

Post-doctoral position

Searching for Dark Matter with a network of atomic clocks

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Description

Several astrophysical observations suggest that ordinary matter contributes only to around 5% to the total energy content of our Universe. The unknown remaining part has never been directly detected so far and is commonly separated into two components: dark matter which behaves as a pressure-less fluid and dark energy, a fluid exerting negative pressure. Many hypotheses have been imagined to explain these two components ranging from the introduction of a new type of matter to a modification of general relativity. Currently, all we know about dark matter is based on the gravitational interaction between the dark and luminous matter. Some theoretical models suggest that dark matter consists of a massive scalar field producing space-time variations of fundamental constants of Nature. Such a dependency of fundamental constants is also predicted by theories motivated by the development of a quantum theory of gravitation and is extensively searched for with atomic clocks. Dark matter models predict either transient or oscillating variations of fundamental constants, requiring the development of new strategies for clock comparisons measurements and data analyses. The aim of this project is to exploit global and local networks of atomic clocks time and frequency comparisons in order to detect or constrain such models. First, we will identify the best strategy to reach this goal and then apply it in order to perform the measurements and the analyses that will detect or constrain dark matter in the form of a massive scalar field.

Skills

Strong skills in data analysis and numerical computation are necessary. A good knowledge of dark matter models and/or atomic clock comparisons will be favored.

Position

The position provides a one year appointment starting preferably before February 2018. It is funded by LabEx First-TF¹. Applicants should send their CV and two recommendation letters to Pacôme Delva (pacome.delva@obspm.fr).

¹ <http://first-tf.com>