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The BepiColombo mission to Mercury: state of the art of the ISA accelerometer implementation onboard the Mercury Planetary Orbiter

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The Italian Spring Accelerometer (ISA) has been selected by ESA to fly onboard the Mercury Planetary Orbiter (MPO) of the BepiColombo space mission. Mercury's exploration represents one of the most important challenges of modern planetary sciences and the mission aims to reach a much better understanding of the internal structure and composition of the planet, which in turn are needed for a deeper comprehension of the formation of the terrestrial planets, hence of that of our solar system. Moreover, because of its proximity to the Sun, Mercury represents a unique opportunity to test Einstein's theory for the gravitational interaction with respect to other proposed theories of gravitation.
The BepiColombo Radio Science Experiments (RSE) are devoted to reach the above ambitious goals and the measurements of the onboard accelerometer are necessary to remove (a posteriori) the very complex to model, strong and subtle, non-gravitational accelerations due to the very strong radiation environment around Mercury.
We focus on the accelerometer characteristics and performance, on the functional tests that are necessary for its implementation onboard the MPO and in the procedures that are necessary for the reduction of the accelerometer measurements in order to be used in the context of the RSE. We finally introduce the description of the accelerometer proof-masses non linearities, their impact in the measurements and the way to handle such effects.