Contribution ID: **185** Type: **not specified**

Design concept and thermal-structural analysis of a high power reflective mm-wave optical mirror (M2) for the ITER ECH Upper Launcher

Monday, 17 September 2018 11:00 (2 hours)

Each of the 4 ITER Electron Cyclotron Heating Upper Launcher (ECHUL) features 8 transmission lines (TLs) used to inject 170 GHz microwave power into the plasma at a level of up to 1.31 MW (at the TL diamond window) per line. The millimetre waves are guided through a quasi-optical section consisting of three fixed mirror sets (M1, M2 and M3) and one front steering mirror set (M4).
The M2 mirror set is composed of an upper and lower part, each reflecting 4 nearly-Gaussian beams coming from the M1 to the M3 mirror, which focuses them towards the M4 steering mirror that will aim at the correct location in the plasma for suppression of the q=3/2 and q=2/1 NTMs.

Mm-wave power is converted into heat by ohmic dissipation, reaching a peak power density of approximately 4 MW/m2 on each of the 4 beam centre spots of the M2 mirror, resulting in a total of 19.4 kW absorbed power.

EPFL-SPC has developed a novel water cooled mirror design concept which is able to dissipate such high heat loads (with up to 60000 thermal cycles) and also resist the applied external loads and dynamic displacements arising from plasma disruptions and seismic events, while complying with: material, manufacturing and space restrictions.

This study describes the main design features of the M2 upper mirror, and its design conformity in accordance to the ASME design code and also its conformity to the Essential Safety Requirements (ESR) for Nuclear In-vessel components.

This work was supported in part by the Swiss National Science Foundation. This work was carried out within the framework of the ECHUL consortium, partially supported by the F4E grant F4E-GRT-615. The views and opinions expressed herein do not necessarily reflect those of the European Commission or the ITER Organization.

Co-authors: Dr SANTOS SILVA, Philip (EPFL); Dr CHAVAN, Rene (EPFL); Dr GOODMAN, Timothy (EPFL); Dr MAS SÁNCHEZ, Avelino (EPFL); Dr VIGNONI, Matteo (EPFL)

Presenter: Dr SANTOS SILVA, Philip (EPFL)

Session Classification: P1

Track Classification: Vessel/In-Vessel Engineering and Remote Handling