

Making human hair transparent

The mutual extinction (ME) effect was recently discovered and measured in our labs [1]. This effect allows us to control the opacity of a sample for laser beam, by crossing a second beam on it. This can be used in telecommunications and microscopy directly by reducing the opacity of a random media or enhancing the scattered light of the target.

Furthermore, the ME effect can tell us information about the sample, like the full scattering amplitude (real and imaginary part) and the scatterers distribution on it. For that, we will need to know the exact phase and angle difference between the two laser beams.

How can we measure the exact phase?

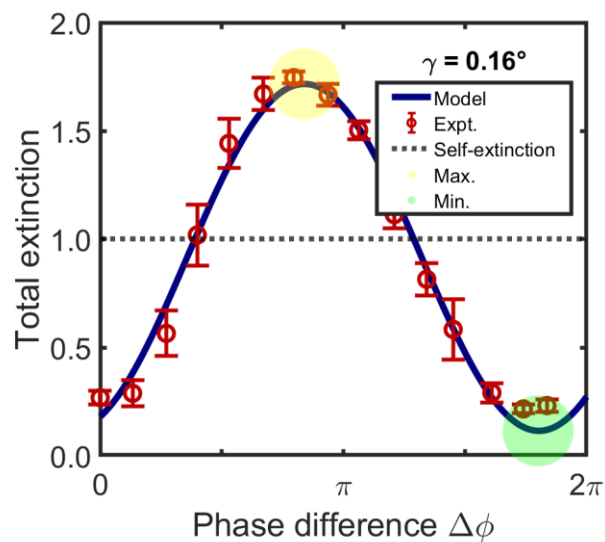


Figure 1. Variation of total extinction of a human hair by changing the phase of one beam. The green highlight circle indicates when the sample is almost transparent (extinction close to zero).

In this BSc project, we want use and expand an existing setup [2] to perform mutual extinction measurements to make a scattering sample (e.g. a human hair) transparent. Additionally, we can use an automatic rotating arm to extract the true phase difference between the laser beams to further characterize the scattering sample.

This project will partially involve design, experiments, and analysis.

References:

1. A Lagendijk, AP Mosk, WL Vos, EPL **130**, 34002 (2020)
2. A. Rates, A. Lagendijk, O. Akdemir, A.P. Mosk, W.L. Vos, Phys. Ref. A, **104** 043515 (2021)

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