Minutes of the 108th Energy Calibration Meeting held on 25 October 1996

1 RF alignment cross checks

Mike Hildreth reported on RF alignment cross checks caried out during the recent startup. The first check verified that the Cu cavities are in exactly the right position at IP's 2 and 6, so there is no genuine path length difference between them.

The second check verified the positions of as many SC units as possible w.r.t. a pair of Cu cavities at IP2, instead of the usual measurement w.r.t. Cu cavities at IP6. The misalignment w.r.t. IP6 is often not equal to the misalignment w.r.t. IP2. The mean "difference of misalignments" for all cavities is –0.9mm, with an r.m.s. of 2.4mm. However, splitting the sample into cavities left and right of an IP the means are -2.2 and 1.1mm respectively, with rms 1.8 and 1.5mm. (The sign convention is such that negative misalignment means too close to the IP).

These measurements should allow a better constraint on the RF model uncertainty.

2 More on the energy change in a fill due to temperature

Guy Wilkinson (slides presented by Mike Koratzinos) has continued to work on using the Enrico Bravin et al temperature model on the LEP tunnel data.

In the real LEP situation, the dominant contribution is from the Tmax term, so that detailed worries about measuring the cooling water temperature are not significant.

The temperature model prediction is compared to the NMR data prediction as a function of time of day. In the quiet period, the temperature model should explain all the rise that is seen. The values of rise in energy per hour are 0.17 ± 0.03 MeV/hour and 0.03 ± 0.02 MeV/hour for the NMR probes 4 and 8 respectively, compared with a rise due to temperature of around 0.2 MeV/hour.

The implications of the new temperature model for the Z scans was investigated by comparing the old (classical) and new (Enrico) models, assuming that the total rise is due to a train rise plus a temperature rise. The train rise is assumed to be the same for 93 and 95, for the NMR48 combination and for the whole ring.

The differences in mean rise for a 12 hour fill due to temperature, (Enrico model minus classical model) are approximately: 1.4 MeV for 1995 NMR48, 0.6 MeV for 1995 ring, 0.2 for 1993 ring. If the Enrico model is correct, this implies that the rise due to trains has been overestimated by 1.4 MeV, and the rise due to temperature has been underestimated by 0.6 and 0.2 MeV (for 1995 and 1993 respectively). The overall rise has therefore been overestimated by 0.8 and 1.2 MeV (for 1995 and 1993 respectively). A cross check is planned of whether the coefficients for the Enrico model evaluated with the ISR test dipole can be reproduced using 1995 and 1996 lep data in the quiet period.

3 Cross check of the temperature model

Angelika Drees presented cross checks of the temperature model with the 1995 NMR data.

The model predicts a different behaviour for octant 3 (equipped with NMR4) compared to the other octants, but the model prediction fits the NMR4 data better than the NMR8 data. The agreement improves if only fills with bend modulation are considered for NMR4. The temperature model can fully explain the rise of NMR4 in the quiet period for the fills with several polarisation measurements.

This complicates the prescription for averaging temperature behaviour where octant3=NMR4 should have 1/8 of the weight, compared to the train behaviour where the weighting should be 3:5.

4 Influence of the dipole gap on the temperature behaviour

Enrico Bravin presented studies in the ISR to correlate the temperature gradient effect in the new model with the size of the gap in the magnet core. An apparatus to measure the gap size to the required precision has been developed. The gap height variations are of the right order of magnitude to explain the magnetic field variations.

The temperature model has been reexamined for smaller temperature variations, and found to still give a good description. The coefficient for the dependence on the minimum temperature reached has been revised as a result to 4.15E–5 (compared to the previous value of 6.15E–5).

5 Polarisation measurements

The attempt to measure the beam energy by resonant depolarisation at the end of fill during the recent Z calibration running failed. An additional peak-2 measurement will therefore be requested, in addition to the higher energy polarisation MD at the end of the 90/60 running.

6 Next Meeting

The next meeting will be at 15:00 on Friday 8 November in the pavillon.

Pippa Wells, 4 November 1996.