Energy Measurement Prescription

Prescription should include:

• “Initial Calibration” (seldom: ~frequent enough to track drifts)
  – cross-calibration of mechanical movers, position readback
  – temperature coefficients of system
  – stray fields
  – something for BPMs here besides initial alignment?

• calibration procedures (regular: ~same frequency as measurement)
  – absolute BPM gain
  – relative BPM gain
  – ?

• Energy Measurement (as needed: continuous?)
Short-term Calibrations

• BPM Gains
  – At LEP we used:
    • beam tilts and offsets to measure relative gains of BPMS
      – “ladder” of different corrector settings ⇒ beam-based alignment
    • central frequency shifts to measure absolute gains
      – precisely-controlllable energy change
  
• At ILC:
  – will only have “straight-line” (null bending field) as calibration
    • probably want to sweep bend angle through $\pm \theta$ to “measure” effects of non-zero field at null point
      – another handle on stray fields, earth’s field, etc.
      – some systematics cancel

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Short-term Calibrations (cont.)

• At ILC:
  – will need a series of correctors upstream (downstream) of chicane to introduce (take out) tilts/offsets into incoming beam
    • also allows study of beam angle effects on BPM measurements
    • use for precise steering
  – Absolute gain done with BPM movers (?)
    • can do in course of energy measurement
Energy Measurement Procedure

- Continuous stair-step scan of B-field during routine operation

- Each field step *could* begin and end with a corrector sweep for relative gain calibration and mover steps for absolute gain

  *Or:* do this once at beginning and end of complete series of steps
Comments

- Length of each step is determined by
  - intrinsic stability
    - speed of gain drifts
    - mechanical/temperature drifts
  - “settle” time
  - noise
  - target of measurements
    - differentiation along bunch train?
    - statistics on train shape?