Appendix: The rough derivation of Eq. (4, 5).

Bases on the Eqs. (21, 28) in [27], we can derive the amplitude modulation ratio of the output fluences at spatial frequency $k_{\perp max}$ to the one at ideal case. The ratio is:

$$A_t(\tau) = \frac{\int U(t)U^*(t-\tau)dt}{\int |U(t)|^2 dt}$$

where τ is defined by (21) in [27]. This ratio $A_t(\tau)$ can also be considered as $\frac{PTA_{out}-PTA_{ideal}}{PTA_{in}-PTA_{ideal}}$.

From $A_t(\tau) = \frac{PTA_{out}-PTA_{ideal}}{PTA_{in}-PTA_{ideal}}$ and Eq. (32) in [27], we can find that

$$\frac{PTA_{out} - PTA_{ideal}}{PTA_{in} - PTA_{ideal}} = T = exp\left(-\left(\frac{L_2 - L_1}{l}\right)^2\right)$$

Or

$$PTA_{out} = e^{-\left(\frac{\lambda\, \Delta L}{\Lambda c \tau_p}\right)^2}(PTA_{in} - PTA_{ideal}) + PTA_{ideal}$$

$$= e^{-\left(\frac{(L_2-L_1)}{l}\right)^2}(PTA_{in} - PTA_{ideal}) + PTA_{ideal}$$

Based on Eqs. (8, 21) in [27], we can achieve that: $\frac{\omega_0}{\Lambda} = \frac{2\pi c}{\lambda_0}$, $\frac{1}{\Lambda} = \frac{cos^3\beta}{cos\alpha(sin\alpha+|sin\beta|)}$.

Based on Eq. (32), we can deduce that: $l = \frac{c\tau_{FWHM}\Lambda}{\sqrt{\ln 2}\,\lambda}$

Hence $l = \frac{c\tau_{FWHM}\Lambda}{\sqrt{\ln 2}\,\lambda} = \frac{\tau_{FWHM}}{\sqrt{\ln 2}}\frac{c}{\lambda}\frac{2\pi\lambda}{k_{\perp max}\lambda_0}$

$$l = \frac{\tau_{FWHM}}{\sqrt{\ln 2}}\frac{1}{k_{\perp max}}\frac{2\pi c}{\lambda_0}$$

$$l = \frac{\tau_{FWHM}}{\sqrt{\ln 2}}\frac{1}{k_{\perp max}}\frac{\omega_0}{\Lambda}$$

As a result: $l = \frac{c\tau_{pFWHM}\Lambda}{\sqrt{\ln 2}\,\lambda} = \frac{\omega_0\tau_{FWHM}}{\sqrt{\ln 2}\cdot k_{\perp max}\cdot \Lambda} = \frac{\omega_0\tau_{FWHM}}{\sqrt{\ln 2}\cdot k_{\perp max}}\frac{cos^3\beta}{cos\alpha(sin\alpha+|sin\beta|)}$.