

HAIRS

Mon, 2014-03-03 13:38 - [admin](#) **Full Name:** Hybrid Architecture for quantum Information using Rydberg ensembles and Superconductors

Coordinator: (CNRS)

Location

France
46° 13' 39.4968" N, 2° 12' 49.4964" E

Website:

TBA

Running time: 2014-02-01 - 2017-01-31

We propose to solve the long-standing problem of coupling quantum states in atoms to solid-state quantum devices. The realization of such a quantum interface represents a major breakthrough for information science, as it enables the development of a powerful hybrid architecture, where long-lived states of atoms store quantum information that can be processed rapidly using superconducting quantum circuits. Within such a hybrid approach, the problem of scalability, fast information processing and long-time storage of quantum information can all be solved on a single integrated platform. The major obstacle, thus far, has been to find a suitable quantum interface between atoms (memory) and the surface of the solid-state device (processor), hampered by too low coupling strengths and/or too fast information loss due to fluctuating atom surface interactions. In this project, we propose to develop and implement a novel approach that solves both of these problems simultaneously.

On the one hand, we will make use of the strong microwave transition between highly-excited, atomic Rydberg states to achieve strong coupling to a superconducting stripline cavity. On the other hand, the key point of this proposal is the use the enormous interactions between Rydberg atoms for collective encoding of quantum information in large ensembles that will be immunised against parasitic field fluctuations by the strong interactions. We will tackle this ambitious goal within a consortium that combines strong experimental and theoretical expertise in all the necessary areas and contributes complementary setups for state-of-the-art experiments on cold Rydberg atoms superconducting quantum circuits.

- [EC - FP7](#)
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