

*“Water was running, children were running,
You were running out of time”*

Input to Miscellaneous ILC Critical Choices

PT

WG1

21-Aug-2005

Note: The judgments in this presentation are solely those of the author and do not represent a consensus of WG1.

Bunch Compressor

- For current parameter list, two stage BC is *mandatory*
 - If 9 mm DR bunch length *and* 150 μm IP length are ruled out, we might revisit this
 - 150 μm parameter sets have very tight emittance growth requirements
 - May not be achievable – does 150 μm become uninteresting if $\gamma\epsilon_y^*$ is 50 nm and not 30 nm?
 - Similarly, 9 mm DR bunch has more emittance growth than 6 mm DR bunch for same final length
- Two serious candidate designs
 - ESK: shorter (< 680 m)
 - RTW: longer (1400 m) but better studied
 - Comparative studies can begin any day
 - Decks in hand
 - Downselect by end 2005

DR Turnaround to BC

- We favor this
 - Allows feedforward to correct DR extraction jitter
 - Can't quantify performance benefit
 - Mainly risk reduction against kickers which don't meet specifications
 - Can use last 20° or so for spin rotator arc

Bypass Lines for Low Energy Running

- Preliminary studies performed (Kubo)
 - Result: don't need bypass lines
 - Would complicate e^+ production
 - Accelerate to 150 GeV, undulate, decelerate scheme has least emittance growth!
- Deeper study indicated
- Also revisit for LL/RE cavities

Linac Diagnostic Sections

- Haven't studied this issue per se at all
- Need to get linac steering studies in better shape before we can study this
 - Time-early: 1st Q 2006.
- Can perhaps be done earlier, but requires other studies be postponed to make space in the schedule
 - BC, linac curvature, LL/RE cavities

Tail Folding Octupoles in BDS

- No-brainer: you put them in
 - They cost next to nothing
 - If they don't work, turn them off
 - you're no worse off than if they were never there in the first place
 - If they do work then all background and collimator wakefield problems get eased enormously

Collimation Strategy

- Put betatron collimators first
 - Need energy collimators to catch low-energy particles scattered out of betatron collimators
- Protection strategy: rely on runaway beam ramp upstream of collimators
 - Need it in any event to protect LCD from failures downstream of collimators
 - Betatron oscillation MPS issues in linac take 100's of usec to develop
 - Lots of time to detect and react
 - Energy errors can develop faster (20 usec?)
 - Need chicane upstream of exit ramp to detect energy failure developing – straightforward to design
 - Machine protection is extremely important – we should take maximum advantage of the long bunch spacing to make the problem easier, even if it means putting in a bit of length and equipment for the purpose

Linac Lattice

- Conservative choice – TESLA spacing of 24 cavities per quad
 - Most thoroughly studied
 - Cryomodules of 8 or 12 cavities OK
 - Split-tune (75/60 or more) provides protection against mode-rotation LRWFs
- Cost saving choice: weaker focusing
 - Hints that smaller emittance growth available
 - Depends on several factors:
 - Achievable cavity alignment to cryomodules
 - Presence or absence of HOM BPMs and CM movers
- Studies of this ongoing as part of larger linac steering/tuning effort
 - Time-early: 1st Q CY 2006
- In any case would like quads separate from RF cavities
 - Optimize quad cryostat for better vibration suppression
 - Separate mechanical alignment of quad cryostats and RF modules will improve achievable emittance growth, esp. if RF modules have movers

BPM Type

- “Cavity” vs “Re-entrant”
 - Per Marc Ross: Cavity BPMs have higher resolution but poorer bunch separation within a train
- My judgement: Cavity is better in most locations
 - Just a few locations where true bunch-by-bunch BPMs will be needed
 - Better quantification of the tradeoff would be nice (what factor of resolution vs what factor of bandwidth)