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)

Keywords
<keyword[, keyword]>

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Contents

Foreword

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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.

5 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
CA_n1A-n3A-n8A-n78A	-	n1	15	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes									
			60		Yes	Yes	Yes									
		n3	15	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes							
		n8	15	Yes	Yes	Yes	Yes									
			30		Yes	Yes	Yes									
			60													
		n78	15		Yes	Yes	Yes			Yes	Yes					
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes[1]	Yes	
			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.																

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	$\Delta T_{IB,c}$ [dB]
CA_n1-n3-n8-n78	n1	0.6
	n3	0.6
	n8	0.6
	n78	0.8

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

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n1-n3-n8-n78	n1	0.2
	n3	0.2
	n8	0.2
	n78	0.5

5.1.3 REFSENS requirements

MSD requirements are captured in lower order combinations.

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
CA_n1A-n3A-n28A-n78A	-	n1	15	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes									
			60		Yes	Yes	Yes									
		n3	15	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes							
		n28	15	Yes	Yes	Yes	Yes[2]									
			30		Yes	Yes	Yes[2]									
			60													
		n78	15		Yes	Yes	Yes			Yes	Yes					
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes[1]	Yes	
			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	$\Delta T_{IB,c}$ [dB]
CA_n1-n3-n28-n78	n1	0.6
	n3	0.6
	n28	0.6
	n78	0.8

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

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n1-n3-n28-n78	n1	0.2
	n3	0.2
	n28	0.2
	n78	0.5

5.2.3 REFSENS requirements

MSD requirements are captured in lower order combinations.

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
CA_n3A-n28A-n77A-n257A	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n77	15		Yes	Yes	Yes			Yes	Yes							
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		n257	60								Yes				Yes	Yes		
			120								Yes				Yes	Yes	Yes	
CA_n3A-n28A-n77A-n257D	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n77	15		Yes	Yes	Yes			Yes	Yes							
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		n257	See CA_n257D BCS0 in Table 5.5A.1-1 in TS 38.101-2															
CA_n3A-n28A-n77A-n257G	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n77	15		Yes	Yes	Yes			Yes	Yes							
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		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	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n77	15		Yes	Yes	Yes			Yes	Yes							
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		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	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n77	15		Yes	Yes	Yes			Yes	Yes							
			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															

5.3.2 $\Delta T_{IB,c}$ 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	$\Delta T_{IB,c}$ [dB]
CA_n3-n28-n77-n257	n3	0.6
	n28	0.5
	n77	0.8
	n257	0

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

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n3-n28-n77-n257	n3	0.2
	n28	0.2
	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
CA_n3A-n28A-n78A-n257A	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n78	15		Yes	Yes	Yes			Yes	Yes							
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		n257	60								Yes				Yes	Yes		
			120								Yes				Yes	Yes	Yes	
CA_n3A-n28A-n78A-n257D	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n78	15		Yes	Yes	Yes			Yes	Yes							
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
		n257	See CA_n257D BCS0 in Table 5.5A.1-1 in TS 38.101-2															
CA_n3A-n28A-n78A-n257G	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes	Yes	Yes									
			60		Yes	Yes	Yes	Yes	Yes									
		n28	15	Yes	Yes	Yes	Yes											
			30		Yes	Yes	Yes											
			60															
		n78	15		Yes	Yes	Yes			Yes	Yes							
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes			
			60		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-n78A-n257H	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes								0
			30		Yes	Yes	Yes	Yes	Yes								
			60		Yes	Yes	Yes	Yes	Yes								
		n28	15	Yes	Yes	Yes	Yes										
			30		Yes	Yes	Yes										
			60														
		n78	15		Yes	Yes	Yes			Yes	Yes						
			30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes		
			60		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-n78A-n257I	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes								0
			30		Yes	Yes	Yes	Yes	Yes								
			60		Yes	Yes	Yes	Yes	Yes								
		n28	15	Yes	Yes	Yes	Yes										
			30		Yes	Yes	Yes										
			60														
		n78	15		Yes	Yes	Yes			Yes	Yes						
			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	$\Delta T_{IB,c}$ [dB]
CA_n3-n28-n78-n257	n3	0.6
	n28	0.5
	n78	0.8
	n257	0

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

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n3-n28-n78-n257	n3	0.2
	n28	0.2
	n78	0.5
	n257	0

5.4.3 REFSENS requirements

MSD requirements are captured in the lower order combinations.

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 operating / channel bandwidth [MHz]																	
NR CA Configuration	**UL Configuration**	**NR Band**	**SCS [kHz]**	**5**	**10**	**15**	**20**	**25**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**Bandwidth combination set**
CA_n7A-n25A-n66A-n78A	-	n7	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes						0
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes						
		n25	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes	Yes							
		n66	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes	Yes							
			60		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	
			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: $\Delta T_{IB,c}$ for 4DL aggregation

Inter-band CA Configuration	NR Band	$\Delta T_{IB,c}$ [dB]
CA_n7-n25-n66-n78	n7	0.5
	n25	0.6
	n66	0.6
	n78	0.8

Table 5.5.2-2: $\Delta R_{IB,c}$ for 4DL aggregation

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n7-n25-n66-n78	n7	0.5
	n25	0.6
	n66	0.6
	n78	0.8

5.5.3 REFSENS requirements

MSD requirements are captured in the lower order combinations.

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
CA_n1A-n3A-n7A-n28A	-	n1	15	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes									
			60		Yes	Yes	Yes									
		n3	15	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes							
		n7	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
		n28	15	Yes	Yes	Yes	Yes									
			30		Yes	Yes	Yes									
			60													
CA_n1A-n3A-n7B-n28A	-	n1	15	Yes	Yes	Yes	Yes									0
			30		Yes	Yes	Yes									
			60		Yes	Yes	Yes									
		n3	15	Yes	Yes	Yes	Yes	Yes	Yes							
			30		Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes							
		n7	See CA_n7B Bandwidth Combination Set 0 in Table 5.5A.1-1 from 38.101-1													
		n28	15	Yes	Yes	Yes	Yes									
			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	$\Delta T_{IB,c}$ [dB]
CA_n1-n3-n7-n28	n1	0.6
	n3	0.6
	n7	0.6
	n28	0.6

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

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n1-n3-n7-n28	n1	0
	n3	0
	n7	0
	n28	0.2

5.6.3 REFSENS requirements

MSD requirements are captured in lower order combinations.

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
CA_n1A-n3A-n7A-n78A	-	n1	15	Yes	Yes	Yes	Yes										0
			30		Yes	Yes	Yes										
			60		Yes	Yes	Yes										
		n3	15	Yes	Yes	Yes	Yes	Yes	Yes								
			30		Yes	Yes	Yes	Yes	Yes								
			60		Yes	Yes	Yes	Yes	Yes								
		n7	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes						
			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	
CA_n1A-n3A-n7B-n78A	-	n1	15	Yes	Yes	Yes	Yes										0
			30		Yes	Yes	Yes										
			60		Yes	Yes	Yes										
		n3	15	Yes	Yes	Yes	Yes	Yes	Yes								
			30		Yes	Yes	Yes	Yes	Yes								
			60		Yes	Yes	Yes	Yes	Yes								
		n7	See CA_n7B Bandwidth Combination Set 0 in Table 5.5A.1-1 from 38.101-1														
		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	

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	$\Delta T_{IB,c}$ [dB]
CA_n1-n3-n7-n78	n1	0.7
	n3	0.7
	n7	0.7
	n78	0.8

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

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n1-n3-n7-n78	n1	0.3
	n3	0.3
	n7	0.3
	n78	0.5

5.7.3 REFSENS requirements

MSD requirements are captured in lower order combinations.

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
CA_n3A-n7A-n28A-n78A	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes							0
			30		Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes							
		n7	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
			30		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
			60		Yes	Yes	Yes	Yes	Yes	Yes	Yes					
		n28	15	Yes	Yes	Yes	Yes									
			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	
CA_n3A-n7B-n28A-n78A	-	n3	15	Yes	Yes	Yes	Yes	Yes	Yes							0
			30		Yes	Yes	Yes	Yes	Yes							
			60		Yes	Yes	Yes	Yes	Yes							
		n7	See CA_n7B Bandwidth Combination Set 0 in Table 5.5A.1-1 from 38.101-1													
		n28	15	Yes	Yes	Yes	Yes									
			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	

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	$\Delta T_{IB,c}$ [dB]
CA_n3-n7-n28-n78	n3	0.6
	n7	0.6
	n28	0.6
	n78	0.6

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

Inter-band CA Configuration	NR Band	$\Delta R_{IB,c}$ [dB]
CA_n3-n7-n28-n78	n3	0.2
	n7	0.2
	n28	0.2
	n78	0.5

5.8.3 REFSENS requirements

MSD requirements are captured in lower order combinations.

Annex A: Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**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: 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	0.0.1	0.1.0
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 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	0.1.0	0.2.0
2020-04	3GPP RAN4#94 bis	R4-2004578			Correction of implementation of TP from RAN4 #93: R4-1913673, “TP for TR 38.716-04-01: NR CA_n3-n28-n78-n257”, SoftBank Corp Implemented TP from RAN4 #94: R4-2001508, “TP for TR 38.716-04-01 for updated scope from RAN #86”, Ericsson	0.2.0	0.3.0
2020-05	3GPP RAN4#94 bis	R4-2005869			Implemented TP from RAN4 #94bis: 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	0.3.0	0.4.0
2020-06	3GPP RAN4#95	R4-2006047			Implemented TP’s from RAN4 #95: 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	0.4.0	0.5.0
2020-06	3GPP RAN #88	RP-200662			No TP’s implemented. Presented for approval at RAN plenary.	0.5.0	1.0.0

Change history							
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