



ID de Contribution: 40

Type: Oral presentation

## Simulating interferometric signals and testing TDI for the LISA space mission

*vendredi 12 février 2021 15:00 (15 minutes)*

Gravitational waves are very small variations of space-time metric which can be detected with high precision laser interferometry. The LISA method consist of measuring distance fluctuations between free-falling test masses.

As with any detector, signal to noise ratio has to be optimised. In actual ground-based interferometers like LIGO/VIRGO experiment, sensitivity is limited by seismic and quantum noises. In the LISA case, the raw measurements are burried within the laser frequency noise. Actually, due to the LISA constellation geometry, the phase fluctuations due to the laser instabilities dominate by 8 orders of magnitude the gravitational wave signal.

A noise reduction method named Time Delay Interferometry (TDI) was developed in the 90's. Recombining in post-processing the interferometric signals, it will remove the laser frequency noise of future LISA data. This algorithm is crucial for the success of the LISA mission and needs to be tested with simulated data before launch.

For several years and with the support of CNES, an electro-optical bench for metrological demonstration named LOT (for "LISA On Table") has been set up at APC. The objective of this bench is to demonstrate experimentally several aspects of TDI, characterize its frequency response and assess the noise residuals. According to the last results, TDI works properly with a reduction factor of the laser frequency noise around  $10^7$  for the optical interferometer and  $10^8$  for the electrical interferometer, using TDI 1.0 for a simplified static LISA constellation. These results and future improvement of the LOT allowing to simulate Doppler and Sagnac effects in order to test TDI 2.0 will be presented.

### Field

Instrumentation

### Day constaints

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**Classification de Session:** Talk

**Classification de thématique:** Astrophysics