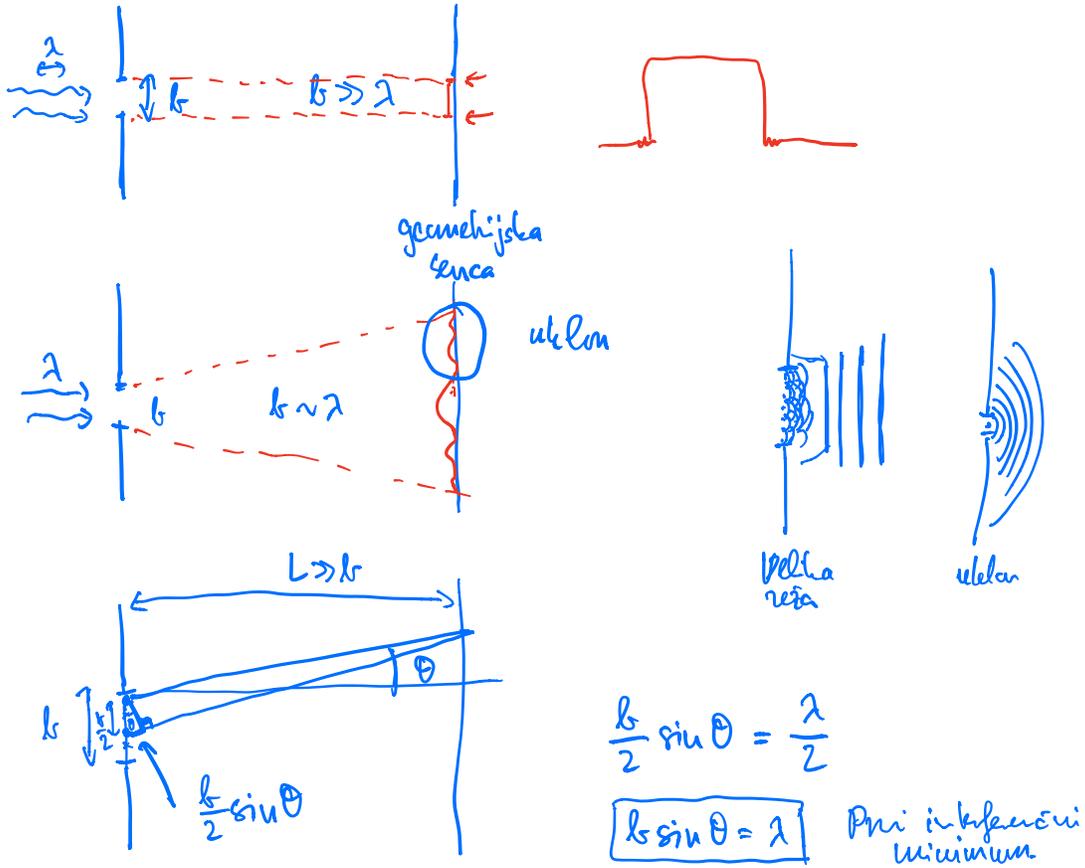


KVANTNA NEODLOČENOST

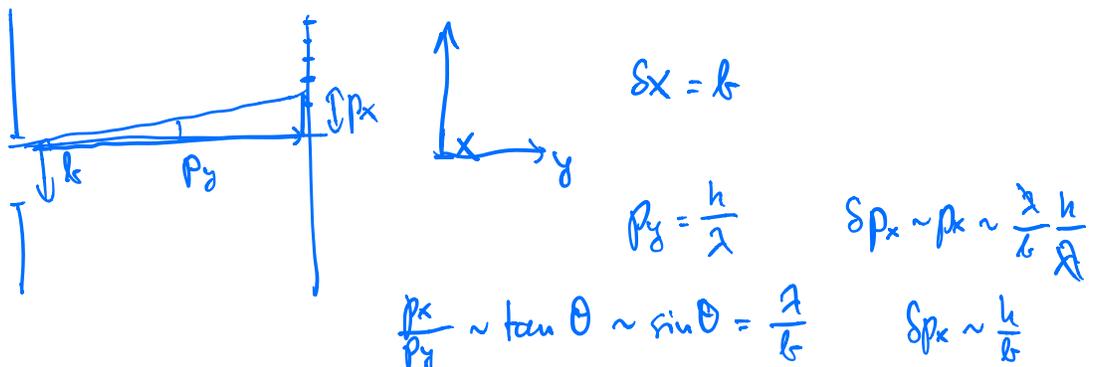
1) UKLON



$b \gg \lambda \quad \sin \theta = \left(\frac{\lambda}{b}\right) \rightarrow 0 \quad \theta \rightarrow 0 \quad \text{caka pralod}$

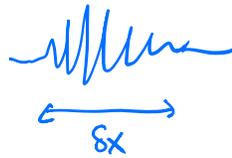
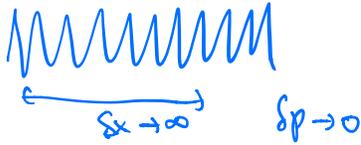
$b \text{ manje} \quad \sin \theta = \frac{\lambda}{b} \sim 1 \quad \theta \text{ velika!}$

2) HEISENBERGOVA NEENAEBA NEODLOČENOSTI



$$\delta x \delta p_x \sim \hbar$$

$$\delta x \delta p_x \geq \hbar/2$$



dispersija

$$\delta x = \sqrt{\langle x^2 \rangle - \langle x \rangle^2}$$

$$\delta p = \sqrt{\langle p^2 \rangle - \langle p \rangle^2}$$

$$\langle x - \bar{x} \rangle \rightarrow \overline{x - \bar{x}} = \bar{x} - \bar{x} = 0$$

$$\begin{aligned} \langle (x - \bar{x})^2 \rangle &\rightarrow \overline{(x - \bar{x})^2} = \overline{x^2 - 2x\bar{x} + \bar{x}^2} \\ &= \overline{x^2} - 2\bar{x}\bar{x} + \bar{x}^2 \\ &= \overline{x^2} - \bar{x}^2 \end{aligned}$$

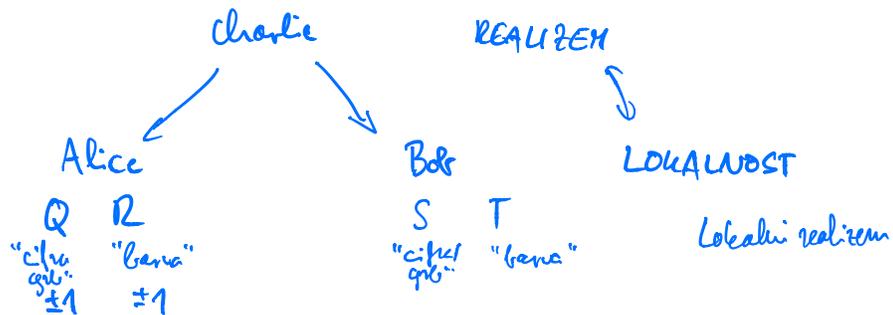
$$\hbar=0 \quad \delta x \delta p = \hbar/2$$

$$\delta A \delta B \geq \frac{1}{2} |\langle [A, B] \rangle|$$

$$A = \hat{x} \quad B = \hat{p} \quad [\hat{x}, \hat{p}] = i\hbar \quad \delta x \delta p \geq \frac{\hbar}{2}$$

$$[A, B] = 0 \rightarrow \delta A \delta B \geq 0 \quad \text{zdrnžljive spazljivke}$$

3) BELLOVA NEENACBA



$$x = QS + RS + RT - QT = \underbrace{(Q+R)}_{R, Q \neq 1} S + \underbrace{(R-Q)}_{R, Q \neq 1} T \leq 2$$

