

New Studies
on VPTs

Stefanie Bolte

Introduction

Setup

RIE

Photonis
XPVPT25

Hamamatsu
R2148MOD1

Hamamatsu
R2148MOD

Summary

Outlook

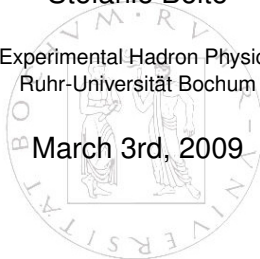


New Studies on VPTs

Stefanie Bolte

Experimental Hadron Physics,
Ruhr-Universität Bochum

March 3rd, 2009



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Electromagnetic Calorimeter Forward Endcap

Special needs for photodetectors because of

- magnetic field \Rightarrow no PMTs
- high rate \Rightarrow no APDs for innermost crystals

\Rightarrow Photodetectors:

sensitive, fast, radiation hard and suitable to operate in magnetic fields

presentation of the new VPT type of Hamamatsu (<24 mm) and measurement concerning the sensitivity of the VPTs' surface

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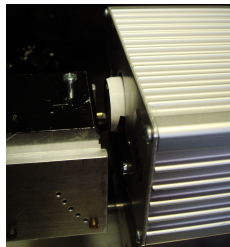
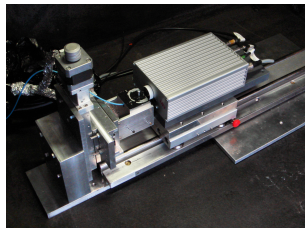
Hamamatsu
R2148MOD1

Hamamatsu
R2148MOD

Summary

Outlook

- LED pulser ($f = 1$ kHz)
- LUXEON1 High-Power LED
 $\lambda = 455$ nm
- optical fibre transfers light pulses to VPT
- preamplifier behind VPT transmits signal to mainamplifier and afterwards to ADC
- preamplifier developed in Basel for \bar{P} ANDA



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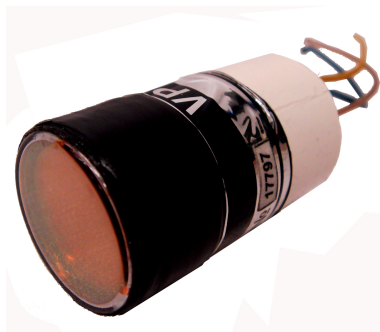
Summary

Outlook

RIE

sample from the CMS experiment

- $\varnothing = 26.5 \text{ mm}$
 $l = 40 \text{ mm}$
- $U_A = 1000 \text{ V}$
 $U_D = 800 \text{ V}$
- $G = 10$
- $QE = 22 \%$
(at 430 nm)



Sensitivity

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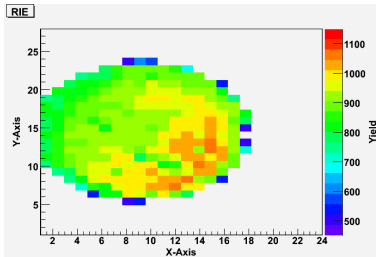
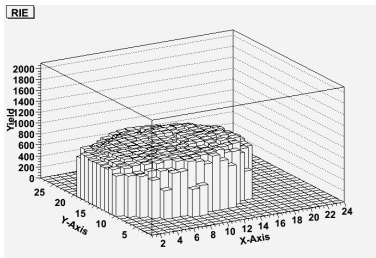
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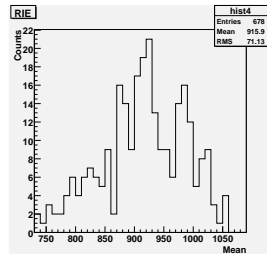
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- maximum in one corner
- yield varies between 750 and 1050
- relative width 7.8 %
- sensitive area $\varnothing = 19$ mm



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Photonis XPVPT25

latest sample from Photonis, made for \bar{P} ANDA

- $\varnothing = 25.2 \text{ mm}$
 $l = 87.4 \text{ mm}$
- $U_A = 1090 \text{ V}$
 $U_D = 763 \text{ V}$
- $G = 30$
- $QE = 20 \%$



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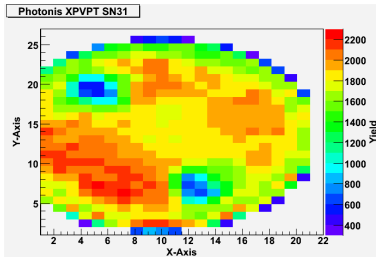
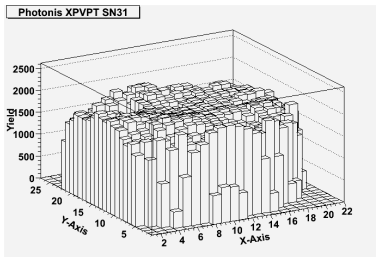
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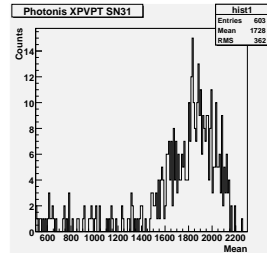
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Outlook



- maximum and minimum side by side
- yield varies between 500 and 2200
- relative width 22.1 %
- sensitive area $\varnothing = 25$ mm



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Hamamatsu R2148MOD1 sample from Rainer Novotny

- $\varnothing = 25.8 \text{ mm}$
 $l = 30 \text{ mm}$
- $U_A = 800 \text{ V}$
 $U_D = 640 \text{ V}$
- $G = 11$
- $QE = 19 \%$
(at 440 nm)



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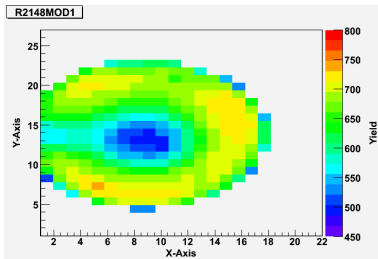
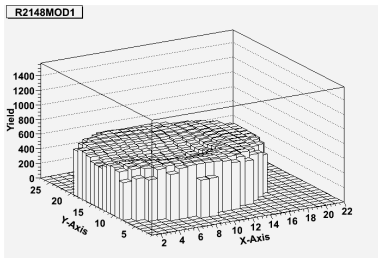
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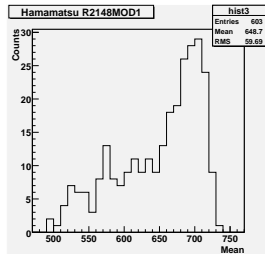
Hamamatsu
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Summary

Outlook



- minimum in the middle, maximum at the edge
- yield varies between 500 and 750
- relative width 9.2 %
- sensitive area $\varnothing = 18$ mm



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Hamamatsu R2148MOD especially made for \bar{P} ANDA, $\varnothing < 24$ mm

- $\varnothing = 23.7$ mm
 $l = 30$ mm
- $U_A = 750$ V
 $U_D = 500$ V
- $G = 9.3$
- $QE = 32\%$
(at 420 nm)



Sensitivity

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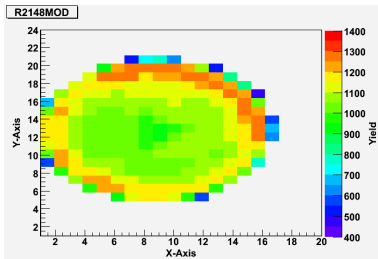
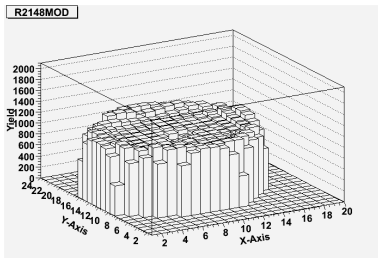
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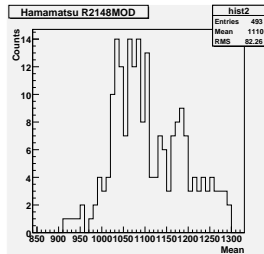
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Outlook



- minimum in the middle, maximum at the edge
- yield varies between 850 and 1300
- relative width 7.4 %
- sensitive area $\varnothing = 16$ mm



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	RIE	Photonis	R2148MOD1	R2148MOD
HV	1000 V	1090 V	800 V	750 V
G	10	30	11	9.3
QE	22 %	20 %	19 %	32 %
\varnothing	26.5 mm	25.2 mm	25.8 mm	23.7 mm
$\varnothing_{sen.area}$	19 mm	25 mm	18 mm	16 mm
rel. width	7.8 %	22.1 %	9.2 %	7.4 %
$G \cdot QE$	2.20	6.00	2.09	2.98
AMP	916	1728	649	1110
$\frac{AMP}{G \cdot QE}$	1.1	0.8	0.8	1

Outlook

Vacuum Photo Tetrode (VPTT), made by RIE

	VPTT
G	≥ 20
QE	25%
$G \cdot QE$	> 3.0
\emptyset	22.5 ± 0.7 mm
l	≤ 46 mm
$\emptyset_{sen.area}$	≥ 16 mm

What more has to be done?

- rate studies
- influence of a magnetic field
- temperature dependency

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