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Protection of window assemblies against ECRH and CTS stray radiation in ITER

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Stray radiation at 60GHz and 170GHz is an engineering challenge for the integrity of various window assemblies in ITER. Their protection and long term performance preservation are essential for both the operational safety of the device and its scientific exploitation. This contribution focuses on the assessment of Electron Cyclotron Resonance Heating (ECRH) and Collective Thomson Scattering (CTS) stray loads impacting the windows of one of the most affected diagnostic port plugs: #11. A Neutral Particle Analyzer (NPA), the Low Field Side Reflectometer, Vacuum Ultra Violet (VUV) and Halpha spectrometers are connected to this port plug and may need protection. Indeed, as ECRH/CTS stray radiation may last throughout most of the discharge, an increase in window temperature may occur leading to excessive stresses in the assemblies. Appropriate measures have therefore to be taken to improve the attenuation of their transmission lines. The attenuation of both at 60GHz (CTS) and 170GHz (ECRH) frequencies has been evaluated with both CST simulations and analytical calculations. The use of mitigation measures (such as coatings, grids, etc) has been considered. Solutions with quite good perspectives have already been identified for the NPA, VUV and Halfa lines. Further studies are under way for the design of the Low Field Side Reflectometer, considering active and/or passive components to dampen the stray radiation travelling through the line. Finally, a preliminary set of qualification tests both for the coating materials and for the fused silica window assemblies, with particular attention to the measurement of their dielectric properties, will be discussed.

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