$$
\begin{cases}
\left(\frac{V^2 c}{V^2-c^2}\right)\left(\frac{1}{r}H_z+\frac{c}{V}\frac{\partial E_z}{\partial r}-\frac{4\pi}{c}j_r\right)=\frac{\partial E_r}{\partial \xi} \\
\left(\frac{V^2 c}{V^2-c^2}\right)\left(-\frac{c}{V}\frac{1}{r}E_z-\frac{\partial H_z}{\partial r}-\frac{4\pi}{c}j_\varphi\right)=\frac{\partial E_\varphi}{\partial \xi} \\
\frac{c}{r}\left(\frac{\partial\left(rH_\varphi\right)}{\partial r}-H_r\right)-4\pi j_z=\frac{\partial E_z}{\partial \xi} \\
\left(\frac{V^2 c}{V^2-c^2}\right)\left(\frac{1}{r}E_z+\frac{c}{V}\left(\frac{\partial H_z}{\partial r}+\frac{4\pi}{c}j_\varphi\right)\right)=\frac{\partial H_r}{\partial \xi} \\
\left(\frac{V^2 c}{V^2-c^2}\right)\left(\frac{c}{V}\left(\frac{1}{r}H_z-\frac{4\pi}{c}j_r\right)+\frac{\partial E_z}{\partial r}\right)=\frac{\partial H_\varphi}{\partial \xi} \\
-\frac{c}{r}\left(\frac{\partial\left(rE_\varphi\right)}{\partial r}+E_r\right)=\frac{\partial H_z}{\partial \xi} \\
\frac{\partial j_{r,\varphi,z}}{\partial \xi}=\frac{\omega_p^2}{4\pi}E_{r,\varphi,z}-\nu j_{r,\varphi,z}
\end{cases}
$$

$$
\begin{cases}
E_r=E_r+\frac{c\Delta t}{\sin^2\theta}\left(\frac{1}{r}H_z+\cos\theta\frac{E_z-E_z}{\Delta r}-\frac{4\pi}{c}j_r\right) \\
E_\varphi=E_\varphi-\frac{c\Delta t}{\sin^2\theta}\left(\cos\theta\frac{1}{r}E_z+\frac{H_z-H_z}{\Delta r}+\frac{4\pi}{c}j_\varphi\right) \\
E_z=E_z+\frac{c\Delta t}{r}\left(\frac{rH_\varphi-rH_\varphi}{\Delta r}-H_r\right)-4\pi\Delta t j_z \\
H_r=H_r+\frac{c\Delta t}{\sin^2\theta}\left(\frac{1}{r}E_z+\cos\theta\left(\frac{H_z-H_z}{\Delta r}+\frac{4\pi}{c}j_\varphi\right)\right) \\
H_\varphi=H_\varphi+\frac{c\Delta t}{\sin^2\theta}\left(\cos\theta\left(\frac{1}{r}H_z-\frac{4\pi}{c}j_r\right)+\frac{E_z-E_z}{\Delta r}\right) \\
H_z=H_z-\frac{c\Delta t}{r}\left(\frac{rE_\varphi-rE_\varphi}{\Delta r}+E_r\right) \\
j_{r,\varphi,z}=j_{r,\varphi,z}+\frac{\omega_{p0}^2\Delta t}{4\pi}f(r)E_{r,\varphi,z}-\nu j_{r,\varphi,z}
\end{cases}
$$