

A digital RF control system design for the 2GeV FFA accelerator 1:4 down-scale cavity

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A high energy and high current isochronous proton accelerator has been extensively studied at the China Institute of Atomic Energy. A down-scale system has been built to evaluate the feasibility of this accelerator's 15 RF systems, including a 1:4 scaled cavity, a 200kW tetrode tube amplifier, and a digital RF control. This new RF control system uses high-speed ADCs to direct sample the RF signals and implements digital algorithms to achieve amplitude/phase measurement and control. The amplitude and phase-controlled RF signal is generated by the numerical oscillator inside the FPGA and amplified by the high-power amplifier to drive the downscale cavity. This room-temperature cavity has two tuning systems. One uses mechanical deformation, and the other regulates the inlet water temperature to stabilize the resonance. A self-excited loop is preferred from a systematic point of view to test the latter. In the LLRF controller design, a clock distribution network is included to synchronize the ADC, the DAC, and the FPGA for this purpose, contributing more flexibility. The progress will be reported in this paper.

Keyword

LLRF, FPGA, digital control

Primary author: YIN, Zhiguo (China institute of atomic energy)

Co-author: FU, Xiaoliang (TRIUMF)

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