

EARTH OBSERVATION SYMPOSIUM (B1)
Future Earth Observation Systems (2)

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STUDY OF A LASER INTERFEROMETER EMPLOYED FOR THE RANGING METROLOGY OF A
LOW-LOW GRAVITY MISSION BEYOND GRACE FOLLOW-ON**Abstract**

The Gravity Recovery and Climate Experiment (GRACE) Follow-On mission, successor of the GRACE mission, is intended to be launched in late 2017 in order to provide continuity of data for the study of the Earth's mass distribution and for climate research. Together with its primary microwave instrument, GRACE Follow-On is going to mount the first intra-satellite Laser Ranging Instrument (namely, the LRI) as a technology demonstrator. The LRI aims to improve the actual range measurement of GRACE of

about a factor of 20. Although the GRACE Follow-On mission is yet to be launched, different institutions are already studying the possibility of having a next generation geodesy mission which embeds a laser instrument as the primary metrology device. This paper presents a new optical layout for the interferometer together with the primary noise sources which influence its overall measurement performance. Herein are also described some novel solutions for designing the phasemeter and improving the pointing performance of the laser beam steering mechanism. The novel design of the phasemeter includes elements of the discrete wavelet transform theory while the pointing performances of the steering mechanism of the laser beam are improved using feedforward control. These new solutions have been tested using dedicated experiments and their results are here analyzed. The final part of this paper describes an initial laser link acquisition experiment which uses part of the technology of the on-ground support equipment developed for the LRI of GRACE Follow-On.