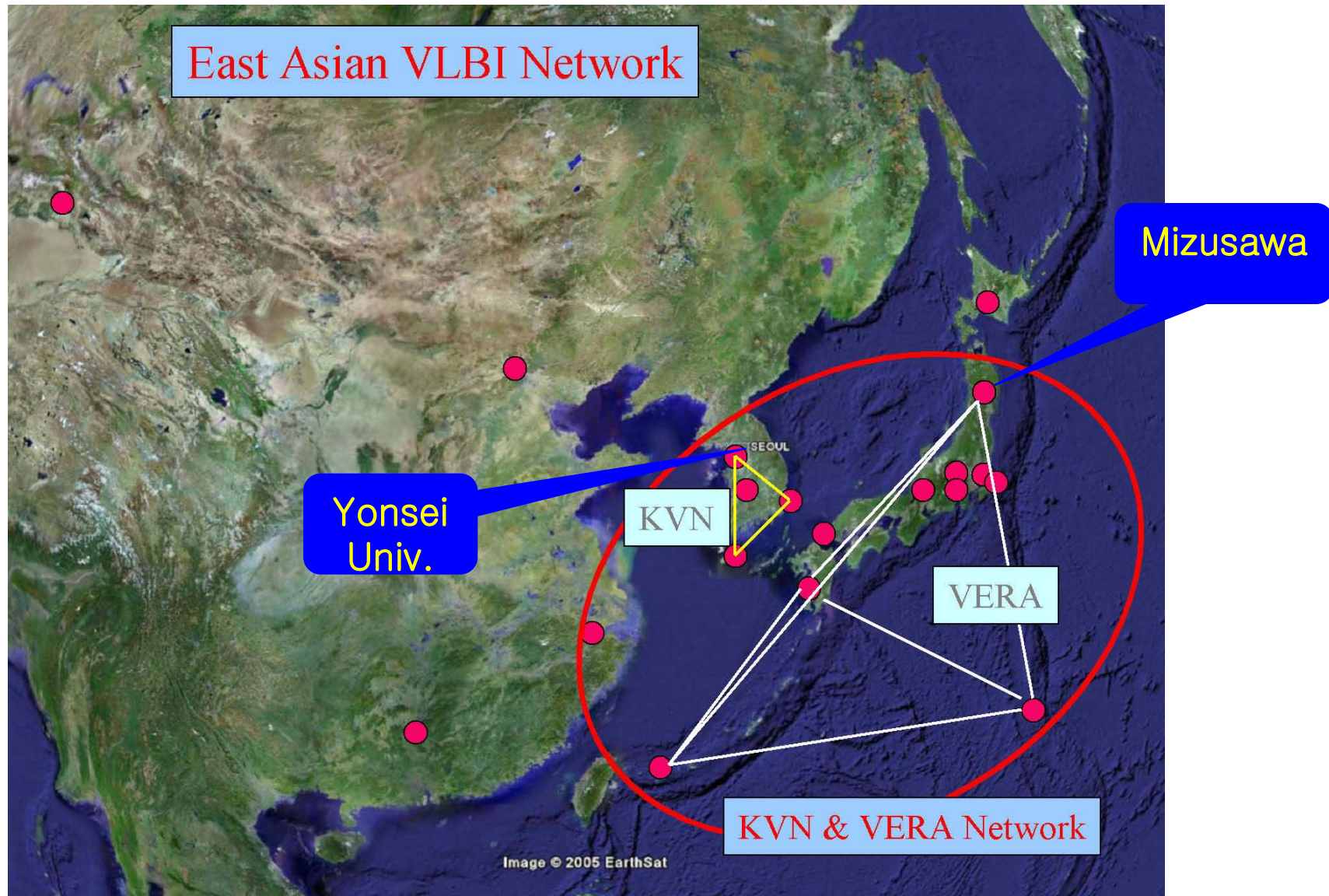
- 2009年 10月 : H/W 開発完了及びテスト
- 2010年 3月 : S/W ver. 1.0 開発完了
- 2010年 10月 : S/W 開発完了



KVN Correlator test

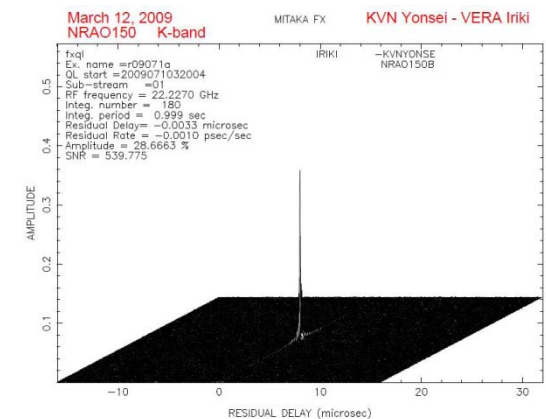
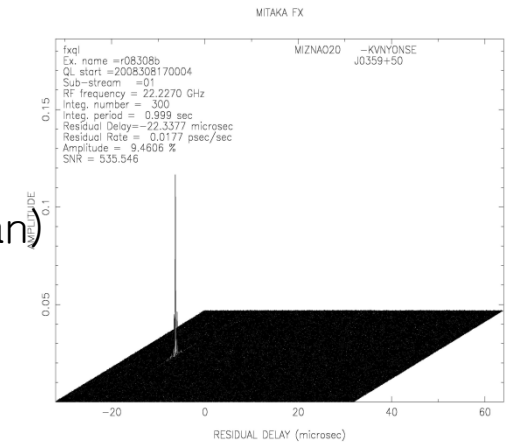


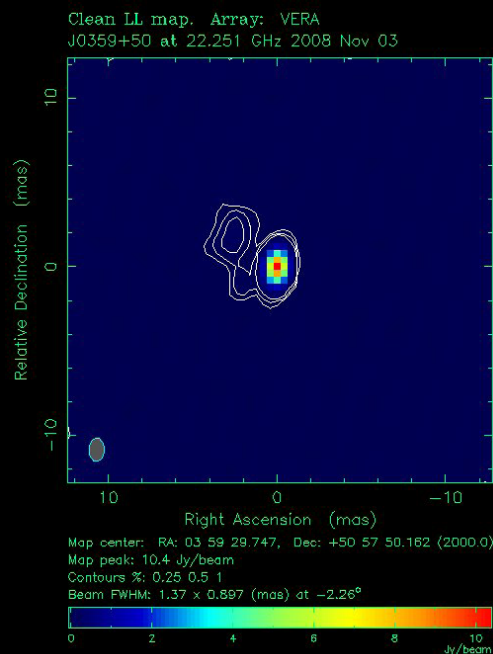
East Asian VLBI Network with KVN



KVN-VERA K/Q band experiments

- 1st fringe test at K-band on 1st/3rd of Nov., 2008
Maser: W49N, Ori-KL, Cont: J2148+0657, NRAO150(10 min/scan)
fringes detected from all observed sources; K band
- 2nd fringe test at K/Q band on 12/13th of March, 2009
After re-installation of 22 and 43 GHz receivers
fringes detected from all observed sources; K/Q bands
Sheshan participated on 12th, failed
- Image sensitivity experiment on 18th April, 2009
good UV-coverages and 1 hour of observation per source
NRAO150, 4C39.35, J0646+4451, 3C236 at K-band
- Image sensitivity experiment on 20/22th May, 2009
good UV-coverages and 1 hour of observation time per source
NRAO150, J0646+4451, 3C236, KV2327+1524, J1502+106 at K-band
Sheshan participated, rst EAVN fringe!, bad weather

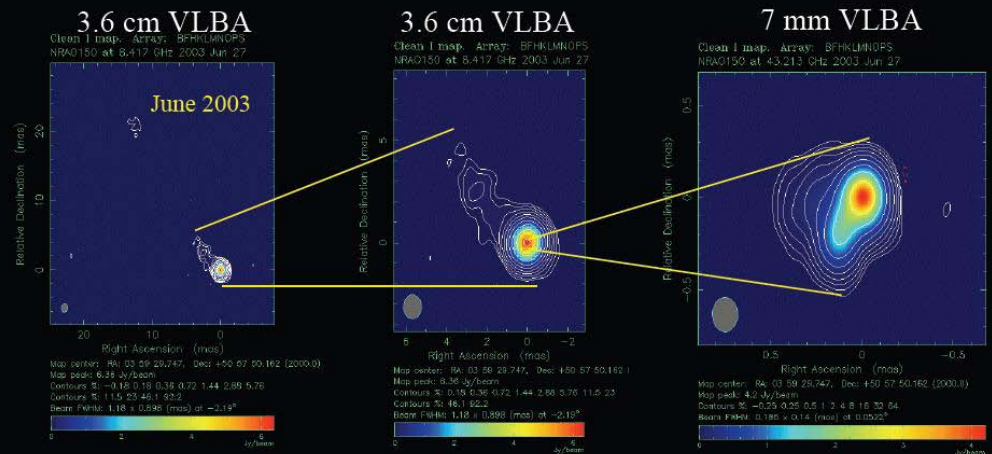




NRAO150 at K-band (3 Nov. 2008), 10mJy=Beam rms-noise are the structures real?

mm-VLBI: 120° inner to outer jet misalignment

Recent VLBA observation at 15 and 43GHz (Agudo, 2007), feel better?



- New 7 mm and 3.6 cm-VLBA observations reveal a strong misalignment (of $\sim 120^\circ$) within the first 0.5 mas
- Likely produced by a jet bent, alignment of the jet with line of sight and projection effects

KVN VLBI 2010

- **KVN-VERA VLBI observation**
- **Tamna fringe tests, KVN image sensitivity tests (with all 3KVN ants)**
- **After Cable cal. installation, phase ref tests**
- **K/Q band calibrator survey, Q-band fringe survey**
- **K-band geodesy test, EVN test participation, K/Q band ICRF**
- **First open use session(s)**