Luminosity Related Measurements

Measured Quantity	*Measurement Principle*	*Comments*
Bunch Current	Bunch Current Transformer	δ I/I < 2% possible Error on total current from DCCT < 1%
Emittance at 7TeV	Wire scanner for I = 10% of I_{nom} Synchrontron light monitor	$\delta\sigma/\sigma$ < 2% between bunches not realistic; most likely 5% ok. For absolute calibration ε proportional β Tail studies require dynamic range > 10^5
β *	k-modulation of insertion quadrupoles – measure change in tune	Evaluation of obtainable precision required
Beam-beam deflection $\rightarrow \varepsilon$	With BPMs	Range of possible beam separation depends on beam current. Orbit difference for maximum kick (2.2σ) > 20μ m in BPMs. Expected resolution: few μ m Study possibility of zoom.
Miscrossing of individual bunch pairs	With LBL monitor? BPMs ?	Require relative resolution between bunches of 2μ m (& 4μ rad)
Beam Loss	BLMs in cleaning section	40 MHz bandwidth; tail studies

The Luminosity Monitor

- Absolute Luminosity Measurements with $\delta L/L < 2\%$ is the task of the LHC experiments

- Absolute Luminosity Measurements with $\delta L/L \sim 5\%$ for luminosities above 10^30 via a machine L-monitor and occasional cross calibrations to the LHC experiments is the task of the machine community.

- Requirements for the Luminosity Monitor:

  1) Available in all 4 Ips

  2) Sensitivity of Luminosity reading to variations of IP position (x*,y* < 1mm) and angle at IP (x*',y*' < 10 μ rad ?) has to be lower than 1%.

  3) The dynamic range with "reasonable" acquisition times for 1% precision has to cover 10^28 to 10^34. For the lower 2 decades of the dynamic range only a much reduced bandwidth is required, as this will be produced with few bunches.

  4) The minimum bandwidth is 132 kHz to see a structure along the batches, a few MHz seems adequate.

- Concerning the two (three) presented proposals:

  1) The SEM monitor will be difficult to make operational in the requested dynamic range of 10^6. It is of no interest to the machine due to the severe bandwidth limitation. The technological alternative of cold silicon counters should be tried instead and studied rather rapidly.

  2) The presented scintillator hodoscope needs much more studies. In case the studies on cold silicon counters are promising, the scintillator proposal should not be followed.

  3) The LBL proposal with the comments below is supported by CERN and in particular by the SL beam instrumentation group.
  This means that the requested studies should be carried out, beam tests should be done in the following two years.
  The situation will be reviewed in spring 2002, after the expected completion of the prototype tests
  At that time also the scintillator proposal or the cold silicon detector will be reviewed.

- Items to be reviewed on the LBL proposal:

  1) Cleaning efficiency of the machine and related background due to charged particles scraping the internal TAS & collimation effect of D1.

  2) Position of the TAN 5m towards the IP (→ optimisation of light path of Synchrotron Light Monitor)

  3) The running scenario for the detector is up to 20 years without access in a highly radioactive zone. Any mechanical design, which weakens the detector, has to be avoided.
     Review plate thickness and distance (0.5 mm) versus bandwidth requirement.

  4) Do we have to instrument the TAS? Can this decision wait until 2002?

  5) Review front end electronics and acquisition system. Make it independent of external machine timing. In case a compromise is needed, the requirement on large dynamic range counts more than high bandwidth.