

## TDCR and Efficiency for Monoenergetic Electrons

Below  $R = \text{TDCR}$  and  $n = \text{mean number of photoelectrons from one PMT}$ .

Probability for triples, T:  $T = (1 - e^{-n})^3$ .

Probability for logical doubles, D:

$$D = 3(1 - e^{-n})^2 - 2(1 - e^{-n})^3 = (1 - e^{-n})^2(1 + 2e^{-n}).$$

$$\text{TDCR} = R = T/D$$

With monoenergetic electrons this simplifies to

$$R = \frac{1 - e^{-n}}{1 + 2e^{-n}}$$

From which

$$e^{-n} = \frac{1 - R}{1 + 2R}$$

Efficiency =  $Eff = \text{probability for logical doubles} = D$ .

$$Eff = (1 - e^{-n})^2(1 + 2e^{-n})$$

$$Eff = \left(1 - \frac{1 - R}{1 + 2R}\right)^2 \left(1 + 2\frac{1 - R}{1 + 2R}\right)$$

$$= \left(\frac{3R}{1 + 2R}\right)^2 \left(\frac{3}{1 + 2R}\right)$$

$$= \frac{27R^2}{(1 + 2R)^3}$$