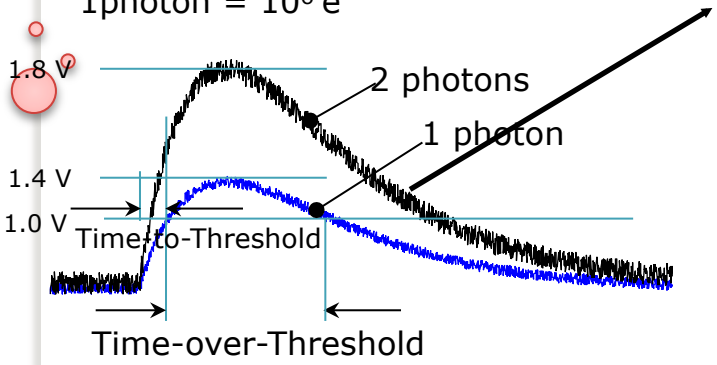
ToT related to charge input.

PMT Gain = 1×10^6

1photon = 10^6 e^-

Decay time = 4.5 ns (300 fF × 15kΩ)



In reality, because of the rise time of the signal and parasitic capacitance at the input, we lose some charge. Also, there are delays because of cables and the experimental setup.

Ideal case :

$$Threshold = Amplitude \times e^{-t/\tau}$$

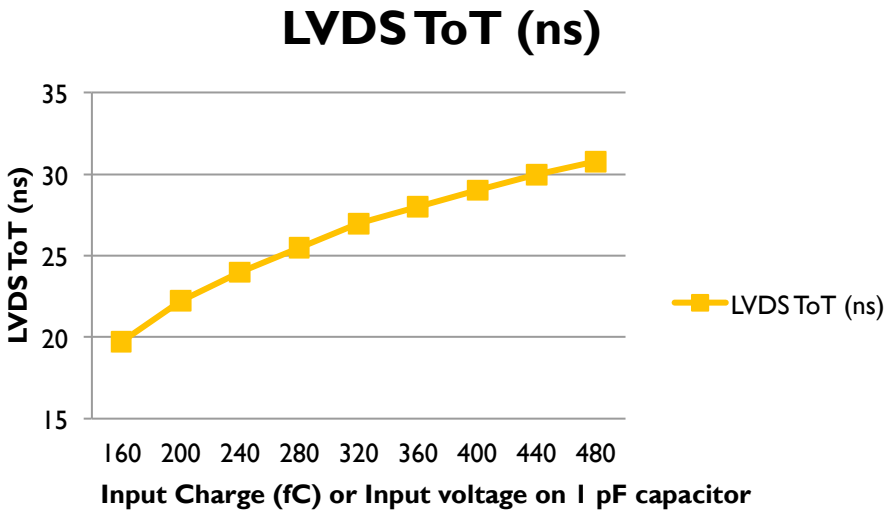
Time over Threshold is the time to reach the threshold on the falling edge.

$$Threshold = Amplitude \times e^{-(ToT - Risetime)/\tau}$$

$$ToT = Risetime + \tau \times \ln \frac{Amplitude}{Threshold}$$

$$ToT = Risetime + \tau \times \ln \frac{Charge/Feedback\ capacitor}{Threshold}$$

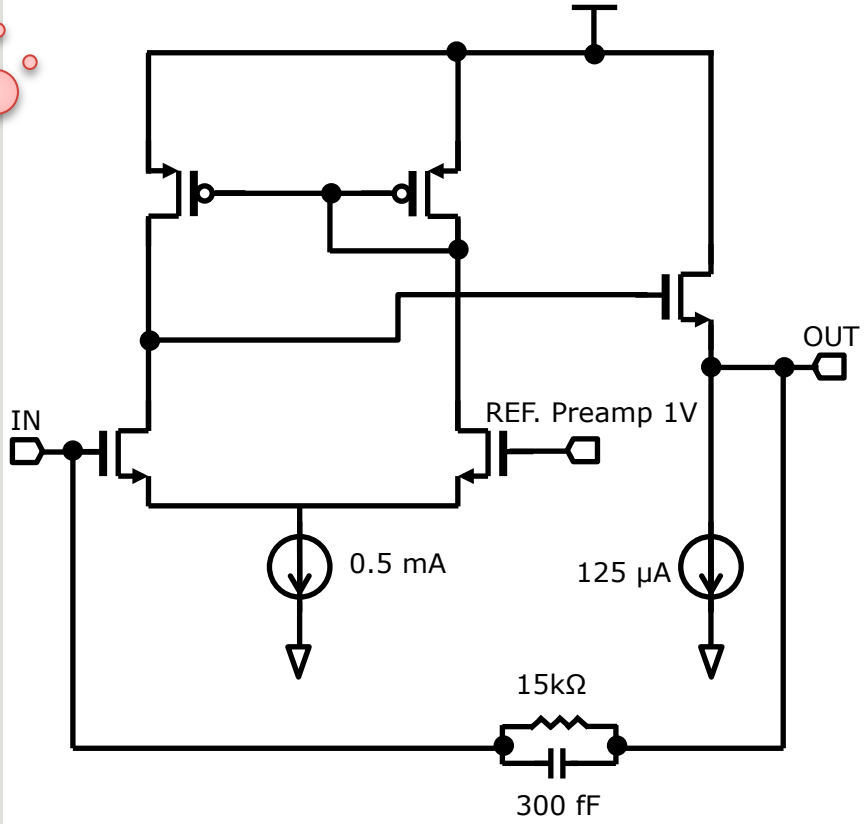
Measured values

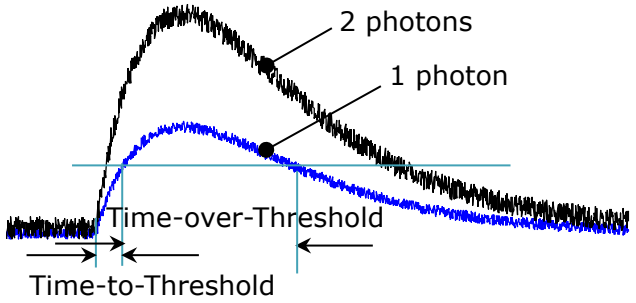


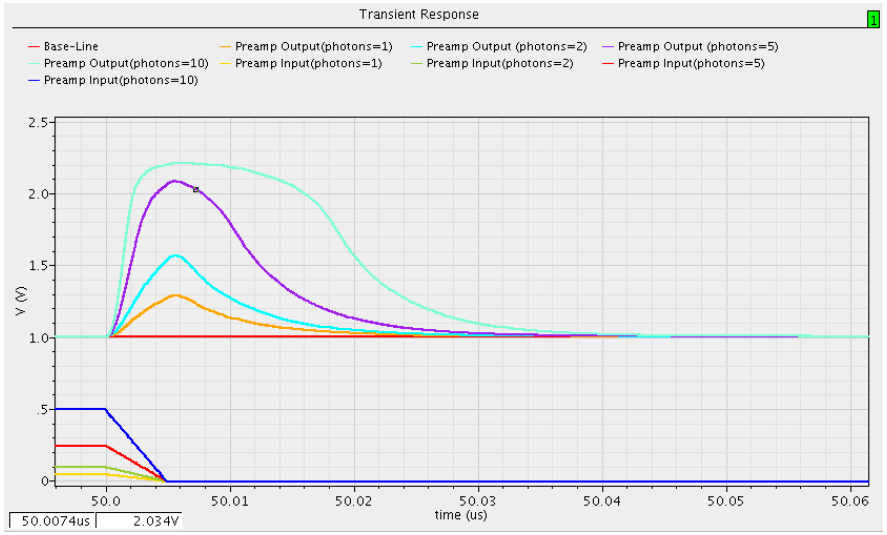
For eg. A pulse generator with 5ns risetime

$$ToT = Risetime + 4.5ns \times \ln \frac{160fC/300fF}{50mV} = Risetime + 10.6ns = 15.6ns$$

Design of Preamplifier in PROMiS_V1







- Two-stage charge preamplifier with RC ~4.5 ns feedback.
- For eg. 1 pe$^-$ on the PMT gives 1×10^6 = 160 fC charge. 50 mV input on a 3.3pF capacitor relates to this charge. This charge will be amplified by the 300 fF feedback capacitor. The preamplifier saturates for a 5 pe$^-$ input.

Thresholds (base line of the amplifier is 1.000V):

- Promis2: 0.8->2.4V (0->256)
- Promis1: 0.8->1.2V (0->256)

Thr	ToT
29	27