

## Cálculo das outras incertezas utilizadas no experimento

### 1. Incerteza do k teórico da associação em paralelo

$$k_{par\_teo} = k_1 + k_2$$

$$\sigma_{k_{par\_teo}}^2 = \left( \frac{\partial k_{par\_teo}}{\partial k_1} \right)^2 \sigma_{k_1}^2 + \left( \frac{\partial k_{par\_teo}}{\partial k_2} \right)^2 \sigma_{k_2}^2$$

$$\frac{\partial k_{par\_teo}}{\partial k_1} = 1$$

$$\frac{\partial k_{par\_teo}}{\partial k_2} = 1$$

$$\sigma_{k_{par\_teo}}^2 = \sigma_{k_1}^2 + \sigma_{k_2}^2$$

$$\sigma_{k_{par\_teo}} = \sqrt{\sigma_{k_1}^2 + \sigma_{k_2}^2}$$

### 1. Incerteza do k teórico da associação em série

$$k_{ser\_teo} = \frac{k_1 k_2}{k_1 + k_2} = k_1 k_2 (k_1 + k_2)^{-1}$$

$$\sigma_{k_{ser\_teo}}^2 = \left( \frac{\partial k_{ser\_teo}}{\partial k_1} \right)^2 \sigma_{k_1}^2 + \left( \frac{\partial k_{ser\_teo}}{\partial k_2} \right)^2 \sigma_{k_2}^2$$

$$u = k_1 k_2$$

$$v = (k_1 + k_2)^{-1}$$

$$\frac{\partial k_{ser\_teo}}{\partial k_1} = (k_2)(k_1 + k_2)^{-1} + k_1 k_2 (-1)(k_1 + k_2)^{-2} = \frac{k_2}{k_1 + k_2} - \frac{k_1 k_2}{(k_1 + k_2)^2} = \frac{k_2^2}{(k_1 + k_2)^2}$$

$$\frac{\partial k_{ser\_teo}}{\partial k_2} = (k_1)(k_1 + k_2)^{-1} + k_1 k_2 (-1)(k_1 + k_2)^{-2} = \frac{k_1}{k_1 + k_2} - \frac{k_1 k_2}{(k_1 + k_2)^2} = \frac{k_1^2}{(k_1 + k_2)^2}$$

$$\sigma_{k_{ser\_teo}}^2 = \left( \frac{k_2^2}{(k_1 + k_2)^2} \right)^2 \sigma_{k_1}^2 + \left( \frac{k_1^2}{(k_1 + k_2)^2} \right)^2 \sigma_{k_2}^2$$

$$\sigma_{k_{ser\_teo}} = \sqrt{\left( \frac{k_2}{k_1 + k_2} \right)^4 \sigma_{k_1}^2 + \left( \frac{k_1}{k_1 + k_2} \right)^4 \sigma_{k_2}^2}$$

