

Oversampling (3B)

-
-

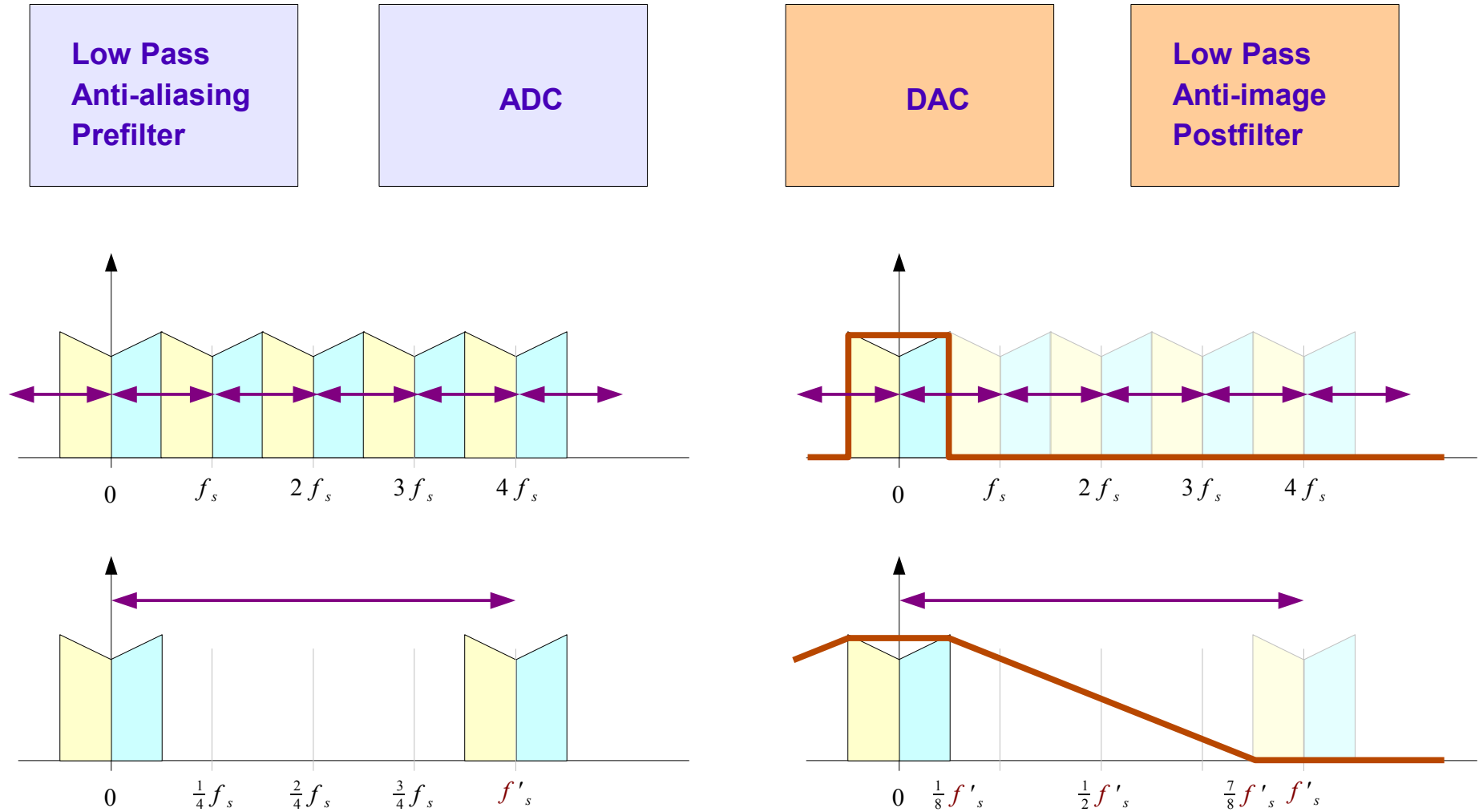
Copyright (c) 2009 - 2012 Young W. Lim.

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

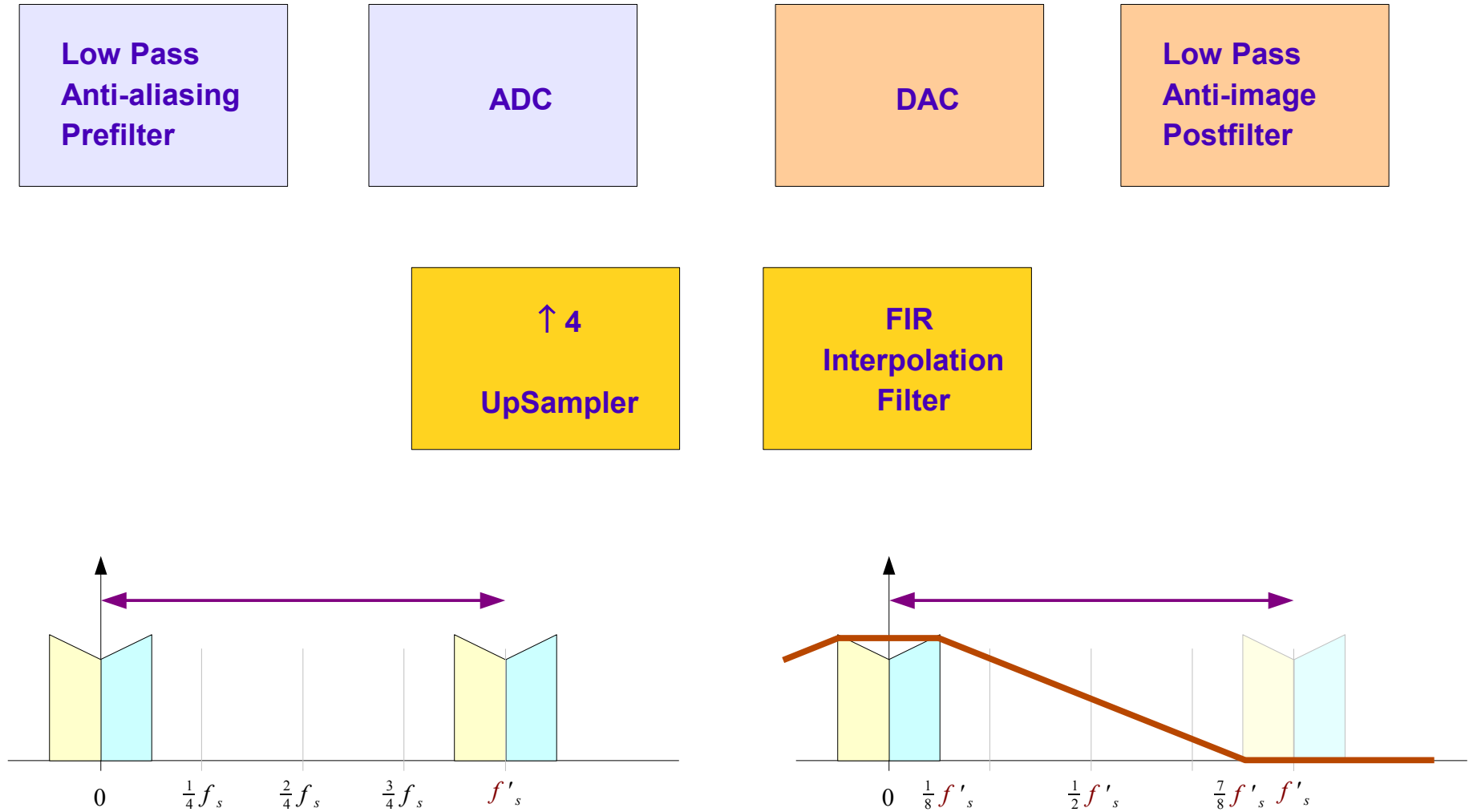
Please send corrections (or suggestions) to youngwlim@hotmail.com.

This document was produced by using OpenOffice and Octave.

Band-limited Signal



Band-limited Signal



Band-limited Signal

Low Pass
Anti-aliasing
Prefilter

ADC

DAC

Low Pass
Anti-image
Postfilter



↑ 4

$$f_{oversampling} = 4^n \cdot f_s \text{ UpSampler}$$

FIR
Interpolation
Filter

$$f_s > 2 \cdot f_H$$

Band-limited Signal

$$f_{\text{oversampling}} = 4^n \cdot f_s$$

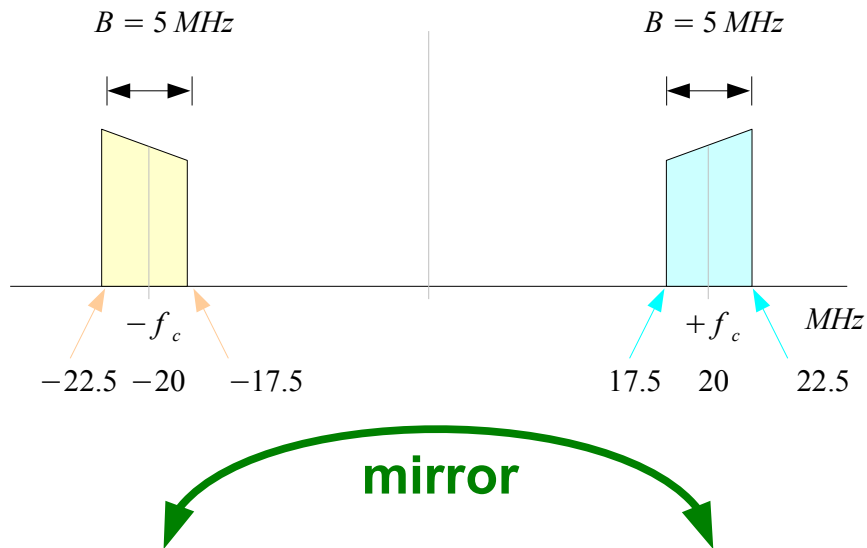
Oversampling and Decimation
Oversample and Lowpass Filter

- **Normal Averaging**
- **Decimation / Interpolation**

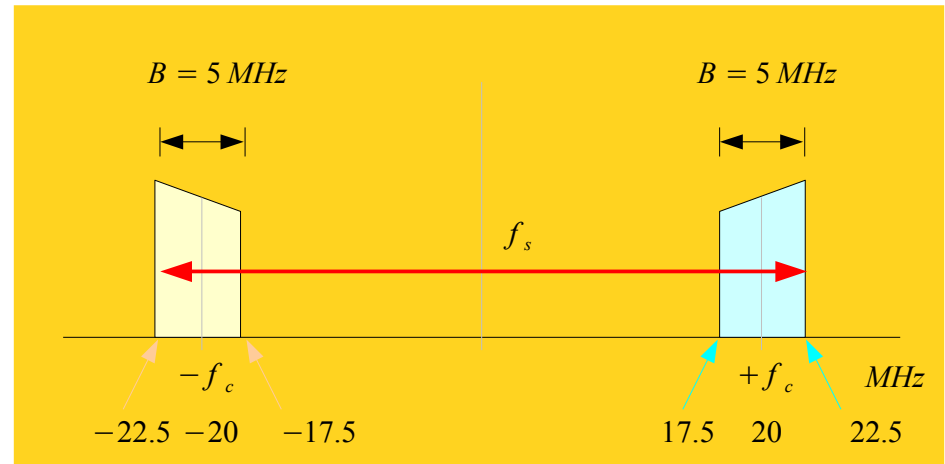


$$f_s > 2 \cdot f_H$$

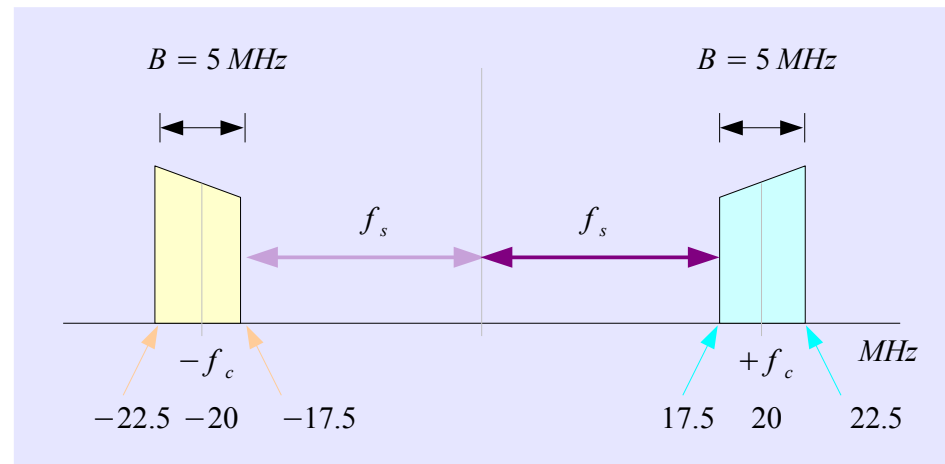
Band-limited Signal



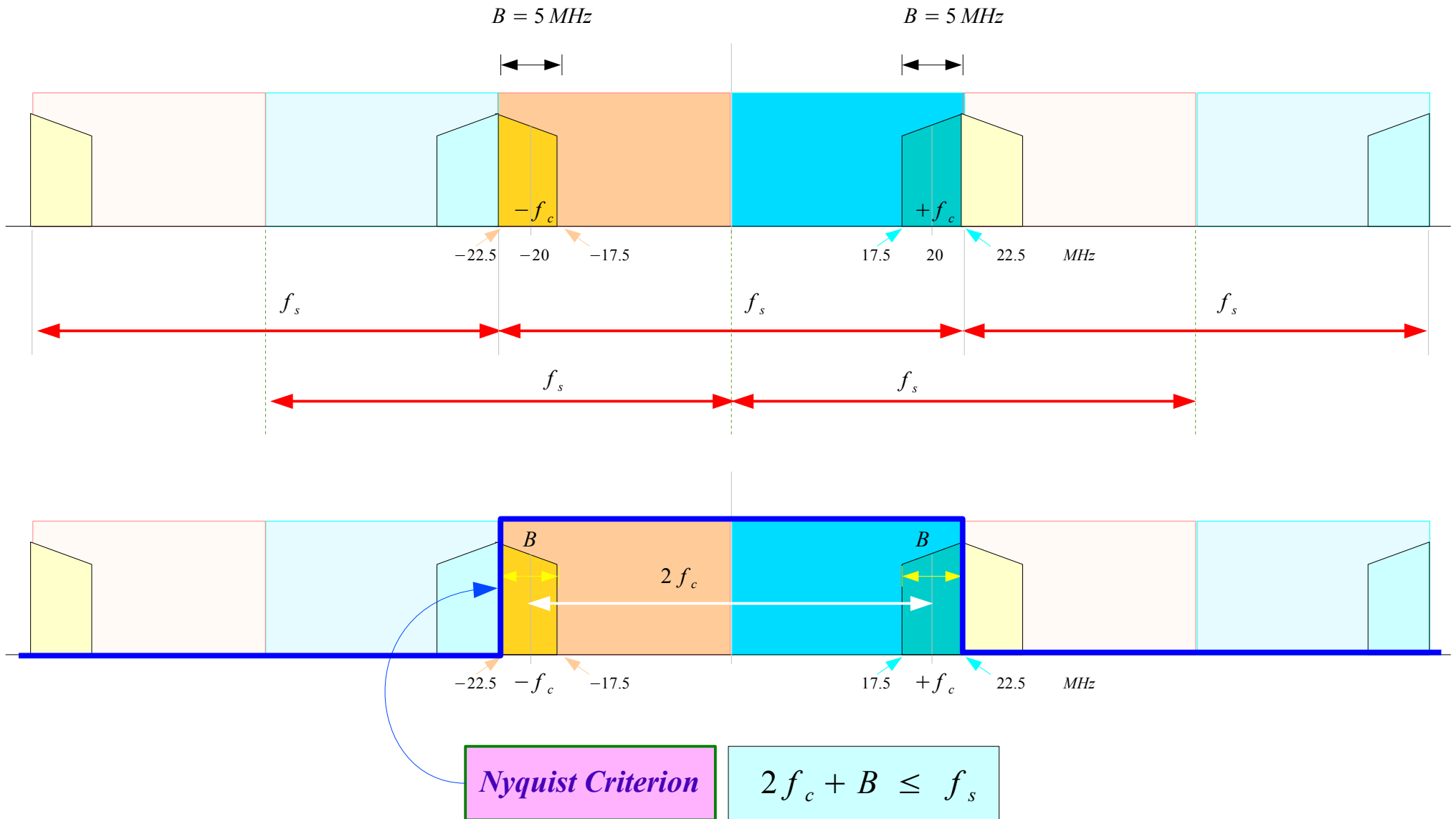
- Bandpass Sampling
- IF filtering
- Harmonic Sampling
- Sub-Nyquist Sampling



- Lowpass Sampling



Low-pass Signal Sampling



References

- [1] <http://en.wikipedia.org/>
- [2] J.H. McClellan, et al., Signal Processing First, Pearson Prentice Hall, 2003
- [3] A “graphical interpretation” of the DFT and FFT, by Steve Mann
- [4] R. G. Lyons, Understanding Digital Signal Processing, 1997
- [5] AVR121: Enhancing ADC resolution by oversampling
- [6] S.J. Orfanidis, Introduction to Signal Processing
www.ece.rutgers.edu/~orfanidi/intro2sp