

Cosmology

Title: Cosmological Parameters Estimation from Cosmic Microwave Background Data

Laboratory: IRFU/DAP/CosmoStat

Supervisors: Valeria Pettorino and Jean-Luc Starck

Contact Informations: valeria.pettorino@cea.fr, jstarck@cea.fr

☎ : 01 69 08 57 64

Duration: between 4 and 6 months

Location: Département d'Astrophysique, CEA Saclay

Keywords: Cosmology, cosmological parameters estimation, CMB

Possibility to continue for a PhD: Yes

Subject:

Recent space missions such as WMAP and PLANCK allow us to map the cosmic microwave background distribution (CMB) with a high resolution both for temperature and polarization. The CMB is the radiation emitted 380,000 years after the Big Bang: its tiny differences in temperature (anisotropies) and its polarization pattern can be related to the evolution and content of the Universe. This gives us the possibility to better constraint cosmological parameters [3] and test the dark universe [4], combining CMB with other late time observations.

Based on new statistical concepts, very clean full sky maps have been built [1,2]. The goal of the internship is to use such CMB maps to derive the cosmological parameters and to compare them to previous published estimations. In order to do so, the student will have a glimpse on how real data can be linked to theoretical interpretation of the Universe, and learn how to use Monte Carlo simulations and a Boltzmann code in cosmology.

References:

- 1) J. Bobin, F. Sureau and J.-L. Starck, "[CMB reconstruction from the WMAP and Planck PR2 data](#)", *Astronomy and Astrophysics*, 591, id.A50, 12 pp, 2016.
- 2) J. Bobin, F. Sureau and J.-L. Starck, "[Polarized CMB recovery with sparse component separation](#)", *Astronomy and Astrophysics*, 583, id.A92, pp 12, 2015.
- 3) Planck 2015 results. XIII. Cosmological parameters, <https://arxiv.org/abs/1502.01589>, *A&A* 594, A13 (2016)
- 4) Planck 2015 results. XIV. Dark energy and modified gravity, <https://arxiv.org/abs/1502.01590>, *Astronomy & Astrophysics*, Volume 594, id.A14, 31 pp.