Contribution ID: **2310** Contribution code: **SUPS060** Type: **Student Poster Presentation**

Disentangling sudden beam loss events and fast beam abort system with the RFSoC-BPM at SuperKEKB

Sunday 1 June 2025 14:00 (2 hours)

In the SuperKEKB/Belle-II experiment, various new physics searches are conducted by colliding 4 GeV positrons and 7 GeV electrons. Future plans aim to significantly increase luminosity, targeting an integrated luminosity 100 times higher than current levels. However, the realization of this goal is challenged by the phenomenon of "Sudden Beam Loss" (SBL), characterized by the abrupt disappearance of the beam within tens of microseconds. As presented at IPAC'24, we developed the RFSoC-BOR (Bunch Oscillation Recorder) system, based on the AMD/Xilinx RF System on Chip (RFSoC). This system enables bunch-by-bunch beam position monitoring and detailed SBL data acquisition. Using the RFSoC-BOR, we analyzed SBL events, identified key contributing factors, and gained insight into strategies for mitigation. Our findings have advanced the understanding of SBL, bringing SuperKEKB closer to higher luminosity operation. Additionally, we are extending the functionality of the RFSoC-BOR to develop a fast beam abort system that improves accelerator component protection. This presentation will cover the role of the RFSoC-BOR in SBL analysis, key insights, and progress on the fast beam abort system.

Footnotes

Paper preparation format

Region represented

Asia

Funding Agency

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Session Classification: Student Poster

Track Classification: MC6: Beam Instrumentation and Controls,Feedback and Operational Aspects: MC6.T03 Beam Diagnostics and Instrumentation