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Renewal of the control system and reliable long term operation of the LHD cryogenic system

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The Large Helical Device (LHD) is a heliotron-type fusion plasma experimental machine which consists of a fully superconducting magnet system cooled by a helium refrigerator having the total equivalent cooling capacity of 9.2 kW@4.4 K. 17 times of plasma experimental campaigns have been performed successfully from 1997 with high reliability. However, 17 years have passed from the beginning of the system operation. The improvements are being done to prevent serious failures and to pursue further reliability. The LHD cryogenic control system was designed and developed as an open system utilizing latest control equipment of VME controllers and UNIX workstations at the construction time. However the generation change of control equipment has been advanced. Down-sizing of control devices has been planned from VME controllers to compact PCI controllers in order to simplify the system configuration and to improve the system reliability. The new system is composed of compact PCI controller and remote I/O connected with EtherNet/IP. Making the system redundant becomes possible by doubling CPU, LAN, and Remote I/O respectively. The system is aiming to increase availability by facilitating diagnosing the system failure. The smooth renewal of the LHD cryogenic control system and the further improvement of the cryogenic system reliability are reported.

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