Corso di dottorato in Fisica / PhD in Physics
Cycle 39
A.Y. 2023/2024

Borsa a tematica vincolata E/ *Reserved scholarships E*

PhD Scholarship Title	Sviluppo e test a Terra del sistema di masse di riferimento del moto geodetico per un osservatorio orbitante di onde gravitazionali/ *Development and ground testing of a system of free-falling reference test masses for an orbiting gravitational wave observatory*
Research group link	https://lisa.physics.unitn.it/home
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Synthetic description of the activity and expected research outcome	The proposed research focuses on the design, analysis, and, in particular, ground testing of the system of geodesic reference test masses for the LISA mission. LISA is an orbiting gravitational wave observatory in the 100 microHz - 1 Hz band, in preparation for launch in 2035 as the ESA L3 "large mission". The most critical element of LISA measurement science and sensitivity at low frequencies is a set of free-falling test masses which trace geodesic motion, free of any spurious accelerations below the 10^15 m/s^2 level on hour-long time scales, and thus sense the gravitational wave-induced tidal accelerations. The Italian hardware contribution to LISA, through the Italian Space Agency (ASI) is this set of free-falling test masses and the surrounding sensing / actuation / shielding hardware and electronics, known collectively as the "gravitational reference system" (GRS) and which is being developed under the scientific responsibility of the Trento group. The doctoral research will focus on testing the GRS in the laboratory, including small force measurements with a torsion pendulum and supporting electronic and electrostatic measurements. In addition to pushing the (femtoNewton) limits on force noise originating in the GRS, the study aims to understand the physics of key limiting noise sources of electrostatic, molecular, electronic-back action, thermal, and photoelectric origin.
Ideal candidate (skills and competencies):	The ideal candidate has a broad and general interest in experimental physics, small force detection and low noise measurements at low frequencies, both in the lab and with analysis. He or she should enjoy working in a team setting to contribute to a large mission with an important impact in both experimental gravitation and astrophysics.