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Cryogenic Broadband Low Noise Amplifier for Quantum Shot Noise Measurements of Graphene.

ABSTRACT - Masterthesis

Graphene is a most promising novel material with possibly great relevance for micro-electronics. For the investigation of the quantum shot noise properties of Graphene a low noise amplifier (LNA) is needed. To suppress intrinsic thermal noise the LNA is cooled down to 4.2 K. To distinguish the noise induced by the LNA from the shot noise of the Graphene source, the input signal is divided by a 3dB power splitter and each branch is separately amplified by two identical amplifiers. Both of the output signals are analysed for correlations, where the uncorrelated parts are ignored, since their origins are the amplifiers. The correlated parts are analysed further.

The goal of the master thesis is the design and implementation of a LNA in the band of 1 GHz to 2.5 GHz with competing specifications for gain, power consumption, noise, matching and stability based on S-Parameters, RF-simulation, layout and precise measurement instrumentation. Based on given S-parameters the LNA is simulated and analysed for matching, stability and noise first. Afterwards the LNA is built up and evaluated. For the simulation purposes software ANSOFT Designer, Microwave Office and TARGET is used. Special construction of housing is made to mount the LNA inside of the cryostat.