Questions on M5 proposals

Proposal Title:

Galileo Galilei (GG)

Q1. The current levels of differential acceleration measurements performed on ground (cited in Table 2) require nearly 5 orders of magnitude extrapolation to the required flight GG resolution, with a novel flexure joint suspension that has not, to our knowledge, been used in small force measurements near the required level (10^{-15} N resolution for the 10 kg test masses). The reference to achieving statistical SNR = 2 in 3.5 hours (Sec. 2.72) is even more daunting, requiring differential acceleration noise near 5 10^{-15} $m/s^2/Hz^{1/2}$, roughly the published LISA Pathfinder value. Ground testing, as we understand from the proposal, has fundamental limits due to the stiffer suspension required but also significant additional "technical" noise that has not been resolved (factor 37).

What will be the strategy for verification of the required differential acceleration sensitivity for the GG apparatus, to limit uncertainties in the science return as early as possible in the project?

Q2. What is the current landscape for interpreting a possible null result in light of evolving theoretical work and the possibility of a null result at the 10^{-15} level by Microscope (with results likely in the very near future)? What are the leading theories and to what extent can they be confirmed or ruled out by a null result at the 10^{-17} level? The proposers are also asked to comment on the specific impact of their results on the dark matter question, alluded to in the proposal introduction.

Q3. There is little discussion of the choice of materials to be used for the "violation" accelerometer. How does the Be / Ti baseline choice maximise the impact of GG as a WEP test?

Q4. What is the strategy behind the choice of the "control" accelerometer with two TM of the same composition (as opposed, for instance, to an accelerometer that inverts the geometric configuration of the two TM)? Will the control accelerometer have the same resolution?