CISPR 12

Edition 6.1 2009-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Vehicles, boats and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of off-board receivers

Véhicules, bateaux et moteurs à combustion interne – Caractéristiques de perturbation radioélectrique – Limites et méthodes de mesure pour la protection des récepteurs extérieurs

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VEHICLES, BOATS AND INTERNAL COMBUSTION ENGINES – RADIO DISTURBANCE CHARACTERISTICS – LIMITS AND METHODS OF MEASUREMENT FOR THE PROTECTION OF OFF-BOARD RECEIVERS

FOREWORD

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International Standard CISPR 12 has been prepared by CISPR subcommittee D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion powered devices.

This consolidated version of CISPR 12 consists of the sixth edition (2007) [documents CISPR/D/322/CDV and CISPR/D/341/RVC] and its amendment 1 (2009) [documents CISPR/D/354/CDV and CISPR/D/361/RVC].

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 6.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

The following changes were made with respect to the previous edition:

– deletion of narrowband / broadband determination
– general improvement of wording

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

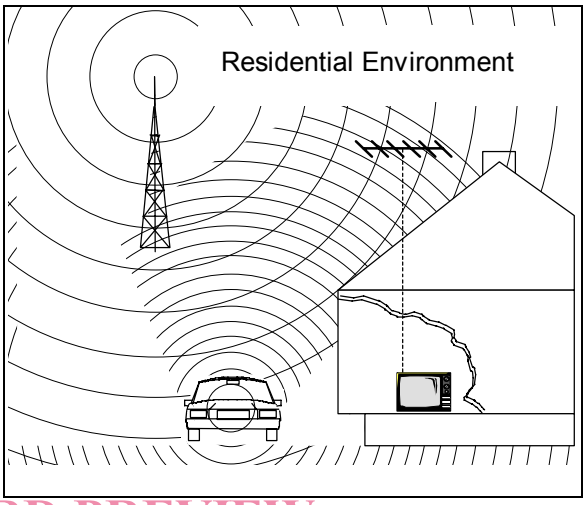
INTRODUCTION

There is a specific need for standards to define acceptable radio frequency performance of all electrical/electronic products. CISPR 12 has been developed to serve the road vehicle and related industries with test methods and limits that provide satisfactory protection for radio reception.

CISPR 12 has been used for many years as a regulatory requirement in numerous countries, to provide protection for radio receivers in the residential environment. It has been extremely effective in protecting the radio environment outside the vehicle.

VEHICLES, BOATS AND INTERNAL COMBUSTION ENGINES – RADIO DISTURBANCE CHARACTERISTICS – LIMITS AND METHODS OF MEASUREMENT FOR THE PROTECTION OF OFF-BOARD RECEIVERS

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 the 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, boat 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 the residential environment, including radio transmissions in frequency ranges other than that specified.

This standard applies to the emission of 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) boats propelled by an internal combustion engine, electrical means or both (see 3.2). Boats are to be tested in the same manner as vehicles except where they have unique characteristics as explicitly stated in this standard;

c) devices equipped with internal combustion engines or traction batteries (see 3.3).

See Annex G for a flow chart to help determine the applicability of CISPR 12.

This standard does not apply to aircrafts, household appliances, traction systems (railway, tramway and electric trolley bus), or to incomplete vehicles. In the case of a dual-mode trolley bus (e.g. propelled by power from either a.c./d.c. mains or an internal combustion engine), the internal combustion propulsion system shall be included, but the a.c./d.c. mains portion of the vehicle propulsion system shall be excluded from this standard.

NOTE 2 Protection of receivers used on board the same vehicle as the disturbance source(s) are covered by CISPR 25.

The measurement of electromagnetic disturbances while the vehicle is connected to power mains for charging is not covered in this standard. The user is referred to appropriate IEC and CISPR standards which define measurement techniques and limits for this condition.

Annex H lists work being considered for future revisions.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

CISPR 16-1-1:2006, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-3:2004, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-3: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Disturbance power*

CISPR 16-1-4:2007, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances*

CISPR 16-2-3:2006, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 25, *Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices – Limits and methods of measurement*

3 Terms and definitions

For the purpose of this document, the terms and definitions contained in IEC 60050-161 as well as the following apply.

3.1
vehicle
machine operating on land which is intended to carry persons or goods

NOTE Vehicles include, but are not limited to, cars, trucks, buses, mopeds, agricultural machinery, earth-moving machinery, material-handling equipment, mining equipment, floor treatment machines and snowmobiles.

3.2
boat
vessel intended to be used on the surface of water, its length being no greater than 15 m

3.3
device
machine driven by an internal combustion engine which is not primarily intended to carry persons or goods

NOTE Devices include, but are not limited to, chainsaws, irrigation pumps, snow blowers, air compressors, walk-behind floor treatment machines and landscaping equipment.

3.4
impulsive ignition noise
unwanted emission of electromagnetic energy, predominantly impulsive in content, arising from the ignition system within a vehicle, boat or device

3.5
ignition noise suppressor
that portion of a high-voltage ignition circuit intended to limit the emission of impulsive ignition noise

3.6
outdoor test site (OTS)
measurement site similar to an open area test site as specified in CISPR 16, however a ground plane is not required and there are dimensional changes

NOTE Specific requirements are defined in this document.

3.7
resistive distributor brush
resistive pick-up brush in an ignition distributor cap

3.8
frequency sub-band
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

3.9
representative frequency
assigned frequency of a frequency sub-band to be used for comparison of the data to the limit

3.10
characteristic level
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, boat or device. Known ambient signals are not considered part of the characteristic level.

3.11
tracking generator
test signal oscillator (continuous wave, cw) that is frequency locked to the receive frequency of a measuring instrument

3.12
RF disturbance power
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

3.13
spark discharge
in this document, the discharge of energy stored in the ignition coil, in an arc across the electrodes of a measuring spark-plug

3.14
resistive high-voltage (HV) ignition cable
ignition cable whose conductor has a high resistance (attenuation)

3.15
residential environment
environment having 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

NOTE Examples of a residential environment include rooming houses, private dwellings, entertainment halls, theatres, schools, public streets, etc.

3.16
traction batteries
high power batteries used for electric vehicle traction applications

4 Limits of disturbance

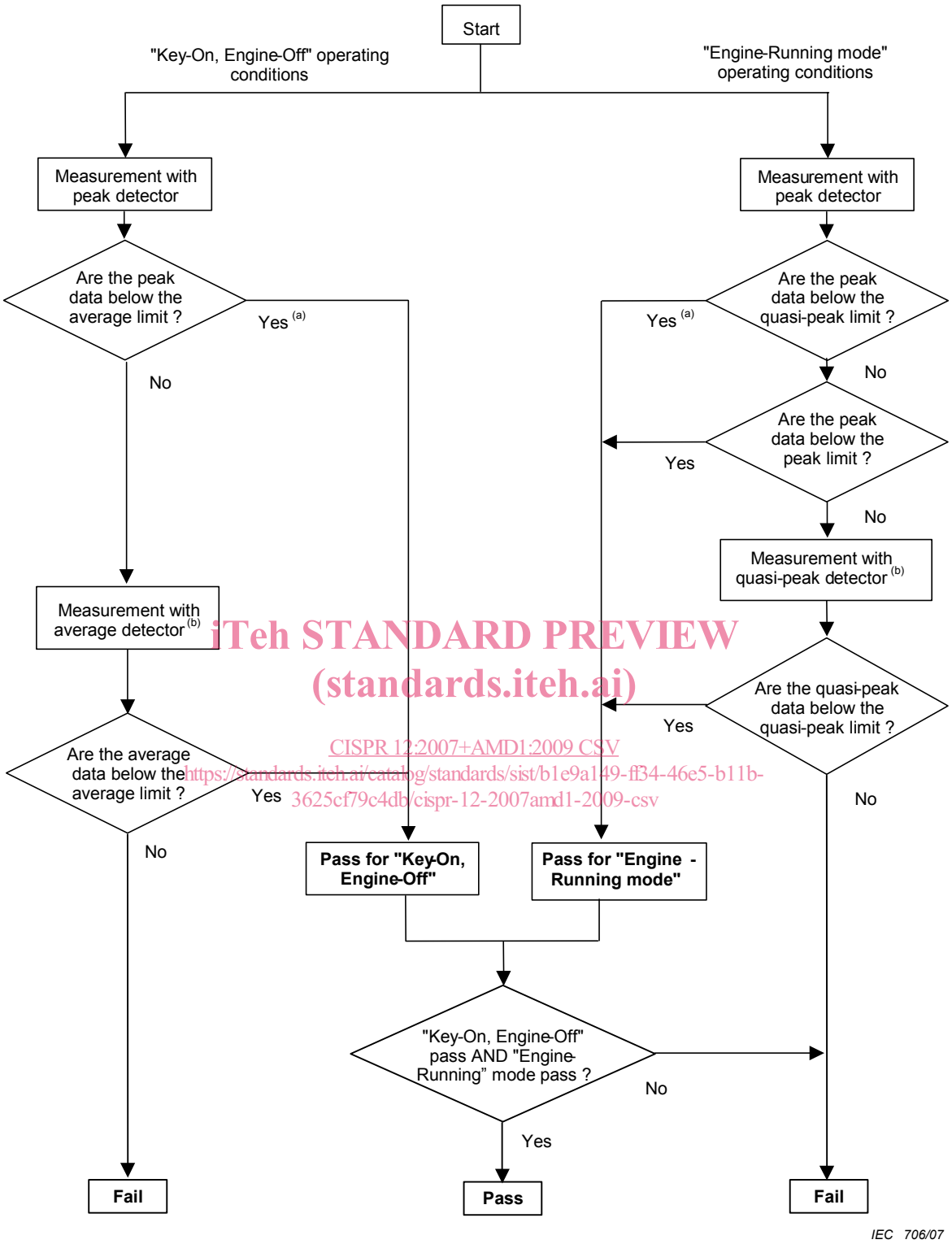
4.1 Determination of conformance of vehicle/boat/device with limits

In the 30 MHz – 1 GHz frequency range, the vehicle/boat/device shall comply with both:

- average limits when the vehicle/boat/device is in “Key-On, Engine-Off” mode (see 5.3.2.1), and
- peak or quasi-peak limits when the vehicle/boat/device is in “Engine-Running” mode (see 5.3.2.2)

The limits given in this standard take into account uncertainties.

Figure 1 defines the method for determination of conformance.



a Because measurement with peak detector is always higher than or equal to measurement with quasi-peak detector (and average detector respectively) and applicable peak limit is always higher than or equal to applicable quasi-peak limit (and average limit respectively), this single detector measurement can lead to a simplified and quicker conformance process.

b This flow-chart is applicable for each individual frequency, e.g only frequencies that are above the applicable limit need to be remeasured with quasi-peak detector (and average detector respectively).

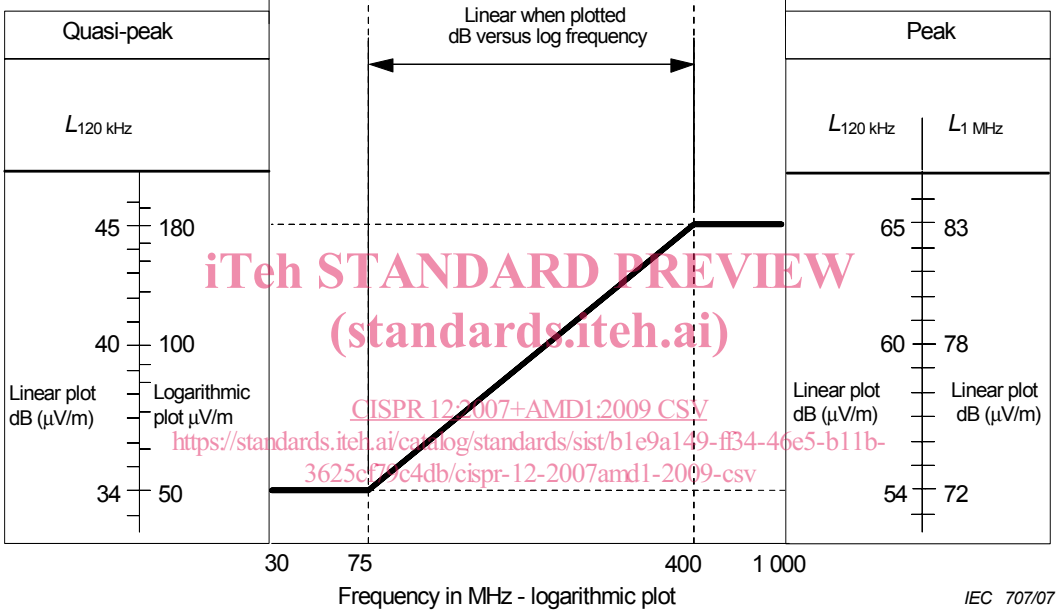
Figure 1 – Method of determination of conformance

4.2 Peak and quasi-peak detector limits

The limit for emissions measured with peak or quasi-peak detector at 10 m antenna distance is given in the table of Figure 2 and is shown graphically in Figure 2. 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 antenna distance, 10 dB shall be added to the limit.

Limit L_{bw} in dB (µV/m) as a function of bandwidth, detector and frequency f in MHz

L_{bw}	30-75 MHz	75-400 MHz	400-1000 MHz	Measurement type
$L_{120\ kHz}$	34	34 + 15,13 lg (f/75)	45	Quasi-peak
$L_{120\ kHz}$	54	54 + 15,13 lg (f/75)	65	Peak
$L_{1\ MHz}$	72	72 + 15,13 lg (f/75)	83	Peak



NOTE 1 For vehicles equipped with electric propulsion motors, see 5.3.2.

NOTE 2 For peak measurements, see 5.5.

NOTE 3 The correlation factor between quasi-peak and peak measurements is +20 dB at 120 kHz bandwidth, based on experimental data accumulated in many countries.

Figure 2 – Limit of disturbance (peak and quasi-peak detector) at 10 m antenna distance

4.3 Average detector limit

The limit for emissions measured with the average detector at 10 m antenna distance is shown in Figure 3. Vehicles/boats/devices not including electronic oscillators with an operating frequency greater than 9 kHz shall be deemed to be in compliance with the average requirements of this clause without performing tests for emissions with average detector. Vehicles/boats/devices which meet the average emissions requirements of CISPR 25, Clause 5 shall also be deemed to be in compliance with the average requirements of this subclause and no further testing is necessary.