Abstract Submitted
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Improved density feedback control range and response time on DIII-D using 3D fields[1] FLORIAN LAGGNER, Princeton Plasma Physics Laboratory, DAVID ELDON, General Atomics, ANDREW O. NELSON, Princeton Plasma Physics Laboratory, DAVID HUMPHREYS, ALAN W. HYATT, PHILIP B. SNYDER, MATTHIAS KNOLKER, General Atomics, EGEMEN KOLEMEN, Princeton University, DIII-D TEAM TEAM — A new algorithm for plasma density feedback control using adaptive, non-axisymmetric (3D) magnetic fields was implemented on DIII-D, enabling a radiative divertor in high performance, Super H-mode discharges. For conventional density feedback by gas valves the natural density at zero gas flow presents a hard limit. The application of 3D magnetic fields in low collisionality plasmas leads to the so-called "density pumpout", i.e. a reduction below the natural density. The newly designed control algorithm combines both actuators allowing for a wider range of density targets. Furthermore, 3D fields have a faster plasma density response than gas puff, improving control response time. With this, accurate control of the density trajectory is achieved, as is necessary for access to the Super H-mode regime with increased pedestal performance. Moreover, it was demonstrated that the pedestal density could be sustained at favorable conditions while the divertor density was increased by injection of impurities to integrate a radiative divertor scenario. The ability to loosen the tight coupling of pedestal and divertor density by 3D field density feedback allows to explore solutions for core-edge integrated scenarios.

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