January 14, 1999
http://www.cern.ch/LEPECAL/spectro/minutes/1998/mtg23.ps

LEP SPECTROMETER PROJECT

Summary Notes of the 23^{rd} meeting held on January 14, 1999

Present: W. Coosemans, D. Cornuet, B. Dehning, M. Hildreth, N. Hilleret, J. Matheson, J. Montes, G. Mugnai, Y. Muttoni, S. Myers (chairman), J. Palacios, J. Prochnow, F. Roncarolo, M. Sassowsky, E. Torrence, L. Vos

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Comments to Summary Notes of previous meeting - None

Update on Hardware Status - Y. Muttoni showed a detailed schedule of the fabrication, assembly, and bake-out procedures for the Spectrometer components (See copies, attached). The existing absorbers will be remounted, surveyed, and sent to Building 927 by 22 January. The new absorbers, of which there will be 6 installed and two spares, are being fabricated now. Six new absorbers should be available in Building 927 for bake-out by 1 February; it's estimated that one pair per week will be ready starting 22 Jan. The pickup blocks and their associated supports should be finished by 22 January, and will be surveyed and moved to Building 927 by 1 February. The critical item on the schedule is actually the stone support blocks, which may not be finished until 5 February. This leaves one week for assembly and alignment in Building 927, and one week for bake-out, before the components are supposed to be installed in the tunnel. Yvon expressed the hope that there would not be a conflict with the bake-out so that all 6 BPM stations could be done at the same time. The designs for the "non-time-critical" items of the BPM station, like the wire sensor supports and the their shielding, are almost finished and will be ready on time.

Planning Schedule for the 1999 Installation - J. Montes gave an overview of the current schedule for installing the Spectrometer components in the LEP tunnel (See copy, attached). The BPM stations are expected to be positioned in LEP starting 22 February. The MBI will be moved on 12 March. As far as we know, nothing in the schedule has slipped so far. LEP closes 16 April.

Status of BPM Electronics and WPS System - B. Dehning gave a brief statement. We have decided to pay BERGOZ $2/3$ of the full cost of the BPM electronics at this time, pending the delivery of a design which includes a working "gating" mode. This will allow us to measure the electron and positron positions simultaneously. This feature did not work well enough in 1998 for it to be usable. A meeting was held with BERGOZ right before the Holidays to discuss this, and we will meet with them again towards the end of January to discuss their proposals for arriving at a completely functional set of electronics that meets our specifications. As far as the WPS system is concerned, we are satisfied with the performance in terms of resolution and are designing the sensor supports to be adjustable, in order to centre the wire, and to be shielded, to protect them from radiation. This should eliminate the "jumps" that we saw in 1998. The order for the rest of the wire sensors is being prepared by G. Mugnai. A new student, J. Prochnow, has arrived and will work on understanding the wire system in detail for his thesis.

Results from the Mapping in the ISR - D. Cornuet showed an overview of the behaviour of the Hall probes used to map the end field regions of the dipole. Essentially, the Hall probes we are using have a constant $2.5\ \mu r_V$ noise, which, at the 0.1 Tesla field of the MBI, corresponds to fluctuations of order 2.5×10^{-4} on the measured field. We believe that the noise is essentially random, so that repeated measurements under the same conditions should be able to reduce the error from this fluctuation. M. Hildreth commented that a study of the integrated end field he had done on a series of 6 successive maps taken at 44 GeV showed a fluctuation of approximately 3×10^{-4} on the total end field, which is in line with what we expect.

J. Palacios showed some results on the reproducibility of the maps, based mainly on the series of 6 maps at 44 GeV. A comparison of the field read by the moving NMR on the mapping arm between the 6 maps results in an rms fluctuation of order 0.4×10^{-5} (relative) in the measured field at any given point along the magnet. One map has a slightly anomalous rise during a small section of the dipole, which inflates the rms of its comparison with the other maps to 0.7×10^{-5}. A comparison was also made of the ratios of the fixed reference NMRs in the same maps. The reference field varies by a total of 1.5×10^{-5} (relative) during the 6 maps, but the rms of the comparisons of the maps themselves are of order $0.3 - 0.4 \times 10^{-5}$. This implies that the local magnetic field around the reference NMRs is stable to this level during a map, even if the overall field level has shifted slightly between successive maps.

E. Torrence reported on the first studies of the temperature coefficient of the magnetic field. These were made by observing the local field in the dipole while the temperature of the core was changed. One interesting feature is that, due to the shielding around the connections of the power cables and cooling to the dipole, there is a temperature gradient along the length of the magnet of up to 3 degrees. (This is under study, with the hope of arriving at a different shielding scheme in order to reduce the gradient.) In any case, for a temperature rise of approximately $1.5\ ^{\circ} r_C$, the local field dropped by 30 mGauss, which implies a temperature coefficient of the local field of -2×10^{-5}. If the dominant effect is that the gap of the magnet is expanding, this should be compensated somewhat in the integral field because the magnet is also getting longer. The maps that were made during this time are still under analysis. Just for information, the time constant for a temperature change of the magnet core seems to be about 12 hours.

B. Dehning gave a summary of the schedule for the mapping campaign. The first milestone is to have all of the reference NMRs placed in their final locations by the end of this week. Once this is completed, we can begin studies which can be used to determine the errors on the integrated fields, and the ratios of integrated fields at different energies, which ultimately is what we want. Test of map reproducibility and temperature effects are ongoing. In parallel, an investigation of the performance of the cooling station has revealed that we may need a bigger pump in order to cool the dipole and the vacuum chamber at 100 GeV. This is still under investigation, but in any case the station as it stands is sufficient for our immediate needs in the mapping campaign.

Discussion of MD Requests for Chamonix - M. Hildreth summarised the current thinking on how much MD time would be needed for the Spectrometer in 1999. The actual spectrometer measurement must have an energy determined from polarisation on the physics optics, which naturally occurs during the cross-calibration of polarisation and physics optics requested by

the Energy Group. We would propose an additional 8 hour shift at the end of each of the cross calibrations to ramp the beam to physics energy and to perform measurements with the Spectrometer. Ideally, we would like the Spectrometer time to begin at midnight, so that we have much less beam motion from the TGV effect. At the moment, two of these cross calibrations are planned - we may request a third. We will benefit greatly from any of the multi-point polarisation fills, which fall under the Energy Group request. Any other short study we would like to do, such as changing the RF frequency, etc., can be done at the end of physics fills and does not need to be officially "requested."

Progress on the Spectrometer Report - M. Hildreth showed the Table of Contents from a draft version of the Spectrometer Report that he had prepared while stranded by a snowstorm in the US (see copies). The introduction and many of the component descriptions are "finished" and the write-up of what was learned from the 1998 installation is partially complete. Likely candidates for authors of the missing sections have been identified and contacted. The plan is to include the analysis of the 1998 data, the outcome of the MBI mapping, and the 1999 design. We hope to finish this by the time LEP starts running this spring. The draft, as it is, can be found on the Spectrometer Web page.

Budget Report - M. Hildreth gave the latest update for the expenditures on the Spectrometer. So far, we have committed 1.2 MCHF, which does not yet include this year's components and the last set of wire sensors. Big spenders are urged to try and make sure that the costs do not rise beyond what is reasonable!

The next meeting will be on Thursday, 4th February.

M. Hildreth