## MEDSI2025 - 13th International Conference on Mechanical Engineering Design of Synchrotron Radiation Equipment and Instrumentation



Contribution ID: 61 Contribution code: WEP43

Type: Poster Presentation

## Mechanical design and finite element analysis of booster girders for particle accelerators under variable construction environments

Wednesday 17 September 2025 17:00 (1 hour)

This study presents a comprehensive engineering design and finite element analysis (FEA) of booster girders, with a focus on their adaptability to diverse construction environments. Booster girders play a pivotal role in maintaining the structural stability and alignment precision of particle accelerators, necessitating robust performance under variable site conditions. A detailed FEA methodology is employed to evaluate the static and dynamic responses of the girders under a range of loading conditions, including seismic forces, which are identified as critical design factors. The simulation results validate the proposed design approach, demonstrating enhanced structural integrity and operational reliability across challenging construction scenarios. This work provides a rigorous design and analysis framework that supports the development of resilient accelerator components, thereby advancing the reliability and scalability of next-generation particle accelerator infrastructures.

## Footnotes

## **Funding Agency**

This research was supported in part by NRF of Korea funded by RS-2024-00431718 and supported by MIST(No. RS-2022-00155836) and also supported by PAL and POSTECH.

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Session Classification: Wednesday Poster Session

Track Classification: ACCELERATORS: Storage Rings