Analysis of Different ECAL Models
Preliminary Results

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Purpose and Scheme of Study

- **To find an ECAL with less number of layers, which can be less expansive in cost and not compromising on over all performance as compared to Standard ECAL Model 'A'.**

- **Two ways to vary the composition of the ECAL**
  - **Varying the number of layers and absorber Thickness, which alternatively changes the sampling ratio, if Si Thickness kept same i.e, 500 microns.**
  - **Varying the silicon Thickness to not go far from actual sampling ratio.**

Different ECAL models for ILD

- Altering the number of layers and their absorber thickness in such a way that Total Absorber thickness in the detector remains nearly the same.
- By altering the ratio of total absorber thickness in the first and second stacks.
- The analyses included in this talk were done with Single Photon events ranging from 0.1GeV to 100 GeV in energy.

Details of the Models.

Presentation:
A(N%) {X/Y}

N% = Percentage of Tungsten thickness in first stack.

x/y = Layers in First Stack / Layers in second Stack

Color = Color on graph.

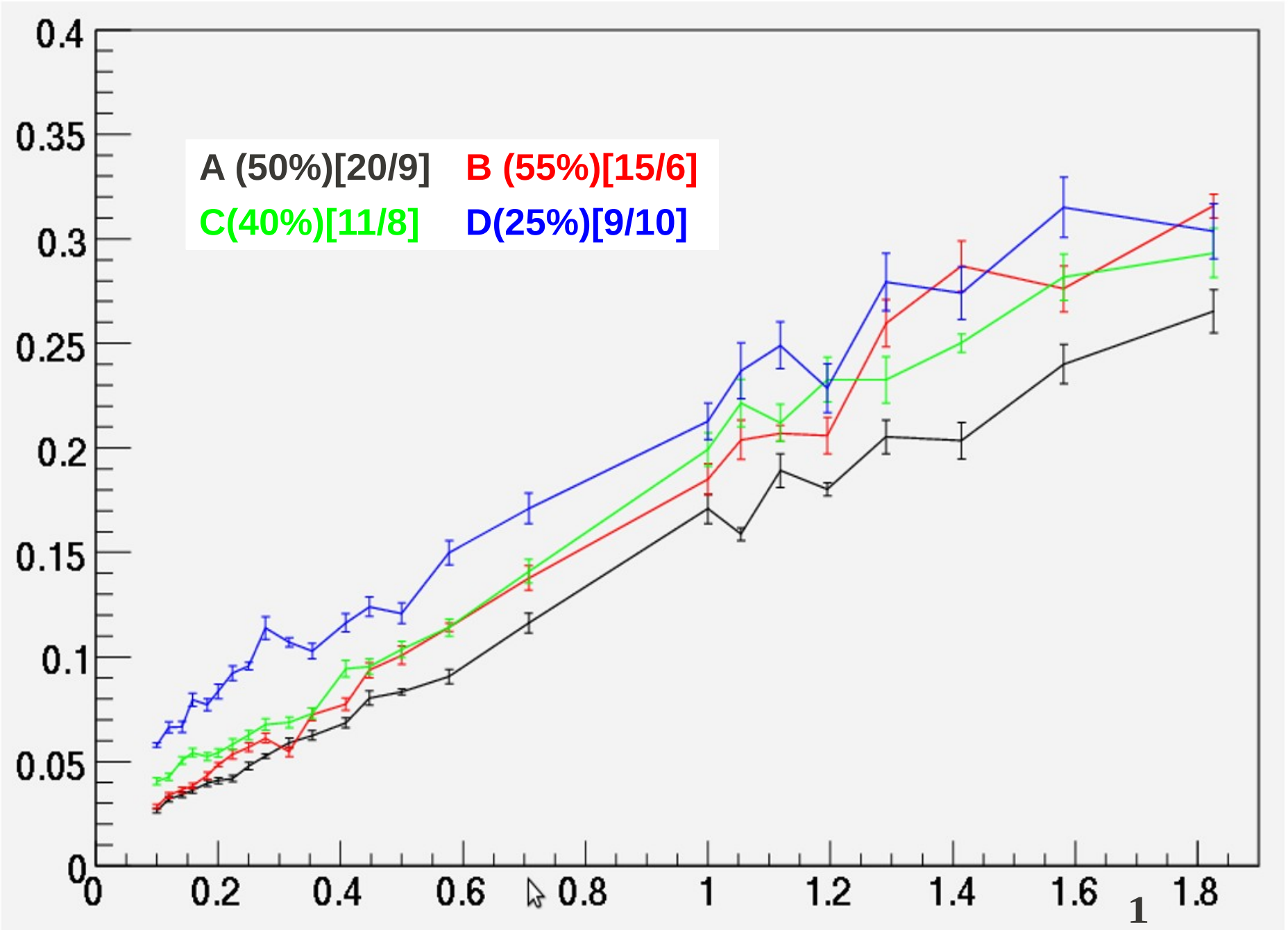
MODEL {mm}	Layers	Thickness {mm}	Total Thickness {mm}
A {79.8}	20 X	2.10	= 42.0
	9 X	4.20	= 37.8
B{81.0}	15 X	3.0	= 45.0
	6 X	6.0	= 36.0
C{81.0}	11 X	3.0	= 33.0
	8 X	6.0	= 48.0
D*{78.0}	9 X	2.0	= 18.0
	10 X	6.0	= 60.0

More Models E G I Z

- **Model(Layers) → Percent thickness of absorber in first stack.**
- E(41) → 25 % ,
- G(15) → 53 % ,
- I(37) → 51% ,
- Z(15) → 25%

MODEL {mm}	Layers	Thickness {mm}	Total Thickness {mm}
E {79.2}	16 X	1.20	= 19.20
	25 X	2.40	= 60.00
G{74.5}	10 X	3.95	= 39.5
	5 X	7.0	= 35.0
I{78.4}	25 X	1.6	= 40.0
	12 X	3.2	= 38.4
Z{79.2}	6 X	3.3	= 19.8
	9 X	6.6	= 59.4

Energy Resolution of the different ECAL Models 500 Micron



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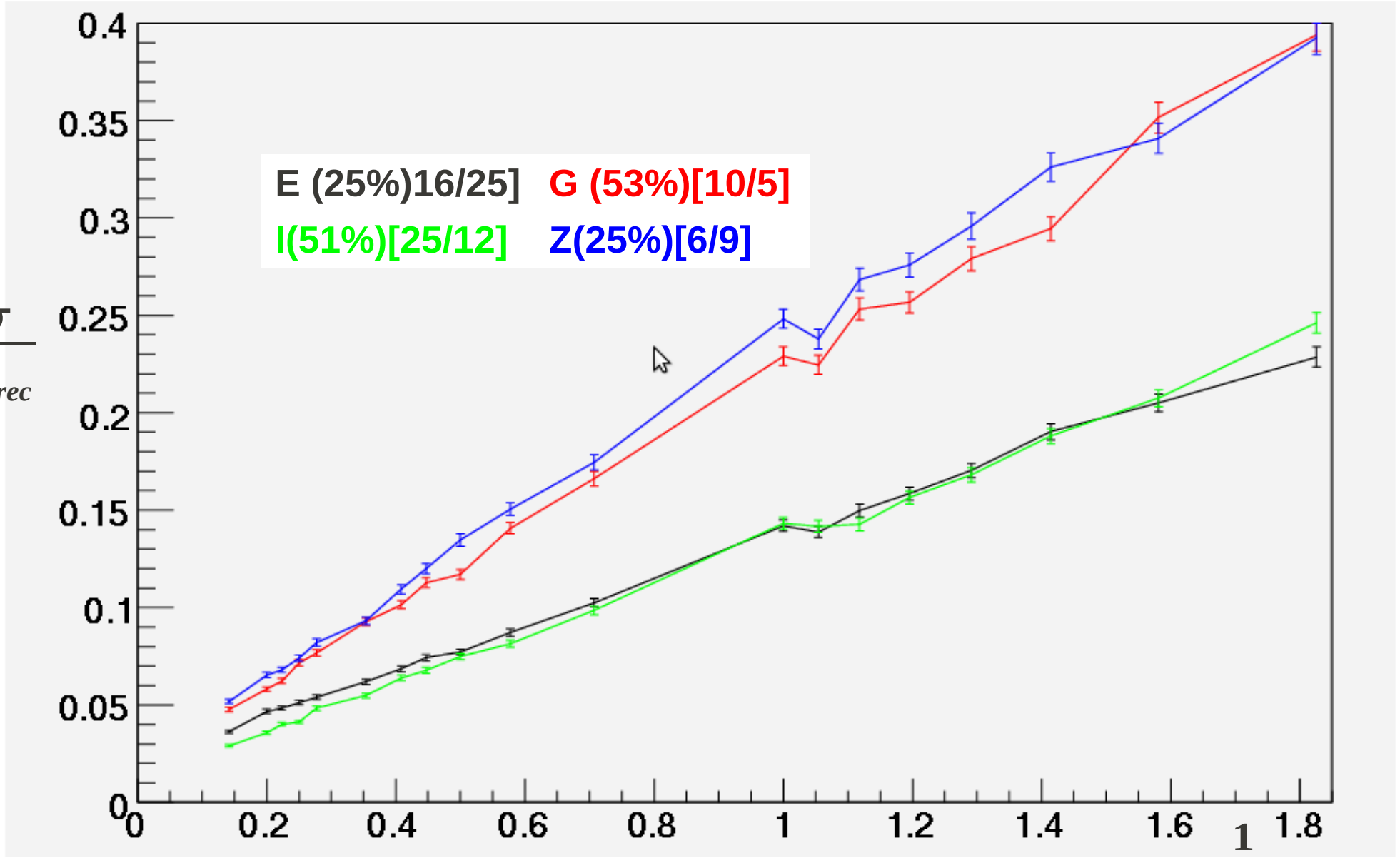
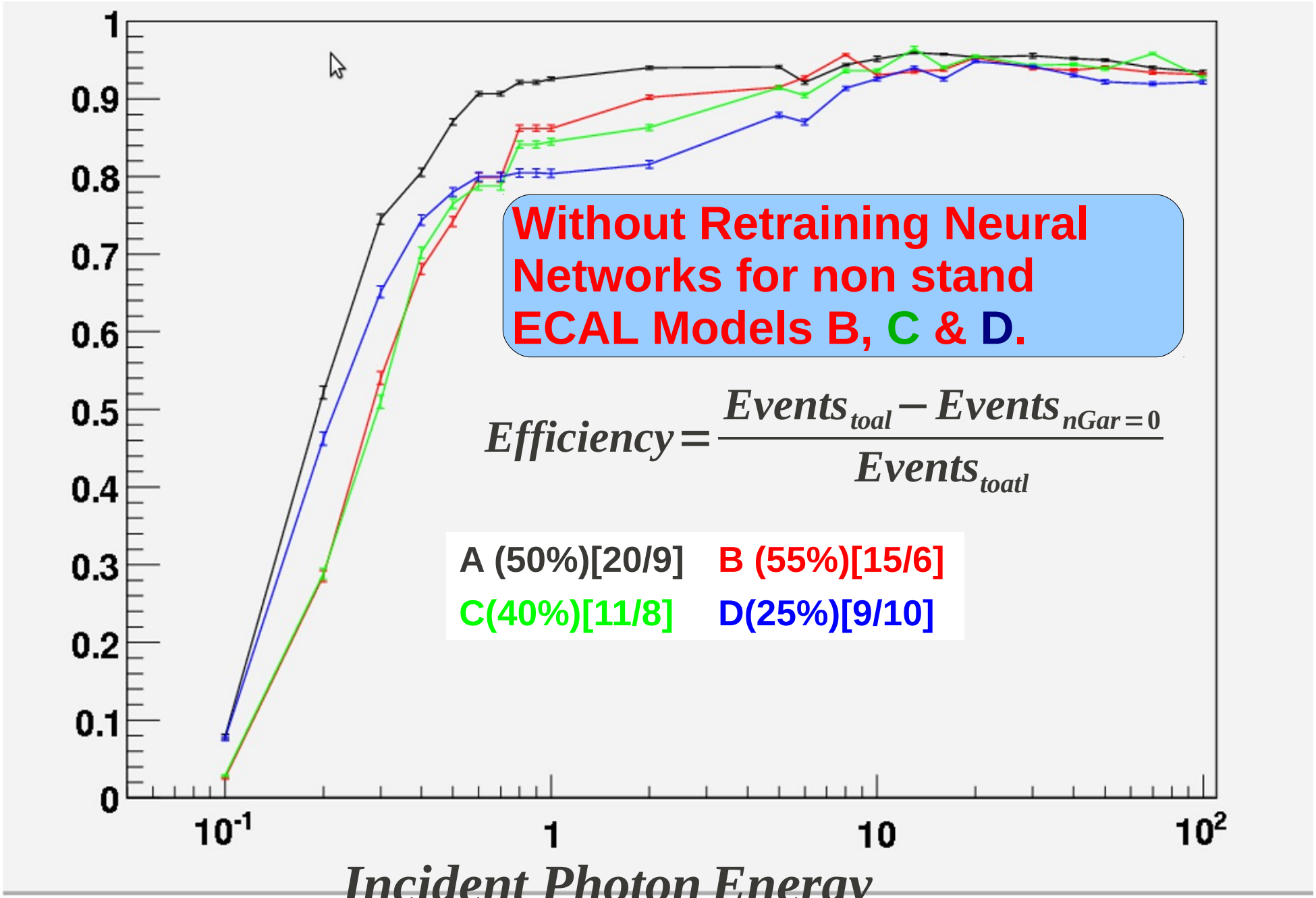


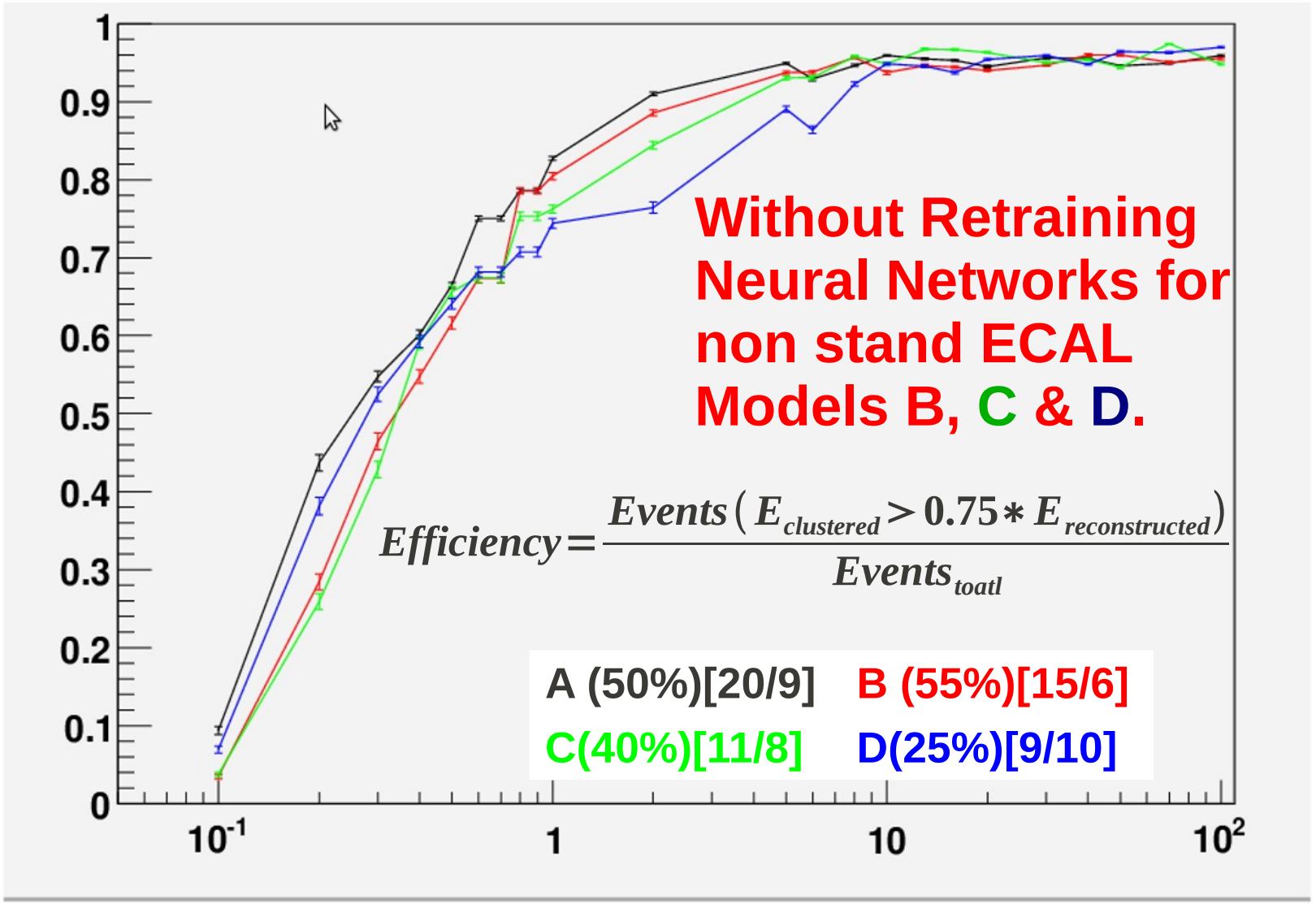
Efficiency of GARLIC to find at least one Photon Cluster with new Garlic Parameters



Summary and Plans

- It is hard to draw a definite conclusion with the analysis done so far. So the plan is
  - To complete the same analysis with {neutral and Charged} Pions and Jet Events.
  - To Analyze the performance of GARLIC with the proper retraining of Neural Networks for each model.
  - To analyze and compare the performances of the same models by taking Si thickness as 800microns instead of 500, in order to improve the sampling ratio for less Layer Models.

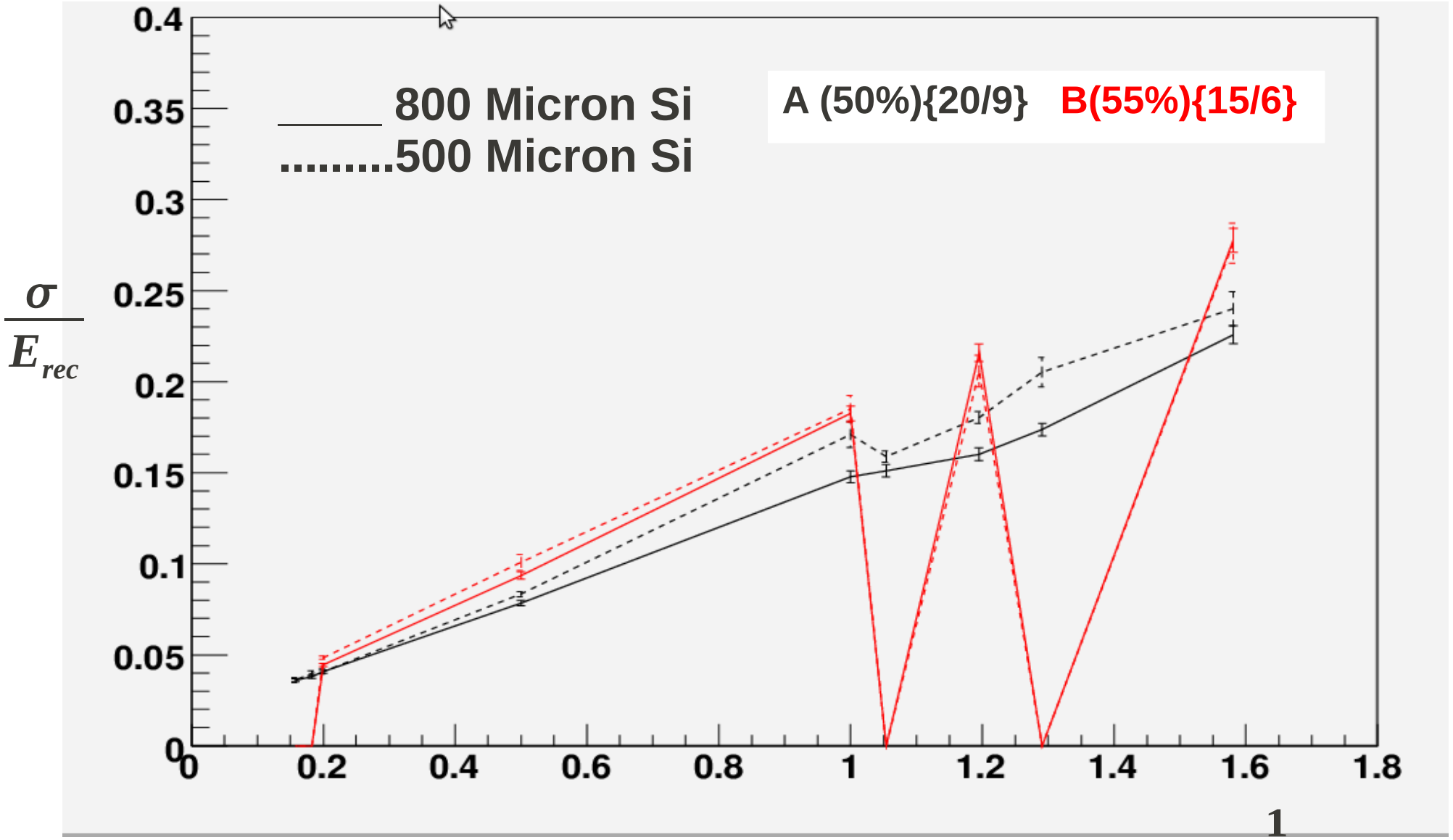
Energy Weighted Efficiency for Photon {75% of Total Reconstructed Energy}



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 = $7X_0$ 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.

Resolution Comparison of A & B for 500 & 800 Micron Si Thicknesses



Energy Resolution Comparison of C & D for 500 & 800 Micron Si Thicknesses