

Lecture 4: Problems

1. As an alternative to the damping rings, it has been proposed to reduce the emittance of the beam from a particle source using a beamline consisting of a sequence of wigglers and RF accelerating cavities.
 - a) Explain the principles behind the use of this system as an alternative to the damping rings.
 - b) Discuss the use of such a scheme for the ILC, given the parameters:

Injected normalised horizontal emittance	0.01 m
Extracted normalised horizontal emittance	8 μm
Injected normalised vertical emittance	0.01 m
Extracted normalised vertical emittance	20 nm
Extracted absolute energy spread	6.5 MeV

You should consider:

- the beam energy (which may vary along the beamline, e.g. starting at low energy and finishing at higher energy);
 - the wiggler parameters (particularly the peak field and the period), which may vary along the beamline;
 - the lattice parameters (i.e. the beta functions);
 - the RF parameters (accelerating gradient and frequency).
- c) Discuss briefly any practical issues that may be important when operating such a damping system.