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EFTrack+Traccc Workshop

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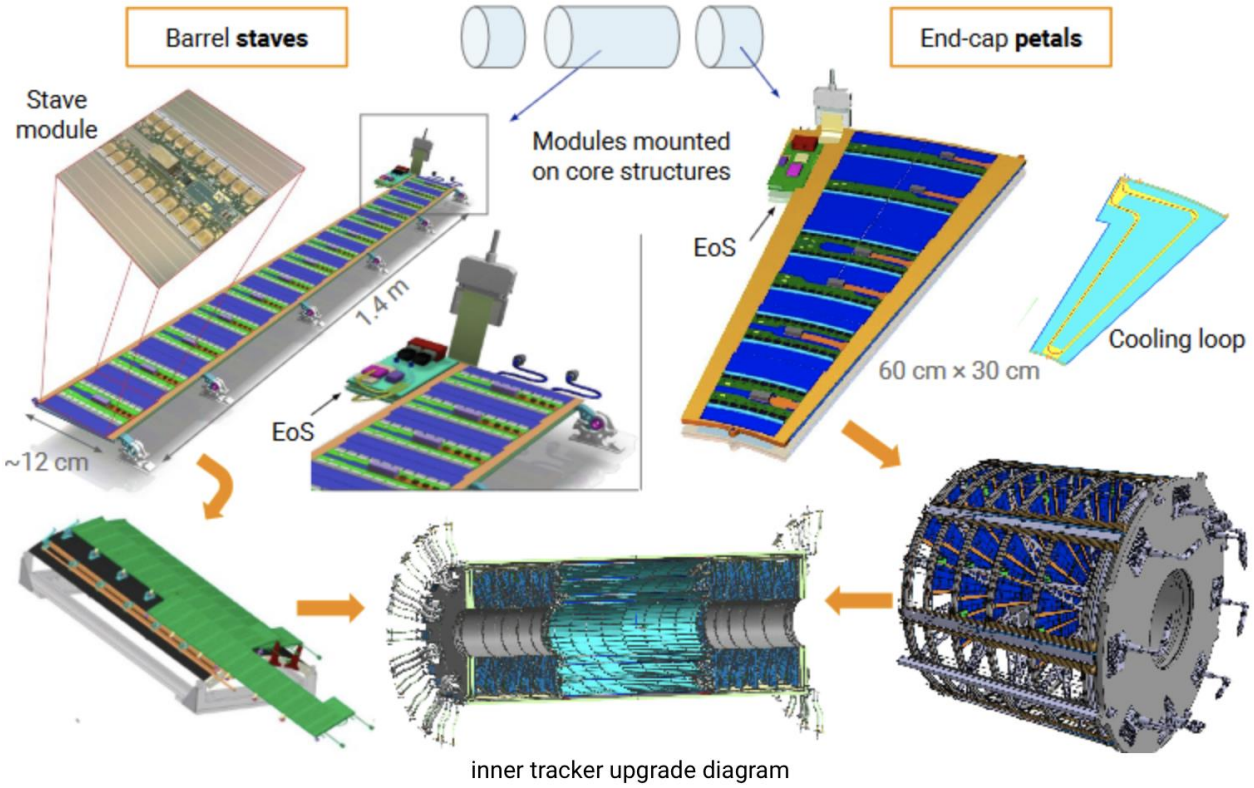
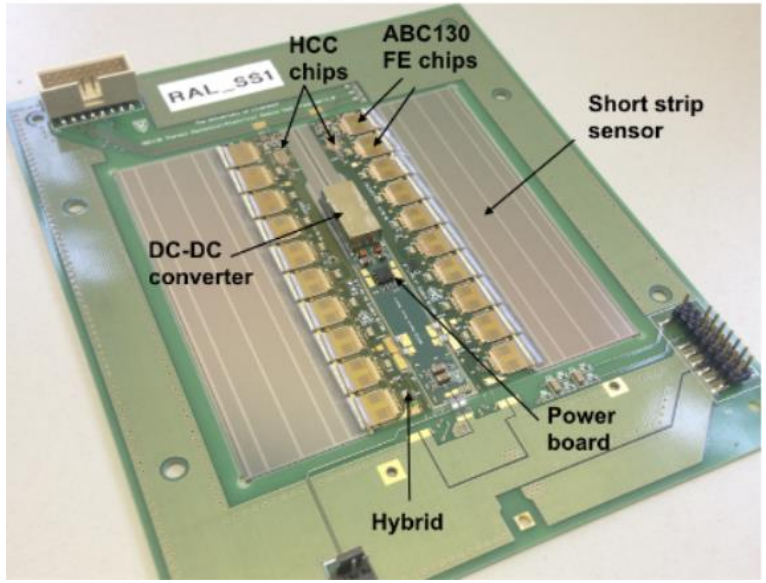
Strip Development Prospect



Module co-ordinate system

- X: Perpendicular to strips
- Y: Parallel to strips
- Z: Out of module

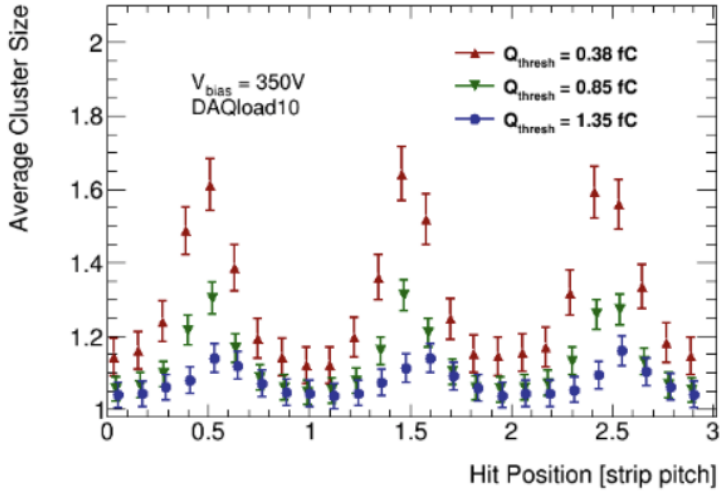


Strip Detector TDR 2017

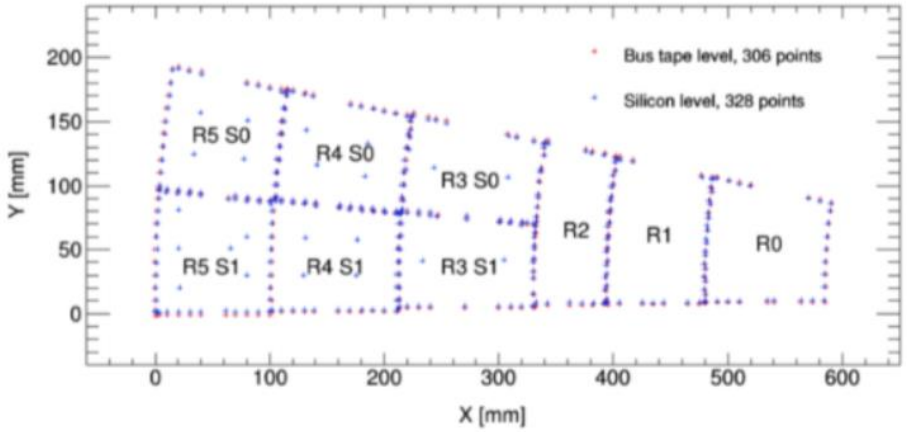
ITk silicon-strips detector: in the production and test of them at Brookhaven National Laboratory (BNL) and at CERN.

Charge Detection Region

https://cds.cern.ch/record/2257755?ln=en



Avg. Cluster size vs hit position. The integer position values correspond to centre of strips.



- Energy deposited in the silicon detectors is grouped into clusters ideally a cluster of a single particle
- Single cluster in pixels and a pair of clusters in strip from a space point.
- This uses stereo angle between them from each side of a cluster.
- Eta and Phi plane corresponds to channel 0 and channel 1 in cell files.

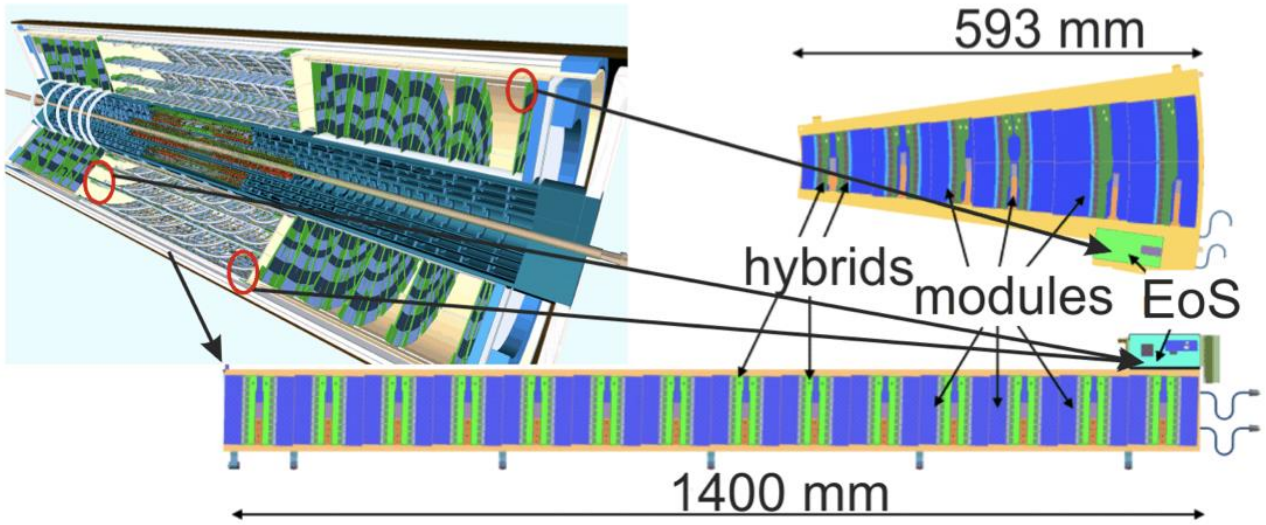
- Barrel strip distributions among LS / SS:

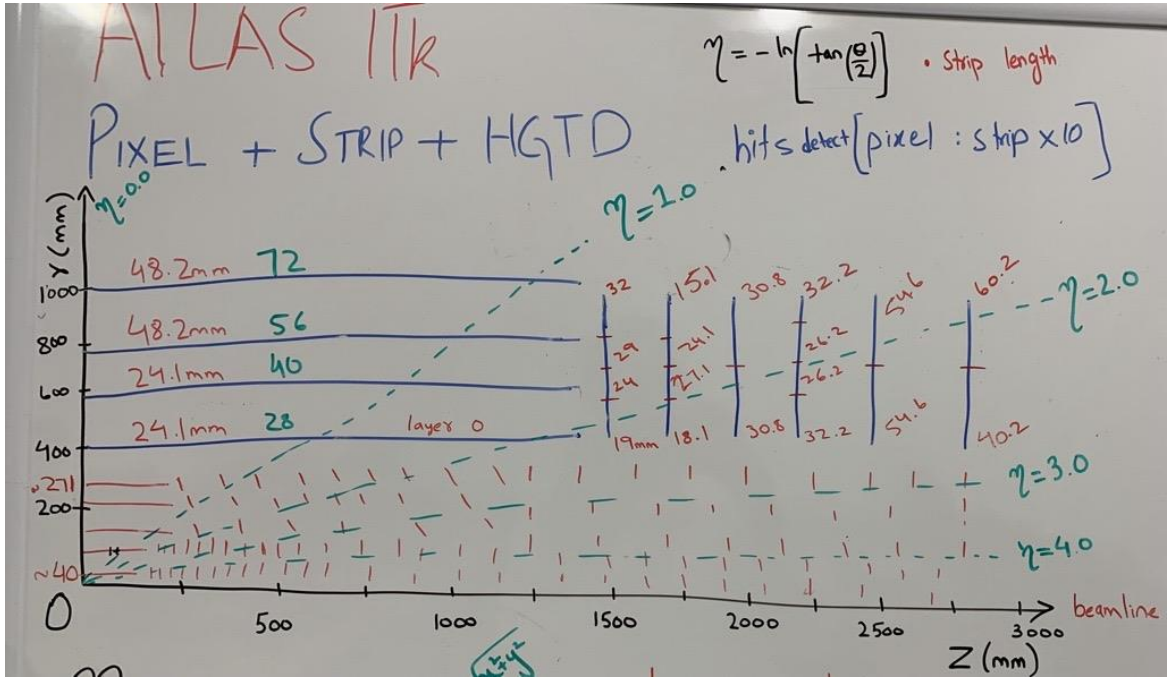
Table 6. Dimensions and component counts for the ITk Barrel Strip Detector.

	Layer	Radius	Strip pitch × length	Staves	Modules	Hybrids	Channels	Sensor area
Short strip	L0	405 mm	75.5 µm × 24.16 mm	56	1,568	3,136	8.0M	15.0 m^2
	L1	562 mm	75.5 µm × 24.16 mm	80	2,240	4,480	11.5M	21.4 m^2
Long strip	L2	762 mm	75.5 µm × 48.35 mm	112	3,136	3,136	8.0M	30.0 m^2
	L3	1000 mm	75.5 µm × 48.35 mm	144	4,032	4,032	10.3M	38.6 m^2
	Total			392	10,976	14,784	37.8M	105.0 m^2

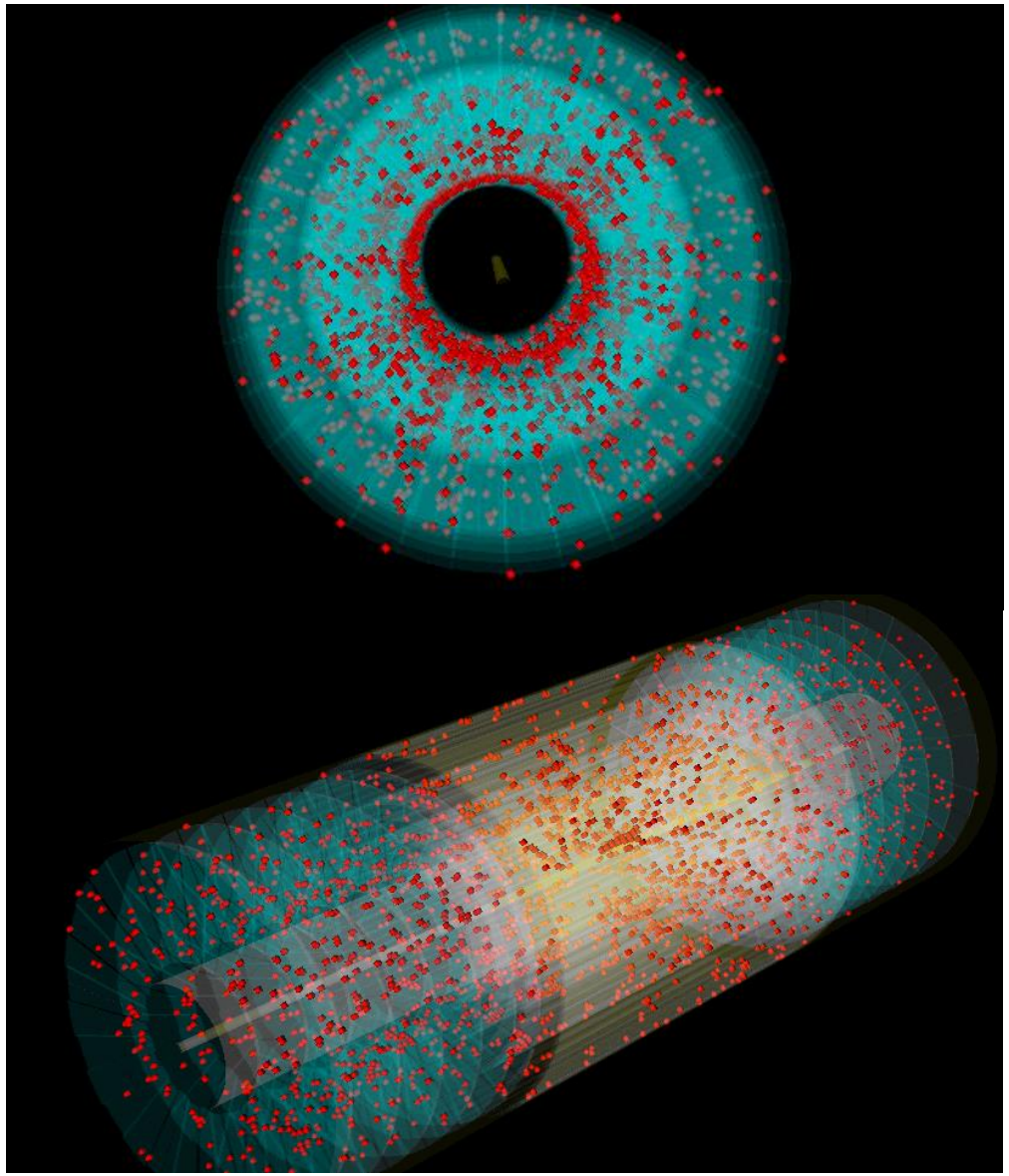
Strip Layout

Barrel	Disk
14 modules (layer 0 each side)	9 models (disk 0 at each side)
Stave (Rectangular)	Petal (Trapezium etc)
Pitch = 75.5 um	Pitch = 69-85 um
4 Layers	6 Disks on barrel like support structure





Current status of the End-of-Substructure (EoS) card project for the ATLAS Strip Tracker Upgrade using final ASICs



Current Focus: (Generate Strip Cell Files From RUN 4 Simulated Files from ATLAS)

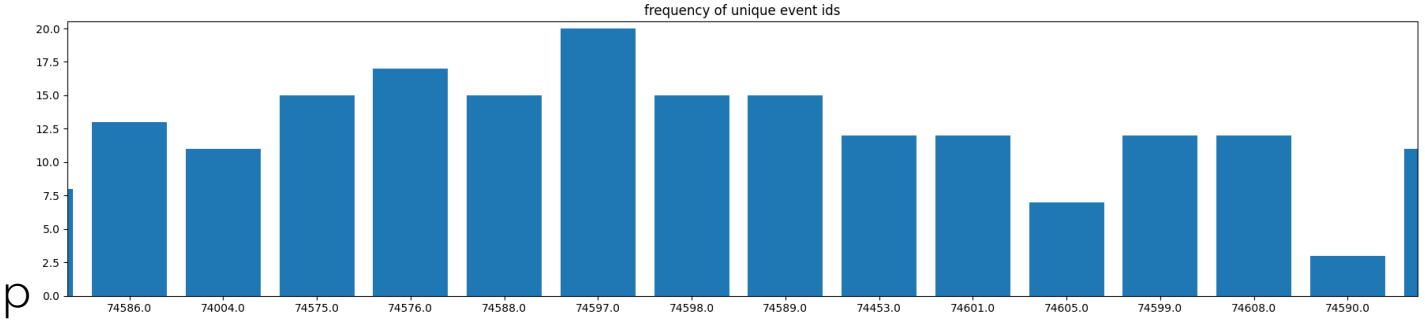
- HITs File: Hits Files used for RDO Analysis
- RDOs: RDO Files:test_Digi_tf_RUN4_ttbar_mu200 (page 3-4 tests with RUN4 in the name)

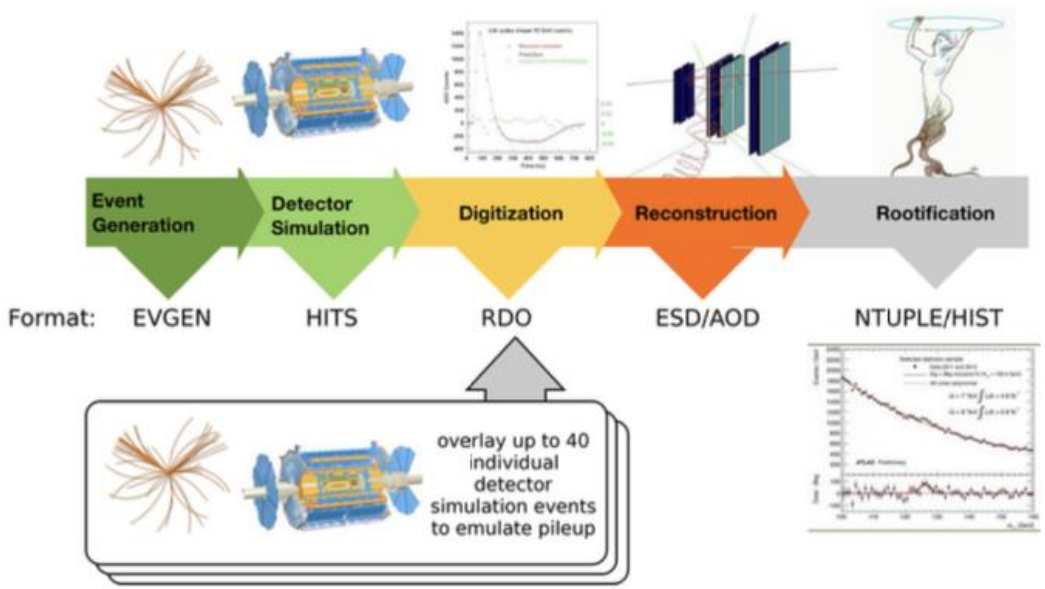
1. RUN4_ttbar.puTruth.RDO.pool.root
2. RDOAnalysis.root (currently using for clusters formation)

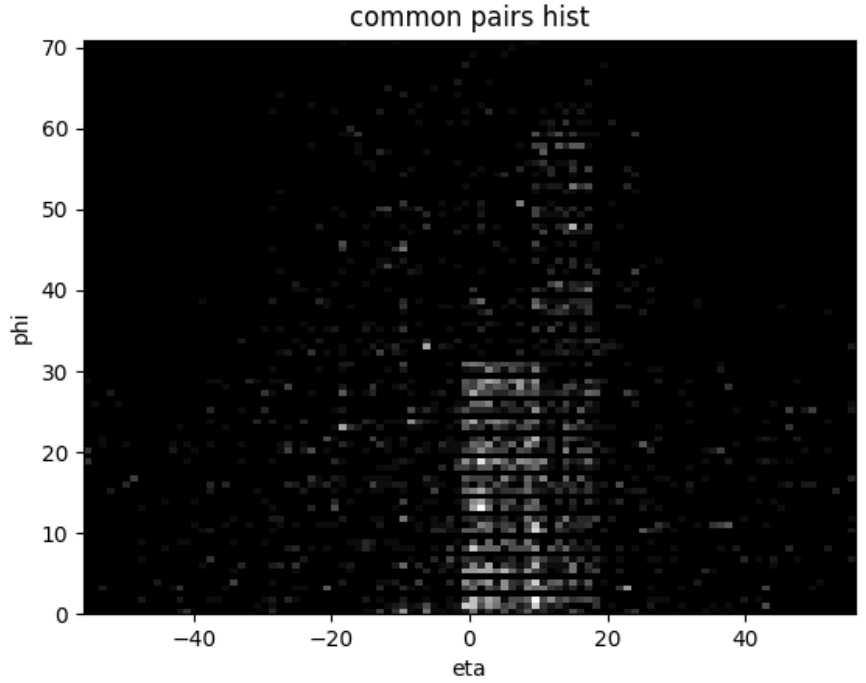
- Checked data with OBJ files provided by Noemi Calace in Inner Detector Workshop May 2023 (BeamPipe and Strip Components)

RDO File Content

- 1000 events
- 592 Strip events
- 371 unique eta/phi module pairs in Strip

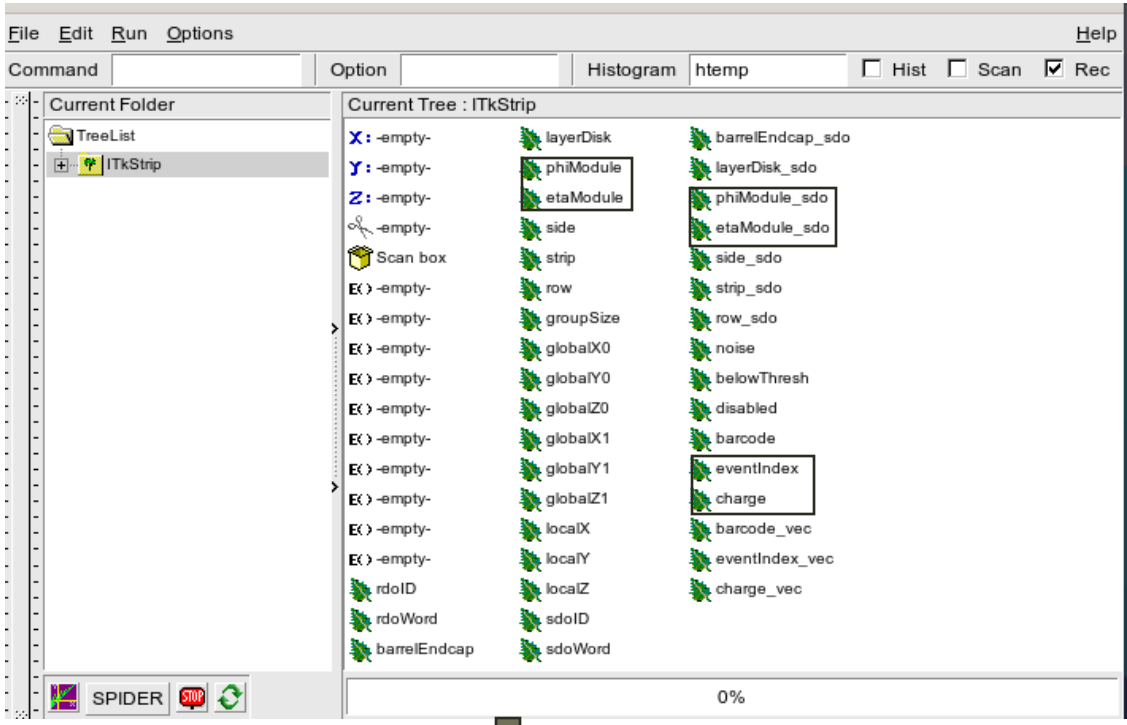


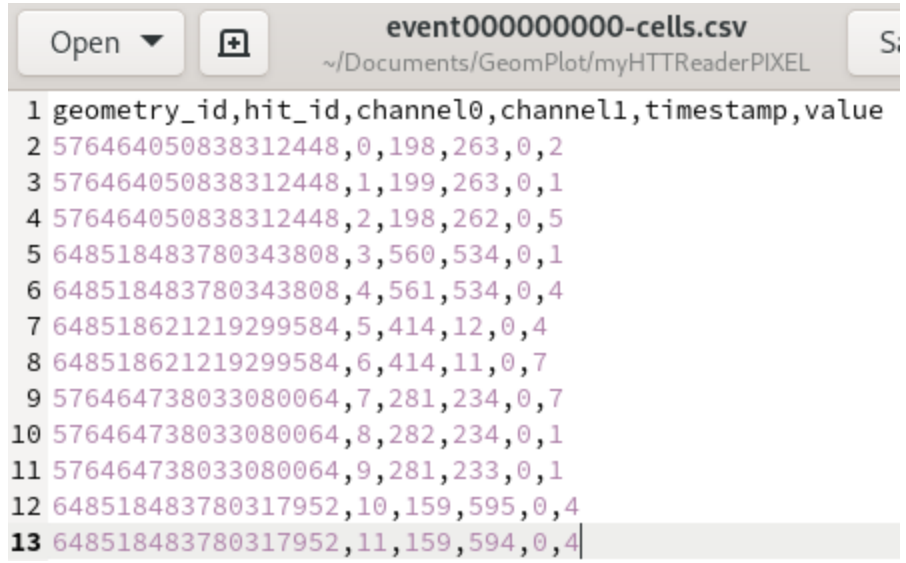




Required Output:

- Currently trying understand how to data points are mapped with geometry_id
- ACTS Gemeotry Identifier
- Athena: Data-Preparation stage -> PrepRawData creation from Raw Data Objects
- Athena: Strip Digitization
- If there is a specific documentation for how geometry_id is encoded in ACTS/traccc to match with ATHENA???

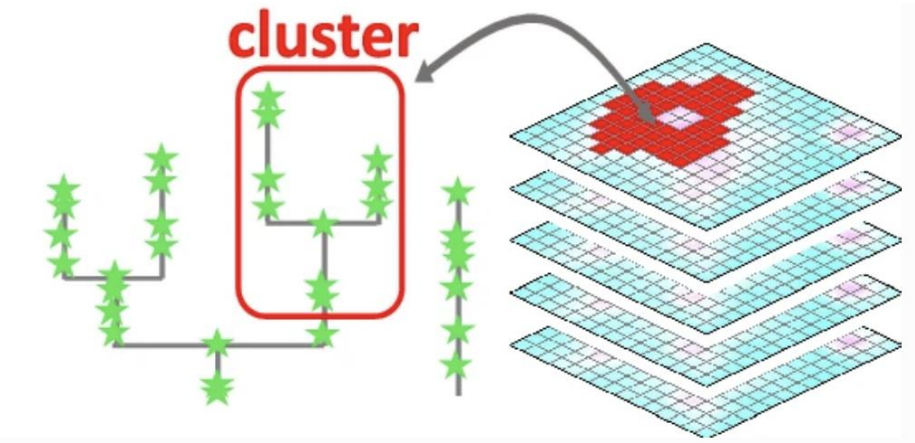




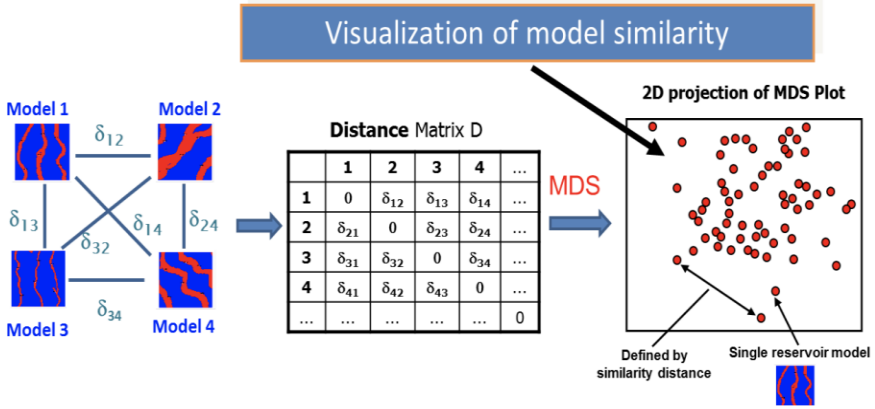
CLUSTERING (Independently)

Two methods:

- In device space (consecutive cells -> clusters -> transformation (local to global)
- In Metric Space (The distance matrix defines the metric space. The metric space can be visualized using multi-dimensional scaling (MDS), **Multidimensional scaling** (MDS) is a means of visualizing the level of similarity of individual cases of a dataset.) MDS is a dimension-reduction algorithm to discover the underlying structure of a space, based on distance measures between objects or cases.



Device Space: Detection of space–time clusters using a topological hierarchy for geospatial data on COVID-19 in Japan



Metric Space Methods: MDS is a dimension-reduction algorithm to discover the underlying structure of a space, based on distance measures between objects or cases.