



CEPC AHCAL Status

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Outline



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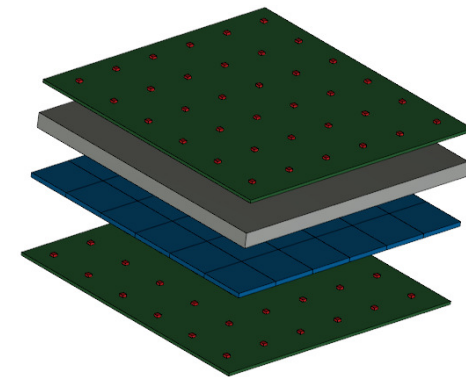
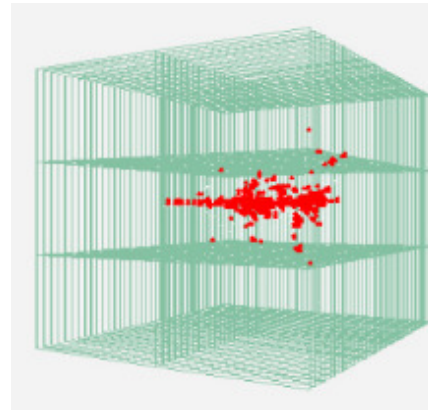
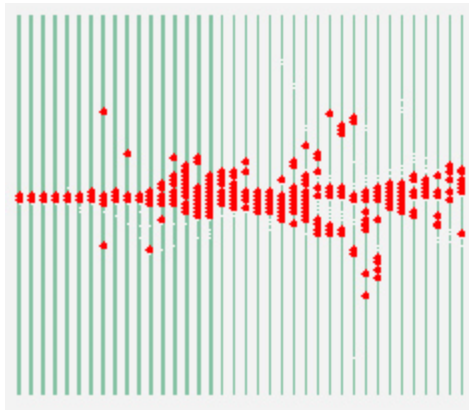
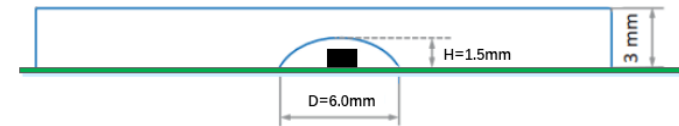
- Introduction
- Studies of scintillator tiles with optimised cell size (4cm*4cm)
- Development of a batch testing system for scintillator tiles
- Development with KlauS chip
- Energy reconstruction and prototype size optimization
- Summary

A Reminder



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- The CEPC AHCAL
 - Scintillator + steel
 - SiPM-on-Tile technology
- The AHCAL project funded by MOST
 - A large size AHCAL prototype



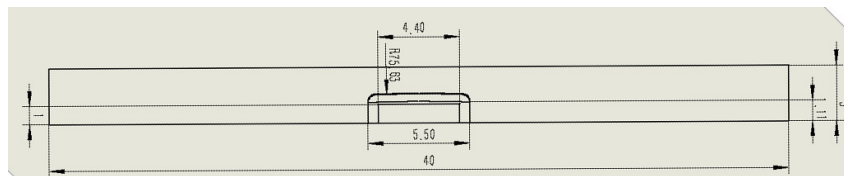
Taken from CALICE

New AHCAL Cell

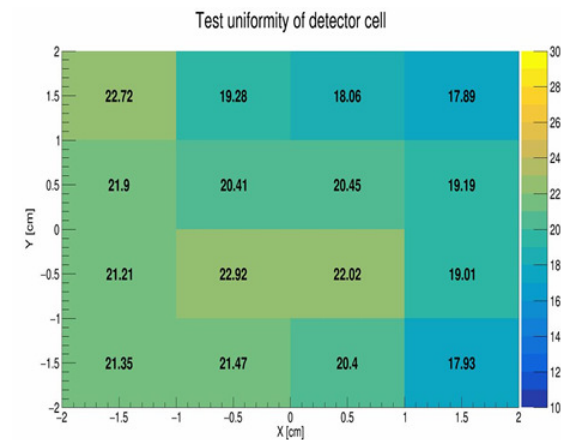


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- Developed a new cell design following the cell size change from 3cm*3cm to 4cm*4cm as a result of optimization
- Assessed its light yield uniformity
- Application of large size SiPM to compensate for the light yield loss due to large cell size.



Active area	4x1.3mmx1.3mm
Pixel size	10um
Breakdown	23.7V
PDE@420nm	35%

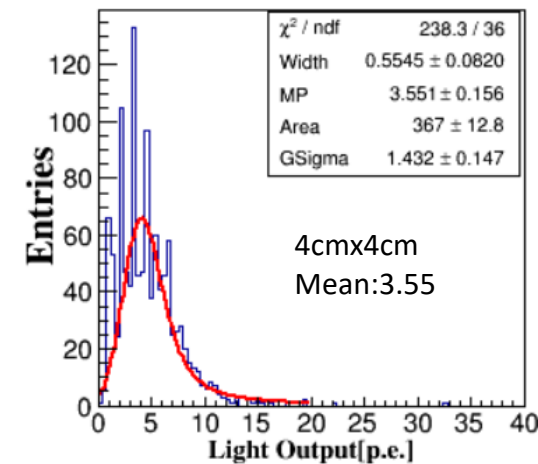
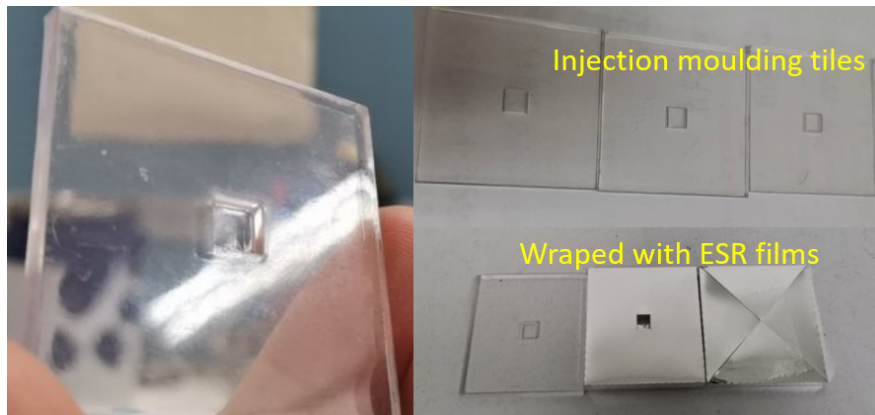


Scintillator tile trial production



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- Produced a first batch of 4cm*4cm tiles using injection moulding
- Light yield too low !
- Need to adjust some key paramters in the production procedure.

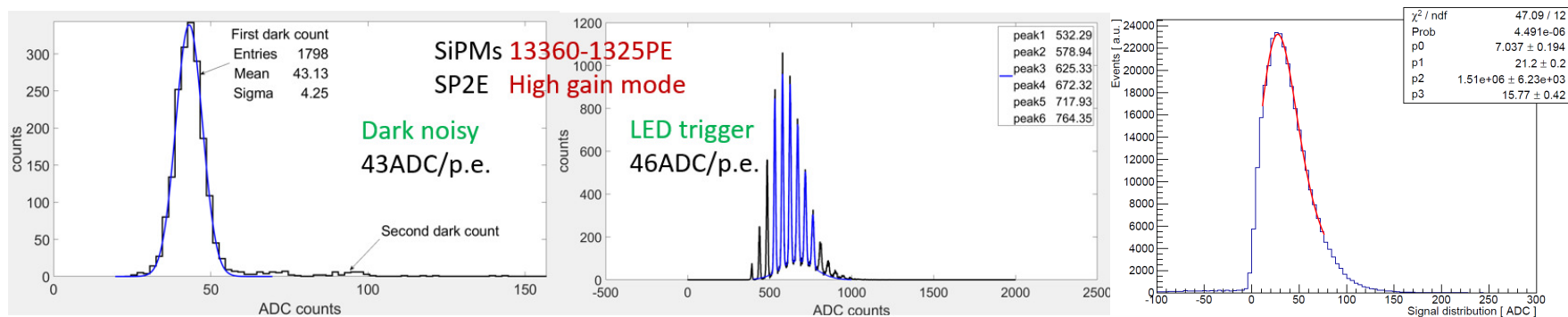
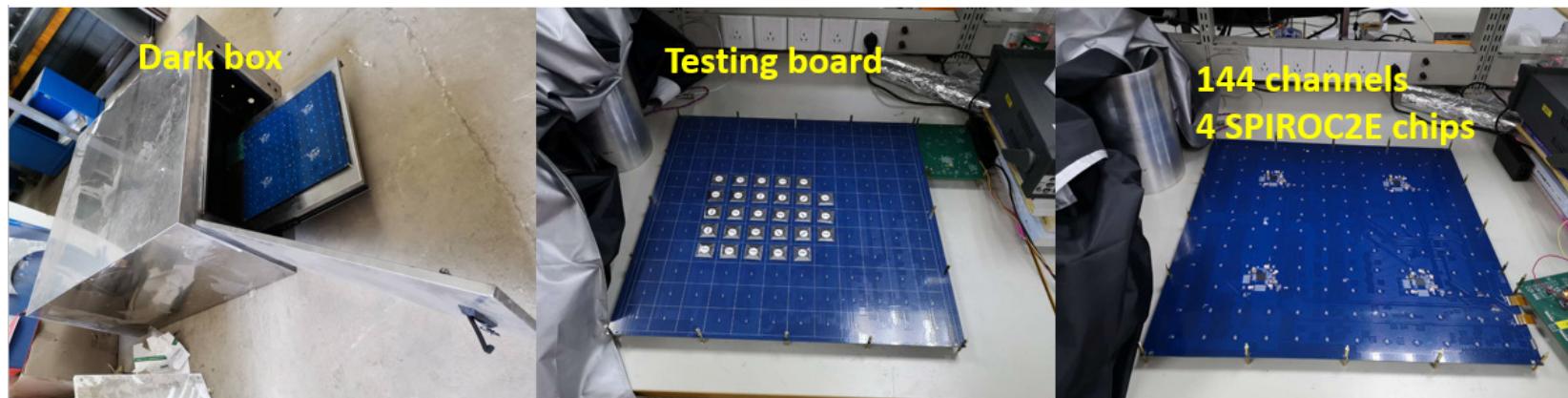


Batch test bench



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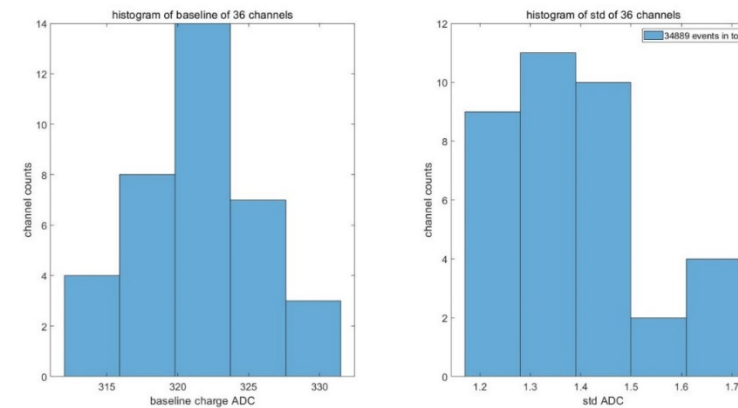
- Developed a batch testing system for scintillator tile quality check.



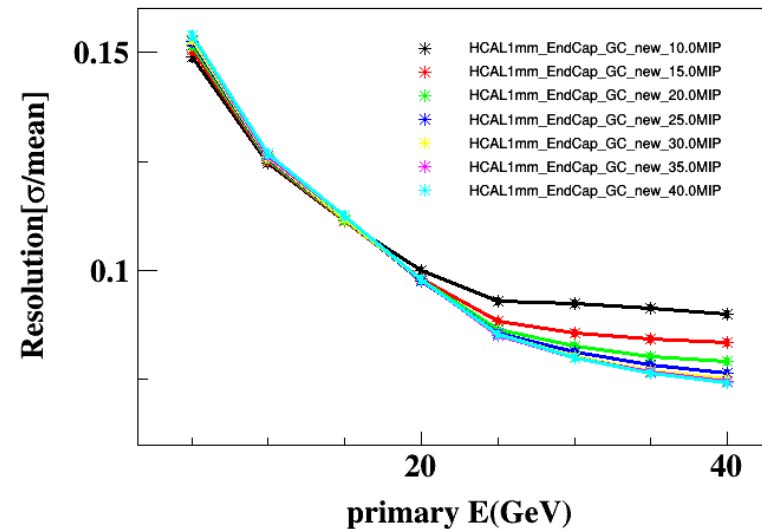
- KLauS chip can run in continuous mode suitable for CEPC. It would be a candidate readout chip for CEPC AHCAL.
- Plan to use it for part of the AHCAL prototype
- Have developed a testing board for Klaus. Will do more tests with the chip.



Pedestals and their RMS



- Construct a C_g factor for each event
 - For a specific event: $C_g = \frac{N_{Hit}(E < e_{lim})}{N_{Hit}(E < mean)} = C_g\left(\frac{h}{e}\right)$
 - e_{lim} is set to 5MIP and mean is the average hit energy for this specific event
- $E_{Cg} = E_{deposition} * C_g$

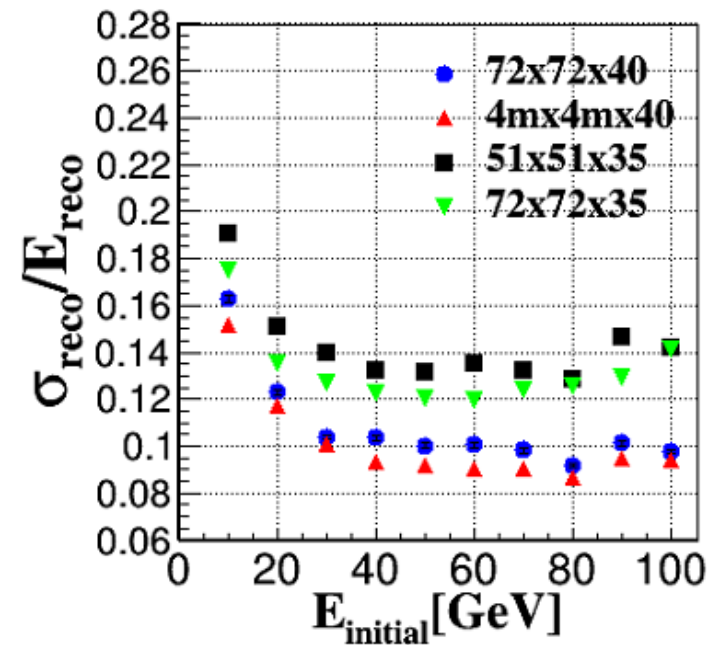
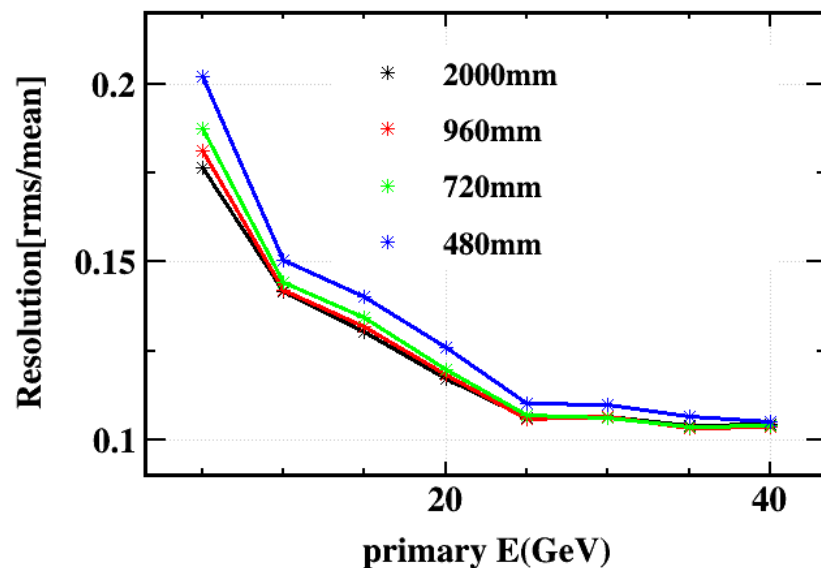


Optimal prototype size



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- $72 \times 72 \text{ cm}^2$ seems a good choice of AHCAL prototype transversal area
- Desirable to have 40 layers



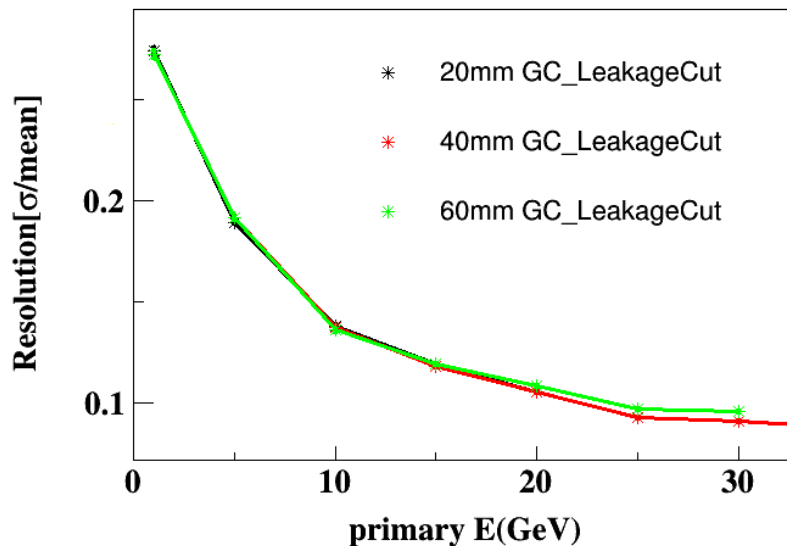
Cell size scanning



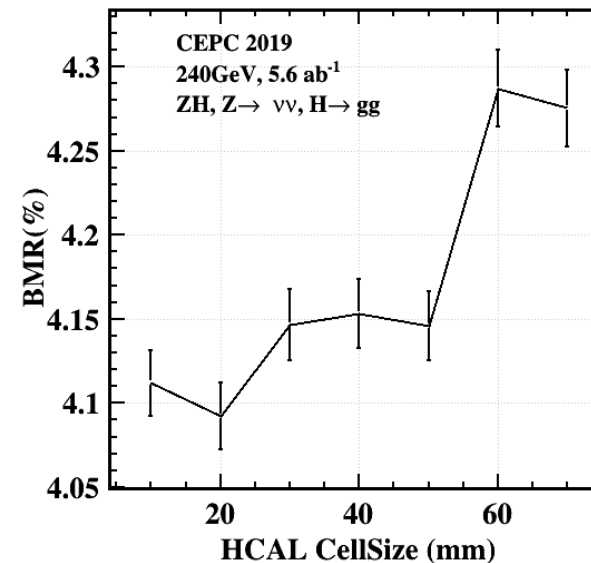
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- Very preliminary. More studies are needed.

Global compensation with different cell sizes



BMR with analogue readout and global compensation



Final Remarks



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- Most of the hardware work had halted due to Covid-19
- Most of the recent activities are on software and performance studies
- The AHCAL prototype size is about to be finalized.
- We are quite behind the project schedule now (by more than half a year)
- We have to expedite our work when the situation largely returns to normal because building a full-size HCAL prototype is really challenging.