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Demonstrating up to 20 dB of straylight suppression with tunable coherence

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As straylight is a dominating limitation for the sensitivity of gravitational wave detectors, we investigate new laser operation concepts and interferometer topologies for a more straylight-resilient detector configuration. Our main focus is the use of tunable coherence realized by phase modulation following a pseudo-random-sequence on the interferometer laser.
This breaks the coherence of the delayed straylight reducing its intrusive impact with the remaining coherence length only depending on the modulation frequency. Thus, effectively realizing a pseudo white-light interferometer with tunable coherence length. We demonstrate this in a Michelson-topology with a remaining coherence length of roughly 30 cm and prepare to experimentally adapt it for cavities and Sagnac-like interferometers.
Here, we present our recent results, achieving close to 20 dB of straylight suppression in a table top Michelson-interferometer using tunable coherence.

Primary authors: VOIGT, Daniel (Universität Hamburg); GERBERDING, Oliver (Universität Hamburg, Institut für Experimentalphysik)

Co-authors: LOHDE, André (Universität Hamburg); EGGERS, Leonie (Universität Hamburg)

Presenter: VOIGT, Daniel (Universität Hamburg)

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