Then, by rearranging and using $\sin^2 x = 1 - \cos^2 x$

$$\left(\frac{E_x(r)}{A_x}\right)^2 + \left(\frac{E_y(r)}{A_y}\right)^2 + 2\left(\frac{E_x(r)}{A_x}\right)\left(\frac{E_y(r)}{A_y}\right)\cos(\phi_x) = \sin^2(\phi_x)$$

Finally by noting that

$\phi_{yx} = \phi_y$ and that $\phi_{yx} = \phi_y - \phi_x$ and using

$\phi_y = 0$, implies that $\phi_{yx} = -\phi_x$

and realizing that $\cos(-\phi_{yx}) = -\cos(\phi_{yx})$

and that $\sin^2(-\phi_x) = \sin^2(\phi_x)$

we obtain the final result

$$\left(\frac{E_x(r)}{A_x}\right)^2 + \left(\frac{E_y(r)}{A_y}\right)^2 - 2\cos(\phi_{yx})\left(\frac{E_x(r)}{A_x}\right)\left(\frac{E_y(r)}{A_y}\right) = \sin^2(\phi_{yx})$$