802.15.4a™

IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements

Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs)

Amendment 1: Add Alternate PHYs

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE
3 Park Avenue
New York, NY 10016-5997, USA

31 August 2007

IEEE Std 802.15.4a™-2007
(Amendment to
IEEE Std 802.15.4™-2006)

Insert after Annex G the following new annex (Annex H):

Annex H

(informative)

UWB PHY optional chaotic pulses

Another noncoherent optional pulse shape that may be used is a chaotic waveform. This optional pulse shape shall be used only when all other devices within the PAN are using a chaotic pulse. This mode can be used for low-power applications where long battery life is critically important. Since chaotic on-off keying (COOK) is noncoherent modulation, the receiver does not need to generate a corresponding chaotic signal for demodulation. For that reason, the technique chosen for generating a chaotic waveform can be freely determined by implementers.

When transmitting preamble fields, the duration of the chaotic pulses shall be the inverse of the mandatory peak PRF of the mandatory preambles (Tc = 1/(2 × mean PRF)), where the mean PRF is defined in Table 39a. In order words, a single chip of the ternary S code of the mandatory length 31 as shown in Table 39c shall be mapped into a noncoherent COOK pulse c(t). Since COOK is noncoherent modulation, the receiver is not required to distinguish the sign of the chaotic pulse c(t). This relationship is shown in Table H.1.

Table H.1—Ternary-code-to-COOK-pulse mapping

Ternary code chip	COOK chaotic pulse
+	c(t)
0	0
–	c(t)

After transmitting the preamble, the duration of the chaotic pulse shall be equal to the duration of pulse burst T_{burst}, which is shown in Figure 27c and Table 39a. Since the chaotic pulse is noncoherent modulation, as shown in Figure 27h, the receiver demodulates only the position of pulse. In other words, because pulse position modulation with a two-position symbol (2-PPM) is being used, position 0 or position 1 of the chaotic pulse can be distinguished by the receiver, but not the sign of the chaotic pulse c(t). This relationship is shown in Table H.2.

Table H.2—UWB PHY bits-to-symbol mapping

Modulation symbols (g1g0)	Chaotic pulse COOK
–10	c(t) PPM Position 0
–11	c(t) PPM Position 1
10	c(t) PPM Position 0
11	c(t) PPM Position 1

Copyright © 2007 IEEE. All rights reserved.