Minutes of the 175th Energy Calibration Meeting held on 30 April 1999

1 Polarisation plans

Massimo Placidi presented the conclusions of a polarisation meeting earlier in the week which attempted to define calibration priorities for the start of the run. (The complete list of aims and requested time, as presented by Pippa Wells in Chamonix, can be found in the attached transparencies.) The following were defined as objectives for the first 1–2 weeks:

- Re-commissionning of 60/60 optics
- Re-commissionning of polarimeter
- k-modulation with 60/60 optics (24 hours)

Note that in contrast to the proposal at Chamonix, the k-modulation will be performed with the calibration optics. It is envisaged that a later experiment may cross-check the results with physics optics, and at high energy.

The below were identified as minimum goals to be achieved before the end of June:

- A multi-point fill of 3/4 points, hopefully spanning a 41-61 GeV lever arm. (16 hours)
- A cross-check calibration with physics optics at 45 GeV

People were reminded that flux-loop cycles accompanying these measurements, and in isolation, were very important.

2 Status of spectrometer

Mike Hildreth reviewed the status of the spectrometer project.

All the equipment is now installed in the tunnel, with the exception of new BPM readout electronics (expected in June) and some shielding for the wire position sensors. Already data have been looked at from the wire position monitors. These indicate that a resolution of much better than a micron is attainable. However, some probes are noisy, and certain systematic effects remain to be understood; for instance a small oscillation of a few microns is observed with a period of 30 minutes.

The mapping campaign of the MBI magnet had been a great success, and the team are to be congratulated. Maps were made at many different energies, at different temperatures, and at different vertical and horizontal positions. Present analysis indicates that the field integral can be controlled to a relative precision of $\sim 5 \times 10^{-5}$ (normalised to the reference probes), with the bulk of the scatter coming from the knowledge of the end field. A more detailed analysis may improve the situation still further. A useful list of likely systematics was presented to focus future work. One of these effects concerns the stability of the field in the ISR laboratory and the tunnel. Studies of this with the 'mole' are reported below.

3 MBI field studies with the 'mole'

Federico Roncarolo presented a status report of his analysis of the spectrometer magnet field integral from the mole data. The mole is a chariot which moves inside the vacuum pipe carrying two NMRs, and a coil which is used to sample the end field. Its data are complementary to those taken with the moving arm in two aspects. Firstly the mole mapped the field with the vacuum pipe in place, the moving arm could not; therefore a comparison between the two procedures constrains any modification to the field induced by the presence of the vacuum pipe. Secondly, the mole took data both in the ISR lab and in the tunnel. Comparison between these data sets will indicate whether or not the magnet field characteristics are the same in both locations. The data taken in the ISR are at 44 and 100 GeV. Those taken in the tunnel are at 41, 44, 60 and 100 GeV.

Federico has observed that one of the four reference NMRs on the magnet ('type 2, NC') shows a different field in the tunnel than in the ISR by an amount 4×10^{-5}. These reference NMRs were taken out and then reinserted when the MBI was moved to the tunnel. Such was the care in mounting the devices, however, that Bernd and Giuseppe are surprised by this change in field. Despite this, in calculating the normalised field integral the other reference probes may be used, or the shift in this probe may be compensated for. When this is done a comparison between the data taken in the tunnel and in the ISR exhibits a scatter less than 2.5×10^{-5} (relative). It is also to be noted that the data in the tunnel are taken with a more extreme temperature variation. A better understanding of the relative temperature coefficient of the end fields may therefore allow the tunnel-ISR scatter to be decreased still further.

Comparing the mole data and the arm data shows a field map with very similar structure, and local differences $\sim 3 \times 10^{-5}$. The comparison of the full field integrals, however, are still under study.

Giuseppe Mugnai reminded the meeting that data were also taken in the ISR with a rotating coil, in order to sample the quadrupole and sextupole components of the field. Analysis of these data will be presented in a future meeting.

4 A further look at E_{pol}/flux loop/NMR linearity

Pete Renton presented the status of his continued study of the 1998 polarisation and flux loop data.

For the two 5-point fills available (5214 and 5337) Pete has plotted the residuals of the individual NMR fits. The conventional 'banana plots' are merely made from an average of these individual plots, but the latter have not yet been studied in isolation. From examining these plots it is clear that there is significant variation NMR to NMR. The fact that the average residual plot of one fill (5337) shows a significant banana is chance sampling of the NMRs which were working for that fill. What is more surprising is that there is significant variation in the shape of an individual NMR residual plot between the two fills. This variation is to some degree diluted in the average plot, so that the average residuals made with the same subset of NMRs in the two fills look very similar (already observed).

Pete also fitted the NMRs to the complete ensemble of 1998 flux loop data in the 41-61 GeV range. The resulting average residual plot shows less variation than the corresponding E_{pol} plot, with no point exhibiting more than 0.5 MeV difference from zero.

Finally, Pete looked to see if any correlation could be observed between the individual NMR residuals at physics energy obtained from the flux loop and E_{pol} fits (both in the 41-61 GeV regime). None was observed.

5 EPS conference contributions

The subject of energy group contributions to the EPS conference was discussed. It was agreed to send in abstracts for two talks, one concerning the energy calibration procedure and results followed in 1996–1998, and one concerning the method and status of the spectrometer. These were sent off the following Monday by Mike Hildreth.

6 Next meeting

The next meeting will be at 14:00 on Wednesday 12 May in the pavilion. (Note unusual time)

Guy Wilkinson, 10 May 1999.