

High density operation close to density limit in EAST tokamak

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In EAST, high density discharges close to Greenwald density limit has been achieved under the condition of ohmic, L mode and H mode confinement. The current shrinkage is obvious from the CCD images in ohmic discharge with constant gas puffing. The density asymmetry, defined as the ratio of density between the up and down symmetrical chords of the 11-channel Polarimeter-INTERferometer (POINT), occurs at the very edge chords firstly. In L mode, the density limit disruption is always accompanied by edge cooling. MARFE occurs at X-point and finally enter the plasma resulting in the disruption. The density gradient in the MARFE region is high and the POINT signal is lost due to the high refraction in this region, causing the wrong density measurement.

The gas ramp experiments have been done in ELMy H mode with Upper Single Null configurations. During the experiment, the line-averaged density measured by vertical HCN interferometry which goes through the region near divertor and dome area is larger than that measured by horizontal POINT, indicating most gas do not enter the plasma. There are three phases in the approach towards the H mode density limit: a stable H mode, a degrading H mode and the breakdown H mode. During the degrading H mode, the ELM frequency increases and the ELM amplitude is slightly decreases with the increase of density. The density peaking factor decreases during the gas ramp. The H-L transition at $0.8n_{GW}$ is caused by the excessive core radiation due to high Z impurities.

References:

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