

# 21st joint workshop on electron cyclotron emission (ECE) and electron cyclotron resonance heating (ECRH)

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## A new 3MW ECRH system at 105 GHz for WEST

*Tuesday, 21 June 2022 14:00 (2h 30m)*

The aim of WEST experiments is to master long plasma pulses (1000 s) and expose ITER-like tungsten tiles to power fluxes up to 10 MW/m<sup>2</sup>. To increase the margin to reach the H-Mode and to control W-impurities in the plasma, an upgraded ECRH system, with a power capability of 3MW/1000s at a frequency of 105 GHz for a central power absorption, is planned for operation in 2023.

The previous Tore Supra ECRH transmitter was equipped with two 118 GHz gyrotrons, 63.5 mm corrugated HE11 mode waveguides and an antenna with six fixed mirrors and three steering mirrors, all actively cooled. With the modifications of Tore Supra to WEST, simulations at a magnetic field of  $B_0 \sim 3.7$ T and a central density of  $n_e \sim 6.1019 \text{ m}^{-3}$  show that the optimum frequency for a central absorption is 105GHz in the new WEST configuration.

For this purpose, a 105 GHz 1MW gyrotron (TH1511) has been designed at KIT in 2021, based on the technological design of the 140 GHz 1.5 MW gyrotron for W7X (TH1507U). Currently, three industrial gyrotrons are under fabrication at THALES. In the first phase of the project, a part from the gyrotron system, the Tore Supra components are going to be re-installed and re-used whenever is possible.

The design of most of the components such as the High Voltage Power Supply system and the Control system require significant modifications. In parallel an updated corrugated waveguide layout and some modifications of the Tore Supra antenna are under consideration. In 2022, the transformations of the EC transmitter and of the antenna are under way.

This paper will describe the studies performed to adapt the new ECRH system at a 105 GHz frequency to WEST and the status of the modifications necessary to re-start the system in 2023 with a challenging schedule.

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