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Technical Report

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Study of Base Station specification structure (Release 12)



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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:

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

1 Scope

The present document is the technical report for the study item on Base Station specification structure.

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] 3GPP TS 25.104: "Base Station (BS) radio transmission and reception (FDD)".
- [3] 3GPP TS 36.104: "Base Station (BS) radio transmission and reception".
- [4] 3GPP TS 37.104: "Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception".
- [5] 3GPP TR 37.900: "Multiple Radio Access Technology (Multi-RAT) Base Station (BS)".
- [6] Recommendation ITU-R M.1457-11 (02/2013), "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)".
- [7] Recommendation ITU-R M.2012 (01/2012), "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced)".
- [8] "LS on BS RF and EMC specification structure", Source: ETSI MSG TR FES, TR FES(13)040015.
- [9] "Response LS on BS and EMC RF specification structure", Source: ARIB (Association of Radio Industries and Businesses).
- [10] 3GPP TS 25.141: "Base Station (BS) conformance testing (FDD)".
- [11] 3GPP TS 36.141: "Base Station (BS) conformance testing".
- [12] 3GPP TS 37.141: "Multi-Standard Radio (MSR) Base Station (BS) conformance testing".
- [13] 3GPP TS 25.113: "Base Station (BS) and repeater Electromagnetic Compatibility (EMC)".
- [14] 3GPP TS 36.113: "Base Station (BS) and repeater Electromagnetic Compatibility (EMC)".
- [15] 3GPP TS 37.113: "Multi-Standard Radio (MSR) Base Station (BS) Electromagnetic Compatibility (EMC)".
- [16] 3GPP TS 25.105: "Base Station (BS) radio transmission and reception (TDD)".
- [17] 3GPP TR 21.801: "Specification drafting rules".

3 Definitions, symbols and abbreviations

3.1 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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].

AAS	Active Antenna System
ARIB	Association of Radio Industries and Businesses
BC	Band Category
CS	Capability Set
ETSI	European Telecommunications Standards Institute
ITU	International Telecommunications Union, Radio communications sector
RAT	Radio Access Technology
RIT	Radio Interface Technology
SDO	Standards Developing Organization
TFES	Task Force for European harmonized Standards
UEM	Unwanted Emissions Mask

4 General

Many of the new RF features introduced and studied for RAN4 specifications are not RAT-specific, but often concern UTRA, E-UTRA and also multi-RAT specifications including GSM/EDGE. Examples are Carrier Aggregation, non-contiguous spectrum operation, multiband capability, AAS, etc. This means that almost identical RF features are often implemented in different RF specifications, within the same or different work items. This duplication not only creates additional work and unnecessary discussions on how to implement new RF features, but in addition often creates unmotivated differences between the specifications and even misalignment and conflicts between the RF requirements across the specifications. The problems will be further accentuated as more features are added and the specifications become more complex. There is a need to study whether the problems can be avoided for future specification releases.

4.1 Study item objective

The study item objective is to investigate the feasibility of introducing a new BS specification structure, in order to avoid duplicate specification work for new RF features (in case of identical features among different RATs) and to avoid future discussions regarding how to implement the new features in single-RAT and/or multi-RAT specifications.

For the new possible specification structures, the following areas should be investigated, considering that no change of existing requirements as a consequence of the new possible BS specification structure is assumed:

1. How future RF features can be incorporated across all RATs, with reduced effort and risk of specification conflicts, considering the possible differences in requirements among different RATs
2. How to declare conformance for BS in the new specification structure
3. Feasibility of compliance of selected future RF feature(s) by legacy BS that conforms to specifications of previous releases
4. How to accommodate regulatory references to the new BS specification structure for single-RAT and multi-RAT Base Stations
5. How to guarantee that a BS compliant to the new BS specification structure, for a requirement that is taken from the legacy structure, will comply to that requirement for each applicable RAT as specified in the legacy structure
6. How to migrate the requirements in the present BS specification structure (including performance requirements) into a new specification structure

5 Status of existing BS core specifications

For a possible re-structuring of the BS specifications, it is important to evaluate and document what the content is of the specifications, how they relate to each other and what possibilities there is to merge or move text. This clause documents the status and content of the BS core specifications. The core specifications for UTRA in TS 25.104 [2] and E-UTRA in TS 36.104 [3] were thoroughly analysed when the MSR specification TS 37.104 [4] was formed in Rel-9. TR 37.900 [5] contains a lot of useful analysis, comparisons and synthesis of the requirements for the work and can be used as a reference also for the BS spec structure work.

The core specifications can be divided into parts that have different characteristics and the analysis in this clause follows a similar division:

- **Clause 3 - Definitions, symbols and abbreviations:** These are partly overlapping and can most likely be moved/merged at a late stage. Only entries that are needed in the final spec structure need to be retained.
- **Clauses 4 & 5 – General parts:** This text does not contain RF requirements as such, but there are a lot of general tables defining frequency bands and numbers, requirement applicability and several clauses giving pre-conditions for the requirements. Much of the text can be analysed in the same way as the RF requirements.
- **Clauses 6, 7 & 8: - Requirements:** The RF and performance requirement are the heart of the specifications and need careful analysis as to how they relate to each other.
- **Annexes: - Additional elements:** The annexes contain both normative and informative elements, of which a large part is RAT-specific.

When text and requirements are compared between documents, we can divide them along the following main "types":

- **Identical text:** This is the simplest case to manage, since in the end, only one copy of the text needs to be maintained.
- **Similar text:** This case needs more careful analysis. If specifications are merged, only the relevant varieties of the text needs to be merged, but it has to be made sure that relevant single-RAT aspects are kept. For an RF requirement, it has to be identified whether there can be a single merged requirement or whether specific single-RAT options should be kept.
- **Different text:** If the text is different for each RAT, both may have to be kept in a merged specification. For a single-RAT RF requirement, the single-RAT version may have to be copied as is to the merged specification, if there are no common elements with other RATs. Single-RAT requirements can also remain in single-RAT specifications.

Based on the three main types above, the classification of text and requirement into different "types" according to Table 5-1 is used in the analysis below.

Table 5-1: Classification of text/requirement into "types"

Text/requirement Type identifier (T)	Type description
ID	Identical text, any version can be kept.
SA	Similar text/requirement that is quite aligned and can be easily merged.
SM	Similar text and/or identical requirement, where only the multi-RAT version needs to be kept
SO	Similar text/requirement, where both multi-RAT option and single-RAT option(s) may have to be kept
DK	Different text, where the Single-RAT version is RAT unique and will have to be kept
DM	Different text that is unique to the MSR specification
RE	Reference to single-RAT requirement.

5.1 FDD specification parts

The following analysis covers the core specifications containing requirements for UTRA FDD and E-UTRA FDD.

5.1.1 Definitions, symbols and abbreviations (clause 3)

Table 5.1.1-1: Analysis of the FDD parts of the core specifications, Clause 3

Topic	TS 25.104		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
Definitions	3.1	SA	3.1	SA	3.1	SA	Not alphabetical in 25.104. Quite aligned, some caution needed.
Symbols	3.2	SA	3.2	SA	3.2	SA	Quite aligned
Abbreviations	3.3	SA	3.3	SA	3.3	SA	Quite aligned

5.1.2 General parts (clause 4-5)

Table 5.1.2-1: Analysis of the FDD parts of the core specifications, Clause 4-5

Topic	TS 25.104		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
Relation between the MSR specification and the single-RAT specifications	-	-	-	-	4.1	DM	MSR specification only, describes the existing specification structure.
Relationship between minimum requirements and test requirements	4.1	ID	4.1	ID	4.2	ID	Identical text
Base station classes	4.2	SA	4.2	SA	4.3	SA	Quite well aligned. MSR spec has extra text on GSM/EDGE.
Regional requirements	4.3	SA	4.3	SA	4.4	SA	Similar text that is related to specific requirements. Should be merged on a per requirement basis.
Applicability of requirements	4.5	TB D	4.4	TB D	-	-	This text is dependent on the present structure of one spec per RAT. It may not be applicable if specs are potentially merged.
Requirements for contiguous and non-contiguous spectrum	4.6	SA	5.8	SA	4.7	SA	Quite aligned
Operating bands and channel arrangement (general)	5.1	SA	5.1	SA	-	-	The informative UTRA and E-UTRA texts can be merged.
Operating bands	5.2	SM	5.5	SM	4.5	SM	Aligned, where the MSR version contains the complete information.
Multicarrier/CA bands	5.2	DK	5.5	DK	-	-	The Multicarrier/CA bands are RAT-specific and can be kept as is, or be replaced by references to the core UE specs.
band categories	-	-	-	-	4.5	DM	MSR BS specific text, also applicable to single-RAT operation.
Channel bandwidth	-	-	5.6	DK	-	-	RAT-specific for E-UTRA.
Tx-Rx frequency separation							
Channel spacing	5.4.1	DK	5.7.1	DK	4.6.1	DM	RAT specific text, to keep with the MSR BS generic text.
Channel raster	5.4.2	DK	5.7.2	DK	4.6.2	DM	RAT specific text, to keep with the MSR BS generic text.
Carrier frequencies and numbering	5.4.3	DK	5.7.3	DK	4.6.3	DM	RAT specific text, to keep with the MSR BS generic text.
Applicability of requirements	-	-	-	-	5	DM	MSR BS specific text, also applicable to single-RAT operation.

5.1.3 Transmitter characteristics (clause 6)

Table 5.1.3-1: Analysis of the FDD parts of the core specifications, Clause 6

Topic	TS 25.104		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
General	6.1	SM	6.1	SM	6.1	SM	Similar text, where the MSR version contains the complete information.
Base station output power	6.2	SM	6.2	SM	6.2	DM	Output power definitions in these specs are quite different, but modified generic MSR requirements can also cover single-RAT version
BS power: Additional requirement (regional)	-		6.2.2	SM	6.2.2	SM	Similar text, where the MSR version contains the complete information.
DL RS power	-	-	6.5.4	DK	6.2.3	RE	Single-RAT specification texts only.
Primary CPICH power	6.4.4	DK	-	-	6.2.4	RE	Single-RAT specification texts only.
BS rated output power for Home BS	6.2.1	SA	6.2	SA	-	-	For MSR, additional BS rated output power for Home BS may need to be added. Applies only for single-RAT.
Home BS output power for adjacent UTRA channel protection	6.4.6	DK	6.2.3 6.2.4 6.2.5	DK	-	-	
Output power dynamics	6.4	DK	6.3	DK	6.3	RE	"Single-RAT only requirements
Transmit ON/OFF power	-	-	-	-	-	-	This requirement concerns only TDD.
Transmitter OFF power	-	-	-	-	-	-	This requirement concerns only TDD.
Transmitter transient period	-	-	-	-	-	-	This requirement concerns only TDD.
Transmitted signal quality							
Modulation quality	6.8.1, 6.8.2, 6.8.3, 6.8.5	DK	6.5.2	DK	6.5.1	RE	Single-RAT only requirements
Frequency error	6.3.1	DK	6.5.1	DK	6.5.2	RE	Single-RAT only requirements
Time alignment error	6.8.4	DK	6.5.3	DK	6.5.3	RE	Single-RAT only requirements
Operating band unwanted emissions/spectrum mask	6.6.2	DK	6.6.3	DK	6.6.2	DM	Different text that is unique to the MSR specification
Spectrum emission mask	6.6.2.1	SO	-	-	-	-	SEM requirements for all BS classes are specified in the same Clause
operating band unwanted emissions	-	-	6.6.3.1 6.6.3.2 6.6.3.2A 6.6.3.2B 6.6.3.2C	SO	6.6.2.1, 6.6.2.2, 6.6.2.3	SO	For E-UTRA, operating band unwanted emissions requirements are specified for each BS class in separate clauses. - Requirements for WA BS are defined separately for Category A and Category B. - Category B option 2 requirements for WA BS are aligned with that for MSR. For MSR, operating band unwanted emissions requirements are specified for BC1/BC3, BC2 and GSM single-RAT in separate clauses;
Additional requirements							
- Limits in FCC Title 47	-	-	6.6.3.3	DK	6.6.2.4.1	DM	Identical requirements.
- Un-synchronized operation for BC3	-	-	6.6.3.3	SM	6.6.2.4.2	SM	Identical requirements.
- Protection of DTT	6.6.2.1	SM	6.6.3.3	SM	6.6.2.4.3	SM	Identical requirements.

- Co-existence with services in adjacent frequency bands (Band 1)	6.6.3.6	SM	6.6.3.3	SM	6.6.2.4.4	SM	Identical requirements.
- Co-existence with services in adjacent frequency bands (Band 7)	6.6.3.6	SM	-	-	-	-	Additional requirement for Band VIII for UTRA.
- Co-existence with RNSS/GPS services in North America	-	-	6.6.3.3	SM	6.6.2.4.5	SM	Identical requirements.
- Additional requirements for band 41	-	-	6.6.3.3	SM	6.6.2.4.6	SM	Identical requirements.
Transmitter spurious emissions (mandatory)	6.6.3.1	SO	6.6.4.1	SO	6.6.1.1.1, 6.6.1.1.2	SM	UTRA spec has additional Cat B requirement of -15dBm/-16dBm per 1MHz/100kHz for bands above/below 1GHz (covered by E-UTRA spec UEM requirements, MSR spec uses more stringent -15dBm/1MHz)
Additional BC2 requirement	-	-	-	-	6.6.1.1.3	DM	Only applicable to BC2 when GSM/EDGE configured
Transmitter spurious emissions (protection of Rx)	6.6.3.2	SO	6.6.4.2	SM	6.6.1.2	SM	UTRA and E-UTRA specs have additional requirement for Home BS, UTRA spec requirements different than in E-UTRA/MSR specs for MR and LA
additional requirement for BC2 WA	-	-	-	-	6.6.1.2	DM	additional requirement for BC2 WA
Transmitter spurious emissions (additional)	6.6.3.3, 6.6.3.5, 6.6.3.9	SM	6.6.4.3	SM	6.6.1.3	SM	UTRA and E-UTRA specs have additional requirement for Home BS
additional requirement on 700/800MHz public safety	6.6.3.8	SA	6.6.4.3	SA	6.6.2.4.1	DM	protection of 700/800MHz public safety operation
Transmitter spurious emissions (co-location) UTRA/E-UTRA WA&LA	6.6.3.4	SM	6.6.4.4	SM	6.6.1.4	SM	
Transmitter spurious emissions (co-location) UTRA/E-UTRA MR	6.6.3.4	SO	6.6.4.4	SM	6.6.1.4	SM	UTRA requirements different than in E-UTRA/MSR specs
Transmitter spurious emissions (co-location) GSM	6.6.3.4	SO	6.6.4.4	SO	6.6.1.4	SM	UTRA LA&MR/E-UTRA LA requirements different than in MSR spec
ACLR	6.6.2.2.1	DK	6.6.2.1	DK	6.6.4.1, 6.6.4.2, 6.6.4.3	RE	RAT-specific requirement, MSR spec referring to UTRA/E-UTRA specs
CACLR	6.6.2.2.2	SA	6.6.2.2	SA	6.6.4.4	SA	The same requirements in all specs
Occupied bandwidth	6.6.1	SA	6.6.1	SA	6.6.3	SA	E-UTRA spec has additional requirement for Intra-band CA which is referenced in the MSR spec
Transmitter intermodulation	6.7	SO	6.7	SM	6.7.1	SM	UTRA spec has UTRA interfering signal while 5MHz E-UTRA interfering signal is used in MSR/E-UTRA specs
Additional requirement	-	-	-	-	6.7.2, 6.7.3	DM	Additional requirement for BC2, BC3 and for non-contiguous spectrum in BC1/BC2

5.1.4 Receiver characteristics (clause 7)

Table 5.1.4-1: Analysis of the FDD parts of the core specifications, Clause 7

Topic	TS 25.104		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
General	7.1	SA	7.1	SA	7.1	SA	similar text
Reference sensitivity level	7.2	DK	7.2	DK	7.2	RE	RAT-specific requirement, MSR spec referring to UTRA/E-UTRA specs, and to UTRA TDD and GSM/EDGE.
Dynamic range	7.3	DK	7.3	DK	7.3	RE	RAT-specific requirement, MSR spec referring to UTRA/E-UTRA specs, and to UTRA TDD and GSM/EDGE.
In-channel selectivity	-	-	7.4	DK	7.8	RE	ICS is an E-UTRA only single-RAT requirement. The MSR spec has a direct reference.
In-band selectivity and blocking:							
In-band blocking, general	7.5.1	SM	7.6.1	SO	7.4.1	SM	The MSR limits are the strictest of UTRA & E-UTRA and are fully aligned with UTRA for all BS classes. Home BS is additional. May have to keep E-UTRA limits as option.
Narrowband blocking	7.5.1	SO	7.5.1	SM	7.4.2	SM	The MSR limits are the strictest of UTRA & E-UTRA and are fully aligned with E-UTRA for all BS classes. Home BS is additional. May have to keep UTRA limits as option.
GSM/EDGE Additional narrowband blocking	-	-	-	-	7.4.3	DM	Only applicable to GSM/EDGE
GSM/EDGE AM suppression	-	-	-	-	7.4.4	DM	Only applicable to GSM/EDGE
Additional BC3 blocking	-	-	-	-	7.4.5	DM	Only applicable to BC3, based on 1.28 Mcps UTRA TDD interferer
ACS	7.4.1	DK	7.5.1	DK	(7.4.2)	-	ACS is only defined for single-RAT. The narrowband blocking requirement in 7.4.2 of 37.104 makes it redundant.
ACS, co-location with UTRA TDD	7.4.2	DK	-	-	-	-	The text in 25.104 is informative.
Out-of-band blocking, general	7.5.1	SM	7.6.1	SM	7.5.1	SM	Identical requirements.
Out-of-band blocking, co-location (UTRA/E-UTRA)	7.5.2	SM	7.6.2	SM	7.5.2	SM	Identical requirements.
Out-of-band blocking, co-location (GSM)	7.5.2	SO	7.6.2	SO	7.5.2	SM	UTRA MR&LA and E-UTRA LA have different values.
Receiver spurious emissions, general	7.7.1	SM	7.7.1	SM	7.6.1	SM	Identical requirements.
Additional BC2 (category B) limit	-	-	-	-	7.6.2	DM	Only applicable to BC2.
Receiver intermodulation, general	7.6.1	SM	7.8.1	SO	7.7.1	SM	The MSR limits are the strictest of UTRA & E-UTRA and are fully aligned with UTRA for all BS classes. Home BS is additional. May have to keep E-UTRA limits as option.
Receiver intermodulation, narrowband	7.6.1	SO	7.8.1	SM	7.7.2	SM	The MSR limits are the strictest of UTRA & E-UTRA and are fully aligned with E-UTRA for all BS classes. Home BS is additional. May have to keep UTRA limits as option.
GSM/EDGE Receiver intermodulation	-	-	-	-	7.7.3	DM	Only applicable to GSM/EDGE

5.1.5 Performance requirements (clause 8)

Table 5.1.5-1: Analysis of the FDD parts of the core specifications, Clause 8

Topic	TS 25.104		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
Performance requirements	8	DK	8	DK	8	RE	All performance requirements are RAT-specific and must be kept as is. The MSR text is a direct reference to the single-RAT requirements, including UTRA TDD and GSM/EDGE.

5.1.6 Annexes

Table 5.1.6-1: Analysis of the FDD parts of the core specifications, Annexes

Topic	TS 25.104		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
Reference measurement channels	Annex A	DK	Annex A	DK	-	-	RAT-specific definitions never referenced from 37.104.
Propagation conditions							
Static propagation condition	Annex B.1	ID	Annex B.1	ID	-	-	identical texts, can be merged/migrated
Multi-path fading propagation conditions	Annex B.2	DK	Annex B.2	DK	-	-	The 25.104 includes 4 cases propagation conditions for multi path fading environments and 36.104 includes EPA, EVA and ETU multi-path fading environments. Used only for performance requirements.
Moving propagation conditions	Annex B.3	DK	Annex B.4	DK	-	-	The propagation conditions for the test in 25.104 are non-fading channel models with two taps, time difference between the two paths and some parameters are covered. The moving propagation conditions in 36.104 is for the UL timing adjustment performance test, time difference between the reference timing and the first tap and some parameters for UL timing adjustment are covered. Used only for performance requirements.
Birth-Death propagation conditions	Annex B.4	DK	-	-	-	-	Only in UTRA spec, can be migrated. Used only for performance requirements.
High speed train conditions	Annex B.4A	SA	Annex B.3	SA	-	-	Similar texts for scenario 1 and scenario 3 between UTRA and E-UTRA, in addition, UTRA covers scenario 2. Used only for performance requirements.
Multi-path fading propagation conditions for E-DPDCH and E-DPCCH	Annex B.5	DK	-	-	-	-	Only in UTRA spec, can be migrated. Used only for performance requirements.
Multi-Antenna channel models	-	-	Annex B.5	DK	-	-	Only in E-UTRA spec, can be migrated. Used only for performance requirements.
Characteristics of interfering signals	Annex C	SA	Annex C	SA	A	SA	RAT-specific definitions, which are partly repeated in 37.104. Can be easily merged.
UTRA FDD interfering signal	Annex C	SA	-	-	Annex A.1	SA	Similar texts between MSR spec and UTRA spec
UTRA TDD interfering signal	-	-	-	-	Annex A.2	DM	Only for UTRA TDD.
E-UTRA interfering signal	-	-	Annex C	SA	Annex A.3	SA	MSR spec only cover interfering signal for narrowband blocking and receiver intermodulation, but TS 36.104 additionally covers interfering signal for in-channel selectivity, ACS and blocking. Can easily be merged.
Environmental requirements for the BS equipment	4.4	SM	Annex D	SM	Annex B	SM	Aligned, where the MSR version covers also alternative ETSI references.
Error vector magnitude evaluation	(In 37.141)	DK	Annex E	DK	-	-	The details of the EVM evaluation for UTRA is in 37.141, Annex E.
Unwanted emissions for multicarrier BS	-	-	Annex F	SO ?	-	SM	Informative text on E-UTRA multicarrier operation. Will not be needed, since the 37.104 requirements cover multicarrier operation fully.
Regional requirement for protection of DTT	Annex D	SA	Annex G	DK	6.6.2.4.3	RE	Informative annex, referenced from 37.104. UTRA and E-UTRA difference is Roman vs. Arabic numerals.

5.2 TDD specification parts

The following analysis covers the core specifications containing requirements for UTRA TDD 1.28Mcps option and E-UTRA TDD.

5.2.1 Definitions, symbols and abbreviations (clause 3)

Table 5.2.1-1: Analysis of the TDD parts of the core specifications, Clause 3

Topic	TS 25.105		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
Definitions	3.1	SA	3.1	SA	3.1	SA	Some caution needed, but can be merged.
Symbols	-	-	3.2	SA	3.2	SA	Quite aligned
Abbreviations	3.3	SA	3.3	SA	3.3	SA	Some caution needed, but can be merged.

5.2.2 General parts (clause 4-5)

Table 5.2.2-1: Analysis of the TDD parts of the core specifications, Clause 4-5

Topic	TS 25.105		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
Relation between the MSR specification and the single-RAT specifications	N/A		N/A		4.1	DM	MSR specification only, describes the existing specification structure.
Relationship between minimum requirements and test requirements	4.1	ID	4.1	ID	4.2	ID	Identical text
Base station classes	4.2	SO	4.2	SA	4.3	SA	UTRA TDD WA BS is characterized by requirements derived from Macro Cell and Micro Cell scenarios with BS to UE coupling losses equal to 70 dB and 53 dB.
Regional requirements	4.3	SA	4.3	SA	4.4	SA	Similar text that is related to specific requirements. Should be merged on a per requirement basis.
Environmental requirements for the BS equipment	4.4	TB D	-		-		Similar requirements exist in all UTRA specs but not in E-UTRA and MSR.
Applicability of requirements	-		4.4	TB D	5	TB D	This text is dependent on the present structure of one spec per RAT. Some of the requirement applicability may need to be changed if specs are potentially merged.
Requirements for contiguous and non-contiguous spectrum	N/A		5.8	SA	4.7	SA	Quite aligned between E-UTRA and MSR. There are no requirements for non-contiguous spectrum operation for UTRA TDD 1.28 Mcps option.
Operating bands and channel arrangement (general)	5.1	SA	5.1	SA	-	-	The informative UTRA and E-UTRA texts can be merged.
Operating bands	5.2	SM	5.5	SM	4.5	SM	Aligned, where the MSR version contains the complete information.
Multicarrier/CA bands	-		5.5	DK	-	-	The Multicarrier/CA bands are RAT-specific and can be kept as it is.
band categories	-	-	-	-	4.5	DM	MSR BS specific text, also applicable to single-RAT operation.
Channel bandwidth	-	-	5.6	DK	-	-	RAT-specific for E-UTRA.
Tx-Rx frequency separation	N/A		N/A		N/A		Not applicable for TDD
Channel spacing	5.4.1.2	DK	5.7.1	DK	4.6.1/4.6.1A	DM	RAT specific text, to keep with the MSR BS generic text.
Channel raster	5.4.2	DK	5.7.2	DK	4.6.2	DM	RAT specific text, to keep with the MSR BS generic text.
Carrier frequencies and numbering	5.4.3	DK	5.7.3	DK	4.6.3	RE	RAT specific text/requirement.

5.2.3 Transmitter characteristics (clause 6)

Table 5.2.3-1: Analysis of the TDD parts of the core specifications, Clause 6

Topic	TS 25.104		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
General	6.1	SM	6.1	SM	6.1	SM	Similar text, where the MSR version contains the complete information.
Base station output power	6.2	SM	6.2	SM	6.2	DM	Output power definitions in these specs are quite different, but modified generic MSR requirements can also cover single-RAT version
BS power: Additional requirement (regional)	-		6.2.2	SM	6.2.2	SM	Similar text, where the MSR version contains the complete information.
Home BS rated output power	6.2		6.2				TDD Home eNB requirement has not been added to MSR spec.
Home BS output power for adjacent/co-channel protection	-	-	6.2.4/5	DK		-	E-UTRA specific text/requirement has to be kept.
Output power dynamics	6.4	DK	6.3	DK	6.3	RE	Single-RAT only requirement
Transmit ON/OFF power	6.4	SO	6.4	SO	6.4	SO	Similar text. But the requirements for transmit off power and transient period are different for UTRA/E-UTRA/MSR.
Transmitter OFF power	6.5.1.1.2	SO	6.4.1	SO	6.4.1	SO	Same comments as above
Transmitter transient period	6.5.2.1.2	SO	6.4.2	SO	6.4.2	SO	Same comments as above
Transmitted signal quality							
Modulation quality	6.8.1, 6.8.2, 6.8.3, 6.8.4		6.5.2	DK	6.5.1	RE	Single-RAT only requirements
Frequency error	6.3.1		6.5.1	DK	6.5.2	RE	Single-RAT only requirements
Time alignment error	6.8.5		6.5.3	DK	6.5.3	RE	Single-RAT only requirements
Operating band unwanted emissions/spectrum mask	6.6.2	SO	6.6.3	SO	6.6.2	SO	UTRA has completely different mask. E-UTRA uses LTE generic mask and additional option 2 mask for Europe. MSR uses option 2 masks as generic mask which is not appropriate for TDD. BC3 mask needs to be revised before the BS specification migration.
Spectrum emission mask	6.6.2.1.2	SO	-	-	-	-	SEM requirements for all BS classes are specified in the same Clause.
operating band unwanted emissions	-	-	6.6.3.1	SO	6.6.2.1	SO	For E-UTRA, operating band unwanted emissions requirements are specified for each BS class in separate clauses. - Requirements for WA BS are defined separately for Category A and Category B. - Category B option 2 requirements for WA BS is intended for Band 33 and Band 34 used in Europe. For MSR, operating band unwanted emissions requirements are specified for BC1/BC3.
Additional requirements							
- Limits in FCC Title 47	-	-	6.6.3.3	DK	6.6.2.4.1	DM	Identical requirements.
- Un-synchronized operation for BC3	-	-	6.6.3.3	ID	6.6.2.4.2	ID	Identical requirements.
- Protection of DTT	-	-	N/A		N/A		Not applicable for TDD

- Co-existence with services in adjacent frequency bands (Band 1)	-	-	N/A		N/A		Not applicable for TDD
- Co-existence with services in adjacent frequency bands (Band 7)	-	-	N/A		N/A		Not applicable for TDD
- Co-existence with RNSS/GPS services in North America	-	-	N/A		N/A		Not applicable for TDD
- Additional requirements for band 41	-	-	6.6.3.3	ID	6.6.2.4.6	ID	Identical requirements.
Transmitter spurious emissions (mandatory)	6.6.3.1	SO	6.6.4.1	SO	6.6.1.1.1, 6.6.1.1.2	SM	UTRA spec has Cat A requirement of -13dBm/MHz and Cat B requirement of -15dBm/1MHz (covered by E-UTRA spec UEM requirements, MSR spec uses -15dBm/1MHz. The exclusion frequency range for UTRA TDD is unique (4MHz), it can be addressed by UEM.
Additional BC2 requirement	-	-	-	-	N/A	-	Not applicable for TDD
Transmitter spurious emissions (protection of Rx)	-	-	N/A	-	N/A	-	Not applicable for TDD
additional requirement for BC2 WA	-	-	-	-	N/A	-	Not applicable for TDD
Transmitter spurious emissions (additional)	6.6.3.2.1	SA	6.6.4.3	SA	6.6.1.3	SA	The measurement bandwidths in UTRA and E-UTRA/MSR are different but the requirements are equivalent. Can be easily merged.
additional requirement on 700/800MHz public safety	-	-	N/A	-	N/A	-	Not applicable for TDD
Transmitter spurious emissions (co-location) UTRA/E-UTRA WA&LA	6.6.3.2.2	SA	6.6.4.4	SA	6.6.1.4	SA	The measurement bandwidths in UTRA and E-UTRA/MSR are different but the requirements are equivalent. Can be easily merged.
Transmitter spurious emissions (co-location) UTRA/E-UTRA MR					TBD		The requirement of TDD MR BS requirement is still missing from MSR spec. MR/LA requirement can be added by a separate WI.
Transmitter spurious emissions (co-location) GSM					TBD		The requirement of TDD MR BS requirement is still missing from MSR spec. MR/LA requirement can be added by a separate WI.
ACLR	6.6.2.2	DK	6.6.2.1	DK	6.6.4.1, 6.6.4.2, 6.6.4.3	RE	RAT-specific requirement, MSR spec referring to UTRA/E-UTRA specs.
CACLR			6.6.2.2	SA	6.6.4.4	SA	The same requirements in all specs
Occupied bandwidth	6.6.1.2	SA	6.6.1	SA	6.6.3	SA	E-UTRA spec has additional requirement for Intra-band CA which is referenced in the MSR spec
Transmitter intermodulation	6.7	SO	6.7	SM	6.7.1	SM	UTRA single-RAT requirement needs to be kept for 1.28Mcps TDD option single-RAT BS.
Additional requirement	-	-	-	-	6.7.3	DM	Additional BC3 requirement is defined for BC3 (TDD) in MSR spec.

5.2.4 Receiver characteristics (clause 7)

Table 5.2.4-1: Analysis of the TDD parts of the core specifications, Clause 7

Topic	TS 25.105		TS 36.104		TS 37.104		Notes
	Clause	T	Clause	T	Clause	T	
General	7.1	SA	7.1	SA	7.1	SA	Similar text
Reference sensitivity level	7.2	DK	7.2	DK	7.2	RE	RAT-specific requirement, MSR specs referring to UTRA/E-UTRA specs, and to UTRA TDD and GSM/EDGE. 25.105 also covers 3.84 and 7.68 Mcps.
Dynamic range	7.3	DK	7.3	DK	7.3	RE	RAT-specific requirement, MSR specs referring to UTRA/E-UTRA specs, and to UTRA TDD and GSM/EDGE. 25.105 also covers 3.84 and 7.68 Mcps.
In-channel selectivity	-	-	7.4	DK	7.8	RE	ICS is an E-UTRA only single-RAT requirement. The MSR spec has a direct reference.
In-band selectivity and blocking:							
In-band blocking, general	(7.5.0)	-	7.6.1	SO	7.4.1	SM	The MSR limits are aligned with E-UTRA. They do not align with UTRA TDD 1.28 Mcps (see additional BC3 blocking however). 25.105 also covers 3.84 and 7.68 Mcps.
Narrowband blocking	-	-	7.5.1	SM	7.4.2	SM	UTRA TDD does not have a narrowband blocking requirement in 25.105.
GSM/EDGE Additional narrowband blocking	-	-	-	-	7.4.3	DM	Only applicable to GSM/EDGE
GSM/EDGE AM suppression	-	-	-	-	7.4.4	DM	Only applicable to GSM/EDGE
Additional BC3 blocking (in-band)	7.5.0	SM	-	-	7.4.5	SM	Only applicable to BC3 WA BS, based on 1.28 Mcps UTRA TDD interferer. 25.105 also covers 3.84 and 7.68 Mcps.
ACS	7.4.1	DK	7.5.1	DK	(7.4.2)	-	ACS is only defined for single-RAT. The narrowband blocking requirement in 7.4.2 of 37.104 makes it redundant. 25.105 also covers ACS for 3.84 and 7.68 Mcps.
Out-of-band blocking, general	7.5.0	SM	7.6.1	SM	7.5.1	SM	Identical requirements. The 25.105 requirement for LA and Home BS are not aligned. 25.105 also covers 3.84 and 7.68 Mcps.
Out-of-band blocking, co-location (UTRA/E-UTRA)	7.5.1	SO	7.6.2	SM	7.5.2	SM	UTRA TDD WA aligns, but UTRA TDD LA has incorrect wanted signal levels. 25.105 also covers 3.84 and 7.68 Mcps.
Out-of-band blocking, co-location (GSM)	7.5.1	SO	7.6.2	SO	7.5.2	SM	UTRA TDD WA aligns, but UTRA TDD LA have non-aligned levels and incorrect wanted signal levels. 25.105 also covers 3.84 and 7.68 Mcps.
Receiver spurious emissions, general	7.7.1	SA	7.7.1	SM	7.6.1	SM	Identical requirements. 25.105 also covers 3.84 and 7.68 Mcps, where there are some additional limits to protect certain bands.
Additional BC2 (category B) limit	-	-	-	-	7.6.2	DM	Only applicable to BC2.
Receiver intermodulation, general	7.6.1	SO	7.8.1	SO	7.7.1	SM	The MSR limits align with UTRA TDD for 1.28 Mcps. The offset aligns for UTRA TDD interferer, but is 100 kHz off for CW. 25.105 also covers 3.84 and 7.68 Mcps.
Receiver intermodulation, narrowband	-	-	7.8.1	SM	7.7.2	SM	UTRA TDD does not have a narrowband intermodulation requirement in 25.105.
GSM/EDGE Receiver intermodulation	-	-	-	-	7.7.3	DM	Only applicable to GSM/EDGE

5.2.5 Performance requirements (clause 8)

Table 5.2.5-1: Analysis of the TDD parts of the core specifications, Clause 8

Topic	TS25.105		TS36.104		TS37.104		Notes
	Clause	T	Clause	T	Clause	T	
Performance requirements	8	DK	8	DK	8	RE	Single-RAT specification texts only. All of the performance requirements are remained in the single-RAT specification with references to those requirements in TS37.104. In addition, MSR spec has extra texts on UTRA TDD and GSM/EDGE.

5.2.6 Annexes

Table 5.2.6-1: Analysis of the TDD parts of the core specifications, Annexes

Topic	TS25.105		TS36.104		TS37.104		Notes
	Clause	T	Clause	T	Clause	T	
Measurement Channels	Annex A	DK	Annex A	DK	-	-	Single-RAT unique texts.no definition in MSR spec.
Propagation condition							
Static propagation condition	Annex B.1	ID	Annex B.1	ID	-	-	identical texts, can be merged/migrated
Multi-path fading propagation conditions	Annex B.2	DK	Annex B.2	DK	-	-	The 25.105 includes 3 cases propagation conditions for multi path fading environments for 3.84Mcps,1.28Mcps and 7.68Mcps TDD option, and 36.104 includes EPA,EVA and ETU multi-path fading environments
High speed train conditions	Annex B.3	SA	Annex B.3	SA	-	-	Similar texts. The only difference between UTRA and E-UTRA is the parameter of maximum Doppler frequency.
Moving propagation conditions	-	-	Annex B.4	DK	-	-	Only in E-UTRA specification, can be migrated. Information on the moving propagation conditions for the UL timing adjustment performance
Multi-Antenna channel models	-	-	Annex B.5	DK	-	-	only in E-UTRA spec, can be migrated
Characteristics of the interfering signals	-	-	Annex C	SA	Annex A	SA	The text is aligned and can easily be merged.
Environmental requirements for the BS equipment	4.4	SA	Annex D	SA	Annex B	SA	The text is aligned and the 37.104 version covers the text in all specs.
Error vector magnitude evaluation	-	-	Annex E	DK	-	-	Only in 36.104, can be migrated
Unwanted emissions for multicarrier BS	-	-	Annex F	DK	-	-	Informative text on E-UTRA multicarrier operation.
Regional requirement for protection of DTT	-	-	Annex G	SA	6.6.2.4.3	RE	Informative annex, referenced from 37.104.

6 Status of existing BS conformance specifications

This clause documents the status and content of the BS conformance test specifications. The test specifications for UTRA in TS 25.141 [11] and E-UTRA in TS 36.141 [12] were thoroughly analysed when the MSR test specification

TS 37.141 [12] was formed in Rel-9. TR 37.900 [5] contains a lot of useful analysis, comparisons and synthesis of the requirements for the work and can be used as a reference also for the BS spec structure work.

The core specifications were classified in "types" that have different characteristics and the analysis of the conformance test requirements in this clause follows a similar approach. When text and requirements are compared between documents, the following same "types" are used as for core requirements, but with the additional types "DT", "CR", "TT" and "TM" to cover certain aspects of test requirements.

Based on the three main types above, the classification of text and requirement into different "types" according to Table 6-1 is used in the analysis below.

Table 6-1: Classification of text/requirement into "types"

Text/requirement Type identifier (T)	Type description
ID	Identical text, any version can be kept.
SA	Similar text/requirement/procedure that is well aligned and can be easily merged.
SM	Similar text/requirement/procedure, where the multi-RAT version covers the single-RAT ones. Some parameters may be RAT specific, as specified in the minimum or test requirement.
SO	Similar text/requirement/procedure, where a generic multi-RAT text plus a single-RAT option may have to be kept
DK	Different text/requirement/procedure, where the Single-RAT version is RAT unique and will have to be kept
DM	Different text/requirement/procedure that is unique to the MSR specification
RE	Reference to single-RAT requirement.
DT	Similar text/requirement/procedure, but with different test signals/test configuration.
CR	Analysis of the requirements can be found in the core requirement analysis.
TT	Analysis of the requirements can be found in the core requirement analysis, but test tolerances are different between RATs.
TM	Text/requirement/procedure missing, where they should be specified in the specification

NOTE: The analysis provided in clause 6 should be viewed as a first input, with additional analysis of e.g. the applicable test configurations to come later in the Work Item phase.

6.1 FDD specification parts

The following analysis covers the conformance test specifications containing requirements for UTRA FDD and E-UTRA FDD.

6.1.1 Definitions, symbols and abbreviations (clause 3)

Table 6.1.1-1: Analysis of the FDD parts of the test specifications, Clause 3

Topic	TS 25.141		TS 36.141		TS 37.141		Notes
	Clause	T	Clause	T	Clause	T	
Definitions	3.1	SA	3.1	SA	3.1	SA	Not alphabetical in 25.141. Quite aligned, some caution needed.
Symbols	3.2	SA	3.2	SA	3.2	SA	Quite aligned
Abbreviations	3.3	SA	3.3	SA	3.3	SA	Quite aligned

6.1.2 General parts (clause 4-5)

Table 6.1.2-1: Analysis of the FDD parts of the test specifications, Clauses 4-5

Topic	TS 25.141		TS 36.141		TS 37.141		Notes
	Clause	T	Clause	T	Clause	T	
Measurement uncertainties and test requirements							
Acceptable uncertainty of Test System	4.1.2, 4.1.3, 4.1.4	DK	4.1.2	DK	4.1.2	DM	BC2 extra part in MSR spec, no info on some E-UTRA and UTRA req. in MSR spec, different TT for blocking, OOB blocking between E-UTRA and MSR specs, UTRA spec has different TT for Tx&Rx spurious emissions, blocking and IMD, no performance TT in MSR spec
Interpretation of measurement results	4.3	SA	4.1.3	SA	4.1.3	SA	Similar text
Base station classes	4.3A	SA	4.2	SA	4.2	SA	GSM/EDGE additional information in MSR spec, Home BS covered in UTRA and E-UTRA specs
Test environments	4.4, 4.1.1	SA	Annex D	SA	Annex B	SA	Information on limits of conditions for normal and extreme test environment, vibration, power supply
Regional requirements	4.7	SO	4.3	SO	4.3	SO	Similar information except extra data in single-RAT specifications which is clarified in MSR spec
Selection of configurations for testing	4.5	SO	4.4	SO			Similar text on subset of possible combinations of test conditions
Operating bands	3.4	CR	5.5	CR	4.4	CR	See core requirement analysis
Channel bandwidth			5.6	DK			RAT-specific for E-UTRA
Channel arrangements	3.5	CR	5.7	CR	4.5	CR	See core requirement analysis
Manufacturer's declarations of regional and optional requirements			4.6	SO	4.6	SO	In E-UTRA spec additional sections on channel bandwidth and BS output power
Manufacturer's declarations of supported RF configurations			4.6.8	SM	4.7.2	SM	MSR spec has general and RAT-specific declarations, MSR spec covers also capability sets
Test configurations			4.10	SO	4.8	SO	MSR spec has more TC/NTCs covering also single-RAT multi-carrier operation, CA specific TC is missing in MSR spec for CA occupied BW
RF channels and test models	4.8	SO	4.7	SO	4.9	SO	MSR spec covers maximum RF BW positions only, what is missing is single-carrier and CA aggregated channel BW positions
Requirements for contiguous and non-contiguous spectrum	4.10	SA	5.8	SA			Generic information how requirements apply for contiguous and non-contiguous spectrum
BS configurations	4.6	SO	4.5	SO	4.10	SO	MSR and E-UTRA specs text aligned with extra info on duplexers in E-UTRA spec (MSR does not cover duplexers supplied as an option), UTRA spec has in addition section on BS with Virtual Antenna Mapping
Format and interpretation of tests	5	SA	4.8	SA	4.11	SA	Text aligned, MSR spec has clarification for single-RAT references
Applicability of requirements and test configurations	4.9	SO	4.9	SO	5	SO	Single-RAT specs clarify for a BS additionally conforming to MSR spec, conformance of some RF requirements can be demonstrated through requirements in MSR spec, MSR has detailed information which TC shall be used for specific requirement and CS

6.1.3 Transmitter characteristics (clause 6)

Table 6.1.3-1: Analysis of the FDD parts of the test specifications, Clause 6

Topic	TS 25.141		TS 36.141		TS 37.141		Notes
	Clause	T	Clause	T	Clause	T	
General	6.1	DK	6.1	DK	6.1	DM	Specific test models are defined in general part of UTRA and E-UTRA specs.
Base station output power	6.2		6.2		6.2		
Base Station maximum output power	6.2.1		6.2		6.2.1		
Definition and applicability	6.2.1.1	SA	6.2.1	SA	6.2.1.1	SA	Similar definitions but with different wording.
Minimum requirement	6.2.1.2	CR	6.2.2	CR	6.2.1.2	CR	All specs refer the core specifications directly.
Test purpose	6.2.1.3	ID	6.2.3	ID	6.2.1.3	ID	
Initial conditions	6.2.1.4.1	SM	6.2.4.1	SM	6.2.1.4.1	SM	
Procedure	6.2.1.4.2	SM	6.2.4.2	SM	6.2.1.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	6.2.1.5	CR	6.2.5	CR	6.2.1.5	CR	All specs reference the core specifications directly.
E-UTRA DL RS power	-	-	6.5.4	SA	6.2.2	SA	
UTRA FDD primary CPICH power	6.2.2	SA	-	-	6.2.3	SA	
UTRA TDD primary CCPCH power	-	-	-	-	6.2.4	DM	Only specific for UTRA TDD
Home BS output power for adjacent UTRA channel protection	6.4.6	DK	6.2.6	DK	-	-	Specific for UTRA and E-UTRA specs
Home BS output power for adjacent E-UTRA channel protection	-	-	6.2.7	DK	-	-	Only specific for E-UTRA
Home BS output power for co-channel E-UTRA protection	-	-	6.2.8	DK	-	-	Only specific for E-UTRA
Secondary CPICH power offset accuracy	6.2.3	DK	-	-	-	-	Only specific for UTRA
Output power dynamics	6.4 (6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.4.5)		6.3 (6.3.1,6.3.2)		6.3		
Inner loop power control	6.4.1	DK	-	-	-	RE	Only specific for UTRA
Power control steps	6.4.2	DK	-	-	-	RE	Only specific for UTRA
Power control dynamic range	6.4.3	DK	-	-	-	RE	Only specific for UTRA
Total power dynamic range	6.4.4	TT	6.3.2	TT	-	RE	0.3dB for UTRA and 0.4dB for E-UTRA
IPDL time mask	6.4.5	DK	-	-	-	RE	Only specific for UTRA
RE Power control dynamic range	-	-	6.3.1	DK	-	RE	Only specific for E-UTRA
Transmit ON/OFF power	-		6.4		6.4		
Definition and applicability	-	-	6.4.1.1, 6.4.2.1	SA	6.4.1	SA	In E-UTRA spec, Transmitter OFF power and Transmitter transient period are specified

							separately.
Minimum requirement	-	-	6.4.1.2, 6.4.2.2	CR	6.4.2	CR	All specs refer to the core specifications directly.
Test purpose	-	-	6.4.1.3, 6.4.2.3	ID	6.4.3	ID	
Initial conditions	-	-	6.4.2.4.1	SA	6.4.4.1	SA	
Procedure	-	-	6.4.2.4.2	SM	6.4.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	-	-	6.4.1.5, 6.4.2.5	CR	6.4.5	CR	Test tolerance is the same in E-UTRA and MSR specs for transmit ON/OFF power.
Transmitted signal quality	6.3, 6.7		6.5		6.5		
Modulation quality	6.7.1, 6.7.2, 6.7.4		6.5.2		6.5.1		
Definition and applicability	6.7.1.1, 6.7.2.1, 6.7.4.1	SM	6.5.2.1	SM	6.5.1.1	SM	EVM, PCDE, RCDE are all covered in MSR spec.
Minimum requirement	6.7.1.2, 6.7.2.2, 6.7.4.2	CR	6.5.2.2	CR	6.5.1.2	CR	Refer to core specifications directly.
Test purpose	6.7.1.3, 6.7.2.3, 6.7.4.3	ID	6.5.2.3	ID	6.5.1.3	ID	
Initial conditions	6.7.1.4.1, 6.7.2.4.1, 6.7.4.4.1	SM	6.5.2.4.1	SM	6.5.1.4.1	SM	Similar conditions for EVM, PCDE and RCDE for UTRA
Procedure	6.7.1.4.2, 6.7.2.4.2, 6.7.4.4.2	SM	6.5.2.4.2	SM	6.5.1.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	6.7.1.5, 6.7.2.5, 6.7.4.5	CR	6.5.2.5	CR	6.5.1.5	CR	EVM Test tolerance are different for UTRA and E-UTRA
Frequency error	6.3		6.5.1		6.5.2		
Definition and applicability	6.3.1	SA	6.5.1.1	SA	6.5.2.1	SA	Similar text in all specs
Minimum requirement	6.3.2	CR	6.5.1.2	CR	6.5.2.2	CR	Refer to core specifications directly.
Test purpose	6.3.3	ID	6.5.1.3	ID	6.5.2.3	ID	
Initial conditions	6.7.1.4.1	SM	6.5.2.4.1	SM	6.5.1.4.1	SM	Initial conditions and procedure are the same as that for modulation quality.
Procedure	6.7.1.4.2	SM	6.5.2.4.2	SM	6.5.1.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	6.3.5	CR	6.5.1.5	CR	6.5.2.5	CR	Same test tolerance for both UTRA and E-UTRA
Time alignment error	6.7.3		6.5.3		6.5.3		
Definition and applicability	6.7.3.1	SM	6.5.3.1	SM	6.5.3.1	SM	
Minimum requirement	6.7.3.2	CR	6.5.3.2	CR	6.5.3.2	CR	Refer to core specifications directly.
Test purpose	6.7.3.3	ID	6.5.3.3	ID	6.5.3.3	ID	
Initial conditions	6.7.3.4.1	SM	6.5.3.4.1	SM	6.5.3.4.1	SM	
Procedure	6.7.3.4.2	SM	6.5.3.4.2	SM	6.5.3.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	6.7.3.5	CR	6.5.3.5	CR	6.5.3.5	CR	Same test tolerance for both UTRA and E-UTRA
Operating band unwanted emissions/spectrum mask	6.5.2.1		6.6.3		6.6.2		
Definition and applicability	6.5.2.1.1	SA	6.6.3.1	SA	6.6.2.1	SA	Additional GSMEDGE single RAT operation is considered in MSR spec.
Minimum requirement	6.5.2.1.2	CR	6.6.3.2	CR	6.6.2.2	CR	Refer to core specifications directly.
Test purpose	6.5.2.1.3	ID	6.6.3.3	ID	6.6.2.3	ID	The test purpose is the same to verify the near end unwanted emissions.

Initial conditions	6.5.2.1.4.1	SM	6.6.3.4.1	SM	6.6.2.4.1	SM	
Procedure	6.5.2.1.4.2	SM	6.6.3.4.2	SM	6.6.2.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	6.5.2.1.5	CR	6.6.3.5	CR	6.6.2.5	CR	Requirements are different in all specs, but the principle of applying test tolerance for UEM/SEM requirements are the same.
Transmitter spurious emissions	6.5.3		6.6.4		6.6.1		
Definition and applicability	6.5.3.1	SA	6.6.4.1	SA	6.6.1.1	SA	Scope of spurious emissions for UTRA includes also the operating band frequency range, while this is covered by the UEM for E-UTRA and MSR.
Minimum requirement	6.5.3.4	CR	6.6.4.2	CR	6.6.1.2	CR	All specs reference the core specifications directly.
Test purpose	6.5.3.5	ID	6.6.4.3	ID	6.6.1.3	ID	
Initial conditions	6.5.3.6.1	SM	6.6.4.4.1	SM	6.6.1.4.1	SM	References to core specs for measurement BW are covered by 37.141. UTRA reference to carrier spacing is covered by 37.141 TCs.
Procedure	6.5.3.6.2	SM	6.6.4.4.2	SM	6.6.1.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	6.5.3.7	CR	6.6.4.5	CR	6.6.1.5	CR	Test tolerance is 0 in all specs for spurious emissions.
ACLR	6.5.2.2		6.6.2		6.6.4		
Definition and applicability	6.5.2.2.1	SA	6.6.2.1	SA	6.6.4.1	SA	E-UTRA and UTRA has additional description for CAACLR. But this can in general be seen as a kind of ACLR requirement.
Minimum requirement	6.5.2.2.2	CR	6.6.2.2	CR	6.6.4.2	CR	All specs reference the core specifications directly. UTRA has more stringent ACLR2 requirement.
Test purpose	6.5.2.2.3	ID	6.6.2.3	ID	6.6.4.3	ID	
Initial conditions	6.5.2.2.4.1	SM	6.6.2.4.1	SM	6.6.4.4.1	SM	Similar text between specs but RAT specific test model is used for UTRA and E-UTRA.
Procedure	6.5.2.2.4.2	SA	6.6.2.4.2	SA	6.6.4.4.2	SA	
Test requirements	6.5.2.2.5	DK	6.6.2.5	DK	6.6.4.5	RE	UTRA has more stringent ACLR2 requirement.
Cumulative ACLR test requirement in non-contiguous spectrum	6.5.2.2.6	SA	6.6.2.6	SA			
Occupied bandwidth	6.5.1		6.6.1		6.6.3		
Definition and applicability	6.5.1.1	ID	6.6.1.1	ID	6.6.3.1	ID	
Minimum requirement	6.5.1.2	CR	6.6.1.2	CR	6.6.3.2	CR	All specs reference the core specifications directly.
Test purpose	6.5.1.3	ID	6.6.1.3	ID	6.6.3.3	ID	
Initial conditions	6.5.1.4.1	SA	6.6.1.4.1	SA	6.6.3.4	RE	E-UTRA includes description for multi-carrier operation.
Procedure	6.5.1.4.2	SA	6.6.1.4.2	SA	6.6.3.4	RE	E-UTRA has description for flexible channel bandwidth.
Test requirements	6.5.1.5	CR	6.6.1.5	CR	6.6.3.5	CR	Test tolerance is 0 in all specs for the occupied bandwidth.
Transmitter intermodulation	6.6		6.7		6.7		
Definition and applicability	6.6.1	SO	6.7.1	SM	6.7.1	SM	UTRA spec has UTRA interfering signal while 5MHz E-UTRA interfering signal is used in MSR/E-UTRA specs
Minimum requirement	6.6.2	CR	6.7.2	CR	6.7.2	CR	All specs reference the core specifications directly.
Test purpose	6.6.3	ID	6.7.3	ID	6.7.3	ID	
Initial conditions	6.6.4.1	SA	6.7.4.1	SA	6.7.4.1	SA	UTRA only has description for single carrier test.
Procedure	6.6.4.2	DT	6.7.4.2	SM	6.7.4.2	SM	Different test model and interfering signal is used for UTRA.
Test	6.6.5	CR	6.7.5	CR	6.7.5	CR	Test tolerance is zero in all test specs.

requirements							
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6.1.4 Receiver characteristics (clause 7)

Table 6.1.4-1: Analysis of the FDD parts of the test specifications, Clause 7

Topic	TS 25.141		TS 36.141		TS 37.141		Notes
	Clause	T	Clause	T	Clause	T	
General	7.1	DK	7.1	DK	7.1	DK	Specific conditions in single-RAT specs, e.g. performance metric, assumption for HARQ in FRC etc. are RAT specific and need to be kept. Specific test model is used for UTRA FDD and E-UTRA FDD.
Reference sensitivity level	7.2		7.2		7.2		
Definition and applicability	7.2.1	SA	7.2.1	SA	7.2.1	SA	This is a single-RAT requirement and the complete test is fully described in single-RAT spec.
Minimum requirement	7.2.2	CR	7.2.2	CR	7.2.2	CR	
Test purpose	7.2.3	ID	7.2.3	ID	7.2.3	ID	
Initial conditions	7.2.4.1	DK	7.2.4.1	DK	7.2.4.1	RE	
Procedure	7.2.4.2	DK	7.2.4.2	DK	7.2.4.2	RE	
Test requirements	7.2.5	CR	7.2.5	CR	7.2.5	RE	
Dynamic range	7.3		7.3		7.3		
Definition and applicability	7.3.1	SA	7.3.1	SA	7.3.1	SA	This is a single-RAT requirement and the complete test is fully described in single-RAT spec.
Minimum requirement	7.3.2	CR	7.3.2	CR	7.3.2	CR	
Test purpose	7.3.3	ID	7.3.3	ID	7.3.3	ID	
Initial conditions	7.3.4.1	DK	7.3.4.1	DK	7.3.4.1	RE	
Procedure	7.3.4.2	DK	7.3.4.2	DK	7.3.4.2	RE	
Test requirements	7.3.5	CR	7.3.5	CR	7.3.5	RE	
In-channel selectivity							
Definition and applicability	-	-	7.4.1	SA	7.8.1	SA	This is a single-RAT E-UTRA requirement and the complete test is fully described in 36.141.
Minimum requirement	-	-	7.4.2	CR	7.8.2	CR	
Test purpose	-	-	7.4.3	ID	7.8.3	ID	
Initial conditions	-	-	7.4.4.1	DK	7.8.4.1	RE	
Procedure	-	-	7.4.4.2	DK	7.8.4.2	RE	
Test requirement	-	-	7.4.5	CR	7.8.5	RE	
In-band selectivity and blocking:							In-band selectivity blocking is split in different ways for the three specs, but test suites can still be compared.
In-band blocking							
Definition and applicability	7.5.1	SA	7.6.1	SA	7.4.1	SA	The clause in 25.104 and 36.104 covers also out-of-band blocking, in 37.104 it covers also narrowband blocking.
Minimum requirement	7.5.2	CR	7.6.2	CR	7.4.2	CR	
Test purpose	7.5.3	SM	7.6.3	SM	7.4.3	SM	
Initial conditions	7.5.4.1	SM	7.6.4.1	SM	7.4.4.1	SM	RF BW positions for multicarrier are covered by 37.141. The same UTRA and E-UTRA test configurations and Measurement system set-up are referenced in TS 37.141.
Procedure	7.5.4.2	SM	7.6.4.2	SM	7.4.4.2	SM	The procedure in terms of power settings, test models, interferers and performance assessment is covered by the text in TS 37.141.
Test requirement	7.5.5	CR	7.6.5	CR	7.4.5.1	CR	Test tolerance is 0 in all specs for the blocking levels.
Narrowband blocking							

Definition and applicability	7.5.1	SM	7.5.1	SM	7.4.1	SM	The text in 37.141 covers narrowband blocking fully, while the text in the single-RAT specs does not.
Minimum requirement	7.5.2	CR	7.5.2	CR	7.4.2	CR	
Test purpose	7.5.3	SA	7.5.3	SA	7.4.3	SA	The text can be aligned, with consideration the different ways the requirements are split.
Initial conditions	7.5.4.1	SM	7.5.4.1	SM	7.4.4.1	SM	RF BW positions for multicarrier are covered by 37.141. The same UTRA and E-UTRA test configurations and reference measurement channels are referenced in 37.141.
Procedure	7.5.4.2	SM	7.5.4.3	SM	7.4.4.3	SM	The procedure in terms of power settings, test models, interferers and performance assessment is covered by the text in TS 37.141.
Test requirement	7.5.5	CR	7.5.5	CR	7.4.5.2	CR	Test tolerance is 0 in all specs for the narrowband blocking levels.
ACS							
Definition and applicability	7.4.1	SA	7.5.1	SA	-	-	ACS is not included in 37-series, since the requirement was determined to be fully covered by narrowband blocking. IN 36.141 it is in the same clause as narrowband blocking.
Minimum requirement	7.4.2	CR	7.5.2	CR	-	-	
Test purpose	7.4.3	ID	7.5.3	ID	-	-	
Initial conditions	7.4.4.1	SA	7.5.4.1	SA	-	-	
Procedure	7.4.4.2	SA	7.5.4.2	SA	-	-	Description is RAT-specific, but with the same principle, and would be possible to align if needed.
Test requirement	7.4.5	CR	7.5.5	CR	-	-	Test tolerance is 0 in all specs for the ACS levels.
Out-of-band blocking							
Definition and applicability	7.5.1	SA	7.6.1	SA	7.5.1	SA	While this is a separate clause for 37.141, it is in the same clause as in-band blocking in 25.141 and 36.141.
Minimum requirement	7.5.2	CR	7.6.2	CR	7.5.2	CR	
Test purpose	7.5.3	SA	7.6.3	SA	7.5.3	SA	
Initial conditions	7.5.4.1	SM	7.6.4.1	SM	7.5.4.1	SM	RF BW positions for multicarrier are covered by 37.141. The same UTRA and E-UTRA test configurations and Measurement system set-up are referenced in TS 37.141.
Procedure	7.5.4.2	SM	7.6.4.2	SM	7.5.4.2		The procedure in terms of test models, interferers and performance assessment is covered by the text in TS 37.141.
Test requirement	7.5.5	CR	7.6.5	CR	7.5.5	CR	Test tolerance is 0 in all specs for the blocking levels.
Receiver spurious emissions							
Definition and applicability	7.7.1	SM	7.7.1	SM	7.6.1	SM	The text in 37.141 covers both UTRA and E-UTRA (FDD and TDD)
Minimum requirement	7.7.2	CR	7.7.2	CR	7.6.2	CR	
Test purpose	7.7.3	ID	7.7.3	ID	7.6.3	ID	
Initial conditions	7.7.4.1	SM	7.7.4.1	SM	7.6.4.1	SM	RF BW positions for multicarrier are covered by 37.141.
Procedure	7.7.4.2	SM	7.7.4.2	SM	7.6.4.2	SM	The 37.141 test configuration covers the single-RAT ones.
Test requirement	7.7.5	CR	7.7.5	CR	7.6.5	CR	Test tolerance is 0 in all specs for spurious emissions.
Receiver intermodulation							
Definition and applicability	7.6.1	SA	7.8.1	SA	7.7.1	SA	
Minimum requirement	7.6.2	CR	7.8.2	CR	7.7.2	CR	
Test purpose	7.6.3	ID	7.8.3	ID	7.7.3	ID	

Initial conditions	7.6.4.1	SM	7.8.4.1	SM	7.7.4.1	SM	RF BW positions for multicarrier are covered by 37.141. The same UTRA and E-UTRA test configurations and Measurement system set-up are referenced in TS 37.141.
Procedure	7.6.4.2	SM	7.8.4.2	SM	7.7.4.2	SM	The procedure in terms of test models, interferers and performance assessment is covered by the text in TS 37.141.
Test requirement	7.6.5	CR	7.8.5	CR	7.7.5	CR	Test tolerance is 0 in all specs for the Rx IM levels.
Verification of the internal BER calculation	7.8	DK	-	-	-	-	Applies only for UTRA Base Station System with internal BER calculation.

6.1.5 Performance requirements (clause 8)

Table 6.1.5-1: Analysis of the FDD parts of the test specifications, Clause 8

Topic	TS 25.141		TS 36.141		TS 37.141		Notes
	Clause	T	Clause	T	Clause	T	
Performance requirements	8	DK	8	DK	-	-	

6.1.6 Annexes

Table 6.1.6-1: Analysis of the FDD parts of the test specifications, Annexes

Topic	TS 25.141		TS 36.141		TS 37.141		Notes
	Clause	T	Clause	T	Clause	T	
Characteristics of interfering signals							
UTRA FDD interfering signal	Annex I	SA	-	-	Annex A.1	SA	Similar texts between MSR spec and UTRA spec
UTRA TDD interfering signal	-	-	-	-	Annex A.2	DM	Only for UTRA TDD.
E-UTRA interfering signal	-	-	Annex C	SO	Annex A.3	SO	MSR spec only cover interfering signal for narrowband blocking and receiver intermodulation, but TS 36.141 additionally covers interfering signal for in-channel selectivity, ACS and blocking
Environmental requirements for the BS equipment	4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.1.1	SA	Annex D	SA	Annex B	SA	Information on limits of conditions for normal and extreme test environment, vibration, power supply. In addition, the extreme environmental conditions and equipment class can also from the corresponding ETSI harmonised standards.
Test Tolerances and Derivation of test requirements	Annex F, 4.2	DK	Annex G	DK	Annex C	DM	BC2 extra part in MSR spec, no info on some E-UTRA and UTRA requirement in MSR spec, no performance TT in MSR spec
Measurement system set-up	Annex B	DK	Annex I	DK	Annex D	DM	Similar measurement system set-up for maximum output power, transmitter/receiver intermodulation. no info on some E-UTRA and UTRA requirement in MSR spec, no performance requirements measurement system set-up in MSR spec
Measurement channels	Annex A	DK	Annex A	DK	-	-	Single-RAT unique texts.no definition in MSR spec.
General rules for statistical testing	Annex C	DK	Annex E	TM	-	-	Single-RAT unique texts, missing texts for E-UTRA, no definition in MSR spec.
Propagation conditions							
Static propagation condition	Annex D.1	ID	Annex B.1	ID	-	-	Identical texts, can be merged/migrated
Multi-path fading propagation conditions	Annex D.2	DK	Annex B.2	DK	-	-	The 25.141 includes 4 cases propagation conditions for multi path fading environments, and 36.141 includes EPA,EVA and ETU multi-path fading environments
Moving propagation conditions	Annex D.3	DK	Annex B.4	DK	-	-	The propagation conditions for the test in 25.141 are non-fading channel models with two taps, time difference between the two paths and some parameters are covered. The moving propagation conditions in 36.141 is for the UL timing adjustment performance test, time difference between the reference timing and the first tap and some parameters for UL timing adjustment are covered
Birth-Death propagation conditions	Annex D.4	DK	-	-	-	-	Only in UTRA spec, can be migrated
High speed train conditions	Annex D.4A	SA	Annex B.3	SA	-	-	Similar texts for scenario 1 and scenario 3 between UTRA and E-UTRA, in addition, UTRA covers scenario 2.
Multi-path fading propagation conditions for E-DPDCH and E-DPCCH	Annex D.5	DK	-	-	-	-	only in UTRA spec, can be migrated
Multi-Antenna channel models	-	-	Annex B.5	DK	-	-	Only in E-UTRA spec, can be migrated
Global In-Channel	Annex E	DK	Annex F	DK	-	-	Single-RAT unique texts (i.e. for UTRA and E-

TX-Test							UTRA)
Acceptable uncertainty of Test Equipment	Annex G	DK	-	-	-	-	Only in UTRA spec, can be migrated
UTRAN Measurement Test Cases	Annex H	DK	-	-	-	-	Only in UTRA spec, can be migrated
E-UTRAN Measurement Test Cases	-	-	Annex H	TM	-	-	Only in E-UTRA spec, can be migrated
Unwanted emission requirements for multi-carrier BS	-	-	Annex J	DK	-	-	Only in E-UTRA spec, can be migrated

7 Status of existing BS EMC specifications

This clause documents the status and content of the BS EMC specifications. The EMC specifications for UTRA (FDD and TDD) in TS 25.113 [13] and E-UTRA in TS 36.113 [14] were analysed when the MSR test specification TS 37.113 [15] was formed in Rel-9. TR 37.900 [5] contains the analysis, comparisons and synthesis of the requirements for the work and can be used as a reference also for the BS spec structure work.

The core specifications were classified in "types" that have different characteristics and the analysis of the conformance EMC requirements in this clause follows a similar approach. When text and requirements are compared between documents, the same "types" are used as for core and test requirement analysis.

Based on the three main types above, the classification of text and requirement into different "types" according to Table 6-1 is used in the analysis below. The analysis covers the EMC specifications containing requirements for UTRA FDD, UTRA TDD and E-UTRA.

Table 6-1: Classification of text/requirement into "types"

Text/requirement Type identifier (T)	Type description
ID	Identical text, any version can be kept.
SA	Similar text/requirement/procedure that is well aligned and can be easily merged.
SM	Similar text/requirement/procedure, where the multi-RAT version covers the single-RAT ones. Some parameters may be RAT specific, as specified in the minimum or test requirement.
SO	Similar text/requirement/procedure, where a generic multi-RAT text plus a single-RAT option may have to be kept
DK	Different text/requirement/procedure, where the Single-RAT version is RAT unique and will have to be kept
DM	Different text/requirement/procedure that is unique to the MSR specification

NOTE: The analysis provided in clause 6 should be viewed as a first input, with additional analysis to come later in the Work Item phase.

7.1 Definitions, symbols and abbreviations (clause 3)

Table 7.1-1: Analysis of the content of EMC specifications: Clause 3

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
Definitions	3.1	SA	3.1	SA	3.1	SA	Quite aligned
Symbols	3.2	SA	3.2	SA	3.2	SA	Quite aligned
Abbreviations	3.3	SA	3.3	SA	3.3	SA	Quite aligned

7.2 Conditions, assessment, criteria and applicability (clause 4-7)

Table 7.2-1: Analysis of the content of EMC specifications, Clause 4

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
General	4.1	SM	4.1	SM	4.1	SM	MSR-text covers all RATs, including GSM/EDGE. UTRA and E-UTRA text covers also repeaters.
Arrangement for establishing a communications link	4.2	SM	4.2	SM	4.2	SM	MSR-text covers all RATs, including GSM/EDGE.
Multiple enclosure BS solution	4.2.1	ID	4.2.1	ID	4.2.1	ID	Identical text.
Narrowband responses on receivers	4.3	SA	4.3	SA	4.3	SA	MSR-text covers all RATs, including GSM/EDGE, but 1.28 Mcps UTRA TDD from 25.113 needs to be added. Can be aligned.
Test conditions for repeater	4.4	SA	4.4	SA	-	-	MSR text does not cover repeater.
Exclusion bands							
Transmitter exclusion band	4.5.1	DK	4.5.1	DK	4.4.1	DM	There is no Tx exclusion band in the MSR specification.
Receiver exclusion band	4.5.2	SA	4.5.2	SA	4.4.2	SA	Expressed in different ways, but can easily be merged.
BS test configurations	-	-	-	-	4.5	DM	MSR spec defines single-RAT and multi-RAT test configurations to use.

Table 7.2-2: Analysis of the content of EMC specifications, Clause 5

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
General	5.1	SM	5.1	SM	5.1	SM	MSR text covers also multi-RAT.
Assessment of performance in uplink	5.2	SM	5.2	SM	5.2	SM	MSR-text covers all RATs, including UTRA TDD and GSM/EDGE.
Assessment of performance in downlink	5.3	SA	5.3	SA	5.3	SA	MSR-text covers all RATs, including UTRA TDD and GSM/EDGE.
Ancillary equipment	5.4	ID	5.4	ID	5.4	ID	Identical text.
Repeaters	5.5	ID	5.5	ID	-	-	MSR text does not cover repeater.

Table 7.2-3: Analysis of the content of EMC specifications, Clause 6

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
Performance criteria for continuous phenomena for BS	6.1	SM	6.1	SM	6.1	SM	MSR-text covers all RATs, including UTRA TDD and GSM/EDGE.
Performance criteria for transient phenomena for BS	6.2	SO	6.2	SO	6.2	SO	MSR-text is more generic. May have to keep the more detailed single-RAT options.
Performance criteria for continuous phenomena for ancillary equipment	6.4	SA	6.3	ID	6.3	ID	Identical text, except for language problem in 25.113
Performance criteria for transient phenomena for ancillary equipment	6.5	ID	6.4	ID	6.4	ID	Identical text
Performance criteria for continuous phenomena for repeater	6.7	ID	6.5	ID	-	-	MSR text does not cover repeater.
Performance criteria for transient phenomena for repeater	6.8	ID	6.6	ID	-	-	MSR text does not cover repeater.

Table 7.2-4: Analysis of the content of EMC specifications, Clause 7

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
Emissions	7.1	SA	7.1	SA	7.1	SA	Well aligned, but MSR text does not cover repeater.
Immunity	7.2	SA	7.2	SA	7.2	SA	Well aligned, but MSR text does not cover repeater.
Applicability of requirements in TS 37.113	7.3	TB D	7.3	TB D	-	-	This text is dependent on the present structure of one spec per RAT. At may not be applicable if specs are potentially merged.

7.3 Emissions and immunity requirements (clause 8-9)

Table 7.3-1: Analysis of the content of EMC specifications: Clause 8

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
Test configurations	8.2	ID	8.1	ID	8.1	ID	
Radiated emissions from BS and Ancillary Equipment	8.3		8.2		8.2		
Radiated emissions from BS (and repeater)	8.3.1	SM	8.2.1	SM	8.2.1	SM	MSR text does not cover repeater, while this is covered by the same text as for the BS for UTRA and E-UTRA.
Definition	8.3.1.1	ID	8.2.1.1	ID	8.2.1.1	ID	
Test method	8.3.1.2	SA	8.2.1.2	SA	8.2.1.2	SA	
Limits	8.3.1.3	SM	8.2.1.3	SM	8.2.1.3	SM	The MSR text expresses the exclusion area in relation to RF bandwidth.
Interpretation of measurement results	8.3.1.4	SA	8.2.1.4	SA	8.2.1.4	SA	Some differences in wording that can be aligned.
Radiated emissions from Ancillary Equipment	8.3.2	ID	8.2.2	ID	8.2.2	ID	Identical text (some typos to be corrected).
Definition	8.3.2.1	ID	8.2.2.1	ID	8.2.2.1	ID	Identical text.
Test method	8.3.2.2	ID	8.2.2.2	ID	8.2.2.2	ID	Identical text.
Limits	8.3.2.3	ID	8.2.2.3	ID	8.2.2.3	ID	Identical text.
Conducted emission DC power input/output port	8.4	ID	8.3	ID	8.3	ID	Identical text.
Definition	8.4.1	ID	8.3.1	ID	8.3.1	ID	Identical text.
Test method	8.4.2	ID	8.3.2	ID	8.3.2	ID	Identical text.
Limits	8.4.3	ID	8.3.3	ID	8.3.3	ID	Identical text.
Conducted emission, AC mains power input/output port	8.5	ID	8.4	ID	8.4	ID	Identical text.
Definition	8.5.1	ID	8.4.1	ID	8.4.1	ID	Identical text.
Test method	8.5.2	ID	8.4.2	ID	8.4.2	ID	Identical text.
Limits	8.5.3	ID	8.4.3	ID	8.4.3	ID	Identical text.
Harmonic current emissions (AC mains input port)	8.6	ID	8.5	ID	8.5	ID	Identical text.
Voltage fluctuations and flicker (AC mains input port)	8.7	ID	8.6	ID	8.6	ID	Identical text.
Telecommunication s port	8.8.	ID	8.7	ID	8.7	ID	Identical text.
Definition	8.8.1	ID	8.7.1	ID	8.7.1	ID	Identical text.
Test method	8.8.2	DK	8.7.2	DK	8.7.2	DM	There is no Tx exclusion band referenced in the MSR specification.
Limits	8.8.3	ID	8.7.3	ID	8.7.3	ID	Identical text.

Table 7.3-2: Analysis of the content of EMC specifications, Clause 9

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
Test configuration	9.2	SM	9.1	SM	9.1	SM	MSR-text covers all RATs, including UTRA TDD and GSM/EDGE.
RF electromagnetic field (80 MHz - 1000 MHz, 1400 MHz to 2700 MHz)	9.3	ID	9.2	ID		ID	
Definition	9.3.1	ID	9.2.1	ID	9.2.1	ID	
Test method and level	9.3.2	ID	9.2.2	ID	9.2.2	ID	
Performance criteria	9.3.3	SA	9.2.3	SA	9.2.3	SA	Well aligned, but MSR text does not cover repeater.
Electrostatic discharge	9.4	ID	9.3	ID	9.3	ID	
Definition	9.4.1	ID	9.3.1	ID	9.3.1	ID	
Test method and level	9.4.2	ID	9.3.2	ID	9.3.2	ID	
Performance criteria	9.4.3	SA	9.3.3	SA	9.3.3	SA	Well aligned, but MSR text does not cover repeater.
Fast transients common mode	9.5	ID	9.4	ID	9.4	ID	
Definition	9.5.1	ID	9.4.1	ID	9.4.1	ID	
Test method and level	9.5.2	ID	9.4.2	ID	9.4.2	ID	
Performance criteria	9.5.3	SA	9.4.3	SA	9.4.3	SA	Well aligned, but MSR text does not cover repeater.
RF common mode (0,15 MHz - 80 MHz)	9.6	ID	9.5	ID	9.5	ID	
Definition	9.6.1	ID	9.5.1	ID	9.5.1	ID	
Test method and level	9.6.2	ID	9.5.2	ID	9.5.2	ID	
Performance criteria	9.6.3	SA	9.5.3	SA	9.5.3	SA	Well aligned, but MSR text does not cover repeater.
Voltage dips and interruptions	9.7	ID	9.6	ID	9.6	ID	
Definition	9.7.1	ID	9.6.1	ID	9.6.1	ID	
Test method and level	9.7.2	ID	9.6.2	ID	9.6.2	ID	
Performance criteria	9.7.3	SA	9.6.3	SA	9.6.3	SA	Well aligned, but MSR text does not cover repeater.
Surges, common and differential mode	9.8	ID	9.7	ID	9.7	ID	
Definition	9.8.1	ID	9.7.1	ID	9.7.1	ID	
Test method and level	9.8.2	ID	9.7.2	ID	9.7.2	ID	
Performance criteria	9.8.3	SA	9.7.3	SA	9.7.3	SA	Well aligned, but MSR text does not cover repeater.

7.4 Annexes

Table 7.4-1: Analysis of the content of EMC specifications: Annexes

Topic	TS 25.113		TS 36.113		TS 37.113		Notes
	Clause	T	Clause	T	Clause	T	
BER assessment for GSM/EDGE	-	-	-	-	Annex A	DM	GSM/EDGE specific.

8 Alternatives for the BS specification structure

The existing structure of the BS specification can be illustrated in a simplified way as in Figure 8-1. The figure shows the core specifications TS 25.104 [2] for UTRA FDD, TS 25.105 [16] for UTRA TDD and TS 36.104 [3] for E-UTRA on the sides, together with the multi-RAT specification TS 37.104 [4] placed in the middle. The conformance test specifications (XX.141) and EMC specifications (XX.113) are not included, but those specifications have the same structural relationship. The UTRA TDD specification is not included in the figure.

A few "types" of requirements are illustrated in Figure 8-1. The first type are those RF requirements that has different description in the single-RAT specifications than for multi-RAT. The single-RAT requirements are identified as [Single-RAT UF] for UTRA FDD, [Single-RAT UT] for UTRA TDD (with the addition of 1.28, 3.84 and 7.68 to distinguish between the chip rates) and [Single-RAT E] for E-UTRA, while the corresponding multi-RAT requirement is identified as [Sngl/Multi-RAT]. Note that the scope of the multi-RAT requirement includes single-RAT operation. The cross-references for multiple requirements are illustrated with a thick dotted arrow and a thinner solid arrow for performance requirements.

The second type are those requirements that is described in the single-RAT specifications, while TS 37.104 only has a normative reference to the single-RAT requirements, identified as [Reference UF], [Reference UT] and [Reference E].

The third type is the performance requirements, which are in clause 8 of all specifications. Here all requirements are pure single-RAT and the complete single-RAT clauses are referenced from TS 37.104 also identified as [Reference UF], [Reference UT] and [Reference E].

Figure 8-1 will be used as a baseline to describe the different alternatives for changing the BS specification structure.

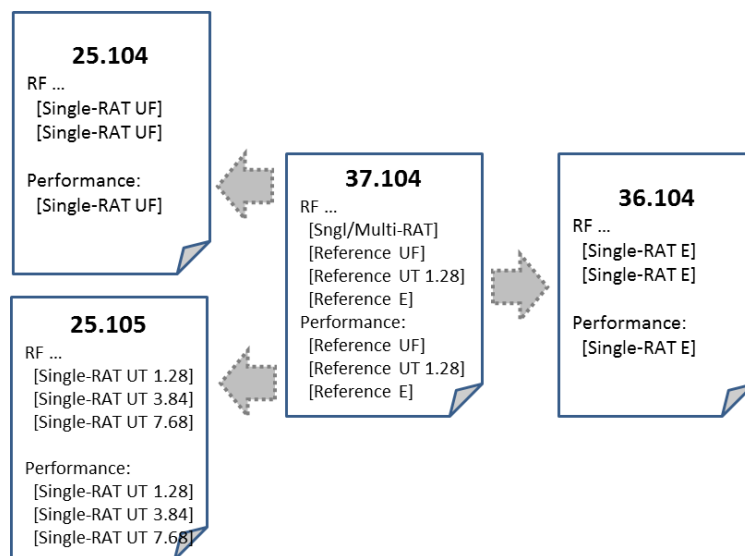


Figure 8-1: Baseline (existing) BS core specification structure (simplified view)

8.1 Alternative 1: Merge into a single specification

The most far-reaching change of the BS specification structure would be to make a complete merge of all requirements into a single specification. The merged specification TS 37.1xx would contain all types of requirements and cover both single-RAT and multi-RAT capable BS for all RATs (excluding GSM single-RAT).

Such a single spec structure is illustrated in Figure 8.1-1.

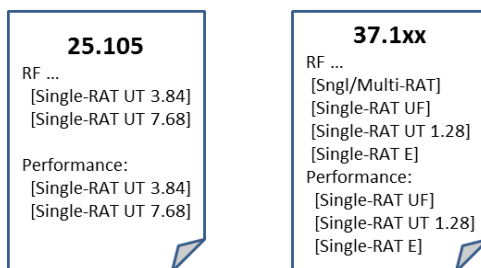


Figure 8.1-1: Alternative 1 for the BS specification structure (simplified view)

Pros of Alternative 1:

- Only a single specification to maintain for single-RAT and multi-RAT, replacing TS 25.104, TS 36.104 and TS 37.104.

Cons of Alternative 1:

- There is no visibility of the previous structure for backwards compatibility, making it more difficult to perform maintenance (Cat A CRs) and follow feature update through releases.
- Risk of high specification complexity with everything in one document.

8.2 Alternative 2: Single spec with shadow single-RAT specs

In order to keep traceability of legacy single-RAT requirements, there could be reasons to keep the single-RAT specifications, but without normative content. The only thing left in the single-RAT "shadow" specifications would be references to identify where in the merged single/multi-RAT specification that the corresponding requirements are found. In this way the old specifications would remain, but not contain any actual requirements, only references to the new specifications. The "shadow" legacy specifications in the new structure would not require any actual maintenance, since they would not contain any description of or limits for requirements. Any correction or new feature would only need to be done in the new merged specification.

The merged specification TS 37.1xx would contain all types of requirements and cover both single-RAT and multi-RAT capable BS for all RATs (excluding GSM single-RAT) as in TS 37.104.

Such a structure with "shadow" single-RAT and multi-RAT specs is illustrated in Figure 8.2-1.

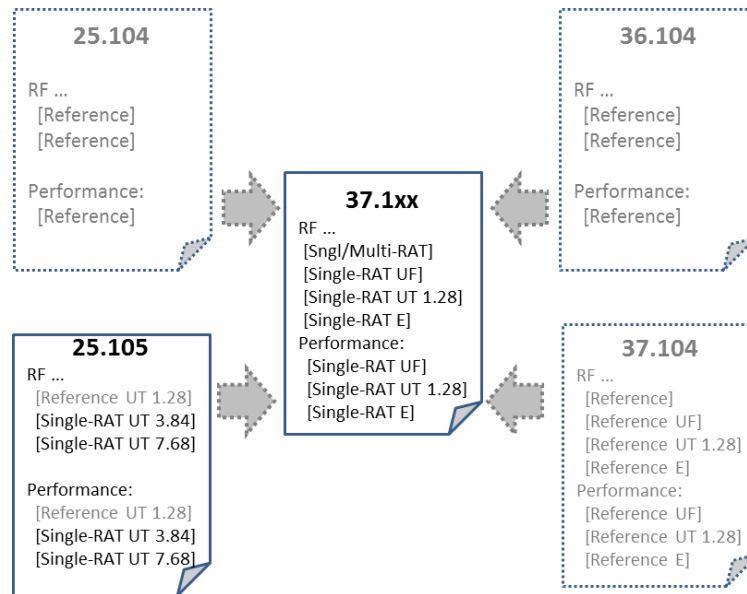


Figure 8.2-1: Alternative 2 for the BS specification structure (simplified view)

Pros of Alternative 2:

- Visibility of the previous structure for backwards compatibility through the "shadow spec" references, thereby facilitating maintenance (Cat A CRs) and to follow feature update through releases.
- A single specification to maintain and extend with new features for single-RAT and multi-RAT, replacing TS 25.104, TS 36.104 and TS 37.104, with a unified set of requirements for single-RAT and multi-RAT.

Cons of Alternative 2:

- Will need to keep the "shadow" TS 25.104, TS 36.104 and TS 37.104 specs (though there will be no maintenance needed).
- Risk of high specification complexity with everything in one document.

8.3 Alternative 3: Separate performance specs and shadow single-RAT specs

When the single RAT requirements are merged together with the existing single/multi-RAT requirements into a unified specification, it could end up being a very large document. In order to keep the size of the document reasonable, the single-RAT performance requirements (chapter 8) could be moved to separate new single-RAT specifications.

Such a structure with separate single-RAT performance specs is illustrated in Figure 8.3-1. Except for the separate single-RAT performance specifications, the structure is the same as in Alternative 2, containing a new merged specification and "shadow" legacy specifications containing references only. The cross-references for multiple RF requirements are illustrated with a thick arrow and for the performance requirements with a thinner arrow.

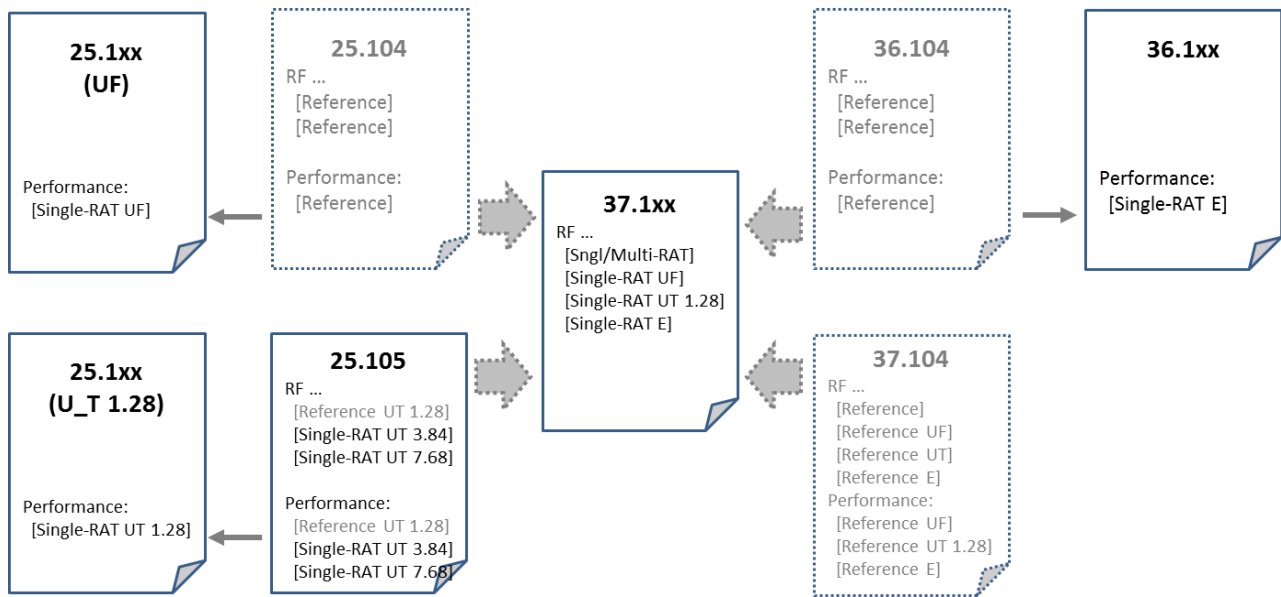


Figure 8.3-1: Alternative 3 for the BS specification structure (simplified view)

Pros of Alternative 3:

- Visibility of the previous structure for backwards compatibility through the "shadow spec" references, thereby facilitating maintenance (Cat A CRs) and to follow feature update through releases.
- The set of new specifications are in themselves easier to maintain and extend with new features, with a unified set of requirements for single-RAT and multi-RAT.
- Separate RF performance specification and Demodulation performance specifications (per RAT) to ensure that the complexity of each specification can be minimized.

Cons of Alternative 3:

- Will need to keep the "shadow" TS 25.104, TS 36.104 and TS 37.104 specs (though there will be no maintenance needed).

8.3a Alternative 3a: Cross referencing between a new unified specification for RF requirements and existing single-RAT specifications for performance requirements.

When the single RAT requirements are merged together with the existing single/multi-RAT requirements into a unified specification, it could end up being a very large document. In order to keep the size of the document reasonable, the single-RAT performance requirements (chapter 8) remain in the existing single-RAT specifications and for the performance requirements, the new unified specification refers back to these single-RAT specifications in the same way as the present MSR specification (TS37.104) does.

The structure is illustrated in Figure 8.3a-1. The difference from Alternative 3 is there are no separate single-RAT performance specifications. For the performance requirements, the new unified BS specification referenced back to each of the original (existing) single-RAT specification. The cross-references for multiple RF requirements are illustrated with a thick arrow.

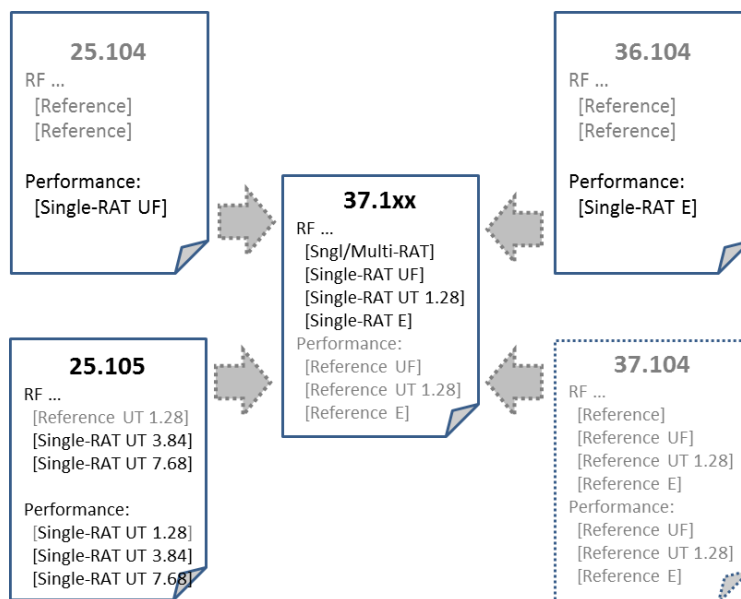


Figure 8.3a-1: Alternative 3a for the BS specification structure (simplified view)

Pros of Alternative 3a:

- Visibility of the previous structure for backwards compatibility by keeping the existing single-RAT specifications. For the RF requirements, these single-RAT specifications refer to the new unified specification which captures all the RF requirements in it. On the contrary, the new unified specification refers back to each single-RAT specification for performance the requirements.
- For the RF related requirements, only the new unified specification should be maintained if essential corrections are needed after a certain work will be completed. For the performance part, the existing single-RAT specifications will be maintained if necessary (as per today) and no additional work load is needed to establish the new BS structure.
- The complexity of the new specification is reduced, since demodulation performance remains in existing single RAT specifications.

Cons of Alternative 3a:

- We will need to keep the existing TS 25.104, TS 36.104 specifications (to maintain their performance part), while TS37.104 could be 'virtually closed (Stopping maintenance)' in the future. For the time being, all of these existing specifications should be kept alive.

8.4 Alternative 4: New BS RF and Performance Specification

In this alternative, two new BS specifications will be created; one for RF core requirements, including all the general, regulatory and regional requirements. The other new specification is for performance (demodulation) requirements. This is illustrated in Figure 8.4-1.

The RF core requirements include all the requirements in clause 4, 5, 6 and 7 of 25-, 36- and 37- series BS RF specifications. RF core requirements in TS 25.104, TS 25.105 and TS 36.104 are single-RAT requirements. The performance requirements are related to the BS demodulation performance requirements in clause 8 (including some annexes) in 25-, 36- and 37- series BS RF specifications. The BS demodulation performance requirements in TS 37.104 are basically referenced back to the single-RAT specifications. Therefore, these single-RAT requirements can be migrated to the new BS demodulation performance specification.

However, certain requirements can be referenced back to other specifications in order to reduce the complexity of new BS RF specifications. In order to keep those requirements in the legacy specification, these requirements should be stable and unlikely to change over time in order to minimise additional maintenance efforts.

To overcome the issues of legacy BS compliancy, regulatory and regional requirements, a transition period is used to ensure that the existing 25-, 36- and 37- series BS RF specifications are maintained in parallel with the new BS

specifications. After the transition period, those legacy specifications can be frozen (i.e. no need to be maintained by the MCC).

NOTE: How some of the legacy single-RAT requirements should be handled (e.g. TDD single-RAT) after the transition period should be further studied. If those requirements are to be maintained and/or kept, then cross-referencing those requirements between legacy specification and the new specification structure may be needed

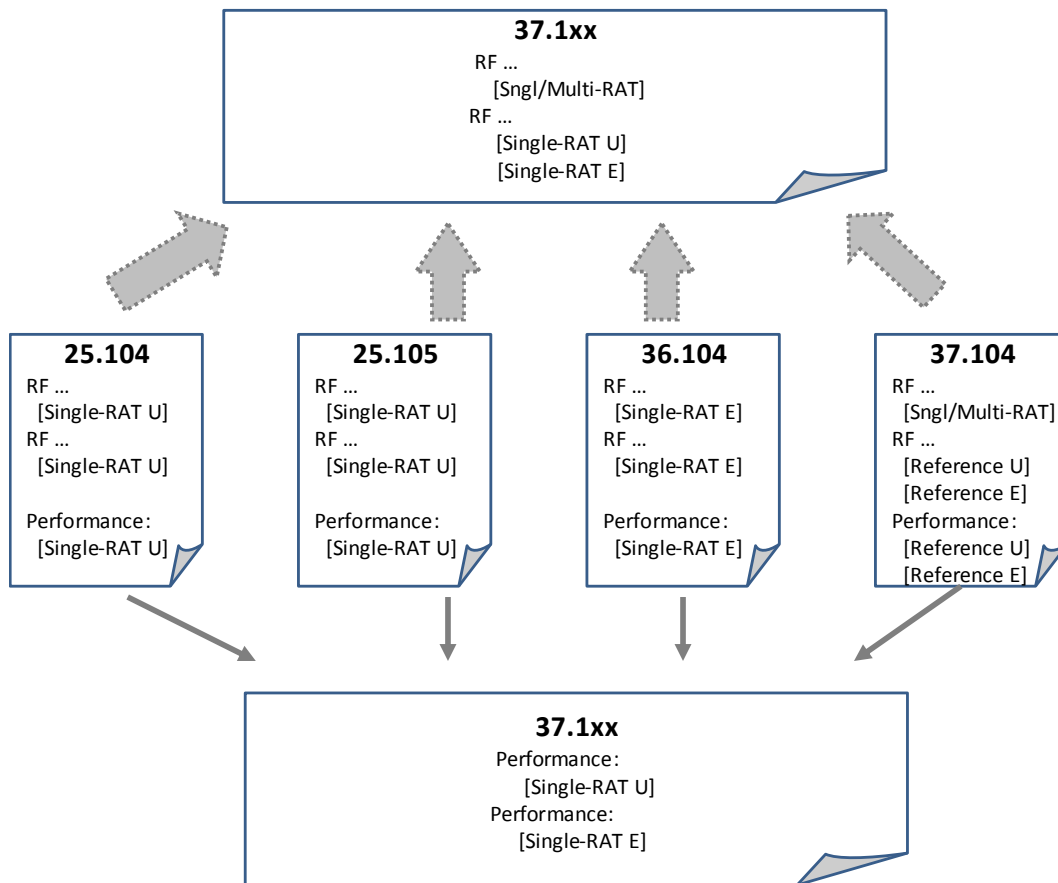


Figure 8.4-1: Alternative 4 for the BS specification structure (simplified view)

Pros of Alternative 4:

- A transition period is given to the legacy specifications (TS 25.104, TS 25.105, TS 36.104 and TS 37.104) to ensure that backward compatibility, regulatory and regional requirements, field deployment issues can be resolved on time.
- Separate RF performance specification and Demodulation performance specification to reduce complexity of each specification can be minimised.
- The set of new specifications are in themselves easier to maintain and extend with new features, with a unified set of requirements for single-RAT and multi-RAT.

Cons of Alternative 4:

- Additional parallel maintenance efforts for both legacy specifications and new specifications during the transition period.
- Due to cessation of legacy specifications maintenance, there may be confusion as no mapping of requirements between legacy and new specifications to facilitate any potential maintenance (i.e. Cat A CRs).
- Two more specifications to maintain and keep aligned than in the legacy specification structure.

9 Managing future RF features in a new structure

The topic of how to manage future RF features in a new structure should be studied for the new alternative structures proposed and really boils down to the specifications being "future proof".

The following are "types" of requirements that need to be managed:

- A) Requirement documented only in RAT-specific single-RAT version(s) (UTRA and/or E-UTRA): It is today updated per RAT (as applicable) for any new feature added. In a new structure, the single-RAT versions will have to be kept since they are different and any new feature would have to be added in the same way as today.
- B) Requirement documented in virtually identical single-RAT version(s) (UTRA and/or E-UTRA) and multi-RAT version: It is today updated per RAT (as applicable) plus multi-RAT, for any new feature added. In a new structure, it would be possible to have only one single, generic version for all RATs, including multi-RAT. Any new feature would be added only once to the "merged" generic requirement.
- C) Requirement documented in different single-RAT version(s) (UTRA and/or E-UTRA) plus a multi-RAT version: It is today updated per RAT (as applicable) plus multi-RAT, for any new feature added. In a new structure, it would be possible to keep both single-RAT and multi-RAT requirement options in the specification. A new feature may be added to any requirement option as needed.

Examples of requirements of the above types are

- Type A: Performance (chapter 8)
- Type B: Spurious emissions
- Type C: Spectrum mask/UEM

The types of requirements above can be managed if proper care is taken when merging specifications. The most important conclusion is that a merged Type B generic requirement (if possible) makes new features and feature maintenance much easier. There are however single-RAT requirements and options, where multiple versions will need updates and maintenance, for legacy reasons. It should be noted however for Type A and C, that just by putting the separate single-RAT requirements in the same documents makes inclusion of new features and maintenance easier, since any difference or divergence will stand out. This is the same advantage that was achieved by putting FDD and TDD in the same specification for E-UTRA.

10 Conformance declaration

Conformance declaration is normally made in relation to the test specification, declaring what requirements (and corresponding tests) that a BS is conforming with. The structure and layout of the requirements in the specification needs to be clear, so that a conformation declaration does not become ambiguous. It should also be clear from the overall structure of the set of specifications which documents you need to declare conformance to.

There are already today multiple Options for some RF requirements, even in the single-RAT specifications. The reason is that some limits may be regional (e.g. Category A/B spurious emissions and other regional limits) or there may be multiple options for other reasons (UEM mask options). If requirements are merged, it is likely that there will be more options for some requirements, especially single-RAT options. This will require careful drafting of a merged specification to avoid ambiguous statements.

One way to identify which requirements are applicable for each RAT capability is through an "Applicability" table such as in the present TS 37.141. Here the applicable requirements are related to a declared "Capability Set" (CSx) that identifies the RAT capability of the BS. Such a structure should be re-used and possibly enhanced in a merged specification covering multiple RAT combinations.

A problem when merging specs for different RATs that has been identified in the analysis of the specifications is that the number of requirement options may increase. Since there may be varying requests from the market as to what requirement options to declare conformance to, there is a risk of an increased burden in terms of conformance testing and documentation. This could be more efficiently handled if it is made clear in the merged specification which requirement option(s) that are inherently fulfilled by testing according to a specific requirement. Such a description

could e.g. be presented as a mapping table between requirements tested and requirement options that are inherently met by the test.

11 Compliance for legacy BS

Regarding compliance for legacy BS in a new BS spec structure, it is noted that the multi-RAT/single-RAT requirements as defined to day in TS 37.104 will remain as they are, since they are based on the study done of single-RAT requirements during the MSR work [5]. Both single-RAT and multi-RAT requirements will however have to be kept in a new structure for both legacy and new BS, in order to make it possible to also upgrade legacy BS to new releases.

The legacy requirement must be kept in the new BS specification structure, since otherwise legacy BS hardware would need to be upgraded to be compliant to the new requirements in future releases. This would also be the case for software upgrades for a future release, in case the BS hardware is designed based on legacy requirements. By maintaining the legacy requirements in the new BS specification structure (as stated in the SI objective), these problems can be avoided.

12 Regulatory references for Base Stations

12.1 General

One area of study is how to accommodate regulatory references to the new BS specification structure for single-RAT and multi-RAT Base Stations. Since regional SDOs develops standards that may directly or indirectly reference 3GPP standards, feedback from the regional SDOs on a possible new BS specification structure will be valuable as future input to the work. There are also references to take into account in the ITU-R recommendations for IMT.

In order to avoid invalidating references from external documents to particular clause, table or figure, it is essential and important to check with the each drafting rules in [17] and follow them when we establish the new BS specification structure from the existing ones. Especially the following drafting rule should be strictly applied:

- Hanging paragraphs should be avoided.
- When removing existing contents in TSs, they should be replaced by the term 'void' and the title of the section will be retained.
- 'Sequential numbering' scheme in the original single RAT TS cannot be kept. Instead general renumbering should be done manually in the new unified TS. If necessary, cross reference table gathering original numbering in the original specification to the renumbered numbers in the new specification could be considered.

12.2 Regulatory references in ETSI

The following is based on feedback received from ETSI MSG TFES [8].

It is noted by TFES that presently, there is in ETSI an IMT harmonized standard part for each 3GPP BS type (UTRA, E-UTRA and MSR) containing BS RF requirements. There is also one requirement (Radiated emissions) in the common harmonized standards part (Part 1) for all BS types. Presently, TFES is initiating work on its 7th standards release, corresponding to 3GPP Release 11. Work on the 8th release, corresponding to 3GPP Release 12, will not start until late 2014 or in 2015.

The ETSI harmonized standards for IMT have both direct and indirect references to the 3GPP BS specifications. It is noted that direct references can be updated in the ETSI harmonized standards to reference new parts of the 3GPP documentation, in case the target of the direct reference is restructured or moved.

A substantial amount of text in the IMT BS harmonized standards is partially aligned with the 3GPP BS specifications without direct reference, thereby giving "indirect reference" to the 3GPP specifications. If needed, this text is possible to update for the 8th release of the IMT harmonized standard, in order to maintain an alignment with the 3GPP BS specifications, in case the layout of the requirements would change because of a restructuring.

Though ETSI MSG TFES has not evaluated what changes that will be made to the BS and EMC specification structure at this time, it is noted that it is possible to adapt also the structure of the multi-part ETSI harmonized standards for IMT, if deemed necessary by TFES.

12.3 Regulatory references in ARIB

The following is based on feedback received from ARIB [9].

ARIB notes that prudent consideration how to accommodate regulatory references to the new BS specification structure for single-RAT and multi-RAT Base Stations are one of the important aspects in this study. As one of SDOs which transposes some of these specifications from 3GPP standards to of its own, ARIB provides the following observations:

1. It is observed that there will be no change in the existing requirements in BS or EMC RF specifications as the consequence of the study in RAN4 since the objective section of the study item description sheet in [2] states as follows:

‘no change of existing requirements as a consequence of the new possible BS specification structure is assumed’.
2. It would be worthwhile to note that several requirements for different single RATs in 3GPP in different releases are referred by at least two ITU-R Recommendations. As an example, for the case of BS Radio transmission and Reception specifications for single RAT cases;
 - ① Section 5.1 (IMT-2000 CDMA Direct Spread) in Recommendation ITU-R M.1457 [6] refers to:
 - UTRA BS (FDD) requirements in ARIB STD-T63-25.104 from Rel-99 to Rel-10
 - E-UTRA BS requirements in ARIB STD-T63-36.104 from Rel-8 to Rel-10
 - ② Section 5.3 (IMT-2000 CDMA TDD) in Recommendation ITU-R M.1457 [6] refers to:
 - UTRA BS (TDD) requirements in ARIB STD-T63-25.105 from Rel-99 to Rel-10
 - E-UTRA BS requirements in ARIB STD-T63-36.104 from Rel-8 to Rel-10
 - ③ Annex 1 (Specification of the LTE-Advanced radio interface technology) in Recommendation ITU-R M.2012 [7] refers to:
 - E-UTRA BS requirements in ARIB STD-T104-36.104 in Release 10.

Table 12.3-1: Referenced ARIB standards by ITU-R Recommendations

ITU-R Recommendations		ARIB STD-T63			ARIB STD-T104
		UMTS (FDD)	UMTS (TDD)	LTE	LTE-Advanced
M.1457-11	FDD section	T63-25.104 (Rel.99 to Rel.10)	-	T63-36.104 (Rel.8 to Rel.10)	-
	TDD section	-	T63-25.105 (Rel.99 to Rel.10)	T63-36.104 (Rel.8 to Rel.10)	-
M.2012	Annex for LTE- Advanced	-	-	-	T104-36.104 (Rel.10)

Each of the ARIB standards mentioned above was transposed from its corresponding 3GPP technical specification.

Neither the above list nor table is not exhaustive and shows a part of referenced specifications in ARIB, the referenced structure is complicated enough. Therefore paying attention to distinction between referenced requirements for different RATs and different releases would be one of the key aspects when to consider the specification structure.

3. The effect of test tolerances on the regulatory aspect should not be overlooked. Since the conformance test requirements in 3GPP, such as TS25.141 (UTRA FDD), TS25.142 (UTRA TDD) or TS36.141 (E-UTRA FDD/TDD), capture the test tolerances, keeping consistent structure of these conformance test requirements with

that of corresponding requirements in specifications for Radio transmission and Reception would be another focal point of the study.

12.4 Regulatory references in ITU-R recommendations

There may also be impact on ITU-R recommendations, which should be investigated. ITU-R has two recommendations describing the Radio Interface Technologies (RIT) for IMT-2000 (M.1457-11 [6]) and for IMT-Advanced (M.2012 [7]). There are no references to the 3GPP BS specifications from the technical description of the RITs concerned. There are however lists in the two recommendations of the relevant 3GPP specifications that give the "Detailed specification of the radio interface". The lists identify the specifications that the relevant SDOs need to transpose from the set of 3GPP specs and make available from their web sites, with references to all our BS core, conformance and EMC specifications. This includes the single-RAT specifications (25-series and 36-series) and multi-RAT specifications (37-series). The single-RAT 25-series is listed only for IMT-2000.

If 3GPP implements a new structure of the BS specification in Rel-12, there would be a new set of specifications to list in the coming versions of M.1457 and M.2012, in place of the ones listed now. It is noted that changing the set of referenced transposed specifications in itself would create a problem. What could be investigated further is if there would be a need to include a note in the ITU-R recommendations to identify which recommendations in previous releases that the new ones correspond to.

13 Compliance to legacy requirements for each RAT

It is discussed in clause 11 how to make compliance for legacy BS possible in a new BS spec structure possible. Another separate study area concerns the "reverse" issue, i.e. how to ensure compliance to legacy requirements for each RAT in a new structure.

The SID objective states that "no change of existing requirements as a consequence of the new possible BS specification structure is assumed". This implies that a requirement stated in one of the specifications today should also remain and be covered by a merged specification.

Since the key here is to ensure compliance to legacy requirements, which is the topic of this clause, it would *in principle* only be necessary to keep the most stringent one if there are multiple legacy requirements. This is however not the case, since all legacy requirement options would have to be kept, since it is clear from the SI objective that requirements cannot be changed (or removed).

With all requirement options merged to a new BS specification structure, there are really two cases:

- If there is only a single requirement in the new structure, that requirement must then be identical to the legacy requirement(s).
- If there are multiple requirement options in the new structure, it must then be identified clearly which requirement that corresponds to a specific requirement in the legacy structure and for which RAT it is valid.

In both cases, a BS compliant to the new BS specification structure, for a requirement that is taken from the legacy structure, will comply with that requirement for each applicable RAT as specified in the legacy structure.

14 Migration of BS specification structure

For the migration of the existing 25-, 36- and 37- series specifications into the new specification structure, the following aspects need to be considered:

- Analysis of each requirement by comparing it across 25-, 36- and 37- series specifications.
- Determination of new specification structure through the alternatives proposed in Clause 8. Based on the chosen alternative, a clear structure will be in place to base the migration on.

- Handling of regulatory requirements. These requirements are unique and highly dependent on the external SDOs.

A work item plan for a New BS specification structure should describe what further studies that may be needed and in what order the specifications can be migrated through CRs. The analysis made in the study item of core, test and EMC specification will be very useful for the actual CR drafting, since it maps the requirements across the specifications and identifies which ones are well aligned already today and which ones that are more complex. The study of core requirements have been very thorough, while it is likely that some more detailed analysis will be needed for the test and EMC specifications in a WI phase.

From the specification analysis, it seems that the test specifications have the most complex relations due to the many elements involved such as test models, test configurations, test signal generation, procedures etc. The core requirements have a cleaner structure and relationship between specifications. A re-structuring could therefore start with the core specifications. While that is on-going, further analysis could be done of the test specifications and possibly the EMC specifications (if needed). As a second step after that, the test specifications can be merged into the new structure, to align with the core specifications. If the mapping between the structures is well defined, there should be no problem to have this phased approach for the migration.

The EMC specifications can be done as a final step. They are not updated with new features very often and have a simpler structure with fewer requirements and can therefore be updated independently. Note that EMC specifications are pure conformance test specifications, with no corresponding core requirement documented.

A work item for a New BS specification structure can then be conducted in four phases:

1. Development and preparation of the new specification structure and further analysis of the specifications
2. Produce a new core specification and CRs to existing core specifications
3. Produce a new test specification and CRs to existing test specifications
4. Produce a new EMC specification CRs to existing EMC specifications

One possibility is to run the preparation phase over two meeting cycles and then have one meeting cycle each of the three CR phases. This should give sufficient time for further analysis and development of the structure before drafting CRs. Since the approached is phased care has to be taken to make sure that the consistency is maintained between core and test specifications

In the migration, there may be CRs submitted in parallel for other Rel-12 work items and Cat A CRs stemming from previous releases. Those have to be tracked carefully by the MCC and the WI Rapporteur, since any type of CR can be seen as overlapping with a re-structuring CR. These CRs will have to be "overlaid" on the restructuring. This should work, since the re-structuring will not change any actual requirements. It may not really be possible to "hold off" CRs of other on-going work items, considering the RAN4 time schedule. There is however no work item in Rel-12 with a large impact on the BS specifications, so the impact may actually be larger from Cat A CRs.

During the WI phase, the work format could be to use a TR to document decision on the structure and attachments in the form of draft TS text, to be used as basis for the coming new specifications. It is however noted that in the end a single CR per existing specification plus a new specification will be needed and it has to be produced in a single meeting cycle from the latest specification version.

15 Conclusion and Recommendation

TSG RAN4 has studied the 3GPP BS specification structure in order to determine the feasibility of a new BS specification structure, in order to avoid duplicate specification work for new RF features (in case of identical features among different RATs) and to avoid future discussions regarding how to implement the new features in single-RAT and/or multi-RAT specifications. The focus has been on possibilities to migrate the present set of RAT-specific specifications into a smaller set of specifications that cover more than one RAT.

The following study areas are covered and concluded:

1. **Future RF features:** Some requirement can differ between RATs, since they may be RAT-specific or because there are different versions for other reasons such as regional variations. It is concluded that this can be managed by keeping all requirement options. There would still be a synergy in terms of having a common updating and maintenance in a merged specification, even for requirement with variations between RATs.
2. **Conformance declaration:** There may be different requirements between RATs and also variations within a RAT and these different options will have to be uniquely defined in a merged specification. By clearly identifying the applicability of each requirement in terms of RATs and configuration, proper references can be made in a conformance declaration.
3. **Compliance for legacy BS:** It is concluded that since the legacy requirement options are kept in a new structure, compliance for legacy BS from previous releases will be maintained in the new structure.
4. **Regulatory References for BS:** It will be important to follow the 3GPP drafting guide lines properly in order to accommodate regulatory references. Liaisons have also been sent to regional SDOs to confirm that a re-structuring of the specifications does not have a detrimental impact on regulatory references.
5. **Compliance to legacy requirements:** It is concluded that both for the cases where a merged specification will contain a single "unified" requirement and for the cases where there will be multiple requirement options, compliance to legacy requirements for each RAT will be maintained for a BS complying with the new BS specification structure.
6. **Migration of BS specifications:** The migration can be done in phases, starting with a preparation phase when also some further studies will be made. This can be followed by a staggered creation of new core, conformance test and EMC specifications, each accompanied by CRs to existing specifications.

Overall, there was no major issue identified among the study areas that would prohibit a migration of the BS specifications to a smaller set covering more than one RAT. There was however several topics identified where care must be taken during a migration to a new structure.

A detailed analysis has also been performed of the 3GPP BS specifications, in order to identify relationships between requirements across specifications and to document which ones that can easily be migrated and which ones that will require more care.

- **Core specifications:** While many requirements are identical or very similar between the specifications, there are also a number of requirements where there are different options that will need to be kept that are either RAT-specific or with regional applicability. This must be done in a way that minimizes complexity of the new specification.
- **Conformance test specifications:** The same relation between requirements exists as for core specifications, but there are also other variations to consider. While many tests are generic in nature, there are some variations in test procedures and test configurations that will need to be considered. More detailed analysis, especially of test configurations, will be needed in the work item phase.
- **EMC specifications:** The EMC specifications are much more generic in nature and there are quite few variations between the specifications concerning test procedures. The EMC requirements and limits are well harmonized across the specifications.

Considering the analysis made and also other relevant criteria for migration of the BS specifications, five different alternatives for a new BS specification structure have been evaluated. Alternative 3a as illustrated in Figure 15-1 was determined to be the most suitable options, since it provides a high visibility of the previous structure for regulatory references and a single RF specification to be maintained together with separate documentation of demodulation

performance requirements for each RAT, in order to reduce the complexity of each document. The structure in Figure 15-1 is documented in more detail in subclause 8.3a.

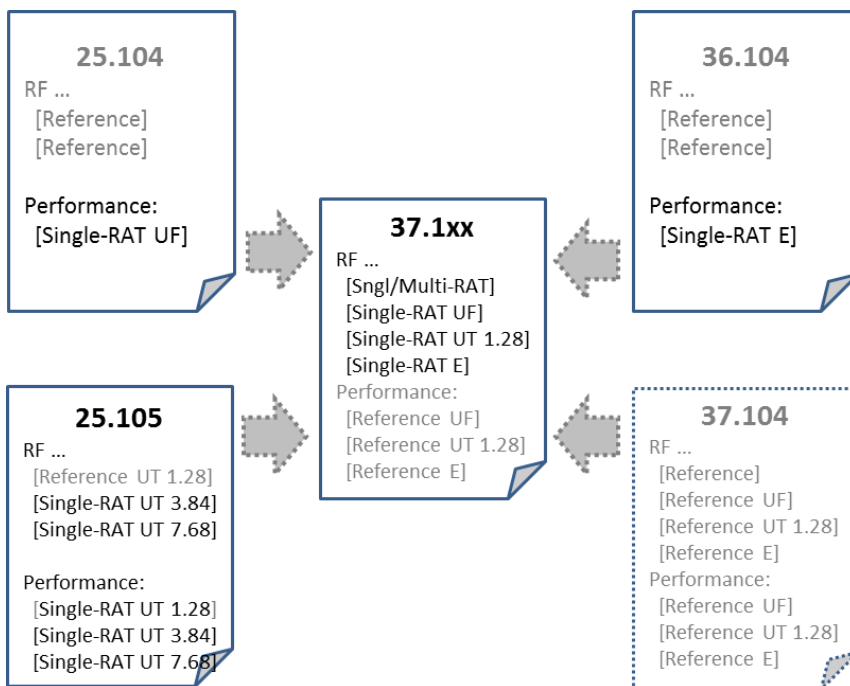


Figure 15-1: Recommended new BS specification structure

Annex A: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2013-01	R4#66	R4-130363			Report skeleton		0.0.1
2013-04	R4#66bis	R4-131432			Agreed Text Proposal in RAN4 #66: R4-130364 , "TP for Study item objective" R4-130366 , "TP for Status of core specs" R4-130956 , "TP for Alternatives for the BS spec structure"	0.0.1	0.1.0
2013-05	R4#67	R4-132216			Agreed Text Proposal in RAN4 #66bis: R4-131994 , "TP for Alternatives for the BS spec structure" R4-132009 , "TP on Managing future RF features in a new structure" R4-132010 , "TP on Compliance to legacy requirements in a new BS specifications structure" R4-132018 , "TP on Regulatory references for the BS structure"	0.1.0	0.2.0
2013-05	R4#67	R4-132996			Agreed Text Proposal in RAN4 #66bis: R4-132219 , "TP for TR 37.810 v0.2.0: Status of core specifications, Rx requirements" R4-132220 , "TP for TR 37.810 v0.2.0: Status of core specifications, Annexes" R4-132221 , "TP for TR 37.810 v0.2.0: Status of test specifications, general parts" R4-132222 , "TP for TR 37.810 v0.2.0: Status of test specifications, Tx requirements" R4-132223 , "TP for TR 37.810 v0.2.0: Status of test specifications, Rx requirements" R4-132224 , "TP for TR 37.810 v0.2.0: Status of test specifications, Annexes" R4-132225 , "TP for TR 37.810 v0.2.0: Status of EMC specifications" R4-132230 , "TP for TR 37.810 v0.2.0: Pros and cons for the Alternative BS specification structures" R4-132438 , "TP for Regulatory references for Base Stations" R4-132597 , "TP for TR 37.810 v0.2.0: Status Analysis of TS25.105 Performance/Annex part" R4-132635 , "TP for TR 37.810 v0.2.0: Status Analysis of TS 25.105, Rx requirements" R4-132980 , "TP for TR 37.810 v0.2.0: Study conclusions" R4-132981 , "TP for TR 37.810 v0.2.0: Status of core specifications, general parts" R4-132982 , "TP for TR 37.810 v0.2.0: Status of core specifications, Tx requirements" R4-132983 , "TP for status of TDD core specs-General part" R4-132984 , "TP for status of TDD core specs-Transmitter characteristics" R4-132985 , "TP for TR 37.810 v0.2.0: Conformance declaration" R4-132986 , "TP for TR 37.810 v0.2.0: Compliance to legacy requirements for each RAT" R4-132987 , "TP for TR 37.810 v0.2.0: Alternatives for the BS spec structure" R4-133081 , "TP for TR 37.810 v0.2.0: Migration of BS specification structure" R4-133100 , "TP for TR 37.810 v0.2.0: Updates to Alternative 4" R4-133128 , "TP for a variation of Alternative 3 for the BS spec structure"	0.2.0	0.3.0
2013-06	RP#60	RP-130661			Presentation to TSG RAN	0.3.0	1.0.0