Contribution ID: **146** Contribution code: **THPD038** Type: **Poster Presentation**

Development and operation of the new beam interlock system of RIKEN RI Beam Factory

Thursday 25 September 2025 16:15 (1h 30m)

We are developing a successor system to the existing machine protection beam interlock system (BIS) (hereafter, RIBF-BIS2) by using CompactRIO, a product by National Instruments, since 2021. The BIS consists of 10 I/O stations distributed throughout the RIBF facility and monitors alert signals from sources such as the magnet power supplies and vacuum equipment, as well as the beam loss detected by the baffle slits in the cyclotrons. During the development phase of the RIBF-BIS2, the I/O stations of the RIBF-BIS2 are being installed in parallel with the existing I/O stations of the BIS while the BIS operation continues for safety, and test operation is being started one by one for stations that have been installed. In development until 2024, the I/O stations of the RIBF-BIS2 are installed to 80% of the I/O station of the BIS. In 2025, the remaining 20% of the I/O stations will be installed so that the BIS can be updated to the RIBF-BIS2.
During the test operation period, we made several improvements to the system. These included enhancing the interlock logic and upgrading the station setup to make maintenance easier. Also, we improved the RIBF-BIS2's front-end circuit installed to shorten the time from the detection of an abnormality in the digital input signal to stop the beam, and the power consumption was reduced to one-fifth while maintaining equivalent performance.

Footnotes

Funding Agency

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Session Classification: THPD Posters

Track Classification: MC07: Functional Safety and Protection Systems