

The Improvements of LLRF Control System for CSNS Linac

In the finished ADS (Accelerator Driven Sub-critical system) project which supported by China 973 Program in the Institute of High Energy Physics, Chinese Academy of Sciences (IHEP, CAS), a 352.2MHz klystron RF power source was used to drive 3.5MeV RFQ accelerator. On this test stand, we carried out R & D of digital low level RF (LLRF) control system prototype for CSNS LINAC RF system. Based on step-by-step successful R & D and operation experience, many important progresses have been achieved. In design of the process, all analog modules were thermostatically controlled by a temperature stabilizing crate, the related circuits of both cavity field signal and reference signal were designed symmetrically. In design of the control software, the FPGA-based feedback control algorithm has been optimized, and some useful functions were added, such as 1) measuring of cavity Q value, detuning phase and frequency shift, 2) automatic frequency matching for cavity warm-up, 3) using feedforward to compensate the amplitude and phase decrease caused by klystron high voltage droop, 4) RF power monitoring and real-time VSWR protection. The improvements and test results of the LLRF control system for CSNS LINAC will be described here.

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