BGO: Status Report

Giovanni Gaudino – 2024, 4th December

Run list

Run list with the BGO: <u>yaml file</u> with the full list Common run description for electrons: **CH1 3010 – filter; CH2 6050 – CAEN amp 18** Common run description for muon: **CH1 3010 – CAEN amp 18; CH2 6050 – CAEN amp 28**



е				μ			
Angle(°)	# Run	Angle(°)	# Run	Angle(°)	# Run	Angle(°)	# Run
0	244	100	224,225	0	201,202	100	185,186
20	241,243	110	221	20	199,200	110	
40	237,240	120	219,220	40	197,198	120	183,184
50	235	130	217,208	50	195,196	130	
60	233,234	140	215,216	60	193,194	140	181,182
70	231,232	160	213,214	70	191,192	160	179,180
80	228,230	180	207,210	80	189,190	180	177,178
90	205,226 ,227			90	187,188		

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Step 1: Model single photon response (**SPR**) from data

Step 2: Compute SiPM signal templates for Čerenkov and Scintillation:

- Cherenkov signal: it is prompt, so same shape as **SPR**
- Scintillation signal: from the convolution of **SPR** with the characteristic crystal time distribution

Step 1: Model single photon response (SPR) from data

SPR modelled using LED pulse data.

- Shape modelled as double exponential + high-pass filter (preAmp AC is coupled to SiPM cathode) on LED driver data
- Amplitude calibrated from LED driver data (finger plots)





SiPM	Gain	mV/p.e.
6x6	28	3,621
6x6	18	1,163
3x3	28	1,236
3x3	18	0,401
3x3	Filter	0,0425



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Scintillation Template

Signal modelled from the convolution of SPR with the characteristic crystal time distribution (measured in cosmic data using PMT)



Scintillation Time Distribution

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Čerenkov Template

Čerenkov photons are prompt, so same signal shape as **SPR**

SPR



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Waveform fit – An example



Fit Example in the Scintillation and Čerenkov channel
c: Čerenkov p.e.
s: Scintillation p.e.

Possible improvements:

- Better removal of pedestal
- Remove the Čerenkov component in the channel 1

Angle Scan - $\#\gamma_C/\#\gamma_S$



For each angle I computed the mean of the c values over the mean of the s values This variable represents the Čerenkov Yield per Energy (Scintillation Yield)

Angle Scan - $\#\gamma_C$



For each angle I computed the mean of the c values

Conclusions and to-do list

- In the electron runs, this procedure seems to work
- From simulation we can estimate the released energy and then the $\#\gamma_C$ /GeV
- In the muons runs, this procedure is too naive, because of the reduced number of photons, I will work on this in the next week
- Next Steps: BSO