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Compatibility of High Performance Operation with JET ILW

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As reported in the FEC 2012, operation with a Be/W wall at JET has had an impact on plasma confinement and scenario development relative to the carbon wall. The main differences observed were a degradation of confinement for low betaN scenarios (typically H98~0.8) and W accumulation in the plasma core at low fuelling gas. In order to develop high performance plasmas in DD and ultimately in DT, subsequent effort has been focused on understanding and improving the energy confinement, control of W accumulation in the core and robustness of the scenarios against disruptions.

To achieve high performance, a high betaN scenario with H98~1.3, safety factor of 3.6~4, betaN>2.5 and tailored q profile and a low betaN scenario, H98~1, safety factor of 2.6~3, betaN~1.8~2 with fully diffused current profile are being developed. These scenarios operate at plasma currents up to 4.5MA and toroidal magnetic fields up to 3.8T. Both scenarios achieve similar values of neutron yield, although the high betaN scenario achieves it at lower plasma current values in quasi-stationary plasmas. To improve confinement whilst controlling the W accumulation, gas fuelling, ICRH for central heating, position of the strike points and increase of additional power are used.

Divertor heat load control is obtained by either sweeping the strike points or by impurity injection. Cooling by N₂ has been demonstrated and scenarios with Ne or Ar injection are being developed. Disruption forces are approximately a factor 2 larger than with a JET-C wall and the use of massive gas injection has proven effective in mitigating forces and avoiding melting.

The confinement studies will be extended to high plasma current and performance in terms of edge pedestal parameters, betaN and power above the power threshold for the L-H transition and compared to previous results in JET-C and previous rho star scaling. Extrapolations to DT will be presented.

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