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P2.047 JET FIR Interferometer laser operation and interlock system upgrade to an open automation system

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We report on the selection, implementation and successful demonstration of a new automated laser control system for JET's Far Infrared Interferometer, a diagnostic essential for machine protection. The new control system allows all laser subsystems and sensors to be interlocked and operated remotely in a precise and preprogramed manner, functionalities that are essential for reliable operation with the additional access restrictions foreseen in the upcoming D-T operation of JET. Our selection process gave priority to known technologies that conform to industry standards and have been proven within the JET operational environment. Weighting was also given to the accessibility of the software interface and the scalability of the technology.
The new laser control system was installed and tested at the end of 2017. It comprises an Industrial PC, running Windows Embedded Standard 7 and a real-time Programmable Logic Controller (PLC) using the proprietary protocol TwinCAT developed by Beckhoff. This technology is extremely compact (DIN rail mountable), scalable, modular and does not require additional wiring between modules. A particularly noteworthy feature is the ability to program the logic via higher level languages, in addition to standard PLC programming techniques. In this example, the main code for control and monitoring of the system was developed in Python using Finite State Machine algorithms.
This technology has application beyond laser control in a wide variety of application areas where reliable and robust remote operation and easy maintenance/service is a priority. Indeed, similar systems have been reliably used in the JET Plant Essential Monitoring System since 2015.

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