Proposer's Guide

VLBI Space Observatory Programme

Prepared by the

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Abstract

This guide provides the technical information necessary to write a proposal for scientific observations with the VSOP space VLBI mission. Whereas the VSOP Announcement of Opportunity (AO) provides an overview of the VSOP mission and the proposal process, this guide provides technical details on many mission components and activities. These components include the VSOP spacecraft, the VSOP spacecraft orbit, and the ground radio telescopes, tracking stations, and correlators that will support VSOP observations. The observational capabilities of the VSOP mission, the VSOP scheduling process, VSOP spacecraft calibration, data analysis tools, proposal aid software, and help to proposers are also described.

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1 VSOP Mission Description

The VLBI Space Observatory Programme (VSOP) is a project of the Japanese Institute of Space and Astronautical Science (ISAS) in close collaboration with the National Astronomical Observatory (NAO). In addition NASA and a number of organizations around the world are providing facilities and other support to the VSOP mission. The VSOP Science Operations Group (VSOG) is responsible for the day-to-day operation and management of the VSOP mission and is comprised of members from ISAS and NAO, with support from other individuals and agencies.

The VSOP spacecraft, as shown in Figure 1, will carry an 8 m radio telescope and is scheduled to be launched from the Kagoshima Space Center in September 1996 by the first launch of the M-V rocket. The spacecraft is expected to have a lifetime of at least 3 years. The mass and power budgets of the spacecraft are presented in Table 1 and Table 2 (Hirosawa *et al.* 1994). VSOP will be in a nominal 6.6 hour orbit with an apogee height of 22,000 km (see §5 for more details on the orbit). The precession of the spacecraft's orbit will allow good (u,v) coverage over the whole sky. The apogee height allows baselines three times longer than on the Earth, while the perigee height of 1000 km is low enough to allow calibration of data obtained on ground-space baselines by comparison with data from ground-only baselines. Typically, an observation of a source will last between 2–4 orbits (13–26 hours), although various constraints result in the loss of ground-space baselines for some part of each orbit.

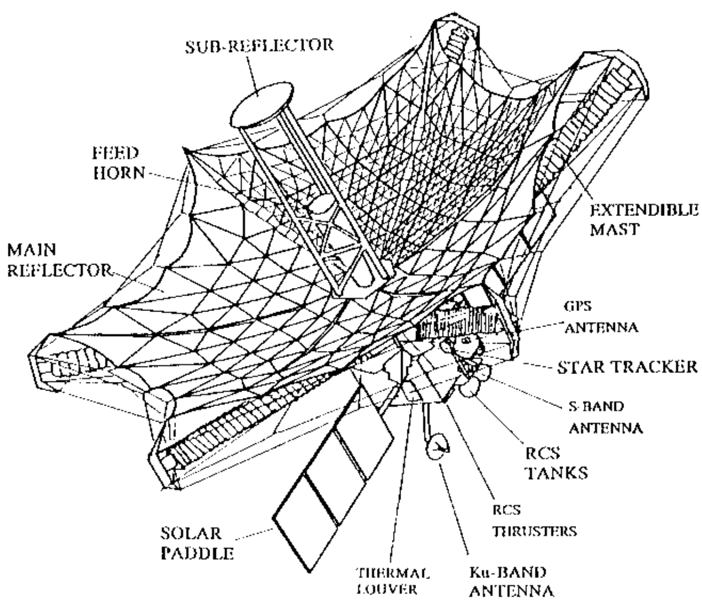

Figure 1: Diagram of the VSOP Spacecraft.

2 VSOP Spacecraft Antenna

The main antenna of the VSOP spacecraft is of a Cassegrain design with a three-waveband coaxial feed at the focus. The main reflector of the antenna is a deployable parabola composed of a thin flexible mesh fixed in position by a set of cables attached to a support structure. The aperture has an area of 50.1 m^2, equivalent to an 8 m diameter reflector, with an expected surface accuracy of 0.5 mm RMS. A breakdown of the expected antenna gain is shown in Table 3 (Takano et al. 1994). Note the large spillover loss at 1.6 GHz due to the limited size of the sub-reflector.