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First LSST dataset: toward the next generation of cosmological constrains

- Thèses, Stages, Formation et Enseignement - Propositions de thèses 2020 -



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Title: First LSST dataset: toward the next generation of cosmological constraints

Supervisor: [Pierre Antilogus](#)

Team: Cosmology and dark energy; group: LSST

Description:

The LPNHE cosmology group is involved in key projects to study the Dark Energy. The group plays/has played a central role in the usage of the Supernova Ia (SNIa) probes, still providing today the dominant constraints on Dark Energy property, but its activity has evolved to integrate the two future key probes, BAO and weak lensing, and to re-activate the peculiar velocity probe which will open an unique new window with the LSST data. The usage of these probes sensitive to the structure formation will also allow to point out possible deviation to the General Relativity at large scale. This evolution toward a multi-probes approach is mandatory to provide the best constraints with the future projects (LSST, Euclid, DESI).

The LPNHE group is involved since 10 years in the construction of the LSST telescope. The LSST project enters now in its commissioning phase, the last step prior to the start of the scientific program. During the commissioning the system is checked and optimized with precursor datasets. The first LSST science data will be collected in 2022 during the thesis.

In this context the proposed thesis work covers two aspects:

- The LSST focal plane is the largest existing focal plane (40 times the apparent surface of the moon) to date. The requested precision for the LSST science implies a precise understanding of the instrumental signature of its sensors. These effects are one of the keys of the LSST success, and the LPNHE group has a strong expertise on this type of effects. Using commissioning data the PhD student will further prepare the removal of the sensor instrumental signature and will also qualify the corresponding corrections on the first science data.
- The peculiar velocity based on a well measured SN Ia sample, is an unique probe to study the universe dominated by dark energy (at low red-shift, $< 0.2- 0.3$, weak lensing and BAO probes are highly limited by cosmic variance) . The LPNHE group is involved in developing the analysis in LSST with this new probe. The goal of the thesis will be to perform preliminary studies related to this probe to prepare the collection and analysis of the first LSST dataset.

Work location: LPNHE, Paris

Possible trips: Still during the thesis, the analysis and commissioning activities will imply travels to the US and Chile

Documentation:

- <http://www.lsst.org/lsst>
- <http://lsst.in2p3.fr/>
- <http://www-lpnhep.in2p3.fr/>

Contact: [Pierre Antilogus](#), 33 (0)1 44 27 41 54