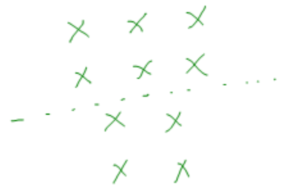
$$I_{tot} = \left| \sum_a f_a e^{i\vec{k}\cdot\vec{r}_a} \right|^2$$



$$A_{below} = \sum_{below} f_{a-below}\, e^{i\vec{k}\cdot\vec{R}_a}$$

$$A_{left} = \sum_{above,\,left} f_a e^{i\vec{k}\cdot\left(\vec{R}_a - \frac{\vec{b}}{2}\right)} = e^{-i\vec{k}\cdot\frac{\vec{b}}{2}} \sum_{left} e^{i\vec{k}\cdot\vec{R}_a}$$

$$A_{right} = \sum_{right} = f_a e^{i\vec{k}\cdot\left(\vec{R}_a + \frac{\vec{b}}{2}\right)} = e^{+i\vec{k}\cdot\frac{\vec{b}}{2}} \sum_{Right} e^{i\vec{k}\cdot\vec{R}_a}$$

$$I_{tot} = (A_{below} + A_{left} + A_{right})^2 = \left(A_b + (1 - i\vec{k}\cdot\tfrac{\vec{b}}{2})A_L^0 + (1 + i\vec{k}\cdot\tfrac{\vec{b}}{2})A_R^0\right)^2$$

$$= (A_b + A_L^0 + A_R^0)^2 + (\ \ -i\vec{k}\cdot\tfrac{\vec{b}}{2} A_L^0)^2 + (i\vec{k}\cdot\tfrac{\vec{b}}{2} A_R^0)^2$$

$$-2i\vec{k}\cdot\tfrac{\vec{b}}{2}(A_A^0)\cdot A_L^0 + 2i\vec{k}\cdot\tfrac{\vec{b}}{2} A_A^0\cdot A_R^0 + 2\vec{k}\cdot\tfrac{\vec{b}}{2} A_L^0\cdot A_R^0$$

$$= \underbrace{I_0 - \frac{(\vec{k}\cdot\vec{b})^2}{4}|A_L^0|^2 - \frac{(\vec{k}\cdot\vec{b})^2}{4}|A_R^0|^2}_{\text{reduced } I_0 \text{ at peak}} + i\vec{k}\cdot\vec{b}\, A_A^0(A_R^0 - A_L^0) + \underbrace{\vec{k}\cdot\vec{b}\ \ A_L^0\cdot A_R^0}$$

zero 'cause imaginary?

should be $\frac{1}{2}\vec{k}\cdot\vec{b}\,(A_L^0 A_R^{0*} + A_L^{0*} A_R^0)$

$A_L^0 \cdot A_R^0$ has fuzzy tails in direction of $\vec{b}$ and downwards

$$\sigma_m e^{ik_y a} = \sigma_m + 1 - e^{-ik_y a N_y}$$

$$\sigma_m = \frac{1 - e^{-ik_y a N_y}}{e^{ik_y a} - 1}$$

$$\sigma_n e^{-ik_z a} = \sigma_n + 1$$

$$\sigma_n = \frac{1 - e^{-ik_z a N_z}}{e^{+ik_z a} - 1}$$

semi- or quadra-infinite fourier transform.

$$\sum_{\substack{lmn\\ m<0\\ n<0}} e^{i(k_x a l + k_y a m + k_z a n)} = \left(\sum_l e^{ik_x a l}\right)\underbrace{\left(\sum_{m<0} e^{ik_y a m}\right)}_{\sigma_m}\left(\sum_{n<0} e^{ik_z a n}\right)$$

$$= \delta_n(l)$$

$$(A_L\cdot A_R^*)_m \to \frac{1 - e^{-ik_y a N_y}}{e^{ik_y a} - 1} \cdot \frac{(1 - e^{+ik_y a N_y'})^*}{(e^{-ik_y a} - 1)^*}$$

$$= Re\left\{\frac{(1 - e^{-ik_y a N_y})^2}{(e^{ik_y a} - 1)^2}\right\} \longrightarrow \sigma_m \text{ doesn't matter!}$$

$$(A_L\cdot A_R^*)_n = \frac{1 - e^{-ik_z a N}}{e^{ik_z a} - 1} \cdot \frac{1 - e^{+ik_z a N}}{e^{-ik_z a} - 1}$$

$$= \frac{2 - e^{-ik_z a N} - e^{+ik_z a N}}{2 - e^{ik_z a} - e^{-ik_z a}} = \frac{1 - \cos k_z a N}{1 - \cos k_z a} = \text{truncation rod in direction downward!}$$