



Recent Report of Development of Korea-Japan Joint VLBI Correlator and KVN Construction

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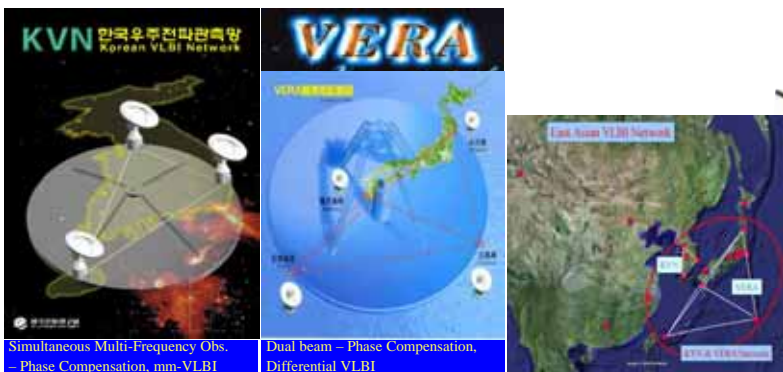
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Abstract

In this presentation, we introduce the development of Korea-Japan Joint VLBI Correlator (KJJVC) and KVN (Korean VLBI Network) construction briefly. The KVN (Korean VLBI Network) is now building 3 new high-precision radio-telescopes of 21-diameters in 3 places (Seoul, Ulsan, Jeju). It is dedicated for mm-wave VLBI observation and the first VLBI facility in Korea. And we are also developing the KJJVC for the combined VLBI network consisting of KVN and VERA including several other telescopes. It is being discussed mainly by the Korean and Japanese correlator teams and applied several new functions and ideas. We present some recent status from both KJJVC development and KVN construction.

VLBI Facility in Asia KVN, VERA, VSOP-2, CVN

- **Dedicated VLBI networks**
 - ✓ VERA (Since 2002), KVN (From 2008), CVN
- **Other Radio Telescopes**
 - ✓ Nobeyama 45m, TRA0 14m, Delingha 14m
 - ✓ Others in many Universities and Institutes



Essential Requirements to the KJJVC

- **Data Rate : 8Gbps/station**
- **# 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) be installed for geodesy on other bench**

Main specifications of the KJJVC

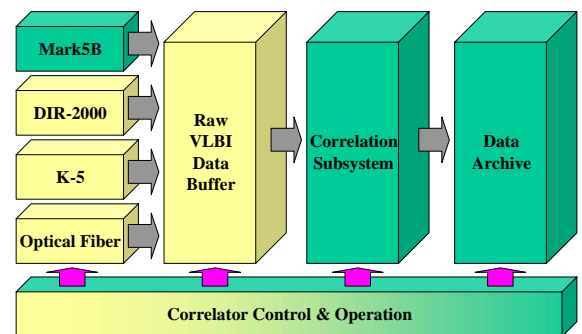
# of Antennas	16
# of Inputs / Antenna	4 bands (4Fx1P, 2Fx2P, 1Fx2P+2Fx1P)
Max. # of Correlations / Input	120 Cross + 16 Auto
Subarray	2 case (12 + 4, 8 + 8)
Bandwidth for each Input	512 MHz
Digitization for each Input	1 Gbps by 2bits/sample
Data Rates per antenna	64 MHz (32 parallels)
Max. Delay compensation	32,000 km
Max. Fringe Tracking	860 kHz
Architecture	FX type, with FPGA and DSP chips
FFT points	256k/128k/64k/32k/16k/8k Adjustable
Word length in FFT	16+16 bits fixed point for real & imag.
Integration	< 25 msec
Data compression (Flexible Binning)	8,192 channels

Next Generation Correlator in East Asia

- Joint Correlator Project between Korea and Japan VLBI Facility in Asia

- We conclude that KASI & NAOJ join together for the best performance.
 - **MOU between KASI & NAOJ (2005. 7. 7.)**
 - Development of Korea-Japan Joint VLBI Correlator
 - Common facility of correlation & data center
 - Joint Development Project was initiated respectively.
 - Japan : 5 years from April 2005
 - Korea : renewed succession project, 5 years from Jan. 2006
 - Requirements & specifications are almost determined.
- Now the **final detailed technical design study** is under way in close cooperation between Korea and Japan.
- The Korea-Japan Joint VLBI Correlator (KJJVC) would fill the role of heart for East Asian VLBI Network and the Space VLBI with VSOP-2. (East Asia VLBI Consortium Committee, organized at the EAMA6 meeting on Oct. 2004)
 - We expect that this project becomes a representative East Asian cooperation in astronomy field. (East Asian Core Observatories Association, organized at Tokyo on Sep. 21, 2005)

Framework of the KJJVC



Responsible to KASI Responsible to NAOJ

Organization



Development Schedule

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

Recent Results on Raw VLBI Data Buffer

- **Purpose :**
 - ✓ Data format adjustment : # of bits per sample, and so on
 - ✓ Easy synchronization while playback (heterogeneous recorder models)
 - ✓ Buffering between recorder speed (1 Gbps) and correlation speed (8 Gbps)
 - ✓ Handy switching over to next session
- Trial Manufacture is under test phase.
 - ✓ VSI I/O subsystem (FVSI-4000) + Mass storage (FDR-1000)
- FVSI-4000 : Two 2 Gbps VSI inputs/outputs (Two FVSI-4000 can cover up to 8 Gbps.)
- FDR-1000 : HDD (Capacity depends on a budgetary scale)



FVSI-4000



FDR-1000