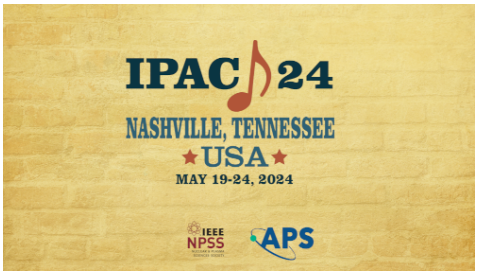

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Real-time digital controller design based on SoC FPGA for general usage in J-PARC MR magnet power supplies

Thursday, 23 May 2024 16:00 (2 hours)

Nowadays, the real-time control is more and more popular in the particle accelerator field because it is a powerful tool for stable operation and beam loss suppression in the particle accelerator. However, in the Japan Proton Accelerator Research Complex (J-PARC) Main Ring (MR), real-time control has not been widely used in magnet power supplies yet. Magnet power supplies are very easily affected by disturbances from external factors, such as environmental temperature, device aging, power grid voltage and current fluctuations, and so on. Therefore, it is worth developing a real-time digital controller with general functions for the magnet power supplies to observe and suppress these disturbances. In this paper, we propose the design of a general-purpose intelligence controller for the magnet power supply realized by a System-on-Chip (SoC) Field Programmable Gate Array (FPGA). This digital controller can also be used as a high-resolution data acquisition system, a pattern generator, and a high-precision current control system for magnet power supplies.

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