

Modelling Superconducting Nanowire Single Photon Detectors with VerilogA for EDA Tool Integration

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Superconducting nanowire single photon detectors (SNSPDs[1]) are the gold standard in demanding photon-counting applications, thanks to their excellent detection metrics. Integration with electronics such as cryogenic-CMOS and superconducting logic families can provide an interesting path forward towards more integrated functionality at the low temperature stage, for both efficient data processing and scaling the detectors to large arrays. Accurately modelling SNSPDs in commercial electronic design automation (EDA) environments, therefore, becomes crucial. Earlier work [2,3] has focussed on modelling the electrothermal dynamics in the LTSpice environment. In this work we move our modelling efforts to the VerilogA[4] behavioural modelling language, which allows efficient cross-platform integration with the modern software standards in circuit design. We present a few models, designed to be optimized for speed or accuracy, depending on the scale of the circuit and simulation, and discuss future directions towards a more complete model. VerilogA provides functionality that can be leveraged to model more advanced electrothermal effects, and this is discussed and shown.

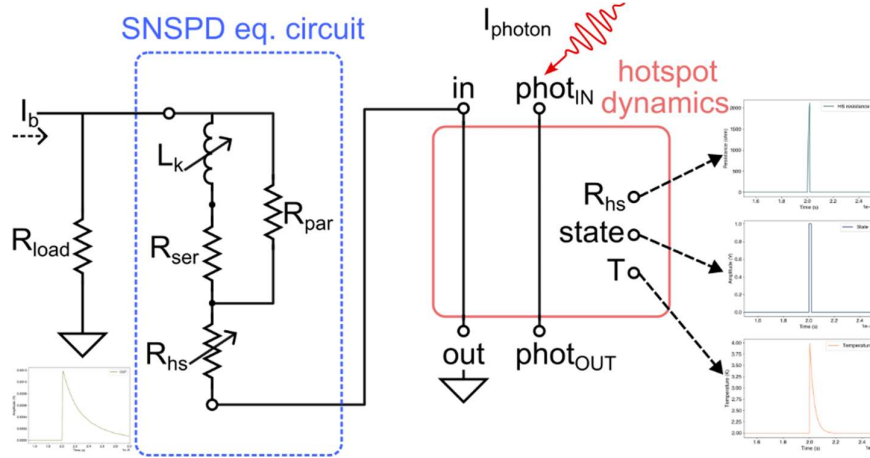


Fig. 1: Equivalent modelling circuit of SNSPD showing relevant simulation values

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References

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