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P2.1010 Spectral intensity of electron cyclotron radiation coming out of plasma in various regimes of ITER operation

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Electron cyclotron radiation (ECR) in ITER (in contrast to all previous devices) is expected to play an important role in power loss balance due to high electron temperature and high magnetic field [1], [2]. This radiation is also a source of additional thermal and electromagnetic load for microwave and optical diagnostic [3]. ECR from the plasma dominates over the nominal stray radiation from electron cyclotron resonance heating (ECRH) and current drive (ECCD) microwave power sources in high performance discharges and therefore its implication for diagnostics must be investigated [3]. This is especially important for mm-wave diagnostics in ITER such as microwave reflectometers, and Collective Thomson scattering system, whose transmission lines allow, in principle, additional measurements of EC radiation spectra [4]. The transmission lines for HFS reflectometry are planned to use the same waveguides for X-mode observation in frequency band 12-90 GHz and O-mode observations in the band 18-140 GHz. Although the working frequency range is significantly lower than the operational frequency for ITER ECRH system (>170 GHz), the antennas and the waveguide can receive the entire emission spectrum at frequencies above 12 GHz. In this case, the absorption and heating in the primary and secondary vacuum windows and the residual power on the receiving mixers is determined both by the initial power of the EC radiation from the plasma and by the transmission line losses, which increase strongly with increasing frequency. Here we report on calculations, with the CYNEQ code [2], [5] of spectral intensity of the ECR coming out of plasma in various regimes of ITER operation in the view of its possible influence on in-vessel components and diagnostics.
References
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