

- 1) Discuss the impact in Luminosity for raising the ILC machine repetition rate to 10Hz. What would be the impact on the damping times? Do the same for CLIC for running at 10Hz. In the case of CLIC, propose ways to recover the lost luminosity and the associated challenges.
- 2) Discuss the impact of doubling the number of bunches in the ILC and CLIC DRs
- 3) Show that – in thin lens approximation – the β function in the quadrupoles of a symmetric FODO structure is given by

$$\hat{\beta} = \frac{L(1 + \sin \frac{\mu}{2})}{\sin \mu} \quad \check{\beta} = \frac{L(1 - \sin \frac{\mu}{2})}{\sin \mu}$$

where μ is

the phase advance of the cell and L its length.

- 4) In the case of a proton beam one usually can assume equal betatron emittances (round beams). The aperture of a proton storage ring has in general a circular shape. What would be the ideal phase advance of a FODO cell, if smallest aperture is desired? Any ideas about electron rings where the vertical emittance is much smaller than the horizontal one ?