



Contribution ID: 195 Contribution code: **S4 High Energy and Particle Physics**
Presentation

Type: **Oral**

Unveiling Circumstellar Structure of High-mass Protostars via Multiple Species of MASERs in KaVA-LP with EAVN

Friday 24 June 2022 09:45 (15 minutes)

Circumstellar structures, such as inclination and opening angles of outflow/jet cavities, thickness and flaring angle of disk surrounding an central object, and so on, is crucial to understand formation processes of high-mass stars and their evolution more quantitatively by determining a spectral energy distribution (SED) accurately that provides us information of the spectral types and to investigate evolutionary phases of high-mass stars. The science working group for star formation researches in KaVA (KVN and VERA Array) has thus initiated a large program (LP) of multi-epoch very-long-baseline-interferometry (VLBI) monitoring studies toward high-mass protostars with multiple species of MASERs (microwave amplification by stimulation emission of radiation) using KaVA, in which each different species maser possibly traces each different significant phenomenon in jet/outflow/disk (T. Hirota, K.-T. Kim, et al.: https://radio.kasi.re.kr/kava/large_programs.php\#sh3). This VLBI monitoring has enabled us to measure proper motions of the maser emissions on the sky plane and understand 3-dimensional (3-D) spatial/velocity structures and dynamics on the circumstellar structures. In this presentation, we would like to show the outline of this large program and the progress for one of follow-up observations: imaging survey and monitoring observations of the 6.7 GHz methanol masers with the East-Asian VLBI Network (EAVN). These EAVN follow-up observations have been conducted in the 2021A open-use semester for 11 target sources that were selected from KaVA-LP source list, and we succeeded imaging their spatial/velocity distributions in 4 sources, in which a source presented a structure evoking an association with a disk and accurate absolute coordinates for some sources were obtained with phase-referencing technique as well. We will also touch the on-going EAVN open-use monitoring in the 2022A semester to measure 3-D structures for the detected high-mass protostars.

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Session Classification: S4 High Energy and Particle Physics

