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8.38 FIDA Diagnostic Development for the C-2W Field-Reversed Configuration Plasma

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TAE's advanced, beam-driven field-reversed configuration device has a large fast-ion population, allowing for fast-ion D-alpha (FIDA) studies. Development of a FIDA spectrometer for the new C-2W device is underway. Previous measurements [1] were combined with C-2W geometry to inform the design. Measured signal levels led to the purchase of a Phantom Miro 110 high-speed camera that will be paired with Kaiser's Holospec f/1.8 spectrograph. The spectrograph utilizes a custom transmission grating centered at 656.0 nm. Simulations were used to choose available ports with expectedly large signals. Eight neutral beams and 354 ports were considered. Experimentally-obtained 1D plasma profiles from C-2U were mapped onto Q2D [2] simulation flux surfaces. For each point on the vessel wall, many lines-of-sight (LOS) are created to view the entirety of each neutral beam path. FIDA spectra are simulated for each LOS using FIDASIM [3]. Integrating over wavelength and beam-space allows individual ports to be chosen for their large prospective signals.

1. Rev. Sci. Instrum. 87, 11E520 (2016)
2. Physics of Plasmas 24, 092518 (2017)
3. <http://d3denergetic.github.io/FIDASIM/index.html>

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