

Physics and Applications of High Brightness Beams



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Beam dynamics simulations with X-band linearizer cavity for the EuPRAXIA@SPARC_LAB RF injector

The EuPRAXIA@SPARC_LAB RF injector provides high brightness electron beams accelerated and longitudinally manipulated in the velocity bunching regime (VB). The RF injector consists of a SPARC_LAB like S-band RF Gun (2.856 GHz) followed by four S-band TW accelerating structures with an overall length of 12.3 m. The RF injector works with the so called comb configuration, foresees a 30pC witness and a 200pC driver longitudinally compressed in the first two accelerating structures both operated in the VB regime. The beams quality can be improved by adding a High Harmonic Cavity to pre-correct the bunch Longitudinal Phase Space to shorten and flatter the charge distribution and manipulate the beams to reach proper transverse and longitudinal parameters. A X-band (11.424 GHz) SW RF structure interposed between the Gun and the first accelerating structure is proposed to do it. The paper reports on beam dynamics studies performed with the insertion of the X-band RF cavity that is proposed to shape the beam current distribution, linearizing the Longitudinal Phase Space, and stabilize it with respect to RF jitters.

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