Above the grating:

$$U_z^{(2)} = A_0^{(2)} \exp\left(i\alpha_0 x - i\beta_0^{(2)} y\right) + \ldots$$

(incident)

$$B_{-N}^{(2)} \exp\left(i\alpha_{-N} x + i\beta_{-N}^{(2)} y\right) + \ldots +$$

$$B_{-1}^{(2)} \exp\left(i\alpha_{-1} x + i\beta_{-1}^{(2)} y\right) +$$

$n = -N$

$n = -1$

$$B_0^{(2)} \exp\left(i\alpha_0 x + i\beta_0^{(2)} y\right) +$$

$n = 0$

$$B_1^{(2)} \exp\left(i\alpha_1 x + i\beta_1^{(2)} y\right) +$$

$n = 1$

$$\ldots + B_N^{(2)} \exp\left(i\alpha_N x + i\beta_N^{(2)} y\right)$$

$n = N$

② Refractive index $\nu_2 = 1$
(vacuum)

θ_2 $\theta_{2,0}$

y

x

z

① Refractive index ν_1
(possibly complex, lossy)

$$\alpha_0 = k_2 \sin\theta_2$$
$$\alpha_n = \alpha_0 + \frac{2\pi n}{d}$$

$\theta_{1,0}$

$n = N$

$n = 1$

$n = 0$

$n = -1$

$n = -N$

$$\ldots + A_N^{(1)} \exp\left(i\alpha_N x + i\beta_N^{(1)} y\right)$$

$$A_1^{(1)} \exp\left(i\alpha_1 x + i\beta_1^{(1)} y\right) +$$

$$A_0^{(1)} \exp\left(i\alpha_0 x + i\beta_0^{(1)} y\right) +$$

$$A_{-1}^{(1)} \exp\left(i\alpha_{-1} x + i\beta_{-1}^{(1)} y\right) +$$

Inside the grating: $U_z^{(1)} = A_{-N}^{(1)} \exp\left(i\alpha_{-N} x + i\beta_{-N}^{(1)} y\right) + \ldots +$

$\theta_{2,n}$

$\boldsymbol{k}_{2,n}$

$k_{2,n,x} = k_2 \sin\theta_{2,n}$
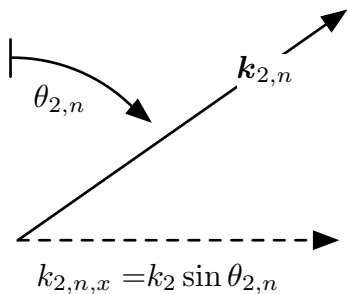
Reflected wavevectors $\boldsymbol{k}_{2,n}$

$k_{1,n,x} = k_1 \sin\theta_{1,n}$

$\theta_{1,n}$

$\boldsymbol{k}_{1,n}$
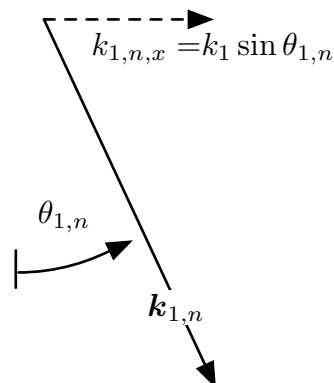
Transmitted wavevectors $\boldsymbol{k}_{1,n}$