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P3.067 Overview of optical designs of the Port-Plug components for the ITER Equatorial Wide Angle Viewing System (WAVS)

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The equatorial visible and infrared Wide Angle Viewing System (WAVS) for ITER is one of the key diagnostics for machine protection, plasma control and physics analysis. To achieve these objectives, the WAVS will monitor the surface temperature of the Plasma Facing Components (PFCs) by infrared (IR) thermography (3-5µm range) and will image the edge plasma emission in the visible range. It will be composed of 15 lines of sight installed in four equatorial ports (no. 3, 9, 12 and 17) in order to survey at least 80% of the overall area of the vacuum vessel.
On top of leading a European consortium including CIEMAT (in Spain) and Bertin Technologies (in France), CEA is currently developing the port-plug components of this diagnostic.
The design of port-plug components has to cope with both challenging performance (wide field of view, diffraction-limited, ...) and severe constraints such as harsh nuclear environment, complex interfaces (the components are embedded within the ITER Diagnostic Shielding Module, DSM), first mirrors facing the plasma, an optical relay transferring the optical beam to the interspace through the vacuum windows while limiting the neutron flux passing through.
This paper provides a comprehensive description of the baseline optical design of the WAVS diagnostic in the Port-Plug and compares it with alternative design solutions. This comparison allows for assessing the most suitable design meeting both the performance requirements and environmental constraints.
For the baseline design, the final performance of the Port-Plug components in operation are assessed thanks to an end-to-end analysis, which includes theoretical aberrations, misalignment, manufacturing errors, thermo-mechanical deformations of the optical surfaces.

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