

# Post-doctoral position

## Searching for Dark Matter transients using Galileo data

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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 ultralight transient topological defects that are regularly crossing the Earth. Such transients will produce signatures on both the GNSS atomic clocks and on the propagation of the GNSS electromagnetic signal. The goal of this project is to develop a modelling of GNSS observables including these possible signatures from Dark Matter transients and to develop a new strategy to analyse GNSS measurements to search for such Dark Matter candidates. First, we will identify the best strategy to search for Dark Matter transients using the Galileo constellation. Then, we will develop a methodology and the associated tools to perform the first search for Dark Matter using Galileo measurements, which will be carried out using Galileo data and support from ESA (European Space Agency) and international laser ranging stations (ILRS - International Laser Ranging Service). The activity will benefit from experience gained by our team in analysing Galileo data for tests of general relativity [[Delva et al. PRL 121, 231101, 2018](#)].

### Skills

Strong skills in statistics, data analysis and numerical computation are necessary. A good knowledge of GNSS data analysis will be favored. Theoretical knowledge of Dark Matter models is a plus.

### Position

The position provides a one year appointment starting preferably before March 2020, but open until filled. It is funded by ESA/H2020. Applicants should send their CV and two recommendation letters to Pacôme Delva ([pacome.delva@obspm.fr](mailto:pacome.delva@obspm.fr)), preferably before December 20<sup>th</sup>, 2019.