

LASER VIEWING SYSTEM FOR IN VESSEL INSPECTION AND CONTROL IN LARGE FUSION MACHINES (JET AND ITER).

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An amplitude modulated laser sensor for in vessel viewing of the fusion machines Jet and Iter has been developed in our laboratory for control and maintenance purposes. The system has a very versatile configuration so that it can be tailored to be applied in several fields in which the lack of accessibility and hostility of the environment of the scanned target is the main problem of the vision task. The developed system is an incoherent electro-optical device in which an amplitude modulated diode laser beam is steered through a single mode optical fiber and a focusing collimator toward a target by a prism based scanning camera; the back scattered signal is collected by a completely passive optical receiver situated in hostile environment (temperature 350 °C, vacuum 10⁻⁹ mbar, radiation background 3 x 10⁻⁴ Gy/hr for JET experimental conditions) and focused through a suitable optical fiber path on a avalanche photodiode surface situated in a safety environment. The received signal is then acquired and processed and the pixel rows and columns lines are restored by means of optical encoders tied to scanning prism itself to obtain a high quality TV like image of the scanned scene. The scanning accuracy is better than one millimeter at ten meters of distance, this is in fact a sufficient resolution to achieve an image quality to highlight all defects and damages due to plasma disruptions during the machine firing. Laboratory tests on an insertion probe mock-up have been performed by scanning real large aperture scene and the obtained results are discussed focusing the attention on the dependence of the quality of the reconstructed image from the optical and mechanical characteristics of the system.