XP1038: Long wavelength turbulence characterization in L- and H-mode plasmas

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Overview

- Document LH and HL transitions at a range of densities by controlling transition timing

  - As byproduct, document fluctuations in L- and H- phases
  - Control LH timing by swinging δ_r^{sep} from positive to negative (USN to LSN)
  - Control HL timing with step-downs in NB power

- Document poloidal dynamics across pedestal during transitions by moving plasma relative to BES poloidal array

  - Scan outer gap

- Compare radial correlation lengths from BES and reflectometers

Run plan – Part 1

- Establish baseline with LH early in Ip flattop [shot development]
  - 800 kA, 4 kG, fiducial-like shape, 3 MW NB
  - Used modified version of 141143 with 3 MW NB SS and drsep>0
  - Positive drsep initially, then swing negative in Ip flattop to trigger LH
  - Low Li rate (~150 mg) to maximize LH power threshold difference between USN and LSN
  - Attempt to eliminate ELMs, AEs, and core modes
  - Attempt HL back-transition with step-downs in NB power in prep for Part 2

- Obtain LH at later times and higher densities with delayed drsep swings [2 shots + contingency]
  - Retain enough OH flux to support H-mode phase for at least 50 ms

- Using scenario with least ELM/AE/core mode activity, scan outer gap to move pedestal relative to BES poloidal array [2-3 shots + contingency]

- Total: 4-5 shots + shot development + contingency

Run plan – Part 2

- Establish baseline discharge with late HL back-transition [shot devel.]
  - Fiducial-like with 800 kA, 4 kG, 3-5 MW NBI
  - Step-down NB power late in discharge to trigger HL back-transition
  - Raise drsep as needed to achieve HL back-transition
  - Attempt to eliminate ELMs, AEs, and core modes, but ELMs may be needed to reduce impurity radiation.

- Obtain HL at earlier times and lower ne by stepping-down NB power earlier [2 shots + contingency]
  - After HL, maintain L phase for at least 50 ms

- Using scenario with least ELM/AE/core mode activity, scan outer gap to move pedestal relative to BES poloidal array [2-3 shots + contingency]

- Total: 4-5 shots + shot development + contingency