Consideriamo il caso in cui nel vuoto, per semplicità, tutte le derivate rispetto a x e y siano nulle. In questo caso le equazioni di Maxwell si riducono a

$$\nabla \times \vec{\mathcal{H}} = \epsilon_o \frac{\partial \vec{\mathcal{E}}}{\partial t} \Rightarrow \begin{cases} -\frac{\partial \mathcal{H}_y}{\partial z} = \epsilon_o \frac{\partial \mathcal{E}_x}{\partial t} \\ \frac{\partial \mathcal{H}_x}{\partial z} = \epsilon_o \frac{\partial \mathcal{E}_y}{\partial t} \\ 0 = \epsilon_o \frac{\partial \mathcal{E}_z}{\partial t} \end{cases}$$

$$-\nabla \times \vec{\mathcal{E}} = \mu_o \frac{\partial \vec{\mathcal{H}}}{\partial t} \Rightarrow \begin{cases} \frac{\partial \mathcal{E}_y}{\partial z} = \mu_o \frac{\partial \mathcal{H}_x}{\partial t} \\ -\frac{\partial \mathcal{E}_x}{\partial z} = \mu_o \frac{\partial \mathcal{H}_y}{\partial t} \\ 0 = \epsilon_o \frac{\partial \mathcal{H}_z}{\partial t} \end{cases}$$

$$\nabla \cdot \vec{\mathcal{E}} = 0 \Rightarrow \frac{\partial \mathcal{E}_z}{\partial z}$$

$$\nabla \cdot \vec{\mathcal{H}} = 0 \Rightarrow \frac{\partial \mathcal{H}_z}{\partial z}$$

Si possono individuare i seguenti sistemi disaccoppiati di equazioni

a)
$$\begin{cases} -\dfrac{\partial \mathcal{H}_y}{\partial z} = \epsilon_0 \dfrac{\partial \mathcal{E}_x}{\partial t} \\ -\dfrac{\partial \mathcal{E}_x}{\partial z} = \mu_0 \dfrac{\partial \mathcal{H}_y}{\partial t} \end{cases}$$

b)
$$\begin{cases} \dfrac{\partial \mathcal{H}_x}{\partial z} = \epsilon_0 \dfrac{\partial \mathcal{E}_y}{\partial t} \\ \dfrac{\partial \mathcal{E}_y}{\partial z} = \mu_0 \dfrac{\partial \mathcal{H}_x}{\partial t} \end{cases}$$

c)
$$\begin{cases} \epsilon_0 \dfrac{\partial \mathcal{E}_z}{\partial t} = 0 \\ \dfrac{\partial \mathcal{E}_z}{\partial z} = 0 \end{cases}$$

d)
$$\begin{cases} \mu_0 \dfrac{\partial \mathcal{H}_z}{\partial t} = 0 \\ \dfrac{\partial \mathcal{H}_z}{\partial z} = 0 \end{cases}$$