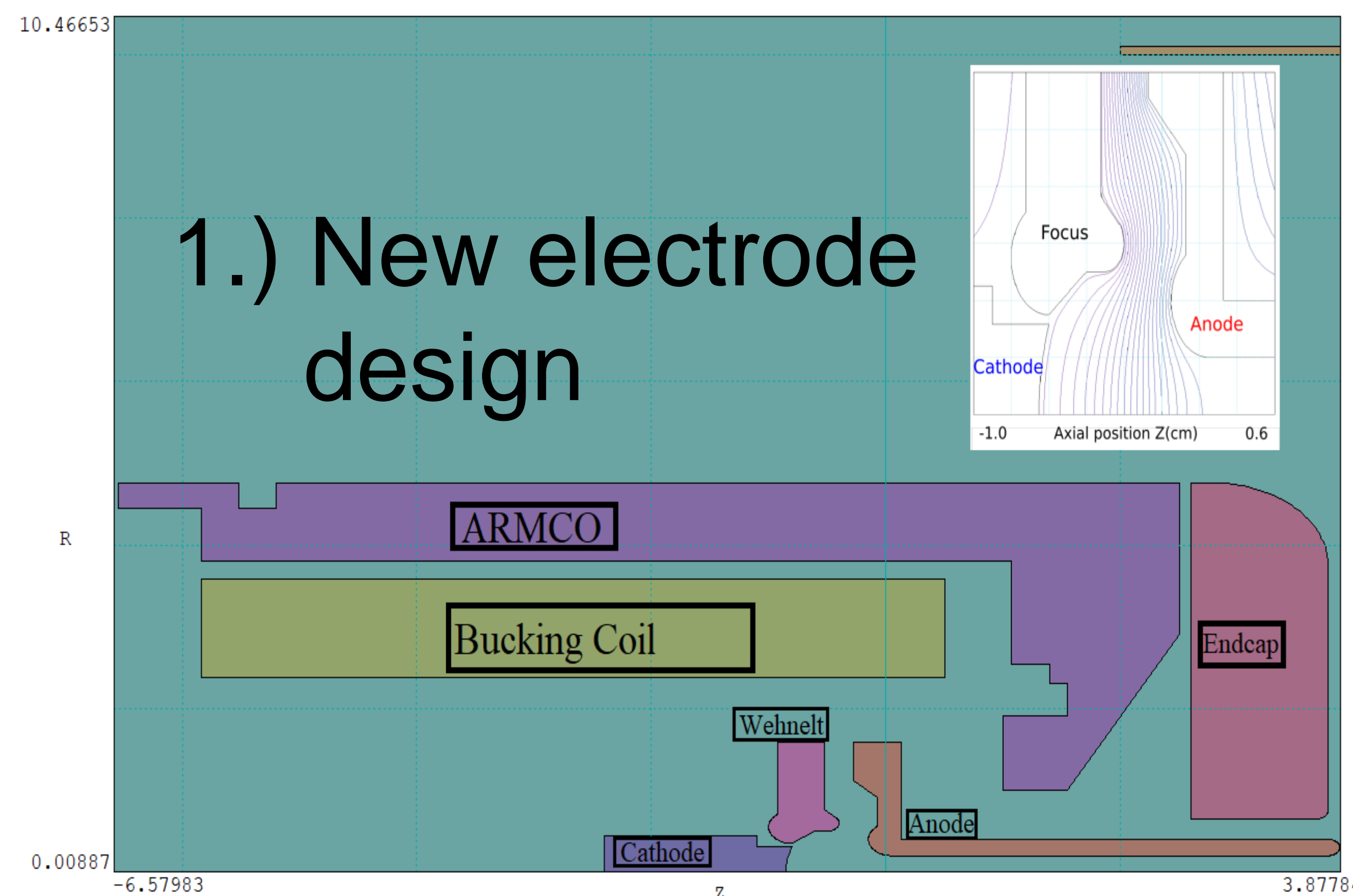


Improving the TITAN EBIT: Second generation electron gun

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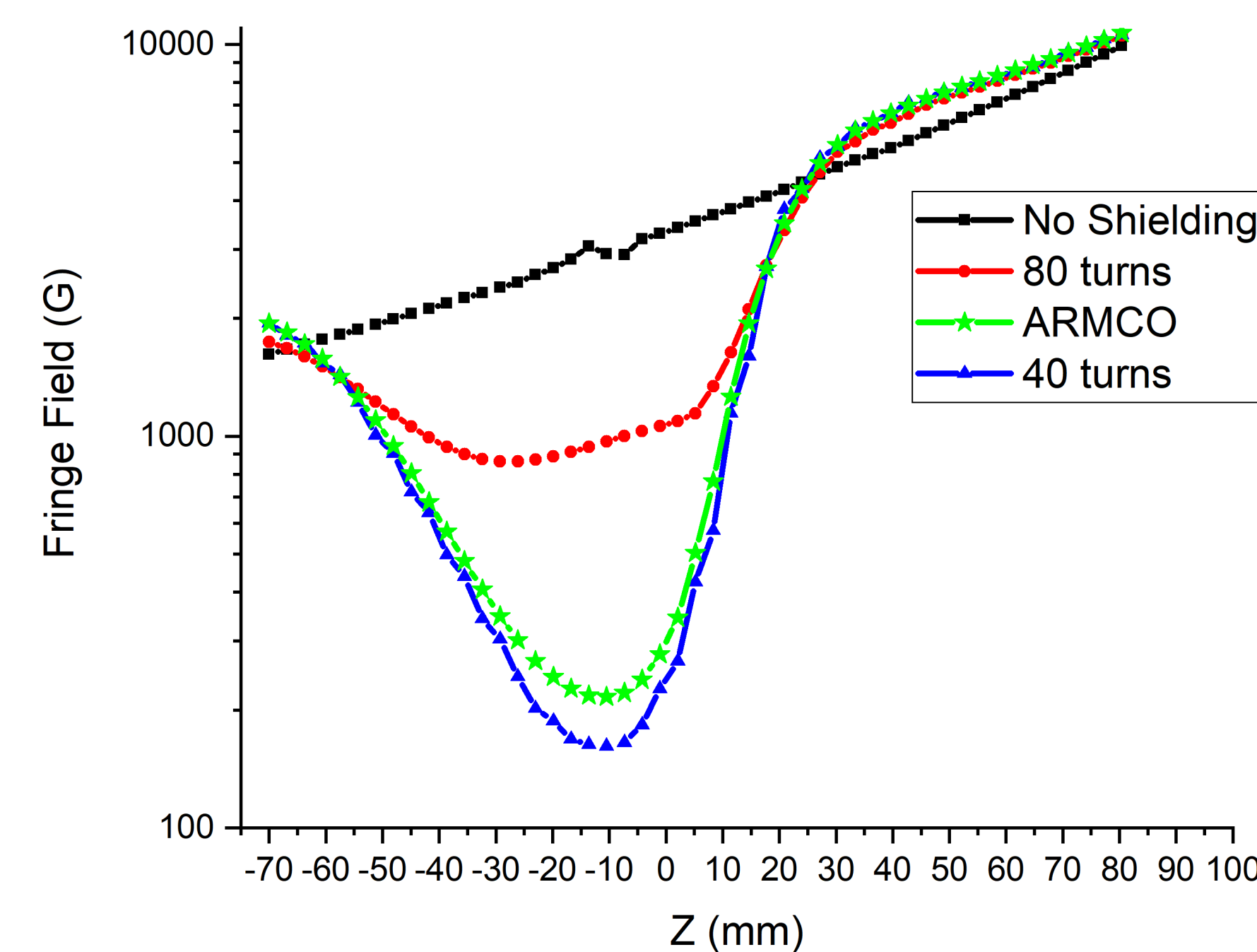
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TRIUMF's Ion Trap for Atomic and Nuclear Science (TITAN) aim is to study the bounds of nuclear structure. To achieve that goal, TITAN performs high precision mass measurements with the Measurement Penning Trap (MPET). Highly charged ions improve the uncertainty of MPET mass measurements; thus, the focus of TITAN Electron Beam Ion Trap (EBIT) is to charge breed short lived radioactive isotopes for use in Penning trap mass spectrometry. In order to increase the charge breeding efficiency of the TITAN EBIT a new electron gun has been designed and simulated.



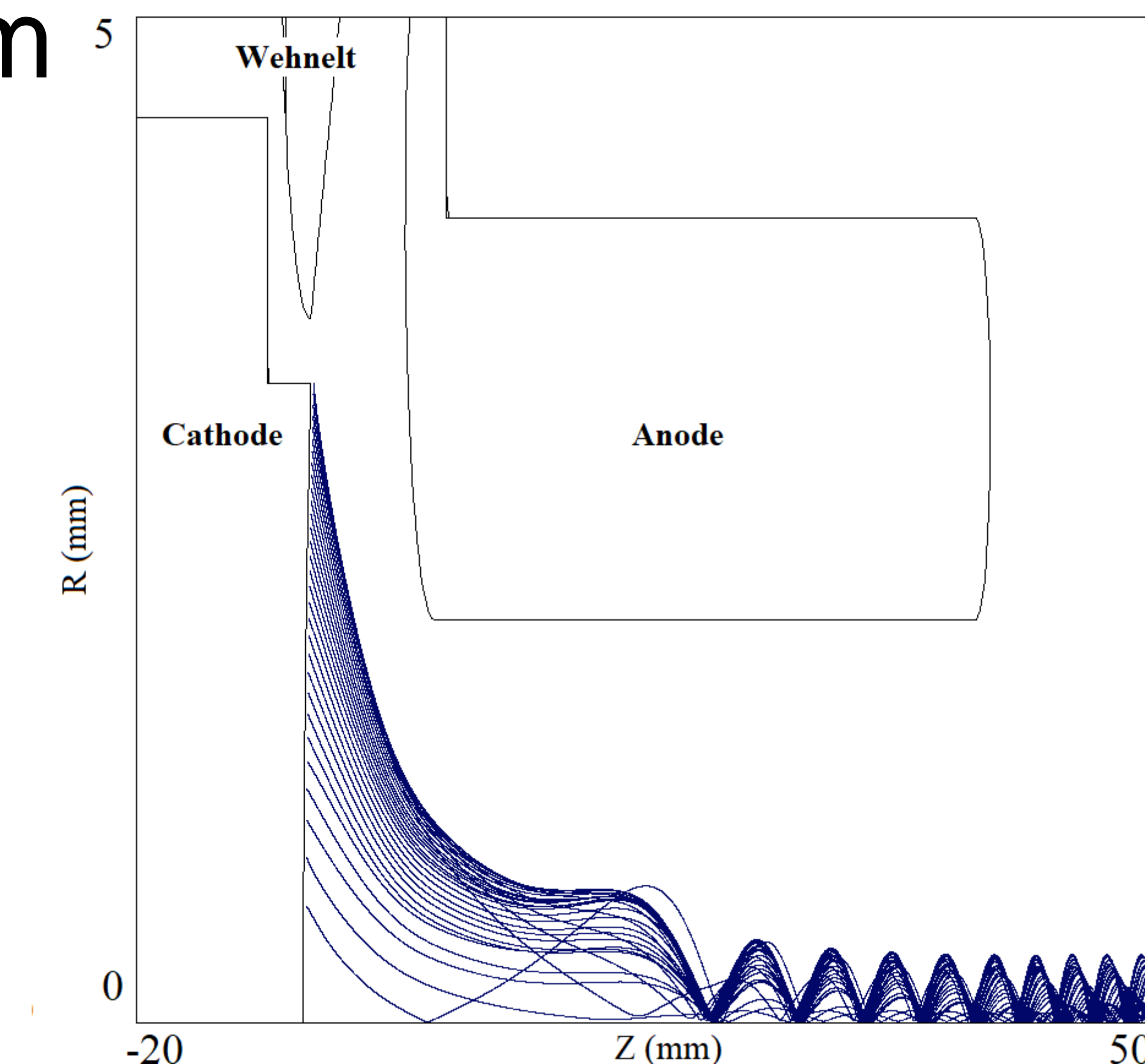
A Wehnelt-Anode pairing was designed for this gun. Multiple forms of fringe field shielding were considered

2.) Map of Magnetic Field



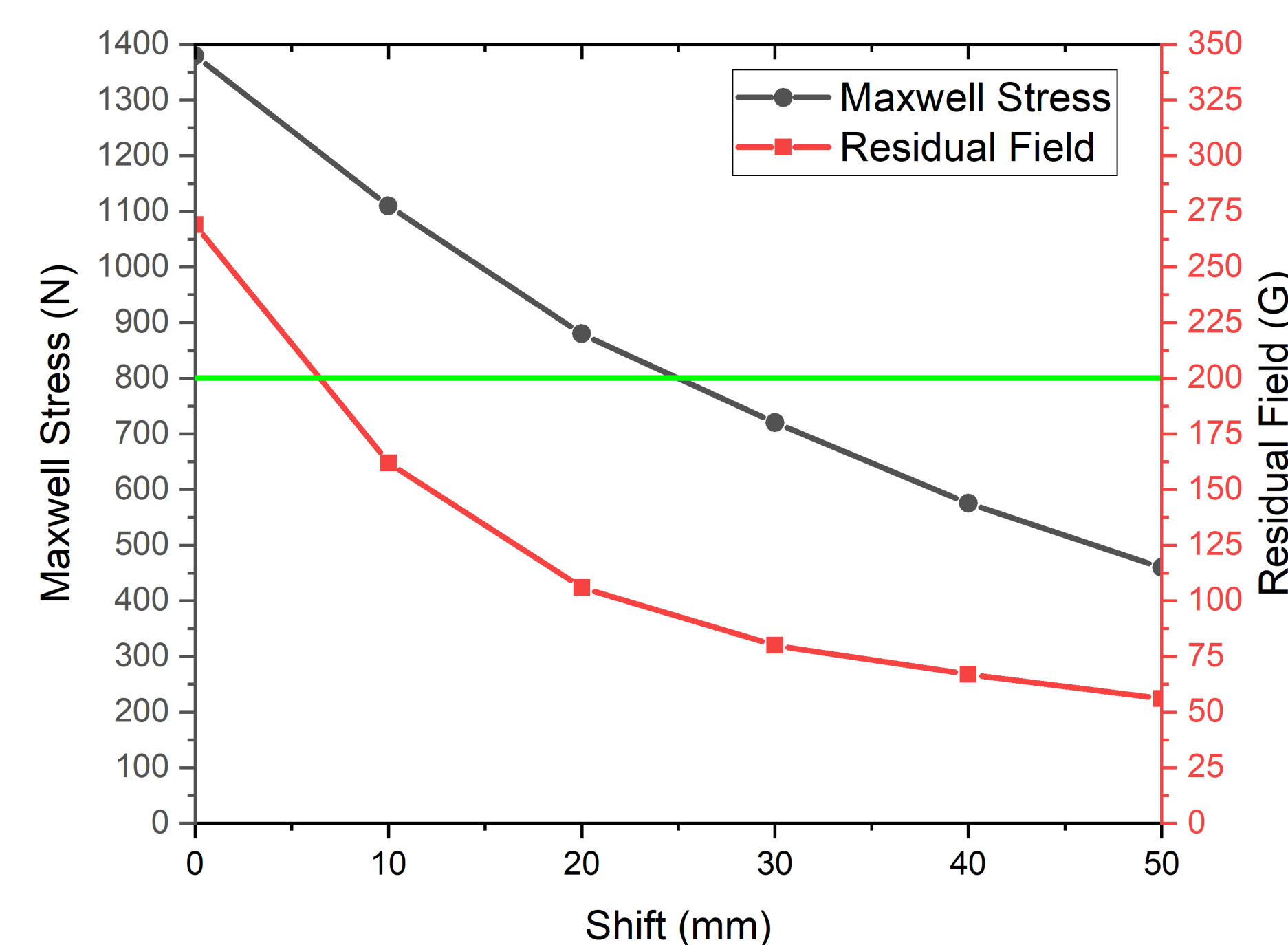
Simulations of the fringe field from the superconducting coil showed a minima of the field at the cathode surface.

3.) Compression of Electron Beam



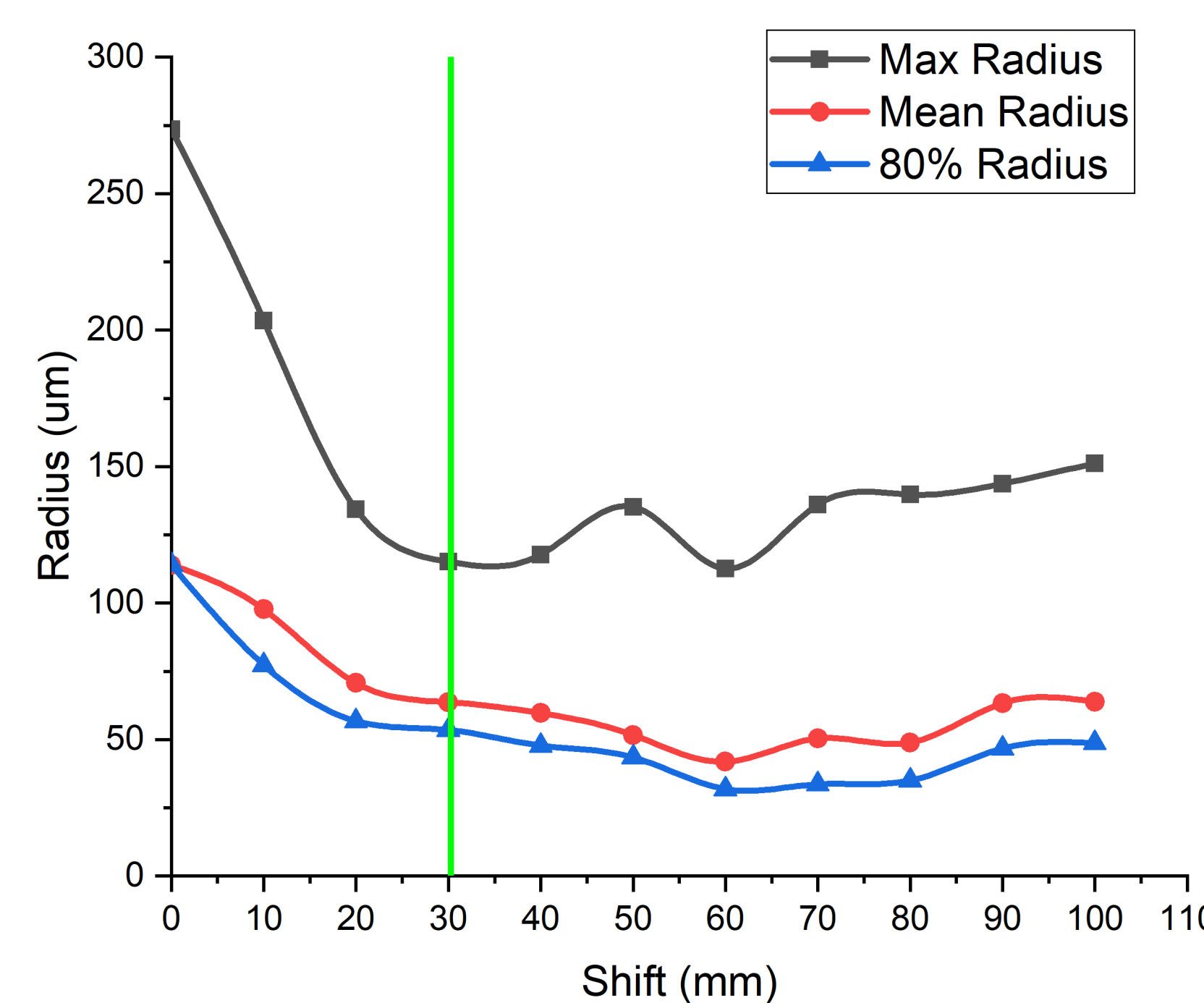
Greater compression of the electron beam will lead to faster charge breeding.

4.) Mechanical Safety



The gun induces a magnetic force on the magnet struts. Shifting the gun position was able to minimize the force to less than the 800N limit.

5.) Electron beam radius



Displacement of the gun did not negatively affect the beam compression!

In order to improve the charge breeding efficiency of the TITAN EBIT a new gun has gone into development. The compression of the electron beam was found to be substantial, even after dealing with the mechanical constraints of the EBIT. This increased compression should allow for faster charge breeding capability. Final checks of the mechanical design are underway, then the gun will go be machined at TRIUMF. Installation and testing to begin in March 2022, and first online experimental use expected in summer 2022.