OBLIQUE ECE MEASUREMENTS ON FTU

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A new antenna system devoted to Oblique ECE measurements has been recently installed in FTU. Due to the very narrow accesses to the vacuum vessel of FTU, it is realized with a movable mirror that can rotate in the toroidal direction between –72° and +72°, being 90° the perpendicular direction to the toroidal magnetic field. The antenna is located slightly above the equatorial plane on the low field side looking through the plasma center. The ECE signal will be analyzed in the first phase with a 12 channel ECE polychromator [1].

Oblique ECE measurements have already been performed in FTU, in discharges with high electron temperature (>10 keV), obtained with strong central ECR heating during current ramp-up [2]. The Fokker-Planck calculation of the ECRH process predicted a distortion of the bulk of the distribution function[3], compatible with both perpendicular and oblique ECE measured spectra [4]. The temporary availability of one of the four ECRH launching antenna has provided an oblique access to the plasma with a line of sight into the plasma at 90°±10°, 90°±20° and 90°±30° with respect to the toroidal direction. ECE spectra, close to the second harmonic, were measured by a high resolution radiometer ($\Delta f \sim 1$ GHz).

Some preliminary measurements with the new system will be made in the next FTU campaign. The main auxiliary heatings will be Lower Hybrid (LH) and ECRH. The distortion of the electron distribution function, induced by the LH wave, consists of a high-energy tail, that produces a broad band and flat ECE spectra. The resolution of the ECE polychromator (~ 7 GHz) and its spectral bandwidth (~100 GHz) are suitable to provide good measurements of the oblique ECE spectra features. A new set of measurements during strong ECRH will be performed as well. In order to minimize the contribution of the multiple reflections to the emission, measurements will be carried out at the second harmonic X mode, so that reflections will be reabsorbed by the optically thick thermal resonant layer. A mode selector will be inserted to reduce the O-mode contribution to the signal. Comparisons at different angles can be made only shot-by-shot in a set of reproducible discharges. Calibration will be made comparing perpendicular measurements of the polychromator with the Michelson interferometer data, in ohmic discharges. In this paper we will present the new antenna system and we will discuss its diagnostic capability, related to distribution function in presence of LH wave. A particular emphasis will be paid to the feasibility of a mode selector in the spectral band of the polychromator. Preliminary measurements on FTU will also be reported.

References

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