FeedForward Case Study

PA to linearize

- Operating frequency: 945 MHz
- Pout (2-tone): 44.5 dBm (average) with CI≈23 dB
- Gain=15 dB, Delay=1.4307 nsec → $\Phi(f_0)=-\omega_0\tau=486.74°\ (126.74°)$

Balance of loop1: S1=25 dB (introduce a phase error)

Balance of loop2: S2=30 dB (introduce a phase error)

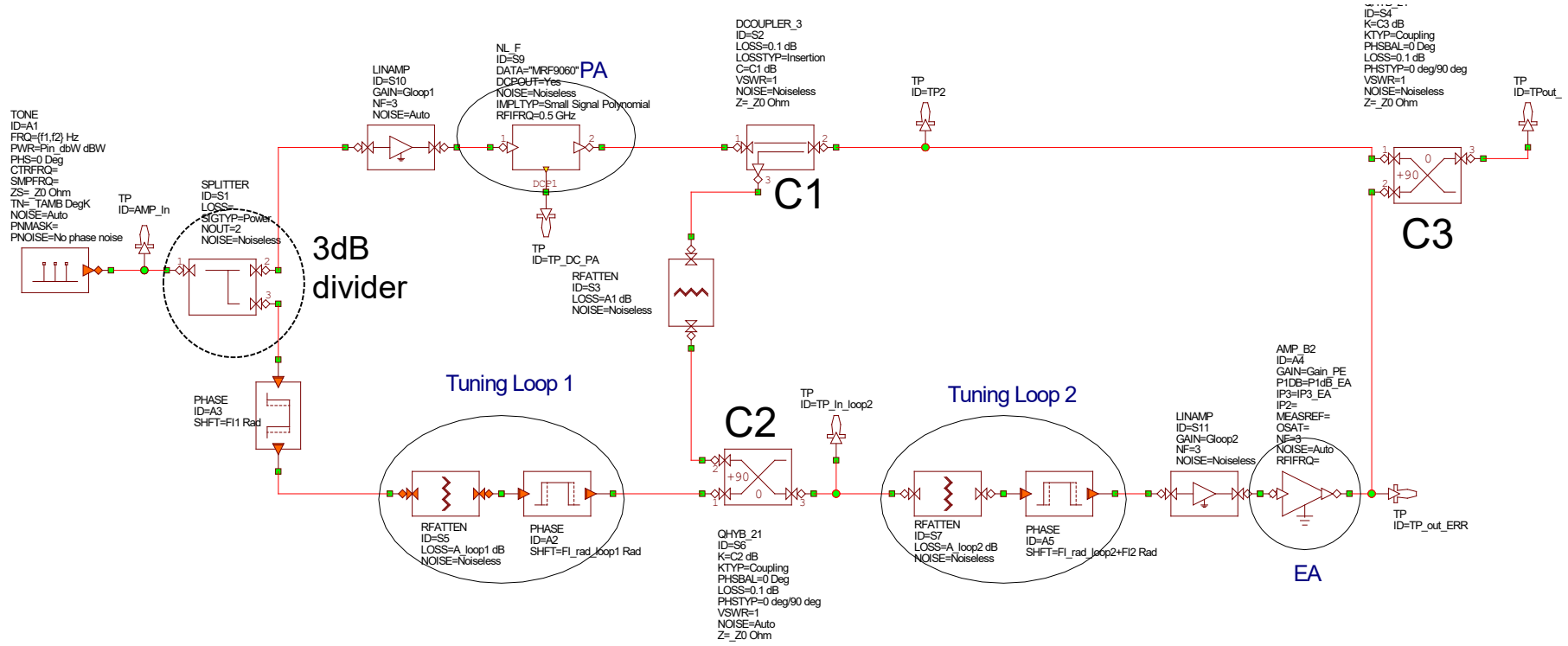
Choice of EA

Impose $CI_{EA}\approx S2+10=40$

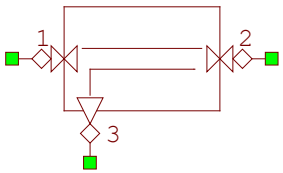
Parameters to assign

C1, C2, C3, A1

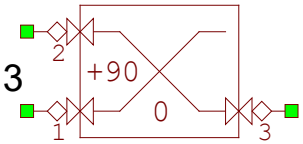
VSS Scheme



In:1, Out: 2,3



In:1,2 Out: 3



$$S_{21} = \sqrt{1 - 10^{\frac{C_{dB}}{10}}}, \qquad S_{31} = j10^{\frac{C_{db}}{20}}$$

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Loop Balance Equations

C1=30, C2=10, C3=10, A1=10

Loop1 Balance

Mag. $-3 + G_{loop1} + G_{PA} - C_1 - A_1 - C_2 = -A_{loop1} - 3 \quad \Rightarrow \quad G_{loop1} = 50 - 15 = 35\,\text{dB}$

Phase $\Phi_{PA} + 90° + 90° = 180° + \Phi_1 \quad \Rightarrow \quad \Phi_1 = \Phi_{PA} = -126.7°$

Loop2 Balance

Mag.

$-C_1 - A_1 - C_2 + G_{EA} + G_{loop2} - C_3 = 0 \quad \Rightarrow \; G_{loop2} = C_1 + A_1 + C_2 - G_{EA} + C_3 = 41.7\,\text{dB}$

Phase $180 = 90° + 90° + \Phi_2 + \Phi_{EA} + 90° \quad \Rightarrow \quad \Phi_2 = -\left(\Phi_{EA} + 90°\right) = 42.78°$

For the loops fine tuning an attenuator plus a phase shifter have been inserted in each loop