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# MICROSCOPE as a test of Lorentz invariance and neutrino physics

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## Abstract

MICROSCOPE is designed to be a test of the Weak Equivalence Principle (WEP) which asserts that all objects in a gravitational field experience the same acceleration at a given space-time point irrespective of their composition. MICROSCOPE will test the WEP by searching for a differential acceleration of test masses in orbit. If such a differential signal were seen it would be natural to attribute it to a violation of the WEP by the gravitational interaction, or as the effect of a new external "fifth force". Here we note the possibility of two alternative explanations: a violation of Lorentz invariance, (LI) and a coupling of the test masses to ambient neutrinos or dark matter. In the first case it can be shown that a violation of LI will in general also lead to a violation of the WEP. In the second case, related to the first, the ambient presence of dark matter and/or neutrinos could simulate the presence of a LI-violating background. Each of these possibilities could produce signals in MICROSCOPE different from what is currently expected, and hence an effort to understand these alternative scenarios appears worthwhile in advance of the proposed launch.

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