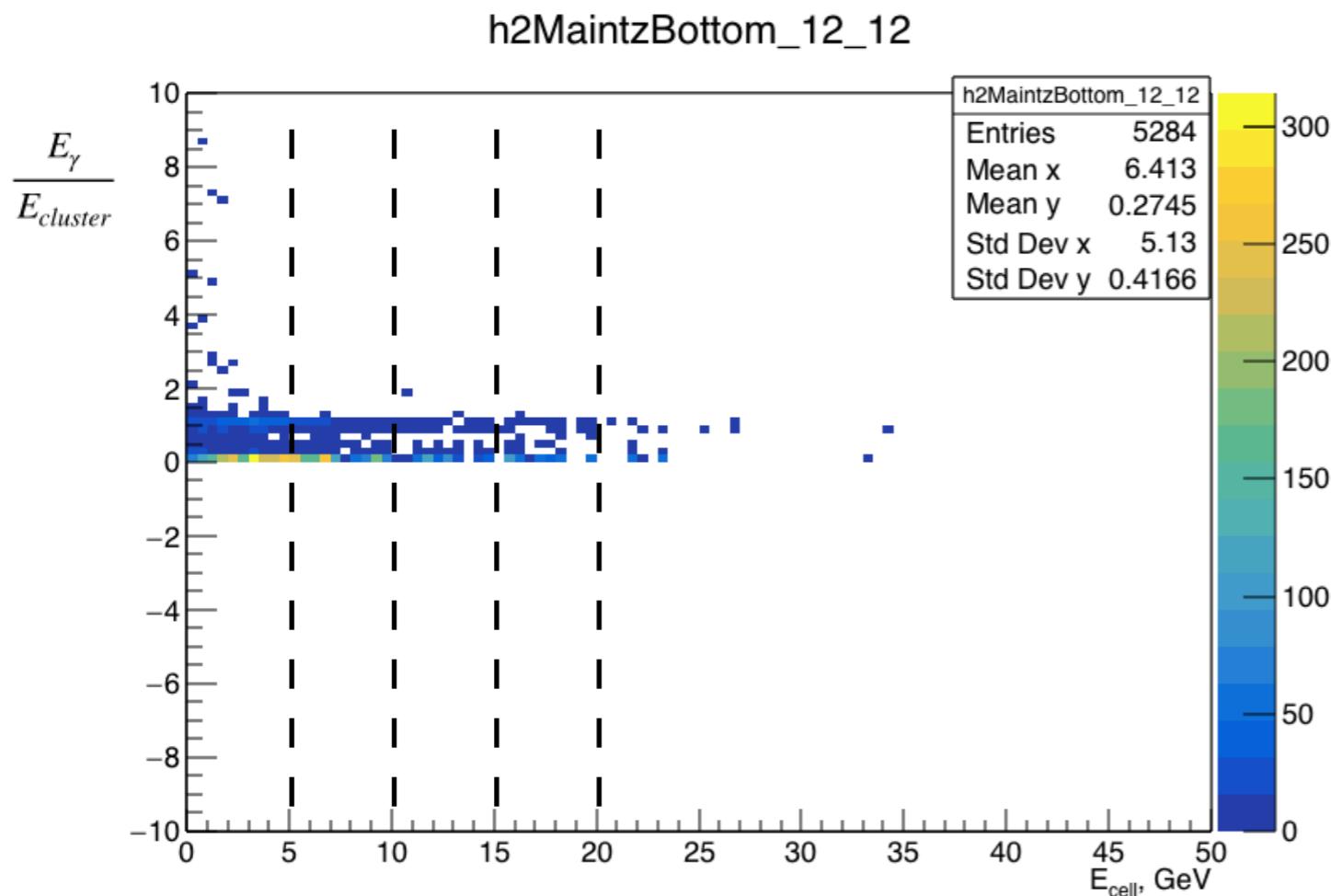


Update on ECAL calibration in 2016MC

Gridin Andrei (JINR)
COMPASS CW meeting
28.05.2021

Energy dependent ECAL calibration



Absorber material in ECAL module excluded from the sensitive material.

Each ECAL module has a set of calibration values in dependence of Ecell.

Calib values are extracted at low statistics with rough (preliminary) parameters.

1092	MaintzBottom_12_12	10	
2.5	0.327	7.5	0.228
12.5	0.243	17.5	0.170
22.5	0.157	27.5	0.967
32.5	0.500	37.5	1.000
42.5	1.000	47.5	1.000

The calibration file for MC has the same format as calibration file for RD.

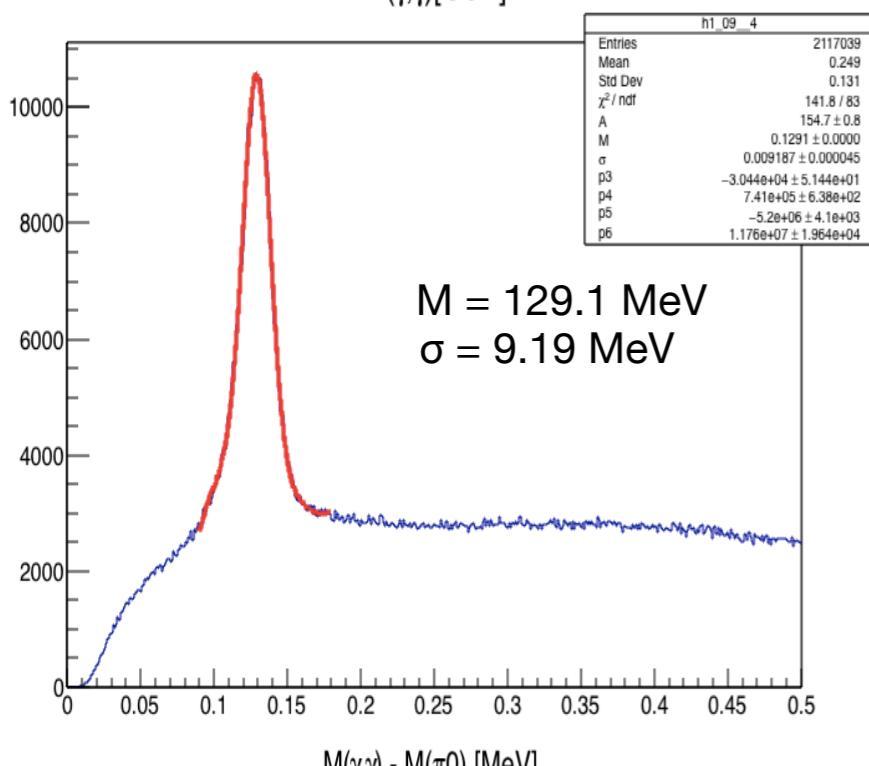
UserEvent17 was used for cluster energy correction.

Energy dependent ECAL calibration

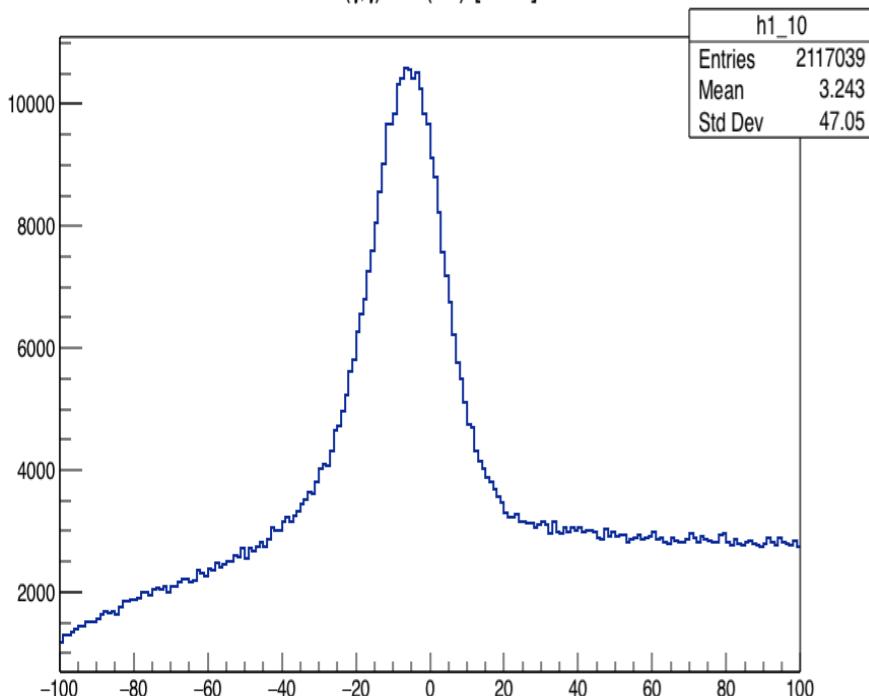
ECAL0

MC P09slot7.1

$M(\gamma,\gamma)$ [GeV]

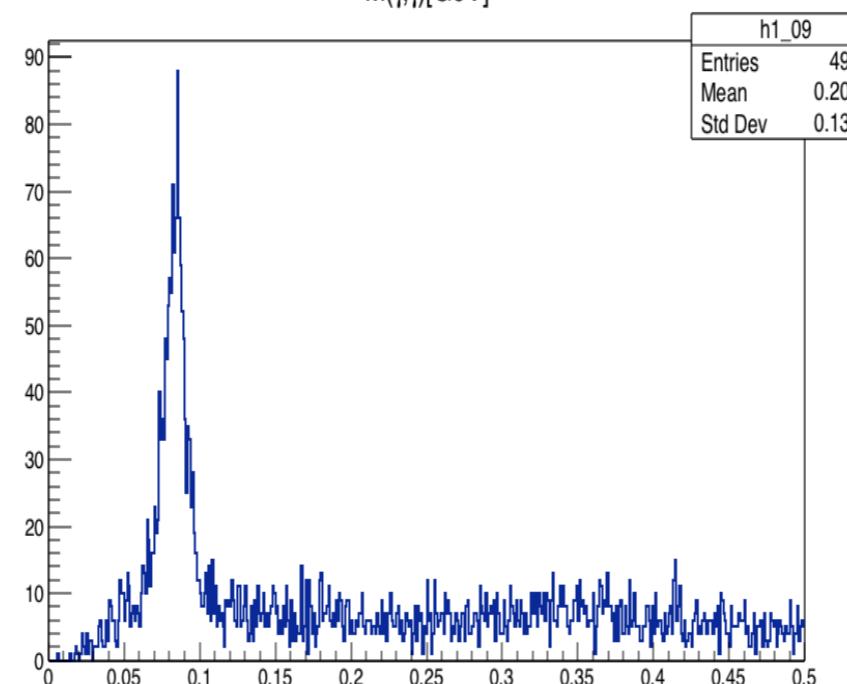


$M(\gamma,\gamma) - M(\pi0)$ [MeV]

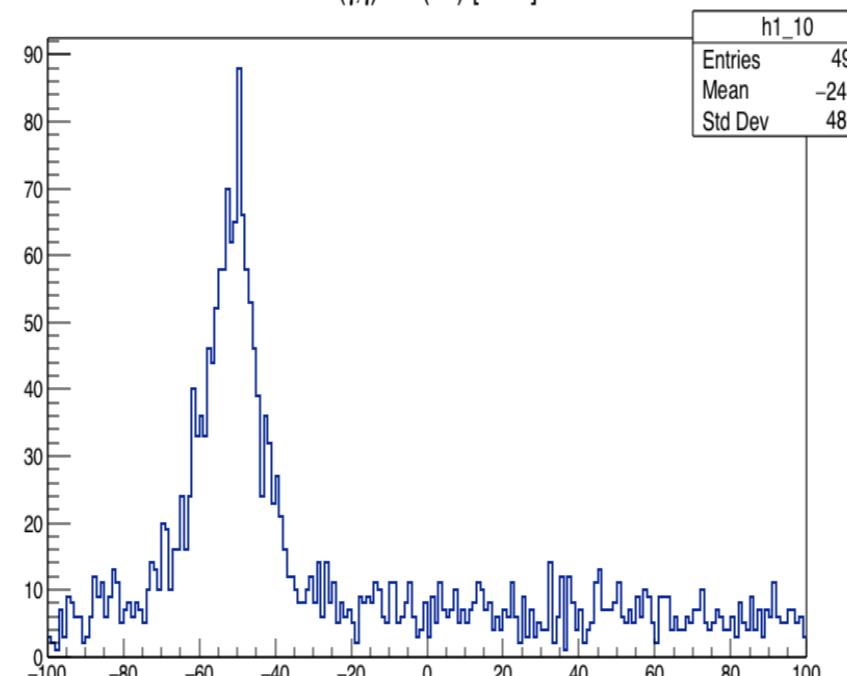


MC without calibration

$M(\gamma,\gamma)$ [GeV]

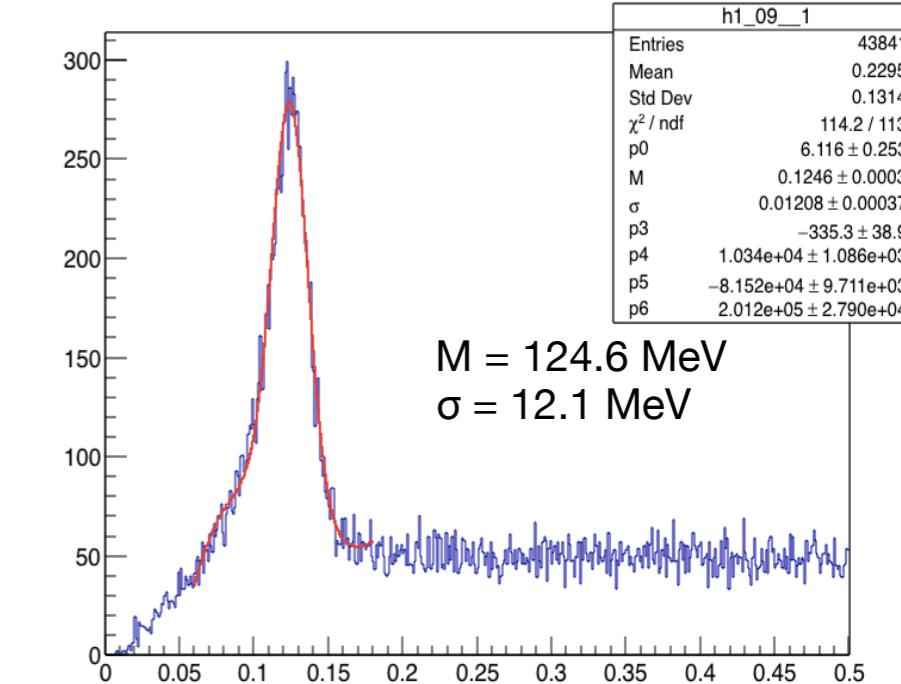


$M(\gamma,\gamma) - M(\pi0)$ [MeV]

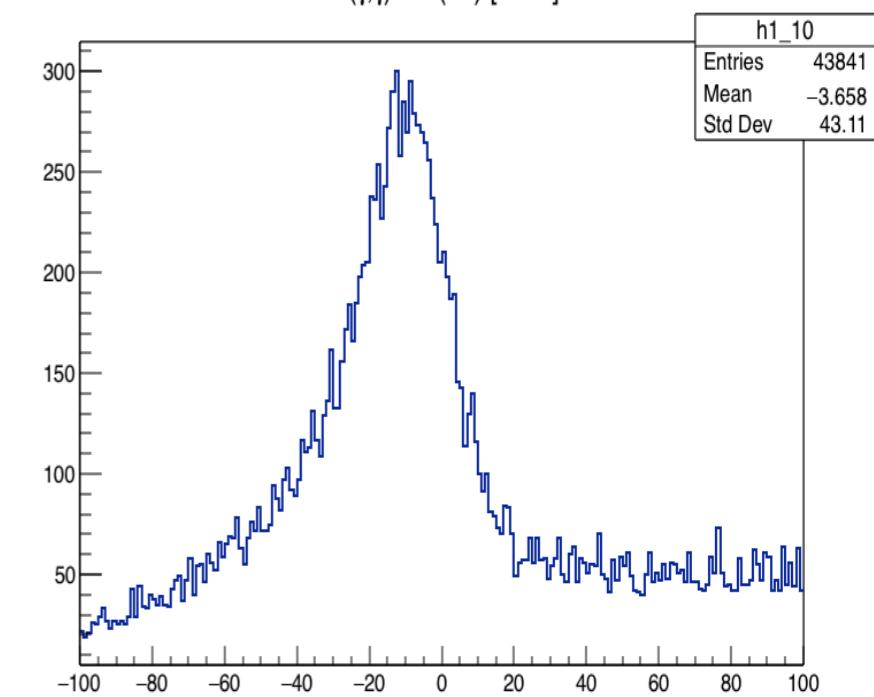


Edep calibration

$M(\gamma,\gamma)$ [GeV]



$M(\gamma,\gamma) - M(\pi0)$ [MeV]



Energy dependent ECAL calibration

ECAL1

MC P09slot7.1

$M(\gamma,\gamma)$ [GeV]

h1_09_5	
Entries	5679554
Mean	0.1968
Std Dev	0.1163
χ^2 / ndf	375.4 / 78
A	326.2 ± 2.5
M	0.1278 ± 0.0000
σ	0.006771 ± 0.000036
p3	$-1.046e+05 \pm 5.273e+03$
p4	$2.669e+06 \pm 1.167e+05$
p5	$-1.889e+07 \pm 8.375e+05$
p6	$4.303e+07 \pm 1.961e+06$

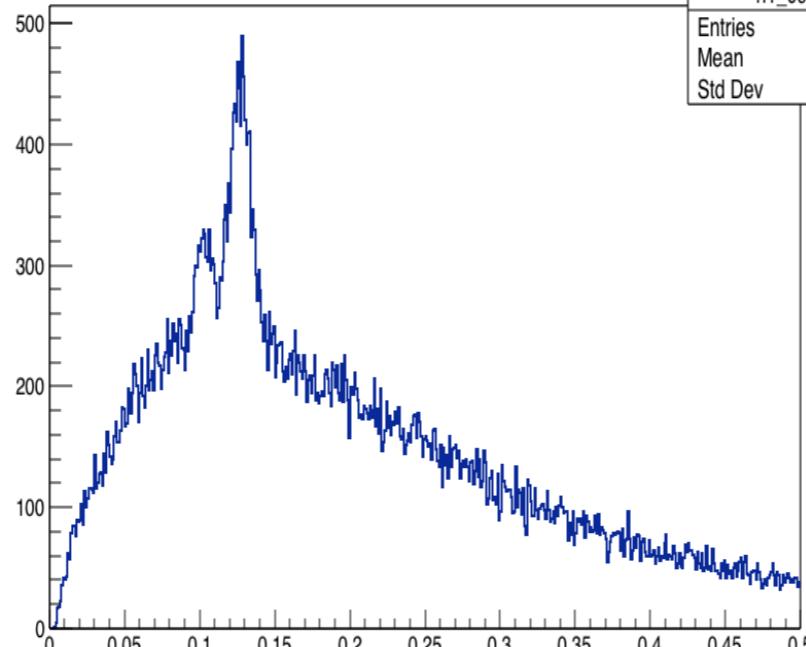
$$M = 127.8 \text{ MeV}$$

$$\sigma = 6.77 \text{ MeV}$$

MC without calibration

$M(\gamma,\gamma)$ [GeV]

h1_09	
Entries	78882
Mean	0.1936
Std Dev	0.1153



Edep calibration

$M(\gamma,\gamma)$ [GeV]

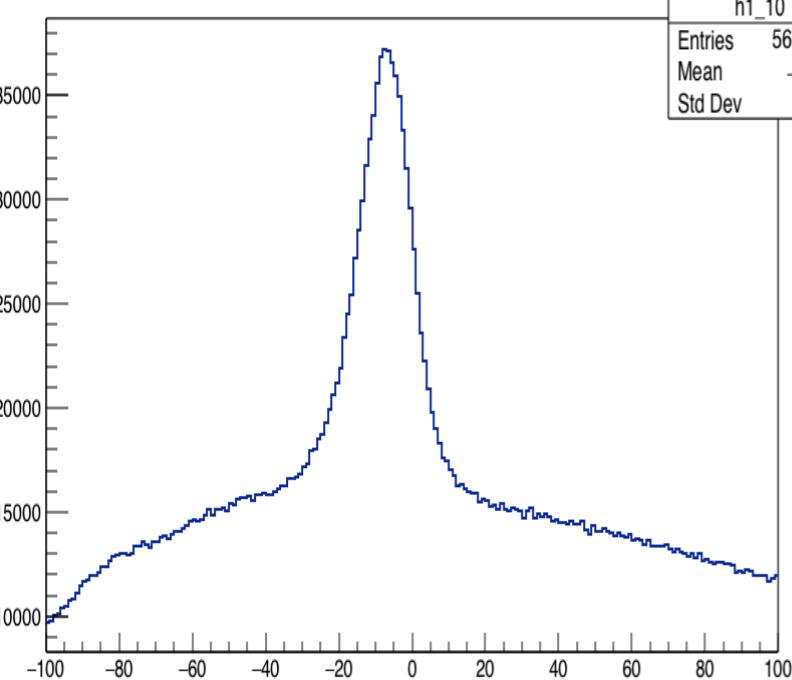
h1_09_2	
Entries	233189
Mean	0.183
Std Dev	0.1145
χ^2 / ndf	150.3 / 113
p0	10.72 ± 0.44
M	0.1194 ± 0.0002
σ	0.009765 ± 0.000313
p3	1137 ± 60.9
p4	-5817 ± 1502.8
p5	$2.607e+04 \pm 1.231e+04$
p6	$-5.491e+04 \pm 3.509e+04$

$$M = 119.4 \text{ MeV}$$

$$\sigma = 9.77 \text{ MeV}$$

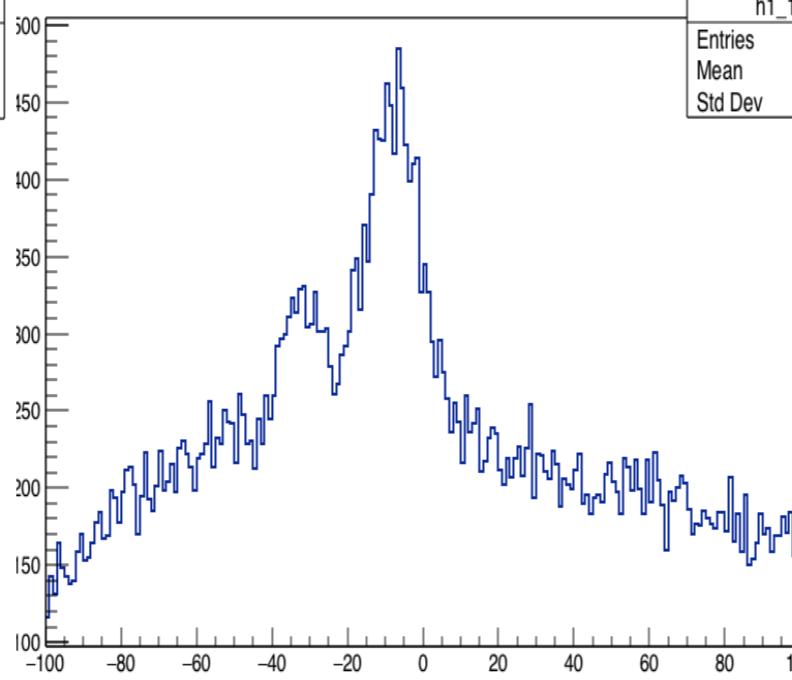
$M(\gamma,\gamma) - M(\pi 0)$ [MeV]

h1_10	
Entries	5679554
Mean	-1.186
Std Dev	51.56



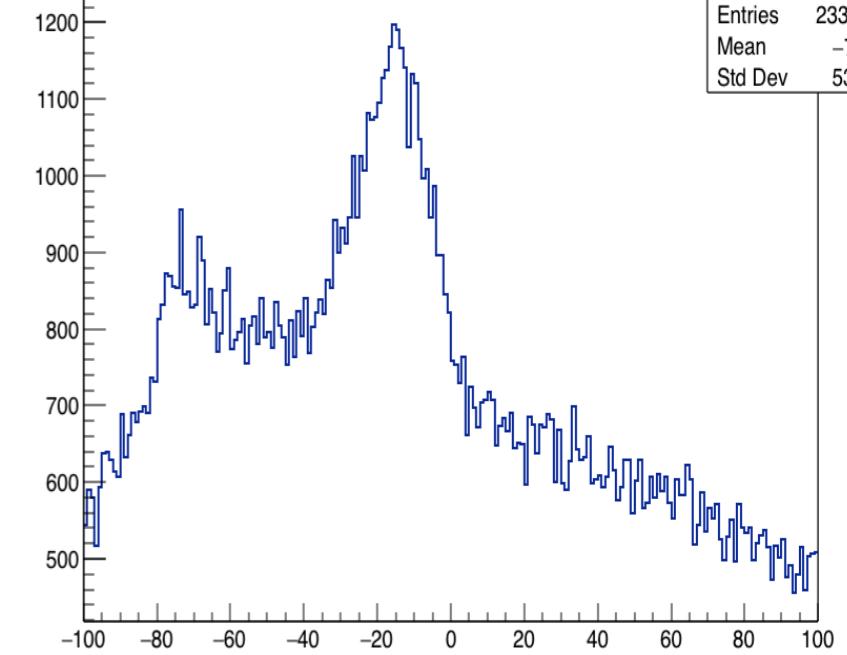
$M(\gamma,\gamma) - M(\pi 0)$ [MeV]

h1_10	
Entries	78882
Mean	-2.508
Std Dev	51.82



$M(\gamma,\gamma) - M(\pi 0)$ [MeV]

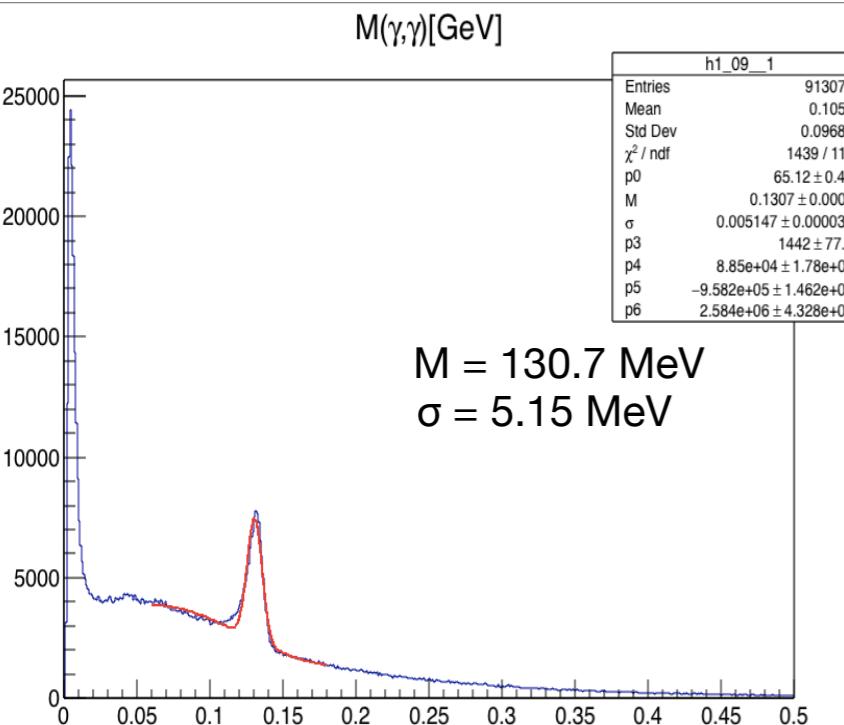
h1_10	
Entries	233189
Mean	-7.56
Std Dev	53.75



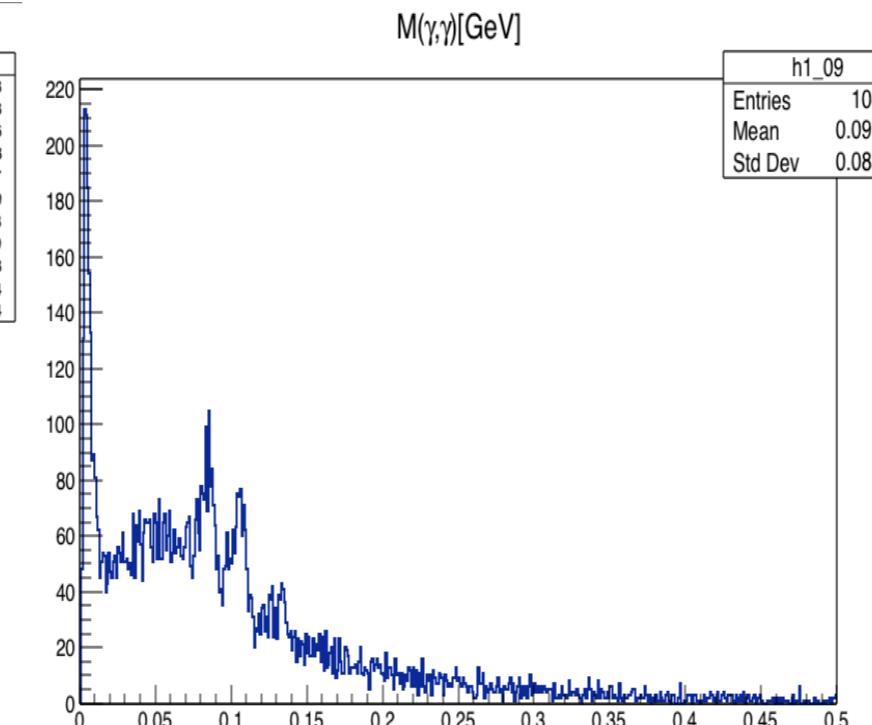
Energy dependent ECAL calibration

ECAL2

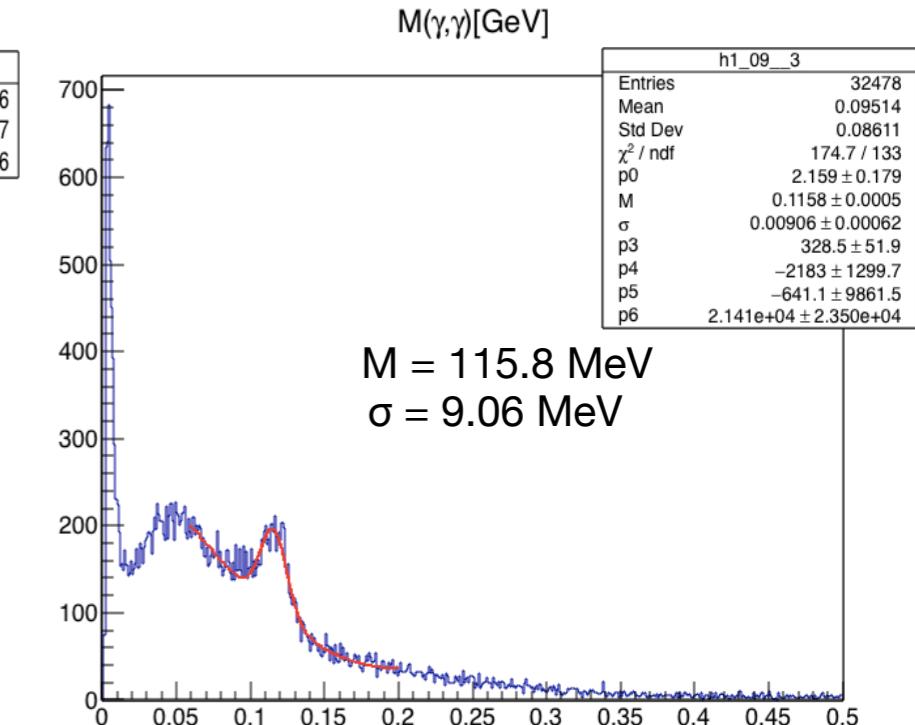
MC P09slot7.1



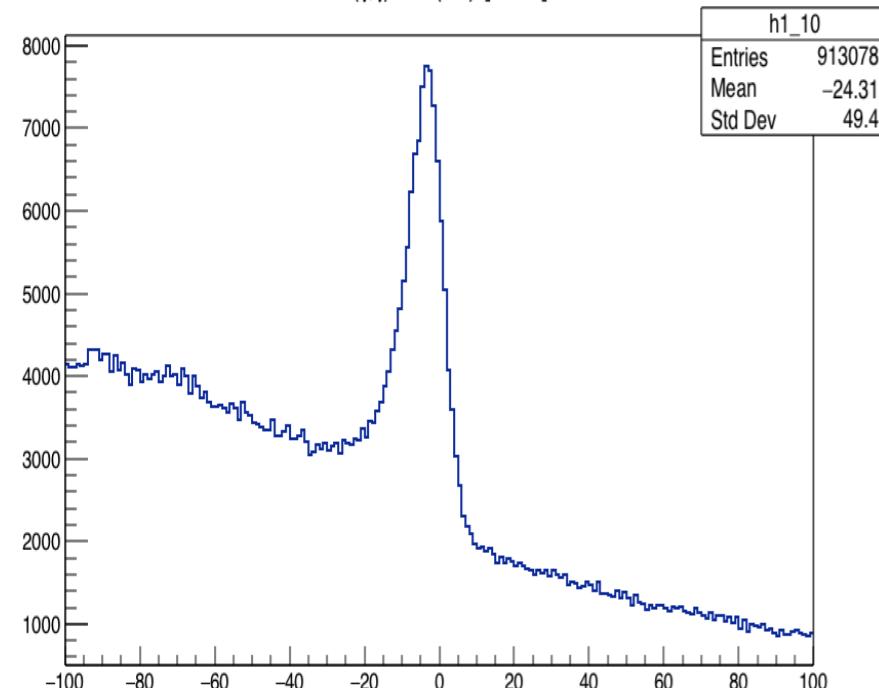
MC without calibration



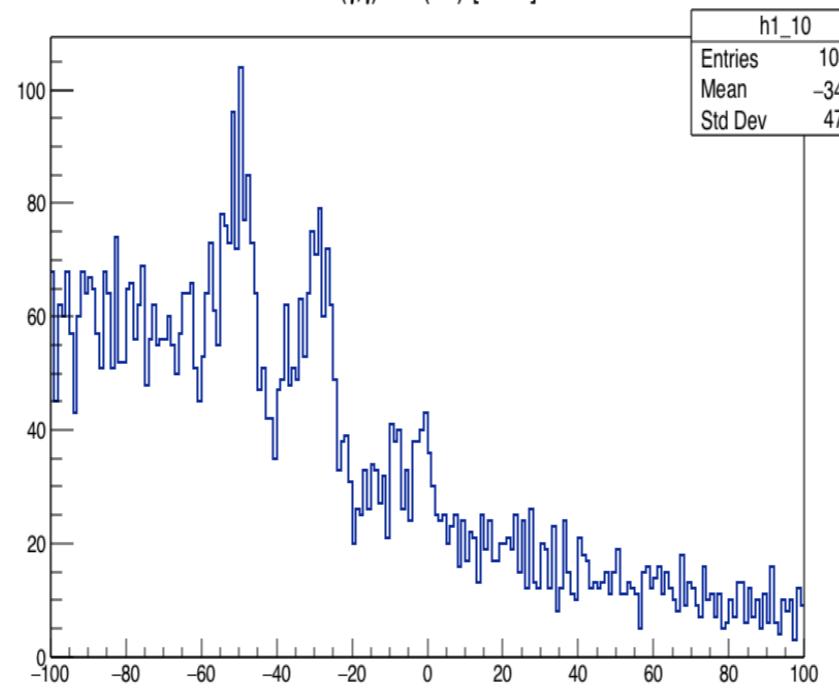
Edep calibration



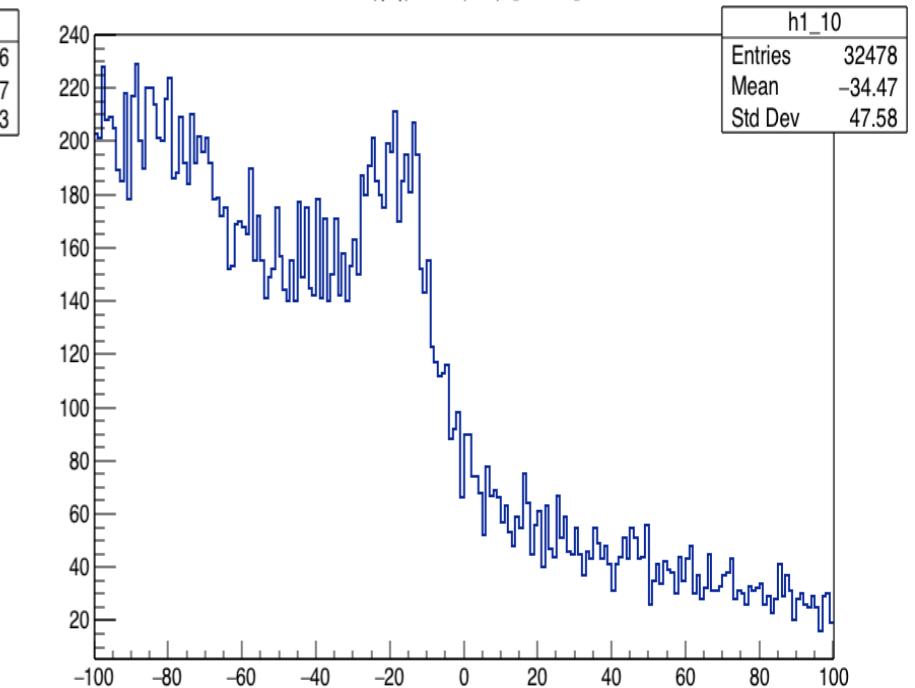
M(γ,γ) - M(π^0)[MeV]



M(γ,γ) - M(π^0)[MeV]



M(γ,γ) - M(π^0)[MeV]



Conclusions

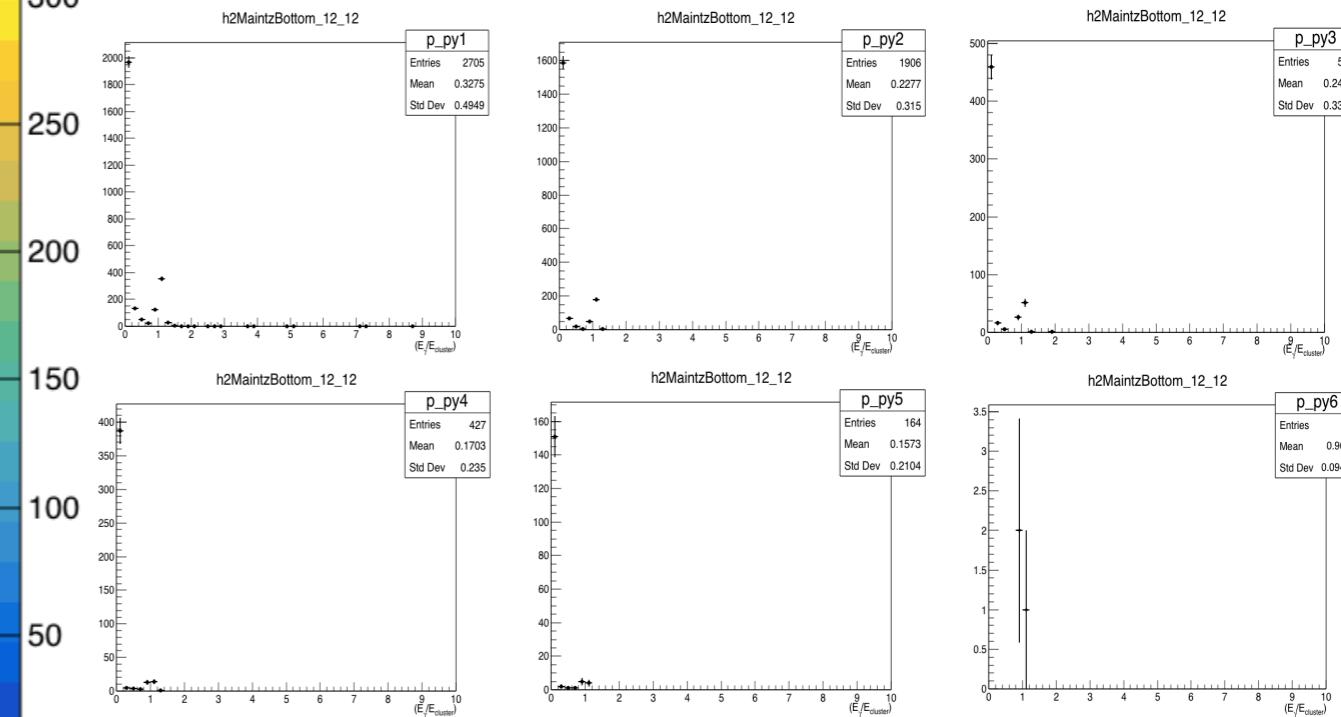
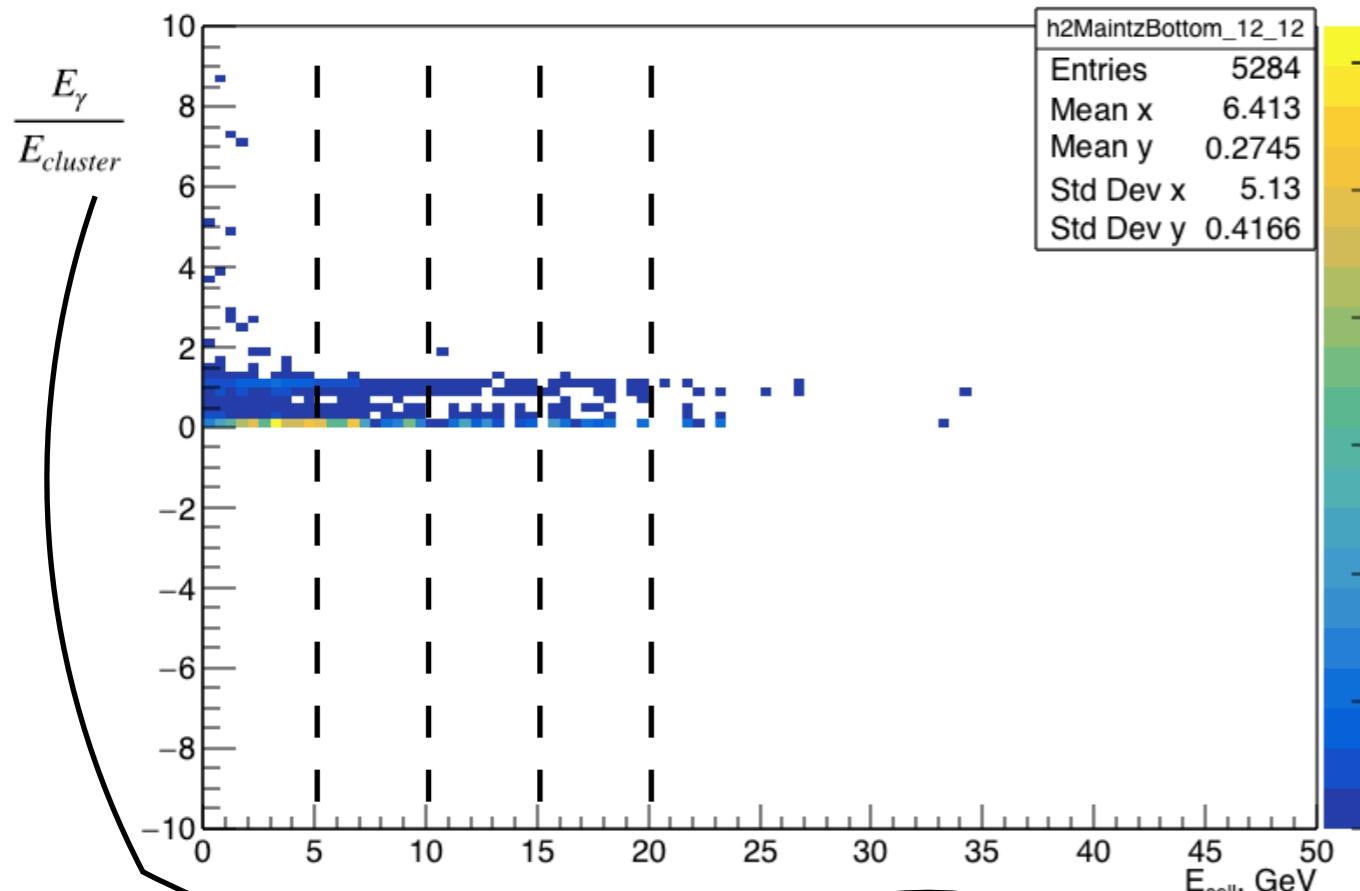
The parameters of π^0 peak are worse than in mass production 2016 MC. An explanation could be:

- the usage of 5GeV Ecell bin (1GeV is used for RD);
- the usage of postcorrection instead of a new reconstruction;

With usage of UE17 no corrections of TGeant and Coral are needed.

Backup

Energy dependent ECAL calibration (preliminary)



1092	MaintzBottom_12_12	1	0	0.327	5
1092	MaintzBottom_12_12	1	0	0.228	10
1092	MaintzBottom_12_12	1	0	0.243	15
1092	MaintzBottom_12_12	1	0	0.170	20
1092	MaintzBottom_12_12	1	0	0.157	25
1092	MaintzBottom_12_12	1	0	0.967	30
1092	MaintzBottom_12_12	1	0	0.500	35
1092	MaintzBottom_12_12	1	0	1.000	40
1092	MaintzBottom_12_12	1	0	1.000	45
1092	MaintzBottom_12_12	1	0	1.000	50

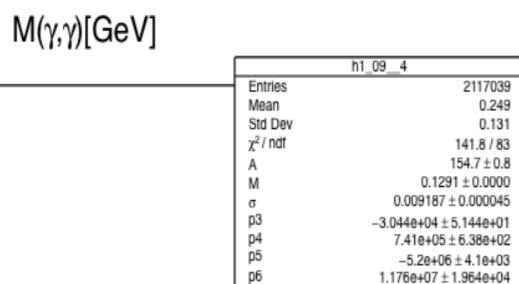
Absorber material in ECAL module was excluded from the sensitive material.

Each ECAL module has a set of calibration values in dependence of Ecell.

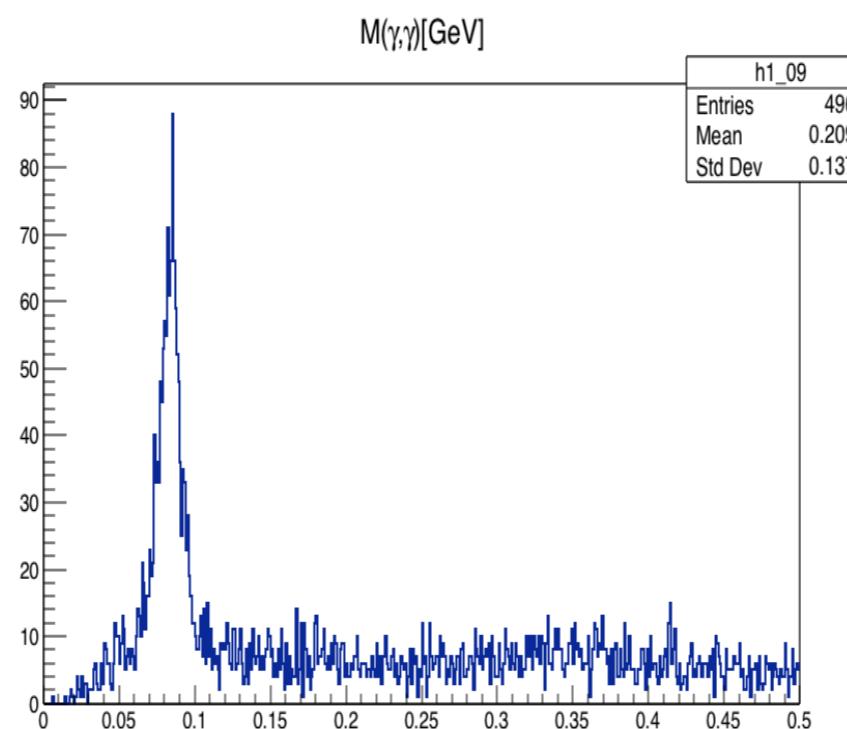
Calib values are extracted at low statistics with rough (preliminary) parameters.

Energy dependent ECAL calibration (preliminary) ECAL0

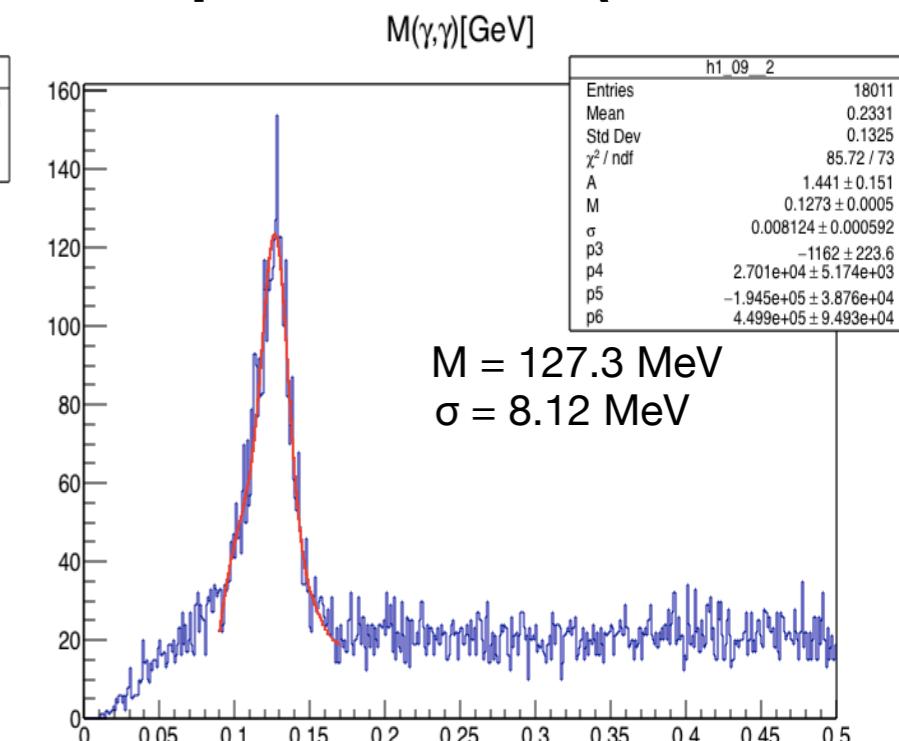
MC P09slot7.1



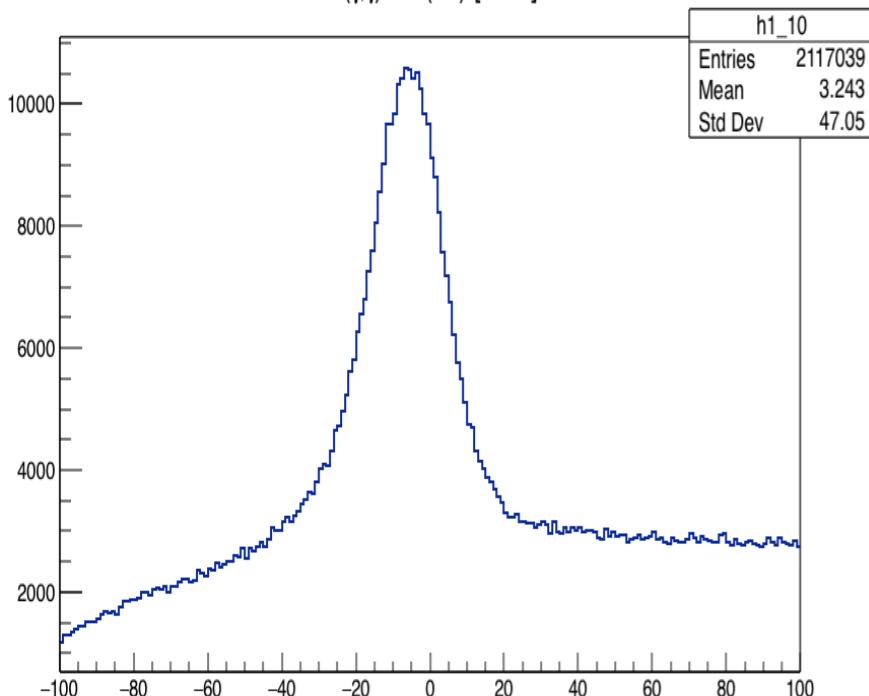
MC without calibration



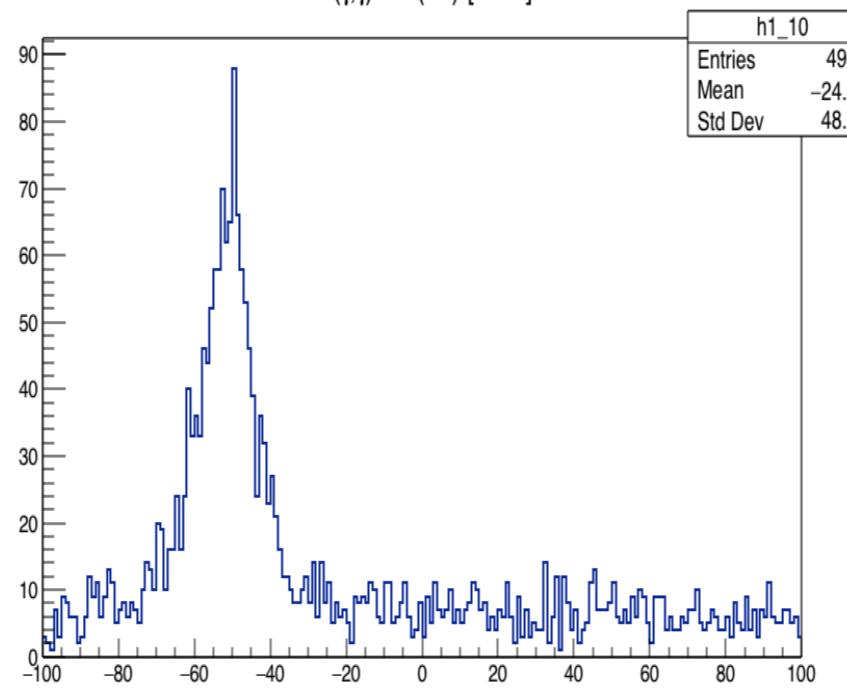
Edep calibration (1 iteration)



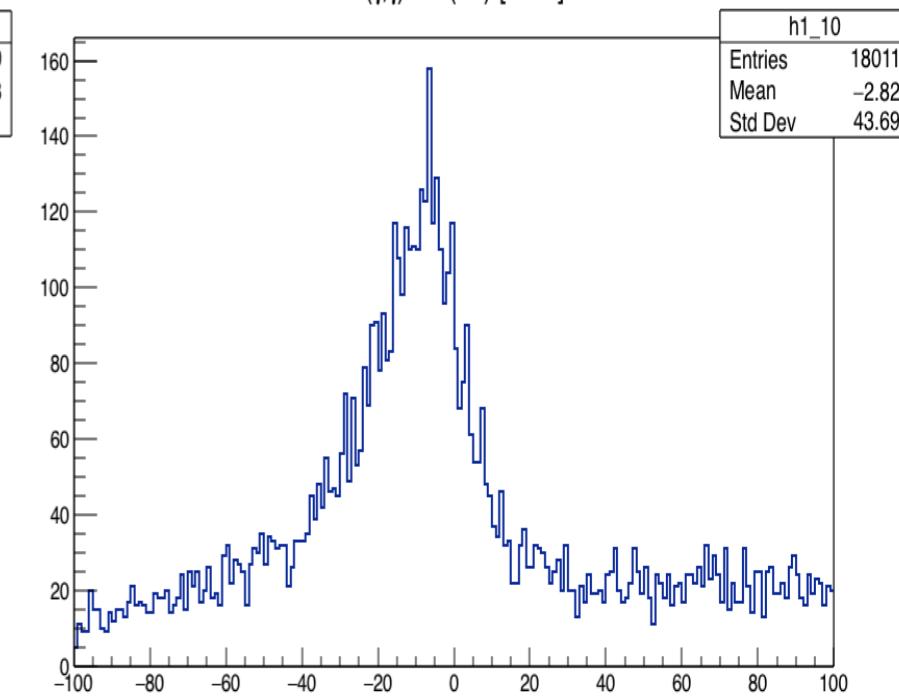
$M(\gamma,\gamma) - M(\pi0) [\text{MeV}]$



$M(\gamma,\gamma) - M(\pi0) [\text{MeV}]$



$M(\gamma,\gamma) - M(\pi0) [\text{MeV}]$



Energy dependent ECAL calibration (preliminary) ECAL1

MC P09slot7.1

$M(\gamma,\gamma)$ [GeV]

h1_09_5	
Entries	5679554
Mean	0.1968
Std Dev	0.1163
χ^2 / ndf	375.4 / 78
A	326.2 ± 2.5
M	0.1278 ± 0.0000
σ	0.006771 ± 0.000036
p3	$-1.046e+05 \pm 5.273e+03$
p4	$2.669e+06 \pm 1.167e+05$
p5	$-1.889e+07 \pm 8.375e+05$
p6	$4.303e+07 \pm 1.961e+06$

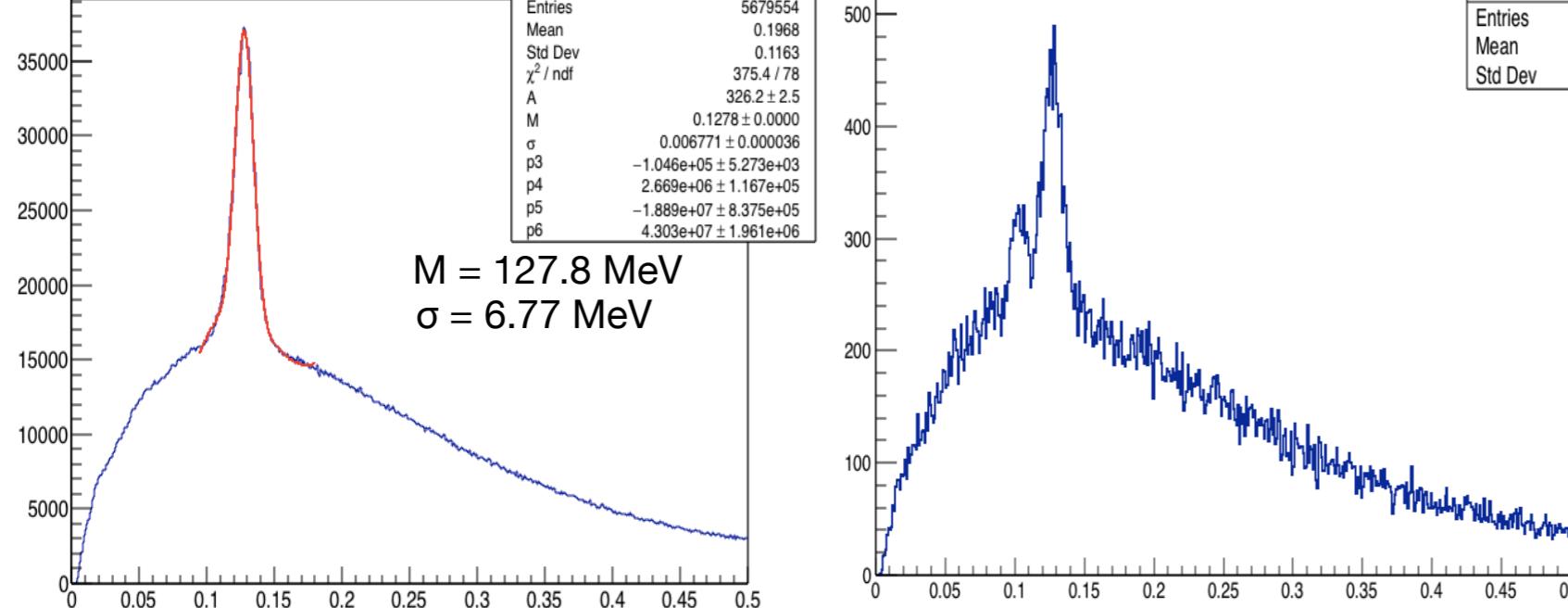
$$M = 127.8 \text{ MeV}$$

$$\sigma = 6.77 \text{ MeV}$$

MC without calibration

$M(\gamma,\gamma)$ [GeV]

h1_09	
Entries	78882
Mean	0.1936
Std Dev	0.1153



Edep calibration (1 iteration)

$M(\gamma,\gamma)$ [GeV]

h1_09_3	
Entries	83183
Mean	0.1916
Std Dev	0.1158
χ^2 / ndf	63.98 / 53
A	7.535 ± 0.476
M	0.1308 ± 0.0004
σ	0.01009 ± 0.00051
p3	612.8 ± 37.6
p4	-435.1 ± 372.4
p5	-4132 ± 1210.1
p6	5657 ± 11694.1

$$M = 130.8 \text{ MeV}$$

$$\sigma = 10.09 \text{ MeV}$$

$M(\gamma,\gamma) - M(\pi 0)$ [MeV]

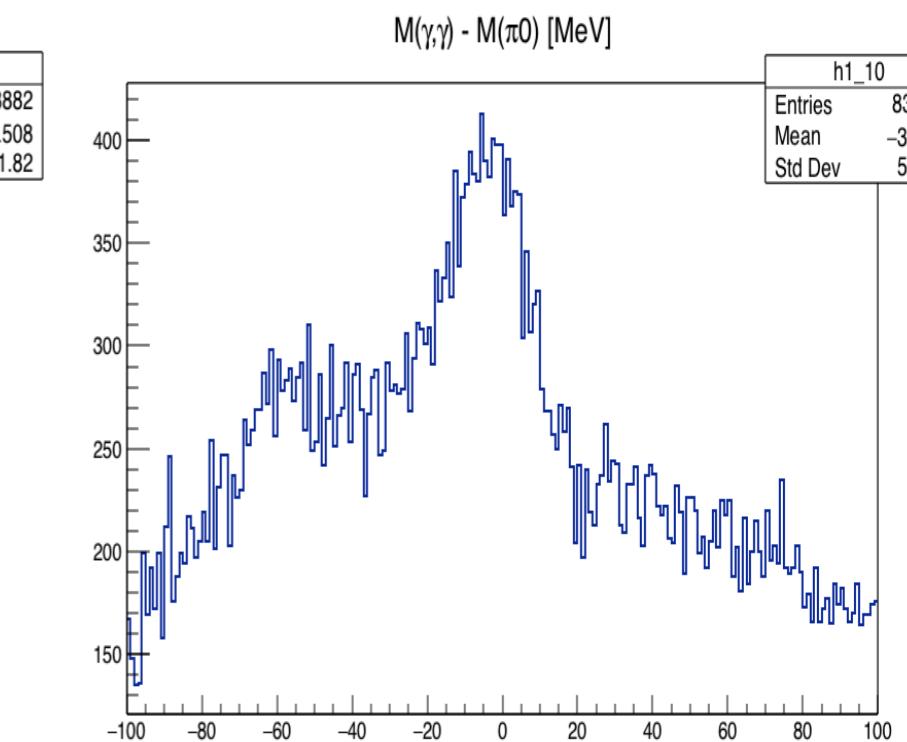
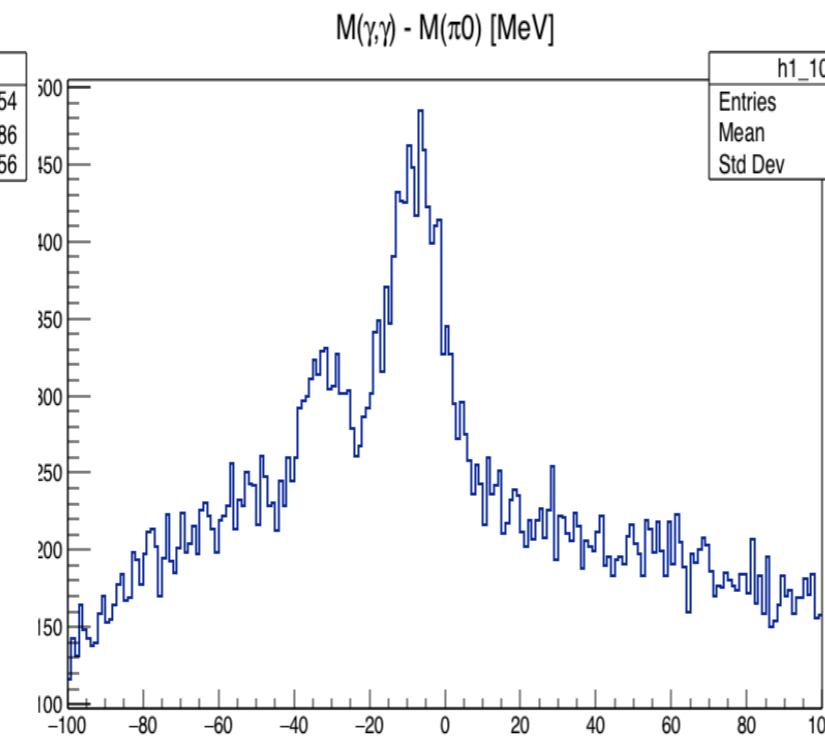
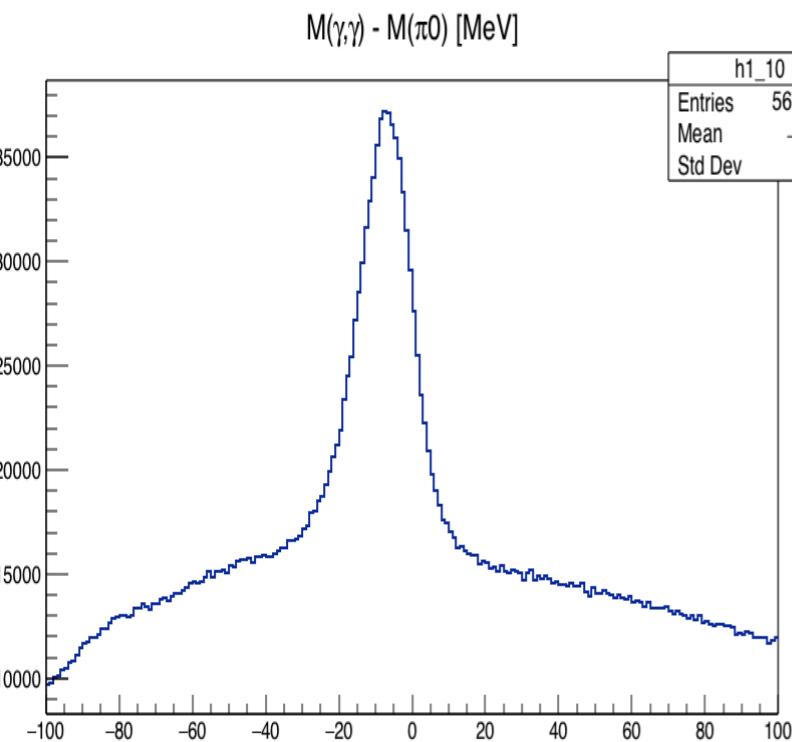
h1_10	
Entries	5679554
Mean	-1.186
Std Dev	51.56

$M(\gamma,\gamma) - M(\pi 0)$ [MeV]

h1_10	
Entries	78882
Mean	-2.508
Std Dev	51.82

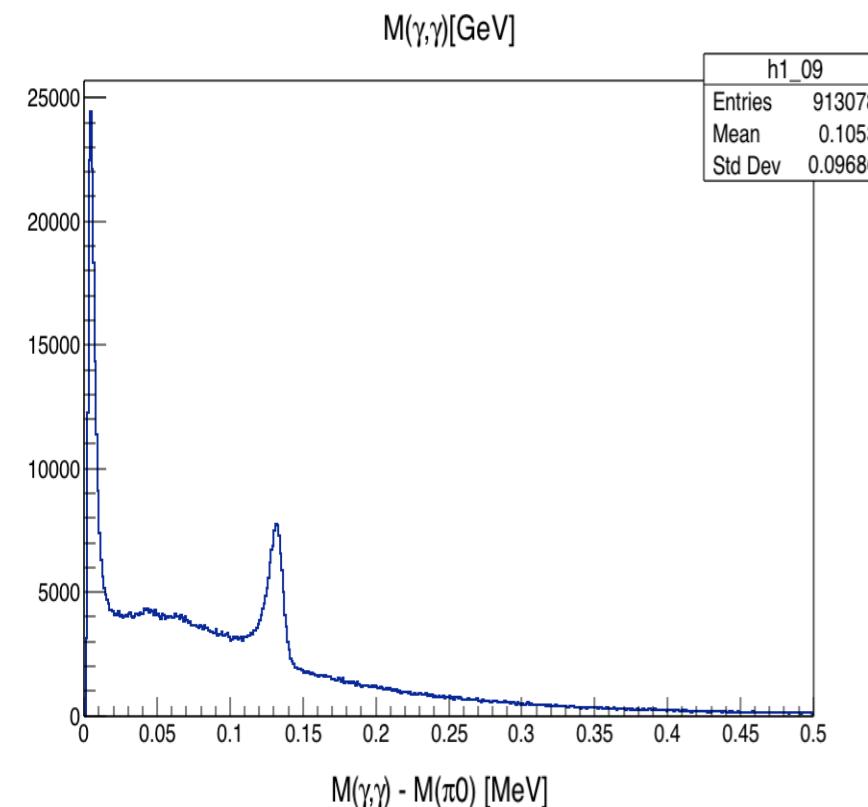
$M(\gamma,\gamma) - M(\pi 0)$ [MeV]

h1_10	
Entries	83183
Mean	-3.777
Std Dev	52.64

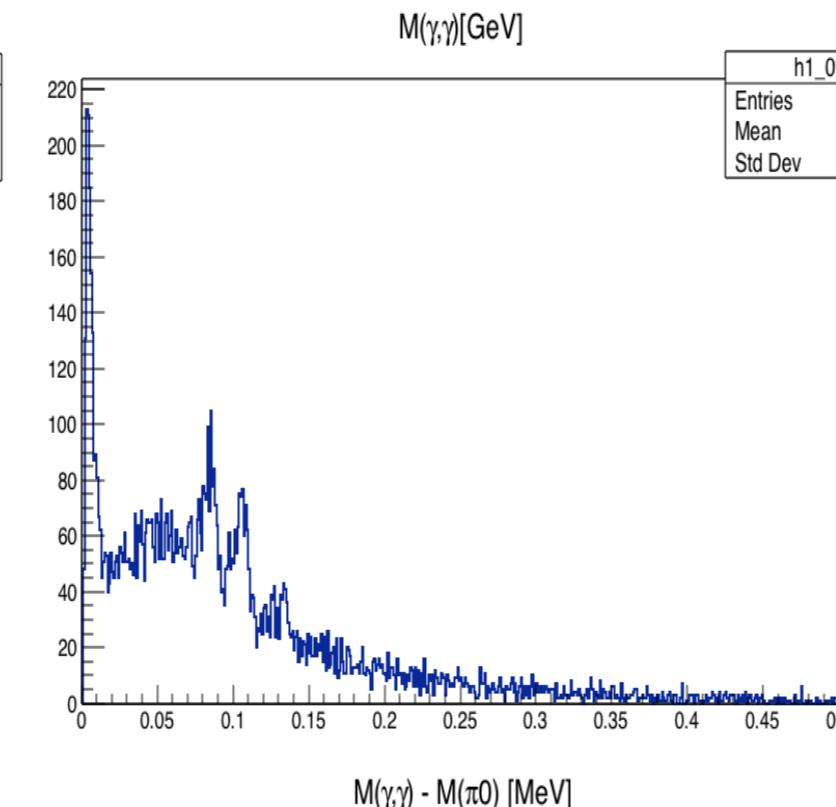


Energy dependent ECAL calibration (preliminary) ECAL2

MC P09slot7.1



MC without calibration



Edep calibration (1 iteration)

