

# 3GPP TR 36.821 V9.1.0 (2010-03)

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*Technical Report*

## **3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Extended UMTS/LTE 1500 work item technical report (Release 9)**



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Keywords

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# Contents

Foreword .....	5
1 Scope .....	6
2 References.....	6
3 Definitions, symbols and abbreviations .....	7
3.1 Definitions .....	7
3.2 Symbols.....	7
3.3 Abbreviations.....	7
4 Background .....	7
4.1 Task description.....	8
5 Study of UTRA Requirements .....	8
5.1 Co-existing with other technologies.....	8
5.2 Technical conditions for UTRA .....	9
5.2.1 Mandatory regulatory requirements:.....	9
5.2.2 Other technical conditions referred in Japan's regulations:.....	12
5.3 Frequency bands and channel arrangement .....	14
5.3.1 Frequency bands.....	14
5.3.2 TX-RX frequency separation .....	15
5.3.3 Channel arrangement .....	15
5.3.3.1 Channel number .....	15
5.3.3.2 UARFCN.....	16
5.4 Specific UE RF requirements.....	16
5.4.1 Spurious emissions.....	16
5.4.2 Reference sensitivity level.....	17
5.4.2.1 Brief overview .....	17
5.4.2.2 Observation for UMTS .....	18
5.4.2.3 Evaluation of the reference sensitivity of revised Band XI for UMTS .....	18
5.4.2.4 Proposal of reference sensitivity of revised Band XI and Band XXI for UMTS .....	19
5.5 Specific BS RF requirements .....	19
5.5.1 Blocking requirements .....	19
6 Study of E-UTRA requirements .....	20
6.1 Co-existing with other technologies.....	20
6.2 Technical conditions for E-UTRA .....	20
6.2.2 Other technical conditions referred in Japan's regulations:.....	24
6.3 Operating bands and channel arrangement .....	27
6.3.1 Operating bands.....	27
6.3.2 TX-RX frequency separation .....	27
6.3.3 Channel arrangement .....	27
6.3.3.1 Carrier frequency and EARFCN .....	27
6.3.4 Channel bandwidths per operating band.....	28
6.4 Specific UE RF requirements.....	28
6.4.1 Maximum output power.....	28
6.4.2 Maximum output power with additional requirements.....	28
6.4.3 Spurious emissions.....	29
6.4.3.1 Spurious emission band UE co-existence for LTE.....	29
6.4.3.2 Additional spurious emissions.....	31
6.4.3.2.1 Relationship between Band 21 and additional spurious emission region .....	31
6.4.3.2.2 Outline of evaluation method .....	31
6.4.3.2.2 Evaluation results.....	33
6.4.4 Reference sensitivity power level.....	34
6.4.4.1 Reference sensitivity of revised Band 11 and Band 21 for LTE .....	34
6.4.4.2 Maximum uplink configuration of revised Band 11 and Band 21 for LTE.....	35
6.4.4.2.1 Comparison of the current Band 11 and revised Band 11 .....	35
6.4.4.2.3 Proposal of minimum uplink configuration .....	36

6.5	Specific BS RF requirements .....	36
6.5.1	Blocking requirements .....	36
7	Summary of required changes to UTRA specifications .....	36
7.1	Required changes to TS 25.101 .....	36
7.2	Required changes to TS 25.104 .....	37
7.3	Required changes to TS 25.113 .....	38
7.4	Required changes to TS 25.133 .....	38
7.5	Required changes to TS 25.141 .....	39
7.6	Required changes to TS 34.124 .....	40
7.7	Required changes to TS 25.306 .....	40
7.8	Required changes to TS 25.307 .....	40
7.9	Required changes to TS 25.331 .....	40
7.10	Required changes to TS 25.461 .....	40
7.11	Required changes to TS 25.466 .....	41
8	Summary of required changes to E-UTRA specifications .....	41
8.1	Required changes to TS 36.101 .....	41
8.2	Required changes to TS 36.104 .....	41
8.3	Required changes to TS 36.113 .....	42
8.4	Required changes to TS 36.124 .....	42
8.5	Required changes to TS 36.133 .....	42
8.6	Required changes to TS 36.141 .....	43
8.7	Required changes to TS 36.331 .....	43
8.8	New specification, TS 36.307 .....	43
9	Project plan.....	44
9.1	Schedule and Work Task Status.....	44
10	Open issues .....	44
<b>Annex A (informative): UARFCN numbers .....</b>		<b>45</b>
A.1	List of UARFCN used for UTRA FDD bands .....	45
<b>Annex B (Informative): Change history.....</b>		<b>48</b>

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# Foreword

This Technical Report has been produced by the 3<sup>rd</sup> 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:

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

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# 1 Scope

The present document is a technical report of the Extended UMTS/LTE 1500 work item, which was established at TSG RAN#44. The objective of this work item is to provide UTRA and E-UTRA specification support for FDD in the Extended 1500 MHz band in Japan. In addition to the schedule and status of the work items, the report includes a description of the motivation, requirements, study results and specification recommendations.

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# 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-090469, "1.5 GHz band plan for UMTS and LTE in Japan", RAN#44
- [3] RP-090470, "Work Item proposal for Extended UMTS/LTE 1500 MHz band in Japan", RAN#44
- [4] "Report of technical conditions concerning effective use of 1.5 GHz band" (In Japanese, Dec. 21, 2006) [http://www.soumu.go.jp/joho\\_tsusin/policyreports/joho\\_tsusin/pdf/061221\\_2.pdf](http://www.soumu.go.jp/joho_tsusin/policyreports/joho_tsusin/pdf/061221_2.pdf)
- [5] R4-092407, "Technical conditions applied for extended UMTS/LTE1500 in Japan", RAN#51b is
- [6] "For Introduction of the 3.9-Generation Mobile Communications System" (Dec. 11, 2008), [http://www.soumu.go.jp/main\\_sosiki/joho\\_tsusin/eng/Releases/Telecommunications/news081211\\_3.html](http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/Releases/Telecommunications/news081211_3.html)
- [7] "Introduction of 3.9G wireless communication systems" (In Japanese, Dec. 11, 2008), MIC, [http://www.soumu.go.jp/s-news/2008/081211\\_3.html](http://www.soumu.go.jp/s-news/2008/081211_3.html)
- [8] "Report of technical conditions of 3.9G wireless communication systems" (In Japanese, Dec. 11, 2008), MIC, [http://www.soumu.go.jp/joho\\_tsusin/policyreports/joho\\_tsusin/bunkakai/pdf/081211\\_1\\_si1-2.pdf](http://www.soumu.go.jp/joho_tsusin/policyreports/joho_tsusin/bunkakai/pdf/081211_1_si1-2.pdf)
- [9] R4-091858 "Output power and sensitivity: operating band edge relaxations," Ericsson, RAN#51
- [10] R4-091742 "Band edge requirement relaxation TC and RC," Nokia, RAN#51
- [11] R4-051307 "Band VIII Rx sensitivity," Motorola, RAN#37
- [12] 3GPP TS 25.101V9.0.0: "User Equipment (UE) radio transmission and reception (FDD)"
- [13] 3GPP TS 36.101V9.2.0: "User Equipment (UE) radio transmission and reception (FDD)"

## 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:

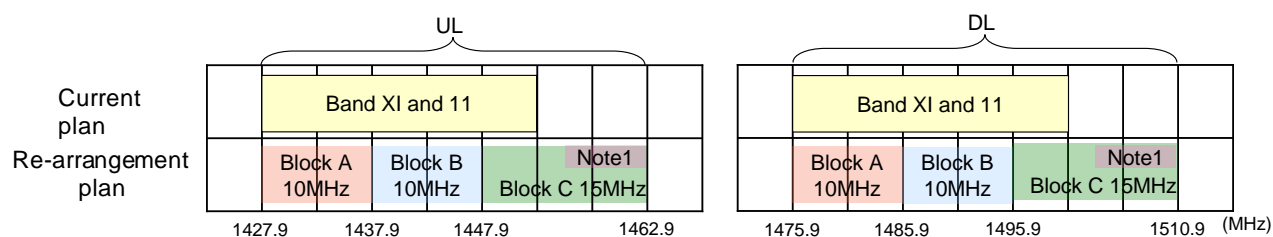
### 3.3 Abbreviations

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].

UE	User Equipment
BS	Base station
UL	Uplink (Reverse Link)
DL	Downlink (Forward Link)

## 4 Background

The work item for UMTS1500 in Japan which corresponds to Band XI (UL: 1427.9 – 1452.9 MHz / DL: 1475.9 – 1500.9 MHz) had been completed in September 2007. The UMTS commercial services for this band have not been launched yet. Meanwhile the study on the technical conditions for LTE has been conducted by the Telecommunications Council of Japan which includes co-existence studies with the following existing technologies: Radio astronomy systems and Mobile satellite communications service. Based on the study outcomes, MIC (Ministry of Internal Affairs and Communications) elaborated draft guidelines for establishment of specified base stations for the introduction of the 3.9-generation mobile communications system and consulted with the Radio Regulatory Council about the guideline. The Council endorsed the guideline which contains the frequency re-arrangement plan for the 1.5 GHz band as shown in Fig. 4-1 [2]. The band plan is constituted from three component sub-bands.



Note 1: In some certain regions in Japan, 1503.35MHz – 1510.9MHz will not be feasible for IMT-2000 systems until the end of March 2014.

- Block A: UL: 1427.9 – 1437.9 MHz / DL: 1475.9 – 1485.9 MHz
- Block B: UL: 1437.9 – 1447.9 MHz / DL: 1485.9 – 1495.9 MHz
- Block C: UL: 1447.9 – 1462.9 MHz / DL: 1495.9 – 1510.9 MHz

**Figure 4-1: Frequency re-arrangement plan for 1.5GHz bands in Japan**

Based on the above allocation, we note that existing Band 11 (36.101) and XI (25.101) as shown below are not aligned with the above MIC block allocation.

TS25.101	XI	UL : 1427.9 - 1452.9 MHz	DL : 1475.9 - 1500.9 MHz
TS36.101	11	UL : 1427.9 - 1452.9 MHz	DL : 1475.9 - 1500.9 MHz

In particular we note that only block A and B are a sub-set of existing band XI/11

We note an existing duplexer cannot support block A, B and C without requiring a split band approach. Hence considering the existing Band 11 / XI allocation and the new band plan (Block A/B/C) and taking into practical RF implementation, it is proposed that existing Band 11 / XI is redefined by with reduction of 5MHz bandwidth and a new band is also specified.

New Band 11 / XI	UL : 1427.9 – 1447.9 MHz	DL : 1475.9 – 1495.9 MHz
New Band Y	UL : 1447.9 – 1462.9 MHz	DL : 1495.9 – 1510.9 MHz

However to allow future performance enhancements in duplexer technologies, it is proposed that UE which can support the existing Band XI/ 11 and the new operating band a relaxation could be allowed in the specification similar to that adopted for band 3 and band 9.

## 4.1 Task description

The purpose of this work item is to:

- a) Study of Extended UMTS/LTE 1500 for a potential deployment in Japan. Generate a new technical report based on the study results.

The specific bands to be studied are:

Band XI/ 11 with reduction of 5MHz bandwidth for UMTS/LTE [Block A, Block B]:

- 1427.9 – 1447.9 MHz: Up-link
- 1475.9 – 1495.9 MHz: Down-link

Band Y for UMTS/LTE [Block C]:

- 1447.9 – 1462.9 MHz: Up-link
- 1495.9 – 1510.9 MHz: Down-link

In addition to the above study, for terminals which support both Band XI / 11 with reduction of 5MHz bandwidth and Band Y a suitable relaxation in the specification would be defined.

- b) Generate CR's to update the appropriate documents
- c) TSG RAN WG2 - study signalling issues related to Extended UMTS/LTE 1500.
- d) Any additional related issues.

The Work Item description for Extended UMTS/LTE 1500 was approved in RAN#44 [3].

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## 5 Study of UTRA Requirements

### 5.1 Co-existing with other technologies

As a result of the co-existing studies with the following technologies: PDC system (ARIB standard RCR STD-27), DIGITAL MCA system (ARIB standard RCR STD-32), Radio astronomy systems, and Mobile satellite communication service, technical condition of the required guard bands between each system was lead in Telecommunications Council of Japan as provided in [4]. Furthermore, after the co-existing studies with E-UTRA in Telecommunications Council of Japan, technical condition of UTRA was lead as provided in [5].



## 5.2 Technical conditions for UTRA

The technical conditions for extended UMTS1500 were derived based on the requirements for 1500MHz band (revised UTRA Band XI and new UTRA band). Necessary changes such as the frequency arrangement or spurious emission requirements were made. Those changes and its rationale are summarized in the following sub sections. Revised parts compared with requirements for Band XI are underlined>.

### 5.2.1 Mandatory regulatory requirements:

#### (a) Frequency arrangement:

The frequency band for extended UMTS1500 in Japan is as follows:

UL: 1427.9MHz – 1462.9MHz

DL: 1475.9MHz – 1510.9MHz

Tx-Rx frequency separation: 48MHz

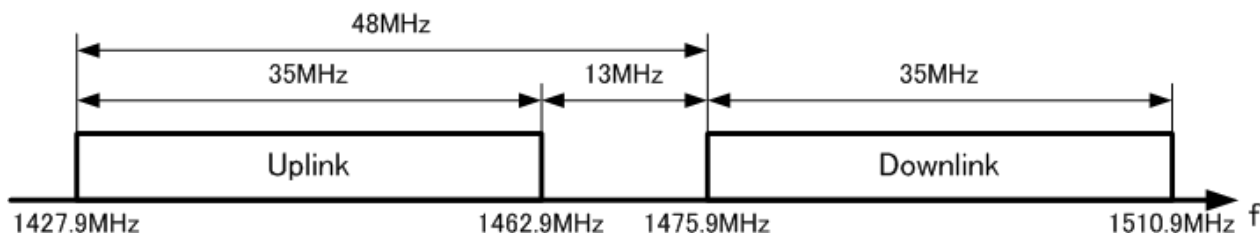


Figure 5.2-1: Frequency band for extended UMTS1500

#### (b) Frequency error:

Frequency error requirements for extended UMTS1500 are specified same as other Bands shown following:

- BS: The modulated carrier frequency of the BS shall be accurate to within  $\pm (0.05\text{ppm}+12\text{Hz})$ .  
For UMTS BS whose maximum output power is not exceed 38dBm, the modulated carrier frequency shall be accurate to within  $\pm (0.1\text{ppm}+12\text{Hz})$ .
- UE: The UE modulated carrier frequency shall be accurate to within  $\pm (0.1\text{ppm}+10\text{Hz})$  compared to the carrier frequency received from the Node B.

#### (c) Spurious emissions:

Spurious emissions requirements for extended UMTS1500 are specified as in Table 5.2.1.

**Table 5.2.1: Spurious emission requirements for extended UMTS1500**

Parameter		Requirement																			
Spurious emissions limits	BS	<p><b>Table 5.2.1-1: Spurious emissions limits for extended UMTS1500 BS</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>9kHz – 150kHz</td> <td>-13dBm/1kHz</td> </tr> <tr> <td>150kHz – 30MHz</td> <td>-13dBm/10kHz</td> </tr> <tr> <td>30MHz – 1000MHz</td> <td>-13dBm/100kHz</td> </tr> <tr> <td>1000MHz – 12.75GHz</td> <td>-13dBm/1MHz</td> </tr> </tbody> </table> <p>The requirements apply at frequencies within the specified frequency ranges, which are more than 12.5MHz below the first carrier frequency used or more than 12.5MHz above the last carrier frequency used.</p> <p><b>Table 5.2.1-2: Additional spurious emission limits for extended UMTS1500 BS</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>1884.5MHz – 1919.6MHz</td> <td>-41dBm/300kHz *</td> </tr> <tr> <td>2010MHz – 2025MHz</td> <td>-52dBm/1MHz</td> </tr> </tbody> </table> <p>Note*: The requirement is applicable at specified frequencies falling between 12.5MHz below the first carrier frequency used and 12.5MHz above the last carrier frequency used.</p>	Frequency range	Maximum level	9kHz – 150kHz	-13dBm/1kHz	150kHz – 30MHz	-13dBm/10kHz	30MHz – 1000MHz	-13dBm/100kHz	1000MHz – 12.75GHz	-13dBm/1MHz	Frequency range	Maximum level	1884.5MHz – 1919.6MHz	-41dBm/300kHz *	2010MHz – 2025MHz	-52dBm/1MHz			
	Frequency range	Maximum level																			
9kHz – 150kHz	-13dBm/1kHz																				
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30MHz – 1000MHz	-13dBm/100kHz																				
1000MHz – 12.75GHz	-13dBm/1MHz																				
Frequency range	Maximum level																				
1884.5MHz – 1919.6MHz	-41dBm/300kHz *																				
2010MHz – 2025MHz	-52dBm/1MHz																				
UE	<p>The requirements below are only applicable for frequencies, which are greater than 12.5 MHz away from the UE centre carrier frequency.</p> <p><b>Table 5.2.1-3: Spurious emission limits for extended UMTS1500 UE</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>9kHz – 150kHz</td> <td>-36dBm/1kHz</td> </tr> <tr> <td>150kHz – 30MHz</td> <td>-36dBm/10kHz</td> </tr> <tr> <td>30MHz – 1000MHz</td> <td>-36dBm/100kHz</td> </tr> <tr> <td>1000MHz – 12.75GHz</td> <td>-30dBm/1MHz</td> </tr> </tbody> </table> <p><b>Table 5.2.1-4: Additional spurious emission limits for extended UMTS1500 UE</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>860MHz – 895MHz</td> <td>-60dBm/3.84MHz</td> </tr> <tr> <td>1844.9MHz – 1879.9MHz</td> <td>-60dBm/3.84MHz</td> </tr> <tr> <td>1884.5MHz – 1919.6MHz</td> <td>-41dBm/300kHz</td> </tr> <tr> <td>2110MHz – 2170MHz</td> <td>-60dBm/3.84MHz</td> </tr> </tbody> </table>	Frequency range	Maximum level	9kHz – 150kHz	-36dBm/1kHz	150kHz – 30MHz	-36dBm/10kHz	30MHz – 1000MHz	-36dBm/100kHz	1000MHz – 12.75GHz	-30dBm/1MHz	Frequency range	Maximum level	860MHz – 895MHz	-60dBm/3.84MHz	1844.9MHz – 1879.9MHz	-60dBm/3.84MHz	1884.5MHz – 1919.6MHz	-41dBm/300kHz	2110MHz – 2170MHz	-60dBm/3.84MHz
Frequency range	Maximum level																				
9kHz – 150kHz	-36dBm/1kHz																				
150kHz – 30MHz	-36dBm/10kHz																				
30MHz – 1000MHz	-36dBm/100kHz																				
1000MHz – 12.75GHz	-30dBm/1MHz																				
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1884.5MHz – 1919.6MHz	-41dBm/300kHz																				
2110MHz – 2170MHz	-60dBm/3.84MHz																				

**(d) Adjacent Channel Leakage power Ratio (ACLR):**

Adjacent Channel Leakage power Ratio (ACLR) requirements for extended UMTS1500 are specified same as other Bands shown in Table 5.2.2. ACLR limits include the test tolerance which is specified in TS25.141 and TS34.121 -1.

**Table 5.2.2: ACLR requirements for extended UMTS1500**

Requirement										
BS	<p>The ACLR limits in the Table 5.2.2-1 below.</p> <p style="text-align: center;"><b>Table 5.2.2-1: ACLR for extended UMTS1500 BS</b></p> <table border="1"> <thead> <tr> <th>Adjacent channel offset</th> <th>ACLR limit</th> <th>Measurement bandwidth</th> </tr> </thead> <tbody> <tr> <td>5MHz</td> <td>-44.2dBc or -7.2dBm</td> <td>3.84MHz</td> </tr> <tr> <td>10MHz</td> <td>-49.2dBc or -7.2dBm</td> <td>3.84MHz</td> </tr> </tbody> </table>	Adjacent channel offset	ACLR limit	Measurement bandwidth	5MHz	-44.2dBc or -7.2dBm	3.84MHz	10MHz	-49.2dBc or -7.2dBm	3.84MHz
Adjacent channel offset	ACLR limit	Measurement bandwidth								
5MHz	-44.2dBc or -7.2dBm	3.84MHz								
10MHz	-49.2dBc or -7.2dBm	3.84MHz								
UE	<p>The ACLR limits in the Table 5.2.2-2 below.</p> <p style="text-align: center;"><b>Table 5.2.2-2: ACLR for extended UMTS1500 UE</b></p> <table border="1"> <thead> <tr> <th>Adjacent channel offset</th> <th>ACLR limit</th> <th>Measurement bandwidth</th> </tr> </thead> <tbody> <tr> <td>5MHz</td> <td>-32.2dBc or -50dBm</td> <td>3.84MHz</td> </tr> <tr> <td>10MHz</td> <td>-42.2dBc or -50dBm</td> <td>3.84MHz</td> </tr> </tbody> </table>	Adjacent channel offset	ACLR limit	Measurement bandwidth	5MHz	-32.2dBc or -50dBm	3.84MHz	10MHz	-42.2dBc or -50dBm	3.84MHz
Adjacent channel offset	ACLR limit	Measurement bandwidth								
5MHz	-32.2dBc or -50dBm	3.84MHz								
10MHz	-42.2dBc or -50dBm	3.84MHz								

**(e) Spectrum emission mask:**

Spectrum emission mask for extended UMTS1500 are specified same as other Bands shown following;

BS: Not specified.

UE: Spectrum emission mask requirements for extended UMTS1500 are specified as in Table 5.2.3.

**Table 5.2.3: Spectrum emission mask requirements for extended UMTS1500 UE**

$\Delta f$ in MHz (Note)	Requirements	Measurement bandwidth
$2.5 \leq \Delta f < 3.5$	$-33.5-15X(\Delta f-2.5)$ dBc	30kHz
$3.5 \leq \Delta f < 7.5$	$-33.5-1X(\Delta f-3.5)$ dBc	1MHz
$7.5 \leq \Delta f < 8.5$	$-37.5-15X(\Delta f-2.5)$ dBc	1MHz
$8.5 \leq \Delta f < 12.5$	-47.5dBc	1MHz

(Note)  $\Delta f$  is the separation between the carrier frequency and the centre of the measurement bandwidth.

**(f) Occupied bandwidth:**

Occupied channel bandwidth shall be less than 5 MHz, specified same as other Bands for BS/UE.

**(g) Maximum output power**

Maximum output power for extended UMTS1500 are specified same as other Bands shown following;

BS: In normal conditions, the Base station maximum output power shall remain within +2.7dB and -2.7dB of the manufacturer's rated output power.

UE: The maximum output power which is defined 23dBm in normal conditions, shall remain within +2.7dB and -2.7dB.

And for 24dBm UE, the maximum output power shall remain between +1.7dB and -3.7dB in normal conditions.

**(h) Transmit OFF power**

Transmit OFF power for extended UMTS 1500 are specified same as other Bands shown following;

BS: Not specified.

UE: Transmit OFF power requirement is defined -55dBm/3.84MHz.

**(i) Transmit Intermodulation**

Transmit Intermodulation for extended UMTS 1500 are specified same as other Bands shown following;

BS: The transmit intermodulation level is the power of the intermodulation products when a W-CDMA modulated interference signal is injected into the antenna connector at a mean power level of 30 dB lower than that of the mean power of the wanted signal. The frequency of the interference signal shall be  $\pm 5$  MHz,  $\pm 10$  MHz,  $\pm 15$  MHz offset from the subject signal carrier frequency. The transmitter intermodulation level shall not exceed the out of band emission or spectrum emission mask or the spurious emission requirements.

UE: Not specified.

**(j) Receiver Spurious emissions:**

Receiver Spurious emissions requirements for extended UMTS 1500 are specified as in Table 5.2.4.

**Table 5.2.4: Receiver Spurious emission requirements for extended UMTS1500**

Parameter		Requirement											
Receiver spurious emissions limits	BS	<b>Table 5.2.4-1: Receiver spurious emission limits for extended UMTS1500 BS</b>											
		<table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>30MHz – 1000MHz</td> <td>-57dBm/100kHz</td> </tr> <tr> <td>1GHz – 12.75GHz</td> <td>-47dBm/1MHz*</td> </tr> <tr> <td>2010MHz – 2025MHz</td> <td>-52dBm/1MHz</td> </tr> </tbody> </table> <p>Note*: With the exception of frequencies between 1465.9MHz and <u>1520.9MHz</u>.</p>	Frequency range	Maximum level	30MHz – 1000MHz	-57dBm/100kHz	1GHz – 12.75GHz	-47dBm/1MHz*	2010MHz – 2025MHz	-52dBm/1MHz			
Frequency range	Maximum level												
30MHz – 1000MHz	-57dBm/100kHz												
1GHz – 12.75GHz	-47dBm/1MHz*												
2010MHz – 2025MHz	-52dBm/1MHz												
	UE	<b>Table 5.2.4-2: Receiver spurious emissions limits for extended UMTS1500 UE</b>											
		<table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>30MHz – 1000MHz</td> <td>-57dBm/100kHz</td> </tr> <tr> <td>1GHz – 12.75GHz</td> <td>-47dBm/1MHz</td> </tr> <tr> <td>1427.9 MHz – <u>1462.9MHz</u></td> <td>-60dBm/3.84MHz</td> </tr> <tr> <td>1475.9 MHz – <u>1510.9MHz</u></td> <td>-60dBm/3.84MHz</td> </tr> </tbody> </table>	Frequency range	Maximum level	30MHz – 1000MHz	-57dBm/100kHz	1GHz – 12.75GHz	-47dBm/1MHz	1427.9 MHz – <u>1462.9MHz</u>	-60dBm/3.84MHz	1475.9 MHz – <u>1510.9MHz</u>	-60dBm/3.84MHz	
Frequency range	Maximum level												
30MHz – 1000MHz	-57dBm/100kHz												
1GHz – 12.75GHz	-47dBm/1MHz												
1427.9 MHz – <u>1462.9MHz</u>	-60dBm/3.84MHz												
1475.9 MHz – <u>1510.9MHz</u>	-60dBm/3.84MHz												

## 5.2.2 Other technical conditions referred in Japan's regulations:

**(a) Reference sensitivity level**

BS: The reference sensitivity level for extended UMTS 1500 are specified as in Table 5.2.5. The reference sensitivity level includes the test tolerance which is specified in TS25.141.

**Table 5.2.5: UMTS BS reference sensitivity levels**

Rated output power	BS reference sensitivity level
> 38dBm	-120.3dBm
≤ 38dBm	-110.3dBm
≤ 24dBm	-106.3dBm

UE: The reference sensitivity level is -114.3dBm. In case DC-HSDPA, the reference sensitivity level is -110.3dBm. The reference sensitivity level includes the test tolerance which is specified in TS34.121-1.

**(b) Adjacent Channel Selectivity (ACS)**

BS: With the conditions described in Table 5.2.6, BER shall be not exceeded 0.1%.

**Table 5.2.6: Test conditions of Adjacent channel selectivity for UMTS BS**

Parameter	Rated output power	Conditions	Unit
Propagation condition	-	Static	-
Wanted signal mean power	-	<REFSENS>+6	dBm
Interfering signal mean power	> 38	-52	dBm
	≤ 38	-42	dBm
	≤ 24	-38	dBm

UE: Requirements of UE ACS for extended LTE1500 are specified as in Table 5.2.7.

**Table 5.2.7: Requirements and Test conditions of Adjacent channel selectivity for UMTS UE**

Parameter	Rel99	DC-HSDPA
Propagation condition	Static	
Wanted signal mean power	(<REFSENS>+14) dBm	
Interfering signal mean power	-52dBm	
Bit rate	12.2 kbps	60 kbps
Requirements	BER shall be not exceeded 0.1%.	BLER shall be not exceeded 10%.

**(c) Blocking characteristics**

BS: With the conditions described in Table 5.2.8, BER shall be not exceeded 0.1%.

**Table 5.2.8: Test conditions of Blocking characteristics for UMTS BS**

Parameter	Rated output power	Conditions	Unit
Propagation condition	-	Static	-
Wanted signal mean power	-	<REFSENS>+6	dBm
Interfering signal mean power	> 38	-40	dBm
	≤ 38	-35	dBm
	≤ 24	-30	dBm

UE: Requirements of UE Blocking characteristics for extended LTE1500 are specified as in Table 5.2.9.

**Table 5.2.9: Requirements and Test conditions of Blocking characteristics for UMTS UE**

Parameter	Rel99	DC-HSDPA
Propagation condition	Static	
Wanted signal mean power	(<REFSENS>+3) dBm	
Interfering signal mean power	-44dBm	
Bit rate	12.2 kbps	60 kbps
Requirements	BER shall be not exceeded 0.1%.	BLER shall be not exceeded 10%.

**(d) Intermodulation characteristics**

BS: With the conditions described in Table 5.2.10, BER shall be not exceeded 0.1% .

**Table 5.2.10: Test conditions of Intermodulation characteristics for UMTS BS**

Parameter	Rated output power	Conditions	Unit
Propagation condition	-	<b>Static</b>	-
Wanted signal mean power	-	<REFSENS>+6	dBm
Mean power of Interfering signal 1 and 2	> 38	-48	dBm
	≤ 38	-44	dBm
	≤ 24	-38	dBm
Interfering signal 1 characteristic	-	CW, 10MHz offset	-
Interfering signal 2 characteristic	-	Modulated, 20MHz offset	-

UE: Requirements of UE Blocking characteristics for extended LTE1500 are specified as in Table 5.2.11.

**Table 5.2.11: Requirements and Test conditions of Intermodulation characteristics for UMTS UE**

Parameter	Rel99	DC-HSDPA
Propagation condition	Static	
Wanted signal mean power	(<REFSENS>+3) dBm	
Mean power of Interfering signal 1 and 2	-46dBm	
Interfering signal 1	CW, 10MHz offset	
Interfering signal 2	Modulated, 20MHz offset	
Bit rate	12.2 kbps	60 kbps
Requirements	BER shall be not exceeded 0.1%.	BLER shall be not exceeded 10%.

**5.3 Frequency bands and channel arrangement****5.3.1 Frequency bands**

UTRA/FDD is designed to operate in the following paired bands:

**Table 5.3-1: UTRA FDD frequency bands**

Operating Band	UL Frequencies UE transmit, Node B receive	DL frequencies UE receive, Node B transmit
XI <i>[revised]</i>	1427.9 – 1447.94452.9 MHz	1475.9 – 1495.94500.9 MHz
XIX	830 – 845 MHz	875 – 890 MHz
XXI	1447.9 – 1462.9 MHz	1495.9 – 1510.9 MHz

## 5.3.2 TX-RX frequency separation

UTRA/FDD is designed to operate with the following TX-RX frequency separation

**Table 5.3-2: TX-RX frequency separation**

Operating Band	TX-RX frequency separation
XI [revised]	48 MHz
XIX	45 MHz
XXI	48 MHz

## 5.3.3 Channel arrangement

### 5.3.3.1 Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN). For revised Band XI and Band XXI, the UARFCN values are defined as follows:

Uplink:  $N_U = 5 * (F_{UL} - F_{UL\_Offset})$ , for the carrier frequency range  $F_{UL\_low} \leq F_{UL} \leq F_{UL\_high}$

Downlink:  $N_D = 5 * (F_{DL} - F_{DL\_Offset})$ , for the carrier frequency range  $F_{DL\_low} \leq F_{DL} \leq F_{DL\_high}$

For revised Band XI and Band XXI,  $F_{UL\_Offset}$ ,  $F_{UL\_low}$ ,  $F_{UL\_high}$ ,  $F_{DL\_Offset}$ ,  $F_{DL\_low}$  and  $F_{DL\_high}$  are defined in Table 5.3-3 for the general UARFCN. For the additional UARFCN,  $F_{UL\_Offset}$ ,  $F_{DL\_Offset}$  and the specific  $F_{UL}$  and  $F_{DL}$  are defined in Table 5.3-4.

**Table 5.3-3: UARFCN definition (general)**

Band	UPLINK (UL) UE transmit, Node B receive			DOWNLINK (DL) UE receive, Node B transmit		
	UARFCN formula offset $F_{UL\_Offset}$ [MHz]	Carrier frequency ( $F_{UL}$ ) range [MHz]		UARFCN formula offset $F_{DL\_Offset}$ [MHz]	Carrier frequency ( $F_{DL}$ ) range [MHz]	
		$F_{UL\_low}$	$F_{UL\_high}$		$F_{DL\_low}$	$F_{DL\_high}$
XI [revised]	733	1430.4	1445.4 1450.4	736	1478.4	1493.4 1498.4
XIX	770	832.4	842.6	735	877.4	887.6
XXI	1358	1450.4	1460.4	1326	1498.4	1508.4

**Table 5.3-4: UARFCN definition (additional channels)**

Band	UPLINK (UL) UE transmit, Node B receive		DOWNLINK (DL) UE receive, Node B transmit	
	UARFCN formula offset $F_{UL\_Offset}$ [MHz]	Carrier frequency [MHz] ( $F_{UL}$ )	UARFCN formula offset $F_{DL\_Offset}$ [MHz]	Carrier frequency [MHz] ( $F_{DL}$ )
XI [revised]	-	-	-	-
XIX	755.1	832.5, 837.5, 842.5	720.1	877.5, 882.5, 887.5
XXI	-	-	-	-

### 5.3.3.2 UARFCN

The following UARFCN range shall be supported.

**Table 5.3-5: UTRA Absolute Radio Frequency Channel Number**

Band	Uplink (UL) UE transmit, Node B receive		Downlink (DL) UE receive, Node B transmit	
	General	Additional	General	Additional
XI <i>[revised]</i>	3487 to 3562 <del>3587</del>	-	3712 to 3787 <del>3842</del>	-
XIX	312 to 363	387, 412, 437	712 to 763	787, 812, 837
XXI	462 to 512	-	862 to 912	-

## 5.4 Specific UE RF requirements

### 5.4.1 Spurious emissions

Table 5.4.1-1 shows the additional spurious emission limits for extended UMTS 1500 UE [5]. It is noted that unlike the spurious emission limits for extended LTE 1500 UE, for extended UMTS 1500, there is no additional spurious emission limit for the frequency range  $1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$  as that of the current Band XI requirement. However, -60dBm/3.84 MHz for the frequency range  $1475.9 \text{ MHz} \leq f \leq 1500.9 \text{ MHz}$  has been already specified as additional spurious emission limit for the current Band XI in [12].

**Table 5.4.1-1: Additional spurious emission limits for extended UMTS1500 UE**

Frequency range	Maximum level
860MHz – 895MHz	-60dBm/3.84MHz
1844.9MHz – 1879.9MHz	-60dBm/3.84MHz
1884.5MHz – 1919.6MHz	-41dBm/300kHz
2110MHz – 2170MHz	-60dBm/3.84MHz

Since the frequency range of the current Band XI is just reduced by 5 MHz to become revised Band XI, it can be seen that there is no need to change the additional requirements -60 dBm/3.84 MHz of the current Band XI. On the other hands, for Band XXI, since the upper edge of transmission band of Band XXI is closer to the lower edge 1475.9 MHz of the spurious emission frequency range than that of the current Band XI by 10 MHz. Considering the practical UE performance on spurious emission, it seems to be highly challenging to specify the same additional requirements of revised Band XI. Therefore, the same additional spurious emission limits of Band 21 for LTE are applied to Band XXI for UMTS. The additional spurious emissions of revised Band XI and XXI are summarized as shown in Table 5.4.1-2.

**Table 5.4.1-2: Additional spurious emission limits for extended UMTS1500 UE**

Operating band	Frequency range	Maximum level
Band XI	$1475.9 \text{ MHz} \leq f \leq 1500.9 \text{ MHz}$	-60dBm/3.84MHz
Revised Band XI	$1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$	-60dBm/3.84MHz
Band XXI	$1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$	-35dBm/1MHz

Finally the spurious emissions requirements are summarized in the below Table 5.4.1-3.



Table 5.4.1-3: Additional spurious emissions requirements

Operating Band	Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
I	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	-60 dBm
	921 MHz ≤ f < 925 MHz	100 kHz	-60 dBm
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	-67 dBm -60 dBm
	935 MHz < f ≤ 960 MHz	100 kHz	-79 dBm
	1475.9 MHz ≤ f ≤ 1510.9 MHz	3.84 MHz	-60 dBm
	1805 MHz ≤ f ≤ 1880 MHz	100 kHz	-71 dBm
	1844.9 MHz ≤ f ≤ 1879.9 MHz	3.84 MHz	-60 dBm
	1884.5 MHz < f < 1919.6 MHz	300 kHz	-41 dBm
	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm
VI	2620 MHz ≤ f ≤ 2690 MHz	3.84 MHz	-60 dBm
	860 MHz ≤ f < 875 MHz	1 MHz	-37 dBm
	875 MHz ≤ f ≤ 895 MHz	3.84 MHz	-60 dBm
	1475.9 MHz ≤ f ≤ 1510.9 MHz	3.84 MHz	-60 dBm
	1844.9 MHz ≤ f ≤ 1879.9 MHz	3.84 MHz	-60 dBm
	1884.5 MHz ≤ f ≤ 1919.6 MHz	300 kHz	-41 dBm
IX	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm
	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	-60 dBm
	1475.9 MHz ≤ f ≤ 1510.9 MHz	3.84 MHz	-60 dBm
	1844.9 MHz ≤ f ≤ 1879.9 MHz	3.84 MHz	-60 dBm
	1884.5 MHz ≤ f ≤ 1919.6 MHz	300 kHz	-41 dBm
XI	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm
	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	-60 dBm
	1475.9 MHz ≤ f ≤ 1510.9 MHz	3.84 MHz	-60 dBm
	1844.9 MHz ≤ f ≤ 1879.9 MHz	3.84 MHz	-60 dBm
	1884.5 MHz ≤ f ≤ 1919.6 MHz	300 kHz	-41 dBm
XIX	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm
	860 MHz ≤ f < 875 MHz	1 MHz	-37 dBm
	875 MHz ≤ f ≤ 895 MHz	3.84 MHz	-60 dBm
	1475.9 MHz ≤ f ≤ 1510.9 MHz	3.84 MHz	-60 dBm
	1844.9 MHz ≤ f ≤ 1879.9 MHz	3.84 MHz	-60 dBm
	1884.5 MHz ≤ f ≤ 1919.6 MHz	300 kHz	-41 dBm
XXI	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm
	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	-60 dBm
	1475.9 MHz ≤ f ≤ 1510.9 MHz	1 MHz	-35 dBm
	1844.9 MHz ≤ f ≤ 1879.9 MHz	3.84 MHz	-60 dBm
	1884.5 MHz ≤ f ≤ 1919.6 MHz	300 kHz	-41 dBm

## 5.4.2 Reference sensitivity level

### 5.4.2.1 Brief overview

The reference sensitivity for the 1500 MHz band in Japan is specified by the Telecommunication Council of Japan as follows [3]. These requirements are not mandatory, but operators are highly recommended to fulfill the requirements when operating within this frequency range, i.e. UL: 1427.9 – 1462.9 MHz/ DL: 1475.9 – 1510.9 MHz (35 MHz pass bandwidth).

- The reference sensitivity level for UMTS is set as -114.3 dBm
- The reference sensitivity level for LTE is set as:

**Table 5.4.2.1-1: UE reference sensitivity levels for LTE**

Channel BW	UE reference sensitivity level (dBm)
5MHz	-97.3
10MHz	-94.3
15MHz	-92.5

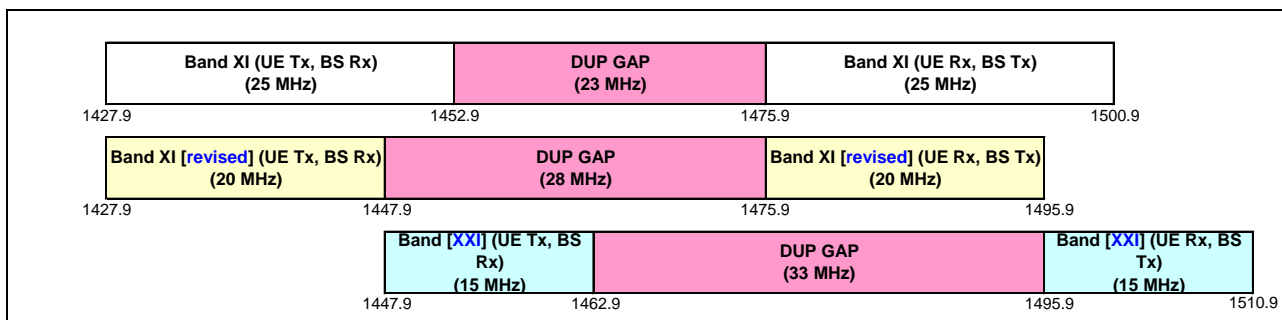
On the other hand, as stated in WI [1], since the existing duplexer cannot satisfy the above reference sensitivity without requiring a split band approach, it was proposed to separate the entire frequency range into two sub bands, i.e. revised Band XI/11 and Band XXI/21. With the separation, it is supposed that the reference sensitivities of those sub bands would be different to the above requirements.

Regarding the case which supports the entire frequency range, operators are also highly recommended to satisfy at least the above reported requirements by using the future performance enhancements in duplexer technologies. However, the concrete specification is for further study and not discussed in this contribution.

### 5.4.2.2 Observation for UMTS

The relation between the existing Band XI, revised Band XI and Band XXI is illustrated in Figure 5.4.2.2-1. The relative duplex gap and relative bandwidth of those bands are also listed in Table 5.4.2.2-1 [9, 10]. From Figure 1, it can be seen that revised Band XI and Band XXI have narrower pass bands and broader duplex bands comparing to the existing Band XI. On the other hand, the relative duplex gap and relative bandwidth of revised Band XI and XXI are respectively higher and lower than that of the existing Band XI in Table 5.4.2.2-1.

From the above observation, it is supposed that the duplexer design for revised Band XI and Band XXI should be easier than for the existing Band XI. This also means that the reference sensitivity of revised Band XI and XXI is expected to be higher than that of the existing Band XI.



**Figure 5.4.2.2-1 Frequency arrangement for Band XI, revised Band XI and Band XXI**

**Table 5.4.2.2-1: comparison of fractional ratio of each band**

	Band XI	Band XI [revised]	Band XXI
Relative duplex gap (%)	1.57	1.92	2.23
Relative bandwidth (%) <sup>Note 1</sup>	1.74	1.39	1.03
Note 1: The figures are derived from the center frequency of Tx band.			

### 5.4.2.3 Evaluation of the reference sensitivity of revised Band XI for UMTS

To verify the above expectation, a prototype UE was developed taking into account the aspects forward commercial service: corresponding bands, protocol stack and so on. It should be noted that the UE also, by definition, satisfies the basic Tx and Rx requirements. The measurements of the reference sensitivity of revised Band XI using the UE were conducted at normal temperature condition. Measurement results comparing to the reference sensitivity -117 dBm/3.84 MHz of Band I, IV, VI, X and XIX are shown in Table 5.4.2.3-1.

**Table 5.4.2.3-1: Measurement results of the reference sensitivity (14 sample units were used)**

Test points	Reference sensitivity DPCH_Ec (dBm/3.84 MHz)				-117 dBm/3.84 MHz- each result (dB)			
	1430.4 MHz	1435.4 MHz	1440.4 MHz	1445.4 MHz	1430.4 MHz	1435.4 MHz	1440.4 MHz	1445.4 MHz
Min	-122.5	-122.5	-122.5	-122.5	5.5	5.5	5.5	5.5
Max	-123.0	-123.5	-123.5	-123.0	6.0	6.5	6.5	6.0

From the above results, it can be seen that the UE meets the reference sensitivity level of -117 dBm/3.84 MHz with at least 5.5 dB margins over the frequency range 1427.9 MHz – 1447.9 MHz of revised Band XI. Therefore, it can be concluded that the revised Band XI UE can sufficiently satisfy the reference sensitivity level of -117 dBm/3.84 MHz even when the filter temperature shift is considered [11].

#### 5.4.2.4 Proposal of reference sensitivity of revised Band XI and Band XXI for UMTS

From the above analysis, it can be seen that the reference sensitivity level of revised Band XI can satisfy -117 dBm/3.84 MHz over the whole frequency range in both normal temperature and with the filter temperature shift. In addition, from the relation of relative duplex gap and relative bandwidth between revised Band XI and Band XXI in Table 5.4.2.2-1, it can be observed that the duplexer design of Band XXI is easier than that of revised Band XI. Therefore, we propose the same reference sensitivity requirement of -117 dBm/3.84 MHz for revised Band XI and Band XXI. The proposed requirements for TS25.101 are summarized in Table 5.4.2.4-1.

**Table 5.4.2.4-1: Reference sensitivity for UMTS**

Operating Band	Unit	DPCH_Ec <REFSENS>	<REF <sub>or</sub> >
XI [revised]	dBm/3.84 MHz	-117 -115	-106.7 -104.7
XXI	dBm/3.84 MHz	-117	-106.7

Note: For the UE which supports both revised Band XI and Band XXI by using the single duplexer, the reference sensitivity level is FFS.

## 5.5 Specific BS RF requirements

### 5.5.1 Blocking requirements

UTRA BS Blocking requirements for Band XI and Band XXI should be specified separately. But the following note is included in this TR considering the BS which supports both Band XI and Band XXI operating bands.

“NOTE: The minimum test requirements for BS which supports both Band XI and Band XXI operating frequencies, are FFS.”

## 6 Study of E-UTRA requirements

### 6.1 Co-existing with other technologies

The study on the technical conditions for LTE has been conducted by the Telecommunications Council of Japan which includes co-existence studies with the following existing technologies: Radio astronomy systems and Mobile satellite communications service. As a result of this study, technical condition of E-UTRA was lead as provided in [5].

### 6.2 Technical conditions for E-UTRA

The technical conditions for extended LTE1500 were derived based on the requirements for 1500MHz band (revised E-UTRA Band 11 and new E-UTRA bands). Necessary changes such as the frequency arrangement or spurious emission requirements were made. Those changes and its rationale are summarized in the following sub sections. Revised parts compared with requirements for Band 11 are underlined>.

#### 6.2.1 Mandatory regulatory requirements:

##### (a) Frequency arrangement:

The frequency band for extended LTE1500 in Japan is as follows:

UL: 1427.9MHz – 1462.9MHz  
 DL: 1475.9MHz – 1510.9MHz  
 Tx-Rx frequency separation: 48MHz

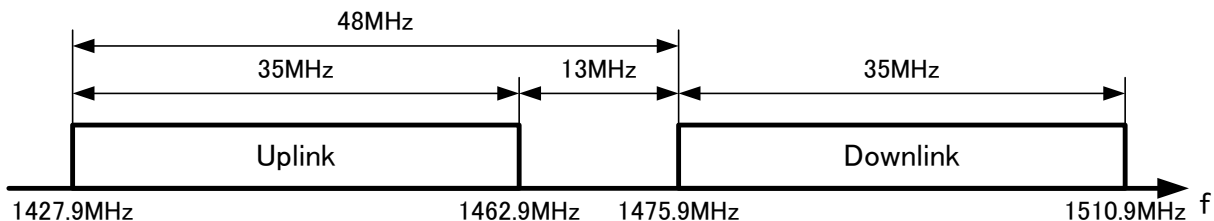


Figure 6.2-1: Frequency band for extended LTE1500

##### (b) Frequency error:

Frequency error requirements for extended LTE1500 are specified same as other Bands shown following;

- BS: The modulated carrier frequency of the BS shall be accurate to within  $\pm (0.05\text{ppm}+12\text{Hz})$ .
- UE: The UE modulated carrier frequency shall be accurate to within  $\pm (0.1\text{ppm}+15\text{Hz})$  compared to the carrier frequency received from the eNode B.

##### (c) Spurious emissions:

Spurious emissions requirements for extended LTE1500 are specified as in Table 6.2.1.

Table 6.2.1: Spurious emission requirements for extended LTE1500

Parameter		Requirement																							
Spurious emissions limits	BS	<p align="center"><b>Table 6.2.1-1: Spurious emissions limits for extended LTE1500 BS</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>9kHz – 150kHz</td> <td>-13dBm/1kHz</td> </tr> <tr> <td>150kHz – 30MHz</td> <td>-13dBm/10kHz</td> </tr> <tr> <td>30MHz – 1000MHz</td> <td>-13dBm/100kHz</td> </tr> <tr> <td>1000MHz – 12.75GHz</td> <td>-13dBm/1MHz</td> </tr> </tbody> </table> <p>The requirements are only applicable for frequencies, which are greater than 10 MHz away from the BS transmitter operating band edge.</p> <p align="center"><b>Table 6.2.1-2: Additional spurious emission limits for extended LTE1500 BS</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>1884.5MHz – 1919.6MHz</td> <td>-41dBm/300kHz *</td> </tr> <tr> <td>2010MHz – 2025MHz</td> <td>-52dBm/1MHz</td> </tr> </tbody> </table> <p>Note*: The requirement is applicable even if the frequencies are lesser than 10MHz away from the BS transmitter operating band edge.</p>	Frequency range	Maximum level	9kHz – 150kHz	-13dBm/1kHz	150kHz – 30MHz	-13dBm/10kHz	30MHz – 1000MHz	-13dBm/100kHz	1000MHz – 12.75GHz	-13dBm/1MHz	Frequency range	Maximum level	1884.5MHz – 1919.6MHz	-41dBm/300kHz *	2010MHz – 2025MHz	-52dBm/1MHz							
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		2010MHz – 2025MHz	-52dBm/1MHz																						
		UE	<p>The requirements below are only applicable for frequencies, which are greater than 12.5 MHz away from the UE centre carrier frequency for 5MHz LTE system. Likewise, greater than 20MHz for 10MHz LTE system, greater than 27.5MHz for 15MHz LTE system and greater than 35MHz for 20MHz LTE system.</p> <p align="center"><b>Table 6.2.1-3: Spurious emission limits for extended LTE1500 UE</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>9kHz – 150kHz</td> <td>-36dBm/1kHz</td> </tr> <tr> <td>150kHz – 30MHz</td> <td>-36dBm/10kHz</td> </tr> <tr> <td>30MHz – 1000MHz</td> <td>-36dBm/100kHz</td> </tr> <tr> <td>1000MHz – 12.75GHz</td> <td>-30dBm/1MHz</td> </tr> </tbody> </table> <p align="center"><b>Table 6.2.1-4: Additional spurious emission limits for extended LTE1500 UE</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>860MHz – 895MHz</td> <td>-50dBm/1MHz</td> </tr> <tr> <td>1475.9MHz – 1510.9MHz</td> <td>-35dBm/1MHz <sup>(Note)</sup></td> </tr> <tr> <td>1844.9MHz – 1879.9MHz</td> <td>-50dBm/1MHz</td> </tr> <tr> <td>1884.5MHz – 1919.6MHz</td> <td>-41dBm/300kHz</td> </tr> <tr> <td>2010MHz – 2025MHz</td> <td>-50dBm/1MHz</td> </tr> <tr> <td>2110MHz – 2170MHz</td> <td>-50dBm/1MHz</td> </tr> </tbody> </table> <p>(Note) Not applied for 5MHz LTE system.</p>	Frequency range	Maximum level	9kHz – 150kHz	-36dBm/1kHz	150kHz – 30MHz	-36dBm/10kHz	30MHz – 1000MHz	-36dBm/100kHz	1000MHz – 12.75GHz	-30dBm/1MHz	Frequency range	Maximum level	860MHz – 895MHz	-50dBm/1MHz	1475.9MHz – 1510.9MHz	-35dBm/1MHz <sup>(Note)</sup>	1844.9MHz – 1879.9MHz	-50dBm/1MHz	1884.5MHz – 1919.6MHz	-41dBm/300kHz	2010MHz – 2025MHz	-50dBm/1MHz
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**(d) Adjacent Channel Leakage power Ratio (ACLR):**

Adjacent Channel Leakage power Ratio (ACLR) requirements for extended LTE1500 are specified same as other Bands shown in Table 6.2.2. ACLR limits include the test tolerance which is specified in TS36.141 and TS36.521-1.

**Table 6.2.2: ACLR requirements for extended LTE1500**

Requirement																																																									
BS	<p>Either the ACLR limits in the Table 6.2.2-1 below or the absolute limit of -13dBm/MHz apply, whichever is less stringent</p> <p style="text-align: center;"><b>Table 6.2.2-1: ACLR for extended LTE1500 BS</b></p> <table border="1"> <thead> <tr> <th>System</th> <th>Frequency separation</th> <th>ACLR limit</th> <th>Measurement bandwidth</th> </tr> </thead> <tbody> <tr> <td rowspan="4">5MHz</td> <td>5MHz</td> <td>-44.2dBc</td> <td>4.5MHz</td> </tr> <tr> <td>10MHz</td> <td>-44.2dBc</td> <td>4.5MHz</td> </tr> <tr> <td>5MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>10MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td rowspan="4">10MHz</td> <td>10MHz</td> <td>-44.2dBc</td> <td>9MHz</td> </tr> <tr> <td>20MHz</td> <td>-44.2dBc</td> <td>9MHz</td> </tr> <tr> <td>7.5MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>12.5MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td rowspan="4">15MHz</td> <td>15MHz</td> <td>-44.2dBc</td> <td>13.5MHz</td> </tr> <tr> <td>30MHz</td> <td>-44.2dBc</td> <td>13.5MHz</td> </tr> <tr> <td>10MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>15MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td rowspan="4">20MHz</td> <td>20MHz</td> <td>-44.2dBc</td> <td>18MHz</td> </tr> <tr> <td>40MHz</td> <td>-44.2dBc</td> <td>18MHz</td> </tr> <tr> <td>12.5MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>17.5MHz</td> <td>-44.2dBc</td> <td>3.84MHz</td> </tr> </tbody> </table>	System	Frequency separation	ACLR limit	Measurement bandwidth	5MHz	5MHz	-44.2dBc	4.5MHz	10MHz	-44.2dBc	4.5MHz	5MHz	-44.2dBc	3.84MHz	10MHz	-44.2dBc	3.84MHz	10MHz	10MHz	-44.2dBc	9MHz	20MHz	-44.2dBc	9MHz	7.5MHz	-44.2dBc	3.84MHz	12.5MHz	-44.2dBc	3.84MHz	15MHz	15MHz	-44.2dBc	13.5MHz	30MHz	-44.2dBc	13.5MHz	10MHz	-44.2dBc	3.84MHz	15MHz	-44.2dBc	3.84MHz	20MHz	20MHz	-44.2dBc	18MHz	40MHz	-44.2dBc	18MHz	12.5MHz	-44.2dBc	3.84MHz	17.5MHz	-44.2dBc	3.84MHz
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5MHz	5MHz	-44.2dBc	4.5MHz																																																						
	10MHz	-44.2dBc	4.5MHz																																																						
	5MHz	-44.2dBc	3.84MHz																																																						
	10MHz	-44.2dBc	3.84MHz																																																						
10MHz	10MHz	-44.2dBc	9MHz																																																						
	20MHz	-44.2dBc	9MHz																																																						
	7.5MHz	-44.2dBc	3.84MHz																																																						
	12.5MHz	-44.2dBc	3.84MHz																																																						
15MHz	15MHz	-44.2dBc	13.5MHz																																																						
	30MHz	-44.2dBc	13.5MHz																																																						
	10MHz	-44.2dBc	3.84MHz																																																						
	15MHz	-44.2dBc	3.84MHz																																																						
20MHz	20MHz	-44.2dBc	18MHz																																																						
	40MHz	-44.2dBc	18MHz																																																						
	12.5MHz	-44.2dBc	3.84MHz																																																						
	17.5MHz	-44.2dBc	3.84MHz																																																						
UE	<p>The adjacent channel power shall be less than or equal to -50 dBm/ 4.5MHz (5MHz system) or -50 dBm/ 9MHz (10MHz system ) or -50 dBm/ 13.5MHz (15MHz system ) or -50 dBm/ 18MHz (20MHz system ) or -50 dBm/ 3.84MHz or as specified by the ACLR limit in the Table 6.2.2-2, whichever is least stringent.</p> <p style="text-align: center;"><b>Table 6.2.2-2: ACLR for extended LTE1500 UE</b></p> <table border="1"> <thead> <tr> <th>System</th> <th>Frequency separation</th> <th>ACLR limit</th> <th>Measurement bandwidth</th> </tr> </thead> <tbody> <tr> <td rowspan="3">5MHz</td> <td>5MHz</td> <td>-29.2dBc</td> <td>4.5MHz</td> </tr> <tr> <td>5MHz</td> <td>-32.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>10MHz</td> <td>-35.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td rowspan="3">10MHz</td> <td>10MHz</td> <td>-29.2dBc</td> <td>9MHz</td> </tr> <tr> <td>7.5MHz</td> <td>-32.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>12.5MHz</td> <td>-35.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td rowspan="3">15MHz</td> <td>15MHz</td> <td>-29.2dBc</td> <td>13.5MHz</td> </tr> <tr> <td>10MHz</td> <td>-32.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>15MHz</td> <td>-35.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td rowspan="3">20MHz</td> <td>20MHz</td> <td>-29.2dBc</td> <td>18MHz</td> </tr> <tr> <td>12.5MHz</td> <td>-32.2dBc</td> <td>3.84MHz</td> </tr> <tr> <td>17.5MHz</td> <td>-35.2dBc</td> <td>3.84MHz</td> </tr> </tbody> </table>	System	Frequency separation	ACLR limit	Measurement bandwidth	5MHz	5MHz	-29.2dBc	4.5MHz	5MHz	-32.2dBc	3.84MHz	10MHz	-35.2dBc	3.84MHz	10MHz	10MHz	-29.2dBc	9MHz	7.5MHz	-32.2dBc	3.84MHz	12.5MHz	-35.2dBc	3.84MHz	15MHz	15MHz	-29.2dBc	13.5MHz	10MHz	-32.2dBc	3.84MHz	15MHz	-35.2dBc	3.84MHz	20MHz	20MHz	-29.2dBc	18MHz	12.5MHz	-32.2dBc	3.84MHz	17.5MHz	-35.2dBc	3.84MHz												
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	12.5MHz	-32.2dBc	3.84MHz																																																						
	17.5MHz	-35.2dBc	3.84MHz																																																						

**(e) Spectrum emission mask:**

Spectrum emission mask for extended LTE1500 are specified same as other Bands larger than 1GHz shown following;

BS: Spectrum emission mask requirements for extended LTE1500 are specified as in Table 6.2.3.

UE: Spectrum emission mask requirements for extended LTE1500 are specified as in Table 6.2.4.

Spectrum emission mask requirements include the test tolerance which is specified in TS36.141 and TS36.521-1.

**Table 6.2.3: Spectrum emission mask requirements for extended LTE1500 BS**

$\Delta f$ in MHz (Note)	Requirement	Measurement bandwidth
$0.05 \leq \Delta f < 5.05$	$-5.5\text{dBm} - 7/5 \times (\Delta f - 0.05)\text{dB}$	100 kHz
$5.05 \leq \Delta f < 10.05$	-12.5dBm	100 kHz
$10.05 \leq \Delta f$	-13dBm	1 MHz

(Note)  $\Delta f$  is offset frequency from edge of channel bandwidth.

**Table 6.2.4: Spectrum emission mask requirements for extended LTE1500 UE**

$\Delta f$ in MHz (Note)	Requirement (dBm)				Measurement bandwidth
	5MHz system	10MHz system	15MHz system	20MHz system	
$0 \leq \Delta f < 1$	-13.5	-16.5	-18.5	-19.5	30 kHz
$1 \leq \Delta f < 2.5$	-8.5	-8.5	-8.5	-8.5	1 MHz
$2.5 \leq \Delta f < 5$	-8.5	-8.5	-8.5	-8.5	1 MHz
$5 \leq \Delta f < 6$	-11.5	-11.5	-11.5	-11.5	1 MHz
$6 \leq \Delta f < 10$	-23.5	-11.5	-11.5	-11.5	1 MHz
$10 \leq \Delta f < 15$		-23.5	-11.5	-11.5	1 MHz
$15 \leq \Delta f < 20$			-23.5	-11.5	1 MHz
$20 \leq \Delta f < 25$				-23.5	1 MHz

(Note)  $\Delta f$  is offset frequency from edge of channel bandwidth.

#### (f) Occupied bandwidth:

Occupied bandwidth for extended LTE1500 are specified same as other Bands shown following;

The occupied channel bandwidth shall be less than 5 MHz (5MHz system) or 10MHz (10MHz system) or 15MHz (15MHz system) or 20MHz (20MHz system).

#### (g) Maximum output power

Maximum output power for extended LTE1500 are specified same as other Bands shown following;

BS: In normal conditions, the Base station maximum output power shall remain within +2.7dB and -2.7dB of the manufacturer's rated output power.

UE: The maximum output power which is defined 23dBm in normal conditions, shall remain within +2.7dB and -2.7dB.

#### (h) Transmit OFF power

Transmit OFF power for extended LTE1500 are specified same as other Bands shown following;

BS: Not specified.

UE: Transmit OFF power requirements are specified as in Table 6.2.5.

**Table 6.2.5: Transmit OFF power requirements for extended LTE1500 UE**

Channel bandwidth	Transmit OFF power	Measurement bandwidth
5MHz	-48.5dBm	4.5 MHz
10MHz	-48.5dBm	9 MHz
15MHz	-48.5dBm	13.5 MHz
20MHz	-48.5dBm	18 MHz

Transmit OFF power requirements include the test tolerance which is specified in TS36.521-1.

### (i) Transmit Intermodulation

Transmit Intermodulation for extended LTE1500 are specified same as other Bands shown following;

BS: The transmit intermodulation level is the power of the intermodulation products when a LTE modulated interference signal is injected into the antenna connector at a mean power level of 30 dB lower than that of the mean power of the wanted signal. The occupied bandwidth for the interference signal is specified as 5MHz. The frequency of the interference signal shall be  $\pm 5$  MHz,  $\pm 10$  MHz,  $\pm 15$  MHz (5MHz system),  $\pm 7.5$  MHz,  $\pm 12.5$  MHz,  $\pm 17.5$  MHz (10MHz system),  $\pm 10$  MHz,  $\pm 15$  MHz,  $\pm 20$  MHz (15MHz system),  $\pm 12.5$  MHz,  $\pm 17.5$  MHz,  $\pm 22.5$  MHz (20MHz system) offset from the subject signal carrier frequency. The transmitter intermodulation level shall not exceed the out of band emission or spectrum emission mask or the spurious emission requirements.

UE: Not specified.

### (j) Receiver Spurious emissions:

Receiver Spurious emissions requirements for extended UMTS/LTE1500 are specified as in Table 6.2.6.

**Table 6.2.6: Receiver Spurious emission requirements for extended LTE1500**

Parameter		Requirement								
Receiver spurious emissions limits	BS	<p><b>Table 6.2.6-1: Receiver spurious emission limits for extended LTE1500 BS</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>30MHz – 1000MHz</td> <td>-57dBm/100kHz</td> </tr> <tr> <td>1GHz – 12.75GHz</td> <td>-47dBm/1MHz*</td> </tr> <tr> <td>2010MHz – 2025MHz</td> <td>-52dBm/1MHz</td> </tr> </tbody> </table> <p>Note*: With the exception of frequencies between 1465.9MHz and 1520.9MHz.</p>	Frequency range	Maximum level	30MHz – 1000MHz	-57dBm/100kHz	1GHz – 12.75GHz	-47dBm/1MHz*	2010MHz – 2025MHz	-52dBm/1MHz
	Frequency range	Maximum level								
30MHz – 1000MHz	-57dBm/100kHz									
1GHz – 12.75GHz	-47dBm/1MHz*									
2010MHz – 2025MHz	-52dBm/1MHz									
UE	<p><b>Table 6.2.6-2: Receiver spurious emissions limits for extended LTE1500 UE</b></p> <table border="1"> <thead> <tr> <th>Frequency range</th> <th>Maximum level</th> </tr> </thead> <tbody> <tr> <td>30MHz – 1000MHz</td> <td>-57dBm/100kHz</td> </tr> <tr> <td>1GHz – 12.75GHz</td> <td>-47dBm/1MHz</td> </tr> </tbody> </table>	Frequency range	Maximum level	30MHz – 1000MHz	-57dBm/100kHz	1GHz – 12.75GHz	-47dBm/1MHz			
Frequency range	Maximum level									
30MHz – 1000MHz	-57dBm/100kHz									
1GHz – 12.75GHz	-47dBm/1MHz									

## 6.2.2 Other technical conditions referred in Japan's regulations:

### (a) Reference sensitivity level

BS: The reference sensitivity level is -100.8dBm. This requirement is applied with a width of 25 resource blocks each for each channel BW. The reference sensitivity level includes the test tolerance which is specified in TS36.141.



UE: The reference sensitivity level for extended LTE1500 are specified as in Table 6.2.7.

**Table 6.2.7: LTE UE reference sensitivity levels**

Channel BW	UE reference sensitivity level
5MHz	-97.3dBm
10MHz	-94.3dBm
15MHz	-92.5dBm
20MHz	-91.3dBm

These values include the test tolerance (0.7dB) which is specified in TS36.521-1.

### (b) Adjacent Channel Selectivity (ACS)

BS: With the conditions described in Table 6.2.8, the throughput shall be larger than or equal to 95 percent of the maximum throughput.

**Table 6.2.8: Test conditions of Adjacent channel selectivity for LTE BS**

Parameter	Channel bandwidth				Unit
	5MHz	10MHz	15MHz	20MHz	
Propagation condition	Static				-
Wanted signal characteristic	QPSK, code rate:1/3				-
Wanted signal mean power	<REFSENS>+6				dBm
Interfering signal mean power	-52	-52	-52	-52	dBm
Few offset (Modulated)	5	7.5	10	12.5	MHz

UE: With the conditions described in Table 6.2.9, the throughput shall be larger than or equal to 95 percent of the maximum throughput.

**Table 6.2.9: Test conditions of Adjacent Channel Selectivity for LTE UE**

Parameter	Channel bandwidth				Unit
	5MHz	10MHz	15MHz	20MHz	
Propagation condition	Static				-
Wanted signal characteristic	QPSK, code rate:1/3				-
Wanted signal mean power	<REFSENS>+14				dBm
Interfering signal characteristic	5MHz BW modulated				-
Interfering signal mean power	<REFSENS> +45.5	<REFSENS> +45.5	<REFSENS> +42.5	<REFSENS> +39.5	dBm
Few offset	5	7.5	10	12.5	MHz

### (c) Blocking characteristics

BS: With the conditions described in Table 6.2.10, the throughput shall be larger than or equal to 95 percent of the maximum throughput.

**Table 6.2.10: Test conditions of Blocking characteristics for LTE BS**

Parameter	Channel bandwidth				Unit
	5MHz	10MHz	15MHz	20MHz	
Propagation condition	Static				-
Wanted signal characteristic	QPSK, code rate:1/3				-
Wanted signal mean power	<REFSENS>+6				dBm
Interfering signal characteristic	5MHz BW modulated				-
Interfering signal mean power	-43	-43	-43	-43	dBm
Few offset	10	12.5	15	17.5	MHz

UE: With the conditions described in Table 6.2.11, the throughput shall be larger than or equal to 95 percent of the maximum throughput.

**Table 6.2.11: Test conditions of Blocking characteristics for LTE UE**

Parameter	Channel bandwidth				Unit
	5MHz	10MHz	15MHz	20MHz	
Propagation condition	Static				-
Wanted signal characteristic	QPSK, code rate:1/3				-
Wanted signal mean power	<REFSENS>+6		<REFSENS>+7	<REFSENS>+9	dBm
Interfering signal 1	Characteristic	5MHz BW modulated			-
	Mean power	-56			dBm
	Few offset	10	12.5	15	17.5
Interfering signal 2	Characteristic	5MHz BW modulated			-
	Mean power	-44			dBm
	Few offset	≥15	≥17.5	≥20	≥22.5

**(d) Intermodulation characteristics**

BS: With the conditions described in Table 6.2.12, the throughput shall be larger than or equal to 95 percent of the maximum throughput.

**Table 6.2.12: Test conditions of Intermodulation characteristics for LTE BS**

Parameter	Channel bandwidth				Unit
	5MHz	10MHz	15MHz	20MHz	
Propagation condition	Static				-
Wanted signal characteristic	QPSK, code rate:1/3				-
Wanted signal mean power	<REFSENS>+6				dBm
Interfering signal 1	Characteristic	CW			-
	Mean power	-52			dBm
	Few offset	10	12.5	15	17.5
Interfering signal 2	Characteristic	5MHz BW modulated			-
	Mean power	-52			dBm
	Few offset	20	22.7	25.5	28.2

UE: With the conditions described in Table 6.2.13, the throughput shall be larger than or equal to 95 percent of the maximum throughput.

Table 6.2.13: Test conditions of Intermodulation characteristics for LTE UE

Parameter		Channel bandwidth				Unit
		5MHz	10MHz	15MHz	20MHz	
Propagation condition		Static				-
Wanted signal characteristic		QPSK, code rate:1/3				-
Wanted signal mean power		<REFSENS>+6		<REFSENS>+7	<REFSENS>+9	dBm
Interfering signal 1	Characteristic	CW				-
	Mean power	-46				dBm
	Few offset	10	12.5	15	17.5	MHz
Interfering signal 2	Characteristic	5MHz BW modulated				-
	Mean power	-46				dBm
	Few offset	20	25	30	35	MHz

## 6.3 Operating bands and channel arrangement

### 6.3.1 Operating bands

E-UTRA is designed to operate in the operating bands defined in Table 6.3-1.

Table 6.3-1: E-UTRA operating bands

EUTRA Operating Band	Uplink (UL) operating band BS receive UE transmit		Downlink (DL) operating band BS transmit UE receive		Duplex Mode
	$F_{UL\_low}$	$F_{UL\_high}$	$F_{DL\_low}$	$F_{DL\_high}$	
11 [revised]	1427.9 MHz	1447.9 MHz <del>1452.9 MHz</del>	1475.9 MHz	1495.9 MHz <del>1500.9 MHz</del>	FDD
19	830 MHz	845 MHz	875 MHz	890 MHz	FDD
21	1447.9 MHz	1462.9 MHz	1495.9 MHz	1510.9 MHz	FDD
...					
33	1900 MHz	1920 MHz	1900 MHz	1920 MHz	TDD

### 6.3.2 TX–RX frequency separation

a) The default E-UTRA TX channel (carrier centre frequency) to RX channel (carrier centre frequency) separation is specified in Table 6.3-2 for the TX and RX channel bandwidths defined in Table 6.3-1

Table 6.3-2: Default UE TX-RX frequency separation

Frequency Band	TX - RX carrier centre frequency separation
11 [revised]	48 MHz
19	45 MHz
21	48 MHz

### 6.3.3 Channel arrangement

#### 6.3.3.1 Carrier frequency and EARFCN

The carrier frequency in the uplink and downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) in the range 0 - 65535. The relation between EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where  $F_{DL\_low}$  and  $N_{OBS-DL}$  are given in table 6.3-3 and  $N_{DL}$  is the downlink EARFCN.

$$F_{DL} = F_{DL\_low} + 0.1(N_{DL} - N_{Offs-DL})$$

The relation between EARFCN and the carrier frequency in MHz for the uplink is given by the following equation where  $F_{UL\_low}$  and  $N_{Offs-UL}$  are given in table 6.3-3 and  $N_{UL}$  is the uplink EARFCN.

$$F_{UL} = F_{UL\_low} + 0.1(N_{UL} - N_{Offs-UL})$$

**Table 6.3-3: E-UTRA channel numbers**

E-UTRA Operating Band	Downlink			Uplink		
	$F_{DL\_low}$ (MHz)	$N_{Offs-DL}$	Range of $N_{DL}$	$F_{UL\_low}$ (MHz)	$N_{Offs-UL}$	Range of $N_{UL}$
11 [revised]	1475.9	4750	4750 – 4949 <del>4999</del>	1427.9	22750	22750 – 22949 <del>22999</del>
19	875	6000	6000 – 6149	830	24000	24000 – 24149
21	1495.9	6450	6450 – 6599	1447.9	24450	24450 – 24599
...						
33	1900	26000	36000 – 36199	1900	36000	36000 – 36199

### 6.3.4 Channel bandwidths per operating band

The requirements in this specification apply to the combination of channel bandwidths and operating bands shown in Table 6.3-4. The transmission bandwidth configuration in Table 6.3-4 shall be supported for each of the specified channel bandwidths. The same (symmetrical) channel bandwidth is specified for both the TX and RX path.

**Table 6.3-4: E-UTRA channel bandwidth**

E-UTRA Band	E-UTRA band / channel bandwidth					
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
11 [revised]			Yes	Yes <sup>[1]</sup>		
19			Yes	Yes <sup>[1]</sup>	Yes <sup>[1]</sup>	
21			Yes	Yes <sup>[1]</sup>	Yes <sup>[1]</sup>	
...						
33			Yes	Yes	Yes	Yes
NOTE 1: bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (Section 6.4.3) is allowed.						

## 6.4 Specific UE RF requirements

### 6.4.1 Maximum output power

Based on the analysis on the relative duplex distance for LTE 1.5GHz band, zero  $\Delta TC$  should be applied for the revised Band 11 and Band 21 which results in no relaxation of the UE output power at its corner frequency ranges. For the UE which supports both Band 11 and Band 21 operating frequencies with single duplexer, applicability of non-zero  $\Delta TC$  is FFS.

### 6.4.2 Maximum output power with additional requirements

When “NS\_09” is indicated in the cell, the power of any UE spurious emission shall not exceed the level specified in Table 6.4.3.2-1. In particular, based on the study in 6.3.2.2, the UEs which support Band 21 are allowed to use A-MPR as shown in Table 6.4.2-1 in addition to the allowed MPR requirements specified in clause 6.2.3 [13].

**Table 6.4.2.-1 Additional Maximum Power Reduction (A-MPR)**

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks	A-MPR (dB)
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2

## 6.4.3 Spurious emissions

### 6.4.3.1 Spurious emission band UE co-existence for LTE

In Japan, the technical conditions for the effective use of mobile commercial-use frequencies for LTE and other next generation communication systems had been investigated by the study group under the Telecommunications Council [5, 6, 7]. The technical conditions for extended LTE 1500 had also been investigated within the study group, and by considering the operation in up to 20 MHz channel bandwidth for the whole extended band (35 MHz) with the corresponding traffic increase, the additional spurious emission limit for extended LTE 1500 was specified as regulations as follows [5].

**Table 6.4.3.1-1: Additional spurious emission limits for extended LTE1500 UE**

Frequency range	Maximum level
860MHz – 895MHz	-50dBm/1MHz
1475.9MHz – 1510.9MHz (Note)	-35dBm/1MHz *
1844.9MHz – 1879.9MHz	-50dBm/1MHz
1884.5MHz – 1919.6MHz	-41dBm/300kHz
2010MHz – 2025MHz	-50dBm/1MHz
2110MHz – 2170MHz	-50dBm/1MHz
Note*: Not applied to 5MHz channel bandwidth	

From Table 6.4.3.1-1, for the frequency range  $1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$ , -35 dBm/1MHz is not applied to 5 MHz channel bandwidth and this means that alternatively general spurious emission limit -30 dBm/1MHz is applied. Taking into account the practical UE performance on spurious emission and more simply specifying its requirement, the spurious emission for the frequency range  $1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$  for Band 21 is proposed as follows.

#### **Proposal:**

***For Band 21, regardless of channel bandwidths, the additional spurious emission for the frequency range  $1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$  is -35dBm/1MHz.***

On the other hands, the frequency range of the current Band 11 is just reduced by 5 MHz to become revised Band 11, it can be seen that there is no need to change the additional requirements -50 dBm/1 MHz of the current Band 11. Finally, additional entries should be introduced as shown in Table 6.4.3.1-2.

**Table 6.4.3.1-2: Spurious emission requirement for extended LTE 1500**

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)			Level (dBm)	Bandwidth (MHz)	Comment
1	E-UTRA Band 1, 3, 7, 8, 9, 11, 21, 34, 38, 40	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note <sup>3</sup> , Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>3</sup> , Note <sup>5</sup>
	E-UTRA band 33	1900	-	1920	-50	1	Note <sup>1</sup>
	E-UTRA band 39	1880	-	1920	-50	1	Note <sup>1</sup>
6	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	875	-37	1	
	Frequency range	875	-	895	-50	1	
		1884.5	-	1919.6			Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>5</sup>
9	E-UTRA Band 1, 9, 11, 21, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>5</sup>
11	Frequency range	1475.9	-	1510.9	-50	1	
	E-UTRA Band 1, 9, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>5</sup>
18	E-UTRA Band 1, 9, 11, 21, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-40	1	Note <sup>6</sup>
		1884.5	-	1919.6			Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>5</sup>
19	E-UTRA Band 1, 9, 11, 21, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-40	1	Note <sup>6</sup>
		1884.5	-	1919.6			Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>5</sup>
21	Frequency range	1475.9	-	1510.9	-35	1	Note <sup>7</sup>
	E-UTRA Band 1, 9, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>5</sup>
...							
34	E-UTRA Band 1, 3, 7, 8, 9, 11, 21, 33, 38,39, 40	FDL_low	-	FDL_high	-50	1	Note <sup>2</sup>
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note <sup>4</sup>
	Frequency range	1884.5	-	1915.7	-41	0.3	Note <sup>5</sup>

Note <sup>1</sup>: To meet these requirements some restriction will be needed for either the operating band or protected band  
 Note <sup>2</sup>: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band  
 Note <sup>3</sup>: Applicable when NS\_05 in section 6.6.3.3.1 in TS 36.101 is signalled by the network.  
 Note <sup>4</sup>: Applicable when co-existence with PHS system operating in. 1884.5 -1919.6MHz.  
 Note <sup>5</sup>: Applicable when co-existence with PHS system operating in 1884.5-1915.7MHz.  
 Note <sup>6</sup>: Applicable when NS\_[08] in section 6.6.3.3.3 in TS 36.101 is signalled by the network  
 Note <sup>7</sup>: Applicable when NS\_[0X] in section [6.6.3.3.X] in TS 36.101 is signalled by the network

### 6.4.3.2 Additional spurious emissions

In case of 10 and 15 MHz channel bandwidth for Band 21, the frequency range  $1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$  in clause 6.4.3.1 includes OOB domain up to  $1475.9 \text{ MHz} \leq f \leq 1482.9 \text{ MHz}$ . However, the whole spurious range  $1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$  shall be protected according to Japanese regulations [8]. Therefore, the additional spurious emission requirement should be specified for the frequency range  $1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$  as the following.

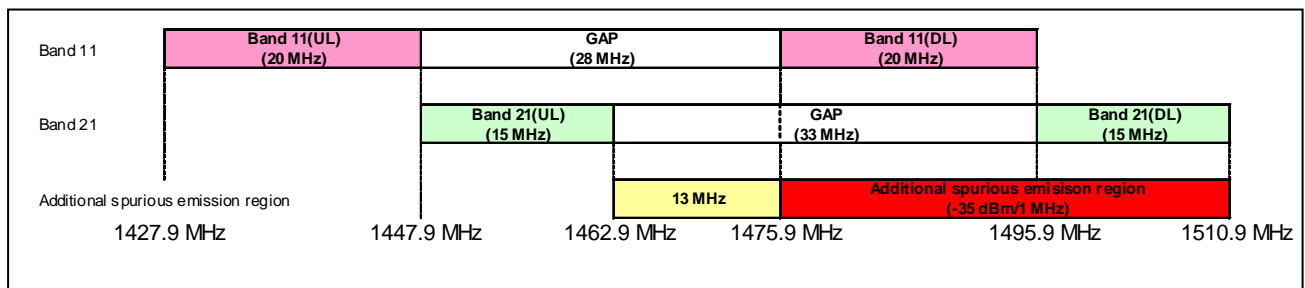
When “NS\_09” is indicated in the cell, the power of any UE spurious emission shall not exceed the level specified in Table 6.4.3.2-1.

**Table 6.4.3.2-1: Additional requirement for extended LTE 1500**

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)			Measurement Bandwidth
	5 MHz	10 MHz	15 MHz	
$1475.9 \text{ MHz} \leq f \leq 1510.9 \text{ MHz}$	-35	-35	-35	1 MHz

#### 6.4.3.2.1 Relationship between Band 21 and additional spurious emission region

Figure 6.4.3.2-1 shows the relationship between operating band of both Band 21 and 11 and their additional spurious emission region. From the Figure 6.4.3.2-1, it should be noted that we need to pay close attention to the gap of 13 MHz between the upper edge of Band 21 uplink and the lower edge of the additional spurious emission region. It is assumed that Band 11 duplexer would be designed considering the lower edge of Band 11 downlink which overlaps with the lower edge of the additional spurious emission region, therefore the UE which supports Band 11 is not required to define A-MPR. On the other hand, the duplexer of Band 21 would be designed without taking into consideration of the lower edge of spurious emission region. Thus, it would be difficult for the UE which supports Band 21 to obtain sufficient attenuation in the vicinity of 1475.9 MHz under extreme conditions. Even if we focus on obtaining some isolation at 1475.9 MHz as keeping generally required specs, it would be difficult to obtain enough it based on the estimation that the ration of the GAP(13 MHz) to the centre frequency( $1469.4 = 1475.9 - 13/2$ ) is only 0.88%. This would mean it's much stringent than that of Band 2 and 8. However, according to our estimate, the obtained value could be around 5 dB at 1475.9 MHz.



**Figure 6.4.3.2-1: Relationship between Band 21 and spurious emission region**

#### 6.4.3.2.2 Outline of evaluation method

##### 6.4.3.2.2.1 general conditions

To evaluate proper A-MPR to satisfy the above spurious emission requirements, measurements of leakage power were actually conducted under the test conditions as shown in Table 6.4.3.2-2. The measurement procedures are summarized below. **It should be noted that unless otherwise stated, some certain implementation margins are incorporated in the measurement results.**

- 1- For each CBW, the largest transmission resource blocks (RBs) are constantly assigned at the upper edge of the transmission band.
- 2- UE UL power is reduced in one dB step until the additional spurious emission requirements are satisfied.

- 3- After satisfying the spurious emission requirements, then, RBs are reduced.
- 4- The steps from 1 to 3 are repeated until the A-MPR is not needed for each CBW.

**Table 6.4.3.2-2: Test conditions**

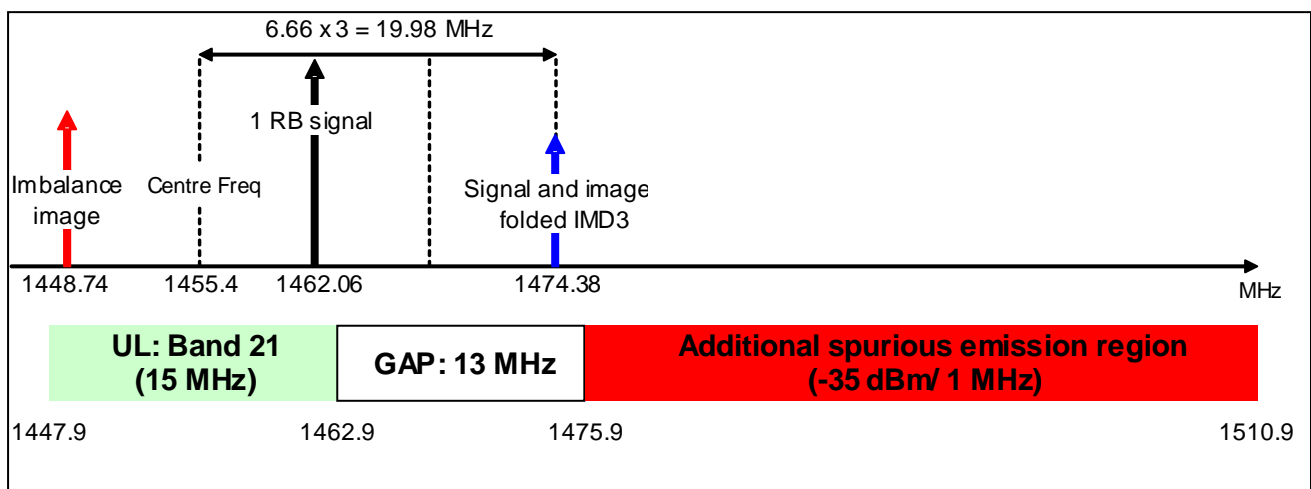
#	Item	Parameter	
1	UE operating band	E-UTRA Band 21	
2	Channel bandwidth	10MHz	15MHz
3	Carrier Frequency	1452.9 MHz	1455.4 MHz
4	Modulation	QPSK, 16QAM	
5	Position of RBs	Upper Edge of the Tx band	
6	IQ imbalance	-28 dBc, (ref) -25 dBc	
7	Resolution bandwidth	100 kHz	

6.4.3.2.2.2 Essential consideration on the conditions at the measurement boundary

As shown in Figure 6.4.3.2.-2, when the UE which supports Band 21 transmit small number of RBs at the either CBW, it can be seen that we need to pay close attention to the third-order inter-modulation (IMD3) and its measurement conditions, since the centre of IMD3 is located just adjacent to the lower edge of the additional spurious emission region. It is noted that in the Figure 6.4.3.2.-2, if the position of 1 RB signal is replaced by that of imbalance image, then CIM3 occurs at the same position of signal and image folded IMD3. However, from the A-MPR table for NS\_07, it can be observed that in this case, signal and image folded IMD3 level would be higher than that of CIM3. Therefore, the CIM3 is not handled in this contribution.

In addition, the IMD3 has its certain bandwidth. Thus, not the whole but some part of it would fall into the additional spurious emission region. From these facts, its minimum necessary A-MPR would be highly affected by its measurement conditions at the measurement boundary. Therefore, to improve the measurement accuracy of PSD at the measurement boundary, the following conditions in 6.6.3 [13] are applied to its evaluation.

- To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.
- For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.



**Figure 6.4.3.2.-2: signal and image folded IMD3**



6.4.3.2.2 Evaluation results

6.4.3.2.3.1 For 15 MHz CBW

Figure 6.4.3.2-3 and 6.4.3.2-4 show the maximum leakage power in Rx band for each RB allocation in case of 15MHz CBW. From the results, it can be observed that some A-MPR is needed to satisfy the spurious emission requirements. Based on the results, the minimum necessary A-MPR is derived by investigating the boundary number of RBs for which the required A-MPR value changes. In each Figure, the boundary line A (blue) and B (pink) show the start points where from each point, A-MPR = 1 and 2 dB may be allowed to used to meet the spurious emission requirements respectively in the following ways. It should be noted that duplexer attenuation has not been included in the measurement results.

- From the boundary line A (blue), A-MPR of 1 dB would be applied.
- From the boundary line B (pink), A-MPR of 2 dB would be applied.

It should also be noted that for small RBs cases, the results highly depend on the IQ imbalance value. Even if the IQ imbalance is set at -25 dBc, it can be seen that any A-MPR is not necessary. In addition, in commercial service, we believe that the IQ imbalance of -25 dBc is quite pessimistic and we can obtain at least -28 dBc at moderate estimate. Therefore, any A-MPR is not needed for small number of RBs case.

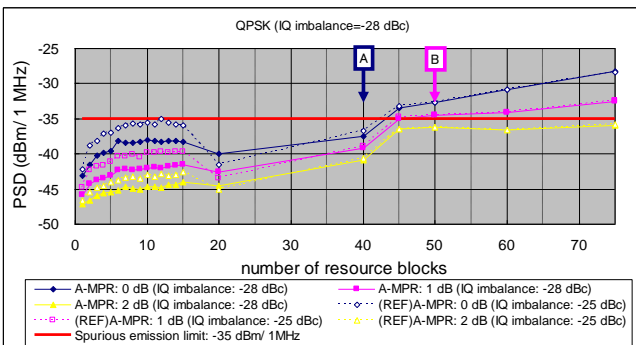


Figure 6.4.3.2-3: PSD for QPSK

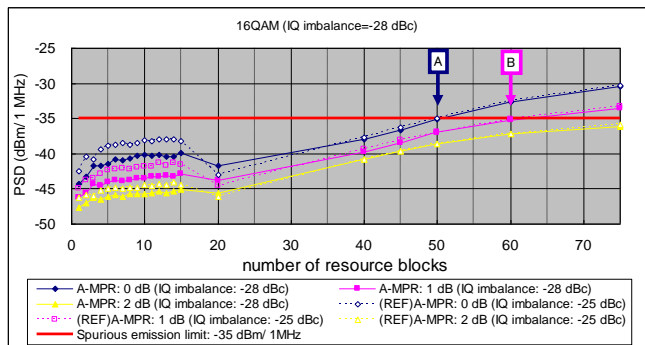


Figure 6.4.3.2-4: PSD for 16QAM

6.4.3.2.3.2 For 10 MHz CBW

Figure 6.4.3.2-5 and 6.4.3.2-6 show the evaluation results in case of 10 MHz CBW. From the results, it can be observed that some A-MPR for 10 MHz CBW is needed to satisfy the spurious emission requirements. A-MPR=1 dB may be allowed to used to meet the spurious emission requirements respectively in the following ways.

- From the boundary line A (blue), A-MPR of 1 dB would be applied.

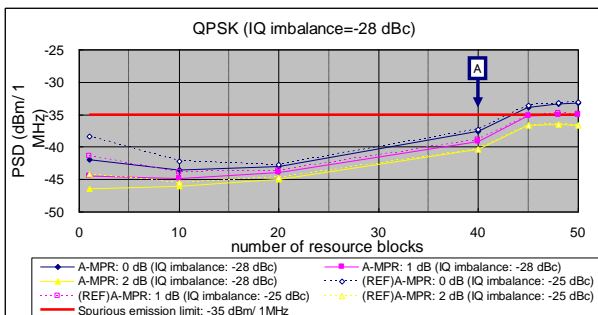


Figure 6.4.3.2-5: PSD for QPSK

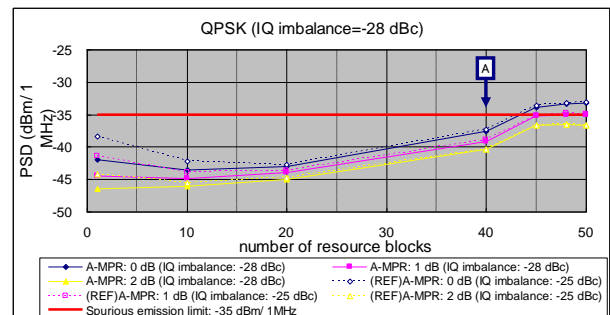


Figure 6.4.3.2-6: PSD for 16QAM

6.4.3.2.3.3 Comparison of Nokia simulation and NTT DOCOMO measurements (QPSK and 15 MHz CBW)

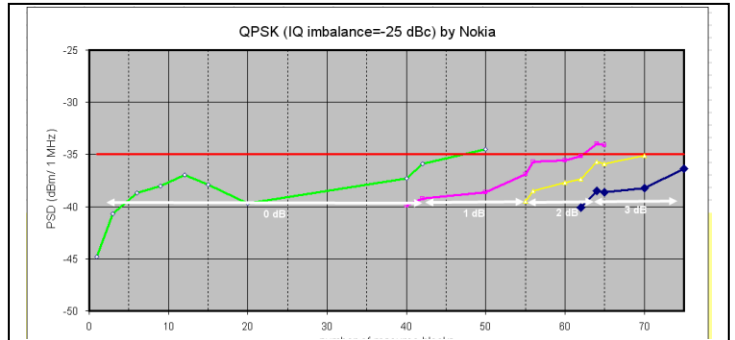
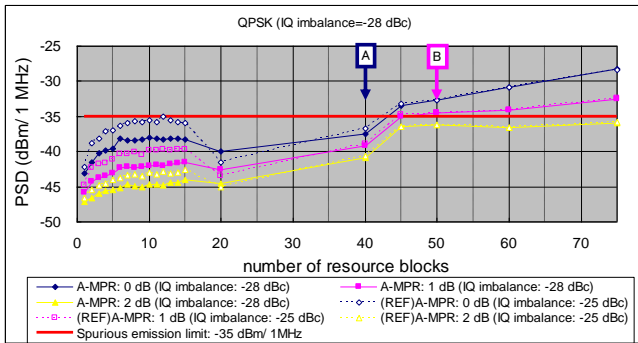


Figure 6.4.3.2-7-a: DOCOMO measurements results

Figure 6.4.3.2-7-b: Nokia simulation results

As a final step, to validate the above results, we compare our measurement results as shown Figure 6.4.3.2-7-a with Nokia’s simulation results as shown in Figure 6.4.3.2-7-b. These two results are in excellent agreement with each other. However, it can be seen that some part of them is different. Specifically, from the Nokia’s result, when the number of RBs is more than 62 RBs, then A-MPR of 3 dB would be needed.

6.4.3.2.3.4 Summary of the results

Finally, considering the duplexer attenuation of 5 dB, the required minimum A-MPR for each combination, number of RBs and CBW can be obtained and summarized in Table 6.4.3.2-3.

Table 6.4.3.2-3 Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks	A-MPR (dB)
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2

6.4.4 Reference sensitivity power level

6.4.4.1 Reference sensitivity of revised Band 11 and Band 21 for LTE

The section 5.4.2.4 verifies that the reference sensitivity of revised Band XI and XXI for UMTS is the same as that of Band I, IV, VI, X and XIX, i.e. -117 dBm/3.84 MHz. This verification result can be applied also to LTE case. Therefore, we propose to apply the same reference sensitivity requirement of Band 1 to that of revised Band 11 and Band 21 in the case 5 MHz, 10 MHz and 15 MHz channel bandwidth respectively. The proposed requirements for TS36.101 are summarized in Table 6.4.4.1-1.

Table 6.4.4.1-1: Reference sensitivity QPSK P<sub>REFSENS</sub>

E-UTRA Band	Channel bandwidth						Duplex Mode
	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	
1	-	-	-100	-97	-95.2	-94	FDD
11 [revised]	-	-	-100 -98	-97 -95	-93.2	-92	FDD
21	-	-	-100	-97	-95.2	-	FDD

Note: For the UE which supports both revised Band 11 and Band 21 by using the single duplexer, the reference sensitivity is FFS.

### 6.4.4.2 Maximum uplink configuration of revised Band 11 and Band 21 for LTE

#### 6.4.4.2.1 Comparison of the current Band 11 and revised Band 11

The relation between the current Band 11, revised Band 11 and Band 21 is illustrated in Figure 6.4.4.2.1-1. From Figure 6.4.4.2.1-1, it can be seen that the current Band 11 can maintain its reference sensitivity up to 25 RBs for 20 MHz Channel bandwidth and the distance between the upper edge of transmission frequency and lower edge of receiver frequency is 28 MHz. Therefore, it can be seen that revised Band 11 can also maintain its reference sensitivity up to 25 RBs for 10 MHz Channel bandwidth since the distance between the upper edge of transmission frequency and lower edge of receiver frequency is 38 MHz. That means it would be reasonable to define the minimum uplink configuration of revised Band 11 as shown in Table 6.4.4.2.1-1.

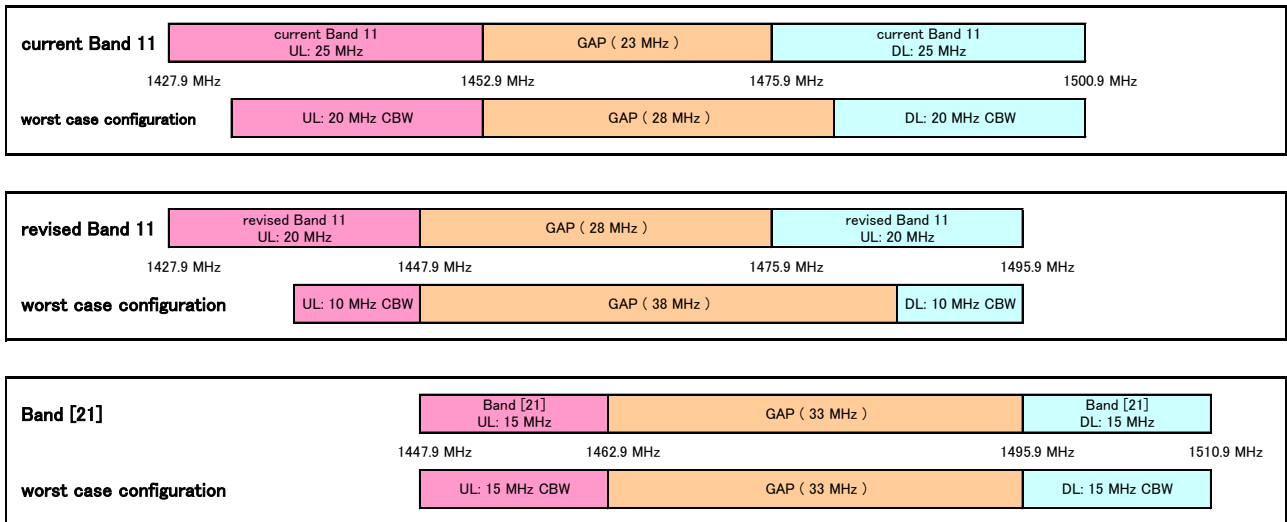


Figure 6.4.4.2.1-1: Frequency arrangement for the current Band 11, revised Band 11 and Band 21

Table 6.4.4.2.1-1: Minimum uplink configuration for revised Band 11

E-UTRA Band / Channel bandwidth / NRB / Duplex mode							
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
11			25	25	25	25	FDD
Revised 11			25	25			FDD

#### 6.4.4.2.2 Comparison of the current Band 11 and Band 21

Similar to the relation between the current Band 11 and revised Band 11, it can be seen that Band 21 can also maintain its reference sensitivity up to 25 RBs for 15 MHz Channel bandwidth since the distance between the upper edge of transmission frequency and lower edge of receiver frequency is 33 MHz, which is larger than the distance 28 MHz of the current Band 11. Therefore, it would be reasonable to define the minimum uplink configuration of Band 21 as shown in Table 6.4.4.2.2-1.

Table 6.4.4.2.2-1: Minimum uplink configuration for Band 21

E-UTRA Band / Channel bandwidth / NRB / Duplex mode							
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
11			25	25	25	25	FDD
21			25	25	25		FDD

### 6.4.4.2.3 Proposal of minimum uplink configuration

From the above observation, although there would be small difference in PA characteristics etc due to frequency dependency, it is supposed that revised Band 11 and Band 21 should be easier to meet its reference sensitivity than for the current Band 11 if the minimum uplink configuration of revised Band 11 or Band 21 defined as 25 RBs for each Channel bandwidth. Therefore, we propose the minimum uplink configuration as shown in Table 6.4.4.2.3-1.

**Table 6.4.4.2.3-1: Minimum uplink configuration of revised Band 11 and Band 21**

E-UTRA Band / Channel bandwidth / NRB / Duplex mode							
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
11			25	25	25	25	FDD
Revised 11			25	25			FDD
21			25	25	25		FDD

Note: For the UE which supports both revised Band 11 and Band 21 by using the single duplexer, the minimum uplink configuration for reference sensitivity is FFS.

## 6.5 Specific BS RF requirements

### 6.5.1 Blocking requirements

The following note is applied to E-UTRA BS Blocking requirements for Band 11 and Band 21 as well as UTRA BS.

“NOTE: The minimum/ test requirements for BS which supports both Band 11 and Band 21 operating frequencies, are FFS.”

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## 7 Summary of required changes to UTRA specifications

### 7.1 Required changes to TS 25.101

Required changes in TS25.101 are shown in Table 7.1-1.

Table 7.1-1: Required Changes for TS25.101

Clause	Description	Description of change
5.2	Frequency band	Revise frequency range for Band XI and add a new row for Band XXI in the table.
5.3	TX-RX frequency separation	Add a new row for Band XXI in the table.
5.4.2	Channel raster	No changes.
5.4.3	Channel number	Revise channel numbering for Band XI and add a new one for Band XXI.
5.4.4	UARFCN	Revise channel numbering for Band XI and add a new one for Band XXI.
6.2.1	Max Output Power	Required for regulatory.
6.6.2.1	Emission Mask	Required for regulatory.
6.6.3	Tx Spurious emissions	<b>Required for regulatory. Revise frequency range for Band XI and add a new row for Band XXI in the table.</b>
7.3	Reference sensitivity	<b>Revise the requirement for Band XI and add a new one for Band XXI.</b>
7.6	Blocking	Revise frequency range for Band XI and add a new row for Band XXI in the table.
7.8	Intermodulation	No changes.
7.9	Rx spurious emission	Required for regulatory.
B.2.2	Multi-path fading propagation conditions	Add conditions for Band XXI (Same for Band XI).
B.2.6	MIMO propagation conditions	Add conditions for Band XXI (Same for Band XI).
E.2	List of UARFCN used for UTRA FDD bands	Add conditions for Band XXI (Same for Band XI).

## 7.2 Required changes to TS 25.104

Required changes in TS25.104 are shown in Table 7.2-1.

**Table 7.2-1: Required Changes for TS25.104**

Clause	Description	Description of change
5.2	Frequency band	Revise frequency range for Band XI and add a new row for Band XXI in the table.
5.3	TX-RX frequency separation	Add a new row for Band XXI in the table.
5.4.2	Channel raster	No changes.
5.4.3	Channel number	Revise channel numbering for Band XI and add new one for Band XXI.
6.6.2.1	Emission mask	No changes.
6.6.2.2	Adjacent Channel Leakage power Ratio (ACLR)	Add requirement for Band XXI.
6.6.3.1.1	Tx Spurious emissions (Category A)	Required for regulatory.
6.6.3.2	Protection of BS receiver	Revise frequency range for Band XI and add requirement for Band XXI.
6.6.3.3	Co-existence with other systems in the same geographical area	Revise frequency range for Band XI and add requirement for Band XXI.
6.6.3.4	Co-existence with co-located and co-sited base stations	Revise frequency range for Band XI and add requirement for Band XXI.
6.6.3.5	Co-existence with PHS	Required for regulatory.
6.6.3.6	Co-existence with services in adjacent frequency bands	No changes.
6.6.3.9	Co-existence with Home BS operating in other bands	Revise frequency range for Band XI and add requirement for Band XXI.
6.6.3.x	Co-existence requirements (Other than above)	No changes.
7.5	Blocking	Revise frequency range for Band XI and add requirement for Band XXI.
7.6	Inter-modulation	No changes.
7.7	Rx spurious emission	Revise frequency range for Band XI and add requirement for Band XXI.
B.2	Multi-path fading propagation conditions	Add conditions for Band XXI.
B.5	Multipath fading propagation conditions	Add conditions for Band XXI.

## 7.3 Required changes to TS 25.113

Required changes in TS25.113 are shown in Table 7.3-1.

**Table 7.3-1: Required changes for TS25.113**

Clause	Description	Description of change
4.5.2	Receiver exclusion band	Revise frequency range for Band XI and add requirement for Band XXI.

## 7.4 Required changes to TS 25.133

Required changes in TS25.133 are shown in Table 7.4-1.

**Table 7.4-1: Required changes for TS25.133**

Clause	Description	Description of change
4.2.2.5a	Measurements of Inter-RAT E-UTRA cells	Revise the requirement for Band 11 and add a new one for Band 21.
8.1.2.6.1	Identification of a new cell	Revise the requirement for Band XI and add a new one for Band XXI.
9.1	Measurement Performance for UE	Revise the requirement for Band XI and add a new one for Band XXI.
A.9.1	Measurement Performance for UE (Normative Annex for Test cases)	Revise the requirement for Band XI and add a new one for Band XXI.

## 7.5 Required changes to TS 25.141

Required changes in TS25.141 are shown in Table 7.5-1.

**Table 7.5-1: Required Changes for TS25.141**

Clause	Description	Description of change
3.4.1	Frequency band	Revise frequency range for Band XI and add a new row for Band XXI in the table.
3.4.2	TX-RX frequency separation	Add a new row for Band XXI in the table.
3.5.2	Channel raster	No changes.
3.5.3	Channel number	Revise channel numbering for Band XI and add new one for Band XXI.
6.5.2.1	Emission mask	No changes.
6.5.2.2	Adjacent Channel Leakage power Ratio (ACLR)	Add requirement for Band XXI.
6.5.3.7.1	Tx Spurious emissions (Category A)	Required for regulatory.
6.5.3.7.3	Protection of BS receiver	Revise frequency range for Band XI and add requirement for Band XXI.
6.5.3.7.4	Co-existence with other systems in the same geographical area	Revise frequency range for Band XI and add requirement for Band XXI.
6.5.3.7.5	Co-existence with co-located and co-sited base stations	Revise frequency range for Band XI and add requirement for Band XXI.
6.5.3.7.6	Co-existence with PHS	Required for regulatory.
6.5.3.7.7	Co-existence with services in adjacent frequency bands	No changes.
6.5.3.7.10	Co-existence with Home BS operating in other bands	Revise frequency range for Band XI and add requirement for Band XXI.
6.5.3.7.X	Co-existence requirements (Other than above)	No changes.
7.5	Blocking	Revise frequency range for Band XI and add requirement for Band XXI.
7.6	Inter-modulation	No changes.
7.7	Rx spurious emission	Revise frequency range for Band XI and add requirement for Band XXI.
D.2	Multi-path fading propagation conditions	Add conditions for Band XXI.
D.5	Multi-path fading propagation conditions	Add conditions for Band XXI.

## 7.6 Required changes to TS 34.124

Required changes in TS34.124 are shown in Table 7.6-1.

**Table 7.6-1: Required changes for TS34.124**

Clause	Description	Description of change
4.4	Receiver exclusion band	Revise frequency range for Band XI and add requirement for Band XXI.

## 7.7 Required changes to TS 25.306

There is no need to change TS25.306.

## 7.8 Required changes to TS 25.307

Required changes in TS25.307 are shown in Table 7.8-1.

**Table 7.8-1 Required changes for TS25.307**

Clause	Description	Description of change
21	Band XXI independent of release	Add a new section of Band XXI

## 7.9 Required changes to TS 25.331

Required changes in TS25.331 are shown in Table 7.9-1.

**Table 7.9-1 Required changes for TS25.331**

Clause	Description	Description of change
10.3.3.21a	Measurement capability extension	Define a new value of Band XXI
10.3.3.42a	UE radio access capability extension	Define a new value of Band XXI
10.3.6.35c	Frequency band indicator	Define a new value of Band XXI

## 7.10 Required changes to TS 25.461

Required changes in TS25.461 are shown in Table 7.10-1

**Table 7.10-1 Required changes for TS25.461**

Clause	Description	Description of change
4.3.7	Operating bands	Revise frequency range for Band XI/11 and add a new row for Band XXI/21 in the table.



## 7.11 Required changes to TS 25.466

Required changes in TS25.466 are shown in Table 7.11-1.

**Table 7.11-1 Required changes for TS25.466**

Clause	Description	Description of change
Annex B	Antenna operating band field	Define new bit field for Band XXI

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## 8 Summary of required changes to E-UTRA specifications

### 8.1 Required changes to TS 36.101

Required changes in TS36.101 are shown in Table 8.1-1.

**Table 8.1-1: Required Changes for TS36.101**

Clause	Description	Description of change
5.5	Frequency band (Operating bands)	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
5.6.1	Channel bandwidth	Revise the requirement for Band 11 and add a new one for Band 21.
5.7.3	Channel number (EARFCN)	Revise channel numbering for Band 11 and add new one for Band 21.
5.7.4	TX-RX frequency separation	Add a new row for Band 21 in the table.
6.2.2	Max Output Power	Required for regulatory. Add a new row for Band 21 in the table.
6.2.4	Max power with additional requirements	Add requirements for Band 21.
6.6.2.1	Emission Mask	Required for regulatory.
6.6.3	Tx Spurious emissions	<b>Required for regulatory.</b> <b>Revise the requirements for Band 11 and add new ones for Band 21.</b>
7.3	Reference sensitivity	<b>Revise the requirement for Band 11 and add a new one for Band 21.</b>
7.6	Blocking	Add requirement for Band 21.
7.8	Intermodulation	No changes.
7.9	Rx spurious emission	Required for regulatory.

### 8.2 Required changes to TS 36.104

Required changes in TS36.104 are shown in Table 8.2-1.

**Table 8.2-1: Required Changes for TS36.104**

Clause	Description	Description of change
5.3	Frequency bands	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
5.4.3	Channel number	Revise channel numbering for Band 11 and add new one for Band 21.
6.6.3	Operating band unwanted emissions	Required for regulatory.
6.6.4.1	Tx Spurious emissions (Cat. A)	Required for regulatory.
6.6.4.3	Additional spurious emissions	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
6.6.4.4	Co-location with other BS	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
6.7	Inter-modulation	No changes.
7.6	Blocking	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
7.7	Rx spurious emission	Required for regulatory.
7.8	Receiver Inter-modulation	No changes.

### 8.3 Required changes to TS 36.113

Required changes in TS36.113 are shown in Table 8.3-1.

**Table 8.3-1: Required changes for TS36.113**

Clause	Description	Description of change
4.5.2	Receiver exclusion band	Revise frequency range for Band 11 and add requirement for Band 21.

### 8.4 Required changes to TS 36.124

Required changes in TS36.124 are shown in Table 8.4-1.

**Table 8.4-1: Required changes for TS36.124**

Clause	Description	Description of change
4.4	Receiver exclusion band	Revise frequency range for Band 11 and add requirement for Band 21.

### 8.5 Required changes to TS 36.133

Required changes in TS36.133 are shown in Table 8.5-1.

**Table 8.5-1: Required changes for TS36.133**

Clause	Description	Description of change
4.2.2.3	Measurements of intra-frequency E-UTRAN cells	Revise the requirement for Band 11 and add a new one for Band 21.
4.2.2.4	Measurements of inter-frequency E-UTRAN cells	Revise the requirement for Band 11 and add a new one for Band 21.
8.1.2.2	E-UTRAN intra frequency measurements	Revise the requirement for Band 11 and add a new one for Band 21.
8.1.2.3	General Measurement Requirements	Revise the requirement for Band 11 and add a new one for Band 21.
9.1	E-UTRAN Measurements	Revise the requirement for Band 11 and add a new one for Band 21.
A.9	Measurement Performance Requirements	Revise the requirement for Band 11 and add a new one for Band 21.

## 8.6 Required changes to TS 36.141

Required changes in TS36.141 are shown in Table 8.6-1.

**Table 8.6-1: Required Changes for TS36.141**

Clause	Description	Description of change
5.5	Operating bands	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
5.7.3	Channel number	Revise channel numbering for Band 11 and add new one for Band 21.
6.6.3	Operating band unwanted emissions	Required for regulatory.
6.6.4.1	Tx Spurious emissions (Cat. A)	Required for regulatory.
6.6.4.5.4	Additional spurious emissions	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
6.6.4.5.5	Co-location with other BS	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
6.7	Inter-modulation	No changes.
7.6	Blocking	Revise frequency range for Band 11 and add a new row for Band 21 in the table.
7.7	Rx spurious emission	Required for regulatory.
7.8	Receiver Inter-modulation	No changes.

## 8.7 Required changes to TS 36.331

There is no need to change TS36.331.

## 8.8 New specification, TS 36.307

E-UTRA; Requirements on User Equipments (UEs) supporting a release-independent frequency band (TS36.307) is newly specified. In TS36.307, contents on Extended UMTS/LTE1500 WI are as shown in Table 8.8-1.

**Table 8.8-1 Contents on Extended UMTS/LTE1500 WI for TS36.307**

Clause	Description	Contents
6	Band 21 independent of release	Add a new section of Band 21

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## 9 Project plan

### 9.1 Schedule and Work Task Status

Table 9.1-1 summarises the schedule and work task status for Extended UMTS/LTE 1500 WI.

**Table 9.1-1: Schedule and work task status**

Item#	Necessary work	Responsibility	Schedule	Status
1	Provide deployment scenarios for Extended UMTS/LTE 1500 MHz in Japan [2]	ARIB <sup>*1</sup>	RAN4#51bis	Completed
2	Provide requirements for co-existence with other technologies in Japan [5]	ARIB <sup>*1</sup>	RAN4#51bis	Completed
3	Propose necessary changes for the relevant specifications based on the information provided in #2	ARIB <sup>*2</sup>	RAN4#51bis	Completed
4.1	Study and check necessary changes for the relevant specifications and collect appropriate information into a TR	RAN4	RAN4#52 - #52bis	Completed
4.2	Generate CRs to update the appropriate specifications and other documents	RAN4	RAN4#52bis - #53	Completed
5	Study any signalling issues related to Extended UMTS/LTE 1500	RAN2	RAN2#67bis - #68	Completed

Note\*1: ARIB provided RAN4 outcomes from Telecommunications Council of Japan.

Note\*2: Individual member of ARIB may provide appropriate information or proposals based on studies at Telecommunications Council of Japan.

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## 10 Open issues

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## Annex A (informative): UARFCN numbers

### A.1 List of UARFCN used for UTRA FDD bands

The UARFCN numbering scheme detailed in clauses 5.4.3 and 5.4.4 of TS25.101 is summarized for information in Table A.1. The table shows the UARFCN assigned to all UTRA FDD operating bands, starting with the lowest UARFCN and continuing up to the highest one assigned.

Each band may have two table entries, one for the "general" numbers and one for the "additional" ones, as specified in Table 5.2 of TS25.101. The entries in Table A.1 are explained as follows:

**Band range:** The size of the frequency range for the UTRA FDD band specified in Table 5.0 of TS25.101.

**Range res.:** The size of the frequency range corresponding to the UARFCN range that has been "reserved" in 3GPP for possible future extensions of the band.

**Formula offset:** The offset parameter ( $F_{UL\_Offset}$  or  $F_{DL\_Offset}$ ) in the formula, used to calculate the UARFCN as specified in Clause 5.4.3 of TS25.101.

**Assigned/reserved:** Indicates the significance of the UARFCN and corresponding frequencies listed as follows:

- Start res.** Start of the UARFCN range reserved for the band.
- Min.** The lowest UARFCN assigned to the band.
- Max.** The highest UARFCN assigned to the band.
- End res.** End of the UARFCN range reserved for the band.

$N_U, N_D$ : Uplink and downlink UARFCN.

$F_{UL}, F_{DL}$ : Corresponding uplink and downlink frequencies.

**(Add.):** Refers to the additional UARFCN (on the 100 kHz raster) as specified in Table 5.1A of TS25.101.

Note that bands V and VI are shown with common entries in Table A.1, since their UARFCN ranges are completely overlapping.

Table A.1: UARFCN used for the UTRA FDD bands

UTRA FDD Band	Band range [MHz]	Range res. [MHz]	Uplink UARFCN				Downlink UARFCN				
			Formula offset $F_{UL\_Offset}$ [MHz]	Assigned/Reserved	$N_U$	$F_{UL}$ [MHz]	Formula offset $F_{DL\_Offset}$ [MHz]	Assigned/Reserved	$N_D$	$F_{DL}$ [MHz]	
II (Add.)	2x60	2x60	1850.1	Start res.		0	1850.1	1850.1	Start res.	400	1930.1
				Min.		12	1852.5		Min.	412	1932.5
				Max.		287	1907.5		Max.	687	1987.5
				End res.		299	1909.9		End res.	699	1989.9
XIX	2x15	2x15	770	Start res.		300	830.0	735	Start res.	700	875.0
				Min.		312	832.4		Min.	712	877.4
				Max.		363	842.6		Max.	763	887.6
				End res.		374	844.8		End res.	774	889.8
XIX (Add.)	2x15	2x15	755.1	Start res.		375	830.1	720.1	Start res.	775	875.1
				Min.		387	832.5		Min.	787	877.5
				Max.		437	842.5		Max.	837	887.5
				End res.		449	844.9		End res.	849	889.9
XXI	2x15	2x15	1358	Start res.		450	1448	1326	Start res.	850	1496
				Min.		462	1450.4		Min.	862	1498.4
				Max.		512	1460.4		Max.	912	1508.4
				End res.		524	1462.8		End res.	924	1510.8
V and VI (Add.)	2x25 (V) 2x10 (VI)	2x45	670.1	Start res.		700	810.1	670.1	Start res.	925	855.1
				Min. (V)		782	826.5		Min. (V)	1007	871.5
				Min. (VI)		812	832.5		Min. (VI)	1037	877.5
				Max. (VI)		837	837.5		Max. (VI)	1062	882.5
				Max. (V)		862	842.5		Max. (V)	1087	887.5
				End res.		924	854.9		End res.	1149	899.9
III	2x75	2x75	1525	Start res.		925	1710.0	1575	Start res.	1150	1805.0
				Min.		937	1712.4		Min.	1162	1807.4
				Max.		1288	1782.6		Max.	1513	1877.6
				End res.		1299	1784.8		End res.	1524	1879.8
IV	2x45	2x70	1450	Start res.		1300	1710.0	1805	Start res.	1525	2110.0
				Min.		1312	1712.4		Min.	1537	2112.4
				Max.		1513	1752.6		Max.	1738	2152.6
				End res.		1649	1779.8		End res.	1874	2179.8
IV (Add.)	2x45	2x70	1380.1	Start res.		1650	1710.1	1735.1	Start res.	1875	2110.1
				Min.		1662	1712.5		Min.	1887	2112.5
				Max.		1862	1752.5		Max.	2087	2152.5
				End res.		1999	1779.9		End res.	2224	2179.9
VII	2x70	2x70	2100	Start res.		2000	2500.0	2175	Start res.	2225	2620.0
				Min.		2012	2502.4		Min.	2237	2622.4
				Max.		2338	2567.6		Max.	2563	2687.6
				End res.		2349	2569.8		End res.	2574	2689.8
VII (Add.)	2x70	2x70	2030.1	Start res.		2350	2500.1	2105.1	Start res.	2575	2620.1
				Min.		2362	2502.5		Min.	2587	2622.5
				Max.		2687	2567.5		Max.	2912	2687.5
				End res.		2699	2569.9		End res.	2924	2689.9
VIII	2x35	2x35	340	Start res.		2700	880.0	340	Start res.	2925	925.0
				Min.		2712	882.4		Min.	2937	927.4
				Max.		2863	912.6		Max.	3088	957.6
				End res.		2874	914.8		End res.	3099	959.8
X	2x60	2x60	1135	Start res.		2875	1710.0	1490	Start res.	3100	2110.0
				Min.		2887	1712.4		Min.	3112	2112.4
				Max.		3163	1767.6		Max.	3388	2167.6
				End res.		3174	1769.8		End res.	3399	2169.8
X (Add.)	2x60	2x60	1075.1	Start res.		3175	1710.1	1430.1	Start res.	3400	2110.1
				Min.		3187	1712.5		Min.	3412	2112.5
				Max.		3462	1767.5		Max.	3687	2167.5
				End res.		3474	1769.9		End res.	3699	2169.9
XI [revised]	2x20 25	2x20 25	733	Start res.		3475	1428.0	736	Start res.	3700	1476.0
				Min.		3487	1430.4		Min.	3712	1478.4
				Max.		3562	1445.4		Max.	3787	1493.4

				End res.	3574	1447.8		End res.	3799	1495.8
					<del>3599</del>	<del>1452.8</del>			<del>3824</del>	<del>1500.8</del>
XII	2x18	2x18	-22	Start res.	3600	698.0	-37	Start res.	3825	728.0
				<b>Min.</b>	<b>3612</b>	<b>700.4</b>		<b>Min.</b>	<b>3837</b>	<b>730.4</b>
				<b>Max.</b>	<b>3678</b>	<b>713.6</b>		<b>Max.</b>	<b>3903</b>	<b>743.6</b>
				End res.	3689	715.8		End res.	3914	745.8
XII (Add.)	2x18	2x18	-39.9	Start res.	3690	698.1	-54.9	Start res.	3915	728.1
				<b>Min.</b>	<b>3702</b>	<b>700.5</b>		<b>Min.</b>	<b>3927</b>	<b>730.5</b>
				<b>Max.</b>	<b>3767</b>	<b>713.5</b>		<b>Max.</b>	<b>3992</b>	<b>743.5</b>
				End res.	3779	715.9		End res.	4004	745.9
XIII	2x10	2x10	21	Start res.	3780	777.0	-55	Start res.	4005	746.0
				<b>Min.</b>	<b>3792</b>	<b>779.4</b>		<b>Min.</b>	<b>4017</b>	<b>748.4</b>
				<b>Max.</b>	<b>3818</b>	<b>784.6</b>		<b>Max.</b>	<b>4043</b>	<b>753.6</b>
				End res.	3829	786.8		End res.	4054	755.8
XIII (Add.)	2x10	2x10	11.1	Start res.	3830	777.1	-64.9	Start res.	4055	746.1
				<b>Min.</b>	<b>3842</b>	<b>779.5</b>		<b>Min.</b>	<b>4067</b>	<b>748.5</b>
				<b>Max.</b>	<b>3867</b>	<b>784.5</b>		<b>Max.</b>	<b>4092</b>	<b>753.5</b>
				End res.	3879	786.9		End res.	4104	755.9
XIV	2x10	2x10	12	Start res.	3880	788.0	-63	Start res.	4105	758.0
				<b>Min.</b>	<b>3892</b>	<b>790.4</b>		<b>Min.</b>	<b>4117</b>	<b>760.4</b>
				<b>Max.</b>	<b>3918</b>	<b>795.6</b>		<b>Max.</b>	<b>4143</b>	<b>765.6</b>
				End res.	3929	797.8		End res.	4154	767.8
XIV (Add.)	2x10	2x10	2.1	Start res.	3930	788.1	-72.9	Start res.	4155	758.1
				<b>Min.</b>	<b>3942</b>	<b>790.5</b>		<b>Min.</b>	<b>4167</b>	<b>760.5</b>
				<b>Max.</b>	<b>3967</b>	<b>795.5</b>		<b>Max.</b>	<b>4192</b>	<b>765.5</b>
				End res.	3979	797.9		End res.	4204	767.9
V and VI	2x25 (V) 2x10 (VI)	2x45	0	Start res.	4050	810.0	0	Start res.	4275	855.0
				<b>Min. (V)</b>	<b>4132</b>	<b>826.4</b>		<b>Min. (V)</b>	<b>4357</b>	<b>871.4</b>
				<b>Min. (VI)</b>	<b>4162</b>	<b>832.4</b>		<b>Min. (VI)</b>	<b>4387</b>	<b>877.4</b>
				<b>Max. (VI)</b>	<b>4188</b>	<b>837.6</b>		<b>Max. (VI)</b>	<b>4413</b>	<b>882.6</b>
				<b>Max. (V)</b>	<b>4233</b>	<b>846.6</b>		<b>Max. (V)</b>	<b>4458</b>	<b>891.6</b>
				End res.	4274	854.8		End res.	4499	899.8
IX	2x45	2x75	0	Start res.	8550	1710.0	0	Start res.	9025	1805.0
				<b>Min.</b>	<b>8762</b>	<b>1752.4</b>		<b>Min.</b>	<b>9237</b>	<b>1847.4</b>
				<b>Max.</b>	<b>8912</b>	<b>1782.4</b>		<b>Max.</b>	<b>9387</b>	<b>1877.4</b>
				End res.	8924	1784.8		End res.	9399	1879.8
II	2x60	2x60	0	Start res.	9250	1850.0	0	Start res.	9650	1930.0
				<b>Min.</b>	<b>9262</b>	<b>1852.4</b>		<b>Min.</b>	<b>9662</b>	<b>1932.4</b>
				<b>Max.</b>	<b>9538</b>	<b>1907.6</b>		<b>Max.</b>	<b>9938</b>	<b>1987.6</b>
				End res.	9549	1909.8		End res.	9949	1989.8
I	2x60	2x60	0	Start res.	9600	1920.0	0	Start res.	10550	2110.0
				<b>Min.</b>	<b>9612</b>	<b>1922.4</b>		<b>Min.</b>	<b>10562</b>	<b>2112.4</b>
				<b>Max.</b>	<b>9888</b>	<b>1977.6</b>		<b>Max.</b>	<b>10838</b>	<b>2167.6</b>
				End res.	9899	1979.8		End res.	10849	2169.8

## Annex B (Informative): Change history

**Table B.1: Change History**

Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2009-06	RAN4#51bis	R4-092405			TR skeleton		0.0.1
2009-06	RAN4#51bis	R4-092413			Update based on the agreed input documents in RAN4 #51bis	0.0.1	0.1.0
2009-08	RAN4#52	R4-092778			Update based on the agreed input documents in RAN4 #52	0.1.0	0.2.0
2009-09	RAN#45	RP-090750			TSG-RAN for information	0.2.0	1.0.0
2009-10	RAN4#52bis	R4-093638			Update based on the agreed input documents in RAN4 #52bis	1.0.0	1.1.0
2009-11	RAN4#53	R4-094270			Update based on the agreed input documents in RAN4 #53	1.1.0	1.2.0
2009-12	RAN#46	RP-091215			TSG-RAN for approval	1.2.0	2.0.0
2009-12	RAN#46	RP-091215			Approved by RAN	2.0.0	9.0.0
2010-03	RAN#47	RP-100264	1	1	A-MPR for Band 21	9.0.0	9.1.0
2010-03	RAN#47	RP-100264	2		Summary of required changes for Extended UMTS/LTE1500 TR	9.0.0	9.1.0