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Arbitrary bunch shaping via wake potential tailoring

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A method is described whereby any desired longitudinal electron bunch profile may be generated in a storage ring by tailoring the wake potential. The required wake function is found by implicitly solving the Haïssinski equation through the usage of a regularization parameter. For two coveted longitudinal profiles—a lengthened profile and a triangular profile—the required solutions are obtained and verified through particle simulations in longitudinal phase space, as well as through full particle tracking simulations. Auxiliary variables such as energy spreads/chirps and transverse phase-space distributions are found to be unaffected by the additional potentials. A possible implementation means is discussed in the context of using multiple harmonic cavities.

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Footnotes

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