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OmniSens in the Einstein Telescope

The detection of low-frequency gravitational waves (below 10 Hz) is critical for probing the astrophysical origins of black holes and for expanding the observable frequency range of next-generation interferometers. However, current detectors are fundamentally limited in this regime by seismic noise and tilt-to-horizontal coupling. The Omnisens project: a 6D interferometric inertial isolation system, addresses this challenge through the development of a seismic isolation platform capable of actively suppressing ground motion in all six degrees of freedom. The platform combines state-of-the-art interferometric inertial sensors, optimized for reduced readout noise, with fused silica suspensions engineered for low thermal noise. This architecture minimizes residual motion and substantially mitigates tilt-to-horizontal coupling, which is particularly detrimental at sub-10 Hz frequencies. By extending the seismic quiet zone and enhancing the stability of suspended test masses, the 6D Omnisens system is expected to enable a significant improvement in the low-frequency sensitivity of the Einstein Telescope. This poster presents design, commissioning progress and current status, highlighting its role as a key technology for achieving the ambitious low-frequency goals of third-generation gravitational wave observatories.

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