

Coherent electron transfer between distant quantum dots in a linear array

Floris R. Braakman¹, Pierre Barthelemy¹, Christian Reichl², Werner Wegscheider² and Lieven M. K. Vandersypen²

¹*Kavli Institute of Nanoscience, Delft, The Netherlands*

²*ETH Zürich, Zürich, Switzerland*

Tunnel coupled quantum dots form the basis for electronic charge and spin qubits in semiconductors. The tunnel coupling gives rise to quantum coherent phenomena such as exchange oscillations of neighboring spins. However, tunnel coupling strength between non-neighbouring sites is negligible and it is therefore desirable to develop a form of long range coupling. In a linear array of three quantum dots, we demonstrate an effective tunnel coupling between the outer dots through virtual occupation of discrete levels in the center dot. The coupling strength depends strongly on the detuning between center and outer dot levels, in agreement with theoretical predictions. The observation of Landau-Zener-Stückelberg oscillations demonstrates the coherent nature of the coupling. The effective long-range tunnel coupling should also allow coherent exchange of remote spins.

Monday

Tuesday

Wednesday

Thursday

Friday