A New Design of Wire Locators for Drift Tubes

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1. The COMPASS Experiment

The **CO**mmon **M**uon and **P**roton **A**pparatus for **S**tructure and **S**pectroscopy [1], a multi-purpose setup to be used with either a hadron or a muon beam produced by the CERN Super Proton Synchrotron, has completed its first year of data taking.

The COMPASS group at Ludwig-Maximilians-Universität München is responsible - after having coordinated its production at the Joint Institute for Nuclear Research in Dubna/Russia - for running the large-area tracking system based on thin-walled ("straw") drift tubes.

2. Signal-wire Positioning inside the Straw-Drift Tubes

In order to achieve the necessary space resolution, among other requirements, the signal wire has to be positioned in the center of each drift tube with an accuracy of $\pm 25\ \mu$m, so every 80 cm a plastics element needs to be glued to the wire, sticking out 3 legs under an angle of 120° towards the tube walls and thus keeping the wire in the center [2].

Although this system is well developed and working reliably, there are some disadvantages, namely the complicated gluing and insertion process.

3. A new Wire-locator Design

In order to overcome these disadvantages, a new system has been developed: A wire locator, consisting of 2 halves made from elastic material are being loaded onto an insertion instrument which runs through the drift tube on a gas cushion, dispensing both signal wire and wire locators in a single step. At each wire-locator position the piston pushes off one set of wire locators, driven by the operator who guides the process by 2 concentrically arranged steel tubes through which also the signal wire and the suspension gas is being fed in. Once released, each set of 2 wire-locator halves forms a prism and thus automatically centers the wire (see artistic view in fig. 1).

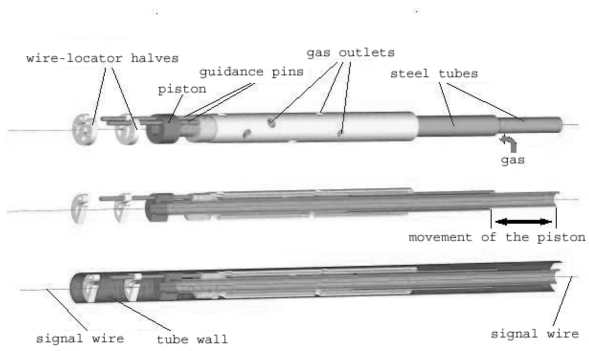

Fig. 1: The positioning tool, which simultaneously dispenses both signal wire and wire locators.

4. Test Results

In order to determine the positioning accuracy and the influence on the drift tube operation a set of test-drift tubes was examined using an X-ray tomograph and a silicon telescope at a C.E.R.N. testbeam. The positioning accuracy fulfills the above mentioned requirements for the COMPASS straw drift tubes and thus could compete with the existing design, while the new wire-locators did even less affect the detection efficiency of the straw tubes. The detection efficiency of test tubes equipped with both types of wire locators is shown in figure 2.

Although actually not in use with the COMPASS-straw drift tubes, the proposed technological alternative deserves further investigation in view of future drift detectors.

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.N. Bychkov et al.: Construction and Manufacture of Large Size Straw-Chambers of the COMPASS Spectrometer Tracking System, Particles and Nuclei, Letters **2**-[111] (1989) 64-73.

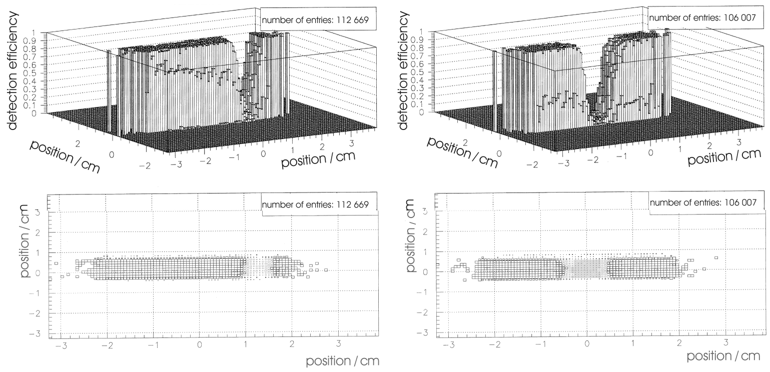

Fig. 2: Detection efficiencies of wire locators. Left: proposed new design. Right: as used in the COMPASS-straw drift tubes. In the area marked in grey in the projection plots on the bottom the efficiency is below 95 %. The respective area for the proposed new wire locators is reproduced in darker grey in the efficiency plot for the COMPASS-wire locators.