

Simulation of a RFQ beam cooler for the TTU ion beam lab

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Experiments with low energy ion beams often utilize radio frequency quadrupoles (RFQs) to act as ion guides and beam coolers as the beam is directed to detectors or other experimental components. The physics department at Tennessee Technological University is in the process of establishing a small ion beam laboratory, incorporating components from the now-decommissioned Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory, including an RFQ. To effectively use this component, a complete 3D CAD model of the RFQ was created and used to run simulations to examine its behavior and determine optimal operating parameters.

In this study, a model was developed in Fusion360 from physical measurements and some incomplete engineering drawings. That information was used to create a computer representation of the RFQ in SIMION 8.2. Literature on the topic was used to conduct simulations with SIMION to determine the optimal operating parameters for minimizing transverse emittance and energy distribution while maximizing ion transmission. Results from the simulation will be presented for a ^{12}C beam.