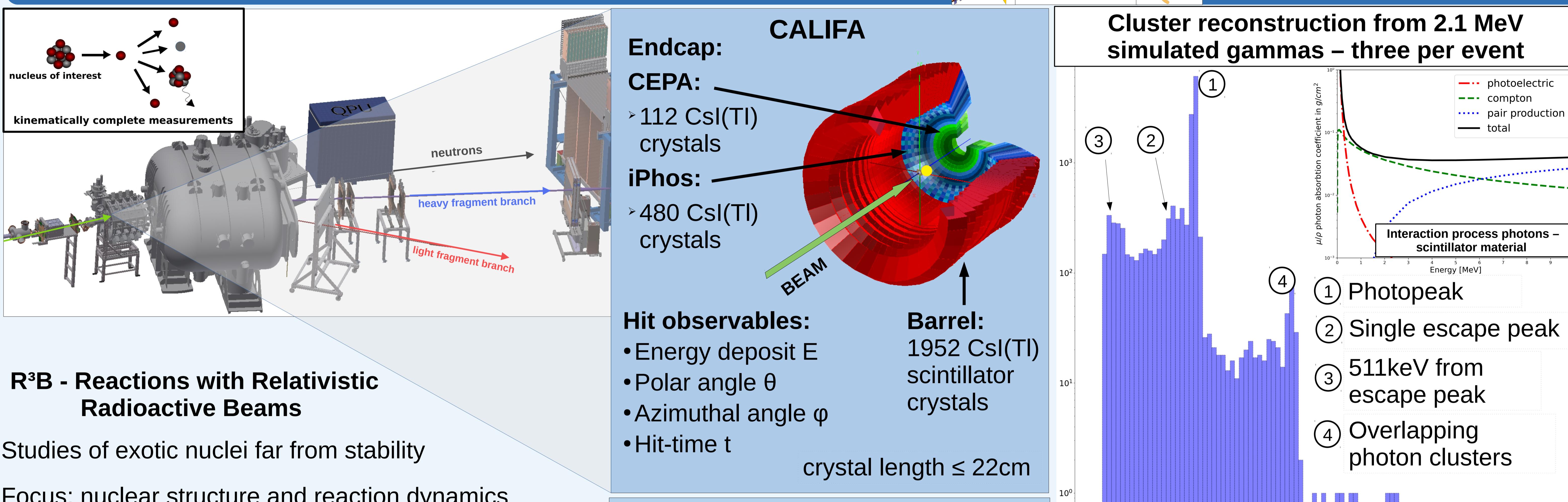


T. Jenegger, R. Gernhäuser for the R<sup>3</sup>B Collaboration,  
N. Hartman, L. Heinrich for the ORIGINS Data Science Laboratory - ODSL

TUM School of Natural Sciences, Technical University of Munich, Germany

## CALIFA – Detection of gammas and light charged particles @ R<sup>3</sup>B

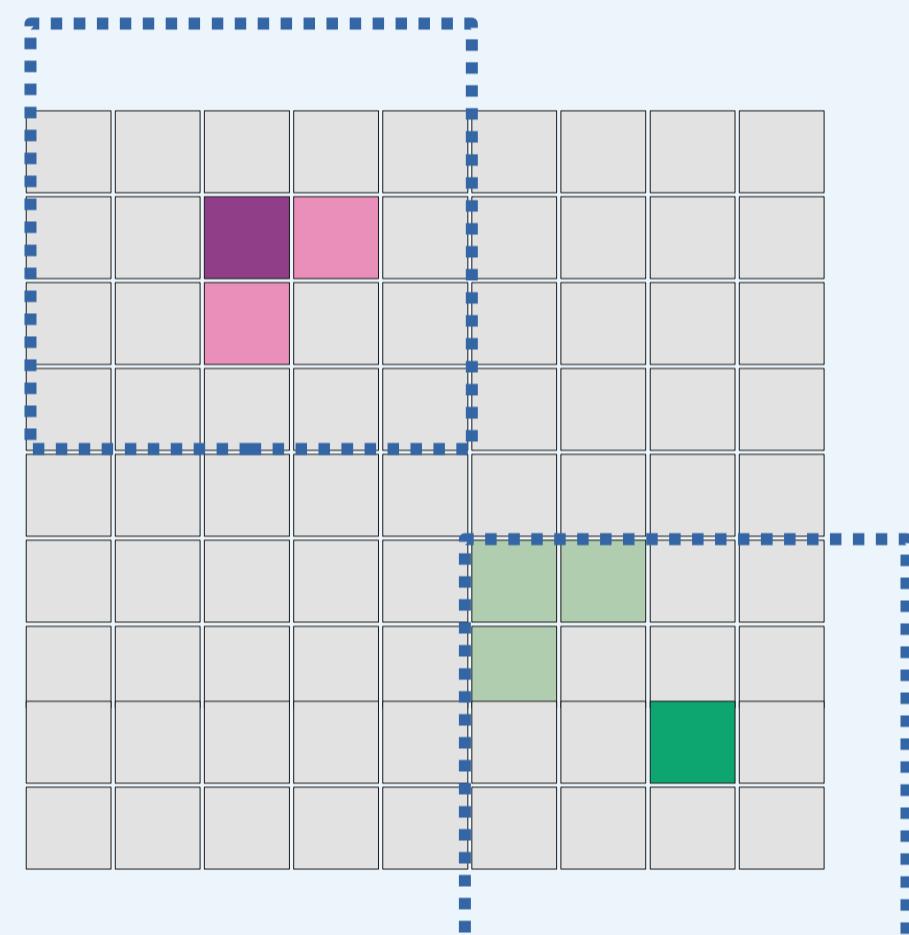
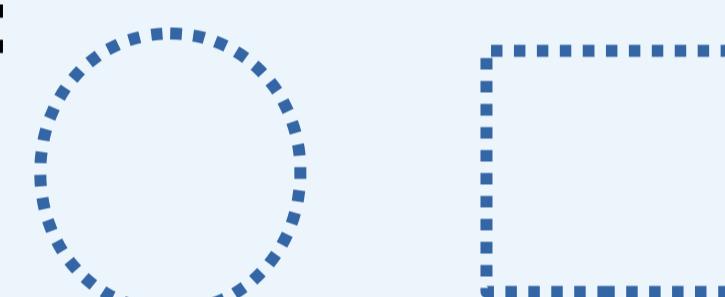


### R<sup>3</sup>B - Reactions with Relativistic Radioactive Beams

- Studies of exotic nuclei far from stability
- Focus: nuclear structure and reaction dynamics

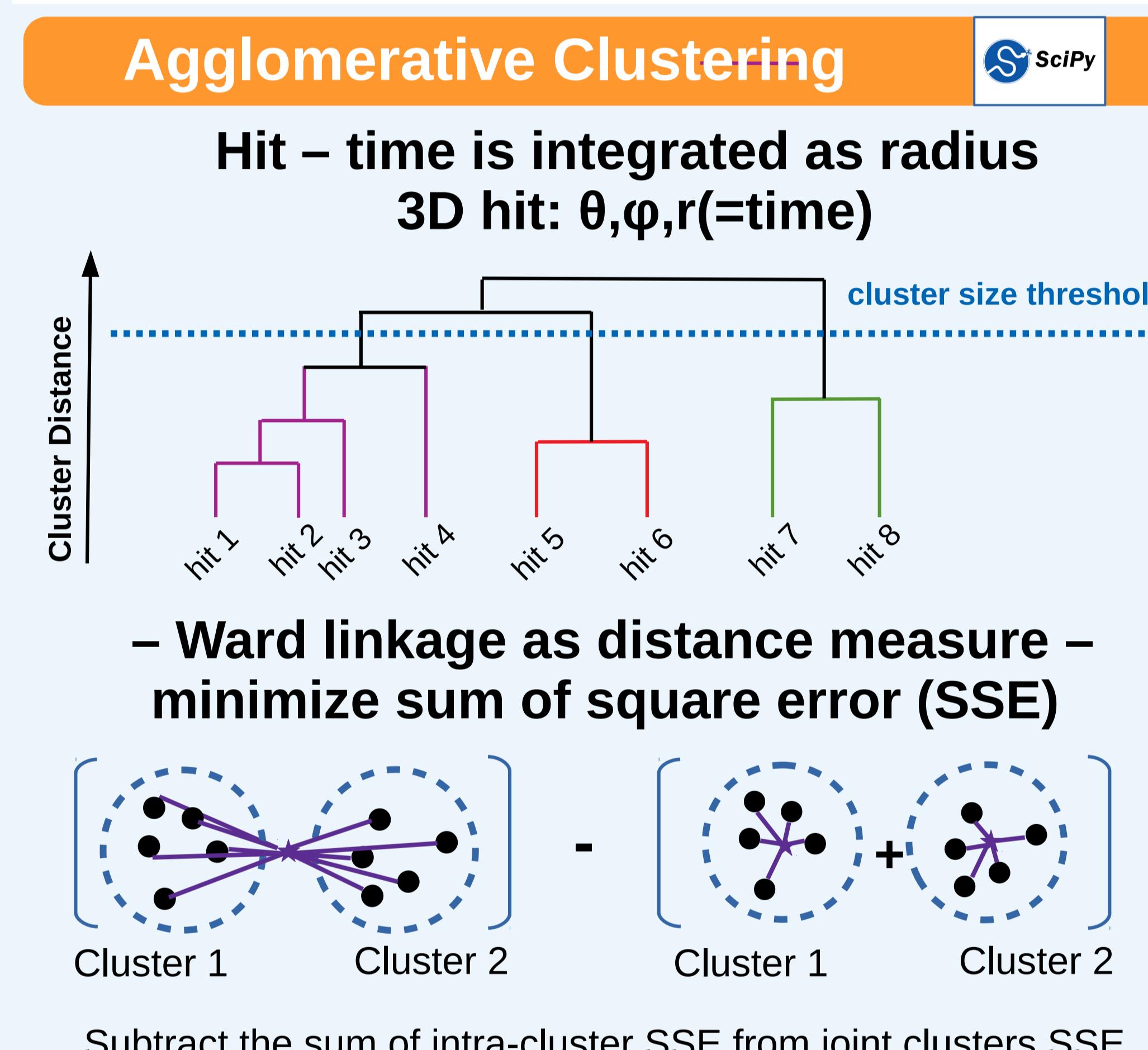
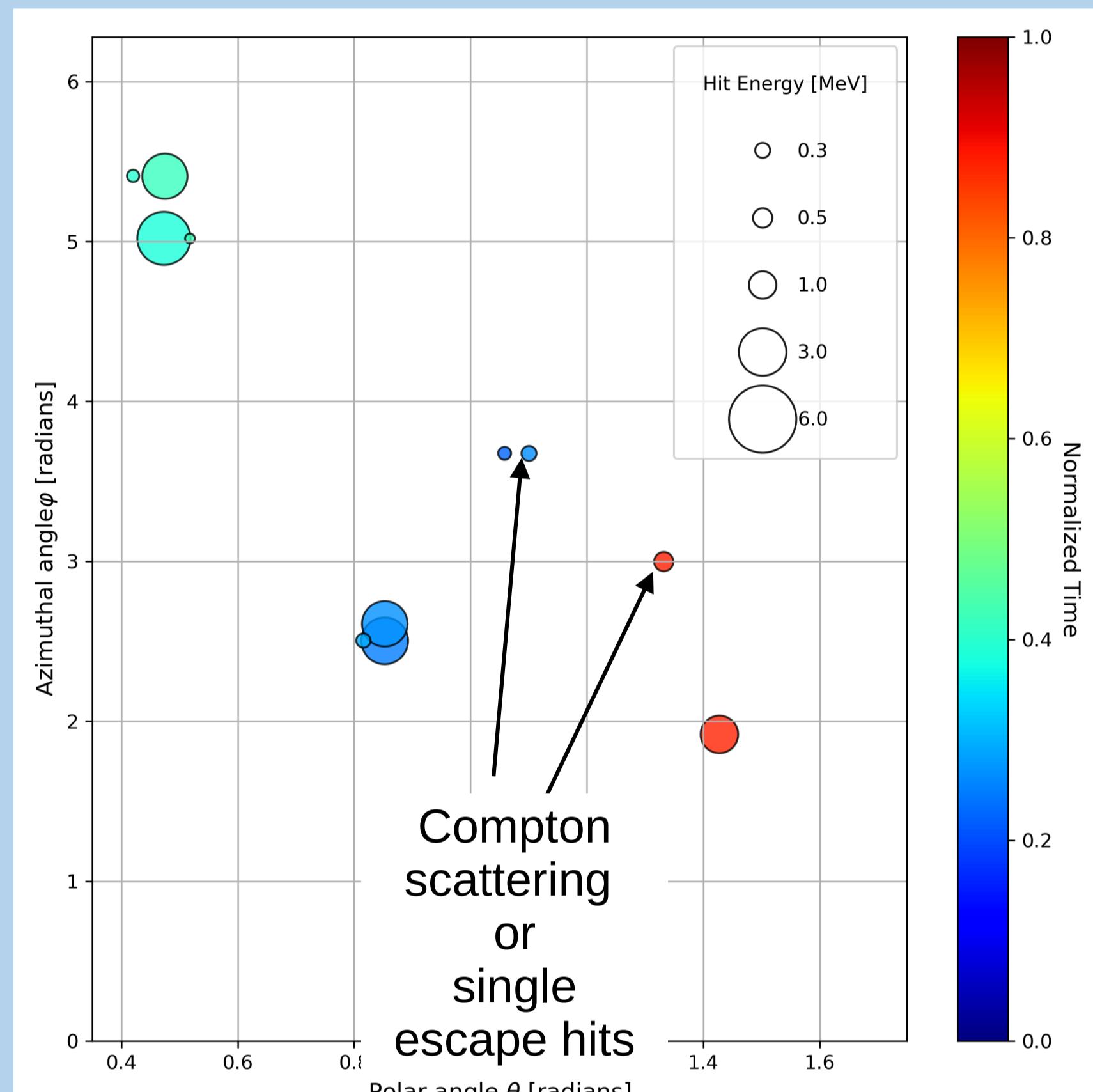
### Constant Geometry Method (CGM)

User defines shape and size of cluster:



and set energy threshold for single crystals

3.1 MeV	Sort the hit list by energy:
2.2 MeV	1. Create cluster centered around first hit
2. MeV	2. Loop over all hits in list
1.5 MeV	› if hit inside cluster add it and remove it from the list
0.7 MeV	
0.5 MeV	
0.3 MeV	3. Do this procedure until list is empty



### Edge Detection Neural Network

#### Pairwise hit comparison (i, j)

12 input features:

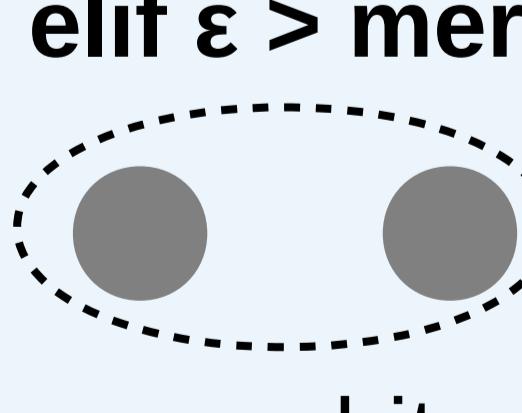
$$E_{ij}, \theta_{ij}, \phi_{ij}, t_{ij}, \Delta E_{ij}, \Delta \theta_{ij}, \Delta \phi_{ij}, \Delta t_{ij}$$

Single node output layer with score  $\varepsilon$  within [0, 1]

If  $\varepsilon <$  merge cut



elif  $\varepsilon >$  merge cut



#### Various Edge Detection NN models analyzed:

- Edge model without time information

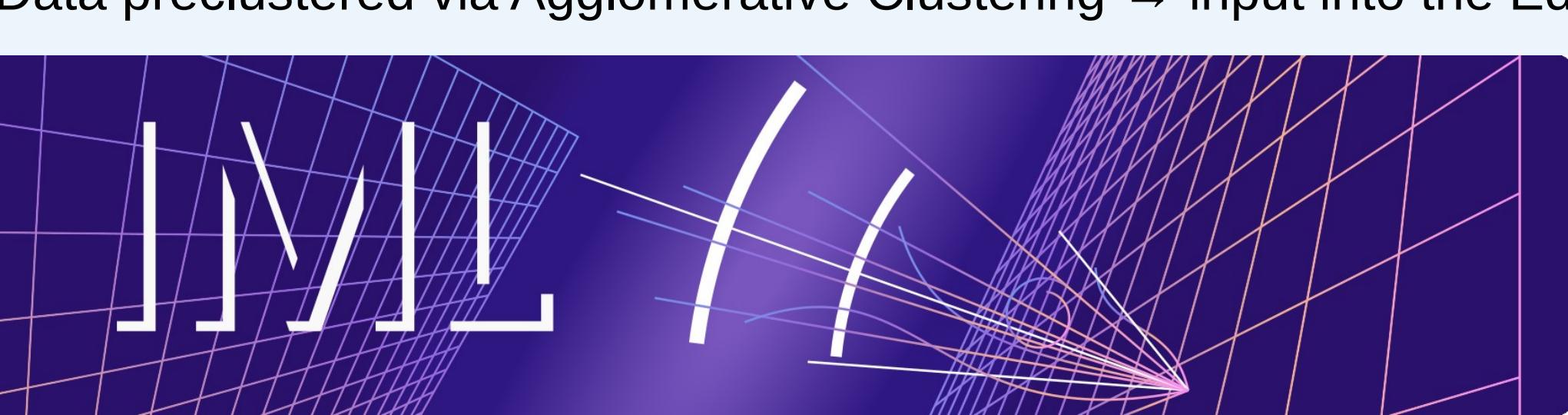
- Edge Model with time information

- R3B + Edge (without time)

Data preclustered via Standard R3B Clustering → input into the Edge model

- Aggro + Edge (with time)

Data preclustered via Agglomerative Clustering → input into the Edge model



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### RESULTS

