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Beam loading for counter-rotating high-intensity beams in the Muon collider

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Muon colliders promise an efficient path to a multi-TeV energy collider facility. In the greenfield study, the final stage of the acceleration chain is planned as a series of four rapid-cycling synchrotrons (RCS). In each RCS, the RF systems are divided into several sections and shared by the two counter-rotating muon bunches. The accelerator requirements are driven by the need to preserve a maximum number of muons by taking advantage of time dilation. Therefore, maintaining a high accelerating voltage throughout the chain is essential, imposing superconducting RF cavities in the GV range. However, the high bunch intensity of up to 2.7×10^{12} particles per bunch and the 1.3 GHz TESLA cavity's small aperture will result in induced voltages in the MV range.
In the muon collider, the induced voltage of the counter-rotating beams will additionally impact the cavity voltage.
This contribution presents the cavity voltage modulation and its impact on the beam loss and stability in the strong transient beam loading regime.

Footnotes

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Europe

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