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Alcator C-Mod Digital Plasma Control System[1] S.M. WOLFE, J.A. STILLERMAN, M. FERRARA, T.W. FREDIAN, I.H. HUTCHINSON, MIT-PSFC — A new digital plasma control system (DPCS) has been implemented for Alcator C-Mod. The new system was put into service at the start of the 2005 run campaign and has been in routine operation since. The system consists of two 64-input, 16-output cPCI digitizers attached to a rack-mounted single-CPU Linux server, which performs both the I/O and the computation. During initial operation, the system was set up to directly emulate the original C-Mod "Hybrid" MIMO linear control system. Compatibility with the previous control system allows the existing user interface software and data structures to be used with the new hardware. The control program is written in IDL and runs under standard Linux. Interrupts are disabled during the plasma pulses to achieve real-time operation. A synchronous loop is executed with a nominal cycle rate of 10 kHz. Emulation of the original linear control algorithms requires 50 μsec per iteration, with the time evenly split between I/O and computation, so rates of about 20 KHz are achievable. Reliable vertical position control has been demonstrated with cycle rates as low as 5 KHz. Additional computations, including non-linear algorithms and adaptive response, are implemented as optional procedure calls within the main real-time loop.

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