IEEE P802.11  
Wireless LANs

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| CIDs 7011, 7014 & 7015 | | | | |
| Date: 2024-05-06 | | | | |
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Abstract

This document contains proposed text changes to address IEEE P802.11-REVme SB2 CIDs 7011, 7014, 7015.

Revision History:

R0: Initial version.

Proposed Resolution:

* CID 7011, 7014 & 7015: Revised. Incorporate the changes shown as “Proposed change” in this document. For CID 7014, changes are not proposed for Thailand.

Note to editor: Changes get applied from 11-24-0599-00-000m-CIDs-7009-7010.docx first.

# CID 7011

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| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed Change |
| 7011 | E.1 | S1G channelization did not take into account the emissions requirements that take effect immediately at the band edges in many regulatory domains. For example the highest 1, 2, 4 and 8 MHz channels in the US regulatory domain cannot be used at the same transmit powers as the lower channels, even with tighter spectral masks and SAW filters. This creates a problem for practical deployments and doesn't make good use of the available spectrum particularly in countries that support 915-928 MHz. | Review S1G channelization and introduce guard bands where appropriate. For example in regulatory domains that support 915-928 MHz the channels should make use of the 12 MHz between 915.5 and 927.5 MHz leaving 500 kHz unused at the band edges. |

## Discussion

In the 902-928 MHz and 915-928 MHz bands in the Americas, Australia, and New Zealand the 1 MHz channels at the band edge are unusable due to out-of-band emissions requirements. So far, no 802.11ah module vendor has achieved FCC certification for the 1 MHz channels at 902.5 MHz and 927.5 MHz. The 2 MHz channels at the band edges generally cannot pass FCC emissions testing except at very low transmit power. The upper 4 and 8 MHz edge channels may also pass at lower transmit powers.

To make best use of the available spectrum we need to provide guard bands at the edges of the available spectrum. For the 902-928 MHz band we can provide 1 MHz guard bands at the edges and move the 2, 4, 8 and 16 MHz channels to fit within 903-927 MHz. The 1 MHz channels do not need to change so that a STA scanning with 1 MHz Probe Requests will pick up both the old and new 2, 4, 8 and 16 MHz operating channels. For the 915-928 MHz band we need to provide 500 kHz guard bands and move all channels to the 915.5-927.5 MHz band.

Note that there are currently around 120 spare global operating class values in Table E-4. The proposed resolution for CIDs 7011, 7014 and 7015 will use eleven of these.

# CID 7014

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| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed Change |
| 7014 | E.1 | The 920-925 MHz band is available in Taiwan and Thailand. | Add entries for Taiwan and Thailand to the S1G Operating classes table E-5. |

## Discussion

Changes to support Thailand are deferred, i.e. we haven’t finally confirmed that the spectrum is available. Taiwan allows IoT devices to operate in the 920-925 MHz band at a transmit power of up to 1 W conducted (indoors).

The Low Power 0002 (LP0002) regulations as of 15 July, 2020 are available from this page:

https://www.ncc.gov.tw/english/news\_detail.aspx?site\_content\_sn=102&is\_history=0&pages=1&sn\_f=5190

See Section 5.8 (Radio Frequency Identification (RFID), radio beacon in seaside, and other IoT devices).

To support 1 W conducted transmit power and meet out-of-band emissions requirements means that 4 x 1MHz channels and 2 x 2 MHz channels should be allocated in 920.5-924.5 MHz leaving a 500 kHz guard band at the edges of the available band.

# CID 7015

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| --- | --- | --- | --- |
| CID | Clause | Comment | Proposed Change |
| 7015 | E.1 | Korea now allows 802.11ah devices to operate in the 925-931 MHz band. | Add entries for the Korean 925-931 MHz band to tables E-4 (Global Operating Classes) and E-5 (S1G Operating Classes) |

## Discussion

The 925-931 MHz band is now available for Ubiquitous Sensor Network (USN) devices, such as 802.11ah devices, in South Korea. See article 8 in: <https://www.law.go.kr/%ED%96%89%EC%A0%95%EA%B7%9C%EC%B9%99/%EC%8B%A0%EA%B3%A0%ED%95%98%EC%A7%80%EC%95%84%EB%8B%88%ED%95%98%EA%B3%A0%EA%B0%9C%EC%84%A4%ED%95%A0%EC%88%98%EC%9E%88%EB%8A%94%EB%AC%B4%EC%84%A0%EA%B5%AD%EC%9A%A9%EB%AC%B4%EC%84%A0%EC%84%A4%EB%B9%84%EC%9D%98%EA%B8%B0%EC%88%A0%EA%B8%B0%EC%A4%80>

The maximum channel size in the 925-931 MHz band is 2 MHz. The spurious emissions requirements are as follows:

* -36 dBm below 1 GHz (see the regulatory document for the reference bandwidth) except for the 718-915 MHz and 949.3-962 MHz band which require average power of -76 dBm
* -30 dBm at 1 GHz and above

The -76 dBM spurious emissions requirement makes it necessary to place two 2 MHz channels in the middle of the available band, in 926-930 MHz, rather than allocating three 2 MHz channels in 925-931 MHz.

***Proposed resolution for CID 7011, 7014 & 7015, update Tables E-4 and E-5 as below:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| * Global operating classes | | | | | | | |
| Operating class | Nonglobal operating class(es) (see NOTE 3) | Channel starting frequency (GHz) | Channel spacing (MHz) | LC IF Channel starting frequency (MHz)(11bb) | Channel set | Channel number of the center frequency(#6420) | Behavior limits set |
| 1–49~~60~~  (#2387) | — | Reserved | Reserved |  | Reserved | — | Reserved |
|  |  |  |  |  |  |  |  |
| 50 | E-5-22, E-5-26 | 0.902 | 1 |  | — | Reserved | — |
| 51 | E-5-23, E-5-27 | 0.902 | 2 |  | — | Reserved | — |
| 52 | E-5-24, E-5-28 | 0.902 | 4 |  | — | Reserved | — |
| 53 | E-5-25, E-5-29 | 0.902 | 8 |  | — | Reserved | — |
| 54 | E-5-32 | 0.902 | 1 |  | — | Reserved | — |
| 55 | E-5-33 | 0.902 | 2 |  | — | Reserved | — |
| 56 | E-5-34 | 0.902 | 4 |  | — | Reserved | — |
| 57 | E-5-35 | 0.840 | 2 |  | — | Reserved | — |
| 58 | E-5-36 | 0.840 | 4 |  | — | Reserved | — |
| 59 | E-5-37 | 0.840 | 8 |  | — | Reserved | — |
| 60 | E-5-38 | 0.840 | 16 |  | — | Reserved | — |
|  |  |  |  |  |  |  |  |
| 64  (#2387) | E-5-9,  E-5-10 | 0.9225 | 2 |  | — | Reserved | — |
| 65  (#2387) | E-5-11,  E-5-12 | 0.9065 | 4 |  | — | Reserved | — |
| 66 | E-5-6, E-5-17 | 0.863 | 1 |  | — | Reserved | — |
| 67 | E-5-19 | 0.863 | 2 |  | — | Reserved | — |
| 68 | E-5-1, E-5-18~~, E-5-22, E-5-26~~ | 0.902 | 1 |  | — | Reserved | — |
| 69 | E-5-2, E-5-20~~, E-5-23, E-5-27~~ | 0.902 | 2 |  | — | Reserved | — |
| 70 | E-5-3, E-5-21~~, E-5-24, E-5-28~~ | 0.902 | 4 |  | — | Reserved | — |
| 71 | E-5-4~~, E-5-25, E-5-29~~ | 0.902 | 8 |  | — | Reserved | — |
| 72 | E-5-5 | 0.902 | 16 |  | — | Reserved | — |

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| --- | --- | --- | --- | --- | --- | --- |
| * S1G operating classes | | | | | | |
| S1G operating Class | Global operating Class (see Table E-4) | Channel starting frequency (GHz) | Channel spacing (MHz) | Channel number of the center frequency(#6420) | CCA Level Classification | Behavior limits set |
|  |  |  |  |  |  |  |
| 13(#2387) | — | Reserved | Reserved | Reserved | Reserved | Reserved |
| 14 (Korea) | 74 | 0.9175 | 1 | 1, 3, 5, 7, 9, 11, 18, 20, 22, 24 | Type 1  (917.5–~~923.5~~931 MHz) | — |
| 15 (Korea) | 75 | 0.9175 | 2 | 2, 6, 10, 19, 23 | Type 1  (917.5–~~923.5~~931 MHz) | — |
| 16 (Korea) | 76 | 0.9175 | 4 | 8 | Type 1  (917.5–923.5 MHz) | — |
| 17 (Singapore) | 66 | 0.863 | 1 | 7, 9, 11 | Type 1  (866–869 MHz) | — |
| 18 (Singapore) | 68 | 0.902 | 1 | 37, 39, 41, 43, 45 | Type 1  (920–925 MHz) | — |
| 19 (Singapore) | 67 | 0.863 | 2 | 10 | Type 1  (866–869 MHz) | — |
| 20 (Singapore) | 69 | 0.902 | 2 | 38, 42 | Type 1  (920–925 MHz) | — |
| 21 (Singapore) | 70 | 0.902 | 4 | 40 | Type 1  (920–925 MHz) | — |
| 22 (Australia) | 50~~68~~ | 0.902 | 1 | ~~27~~28, ~~29~~30, ~~31~~32, ~~33~~34, ~~35~~36  ~~37~~38, ~~39~~40, ~~41~~42, ~~43~~44, ~~45~~46, ~~47~~48, ~~49~~50~~, 51~~ | Type 1  (915–92~~0~~8 MHz)  ~~Type 2  (920–928 MHz)~~ | — |
| 23 (Australia) | 51~~69~~ | 0.902 | 2 | ~~30~~29, ~~34~~33  ~~38~~37, ~~42~~41, ~~46~~45, ~~50~~49 | Type 1  (915–92~~0~~8 MHz)  ~~Type 2  (920–928 MHz)~~ | — |
| 24 (Australia) | 52~~70~~ | 0.902 | 4 | ~~32~~31  ~~40~~39, ~~48~~47 | Type 1  (915–92~~0~~8 MHz)  ~~Type 2  (920–928 MHz)~~ | — |
| 25 (Australia) | 53~~71~~ | 0.902 | 8 | 35, 43 ~~44~~ | Type 1~~2~~  (915~~20~~–928 MHz) | — |
| 26 (New Zealand) | 50~~68~~ | 0.902 | 1 | ~~27~~28, ~~29~~30, ~~31~~32, ~~33~~34, ~~35~~36, ~~37~~38, ~~39~~40, ~~41~~42, ~~43~~44  ~~45~~46, ~~47~~48, ~~49, 51~~50 | Type 1  (915–92~~4~~8 MHz)  ~~Type 2  (924–928 MHz)~~ | — |
| 27 (New Zealand) | 51~~69~~ | 0.902 | 2 | 29~~30~~, 33~~34~~, 37~~38~~, 41~~42~~  45~~46~~, 49~~50~~ | Type 1  (915–92~~4~~8 MHz)  ~~Type 2  (924–928 MHz)~~ | — |
| 28 (New Zealand) | 52~~70~~ | 0.902 | 4 | 31~~32~~, 39~~40,~~  47~~48~~ | Type 1  (915–92~~4~~8 MHz)  ~~Type 2  (924–928 MHz)~~ | — |
| 29 (New Zealand) | 53~~71~~ | 0.902 | 8 | 35, 43~~44~~ | Type 1  (915–92~~4~~8 MHz) | — |
| 30 (Europe) | 77 | 0.9014 | 1 | 33, 35 | Type 1  (917.4–919.4 MHz) | — |
|  |  |  |  |  |  |  |
| 32 (Taiwan) | 54 | 0.902 | 1 | 38, 40, 42, 44 | Type 1 (920-925 MHz | — |
| 33 (Taiwan) | 55 | 0.902 | 2 | 39, 43 | Type 1 (920-925 MHz | — |
| 34 (Taiwan) | 56 | 0.902 | 4 | 41 | Type 1 (920-925 MHz | — |
| 35 (United States and its territories) | 57 | 0.840 | 2 | 128, 132, 136, 140, 144, 148, 152, 156, 160, 164, 168, 172 | Type 1 (902-928 MHz | — |
| 36 (United States and its territories) | 58 | 0.840 | 4 | 130, 138, 146, 154, 162, 170 | Type 1 (902-928 MHz | — |
| 37 (United States and its territories) | 59 | 0.840 | 8 | 134, 150, 166 | Type 1 (902-928 MHz | — |
| 38 (United States and its territories) | 60 | 0.840 | 16 | 142 | Type 1 (902-928 MHz | — |

**References:**