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Design and Operation of a Frequency Doubled Nd:YAG Thomson Scattering System with Transmission Grating ICCD Spectrometer[1] N.L. SCHOENBECK, A.S. DOWD, R.J. FONCK, D.J. SCHLOSSBERG, G.R. WINZ, University of Wisconsin-Madison — A novel Thomson scattering system has been deployed on the Pegasus Toroidal Experiment. It provides a relatively low-cost, simplified design. Scattering is achieved using a 7 ns, 2 J frequency doubled Nd:YAG laser operating at 532 nm. The laser focuses to ∼3 mm diameter within the plasma via a 7 m beam-line. The beam-line contains cameras as beam finders and remotely adjustable mirrors for shot-to-shot alignment. A custom multi-element lens collects scattered photons from 15 cm $< R_{maj} <$ 85 cm with 1.2 cm radial resolution. Eight fiber optic bundles provide 8 spatial points for sampling the laser or background light. Each set of 8 channels is measured in a single spectrometer that utilizes a high efficiency (∼80%) volume phase holographic grating and a high quantum efficiency ($>$ 40%) image intensified CCD (ICCD) camera. Three spectrometers provide a total of 24 channels. Two interchangeable gratings exist to cover low (T_e = 10–100 eV) and high (T_e = 0.10–1 keV) electron temperature regimes on Pegasus. The spectrometer is optimized for n_e from mid-10^{18} to mid-10^{19} m^{-3}. The signal-to-noise expected is ∼0.5 of an equivalent system using Nd:YAG at 1064 nm and avalanche photodiode detectors.

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