EJERCICIOS DE RUIDO

Ej 1:

Ganancia en dB amp. ideal

$f = 150\,MHz$

$P_i = 1\,mW$; $P_o = 1\,W$

¿$P_i \big|_{P_o = 4W}$?

$$\begin{cases} G\big|_{dB} = 10 \log\left(\frac{1W}{1mW}\right) = 30\,dB \\ G = \frac{1W}{1mW} = 1000 \end{cases}$$

Si la ~~entrada~~ salida es 4W entonces la entrada:

$$P_i = \frac{4W}{1000} = 4\,mW$$

Ej N°2:

Calcular Vpp, Vrms en dBV y dBm de una senoidal de 2mW sobre $R = 50\,\Omega$

Sabemos que:

$$P = V \cdot I = \frac{V^2}{R}$$

$\therefore$

$$\begin{cases} V_{RMS} = \sqrt{P \cdot R} = \sqrt{2\,mW \cdot 50\,\Omega} = 316{,}2\,mV \\ V_p = \sqrt{2} \cdot V_{RMS} = 447{,}2\,mV \\ V_{pp} = 894{,}43\,mW \end{cases}$$

Escaneado con CamScanner

$$P/_{dBW} = 10\log\left(\frac{V_{RMS}^2}{R}\right) = -16{,}98\ dBW$$

$$P/_{dBm} = 3\ dBm$$

Ej Nº3: V_P, V_{PP}, P en mW, dBW, dBm

señal senosoidal $0{,}7\ V_{RMS}$ $(\sqrt{2}/2)$

$R = 50\,\Omega$

$$\begin{cases} V_P = \sqrt{2}\cdot V_{RMS} = 1V \\ V_{PP} = 2V_P = 2V \end{cases}$$

$$P = V_{RMS}^2/R = 10\,mW \begin{cases} -20\ dBW \\ 10\ dBm \end{cases}$$

Ej Nº4:

$$\circ\!\!-\!\!\boxed{-2dB}-\boxed{G_1}-\boxed{-5dB}-\boxed{20dB}-\!\!\circ$$

- $P_{sal} = -40\,dBm$
- $V_{RMS}^{IN} = 79\,\mu V_{RMS}$
- $R = 50\,\Omega$

sabemos que $G = A_1 G_1 A_2 G_2$

$= -2dB - 5dB + 20dB + G_1$

$$P_{IN} = \frac{V_{RMS}^2}{R} = 124{,}82\,pW \rightarrow -129\ dBm$$

$$P\ P_{dB} = 10\log(P_{OUT}/1000) \rightarrow P_{OUT} = 10^{P_{dB}/10}\cdot 1000\ W$$

$$= 100\,mW$$

$$P_{OUT} - P_{IN} = A_1 + A_2 + G_1 + G_2$$

$$G_1 = -40\,dBm + 129\,dBm + 7dB - 20dB = \boxed{76\,dB = G_1}$$

Ej N° 5: Amp. ideal $13dB = G_1$

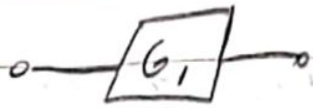
$T = 290°K$

$Z_{IN} = Z_{OUT} = 50\Omega$

$\Delta B = 2 MHz$

$P_{IN} = -90dBm$

- N_{IN} - P_{OUT}
- SN_{IN} - N_{OUT}
- SN_{OUT} - F y NF



$$N_{IN} = kT\Delta f = 1.381 \times 10^{-23} \frac{W \cdot \cancel{s}}{\cancel{°K}} \cdot 290\cancel{°K} \cdot 1 \times 10^{6} \frac{1}{\cancel{s}}$$

$$= 4\,fW \rightarrow -173\,dBm$$

$$P + N = 1\mu W + 4_f W \sim 1\mu W$$

$$- SN_{IN} = -90dBm + 173dBm = 83\,dBm$$

$$\left\{ \begin{array}{l} P_{OUT} = G_1 + P_{IN} = -77\,dBm \\ N_{OUT} = G_1 + N_{IN} = -160\,dBm \end{array} \right\} SN_{OUT} = 83\,dBm$$

¿acá no va el NF?

$$\left\{ \begin{array}{l} NF = SN_{IN} - SN_{OUT} = 0 \\ F = 1 \end{array} \right.$$

Ej Nº 6:

$G_1 = 13 dB$ — SNIN — SNOUT

$NF = 3 dB$ — POUT — F

$R = 50 \Omega$ — NOUT

$P_{IN} = -90 dBm$; $N_{IN} = -114 dBm$

$SN_{IN} = -90 dBm + 114 dBm = 24 dBm$

$$\begin{cases} P_{OUT} = G_1 + P_{IN} = 77 dBm \\ N_{OUT} = G_1 + N_{IN} + NF = -98 dBm \end{cases}$$

$SN_{OUT} = 21 dBm$

$NF = SN_{IN} - SN_{OUT} = 3 dB$ ✓

El cálculo se corresponde con los datos (NF = 3 dB). La relación señal ruido disminuye en la salida ya que el ~~ampl.~~ ~~ins~~ fe ruido.

$F = 10^{3/10} = 1,99$

$Ej\,7:\quad G_1 \text{ y } G_2 = 10dB$

$NF = 3dB$

$- SN_{IN\,G_1} \quad - SN_{OUT\,G_2}$

$- \cancel{P}_{OUT}$

$- \cancel{N}_{OUT}$

$N_{IN} = -114\,dBm$

$P_{IN} = -90\,dBm$

$$\begin{cases} P_{OUT\,G_1} = -90\,dBm + 10\,dB = -80\,dB \\ N_{OUT\,G_1} = -114\,dBm + 10\,dB + 3\,dB = -101\,dBm \end{cases}$$

$SN_{IN\,G_1} = 24\,dB$

$$\begin{cases} P_{OUT\,G_2} = P_{OUT\,G_1} + G_1 = -70\,dB \\ N_{OUT\,G_2} = N_{OUT\,G_1} + G_1 + NF = -88\,dB \end{cases}$$

$SN_{OUT} = 18\,dB$

E) 8: $R_{IN} = 50\Omega$; $R_{OUT} = 600\Omega$

$f_{SIN} = 10\,MHz$ de $10\,dBm$

$P_{OUT} = 0{,}01\,W$

a) $V_{PP\,IN}$ y $V_{RMS\,IN}$

$P_{IN} = \frac{V_{RMS}^2}{R_{IN}}$ ∴ $V_{RMS} = \sqrt{10^{10/10} \cdot 1000W\,50\Omega} = 707\,V$

$V_{PP} = 2\sqrt{2}\; V_{RMS} = 2000\,V$

$= 10.000\,W$

b) $V_{PP\,OUT}$ y P_{OUT}

$P_{OUT}/dB = 10\log\left(\frac{P_{OUT}}{1mW}\right) = -50\,dBm$

$V_{PP\,OUT} = 2\sqrt{2} \cdot \sqrt{P_{OUT} \cdot R_{OUT}} = 6{,}93\,V$

c) La variación en dB entre potencia in-out

¿ $10\log((P_{IN} - P_{OUT})) = 39{,}9\,dB \sim 40\,dB$

¿variación?

Ej N° 9: F_H del cual $F_L = 100\,MHz$ y AB es una octava

$F_H = 2 \cdot F_L = 200\,MHz$

Ej N° 10: $F_H = 200\,MHz$ y AB 0,301 dec. $F_L =$

$0,301 = \log_{10}\left(\frac{F_H}{F_L}\right)$

$10^{0,301} = F_H / F_L \rightarrow F_L = 100\,MHz$ ✓

0,301 dec ≈ 1 octava

Ej N° 11: $f = 200\,MHz$. Calcular Amplitud a través de un LPF. ~~Ej~~ $m = -2\,dB/oct$. $A|_{100MHz} = 10\,dB$

$A|_{200MHz} = 8\,dB$