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Scattered light measurement and active mitigation for Advanced Virgo Plus

Scattered light is a source of noise which limits the performance of current gravitational wave detectors.
In order to understand and mitigate this effect it is important to know quantitatively the amount of light backscattered by all the elements located on optical benches. To this purpose we built at LAPP an interferometric scattermeter with which the BRDF of the desired elements is measured.
In parallel, in Virgo we are working to mitigate the identified scattered light sources. On the one hand, we conducted a complete mitigation campaign of secondary beams, i.e. ghost beams, on all Virgo subsystems. As these unwanted beams propagate, they can produce scattered light that recombines with the interferometer beam. On the other hand, we developed a control loop to actively correct the stray light noise that was affecting the squeezing system. The principle of this system can be applied in other circumstances.

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