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Conceptual study of a 6-D active preisolator

We present the conceptual design of a six-degrees-of-freedom (6-D) active preisolator, building on the experience of the Virgo Superattenuator. The goal is to extend active control from the current three translational degrees of freedom to the full 6-D configuration, combining a mechanically optimized supporting structure with piezoelectric actuators and dedicated control strategies. The experimental validation is based on a testbench-sized Superattenuator installed at INFN Pisa. At present, this setup operates in 3-D and is used for transfer function measurements, noise characterization, and validation of numerical models. Its planned upgrade to 6-D will allow us to test the conceptual design under realistic conditions, while benchmarking the simulations against experimental data. This approach will provide a solid foundation for reliable modeling and the design of future full-scale systems.

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