We want to express the electric field so its transverse component is circularly polarized, i.e.

$$\mathbf{E}_{\text{trans}}(\mathbf{x},t)=E_0(\mathbf{x},y)(\hat{\mathbf{e}}_1\pm i\hat{\mathbf{e}}_2)e^{ikz-i\omega t} \tag{1}$$

However if this is the whole thing, to satisfy $\nabla\cdot\mathbf{E}=0$, we must have

$$\frac{\partial E_0(x,y)}{\partial x}\pm i\frac{\partial E_0(x,y)}{\partial y}=0 \tag{2}$$

which means the amplitude E_0 is a constant for all x,y, which violates the finite extent assumption.

This contradiction means the electric field must have a longitudinal component, i.e.,

$$\mathbf{E}(\mathbf{x},t)=\left[E_0(x,y)(\hat{\mathbf{e}}_1\pm i\hat{\mathbf{e}}_2)+F(x,y)\hat{\mathbf{e}}_3\right]e^{ikz-i\omega t} \tag{3}$$

Then $\nabla\cdot\mathbf{E}=0$ requires

$$\frac{\partial E_0(x,y)}{\partial x}\pm i\frac{\partial E_0(x,y)}{\partial y}+ikF(x,y)=0 \qquad\Longrightarrow\qquad F(x,y)=\frac{i}{k}\left(\frac{\partial E_0}{\partial x}\pm i\frac{\partial E_0}{\partial y}\right) \tag{4}$$

Moreover, $-\partial\mathbf{B}/\partial t=\nabla\times\mathbf{E}$ implies

$$\begin{aligned}
i\omega\mathbf{B}=\nabla\times\mathbf{E}&=e^{ikz-\omega t}\left\{\hat{\mathbf{e}}_1\left[\frac{\partial F}{\partial y}-ik(\pm iE_0)\right]+\hat{\mathbf{e}}_2\left(ikE_0-\frac{\partial F}{\partial x}\right)+\hat{\mathbf{e}}_3\left[\frac{\partial(\pm iE_0)}{\partial x}-\frac{\partial E_0}{\partial y}\right]\right\}\\
&\approx e^{ikz-i\omega t}\left[\pm kE_0\hat{\mathbf{e}}_1+ikE_0\hat{\mathbf{e}}_2\pm i\left(\frac{\partial E_0}{\partial x}\pm i\frac{\partial E_0}{\partial y}\right)\hat{\mathbf{e}}_3\right]\\
&=\pm k\left[E_0(\hat{\mathbf{e}}_1\pm i\hat{\mathbf{e}}_2)+F\hat{\mathbf{e}}_3\right]e^{ikz-i\omega t}=\pm k\mathbf{E}
\end{aligned} \tag{5}$$

where the approximation ignores the second order space derivatives $\partial F/\partial x,\partial F/\partial y$.

This gives

$$\mathbf{B}\approx\mp\frac{ik}{\omega}\mathbf{E}=\mp i\sqrt{\mu\epsilon}\mathbf{E} \tag{6}$$