APD-based Gas Puff Imaging (GPI) plans for NSTX-U for FY16-FY19

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NSTX-U presently employs a Phantom camera viewing a region near an extended gas-puffing nozzle/manifold on the low-field side of the device. It views the plasma edge and SOL above the midplane. This system has been successful in a number of important investigations. The MIT group will augment this capability in a staged manner, initially, by sharing the existing view with the 9x10 pixel/2 Mhz APD-based system imported from the C-Mod experiment. We will also import the 5x6 pixel/2MHz APD-based system to view a plasma-fueling gas puff presently installed on the center stack, thereby enabling new turbulence measurements in the high-field side boundary. After the initial experiments and within the FY16-FY19 time frame, we will design for a stand-alone view of the gas-puff for the larger APD system. The planned GPI studies include:

* Correlate the edge and SOL turbulence with the SOL heat-flux width;
* Characterize and compare the edge, SOL, and private flux region turbulence in different divertor configurations;
* Analyze the edge turbulence across the L-H transition in search of a trigger mechanism for the transition by investigating the nonlinear turbulent kinetic energy transfer from the background turbulence into sheared quasi-static flows;
* Diagnose and characterize pedestal modes (EHO, GAMs, ELMs);
* Characterize changes in edge and SOL turbulence upon application of applied 3D fields (RMP);
* Investigate the presence of SOL flows induced by High Harmonic Fast Wave RF Heating as compared to NBI heating, seeking a link between RF heating efficiency and RF interaction with the SOL plasma;
* Characterize the SOL turbulence in the presence of reduced recycling resulting from Lithium wall-conditioning.