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Upgrade and crosscheck of neutron measurements on DIII-D¹ D. LIU, W. W. HEIDBRINK, K. GAGE, UC Irvine, D. FINKENTHAL, Palomar Scientific Instruments, G. SMALLEY, PPPL — The neutron diagnostic system on DIII-D consists of a set of neutron counters and a set of scintillators which, together provide critical measurements for assessing beam ion confinement. In order to accommodate the large dynamic range encountered in the broad range of DIII-D scenarios, each set contains multiple detectors with different sensitivities. The neutron counter system that formerly used NIM and CAMAC modules has been replaced by modern Field Programmable Gate Array (FPGA) based pulse-counting electronics. The new system features a 12-channel, 16-bit resolution digitizer with maximum sampling rate of 120MSPS. The onboard FPGA is currently used as a pulse height analyzer, and has the potential capability for neutron and gamma discrimination. In addition, the signal of one fission chamber is analyzed with a commercial neutron flux monitor loaned from PPPL, which provides amplification, pulse shaping, discrimination against alpha, gamma and electronics noise in a rackmount drawer. Absolute calibration is obtained using a Cf source on a model train, followed by cross-calibration of less sensitive detectors during plasma shots. Theoretical predictions by the TRANSP code in MHD quiescent plasmas check the calibration. The scintillators provide <0.1ms time resolution, as well as an independent check of the stability of the calibration.

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