Minutes of the 186th Energy Calibration Meeting held on 19 Nov 1999

1 Status of spectrometer analysis

Eric Torrence presented the status of the spectrometer analysis. 7 depolarisation fills are in principle available with the 'proper' BPM electronics. Of these 6 have more than one energy calibrated, and 4 have a ramp to high energy. At each energy point a sequence of beam rotations/displacements was performed, and these have been used to calibrate the relative BPM gains, and then measure the bend angle. Together with the integrated field these can be used to calculate the spectrometer determined energy changes between points. All of these have been studied by Eric, but at present fill 6302 (odd integrated field) and 6509 (unstable gains after swap of electronics cards) are excluded from the analysis.

The relative gains are reasonably stable, point to point and fill to fill. The following features have been observed in the analysis:

- Excursions seen in the triplets have been correlated to non-linearities when the beams go *very* off-centre in the BPMs, and are therefore not worrying.
- The bend angle is observed to change when bumps are applied, with a value of 1.6×10^{-4}/mm. This is not understood, but the effect is independent of energy.
- A nice variation of the bend angle on RF frequency is found. The value of the slope, which depends on the absolute gain scale, is close to expectation. [1] For one fill however two points at the same RF frequency give different bend angles. This is not yet understood.

The NMR model has been calculated at those times when the bend angle has been determined, and this has been compared with the spectrometer prediction. The NMR model here includes a proper calculation of RF effects, but is missing small horizontal corrector corrections. The compariosn is shown in the minutes, for both the case where the energy change is defined with respect to the previous point (top plot), and where it is always defined with respected to the lowest energy point (bottom plot). The mean of the spectrometer energy change estimate is close to that of the NMR model (within $\sim 10\,\mathrm{MeV}$). The scatter of Spectrometer - NMR has a full width of $\sim 20\,\mathrm{MeV}$, and this scatter seems to be similar at low energy and high energy (only 3 points though). These results are very encouraging. It is hoped that improved understanding of the systematic effects in the BPM analysis may improve the scatter.

[1] It was previously thought that this scale need only be known at the 10% level. Eric now realises that it must be known better, as the bend angle measurement can be performed at different RF frequencies for each energy points within a fill. It should be possible to fix this gain from the data.

2 Next meetings

Note the following meetings:

- **Wed 24 Nov, 14:00: Rehearsal of SL seminar**
  John Matheson. Place to be announced.
- **Tue 30 Nov, 16:00, IT auditorium: SL seminar on the spectrometer, John Matheson.**
- **Fri 3 Dec, 14:00, Pavilion: Energy Calibration Meeting**
  This will focus on the status of the NMR/Flux Loop analysis, and a first discussion of machine requirements in 2000.
- **Fri 10 Dec, 14:00, Pavilion: Energy Calibration Meeting – T.B.C.**
  If necessary we will have a meeting on this day to further discuss our 2000 machine requests, which will be presented in the Chamonix workshop in Janurary.

Guy Wilkinson, 19 November 1999.