

# Analysis of Performance of Garlic in Different ECAL Models

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# Different ECAL models for ILD

- To check the performance of GARLIC.
- Four models with different number of layers and **different absorber thicknesses** But keeping the **total Detector thickness almost same**.
- Steering files for standard GARLIC need to be changed depending on the different geometry of Each New Model.

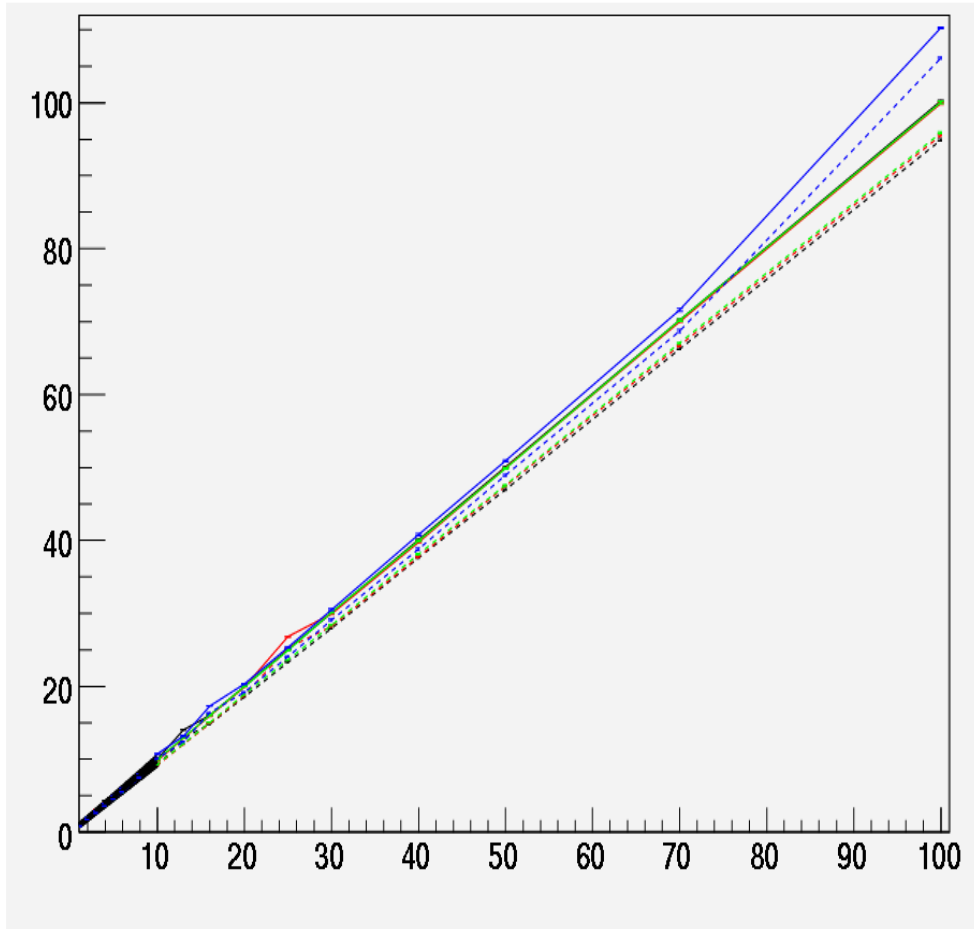
MODEL {mm}	Layers	Thickness {mm}	Total Thickness {mm}
A {79.8}	20 X	2.10	= 42.0
	9 X	4.20	= 37.8
B{81.0}	15 X	3.0	= 45.0
	6 X	6.0	= 36.0
C{81.0}	11 X	3.0	= 33.0
	8 X	6.0	= 48.0
D{78.0}	9 X	2.0	= 18.0
	10 X	6.0	= 60.0

# Garlic Parameter to be changed

- Number of Layers.
  - Number of Hits
- Taking into account that total thickness remains almost same, the criteria for Minimum number of hits and minimum number of layers for searching a seed and its validation is changed.
  - There parameters come into affect along side the new calibration Constants.

Model	N Layers	N Hits
A	12	5
B	8	4
C	8	4
D	10	4

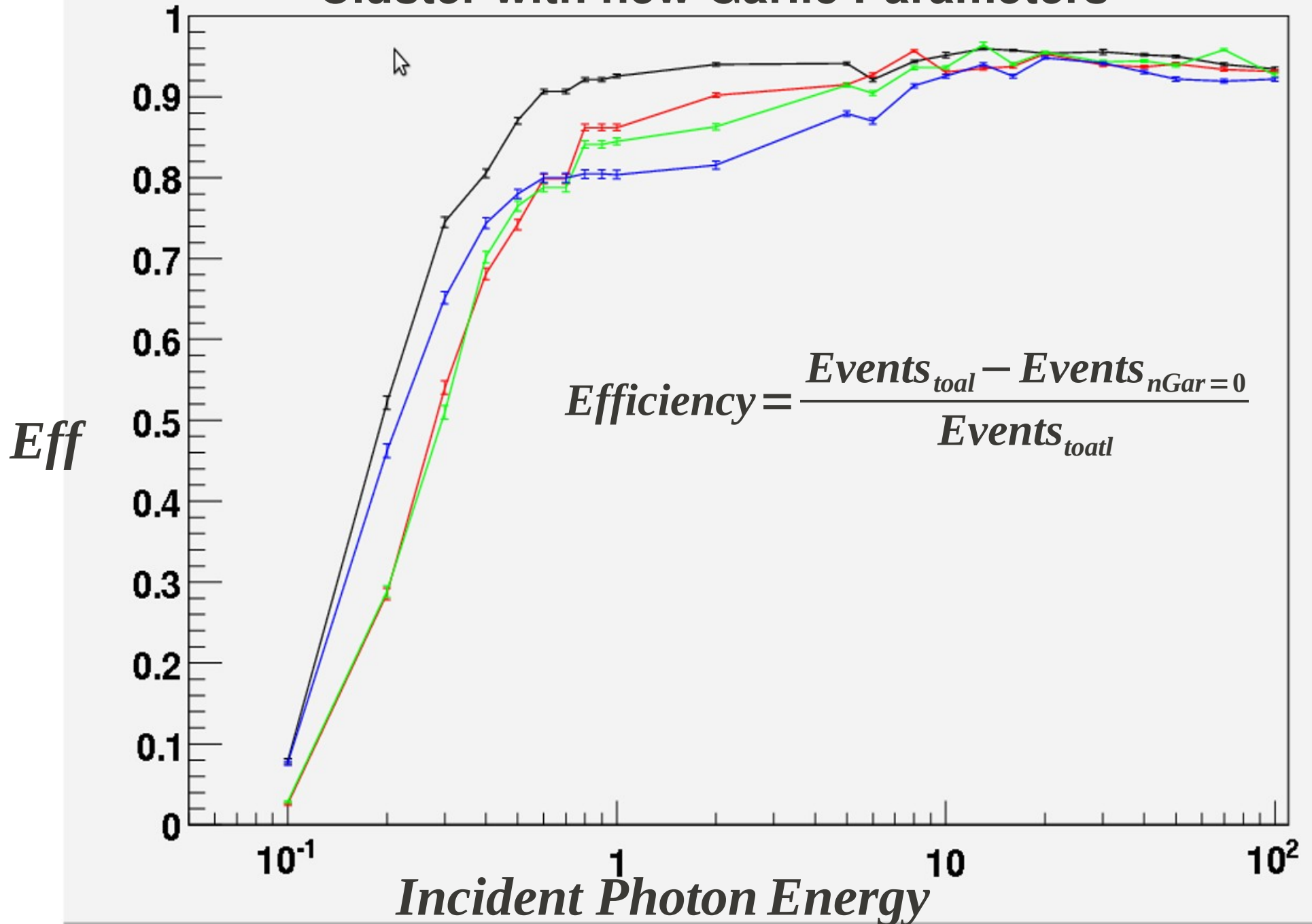
# Re-parametrization of GARLIC



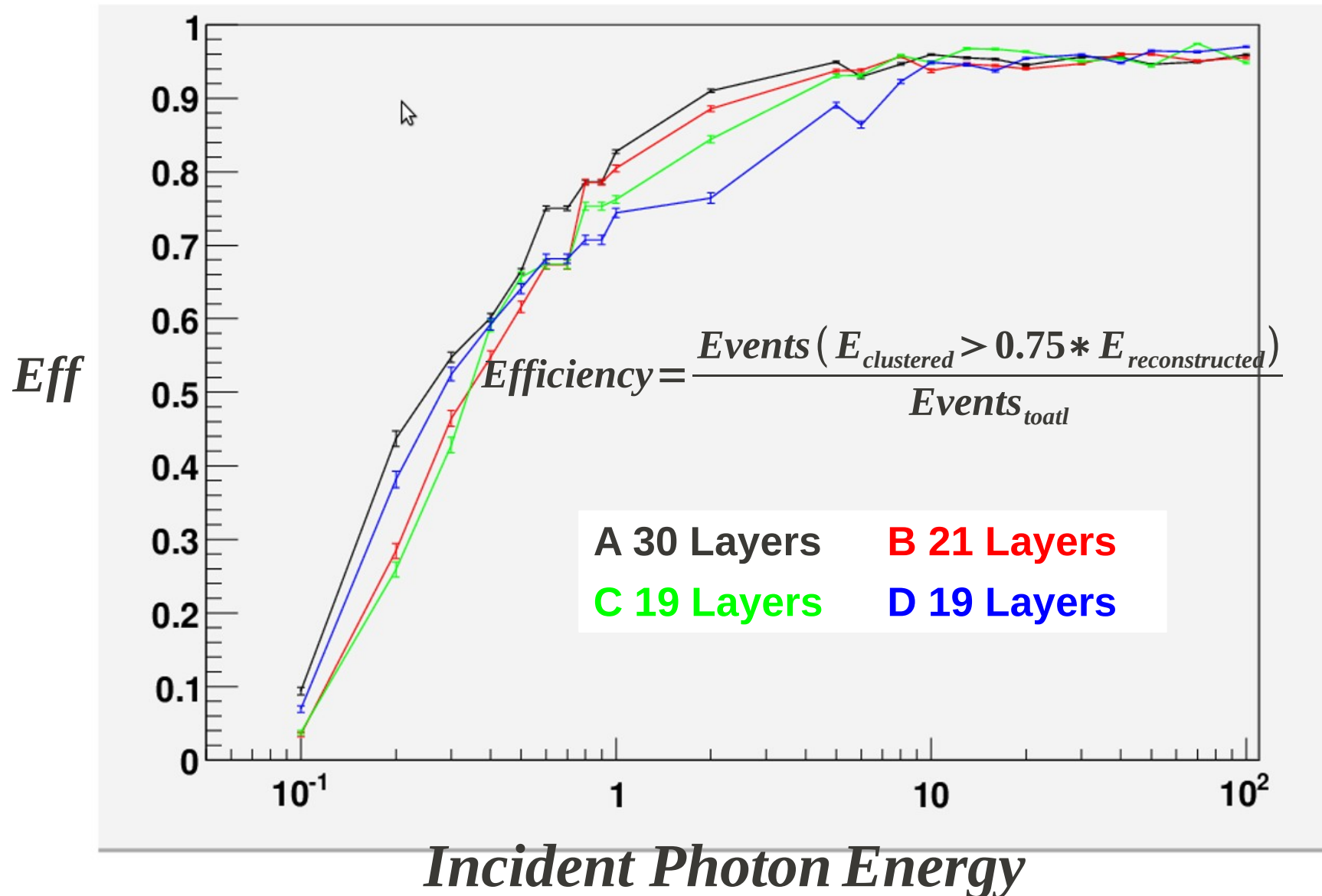
**X- and Y-Axis show the Energy of Incident Particles and Reconstructed Energy respectively.**

- New Calibration Constants are calculated by fitting the linearity graphs between 0 and 10.
- At relative higher energies
- Performance of these four different models was checked in two ways.
  - \_ Clustered Hits
  - \_ Unclustered Hits
- In the second method, energy reconstruction is done in the whole ECAL, taking into account all the hits which GARLIC may reject for its clustering depending upon its clustering criteria.

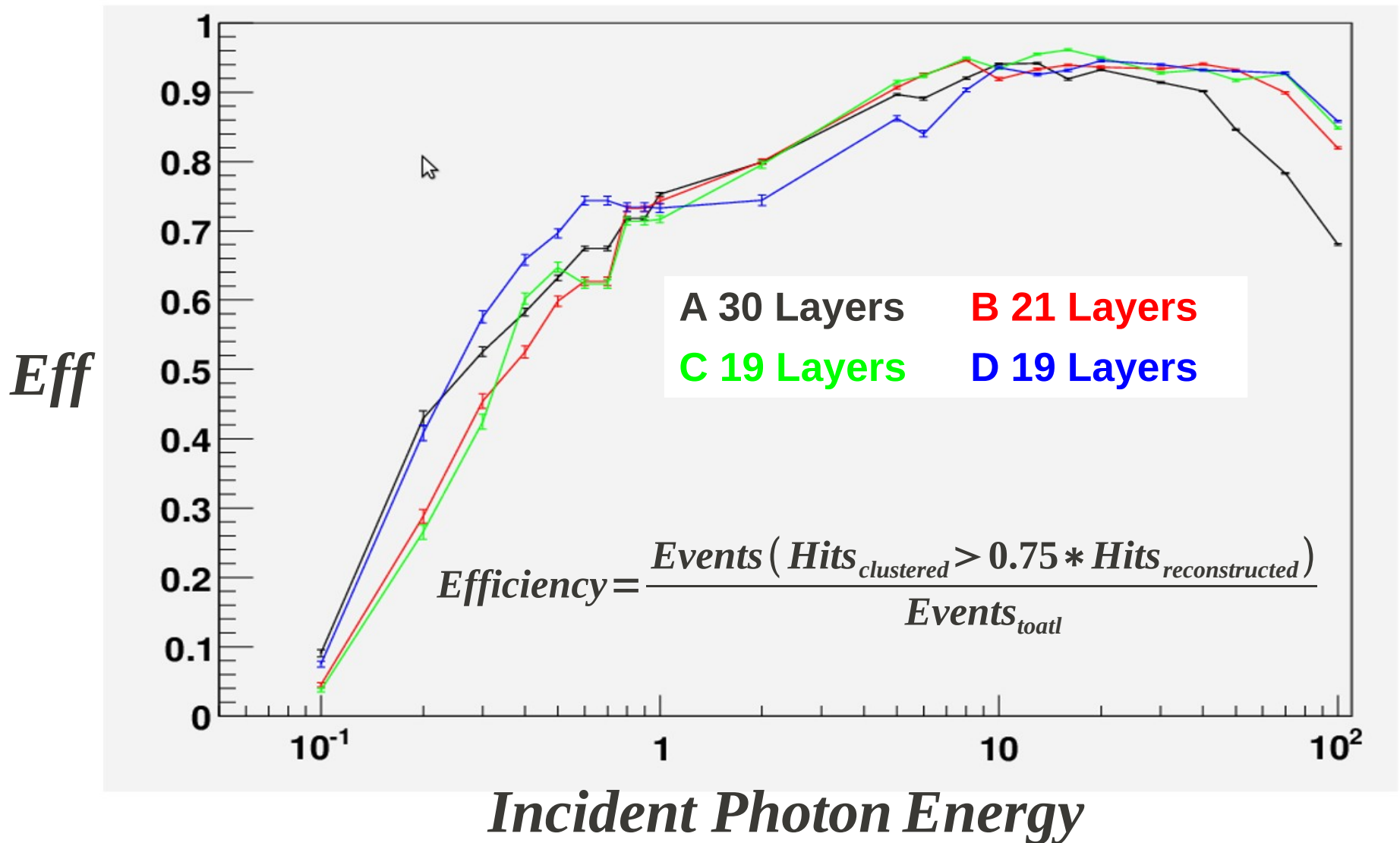
# Efficiency of GARLIC to find at least one Photon Cluster with new Garlic Parameters



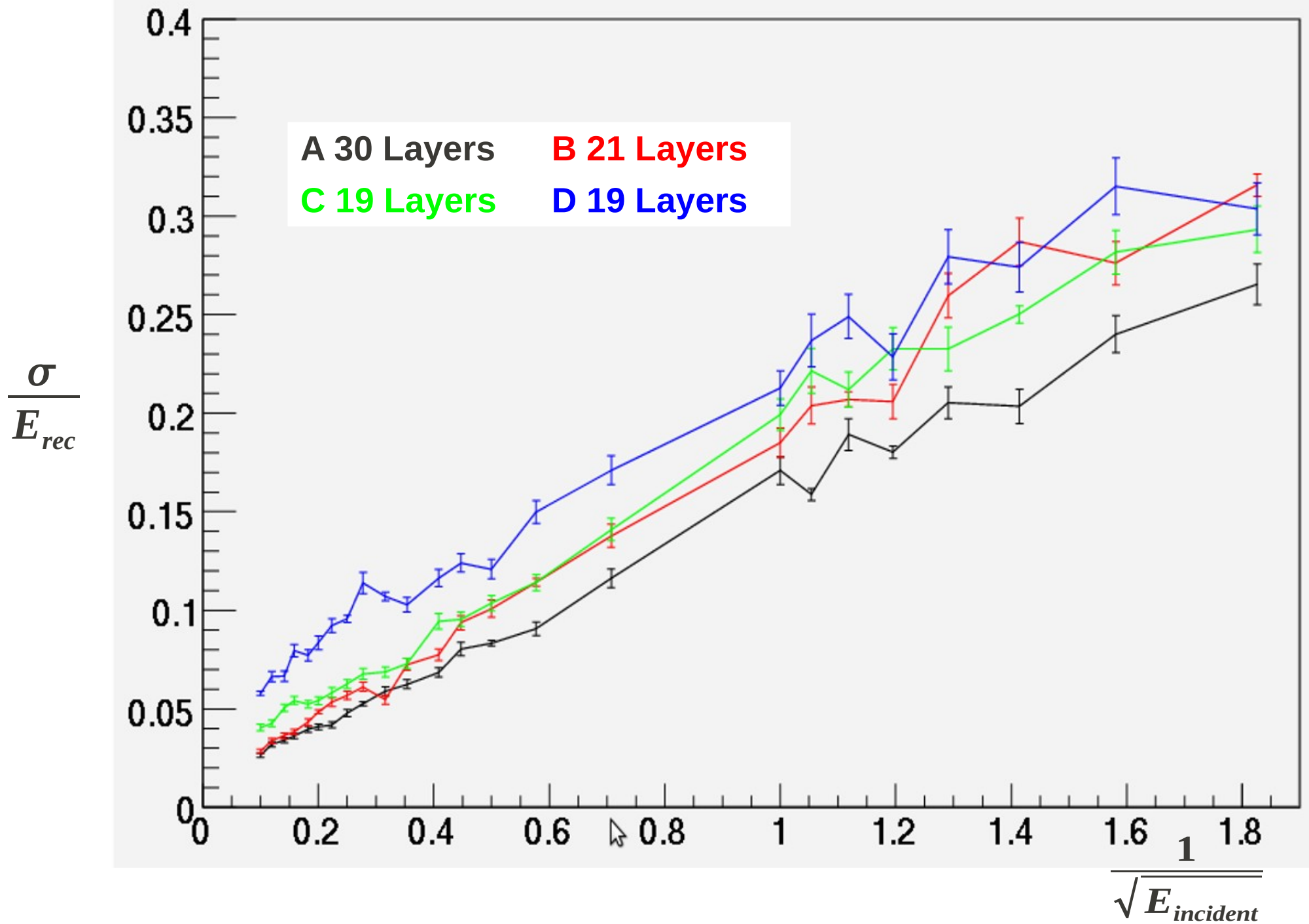
# Energy Weighted Efficiency for Photon {75% of Total Reconstructed Energy}



# Efficiency of Garlic for Clustering the Total hits in ECAL.

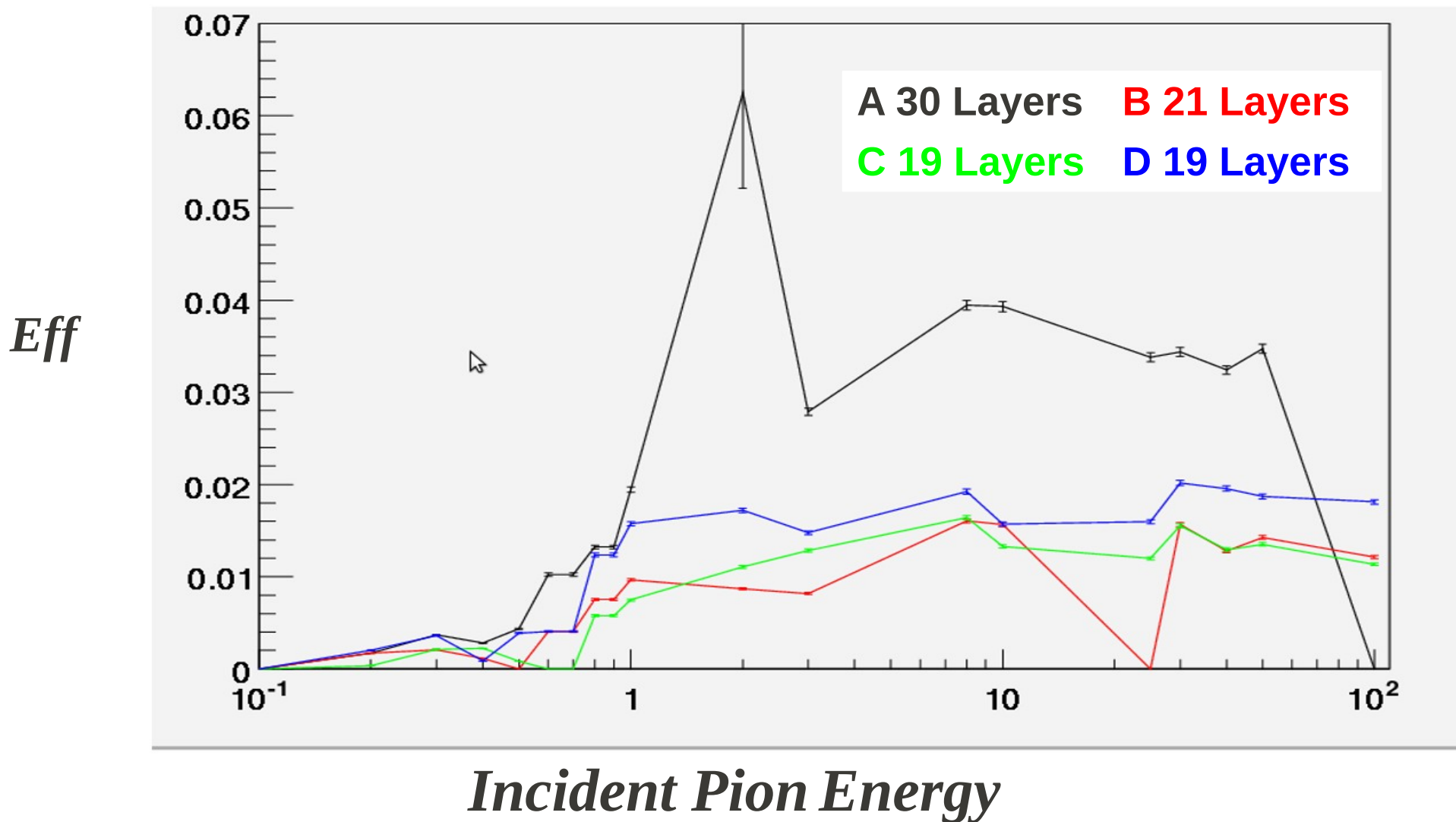


# Resolution of the different ECAL Models .

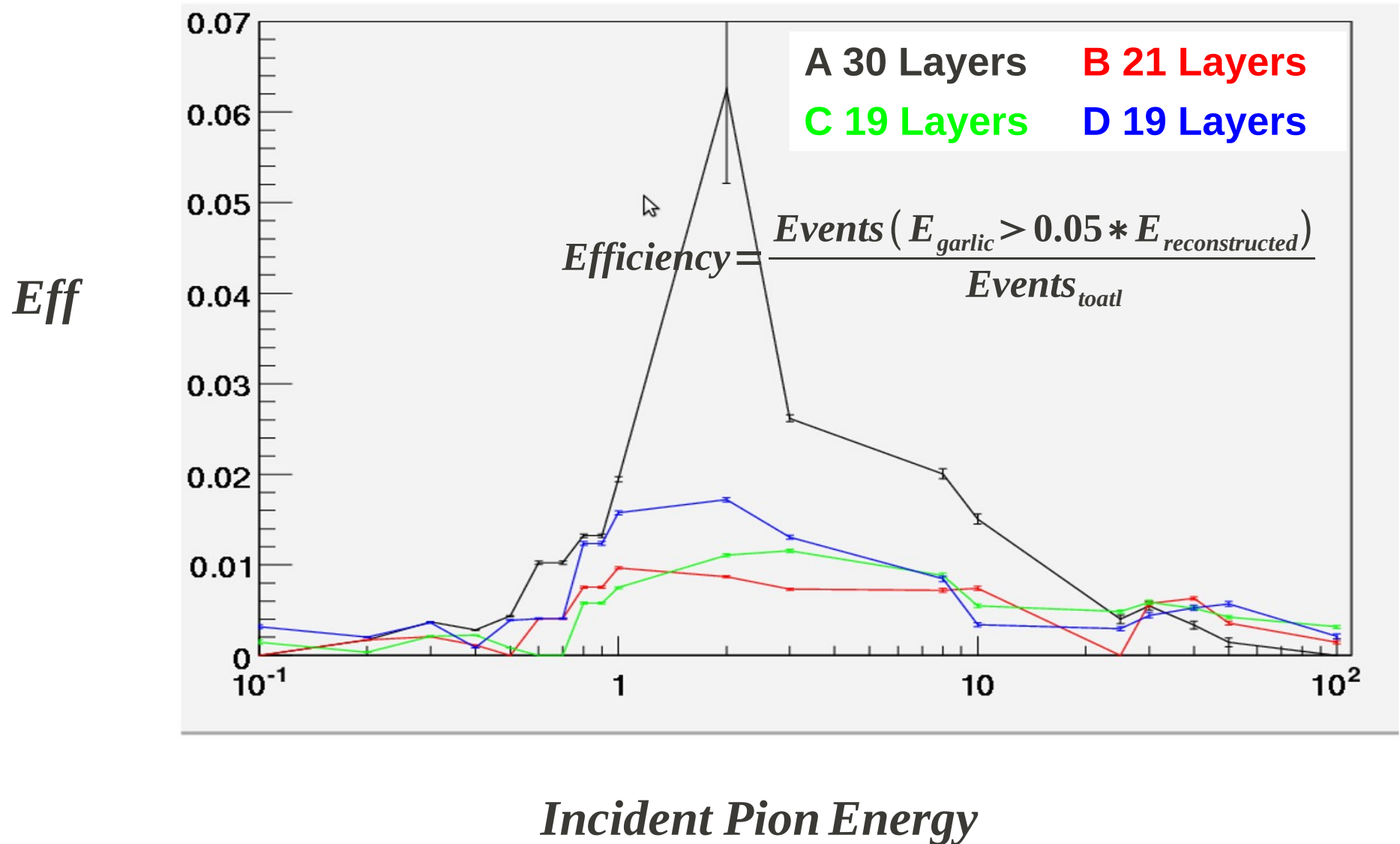




# Efficiency of Garlic to Find at least One Cluster in Charged Pion Events



# Energy Weighted Efficiency (5 % of Incident Energy)

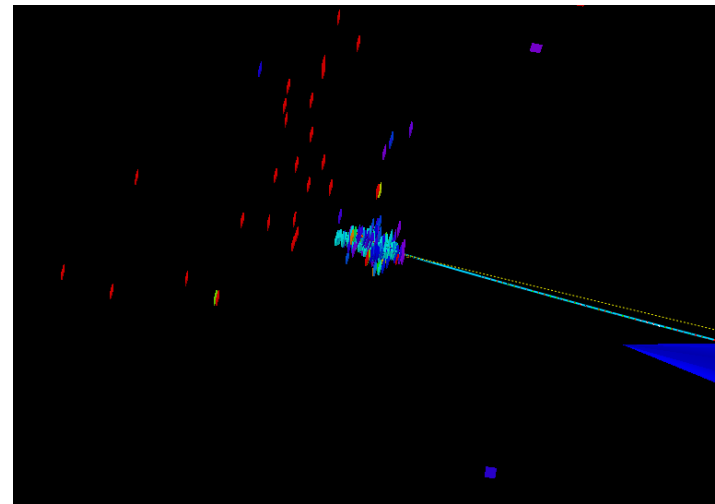
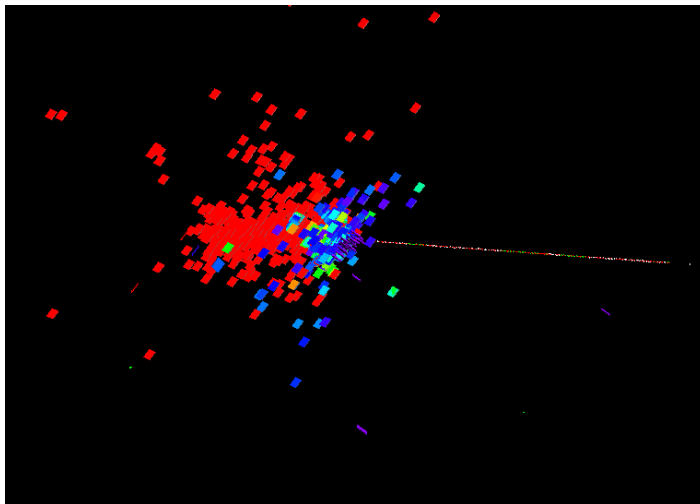
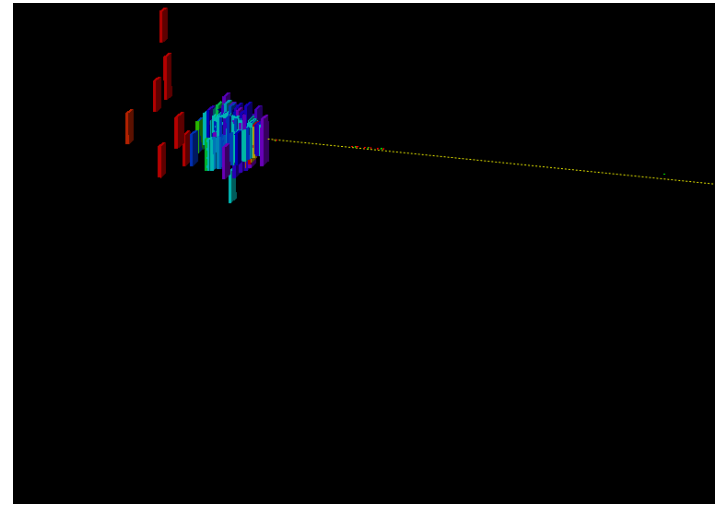
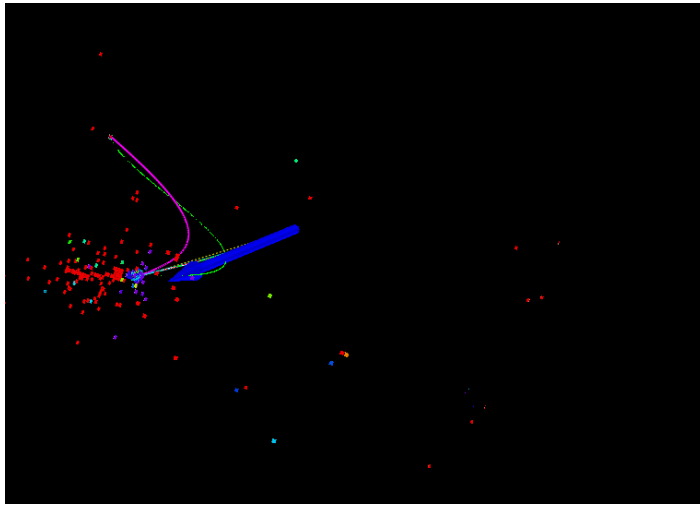


# Future Work Plans

- To study the performance of Garlic for  $\text{Pi}^0$  events for different ECAL Models to check its ability of separating very close photons.
- Analyzing the Garlic Performance in Jet Events rather than single particle events.
- Same studies to be carried out using different silicon thickness.

BACK UP

# Possible reasons for Finding a Photon {Early Interaction of Pion in ECAL}

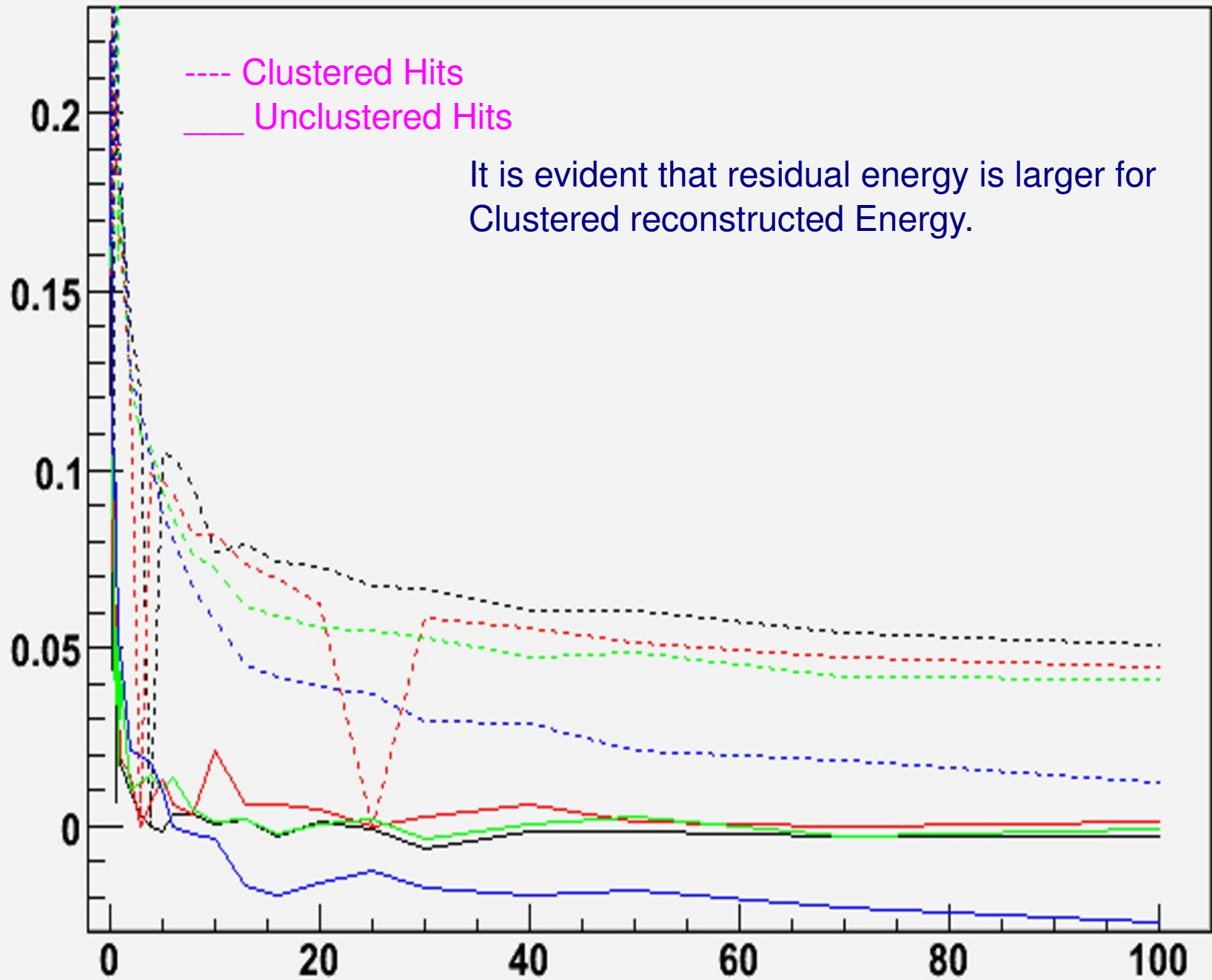


# How Garlic Works

- Pre-Clustering, seed finding, and seed validation.
- Seed searching is done in a minimum number of layers, default is 12. { $12 * 2.1 = 25.2$  mm of absorber thickness.}
- For seed validation, the criteria includes number of least hits, Minimum energy.
- Having the new Models with different number of layers and a different distribution of absorber thickness, these parameters need to be modified.

# Residual Energy

**Residual Energy**



It is evident that residual energy is larger for Clustered reconstructed Energy.

**Incident Energy**

# CLUSTERED Resolution

