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## **Design of a new iron plug for the TRIUMF ECRIS charge state booster**

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This paper presents an innovative solution to address the issue of asymmetric dipole fields in the injection region of the TRIUMF electron cyclotron resonance ion source charge state booster. The asymmetric fields arise from a wide gap in the booster's injection soft iron plug, which allows the connection of the RF waveguide to the plasma chamber. Simulations have revealed that singly charged ions, injected for charge breeding, experience deflection and get lost due to the asymmetric magnetic fields instead of being effectively captured by the plasma, thereby diminishing the efficiency of the charge state booster. To rectify this problem, a novel iron plug with an enlarged inner diameter, which allows the RF waveguide to connect to the plasma chamber with no gap was designed. Furthermore, this new design necessitates alterations to the injection electrodes and plasma chamber of the booster. Additionally, the waveguide and gas-inlet windows were repositioned to ensure better RF coupling into the plasma cavity. By eliminating the gap and implementing these design changes, it is anticipated that the TRIUMF charge state booster will operate at the same overall efficiency as other PHOENIX boosters.

### **Footnotes**

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Yes

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