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# General Considerations for SSC Scintillator Calorimeters†

(For the Scintillator General Subgroup*)

L. Nodulman

High Energy Physics Division
Argonne National Laboratory, Argonne, Illinois 60439

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The Scintillator Calorimetry group divided into three subgroups: a conventional Uranium and plate design ala ZEUS, fiber design, and a group on general considerations. The considerations of the third group are reported here on geometrical and technical issues.

*Members of the general subgroup were R. DeSalvo (CERN), J. Hoftiezer (LeCroy), P. K. Job (ANL), D. D. Reeder (Wisconsin), and G. Trilling (LBL).

The existing general purpose hadron collider detectors are all implementations of scintillator calorimetry. Although much of the advance in understanding calorimeters comes from scintillator calorimeter development for ZEUS, both the UA1 upgrade and the DO detector at FNAL use alternatives. On the other hand, the high luminosity of SSC emphasizes the fundamental advantages of optical coupling for speed and low noise. The usual criticisms of scintillator for radiation damage and segmentation problems are being met by developments in radhard scintillators and comparisons of what can be done to realistic requirements.

The first considerations were geometry. Whereas a non-magnetic detector is quite straightforward, putting in a magnet involves choices. We decided to adopt as a standard geometry a variation of the LSD design. To make light readout easier, the coil was returned to the inside. If it is 1 radiation length thick, it would make up a substantial part of a preradiator. It could be supported at its ends by conic sections of about 1 inch aluminum. If the cone misses being projective by 15 degrees, it represents only 1 radiation length along a trajectory. This level of disturbance would not be a serious disruption to a realistic calorimeter.

A conservative extrapolation of developments in radiation hard scintillator allow the calorimeter to cover down to 6 degrees or 10 Mrad integral dose. This is in fact the break in the LSD design. The geometry is summarized in Figure 1.

Transverse segmentation smaller than a few cm is an extravagance with respect to the size of showers. While a segmentation for general energy flow measurements of 0.05 x 0.05 ($\eta$ - $\phi$) is reasonably sufficient, electron/pion separation tends to prefer finer information. This may take the form of small cells, shower max detectors as in CDF or ZEUS, or preradiator detectors. For the geometry of Figure 1, the basic towers at 6 degrees need not be much smaller than what is currently being built for ZEUS.

In the busy environment at SSC, overlap will be a major source of background to electrons, particularly to non-magnetic detectors. A tracking type technology before and after a preradiator offers the possibility of matching the early shower to a charged track with good accuracy. Development of such devices will be of great utility for any calorimeter design.

Either a conventional design or an innovation involving fibers may provide an attractive solution for an SSC calorimeter. In addition to continued pursuit of radiation hardness which may facilitate use of scintillator inside 6 degrees, there are encouraging developments in inexpensive stable substitutes for PMTs which may be quite valuable.

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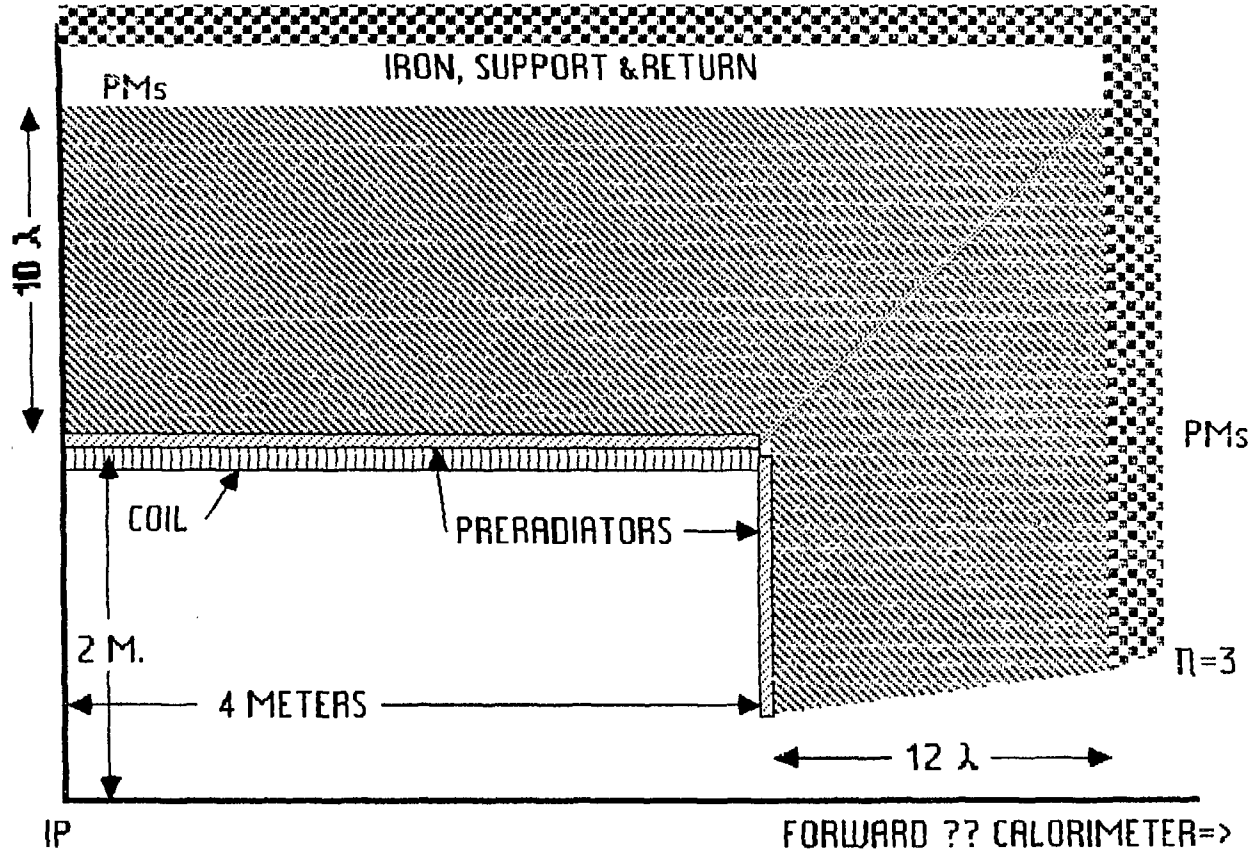


Figure 1 Scintillator magnetic geometry scheme.