2001년부터 총 230억원의 건설 예산을 투입한 한국우주전파관측망(KVN) 건설 프로젝트는 2008년 KVN을 구성하는 3개의 전파 망원경 건설을 마무리 하였고, 2009년 22GHz와 43GHz에서 세 기선의 프린지 검출에 성공하였다. 국내 최초 VLBI 관측망인 KVN은 2009년 프린지 검출로 VLBI의 첫 걸음을 시작한 이 후 올해로 VLBI 관측 역사의 10년에 이르렀다. 2009년부터 첫 4년간의 시험 관측을 거쳐 2013년 세계 최초로 22,43,86,129GHz 4개 주파수 동시 관측을 지원하는 본격적인 VLBI 관측 운영을 시작하였다. 지난 10년간의 KVN을 활용한 연구 성과를 통해 KVN 방식의 동시 다주파수 관측 시스템은 전 세계적으로 mm-VLBI의 국제 표준으로 인정받고 있다. 본 발표는 지난 10년간의 KVN의 운영 과정과 이를 통해 이룬 주요 연구 성과를 되돌아보고 앞으로의 전망에 대해 소개한다.

[구 KVN-02] Observational Studies on Evolved Stars Using KVN and KaVA/EAVN

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At the commissioning phase of KVN from 2009 to 2013, single-dish survey and monitoring observations were performed toward about 1000 evolved stars and about 60 relatively strong SiO and H2O maser sources respectively. Based on these single-dish results and VLBI feasibility test observations at K/Q/W/D bands in 2014, KVN Key Science Project (KSP) has started from 2015 and will be completed in 2019 as KSP phase I. Here we present the overview of observational studies on evolved stars using KVN. In KSP phase I, we have focused on nine KSP sources which show a successful astrometrically registered maps of SiO and H2O masers using the source frequency phase referencing method. We aim at investigating the spatial structure and dynamical effect from 43/42/86/129 GHz SiO to 22 GHz H2O maser regions associated with a stellar pulsation and development of asymmetry in circumstellar envelopes.

Using the combined network KaVA (KVN+Japanese VLBI network VERA), KaVA Large Program titled on “Expanded Study on Stellar Masers: ESTEMA Phase I” was performed from 2015 to 2016. Based on ESTEMA Phase I, EAVN Large Program titled on “EAVN Synthesis of Stellar Maser Animations: ESTEMA Phase II” was also performed from 2018. The ESTEMA II project aims to publish composite animations of circumstellar H2O and SiO masers, which taken from up to 6 long-period variable stars with a variety of the pulsation periods (333-1000 days). The animations will exhibit the three-dimensional kinematics of the maser gas clumps with complexity caused by stellar pulsation-driven shock waves and anisotropy of clump ejections from the stellar surface. Adding three EAVN telescopes (Tianma 65m, Nanshan 26m and NRO 45m telescopes) with KaVA always secures the high quality of the maser image frames through the monitoring program.

[구 KVN-03] A KVN KSP - the iMOGAGBA and its future

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As one of the Korean VLBI Network (KVN) Key Science Programs, the Interferometric Monitoring of Gamma-ray Bright AGNs (iMOGABA) aims to reveal the origins and nature of the gamma ray flares in active galactic nuclei (AGNi). Here we report a summary of activities and recent scientific results of the iMOGABA program, including statistical properties of the whole sample, as well as scientific highlights for the iMOGABA on specific sources. We also introduce future prospects and directions for the development and expansion of iMOGABA.

[구 KVN-04] KVN unveils the plasma physics of AGN

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Its ability to measure the polarization of light at four frequencies makes the KVN a "plasma physics observatory" that can probe the internal physics (e.g., magnetic fields, outflow geometries) of AGN radio jets and cores. We initiated a Key Science Program, the Plasma-physics of Active Galactic Nuclei (PAGaN) project, dedicated to polarimetric monitoring of 14 radio-bright AGN. We have been able to measure the Faraday rotation measure of the cores of our targets as function of frequency; the observed scaling relation is in good agreement with conically expanding outflows to first order. We are further probing a polarized hotspot in the jet of 3C84 and possible systematic differences in the Faraday rotation in BL Lacertae objects and flat spectrum radio quasars.

[구 KVN-05] Understanding high-mass star formation through KaVA observations of water and methanol masers

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