\[ A_{11b} = \sqrt{0.145} \left| \begin{array}{c} \alpha_1 \\ \alpha_5 \end{array} \right| \]

\[ A_{1P_3} = \frac{\frac{4}{3} \left| \begin{array}{c} \alpha_1 \\ \alpha_5 \end{array} \right|}{\sqrt{\alpha_3^2 \beta_1 + 2\alpha_1 \alpha_5 \beta_2 + \alpha_5^3 \beta_3}} \]

\[ \rho_{11b} \approx 11P_3 - 9.66 \text{dB} \]

\[ \frac{1}{A_{1P_3}} = \frac{1}{2} \left( \frac{\alpha_1 \beta_1}{A_{1P_3}} \right) + \frac{\alpha_1^2}{A_{1P_3}} + \frac{\alpha_1^2 \beta_1}{A_{1P_3}} + \ldots \]

Separate out 1st & 3rd order terms

\[ \Rightarrow A_{1P_3} = \sqrt{\frac{4}{3} \left| \begin{array}{c} \alpha_1 \beta_1 \\ \alpha_3 \beta_1 + 2\alpha_1 \alpha_5 \beta_2 + \alpha_5^3 \beta_3 \end{array} \right|} \]

What - case estimate of \( \Delta \kappa \)

\[ = 1(\alpha_3 \beta_1) + (2\alpha_1 \alpha_5 \beta_2) + 1(\alpha_5^3 \beta_3) \]

\[ \frac{1}{A_{1P_3}} = \frac{1}{4} \left( \frac{3}{1} + \frac{1}{1} \right) + \frac{1}{1} \]

\[ \frac{1}{A_{1P_3}} = \frac{1}{A_{1P_3}} + \frac{\alpha_1^2}{A_{1P_3}} + \frac{\alpha_1^2 \beta_1}{A_{1P_3}} + \ldots \]

Cascaded 11P₃

\[ x(t) \xrightarrow{\text{11P₃,1}} y₁(t) \xrightarrow{\text{11P₃,2}} y₂(t) \]

\[ y₁(t) = \alpha₁ nₙ(t) + \alpha₃ nₙ(t) + \alpha₅ nₙ(t) \]

\[ y₂(t) = \beta₁ y₁(t) + \beta₃ y₂(t) + \beta₅ y₅(t) \]

\[ = \beta₁ (t) + \beta₃ (t)^3 + \beta₅ (t)^5 \]

- 1st harmonic @ output of 1st stage is very small
- Middle term is negligible

\[ \frac{1}{A_{1P_3}} = \frac{1}{A_{1P_3,1}} + \frac{\alpha_1}{A_{1P_3,1}} + \frac{\alpha_1^2 \beta_1}{A_{1P_3,1}} + \ldots \]
# 11f_3 of later stages is dominant

\begin{align*}
\text{ideal, passive filter} \\
\text{II}f_3 = \text{II}f_3, \quad \text{II}f_3 = \infty
\end{align*}

\[ I_{\text{in,ckt}} = 4kT \delta f \quad (A^2/Hz) \]

\[ \text{white noise} \]

\[ \text{long channel} \rightarrow \dot{g}_{d,0} = 8m \quad \gamma = 1/3 \]

\[ \text{short channel} \quad \dot{g}_{d,0} = 8m/\lambda \quad (\gamma m) \]

\[ \dot{g}_{m} = \alpha < 1 \quad (\text{for short channel}) \]

\[ \frac{\text{d} I_{\text{in,ckt}}}{\text{d} f} = \frac{4kT \delta f}{\lambda} \frac{g_{m}}{\alpha} \]

\[ \text{few GHz} \]