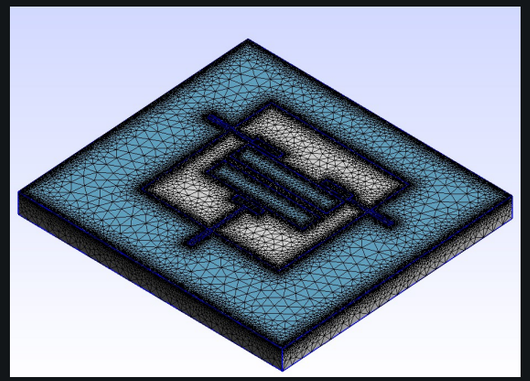
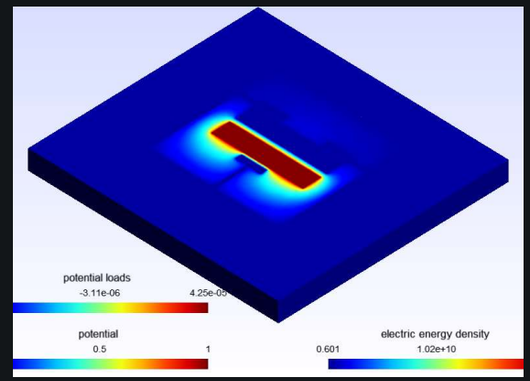
#12 Open-source FEM solver for Qiskit Metal

QAMP - Fall 2022 (Checkpoint 01)

- Qiskit metal is an open-source framework to design superconducting quantum devices
- Issue: simulations run using ANSYS, which is NOT open-source (in fact, it is very $$$)





	Q1_readout_connector_pad	Q1_coupler1_connector_pad	Q1_coupler2_connector_pad	Q1_pad_top	Q1_pad_bot	ground_plane
Q1_readout_connector_pad	63.352888	-0.093508	-0.093037	-1.578712	-20.074819	-41.512812
Q1_coupler1_connector_pad	-0.093508	59.568083	-0.275162	-17.200597	-1.532619	-40.466197
Q1_coupler2_connector_pad	-0.093037	-0.275162	58.932554	-17.255759	-1.516402	-39.792194
Q1_pad_top	-1.578712	-17.200597	-17.255759	102.191508	-39.842827	-26.313612
Q1_pad_bot	-20.074819	-1.532619	-1.516402	-39.842827	94.824211	-31.857545
ground_plane	-41.512812	-40.466197	-39.792194	-26.313612	-31.857545	300.000000

- Current effort: use open-source tools to mesh and simulate
  - GMSH for meshing and
  - Elmer for Finite Element Analysis (FEA)
- Limitations of current code:
  - Only supports planar structures (needs multiplanar)
  - Only supports capacitance extraction (needs eigenfrequency)

TEAM:

- **Mentee:** Diego Emilio Serrano
- **Mentors:** Abeer Vaishnav, Thomas G. McConkey, Priti A. Shah, Patrick Obrien

DELIVERABLES:

- Expand simulator capability to support multi-planar designs

IF TIME ALLOWS:

- Integrate QElmerRenderer with qiskit metal
- Add eigenfrequency analysis capabilities