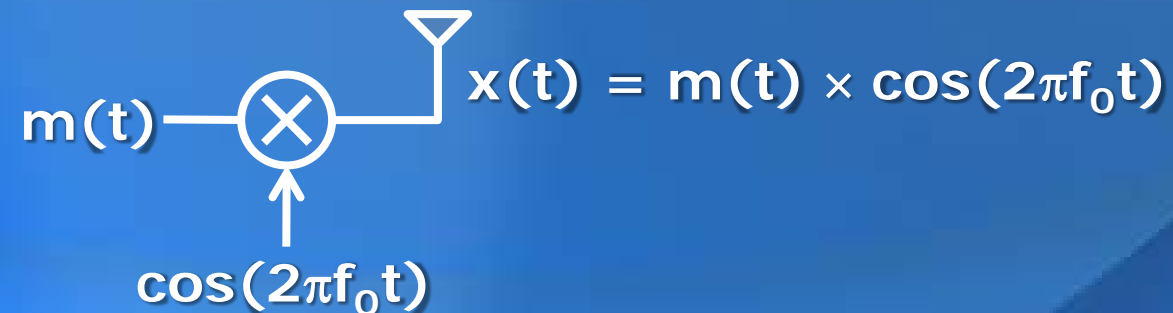


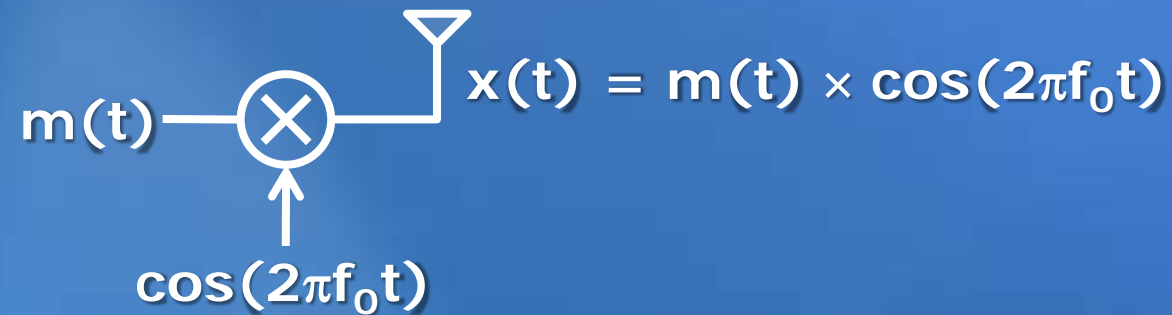
# Binary Phase Shift Keying

# Amplitude Modulation

- Generally speaking, **modulation** is the process of varying one or more properties of the carrier signal according to a modulating signal containing information we wish to transmit.
- The modulation technique we have studied is called **amplitude modulation** (AM), because the modulating signal changes the amplitude of the carrier.

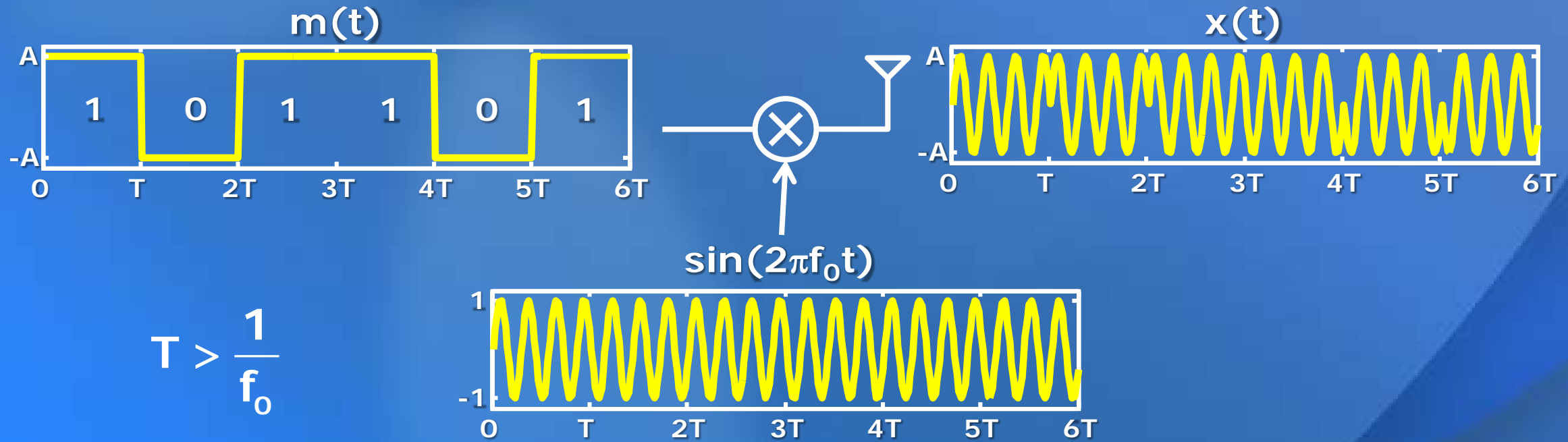


# Analog/Digital Modulation



- **Analog modulation:** The modulating signal  $m(t)$  is an analog signal (e.g. sound or voice)
- **Digital modulation:** The modulating signal  $m(t)$  encodes a digital bit stream.

# Binary Phase Shift Keying

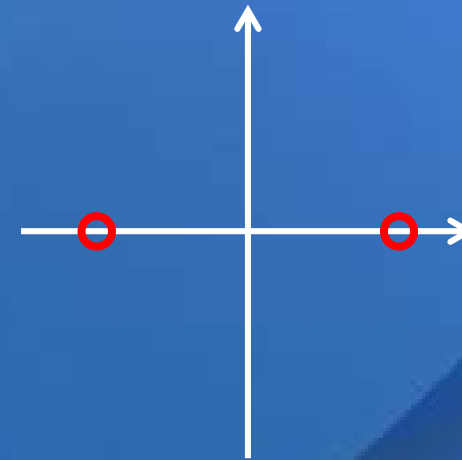


Represent each bit by holding  $m(t)$  at  $-A$  (0) or  $+A$  (1) for one bit time,  $T$ .

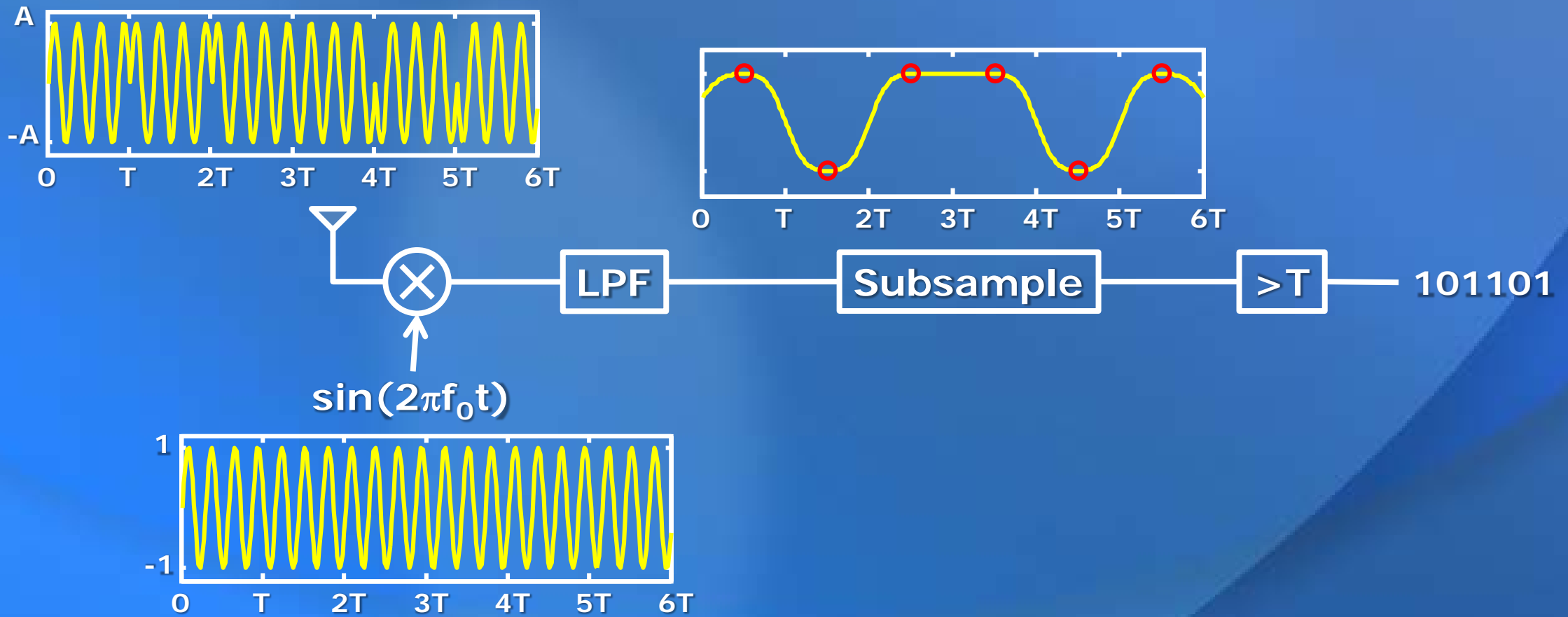
# Phase Shift Keying

- BPSK can be considered to be amplitude modulation.
- BPSK can also be considered to be phase modulation.

- If the input bit is 1, send  $A \cdot \sin(2\pi f_0 t)$
- If the input bit is 0, send  $-A \cdot \sin(2\pi f_0 t) = A \cdot \sin(2\pi f_0 t + \pi)$

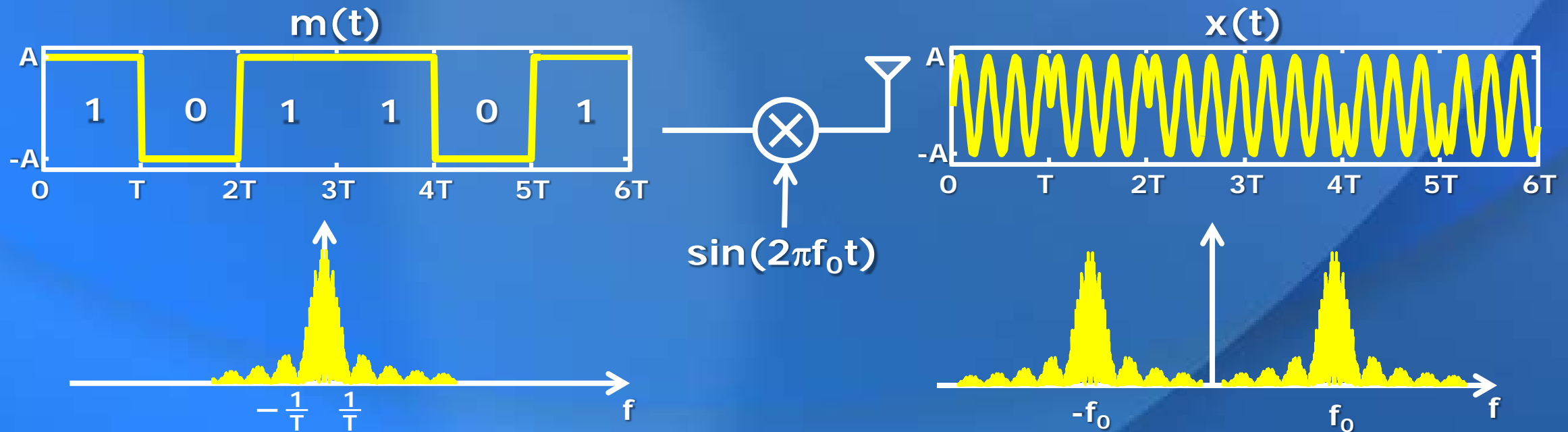


# BPSK Receiver



# Transmission Bandwidth

- Wireless communication channels are shared!
- Sharply changing waveforms lead to a wide bandwidth spectrum.



# Reducing Bandwidth

Add a low pass filter, also known as a **pulse shaping filter** or **transmit filter**.

Must be careful: may introduce intersymbol interference.

