1. The tangential field in the opening given by (3.186) is

$$\mathbf{E}_{\tan}(\rho) = \frac{E_0}{\pi}\frac{\boldsymbol{\rho}}{\sqrt{R^2-\rho^2}} \tag{1}$$

   Then by (9.72), the effective electric dipole is

$$\begin{aligned}
\mathbf{p}_{\text{eff}} &= \epsilon\mathbf{n}\int(\mathbf{x}\cdot\mathbf{E}_{\tan})\,da = \epsilon\mathbf{n}\int\frac{E_0}{\pi}\frac{\rho^2}{\sqrt{R^2-\rho^2}}da && \text{note } \mathbf{n}E_0 = -\mathbf{E}_0 \text{ by the sign convention}\\
&= -\epsilon\frac{\mathbf{E}_0}{\pi}\cdot 2\pi\int_0^R\frac{\rho^2}{\sqrt{R^2-\rho^2}}\rho\,d\rho && \text{let } \rho = R\sin\theta\\
&= -2\epsilon R^3\mathbf{E}_0\int_0^{\pi/2}\sin^3\theta\,d\theta\\
&= -\frac{4\epsilon R^3\mathbf{E}_0}{3} && \Longrightarrow\\
\gamma^E &= -\frac{4R^3}{3}
\end{aligned} \tag{2}$$

2. By (9.72),

$$\begin{aligned}
i\mu\omega\mathbf{m}_{\text{eff}} &= 2\int\mathbf{n}\times\mathbf{E}_{\tan}da = 2\int\frac{E_0}{\pi}\frac{\rho}{\sqrt{R^2-\rho^2}}\hat{\boldsymbol{\phi}}\,da\\
&= 2\frac{E_0}{\pi}\overbrace{\int_0^{2\pi}(-\sin\phi\,\hat{\mathbf{x}}+\cos\phi\,\hat{\mathbf{y}})\,d\phi}^{0}\int_0^R\frac{\rho^2}{\sqrt{R^2-\rho^2}}d\rho = 0
\end{aligned} \tag{3}$$

3. But if we calculate the effective magnetic dipole using (9.74) and (5.132)

$$\begin{aligned}
\mathbf{m}_{\text{eff}} &= 2\int\mathbf{x}(\mathbf{n}\cdot\mathbf{H})\,da = 2\int\boldsymbol{\rho}\frac{2H_0}{\pi}\frac{\rho}{\sqrt{R^2-\rho^2}}\sin\phi\,da\\
&= \frac{4H_0}{\pi}\overbrace{\int_0^{2\pi}(\cos\phi\,\hat{\mathbf{x}}+\sin\phi\,\hat{\mathbf{y}})\sin\phi\,d\phi}^{\pi\hat{\mathbf{y}}}\underbrace{\int_0^R\frac{\rho^3}{\sqrt{R^2-\rho^2}}d\rho}_{R^3\cdot 2/3} = \frac{8H_0R^3}{3}\hat{\mathbf{y}}
\end{aligned} \tag{4}$$

   Refer back to figure 5.15, we see that the direction of $\mathbf{H}_0$ is along the $\hat{\mathbf{y}}$ direction, which means the effective magnetic polarizability (without referencing to a particular orientation of frame) is

$$\gamma^M_{\alpha\beta} = \frac{8R^3}{3}\delta_{\alpha\beta} \tag{5}$$

4. The difference between (3) and (4) is explained by the text (end of first paragraph of on page 423): *To lowest order their time dependence can be ignored, provided the effective dipole moment is related to* $\mathbf{E}_0$ *and the magnetic moment to* $\mathbf{H}_0$.