BandPass (4A)

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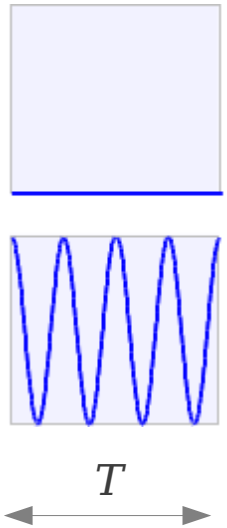
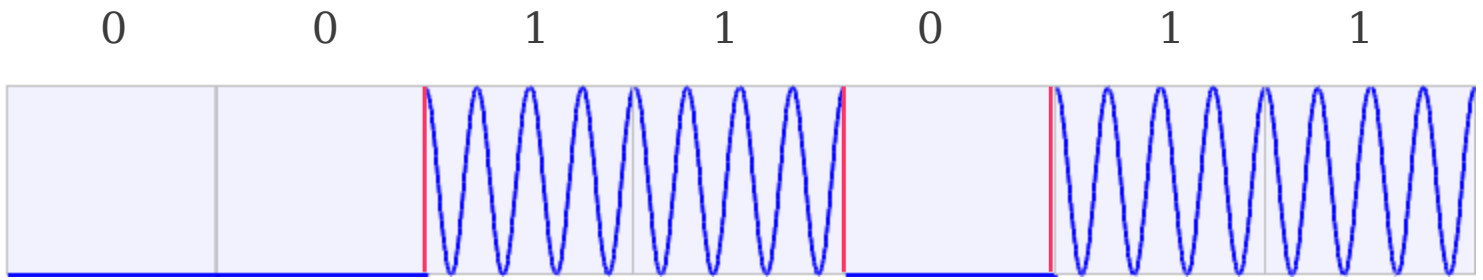
Binary ASK (Amplitude Shift Keying)

$$s_0(t) = \sqrt{\frac{2E_0(t)}{T}} \cos(\omega_0 t + \Phi)$$

$$s_1(t) = \sqrt{\frac{2E_1(t)}{T}} \cos(\omega_0 t + \Phi)$$

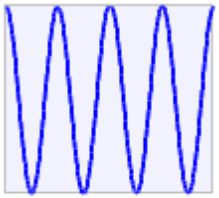




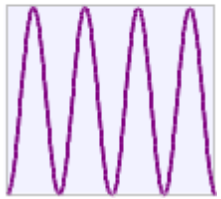
M: size of a set of message symbols

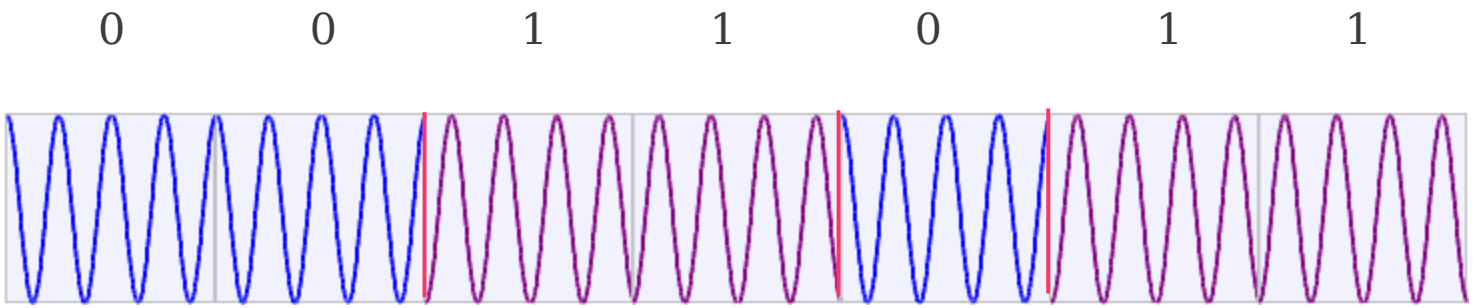
Binary PSK (Phase Shift Keying)

$$s_0(t) = \sqrt{\frac{2E}{T}} \cos\left(\omega_0 t + \frac{2\pi \cdot 0}{2}\right)$$



$$s_1(t) = \sqrt{\frac{2E}{T}} \cos\left(\omega_0 t + \frac{2\pi \cdot 1}{2}\right)$$

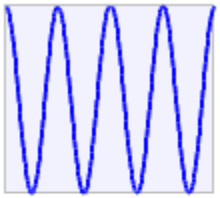




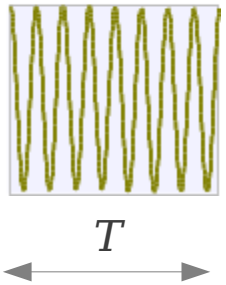
M: size of a set of message symbols

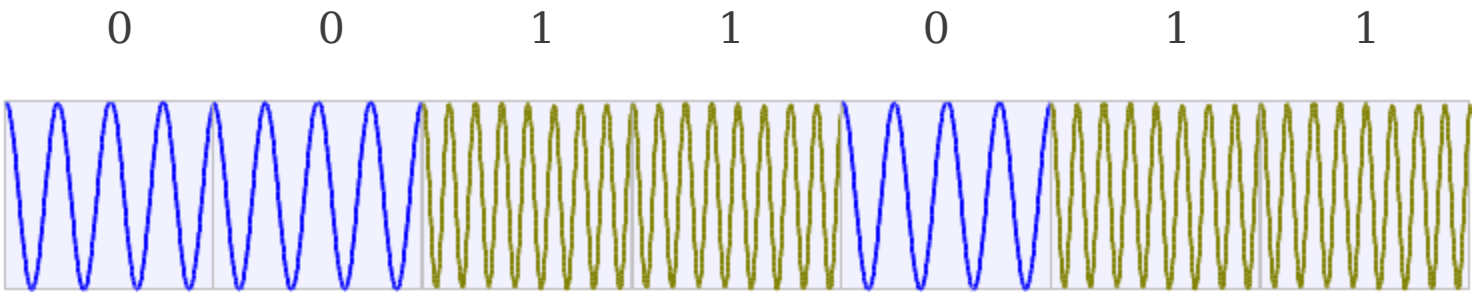
Binary FSK (Frequency Shift Keying)

$$s_0(t) = \sqrt{\frac{2E}{T}} \cos(\omega_0 t + \Phi)$$



$$s_1(t) = \sqrt{\frac{2E}{T}} \cos(\omega_1 t + \Phi)$$





M: size of a set of message symbols

Coherent and Non-Coherent Detection

Coherent Detection

The Sinusoidal Reference Signal
is synchronous in phase
with the carrier wave used in the modulator
Phase Locked Loop

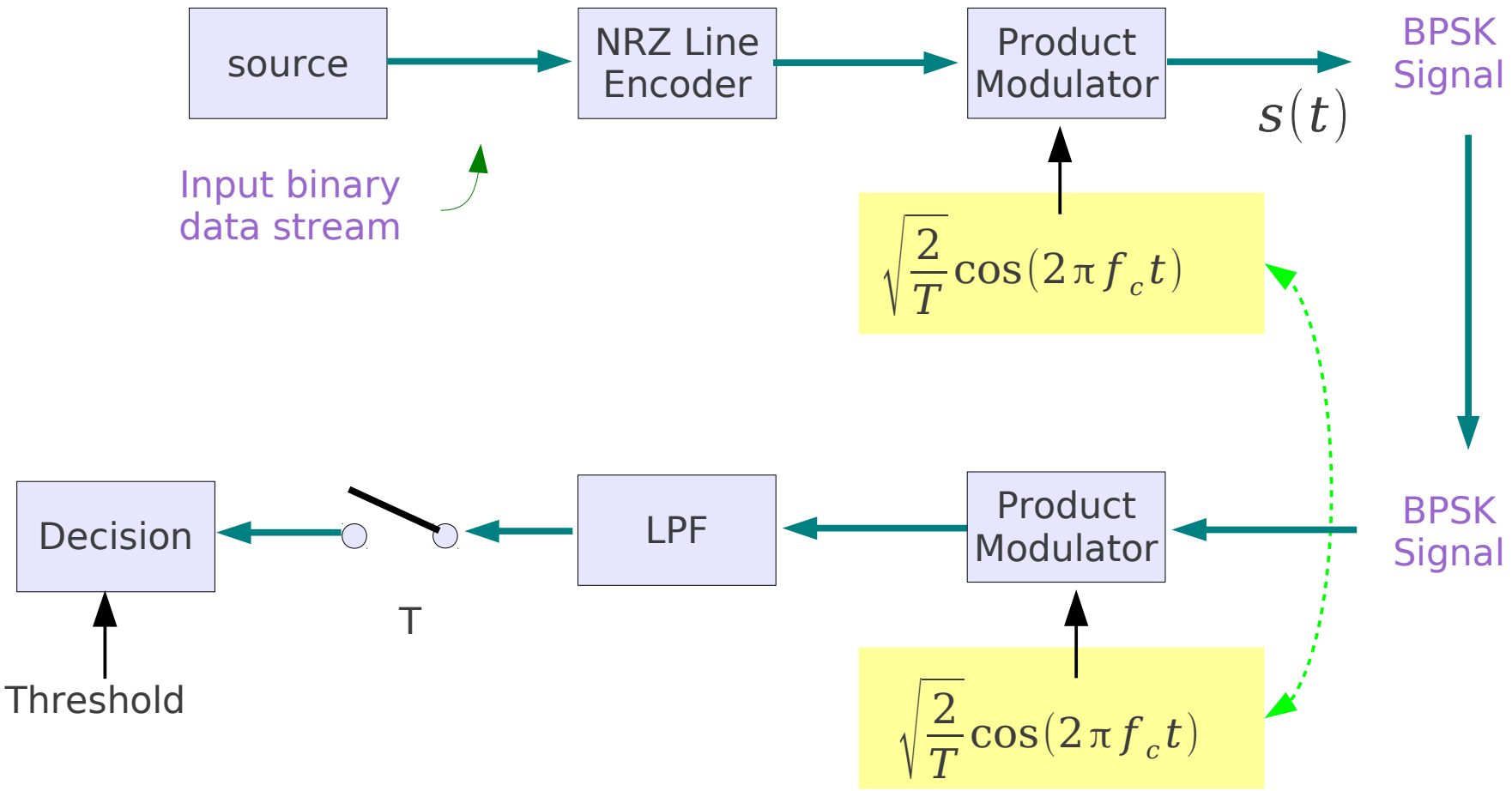
Synchronous Phase
Symbol Interval

Cost

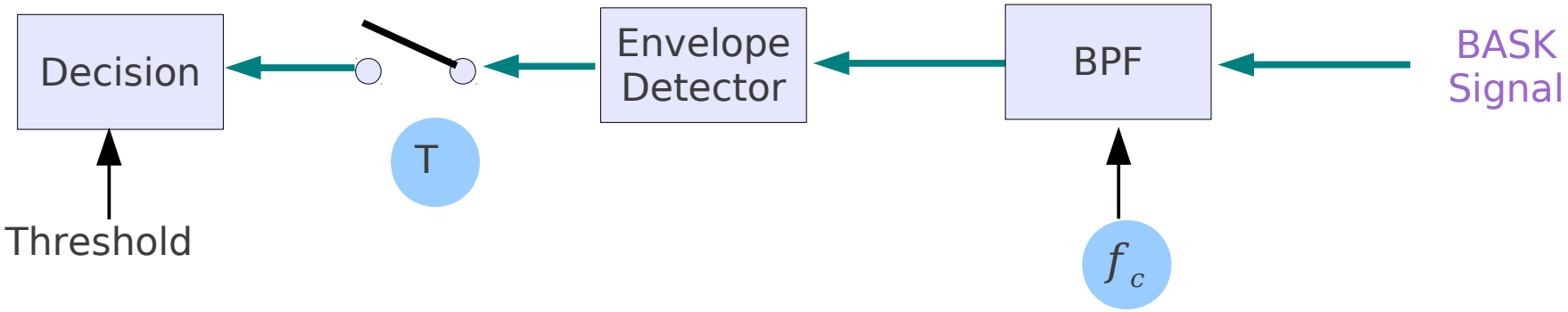
Non-Coherent Detection

Abandon phase synchronization

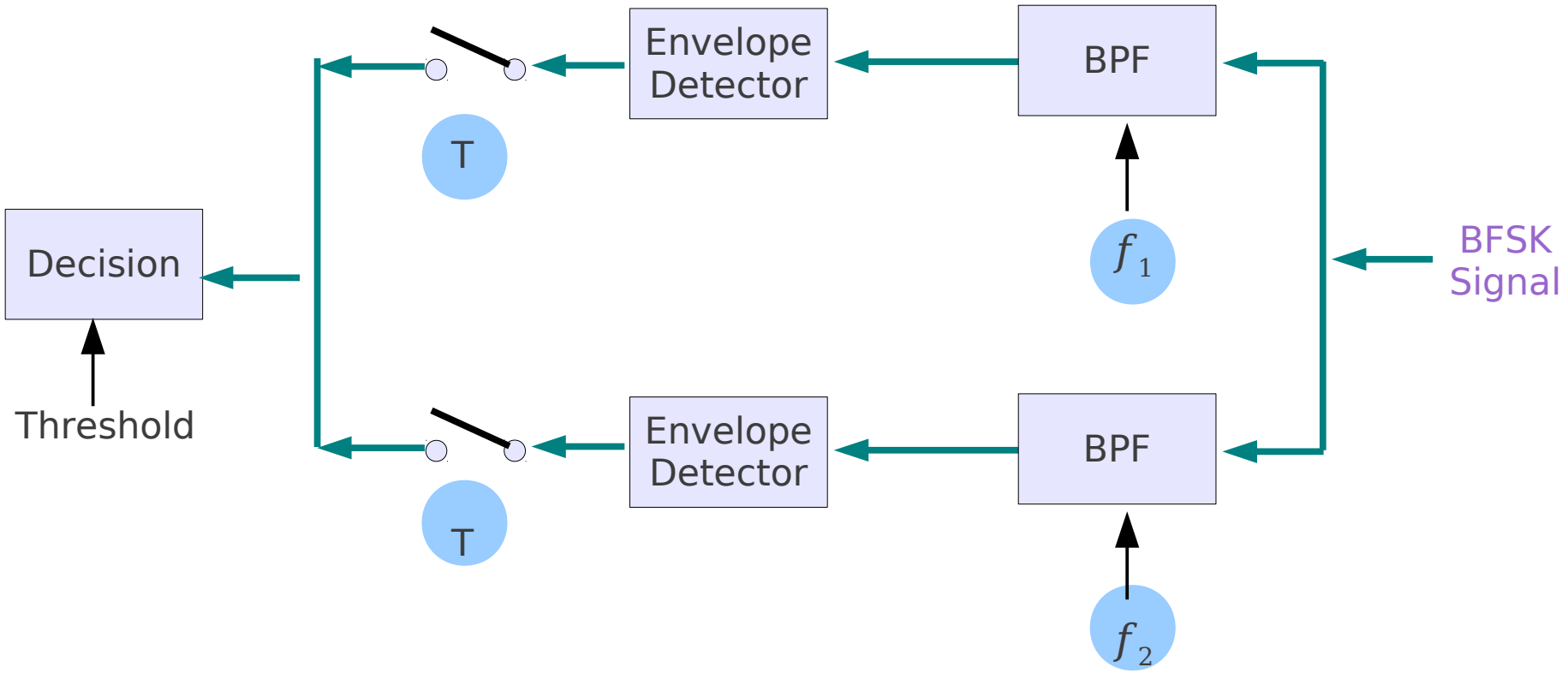
Coherent Detection of BPSK signals



Non-Coherent Detection of BASK signals

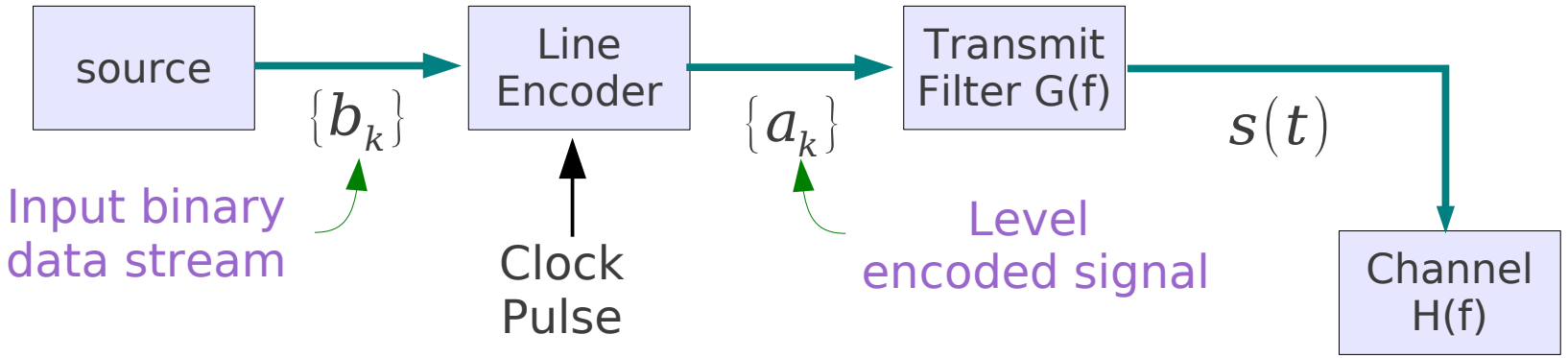


Non-Coherent Detection of BFSK signals



M-ary PAM

The amplitude of transmitted pulses is varied in a discrete manner in accordance with an input stream of digital data



M-ary PAM Bit Rate

$$T = T_b \log_2 M$$

M possible amplitude level (M>2)
M symbols
Transmits sequence of symbols

T: Symbol duration
1/T : Symbol rate

Binary PAM
Tb : Bit duration
1/Tb : Bit rate

Line Encode

NRZ
RZ
...

Signal Space

ISI

Autocorrelation of Random and Power Signals

Time Averaging and Ergodicity

Autocorrelation of Random and Power Signals

Time Averaging and Ergodicity

References

[1] http://en.wikipedia.org/
[2] http://planetmath.org/
[3] B. Sklar, “Digital Communications: Fundamentals and Applications”