

$$I_{NLA}(E_{in}, a, \phi_{LO}, \alpha; \eta, t_{out}, \kappa, L, t_{NLA}, t_{\alpha}, t_{in}, t_{LO}) = \eta(|E_1|^2 - |E_2|^2),$$

$$E_1 = \frac{t_{out}}{\sqrt{2}}(E_{LO} + iE_{NLA}),$$

$$E_2 = \frac{t_{out}}{\sqrt{2}}(iE_{LO} + E_{NLA}),$$

$$E_{NLA} = f(E_{\alpha}),$$

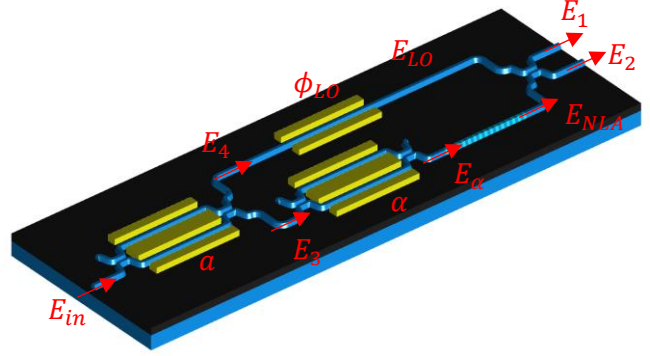
$$f(E_{\alpha}) = t_{NLA}E_{\alpha} \operatorname{sech}(\kappa LE_{\alpha}),$$

$$E_{\alpha} = t_{\alpha}\alpha E_3,$$

$$E_3 = t_{in}aE_{in},$$

$$E_{LO} = t_{LO}e^{i\phi_{LO}}E_4,$$

$$E_4 = t_{in}i\sqrt{1-a^2}E_{in}.$$



parameter	description	default value
η	photodetector quantum efficiency	1
t_{out}	output coupler field transmission coefficient	1
κ	nonlinear coupling coefficient	510 m^{-1}
L	PPLN length	$2 \times 10^{-3} \text{ m}$
t_{NLA}	PPLN field transmission coefficient	1
t_{α}	α modulator field transmission coefficient	1
t_{in}	input coupler field transmission coefficient	1
t_{LO}	LO modulator field transmission coefficient	1

$$I_{MAC}(E_{in}, a, \phi_{LO}, \alpha, \beta, \gamma, \phi; \eta, t_{out}, t_{MZI}, t_{\alpha}, t_{\beta}, t_{\gamma}, t_{\phi}, t_{in}, t_{LO}) = \eta(|E_1|^2 - |E_2|^2),$$

$$E_1 = \frac{t_{out}}{\sqrt{2}}(E_{LO} + iE_{MAC}),$$

$$E_2 = \frac{t_{out}}{\sqrt{2}}(iE_{LO} + E_{MAC}),$$

$$E_{MAC} = \frac{t_{MZI}}{\sqrt{2}}(E_{\beta\gamma} + iE_3),$$

$$E_{\beta\gamma} = t_{\gamma}\gamma E_{\beta},$$

$$E_{\beta} = \frac{t_{\beta}}{\sqrt{2}}\beta E_{\alpha},$$

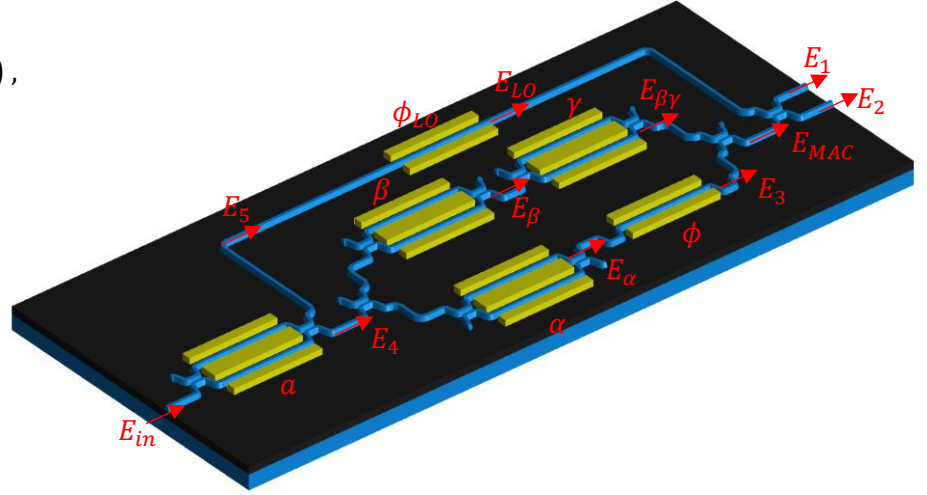
$$E_3 = t_{\phi}e^{i\phi}E_{\alpha},$$

$$E_{\alpha} = \frac{it_{\alpha}}{\sqrt{2}}\alpha E_4,$$

$$E_4 = t_{in}aE_{in},$$

$$E_{LO} = t_{LO}e^{i\phi_{LO}}E_5,$$

$$E_5 = t_{in}i\sqrt{1-a^2}E_{in}.$$



parameter	description	default value
η	photodetector quantum efficiency	1
t_{out}	output coupler field transmission coefficient	1
t_{MZI}	MZI field transmission coefficient	1
t_{α}	α modulator field transmission coefficient	1
t_{β}	β modulator field transmission coefficient	1
t_{γ}	γ modulator field transmission coefficient	1
t_{ϕ}	ϕ modulator field transmission coefficient	1
t_{in}	input coupler field transmission coefficient	1
t_{LO}	LO modulator field transmission coefficient	1