

**Contracts Final Presentation 19-20 Feb. 2004**

**1. Title of the presentation**

Geant4 Simulations of Test-Mass Charging in the LISA and LISA Pathfinder Space Missions

**2. Speaker**

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**3. Abstract**

The radiation environment which will be encountered by the LISA space interferometer in its Earth-like orbit around the Sun can challenge its ambitious sensitivity to detect gravitational waves. Its precursor mission, LISA Pathfinder (formerly known as SMART-2), will be similarly vulnerable at the Earth-Sun L1 Lagrange point. Important effects can arise from the accumulation of electrostatic charge in the isolated masses due to the constant flux of cosmic-ray and solar particles and their interaction with the materials in the spacecraft. A charged test mass will interact electromagnetically with any surrounding conducting surfaces as well as with magnetic fields in the interplanetary space. These spurious Coulomb and Lorentz forces can produce coherent signals and fluctuations in the measurement bandwidth which can limit the sensitivity to gravitational waves. The Geant4 Monte Carlo toolkit has been used to produce estimates of test-mass charging rates and associated fluctuations based on extensive simulations of the LISA and SMART-2 spacecrafts, for several exposure scenarios. These simulations have relied on detailed geometry implementations, the most up-to-date physics models and significant computational power to give an insight into the underlying charging mechanisms.