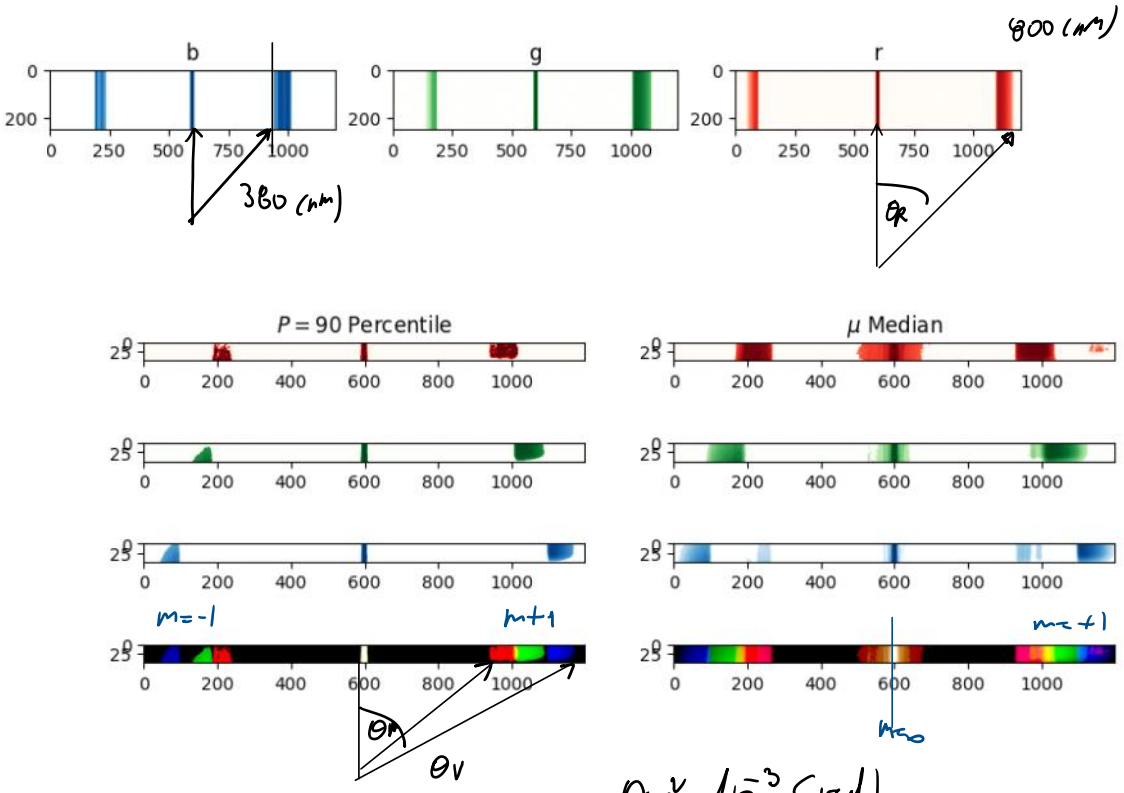
Primer estudio de la resolucion

Monday, May 13, 2024 8:43 AM



$\theta \approx 10^{-3}$ (rad)

$d \sin\theta = m\lambda$

$d = 1{,}6\,(\mu m) = 1{,}6 \times 10^{-6}\,(m)$

$\lambda_R = 800\,(nm) = 800 \times 10^{-9}\,(m)$

$\lambda_R = 0{,}8 \times 10^{-6}\,[m]$

$\lambda_V = 0{,}36 \times 10^{-6}\,(m)$

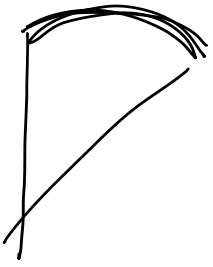
$$\sin\theta_R = \frac{+1 \cdot 0{,}8 \times 10^{-6}\,(m)}{1{,}6 \times 10^{-6}\,(m)}$$

$\sin\theta_R = 0{,}5$

$\theta_R = 0{,}524$ (rad)

$\theta_V = .226$ (rad)

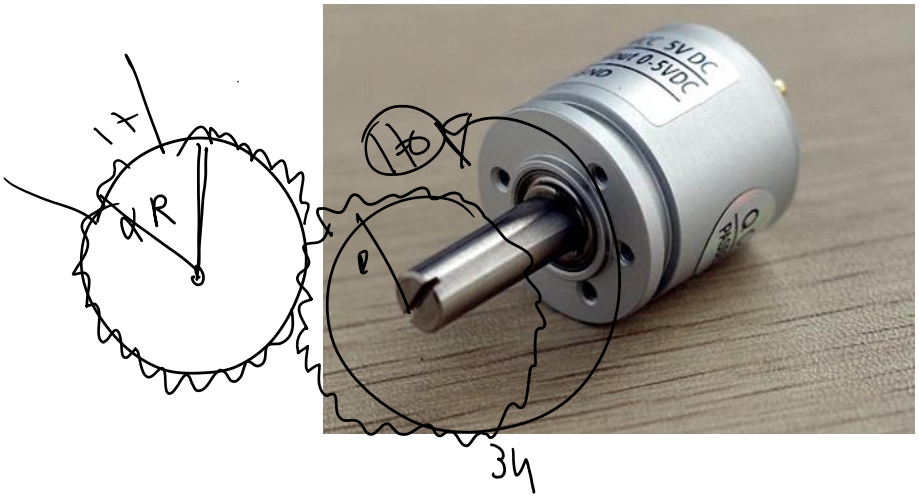
0.3 (rad) $= 17{,}18°$



$N = 1000$

N = 10000

multiplicador de precisión



10^{-3} (rad)

$\alpha = 2$

$\sigma' = \frac{\sigma}{\alpha}$

$\sigma' = 10^{-4}$ (rad)

¿Cual sería la resolución?

0.17 nm

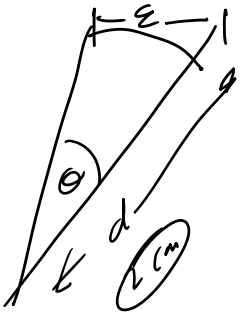
Hipotesis

1 (nm)

$\varepsilon \leq$ 0.01 nm

$d = 5$ (cm) $= \frac{1}{2} \times 10^{-2}$ (m)

$\varepsilon \leq 10^{-11}$ (m)



$\varepsilon = \theta \cdot 10^{-2}$ (m)

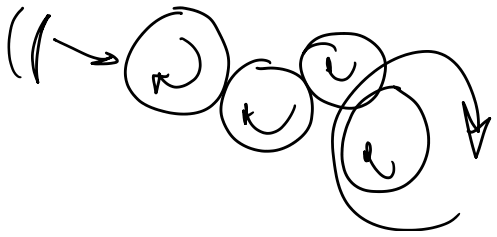
$10^{-11} \geq \delta\theta \cdot d$

10^{-9} (rad) $\geq \delta\theta$ requerida

10^{-3} (rad) $= \delta\theta$ real.

con $\varepsilon = 1$ (mm)

$\frac{10^{-9}}{10^{-4}}$ (m) $= 10^{-5}$ (m) $\geq d$ (m)



$$R = \frac{\lambda}{\Delta\lambda} \geq 10'000$$

ε → $\Delta\lambda$

$\lambda \sim 10^{-7}$ (m) $\Rightarrow$ $\frac{10^{-7}\text{(m)}}{\varepsilon} \geq 10^{4}$

$10^{-11}\text{(m)} \geq \varepsilon$

Compar

pixel array

10^{2} (m)

10^{-11} (m)

0,1 (mm)

vs

angular arm ✓

$\Delta\lambda = d\,\delta\theta'$

$10^{-6}\text{(rad)} = \delta\theta'$

precisión efectiva con gear

Propuesta

$$R = \frac{\lambda}{\Delta\lambda} = \frac{10^{-7}\text{ (m)}}{10^{-5}\text{(rad)} \cdot 10^{-2}\text{ (m)}}$$

$$R = \frac{10^{-7}}{10^{-7}\text{ (m)}} = 10$$

precisión meta

$$k = 5000 \geq \frac{10^{-7}\text{ (m)}}{\delta\theta\ 10^{-2}\text{ (m)}}$$

$$\delta\theta \geq 10^{-10}$$

2. **High-Resolution Optical Microscope Camera**:
   - Pixel pitch: 200 nm
   - This means each pixel measures 200 nm from center to center.

$\Delta\lambda = 200 \times 10^{-9}\ (m)$

$R = \frac{10^{-7}}{10^{-7}} = 1$