

Source: TSG RAN
Title: Unwanted Emissions to be Included in ITU-R IMT.RSPC
Document for: Approval
Agenda Item: 6.5.3

This document contains a contribution to be submitted to the next meeting of ITU-R TG 8/1 (Helsinki, 25 October – 5 November 1999).

The purposes of the proposed attached contribution are twofolds:

- (1) – Respond to ITU-R TG8/1 from 3GPP TSG RAN on the issue of generic unwanted emissions limits regarding terminals. The FDD material is taken from the specification TS 25.101 version 3.0.0 while the TDD material is taken from TS25.102 version 3.0.0.
- (2) – Provide the opinion from 3GPP TSG RAN on how this issue should be treated in IMT.RSPC.

ANNEX

[3GPP MEMBER, OR ADMINISTRATION][#]

RESPONSE TO THE RECEIVED LIAISON FROM TG8/1 CONTAINING A REQUEST FOR UNWANTED EMISSION LIMITS FOR THE PURPOSE OF INCLUSION IN IMT.RSPC, SECTION 7

This document contains a response to the received liaison from TG8/1 with a request for unwanted emission limits for the purpose of inclusion in IMT.RSPC, section 7 of Doc. 8-1/424 (Attachment 13). Within the 3GPP TSG RAN the opinion is that there is no need for a separate section in IMT.RSPC on terminal unwanted emissions for carrier off-state and carrier-on state since this text is already included in the specifications that has been developed within 3GPP and are referenced in Section 5.x.3 of the draft version of IMT.RSPC. 3GPP TSG RAN therefore proposes, rather than having a separate Section 7 with dedicated text on unwanted emission limits, to include in Section 5.x.2 the relevant material in an appropriate format; alternatively, if TG8/1 wants to keep a separate Section 7 devoted to Unwanted Emissions, 3GPP TSG RAN proposes to include in Section 7 a list of references to those Specifications that contain the relevant material needed to define the terminal unwanted emission limits.

In case TG8/1 concludes that none of the above alternatives is acceptable, 3GPP TSG RAN submits the attached Annex that contains a response to the received liaison from TG8/1. Looking at the draft version of the RSPC document and associated references (e.g. draft recommendation IMT.TERM), TG8/1 asks for input on terminal unwanted emissions for carrier off-state and carrier-on state. The material may be generic requirements such as defined in other ITU-R recommendations or technology specific (see section 5 in the draft RSPC). In that case it is suggested to include the attached material as being specified in 3GPP for the UTRA FDD and UTRA TDD radio interface technologies.

Attachment: Proposed answer to ITU-R TG8/1 on 3GPP unwanted emission limits for inclusion in IMT.RSPC (if the current Section 7 in draft RSPC is confirmed by TG8/1).

[#] This contribution was developed in 3GPP TSG RAN.

ATTACHMENT

Proposed answer to ITU-R TG8/1 on 3GPP unwanted emission limits for inclusion in IMT.RSPC (if the current Section 7 in draft RSPC is confirmed by TG8/1).

UTRA FDD unwanted emission for carrier off-state

The transmit OFF power state is when the User Equipment (UE) does not transmit except during uplink discontinuous transmission (DTX) mode. This parameter is defined as the maximum output transmit power within the channel bandwidth when the transmitter is OFF. The requirement for the transmit OFF power shall be better than -50 dBm measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

UTRA FDD unwanted emission for carrier on-state

Out of band emissions are unwanted emissions immediately outside the nominal channel resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and Adjacent Channel Leakage power Ratio. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies, which are between 2.5 MHz and 12.5 MHz away from the UE center carrier frequency. The out of channel emission is specified relative to the UE output power measured in a 3.84 MHz bandwidth.

The power of any UE emission shall not exceed the levels specified in Table 1.

Table 1: Spectrum Emission Mask Requirement

Frequency offset from carrier f	Minimum requirement	Measurement bandwidth
2.5 – 3.5 MHz	$-35 - 15 * (\Delta f - 2.5)$ dBc	30 kHz *
3.5 – 7.5 MHz	$-35 - 1 * (\Delta f - 3.5)$ dBc	1 MHz *
7.5 – 8.5 MHz	$-39 - 10 * (\Delta f - 7.5)$ dBc	1 MHz *
8.5 – 12.5 MHz	-49 dBc	1 MHz *

Note *

1. The first and last measurement position with a 30 kHz filter is 2.515 MHz and 3.485 MHz
2. The first and last measurement position with a 1 MHz filter is 4 MHz and 12 MHz
3. The lower limit should be -50 dBm/3.84 MHz or which ever is higher

Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the transmitted power to the power measured after a receiver filter in the adjacent channel(s). Both the transmitted power and the received power are measured with a filter that has a Root-Raised Cosine (RRC) filter response with roll-off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

The ACLR shall be better than the value specified in Table 2. Power class 4 is equal to a maximum power of 21 dBm with a tolerance of ± 2 dB.

Table 2: User Equipment ACLR

Power Class	UE channel	ACLR limit
4	+ 5 MHz or – 5 MHz	33 dB or -50 dBm which ever is higher
4	+ 10 MHz or –10 MHz	43 dB or -50 dBm which ever is higher

Note

1. The ACLR due to switching transients shall not exceed the limits in Table 2.
2. The ACLR requirements reflect what can be achieved with present state of the art technology.

3. Requirement on the UE shall be reconsidered when the state of the art technology progresses.

Spurious emissions

The frequency boundary and the detailed transitions of the limits between the requirement for out band emissions and spectrum emissions are based on ITU-R Recommendation SM.329.

The requirements in Tables 3a and 3b are only applicable for frequencies, which are greater than 12.5 MHz away from the UE center carrier frequency.

Table 3a: General spurious emissions requirements

Frequency Bandwidth	Resolution Bandwidth	Minimum requirement
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36 dBm
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36 dBm
$30 \text{ MHz} \leq f < 1000 \text{ MHz}$	100 kHz	-36 dBm
$1 \text{ GHz} \leq f < 12.75 \text{ GHz}$	1 MHz	-30 dBm

Table 3b: Additional spurious emissions requirements

Frequency Bandwidth	Resolution Bandwidth	Minimum requirement
$1893.5 \text{ MHz} < f < 1919.6 \text{ MHz}$	300 kHz	-41 dBm
$925 \text{ MHz} \leq f \leq 935 \text{ MHz}$	100 kHz	-67 dBm *
$935 \text{ MHz} < f \leq 960 \text{ MHz}$	100 kHz	-79 dBm *
$1805 \text{ MHz} \leq f \leq 1880 \text{ MHz}$	100 kHz	-71 dBm *

Note

* The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 3a are permitted for each UTRA Absolute Radio Frequency Channel Number (UARFCN) used in the measurement.

UTRA TDD unwanted emission for carrier off-state

The transmit OFF power state is when the UE does not transmit. This parameter is defined as the maximum output transmit power within the channel bandwidth when the transmitter is OFF.

The requirement for transmit OFF power shall be better than -65 dBm measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha=0.22$ and a bandwidth equal to the chip rate.

UTRA TDD unwanted emission for carrier on-state

Out of band emissions are unwanted emissions immediately outside the nominal channel resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and adjacent channel power ratio. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

Spectrum emission mask

The spectrum emission mask of the terminal UE is requirement that applies to frequencies, which are between 2.5 and 12.5MHz from a carrier frequency. The out of channel emission is specified relative to the UE output power in measured in a 3.84 MHz bandwidth.

The power of the 21dBm power class 3 UE emission shall not exceed the levels specified in table 4.

Table 4: Spectrum Emission Mask Requirement

Frequency offset from carrier f	Minimum requirement	Measurement bandwidth
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2.5 - 3.5 MHz	-35 -15*($\Delta f - 2.5$) dBc	30 kHz *
3.5 - 7.5 MHz	-35- 1*($\Delta f-3.5$) dBc	1 MHz *
7.5 - 8.5 MHz	-39 - 10*($\Delta f - 7.5$) dBc	1 MHz *
8.5 - 12.5 MHz	-49 dBc	1 MHz *

Note

1. The first and last measurement position with a 30 kHz filter is 2.515 MHz and 3.485 MHz
2. The first and last measurement position with a 1 MHz filter is 4 MHz and 12 MHz
3. The lower limit shall be -50dBm/3.84 MHz or which ever is the higher

Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the transmitted power to the power measured after a receive filter in the adjacent channels(s). Both the transmitted power and the received power are measured with a filter response that has a Root-Raised Cosine (RRC) filter response with roll-off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

The ACLR shall be better than the value specified in Table 5.

Table 5: UE ACLR

Power Class	UE channel	ACLR limit
3	± 5 MHz	33 dB or -50 dBm which ever is higher
3	± 10 MHz	43 dB or -50 dBm which ever is higher

Note

1. The ACLR due to switching transients shall not exceed the limits in the above table.

Spurious emissions

The frequency boundary and the detailed transitions of the limits between the requirement for out band emissions and spectrum emissions are based on ITU-R Recommendations SM.329.

The requirements in Tables 6a and 6b are only applicable for frequencies that are greater than 12.5 MHz away from the UE center carrier frequency.

Table 6a: General Spurious emissions requirements

Frequency Bandwidth	Resolution Bandwidth	Minimum requirement
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36 dBm
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36 dBm
$30 \text{ MHz} \leq f < 1000 \text{ MHz}$	100 kHz	-36 dBm
$1 \text{ GHz} \leq f < 12.75 \text{ GHz}$	1 MHz	-30 dBm

Table 6b: Additional Spurious emissions requirements

Frequency Bandwidth	Resolution Bandwidth	Minimum requirement
$925 \text{ MHz} \leq f \leq 935 \text{ MHz}$	100 KHz	-67 dBm*
$935 \text{ MHz} < f \leq 960 \text{ MHz}$	100 KHz	-79 dBm*
$1805 \text{ MHz} \leq f \leq 1880 \text{ MHz}$	100 KHz	-71 dBm*

Note

* The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 6a are permitted for each UARFCN used in the measurement.