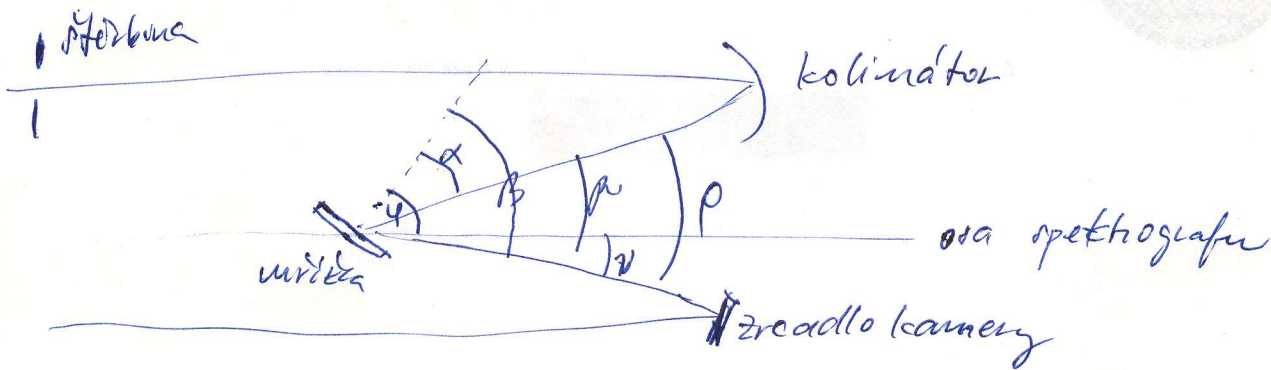


Výpočet natočení mřížky

- aby do patřičného směru patřičnou λ v patřičném řádu n



α, β, \dots mřížková rovnice, $\sin \alpha + \sin \beta = \frac{n \lambda}{d} = n \lambda c$

μ, ρ, ν, \dots konstanty (konstrukce spektrografu)
 řešení pro α, β, φ

trigonometrie

$$\left. \begin{aligned} \beta + \alpha &= \rho \\ \varphi &= \beta - \nu \\ \varphi &= \alpha + \mu \end{aligned} \right\} \begin{aligned} 2\varphi &= \alpha + \beta + \mu - \nu \\ \Rightarrow \varphi &= \frac{\alpha + \beta}{2} + \frac{\mu - \nu}{2} \end{aligned}$$

↑ ↑ ↑
 konstanty konstanty konstanty

$$\sin \alpha + \sin \beta = n \lambda c = \sin \alpha + \sin(\alpha + \rho) =$$

$$= \sin \alpha + \sin \alpha \cos \rho + \cos \alpha \sin \rho = \sin \alpha + \sin \alpha \cos \rho + \sqrt{1 - \sin^2 \alpha} \sin \rho$$

$$\sqrt{1 - \sin^2 \alpha} \sin \rho = n \lambda c - \sin \alpha (1 + \cos \rho)$$

$$x = \sin \alpha$$

$$\sqrt{1 - x^2} \sin \rho = n \lambda c - x(1 + \cos \rho) \quad |^2$$

$$(1 - x^2) \sin^2 \rho = n^2 \lambda^2 c^2 - 2 n \lambda c x (1 + \cos \rho) + x^2 (1 + \cos \rho)^2$$

$$v \sin^2 \varphi - x^2 \sin^2 \varphi = v^2 \lambda^2 c^2 - 2v \lambda c x (1 + \cos \varphi) + x^2 (1 + \cos \varphi)^2$$

$$v \sin^2 \varphi - x^2 \sin^2 \varphi = v^2 \lambda^2 c^2 - 2v \lambda c x (1 + \cos \varphi) + x^2 + 2x^2 \cos \varphi + x^2 \cos^2 \varphi \Rightarrow$$

$$x^2 (-\sin^2 \varphi - 1 - 2\cos \varphi - \cos^2 \varphi) + 2v \lambda c x (1 + \cos \varphi) + v \sin^2 \varphi - v^2 \lambda^2 c^2 = 0$$

$$-2x^2 (1 + \cos \varphi) + 2v \lambda c x (1 + \cos \varphi) + v \sin^2 \varphi - v^2 \lambda^2 c^2 = 0$$

$$x^2 - v \lambda c x + \frac{v^2 \lambda^2 c^2 - v \sin^2 \varphi}{2(1 + \cos \varphi)} \quad M = v \lambda c$$

$$x^2 - Mx + \frac{M^2 - v \sin^2 \varphi}{2(\cos \varphi + 1)} = 0$$

diskriminans uzat'pony!

$$\Delta = M^2 - 4 \frac{M^2 - v \sin^2 \varphi}{2(\cos \varphi + 1)} = \frac{M^2(\cos \varphi + 1) - 2(M^2 - v \sin^2 \varphi)}{\cos \varphi + 1} =$$

$$= \frac{M^2 \cos \varphi + M^2 - 2M^2 + 2v \sin^2 \varphi}{\cos \varphi + 1} = \frac{M^2(\cos \varphi - 1) + 2v \sin^2 \varphi}{\cos \varphi + 1} =$$

$$= \frac{M^2(\cos \varphi - 1)(\cos \varphi + 1) + 2v \sin^2 \varphi(\cos \varphi + 1)}{(\cos \varphi + 1)^2} = \frac{M^2(\cos^2 \varphi - 1) + 2v \sin^2 \varphi(\cos \varphi + 1)}{(\cos \varphi + 1)^2} =$$

$$= \frac{-M^2 \sin^2 \varphi + 2v \sin^2 \varphi(\cos \varphi + 1)}{(\cos \varphi + 1)^2} = \frac{4v \sin^2 \varphi}{(\cos \varphi + 1)^2} \left(\frac{\cos \varphi + 1}{2} - \frac{M^2}{4} \right)$$

$$\Rightarrow \Delta \geq 0 \Rightarrow \frac{\cos \varphi + 1}{2} - \frac{M^2}{4} \geq 0$$

$$\frac{(v \lambda c)^2}{4} \leq \frac{\cos \varphi + 1}{2}$$

$$v \leq \frac{1}{\lambda c} \sqrt{2(\cos \varphi + 1)}$$

maximaln' pou fiteley' v'edol

