Minutes of the 142nd Energy Calibration Meeting held on 27 October 1997

Matthew Chalmers from ALEPH attended the meeting. He is interested in getting involved with the spectrometer project.

1 Reminder of 1993–1995 status

Draft 2 of the paper has been made available. Everyone is encouraged to read it. There is a hard deadline for comments by 4 November.

2 Radiative return events - DELPHI

James Libby presented an update of the study of $\mu\mu\gamma$ events in DELPHI, where the photon goes down the beam pipe.

The effects of ISR modelling have been examined by comparing fits to 100k (10 fb-1) of KORALZ4.2 and DYMU3 events. The fitted beam energies are different by 135 MeV (with statistical errors of about 17 MeV for each fit).

Shifts in the beam energy from smearing the tracks with these large samples are negligible. A systematic bias of the tracks to larger or smaller theta makes a shift of 8 MeV for a 1 mrad shift and 50 MeV for a 5 mrad shift.

More work on the modelling of ISR is clearly needed. Work is in progress in DELPHI on using hadronic events.

3 Radiative return events - ALEPH/OPAL status

Some very preliminary numbers have been circulated, but ambiguities remain as to whether each experiment is quoting the extrapolation for 500pb-1 in 1 detector or 4 detectors, and the error on the beam energy or the centre-of-mass energy. These should be sorted out for the next meeting, where a more complete comparison of the estimates and list of systematic uncertainties remaining to be addressed can be made before the LEPC on 11 November.

4 A first look at the rise in a fill for 1997

Peter Renton has started to look at the rise due to temperature and train effects in 1997. He has made a fit for the rise in each NMR, allowing one temperature coefficient and three terms to describe the train rise to float. Fills from 3947 have a bending modulation at the start. Peter has used all fills from 3928 to 4181. He has refitted the 1996 data using the same procedure for comparison.

Several examples of the raw data for particular fills compared with the fitted model for specific NMR's and for the NMR48 combination were shown. The temperature rise during a fill is around 1 to 2 degrees.

In a summary table, the fitted values of CTmax (with CT fixed to -3×10^{-5}) are listed. A tick or cross indicates whether the contribution to the rise from the train term is significant or not. Some probes were not available for the 1996 data. The mean value of CTmax+CT is $(3.6 \pm 1.1) \times 10^{-5}$, but for the NMR48 combination the value is 12×10^{-5}.

Peter has also made a comparison to the resonant depolarisation energy values, but only for the NMR48 combination. This shows the same trends as the results shown by Guy averaging over all NMR's (see below).

5 Analysis of Epol vs Enmr

Guy showed updated studies of the following fills:

- 4000 and 4274 (90/60 optics, peak-2 only),
- 4121 and 4237 (60/60 optics, peak-2 and 50 GeV),
- 4242 and 4279 (60/60 optics, 41, peak-2, 50 and 55 GeV).

For each fill with more than one energy point, a calibration coefficient to convert Gauss to GeV is calculated for each probe for the peak-2 point. The deviation of Epol-ENMR is then examined for all the other energy points (using the same model as for 1996 to correct for tides etc). In each probe, the behaviour from energy point to energy point is very well reproduced from fill to fill. However, from probe to probe there are different slopes, positive and negative. It is worth noting that for probes in a string of magnets in the same octant, the gradients can be of any sign.

Taking an average over all the probes, there is a slight negative slope. If an error is derived from the spread of NMR values at each point, then the average slope is -0.26 ± 0.10 MeV/GeV. If the second fill with four points is neglected the slope is consistent: -0.21 ± 0.13 MeV/GeV. If the average is made treating all probes equally instead of giving each octant equal weight, the slope is -0.19 ± 0.13 MeV/GeV. In other words the slope is reasonably robust and would give around a 10 MeV correction at physics energy.

The slight negative slope of the average NMR energies compared to the polarisation energies prompted the suggestion that the NMR field plate leads to a remnant field at zero current, and therefore that an offset from zero as well as a calibration scaling factor was needed for each NMR. (This would require two energy points just to calibrate the NMR's). However, the observation that in some probes the gradient has the opposite sign doesn't really support this.

Guy also showed a comparison of the 90/60 and 60/60 fills. He used fill 4000 to fix the scale factor for all NMR's at peak-2, and then compared the NMR and polarisation peak-2 points in all other fills. The 60/60 fills were all 3–4 MeV higher. In the following discussion it was said that in 1992, differences of around 2 MeV were calculated as typical between different optics. Joerg Wenninger will try to dig out this calculation and reexamine it, in particular with a view to deciding how to apply this difference at physics energies.

6 Comments on the NMR/flux-loop comparison

Joerg Wenninger gave a verbal plus handwaving description of the NMR/flux-loop comparison (really ... you just had to be there...). Joerg makes a straight line fit to the NMR and FL values, allowing an offset from zero (because there is no absolute calibration of the FL). He then examines the deviations from this straight line. The average of all the NMR's shows very small deviations, but from probe to probe there are different shapes, with positive and negative slopes, and sometimes a local slope in the 41-55 GeV range that doesn't agree with the overall slope.

A careful comparison of the NMR/FL discrepencies with the NMR/pol discrepencies will be made as soon as possible after the 102/90 optics tests are complete.

7 Dispersion measurement

Joerg Wenninger and Alfons Weber will try to measure (or at least constrain) the opposite sign vertical dispersion at the IP's during a physics fill in the next day or so.

Note added after the meeting - this was fill 4360, which had a very large number of beam beam deflection and luminosity vernier scans.

8 Next Polarisation MD

After some discussion of the work presented above, it was agreed to try to measure 41/50/55 GeV in the same fill during the next MD. During the long polarisation MD when there was a cryogenics problem at DELPHI, about 1.5% polarisation was achieved at 60 GeV, but there is not enough time available in this next (13 hour) session to make another full investigation of 60 GeV.

9 Next Meeting

The next meeting will be at 15:00 in the Pavillon on Friday 7 November. At this meeting, we need to pull together the status of all the analyses and projects for a report in the closed session of the LEPC on 11 November.

Pippa Wells, 28 October 1997