DIGITAL COMMUNICATION LAB THIRD STAGE

Eng: Shaymaa Fakhir

Experiment:6

Phase Shift Key Modulation &Demodulation (PSK)

OBJECT

☐ To study the generation of the Phase Shift Keyed output and also to demodulate the PSK output.

FEATURES

☐ The board consists of the following built-in parts:

01. ± 5V D.C. at 100mA IC regulated power supply internally connected
02. IC 741 as Op-Amp.
03. IC 7490 as decade counter.
04. IC TL-084 Quad Op-Amp.
05. CD 4051 as multiplexer.
06. IC-7486 Quad, 2-input EXCLUSIVE-OR gate
07. Mains ON/OFF switch.
08. The unit is operative on 230V ±10% at 50Hz A.C. Mains.
09. Adequate no. of patch cords 4mm length 50cm.
10. Good Quality, reliable terminal/sockets are provided at appropriate places on panel for connections /observation of waveforms.

PSK – phase of carrier signal is varied to represent binary 1 or 0

- peak amplitude & freq. remain constant during each bit interval

- <u>example</u>: binary 1 = 0⁰ phase, binary 0 = 180⁰ (πrad) phase
  $\Rightarrow$ **PSK is equivalent to multiplying carrier signal by +1 when the information is 1, and by -1 when the information is 0**

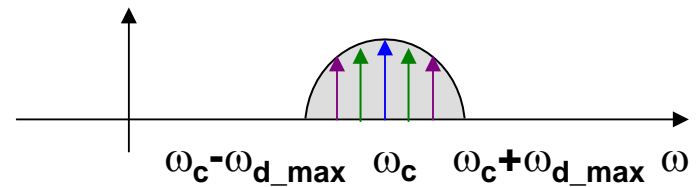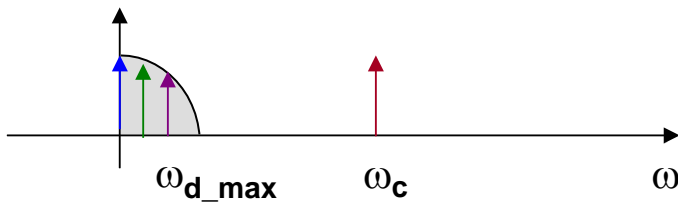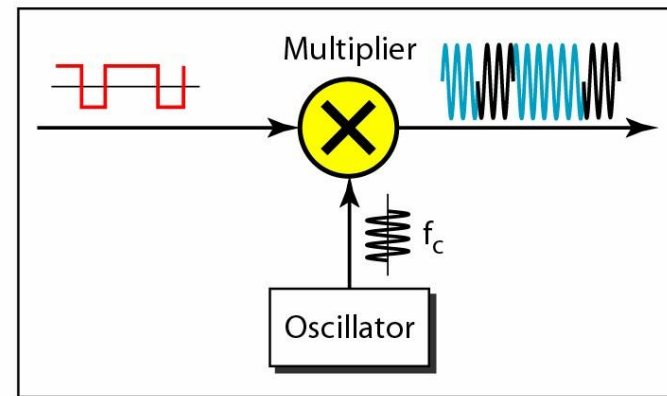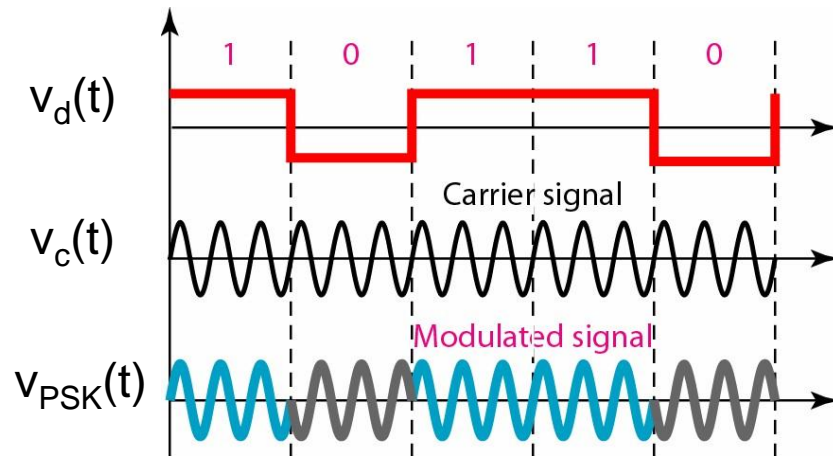| |
|---|
| **2-PSK, or** **Binary PSK**, since only 2 different phases are used. |

$$s(t) = \begin{cases} A\cos(2\pi f_c t), & \text{binary 1} \\ A\cos(2\pi f_c t + \pi), & \text{binary 0} \end{cases}$$

$$s(t) = \begin{cases} A\cos(2\pi f_c t), & \text{binary 1} \\ -A\cos(2\pi f_c t), & \text{binary 0} \end{cases}$$

1   0   1   1   0   1

+A

-A
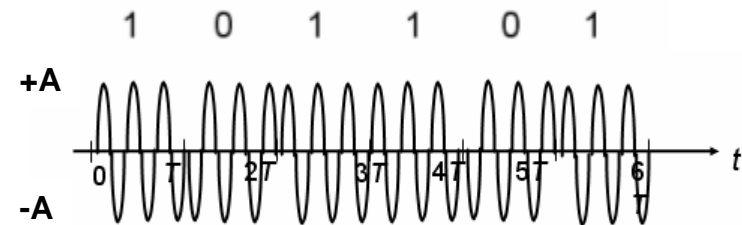
- **demodulation**: demodulator must determine the phase of received sinusoid with respect to some reference phase

- **advantage**: ▪ PSK is less susceptible to errors than ASK, while it requires/occupies the same bandwidth as ASK

  ▪ more efficient use of bandwidth (higher data-rate) are possible, compared to FSK !!!

- **disadvantage**: more complex signal detection / recovery process, than in ASK and FSK

Example **[PSK]**

PSK

$Y_i(t) = A_k \cos(2\pi f_c t) \longrightarrow$ ⊗ $\longrightarrow$ Low-pass filter with cutoff W Hz $\longrightarrow X_i(t)$

$2\cos(2\pi f_c t)$

$2A_k \cos^2(2\pi f_c t) = A_k \{1 + \cos(2\pi 2 f_c t)\}$