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Touschek lifetime and periodic beam loading effect in the storage ring of SRF "SKIF"

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The collective effects observed in storage rings with high-intensity beams are numerous and diverse. One such effect is that of periodic beam loading of accelerating RF cavities. This effect is contingent upon the impedance of the fundamental mode of the RF cavities and the mode of filling pattern. In a multitude of configurations, the periodic beam loading effect in storage rings leads to a change in the Touschek lifetime along the beam. This work is dedicated to the calculation of this effect in the storage ring of SRF "SKIF", a novel fourth-generation synchrotron radiation source currently under construction in Novosibirsk. Analytical calculations of this effect have been carried out for the main filling mode of the storage ring. It has been demonstrated that bunches in this regime can exhibit significantly disparate Touschek lifetimes. Furthermore, it has been shown that the effect is negligible when the RF acceptance is equal to the energy acceptance of the storage ring.

Footnotes

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