IEEE P802.15

Wireless Personal Area Networks

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| Abstract | [IEEE 802.15 SC Maintenance state diagrams] |
| Purpose | [] |
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Figure 18 CSMA-CA Algorithm

6.2.5.2

…

As illustrated in Figure 18, when a TSCH device has a packet to transmit, it shall wait for a link to the destination device. If TSCH CCA has been set to on ~~enabled~~, the MAC requests the PHY to perform a CCA at the designated time in the timeslot, macTsCCAOffset, without any backoff delays. ~~The operation of CCA for TSCH mode is illustrated in Figure 18.~~



Figure 19 TSCH Retransmission

6.2.5.3 TSCH Retransmission ~~CSMA-CA~~ algorithm

Shared links (links with the linkOptions Bitmap set to shared transmission) are intentionally assigned to more than one device for transmission. This can lead to collisions and result in a transmission failure detected by not receiving an acknowledgment. To reduce the probability of repeated collisions when the packets are retransmitted, ~~a~~ the retransmission backoff algorithm as shown in Figure 19 shall be implemented for shared links.

When a packet is transmitted on a shared link for which an acknowledgment is expected and none is received, the transmitting device shall invoke the TSCH CSMA-CA retransmission algorithm. Subsequent retransmissions may be in either shared links or dedicated links as retransmission occurs in the next link to the destination. This backoff algorithm has the following properties:

The retransmission backoff wait applies only to the transmission on shared links. There is no waiting for transmission on dedicated links. The retransmission backoff is calculated in the number of shared transmission links. The backoff window increases for each consecutive failed transmission in a shared link.

A successful transmission in a shared link resets the backoff window to the minimum value. The backoff window does not change when a transmission is a failure in a dedicated link.

The backoff window does not change when a transmission is successful in a dedicated link and the transmission queue is still not empty afterwards.

The backoff window is reset to the minimum value if the transmission in a dedicated link is successful and the transmit queue is then empty.

In the TSCH mode, backoff is calculated in shared links, so the CSMA-CA aUnitBackoffPeriod is not used.

For the macMaxBE and macMinBE values when the device is in TSCH mode refer to Table 134.

The device shall use an exponential backoff mechanism analogous to that described in 6.2.5.1. A device upon encountering a transmission failure in a shared link shall initialize the BE to *macMinBE*. The MAC sublayer shall delay for a random number in the range 0 to 2BE – 1 shared links (on any slotframe) before attempting a retransmission on a shared link. Retransmission on a dedicated link may occur at any time. For each successive failure on a shared link, the device should increase the backoff exponent until the backoff exponent = macMaxBE. Successful transmission on a shared link resets the backoff exponent to macMinBE.

If an acknowledgment is still not received after macMaxFrameRetries retransmissions, the MAC sublayer shall assume the transmission has failed and notify the next higher layer of the failure. ~~This is illustrated in Figure 19.~~