THE MEG EXPERIMENT

R–99-05, MEG Collaboration: BINP Novosibirsk – INFN & Univs. Genova, Lecce, Pavia, and Pisa – KEK – Osaka Univ. – PSI – ICEPP Tokyo – Waseda

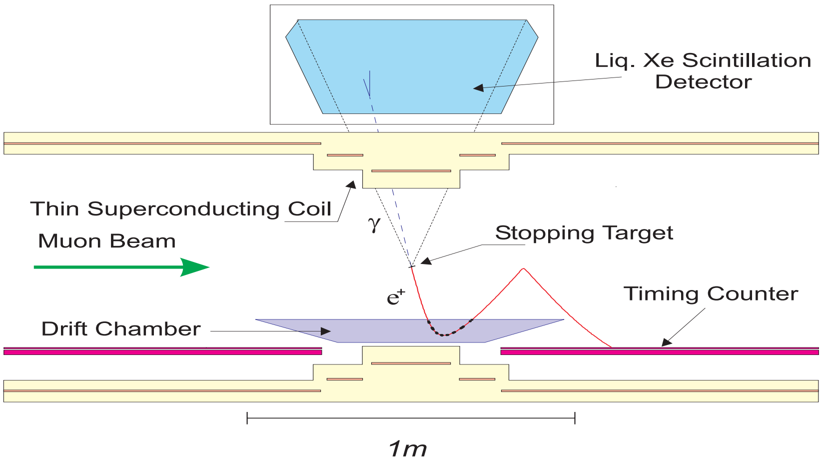

Figure 1: Schematic View of the MEG Detector showing the main components, as well as an example of the decay trajectories of the positron and photon.

Progress was made on several aspects of the MEG experiment during 2003, which involved beam times in both Japan and at PSI. With the goal set to build a detector capable of distinguishing $\mu \rightarrow e\gamma$ events from combinatorial normal and radiative muon decays, with a sensitivity more than two-orders of magnitude lower than the current best limit[1], a tremendous effort in terms of R&D work is required.

Figure 1 shows a schematic of the detector. The two main detection components are the Liquid Xenon(LXe) Calorimeter, for the photon and the COBRA Spectrometer for the positron. A high-rate surface muon beam of 28 MeV/c is stopped in a small thin target placed, at the centre of a thin-coil superconducting solenoid (COBRA magnet). This has novel features associated with its gradient field design, such that the Michel decay positrons from the target exhibit a spiral path with increasing pitch, the bending radius of which depends entirely on the particle's total momentum and is 'independent' of its emission angle. The maximum field strength of COBRA is 1.27 T at its centre and decreases axially on both sides. The positron's angle and momentum are determined by tracking the particle with a set of azimuthally spaced, staggered-cell drift chambers. For the photon, its energy, timing and angle are determined from the information from the 800 photomultipliers viewing the fiducial volume of the LXe Calorimeter. The timing information of the positron and hence the trigger condition for a coincident back-to-back event signature is provided by a set of fast, double-layered, orthogonally placed, scintillator timing-counter arrays, positioned at either end of the spectrometer.

In order to achieve the necessary energy/momentum-, positional- and timing-resolutions for both the photon and positron detection sides, this years beam time was dedicated, notably to: (i)the Large Prototype LXe calorimeter (3 weeks at TERAS, in Japan and 11 weeks in πE1) (ii) the drift chamber prototype (2 weeks in πM1) (iii) the beam transport system/beam studies (4 weeks πE5). Some parasitic time was also used for Timing Counter and Trigger studies.

The end of 2003 saw the arrival of the COBRA magnet, shipped from Tokyo to PSI a long voyage across three oceans and a short trip down the Rhine to Basel. Figure 2 shows the magnet being unpacked in the SLS hall, in preparation for first excitation tests at PSI.

More detailed contributions on some of the above mentioned aspects of the experiment are presented on the following pages.

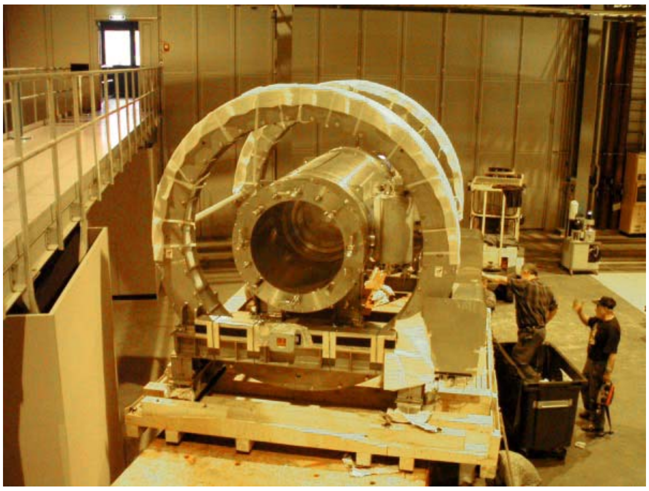

Figure 2: COBRA magnet being unpacked in the SLS Hall, after its long voyage from Japan.

REFERENCES

[1] M. L. Brooks *et al.*, Phys. Rev. Lett. **83**, 1521 (1999).