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Development of primary vacuum windows for ITER diagnostics

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Most of ITER's diagnostics will be provided with viewing lines (optical, microwave, spectroscopic) for the monitoring of key characteristics of the plasma or for the achievement of physical measurements inside the vacuum vessel. The nature of the physical signal transmitted through the viewing lines requires the implementation of window assemblies incorporating non-metallic window. Placed at the vacuum boundary, the window assembly shall also ensure the vacuum integrity required for the plasma. Moreover, the diagnostic window assemblies form part of the ITER primary confinement boundary. Their integrity is consequently of prime importance in containing the reactant materials such as tritium in the inside of the vacuum vessel and, thus, directly related to the Nuclear Safety. The window assemblies are Protection Important Components (PICs) and their design, procurement and operation are considered as Protection Important Activities (PIAs). The primary confinement boundary shall be fully ensured during all the normal and accidental conditions. Window assemblies are part of the unpressurized area of the radioactivity confinement barrier, with safety related functions. These assemblies are made from components with non-metallic materials, particularly high grade ceramics, which are generally not covered by pressure vessel codes and for which there is no existing industrial standard that specifies the criteria for the design, manufacturing, and testing directly applicable to ITER. To incorporate non-metallic replaceable window assemblies in the confinement barrier of ITER, it shall be a requirement that the Operator (ITER Organization) has these window assemblies designed, procured, installed and operated based on procedures and records the French Nuclear Order known as "the Order 7th February 2012", concerning basic nuclear installation design construction and operation quality.

The paper will discuss the progress in the ongoing design and development of the primary vacuum window assemblies, covering several aspects, such as design, interfacing loads, integration in the port infrastructure and impact on the diagnostic performance. Also, maintenance and associated tools for window assemblies will be discussed.

Eligible for student paper award?

No

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