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COMPASS: VLBI BEACONS IN SUPPORT OF SOLAR SYSTEM SCIENCE AND EXPLORATION

Abstract

The large constellations of spacecraft likely to be deployed on the Moon, in cislunar space, (on the Lunar surface, in Lunar orbit, and Mars, Venus and nearby asteroids) will require new solutions for positioning, navigation and timing (PNT). Here, I describe COMPASS (Combined Observational Methods for Positional Awareness in the Solar System), a spacecraft navigation system to provide cost-effective techniques for the positioning of large numbers of spacecraft in cis-lunar and planetary space. COMPASS is based on beacons that emit coherent ultra-wideband signals designed to be interoperable with existing and future Very Long Baseline Interferometry (VLBI) networks. Using differential VLBI, COMPASS can provide rapid determination of the interferometric phase delay with picosecond level accuracy during routine VLBI observing sessions. Multi-baseline phase-referenced COMPASS-VLBI observations with simultaneous calibrator observations should thus enable sub-meter accuracy transverse positioning on the Moon ~ 10 meter level positioning in the inner solar system.