

GENERIC DIAGNOSTIC PORT INTEGRATION FOR THE EQUATORIAL PORT PLUG OF ITER (P1-D-172)

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ITER requires an extensive set of diagnostic systems to provide several key functions such as protection of the device, input to plasma control systems and evaluation of the plasma performance. Most of these diagnostics system are to be integrated in port plugs, which are water cooled stainless steel structures (approximately: 50t, 2m x 2m x 4m) inserted into the vacuum-vessel ports. The port plug must perform basic functions such as providing neutron and gamma shielding, supporting the first wall armour and shielding blanket material, closing the vacuum vessel ports, supporting the diagnostic equipment (within the primary vacuum, on the primary vacuum boundary and in the port interspace).

CEA (Commissariat à l'Énergie Atomique) has contributed to the engineering activities on the port plugs and has more particularly focused on the design and diagnostic integration in the representative equatorial port plug EQ01. The specific CEA contributions were to perform the general engineering, structural and thermal analysis. These detailed analysis have highlighted some design issues which were worked out through different solutions.

This paper will contain the description of the engineering activities performed such as:

- The conceptual design of the EQ01 and the associated diagnostics, such as the visible and infra red optical diagnostic,
- The static mechanical calculations, taking into account the electromagnetic loads occurring during fast transient plasma events,
- The dynamic calculation constituted of modal and transient analysis under the same electromagnetic loads to estimate the dynamic amplification factor due to the resonance phenomenon,
- The thermal assessment under the neutronic load of the water-cooled stainless steel structure,
- The seismic response of the port plug inside the vacuum vessel, taking into account the ground spectra and soil conditions in the Cadarache site.

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