**3GPP TSG-WG4 Meeting #113 *R4-2420356***

**Orlando, USA, November 18 – 22, 2024**

**Title:** WF on UE RF requirements for EESS protection

**Agenda Item:** 6.1

**Source:** Huawei, China Unicom

**Document for:** Approval

Way forward

**Issue 1: NS values & A-MPR for EESS requirement only (additional spurious emission with -5dBm/200MHz)**

**Table-1: Additional requirements for only EESS requirement in Rel-19**

|  |  |  |
| --- | --- | --- |
| **Frequency band****(GHz)** | **Spectrum emission limit (dBm)** | **Measurement bandwidth** |
| 23.6 f 24.0 | -5dBm | 1. MHz
 |

**<Way forward for NS value>:**

* Introduce NS\_205 and CA\_NS\_205 for the limit of -5dBm/200 MHz in the 23.6-24.0 GHz frequency range for n257 and n258.
* Apply *modifiedMPRbehavior* indication, which applies for both n257 and n258.
	+ **NS\_205 and CA\_NS\_205 is mandatory and the corresponding modifiedMPRbehavior bit shall be indicated for UE(s) from Rel-15**.

**<Way forward for A-MPR >:**

**For NS\_205:**

* PC1:

~~For contiguous allocation,~~ 7.0 dB if offset frequency < BWchannel, 6.0 dB otherwise

~~For non-contiguous allocation, [13.0] dB if offset frequency < BW~~~~channel~~~~, 6.0 dB otherwise.~~

* Other PC:

~~For single contiguous allocation,~~ 2.0 dB if offset frequency < BWchannel, 0.0 dB otherwise

~~For non-contiguous allocation, [8.0 dB] if offset frequency < BW~~~~channel~~~~, 0.0 dB otherwise.~~

The Offset frequency is defined as the frequency from the upper edge of the protected frequency range to the lower edge of the channel bandwidth.

**For CA\_NS\_205**

* PC1:

For contiguous UL CA with single contiguous allocation, [9.0 dB] if offset frequency < BWintraCA, 6.0 dB otherwise.

For contiguous UL CA with non-contiguous allocation or NC UL CA, [13.0 dB] if offset frequency < BWintraCA, 6.0 dB otherwise.

* Other PC:

For contiguous UL CA with single contiguous allocation, [5.0 dB] if offset frequency < BWintraCA, 0.0 dB otherwise.

For contiguous UL CA with non-contiguous allocation or NC UL CA, [8.0 dB] if offset frequency < BWintraCA, 0.0 dB otherwise.

The Offset frequency is defined as the frequency from the upper edge of the protected frequency range to the lower edge of the lowest CC among the configured UL CA.

**<Way forward for general requirement>**

Not to update the general spurious emission requirement for EESS protection for n257.

**Issue 2: NS values & A-MPR for EESS requirement (additional spurious emission with -5dBm/200MHz) and EU regulation.**

**Table-2: Additional requirements EESS requirement and EU regulation in Rel-19**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **Maximum Level** | **Measurement bandwidth** | **NOTE** |
| 7.25 GHz ≤ f ≤ 2nd harmonic of the upper frequency edge of the UL operating band | -10 dBm | 100 MHz |  |
| 23.6 f 24.0 | -5 dBm | 200 MHz | 1 |
| NOTE 1: This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3-1 from the edge of the channel bandwidth. The protection of frequency range 23600 - 24000 MHz is meant for protection of satellite passive services. |

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**<Way forward >**

Updated NS\_202 by replacing +1 dBm/200 MHz with -5dBm/200MHz EESS passive services protection in the 23.6GHz-24GHz for band n257 and n258, and define *modifiedMPRbehaviour* bit to differentiate between legacy NS\_202 and new NS\_202 requirements.

* It is mandatory to report *modifiedMPRbehaviour* bit from Rel-15 for new UEs.
* A-MPR for updated NS\_202
* PC1:

~~For single contiguous allocation,~~ 11.0 dB ~~if offset frequency < BW~~~~channel~~~~.~~

~~For non-contiguous allocation, [13.0 dB] if offset frequency < BW~~~~channel~~~~, 11.0 dB otherwise.~~

* Other PC:

~~For single contiguous allocation,~~ 2.0 dB ~~if offset frequency < BW~~~~channel~~~~, 1.0 dB otherwise~~.

~~For non-contiguous allocation, 8.0 dB if offset frequency < BW~~~~channel~~~~, 1.0 dB otherwise.~~

The Offset frequency is defined as the frequency from the upper edge of the protected frequency range to the lower edge of the channel bandwidth.

* A-MPR for updated CA\_NS\_202
	+ PC1:

For contiguous UL CA with contiguous allocation, 11.0 dB

For contiguous UL CA with non-contiguous allocation or NC UL CA, [13.0 dB] if offset frequency < BWintraCA, 11.0dB otherwise.

* + PC3:

For contiguous UL CA with contiguous allocation, [5.0 dB] if offset frequency < BWintraCA, 2.0dB otherwise.

For contiguous UL CA with non-contiguous allocation or NC UL CA, [8.0 dB] if offset frequency < BWintraCA, 2.0dB otherwise.

 The Offset frequency is defined as the frequency from the upper edge of the protected frequency range to the lower edge of the lowest CC among the configured UL CA.

Annex for reference

6.5.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions unless otherwise stated. The spurious emission limits are specified in terms of general requirements in line with SM.329 [7] and NR operating band requirement to address UE co-existence. Spurious emissions are measured as TRP.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3-1 starting from the edge of the assigned NR channel bandwidth. The spurious emission limits in Table 6.5.3-2 apply for all transmitter band configurations (NRB) and channel bandwidths. The requirement is verified in beam locked mode with the test metric of TRP (Link=TX beam peak direction, Meas=TRP grid).

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.5.3-1: Boundary between NR out of band and spurious emission domain**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Channel bandwidth** | **50****MHz** | **100****MHz** | **200****MHz** | **400****MHz** | **800 MHz** | **1600 MHz** | **2000 MHz** |
| OOB boundary FOOB (MHz) | 100 | 200 | 400 | 800 | 1600 | 3200 | 4000 |

6.5.3.2 Additional spurious emissions (SC)

6.5.3.2.3 Additional spurious emission requirements for NS\_202

When "NS\_202" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.2.3-1.

**Table 6.5.3.2.3-1: Additional requirements (NS\_202)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **Maximum Level** | **Measurement bandwidth** | **NOTE** |
| 7.25 GHz ≤ f ≤ 2nd harmonic of the upper frequency edge of the UL operating band | -10 dBm | 100 MHz |  |
| 23.6 GHz f 24.0 GHz | +1 dBm | 200 MHz | 1 |
| NOTE 1: This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3-1 from the edge of the channel bandwidth. The protection of frequency range 23600 - 24000 MHz is meant for protection of satellite passive services. |

6.5.3.2.4 Additional spurious emission requirements for NS\_203

When "NS\_203" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.2.4-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3-1 from the edge of the channel bandwidth.

**Table 6.5.3.2.4-1: Additional requirements (NS\_203)**

|  |  |  |
| --- | --- | --- |
| **Frequency band****(GHz)** | **Spectrum emission limit (dBm)** | **Measurement bandwidth** |
| 23.6 f 24.0 | +1 | 200 MHz |

6.5A.3.2 Additional spurious emissions (CA)

6.5A.3.2.3 Additional spurious emission requirements for CA\_NS\_202

When "CA\_NS\_202" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.2.3-1.

6.5A.3.2.4 Additional spurious emission requirements for CA\_NS\_203

When "CA\_NS\_203" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.2.4-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) as defined in section 6.5A.3.

6.2.3.3 A-MPR for NS\_202

6.2.3.3.1 A-MPR for NS\_202 for power class 1

For power class 1, A-MPR for NS\_202 shall be 11.0 dB.

6.2.3.3.2 A-MPR for NS\_202 for power class 2

For power class 2, A-MPR for NS\_202 specified in clause 6.2.3.3.3 applies.

6.2.3.3.3 A-MPR for NS\_202 for power class 3

For power class 3, A-MPR for NS\_202 shall be 1.0 dB.

6.2.3.3.4 A-MPR for NS\_202 for power class 4

For power class 4, A-MPR for NS\_202 specified in clause 6.2.3.3.3 applies.

6.2.3.3.5 A-MPR for NS\_202 for power class 5

For power class 5, A-MPR for NS\_202 specified in clause 6.2.3.3.3 applies.

6.2.3.3.6 A-MPR for NS\_202 for power class 6

For power class 6, A-MPR for NS\_202 specified in clause 6.2.3.3.3 applies.

6.2.3.3.7 A-MPR for NS\_202 for power class 7

For power class 7, A-MPR for NS\_202 specified in clause 6.2.3.3.3 applies.

6.2A.3.3 A-MPR for CA\_NS\_202

6.2A.3.3.1 A-MPR for CA\_NS\_202 for power class 1

For intra-band contiguous CA, A-MPR for CA\_NS\_202 shall be 11.0 dB.

6.2A.3.3.2 A-MPR for CA\_NS\_202 for power class 2

For intra-band contiguous CA, A-MPR for CA\_NS\_202 specified in sub-clause 6.2A.3.3.3 applies.

6.2A.3.3.3 A-MPR for CA\_NS\_202 for power class 3

For intra-band contiguous CA, A-MPR for CA\_NS\_202 shall be 2.0 dB.

6.2A.3.3.4 A-MPR for CA\_NS\_202 for power class 4

For intra-band contiguous CA, A-MPR for CA\_NS\_202 specified in sub-clause 6.2A.3.3.3 applies.

6.2A.3.3.5 A-MPR for CA\_NS\_202 for power class 5

For intra-band contiguous CA, A-MPR for CA\_NS\_202 specified in sub-clause 6.2A.3.3.3 applies.

6.2A.3.3.6 A-MPR for CA\_NS\_202 for power class 6

For intra-band contiguous CA, A-MPR for CA\_NS\_202 specified in sub-clause 6.2A.3.3.3 applies.

6.2.3.4 A-MPR for NS\_203

6.2.3.4.1 A-MPR for NS\_203 for power class 1

For power class 1, A-MPR for NS\_203 shall be 3.0 dB if Offset frequency < BWchannel, 0.0 dB otherwise.
The Offset frequency is defined as the frequency from 24.25 GHz to the lower edge of the channel bandwidth.

6.2.3.4.2 A-MPR for NS\_203 for power class 2

For power class 2, A-MPR for NS\_203 specified in subclause 6.2.3.4.3 applies.

6.2.3.4.3 A-MPR for NS\_203 for power class 3

For power class 3, A-MPR for NS\_203 shall be 0 dB.

6.2.3.4.4 A-MPR for NS\_203 for power class 4

For power class 4, A-MPR for NS\_203 specified in subclause 6.2.3.4.3 applies.

6.2.3.4.5 A-MPR for NS\_203 for power class 5

For power class 5, A-MPR for NS\_203 specified in subclause 6.2.3.4.3 applies.

6.2.3.4.6 A-MPR for NS\_203 for power class 6

For power class 6, A-MPR for NS\_203 specified in subclause 6.2.3.4.3 applies.

6.2.3.4.7 A-MPR for NS\_203 for power class 7

For power class 7, AMPR for NS\_203 specified in subclause 6.2.3.4.3 applies.

6.2A.3.4 A-MPR for CA\_NS\_203

6.2A.3.4.1 A-MPR for CA\_NS\_203 for power class 1

For intra-band contiguous CA, A-MPR for CA\_NS\_203 shall be 6.5 dB, if Offset frequency < BWChannel\_CA of the UL CA configuration, 0.0 dB, otherwise
The Offset frequency is defined as the frequency from 24.25 GHz to the lower edge of the lowest CC among the configured UL CA.

6.2A.3.4.2 A-MPR for CA\_NS\_203 for power class 2

For intra-band contiguous CA, AMPR specified in sub-clause 6.2A.3.4.3 applies.

6.2A.3.4.3 A-MPR for CA\_NS\_203 for power class 3

For intra-band contiguous CA, A-MPR for CA\_NS\_203 shall be 2.5 dB, if Offset frequency < BWChannel\_CA of the UL CA configuration, 0.0 dB otherwise.
The Offset frequency is defined as the frequency from 24.25 GHz to to the lower edge of the lowest CC among the configured UL CA.

6.2A.3.4.4 A-MPR for CA\_NS\_203 for power class 4

For intra-band contiguous CA, AMPR specified in sub-clause 6.2A.3.4.3 applies.

6.2A.3.4.5 A-MPR for CA\_NS\_203 for power class 5

For intra-band contiguous CA, AMPR specified in sub-clause 6.2A.3.4.3 applies.

6.2A.3.4.6 A-MPR for CA\_NS\_203 for power class 6

For intra-band contiguous CA, AMPR specified in sub-clause 6.2A.3.4.3 applies.