3GPP TR 36.716-04-01 V16.0.0 (2020-06)

Technical Report

3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; LTE inter-band CA for 4 bands DL with 1 band UL (Release 16)





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3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis Valbonne - FRANCE Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

http://www.3gpp.org

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Foreword

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

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1 Scope

The present document is a technical report on inter-band CA for 4 bands DL with 1 band UL under Rel-16 time frame. The purpose is to gather the relevant background information and studies in order to address 4 bands DL/1 band UL Inter-band Carrier Aggregation requirements for the Rel-16 band combinations in Table 1-1.

Table 1-1: Release 16 4 bands DL/1 band UL inter-band carrier aggregation combinations

CA combination
CA_n1A-n3A-n8A-n78A
CA_n1A-n3A-n28A-n78A
CA_n3A-n28A-n77A-n257A
CA_n3A-n28A-n77A-n257D
CA_n3A-n28A-n77A-n257G
CA_n3A-n28A-n77A-n257H
CA_n3A-n28A-n77A-n257I
CA_n3A-n28A-n78A-n257A
CA_n3A-n28A-n78A-n257D
CA_n3A-n28A-n78A-n257G
CA_n3A-n28A-n78A-n257H
CA_n3A-n28A-n78A-n257I
CA_n3A-n28A-n77(2A)-n257A
CA_n3A-n28A-n77(2A)-n257D
CA_n3A-n28A-n77(2A)-n257G
CA_n3A-n28A-n77(2A)-n257H
CA_n3A-n28A-n77(2A)-n257I
CA_n3A-n28A-n77(3A)-n257A
CA_n3A-n28A-n77(3A)-n257D
CA_n3A-n28A-n77(3A)-n257G
CA_n3A-n28A-n77(3A)-n257H
CA_n3A-n28A-n77(3A)-n257I
CA_n7A-n25A-n66A-n78A
CA_n1A-n3A-n7A-n28A
CA_n1A-n3A-n7B-n28A
CA_n1A-n3A-n7A-n78A
CA_n1A-n3A-n7B-n78A
CA_n3A-n7A-n28A-n78A
CA_n3A-n7B-n28A-n78A
CA_n2A-n5A-n66A-n260A
CA_n2A-n5A-n30A-n260A
CA_n5A-n30A-n66A-n260A
CA_n2A-n30A-n66A-n260A
CA_n2A-n5A-n66A-n260M
CA_n2A-n5A-n30A-n260M
CA_n5A-n30A-n66A-n260M
CA_n2A-n30A-n66A-n260M
CA_n2(2A)-n5A-n30A-n66A
CA_n2A-n5A-n30A-n66(2A)
CA_n2A-n5A-n30A-n66A

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] RP-191196, "New WID Rel-16 NR inter-band CA for 4 bands DL with 1 band UL", RAN#84, Ericsson

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 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 TR 21.905 [1].

3.2 Symbols

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

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

4 Background

The present document is a technical report for 4 bands DL/1 band UL Inter-band Carrier Aggregation under Rel-16 timeframe. 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.

4 Band Carrier Aggregation with Single UL: Specific Band Combination Part

5.1 CA_n1A-n3A-n8A-n78A

5.1.1 Channel bandwidths per operating bands for CA

Table 5.1.2-1: Supported channel bandwidths per CA configuration for 3DL inter-band CA

NR CA Configuration	UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	80	90	100	Bandwidth combination set
			15	Yes	Yes	Yes	Yes									
		n1	30		Yes	Yes	Yes									0
			60		Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes	Yes	Yes							
		n3	30		Yes	Yes	Yes	Yes	Yes							
CA_n1A-n3A-			60		Yes	Yes	Yes	Yes	Yes							
n8A-n78A			15	Yes	Yes	Yes	Yes									
		n8	30		Yes	Yes	Yes									
			60													
			15		Yes	Yes	Yes			Yes	Yes					
		n78	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes ¹	Yes	
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes ¹	Yes	

5.1.2 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

For three simultaneous DLs and one UL of Band n1, n3, n8 and n78, the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.1.4-1 and table 5.1.4-2, respectively. Values are derived from DC_1-3-8_n78.

Table 5.1.4-1: ΔTIB,c for 3DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n1	0.6
CA_n1-n3-n8-	n3	0.6
n78	n8	0.6
	n78	0.8

Table 5.1.4-2: ΔRIB,c for 3DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n1	0.2
CA_n1-n3-n8-	n3	0.2
n78	n8	0.2
	n78	0.5

5.1.3 REFSENS requirements

5.2 CA n1A-n3A-n28A-n78A

5.2.1 Channel bandwidths per operating bands for CA

Table 5.2.2-1: Supported channel bandwidths per CA configuration for 3DL inter-band CA

NR CA Configuration	UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	80	90	100	Bandwidth combination set
			15	Yes	Yes	Yes	Yes									
		n1	30		Yes	Yes	Yes									
	_		60		Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes	Yes	Yes							
		n3	30		Yes	Yes	Yes	Yes	Yes							
CA_n1A-n3A-			60		Yes	Yes	Yes	Yes	Yes							0
n28A-n78A	-		15	Yes	Yes	Yes	Yes ²									
		n28	30		Yes	Yes	Yes ²									
			60													
			15		Yes	Yes	Yes			Yes	Yes					
		n78	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes ¹	Yes	3
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes ¹	Yes	

NOTE 1: This UE channel bandwidth is optional in this release of the specification.

NOTE 2: For the 20 MHz bandwidth, the minimum requirements are specified for NR UL carrier frequencies confined to either 713-723 MHz or 728-738 MHz.

5.2.2 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

For three simultaneous DLs and one UL of Band n1, n3, n28 and n78, the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.2.4-1 and table 5.2.4-2, respectively. Values are derived from DC_1-3-28_n78.

Table 5.2.4-1: ΔTIB,c for 3DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n1	0.6
CA_n1-n3-n28-	n3	0.6
n78	n28	0.6
	n78	0.8

Table 5.2.4-2: ΔRIB,c for 3DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n1	0.2
CA_n1-n3-n28-	n3	0.2
n78	n28	0.2
	n78	0.5

5.2.3 REFSENS requirements

5.3 CA n3-n28-n77-n257

5.3.1 Channel bandwidths per operating bands for CA

Table 5.3.2-1: Supported channel bandwidths per CA configuration for 4DL inter-band CA

NR CA Configuration	UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	80	90	100	200	400	Bandwidth combination set
			15	Yes	Yes	Yes	Yes	Yes	Yes									
		n3	30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes											
CA_n3A-n28A-	_	n28	30		Yes	Yes	Yes											0
n77A-n257A			60															
		n77	15 30		Yes	Yes	Yes			Yes	Yes	Voc	Voc	Voc	Voc			
		n77	60		Yes Yes	Yes Yes	Yes Yes			Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes			
			60		res	res	res			res	Yes	res	res	res	Yes	Yes		
		n257	120								Yes				Yes	Yes	Yes	
			15	Yes	Yes	Yes	Yes	Yes	Yes		103				103	103	103	
		n3	30	100	Yes	Yes	Yes	Yes	Yes									
		110	60		Yes	Yes	Yes	Yes	Yes									1
			15	Yes	Yes	Yes	Yes		. 00									
CA_n3A-n28A-		n28	30		Yes	Yes	Yes											
n77A-n257D	-		60															0
			15		Yes	Yes	Yes			Yes	Yes							1
		n77	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			1
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		n257				See	e CA_n2	257D B	CS0 in	Table 5	5.5A.1-	1 in TS	38.10	1-2				
			15	Yes	Yes	Yes	Yes	Yes	Yes									
		n3	30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes											
CA_n3A-n28A-	-	n28	30		Yes	Yes	Yes											0
n77A-n257G			60															
			15		Yes	Yes	Yes			Yes	Yes			.,	.,			
		n77	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		.057	60		Yes	Yes	Yes	1570 D	000:-	Yes	Yes	Yes	Yes	Yes	Yes			
		n257	15	Yes	Voc		CA_n2	1		i abie :	5.5A.1- I	1 IN 15	38.10	I-2 I	1	1	1	
		n3	30	res	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes									-
		113	60		Yes	Yes	Yes	Yes	Yes									-
			15	Yes	Yes	Yes	Yes	163	163									1
CA_n3A-n28A-		n28	30	100	Yes	Yes	Yes											
n77A-n257H	-	1120	60		100	100	100											0
			15		Yes	Yes	Yes			Yes	Yes							
		n77	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		n257				See	CA_n2	257H B	CS0 in	Table 5								1
			15	Yes	Yes		Yes											
		n3	30		Yes	Yes	Yes	Yes	Yes]
			60		Yes	Yes	Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes											
CA_n3A-n28A-	<u> </u>	n28	30		Yes	Yes	Yes											0
n77A-n257I] -		60]
]	15		Yes	Yes	Yes			Yes	Yes							
		n77	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes]
		n257				Se	e CA_n	257I BO	CS0 in	Table 5	5.5A.1-1	I in TS	38.101	-2				

5.3.2 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

For three simultaneous DLs and one UL of Band combinations n3-n28-n77, n3-n28-n257, n3-n77-n257 and n28-n77-n257, the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.3.4-1 and table 5.3.4-2, respectively.

Table 5.3.4-1: ΔTIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n3	0.6
CA_n3-n28-	n28	0.5
n77-n257	n77	0.8
	n257	0

Table 5.3.4-2: ΔRIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n3	0.2
CA_n3-n28-	n28	0.2
n77-n257	n77	0.5
	n257	0

5.3.3 REFSENS requirements

MSD requirements are captured in the lower order combinations.

5.4 CA_n3-n28-n78-n257

5.4.1 Channel bandwidths per operating bands for CA

Table 5.4.2-1: Supported channel bandwidths per CA configuration for 4DL inter-band CA

NR CA Configuration	UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	80	90	100	200	400	Bandwidth combination set
			15	Yes	Yes	Yes	Yes	Yes	Yes									
		n3	30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes											
CA_n3A-n28A-	_	n28	30		Yes	Yes	Yes											0
n78A-n257A			60				.,				.,							
		n78	15 30		Yes Yes	Yes Yes	Yes Yes			Yes Yes	Yes Yes	Yes	Yes	Yes	Yes			
		1170	60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			1
			60		100	100	100			100	Yes	100	100	100	Yes	Yes		
		n257	120								Yes				Yes	Yes	Yes	
			15	Yes	Yes	Yes	Yes	Yes	Yes									
		n3	30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes											0
CA_n3A-n28A-	-	n28	30		Yes	Yes	Yes											
n78A-n257D			60															
		. 70	15		Yes	Yes	Yes			Yes	Yes	1/						
		n78	30 60		Yes Yes	Yes Yes	Yes Yes			Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes			
		n257	60		res		CA n2	57D B	CSO in						168		l	
		11237	15	Yes	Yes	Yes	Yes	Yes	Yes	I able c).J/\. I-	1 111 13	50.10					
		n3	30	100	Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes											
CA_n3A-n28A-	_	n28	30		Yes	Yes	Yes											0
n78A-n257G	-		60															0
			15		Yes	Yes	Yes			Yes	Yes							
		n78	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		n257				See	CA_n2	57G B	CS0 in	Table 5	5.5A.1-	1 in TS	38.101	l-2				

			15	Yes	Yes	Yes	Yes	Yes	Yes																											
		n3	30		Yes	Yes	Yes	Yes	Yes																											
			60		Yes	Yes	Yes	Yes	Yes																											
			15	Yes	Yes	Yes	Yes																													
CA_n3A-n28A-		n28	30		Yes	Yes	Yes										0																			
n78A-n257H	-		60														0																			
			15		Yes	Yes	Yes			Yes	Yes																									
		n78	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes																					
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes																					
		n257				See	e CA_n2	257H B	CS0 in	Table 5	5.5A.1-	1 in TS	38.101	1-2																						
			15	Yes	Yes	Yes	Yes	Yes	Yes																											
		n3	30		Yes	Yes	Yes	Yes	Yes																											
			60		Yes	Yes	Yes	Yes	Yes																											
			15	Yes	Yes	Yes	Yes																													
CA_n3A-n28A-	_	n28	30		Yes	Yes	Yes										0																			
n78A-n257I			60														U																			
	n78																					15		Yes	Yes	Yes			Yes	Yes						
		n78	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes																					
			60		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																																	

5.4.2 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

For three simultaneous DLs and one UL of Band combinations n3-n28-n78, n3-n28-n257, n3-n78-n257 and n28-n78-n257, the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.4.4-1 and table 5.4.4-2, respectively.

Table 5.4.4-1: ΔTIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n3	0.6
CA_n3-n28-	n28	0.5
n78-n257	n78	0.8
	n257	0

Table 5.4.4-2: ΔRIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n3	0.2
CA_n3-n28-	n28	0.2
n78-n257	n78	0.5
	n257	0

5.4.3 REFSENS requirements

5.5 CA_n7-n25-n66-n78

5.5.1 Channel bandwidths per operating band for CA

Table 5.5.1-1: Supported channel bandwidths per CA configuration for 4DL inter-band CA

				CA	opera	ting / c	hanne	el band	lwidth	[MHz]							
NR CA Configuration	UL Configuration	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	70	80	90	100	Bandwidt h combinati on set
		n7	15	Ye s	Yes	Yes	Yes	Yes	Yes	Yes	Yes						
		117	30		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
	0.5	15	Ye s	Yes	Yes	Yes	Yes	Yes	Yes								
CA_n7A-		n25 n66	30		Yes	Yes	Yes	Yes	Yes	Yes							
n25A-n66A-	_		60		Yes	Yes	Yes	Yes	Yes	Yes							0
n78A -			15	Ye s	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes	Yes]
			15		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
		n78	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		

5.5.2 ΔT_{IB} and ΔR_{IB} values

For three simultaneous DLs and one UL of Band combinations n7-n25-n66, n7-n66-n78 and n25-n66-n78, the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.5.2-1 and table 5.5.2-2, respectively.

Table 5.5.2-1: ΔT_{IB,c} for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n7	0.5
CA_n7-n25-n66-	n25	0.6
n78	n66	0.6
	n78	0.8

Table 5.5.2-2: ΔR_{IB,c} for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n7	0.5
CA_n7-n25-n66-	n25	0.6
n78	n66	0.6
	n78	0.8

5.5.3 REFSENS requirements

5.6 CA n1A-n3A-n7A-n28A, CA n1A-n3A-n7B-n28A

5.6.1 Channel bandwidths per operating bands for CA

Table 5.6.2-1: Supported channel bandwidths per CA configuration for 3DL inter-band CA

NR CA Configuration	UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	80	90	100	Bandwidth combination set				
			15	Yes	Yes	Yes	Yes													
		n1	30		Yes	Yes	Yes													
			60		Yes	Yes	Yes													
			15	Yes	Yes	Yes	Yes	Yes	Yes											
		n3	30		Yes	Yes	Yes	Yes	Yes											
CA_n1A-n3A-	_		60		Yes	Yes	Yes	Yes	Yes							0				
n7A-n28A			15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes									
		n7	30		Yes	Yes	Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes									
			15	Yes	Yes	Yes	Yes													
		n28	30		Yes	Yes	Yes													
			60																	
			15	Yes	Yes	Yes	Yes													
		n1	30		Yes	Yes	Yes													
			60		Yes	Yes	Yes													
			15	Yes	Yes	Yes	Yes	Yes	Yes											
CA_n1A-n3A-		n3	30		Yes	Yes	Yes	Yes	Yes							0				
n7B-n28A	-	-	60		Yes	Yes	Yes	Yes	Yes							U				
III D-IIZOA		n7	See	CA_n7	B Ban	dwidth	Combi	nation	Set 0 i	n Table	e 5.5A	.1-1 fı	rom 3	8.101	I-1	1				
			15	Yes	Yes	Yes	Yes													
		n28	30		Yes	Yes	Yes													
			60																	

5.6.2 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

For CA_n1-n3-n7-n28 the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.6.2-1 and table 5.6.2-2, respectively. Values are derived from DC_1-3-7_n28.

Table 5.6.2-1: ΔTIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n1	0.6
CA_n1-n3-n7-	n3	0.6
n28	n7	0.6
	n28	0.6

Table 5.6.2-2: ΔRIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n1	0
CA_n1-n3-n7-	n3	0
n28	n7	0
	n28	0.2

5.6.3 REFSENS requirements

5.7 CA_n1A-n3A-n7A-n78A, CA_n1A-n3A-n7B-n78A

5.7.1 Channel bandwidths per operating bands for CA

Table 5.7.2-1: Supported channel bandwidths per CA configuration for 3DL 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	Bandwidth combination set
		15	Yes	Yes	Yes	Yes											
		n1	30		Yes	Yes	Yes										
			60		Yes	Yes	Yes										
			15	Yes	Yes	Yes	Yes	Yes	Yes								
		n3	30		Yes	Yes	Yes	Yes	Yes								
CA_n1A-n3A-	_		60		Yes	Yes	Yes	Yes	Yes								0
n7A-n78A	_		15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes						
	n7	n7	30		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
		n78	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
			15		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
			15	Yes	Yes	Yes	Yes										
		n1	30		Yes	Yes	Yes										
			60		Yes	Yes	Yes										
			15	Yes	Yes	Yes	Yes	Yes	Yes								
CA n1A-n3A-		n3	30		Yes	Yes	Yes	Yes	Yes								0
n7B-n78A	-	60		Yes	Yes	Yes	Yes	Yes								· ·	
= •		n7		See (CA_n7l	B Band	lwidth	Combir	nation	Set 0 ir	n Table	e 5.5A.	1-1 fron	n 38.10)1-1		
			15		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
		n78	30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
			15		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

5.7.2 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

For CA_n1-n3-n7-n78 the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.7.2-1 and table 5.7.2-2, respectively. Values are derived from DC_1-3-7_n78.

Table 5.7.2-1: ΔTIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n1	0.7
CA_n1-n3-n7-	n3	0.7
n78	n7	0.7
	n78	0.8

Table 5.7.2-2: ΔRIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n1	0.3
CA_n1-n3-n7-	n3	0.3
n78	n7	0.3
	n78	0.5

5.7.3 REFSENS requirements

5.8 CA_n3A-n7A-n28A-n78A, CA_n3A-n7B-n28A-n78A

5.8.1 Channel bandwidths per operating bands for CA

Table 5.8.2-1: Supported channel bandwidths per CA configuration for 3DL inter-band CA

NR CA Configuration	UL Config	NR Band	SCS [kHz]	5	10	15	20	25	30	40	50	60	80	90	100	Bandwidth combination set
		n3	15	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes							
			15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
		n7	30		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
CA_n3A-n7A-	_		60		Yes	Yes	Yes	Yes	Yes	Yes	Yes					0
n28A-n78A			15	Yes	Yes	Yes	Yes									
		n28	30		Yes	Yes	Yes									
			60													
		n78	15		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
			15		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
			15	Yes	Yes	Yes	Yes	Yes	Yes							
		n3	30		Yes	Yes	Yes	Yes	Yes							0
	-		60		Yes	Yes	Yes	Yes	Yes							
CA_n3A-n7B- n28A-n78A		n7	Se	e CA_	n7B Ba	andwid	th Con	nbinatio	on Set	0 in Ta	able 5.5	5A.1-1	from 3	8.101-	1	
			15	Yes	Yes	Yes	Yes									U
		n28	30		Yes	Yes	Yes									
			60													
			15		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
		n78	30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
			15		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

5.8.2 $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values

For CA_n3-n7-n28-n78 the $\Delta T_{IB,c}$ and $\Delta R_{IB,c}$ values are shown in table 5.8.2-1 and table 5.8.2-2, respectively. Values are derived from DC_3-7-28_n78.

Table 5.8.2-1: ΔTIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔT _{IB,c} [dB]
	n3	0.6
CA_n3-n7-n28-	n7	0.6
n78	n28	0.6
	n78	0.6

Table 5.8.2-2: ΔRIB,c for 4DL aggregation

Inter-band CA Configuration	NR Band	ΔR _{IB,c} [dB]
	n3	0.2
CA_n3-n7-n28-	n7	0.2
n78	n28	0.2
	n78	0.5

5.8.3 REFSENS requirements

MSD requirements are captured in lower order combinations.

Annex A: Change history

_		T			Change history		1
Date	TSG #	TSG Doc.	CR R		Subject/Comment Subject/Commen	Old	New
2019-08	3GPP RAN4#92	R4- 1909786			Initial TR skeleton		0.0.1
2019-11	3GPP RAN4#93	R4- 1914684			Implemented TP's from RAN4 #92bis:	0.0.1	0.1.0
					R4-1912260, "TP for TR 38.716-04-01 to include CA_n1- n3-n8-n78", Ericsson, Swisscom		
					R4-1912261, "TP for TR 38.716-04-01 to include CA_n1- n3-n28-n78", Ericsson, Swisscom		
2020-02	3GPP RAN4#94	R4- 2001504			Implemented TP's from RAN4 #92bis: R4-1912238, "TP for TR 38.716-04-01: updated scope of	0.1.0	0.2.0
					the NR 4-band CA REL-16 WI", Ericsson		
					Implemented TP's from RAN4 #93:		
					R4-1913672, "TP for TR 38.716-04-01: NR CA_n3-n28- n77-n257", SoftBank Corp		
					R4-1913673, "TP for TR 38.716-04-01: NR CA_n3-n28- n78-n257", SoftBank Corp		
2020-04		R4- 2004578			Correction of implementation of TP from RAN4 #93:	0.2.0	0.3.0
	bis				R4-1913673, "TP for TR 38.716-04-01: NR CA_n3-n28- n78-n257", SoftBank Corp		
				ı	Implemented TP from RAN4 #94:		
					R4-2001508, "TP for TR 38.716-04-01 for updated scope from RAN #86", Ericsson		
2020-05	3GPP RAN4#94	R4- 2005869			Implemented TP from RAN4 #94bis:	0.3.0	0.4.0
	bis				R4-2004581, "TP for TR 38.716-04-01 for updated scope from RAN #87", Ericsson		
					R4-2004072, "TP to TR 38.716-04-01 for CA_n7-n25-n66-n78", Huawei, HiSilicon, Bell Mobility, Telus		
2020-06	3GPP	R4-			Implemented TP's from RAN4 #95:	0.4.0	0.5.0
2020-00	RAN4#95				implemented 11 3 non train-1-20.	0.4.0	0.5.0
					R4-2006611, "TP to TR 38.716-04-01 for CA_n7-n25-n66-n78", Huawei, HiSilicon, Bell Mobility, Telus		
					R4-2007631, "TP for TR 38.716-04-01 to include CA_n1-		
					n3-n7-n28", Ericsson, Telstra		
					R4-2007632, "TP for TR 38.716-04-01 to include CA_n1- n3-n7-n78", Ericsson, Telstra		
					R4-2007633, "TP for TR 38.716-04-01 to include CA_n3- n7-n28-n78", Ericsson, Telstra		
2020-06	3GPP	RP-200662			No TP's implemented. Presented for approval at RAN	0.5.0	1.0.0
	RAN #88				plenary.		

Change history									
Date	Date Meeting TDoc CR Rev Cat Subject/Comment					New			
							version		
2020-06	RAN#88					Approved by plenary – Rel-16 spec under change control	16.0.0		