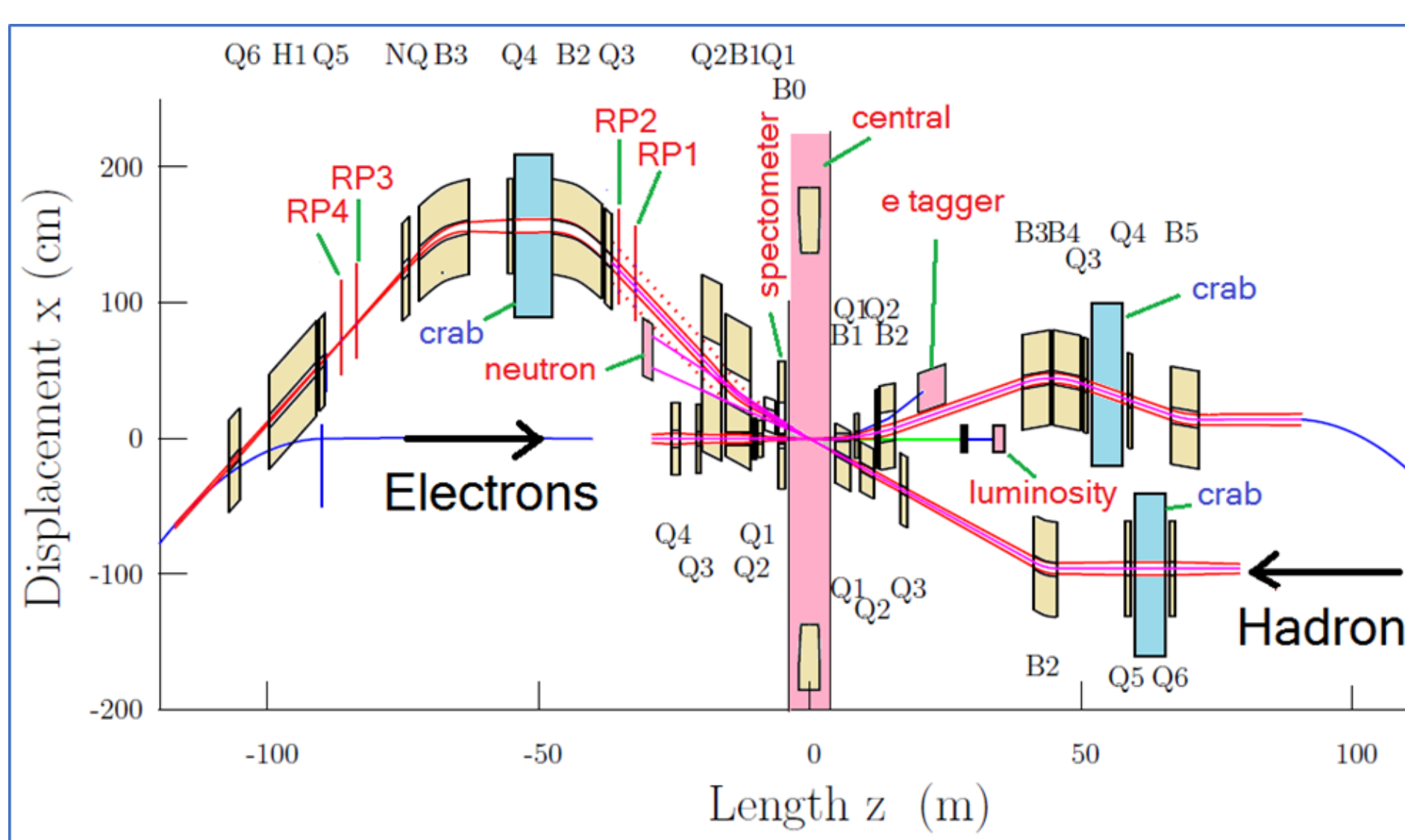
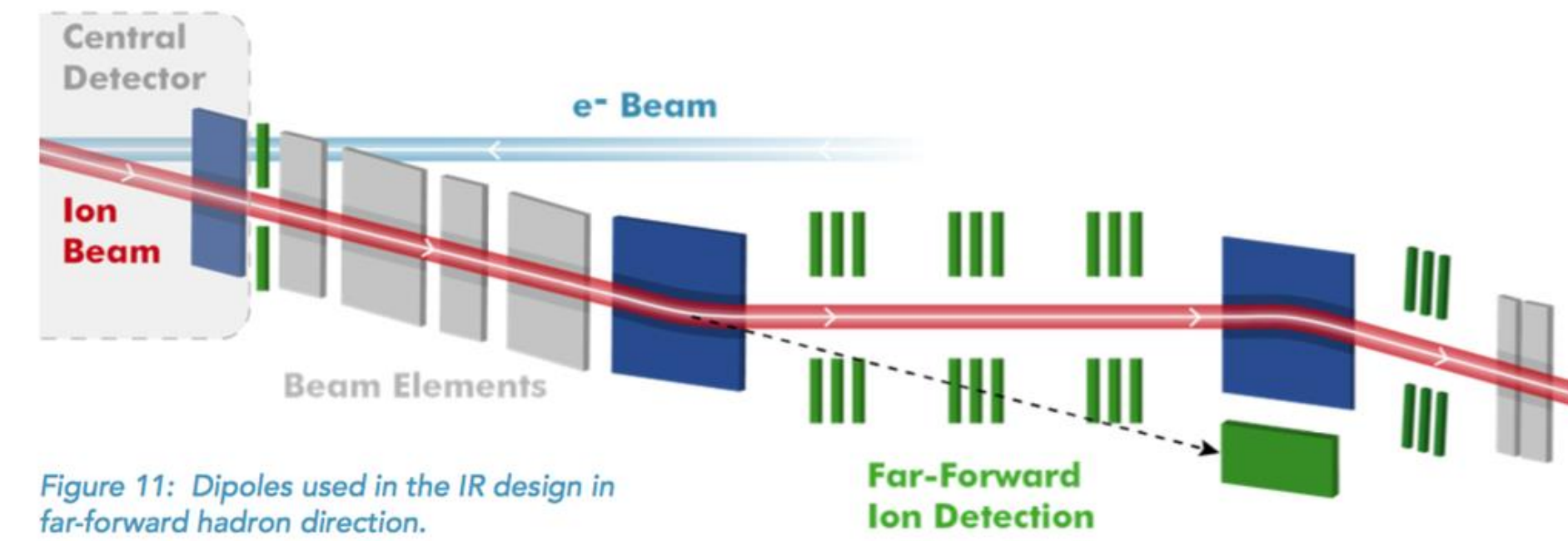
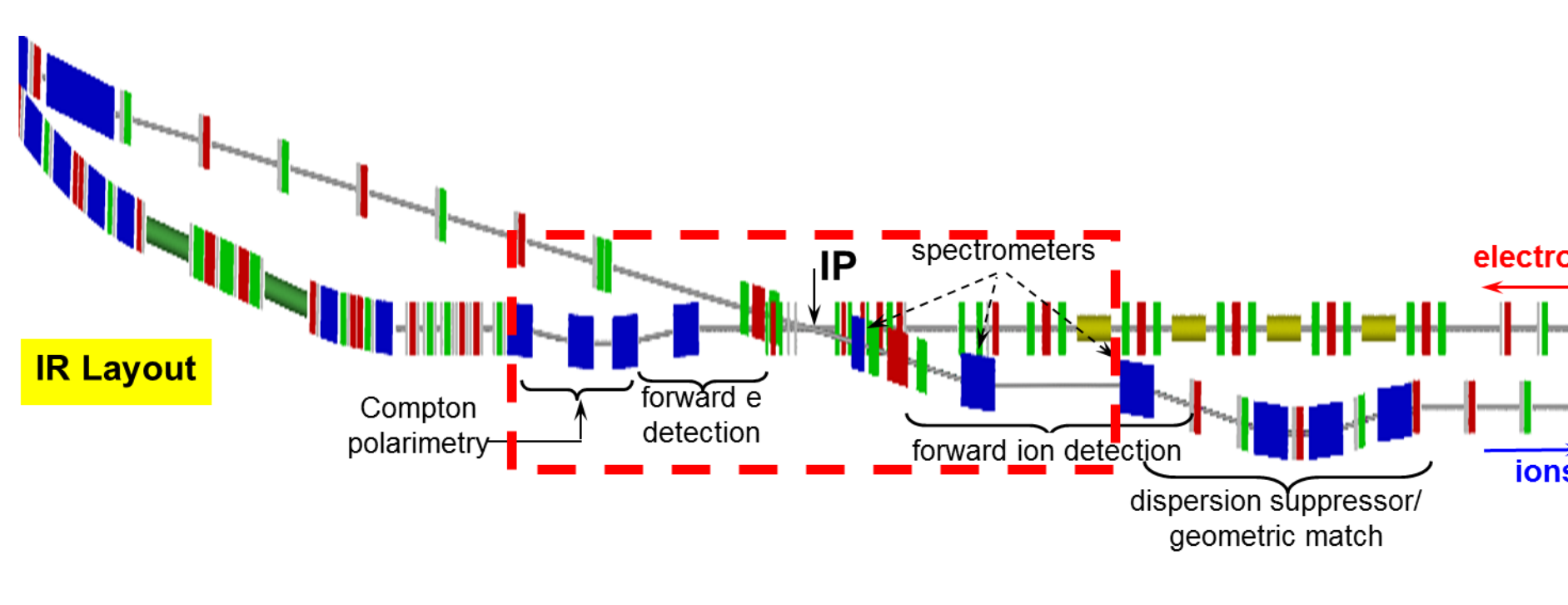


Issue

The proposed Electron-Ion Collider (EIC) needs a near field free region for electron beam in the close proximity of high field magnets for proton beam.



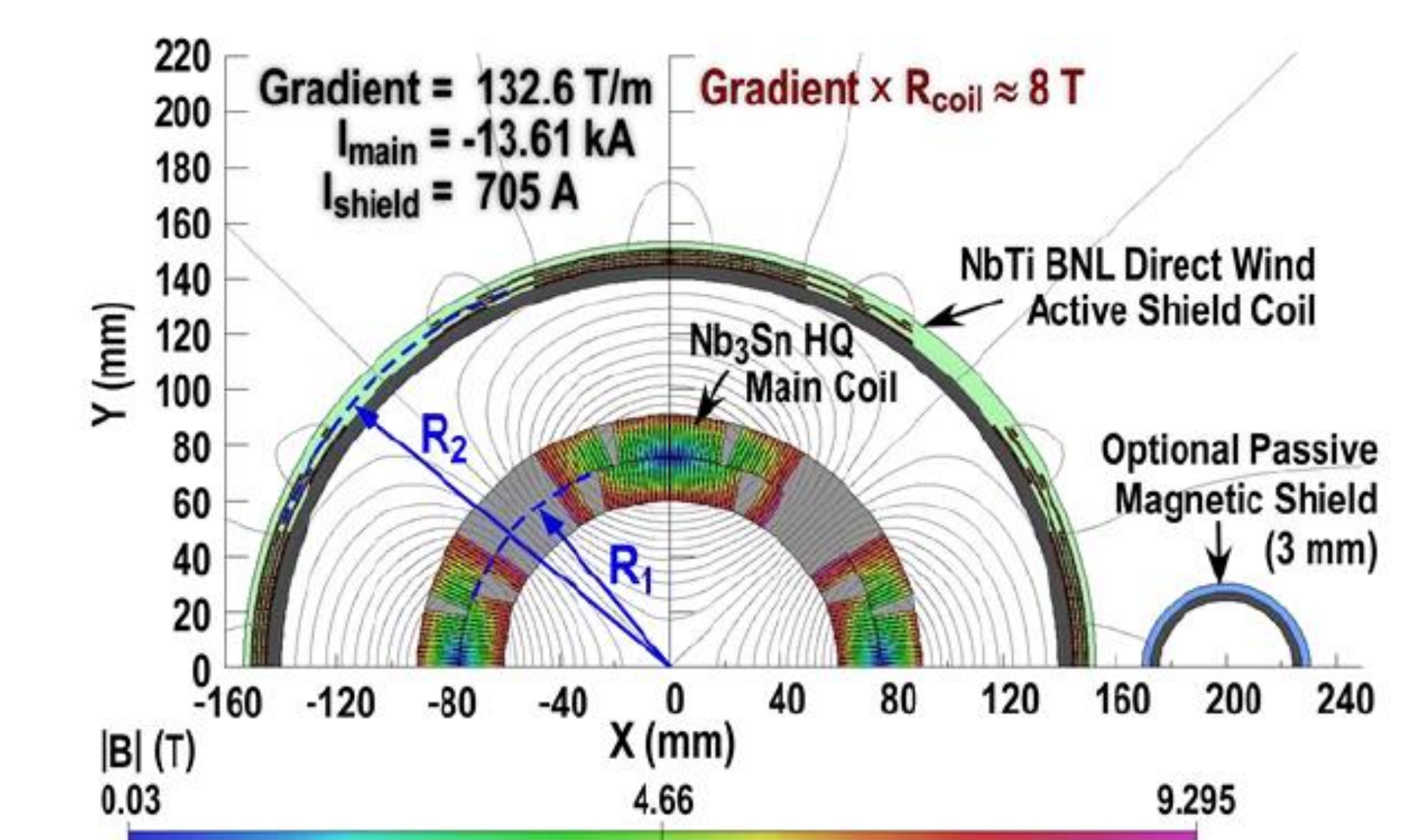
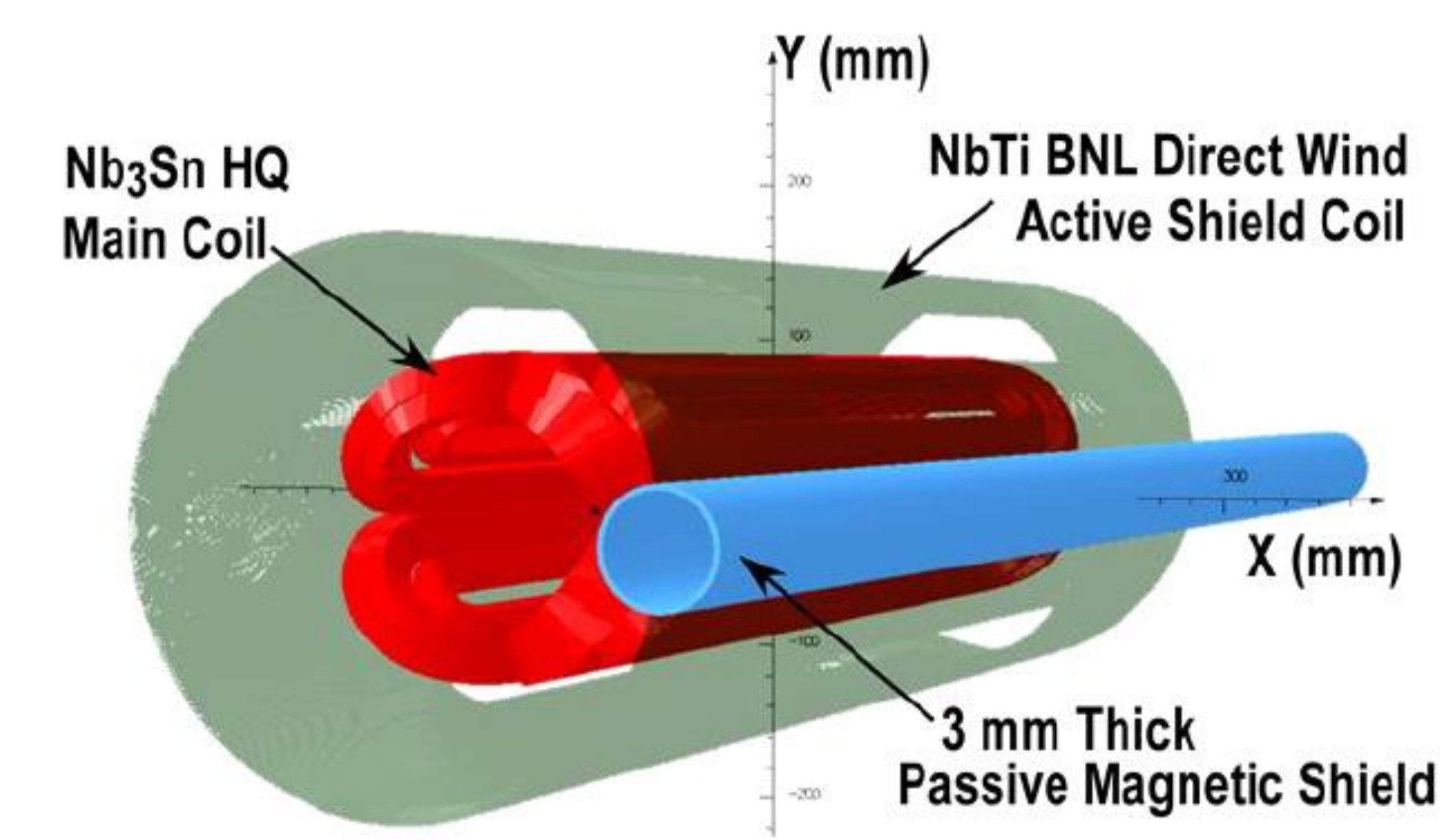
Proposed layout of the Interaction Region (IR) for the BNL eRHIC design of the EIC.



Proposed layout of the IR for the JLAB design of the EIC (top). The sketch at the bottom shows more detail of the magnet elements and the path of the ion and electron beams.

Current Solution

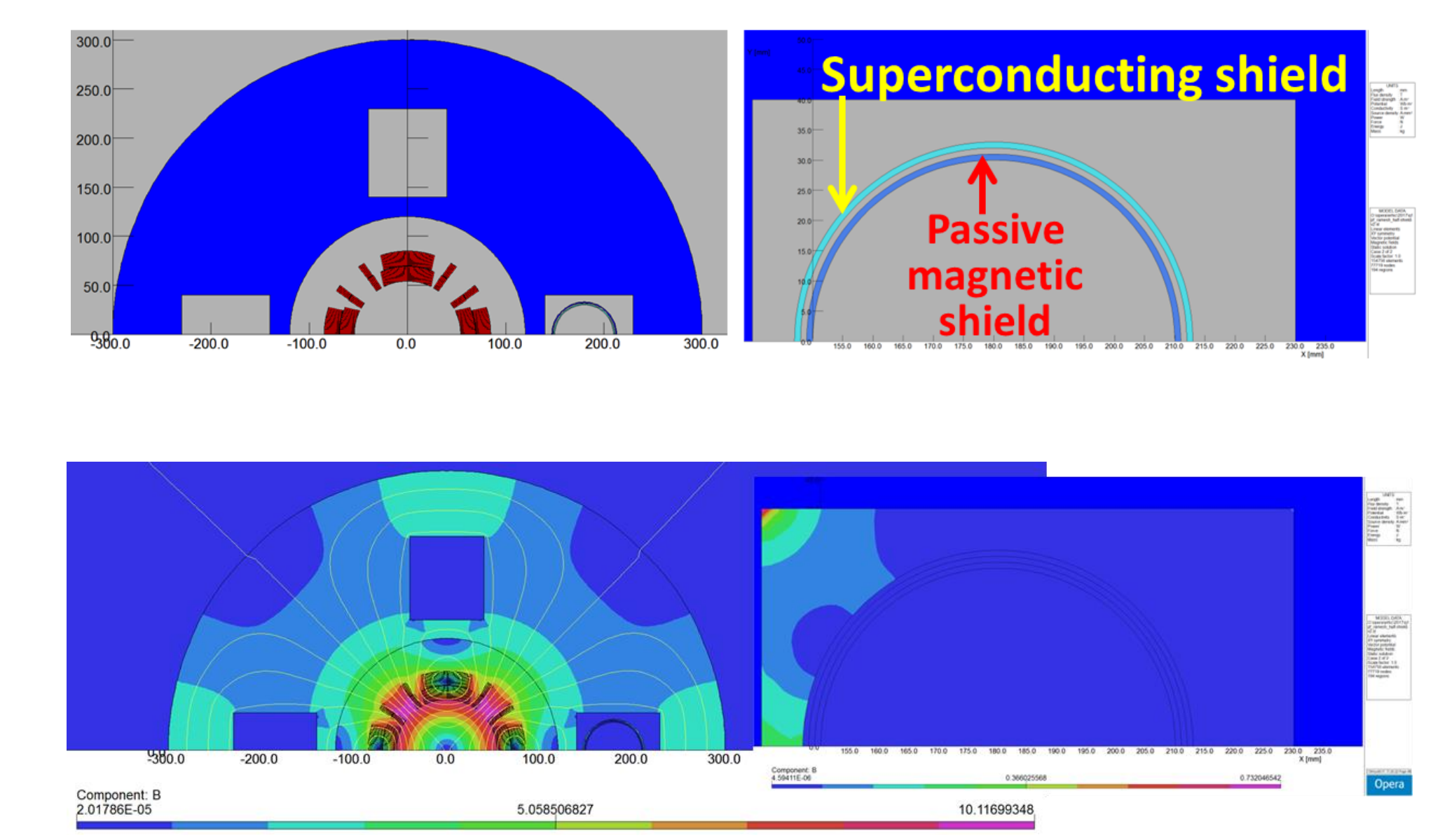
Active shielding coils to cancel field outside the magnet.



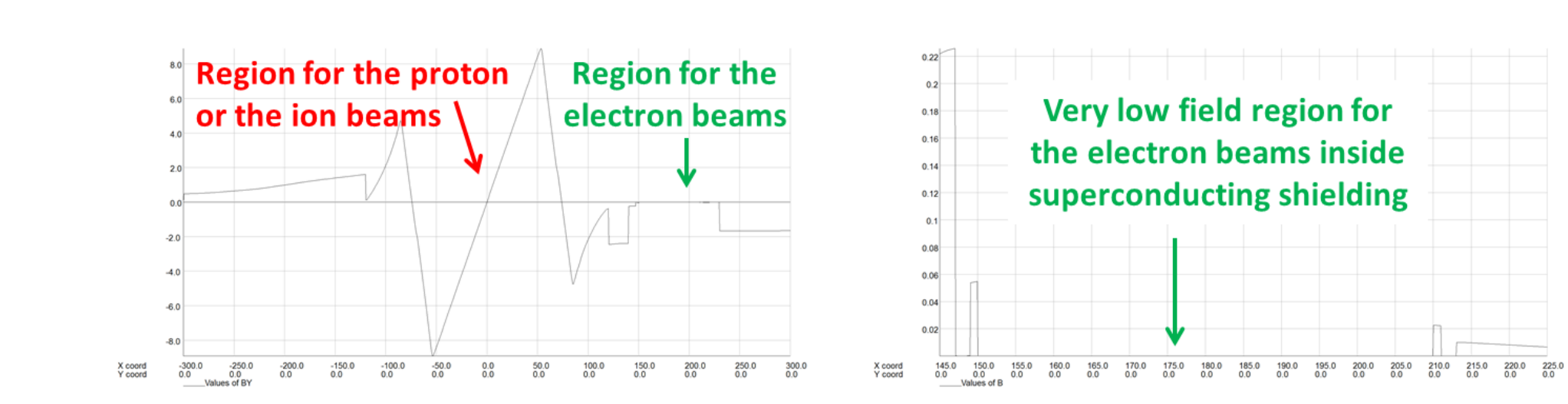
3-d and 2-d models of the current approach where the external field of the main high field Nb₃Sn quadrupole coils for the proton or ion beams is cancelled by the outer NbTi coils (providing active shielding) to obtain a near field-free region for passage of the electron beam.

Proposed Solution

Superconducting passive shield. Shielding system will include a magnetic shield also to take care of remnant field for whatever reason (transient, decay, etc.).



Magnetic design of the quadrupole with iron yoke and superconducting shield.



Magnitude of the field on the horizontal axis.

Possible Superconducting Shielding Materials

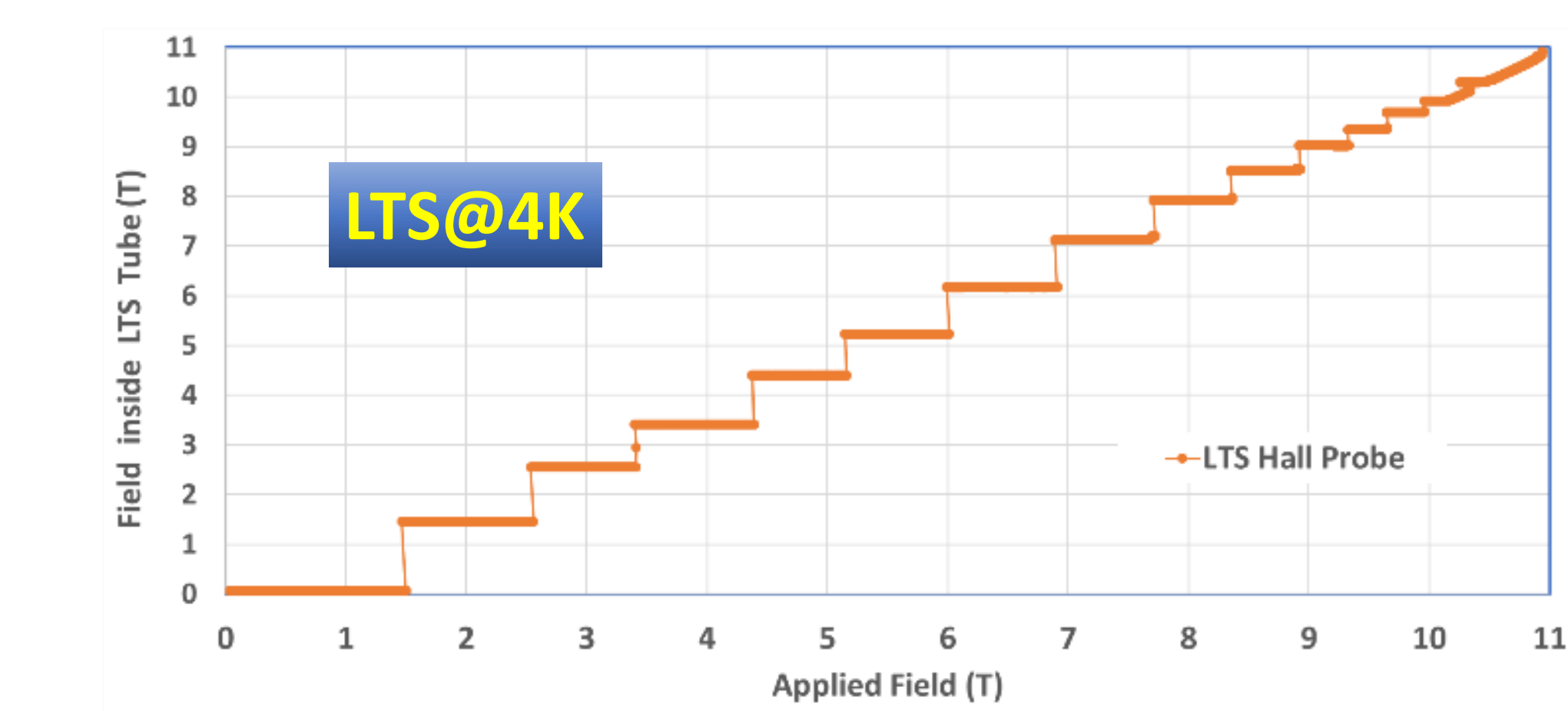
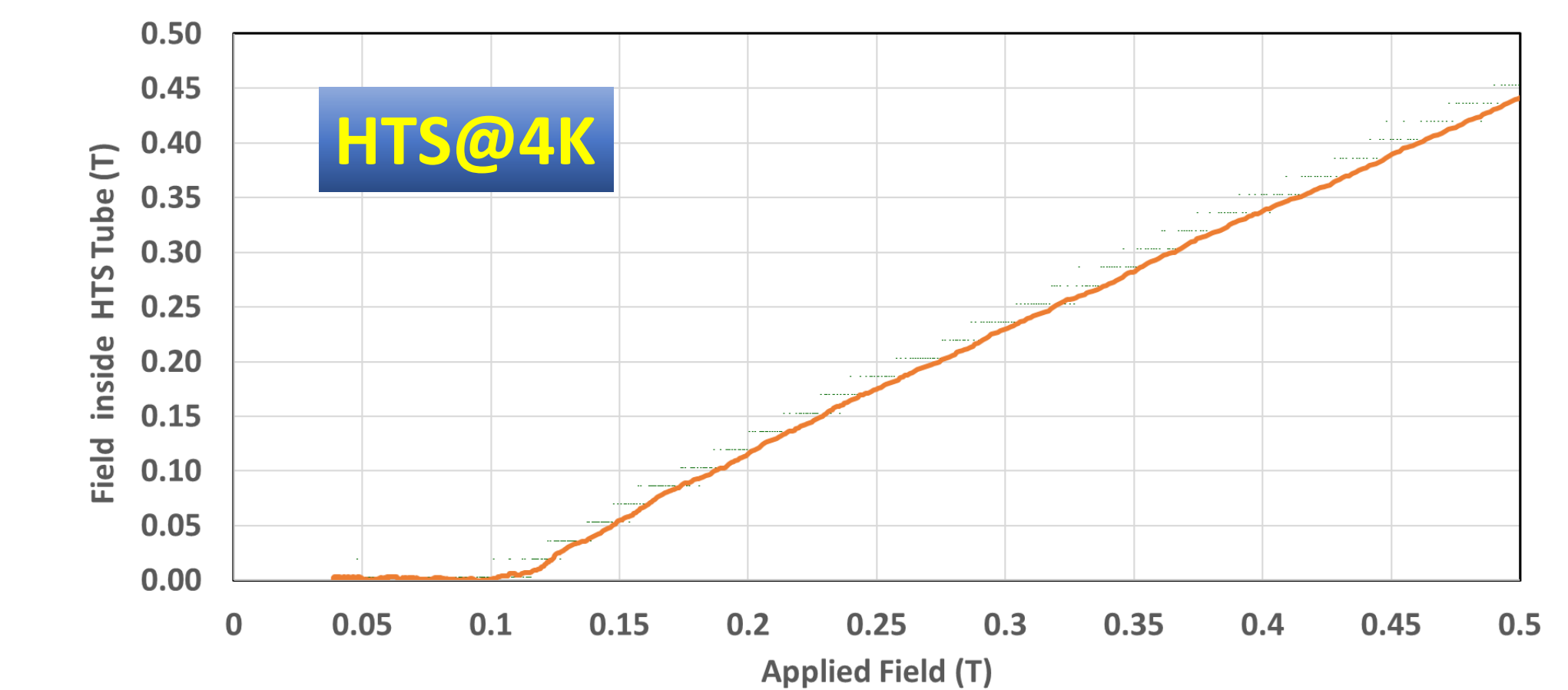
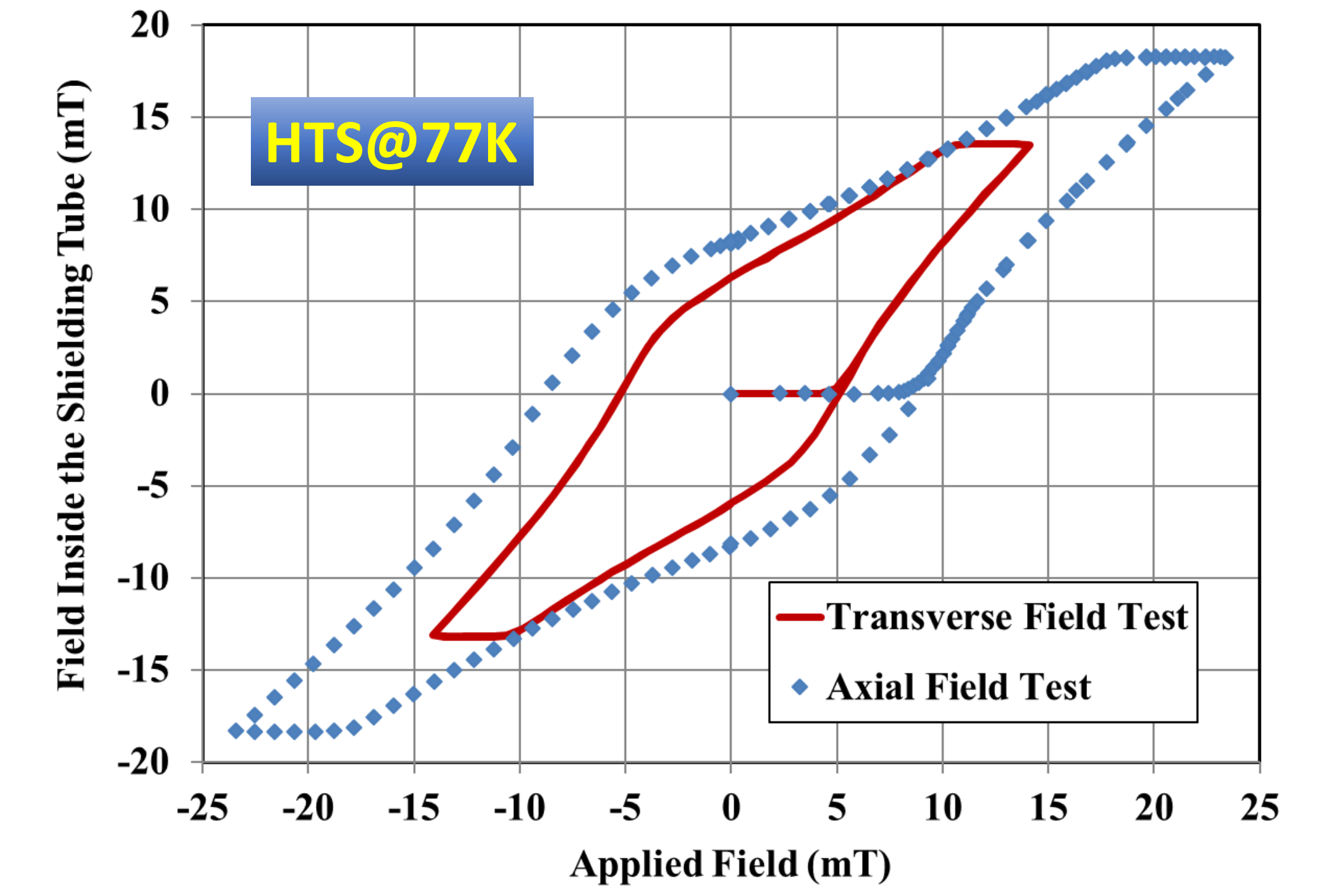
- HTS: Tubes and tapes
- LTS: Tubes and sheets



Shielding Test Setup



Shielding Test Results



Discussion

The benefit of a passive superconducting shielding system over the active shielding coil is that it should be simpler, cheaper, requires less space and no power supply.