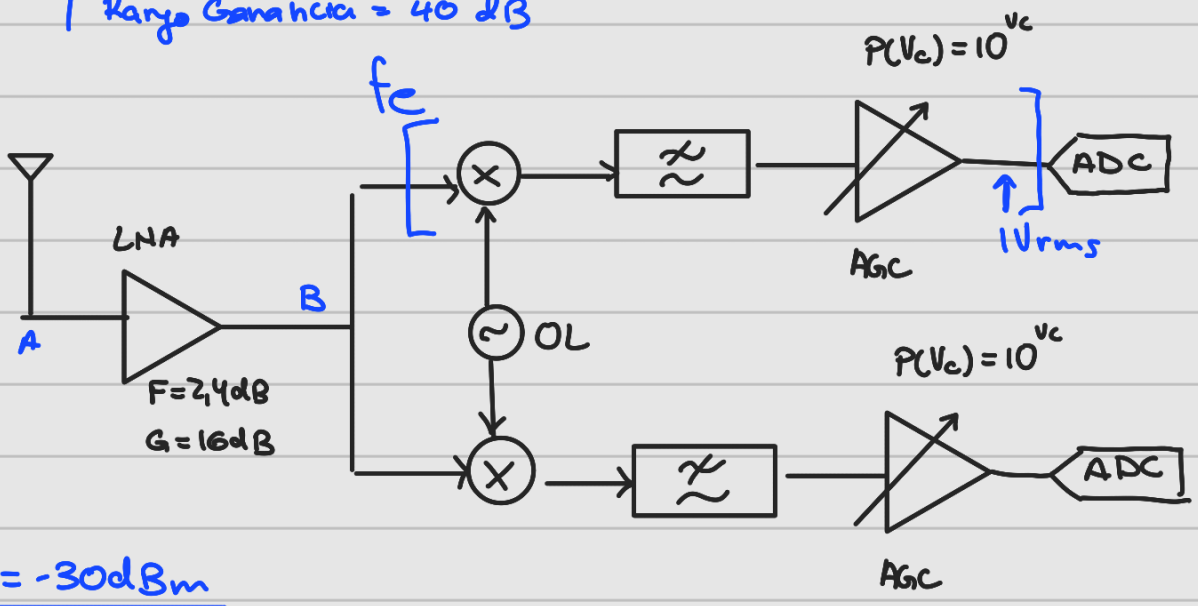
BLOQUE 2:

Receptor →
- LNA
- Mezclador → IF = 2,4 GHz; OL = 2,4 GHz
- Filtro paso bajo
- Control automático de Ganancia
- Convertidor A/C

LNA →
- F = 2,4 dB
- G = 16 dB
- BW_N = 20 MHz

Nivel máximo de entrada = -30 dBm

AGC →
- V_o = 1 Vrms
- Rango Ganancia = 40 dB



1) V_i = -30 dBm

$$SNR_{entrada} = 10 \log \left(\frac{(31{,}6\,\mu V)^2}{4 \cdot K \cdot T \cdot 50 \cdot 20\,M} \right) = 17{,}8\ dB$$

$$SNR_{salida} = SNR_{entrada} - \underset{(F)}{2{,}4} = 15{,}4\ dB$$

V_i = -70 dBm

$$SNR_{entrada} = 10 \log \left(\frac{(0{,}316\,\mu V)^2}{4KT \cdot 50 \cdot 20M} \right) = -22{,}2\ dB$$

$$SNR_{salida} = SNR_{entrada} - F = -24{,}6\ dB$$

2)

$$F_t = f_1 + \frac{f_e - 1}{g_1} = 10 \Rightarrow f_e = 10^{1'6}\left(10 - 10^{0,24}\right) + 1 = 329,92$$

$f_1 = 10^{\frac{2,4}{10}}$; $g_1 = 10^{\frac{15}{10}}$

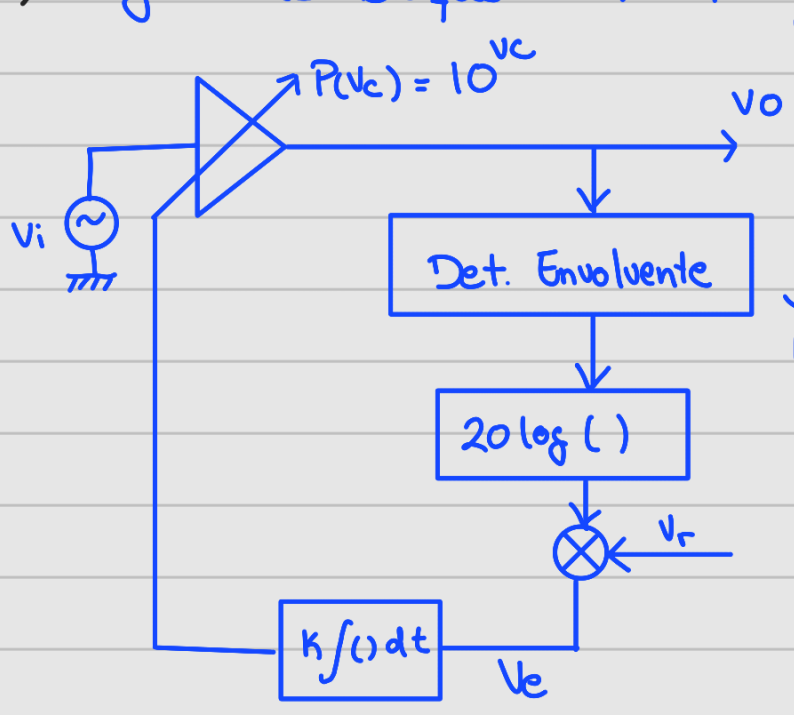
$\boxed{f_e \leq 25,18\ dB \text{ para mantener } F_t = 10\ dB}$

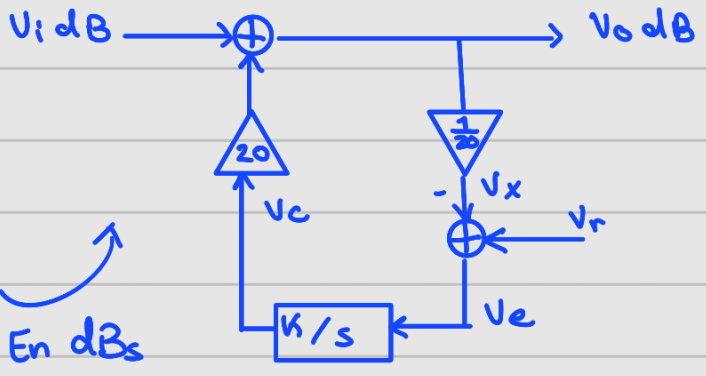
3)

$$V_o = V_i + G_{ACC} = 20 \cdot \log\left(\frac{1\,V_{rms}}{1\,mV_{rms}}\right) \Rightarrow 60\,dBm - (-70\,dBm) = G_{max\,AGC}$$

$$\boxed{G_{max\,AGC} = 130\,dB \Rightarrow G_{min\,AGC} = 90\,dB}$$

4) Diagrama de Bloques en lineal





$V_{o(dB)} = V_{i(dB)} + 20\,V_{c\,(dB)}$

$60\,dBm$

$\hookrightarrow V_{orms} = V_{irms} \cdot 10^{V_c}$

ley de Control

$P(V_c) = 10^{V_c}$

$$\begin{cases} V_c = \frac{K}{S}\left(V_r - \frac{V_o}{20}\right) \\ \hookrightarrow V_o = V_i + 20\frac{K}{S} \cdot V_r - \frac{K}{S} \cdot V_o \end{cases}$$

$$V_o = V_i \frac{S}{S+r} + 20\,V_r \frac{K}{S+K}$$

Analizado en régimen permanente.

$V_o\big|_{s=0} = 20 \cdot V_r$

$60\,dBm$; $V_i\,dB = x$

$\hookrightarrow V_r = \frac{60}{20} = 3\,dB$

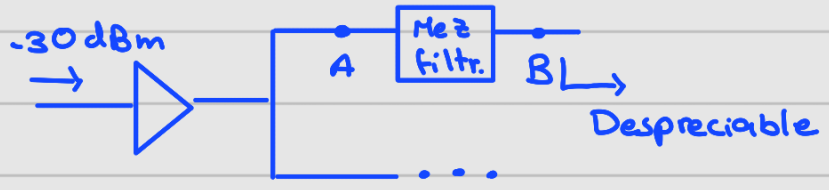
$$\boxed{V_r = 10^{\frac{3}{20}} = 1,41\,V_{rms}}$$

6)

Según la simulación, para una V_i de $-30dBm$

↳ El ruido → $V_{RMS} = 38,628\,\mu V$

→ Analizando la figura de ruido:



(apartado b)

$SNR_A = 15,4dB$

$P_{NB} = (38,628\,\mu V)^2\ W$

$P_{SB} = -30dBm + 16dB + 1dB = -13dBm$

(16dB ↓ LNA; 1dB ↓ mezc.)

$P_{SB} = (223,87\,pV)\ W$

$SNR_B = 10\log\left(\frac{P_{SB}}{P_{NB}}\right) = 45,26dB$

$F_{mez} = SNR_B - SNR_A$

$\boxed{F_{mez} = 29,86dB}$

↳ NO se cumple la condición