Directly Coupled Scintillator Tiles to Hamamatsu MPPC

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Outline

• Abstract (tiles exposed to 120 GeV proton beam)
• Motivation and scope (MPPS, groove, fiber, PFA)
• Experimental apparatus (TB4, CAPTAN)
• Data preparation
• Uniformity of response across the area
• Response as a function of tile angle
• Summary
• Acknowledgment
Possible Simplified Approach
Dimpled Scintillator Tile Schematic (not to scale for 9 cm²)
Flat (left) and Dimpled (right) Tiles
Tiles Response to Sr90
Scintillator/MPPC Test Using Existing Pixel Telescope at FNAL
Scintillator Tiles and MPPCs Beam Setup within Middle Compartment of the Pixel Detector

U is upstream and D is downstream

UC  UF  DF  DC

Dimple tile with S10362-11-50C

Flat tile with S10362-11-25C

MPPC

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Projection of Tracks at UF Tile (right) and Response of UF Channel (left)
Response of Tiles as a Function of a Track Position at the Normal Incidence
Tile Responses Along Y Axis at X=0 for Beam (black) and Sr90 (red)
Tile Rotation Angle with Respect to the Beam (Schematic)

10 degrees rotation angle

Normal beam incidence
0 degrees rotation angle
Response of Tiles as a Function of a Track Position at the 40 Degree Angle

UC

UF

DF

DC
Responses vs Effective Length of Tracks in the Scintillator
Array of Dimpled Tiles and Electronic Board with Photo Detectors
Summary

• Dimpled tile has uniform response with high energy beam particles. Response depends on MPPC, tile, and the tile angle
• The beam pulse response and the narrow collimated Sr90 current response of MPPC are in qualitative agreement
• Dimpled tile is a plausible way to simplify design of a scintillator base calorimeter
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