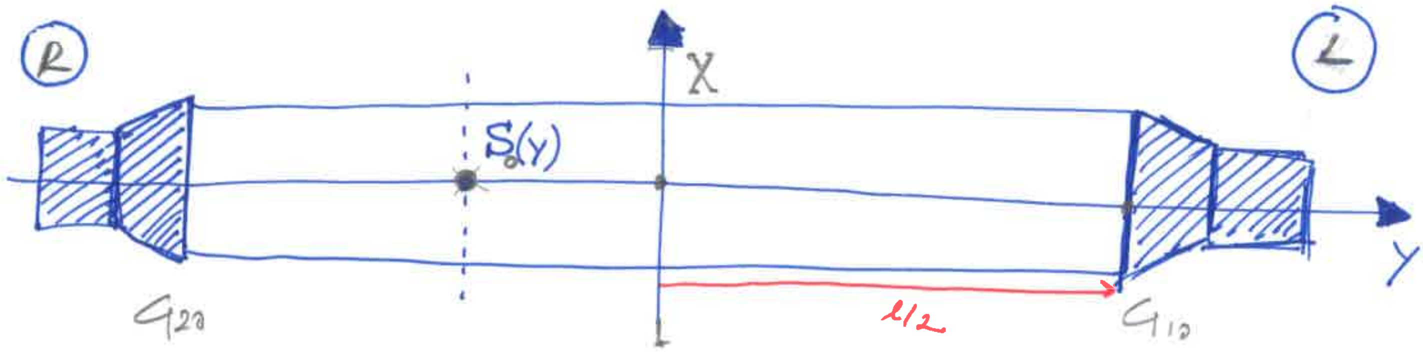


(1) $$G_1(y) = G_{01} \cdot S_0(y) \cdot e^{-\lambda_1\left(\frac{l}{2} - y\right)}$$

(2) $$G_2(y) = G_{02}\, S_0(y)\, e^{-\lambda_2\left(y + \frac{l}{2}\right)}$$

These are the signals observed by PMTs

First we need to match these gains in the center

(3) $$G_1(0) = G_2(0)$$

$$G_{01}\, S_0\cancel{(y)}\, e^{-\lambda_1\left(\frac{l}{2} - \cancel{0}\right)} = G_{02}\, S_0\cancel{(y)}\, e^{-\lambda_2\left(\cancel{0} + \frac{l}{2}\right)}$$

$$\underbrace{G_{01}\, e^{-\lambda_1 \frac{l}{2}}} = G_{02}\, e^{-\lambda_2 \frac{l}{2}}$$

(4) $$\boxed{\tilde{G}_{01} = \tilde{G}_{02}}$$

This needs to be matched.

$$G_1(y) = \tilde{G}_{01} \cdot S_0(y)\, e^{+\lambda_1 y}$$

$$G_2(y) = \tilde{G}_{02}\, S_0(y)\, e^{-\lambda_2 y} = \tilde{G}_{01}\, S_0(y)\, e^{-\lambda_2 y}$$

AM: $$\frac{G_1(y) + G_2(y)}{2} = \langle G(y) \rangle = \frac{1}{2} \tilde{G}_{01}\, S_0(y)\left(e^{+\lambda_1 y} + e^{-\lambda_2 y}\right) =$$

$$= \frac{1}{2} \tilde{G}_{01}\, S_0(y)\left(e^{\lambda_1 y} + e^{-\lambda_2 y}\right)$$ (5)

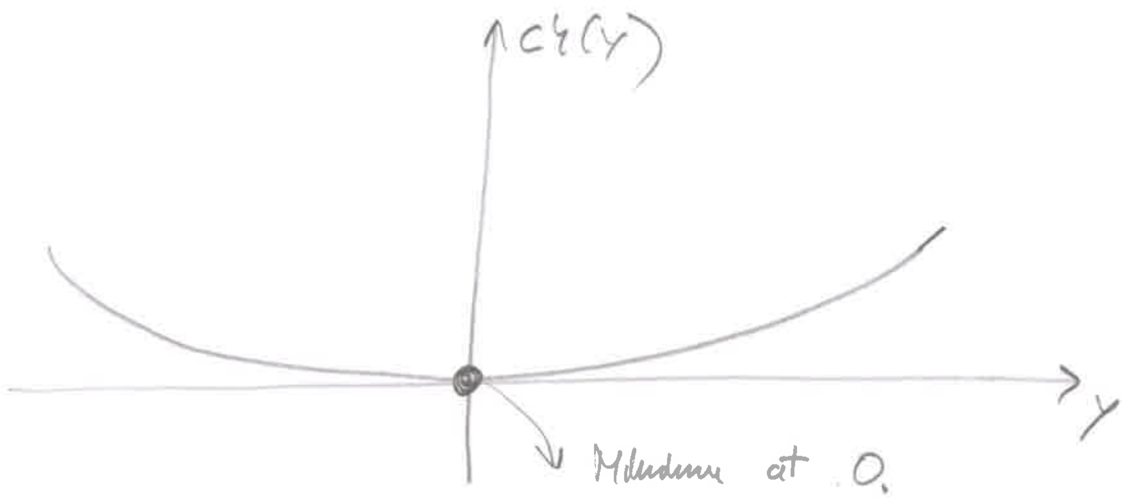
$$\delta G(y) := -\left(G_1(y) - G_2(y)\right) = \tilde{G}_{01}\, S_0(y)\left(-e^{\lambda_1 y} + e^{-\lambda_2 y}\right) =$$

$$= -2\, \tilde{G}_{01}\, S_0(y) \left(\frac{e^{\lambda_1 y} - e^{-\lambda_2 y}}{2} \right) \qquad (6)$$

① $\lambda_1 = \lambda_2$:

$$\langle G(y) \rangle = \tilde{G}_{01}\, S_0(y) \cdot \frac{e^{\lambda_1 y} + e^{-\lambda_1 y}}{2} =$$

$$= \tilde{G}_{01}\, S_0(y) \cdot ch(\lambda_1 y) \qquad (7)$$

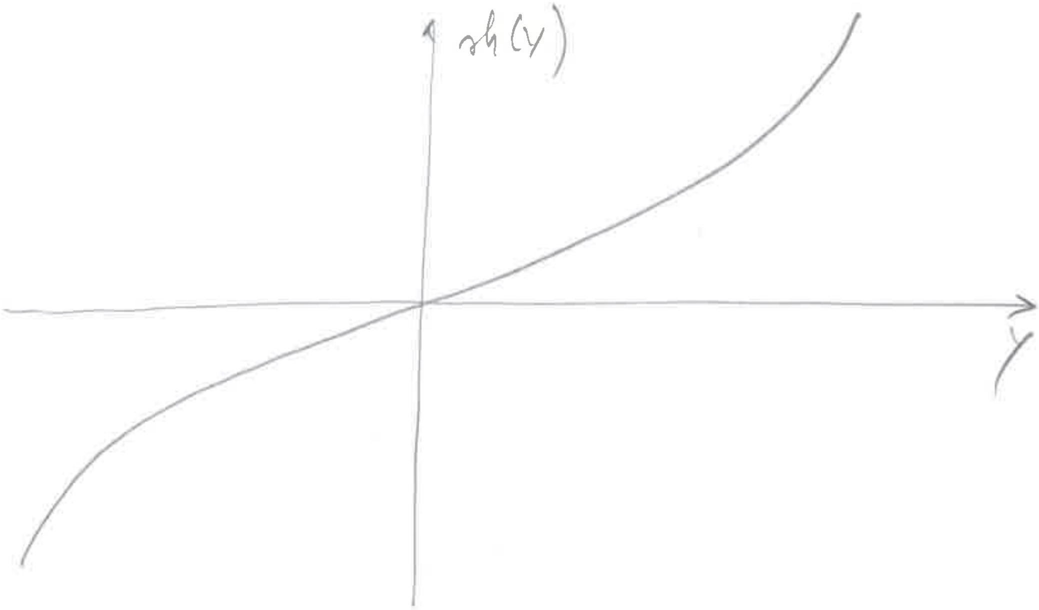


If we expand this into Taylor Series :

$$\langle G(y) \rangle = \tilde{G}_{01}\, S_0(y) \cdot \left[1 + \frac{x^2}{2} + \frac{x^4}{24} + O(x^6) \right] \qquad (8)$$

$$\delta G(y) = 2\,\tilde{G}_{01}\,S_0(y)\,\frac{e^{\lambda_1 y} - e^{-\lambda_1 y}}{2} =$$

$$= 2\,\tilde{G}_{01}\,S_0(y)\cdot sh(\lambda_1 y) \qquad (9)$$



If we expand this:

$$\delta G(y) = 2\,\tilde{G}_{01}\,S_0(y)\cdot\left[x + \frac{x^3}{6} + O(x^5)\right] \qquad (10)$$

Geometric Mean:

$$\overline{G}(y) = \sqrt{G_1(y)\, G_2(y)} = \tilde{G}_{01}\, S_0(y) \cdot \sqrt{e^{\lambda_1 y} \cdot e^{-\lambda_2 y}}$$

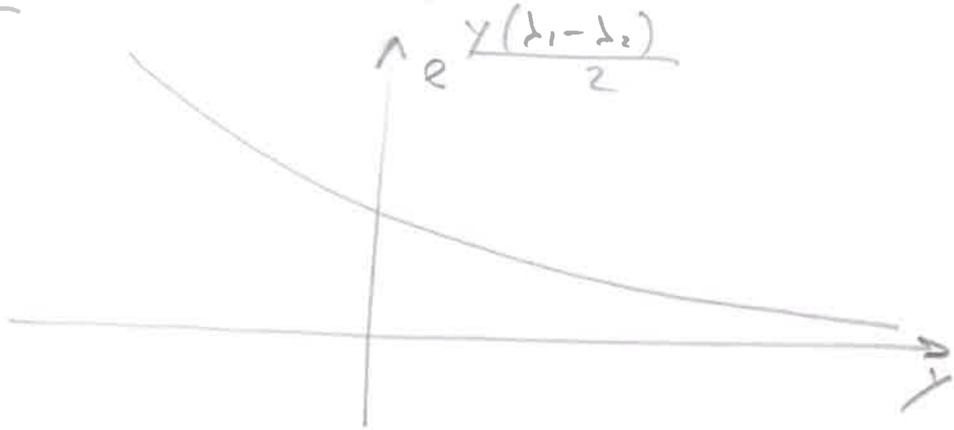
$$= \tilde{G}_{01}\, S_0(y)\, e^{\frac{y(\lambda_1 - \lambda_2)}{2}} \qquad (11)$$

If $\lambda_1 = \lambda_2$:

$$\boxed{\overline{G}(y) = \tilde{G}_{01}\, S_0(y) \cdot 1} \qquad (12)$$

This is flat, independent of y!

If $\lambda_1 \neq \lambda_2$ $(\lambda_2 > \lambda_1)$ $\Rightarrow$



(13)