

HTPD 2018



Contribution ID : 187

Type : not specified

4.10 FPGA - based Active - Feedback Laser Alignment System for the ITER Toroidal Interferometer and Polarimeter (TIP)

Monday, 16 April 2018 20:30 (120)

The ITER TIP system design utilizes active feedback alignment to maintain laser position along the 120m long beam path from an optical table to the tokamak and back. This is accomplished using a series of high-speed piezoelectric tip-tilt mirror mounts, beam position sensing detectors (PSDs), and a custom feedback controller. The controller features a high-density Field Programmable Gate Array (FPGA) and utilizes digital signal processing (DSP) techniques to implement a variety of control algorithms including a high-speed proportional-integral-derivative (PID) loop. The versatility of the design allows the continued development of more refined and advanced control algorithms such as machine-learning and fuzzy-logic. A working system has been constructed using ITER-approved FPGA hardware components and installed on the DIII-D prototype TIP system. Results indicate that active alignment is important for meeting ITER requirements because of the large motions of the machine during operations and the need to stabilize the signals on the detectors during discharges. In addition, the design also provides a fail-safe feature for automatic re-alignment in case of temporary beam loss. *Work supported by U.S. DOE Contracts DE-AC-02-09CH11466 and DE-FC02-04ER54698

Primary author(s) : FINKENTHAL, Daniel (Palomar Scientific Instruments)

Presenter(s) : FINKENTHAL, Daniel (Palomar Scientific Instruments); COLIO, R.A. (Palomar Scientific Instruments); VAN ZEELAND, M.A. (General Atomics); CARLSTROM, T.N. (General Atomics); GATUSSO, A. (General Atomics); O'NEILL, R. (General Atomics); BOIVIN, R.L. (General Atomics); JOHNSON, D. (Princeton Plasma Physics Laboratory,)

Session Classification : Session #4, Monday Night Poster Session