For an oscillating electric dipole, $\mathbf{H} = \frac{ck^2}{4\pi}\frac{e^{ikr}}{r}\hat{\mathbf{r}} \times \mathbf{p}$, $\mathbf{E} = -Z_0\hat{\mathbf{r}} \times \mathbf{H}$, the time-averaged power per solid angle is

$$\begin{aligned}
\frac{\mathrm{d}P}{\mathrm{d}\Omega} &= \mathrm{Re}\left[r^2\hat{\mathbf{r}} \cdot \frac{1}{2}\mathbf{E} \times \mathbf{H}^*\right] = \mathrm{Re}\left[r^2\hat{\mathbf{r}} \cdot \frac{1}{2}(-Z_0\hat{\mathbf{r}} \times \mathbf{H}) \times \mathbf{H}^*\right] \\
&= \frac{Z_0 r^2}{2}\mathrm{Re}\left\{\hat{\mathbf{r}} \cdot [\mathbf{H}^* \times (\hat{\mathbf{r}} \times \mathbf{H})]\right\} \\
&= \frac{Z_0 r^2}{2}\mathrm{Re}\left\{\hat{\mathbf{r}} \cdot [\hat{\mathbf{r}}(\mathbf{H}^* \cdot \mathbf{H}) - \mathbf{H}(\hat{\mathbf{r}} \cdot \mathbf{H}^*)]\right\} \qquad \leftarrow \hat{\mathbf{r}} \cdot \mathbf{H}^* \propto \hat{\mathbf{r}} \cdot (\hat{\mathbf{r}} \times \mathbf{p}^*) = 0 \\
&= \frac{Z_0 r^2}{2}\left|\mathbf{H}\right|^2 = \frac{Z_0 r^2}{2}\left|\frac{ck^2}{4\pi}\frac{e^{ikr}}{r}\hat{\mathbf{r}} \times \mathbf{p}\right|^2 = \frac{Z_0 c^2 k^4}{32\pi^2}\left|\hat{\mathbf{r}} \times \mathbf{p}\right|^2 \\
&= \frac{Z_0 c^2 k^4}{32\pi^2}\left|\mathbf{p}\right|^2 \sin^2\theta.
\end{aligned}$$

The total power is

$$\begin{aligned}
P &= \int \frac{\mathrm{d}P}{\mathrm{d}\Omega}\mathrm{d}\Omega = \frac{Z_0 c^2 k^4}{32\pi^2}\left|\mathbf{p}\right|^2 \iint \sin^2\theta \sin\theta \mathrm{d}\theta \mathrm{d}\phi \qquad \leftarrow z = \cos\theta \\
&= \frac{Z_0 c^2 k^4}{32\pi^2}\left|\mathbf{p}\right|^2 \cdot 2\pi \cdot \int_{-1}^{1}(1 - z^2)\mathrm{d}z \\
&= \frac{Z_0 c^2 k^4 \left|\mathbf{p}\right|^2}{12\pi^2}
\end{aligned}$$