BS ISO 11451-1:2015

BSI Standards Publication

Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy

Part 1: General principles and terminology

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National foreword

This British Standard is the UK implementation of ISO 11451-1:2015. It supersedes BS ISO 11451-1:2005+A1:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/16, Data Communication (Road Vehicles).

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

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Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy —

Part 1: General principles and terminology

Véhicules routiers — Méthodes d'essai d'un véhicule soumis à des perturbations électriques par rayonnement d'énergie électromagnétique en bande étroite —

Partie 1: Principes généraux et terminologie

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

This fourth edition cancels and replaces the third edition (ISO 11451-1:2005), which has been technically revised. It also incorporates the Amendment ISO 11451-1:2005/Amd 1:2008.

ISO 11451 consists of the following parts, under the general title *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy*:

— *Part 1: General principles and terminology*

— *Part 2: Off-vehicle radiation sources*

— *Part 3: On-board transmitter simulation*

— *Part 4: Bulk current injection (BCI)*

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Introduction

In recent years, an increasing number of electronic devices for controlling, monitoring, and displaying a variety of functions have been introduced into vehicle designs. It is necessary to consider the electrical and electromagnetic environment in which these devices operate.

Electrical and radio-frequency disturbances occur during the normal operation of many items of motor vehicle equipment. They are generated over a wide frequency range with various electrical characteristics and can be distributed to on-board electronic devices and systems by conduction, radiation, or both. Narrowband signals generated from sources on or off the vehicle can also be coupled into the electrical and electronic system, affecting the normal performance of electronic devices. Such sources of narrowband electromagnetic disturbances include mobile radios and broadcast transmitters.

The characteristics of the immunity of a vehicle to radiated disturbances have to be established. ISO 11451 provides various test methods for the evaluation of vehicle immunity characteristics (not all methods need be used to test a vehicle).

ISO 11451 is not intended as a product specification and cannot function as one (see A.1). Therefore, no specific values for the test severity level are given.

Annex A specifies a general method for function performance status classification (FPSC), Annex B specifies Artificial Networks (AN), Artificial Mains Networks (AMN) and Asymmetric Artificial Networks (AAN), while annex C explains the principle of constant peak test level. Typical severity levels are included in an annex of each of the other parts of ISO 11451.

Protection from potential disturbances needs to be considered in a total system validation, and this can be achieved using the various parts of ISO 11451.

NOTE Immunity measurements of complete vehicles are generally able to be carried out only by the vehicle manufacturer, owing to, for example, high costs of absorber-lined shielded enclosures, the desire to preserve the secrecy of prototypes or a large number of different vehicle models. ISO 11452 specifies test methods for the analysis of component immunity, which are better suited for supplier use.

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INTERNATIONAL STANDARD ISO 11451-1:2015(E)

Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy —

Part 1: General principles and terminology

1 Scope

This part of ISO 11451 specifies general conditions, defines terms, gives practical guidelines, and establishes the basic principles of the vehicle tests used in the other parts of ISO 11451, for determining the immunity of passenger cars and commercial vehicles to electrical disturbances from narrowband radiated electromagnetic energy, regardless of the vehicle propulsion system (e.g. spark-ignition engine, diesel engine, electric motor).

The electromagnetic disturbances considered are limited to continuous narrowband electromagnetic fields. A wide frequency range (0,01 MHz to 18 000 MHz) is allowed for the immunity testing in this and the other parts of ISO 11451.

2 Normative references

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

CISPR 16-1-2, *Specification for radio disturbance and immunity measuring apparatus and methods — Part 1-2: Radio disturbance and immunity measuring apparatus — Ancillary equipment — Conducted disturbances; Edition 1.2.*

3 Terms and definitions

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

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

Note 1 to entry: The common practice is for the room to have a metallic floor, but absorbing material can also be used on the floor.

3.2
amplitude modulation
AM
process by which the amplitude of a carrier wave is varied following a specified law, resulting in an AM signal

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3.3
artificial mains network
AMN
provides a defined impedance to the EUT at radio frequencies, couples the disturbance voltage to the measuring receiver, and decouples the test circuit from the supply mains

Note 1 to entry: There are two basic types of AMN, the V-network (V-AMN) which couples the unsymmetrical voltages and the delta-network which couples the symmetric and the asymmetric voltages separately. The terms line impedance stabilization network (LISN) and V-AMN are used.

Note 2 to entry: This network is inserted in the power mains of the vehicle in charging mode and provides, in a given frequency range, a specified load impedance and which isolates the vehicle from the power mains in that frequency range.

3.4
artificial network
AN
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 can isolate the apparatus from the supply or signal sources/loads in that frequency range

Note 1 to entry: This network is inserted in the DC power lines of the vehicle in charging mode and provides, in a given frequency range, a specified load impedance and which isolates the vehicle from the DC power supply in that frequency range.

3.5
asymmetric artificial network
AAN
network used to measure (or inject) asymmetric (common mode) voltages on unshielded symmetric signal (e.g. telecommunication) lines while rejecting the symmetric (differential mode) signal

Note 1 to entry: This network is inserted in the communication/signal lines of the vehicle in charging mode to provide a specific load impedance and/or a decoupling (e.g. between communication/signal lines and power mains).

3.6
bonded (ground connection and DC resistance)
grounding connection where the purpose of the bonding is to provide the lowest possible impedance (resistance and inductance) connection between two metallic parts with a d.c. resistance which shall not exceed 2,5 mΩ

Note 1 to entry: A low current (≤100 mA) 4-wire milliohm meter is recommended for this measurement.

3.7
bulk current
total amount of common mode current in a harness

3.8
compression point
input signal level at which the measurement system becomes non-linear

Note 1 to entry: When the measurement system is non-linear, the output value will deviate from the value given by an ideal linear system.

3.9
coupling
means or device for transferring power between systems

[SOURCE: IEC 60050-726]

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3.10
current injection probe
device for injecting current in a conductor without interrupting the conductor and without introducing significant impedance into the associated circuits

3.11
current (measuring) probe
device for measuring the current in a conductor without interrupting the conductor and without introducing significant impedance into the associated circuits

[SOURCE: IEC 60050-161]

3.12
degradation (of performance)
undesired departure in the operational performance of any device, equipment, or system from its intended performance

Note 1 to entry: The term "degradation" can apply to temporary or permanent failure.

[SOURCE: IEC 60050-161]

3.13
dual directional coupler
four-port device consisting of two transmission lines coupled together in such a manner that a single travelling wave in any one transmission line will induce a single travelling wave in the other, the direction of propagation of the latter wave being dependent upon that of the former

[SOURCE: IEC 60050-726]

3.14
electromagnetic compatibility
EMC
ability of equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbance to anything in that environment

[SOURCE: IEC 60050-161]

3.15
electromagnetic disturbance
any electromagnetic phenomenon which can degrade the performance of a device, equipment, or system or adversely affect living or inert matter

EXAMPLE An electromagnetic disturbance can be an electromagnetic noise, an unwanted signal, or a change in the propagation medium itself.

[SOURCE: IEC 60050-161]

3.16
electromagnetic interference
EMI
degradation of the performance of equipment, transmission channel, or system caused by electromagnetic disturbance

Note 1 to entry: The English words "interference" and "disturbance" are often used indiscriminately.

[SOURCE: IEC 60050-161]

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