Paper ID: 41834
oral

SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS (A7)
Space Agency Strategies and Plans (1)

Author: Mr. Cesar García Marirrodriga
ESTEC, European Space Agency, The Netherlands

TECHNOLOGY CHALLENGES AND RESULTS OF LISA PATHFINDER

Abstract

We report the technological challenges and the results of the LISA Pathfinder in-flight experiment. The results demonstrate that two free-falling reference test masses, such as those needed for a space-based gravitational wave observatory like LISA, can be put in free fall with a relative acceleration noise with a square root of the power spectral density of 5.2+/-0.1fm*s-2/sqrt(Hz) or (0.54 +/-0.01)*10-15g/sqrt(Hz), with g the standard gravity, for frequencies between 0.7 and 20 mHz. This value is lower than the LISA Pathfinder requirement by more than a factor of 6.5 and just at the level of the requirement for the LISA mission, and is compatible with Brownian noise from viscous damping due to the residual gas surrounding the test masses. Above 60 mHz the acceleration noise is dominated by interferometer displacement readout noise at a level of (34.8+/-0.3)fm/sqrt(Hz), about 2 orders of magnitude better than requirements. At f 0.1 mHz we observe a low-frequency tail that stays below 12 fm*s-2/sqrt(Hz) down to 0.1 mHz. This performance would allow for a space-based gravitational wave observatory with a sensitivity as recently proposed for LISA, the third large ESA mission in the Science Programme.