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The “Akìnetos” Large-band Tiltmeter for Virgo ground tilt measurement

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Newtonian noise (NN) is one of the limiting noise sources for the low-frequency sensitivity of GW detectors. To measure this contribution, during O3 a tiltmeter was installed in Virgo as part of a NN reduction system. As tiltmeter, we exploited the prototype balance for the Archimedes experiment, devoted to the measurement of the interaction between quantum vacuum energy and gravity. The same prototype was moved to Sos-Enattos in Lula (NU) to measure the ground tilt at the site candidate to host the 3G GW detector ET. The comparison of ground tilt noise at the two sites showed that the latter is about 100 times quieter than the Virgo site. This measurement also demonstrated that the prototype sensitivity reaches values below $10^{(-12)}$ rad/ $\sqrt{\text{Hz}}$ in the region between 1 and 10 Hz, which makes it the most sensitive tiltmeter in the world.

In view of O4, a new tiltmeter was designed, realized, and recently installed close to the Virgo North End tower. Besides the NN reconstruction aims, we will test the coherence of the tiltmeter data with the Virgo interferometer signal and with the environmental data below 10Hz, possibly giving a contribution to the noise reduction already in this phase of Virgo interferometer.

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