Directly Coupled Scintillator Tiles to Hamamatsu MPPC

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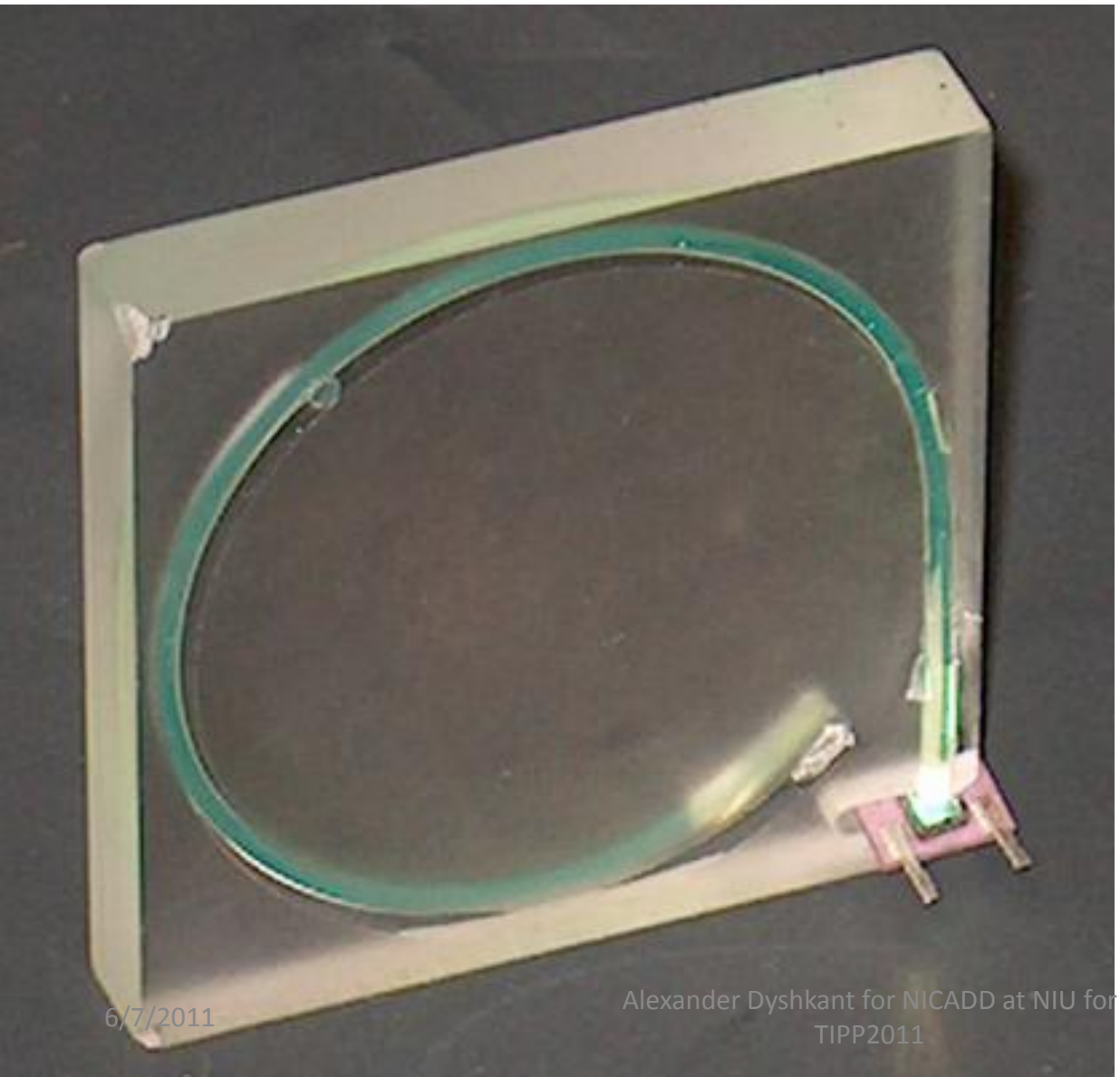
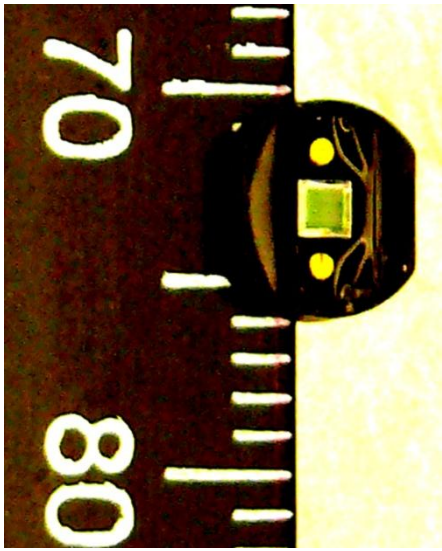
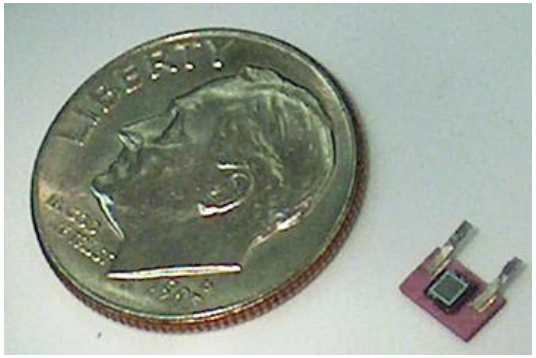
Outline

- 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

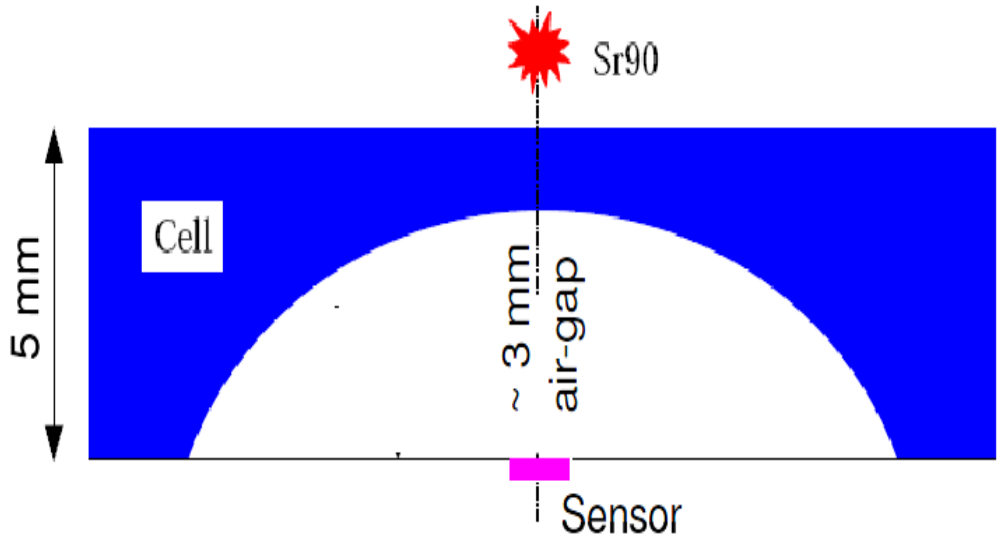
Possible Simplified Approach



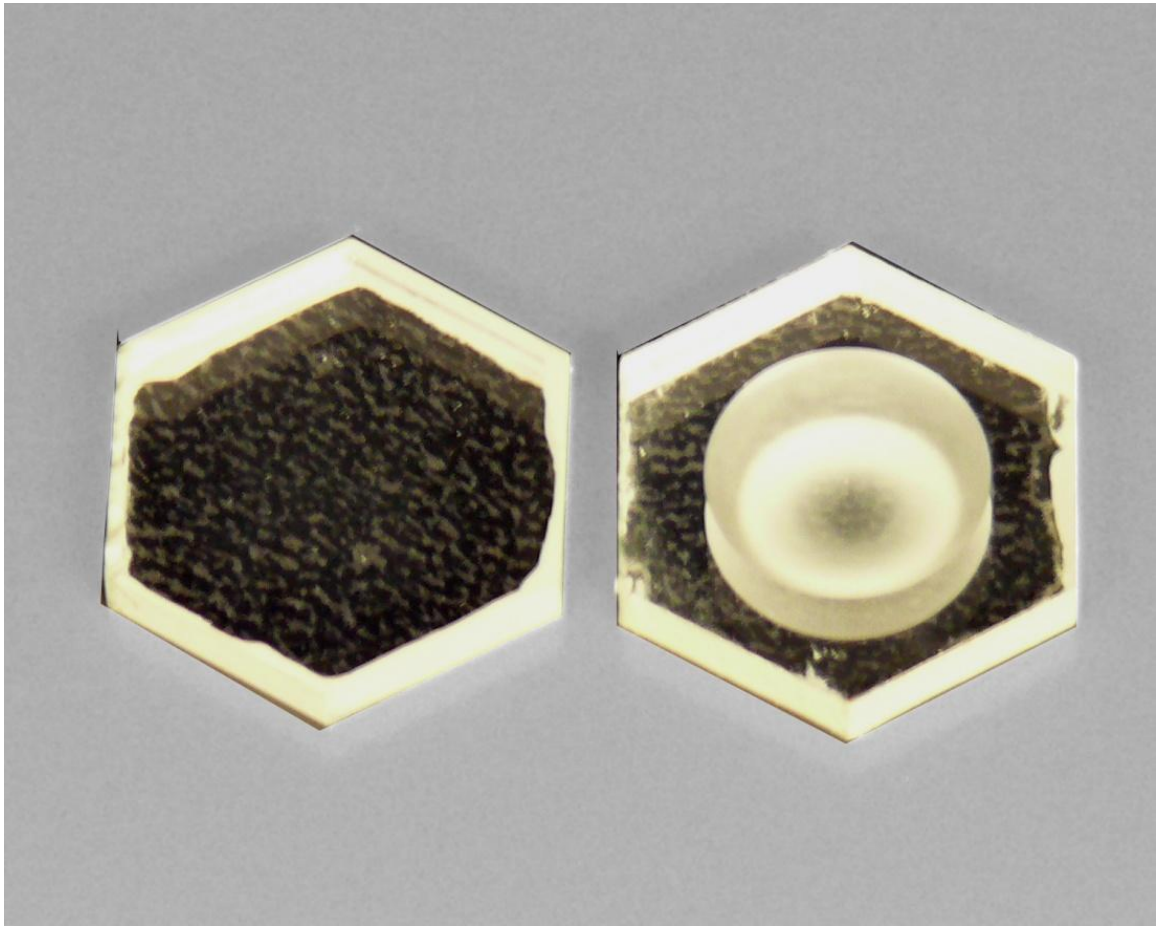




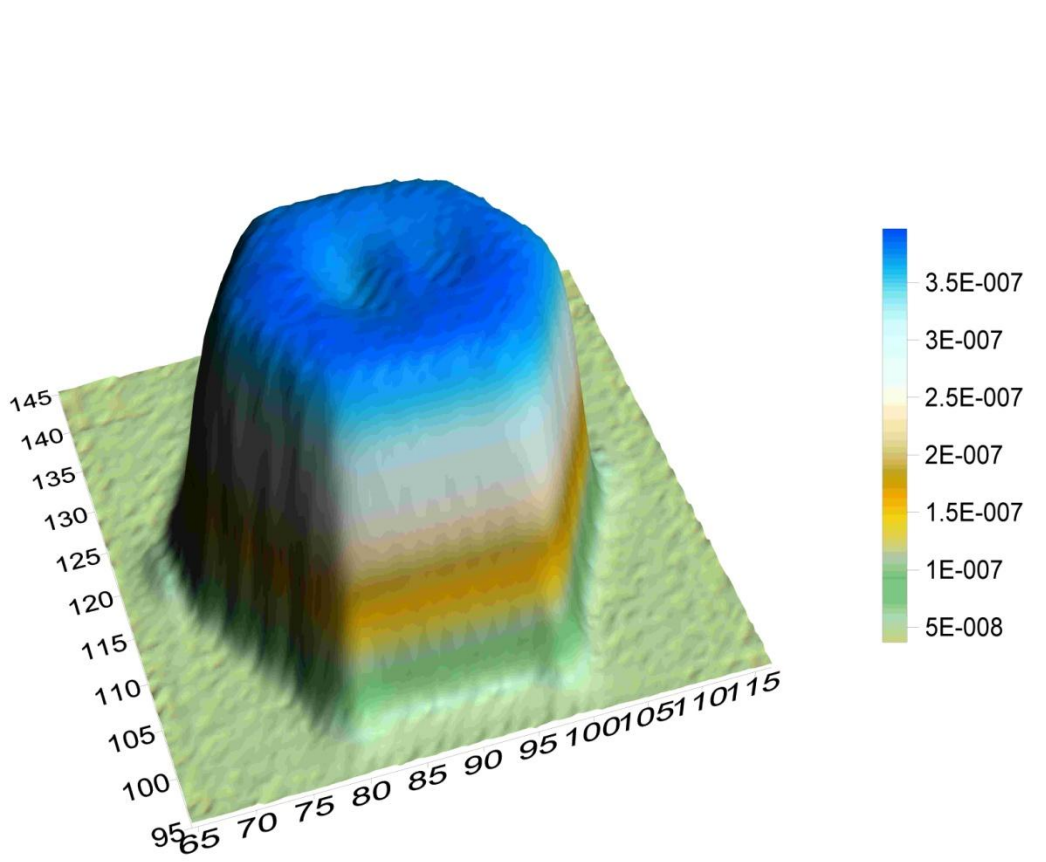
Dimpled Scintillator Tile Schematic (not to scale for 9 cm²)

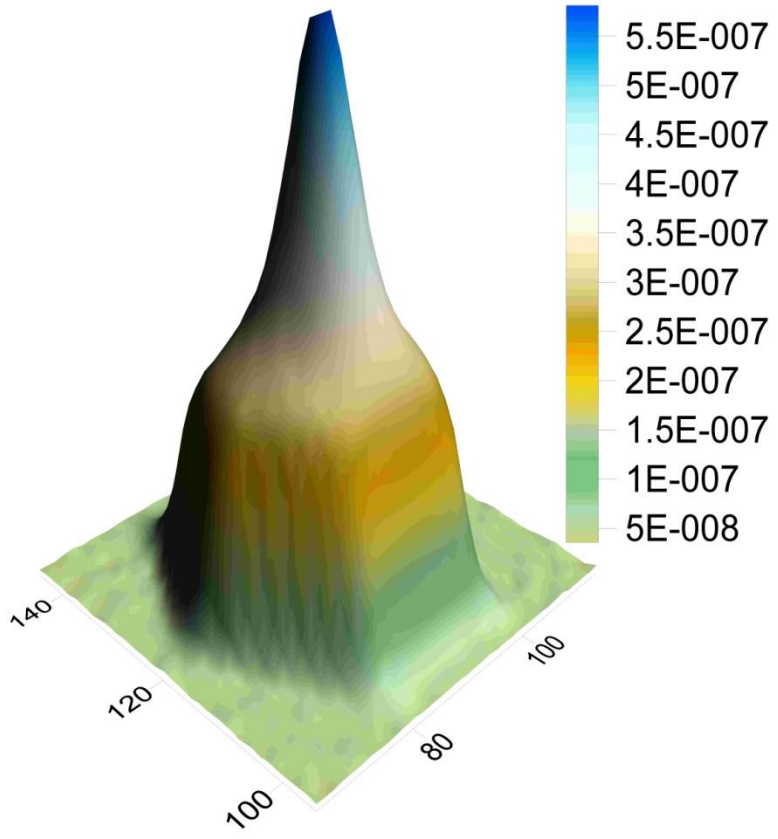


Flat (left) and Dimpled (right) Tiles

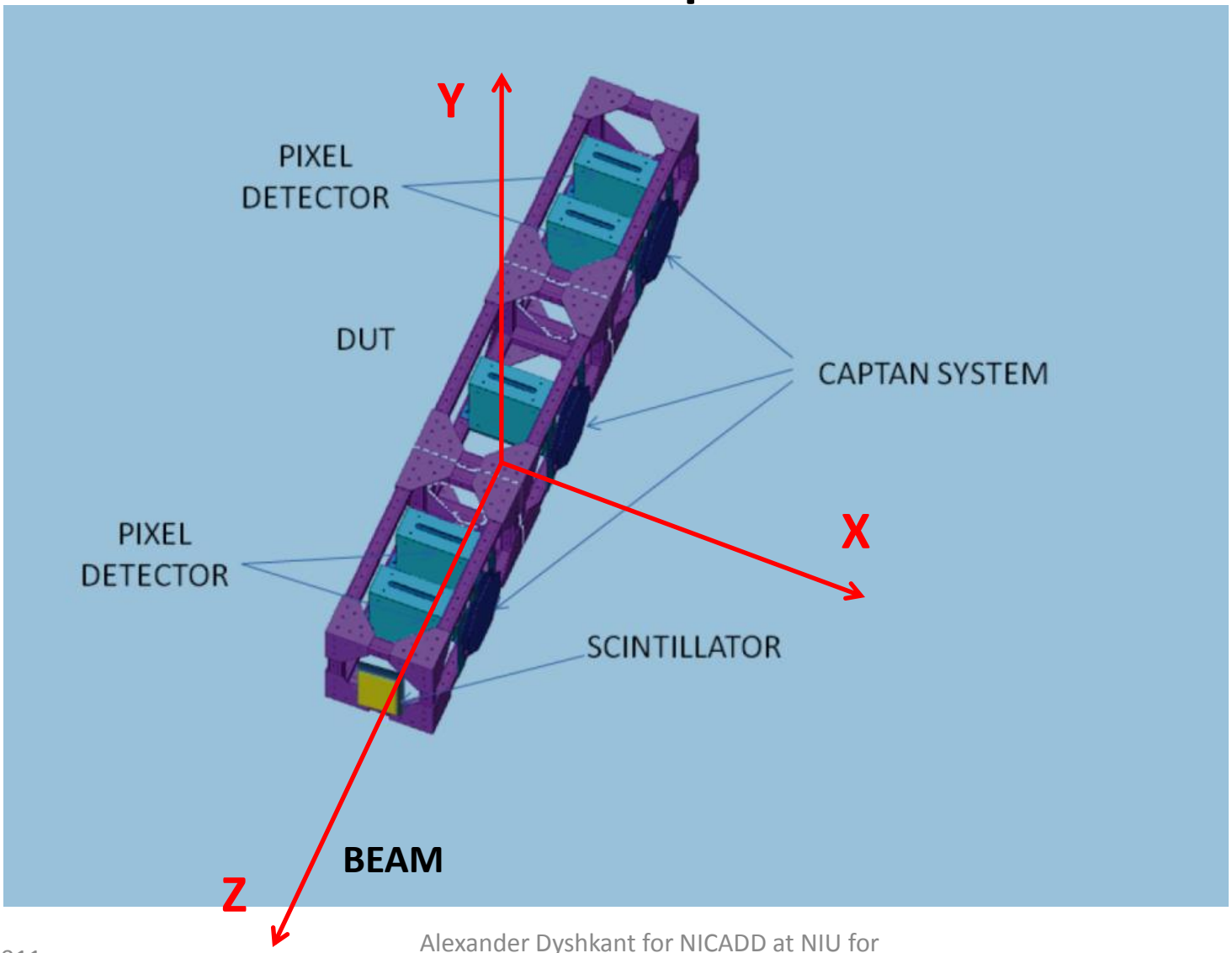


Tiles Response to Sr90



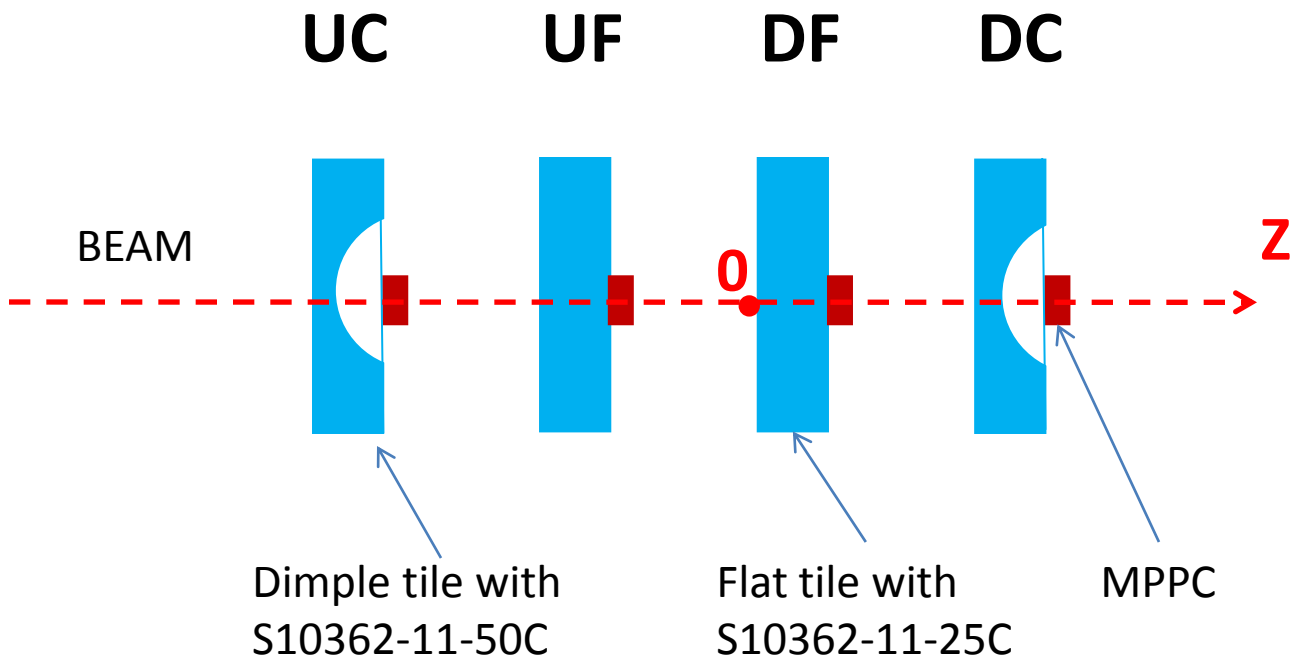


Scintillator/MPPC Test Using Existing Pixel Telescope at FNAL

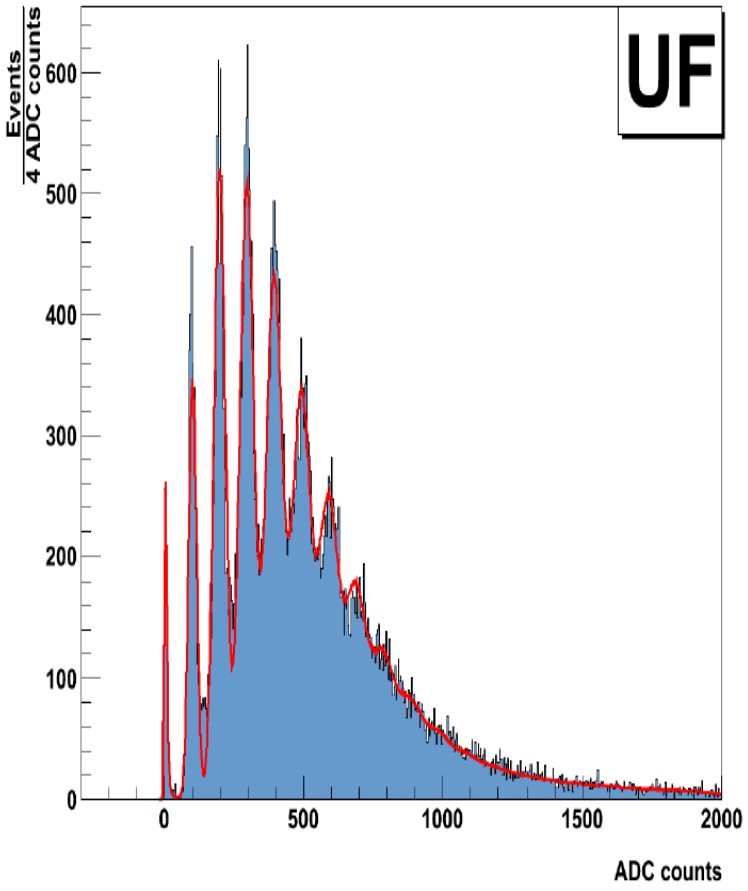


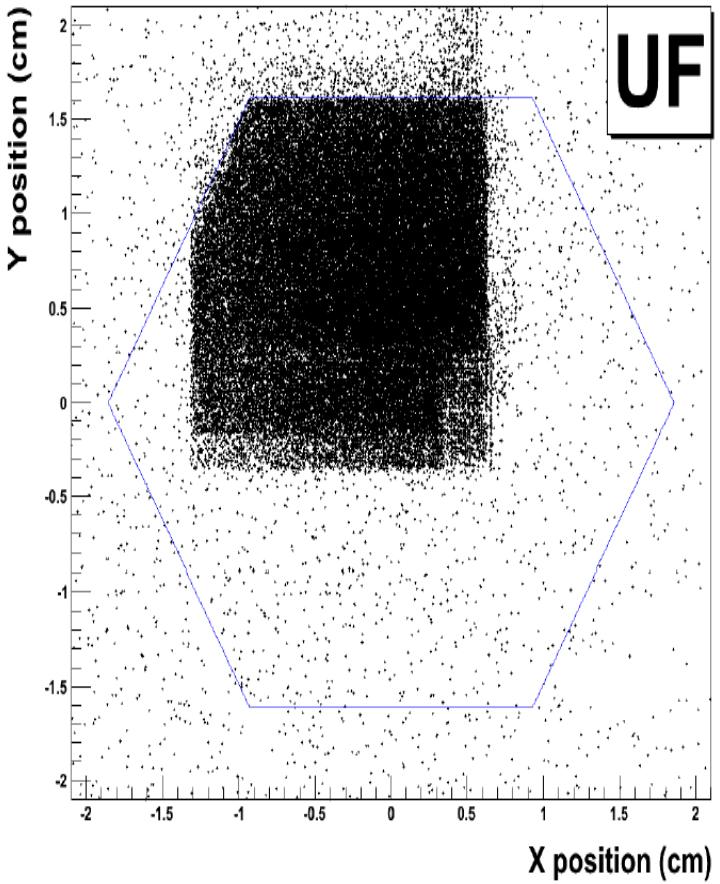
Scintillator Tiles and MPPCs Beam Setup within Middle Compartment of the Pixel Detector

U is **u**pstream and **D** is **d**ownstream

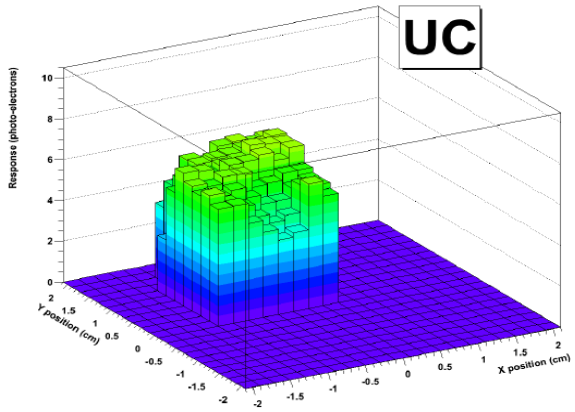


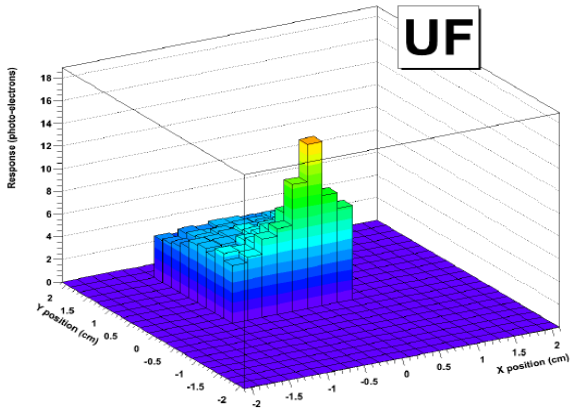
Projection of Tracks at UF Tile (right) and Response of UF Channel (left)

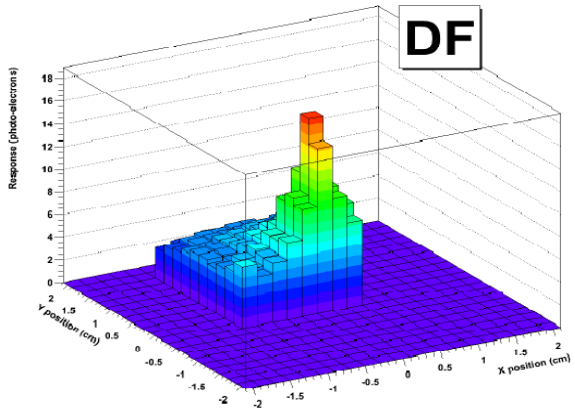


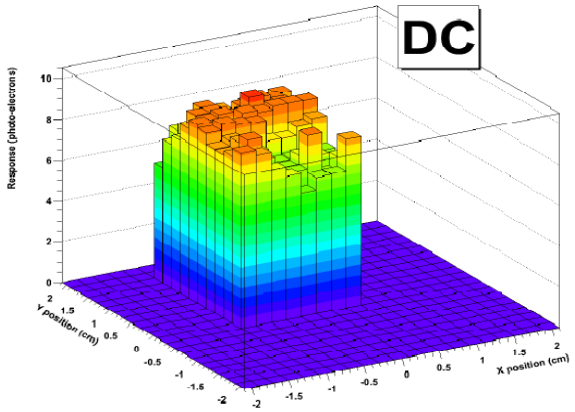


Response of Tiles as a Function of a Track Position at the Normal Incidence

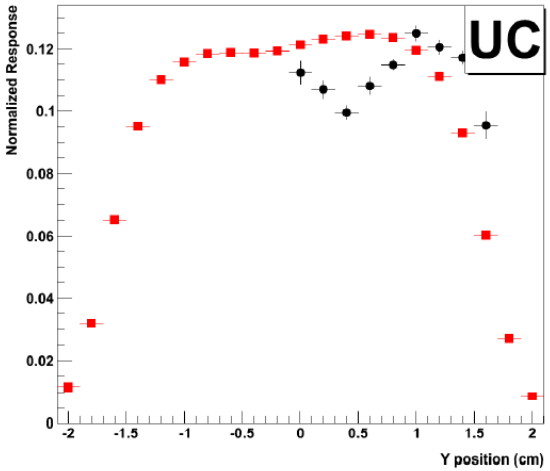


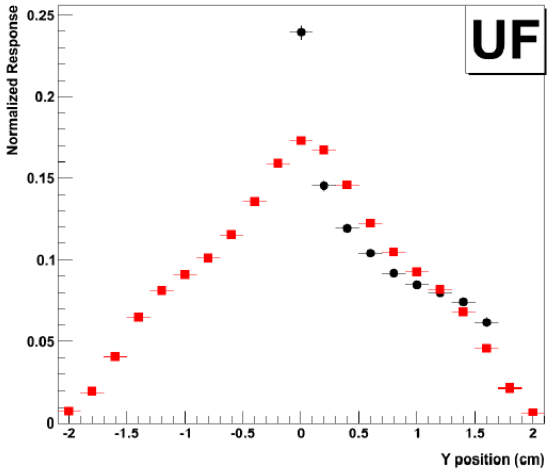


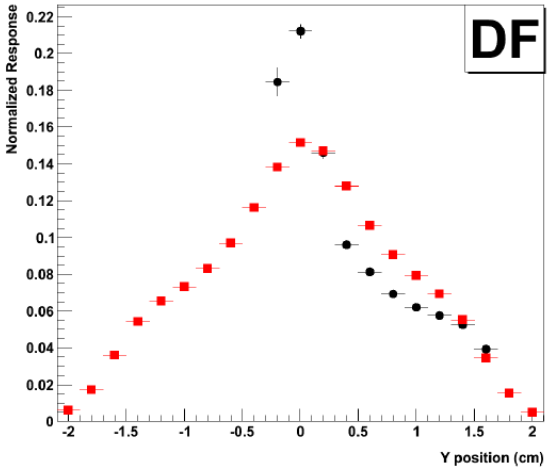


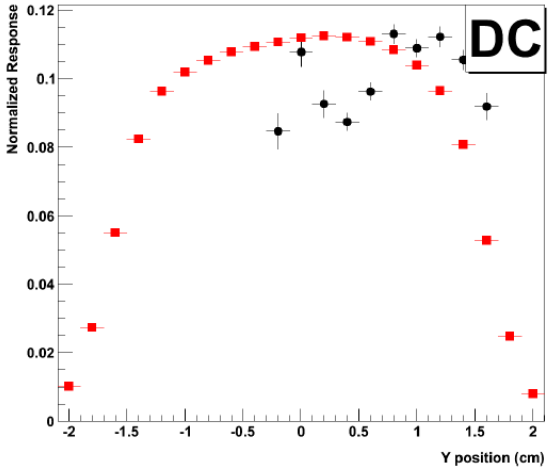


Tile Responses Along Y Axis at X=0 for Beam (black) and Sr90 (red)

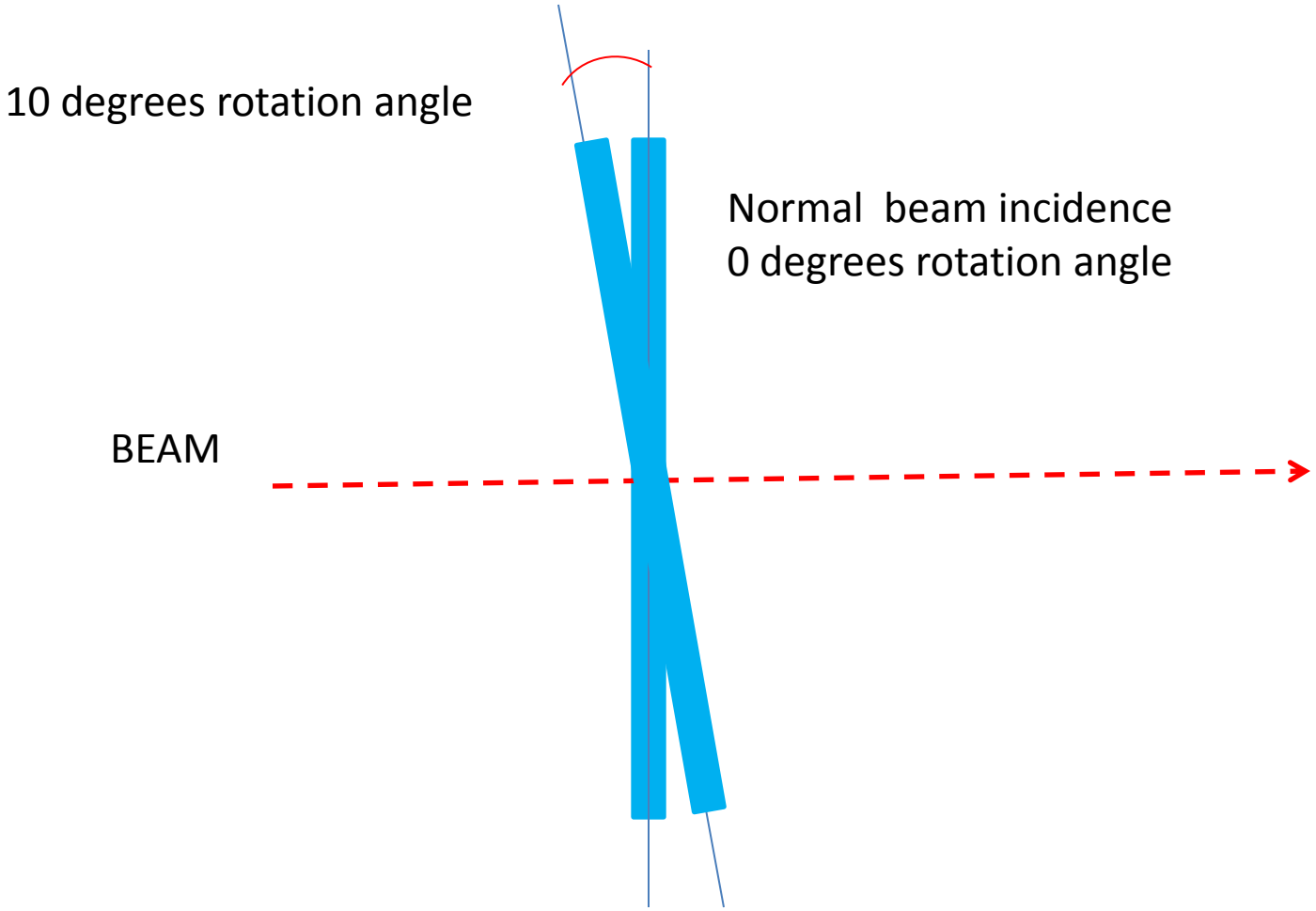




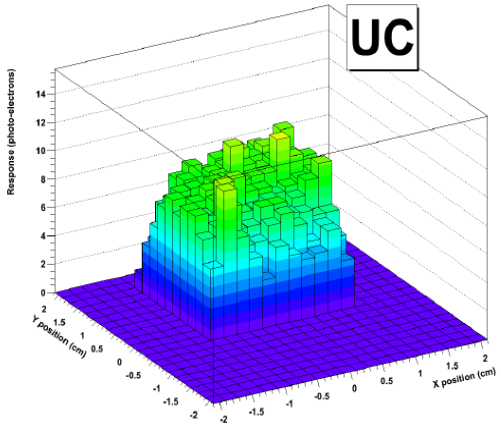


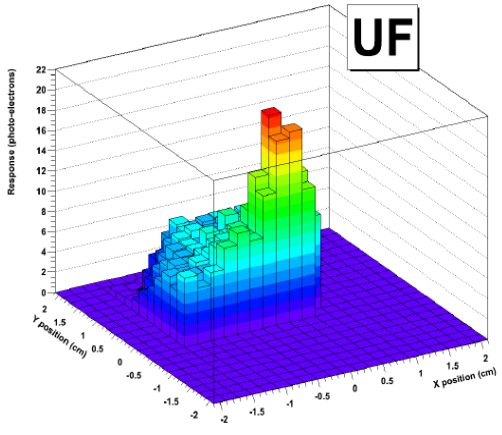


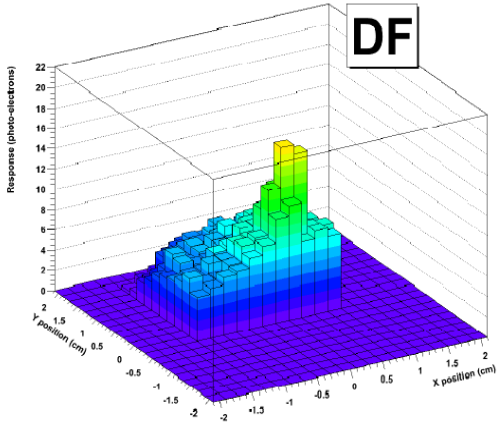
Tile Rotation Angle with Respect to the Beam (Schematic)

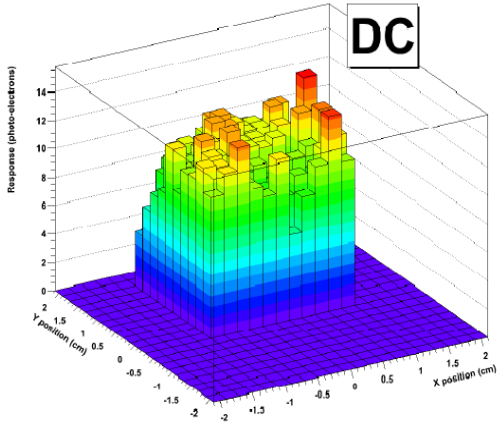


Response of Tiles as a Function of a Track Position at the 40 Degree Angle

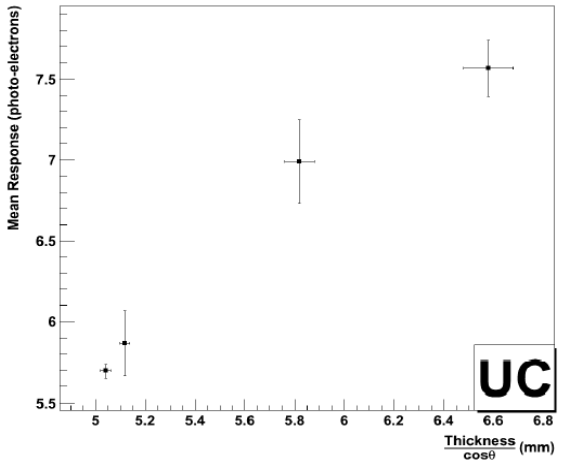


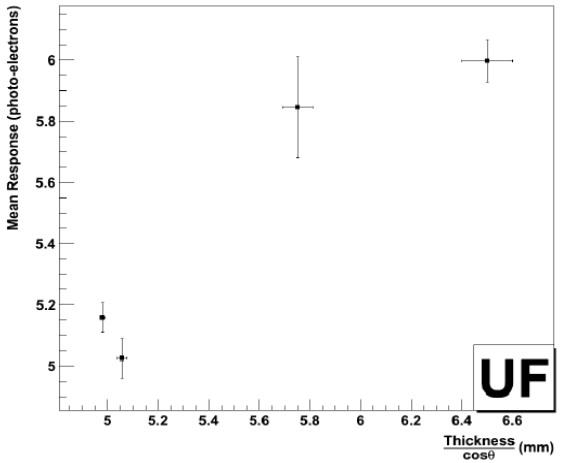


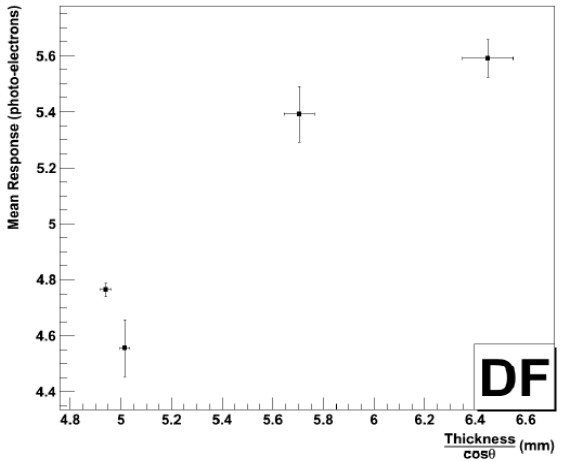


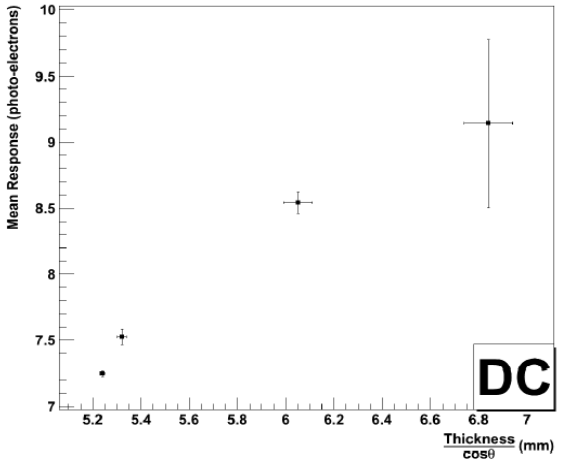


Responses vs Effective Length of Tracks in the Scintillator

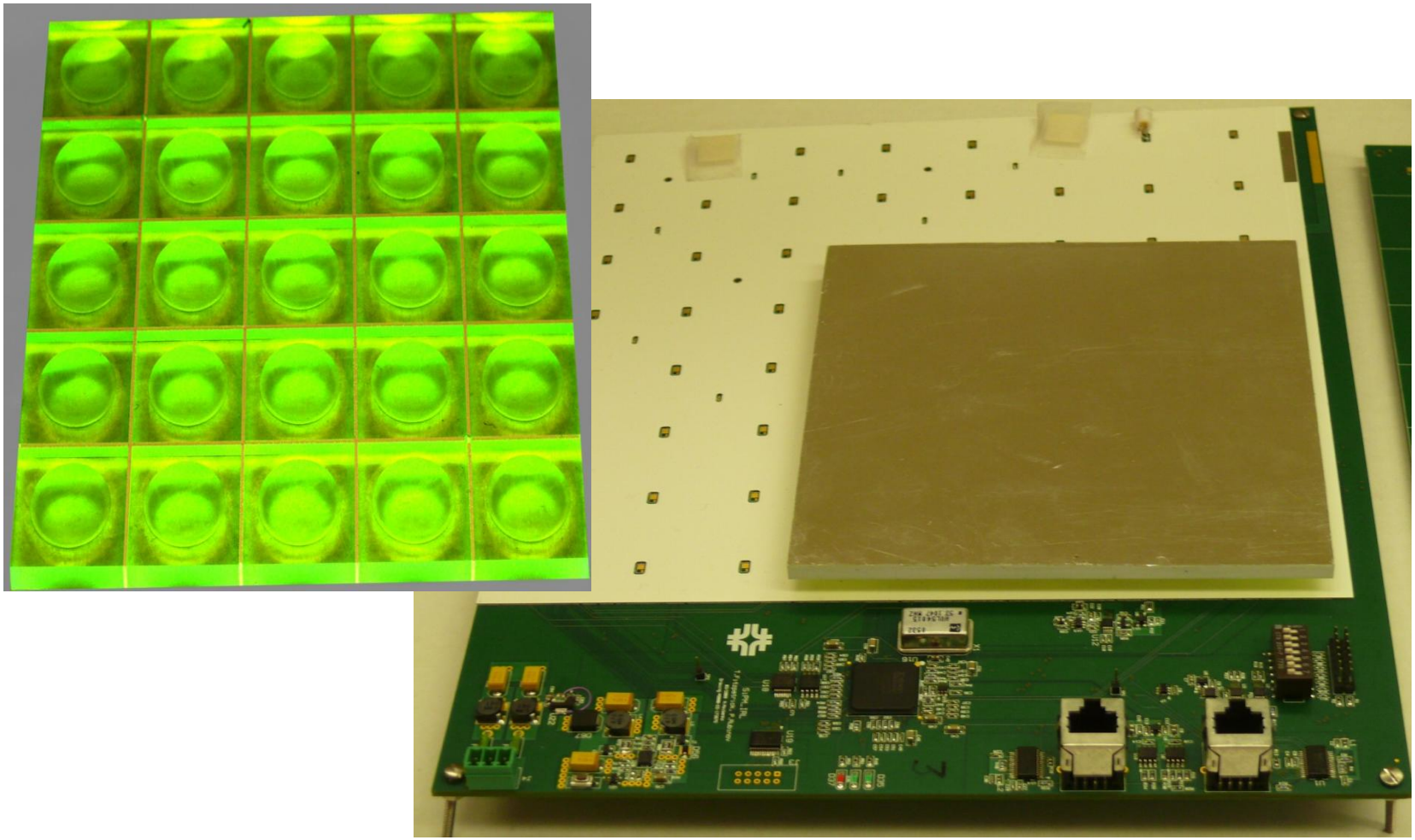








Array of Dimpled Tiles and Electronic Board with Photo Detectors



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

Acknowledgments

- We would like to thank Phillip Stone for his assistance with preparation of the apparatus and Fermilab stuff for a lot of support.