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

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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

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