

RF-Track simulations of Linac4

Monday 26 August 2024 16:00 (2 hours)

A series of detailed Linac4 end-to-end simulations were conducted using RF-Track and benchmarked against PATH for validation. The simulations were performed from the RFQ entrance to the Linac4 end. In RF-Track, all the accelerating structures are described with calculated 3d field maps while the calculation time remains within minutes for half a million particles. Despite the inherent differences between the two codes, excellent agreement was found, almost particle by particle, in the case without space-charge effects. When space-charge effects were considered, the different algorithms implemented gave results that could not be compared particle-by-particle but were compatible in terms of emittance growth, beam size, bunch length, and energy spread. Particular care was put into handling space-charge effects in the transition between continuous and bunched beams, and the RF-Track's space-charge model was extended accordingly. As a result, we now have two complementary codes that accurately describe the dynamics of LINAC4. The results of this study are presented in this paper.

Footnotes

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Primary author: LATINA, Andrea (European Organization for Nuclear Research)

Co-authors: LOMBARDI, Alessandra (European Organization for Nuclear Research); BELLODI, Giulia (European Organization for Nuclear Research); LALLEMENT, Jean-Baptiste (European Organization for Nuclear Research)

Presenter: LATINA, Andrea (European Organization for Nuclear Research)

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