

supplement (Enge Field, MA-PMT)

The University of Tokyo

Sho Nagao

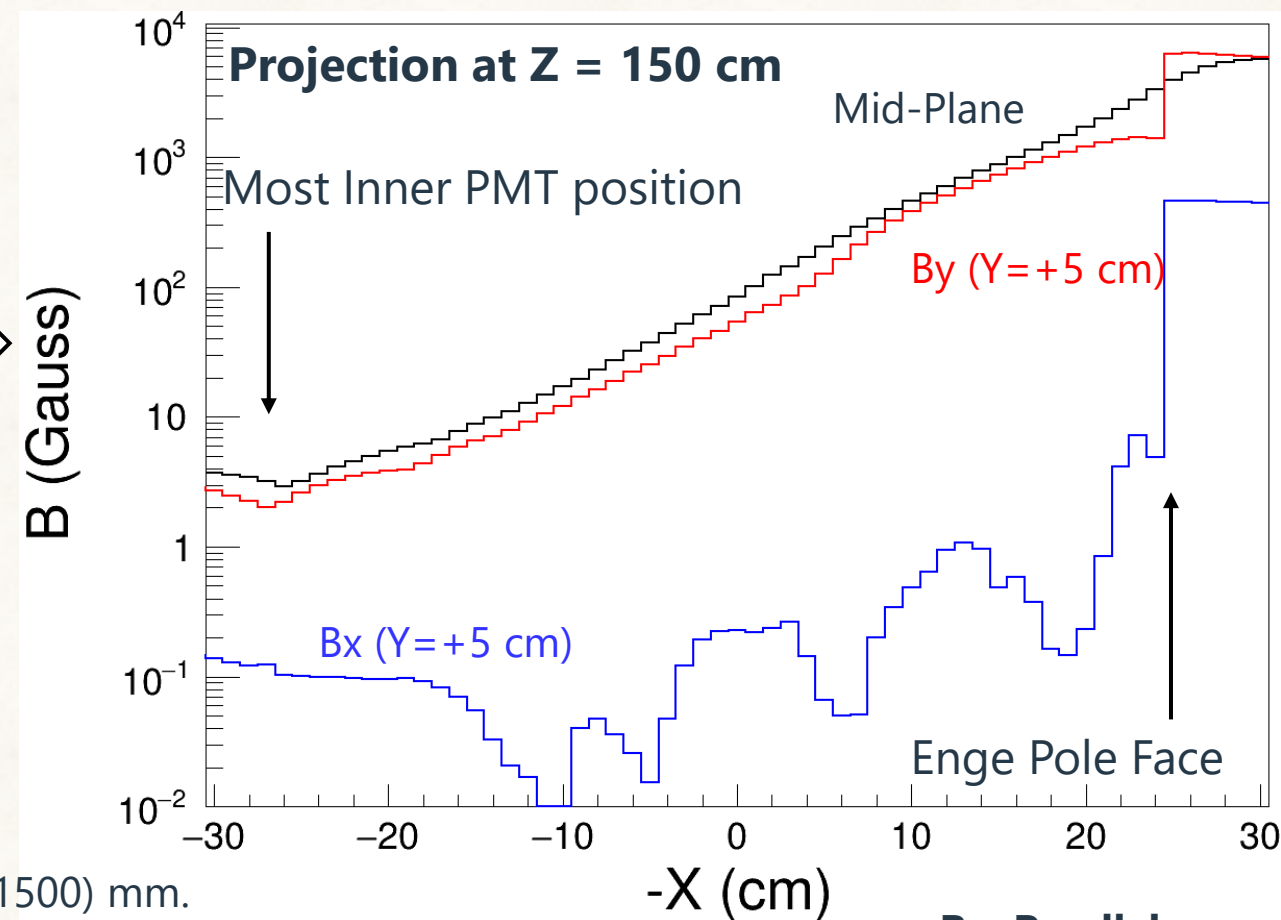
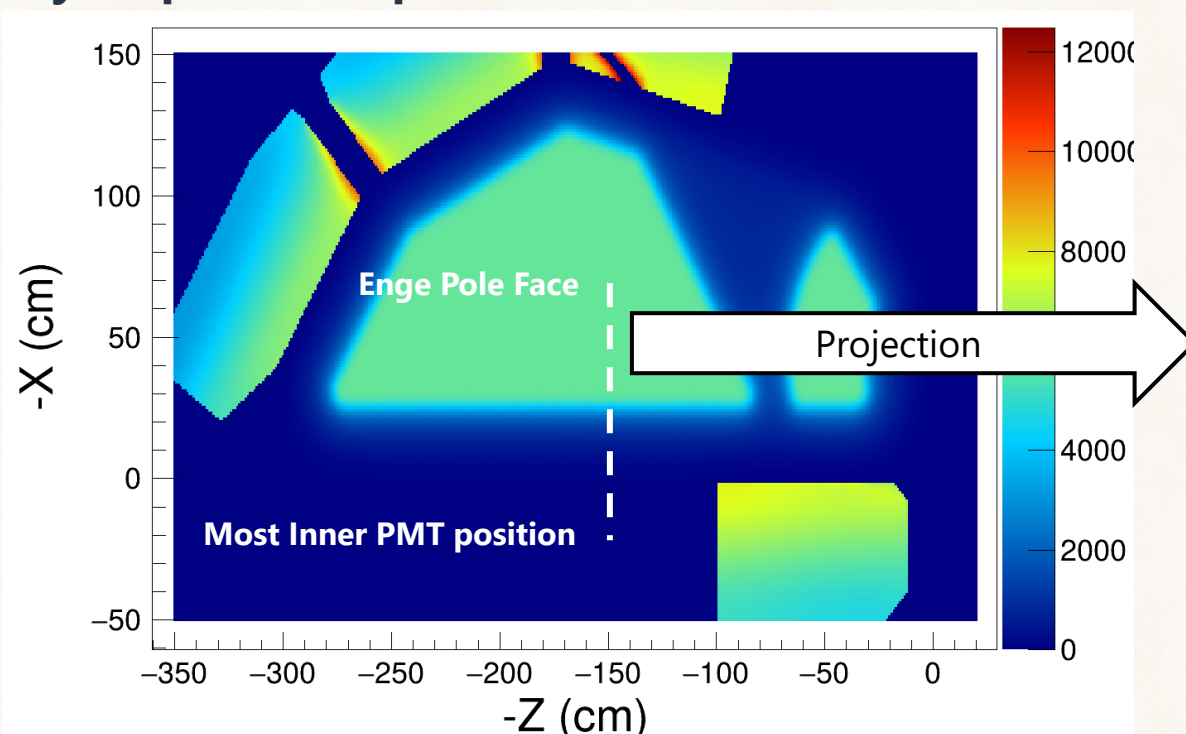
on behalf of

JLab hypernuclear collaboration

Experimental Readiness Review 2026

Enge Fringe Field (by TOSCA)

By map at $Y = 0$ plane



The magnetic field distribution was calculated using TOSCA.

The PMT closest to the magnet is around $(x, y, z) = (250, 300, 1500)$ mm.

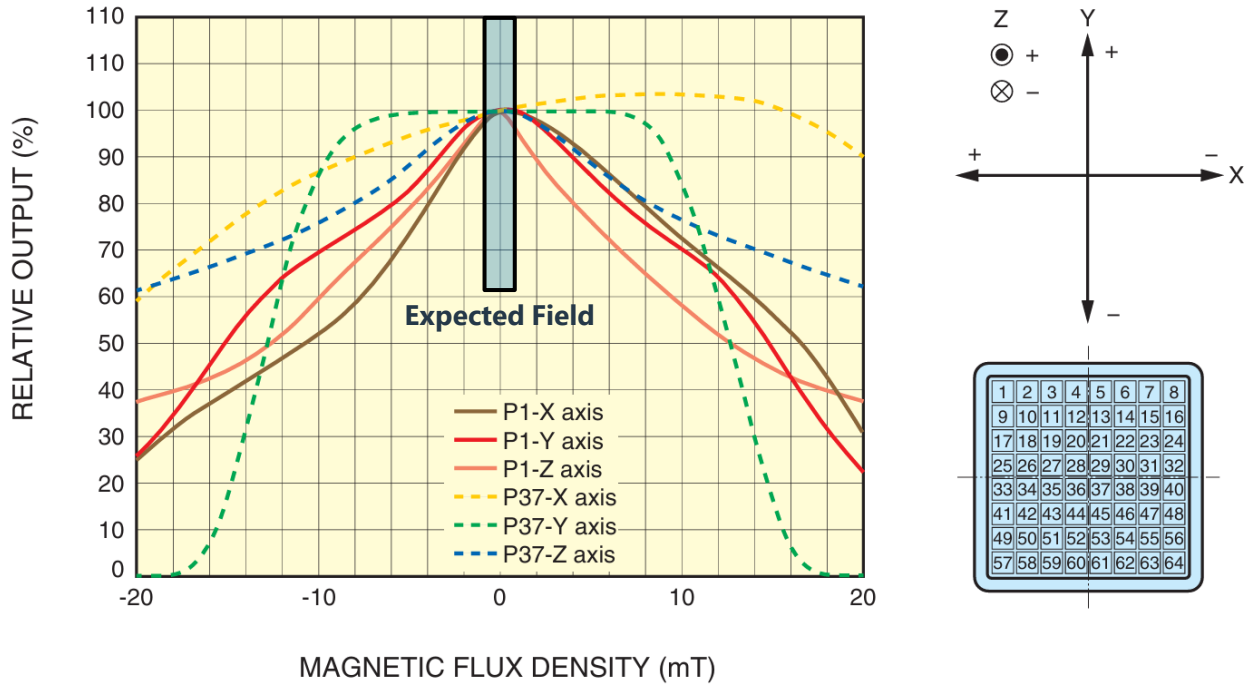
At mid-plane $(x, y, z) = (250, 0, 1500)$ mm, $B_y = 3\text{--}4$ Gauss.

At $(x, y, z) = (250, 50, 1500)$ mm, $B_y = 2\text{--}3$ Gauss, The transverse component $B_x = 0.1\text{--}0.2$ Gauss.

By: Parallel
Bx: Transverse

Effects of external magnetic field

Hamamatsu Technical Note



Results on the OPERA experiment

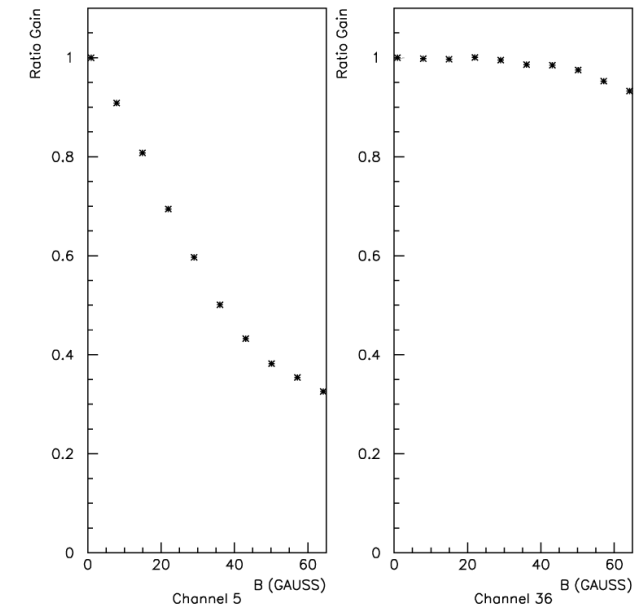


Fig. 32. Gain ratio for channel #5 (border) and channel #36 (central).

A magnetic field of 5 Gauss along the PMT axis causes a gain reduction of only about 5%. Since the average light yield would be ~ 10 p.e., this corresponds to a reduction of only ~ 0.5 p.e. Even with this reduction, the detection efficiency is expected to remain above $\epsilon > 99\%$ for >2 p.e. threshold. The effect of the external magnetic field is considered to be negligibly small.

H7546A-300 MA-PMT (Official Doc.)



H7546B

Type No.	Spectral response		Photo-cathode material ^(A)	Window material ^(B)	Dynode structure / Stages ^(C)	Maximum ratings		Cathode characteristics				
	Range (nm)	Peak wavelength (nm)				Supply voltage between anode and cathode (V)	Average anode output current in total (mA) ^(D)	Luminous		Blue sensitivity index Typ.	Red/White ratio Typ.	Radiant Typ. (mA/W)
			Min. (μA/lm)	Typ. (μA/lm)								
H7546A/B	300 to 650	420	BA	K	MC/12	-1000	0.023	60	80	9.5	—	80
H7546A/B-100	300 to 650	400	SBA	K	MC/12	-1000	0.023	90	105	13.5	—	110
H7546A/B-200	300 to 650	400	UBA	K	MC/12	-1000	0.023	110	135	15.5	—	130
H7546A/B-300	300 to 700	420	EGBA	K	MC/12	-1000	0.023	120	160	14.0	—	125
H7546A/B-20	300 to 920	530	ERMA	K	MC/12	-1000	0.023	350	500	—	0.4	78

NOTE: ^(A) BA: Bialkali, SBA: Super bialkali, UBA: Ultra bialkali, EGBA: Extended green bialkali, ERMA: Extended red multialkali
^(B) K: Borosilicate glass
^(C) MC: Metal channel
^(D) The maximum average anode current is defined as 5 % of divider current when maximum high voltage is applied.

FEATURES

- 8 × 8 multianode, Anode size: 2 mm × 2 mm / Anode
- Effective area: 18.1 mm × 18.1 mm
- High speed response
- Low cross-talk: 2 % Typ.
- High cathode sensitivity
- Two configurations are available for -HV input (see figure 8)
 H7546A: Cable input type
 H7546B: Hard pin input type
- Weight: Approx. 95 g (H7546A)
 Approx. 60 g (H7546B)

Figure 1: Typical spectral response

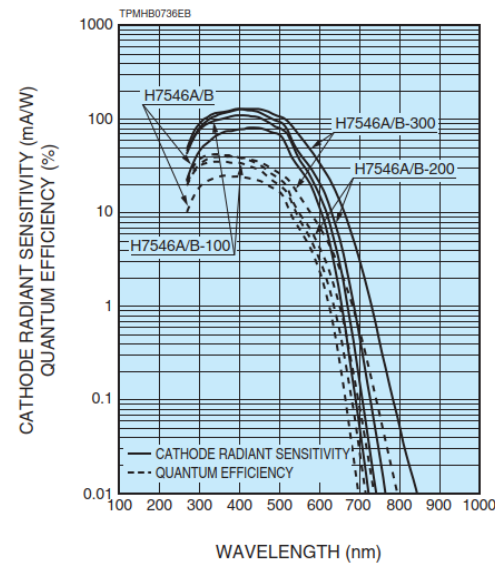


Figure 2: Typical gain

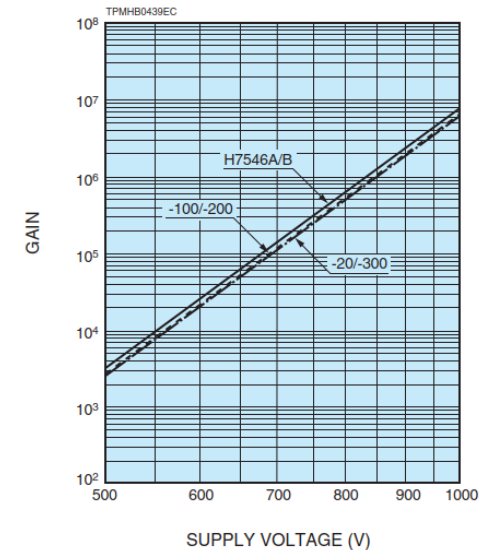
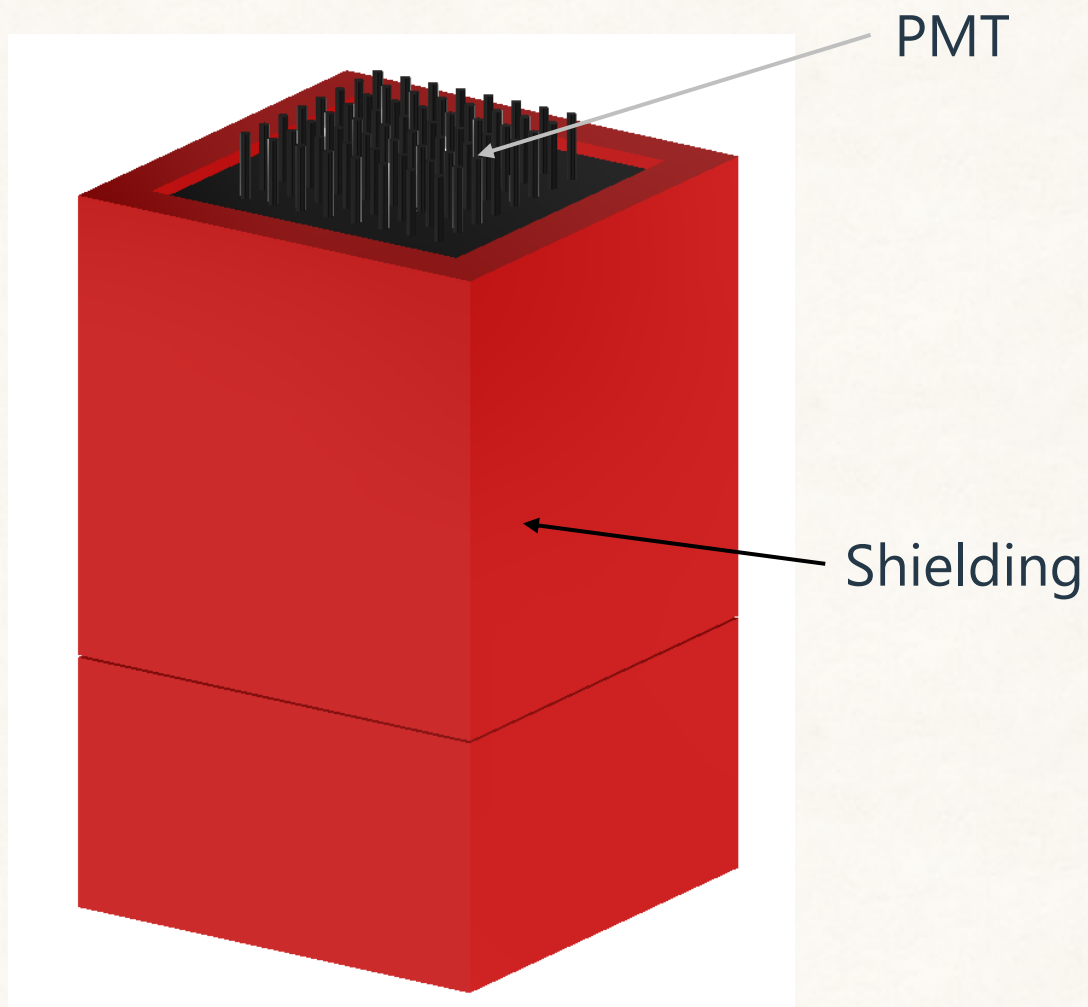


Figure 5: Anode cross-talk (Example)

0.3	1.4	0.4
0.8	100	1.2
0.2	1.1	0.3

SUPPLY VOLTAGE: -800 V
 LIGHT SOURCE: TUNGSTEN LAMP (DC LIGHT)
 (with φ1 mm optical fiber on Photocathode)

Shielding (if necessary)



The impact of gain reduction due to the external magnetic field is negligibly small.

Therefore, no additional magnetic shielding is required.

If necessary, rectangular iron cube can be used as PMT support structures. This would also provide additional local magnetic shielding for each PMT.