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First Operation with the JET ITER-Like Wall[1]

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To consolidate ITER design choices and prepare for its operation, JET has implemented ITER's plasma facing materials, namely Be at the main wall and W in the divertor. In addition, protection systems, diagnostics and the vertical stability control were upgraded and the heating capability of the neutral beams was increased to over 30 MW. First results confirm the expected benefits and the limitations of all metal plasma facing components (PFCs), but also yield understanding of operational issues directly relating to ITER. H-retention is lower by at least a factor of 10 in all operational scenarios compared to that with C PFCs. The lower C content ($\sim$ factor 10) have led to much lower radiation during the plasma burn-through phase eliminating breakdown failures. Similarly, the intrinsic radiation observed during disruptions is very low, leading to high power loads and to a slow current quench. Massive gas injection using a D_2/Ar mixture restores levels of radiation and vessel forces similar to those of mitigated disruptions with the C wall. Dedicated L-H transition experiments indicate a reduced power threshold by 30%, a distinct minimum density and pronounced shape dependence. The L-mode density limit was found up to 30% higher than for C allowing stable detached divertor operation over a larger density range. Stable H-modes as well as the hybrid scenario could be only re-established when using gas puff levels of a few 10^{21}e/s. On average the confinement is lower with the new PFCs, but nevertheless, H factors around 1 (H-Mode) and 1.2 (at β_N $\sim$3, Hybrids) have been achieved with W concentrations well below the maximum acceptable level ($<10^{-5}$).

[1]Presented on behalf of JET EFDA contributors (see App. of F. Romanelli et al., Proc. 23rd IAEA FEC 2010, Daejeon, Korea)

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