ID de Contribution: 9

Optical Simulation using python : analysis of tilt-to-length coupling for LISA

mardi 10 juin 2025 14:40 (20 minutes)

Space based gravitational wave detectors are plagued with a parasitic coupling between the jitter of the laser beams relative to one another and the optical path length read out of the interferometer. This noise source was not limiting on ground based GW detectors since the state of the art stabilisation technologies developed for LVK observatories allow to have extremely stable test masses, thus extremely stable interferometric beams.

This will not be the case for space based observatories that will be subjected to many external forces acting on different systems of the instrument and inducing important levels of jitter on all 3 spacecrafts, then being imprinted on the laser beams exiting and incoming onto the spacecraft.

In some case, this coupling can be mitigated by the use of careful design and calibration; but with some sources like wavefront error we won't be able to differentiate between TTL and a true GW signal. For this reason, simulation have to be performed to assess the influence of wavefront error on the TTL coupling in order to be able to properly choose the specification to impose on the quality of the optical system as a whole.

For this contribution, I will give an overview of the current knowledge about TTL coupling, and give a few information about the context of this study.

I will then describe the simulation tool developed for this study and summarize the main results that have been obtained and finally open about the next steps.

Author: VINCENT, Maxime (AstroParticule et Cosmologie)

Orateur: VINCENT, Maxime (AstroParticule et Cosmologie)

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