

1-D equilibrium (radial) profile to simulate a hollow current profile in an FRC plasma by using symmetry

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In field reversed configurations (FRC), former studies on the radial magnetic field $B_z(r)$ reveal having a hollow current density distribution. It is from small variations in $B_z(r)$ that allows to capture a hollow current profile. In most cases, the $B_z(r)$ profile is matched with the rigid rotor (RR) profile. However, the RR profile can only have a peaked current density profile. This calls for some analytic model to simulate a hollow current density. The ideal FRC, having a pure vacuum field outside of the separatrix, has several unique symmetrical properties that can be used. By taking advantage of these properties lead to a mathematical model to determine the inner structure (from axis to separatrix radius) of the FRC. The 1-D equilibrium model has one key fitting parameter that can be adjusted to also simulate the RR profile.