image theory. when image theory is applied, region I is substituted by free space and the equivalent magnetic current becomes $2\mathbf{M}_e$. this argument is valid only for $z > 0$,where the equivalent electromagnetic field becomes $2\mathbf{E}_{em}$ and $2\mathbf{H}_{em}$ similar to the equations (7)(8).

$$\mathbf{E}_e = 2\mathbf{E}_{em} = \hat{\mathbf{x}}E_0 \exp(-jk_0 z) = \mathbf{E}_o \tag{15}$$

$$\mathbf{H}_e = 2\mathbf{H}_{em} = \hat{\mathbf{y}}\frac{E_0}{Z_0} \exp(-jk_0 z) = \mathbf{H}_o \tag{16}$$

Therefore, the original field appears in region II and is observed in fig.7. In region I the electromagnetic field vanishes because of PEC.

1.4 Equivalent model for region I when region II is perfect electric conductor (PEC)

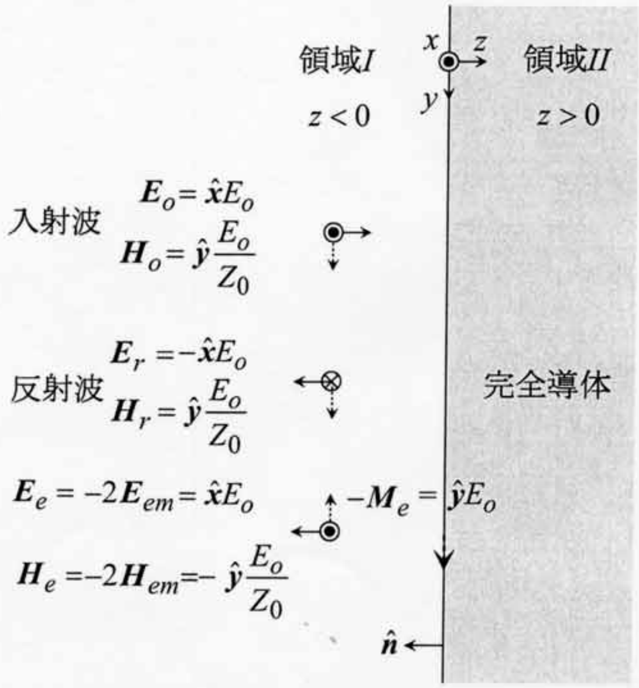

Figure 9: 領域 II を完全導体で満たした領域 I の等価モデル (1)

Figure 9 shows case when region II is PEC. In this case when the original field ($\mathbf{E}_o$,$\mathbf{H}_o$) hits the electric wall, the reflected field ($\mathbf{E}_r$,$\mathbf{H}_r$) is induced. On the electric wall the equivalent magnetic current $-\mathbf{M}_e$ produce the equivalent electromagnetic field ($\mathbf{E}_e$,$\mathbf{H}_e$). For the total contribution the three components are needed. The reflected wave ($\mathbf{E}_r$,$\mathbf{H}_r$) is defined so that the tangential components of electric field vanishes on the electric wall$S$.

$$\mathbf{E}_r = -\hat{\mathbf{x}}E_0 \exp(jk_0 z) \tag{17}$$

$$\mathbf{H}_r = \hat{\mathbf{y}}\frac{E_0}{Z_0} \exp(jk_0 z) \tag{18}$$

Because the electric wall S is infinite plane, the electromagnetic field ($\mathbf{E}_e$,$\mathbf{H}_e$) produced by equivalent magnetic current $-\mathbf{M}_e$ for $z < 0$ might be calculated using image theory. When