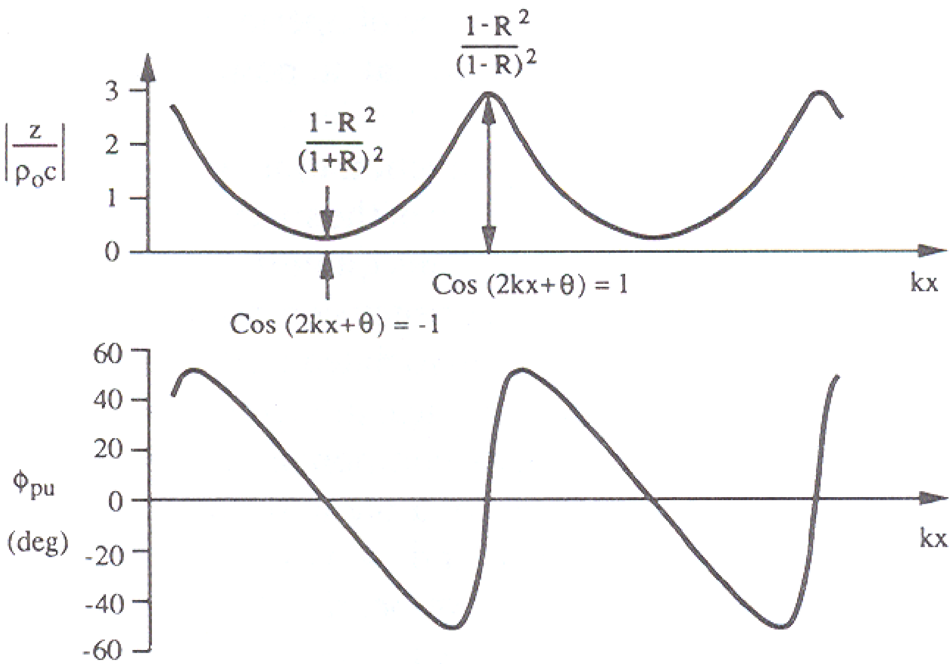
A perhaps somewhat more general situation associated with two counter-propagating monochromatic plane waves in "***free air***", is *e.g.* the case when $|\tilde{R}| \equiv |\tilde{B}|/|\tilde{A}| = 0.5$ and $\Delta\varphi_{BA}^{o} = 0.5$; the {normalized} magnitude of the complex longitudinal ***specific*** acoustic impedance $|\tilde{z}_{tot}^{\parallel}(x)|/z_o = |\tilde{z}_{tot}^{\parallel}(x)|/\rho_o c$ and its phase $\varphi_z(x) = \Delta\varphi_{p_{tot}-u_{tot}^{\parallel}}(x) = \varphi_{p_{tot}}(x) - \varphi_{u_{tot}^{\parallel}}(x)$ *vs.* kx are shown in the figure(s) below.



The complex ***frequency-domain*** total/resultant complex longitudinal sound intensity associated with two counter-propagating monochromatic plane waves in "***free air***" , with $k = \omega/c$ is:

$$\tilde{I}_{a_{tot}}^{\parallel}(x,\omega) \equiv \frac{1}{2}\tilde{p}_{tot}(x,\omega)\cdot\tilde{u}_{tot}^{\parallel *}(x,\omega)$$

$$= \frac{1}{2}\tilde{A}\left[1 + |\tilde{R}|e^{i(2kx+\Delta\varphi_{BA}^{o})}\right]\cancel{e^{i(\omega t - kx)}}\cdot\frac{\tilde{A}^*}{\rho_o c}\left[1 - |\tilde{R}|e^{-i(2kx+\Delta\varphi_{BA}^{o})}\right]\cancel{e^{-i(\omega t - kx)}}$$

$$= \frac{1}{2}\frac{|\tilde{A}|^2}{\rho_o c}\left[1 + |\tilde{R}|e^{i(2kx+\Delta\varphi_{BA}^{o})}\right]\cdot\left[1 - |\tilde{R}|e^{-i(2kx+\Delta\varphi_{BA}^{o})}\right]$$

$$= \frac{1}{2}\frac{|\tilde{A}|^2}{\rho_o c}\left[1 + |\tilde{R}|\left\{e^{i(2kx+\Delta\varphi_{BA}^{o})} - e^{-i(2kx+\Delta\varphi_{BA}^{o})}\right\} - |\tilde{R}|^2\right] \quad \text{and using: } z_o \equiv \rho_o c$$

$$= \frac{1}{2}\frac{|\tilde{A}|^2}{z_o}\left[1 + 2i|\tilde{R}|\sin\left(2kx + \Delta\varphi_{BA}^{o}\right) - |\tilde{R}|^2\right] = \frac{1}{2}\frac{|\tilde{A}|^2}{z_o}\left[\left\{1 - |\tilde{R}|^2\right\} + 2i|\tilde{R}|\sin\left(2kx + \Delta\varphi_{BA}^{o}\right)\right]$$