Minutes of the 180th Energy Calibration Meeting held on 9 July 1999

1 Polarisation plans and spectrometer status

It had been agreed in the scheduling meeting that there was a possibility of a calibration MD the following Tuesday (13/7/99), during cryo de-icing, but this might take second priority to the commissioning of a new physics optics. In this case a calibration would be scheduled the week starting 19/7/99.

The spectrometer BPM electronics are still not ready. Following pressure from the ECAL group, the firm has agreed to work through the weekend in an attempt to deliver 4 cards for Monday, in time for any calibration on Tuesday. The meeting considered this good news, but was sceptical that the cards would be sufficiently understood on this brief timescale to yield useful data during such a calibration. Therefore it was agreed to plan for a possible measurement on the Tuesday independent of the spectrometer.

The following decisions were taken:

- Any calibration on 13/7/99 should put priority on obtaining a high energy point. Therefore we should aim to depolarise at 41 GeV, 44 GeV and 55 GeV (anything higher a bonus!).
- Assuming operational BPM electronics, any planned calibration in the week starting 19/7/99 should request sufficient time to record as many points as possible (eg. 5), and monitor the spectrometer behaviour throughout.

News since meeting: the bad news is that optics commissioning has indeed precluded a calibration; the good news is that several BPM cards have been delivered and at first sight appear to function well.

2 Preliminary analysis of 1999 data

The write up detailing the preliminary analysis of the existing 1999 data is available on the web as ECAL 99/02.

3 Analysis of MBI data

Federico Roncarolo presented the conclusions of his analysis on the MBI data.

He reminded us that in going from the ISR lab to the tunnel there has been a change in the readings of the type 2 'non-connection side' probe. He gave correction factors at two energies to account for this shift.

Using the two NMRs mounted side by side on the mole (separation 15 mm), the transverse field gradient can be studied in the core of the magnet. This is found to be a relative $2.8 \times 10^{-6}\,\mathrm{mm}^{-1}$ for the two energy points considered. This conclusion is consistent with the results presented by Juan Palacios using the arm data. Recall that the transverse gradient for the total field integral is even less than this, due to a cancellation coming from the end field contribution.

Mole maps made with a vertically displaced NMR and coil indicate a relative vertical gradient in the *total* field integral of 4×10^{-6}.

Fits performed to the mole data give good residuals not only for these data themselves, but also for the arm data. This indicates excellent stability in going from the arm set up in the ISR lab, to the operational set up, including vacuum chamber, in the tunnel.

4 Study of the WPS data from calibration fill

Jan Prochnow presented analysis of the wire position sensor (WPS) data monitoring the movements of the BPMs during the last calibration fill (5799, 25/6/99).

A significant temperature excursion of 0.8° was seen on the BPMs during the fill. This was not correlated to any ramp, and the cause is at present not understood. A corresponding change is seen in the WPS data. When the WPS data are corrected for temperature effects, stability is seen to $\sim 1\mu$m.

The data from the two WPS either side of the BPMs can be combined together to give both the movement and the expansion of the BPM. When this is done for station 1 a movement (expansion) of 1.9μm (2.5μm), after temperature correction is found. Similar values are seen for the other stations.

It is desirable to understand these movements better, and have lower temperature excursions in future fills.

5 Effect of temperature on BPM readings

John Matheson presented a theoretical study of the effect of temperature excursions on the response of the BPMs. This built on the mathemetical model he had presented in the meeting of 12/5/99.

A BPM is a block with an elliptical hole at its centre. The beam position is deduced from 4 buttons around the hole. The position calculated from a simple combination of the button data differs from the true position due to non-linearities, which in principle can be accounted for. However in the centre of the BPM these non-linearities can be neglected. A uniform expansion of the BPM due to temperature was considered, and it was seen what change arose in the calculated position, assuming the linear approximation.

It was found that close to the centre of the BPM, biases of $\sim 0.1\mu$m are induced by a 1° temperature change. These are negligible in the spectrometer analysis. The meeting however was interested to learn what biases would result for a more off-centre beam, and what is the expected degree of off-centredness during operation (< 1mm ?). A further question concerned the effect from any non-uniform expansion.

6 Rehearsal talk for EPS 99

The organisers of EPS 99 have finally agreed to the energy group making a brief presentation in the electroweak parallel session. This will be given by Eric Torrence. Eric presented a rehearsal of the talk in the meeting. It contains a brief overview of the magnetic extrapolation method of the LEP2 energy determination, but concentrates on the status of the spectrometer.

7 Addition to the transparencies

Appended to the copies of the transparencies of the meeting are plots concerned with the k-modulation analysis produced by John Matheson, and relevant to the meeting of 11/6/99.

8 Next meeting

Due to conference committments and vacations, a date for the next meeting has not yet been fixed. When one is decided it will be announced to the distribution list.

Guy Wilkinson, 13 July 1999.