Beam commissioning

A core dump of random thoughts

Nick Walker - MDI/CFS workshop - 6.09.14 - Ichinoseki

See also “ILC BDS commissioning” by Glen White (ALWC 14)

Beam Commissioning

- **In general, should distinguish between**
  - First (early) commissioning
  - Start-up (re-start) or routine tuning
- **Single-beam tuning (start-up)**
  - Beam-based alignment (BPMs)
    - low beam power. Single bunch (or short bunch train), but maintain Q_{bunch}
  - Emittance tuning (laser wires)
  - IP tuning - how?

IP beam tuning

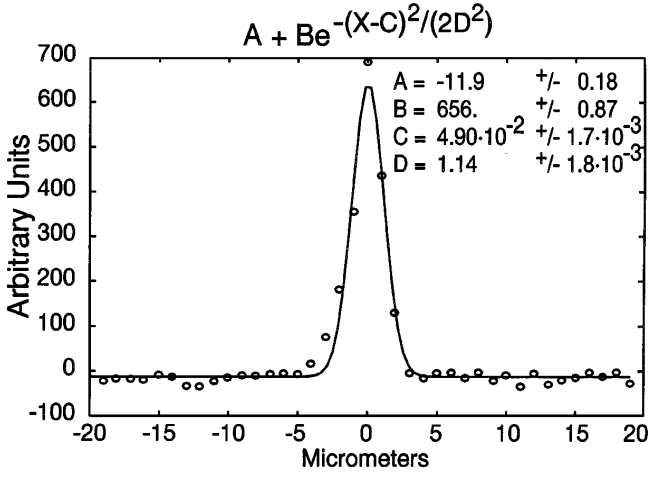
- General philosophy: establish collisions ASAP and use beam-beam
  - Start with “micron” scale beams
  - One bunch (assuming beam jitter is small enough)
  - Or short train for feedback
  - (long enough train for single-pulse scans)
- At AWLC we discussed having a “temporary” Shintaki monitor @ IP
  - Impractical (IMO) [unless detectors are delayed]
  - Beam-beam much better
- 2-beam tuning: beam-beam scans and then luminosity

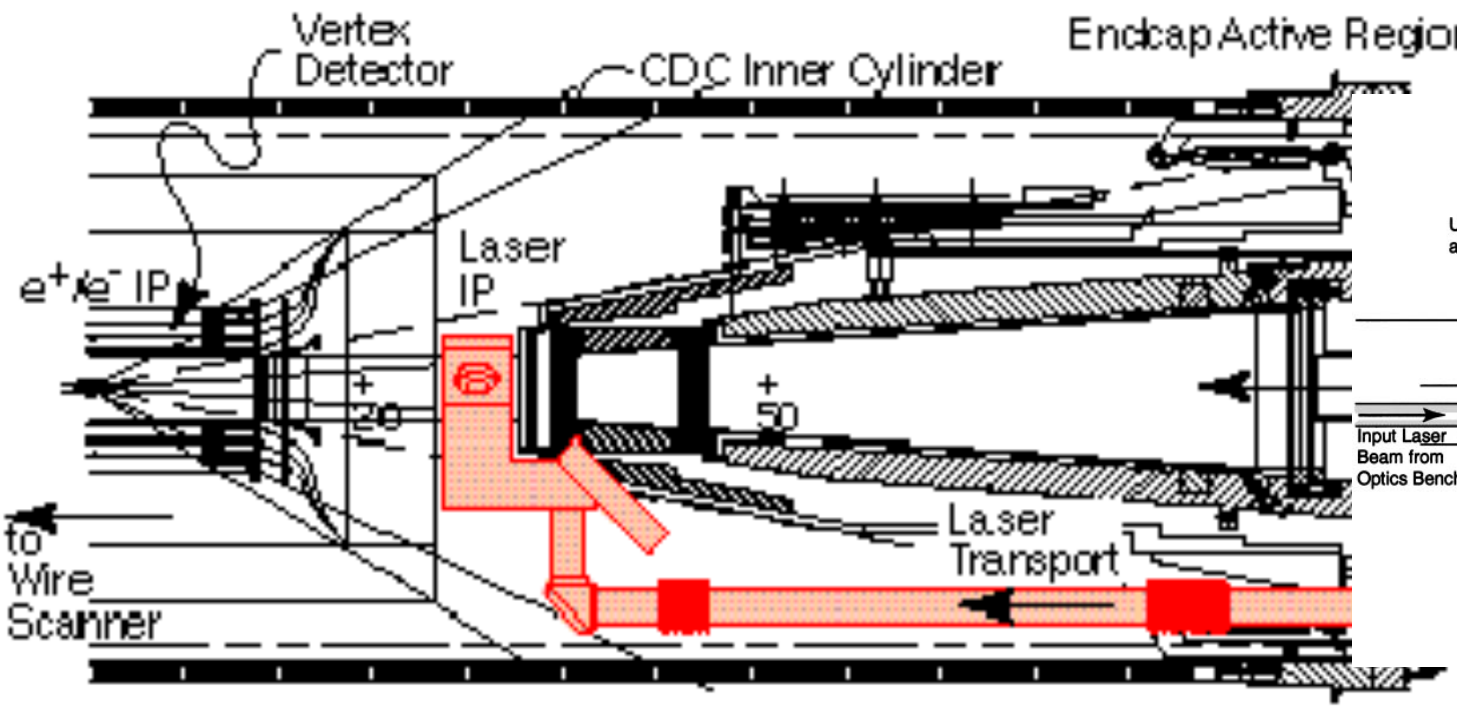
Establishing Collisions (questions)

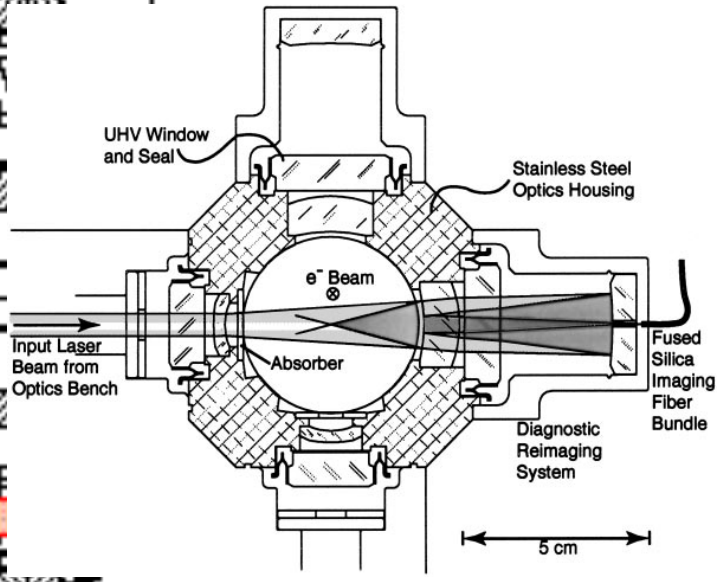
- SLC experience invaluable here (but I'm slowly forgetting!!)
- BBA of IR important (FD alignment)
  - Key: establishing a common reference between e+ and e- beams
- Need to bring beams "close" together, and then scan to find collisions
  - signal? no lumi so again beam-beam deflection. Some beamstrahlung?
- Initial placement using IR BPMs (fitting to IP: "virtual BPM")?
  - Same location for both beams? (Common frame of reference)
  - the need for a "Witold" BPM downstream of QD0?
- Would a laser diagnostic "close" to IP be useful?
  - could locate beams on wire (albeit displaced from IP)
  - could use to initial single-beam tuning (down to ~250nm?)

IR laser wire? (SLD did it)

Profile monitor “close” to IP?
Probably can’t do better than 250nm?
Need to “move waist” to ±X cm?
Useful? (Q to machine) Feasible? (Q for Det)







Other consideration / comments

- Initial commissioning takes longest
- Re-establish collisions / lumi after "short" interruptions should be quick
  - SLC experience
- Longer periods → longer recovery
  - Machine drifts away from previous configuration
  - time scales depend on
    - BPM stability (electrical)
    - Component alignement drift (GM / T)
- Finding practical methods of speed up re-establishing collisions is important