

eeFACT 2025 - 70th ICFA Advanced Beam Dynamics Workshop on High Luminosity Circular e+e-Colliders



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Improving Beam Quality and Reliability through Low-Level RF Control in Superconducting Accelerators

Beam dynamics during acceleration are inherently sensitive to numerous external factors, particularly within superconducting linear accelerators. In such systems, the high-Q superconducting RF cavities are especially vulnerable to instabilities caused by unforeseen disturbances, which can significantly degrade beam quality or even lead to beam loss. The low-level RF (LLRF) control system, which allows for precise regulation of RF fields, is a critical component in maintaining and enhancing beam quality. Drawing on the presenter's extensive operational experience with multiple superconducting accelerators at KEK (Japan) and the Institute of Modern Physics (China), this presentation explores the pivotal role of LLRF systems in improving beam quality, increasing accelerator reliability, and advancing automation. Specific topics will include achieving ultra-low beam energy spread, enhancing beam availability, and enabling automated RF system operations.

Footnotes

Funding Agency

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Yes

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