**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | IEEE 802.15.4z PHY LRP – Comment resolution LB161 |
| Date Submitted | 19-September-2019 |
| Source | David Barras (3db Access AG)Boris Danev (3db Access AG)Peter Sauer (Microchip) |
| Re: | Letter Ballot comment resolution of draft Standard document P802.15.4z-D2 |
| Abstract | This contribution proposes updated text for the baseline draft P802.15.4z-D2 |
| Purpose | Provision of the text to facilitate its incorporation into the draft text of the IEEE 802.15.4z standard currently under development in TG4z. |
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***Comments Resolutions for the TG4z Recirculated Draft (P802.15.4z-D2.pdf, LB161)***

**r1-0876, r1-0877, r1-0879 *Resolution:***

***1) update Table 59;***

***2) modify section titles and description on line 13, p. 153.***

**19.9 LRP UWB ~~Return Time~~ Transmit and Receive Timing Requirements**

**19.9.1 ~~Receive-to-transmit turnaround~~ Fixed reply time**

The receive-to-transmit ~~turnaround~~ reply time for a device with *phyFixedReplyTimeSupported* attribute value of TRUE shall be the fixed reply time as specified in Table 59 selected by the *phyLrpUwbFixedReplyTime* attribute.

**Table 59 – Fixed reply times for the LRP-ERDEV**

|  |  |
| --- | --- |
| **Value of the *phyLrpUwbFixedReplyTime*** **attribute**  | **Selected fixed reply time****~~[μs]~~****[RSTU, number of base chip period]** |
| FRT3 | 3 |
| FRT7 | 7 |
| FRT15 | 15 |
| FRT31 | 31 |

**Reminder**: base chipping rate (RSTU) is defined in 6.9.1.2 of first draft version (P802.15.4z-D1.pdf)

**Reminder:** timing accuracy has been defined in section 19.7.2 of first draft version (P802.15.4z-D1.pdf):

|  |
| --- |
| **19.7.2 Pulse timing*****Insert the following new paragraph in clause 19.7.2 after the first paragraph:***For a LRP-SRDEV, the transmission time of any individual pulse shall not drift more than 2 ns from its nominal transmission time during 128 pulse periods transmitted at the lowest PRF of 1 MHz over the specified operating temperature range of the device. |

***3) Provide a picture that accurately describes timing for fixed reply time***



**Figure XX – Fixed reply time as a function of FRTx parameter for LRP-ERDEV**

Assuming perfectly synchronized transmitter and receiver, a fixed reply time of FRTx corresponds to a equivalent time of FRTx+1 between the active portion (pulses) of the last received chip and the first transmitted chip. In the exemple of Figure XX, a fixed reply time value of FRT3 defines a pulse-to-pulse fixed reply time of 4 RSTU.

***4) Rewrite 19.9.2 in a cleaner way as follows***

**19.9.2 ~~Transmit-to-receive~~ Turnaround times**

~~The transmit-to-receive turnaround times for a device with~~ *~~phyFixedReplyTimeSupported~~* ~~attribute value of TRUE set to true shall be less than the fixed reply time as specified in Table 59 selected by the~~ *~~phyLrpUwbFixedReply~~*~~Time attribute.~~

When *phyFixedReplyTimeSupported* attribute is set to true, the turnaround time for a device to be configured from receiver to transmitter mode and from transmitter to receiver mode shall be less than the fixed reply time as specified in Table 59 selected by the *phyLrpUwbFixedReply*Time attribute .

**r1-0852 *Resolution:***

***Modify lines 11 and 12, p. 142, as proposed below:***

**19.2.4.2 Dual-frequency and extended dual-frequency (without EPC)**

The pulse is nominally sent in the center of the ~~symbol~~ chip period ~~Tdsym~~ Tchip as shown in Figure 19-1 for the base mode and Figure 19-2 for the extended mode,…

**r1-0388, r1-0398, r1-0405, r1-0405, r1-0409, r1-423 *Resolution:***

***1) Modify text in rectangle boxes of Figures 38, 39, 41, 42, 44***

See contribution 15-19-0259-03-004z-lb-comment-resolution-clause-6.9.9

**r1-0730, r1-0757 *Resolutions:***

***1) add reference to the PIB attribute UwbPreambleSymbolRepetitions in the text, change the text of subclause 19.3.1.1 as follows:***

The LRP UWB base mode SHR preamble consists of a continuous stream of pulses at the base mode PRF of 1 MHz, with the number of pulses being between 16 and 128 for non-ERDEV LRP, or between 16 and 256 for LRP ERDEV, as specified by *UwbPreambleSymbolRepetitions* attribute.

***2) the same referencing to PIB attribut should be also added in the base standard under Sections 19.3.1.2***

The LRP UWB extended mode SHR preamble consists of a continuous stream of pulses at the extended mode PRF of 1 MHz, with a length between 16 and 256, as specified by *UwbPreambleSymbolRepetitions* attribute.

***3) the same referencing to PIB attribut should be also added in the base standard under Sections 19.3.1.3***

… a) A continuous stream of pulses at the long-range mode PRF of 2 MHz, with a length between

1024 and 8192 pulses, as specified by *UwbPreambleSymbolRepetitions* attribute.

***4) the same referencing to PIB attribut should be also added in the base standard under Sections 19.3.1.4***

The SHR preamble for all LRP UWB dual-frequency modes consist of a continuous stream of pulse with 14 alternate binary values [0, 1, 0, 1, …, 0, 1, 0, 1] using the encoding frequencies as specified in Table 40, 15 and transmitted at the nominal PRF of 1, 2 or 4 MHz, or the PRF according to the specification in Table 41 16 when variable PRP is being employed. The length of the preamble is between 16 and 256, as specified by *UwbPreambleSymbolRepetitions* attribute.

**r1-0722, r1-0729, r1-0745, r1-0836, r1-0838, r1-0839, r1-0756 *Resolutions:***

***1) Remove 19.10***

***2) Add new Section 10.3***

***3) Add new Section 10.3.1 General***

***4) Add new Section 10.3.2 Distance commitment on PSDU with modified text from 19.10 with track changes***

**10.3 Ranging capable PHY**

**10.3.1 General**

This section applies for devices that have implemented ranging support (RDEVs).

**10.3.2 Distance commitment on PSDU**

Distance commitment on data is a decoding method that only captures the energy during short active RF periods within each symbol of the PSDU. The position of short active period within a symbol duration is selected from information of the channel obtained during the preamble such that the earliest path(s) are captured. Figure 85 illustrates the distance commitment principle.

**5) Move Figure 85 here**

Distance commitment can be used by ranging capable PHYs which implement channel sounding and are able to provide channel state information (amplitude and/or phase in time domain) after the SHR and before the processing of the PSDU symbols. . The time of arrival of the earliest detected leading edge of the received signal can be extracted from the channel state information available as described in 7.1.1.4 of (*Applications of IEEE Std 802.15.4* [B3])..

Under distance commitment operation at the receiver, the time of arrival and the energy integration window Tint,RF shall be used for PSDU symbol decoding. The aperture Tint,RF is the allowed window duration for collecting and integrating the incoming RF energy at the receiver. Distance commitment ensures that the symbols of the PSDU are decoded at the measured distance corresponding to the time of arrival of the earliest detected leading edge with maximum PSDU symbol distance offset from RMARKER provided in Table YY. . Relevant implementation guidelines are provided in Section 2 of “Authenticated Ranging of 802.15.4” [B24].

**Table YY – Distance commitment level definition for authenticated ranging**

|  |  |  |
| --- | --- | --- |
| **DistanceCommitmentLevel** | **Tint,RF aperture time** | **Maximum PSDU symbol distance offset from RMARKER (c0=speed of light)** |
| DCL\_1\_4096 | RSTU/4096 | RSTU/4096 ∙ c0 |
| DCL\_1\_2048 | RSTU/2048 | RSTU/2048 ∙ c0 |
| DCL\_1\_1024 | RSTU/1024 | RSTU/1024 ∙ c0 |
| DCL\_1\_512 | RSTU/512 | RSTU/512 ∙ c0 |
| DCL\_1\_256 | RSTU/256 | RSTU/256 ∙ c0 |
| DCL\_1\_128 | RSTU/128 | RSTU/128 ∙ c0 |
| DCL\_1\_64 | RSTU/64 | RSTU/64 ∙ c0 |
| DCL\_DISABLED | N/A | N/A |

include the DistanceCommitment parameter to set the value of .