

$T_{R-C A}$

$$T_{R-C A} = \begin{vmatrix} \frac{Z_{11A}}{Z_{21A}} & \frac{\Delta Z_A}{Z_{21A}} \\ \frac{1}{Z_{21A}} & \frac{Z_{22A}}{Z_{21A}} \end{vmatrix} = \frac{1}{Z_{21A}} \begin{vmatrix} Z_{11A} & \Delta Z_A \\ 1 & Z_{22A} \end{vmatrix}$$

$$T_{VNIC} = \begin{vmatrix} -K & 0 \\ 0 & 1 \end{vmatrix}$$

$$T_{R-C B} = \begin{vmatrix} \frac{Z_{11B}}{Z_{21B}} & \frac{\Delta Z_B}{Z_{21B}} \\ \frac{1}{Z_{21B}} & \frac{Z_{22B}}{Z_{21B}} \end{vmatrix} = \frac{1}{Z_{21B}} \begin{vmatrix} Z_{11B} & \Delta Z_B \\ 1 & Z_{22B} \end{vmatrix}$$

$$\left. \frac{V_2}{I_1} \right|_{Z_{2,2}=0} = \frac{1}{C} T_{Total}$$

$$T_{Total} = T_{R-C A} \times T_{VNIC} \times T_{R-C B}$$

$$T_{Total} = \left( \frac{1}{Z_{21A} \times Z_{21B}} \right) \begin{vmatrix} Z_{11A} & \Delta Z_A \\ 1 & Z_{22A} \end{vmatrix} \begin{vmatrix} -K & 0 \\ 0 & 1 \end{vmatrix} \begin{vmatrix} Z_{11B} & \Delta Z_B \\ 1 & Z_{22B} \end{vmatrix}$$

$$T_{total} = \left( \frac{1}{z_{1A} z_{1B}} \right) \begin{vmatrix} -K_2 z_{1A} & \Delta_{2A} \\ -K_1 & z_{2A} \end{vmatrix} \begin{vmatrix} z_{1B} & \Delta_{2B} \\ 1 & z_{2B} \end{vmatrix}$$

$$C_{\text{inv}} = \frac{1}{z_{1A} z_{1B}} \cdot (-K_2 z_{1B} + z_{2A})$$

$$C_{\text{out}} = \frac{z_{2A} - K_2 z_{1B}}{z_{1A} z_{1B}}$$

$$\frac{1}{C} = \frac{z_{1A} \cdot z_{1B}}{z_{2A} - K_2 z_{1B}} = \frac{V_2}{I_1 / I_{2,0}}$$

$$\frac{V_2}{I_1}|_{I_2=0} = \frac{1}{s^3 + 2s^2 + 2s + 1}$$

↑ Polinomio de Butter de 3<sup>er</sup> orden

$$\frac{1}{s^3 + 2s^2 + 2s + 1} = \frac{Z_{0A} \cdot Z_{2B}}{Z_{2A} - K Z_{1B}} = \frac{V_2}{I_1}|_{I_2=0}$$

$$\frac{V_2}{I_1} = \frac{\frac{N(s)}{D(s)}}{\frac{D(s)}{Q(s)}} = \frac{Z_{2A} \cdot Z_{2B}}{Z_{2A} - K Z_{1B}} \cdot \frac{Q(s)}{Q(s)}$$

$$\frac{D(s)}{Q(s)} = \frac{s^3 + 2s^2 + 2s + 1}{Q(s)} = \frac{(s^2 + s + 1)(s + 1)}{Q(s)}$$

Q(s) debe ser 2/ menos de grado 3

2 docto  $Q(s) = s \cdot (s+2) \cdot (s+3)$

$$\frac{D(s)}{Q(s)} = \frac{(s^2 + s + 1)(s + 1)}{s(s+2)(s+3)} = \frac{A}{s} + \frac{B}{s+2} + \frac{C}{s+3} + K_0$$

$$K_0 = \lim_{s \rightarrow \infty} \frac{D(s)}{Q(s)} = 1$$

$$A = \lim_{s \rightarrow 0} \frac{(s^2 + s + 1)(s + 1)}{s(s+2)(s+3)} \cdot s = \frac{1}{6}$$

$$B = \lim_{s \rightarrow -2} \frac{(s^2 + s + 1)(s + 1)}{s(s+2)(s+3)} \cdot (s+2) = \frac{3}{2}$$

$$C = \lim_{s \rightarrow -3} \frac{(s^2 + s + 1)(s + 1)}{s(s+2)(s+3)} \cdot (s+3) = \frac{-14}{3}$$

$$\frac{D(s)}{Q(s)} = 1 + \underbrace{\frac{1/6}{s}}_{Z_{1A}} + \underbrace{\frac{3/2}{s+2}}_{Z_{2A}} + \underbrace{\frac{(-14/3)}{s+3}}_{Z_{2B}}$$

"2. B K"

$$\frac{B(s)}{A(s)} = \frac{1}{s(s+1)(s+2)} = \frac{Z_{2,1}}{s} + \frac{Z_{2,2}}{s+1} + \frac{Z_{2,3}}{s+2}$$

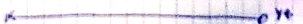
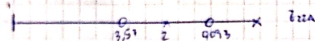
$$Z_{2,1} = 1 + \frac{1}{s+1} + \frac{2}{s+2} \quad K_{2,1} = \frac{14}{3(s+3)}$$

$$Z_{2,2} = \frac{K_{2,2}}{s(s+2)}$$

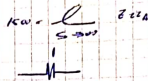
$$Z_{2,3} = \frac{K_{2,3}}{s(s+1)}$$

$$Z_{2,1} = \frac{6s^2 + 12s + 5 + 2 + 9s}{6s(s+1)} = \frac{6s^2 + 22s + 2}{6s(s+1)} = \frac{s^2 + \frac{11}{3}s + \frac{1}{3}}{s(s+1)}$$

$$Z_{2,1} = \frac{(s + 9.093)(s + 3.57)}{s(s+1)}$$



$$Z_4 = Z_{22A} - K_{00}$$



$$Z_4 = \frac{s^2 + \frac{1}{5}s + \frac{1}{3}}{s(s+2)} - 1$$

$$Z_4 = \frac{s^2 + \frac{1}{5}s + \frac{1}{3} - s^2 - 2s}{s(s+2)} = \frac{\frac{5}{3}s + \frac{1}{3}}{s(s+2)}$$

$$Y_4 = \frac{s(s+2)}{\frac{5}{3}(s + \frac{1}{5})}$$

$$Y_6 = Y_4 - K_1 \cdot s$$

$$K_1 = \lim_{s \rightarrow \infty} \frac{Y_4}{s} = \frac{s(s+2)}{\frac{5}{3}s^2 + \frac{1}{3}s} = \frac{3}{5} \quad \frac{1}{\frac{5}{3}} \frac{3}{5}$$

$$Y_6 = \frac{s(s+2)}{\frac{5}{3}(s + \frac{1}{5})} - \frac{3}{5} \cdot s = \frac{s(s+2) - s^2 - \frac{1}{5}s}{\frac{5}{3}(s + \frac{1}{5})} = \frac{s^2 + 2s - s^2 - \frac{1}{5}s}{\frac{5}{3}(s + \frac{1}{5})} = \frac{2s - \frac{1}{5}s}{\frac{5}{3}(s + \frac{1}{5})}$$

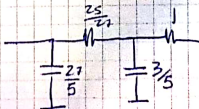
$$Y_6 = \frac{\frac{9}{5}s}{\frac{5}{3}(s + \frac{1}{5})} = \frac{27s}{25(s + \frac{1}{5})}$$

$$Z_6 = \frac{25(s + \frac{1}{5})}{27s} \quad \frac{25/27}{1}$$

$$Z_8 = Z_6 - Z_6(00) = \frac{25(s + \frac{1}{5})}{27s} - \frac{25}{27} = \frac{25s + 5 - 25s}{27s} = \frac{5}{27s}$$

$$Y_9 = \frac{27s}{5} \quad \frac{1}{\frac{5}{27}} \frac{27}{5}$$

Real A.



oro forms

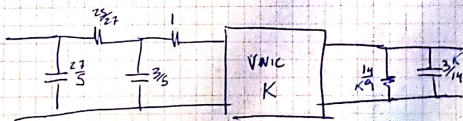
$$\begin{aligned}
 & \frac{S^2 + \frac{11}{6}S + \frac{1}{3}}{S^2 + 2S + \frac{5}{3}} \cdot \frac{S^2 + 2S}{S^2 + \frac{1}{3}} \\
 & \frac{S^2 + 2S + 1}{S^2 + \frac{1}{3}} \cdot \frac{\frac{5}{3}S + \frac{1}{3}}{\frac{3}{5}S} \\
 & \frac{\frac{5}{3}S + \frac{1}{3}}{\frac{3}{5}S} \cdot \frac{\frac{9}{5}S}{\frac{25}{27}} \\
 & \frac{\frac{5S}{3} + \frac{1}{3}}{\frac{25}{27}} \cdot \frac{27S}{5} \\
 & \frac{9S}{5} \cdot \frac{1}{3} \\
 & \frac{4S}{6} \cdot \frac{27S}{5} \\
 & \frac{0}{2}
 \end{aligned}$$

Red B

$$K \cdot Z_{11B} = \frac{14}{3(Sr3)}$$

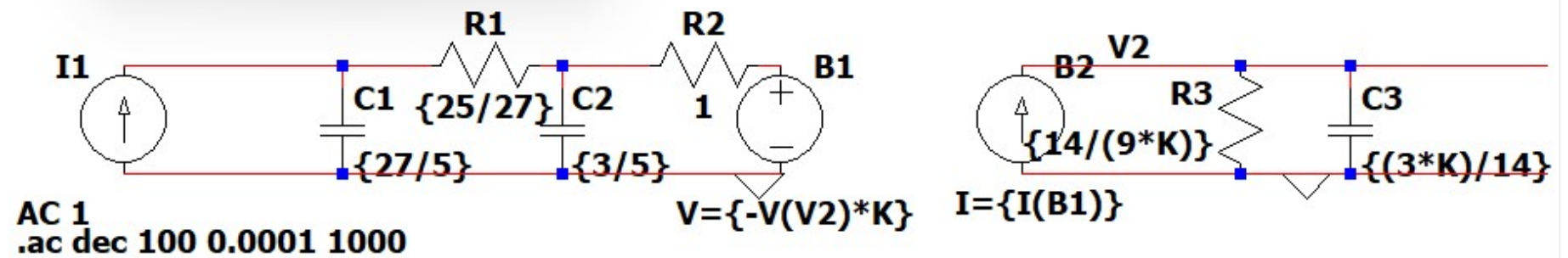
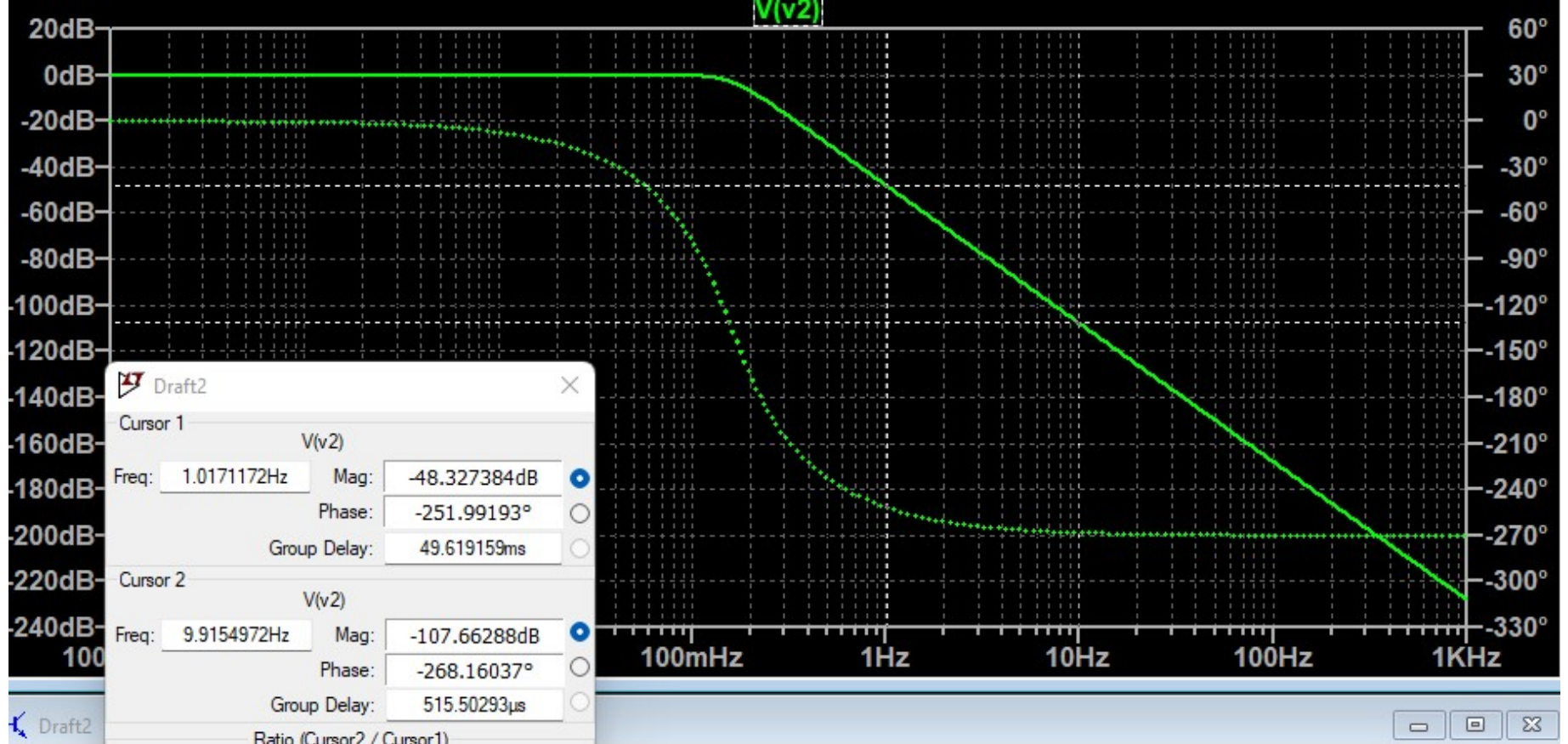
$$Z_{11B} = \frac{K_B}{Sr3}$$

$$Z_{11B} = \frac{1}{\frac{53}{14} + \frac{9}{14}}$$



Con K aditivos la ganancia sin modificar la forma





`.param K=1.5555`