23/1/20

Lec 6

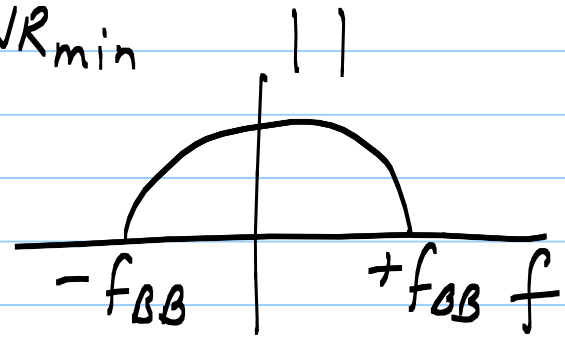
Friis Equation → indicates the need for a "Low Noise Amplifier" LNA

Minimum signal power that can be Received $= P_{min}$

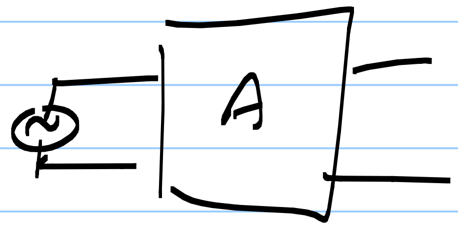
$V\cos(\omega t + \varphi(t))$ PM

$V\cos[\omega(t)\cdot t]$ FM

$$F = \frac{SNR_{in}}{SNR_{out}} = \frac{P_{min}/kTB}{SNR_{min}}$$



$V\cos\omega t$



$AV\cos\omega t$

$V(t)\cos\omega t \longrightarrow AV(t)\cos\omega t$

AM

$V_1(t)\cos\omega_1 t + V_2(t)\cos\omega_2 t \longrightarrow A\,(V_1(t)\cos\omega_1 t + V_2(t)\cos\omega_2 t)$

$$F = \frac{P_{min} / kTB}{SNR_{min}}$$

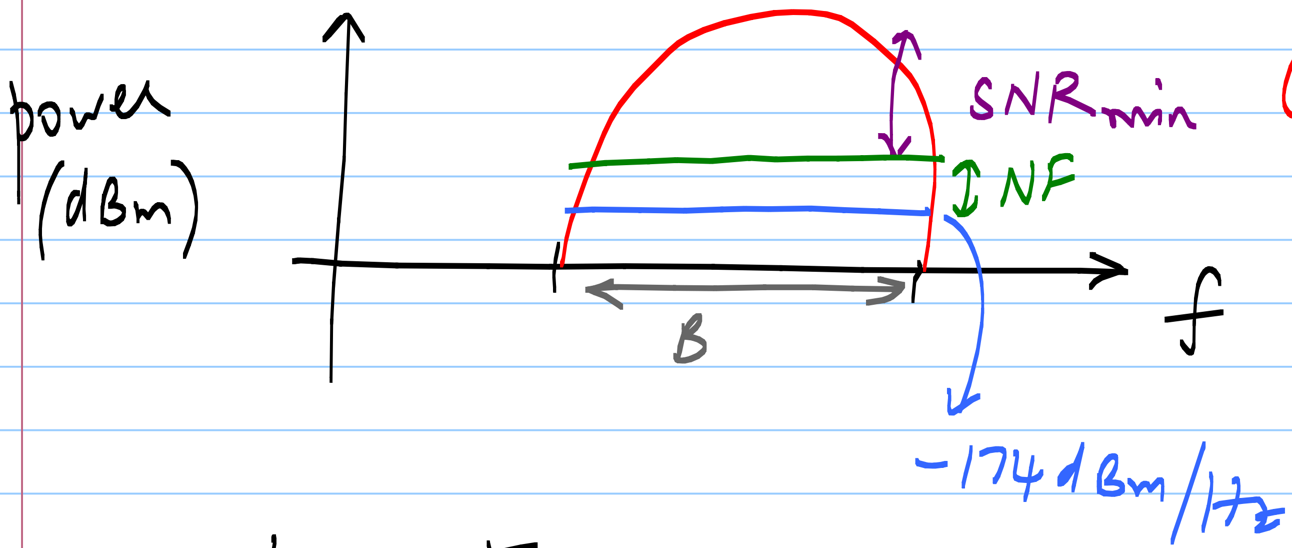
$$P_{min} = F \cdot SNR_{min} \cdot kTB$$

$$P_{min_{dB}} = NF_{dB} + SNR_{min_{dB}} + 10\log(kT) + 10\log(B)$$

"Sensitivity" of Rx

$$P_{min} = -174\ dBm/Hz + NF_{dB} + 10\log(B) + SNR_{min}$$

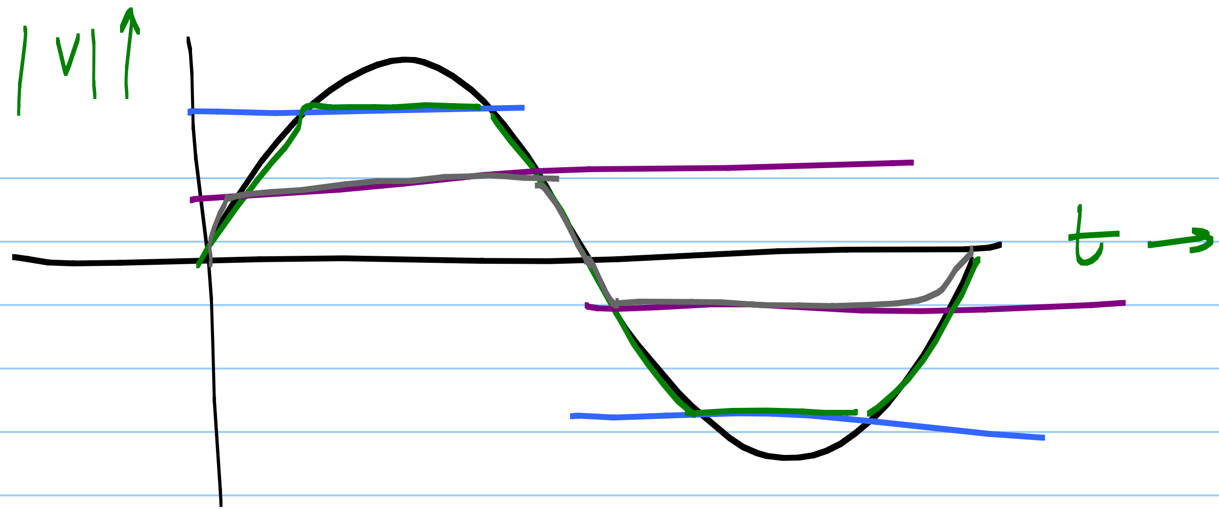
in dBm

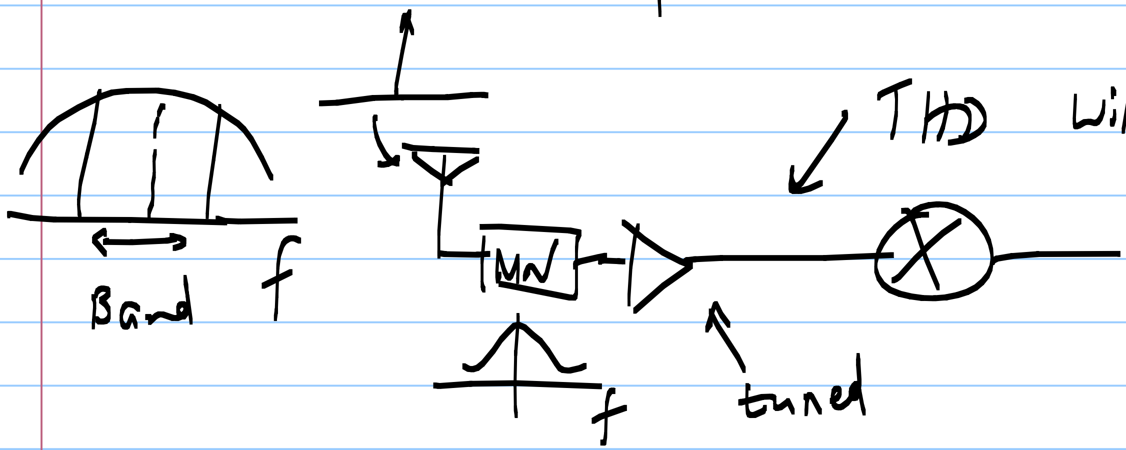


(integrated over B for signal & noise)

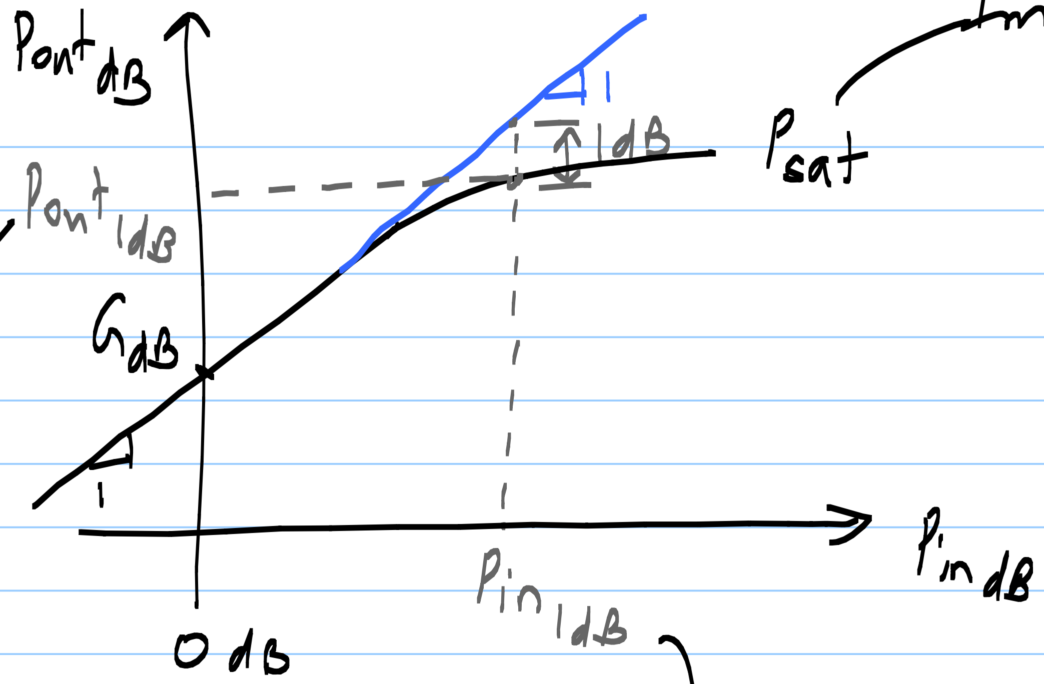
Linearity

Analog →
- Small-signal operation
- Clipping limits (swing limits)
- THD in %





THD will look very good if Q is high



Important for Tx

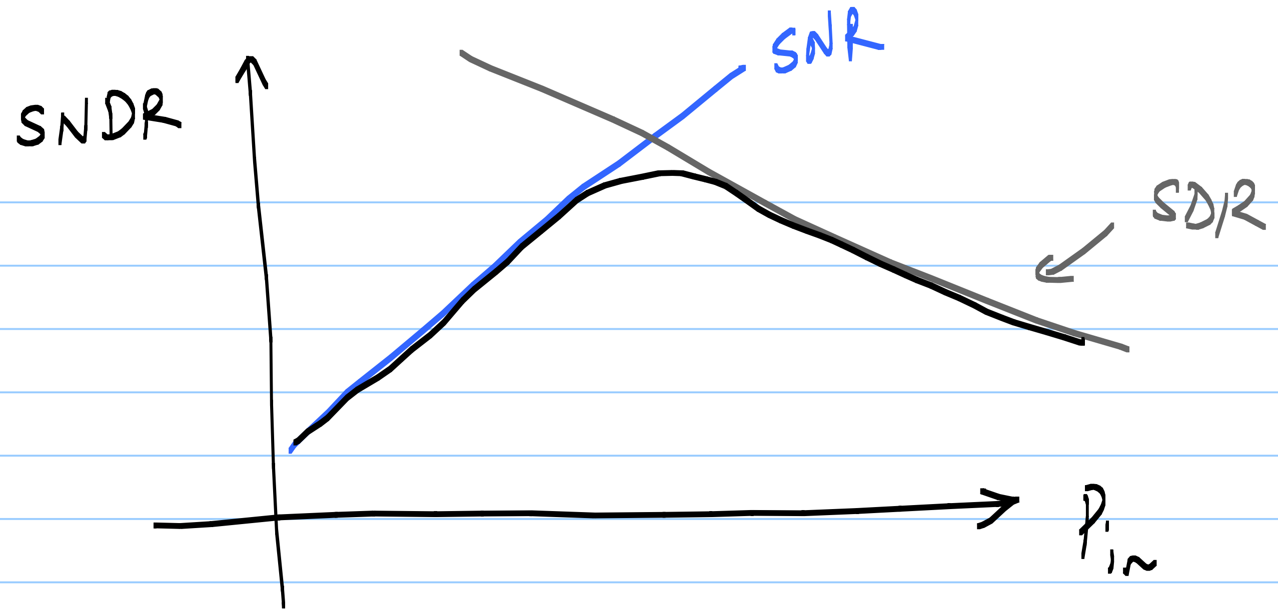
$$P_{out} = G \cdot P_{in}$$

$$P_{out_{dB}} = P_{in_{dB}} + G_{dB}$$

slope = 1

Output-referred 1-dB compression point

Input-referred 1-dB compression point


SNDR
SNR
SDR
P_{in}