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Two-Rod-Antenna Microwave Injection System for Production of Circularly Polarized Microwaves in Cylindrical ECRIS Cavities

In the design of Electron Cyclotron Resonance Ion Sources (ECRIS) three topics generally need to be addressed: (i) The feed of a microwave to generate a plasma, (ii) the creation of a magnetic field guiding the charged particles, and (iii) the design of an ion extraction system. In this report, we concentrate on improvements of aspect (i), a new microwave injection system introduced to the Dresden ECRIS 2.45M, a permanent-magnet 2.45 GHz ECRIS, applied, e.g., for the production of proton currents in medical particle therapy. The improvements include the replacement of its one-rod antenna system by two rod antennas on one cross-sectional circle of the cylindrical ECRIS cavity positioned under an angle of 90° towards each other. Feeding two microwave signals with a relative phase shift of 90°, a right-hand circularly polarized wave can be created inside the cavity to efficiently heat the electrons. Basic considerations, simulations, and results from first experiments are presented.

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