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## ET Coating R&D @ UniSA/UniSannio

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The University of Sannio and the University of Salerno joined forces to develop advanced optical coatings for 3G gravitational wave detectors.

We own a fully programmable plasma-assisted e-beam optical-coating deposition system with sub-nm accuracy/repeatability, using up to 6 different materials in a single batch, and state-of-the-art thin-film characterization facilities including AFM, STM, XRD, SEM and TEM.

Identifying cryo-compatible high and low index optical materials (free from the well known blow-up of mechanical losses at cryo-temperatures observed in the materials used in 2G detectors) is a key problem for ET. Recent results, obtained in collaboration with NTHU, demonstrated that nanolayered composites made by a glassy but not cryo-friendly material like Silica, and a cryo-friendly material but prone to crystallization upon annealing like Titania tolerate very high post-deposition annealing temperatures without crystallizing, and do not exhibit a cryogenic mechanical-loss peak.

In the light of these results, nanolayered Silica/Alumina composites are suggested as an excellent candidate low-index ( $n \sim 1.6$ ) cryo-friendly coating material for ET, possibly better than currently candidate Silica-doped Hafnia ( $n \sim 1.8$ ).

The expected performance of a whole 5ppm transmittance coating based on a-Si and nanolayered  $\text{SiO}_2::\text{Al}_2\text{O}_3$  will be illustrated together with our deposition and testing plans for the next months.

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