

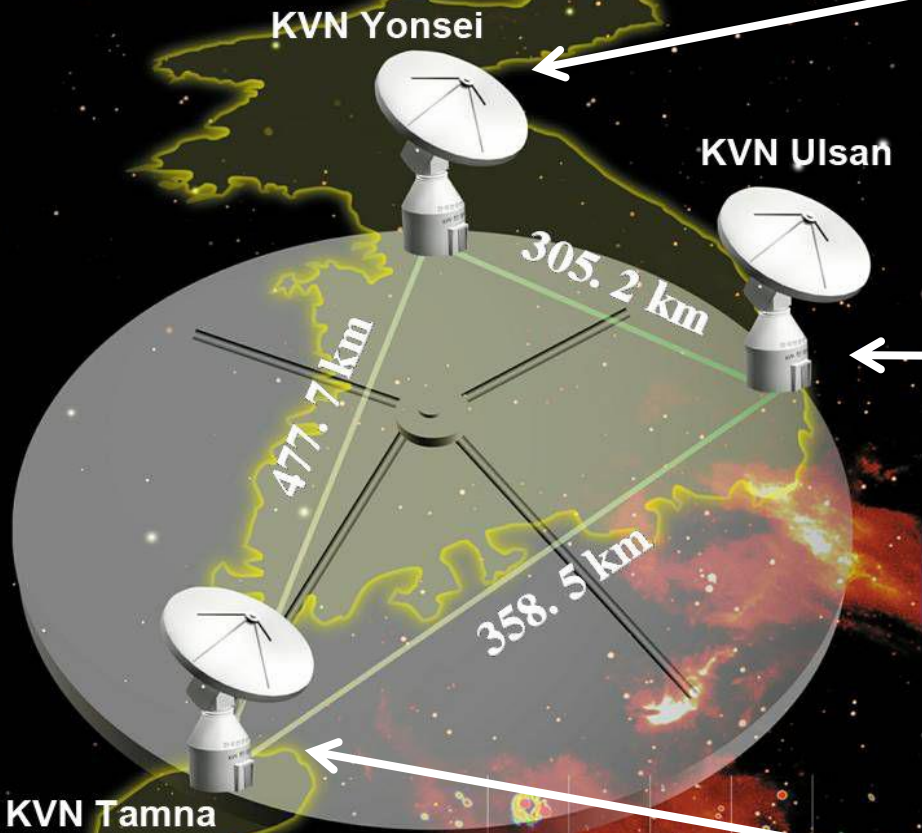
Recent Activities of the KVN

Do-Young Byun and KVN Group
Korea Astronomy and Space science
Institute

2014. Sep. 24

VERA User's Meeting, Mitaka

KVN 한국우주전파관측망 Korean VLBI Network



$\theta_{\text{HPBW}} \sim 6 \text{ mas} @ 22$
 $\sim 1 \text{ mas} @ 129$

KVN Yonsei
Observatory



KVN Ulsan
Observatory

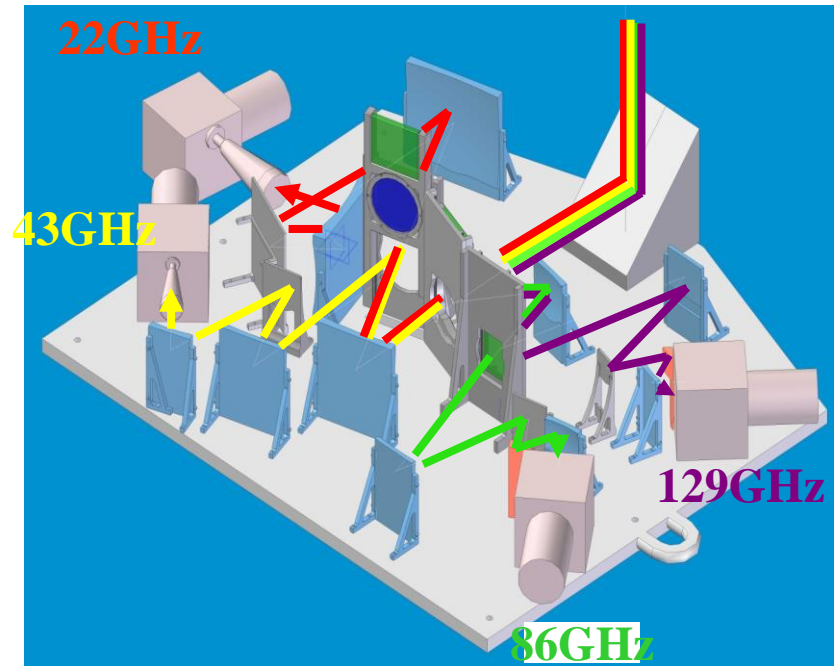
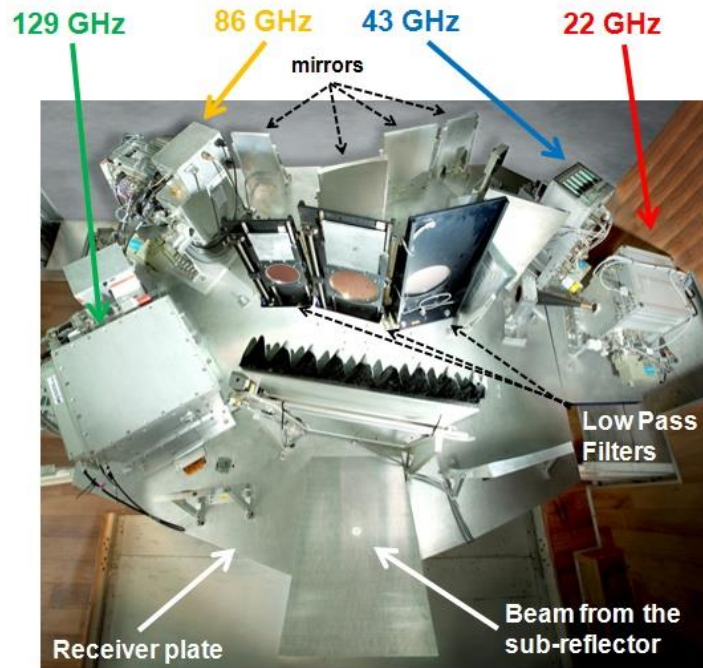


KVN Tamna
Observatory



Multi-Frequency Receiving System

- Simultaneous Multi-frequency Observation
 - @ 22/43/86/129GHz
 - Multi-Frequency Phase Referencing enable us to overcome limitation of mm-VLBI
 - Rapid phase variation due to water vapor in troposphere
 - Typical coherence time scale ~30sec @ 100GHz



Weak Source Detection at High Frequency by Multi- Frequency Phase Referencing (Taehyun Jung+ in prep)

- Short term variation of visibility phase at 22GHz traces tropospheric phase variation
- Trop. phase variation $\propto \nu$

$$\Phi_{129, \text{referenced}} = \Phi_{129, m} - \Phi_{22, m} \times \left(\frac{\nu_{129}}{\nu_{22}} \right)$$

- Flux

1308+326 : 300~420 mJy

NRAO512 : 160~250 mJy

The FIRST detections at 129GHz.
Successful evaluation of MFPR.

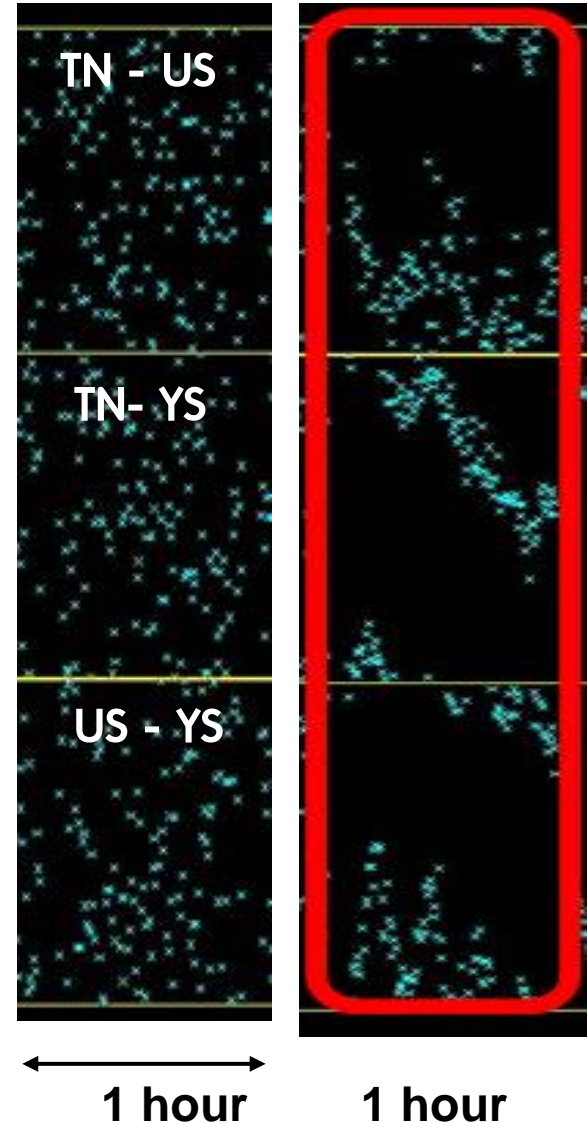
Source : 1308+326

Phase Referencing

(前)

(後)

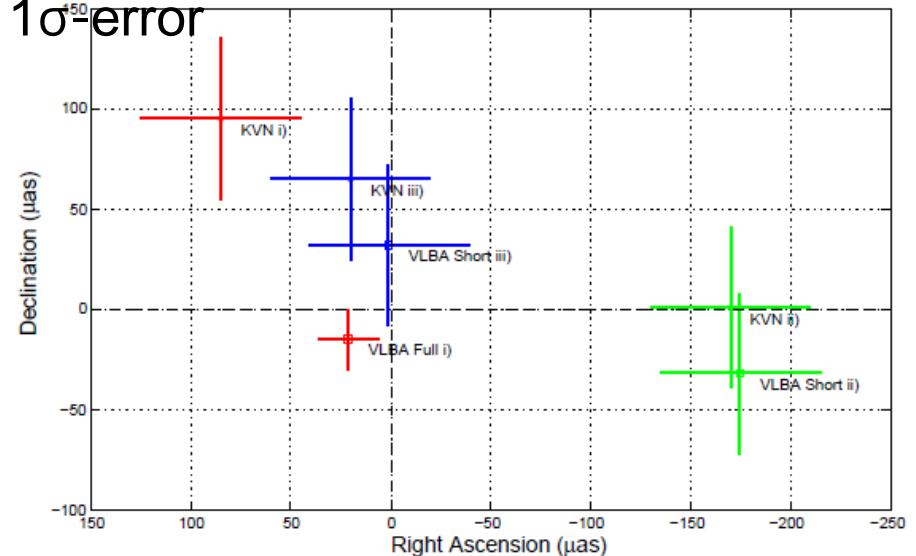
Visibility Phase @ 129GHz
[-180° ~ 180°]



Source Frequency Phase Referencing for AGN core shift

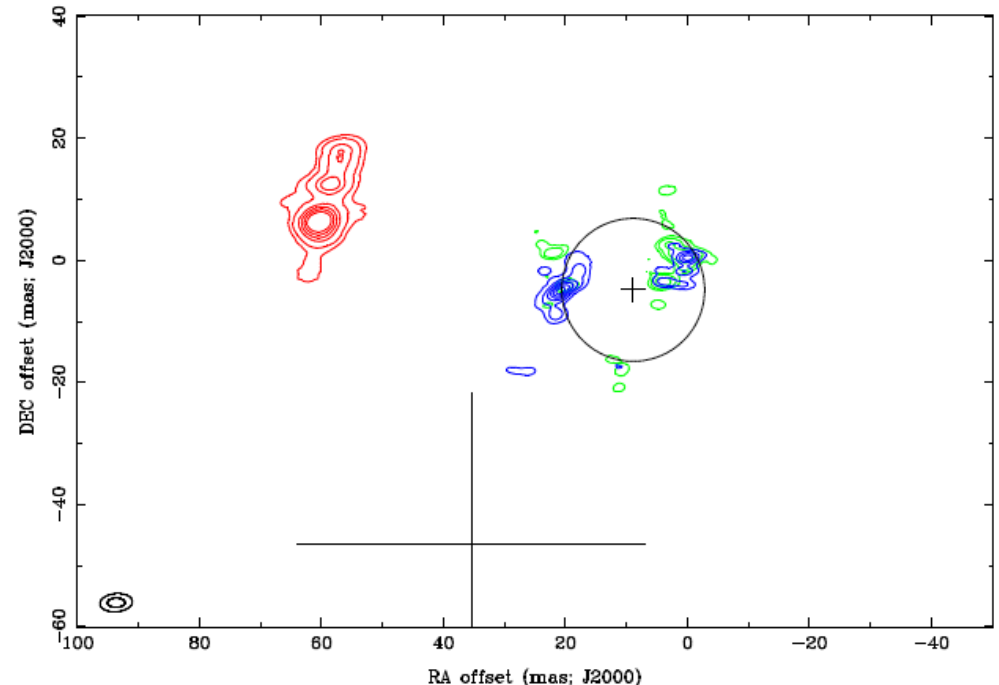
- Maria J. Rioja+, 2014, AJ accepted
- SFPR
 - Multifreq Phase Transfer + Ionospheric / instrumental phase calibration using bright calibrator
 - Relative astrometric position at high freq wrt low freq
- KVN Simultaneous 22/43GHz / VLBA Frequency Switching
 - 0854+213 w/ reference OJ287 (1.2deg away)
- Core shift accuracy of KVN $\sim 40 \mu\text{as}$ @ 43GHz
 - Consistent with VLBA within 1σ error

- Structure blending effect should be considered
- Flux recovery $\sim 94\%$ using KVN SFPR



Source Frequency Phase Referencing of Stellar Maser Lines

- Richard Dodson + , 2014, PASJ accepted
- H₂O and 43GHz SiO ($v=1, v=2$) of R LMi
 - Reference : 4C39.25 ~ 6 deg away
- H₂O position accuracy < 3x5 mas
- mas-level astrometric alignment of SiO maser wrt H₂O maser



KVN Key Science Projects

- Early Phase Key Science Projects will be launched 2015
 - Total KSP time ~1000 hr/yr for 3 years
- Evolved Star
 - Simultaneous Monitoring of KVN 4 bands toward Evolved Stars (H₂O & SiO masers using SFPR)
- AGN
 - Origin of Gamma-ray flares in AGN (iMOGABA)
 - MF AGN Survey
 - MF Polarization Survey
- Star Forming Region
 - 22/44(/95GHz) maser study
 - 22/44GHz maser polarization

Common Use of KVN and KaVA

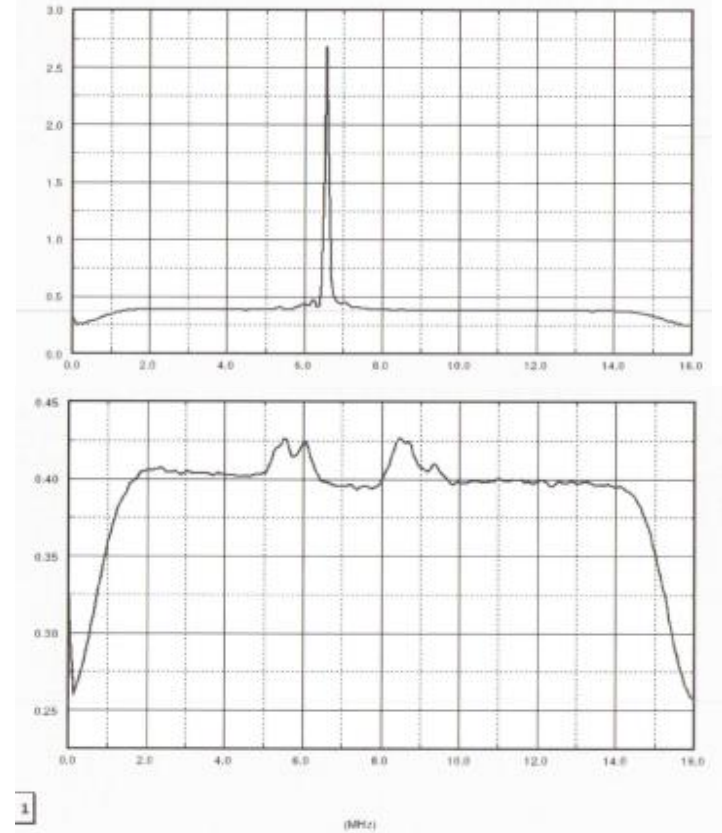
- KVN
 - 2013B semester : Open to Korean community
 - 2014A/B semester : Open to East Asian community
 - 2015A semester : Open to East Asian community
 - Deadline: early Nov. (<http://kvn.kasi.re.kr>)
 - Open Use Time : ~300h
 - 22, 43, 86GHz : normal / 129GHz : risk shared
 - 2015B semester : Open to World community
- KVN+VERA (KaVA) Common Use
 - 2015A semester : Open to East Asian community
 - Deadline: early Nov.
 - Open Use Time : ~ 250h
 - single frequency observations at 22GHz or 43GHz
 - Risk shared, Imaging only

Upgrade Activities

- 8Gbps operation
 - 2Gbps x 4 streams
(Mark5B : 1Gbps recording)
 - Mark6 (16Gbps max)
+ Fila10G(VSI – Optical converter)
 - First fringe test in next week
- Network Speed Upgrade
 - 10Gbps to Yonsei
 - 5Gbps to Ulsan, Tamna



Quasi Optics for K/Q Simultaneous Observation at VERA Mizusawa



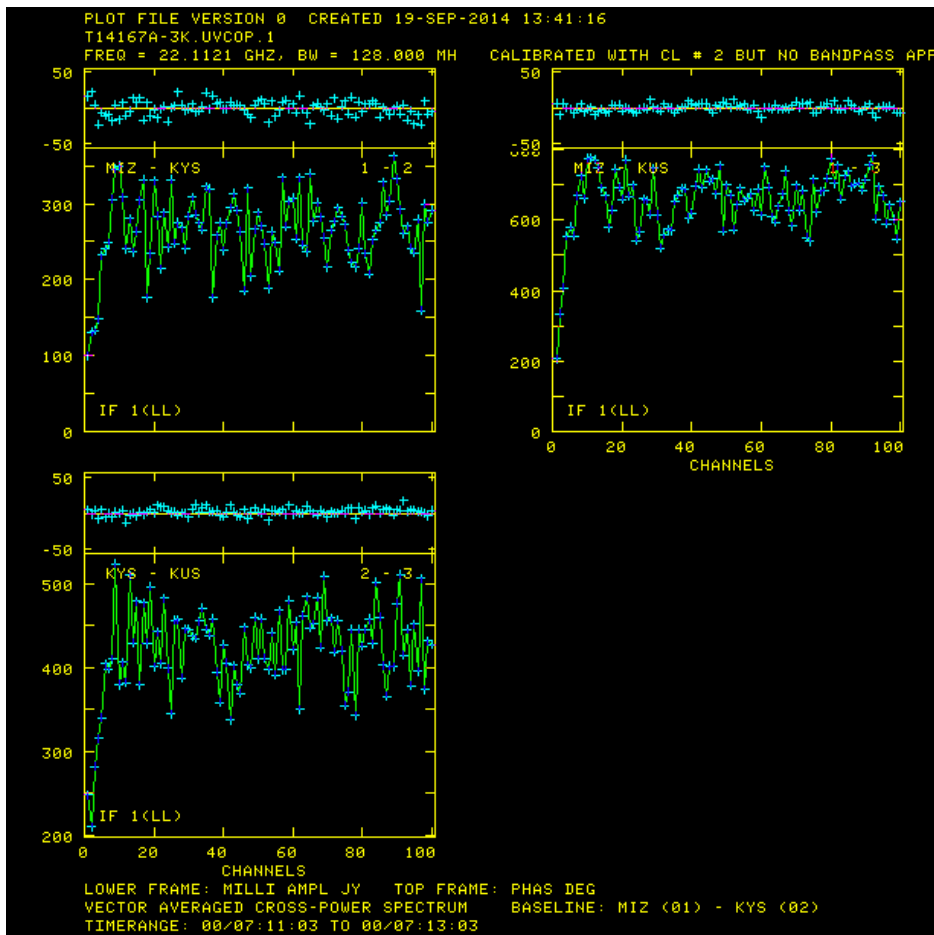
- Quasi optics for K/Q simultaneous observation at Mizusawa was installed on 5 Dec 2013.
(Dr. Han, Mr. Kang (KASI), Dr. Kameya)

First KVN-MIZ K/Q Simultaneous Fringes!!

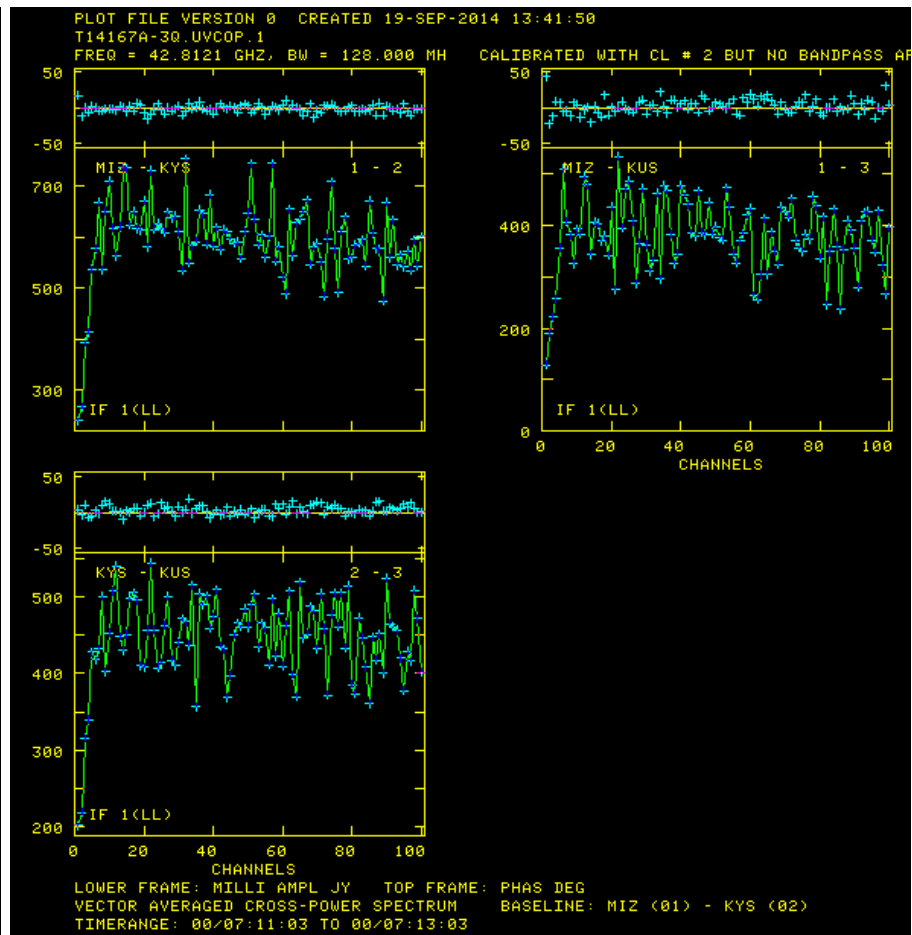
observation : 2014-06-16

correlation : KJCC

Source : OJ287



K-band



Q-band

Summary

- KVN is in steady operation phase and there will be common use call for 2015.
- KVN is producing early science results
 - Weak source detection using MFPR capability
 - SFPR techniques applied to KVN observations
- Early Phase KVN Key Science will start from 2015
- 8Gpbs mode will be available from 2015