

Research Result Report

ICRR Inter-University Research Program 2025

Research Subject:

Position control system for silicon monolithic suspension in cryogenic gravitational waves detectors.

Principal Investigator:

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Summary of Research Result :

Activities Organization

The activities at ICRR during 2025 included electronics modification and testing, firmware development, and control algorithm development. In addition, the work involved second dummy monolithic payload manufacturing and results publication drafting and submission to the journal.

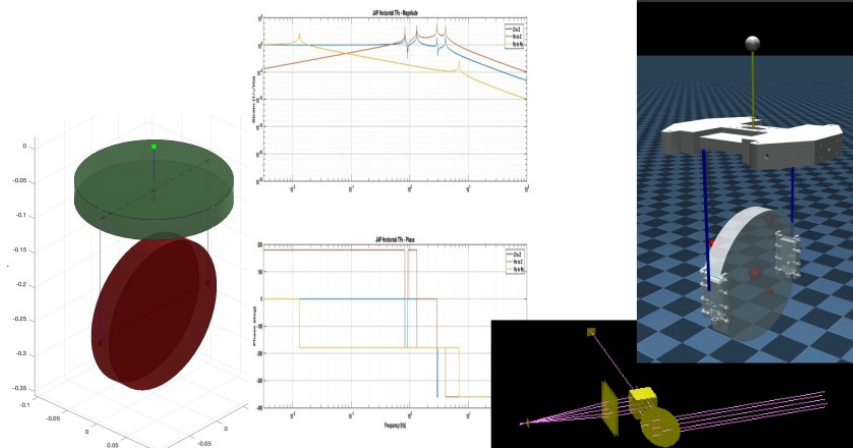
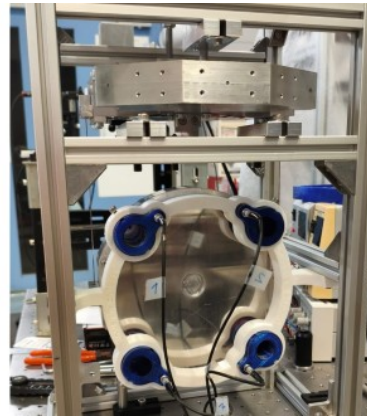
The project also included a coordinated summer stay of 113 person-days, supporting the integration of these activities.

Research Results

The work on the monolithic system focused on modifications to the marionette suspension point (unstable → stable) and on the replication of the entire mechanical system for test in Perugia.

The position control system was addressed through replication of the position control system, with the observation of position lock signals. Modifications to electronics and tests included feedback loop software development and GUI, thermal verification, and actuator current/force calibration. Simulation activities were carried out with frequency domain simulation performed using FEMTO and time domain simulation performed using MuJoCo. The project

produced a results publication: “Characterization of the temperature dependence of the quality factor of a silicon substrate using the gentle nodal suspension method”, submitted for publication to Classical and Quantum Gravity, with the first round with referees concluded in December.



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