SPREAD SPECTRUM SYSTEMS WITH COMMERCIAL APPLICATIONS

THIRD EDITION

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sequence modulation will become a familiar form of modulation in many areas in the foreseeable future. Even now, commercial applications of such systems are being contemplated (see part 2, Commercial Applications).

Characteristics of Direct Sequence Signals

Direct sequence modulation, as mentioned in Chapter 1, is just exactly that —modulation of a carrier by a code sequence. In the general case, the format may be AM (pulse), FM, or any other amplitude- or angle-modulation form. Very common, however, is 180° biphase phase-shift keying, though the reasons for it may not be immediately obvious. The basic form of direct sequence signal is that produced by a simple, biphase-modulated (PSK) carrier. A spectrum typical of this signal format is shown in Figure 2.1 The main lobe bandwidth (null-to-null) of the signal shown is twice the clock rate of the code sequence used as a modulating signal. Each of the sidelobes has a bandwidth from null-to-null that is equal to the clock rate; that is, if the code sequence being used as a modulating waveform has a 5-Mcps (cps = chips per second) operating rate, the main lobe null-to-null bandwidth will be 10 MHz and each sidelobe will be 5 MHz wide. This is exactly the case in Figure 2.1.

Typically, the direct sequence biphase modulator has the form shown in Figure 2.2, where a balanced mixer whose inputs are a code sequence and an RF carrier operates as the biphase modulator. In the time domain the

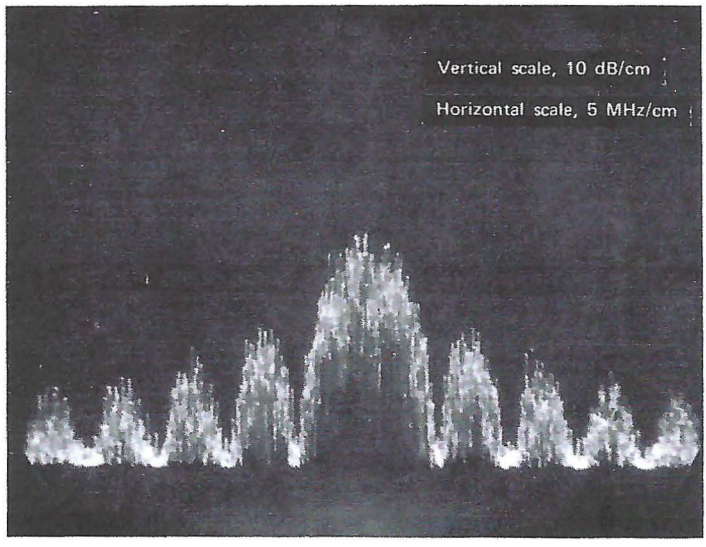

Figure 2.1 Direct sequence spread spectrum signal 180° biphase-modulated by a 5 Mcps code.

APPENDIX 1

GLOSSARY OF TERMS

This glossary is intended to define the terms used in this book in ways that are meaningful here but do not necessarily carry the same impact as they do elsewhere. Also defined are a number of terms commonly abbreviated without explanation. This is done as much as for any other reason to ensure that what is said here does have some relation to the real world.

AGC. Automatic gain control.

AJ. Antijamming.

AJ Margin. Antijamming margin; the worst case jamming-to-signal ratio at which a receiver will deliver rated performance.

AM. Amplitude modulation.

Antijamming. Capability of withstanding jamming or interference.

Autocorrelation. Multiplication of a signal with a time-delayed replica of itself, with product integration

$$\psi_{\text{auto}} = \int f(t) f(t - \tau)\, dt.$$

Baseband. The basic information channel for a communication system. For voice systems approximately 3-kHz low-pass baseband bandwidths are usually required.

Biphase. A term used to signify two-phase ($\pm 90°$) phase-shift keying.