Engineering aspects of integration of ITER divertor diagnostics

A. Encheva[1], P. Andrew[1], E. Briani[2], C.Gianini[2], V. Komarov[1], A. Kukushkin[1], F. Lucca[2], A. Marin[2], A. Martin[1], M. Merola[1], M. Roccella[2], R. Roccella[1], C. Walker[1]

[1] *ITER Organization, CS 90 046, 13067 St Paul lez Durance Cedex, France*

[2] *L.T.Calcoli SaS, Merate, Italy*

Corresponding author: anna.encheva@iter.org

Abstract

ITER diagnostic components are installed within the vacuum vessel, and in vacuum vessel ports at the upper, **e**quatorial and divertor levels. The installation and integration issues are different in each of these 4 locations.
In the divertor, diagnostic components are concentrated in the cassettes: segments for the divertor that are remote handled through divertor ports. Of the 54 divertor cassettes, 16 are dedicated to various diagnostics. These include both optical diagnostics where light is relayed through the divertor ports, and electrical sensors.

Diagnostic equipment in the divertor cassette itself is integrated in a protected housing, called a "mirror box" cooled with the cooling water of the divertor cassette. In the divertor ports, diagnostic equipment is installed in a diagnostic support structure called the diagnostic rack. Permanent cabling for instrumented and diagnostic cassettes is routed along the port.

In the preparation phase for the procurement of the divertor, the divertor mirror box and the diagnostic rack have been analysed in order to verify that they meet the integration criteria:
1) preserve overall functionality of the divertor system, while fulfilling the requirements of each specific diagnostic sub-system.
2) avoid as much as possible creating divertor cassette variants,
3) minimize manufacturing costs and maximize the flexibility in the management of spared parts.
The comprehensive design and assessment of the divertor mirror box and diagnostic rack has been obtained through R&D activities based on:
- the estimation of the heat flux deposition from Plasma and shielding capability;
- the calculation of the related thermal and mechanical effects and the comparison of the computed stress with the design loads;
- the estimation of EM (electromagnetic) loads due to the off-normal events and calculation of the related mechanical stress, then compared with the design criteria.

This paper outlines the engineering aspects of the ITER divertor diagnostic's integration and focuses on the feasibility of the present design of divertor mirror box and diagnostic rack.

Keywords: ITER, diagnostics, divertor, interfaces, diagnostic rack, divertor mirror box