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Mitigation of back-scattered light by dual balanced-homodyne readout

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Back-scattered light results in parasitic modulations of the output light of gravitational-wave observatories. It constitutes a major noise source at low audio-band and sub-audio-band frequencies. Whereas gravitational-wave (GW) signals exclusively appear as amplitude modulations of the output light, modulations due to back-scattered light in general also have projections onto the phase quadrature. This contribution proposes to use two-mode squeezed, dual balanced homodyne detection to discriminate between GW signals and parasitic interferences and to subtract the disturbances from the h(t) output. The proof of principle was researched in recent years [1-2].

[1] M. Meinders; R. Schnabel, Sensitivity improvement of a laser interferometer limited by inelastic back-scattering, employing dual readout, Class. Quantum Grav. 32, 195004 (2015).
[2] M. Ast, S. Steinlechner, R. Schnabel, Reduction of Classical Measurement Noise via Quantum-Dense Metrology, Phys. Rev. Lett. 117, 180801 (2016).

Primary authors: SCHNABEL, Roman (Universität Hamburg); Dr STEINLECHNER, Sebastian (Maastricht University & Nikhef); Dr AST, Melanie (Max-Planck-Institut für Gravitationsphysik)

Presenter: SCHNABEL, Roman (Universität Hamburg)

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