Data Communications and Networking Fourth Edition

Forouzan

Chapter 6

Bandwidth Utilization: Multiplexing and Spreading

6-1 SPREAD SPECTRUM

In spread spectrum (SS), we combine signals from different sources to fit into a larger bandwidth, but our goals are to prevent eavesdropping and jamming. To achieve these goals, spread spectrum techniques add redundancy.

https://www.youtube.com/watch?v=ijbwqvIQbMo&list=PL8S7lt_YQwFLVEod9xdAr4kMKU21PflW0

Topics discussed in this section:

- **Frequency Hopping Spread Spectrum (FHSS)**
- **Direct Sequence Spread Spectrum (DSSS)**

Spread Spectrum

- A signal that occupies a bandwidth of B, is spread out to occupy a bandwidth of B_{ss}
- All signals are spread to occupy the same bandwidth B_{ss}
- Signals are spread with different codes so that they can be separated at the receivers.
- Signals can be spread in the frequency domain or in the time domain.

Figure 6.27 *Spread spectrum*

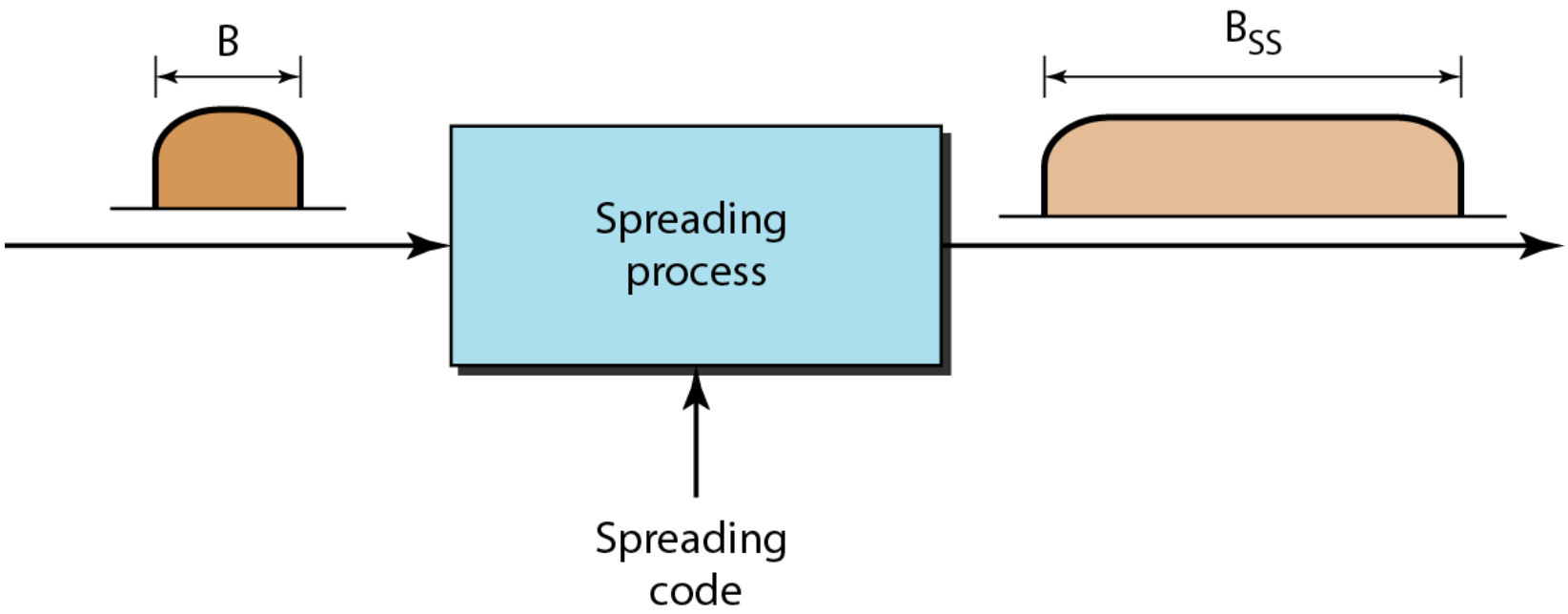

Figure 6.28 *Frequency hopping spread spectrum (FHSS)*

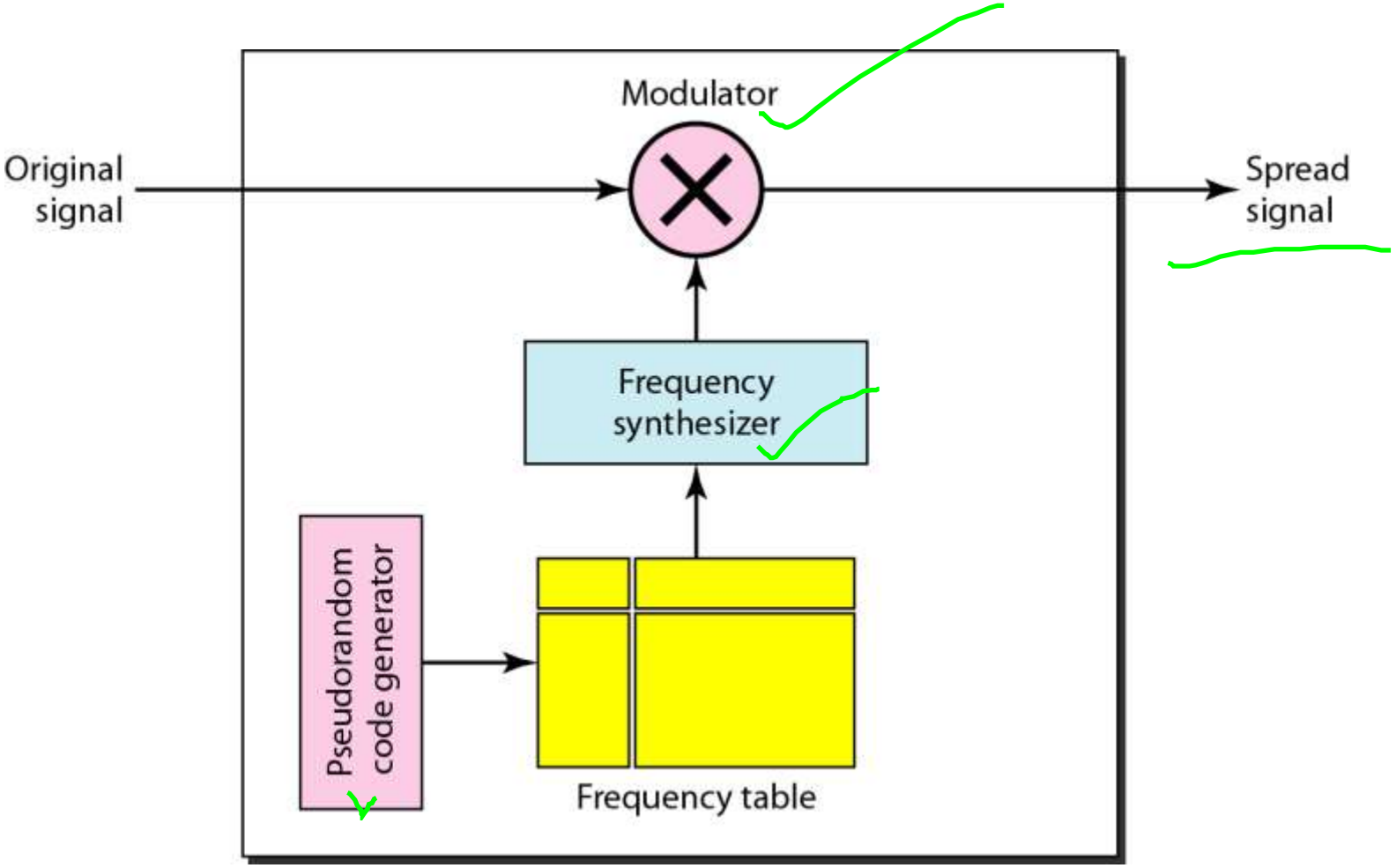

Figure 6.29 *Frequency selection in FHSS*

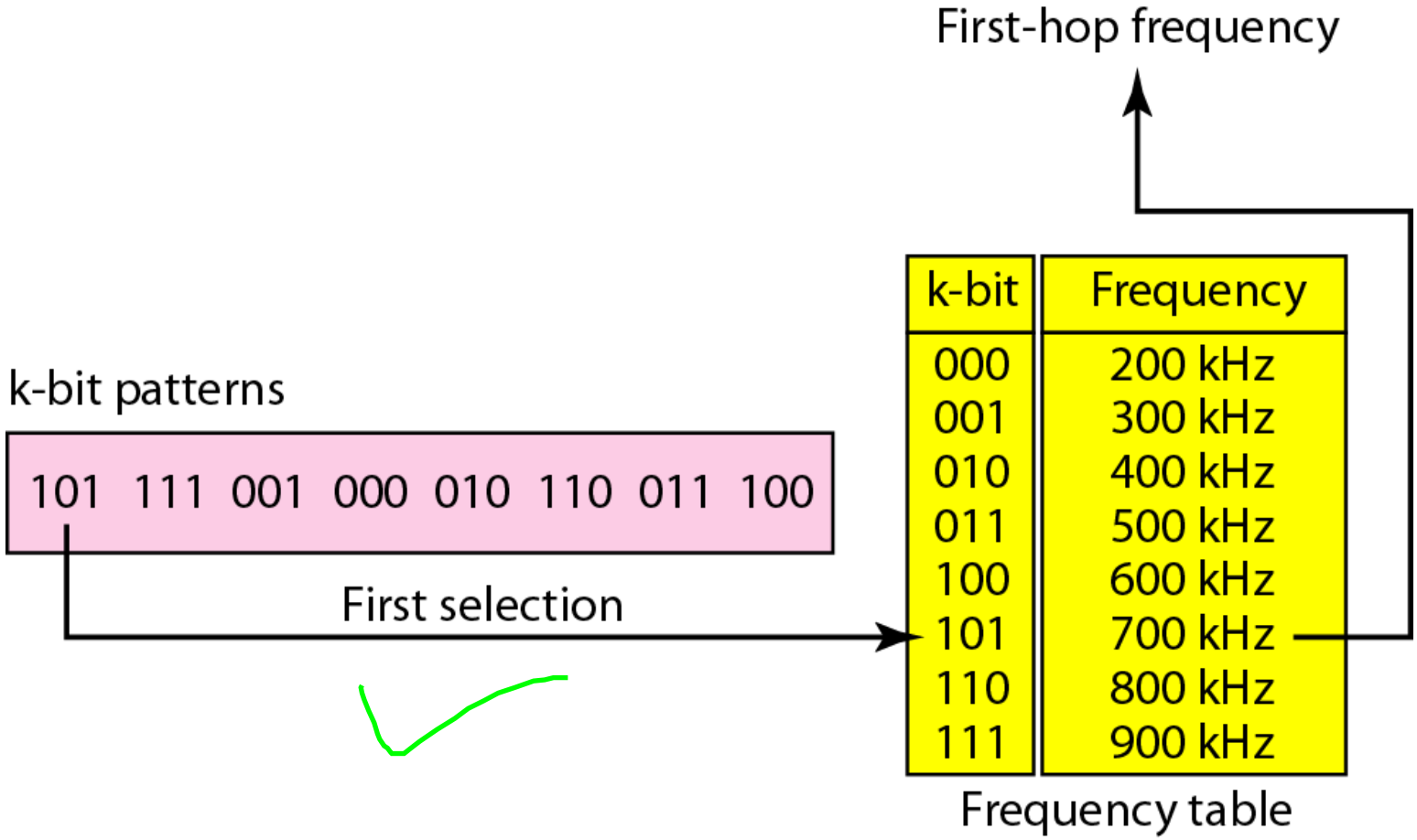

Figure 6.30 *FHSS cycles*

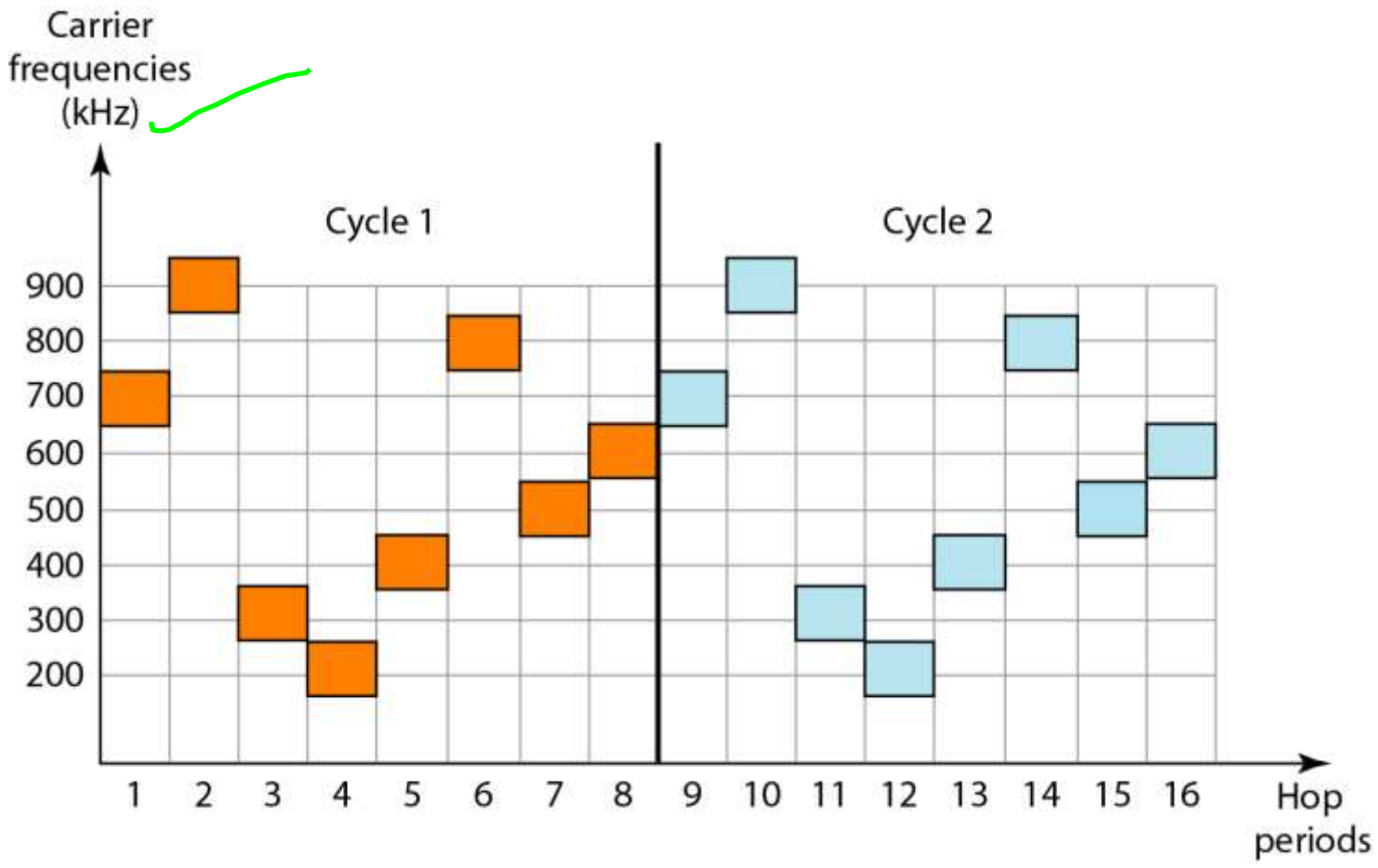

Figure 6.31 *Bandwidth sharing*

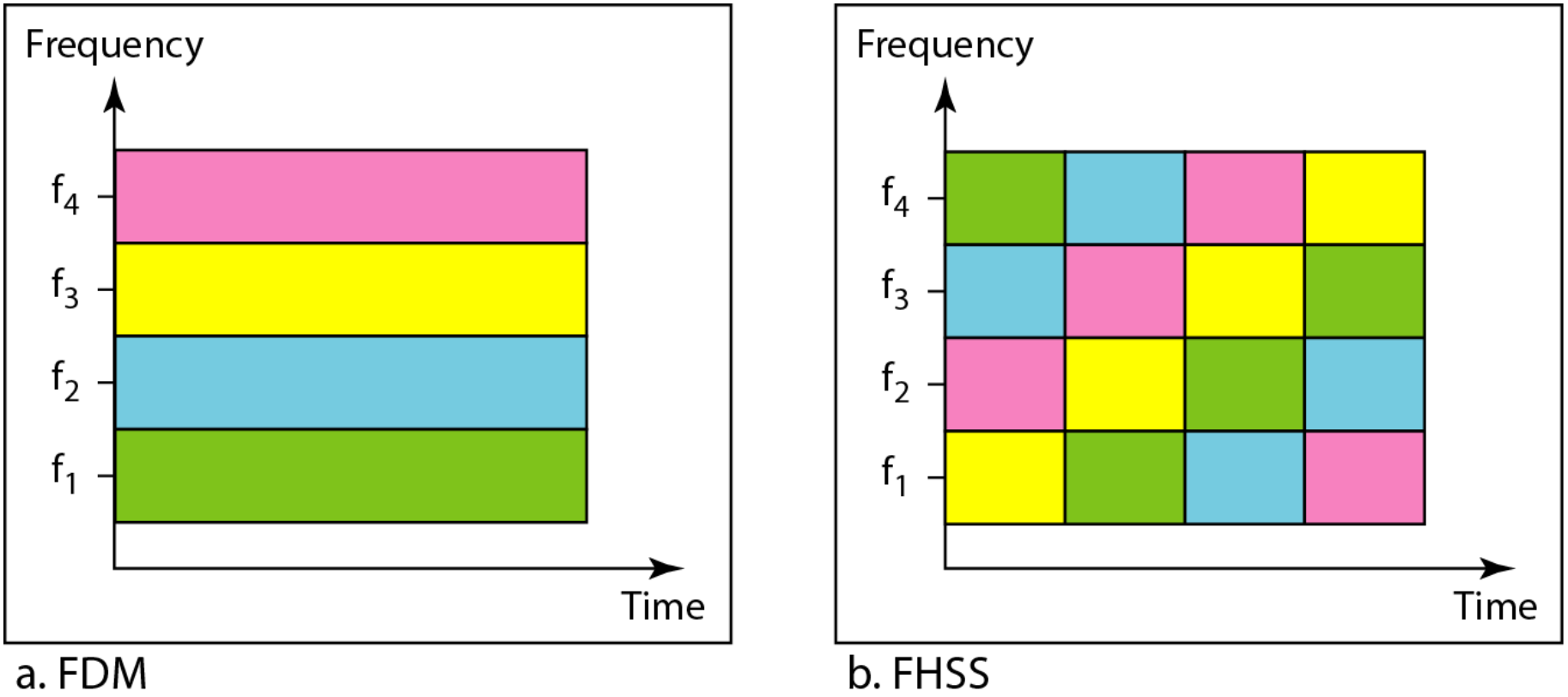

Figure 6.32 *DSSS*

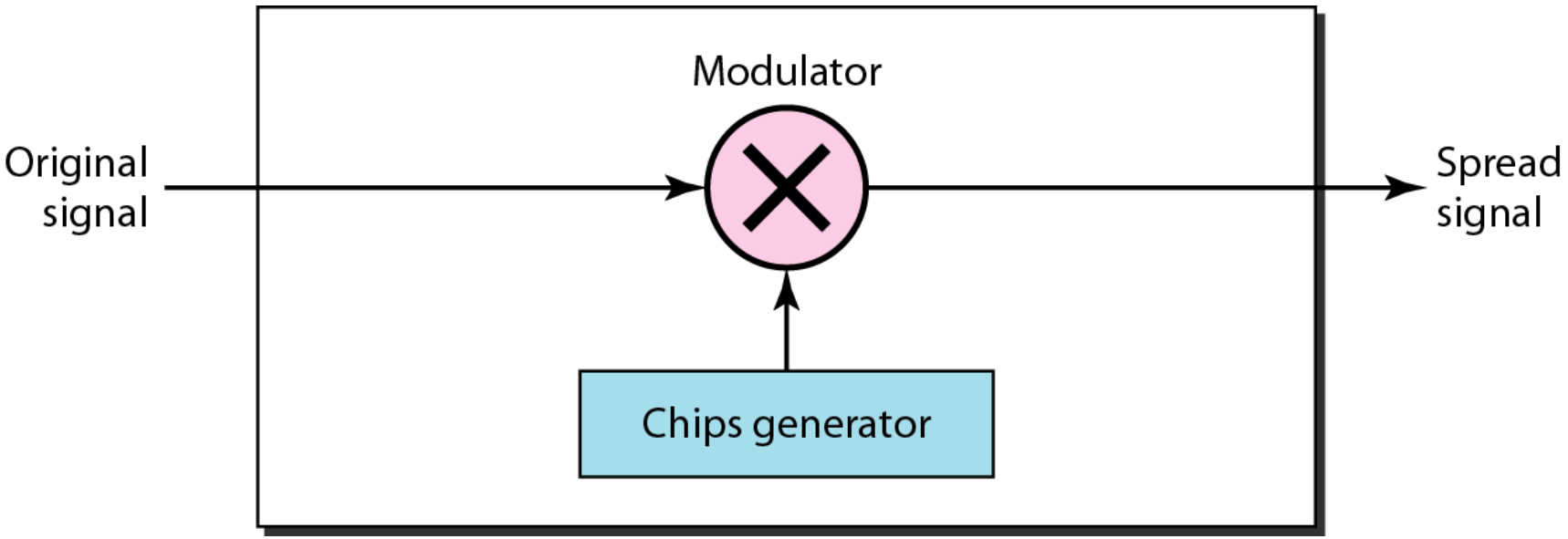

Figure 6.33 *DSSS example*