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Suspension fibers for large masses of Advanced Virgo Plus and beyond

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The observation of gravitational waves is highly influenced by the detectors sensitivity, that is limited at low frequencies (10 -100 Hz) by the thermal noise. For this reason, the monolithic suspensions are one of the most important upgrades of the interferometric detectors including Advanced Ligo (aLigo) and Advanced Virgo (AdV). The target sensitivity for the new updates of Advanced Virgo Plus (AdV+) passes through larger and heavy reference masses; this choice requires, among other things, a re-design of the silica fibers and a new capability to produce and test them, in order to minimize the thermal noise in the band of interest and to fit the load constraints.

The talk will present the design requirements of the silica fibers for large masses in terms of mechanical stress, thermal noise and resonant frequencies. Upgrades to the fiber manufacturing system and its advantages will be discussed. Moreover measurements of mechanical behavior and the comparison, in terms of thermal noise, with the AdV configuration will be presented.

Finally we will describe a project for the use of the fiber fabrication machine to produce silicon fibers using a silicon core surrounded by a silica cladding: some preliminary results will be shown.

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