

Development of an integrated monitor system for real-time relative phase measurement between the cavity-RF and beam

Tuesday 27 August 2024 16:00 (2 hours)

In a linear accelerator, phase drift in upstream cavities can adversely affect downstream cavity synchronization, leading to beam degradation and potential loss. J-PARC LINAC employs different phase reference signals for beam monitoring and RF systems, hindering direct comparison. Recent observations revealed susceptibility of reference signals to environmental effects in the Klystron Gallery. Hence, a thorough observation of the relative phase between cavity-RF and beam is imperative. Addressing this, we took advantage of the newly developed MicroTCA.4-based monitor digitizers to meticulously analyze RF signals from cavity pick-up and beam signals from existing fast current transformers dedicated to measuring beam phase. Initial results show enhanced long-term stability in the relative phase with a shared RF reference. A beam study was also conducted wherein deliberate alterations were made to the cavity-RF phase settings via the LLRF system to detect their impact on the phase drift of downstream cavities. The system recorded downstream beam oscillations prompted by phase drift in upstream cavities. Our work elucidates a real-time monitoring strategy for relative phase detection.

Footnotes

Funding Agency

Primary author: CICEK, Ersin (High Energy Accelerator Research Organization)

Co-authors: FANG, Zhigao (High Energy Accelerator Research Organization); FUKUI, Yuji (High Energy Accelerator Research Organization); FUTATSUKAWA, Kenta (High Energy Accelerator Research Organization); MIYAO, Tomoaki (High Energy Accelerator Research Organization); MIZOBATA, Satoshi (High Energy Accelerator Research Organization); KAMIYA, Junichiro (Japan Atomic Energy Agency); MORIYA, Katsuhiro (Japan Proton Accelerator Research Complex (J-PARC)); SHINOZAKI, Shinichi (Japan Atomic Energy Agency); SATO, Yoshikatsu (Japan Atomic Energy Agency)

Presenter: CICEK, Ersin (High Energy Accelerator Research Organization)

Session Classification: Tuesday Poster Session

Track Classification: MC4: Technology: MC4.1 Beam diagnostics