Using the Euler relations: $\cos\theta \equiv \frac{1}{2}\left(e^{i\theta}+e^{-i\theta}\right)$ and: $\sin\theta \equiv \frac{1}{2i}\left(e^{i\theta}-e^{-i\theta}\right)$:

$$\tilde{z}_{a\,tot}^{\parallel}(x) = z_o \frac{\left[\left\{1-\left|\tilde{R}\right|^2\right\}+2i\left|\tilde{R}\right|\sin\left(2kx+\Delta\varphi_{BA}^{o}\right)\right]}{\left[\left\{1+\left|\tilde{R}\right|^2\right\}-2\left|\tilde{R}\right|\cos\left(2kx+\Delta\varphi_{BA}^{o}\right)\right]}$$

We can also write this as a dimensionless quantity:

$$\frac{\tilde{z}_{a\,tot}^{\parallel}(x)}{z_o} = \frac{\left[\left\{1-\left|\tilde{R}\right|^2\right\}+2i\left|\tilde{R}\right|\sin\left(2kx+\Delta\varphi_{BA}^{o}\right)\right]}{\left[\left\{1+\left|\tilde{R}\right|^2\right\}-2\left|\tilde{R}\right|\cos\left(2kx+\Delta\varphi_{BA}^{o}\right)\right]} = \frac{\tilde{c}_{a\,tot}^{\parallel}(x)}{c}$$

Note that $\tilde{z}_{tot}^{\parallel}(x)$ and $\tilde{c}_{a\,tot}^{\parallel}(x)$ have ***no*** explicit time dependence, but both have spatial/position (x-) and frequency (f-) dependence (via the wavenumber $k = 2\pi/\lambda = 2\pi f/c = \omega/c$)!

The ***magnitude*** of the complex longitudinal specific acoustic impedance associated with the two counter-propagating 1-D monochromatic plane waves is:

$$\left|\tilde{z}_{a\,tot}^{\parallel}(x)\right| \equiv \sqrt{\tilde{z}_{tot}^{\parallel}(x)\cdot\tilde{z}_{tot}^{\parallel *}(x)}$$

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

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

$$= z_o \frac{\sqrt{\left\{1-\left|\tilde{R}\right|^2\right\}^2+4\left|\tilde{R}\right|^2\sin^2\left(2kx+\Delta\varphi_{BA}^{o}\right)}}{\left[\left\{1+\left|\tilde{R}\right|^2\right\}-2\left|\tilde{R}\right|\cos\left(2kx+\Delta\varphi_{BA}^{o}\right)\right]}$$

Again, we can write this as a dimensionless quantity:

$$\frac{\left|\tilde{z}_{a\,tot}^{\parallel}(x)\right|}{z_o} = \frac{\sqrt{\left\{1-\left|\tilde{R}\right|^2\right\}^2+4\left|\tilde{R}\right|^2\sin^2\left(2kx+\Delta\varphi_{BA}^{o}\right)}}{\left[\left\{1+\left|\tilde{R}\right|^2\right\}-2\left|\tilde{R}\right|\cos\left(2kx+\Delta\varphi_{BA}^{o}\right)\right]} = \frac{\left|\tilde{c}_{a\,tot}^{\parallel}(x)\right|}{c}$$