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New photoinjector design of the high charge S-band ThomX accelerator

We report the results of a recent beam dynamics study that has led to promising working points for the split ThomX photoinjector. ThomX is a back-scattering Thomson light source project that will use S-band electron Linac with tunable energy from 50 MeV to 70 MeV to produce high X-rays flux (10^{11} - 10^{13} ph/s) in the energy range from 45 keV to 90 keV. Since ThomX has been conceived to maximise the average X-rays flux in a fixed bandwidth, the high rate electron-photon collisions impose a linear accelerator combined with a storage ring. The high performances of the accelerator are largely affected by the high quality of the electron beam at the interaction point in the ring. Beam specifications at the interaction point should be achieved with 1 nC, 50 nA average current single bunch with normalised rms transverse emittance less than 5 mm-mrad and around 0.3% energy spread, at the end of the linac. The beam dynamics along the linac has been extensively studied to demonstrate the capability of the accelerator to meet the requirements for the high brightness electron beam using an RF photoinjector configuration.

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