

**Aeronautical Communications;  
Classification of RF-parameters of ground-based  
Air Traffic Management-related radio equipment  
as being governed by R&TTE Directive or  
Single European Sky (SES) Interoperability Regulation**

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Reference

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Keywords

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# Contents

Intellectual Property Rights .....	4
Foreword.....	4
Introduction .....	4
1 Scope .....	5
2 References .....	5
2.1 Normative references .....	5
2.2 Informative references.....	5
3 Definitions and abbreviations.....	7
3.1 Definitions .....	7
3.2 Abbreviations .....	7
4 Approach to classify RF parameters of ground-based ATM radio equipment.....	8
4.1 General considerations .....	8
4.2 Overview over Essential Requirements to be respected for ground-based ATM radio equipment.....	9
4.3 Practical approach .....	10
4.4 Example 1: Communication: aeronautical radios.....	12
4.5 Example 2: Surveillance: A-SMGCS equipment .....	12
4.6 Example 3: aeronautical Navigation equipment.....	12
4.7 Conclusion.....	12
<b>Annex A: Bibliography .....</b>	<b>14</b>
History .....	15

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## Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

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## Introduction

On global level civil aviation is governed by the ICAO convention which has been signed (among others) by all member states of the European Union. Annex 10 to this convention (sometimes augmented by other types of ICAO documents) provides the necessary provisions for the global interoperability between the radio equipment installed on-board of aircrafts and the ground-based, air traffic management related radio equipment.

R&TTE Directive [i.7] was introduced in order to support a market-led approach into the Radio and Telecommunications Terminal Equipment sector, and it removed the regime of type approvals. Conformity with the Essential Requirements in article 3 of the R&TTE Directive [i.7] became by manufacturer's declaration, and could be based on Harmonized Standards, or using other means. Annex I.5 of R&TTE Directive [i.7] exempted radio equipment on board of aircraft and annex I.6 of that directive exempted consistently air traffic management equipment from its application.

The European Union launched the "Single European Sky" (SES) legislation in 2002 which was adopted in 2004 and amended in 2009 [i.26].

The SES legislation is based on a framework of 4 regulations, which includes the Interoperability Regulation [i.1]. The objective of the Interoperability Regulation is to ensure interoperability of the European Air Traffic Management Network (EATMN) consistent with air navigation services including ground-based, air-borne and space-based constituents. Under this regulation, the use of a European Standard referenced in the Official Journal of the European Union as Community Specification (CS) is a means of compliance to the essential requirements of the Regulation and/or the relevant implementing rules for interoperability.

Following a legal opinion of the European Commission presented to TCAM the exemption of air traffic management equipment from the application of R&TTE Directive [i.7] ended 18 month after the coming into force of the Interoperability Regulation [i.1] as a consequence of the transition arrangements included in the latter.

Consequently the European Commission issued mandate M/405 to CEN, CENELEC ETSI to produce Harmonized Standards covering the Essential Requirements of R&TTE Directive for air traffic management radio equipment while mandates M/390, M/408 and M/438 were issued to produce Community Specifications as means of compliance to the Essential Requirements of the Interoperability Regulation [i.1] and the relevant implementing rules for interoperability. The present document provides the results of an analysis under which legal framework the requirements on RF-parameters of ATM equipment fall.

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# 1 Scope

The present document summarizes the rationale on which current developments of ETSI European standards (EN) for ground-based air traffic management radio equipment and constituents has been based to allocate RF-parameters either to Harmonized Standards covering essential requirements under the R&TTE Directive [i.7] or to Community Specifications as means of compliance to the essential requirements of the Interoperability Regulation [i.1] and the requirements from relevant implementing rules for interoperability.

NOTE: This rationale is consistent with the existing ETSI documents EG 201 399 [i.4] and TR 102 579 [i.5] on the development of such documents.

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# 2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

## 2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

## 2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (interoperability Regulation), OJ L 96, 31.03.2004 as amended by Regulation (EC) No 1070/2009.
- [i.2] Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, OJ L 79, 19.03.2008, p. 1-49.
- [i.3] Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC, OJ L 309, 24.11.2009, p. 51-70.
- [i.4] ETSI EG 201 399 (V2.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of Harmonized Standards for application under the R&TTE Directive".
- [i.5] ETSI TR 102 579 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Report providing guidance for the production of Community Specifications for application under the Single European Sky Interoperability Regulation EC 552/2004".
- [i.6] Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation), OJ L 96, 31.03.2004 as amended by Regulation (EC) No 1070/2009.

- [i.7] 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, OJ L 91, 07.04.1999.
- [i.8] Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, OJ L 37, 13.2.2003 (ROHS Directive).
- [i.9] Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres, OJ L 100, 19.4.1994 (ATEX Directive).
- [i.10] Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC (EMC Directive).
- [i.11] Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).
- [i.12] Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.
- [i.13] Commission Regulation (EC) No. 29/2009, of 16 January 2009, laying down requirements on data link services for the single European sky, OJ L 13/3 (17.1.2009), including Corrigendum published in the EU Official Journal L104 at 24.04.2009.
- [i.14] Commission Regulation (EC) No 1265/2007 of 26 October 2007 laying down requirements on air-ground voice channel spacing for the single European sky, OJ L 283, 27.10.2007.
- [i.15] ETSI EN 300 676-2: "Ground-based VHF hand-held, mobile and fixed radio transmitters, receivers and transceivers for the VHF aeronautical mobile service using amplitude modulation; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".
- [i.16] ETSI EN 302 617-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Ground-based UHF radio transmitters, receivers and transceivers for the UHF aeronautical mobile service using amplitude modulation; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- [i.17] ETSI EN 303 213-3: "Advanced Surface Movement Guidance and Control System (A-SMGCS); Part 3: Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 for a deployed cooperative sensor including its interfaces".
- [i.18] ETSI EN 303 213-4-1: "Advanced Surface Movement Guidance and Control System (A-SMGCS); Part 4: Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 for a deployed non-cooperative sensor including its interfaces; Sub-part 1: Generic requirements for non-cooperative sensor".
- [i.19] ETSI EN 303 213-4-2: "Advanced Surface Movement Guidance and Control System (A-SMGCS); Part 4: Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 for a deployed non-cooperative sensor including its interfaces; Sub-part 2: Specific requirements for a deployed Surface Movement Radar sensor".
- [i.20] ETSI EN 303 213-6: "Advanced Surface Movement Guidance and Control System (A-SMGCS); Part 6: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for deployed surface movement radar sensors sub-part 1: sensors using pulsed signals and transmitting power up to 100 kW".
- [i.21] ETSI EN 303 214: "Data Link Services (DLS) System; Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 requirements for ground constituents and system testing".

- [i.22] ETSI EN 301 841-3: "VHF air-ground Digital Link (VDL) Mode 2 Part 3: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- [i.23] ETSI EN 303 213-5: "Advanced Surface Movement Guidance and Control System (A-SMGCS) ; Part 5: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for transmitter used in multilateration equipment".
- [i.24] ETSI EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- [i.25] ETSI EN 301 489-22: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 22: Specific conditions for ground based VHF aeronautical mobile and fixed radio equipment".
- [i.26] CENELEC EN 60215: "Safety Requirements For Radio Transmitting Equipment".
- [i.27] Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast), OJ L 157, 9.6.2006, p. 24-86 (Machinery Directive).
- [i.28] ITU Radio Regulations.

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following terms and definitions given in [i.6] and the following apply:

**constituents:** tangible objects such as hardware and intangible objects such as software upon which the interoperability of the EATMN depends

NOTE: This is the legally binding definition in the context of Single European Sky [i.6].

**system:** aggregation of airborne and ground-based constituents, as well as space-based equipment, that provides support for air navigation services for all phases of flight

NOTE: This is the legally binding definition in the context of Single European Sky [i.6].

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in [i.28] and the following apply:

ATM	Air Traffic Management
CEPT	Conférence Européenne des Postes et Télécommunications
DME	Distance Measuring Equipment
EASA	European Aviation Safety Agency
EATMN	European Air Traffic Management Network
EC	European Commission

NOTE: Often referred to as "Commission" in the present document.

ECC	Electronic Communications Committee (a committee of CEPT)
EMC	Electromagnetic Compatibility

NOTE: See "new" EMC Directive 2004/108/EC [i.10].

EN	European Norm - (standard)
ER	Essential Requirement
EUROCAE	European Organisation for Civil Aviation Equipment

GBAS	Ground Base Augmentation System
HS	Harmonized Standard
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
ITU	International Telecommunication Union
LVD	Low Voltage Directive

NOTE: See Directive 73/23/EEC [i.11], more recently replaced by 2006/95/EC [i.12].

RF	Radio Frequency
SES	Single European Sky

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## 4 Approach to classify RF parameters of ground-based ATM radio equipment

### 4.1 General considerations

As a generic position, ATM radio equipment should comply with all legal provisions which are applicable to it. These provisions may be of local, regional, national or European nature.

NOTE: Provision from international treaties (like e.g. ICAO, ITU, CEPT provisions) are binding on the signatories of such treaties and therefore transposed in national or European provisions to be binding on citizens or legal entities.

A distinction is drawn between provisions that are ATM specific ("fit for purpose requirements") and provisions generally applicable to all type of radio equipment, to all types of electronic equipment or to all types of equipment at a certain place or a certain type of place. For the purpose of the present document the latter are called "horizontal" requirements (e.g. valid for all type of radio equipment) whereas the 'fit-for-purpose'-requirements ensure that the piece of ATM equipment serves its purpose in the EATMN.

As horizontal requirements are laid down in manifold legislation - the majority in directives -, the given references in the following clauses are not necessarily exhaustive. Their application differs from the purpose, location, environment and conditions for use of the relevant equipment,

The "fit-for-purpose"-requirements however are exclusively manifested in the SES Interoperability Regulation [i.1], the EASA Basic Regulation [i.2] (as amended by [i.3]) and Implementing Rules based an these two regulations.

For the sake of completeness it should be mentioned, that there are also sector-specific rules on products (outside of the ATM sector), which have to comply with the R&TTE Directive. E.g. radio-controlled heart pacemaker are subject to the medical device Directive as well as to R&TTE Directive, and, potentially to requirements from other legal instruments.

## 4.2 Overview over Essential Requirements to be respected for ground-based ATM radio equipment

Type of equipment	Specific for all ATM systems and constituents		Specific for some types of ATM systems and constituents	
Legal instrument	Amended EASA regulation [i.3], Annex Vb <i>ER 3a: General</i>  <i>ER 3b: Systems and constituents; integrity, performance and reliability</i>  <i>ER 3c: Design of systems and constituents</i>  <i>ER 3d: Continuity and level of service</i>	SES Interoperability regulation [i.1], Annex II, part A <i>ER 7: Principles governing the construction of systems</i> <i>ER 6: Principles governing the logical architecture of systems</i> <i>ER 5: Environmental constraints</i> (invokes all relevant Community legislation on environment; example could be ROHS-Directive [i.8]) <i>ER 4: Civil-military coordination</i> <i>ER 3: Safety</i> <i>ER 2: Support for new concepts of operation</i> <i>ER 1: Seamless operation</i>	SES Interoperability regulation [i.1], Annex II, part B Specific ERs for communication systems and procedures: - <i>Seamless operation</i> - <i>Support for new concepts of operation</i>	Amended EASA regulation [i.3], Annex Va A3 "visual and non-visual aids and aerodrome equipment"
Applicable to all radio equipment: R&TTE-Directive [i.7]	Article 3.2 (efficient use of spectrum, avoid harmful interference)			
	Article 3.1b (EMC)			
	Article 3.1a (LVD)			
Applicable to all equipment in a certain type of place	Out of scope of the present document (example could be ATEX Directive [i.9] if scope of that Directive is applicable)			
NOTE:	Rotating antennas used in ATM surveillance systems ("Radar") are additionally under the scope of the Machinery Directive [i.27].			

NOTE 1: The full official text of the essential requirements can be found in the referenced documents; only the summarizing headlines from the official documents are taken and used for the purpose of the presented document.

From the table above, it could be inferred that ground-based ATM related radio equipment should comply with the Essential requirements (ER) from R&TTE Directive [i.7] **AND** with the general Essential requirements from SES-Interoperability Regulation [i.1] as well as from EASA Basic Regulation [i.2] (as amended by [i.3] **AND** - depending on their nature as communication, navigation or surveillance equipment - with the *appropriate specific* Essential requirements from SES Interoperability Regulation [i.1]).

This approach ensures that ATM-related radio equipment is on the one hand fit-for-purpose and on the other hand does sufficiently protect non-ATM radio equipment in neighbouring frequency bands as well as is (as victim) sufficiently protected from harmful interference from non-ATM radio equipment.

NOTE 2: ITU Radio Regulations [i.28] requires that Safety-of-live-services are sufficiently protected against harmful interference from other services in neighbouring frequency bands.

The Interoperability Regulation has an essential requirement in respect of harmful interference. The R&TTE Directive addresses harmful interference from the perspective of electromagnetic interference whether intentional or unintentional interference from ATM equipment. The R&TTE Directive therefore serves the purpose of this requirement at least in respect of transmitter requirements. As such, **there is no overlap amongst the above legislation but only complementarily aspects**. It should be emphasised however that to be as effective as possible, that ATM equipment receiver characteristics should be clearly within the scope of R&TTE compliance.

NOTE 3: Harmonized Standards covering the essential requirement of Article 3.2 for ground-based ATM-related radio equipment could be a sound, by consensus accepted base for compatibility studies between ATM-related radio equipment and other radio equipment. The availability of such harmonized standards could therefore contribute to aviation safety.

NOTE 4: The protection of ground-based ATM equipment from other ground-based ATM equipment in neighbouring geographical areas or neighbouring frequencies may be seen either as a matter of ER 3 of [i.1] or as a matter of Article 3.2 of [i.7]. However this question is out of the scope of the present document.

NOTE 5: Some of the Essential requirements from SES Interoperability Regulation [i.1] are addressing "constituents" and "systems" while other are only addressing "systems". Under the SES Interoperability Regulation [i.1] manufacturer are obliged to declare the conformity of their "constituents" by a EC-declaration of conformity (if a Community Specification related to the constituent exist) or by a EC-declaration of suitability for use (if no Community Specification is available).

## 4.3 Practical approach

Annex A of the ETSI Guide to the production of candidate Harmonized Standards for application under the R&TTE Directive EG 201 399 [i.4] gives practical guidance how to relate RF-parameters to essential requirements of R&TTE Directive [i.7].

ATM-related radio equipment investigated so far for the development of EN 300 676-2 [i.15], EN 302 617-2 [i.16], EN 301 841-3 [i.22], EN 303 213-5 [i.23] and EN 303 213-6 [i.20] show usually (at least) attributes B, D and F as defined in clause A.1 of EG 201 399 [i.4]. Whether the rationale on attribute D it really qualifies as a "horizontal" one, or whether the related "technical phenomena" would be better placed under "fit-for-purpose" may need further considerations.

The choice of attributes B, D and F translates into the following technical phenomena.

Essential Requirement	Phenomena	B	D	F
		3.2 (Transmitting)	Frequency error/stability, and designation of channels Transmitter power Adjacent channel power Spurious emissions Inter-modulation attenuation Release time Transient behaviour of the transmitter Modulation Accuracy Duty cycle	Yes Yes Yes Yes Yes Yes
3.2 (Directional)	Off-axis EIRP density Antenna gain Antenna X-polar discrimination Antenna pointing accuracy/control Active antenna spurious emissions (see guidance from TCAM in clause A.3 of EG 201 399 [i.4])	Yes Yes Yes Yes		
3.2 (Receiving)	(Maximum usable) sensitivity (inc. duplex) Co-channel rejection Adjacent channel selectivity Spurious response rejection (inc. duplex) Inter-modulation response rejection Blocking or desensitization (inc. duplex) Spurious emissions Multipath sensitivity	Yes Yes Yes Yes Yes	Yes Yes	Yes
3.2 (TDM: CDM: Control and Monitoring Functions for Terminal)	Enabling Signalling  Sharing Protocols Network interface bit errors Error control by coding and decoding of logical channels Logical channel arrangement Control of communication in logical channels Correct interpretation of Network control information Network interface addressing Control of basic link communication Control of random access Control of radio resource allocation Monitoring functions for cell selection Control functions for usage of cells Control of group attach/detach Tx enable/disable control Tx Call set up control Control of call maintenance Control of call disconnect Authentication control Encryption control procedures	Yes		

NOTE: This table has been derived from table A.2 of EG 201 399 [i.4].

Table A.1 of EG 201 399 [i.4] - being independent from the attributes used above - should be applied in its entirety.

ICAO-, EUROCAE- and ECC-documents have been very useful, but sometimes incomplete sources for the drafting Harmonized Standards covering the essential requirement from Article 3.2 of R&TTE Directive.

For practical purpose all other technical phenomena and all procedural issues should be considered as "fit-for-purpose"-requirements and should therefore not covered in a Harmonised Standard, but should be included in appropriate Community Specification.

It should be noted that, as a result of applicability of R&TTE-Directive [i.7], ground-based ATM-related radio equipment needs CE-marking and the requirements for Conformity Assessment from R&TTE-Directive [i.7] apply. The compliance with Essential Requirements from SES-Interoperability Regulation need not to be marked with the CE-mark.

#### 4.4 Example 1: Communication: aeronautical radios

		<b>Aeronautical VHF-radio for voice and ARCAS-datalink</b>	<b>Aeronautical VHF-radio for VDL Mode 2</b>	<b>Aeronautical UHF-radio for voice to serve non-equipped state aircraft</b>
Related legal provisions under SES	Essential Requirements from 552/2004 [i.1]	ER1 to ER7 from Annex II part A and specific ERs from Annex II, part B for communication systems and procedures		
	Implementing rule	Commission Regulation (EC) 1265/2007 [i.14]	Commission Regulation (EC) 29/2009 [i.13]	Commission Regulation (EC) 1265/2007 [i.14]
Related Community Specification(s)		None	EN 303 214 [i.21]	None
R&TTE- Directive [i.7] and related HS	Article 3.2 (efficient use of spectrum, avoid harmful interference)	EN 300 676-2 [i.15]	EN 301 841-3 [i.22]	EN 302 617-2 [i.16]
	Article 3.1b (EMC)	EN 301 489 parts 1 [i.24] and 22 [i.25]		EN 301 489-1 [i.24] (tbc)
	Article 3.1a (LVD)	EN 60215 [i.26]		

#### 4.5 Example 2: Surveillance: A-SMGCS equipment

		<b>A-SMGCS - cooperative sensor (multilateration)</b>	<b>A-SMGCS - non-cooperative sensor Surface Movement Radar</b>
Related legal provisions under SES	Essential Requirements from 552/2004 [i.1]	ER1 to ER7 from Annex II part A and specific ER from Annex II, part B for surveillance systems and procedures	
	Implementing rule	None	None
Related Community Specification(s)		EN 303 213-3 [i.17]	EN 303 213-4-1 [i.18] and EN 303 213-4-2 [i.19]
R&TTE- Directive [i.7] and related HS	Article 3.2 (efficient use of spectrum, avoid harmful interference)	EN 303 213-5 [i.23]	EN 303 213-6 [i.20]
	Article 3.1b (EMC)	EN 301 489-1 [i.24]; (new sub-part may be required)	EN 301 489-1 [i.24]; (new sub-part may be required)
	Article 3.1a (LVD)	EN 60215 [i.26]	

#### 4.6 Example 3: aeronautical Navigation equipment

There is currently no work concerning Community Specification on aeronautical navigation equipment as M/408 is paused and the development of HS for (aeronautical) navigation equipment like DME, ILS, GBAS Cat I, etc. under M/405 has not yet been started.

#### 4.7 Conclusion

The Essential Requirements from the R&TTE Directive [i.7] on one hand, EASA Regulation and SES Interoperability Regulation [i.1] on the other hand are complementary and an exemption of ATM radio equipment from R&TTE Directive [i.7] is not necessary.

Furthermore the revised R&TTE Directive should clarify that radio equipment falling additionally into the scope of sector specific European legislation may only be put into service if both R&TTE Directive as well as sector specific European legislation are complied with, even if the sector specific legislation does not require the CE marking.

NOTE: All equipment falling under R&TTE needs the CE marking.

Notwithstanding what has been said above, it is recommended to foresee a clause in the revised R&TTE Directive that delegates the decision on the possible exclusion of certain ATM equipment from the R&TTE Directive to TCAM **only after due consultation with the Single Sky Committee.**

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## Annex A: Bibliography

Commission Regulation (EC) No 1702/2003 of 24 September 2003 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations, OJ L 243, 27.09.2003, p.6-79.

Regulation (EC) No 1070/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004 and (EC) No 552/2004 in order to improve the performance and sustainability of the European aviation system, OJ L 300, 14.11.2009.

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## History

<b>Document history</b>		
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