Numerical simulation of rf-SQUIDs

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We study the interaction of electromagnetic waves with rf-SQUIDs aligned on a thin film [1]. This yields a system of Maxwell's equations coupled with an anharmonic oscillator via a jump condition for the normal derivative at the interface. Since our main interest is the calculation of the reflection and transmission coefficients of the film, we introduce transparent boundary conditions [2], which drastically reduce the computational effort. In fact, the spatial resolution of our numerical examples does not affect the computational cost.
In this talk, we show well-posedness using [3] for a first order reformulation of this system. We further discuss the discretization with finite elements in space and the Crank-Nicolson method in time and prove convergence results. Finally, we confirm these results presenting numerical examples.

References

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[3] J. Leibold, Semilineare Wellengleichungen mit dynamischen Randbedingungen, *Master's thesis, Karlsruhe Institute of Technology* (2017)