Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: Inconsistency in SUN O-QPSK preamble length

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Source: Henk de Ruijter and Emmanuel Gautier, Silicon Labs

Address: 400 W Cesar Chavez St, Austin, TX 78701

Abstract: Inconsistency in SUN O-QPSK preamble length

Purpose: Discussion

Introduction:

- More frequency bands were added in 2020 revision causing an inconsistency in the SUN O-QPSK preamble specification

See 802.15.4-2015:

22.2.1.1 Preamble field format

The Preamble field shall contain a sequence of 56 bits, all zero, for the 780 MHz, 915 MHz, 917 MHz, and 2450 MHz frequency bands. It shall contain a sequence of 32 bits, all zero, for the 470 MHz, 868 MHz, and 920 MHz frequency bands.

Table 22-2—SHR coding and spreading parameters

Frequency band (MHz)	Chip rate (kchip/s)	BDE	Spreading mode
470–510	100	yes	$(32,1)_0$-DSSS
779–787	1000	yes	(64,1)-DSSS
868–870	100	yes	$(32,1)_0$-DSSS
902–928	1000	yes	(64,1)-DSSS
917–923.5	1000	yes	(64,1)-DSSS
920–928	100	yes	$(32,1)_0$-DSSS
2400–2483.5	2000	yes	(128,1)-DSSS

See 802.15.4-2020:

21.2.2.2 Preamble field format

The Preamble field shall contain a sequence of 56 bits, all zero, for the 780 MHz, 915 MHz, 915 MHz-a, 915 MHz-b, 915 MHz-c, 917 MHz, and 2450 MHz frequency bands. It shall contain a sequence of 32 bits, all zero, for the 470 MHz, 866 MHz, 867 MHz, 868 MHz, 870 MHz, 915 MHz-d, 915 MHz-e, 919 MHz, 920 MHz, 920 MHz-a, and 920 MHz-b frequency bands.

See 802.15.4-2020:

Table 21-2—SHR coding and spreading parameters

Band designation (MHz)	Chip rate (kchip/s)	BDE	Spreading mode
470	100	yes	$(32,1)_0$-DSSS
780	100	yes	$(32,1)_0$-DSSS
	1000	yes	(64,1)-DSSS
866	100	yes	$(32,1)_0$-DSSS
867	100	yes	$(32,1)_0$-DSSS
868	100	yes	$(32,1)_0$-DSSS
870	100	yes	$(32,1)_0$-DSSS
915	100	yes	$(32,1)_0$-DSSS
	1000	yes	(64,1)-DSSS
915-a	100	yes	$(32,1)_0$-DSSS
	1000	yes	(64,1)-DSSS
915-b	100	yes	$(32,1)_0$-DSSS
	1000	yes	(64,1)-DSSS
915-c	100	yes	$(32,1)_0$-DSSS
	1000	yes	(64,1)-DSSS
915-d	100	yes	$(32,1)_0$-DSSS
915-e	100	yes	$(32,1)_0$-DSSS
917	100	yes	$(32,1)_0$-DSSS
	1000	yes	(64,1)-DSSS
919	100	yes	$(32,1)_0$-DSSS
920	100	yes	$(32,1)_0$-DSSS
920-a	100	yes	$(32,1)_0$-DSSS
920-b	100	yes	$(32,1)_0$-DSSS
2450	2000	yes	(128,1)-DSSS

Suggested resolution:

- Found no record on 22.2.1.1 amendment
- In 2020 revision, the preamble length is dependent on frequency band. This was probably not intended. Should be coupled to the PHY.
- PHY is not used yet by Wi-SUN. Not too late to correct this.
- Change text in clause 21.2.2.2 to:
- "The Preamble field shall contain a sequence of 56 bits, all zero for chip rates of 1000 kchip/s and 2000 kchip/s and 32 bits of all zero for chip rate of 100 kchip/s."

Clause 19.2.5:

- Wrong description of parity calculation:

The Parity Check field provides error detection for the mode switch PPDU. Its value is calculated using the first 11 bits from the PHR,(b0, b1, … b10), using the following equation:

Parity Check = b0 ⊕ b1 ⊕ b2 ⊕ b3 ⊕ b4 ⊕ b5 ⊕ b6 ⊕ b7 ⊕ b8 ⊕ b9 ⊕ b10

- For double error detection, the parity bit should be calculated including the checksum field.
- Suggested resolution:

"The Parity Check field provides error detection for the mode switch PPDU. Its value is calculated using the first 15 bits from the PHR,(b0, b1,… b10), using the following equation:"

Parity Check = b0 ⊕ b1 ⊕ b2 ⊕ b3 ⊕ b4 ⊕ b5 ⊕ b6 ⊕ b7 ⊕ b8 ⊕ b9 ⊕ b10 ⊕ b11 ⊕ b12 ⊕ b13 ⊕ b14