Analysis of the heating of the Magnum-PSI and Pilot-PSI plasma in the GHz range

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Magnum-PSI (under construction) and Pilot-PSI [1] are linear plasma machines. The former is designed to study plasma-surface interactions in conditions relevant to the ITER divertor. To generate the power flux required by these studies, radio-frequency heating has been planned. Around typical Magnum-PSI conditions (B_0=3T, n_e=10^{20}-10^{21} m^{-3}, T=1-5 eV), after low frequency [2], higher-frequency schemes are investigated. These range from the lower-hybrid frequency to the helicon wave range with a preference for 2.45 GHz where equipment is easily available. First experiments have been performed on the smaller machine Pilot-PSI (B_0=0.4-1.6T). In this paper the conditions for wave propagation and absorption are investigated for both machines in broad parameter ranges to determine the most favourable heating conditions. The importance of choosing suitable wave polarization and launched $k_{//}$-spectrum will be discussed. A spectral code has been developed to compute the coupling of a rectangular wave-guide field to the cylindrical plasma. Results will be presented showing in particular the reflection coefficient in wide parameter ranges and for different incidence angles of the waveguide.

[1] G. J. van Rooij, et al., accepted for publication in Appl. Phys. Lett., **90**(2007) Issue 12, 19-MAR-07.
[2] R. Koch et al., Trans. of Fus. Science & Techn., **47**(2005)249.