

Council Directive 72/245/EEC of 20 June 1972 relating to the radio interference (electromagnetic compatibility) of vehicles (repealed)

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[^{F1}ANNEX I

REQUIREMENTS TO BE MET BY VEHICLES AND ELECTRICAL/ ELECTRONIC SUBASSEMBLIES FITTED TO A VEHICLE

Textual Amendments

- F1** Substituted by [Commission Directive 2004/104/EC](#) of 14 October 2004 adapting to technical progress [Council Directive 72/245/EEC](#) relating to the radio interference (electromagnetic compatibility) of vehicles and amending [Directive 70/156/EEC](#) on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers (Text with EEA relevance).

1. SCOPE

This Directive applies to the electromagnetic compatibility of vehicles covered in Article 1, being vehicles or trailers (hereinafter referred to as vehicles) as supplied by the vehicle manufacturer and to components or separate technical units intended to be fitted in vehicles.

It covers:

- requirements regarding the immunity to radiated and conducted disturbances for functions related to direct control of the vehicle, related to driver, passenger and other road users' protection and related to disturbances, which would cause confusion to the driver or other road users,
- requirements regarding the control of unwanted radiated and conducted emissions to protect the intended use of electrical or electronic equipment at own or adjacent vehicles or nearby, and the control of disturbances from accessories that may be retrofitted to the vehicle.

2. DEFINITIONS

2.1. For the purposes of this Directive:

- 2.1.1. 'Electromagnetic compatibility' means the ability of a vehicle or component(s) or separate technical unit(s) to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.
- 2.1.2. 'Electromagnetic disturbance' means any electromagnetic phenomenon which may degrade the performance of a vehicle or component(s) or separate technical unit(s), or of any other device, unit of equipment or system operated in vicinity of a vehicle. An electromagnetic disturbance may be electromagnetic noise, an unwanted signal or a change in the propagation medium itself.
- 2.1.3. 'Electromagnetic immunity' means the ability of a vehicle or component(s) or separate technical unit(s) to operate without degradation of performance in the presence of (specified) electromagnetic disturbances which includes wanted radio frequency signals from radio transmitters or radiated in-band emissions of industrial-scientific-medical (ISM) apparatus, internal or external to the vehicle.
- 2.1.4. 'Electromagnetic environment' means the totality of electromagnetic phenomena existing at a given location.
- 2.1.5. 'Broadband emission' means an emission, which has a bandwidth greater than that of a particular measuring apparatus or receiver (International Special Committee on Radio Interference (CISPR) 25, 2nd edition).

- 2.1.6. ‘Narrowband emission’ means an emission which has a bandwidth less than that of a particular measuring apparatus or receiver (CISPR 25, 2nd edition).
- 2.1.7. ‘Electrical/electronic system’ means (an) electrical and/or electronic device(s) or set(s) of devices together with any associated electrical connections which form part of a vehicle but which are not intended to be type-approved separately from the vehicle.
- 2.1.8. ‘Electrical/electronic subassembly’ (ESA) means an electrical and/or electronic device or set(s) of devices intended to be part of a vehicle, together with any associated electrical connections and wiring, which performs one or more specialised functions. An ESA may be approved at the request of a manufacturer or his authorised representative as either a ‘component’ or a ‘separate technical unit (STU)’ (see Directive 70/156/EEC, Article 2).
- 2.1.9. ‘Vehicle type’ in relation to electromagnetic compatibility means vehicles which do not differ essentially in such respects as:
- 2.1.9.1. the overall size and shape of the engine compartment;
- 2.1.9.2. the general arrangement of the electrical and/or electronic components and the general wiring arrangement;
- 2.1.9.3. the primary material of which the body or shell (if applicable) of the vehicle is constructed (for example, a steel, aluminium or fibreglass body shell). The presence of panels of different material does not change the vehicle type provided the primary material of the body is unchanged. However, such variations must be notified.
- 2.1.10. An ‘ESA type’ in relation to electromagnetic compatibility means ESAs which do not differ in such essential respects as:
- 2.1.10.1. the function performed by the ESA;
- 2.1.10.2. the general arrangement of the electrical and/or electronic components, if applicable.
- 2.1.11. ‘Vehicle wiring harness’ means supply voltage, bus system (e.g. CAN), signal or active antenna cables, which are installed by the vehicle manufacturer.
- 2.1.12. Immunity-related functions are:
- (a) functions related to the direct control of the vehicle:
- [F²by degradation or change in: e.g. engine, gear, brake, suspension, active steering, speed limitation devices]
 - by affecting driver’s position, e.g. seat or steering wheel positioning,
 - by affecting driver’s visibility: e.g. dipped beam, windscreen wiper;
- (b) functions related to driver, passenger and other road-user protection:
- e.g. airbag and safety restraint systems;
- (c) functions which, when disturbed, cause confusion to the driver or other road users:
- optical disturbances: incorrect operation of e.g. direction indicators, stop lamps, end outline marker lamps, rear position lamp, light bars for emergency system, wrong information from

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- warning indicators, lamps or displays related to functions in clauses (a) or (b) which might be observed in the direct view of the driver,
 - acoustical disturbances: incorrect operation of anti-theft alarm, horn, for example;
 - (d) functions related to vehicle data bus functionality:
 - by blocking data transmission on vehicle data bus-systems, which are used to transmit data, required to ensure the correct functioning of other immunity-related functions;
 - (e) functions which, when disturbed, affect vehicle statutory data: e.g. tachograph, odometer.
- 2.1.13. ‘^{F3}24 GHz short-range radar equipment’ means a radar as defined in Article 2(2) of Commission Decision 2005/50/EC⁽¹⁾, and satisfying the performance requirements of Article 4 of that Decision.]
- 2.1.14. [^{F4}]

Textual Amendments

- F2** Substituted by [Commission Directive 2005/83/EC of 23 November 2005 amending, for the purposes of their adaptation to technical progress, Annexes I, VI, VII, VIII, IX and X to Council Directive 72/245/EEC relating to the radio interference \(electromagnetic compatibility\) of vehicles \(Text with EEA relevance\).](#)
- F3** Inserted by [Commission Directive 2005/49/EC of 25 July 2005 amending, for the purposes of their adaptation to technical progress, Council Directive 72/245/EEC relating to the radio interference \(electromagnetic compatibility\) of vehicles and Council Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers \(Text with EEA relevance\).](#)
- F4** Deleted by [Commission Directive 2006/28/EC of 6 March 2006 amending, for the purposes of their adaptation to technical progress, Council Directive 72/245/EEC of 20 June 1972 relating to the radio interference \(electromagnetic compatibility\) of vehicles and Council Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers \(Text with EEA relevance\).](#)

3. APPLICATION FOR EC TYPE-APPROVAL

3.1. Approval of a vehicle type

- 3.1.1. The application for approval of a vehicle type, with regard to its electromagnetic compatibility pursuant to Article 3(4) of Directive 70/156/EEC shall be submitted by the vehicle manufacturer.
- 3.1.2. A model for the information document is given in Annex IIA.
- 3.1.3. The vehicle manufacturer shall draw up a schedule describing all relevant vehicle electrical/electronic systems or ESAs, body styles⁽²⁾, variations in body material⁽²⁾, general wiring arrangements, engine variations, left-hand/right-hand drive versions and wheelbase versions. Relevant vehicle electrical/electronic systems or ESAs are those which may emit significant broadband or narrowband radiation and/or those which are involved in immunity-related functions (see paragraph 2.1.12 of this Annex) of the vehicle.

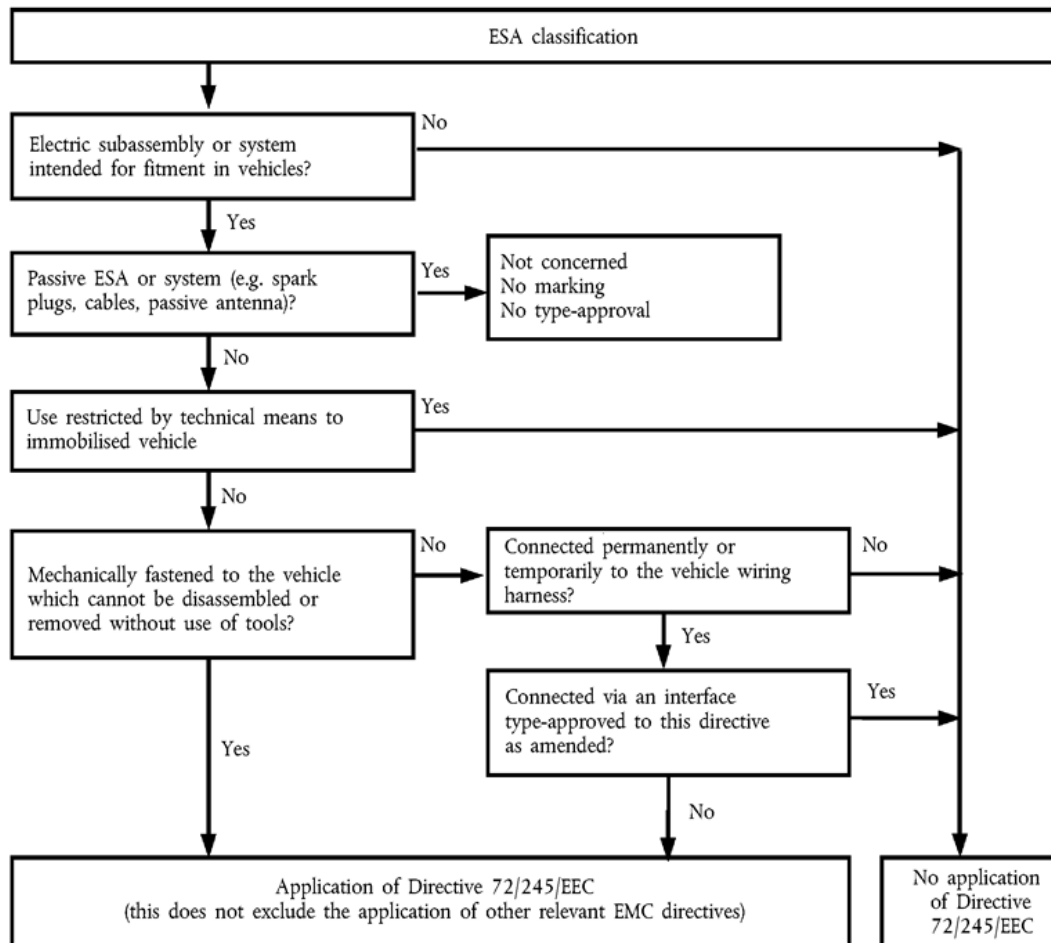
- 3.1.4. A representative vehicle shall be selected from this schedule for the purpose of being tested, in mutual agreement between the manufacturer and the competent authority. This vehicle shall represent the vehicle type (see Appendix 1 to Annex IIA). The choice of vehicle shall be based on the electrical/electronic systems offered by the manufacturer. One or more vehicles may be selected from this schedule for the purpose of being tested if it is considered by mutual agreement between the manufacturer and the competent authority that different electrical/electronic systems are included which are likely to have a significant effect on the vehicle's electromagnetic compatibility compared with the first representative vehicle.
- 3.1.5. The choice of the vehicle(s) in conformity with paragraph 3.1.4 is limited to vehicle/electrical/electronic system combinations intended for actual production.
- 3.1.6. The manufacturer may supplement the application with a report from tests, which have been carried out. Any such data provided may be used by the approval authority for the purpose of drawing up the type-approval certificate.
- 3.1.7. If the technical service responsible for the type-approval test carries out the test itself, then a vehicle representative of the type to be approved, according to paragraph 3.1.4 shall be provided.
- 3.1.8. The vehicle manufacturer must provide a statement of frequency bands, power levels, antenna positions and installation provisions for the installation of RF-transmitters, even if the vehicle is not equipped with RF-transmitter at time of type-approval. This should cover all mobile radio services normally used in vehicles. This information must be made publicly available following the type-approval.

Vehicle manufacturers must provide evidence that vehicle performance is not adversely affected by such transmitter installations.

3.2. Approval of a type of electrical/electronic subassembly (ESA)

3.2.1. Applicability of this Directive to ESA:

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- 3.2.2. The application for approval of a type of ESA with regard to its electromagnetic compatibility pursuant to Article 3(4) of Directive 70/156/EEC shall be submitted by the vehicle manufacturer or by the manufacturer of the ESA or his/her authorised representative.
- 3.2.3. A model for the information document is given in Annex II B.
- 3.2.4. The manufacturer may supplement the application with a report from tests which have been carried out. Any such data provided may be used by the approval authority for the purpose of drawing up the type-approval certificate. For equipment intended for installation in a vehicle, the manufacturer may supplement the application with the manufacturer's Declaration of Conformity in line with the provisions of Directive 99/5/EC or Directive 89/336/EEC, the EMC test report and the instruction for the user giving guidance for installation of such equipment in vehicles.
- 3.2.5. If the technical service responsible for the type-approval test carries out the test itself, then a sample of the ESA system representative of the type to be approved shall be provided, if necessary, after discussion with the manufacturer on, for example, possible variations in the layout, number of components, number of sensors. If the technical service deems it necessary, it may select a further sample.

- 3.2.6. The sample(s) must be clearly and indelibly marked with the manufacturer's trade name or mark and the type designation.
- 3.2.7. Where applicable, any restrictions on use should be identified. Any such restrictions must be included in Annexes II B and/or III B.
- 3.2.8. ESAs which are brought to the market as spare parts need no type-approval if they are obviously marked as a spare part by an identification number and if they are identical and from the same manufacturer as the corresponding original equipment manufacturer (OEM) part for an already type-approved vehicle.
- 3.2.9. Components sold as aftermarket equipment and intended for the installation in motor vehicles need no type-approval if they are not related to immunity-related functions (Annex I, 2.1.12). In this case a Declaration of Conformity according to the procedures of Directive 89/336/EEC or 1999/5/EC must be issued. Part of this declaration must be that the ESA fulfils the limits defined in paragraphs 6.5, 6.6, 6.8 and 6.9 of Annex I to this Directive.

[^{F5}.....]

Textual Amendments

- F5** Deleted by [Commission Directive 2009/19/EC of 12 March 2009 amending, for the purposes of its adaptation to technical progress, Council Directive 72/245/EEC relating to the radio interference \(electromagnetic compatibility\) of vehicles \(Text with EEA relevance\)](#).

4. TYPE-APPROVAL

- 4.1. Routes to type-approval
- 4.1.1. Type-approval of a vehicle

The following alternative routes to type-approval of a vehicle may be used at the discretion of the vehicle manufacturer.

4.1.1.1. Approval of a vehicle installation

A vehicle installation may achieve type-approval directly by following the provisions laid down in the relevant parts of paragraph 6 of this Annex. If this route is chosen by a vehicle manufacturer, no separate testing of electrical/electronic systems or ESAs is required.

4.1.1.2. Approval of vehicle type by testing of individual ESAs

A vehicle manufacturer may obtain approval for the vehicle by demonstrating to the approval authority that all the relevant (see paragraph 3.1.3 of this Annex) electrical/electronic systems or ESAs have individually been approved in accordance with this Directive and have been installed in accordance with any conditions attached thereto.

- 4.1.1.3. A manufacturer, if he/she wishes, may obtain approval according to this Directive if the vehicle has no equipment of the type which is subject to immunity or emission tests. Such approvals do not require testing.

4.1.2. Type-approval of an ESA

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Type-approval may be granted to an ESA to be fitted either to any vehicle type (component approval) or to a specific vehicle type or types requested by the ESA manufacturer (separate technical unit approval).

4.1.3. ESAs, which are intentional RF transmitters, which have not received type-approval in conjunction with a vehicle manufacturer, must be supplied with suitable installation guidelines.

4.2. Granting of type-approval

4.2.1. Vehicle

4.2.1.1. If the representative vehicle fulfils the requirements of this Directive, EC type-approval pursuant to Article 4(3), and if applicable, Article 4(4) of Directive 70/156/EEC shall be granted.

4.2.1.2. A model for the EC type-approval certificate is given in Annex III A.

4.2.2. ESA

4.2.2.1. If the representative ESA system(s) fulfil(s) the requirements of this Directive, EC type-approval pursuant to Article 4(3), and if applicable, Article 4(4) of Directive 70/156/EEC shall be granted.

4.2.2.2. A model for the EC type-approval certificates is given in Annex III B.

4.2.3. In order to draw up the certificates referred to in paragraph 4.2.1.2 or 4.2.2.2, the competent authority of the Member State granting the approval may use a report prepared by a test laboratory accredited to ISO 17025 and recognised by the Approval Authority.

4.3. Amendments to approvals

4.3.1. In the case of amendments to approvals granted pursuant to this Directive, the provisions of Article 5 of Directive 70/156/EEC shall apply.

4.3.2. Amendment of a vehicle type-approval by ESA addition or substitution

4.3.2.1. Where a vehicle manufacturer has obtained approval for a vehicle installation and wishes to fit an additional or substitutional electrical/electronic system or ESA which has already received approval pursuant to this Directive, and which will be installed in accordance with any conditions attached thereto, the vehicle approval may be amended without further testing. The additional or substitutional electrical/electronic system or ESA shall be considered as part of the vehicle for conformity of production purposes.

4.3.2.2. Where the additional or substitutional part(s) has (have) not received approval pursuant to this Directive, and if testing is considered necessary, the whole vehicle shall be deemed to comply if the new or revised part(s) can be shown to comply with the relevant requirements of paragraph 6 or if, in a comparative test, the new part can be shown not to be likely to adversely affect compliance of the vehicle type.

4.3.3. The addition of used ESAs, which are not type-approved according to this Directive because at their first time of installation no type-approval was required, shall not invalidate the type-approval if the installation of such used ESAs is done according to the recommendations of the ESA and vehicle manufacturer.

5. MARKING

5.1. Every ESA conforming to a type approved under this Directive shall bear an EC type-approval mark.

5.2. The EC type-approval mark shall consist of

a rectangle surrounding the lower case letter 'e' followed by the distinguishing number of the Member State which has granted the EC component type-approval:

1	for Germany
2	for France
3	for Italy
4	for the Netherlands
5	for Sweden
6	for Belgium
7	for Hungary
8	for the Czech Republic
9	for Spain
11	for the United Kingdom
12	for Austria
13	for Luxembourg
17	for Finland
18	for Denmark
[^{F6} 19	for Romania]
20	for Poland
21	for Portugal
23	for Greece
24	for Ireland
[^{F7} 25	for Croatia]
26	for Slovenia
27	for Slovakia
29	for Estonia
32	for Latvia
[^{F6} 34	for Bulgaria]
36	for Lithuania
49	for Cyprus
50	for Malta

Textual Amendments

- F6** Inserted by [Council Directive 2006/96/EC of 20 November 2006 adapting certain Directives in the field of free movement of goods, by reason of the accession of Bulgaria and Romania.](#)
- F7** Inserted by [Council Directive 2013/15/EU of 13 May 2013 adapting certain directives in the field of free movement of goods, by reason of the accession of the Republic of Croatia.](#)

In the vicinity of the rectangle the 'base approval number' contained in section 4 of the type-approval number referred to in Annex VII of Directive 70/156/EEC preceded by the two figures indicating the sequence number assigned to the latest major technical amendment to this Directive. The amendment sequence number and the component type-approval number shown on the certificate shall be separated by a single space. In this Directive the sequence number is 03.

5.3. The EC type-approval mark must be affixed to the main part of the ESA (e.g. the electronic control unit) in such a way as to be clearly legible and indelible.

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- 5.4. An example of the EC type-approval mark is shown in Appendix 8.
- 5.5. No marking is required for electrical/electronic systems included in vehicle types approved by this Directive, and for spare parts as defined in paragraph 3.2.8.
- 5.6. Markings on ESAs in compliance with paragraph 5.3 need not be visible when the ESA is installed in a vehicle.

6. SPECIFICATIONS

6.1. General specification

6.1.1. A vehicle and its electrical/electronic system(s) or ESA(s) shall be so designed, constructed and fitted as to enable the vehicle, in normal conditions of use, to comply with the requirements of this Directive.

6.1.1.1. A vehicle shall be tested for radiated emissions and for immunity to radiated disturbances. No tests for conducted emissions or immunity to conducted disturbances are required for vehicle type-approval.

6.1.1.2. ESA(s) shall be tested for radiated and conducted emissions, for immunity to radiated and conducted disturbances.

6.1.2. Before testing, the technical service has to prepare a test plan in conjunction with the manufacturer, which contains at least mode of operation, stimulated function(s), monitored function(s), pass/fail criteria(s) and intended emissions.

6.2. Specifications concerning broadband electromagnetic radiation from vehicles

6.2.1. Method of measurement

The electromagnetic radiation generated by the vehicle representative of its type shall be measured using the method described in Annex IV. The method of measurement shall be defined by the vehicle manufacturer in accordance with the technical service.

6.2.2. Vehicle broadband type-approval limits

6.2.2.1. If measurements are made using the method described in Annex IV using a vehicle-to-antenna spacing of $10,0 \pm 0,2$ m, the limits shall be 32 dB microvolts/m in the 30 to 75 MHz frequency band and 32 to 43 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 2 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 43 dB microvolts/m.

6.2.2.2. If measurements are made using the method described in Annex IV using a vehicle-to-antenna spacing of $3,0 \pm 0,05$ m, the limits shall be 42 dB microvolts/m in the 30 to 75 MHz frequency band and 42 to 53 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 3 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 53 dB microvolts/m.

6.2.2.3. On the vehicle representative of its type, the measured values, expressed in dB microvolts/m shall be below the type-approval limits.

6.3. Specifications concerning narrowband electromagnetic radiation from vehicles.

6.3.1. Method of measurement

The electromagnetic radiation generated by the vehicle representative of its type shall be measured using the method described in Annex V. These shall be defined by the vehicle manufacturer in accordance with the technical service.

6.3.2. Vehicle narrowband type-approval limits

6.3.2.1. If measurements are made using the method described in Annex V using a vehicle-to-antenna spacing of $10,0 \pm 0,2$ m, the limits shall be 22 dB microvolts/m in the 30 to 75 MHz frequency band and 22 to 33 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 4 of this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 33 dB microvolts/m.

6.3.2.2. If measurements are made using the method described in Annex V using a vehicle-to-antenna spacing of $3,0 \pm 0,05$ m, the limit shall be 32 dB microvolts/m in the 30 to 75 MHz frequency band and 32 to 43 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 5 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 43 dB microvolts/m.

6.3.2.3. On the vehicle representative of its type, the measured values, expressed in dB microvolts/m, shall be below the type-approval limit.

6.3.2.4. Notwithstanding the limits defined in paragraphs 6.3.2.1, 6.3.2.2 and 6.3.2.3 of this Annex, if, during the initial step described in Annex V, paragraph 1.3, the signal strength measured at the vehicle broadcast radio antenna is less than 20 dB microvolts over the frequency range 76 to 108 MHz measured with an average detector, then the vehicle shall be deemed to comply with the limits for narrowband emissions and no further testing will be required.

6.4. Specifications concerning immunity of vehicles to electromagnetic radiation.

6.4.1. Method of testing

The immunity to electromagnetic radiation of the vehicle representative of its type shall be tested by the method described in Annex VI.

6.4.2. Vehicle immunity type-approval limits.

6.4.2.1. If tests are made using the method described in Annex VI, the field strength shall be 30 volts/m rms in over 90 % of the 20 to 2 000 MHz frequency band and a minimum of 25 volts/m rms over the whole 20 to 2 000 MHz frequency band.

6.4.2.2. The vehicle representative of its type shall be considered as complying with immunity requirements if, during the tests performed in accordance with Annex VI, there shall be no degradation of performance of 'immunity-related functions'.

6.5. Specification concerning broadband electromagnetic interference generated by ESAs

6.5.1. Method of measurement

The electromagnetic radiation generated by the ESA representative of its type shall be measured by the method described in Annex VII.

6.5.2. ESA broadband type-approval limits

6.5.2.1. If measurements are made using the method described in Annex VII, the limits shall be 62 to 52 dB microvolts/m in the 30 to 75 MHz frequency band, this limit decreasing

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logarithmically with frequencies above 30 MHz, and 52 to 63 dB microvolts/m in the 75 to 400 MHz band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 6 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 63 dB microvolts/m.

6.5.2.2. On the ESA representative of its type, the measured values, expressed in dB microvolts/m, shall be below the type-approval limits.

6.6. Specifications concerning narrowband electromagnetic interference generated by ESAs.

6.6.1. Method of measurement

The electromagnetic radiation generated by the ESA representative of its type shall be measured by the method described in Annex VIII.

6.6.2. ESA narrowband type-approval limits

6.6.2.1. If measurements are made using the method described in Annex VIII, the limits shall be 52 to 42 dB microvolts/m in the 30 to 75 MHz frequency band, this limit decreasing logarithmically with frequencies above 30 MHz, and 42 to 53 dB microvolts/m in the 75 to 400 MHz band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 7 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 53 dB microvolts/m.

6.6.2.2. On the ESA representative of its type, the measured value, expressed in dB microvolts/m shall be below the type-approval limits.

6.7. Specifications concerning immunity of ESAs to electromagnetic radiation.

6.7.1. Method(s) of testing

The immunity to electromagnetic radiation of the ESA representative of its type shall be tested by the method(s) chosen from those described in Annex IX.

6.7.2. ESA immunity type-approval limits

6.7.2.1. If tests are made using the methods described in Annex IX, the immunity test levels shall be 60 volts/m for the 150 mm stripline testing method, 15 volts/m for the 800 mm stripline testing method, 75 volts/m for the TEM cell testing method, 60 mA for the bulk current injection (BCI) testing method and 30 volts/m for the free field testing method in over 90 % of the 20 to 2 000 MHz frequency band, and to a minimum of 50 volts/m for the 150 mm stripline testing method, 12,5 volts/m for the 800 mm stripline testing method, 62,5 volts/m, for the TEM cell testing method, 50 mA for the bulk current injection (BCI) testing method and 25 volts/m for the free field testing method over the whole 20 to 2 000 MHz frequency band.

6.7.2.2. The ESA representative of its type shall be considered as complying with immunity requirements if, during the tests performed in accordance with Annex IX, there shall be no degradation of performance of 'immunity-related functions'.

6.8. Specifications concerning the immunity to transient disturbances conducted along supply lines

6.8.1. Method of testing

The immunity of ESA representative of its type shall be tested by the method(s) according to [F²ISO 7637-2: 2nd edition 2004] as described in Annex X with the test levels given in Table 1.

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Table 1:

IMMUNITY OF ESA

Test pulse number	Immunity test level	Functional status for systems	
		Related to immunity-related functions	Not related to immunity-related functions
1	III	C	D
2a	III	B	D
2b	III	C	D
3a/3b	III	A	D
4	III	B <i>(for ESA which must be operational during engine start phases)</i> C <i>(for other ESAs)</i>	D

6.9. Specifications concerning the emission of conducted disturbances

6.9.1. Method of testing

The emission of ESA representative of its type shall be tested by the method(s) according to [F²ISO 7637-2: 2nd edition 2004] as described in Annex X for the levels given in Table 2.

Table 2:

MAXIMUM ALLOWED PULSE AMPLITUDE

Polarity of pulse amplitude	Maximum allowed pulse amplitude for	
	vehicles with 12 V systems	vehicles with 24 V systems
Positive	+ 75	+ 150
Negative	– 100	– 450

7. CONFORMITY OF PRODUCTION

7.1. Measures to ensure the conformity of production shall be taken in accordance with the provisions laid down in Article 10 of Directive 70/156/EEC.

7.2. Conformity of production with regard to the electromagnetic compatibility of the vehicle or component of separate technical unit shall be checked on the basis of the data contained in the type-approval certificate(s) set out in Annex III A and/or B of this Directive as appropriate.

7.3. If the authority is not satisfied with the auditing procedure of the manufacturer, then items 2.4.2 and 2.4.3 of Annex X to Directive 70/156/EEC and paragraphs 7.3.1 and 7.3.2 below shall apply.

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- 7.3.1. If the conformity of a vehicle, component or STU taken from the series is being verified, production shall be deemed to conform to the requirements of this Directive in relation to broadband radiated emissions and narrowband radiated emissions if the levels measured do not exceed by more than 4 dB (60 %) the type-approval limits prescribed in paragraphs 6.2.2.1, 6.2.2.2, 6.3.2.1, 6.3.2.2, 6.3.2.4, 6.5.2.1 and 6.6.2.1 (as appropriate).
- 7.3.2. If the conformity of a vehicle, component or STU taken from the series is being verified, production shall be deemed to conform to the requirements of this Directive in relation to immunity to electromagnetic radiation if the vehicle, component or STU shows no degradation of performance of ‘immunity-related functions’ when the vehicle, component or STU is in the state defined in Annex VI, paragraph 2, and subjected to a field strength or current, expressed in volts/m or mA, up to 80 % of the type-approval limits prescribed in paragraphs 6.4.2.1 and 6.7.2.1 of this Annex as appropriate.
- 7.3.3. If the conformity of a component or STU taken from the series is being verified, production shall be deemed to conform to the requirements of this Directive in relation to immunity to conducted disturbances and emission if the component or STU shows no degradation of performance of ‘immunity-related functions’ up to levels given in 6.8.1 and does not exceed the levels given in 6.9.1.

8. EXCEPTIONS

- 8.1. Where a vehicle or electrical/electronic system or ESA does not include an electronic oscillator with an operating frequency greater than 9 kHz, it shall be deemed to comply with paragraph 6.3.2 or 6.6.2 of Annex I and with Annexes V and VIII.
- 8.2. Vehicles which do not have electrical/electronic systems with ‘immunity-related functions’ need not be tested for immunity to radiated disturbances and shall be deemed to comply with paragraph 6.4 of Annex I and with Annex VI to this Directive.
- 8.3. ESAs with no immunity-related functions need not be tested for immunity to radiated disturbances and shall be deemed to comply with paragraph 6.7 of Annex I and with Annex IX to this Directive.
- 8.4. Electrostatic discharge

For vehicles fitted with tyres, the vehicle body/chassis can be considered to be an electrically isolated structure. Significant electrostatic forces in relation to the vehicle's external environment only occur at the moment of occupant entry into or exit from the vehicle. As the vehicle is stationary at these moments, no type-approval test for electrostatic discharge is deemed necessary.

8.5. Conducted emission

ESAs that are not switched, contain no switches or do not include inductive loads need not be tested for conducted emission and shall be deemed to comply with paragraph 6.9 of this Annex.

- 8.6. The loss of function of receivers during the immunity test, when the test signal is within the receiver bandwidth (RF exclusion band) as specified for the specific radio service/product in the harmonised EMC standard and whose reference is published in the *Official Journal of the European Union*, does not necessarily lead to a fail criteria.
- 8.7. RF transmitters shall be tested in the transmit mode. Wanted emissions (e.g. from RF transmitting systems) within the necessary bandwidth and out of band emissions are

disregarded for the purpose of this Directive. Spurious emissions are subject to this Directive but need not be tested if the transmitter has a Declaration of Conformity according to Directive 1999/5/EC using a harmonised standard.

- 8.7.1. 'Necessary bandwidth': for a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions (Article 1, No 1152 of the radio regulations).
- 8.7.2. 'Out-of-band emissions': emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions (Article 1, No 1144 of the radio regulations).
- 8.7.3. 'Spurious emission': in every modulation process additional undesired signals exist. They are summarised under the expression 'spurious emissions'. Spurious emissions are emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions (Article 1 No 1145 of the radio regulations).

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Appendix 1

List of standards referred to in this Directive

1. CISPR 12 ‘Vehicles’, motorboats’ and spark-ignited engine-driven devices’ radio disturbance characteristics — Limits and methods of measurement’, 5th edition 2001
2. CISPR 16-1 ‘Specifications for radio disturbance and immunity measuring apparatus and methods — Part 1: Radio disturbance and immunity measuring apparatus’, 2nd edition 2002
3. CISPR 25 ‘Limits and methods of measurement of radio disturbance characteristics for the protection of receivers used on board vehicles’, 2nd edition 2002
4. ISO 7637-1 ‘Road vehicles — Electrical disturbance from conduction and coupling — Part 1: Definitions and general considerations’, 2nd edition 2002
5. ISO 7637-2 ‘Road vehicles — Electrical disturbance from conduction and coupling — Part 2: Electrical transient conduction along supply lines only on vehicles with nominal 12 V or 24 V supply voltage’, 2nd edition 2004
6. ISO-EN 17025 ‘General requirements for the competence of testing and calibration laboratories’, 1st edition 1999
7. ^[F2]ISO 11451 ‘Road vehicles — Electrical disturbances by narrowband radiated electromagnetic energy — Vehicle test methods’

Part 1:	General and definitions	(ISO 11451-1: 3rd edition 2005)
Part 2:	Off vehicle radiation source	(ISO 11451-2: 3rd edition 2005)
Part 4:	Bulk current injection (BCI)	(ISO 11451-4: 1st edition 1995)]

8. ^[F2]ISO 11452 ‘Road vehicles — Electrical disturbances by narrowband radiated electromagnetic energy — Component test methods’

Part 1:	General and definitions	(ISO 11452-1: 3rd edition 2005)
Part 2:	Absorber lined chamber	(ISO 11452-2: 2nd edition 2004)
Part 3:	Transverse electromagnetic mode (TEM) cell	(ISO 11452-3: 2nd edition 2001)
Part 4:	Bulk current injection (BCI)	(ISO 11452-4: 3rd edition 2005)
Part 5:	Strip line	(ISO 11452-5: 2nd edition 2002)]

9. ITU Radio Regulations, Edition 2001

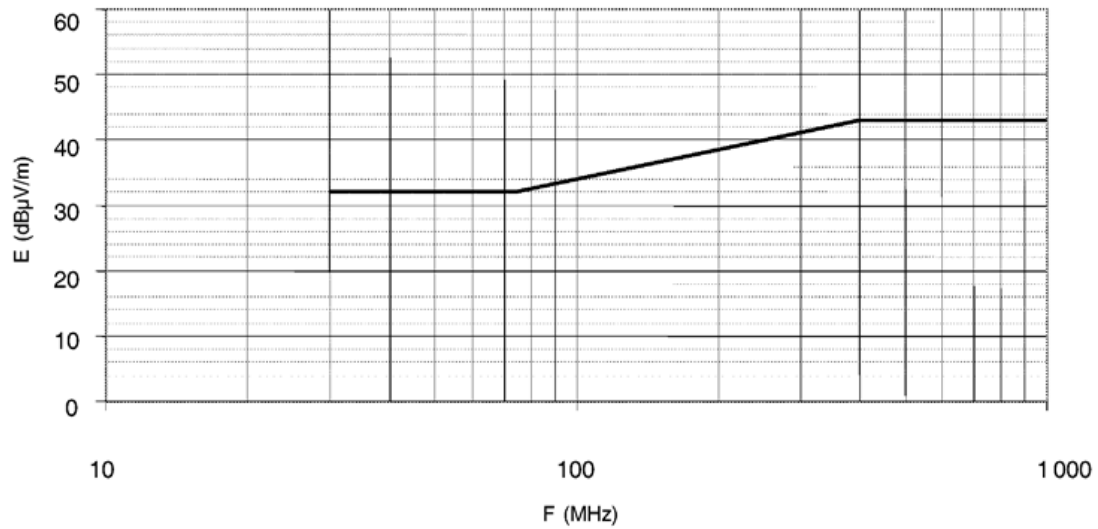
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Appendix 2

Vehicle Antenna-vehicle separation: 10 m
 broadband
 reference
 limits

Limit E (dBµV/m) at frequency F (MHz)		
30-75 MHz	75-400 MHz	400-1 000 MHz
E = 32	$E = 32 + 15,13 \log (F/75)$	E = 43

$\blacktriangleright^m \longleftarrow$ Vehicle-radiated emission limit
 Broadband type-approval limit — 10 m
 Quasi-peak detector — 120 kHz bandwidth



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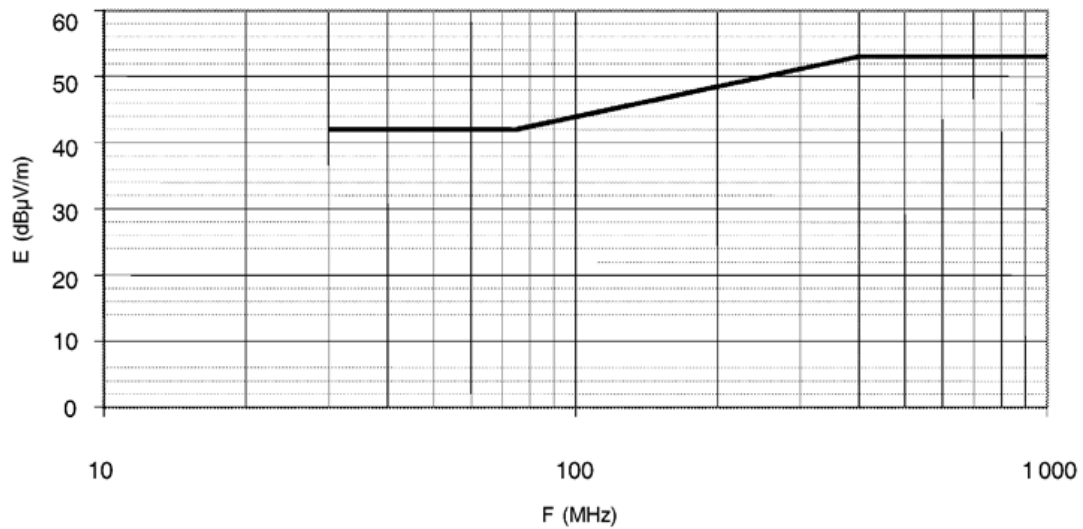
Appendix 3

Vehicle Antenna-vehicle separation: 3 m
broadband
reference
limits

Limit E (dB μ V/m) at frequency F (MHz)

30-75 MHz	75-400 MHz	400-1 000 MHz
E = 42	$E = 42 + 15,13 \log (F/75)$	E = 53

\blacktriangleleft \blacktriangleright Vehicle-radiated emission limit
 Broadband type-approval limit — 3 m
 Quasi-peak detector — 120 kHz bandwidth

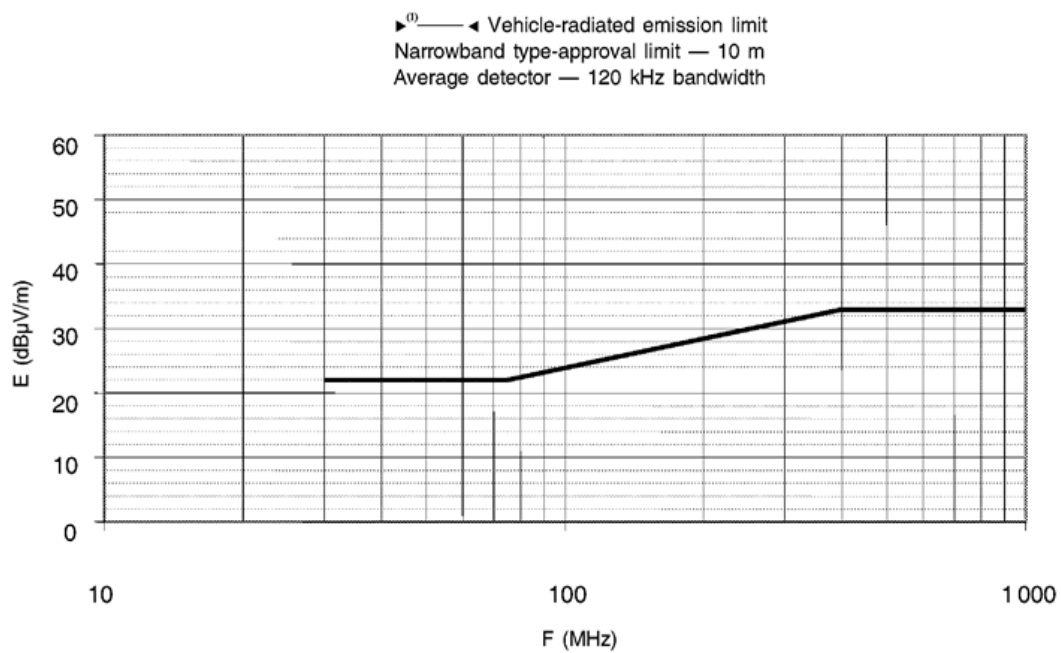


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Appendix 4

Vehicle Antenna-vehicle separation: 10 m
 narrowband
 reference
 limits

Limit E (dBµV/m) at frequency F (MHz)		
30-75 MHz	75-400 MHz	400-1 000 MHz
E = 22	$E = 22 + 15,13 \log (F/75)$	E = 33



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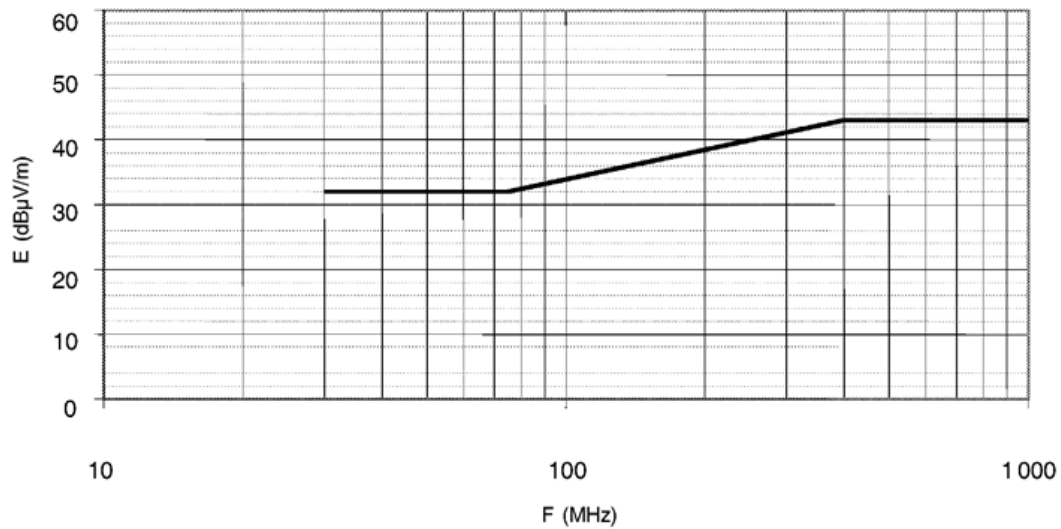
Appendix 5

Vehicle Antenna-vehicle separation: 3 m
narrowband
reference
limits

Limit E (dB μ V/m) at frequency F (MHz)

30-75 MHz	75-400 MHz	400-1 000 MHz
E = 32	$E = 32 + 15,13 \log (F/75)$	E = 43

►⁽¹⁾ ◀ Vehicle-radiated emission limit
Narrowband type-approval limit — 3 m
Average detector — 120 kHz bandwidth



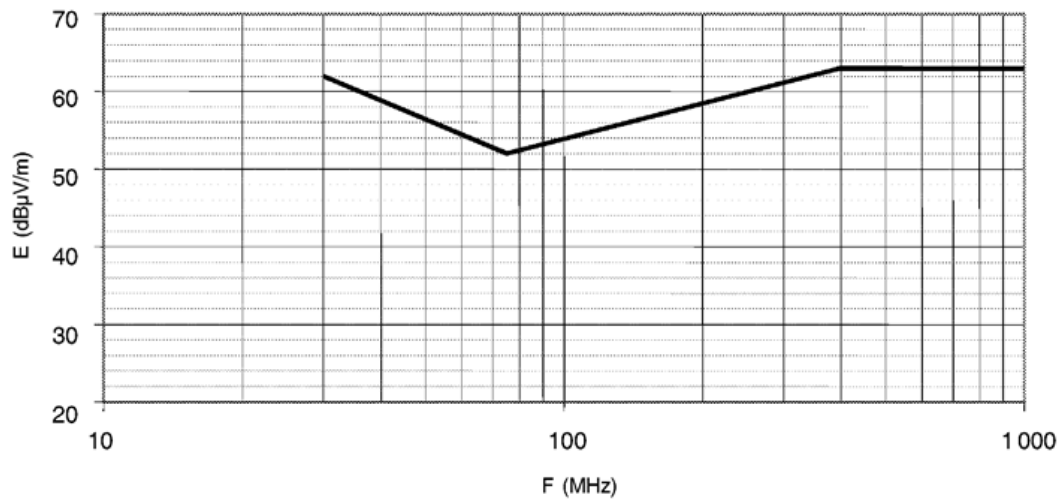
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Appendix 6

Electrical Broadband reference limits
 electronic
 subassembly

Limit E (dBµV/m) at frequency F (MHz)		
30-75 MHz	75-400 MHz	400-1 000 MHz
$E = 62 - 25,13 \log (F/30)$	$E = 52 + 15,13 \log (F/75)$	$E = 63$

▶⁽¹⁾ ← ESA-radiated emission limit
 Broadband type-approval limit — 1 m
 Quasi-peak detector — 120 kHz bandwidth



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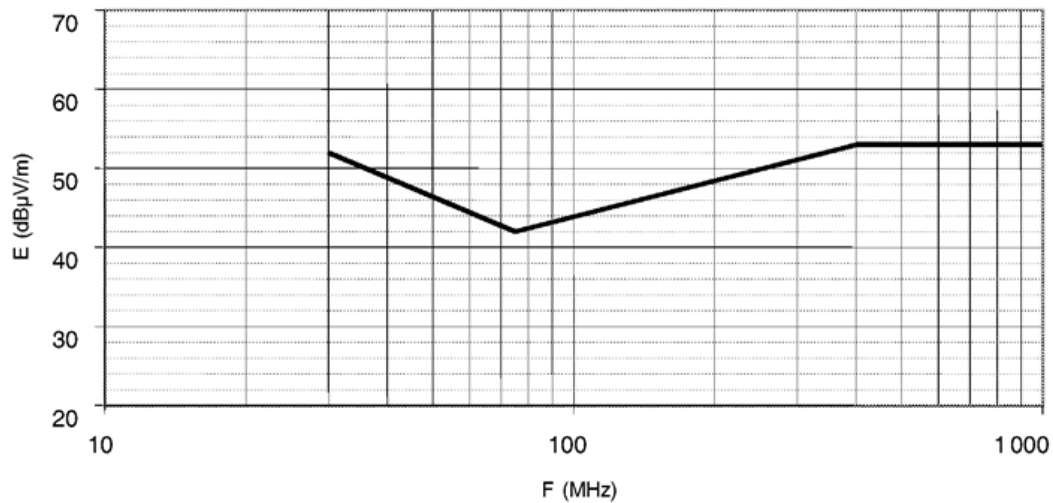
Appendix 7

ElectricalNarrowband reference limits
electronic
subassembly

Limit E (dB μ V/m) at frequency F (MHz)

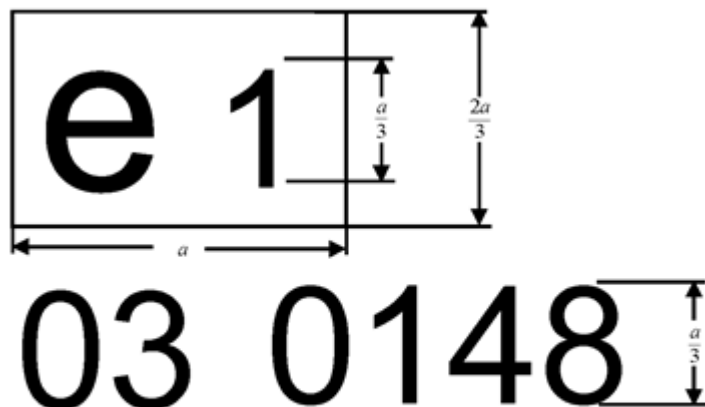
30-75 MHz	75-400 MHz	400-1 000 MHz
$E = 52 - 25,13 \log (F/30)$	$E = 42 + 15,13 \log (F/75)$	$E = 53$

▶⁽¹⁾ ← ESA-radiated emission limit
Narrowband type-approval limit — 1 m
Average detector — 120 kHz bandwidth



Appendix 8

Model for the EC type-approval mark

 $a \geq 6 \text{ mm}$

The ESA bearing the above EC type-approval mark is a device which has been approved in Germany (e1) under the base approval number 0148. The first two digits (03) indicate that the device conforms to the requirements of Directive 72/245/EEC, as amended by this Directive.

The figures used are only indicative.]

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- (1) [^{F1}[^{F3}OJ L 21, 25.1.2005, p. 15.]
- (2) If applicable.]

Textual Amendments

- F1** Substituted by Commission Directive 2004/104/EC of 14 October 2004 adapting to technical progress Council Directive 72/245/EEC relating to the radio interference (electromagnetic compatibility) of vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers (Text with EEA relevance).
- F3** Inserted by Commission Directive 2005/49/EC of 25 July 2005 amending, for the purposes of their adaptation to technical progress, Council Directive 72/245/EEC relating to the radio interference (electromagnetic compatibility) of vehicles and Council Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers (Text with EEA relevance).