$$\underline{v}' = (v_1', v_2')$$

$$v_1' = u_0 + \frac{Q_1}{2\pi}\left[\frac{x'}{|\underline{x}'|^2} - \frac{\rho(x'-L)}{y'^2+(x'-L)^2}\right]$$

$$\Rightarrow v_1 = u.u_0 + \frac{Q_1}{2\pi L}\left[\frac{x}{|\underline{x}|^2} - \frac{\rho(x-1)}{y^2+(x-1)^2}\right]$$

$$v_1 = \gamma + \lambda\left[\frac{x}{x^2+y^2} - \frac{\rho(x-1)}{y^2+(x-1)^2}\right]$$

with $\gamma = u.u_0$, $\lambda = \frac{Q_1}{2\pi L}$, $\rho = \frac{Q_2}{Q_1}$

$$v_2' = \frac{Q_1}{2\pi}\left[\frac{y'}{|\underline{x}'|^2} - \frac{\rho y'}{y'^2+(x'-L)^2}\right]$$

$$\Rightarrow v_2 = \frac{Q_1}{2\pi L}\left[\frac{y}{|\underline{x}|^2} - \frac{\rho y}{y^2+(x-1)^2}\right]$$

$$v_2 = \lambda\left[\frac{y}{x^2+y^2} - \frac{\rho y}{y^2+(x-1)^2}\right]$$

Let k' denote the velocity magnitude of interest. Then on the x-axis ($y=0$) around the source. The distance away from the source is given by Note: $k = \frac{k'}{u}$

$$\left(\frac{\lambda x}{x^2}\right)^2 = k^2 \Rightarrow x = \frac{\lambda}{k}$$

Then the initial positions are given by

$x_0 = r\cos\theta$, $y_0 = r\sin\theta$ where $r = \lambda/k$

For an initial velocity same as the flow at (x_0, y_0), we have

$$(v_1)_0 = \gamma + \lambda\left[\frac{x_0}{x_0^2+y_0^2} - \frac{\rho(x_0-1)}{y_0^2+(x_0-1)^2}\right]$$

$$(v_2)_0 = \lambda\left[\frac{y_0}{x_0^2+y_0^2} - \frac{\rho y_0}{y_0^2+(x_0-1)^2}\right]$$