

Development of Hybrid system for Quantum Computing

Quantum computing is a new methodology aiming at improving the existing “classical” computing capabilities by employing quantum species as computing elements. These quantum species can be, for example, electron spins, which under the influence of a static magnetic field have two discrete energy levels, one parallel and the other antiparallel to the magnetic field. Electrons can be also in a superposition of these two states. Electron spins can be embedded inside a superconducting cavity, which can modulate the interaction between the spins – a capability of great importance for quantum computation. Such structures, where the cavity is part of the quantum system are called hybrid systems. The aim of the project is to design and construct such hybrid system, using delicate nano-scale lithography processes, and then measure its quantum properties at low cryogenic temperatures.

The central image below shows a micro-cavity with a silicon sample placed on it, having few electron spins in it. The upper image shows the microwave mode of the cavity and the lower image shows the structure of the entire cavity, which is ~ 1 mm in size, and zoom in to its central micro-scale miniature section.

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