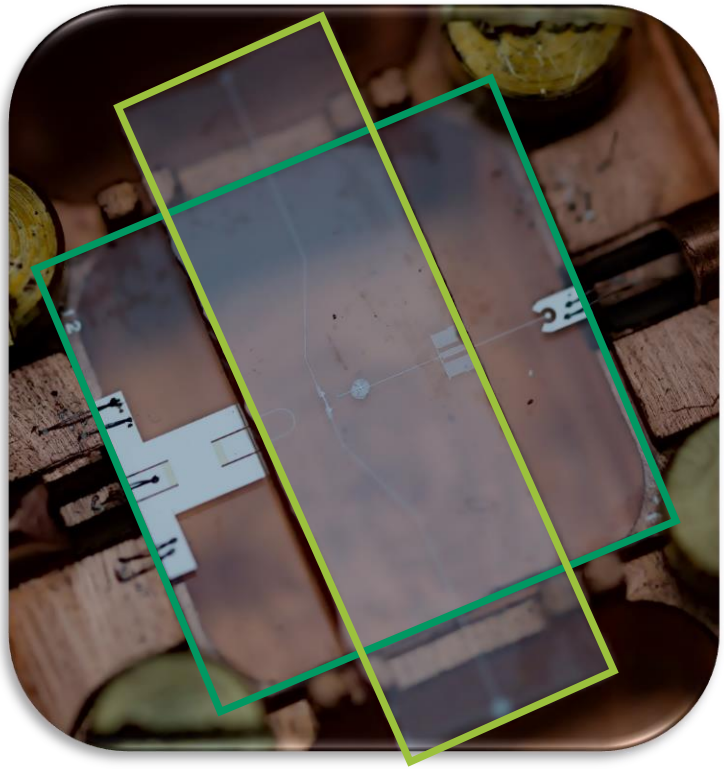
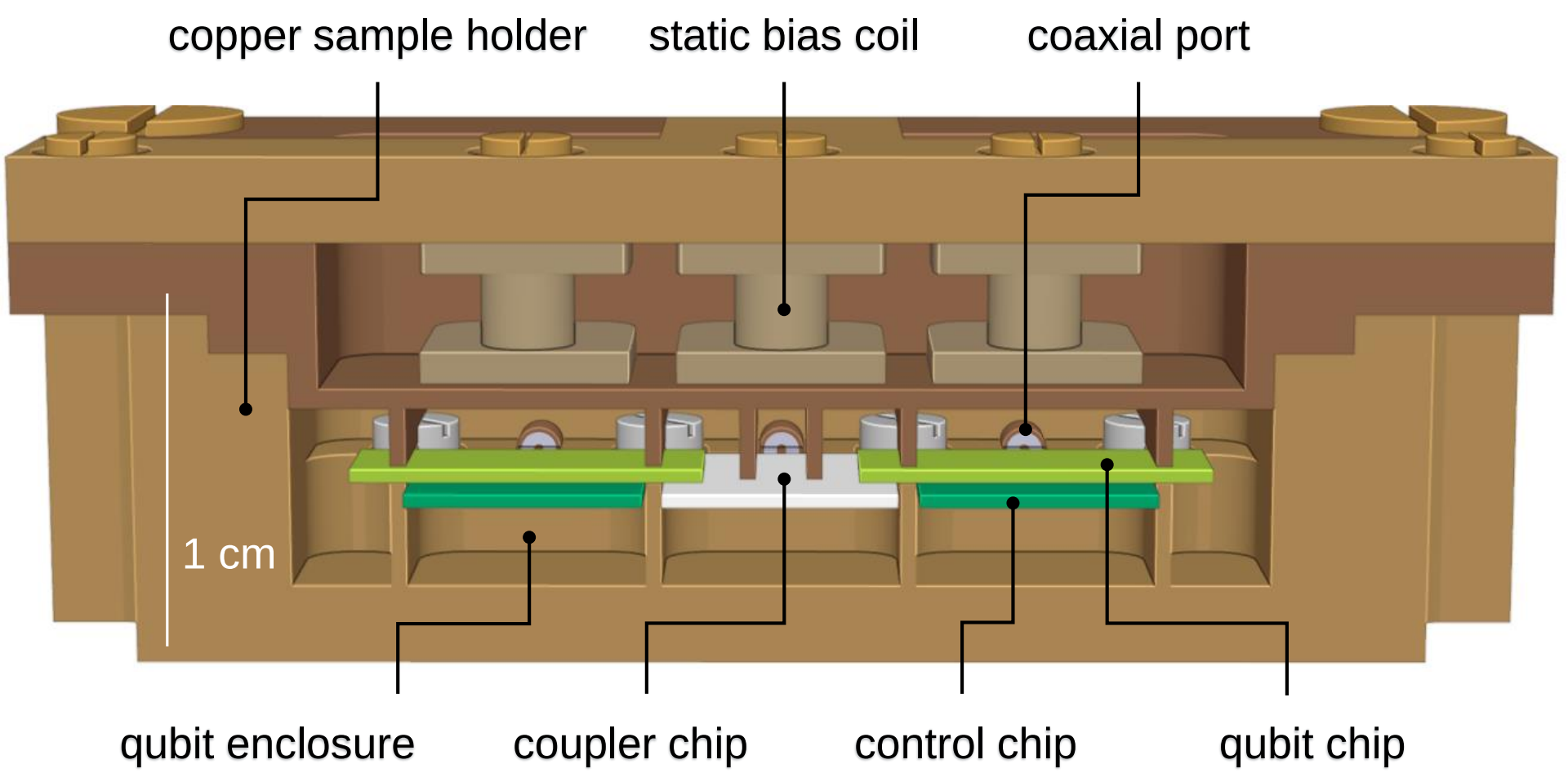
Karlsruhe Institute of Technology

AVaQus

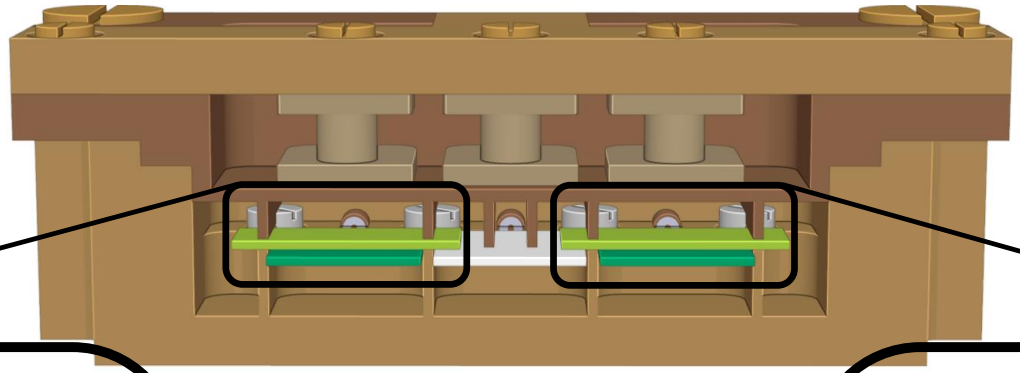
Tunable couplers for a modular architecture

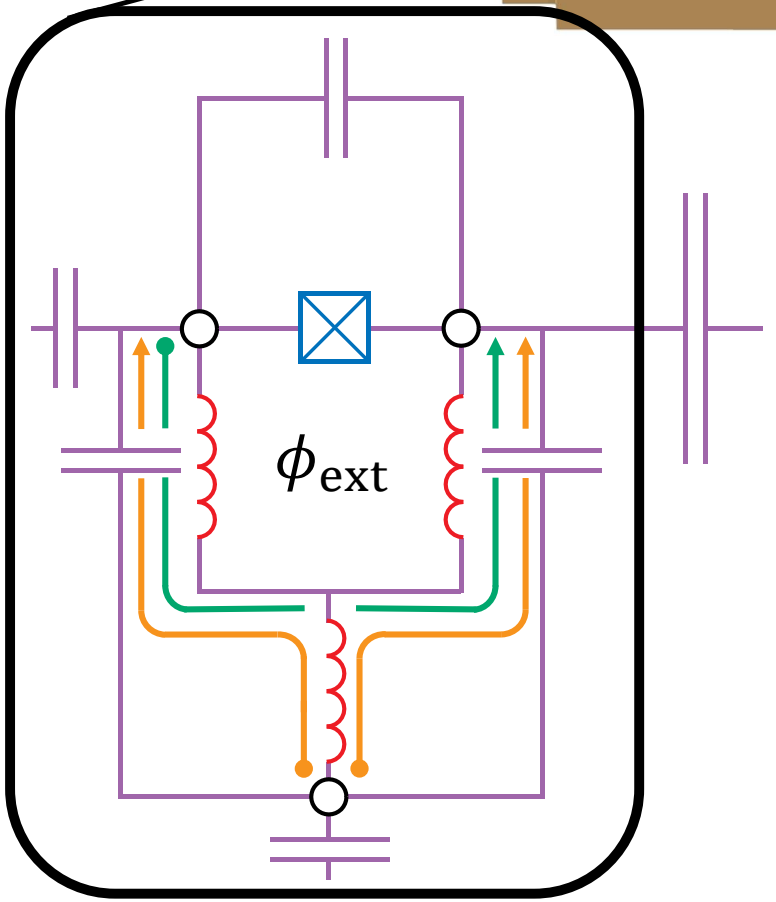


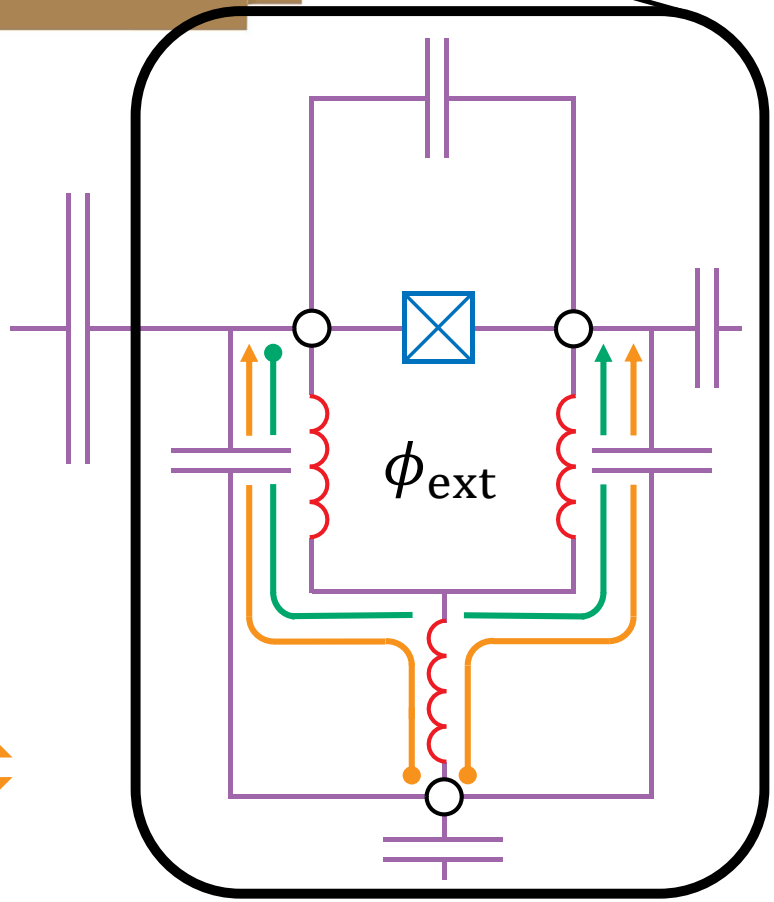
The architecture



qubit-qubit coupling



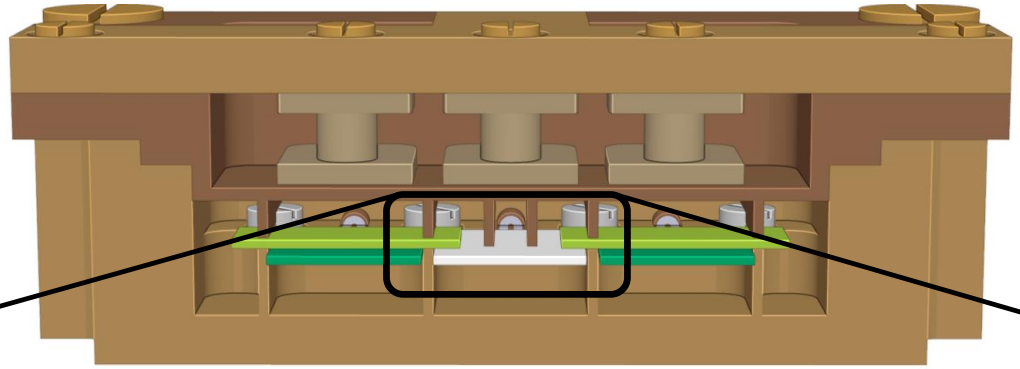


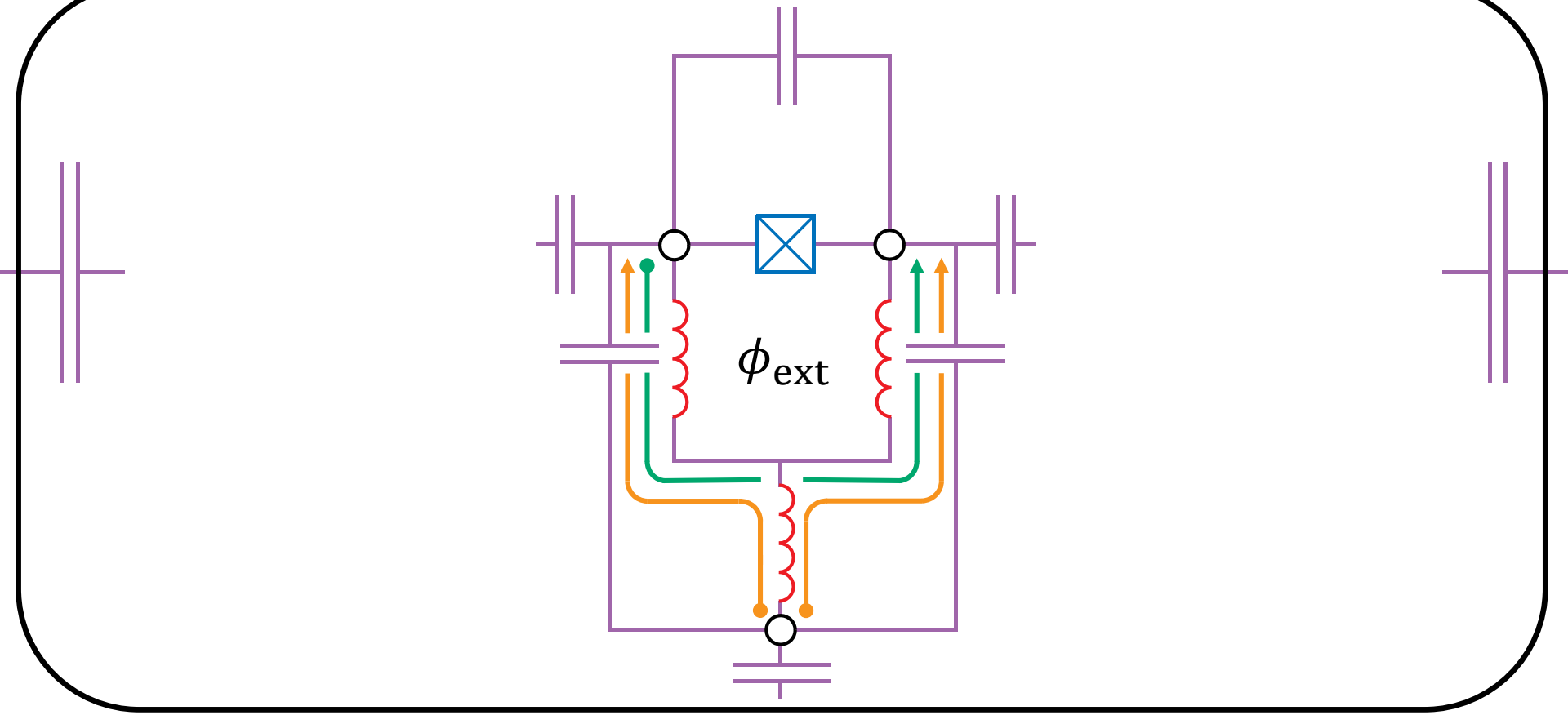


qubit ⇔

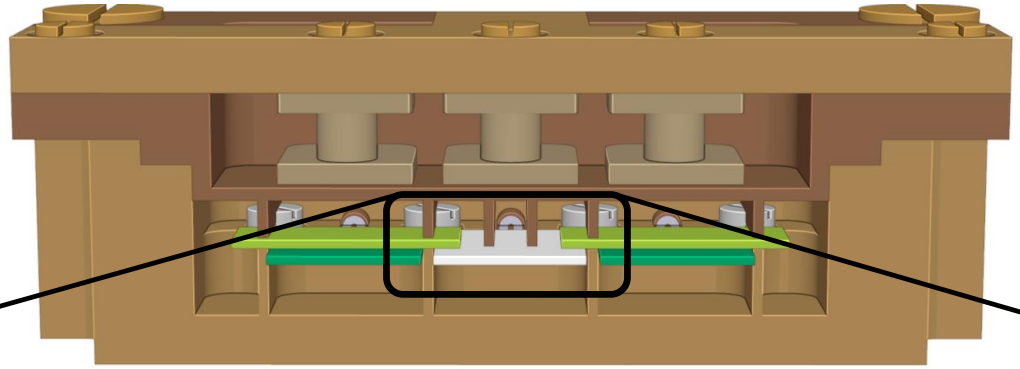
readout ⇕

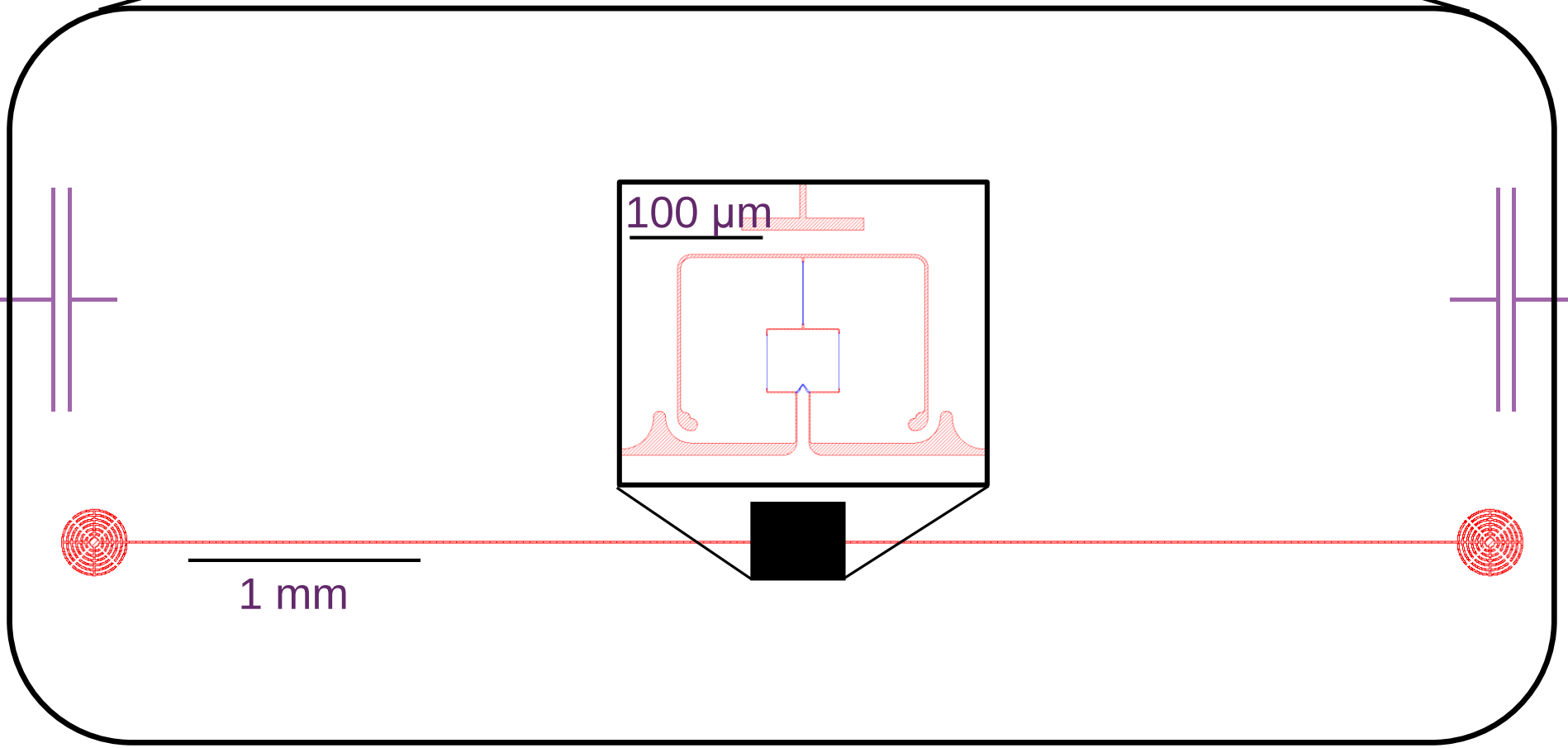
qubit-qubit coupling



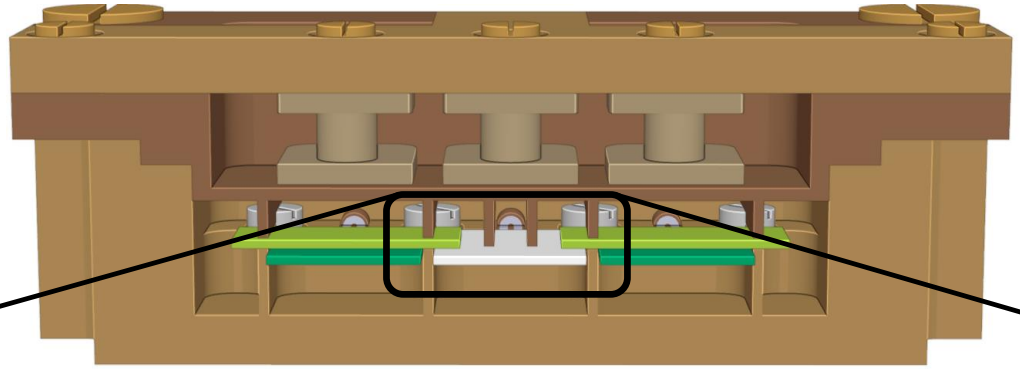


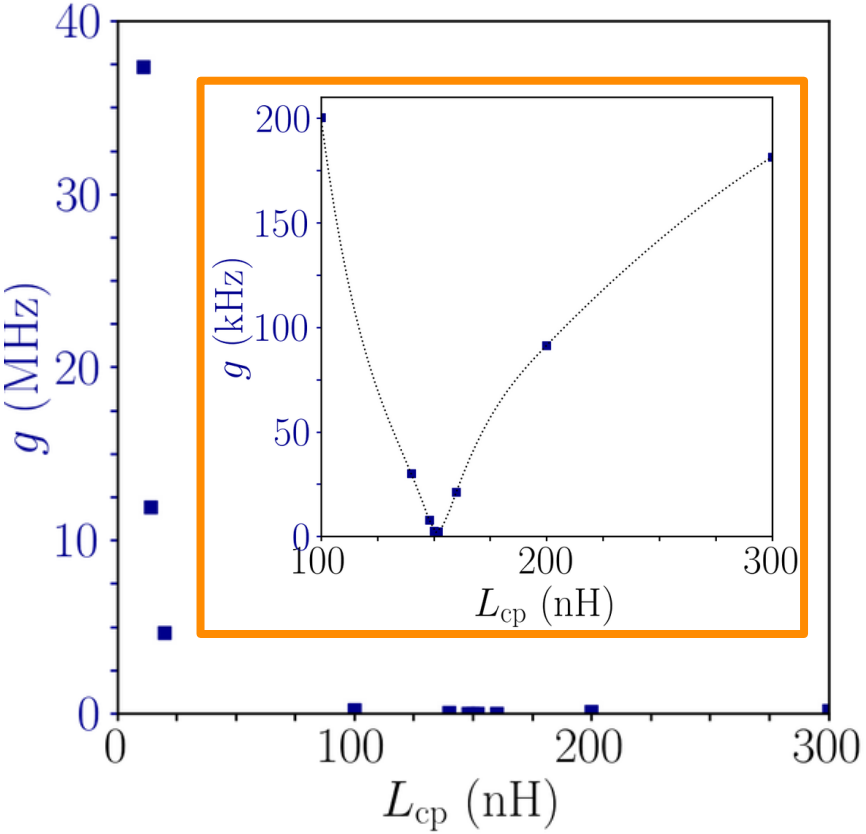
qubit-qubit coupling



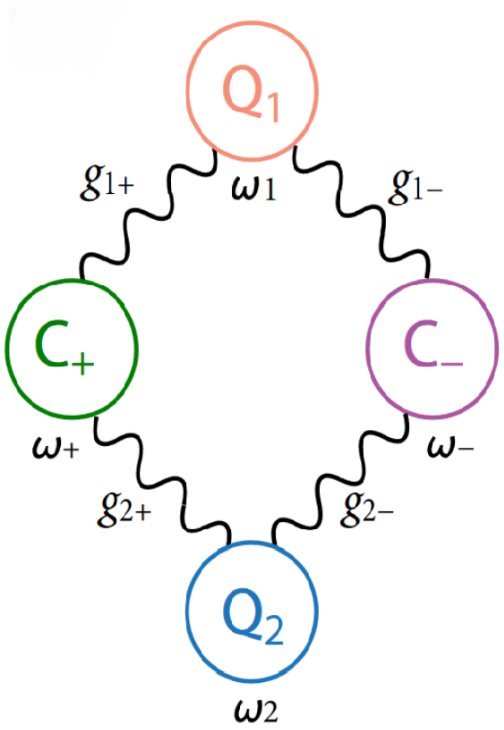


qubit-qubit coupling

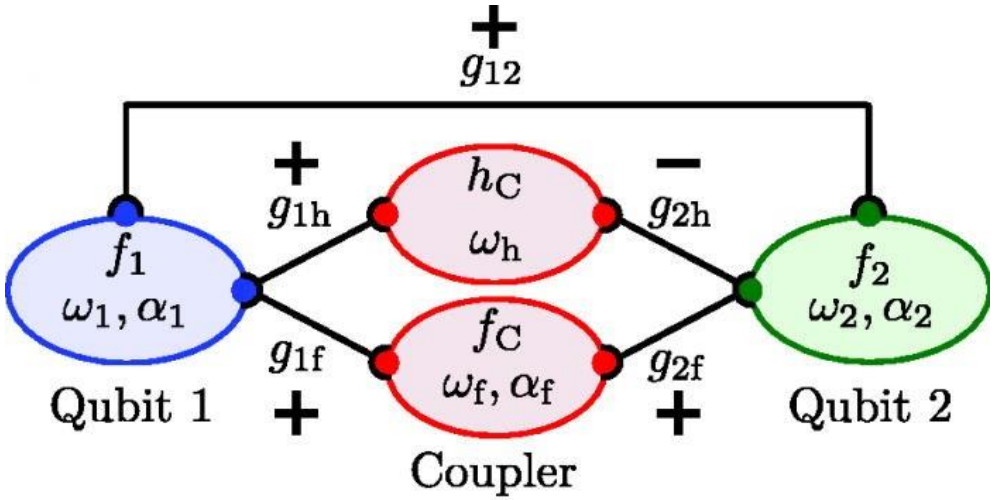




Eliminating residual couplings

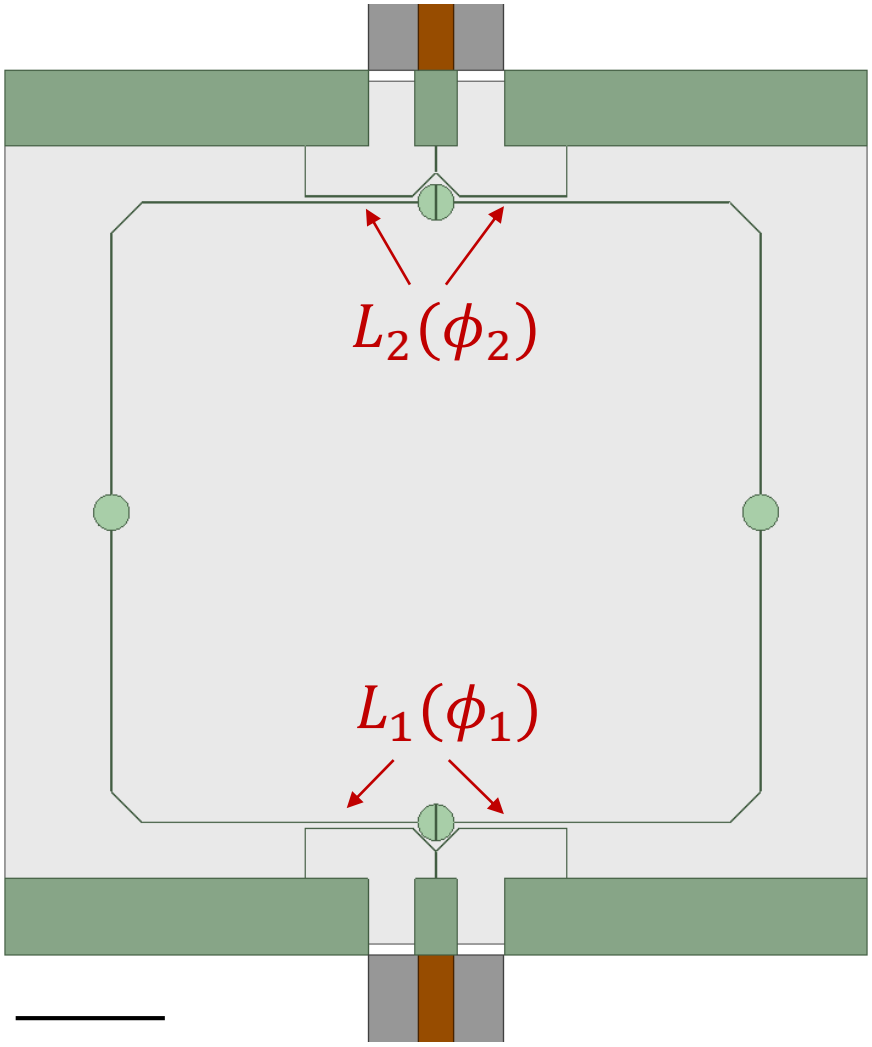


Mundada *et al.,* Phys. Rev. Applied 12, 054023 (2019)



Moskalenko *et al.,* Appl. Phys. Lett. 119, 194001 (2021)

„Quadrupole“ coupler



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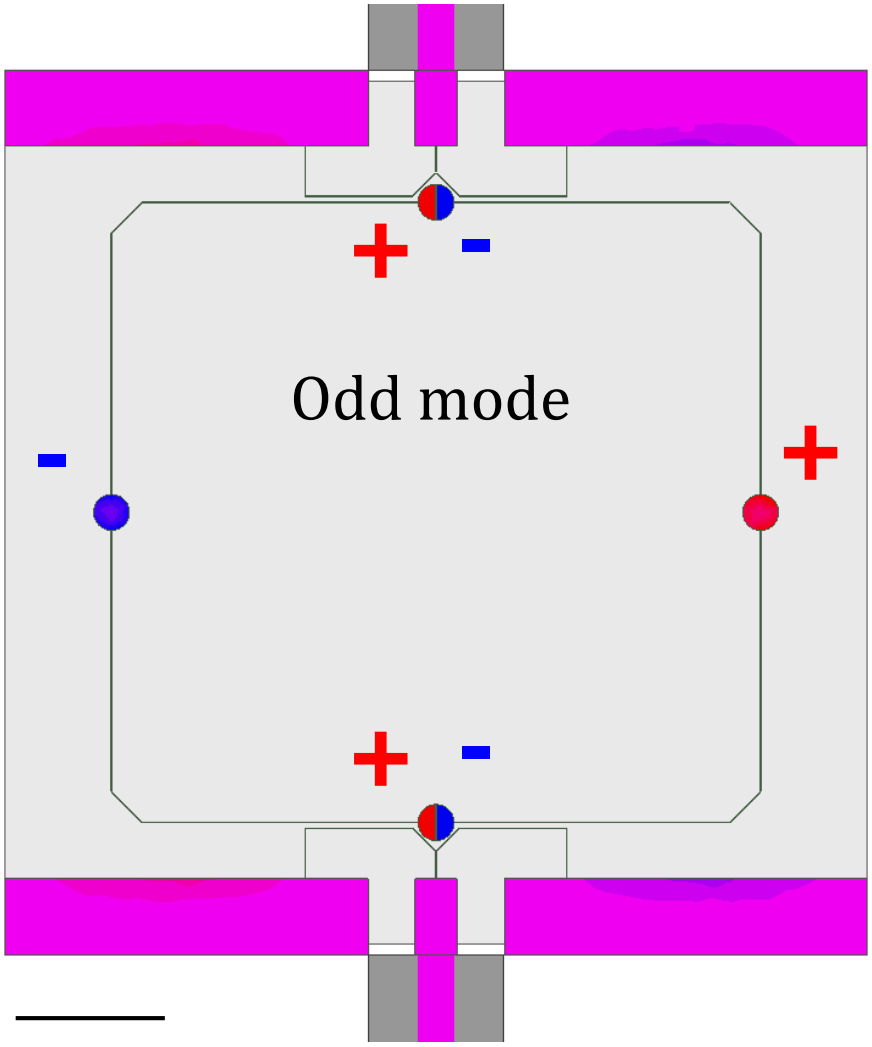

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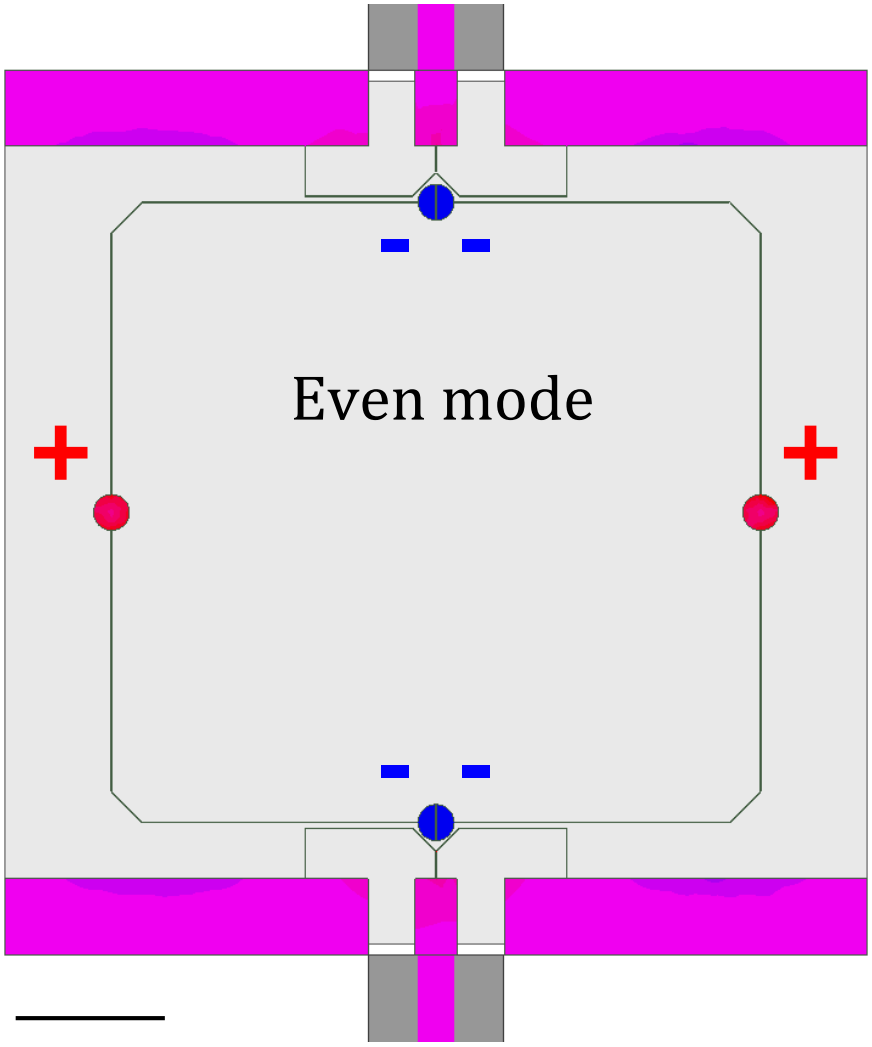

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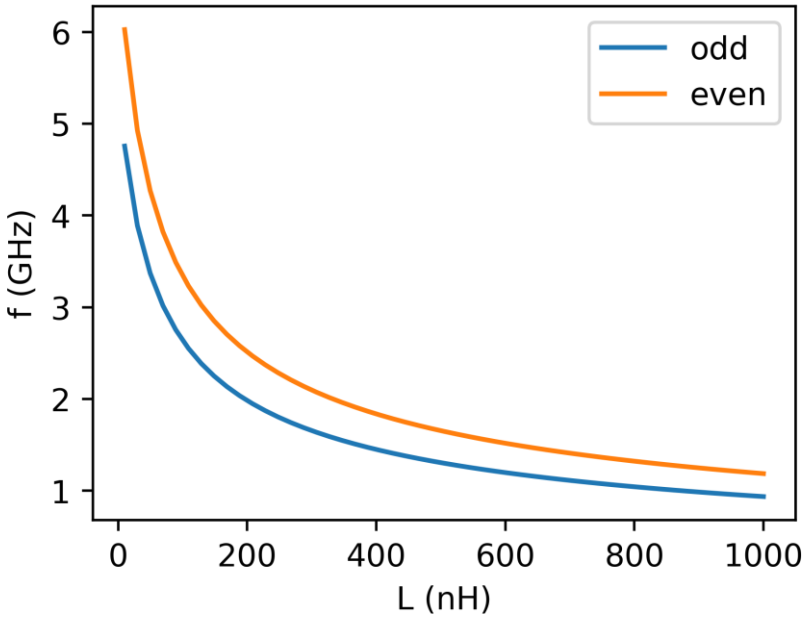
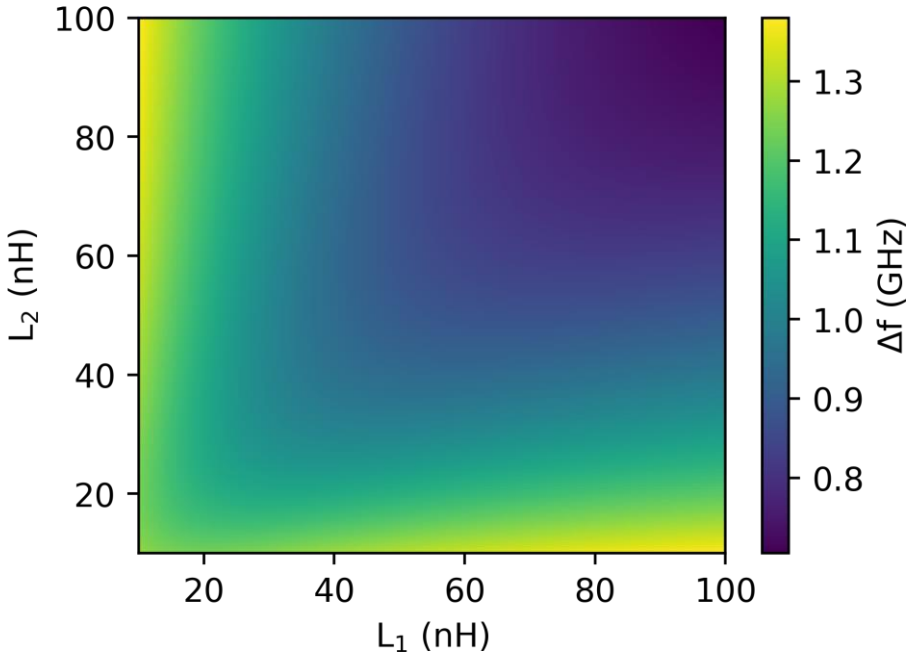
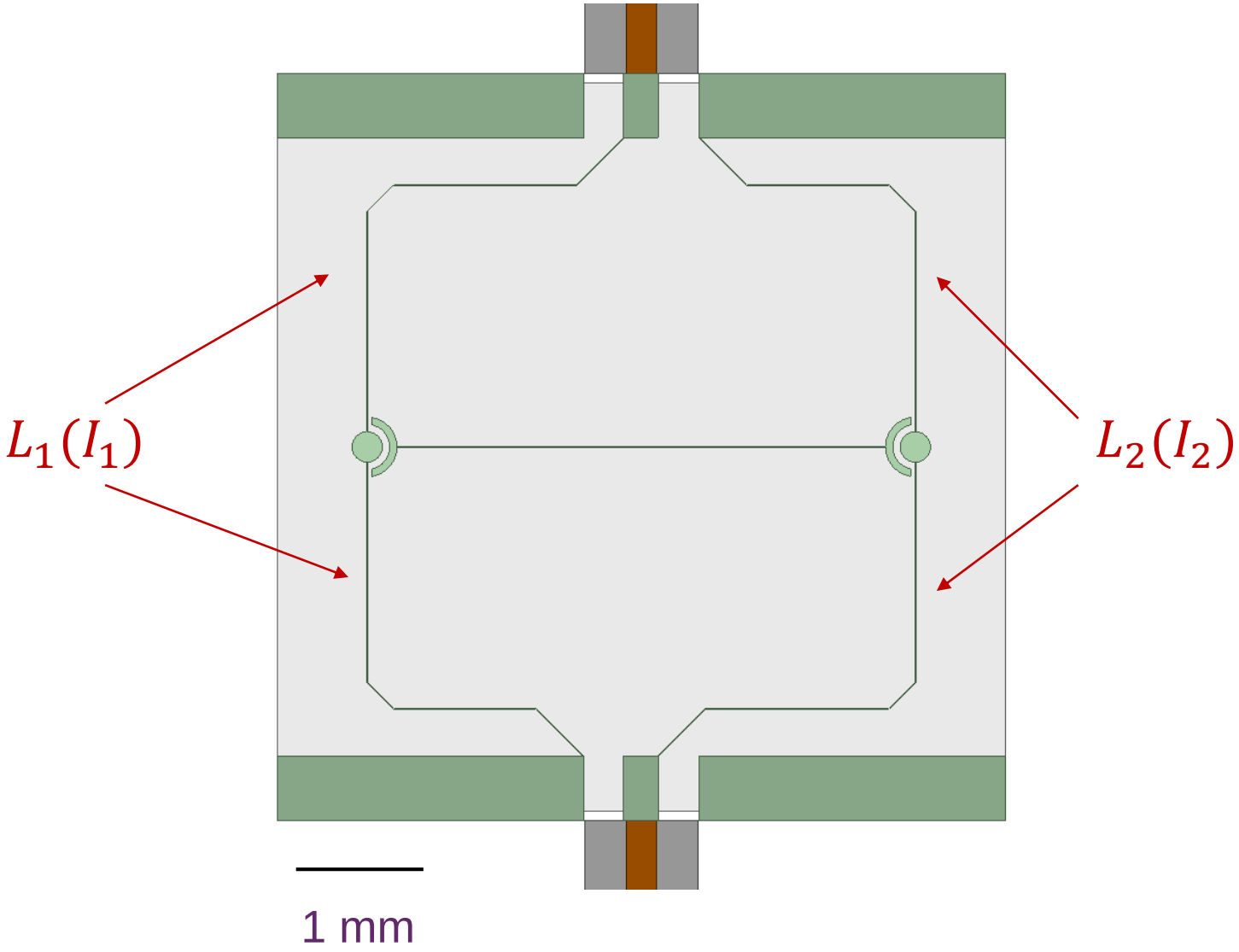
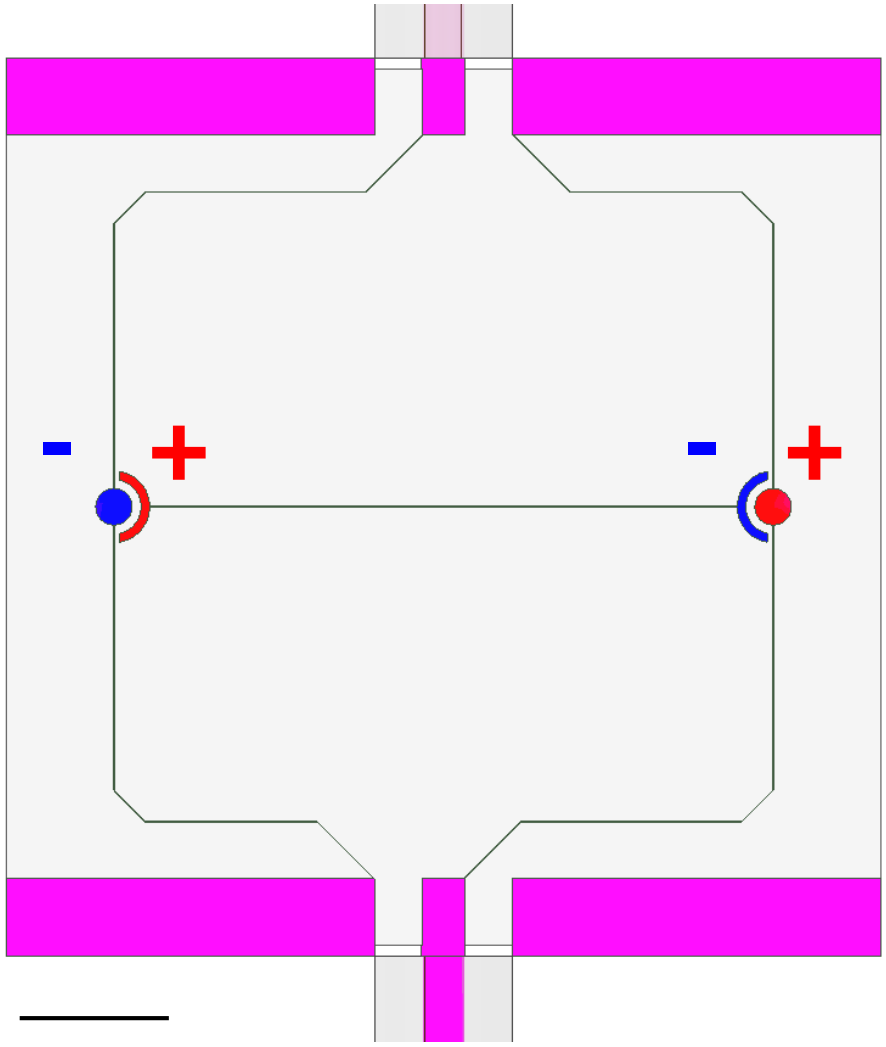




Asymmetric coupler



Asymmetric coupler



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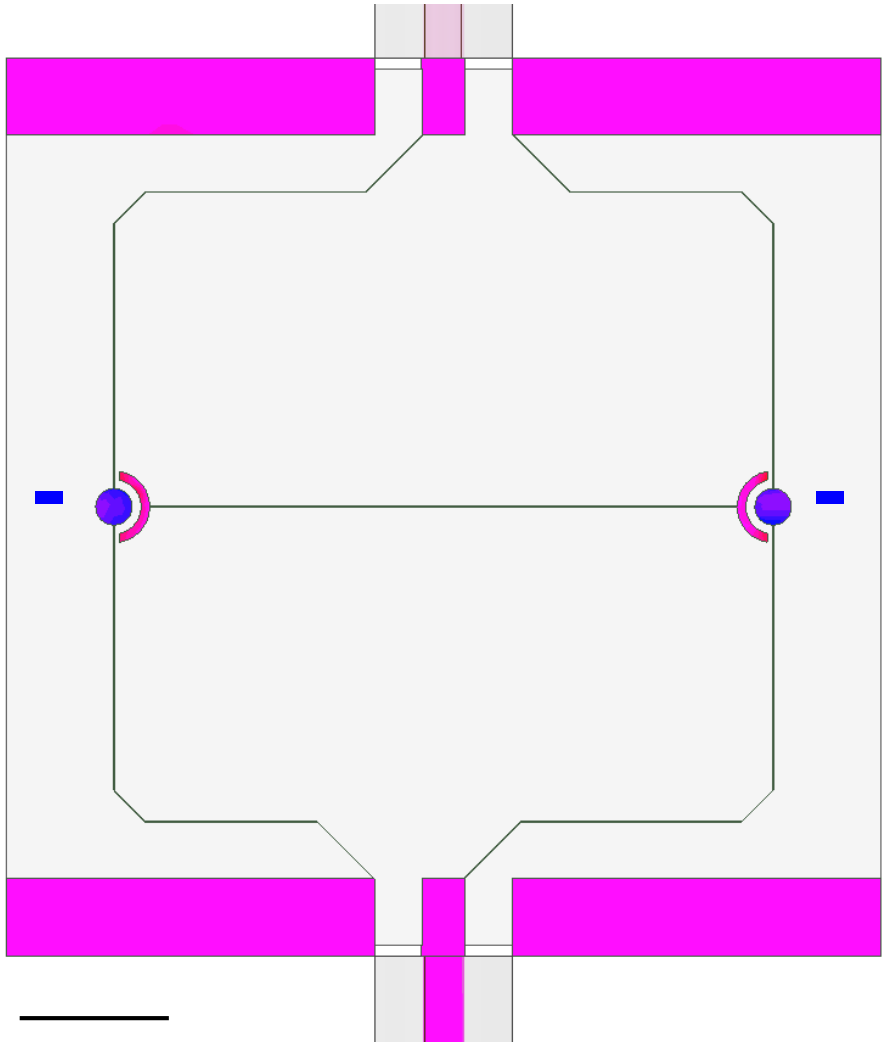

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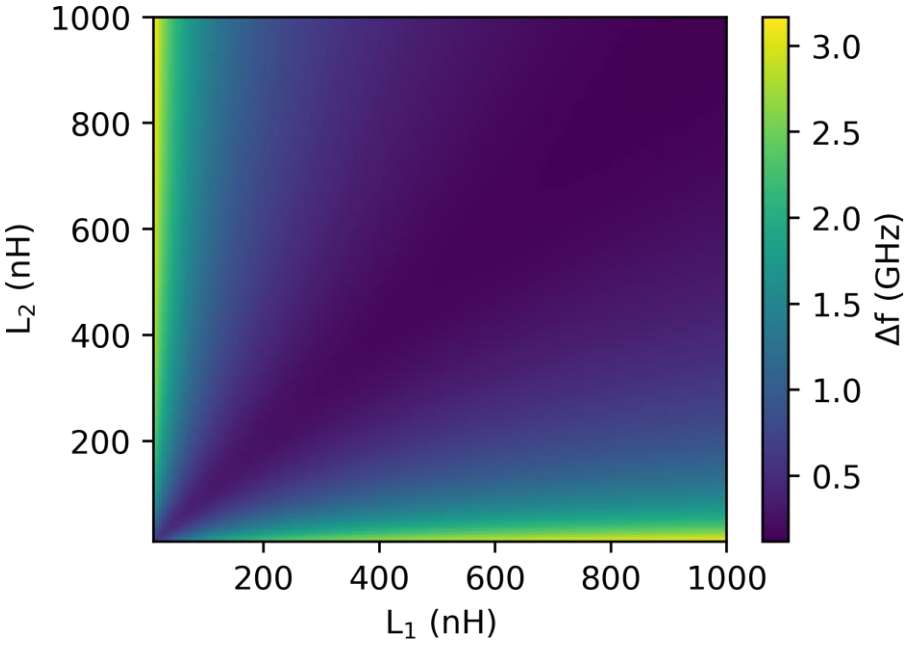
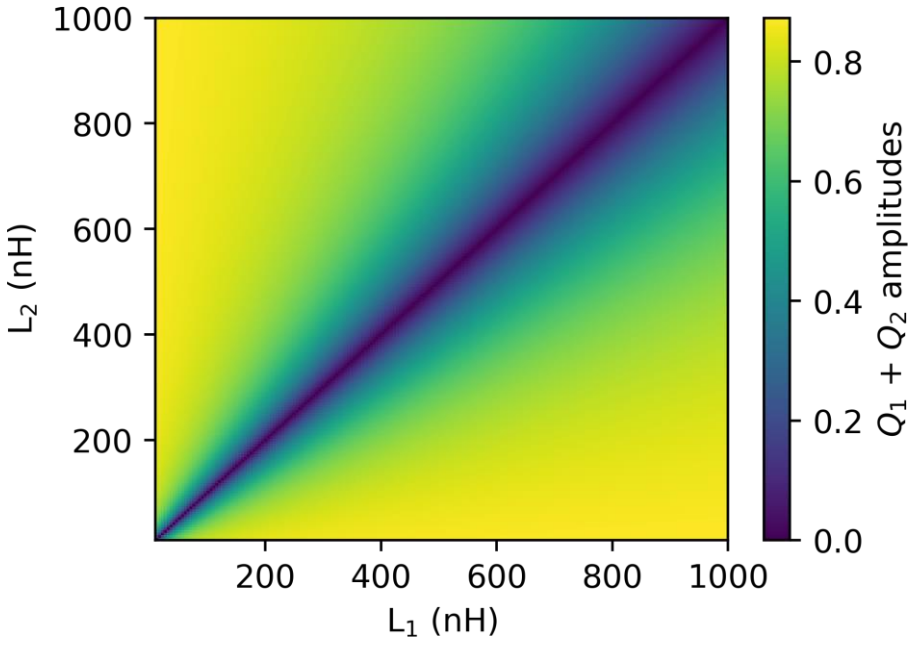
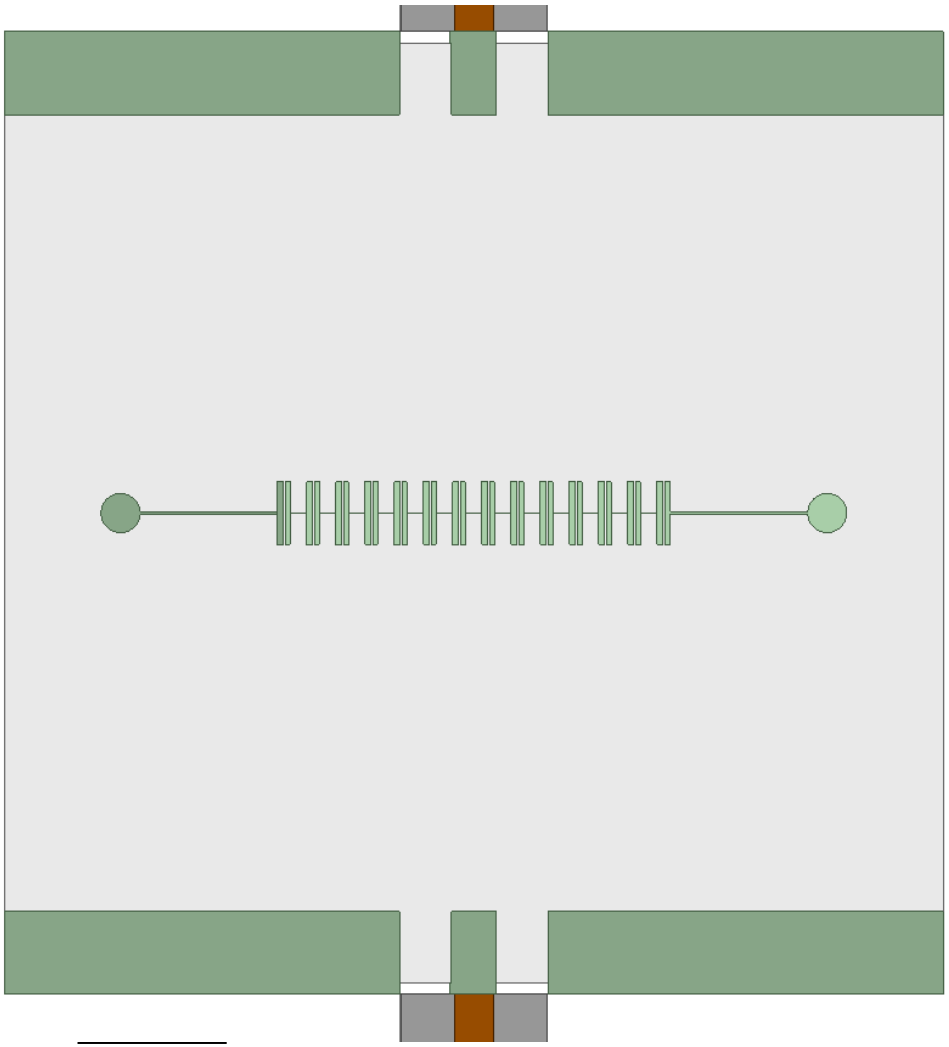
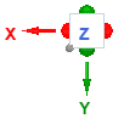




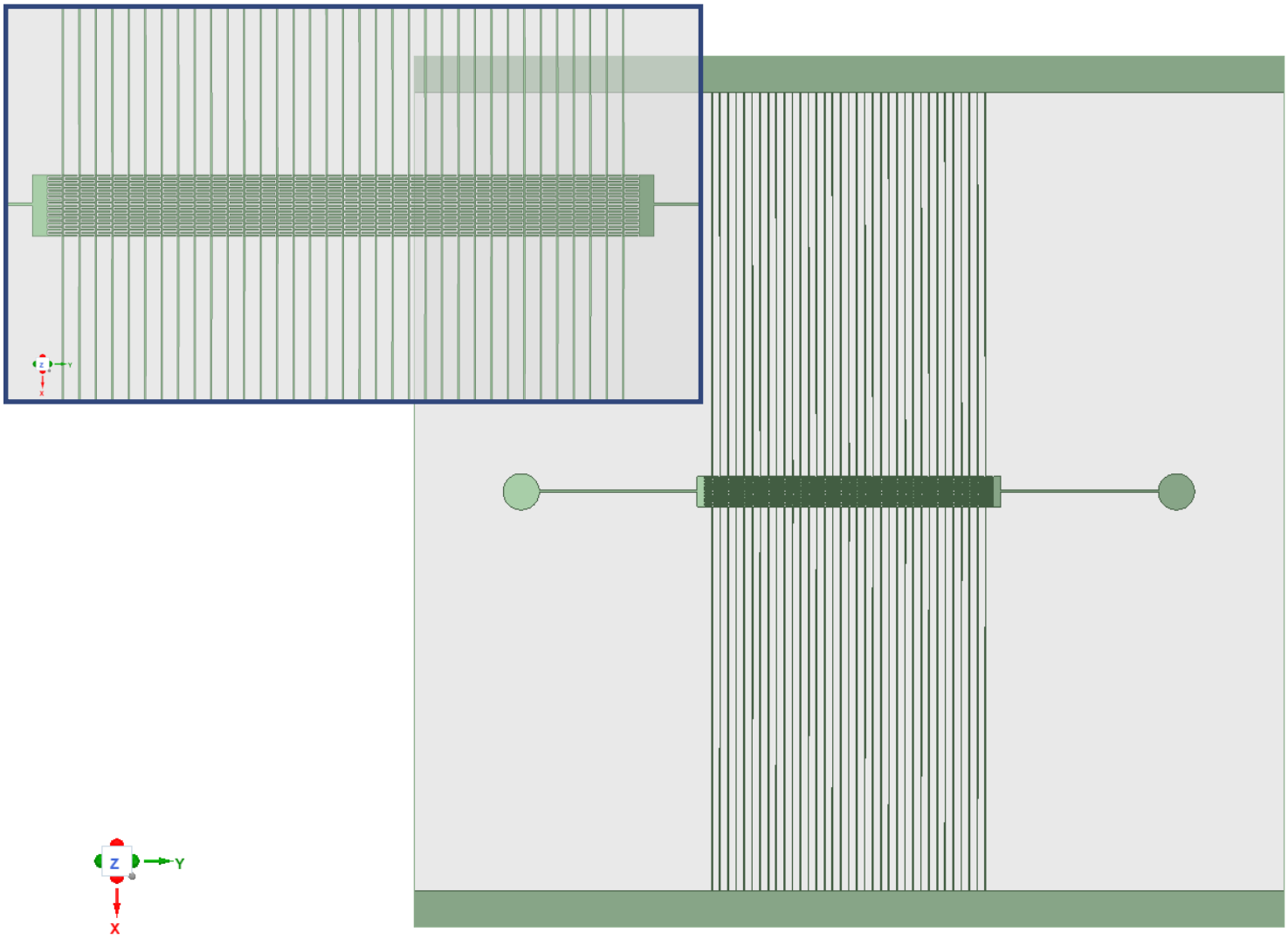
Metamaterial coupler: Lumped resonator array



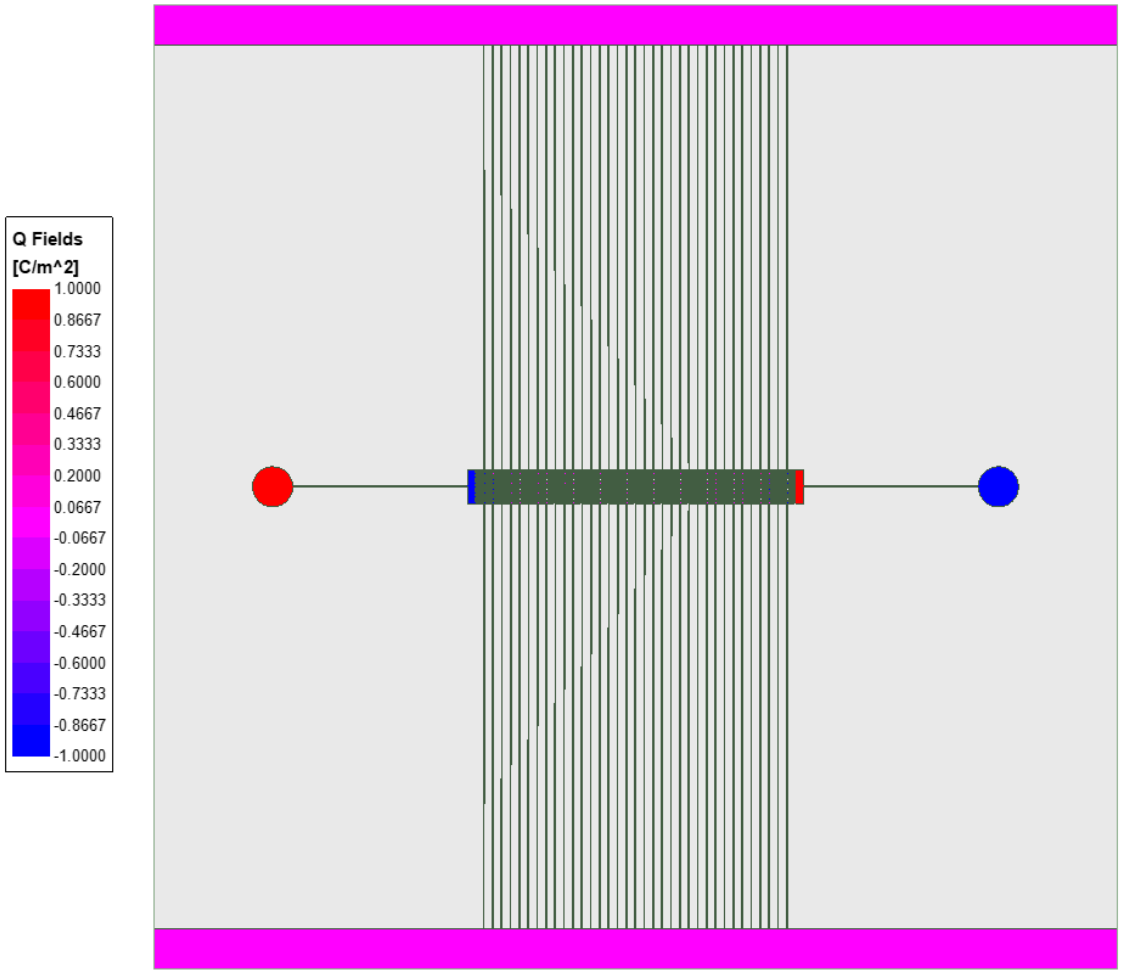


1 mm

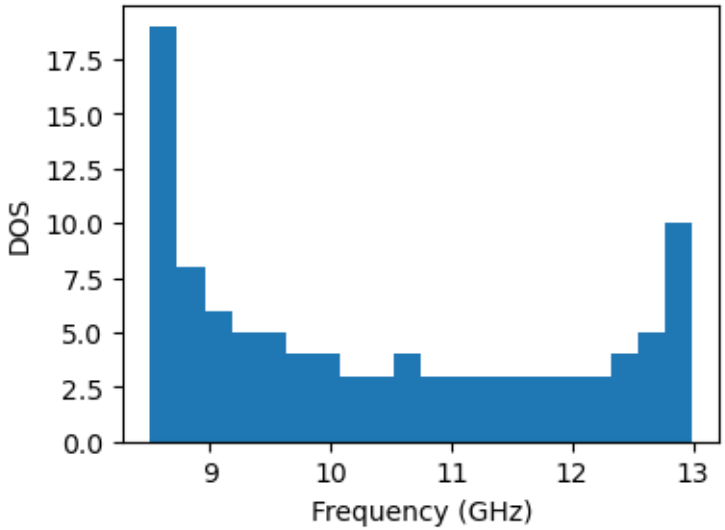
Metamaterial coupler: Stripline Array

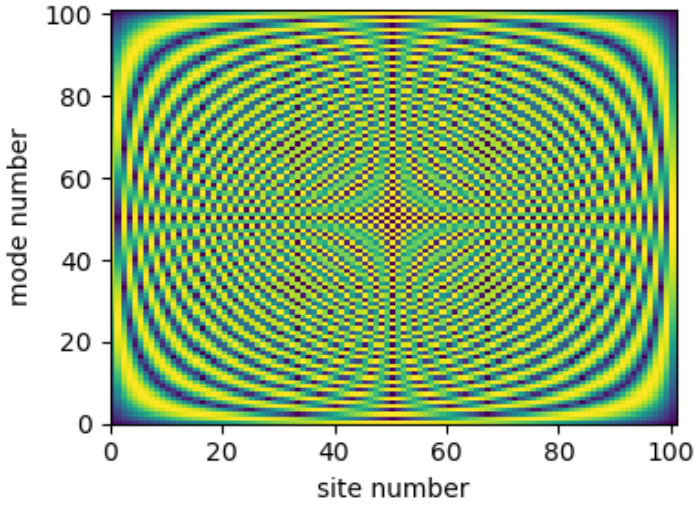


Metamaterial coupler: Stripline Array

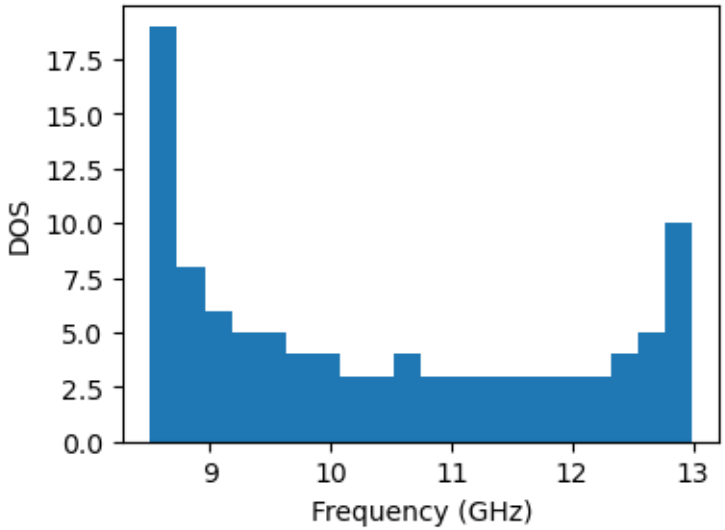


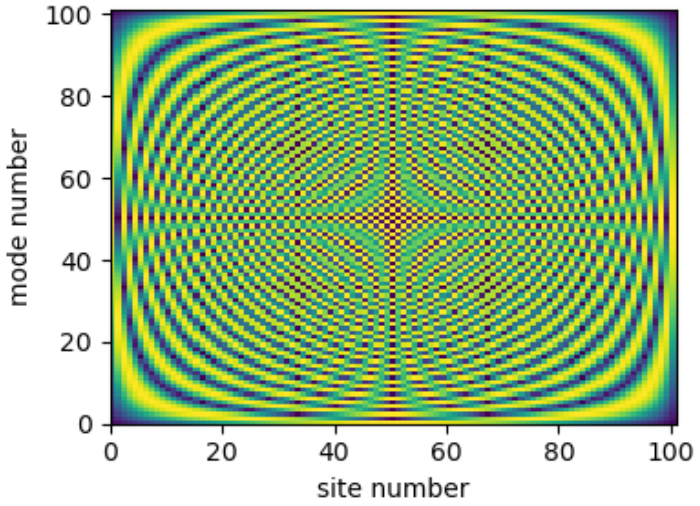
Metamaterial coupler: Stripline Array

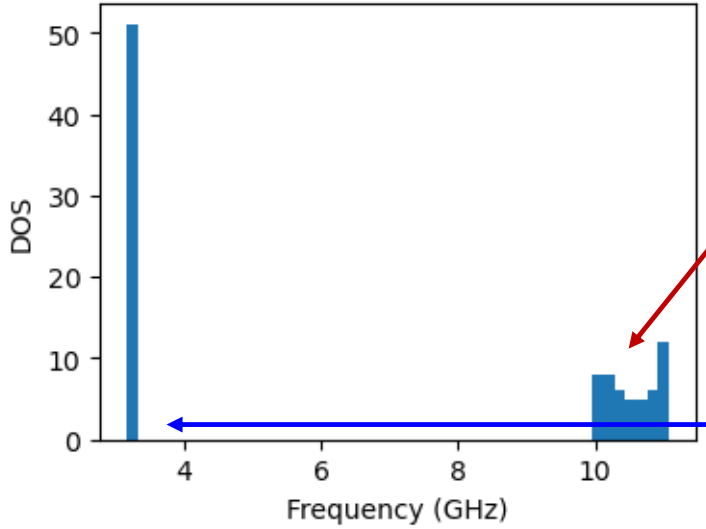


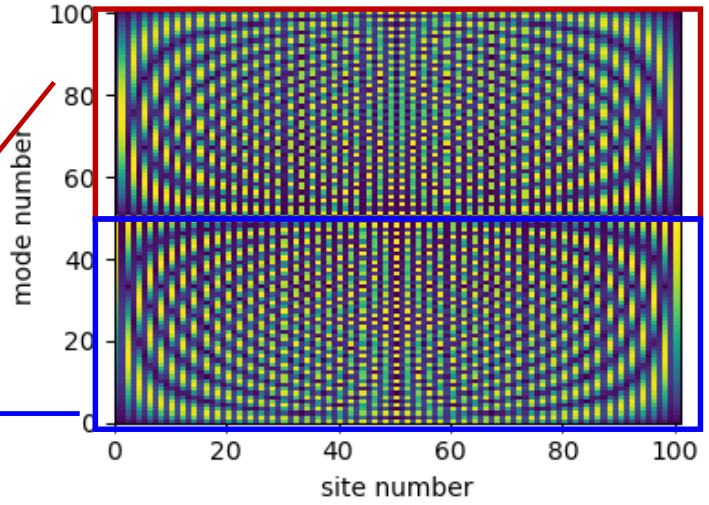


Metamaterial coupler: Stripline Array

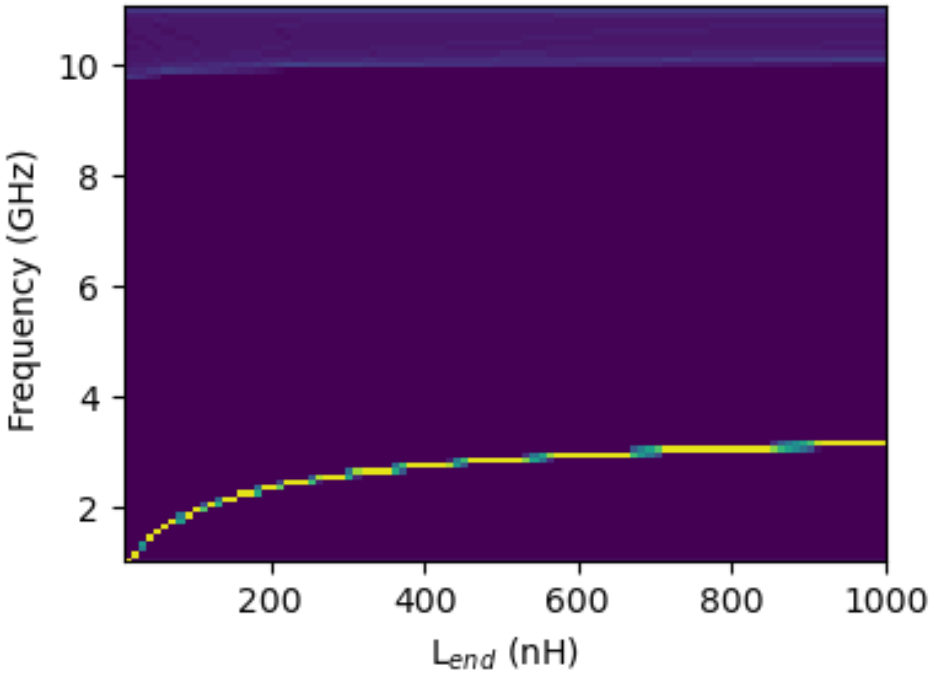






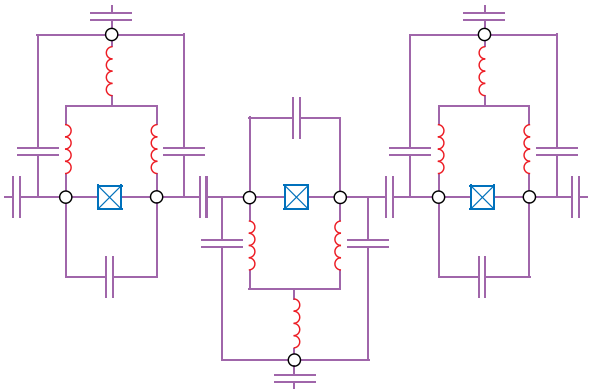


Metamaterial coupler: Stripline Array

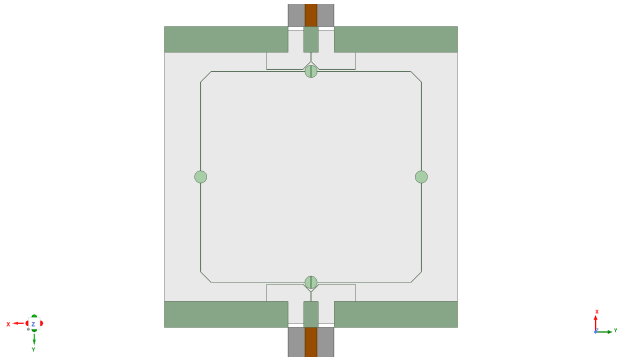


Summary

- Capacitively coupled flux qubits (and resonators!)



- Even-odd mode couplers via DC-SQUID arrays



- Tunable band-engineered metamaterials