



# Current Status of Korean VLBI Network



한국우주전파관측망  
KOREAN VLBI NETWORK · KASI

Se-Hyung Cho and KVN Team

# Contents



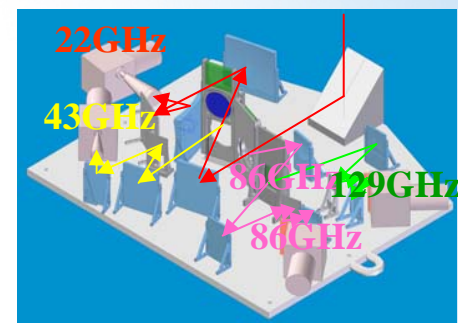
- **Characteristics of Korean VLBI Network**
- **KVN Schedule**
  
- **Installation of Antenna**
- **Quasi-optic System**
- **Receiver System**
- **Korea-Japan Correlator**
  
- **KVN Science**
- **Plan of 2008**
  
- **Construction Plan of KVN Research Center Building**
  
- **Future Plan of KVN**



# Characteristics of Korean VLBI Network



- **National Facility dedicated to exclusive mm-VLBI (KVN 21 m x 3 + TRAO 14 m)**
- ***Simultaneous* multi-frequency observation from 22GHz up to 129GHz**
- **Multi-frequency phase-referencing and fast-switching phase-referencing capabilities**  
→ Faint sources, weak lines at mm wavelengths
- **Compact network with a few hundred km baselines**





## ■ Observatory Building

- KVN Ulsan, Yonsei, Tamna obs. building was completed

## ■ Antenna Installation

- First antenna at Ulsan observatory
  - Installation and panel adjustment was completed in Sep. 2007 (total rms of main reflector ~ 58  $\mu\text{m}$ )
  - Test observation of 100 GHz band for acceptance as a single dish : Dec. 10–Dec. 21, 2007
- Second antenna at Yonsei observatory
  - Panel adjustment and test observation for acceptance will be completed within Feb. 2008
- Third antenna at Tamna observatory
  - Installation and acceptance will be completed within March 2008

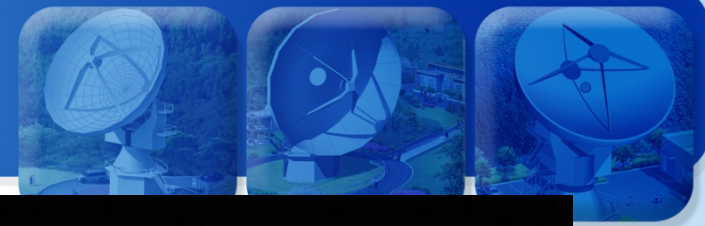


## ■ Receiver Development and Installation

- One set of 22, 43 GHz band receiver at the 1st stage will be developed and installed within Dec. 2007 and two sets of 22, 43 GHz band receiver will be developed and installed within the latter half of 2008
- 86, 129 GHz band receivers at the 2nd stage
  - Under design work in 2007
  - Development and installation will be completed until 2010

## ■ Correlator Development and Installation

- Contract for manufacturing in Aug. 2007, Korea-Japan working group and review committee are in activity since 2006
- Assemble whole correlator system and start of experimental operation in 2009
- Practical use for KVN and K-J joint VLBI network in 2010



## Panel adjustment by Photogrammetric method

→ total rms of 21m reflector :  
~ 58  $\mu\text{m}$  (Sept. 3, 2007)





June 2007



Aug. 2007



Oct. 28, 2007



# KVN Tamna



May 2007



Nov. 2007



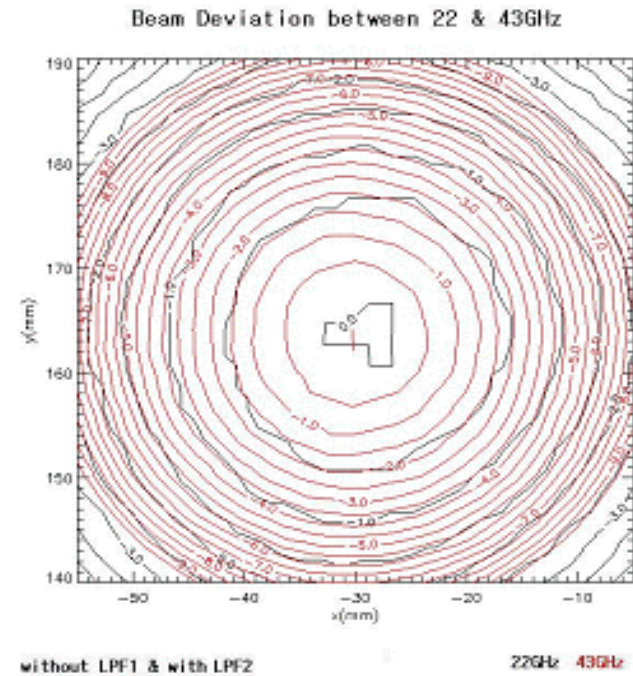
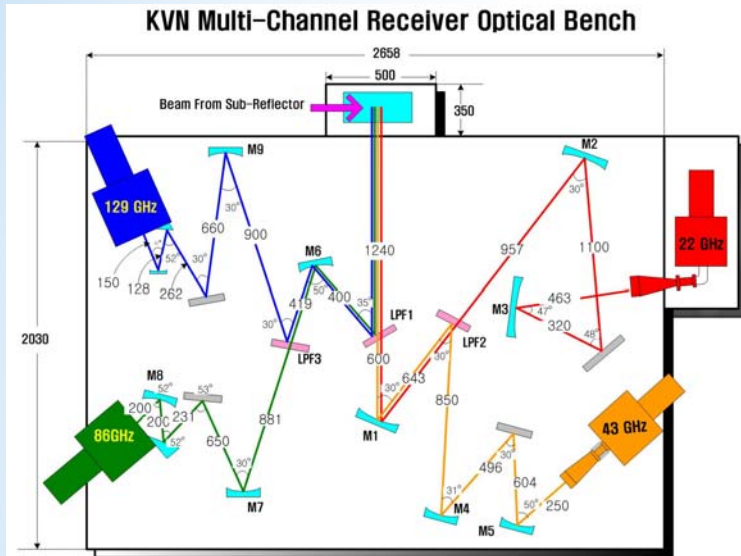
Sept. 2007



Bird's - eye View



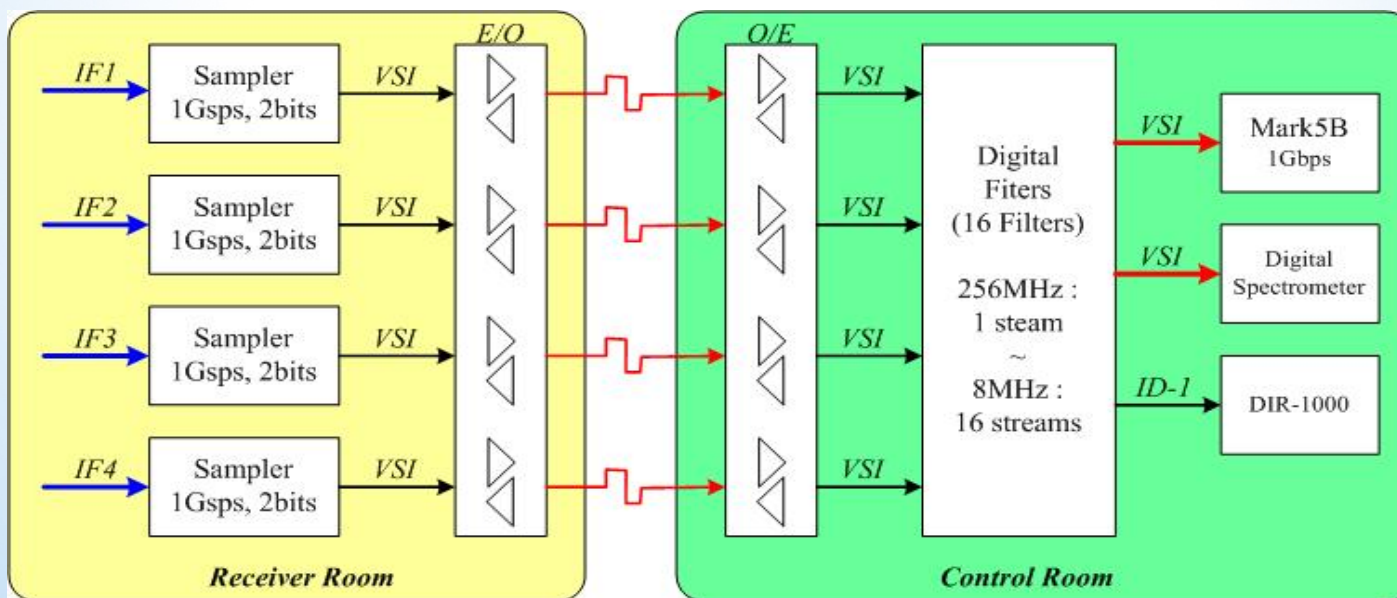
# Quasi-optic System



# Receiver system & DAS



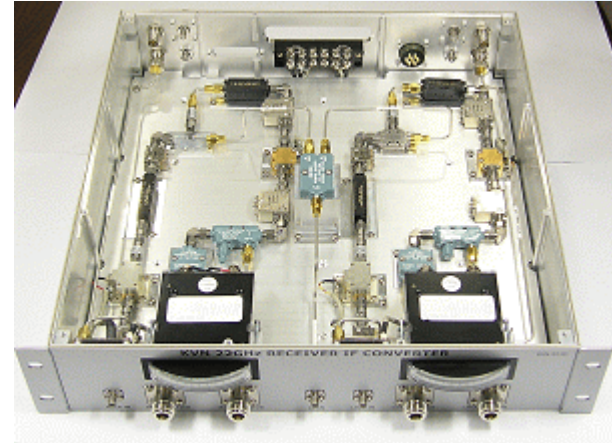
Freq. Band	S Band	X Band	K Band	Q Band
Freq. Range	2.2 ~ 2.8 GHz	8 ~ 9 GHz	21.5 ~ 23.5 GHz	42 ~ 44 GHz
Rx Noise	< 25 K	< 25 K	< 30 K	< 50 K
1 <sup>st</sup> IF / BW	2.5G/600MHz	8.5G/1GHz	8.5G/2GHz	8.5G/2GHz
IF Power	-20 dBm	-20 dBm	-20 dBm	-20 dBm
Polarization	LCP/RCP	LCP/RCP	LCP/RCP	LCP/RCP



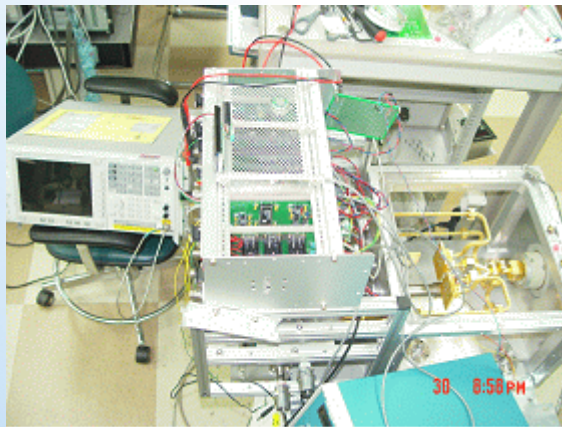
# Receiver system



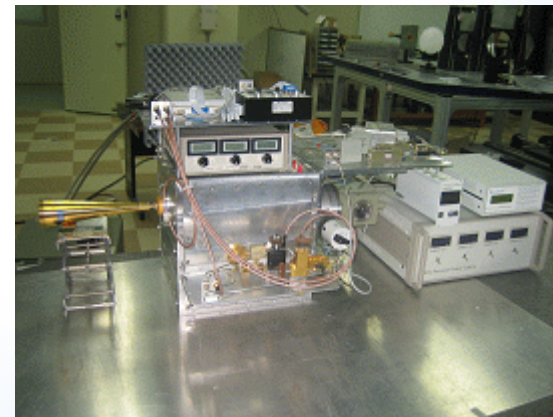
22 GHz Band RX



22 GHz Band IF



43 GHz Band RX

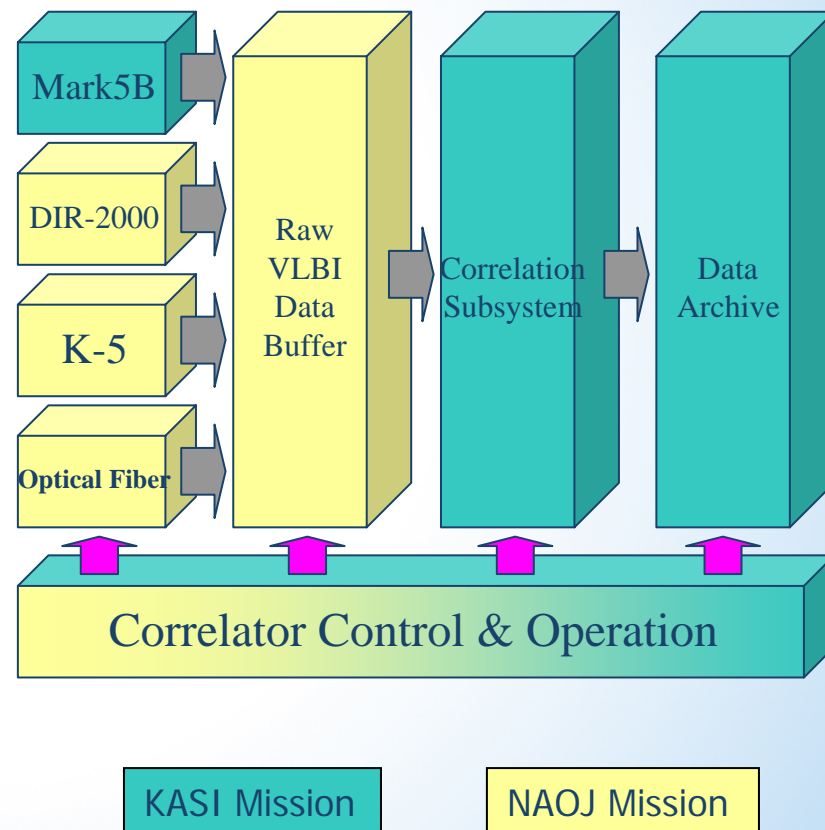


100 GHz Band RX

# Specification and Framework of Korea–Japan Correlator



# 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
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



# Korea-Japan Correlator in 2007



- **Contraction of manufacturing correlator sub-system with ELECS company in Aug.**  
(completion : Aug. 2007-Aug. 2009)
- **4 times WG meetings every 2-3 months : discussion on specification and correlator developing work etc.**
- **Third review committee meeting in Nov. 15-16 at NAOJ, Tokyo**
- **Practical use for K-J Joint VLBI network and establishment K-J Joint Correlation Data Center in 2010**



## ■ Multi-frequency and multi-epoch observational study for

Star forming region, late-type stars, Galactic center, AGN, detection of core shift, variability of microquasars, gravitational lens objects

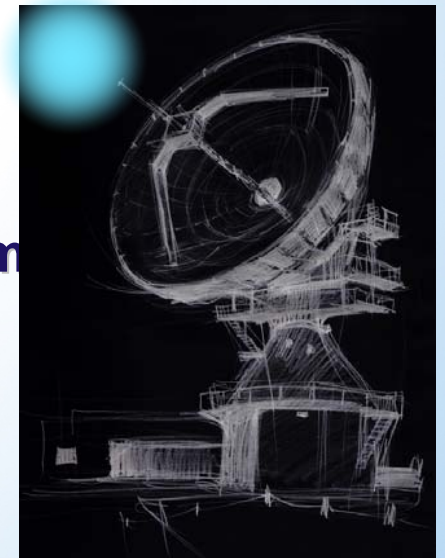
- Maser mini workshop : July 2006 at KASI
- AGN mini workshop : Aug. 2006, AGN Summer School : July 2007 at KASI

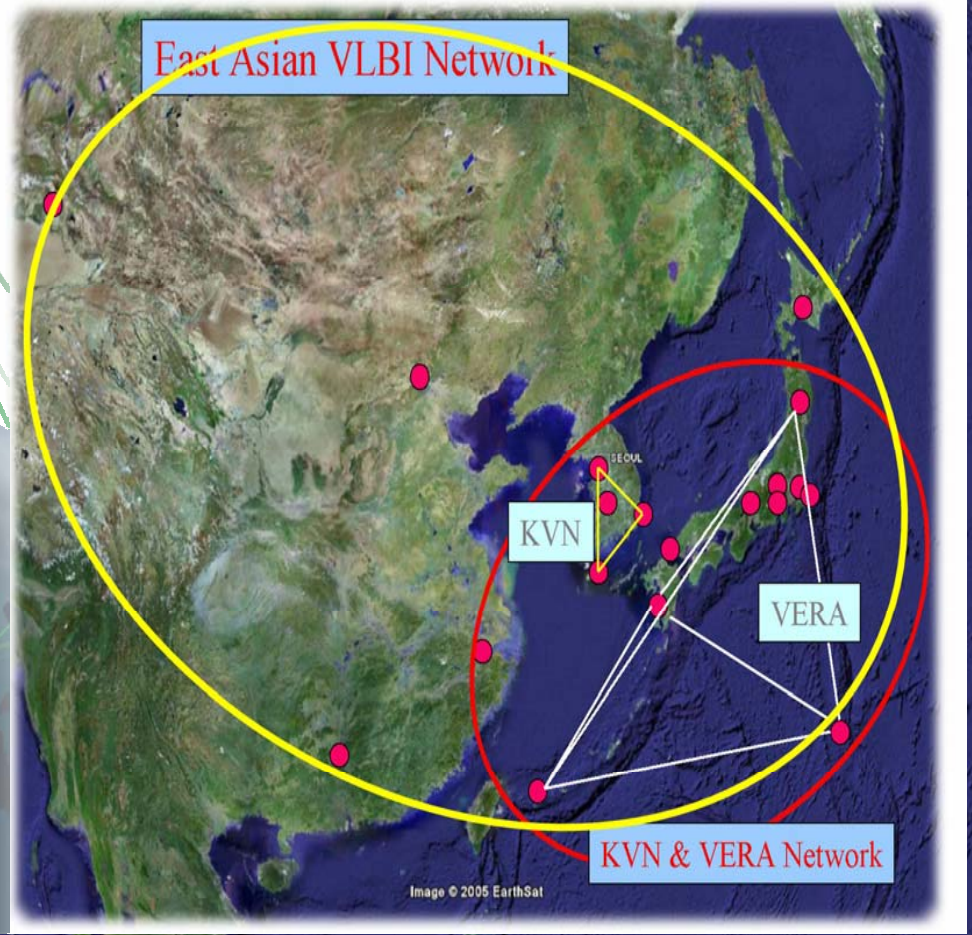
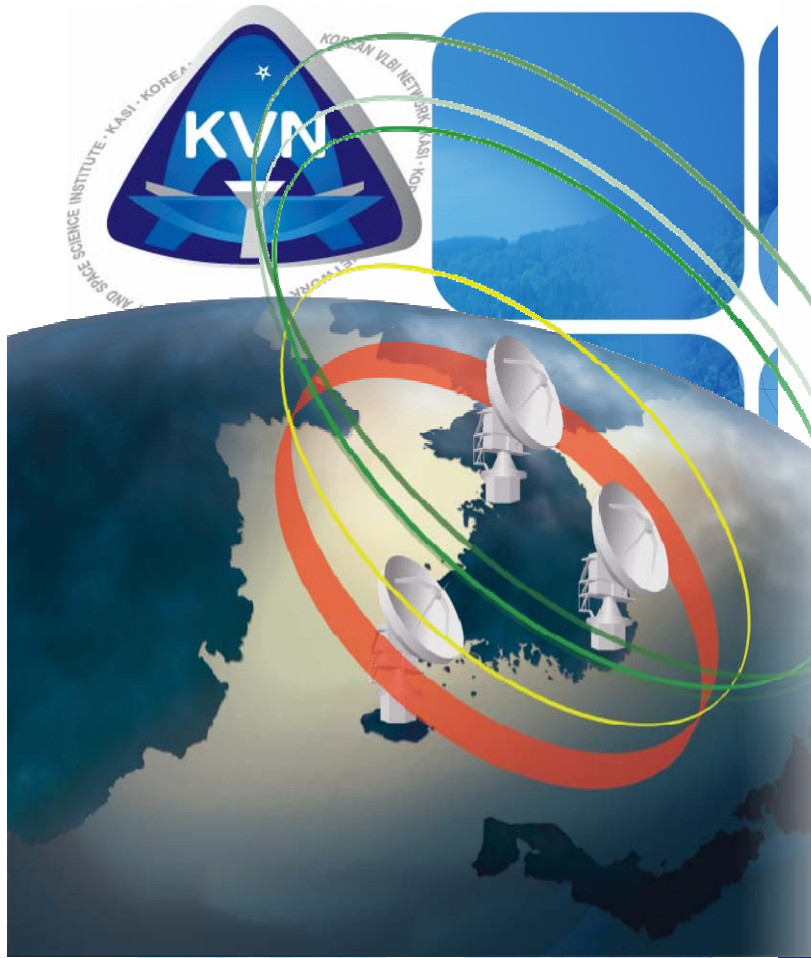
- *Workshop in Dec. 2007 by Radio Astronomy Sectional Committee of Korean Astronomical Society :*  
KVN key science will be also discussed

# Plan of 2008



- **Complete installation and panel adjustment of telescope at Yonsei and Tamna in Feb. and March 2008**
  - Test observations of 100 GHz band for acceptance (confirming total rms of 21 m reflector within 60  $\mu\text{m}$ )
  
- **One station of KVN can be used for VLBI test observation with VERA/JVN (Scheduling etc. will be discussed)**
  - KVN Yonsei tel. equipped with first one set of 22/43 GHz RX since March will be used as a test bed
  
- **Manufacture two sets of 22/43 GHz RX within autumn**
  
- **Request budget for construction of KVN Research Center Building again**
  - Budget : \$15M ( $\sim 8,250 \text{ m}^2 = 2,500 \text{ 坪}$ )
  - Construction period : 2009 ~ 2011

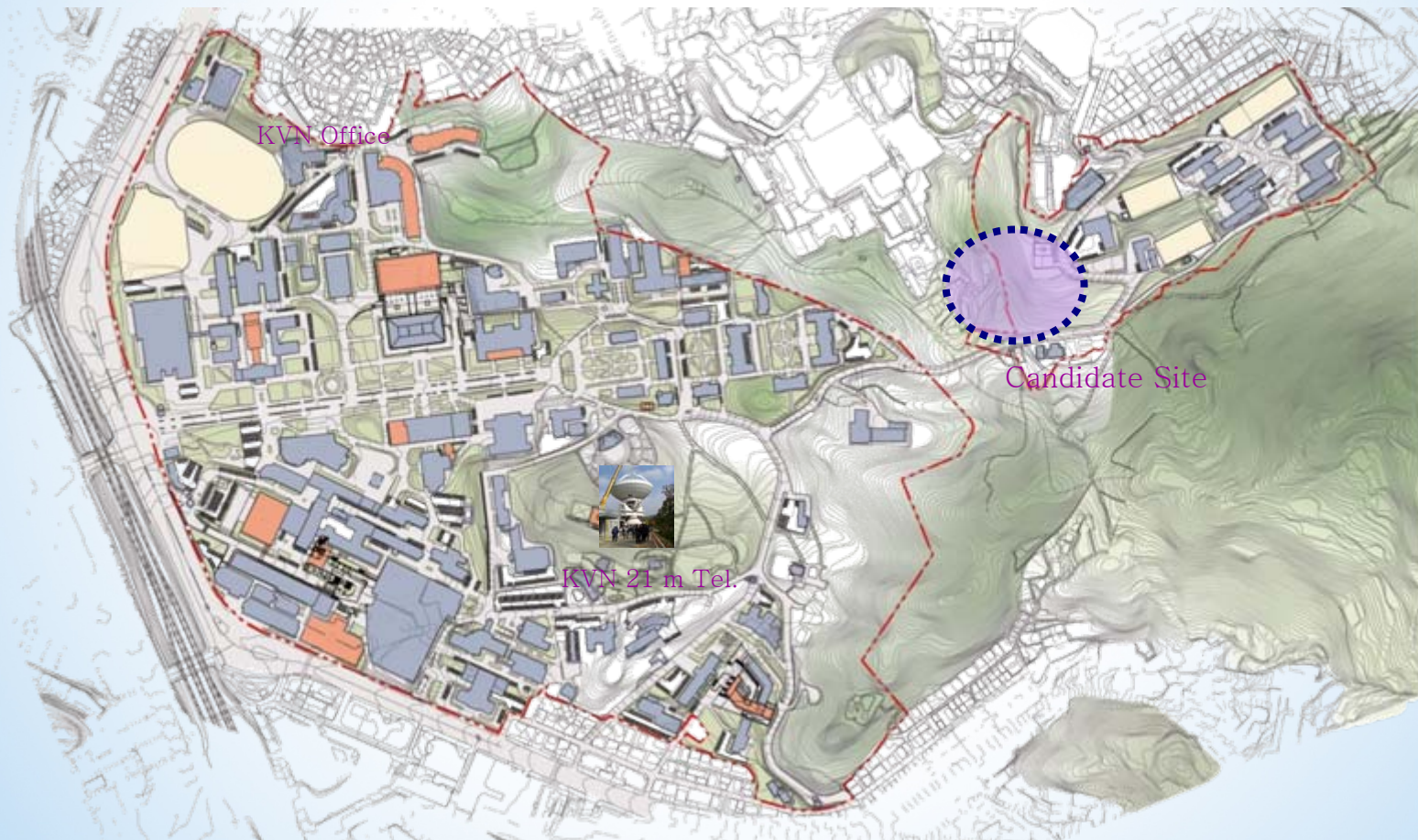




## Construction Plan of KVN Research Center Building toward East Asian VLBI Research Center



# Location of KVN Research Center Building at Yonsei Campus



# Role of KVN Research Center Building



## ■ Space for National VLBI Research Center

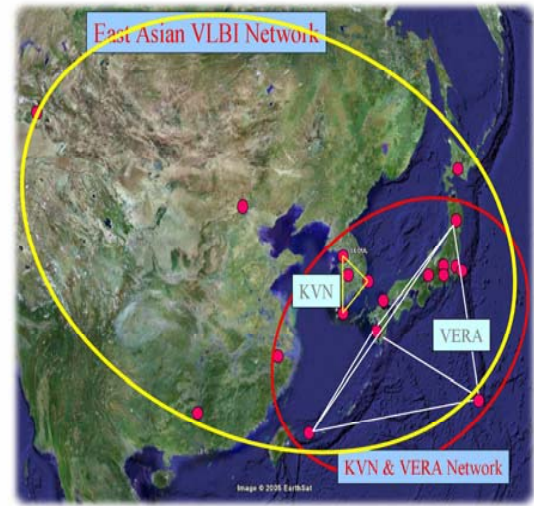
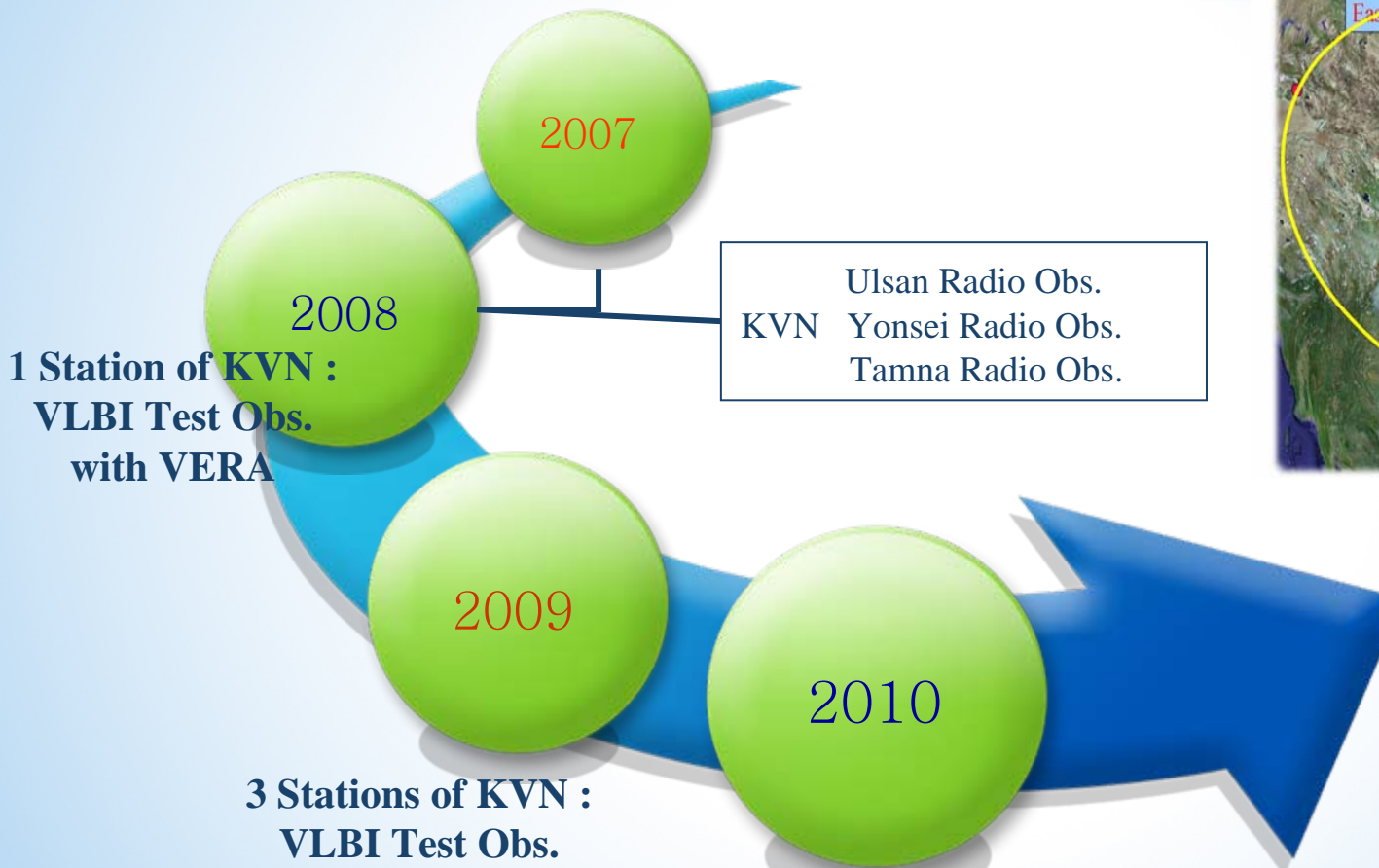
- Institute-University Cooperation in Korea
- Korea-Japan, East Asia, and International Collaboration

## ■ Correlator Operation Center

- like Socorro and JIVE correlation center

## ■ Infra-structure for East-Asian VLBI Research

# Future Plan of KVN



East Asian  
VLBI Research  
Center

Completion of K-J Correlator  
Completion of mm VLBI (86 & 129 GHz)  
Construction of KVN Research Center Building