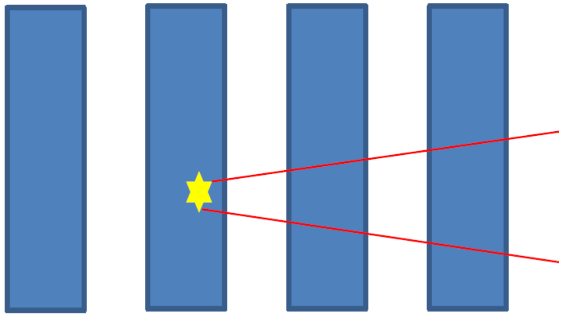
# Neutron Detector Simulation
# 2015 / 05 / 28



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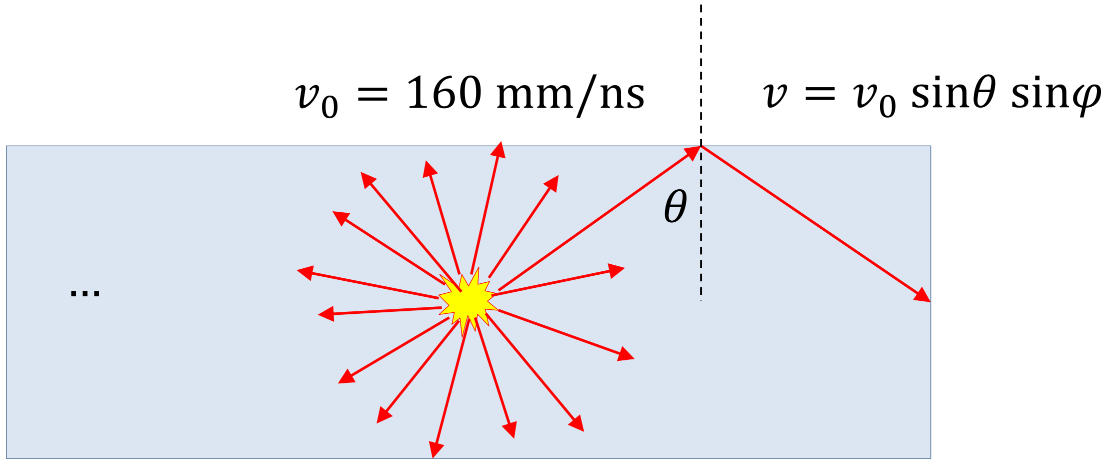
# Photon Propagation

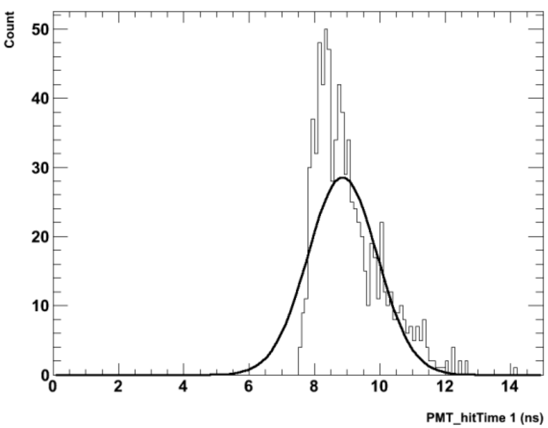



- BC-408 은 Light energy 1 MeV 당 약 7500 개의 photons 생성.
  - ❖ Reference : A Comprehensive Technique for Determining the Intrinsic Light Yield of Scintillators, Joanna S. Salacka & Minesh K. Bacrania, IEEE Transactions on Nuclear Science, April 2010
- 각각의 photon 은 1/7500 MeV 의 energy 를 가진다 가정.
- Photons 는 energy deposit 이 발생한 위치를 중심으로 하는 3 차원 구형 대칭으로 random 하게 퍼져나감.
- BC-408 의 굴절률 = 1.58
- Critical angle $\theta_C$ = Arcsine (1/1.58) ≈ 39.27 °
- $\theta$ 가 $\theta_C$ 보다 커야만 photon 이 흡수되지 않고 PMT 까지 도달할 것.
- 이때, spherical coordinates 에서 photon 의 scintillator 방향으로의 속력 $v = v_0 \sin\theta \cos\varphi$

# Photon Propagation

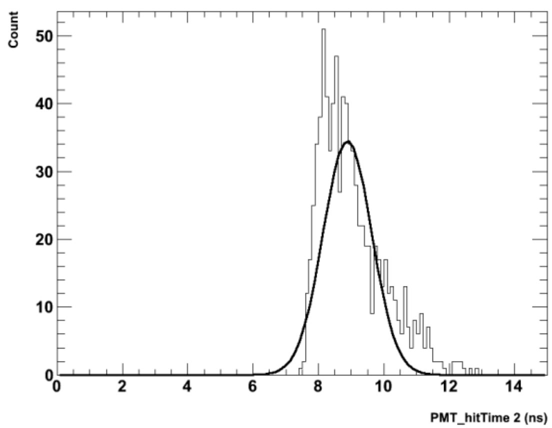
- 300 MeV 의 중성자가 $0.1 \times 0.1 \times 2\ \mathrm{m}^3$ bar-type scintillator module 을 지나간 경우의 signal hitTime
  - Electron equivalent threshold = 2 MeV

- $l_1$ = 100 cm, $l_2$ = 100 cm (center)



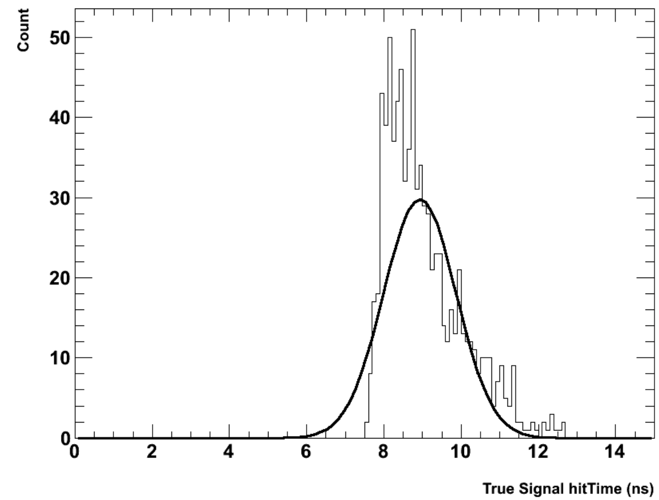

$m_{t1}$ = 8.859 ns
$\sigma_{t1}$ = 1.059 ns

$t_{signal1}$

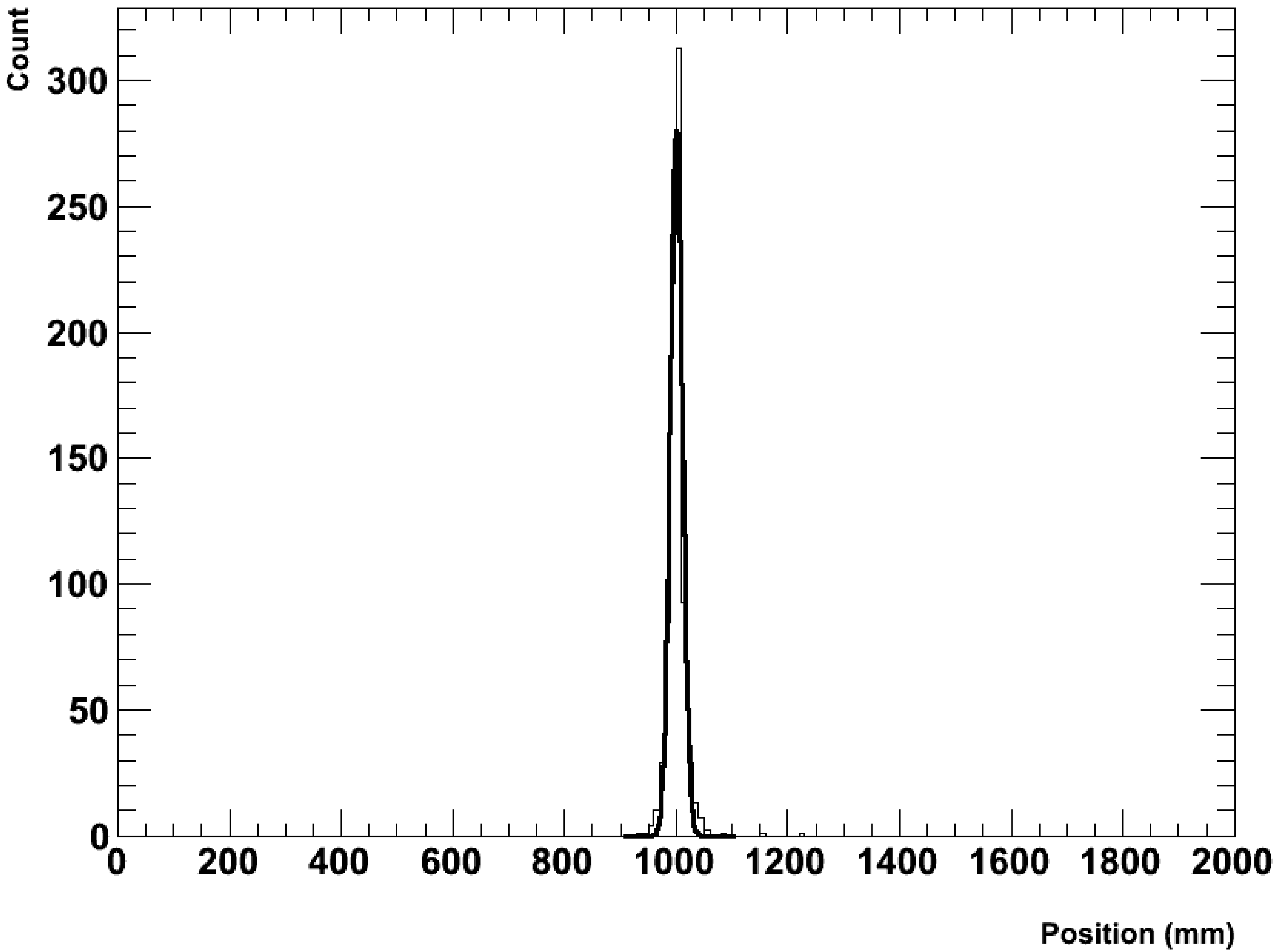



$m_{t2}$ = 8.885 ns
$\sigma_{t2}$ = 0.742 ns

$t_{signal2}$




$m_{true}$ = 8.930 ns
$\sigma_{true}$ = 0.937 ns


Count
300
250
200
150
100
50
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Position (mm)