gauss. apodizace

(L4)

$$\int_0^1 \underbrace{e^{-\alpha^2 x^2}}_{g} \underbrace{J_0(\beta x)\, x}_{h'}\, dx \;=$$

$R_p \to x$

$(q u)^2 \to \alpha^2$

$2\pi R' \to \beta$

$$(gh)' = g'h + gh'$$

$$\int_a^b g h' \, dx = [gh]_a^b - \int_a^b g' h \, dx$$

$$\int_{\cancel{0}}^{1} x^m J_{m-1}(\beta x)\, dx = \frac{x^m J_m(\beta x)}{\beta}$$ (antider.)

$$= e^{-\alpha^2 x^2} \frac{x J_1(\beta x)}{\beta} \Bigg|_0^1$$ $(m = 1)$

$$- \int_0^1 e^{-\alpha^2 x^2} (-\alpha^2 2x) \frac{x J_1(\beta x)}{\beta} \, dx$$

$$= e^{-\alpha^2}\frac{J_1(\beta)}{\beta} + \frac{2\alpha^2}{\beta}\underbrace{\int_0^1 \underbrace{e^{-\alpha^2x^2}}_{g}\,\underbrace{x^2 J_1(\beta x)\,dx}_{h'}}_{A} \;(=)$$

$$A = e^{-\alpha^2x^2}\,\frac{x^2 J_2(\beta x)}{\beta}\Bigg|_0^1 \qquad (m=2)$$

$$-\int_0^1 e^{-\alpha^2x^2}(-\alpha^2 2x)\,\frac{x^2 J_2(\beta x)}{\beta}\,dx$$

$$= e^{-\alpha^2}\frac{J_2(\beta)}{\beta} + \frac{2\alpha^2}{\beta}\int_0^1 e^{-\alpha^2x^2}x^3 J_2(\beta x)\,dx$$

$$(=)\; e^{-\alpha^2}\frac{J_1(\beta)}{\beta} + \frac{2\alpha^2}{\beta^2}e^{-\alpha^2}J_2(\beta)$$

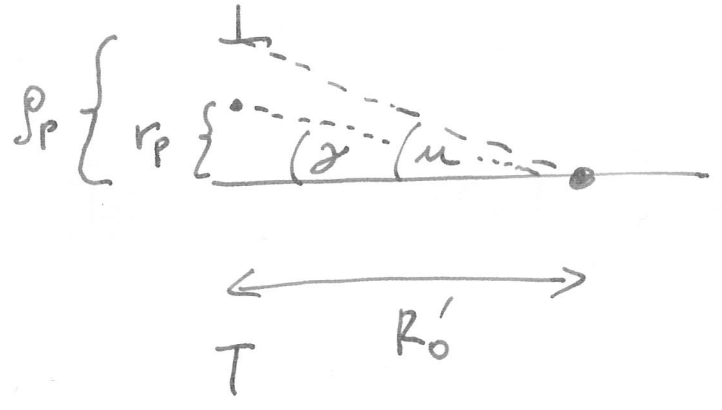
$$+\frac{2^2\alpha^4}{\beta^2}\int_0^1 e^{-\alpha^2x^2}x^3 J_2(\beta x)\,dx$$

$$= e^{-\alpha^2}\left[\frac{J_1(\beta)}{\beta} + \frac{J_2(\beta)}{\beta}\frac{2\alpha^2}{\beta} + \frac{J_3(\beta)}{\beta}\left(\frac{2\alpha^2}{\beta}\right)^2 + \dots\right]$$

$gh' \to gh$ $\quad\quad$ $gh' \to g'h$

$$= e^{-\alpha^2}\sum_{m=1}^{\infty} J_m(\beta)\, 2^{m-1}\,\frac{\alpha^{2(m-1)}}{\beta^m}$$

<u>aperturní úhel</u>



$$P(r_p) \sim e^{-(\underbrace{q u R_p}_{\gamma})^2}$$

$$u \cdot R_p = \frac{\rho_p}{R_0'}\cdot R_p = \frac{r_p}{R_0'} = \gamma$$

inv. apodizace

$$a(R') = \int_m^1 J_0(\underbrace{2\pi R'}_{\beta} R_p)\, R_p \, dR_p$$

$$= \underbrace{\int_0^1 J_0(\beta R_p) R_p \, dR_p}_{A} - \underbrace{\int_0^m J_0(\beta R_p) R_p \, dR_p}_{B}$$

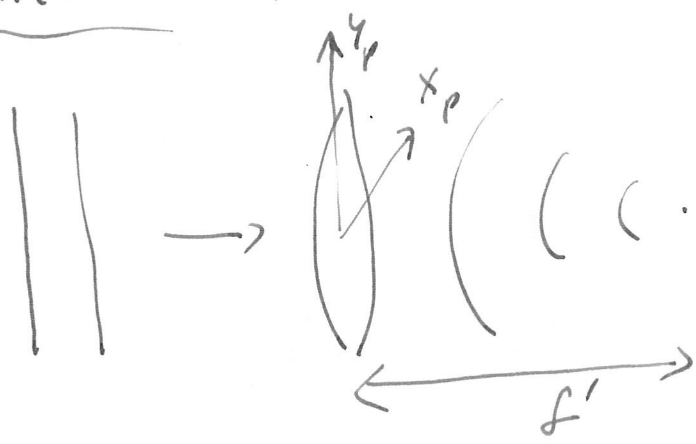
A $\quad \left. \dfrac{R_p J_1(\beta R_p)}{\beta} \right|_0^1 = \dfrac{J_1(\beta)}{\beta}$

B $\quad \left. \dfrac{R_p J_1(\beta R_p)}{\beta} \right|_0^m = \dfrac{m J_1(\beta m)}{\beta}$

$$a(R') = \frac{J_1(2\pi R')}{2\pi R'} - m^2 \frac{J_1(2\pi R' m)}{2\pi R' m}$$

difraktivní čočka

tenká čočka



$$t(x_p, y_p) \sim e^{-ikr} \approx e^{-i\frac{k}{2f'}(x_p^2+y_p^2)}$$

difraktivní čočka

$$t(x_p, y_p) \sim 1 + \cos\left[\alpha\,(x_p^2+y_p^2)\right]$$

$$e^{i\alpha(x_p^2+y_p^2)} \qquad e^{-i\alpha(x_p^2+y_p^2)}$$

$$\frac{k}{2f'} = \pm\alpha \quad \Rightarrow \quad f' = \pm\frac{k}{2\alpha} = \pm\frac{\pi}{\lambda\alpha}$$