LENS-QSTAR Seminar
April 8, 2014 at 11:00, Room 31
Dipartimento di Fisica e Astronomia, sede di Arcetri, L.go E. Fermi 2

Carlos Sabín Lestayo
University of Nottingham

Relativistic quantum clocks

Time dilation, a striking prediction of Einstein's relativity, plays an important role in applications such as the Global Positioning System. One of the most compelling consequences of time dilation is known as the twin paradox, where a twin at rest ages more than her sibling travelling at relativistic speeds.

In this talk, we discuss an implementation of the twin paradox in superconducting circuits with velocities as large as a few percent of the speed of light. Ultrafast modulation of the boundary conditions for the electromagnetic field in a microwave cavity simulates a clock moving at relativistic speeds. While previous demonstrations of this effect involve point-like clocks, our superconducting cavity has a finite length, allowing us to investigate the role of clock size as well as interesting quantum effects on time dilation. In particular, our theoretical results show that the travelling twin ages slower for larger cavity lengths and that quantum particle creation, known in this context as the dynamical Casimir effect, increases time dilation.

Finally, we will discuss how the accuracy of a clock is affected by the Dynamical Casimir Effect and other phenomena generated by relativistic motion.

Contact: c.sabin.les@gmail.com

Reference person : Augusto Smerzi