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Design for an 18 GHz Open Hexapole ECR Source

Responding to a request by the user community for higher beam intensities, an upgrade of the Argonne National Laboratory ECR2 ion source is in progress. The upgrade has three main constraints: 1) The overall source architecture as defined by the solenoid coils cannot change, 2) radial access to the plasma chamber has to be maintained, and 3) the amount of time the source can be shut down for hardware installation is < 2 months.

A new NdFeB open hexapole is projected to produce a 1.1 T wall field with six radial slots (6.35 mm x 91.2 mm) allowing solid material access and ~120 l/s of pumping to the plasma chamber. The axial magnetic fields will be enhanced with a vanadium permendur plug and optimization of the iron resulting in a B_{inj} of 2.4 T, B_{min} of 0.4 T, and B_{ext} of 1.0 T and magnetic gradients of 5.9 T/m for 14.5 GHz and 7.4 T/m for 18 GHz.

The plasma is currently heated with multiple-frequency RF provided by two traveling wave tube amplifiers (TWTA) operating between 11 and 14.5 GHz and capable of providing 1100 W total power. The new magnetic structure will support 18 GHz operation with RF provided by a new TWTA.

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Yes

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