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Single-bunch instabilities and their mitigation in Diamond-II

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Diamond-II is a future 4-th generation synchrotron light source with a significantly narrower vacuum chamber compared to the existing Diamond storage ring. The strength of wake fields will increase, and, consequently, the risk of single-bunch instabilities also rises. We consider chromaticity adjustment and a passive harmonic cavity as mitigation measures, including for cases with impedance strength larger than the design value. This work presents single-bunch thresholds obtained in particle tracking simulations for the latest lattice and impedance database, including the case of non-equal bunch lengthening in realistic filling patterns due to beam loading in the RF cavities. The impedance database includes accurate computations of asymmetric vessels causing non-zero monopole and quadrupole components of the wake. Resulting emittance dilution due to impedance is found to be tolerable.

Footnotes

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Europe

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