**IEEE P802.15**

**Wireless Specialty Networks**

|  |  |
| --- | --- |
| Project | IEEE P802.15 Working Group for Wireless Specialty Networks (WSNs) |
| Title |  **Qualitative approach to coexistence and QoS mechanisms**  |
| Date Submitted | February 20th, 2023 |
| Source | Marco Hernandez1,2, Ryuji Kohno1,3, Takumi Kobayashi1,3, Minsoo Kim1, Daisuke Anzai4 | 1YRP-IAI, Japan, 2CWC Oulu Univ. Finland, 3YNU, Japan, 4Nagoya I.T., Japan |
| Abstract | Call for Proposals |
| Purpose | Announce Call for Proposals to develop the IEEE 802.15.6ma standard specification. |
| Notice | This document has been prepared to assist the IEEE P802.15.6ma. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. |
| Release | The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.6ma. |

##

The 15.6ma revision deals with high reliability in dense environments with intra-interference and inter-interference due to other wireless systems operating in the same frequency band.

Also, the 15.6ma revision supports QoS. Currently, the 15.6‒2012 Std defines QoS in terms of traffic type indicated in the below table and used as reference:

|  |  |
| --- | --- |
| **User priority QoS** | **Traffic type** |
| 0 | Background |
| 1 | Best effort |
| 2 | Excellent effort  |
| 3 | Video |
| 4 | Voice |
| 5 | Medical or network control |
| 6 | High priority medical or network control |
| 7 | Emergency or implant  |

Hence, a qualitative approach to coexistence consists in combining certain techniques to help deal with interference while offering certain level of QoS.

That requires to identify interference environments. A classification of interference environments is indicated in the following table:

|  |  |
| --- | --- |
| **Coexistence support level** | **Environment** |
| 0 | 6ma BAN only |
| 1 [1a] | Multiple 6ma BANs 1a |
| 2 [1b] | Multiple 15.6 & 6ma BANs  |
| 3  | Multiple 6ma BANs & non-UWB systems (Wi-Fi & Unlicensed 3GPP) |
| 4 [2a] | Multiple 6ma BANs & 802.15 UWB systems |
| 5 [2b] | Multiple 6ma BANs, non-802.15 UWB systems (ETSI UWB systems) |
| 6 [2c] | Multiple 6ma BANs & 802.15 UWB & non-802.15 UWB systems (ETSI UWB)  |
| 7 | Multiple 6ma BANs & non-UWB systems (Wi-Fi & Unlicensed 3GPP) & 802.15 UWB & non-802.15 UWB systems (ETSI UWB) |

The coexistence parameters are classified as:

1. MAC: 1) CFP, 2) CAP.
2. PHY, FEC: 1) (BCC, LDPC), 2) External FEC (Super-orthogonal CC), 3) Interference Mitigation techniques.
3. MAC & PHY: HARQ (composable CC).

A combination of such techniques and QoS gives the different modes of transmission depending on the required QoS and the interference environment of operation:

**Now, we are testing (simulations) the proposed MAC with intra-interference; and the proposed UWB PHY with 6ma channel models, BCC, LDPC and HARQ.**

**Based on that, we will have a better understanding of the Extrinsic FEC design.**

|  |  |
| --- | --- |
| **Coexistence support level** | **Technologies** |
| 0 |  BCC; LDPC |
| 1 [1a] |  BCC; LDPC + Extrinsic |
| 2 [1b] |   |
| 3  |   |
| 4 [2a] |   |
| 5 [2b] |   |
| 6 [2c] |   |
| 7 |   |

For testing purposes:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| QoS/Cox | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0 | BCC | BCC+E | BCC+E | BCC+E |  |  | HARQ | HARQ |
| 1 | BCC | BCC+E | BCC+E | BCC+E |  |  | HARQ | HARQ |
| 2 | BCC | BCC+E | BCC+E | BCC+E |  |  | HARQ | HARQ |
| 3 | BCC | BCC+E | BCC+E | BCC+E |  |  | HARQ | HARQ |
| 4 | BCC | BCC+E | BCC+E | BCC+E |  |  | HARQ | HARQ |
| 5 | BCC | BCC+E | BCC+E | BCC+E |  |  | HARQ/IM | HARQ/IM |
| 6 | CFP/HARQ | CFP/HARQ | CFP/HARQ | CFP/HARQ | CFP/HARQ | CFP/HARQ | HARQ/IM | HARQ/IM |
| 7 | CFP/HARQ | CFP/HARQ | CFP/HARQ | CFP/HARQ | CFP/HARQ | CFP/HARQ | HARQ/IM | HARQ/IM |

High coexistence level support means high intra-interference or inter-interference or both. Hence, operation in the CFP cannot be guarantee. The CFP would be preferable for transmission of high QoS traffic in low or non-interference environment.

Of course, the above table in an initial qualitative approach. We need to corroborate with simulations, or analysis.