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IGISOL control system modernization

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Since 2010 a lot has happened in the IGISOL research facility [1] at the Accelerator laboratory of the University of Jyväskylä. The facility has moved to a completely new target hall. The facility area has increased by multifold and the length of the ion transport line has grown to about 50 metres with several measurement setups and extension possibilities. Now the facility can have accelerated ions from two different cyclotrons. The facility has evolved to much more complex system including hundreds of manual, pneumatic and electronic devices. The facility is now known as IGISOL4.

The move of the IGISOL research facility gives perfect opportunity to examine the operational factors of the facility with modern perspective. As the complexity of the facility has increased the safety, usability and maintainability issues require more attention. All these aspects overlap in modern facility-wide control system which enables user and device level safety, introduces a whole new level of user operations, and makes system maintenance and further development more straightforward.

The previous IGISOL3 control system was already partly relying on modern digital design [2] in which devices are operated remotely by dedicated hardware and software. In IGISOL4 this concept is taken a step further since as many devices as possible are to be included to the software-based remote control system. In IGISOL4 the main architecture of the control system hardware involves ethernet as the main communication medium which gives good integration of wide range of devices. In the hierarchy of hardware architecture the highest level includes PCs as the main control system units with main control logic. The middle level includes semi-intelligent devices such as function generators. The lowest level of hardware includes dummy fieldside devices like valves. The software architecture of the IGISOL4 control system is relying on EPICS ecosystem as the backbone. EPICS communicates through ethernet via Channel Access protocol. EPICS is a powerful tool which forms a versatile real-time database from the facility process variables and in such offers a clean interface between higher and lower level hardware and software.

[1] H. Penttilä et. al., The Possibilities of the Extended IGISOL Facility at JYFL, J. Korean Phys. Soc., Vol. 59, No. 2, August 2011

[2] J. Hakala et. al., The JYFLTRAP Control and Measurement System, Nucl. Inst. And Meth. B 266 (2008) 4628-4631 (EMIS07 proceedings)

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