

NLC - The Next Linear Collider Project



Electron Cloud and Other Issues

ARDA Collective Effects Group



Electron Cloud

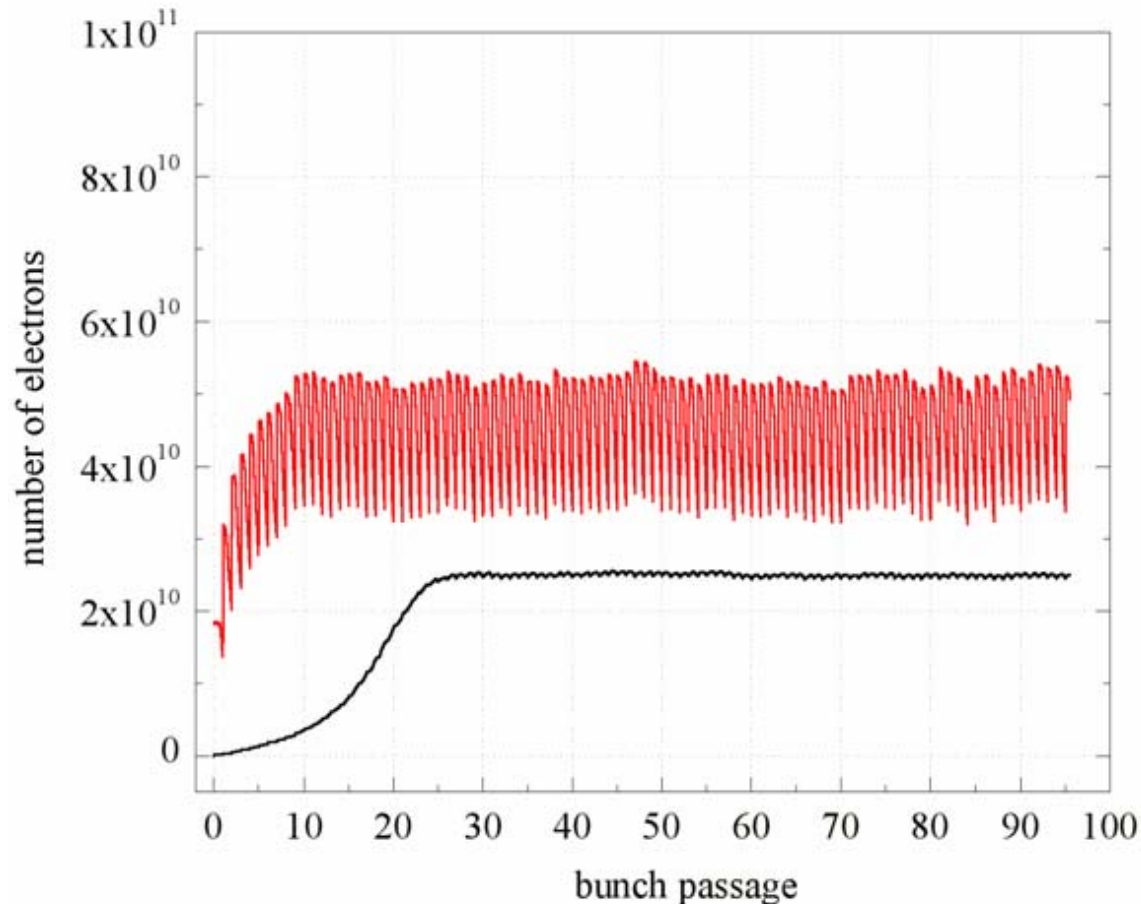
- Positron damping rings

- Currently being studied by Mauro Pivi at LBNL

- My interpretation:

- Sees rapid saturation of e- plasma
 - Plasma density not enough to drive rapid multi-bunch instability
 - Need to confirm simulations and study single bunch effects

- What about TESLA?



Electron Cloud

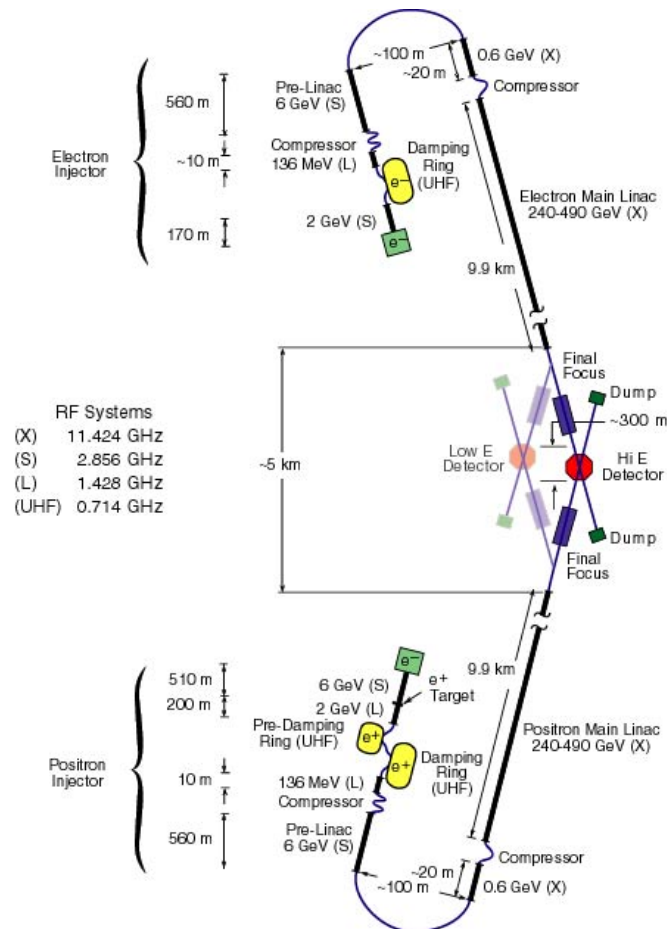
- Single Pass effects

- Beam emittance is tiny (smaller issue for e- cloud than ions but still sensitive)
- Multi- and single bunch

- 180 degree turn around

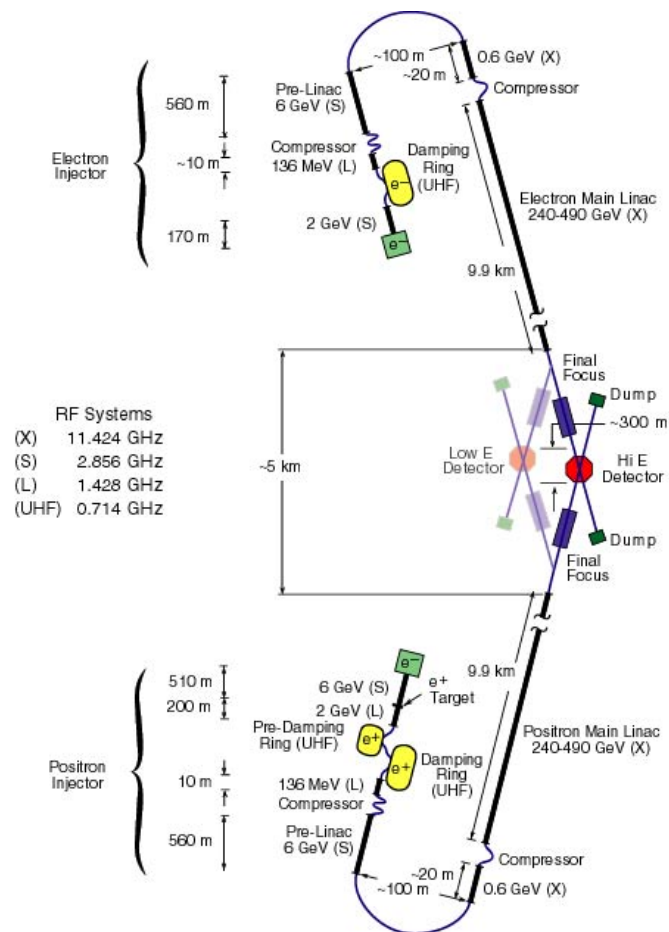
- there are lots of photons,
- the energy is relatively low,
- the vacuum chamber does not have an ante-chamber

- What is the impact of the vacuum chamber aperture
- Previous aperture was near multi-pactoring resonance



Electron Cloud

- Linac
 - There is some radiation from quadrupoles - can this drive dipole instability through photo-ionization
 - Bending magnets in chicanes will send radiation down linac - is this important?

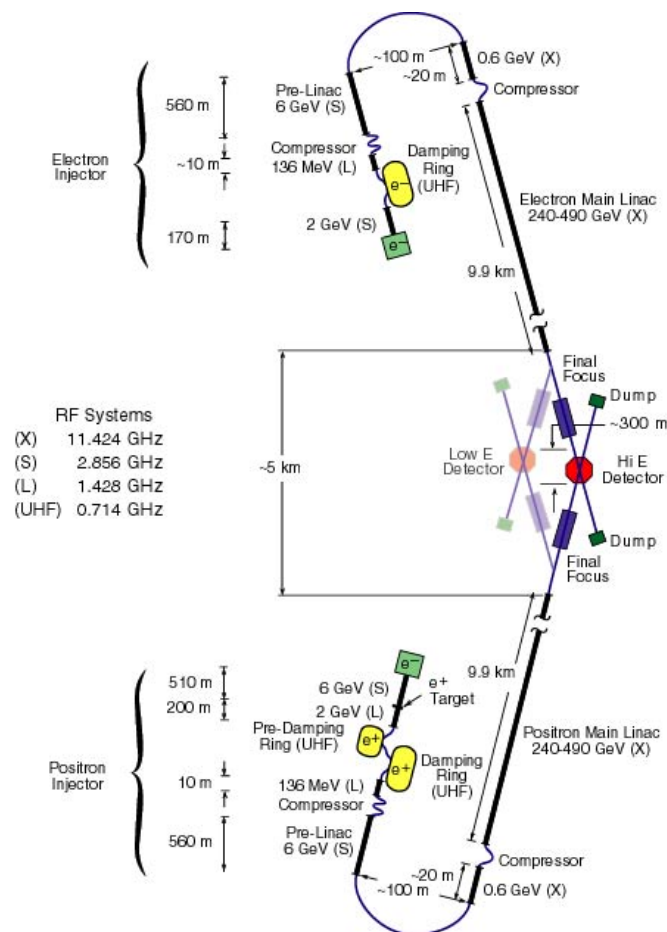


Electron Cloud

- Beam Delivery

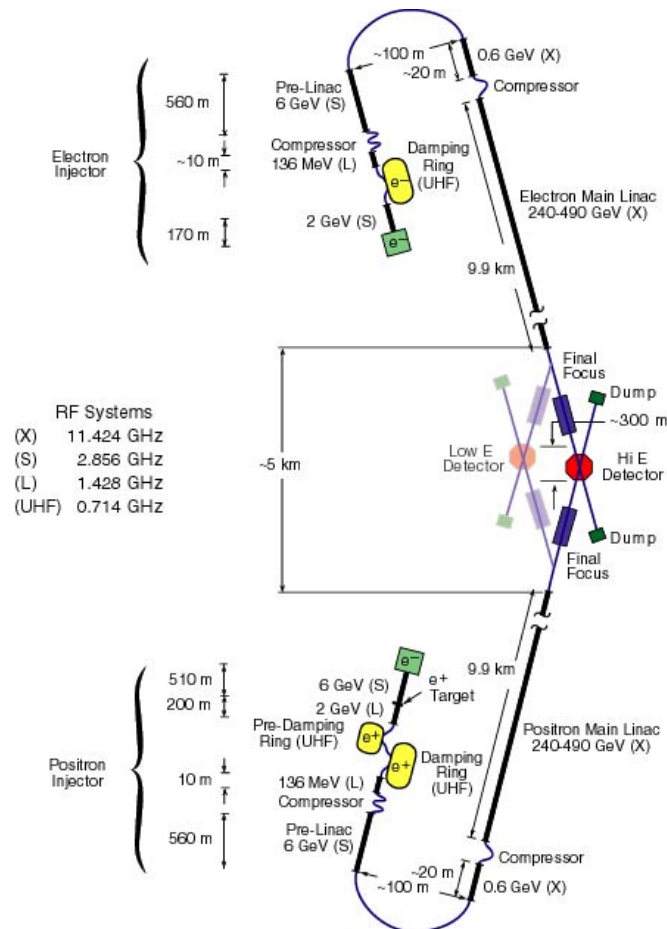
- There are lots of bends and a lot of photons,
- the beta functions are huge,
- the vacuum chamber does not have an ante-chamber

- What is the impact of the vacuum chamber aperture
- How important is photo-ionization here



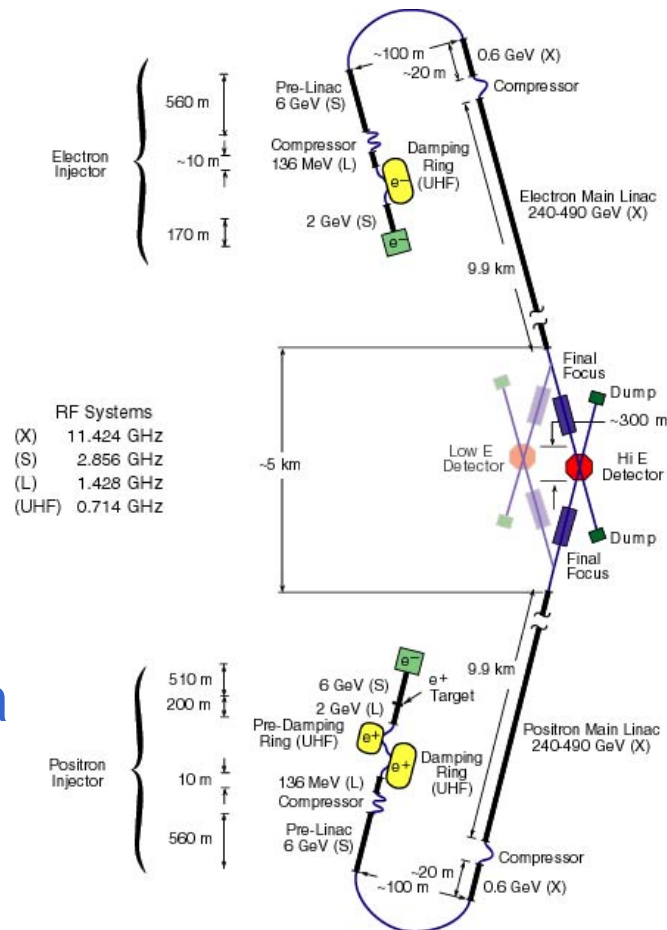
Electron Cloud

- Dark current questions:
 - Can dark current drive dipole modes or cause transverse beam jitter
 - What is effect on BPMs?
 - Can dark current cascade with a net increase between quadrupoles?
 - What is effect in TESLA?



Ion Instabilities

- Fast Beam Ion instability is predicted to be a possible limitation in:
 - Damping rings
 - Low energy transport lines
 - Final focus
- Can ions at IP be important?
- Is there a single bunch effect that is important in the BC or linac (possibly similar by Emma to that described in EPAC 94)





Summary

- Lots of questions for both NLC and TESLA
 - Electron cloud
 - There is radiation everywhere!
 - Single and multi-bunch effects might be important
 - Need basic scaling to understand where it might be important
 - Dark current
 - Dipole deflections
 - Cascade development
 - Ions
 - Possibly important because of small beam sizes
 - Again single and multi-bunch effects