The complex sound field $\tilde{S}(\vec{r},t)$ associated with a "point" monopole sound source radiating monochromatic, radially-outgoing spherical waves thus has ***three*** basic regions, or zones:

(a) **The "near" zone:** $kr \ll 1$, the radial particle velocity $\tilde{u}_{\text{r}}(r,t) \sim -i\left|\tilde{B}\right|/z_o kr^2$ is largely ***imaginary*** (*i.e.* ***reactive***), decreasing as $\sim 1/r^2$ (while the pressure $\tilde{p}(r,t) \sim \left|\tilde{B}\right|/r$ decreases as $\sim 1/r$), and where the particle velocity ***lags*** the pressure by $\varphi_p - \varphi_u = \tan^{-1}(1/kr) \sim \tan^{-1}(\infty) \sim 90^{\text{o}}$ in phase. This region of the complex sound field $\tilde{S}(\vec{r},t)$ is ***reactive***, largely consisting of ***non-propagating*** acoustic energy, and is also ***inertia***-like (*i.e.* ***mass***-like), because $u_{\text{r}\,i}(r) = \text{Im}\{\tilde{u}_{\text{r}}(r)\} < 0$ for $kr \ll 1$.

(b) **The "intermediate" zone:** $kr \sim 1$, the radial particle velocity $\tilde{u}_{\text{r}}(r,t) \sim (1-i)\left|\tilde{B}\right|/2z_o r$ has ~ comparable ***real*** and ***imaginary*** components, decreasing somewhat/slightly faster than $\sim 1/r$ (while the pressure $\tilde{p}(r,t) \sim \left|\tilde{B}\right|/r$ decreases as $\sim 1/r$), and where the particle velocity ***lags*** the pressure by $\varphi_p - \varphi_u = \tan^{-1}(1/kr) \sim \tan^{-1}(1) \sim 45^{\text{o}}$ in phase. This region of the complex sound field $\tilde{S}(\vec{r},t)$ is ~ an ***equal*** mix of ***propagating*** and ***non-propagating*** acoustic energy.

(c) **The "far" (or radiation) zone:** $kr \gg 1$, the radial particle velocity $\tilde{u}_{\text{r}}(r,t) \sim 1\left|\tilde{B}\right|/z_o r$ is largely ***real*** (i.e. ***active***), decreasing $\sim 1/r$ (while the pressure $\tilde{p}(r,t) \sim \left|\tilde{B}\right|/r$ also decreases as $\sim 1/r$), and where the radial particle velocity is ***in-phase*** with the pressure, *i.e.* $\varphi_p - \varphi_u = \tan^{-1}(1/kr) \sim \tan^{-1}(0) \sim 0^{\text{o}}$. This region of the complex sound field $\tilde{S}(\vec{r},t)$ is ***active***, dominated by ***propagating*** acoustic energy.

The radial complex ***specific*** acoustic impedance and its magnitude are:

$$\tilde{z}_{a_{\text{r}}}(r,\omega) \equiv \frac{\tilde{p}(r,\omega)}{\tilde{u}_{\text{r}}(r,\omega)} = z_o \frac{1}{[1-i/kr]} = z_o \frac{[1+i/kr]}{\left[1+(1/kr)^2\right]} \quad \text{and:} \quad \left|\tilde{z}_{a_{\text{r}}}(r,\omega)\right| = z_o \frac{\sqrt{1+(1/kr)^2}}{\left[1+(1/kr)^2\right]} = z_o \frac{1}{\sqrt{1+(1/kr)^2}}$$

Note that since $\tilde{z}_{a_{\text{r}}}(r,\omega) = \rho_o \tilde{c}_{a_{\text{r}}}(r,\omega)$ these relations can be written in dimensionless form as:

$$\frac{\tilde{z}_{a_{\text{r}}}(r,\omega)}{z_o} = \frac{[1+i/kr]}{\left[1+(1/kr)^2\right]} = \frac{\tilde{c}_{a_{\text{r}}}(r,\omega)}{c} \quad \text{and:} \quad \frac{\left|\tilde{z}_{a_{\text{r}}}(r,\omega)\right|}{z_o} = \frac{1}{\sqrt{1+(1/kr)^2}} = \frac{\left|\tilde{c}_{a_{\text{r}}}(r,\omega)\right|}{c}$$

The real and imaginary parts of the complex radial ***specific*** acoustic impedance associated with the point monopole sound source are thus:

$$z_{a_{\text{r}}}^{\text{r}}(r,\omega) = \text{Re}\{\tilde{z}_{a_{\text{r}}}(r,\omega)\} = z_o \frac{1}{\left[1+(1/kr)^2\right]} \quad \text{and:} \quad z_{a_{\text{r}}}^{\text{i}}(r,\omega) = \text{Im}\{\tilde{z}_{a_{\text{r}}}(r,\omega)\} = z_o \frac{1/kr}{\left[1+(1/kr)^2\right]}$$