MODELLING TOOLS FOR THE ITER CENTRAL INTERLOCK SYSTEM

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The Central Interlock System (CIS) provides protection of the investment for the ITER tokamak [1]. In particular, it executes automatic interlocks generated on the basis of either the machine status or the operation limits and conditions. Furthermore it executes interlock actions manually requested by the operator.

When a new and non-conventional control system, such as the ITER CIS, has to be deployed, it is strongly recommended to use modelling and simulation tools since the early design phase. Modelling tools can help in the definition of the system requirements and of the interfaces with the other plant systems. Moreover, they can be used to test and validate the control logics.

Such design approach is based on the availability of several plant models. Indeed, models at different level of details are needed during each design phase. Simplified models, i.e. models that catch only the qualitative behavior of the plant, are sufficient to carry out the early design phase. Whereas reliable and detailed models are needed to carry out the control algorithm validation and the performance assessment. These detailed models must be validated against experimental data. Eventually, to test and validate the prototypes of the control system, simplified versions of the detailed models are usually considered, so as to reduce the computational effort needed to perform real-time simulations [2].

A set of Simulink tools, which have been recently developed to perform the modelling of the ITER CIS, is presented in this paper. The paper focuses its attention on the functionalities provided by these tools, describing the architecture of the CIS Oriented Plant Simulator (CIS-OPS), which has been used to design a preliminary prototype of the CIS. The scope of this preliminary version is limited to the three specific ITER subsystems: the superconducting magnets, their power supplies and the cryogenic system.

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