

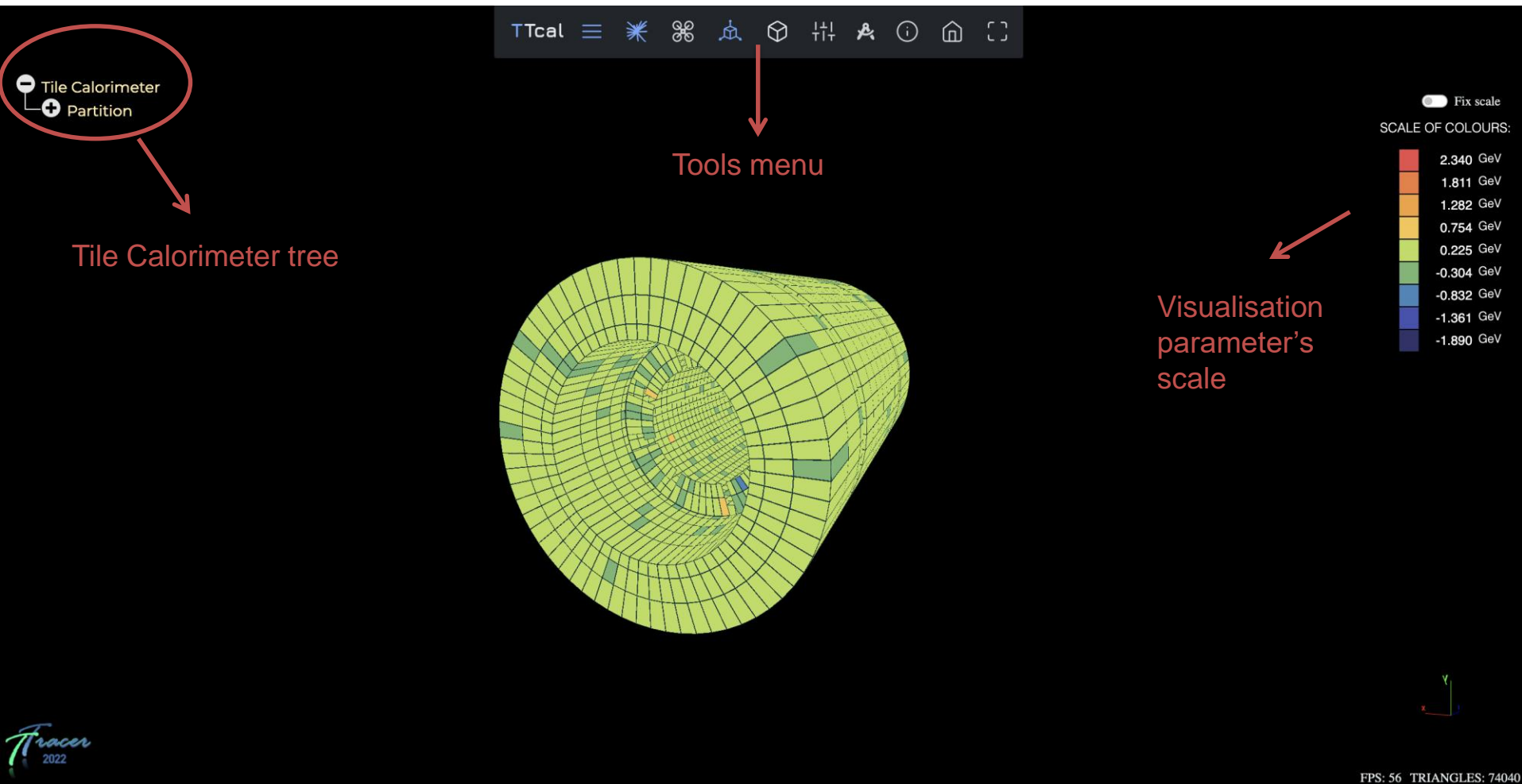
Tracer TiICAL Application Development

ATLAS-GTU TAI Agreement Workshop 29 Nov 2022

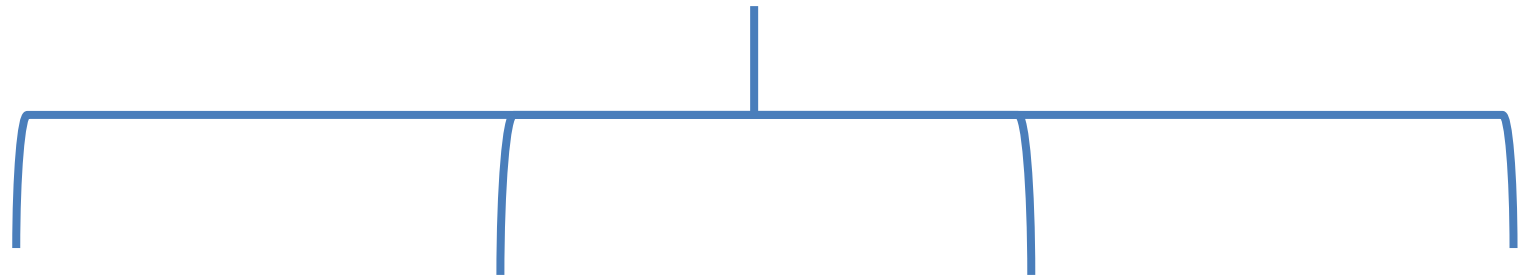
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Tracer TileCal

Web-based 3 dimensional application for visualizing Tile Calorimeter with implemented tools for analysis



Requirements



General

- Easy To Use
- Easy To Run
- Easy To Access

Outreach

- Attractive
- Innovative
- Fun

Education

- Informative
- Interesting
- Intuitive

Analytics

- Data Visualization
- Lots of Interactions
- Informative

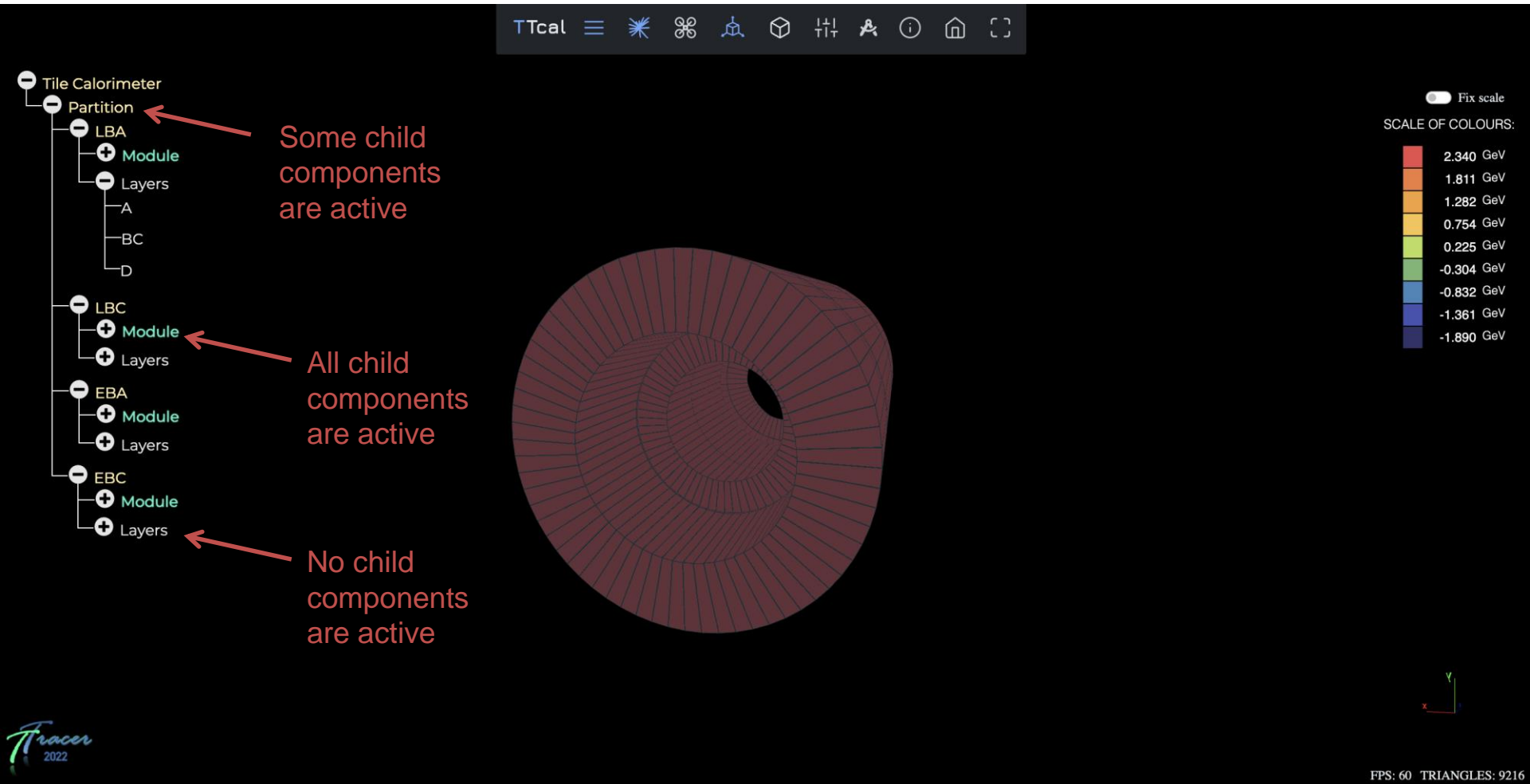
Selecting Application Type

- Using Web Application, we can share our application to world, without any downloads or extra steps.
- Using Three.JS Web Graphics Library (WebGL), we can create 3 dimensional Web Application.



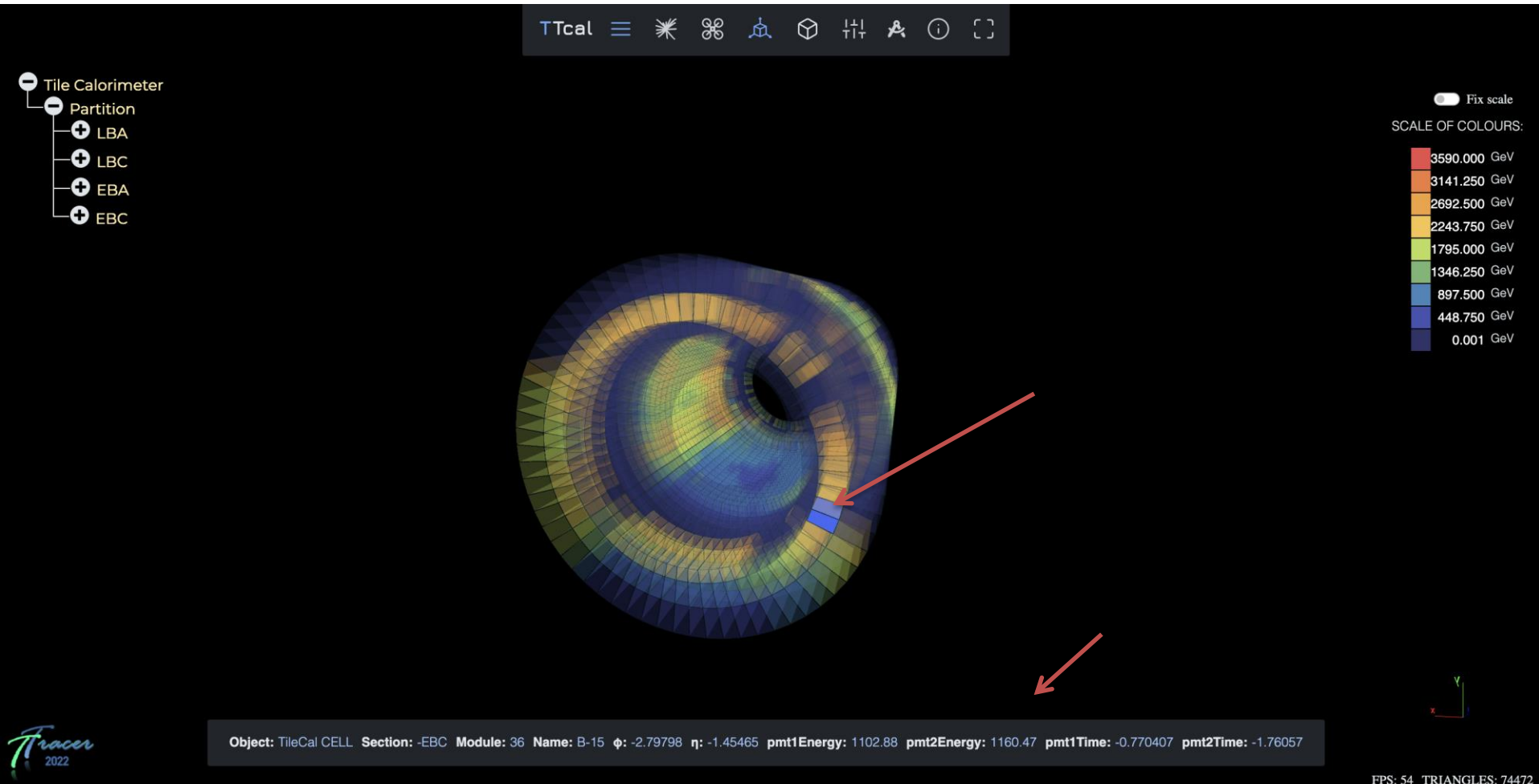
- ThreeJS gives us opportunity to create Web Detector Display Application
- Three.js is the most popular WebGL library. Reasons are: stability, it provides many features, the documentation is remarkable, the community is working hard on updates, and it's still close enough to native WebGL.

TileCal Geometry tree



TileCal Selecting Cells

User can check cell/channel info by clicking on corresponding object in scene



TileCal Event Menu Tools

The screenshot displays the TileCal Event Menu Tools interface. On the left, a tree view shows the hierarchy: Tile Calorimeter, Partition, LBA, LBC, EBA, and EBC. The central 3D visualization shows a cylindrical calorimeter structure with a grid of cells, colored according to energy. On the right, an 'EVENTS' panel is open, showing a 'VISUALIZE' dropdown menu. A red arrow points to this menu, which is currently set to 'Calibration constants per Channel'. Below the dropdown, there are fields for 'Choose files', 'Choose a constant for visualisation' (set to 'constant 1'), and 'Choose gain' (set to '0'). To the right of the 3D view is a 'SCALE OF COLOURS' legend with a 'Fix scale' toggle and a color scale from 0.186 GeV (dark blue) to 1.615 GeV (red). At the bottom right, a small 3D coordinate system is visible. In the bottom right corner, a status bar shows 'FPS: 54 TRIANGLES: 74040'. A dropdown menu at the bottom center shows the following options: Total Energies, PMT1/PMT2 Energies, **Calibration constants per Channel** (checked), and Noise per Cell.

Tile Calorimeter

- Partition
 - LBA
 - LBC
 - EBA
 - EBC

EVENTS

GROUP E 05/50

FILTER INFO VISUALIZE

Visualize TileCal colours by

Calibration constants per Channel

Choose files No file chosen

Choose a constant for visualisation

constant 1

Choose gain

0

Fix scale

SCALE OF COLOURS:

- 1.615 GeV
- 1.437 GeV
- 1.258 GeV
- 1.079 GeV
- 0.901 GeV
- 0.722 GeV
- 0.543 GeV
- 0.364 GeV
- 0.186 GeV

Total Energies

PMT1/PMT2 Energies

✓ Calibration constants per Channel

Noise per Cell

FPS: 54 TRIANGLES: 74040

TileCal Event Loading Options

The screenshot displays the TTcal software interface. On the left, a tree view shows the hierarchy: Tile Calorimeter, Partition, LBA, LBC, EBA, and EBC. The central 3D visualization shows a cylindrical structure with a central hole, colored in shades of green and yellow. On the right, a color scale legend is visible, ranging from -1.890 GeV (dark blue) to 2.340 GeV (dark red). The 'EVENTS' panel is open, showing a list of events. The 'LOAD' button is highlighted in blue. A red arrow points to the 'LOAD' button with the text 'Upload local Event'. Another red arrow points to the event list with the text 'Choose Event from list'.

TTcal

Tile Calorimeter

- Partition
 - LBA
 - LBC
 - EBA
 - EBC

SCALE OF COLOURS:

- 2.340 GeV
- 1.811 GeV
- 1.282 GeV
- 0.754 GeV
- 0.225 GeV
- 0.304 GeV
- 0.832 GeV
- 1.361 GeV
- 1.890 GeV

EVENTS

GROUP E 05/50

group E Event #05 LOAD

FILTER INFO VISUALIZE

Event E 05/50

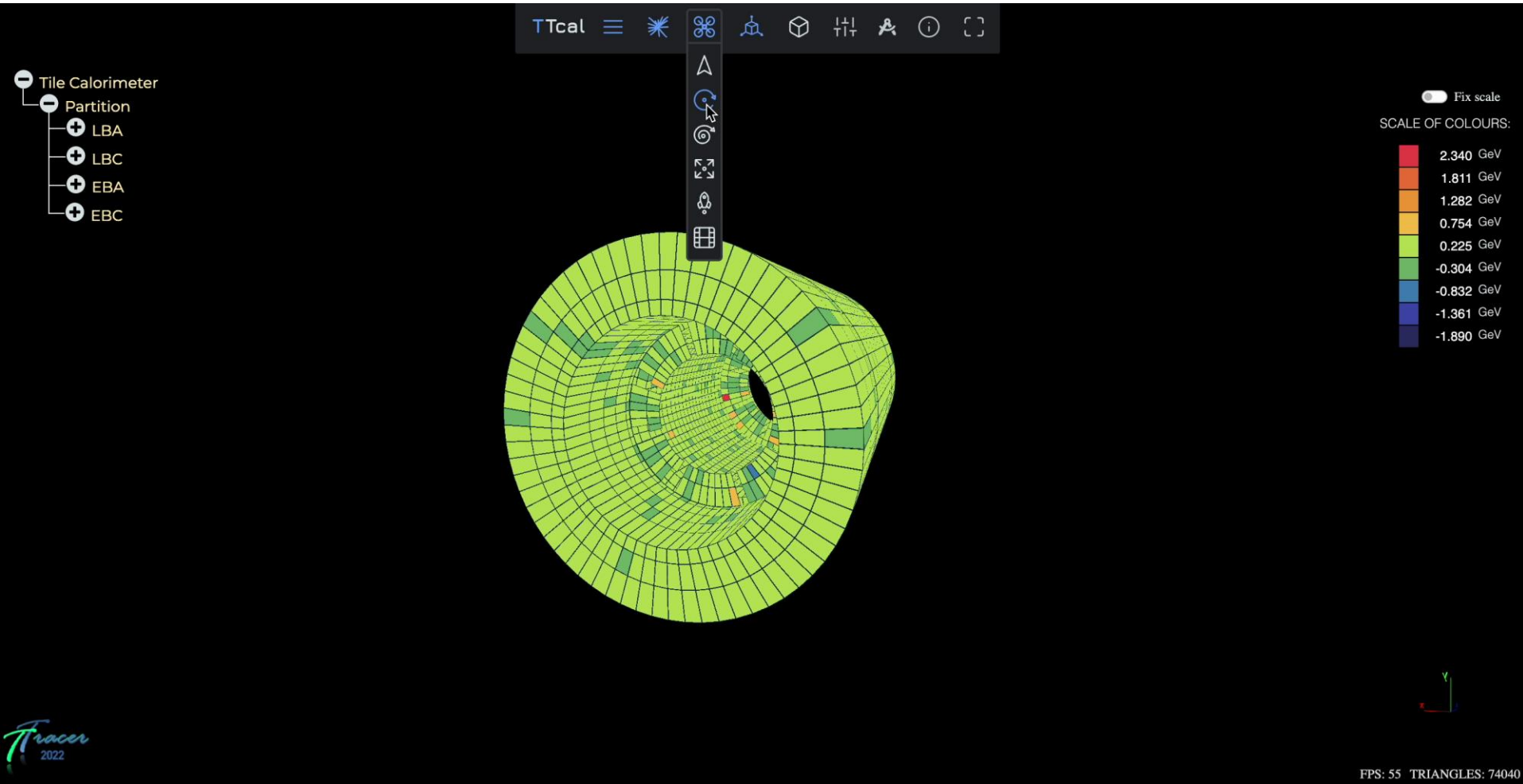
- Num: 1659078
- LumiB: 65
- RunN: 206497
- Date: 2012-07-06
- Time: 03:38:35

Loaded Events(1)

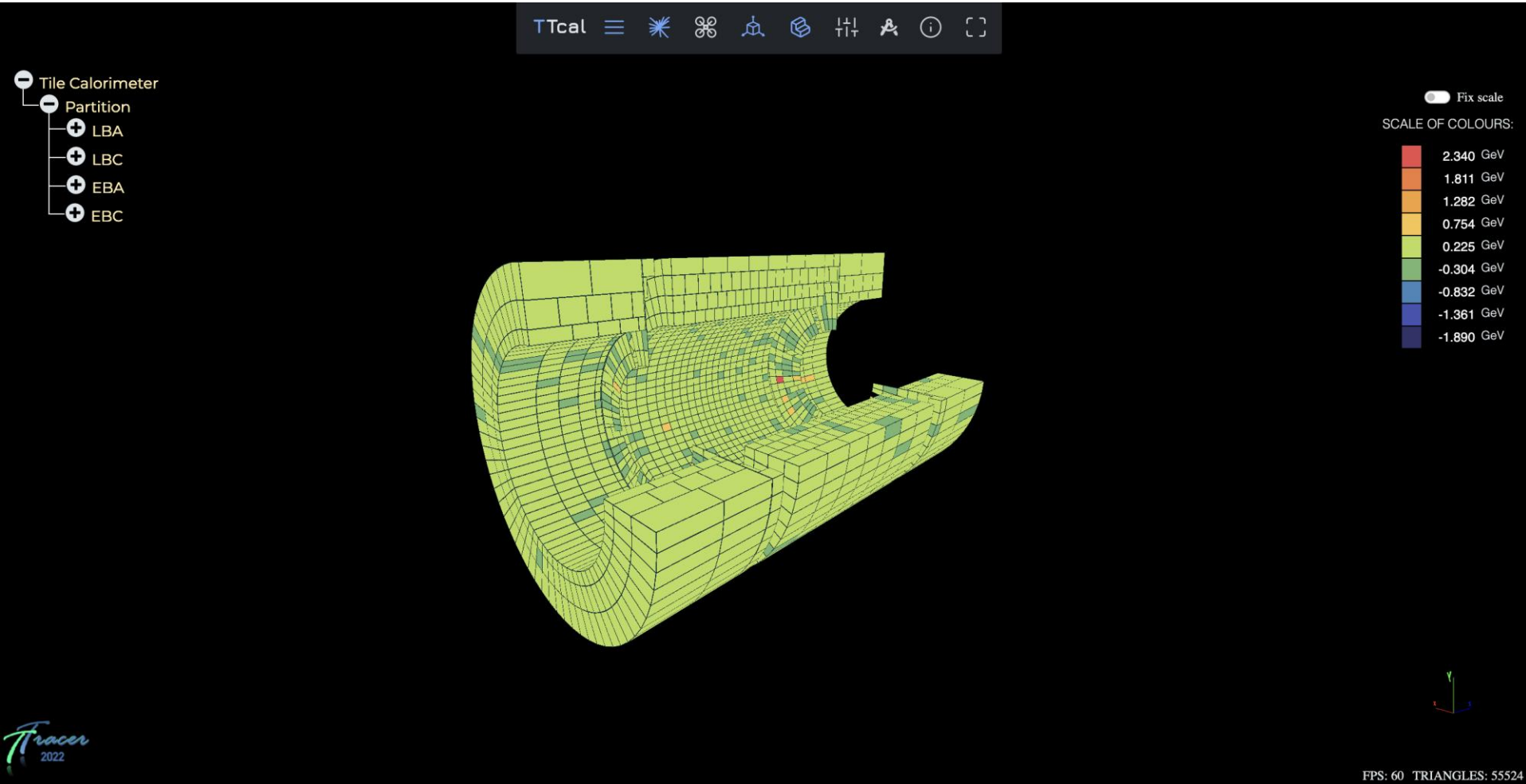
Upload local Event

Choose Event from list

TileCal Drone Options

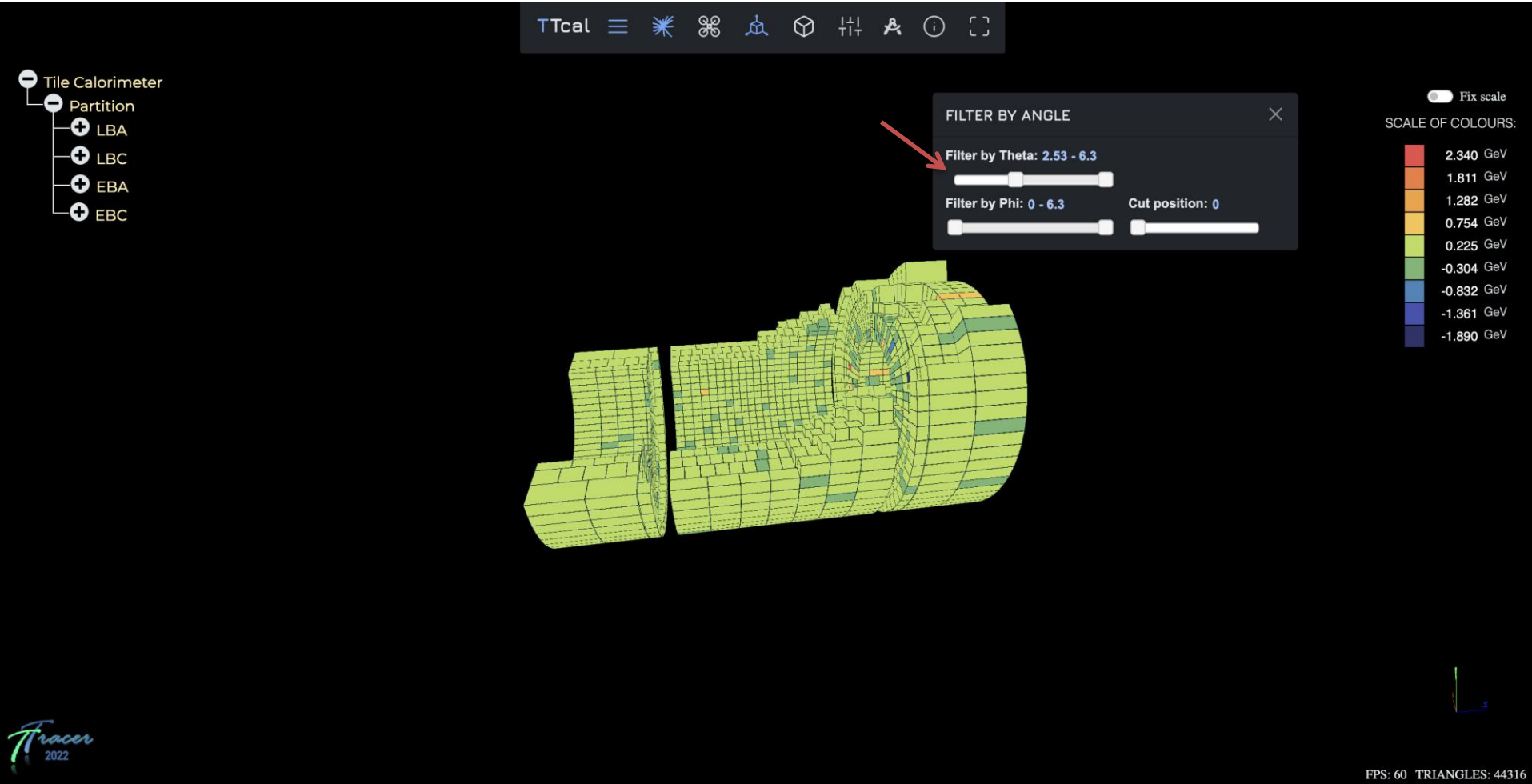


TileCal Predefined cuts



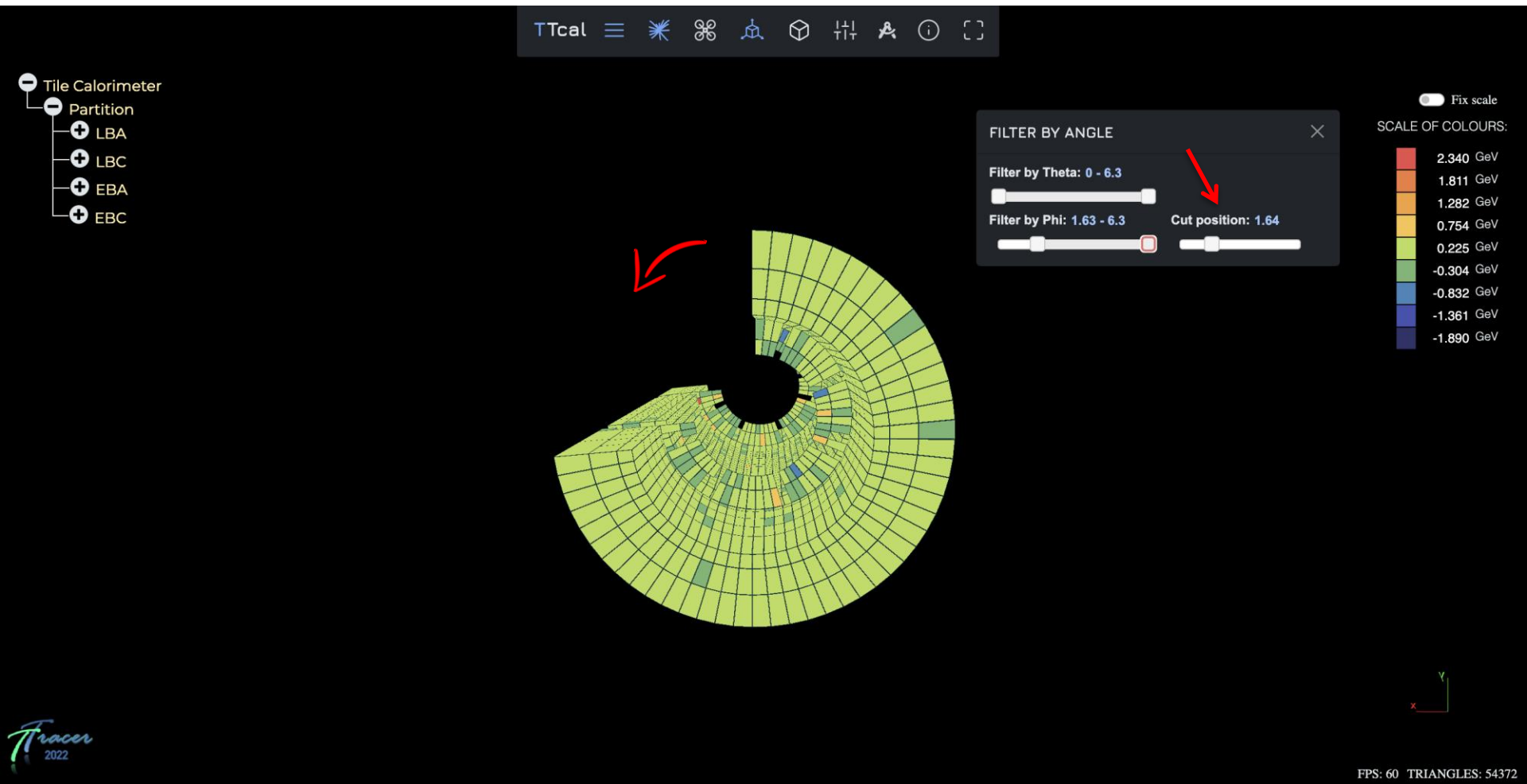
TileCal Cuts Slider

Cut by angle Theta



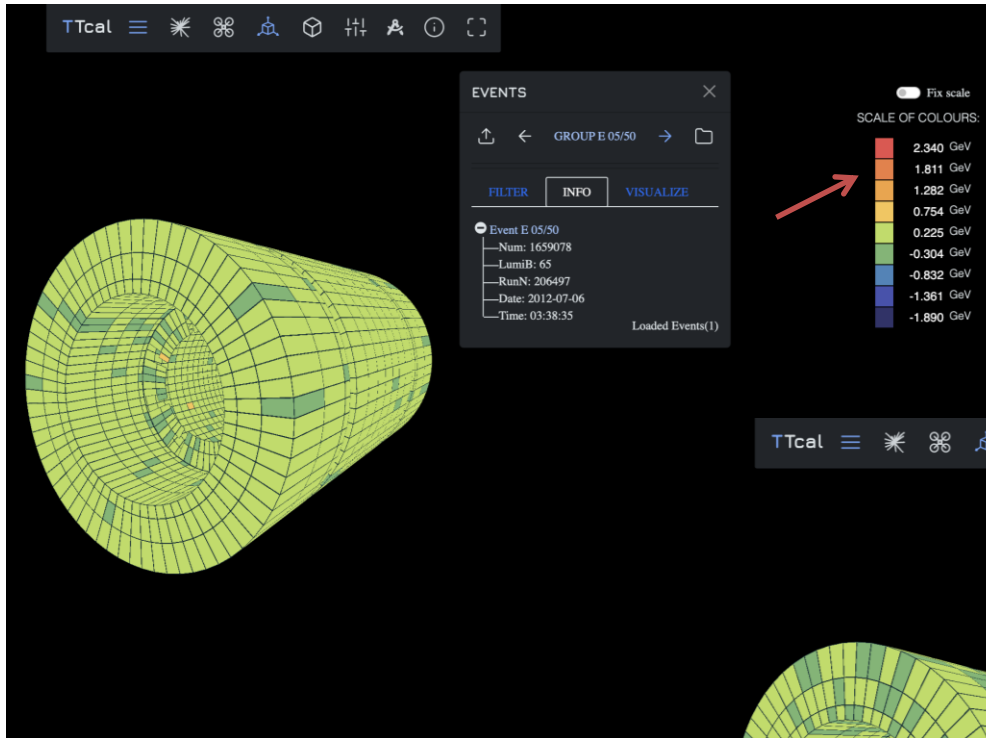
TileCal Cuts Slider

Cut by angle Phi

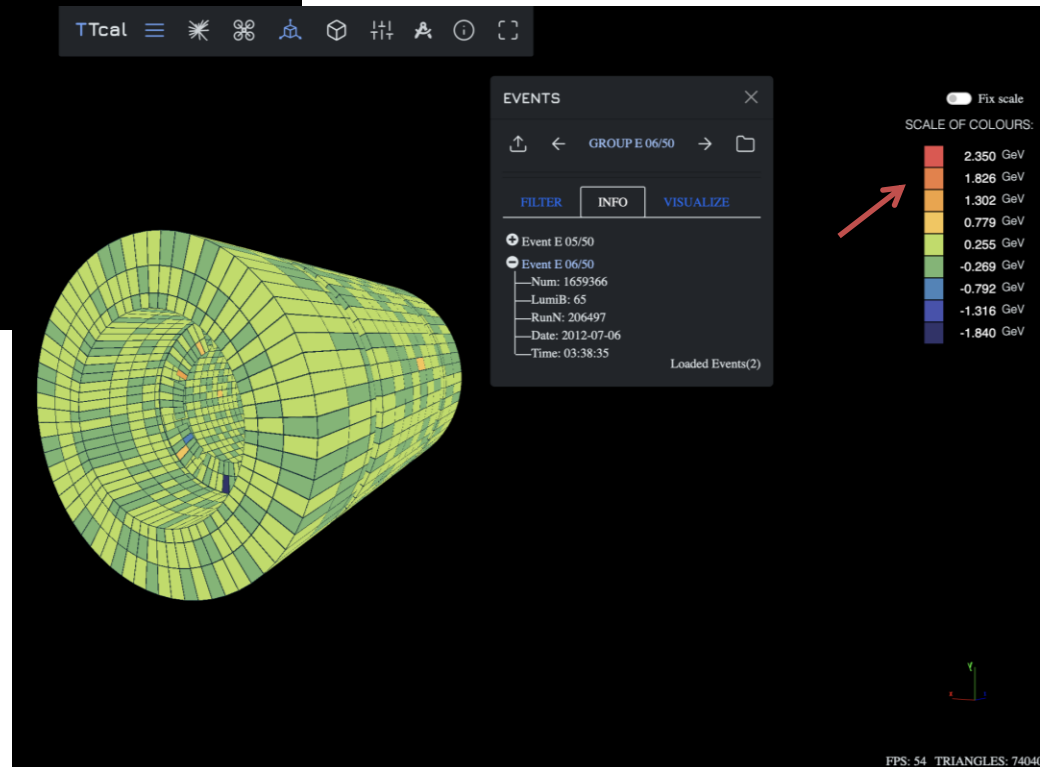


TileCal Fix Color Scheme Tool

Without Fixing the Scale



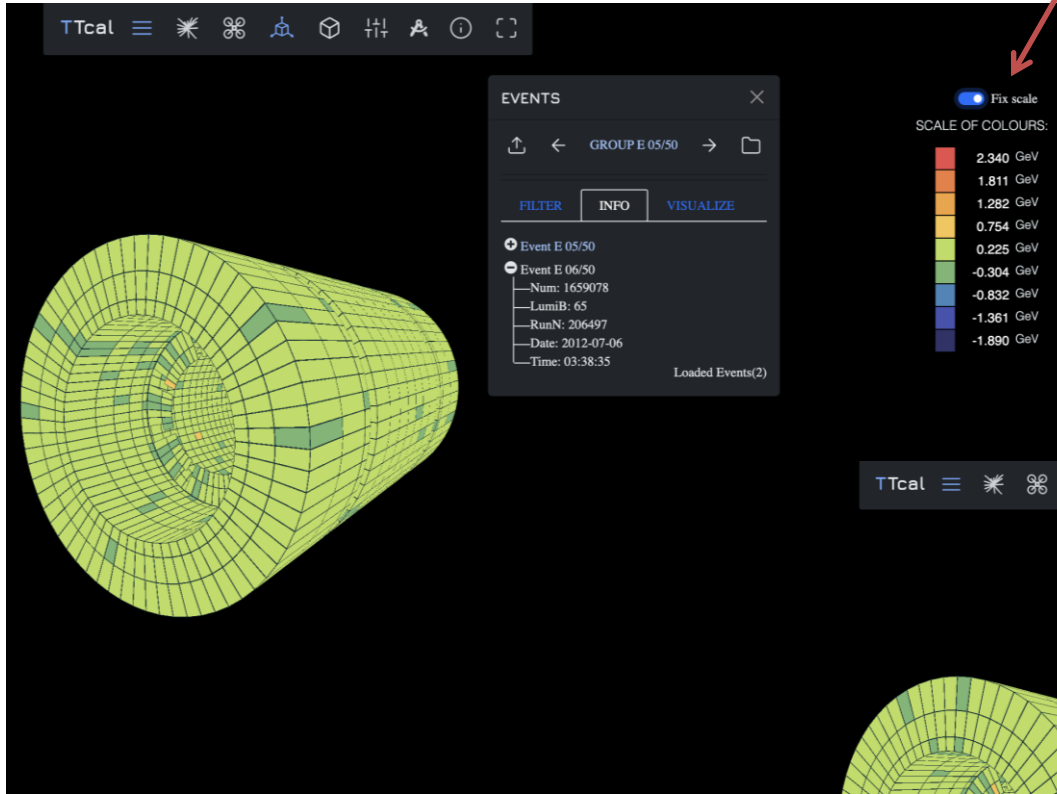
Event A



Event B

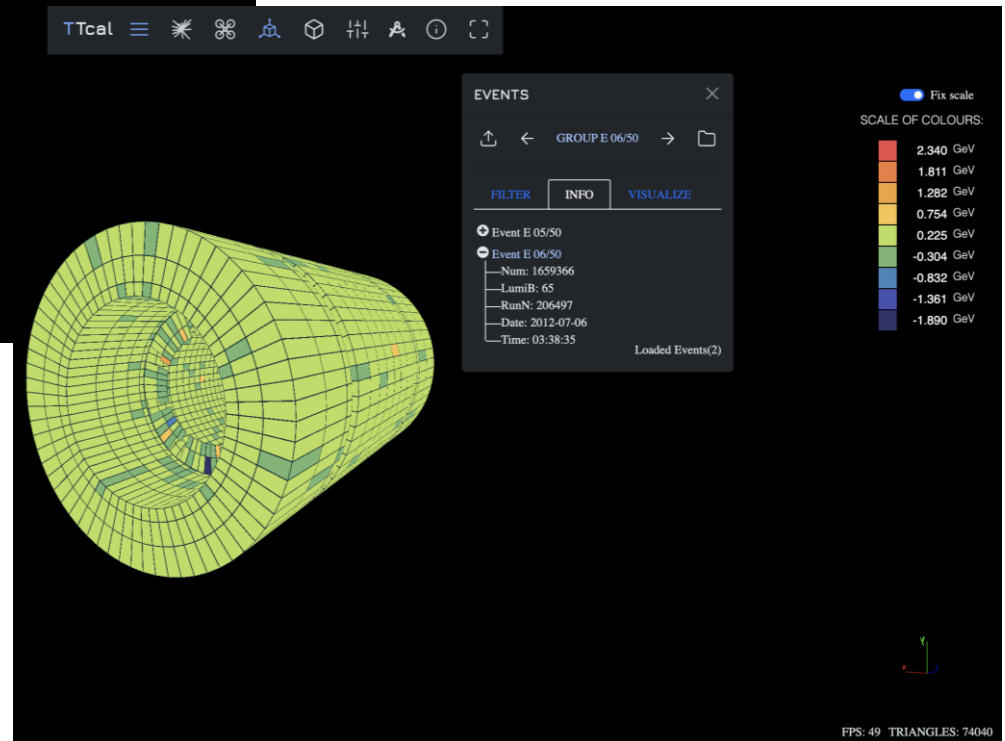
TileCal Fix Color Scheme Tool

With Fixing the Scale

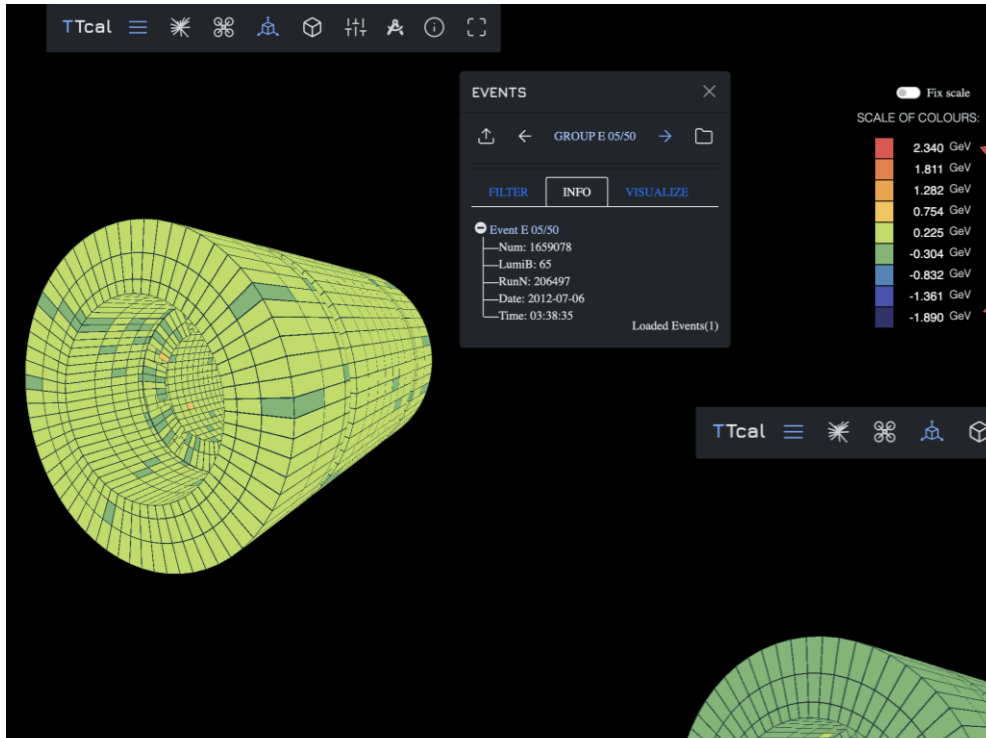


Event A

Event B

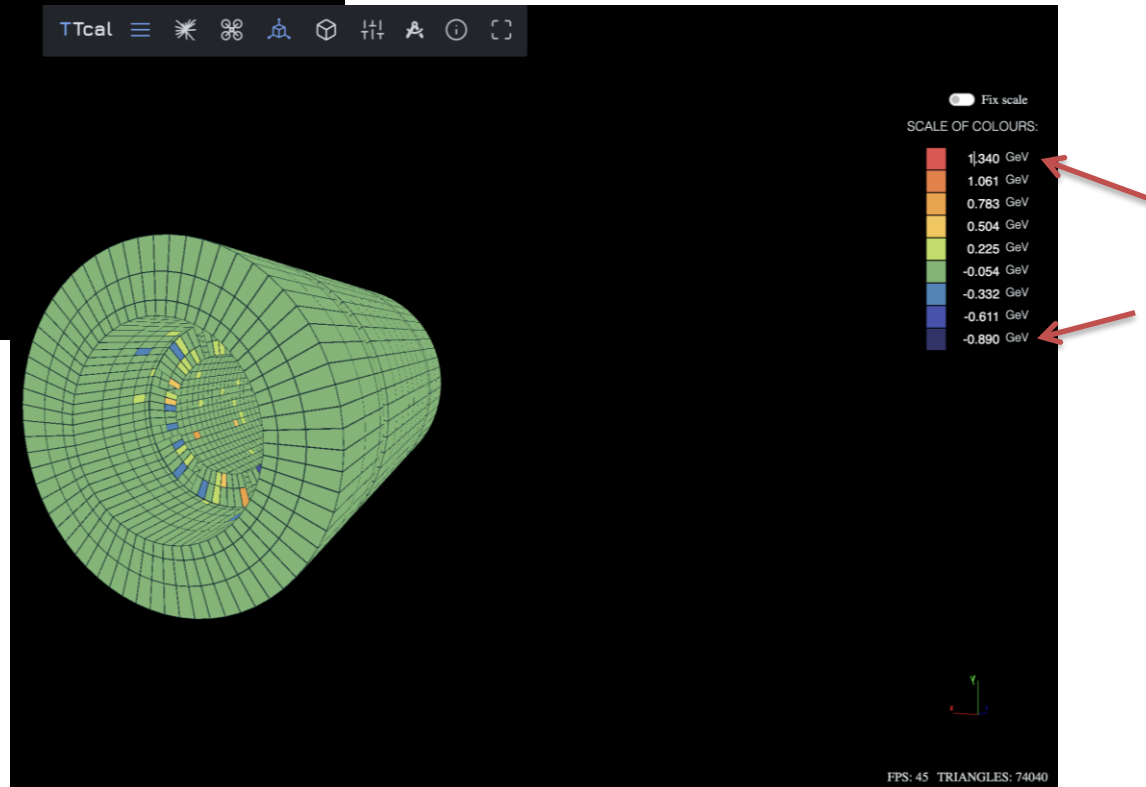


TileCal Change Color Scheme min/max

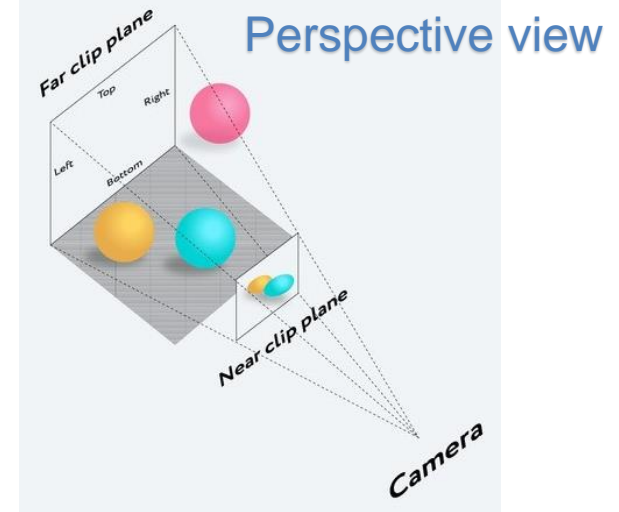
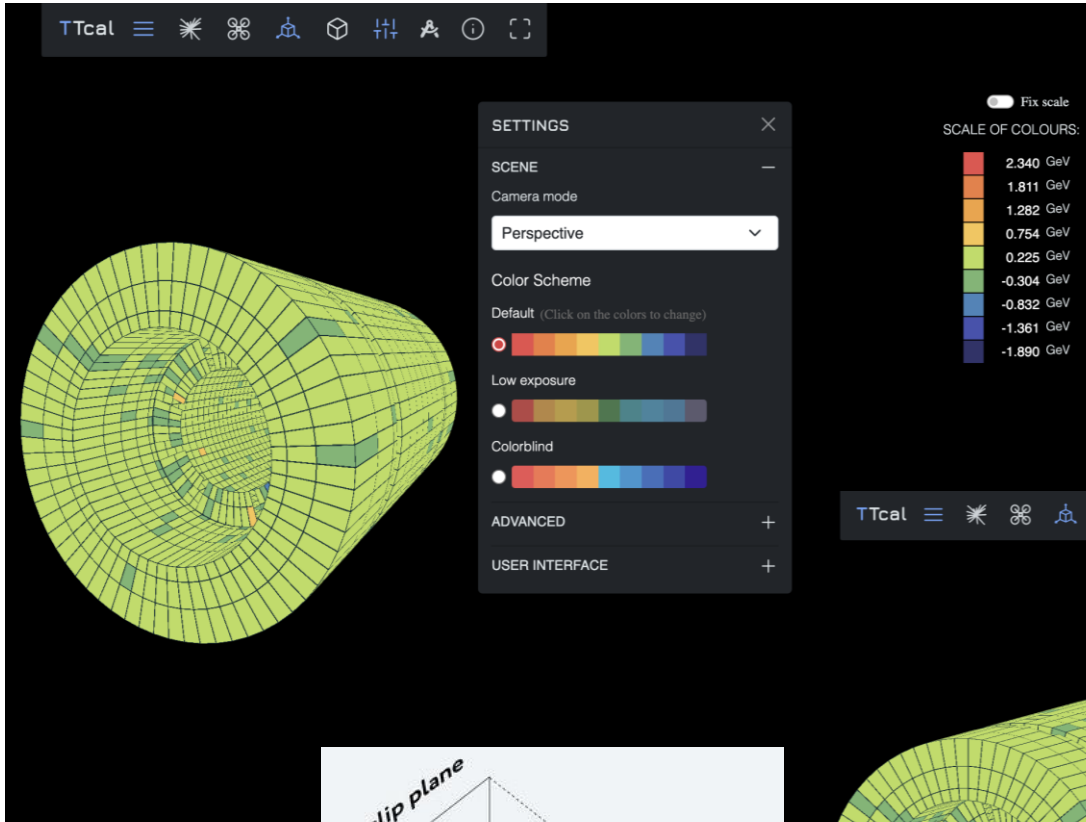


1. Click on min or max value
2. Insert different number
3. Press Enter

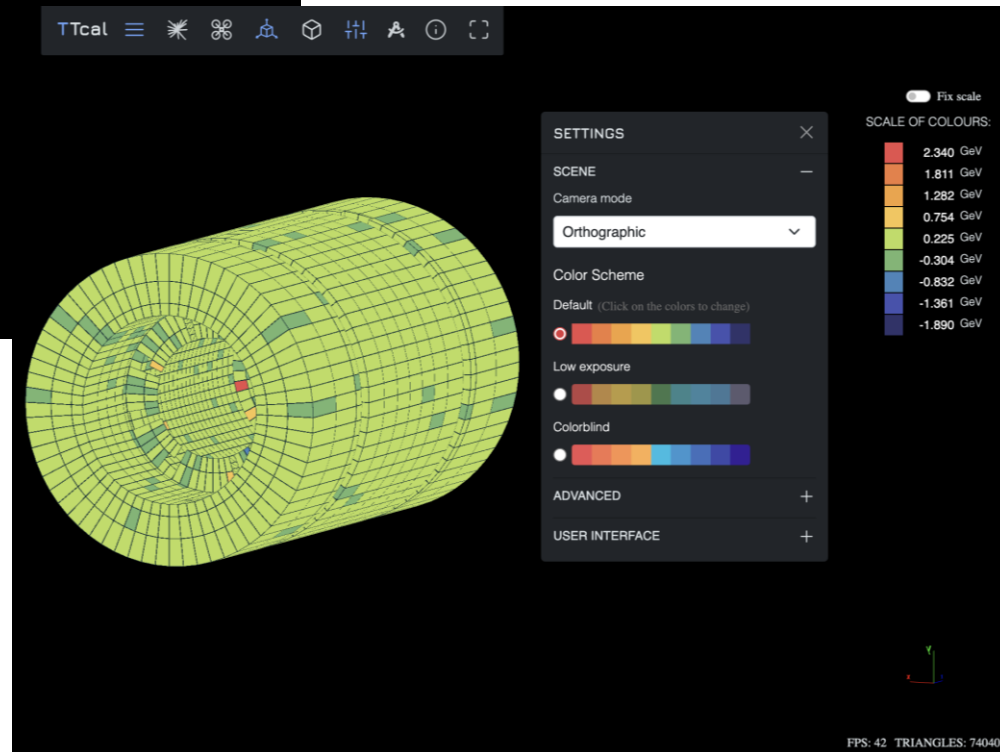
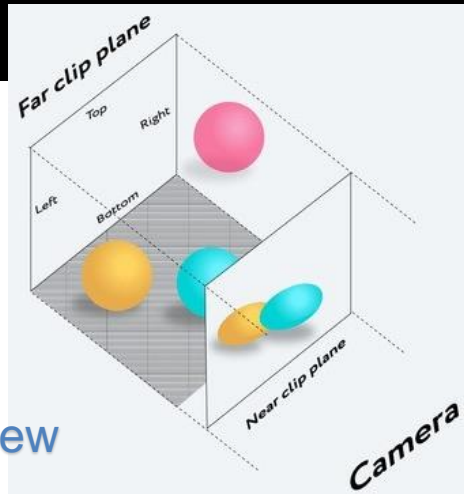
Same Event



TileCal Camera Mode: Perspective vs Orthographic



Orthographic view



TileCal Change Color Scheme Colors

The screenshot displays the Tracer 2022 software interface for visualizing the Tile Calorimeter (TileCal). On the left, a tree view shows the hierarchy: Tile Calorimeter, Partition, LBA, Module, Layers (A, BC, D), LBC, Module, Layers, EBA, Module, Layers, and EBC, Module, Layers. The main view shows a 3D visualization of the calorimeter structure. A 'SETTINGS' menu is open, showing 'SCENE' settings: Camera mode (Perspective), Color Scheme (Default), Low exposure, and Colorblind. A color picker is active, showing RGB values of 48, 51, and 107. On the right, a 'SCALE OF COLOURS' legend maps colors to energy values in GeV: 2.340 (red), 1.811 (orange), 1.282 (yellow), 0.754 (light green), 0.225 (green), -0.304 (teal), -0.832 (blue), -1.361 (dark blue), and -1.890 (purple). A 'Fix scale' toggle is also visible.

Tile Calorimeter

- Partition
 - LBA
 - Module
 - Layers
 - A
 - BC
 - D
 - LBC
 - Module
 - Layers
 - EBA
 - Module
 - Layers
 - EBC
 - Module
 - Layers

SETTINGS

SCENE

Camera mode

Perspective

Color Scheme

Default (Click on the colors to change)

Low exposure

Colorblind

ADVANCED

USER INTERFACE

Fix scale

SCALE OF COLOURS:

- 2.340 GeV
- 1.811 GeV
- 1.282 GeV
- 0.754 GeV
- 0.225 GeV
- 0.304 GeV
- 0.832 GeV
- 1.361 GeV
- 1.890 GeV


48 51 107

R G B

Tracer 2022

FPS: 54 TRIANGLES: 74040

What are future developments of TileCal?

- **Official Working Plan: Development of the Tile Calorimeter Events Display TracerTCal (2021)**
- **Responsive Application (for any device)** 
- **Check the visualised geometry with Tile experts**
- **Creating Strict filters for uploading file format**
- **Implement Other Structures (Geometries) from ATLAS Detector**

Working plan Status

1	Visualise Channels	✓	11	Display energy deposit in cells by radiuses on plane - sum of layers	?
2	Display Calibration Constants per Channel (1 cell= 2 Channels)	✓	12	Display energy deposit in cells alongside the eta	?
3	Visualise C1, C2, C3 constants values per Channel by colour and control values by smooth transaction of colours. Then if somewhere smooth transaction is broken, it will be visible that constant value is wrong and something wrong is happening in corresponding channel	✓	13	Display cells together with TileCal subsystems	?
4	Possibility to select constant for visualisation	✓	14	Creation of standard cuts for cells representation. make cuts by the used controlled plane	✓
5	Visualise changed values of constants (or RMS) in time	?	15	Energy scheme should adjust properties of cells/channels when loading new event, but during filtering with energy, energy scheme should not change	✓
6	Visualise other conditions as well, ex. noisy per cells.	✓	16	Add tool to change energy scheme max/min values	✓
7	Display dE/dX by cells and verify of uniformity. If not then Calibration Constants are wrong in the cell. dE/dX values will be provided by separate file.	?	17	Add selecting gain when loading calibration constants into file	✓
8	Display Energy, Time	✓	18	Check the visualised geometry with Tile experts	
9	Development Release 5.1. Display everything in 1:1 scale and also in deformed scale to make visible all detector components in full scale	?	19	Start application from pre-sets (links): with pre-defined event+geometry+camera position+zooming, etc. Similar to Atlantis	
10	Display energy deposit in cells by same colour but different size inside the cell	?			

20	Create pre-defined cuts (1/2, 3/4...)	<input checked="" type="checkbox"/>
21	Create general readers for file format as for example Calibration Constant file.	<input type="checkbox"/>
22	Create tool to change colours in colour scheme	<input checked="" type="checkbox"/>
23	Add tool to fix energy scale	<input checked="" type="checkbox"/>
24	Add possibility to upload multiple files (calibration constants and noise per cell)	<input checked="" type="checkbox"/>
25	Add slider to change between uploaded files (calibration constants and noise per cell)	<input checked="" type="checkbox"/>

Thanks for your
Attention!

Comments are Welcome

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