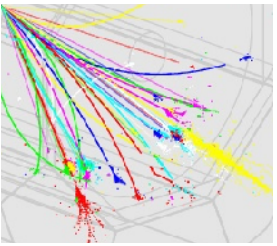
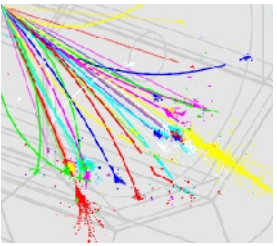


Segmentation results

SiD PFA Meeting

28.05.2008

M. Stanitzki

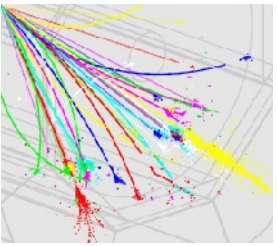


three variants

- Keep
  - total HCAL thickness
  - Active material (Scintillator)
  - Absorber material
- change segmentation (30,40,50 layers)
  -

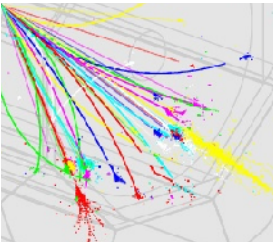
Layers	total thickness	Iron thickness	Absorber thickness	HCAL thickness	λ
30	32.7	26.2	6.5	980	4.92
40	24.5	18.0	6.5	980	4.61
50	19.6	13.1	6.5	980	4.45

  - the 40 layer version is the "standard" SiDish !
  - λ done with λ_{Iron}=168 mm and λ_{Scint}=795 mm
  - note: there is some more material between HCAL and ECAL

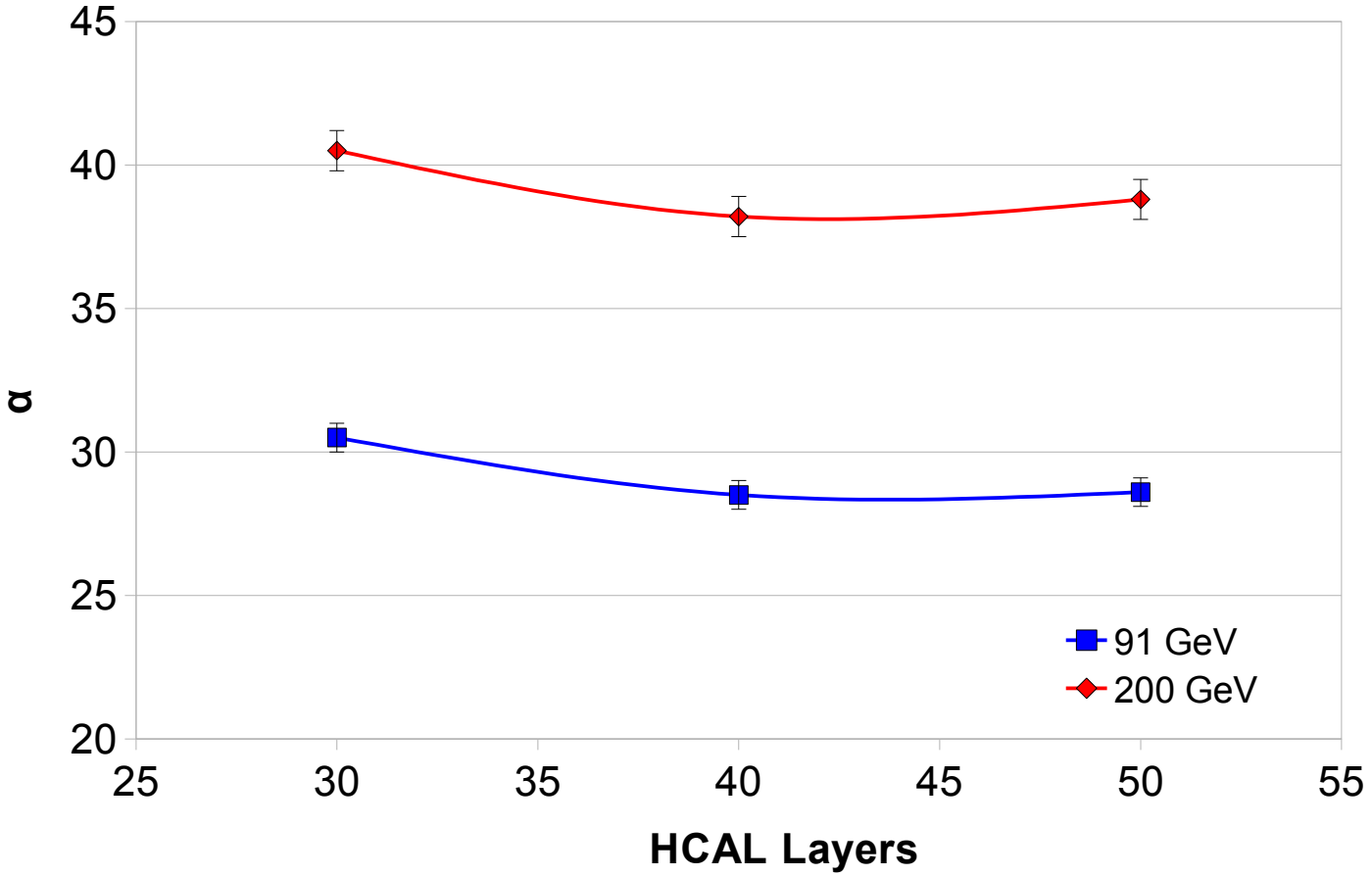


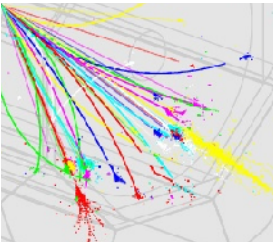
The results

Detector Tag	Layers	uds (91 Gev)		uds (200 GeV)	
		α %	Error	α %	Error
SIDish_v2_hcal30	30	30.5	0.4	40.5	0.7
SIDish_v2_hcal40	40	28.5	0.5	38.2	0.7
SIDish_v2_hcal50	50	28.6	0.4	38.8	0.8

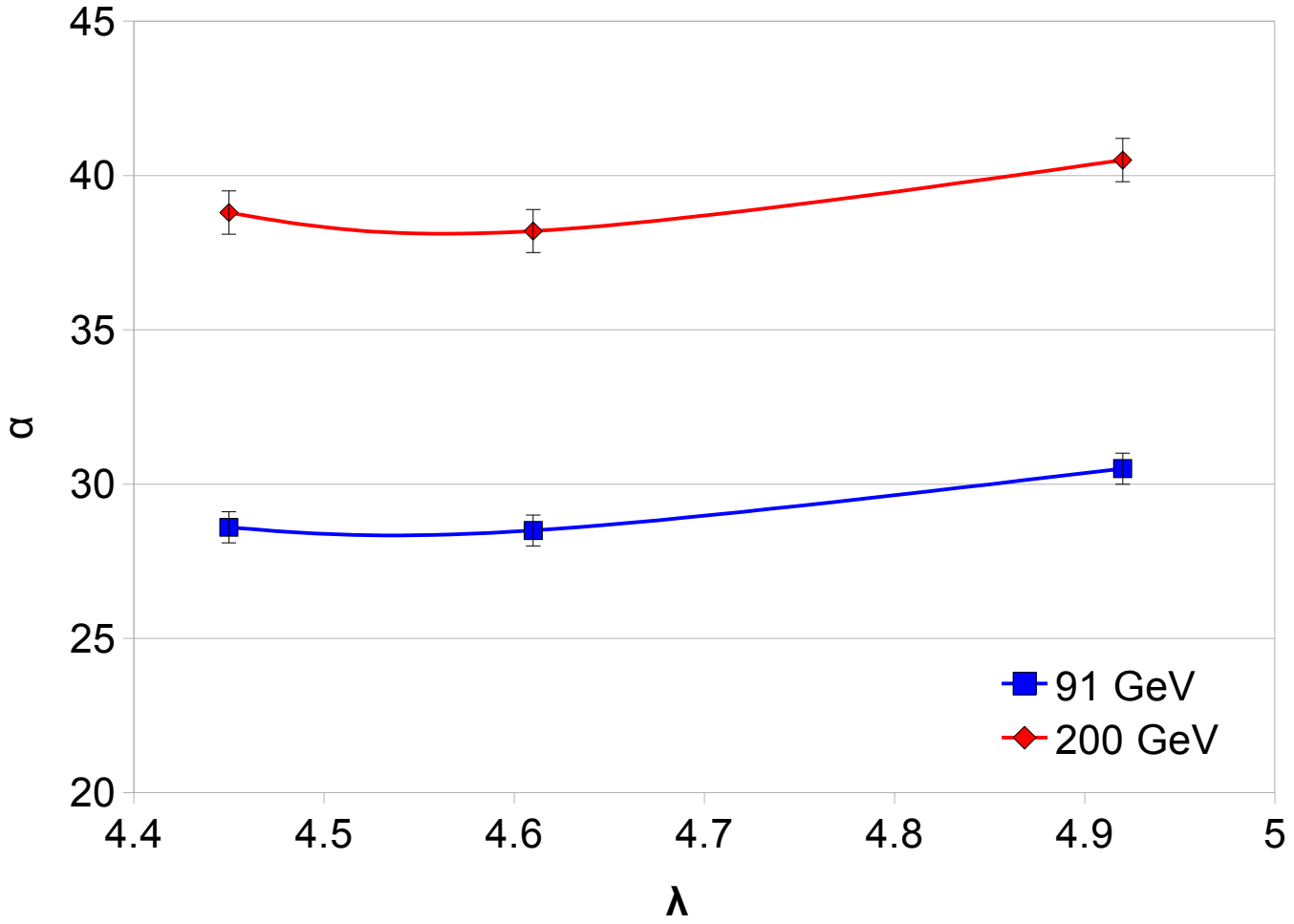


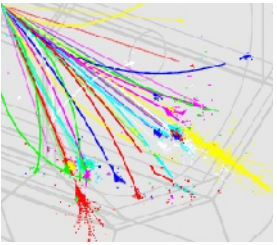
Some plots



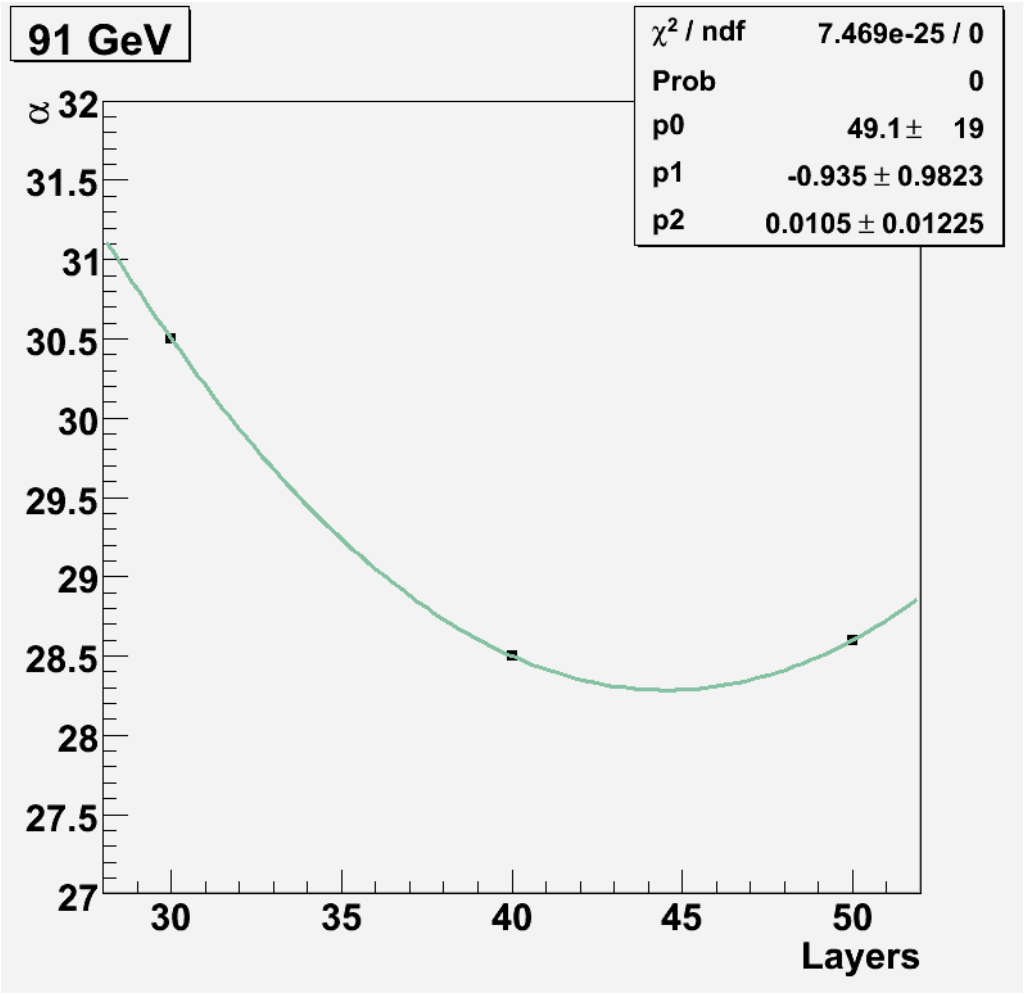


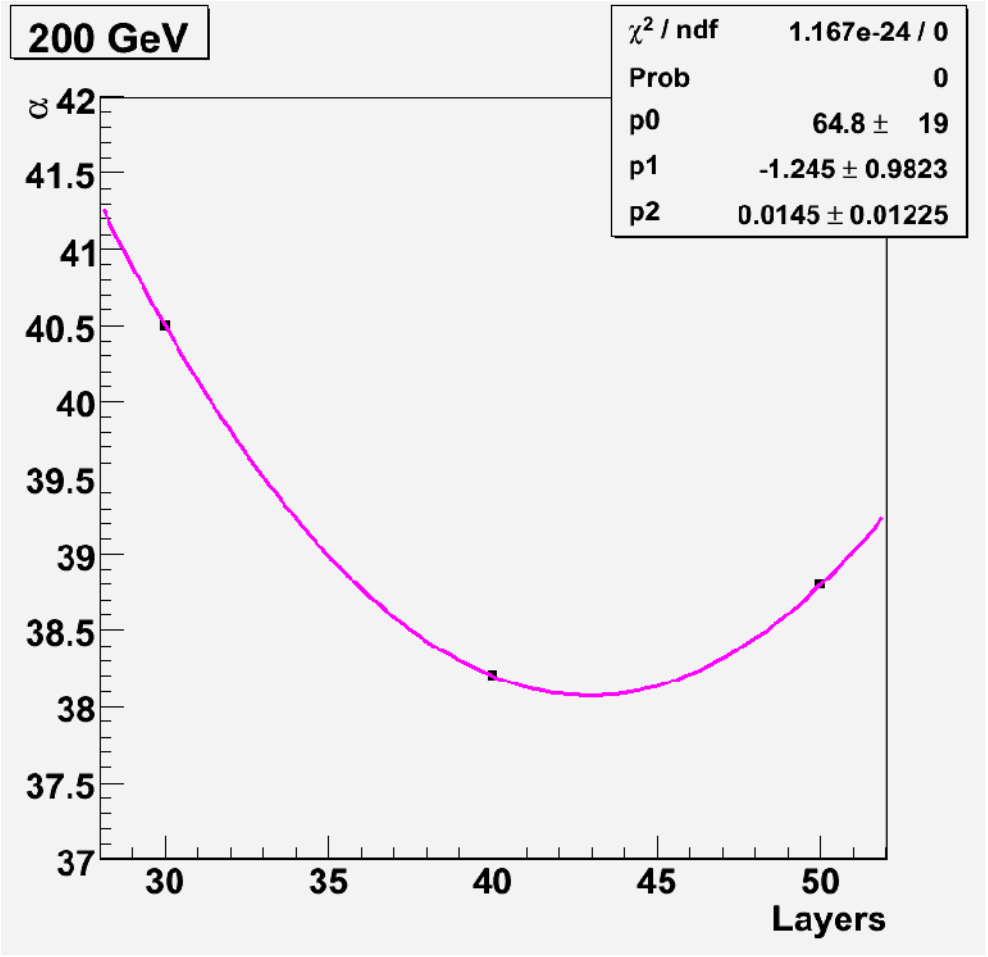
More plots

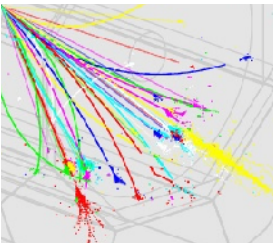




and more

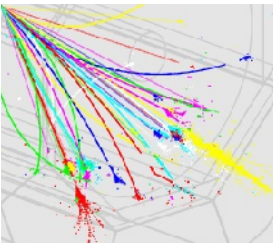

91 GeV
χ² / ndf 7.469e-25 / 0
Prob 0
p0 49.1 ± 19
p1 -0.935 ± 0.9823
p2 0.0105 ± 0.01225
α
32
31.5
31
30.5
30
29.5
29
28.5
28
27.5
27
30
35
40
45
50
Layers


200 GeV
χ² / ndf 1.167e-24 / 0
Prob 0
p0 64.8 ± 19
p1 -1.245 ± 0.9823
p2 0.0145 ± 0.01225
α
42
41.5
41
40.5
40
39.5
39
38.5
38
37.5
37
30
35
40
45
50
Layers



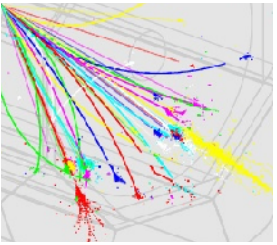
Playing with the ECAL

- Point raised by Harry, is the ECAL optimal ?
  - we see a benefit going from 20+10 to 30+10 layers
  - better segmentation helps ?
  - or just pure thickness ?
  - Effect is ~ 2 %
- Made a SiDish_ecal_q37
  - SiDish with 37 layers but same overall thickness
- Make a SIDish_ecal25_50
  - 20+10 layers
  - 2.5 mm /5.0 mm tungsten thickness and smaller gaps (1 mm)
  - will change global radius (very small effect)

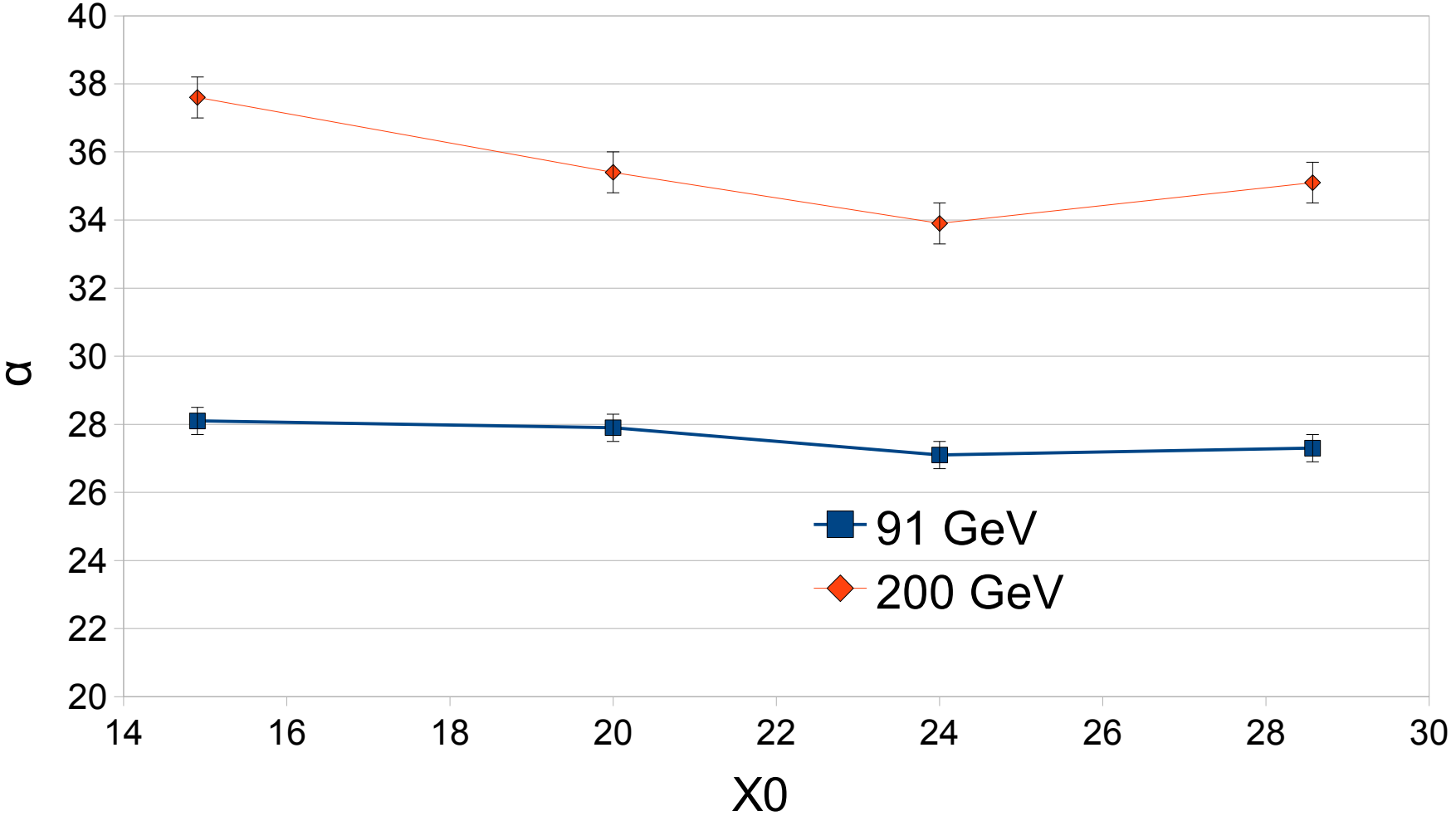


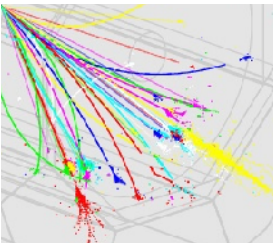
Some results

Detector Tag	Radiator Thickness	Layers	X_0	uds (91 Gev)		uds (200 GeV)	
				α %	Error	α %	Error
SIDish	1.4/4.2 mm	20+10	20	27.9	0.4	35.4	0.7
SIDish_ecal40	1.4/4.2mm	30+10	24	27.1	0.5	33.9	0.6
SIDish_ecal_eq37	1.41 mm	37	15	28.1	0.4	37.6	0.6
SIDish_ecal25_50	2.5/5.0 mm	20+10	29	27.3	0.4	35.1	0.6



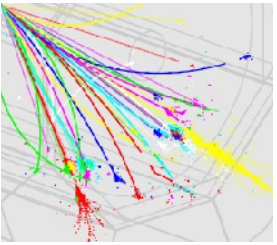
some plots


40
38
36
34
32
30
28
26
24
22
20
α
14
16
18
20
22
24
26
28
30
X0
91 GeV
200 GeV

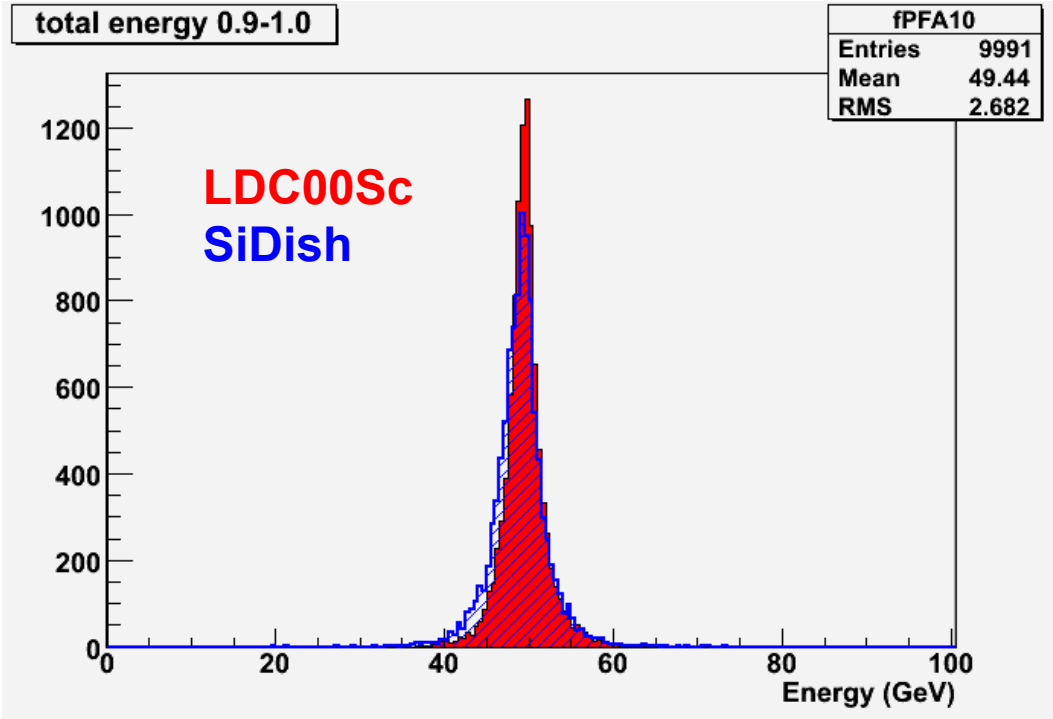


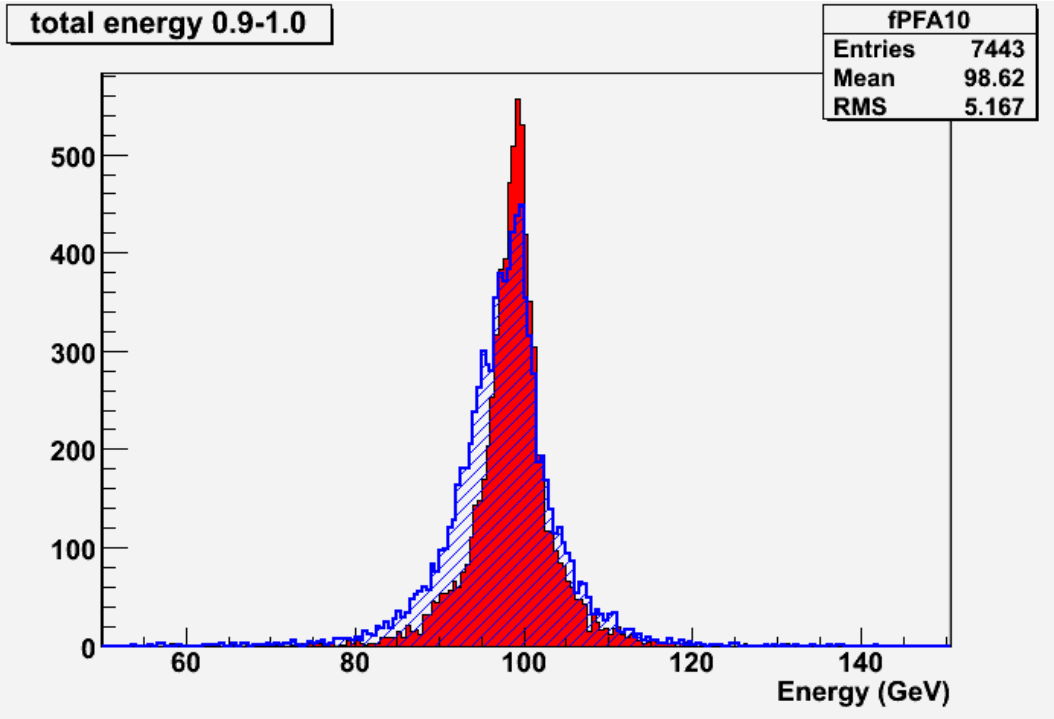
Z dependence

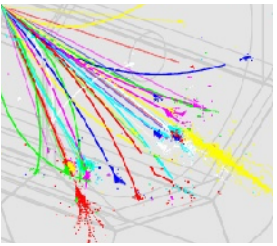
- Due to popular request by a single gentleman
- Norman kindly generated u jets going at cos(θ)=0.92 for three energies: 50, 100, 250
- 250 GeV one are still running ...



Some Plots

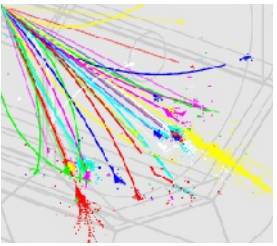

total energy 0.9-1.0
fPFA10
Entries 9991
Mean 49.44
RMS 2.682
LDC00Sc
SiDish
1200
1000
800
600
400
200
0
0
20
40
60
80
100
Energy (GeV)


total energy 0.9-1.0
fPFA10
Entries 7443
Mean 98.62
RMS 5.167
500
400
300
200
100
0
60
80
100
120
140
Energy (GeV)



Results

Detector Tag	u (50 GeV)		u (100 GeV)	
	α %	Error	α %	Error
SIDish	39.9	0.4	40.2	0.4
LDC00Sc	32.0	0.3	29.6	0.3

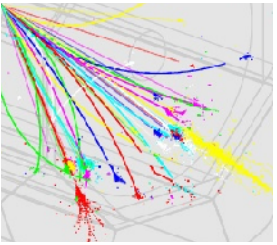


Looking at other points

Taking the standard samples at 91 GeV and looking in the forward ...

Detector Tag	B	Z	uds (91 Gev)	
			α %	Error
SIDish	5	1.7	70.4	1.8
SIDish_r125_z15	5	1.5	76.1	2.1
SIDish_r125_z19	5	1.9	67.8	1.7
SIDish_4T	4	1.7	71.8	1.8
SIDish_6T	6	1.7	69.5	1.7

This is way less statistics plus there are two jets and not one well defined u-quark !



Conclusions

- HCAL seems to say
  - a magic number of layers per Lambda
  - if you fit a polynomial you find 44 is the answer
- ECAL prefers fine segmentation
  - in the first layers
- Depth is a good thing
- Understanding the Z stuff will require a few more data points