Abstract Submitted
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Upgrade of a CHERS diagnostic system for fast-ion and drift-instability measurements[1] TAKASHI NISHIZAWA, University of Wisconsin-Madison, D. CRAIG, Wheaton University, IL, D.J. DEN HARTOG, M.D. NORNBERG, University of Wisconsin-Madison — Energetic particle modes and drift instabilities have fluctuation frequencies above the 100 kHz design specification for the current Charge Exchange Recombination Spectroscopy (CHERS) diagnostic on MST. Upgrading the CHERS system to detect fluctuations at these frequencies requires an optimization of all the light detection stages including the photomultiplier tubes (PMTs), the transimpedance amplifiers, and the data acquisition system. The PMTs need to have a linear response to the photon flux and be protected against abnormal events with much brighter light than ordinary plasmas. For this purpose, the resistor- divider network for the PMTs has been optimized based on the results of circuit-simulations and gain and linearity measurements. The pulse outputs of the PMTs corresponding to a single photoelectron are about 7.5 ns long. Therefore, the raw PMT signals require transimpedance amplifiers with shaping capabilities that will allow practical digitization rates. This digitization intrinsically causes errors in photon counts. We modeled each stage involved in the diagnostic using a Poisson process, circuit-simulations, and the superposition theorem to estimate those errors. We will discuss the details of the measurements and simulations and how parameters are optimized.

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