

Progress in development of new LLRF Control and RF Reference System for SuperKEKB

For the SuperKEKB project, a new LLRF control system has been developed to realize high accuracy and flexibility. High power test of the prototype was performed with the ARES cavity. The feedback control stability with klystron driving agreed well with the low-level evaluation, and very good FB stability of 0.02% in amplitude and 0.02 deg. in phase was obtained in “out of the loop” measurement. Auto tuner control also worked successfully. The start-up sequencer program for the cavity operation and auto-aging program also worked very well.

The temperature characteristics of the system depend largely on band-pass filters (BPF). We tried to tune the BPF to reduce the temperature coefficient. Consequently the temperature dependence was improved to satisfy the required stability.

A new RF reference distribution system was also designed for the SuperKEKB. In this system the reference signal will be distributed by means of “Star” configuration into the RF control sections and transferred optically by using the phase-stabilized optical fiber. Furthermore phase-lock control function will be implemented to compensate the temperature drift of each transfer line. For this phase stabilization, a new optical delay control system for multi-divided transfer lines was developed originally by applying the direct IQ sampling method, and the its performance was evaluated and the required stability of ± 0.1 degrees was obtained.

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