**IEEE P802.15**

**Wireless Specialty Networks**

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| Project | IEEE P802.15 Working Group for Wireless Specialty Networks (WSNs) – 802.15.6ma |
| Title | **Proposed draft for resolving SA Ballot comment – time base and superframe**  |
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| Re: | Contribution to IEEE 802.15.6ma  |
| Abstract | This document provides a proposed text draft for resolving SA Ballot comment, I-25 and I-226, on MAC time reference base and superframe structure. |
| Purpose | Support development of technical content for the draft |
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Draft for

1. Overview
	1. Scope
2. Normative references
3. Definitions, acronyms, and abbreviations
	1. Definitions
	2. Acronyms and abbreviations

BTU beacon time unit

TBI target beacon interval

1. General framework elements
	1. General
	2. Time base

All nodes and coordinators are to establish a time reference base, as shown in Figure 4, if their medium access is to be scheduled in time, where the time axis is divided into beacon periods (superframes) of equal length and each beacon period (superframe) is composed of allocation slots of equal length and numbered from *0, 1, ..., s,* where *s* ≤ 255*.* An allocation interval may be referenced in terms of the numbered allocation slot comprising it, and a point of time may be referenced in terms of the numbered allocation slots preceding or following it as appropriate.



1. —Time reference base

If time reference is needed for access scheduling in its BAN, the coordinator is required to choose the boundaries of beacon periods (superframes) and hence of the allocation slots therein. In beacon mode operation for which beacons are transmitted, the coordinator shall communicate such boundaries by transmitting beacons at the start or other specified locations of beacon periods (superframes), and optionally timed frames (T-Poll frames) containing their transmit time relative to the start time of current beacon period (superframe). In non-beacon mode operation for which beacons are not transmitted but time reference is needed, the coordinator is required to communicate such boundaries by transmitting timed frames (T-Poll frames) also containing their transmit time relative to the start time of current superframe.

A node requiring a time reference in the BAN needs to derive and recalibrate the boundaries of beacon periods (superframes) and allocation slots from reception of beacons or/and timed frames (T-Poll frames).

A frame transmission may span more than one allocation slot, starting or ending not necessarily on an allocation slot boundary.

The time reference base in 4.4 is applied only to the IEEE 802.15.6-2012. For the HRP-MAC superframe, time slot, target beacon interval (TBI), and beacon time unit (BTU) are defined in 6.3.1.

1. MAC frame formats
2. HRP-MAC service specification
	* 1. Data service
			1. General
	1. MAC data service specification
	2. Superframe structure
		1. Superframe

The MAC superframe is bounded by the transmission of a Beacon frame and may have an active portion and an inactive portion. The coordinator may enter a low power (sleep) mode during the inactive portion.

The beacon shall be transmitted at the start of slot 0, and the Contention Access Period (CAP) shall commence immediately following the beacon. The start of slot 0 is defined as the point at which the first symbol of the beacon PPDU is transmitted. The Contention Free Period (CFP), if present, follows immediately after the CAP and extends to the end of the active portion of the superframe. Any allocated Guranteed Time Slot (GTS) shall be located within the CFP.

For synchronization, control, and management, a beacon is transmitted at the Target Beacon Interval (*TBI*).



1. —MAC superframe structure

NOTE: If a device is not used or decides to save power, it goes to an inactive state, indicating that action to the coordinator. If the coordinator requires such a device to be active, it will indicate that in a beacon (the device only wakes up to listen to beacons).

The *TBI* is a multiple of a Beacon Time Unit (BTU) of 1024 µs:

*TBI*=*N* BTU, where *N* is a positive integer.

NOTE⎯The 

However, the coordinator may change these values depending on the BAN capacity, target application or coexistence scenario class indicating that in the Control frame.

The TBI may not occur exactly at *N* BTU. If the wireless medium is available for the next TBI, the beacon is transmitted. Otherwise, if the medium is busy, the beacon is given high priority after the current transmission.



1. —Time adjustment of TBI.
	* 1. Contention access period (CAP)

The CAP shall start immediately following the Inactive period and complete before the beginning of the CFP of a superframe or at the end of the active portion of the superframe, if the CFP is zero length. The length of the CAP shall be at least *aMinCapLength*.

All frames transmitted in the CAP shall use a slotted Aloha mechanism to access the channel. A device transmitting within the CAP shall verify that its transaction is complete via the reception of an Ack frame. If this is not possible within the CAP, the device shall defer its transmission until the CAP of the following superframe.

* + 1. Contention free period (CFP)

The CFP shall start immediately following the CAP, and shall be completed at end of the active portion of the superframe. GTS resources are scheduled over multiple superframes as one of configuration types:

Aperiodic GTS: Single slot part in a superframe, specified with the length of slots over reserving duration.

Periodic Uniform GTS: Equally distributed slot parts in a superframe or over multiple superframes, specified with the number of parts, the interval of slot parts, and the length of consecutive slots of a slot part.

Periodic Configured GTS: Unequally distributed slot parts over multiple superframes, specified with the number of parts, the starting slot number of each slot part, and the length of consecutive slots of each slot part