

Homework 3 - Wednesday

Task 1

In laser plasma accelerator, the final energy of an accelerated electron beam is 1 GeV. The wavelength of the laser used for laser plasma acceleration is 800 nm (or another wavelength that you selected for Project 3). Part of the same laser pulse is redirected with mirrors to collide head-on with the accelerated electron beam. Estimate the energy of photons created in such a Compton source and the angular spread of the photons.

Task 2

Estimate average beta function in a weak focusing circular accelerator (where focusing is provided just by edge focusing of dipoles) with perimeter 20 m (or another value you selected for Project 3) and betatron tune equal to 0.3.

Task 3

Estimate the average dispersion function for the Project 3 ring, assuming weak focusing, and taking the value of ring perimeter for one of the configurations of Project 3.

Task 4

Estimate parameters (maximum field and period) of a wiggler (or undulator) suitable for 1 GeV beam (of Project 3). What is the value of K for the selected parameters?

Task 5 (collective work)

Contribute to writing draft report in Word, describing the compact source (Project 3), creating and filling the tables of parameters, describing assumptions, etc. Follow the parameter set agreed for your group (e.g. 1 GeV beam for one group, and 3 GeV beam for another group). The parameter table can thus be describing four cases: 1 or 3 GeV, normal conducting or superconducting bends.