DOI: 10.34854/ICPAF.51.2024.1.1.020

REGISTRATION OF THE INTERNAL TRANSPORT BARRIER WITH THOMSON SCATTERING DIAGNOSTICS ON THE T-10 TOKAMAK *)

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The Thomson scattering system on the T-10 tokamak was upgraded in 2016 [1]. The upgraded system was based on 100 Hz Nd: YAG laser operating with pulse energy up to 2.5 J on the second harmonic, λ = 532 nm, and television registration system with CMOS camera and image intensifier. The diagnostic worked during three experimental campaigns. New diagnostic capabilities of the upgraded system made it possible to observe the evolution of the temperature profile during the whole plasma discharge with spatial resolution up to 5 mm.

The work demonstrates the formation of regions with a steep temperature gradient, which is interpreted as the internal transport barrier, in discharges with off-axis electron cyclotron current drive (ECCD), r_{cd} from 7.5 to 10 cm. The values of normalized gradients in the barrier zone reached R/L_{Te}~20, which significantly exceeds the typical values for the L-mode, $R/L_{Te} \leq 10$.

To determine the position of the transport barrier relative to the rational surfaces, modeling of the current and *q(r)* profiles evolution was made using the ASTRA transport code [2]. The simulation showed that the off-axis ECCD led to a decrease of the magnetic shear in the power deposition zone. In the experiments discussed here, it corresponded to the region near the q=1 surface. A decrease in magnetic shear resulted in the rarefaction of rational magnetic surfaces in the vicinity of q=1. This caused the transport barrier formation in this region in accordance with modern theoretical concepts [3]. An estimation of the effective electron thermal conductivity (χ_{eff}) from the energy balance showed a decrease of χ_{eff} in the region of steep electron temperature gradient, which also indicates the transport barrier formation.

Obtained results do not contradict to modern theory of internal transport barrier formation and are consistent with former T-10 results [4].

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