

Physics and Applications of High Brightness Beams



Contribution ID: 47

Type: **Poster**

Modeling High Order Modes in Energy Recovery Linacs for Optimal FEL Performance

High order modes (HOM) in linear accelerators (Linacs) can negatively affect the quality and stability of the electron beam, which is essential for Free Electron Lasers (FELs). To address this issue, the Compact HOMEN (High Order Mode Evolution based on Energy budget) model has been developed to accurately predict and analyze HOM effects on beam dynamics in superconducting cavities. This model enables the optimization of beam quality and stability, leading to significant advancements in high-brightness accelerated electron beam technology. The optimized beam quality and stability in Linacs can have a profound impact on the performance of FELs. FELs require a high-brightness electron beam to produce high-quality THz and X-ray emissions with crucial applications in advanced technological fields such as materials science, biophysics, and chemistry. Therefore, the studies on HOMs in Linacs have the potential to greatly benefit the work of FELs, enabling the production of high-quality emissions for various scientific and industrial applications.

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Session Classification: Poster