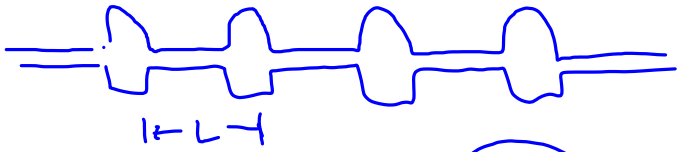
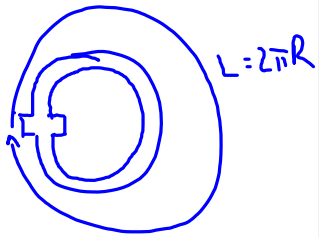
Phase Stability and Synchrotron Oscillations:

(1) Linac



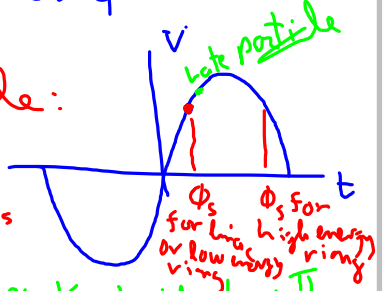
(2) Ring



Assume cavity gives voltage V at phase ϕ so that $\Delta E = qV\sin\phi$

Synchronous Particle:

$$E^s_{n+1} = E^s_n + qV\sin\phi_s$$



Late particle → Bigger kick if $\phi_s < \frac{\pi}{2}$

Early particle → Smaller kick if $\phi_s < \pi/2$

Late particle → smaller kick if $\phi_s > \frac{\pi}{2}$

Early particle → bigger kick if $\phi_s > \pi/2$