Beam Dynamics Issues

D. Schulte

Beam Dynamics Issues for Diagnostics I

- How many diagnostics stations do we need for the main linac and what do they include?
  We likely need at least one station before and after the linac, but what is the criterion to choose their number and location in the main linac?
- Do we need to be able to measure the dipole fields in the cavities to use them as BPMs?
  Measuring the beam offset in the cavities will reduce the wakefield effects but will also increase the cost of the diagnostics. Is the gain worth the price?
- In which positions do we have laser wires, what is their resolution and how will they be used?
  Laser wires are relatively complex devices, so their integation may not always be obvious. Their use in different phases of the machine operation should be clarified to find a good balance between cost and benefit.

Beam Dynamics Issues for Diagnostics II

- Do we need a Shintake monitor in the IP and how will it be operated? Due to the detector the integration of diagnostics at the IP will be complicated. It is necessary to specify during which pahse of the operation which diagnostics equipment is need in the IP.
- Which are the most critical BPMs? We will need to determine the different requirements, e.g.
  - linearity with offsets, beam current changes,bunch length etc.
  - resolution/aperture
  - background sensitivity
  - long term stability
- Where do we need which type of loss monitors and how are they integrated into the machine and used in operation?

Beam Dynamics Issues for Diagnostics III

- How does the beamstrahlung monitor integrate into the machine and the operation?
  The beamstrahlung is hard to miss and can be useful for collision diagnostics. But problem in it's use need to be identified.

- How incoherent pair monitor integrated into the machine and it's operation and which problems could affect it's performance?

- How reliable are the luminosity weighted predictions of

  - energy spectrum

  - polarisation

  from single beam measurements and even from collision measurements?

Beam Dynamics Issues for Main Linac and Cavities

- What is the correct model for the RF errors?
  - How stable are the phase and amplitude from pulse-to-pulse?
  - How stable are they inside of a pulse?
  - How are they affected by beam loading effects?
- If necessary: How stable can the RF for the bunch compressor be made to meet the requirements?
- What is a realistic model for the static and dynamics imperfections?
- What is a realistic wakefield model?

Beam Dynamics Issues for the Simulation Standards

- Derive short term and long term standards for
  - the beam description
  - the lattice description
  - the hardware description
  - interaction with the detector community
- Agree on repositories for
  - codes
  - lattices
  - studies

Beam Dynamics Issues I

- Input to all the questions raised for other working groups
- Derive a bunch compressor lattice design
- Derive a main linac lattice design
- Obtain lattices from beam delivery working group for BDS and post collision line
- Obtain/develop other lattices
- Should we follow the curvature of the earth? If yes, in which way?
  The answer to this question depends on beam dynamics and may be site dependent.

Beam Dynamics Issues II

- Define the static beam-based alignment strategy for

  bunch compressor, main linac, beam delivery system

- Define the feedback systems for

  bunch compressor, main linac, beam delivery system, interaction point, post collision line

- Develop an integrated tuning procedure for the overall LET

- Verify that the strategy is effective

Beam Dynamics Issues III

- Study whether realistic background levels are acceptable (in collaboration)
- Find procedures to reduce the background to acceptable levels
- Develop a complete list of the relevant failure modes
- For each mode find a mitigation strategy
- Verfiy that the strategy is effective