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Status of the ISIS Synchrotron Digital LLRF System

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The ISIS synchrotron routinely uses a dual harmonic RF system to accelerate beam currents in excess of 230 μA to two target stations. Commissioning of a new PXI-based LLRF system was reported at the LLRF'19 workshop. Since then, the system has been deployed for all ISIS user cycles. Further developments include using the IQ loop error signals for RF cavity tuning and we plan to extend this approach to replace more of the analogue modules still used in the tuning loop.

We have used the new system to implement power saving during the last two ISIS user cycles by triggering the full accelerating Voltage demand to coincide only with the 10Hz beam to the second Target Station rather than our usual 50Hz to both targets. This approach has reduced the power requirement by approximately 500kW during the TS2 only operational cycles.

More recently, we have upgraded the FPGA modules, Frontend Transceivers, PXI crate and controller to avoid clock synchronisation issues seen after re-boots on the previous system and to avoid end of life obsolescence for the older modules. This work and our plans for future development of the ISIS digital LLRF systems will be presented in further detail.

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