CISPR 25

Edition 3.0 2008-03

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 on-board receivers

Véhicules, bateaux et moteurs à combustion interne – Caractéristiques des perturbations radioélectriques – Limites et méthodes de mesure pour la protection des récepteurs embarqués

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX XC

ICS 33.100.10; 33.100.20

ISBN 2-8318-9664-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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FOREWORD

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International Standard CISPR 25 has been prepared by CISPR subcommittee D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices.

This third edition cancels and replaces the second edition published in 2002. This edition constitutes a technical revision.

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

– addition of required measurements with both an average detector and a peak or quasi-peak detector;
– addition of methods and limits for the protection of new analogue and digital radio services, which cover the frequency range up to 2 500 MHz;
– addition of a new measurement method for components (stripline) as an informative Annex G;

– addition of the contents of CISPR 21 as Annex H; CISPR 21 in its entirety now becomes obsolete.

– deletion of narrowband / broadband determination;

– deletion of the Annex on rod antenna characterisation (this is now covered by CISPR 16-1-4);

– deletion of the Annex on characterisation of shielded enclosure (CISPR 25 will be amended when the CISPR/D / CISPR/A Joint Task Force on chamber validation finishes its work).

The text of this standard is based on the following documents:

Enquiry draft	Report on voting
CISPR/D/344/CDV	CISPR/D/352/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above Table.

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

The committee has decided that the contents of this publication 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.

The contents of the corrigendum of January 2009 have been included in this copy.

INTRODUCTION

This International Standard is designed to protect on-board receivers from disturbances produced by conducted and radiated emissions arising in a vehicle.

Test procedures and limits given are intended to provide provisional control of vehicle radiated emissions, as well as component/module conducted/radiated emissions of long and short duration.

To accomplish this end, this standard:

- establishes a test method for measuring the electromagnetic emissions from the electrical system of a vehicle;
- sets limits for the electromagnetic emissions from the electrical system of a vehicle;
- establishes test methods for testing on-board components and modules independent from the vehicle;
- sets limits for electromagnetic emissions from components to prevent objectionable disturbance to on-board receivers;
- classifies automotive components by disturbance duration to establish a range of limits.

NOTE Component tests are not intended to replace vehicle tests. Exact correlation between component and vehicle test performance is dependent on component mounting location, harness length, routing and grounding, as well as antenna location. Component testing, however, permits components to be evaluated prior to actual vehicle availability.

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

1 Scope

This International Standard contains limits and procedures for the measurement of radio disturbances in the frequency range of 150 kHz to 2 500 MHz. The standard applies to any electronic/electrical component intended for use in vehicles, trailers and devices. Refer to International Telecommunications Union (ITU) publications for details of frequency allocations. The limits are intended to provide protection for receivers installed in a vehicle from disturbances produced by components/modules in the same vehicle. The method and limits for a complete vehicle are in Clause 5 and the methods and limits for components/modules are in Clause 6. Only a complete vehicle test can be used to determine the component compatibility with respect to a vehicle's limit.

The receiver types to be protected are, for example, broadcast receivers (sound and television), land mobile radio, radio telephone, amateur, citizens' radio, Satellite Navigation (GPS, etc.) and Bluetooth. For the purpose of this standard, a vehicle is a machine, which is self-propelled. Vehicles include (but are not limited to) passenger cars, trucks, agricultural tractors and snowmobiles. Annex A provides guidance in determining whether this standard is applicable to particular equipment.

The limits in this standard are recommended and subject to modification as agreed between the vehicle manufacturer and the component supplier. This standard is also intended to be applied by manufacturers and suppliers of components and equipment which are to be added and connected to the vehicle harness or to an on-board power connector after delivery of the vehicle.

This International Standard does not include protection of electronic control systems from radio frequency (RF) emissions, or from transient or pulse-type voltage fluctuations. These subjects are included in ISO publications.

Since the mounting location, vehicle body construction and harness design can affect the coupling of radio disturbances to the on-board radio, Clause 6 of this standard defines multiple limit levels. The level class to be used (as a function of frequency band) is agreed upon between the vehicle manufacturer and the component supplier.

CISPR 25 defines test methods for use by vehicle manufacturers and suppliers, to assist in the design of vehicles and components and ensure controlled levels of on-board radio frequency emissions.

Vehicle test limits are provided for guidance and are based on a typical radio receiver using the antenna provided as part of the vehicle, or a test antenna if a unique antenna is not specified. The frequency bands that are defined are not applicable to all regions or countries of the world. For economic reasons, the vehicle manufacturer must be free to identify what frequency bands are applicable in the countries in which a vehicle will be marketed and which radio services are likely to be used in that vehicle.

As an example, many vehicle models will probably not have a television receiver installed; yet the television bands occupy a significant portion of the radio spectrum. Testing and mitigating noise sources in such vehicles is not economically justified.

The vehicle manufacturer should define the countries in which the vehicle is to be marketed, then choose the applicable frequency bands and limits. Component test parameters can then be selected from CISPR 25 to support the chosen marketing plan.

The World Administrative Radio communications Conference (WARC) lower frequency limit in region 1 was reduced to 148,5 kHz in 1979. For vehicular purposes, tests at 150 kHz are considered adequate. For the purposes of this standard, test frequency ranges have been generalized to cover radio services in various parts of the world. Protection of radio reception at adjacent frequencies can be expected in most cases.

Annex H defines a qualitative method of judging the degradation of radio communication in the presence of impulsive noise.

Annex I 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 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*
Amendment 1:1997
Amendment 2:1998

CISPR 12:2007, *Vehicles, motorboats, and internal combustion engine-driven devices – Radio disturbance characteristics – Limits and methods of measurement for the protection of receivers except those installed in the vehicle/boat/device itself or in adjacent vehicles/boats/devices*

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*
Amendment 1:2006
Amendment 2:2007

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*
Amendment 1:2004
Amendment 2:2006

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*
Amendment 1:2007

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*

ISO 11452-4:2005 - *Road vehicles – Component test methods for electrical disturbances from narrowband radiated electromagnetic energy – Part 4: Bulk current injection (BCI)*

SAE ARP 958.1 Rev D:2003-02 – Electromagnetic Interference Measurement Antennas; Standard Calibration Method

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
absorber lined shielded enclosure (ALSE)
shielded enclosure/screened room with radio frequency-absorbing material on its internal ceiling and walls

3.2
antenna factor
the factor which is applied to the voltage measured at the input connector of the measuring instrument to give the field strength at the antenna

3.3
antenna matching unit
a unit for matching the impedance of an antenna to that of the 50 Ω measuring instrument over the antenna measuring frequency range

3.4
class
a performance level agreed upon by the purchaser and the supplier and documented in the test plan

3.5
component continuous conducted emissions
the noise voltages/currents of a steady-state nature existing on the supply or other leads of a component/module which may cause disturbance to reception in an on-board receiver.

3.6
compression point
the input signal level at which the gain of the measuring system becomes non-linear such that the indicated output deviates from an ideal linear receiving system's output by the specified increment in dB

3.7
device
a 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, and landscaping equipment.

3.8
receiver terminal voltage (antenna voltage)
the voltage generated by a source of radio disturbance and measured in dB (μV) by a radio disturbance measuring instrument conforming to the requirements of CISPR 16

3.9
RF boundary
an element of an EMC test set-up that determines what part of the harness and/or peripherals are included in the RF environment and what is excluded. It may consist of, for example, ANs, filter feed-through pins, RF absorber coated wire, and/or RF shielding

3.10
artificial network (AN) ; line impedance stabilization network (LISN[1])
a network inserted in the supply lead or signal/load lead of apparatus to be tested which provides, in a given frequency range, a specified load impedance for the measurement of *disturbance voltages* and which may isolate the apparatus from the supply or signal sources/loads in that frequency range

[IEV 161-04-05, modified]

3.11
average detector
a detector, the output voltage of which is the average value of the envelope of an applied signal

NOTE The average value must be taken over a specified time interval.

[IEV 161-04-26]

3.12
bandwidth

3.12.1
bandwidth (of an equipment)
the width of a frequency band over which a given characteristic of an equipment or transmission channel does not differ from its reference value by more than a specified amount or ratio

NOTE The given characteristic may be, for example, the amplitude/frequency characteristic, the phase/frequency characteristic or the delay/frequency characteristic.

[IEV 161-06-09, modified]

3.12.2
bandwidth (of an emission or signal)
the width of the frequency band outside which the level of any spectral component does not exceed a specified percentage of a reference level

[IEV 161-06-10]

3.13
broadband emission
an *emission* which has a *bandwidth* greater than that of a particular measuring apparatus or receiver

[IEV 161-06-11, modified]

NOTE An emission which has a pulse repetition rate (in Hz) less than the bandwidth of a particular measuring instrument can also be considered as a broadband emission.

3.14
disturbance suppression
action which reduces or eliminates *electromagnetic disturbance*

[IEV 161-03-22]

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1 USA

3.15
disturbance voltage; interference voltage (deprecated in this sense)
voltage produced between two points on two separate conductors by an *electromagnetic disturbance*, measured under specified conditions

[IEV 161-04-01]

3.16
electromagnetic environment
the totality of electromagnetic phenomena existing at a given location

[IEV 161-01-01]

3.17
ground (reference) plane
a flat conductive surface whose potential is used as a common reference.

[IEV 161-04-36]

3.18
narrowband emission
an *emission* which has a *bandwidth* less than that of a particular measuring apparatus or receiver

[IEV 161-06-13]

NOTE An emission which has a pulse repetition rate (in Hz) greater than the bandwidth of a particular measuring instrument can also be considered as a narrowband emission.

3.19
peak detector
a detector, the output voltage of which is the peak value of an applied signal

[IEV 161-04-24]

3.20
quasi-peak detector
a detector having specified *electrical time constants* which, when regularly repeated identical *pulses* are applied to it, delivers an output voltage which is a fraction of the peak value of the pulses, the fraction increasing towards unity as the pulse repetition rate is increased

[IEV 161-04-21]

3.21
shielded enclosure; screened room
a mesh or sheet metallic housing designed expressly for the purpose of separating electromagnetically the internal and the external environment

[IEV 161-04-37]

4 Requirements common to vehicle and component/module emissions measurement

4.1 General test requirements and test plan

4.1.1 Categories of disturbance sources (as applied in the test plan)

Electromagnetic disturbance sources can be divided into two main types: