gkm, 12. May, 1997

Minutes of the

First Meeting of the COMPASS Technical Board

14:30–18:00, April 25, 1997

present: F. Bradamante, E. Chudakov, S. Dalla Torre, M. Faessler, J. Kyynäräinen, G. Mallot, S. Paul, E. Rosso, M. Sapozhnikov, A. Singovski, U. Wiedner

The proposed composition of the COMPASS Technical Board comprises the technical co-ordinator (E. Rosso), the spokespersons, the detector co-ordinators, and the test beam co-ordinators. According to the agenda experts will be invited to attend. G. Mallot will act as secretary of the Technical Board. The goal of the Technical Board is to provide a design of the experimental apparatus which fulfils the needs of the physics programme. The boundary conditions due to geometry, safety requirements, and available resources have to be taken into account and well as the time schedule.

The main topic of this first meeting was the geometry and overall design of the spectrometer to locate possible conflicts in detector positions and dimensions. From the collected information a first realistic sketch of the spectrometer should be made. For this the detector dimensions including services and frames are needed.

The position of the polarised target is the fix point in the COMPASS spectrometer. An important issue is its position in the experimental hall. It depends on the final set up of the M2 beam line. For particle identification in the hadron beam two threshold Cherenkov counters of the CEDAR type are required. They must be placed in a region of parallel beam and occupy about 12 m in space. Possible locations have been identified at the present position of the scraper 7 and the magnetised iron block, MIB 3, close to the end of the tunnel in front of the experimental hall. Whether these beam line elements can be removed without increasing the halo of the muon beam is presently being studied in a measurement. The possibility to replace scraper 5/MIB 3 by the CEDARs for the hadron programme only was brought up. Such replacements could be performed in the winter shut downs. According to J. Kyynäräinen a movement of the polarised target is difficult and expensive. A movement along the beam by up to five metres can be realized by increasing the length of the ^{3}He pumping line, while a movement of more than five metres requires a displacement of the pumps and the pump room. The latter option also involves a displacement of the target control room. The present idea was to keep the cabling for the target control untouched. The final position of the polarised target has not yet been decided.
Information obtained after the meeting: The result of the halo measurement shows that the muon halo is not drastically increased when scraper 7 and MIB 3 are opened and switched off. However, this might change when scrapers 4 and 5 are

not completely opened as during this measurement. These scrapers 4&5 define the muon momentum and can generate halo if partly closed. In a meeting on the M2 beam on April 30 it was pointed out by L. Gatignon that although the CEDARs may fit in the positions of scraper 7 and MIB 3 the optics is not favourable for the hadron beam. An additional space of 10–15 m would allow the installation of additional quadrupoles to optimise the proton beam spot. In the present design the horizontal and vertical magnifications are 1.5 and 5, which yields a rather large and asymmetric beam spot. This would add to the 12 m needed for the CEDARs resulting in a 22–27 m movement of the polarised target.

The first spectrometer magnet SM1. In the original proposal two different spectrometer magnets were foreseen for the muon and hadron programme, SM1m and SM1h. Presently it is studied whether the Open-Axial-Field-Magnet, OAFM, used in Obelix can be used for both programmes. For the hadron programme its aperture would be reduced by additional pole pieces. A first look showed that in this configuration a central field of about 1 T (Flegel) can be obtained, as required for the hadron programme. The real issue is the fringe field, which has to be studied further. The main limitations come from the central production programme using a liquid hydrogen target and a time-of-flight barrel. The installation of the OAFM magnet is not straight forward. The magnet is sitting on the yoke, which in COMPASS has to be put upright. Then the magnet centre is at a height of 3.45 m compared to the beam height of 2.86 m. The beam height cannot be changed. The last vertical bending magnet, B6, is close to the ceiling of the tunnel. Upstream of B6 the beam has a vertical inclination of 33.7 mr. Additional 18 m would be needed to move the beam up up 60 cm. However, such a prolongation of the inclined section would destroy the present dispersion-free optics of the muon beam. Two alternatives were discussed (Rosso): a) to cut the magnet yoke and redistribute the iron and b) to dig a hole to adept to the beam height. Presently the latter solution appears more favourable. The decisions to be taken are if the magnet can be used for the muon and hadron programme and how to install it.

Downstream of RICH1 The detectors and the SM2 magnet (FSM) downstream of the first RICH counter must be movable by 5–6 m along the beam direction to enable variable decay length between the target and the second spectrometer stage. The present idea is that all tracking detectors are suspended from a structure extending from RICH1 to the downstream end of the apparatus. The SM1 magnet, RICH2, and the calorimeters will be mounted on rails.

Dimensions of individual detectors

- K.-D. Lohmann has informed us that the expert for the beam momentum station, M. Desroziers, will retire in a few weeks. He offered to train an electronics engineer from COMPASS.

- The dimensions of the polarised target and the platform were discussed by J. Kyynäräinen.

- For the liquid hydrogen target a space of at least 2.6 m (Singovski) is needed between the downstream end of the polarised target and the end of the time-of-flight barrel, which in the original design was 0.5 m from the pole of the DISTO magnet. In the proposal a distance of about 1.5 m is foreseen between the end of the polarised target solenoid and the pole show of SM1m.

- The straw tube detectors were discussed by E. Chudakov. The present design foresees about 30000 channels of straw tubes and 27000 channels of multiwire proportional chambers. The number of planes has been considerably reduced due to funding boundary conditions. Detailed Monte Carlo studies are needed to ensure that the present scenario is sufficient for pattern recognition.

- The amount of aluminium in the end cap of the monitored drift tubes (MDT's) has to be optimised as well as the arrangement of the individual modules to the complete structure (Faessler). The question of the necessity of stereo view was discussed. In the present design the MDT station will occupy 0.3–0.5 m.

- The space foreseen for ECAL1 and HCAL1 in the proposal are 0.8 m and 1 m, respectively. In the existing set up the calorimeters occupy 2.2 m and 1.5 m, respectively (Singovski). In addition a separation of 1.2 m is desirable. The OLGA modules to be added to GAMS to cover the outer region, where foreseen to be mounted behind or in front of GAMS, adding about another metre. The total length along the beam would thus add up to 5.9 m instead of the 2 m given in the proposal. Such a large increase reduces the aperture of the small angle spectrometer dramatically and is not acceptable. E. Rosso will start to look with an engineer into a possible new design of the GAMS frame, which includes also the OLGA modules. The total weight is in the order of 40 t (20 t for GAMS). The new frame should take care of the calibration needs for the calorimeter. The present frame fits in its dimensions well for ECAL2, for which no frame exists presently.

- The design of the tubes for the first muon wall was presented by M. Sapozhnikov. Presently aluminium profiles are favoured over plastic profiles.

- It is planned to test full length drift tubes for the second muon wall in June or July at CERN (Wiedner, Khokhlov).

- The parameters of RICH1 and RICH2 were discussed by S. Dalla Torre. The option of using iso-C_4H_{10} instead of C_4F_{10} is unlikely, since normally only 100 kg flammable gases are allowed for (underground) experiments. RICH1 would require 200 kg alone of iso-C_4H_{10}. It was mentioned (Singovski) that there is some interest to take central production data with RICH2 removed. Since this causes many problems it was suggested to construct a small calorimeter, which could sit in front of RICH2 for this measurement. Some general information on the infrastructure, e.g. crane height, door heights, and information on the cooling of electronics racks would be useful.