

$$L = 10 \log_{10} \left(\frac{I}{I_0} \right)$$

$$\frac{L}{10} = \log_{10} \left(\frac{I}{I_0} \right)$$

$$\frac{I}{I_0} = 10^{\frac{L}{10}}$$

Média de $\frac{I}{I_0}$:

$$\left(\frac{\bar{I}}{I_0} \right) = \frac{\sum_{i=1}^n \left(\frac{I_i}{I_0} \right)}{n} = \frac{\sum_{i=1}^n \left(10^{\frac{L_i}{10}} \right)}{n}$$

$$\bar{L} = 10 \log_{10} \left(\frac{\bar{I}}{I_0} \right)$$

$$= 10 \log_{10} \left(\frac{\sum_{i=1}^n \left(10^{\frac{L_i}{10}} \right)}{n} \right) = 10 \log_{10} \left(\sum_{i=1}^n \left(10^{\frac{L_i}{10}} \right) \right) - 10 \log_{10} (n)$$

Períodos:

1. Diurno (índice d) das 7 : 00 às 20 : 00
2. Entardecer (índice e) das 20 : 00 às 23 : 00
3. Noite (índice n) das 23 : 00 às 7 : 00

$$L_{den} = 10 \log_{10} \left(\frac{I_{den}}{I_0} \right)$$

$$L_{den} = 10 \log_{10} \left(\frac{13}{24} \left(\frac{I_d}{I_0} \right) + \frac{3}{24} \left(\frac{I_e}{I_0} \right) + \frac{8}{24} \left(\frac{I_n}{I_0} \right) \right)$$

$$L_{den} = 10 \log_{10} \left(\frac{13}{24} \left(10^{\frac{L_d}{10}} \right) + \frac{3}{24} \left(10^{\frac{L_e}{10}} \right) + \frac{8}{24} \left(10^{\frac{L_n}{10}} \right) \right)$$

$$L_{den} = 10 \log_{10} \left[\frac{1}{24} \left(13 \times 10^{\frac{L_d}{10}} + 3 \times 10^{\frac{L_e}{10}} + 8 \times 10^{\frac{L_n}{10}} \right) \right]$$

Há uma penalização de 5 dB no entardecer e de 10 dB durante a noite, logo:

$$L_{den} = 10 \log_{10} \left[\frac{1}{24} \left(13 \times 10^{\frac{L_d}{10}} + 3 \times 10^{\frac{L_e+5}{10}} + 8 \times 10^{\frac{L_n+10}{10}} \right) \right]$$