**Quantum measurement and real-time feedback with a spin register in diamond.**

PhD thesis of : M.S. Blok

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Quantum objects that are trapped in the crystal lattice of diamond, pose an excellent system to study fundamental questions about quantum mechanics and have the potential to become the building block of future quantum technologies, such as an unhackable quantum internet or extremely sensitive sensors that can perform measurements inside a living cell. However, controlling these quantum systems remains very challenging, because they can be disturbed by merely measuring them.

In his PhD dissertation titled “Quantum measurement and real-time feedback with a spin register in diamond.”, M.S. Blok presents a series of experiments with spins (tiny ‘quantum magnets’) in diamond that study the disturbance associated with quantum measurements. By combining these measurements with real-time feedback, this disturbance can even be used as a control mechanism. In the experiments, quantum measurements are used to steer a single spin to a desired state, to connect (entangle) two spins that are separated by 3 meters and to teleport a quantum state over a distance of 3 meters from one diamond to the other. Furthermore the results demonstrate that the sensitivity of a diamond-based quantum sensor can be improved by means of real-time feedback.

These research findings provide insight in the fundamental aspects of quantum measurements and the newly developed (feedback) techniques pose an important next step towards applications in quantum information processing and quantum metrology.

The public defence of the PhD-thesis of ir. M.S.Blok, titled “Quantum measurement and real-time feedback with a spin register in diamond.”, will take place on Tuesday 24th of November 2015 at 15:00 hours in the Aula of Delft University of Technology. Prior to the defence, from 14:30 – 15:00 M.S. Blok will give a short presentation to explain this research.