



Status on the PSD activities in Lecce

G. Marsella on behalf of Lecce group

Outline

Must be revisited
after this meeting

Activity in Lecce in 2019-2021:

PSD bars segmentation studies to optimize SiPM readout to get charge dynamics from 1 to 26

- Test station for SiPM readout
- MC studies to optimize detector geometry
- Dynamic range studies for different configurations

Future

- Digital Readout for detectors

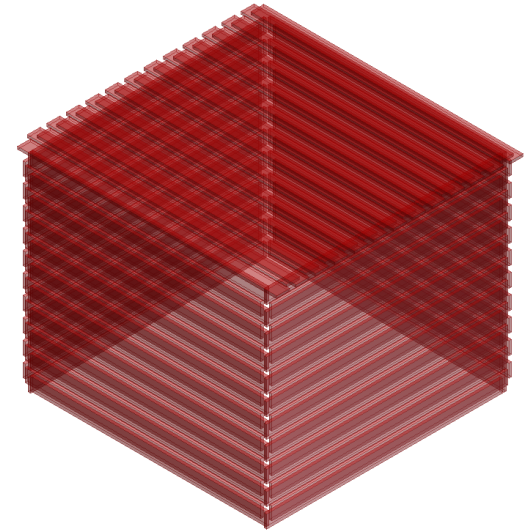
Trigger

DAQ

The HERD PSD

plastic scintillator detector

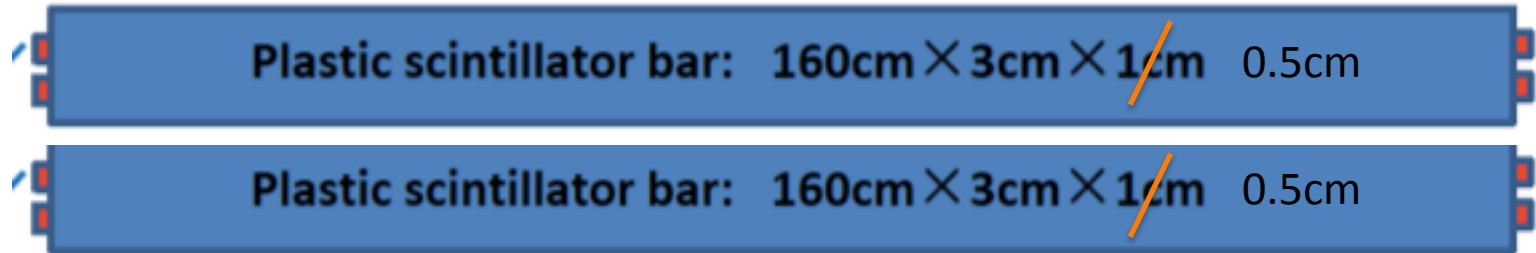
- Low energy gamma identification
- CR identification by Charge Measurement
- Design
 - 1 X/Y layer on top, 4 lateral sides
 - X layer for LE photon trigger
 - X & Y layers for Z measurement and e/
gamma discrimination
 - 1 X layer on bottom side
 - SiPM + IDE3380 ASIC
 - Low & high range to cover Z=1-26
 - Redundancy SiPMs



Bars vs Tiles layout
resulting from the
optimization of efficiency /
mechanics / no. channels
and backsplash effects

Alternative approach: tile geometry

PSD New idea



Double dynamic range

readout chain should cover more than 2 decades,
taking into account the quenching effect in the plastic
scintillator.

Study to optimize layout, cost, etc..

Actually in Lecce

- Bars PSD
 - Set-up for SiPM test
 - Test Bars + SiPM
- MC
 - Installed Herdsoftware
 - Run first protons

PSD bar test
In collaboration with GSSI and INFN Bari

Test Setup

Dark Box 1

Dark Box 2



Test Setup 1

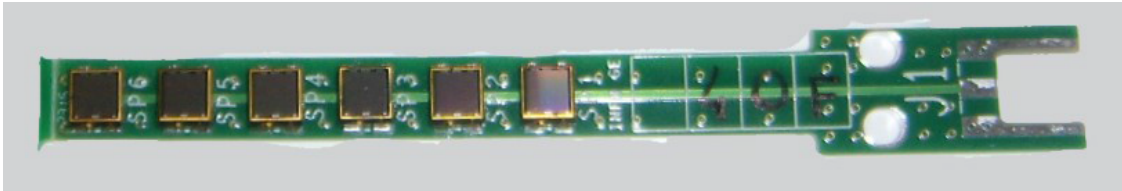
Printed circuit from Pavia 3 config:

0101010

0010100

0001000

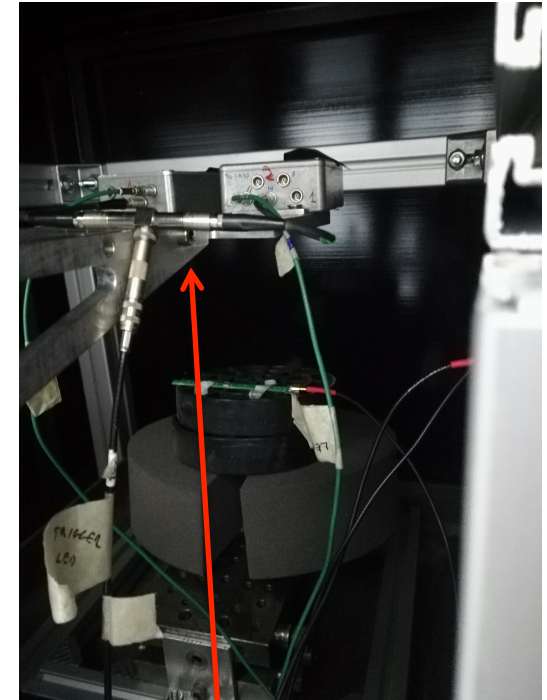
SiPM Hamamatsu mod S12572 15 um 3x3 mm²



20x10x1000 mm³

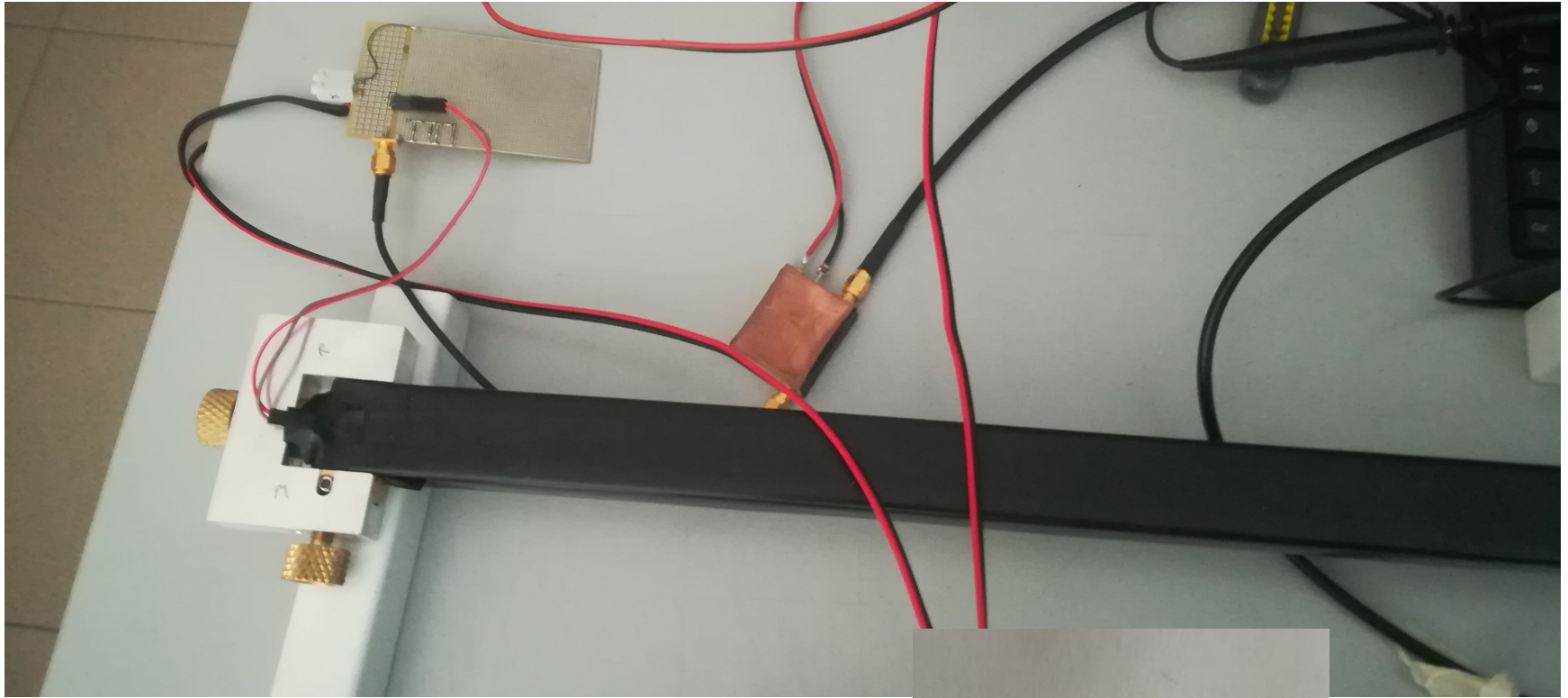
30x10x1000 mm³ At the moment 3 bars from Pavia

50x10x1000 mm³



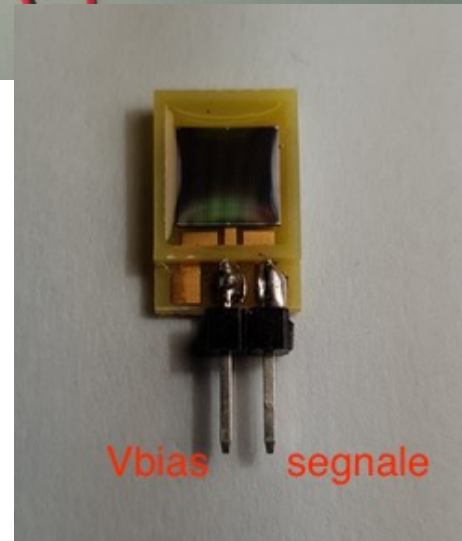
2 Leds inside dark box 1 (and 2)
Allows linearity measurements

Test Set-up 2

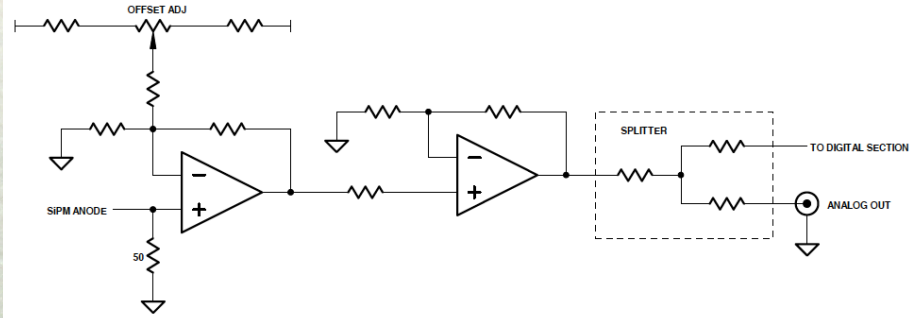
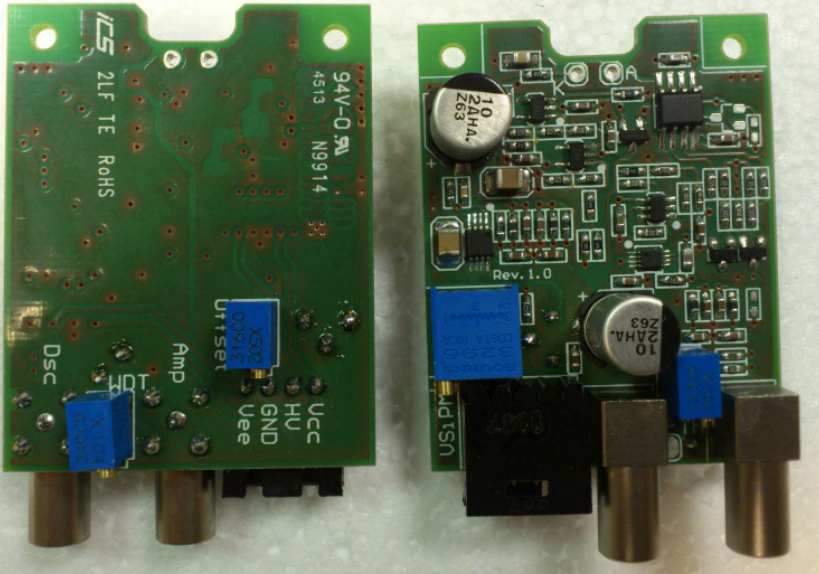


1 bar 1x1x70 cm³

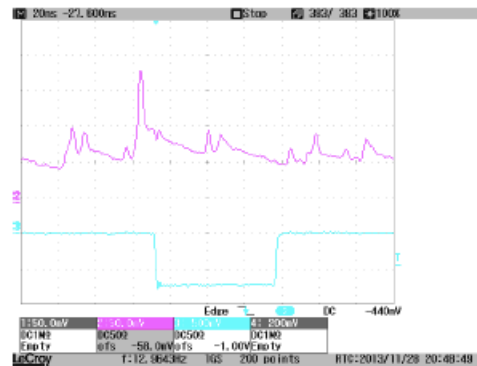
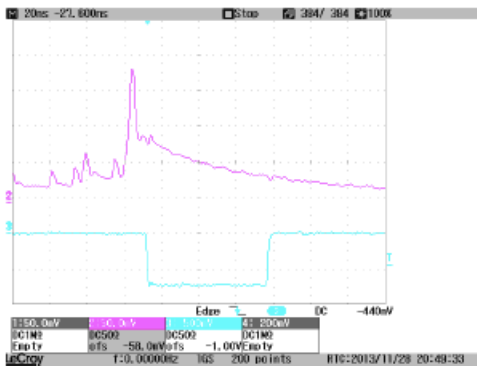
1 SiPM Advansid CTA 6x6 mm² ($V_b = 26.5$ V)



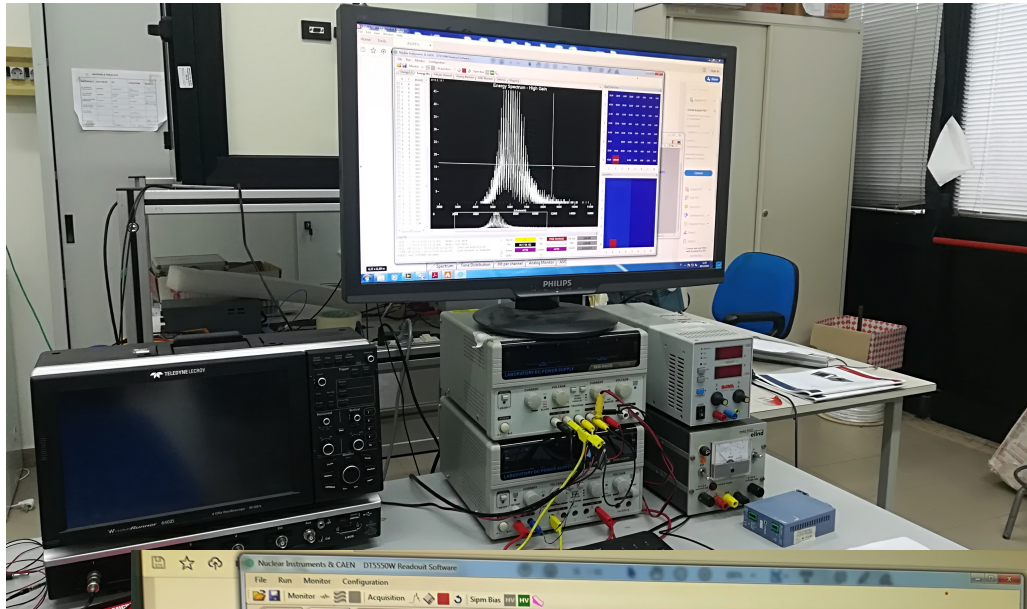
Test Setup



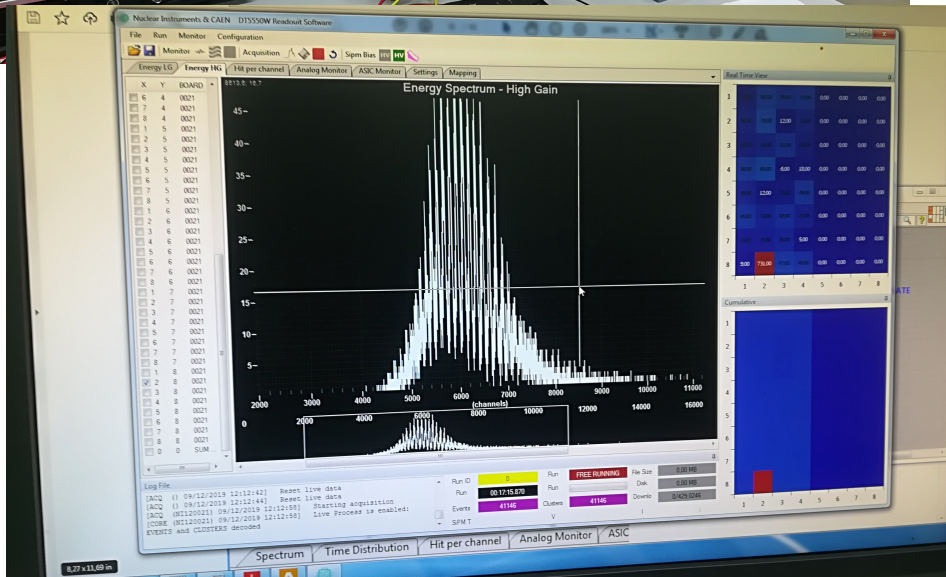
Board to read SiPM
From GSSI – LNGS
Attanasio



Test Setup



CAEN DT5550W
2 citiroc



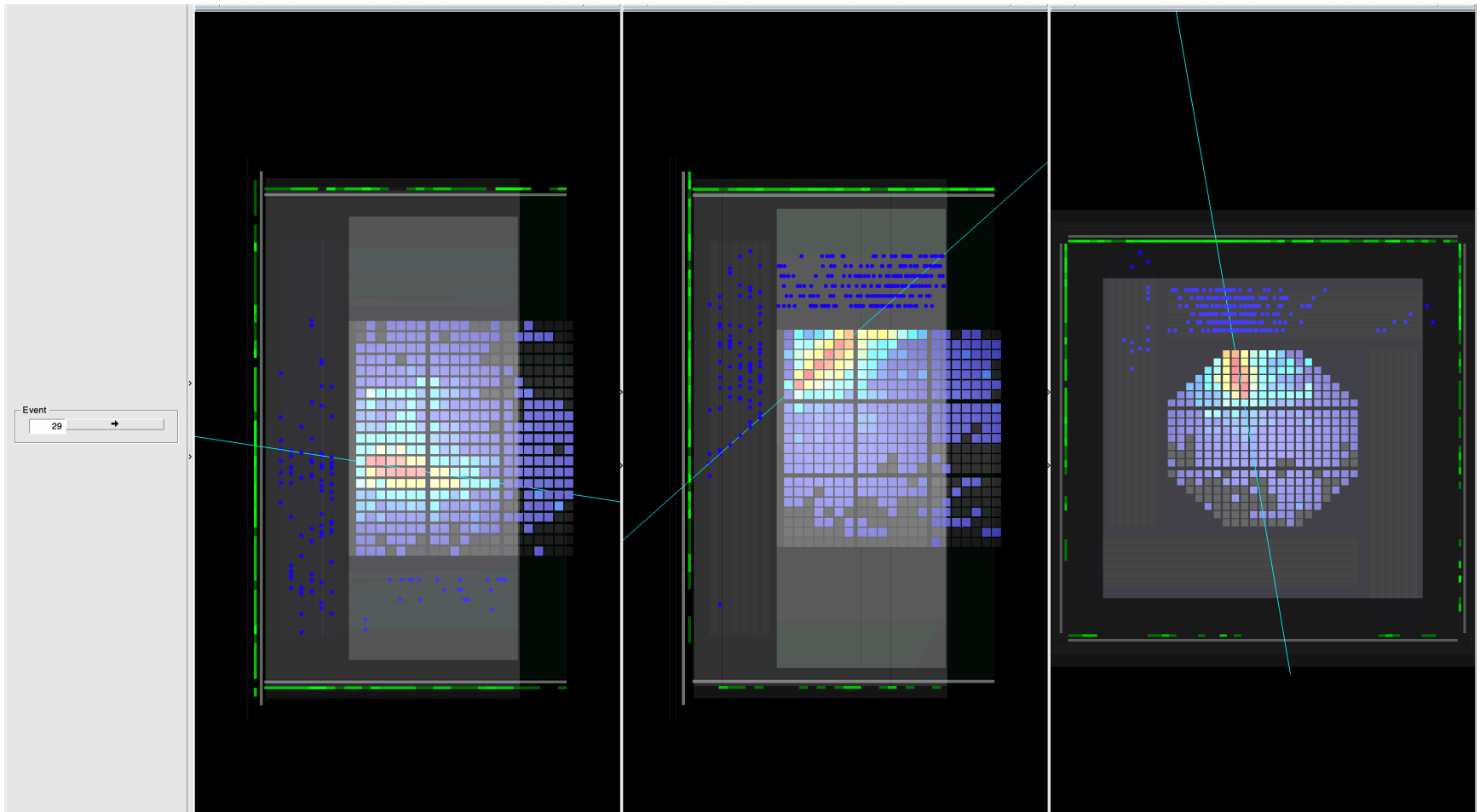
- Started characterization of SiPM with LED
- Tuning DAQ System
- Prepared first available bars with SiPM

HerdSoftware

- Installed HerdSoftware (GEANT4, EventAnalysis, ROOT etc)
- Participated to last hands-on meeting in Bari
- Started to play with software (protons, EventDisplay, Analysis tools)

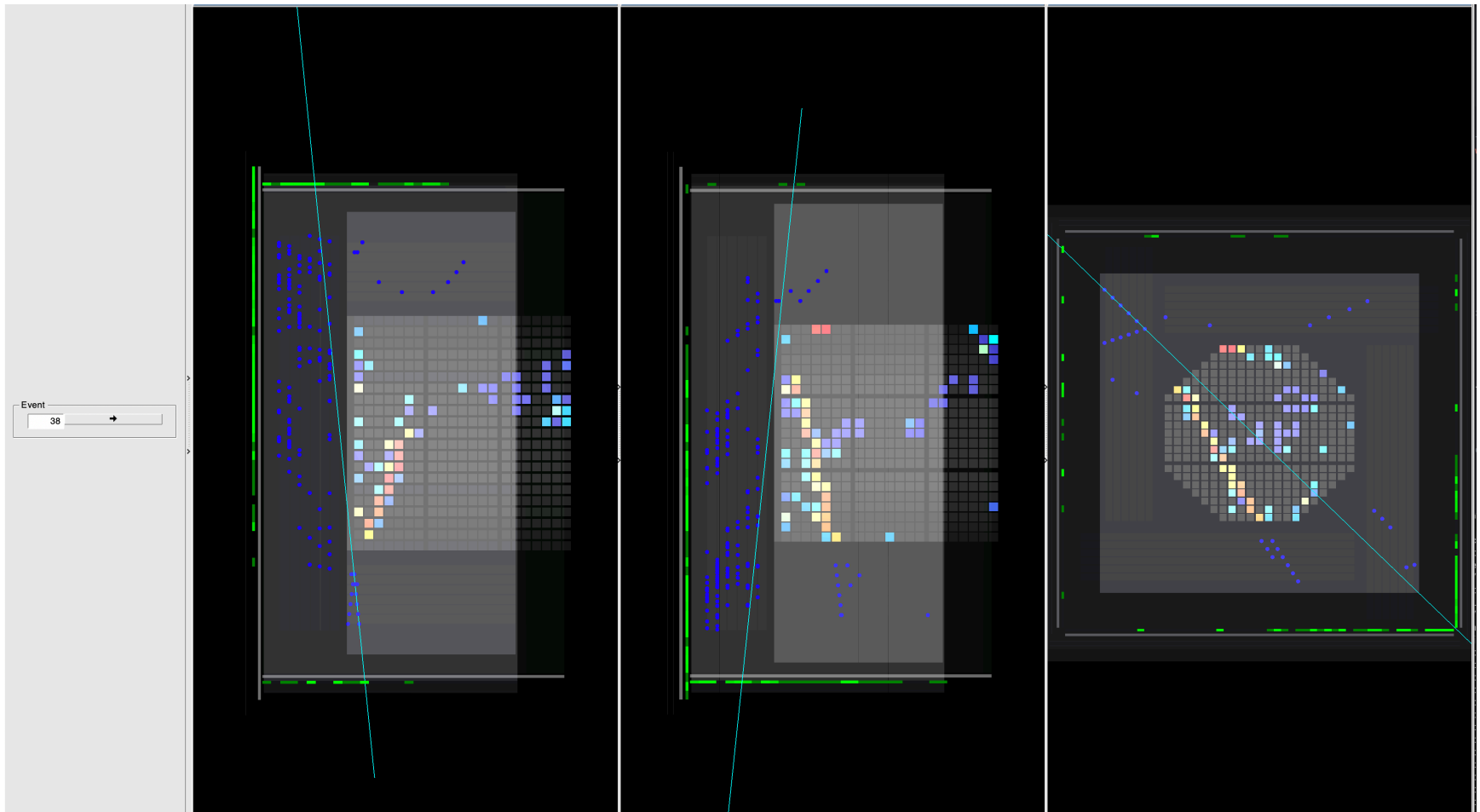
HerdSoftware Display

P 100 GeV decl. 0-120 deg



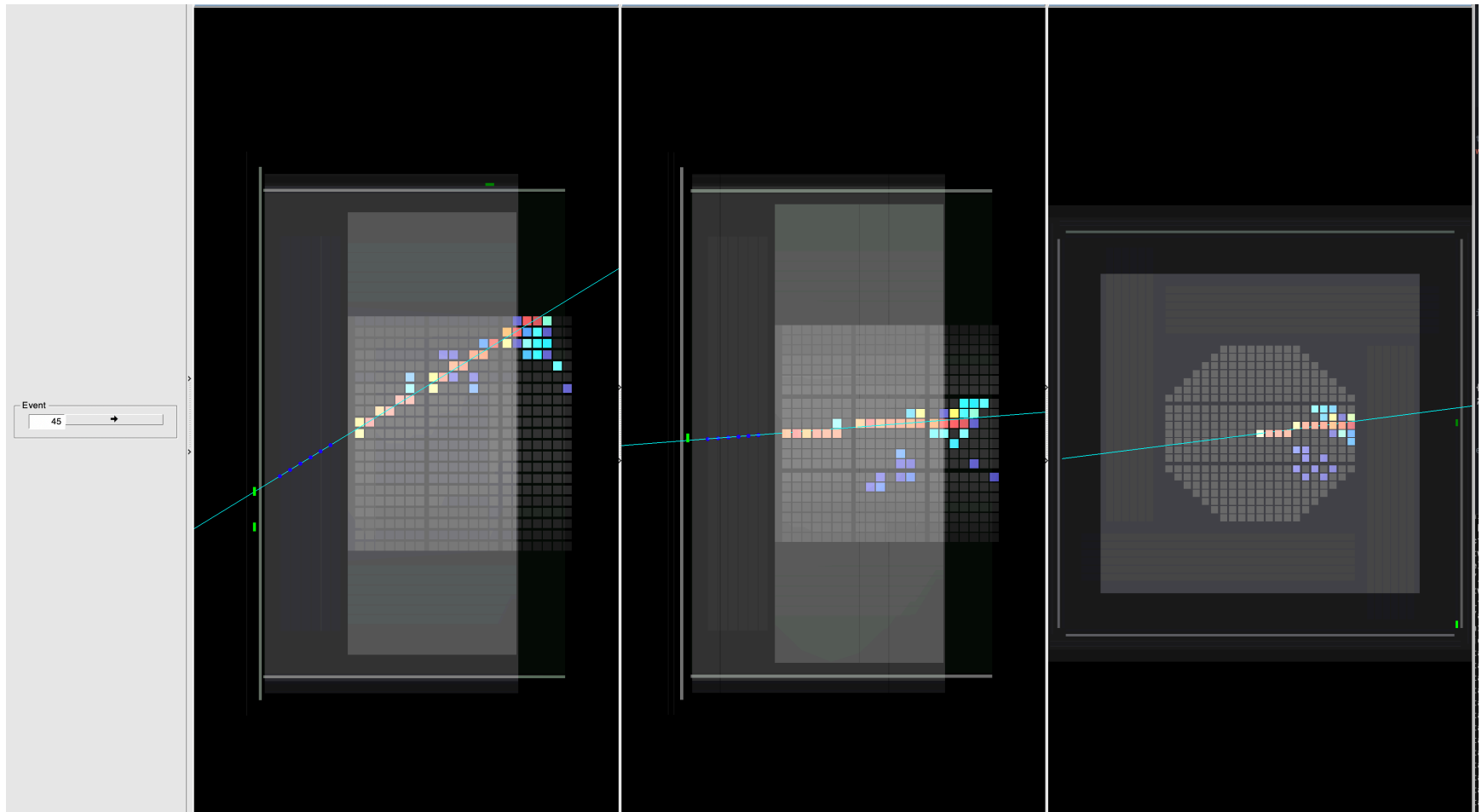
HerdSoftware Display

P 100 GeV decl. 0-120 deg



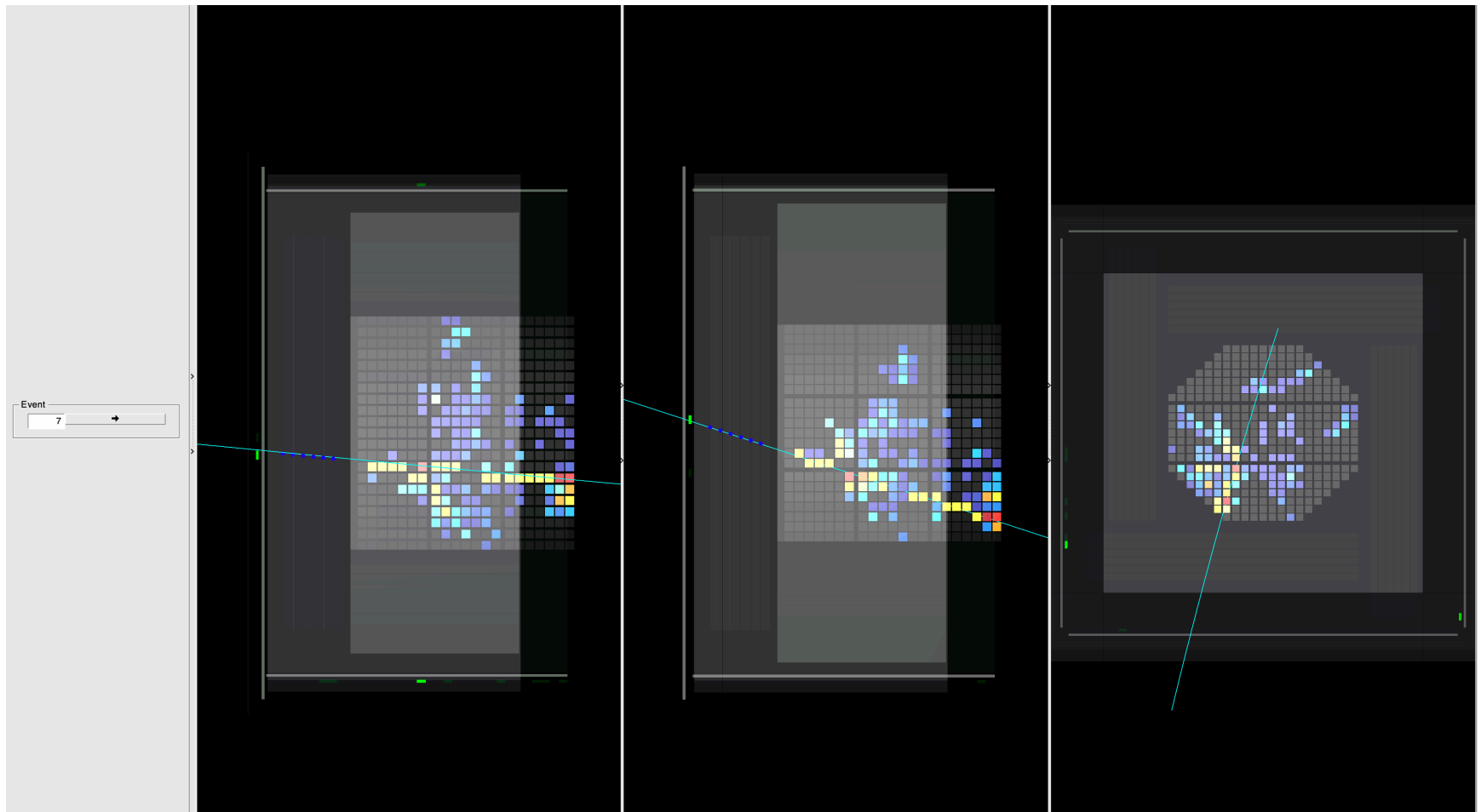
HerdSoftware Display

P 100 GeV decl. 0-120 deg



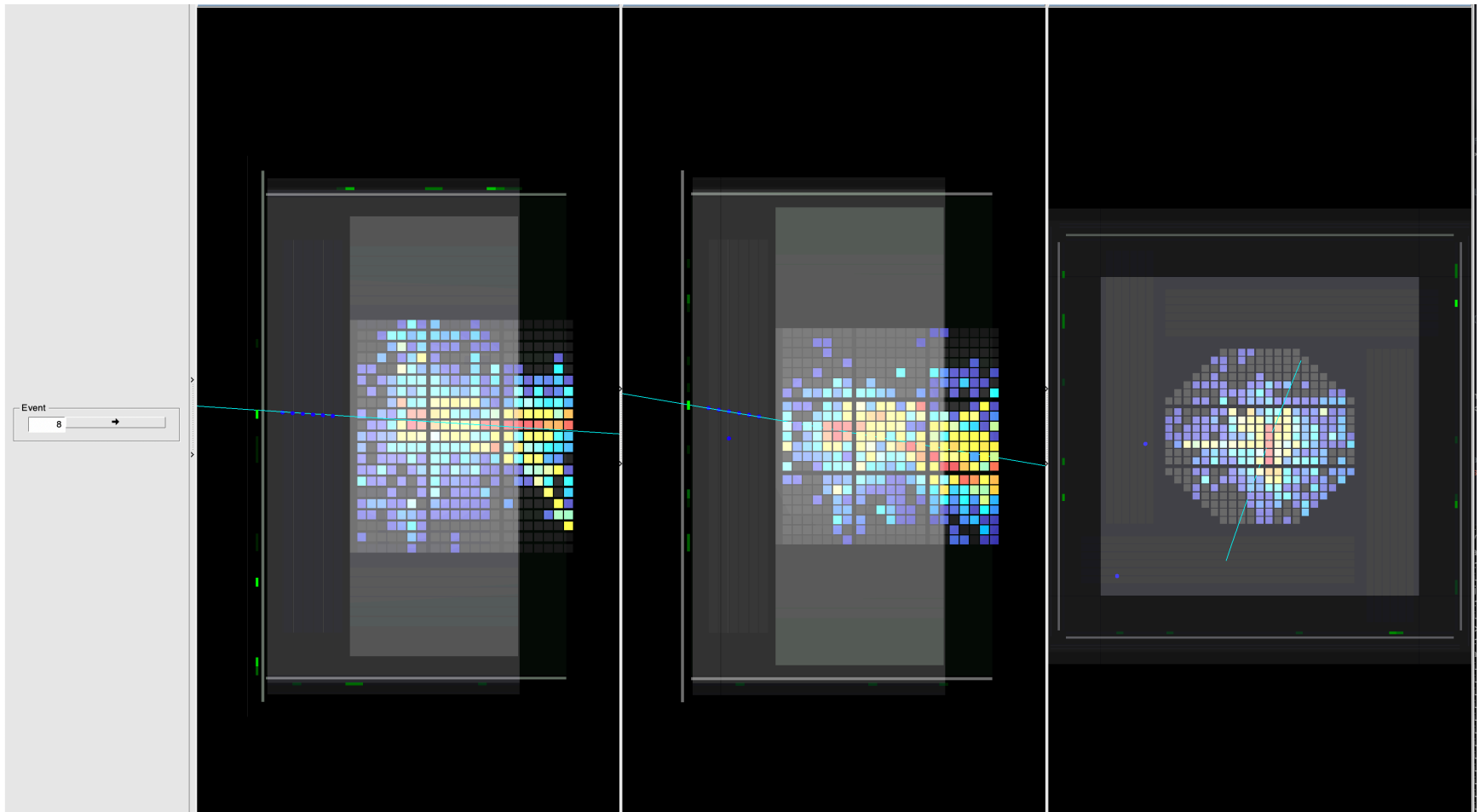
HerdSoftware Display

P 10 GeV decl. 0-5 deg



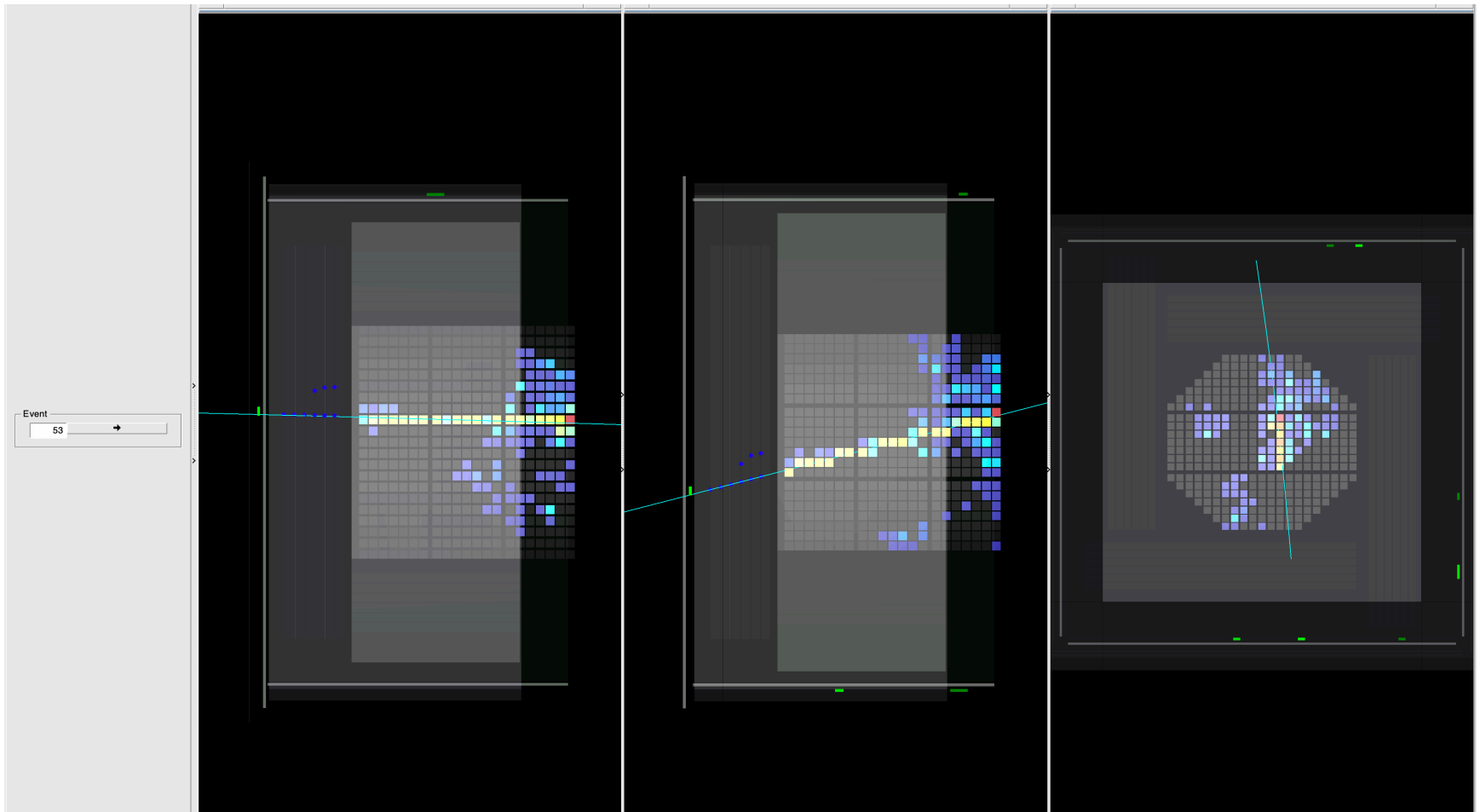
HerdSoftware Display

P 10 GeV decl. 0-5 deg



HerdSoftware Display

P 10 GeV decl. 0-5 deg



Conclusions

- Facility to test SiPM and scintillator bars in Lecce is ready
- Studies on Scintillator bars in collaboration with GSSI
- Installed HerdSoftware tools for MC production and Data analysis.
- TO Do:
 - PSD bars geometry and digitization must be defined and implemented in HerdSoftware
 - Prepare more bars and SiPM configuration to be tested on 2020 Test Beam campaign