

Progress of VERA project

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ABSTRACT

VERA is the first VLBI array, which is designed to be free from the atmosphere phase fluctuations. It has four VLBI station with 2,300 km maximum baseline length within Japan islands. And observing frequency bands are 2, 8, 22, and 43 GHz. 22 and 43 GHz bands are mainly used for H₂O and SiO maser objects observations, respectively. And 2 and 8 GHz bands are mainly used for geometric observations to determine the station positions. And VERA uses a 1Gbps recording system with cassette magnetic tapes. They are correlated by the VSOP correlator at Mitaka.

VERA aims astrometry observations with 10 micro-arc-second accuracy. In order to achieve such high accuracy, only VLBI technique must be used with phase referencing techniques. To compensate phase fluctuations of interferometer visibilities, which are mainly caused by the atmospheric turbulences and phase drifts of local oscillators, VERA antenna has two-receiver system which makes simultaneous observations of two objects. By the comparison the visibility phase between these two objects, simultaneous phase referencing VLBI will be achieved. Usually a galactic maser object is selected as a target and a extra galactic object is selected as a reference source.

The goal of astrometry accuracy is 10 micro-arc-seconds. By this accuracy, distance measurements of whole galactic objects can be made possible with 10% accuracy. And a final scientific goal is to reveal the structure of the Galaxy and determine the velocity field of the Galaxy. And astrometry observations can be used to compare maps with different frequency band. For example, direct comparisons of H₂O and SiO maser distributions around late type stars and star forming regions can be possible. And also phase referencing VLBI make sensitive observations possible with long time integrations.

Currently the construction of four stations was complete. And test observations are undergoing and we confirmed phase fluctuations are well compensated between two objects. Conventional one-beam VLBI observations already produce some scientific results. Statistical parallaxes of maser objects are measured for star forming region objects and late type star object. Currently the feasibility of two-beam phase referencing VLBI is checking. And operations of the array are in steady-state. Four stations are controlled by a remote control room. And on-site operators are needed for tape change and simple checking of the observation system. Then VERA observes three weeks per month. From Nov. 2003 to Oct. 2004, 117 days were used for observations. I will present some results of astrometry observations.