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First demonstration of tunable coherence in a power-recycled Michelson

As straylight is an important 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-noise (PRN)-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 PRN frequency. Thus, effectively realizing a pseudo white-light interferometer with tunable coherence length.
In addition to our successful concept demonstration in a Michelson interferometer and optical cavities individually, we effectively reduced the resonant enhancement of these cavities to a delays in the μm range.
Now, we present first results from a power-recycled Michelson at increased PRN frequencies up to 10 GHz reducing the coherence down to only several wave lengths.

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