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# Simulation and measurement studies of longitudinal acceptance based on the CAFe superconducting linac

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The accurate measurement of longitudinal beam parameters is paramount for controlling beam losses in high-power superconducting linac accelerators, particularly for low-energy beams which are significantly affected by the compensative challenges of nonlinear effects and pronounced space charge effects. In this context, systematic simulation and experimental studies of longitudinal acceptance have been performed based on the CAFe linac, employing techniques of phase and energy scanning. This paper provides a detailed description of the principles of the longitudinal acceptance measurement and presents an analysis of preliminary experimental results obtained from the CAFe linac. It was observed that the experimental longitudinal acceptance of the accelerator was reduced compared to the simulation predictions. Key factors such as transverse orbit deviations and RF phase errors are examined, and a thorough analysis of these discrepancies is discussed in the paper.

## Footnotes

## Funding Agency

**Primary author:** LI, tingyue (Institute of Modern Physics, Chinese Academy of Sciences)

**Co-authors:** LIU, Shuhui (Institute of Modern Physics, Chinese Academy of Sciences); WANG, Zhijun (Institute of Modern Physics, Chinese Academy of Sciences)

**Presenter:** WANG, Zhijun (Institute of Modern Physics, Chinese Academy of Sciences)

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