

**Fixed Radio Systems;
Generic definitions, terminology and applicability
of essential requirements under the article 3.2
of 1999/05/EC Directive to Fixed Radio Systems**



Reference

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Keywords

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM).

1 Scope

The present document, is intended for complementing the EG 201 399 [i.1] for specific guidance related to Digital Fixed Radio Systems (DFRS) in the production of candidate harmonized standards under the Council Directive 1999/5/EC [i.2] (commonly identified as the R&TTE Directive). Consequently the present document should always be used in conjunction with EG 201 399 [i.1] whenever DFRS are concerned.

The present document identifies, among the generic attributes and technical phenomena, relevant for the article 3.2 of the Directive [i.2], presently quoted by EG 201 399 [i.1], those which are relevant and applicable, for the various typologies of Fixed Digital Radio Systems.

Moreover it gives the cross reference from the generic terminology used in EG 201 399 [i.1] and that currently used within the Fixed Radio technical community.

Considerations about attributes and technical phenomena related to articles 3.1 (health, safety and EMC) and 3.3 (interworking and other special requirements) of the R&TTE Directive [i.2] are outside the scope of the present document.

2 References

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Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

- [i.2] Directive 1999/05/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).
- [i.3] ITU-T Recommendation G.826: "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [i.4] ITU-T Recommendation G.827: "Availability parameters and objectives for path elements of international constant bit-rate digital paths at or above the primary rate".
- [i.5] ITU-R Recommendation F.1399: "Vocabulary of terms for wireless access".
- [i.6] ITU-R Recommendation F.1565: "Performance degradation due to interference from other services sharing the same frequency bands on a co-primary basis with real digital fixed wireless systems used in the international and national portions of a 27 500 km hypothetical reference path at or above the primary rate".
- [i.7] ITU-R Recommendation F.1668: "Error performance objectives for real digital fixed wireless links used in 27 500 km hypothetical reference paths and connections".
- [i.8] ITU-R Recommendation F.1703: "Availability objectives for real digital fixed wireless links used in 27 500 km hypothetical reference paths and connections".
- [i.9] ETSI EN 301 390: "Fixed Radio Systems; Point-to-point and Multipoint Systems; Spurious emissions and receiver immunity limits at equipment/antenna port of Digital Fixed Radio Systems".
- [i.10] CEPT/ERC Recommendation 74-01: "Spurious Emissions".
- [i.11] ETSI EN 301 126-1: "Fixed Radio Systems; Conformance testing; Part 1: Point-to-Point equipment - Definitions, general requirements and test procedures".
- [i.12] ETSI EN 302 217-4-2: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 4-2: Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for antennas".
- [i.13] ETSI EN 302 326-3: "Fixed Radio Systems; Multipoint equipment and antennas; Part 3: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for Multipoint Radio Antennas".
- [i.14] CEPT/ERC Recommendation 12-09: "Radio Frequency channel arrangement for fixed service systems operating in the band 57,0 - 59,0 GHz which do not require frequency planning".
- [i.15] TCAM (9)02: " Minutes TCAM 8".
- [i.16] TCAM (8)51: "ADCO Report to TCAM8".
- [i.17] TCAM (17)57: "Application of r&tte antenna (UK)".
- [i.18] TCAM (20)02: "Minutes TCAM 19".
- [i.19] TCAM (21)02: "Minutes TCAM 20".
- [i.20] TCAM (7)48: "Contribution on antennas (IT)".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

air interface interoperability: requirement by which DFRS terminals from different manufacturer can be connected inside the same radio systems

NOTE: It requires standardisation of the physical radio layer (e.g. modulation format, digital codings, synchronisation procedures, etc.) and part or all of the higher network layers protocols.

digital fixed radio systems: comprise the whole family of Point-to-point (P-P), Point-to-multipoint (P-MP) and Multipoint-to-multipoint (MP-MP) radio equipment (see note 2), which may be used in fixed locations as part of public or private core or access networks (see note 3)

NOTE 1: It is equivalent to the ITU-R definition of Fixed Wireless Systems (FWS) and comprises Fixed Wireless Access (FWA) systems and, in specific cases, their optional extension to Nomadic Wireless Access (NWA) (see note 4).

NOTE 2: The two latter generically identified as Multipoint (MP) systems.

NOTE 3: Analogue systems are no longer implemented; therefore, for the purpose of the present document only digital applications are treated identified as DFRS.

NOTE 4: NWA systems are defined in ITU-R Recommendation F.1399 [i.5] as "Wireless access application in which the location of the end-user termination may be in different places but it must be stationary while in use".

essential phenomenon: radio frequency phenomenon related to the essential requirements under article 3.2 of the Directive capable of being expressed in terms of quantifiable technical parameters

harmonized radio frequency band: commonly referred as a portion of the frequency spectrum that CEPT/ERC allocates to a specific service through a CEPT/ERC Decision (proper definition is currently under study by CEPT/ERC)

NOTE: It should be noted that, presently, radio frequency bands allocated to Fixed Service are not harmonized.

radio Equipment (Article 2 of 1999/05/EC Directive [i.2]): 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 radiocommunication

telecommunications terminal equipment (Article 2 of 1999/05/EC Directive [i.2]): product enabling communication or a relevant component thereof which is intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks (that is to say, telecommunications networks used wholly or partly for the provision of publicly available telecommunications services)

3.2 Symbols

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

dB _i	decibels relative to isotropic radiator
GHz	GigaHertz

3.3 Abbreviations

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

ADCO	Administrative Co-operation group
ATPC	Automatic Transmission Power Control
BER	Bit Error Ratio
BTS	Base Station

CDMA	Code Division Multiple Access
CRS	Central Radio Station
CW	Continuous Wave
DFRS	Digital Fixed Radio Systems
EIRP	Effective Isotropic Radiation Power
FDMA	Frequency Division Multiple Access
FH	Frequency Hopping
FS	Fixed Service
FWA	Fixed Wireless Access
FWS	Fixed Wireless Systems
GSM	Global System Mobile
MP	MultiPoint
MP-MP	MultiPoint-to-MultiPoint
NWA	Nomadic Wireless Access
PCN	Public Communication Network
P-MP	Point-to-MultiPoint
P-P	Point-to-Point
QoS	Quality of Service
R&TTE	Radio equipment and Telecommunications Terminal Equipment and the mutual recognition of their conformity
RE	Radio Equipment
RFC	Remote Frequency Control
RPE	Radiation Pattern Envelope
RSL	Received Signal Level
RTPC	Remote Transmit Power Control
RX	interface signal Receiver
TCAM	Telecommunication Conformity Assessment and Market Surveillance Committee
TDMA	Time Division Multiple Access
TTE	Telecommunication Terminal Equipment
Tx	Transmitter
WG TM4	Working group TM4 of ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (TC ATTM)
XPD	cross Polar Discrimination

4 General principles

The objective of a Harmonized Standard under the R&TTE Directive [i.2] for a DFRS is to define clear and unambiguous provisions for the essential requirements referred in the Directive, which are applicable to the system concerned.

To aid the ETSI Technical Bodies in the production of candidate harmonized standards, ETSI produced the EG 201 399 [i.1] that expands the general concepts of essential requirements into a more detailed subdivision and gives guidance for categorizing Telecommunication Terminal Equipment (TTE) and Radio Equipment (RE) in order to identify the technical phenomena relevant to the essential requirement under consideration.

However, particularly in the parts that refer to article 3.2 "The effective use of the radio spectrum" of the R&TTE Directive [i.2], also EG 201 399 [i.1] uses terminology and concepts that, when applied to a specific family of radio systems such as the Fixed Radio, proves to be still too generic; therefore further guidance, more technically based on the technology and terminology used by the relevant technical community, is reported in the present document. Therefore the present document should always be used in conjunction with the EG 201 399 [i.1] whenever Fixed Digital Radio Systems (DFRS) are concerned.

5 Application of Equipment Attributes in EG 201 399 to Digital Fixed Radio Systems (DFRS)

5.1 Equipment Attributes

Presently EG 201 399 [i.1] defines the following attributes for Radio Equipment (RE) and Telecommunication Terminal Equipment (TTE) or both:

- a) RE that is unable to transmit before receiving an appropriate enabling signal under any circumstances.
- b) RE that is able to transmit without receiving an appropriate enabling signal.
- c) RE capable of receive only.
- d) Apparatus intended for use in "Emergency applications".
- e) Short range radio transmitting devices.
- f) RE intended for installation in sites which may be shared with other RE without co-ordination from a single operator.
- g) RE sharing radio spectrum resources with or without operational co-ordination.
- h) TTE using an electrical interface for communication.
- i) TTE using an optical interface for communication.
- j) RE using received signal (e.g. the receiver level) to control transmitter power level or channel access (automatically or manually).

5.2 Equipment attributes and their applicability to DFRS

5.2.1 Attribute A: RE that is unable to transmit before receiving an appropriate enabling signal under any circumstances

This attribute is typical of systems like GSM, of which terminals of different manufacturer can be connected at any time to a BTS; in this case the radio frequency interface is standardized in GSM coexistence standards and air interface interoperability.

Even without requirement for air interface interoperability, some MP terminals need granting from CRS, however, in this case, the enabling signal still is an "intra system" feature, therefore not relevant from the point of view of the essential requirements under the R&TTE Directive [i.2].

This attribute would be relevant for DFRS only in the case of standards that would possibly be developed requiring air interface interoperability.

The analysis of the relevant phenomena is left for further study, if required.

5.2.2 Attribute B: RE that is able to transmit without receiving an appropriate enabling signal

In principle conventional DFRS transmit without enabling signals. However, in order to avoid harmful or unacceptable interference and to ensure the efficient use of the spectrum in not harmonized frequency bands, allocated to the Fixed Service, national frequency co-ordination and link by link licensing is applied. In not harmonized and not co-ordinated bands (e.g. 58 GHz) the argument is not relevant.

The "national licensing" may be considered as an "enabling signal" of different nature, therefore this attribute is considered not relevant for conventional DFRS.

Presently, for DFRS, this attribute could be relevant only to transportable equipment for provisional links (in the event that the national licensing policy is different from permanent links). This type of equipment is in general not considered specifically in WG TM-4 standards, but is possibly offered independently by suppliers to specific customers as not standardized options.

The analysis of the relevant phenomena is left for further study, if required.

5.2.3 Attribute C: RE capable of receive only

This attribute is presently considered not relevant for DFRS presently standardized in WG TM-4, because DFRS applies only to telecommunications.

5.2.4 Attribute D: Apparatus intended for use in 'Emergency applications'

This attribute is also more detailed in the EG 201 399 [i.1] as "Equipment having this attribute requires a high assurance of performance when operating".

From the applicable essential phenomena point of view, this attribute is one of the two that presently require as essential phenomena the "(Maximum usable) sensitivity (including duplex)" and the only one requiring "co-channel rejection"; these parameters are commonly required for frequency co-ordination purpose in order to guarantee the link performance and availability.

It is commonly understood that when used in PCN (Public Communication Networks), DFRS, as all other media equipment, should meet a number of ITU-T and ITU-R performance and availability recommendations (e.g. ITU-T Recommendations G.826 [i.3], G.827 [i.4] and ITU-R Recommendations F.1668 [i.7], F.1703 [i.8], F.1565 [i.6]), which are essential for national and international communications that may commonly include any kind of high priority government, business and emergency communications.

It is also noted that, having the fulfilment of those ITU requirements implies the definition, for each link, of a well-defined fade-margin, which is composed by the Tx Pout as well as by the RX minimum sensitivity. Therefore, poor RX sensitivity and co-channel rejection, beyond a minimum standardised requirement, would require a correspondent higher Tx power with potential increase of the probability of causing harmful interference to other users of the band.

Therefore it is considered that, for P-P and MP equipment used in the "public core and access networks", carrying traffic which includes conventional voice telephony and "high performance leased lines option" this attribute is applicable.

For equipment intended only for "residential access network" (where entertainment and commercial traffic may dominate) and private networks, the subject is left to a case-by-case analysis.

By the nature and usage of not co-ordinated bands (e.g. 58 GHz band referenced in CEPT/ERC Recommendation 12-09 [i.14]), equipment designed for these bands, are not considered suitable for this attribute.

5.2.5 Attribute E: Short range radio transmitting devices

This attribute is not relevant for DFRS.

5.2.6 Attribute F: RE intended for installation in sites which may be shared with other RE without co-ordination from a single operator

This attribute is specifically referred by EG 201 399 [i.1] as applicable to DFRS.

However at least one other attribute should accompany this attribute.

The suggested phenomena for this attribute, to be considered in defining essential requirements, cover only transmitter and receiver intermodulation, which are a consequence of the shared installation site, not elsewhere covered by other equipment specific attributes.

The justification for differentiation of this attribute is principally because the equipment is stationary and thus if any problems do arise the assumption should be that the problem is permanent and thus may permanently degrade the intended usage.

Examples of such equipment "sharing" the same site or its close vicinity are base stations of any type, fixed link stations broadcast transmitters, and pager stations.

Also other receiver intermodulation effects might become more important. Due to a possible large number of antennas and DFRS types, installed at the same site or in close vicinity to an existing site, the interference from "unwanted" emissions may become more critical.

However the traditional mitigation solutions of antenna filters, circulators, etc are commonly used in DFRS; in addition, the frequency coordination, in use among other DFRS, avoids the presence of high Tx carrier power in close vicinity of RX, unconventional solutions, possible for solving uncommon network problems, are usually treated on a case-by-case bases with site-engineering procedure. Therefore, this attribute is not generally applicable to DFRS.

5.2.7 Attribute G: RE sharing radio spectrum resources with or without operational co-ordination

DFRS need this attribute differentiation for coexistence with similar systems deployed in the same geographical area and using the same frequency band.

This attribute is the most appropriate for DFRS and contains most of the radio frequency co-ordination parameters, including antenna parameters.

Logically, for bands not requiring co-ordination, a reduced sub-set of receiver and antenna essential parameters is required in comparison to those required for co-ordinated bands.

5.2.8 Attribute H: TTE using an electrical interface for communication

The phenomena list for this attribute is presently empty.

A radio equipment may have also an electrical interface towards the network or user side. When the equipment is also considered a TTE (see definition of TTE), this attribute may be applicable also to radio equipment.

The relevant phenomena, if any, will be defined after specific TCAM request, which would fall under article 3.3 of the R&TTE Directive [i.2] that is outside the scope of the present document.

5.2.9 Attribute I: TTE using an optical interface for communication

The phenomena list for this attribute is presently empty.

Radio equipment may have also an optical interface towards the network or user side. When the equipment is also considered a TTE (see definition of TTE), this attribute may be applicable also to radio equipment.

The relevant phenomena, if any, will be defined after specific TCAM requirement, which would fall under article 3.3 of the R&TTE Directive [i.2] that is outside the scope of the present document.

5.2.10 Attribute J: RE using received signal (e.g. the receiver level) to control transmitter power level or channel access (automatically or manually)

This attribute, has been added in EG 201 399 [i.1] at later stage (after ERM/TG18 report endorsed by TCAM 7) for specifically taking into account equipment where "*...the received signal (e.g. the receiver level) is used to control (automatically or manually) channel access by the transmitter or the power level of the transmitter*" and "*...unlike equipment qualified with attribute A, equipment having attribute J does not necessarily need to receive an enabling signal from some other equipment prior to transmit*".

Fixed Service stations are specifically mentioned among the examples for this attribute.

This attribute definitely contains only the RX sensitivity as technical phenomena.

6 Attribute sets relevant to DFRS

From previous discussion the following sets of attributes can be identified for different application of DFRS.

6.1 DFRS which do not require air interface interoperability

6.1.1 Point-to-point and point-to-multipoint systems in not harmonized frequency bands where co-ordination is required

Attributes F, G, D and J are considered appropriate for DFRS intended for the application in the public core and access networks offering high network performance and availability (e.g. conventional voice telephony and leased lines).

For equipment intended only for the application in the residential access networks for data management and entertainment and private networks, a subset of the receiver parameters referred in the above attributes may be applicable but the subject is left for further study.

6.1.2 Point-to-point and point-to-multipoint systems in frequency bands where co-ordination is not required

Attributes F and G are considered appropriate for this category of DFRS.

6.2 DFRS that do require air interface interoperability subject to interface publication according article 4.2 of the R&TTE Directive

Presently no such cases are foreseen in any standards for DFRS.

Whenever required, the analysis is left for future study.

7 Application of technical phenomena in EG 201 399 to DFRS

The content of the present document follows the guidance of the present status of annex A of EG 201 399 [i.1].

NOTE: The EG 201 399 [i.1] was released by TC ERM to other technical bodies for preliminary use in production of Harmonized Standards.

7.1 DFRS which do not require air interface interoperability

From the guidance given by the EG 201 399 [i.1] and from the considerations made on equipment attributes in clause 5 of the present document that lead to their selection for DFRS purpose as shown in clauses 6.1.1 and 6.1.2, a more detailed applicability to DFRS of phenomena related to essential requirements may be derived as shown in table 1.

Table 1: Essential requirements and phenomena relevant to DFRS which do not require air interface interoperability; related background and terminology for phenomena reported in EG 201 399 [i.1] for the attributes F, G, D and J

Essential Requirement	Phenomena	Relevance as standardized parameter for DFRS	Alternative WG TM4 terminology	Essential parameter Y=yes N=no
3.2 (System at transmitting site)	Frequency error/stability, and designation of channels	As frequency error/stability only.	Radio frequency tolerance	Y
	Transmitter power	DFRS standards define only the maximum output power; in practice a radio link may be designed in order to transmit, with suitable power setting methods, the appropriate transmission power to fulfil the performance, availability and interference requirements. Therefore for the essential requirements, relevant is the power tolerance on the nominal activation (licensed) value (including ATPC effects), within Remote and/or Automatic Transmit Power Control (RTPC/ATPC) ranges, if any, to guarantee stable frequency co-ordination.	Nominal transmitter output power and its tolerance, or Transmitter power range	Y
	Adjacent channel power	Common practice for DFRS is to define a mask for spectral density relative to actual centre frequency ranging up to 2,5 times of the actual radio-frequency channel separation, from which adjacent channel interference may be derived in conjunction with the receiver selectivity.	Radio Frequency spectrum mask, Transmitter Spectrum Mask and Spectral lines at symbol rate and Remote /Automatic transmit power control (RTPC/ATPC)	Y
	Spurious emissions	They are relevant as defined by CEPT/ERC Recommendation 74/01 [i.10] or the more stringent EN 301 390 [i.9].	Spurious emissions-external	Y
	Inter-modulation attenuation	DFRS commonly use non-reciprocal passive circuits (e.g. isolators) at transmitter output for guaranteeing the required return loss and for preventing intermodulation phenomena on the final active power devices of transmitter. The output power of DFRS is commonly rather low, therefore also any intermodulation produced by these non-reciprocal devices is irrelevant. Moreover DFRS antennas are passive and usually highly directive. Therefore this phenomenon has never been considered relevant. However in case of systems that will eventually adopt active antennas this parameter may become relevant and should be defined to comply with the R&TTE Directive [i.2].	None	Y (active antennas only) N (all other cases)

Essential Requirement	Phenomena	Relevance as standardized parameter for DFRS	Alternative WG TM4 terminology	Essential parameter Y=yes N=no
	Release time	This parameter is relevant for network equipment, only when a terminal will be ordered to vacate a channel for a number of different reasons (e.g. it terminates the call or it moves to another cell). Obviously if the other user appears before the first user has vacated the channel there will be severe interference which will cause the new user to lose his connection. In DFRS technology the sharing, by different systems, of the same RF channel in the same geographical area, is achieved by frequency planning (co-ordination). Sub-channels sharing within the same MP system, being possible with dynamic traffic control, is an intra-system problem only). This parameter is not relevant for DFRS.	None	N
	Transient behaviour of the transmitter	Transmitters can have dynamic variation in both power (e.g. ATPC, TDMA operation, etc.) and frequency (e.g. RFC, FH or FDMA with dynamic "channel" allocation, etc.) it is relevant that during these transition the relevant spectrum parameters (Licensed power, Spectrum mask, frequency tolerance, etc.) should not be exceeded or should be controlled by specific requirements.	Automatic Transmit Power Control (ATPC) and Remote Frequency Control (RFC)	Y
	Modulation Accuracy	This parameter may be relevant only in case of standardized radio frequency interface for interoperability of equipment from different manufacturer (e.g. GSM-like air interface interoperability).	Presently none	Y (systems designed for interoperability) N (all other cases)
	Duty cycle	This parameter may be relevant only in case of standardized radio frequency interface for interoperability of equipment from different manufacturer (GSM-like air interface interoperability).	Presently none	Y (systems designed for interoperability) N (all other cases)
3.2 (Antennas, directional)	Off-axis EIRP density	Provided the normally high directivity of DFRS antennas, this parameter is relevant for frequency co-ordination in not harmonized frequency bands. Furthermore this parameter is mandatory to ensure the efficient use of the spectrum also in not co-ordinated frequency bands. It is consequently relevant for all DFRS.	Radiation Pattern Envelope (RPE)	Y
	Antenna gain	The absolute value of this parameter is conventionally not standardized in TM4 standards provided that many options are required to cover the Network requirements; only a minimum gain for each antenna class is required; however, the actual gain should be declared by the supplier in the conformance testing. Even if the antenna gain is required for frequency co-ordination (as the absolute transmitter power) to evaluate the EIRP, a specific value is not required from the point of view of its standardisation, since its value may be determined link by link during the design. However it is essential for complying with R&TTE Directive [i.2] that the supplier declares the value, above the minimum required by the relevant antenna class, with the relative tolerance.	Antenna gain	Y (value declaration above the minimum)

Essential Requirement	Phenomena	Relevance as standardized parameter for DFRS	Alternative WG TM4 terminology	Essential parameter Y=yes N=no
	Antenna X-polar discrimination	Relevant for frequency co-ordination in not harmonized frequency bands, consequently relevant for DFRS. Furthermore this parameter is mandatory to ensure the efficient use of the spectrum because of the relatively high XPD of DFRS antennas.	Antenna Cross-Polar Discrimination (XPD) or Cross-polar radiation pattern	Y (for co-ordinated bands only)
	Antenna pointing accuracy/control	In case of systems that will eventually apply adaptive antennas this parameter may become relevant and should be defined to comply with the R&TTE Directive [i.2].	Presently none	Y (for equipment with adaptive antennas in co-ordinated bands) N (all other cases)
3.2 (System at the receiving site)	(Maximum usable) sensitivity (inc. duplex)	This parameter is the base on which, through proper frequency co-ordination techniques to assure the efficient use of the spectrum, the required QoS and availability for DFRS in public core and access networks, offering high network performance (e.g. for leased lines), may be assessed and calculated in presence of interference. This parameter is the only system parameter at the receive site, which enables to assess the co-channel rejection and the adjacent selectivity (see below).	BER as a function of receiver input signal level (RSL)	Y (for co-ordinated bands only)
	Co-channel rejection	This parameter is required to define the amount of frequency reuse still assuring the required QoS for fixed radio in public communication networks (e.g. in a nodal station or in systems on a geographical area). Therefore this parameter is mandatory to ensure the efficient use of the spectrum.	Co-channel interference sensitivity or Co-channel "external" interference sensitivity	Y (for co-ordinated bands only)
	Adjacent channel selectivity	This parameter is required for frequency co-ordination among different DFRS operated in the same geographical area by network operators (e.g. more than one). It defines the amount of frequency separation (e.g. at P-P nodal stations) or the amount of geographical separation (e.g. in MP systems deployment) for adjacent channel, still assuring the required QoS for DFRS in public communication networks. Therefore this parameter is mandatory to ensure the efficient use of the spectrum.	Adjacent channel interference sensitivity	Y (for co-ordinated bands only)

Essential Requirement	Phenomena	Relevance as standardized parameter for DFRS	Alternative WG TM4 terminology	Essential parameter Y=yes N=no
	Inter-modulation response rejection	<p>This parameter covers the receivers capability of rejecting (withstanding) more than one interfering signals, spaced by two or several channels that may possibly create 3rd order intermodulation products which fall in band of the main receive signal.</p> <p>This parameter is not relevant for systems which foresee multichannel branching with relatively narrow RF filters for each channel; it may be relevant only for systems with an RF duplexer pass-band relatively large compared to the RF-channel bandwidth.</p> <p>However this parameter is understood as derived from mobile systems requirements, where the receivers have to withstand a large amount of unwanted adjacent channel signals (interferer) due to relatively wide band RF-filtering (e.g. in portable terminals) in conjunction with antennas having poor or no directivity at all and where the interference scenario is continuously changing with possible danger of random blocking because of intermodulation among adjacent carriers. On the contrary, the interference scenario for DFRS is stable in the time and antennas are directive, therefore this phenomenon, if experienced, is confined once in a time during the commissioning of a link or of one of its adjacent channels; this means that countermeasures may be taken to overcome the problem when happening.</p> <p>Also in EN 301 126-1 [i.11], developed in order to unify the procedure for type approval among various regulatory bodies, this parameter has not been considered essential even for those systems that already provided it in the relevant EN.</p> <p>Therefore it will be commonly considered not essential unless for specific cases presently not identified.</p>	Front-end non-linearity requirements (two-tone CW spurious interference)	N (Common choice) Y (special cases only)
	Blocking or desensitisation (inc. duplex)	<p>This parameter is relevant for showing the receiver capability of supporting interference at frequencies far away from the adjacent channel. It was also required for harmonized standards under present EMC directive; therefore it is relevant also for the new R&TTE Directive [i.2]</p> <p>Presently trunk systems with narrow-band RF filters do not include such requirement because obviously irrelevant, however the EN 301 390 [i.9] may be referenced for them.</p>	CW Spurious Interference or Receivers immunity at antenna port	Y (for co-ordinated bands only)
	Spurious response rejection (inc. duplex)	<p>This parameter is complementary to the previous dealing only with specific frequency(ies) response that may have been excluded from it due to different sensitivity than the generic rejection capability required under the "blocking or desensitisation"</p> <p>It is "optional" but relevant if there are frequencies excluded from the previous "blocking or desensitisation" and mentioned here.</p>	Presently none	Y (if eventually foreseen by the relevant EN)
	Spurious emissions	They are relevant as defined by CEPT/ERC Recommendation 74/01 [i.10] or the more stringent EN 301 390 [i.9].	Spurious emissions-external	Y

Essential Requirement	Phenomena	Relevance as standardized parameter for DFRS	Alternative WG TM4 terminology	Essential parameter Y=yes N=no
	Multipath sensitivity	This parameter is mentioned only in Attribute D list. For "not-line-of-sight" systems (e.g. cellular mobile systems), the multipath is intended due to multiple reflection phenomena (e.g. building reflections) and it may highly impair the connection, even blocking the transmission. In DFRS the distortion sensitivity (i.e. signature data) is only required in order to design a link which fulfil "high performance quality" in frequency bands below 18 GHz, since it defines the sensitivity to multipath phenomena produced by atmospheric diffraction in "line of sight" links. This parameter is not used for frequency co-ordination purpose, therefore it is not relevant for DFRS.	distortion sensitivity	N
3.2 (System Control and Monitoring Functions for Terminal; e.g. TDMA, CDMA, FDMA, FH)	Sharing Protocols	This parameter, when in conjunction with equipments falling in Attribute G category, may be relevant only in case of any sharing procedure for enabling the transmission in not co-ordinated frequency bands. In other cases may be relevant only in case of standardized radio frequency interface for interoperability of equipments from different manufacturer, which will be subject to publication according to article 4.2 of the R&TTE Directive [i.2] (e.g. GSM-like air interface interoperability), presently not foreseen by TM4 standards.	Interference avoidance requirement	Y (for systems requiring sharing procedure) N (all other cases)

7.2 DFRS which do require air interface interoperability

Presently no such cases are foreseen in any ETSI standards for DFRS.

Whenever required, detailed analysis, beyond the phenomena, relevant for general frequency co-ordination purpose, eventually reported in table 1, is left for future study.

7.3 DFRS Antennas

From the considerations in clause 7.1, antenna directional parameters play a significant role for conformity to essential requirements under Article 3.2. However, in the DFRS market two cases are possible:

- Radio equipment and antenna are provided by the manufacturer as an integral product;
- Radio equipment and antennas are produced and placed on the FS market as separate products by specialised suppliers; the integration is directly made on the radio station through RF cables or waveguides, without possibility of joint assessment.

In principle, stand alone FS antennas, being a passive component, might not be intended to be covered by the R&TTE Directive [i.2]; however, if those antennas would not fulfil the directional phenomena requirements, significant risk of harmful interference can be expected. Therefore, when the Directive entered into force, the argument was thoroughly examined by TCAM that concluded: "*when it is possible to identify a reasonable risk that failure to meet the essential requirements of the Directive will result from its use*", passive stand alone antennas can be considered to fall under the Directive.

In particular P-P FS antennas has been subject of a specific TCAM decision for their relevance to the essential requirements; annex A.1 reports and comments a relevant set of abstracts from TCAM documents dealing with passive antenna arguments.

Annex A: FS antennas and R&TTE relationship

Just before the R&TTE Directive [i.2] entered into force, in January 2000 ETSI published the first version and, at later stage, revisions as suitable of EG 201 399 [i.1], which already contained antenna parameters justifications under article 3.2.

However, soon after, discussion was initiated in TCAM about whether antennas (passive and active), and in particular "stand-alone" marketed antennas, were covered or not under the R&TTE Directive [i.2].

Here below, a summary of the TCAM activity on the issue is reported with the relevant abstracts and references to TCAM official documents.

A.1 TCAM background on antennas.

A.1.1 Antenna issues up to TCAM 8

TCAM was already debating the stand-alone antennas issue since meeting TCAM 5, under the pressure of "blinking antennas" (active) on the market, which were found to alter the behaviour of the mobile terminals possibly associated.

ETSI WG TM4 expressed concern on the fact that passive FS antennas might be finally excluded from R&TTE Directive [i.2] coverage, because they are essential in coordination, coexistence and sharing; supporting contribution to TCAM 7 has been produced through a national delegation (see TCAM (7)48 [i.20]).

An Administrative Co-operation group (ADCO) was established for studying the issue and reporting back conclusions to TCAM 8 where the final discussion on the ADCO group dedicated study took place; TCAM (8)51 [i.16] ADCO Report, (TCAM (8)51 [i.16]) contains the final proposed guidance on antennas, which quotes:

"7 The above guidance takes into account that in practice there is a low risk of harm to people or of harmful interference resulting from the separate sale of passive antennas, and that it would be disproportionate to consider them as relevant components. However, in exceptional cases, TCAM can decide that an a priori passive antenna can nevertheless be treated as "active" when it is possible to identify a reasonable risk that failure to meet the essential requirements of the Directive will result from its use."

TCAM 8 decided to adopt the ADCO guidance; TCAM 8 minutes (TCAM (9)02 [i.15]), at A.I. 6 legal issues paragraph 3, quotes:

3 Components, antennas, borderline of coverage of the Directive (Discussion)	Doc. 51, 57 (11, 12, 22, 23, 24)
33 The chairman then concluded that a large majority of TCAM supported the guidance proposed by ADCO (Decision 1).	

A.1.2 Further FS Antenna issues up to TCAM 19

FS antennas, either integral or separately placed on the market, were considered one of those cases of "*reasonable risk that failure to meet the essential requirements*"; ETSI WG TM4 has recognised it in FS harmonized standards already published in the EC Official Journal. At later TCAM 17, UK proposed a formal TCAM decision (see TCAM(17)57 [i.17] and its annexes A, B and C) regarding antennas in the scope of harmonized EN 302 217-4-2 [i.12].

After further analysis, TCAM 19 deliberated to adopt UK position; document (20)02 [i.18]-TCAM 19 minutes (6-Legal issues section 5 and Decision 18.5) quotes:

6 Legal issues		
5	Coverage of antennas, application of TCAM conclusions to directional antennas (Decision) ^[M.P.A.M.8]	TCAM 18. 7, 52 TCAM 17: 57

56. The Netherlands introduced their contribution and argued that there are no reasons to exclude certain types of passive antennas.

57. The United Kingdom considered that they considered it appropriate to have antennas covered, when ETSI had concluded that harmonised standards are necessary.

58. Sweden had a difficulty with including passive devices in the Directive. Such would be meaningless as market surveillance would be impossible.

59. The chair counter argued that it would not be appropriate to exclude equipment because it is passive. When one would follow that line, electrical switchgear could not be covered under the LVD. He considered that directional antennas have a major impact on compliance with the essential requirements of the Directive. Industry has not argued against this approach.

60. All delegations except the Netherlands then agreed with the conclusion proposed by the United Kingdom in annex C of their document (**Decision 5**).

TCAM 19 Decision list	
18.5	Antennas within the scope of EN 302 217-4-2 are covered by the R&TTE Directive.

A.1.3 TCAM 20 - Generic guidance at for adoption of ETSI harmonised standard containing passive antennas parameters

Having deliberated at TCAM 19 about FS passive antennas in the scope of EN 302 217-4-2 [i.12], TCAM 20 considered the proposed ETSI approach whenever the issue of passive antennas in HS would be faced.

Document (21)02 [i.19]-TCAM 20 minutes (6-Legal issues, section10) quotes:

10.Coverage of antennas (Decision)	Doc. 32#4, 42
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51. Owen (ETSI) introduced the matter of coverage of passive antennas by the Directive. In order to ensure a common understanding between TCAM and ETSI she proposed:

1. ETSI should inform TCAM when requirements concerning stand-alone, passive antennas (to be sold separately) are to be included in candidate Harmonised Standards.

2. *TCAM agreement would be assumed unless TCAM would provide ETSI with a contrary decision following consideration of the ETSI report.*
3. *The current TCAM Decision on passive antennas to be amended to include the procedure described at 1 and 2.*
52. *The Commission Services should propose a revision of the TCAM Decision for consultation in the next meeting (Action 1).*

ETSI TM4 interpretation of TCAM 20 text

It is here understood that the above generic guidance, agreed between TCAM and ETSI at TCAM 20 on the adoption of HS containing passive antenna parameters, is to be considered when the first version of the EN is undergoing ETSI approval/publication. Subsequent revisions of the same HS, as it is the current situation for EN 302 217-4-2 [i.12] and EN 302 326-3 [i.13], having already obtained clearance would not need to follow that procedure.

A.2 Extension to all FS antennas.

In the above clause, it is shown that TCAM has been specifically requested for a decision on PP antennas in the scope of EN 302 217-4-2 [i.12]; at that point in time, no other country felt it necessary to request TCAM for similar formal action regarding P-MP antennas (e.g. in the scope of EN 302 326-3 [i.13]). However, from the discussion in TCAM 18 reported above, the general approach expressed by UK and the conclusions by the Chair (i.e. that *"it is appropriate to have antennas covered, when ETSI had concluded that harmonised standards are necessary"*) it is understood that ETSI can adopt a case by case position.

Therefore, considering the EG 201 399 [i.1] guidance and the above TCAM background, ETSI FS community concluded that parameters of all FS antennas, including those placed on the market as FS specific stand-alone antennas, are relevant to Article 3.2 of R&TTE Directive [i.2]. This unless TCAM would possibly re-visit the argument with different opinion.

History

Document history		
V1.1.1	January 2000	Publication
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