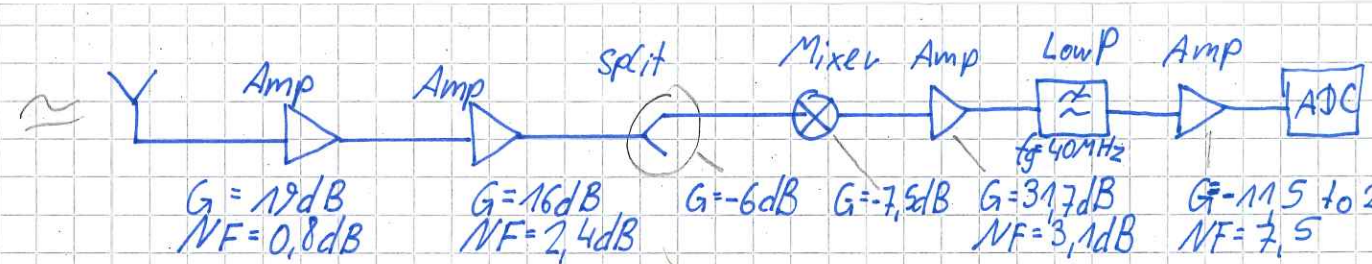

Eingangssignal

$P_{in} = -60\,dBm = 10^{-8}\,W$ Frequenz = 1 GHz

Rauschleistung pro Bandbreite

$P_{noise} = k \cdot T \cdot B$

k... Boltz constant $1{,}38 \cdot 10^{-23}$
T... Temperature in Kelvin 298
B... Bandwidth ~~1 GHz~~ 40 MHz (Lowpass filter)

$P_{noise} = 1{,}38 \cdot 10^{-23} \cdot 298 \cdot 40 \cdot 10^{6} = \underline{1{,}645 \cdot 10^{-13}\,W}$

Signal to Nois Ratio am Eingang (SNR_{in})

$$SNR_{in} = \frac{P_{sigin}}{P_{noisein}} = \frac{10^{-8}\,W}{1{,}645 \cdot 10^{-13}\,W} = 6{,}0792 \cdot 10^{3}$$

Signalleistung am Ausgang nach dem 1. Amp (Gain = 19dB NF = 0,8dB)

$P_{sigout} = P_{sigin} \cdot Gain = 10^{-8}\,W \cdot 79{,}4328 = 7{,}9433 \cdot 10^{-8}\,W$

Noise Figure

$$NF = \frac{\frac{P_{sigin}}{P_{noisein}}}{\frac{P_{sigout}}{P_{noiseout}}} = \frac{SNR_{in}}{SNR_{out}} \qquad \frac{SNR_{in}}{NF} = SNR_{out}$$

$$SNR_{out} = \frac{6{,}0792 \cdot 10^{3}}{1{,}2023} = 5{,}0564 \cdot 10^{3}$$

$$SNR_{out} = \frac{P_{sigout}}{P_{noiseout}} \qquad P_{noiseout} = \frac{P_{sigout}}{SNR_{out}} = \frac{7{,}9433 \cdot 10^{-8}\,W}{5{,}0564 \cdot 10^{3}} = \underline{1{,}5709 \cdot 10^{-11}\,W}$$

Verstärkerkette

Gain (no VGA) = (last Amp) ~~$1{,}5409 \cdot 10^{4}$~~ $1{,}5409 \cdot 10^{4}$

Gain (with VGA) = $1{,}5409 \cdot 10^{6}$

Rauschleistung vor dem ADC

$P_{noise1} = P_{noiseout} \cdot Gain_{noVGA} = 1{,}5709 \cdot 10^{-11}\,W \cdot 1{,}5409 \cdot 10^{4} = \underline{2{,}4207 \cdot 10^{-7}\,W}$

$P_{noise2} =$ —11— $\cdot\, Gain_{with\,VGA} = 1{,}5709 \cdot 10^{-11}\,W \cdot 1{,}5409 \cdot 10^{6} = \underline{2{,}4207 \cdot 10^{-5}\,W}$