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title: Metrology, Attitude, and Orbit Determination for Spaceborne Interferometric Synthetic Aperture **Radar** (IFSAR)

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abstract: Spaceborne Interferometric Synthetic Aperture Radar (IFSAR) provides a powerful technique for mapping the Earth's land topography. The Shuttle Radar Topography Mission (SRTM), scheduled for a 10 day shuttle mission in 1999, will use an IFSAR instrument to map 85% of the. earth's land surface with 16 m absolute vertical height accuracy and 30 m horizontal posting The SRTM interferometric baseline will be achieved by extending a receive-only radar antenna on a 60 meter deployable mast from the shuttle payload bay (the active antenna will remain in the payload bay). Continuous measurement of the interferometric baseline length, attitude, and position is required at the 3 mm, 9 arcsec, and 1 m (1.6 sigma) levels, respectively, in order to obtain the desired height accuracy. The Attitude and Orbit Determination Avionics (AODA) system will provide these measurements for SRTM. The AODA flight segment will consist of a suite of electro-optical metrology sensors, inertial attitude determination sensors, GPS receivers, supporting electronics, and dedicated laptop computers. The sensors represent a mix of new and existing technologies, including commercial off-the-shelf rangefinders which have been modified for space flight. The AODA ground segment will include computers and algorithms used to support SRTM performance evaluation during the mission and height reconstruction following the mission. A description of the AODA system architecture, theory Of operation, error budgets, expected performance, and some of the challenges involved with measuring large space structures are presented.