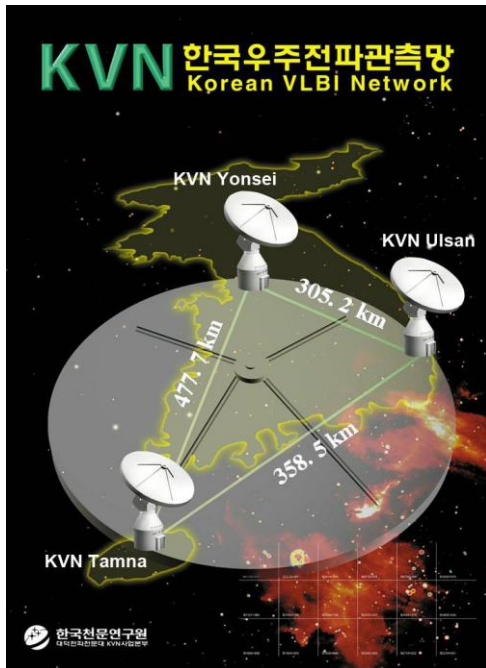


Recent Activities of the KVN

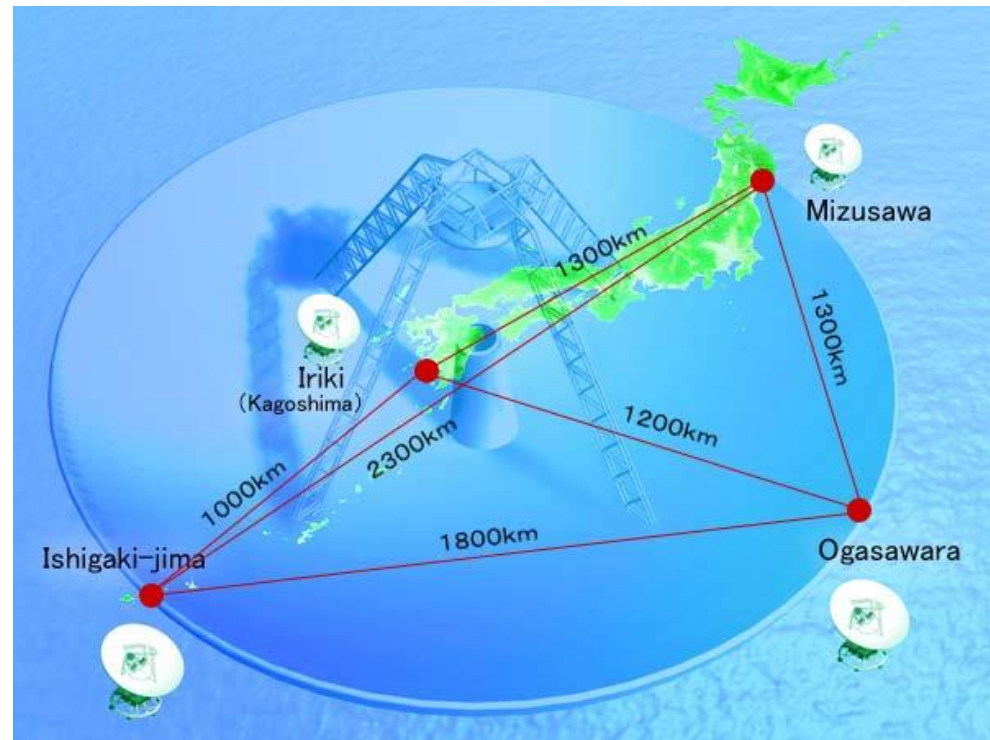
Chung-Sik Oh (KASI)
VERA User's Meeting 2015

KaVA : KVN and VERA Array



KVN Baseline 300- 500 km

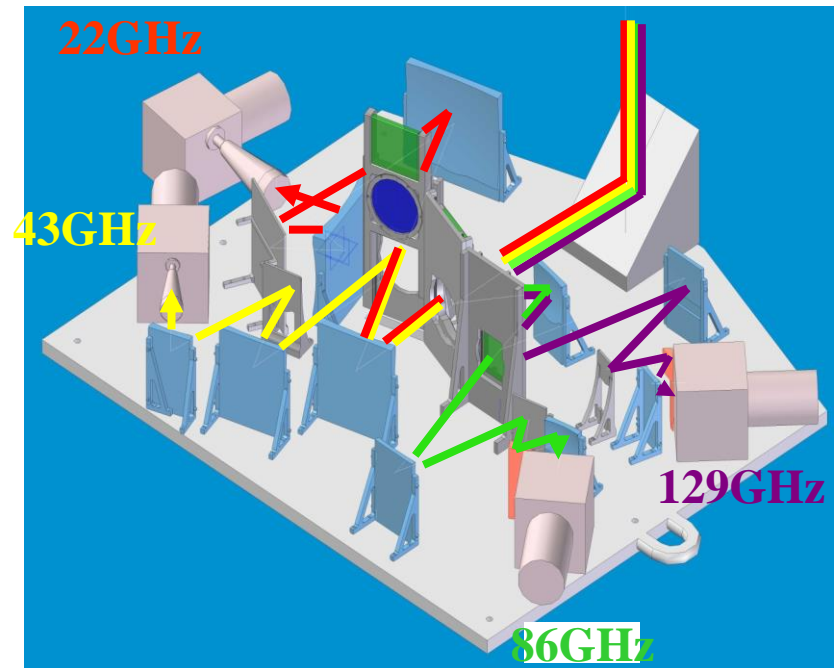
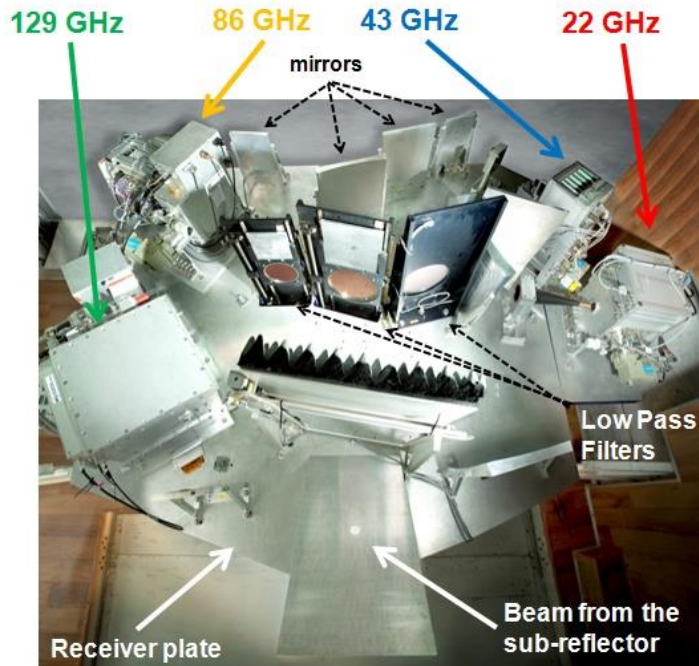
VERA (VLBI Exploration of Radio Astrometry)
Four 20m antennas , Baseline 1000- 2300 km



Correlated by Daejeon HW Correlator at KJCC

Multi-Frequency Receiving System of KVN

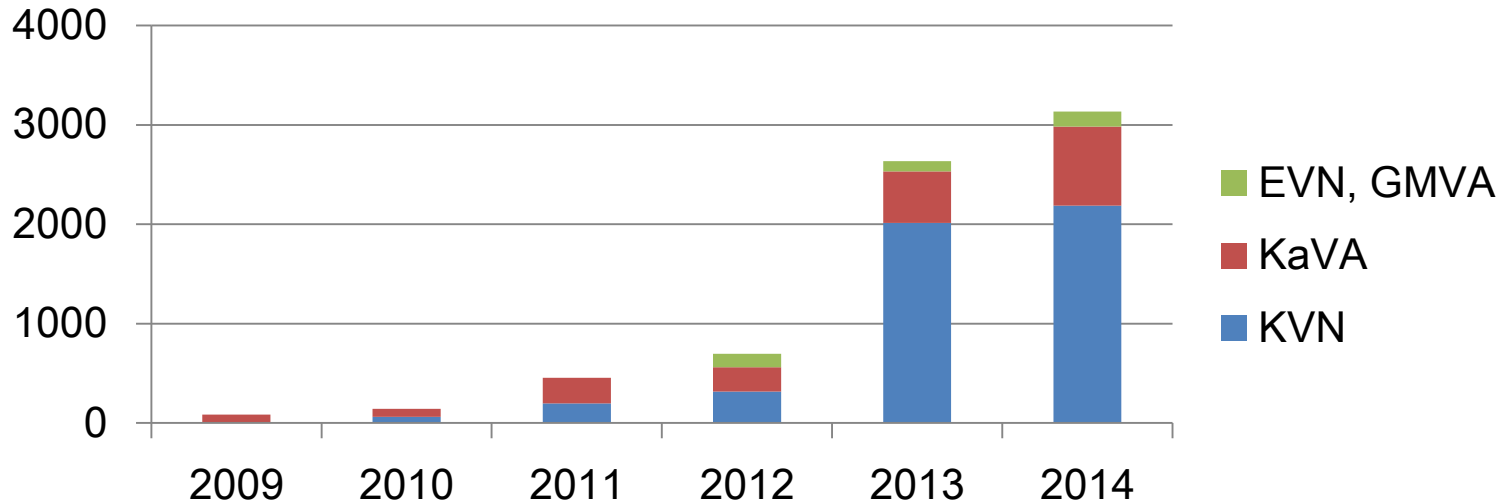
- Simultaneous Multi-frequency Observation
 - @ 22/43/86/129GHz (Aperture Efficiencies: 60 – 30%)
 - integration time > 5 min @ 130GHz
- Dual Pol : LCP & RCP
 - Simultaneous 2 freq bands w/ full stokes



Science using KVN Multi-Freq. Capability

- Weak source detection
- Chromatic Astrometry
 - AGN Core Shift
 - Registration of multi-transition maser maps
 - : Water + SiO Masers of Evolved Star
 - : Water + Methanol Masers of Massive SFR
- AGN Jets
 - Spectral Index Distribution
 - Faraday Rotation Measurement (Polarization)

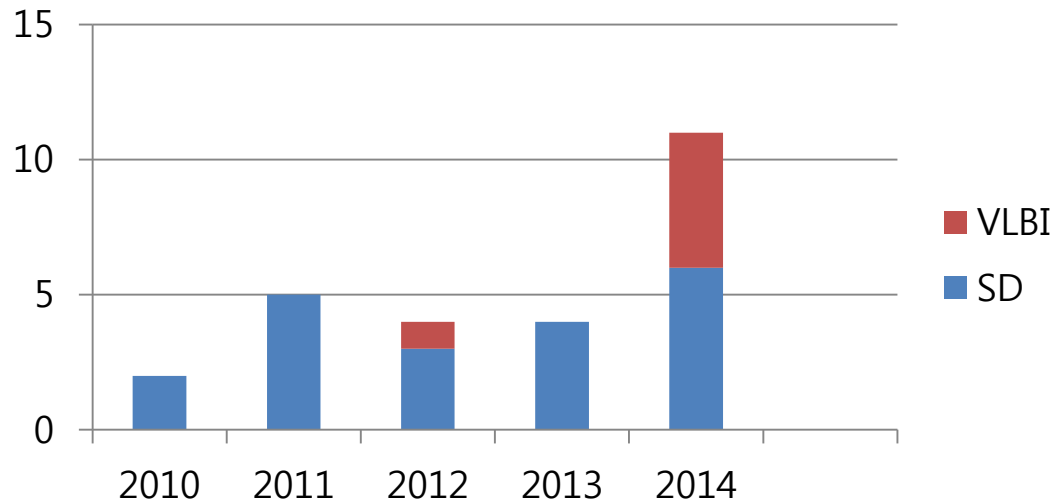
KVN Operation Time



- Operation Time
 - > 3000 h/yr for VLBI, 3x 600h/yr for SD
 - KVN KSP : 1000h/yr , KaVA Science WG : 500h/yr
- Common Use (~1100h/yr)
 - 600h/yr for KVN (Open to Global from 2015B)
 - 500h/yr for KaVA (Open to Global from 2016A)

Publications

- 5 VLBI + 6 SD papers in 2014



VLBI Publications in 2014

- Early Science with the KVN : [Evaluation of System Performance](#) - S.S. Lee + (AJ)
- [Verification of the Astrometric Performance](#) of the Korean VLBI Network using comparative SFPR studies with the VLBA at 14/7 mm – M. Rioja + (AJ)
- Astrometrically Registered Simultaneous Observations of the 22 GHz H₂O and the 43GHz SiO masers towards R Leonis Minoris using KVN and Source/Frequency Phase Referencing – R. Dodson + (AJ)
- The First VLBI Image of a 44 GHz Methanol Maser with the KaVA – N. Matsumoto + (ApJL)
- VLBI observations of bright AGN jets with KaVA: [Evaluation of Imaging Capability](#) – K. Niinuma + (PASJ)

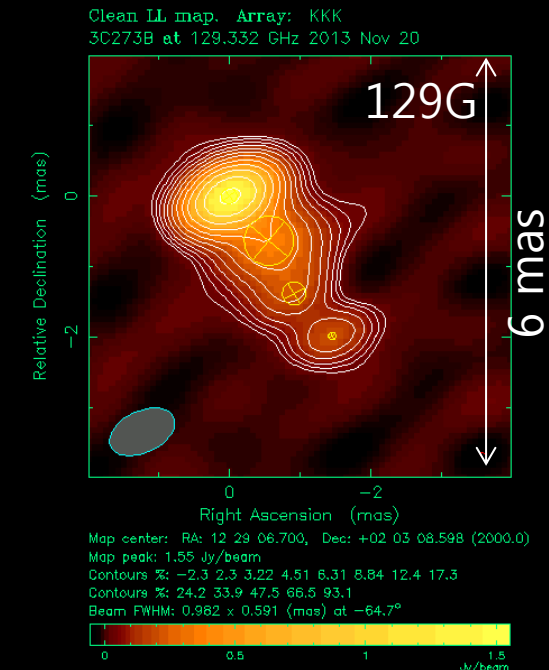
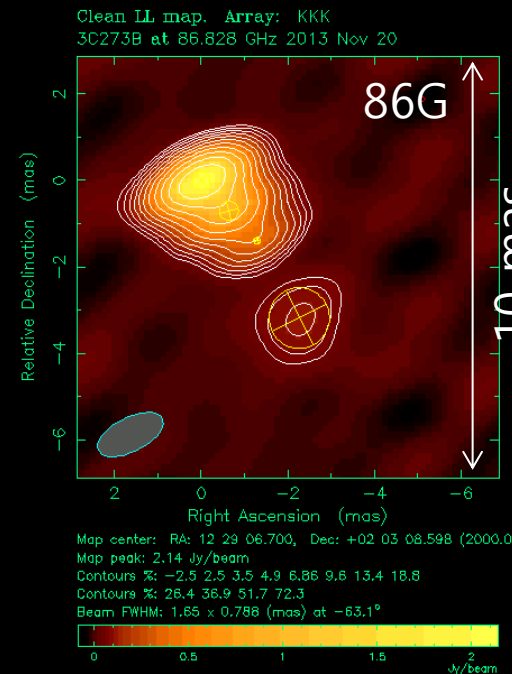
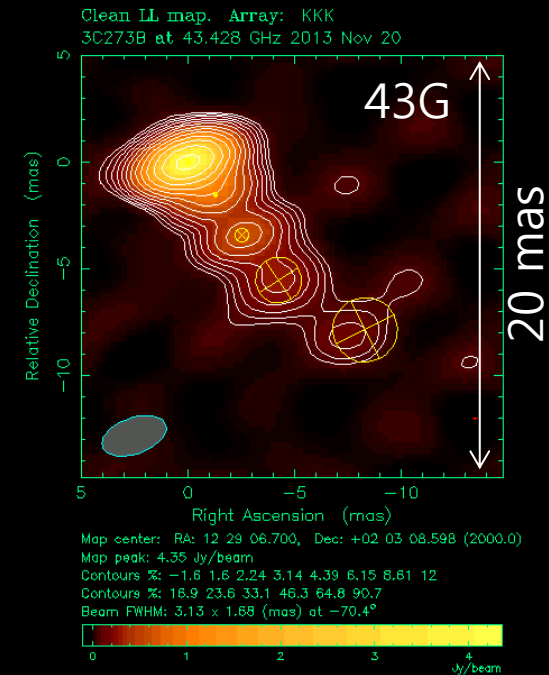
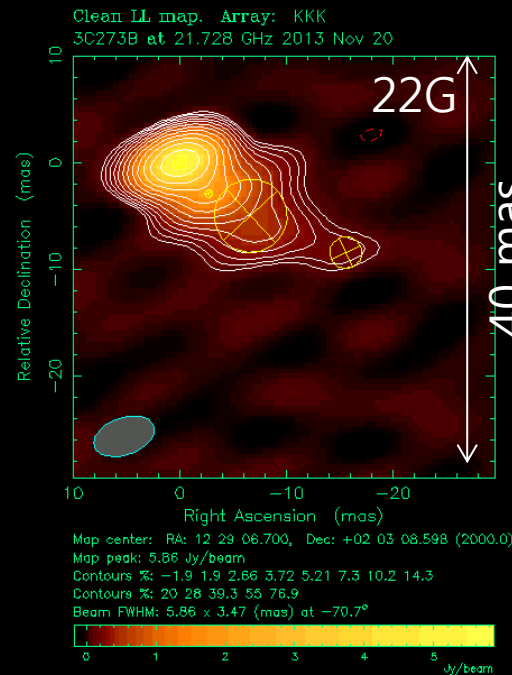
Key Science Projects (KSP)

- 1st KSP Phase (2015-2018)
 - KSP time ~ 1000 h/yr + α
- 2 KSP projects + (2-3 Candidates)
 - Interferometric MOnitoring of GAMMA-ray Bright AGN : iMOGABA (P.I.: Sang-Sung Lee)
 - Simultaneous Monitoring of KVN 4 Bands toward Evolved Stars (P.I.: Se-Hyung Cho)

KSP1: iMOGABA

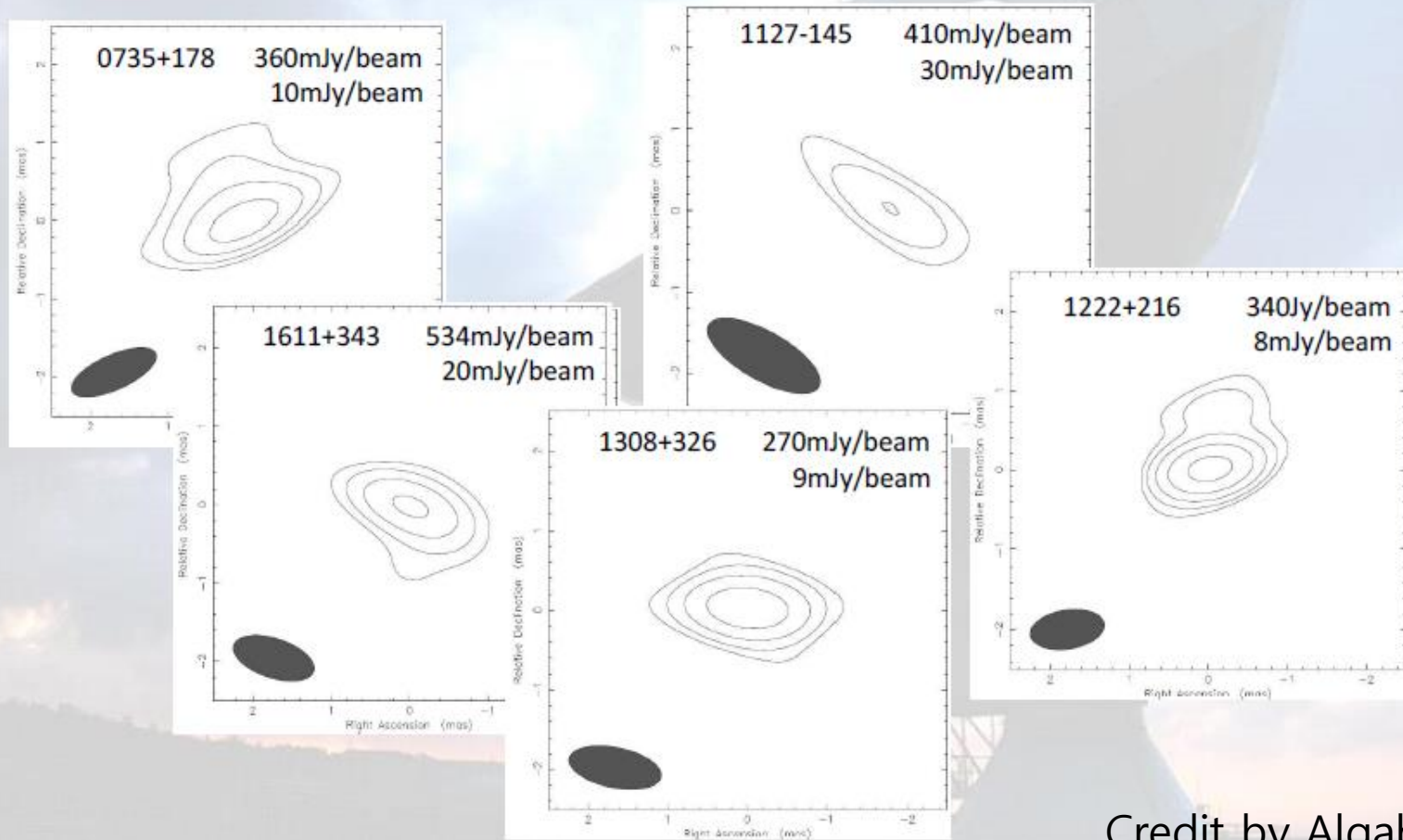
by Sang-Sung Lee

- ~30 Sources
- 22/43/86/129GHz
- Snap Shot Imaging
3-5 5-min scans/source
- 1 month interval
- + SD Polarization ToO



FPT Evaluation for iMOGABA

■ Imaging at 129 GHz



Credit by Algaba

Standard Method : 18 successful images among 30

Frequency Phase Transfer Method : 28 successful images

KSP2: KVN 4 band monitoring of Evolved Stars

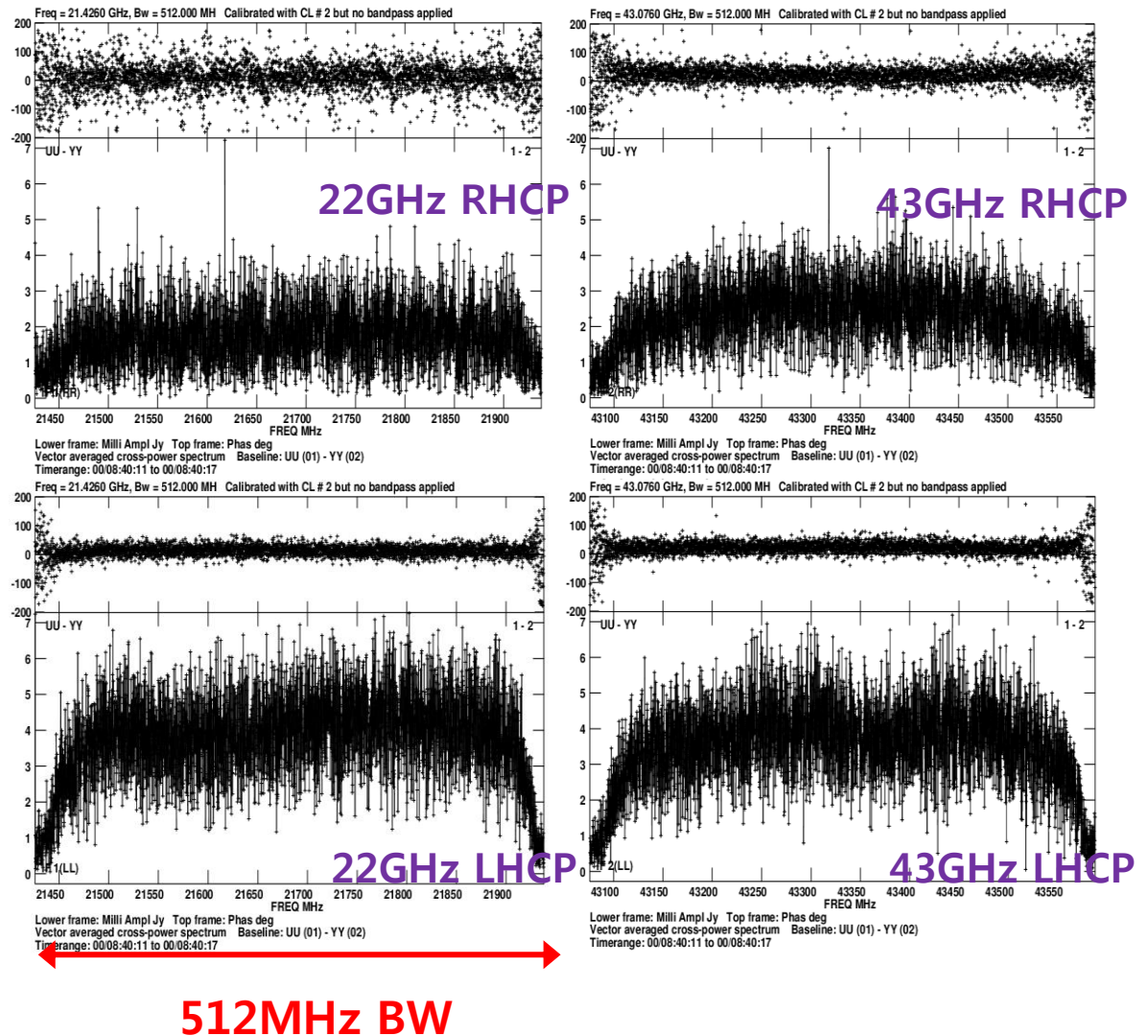
- Spatial structure and dynamical effect **from SiO to 22 GHz H₂O maser regions** according to stellar pulsation through simultaneous monitoring obs. of KVN 4 bands (~15 Objects)
 - Pulsation and shock wave propagation effect : development of outflow motion and asymmetry ► Mass loss mechanism
- Correlation and difference of maser properties (spatio-kinematic properties etc) **among SiO J=1-0, J=2-1, J=3-2 masers**
 - Constraints on SiO maser excitation and pumping models (collisional and/or radiative)
- **Dynamical evolution from AGB to post-AGB stars :** Morphology & mechanism, characteristics of SiO and H₂O maser properties
 - Synergy with KaVA Evolved Star Large Program and ALMA Observations

Recent Upgrade Activities

- Astrometry with the KVN (and KaVA)
 - KaVA K-band geodesy observations
 - Multi-Frequency P-Cal / New HVAC
 - Wet Delay Correction using GPS data
- Wideband Operations
 - KVN: 4 IFs x 2 Gbps with (Fila10G+) Mark6 Recorder
 - VERA : 2 IFs x 2Gbps with OctaDisk
- Collaboration for Multi-Frequency Operation
 - VERA Miz & Iriki, Yebes 40m, ATCA sub array, **Sejong 22m**
- High Speed Network Connection
 - YS (10GbE), US & TN (3GbE)
 - e-Shipping (e-transfer) or e-VLBI for Fringe Check

First 8Gbps Operation Fringes

- 22L/R, 43L/R
- 4 x 2 Gbps (512MHz)
- Yonsei-Ulsan
- Fila10G+Mark6
- DiFX Corr
- Fringes from All 4 IFs
- Corruption in 22RCP
- 4-8Gbps for Common Use from 2016

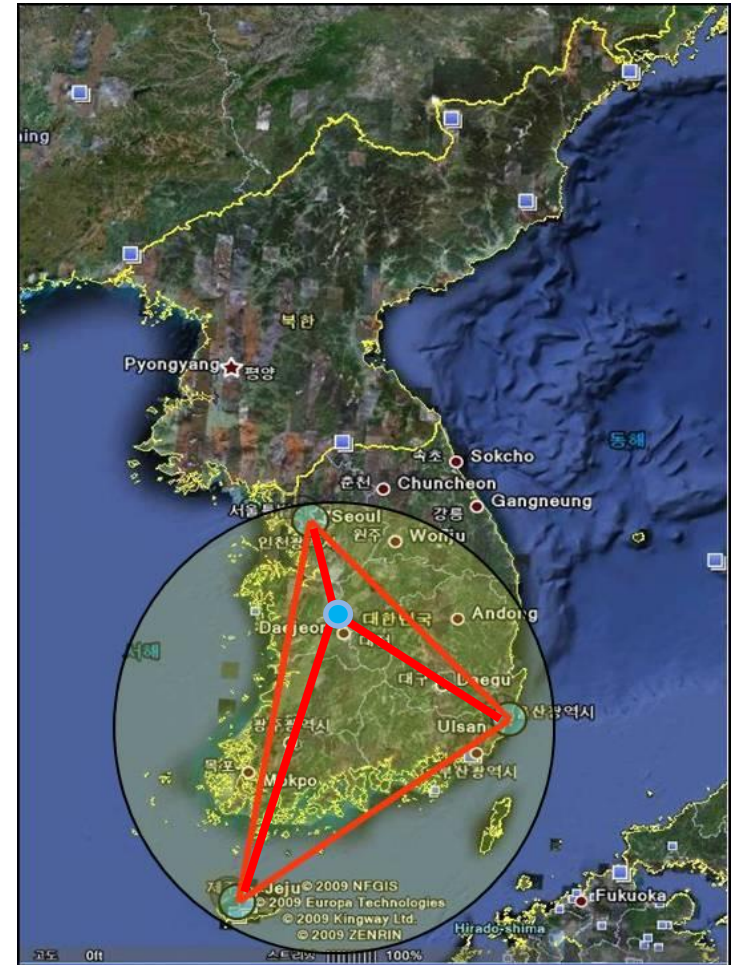


Sejong Geodesy Station

- 22-m Diameter
- Frequency : 2/8/22/43GHz
- Location: ~20km North from Daejeon
- Baselines between SJ-KVN

	YS	US	TN	SJ
YS	-	305	477	120
US	305	-	358	206
TN	477	305	-	367
SJ	120	206	367	-

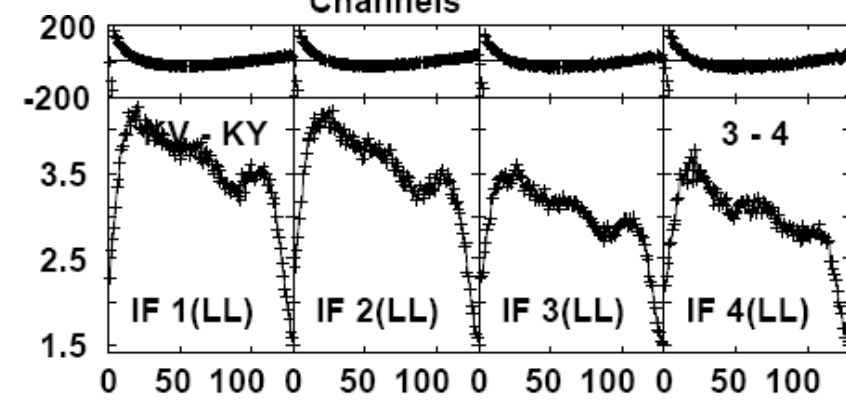
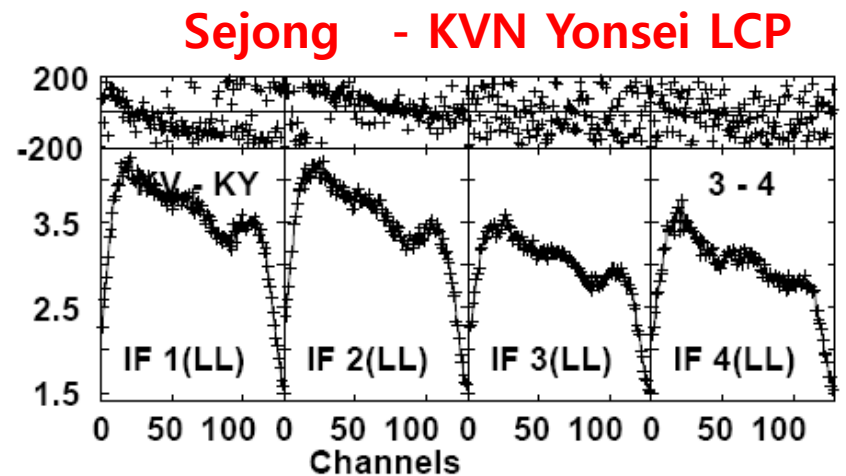
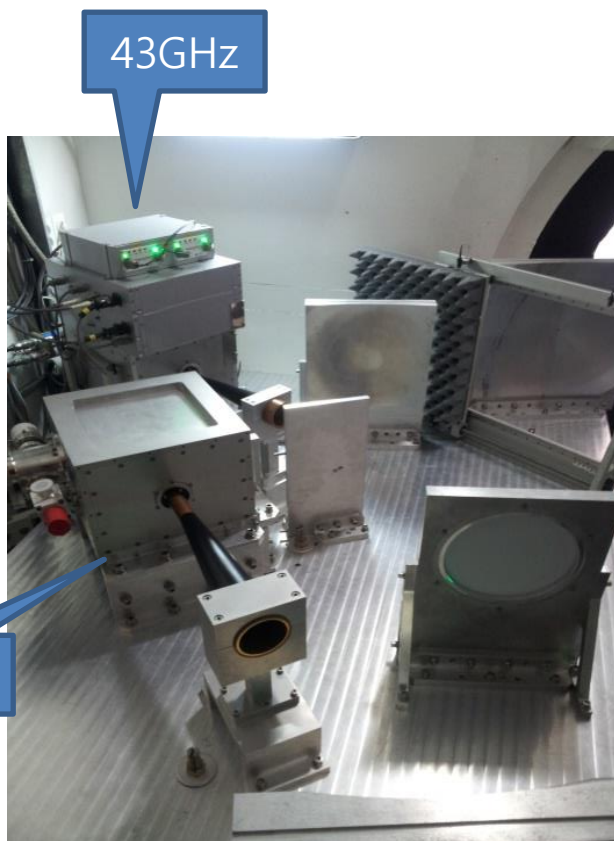
- K5 VLBI terminal
- 22/43 Simultaneous Quasi-Optics
- Trx : 50K / 80K @ K/Q
- Aeff : 59% / 53% @ K/Q



K/Q Fringe between Sejong and KVN

- Simultaneous K/Q Fringe

Top: before Fringe Fitting , Bottom: After Fringe Fitting



22GHz

43GHz

Summary

- Steady VLBI Operation
 - VLBI Operation Time > 3000 h/yr (incl. KaVA > 500h/yr)
- KVN Key Science Projects were launched
 - AGN Monitoring(iMOGABA)
 - Evolved Star Monitoring
 - using (Source) Frequency Phase Transfer Technique
- (Source) Frequency Phase Transfer Technique are successful both for continuum and maser sources
 - First 4 bands overlap image (VY-CMa)
- Collaboration for Multi-Frequency Capability
- K/Q fringes between Sejong and KVN