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Transient beam loading studies at ALBA

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The bunch lengthening performance of harmonic RF systems is significantly affected by gaps in the filling pattern, which induce a transient beam loading effect (TBL). To optimize the performance of the active harmonic system planned for the upgrade of ALBA storage ring, strategies to mitigate TBL under worst-case gap scenarios are being investigated. The primary approach involves employing additional generator power both in the main and harmonic systems to compensate for beam voltage variations caused by the gap, thereby flattening the total voltage signal and enabling longer average bunch lengths. A semi-analytical model has been developed to support this effort, validated through tracking simulations and machine studies. This paper presents the key findings and implications of these results.

Footnotes

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