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Characterization of light scattering point defects in high-performance mirrors for gravitational wave detectors

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The high reflective mirrors of the gravitational waves detector LIGO & Virgo present in the coating many micrometer size defects that scatter the light in the interferometer. This scattered light induces a loss of the laser power of the order of a few tens of parts per million (ppm) and a phase noise because of the recombination with the main beam after reflection on the tube walls. This phenomenon limits the sensitivity of the detector and impacts the ability to detect astrophysical events. A reduction of the scattered light is thus required in order to improve the optical performances of the coatings for the new mirrors of the Advanced LIGO and Virgo plus upgrade. For this purpose we studied the point defects for each material and we analyzed the impact of different parameters in order to compare the density and the size distribution of the defects.

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