

Neon Gas Seeded Radiative Improved Mode in Aditya-U Tokamak

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Neon impurity injection into the tokamak plasma has been found to improve the plasma confinement, known as Radiative Improved (RI) mode in many tokamaks. It is believed that improved confinement in the RI mode is mostly based on the reduction of growth characteristics of the toroidal ion temperature gradient (ITG) mode due to the increase of Zeff and also because of the suppression of turbulence due to increase of ExB shear rotation in the impurity injected plasma. During the last phase of operation of Aditya tokamak neon gas was puffed at the plasma current flattop region to obtain RI mode [1]. In that experiment, the time for the gas puff to start, time gap between gas puffs, number of gas puffs, amount of gas injection by varying pulse width and voltage level in the gas fuelling system were varied. It was found that line average electron density, ne and central electron temperature were increased after the neon puff. Substantial change in plasma edge properties was observed with the increase of radiation and reduction of hydrogen recycling, which led to better particle confinement. The energy confinement time, tau_e, is increased by a factor of 2 from 6.3 to 12.5 ms. This is almost same to the H-mode scaling law of ITER93 ELM-free and 1.4 times the Neo-Alcator scaling for Ohmically heated tokamak plasma. In Aditya-U tokamak, experiment with neon gas puff was carried out to obtain the RI mode and understand the physical mechanism. Along with various similar results obtained earlier in Aditya, many interesting outcomes observed during the experiments in Aditya-U tokamak will be reported in this presentation.

[1] R. L. Tanna et al, Nucl. Fusion 57 102008 2017.

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