gkm, 24. June, 1997

Minutes of the

2nd Meeting of the COMPASS Technical Board

14:30–18:30, June 13, 1997

present: Y. Andrès, F. Bradamante, E. Chudakov, S. Dalla Torre, W. Flegel, J. Hauffe, I. Khokhov, G. Mallot, S. Masciocchi, S. Paul, S. Platchkov, E. Rosso, L. Schmitt, A. Singovski, U. Wiedner

The present option for the SM1 spectrometer magnet was discussed by W. Flegel. The idea is to use the Open Axial Field Magnet (OAFM) for both, the muon and hadron programme of COMPASS. The OAFM was originally constructed for the ISR and was later used in the Obelix experiment. It has cylindrical pole shoes of 1200 mm diameter, which leave a gap of 1500 mm. Originally the magnet was used in horizontal position with horizontal field. For COMPASS it has to be mounted vertically. Then the magnet is 6890 mm high, 4540 mm wide and extends 3000 mm along the beam. The height requires to dig whole into the hall floor. Assuming a beam height of 2800 mm a 1350 mm deep hole of 5800 mm length along and 7000 mm width transverse to the beam was proposed in a first design. A mobile crane will be needed because the hall crane can handle only 40 t. The largest pieces of OAFM weigh 60 t (total 312 t). The upright mounting of OAFM requires a re-enforcement of the coils' support. Ideally this could be combined with shielding plates limiting the fringe field. With the nominal current of 2×415 kA a central field of 0.58 T is found in a two-dimensional Poisson calculation. For the hadron programme additional pole pieces of 4 t each will reduce the gap to about 600 mm yielding a central field of 1.1 T. The critical property of the magnet is its fringe field of order 0.05 T in 2000 mm distance from the centre. The most stringent requirements on the fringe field come from the central production programme and its time-of-flight (TOF) measurement of slow protons. If the OAFM is a viable solution for SM1 can only be decided on the basis of a three-dimensional field calculation (TOSCA) including the shielding plates. The size of the holes in the shielding plates for all physics programmes has to be defined urgently. TOSCA calculations can hopefully be performed by the end of June '97.

The layout of the beam line as proposed by L. Gatignon was discussed by G. Mallot. The conclusion from a study of the present beam line was that a quadrupole triplet instead of the present dublet should be used to focus the beam onto the target. This would reduce the beam spot asymmetry and divergence and would grant more flexibility in the beam tuning. An installation of the two 6267 mm long CEDARs (special RICH devices for beam particles) in the hall would largely facilitate their maintenance. The proposed beam-line layout starts at the entrance of the hall with two upward bending dipoles (6 mrad) followed by the two CEDARs which use the space up to the present polarised target position. For the quadrupole triplet a length of 35 m is needed, implying that the target must be moved downstream by the same distance. The beam could be bend back parallel to the floor in the 8.5 m free region upstream of the target or in between the quadrupoles. The maximum gain in beam height is 300 mm on the 52 m long distance from the entrance of the hall to the polarised target. Thus 50 % of the 110 m long experimental hall would be occupied by beam-line elements. This fact was criticised and the possibility to install the CEDARs at the end of the tunnel will be further pursued. Such a scenario, however, would scarify the MIB3 and scraper 7 beam-line elements. These elements are needed to reduce the muon halo in the case of not completely opened upstream collimators and scrapers, e.g. when a limited momentum band is selected. The muon beam spot size reached with this layout is 1.3×3 mm^2 (rms, hor$\times$vert). The divergence in the dispersive plane is reduced from 1 to 0.5 mrad. The preliminary simulation yielded for the proton beam magnifications of about 2.3×2.7 compared to 1.5×5 for the dublet. Thus for monochromatic protons a symmetric proton beam spot of about 1.3 mm (rms) can be reached.

The layout the experimental apparatus was discussed by E. Rosso. A first three-dimensional design was produced by Yves Andrès using the EUCLID program (Fig. 1). This system is very flexible and new detectors can easily be introduced. The drawings are based on the information in the COMPASS proposal with the exception of SM1, for which the OAFM was assumed. For the polarised target a position 35 m downstream of the present one was assumed. Several plots showing the different spectrometer configurations are available. A drawing of the location of the spectrometer within the experimental hall illustrates the problem arising from a small access tunnel under the hall. SM1 is located just downstream of the tunnel. To be able to dig a hole SM1 has to be moved either by at least 2 m downstream or by 7 m upstream. A better number has to be obtained from the civil engineering group. Finally the incompatibility of the existing TOF detector for central production and the muon programme is clearly visible. An interface between EUCLID and GEANT will become available in about a month. The geometry presently used in the Monte-Carlo simulations and that implemented in EUCLID has to be unified.

The possible displacement of the polarised target was studied by J. Kyynäräinen and the result was presented by G. Mallot. For a movement of up to 5 m the control room and the pump room could stay at their present location. Jukka estimated a total cost of 82 kCHF and 9 man-months for the movement of the target. For a displacement by more than 5 m also the control room and the pump room (due to the impedance of the ^{3}He recovery line) must be moved. The cost would exceed 260 kCHF and 18 man-months. A new location of the pump room must guarantee fast and easy access for e.g. for setting up, emergencies, and deliveries like liquid nitrogen. A movement of more than 10–15 m might in addition require a movement of the coldbox. Wherever the target goes, the platform and cryogenics should be ready to accept the new solenoid when it is delivered at the end of March, 1998.

Detector status reports

Monitored drift tubes (U. Wiedner)**:** Aging has been observed in ATLAS tests of the MDTs with a ^{90}Sr source. The mechanism is not yet clear. Faster flushing of gas could reduce the effect. E. Rosso pointed out that such aging tests can be misleading. A coating of the inner tube surface is being considered. The ATLAS specification is 500 Hz/cm^2 for 15-20 years.
RICHes (S. Dalla Torre)**:** Detailed studies of the vessel design of RICH1 were presented. The radiator gas system of HERA-B, which is being build at CERN (Bosteels EST) was discussed. A close-to-final cost estimate for this system is 175 kCHF. A similar system is envisaged for RICH1. The magnetic fringe field will cause no problem for the particle identification provided the tracking can be performed with sufficient accuracy. Preliminary specifications for the read-out chips were fixed.
Silicon microstrip detectors (S. Masciocchi)**:** The first five 300 μm thick prototypes with 12 μm pitch from Hamamatsu show excellent quality. One of them will soon be mounted with VA2 readout chips and then installed at the X5 test beam. The cluster size, efficiency, and resolution will be studied in detail and compared to the 150 μm thick detectors. The prototypes will also serve irradiation and mounting tests. The WA89 silicon telescope is installed in X5 and ready to operate as reference when the SPS will be revived.
Calorimeters (A. Singovski)**:** The mechanical design of the support structures of ECAL1 and the modification of the GAMS-4000 mechanics for ECAL2 started at INP and IHEP, respectively. The preparation for the ECAL beam tests are going on according to schedule. The PWO crystals and lead glass blocks will be mounted at the end of June. A special test for the optimisation of monitoring and correcting of radiation damage is foreseen in July at CERN and/or Saclay. About 100 HCAL1 modules are mounted. 10–20 will be delivered at CERN and tested at the X5 beam in September – October. The QVC chip is being tested. First results are rather promising. The linearity is good: no nonlinear effects can be detected by the existing at IHEP and KEK standard equipment. A special high-precision test system is produced now and is expected to be ready in July.
Scintillating fibres (J. Hauffe)**:** The Hamamatsu 4×4 PSPM tube is being tested at Erlangen. The time resolution reached is about 0.7 ns. The maximum cross talk of neighbouring channels is 3–4 %. A new SciFi lab has been set up in Erlangen in collaboration with projects for DESY and COSY. Tests are foreseen later this year in the muon beam line and should be combined with the Saclay micromega tests.
MSGC and GEMS (S. Paul)**:** Two options are being investigated, GEMS with normal MSGC at Heidelberg and GEMS with only anodes strips at CERN.

Micromegas chambers (S. Platchkov)**:** In a Micromegas chamber 64 channels were equipped with fast electronics. Tests with this chamber will be performed in July in the T9 beam line and in October in the M2 muon beam line. A few shifts will be devoted to study the behaviour of the chamber in the nominal COMPASS intensity. From the new SPS schedule high intensity could be delivered to T6 in late October.

DAQ (L. Schmitt)**:** A DAQ computer was bought and a sample DAQ will be

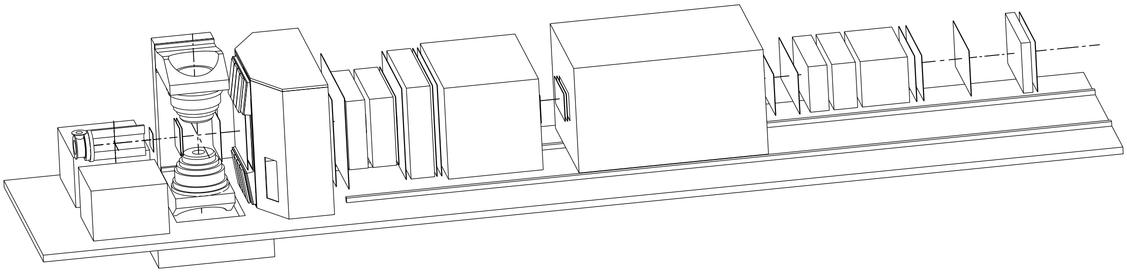

Figure 1: Generell layout of the COMPASS apparatus

set up with the silicon detectors.
IHEP drift tubes (I. Khokhlov)**:** No aging was observed for the drift tubes for the D0 experiment, which are of the same type as the COMPASS tubes. Irradiation tests for the IHEP tubes are envisaged at CERN's irradiation facility. 16 drift tube will be tested in the X5 test beam.

The next meeting will take place in connection with the COMPASS meeting in the week of July, 21.

These minutes and some more figures can be found on the Web under
URL `http://wwwcompass.cern.ch/compass/tech-board/`.