

Coplanar stripline resonators for superconductor-semiconductor hybrid devices

Ivo Cools

R.M. López Báez, V. Buccheri, N. Trnjanin, O. Shvetsov, A. Geresdi, S. Dash

Quantum device physics laboratory,
Department of Microtechnology and
Nanoscience,
Chalmers University of Technology, Sweden
Cools@chalmers.se

High impedance resonators, often fabricated by using a high kinetic inductance material, enhance the coupling of microwave photons to charges in semiconductor structures as desired for example in spin qubit research. In this study, we characterize quarter wavelength differentially driven coplanar stripline (CPS) resonators made of sputtered niobium titanium nitride (NbTiN). By varying geometrical and material parameters (width, gap distance, kinetic inductance), changes in the internal quality factor are observed. The CPS geometry is particularly well suited to be coupled to semiconductor nanostructures, whose gate-tunable properties influence the resonance frequency. This research continues by building a Josephson parametric amplifier using the nanowire-resonator structure.

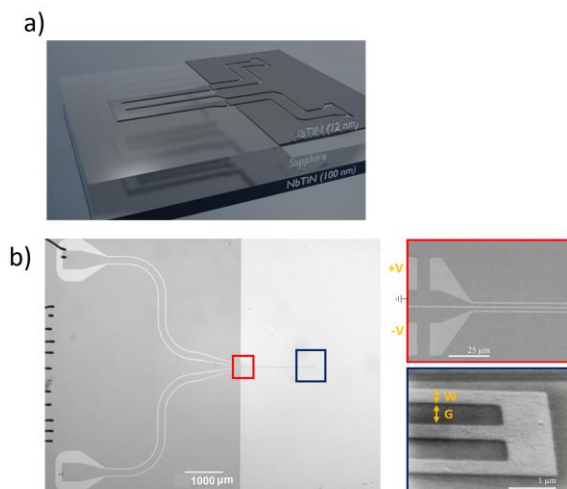


Figure 1:
Coplanar stripling geometry and geometrical parameters under investigation (W , G)

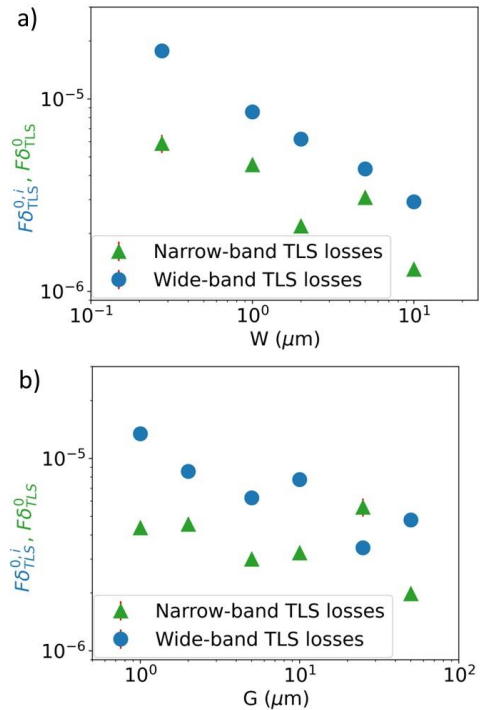


Figure 2:
Measured losses by variation of the width (W) and gap (G) geometric parameters

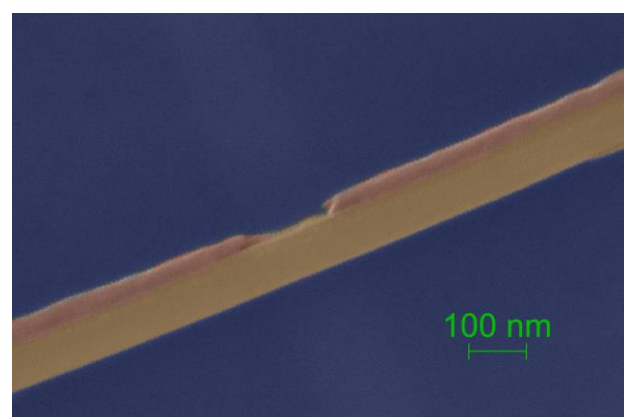


Figure 3:
Etched nanowire (blue: Si - orange: Al - yellow: InAs), to be used in a nanowire-resonator structure