

# 3GPP TR 25.806 V7.0.0 (2006-10)

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*Technical Report*

## **3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; UMTS 1700/2100 MHz Work Item Technical Report (Release 7)**



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Keywords

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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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# 1 Scope

This document is a technical report of the UMTS 1700/2100 MHz work item, which was approved to establish in TSG RAN#19. The purpose of these work items is to provide UMTS specification support for UTRA/FDD in the new band allocation on 1710 –1770 MHz UL and 2110-2170 MHz DL band pairing in ITU region 2. In addition to the schedule and status of the work item, the report includes a description of the motivation of requirements 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] RP-030186 WI proposal for UMTS 1700/2100 MHz , Work Task Descriptions, TSG RAN#19.
- [2] 3GPP TR25.942: " RF System Scenarios".
- [3] 3GPP TS 25.101: "UE Radio Transmission and Reception (FDD)".
- [4] 3GPP TS 25.104: "BS Radio transmission and Reception (FDD)".
- [5] R4-030528, Introduction of UMTS 1.7/2.1 GHz WI, Nokia.
- [6] 3GPP TR 25.889, " Viable deployment of UTRA in additional and diverse spectrum arrangements"
- [7] FCC news, Action by the Commission, October 16, 2003, by Report and Order (FCC 03-251)
- [8] "Revised proposal for new UARFCN scheme and re-numbering", R4-051368, Source: Ericsson, TSG-RAN Working Group 4 #37, Seoul, Korea, 7 – 11 November 2005.
- [9] "Inter-band mobility", Tdoc R2-052004, Source: Nokia, 3GPP TSG RAN WG2 #48 , London, U.K., 29 Aug – 2 Sep 2005.
- [10] "Potential inter-RAT inter-working problem caused by overlapping UTRAN operating bands", Tdoc R2-051940, Source: Ericsson, 3GPP TSG RAN WG2 #48, London, U.K., 29 Aug – 2 Sep 2005.
- [11] "Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands", WT Docket No. 02-353, Report and Order, FCC 03-251, November 25, 2003.
- [12] "Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands", WT Docket No 04-356, Report and Order, FCC 04-218, September 24, 2004.
- [13] "Advanced Wireless Services (AWS) Band Plan", as published by the FCC (<http://wireless.fcc.gov/services/aws/data/awsbandplan.pdf>).
- [14] "Letter from 3G Americas to extend the 1.7/2.1 GHz band to cover the entire 1710-1770/2110-2170 MHz band", R4-060011, TSG-RAN Working Group 4 #38, Denver, CO, 13-17 February, 2006.
- [15] "Title 47 of the Code of Federal Regulations (CFR)", Federal Communications Commission.

## 3 Definitions, symbols and abbreviations

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

WCDMA	Wideband Code Division Multiple Access, a type of cellular system meeting ITU-2000 requirement
UMTS	Universal Mobile Telecommunications System, often used synonymously with WCDMA
GSM	Mobile cellular system (throughout this document, this acronym is generally to also means the services GPRS and EDGE, both enhancements to GSM, unless not applicable to the discussion.)
UE	User Equipment, also cellular terminal
BS	Cellular system base station
DL	Downlink, the RF path from BS to UE
ACIR	Adjacent Channel Interference Rejection, can be translated to receiver selectivity when the emission mask of the interfering signal is accounted for.
TX	Transmitter
RX	Receiver

## 4 Introduction

Recently there have been initiatives taken by one Administration in Region 2 that allows parts of the band 1710-1770 MHz (UL) to be paired with parts of the band 2110-2170 MHz (DL). In the WRC 2000, additional spectrum for IMT-2000 was identified which included the band 1710-1885 MHz. 3GPP has specified the band 2110-2170 MHz, and this is well suited for using with 1710-1770 MHz as uplink.

This WI focus to combine existing requirements in new manner to have consistent specifications for new band allocation denoted as Band IV, 2x 60 MHz paired spectrum in 1710-1770 MHz UL and 2110-2170 MHz DL. While working with UMTS 1700/2100 MHz, 3GPP TSG RAN WG4 should consider information made available by FCC and Committee T1 (T1P1) concerning band plans, and ITU Region 2 implementation issues that may consider this new frequency allocation in North America.

### 4.1 Task description (Rel-6)

The purpose of this work item is to generate necessary information of 1700/2100 MHz FDD system for potential deployment only in ITU Region 2 detailed below:

- 1) Generate a report summarizing a study of radio requirements UTRA FDD in the 1700/2100 MHz Band
  - 1710 – 1770 MHz: Up-link (UE transmit, Node B receive)
  - 2110 – 2170 MHz: Down-link (Node B transmit, UE receive)

It has to be noted that this WRC 1700/2100 MHz Band includes the current FCC band allocation (2x45 MHz) given below for information

- 1710 – 1755 MHz: Up-link (UE transmit, Node B receive)
- 2110 – 2155 MHz: Down-link (Node B transmit, UE receive)

This report, while considering the radio requirements for UTRA FDD in the 1700/2100 MHz Band, shall investigate

- If there is a need for two sets of Node B's requirements: One for the full band and another one for the restricted FCC bands given above.
  - Scenarios about the use of UE's operating over 2\*60 MHz in North America with possible interferers in 1755- 1770 MHz and 2155-2170 MHz.
- 2) Generate CR's to update the appropriate specifications.
  - 3) TSG RAN WG2 - study any issues related to UMTS at 1700/2100 MHz FDD band-signalling aspects.
  - 4) TSG RAN WG3 - study any possible interface impacts to UMTS networks.

- 5) Any additional related issues.

## 4.2 Task description (Rel-7)

The purpose of this work item is to generate necessary information of Extended 1.7/2.1 GHz FDD system for potential deployment only in ITU Region 2 detailed below:

- 1) Update the report TR 25.806 with radio requirements for UTRA FDD in the Extended 1.7/2.1 GHz Band, defined as a new operating band:

1710– 1770 MHz: Up-link (UE transmit, Node B receive)

2110– 2170 MHz: Down-link (Node B transmit, UE receive)

Note that this extended operating band contains the whole Band IV (1710-1755/2110-2155 MHz) as a sub-band. The report, while considering the radio requirements for UTRA FDD in the Extended 1.7/2.1 GHz Band, shall investigate possible commonality between the new Extended 1.7/2.1 GHz band and Band IV radio requirements.

- 2) Generate CR's to update the appropriate specifications.  
 3) TSG RAN WG2 - study any issues related to Extended 1.7/2.1 GHz FDD band-signalling aspects.  
 4) TSG RAN WG3 - study any possible interface impacts to UMTS networks.  
 5) Any additional related issues.

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## 5 Requirements (Rel-6)

This section includes the high-level requirements for the UMTS1700/2100 MHz work item.

### 5.1 Deployment Scenarios

FCC has released Order on Service Rules for AWS (Advanced Wireless Services) at 1.7/2.1 GHz on October 16, 2003 [7]. FCC provided service rules for the 1710-1755 MHz and 2110-2155 MHz spectrum bands to be used for 3G services. The band plan for this spectrum includes a mixture of license sizes and geographic areas. The 1710-1755 MHz and 2110-2155 MHz spectrum will be licensed on the following basis:

**Table 1: Band licenses**

Block	Total MHz	Pairings	Geographic area
A	20	1710-1720 and 2110-2120 MHz	Economic Area (EA)
B	20	1720-1730 and 2120-2130 MHz	Regional Economic Area Group (REAG)
C	10	1730-1735 and 2130-2135 MHz	(REAG)
D	10	1735-1740 and 2135-2140 MHz	Cellular Market Area (CMA)
E	30	1740-1755 and 2140-2155 MHz	(REAG)

Based on these rules, a 2 x 5 MHz deployment scenario shall be considered for UMTS1700/2100.

### 5.2 Co-existence with other technologies

Specific co-existence requirements regarding other systems than UTRA within Band IV, require input regarding the relevant deployment scenarios within the 1.7/2.1 GHz bands (e.g. type of systems and respective frequency separations towards UMTS1700/2100).

FCC Service rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands don't preclude operation of narrow band systems within this band and therefore it's proposed that similar narrow band blocking and intermodulation requirements as currently in bands II and V should also be applied in UMTS 1.7/2.1 GHz.

Considering the Macro cell propagation model of TR 25.942, one finds that the path loss difference between 1.7 GHz and 1.9 GHz is merely  $21 * (\log_{10}(1700) - \log_{10}(1900)) = -1.01$  dB. Hence, in 1.7 GHz one can expect similar cell radii,



antenna gains, BS antenna heights, etc as for 1.9 GHz installations. Simulation results, which have been used in identifying requirements for the UMTS1900/1800 WI should therefore be in principle applicable to the 1.7 GHz. In addition, earlier simulation results obtained for Band I should be directly applicable to 2.1 GHz DL scenarios.

## 5.3 Region 2 Requirements

It is reasonable to expect that UTRA FDD operating in the 1700/2100 MHz band should support co-existence with the following systems in the 850 MHz cellular bands or Band II:

- GSM850
- UMTS850
- PCS1900
- UMTS1900

The requirements can be set according to the patterns used in the existing specifications.

Furthermore, it needs to be checked if these requirements provide also adequate protection of IS-95/cdma2000.

## 5.4 Support for 2x60 MHz operation

It has to be noted that the current FCC band allocation supports 2x45 MHz operation in the 1700/2100 MHz Band as follows:

- 1710 – 1755 MHz: Up-link (UE transmit, Node B receive)
- 2110 – 2155 MHz: Down-link (Node B transmit, UE receive)

However, the feasibility to have a single set of Node B requirements for the full 2x60 MHz allocation, i.e.

- 1710 – 1770 MHz: Up-link (UE transmit, Node B receive)
- 2110 – 2170 MHz: Down-link (Node B transmit, UE receive),

should be studied further. It would need to be checked if the operational constraints originating from initial 2x45 MHz operation and co-existence with radio systems<sup>1</sup> operating within the 1755-1770 / 2155 -2170 MHz band could be met by assuming typical in-band performance.. The requirements to be considered in this respect are:

- 1) In-band blocking level of  $-40$  dBm/3.84 MHz also across 1755-1770 MHz
- 2) In-band spurious emissions of  $-15$  dBm/MHz across 2155 -2170 MHz

Based on some publicly available information from e.g. NTIA, it is believed that item 1. is the limiting interference case, mainly due to a smaller number of satellite earth stations operating within 1761 – 1842 MHz. Hence, the feasibility of a blocking level of  $-40$  dBm MHz across 1755-1790 MHz should be analysed further.

The FCC Order [7] establishes rules to protect co-channel and adjacent channel Government and non-Government operations from interference. Co-existence requirements with this and other systems operating in this part of the band within the US requires further inputs and study.

Regarding the UE, in order to make a potential transition from 2x45 MHz operation towards 2x60 MHz in the 1700/2100 MHz band in cost-effective manner, the feasibility of UEs supporting 2x60MHz operation already in the beginning should be studied. The requirements to be considered are:

□ \_\_\_\_\_

<sup>1</sup> The systems are currently operated by NASA and DoD, see e.g. <http://www.ntia.doc.gov/ntiahome/threeg/33001/3g33001.pdf>

- 1) Spurious emissions level on 1755-1770MHz band as emission mask and FCC limits.
- 2) Blocking requirements in 2155-2170 MHz band as in-band case for 45 MHz allocations.

## 6 Study Areas (Rel-6)

This section summarizes the studies and analyses that were necessary to complete the work item.

### 6.1 Frequency arrangements

According to the FCC rules [7] the allocation of the UL and DL bands is symmetrical. The operation in 1700/2100 band can be based on earlier release signalling in release independent manner, and only having essential addition due the new frequency band operation for relevant signalling elements for UE capability and measurement control messages.

### 6.2 UE requirements

Required changes in specification TS 25.101 together with their currently assumed values are discussed in Table 2. Requirements which are not shown are applicable to UMTS 1.7/2.1 GHz without any modifications from the existing specifications.

**Table 2: Required Changes in TS 25.101 (v 6.2.0)**

Section	Requirement	Discussion / Required Changes in TS 25.101 (v 6.2.0)
5.2	Frequency bands	New operating band 2x45 MHz needs to be added as Band IV. 1710 – 1755 MHz: Up-link (UE transmit, Node B receive) 2110 – 2155 MHz: Down-link (Node B transmit, UE receive)
5.3	TX-RX frequency separation	Add this requirement for Band IV. 400 MHz.
5.4.2	Channel raster	Add this requirement for Band IV. 200 kHz raster as in Band I, II and III Additional channels are needed in the middle of 5 MHz blocks 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5 1742.5 1747.5 and 1752.5 MHz for UL 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5 and 2152.5 MHz for DL

5.4.3	Channel number	Additional UARFCN definitions for Band IV. UL: $N=5*(F_{\text{uplink}}-1480.1 \text{ MHz})$ DL: $N=5*(F_{\text{downlink}}-1820.1 \text{ MHz})$
5.4.4	UARFCN	Define UARFCN range for band IV. 8562 to 8843 for UL, 10562 to 10838 for DL Additional UARFCNs 1162, 1187, 1212, 1237, 1262, 1287, 1312, 1337 and 1362 for UL 1462, 1487, 1512, 1537, 1562, 1587, 1612, 1637 and 1662 for DL
6.2.1	UE maximum output power	Add UE power classes for band IV. +24dBm +1/-3dB: Power class 3 +21dBm +2/-2dB: Power class 4
6.6.2.1	Spectrum emission mask	Add spectrum emission mask requirement for Band IV. It may be assumed as a working assumption that a similar additional requirement as currently formulated for Band II (-15 dBm/30kHz when $2.5\text{MHz} < \Delta f \leq 3.5\text{MHz}$ and -13 dBm/1MHz when $3.5\text{MHz} < \Delta f \leq 12.5\text{MHz}$ kHz) will also be applied for Band IV.
6.6.3	TX spurious emissions	Add additional TX spurious emissions requirements for Band IV. Requirements can be set according to the patterns used in the existing specifications. Requirements should be written for UMTS850, GSM850, UMTS1900 and PCS1900 Down-link bands.
7.3	Reference sensitivity level	Add reference sensitivity level requirement for band IV. Existing REFSENS definitions for Band I can be used for Band IV. $DPCH\_Ec < REFSENS > = -117\text{dBm}$ .
7.6.2	Minimum requirement (Out of-band blocking)	Add out-of-band blocking requirements for band IV. Requirements can be derived from existing Band I, II and III requirements
7.6.3	Minimum requirement (Narrow band blocking)	Add narrowband blocking requirement for band IV. Requirements can be derived from existing Band II and V requirements
7.8.2	Intermodulation characteristics, Minimum requirement (Narrow band)	Narrowband IM requirement for band IV is FFS..
7.9	RX spurious emissions	Add additional receiver spurious emission requirements for band IV. -60 dBm/3.84MHz UE transmit band in URA_PCH, Cell_PCH and idle state -60 dBm/3.84MHz UE receive band

## 6.3 BS requirements

Required changes in specification TS 25.104 together with their currently assumed values are discussed in Table 3. Requirements which are not shown are applicable to UMTS 1.7/2.1 GHz without any modifications from the existing specifications.

Table 3: Required Changes in TS 25.104 (v 6.3.0)

Section	Requirement	Discussion / Required Changes in TS 25.104 (v 6.3.0)
4.3	Regional requirements	Addition of co-existence / co-location clauses needed
5.2	Frequency bands	New operating band 2x45 MHz needs to be added as Band IV. 1710 – 1755 MHz: Up-link (UE transmit, Node B receive) 2110 – 2155 MHz: Down-link (Node B transmit, UE receive)
5.3	TX-RX frequency separation	Add this requirement for Band IV. 400 MHz.
5.4.2	Channel raster	Add this requirement for Band IV. 200 kHz raster as in Band I, II and III Additional channels are needed in the middle of 5 MHz blocks 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5 1742.5 1747.5 and 1752.5 MHz for UL 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5 and 2152.5 MHz for DL
5.4.3	Channel number	Additional UARFCN definitions for Band IV. UL: $N=5*(F_{\text{uplink}}-1480.1 \text{ MHz})$ DL: $N=5*(F_{\text{downlink}}-1820.1 \text{ MHz})$
6.2	BS output power	Existing PRAT definitions can be used for Band IV for all BS classes.
6.6.2.1	Spectrum emission mask	Add this requirement for Band IV. It may be assumed as a working assumption that a similar additional requirement from FCC as currently formulated for Band II (-15 dBm/30 kHz) will also be applied for Band IV
6.6.3.1	TX Spurious emissions	Add appropriate tables for Band IV. For Cat B spurious emissions use same values as in Table 6.9 for Band I
6.6.3.2	Protection of BS receiver of own or different BS	Add requirements for Band IV. Add protection of -96 dBm/100 kHz for 1710 – 1755 MHz to Table 6.10.
6.6.3.3 – 6.6.3.11	Spurious emissions / Co-existence requirements	Add requirements for Band IV. - Requirements for co-existence is the same geographical area and for BS co-location - Protection of PCS 1900 BS, use Tables 6.22A, 6.23 - Protection of GSM850 BS, use Tables 6.23A, 6.24 - Protection of UMTS1900 - Formulate additional requirements for UMTS850
7.2	Reference sensitivity level	Existing REFSENS levels can be used for Band IV for all BS classes.
7.5	Blocking characteristics	Add requirements for Band IV. Example for WA BS: 1710 – 1755 MHz: -40 dBm / WCDMA signal 1690 – 1710 MHz: -40 dBm / WCDMA signal 1755 – 1775 MHz: -40 dBm / WCDMA signal Otherwise -15 dBm For other BS classes same pattern as current specification Add NB blocking requirements. Requirements can be derived from existing Band II and V requirements
7.5.2	Blocking/Co-location	Add additional blocking requirements for Band IV. Co-location with UMTS1700/2100 in Band IV Co-location with PCS1900 Co-location with UMTS1900 Co-location with GSM850 Formulate an additional requirement for co-location with UMTS850 Same blocker level +16 dBm
7.6	Intermodulation characteristics	Add requirements for Band IV. Relevant for all BS classes Add NB intermodulation requirements. Requirements can be derived from existing Band II and V requirements
7.7.1	RX Spurious emissions	Add requirements for Band IV.
8, Annex B	Performance requirement	Add requirements for Band IV. In order to keep the requirements consistent, the performance requirements of Node B in 1700 MHz band could be defined based on the existing requirements on Band I by scaling the velocity used in different propagation models accordingly.

## 6.4 Signalling issues

In this section issues regarding controlling functionalities for operating UMTS system in more than one band are described.

### 6.4.1 UE capability indication

New frequency band support IE needs to be added into UE capability information message.

### 6.4.2 Control of UL frequency in the system

Since 2110-2170 MHz DL band is in use in region 1 countries with different UL band allocation, it is necessary to make sure that UE will get information from UTRAN regarding the used UL frequencies when making attachment to the system even for the first time, e.g. some modification to the common channel information element is required to prevent unwanted emissions to other cellular systems. One solution for this has been discussed in RAN2, where an extension to SIB5 information element has been considered. SIB5 has to anyway be read before UE is performing attachment to the system.

### 6.4.3 Broadcasting information for UE Idle mode control

Broadcasting information allows already the indications of neighbours per frequency, and hence this issue shouldn't pose problems. In addition a mechanism to "prioritise" certain carrier frequencies (like HCS mechanisms) as in Rel-99 are possible to be extended for operating across separated frequency bands.

Hence it is concluded that new mechanisms to support 1.7/2.1 GHz band operation are not required.

### 6.4.4 Handover control

Handovers are controlled with radio link reconfigurations, and in this case handover to another frequency band should be a similar process as is inter-frequency handover up to rel-5 bands.

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## 7 Frequency arrangements (Rel-7)

### 7.1 The Band X frequency plan

It is pointed out in [14] that CITELE, the Inter-American Telecommunications Commission (an entity of the Organization of American States), already recognizes the 1710-1770/2110-2170 MHz band (2x60 MHz) for Advanced Wireless services, and many countries throughout the Western Hemisphere have reserved the entire band for future wireless auctions and deployments. The already specified Band IV (2x45 MHz) is a part of this band and will be auctioned in 2006 in the US as discussed in Clause 7.2.

Figure 7.1 shows the frequency arrangement for Band X in relation to Band IV and illustrates how Band X is an extension to Band IV. The separation between up- and downlink is large, giving a 400 MHz duplex spacing and a 340 MHz duplex gap.

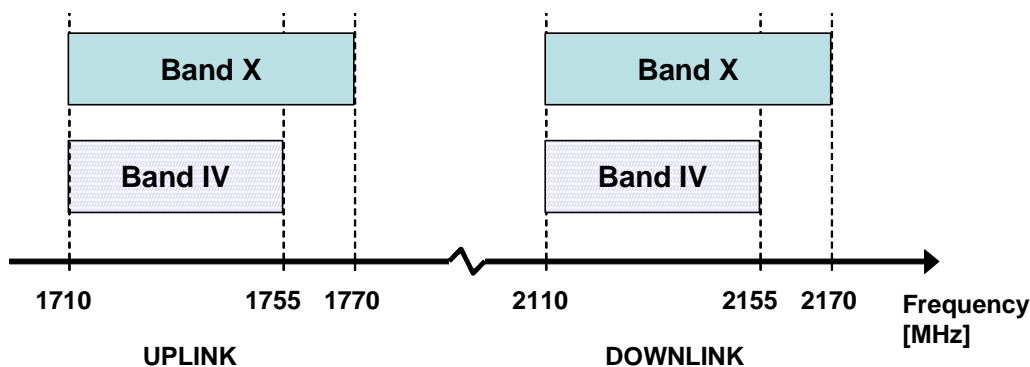


Figure 7.1 Frequency arrangement for Band X in relation to Band IV.

## 7.2 The FCC band plan for AWS

In November 2003, the FCC created service rules for 90 MHz of AWS spectrum at 1710-1755 and 2110-2155 MHz [11]. The FCC plans to auction this spectrum as early as June 2006. This spectrum will be licensed on a flexible use basis under Part 27 of the Commission's rules, according to the band plan. The AWS spectrum bands are officially the 1710-1755 and 2110-2155 MHz, which is also the frequency ranges included in Band IV.

In addition, in October 2004, the FCC allocated an additional 20 MHz of AWS spectrum ("AWS II") as 1915-1920 MHz paired with 1995-2000 MHz and 2020-2025 MHz paired with 2175-2180 MHz, and sought comment on the service and technical rules for this spectrum [12]. Regarding the 2155-2175 MHz, it is not clear how it would be used. It could be assigned as an "auxiliary" downlink for AWS. It is however unlikely that the range 1755-1775 MHz would be included in such an arrangement, due to the current government use. The whole situation for the AWS bands is summarized in Figure 7.2.

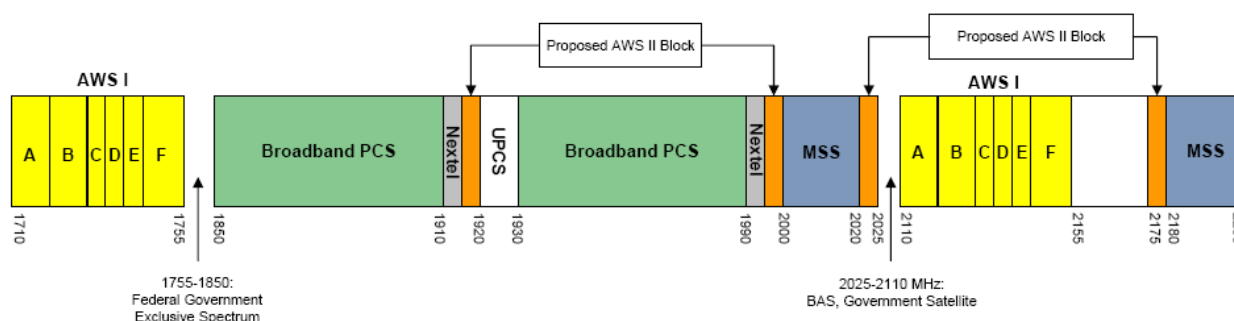


Figure 7.2 Present AWS band plan including new proposed blocks (from FCC [13]).

The extension of the AWS band ("AWS II") is thus not a part of the Extended 1.7/2.1 GHz band (Band X) that is the scope of this report. There are also several uncertainties on when and in what way the AWS band may be extended. It is therefore concluded that the extension of AWS to AWS II will not be any part of the new Band X as defined at the moment.

## 8 Study of RF requirements (Rel-7)

### 8.1 Co-existence in the band

As is discussed in subclause 5.2, the existing rules for operation in the 1.7 GHz and 2.1 GHz Bands do not preclude operation of narrow band systems within the band. Similar narrow band blocking and intermodulation requirements as currently in band IV (and bands II and V) should also be applied for Band X.

It is also concluded in subclause 5.2 that the propagation path loss difference between 1.7 and 1.9 GHz is quite small. For this reason, simulation results used in identifying requirements for the UMTS1900/1800 WI should in principle be applicable also at 1.7 GHz uplink. In addition, earlier simulation results obtained for Band I should be directly applicable to 2.1 GHz downlink scenarios. These results are also valid for Band X.

The conclusion is that the co-existence requirements in the extended Band X can be the same as in Band IV and no special studies are needed for Band X.

## 8.2 Commonality with Band IV RF requirements

As was shown in Subclause 7.1, the band plans for the new Band X is completely overlapping with that of Band IV. The duplex separation is identical (400 MHz) and the complete frequency range of Band IV (2x45 MHz) is a subset of the Band X range (2x60 MHz).

This opens up possibilities for commonality in RF design between Band IV and X, if the RF requirements are sufficiently aligned. Such a commonality is especially important for UEs to enable dual-band operation and to give economies of scale. The discussion below shows the potential and possible advantages of such a commonality between Band IV and Band X RF requirements for the UE.

Many requirements will implicitly be identical between Band IV and X. There are however three requirements that have a strong dependence on the frequency band range, with a potential implementation impact. These are

- Additional spurious emissions requirements
- Receiver spurious emissions
- In-band and out-of-band blocking

These are considered further for commonality below.

### 8.2.1 UE Requirements that are implicitly identical to Band IV

When a new frequency band is introduced in 3GPP specifications, there are a number of UE RF requirements that have a separate entry for the new band. Some of these have direct relations to the operating band range (mainly spurious emissions and blocking limits), while many others only have indirect relations to the operating band. Since Band IV and Band X are very similar, having approximately the same frequency range and duplex gap, there is a potential for a number of requirements to be identical between Bands IV and X.

The following requirements can for this reason be the same for Band IV and X:

- Transmitter characteristics (Clause 6 of 25.101)
- **UE maximum output power (6.2.1):** The same power classes (3 and 4) can be defined for Band X. It is possible to add also power class 3bis to Band X and still keep full commonality with Band IV, since power class 3bis implies a common RF design with class 3.
- **Spectrum emission mask (6.6.2.1):** Since Band X should comply with the FCC limits on unwanted emissions that also apply for Band IV (FCC Title 47 part 27.53 [15]), it should have both "minimum" and "additional" requirements for the spectrum mask, identical to Band IV.
- Receiver characteristics (Clause 7 of 25.101)
- **Reference sensitivity level (7.3.1):** The reference sensitivity does vary between the different operating bands, mostly depending on the differences in duplex gap and operating bandwidth. Since Band IV and X are very similar in this respect and have the same very large duplex separation (400 MHz), they can have the same Rx sensitivity of -117 dBm.
- **Narrow band blocking (7.6.3):** This requirement applies to all operating bands that may potentially have narrowband systems such as GSM in the band. This is true for both Band IV and X, and the limits can be the same with the same worst case distance to the potential interferer (2.7 MHz) assuming a WCDMA carrier on one of the "additional" channels in the channel raster.

- **Intermodulation (narrow band) (7.8.2):** This requirement also applies to all operating bands that may potentially have narrowband systems such as GSM in the band. It can have the same limit and distances to the potential interferer (3.5 and 5.9 MHz) as for Band IV.
- **Multi-path fading propagation (Annex B.2.2 of 25.101):** The performance requirements in Clauses 8, 9 and 10 are identical between bands. Since Band IV and X both operate with a 2.1 GHz down link, the corresponding mobile speeds assumed for the Multi-path fading propagation conditions in Annex B.2.2 can also be identical.

## 8.2.2 Additional spurious emissions requirements (Clause 6.6.3)

The additional spurious emissions requirements for the UE in Band IV are introduced in Rel-6 to protect the downlink of all the bands that potentially operate in the same geographical area, as shown in Table 8.1. The bands protected are 869 – 894 MHz (Band V downlink), 1930 – 1990 MHz (Band II downlink) and 2110 – 2155 MHz (Band IV downlink).

**Table 8.1 Additional spurious emissions requirements in Rel-6 (from TS 25.101 [3] Table 6.13)**

Operating Band	Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
IV	$869 \text{ MHz} \leq f \leq 894 \text{ MHz}$	3.84 MHz	-60 dBm
	$1930 \text{ MHz} \leq f \leq 1990 \text{ MHz}$	3.84 MHz	-60 dBm
	$2110 \text{ MHz} \leq f \leq 2155 \text{ MHz}$	3.84 MHz	-60 dBm

When Band X is introduced in Rel-7, it should provide protection of the same band ranges, since it potentially will operate in the same geographical area. In addition, the downlink of Band X (2110 – 2170 ) will also need protection from other Band X UEs as well as from Band II, IV and V UEs. An additional entry should be introduced in Table 6.13 for each of those operating bands in order to protect 2110 – 2170 MHz. But the additional range of 2110 – 2170 MHz overlaps completely with the already existing 2110 – 2155 MHz requirement range, making a single entry with the extended range simpler. The table for Rel-7 will then look like Table 8.2. New or modified entries are marked yellow.

**Table 8.2 Proposed additional spurious emissions requirements for Band IV and X in Rel-7.**

Operating Band	Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
IV	$869 \text{ MHz} \leq f \leq 894 \text{ MHz}$	3.84 MHz	-60 dBm
	$1930 \text{ MHz} \leq f \leq 1990 \text{ MHz}$	3.84 MHz	-60 dBm
	$2110 \text{ MHz} \leq f \leq 2170 \text{ MHz}$	3.84 MHz	-60 dBm
X	$869 \text{ MHz} \leq f \leq 894 \text{ MHz}$	3.84 MHz	-60 dBm
	$1930 \text{ MHz} \leq f \leq 1990 \text{ MHz}$	3.84 MHz	-60 dBm
	$2110 \text{ MHz} \leq f \leq 2170 \text{ MHz}$	3.84 MHz	-60 dBm

This also means that in Rel-7, the "Additional spurious emissions requirements" will be identical for Band IV and Band X, thereby facilitating commonality of RF requirements from this aspect.

## 8.2.3 Receiver spurious emissions (7.9)

The situation for receiver spurious emissions requirements (Table 7.11 in TS 25.101 [3]) is very similar to that of the "Additional spurious emissions requirements". Requirements for Band X can be introduced in Rel-7 by changing the range protected from This also means that in Rel-7, the "Receiver spurious emissions" requirements (except for the protection of its own transmitter band) will be identical for Band IV and Band X, thereby facilitating commonality of RF requirements from this aspect.

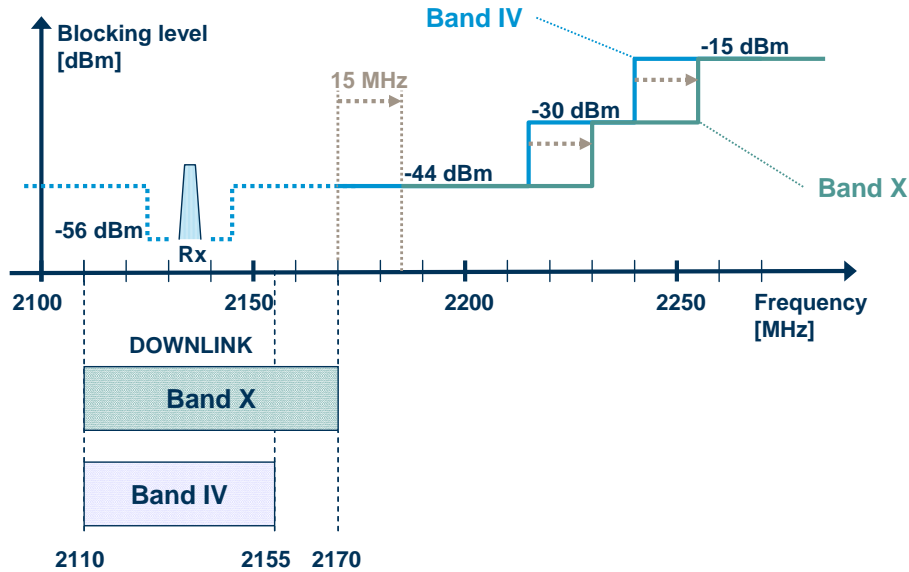
## 8.2.4 In-band and out-of-band blocking

In TS 25.101[3], the in-band blocking requirements are defined in subclause 7.6.1 (Table 7.6) and the out-of band requirements in subclause 7.6.2 (Table 7.7). The limits are illustrated in Figure 8.1.

The in-band blocking levels are defined over the operating band plus 15 MHz on each side, i.e. over 2095 – 2170 MHz for Band IV. This range will extend with 15 MHz to 2095 – 2185 MHz for Band X, but the requirement as such remains the same as it is set relative to the carrier position.



The out-of-band blocking levels start 15 MHz above (and below) the operating band. For frequencies above the operating band in the new Band X, the required level for the unwanted blocking signal should be shifted another 15 MHz up in frequency if the same relative requirement is to be kept, as shown in Figure 8.1.



**Figure 8.1** Blocking levels for Band IV (blue) and Band X (green). In-band blocking levels (dotted) are set relative to the carrier position. Out-of-band blocking levels are shifted up 15 MHz for Band X.

## 8.2.5 Possibilities for dual-band operation

If a UE is designed for dual-band operation with a single RF for Band IV and X, it has some implications for the requirements above. Most RF requirements will be identical for Band IV and X operation as shown in 8.2.1, 8.2.2 and 8.2.3. Also in-band blocking in 8.2.4 will be identical, but over the larger operating band.

As was shown in 8.2.4, the Band X out-of-band blocking requirements are in absolute terms "relaxed" for Band X since the frequency of the blocking signal is moved 15 MHz up in frequency. For a common RF to operate in both Bands, it would have to meet the "stricter" Band IV requirements in a dual-band operation.

It is worth noting that the Band X downlink has exactly the same frequency range as Band I and all Band X downlink requirements are in fact taken to be identical to Band I here. The implication is that a UE designed for dual-band operation between Band IV and I should already support the wider downlink of Band X. This means that the complexity of designing a common RF between Bands IV and X should be the same as for Bands IV and I.

## 8.2.6 Conclusion

Essentially all RF requirements will be identical between Band IV and Band X and will easily facilitate a common RF design. The main differentiating requirement is out-of-band blocking. It is however noted that since Band I and Band X downlinks have identical frequency ranges, the RF complexity of a UE for dual-band IV+X operation should be the same as for dual-band IV+I operation.

## 8.3 Channel raster

### 8.3.1 Analysis of options for UARFCN numbering

The existing Band IV is a sub-band of the new Band X, as was shown in Clause 7. Taking this into account there are two options for defining UARFCN numbers for Band X:

- A) A complete new range of UARFCN unique to Band X.
- B) Building on the UARFCN numbers defined for Band IV and extending that range from covering 2x45 MHz to 2x60 MHz

Option A will always work in practice, but will obviously "use up" a larger part of the available UARFCN range. Also, it does not make maximum use of the possible commonality of RF requirements.

For Option B to work there has to be a possibility to extend the Band IV range. As is shown in Table 8.1, there is such a possibility since a number range extended to 2x70 MHz is reserved for the 1.7/2.1 GHz band pairing in the UARFCN numbering scheme, specifically to cater for an extension of the band [8].

**Table 8.1: UARFCN used and reserved for UTRA FDD Band IV (from TS 25.101 Annex E [3])**

UTRA FDD Band	Band range [MHz]	Range res. [MHz]	Uplink UARFCN				Downlink UARFCN			
			Formula offset F <sub>UL</sub> _Offset [MHz]	Assigned/Reserved	N <sub>U</sub>	F <sub>UL</sub> [MHz]	Formula offset F <sub>DL</sub> _Offset [MHz]	Assigned/Reserved	N <sub>D</sub>	F <sub>DL</sub> [MHz]
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

Option B makes maximum use of commonality between RF requirements, but it also relies on UE requirements not being too different for Band IV and the new Band X mobiles. When the present UARFCN scheme was devised [8], considerations were made for the impact of overlapping UARFCN ranges for different bands and its impact on inter-band mobility [9] and inter-RAT inter-working between GSM and UTRA [10]. If mobiles for the new Band X are not dual band IV/X UEs (i.e. they are not allowed to operate in Band IV), the overlapping UARFCN potentially causes two problems:

- As shown in [9], once the UE is camped on a cell of a band it supports, there can be several neighbour cells indicated in SIB11 belonging to other bands. The inter-band mobility means that a multi-band UE supporting Band X will check the DL UARFCN of the neighbouring cells and decide which cells belong to the bands it supports and measure them. If it discovers a UARFCN in the range that overlaps between Bands IV and X, it cannot tell whether it is a Band IV or Band X cell. Under these conditions, the UE will still measure the cell and evaluate it for reselection purposes and only when reading the System Information of the target cell, detect if it can reselect to it or if it has to go back to the previous cell. These potential incorrect measurements and reselection attempts will happen continuously, leading to unnecessary battery drainage and will cause loss of paging.
- As shown in [10], there is a similar situation in GERAN dedicated mode and in GERAN dual transfer mode. The UE will then receive measurement information containing a list of 3G neighbouring cells. A UTRAN FDD neighbouring cell is identified by its DL-UARFCN and the primary scrambling code, giving the same problem to distinguish between Band IV and Band X cells in the overlapping UARFCN range. This can potentially cause false inter-system handover attempts towards unsupported 3G cells.

The reverse situation occurs for Band IV UEs receiving a potential Band X cell UARFCN in its measurement list, if it is in the overlapping UARFCN range. These issues do not cause any problems if Band IV and Band X RF requirements are common in such a way that

- Band X UEs can operate in the sub-band which is the Band IV frequency range, meeting Band IV UE requirements.
- Band IV UEs can operate in the Band IV sub-band part of Band X, meeting Band X UE requirements. It does not necessarily have to support the complete frequency range, if the network is aware of it being a Band IV UE.

Since it cannot be mandated that all Band X UEs support dual-band IV/X operation and vice versa, and because of the potential problems with inter-band and inter-RAT mobility listed above, it is concluded not to have overlapping UARFCN ranges between Bands IV and X. A complete new range of UARFCN unique to Band X should therefore be defined according to Option A above.

### 8.3.2. Definition of a new UARFCN range for Band X

Based on the proposed Option A above, a new range of UARFCN unique to Band X is defined. The new UARFCN range covering 2x60 MHz is added for general and additional Band X frequencies in sequence after the UARFCN numbers defined for Band VIII (see TS 25.101 [3] Table E.1.) The UARFCN range needed is shown in Table 8.2.

The resulting parameters to define the Band X UARFCN range are shown in Table 8.3 and 8.4 and the resulting UARFCN ranges for Band X are shown in Table 8.5.

**Table 8.2: UARFCN for UTRA FDD Band X (to be added to TS 25.101 Table E.1)**

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]
X	2x60	2x60	1135	Start res.	2875	1710.0	1490	Start res.	3100	2110.0
				Min.	<b>2887</b>	<b>1712.4</b>		Min.	<b>3112</b>	<b>2112.4</b>
				Max.	<b>3163</b>	<b>1767.6</b>		Max.	<b>3388</b>	<b>2167.6</b>
				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.	<b>3187</b>	<b>1712.5</b>		Min.	<b>3412</b>	<b>2112.5</b>
				Max.	<b>3462</b>	<b>1767.5</b>		Max.	<b>3687</b>	<b>2167.5</b>
				End res.	3474	1769.9		End res.	3699	2169.9

**Table 8.3: UARFCN definition for Band X (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]	
		$F_{UL\_low}$	$F_{UL\_high}$		$F_{DL\_low}$	$F_{DL\_high}$
X	1135	1712.4	1767.6	1490	2112.4	2167.6

**Table 8.4: UARFCN definition for Band X (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 ( $F_{UL}$ ) [MHz]	UARFCN formula offset $F_{DL\_Offset}$ [MHz]	Carrier frequency ( $F_{DL}$ ) [MHz]
X	1075.1	1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5, 1757.5, 1762.5, 1767.5	1430.1	2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5, 2157.5, 2162.5, 2167.5

**Table 8.5: UARFCN for Band X**

Band	Uplink (UL) UE transmit, Node B receive		Downlink (DL) UE receive, Node B transmit	
	General	Additional	General	Additional
X	2887 to 3163	3187, 3212, 3237, 3262, 3287, 3312, 3337, 3362, 3387, 3412, 3437, 3462	3112 to 3388	3412, 3437, 3462, 3487, 3512, 3537, 3562, 3587, 3612, 3637, 3662, 3687

## 9 Required changes for specifications (Rel-7)

### 9.1 Required changes to TS 25.101

Required changes in specification TS 25.101 together with their currently assumed values are discussed in Table 9.1. Requirements which are not shown are applicable to Band X without any modifications from the existing specifications. In particular, Band IV requirements should be re-used on the overlapping frequencies in order to facilitate roaming between the bands.

**Table 9.1: Required Changes in TS 25.101**

Section	Requirement	Discussion / Required Changes
5.2	Frequency bands	New operating band 2x60 MHz, Band X. 1710 – 1770 MHz: Up-link (UE transmit, Node B receive) 2110 – 2170 MHz: Down-link (Node B transmit, UE receive)
5.4.2	Channel raster	Additional channels are needed in the middle of 5 MHz blocks 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5, 1757.5, 1762.5 and 1767.5 MHz for UL 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5, 2157.5, 2162.5 and 2167.5 MHz for DL
5.4.3	Channel number	Modify general and additional UARFCN definitions for Band X.
5.4.4	UARFCN	Modify general and additional UARFCN definitions for Band X.
6.2.1	UE maximum output power	Add UE power class for Band X.
6.6.2.1	Spectrum emission mask	Add minimum and additional requirements for Band X.
6.6.3	TX spurious emissions	Add additional TX spurious emissions requirements for Band X.
7.3.1	Reference sensitivity level	Add minimum requirement for Band X.
7.6.1	In-band blocking	Modify requirement for Band X.
7.6.2	Minimum requirement (Out of-band blocking)	Modify out-of-band blocking requirements for Band X.
7.6.3	Minimum requirement (Narrow band blocking)	Add narrow band blocking requirements for Band X.
7.8.2	Intermodulation characteristics, Minimum requirement (Narrow band)	Add narrow band IM requirements for Band X.
7.9	RX spurious emissions	Modify additional receiver spurious emission requirements for Band X.
Annex B.2.2	Multi-path fading propagation conditions	Add requirements for Band X.
Annex E	UARFCN numbers	Add parameters for Band X.

### 9.2 Required changes to TS 25.104

Required changes in specification TS 25.104 together with their currently assumed values are discussed in Table 9.2. Requirements which are not shown are applicable to Band X without any modifications from the existing specifications. In particular, Band IV requirements should be re-used on the overlapping frequencies in order to facilitate commonality of BS equipment between the bands.

**Table 9.2: Required Changes in TS 25.104**

Section	Requirement	Discussion / Required Changes
5.2	Frequency bands	New operating band 2x60 MHz, Band X 1710 – 1770 MHz: Up-link (UE transmit, Node B receive) 2110 – 2170 MHz: Down-link (Node B transmit, UE receive)
5.3	TX-RX frequency separation	New operating band X with 400 MHz TX-RX frequency separation.
5.4.2	Channel raster	Additional channels are needed in the middle of 5 MHz blocks 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5, 1757.5, 1762.5 and 1767.5 MHz for UL 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5, 2157.5, 2162.5 and 2167.5 MHz for DL
5.4.3	Channel number	Modify general and additional UARFCN definitions for Band X.
6.6.2.1	Spectrum emission mask	Add minimum and additional requirements for Band X.
6.6.3.1	TX Spurious emissions	Extend table according to the Band IV patterns
6.6.3.2	Protection of BS receiver of own or different BS	Modify requirements for Band X. Define band to be 1710 – 1770 MHz in Table 6.10.
6.6.3.3 – 6.6.3.4	Spurious emissions / Co-existence requirements	Modify requirements for Band X.
7.5	Blocking characteristics	Modify requirements for Band X. Example for WA BS: 1710 – 1770 MHz: -40 dBm / WCDMA signal 1690 – 1710 MHz: -40 dBm / WCDMA signal 1770 – 1790 MHz: -40 dBm / WCDMA signal Otherwise –15 dBm
7.5.2	Blocking/Co-location	Modify additional blocking requirements for Band X.
7.6	Intermodulation characteristics	Add narrow band Intermodulation requirements for Band X.
7.7.1	RX Spurious emissions	Modify requirements for Band X.
Annex B.2	Multi-path fading propagation conditions	Add requirements for Band X.
Annex B.5	Multi-path fading propagation conditions for E-DPDCH and E-DPCCH	Add requirements for Band X.

### 9.3 Required changes to TS 25.113

Required changes in specification TS 25.113 are summarized in Table 9.3. Requirements which are not shown are applicable to Band X (Extended UMTS 1.7/2.1 GHz) without any modifications from the existing specification.

**Table 9.3: Required Changes to TS 25.113**

Section	Requirement	Discussion / Required Changes
4.5.2	Receiver exclusion band	Add receiver exclusion band for Band X (Extended UMTS 1.7/2.1 GHz)

### 9.4 Required changes to TS 25.133

Required changes in specification TS 25.133 are summarized in Table 9.4. Requirements which are not shown are applicable to Band X (Extended UMTS 1.7/2.1 GHz) without any modifications from the existing specification.

**Table 9.4: Required Changes to TS 25.133**

<b>Section</b>	<b>Requirement</b>	<b>Discussion / Required Changes</b>
9.1.1	CPICH RSCP	Add Band X absolute and relative accuracy requirements for Intra and Inter frequency measurements.
9.1.2	CPICH Ec/Io	Add Band X absolute and relative accuracy requirements for Intra and Inter frequency measurements.
9.1.3	UTRA Carrier RSSI	Add Band X absolute and relative accuracy requirements.
9.1.7	SFN-CFN observed time difference	Add Band X Intra and Inter frequency requirements.
9.1.8	SFN-SFN observed time difference	Add Band X requirements for SFN-SFN observed time difference Type 1 and Type2.
9.1.9	UE Rx-Tx time difference	Add Band X requirements for UE Rx-Tx time difference Type 1 and Type2.
A.9.1.1	CPICH RSCP	Add Band X absolute and relative accuracy requirements for Intra and Inter frequency measurements.
A.9.1.2	CPICH Ec/Io	Add Band X absolute and relative accuracy requirements for Intra and Inter frequency measurements.
A.9.1.3	UTRA Carrier RSSI	Add Band X absolute and relative accuracy requirements.
A.9.1.4	SFN-CFN observed time difference	Add Band X Intra and Inter frequency requirements.
A.9.1.5	SFN-SFN observed time difference	Add Band X intra frequency requirements for SFN-SFN observed time difference Type 1 and Type2.
A.9.1.6	UE Rx-Tx time difference	Add Band X intra frequency requirements for UE Rx-Tx time difference Type 1 and Type2.

## 9.5 Required changes to TS 25.141

Required changes in specification TS 25.141 together with their currently assumed values are discussed in Table 9.5. Requirements which are not shown are applicable to Band X without any modifications from the existing specifications. In particular, Band IV requirements should be re-used on the overlapping frequencies in order to facilitate commonality of BS equipment between the bands.

**Table 9.5: Required Changes to TS 25.141**

Section	Requirement	Discussion / Required Changes
3.4.1	Frequency bands	New operating band 2x60 MHz, Band X 1710 – 1770 MHz: Up-link (UE transmit, Node B receive) 2110 – 2170 MHz: Down-link (Node B transmit, UE receive)
3.4.2	TX-RX frequency separation	New operating band X with 400 MHz TX-RX frequency separation
3.5.2	Channel raster	Additional channels are needed in the middle of 5 MHz blocks 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5, 1757.5, 1762.5 and 1767.5 MHz for UL 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5, 2157.5, 2162.5 and 2167.5 MHz for DL
3.5.3	Channel number	Modify general and additional UARFCN definitions for Band X.
6.5.2.1	Spectrum emission mask	Add minimum and additional requirements for Band X.
6.5.3	TX Spurious emissions	Extend table according to the Band IV patterns
6.5.3.7.3	Protection of BS receiver of own or different BS	Modify requirements for Band X. Define band to be 1710 – 1770 MHz in tables.
6.5.3.7.4 – 6.5.3.7.5	Spurious emissions / Co-existence requirements	Modify requirements for Band X.
7.5.5	Blocking characteristics	Modify requirements for Band X. Example for WA BS: 1710 – 1770 MHz: -40 dBm / WCDMA signal 1690 – 1710 MHz: -40 dBm / WCDMA signal 1770 – 1790 MHz: -40 dBm / WCDMA signal Otherwise –15 dBm
7.5.5	Blocking/Co-location	Modify additional blocking requirements for Band X.
7.6.5	Intermodulation characteristics	Add narrow band Intermodulation requirements for Band X.
7.7.5	RX Spurious emissions	Modify requirements for Band X.
Annex D.2	Multi-path fading propagation conditions	Add requirements for Band X.
Annex D.5	Multi-path fading propagation conditions for E-DPDCH and E-DPCCH	Add requirements for Band X.

## 9.6 Required changes to TS 25.306

The possible UE radio access capability parameter settings in TS25.306 contain several instances of a parameter "Radio frequency bands" that defines the uplink and downlink frequency bands supported by the UE. The parameter is defined only by direct references TS 25.101 [3].

No update of TS 25.306 will thus be needed for the introduction of Band X.

## 9.7 Required changes to TS 25.307

Required changes in specification TS 25.307 are summarized in Table 9.7.1. Requirements which are not shown are applicable to Band X (Extended UMTS 1.7/2.1 GHz) without any modifications from the existing specification.

**Table 9.7.1: Required Changes to TS 25.307**

Section	Requirement	Discussion / Required Changes
x	Band X Independent of Release	A new section for Band X (Extended UMTS 1.7/2.1 GHz)

## 9.8 Required changes to TS 25.331

Required changes in specification TS 25.331 are summarized in Table 9.8.1. Requirements which are not shown are applicable to Band X (Extended UMTS 1.7/2.1 GHz) without any modifications from the existing specification.

**Table 9.8.1: Required Changes to TS 25.331**

Section	Requirement	Discussion / Required Changes
8.1.1.1.2	System information blocks	Additional comment for the IE "System information block type 5 and 5bis" is changed to include Band X (Extended UMTS 1.7/2.1 GHz)
10.2.48.8.8	System Information Block type 5 and 5bis	Section description is changed to indicate system information block type 5bis is also sent in networks that use Band X (Extended UMTS 1.7/2.1 GHz)
10.3.3.21a	Measurement capability extension	A new reference for the FDD Frequency band 2 (Band X - Extended UMTS 1.7/2.1 GHz)
10.3.3.42a	UE radio access capability extension	A new reference for the Frequency band 2 (Band X - Extended UMTS 1.7/2.1 GHz)
10.3.6.35c	Frequency band indicator 2	Semantics description is changed to exclude Band X (Extended UMTS 1.7/2.1 GHz)

## 9.9 Required changes to TS 25.423

In TS 25.423, the operating band number is used in the "Frequency Band Indicator" IE for the "Neighbouring FDD Cell Information" IE in RNSAP. The current coding in RNSAP allows indication of bands between I and XXII. The specification references TS 25.104 [4] for UARFCN and operating band definitions.

No update of TS 25.423 will thus be needed for the introduction of Band X.

## 9.10 Required changes to TS 25.461

Required changes in specification TS 25.461 are summarized in Table 9.10. Requirements which are not shown are applicable to Band X (Extended UMTS 1.7/2.1 GHz) without any modifications from the existing specification.

**Table 9.10: Required Changes to TS 25.461**

Section	Requirement	Discussion / Required Changes
4.3.7	Operating bands	Add operating band for Band X (Extended UMTS 1.7/2.1 GHz)

## 9.11 Required changes to TS 25.463

Required changes in specification TS 25.463 are summarized in Table 9.11. Requirements which are not shown are applicable to Band X (Extended UMTS 1.7/2.1 GHz) without any modifications from the existing specification.

**Table 9.11: Required Changes to TS 25.463**

Section	Requirement	Discussion / Required Changes
Annex B	Assigned fields for additional data	Define new bit fields for Band X (Extended UMTS 1.7/2.1 GHz)

## 9.12 Required changes to TS 34.124

Required changes in specification TS 34.124 are summarized in Table 9.12. Requirements which are not shown are applicable to Band X (Extended UMTS 1.7/2.1 GHz) without any modifications from the existing specification.

**Table 9.12: Required Changes to TS 34.124**

Section	Requirement	Discussion / Required Changes
4.4	Receiver exclusion band	Add receiver exclusion band for Band X (Extended UMTS 1.7/2.1 GHz)



10 (void)

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## Annex A (informative): Change History

**Table A.1: Change History**

<b>TSG</b>	<b>Doc</b>	<b>CR</b>	<b>R</b>	<b>Title</b>	<b>Cat</b>	<b>Curr</b>	<b>New</b>	<b>Work Item</b>
				Rel-7 version created from v6.0.0			7.0.0	
RP-33	RP-060525	0001		Introduction of Extended 1.7/2.1 GHz FDD (Band X) in Rel-7			7.0.0	RInImp-UMTS172 1Ext