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Extrapolation of axis-symmetric magnetic fields in MDIS and ECRIS

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Microwave discharge ion sources (MDIS) and electron cyclotron resonance ion sources (ECRIS) are widely used to feed particle accelerators. Their magnetic field consists in an axis-symmetric magnetic field that can be produced by permanent magnets or coils with the aim of assuring plasma heating by electron cyclotron resonance and confining the plasma axially. In ECRIS, a sextupole is added for radial plasma confinement. The 3D configuration of the magnetic field is needed to simulate beam extraction and plasma particles motion in the plasma chamber. Due to mechanical constraints, the measurement of the magnetic field in the entire chamber volume is often difficult or not possible.

This work introduces a numerical method for magnetic field extrapolation in the whole ion source volume by experimental measurements of the magnetic field in the plasma chamber along the axis.

The approach has been validated by comparing extrapolated values with experimental measurements.

Footnotes

Funding Agency

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Yes

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