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MECHANICAL REALIZATION OF MULTICHANNEL MARTIN PUPLETT INTERFEROMETER FOR PERPENDICULAR AND OBLIQUE ECE MEASUREMENTS ON JET

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In the project of the New MWA diagnostic system at JET [1,2], the pre-existing one channel Martin-Puplett interferometer (MPI) for ECE measurement needed a multichannel extension for oblique ECE, that was only possible with a complete redesign of the collection optics system. The new instrument [3] is designed to analyze the incoming radiation from standard perpendicular view (two channels, from two different waveguides or O+X modes from the same one) and from oblique view of the ECE radiation at two different angles (four channels to measure the mostly-O and mostly-X modes separately) at ~11° and ~23° in the toroidal direction with respect to the perpendicular to the magnetic field. The new optical scheme [4] needed a totally new mechanical layout of the system. The new mechanical layout must fulfil several critical constraints. All the six MIPs channels share the existing rotating mirror (helicoidally shaped, arranged on a wheel with diameter 300 mm) [5], and therefore the nearly 50 optical components must be positioned in a limited space. Moreover back-reflection on the rotating mirror requires precise alignment in off-normal directions. The polarization must be precisely controlled as well therefore each optical component (mirrors, beam splitters) requires an accurate machining and a precise spatial and angular positioning (the tight tolerances were estimated from electromagnetic simulations). The non-modularities have been concentrated in a small number of pieces (supports, positioners and wedges) and the number of non identical pieces has been minimized. A rigid layout was chosen for an alignment-free system, given the large number of components to be aligned and to endure the accidental vibrations undamaged. Most of components are placed on three layers, two perpendicular and one parallel to the axis of the rotating mirror. The layout of the main frame is therefore made of two optical planes in a “T-shaped” arrangement facing the rotating mirror. It can be removed without losing the correct alignment from the rotating mirror structure to gain access to the rotary reflector and the front fixed optics.
This paper deals with the detailed description of the mechanical realization of the system.

References

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