

A Very High Resolution Imaging Space-VLBI Mission VSOP-2

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First Space-VLBI mission, VSOP, has successfully started with the launch of dedicated space-VLBI satellite HALCA in 1997. The mission has been in scientific operation in 1.6 GHz and 5 GHz bands, and studies has been done mainly in the jet phenomena related to active galactic nuclei. VSOP mission will end in March 2006 after its start in 1989.

Extending the frequency into higher frequency range has the advantage of less absorption through the ambient plasma and less contribution from the scattering. This also add merits for very higher angular resolution observations.

VSOP-2, as a second generation space-VLBI, has been planned by the Next-Generation space-VLBI Working Group formed at ISAS/JAXA with many collaborators inside and outside of ISAS.

Science targets of VSOP-2 is more focused on the core of AGNs with better angular resolution and transparency, and not only jets but also accretion disks are in target. One important new area for VSOP-2 is resolving magnetosphere of flaring young stellar objects. 22 GHz band was not scientifically operational in VSOP, and so this band is new for space-VLBI.

The spacecraft is planned to observe with ground radio telescopes at 8, 22 and 43 GHz bands, and the maximum angular resolution at 43GHz(7mm) reaches about 40 micro-arc-second. The nominal apogee height and perigee height are 25,000 km and 1,000 km, respectively with about 8 hours orbital period.

To have better sensitivity, 22 and 43 GHz band receiver frontends are cryogenically cooled to 30 K. Also, to gain sensitivity for continuum observing, high data rate of 1 Gbps is adopted. Phase-reference observing mode is also possible by fast switching of target source and reference source within 3 degrees in separation. This mode gives the capabilities of astrometry or longer coherent integration time. Polarization mapping is also included in the design with the use of simultaneous reception of both sense of polarizations.

The working group has received development budgets since 2005, and has continued studies for deployable antenna, spacecraft pointing and switching, receiver frontends and coolers, wide-band data transfer, etc. And the mission was proposed to ISAS in

2005, and is now selected in 2006, to proceed for budget request with the current planned schedule of January-February 2012 launch.

The operation plan of the VSOP-2 mission is similar to that of VSOP. Satellite tracking network for frequency and phase transfer(up-link) and VLBI data transfer(down-link) is necessary, and participation of international ground telescope array is assumed.

The VSOP-2 system naturally will have the impact for further future for mm and sub-mm space-VLBI in the future.