

**Seminario: 25/02/2020, ore 15.00, Aula HT6-1 Incubatore d'Impresa**

**Docente/Relatore: Dr. Roberto Stassi, Dip. MIFT – Università degli Studi di Messina**

## **Exploiting ultrastrong coupling regime for quantum computation**

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Using superconducting circuits, is possible to achieve very strong coupling between a two-level system and a cavity field [1]. In this second talk, I will discuss two proposals that make use of ultrastrong coupling regime to improve the performance of quantum computers. In the first one, I will show how to increase the coherence time of a superconducting qubit for a quantum memory [2].

The coupling among superconducting qubits is restricted only to nearest-neighbours. This is one of the limiting factors for the scalability of this technology, and a problem of central importance. In the second part of this talk, I will discuss a proposal for a scalable architecture to simultaneously connect many distant pairs of logical qubits [3].

[1] Yoshihara, F., et al. "Superconducting qubit–oscillator circuit beyond the ultrastrong-coupling regime." *Nature Physics* 13.1 (2017): 44-47.

[2] Stassi, R., and Nori, F. "Long-lasting quantum memories: Extending the coherence time of superconducting artificial atoms in the ultrastrong-coupling regime." *Physical Review A* 97.3 (2018): 033823.

[3] Stassi, R., Cirio, M., and Nori, F. "Quantum bus building-block for a scalable quantum computer architecture." *arXiv preprint arXiv:1902.06569* (2019).