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**Source:** Ericsson

**Title:** TP to TS 38.194 Inband blocking OOB and Spurious

**Agenda item:** 7.22.3.1

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# Introduction

In this paper, we propose the TP for ACS and IBB, Spurious requirements.

# TP proposal

Editor note: The TP is modified based on 38.104 text and using the tacking change so the review is easier to understand the changes comparing to the legacy requirements.

7.4 In-band selectivity and blocking

7.4.1 Adjacent Channel Selectivity (ACS)

7.4.1.1 General

Adjacent channel selectivity (ACS) is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency at the *antenna connector* for *BS type 1-C* in the presence of an adjacent channel signal with a specified centre frequency offset of the interfering signal to the band edge of a victim system.

7.4.1.2 Minimum requirement for *BS type 1-C*

The MDR performance shall be [1%] of the reference measurement channel.

The wanted and the interfering signal coupled to the *BS* *type 1-C* *antenna connector* are specified in table 7.4.1.2-1 and the frequency offset between the wanted and interfering signal in table 7.4.1.2-2 for ACS. The reference measurement channel for the wanted signal is identified in table 7.2.2-1, 7.2.2-2 and 7.2.2-3 for each *BS D2R channel bandwidth* in any operating band and further specified in annex A.1. The characteristics of the interfering signal is further specified in annex D.

The ACS requirement is applicable outside the *Base Station RF Bandwidth* or *Radio Bandwidth*. The interfering signal offset is defined relative to the *Base station RF Bandwidth* edges or *Radio Bandwidth* edges.

Minimum conducted requirement is defined at the *antenna connector* for *BS type 1-C.*

* **Table 7.4.1.2-1: Base station ACS requirement**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A-IoTchannel bandwidth of the lowest/highest carrier received [kHz] | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] | Interfering signal centre frequency offset to the lower/upper Base Station RF Bandwidth edge [kHz] | Type of interfering signal |
| 200 | PREFSENS + 6dB (Note) | -53 | ±100 | 3 MHz DFT-s-OFDM NR signal, 15 kHz SCS, 1 RB，closest to wanted signal |
| 3520 | PREFSENS + 6dB (Note) | -53 | ±100 | 3 MHz DFT-s-OFDM NR signal |
| Note: PREFSENS depends on the sub-carrier spacing as specified in Table X |

* **Table 7.4.1.2-2: Base Station ACS interferer frequency offset values**

|  |  |  |
| --- | --- | --- |
| ***BS channel bandwidth* of the *lowest/highest carrier* received (kHz)** | **Interfering signal centre frequency offset from the lower/upper *Base Station RF Bandwidth edge* or *sub-block* edge inside a *sub-block gap* (kHz)** | **Type of interfering signal** |
| 200 | ±100 | 3 MHz DFT-s-OFDM NR signal, 15 kHz SCS, 1 RB，closest to wanted signal |
| 3520 | ±100 | 3 MHz DFT-s-OFDM NR signal |

7.4.2 In-band blocking

7.4.2.1 General

The in-band blocking characteristics is a measure of the receiver's ability to receive a wanted signal at its assigned channel at the *antenna connector* for *BS type 1-C* in the presence of an unwanted interferer, which is an NR signal for general blocking or an NR signal with one resource block for narrowband blocking.

7.4.2.2 Minimum requirement for *BS type 1-C*

The MDR performance shall be [1%] of the reference measurement channel, with a wanted and an interfering signal coupled to *BS type 1-C* *antenna connector* using the parameters in tables 7.4.2.2-1, 7.4.2.2-2 and 7.4.2.2-3 for general blocking and narrowband blocking requirements. The reference measurement channel for the wanted signal is identified in clause 7.2.2 for each *BS channel bandwidth* and further specified in annex A.1. The characteristics of the interfering signal is further specified in annex D.

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The in-band blocking requirements apply outside the *Base Station RF Bandwidth* or *Radio Bandwidth*. The interfering signal offset is defined relative to the *Base Station RF Bandwidth edges* or *Radio Bandwidth* edges.

The in-band blocking requirement shall apply from FUL,low - ΔfOOB to FUL,high + ΔfOOB, excluding the downlink frequency range of the FDD *operating band*. The ΔfOOB for *BS type 1-C* is defined in table 7.4.2.2-0.

Minimum conducted requirement is defined at the *antenna connector* for *BS type 1-C.*

* **Table 7.4.2.2-0: ΔfOOB offset for NR *operating bands***

|  |  |  |
| --- | --- | --- |
| **BS type** | ***Operating band* characteristics** | **ΔfOOB (MHz)** |
|  | FUL,high – FUL,low ≤ 200 MHz | 20 |
| *BS type 1-C* | 200 MHz < FUL,high – FUL,low ≤ 900 MHz | 60 |
|  |  |  |

* **Table 7.4.2.2-1: Base station general blocking requirement**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***BS channel bandwidth* of the *lowest/highest carrier* received (kHz)** | **Wanted signal mean power (dBm) (Note 2)** | **Interfering signal mean power (dBm)** | **Interfering signal centre frequency minimum offset from the lower/upper *Base Station RF Bandwidth edge* or *sub-block* edge inside a *sub-block gap* (kHz)** | **Type of interfering signal** |
| 200 | PREFSENS + x dB | -38 | ±7.5 | 3 MHz DFT-s-OFDM NR signal15 kHz SCS, 15 RBs |
| 3520 | PREFSENS + x dB | -38 | ±4760 | 3 MHz DFT-s-OFDM NR signal15 kHz SCS, 15 RBs |
| NOTE 1: PREFSENS depends also on the *BS channel bandwidth* as specified in tables [7.2.2-1]NOTE 2: For a BS capable of single band operation only, "x" is equal to 6 dB. For a BS capable of multi-band operation, "x" is equal to 6 dB in case of interfering signals that are in the in-band blocking frequency range of the operating band where the wanted signal is present or in the in-band blocking frequency range of an adjacent or overlapping operating band. For other in-band blocking frequency ranges of the interfering signal for the supported operating bands, "x" is equal to 1.4 dB. |

* **Table 7.4.2.2-2: Base Station narrowband blocking requirement**

|  |  |  |
| --- | --- | --- |
| ***BS channel bandwidth* of the *lowest/highest carrier* received (MHz)** | **Wanted signal mean power (dBm)** | **Interfering signal mean power (dBm)** |
|  0.2, 3.52 | PREFSENS + 6 dB | -44 |
| NOTE1: PREFSENS depends on the *BS channel bandwidth* as specified in tables [7.2.2-1, 7.2.2-2 and 7.2.2-3].  |

* **Table 7.4.2.2-3: Base Station narrowband blocking interferer frequency offsets**

|  |  |  |
| --- | --- | --- |
| ***BS channel bandwidth* of the *lowest/highest carrier* received (MHz)** | **Interfering RB centre frequency offset to the lower/upper *Base Station RF Bandwidth edge* or *sub-block* edge inside a *sub-block gap* (kHz) (Note 2)** | **Type of interfering signal** |
| 200 | ±(350+m\*180),m=0, 1, 2, 3, 4, 9, 14, 19, 24 | 5 MHz DFT-s-OFDM NR signal, 15 kHz SCS, 1 RB |
| 3520 | ±(350+m\*180),m=0, 1, 2, 3, 4, 9, 14, 19, 24 | 5 MHz DFT-s-OFDM NR signal, 15 kHz SCS, 1 RB |
| NOTE 1: Interfering signal consisting of one resource block positioned at the stated offset, the *channel bandwidth* of the interfering signal is located adjacently to the lower/upper *Base Station RF Bandwidth edge* or *sub-block* edge inside a *sub-block gap*. NOTE 2: The centre of the interfering RB refers to the frequency location between the two central subcarriers. |

7.5 Out-of-band blocking

7.5.1 General

The out-of-band blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel at the *antenna connector* for *BS type 1-C* in the presence of an unwanted interferer out of the *operating band*, which is a CW signal for out-of-band blocking.

7.5.2 Minimum requirement for *BS type 1-C*

the MDR performance shall be [1%] of the reference measurement channel, with a wanted and an interfering signal coupled to *BS type 1-C* *antenna connector* using the parameters in table 7.5.2-1.

The reference measurement channel for the wanted signal is identified in clause 7.2.2 for each *BS channel bandwidth* and further specified in annex A.1. The characteristics of the interfering signal is further specified in annex D.

The out-of-band blocking requirement apply from 1 MHz to FUL,low - ΔfOOB and from FUL,high + ΔfOOB up to 12750 MHz, including the downlink frequency range of the FDD *operating band* for BS supporting FDD. The ΔfOOB for *BS type 1-C* and *BS type 1-H* is defined in table 7.4.2.2-0.

Minimum conducted requirement is defined at the *antenna connector* for *BS type 1-C.*

* **Table 7.5.2-1: Out-of-band blocking performance requirement for NR**

|  |  |  |
| --- | --- | --- |
| **Wanted Signal mean power (dBm)** | **Interfering Signal mean power (dBm)** | **Type of Interfering Signal** |
| PREFSENS +6 dB(Note) | -15  | CW carrier  |
| NOTE 1: PREFSENS depends also on the *BS channel bandwidth* as specified in Table 7.2.2-1.  |

7.6 Receiver spurious emissions

7.6.1 General

The receiver spurious emissions power is the power of emissions generated or amplified in a receiver unit that appear at the *antenna connector* (for *BS type 1-C*). The requirements apply to all BS with separate RX and TX *antenna connectors*.

NOTE: In this case for FDD operation the test is performed when both TX and RX are ON, with the TX *antenna connectors* terminated.

For *antenna connectors* supporting both RX and TX in FDD, the RX spurious emissions requirements are superseded by the TX spurious emissions requirements, as specified in clause 6.6.5.

7.6.2 *Basic limits*

The receiver spurious emissions *basic limits* are provided in table 7.6.2-1.

* **Table 7.6.2-1: General BS receiver spurious emissions limits**

| **Spurious frequency range** | ***Basic limits*** | ***Measurement bandwidth*** | **Note** |
| --- | --- | --- | --- |
| 30 MHz – 1 GHz | -57 dBm | 100 kHz | Note 1 |
| 1 GHz – 12.75 GHz | -47 dBm | 1 MHz | Note 1, Note 2 |
| 12.75 GHz – 5th harmonic of the upper frequency edge of the UL *operating band* in GHz | -47 dBm | 1 MHz | Note 1, Note 2, Note 3 |
| 12.75 GHz ‑ 26 GHz | -47 dBm | 1 MHz | Note 1, Note 2, Note 5 |
| NOTE 1: *Measurement bandwidth*s as in ITU-R SM.329 [2], s4.1.NOTE 2: Upper frequency as in ITU-R SM.329 [2], s2.5 table 1.NOTE 3: Applies for Band for which the upper frequency edge of the UL *operating band* is greater than 2.55 GHz and less than or equal to 5.2 GHz.NOTE 4: The frequency range from ΔfOBUE below the lowest frequency of the BS transmitter *operating band* to ΔfOBUE above the highest frequency of the BS transmitter *operating band* may be excluded from the requirement. ΔfOBUE is defined in clause 6.6.1. For *multi-band* *connectors*, the exclusion applies for all supported *operating bands*.NOTE 5: Applies for Band for which the upper frequency edge of the UL *operating band* is greater than 5.2 GHz. |

7.6.3 Minimum requirement for *BS type 1-C*

The RX spurious emissions requirements for *BS type 1-C* are that for each *antenna connector,* the power of emissions shall not exceed *basic limits* specified in table 7.6.2-1.

## 7.7 Receiver intermodulation

### 7.7.1 General

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency at the *antenna connector* for *BS type 1-C* in the presence of two interfering signals which have a specific frequency relationship to the wanted signal.

7.7.2 Minimum requirement for *BS type 1-C*

The MDR performance shall be [1%] of the reference measurement channel, with a wanted signal at the assigned channel frequency and two interfering signals coupled to the *BS type 1-C antenna connector*, with the conditions specified in tables 7.7.2-1 and 7.7.2-2 for narrowband intermodulation performance. The reference measurement channel for the wanted signal is identified in tables 7.2.2-1, 7.2.2-2 and 7.2.2-3 for each *BS channel bandwidth* and further specified in annex A.1. The characteristics of the interfering signal is further specified in annex D.

The receiver intermodulation requirement is applicable outside the *Base Station RF Bandwidth* or *Radio Bandwidth edges*. The interfering signal offset is defined relative to the *Base Station RF Bandwidth edges* or *Radio Bandwidth* edges.

For a BS operating in *non-contiguous spectrum* within any *operating band*, the narrowband intermodulation requirement shall apply in addition inside any *sub-block gap* in case the *sub-block gap* is at least as wide as the *channel bandwidth* of the NR interfering signal in table 7.7.2-2 or 7.7.2-4. The interfering signal offset is defined relative to the *sub-block* edges inside the *sub-block gap*.

**Table 7.7.2-1: Narrowband intermodulation performance requirement for A-IoT Medium Range BS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Channel bandwidth of the lowest/highest carrier received [kHz]** | **Wanted signal mean power [dBm]** | **Interfering signal mean power [dBm]** | **Interfering RB centre frequency offset from the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [kHz]** | **Type of interfering signal** |
| 200 | PREFSENS + 6dB\* | -53 | ±340 | CW |
| -53 | ±880 | 5MHz E-UTRA signal, 1 RB\*\* |
| 3520 | PREFSENS + 6dB\* | -53 | ±270 | CW |
|  |  | -53 | ±780 | 3.0 MHz E-UTRA signal, 1 RB\*\* |
| Note\*: PREFSENS depends on the sub-carrier spacing as specified in Table 7.2.1-5c.Note\*\*: Interfering signal consisting of one resource block positioned at the stated offset, the channel bandwidth of the interfering signal is located adjacently to the lower/upper Base Station RF Bandwidth edge. |