

$$s[t] = \int \int \rho(x, y) e^{-t/T_2} e^{-j2\pi(\bar{\gamma}\Delta B_0(x, y)t + k_x x + k_y y)} dx dy$$

$$\rho_a(x, y) = \sum_i \theta_i \text{rect}(x - x_i, y - y_i)$$

$$s[t] = \sum_i \theta_i e^{-t/T_2} \int \int \text{rect}(x - x_i, y - y_i) e^{-j2\pi(\bar{\gamma}\Delta B_0(x, y)t + k_x x + k_y y)} dx dy$$

$$s[t] = \sum_i \theta_i e^{-t/T_2} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} \int_{y_i - \Delta y/2}^{y_i + \Delta y/2} e^{-j2\pi(\bar{\gamma}\Delta B_0(x, y)t + k_x x + k_y y)} dx dy$$

$$\Delta B_0(x, y) \approx B_0(x_i, y_i) + B_x(x_i, y_i)(x - x_i) + B_y(x_i, y_i)(y - y_i)$$

$$s[t] = \sum_i \theta_i e^{-t/T_2} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} \int_{y_i - \Delta y/2}^{y_i + \Delta y/2} e^{-j2\pi(\bar{\gamma}B_0(x_i, y_i)t + \bar{\gamma}B_x(x_i, y_i)(x - x_i)t + \bar{\gamma}B_y(x_i, y_i)(y - y_i)t + k_x x + k_y y)} dx dy$$

$$s[t] = \sum_i \theta_i e^{-j2\pi\bar{\gamma}B_0(x_i, y_i)t} e^{-t/T_2} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} \int_{y_i - \Delta y/2}^{y_i + \Delta y/2} e^{-j2\pi(\bar{\gamma}B_x(x_i, y_i)(x - x_i)t + \bar{\gamma}B_y(x_i, y_i)(y - y_i)t + k_x x + k_y y)} dx dy$$

$$s[t] = \sum_i \theta_i e^{-j2\pi\bar{\gamma}B_0(x_i, y_i)t} e^{-t/T_2} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} \int_{y_i - \Delta y/2}^{y_i + \Delta y/2} e^{-j2\pi(\bar{\gamma}B_x(x_i, y_i)x_i t - \bar{\gamma}B_x(x_i, y_i)x_i t + \bar{\gamma}B_y(x_i, y_i)y_i t - \bar{\gamma}B_y(x_i, y_i)y_i t + k_x x + k_y y)} dx dy$$

$$s[t] = \sum_i \theta_i e^{-j\gamma B_0(x_i, y_i)t} e^{-t/T_2} e^{j\gamma B_x(x_i, y_i)x_i t} e^{j\gamma B_y(x_i, y_i)y_i t} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} \int_{y_i - \Delta y/2}^{y_i + \Delta y/2} e^{-j2\pi(\bar{\gamma}B_x(x_i, y_i)x t + \bar{\gamma}B_y(x_i, y_i)y t + k_x x + k_y y)} dx dy$$

$$s[t] = \sum_i \theta_i e^{-j\gamma B_0(x_i, y_i)t} e^{-t/T_2} e^{j\gamma B_x(x_i, y_i)x_i t} e^{j\gamma B_y(x_i, y_i)y_i t} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} \int_{y_i - \Delta y/2}^{y_i + \Delta y/2} e^{-j2\pi((\bar{\gamma}B_x(x_i, y_i)t + k_x)x + (\bar{\gamma}B_y(x_i, y_i)t + k_y)y)} dx dy$$

$$s[t] = \text{"} e^{j\gamma B_x(x_i, y_i)x_i t} e^{j\gamma B_y(x_i, y_i)y_i t} \frac{-1}{j2\pi(\bar{\gamma}B_y t + k_y)} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} e^{-j2\pi((\bar{\gamma}B_x(x_i, y_i)t + k_x)x + (\bar{\gamma}B_y(x_i, y_i)t + k_y)y)} \Big|_{y_i - \Delta y/2}^{y_i + \Delta y/2} dx$$

$$s[t] = \text{"} e^{j\gamma B_x(x_i, y_i)x_i t} e^{j\gamma B_y(x_i, y_i)y_i t} \frac{-1}{j2\pi(\bar{\gamma}B_y t + k_y)} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} e^{-j2\pi((\bar{\gamma}B_x(x_i, y_i)t + k_x)x + (\bar{\gamma}B_y(x_i, y_i)t + k_y)(y_i + \Delta y/2))} - \\ e^{-j2\pi((\bar{\gamma}B_x(x_i, y_i)t + k_x)x + (\bar{\gamma}B_y(x_i, y_i)t + k_y)(y_i - \Delta y/2))} dx$$

$$s[t] = \text{"} e^{j\gamma B_x(x_i, y_i)x_i t} e^{j\gamma B_y(x_i, y_i)y_i t} \frac{-1}{j2\pi(\bar{\gamma}B_y t + k_y)} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} e^{-j2\pi((\bar{\gamma}B_x(x_i, y_i)t + k_x)x + (\bar{\gamma}B_y(x_i, y_i)t + k_y)\Delta y/2)} - \\ e^{-j2\pi((\bar{\gamma}B_x(x_i, y_i)t + k_x)x + (\bar{\gamma}B_y(x_i, y_i)t + k_y)(-\Delta y/2))} dx$$

$$s[t] = \text{"} e^{j\gamma B_x(x_i, y_i)x_i t} e^{j\gamma B_y(x_i, y_i)y_i t} \frac{-1}{j2\pi(\bar{\gamma}B_y t + k_y)} \int_{x_i - \Delta x/2}^{x_i + \Delta x/2} e^{-j2\pi((\bar{\gamma}B_x(x_i, y_i)t + k_x)x} dx$$