

Universal Mobile Telecommunications System (UMTS); 2,6 GHz Frequency Division Duplex (FDD) downlink external



Reference

DTR/MSG-002600FDDtr

Keywords

UMTS, FDD, radio

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Mobile Standards Group (MSG).

1 Scope

The present document is a technical report of the UMTS 2,6 GHz FDD Downlink External work item, which was approved to establish in ETSI MSG#12. The purpose of the work item is to provide UMTS specification support for the following band allocation options:

- 2 010 - 2 025 MHz and 1 900 - 1 920 MHz: Up-link options (UE transmit, Node B receive).
- 2 570 - 2 620 MHz: Down-link (Node B transmit, UE receive).

In addition to the schedule and status of the work item, the report includes a description of the motivation of requirements and specification recommendations.

This work item is intended only for ITU region 1 and is inline with ECC Decision (ECC/DEC/(05)05) [1] of 18 March 2005 on harmonized utilization of spectrum for IMT-2000/UMTS systems operating within the band 2 500 - 2 690 MHz, and ECC Decision (ECC/DEC/(06)01) [2] of 24 March 2006 on the harmonized utilization of spectrum for terrestrial IMT-2000/UMTS systems operating within the bands 1 900 - 1 980 MHz, 2 010 - 2 025 MHz and 2 110 - 2 170 MHz.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

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2.1 Informative references

- [1] ECC/DEC/(05)05: Electronic Communications Committee, "ECC Decision of 18 March 2005 on harmonized utilization of spectrum for IMT-2000/UMTS systems operating within the band 2500 - 2690 MHz".
- [2] ECC/DEC/(06)01: Electronic Communications Committee, "ECC Decision of 24 March 2006 on the harmonized utilization of spectrum for terrestrial IMT-2000/UMTS systems operating within the bands 1900 - 1980 MHz, 2010 - 2025 MHz and 2110 - 2170 MHz".
- [3] 3GPP TR 25.810 (V7.0.0): "UMTS 2.6 GHz (FDD) Work Item Technical Report; (Release 7)".
- [4] 3GPP TR 25.811 (V7.0.0): "UMTS 2.6 GHz TDD Work Item Technical Report (Release 7)".

- [5] ERC Report 65, Electronic Communications Committee: "Adjacent Band Compatibility between UMTS and Other Services in the 2 GHz Band", Menton, May 1999; revised in Helsinki, November 1999.
- [6] ETSI TR 125 942 (V6.4.0): "Universal Mobile Telecommunications System (UMTS); Radio Frequency (RF) system scenarios (3GPP TR 25.942 version 6.4.0 Release 6)".
- [7] ETSI TS 125 101: "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101 version 7.8.0 Release 7)".
- [8] ETSI TS 125 113: "Universal Mobile Telecommunications System (UMTS); Base station and repeater electromagnetic compatibility (EMC) (3GPP TS 25.113 version 7.6.0 Release 7)".
- [9] ETSI TS 125 133: "Universal Mobile Telecommunications System (UMTS); Requirements for support of radio resource management (FDD) (3GPP TS 25.133 version 7.8.0 Release 7)".
- [10] ETSI TS 125 141: "Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.8.0 Release 7)".
- [11] ETSI TS 125 306: "Universal Mobile Telecommunications System (UMTS); UE Radio Access capabilities (3GPP TS 25.306 version 7.4.0 Release 7)".
- [12] ETSI TS 125 331: "Universal Mobile Telecommunications System (UMTS); Radio Resource Control (RRC); Protocol specification (3GPP TS 25.331 version 7.5.0 Release 7)".
- [13] ETSI TS 125 423: "Universal Mobile Telecommunications System (UMTS); UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling (3GPP TS 25.423 version 7.5.0 Release 7)".
- [14] ETSI TS 125 461: "Universal Mobile Telecommunications System (UMTS); UTRAN Iuant interface: Layer 1 (3GPP TS 25.461 version 7.5.0 Release 7)".
- [15] ETSI TS 125 463: "Universal Mobile Telecommunications System (UMTS); UTRAN Iuant interface: Remote Electrical Tilting (RET) antennas Application Part (RETAP) signalling (3GPP TS 25.463 version 7.5.0 Release 7)".
- [16] ETSI TS 134 124: "Universal Mobile Telecommunications System (UMTS); Electromagnetic compatibility (EMC) requirements for mobile terminals and ancillary equipment (3GPP TS 34.124 version 7.5.0 Release 7)".
- [17] ETSI TS 125 307: "Universal Mobile Telecommunications System (UMTS); Requirements on User Equipments (UEs) supporting a release-independent frequency band (3GPP TS 25.307 version 7.1.0 Release 7)".
- [18] ETSI TS 125 104: "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (FDD) (3GPP TS 25.104 version 7.7.0 Release 7)".
- [19] ETSI TR 121 905 "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Vocabulary for 3GPP Specifications".

3 Definitions, symbols and abbreviations

For the purposes of the present document, the terms and definitions, symbols and abbreviations given in [1] to [19] apply.

4 Task description

The work item task is to generate necessary information of 2,6 GHz FDD system detailed below:

- Generate a report summarizing a study of radio requirements UTRA FDD:
 - 2 010 - 2 025 MHz and 1 900 - 1 920 MHz: Up-link options (UE transmit, Node B receive).
 - 2 570 - 2 620 MHz: Down-link (Node B transmit, UE receive).
- The co-existence with IMT2000 technology within 2 500 - 2 690 MHz and with 1 900 - 1 980, 2 010 - 2 025 and 2 110 - 2 170 MHz bands needs to be considered.
- Generate CR's to update the appropriate FDD documents.
- study any issues related to UMTS at 2,6 GHz FDD DL external band-signalling aspects.
- study any possible interface impacts to UMTS networks.

This work item is intended only for ITU region 1 and is inline with ECC Decision (ECC/DEC/(05)05) of 18 March 2005 on harmonized utilization of spectrum for IMT-2000/UMTS systems operating within the band 2 500 - 2 690 MHz, and ECC Decision (ECC/DEC/(06)01) of 24 March 2006 on the harmonized utilization of spectrum for terrestrial IMT-2000/UMTS systems operating within the bands 1 900 - 1 980 MHz, 2 010 - 2 025 MHz and 2 110 - 2 170 MHz.

5 Frequency arrangements

5.1 Frequency bands

UTRA FDD 2,6 GHz DL external is designed to operate in the following paired bands:

- Operating Band XV:
 - 1 900 - 1 920 MHz (UE transmit, Node B receive);
 - 2 600 - 2 620 MHz (UE receive, Node B transmit);
 - operating with a fixed TX-RX frequency separation of 700 MHz.
- Operating Band XVI:
 - 2 010 - 2 025 MHz (UE transmit, Node B receive);
 - 2 585 - 2 600 MHz (UE receive, Node B transmit);
 - operating with a fixed TX-RX frequency separation of 575 MHz.

The band gap between the downlink of Operating Band XVI and the uplink of Operating Band VII is 15 MHz.

6 Deployment aspects

6.1 Co-existence in the band

6.1.1 Co-existence with IMT-2000

There are extensive co-existence studies performed between UTRA systems for Band I, with the uplink at 1 920 MHz -1980 MHz and downlink at 2 110 MHz - 2 170 MHz [6]. As is concluded for UMTS2600 in [3], such studies are "re-usable" also for a system with a downlink at 2 600 MHz, in spite of the difference in propagation between bands.

Co-existence studies between UTRA and cdma2000 were also performed for Bands II and III. Also those studies are "re-usable" for UMTS 2,6 GHz downlink (external).

Since the existing co-existence studies in other bands can be re-used, the relevant adjacent channel receiver and transmitter parameters should be adopted from those existing bands.

6.1.2 Co-existence with GSM

Co-existence with GSM in the band has not been stated as a requirement for 2,6 GHz downlink external, although Single Carrier TDMA (UWC136) is an IMT-2000 technology.

6.1.3 Co-existence with TDD

As already indicated in [1] and [2] and also established as a working assumption in MSG, it is assumed that an administration would not implement mixed FDD/TDD in the bands for UMTS 2,6 GHz downlink (external).

6.2 Co-existence with adjacent bands

6.2.1 Uplink bands 1 900 MHz - 1 920 MHz and 2 010 MHz - 2 025 MHz

The uplink bands for UMTS 2,6 GHz FDD downlink (external) are part of the bands assigned for IMT-2000 in ERC/DEC(97)07, now replaced by ECC/DEC/(06)01 [2]. Compatibility between UMTS and services in bands adjacent to these uplink bands was studied in ERC Report 65 [5] as illustrated in figure 6.2.1.

The relevant adjacent band services are (numbers in brackets refer to figure 6.2.1):

- DECT operating adjacent to 1 900 MHz (1).
- UMTS operating adjacent to 1 920 MHz.
- MSS (UMTS-S) operating adjacent to 2 010 MHz (3).
- Fixed Services & Space Services operating adjacent to 2 025 MHz (4).

Reference [5] contains adjacent band compatibility studies for cases (1), (3) and (4) assuming that the bands 1 900 MHz - 1 920 MHz and 2 010 MHz - 2 025 MHz are used for UMTS TDD. Since TDD implies both an uplink and a downlink in those bands, the TDD uplink results are applicable also to the 2,6 GHz DL external case where the bands are used for FDD uplink only.

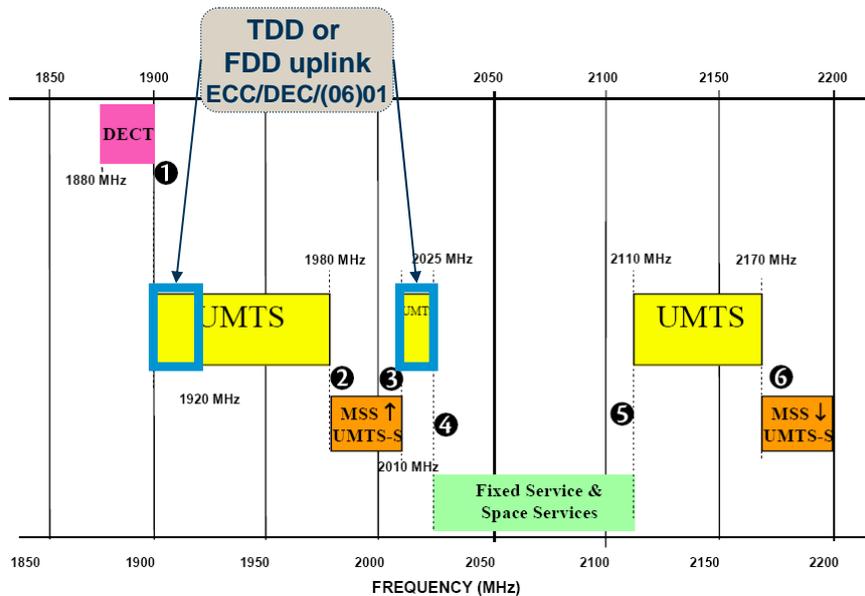


Figure 6.2.1: Adjacent band scenarios for the FDD uplink bands available, based on figure 1 of ECC Report 65 [5]

The required minimum carrier separations are indicated in table 13 of [5]. Since we are only concerned with UMTS FDD uplink here, the following interpretation should be applied to the conclusions of ERC Report 65 [5]:

- DECT at 1 900 MHz (1): The only relevant and critical case mentioned is DECT WLL to UMTS Macro BS.
- MSS (UMTS-S) at 2 010 MHz (3): Minimum carrier separation is dominated by downlink; it will be reduced to 3,0 MHz if only FDD uplink is considered.
- Space Services at 2 025 MHz (4): The table entries apply for FDD uplink.
- Fixed Services at 2 025 MHz (4): The table entries and statement on co-ordination apply to the downlink of TDD. They do therefore not apply for FDD uplink at 2 025 MHz.

For adjacent band compatibility between UTRA FDD uplinks at 1 920 MHz, the existing compatibility studies between adjacent UTRA systems in Band I [6] apply also here.

The overall conclusion for FDD uplink at 1 900 - 1 920 MHz and 2 010 - 2 025 MHz is that since existing studies of adjacent band compatibility for UTRA FDD and TDD apply as outlined above, the relevant uplink adjacent band parameters should be adopted for the new uplink bands from those existing bands. Note that parameters such as ACLR and spectrum mask limits are fundamentally the same for UTRA FDD and TDD.

6.2.2 Downlink band 2 570 - 2 620 MHz

The UMTS 2,6 GHz FDD (external) downlink band is situated between the uplink and downlink bands of Band VII as shown in figure 6.2.2. The following should be noted:

- For adjacent band compatibility between UTRA FDD downlinks at 2 620 MHz, the existing compatibility between adjacent UTRA systems apply also here as pointed out in [3].
- For compatibility between UMTS 2,6 GHz downlink (external) and the FDD uplink at 2 570 MHz, the frequency arrangement contains a guard band in terms of a "band gap" as shown in figure 6.2.2. The band gap is further discussed in clause 6.2.3.

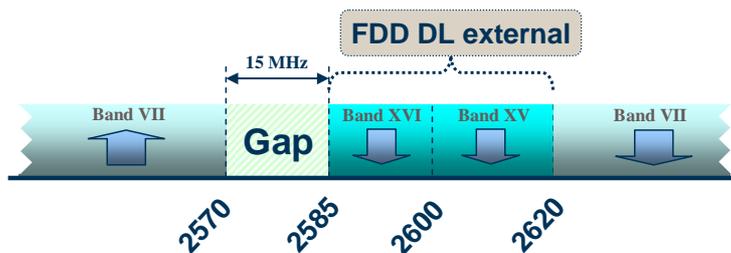


Figure 6.2.2: Adjacent band situation for the UTRA 2,6 GHz FDD (external) downlink band

- The overall conclusion for FDD downlink at 2 570 - 2 620 MHz is that since existing studies of adjacent band compatibility for UTRA FDD and TDD apply as outlined above, the relevant receiver and transmitter parameters for adjacent bands should in general be adopted for the new downlink bands from those existing bands.

6.2.3 Band gap at 2 570 - 2 585 MHz

The gap between Band XVI downlink and Band VII uplink is 15 MHz as shown in figure 6.2.2, have some potential implications for Band XVI operation:

- While the UE blocking level in the frequency range up to 2 570 MHz is kept identical to that of a Band VII UE for a Band XVUE, this is not the case for a Band XVI UE. In this case, the blocking level in the frequency range 2 500 - 2 570 MHz need to be relaxed to -30 dBm due to the close proximity to the Band XVI UE Rx band starting at 2 585 MHz.
- The Band VII (UMTS2600) spurious emission is set to -50 dBm/MHz in the frequency range 2 590 - 2 620 MHz in order to protect UMTS TDD or UMTS downlink external operation. The limit is -30 dBm/MHz below 2 590 MHz. Since Band XVI downlink starts at 2 585 MHz, a UE operating in the frequency range 2 585 - 2 590 MHz will not have the same level of protection from UE-to-UE interference as UEs in 2 590 - 2 620 MHz.
- There may be difficulties implementing a Base Station that operates on Band VII and Band XVI on the same antenna connector, due to the close proximity between the Band VII uplink band and Band XVI downlink band.

7 Study of RF requirements (Rel-7)

7.1 Channel raster and numbering

7.1.1 Channel raster considerations

The plan agreed for the 2,6 GHz band in ECC DEC 05(05) [1] states that assigned blocks shall be in multiples of 5,0 MHz. The frequency arrangement will then consist of exactly four blocks of 2x5 MHz for Band XV and three blocks of 2x5 MHz for Band XVI. Since it must be possible to place a carrier centred on each block and these centre positions will not fall on the "general" 200 kHz channel raster, there will be four UARFCN needed for the "additional" channels in those positions for Band XV and three for Band XVI.

7.1.2 Definition of a UARFCN range for Band XV

Based on the frequency arrangement for Band XV and the channel raster considerations above, a new range of UARFCN unique to Band XV is defined. The new UARFCN range covering 2x20 MHz is added for general and additional Band XV frequencies. The UARFCN are selected in sequence before the UARFCN numbers defined for Band IX (see TS 125 101 [7] table E.1.) The UARFCN ranges needed are shown in table 7.1.1.

The resulting parameters to define the Band XV UARFCN range are shown in tables 7.1.2 and 7.1.3 and the resulting UARFCN ranges for Band XV are shown in table 7.1.4.

Table 7.1.1: UARFCN for UTRA FDD Band XV (to be added to TS 125 101 [7] 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]
XV	2x20	2x20	240	Start res.	8 300	1 900.0	840	Start res.	8 800	2 600.0
				Min.	8 312	1 902.4		Min.	8 812	2 602.4
				Max.	8 388	1 917.6		Max.	8 888	2 617.6
				Stop res.	8 399	1 919.8		Stop res.	8 899	2 619.8
XV (Add.)	2x20	2x20	220,1	Start res.	8 400	1 900.1	820.1	Start res.	8 900	2 600.1
				Min.	8 412	1 902.5		Min.	8 912	2 602.5
				Max.	8 487	1 917.5		Max.	8 987	2 617.5
				Stop res.	8 499	1 919.9		Stop res.	8 999	2 619.9

Table 7.1.2: UARFCN definition for Band XV (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}
XV	240	1 902.4	1 917.6	840	2 602.4	2 617.6

Table 7.1.3: UARFCN definition for Band XV (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})

Table 7.1.4: UARFCN for Band XV

Band	Uplink (UL) UE transmit, Node B receive		Downlink (DL) UE receive, Node B transmit	
	General	Additional	General	Additional

7.1.3 Definition of a UARFCN range for Band XVI

Based on the frequency arrangement for Band XVI and the channel raster considerations above, a new range of UARFCN unique to Band XVI is defined. The new UARFCN range covering 2x15 MHz is added for general and additional Band XVI frequencies. The UARFCN are selected in sequence before the UARFCN numbers defined for Band XV (see TS 125 101 [7] table E.1.) The UARFCN ranges needed are shown in table 7.1.5.

The resulting parameters to define the Band XVI UARFCN range are shown in tables 7.1.6 and 7.1.7 and the resulting UARFCN ranges for Band XVI are shown in table 7.1.8.

Table 7.1.5: UARFCN for UTRA FDD Band XVI (to be added to TS 125 101 [7] 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]
XVI	2x15	2x15	380	Start res.	8 150	2 010.0	855	Start res.	8 650	2 585.0
				Min.	8 162	2 012.4		Min.	8 662	2 587.4
				Max.	8 213	2 022,6		Max.	8 713	2 597.6
				Stop res.	8 224	2 024.8		Stop res.	8 724	2 599.8
XVI (Add.)	2x15	2x15	365.1	Start res.	8 225	2 010.1	840.1	Start res.	8 725	2 585.1
				Min.	8 237	2 012.5		Min.	8 737	2 587.5
				Max.	8 287	2 022.5		Max.	8 787	2 597.5
				Stop res.	8 299	2 024.9		Stop res.	8 799	2 599.9

Table 7.1.6: UARFCN definition for Band XVI (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}
	380	2 012.4	2 022,6	855	2 587.4	2 597.6

Table 7.1.7: UARFCN definition for Band XVI (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})
XVI	365.1	2 012.5, 2 017.5, 2 022.5	840.1	2 587.5, 2 592.5, 2 597.5

Table 7.1.8: UARFCN for Band XVI

Band	Uplink (UL) UE transmit, Node B receive		Downlink (DL) UE receive, Node B transmit	
	General	Additional	General	Additional
XVI	8 162 to 8 213	8 237, 8 262, 8 287	8 662 to 8 713	8 737, 8 762, 8 787

7.2 Commonality with other bands

It is concluded in clause 6.2, both for FDD uplink at 1 900 - 1 920 MHz and 2 010 - 2 025 MHz and for FDD downlink at 2 570 - 2 620 MHz, that the relevant receiver and transmitter parameters for adjacent bands should in general be adopted from the existing bands.

7.2.1 Possibilities for multi-band operation

Multi band operation for UEs is in general possible with all other frequency bands. When setting the receiver sensitivity requirements for Band XV and XVI, consideration has been taken for the band gap size between Band VII uplink and the new Band XV and XVI downlink, also in view of different possible receiver implementations.

For the BS requirements, special consideration has been taken for BS supporting both Band I and XV operation as discussed in clause 7.4. Note that due to the 15 MHz band gap size between Band VII uplink and Band XVI downlink, operation of those two bands may be difficult on the same antenna.

7.3 Specific UE requirements

7.3.1 Band XV and XVI Reference sensitivity level:

Band XVI with UL at 2 010 - 2 025 MHz and DL at 2 585 - 2 600 MHz has duplex spacing of 575 MHz. The wide duplex separation relaxes the requirements for duplex filter and therefore it is expected that a standalone Band XV or XVI capable device should be able to achieve -117 dBm DPCH_Ec reference sensitivity level. However, it is unlikely that UEs will support only the Band XV or XVI, but also other 2,6 GHz frequency variants, which make the UE RF front-end design significantly more challenging.

Due to size constraints and challenging TRP/TRS requirements it is unlikely that there will be several 2,6 GHz antennas in multi mode / multi band UE unless RX-diversity or MIMO is supported. Therefore there is always a need to combine all 2,6 GHz bands to single antenna feed. This can be done either by:

- Using a band specific duplex filter for each two or three supported bands and using a switching element to combine them into same antenna feed. The switching elements will always introduce some losses to both receive and transmit chains.
- Design filters that support more than one of the bands. This will lead to more stringent requirements for filters and higher insertion losses in receiver and transmit chains,

Both of the proposed solutions introduce additional losses to signal paths if compared to single band and single mode device. In order to enable straightforward, cost and size effective implementation of the multi band and multi mode 2,6 GHz supporting terminals it is proposed that these additional losses are taken into consideration when reference sensitivity requirements for Band XV and XVI are defined.

Based on preliminary analysis a reference sensitivity level of -115 dBm DPCH_Ec reference is seen as a good minimum requirement for both bands XV and XVI.

7.3.2 Band XVI out-of-band blocking requirements:

A blocking requirement of -15 dBm is typically used as sufficient protection against close by UE/MS transmitters. The -15 dBm level can be analytically derived assuming maximum output and about 40 dB MCL (1 m separation) between the interferer and the victim. The analytical approach leads however to very pessimistic results and in this case to extremely challenging filtering and linearity requirements. Due to limitations in the available technology it is proposed that a blocking level of -30 dBm is defined for frequency range that covers UMTS2600 internal UL band.

- 1 - 2 500 MHz/2 775 - 12 750 MHz: -15 dBm.
- 2 500 - 2 570 MHz and 2 750 - 2 775 MHz: -30 dBm.
- 2 705 - 2 750 MHz: -44 dBm.

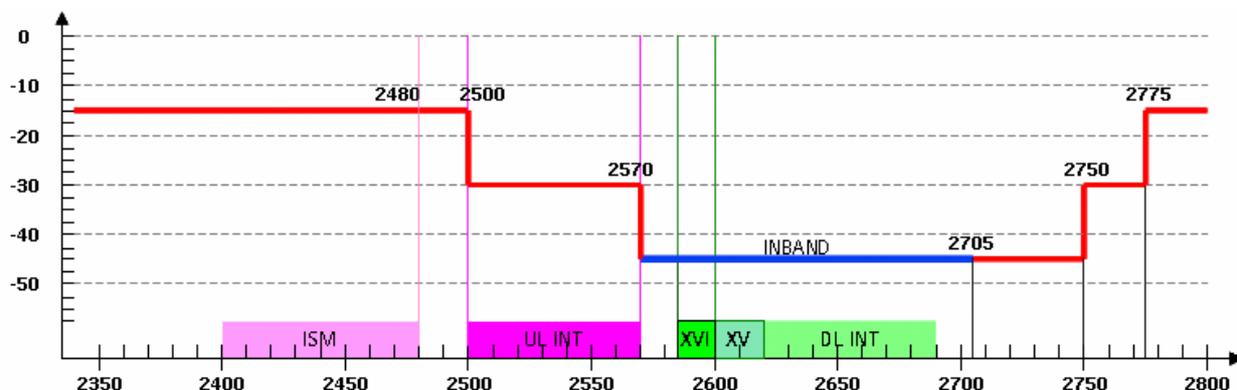


Figure 7.3.1: Band XVI out-of-band blocking requirements

7.4 Specific BS requirements

Band XV is introduced with a BS receiver frequency range of 1 900 - 1 920 MHz, which is adjacent to the Band I BS receiver frequency range of 1 920 - 1 980 MHz. For a BS that supports both Band I and Band XV, the total BS receiver frequency range will be 1 900 - 1 980 MHz. Such a BS would be difficult to implement with the Band XV out-of-band blocking requirement (-15 dBm) starting at 1 940 MHz, which is inside the Band I receiver band. Also the Band I out-of-band blocking requirement (-15 dBm) below 1 900 MHz would be difficult.

A special blocking requirement is therefore introduced for a BS supporting both Band I and Band XV, based on the joint receive band of 1 900 - 1 980 MHz. As an example, the requirements for a Wide Area BS will be:

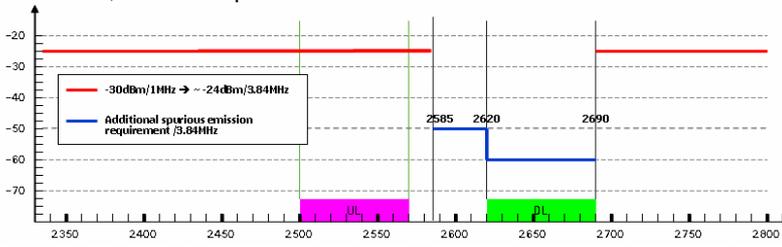
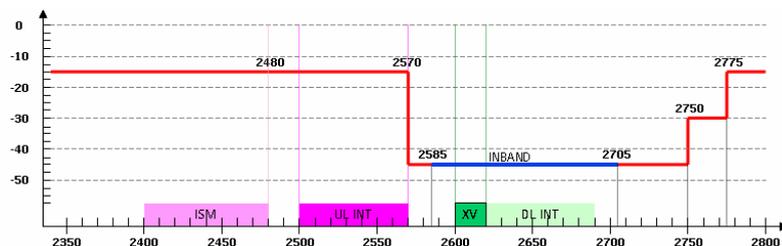
- 1 900 - 1 980 MHz: -40 dBm / WCDMA signal.
- 1 880 - 1 900 MHz: -40 dBm / WCDMA signal.
- 1 980 - 2 000 MHz: -40 dBm / WCDMA signal.
- Otherwise -15 dBm/CW.

8 Required changes for specifications (Rel-7)

8.1 Required changes to TS 125 101

Required changes in specification TS 125 101 [7] for Band XV are summarized in table 8.1.1. Requirements which are not shown are applicable to Band XV (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

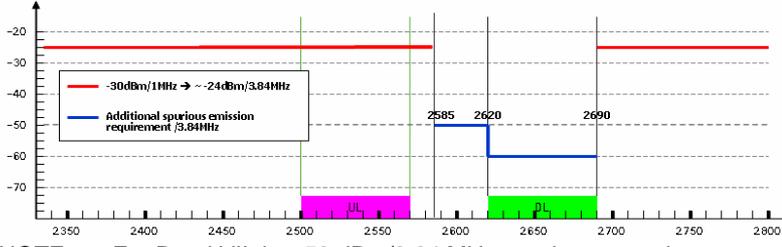
Table 8.1.1: Required Changes in TS 125 101 [7] for band XV

Section	Requirement	Discussion / Required Changes in TS 125 101 [7]
5.2	Frequency bands	New operating band 2x20 MHz needs to be added as Band XV: 1 900 - 1 920 MHz: Up-link (UE transmit, Node B receive). 2 600 - 2 620 MHz: Down-link (Node B transmit, UE receive).
5.3	TX-RX frequency separation	Add this requirement for Band XV. 700 MHz
5.4.2	Channel raster	Add this requirement for Band XV: 200 kHz raster as in Band I. Additional channels are needed in the middle of 5 MHz blocks. 1 902.5, 1 907.5, 1 912.5, and 1 917.5 MHz for UL. 2 602.5, 2 607.5, 2 612.5, and 2 617.5 MHz for DL.
5.4.3	Channel number	Define general and additional UARFCN definitions for Band XV.
5.4.4	UARFCN	Define general and additional UARFCN definitions for Band XV.
6.2.1	UE maximum output power	Add UE power classes for band XV: +24 dBm +1/-3 dB: Power class 3. +21 dBm +2/-2 dB: Power class 4. +23 dBm +2/-2 dB: Power class 3bis.
6.6.2.1	Spectrum emission mask	Additional requirements for spectrum emission mask are not needed for Band XV.
6.6.3	TX spurious emissions	Add additional TX spurious emissions requirements for Band XV. Requirements can be set according to the patterns used in the existing specifications. Requirements should be written for GSM900, GSM1800, UMTS1800, UMTS2000 and UMTS2600 down-link bands. -50 dBm/3,84 MHz requirement for 2 585 - 2 620 MHz  NOTE: For Band VII the -50 dBm/3,84 MHz requirement only covers frequency range of 2 590 - 2 620 MHz.
7.3	Reference sensitivity level	Add reference sensitivity level requirement for band XV: DPCH_Ec < REFSENS> = -115 dBm (Assuming the blocking requirements proposed for 7.6.1 and 7.6.2 in this table). As standalone variant more stringent sensitivity requirement is achievable. However, it is likely that the most viable implementation is one where Band VII and Band XV share the same RX front-end and possibly in the future also the RX filters the sensitivity requirement should be aligned with Band VII.
7.6.1	Minimum requirement (In-band blocking)	Add in-band blocking requirements for band XV: Requirements can be set according to the patterns used in the existing specifications. Band VII DL also considered as in-band.
7.6.2	Minimum requirement (Out of-band blocking)	Add out-of-band blocking requirements for band XV: Requirements can be set according to the patterns used in the existing specifications with following exceptions. FDD internal DL only frequency block will have -44 dBm in band requirement. 1 to 2 570 MHz/2 775 - 12 750 MHz: -15 dBm. 2 750 - 2 775 MHz: -30 dBm. 2 570 - 2 585 MHz/2 705 - 2 750 MHz: -44 dBm. 

Section	Requirement	Discussion / Required Changes in TS 125 101 [7]
7.9	RX spurious emissions	Add additional receiver spurious emission requirements for band XV: -60 dBm/3,84 MHz UE transmit band in URA_PCH, Cell_PCH and idle state -60 dBm/3,84 MHz UE receive band
8, annex B	Performance requirement	Add velocity scaled speeds for Band XV, same requirements as for Band VII.
Annex E	UARFCN numbers	Add Band XV UARFCN numbers to List of UARFCN used for UTRA FDD bands.

Required changes in specification TS 125 101 [7] for Band XVI are summarized in table 8.1.2. Requirements which are not shown are applicable to Band XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.1.2: Required Changes in TS 125 101 [7] for Band XVI

Section	Requirement	Discussion / Required Changes in TS 125 101 [7]
5.2	Frequency bands	New operating band 2x15 MHz needs to be added as Band XVI: 2 010 - 2 025 MHz: Up-link (UE transmit, Node B receive). 2 585 - 2 600 MHz: Down-link (Node B transmit, UE receive).
5.3	TX-RX frequency separation	Add this requirement for Band XVI: 575 MHz
5.4.2	Channel raster	Add this requirement for Band XVI: 200 kHz raster as in Band I. Additional channels are needed in the middle of 5 MHz blocks. 2 012,5, 2 017,5 and 2 022,5 MHz for UL. 2 587,5, 2 592,5 and 2 597,5 MHz for DL
5.4.3	Channel number	Define general and additional UARFCN definitions for Band XVI.
5.4.4	UARFCN	Define general and additional UARFCN definitions for Band XVI.
6.2.1	UE maximum output power	Add UE power classes for band XVI: +24 dBm +1/-3 dB: Power class 3. +21 dBm +2/-2 dB: Power class 4. +23 dBm +2/-2 dB: Power class 3bis.
6.6.2.1	Spectrum emission mask	Additional requirements for spectrum emission mask are not needed for Band XVI.
6.6.3	TX spurious emissions	Add additional TX spurious emissions requirements for Band XVI: Requirements can be set according to the patterns used in the existing specifications. Requirements should be written for GSM900, GSM1800, UMTS1800, UMTS2000 and UMTS2600 down-link bands. -50 dBm/3,84 MHz requirement for 2 585 - 2 620 MHz. 
		NOTE: For Band VII the -50 dBm/3,84 MHz requirement only covers frequency range of 2 590 - 2 620 MHz.
7.3	Reference sensitivity level	Add reference sensitivity level requirement for band XVI. DPCH_Ec < REFSENS> = -115 dBm (Assuming the blocking requirements proposed for 7.6.1 and 7.6.2 in this table). As standalone variant more stringent sensitivity requirement is achievable. However, it is likely that a device supporting Band XVI also supports other 2,6 GHz variants and therefore -115 dBm DPCH_Ec reference sensitivity requirement is proposed to enable straightforward, cost and size effective implementation of the multi band and multi mode 2,6 GHz supporting terminals.
7.6.1	Minimum requirement (In-band blocking)	Add in-band blocking requirements for band XVI: Requirements can be set according to the patterns used in the existing specifications. Band VII and Band XV DL also considered as in-band.

Section	Requirement	Discussion / Required Changes in TS 125 101 [7]
7.6.2	Minimum requirement (Out of-band blocking)	<p>Add out-of-band blocking requirements for band XVI: Requirements can be set according to the patterns used in the existing specifications with following exceptions. Band VII and Band XV will have -44 dBm in-band requirement. 1 - 2 500 MHz/2 775 - 12 750 MHz: -15 dBm. 2 500 - 2 570 MHz and 2 750 - 2 775 MHz: -30 dBm. 2 705 - 2 750 MHz: -44 dBm.</p>
7.9	RX spurious emissions	<p>Add additional receiver spurious emission requirements for band XVI: -60 dBm/3,84 MHz UE transmit band in URA_PCH, Cell_PCH and idle state. -60 dBm/3,84 MHz UE receive band.</p>
8, Annex B	Performance requirement	Add velocity scaled speeds for Band XVI, same requirements as for Band VII.
Annex E	UARFCN numbers	Add Band XVI UARFCN numbers to List of UARFCN used for UTRA FDD bands.

8.2 Required changes to TS 125 104

Required changes in specification TS 125 104 are summarized in table 8.2.1. Requirements which are not shown are applicable to Band XV and Band XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.2.1: Required Changes to TS 125 104

Section	Requirement	Discussion / Required Changes
5.2	Frequency bands	<p>New operating band 2x20 MHz, Band XV 1 900 - 1 920 MHz: Up-link (UE transmit, Node B receive) 2 600 - 2 620 MHz: Down-link (Node B transmit, UE receive) New operating band 2x15 MHz, Band XVI 2 010 - 2 025 MHz: Up-link (UE transmit, Node B receive) 2 585 - 2 600 MHz: Down-link (Node B transmit, UE receive)</p>
5.3	TX-RX frequency separation	<p>New operating band XV with 700 MHz TX-RX frequency separation. New operating band XVI with 575 MHz TX-RX frequency separation.</p>
5.4.2	Channel raster	<p>Additional channels are needed in the middle of 5 MHz blocks for Band XV 1 902.5, 1 907.5, 1 912.5, and 1 917.5 MHz for UL. 2 602.5, 2 607.5, 2 612.5, and 2 617.5 MHz for DL. Additional channels are needed in the middle of 5 MHz blocks for Band XVI 2 012.5, 2 017.5 and 2 022.5 MHz for UL 2 587.5, 2 592.5 and 2 597.5 MHz for DL</p>
5.4.3	Channel number	Add general and additional UARFCN definitions for Band XV and XVI.
6.6.2.1	Spectrum emission mask	Add minimum requirements for Band XV and XVI.
6.6.3.1	TX Spurious emissions	Add Band XV and XVI to Category B requirements (>1 GHz) in table 6.9.
6.6.3.2	Protection of BS receiver of own or different BS	<p>Add requirements for Band XV in the band 1 900 - 1 920 MHz in table 6.10, 6.10A and 6.10B. Add requirements for Band XVI in the band 2 010 - 2 025 MHz in table 6.10, 6.10A and 6.10B.</p>
6.6.3.3 - 6.6.3.4	Spurious emissions / Co-existence requirements	Add requirements for Band XV and XVI in table 6.11, 6.12, 6.13 and 6.14.

Section	Requirement	Discussion / Required Changes
7.5	Blocking characteristics	Add requirements for Band XV in tables 7.4, 7.4A and 7.4B. Example for WA BS: 1 900 - 1 920 MHz: -40 dBm / WCDMA signal 1 880 - 1 900 MHz: -40 dBm / WCDMA signal 1 920 - 1 940 MHz: -40 dBm / WCDMA signal Otherwise -15 dBm/CW Add requirements for BS supporting both Band I and Band XV in tables 7.4, 7.4A and 7.4B. Example for WA BS: 1 900 - 1 980 MHz: -40 dBm / WCDMA signal 1 880 - 1 900 MHz: -40 dBm / WCDMA signal 1 980 - 2 000 MHz: -40 dBm / WCDMA signal Otherwise -15 dBm/CW Add requirements for Band XVI in Tables 7.4, 7.4A and 7.4B. Example for WA BS: 2 010 - 2 025 MHz: -40 dBm / WCDMA signal 1 990 - 2 010 MHz: -40 dBm / WCDMA signal 2 025 - 2 045 MHz: -40 dBm / WCDMA signal Otherwise -15 dBm/CW.
7.5.2	Blocking/Co-location	Add additional blocking requirements for Band XV and XVI in tables 7.5C, 7.5D and 7.5E.
7.7.1	RX Spurious emissions	Add requirements for Band XV and XVI in table 7.7A.
Annex B.2	Multi-path fading propagation conditions	Add requirements for Band XV and XVI in table B.1 (together with Band I).
Annex B.5	Multi-path fading propagation conditions for E-DPDCH and E-DPCCH	Add requirements for Band XV and XVI in table B.3 (together with Band I).

8.3 Required changes to TS 125 113

Required changes in specification TS 125 113 [7] are summarized in table 8.3.1. Requirements which are not shown are applicable to Band XV and Band XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.3.1: Required Changes to TS 125 113 [8]

Section	Requirement	Discussion / Required Changes
4.5.2	Receiver exclusion band	Add receiver exclusion band for Band XV and Band XVI (2,6 GHz FDD Downlink External): The receiver exclusion band for base stations extends from the lower frequency of the Base Station receive band minus 20 MHz to the upper frequency of the Base Station receive band plus 20 MHz i.e. 1 880 MHz to 1 940 MHz for Band XV and 1 990 MHz to 2 045 MHz for Band XVI respectively.

8.4 Required changes to TS 125 133

Required changes in specification TS 125 133 [7] are summarized in table 8.4.1. Requirements which are not shown are applicable to Bands XV and XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.4.1: Required Changes to TS 125 133 [7]

Section	Requirement	Discussion / Required Changes
9.1.1	CPICH RSCP	Add Bands XV and XVI absolute and relative accuracy requirements for Intra and Inter frequency measurements.
9.1.2	CPICH Ec/Io	Add Bands XV and XVI absolute and relative accuracy requirements for Intra and Inter frequency measurements.
9.1.3	UTRA Carrier RSSI	Add Bands XV and XVI absolute and relative accuracy requirements.
9.1.7	SFN-CFN observed time difference	Add Bands XV and XVI Intra and Inter frequency requirements.
9.1.8	SFN-SFN observed time difference	Add Bands XV and XVI requirements for SFN-SFN observed time difference Type 1 and Type 2.
9.1.9	UE Rx-Tx time difference	Add Bands XV and XVI requirements for UE Rx-Tx time difference Type 1 and Type 2.
A.9.1.1	CPICH RSCP	Add Bands XV and XVI absolute and relative accuracy requirements for Intra and Inter frequency measurements.
A.9.1.2	CPICH Ec/Io	Add Bands XV and XVI absolute and relative accuracy requirements for Intra and Inter frequency measurements.
A.9.1.3	UTRA Carrier RSSI	Add Bands XV and XVI absolute and relative accuracy requirements.
A.9.1.4	SFN-CFN observed time difference	Add Bands XV and XVI Intra and Inter frequency requirements.
A.9.1.5	SFN-SFN observed time difference	Add Bands XV and XVI intra frequency requirements for SFN-SFN observed time difference Type 1 and Type 2.
A.9.1.6	UE Rx-Tx time difference	Add Bands XV and XVI intra frequency requirements for UE Rx-Tx time difference Type 1 and Type 2.

8.5 Required changes to TS 125 141

Required changes in specification TS 125 141 [10] are summarized in table 8.5.1. Requirements which are not shown are applicable to Band XV and Band XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.5.1: Required Changes to TS 125 141 [10]

Section	Requirement	Discussion / Required Changes
3.4.1	Frequency bands	New operating band 2x20 MHz, Band XV: 1 900 - 1 920 MHz: Up-link (UE transmit, Node B receive). 2 600 - 2 620 MHz: Down-link (Node B transmit, UE receive). New operating band 2x15 MHz, Band XVI: 2 010 - 2 025 MHz: Up-link (UE transmit, Node B receive). 2 585 - 2 600 MHz: Down-link (Node B transmit, UE receive).
3.4.2	TX-RX frequency separation	New operating band XV with 700 MHz TX-RX frequency separation. New operating band XVI with 575 MHz TX-RX frequency separation.
3.5.2	Channel raster	Additional channels are needed in the middle of 5 MHz blocks for Band XV: 1 902.5, 1 907.5, 1 912.5, and 1 917.5 MHz for UL. 2 602.5, 2 607.5, 2 612.5, and 2 617.5 MHz for DL. Additional channels are needed in the middle of 5 MHz blocks for Band XVI: 2 012.5, 2 017.5 and 2 022.5 MHz for UL. 2 587.5, 2 592.5 and 2 597.5 MHz for DL.
3.5.3	Channel number	Add general and additional UARFCN definitions for Band XV and XVI.
6.5.2.1.5	Spectrum emission mask	Add test requirements for Band XV and XVI.
6.5.3.7.2	TX Spurious emissions	Add Band XV and XVI to Category B requirements (>1 GHz) in table 6.36.
6.5.3.7.3	Protection of BS receiver of own or different BS	Add requirements for Band XV in the band 1900 - 1920 MHz in tables 6.37, 6.37A and 6.37B. Add requirements for Band XVI in the band 2010 - 2025 MHz in tables 6.37, 6.37A and 6.37B.
6.5.3.7.4 - 6.5.3.7.5	Spurious emissions / Co-existence requirements	Add requirements for Band XV and XVI in tables 6.38, 6.39, 6.40 and 6.41.
7.5.5	Blocking characteristics	Add requirements for Band XV in Tables 7.4K, 7.4L and 7.4M. Example for WA BS: 1 900 - 1 920 MHz: -40 dBm / WCDMA signal. 1 880 - 1 900 MHz: -40 dBm / WCDMA signal. 1 920 - 1 940 MHz: -40 dBm / WCDMA signal. Otherwise -15 dBm/CW Add requirements for BS supporting both Band I and Band XV in tables 7.4K, 7.4L and 7.4M. Example for WA BS: 1 900 - 1 980 MHz: -40 dBm / WCDMA signal. 1 880 - 1 900 MHz: -40 dBm / WCDMA signal. 1 980 - 2 000 MHz: -40 dBm / WCDMA signal. Otherwise -15 dBm/CW Add requirements for Band XVI in Tables 7.4K, 7.4L and 7.4M. Example for WA BS: 2 010 - 2 025 MHz: -40 dBm / WCDMA signal 1 990 - 2 010 MHz: -40 dBm / WCDMA signal 2 025 - 2 045 MHz: -40 dBm / WCDMA signal Otherwise -15 dBm/CW
7.5.5	Blocking/Co-location	Add additional blocking requirements for Band XV and XVI in tables 7.4N, 7.4P and 7.4Q.
7.7.5	RX Spurious emissions	Add requirements for Band XV and XVI in table 7.7A(b).
Annex D.2	Multi-path fading propagation conditions	Add requirements for Band XV and XVI in table D.1 (together with Band I).
Annex D.5	Multi-path fading propagation conditions for E-DPDCH and E-DPCCH	Add requirements for Band XV and XVI in table D.3 (together with Band I).

8.6 Required changes to TS 125 306

The possible UE radio access capability parameter settings in TS 125 306 [11] 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 125 101 [7].

No update of TS 125 306 [11] will thus be needed for the introduction of Band XV and XVI.

8.7 Required changes to TS 125 307

Required changes in specification TS 125 307 [17] are summarized in table 8.7.1 and apply to Rel-5 and Rel-6 of the specification. Requirements which are not shown are applicable to Bands XV and XVI without any modifications from the existing specification.

Table 8.7.1: Required Changes to TS 125 307 [17]

Section	Requirement	Discussion / Required Changes
x	Band XV Independent of Release	A new section for Band XV implementation independent of release, identifying: - Specific RF requirements. - Specific Signalling requirements.
x	Band XVI Independent of Release	A new section for Band XVI implementation independent of release, identifying: - Specific RF requirements. - Specific Signalling requirements.

8.8 Required changes to TS 125 331

Required changes in specification TS 125 331 [7] are summarized in table 8.8.1. Requirements which are not shown are applicable to Bands XV and XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.8.1: Required Changes to TS 125 331 [7]

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 Bands XV and XVI.
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 Bands XV and XVI.
10.3.3.21a	Measurement capability extension	A new reference for the FDD Frequency band 2 (Bands XV and XVI).
10.3.3.42a	UE radio access capability extension	A new reference for the Frequency band 2 (Bands XV and XVI).
10.3.6.35c	Frequency band indicator 2	Semantics description is changed to exclude Bands XV and XVI.

8.9 Required changes to TS 125 423

In TS 125 423 [13], 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 125 104 [18] for UARFCN and operating band definitions.

No update of TS 125 423 [13] will thus be needed for the introduction of Band XV and XVI.

8.10 Required changes to TS 125 461

Required changes in specification TS 125 461 [14] are summarized in table 8.10.1. Requirements which are not shown are applicable to Band XV and XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.10.1: Required Changes to TS 125 461 [14]

Section	Requirement	Discussion / Required Changes
4.3.7	Operating bands	Add operating band for Band XV and XVI (2,6 GHz FDD Downlink External)

8.11 Required changes to TS 125 463

Required changes in specification TS 125 463 [15] are summarized in table 8.11.1. Requirements which are not shown are applicable to Band XV and XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.11.1: Required Changes to TS 125 463 [15]

Section	Requirement	Discussion / Required Changes
Annex B	Assigned fields for additional data	Define new bit fields for Band XV and XVI (2,6 GHz FDD Downlink External)

8.12 Required changes to TS 134 124

Required changes in specification TS 134 124 [16] are summarized in table 8.12.1. Requirements which are not shown are applicable to Band XV and Band XVI (2,6 GHz FDD Downlink External) without any modifications from the existing specification.

Table 8.12.1: Required Changes to TS 134 124 [16]

Section	Requirement	Discussion / Required Changes
4.4	Receiver exclusion band	Add receiver exclusion band for Band XV and Band XVI (2,6 GHz FDD Downlink External): The receiver exclusion band for terminals extends from the lower frequency of the allocated receiver band minus 85 MHz to the upper frequency of the allocated receiver band plus 85 MHz. i.e. 2 515 MHz to 2 705 MHz for Band XV and 2 500 MHz to 2 685 MHz for Band XVI respectively.

Annex A: Change history

Time	Doc	CR	Rev	Subject/Comment	New
MSG-15	-	-	-	Version 7.0.0 (first version, for Release 7)	7.0.0

History

Document history		
V7.0.0	September 2007	Publication