Lecture 7: Problems

1. Given the nominal parameters for an ILC damping ring:

Circumference	6.7 km
Beam energy	5 GeV
Particles per bunch	2×10^{10}
Bunch length	6 mm
Vertical tune	52.4
Horizontal tune	49.3
Normalised horizontal emittance	5 μm
Normalised vertical emittance	20 nm

   make a rough estimate of the horizontal and vertical incoherent space-charge tune shifts.

2. Discuss some methods to mitigate space-charge tune shifts in a storage ring, and their application to the ILC damping rings.

3. The figure below shows measurements of the energy spread in a single bunch in the KEK-ATF storage ring, as a function of time after injection, for three different bunch charges (corresponding to three different single-bunch currents). Explain the principal features of this plot.