



Contribution ID: 202 Contribution code: WEBI01

Type: Invited Oral Presentation

Chicane or arc compressors for FEL? - Experience with the MAX IV arc compressors and beyond

Wednesday 21 August 2024 11:00 (35 minutes)

The MAX IV bunch compressors consist of two achromatic arcs each where linearisation of longitudinal phase space is done with a sextupole in the centre of each achromat instead of a harmonic cavity. Although the initial design choice was a cost-saving solution, simulations and 10 years of experience demonstrate that arc compressors not only perform as well as a chicane compression system but can actually do better for some beam properties, such as arrival time jitter, ultra-short bunch length and high peak current. We compare variants of both schemes, and discuss the pros and cons. We show in simulation the superior performance of arc compression schemes, especially in the regime of strong compression where CSR-driven emittance degradation and microbunching is dominant.

With the newly installed and commissioned transverse deflecting cavity system, the MAX IV compression and linearisation scheme has been studied and characterised and the results show a very stable compression scheme for the current Short Pulse Facility as well as promising ultra-short bunches for proposed FELs.

Footnotes

Funding Agency

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Session Classification: Electron beam dynamics

Track Classification: Electron beam dynamics