Oversampling (3B)

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

This document was produced by using OpenOffice and Octave.

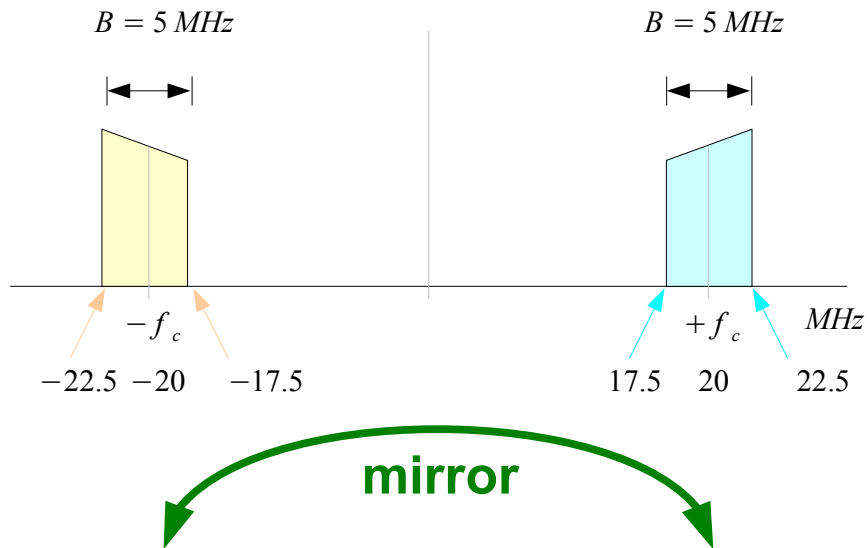# Band-limited Signal

$$f_s > 2 \cdot f_H$$

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

Oversampling and Decimation
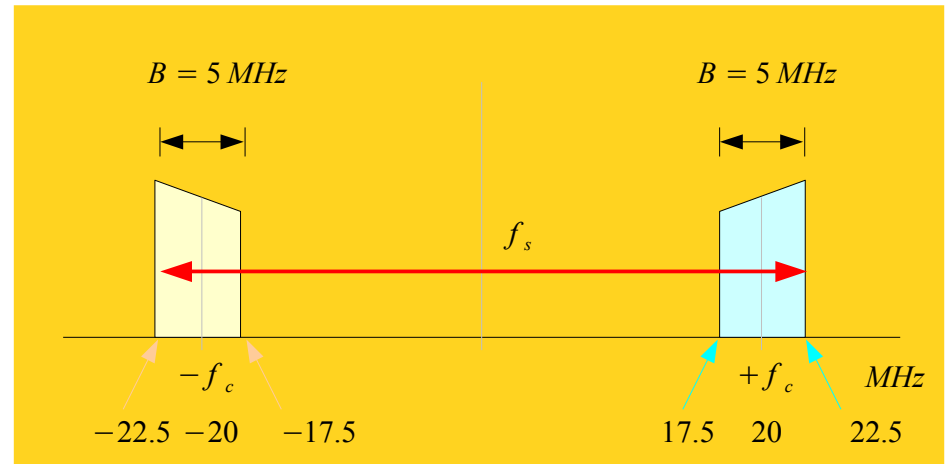**Oversample and Lowpass Filter**

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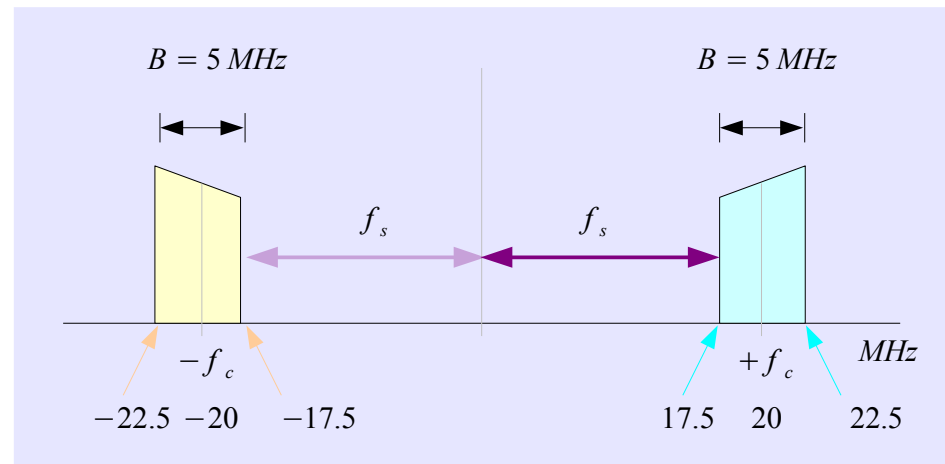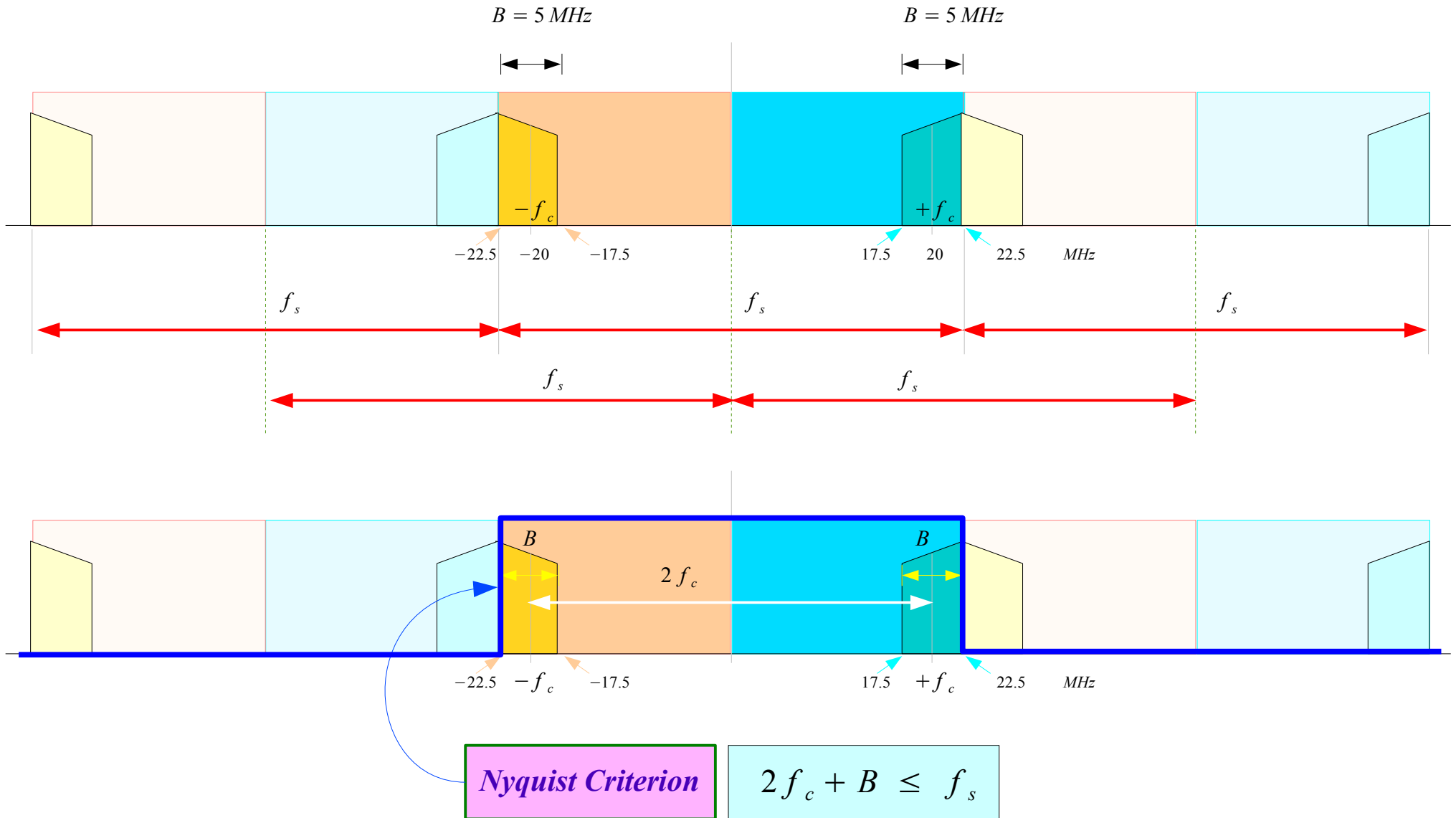- **Decimation / Interpolation**

Band-limited Signal

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

- **Lowpass Sampling**

Low-pass Signal Sampling

$B = 5\ MHz$

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$-f_c$

$+f_c$

-22.5 -20 -17.5 17.5 20 22.5 MHz

f_s f_s f_s

f_s f_s

B $2\,f_c$ B

-22.5 $-f_c$ -17.5 17.5 $+f_c$ 22.5 MHz

Nyquist Criterion

$$2\,f_c + B \;\leq\; f_s$$

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