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Preparation of multi-frequency monitoring of compact radio sources with the KVN

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The Korean VLBI network is the first VLBI network in Korea dedicated to mm-VLBI. Its multi-frequency phase referencing technique ensures high image sensitivity and high temporal resolution observations. Here we outline our research plans of compact young radio sources with this new facility.

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1 Introduction

The Korean VLBI Network (KVN) is the first VLBI facility in Korea, which will be used for VLBI studies in astronomy, geodesy, etc. The KVN will be constructed as an advanced millimetre wave (up to ∼130 GHz) VLBI network. Therefore, flat spectrum blazars, extremely young radio sources, e.g. High Frequency Peakers (Dallacasa et al. 2000; Orienti 2009), and high frequency transition lines of masers are addressed as key science targets. Since mm-VLBI is still in the developing stages around the world, we expect that KVN will play an important role in the mm VLBI research activities (Sohn et al. 2007; Kim, Han & Sohn 2007). With their unique multi-band simultaneous observation capability (22, 43, 86, and 129 GHz), KVN radio telescopes (Fig. 1) will also serve as single dishes.

2 Multi-frequency monitoring of compact sources

As a first step of scientific operation of KVN, we are preparing a multi-purpose, multi-frequency, and multi-epoch survey (KVN ^{3}M survey) of compact radio sources. One of the main purposes of the ^{3}M survey is the search for phase calibrators at K band. Since strong tropospheric phase fluctuation is inevitable at mm wavelengths, the KVN will adopt simultaneous multifrequency (Sasao 2003; Sohn et al. 2007) and fast position-switching phase referencing techniques in order to achieve high image sensitivity of weak continuum sources.

The aim of the ^{3}M survey is to find and monitor a complete sample of compact radio sources at 22 GHz which have flux densities above 100 mJy. We select the candidates based on the VLBA calibrator survey at S/X band (Beasley et al. 2002). From the spectral index, the 22-GHz flux densities of the sources are extrapolated (Fig. 2). Most of them, if not all, are compact extragalactic sources. Therefore, a large variety of spectral shapes, a wide range of turn-over

Fig. 1 KVN Yonsei radio observatory.

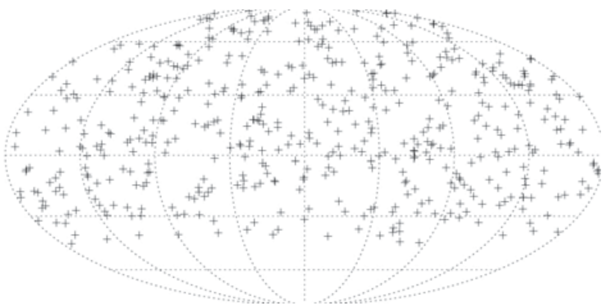

Fig. 2 Candidates of KVN ^{3}M survey in equatorial coordinates. The center of the map is the $(0, 0)$ position.

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Table 1 *Tentative* 10 σ levels of KVN antenna. 1 GHz bandwidth and 60 seconds of integration time are used for the estimation. Antenna efficiencies ($A_{\rm eff}$) are *not* confirmed but expected values. For single-dish observations, the observing bandwidth per band can be as wide as 2 GHz.

Frequency:	22 GHz	43 GHz	86 GHz	129 GHz
$T_{\rm sys}$	70	140	250	300
$A_{\rm eff}$	0.7	0.7	0.6	0.5
ΔS (mJy)	79	158	328	472

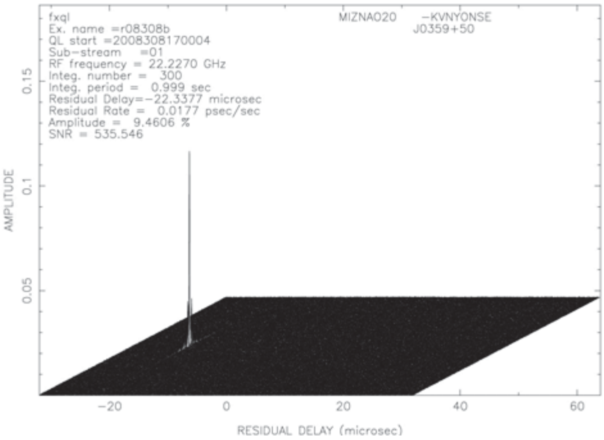

Fig. 3 Fringe obtained from the KVN Yonsei–VERA Mizusawa baseline.

frequencies, and variability of luminosity are expected to be investigated. The first stage of the survey consists of single dish multi-epoch observations of the candidates at 22 and 43 GHz. The first stage will begin in 2009. The frequency coverage of the survey will be extended after the installation of the 86 and the 129 GHz receiver systems in 2011.

Based on the flux density of the unresolved core obtained through VLBI observations at 22 GHz, the catalog of KVN K-band phase calibrators will be finalized. The phase calibrators themselves at higher frequency and the sources within 2 to 3 degrees radius of the phase calibrators can be imaged with sub-mJy sensitivity and with sub-mas resolution through the coordinated East-Asian VLBI Network (EAVN) where the KVN plays a key role (Inoue 2005). Figure 3 shows the first fringe detection between KVN and VERA (NRAO150 at 22 GHz).

3 KVN and extremely young radio sources

Orienti, Dallacasa & Stanghellini (2007) have pointed out spectral variability as a key criterion for the selection of genuine young radio sources. Although the expected number of

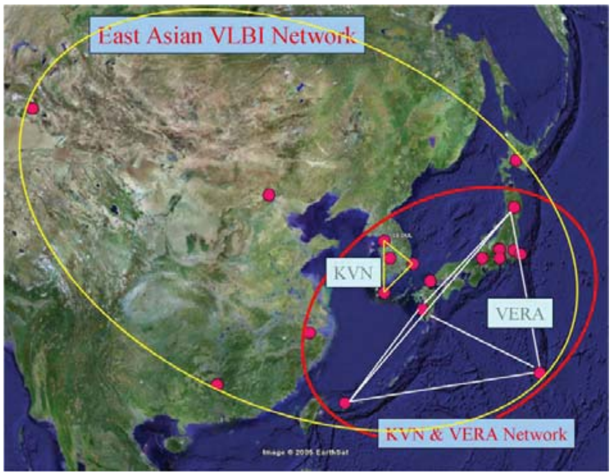

Fig. 4 (online colour at: www.an-journal.org) Geographical location of East Asian VLBI network stations.

the extremely young sources which can be detected with a single KVN antenna is not huge, the systematic high-frequency exploration of those sources is expected to deepen our knowledge of the evolution of young radio sources, e.g. through the estimation of spectral ages.

A far more beneficial aspect of KVN (and EAVN; Fig. 4) for the study of compact young radio sources will be its high image sensitivity. The study of kinematic and spectral evolution, magnetic fields, the interaction with the Interstellar Medium will be extended to a high-z sample of this class and also to its radio-weak counter part.

References

Beasley, A.J., Gordon, D., Peck, A.B., Petrov, L., MacMillan, D.S., Fomalont, E.B., Ma, C.: 2002, ApJS 141, 13
Dallacasa, D., Stanghellini, C., Centonza, M., Fanti, R.: 2000, A&A 363, 887
Inoue, M.: 2005, JKAS 38, 77
Kim, H.G., Han, S.T., Sohn, B.W.: 2006, in: A. Lobanov et al. (eds.), *Exploring the Cosmic Frontier*, ESO Astrophysics Symposia, p. 41
Orienti, M.: 2009, AN 330, 167
Orienti, M., Dallacasa, D., Stanghellini, C.: 2007, A&A 475, 813
Sasao, T.: 2003, in: Y.C. Minh (ed.), *New Technologies in VLBI*, ASPC 306, p. 53
Sohn, B.W., Kim, H.R., Chung, H.S., et al.: 2007, in: A. Marecki (ed.), *9th EVN Symposium*, PoS, p. 440

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