

High power measurements on a remote steering upper port launcher mockup for ITER

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The association FOM-Rijnhuizen together with European partners in the EFDA Electron Cyclotron Heating Upper-port Launcher (ECHULA) group is developing a plug-in 170 GHz ECW launcher system for use in the upper-ports of ITER, based on the remote steering (RS) principle. In this concept, the microwave beam is steered by a mirror that is located at the source side of the waveguide that launches the wave. This has the advantage that there are no moving or otherwise vulnerable components close to the plasma. To validate (with respect to power-loss, antenna patterns & polarisation) the remote steering design that is foreseen for ITER a high power-testing program was performed. Measurements were made in cooperation with the Forschungszentrum Karlsruhe on a single launcher transmission line mock-up.

In the final phase a front mirror was included in the tests. The test used the new coaxial 170 GHz gyrotron in development at FZK, which was available for short-pulse (< 10 ms) testing. Antenna pattern measurements of the remote steering mock-up were performed using an absorbing pvc screen and infrared-camera. Additionally using a calorimeter, measurements on the relative waveguide efficiency were performed. Although the output beam of the gyrotron was not yet optimal for the remote steering launcher and this caused some problems with interpretation useful results are obtained. Both at the output of the remote steering waveguide and after the front mirror good quality output beams ($\approx 98\%$ Gaussian intensity distribution) were found. Measured losses were slightly higher than predicted. The high-power tests provided useful input to the improvement of the current design of the remote steering launcher.

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