



Contribution ID: 62

Type: talk

MICROSCOPE: while waiting for the final results

Thursday, 21 February 2019 09:35 (35 minutes)

MICROSCOPE is a CNES-ESA-DLR-ONERA-CNRS-OCA-ZARM space mission that aimed to test the Weak Equivalence Principle (WEP) at the 10^{-15} level, i.e. two orders of magnitude better than the best “pre-MICROSCOPE” on-ground tests. The WEP is the cornerstone of General Relativity, the postulate that led Einstein to establish his theory: it states that all bodies fall at the same rate, independently of their mass and composition. Alternative theories of gravity, like those developed to overcome such conundrums as dark energy or the unification of gravity with the forces of the standard model of particle physics, generically predict a small violation of the WEP. As a consequence, not only does MICROSCOPE test the very foundation of General Relativity, but it also provides new constraints on theories beyond Einstein’s.

Launched on April 25, 2016, the MICROSCOPE satellite and its scientific instruments provided high-quality data during the entire mission, which came to its end on October 16, 2018. The first results, based on 7% of the total data, ruled out a violation of the WEP greater than 2×10^{-14} . Since then, more data have been taken and additional analyses have been conducted to better constrain the level of systematic errors. While the remaining data is still being analysed, the final MICROSCOPE results should come closer to the 10^{-15} precision; they should be published at the end of 2019.

In this talk, I will first introduce the MICROSCOPE mission, in particular its scientific goals and measurement principles. Then, I will discuss its first results and mention what constraints MICROSCOPE can bring on some modified gravity models.

Summary

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Session Classification: General Relativity & Cosmology

Track Classification: Gravity: Experiments