$$\left|\vec{\tilde{z}}_a(\vec{r},t)\right| = \sqrt{\vec{\tilde{z}}_a(\vec{r},t)\bullet\vec{\tilde{z}}_a^*(\vec{r},t)} = \sqrt{\left|\tilde{z}_{a_x}(\vec{r},t)\right|^2+\left|\tilde{z}_{a_y}(\vec{r},t)\right|^2+\left|\tilde{z}_{a_z}(\vec{r},t)\right|^2}$$

$$= \sqrt{\frac{\left|\tilde{p}(\vec{r},t)\right|^2\left|\tilde{u}_x(\vec{r},t)\right|^2}{\left(\left|\vec{\tilde{u}}(\vec{r},t)\right|^2\right)^2}+\frac{\left|\tilde{p}(\vec{r},t)\right|^2\left|\tilde{u}_y(\vec{r},t)\right|^2}{\left(\left|\vec{\tilde{u}}(\vec{r},t)\right|^2\right)^2}+\frac{\left|\tilde{p}(\vec{r},t)\right|^2\left|\tilde{u}_z(\vec{r},t)\right|^2}{\left(\left|\vec{\tilde{u}}(\vec{r},t)\right|^2\right)^2}}$$

$$= \sqrt{\frac{\left|\tilde{p}(\vec{r},t)\right|^2\left[\left|\tilde{u}_x(\vec{r},t)\right|^2+\left|\tilde{u}_y(\vec{r},t)\right|^2+\left|\tilde{u}_z(\vec{r},t)\right|^2\right]}{\left(\left|\vec{\tilde{u}}(\vec{r},t)\right|^2\right)^2}} = \sqrt{\frac{\left|\tilde{p}(\vec{r},t)\right|^2\cancel{\left|\vec{\tilde{u}}(\vec{r},t)\right|^2}}{\left(\left|\vec{\tilde{u}}(\vec{r},t)\right|^2\right)^{\cancel{2}}}}$$

$$= \sqrt{\frac{\left|\tilde{p}(\vec{r},t)\right|^2}{\left|\vec{\tilde{u}}(\vec{r},t)\right|^2}} = \frac{\left|\tilde{p}(\vec{r},t)\right|}{\left|\vec{\tilde{u}}(\vec{r},t)\right|} = \frac{1}{\left|\vec{\tilde{y}}_a(\vec{r},t)\right|}$$

However, we also see for the individual *x*, *y*, *z* components of the complex 3-D vector specific acoustic immittances that:

$$\left\{\tilde{y}_{a_x}(\vec{r},t) \equiv \frac{\tilde{u}_x(\vec{r},t)}{\tilde{p}(\vec{r},t)}\right\} \neq \left\{\frac{1}{\tilde{z}_{a_x}(\vec{r},t)} \equiv \frac{\left|\vec{\tilde{u}}(\vec{r},t)\right|^2}{\tilde{p}(\vec{r},t)\tilde{u}_x^*(\vec{r},t)}\right\}$$

$$\left\{\tilde{y}_{a_y}(\vec{r},t) \equiv \frac{\tilde{u}_y(\vec{r},t)}{\tilde{p}(\vec{r},t)}\right\} \neq \left\{\frac{1}{\tilde{z}_{a_y}(\vec{r},t)} \equiv \frac{\left|\vec{\tilde{u}}(\vec{r},t)\right|^2}{\tilde{p}(\vec{r},t)\tilde{u}_y^*(\vec{r},t)}\right\}$$

$$\left\{\tilde{y}_{a_z}(\vec{r},t) \equiv \frac{\tilde{u}_z(\vec{r},t)}{\tilde{p}(\vec{r},t)}\right\} \neq \left\{\frac{1}{\tilde{z}_{a_z}(\vec{r},t)} \equiv \frac{\left|\vec{\tilde{u}}(\vec{r},t)\right|^2}{\tilde{p}(\vec{r},t)\tilde{u}_z^*(\vec{r},t)}\right\}$$

Additionally, the expressions for the complex 3-D vector specific acoustic immittances:

$$\vec{\tilde{y}}_a(\vec{r},t) \equiv \frac{\vec{\tilde{u}}(\vec{r},t)}{\tilde{p}(\vec{r},t)} = \tilde{y}_{a_x}(\vec{r},t)\hat{x}+\tilde{y}_{a_y}(\vec{r},t)\hat{y}+\tilde{y}_{a_z}(\vec{r},t)\hat{z} = \frac{\tilde{u}_x(\vec{r},t)}{\tilde{p}(\vec{r},t)}\hat{x}+\frac{\tilde{u}_y(\vec{r},t)}{\tilde{p}(\vec{r},t)}\hat{y}+\frac{\tilde{u}_z(\vec{r},t)}{\tilde{p}(\vec{r},t)}\hat{z}$$

and:

$$\vec{\tilde{z}}_a(\vec{r},t) \equiv \frac{\tilde{p}(\vec{r},t)}{\vec{\tilde{u}}(\vec{r},t)} = \tilde{z}_{a_x}(\vec{r},t)\hat{x}+\tilde{z}_{a_y}(\vec{r},t)\hat{y}+\tilde{z}_{a_z}(\vec{r},t)\hat{z} = \frac{\tilde{p}(\vec{r},t)\left[\tilde{u}_x^*(\vec{r},t)\hat{x}+\tilde{u}_y^*(\vec{r},t)\hat{y}+\tilde{u}_z^*(\vec{r},t)\hat{z}\right]}{\left|\vec{\tilde{u}}(\vec{r},t)\right|^2}$$

can be seen to mathematically behave properly *e.g.* under arbitrary rotations of the local 3-D coordinate system, as well as for rotations of 3-D sound sources, and also for complex 3-D sound fields composed of *e.g.* an arbitrary superposition/linear combination of three mutually-orthogonal propagating monochromatic plane traveling waves – propagating in the $+\hat{x}$, $+\hat{y}$ and $+\hat{z}$ directions, with common scalar complex pressure, $\tilde{p}_{tot}(\vec{r},t) = \tilde{p}_1(\vec{r},t)+\tilde{p}_2(\vec{r},t)+\tilde{p}_3(\vec{r},t)$.