Measurement of Neon impurity transport by ME-SXR diagnostic in the EAST tokamak

Y. L. Li,[1,2]* G. S. Xu,[1] K. Tritz,[3] Y. Liang,[1,2] X. Lin,[1] H. Q. Liu,[1] Q. Zang,[1] T. Zhang,[1] W. Zhang,[1] L. Wang,[1] W. Feng,[1] X. L. Li,[1] and the EAST team

[1] *Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 230031, China*
[2] *Forschungszentrum Jülich GmbH, Institut für Energie- und Klimaforschung – Plasmaphysik, Partner of the Trilateral Euregio Cluster (TEC), 52425 Jülich, Germany*
[3] *Department of Physics and Astronomy, Johns Hopkins University, Baltimore, Maryland 21218, USA*
**y.li@fz-juelich.de*

The neon impurity transport has been analysed by multi-energy soft x-ray (ME-SXR) diagnostic in the EAST tokamak. ME-SXR contains five arrays, of which one non-foil is bolometric while four different foil filters (5 μm beryllium, Be, 15 μm Be, 25 μm Be and 50 μm Be foil) are used to measure the radiation spectrum of soft x-ray emitted by plasma. For typical plasma temperature (~450 eV), the bolometer signal is dominated by L-shell emission, while the 5, 15 and 25 μm Be filter arrays primarily measure K-shell lines and the 50 μm Be array measures continuum emission from fully stripped neon. To study the neon transport, the time derivative of the emissivity is introduced to describe the neon impurity transport. The radial perturbation velocity of K-shell line emission emitted by neon impurity is measured about 40 m/s in H mode regime and is originally propagated near the separatrix along with forming two perturbed emissivity peaks in the movement path. In contrast, the perturbation velocity of continuum emission is much slower and is observed to begin to spread near the pedestal top. The estimated electron pressure obtained by multiplying the electron density and electron temperature, which is measured by POINT and ME-SXR respectively, shows that the pedestal top pressure gradually decreases during the neon impurity propagating to the core plasma region. The mitigation of edge localized modes is delayed for 20 ms after the neon injection, after which the recovered ELM eruption time measured by the emissivity in 5 μm Be is twice that in 50 μm Be array.

Reference

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