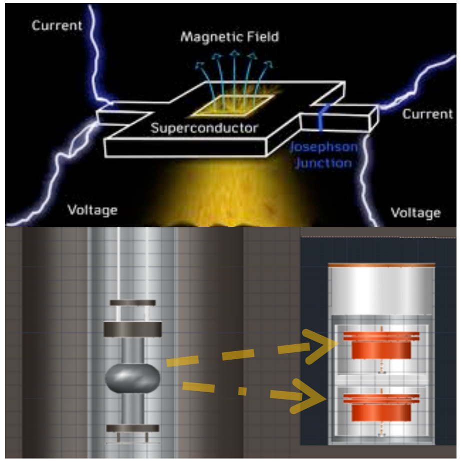
Figure 1: Prototype tuneable detector cavity (variable cell to cell Coupling), Bulk Niobium.

LECTURE
La Sapienza University of Rome
And INFN Rome/Frascati
July 5, 2016



Quantum Sensors for Fundamental Science and the Dark Universe

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Tremendous advances have been made in the last two decades in precision 'Quantum' technologies and techniques in multiple disciplines e.g. cavity electrodynamics, atomic beam interferometry, SQUIDS, quantum optical "squeezed state" techniques for noise-free single photon detection, qubit-based quantum entanglement techniques, high-Q superconducting cavities, precision NMR detection via designer materials, etc. These advances promise to enable transformational research using ultra-sensitive probes to explore very "weak effects" on a laboratory scale. These weak effects are manifest everywhere in nature in material and living systems from the laboratory to outer space. Potential "mezzo-scale" experiments and facilities can be envisaged using "quantum sensors" to search for ultra-weak physical, chemical or biological signals of fundamental significance to the material and living world around us as well as explore the "inner" and "outer" dimension of "vacuum" believed to be manifest in the so-called "dark" universe. This talk will illustrate this potential via a few exciting examples discussed at the recent US Department of Energy Round Table on Quantum Sensors in February 2016.