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Analysis of single-bunch instabilities for Diamond-II

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Single-bunch instabilities are among the major effects limiting beam intensity in synchrotrons. In the case of a light source with ultra-low emittances, this might be a critical issue causing poor performance of the synchrotron. This study elaborates on the case of the Diamond-II storage ring showing the results of particle simulations for different configurations of the updated lattice and the impedance model. Alongside with the results of simulations, we present an updated database of the Diamond-II impedance. The resulting impedance-induced betatron tune shifts, bunch lengthening, and synchrotron phase shifts obtained in simulations agree with analytical predictions. We obtain optimal parameters for horizontal and vertical chromaticities for all possible lattice and impedance configurations considering chromaticity variation as one of the measures to mitigate single-bunch instabilities.

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Footnotes

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Yes

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