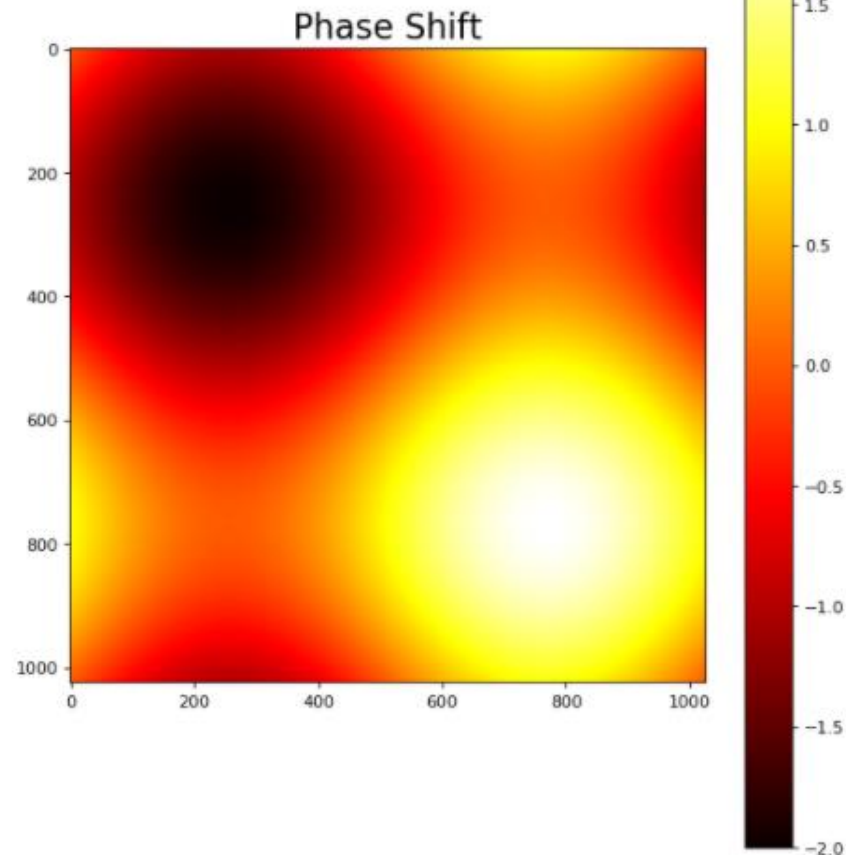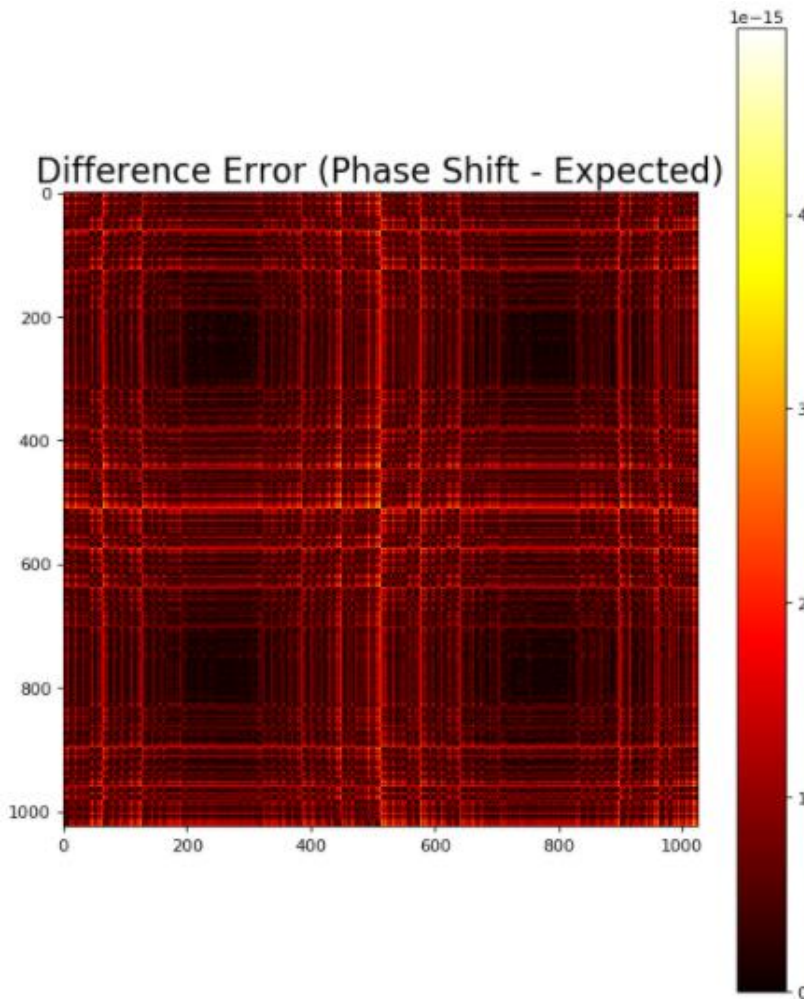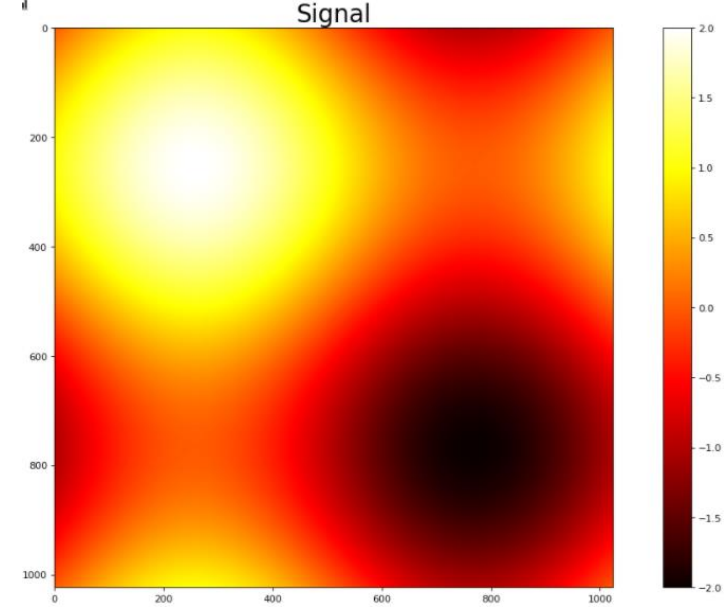# Phase retrieval and calculation of error (error around 10^-15)

FFT derivative

$$\frac{d^2 f}{dx^2} = FFT^{-1}\{(ik)^2 FFT\{f\}\}$$

$$[phase\ shift] = FFT^{-1}\left\{\frac{FFT\{Signal\}}{(ik)^2}\right\}$$

Signal

Difference Error (Phase Shift - Expected)

Phase Shift

$$\frac{d^2}{dx^2}\sin(x) = \sin(x + \pi) = -\sin(x)$$

To compare to FFT result