Experimental validation for low-frequency isolation of six degrees of freedom systems using optical inertial sensors

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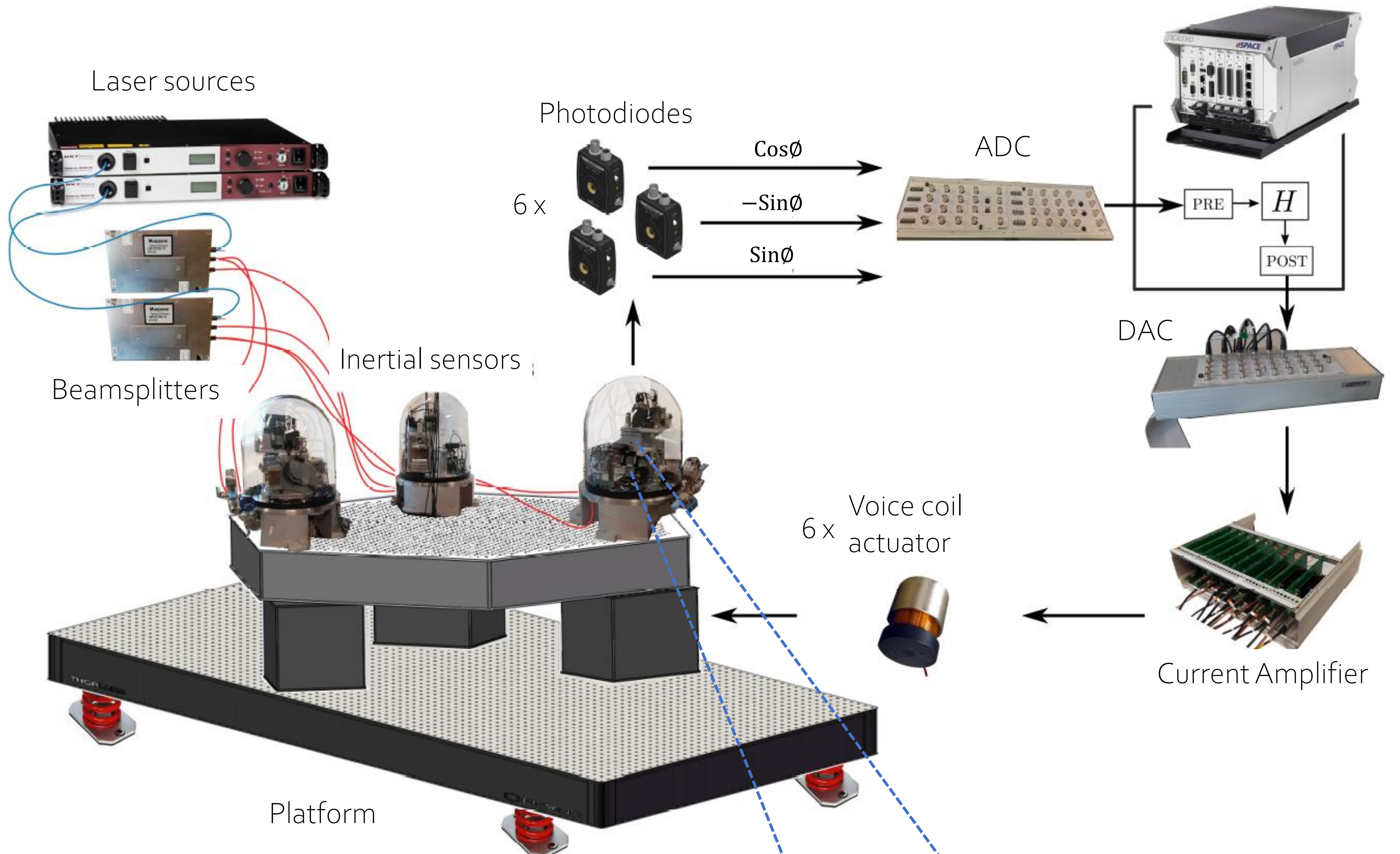
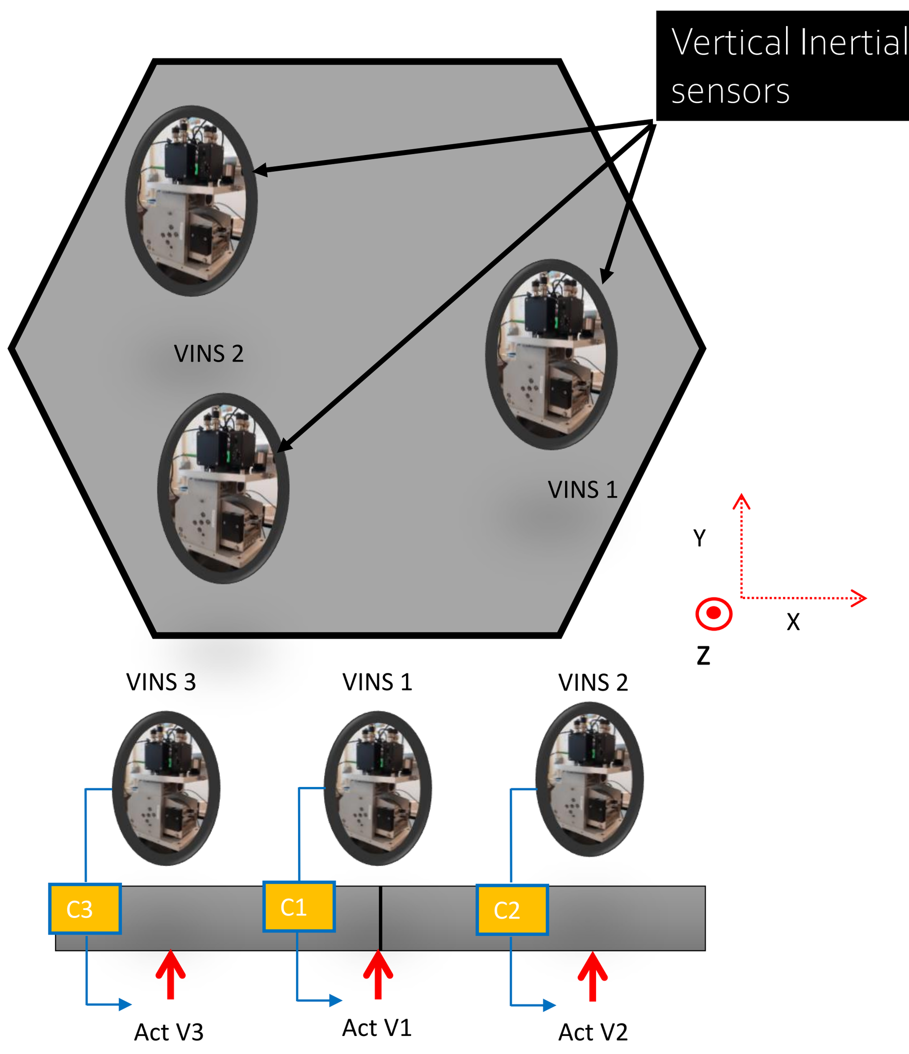
Abstract

Gravitational wave detectors are required to operate in an ultra-stable environment that can be obtained only by isolating them from external disturbances. Moreover, active isolation is a major approach in this context and it was successfully implemented in LIGO's positioning platform [1][2]. This study addresses theoretical approaches and corresponding experimental validations for low-frequency active damping and isolation of a six degrees of freedom platform between 0,1 Hz and 10 Hz [3].

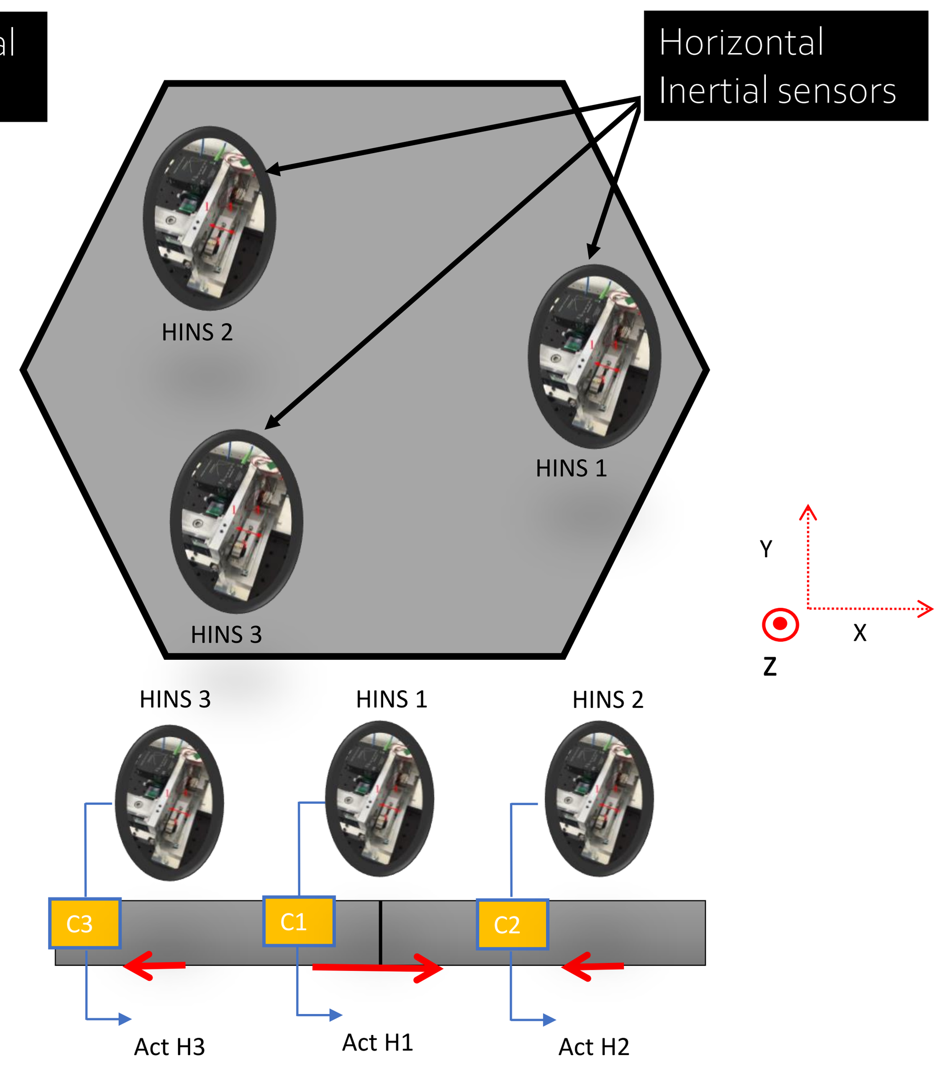


Six degrees of freedom setup

Decentralized control

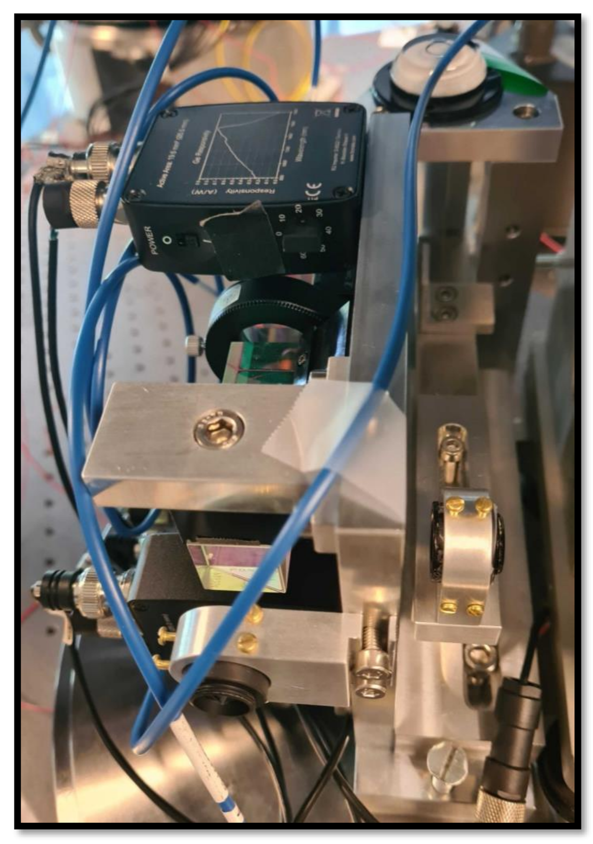


Vertical loops closed in a decentralized way



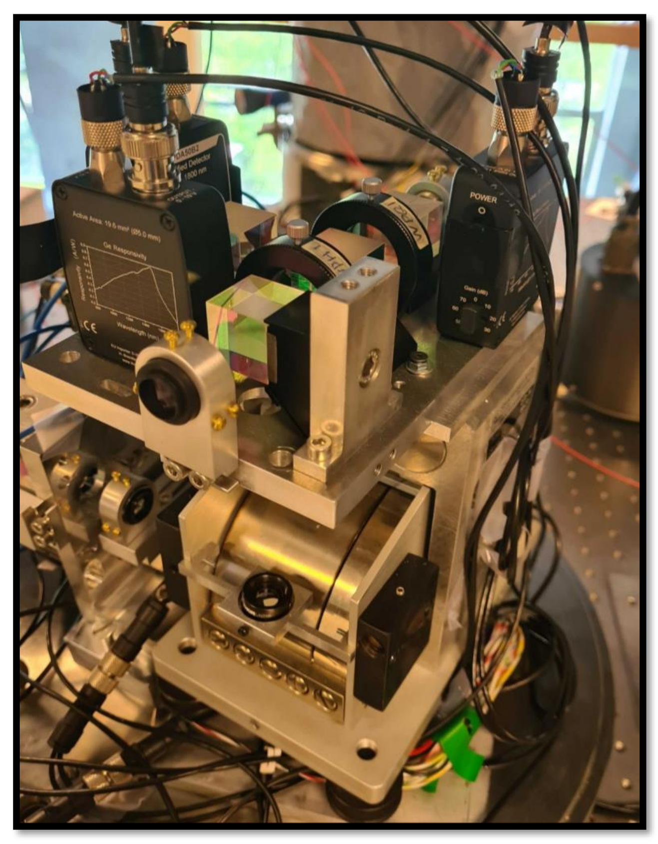
Horizontal loops closed in a decentralized way

Horizontal sensors



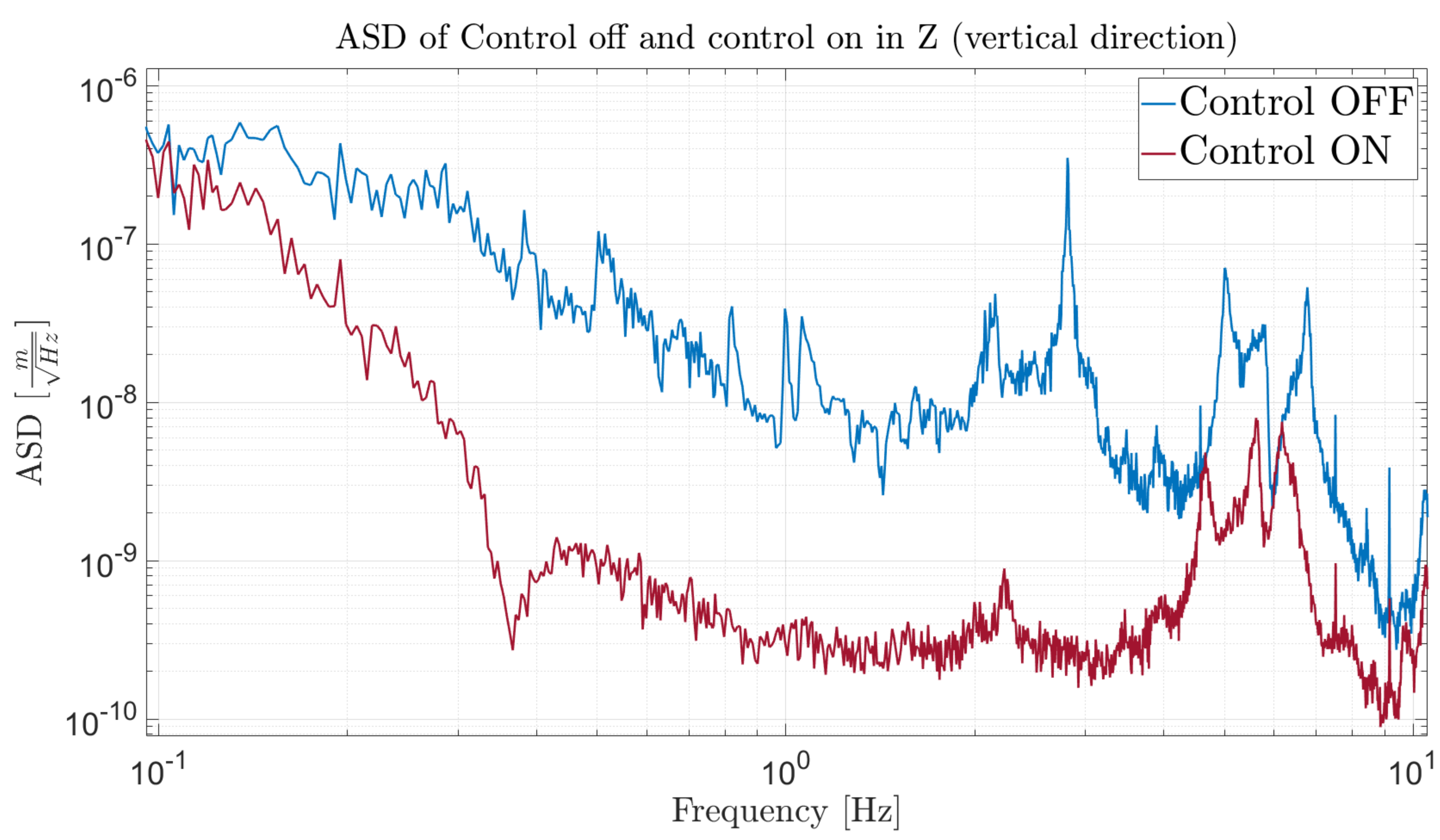
Horizontal Inertial sensor [4]

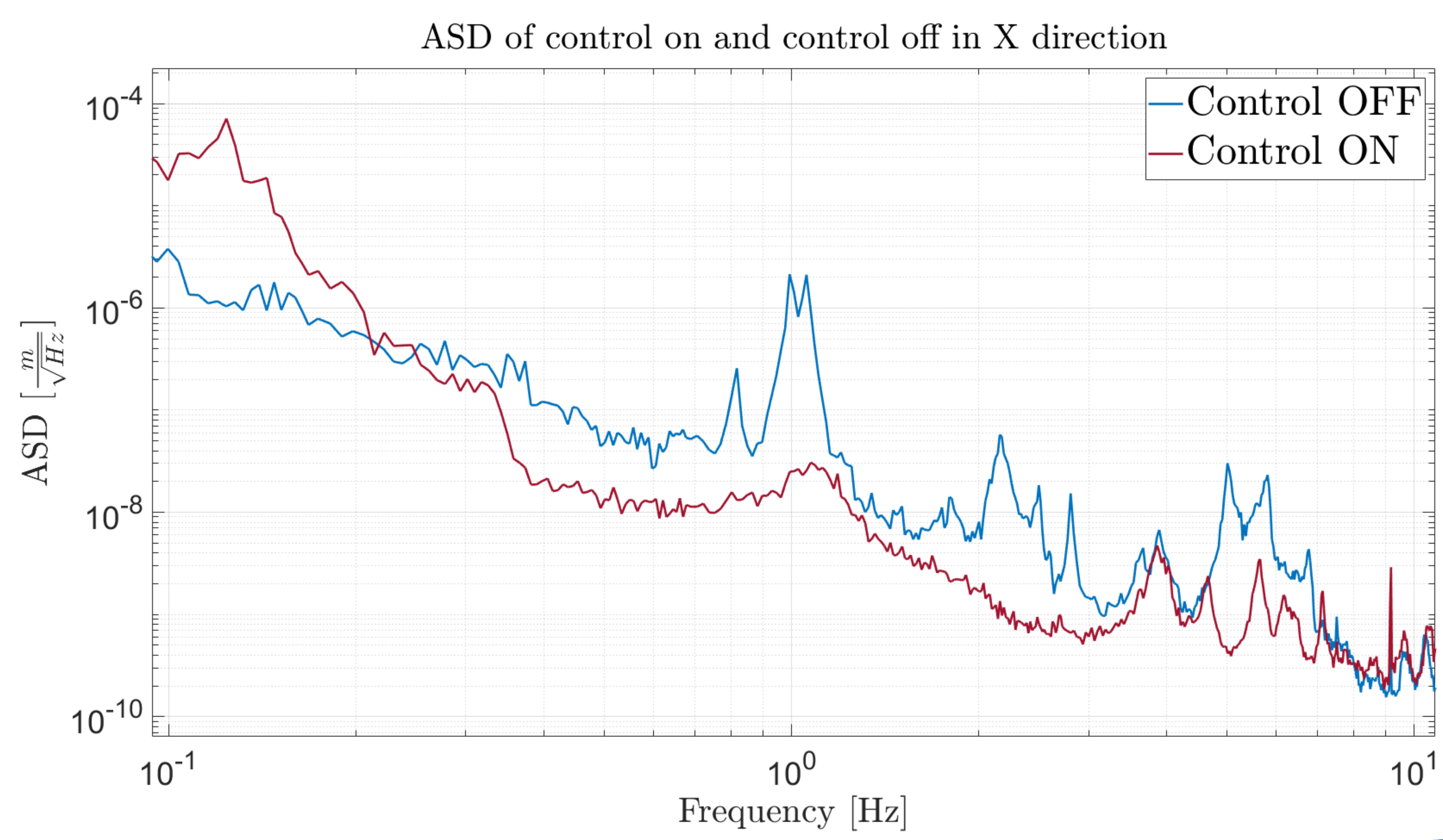
Vertical sensors



Vertical Inertial sensor [4]

Results





Acknowledgments

The authors gratefully acknowledge the European Research Council, Consolidator grant SILENT (grant agreement number 866259) for funding this research. The authors also acknowledge the LIGO scientific community for reviewing this research. This paper has been assigned the LIGO DCC number P2200218.

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