

Vehicles, motorboats and spark-ignited engine-driven devices — Radio disturbance characteristics — Limits and methods of measurement

ICS 33.100.10

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National foreword

This British Standard reproduces verbatim CISPR 12:1997 and implements it as the UK national standard. It supersedes BS 833:1970 (1985) which is now obsolescent but will be retained as reference is made to it in SI 217 which was issued under the Wireless Telegraphy (Control of interference from ignition apparatus) Regulations 1973. The DTI have confirmed that whilst SI 217 remains in force equipment must comply with the provisions of BS 833.

The UK participation in its preparation was entrusted by Technical Committee GEL/210, Electromagnetic compatibility, to Subcommittee GEL/210/4, Motor vehicles and internal combustion engines generally, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the CISPR title page, pages ii to iv, pages 1 to 37 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 April 1999

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ISBN 0 580 32373 0

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
National foreword	Inside front cover
Text of CISPR 12	1

COMMISSION
ÉLECTROTECHNIQUE
INTERNATIONALE

CISPR
12

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

Quatrième édition
Fourth edition
1997-05

COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

**Véhicules, bateaux à moteur et engins entraînés
par des moteurs à allumage commandé –
Caractéristiques de perturbation radioélectrique –
Limites et méthodes de mesure**

**Vehicles, motorboats and spark-ignited
engine-driven devices –
Radio disturbance characteristics –
Limits and methods of measurement**



Numéro de référence
Reference number
CISPR 12: 1997

Contents

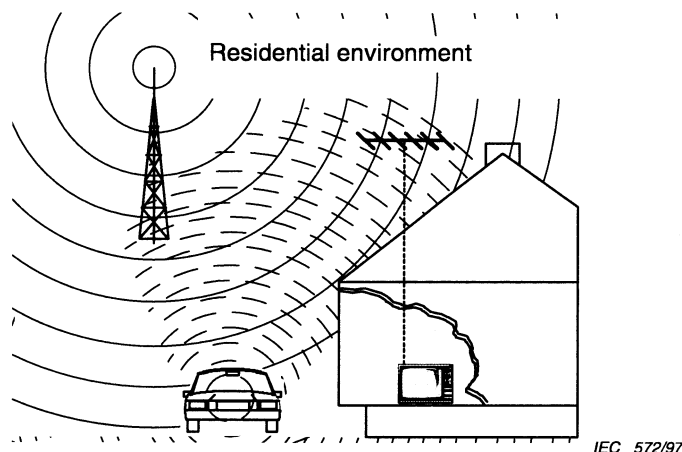
	Page
1 Scope	1
2 Normative references	1
3 Definitions	2
4 Limits of disturbance	4
4.1 Determination of appropriate limit level	4
4.2 Broadband emissions	4
4.3 Narrowband emissions	5
5 Methods of measurement	6
5.1 Measuring instrument requirements	6
5.2 Measuring location requirements	7
5.3 Test object conditions	11
5.4 Test frequencies	13
5.5 Data collection	13
6 Methods of checking for compliance with CISPR requirements	14
6.1 Evaluation (general)	14
6.2 Type test	14
6.3 Surveillance of series production	14
6.4 Quick prototype check for development testing (broadband emissions only)	14
Annex A (normative) Statistical analysis of the results of measurements	15
Annex B (normative) Rod antenna calibration — The equivalent capacitance substitution method	17
Annex C (normative) Antenna and transmission line maintenance and calibration	19
Annex D (informative) Construction features of motor vehicles affecting the emission of ignition noise	23
Annex E (informative) Measurement of the insertion loss of ignition noise suppressors	24
Annex F (informative) Methods of measurement to determine the attenuation characteristics of ignition noise suppressors for high-tension ignition systems	29
Figure 1 — Example method of determination of conformance of radiated disturbance	4
Figure 2 — Limits of disturbance (broadband) at 10 m	5
Figure 3 — Limits of disturbance (narrowband) at 10 m	5
Figure 4 — Measuring site	8
Figure 5 — Antenna position to measure emissions: vertical polarization	9
Figure 6 — Antenna position to measure emissions: horizontal polarization	10
Figure 7 — Motor boat measuring site	13
Figure B.1 — Measurement of 1 m monopole antenna factor	19
Figure C.1 — Alternate antenna factor determination (10 m test distance)	22
Figure E.1 — Test circuit	25
Figure E.2 — General arrangement of the test box	26
Figure E.3 — Details of the test box lid	26
Figure E.4 — Details of the test box	27
Figure E.5 — Straight spark plug ignition noise suppressor (screened or unscreened)	27
Figure E.6 — Right-angle spark plug ignition noise suppressor (screened or unscreened)	27
Figure E.7 — Noise suppression spark plug	28
Figure E.8 — Resistive distributor brush	28
Figure E.9 — Noise suppressor in distributor cap	28

	Page
Figure E.10 — Noise suppression distributor rotor	29
Figure E.11 — Noise suppression ignition cable (resistive or reactive)	29
Figure F.1 — Test set-up, side view	31
Figure F.2 — Test set-up, top view	32
Figure F.3 — Pressure chamber with ventilation	33
Figure F.4 — Top view of the set-up of a right-angle ignition noise suppressor for distributors	34
Figure F.5 — Side view of the test set-up for the distributor rotors	35
Figure F.6 — Top view of the test set-up for the distributor rotors	36
Figure F.7 — Side view of the test set-up for ready-to-use resistive ignition cables	37
Table 1 — Minimum scan time	6
Table 2 — Recommended measuring instrument bandwidth (6 dB)	6
Table 3 — Internal combustion engine operating speeds	11
Table A.1 — Statistical factors	15
Table A.2 — Example of frequency sub-bands	16

1 Scope

The limits in this International Standard are designed to provide protection for broadcast receivers in the frequency range of 30 MHz to 1 000 MHz when used in a residential environment.

Compliance with this standard may not provide adequate protection for new types of radio transmissions or receivers used in the residential environment nearer than 10 m to the vehicle or device.



NOTE 1 Experience has shown that compliance with this standard may provide satisfactory protection for receivers of other types of transmissions when used in a residential environment, including radio transmissions in frequency ranges other than that specified.

This standard applies to the emission of broadband and narrowband electromagnetic energy which may cause interference to radio reception and which is emitted from:

- a) vehicles propelled by an internal combustion engine, electrical means or both (see 3.1);
- b) motor boats propelled by an internal combustion engine, electrical means or both;

NOTE 2 For the purpose of this standard motor boats are considered to be a subset of vehicles, unless specifically mentioned to the contrary.

- c) devices equipped with spark-ignited internal combustion engines (see 3.2).

This standard includes limits and test methods for both broadband and narrowband emissions.

This standard does not apply to aircraft, traction systems (railway, tramway and trolley bus), or to incomplete vehicles.

NOTE 3 Protection of receivers used on board the same vehicle as the disturbance source(s) are covered by CISPR 25.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) — Chapter 161: Electromagnetic compatibility*.

CISPR 16-1:1993, *Specification for radio disturbance and immunity measuring apparatus and methods — Part 1: Radio disturbance and immunity measuring apparatus*.

CISPR 25:1995, *Limits and methods of measurement of radio disturbance characteristics for the protection of receivers used on board vehicles*.

3 Definitions

For the purpose of this International Standard, the definitions contained in IEC 60050(161) are applicable. The following definitions are specific to this standard:

3.1 vehicle

a machine which is self-propelled. Vehicles include, but are not limited to, cars, trucks, buses, mopeds, agricultural tractors, material-handling equipment and snowmobiles

3.2 device

a machine which is not self-propelled. Devices include, but are not limited to, chain-saws, irrigation pumps, air compressors, lawn mowers, and stationary or mobile concrete mixers

3.3 impulsive ignition noise

the unwanted emission of electromagnetic energy, predominantly impulsive in content, arising from the ignition system within a vehicle or device

3.4 ignition noise suppressor

that portion of a high-voltage ignition circuit intended to limit the emission of impulsive ignition noise

3.5 resistive distributor brush

a resistive pick-up brush in an ignition distributor cap

3.6 frequency sub-band

a segment of the frequency spectrum (30 MHz to 1 000 MHz) defined to enable statistical evaluation of the test data acquired by swept frequency testing

3.7 representative frequency

the assigned frequency of a frequency sub-band to be used for comparison of the data to the limit. To be used only in 6.4 and Annex A

3.8 characteristic level

the controlling (or dominant) emission level experienced in each frequency sub-band. The characteristic level is the maximum measurement obtained for both antenna polarizations and for all the specified measurement positions of the vehicle or device. Known ambient signals are not to be considered part of the characteristic level

3.9 tracking generator

a test signal oscillator (continuous wave) that is frequency locked to the received frequency of a measuring instrument

3.10 RF disturbance power

the RF power measured with a current transformer of an absorbing clamp and an RF measuring instrument. It may be measured — as the RF disturbance voltage — in a peak or quasi-peak mode

3.11 spark discharge

discharge of energy stored in the ignition coil, in an arc across the electrodes of a measuring spark plug

3.12**resistive high-tension (HT) ignition cable**

an ignition cable whose conductor has a high resistance (attenuation)

3.13**residential environment**

an environment with a 10 m protection distance between the source and the point of radio reception and where the source uses the public low-voltage power system or battery power. For example, rooming houses, private dwellings, entertainment halls, theatres, schools, public streets, etc.

4 Limits of disturbance

4.1 Determination of appropriate limit level

If the type of disturbance is unknown, the flow chart shown in Figure 1 may be used to determine which limit shall be applied.

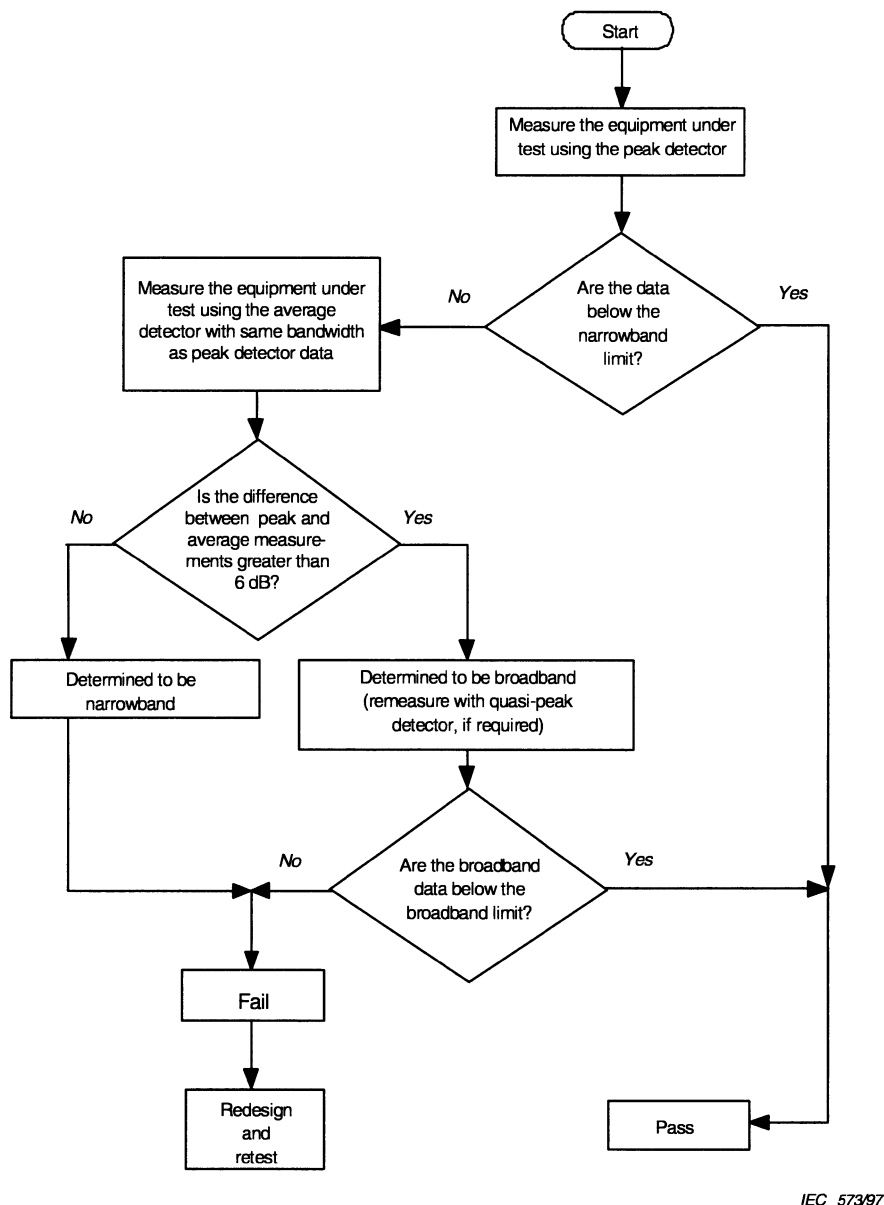
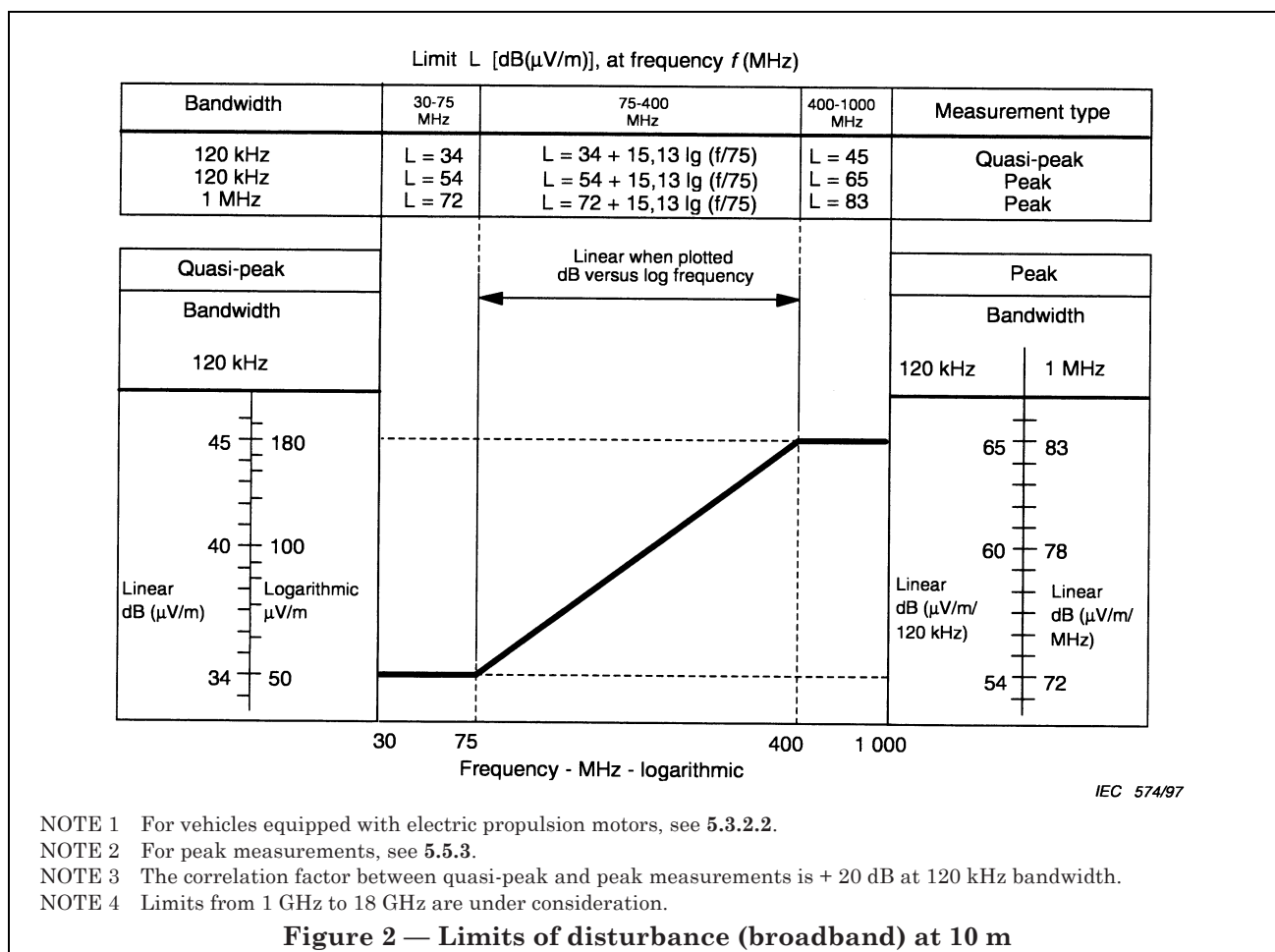


Figure 1 — Example method of determination of conformance of radiated disturbance

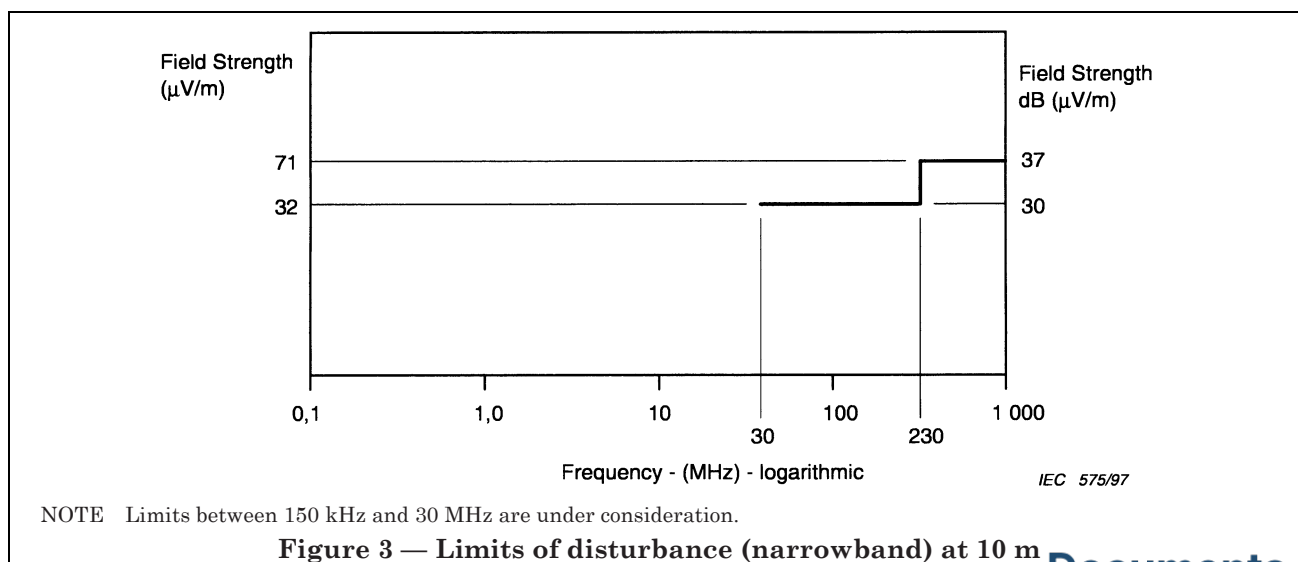
4.2 Broadband emissions

The limits for broadband emissions are given in Figure 2, both as a table and graphically. Only one of the bandwidths listed needs to be chosen for testing. For more accurate determination, the equations given in Figure 2 shall be used. For measurements at 3 m, 10 dB shall be added to the limit.



4.3 Narrowband emissions

The limits for narrowband emissions are shown in Figure 3. The limit applies to peak or quasi-peak detector measurements. Vehicles which meet the narrowband emissions requirements of CISPR 25 section 2 shall be deemed to be in compliance with the narrowband requirements of this subclause and no further testing is necessary. For measurements at 3 m, 10 dB shall be added to the limit.



5 Methods of measurement

NOTE Methods of measurement from 1 GHz to 18 GHz are under consideration.

5.1 Measuring instrument requirements

5.1.1 Measuring instrument

5.1.1.1 Type

The measuring instrument shall comply with the requirements of CISPR 16-1. Either manual or automatic frequency scanning may be used. Special consideration shall be given to overload, linearity, selectivity and the normal response to pulses.

NOTE Spectrum analyzers and scanning receivers are particularly useful for disturbance measurements. The peak detection mode of spectrum analyzers and scanning receivers provides a display indication which is never less than the quasi-peak indication for the same bandwidth. It may be convenient to measure emissions using peak detection because of the faster scan possible than with quasi-peak detection.

When quasi-peak limits are being used and a peak detector is being used for time efficiency, any peak measurements at or above the single sample type test limit shall be remeasured using the quasi-peak detector.

5.1.1.2 Minimum scan time

The scan rate of a spectrum analyzer or scanning receiver shall be adjusted for the CISPR frequency band and detection mode used. The minimum sweep time/frequency (i.e. most rapid scan rate) is listed in Table 1.

Table 1 — Minimum scan time

Frequency band		Peak detection	Quasi-peak detection
A	9 kHz – 150 kHz	Does not apply	Does not apply
B	0,15 MHz – 30 MHz	100 ms/MHz	200 s/MHz
C, D	30 MHz – 1 000 MHz	1 ms/MHz	20 s/MHz
Band definition from BS CISPR 16-1. Bands A and B are not used in this standard.			
NOTE Certain signals (e.g. low repetition rate signals) may require slower scan rates or multiple scans to ensure that the maximum amplitude has been measured.			

5.1.1.3 Measuring instrument bandwidth

The bandwidth of the measuring instrument shall be chosen such that the noise floor is at least 6 dB lower than the limit curve. The bandwidths in Table 2 are recommended.

NOTE When the bandwidth of the measuring instrument exceeds the bandwidth of a narrowband signal, the measured signal amplitude will not be affected. The indicated value of impulsive broadband noise will be lower when the measuring instrument bandwidth is reduced.

Table 2 — Recommended measuring instrument bandwidth (6 dB)

Frequency band MHz	Broadband peak	Broadband quasi-peak	Narrowband peak	Narrowband average
0,15 – 30 (not used in this standard)	9 kHz	9 kHz	9 kHz	9 kHz
30 – 1 000	120 kHz	120 kHz	120 kHz	120 kHz

If a spectrum analyzer is used for peak measurements, the video bandwidth shall be at least three times the resolution bandwidth.

5.1.2 Antenna types

5.1.2.1 Reference antenna

5.1.2.1.1 Frequency range of 150 kHz to 30 MHz

The reference antenna shall be the 1 m rod antenna of CISPR 16-1, vertically polarized, having its terminal voltage referenced to a counterpoise of the size and shape appropriate to the design of the antenna. The size and shape of the counterpoise shall be determined by the antenna manufacturer.