Machine-Detector Interface

MDI Panel Report

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MDI Panel is one of several World-Wide Study (WWS) panels
(R&D, Detector costing, MDI, 2 IRs)

Interim panel members (thru Snowmass): P. Bambade, T. Tauchi, M. Woods

Present activities of panel

1. ILC baseline design choices
   - help evaluate design choices for ILC baseline configuration that relate to MDI
   - provide a list of these design choices and describe MDI context
   - help prepare questions to pose to machine and experiment communities
2. Machine and Experiment CDRs, TDRs
   - help evaluate MDI issues that impact developing these
   - provide a list of these design issues
   - help prepare questions to pose to machine and experiment communities
3. Facilitate discussions between ILC Accelerator working groups, World-Wide Study and Detector Concept groups.
4. Report on this work at Snowmass; co-ordinate MDI discussions there.

A status report on this was submitted June 15 to WWSOC, Detector Concept Groups, ILC WG1 and WG4

MDI Issues I: ILC Design Choices

1. Multi-TeV extendibility
2. IR crossing angles
3. 2 versus 1 IR/Detector and their scopes (includes simultaneous or sequential running of 2 IRs/detectors)
4. e-e-
5. e-gamma and gamma-gamma
6. Z-pole running and Z-pole calibration
7. Polarized positrons
8. Fixed Target
9. ILC Parameters: nominal + 3 variants + 1 high lumi option, for both 500 GeV and 1 TeV

Community has a goal to develop an ILC baseline by end of 2005. A starting point is provided by the LC Parameters document, www.fnal.gov/directorate/icfa/LC_parameters.pdf

MDI Issues II: Machine and Detector CDRs, TDRs

1. Radius & length of vertex detector; collimation depth
2. L* and minimum veto angle
3. IR quad stabilization
4. IR magnet design
5. Fast feedback: IP beam position monitors, kicker, pair detector
6. Beam parameter diagnostics and beam tuning
7. Electron id, 2-photon veto w/ pair detector
8. Beam instrumentation for lumi spectrum, energy, polarization.
9. EPS (experiment protection system); rad hard specs for accident scenarios; abort kicker system and #bunches in queue
10. Beam RF and other EMI (electromagnetic interference) effects on detector signal processing and DAQ.
11. Evaluation of beam background levels and corresponding detector tolerances.
12. Dark current between bunches (use of Linac rf kicker?)
13. Detector assembly ↔ BDS commissioning

MDI Evaluation of MDI Issues I: ILC Design Choices

Note: this is a starting point and will evolve; need input from ILC working groups (in particular WG1 and WG4), WWSOC and Detector concept groups.

We think highest priority should be evaluation for items 1-3, 7, 9.

1. Multi-TeV extendibility (Linac crossing angles, tunnel design)
2. IR crossing angles
3. 2 versus 1 IR/Detector and their scopes (includes simultaneous or sequential running of 2 IRs/detectors)
4. e-e-
5. e-gamma and gamma-gamma
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Some examples, extracted from the document (w/ relevance for IPBI)

2. IR crossing angle geometries (0, 2, 20 mrad)

i) Questions for IPBI:

- Quantify effect on polarimetry from angle between beam and solenoid axis
- Compare precision of downstream energy & polarization msmts (backgrounds, sensitivity to beam jitter, …)
- Evaluate effect on electron id and 2-photon veto

4. e-e-

i) Questions for IPBI:

- Expected precision on energy and polarization measurements

6. Z-pole running

i) Questions for IPBI:

- Expected precision on energy and polarization measurements
- Precision required?
- Is positron polarization required?
- How much beamsstrahlung can be tolerated?

Some examples, extracted from the document (w/ relevance for IPBI)

7. Polarized positrons

i) Questions for IPBI:

- How frequently does e+ polarization need reversals

9. ILC parameter sets

i) Questions for IPBI:

- Evaluate impact of backgrounds for 4 parameter sets at 500 GeV, 1 TeV; impact on expected precision of extraction line energy and pol msmts
- Evaluate impact of reducing bunch spacing to 154 ns

Next Steps:

- feedback from WWS, Detector Concepts, ILC WGs
- further develop evaluation:
  - develop further the current status report; it's a working document
  - a large amount of work has been done and can be referenced
  - clarify and prioritize work to be done before Snowmass
  - how to summarize evaluation needs work
- At Snowmass,
  - Present status report
  - Continue evaluation, working with machine and experiment groups