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Contents

Foreword

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1 Scope

The present document is a technical report of the UMTS-LTE 3500 MHz work item, which was established at TSG RAN#38. The objective of the work item is to study current band plans in the frequency bands 3.4-3.6 GHz and 3.6-3.8 GHz, where they exist, with respect to feasibility for WCDMA as well as LTE. For these current band plans, suitable band arrangements, which are adopted by regulators, shall be identified for the purpose of developing specifications, without excluding other future arrangements.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] RP-071012, “New Work Item Proposal: UMTS/LTE 3500”, TSG-RAN #38, Cancun, Mexico, 27-30 November, 2007.

[3] RP-080133, “Regional 3500 MHz band arrangements and use”, Rapporteur UMTS/LTE 3500 (Ericsson), TSG-RAN meeting #39.

[4] R4-080136, "3500 MHz band status in Europe" (Ericsson).

[5] R4-080214, "Information on the future usage of the band, 3.4-4.2GHz in Japan" (ARIB).

[6] Off-line input during RAN4#46 from NII Holdings (3GPP Guest Member).

[7] “ECC Decision of 30 March 2007 on availability of frequency bands between 3400-3800 MHz for the harmonised implementation of Broadband Wireless Access systems (BWA)”, ECC/DEC/(07)02.

[8] “Guidelines for Accommodation and Assignment of Multipoint Fixed Wireless Systems in Frequency Bands 3.4-3.6 GHz and 3.6-3.8 GHz”, ECC Recommendation (04)05.

[9] “Draft Report from CEPT to the European Commission in response to the Mandate to develop least restrictive technical conditions for frequency bands addressed in the context of WAPECS”, CEPT Report 019 (under consultation).

[10] “Report from CEPT to the European Commission in response to the Mandate to identify the conditions relating to the provision of harmonised radio frequency bands in the European Union for Broadband Wireless Access applications”, CEPT Report 015, 12 June 2007.

[11] R4-071342, "LTE at 3.5 GHz", Source: TeliaSonera.

[12] “Auction Terms And Conditions to Grant Concessions for the Use, Exploitation and Profit from Frequency Bands in the Radio Electric Spectrum for The Provision of Fixed or Mobile Wireless Access Service “, Federal Telecommunications Commission of Mexico, Sept. 3, 1997, http://www.cft.gob.mx/cofetel/cft2/public_html/html/ina_bases_ing.html

[13] R4-081114, "Examples of regional bands for 3.5GHz" (Motorola).

[14] Office of Communications (www.ofcom.org.uk).

[15] BWA - Broadband Wireless Access - Präsidentenkammerentscheidung, Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen (http://bwa-versteigerung.bundesnetzagentur.de/images/Praesidentenkammerentscheidung.pdf) (in German).

[16] "Utilisation des bandes BLR ", Autorité de Régulation des Communications électroniques et des Postes (http://www.arcep.fr/fileadmin/reprise/dossiers/blr/wimax/frqc-blr-wimax.pdf) (in French).

[17] "Übersicht spectrum 3500 MHz", Rundfunk und Telekom Regulierungs-GmbH (RTR-GmbH) (http://www.rtr.at/en/tk/Spektrum3500MHz) (in German).

[18] Title 47 of the Code of Federal Regulations (CFR), Part 90, Federal Communications Commission (FCC),(http://www.access.gpo.gov/nara/cfr/waisidx_07/47cfr90_07.html).

[19] ECC PT1(08)102R2 (Annex 11), "Draft minutes (26 September 2008)", 30th ECC PT1 meeting, Paris, 16 -18 September 2008.

[20] CEPT/ERC/Recommendation 14-03e, "Harmonised Radio Frequency Channel Arrangements and Block Allocations for Low and Medium Capacity Systems in The Band 3400 MHz to 3600 MHz", Podebrady 1997.

[21] Decision 2008/411/EC, "Commission decision of 21 May 2008 on the harmonisation of the 3 400-3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community".

[22] ITU-R Recommendation SM.329-10: "Unwanted emissions in the spurious domain".

[23] 3GPP TR 30.007: "Guideline on WI/SI for new Operating Bands"

3 Abbreviations

3.1 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

BWA	Broadband Wireless Access
CEPT	European Conference of Postal and Telecommunications Administrations
ECC	European Communications Committee (of CEPT)
ENG	Electronic News Gathering
FPU	Field Pickup Unit
FWA	Fixed Wireless Access
FCC	Federal Communications Commission
GB	Guard Band
EU	European Union
MWA	Mobile Wireless Access
NWA	Nomadic Wireless Access
OB	Outside Broadcast
PMSE	Programme Making and Special Events
RAT	Radio Access Technology
RB	Restricted Block
STL	Studio to Transmitter Link
TTL	Transmitter to Transmitter Link
TSL	Transmitter to Studio Link
WRC	World Radiocommunication Conference

4 Background

There are two new bands: 3.4-3.6 GHz and 3.6-3.8 GHz decided for Broadband Wireless Access, which are already widely available for licensing in Europe. These bands have earlier been allocated to the Fixed Service on a primary basis in Region 1. Furthermore, the 3.4-3.6 GHz band was allocated to the mobile service on a primary basis and identified for IMT at WRC 07.

These bands constitute a substantial amount of spectrum that *will be* available in many countries in the short term. In Europe (Region 1) both bands can be used so block sizes could be large for any duplex arrangement.

The ECC Decision (07)02 [7] not only designates the band 3.4-3.8 GHz for BWA deployment, it provides condition for 'flexible usage modes within authorised BWA deployments'. This regulatory provision will allow licence holders to deploy various types of terminal stations, from fixed to mobile.

4.1 Task description

The purpose of this work item is to:

- Study of UMTS/LTE 3500 for a potential deployment in Europe as well as in other regions. The current band plans, where they exist, shall be studied with respect to feasibility for WCDMA as well as LTE and band arrangement shall be proposed for all applicable regions.
  Generate a new technical report based on study results.
- The specific bands to be studied are:
  - 3.4-3.6 GHz
  - 3.6-3.8 GHz
- Generate CR's to update the appropriate documents. All CRs will be delivered as one complete package for UMTS and LTE.
- TSG RAN WG2 - study signalling issues related to UMTS/LTE 3500.
- The WI should introduce the UMTS/LTE 3500 in the specifications for UTRA/E-UTRA.
- Any additional related issues.

5 Frequency band arrangements

The description of band arrangements in this clause is based on the input in [4], [5] and [6], which is also summarized in [3].

In Europe, a majority of countries already license the band 3.4-3.6 GHz for Fixed Wireless Access, in some countries also for mobile use. Licensing of 3.6-3.8 GHz for Wireless Access is more limited. CEPT/ECC has generated documentation including a spectrum decision for 3.4-3.8 GHz with "Flexible usage modes" for deployment of fixed, nomadic and mobile networks. A European commission decision for harmonised conditions was made in May 2008 [21], making the band 3.4-3.6 GHz available from 2008 and the band 3.6-3.8 GHz from 2012. Frequency arrangements considered in the ECC decision include FDD use with 100 MHz block offset between paired blocks and/or TDD use as shown in Annex A. It shall be noted that ECC PT1 is working on channeling arrangements in the band 3400- 3800 MHz for IMT and plan to finalize a draft deliverable in January 2011.

In Japan, not only 3.4-3.6GHz but also 3.6-4.2GHz will be available to terrestrial mobile service such as IMT to use after 2010. No discussion has started yet on the detailed frequency arrangements.

In Latin America, the band 3.4-3.6 GHz was licensed in Mexico and Peru to operators that have acquired paired frequency blocks with 100 MHz separation. Both FDD and TDD operation is allowed. The situation is similar in Argentina, but blocks have been paired with both 50 and 100 MHz separation, see also Annex C.

5.1 Band status in Europe

The source of this information is the contributions in [4] and [13].

5.1.1 CEPT/ECC studies and decisions

The band 3.4-3.8 GHz was studied extensively by CEPT Electronic Communications Committee (ECC) in the last few years, resulting in several reports, recommendations and decision [7,8,9,10]. The studies clearly identify the band 3400-3600 MHz as the widest available choice for current and future BWA deployment in Europe. The band 3600-3800 MHz is identified as a possible additional or alternative frequency band. An ERO survey indicated that a clear majority of European countries already use the 3400-3600 MHz band for Fixed Wireless Access (FWA), while the use of the 3600-3800 MHz band for wireless access systems was limited to a few European countries at the time of the survey (2006). In some countries the bands are licensed also for mobile use.

The ECC Decision (07)02 [7] designates the bands 3.4-3.6 and 3.6-3.8 GHz for BWA deployment. The designation gives considerations for "Flexible usage modes", allowing a license holder to deploy various types of terminal stations for Fixed, Nomadic or Mobile Wireless Access (FWA, NWA or MWA). Technical conditions for implementation of flexible usage mode are given in ECC Recommendation (04)05 [8]. For Mobile Wireless Access, additional requirements limit the radiated power, the TPC range and the block edge emissions.

WRC-07 identified the 3400 - 3600 MHz band for IMT in 41 European countries and 40 others in Region 1. Therefore, the ECC has tasked ECC Project Team 1 (PT1) to develop appropriate ECC Deliverables which define band plans for the usage of this band in the CEPT countries. The deliverables should also address the band 3600 - 3800 MHz. According to the guidance given by the ECC, an optimised solution has to be found for the band 3400 - 3800 MHz, which would facilitate the convergence between cellular and broadband wireless access systems already planned for the band 3400 - 3800 MHz in some European countries.

5.1.2 European harmonised conditions for 3.4-3.8 GHz

CEPT/ECC has produced a report [10] to the European commission on BWA, concluding that the deployment of fixed, nomadic and mobile networks is technically feasible within the frequency band 3.4-3.8 GHz. Another CEPT/ECC report to the commission on the technical conditions for different frequency bands in the context of WAPECS[1] also addresses 3.4-3.8 GHz [9].

It is expected that early in 2008, there will be a European commission decision to harmonise the conditions for the 3.4-3.8 GHz band, where member states shall allow the use of the band for fixed, nomadic and mobile electronic communication services. The decision will include technical conditions to ensure co-existence, but also allowing for less stringent conditions to be applied if agreed between operators.

The band 3.4-3.6 GHz will be made available from 2008 and the band 3.6-3.8 GHz from 2012.

5.1.3 Frequency arrangements

The ECC decision [7] considers that within the two frequency bands, pairing of sub-bands 3400-3500/3500-3600 MHz and 3600-3700/3700-3800 provide suitable frame conditions for FDD and TDD systems or their combination.

Two examples of frequency arrangements in line with those considerations are given in the ECC Recommendation [8]. The example arrangements contain paired blocks or combinations of paired and unpaired blocks, with a 100 MHz offset between the paired low and high blocks. No specific consideration has been made for the necessary duplex gap. The ECC example arrangements are shown in Figure 5.1.3-1 and 5.1.3-2 below and are also discussed in [11].

[1] WAPECS = Wireless Access Policy for Electronic Communications Services

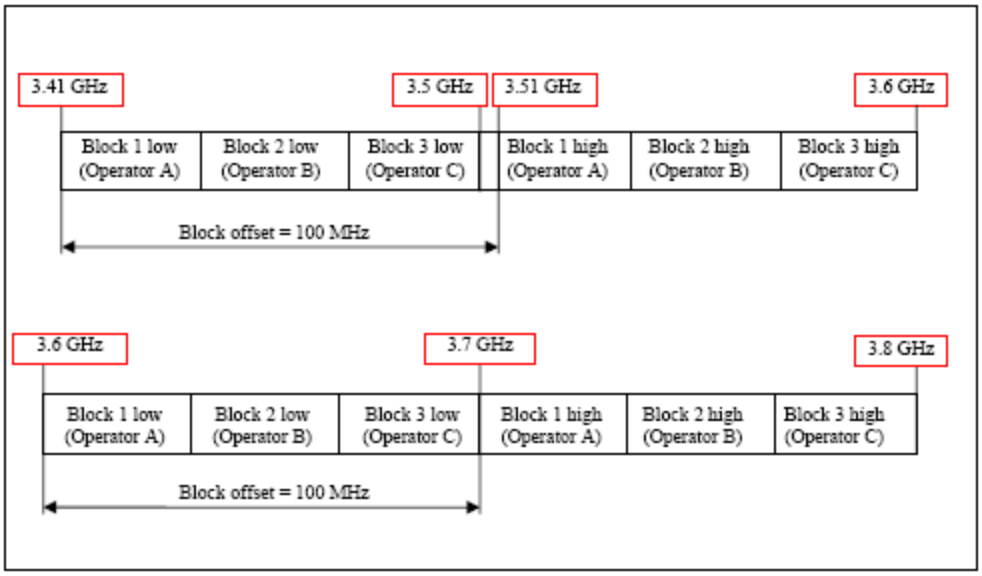

Figure 5.1.3-1 Example scheme with paired equal blocks in the 3.4-3.6 and 3.6-3.8 GHz bands (from [8])

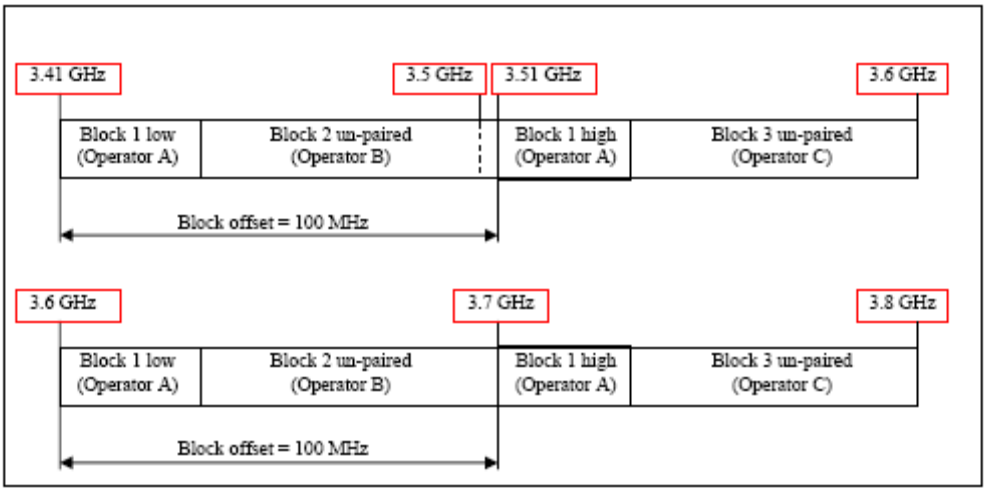

Figure 5.1.3-2 Example scheme with paired and unpaired blocks in the 3.4-3.6 and 3.6-3.8 GHz bands (from [8])

In the subclauses below, several regional band plans for the band 3400 to 3600 MHz in Europe are presented, which were collected from the various available documents published by European administrations.

5.1.4 Band plan in UK

In the UK the 3400 to 3600 MHz band plan pretty much follows ECC REC (04)05 [8]. Spectrum is typically assigned in blocks of 20 MHz. Most of the spectrum is assigned for PMSE ENG/OB applications. In this band also two blocks with a duplex distance of 100 MHz are assigned to broadband wireless applications.

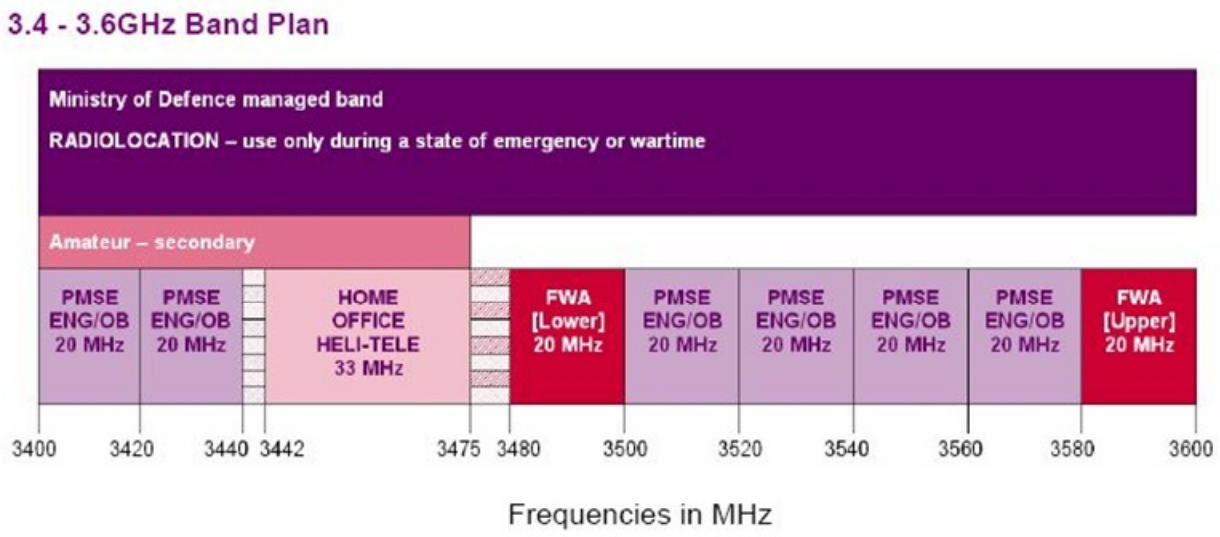

Figure 5.1.4-1: UK band plan for 3400 to 3600 MHz (source: [14])

5.1.5 Band plan in Germany

In Germany the 3400 to 3600 MHz band was auctioned in December 2006 for broadband wireless access (BWA) systems. Figure 5.1.5-1 shows the band plan, which was used for the auction. The band plan is based on a 7 MHz raster with altogether 8 blocks. Two blocks with a duplex distance of 100 MHz are grouped to one package:

- Package A: 3410-3431 & 3510-3531 MHz
- Package B: 3431-3452 & 3531-3552 MHz
- Package C: 3452-3473 & 3552-3573 MHz
- Package D: 3473-3494 & 3573-3594 MHz

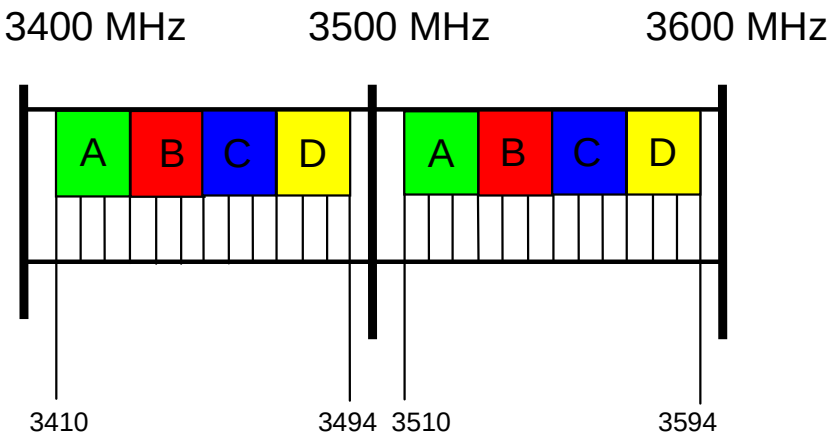

Figure 5.1.5-1: Band plan Germany (source: [15])

From the band plan it can be seen that no external guard band between the blocks is provided. The assignment of blocks is assumed under the provision of ECC REC(04)05 [8], which defines an internal guard of half the system channel bandwidth at the block edge. At the 3400 MHz boarder the first block starts at 3410 MHz with a guard band of 10 MHz to protect services below 3400 MHz.

5.1.6 Band plan in France

Also France is following in principle a similar approach like Germany. For BWA three packets with two blocks each of 15 MHz in the 3.5 GHz band are defined. Figure 5.1.6-1 shows the arrangement for BWA blocks.

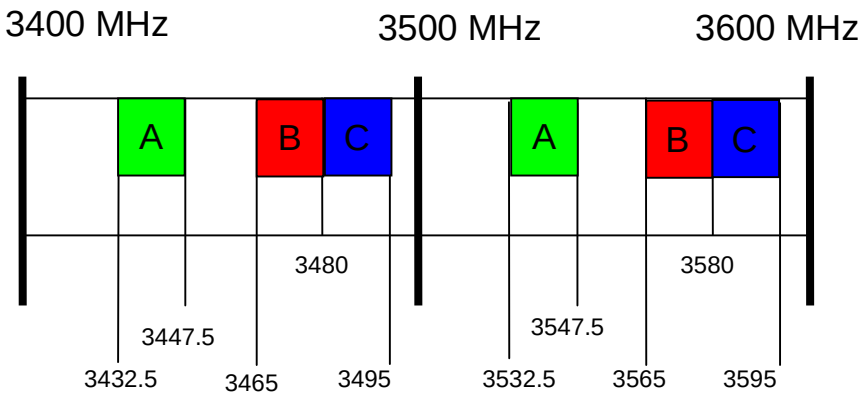

Figure 5.1.6-1: Band plan France (source: [16])

The 3 packages (2x 15 MHz) have a duplex distance of 100 MHz with the following arrangement:

- Package A: 3432.5-3447.7 & 3532.5-3547.7 MHz
- Package B: 3465-3480 & 3565-3580 MHz
- Package C: 3480-3495 & 3580-3595 MHz

5.1.7 Band plan in Austria

As a further example of a European band plan, the band plan from Austria is shown in Figure 5.1.7-1. In Austria two possible band plan arrangements are available depending on the region. Like other countries (e.g. Germany or France) the 3.5 GHz licenses are divided in different geographical regions, however typically using the same band plan arrangement. Austria is divided in six regions with the option that in each region either arrangement A, B and C or the blocks D and E can be used. At the moment the arrangement D and E is only used in one small rural region. In all the other regions the block arrangement A, B and C is used.

Between the blocks an external guard band of 7 MHz is established and the first block starts at 3410 MHz with a 10 MHz guard band to protect applications below 3400 MHz. All blocks are based on a 7 MHz raster and two blocks are grouped to a package with a duplex distance of 100 MHz:

Block arrangement 1:

- Package A (2x 21 MHz): 3410-3431 & 3510-3531 MHz
- Package B (2x 28 MHz): 3438-3466 & 3538-3566 MHz
- Package C (2x 21 MHz): 3473-3494 & 3573-3594 MHz

Block arrangement 2:

- Package D (2x 35 MHz): 3410-3445 & 3510-3545 MHz
- Package E (2x 42 MHz): 3452-3494 & 3552-3594 MHz

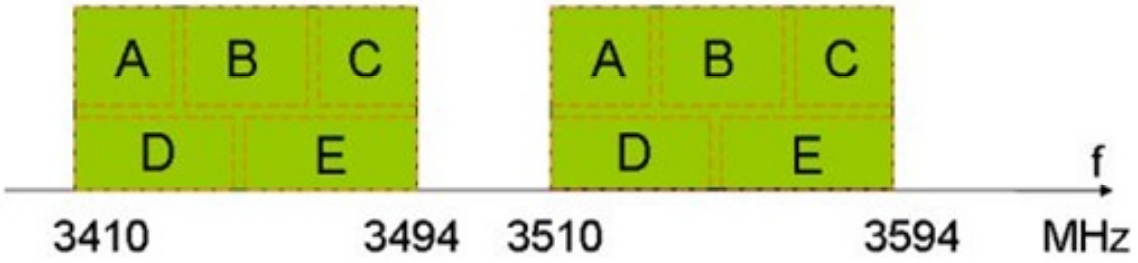

Figure 5.1.7-1: Band plan Austria (source: [17])

5.1.8 Summary of band arrangement in Europe

At the recent ECC PT1 meeting, a report was put together based on an "ERO questionnaire on the use of 3400-3600 MHz and 3600 - 3800 MHz bands" [19]. It is based on the replies from 32 European countries, including the four countries presently documented in the present document. The detail of information reported differs from country to country, but for at least sixteen countries there is detailed information of existing band arrangements, channelization and duplex in the band 3400-3600 MHz. That information is summarized below in Table 5.1.8-1 and also illustrated in Figure 5.1.8-1.

Table 5.1.8-1 Summary of the survey in [19] for 16 European countries.

Country	Uplink frequency range [MHz]		Downlink Frequency range [MHz]		Duplex arrangement	Duplex separation for FDD	Block sizes [MHz]
Austria	3410	3494	3510	3594	FDD, TDD	100 MHz	21, 28, 35, 42
Belgium	3450	3500	3550	3600	FDD, TDD	100 MHz	25
Bosnia & Herzegovina	3410	3494	3510	3594	FDD	100 MHz	21
Czech Republic	3410	3480	3510	3580	FDD, TDD	100 MHz	3.5 (raster)
France	3432.5	3495	3532.5	3595	FDD, TDD	100 MHz	15
Germany	3410	3494	3510	3594	FDD, TDD	100 MHz	21
Hungary	3410	3494	3510	3594	FDD, TDD	100 MHz	14
Ireland	3410	3500	3510	3600	FDD, TDD	100 MHz	11, 25, 35
Italy	3425	3500	3525	3600	FDD, TDD	100 MHz	21
Macedonia (FYROM)	3410	3494	3510	3594	FDD, TDD	100 MHz	31.5, 14
Norway	3413.5	3500	3513.5	3600	FDD, TDD	100 MHz	3.5 (raster)
Portugal	3410	3438	3510	3538	FDD, TDD	100 MHz	28
Russian Federation	3400	3450	3500	3550	FDD, TDD	100 MHz	
Sweden	3410	3494	3510	3594	FDD, TDD	100 MHz	28
Switzerland	3410	3497.5	3510	3597.5	FDD, TDD	100 MHz	17.5, 21, 28
United Kingdom	3480	3500	3580	3600	FDD, TDD	100 MHz	20

Several observations can be made when analyzing the survey results summarized above:

- Blocks with FDD arrangements are possible in all listed countries and TDD arrangements in all but two.
- For FDD arrangements, the duplex separation is consistently 100 MHz.
- Block sizes are large, in general ≥14 MHz.
- While there are some variations in the frequency ranges, only one country has frequency blocks below 3410 MHz. For many countries, the frequency range 3400-3410 MHz is designated as a "guard band".
- Most countries have frequency ranges ending at 3494 (and 3594) MHz, while a few have the whole range up to 3600 MHz designated.

Several countries reference give reference to ERC Recommendation 14-03E Annex B [20], where harmonised 100 MHz arrangements for these bands are given. The arrangements in [20] are for channel spacing of 1.75, 3.5, 7 and 14 MHz, but can easily be extended to multiples of those numbers, such as 21, 28, 35 and 42 MHz. The recommendation [20] also gives channel raster for the arrangements. For any channel spacing ≥7 MHz, the edge of the uppermost

channel will be at 3494 MHz. This is also reflected in the frequency ranges for the arrangements in these countries in Table 5.8.1-1.

The conclusion from the ERO survey is that an FDD arrangement where 3410-3500 MHz is paired with 3510-3600 MHz covers a substantial part of the existing band arrangements in Europe.

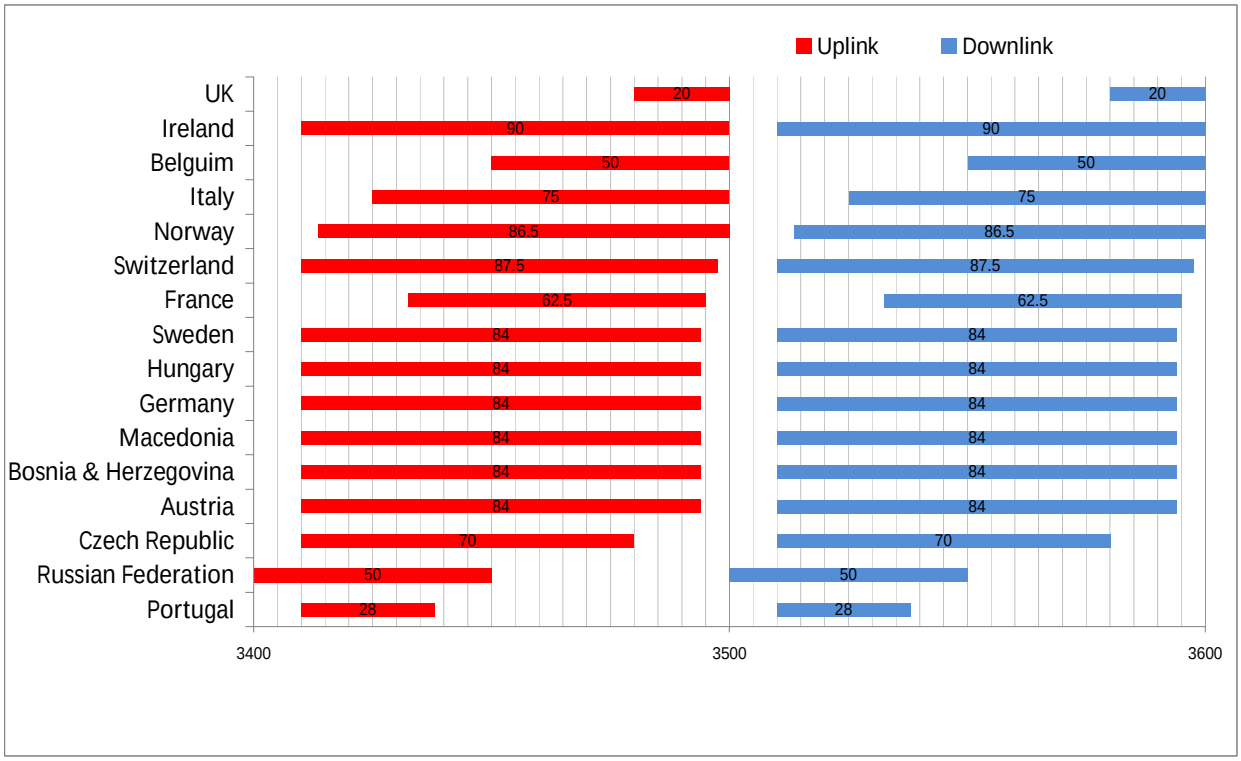

Figure 5.1.8-1 Illustration of the band arrangements in 16 European countries (from [19]).

5.1.9 Additional frequency arrangements in the 3.4-3.6/3.6-3.8 GHz band

The recently approved EC Decision 2008/411/EC for the identification of the band 3.4-3.8 GHz for BWA applications [7] supports the introduction of Mobility in the band 3.4-3.6 GHz and 3.6-3.8 GHz. This introduction should be made according to some technical constraints reported in Annex to the Decision; these constraints were identified by CEPT after careful study of the consequences of the extension to Mobility of the usages in this band.

It should be noted that technical conditions in the Annex of the EC Decision have been defined on the basis of full neutrality with no hypothesis of TDD of FDD usage of any block; as a consequence the technical conditions at edge blocks are very stringent. In case neighbour operators both use FDD or synchronized TDD networks, these technical conditions could be considerably relaxed.

Because of this technology neutrality, a plurality of allocation scenarios can be met. These scenarios include:

- Operation of TDD and FDD in adjacent frequency allocations
- Operation of different or same RAT in adjacent spectrum blocks allocations

There are numerous cases where a part of the spectrum will be occupied by another RAT, before LTE is deployed. It is important to offer dual operation, or smooth migration to LTE perspectives.

The 3 following generic scenarios are described and commented in this contribution. Note that these scenarios are compatible with the ECC recommendation (04)05 [8]

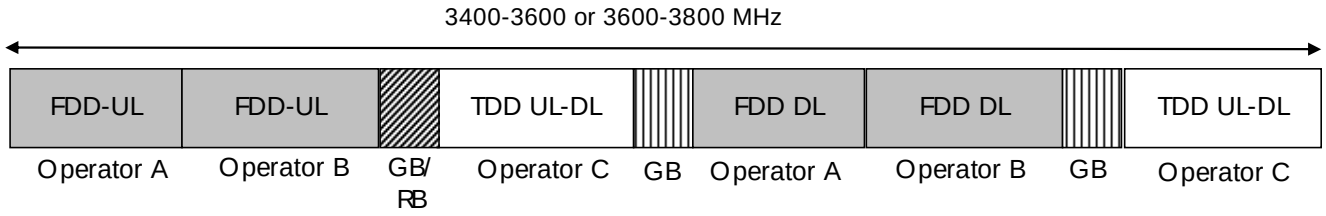

Figure 5.1.9-1: Scenario A1 FDD and TDD in adjacent blocks

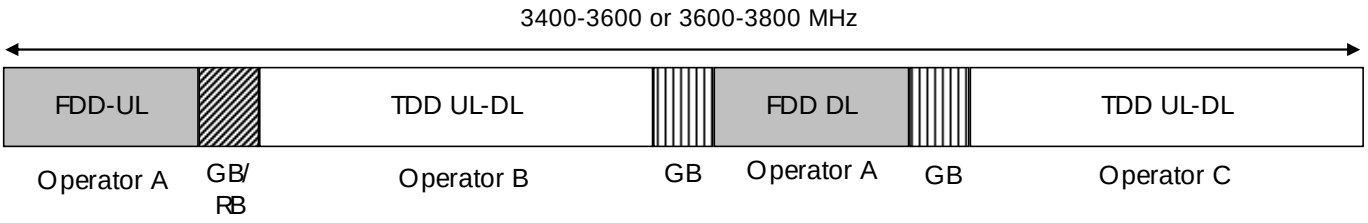

Figure 5.1.9-2: Scenario A2 FDD and TDD in adjacent blocks, variant of A1

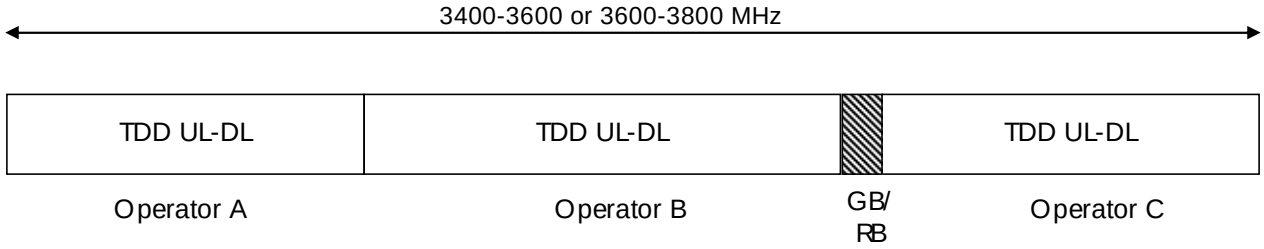

Figure 5.1.9-3: Scenario A3 TDD only scenario

GB refers to guard bands which may be necessary between TDD and FDD blocks, and possibly between TDD blocks when they are not synchronized, and frames properly configured.

RB refers to Restricted Blocks. RB can be allowed provided that the risk of adjacent channel interference is not increased.

Comments on scenarios:

Scenario A1: FDD and TDD operation in adjacent blocks

- As a consequence of their support to neutrality, CEPT and EC allow the implementation of TDD solutions in paired blocks.

Scenario A2: FDD and TDD operation in adjacent blocks (variant)

- As a further improvement for the implementation of TDD, two TDD Operators assigned with adjacent paired blocks are allowed to swap their spectrum to create larger unpaired blocks.

Scenario A3: TDD only operation in adjacent blocks

- Note that guard bands may or may not be required depending on frame and switching points alignments. Figure 5.1.9.3 assumes that Operator A operator B are synchronized, while operators B and C are not synchronized.

5.2 Band status in Japan

The source of this information is the contribution in [5] and [13].

5.2.1 Information on the future usage of 3.4-4.2GHz in Japan

In Japan, not only 3.4-3.6GHz but also 3.6-4.2GHz will be available to terrestrial mobile service such as IMT to use after 2010. No discussion has started yet on the frequency arrangement (i.e. the band or part(s) of the band should be TDD, FDD uplink or FDD downlink) in the band.

In addition, 4.4-4.9 GHz will also be available to terrestrial mobile service such as IMT to use after 2010.

Figure 5.2.1-1 shows the spectrum allocation plan from the Ministry Internal affairs and Communication in Japan.

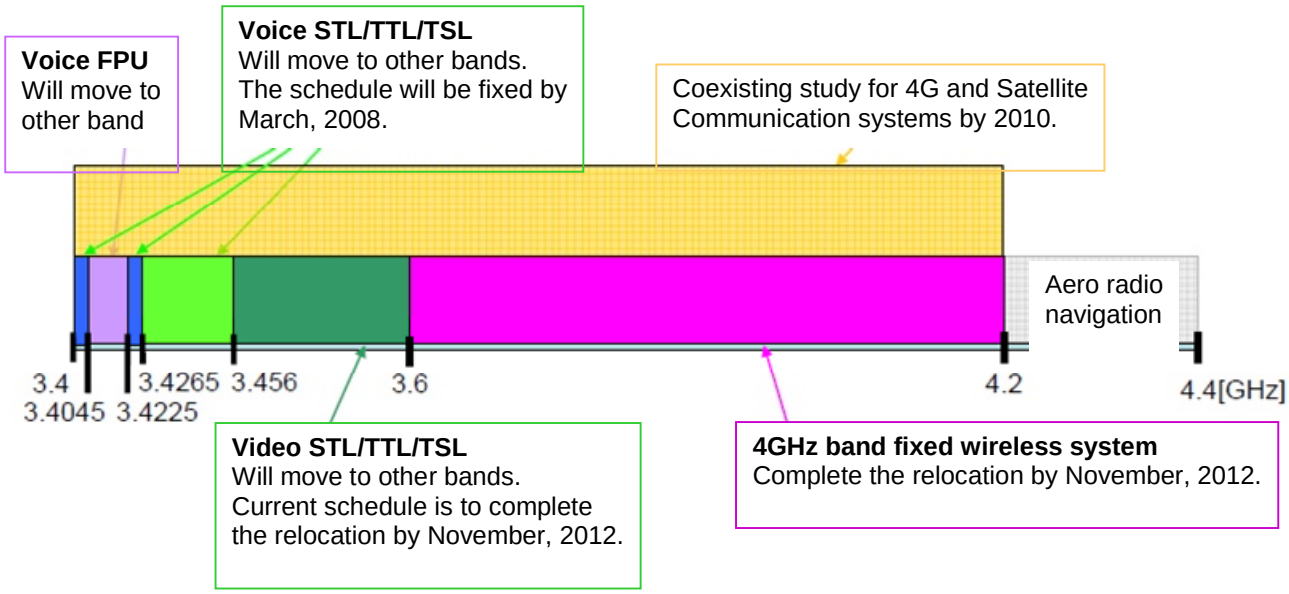

Figure 5.2.1-1: Japan Spectrum allocation action plan for 3.4 to 4.4 GHz.

5.3 Band status in Latin America

The source of this information is the contribution in [6].

Several countries in Latin America (Region 2) have auctioned spectrum in the 3.4-3.6 GHz band. Many of these bands are currently being used for broadband wireless services. This paper gives some background information on the allocation of spectrum in the 3.4-3.6 GHz band in three countries in Latin America: Mexico, Peru and Argentina.

5.3.1 Mexico and Peru

In Mexico and Peru, the spectrum from 3.4-3.6 GHz was divided into 8 blocks of 25 MHz each. The blocks were auctioned off individually, but acquired in pairs by operators. The result was 4 paired bands with 100 MHz offset between the low and high band. Operation in both FDD and TDD mode is permitted in each of these bands.

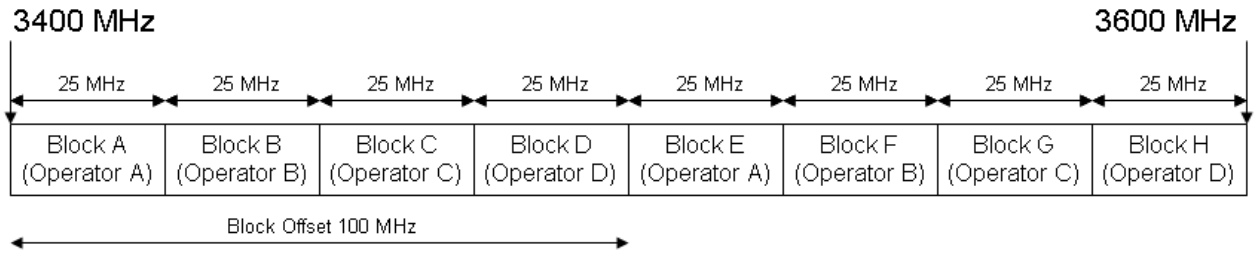

Figure 5.3-1 Band arrangement in Mexico and Peru

5.3.2 Argentina

Argentina also auctioned spectrum between 3.4 and 3.6 GHz. The blocks in Argentina were also auctioned off individually, and acquired in paired by the operators. Some of the blocks, as paired by the licensees, have 100 MHz of separation and some have 50 MHz of separation. Operation in both FDD and TDD mode are permitted in these bands.

5.4 Band status in North America

The source of this information is the contribution in [13].

5.4.1 US status

In the US in the 3.5 GHz band only 50 MHz of spectrum from 3650 to 3700 MHz are available for terrestrial mobile applications. The band 3500 to 3650 MHz is used by the federal government for high power radars and above 3.7 GHz the band is used for broadcasting.

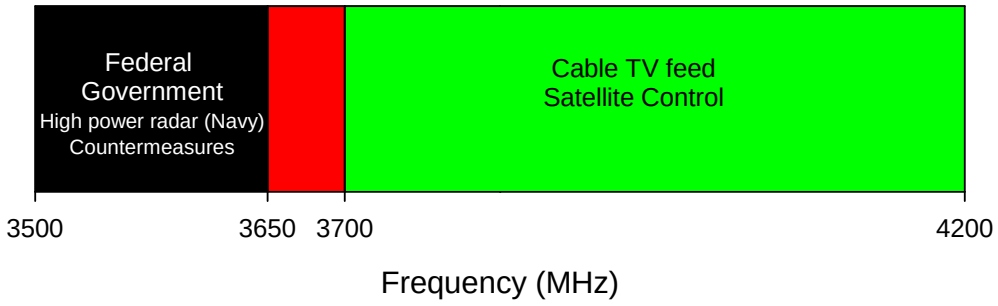

Figure 5.4.1-1: US band plan for 3.5 to 4.2 GHz

For the available 50 MHz the following FCC rules apply [18]:

- Nationwide non-exclusive licensees for entire 50 MHz
- Registration required for individual fixed stations operating under nationwide license
- 10 year license
- Equipment employing unrestricted contention-based protocol (i.e. one capable of avoiding co-frequency interference with devices using all other types of contention-based protocols) may operate throughout the entire 50 MHz.
- Equipment incorporating a restricted contention-based protocol (i.e. one that does not qualify as unrestricted) may only operate in the lower 25 MHz.
- Governed under Part 90 of the FCC's rules [18].

5.4.2 Canada

Figure 5.4.2-1 shows the Canadian band plan for the band 3400 MHz to 3650 MHz. Spectrum is assigned in blocks of 25 MHz continuously. The band is limited to fixed wireless access systems and in 3400 to 3450 MHz grandfathered operations are deployed. In addition, the band has been extended from 3650 to 3700 MHz and harmonized with the US for Wireless Broadband Service (WBS).

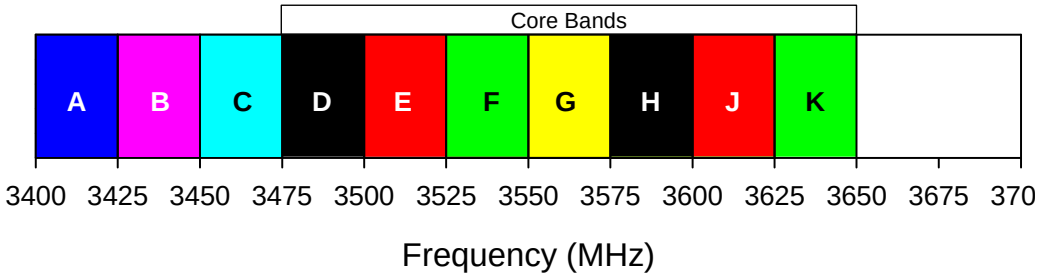

Figure 5.4.2-1: Band plan for Canada for 3400 MHz to 3700 MHz

5.5 Conclusion on frequency band arrangements

5.5.1 Summary of regional band plans

The frequency band arrangements were studied and reported above for the following regions:

- **Europe:** The harmonised conditions determined by ECC and in the EU decision for BWA use in the bands are summarized in subclause 5.1. In addition, the local band plans applied in UK, Germany, France and Austria for the band 3.4-3.6 GHz is documented.
- **Japan:** The present use of the band 3.4-4.2 GHz is reported in subclause 5.2. The band will be made available for terrestrial mobile services such as IMT, but there is currently no band plan.
- **Latin America:** The situation in Mexico, Peru and Argentina is documented in subclause 5.3. Many of the bands are used for BWA services.
- **North America:** The situation in US and Canada is documented in subclause 5.4. Canada has band plans for FWA in 225 MHz of spectrum with the upper 50 MHz (3650 – 3700 MHz) designated for Wireless Broadband Services which is capable of supporting mobile applications as well. Only 50 MHz is available for terrestrial mobile services in the US.

Some observations can be made of the studies above. Looking first at Europe, it can be noted that all countries studied except UK have paired band plans in use today that are aligned with the ECC decision [7] and the band plans given in the ECC recommendation [8]. The ECC plan is based on pairing of the bands 3.4-3.6 GHz and 3.6-3.8 GHz as shown in Figure 5.5-1, with use of the spectrum for either FDD or TDD. For FDD, the uplink-downlink duplex frequency separation is 100 MHz. There is no given duplex band gap for the FDD arrangement in this proposal. There is a need to find solution for this further during the work by e.g. half-duplex operation or flexible arrangements on national basis.

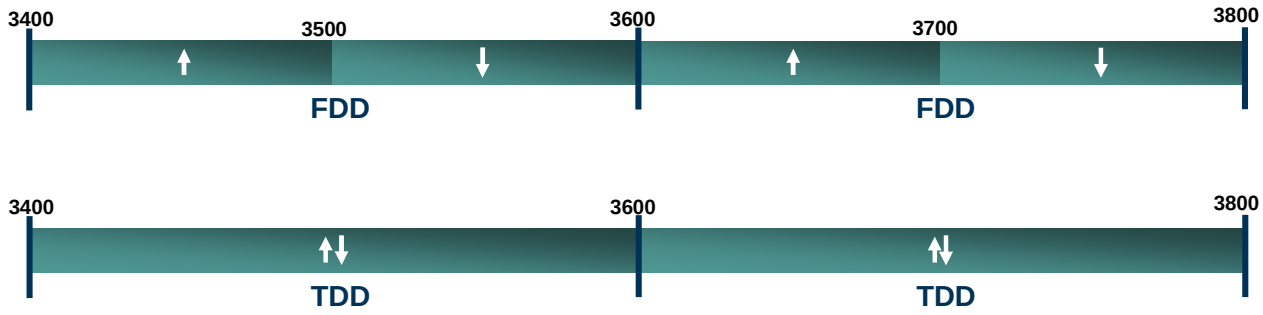

Figure 5.5.1-1FDD and TDD band plan in 3.4-3.6 GHz and 3.6-3.8 GHz.

For Latin America, it can be noted that the plans for Mexico and Peru are very similar to the European allocations. They have a 100 MHz uplink-downlink separation and fit within the plan in Figure 5.5-1. Some blocks in Argentina also have 100 MHz uplink-downlink spacing, while others have 50 MHz.

The North American plans differ from the European and Latin American, especially for the US. In Canada, it remains to be seen if paired spectrum, unpaired spectrum, or any combination would be made available in future for mobile services within 3400-3800 MHz and/or harmonized with European band plans.

5.5.2 Band plan working assumption

The studies performed above shows that the band plan in Figure 5.5.1-1 has good support throughout Europe and also in some other parts of the world where a band plan compatible with the arrangement in Figure 5.1.3-1 and/or Figure 5.1.3-2 is assumed. The plan calls for the bands to be paired with 100 MHz uplink-downlink duplex frequency separation of 100 MHz. Alternatively, any of the bands can be used as unpaired.

A *framework frequency arrangement* based on the studies would then be as follows (see also Figure 5.5-1):

3.4-3-6 GHz band:

- FDD Uplink 3400-3500 MHz
- FDD Downlink 3500-3600 MHz
- *or* TDD Unpaired 3400-3600 MHz

3.6-3-8 GHz band:

- FDD Uplink 3600-3700 MHz
- FDD Downlink 3700-3800 MHz
- *or* TDD Unpaired 3600-3800 MHz

Continued studies of deployment aspects and specific RF and signaling requirements would use this framework frequency arrangement above as a working assumption.

The *framework frequency arrangement* as described above is to be applied for the UMTS/LTE 3500 work.

5.5.3 Baseline frequency arrangements in 3400-3600 MHz

The FDD arrangement where 3410-3490 MHz is paired with 3510-3590 MHz is taken as the baseline FDD pairing to use for further work on the band 3400-3600 MHz, as shown in Figure 5.5.3-1.

From an implementation point of view, the following is noted:

- It would be difficult to implement a complete arrangement larger than 2x80 MHz with a single duplexer in a UE. A single duplexer for 2x80 MHz is deemed feasible with some extrapolation of current technology and would be available in the next few years.

- A dual duplexer approach would make UE implementation easier from self desense point of view but would not help the UE to UE co-existence at the edge of the other DL band.

- For the Base Station implementation, full band duplexers larger than 2x80 MHz have been identified as being difficult. The feasibility is further discussed in subclause 5.5.3.1.

A TDD arrangement should cover the whole frequency range 3400-3600 MHz.

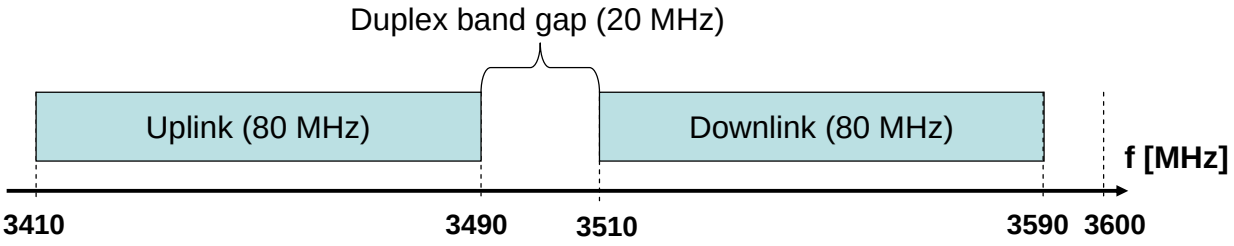

Figure 5.5.3-1 Baseline FDD pairing arrangement for 3400-3600 MHz.

5.5.3.1 Feasibility of 2x80 MHz BS filters

As pointed in 5.5.3, implementing a 2x80 MHz single duplex filter can be difficult from the BS side. Figure 5.5.3.1-1 shows simulations for a full band duplexer on the BS. The DL passband is defined as 3510-3590 MHz and the UL passband is 3410-3490 MHz. It has been considered that the UL should have enough rejection towards its own DL (90dB) as well as to be able to fulfill 3GPP general blocking requirements (20dB). It has also been taken into account that the DL should protect its own UL (90dB) and be able to co-exist with TDD systems at 3600MHz (40dB). It can be observed that it is feasible to create a single 80 MHz duplexer, with 3 zeros and 9 poles, on the BS side with the proposed requirements above and having an acceptable Insertion Loss in the passband, as shown in Figure 5.5.3.1-2

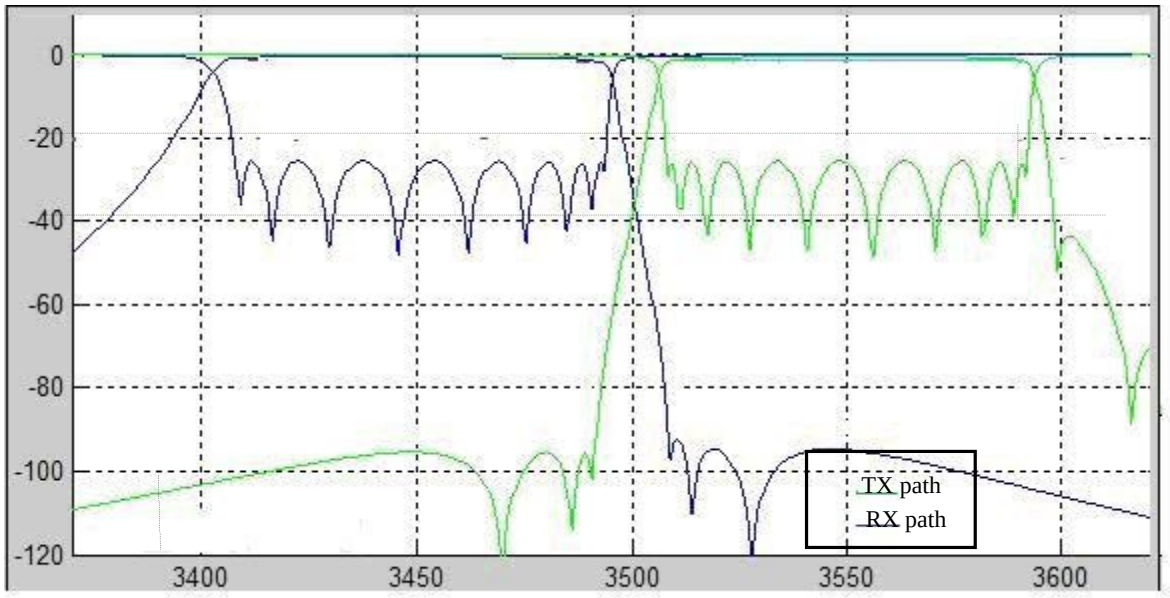

Figure 5.5.3.1-1. Attenuation of the BS duplexer for the TX and RX path.

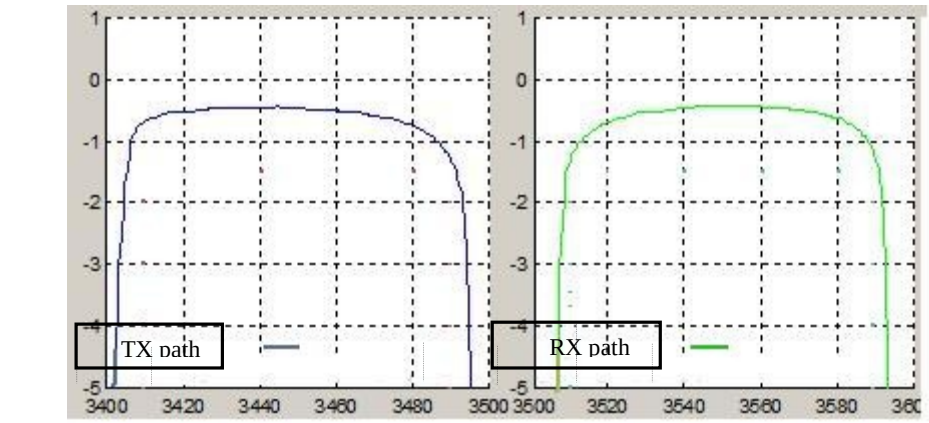

Figure 5.5.3.1-2. Insertion loss of the BS duplexer for the TX and RX path.

5.5.3.2 Feasibility of a 2x80 MHz arrangement for the UE

A 2 x 80 MHz arrangement using a single duplexer is deemed feasible within the next few filter generations, but it is relevant to start defining requirements based on a split duplexer solution for initial deployment. One possible implementation is to cover the 80 MHz passband with two 50 MHz filters with a 20 MHz overlap as shown in Figure 5.5.3.2-1.

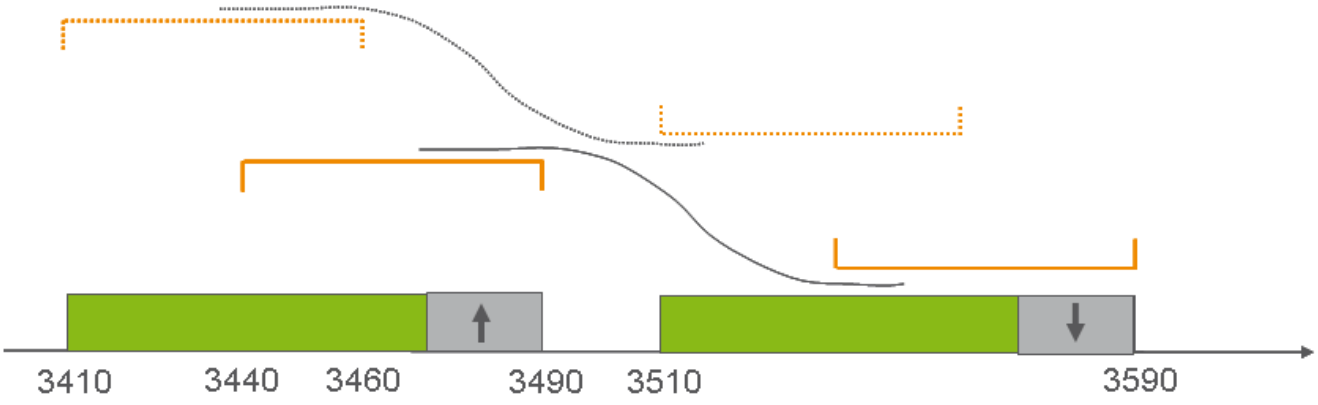

Figure 5.5.3.2-1: split duplexer arrangement with a 20 MHz overlap.

The overlap is 20 MHz, which means that all E-UTRA carrier bandwidths can be supported. A possible UE implementation with a split duplexer is shown in Figure 5.5.3.2-2. This architecture is used as a baseline to discuss the FDD requirements in 3.4-3.6 GHz. The requirements are defined as single requirements and should be met by either a split-duplexer or a single duplexer solution.

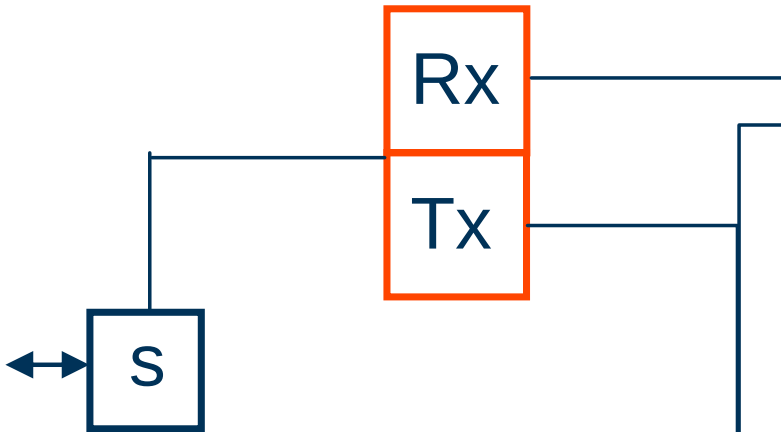

Figure 5.5.3.2-2: a possible split-duplexer architecture in the UE.

6 Deployment aspects

6.1 Deployment based on European scenarios

6.1.1 Possible interference scenarios from ERC/REC(04)05

The band arrangement presented in clause 5.5 is mainly based on European conditions, as expressed in a recent EU decision [21] and ECC/REC(04)05 [3]. The ECC recommendation considers both paired arrangements for FDD and unpaired for TDD. Potentially, an implementation of the recommendation in [3] may be mix of FDD/TDD and/or unsynchronized TDD.

Band plans that mix FDD and TDD within one or both bands shall be avoided to prevent difficult interference scenarios and inefficient spectrum use, for the following reasons:

- Mix of FDD and TDD in the same geographical area gives adjacent up and downlink transmissions, which may result in unreasonable terminal requirements to avoid mobile-to-mobile interference.
- The mix of FDD and TDD in the same geographical area results in spectrum inefficiency due to the need for large guard bands. Especially, when considering large bandwidths of 20 MHz and above for LTE-Advanced, it is important to avoid spectrum fragmentation and not waste spectrum for large guard bands
- LTE needs large channel bandwidths and use of multiple antennas to achieve the high data throughput requirements for IMT systems. Mixing TDD/FDD is a major technical challenge for mobile terminal equipment requiring multiple duplexers for each antenna.
- For LTE Advanced carrier aggregation, 3GPP is currently not studying a mixture of FDD and TDD operation.

The aim must be to avoid multiple interference scenarios in band plans, in order not to create difficulties in deriving a common equipment standard. If such an interference scenario were to occur in a country where UMTS/LTE 3500 MHz is to be deployed, the primary solution should be deployment and site solutions tailored to that specific situation.

6.1.2 Assumptions for deriving requirements

Based on the conclusions in subclause 6.1.2, the following taken as a working assumption for deriving RF requirements for deployment based on European scenarios:

- Any deployment is based on ECC/REC(04)05 [8], but local variations and additional restrictions may exist that vary between countries and regions.

- It is assumed that FDD and TDD are not deployed in the same frequency range, i.e. 3400-3600 MHz and 3600-3800 MHz respectively are either deployed with TDD only or FDD only.
- For TDD deployment in a band, it is assumed that systems are synchronized.
- Other services in the band, mix of FDD/TDD and/or unsynchronized TDD will not be reflected through specific RF requirements.

Based on these assumptions, there will be no new interference scenarios specific to the bands 3400-3600 MHz and 3600-3800 MHz, making it possible to re-use RF requirements from other bands.

7 Study of UTRA requirements

7.1 General aspects

7.1.1 UTRA Channel raster and numbering

It was shown in Table 5.1.8-1 that the frequency allocations in 3.4-3.6 GHz throughout Europe are made in blocks of from 2x11 up to 2x42 MHz. Block sizes are generally large, so there does not seem to be a need to have any UARFCN in addition to the default 200 kHz raster.

For the band 3400-3600 MHz, a 2x80 MHz FDD duplex arrangement was concluded in Subclause 5.5.3 and illustrated in Figure 5.5.3-1:

- FDD Uplink 3410-3490 MHz
- FDD Downlink 3510-3590 MHz

This band allocation is for UTRA referred to as Band XXII.

UARFCN can be defined as in Table 7.1.1-1, by reserving a part of the unused numbers that follow the Band XX allocation.

Table 7.1.1-1: UARFCN allocated for UTRA FDD Band XXII

			Uplink UARFCN				Downlink UARFCN			
UTRA FDD Band	**Band range [MHz]**	**Range res. [MHz]**	**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]**
XXII	80	80	2525	Start res.	4425	3410.0	2580	Start res.	4650	3510.0
				Min.	4437	3412.4		**Min.**	4662	3512.4
				Max.	4813	3487.6		**Max.**	5038	3587.6
				Stop res.	4824	3489.8		Stop res.	5049	3589.8

7.1.2 Spurious emissions frequency bandwidth

In order to cover spurious emissions up to the 5th harmonic, as recommended in ITU-R SM.329 [1], s2.5 table 1 [22], the upper frequency limit for “Transmitter spurious emissions” and “Receiver spurious emissions” in TS 25.101, TS 25,104 and TS 25.141 needs to be extended from 12.75 GHz to 19 GHz for Band 42, Band 43 and Band XXII.

7.2 Void

7.3 Specific BS RF requirements for UTRA

7.3.1 Unwanted emissions

The "Transmitter spurious emissions" in T25.104 and TS 25.141 require alteration to accommodate the LTE3500 frequency band for FDD, as follows. Also, the tables on minimum co-location emissions requirements similarly require alteration. Limits are the same as in other bands.

It is assumed that FDD and TDD are not deployed in the same frequency range in the same area. Thus, co-existence and co-location requirements for this scenario are not treated.

Table 7.3.1-1: BS Mandatory spurious emissions limits, operating band I, II, III, IV, VII, X, XXII (Category B)

Band	Maximum Level	Measurement Bandwidth	Note
9 kHz ↔ 150 kHz	-36 dBm	1 kHz	Note 1
150 kHz ↔ 30 MHz	-36 dBm	10 kHz	Note 1
30 MHz ↔ 1 GHz	-36 dBm	100 kHz	Note 1
1 GHz ↔ F_{low} - 10 MHz	-30 dBm	1 MHz	Note 1
F_{low} - 10 MHz ↔ F_{high} + 10 MHz	-15 dBm	1 MHz	Note 2
F_{high} + 10 MHz ↔ 12.75 GHz	-30 dBm	1 MHz	Note 3
NOTE 1: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1 NOTE 2: Limit based on ITU-R Recommendation SM.329 [1], s4.3 and Annex 7 NOTE 3: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1. Upper frequency as in ITU-R SM.329 [1], s2.5 table 1			
Key: F_{low}: The lowest downlink frequency of the operating band as defined in Table 5.0. F_{high}: The highest downlink frequency of the operating band as defined in Table 5.0.			

Table 7.3.1-2: Wide Area BS Spurious emissions limits for protection of the BS receiver

Operating Band	Band	Maximum Level	Measurement Bandwidth	Note
XXII	3410 -3490MHz	-96 dBm	100 kHz	

Table 7.3.1-3: Medium Range BS Spurious emissions limits for protection of the BS receiver

Operating Band	Band	Maximum Level	Measurement Bandwidth	Note
XXII	3410 -3490MHz	-86 dBm	100 kHz	

Table 7.3.1-4: Local Area BS Spurious emissions limits for protection of the BS receiver

Operating Band	Band	Maximum Level	Measurement Bandwidth	Note
XXII	3410 -3490MHz	-82 dBm	100 kHz	

Table 7.3.1-5: Home BS Spurious emissions limits for protection of the BS receiver

Operating Band	Band	Maximum Level	Measurement Bandwidth	Note
XXII	3410 -3490MHz	-82 dBm	100 kHz	

Table 7.3.1-6: BS Spurious emissions limits for UTRA FDD BS in geographic coverage area of systems operating in other frequency bands

System type operating in the same geographical area	Band for co-existence requirement	Maximum Level	Measurement Bandwidth	Note
UTRA FDD Band XXII or E-UTRA Band 22	3510 - 3590MHz	-52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in band XXII
	3410 – 3490MHz	-49 dBm	1 MHz	This requirement does not apply to UTRA FDD BS operating in frequency band XXII, since it is already covered by the requirement in sub-clause 6.6.3.2.
E-UTRA Band 42	3400 - 3600MHz	-52 dBm	1 MHz	
E-UTRA Band 43	3600 - 3800MHz	-52 dBm	1 MHz	

Table 7.3.1-7: BS Spurious emissions limits for Wide Area BS co-located with another BS

Type of co-located BS	Band for co-location requirement	Maximum Level	Measurement Bandwidth	Note
WA UTRA FDD Band XXII or E-UTRA Band 22	3410 – 3490MHz	-96 dBm	100 kHz	
WA E-UTRA Band 42	3400 - 3600MHz	-86 dBm	1 MHz	
WA E-UTRA Band 43	3600 - 3800MHz	-86 dBm	1 MHz	

Table 7.3.1-8: BS Spurious emissions limits for Medium Range BS co-located with another BS

Type of co-located BS	Band for co-location requirement	Maximum Level	Measurement Bandwidth	Note
MR UTRA FDD Band XXII	3410 – 3490MHz	-86 dBm	100 kHz	

Table 7.3.1-9: BS Spurious emissions limits for Local Area BS co-located with another BS

Type of co-located BS	Band for co-location requirement	Maximum Level	Measurement Bandwidth	Note
LA UTRA FDD Band XXII	3410 – 3490MHz	-82 dBm	100 kHz	

Table 7.3.1-10: Home BS Spurious emissions limits for co-existence with Home BS operating in other bands

Type of Home BS	Band for co-existence requirement	Maximum Level	Measurement Bandwidth	Note
UTRA FDD Band XXII or E-UTRA Band 22	3410 – 3490MHz	-71 dBm	100 kHz	

7.3.2 Blocking requirements

The blocking performance requirements in TS 36.104 and 36.141 require alteration to accommodate the LTE3500 frequency bands for FDD, as follows.

Table 7.3.2-1: Blocking performance requirement for Wide Area BS

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
XXII	3410 – 3490MHz	-40 dBm	-115 dBm	±10 MHz	WCDMA signal *
	3390 - 3410 MHz 3490 - 3510 MHz	-40 dBm	-115 dBm	±10 MHz	WCDMA signal *
	1 MHz -3390 MHz 3510 MHz - 12750 MHz	-15 dBm	-115 dBm	—	CW carrier

Table 7.3.2-2: Blocking performance requirement for Medium range BS

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
XXII	3410 – 3490MHz	-35 dBm	-105 dBm	±10 MHz	WCDMA signal *
	3390 - 3410 MHz 3490 - 3510 MHz	-35 dBm	-105 dBm	±10 MHz	WCDMA signal *
	1 MHz -3390 MHz 3510 MHz - 12750 MHz	-15 dBm	-105 dBm	—	CW carrier

Table 7.3.2-3: Blocking performance requirement for Local Area / Home BS

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
XXII	3410 – 3490MHz	-30 dBm	-101 dBm	±10 MHz	WCDMA signal *
	3390 - 3410 MHz 3490 - 3510 MHz	-30 dBm	-101 dBm	±10 MHz	WCDMA signal *
	1 MHz -3390 MHz 3510 MHz - 12750 MHz	-15 dBm	-101 dBm	—	CW carrier

Table 7.3.2-4: Blocking performance requirement for Wide Area BS when co-located with BS in other bands.

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
WA UTRA FDD Band XXII or E-UTRA Band 22	3510 – 3590MHz	+16 dBm	-115 dBm	CW carrier
WA E-UTRA Band 42	3400 - 3600MHz	+16 dBm	-115 dBm	CW carrier
WA E-UTRA Band 43	3600 - 3800MHz	+16 dBm	-115 dBm	CW carrier

Table 7.3.2-5: Blocking performance requirement for Medium Range BS when co-located with BS in other bands.

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
MR UTRA FDD Band XXII	3510 – 3590MHz	+8 dBm	-105 dBm	CW carrier

Table 7.5E: Blocking performance requirement for Local Area BS when co-located with BS in other bands.

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
LA UTRA FDD Band XXII	3510 – 3590MHz	-6 dBm	-101 dBm	CW carrier

8 Study of E-UTRA requirements

8.1 General aspects

8.1.1 E-UTRA Channel raster and numbering

It was shown in Table 5.1.8-1 that the frequency allocations in 3.4-3.6 GHz throughout Europe are made in blocks of from 2x11 up to 2x42 MHz. E-UTRA is based on channel bandwidths from 1.4 to 20 MHz and a 100 kHz raster that supports carrier deployment anywhere within those block sizes.

For the band 3400-3600 MHz, a 2x80 MHz FDD duplex arrangement was concluded in Subclause 5.5.3 and illustrated in Figure 5.5.3-1:

- FDD Uplink 3410-3490 MHz
- FDD Downlink 3510-3590 MHz

This band allocation is for E-UTRA referred to as Band 22.

E-UARFCN can be defined as in Table 8.1.1-1, by reserving a part of the unused numbers that follow the band [21] allocation.

Table 8.1.1-1 EARFCN allocated for E-UTRA Band 22

E-UTRA Operating Band	Downlink			Uplink		
	F_{DL_low} [MHz]	$N_{Offs-DL}$	Range of N_{DL}	F_{UL_low} [MHz]	$N_{Offs-UL}$	Range of N_{UL}
22	3510	6600	6600 – 7399	3410	24600	24600 – 25399

It was concluded in Subclause 5.5.3 that TDD can be deployed in 3400-3600 MHz. Using the complete frequency range available in 3400-3600 MHz would cover all possible arrangements. As indicated in subclause 5.5.2, the band 3600-3800 MHz can also be used for unpaired arrangement, in line with ECC recommendation (04)05 [8].

Two unpaired arrangements for TDD are therefore defined for E-UTRA TDD:

- 3400-3600 MHz
- 3600-3800 MHz

The band allocations are for E-UTRA referred to as Band 42 and 43 respectively.

E-UARFCN can be defined as in Table 8.1.1-2, by reserving a part of the unused numbers that follow the band 41 allocation.

Table 8.1.1-2 EARFCN allocated for E-UTRA Band 42 and 43

E-UTRA Operating Band	Downlink			Uplink		
	F_{DL_low} [MHz]	$N_{Offs-DL}$	Range of N_{DL}	F_{UL_low} [MHz]	$N_{Offs-UL}$	Range of N_{UL}
42	41590	41590 – 43589	41590	3400	41590	41590 – 43589
43	43590	43590 – 45589	43590	3600	43590	43590 – 45589

8.1.2 MSR BS operating band and categories

The tables identifying the band designations of unpaired bands in TS 37.104 and TS 37.141 will require alteration to accommodate the new LTE3500 frequency band parameters, as follows.

Table 8.1.2-1: Unpaired bands in E-UTRA and UTRA.

MSR and E-UTRA Band number	UTRA Band number	Uplink (UL) BS receive UE transmit	Downlink (DL) BS transmit UE receive	Band category
22	XXII	3410 MHz – 3490 MHz	3510 MHz – 3590 MHz	1
42	-	3400 MHz – 3600 MHz	3400 MHz – 3600 MHz	3
43	-	3600 MHz – 3800 MHz	3600 MHz – 3800 MHz	3

8.1.3 Spurious emissions frequency bandwidth

"Transmitter spurious emissions" and "Receiver spurious emissions" in TS 36.101, TS 36,104, TS 36.141, TS 37.104 and TS 37.141 need to extend the frequency range from 12.75 GHz to 19 GHz for Band 22, Band 42 and Band 43 to cover spurious emissions from those bands up to the 5th harmonic, as recommended in ITU-R SM.329 [1], s2.5 table 1 22.

8.2 Specific UE RF requirements for E-UTRA

8.2.1 Void

8.2.2 Receiver performance

8.2.2.1 Reference sensitivity

The reference sensitivity requirements for Band 22 should be specified such that it can be met by either a split-duplexer or a single duplexer solution. The duplex spacing is 100 MHz and we assume passband of 50 MHz of the constituent duplexers as shown in Figure 5.5.3.2-1. In view of transmitter noise, one may look at Band 3 and Band 9 that has a similar spacing, and assume a performance in between these bands, e.g. like Band 2. Then losses of the switches in Figure 5.5.3.2-2 should be added, and 0.5 dB per switch should be possible at 3.5 GHz suggesting Band 3 performance altogether. This performance may also be reasonable for a future single-duplexer arrangement with an 80 MHz passband. The proposed requirements for Band 22 are shown in Table 8.2.2.1-1.

Table 8.2.2.1-1: Reference sensitivity QPSK $P_{REFSENS}$

Channel bandwidth							
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
22			-97	-94	-92.2	-91	FDD

The uplink allocation for Band 22 should be similar to Band 2 and Band 3 that have a similar duplex spacing.

Table 8.2.2.1-2: Uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / NRB / Duplex mode							
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
2	6	15	25	50	50[1]	50[1]	FDD
3	6	15	25	50	50[1]	50[1]	FDD
…							
22			25	50	50[1]	50[1]	FDD

8.3 Specific BS RF requirements for E-UTRA

8.3.1 Unwanted emissions

For the "Operating band unwanted emissions" in TS 36.104 and TS 36.141, the existing tables of requirements are applicable to warrant addition of Bands 22 (3410-3490MHz/3510-3590 MHz), 42 (3400-3600 MHz) and 43 (3600-3800 MHz).

The "Transmitter spurious emissions" in TS 36.104 and TS 36.141 require alteration to accommodate the LTE3500 frequency bands for TDD and FDD, as follows. Also, the tables on minimum co-location emissions requirements similarly require alteration. Limits are the same as in other bands.

Co-existence or co-located TDD base stations that are synchronized and using the same or adjacent operating band can transmit without special co-existence or co-location requirements. For unsynchronized base stations, special co-existence or co-location requirements may apply that are not covered by the 3GPP specifications. This is not applicable to Home BS. In this case, a study on the synchronization requirement is needed in order to decide the applicability of co-existence/co-location requirements. This study is not in the scope of the present WI.

It is assumed that FDD and TDD are not deployed in the same frequency range in the same area. Thus, co-existence and co-location requirements for this scenario are not treated.

Table 8.3.1-1: BS Spurious emissions limits for E-UTRA BS for co-existence with systems operating in other frequency bands

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum Level	Measurement Bandwidth	Note
UTRA FDD Band XXII or E-UTRA Band 22	3510 - 3590MHz	-52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in band 22
	3410 – 3490MHz	-49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in band 22, since it is already covered by the requirement in subclause 6.6.4.2.
E-UTRA Band 42	3400 - 3600MHz	-52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 42 or 43
E-UTRA Band 43	3600 - 3800MHz	-52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 43 or 42

Table 8.3.1-2: Home BS Spurious emissions limits for co-existence with Home BS operating in other frequency bands

Type of coexistence BS	Frequency range for co-location requirement	Maximum Level	Measurement Bandwidth	Note
UTRA FDD Band XXII or E-UTRA Band 22	3410 - 3490MHz	-71 dBm	100 kHz	This is not applicable to Home BS operating in Band 22

8.3.1-3: BS Spurious emissions limits for Wide Area BS co-located with another BS

Type of co-located BS	Frequency range for co-location requirement	Maximum Level	Measurement Bandwidth	Note
WA UTRA FDD Band XXII or E-UTRA Band 22	3410 - 3490MHz	-96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22
WA E-UTRA Band 42	3400 - 3600MHz	-96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42 or 43
WA E-UTRA Band 43	3600 - 3800MHz	-96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 43 or 42

Table 8.3.1-4: BS Spurious emissions limits for Local Area BS co-located with another BS

Type of co-located BS	Frequency range for co-location requirement	Maximum Level	Measurement Bandwidth	Note
LA UTRA FDD Band XXII or E-UTRA Band 22	3410 - 3490MHz	-96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22
LA E-UTRA Band 42	3400 - 3600MHz	-88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42 or 43
LA E-UTRA Band 43	3600 - 3800MHz	-88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 43 or 42

8.3.2 Blocking requirements

The blocking performance requirements in TS 36.104 and 36.141 require alteration to accommodate the LTE3500 frequency bands for TDD, as follows.

Table 8.3.2-1: Blocking performance requirement for Wide Area BS

Operating Band	Centre Frequency of Interfering Signal [MHz]	Interfering Signal mean power [dBm]	Wanted Signal mean power [dBm]	Interfering signal centre frequency minimum frequency offset from the channel edge of the wanted signal [MHz]	Type of Interfering Signal
22, 42, 43	(F_{UL_low} -20) to (F_{UL_high} +20)	-43	$P_{REFSENS}$ +6dB*	See table 7.6.1.1-2	See table 7.6.1.1-2
	1 to (F_{UL_low} -20) (F_{UL_high} +20) to 12750	-15	$P_{REFSENS}$ +6dB*	—	CW carrier
Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 Table 7.2.1-1.					

Table 8.3.2-2: Blocking performance requirement for Local Area BS

Operating Band	Centre Frequency of Interfering Signal [MHz]	Interfering Signal mean power [dBm]	Wanted Signal mean power [dBm]	Interfering signal centre frequency minimum frequency offset from the channel edge of the wanted signal [MHz]	Type of Interfering Signal
22, 42, 43	(F_{UL_low} -20) to (F_{UL_high} +20)	-35	$P_{REFSENS}$ +6dB*	See table 7.6.1.1-2	See table 7.6.1.1-2
	1 to (F_{UL_low} -20) (F_{UL_high} +20) to 12750	-15	$P_{REFSENS}$ +6dB*	—	CW carrier
Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 Table 7.2.1-2.					

Table 8.3.2-3: Blocking performance requirement for Home BS

Operating Band	Centre Frequency of Interfering Signal [MHz]	Interfering Signal mean power [dBm]	Wanted Signal mean power [dBm]	Interfering signal centre frequency minimum frequency offset from the channel edge of the wanted signal [MHz]	Type of Interfering Signal
22, 42, 43	(F_{UL_low} -20) to (F_{UL_high} +20)	-27	$P_{REFSENS}$ +14dB*	See table 7.6.1.1-2	See table 7.6.1.1-2
	1 to (F_{UL_low} -20) (F_{UL_high} +20) to 12750	-15	$P_{REFSENS}$ +14dB*	—	CW carrier
Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 Table 7.2.1-3.					

The co-location blocking performance requirements in TS 36.104 and TS 36.141require alteration to accommodate the LTE3500 frequency bands for TDD, as follows.

Table 8.3.2-4: Blocking performance requirement for E-UTRA Wide Area BS when co-located with BS in other frequency bands.

Co-located BS type	Centre Frequency of Interfering Signal (MHz)	Interfering Signal mean power (dBm)	Wanted Signal mean power (dBm)	Type of Interfering Signal
WA UTRA FDD Band XXII or E-UTRA Band 22	3510 – 3590	+16	$P_{REFSENS}$ + 6dB*	CW carrier
WA E-UTRA in Band 42	3400 – 3600	+16	$P_{REFSENS}$ + 6dB*	CW carrier
WA E-UTRA in Band 43	3600 – 3800	+16	$P_{REFSENS}$ + 6dB*	CW carrier
Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 Table 7.2.1-1.				
NOTE 1: Except for a BS operating in Band 13, these requirements do not apply when the interfering signal falls within the uplink operating band or in the 10 MHz immediately outside the uplink operating band. For a BS operating in band 13 the requirements do not apply when the interfering signal falls within the frequency range 768-797 MHz.				
NOTE 2: Some combinations of bands may not be possible to co-site based on the requirements above. The current state-of-the-art technology does not allow a single generic solution for co-location of UTRA TDD or E-UTRA TDD with E-UTRA FDD on adjacent frequencies for 30dB BS-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942.				

Table 8.3.2-5: Blocking performance requirement for Local Area BS when co-located with BS in other frequency bands.

Co-located BS type	Centre Frequency of Interfering Signal (MHz)	Interfering Signal mean power (dBm)	Wanted Signal mean power (dBm)	Type of Interfering Signal
LA E-UTRA in Band 42	3400 – 3600	-6	$P_{REFSENS}$ + 6dB*	CW carrier
LA E-UTRA in Band 43	3600 – 3800	-6	$P_{REFSENS}$ + 6dB*	CW carrier
Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 Table 7.2.1-2.				
NOTE 1: Except for a BS operating in Band 13, these requirements do not apply when the interfering signal falls within the uplink operating band or in the 10 MHz immediately outside the uplink operating band. For a BS operating in band 13 the requirements do not apply when the interfering signal falls within the frequency range 768-797 MHz.				
NOTE 2: Some combinations of bands may not be possible to co-site based on the requirements above. The current state-of-the-art technology does not allow a single generic solution for co-location of UTRA TDD or E-UTRA TDD with E-UTRA FDD on adjacent frequencies for 30dB BS-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942.				

8.4 Specific signalling requirements for E-UTRA

8.4.1 Iuant interface

The list of frequency bands in TS 35.461 is updated according to Table 8.4.1-1. The coding for the bands is updated in TS 25.466 according to Table 8.4.1-2. The following is noted:

Table 8.4.1-1: Frequency bands in TS 25.461

UTRA Operating Band	E-UTRA Operating Band	UL operating band UE transmit, BS receive	DL operating band UE receive, BS transmit
XXII	22	3410 – 3490 MHz	3510 – 3590 MHz
-	42	3400 – 3600 MHz	3400 – 3600 MHz
-	43	3600 – 3800 MHz	3600 – 3800 MHz

Table B.2-1: Coding for operating bands in field 0x08

Bit no	15	14…10	9	8	7	6	5	4	3	2	1	0
Operating band	Res.	Spare	XXIV	-	XXII	XXI	XX	XIX	XVIII	XVII	Res.	Res.

Table B.2-2: Coding for operating bands in field 0x09 in TS 25.466

Bit no	15	14…11	10	9	8	7	6	5	4	3	2	1	0
Operating band	Res.	Spare	43	42	41	e40	f39	d38	c37	b36	b35	a34	a33

9 Required changes to UTRA FDD specifications

The required changes to the 3GPP specifications for Band XXII are summarised in a Table 9-1.

Table 9-1: Overview of 3GPP specifications with required changes

3GPP specification	Clause in TR 30.007 [23] where the required changes are given	Clause in the present document identifying additional changes
TS 25.101	8.2.2.1	
TS 25.104	8.2.2.3	
TS 25.113	8.2.2.6	
TS 34.124	8.2.2.8	
TS 25.133	8.2.2.9	
TS 25.141	8.2.2.10	
TS 25.307	8.2.2.13	
TS 25.331	8.2.2.14	
TS 25.461	8.2.2.15	
TS 25.466	8.2.2.16	

10 Required changes to E-UTRA specifications

10.1 Required changes to TS 36.101

Required changes in specification TS 36.101 are described in the tables below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 10.1-1: Required Changes in TS 36.101 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 36.101
5.5	Frequency bands	Three new operating bands need to be added as: • Band 42, 200 MHz for TDD mode, 3400 – 3600 MHz • Band 43, 200 MHz for TDD mode, 3600 – 3800 MHz
5.6	Channel Bandwidth	Add these new bands in E-UTRA channel bandwidth, supported bandwidths are [5, 10, 15, and 20 MHz].
5.7.3	Carrier frequency and EARFCN	Add the EARFCN numbers and parameters as in Table 8.1-2 of the present document.
6.2.2	UE maximum output power	Add 23 dBm UE power class for band 42 and 43.
6.6.2.1	Spectrum emission mask	The current spectrum emission masks will remain.
6.6.3.1	TX spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
6.6.3.2	TX spurious emissions band UE co-existence	[Add Tx spurious emissions for band 42 and 43.
7.3.1	Reference sensitivity level	[Add reference sensitivity level requirement for band 42 and 43. The requirement is FFS.]
7.6.2	Minimum requirement (Out of-band blocking)	[Add out-of-band blocking requirements for band 42 and 43.
7.9.1	RX spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43

Table 10.1-2: Required Changes in TS 36.101 for Band 22

Section	Requirement	Discussion / Required Changes in TS 36.101
5.5	Frequency bands	Three new operating bands need to be added as: • Band 22, 2x90 MHz for FDD mode 3410 – 3500 MHz: Up-link (UE transmit, Base station receive) 3510 – 3600 MHz: Down-link (Base station transmit, UE receive)
5.6	Channel Bandwidth	Add these new bands in E-UTRA channel bandwidth, supported bandwidths are 5, 10, 15, and 20 MHz.
5.7.3	Carrier frequency and EARFCN	Add the EARFCN numbers and parameters as in Table 8.1-1 of the present document.
5.7.4	TX-RX frequency separation	Add this requirement for Band 22. 100 MHz
6.2.2	UE maximum output power	Add 23 dBm UE power class for band 22.
6.6.2.1	Spectrum emission mask	The current spectrum emission masks will remain.
6.6.3.2	TX spurious emissions	[Add Tx spurious emissions for band 22. The spurious emission requirement is FFS.]
7.3.1	Reference sensitivity level	[Add reference sensitivity level requirement for band 22. The requirement is FFS.]
7.6.2	Minimum requirement (Out of-band blocking)	[Add out-of-band blocking requirements for band 22. The limits are FFS and need to take into account the implementation of duplexer.]

10.2 Required changes to TS 36.104

Required changes in specification TS 36.104 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 10.2-1: Required Changes in TS 36.104 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 36.104
5.5	Frequency bands	Three new operating bands need to be added as: • Band 42, 200 MHz for TDD mode, 3400 – 3600 MHz • Band 43, 200 MHz for TDD mode, 3600 – 3800 MHz
5.7.3	Carrier frequency and EARFCN	Add the EARFCN numbers and parameters as in Table 8.1-2 of the present document.
6.6.3.1	Operating band unwanted emissions (Category A)	Add this requirement for Band 42 and 43, see subclause 10.2.1.
6.6.3.2	Operating band unwanted emissions (Category B)	Add this requirement for Band 42 and 43, using option 2, see subclause 10.2.1.
6.6.4.1	Mandatory Transmitter spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
6.6.4.2	Protection of BS receiver of own or different BS	The current requirements will remain for the new band 42 and 43 , see subclause 10.2.1.
6.6.4.3 – 6.6.4.4	Spurious emissions / Co-existence requirements	Add requirements for Band 42 and 43 , see subclause 10.2.1: • Requirements for co-existence in the same geographical area and for BS co-location with other bands •
7.6.1	General blocking requirement	Add requirements for Band 42 and 43 , see subclause 10.2.2.
7.6.2	Co-location with other base stations	Add requirements for Band 42 and 43 , see subclause 10.2.2.
7.7.1	Receiver spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43

Table 10.2-2: Required Changes in TS 36.104 for Band 22

Section	Requirement	Discussion / Required Changes in TS 36.104
5.5	Frequency bands	Three new operating bands need to be added as: • Band 22, 2x90 MHz for FDD mode 3410 – 3500 MHz: Up-link (UE transmit, Base station receive) 3510 – 3600 MHz: Down-link (Base station transmit, UE receive)
5.7.3	Carrier frequency and EARFCN	Add the EARFCN numbers and parameters as in Table 8.1-1 of the present document.
6.6.3.1	Operating band unwanted emissions (Category A)	Add this requirement for Band 22 see subclause 10.2.1.
6.6.3.2	Operating band unwanted emissions (Category B)	Add this requirement for Band 22, using option 2, see subclause 10.2.1.
6.6.4.1	Transmitter spurious emissions	The mandatory requirement is not changed, see subclause 10.2.1.
6.6.4.2	Protection of BS receiver of own or different BS	The current requirements will remain for the new band 22 , see subclause 10.2.1.
6.6.4.3 – 6.6.4.4	Spurious emissions / Co-existence requirements	Add requirements for Band 22 , see subclause 10.2.1: • Requirements for co-existence is the same geographical area and for BS co-location with other bands (Band 22) •
7.6.1	General blocking requirement	Add requirements for Band 22 see subclause 10.2.2.
7.6.2	Co-location with other base stations	Add requirements for Band 22 see subclause 10.2.2.

10.3 Required changes to TS 36.141

Required changes in specification TS 36.141 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 10.3-1: Required Changes in TS 36.141 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 36.141
4.1.2	Acceptable uncertainty of Test System	Measurement uncertainty may need to be updated for the 3.5 GHz band.
5.5	Operating bands	Three new operating bands need to be added as: Band 42, 200 MHz for TDD mode, 3400 – 3600 MHz Band 43, 200 MHz for TDD mode, 3600 – 3800 MHz
5.7.3	Carrier frequency and EARFCN	Add the EARFCN numbers and parameters as in Table 8.1-2 of the present document.
6.6.2	Adjacent Channel Leakage power Ratio (ACLR)	The mandatory requirement is not changed.
6.6.3	Operating band unwanted emissions	The mandatory requirement is not changed.
6.6.4.5.1	Mandatory TX spurious emissions (Category A)	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
6.6.4.5.1	Mandatory TX spurious emissions (Category B)	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
6.6.4.5.4	Coexistence with other systems in the same geographical area	Add requirements for Band 42 and 43, • According note 2, overlapping frequency arrangements 22 and 42, the special co-ex requirement apply for European market.
6.6.4.5.5	Colocation with other base stations	Add requirements for Band [4421] and 43.
7.6.5.1	General requirement	Add requirements for Band 42 and 43.
7.6.5.2	Co-location with other base stations	Add requirements for Band 42 and 43.
7.7.5	RX spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
Annex G	Test Tolerances and Derivation of Test Requirements	Measurement uncertainty may need to be updated for the 3.5 GHz band.

Table 10.3-2: Required Changes in TS 36.141 for Bands 22

Section	Requirement	Discussion / Required Changes in TS 36.141
4.1.2	Acceptable uncertainty of Test System	Measurement uncertainty may need to be updated for the 3.5 GHz band.
5.5	Operating bands	Three new operating bands need to be added as: Band 22, 2x90 MHz for FDD mode 3410 – 3500 MHz: Up-link (UE transmit, Base station receive) 3510 – 3600 MHz: Down-link (Base station transmit, UE receive)
5.7.3	Carrier frequency and EARFCN	Add the EARFCN numbers and parameters as in Table 8.1-1 of the present document.
6.6.2	Adjacent Channel Leakage power Ratio (ACLR)	The mandatory requirement is not changed.
6.6.3	Operating band unwanted emissions	The mandatory requirement is not changed.
6.6.4.5.4	Coexistence with other systems in the same geographical area	Add requirements for Band 22. • Requirements for co-existence is the same geographical area and for BS co-location with other bands (Band 22) • According note 2, overlapping frequency arrangements 22 and 42, the special co-ex requirement apply for European market.
6.6.4.5.5	Colocation with other base stations	Add requirements for Band 22. The requirement is FFS.
7.6.5.1	General requirement	Add requirements for Band 22. The requirement is FFS.
7.6.5.2	Co-location with other base stations	Add requirements for Band 22. The requirement is FFS.
Annex G	Test Tolerances and Derivation of Test Requirements	Measurement uncertainty may need to be updated for the 3.5 GHz band.

10.4 Required changes to TS 36.307

Required changes in specification TS 36.307 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 10.4-1: Required Changes in TS 36.307 (Rel-8 and Rel-9) for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 36.307
New	Band 42 Independent of Release	New clause listing all Rel-10 RF and RRM requirements that a Band 42 shall comply with.
New	Band 43 Independent of Release	New clause listing all Rel-10 RF and RRM requirements that a Band 43 shall comply with.

10.5 Required changes to TS 36.113

Required changes in specification TS 36.113 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 10.5-1: Required Changes in TS 36.113 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 36.113
4.5.2	Receiver exclusion band	Add new entries for Bands 42 and 43 are required in clause 4.5.2. The exclusion applies to 20 MHz below the lower frequency band edge, to 20 MHz above the upper frequency band edge. Band 42 3380 MHz – 3620 MHz Band 43 3580 MHz – 3820 MHz

10.6 Required changes to TS 36.124

Required changes in specification TS 36.113 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 10.6-1: Required Changes in TS 36.124 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 36.124
4.4	Receiver exclusion band	Add new entries for Bands 42 and 43 in clause 4.4. The exclusion applies to 85 MHz below the lower frequency band edge, to 85 MHz above the upper frequency band edge. Band 42 3315 MHz – 3685 MHz Band 43 3515 MHz – 3885 MHz

11 Required changes to MSR specifications

11.1 Required changes to TS 37.104

Required changes in specification TS 37.104 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 11.1-1: Required Changes in TS 37.104 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 37.104
4.5	Operating bands and Band Categories	Table 4.5-2 “Unpaired bands in E UTRA and UTRA” requires alteration to accommodate the new LTE3500 frequency band parameters, see subclause 8.1.1.
6.6.1.1.	Mandatory TX spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
6.6.1.3.1	BS spurious emissions limits for co-existence with systems operating in other frequency bands	Add requirements for co-existence with Bands 42 and 43, with same limits as for other bands. According to Note 1, the 10 MHz frequency range immediately outside the downlink operating band is excluded.
6.6.1.4.1	BS spurious emissions limits for BS co-located with another BS	Add requirements for co-existence with Bands 42 and 43, with same limits as for other bands. According to Note 1, the 10 MHz frequency range immediately outside the downlink operating band is excluded.
7.4.1	General blocking minimum requirement	Bands 42 and 43 are added to the same entry as the other TDD bands, giving the same limits as for bands 33 to 40.
7.4.5	Additional BC3 blocking minimum requirement	Bands 42 and 43 are added to the same entry as the other TDD bands, giving the same limits as for other bands 33 to 40.
7.5.1	General minimum requirement for out-of-band blocking	Bands 42 and 43 are added to the same entry as the other TDD bands, giving the same limits as for bands 33 to 40.
7.5.2	Co-location minimum requirement for out-of-band blocking	Add requirements for co-existence with Bands 42 and 43, with same limits as for other bands. According to Note 2, the 10 MHz frequency range immediately outside the downlink operating band is excluded.
7.6	RX spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43

11.2 Required changes to TS 37.113

Required changes in specification TS 37.113 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 11.2-1: Required Changes in TS 37.113 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 37.113
4.4.2	Receiver exclusion band	Table 4.4-3 "Receiver exclusion band for base stations (unpaired bands)" requires alteration to accommodate the new LTE3500 frequency band parameters. The exclusion applies to 20 MHz below the lower frequency band edge, to 20 MHz above the upper frequency band edge. Band 42 3380 MHz – 3620 MHz Band 43 3580 MHz – 3820 MHz

11.3 Required changes to TS 37.141

Required changes in specification TS 37.141 are described in the table below. Requirements which are not shown are applicable without any modifications from the existing specifications.

Table 11.3-1: Required Changes in TS 37.141 for Bands 42 and 43

Section	Requirement	Discussion / Required Changes in TS 37.141
4.4	Operating bands and Band Categories	Table 4.4-2 "Unpaired bands in E UTRA and UTRA" requires alteration to accommodate the new LTE3500 frequency band parameters, see subclause 8.1.1.
6.6.1.5.1.	Mandatory TX spurious emissions (Category A)	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
6.6.1.5.2.	Mandatory TX spurious emissions (Category B)	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43
6.6.1.5.5	Additional spurious emissions requirement for co-existence with systems operating in other frequency bands	Add requirements for co-existence with Bands 42 and 43, with same limits as for other bands. According to Note 1, the 10 MHz frequency range immediately outside the downlink operating band is excluded.
6.6.1.5.6	Spurious emissions limits for BS co-located with another BS	Add requirements for co-existence with Bands 42 and 43, with same limits as for other bands. According to Note 1, the 10 MHz frequency range immediately outside the downlink operating band is excluded.
7.4.5.1	General blocking test requirement	Bands 42 and 43 are added to the same entry as the other TDD bands, giving the same limits as for bands 33 to 40.
7.4.5.5	Additional BC3 blocking test requirement	Bands 42 and 43 are added to the same entry as the other TDD bands, giving the same limits as for other bands 33 to 40.
7.5.5.1	General minimum requirement for out-of-band blocking	Bands 42 and 43 are added to the same entry as the other TDD bands, giving the same limits as for bands 33 to 40.
7.5.5.2	Co-location test requirement	Add requirements for co-existence with Bands 42 and 43, with same limits as for other bands. According to Note 2, the 10 MHz frequency range immediately outside the downlink operating band is excluded.
7.6.5.1	RX spurious emissions	The upper frequency limit needs to be extended from 12.75 GHz to 19 GHz for Band 42 and Band 43

Annex A:
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2008-04	RAN4#47	R4-080935			TR skeleton		0.0.1
2008-05	RAN4#47	R4-081212			Agreed TP in RAN4#47: **R4-081210**, "TP for Regional 3500 MHz band arrangements and use"	0.0.1	0.1.0
2008-11	RAN4#49	R4-083231			Agreed TP in RAN4#49: **R4-082953**, "TP for LTE/UMTS3500 TR: Frequency band arrangements"	0.1.0	0.2.0
2009-02	RAN4#50	R4-091019			TR updated to be in line with TR template v1.7.0. Agreed Text Proposals in RAN4#50: **R4-090615**, "TP for band pairing 3400-3600 MHz"	0.2.0	0.3.0
2009-05	RAN4#51	R4-092007			Agreed Text Proposal in RAN4#50bis: **R4-091216**, "Additional arrangements in the 3.4-3.8MHz band"	0.3.0	0.4.0
2009-10	RAN4#52bis	R4-093981			Agreed Text Proposal in RAN4#52 and RAN4#52bis: **R4-092959**, "Text proposal on UMTS/LTE 3500 TDD channel raster and numbering" **R4-093037**, "UMTS/LTE 3500: Channel raster and numbering for paired bands (TR ch 7.1 and 8.1)" **R4-093038**, "UMTS/LTE 3500: Channel raster and numbering for unpaired bands (TR ch 8.1)" **R4-093743**, "Text proposal on corrections of additional arrangements in the 3.4-3.8MHz band" **R4-093948**, "TP on UE Requirements for New Bands of 3.5 GHz" **R4-093949**, "TP on BS Requirements for New Bands of 3.5 GHz"	0.4.0	0.5.0
2009-11	RAN4#53	R4-094780			Agreed Text Proposal in RAN4#53: **R4-094840**, "Required Changes of Base Station Conformance Testing for 3.5 GHz (36.141)"	0.5.0	0.6.0
2010-06	RAN4 AH#3	R4-102544			Agreed Text Proposal in RAN4 #55: **R4-102335**, "TP for LTE3500 TR, clause 10.2, 10.3 (Blocking requirements)" **R4-102336**, "TP for LTE3500 TR, clause 10.2, 10.3 (Unwanted emissions)"	0.6.0	0.7.0
2010-08	RAN4#56	R4-103160			Agreed Text Proposal in RAN4 AH#3: **R4-102441**, "TP for LTE3500 TR, Band and channel arrangement (MSR specifications)" **R4-102442**, "TP for LTE3500 TR, Band and channel arrangement (TDD UTRA specifications)" **R4-102443**, "TP for LTE3500 TR, Band and channel arrangement (TDD UTRA Iuant interface specifications)"	0.7.0	0.8.0
2010-10	RAN4# AH#4	R4-103916			Agreed Text Proposal in RAN4 AH#3: **R4-103715**, "TP on Way forward for UMTS-LTE 3500 deployment aspects" **R4-103716**, "TP for Updates to general parts (TR 37.801 clause 3-5)" **R4-103717**, "TP for Corrections of E-UTRA updates (TR 37.801 clause 8-10)" **R4-103718**, "TP for Required changes to TS 36.307 (TR 37.801 clause 10.4)" **R4-103719**, "TP for Required changes to TS 36.113 (TR 37.801 clause 10.X)" **R4-103720**, "TP for Required changes to TS 36.124 (TR 37.801 clause 10.X)" **R4-103822**, "TP for Required changes to TS 37.104 (TR 37.801 clause 11.1)" **R4-103823**, "TP for Required changes to TS 37.141 (TR 37.801 clause 11.3)"	0.8.0	0.9.0
2010-11	RAN4#57	R4-104399			Editorial updates and corrections	0.9.0	0.9.1

2010-11	RAN4#57	R4-104786			Agreed Text Proposal in RAN4 AH#3: **R4-104474**, "TP for UMTS-LTE 3500 MHz spurious emissions range (TR 37.801)" **R4-104613**, "TP for Radio Frequency Channel Number (RFCN)" **R4-104785**, "TP for Band 42 and 43 EARFCN (TR 37.801 clause 8.1)"	0.9.0	0.10.0
2011-02	RAN4#58	R4-111610			Agreed Text Proposal in RAN4 AH#3: **R4-111026**, "TP on BS Band 42/43 clearance of unresolved issues" **R4-111134**, "Revised frequency arrangement for FDD in 3400-3600 MHz (TR 37.802)" **R4-111409**, "TP to TR37.801: UMTS/LTE3500"	0.10.0	0.11.0
2011-02	RAN4#58	R4-111693			Email review after RAN4#58. Modification of the text proposed in **R4-111134**, "Revised frequency arrangement for FDD in 3400-3600 MHz (TR 37.802)"	0.11.0	0.12.0
2011-04	RAN4#58AH	R4-112579			Agreed Text Proposal in RAN4 #58 AH: **R4-112128**, "Update TR 37.801 with 2x80 MHz FDD arrangement (3410-3490 MHz/3510-3590 MHz)" **R4-112129**, "E-UTRA BS requirements for FDD arrangement (3410-3490 MHz/3510-3590 MHz)" **R4-112130**, "Correction of co-existence/co-location requirements between Band 42 and Band 43 on TR 37.801" **R4-112131**, "Feasibility of BS 2x80 MHz duplexers (3410-3490 MHz/3510-3590 MHz)"	0.12.0	0.13.0
2011-05	RAN4#59	R4-113250			Agreed Text Proposal in RAN4 #59: **R4-112618**, "TP for TR 37.801: Requirements for FDD arrangement in 3500 MHz"	0.13.0	0.14.0
2011-06	TSG RAN#52	RP-110768			Presentation to TSG RAN for information	0.14.0	1.0.0
2011-08	RAN4#60	R4-114776			Agreed Text Proposal in RAN4 #59AH: **R4-113642**, "TP for 37.801: for 3500 MHz FDD arrangement requirements for the UE" Agreed Text Proposal in RAN4 #60: **R4-114387**, "TP for General corrections in TR 37.801"	1.0.0	1.1.0
2011-09	RAN4#60	R4-114829			Updates agreed on e-mail approval	1.1.0	1.2.0
2011-09	TSG RAN#53	RP- 111235			Presentation to TSG RAN for approval	1.2.0	2.0.0
2011-09	TSG RAN#53	RP- 111235			TR approved by TSG RAN	2.0.0	10.0.0