IEEE P802.15

**Wireless Personal Area Networks**

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| Re: | [] | |
| Abstract | [This document contains revisions to low energy text in 15-09-0604-03-004e draft.] | |
| Purpose | [] | |
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Revisions to Low Energy text in 15-09-0604-03-004e

* **Section 4 (page 2): add the following**
  + **LE: Low Energy**
  + **CSL: Coordinated Sampled Listening**
* **Section 7.3.14.1-3 (page 94-95): move the 3 sections to a new subsection of 7.2 titled LE-Frame Formats because Wakeup Frame and Secure Ack Frame are not command frames.**
* **Section 7.3.14.4 (page 95): Leave section as is under 7.3.14.**
* **Page 100: replace Table 127.h with the following**

**Table xx—MAC PIB attributes**

| **Attribute** | **Identifier** | **Type** | **Range** | **Description** | **Default** |
| --- | --- | --- | --- | --- | --- |
| macCSLPeriod |  | Integer | 0 … 65535 | CSL sampled listening period in unit of 10 symbols. 0 means always listening, i.e., CSL off. | 0 |
| macCSLMaxPeriod |  | Integer | 0 … 65535 | Maximum CSL sampled listening period in unit of 10 symbols in the entire PAN. This determines the length of the wakeup sequence when communicating to a device whose CSL listen period is unknown. NHL may set this attribute to 0 to stop sending wakeup sequences with proper coordination with neighboring devices. | macCSLPeriod |
| macCSLChannelMask |  | Integer |  | 32-bit bitmap relative to phyCurrentPage of channels. It represents the list of channels CSL operates on. 0 means CSL operates on phyCurrentChannel of phyCurrentPage. | 0 |
| macCSLFramePendingWaitT |  | Integer |  | Number of symbols to keep the receiver on after receiving a payload frame with FCF frame pending bit set to 1. |  |
| macSecAckWaitDuration |  | Integer |  | The maximum number of symbols to wait for a secure acknowledgement frame to arrive following a transmitted data frame. |  |
| macRitPeriod |  | Integer | 0x000000 -0xffffff | The interval (in unit periods) for periodical transmission of RIT data request command in RIT mode.  The unit period is aBaseSuperframeDuration.  0 means RIT is off | 0 |
| macRitDataWaitPeriod |  | Integer | 0x00 – 0xff | The maximum time (in unit period) to wait for Data frame after transmission of RIT data request command frame in RIT mode.  The unit period is aBaseSuperframeDuration. | 0 |
| macRitTxWaitTime |  | Integer | macRitPeriod - 0xffffff | The maximum time (in unit periods) that a transaction is stored by a device in RIT mode.  The unit period is aBaseSurperframeDuration. | 0 |

* **Section 7.5.2.1 (page 106): insert the following paragraph:**

When macCSLPeriod is set to non-zero, CSL is deployed in channel scans. When macCSLMaxPeriod is set to non-zero, each coordinator broadcasts beacon frames with wakeup sequence. This allows devices to perform channel scans with low duty cycles.

* **Section 7.5.11.1.1.4 (page 134): Replace the bullet “Unsynchronized transmission” with the following:**
  + Unsynchronized transmission: This is the case when the MAC layer does not know the CSL phase and period of the destination device. In this case, the wakeup sequence length is macCSLMaxPeriod.
* **Page 135 line 4: delete the word “milliseconds”.**
* **Section 7.5.11.1.1.9 (page 136): replace section with the following paragraph:**

The next higher layer has the option to turn off sampled listening and stop sending wakeup sequences to reduce latency for urgent messages. This assumes that the higher layer manages the coordination between the sender and receiver in turning on and off sampled listening. To turn off sampled listening, the higher layer simply sets macCSLPeriod to zero. To turn on sampled listening, the high layer restores macCSLPeriod to their previous non-zero values. Similarly, to stop sending wakeup sequences, the higher layer sets macCSLMaxPeriod to zero and restores it to its previous value to return to normal CSL mode. To request a neighboring device to turn off sampled listening, the higher layer must send a frame to the device with frame pending bit set to 1. This prevents CSL from turning off the radio before the request is processed.

* **Starting at Section 7.5.11.1.2 (page 136): renumber sections as follows:**

**Change:**

7.5.11.1.2 Receiver Initiated Transmission (RIT)

7.5.6.8.1 Periodical RIT data request transmission and reception

7.5.11.1.3 Data transmission in RIT mode

7.5.11.1.4 Muticast transmission

**To:**

7.5.11.2 Receiver Initiated Transmission (RIT)

7.5.11.2.1 Periodical RIT data request transmission and reception

7.5.11.2.2 Data transmission in RIT mode

7.5.11.2.3 Muticast transmission

* **Section 7.3.14.4.1 (page 95): replace Figure 103.pp with the following:**

|  |  |  |
| --- | --- | --- |
| Octets : (see 7.2.2.4) | 1 | 0 or 4 |
| MHR fields | Command Frame Identifier （see Table 82） | Optional command payload |

* **Section 7.3.14.4.2 (page 96): add new subsection as follows**

**7.3.14.4.3 Optional Command Payload**

**The command payload can be either 0 or 4 octets. The 4-octet payload is defined as follows:**

|  |  |  |
| --- | --- | --- |
| **Octets: 1**  **Time to 1st Listen (T0)** | **1**  **Number of Repeat (N)** | **2**  **Repeat Listen Interval (T)** |

**Time to 1st Listen (T0) and Repeat Listen Interval (T) are in the same unit as macRitPeriod. Number of Repeat Listen (N) is constrained by T0 + N\*T < macRitPeriod.**

* **Page 136 line 17: replace the last sentence with “Figure 111.o illustrates the basic RIT operations. Figure XXX illustrates the RIT operations when RIT data request command payload carries schedule information.”**
* **After Figure 111.o: insert the following new figure XXX.**

**Figure XXX --- RIT operations when datareq carries schedule information (See 7.3.14.4.3)**

* **Section 7.5.6.8.1 (page 136): replace the first paragraph with the following:**

In RIT mode, a device transmits RIT data request command every *macRitPeriod* using unslotted CSMA-CA. The destination address of the command may be broadcast address (0xffff) or the address of intended transmitter of data (associated coordinator). The command may optional contain a 4-octet payload defined in 7.3.14.4.3. When the command carries no payload, after the transmission of RIT data request command frame, the device listens for *macRitDataWaitPeriod* for incoming frame (except RIT data request frame) and goes back to idle state till the next periodical transmission of RIT data request command. When a device is in the receiving state after transmission of RIT data request command, RIT data request command frame from another device shall be discarded. When data request command carries a 4-octet payload (time to 1st listen T0, number of repeat N, repeat listen interval T), the device goes back to sleep for T0 period of time then listen for macRitDataWaitPeriod before going back to sleep. The first listen on, it repeats a listen interval of macRitDataWaitPeriod every T period of time for N times. The device shall start listening slightly before each scheduled listen time based on a guard time computed from possible clock skew since the last data request command transmission.

* **Section 7.5.11.1.3 (page 137): add the following new paragraph:**

**When the data request commands carry the listen schedule payload, the device can either wait to receive a data request frame from the receiving device as described above, or sleep until the next scheduled listen time by the receiving device then wakeup to transmit the intended frame.**