

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Guide to the application of harmonized standards to
multi-radio and combined radio and non-radio equipment;
Part 2: Effective use of the radio frequency spectrum**



Reference

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Foreword

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

Introduction

The following text is taken from the harmonized standard pro-forma and is included here to provide the reader with an overview of Harmonized standards and their relationship with the R&TTE Directive 1999/5/EC [1].

Harmonized standards produced by ETSI for use under the R&TTE Directive are designed to fit in a modular structure to cover all radio and telecommunications terminal equipment under the R&TTE Directive [1]. Each standard is a module in the structure. The modular structure is shown in figure 1.

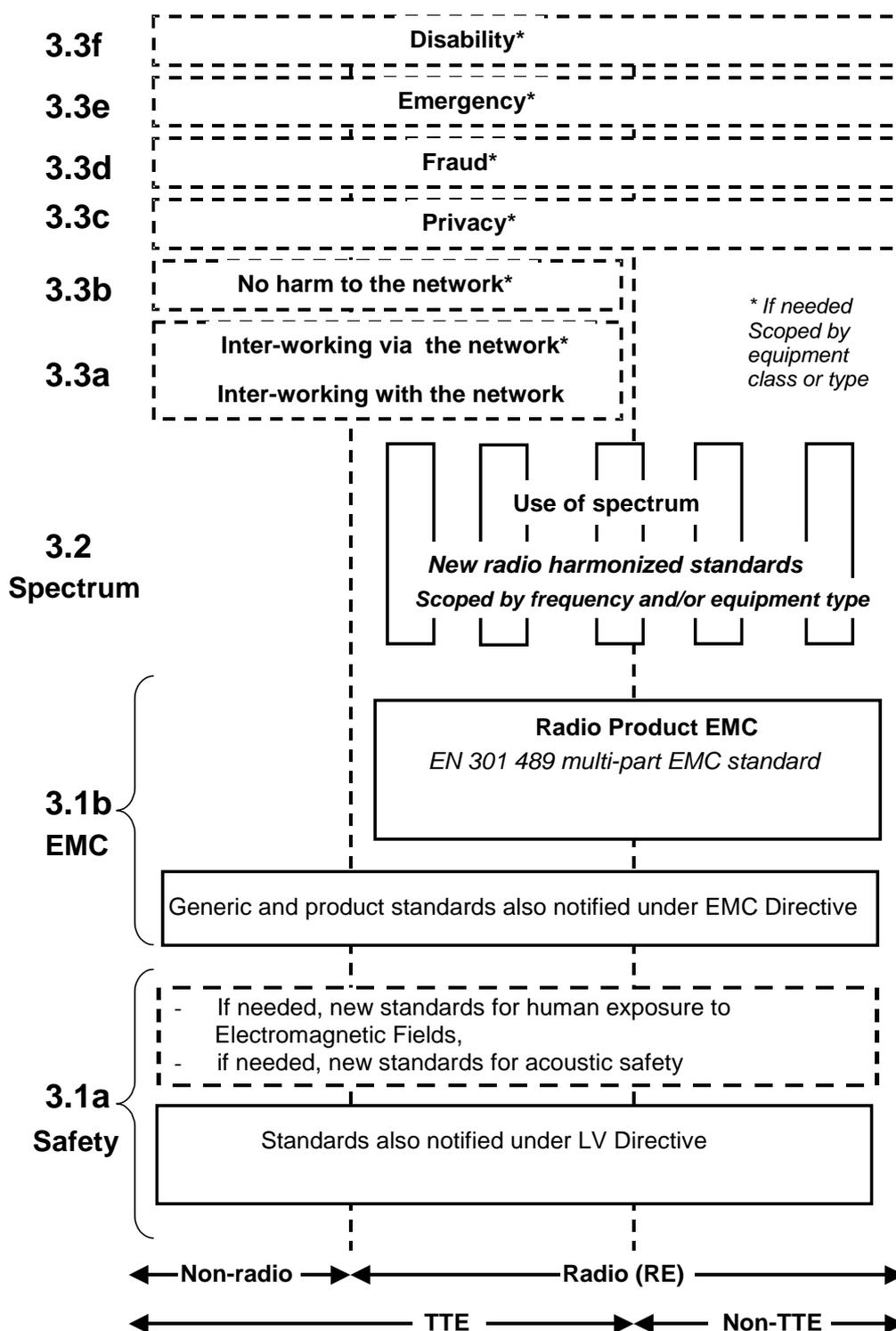


Figure 1: Modular structure for the various standards used under the R&TTE Directive [1]

The left hand edge of the figure 1 shows the different clauses of article 3 of the R&TTE Directive [1].

For article 3.3 various horizontal boxes are shown. Dotted lines indicate that at the time of publication of the present document essential requirements in these areas have to be adopted by the Commission. If such essential requirements are adopted, and as far and as long as they are applicable, they will justify individual standards whose scope is likely to be specified by function or interface type.

The vertical boxes show the standards under article 3.2 for the use of the radio spectrum by radio equipment. The scopes of these standards are specified either by frequency (normally in the case where frequency bands are harmonized) or by radio equipment type.

For article 3.1b the diagram shows EN 301 489, the multi-part product EMC standard for radio used under the EMC Directive [2].

For article 3.1a the diagram shows the existing safety standards currently used under the LV Directive [2] and new standards covering human exposure to electromagnetic fields. New standards covering acoustic safety may also be required.

The bottom of the figure shows the relationship of the standards to radio equipment and telecommunications terminal equipment. A particular equipment may be radio equipment, telecommunications terminal equipment or both. A radio spectrum standard will apply if it is radio equipment. An article 3.3 standard will apply as well only if the relevant essential requirement under the R&TTE Directive [1] is adopted by the Commission and if the equipment in question is covered by the scope of the corresponding standard. Thus, depending on the nature of the equipment, the essential requirements under the R&TTE Directive [1] may be covered in a set of standards.

The modularity principle has been taken because:

- it minimizes the number of standards needed. Because equipment may, in fact, have multiple interfaces and functions it is not practicable to produce a single standard for each possible combination of functions that may occur in an equipment;
- it provides scope for standards to be added:
 - under article 3.2 when new frequency bands are agreed; or
 - under article 3.3 should the Commission take the necessary decisions without requiring alteration of standards that are already published.
- it clarifies, simplifies and promotes the usage of Harmonized Standards as the relevant means of conformity assessment.

1 Scope

The present document provides guidance in resolving the technical difficulties with the application of harmonized standards which are used to demonstrate compliance with the essential requirements for effective use of the radio frequency spectrum for combined equipment, which include a radio and/or a telecommunication function. Examples to be covered include combined equipment containing multiple radio technologies, radio in IT equipment, radio in domestic equipment etc.

The present document is intended to cover combined equipment, which are subject to the provisions of article 3.2 of the R&TTE Directive, as a result of this combination.

The purpose of the present document is:

- to provide guidance with the testing of this type of equipment;
- to eliminate duplicate testing wherever possible;
- to provide guidance for conformance assessment and market surveillance.

The present document provides guidance on the application of harmonized EMC product standards for combined equipment under article 3.1(b) (EMC) of the R&TTE directive 1999/5/EC [1].

The present document does not cover:

- single custom built products that are tailored to a specific customer quotation;
- products that operate independently if they are not contained within a single enclosure.

2 References

For the purposes of this Technical Report (TR) the following references apply:

- [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.
- [2] 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.
- [3] Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

3 Definitions and abbreviations

3.1 Definitions

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

combined equipment: any equipment made of two or more individual products or functions

NOTE: At least one of the individual products or functions falls within the scope of the R&TTE Directive 1999/5/EC [1]. The result of this combination provides additional control and/or functionality to the combined equipment.

control: any signals, whether analogue or digital, designed to change the basic operation, or internal configuration of the receiving product, except where selections are made from predetermined, unchangeable options

function: functionality that cannot be identified as a separate product and is embedded into another product

manufacturer: manufacturer of the equipment, or his authorized representative, or an equipment supplier to the European market

multi-radio equipment: radio equipment containing two or more radio transmitters and/or receivers using different technologies that may operate simultaneously

primary function: the function of a combined equipment, declared by the manufacturer, as the key operation of the equipment

primary product: the individual product within a combined equipment that provides the primary function

3.2 Abbreviations

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

EMC	ElectroMagnetic Compatibility
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
LAN	Local Area Network
PABX	Private Automatic Branch eXchange
PAN	Personal Area Network
PC	Personal Computer
PDA	Personal Digital Assistant
RF	Radio Frequency
RLAN	Radio Local Area Network
R&TTE	Radio and/or Telecommunications Terminal Equipment
USB	Universal Serial Bus
WAN	Wide Area Network

4 Products considered in the present document

4.1 Relationship between individual components of a combined equipment

In all of the various scenarios at least one of the **products** or **functions** falls within the scope of article 3.2 of the R&TTE Directive 1999/5/EC [1], i.e. at least one of the **products** or **functions** is a radio.

The integration of a radio into a non-radio product and the integration of several radios into a single equipment is a non linear process, which needs careful consideration of the emissions.

The wanted signal from a radio transmitter may generate harmonics in other parts of the circuitry and may generate intermodulation products with other RF sources. These RF sources may be internal clock oscillators not intended to radiate, they may be local oscillators of radio receivers as well as RF generators of radio transmitters.

The following figures illustrate the various product combinations considered in the present document.

4.1.1 Scenario 1

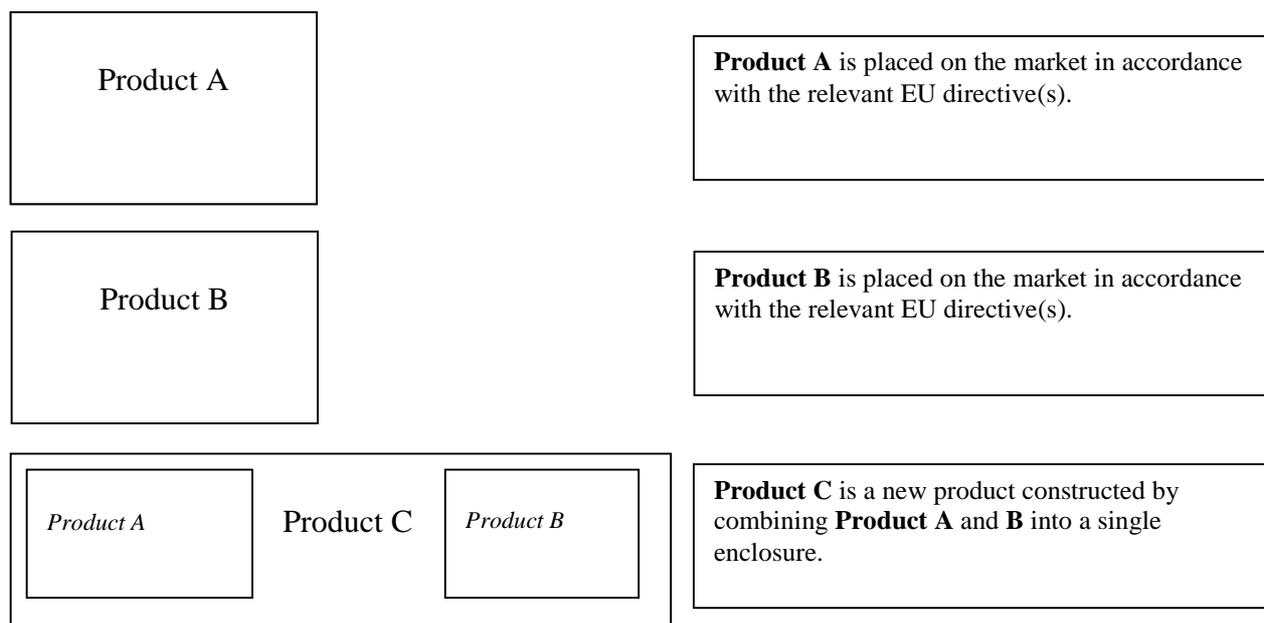


Figure 2

In this scenario all three of the above products are products in their own right with their own functionality and compliance to their respective EU directives, but may in some cases be reliant upon one of the other products for its power supply. In this scenario either **product A** and/or **product B** is a product that falls within the scope of the R&TTE Directive therefore **product C** also falls under the scope of the R&TTE Directive.

4.1.2 Scenario 2

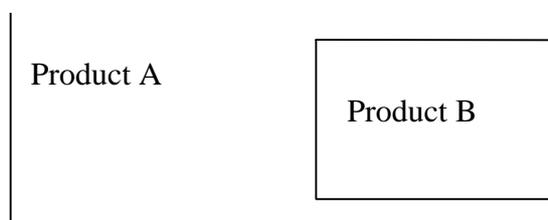


Figure 3

Product A is a product in its own right and is placed upon the EU market in accordance with the relevant directives. **Product B** is dependent upon **product A** and relies upon **product A** for control and possibly power. **Product B** is physically installed within **product A** according to the manufacturer's instruction, e.g. plug and socket, hard wiring. There may be multiple types of **product Bs** within a single **product A**.

4.1.3 Scenario 3

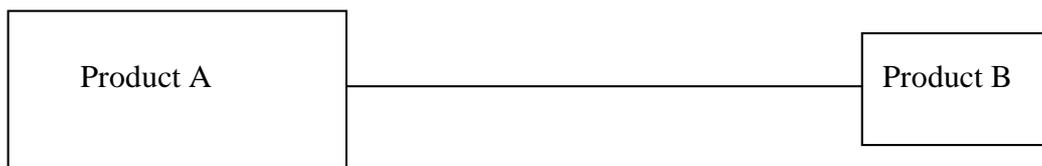


Figure 4

Product A is a product in its own right and is placed upon the EU market in accordance with the relevant directives. **Product B** is dependent upon **product A** and relies upon **product A** for control and possibly its power supply. **Product B** is physically connected by either cable or fibre to **product A**, and the two products may be some distance apart. There may be several **product Bs** connected to a single **product A**.

4.1.4 Scenario 4

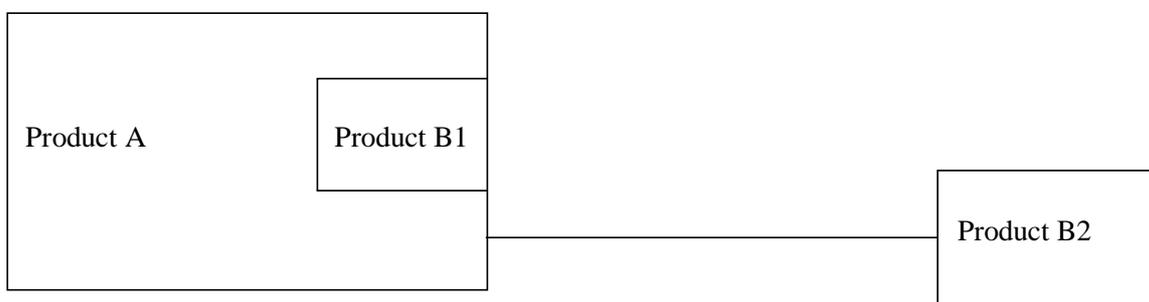


Figure 5

This scenario is a combination of the previous two scenarios. **Product B1** is physically installed within **product A** according to the manufacturer's instruction, e.g. plug and socket, hard wiring, whilst **product B2** is physically connected by either cable or fibre to **product A** and may be some distance apart.

4.1.5 Scenario 5

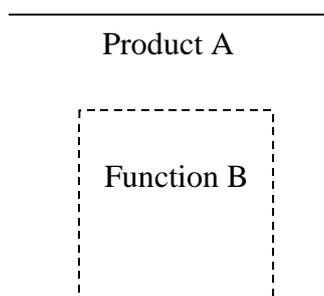


Figure 6

Product A was a product in its own right and was placed upon the EU market in accordance with the relevant directives. In this scenario an additional function, **function B**, is incorporated into **product A** during a design evolution and cannot be identified as a separate part of **product A**. However **product A** can be operated without using **function B**.

4.1.6 Scenario 6

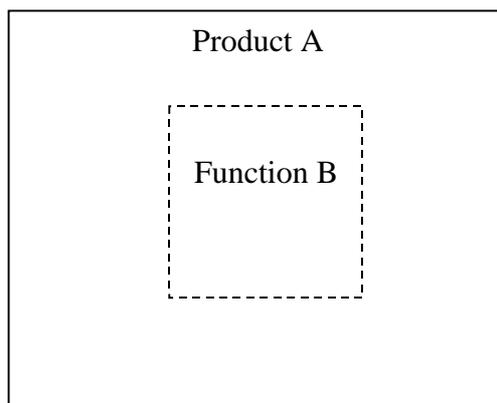


Figure 7

Function B is part of **product A** which was added during design. **Product A** cannot be operated without using **function B**.

4.1.7 Scenario 7



Figure 8

Products A and **B** are products in their own right. However **product A** relies upon **product B** for its operation. **Product B** may work with other products. The link between **product A** and **B** may be either a physical link (e.g. cable) or non-physical (e.g. radio).

5 Application of harmonized standards to combined equipment

It is always necessary to perform a conformance assessment for combined equipment under article 3.2 of the R&TTE Directive 1999/5/EC [1]. However, this assessment may not necessarily lead to testing of the combined equipment.

5.1 Functional dependencies

The following table takes the above scenarios, from clause 4.1, and places them into product combinations which are dependant upon whether the individual products/functions can operate independently of each other. The final column in the table indicates where guidance upon application of harmonized standards can be found.

Any of the scenarios described in clause 4.1 may be applicable to multi-radio equipment.

Table 1: Functional dependencies

	Product A		Product/Function B		Reference clause in present document for application of harmonized standards
	Works alone	Does not work alone	Works alone	Does not work alone	
Scenario 1	X		X		6.1 or 6.2
Scenario 2	X			X	6.1 or 6.2 or 6.6
Scenario 3	X			X	6.4 or 6.5
Scenario 4	X			X	(6.1 or 6.2 or 6.6) and (6.4 or 6.5)
Scenario 5	X			X	6.3 or 6.6
Scenario 6		X		X	6.3 or 6.6
Scenario 7		X	X		6.4 or 6.5

NOTE 1: Product B can mean more than one product.
NOTE 2: Multi-radio equipment (clause 6.7) should be considered in addition to the identified clause(s) from above.

6 Product combinations considered in the present document

6.1 Non-radio products that may accept a plug-in radio module with an integral antenna

Where the radio plug-in module is able to be assessed separately, then this module may be declared compliant with article 3.2 of the R&TTE Directive 1999/5/EC [1], independently of any potential host product, using the appropriate radio harmonized standard.

In the above case or if the radio plug-in module(s) has been previously assessed to article 3.2 of the R&TTE Directive 1999/5/EC [1] and is used according to the manufacturer's instructions, no further assessment of the combined equipment to article 3.2 R&TTE Directive 1999/5/EC [1] is required.

It should be noted that assessment does not necessarily lead to testing.

6.2 Non-radio products that may accept a plug-in radio module without an integral antenna

Where the radio plug-in module is able to be assessed separately, then this module may be declared compliant with article 3.2 of the R&TTE Directive 1999/5/EC [1], independently of any potential host product, using the appropriate radio harmonized standard.

In the above case or if the radio plug-in module(s) has been previously assessed to article 3.2 of the R&TTE Directive 1999/5/EC [1] and is used according to the manufacturer's instructions, no further assessment of the combined equipment to article 3.2 R&TTE Directive 1999/5/EC [1] is required.

However, should a system integrator change the antenna from that used in the initial assessment, reassessment to article 3.2 of the R&TTE Directive 1999/5/EC [1] should be carried out using the appropriate radio harmonized standard.

It should be noted that assessment does not necessarily lead to testing.

6.3 Non-radio products that contain an embedded radio functionality

Where the embedded radio function cannot operate independently from the primary product then the combined equipment should be assessed to the harmonized standard relevant for the radio technology utilized.

Alternatively, for radiated spurious emissions in receive and/or standby mode, the harmonized EMC standard for the primary product may be used. For the remaining parts of the frequency measurement ranges covered by the radio standard, but not the primary product EMC standard, the requirements in the radio standard should be used to demonstrate compliance to article 3.2 of the R&TTE Directive 1999/5/EC [1].

Further applications which utilize the identical radio design, shielding, interface and physical layout should undergo an assessment to ensure continuing compliance is maintained. In this case further testing may not be required as these applications can be regarded as identical in performance to the original application.

Where a system integrator wishes to utilize an antenna not included in the original assessment or changes any other aspect of the original radio design and/or physical layout, then a new assessment should be carried out using the appropriate radio harmonized standard covering article 3.2 of the R&TTE Directive 1999/5/EC [1].

It should be noted that assessment does not necessarily lead to testing.

6.4 Radio product with an integral antenna connected to a non-radio product

Where the radio product is able to be assessed separately, then this product may be declared compliant with article 3.2 of the R&TTE Directive 1999/5/EC [1], independently of any connected product, using the appropriate radio harmonized standard.

In the above case or if the radio product(s) has been previously assessed to article 3.2 of the R&TTE Directive 1999/5/EC [1] and is used according to the manufacturer's instructions, no further assessment of the combined equipment to article 3.2 R&TTE Directive 1999/5/EC [1] is required.

It should be noted that assessment does not necessarily lead to testing.

6.5 Radio product without an integral antenna connected to a non-radio product

Where the radio product is able to be assessed separately, then this product may be declared compliant with article 3.2 of the R&TTE Directive 1999/5/EC [1], independently of any connected product, using the appropriate radio harmonized standard.

In the above case or if the radio product(s) has been previously assessed to article 3.2 of the R&TTE Directive 1999/5/EC [1] and is used according to the manufacturer's instructions, no further assessment of the combined equipment to article 3.2 R&TTE Directive 1999/5/EC [1] is required.

However, should a system integrator change the antenna from that used in the initial assessment, reassessment to article 3.2 of the R&TTE Directive 1999/5/EC [1] should be carried out using the appropriate radio harmonized standard.

It should be noted that assessment does not necessarily lead to testing.

6.6 Radio products that contain a non-radio function or plug-in module

When a non radio plug-in module or function is embedded into a radio product, the combined equipment shall be re-assessed to ensure that the combined equipment maintains compliance with the relevant harmonized radio product standard used to demonstrate compliance with article 3.2 of the R&TTE Directive [1].

It should be noted that assessment does not necessarily lead to testing.

6.7 Multi-radio equipment

The applicable requirements and limits for multi-radio equipment are those set out in the relevant harmonized radio product standards. It should be noted that in the majority of cases the levels for spurious emissions set out in harmonized standards for radio equipment are identical.

When measuring spurious emissions in the receive and/or standby mode, it is essential that none of the transmitters within the combined equipment are transmitting.

6.7.1 The spurious emissions from each radio can be identified

Where the spurious emissions from each radio can be identified, then the spurious emissions from each radio are assessed to the relevant harmonized radio standard.

It should be noted that assessment does not necessarily lead to testing.

6.7.2 The spurious emissions from each radio cannot be identified

Where the spurious emissions from each radio cannot be identified, then the combined equipment is assessed to the spurious emission requirements contained in all of the relevant harmonized radio standards applicable to the radios contained within the combined product.

Where the applicable harmonized radio standards contain different limits and measuring conditions, then the combined product is assessed to the harmonized radio standard that specifies the least stringent limits for the common part of the frequency measurement ranges. To assess the remaining parts of the frequency measurement ranges the limits from the relevant harmonized radio standard should be used.

It should be noted that assessment does not necessarily lead to testing.

7 Harmonized radio product standards

The relevant harmonized radio product standard for the specific radio service/product should be selected from the list of radio standards published in the EC official journal, under article 3.2 of the R&TTE Directive 1999/5/EC [1].

The radio product standard may be selected for a specific radio service and/or type of product used in that service.

Annex A: Examples of various type of combined equipment

A.1 Examples scenario 1 products

GPRS Base station: Constructed by combining an existing GSM base station with and an existing IP enabled digital switch in a single enclosure.

A.2 Examples scenario 2 products

PC with plug in Radio LAN card; where Radio LAN card relies upon the PC for control and power supply.

PDA with plug in WAN card; where WAN card relies upon the PDA for control and power supply.

GSM phone with SIM card containing free-running oscillator.

A.3 Examples scenario 3 products

Cordless PABX; where cordless radio unit is external to the PABX but relies upon the PABX for control and power supply.

PDA connected to an external RLAN; where the RLAN module is external to the PDA but relies upon the PDA for control and power supply.

A.4 Examples scenario 4 products

PC with plug in RLAN card and an external mobile phone connected via a USB cable; where both the RLAN and mobile phone rely upon the PC for control and/or power supply.

A.5 Examples scenario 5 products

Refrigerator controlled by RLAN with manual control option.

Printer with both cable connection and built in RLAN connectivity; thus allowing data to be sent either via the RLAN or the cable connection, but where the RLAN functionality cannot be removed.

A.6 Examples scenario 6 products

Radio controlled light dimmer; where the radio link is the only means of control and where the radio function embedded within the light dimming function.

Printer with RLAN connectivity only; where operation is only possible via the RLAN link and where the RLAN circuitry is embedded within the printer circuitry.

Notebook and Video camera with embedded such as Bluetooth™ link.

A.7 Examples scenario 7 products

Television receiver with universal radio remote control and no manual controls, where the universal radio remote control can control other appliances.

Satellite Television set top box with HomeRFTM link to other video monitors.

A.8 Examples of multi-radio equipment

3G handset with dual band GSM capability with BluetoothTM link for cordless headset.

PDA's with WAN/LAN/PAN modules.

History

Document history		
V1.1.1	November 2002	Publication