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The Thomson Scattering System for DTT (Divertor Test Tokamak) pedestal

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The preliminary design of the Thomson Scattering (TS) system devoted to the measurement of the electron density and temperature in the pedestal region of DTT (Divertor Test Tokamak) is described. The evaluation of the DTT pedestal width based on the presently elaborated models tested on JET and DIII-D leads to a pedestal width $\Delta=15\text{mm}$, assuming maximum temperature $T_e=20\text{keV}$ and density $n_e=5 \cdot 10^{20} \text{ m}^{-3}$. The pedestal region to be measured could be evaluated in 75mm (5 times the pedestal width). The geometry considered for the installation of the TS is the DTT equatorial port #17 : both the laser focusing optics and the collection optics are installed inside the port , thus realizing a compact backscattering design. The evaluation of numerical aperture of the collection optics is $F\#/5$ (optics clear aperture $\approx 20\text{cm}$, distance of the optics to the plasma $\approx 100\text{cm}$) leading to a feasible spatial resolution on the pedestal $\delta r \approx 5\text{mm}$, with accuracy of 10% in the electron temperature measurement and 5% in density measurements. These numbers are consistent with the measurements technical specifications of the ITER EDGE TS . The number of the spatial points object of measurement is 75. The minimum laser energy per pulse is 2J at a 100Hz repetition rate . Given the neutron flux evaluated for DTT scenarios, a collection optics made by rhodium coated molybdenum mirrors can be considered, together with collimating lenses while the collecting fibres are placed outside the port exit window.

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