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Technical Report

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); LTE-Advanced intra-band contiguous Carrier Aggregation (CA) in Band 7 (Release 11)



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Foreword

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1 Scope

The present document is a technical report of the work item for LTE Advanced Carrier Aggregation in Band 7 which was approved at TSG RAN #53 [2]. The report provides background, analysis of the requirements, and a list of recommended changes to the 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-111356, "LTE Advanced Carrier Aggregation in Band 7".
- [3] R4-114877, Work plan for LTE_CA_B7 WI, China Unicom
- [4] R4-114878, Operating bands and bandwidths for LTE_CA_B7, China Unicom
- [5] R4-115299, Expected changes to E-UTRA specifications for introducing CA in Band 7, China Unicom
- [6] ITU-R-REC-M.1036-3, "RECOMMENDATION ITU-R M.1036-3"
- [7] 3GPP TR25.810, "UMTS 2.6 GHz (FDD) Work Item Technical Report"

- [8] 3GPP TR25.811 “UMTS 2.6 GHz (TDD) Work Item Technical Report”
- [9] R4-115536, Band 7 spectrum and regulation review for LTE_CA_B7
- [10] R4-115537, TP of BS RF requirements for LTE_CA_B7
- [11] R4-116214, TP of UE maximum output power for LTE_CA_B7
- [12] R4-115559, Text proposal of blocking requirements for LTE_CA_B7
- [13] R4-120897, TP of UE RRM requirements for LTE_CA_B7
- [14] R4-120140, UE Reference sensitivity for LTE_CA_B7
- [15] R4-121228, TP of UE minimum output power for LTE_CA_B7
- [16] R4-121229, TP of UE Transmit OFF power for LTE_CA_B7
- [17] R4-121525, TP Demodulation performance for UE and BS
- [18] R4-122737, TP of B7&B38 coexistence for LTE_CA_B7
- [19] R4-124332, CA_7C A-MPR for contiguous transmissions, Nokia Corporation
- [20] R4-124668, CA_7C A-MPR, Qualcomm Incorporated
- [21] R4-123802, The required back off for band 7 CA to protect band 38, ZTE
- [22] R4-124333, CA_7C A-MPR for multi-cluster transmissions, Nokia Corporation
- [23] R4-124448, TP of background task for LTE_CA_B7
- [24] R4-124452, TP of bandwidths for LTE_CA_B7

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

Band 7 is a major FDD LTE band which has been allocated in Region 1, and most likely to be allocated in China. Some operators have been granted with more than 20MHz bandwidth and have big interests to support carrier aggregation in this band.

Building on the generic intra-band carrier aggregation work of Band 1, this work item proposes to start the work on intra-band contiguous carrier aggregation for Band 7 to support deployment of LTE-advanced.

The output of this work item can also be reused, in case of Band 7 is authorized for FDD LTE deployment in other regions in the future.

4.1 Task description

This WI is to specify the band specific core and performance requirements for intra-band carrier aggregation in band 7:

- 1) Specifying the core requirements for BS and UE in RAN4 specifications, and taking the coexistence with adjacent Band 38 into account.
- 2) Specify band specific RRM requirements in RAN4 if any.
- 3) Signalling support in RAN2 specifications if any.
- 4) Performance requirements for BS and UE in RAN4 specifications.

4.2 Spectrum and regulatory review

This Work Item [2] is based on the spectrum arrangement as shown in Table 4.2-1[6].

Table 4.2-1 Frequency arrangements in the band 2 500-2 690 MHz

Frequency arrangement	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	Centre gap usage
C1	2 500-2 570	50	2 620-2 690	120	TDD

The frequency band 2500-2570 MHz is paired with 2620-2690 MHz for FDD operation with the mobile terminals transmit within the lower band and base stations transmit within the upper band. This paired spectrum blocks are designated as Band 7 [7] in 3GPP E-UTRA specifications. The frequency band 2570-2620 MHz is for TDD operation and is designated as Band 38 [8].

Band 7 is a major FDD band which has been allocated in region 1. Some operators have been granted with more than 20MHz bandwidth.

5 Band and channel arrangement

5.1 CA operating bands

The CA operating band for Band 7 is defined in Table 5.1-1.

Table 5.1-1 Intra band CA operating bands

E-UTRA CA Band	E-UTRA Band	Uplink (UL) operating band			Downlink (DL) operating band			Duplex Mode
		BS receive / UE transmit			BS transmit / UE receive			
		FUL_low	–	FUL_high	FDL_low	–	FDL_high	
CA_7	7	2500 MHz	–	2570 MHz	2620 MHz	–	2690 MHz	FDD

5.2 CA channel bandwidth

Table 5.2-1 defines the supported E-UTRA bandwidths for intra-band contiguous CA in Band 7. 20 MHz and 15 MHz component carrier channel bandwidths are proposed to be supported for Band 7 carrier aggregation.

Table 5.2-1: Supported CC combinations per CA configuration for intra-band contiguous CA

CA Configuration / N _{RB_agg}				
CA Configuration	E-UTRA Band	50 RB+100 RB (10 MHz + 20 MHz)	75 RB+75 RB (15 MHz + 15 MHz)	100 RB+100 RB (20 MHz + 20 MHz)
CA_7C	7		Yes	Yes

6 E-UTRA RF requirements for UE

6.1 Transmitter characteristics

6.1.1 UE maximum output power

Section 6.2.2 in TS36.101 specifies the UE maximum output power requirements for Band 7 UE. In CA_B7 WI, it's proposed to reuse the result in Table 6.2.2-1 in TS 36.101 and a row is required to be added into Table 6.2.2A-1 in TS 36.101 as follow.

Table 6.1.1-1: CA UE Power Class

EUTRA band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
CA_7C					23	+2/-2 ^z		
Note 1:	The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS							
Note 2:	For transmission bandwidths (TS36.101 Figure 5.6-1) confined within F _{UL_low} and F _{UL_low} + 4 MHz or F _{UL_high} - 4 MHz and F _{UL_high} , the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB							
Note 3:	P _{PowerClass} is the maximum UE power specified without taking into account the tolerance							
Note 4:	For intra-band contiguous carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).							

6.1.2 UE minimum output power

Section 6.3.2A in TS 36.101 specifies the UE minimum output power requirements for intra-band contiguous carrier aggregation. In LTE_CA_B7 WI, it is proposed to reuse the result in Table 6.3.2A.1-1 in TS 36.101 and the minimum output power is defined as the mean power in one sub-frame (1ms).

20 MHz and 15 MHz component carrier channel bandwidths are proposed to be supported in Band 7 carrier aggregation. The minimum output power shall not exceed the values specified in Table 6.1.2-1.

Table 6.1.2-1: Minimum output power for LTE_CA_B7 UE

	Channel bandwidth / Minimum output power / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Minimum output power	-40 dBm					
Measurement bandwidth					13.5 MHz	18 MHz

6.1.3 UE Transmit OFF power

Section 6.3.3A in TS 36.101 specifies the UE Transmit OFF power requirements for intra-band contiguous carrier aggregation. In LTE_CA_B7 WI, it is proposed to reuse the result in Table 6.3.3A.1-1 in TS 36.101 and transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1 ms) excluding any transient periods.

20 MHz and 15 MHz component carrier channel bandwidths are proposed to be supported in Band 7 carrier aggregation. UE transmit OFF power shall not exceed the values specified in Table 6.1.3-1

Table 6.1.3-1: Transmit OFF power for intra-band contiguous LTE_CA_B7 UE

	Channel bandwidth / Minimum output power / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Transmit OFF power	-50 dBm					
Measurement bandwidth					13.5 MHz	18 MHz

6.2 Receiver characteristics

6.2.1 UE Reference sensitivity

From the section 7.3.1A in TS36.101, it is known that the reference sensitivity for CA is defined to be met with both downlink component carrier active and each component carrier shall meet the requirements specified in clause 7.3.1. To avoid the effect from the uplink signal, the noise at PA output which is generated by UL allocation should be small enough to reduce the interference on DL signal when testing REFSSENS, so the UL allocation for CA should be restricted as shown in table 7.3.1A-1 in TS36.101.

In order to establish the UL allocation for CA band 7, the way how to establish the UL allocation for CA band 1 is recalled in the following figure 6.2.1-1.

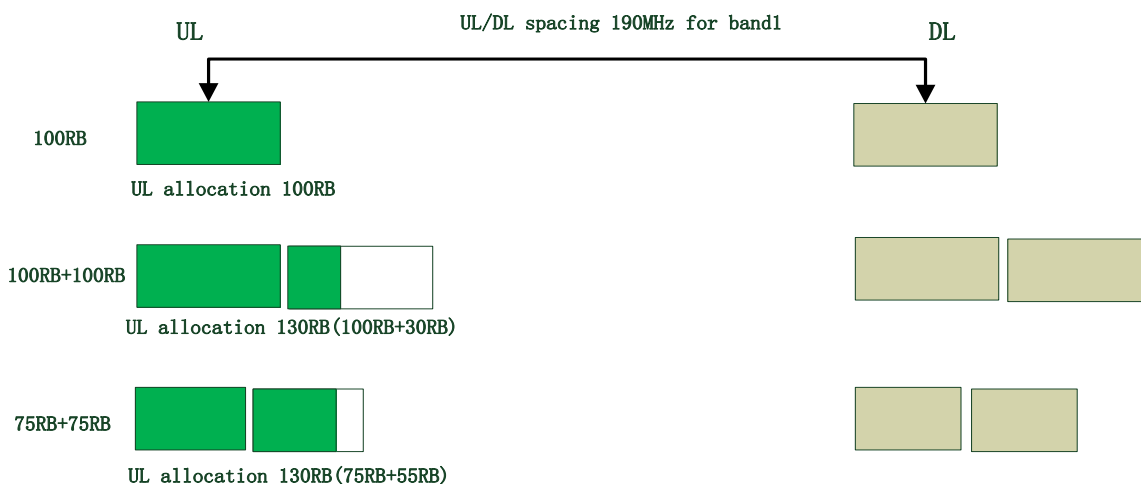


Figure 6.2.1-1 UL allocation for CA band 1 in TS36.101 when testing REFSSENS

From above figure 6.2.1-1, it can be seen that the UL allocation should be restricted to 130 RBs when testing REFSSENS for CA band 1. It means when UL allocation is 130 RB, the influence of UL signal on DL signal is so small that can be ignored when testing REFSSENS, no matter 100 RB+100 RB or 75 RB+75 RB combinations. For band 7, the UL/DL spacing is 120 MHz according to TS 36.101, which is smaller than 190 MHz for band 1. When testing REFSSENS in TS36.101 R8, the UL allocation is also restricted to be 75 RB rather than 100 RB for 20 MHz. So, for CA operation, it

is preferred to keep the UL allocation 75 RB for reducing the interference on DL signal. In order to compare with CA band1, the following figure 6.2.1-2 is also given for CA band 7.

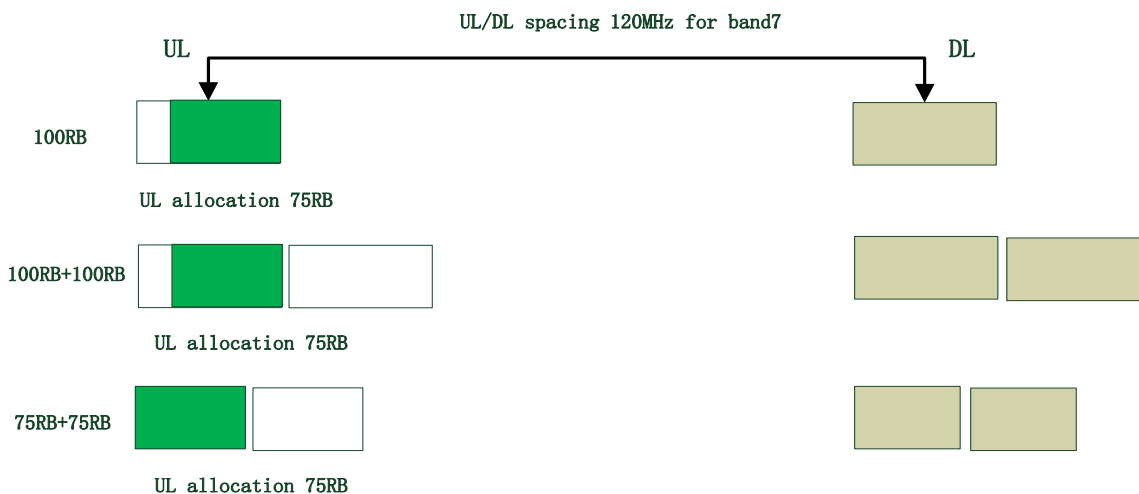


Figure 6.2.1-2 UL allocation for CA band 1 in TS 36.101 when testing REFSSENS

Base on above analysis, it is proposed that the uplink configuration for CA band 7 when testing REFSSENS is shown in table 6.2.1-1.

In addition, in order to avoid the confusion of UL allocation in PCC and SCC, the Note 4 is added in the following table 6.2.1-1.

Table 6.2.1-1: Intra-band CA uplink configuration for reference sensitivity

CA Band / Aggregated channel bandwidth / NRB / Duplex mode							
CA Band	100 RB+50 RB		75 RB+75 RB		100 RB+100 RB		Duplex Mode
CA_7C	n/a	n/a	PCC	SCC	PCC	SCC	FDD
	n/a	n/a	75	0	75	0	
NOTE 1. The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band. NOTE 2. The transmitted power over both PCC and SCC shall be set to P_{UMAX} as defined in clause 6.2.5 in TS36.101. NOTE 3. The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1 in TS36.101). NOTE 4. The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.							

6.2.2 In-band blocking

Section 7.6.1.1A in TS 36.101 specifies the in-band blocking requirements for CA operation. There are no special blocking requirements for Band 7 relative to the other bands, so no changes need to be made to the existing requirements for CA operation.

All that required is to modify Table 7.6.1.1-2 to indicate that the same requirements that applied to Band 1 and Band 40 CA are also applied to Band 7 CA, as shown below.

Table 6.2.2-1: In-band blocking

CA operating band	Parameter	Unit	Case 1	Case 2
		$P_{\text{Interferer}}$	dBm	-56
	$F_{\text{Interferer}}$	MHz	$=-F_{\text{offset}} - F_{\text{offset,case 1}}$ & $=+F_{\text{offset}} + F_{\text{offset,case 1}}$	$\leq -F_{\text{offset}} - F_{\text{offset,case 2}}$ & $\geq +F_{\text{offset}} + F_{\text{offset,case 2}}$
CA_1C, CA_40C, CA_7C	$F_{\text{Interferer}}$ (Range)	MHz	(Note 2)	$F_{\text{DL_low}} - 15$ to $F_{\text{DL_high}} + 15$
<p>Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band</p> <p>Note 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency $-BW/2 - F_{\text{offset, case 1}}$ and b. the carrier frequency $+BW/2 + F_{\text{offset, case 1}}$</p> <p>Note 3: F_{offset} is the frequency offset from the center frequency of the adjacent CC being tested to the edge of aggregated channel bandwidth.</p> <p>Note 4: The $F_{\text{interferer}}$ (offset) is relative to the center frequency of the adjacent CC being tested and shall be further adjusted to $\lfloor F_{\text{interferer}} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.</p>				

6.2.3 Out-of-band blocking

Section 7.6.2.1A in TS 36.101 specifies the out-of-band blocking requirements for CA. There are no special blocking requirements for Band 7 relative to the other bands, so no changes need to be made to the existing requirements for CA.

All that required is to modify Table 7.6.2.1-2 in TS 36.101 to indicate that the same requirements that applied to Band 1 and Band 40 CA are also applied to Band 7 CA, as shown below.

Table 6.2.3-1: Out of band blocking

CA operating band	Parameter	Units	Frequency		
			range 1	range 2	range 3
	$P_{\text{Interferer}}$	dBm	-44	-30	-15
CA_1C, CA_40C, CA_7C	$F_{\text{Interferer}}$ (CW)	MHz	FDL_low -15 to FDL_low -60	FDL_low -60 to FDL_low -85	FDL_low -85 to 1 MHz
			FDL_high +15 to FDL_high +60	FDL_high +60 to FDL_high +85	FDL_high +85 to +12750 MHz

6.3 E-UTRA B7/B38 coexistence requirements

The spurious emission requirements for bandwidth class C in Band 7 CA should not exceed the requirements defined in Table 6.3-1 for coexistence with the protected bands.

Table 6.3-1: Requirements

E-UTRA Band	Spurious emission					
	Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)
CA_7C	E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 42, 43	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1
	Frequency range	2570	-	2575	+1.6	5
	Frequency range	2575	-	2595	-15.5	5
	Frequency range	2595	-	2620	-40	1

6.3.1 A-MPR for band 7 CA to protect band 38

The simulation campaign was performed and details were added into Annex A1. Based on the results of the study, the A-MPR solution for CA_7C operation with contiguous allocations presented in table 6.3.1-1 is proposed.

Table 6.3.1-1: Contiguous allocation A-MPR for CA_7C

	RB_End	L_CRB [RBs]	A-MPR for QPSK and 16-QAM[dB]
100RB/100RB	[0 – 22]	>[0]	≤ [4] dB
	[23 – 33]	> [RB_End – 10]	≤ [2] dB
	[106 – 142]	> [75]	≤ [3] dB
	[143 – 178]	>[70]	≤ [5] dB
	[179 – 199]	> [0]	≤ [10] dB
	75RB/75RB	[0 – 7]	>[0]
[20- 75]		> [RB_End – 10]	≤ [2] dB
[75 – 110]		>[64]	≤ [2] dB
[110 – 144]		>[35]	≤ [6] dB
[145 – 149]		>[0]	≤ [10] dB

6.3.2 A-MPR for multi-cluster transmission

A simulation campaign was performed and details were added into Annex A2. Based on this study, the proposed backoff mask for CA_7C coexistence with band 38 is shown in Figure 6.3.2-1.

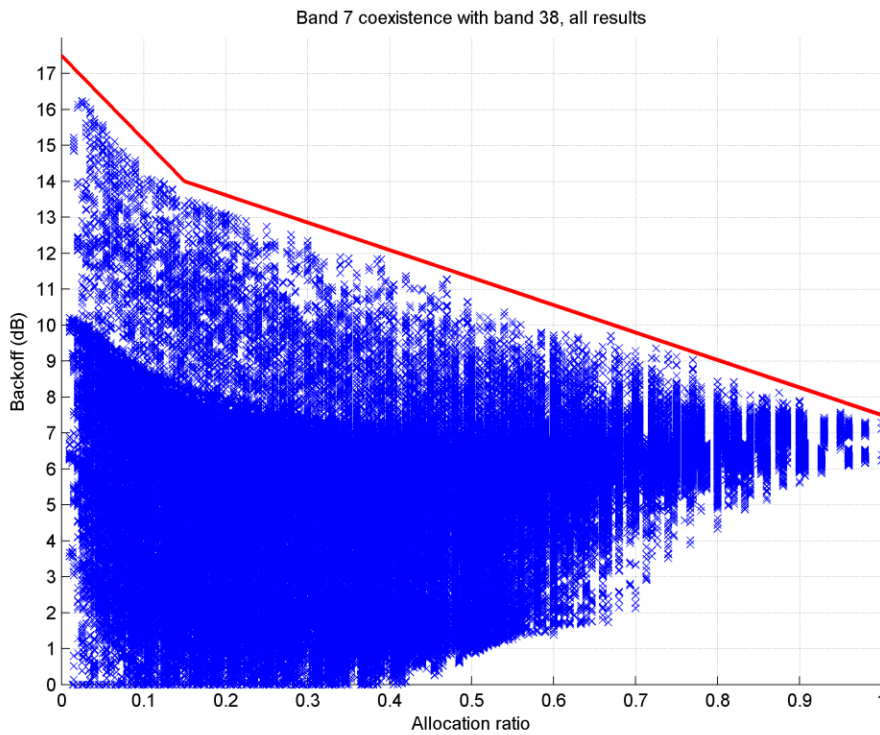


Figure 6.3.2-1: All simulation results and the proposed mask.

The proposed mask that shown in Figure 6.3.-1 can be formally written as follows

$$A\text{-MPR} = \text{CEIL} \{M_A, 0.5\}$$

Where M_A is defined as follows

$$M_A = [-23.33A + 17.5 \quad ; 0 \leq A < 0.15$$

$$-7.65A + 15.15 \quad ; 0.15 \leq A \leq 1]$$

Where $A = N_{\text{RB_alloc}} / N_{\text{RB_agg}}$.

7 E-UTRA RRM requirements for UE

A study of the existing technical specifications was conducted. The study concluded that no change to UE RRM specifications is required.

8 E-UTRA RF requirements for BS

8.1 Transmitter characteristics

CA_7 could refer to use the requirements of BS Transmitter characteristics in current TS36.104.

8.2 Receiver characteristics

CA_7 could refer to use the requirements of BS Receiver characteristics in current TS36.104.

9 E-UTRA demodulation performance for BS and UE

A study of the UE and BS demodulation performance requirements in section 8 of TS 36.101 and TS 36.104 was conducted. Since the demodulation performance requirements in both specifications are band agnostic, and there is no specific UE and BS demodulation performance required for Band 7 CA, it is concluded that there is no change to the demodulation performance needed for supporting Band 7 CA.

10 Summary of required changes to E-UTRA specifications

10.1 Required changes to TS36.101

Required changes in TS 36.101 are shown in Table 10.1-1.

Table 10.1-1 Required changes in TS 36.101

Section	Requirement	Expected Changes in TS 36.101
5.5A	Operating bands for CA	A new row is expected to be added in Table 5.5A-1 to add CA_7 to the supported Intra band CA operating bands.
5.6A.1	Channel bandwidths per operating band for CA	A new row is expected to be added in Table 5.6A.1-1 for the supported E-UTRA bandwidths of intra-band contiguous B7 CA.
6.2.2A	UE Maximum Output Power for intra-band contiguous CA	A new row is expected to be added in Table 6.2.2A-1. It's proposed to evaluate the appropriate UE maximum output power requirement for intra-band contiguous B7 CA.
7.3.1A	Minimum requirements (QPSK) for CA	A new row is expected to be added in Table 7.3.1A-1 for intra-band CA uplink configuration for reference sensitivity.
7.6.1.1A	In-band blocking for intra-band contiguous CA	Appropriate changes are expected in Table 7.6.1.1A-2. It's proposed to evaluate whether the existing CA_1C in-band blocking requirement is valid for CA_7C or not.
7.6.2.1A	Out-of-band blocking for intra-band contiguous CA	Appropriate changes are expected in Table 7.6.2.1A-2. It's proposed to evaluate whether the existing CA_1C Out-of-band blocking requirement is valid for CA_7C or not.

10.2 Required changes to TS36.104

Required changes in TS 36.104 are shown in Table 10.2-1.

Table 10.2-1 Required changes in TS 36.104

Section	Requirement	Expected Changes in TS 36.104
5.5	Operating bands	A new row is expected to be added in Table 5.5-2 to support Band 7 intra-band contiguous CA configuration.

10.3 Required changes to TS36.133

No required changes in TS 36.133

10.4 Required changes to TS36.141

Required changes in TS 36.141 are shown in Table 10.4-1.

Table 10.4-1 Required changes in TS 36.141

Section	Requirement	Expected Changes in TS 36.141
5.5	Operating bands	A new row is expected to be added in Table 5.5-2 to support Band 7 intra-band contiguous CA configuration.

10.5 Required changes to TS36.307

Required changes in TS 36.307 are shown in Table 10.5-1.

Table 10.5-1 Required changes in TS 36.307

Section	Requirement	Expected Changes in TS 36.307
8	Band 7 independent of release	Expect to add some changes to 36.307 Rel-10 to provide the appropriate pointers to the Rel-11 spec to enable backdating of band 7 CA to Rel-10.

10.6 Required changes to TS37.104

No required changes for TS 37.104.

10.7 Required changes to TS37.141

No required changes for TS 37.141.

11 Project plan

The work plan proposed in [3] and agreed in RAN# 60bis.

It is expected that the WI could be finished at RAN#58.

The detailed task schedule is provided in the following sub clause.

11.1 Schedule and Work Task Status

The follows are the Project plan for this WI:

1. By the end of RAN4 #60-BIS in Zhuhai (Oct 2011): to provide and approve skeleton TR; to reach agreement on the proposed bandwidths configuration of LTE_CA_B7 in RAN4 specifications.
2. By the end of RAN4 #64 in Prague (May 2012): to reach agreement of the UE Tx and UE Rx requirements
3. By the end of RAN4 #65 in Tsing Dao(Aug 2012): to clean up the rests of the Tx and Rx requirements
 - All the requirements are captured in Technical Report.
 - Technical report presented to RAN plenary #57for information
4. By the end of RAN4 #67 (Nov 2012): to have all the CRs agreed
 - All CRs to be presented in RAN #58 for approval.
 - Technical reports presented to RAN#58 for final approval.

Annex A: A-MPR simulation

A.1 A-MPR for contiguous transmission

A.1.1 Simulation campaign

In these simulations emissions from band 7 to band 38 were studied and sufficient backoff was searched to reach emission limits. Simulations were performed with 100+100 RB and 75+75 RB configurations and they were placed in the worst case position at the upped edge of band 7. Uplink centre frequency was 2550.1 MHz for 100+100 RB configuration and 2555 MHz for 75+75 RB configuration.

Emission limits for band 38 frequencies were as follows.

Table A1.1-1: Emission limits from band 7 to band 38

Frequency range	Emission limit	Measurement bandwidth
2570 – 2575 MHz	+1.6 dBm	5 MHz
2575 – 2595 MHz	-15.5 dBm	5 MHz
2595 – 2620 MHz	-40 dBm	1 MHz

For OOB region below transmitted signal general E-UTRA CA spectrum emission mask was used.

Table A1.1-2: General E-UTRA CA spectrum emission mask

Δf_{OOB} (MHz)	Spectrum emission limit [dBm]/BW _{Channel_CA}				Measurement bandwidth
	29.9 MHz	30 MHz	34.85 MHz	39.8 MHz	
± 0-1	-22.5	-22.5	-23.5	-24	30 kHz
± 1-5	-10	-10	-10	-10	1 MHz
± 5-29.9	-13	-13	-13	-13	1 MHz
± 29.9-30	-25	-13	-13	-13	1 MHz
± 30-34.85	-25	-25	-13	-13	1 MHz
± 34.85-34.9	-25	-25	-25	-13	1 MHz
± 34.9-35		-25	-25	-13	1 MHz
± 35-39.8			-25	-13	1 MHz
± 39.8-39.85			-25	-25	1 MHz
± 39.85-44.8				-25	1 MHz

The following ACLR limits were used.

- UTRA_{ACLR1} = 33 dB
- UTRA_{ACLR2} = 36 dB
- CA E-UTRA_{ACRL} = 30 dB

Spurious emissions limit was -30 dBm with 1MHz measurement bandwidth.

Simulation assumptions were as follows:

- PA operating point: with fully allocated REL-8 100RB QPSK signal UTRA_{ACLR1} = 33 dBc with Pout = 22 dBm.
- Modulator IQ – image = 25 dB
- Modulator carrier leakage = 25 dBc

- Modulator C_IM3 = 60 dBc

When setting the PA operating point it was checked that all ACLR results were within the limits.

Post PA loss of 4 dB was used but no additional attenuation from duplex filter was assumed.

A.1.2 Simulation results

Based on the simulation results in [19][20][21], the A-MPR solution for CA_7C operation with contiguous allocations presented table A1.2-1 is proposed.

Table A1.2-1: A-MPR for CA_7C

	RB_End	L_CRB [RBs]	A-MPR for QPSK and 16-QAM[dB]
100RB/100RB	[0 – 22]	>[0]	≤ [4] dB
	[23 – 33]	> [RB_End – 10]	≤ [2] dB
	[106 – 142]	> [75]	≤ [3] dB
	[143 – 178]	>[70]	≤ [5] dB
	[179 – 199]	> [0]	≤ [10] dB
	75RB/75RB	[0 – 7]	>[0]
[20- 75]		> [RB_End – 10]	≤ [2] dB
[75 – 110]		>[64]	≤ [2] dB
[110 – 144]		>[35]	≤ [6] dB
[145 – 149]		>[0]	≤ [10] dB

A.2 A-MPR for multi-cluster transmission

A.2.1 Simulation campaign

In these simulations emissions from band 7 to band 38 were studied and sufficient backoff was searched to reach emission limits. Simulations were performed with 100+100 RB and 75+75 RB configurations and they were placed in the worst case position at the upped edge of band 7. Uplink center frequency was 2550.1 MHz for 100+100 RB configuration and 2555 MHz for 75+75 RB configuration.

Emission limits for band 38 frequencies were as follows

Table A2-1: Emission limits from band 7 to band 38

Frequency range	Emission limit	Measurement bandwidth
2570 – 2575 MHz	+1.6 dBm	5 MHz
2575 – 2595 MHz	-15.5 dBm	5 MHz
2595 – 2620 MHz	-40 dBm	1 MHz

For OOB region below transmitted signal general E-UTRA CA spectrum emission mask was used.

Table A2-2: General E-UTRA CA spectrum emission mask

Spectrum emission limit [dBm]/BW _{Channel_CA}					
Δf_{OoB} (MHz)	29.9 MHz	30 MHz	34.85 MHz	39.8 MHz	Measurement bandwidth
$\pm 0-1$	-22.5	-22.5	-23.5	-24	30 kHz
$\pm 1-5$	-10	-10	-10	-10	1 MHz
$\pm 5-29.9$	-13	-13	-13	-13	1 MHz
$\pm 29.9-30$	-25	-13	-13	-13	1 MHz
$\pm 30-34.85$	-25	-25	-13	-13	1 MHz
$\pm 34.85-34.9$	-25	-25	-25	-13	1 MHz
$\pm 34.9-35$		-25	-25	-13	1 MHz
$\pm 35-39.8$			-25	-13	1 MHz
$\pm 39.8-39.85$			-25	-25	1 MHz
$\pm 39.85-44.8$				-25	1 MHz

The following ACLR limits were used.

- UTRA_{ACLR1} = 33 dB
- UTRA_{ACLR2} = 36 dB
- CA E-UTRA_{ACRL} = 30 dB

Spurious emissions limit was -30 dBm with 1MHz measurement bandwidth.

Simulation assumptions were as follows:

- PA operating point: with fully allocated REL-8 100 RB QPSK signal UTRA_{ACLR1} = 33 dBc with Pout = 22 dBm.
- Modulator IQ – image = 25 dB
- Modulator carrier leakage = 25 dBc
- Modulator C_IM3 = 60 dBc

When setting the PA operating point it was checked that all ACLR limits are within the limits.

Post PA loss of 4 dB was used but no additional attenuation from duplex filter was assumed.

A large amount of allocations were randomly created and required backoff was searched. Used allocations contained up to 4 separate clusters.

Annex B: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2011-10	RAN4#6 0bis	R4- 115298			Skeleton	N/A	0.0.1
2011-11	RAN4#6 1	R4- 115552			Incorporated agreed text proposals in RAN4#60bis. Added operating bands and bandwidths, expected changes, work plan based on [3][4][5]	0.0.1	0.0.2
2012-02	RAN4#6 2	R4- 120022			Incorporated agreed text proposals in RAN4#60bis. Added Band 7 spectrum and regulation review, BS RF requirements, UE maximum output power, blocking requirements based on [9][10][11][12]	0.0.2	0.0.3
2012-03	RAN4#6 2Bis	R4- 121531			Incorporated agreed text proposals in RAN4#62. Added Band 7 UE RRM requirements, reference sensitivity based on [13][14]	0.0.3	0.1.0
2012-05	RAN4#6 3	R4- 122241			Incorporated agreed text proposals in RAN4#62bis. Added Band 7 UE minimum output power, Transmit OFF power, demodulation performance for UE and BS [15][16][17]	0.1.0	0.2.0
2012-08	RAN4#6 4	R4- 124465			Incorporated agreed text proposals in RAN4#63. Added B7/B38 coexistence requirements	0.2.0	0.3.0
2012-08	RAN#57	RP- 121157			Presented to RAN for approval	0.3.0	1.0.0
2012-09	RAN#57				TR Approved by RAN	1.0.0	11.0.0
2013-08					Conversion to from 36.831 to 36.833-1-07	36.831 11.0.0	36.833-1-07 11.0.0