APR09-2009-000599

Abstract for an Invited Paper
for the APR09 Meeting of
the American Physical Society

LISA Pathfinder: testing the limits of pure geodesic motion for gravitational wave observation in space

WILLIAM WEBER, University of Trento and INFN

Placing a gravitational reference test mass in nearly perfect geodesic motion, without any perturbing forces, is a critical problem for space-based gravitational wave detection and for a wide class of precision gravitational measurements. For the Laser Interferometer Space Antenna (LISA), high resolution observation of gravitational radiation from distant coalescing massive black holes will require that the geodesic reference test masses that serve as interferometry end mirrors be in free-fall to within a residual acceleration noise of order femto-m / s^2/ $\sqrt{Hz}$ at frequencies near 0.1 mHz. The LISA Pathfinder mission, scheduled for launch by ESA and NASA in 2010, aims to demonstrate geodesic purity for a LISA-like test mass inside a co-orbiting spacecraft at a level approaching this LISA free-fall goal. In this talk, I will discuss the LISA Pathfinder flight experiment and what we have learned, in ground-based preparations for the mission, about the limits of free-fall that are relevant to gravitation wave detection and to other precise small force measurements.