Minutes of the 204th Energy Calibration Meeting held on 15 December 2000

1 RF studies update

Joerg Wenninger presented the latest update on his continuing studies of the RF sawtooth with the BOM. (See minutes of previous two meetings for introduction to this topic.)

Joerg has investigated what size of error enters his RF/BOM fits from systematic effects arising from time lags in the RF logging etc. This error is in addition to the fit error itself and the BOM calibration/dispersion error, which have already been considered. For the 'RF MDs' he has compared the BOM and model prediction for two nominal RF configurations. Scaling the errors to give an acceptable χ^2 leads to the conclusion that the typical systematic uncertainty is $3-4$ MeV.

Joerg has attempted to tune the RF model to the data of the two MDs, tuning on both the relative BOM data and the Q_s measurements. The free parameters are for each IP a voltage calibration factor and a phase shift. These are corrections on top of the initial Ernst Peschardt misalignments and voltage calibration factors. As MAD is not suited for MINUIT manipulation the fit has been performed by trial and error, and informed guesswork. Values of $1-3\%$ are obtained for the calibration factors and $2-3^\circ$ for the phase shifts. (Note that there is a global phase shift which can be normalised out, so that what counts are the relative phase shifts between IPs.) These parameters give in general excellent agreement between the model and the data, but may not be the only solution. Furthermore these parameters give an accurate prediction of the absolute BOM sawtooth, good to about 5 MeV per beam.

Sawtooth corrections at the spectrometer for the untuned model and for the model after fitting have been calculated at the time of the energy measurements. These have been included in both the analyses of Esther Barbero Soto and Eric Torrence, and compared with the baseline numbers using the naive, online model. The mean result for all the data differs little for the three cases, but the discrepancy between the electron and positrons results is significantly different for each set of corrections, varying by $20-30$ MeV. This indicates how sensitive the general consistency of the data is to the details of this modelling, but that to first order the mean result is quite robust, because of the anti-correlation the electron and positron correction.

At present however, the results of the tuned model cannot be trusted for the full data set. Joerg has looked at several example orbits where the RF system was stable throughout the year and found that the BOM data diverge from the model predictions to a large degree (up to 35 MeV), but in a manner with an evident time structure. The next step is to accommodate this time evolution in the tuning and obtain reliable corrections (with errors) at the times of interest.

2 Analysis status

Esther presented a set of results for each of the sawtooth models provided by Joerg, with and without an ambient field correction, and with and without a WPS correction.

As remarked above, the alternative RF models do not affect the mean result greatly, but rather improve/degrade the consistency of the data. The ambient field correction changes the mean result by about 14 MeV. The WPS correction changes the mean result by less than 2 MeV.

3 Summary of instrumental systematics

Esther showed some key slides from a talk she had given the previous week in a BI meeting which summarises many of the tests performed in the laboratory and in the tunnel, investigating issues such as the BPM electronics' stability with respect to temperature, frequency, beam current etc. From studying the conditions of the run it is concluded that most of these effects should induce systematic errors of less than $1\,\mu$m.

4 Status of dismantling

Giuseppe Mugnai told the meeting that the dismantling of the spectrometer was proceeding well, and it is possible that the dipole will be removed before Christmas. Re-mapping is scheduled to start at the end of January.

5 Next meeting

To be announced.

Guy Wilkinson, 16 December 2000