



East Asia VLBI Network

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NAOJ, VERA

2nd meeting of EACOA@2006.Mar.,7

VLBI stations

A light blue map of East Asia, including Japan, Korea, and China, serves as a background for the text. The map is semi-transparent and shows the geographical outlines of the countries.

- **Japan(11+1)**

- VERA(4), Kashima, Tsukuba, Yamaguchi, Nobeyama, Usuda, Tomakomai, Gifu, (Takahagi)

- **Korea(1+3)**

- Taejun, (+KVN (3))

- **China(2+3)**

- Shanghai, Urumqi, (+Beijin, Kumming, Delingha)

Feature of East Asia VLBI array

- **Dense station distribution**
total effective aperture : (more than VLBA)
 - 5,600 m² @8GHz
 - 4,400 m² @22GHz
- **Wide area distribution**
 - Maximum baseline length ~7,000 km
- **Wide band observation**
 - Wide band recording
 - Optical fiber link
- **Phase referencing**
 - VERA : 2 beam
 - KVN : multi-frequency

Activities

- **1st East Asia VLBI network meeting**
 - Ishigakijima island
 - Nov. 12th , 2005
 - 10 people from Korea
 - 2 people from China
 - 15 people from Japan
- **EAVN Science meeting on May 22,2006**
- **2nd will be held at Ulsan on Nov. 2006**

Activity related to East Asian VLBI

A light blue map of East Asia, showing the outlines of China, Korea, and Japan, serving as a background for the title and list.

- **China**

- FAST ; extremely powerful correcting area
- New telescopes at Miyun and Kumming
- Cheung'E : good opportunity for VLBI science
- Delingha : challenge for 3-mm VLBI station

- **Korea**

- KVN : new powerful array at higher frequency

- **Japan**

- VERA : some scientific outputs
- JVN : stable observations at 8GHz and test of 22GHz
- VSOP-2

Scientific results and interests

- **Japanese VLBI networks**
 - Demonstration of good feasibility
 - Phase referencing
 - Transient object ex. Cyg-X3
 - Methanol masers
- **Late type stars**
 - TRA0 – Nobeyama experiments
 - Multi-epoch tracing of different masers and transitions
- **Sgr A***
 - Structure
 - Challenge for variability

Scientific needs

- **Ambitious objects**
 - **Low luminosity AGN**
 - Radio quiet objects (Doi)
 - HST deep field survey (Fujisawa)
 - **Low brightness objects**
 - Cyg-X3, micro-quasars
- **Flexible and frequent observations**
 - Sgr A* variability (Shen)
- **New bands**
 - Methanol masers (Zheng, Honma)

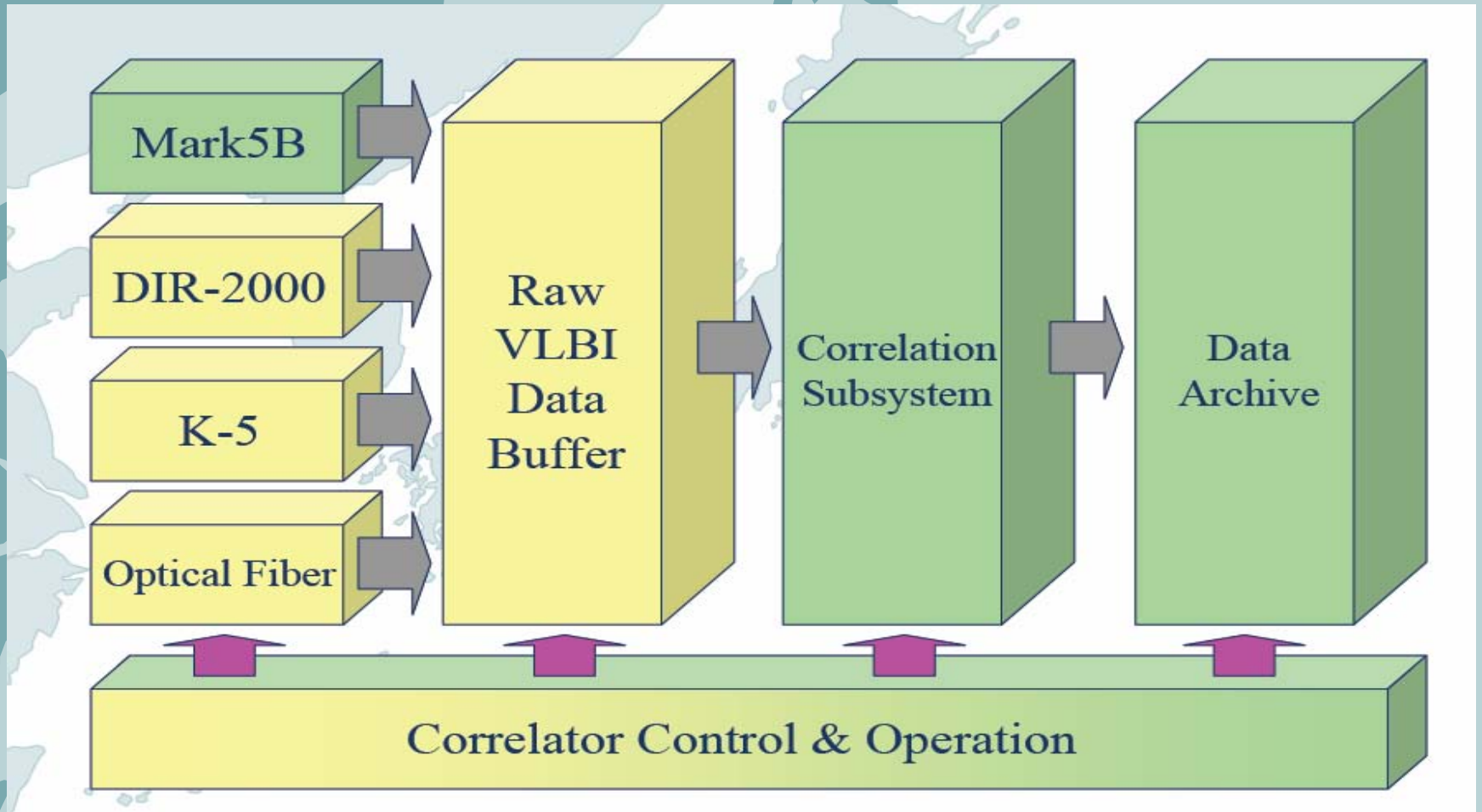
Terminal compatibility

	S2	K4	VERA	Mark V	K5
VERA Usuda/Nobeyama		○	○		
Jpn stns		○			○
KVN				○	
Sheshan Urumqi	○			○	
Miyun Kumming				○ ?	
Correlator	Mtk FX	Mtk FX	Mtk FX Mtk SW Seoul CR	Mtk SW Seoul CR	Mtk SW Seoul CR

Near future plan

- **Distribution of K4 terminals**
 - Some K4 terminal(256Mbps) available for EAVN from GSI.
 - GSI of Japan moved from K4 to K5
 - Three of them will be distributed to Shanghai, Urumqi, and Uchinoura.
- **3mm experiments with Nobeyama, Taeduk, and Delingha are under discussion.**

東アジア相関器構成図



東アジアVLBI相関器基本性能

- **Data Rate : 8Gbps/station Max.**
- **# of stations : 10 (min.), 16, 20 (hopefully)**
- **Freq. Resolution : <0.05 km/s at 22GHz**
- **Field of View : >1 arcmin**
Min. Integ. Time : <25 msec
- **For Space VLBI, Max. Delay : 32,000 km**
- **Max. Fringe Tracking Rate : 860kHz**
- **Various Playbacks : Mark5B, DIR2000, K5,
Optical Fiber(e-VLBI)**

東アジアVLBI相関器要求仕様

# of Antennas	16
# of Inputs / Antenna	4 bands (4Fx1P, 2Fx2P,1Fx2P+2Fx1P)
Max. # of Correlations / Input	120 Cross + 16 Auto
Subarray	2 case (12 + 4, 8 + 8)
Bandwidth for each Input	512 MHz
Digitization for each Input	1 Gsps by 2bits/sample
Clock for Input data	128 MHz
Max. Delay compensation	32,000 km
Max. Fringe Tracking	860 kHz
FFT points	1,048,576, w.r.t. multi-channel stream
Word length in FFT	16+16 bits fixed point for real & imag. Re-quantization to 4+4 bits fixed point
Integration	< 25 msec
Data compression (Flexible Binning)	8,192 channels

開発スケジュール

2005	Requirements, Specification Start of Technical Design
2006	Completion of Technical Design Start of Manufacturing (each parts)
2007	Manufacturing (each parts) Development of Control & Operation Software
2008	Assemble into whole correlator system Test and debug the correlator system (HW & SW)
2009	Start of Experimental Operation Completion of Archive System
2010	Open for Korea-Japan Joint VLBI Network Establish the K-J Joint Correlation (Data) Center

開発体制・



Future works

- **Check imaging capability and Tb limit**
 - 8GHz observations
 - Phase referencing
- **For stable observations**
 - K4 to Chinese telescopes
 - Or wait until Seoul correlator (2008 or 09)
- **Reorganization of 3mm**
 - Nobeyama, Taeduk, Delingha
 - For future KVN 3mm