THE DESIGN AND PHYSICS PERFORMANCE OF THE ITER UPPER PORT ECH FRONT STEERING LAUNCHER

M. Henderson, R. Chavan, R. Heidinger, G. Ramponi, G. Saibene, F. Sanchez, O. Sauter, H. Shidara, and H. Zohm.
Centre de Recherche en Physique des Plasmas, Association EURATOM-Confederation Suisse, Ecole Polytechnique Federale de Lausanne, CH-1015 Lausanne, Switzerland.
Mark.Henderson@epfl.ch

The purpose of the ITER electron cyclotron resonance heating (ECRH) upper port launcher will be to stabilize the neoclassical tearing mode (NTM) by driving currents (ECCD) locally inside either the q=3/2 or 2 island. In order to deposit current predominately inside the island, a narrow ECCD current deposition profile is required. Also, a wide steering range is desired for application of co-ECCD on the relevant flux surfaces over the wide spectra of possible ITER plasma equilibria. A front steering (FS) launcher has been designed for application on the ITER upper port, offering a wider poloidal steering angle (≥20˚) and a higher ECCD density (factor of 3.0 on average) than the presently planned remote steering (RS) launcher. The launcher is capable of injecting 16MW per port (eight beams of 2.0MW) using a two mirror system (1 focusing and 1 steering) for focusing and redirecting the beam towards either the q=3/2 or 2 flux surfaces for all envisioned plasma equilibria. The steering mechanism is bearing-free with flexure pivots, in a compact cartridge capable of ±12˚ rotation (corresponding to a poloidal steering range of ±24˚ for the microwave beam). The increased steering range enlarges the range in which the ECCD deposition can be applied, offering the potential to address other physics issues such as sawtooth, FIR or ELM control. The complete design concept and calculated ECCD performance for NTM stabilization will be presented.