

Conceptual design of JT-60SA edge Thomson scattering diagnostic

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JINST **15** (2020) C01011; <https://doi.org/10.1088/1748-0221/15/01/C01011>

Abstract:

JT-60SA will complement ITER in resolving key issues to finally decide an acceptable DEMO design. Diagnostics play a key role in this mission. The electron temperature and density profiles are measured by a core and an edge Thomson scattering (TS) diagnostics with high spatial resolution, needed to identify the pedestal parameters and small profile structures. The two systems use a common tangential Nd:YAG laser beam path in the plasma equatorial plane. The collection optics for the edge system (low field side) is hosted in a lower oblique port and that for the core system in a horizontal port. The optics fit in the port plug tube and image the scattering volumes into an array of fiber bundles. They both are exposed to a high neutron dose of 10^{16} n/cm² over 13 years of operation. The optics are supported by a mechanical structure decoupled from the cryostat. A set of filter polychromators with avalanche photodiode (APD) detectors spectrally analyze the scattered radiation. The development of the TS systems is carried out by a joint Japan-EU team. The conceptual design of the edge TS system is presented here. Simulations of the TS signals show acceptable accuracy down to 1×10^{19} m⁻³ electron density, sufficient to measure the edge gradient and even a small region outside the separatrix.