

Oriunno, Marco

From: Elton Smith <elton@jlab.org>
Sent: Thursday, October 17, 2013 12:58 PM
To: Garcon Michel; stepanya@jlab.org; Raffaella De Vita; Francois-Xavier Girod; Oriunno, Marco; Emmanuel Raully (raully@ipno.in2p3.fr); Jaros, John A.; dupre
Subject: Re: TR: PbWO4 light output

Hi Stepan,

More thoughts on the number of p.e. I went through the exercise again of estimating the number of p.e. from the cosmic-ray muon data shown by Francois (p. 7): 23 pC / minimum ionizing signal transverse to crystal. (Note the difference in the dE/dx from what we used earlier). This uses the 10x10 APD at 18 deg C.

Assume: Thickness = $(1.6+1.3)/2 = 1.5$ cm dE/dx = 10.2 MeV/cm (PDG Table 28.4) DeltaE = 15.3 MeV APD gain = 150
Preamp gain = 1800

Number of p.e. / MeV = 23 pC / $(150 \times 1800 \times 1.6 \times 10^{-19} \text{C}) / 15.3 \text{ MeV} =$
532 p.e. / 15.3 MeV = 35 p.e.

If we compare this to the Fair/Panda TDR-EMC (P. 51). They quote the following: PANDA PWO: 17-20/MeV at 18 deg C at a QE of 20% -> $19 (70/20) = 67$ p.e.
On fig 4.16, we can get the ratio of CMS PWO/ PANDA PWO $\sim 8 / 19 = 0.42$.
-> Estimate of number of p.e./MeV for the CMS PWO is $67 \times 0.42 = 28$.

I believe this is to be compared to the value of 25 used by Raully. [6 for the 5x5].

So it may be that the values used as a basis for gain calculations may not be too far off. However, this leaves the discrepancy related to the numbers coming from Michel and Oleg from the previous experiments. However, the discrepancy is mostly eliminated if the number of p.e. resulted from measurements using photodetectors with QE $\sim 20\%$.

Cheers, Elton.

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On 10/17/13 11:29 AM, Garcon Michel wrote:

> This is the only info I have on IC crystal light output. I don't think there is a documentation on how this was obtained. Michel. Oleg is mixing up photons and p.e. at some points, but what he means is clear.

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> _____

> Michel Garçon

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>
> -----Message d'origine-----
> De : pogorelk@jlab.org [mailto:pogorelk@jlab.org] Envoyé : samedi 12
> octobre 2013 18:52 À : Garçon Michel Objet : Re: PbWO4 light output
>
> Hi Michel,
> You are right. The light output of CERN crystals was 12 p.e./MeV, APD
> quantum efficiency 0.75 I guess, that the light output of IC crystals
> was 12000 p.e./GeV x
> $5 \times 5 / 13.3 \times 13.3 \times 0.75$
> = 1269 p.e./GeV
> Welcome,
> Oleg
>
>> Dear Oleg,
>>
>> I was trying to recover information about the light
>> output of the CLAS/DVCS/IC crystals. I have somewhere 2000
>> photo-electrons / GeV (light output x light transmission x APD
>> area/Crystal area x APD quantum efficiency). Can you confirm? How did
>> you get that number ?
>>
>>
>> Thank you and best regards,
>> Michel.
>>
>> Michel Garçon
>> -----
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