

Improvements of Low Level RF Control Systems for J-PARC LINAC 400-MeV Upgrade

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The low level rf (LLRF) control systems have been successfully improved for the J-PARC LINAC upgrade. After adding the 972-MHz high- β acceleration section behind the 324-MHz low- β section from the summer of 2013, the proton beam was successfully accelerated to 400 MeV in January 2014. Many improvements of the LLRF control systems have been carried out for the J-PARC LINAC 400-MeV operation, and most important improvements will be presented in this paper.

For the whole J-PARC LINAC, the rf timing distribution system for all the 48 rf stations has been improved. Instead of previous electrical fan-out systems, three optical couplers have been applied into the distribution system. And by applying the 12-MHz signal from the reference generator system directly to the distribution system in the meantime, a very good stability of the rf timing system has been successfully achieved for long-term operation.

For each rf station, a novel auto-tuning system has been successfully developed. During the warm-up process of rf cavity, the input rf frequency is tuned to match the rf cavity resonance frequency. In the meantime, the mechanical tuner is automatically controlled to reach the position for cavity resonance at the operation frequency. This novel auto-tuning system is very helpful for the accelerator operation, especially for the 972-MHz acceleration section.