Magnetic-field compatibility of SNS transmon qubits

FLO-RIAN LUTHI, THIJS STAVENGA, ALESSANDRO BRUNO, CHRISTIAN DICKEL, NATHAN LANGFORD, ADRIAAN ROL, QuTech and Kavli Institute of Nanoscience, Delft University of Technology, Delft, The Netherlands, DAVID THOEN, AKIRA ENDO, Department of Microelectronics and Kavli Institute of Nanoscience, Delft University of Technology, Delft, The Netherlands, THOMAS JESPERSEN, JESPER NYGARD, PETER KROGSTRUP, Center for Quantum Devices and Station Q Copenhagen, Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark, LEO DICARLO, QuTech and Kavli Institute of Nanoscience, Delft University of Technology, Delft, The Netherlands — We present an experimental investigation of the magnetic-field resilience of superconductor-semiconductor-superconductor (SNS) transmon qubits. Our study includes fixed-frequency and gate-tuneable single-junction transmons and flux-tunable, two-junction variants. The clean interface between the InAs nanowires and epitaxially-grown aluminium shells that constitute the Josephson element give these transmons energy relaxation times $T_1$ up to 15 μs and echo dephasing times $T_{2e}$ up to 30 μs at zero field. We track the evolution of transition frequency and coherence at in-plane fields up to 70 mT, using standard spectroscopy and time-domain techniques to identify dominant sources of relaxation and dephasing.

1Research funded by Microsoft Research, the Dutch research organizations FOM and NWO, an ERC Synergy grant, and the Danish National Research Foundation.

Florian Luthi
QuTech and Kavli Institute of Nanoscience, Delft University of Technology, Delft, The Netherlands

Date submitted: 10 Jan 2017