

PANDA SciTil Mechanics

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GSI, September 28th 2010*

Agenda

SciTil Detector

- Lars: Introduction
- Philippe: First consideration for SciTil in Barrel EMC
- Discussion of mechanics for SciTil in Barrel EMC
- *Lunch*
- Myroslav (for Henk): Mechanics for FE EMC
- Discussion of mechanics for SciTil in FE EMC
- Myroslav: Measurements of SiPM at KVI
- Matthias: Time-angle correlations in $p\bar{p} \rightarrow \phi\phi\eta$



Timing Detector:

Scintillator Tile

Hodoscope

SciTil

A Detector for Timing and more



Optimization reasoning:

- Minimize material
- Position close to EMC

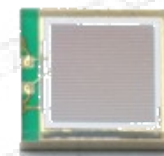
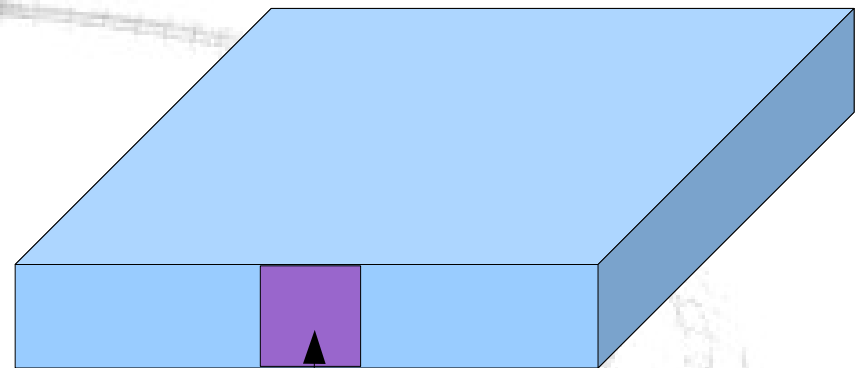
Scintillator barrel ToF:

- Main reason for thickness: long scintillators attenuate light
- Thickness for higher light yield

New timing detector concept:

- $2 \times 2 \times 0.5 \text{ cm}^3$ scintillator tile
- SiPM of $3 \times 3 \text{ mm}^2$ for readout
- Light yield at 1 GeV (MIP): 50-100 photons detected

$2 \times 2 \times 0.5 \text{ cm}^3$ scintillator

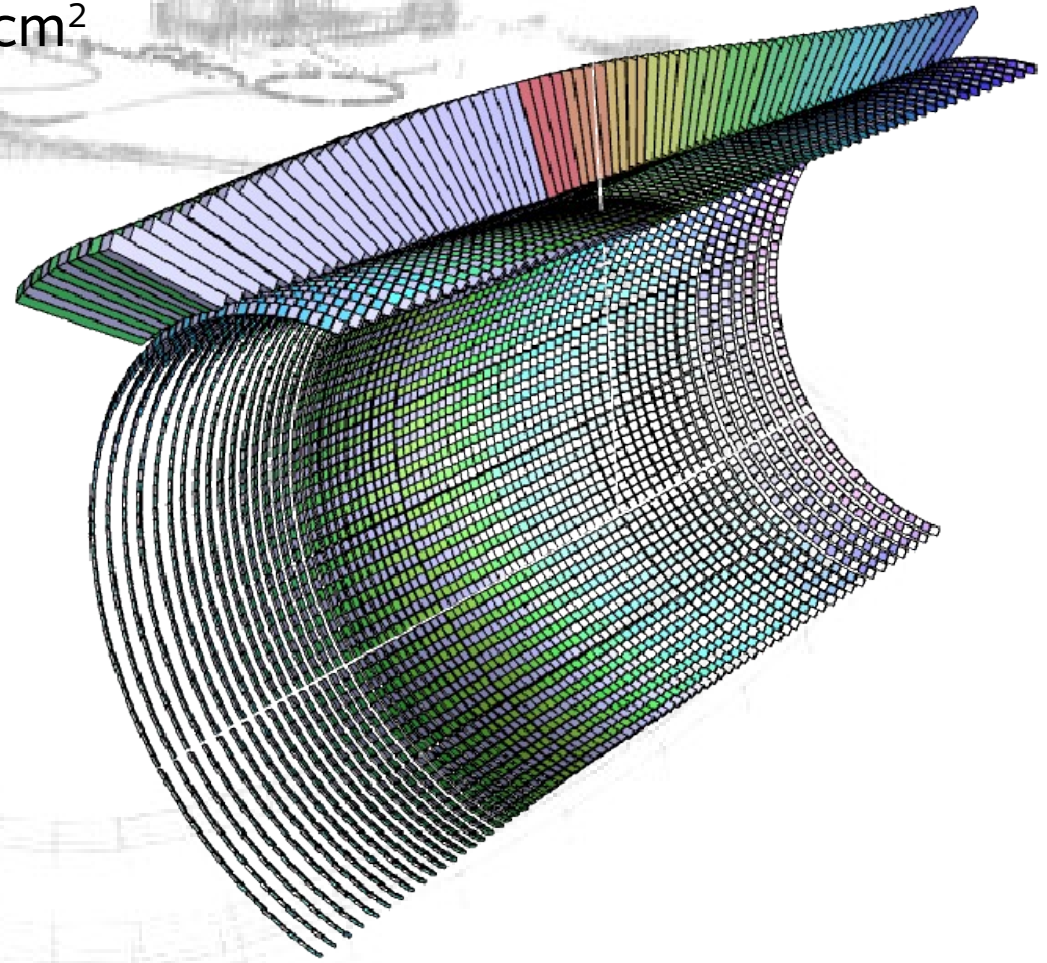


Hamamatsu MPPC
S10931-050P, $3 \times 3 \text{ mm}^2$

Tile Hodoscope Layout



- Position one scintillator tile $2 \times 2 \text{ cm}^2$ in front of each PWO crystal
- Placement in the cold volume
- Each tile has one SiPM attached on the side
- Two cables per SiPM: bias & readout
- Electronics: Discriminator + TDC
- SiPM candidates:
 - Hamamatsu MPPC: nice formfactor, available
 - Philips Digital SiPM: on-die TDC electronics



Tile Hodoscope Pros and Cons



Advantages of the concept

- Lowest possible material budget
- Fast timing in the order of 100 ps for trigger and ToF
- Detection of γ -conversions in front of EMC
- Charged-neutral discrimination
- If employed in forward endcap: additional timing
- Space resolved timing signals (input to DIRC PID & TPC)

Disadvantages:

- SiPM operation in this mode has to be tested
- Cost increase by 2x compared to scintillator barrel
- Someone has to build this

The R&D efforts needed for this are quite limited

Expression of Interest for SciTil



The group: BARC Mumbai

- Members: D. Dutta, V. Jha, B. Roy worked for PANDA, further Post Docs and students, university connections
- BARC will take care of simulations, tests, production, finances
- Help for ASIC and mechanics design fitting to EMC

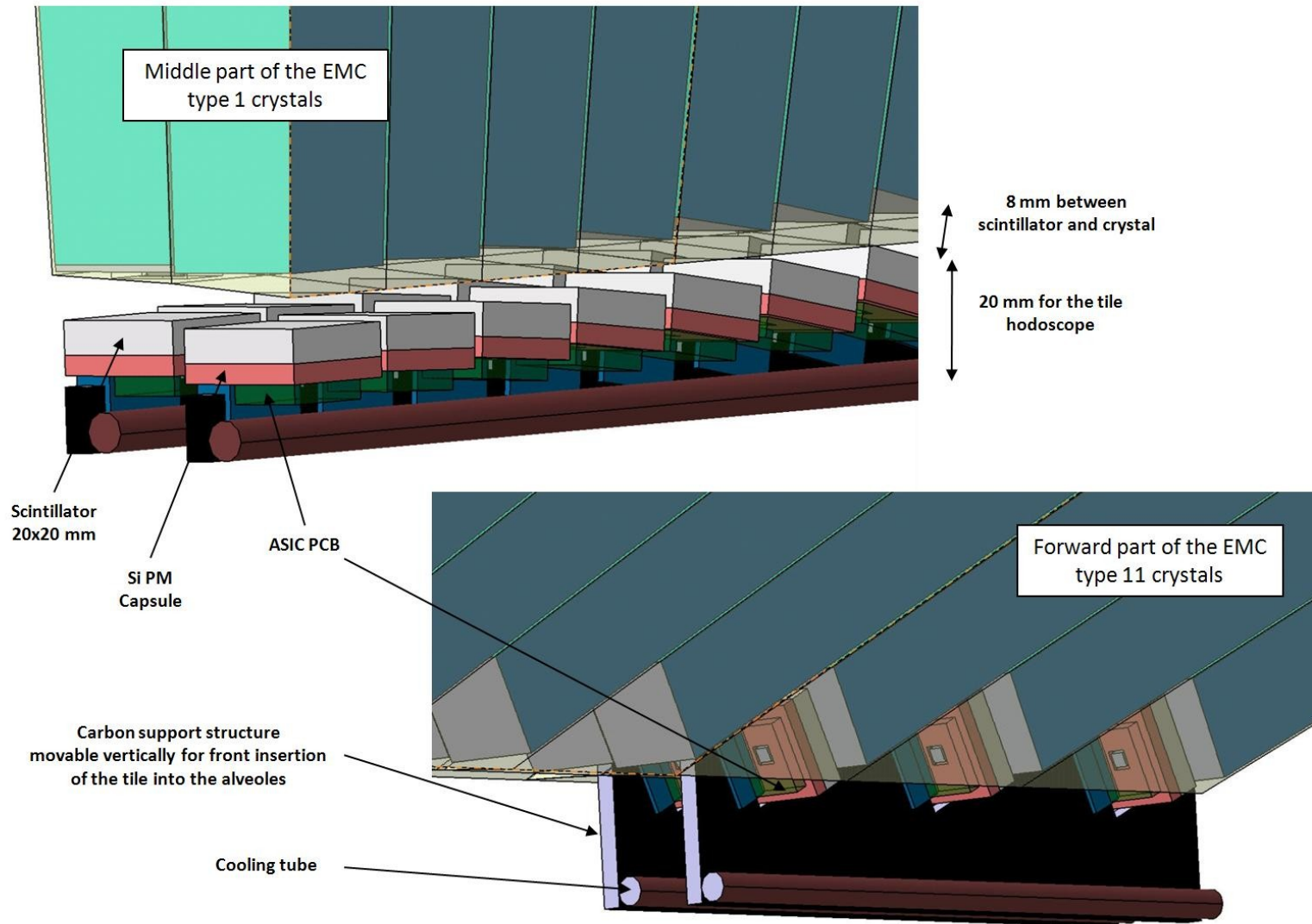
Motivation:

- BARC would like the lead in a visible project
- SiPM development at BARC fits nicely to the project
- Spin-off similar detectors for other purposes

Project plan:

- Optimisation of light collection: simulation and lab tests
- Production of tiles including SiPMs
- Financing via FAIR India funds

First Mechanical Draft: P. Rosier



Preliminary concept for the tile hodoscope mechanics – 01/09/2010 – Rosier P.

- PANDA has no *hardware trigger* to start detector readout
- PANDA will have *software triggers* to do fast selection
- Software triggers rely on simple signature which allow large rejection factors
- Fast selection and event association require precise timing which must be easily available (no complicated reco)
- The design of software triggers is in a virgin state

At this time we cannot throw out the only simple detector for high precision timing

- A *tile hodoscope* in front of the EMC crystals serves in multiple ways, gives good timing at lowest possible material budget
- An expression of interest for this device is about to be put forward