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Single-beam collective effects

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Collective effects due to the high beam intensities in FCC-ee, in particular for the Z-pole configuration, are very important for reaching the design performance. While resistive wall represents a major source of impedance for such a large machine, also other contributions, such as that of the bellows with included RF fingers, cannot be neglected. We have studied the single beam instabilities in the longitudinal and transverse planes produced by the impedance devices evaluated so far, as well as possible mitigation effects due to chromaticity and feedback system.
Additionally, the interplay between beam-beam interaction, beamstrahlung and the longitudinal beam coupling impedance has a strong influence on the coherent X-Z instability, it may reduce the stable tune region, and it must be carefully analyzed.

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