



Discussion for a pre-study on Extended KVN

- Science Working Group -

Friday Seminar

2017 June 23

Plan for the pre-study on science

- » Study on the distinguished capability of an extended KVN w.r.t. that of the KVN
 - Improved imaging sensitivity due to the increased B (number of baselines)
 - N=4 → B=6 : 2 x DR (the Dynamic range of the current KVN)
 - N=5 → B=10 : 3 x DR
 - Uniqueness of the additional baselines
 - KVN's longest baseline length: 300km
 - VLBA's shortest one : 400km
 - VLA' longest one : 40km
 - eMERLIN's longest one: 200km (upto 24GHz)
 - unique baselines: 40-300km (unsampled coverage at >24GHz)

Plan for the pre-study on science

- » Study on unique science case candidates only with the distinguished capability
 - Improved imaging sensitivity : faint sources or structures
 - high-z AGN
 - large scale jet structures of nearby AGN
 - microquasars
 - faint maser features of late type stars or star-forming regions
 - Increased shorter baselines : large angular-scale sources
 - Galactic compact radio sources (radio stars, SNe, protostellar disks etc)
 - extragalactic compact radio sources (SNe, radio galaxies etc.)
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Discussion plan

- Science WG meetings
 - KVN Science group leaders (June 12): suggestion of science cases
 - KVN internal discussion (Friday seminar, today): discussion, WG formation
 - Science WG meetings (July-October)
- Collection of interests from KaVA Science mailing list: A. Jung, Imai, Zhao
- 1st workshop
 - Radio telescope user's meeting (August 17-18):
 - invitation of researchers from East Asian regions based on the interests and the WG activity
- KAS meeting
 - October: presenting results of the pre-study on scientific justifications
- 2nd workshop
 - KaVA/EAVN joint science workshop (Nov. 21-23)?
 - A workshop in honor of Dr. Cho's retirement (end Nov)?
- White Paper for science cases
 - Korean version to fit in the formal report of the pre-study
 - English version to be published to e.g., JKAS

Plan for the White paper (Science cases)

- Complete list of authors (end June)
 - volunteer based and some suggestions
- Discussion in WG meetings (7-10월)
- Contents:
 - Introduction: KVN and EKVN
 - Review of current KVN sciences
 - Expected performance of EKVN
 - Science cases of EKVN
 - Summary
 - try to divide it into several white papers for e.g., overview, science cases

Scientific projects using current KVN (limitations and future plans)

- Scientific projects using current capability of KVN
 - fringe detection (high sensitivity)
 - MASK, MASK2 with EKVN (amplitude self-cal.)
 - MQ
 - AGN (GPS, Young Radio Galaxies)
 - SFR-44G-Methanol
 - 95G Class I Methanol Maser with EKVN (shorter baseline)
 - 85G Class II Methanol Maser with EKVN (shorter baseline)
 - imaging capability (full-track or snapshot)
 - iMOGABA
 - MQ (amplitude self-cal)
 - AGN (GPS, FR0, YRG) (EKVN with amplitude self-cal)
 - SgrA* with EKVN
 - multi-wavelength accurate flux measurement
 - iMOGABA
 - MASK
 - 4(3)-band multi-frequency simultaneous observations
 - AGB, AGN, SFR-OrionKL, MQ
 - high resolution
 - high frequency : MQ (histerisis curve, at higher frequencies of > 22GHz), SiO masers at 86/129GHz
 - phase referencing
 - polarization : 86/129GHz (SNU), 44/95G Methanal maser with EKVN
 - amplitude self-calibration
 - wide bandwidth: radio flare in protostar (astrometry)

Suggested science cases by KVN science group leaders

- Science cases
 - Using unique shorter baselines (40-300km, @ $\geq 43\text{GHz}$)
 - AGB star continuum, extended H₂O/SiO maser features
 - MASK2
 - 95/85G Methanal Maser
 - microquasars (43/86/129GHz)
 - AGN (GPS) with radio lobe/hot spots (43/86/129GHz)
 - Using longer baselines (>500km, 86/129GHz)
 - high spatial resolution ops of SiO maser features
 - MASK2, microquasars (86/129GHz)
 - AGN (GPS) with radio lobe/hot spots (86/129GHz)
 - Using improved imaging sensitivity:
 - HCN maser (80G대역), SiO 86G maser ($v \geq 2$), ²⁹SiO, ³⁰SiO
 - Large radio telescope (D~40m?):

Discussion

- any volunteer for science WG
 - A. Jung, D. Byun, JW Lee
 - G. Zhao, J. Hodgson, J. Algaba
 - Imai, A. Jung
- any suggestions for science cases
 - astrometric capability based on improved imaging capability with additional longer baselines
 - better to suggest more detailed key science project with EKVN (e.g., imaging of protostellar disk with ALMA)
 - Large radio telescope (D~40m?):
 - better to study in more detail
 - may need broader science cases with more careful discussion/efforts/pre-study
 - a thought on having the EKVN with same size telescopes (e.g. wide field imaging, etc.) :
 - many people want to have larger KVN telescope for e.g., extragalactic sciences (CO survey)
- possibility to expand the backend of the KVN within this project?
 - aim to have this project a 5year project which may not fit to the expansion

discussion

- possibility to have additional stations abroad
 - budget limitation? 30billion KRW
- need to distinguish the EKVN sciences with those of KaVA
- a long baseline, high cadence AGN cosmology
 - would be better to have multi-frequency capability