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Commissioning and performance of the external injection bench seismic attenuation system for the Advanced Virgo gravitational wave detector

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Recently, the upgrade of the Virgo gravitational wave detector was kicked off with the installation of the new seismic attenuation system for the external injection bench. In the next two years the sensitivity of Virgo will be improved by an order of magnitude and it is believed that with its improved capability, Advanced Virgo will herald the era of gravitational wave astronomy.

The enhanced sensitivity of Advanced Virgo can only be achieved if the seismic isolation of several optical benches, hosting ancillary optics and angular and longitudinal sensing photodiodes, is improved. In particular, the external injection bench was found to be major source of beam jitter in Virgo+. New bench support structures, capable of attenuating seismic motion from 60 to 160 dB (> 10 Hz) in all six degrees of freedom are being constructed at Nikhef.

To reach the required performance these seismic attenuation systems make use of passive filters: short inverted pendulums and geometric anti-springs. Low frequency resonances are actively damped with a feedback system using accelerometers, LVDTs and voice coil actuators. Apart from systems that will be operated in air, systems that can operate in vacuum are being constructed.

The installation and commissioning of the first of these systems was completed in March 2012. We will give an overview of the design, installation and commissioning of this system and show the performance we have achieved.

for the collaboration

Virgo

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