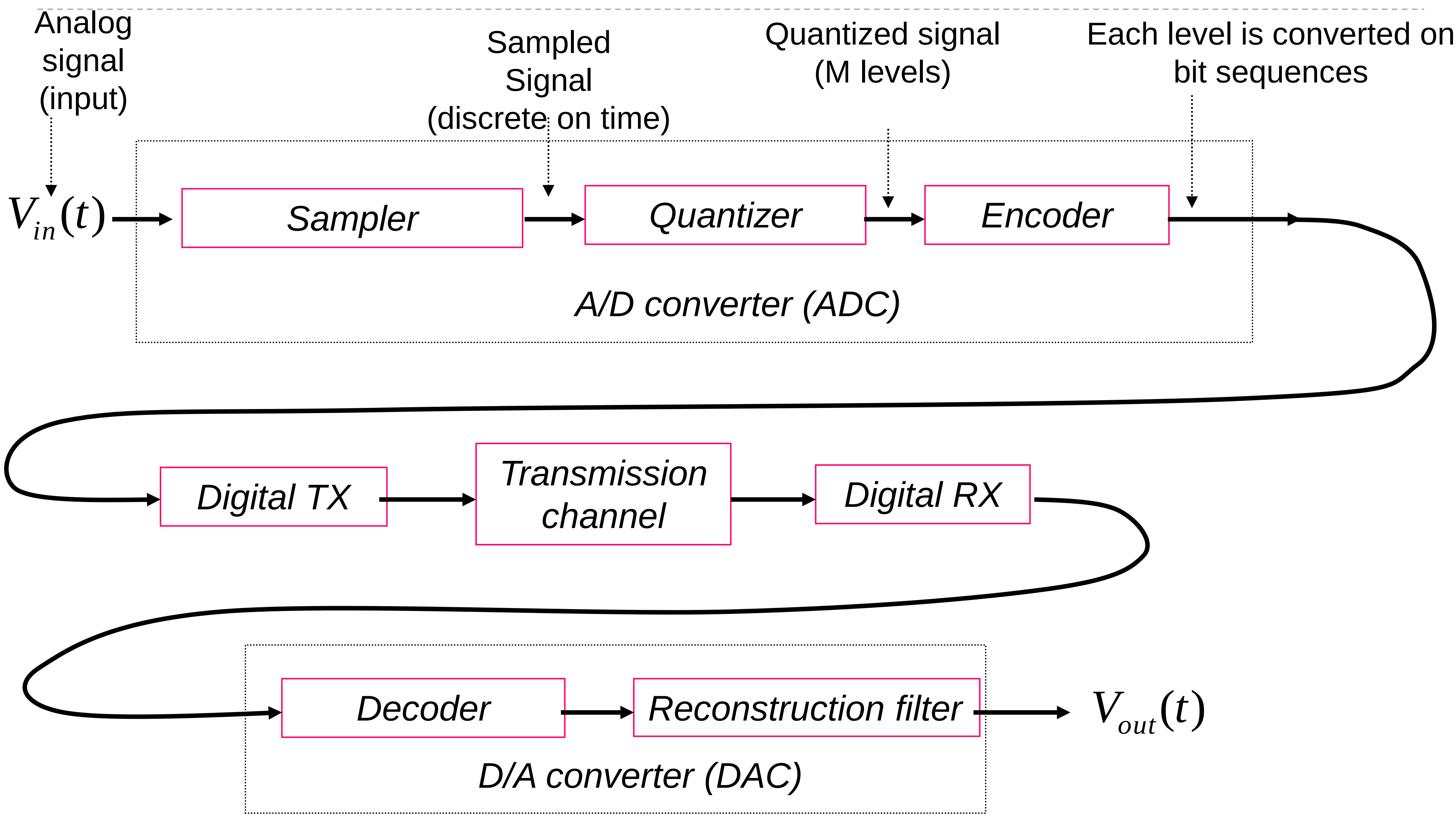
LAB #1

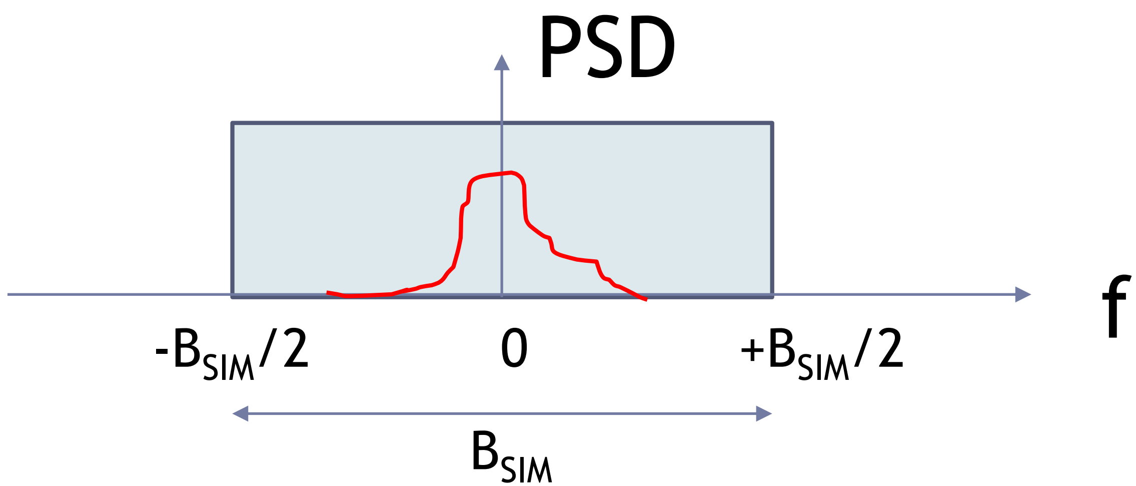
PCM block diagram



SAMPLING AND SIMULATION BANDWIDTH

Rule: satisfy sampling theorem $f_c > B_{SIGNAL}$

$$T_C = \frac{1}{f_c} \quad \Rightarrow \quad B_{SIM} = \frac{1}{T_c}$$



WHERE IS THE SAMPLER?

- You will start with a sampled signal
  - Software generated by Matlab (uniform distribution)
  - Taken from an audio file

SNR MEASUREMENT

- Let's use the SNR definition applied to our system:
  - ratio between signal power and noise (error) power
- It can be obtained as the ratio between variances:

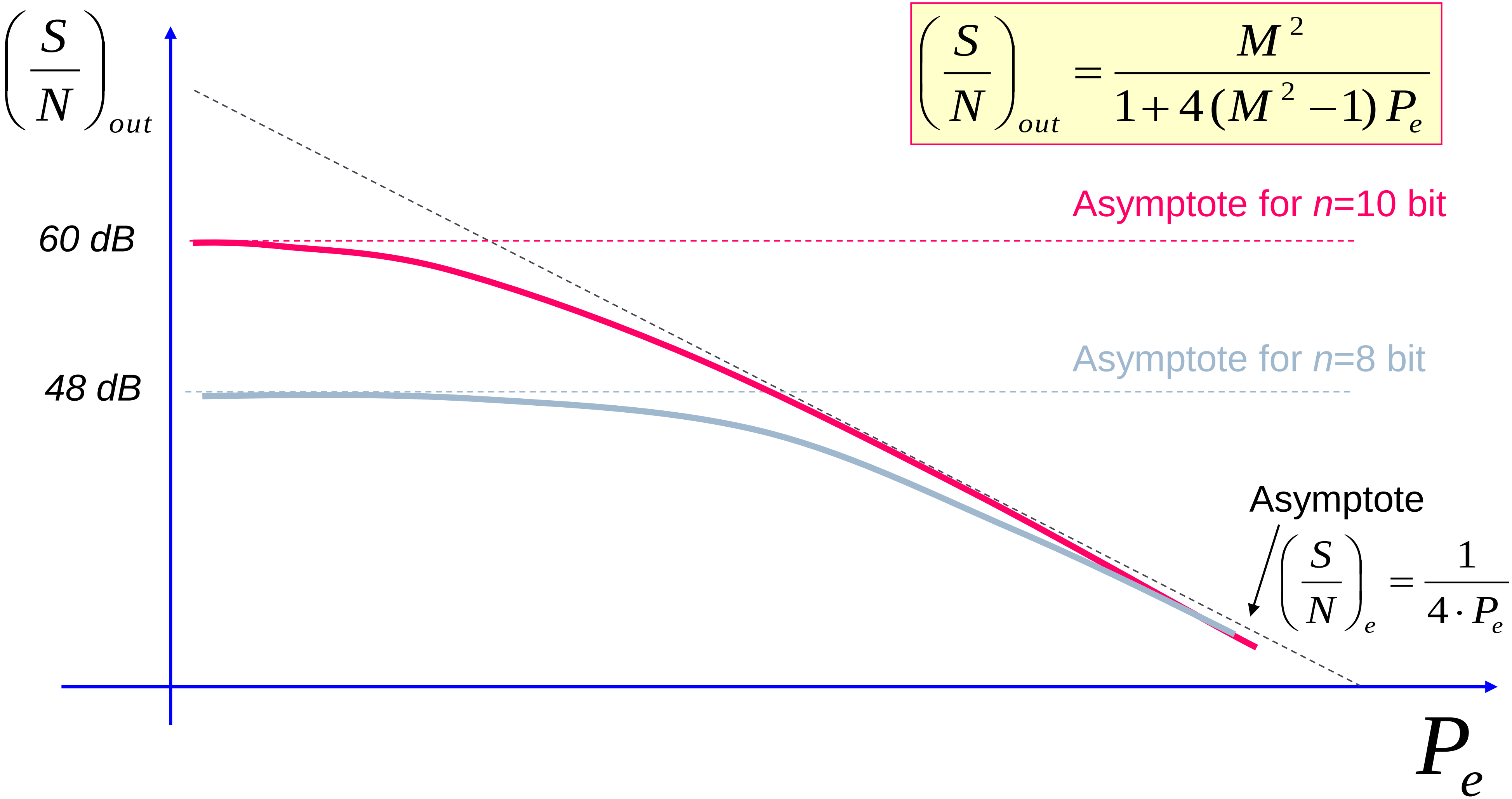
$$\left(\frac{S}{N}\right) = \frac{\sigma_{V_{in}}^2}{\sigma_e^2}$$

where

$$e = V_{out} - V_{in}$$

PCM performance (signal with uniform pdf)

$$\left(\frac{S}{N}\right)_{out} = \frac{M^2}{1+4(M^2-1)P_e}$$



MATLAB COMMAND - I

- SIGNAL WITH UNIFORM PDF GENERATOR
  - sig=rand(sz1,sz2);
- QUANTIZER
  - [index,quants]=quantiz(sig,partition);
- ENCODER
  - words=de2bi(index);
- BINARY SYMMETRIC CHANNEL
  - outdata=bsc(indata,probability);
- DECODER
  - index=bi2de(words);

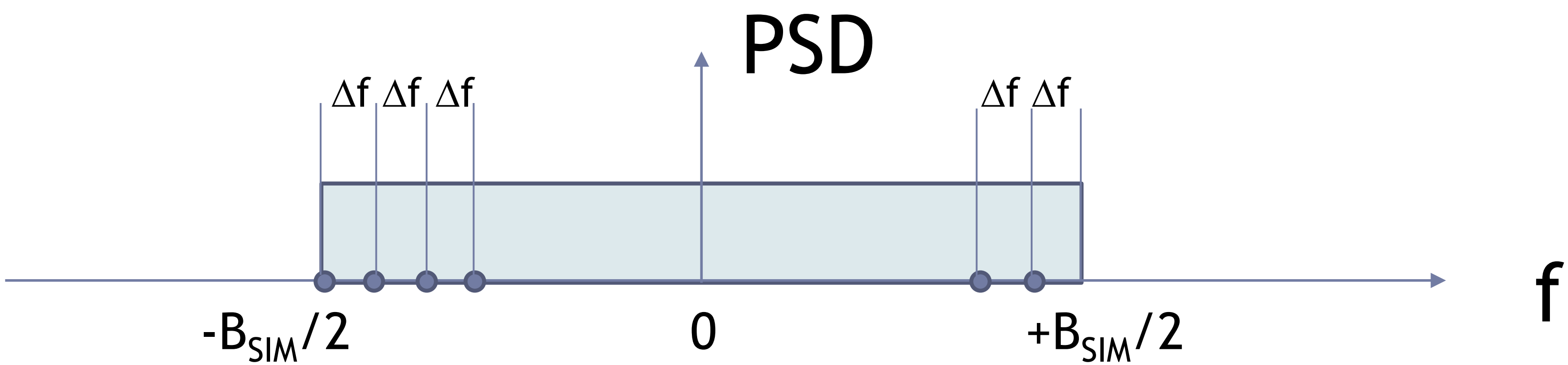
MATLAB COMMAND - II

- PDF plot
  - histogram(x,nbinm'Normalization', 'pdf');

- PSD plot
  - psd=abs(fft(x)).^2;
  - plot(f,fftshift(psd));

FFT

N_{FFT} frequency points
Frequency spacing: $\Delta f = B_{SIM}/N_{FFT}$



$f=[B_{SIM}/2:\Delta f:B_{SIM}/2-\Delta f];$