

Compensation of quadrupole component of RF field in solenoidal focusing channel

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High-intensity Superconducting Radio Frequency (SRF) ion/proton linear accelerators (linacs) typically utilize Half Wave Resonators (HWR) and Single Spoke Resonators (SSR) for beam acceleration in the low-energy section of the linac. Because of lack of azimuthal symmetry, HWR and SSR geometries result in a quadrupole field component of operating mode accelerating field. This, in turn, results in a quadrupole-like RF kick to the beam leading asymmetric growth in the transverse beam sizes. It becomes difficult to control the beam sizes in presence of non-linear space charge forces in a regular solenoidal focusing channel that provides uniform focusing in both transverse planes. Subsequently, if not compensated appropriately, the kick imposes severe implications on dynamics including emittance dilution. This paper delves into the effects of quadrupole RF kick in the low energy section of a SRF linac and presents a novel concept to compensate this kick locally using solenoidal focusing.

Footnotes

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