802.15.4 2.5 GHz PHY

- gain — total gain →
  - gain distribution
  - at antenna -85 dBm (PER < 1% for PSDU of 20 bytes.)

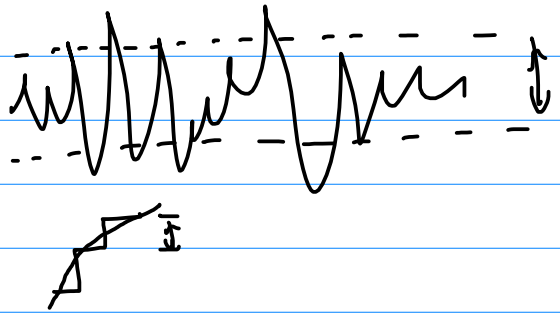
$$\frac{V^2}{R} = 10^{-8.5} \times 10^{-3}$$

$$V = \sqrt{50 \cdot 10^{-11.5}}$$

$$\approx 13\ \mu V$$

- for your design,

Assume ADC needs 1V p-p



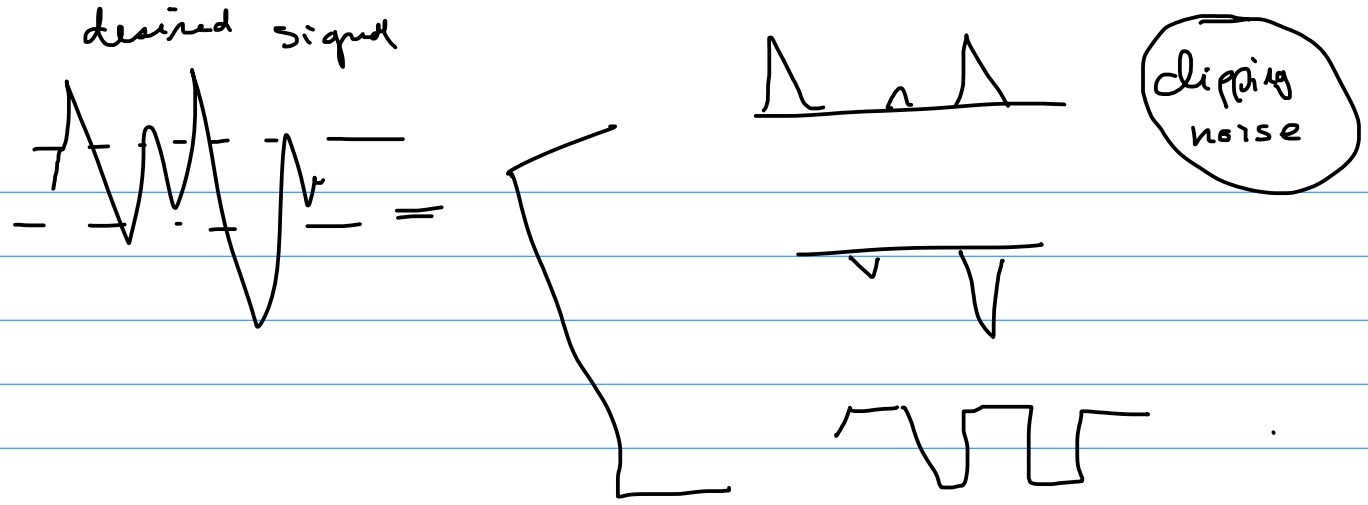
- input level @ ADC input is compromise between clipping & quantization noise

- need pdf of signal: Gassian or sinusoidal?
  - assume Gaussian

- maximum in > -20 dBm

- gain distribution between LNA & IF & Baseband filters to maximize IIP3.

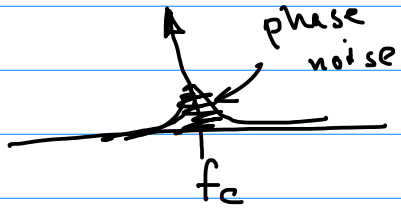
- Consider using noise floor as minimum input signal level.



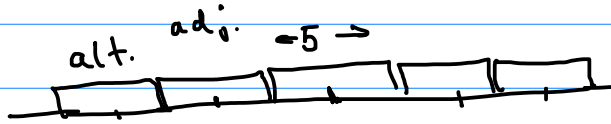
total noise = quant. noise + clipping noise

(2) LO Specifications.

- frequency : $2405 + 5 \cdot n$ MHz
- accuracy & stability (ppm)
- output level (to match mixer)
- phase noise

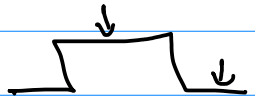


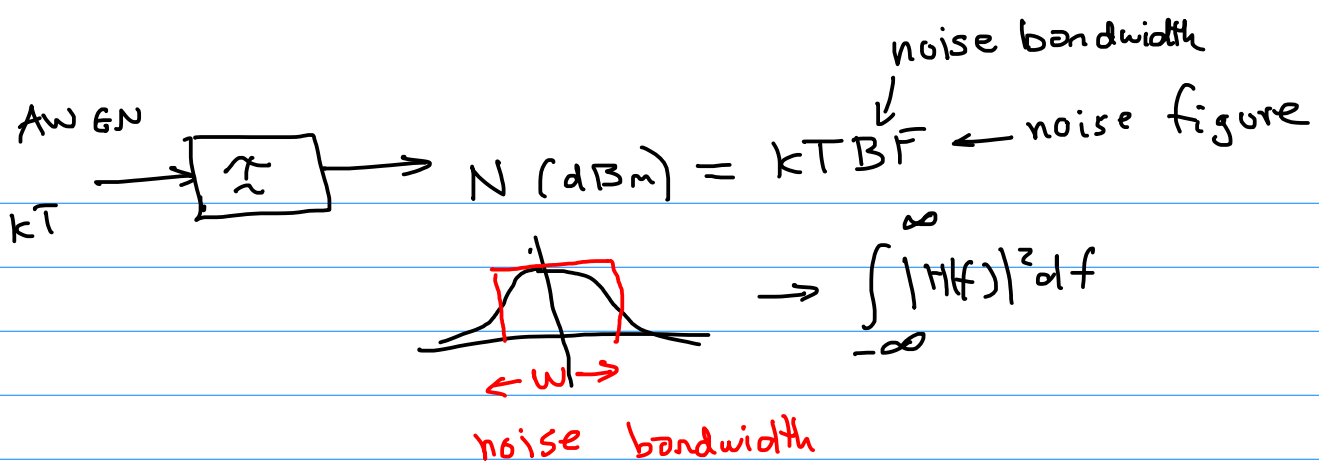
(3) Selectivity



- adjacent ±5 MHz 0 dB.
  w/ −82 dBm desired, & adj @ −82 dBm PER<1%
- alternate ±10 MHz 30 dB
  w/ −82dBm desired & alt @ −52 dBm PER<1%

- also:
  - no ISI
  - linear phase
  - noise bandwidth



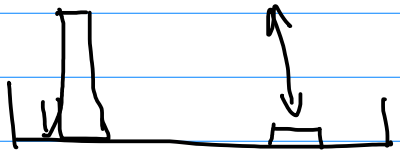


$$\int_{-\infty}^{\infty} |H(f)|^2 df$$

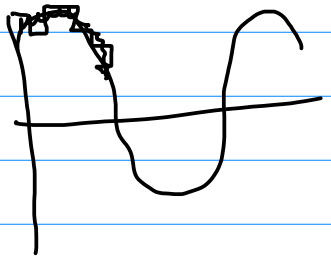
(4) noise figure (cascade, overall, system)

- primarily set by LNA NF

(5) Mixer - gain / loss
- isolation (to meet FCC spec.)



(6) ADC - signal level
- # bits
- sampling rate



PER to BER

$$P_c = (1 - BER)^N$$

$$PER = 1 - (1 - BER)^N$$

ISM $\Rightarrow$ unlicensed