SYSTEM DESIGN AND PERFORMANCE FOR THE RECENT DIII-D NEUTRAL BEAM COMPUTER UPGRADE*

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Recently an upgrade to the computer system charged with control and data acquision for Neutral Beam Injection System at the DIII–D National Fusion Facility, funded by the U.S. Department of Energy and operated by General Atomics (GA), was completed.

This upgrade represents the third and latest major revision to a system which has been in service over twenty years. The first control and data acquisition computers, four 16 bit 'mini' computers, ran on a proprietary and archaic operating system. Each of the four controlled two ion sources over dedicated CAMAC highways. In an upgrade done in 1995 this evolved to be two 32 bit Motorola based mini-computers running a version of UNIX. Each computer controlled 4 ion sources and two CAMAC highways per CPU. This latest upgrade builds on this same logical organization, but makes significant advances in cost, maintainability, and the degree to which the system is open to future modification.

The new control and data acquisition for the Neutral Beam Injection System is formed of two 2 GHz Intel Pentium 4 based PC's, running the LINUX operating system. Each PC drives two CAMAC serial highways using a combination of Kinetic Systems PCI standard CAMAC Hardware Drivers and a low-level software driver written in-house expressly for this device and the LINUX operating system. Functionality previously contained in a monolithic third party software package was broken down into logical building blocks. The scanning of CAMAC, and the database for run-time values are examples of tasks handled in-house. The Graphical User Interface (GUI) was developed using a commercial package by Borland. Procedural logic and shot sequencing, a set of codes written in plain 'C', was ported from the previous system largely intact. Data Acquisition is managed by code in common with the central DIII-D Data Acquisition system. While Neutral Beam Injection Systems may be unusual in having a consolidated control and data acquisition system, the component parts represent codes and methods standard to the DIII-D Facility.

This paper discusses the overall system design, goals, cost, and implementation detail, also describing actual operating experience for the initial 5 months of operation.

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