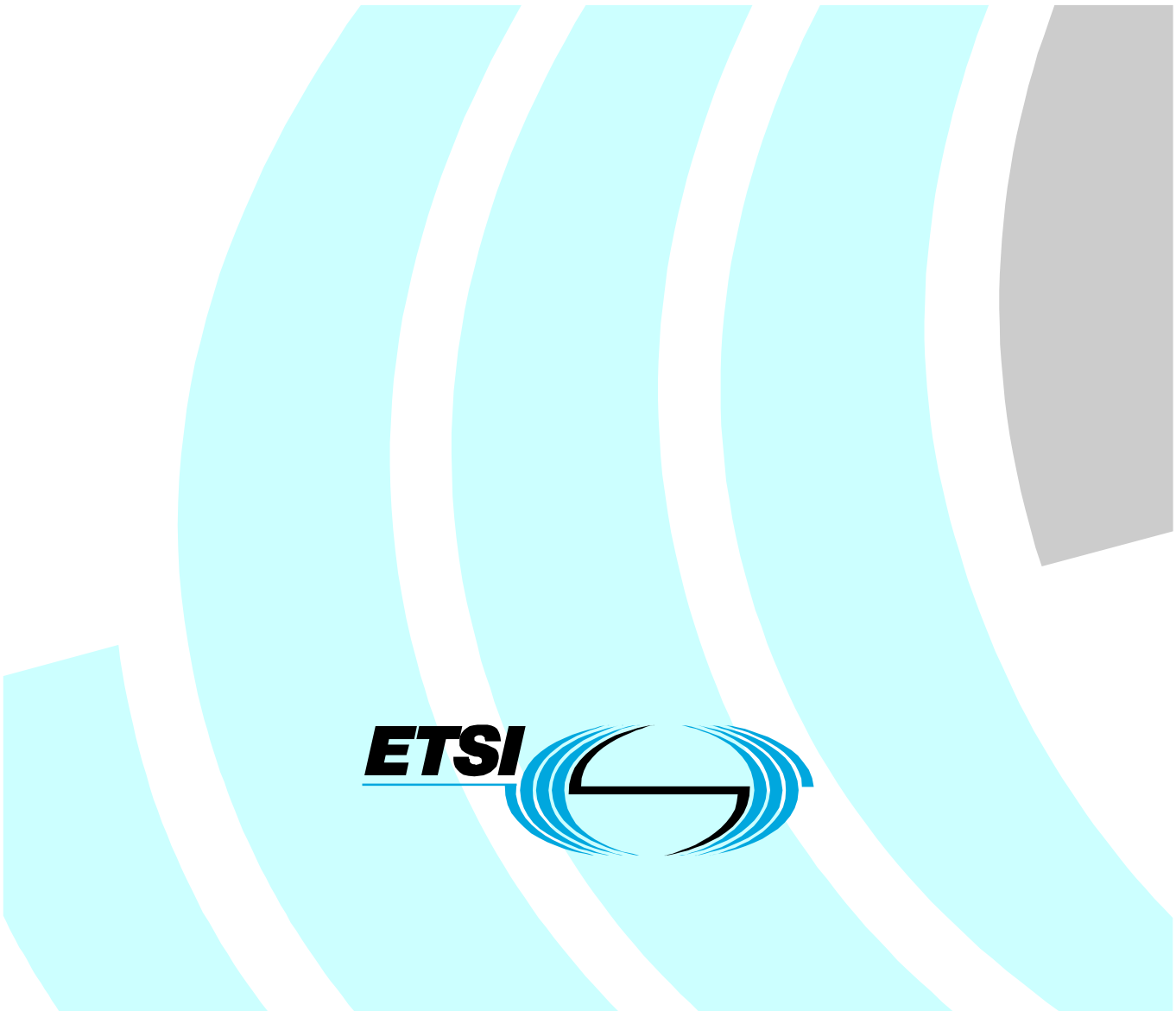
ETSI TS 102 524 V1.1.1 (2006-07)

Technical Specification

Fixed Radio Systems;
Point-to-Point equipment;
Radio equipment and antennas for use in Point-to-Point Millimetre wave applications in the Fixed Services (mmwFS) frequency bands 71 GHz to 76 GHz and 81 GHz to 86 GHz



Reference
DTS/TM-04166

Keywords
antenna, DFRS, FWA, point-to-point, radio, transmission

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM).

Introduction

ECC/REC (05)07 [14] defines the channel arrangement for the 71 GHz to 76 GHz and 81 GHz to 86 GHz bands. Within each 5 GHz bandwidth, nineteen 250 MHz channels are defined, with a 125 MHz guard band at the bottom and top of each 5 GHz band. Aggregation of any number of channels, from 1 to 19, is permitted.

The technical specifications of millimetre wave applications in the Fixed Service (mmwFS) in the band 71 GHz to 86 GHz and 81 GHz to 86 GHz are described in the present document. Antenna systems suitable for use in mmwFS are also described in the present document.

Currently, all standardized point-to-point systems, in bands between 1 GHz and 58 GHz, have been combined into a single multi-part standard, EN 302 217 (see bibliography), which includes Harmonized parts 2-2 and 4-2 that are relevant to article 3.2 of the Directive 1999/5/EC [1] (R&TTE Directive).

Transposition of these technical specifications into a Harmonized EN will require further activity inside ETSI, to resolve questions related to the effective use of the spectrum and the "Technology independent assignment" of the band.

1 Scope

The present document applies to millimetre wave applications in the Fixed Service (mmwFS) in the band 71 GHz to 76 GHz and 81 GHz to 86 GHz.

Systems proposed for these bands concentrate radiated power in a very narrow path and have considerable attenuation at much shorter distances than occurs in the lower microwave bands.

At least two types of equipment are identified:

- Equipment using less complex (lower-order) modulation schemes is feasible in this band still offering suitable link lengths. Typical applications are very wide-band short connections made with simple and robust modulation formats.
- Equipment using higher modulation schemes is also feasible offering the possibility to carry extremely high capacities, in order to support interfaces like Gigabit Ethernet on very short lengths, for instance as an alternative to FSO connections.

Even if no limitation in terms of spectral efficiency and modulation format is here made, a minimum applicable RIC figure, according with the channel widths and the class of operation of the systems, are provided. For the purpose of the present document system classes are defined according to table 1.

Table 1: System classes of operation

Spectral efficiency	128 states Modulation	64 states Modulation	32 states Modulation	16 states Modulation	4 states Modulation	2 states Modulation
Class	5H	5L	4H	4L	2	1
NOTE: Modulation is only for reference (other modulation schemes could be used).						

For the purpose of the present document, a planning assumption is made that the system operates within a "Technology-independent assignment" of any size up to 5 GHz (see note); therefore, it includes those system characteristics that, according to the related planning assumptions, may be considered relevant to essential parameters under article 3.2 of the Directive1999/5/EC [1], which states that "*[…] radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference*".

NOTE: Links may be assigned to operate in any bandwidth within the band, or to operate across the entire band. The relevant equipment parameters are referenced in the present document as well as antenna parameters.

A wide range of millimetre wave applications in the Fixed Service (mmwFS) is possible. Where appropriate, the corresponding test requirements are cross-referenced to EN 301 126-1 [2] and EN 301 126-3-1 [3].

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[2] ETSI EN 301 126-1: "Fixed Radio Systems; Conformance testing; Part 1: Point-to-point equipment - Definitions, general requirements and test procedures".

[3] ETSI EN 301 126-3-1: "Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas; Definitions, general requirements and test procedures".

[4] ITU-R Recommendation SM.1541: "Unwanted emissions in the out-of-band domain".

[5] CEPT/ERC/REC 74-01: "unwanted emissions in the spurious domain".

[6] ITU-R Recommendation SM.1045-1: "Frequency tolerance of transmitters".

[7] ITU-T Recommendation O.151: "Error performance measuring equipment operating at the primary rate and above".

[8] ITU-T Recommendation O.181: "Equipment to assess error performance on STM-N interfaces".

[9] ITU-T Recommendation O.191: "Equipment to measure the cell transfer performance of ATM connections".

[10] IEEE 1802.3 (2001): "IEEE Conformance Test Methodology for IEEE Standards for Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access With Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".

[11] IEEE 802.3 (2005): "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".

[12] ETSI EN 301 997-2: "Transmission and Multiplexing (TM); Multipoint equipment; Radio equipment for use in Multimedia Wireless Systems (MWS) in the frequency band 40,5 GHz to 43,5 GHz; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

[13] ITU Radio Regulations.

[14] CEPT/ECC/REC (05)07: "Radio frequency channel arrangements for Fixed Service Systems operating in the bands 71-76 GHz and 81-86 GHz".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

aggregated channel: the overall channel size, consisting of one to nineteen adjoined 250 MHz channels according CEPT/ECC/REC (05)07 [14]

asssignment (of a radio frequency or radio frequency channel): authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions (RR article 1, No. 18 of ITU Radio Regulations [13])

NOTE: In the present document this term is also applied to the aggregate channel concerned.

conformity assessment procedure: See Directive 1999/5/EC [1] annexes II, III, IV and V.

environmental profile: range of environmental conditions, declared by the supplier, under which equipment, within the scope of TS 102 524, is required to comply with the provisions of TS 102 524

essential phenomenon: radio frequency phenomenon related to the essential requirements under article 3.2 of the Directive 1999/5/EC [1] that is capable of expression in terms of quantifiable technical parameters

occupied bandwidth: the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage β/2 of the total mean power of a given emission

NOTE: For the purpose of the present document, β/2 is assumed to be equal to 0,5 %.

operating frequency range: range(s) of radio frequency channels covered by the Equipment Under Test (EUT) without any change

radio equipment: a product or relevant component thereof capable of communication by means of the emission and/or reception of radio waves utilizing the spectrum allocated to terrestrial/space radio communication

NOTE: See article 2 of Directive 1999/5/EC [1].

3.2 Symbols

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

dBm	decibel ratio relative to 1 milliWatt
dBW/MHz	spectral power density relative to 1 Watt in 1 MHz bandwidth

3.3 Abbreviations

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

BER	Bit Error Ratio
CW	Continuous Wave
DFRS	Digital Fixed Radio Systems
EIRP	Equivalent Isotropically Radiated Power
mmwFS	millimetre wave applications in the Fixed Service
R&TTE	Radio equipment and Telecommunications Terminal Equipment (Directive)
RF	Radio Frequency
RFC	Remote Frequency Control
RIC	Radio Interface Capacity
RPE	Radiation Pattern Envelope
RSL	Receive Signal Level
Tx	Transmitter

4 System requirements

The following clauses describe the requirements that have been considered necessary for the deployment of systems with the planning assumptions in the scope of the present document. They may be used, by equipment suppliers in agreement with a Notified Body, as reference for the phenomena relevant to essential requirements under article 3.2 of Directive 1999/5/EC [1].

NOTE: Test methods referenced below are only those considered essential for the possible assessment of conformity to article 3.2 (i.e. for the reproducibility of the results).

4.1 Phenomena description

Guidance and description of the phenomena relevant to "essential requirements" under article 3.2 is given in EG 201 399 (see bibliography); specific applications and descriptions for DFRS is given in TR 101 506 (see bibliography).

4.2 Environmental specifications and tests

The technical requirements of the present document apply under the environmental profile for intended operation of the equipment and or antennas, which shall be declared by the manufacturer or person responsible for placing the apparatus on the market.

The environmental profile may be determined by the environmental class of the equipment and antennas according to the guidance given in clause 4.4 of EN 301 126-1 [2].

The environmental profile of the equipment and antennas shall be declared by the manufacturer or person responsible for placing the apparatus on the market.

The equipment and antennas shall comply with all of the requirements of the present document at all times, when operating within the boundary limits of the required declared operational environmental profile.

Any test carried out with the intention of generating a test report and/or declaration of conformity, required to fulfil any conformity assessment procedure foreseen by the R&TTE Directive [1] for radio equipment, shall be carried out with the same principles and procedures for both reference and extreme conditions reported in clause 4.4 of EN 301 126-1 [2]. The requirement for testing at reference or extreme conditions is reported in any relevant clauses of the present document, according to the principles for similar requirements in EN 301 126-1 [2].

Any test carried out with the intention of generating a test report and/or declaration of conformity, required to fulfil any conformity assessment procedure foreseen by the R&TTE Directive (1999/5/EC) [1] for integral or stand-alone antennas, shall be carried out with the same principles and procedures for both reference and extreme conditions reported in clause 4.4 of EN 301 126-1 [2]. The requirement for testing at reference or extreme conditions is reported in any relevant clauses of the present document, according to the principles for similar requirements in EN 301 126-1 [2].

The test report shall be produced according to the procedure foreseen by article 10 of the Directive 1999/5/EC [1].

4.3 Radio-frequency range for which specifications and tests for equipment are applicable

4.3.1 Radio equipment

Equipment can provide single radio frequency operation (e.g. when the RF duplexer filters are tuned to a specific operating frequency) or offer a wider operating frequency range (e.g. wide-band RF duplexer and frequency agility through the use of an RFC function). Ease of deployment and spare parts handling by operators with large networks is facilitated where more than one frequency is used.

The equipment shall comply with all the requirements of the present document at any possible operating frequency. ECC/REC (05)07 [14] defines the channel arrangement for the 71 GHz to 76 GHz and 81 GHz to 86 GHz bands. Within each 5 GHz bandwidth, nineteen 250 MHz channels are defined, with a 125 MHz guard band at the bottom and top of each 5 GHz band. Aggregation of any number of channels, from 1 to 19, is permitted.

The tests shall be carried out in the following way:

1) in the case of equipment intended for single frequency operation, the test report shall be produced for a single operating radio frequency arbitrarily chosen by the supplier (see figure 1);

2) in the case of equipment intended for covering an operating frequency range, the test report shall be produced for the lowest, central (intermediate) and highest possible operating radio frequencies within that operating frequency range (see figure 1);

3) it is not required that all the tests, required for the test report, are made on the same sample of equipment and at the same time; provided that the test report includes all of the tests required by the present document, each test may be made on different samples of the same equipment, at different operating frequencies or frequency ranges and at different times.

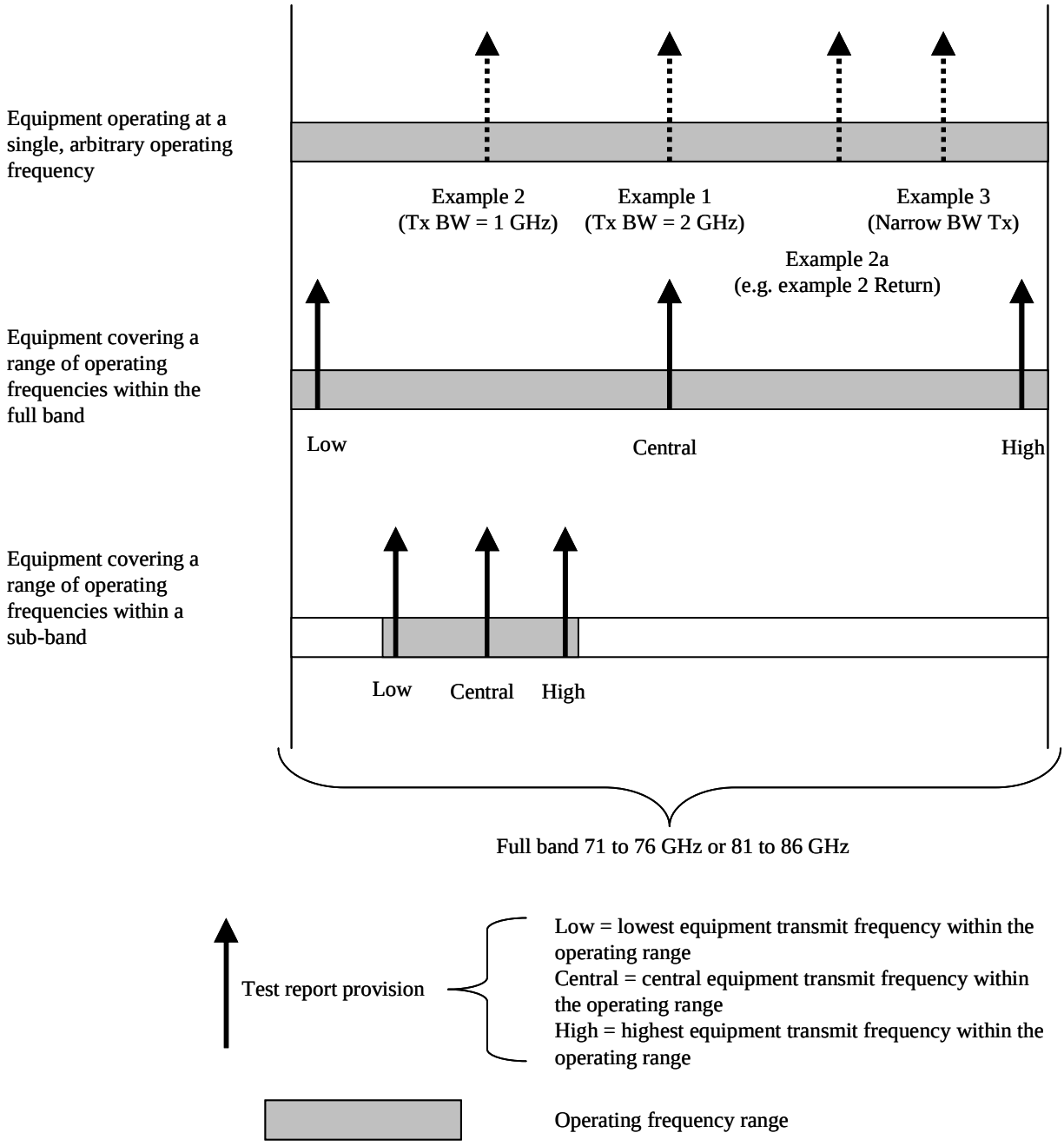


Figure 1: Test report frequency requirements for equipment intended to cover a single frequency or range of operating frequencies within 71 GHz to 76 GHz and 81 GHz to 86 GHz

4.3.2 Antennas for applications in the fixed service

Commonly, antennas cover an operating frequency range declared by the supplier. The antenna parameters shall comply with all the requirements of the present document within the declared operating frequency range. The tests shall be carried out at the lowest, middle and highest frequency of the relevant frequency range to produce the test report and/or declaration of conformity required (Directive 1999/5/EC [1]).

Furthermore, the tests shall be carried out according to clause 4 of EN 301 126-3-1 [3].

4.4 Radio Interface Capacity

The radio interface capacity (RIC) is defined in EN 302 217-1: It is the maximum user capacity defined at reference point X/X' of the figure 1 of EN 302 217-1 that can be transmitted over the radio interface, defined at reference point C'. It includes additional capacity added for framing and multiplexing/demultiplexing different baseband signals (at X/X') into a transport module eventually integrated in the baseband processing of the radio system, virtually defined at the Z/Z' reference points (e.g. the STM-N for the standardized SDH case or the higher level PDH frames for the transport of Nx2 Mbit/s or similar declared proprietary multiplexing frames of different signals). It does not include other additional proprietary algorithms and signals used for specific radio systems purposes typically error correction codes and radio system service channels.

The Radio Interface Capacity (RIC) must exceed the minimum RIC given in table 2 (definition of classes see table 1 within scope).

Table 2: Minimum RIC Values

Channels	Minimum RIC values (Mbps)					
(MHz)	Class 5H	Class 5L	Class 4H	Class 4L	Class 2	Class 1
250	1000	900	750	600	300	150
500	2000	1800	1500	1200	600	300
750	3000	2700	2250	1800	900	450
1000	4000	3600	3000	2400	1200	600
1250	5000	4500	3750	3000	1500	750
1500	6000	5400	4500	3600	1800	900
1750	7000	6300	5250	4200	2100	1050
2000	8000	7200	6000	4800	2400	1200
2250	9000	8100	6750	5400	2700	1350
2500	10000	9000	7500	6000	3000	1500
2750	11000	9900	8250	6600	3300	1650
3000	12000	10800	9000	7200	3600	1800
3250	13000	11700	9750	7800	3900	1950
3500	14000	12600	10500	8400	4200	2100
3750	15000	13500	11250	9000	4500	2250
4000	16000	14400	12000	9600	4800	2400
4250	17000	15300	12750	10200	5100	2550
4500	18000	16200	13500	10800	5400	2700
4750	19000	17100	14250	11400	5700	2850
N.A.= Not applicable						

4.5 Multi-rate/multi-format equipment specification and tests

mmwFS equipment can cover a number of different payload-rates or different modulation formats, e.g. through software presetting.

In such cases the equipment shall comply with all the requirements of the present document at any offered payload operation.

The tests shall be carried out for the transmitter requirements (see clause 4.5) at any offered bit-rate and modulation format, while the receiving requirements (see clause 4.7) shall be tested only at the lowest and the highest bit-rate for any modulation format.

4.6 Transmitter requirements

The specified transmitter characteristics shall be met with the appropriate base band signals applied at one of the reference points X' of figure B.1.

Table 3 gives the appropriate base band signals.

Table 3: Test signal and type of base band interface

Type of base band signal interface at X/X'	Test signal to be applied according to
PDH	PRBS ITU-T Recommendation O.151 [7]
SDH	ITU-T Recommendation O.181 [8]
ATM	ITU-T Recommendation O.191 [9]
Ethernet interface (Packet Data)	IEEE 1802.3 [10] and IEEE 802.3 [11]
Other than the above (see note)	Relevant standards which the interface refers to (see note)
NOTE: When standard interfaces are provided they shall comply with ITU-T standards or other standardized interface declared by the supplier. However, in some applications of these radio relay systems, interface parts may be integrated with other systems and therefore standard interfaces (X, X' reference sections) are not available under these circumstances. In the latter case the radio system assessment shall be made including those other equipment for properly supplying all loading conditions foreseen.	

4.6.1 Radio frequency tolerance

The maximum radio frequency tolerance shall not exceed ±150 ppm (see ITU-R Recommendation SM.1045-1 [6]) for operation in the environmental profile declared by the supplier.

The limits include both short-term factors (e.g. environmental effects) and long term factors (e.g. ageing effects).

Tests shall be carried out at reference and extreme climatic conditions according to clause 4.4 of EN 301 126-1 [2], to produce the test report and/or declaration of conformity required (Directive 1999/5/EC [1]).

4.6.2 Transmitter emission limits

4.6.2.1 Maximum EIRP

The maximum EIRP, including any tolerance, shall be equal to +45 dBW.

The test can be carried out, whenever possible, with separate tests for equipment output power and antenna gain.

NOTE: Testing EIRP requirements is necessary for assessment of equipment with integral antenna only; however, equipment placed on the market without antennas should, in principle, refer, when relevant in common practice, to such limitation (e.g. defining the maximum associated antenna gain).

For equipment with integral antenna, the test methods for the EIRP may be derived from the gain measurement in clause 6.3 of EN 301 126-3-1 [3].

The tests shall be carried out at reference and extreme climatic conditions according to clause 4.4 of EN 301 126-1 [2] to produce the test report and/or declaration of conformity required (Directive 1999/5/EC [1]).

4.6.2.2 EIRP Spectrum density mask

The maximum power shall be limited, in terms of the power EIRP of the systems, to within the EIRP spectral density mask shown below. Those limits shall be inclusive of tolerances and, if applicable, ATPC/RTPC influence.

NOTE: Testing EIRP requirements is necessary for assessment of equipment with integral antenna only; however, equipment placed on the market without antennas should, in principle, refer, when relevant in common practice, to such limitation (e.g. defining the maximum associated antenna gain).

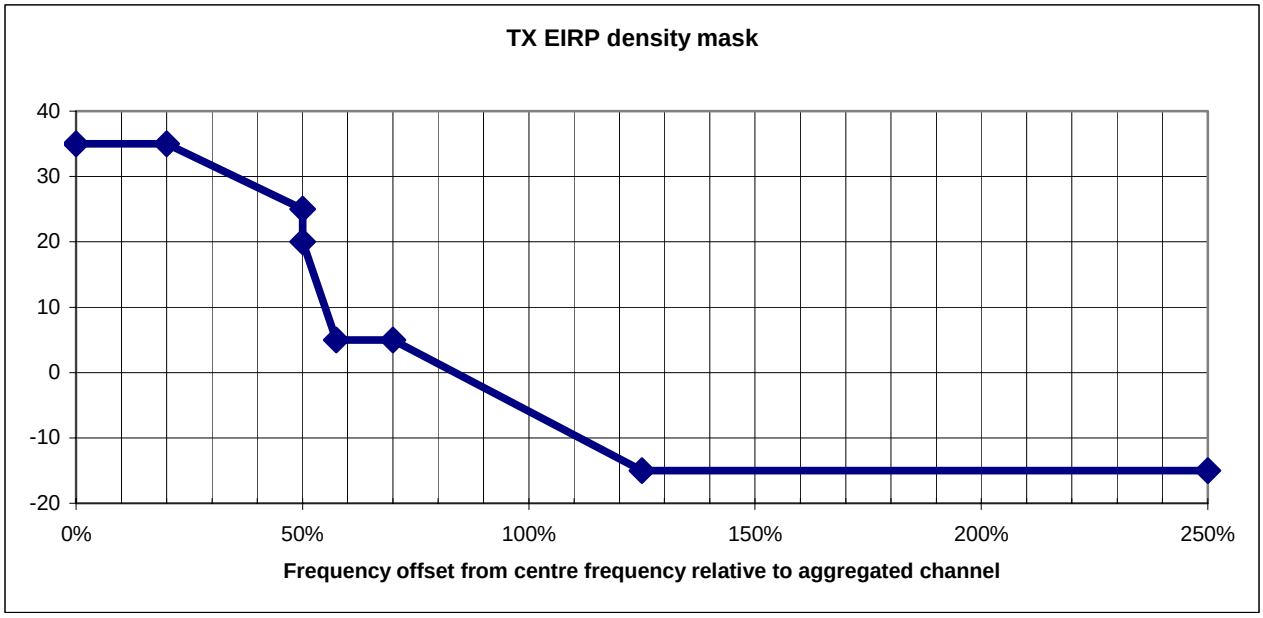
The tests shall be carried out at reference and extreme climatic conditions according to clause 4.4 of EN 301 126-1 [2] to produce the test report and/or declaration of conformity required (Directive 1999/5/EC [1]).

There are no mandatory requirements for the EIRP density mask for any particular system, so long as the EIRP of the emission remains within the spectral density mask limits shown in figure 2 and that the unwanted emissions requirements specified in ITU-R Recommendation SM.1541 [4] are met. However, it is recommended that the manufacturer or person responsible for placing the apparatus on the market shall provide the transmit mask characteristics met by the equipment. Also, in order to assist administrations and operators in the planning of networks, where appropriate, the duplex arrangement (Go/Return separation) should be provided.

The mask of figure 2 is not inclusive of frequency tolerance.

The test method for declaration of results are reported in EN 301 997-2 [12].

For regulatory reasons, the occupied bandwidth must remain within the specified band 71 GHz to 86 GHz and 81 GHz to 86 GHz, but emissions may fall outside of the occupied bandwidth but within the (2,5 x Occ BW) boundary for spurious emissions domain; consequently the EIRP spectral density falling outside of the band 71 GHz to 86 GHz and 81 GHz to 86 GHz shall not exceed 2 dBW/MHz.



EIRP density (dBW/MHz)	Offset (% of aggregated channel) (see note 1)
35	0
35	20
25	50
20	50
5	57,5
5	70
-15	125
-15	250 (see note 2)

NOTE 1: See definition of aggregated channel in clause 3.1.
NOTE 2: For channel higher than 500 MHz the 250 % is reduced to value of 150 % +500 MHz.

Figure 2: Tx EIRP spectral density mask

4.6.2.3 Output Power Limitation

The maximum total output power at antenna port should not exceed 30 dBm. Output power should be measured at point C' according figure B.1.

4.6.2.4 Minimum antenna gain

The antenna gain shall be a minimum of 43 dBi.

4.6.2.5 Spurious emissions

The equipment shall comply with the spurious emission limits defined in CEPT/ERC/REC 74-01 [5] (see note).

NOTE: According that Recommendation, provided that there are no recommended channel arrangements in this frequency band, the frequency boundary where limits apply for fixed service systems needs to be evaluated as a function of the occupied bandwidth of the emission.

The limits are applicable at reference point C' or at point B' if C' is not available. The equipment shall comply with the relevant requirements in any setting conditions of transmit power. Test methods shall be in accordance with clause 5.2.9 of EN 301 126-1 [2].

The tests shall be carried out to produce the test report and/or declaration of conformity required (Directive 1999/5/EC [1]) with equipment set to maximum available power. The actual test shall be limited to the practical frequency ranges foreseen by CEPT/ERC/REC 74-01 [5].

The test shall be carried out at reference climatic conditions according to clause 4.4 of EN 301 126-1 [2].

4.7 Directional phenomena

These systems are intended to be operated with high gain directional antennas.

4.8 Receiver requirements

When operating in accordance with the scope of the present document, the only essential receiver phenomena are related to spurious emissions. Typical receiver specifications, considered non-essential for the purpose of the present document, are shown in annex A.

4.8.1 Spurious emissions - external

The spurious emission limits defined in CEPT/ERC/REC 74-01 [5] shall apply (see note). Those limits are applicable at reference point C or at point B if C is not available.

NOTE: According that Recommendation, provided that there are no recommended channel arrangements in this frequency band, the frequency boundary where limits apply for fixed service systems needs to be evaluated as a function of the occupied bandwidth of the emission.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

The technical requirements of the present document apply under the environmental profile for intended operation of the system, which shall be declared by the manufacturer.

The environmental profile, may be determined by the environmental class of the equipment according to the guidance given in clause 4.2 of EN 301 126-1 [2].

The equipment shall comply with all the requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

Any test, requested to generate the test report and/or declaration of conformity in order to fulfil any conformity assessment procedure foreseen by the R&TTE Directive [1], shall be carried-out:

a) for radio equipment, with respect to the same principles and procedures, for reference and extreme conditions, set out in clause 4.4 of EN 301 126-1 [2];

b) for integral DFRS antennas (directional phenomena of clause 4.6 of the present document), at reference environmental conditions of the test field according to clause 4.1 of EN 301 126-3-1 [3].

The test report shall be produced according to the procedure set out by article 10 of the Directive 1999/5/EC [1].

5.2 Wide radio-frequency band covering equipment specification and tests

DFRS equipment commonly covers an operating frequency range. The equipment parameters shall comply with all the requirements of the present document at any possible operating frequency.

The tests, requested to generate the test report and/or declaration of conformity in order to fulfil any conformity assessment procedure foreseen by the Directive 1999/5/EC [1], shall be carried-out at the highest and the lowest possible operating frequency.

5.3 Radio test suites

The tests, carried out to generate the test report and/or declaration of conformity in order to fulfil any conformity assessment procedure with respect to the R&TTE Directive (1999/5/EC) [1], shall be carried-out at climatic conditions referred to in table 4.

Tables 4 and 5 indicate the different clauses applicable, for a given parameter, to the requirement, the test clause in that chapter and the corresponding test method in the base test documents EN 301 126-1 [2] and EN 301 126-3-1 [3].

The test methods for the requirements considered essential are stated, where applicable, in table 4. The test methods for the requirements considered non-essential are stated, where applicable, in table 5.

Table 4: Test methods for compliance with technical requirements considered essential

Clause	Relevant clause title	Test method
General		
4.2	Environmental specifications and tests	Clause A.1.3.3, EN 301 126-1 [2]
Transmitter/antenna	**--------**	**---------**
4.5.2.1	Transmitter maximum EIRP limit	Clause 5.2.1, EN 301 126-1 [2] and/or Clause 6.3, EN 301 126-3-1 [3]
4.5.2.2	Adjacent channel power (EIRP density mask)	Clause 5.2.6, EN 301 126-1 [2] Clause 6.3, EN 301 126-3-1 [3]
4.5.2.3	Spurious Emissions	Clause 5.2.9, EN 301 126-1 [2]
4.6.1	Off-axis EIRP density (RPE)	Clause 6.1, EN 301 126-3-1 [3]
4.6.2	Antenna gain	Clause 6.3, EN 301 126-3-1 [3]
Receiver	**---------**	**---------**
4.7.1	Spurious Emissions	Clause 5.3.2, EN 301 126-1 [2]

Table 5: Test methods for compliance with technical requirements (considered non-essential)

Clause	Relevant clause title	Test method
Receiver		
B.1	BER as a function of receiver input signal level RSL	Clause 5.3.3.1, EN 301 126-1 [2]
B.2	Co-channel "external" interference sensitivity	Clause 5.3.3.2, EN 301 126-1 [2]
B.3	CW spurious interference	Clause 5.3.3.4, EN 301 126-1 [2]

Annex A (informative): Receiving requirements

When operating in accordance within the scope of the present document, the only essential receiving phenomena are related to spurious emissions. Other receiver specifications, considered non-essential for the purpose of the present document, are shown within this annex.

Tables A.1, A.2 and A.3 set out typical receiver characteristics for 71 GHz to 76 GHz and 81 GHz to 86 GHz equipment.

Table A.1: Typical receiver characteristics for 1 Gbps, 128 QAM equipment operating in a 250 MHz channel bandwidth

Frequency bands	GHz	71 to 76	81 to 86
Receiver Noise bandwidth	MHz	190	
Receiver Noise Figure @ Antenna Port	dB	12	13
Receiver signal power for BER 10-6	dBm	-56	-55

Table A.2: Typical receiver characteristics for 1 Gbps, 16 QAM equipment operating in a 500 MHz channel bandwidth

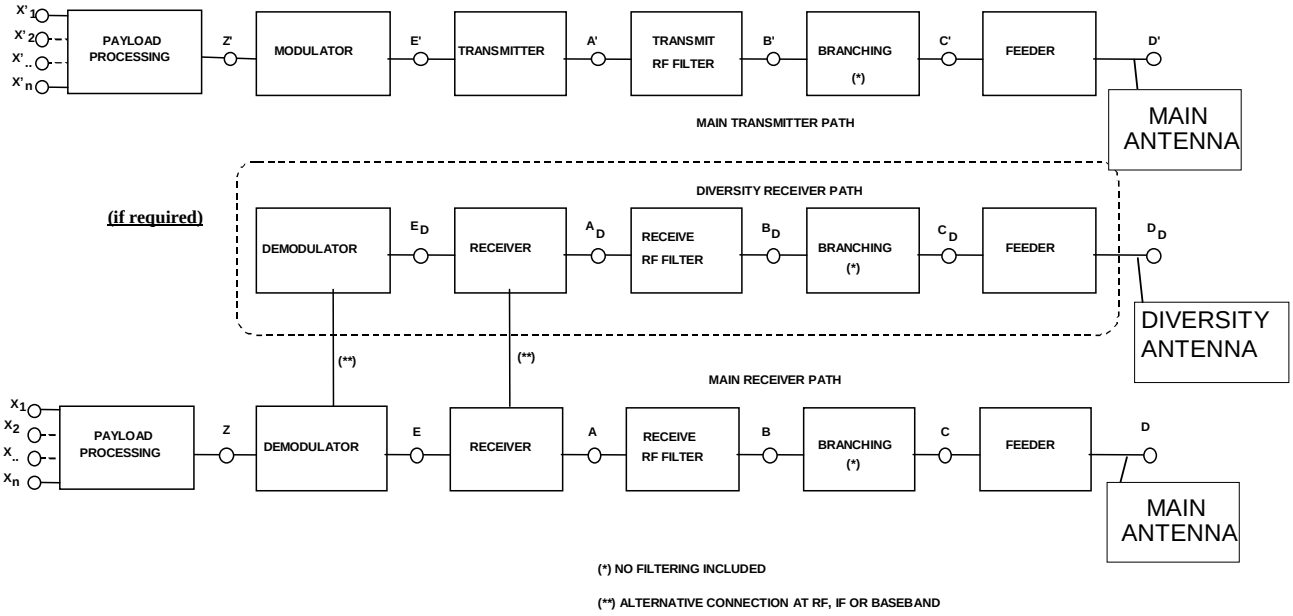
Frequency bands	GHz	71 to 76	81 to 86
Receiver Noise bandwidth	MHz	350	
Noise Figure @ Antenna Port	dB	12	13
Receiver signal power for BER 10-6	dBm	-61	-60

Table A.3: Typical receiver characteristics for 1 Gbps, FSK equipment operating in a 1 250 MHz channel bandwidth

Frequency bands	GHz	71 to 76	81 to 86
Receiver Noise bandwidth	MHz	1 000	
Noise Figure @ Antenna Port	dB	12	13
Receiver signal power for BER 10-6	dBm	-64	-63

Annex B (informative): System block diagram

The reference points of the system block diagram (figure B.1) will be used in the descriptions of requirements and of test points in the other parts of the present document.



NOTE 1: For the purpose of defining the measurement points, the branching network does not include a combiner.
NOTE 2: The points shown above are reference points only and do not mandate any implementation; points C and C', D and D' in general coincide.
NOTE 3: Points B, C, B' and C' may coincide when a simple duplexer is used.
NOTE 4: Points X1, X2, …Xn and points X'1, X'2, …X'n correspond to one or more digital or analogue signal input reference points. They are generically referred to as X and X'.
NOTE 5: The subdivision of "Payload processing" and the "Modulator/demodulator" blocks is functional and not physical. The first functionally contains the payload processing needed for building up the transport module (e.g. framing, multiplexing and or concentration), the latter functionally contains mo-demodulation, coding-decoding and service signals processing needed for transmission (e.g. error correction algorithms and service channels). Points Z and Z', that might not be physically available, represent the virtual points where , the radio interface capacity (RIC), referred in the provisions of annexes F of Parts 2-1 and 2-2 of the multi-part EN 302 217 shall be defined.

Figure B.1: System block diagram

Annex C (informative): Current and future systems

One of the typical applications for the present document provides cost-effective, short-range, very high-bandwidth digital links (>100 Mbps). Systems proposed for these bands concentrate radiated power in a very narrow path and have considerable attenuation at much shorter distances than occurs in the lower microwave bands so those systems are designed to operate co-frequency with very short re-use distances.

In this case, overall re-use efficiency (bits per Hz per m^3) is more relevant than simple spectral efficiency (bits per Hz). In the short term, therefore, it is expected that equipment with only low-order modulation techniques and broad bandwidth will be available. In the longer term, however, equipment with higher-order modulation techniques and narrower bandwidths may be produced.

Some administrations may consider channelizing the band for systems operating within their country. If so, they would be advised to take into account the bandwidth and channelization of available and planned equipment. In addition, a harmonized channel scheme, such as those developed and recommended by CEPT, would ensure that similar equipment could be used in multiple countries.

Annex D (informative): Bibliography

ETSI EG 201 399 (V1.3.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

ETSI TR 101 506 (V1.1.1): "Fixed Radio Systems; Generic definitions, terminology and applicability of essential requirements under the article 3.2 of 99/05/EC Directive to Fixed Radio Systems".

ETSI EN 302 217 (all parts): "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas".

History

Document history		
V1.1.1	July 2006	Publication