Minutes of the 178th Energy Calibration Meeting held on 11 June 1999

1 1999 polarisation and flux loop: status, analysis and plans

The first attempt at calibration this year was successful (fill 5670, 7-8 June). The energy was measured both at 41 and 45 GeV. The fill ended with lost beam when attempting to optimise the polarisation at 50 GeV.

Pete Renton has had a preliminary look at the data from this fill. He finds that many NMRs do not lock, and is only able to find 6 devices which are present at both points. (By loosening the criteria in his interpolation algorithm, it may be possible to include several more probes which are observed to lock intermittently.) He has passed the coefficients from his fit to Guy Wilkinson who has applied them to the 192 GeV physics running. It is seen that this calibration gives a beam energy within 10 MeV of that obtained using the 1998 coefficients and the same subset of 6 NMRs. Thus the first indications are that the calibration is rather stable. It is also noticed that the dipole energy has risen by 20-30 MeV throughout the run so far.

Pete has also analysed the 4 1999 flux loop experiments. He has fitted the NMRs against the flux loop in the 40-60 GeV interval and then compared the expected flux loop reading from the NMRs with the observed reading at 98 GeV (ie. an identical procedure to previous years). He finds a mean offset of about -10 ± 10 MeV which is stable between the experiments. This is similar to what was observed in 1998. He has also looked at the mean offset of each individual probe, averaged over the experiments. This has a significant scatter, but the correlation in probe offset between 1999 and 1998 is found to be remarkably good.

The meeting agreed that it was desirable to attempt another calibration in the near future. Other machine activities meant that sometime in the period 21-25 June was suitable. Giuseppe Mugnai and Bernd Dehning undertook to obtain an access in the period prior to this, to replace those NMRs which were most radiation damaged.

2 K modulation

John Matheson reported on the analysis of the arcs k-modulation data, which were taken a few weeks ago.

He outlined the analysis procedure. The offsets for each BPM with respect to its associated quadrupole are calculated and those with an acceptable error ($< 80\,\mu$m) are deemed good measurements, and are propagated for use in the BOM software.

The mean offset for the 1999 data is $41\,\mu$m with an RMS of $150\,\mu$m. This is to be compared with a mean of $38\,\mu$m and an RMS of $178\,\mu$m in 1998. Thus the results are seen to be stable. A detailed comparison quad by quad has yet to be made.

The analysis of the straight section data is underway, and measurements are still being made of the QS0s.

3 Spectrometer news

Bernd Dehning reported that all the electronics cards for the spectrometer BPMs had now arrived and been installed.

Bernd also presented results of Federico Roncarolo (absent) on the comparison between the MBI field integral measured in the ISR lab with the moving arm (bench), in the ISR lab with the 'mole', and in the LEP tunnel itself with the mole. These three configurations cover many changes in conditions, namely: with and without the vacuum pipe, before and after transportation, different environment, different power converters, removal and re-insertment of the reference NMRs. A fit between the readings of a reference NMR and the field integral using the full ensemble of data indicates a stability of a few 10^{-5}. The result was checked for two of the reference probes. This comparison gives confidence that the detailed measurements made with the bench in the ISR lab can be used in the analysis of operation in LEP.

Giuseppe Mugnai reminded the meeting that a final set of magnetic measurements made of the MBI, using a rotating coil, was still under analysis and would be presented in the near future.

4 Energy determination through Q_s

Joerg Wenninger said that he and Anke-Susanne Muller intended to request two periods of machine time for the measurement of the energy with the Q_s method (see last meeting). The first of these would be used to measure the parasitic mode losses, an important systematic in the method. The second would be to collect data for an actual energy measurement. It would be best to perform the latter when the spectrometer was fully commissioned.

5 Any other business

Patrick Janot told the meeting that a scheme to increase the upper energy reach of LEP in the year 2000 was under consideration. The proposal is to increase the dipole field by adding windings to the quadrupoles and sextupoles, and by equipping corrector magnets which have been remaining uncabled since the start of LEP. Together these upgrades would allow an extra ~ 1 GeV in centre-of-mass energy. He asked what consequences this work would have for the energy calibration.

The additional windings on the quadrupoles could only be installed if the k-modulation cables were removed, thereby making future k-mod measurements impossible. It seems though that the BPM offsets are reasonably stable, year to year. A more serious problem

is that the determination of the energy through the extrapolation method would acquire a larger uncertainty due to the additional bending field outside the dipole magnets. It was felt impossible to estimate the scale of this uncertainty on a short time scale. This problem, however, will be irrelevant for determining the energy with the spectrometer method.

6 Next meeting

The next meeting will be at 14:30 on Friday 25 June in the pavilion. (Note the earlier starting time, which we intend to adopt as default for subsequent meetings.)

Guy Wilkinson, 14 June 1999.