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Evaluating VLBI Scenarios for Genesis: Orbital and Observational Configurations

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Genesis is an upcoming satellite mission by the European Space Agency (ESA) that will integrate multiple space geodetic techniques on a single satellite at an altitude of 6000 km, including a dedicated Very Long Baseline Interferometry (VLBI) transmitter. This innovative, dynamic space geodetic observatory aims to establish highly accurate and continuous space ties, significantly enhancing the accuracy and stability of Terrestrial Reference Frames (TRFs). Including a VLBI transmitter will enable observations to Genesis using existing VGOS antennas and infrastructure, but several technical challenges must be addressed to ensure the success of VLBI observations.

A key open question is the choice of the satellite's orbit, whether polar (97°) or inclined (60°). Additionally, the allocation of observation time between satellite and quasar observations must be carefully optimized. While sufficient VLBI observations of Genesis are needed to estimate accurate station positions, maintaining a good sky coverage of quasar observations is essential for precise tropospheric delay modeling, the major error source in VLBI measurements.

This simulation study addresses these points by evaluating various observation scenarios for two VGOS station networks, considering different orbital configurations and observation time distributions. Based on the determination of TRFs from weekly VLBI sessions over a two-year investigation period, we aim to identify the optimal setup for VLBI observations of Genesis.