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Fast Corrector Vessel Selection for High Bandwidth Fast Orbit Feedback

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The Diamond-II upgrade will enhance the performance of the Diamond Light Source synchrotron, including improved beam stability by the Fast Orbit Feedback system. Achieving the targeted closed-loop bandwidth of 1 kHz necessitates an open-loop actuator bandwidth of approximately 10 kHz, which presents significant design challenges for the corrector magnet vacuum vessel. Additionally, subsystems such as the corrector magnet power supplies and Beam Position Monitors, must comply with a stringent closed-loop latency of less than 100 microseconds. Initially, a 1 millimetre stainless steel vessel was deemed viable; however, experimental findings indicated that the combination of stainless steel and neighbouring copper vessels resulted in a decrease in both integrated magnetic field strength and system bandwidth. This prompted a reassessment of the material selection for the fast corrector vessels to optimise orbit feedback performance. This paper investigates these challenges, analyses experimental data, and explores solutions to achieve the necessary bandwidth for the Diamond-II upgrade.

Footnotes

Funding Agency

I have read and accept the Conference Policies

Yes

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