THE MULTICHANNEL EXTENSION OF THE MARTIN-PUPLETT INTERFEROMETER FOR PERPENDICULAR AND OBLIQUE ECE MEASUREMENTS ON JET.

*C.Sozzi[1], A.Simonetto[1], S.Garavaglia[1], E.DeLaLuna[2], J.Fessey[3], S.Nowak[1], M.Zerbini[4] and JET-EFDA contributors**

[1]IFP-CNR, Assoc. EURATOM-ENEA-CNR sulla Fusione, Milan, Italy
[2]Asociación EURATOM-CIEMAT, CIEMAT, Madrid, Spain
[3]EURATOM-UKAEA Fusion Assoc., Culham Science Centre, Abingdon, UK
[4]Associazione EURATOM-ENEA sulla Fusione, Centro Ricerche Frascati, Rome, Italy

First Author email: sozzi@ifp.cnr.it

A set of new microwave diagnostic tools has been recently made available on JET in the framework of the Enhancement Projects [1], also requiring the extension of the capabilities of the Martin-Puplett interferometer for the spectral analysis of the ECE perpendicular and oblique signals. The frequency range of the instrument is 75-800 Ghz and an entirely new quasi optical system allows the contemporary use of up to 6 channels, with 10.7ms scan time and 40mm scan length, corresponding in average to ≈8 cm of equivalent spectral resolution. The interferometer layout accordingly with the present design is ideally split into two sets of components. The first is the group of the moving arms, based on an array of four helicoidally shaped roof top mirrors, arranged on a wheel. This array, with its motor and control system has been previously installed and was used as part of a single channel interferometer for the perpendicular ECE [2]. The second is the group of the fixed optical elements (mirrors and polarizing grids) of the reference arms, their supports and positioners, and the optics for input and output of the signals. The fixed optical elements are mounted on a couple of optical boards in a "T-shaped" arrangement facing the rotating mirror array. The system is alignment free once installed and the fixed optics can be removed and repositioned without loss of alignment. The orientation in space of the input waveguides and the location of the access points of the ECE signals onto the rotating array have been optimized in order to preserve as much as is possible the information related to the polarization of the incoming oblique ECE signals (mostly O-mode and mostly X-mode for two linearly perpendicular polarizations). The conceptual design of the quasi optical system [3] has been verified with electromagnetic simulations, also providing the requirements for acceptable mechanical tolerances. The detection chain is realized with a liquid helium cooled InSb detector, a preamplifier and a remotely controlled amplifier for each channel. The acquisition of the data points, based on two 4-channels fast digitizers, is triggered by an optical encoder which provides the angular position of the roof top mirror array. The uncalibrated ECE spectra are then provided through a procedure automatically launched on shot-by-shot basis. While an absolute in vessel calibration is foreseen, only data relatively calibrated to other ECE diagnostics will be acquired during the initial phase. This paper deals with the detailed description of the system, the installation and characterization procedure and the evaluation of its performances.

References

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