$$\mathbf{H}_{em} = \begin{cases} \hat{\mathbf{y}}\frac{E_0}{2Z_0}\exp\left(jk_0 z\right) & (z<0) \\ \hat{\mathbf{y}}\frac{E_0}{2Z_0}\exp\left(-jk_0 z\right) & (z>0) \end{cases} \tag{8}$$

where the electric field direction is given by counterclockwise rotation around the magnetic current. Because the propagation and magnetic field direction are known, the magnetic field direction is found by using right hand law.

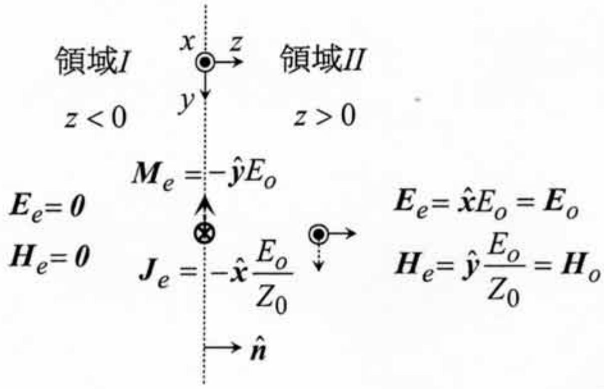

Figure 4: 領域IIの等価モデル (2)

Equivalent electromagnetic field($\mathbf{E}_e$,$\mathbf{H}_e$) is found adding contribution from electrical and magnetic equivalent field ($\mathbf{E}_{ej}$,$\mathbf{H}_{ej}$) and ($\mathbf{E}_{em}$,$\mathbf{H}_{em}$) according to the boundary.

$$\mathbf{E}_e = \mathbf{E}_{ej} + \mathbf{E}_{em} = \begin{cases} \mathbf{0} & (z<0) \\ \hat{\mathbf{x}}E_0\exp\left(-jk_0 z\right) = \mathbf{E}_o & (z>0) \end{cases} \tag{9}$$

$$\mathbf{H}_e = \mathbf{H}_{ej} + \mathbf{H}_{em} = \begin{cases} \mathbf{0} & (z<0) \\ \hat{\mathbf{y}}\frac{E_0}{Z_0}\exp\left(-jk_0 z\right) = \mathbf{H}_o & (z>0) \end{cases} \tag{10}$$

The same result is observed in fig.4. In region II original field is given and field becomes zero in region I.

1.2 Equivalent model for region I

In fig.5 the equivalent model for region I is shown. in region I the original plane wave ($\mathbf{E}_o$,$\mathbf{H}_o$) must be taken into account. in this region the original electromagnetic field and the field produced by the equivalent electromagnetic current must be added. because the vector n is defined as unitary vector in the inner direction for region I ($\hat{\mathbf{n}} = -\hat{\mathbf{z}}$), the equivalent electromagnetic currents on the boundary $S(z=0)$ become $-\mathbf{J}_e$ and $-\mathbf{M}_e$. From (9) and (10) the electromagnetic field ($\mathbf{E}_e$,$\mathbf{H}_e$) produced by these equivalent electromagnetic currents becomes zero in region I and minus the original region II.

$$\mathbf{E}_e = \begin{cases} \mathbf{0} & (z<0) \\ -\hat{\mathbf{x}}E_0\exp\left(-jk_0 z\right) = -\mathbf{E}_o & (z>0) \end{cases} \tag{11}$$

$$\mathbf{H}_e = \begin{cases} \mathbf{0} & (z<0) \\ -\hat{\mathbf{y}}\frac{E_0}{Z_0}\exp\left(-jk_0 z\right) = -\mathbf{H}_o & (z>0) \end{cases} \tag{12}$$