Production of Straw Detectors for the COMPASS Experiment

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1. The COMPASS Experiment

For studies of hadron structure and hadron spectroscopy the COMPASS spectrometer is currently being commissioned at CERN. It provides particle identification facilities and calorimetry, capable of standing beam intensities up to $2 \cdot 10^8$ particles per spill. The **CO**mmon **M**uon and **P**roton **A**pparatus for **S**tructure and **S**pectroscopy [1] is a multi-purpose setup to be used with either a hadron or a muon beam produced by the CERN Super Proton Synchrotron.

The COMPASS group at Ludwig-Maximilians-Universität München is responsible for the production and the commissioning of the large-area tracking system based on thin-walled ("straw") drift tubes.

Fig. 1: Automatic steel-sphere insertion into a straw tube

2. Design Considerations

In order to reach the necessary resolution for the reconstruction of events containing for example D^0 mesons, the aim is to obtain a spatial resolution of 100μm, so the maximum mechanical precision has to be achieved with the drift chambers covering an active area of 320cm × 260cm. A space resolution of 100μm would lead to the desired D^0 mass resolution in the order of 10MeV.

In order to provide the necessary tracking facilities for bent tracks between the first spectrometer magnet and the Ring Imaging Cherenkov Counter, 15 double layers of straw tubes are foreseen.

3. Straw Chamber Mass Production at Dubna

After having successfully fulfilled several beam tests at CERN, the first full-size prototype has gone into mass production at the Joint Institute for Nuclear Research at Dubna/Russia [2].

While minor changes in the meantime have been applied to the production technique, the general process is still the same: Every tube is automatically filled with steel spheres, assembled to straw-tube planes on a precision steel table, where the tubes are being glued together by automatic dispensation of epoxy resin, ensuring an equal mass distribution across the detector plane.

Presently the average output of the two production lines being operational at Dubna is 1 straw driftchamber every 27 days, which means a production time of 0,45 minutes per channel during a 2 shift working day. 10 out of 15 chambers have already been delivered to CERN, the rest is supposed to be shipped there by August 2002.

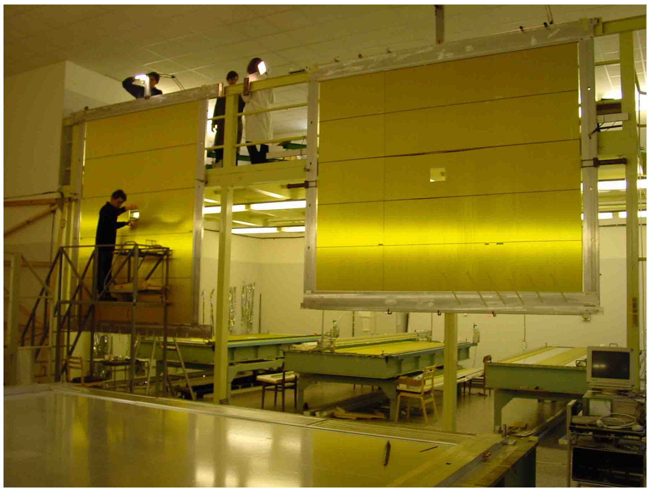

Fig. 2: Wiring of the straw double planes

References

[1] COMPASS, A Proposal for a **CO**mmon **M**uon and **P**roton **A**pparatus for **S**tructure and **S**pectroscopy, CERN/SPSLC **96-14** (SPSLC/P297) 1 March 1996

[2] V. Pechekhonov, Joint Institute for Nuclear Research, Dubna, Russian Federation, private communication