Pedestal Profiles During QH-mode Operation on DIII-D*

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The QH-mode on DIII-D exhibits an H-mode like edge pedestal, with similar values of pedestal pressure and global energy confinement to ELMing H-mode, but without ELMs. In many cases this mode is observed to reach a nearly stationary operating point, limited in duration only by hardware limitations. This mode is usually obtained in a plasma configuration that is strongly pumped, and electron densities at the top of the pedestal are low, below 0.3 of the Greenwald density. Electron temperatures at the top of the pedestal range from 1.2 to 2.2 keV. Ion temperatures at the pedestal are much higher, ranging up to 5 keV. The QH-mode is usually accompanied by a saturated, coherent, multi-harmonic edge electromagnetic mode (EHO), observed in magnetic probes on both the inboard and outboard sides of the plasma at a frequency between 5 and 11 kHz for the n=1 toroidal mode. The oscillation is also seen in the electron density near the separatrix.

In this paper we will discuss the edge profiles observed in QH-mode over the wide range of plasma shapes, auxiliary heating power, and plasma current in which QH-mode has been observed. A selection of these profiles will be used as input to the Corsica code to determine the edge current profile, which is dominated by the bootstrap current. These measured edge density and temperature profiles, along with the calculated current profiles, will be used to determine the stability of the QH edge against ballooning/peeling modes using the ELITE code. We will also discuss results of experiments in which we will attempt to expand the range of edge parameters, especially the edge density, achievable in QH-mode.