

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

CISPR 12:2007

<https://standards.iteh.ai/catalog/standards/iec/3e434cf6-f693-416e-86ad-251041574835/cispr-12-2007>





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.



CISPR 12

Edition 6.1 2009-03
CONSOLIDATED VERSION

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

[CISPR 12:2007](https://standards.iteh.ai/CISPR-12-2007)

<https://standards.iteh.ai/catalog/standards/iec/3e434cf6-f693-416e-86ad-251041574835/cispr-12-2007>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 27.020; 33.100.10

ISBN 978-2-8891-0004-0

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	9
3 Terms and definitions	9
4 Limits of disturbance	11
4.1 Determination of conformance of vehicle/boat/device with limits.....	11
4.2 Peak and quasi-peak detector limits	13
4.3 Average detector limit.....	13
5 Methods of measurement	14
5.1 Measuring instrument.....	14
5.1.1 Spectrum analyser parameters	15
5.1.2 Scanning receiver parameters	15
5.1.3 Antenna types	16
5.1.4 Accuracy	16
5.2 Measuring location requirements.....	17
5.2.1 Outdoor test site (OTS) requirements.....	17
5.2.2 Absorber lined shielded enclosure (ALSE) requirements.....	19
5.2.3 Antenna requirements	20
5.3 Test object conditions.....	22
5.3.1 General	22
5.3.2 Vehicles and boats	22
5.3.3 Devices	23
5.4 Data collection	24
6 Methods of checking for compliance with CISPR requirements	24
6.1 General.....	24
6.2 Application of limit curves.....	24
6.2.1 Measurements under dry conditions	24
6.2.2 Measurements under wet conditions.....	24
6.3 Evaluation (general).....	25
6.4 Type approval test.....	25
6.4.1 Single sample.....	25
6.4.2 Multiple samples (optional).....	25
6.5 Surveillance (quality audit) of series production.....	25
6.5.1 Single sample.....	25
6.5.2 Multiple samples (optional).....	25
6.6 Quick prototype check for development testing (optional, quasi-peak detector emissions only)	25
Annex A (normative) Statistical analysis of the results of measurements	26
Annex B (normative) Procedure to determine an alternative emission limit for measurements at 3 m antenna distance.....	28

Annex C (informative) Antenna and transmission line maintenance and characterization	30
Annex D (informative) Construction features of motor vehicles affecting the emission of ignition noise	35
Annex E (informative) Measurement of the insertion loss of ignition noise suppressors.....	36
Annex F (informative) Methods of measurement to determine the attenuation characteristics of ignition noise suppressors for high voltage ignition systems	42
Annex G (informative) Flow chart for checking the applicability of CISPR 12.....	52
Annex H (informative) Items under consideration	54
Bibliography.....	55
Figure 1 – Method of determination of conformance.....	12
Figure 2 – Limit of disturbance (peak and quasi-peak detector) at 10 m antenna distance.....	13
Figure 3 – Limits of disturbance (average detector) at 10 m antenna distance	14
Figure 4 – Measuring site (OTS) for vehicles and devices.....	18
Figure 5 – Measuring site (OTS) for boats	19
Figure 6 – Antenna position to measure emissions – Vertical polarization.....	20
Figure 7 – Antenna position to measure emissions – Horizontal polarization.....	21
Figure B.1 – Determination of the maximum antenna angle.....	28
Figure B.2 – Calculation of the resulting gain reduction a	29
Figure C.1 – Alternate antenna factor determination (10 m antenna distance).....	34
Figure E.1 – Test circuit.....	38
Figure E.2 – General arrangement of the test box.....	38
Figure E.3 – Details of the test box lid	39
Figure E.4 – Details of the test box	39
Figure E.5 – Straight spark-plug ignition noise suppressor (screened or unscreened).....	40
Figure E.6 – Right-angle spark-plug ignition noise suppressor (screened or unscreened).....	40
Figure E.7 – Noise suppression spark-plug	40
Figure E.8 – Resistive distributor brush	40
Figure E.9 – Noise suppressor in distributor cap	41
Figure E.10 – Noise suppression distributor rotor.....	41
Figure E.11 – Noise suppression ignition cable (resistive or reactive)	41
Figure F.1 – Test set-up, side view	44
Figure F.2 – Test set-up, top view.....	45
Figure F.3 – Pressure chamber with ventilation.....	46
Figure F.4 – Top view of the set-up of a right-angle ignition noise suppressor for distributors.....	47
Figure F.5 – Location of high voltage ignition components	48
Figure F.6 – Top view of the test set-up for distributor rotors	49

Figure F.7 – Side view of the test set-up for ready-to-use resistive ignition cables 50

Table 1 – Spectrum analyser parameters 15

Table 2 – Scanning receiver parameters 15

Table 3 – Internal combustion engine operating speeds 23

Table A.1 – Statistical factors 26

Table A.2 – Example of frequency sub-bands 27

Table F.1 – Limits 42

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[CISPR 12:2007](#)

<https://standards.iteh.ai/catalog/standards/iec/3e434cf6-f693-416e-86ad-251041574835/cispr-12-2007>

INTERNATIONAL ELECTROTECHNICAL COMMISSION
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

CISPR 12 edition 6.1 contains the sixth edition (2007-05) [documents CISPR/D/322/CDV and CISPR/D/341/RVC] and its amendment 1 (2009-03) [documents CISPR/D/354/CDV and CISPR/D/361/RVC].

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

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.

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.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[CISPR 12:2007](#)

<https://standards.iteh.ai/catalog/standards/iec/3e434cf6-f693-416e-86ad-251041574835/cispr-12-2007>

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.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[CISPR 12:2007](#)

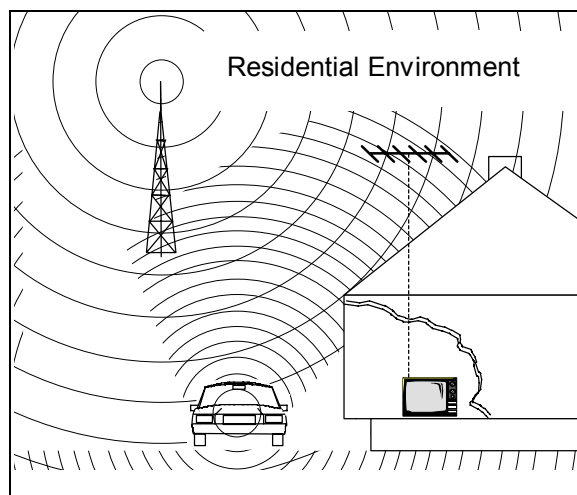
<https://standards.iteh.ai/catalog/standards/iec/3e434cf6-f693-416e-86ad-251041574835/cispr-12-2007>

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: Electro-magnetic 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)

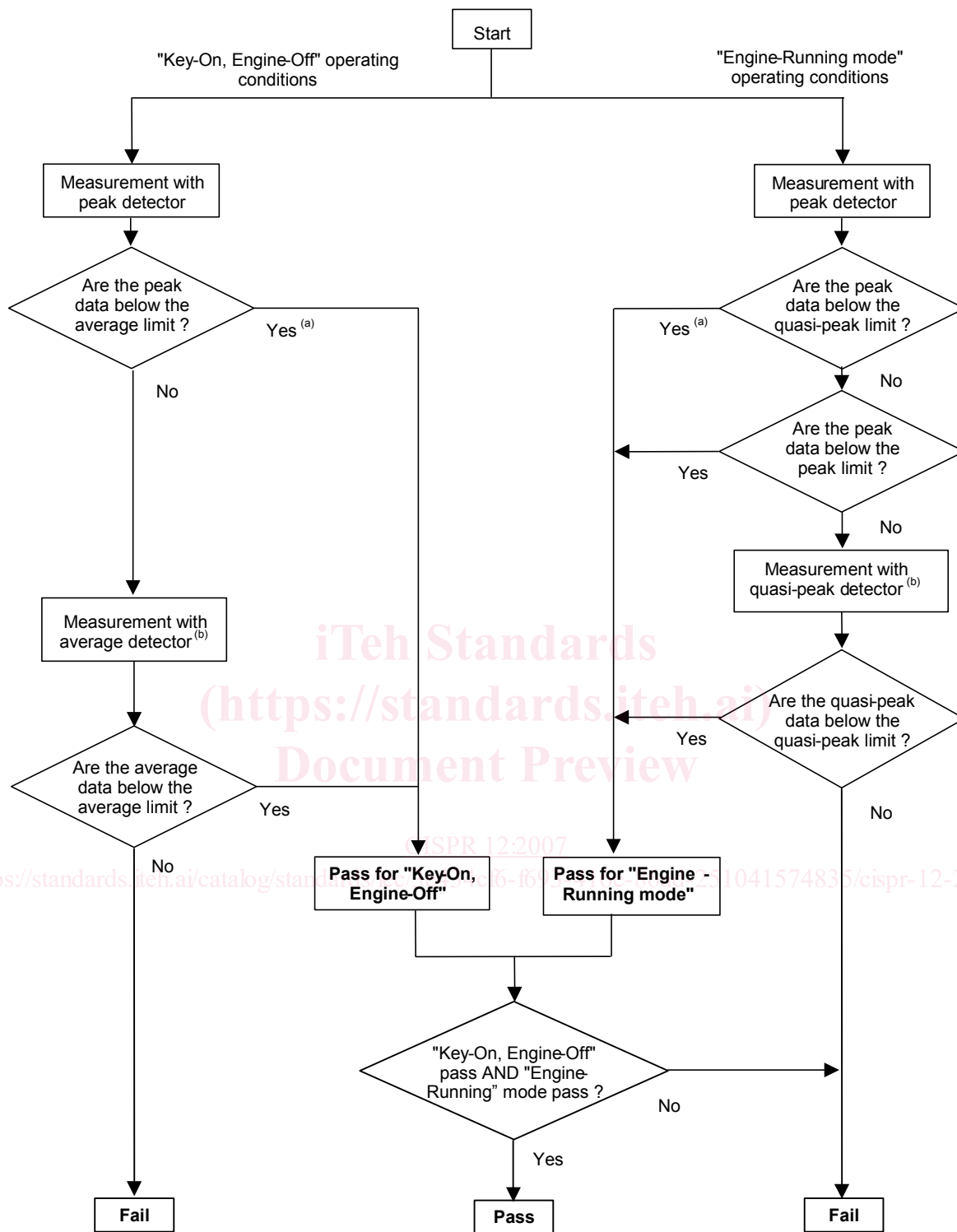
The limits given in this standard take into account uncertainties.

Figure 1 defines the method for determination of conformance.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[CISPR 12:2007](https://standards.iteh.ai/catalog/standards/iec/3e434cf6-f693-416e-86ad-251041574835/cispr-12-2007)

<https://standards.iteh.ai/catalog/standards/iec/3e434cf6-f693-416e-86ad-251041574835/cispr-12-2007>



IEC 706/07

- 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