3GPP TR 38.717-04-02 V0.1.0 (2020-08)

Technical Report

3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; NR inter-band Carrier Aggregation / Dual Connectivity; for DL 4 bands and 2 UL bands; (Release 17)

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Contents

Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document is a technical report for NR inter-band Carrier Aggregation (CA) and/or Dual Connectivity (EN-DC) of 4DL NR bands and 2UL NR bands under Rel-17 time frame. The purpose is to gather the relevant background information and studies in order to address NR inter-band CA and/or DC for the Rel-17 band combinations in Table 1-1.

This TR contains a band specific combination part. The actual requirements are added to the corresponding technical specifications.

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"

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms 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].

Definition format (Normal)

<defined term>: *<definition>.*

example: text used to clarify abstract rules by applying them literally.

3.2 Symbols

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

Symbol format (EW)

<symbol> <Explanation>

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].

Abbreviation format (EW)

<ABBREVIATION> <Expansion>

4 Background

The present document is a technical report for NR inter-band Carrier Aggregation (CA) and/or Dual Connectivity (EN-DC) of 4 NR bands and 2 NR bands under Rel-17 time frame. The document covers each band combination specific issues (i.e. one sub-clause defined per band combination)

4.1 TR Maintenance

A single company is responsible for introducing all approved TPs in the current TR, i.e. TR editor. However, it is the responsibility of the contact person of each band combination to ensure that the TPs related to the band combination have been implemented.

5 4 DL bands inter-band Carrier Aggregation with 2 UL bands: Specific Band Combination Part

5.1 Inter-band CA within FR1

5.1.x CA_nA-nB-nC-nD

5.1.x.1 Operating bands for CA

Table 5.1.x.1-1: Inter-band CA operating bands of CA_nA-nB-nC-nD

NR CA Band	NR Band (Table 5.2-1 in TS38.101-1[2])

5.1.x.2 Channel bandwidths per operating band for CA

Table 5.1.x.2-1: Supported bandwidths per CA_nA-nB-nC-nD

NR CA configuration	Uplink CA configuration	NR Band	SCS (kHz)	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz	Maximum Aggregated bandwidth [MHz]	Bandwidth combination set
CA_nA-nB-nC-nD	CA_nA-nB	nA	15															
			30															
			60															
		nB	15															
			30															
			60															
		nC	15															
			30															
			60															
		nD	15															
			30															
			60															

<Editor Note: Sub-clause 5.1.x3, 5.1.x.4 and 5.1.x.5 are optional, since the study of corresponding lower-order combination can be applied>

5.1.x.3 UE co-existence study

5.1.x.4 ΔT_{IB} and ΔR_{IB} values

5.1.x.5 REFSENS requirements

5.2 Inter-band CA including RF2

5.2.1 CA_n3-n28-n77-n257

5.2.1.1 Operating bands for CA

Table 5.2.1.1-1: Inter-band CA operating bands of CA_n3-n28-n77-n257

NR CA Band	NR Band (Table 5.2-1 in TS38.101-1[2] and TS38.101-2[3])
CA_n3-n28-n77-n257	n3, n28, n77, n257

5.2.1.2 Channel bandwidths per operating bands for CA

Table 5.2.x.2-1: Supported channel bandwidths per CA configuration for 4DL/2UL inter-band CA

NR CA Configuration	UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	70	80	90	100	200	400	Bandwidth combination set
CA_n3A-n28A-n77A-n257A		n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes	Yes									

	CA_n3A-n257A CA_n28A-n257A CA_n77A-n257A	n28	15	Yes	Yes	Yes	Yes		Yes										
			30		Yes	Yes	Yes		Yes										
			60																
		n77	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes								
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
		n257	60								Yes					Yes	Yes		
			120								Yes					Yes	Yes	Yes	
CA_n3A-n28A-n77A-n257G	CA_n3A-n257A CA_n28A-n257A CA_n77A-n257A CA_n3A-n257G CA_n28A-n257G CA_n77A-n257G	n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes		Yes										
			30		Yes	Yes	Yes		Yes										
			60																
		n77	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes								
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
		n257	See CA_n257G BCS0 in Table 5.5A.1-1 in TS 38.101-2																
CA_n3A-n28A-n77A-n257H	CA_n3A-n257A CA_n28A-n257A CA_n77A-n257A CA_n3A-n257G CA_n28A-n257G CA_n77A-n257G CA_n3A-n257H CA_n28A-n257H CA_n77A-n257H	n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes		Yes										
			30		Yes	Yes	Yes		Yes										
			60																
		n77	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes								
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
		n257	See CA_n257H BCS0 in Table 5.5A.1-1 in TS 38.101-2																
CA_n3A-n28A-n77A-n257I	CA_n3A-n257A CA_n28A-n257A CA_n77A-n257A CA_n3A-n257G CA_n28A-n257G CA_n77A-n257G CA_n3A-n257H CA_n28A-n257H CA_n77A-n257H CA_n3A-n257I CA_n28A-n257I CA_n77A-n257I	n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes		Yes										
			30		Yes	Yes	Yes		Yes										
			60																
		n77	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes								
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
		n257	See CA_n257I BCS0 in Table 5.5A.1-1 in TS 38.101-2																

5.2.1.3 UE co-existence studies

The coexistence studies have been captured into the constituent fallback modes in TR 38.716-03-02, there is no additional harmonic and intermodulation impact for the additional band receiver.

5.2.1.4 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

The $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ could reuse the values for CA_n3-n28-n77-n257 with 1UL that have been captured into TR38.716-04-01.

5.2.1.5 REFSENS requirements

There is no need to specify additional MSD requirement for this UL CA configuration.

5.2.2 CA_n3-n28-n78-n257

5.2.2.1 Operating bands for CA

Table 5.2.2.1-1: Inter-band CA operating bands of CA_n3-n28-n78-n257

NR CA Band	NR Band (Table 5.2-1 in TS38.101-1[2] and TS38.101-2[3])
CA_n3-n28-n78-n257	n3, n28, n78, n257

5.2.2.2 Channel bandwidths per operating bands for CA

Table 5.2.2.2-1: Supported channel bandwidths per CA configuration for 4DL/2UL inter-band CA

R CA guration		UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	70	80	90	100	200	400	Bandw combin se
		CA_n3A-n257A CA_n28A-n257A CA_n78A-n257A	n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									
				30		Yes	Yes	Yes	Yes	Yes	Yes									
				60		Yes	Yes	Yes	Yes	Yes	Yes									
			n28	15	Yes	Yes	Yes	Yes		Yes										
_n3A-n78A-257A				30		Yes	Yes	Yes		Yes										0
				60																
			n78	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes								
				30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
				60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
			n257	60								Yes					Yes	Yes		
				120								Yes					Yes	Yes	Yes	
		CA_n3A-n257A CA_n28A-n257A CA_n78A-n257A CA_n3A-n257G CA_n28A-n257G CA_n78A-n257G	n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									
				30		Yes	Yes	Yes	Yes	Yes	Yes									
				60		Yes	Yes	Yes	Yes	Yes	Yes									
			n28	15	Yes	Yes	Yes	Yes		Yes										
_n3A-n78A-257G				30		Yes	Yes	Yes		Yes										0
				60																
			n78	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes								
				30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
				60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
			n257	See CA_n257G BCS0 in Table 5.5A.1-1 in TS 38.101-2																
		CA_n3A-n257A CA_n28A-n257A CA_n78A-n257A CA_n3A-n257G CA_n28A-n257G CA_n78A-n257G CA_n3A-n257H CA_n28A-n257H CA_n78A-n257H	n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									
				30		Yes	Yes	Yes	Yes	Yes	Yes									
				60		Yes	Yes	Yes	Yes	Yes	Yes									
			n28	15	Yes	Yes	Yes	Yes		Yes										
_n3A-n78A-257H				30		Yes	Yes	Yes		Yes										0
				60																
			n78	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes								
				30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
				60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
			n257	See CA_n257H BCS0 in Table 5.5A.1-1 in TS 38.101-2																
		CA_n3A-n257A CA_n28A-n257A	n3	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes									
				30		Yes	Yes	Yes	Yes	Yes	Yes									
				60		Yes	Yes	Yes	Yes	Yes	Yes									
			n28	15	Yes	Yes	Yes	Yes		Yes										
_n3A-n78A-257I				30		Yes	Yes	Yes		Yes										0

	CA_n78A-n257A CA_n3A-n257G CA_n28A-n257G CA_n78A-n257G CA_n3A-n257H CA_n28A-n257H CA_n78A-n257H CA_n3A-n257I CA_n28A-n257I CA_n78A-n257I		60															
		n78	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
		n257	See CA_n257I BCS0 in Table 5.5A.1-1 in TS 38.101-2															

5.2.2.3 UE co-existence studies

The coexistence studies have been captured into the constituent fallback modes in TR 38.716-03-02, there is no additional harmonic and intermodulation impact for the additional band receiver.

5.2.2.4 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

The $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ could reuse the values for CA_n3-n28-n78-n257 with 1UL that have been captured into TR38.716-04-01.

5.2.2.5 REFSENS requirements

There is no need to specify additional MSD requirement for this UL CA configuration.

5.2.x CA_nA-nB-nC-nD

5.2.x.1 Operating bands for CA

Table 5.2.x.1-1: Inter-band CA operating bands of CA_nA-nB-nC-nD

NR CA Band	NR Band (Table 5.2-1 in TS38.101-1[2] and TS38.101-2[3])

5.2.x.2 Channel bandwidths per operating band for CA

Table 5.2.x.2-1: Supported bandwidths per CA_nA-nB-nC-nD

NR CA configuration	Uplink NR CA configuration	NR Band	SCS (kHz)	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz	200 MHz	400 MHz	BCS
CA_nA-nB-nC-nD	CA_nA-nB	nA	15																
			30																
			60																

		nB	15																
			30																
			60																
		nC	15																
			30																
			60																
		nD	60																
			120																

<Editor Note: Sub-clause 5.2.x3, 5.2.x.4 and 5.2.x.5 are optional, since the study of corresponding lower-order combination can be applied>

5.2.x.3 UE co-existence study

5.2.x.4 ΔT_{IB} and ΔR_{IB} values

5.2.x.5 REFSENS requirements

6 4 DL bands Dual Connectivity with 2 UL bands: Specific Band Combination Part

6.1 DC within FR1

6.1.x DC_nA-nB-nC-nD

6.1.x.1 Operating bands for DC

Table 6.1.x.1-1: Inter-band DC operating bands of DC_nA-nB-nC-nD

NR DC Band	NR Band (Table 5.2-1 in TS38.101-1[2])

6.1.x.2 Configuration for DC

Table 6.1.x.2-1: Inter-band DC configuration of DC_nA-nB-nC-nD

Downlink NR DC configuration	Uplink NR DC configuration

6.2 DC including RF2

6.2.1 DC_n3-n28-n77-n257

6.2.1.1 Operating bands for DC

Table 6.2.1.1-1: Inter-band DC operating bands of DC_n3-n28-n77-n257

NR DC Band	NR Band (Table 5.2-1 in TS38.101-1[2] and TS38.101-2[3])
DC_n3-n28-n77-n257	n3, n28, n77, n257

6.2.1.2 Configurations for DC

Table 6.2.1.2-1: Inter-band DC configuration of DC_n3-n28-n77-n257

Downlink NR DC configuration	Uplink NR DC configuration
DC_n3A-n28A-n77A-n257A	DC_n3A-n257A DC_n28A-n257A DC_n77A-n257A
DC_n3A-n28A-n77A-n257G	DC_n3A-n257A DC_n28A-n257A DC_n77A-n257A DC_n3A-n257G DC_n28A-n257G DC_n77A-n257G
DC_n3A-n28A-n77A-n257H	DC_n3A-n257A DC_n28A-n257A DC_n77A-n257A DC_n3A-n257G DC_n28A-n257G DC_n77A-n257G DC_n3A-n257H DC_n28A-n257H DC_n77A-n257H
DC_n3A-n28A-n77A-n257I	

Downlink NR DC configuration	Uplink NR DC configuration
	DC_n3A-n257A
	DC_n28A-n257A
	DC_n77A-n257A
	DC_n3A-n257G
	DC_n28A-n257G
	DC_n77A-n257G
	DC_n3A-n257H
	DC_n28A-n257H
	DC_n77A-n257H
	DC_n3A-n257I
	DC_n28A-n257I
	DC_n77A-n257I
NOTE 1: NR configuration for FR1 and FR2 are defined in TS 38.101-1 [2] and TS 38.101-2 [3] respectively.	

6.2.2 DC_n3-n28-n78-n257

6.2.2.1 Operating bands for DC

Table 6.2.2.1-1: Inter-band DC operating bands of DC_n3-n28-n78-n257

NR DC Band	NR Band (Table 5.2-1 in TS38.101-1[2] and TS38.101-2[3])
DC_n3-n28-n78-n257	n3, n28, n78, n257

6.2.2.2 Configurations for DC_n3-n28-n78-n257

Table 6.2.2.2-1: Inter-band DC configuration of DC_n3-n28-n78-n257

Downlink NR DC configuration	Uplink NR DC configuration
DC_n3A-n28A-n78A-n257A	DC_n3A-n257A DC_n28A-n257A DC_n78A-n257A
DC_n3A-n28A-n78A-n257G	DC_n3A-n257A DC_n28A-n257A DC_n78A-n257A DC_n3A-n257G DC_n28A-n257G DC_n78A-n257G
DC_n3A-n28A-n78A-n257H	DC_n3A-n257A DC_n28A-n257A DC_n78A-n257A DC_n3A-n257G DC_n28A-n257G DC_n78A-n257G DC_n3A-n257H

Downlink NR DC configuration	Uplink NR DC configuration
	DC_n28A-n257H DC_n78A-n257H
DC_n3A-n28A-n78A-n257I	DC_n3A-n257A DC_n28A-n257A DC_n78A-n257A DC_n3A-n257G DC_n28A-n257G DC_n78A-n257G DC_n3A-n257H DC_n28A-n257H DC_n78A-n257H DC_n3A-n257I DC_n28A-n257I DC_n78A-n257I
NOTE 1: NR configuration for FR1 and FR2 are defined in TS 38.101-1 [2] and TS 38.101-2 [3] respectively.	

6.2.x DC_nA-nB-nC-nD

6.2.x.1 Operating bands for DC

Table 6.1.x.1-1: Inter-band DC operating bands of DC_nA-nB-nC-nD

NR DC Band	NR Band (Table 5.2-1 in TS38.101-1[2] and TS38.101-2[3])

6.2.x.2 Configuration for DC

Table 6.2.x.2-1: Inter-band DC configuration of DC_nA-nB-nC-nD

Downlink NR DC configuration	Uplink NR DC configuration

Annex A (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2020-08	RAN4#96e	R4-2010222				Initial TR skeleton	0.0.1
2020-08	RAN4#96e	R4-2011891				Updated TR to incorporate below TP approved in RAN4#96e with editorial update: R4-2010255 TP for TR 38.717-04-02 CA_n3-n28-n77-n257 and DC_n3-n28-n77-n257 R4-2010256 TP for TR 38.717-04-02 CA_n3-n28-n78-n257 and DC_n3-n28-n78-n257	0.1.0