$$H^* = -\frac{I\Delta z}{4\pi} j\beta \frac{e^{j\beta r}}{r} \sin\theta\, \hat{\phi} + \frac{I\Delta z}{4\pi} \frac{e^{j\beta r}}{r^2} \sin\theta\, \hat{\phi}$$

$$= \frac{I\Delta z}{4\pi} j\beta \frac{e^{j\beta r}}{r} \sin\theta \left(-1 + \frac{1}{j\beta r}\right) \hat{\phi}$$

$\hat{\theta} \times \hat{\phi}$

$$\left(\frac{I\Delta z}{4\pi}\right)^2 (+1)\, \omega\mu\beta \frac{\sin^2\theta}{r^2} \underbrace{\left(-1 + \frac{1}{j\beta r}\right)\left(1 + \frac{1}{j\beta r} - \frac{1}{(\beta r)^2}\right)}\, \hat{r}$$

$$+1 - \cancel{\frac{1}{j\beta r}} + \frac{1}{(\beta r)^2} + \cancel{\frac{1}{j\beta r}} + j\frac{1}{(\beta r)^3}$$

$\hat{r} \times \hat{\phi}$

$$\left(I\Delta z\right)^2 j\beta\eta \frac{\sin\theta\cos\theta}{r^2} \underbrace{\left(-1 + \frac{1}{j\beta r}\right)\left(\frac{1}{r} - j\frac{1}{\beta r^2}\right)}\, (+\hat{\theta})$$

$$+\frac{1}{r} + \cancel{j\frac{1}{\beta r^2}} - \cancel{j\frac{1}{\beta r^2}} + \frac{1}{\beta^2 r^3}$$

$$S = \frac{1}{2}\left[\frac{(I\Delta z)^2}{16\pi^2} \omega\mu\beta \frac{\sin^2\theta}{r^2}\left(1 + \frac{1}{j(\beta r)^3}\right)\hat{r} + \frac{(I\Delta z)^2}{8\pi^2} j\beta\eta \frac{\sin\theta\cos\theta}{r^2}\left(\frac{1}{r} + \frac{1}{\beta^2 r^3}\right)\hat{\theta}\right]$$