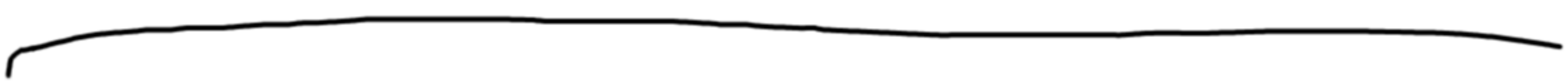
$$F(k,k') = \sum_x \sum_y f(x,y)\, e^{-2\pi i k x/N}\, e^{-2\pi i k' y/M}$$

$$= \sum_x e^{-2\pi i k x/N} \sum_y f(x,y)\, e^{-2\pi i k' y/M}$$



$k \longrightarrow$

$$E_{\text{two signal}} = E_1 e^{i(k_1 x - \omega_1 t)} + E_2 e^{i(k_2 x - \omega_2 t)}$$

Stationary noise : $\langle n_i \, n_j \rangle = g(|i-j|)$

$f(x)$, $\langle f(x) \, f(x+dx) \rangle = g(dx) \Rightarrow$ stationary

$$\langle f(k) f^*(k') \rangle = \left\langle \sum_x f(x) e^{-2\pi i k x/N} \sum_{x'} f(x') e^{2\pi i k' x'/N} \right\rangle$$

$\delta x = x' - x$, $x' = x + \delta x$

$$\langle f(k) f^*(k') \rangle = \left\langle \sum_x f(x) e^{-2\pi i k x/N} \sum_{dx} f(x+dx) e^{+2\pi i k'(x+dx)/N} \right\rangle$$

$$= \left\langle \sum_{dx} e^{2\pi i k' dx/N} \sum_x \underline{f(x) f(x+dx)} \, e^{2\pi i (k'-k) x/N} \right\rangle$$

$$= \sum_{dx} e^{2\pi i k' dx/L} g(dx) \underbrace{\sum_{x} e^{2\pi i (k'-k) x/L}}_{N\delta_{kk'} \;\Rightarrow\; k'=k}$$

$$= \sum_{dx} g(dx)\, N e^{2\pi i k dx/L}$$

$$\boxed{= N \sum_{dx} g(dx)\, e^{2\pi i k dx/L}}$$ if $k'=k$

$= 0$ if $k' \neq k$

in Fourier space, noise diagonal

$\langle |f(k)|^2 \rangle \sim FT(g) \Rightarrow$ Wiener Khinchin theorem:

for stat invariant noise $\langle |f(k)|^2 \rangle = FT(g(dx))$

$\langle n_i n_j \rangle = 0$ if $i \neq j$
$= n^2$ if $i = j$

$g(dx) = 1$ for $dx = 0$

$= 0$ for $dx \neq 0$

$\langle (f(x) - f(x+dx))^2 \rangle = C\,dx$

$\Rightarrow f(x) f(x+dx) = F(k) \sim k^{-2}$

FT (delta) = flat, constant

in fourier space, uncorrelated noise $\Rightarrow$ uncorrelated noise

"white noise"