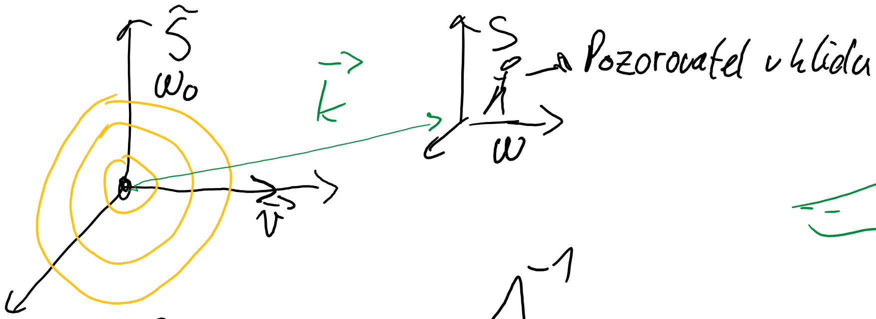
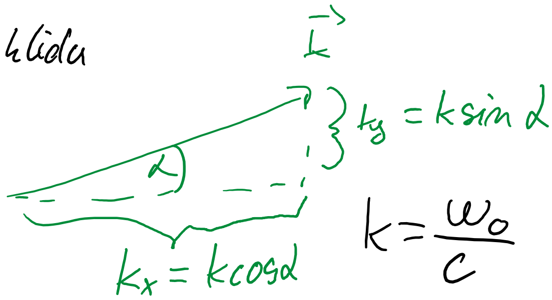
23. Relativistický doplerův jev

Thursday, January 16, 2025 14:56





$$k = \frac{\omega_0}{c}$$

$$\underset{S}{\begin{pmatrix} \omega/c \\ k_x \\ k_y \\ k_z \end{pmatrix}} = \overbrace{\begin{pmatrix} \gamma & \beta\gamma & 0 & 0 \\ \beta\gamma & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}}^{\Lambda^{-1}} \cdot \begin{pmatrix} \omega_0/c \\ \frac{\omega_0}{c}\cos\alpha \\ \frac{\omega_0}{c}\sin\alpha \\ 0 \end{pmatrix} = \begin{pmatrix} \gamma\frac{\omega_0}{c} + \beta\gamma\frac{\omega_0}{c}\cos\alpha \\ \\ \\ \\ \end{pmatrix}$$

$$\frac{\omega}{\cancel{c}} = \gamma\frac{\omega_0}{\cancel{c}} + \gamma\beta\frac{\omega_0}{\cancel{c}}\cos\alpha$$

$$\omega = \gamma\cdot\omega_0(1+\beta\cos\alpha) = \underline{\underline{\gamma\omega_0\left(1+\frac{v}{c}\cos\alpha\right)}}$$

↳ pro malé v $\gamma \doteq 1$

a pokud bude $\alpha = 0$

tak dostaneme $\underline{\underline{\omega = \omega_0\left(1+\frac{v}{c}\right)}}$