

(EX/P8-32): Distributed digital real-time control system for the TCV tokamak and its applications

- Development and installation of the distributed digital control system has provided the ability to control the TCV actuator set, including PF coils, gas valves, and the ECRH/ECCD system in real-time.
- User-friendly Simulink environment together with the automatic code generation using Simulink Embedded Code have proven to be powerful tools to rapidly design and implement control algorithms.
 - Generalized plasma position and shape controller: Successfully tested on various complex TCV plasma configurations.
 - Real time magnetic analysis node: facilitates design of advanced control algorithms using information on the plasma state to improve plasma performance and stability.
- Outlook:
 - Addition of signals from existing TCV diagnostics, including multiview pinhole X-ray diagnostics, Thomson scattering and visible image processing.
 - System based on field programmable gate arrays (FPGA) are planned for stabilization of TCV plasma vertical position using internal coils, previously handled by the legacy analog controller system.