Minutes of the 195th Energy Calibration Meeting held on 30 June 2000

1 Spectrometer analysis

Eric Torrence presented his latest investigations into the spectrometer mystery.

Initially reviewing the datasets, Eric explained that there are 6 MDs this year where spectrometer data were recorded at 2 or more energy points. 4 of these are with electrons, 2 with positrons. 3 of them had RDP performed in parallel. Eric has analysed all of these experiments, apart from a single electron fill without RDP (7491). (A preliminary look at this fill by Bernd Dehning had suggested it to be rather consistent with other electron fills.) Some of these fills are with gated timing; some without gating; some with a mixture.

To help in analysis Eric has developed another method of visualising the data. At a given time/energy, the difference in beam position is plotted for each BPM with respect to the position at some reference time/energy. Any slope coming from beam rotation is that taken out. There remains a series of points for either arm which should be a consistent with a line. Deviations from this line indicate the internal inconsistencies which have already been seen in the data. The difference in slope between the left hand and right hand lines give the change in the bend angle. Furthermore, the left and right handed lines should intercept in the centre of the magnet. Looking at these Ericograms it is easy to judge the consistency of the data, to estimate how masking certain BPMs will affect the result, and to observe how problems evolve with energy.

From Eric's plots and some (limited) numerical analysis the following conclusions can be reached:

- The positron fills give results which are much closer to expectation and more internally consistent than the electron fills. (Arguably fill 7391 is nicer than 7380...)
- The electron fills show very reproducible behaviour, with a large systematic effect seen. Looking at the plots one is very tempted to blame the rightmost BPM (no. 3). But there is not enough redundancy in the data to say this with certainty.
- At 50 GeV in one electron fill the wigglers were turned on and off. The Ericogram shows a correlated problem appear in the bend angle data, similar to that seen after ramps. This is consistent with synchrotron radiation being the/a cause of the problem.
- On the whole the ungated and the gated data give similar results, although there are exceptions (fill 7380). There is a prejudice to prefer the ungated data.

In terms of analysis, it remains to make a more careful numerical evaluation of the data, using the correct inputs (for some of the later fills the magnet behaviour has been assumed from previous experience). Interesting questions are whether the electron data agrees with the positron data if the outermost BPM is discarded, and how this agrees with the NMR expectation. It will also be important to analyse some of the 1999 data in a similar manner. John Matheson is developing a parallel analysis chain and will help to tackle these tasks. Eric also suggested that it would be perhaps useful to refit the bend angle changes using the centre of the magnet as a constraint – this will give improved robustness.

Concerning further measurements, the meeting agreed on two parallel requests:

- In order to accumulate data which can be used (we hope) directly in the energy determination, we require periodic short fills with positrons, ungated timing and lowish currents (in order to minimize any synchrotron related problem).
- In order to understand the problem further and test the synchrotron radiation hypothesis, two short electron fills with high and low currents respectively should be taken.

Finally Eric explained that in order to investigate whether the problem was localised in particular BPM buttons, he had calculated the x-position using only the top and bottom pairs of buttons respectively. Comparing the results enables systematics to be exposed. Differences are seen, but the firm conclusions are difficult to draw.

2 Gain and temperature analysis

Esther Barbero presented an analysis of the relative gains of each BPM made at each energy point in the recent RDP electron fill (7519). There is an change in result at the percent level. Eric Torrence pointed out, however, that the beam was sufficiently well re-positioned for this to induce only a small error.

The temperature behaviour for this and the following positron fill (7520) show the expected characteristics.

3 Other matters

- Work on the 2000 preliminary energy files is ongoing. The miniramps have caused many technical problems, but these are being overcome. A technical version of the file was released this morning for experiments to gain familiarity with the new format and provide feedback.
- Please send me your vacation absences to Guy! This will be useful input for planning measurements over the summer months.
- Giuseppe Mugnai asked that the data be studied in recent fills for the spectrometer NMRs. His guess is that replacement is necessary. Guy agreed to do this.

4 Next meeting

It is hoped the next meeting will be on Friday 14 July in which Pete Renton will give a rehearsal of his Osaka talk – to be confirmed.

Guy Wilkinson, 30 June 2000.