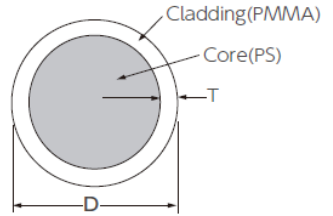
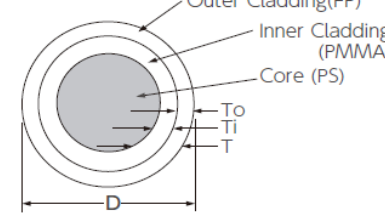
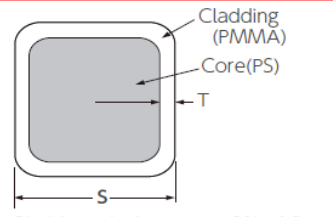


Trapping Efficiency

최재민

Trapping Efficiency

Cross-section and Cladding Thickness

	Single Cladding	Multi-Cladding (M)
Round Fiber (D)	 <p>Cladding Thickness¹⁾: T=2% of D Numerical Aperture: NA=0.55 Trapping Efficiency : 3.1%</p>	 <p>Cladding Thickness²⁾: T=2%(To)+2%(Ti) =4% of D Numerical Aperture : NA=0.72 Trapping Efficiency : 5.4%</p>
Square Fiber (SQ)	 <p>Cladding Thickness : T=2% of S Numerical Aperture : NA=0.55 Trapping Efficiency : 4.2%</p>	Not available

1) In some cases, cladding thickness T is 3% of D. 2) In some cases, cladding thickness T is 6% of D. To and Ti are both 3% of D.

<Properties table of Y-11>

Critical Angle for total reflection in WLS fiber

- Refractive Index of core : 1.59
- Refractive index of cladding : 1.49

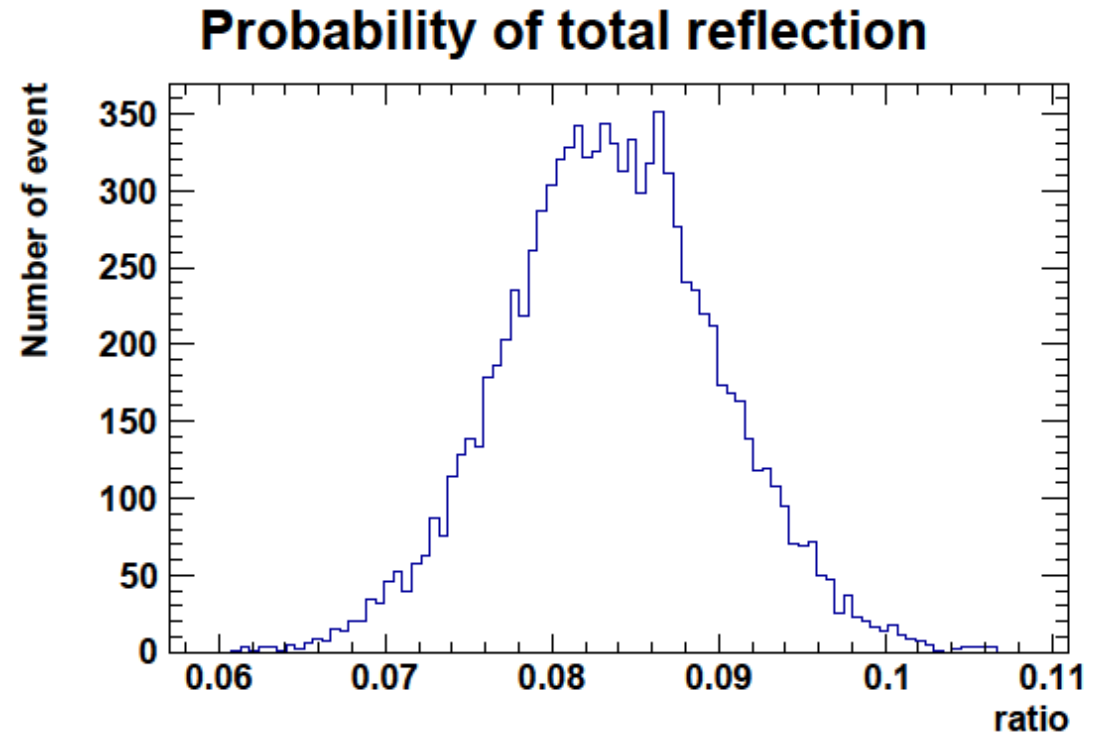
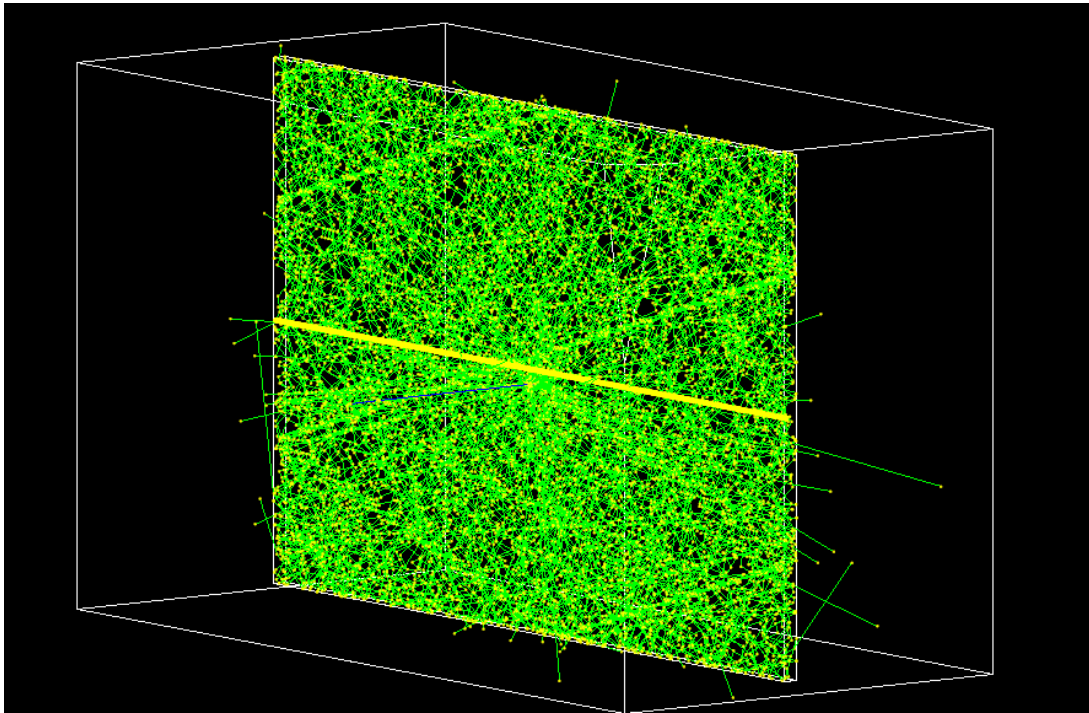
$$\text{critical angle } \theta_c = \sin^{-1}\left(\frac{1.49}{1.59}\right) = 69.57^\circ$$

Assume that there is no attenuation and emission occurs isotropically. Probability for total reflection is

$$P = \frac{2 \times \int_0^{2\pi} \int_0^{20^\circ} \sin\theta d\theta d\phi}{\int d\Omega} = \frac{2 \times 0.06}{2} = 6\%$$

<Calculated results of Trapping Efficiency>

Probability for total reflection



Ratio between the number of WLS process and the number of photon arrived at MPPC

Average of absorption ratio 0.084 is larger than our calculation 0.06.

New Calculation

Equation for total reflection

- As a results

$$\sin \theta = \frac{\cos \psi_c}{1 - \frac{a^2}{R^2} \sin^2 \varphi}$$

Back up

- Hello. This is Jae Min Choi worked in Korea university and KEK.
- I am studying multi-cladding WLS fiber named Y-11.
- I read the properties table of Y-11, but I want to ask you question.

- 1. First of all, is there any coating for total reflection?
- And if so, could you tell me the value of reflectivity?

- 2. According to properties table, trapping efficiency is 5.4%
- I want to know if the value is in one direction or both ends of fiber.
- I mean, if this is the value for one direction, I need to multiply 2, because I count the number of photon in both ends of fiber.
- And also I need the information about how to measure trapping efficiency.

- 3. I saw the emission spectrum and absorption spectrum and I understand what emission spectrum means. However, I don't know how to measure the absorption amplitude in absorption spectrum and what it means. Could you tell me about this?