Mediciones Indirectas (MI)

Por ej.: ***SUMA*** de dos MF

$$L = a + b$$

$$a = (a_0 \pm \Delta a)\ Ud.$$

$$b = (b_0 \pm \Delta b)\ Ud.$$

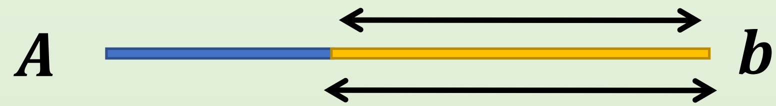
$$L = (L_0 \pm \Delta L)\ Ud.$$

$$a_0 - \Delta a \leq a \leq a_0 + \Delta a$$

$$b_0 - \Delta b \leq b \leq b_0 + \Delta b$$

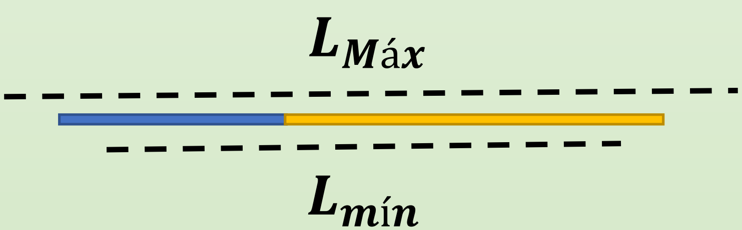
$$L_0 - \Delta L \leq L \leq L_0 + \Delta L$$

$$b_{mín} = b_0 - \Delta b$$



$$b_{Máx} = b_0 + \Delta b$$

$$L_{mín} \leq L \leq L_{Máx}$$



$$L_{Máx} = (a_0 + \Delta a) + (b_0 + \Delta b)$$

$$L_{mín} = (a_0 - \Delta a) + (b_0 - \Delta b)$$

Puedo Estimar el valor de L

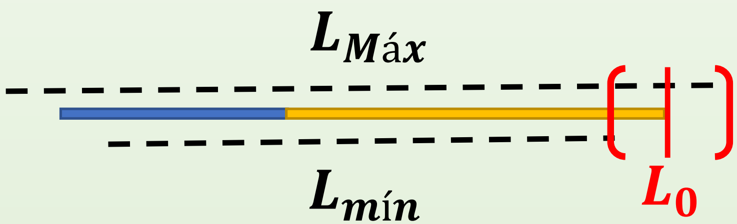
Estimemos un posible valor de L

Por ej.: SUMA de dos MF $L = a + b$

$$L_{mín} \leq L \leq L_{Máx}$$

$$L_{Máx} = (a_0 + \Delta a) + (b_0 + \Delta b)$$

$$L_{mín} = (a_0 - \Delta a) + (b_0 - \Delta b)$$



Valor más representativo L_0

$$L_0 = \frac{L_{Máx} + L_{mín}}{2} = \frac{(a_0 + \cancel{\Delta a}) + (b_0 + \cancel{\Delta b}) + (a_0 - \cancel{\Delta a}) + (b_0 - \cancel{\Delta b})}{2}$$

$$L_0 = \frac{2(a_0 + b_0)}{2}$$

$$L_0 = a_0 + b_0 = \boldsymbol{L(a_0, b_0)}$$

Reemplazar en la Fórmula con los valores más representativos

Estimemos un posible valor de L

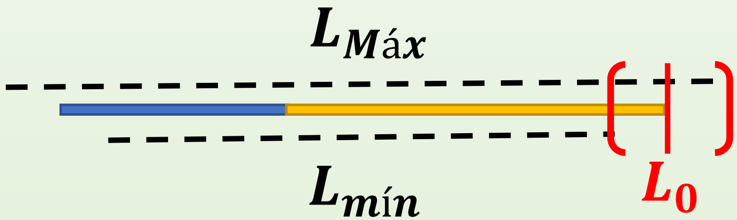
Por ej.: SUMA de dos MF

$$L = a + b$$

$$L_{mín} \leq L \leq L_{Máx}$$

$$L_{Máx} = (a_0 + \Delta a) + (b_0 + \Delta b)$$

$$L_{mín} = (a_0 - \Delta a) + (b_0 - \Delta b)$$



Es una Estimación posible en algunos casos

Error Absoluto ΔL

$$\Delta L = \frac{L_{Máx} - L_{mín}}{2} = \frac{(\cancel{a_0} + \Delta a + \cancel{b_0} + \Delta b) - (\cancel{a_0} - \Delta a + \cancel{b_0} - \Delta b)}{2}$$

$$L_0 = \frac{2(\Delta a + \Delta b)}{2}$$

$$\Delta L = \Delta a + \Delta b$$

Por ej.: SUMA de dos MF $L = a + b$

$$a = (a_0 \pm \Delta a)\ Ud.$$

$$b = (b_0 \pm \Delta b)\ Ud.$$

$$L = (L_0 \pm \Delta L)\ Ud.$$

$$L_0 = L(a_0, b_0)$$

$$L_0 = a_0 + b_0$$

$$\Delta L = \sqrt{\left(\left.\frac{\partial L(a,b)}{\partial a}\right|_{a_0,b_0}\right)^2 \Delta a^2 + \left(\left.\frac{\partial L(a,b)}{\partial b}\right|_{a_0,b_0}\right)^2 \Delta b^2}$$

DERIVADAS PARCIALES

$$\frac{\partial L(a,b)}{\partial a} = \mathbf{1} \rightarrow \left.\frac{\partial L(a,b)}{\partial a}\right|_{a_0,b_0} = \mathbf{1}$$

$$\frac{\partial L(a,b)}{\partial b} = \mathbf{1} \rightarrow \left.\frac{\partial L(a,b)}{\partial b}\right|_{a_0,b_0} = \mathbf{1}$$

$$\Delta L = \sqrt{1^2 \Delta a^2 + 1^2 \Delta b^2} = \sqrt{\Delta a^2 + \Delta b^2}$$