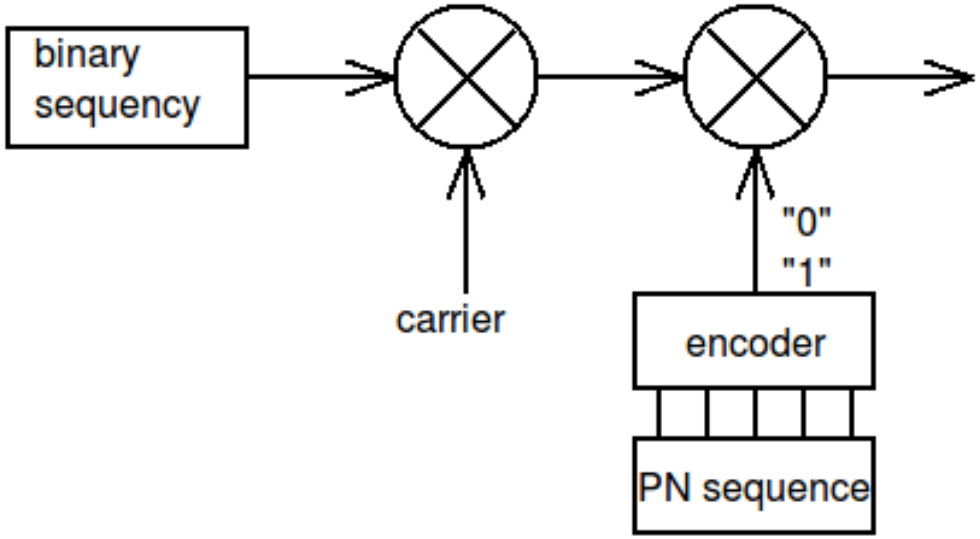
Espectro Espalhado por Salto de Tempo (THSS)

- O espalhamento de espectro é feito de modo sequencial no tempo
- Os geradores de sequência pseudo-aleatória são usados para modular a amplitude da portadora (período e ciclo de trabalho)
- A demodulação é feita a partir da mesma sequência pseudo-aleatória utilizada na modulação
- Múltiplos símbolos são transmitidos por cada “salto” de tempo
- Está diretamente ligada à modulação por posição de pulsos
- Normalmente é associada a outra forma de modulação de espalhamento de espectro (modo híbrido)

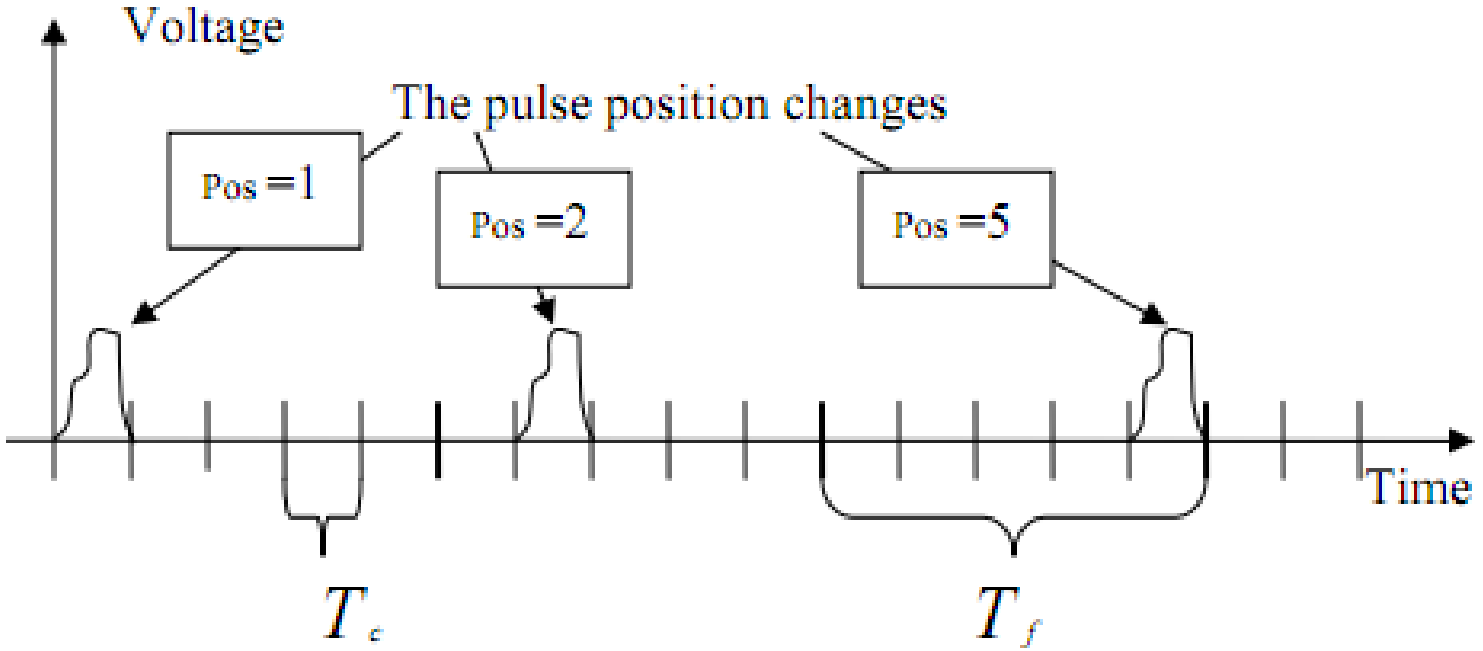
THSS

- Diagrama em blocos da modulação THSS:



THSS

- Diagrama de tempos da modulação THSS:

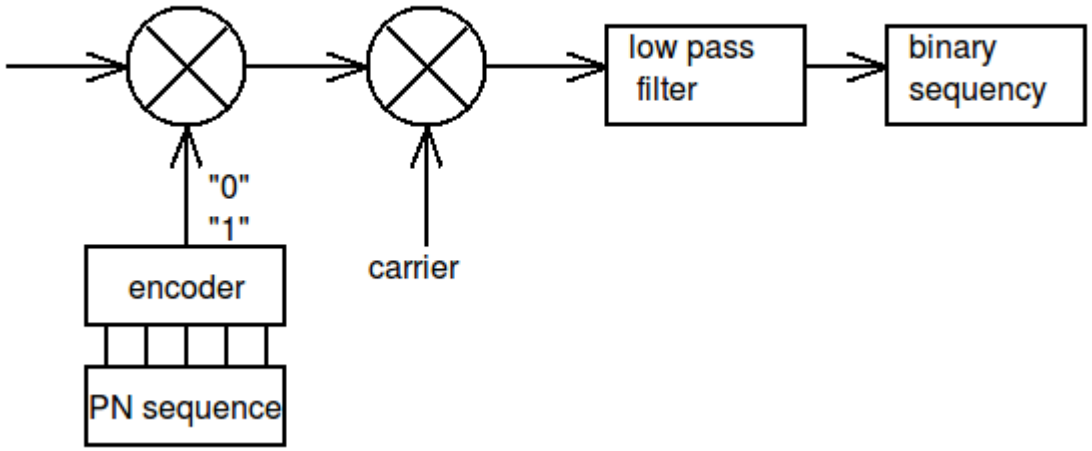


T_c: período de "chirp"

T_f: período de "frame"

THSS

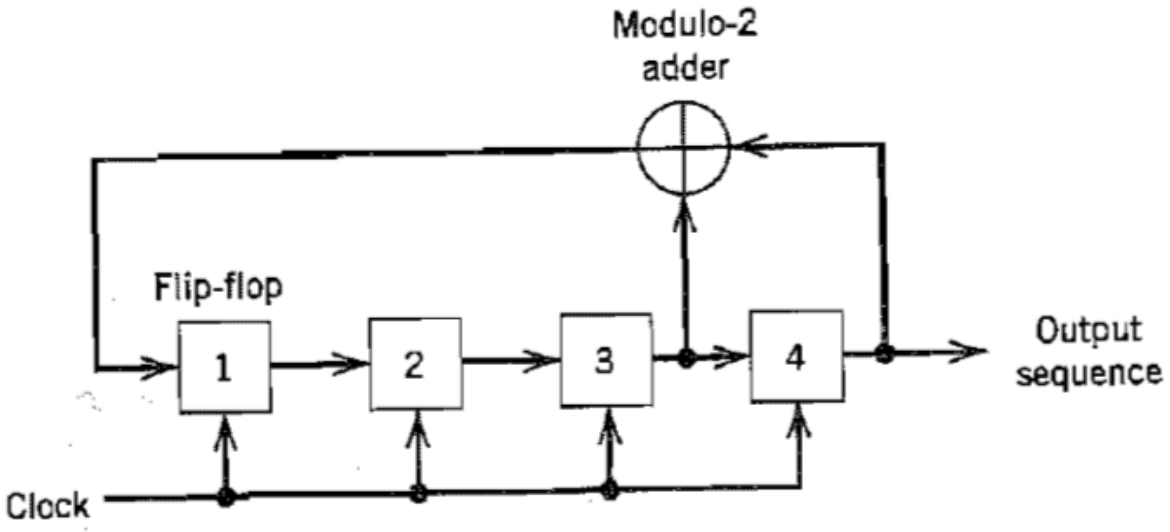
- Diagrama em blocos da demodulação THSS:



Exercícios

(Communication Systems – Simon Heykin)

7.2 Figure P7.2 shows a four-stage feedback shift register. The initial state of the register is 1000. Find the output sequence of the shift register.



Exercícios

(Communication Systems – Simon Heykin)

7.9 A direct-sequence spread binary phase-shift keying system uses a feedback shift register of length 19 for the generation of the PN sequence. Calculate the processing gain of the system. and the output SNR_{dB}

7.12 A slow FH/MFSK system has the following parameters:

Number of bits per MFSK symbol = 4

Number of MFSK symbols per hop = 5

Calculate the processing gain of the system.

Exercícios

(Communication Systems – Simon Heykin)

Problem 7.12

The processing gain (PG) is

$$PG = \frac{\text{FH bandwidth}}{\text{symbol rate}}$$

$$= \frac{W_c}{R_s}$$

$$= 5 \times 4 = 20$$

Hence, expressed in decibels,

$$PG = 10 \log_{10} 20$$

$$= 26 \text{ db}$$

Exercícios

(Communication Systems – Simon Haykin)

EXAMPLE 7.4

Figure 7.11*a* illustrates the variation of the frequency of a slow FH/MFSK signal with time for one complete period of the PN sequence. The period of the PN sequence is $2^4 - 1 = 15$. The FH/MFSK signal has the following parameters:

Number of bits per MFSK symbol	$K = 2$
Number of MFSK tones	$M = 2^K = 4$
Length of PN segment per hop	$k = 3$
Total number of frequency hops	$2^k = 8$

In this example, the carrier is hopped to a new frequency after transmitting two symbols or equivalently, four information bits. Figure 7.11*a* also includes the input binary data, and the PN sequence controlling the selection of FH carrier frequency. It is noteworthy that although there are eight distinct frequencies available for hopping, only three of them are utilized by the PN sequence.

Figure 7.11*b* shows the variation of the dehopped frequency with time. This variation is recognized to be the same as that of a conventional MFSK signal produced by the given input data. ◀

Modulações ASK, PSK, FSK

Taxa de Erro de Bit (BER) para 2 níveis: Análise Teórica

- ASK: $$BER = \frac{1}{2} erfc \sqrt{\frac{E_b}{2N_0}}$$
- PSK: $$BER = \frac{1}{2} erfc \sqrt{\frac{E_b}{N_0}}$$
- FSK: $$BER = \frac{1}{2} erfc \sqrt{\frac{E_b}{2N_0}}$$