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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

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Contents

Foreword

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1 Scope

The present document establishes the minimum RF requirements for NR User Equipment (UE) Interworking operation with other radios. This includes but is not limited to additional requirements for carrier aggregation or NR dual connectivity between Range 1 and Range 2 and additional requirements due to NR non-standalone (NSA) operation mode with E-UTRA.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone"

[3] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone"

[4] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception"

[5] 3GPP TS 38.521-3: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios"

[6] Recommendation ITU-R M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000"

[7] 3GPP TS 36.211: "E-UTRA; Physical channels and modulation"

[8] 3GPP TS 36.331: " Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification"

[9] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification"

[10] 3GPP TS 38.213: "NR; Physical layer procedures for control"

[11] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities

[12] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[13] 3GPP TS 38.211: "NR; Physical channels and modulation".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2 Symbols

For the purposes of the present document, the following symbols apply:

$\Delta R_{IB,c}$ Allowed reference sensitivity relaxation due to support for CA or DC operation, for serving cell *c*.
$\Delta T_{IB,c}$ Allowed maximum configured output power relaxation due to support for CA or DC operation, for serving cell *c*
$BW_{E\text{-}UTRA\_Channel}$ Channel bandwidth of E-UTRA carrier
$BW_{E\text{-}UTRA\_Channel\_CA}$ Channel bandwidth of E-UTRA sub-block which is composed of intra-band contiguous CA E-UTRA carriers
$BW_{NR\_Channel}$ Channel bandwidth of NR carrier
$BW_{NR\_Channel\_CA}$ Channel bandwidth of NR sub-block which is composed of intra-band contiguous CA NR carriers
Ceil(x) Rounding upwards; ceil(x) is the smallest integer such that ceil(x) ≥ x
$EN\text{-}DC_{ACLR}$ The ratio of the filtered mean power centred on the aggregated sub-block bandwidth ENBW to the filtered mean power centred on an adjacent bandwidth of the same size ENBW
$E\text{-}UTRA_{ACLR}$ E-UTRA ACLR
F_C *RF reference frequency* for the carrier center on the channel raster
F_{DL_low} The lowest frequency of the downlink *operating band*
F_{DL_high} The highest frequency of the downlink *operating band*
F_{UL_low} The lowest frequency of the uplink *operating band*
F_{UL_high} The highest frequency of the uplink *operating band*
F_{OOB} The boundary between the NR out of band emission and spurious emission domains
L_{CRB} Transmission bandwidth which represents the length of a contiguous resource block allocation expressed in units of resource blocks
Max() The largest of given numbers
Min() The smallest of given numbers
NR_{ACLR} NR ACLR
N_{RB} Transmission bandwidth configuration, expressed in units of resource blocks
N_{RB_agg} The number of the aggregated RBs within the fully allocated aggregated channel bandwidth
$N_{RB\_agg} = \sum_1^j N_{RB_j} * 2^{\mu j}$ for carrier 1 to j, where μ is defined in TS 38.211 [13]
$N_{RB,c}$ The transmission bandwidth configuration of component carrier c, expressed in units of resource blocks
$N_{RB,cj} = N_{RB_j} * 2^{\mu j}$ for carrier j, where μ is defined in TS 38.211 [13]
P_{CMAX} The configured maximum UE output power
RB_{start} Indicates the lowest RB index of transmitted resource blocks
W_{gap} The sub-block gap between the two sub-blocks

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ACLR Adjacent Channel Leakage Ratio
ACS Adjacent Channel Selectivity
A-MPR Additional Maximum Power Reduction
BCS Bandwidth Combination Set
CA Carrier Aggregation

CC	Component Carrier
DC	Dual Connectivity
EN-DC	E-UTRA/NR DC
EVM	Error Vector Magnitude
FDM	Frequency Division Multiplexing
FR	Frequency Range
ENBW	The aggregated bandwidth of an E-UTRA sub-block and an adjacent NR sub-block
ITU-R	Radiocommunication Sector of the International Telecommunication Union
MBW	Measurement bandwidth defined for the protected band
MPR	Allowed maximum power reduction
MSD	Maximum Sensitivity Degradation
MCG	Master Cell Group
NR	New Radio
NS	Network Signalling
NSA	Non-Standalone, a mode of operation where operation of an other radio is assisted with an other radio
OOB	Out-of-band
OOBE	Out-of-band emission
OTA	Over The Air
PRB	Physical Resource Block
RE	Resource Element
REFSENS	Reference Sensitivity
RF	Radio Frequency
Rx	Receiver
SCG	Secondary Cell Group
SCS	Subcarrier spacing
SEM	Spectrum Emission Mask
SUL	Supplementary uplink
TDM	Time Division Multiplex
Tx	Transmitter
UE	User Equipment
UL MIMO	Up Link Multiple Antenna transmission
ULSUP	Uplink sharing from UE perspective

4 General

4.1 Relationship between minimum requirements and test requirements

The present document is interwork specification for NR UE, covering RF characteristics and minimum performance requirements. Conformance to the present specification is demonstrated by fulfilling the test requirements specified in the conformance specification 3GPP TS 38.521-3 [5].

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification TS 38.521-3 [5] defines test tolerances. These test tolerances are individually calculated for each test. The test tolerances are used to relax the minimum requirements in this specification to create test requirements. For some requirements, including regulatory requirements, the test tolerance is set to zero.

The measurement results returned by the test system are compared - without any modification - against the test requirements as defined by the shared risk principle.

The shared risk principle is defined in Recommendation ITU-R M.1545 [6].

4.2 Applicability of minimum requirements

a) In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios