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MicroTCA Hardware Upgrade for the 200 MHz Cavity Controller in the CERN Proton Synchrotron

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The CERN Proton Synchrotron (PS) provides hadron beams to the downstream accelerators, to dedicated experimental areas and for anti-proton production. Six 200 MHz cavities are driven by a phase modulated RF signal resulting in controlled longitudinal emittance blow-up. The cavities also provide bunching for the PS-to-SPS transfer. During the long shutdown (LS2) an upgrade of the cavity controller has been carried out, and MicroTCA was chosen as the platform. The system consists of six SIS8300KU boards (Struck) on which the entire signal processing is implemented to generate the RF carrier synchronous with the beam. Each board is paired with a DS8MV1 rear transition module which provides ADCs for sensing the return signal from the cavities, as well as DACs and a mixer to generate the cavity drive signal at 200 MHz. To be synchronous with the circulating beam an AFC board (Creotech) receives the manchester encoded revolution frequency through a dedicated serial link, together with clock and data signals. These signals are then transferred to the cavity controllers on the SIS boards through the RF backplane (NAT) using the MLVDS lines. It also allows to distribute the White Rabbit synchronous clock and LO signals generated by a CERN custom made module. The system has been validated with beam and is now in the last development stages to operate all six cavity controllers in parallel and to complete the integration with the controls infrastructure.

Summary

Upgrade of 200MHz cavity controller in the CERN proton synchrotron

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