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A VARIATION ON THE STRAW CHAMBER THEME FOR THE CENTRAL SSC DRIFT CHAMBER*

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At Snowmass 86, a straw drift chamber was proposed by a subgroup of the tracking group. It consisted of aluminized plastic straws 3 mm in diameter glued together to form cylindrical layers. What was foreseen were 13 layers (7 axial 3 u and 3 v) with each layer composed of eight staggered sublayers. The sense wire would be held by supports from the walls. The appealing part of the proposal was the belief that the accuracies of 50 μ could be obtained in a large system. Therefore, the 5 m diameter proposed for the previous drift chamber (Snowmass 84) could be reduced to 2.5 m with attendant savings. A problem with this and all of the chambers proposed up to now is the very large number of channels required (150–200 K). Brig Williams made the assertion that if the number of channels could be reduced to about 25 K (set by power dissipation), then all of the drift chamber electronics could be inside the magnet. If this was acheived, the number of cables communicating with the outside could be radically reduced, thus allowing *high quality hermetic calorimetry.* With this in mind, I propose the following variation.

THE VARIATION

It would not be possible to reduce the number of channels by a factor of 6 to 8 without losing something. What we could lose and still not be hurt too badly for high Pt physics is the detailed trajectory of the track. The idea occurred to me on observing an event on W–W production from a simulation program run by Gail Hansen. A large number of tracks were spiraling inside the 5 m diameter 1.5 Tesla field magnet. These tracks were not useful but were the background instead.

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The useful tracks were almost straight radial lines. One does not need a detailed trajectory to reconstruct these tracks. They start near or at the interaction point and come almost straight out. Using the beam position and the angles of the track at the surface of the magnet is sufficient. What we want to do is pull out our 25 K channels as far out as possible against the magnet coil support. The smallest number of straw sublayers to define the problem is 8. This would include A–A, U–U, V–V, and A–A. Dividing 25 K channels by 8 gives about 3 K straws as a maximum number per sublayer. The straw diameter is then $2\pi R(magnet)/3\ K$, which for the numbers used ($R = 2500\ \ mm$) is 5 mm. This diameter is larger than the 3 mm ones used in the original straw chamber proposal, but those were closer at a maximum radius of 2.5 m. Thus, the angular resolution is actually improved. *What is lost in the 5 mm case is the longer drift time and consequent pileup of events.*

The axial straws must be spaced far enough apart radially so that the angle with the radius that a 1 TEV/c Pt track makes can be measured sufficiently well to get a sign determination. As the angle such a track makes with the radius is 1.1 mrad, the accuracy required is about 0.3 mrad. For spatial accuracies of 50 m, a radial spacing of 165 mm is required. This is more than eight layers of 5 mm straws in closepack. The sublayers must be spaced apart. Perhaps between every pair of sublayers, nine empty sublayers of 5 mm straws could be placed, allowing the whole mass to be glued together.

The numbers in this variation are by no means fixed. The reader is encouraged to optimize the system.

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