

# 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

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