Presentation of Specification to TSG RAN

Presentation to:	**TSG RAN Meeting # 23**
Document for presentation:	**TR25.806, Version 1.0.1**
Presented for:	**Approval**

Abstract of document:

This document is a technical report titled “UMTS 1700/2100 MHz Work Item Technical Report” for the Release 6 work item “UMTS 1.7/2.1 GHz”, RInImp-UMTS1721.

Changes since last presentation to TSG RAN:

This is the first time TR25.806 is presented for TSG RAN meeting #23. Report contains information, which are used as a basis for radio requirements for this frequency variant.

Work is completed in RAN WG4, and it is proposed to approve this TR as a version 6.0.0 and put it under change control.

Status report for “UMTS 1700/2100 MHz” can be found in [1].

Outstanding Issues:

No Outstanding Issues.

Contentious Issues:

No Contentious Issues.

References:

[1] RP-040004, Status Report for WI on UMTS 1.7/2.1 GHz.

3GPP TR 25.806 V1.0.1 (2004-03)

Technical Report

3rd Generation Partnership Project;
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Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

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Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

This document is a technical report of the UMTS 1700/2100 MHz work item, which was approved to establish in TSG RAN#19. The purpose of these work items is to provide UMTS specification support for UTRA/FDD in the new band allocation on 1710 –1770 MHz UL and 2110-2170 MHz DL band pairing in ITU region 2. In addition to the schedule and status of the work item, the report includes a description of the motivation of requirements and specification recommendations.

2 References

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

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

[1] RP-030186 WI proposal for UMTS 1700/2100 MHz , Work Task Descriptions, TSG RAN#19.

[2] 3GPP TR25.942 “RF System Scenarios”

[3] 3GPP TS 25.101 “UE Radio Transmission and Reception (FDD)”

[4] 3GPP TS 25.104 “BS Radio transmission and Reception (FDD)”

[5] R4-030528, Introduction of UMTS 1.7/2.1 GHz WI, Nokia.

[6] 3GPP TR 25.889, ”Viable deployment of UTRA in additional and diverse spectrum arrangements”

[7] FCC news, Action by the Commission, October 16, 2003, by Report and Order (FCC 03-251)

3 Definitions, symbols and abbreviations

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

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

4 Introduction

Recently there have been initiatives taken by one Administration in Region 2 that allows parts of the band 1710-1770 MHz (UL) to be paired with parts of the band 2110-2170 MHz (DL). In the WRC 2000, additional spectrum for IMT-

2000 was identified which included the band 1710-1885 MHz. 3GPP has specified the band 2110-2170 MHz, and this is well suited for using with 1710-1770 MHz as uplink.

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

4.1 Task description

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

1) Generate a report summarizing a study of radio requirements UTRA FDD in the 1700/2100 MHz Band

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

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

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

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

   - If there is a need for two sets of Node B's requirements: One for the full band and another one for the restricted FCC bands given above.
   - Scenarios about the use of UE's operating over 2*60 MHz in North America with possible interferers in 1755- 1770 MHz and 2155-2170 MHz.

2) Generate CR's to update the appropriate specifications.
3) TSG RAN WG2 - study any issues related to UMTS at 1700/2100 MHz FDD band-signalling aspects.
4) TSG RAN WG3 - study any possible interface impacts to UMTS networks.
5) Any additional related issues.

5 Requirements

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

5.1 Deployment Scenarios

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

Table 1: Band licenses

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

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

5.2 Co-existence with other technologies

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

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

Considering the Macro cell propagation model of TR 25.942, one finds that the path loss difference between 1.7 GHz and 1.9 GHz is merely *21*(log10(1700)-log10(1900)) = -1.01 dB.* Hence, in 1.7 GHz one can expect similar cell radii, antenna gains, BS antenna heights, etc as for 1.9 GHz installations. Simulation results, which have been used in identifying requirements for the UMTS1900/1800 WI should therefore be in principle applicable to the 1.7 GHz. In addition, earlier simulation results obtained for Band I should be directly applicable to 2.1 GHz DL scenarios.

5.3 Region 2 Requirements

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

- GSM850
- UMTS850
- PCS1900
- UMTS1900

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

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

5.4 Support for 2x60 MHz operation

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

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

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

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

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

1) In-band blocking level of –40 dBm/3.84 MHz also across 1755-1770 MHz

2) In-band spurious emissions of –15 dBm/MHz across 2155 -2170 MHz

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

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

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

1) Spurious emissions level on 1755-1770MHz band as emission mask and FCC limits.

2) Blocking requirements in 2155-2170 MHz band as in-band case for 45 MHz allocations.

6 Study Areas

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

6.1 Frequency arrangements

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

6.2 UE requirements

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

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

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

Section	Requirement	Discussion / Required Changes in TS 25.101 (v 6.2.0)
5.2	Frequency bands	New operating band 2x45 MHz needs to be added as Band IV. 1710 – 1755 MHz: Up-link (UE transmit, Node B receive) 2110 – 2155 MHz: Down-link (Node B transmit, UE receive)
5.3	TX-RX frequency separation	Add this requirement for Band IV. 400 MHz.
5.4.2	Channel raster	Add this requirement for Band IV. 200 kHz raster as in Band I, II and III Additional channels are needed in the middle of 5 MHz blocks 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5 1742.5 1747.5 and 1752.5 MHz for UL 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5 and 2152.5 MHz for DL
5.4.3	Channel number	Additional UARFCN definitions for Band IV. UL: N=5*(F_{uplink}-1480.1 MHz) DL: N=5*($F_{downlink}$-1820.1 MHz)
5.4.4	UARFCN	Define UARFCN range for band IV. 8562 to 8843 for UL, 10562 to 10838 for DL Additional UARFCNs 1162, 1187, 1212, 1237, 1262, 1287, 1312, 1337 and 1362 for UL 1462, 1487, 1512, 1537, 1562, 1587, 1612, 1637 and 1662 for DL
6.2.1	UE maximum output power	Add UE power classes for band IV. +24dBm +1/-3dB: Power class 3 +21dBm +2/-2dB: Power class 4
6.6.2.1	Spectrum emission mask	Add spectrum emission mask requirement for Band IV. It may be assumed as a working assumption that a similar additional requirement as currently formulated for Band II (-15 dBm/30kHz when 2.5MHz < $\Delta f \leq$3.5MHz and -13 dBm/1MHz when 3.5MHz < $\Delta f \leq$12.5MHz kHz) will also be applied for Band IV.
6.6.3	TX spurious emissions	Add additional TX spurious emissions requirements for Band IV. Requirements can be set according to the patterns used in the existing specifications. Requirements should be written for UMTS850, GSM850, UMTS1900 and PCS1900 Down-link bands.
7.3	Reference sensitivity level	Add reference sensitivity level requirement for band IV. Existing REFSENS definitions for Band I can be used for Band IV. DPCH_Ec < REFSENS> = -117dBm.
7.6.2	Minimum requirement (Out of-band blocking)	Add out-of-band blocking requirements for band IV. Requirements can be derived from existing Band I, II and III requirements
7.6.3	Minimum requirement (Narrow band blocking)	Add narrowband blocking requirement for band IV. Requirements can be derived from existing Band II and V requirements
7.8.2	Intermodulation characteristics, Minimum requirement (Narrow band)	Narrowband IM requirement for band IV is FFS..
7.9	RX spurious emissions	Add additional receiver spurious emission requirements for band IV. -60 dBm/3.84MHz UE transmit band in URA_PCH, Cell_PCH and idle state -60 dBm/3.84MHz UE receive band

6.3 BS requirements

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

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

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

6.4 Signalling issues

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

6.4.1 UE capability indication

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

6.4.2 Control of UL frequency in the system

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

6.4.3 Broadcasting information for UE Idle mode control

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

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

6.4.4 Handover control

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

7 Conclusions

8 Recommendations for specifications

9 Project Plan

9.1 Schedule

Table 4: Schedule

Date	Meeting	[expected] Input	[expected]Output
19th-23rd of May	TSG RAN WG4#27	- UMTS 1700/2100MHz TR created Work plan proposal	- Approved - Work plan agreed
	TSG RAN #20	- Status report	

	TSG RAN WG4#28	- Frequency arrangements UL and DL requirement proposals	- Channel numbers - Agreement on performance issues
	TSG RAN #21	- Status report	
	TSG RAN WG4#29	- TR 25.8xx for UMTS 1700/2100MHz for approval - CR proposals for specifications - TS 25.101 - TS 25.104 - TS 25.113 - TS 25.133 - TS 25.141 - TS 25.306 - TS 25.307 - TS 25.331	- TR 25.8xx for UMTS 1700/2100MHz approved. - CR's approved
	TSG RAN #22	- TR 25.8xx for UMTS 1700/2100MHz for approval - CR's for approval	- TR 25.8xx for UMTS 1700/2100MHz approved. - CR's approved - WI closed

10 Open Issues

11 History

Document history		
RAN WG4#28 Sophia Antipolis		R4-030830, TR on UMTS 1700/2100 MHz Work Item (r2), Nokia
RAN WG4#29 San Diego		R4-031120, Text proposal for UMTS1700/2100 MHz TR, Changes in TS25.101 and 104 from Nokia was added to the TR
RAN WG4#30 Munich		R4-040122, Text proposal for UMTS1700/2100 MHz TR, Narrow band blocking requirements from Nokia was added to the TR
Rapporteur for 3GPP RAN TR 25.806 is: Jussi Numminen, Nokia Mobile Phones		
Editor: Jussi Numminen, Nokia Mobile Phones, Salo, Finland jussi.numminen@nokia.com		
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