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FIRST: going above the resolution limit of a telescope for substellar companion characterization

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FIRST (Fibred Imager foR a Single Telescope) is an original instrument dedicated to imaging substellar companions at high contrast and high angular resolution in the visible. Its principle is based on the pupile remapping technique, which turns a monolithic telescope into an interferometer. Thanks to the monomode filtering operated by the optical fibers and an appropriate beam recombination scheme, this method allows the detection of companions at angular separations shorter than the diffraction limit of the telescope. In addition, the interferometric recombination of FIRST is coupled with a spectrometer, allowing the spectral characterization of the detected companions, a unique capability at such spatial scales.

A first version of the instrument has been installed on the Subaru Japanese 8m-telescope, in Hawaii. An upgraded version, FIRSTv2, is currently under development at LESIA and includes instrumental modifications in order to increase its sensitivity. The main modification consists in the integration of an innovative integrated optics chip to perform the interferometric recombination. In particular, this electro-optic component provides an on-chip mean to modulate the phase at high frequency, opening new observing mode possibilities.

In this presentation I will explain all these aspects of this instrument and talk about my thesis project: characterize the second version of this instrument, integrate it at the Subaru telescope and astrophysical exploitation of it.

Field

Instrumentation

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Classification de Session: Talk

Classification de thématique: Astrophysics