

BSc/MSc project

NanoElectronics Group
www.nano-electronics.nl



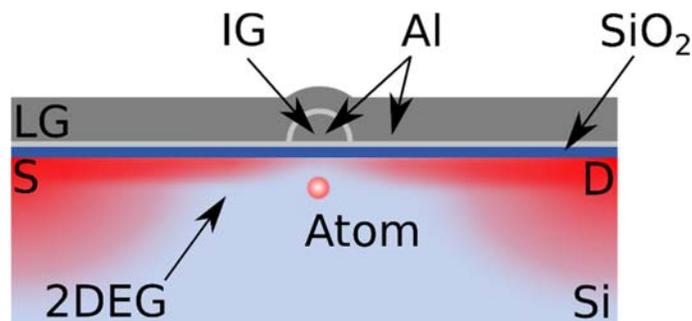
Title: *Single-atom transistor*
Supervisor: *Sergey Amitonov (Post-doctoral researcher)*

Goal and motivation

A single-atom transistor (SAT) is an outstanding system to study atomic physics in the solid state. SATs are single-electron tunneling devices, consisting of an individual ion coupled to source, drain and gate electrode (see Figure).

The CMOS-compatible methods that we use for fabrication of the transistors allow to get highly reproducible results and utilize them in different branches of applied science e.g. as qubits, building blocks of a quantum computer.

One of the proposed schemes to quantum computation is creating quantum bits with the spin of a single charge carrier (electron or hole) on a single dopant atom in silicon. Understanding how single carriers behave in proximity of the dopant atom is essential to create quantum logic devices.



Schematic side-view of a single dopant transistor in silicon. A 2DEG at the Si/SiO₂ interface is induced by an aluminum lead gate (LG). By locally depleting the 2DEG using the ionization gate (IG) the tunnel coupling of the atom with the carrier reservoirs can be changed.

The assignment

- Measuring various quantum structures that are made in our own NanoLab.
- Analyzing transport and quantum effects of single dopants, e.g. orbital excited and spin excited states.

Profile

A background in electrical engineering, applied physics, or advanced technology is preferred. If you like to be part of a young, international team and you are motivated to learn and discover new interesting physics, then you are a perfect candidate for us.

Graduating in NE

As a student in NE you are a full group member and expected to give an active contribution to ongoing research. You will be involved in specific aspects of the research (device fabrication, measurements and analysis). Besides you are also encouraged to participate in the regular social activities.

Contact

Prof.dr.ir. Wilfred van der Wiel
[W.G.vanderWiel\[at\]utwente.nl](mailto:W.G.vanderWiel[at]utwente.nl)