

Quantum Technologies within INFN: status and perspectives



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Ion beam techniques for the development of solid-state quantum devices

The second quantum mechanical revolution is based on the manipulation and control of single or coupled quantum systems called qubits. The negatively charged NV centers based on the nitrogen atom and a vacancy in diamond is one of these solid state qubits at room temperature. Ion implantation is the only way to generate and address NV centers in diamond with high lateral resolution. Recently, we have found that additional sulfur implantation in diamond solves this problem and increase the creation yield of shallow implanted NVs from 7% to 80%, all NV centers are negatively charged and furthermore the method increases the coherence time of the NVs by a factor of 20.

The talk will discuss the state of the art of single-ion nano-implantation techniques and new developments in materials science to overcome the limitations encountered in the construction of NV centers so far.

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