

EFFECTS OF LITHIUM-COATING WALL CONDITIONS ON TURBULENT TRANSPORT IN EAST ELECTRON HEATING DOMINANT PLASMAS

¹J. LIU, L. XU, X. GAO, Q. ZANG, X. WU, Y. JIN, H. LIU, J. QIAN, X. GONG, ²Y. LIANG

¹Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 230031, China

²Forschungszentrum Jülich GmbH, Institute of Fusion Energy and Nuclear Waste Management – Plasma Physics, Partner of the Trilateral Euregio Cluster (TEC), 52425 Jülich, Germany

Email: jianwen.liu@ipp.ac.cn

1. ABSTRACT

In future fusion plasmas, alpha particles are expected to predominantly heat electrons due to their significantly higher birth energy compared to the temperature of the deuterium-tritium fuel ions [1]. Therefore, understanding the characteristics of electron heat and particle transport in electron heating dominant plasmas is crucial for magnetic confinement fusion research.

Recent observations in EAST electron heating dominant plasmas have revealed significant effects of plasma wall conditions on density control. Under lithium-coating wall conditions, both density control and particle exhaust performance are more favourable. As shown in Figure 1, after turning off the density feedback control under lithium-coating wall conditions, the core line-averaged electron density decreased by up to 40%. Correspondingly, the electron temperature profiles became more peaked, with the core electron temperature doubling. Preliminary turbulent transport analysis indicates that as the density decrease, the electron temperature profile stiffness also decreases, and an electron internal transport barrier (ITB) appears in the electron temperature channel. Meanwhile, the TEM unstable modes become the dominant turbulent instability during this period, which is consistent with changes in plasma collision rates [2]. Additionally, during the period with density feedback turned off, a 1/1 mode can be observed in the magnetic spectrum, showing a strong correlation with variations in core electron temperature. Furthermore, a magnetic fluctuation at approximately 200 kHz is observed in the high-frequency range, closely related to the changes in density. Detailed results still require further experimental and simulation studies.

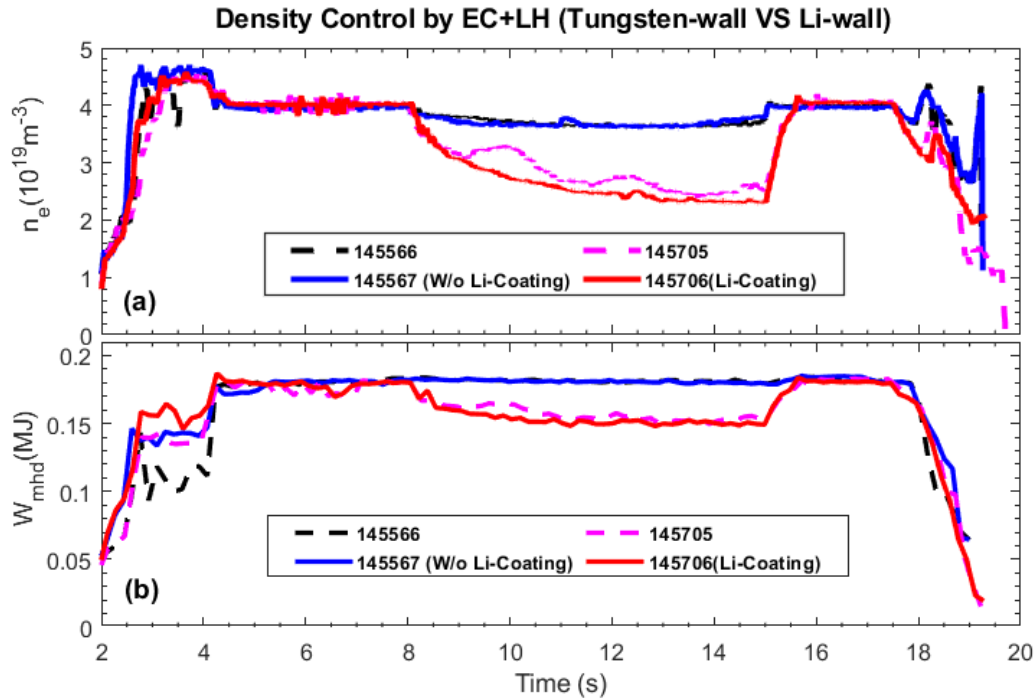


Fig.1 Time evolution of (a) line averaged density and (b) stored energy after turning off the density feedback control on EAST.

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