Minutes of the 181st Energy Calibration Meeting held on 2 August 1999

1 Rotating coil analysis of MBI field map

The meeting welcomed Oreste Pagano. Towards the end of the MBI mapping campaign in the ISR lab, Oreste, with help from Giuseppe Mugnai and others, mapped the field profile of the spectrometer magnet with a rotating coil device. This is complementary to the NMR based maps of the moving arm and 'mole' since an analysis of the rotating coil data is sensitive to higher order (quadrupole, sextupole etc) components of the field.

Maps were taken at 44 and 100 GeV. The field probe (which contains 3 coils – one central, and two displaced) was placed at 10 measuring positions along the magnet and data were taken. To obtain absolute values of the integrated field requires calibrating the position of the coils and measured values against the NMR maps. This calibration can then be used in those measuring positions sampling the end field. Uncertainties in the length of the detection region means that it is not useful to compare the absolute values of the total field integrals between the NMR and rotating coil maps. Rather one should study the ratios at the two energies, and what the coil probe can tell us about the higher order harmonics.

In the copies of the transparencies can be seen plots marked 'multipoles'. These show the relative strength of the n^{th} pole components to the dipole components, for each measuring position. The normal components are shown first (dark shading) and then the skew components (light shading). Some plots include only the central 6 measuring positions (core field), while others have the full 10 positions (end fields + core). It can be seen that in core region the quadrupole and sextupole components are mainly skew, whereas in the endfield region the normal components dominate. The reproducibility is good.

From Oreste's measurements it will be possible to estimate possible systematics coming from the horizontal and vertical field gradients. It will also be useful to compare the ratios of the field integrals at the two energies as returned by these measurements with the NMR based readings.

Federico Roncarolo concluded the discussion by stating that the NMR maps of the MBI had very little sensitivity to any horizontal field components. This emphasises the worth of the rotating coil data.

2 Status of spectrometer

Since the last meeting all the BPM stations have been installed with readout cards. The recent long polarisation experiment (22 and 23 July) has provided useful data to learn about the performance of the BPMs over a long period of time and at different energies. Bernd Dehning showed an analysis of the data from this period.

Bumps were applied to calibrate the BPM readings (a factor of $\sim 2.3\,\mu$m/mV is obtained). The data from individual stations show horizonal drifts of order $100\,\mu$m during nominal stable energy operation. However this effect disappears if the triplet residuals are formed. These residuals show resolutions of $3\,\mu$m for the right arm (stations 1,2 & 3) and $1.6\,\mu$m for the left arm (stations 4,5 & 6).

Data were also shown from the period where the RF frequency was changed, in order to vary the beam energy. It happens that for these data the right arm resolution is worse than before. What is interesting is to ask whether the bend angle between the arms varies as expected when the RF frequency is changed. At the time of the meeting the analysis had not progressed sufficiently to be sure, but subsequent work by Eric Torrence indicates a dependence which is as expected. Note however that to see this correlation significant, and potentially worrying, effects need to be corrected for, in particular a (current dependent ?) drift.

A BEUV analysis of John Matheson indicates that the beam sizes vary by $\sim 5\%$ during the RF frequency changes.

In conclusion, progress has certainly been made, but work is required to understand systematic effects, and the inferior resolution of the right arm triplet (presumably due to a single card?). Improvements already performed/ scheduled include a change of the noise filter from 1 Hz to 0.1 Hz, and a speed up of the data acquisition.

3 Summary of polarisation status

For convenience I include in these minutes a summary of the energy points so far calibrated this year. This was not shown in the meeting.

Fill	Date	Optics	41 GeV	44 GeV	50 GeV	55 GeV	60 GeV
5670	7/6/99	60/60	Y	Y			
5799	25-26/6/99	60/60	Y	Y	Y		
5969	22/7/99	60/60	Y				
5971	22/7/99	60/60		Y	Y		
6087	8/8/99	60/60				Y	

It is desirable to obtain more high energy points (55 and 50 GeV), and to record more multipoint fills. Of these the former is of more importance, as from previous years' experience I believe we know what to expect from fill-to-fill scatter. And let us not forget the spectrometer...

4 Next meeting

I propose we meet again at 14:30 on 27/8/99. This will be confirmed by e-mail.

Guy Wilkinson, 13 August 1999.