

Tunnel Geometry (Himmel Critical Choice 3)

PT for ILC WGs and GGs

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The Options

- There are 3:
 - Laser straight
 - Piecewise straight with discrete vertical arcs
 - Continually Curved
- To some extent the candidate sites will dictate which choices are really viable
 - We want to determine which options are really open to us prior to selection of candidate sites

Pros/Cons

- LET Luminosity:
 - Laser straight presents lowest risk
 - Most studied
 - No design dispersion which needs to be taken into account
 - Continually curved presents highest luminosity risk
 - Piecewise straight presents highest MPS risk
- Cryogenic: Continually curved favored
 - Prefer to limit angles wrt gravity to 0.3 mrad
 - Max straight segment length ~ 4.2 km
 - Implies a lot of bending arcs!
 - Each arc costs in length, components, SR, MPS risk
- BDS:
 - Both sides of BDS should lie in one plane
 - Would like last km of linac each side in same plane
 - Risk management – may want to extend BDS back into linac, longer FF, additional collimation iterations, etc
- Dogbone DR:
 - Anecdotal communication == “can tolerate any of the 3 choices”

Conclusions and Caveats

- Linac can have any of the 3 geometries
- BDS should lie in a plane, along with last km of linac on each side
- Haven't yet considered bunch compressor
- Only studied mean curvature == Earth's radius (6370 km)
 - Cannot vouch for sharper curvature
 - Would require dedicated study prior to selection of a candidate site
- Conclusion subject to additional studies
 - Both continual-curved and piecewise straight solutions relatively new and not thoroughly vetted

R & D

- LET
 - Firm up results for non-straight geometries
 - Consider bunch compressor
 - Consider spin transport issues
 - Can probably complete all in 1st Q CY 2006
- Engineering
 - Fully capture cost savings of optimal cryo model (dictates 0.3 mrad angle) vs non-optimal ones
- Other
 - Tolerance for sharper mean radii of curvature – on request when candidate sites identified

Extra Slides (1 of 2)

- For continual curvature BPM linearity and scale factor are more important than for others
- Y jitter in BPMs includes contribution from energy jitter
- Design dipole field equivalent to 400 μm quad offsets
 - Comparable to alignment tolerance
 - Use quad offsets or dedicated dipole windings? Investigate tradeoffs!
- Not much difference in pre-alignment
- Continual curvature not as hard as might seem at outset
 - Design dispersion only 1 mm-ish
 - Projected emittance at injection only a few times larger than normal mode
 - Contribution from $\eta \cdot \Delta$ damps with momentum

Extra Slides (2 of 2)

- More complete studies of steering
 - Straight can use DFS, BA, KM
 - Piecewise straight presumably similar
 - Would like make sure we have 3 options for steering even in continual curve case