# Finesse 3 simulation for GW detector: using multi-modal simulation to design and prepare the O5 upgrade on Virgo

*mardi 10 juin 2025 14:00 (20 minutes)*

Backscattered light is a source of noise in the Virgo interferometer. A fraction of light scattered by elements in optical benches recouples with the main beam, either in the Fabry-Perot cavity for end-arm benches or in the Signal Recycling Cavity for detection benches. During O4, the mirror of the signal recycling cavity (SR) was misaligned to increase the sensitivity.

If it's possible to directly measure the noise added by the backscattered light, transfer functions are necessary to link this measurement to a fraction of backscattered light by benches. These transfer functions allow linking the movement of the bench to h(t). Previously, these transfer functions were obtained using Optickle, which is not maintained anymore and cannot model mirror misalignment.

In this talk, I will describe how Finesse 3 helped me to update this Optickle model to compute new transfer functions between bench movements and h(t). I will also describe general Finesse 3 capability on transfer function measurement.

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**Classification de Session:**  Contributions (15' + 5' de questions)