

THE WEST THOMSON SCATTERING DIAGNOSTICS

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The IRFM has designed an innovative Thomson scattering diagnostic for WEST in order to obtain measurements of the density and temperature profiles with a centimetric spatial resolution in the plasma core area and a millimetric resolution in the pedestal region.

Due to the different plasma configurations possible in the WEST Tokamak, 50 viewing lines will be installed: 20 in the core with 25 mm resolution and 30 for the pedestal measurement with 6 mm resolution.

Although the optomechanical design for the core views is classic, the one for the edge is much more challenging. Indeed, to avoid reflections from the divertor, the measurement of the pedestal can only be done by introducing an endoscope inside the vacuum chamber, so all internal optical components are protected from the plasma radiation with a water-cooled thermal shield and the first mirror will be actively cooled.

The former inner wall has been replaced by one with a viewing dump to reduce the light coming from the lower divertor.

Two lasers of 2J at 30Hz repetition frequency have been installed. The characteristics as well as the displacement of their beams are controlled all along the path by cameras, pyrometers, photodiodes and motorized mounts.

For both diagnostics, single and duplexed optical fiber bundles have been designed to carry the scattered light towards the polychromators placed in thermoregulated cubicles located in the Torus Hall. The swift nanosecond electrical pulse waveforms generated by the APDs inside the polychromators are acquired using Nectar fast analog sampler chips. A custom electronic board was designed to provide, for each polychromator, six Nectar input channels, six slower channels for background measurements and the necessary programmable resources for data readout and possible local real time processing. Downstream a local gigabit network, the data acquisition system includes back-end PCs to gather and further process the acquired waveforms.

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