INTERNATIONAL STANDARD

ISO 11451-2

Redline version
compares Fourth edition to
Third edition

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

Part 2: Off-vehicle radiation sources

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

Partie 2: Sources de rayonnement hors du véhicule

Reference number
ISO 11451-2:redline:2015(E)

IMPORTANT — PLEASE NOTE

This is a mark-up copy and uses the following colour coding:

Text example 1	— indicates added text (in green)
~~Text example 2~~	— indicates removed text (in red)
	— indicates added graphic figure
	— indicates removed graphic figure
1.x ...	— Heading numbers containg modifications are highlighted in yellow in the Table of Contents

All changes in this document have yet to reach concensus by vote and as such should only be used internally for review purposes.

DISCLAIMER

This Redline version provides you with a quick and easy way to compare the main changes between this edition of the standard and its previous edition. It doesn't capture all single changes such as punctuation but highlights the modifications providing customers with the most valuable information. Therefore it is important to note that this Redline version is not the official ISO standard and that the users must consult with the clean version of the standard, which is the official standard, for implementation purposes.

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Foreword

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~~International Standards are~~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 ~~rules given in~~editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

~~The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.~~

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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

~~ISO 11451-2 was prepared by Technical Committee~~The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC ~~3~~32, *Electrical and electronic ~~equipment~~components and general system aspects*.

Annex A of this part of ISO 11451 is for information only.

This ~~third~~fourth edition cancels and replaces the ~~second~~third edition (~~ISO 11451-2:2001~~),ISO 11451-2:2005) which has been technically revised.

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)*

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

Part 2:
Off-vehicle radiation sources

1 Scope

This part of ISO 11451 specifies a ~~vehicle test~~ method for ~~determining~~testing the immunity of passenger cars and commercial vehicles to electrical disturbances from off-vehicle radiation sources, regardless of the vehicle propulsion system (e.g. spark~~-~~ ignition engine, diesel engine, electric motor). ~~It can also be readily applied to other types of vehicles.~~

The electromagnetic disturbances considered are limited to narrowband electromagnetic fields.

While this standard refers specifically to passenger cars and commercial vehicles, generalized as “vehicle(s)”, it can readily be applied to other types of vehicles.

ISO 11451-1 specifies general test conditions, definitions, practical use, and basic principles of the test procedure.

~~The electromagnetic disturbances considered are limited to narrowband~~Function performance status classification guidelines for immunity to electromagnetic radiation from an off-vehicle radiation source are given in Annex A ~~electromagnetic fields~~.

2 Normative references

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

ISO 11451-1~~:2001~~, *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11451-1 apply.

4 ~~General test~~Test conditions

The applicable frequency range of this test method is 0,01 MHz to 18 000 MHz. Testing over the full frequency range could require different field-generating devices, but this does not imply that testing of overlapping frequency ranges is required.

The user shall specify the test severity level or levels over the frequency range. Suggested test severity levels are given in Annex A of this International Standard.

~~See~~Standard ~~ISO 11451-1 for descriptions of, and requirements~~test conditions are given in ISO 11451-1 for~~, the following standard test conditions, applicable to this part of~~ the following~~ISO 11451~~:

— test temperature;

— supply voltage;

— modulation;

— dwell time;

— frequency step sizes;

— definition of test severity levels;

— test signal quality.

5 Test location

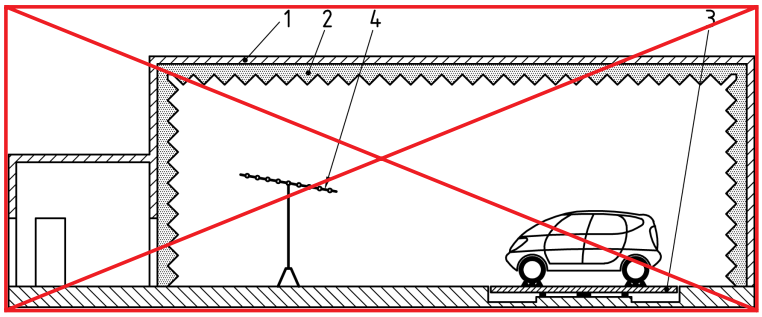
The test should be performed in an absorber-lined shielded enclosure.

The ~~test should be performed in~~aim of using an absorber-lined shielded enclosure~~, the aim being~~ is to create an indoor electromagnetic compatibility testing facility that simulates open field testing.

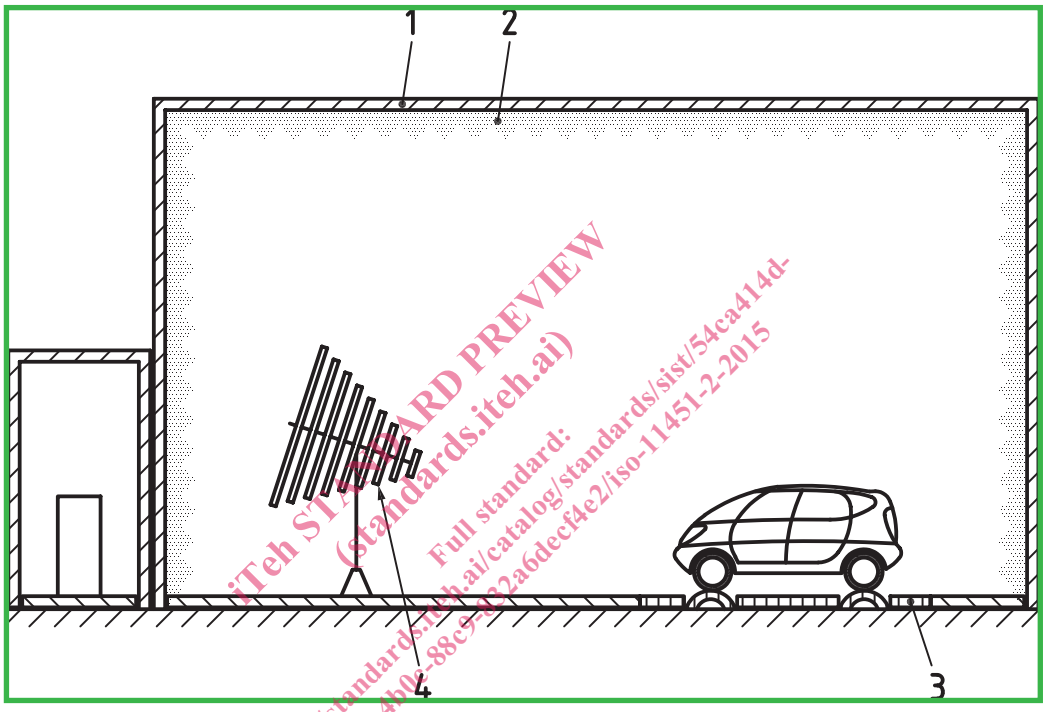
The size, shape, and construction of the enclosure can vary considerably. Typically, the floor is not covered with absorbing material, but such covering is allowed[1]. Measurements in enclosures with or without floor absorbers can lead to different results. The minimum size of the shielded enclosure is determined by the size of the test region needed, the size of the field generation device or devices, the needed clearances between these and the largest vehicle to be tested, and the characteristics of the absorbing material. To create the test region, the absorber, field generation system and enclosure shape are selected such that the amount of extraneous energy in the test region is reduced to below a minimum value that will give the desired measurement accuracy. The design objective is to reduce the reflected energy in the test region to −10 dB or less over the test frequency range ~~[~~(not applicable to transmission line system (TLS) field generation systems~~]~~). An example of a rectangular shielded enclosure is shown in Figure 1.

~~Alternatively, the~~The test may alternatively be performed at an outdoor test site. The test facility shall comply with (national) legal requirements regarding the emission of electromagnetic fields.

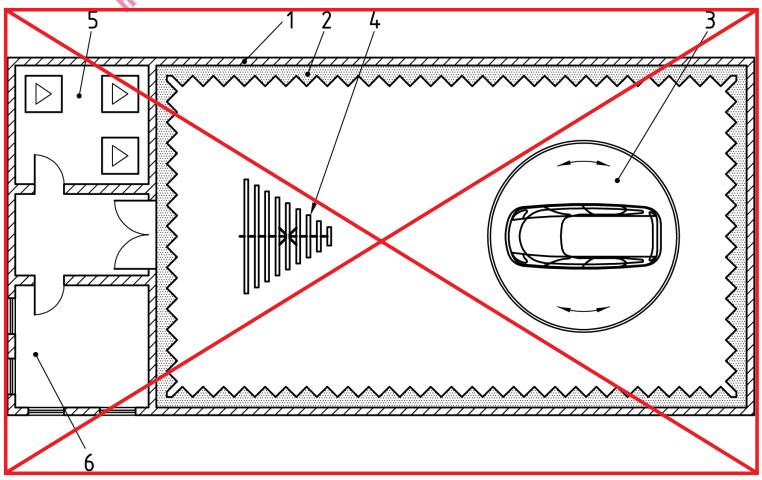
1) ~~Measurements in enclosures with or without floor absorbers can lead to different results.~~



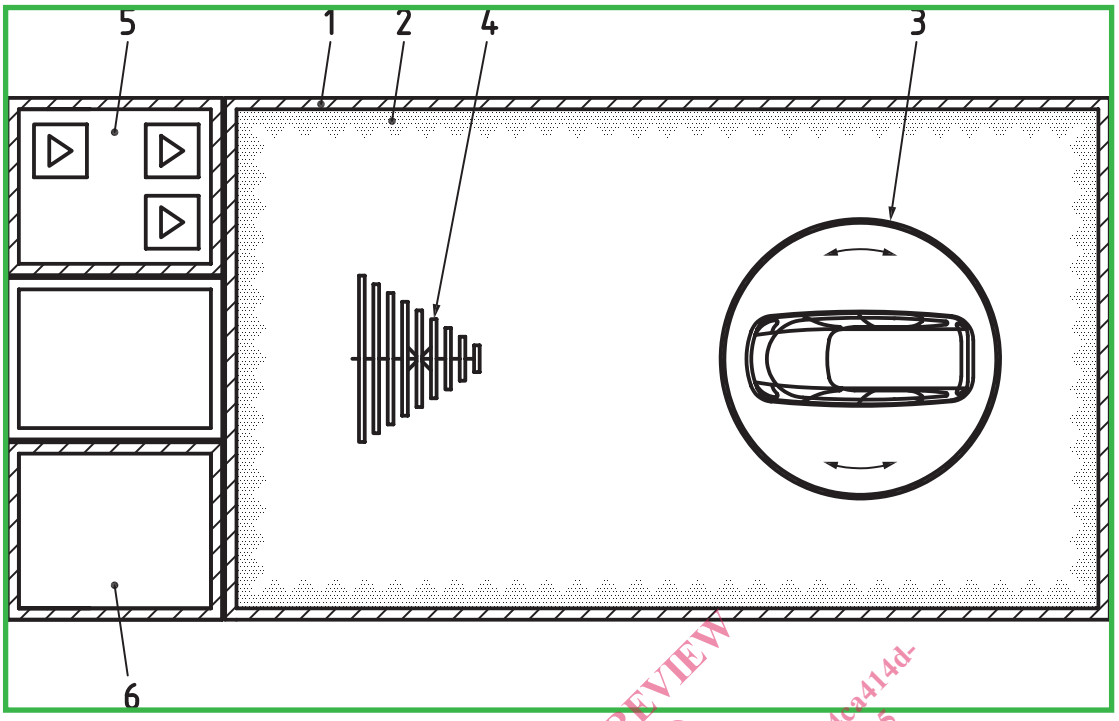
a) Vertical polarization



a) Side view (vertical polarization)



b) Horizontal polarization



b) Top view (horizontal polarization)

Key

~~1~~ ~~absorber-lined shielded enclosure~~
~~2~~ ~~RF absorber material~~
~~3~~ ~~vehicle dynamometer on turntable~~<?>
~~4~~ ~~antenna~~
~~5~~ ~~amplifier room~~
~~6~~ ~~control room~~

1 absorber-lined shielded enclosure
2 RF absorber material
3 vehicle dynamometer on turntable[a]
4 antenna
5 amplifier room
6 control room

[a] Turntable shown rotatable through ±180° with two pairs of variable wheelbase rollers to accommodate all vehicle sizes and functions.

Figure 1 — Example of absorber-lined shielded enclosure

6 Test ~~apparatus~~instrumentation

Testing consists of generating radiated electromagnetic fields using antenna sets with radio frequency (RF) sources capable of producing the desired field strength over the range of test frequencies~~, for which the following apparatus/instrumentation shall be used~~.

The following test instrumentation is used:

— Field generating device(s): e.g. antenna(s);

— Field probe(s);

— RF signal generator with internal or external modulation capability;

— High power amplifier(s);

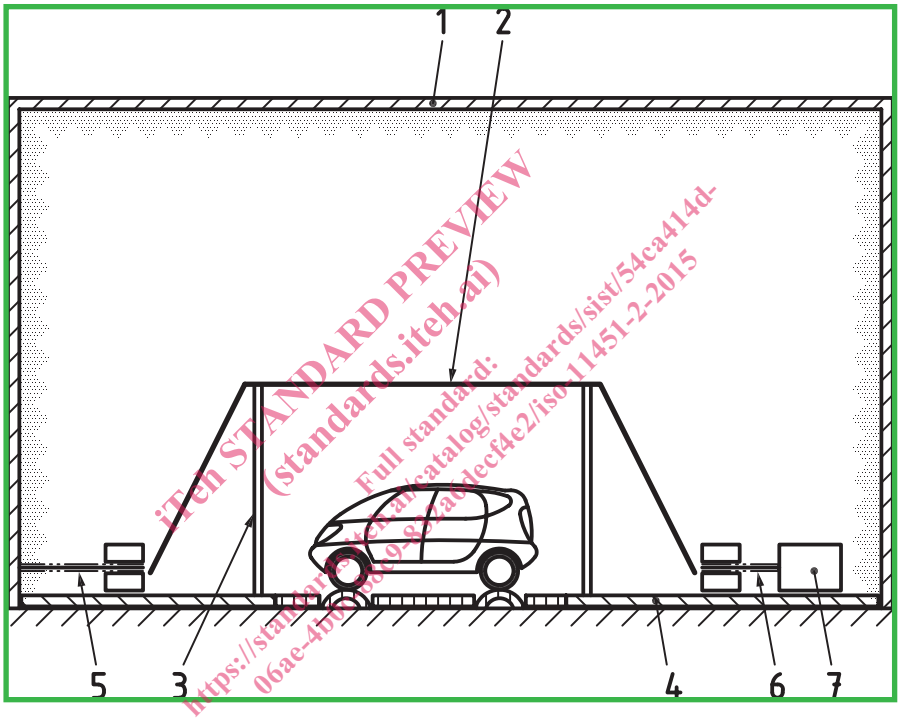
— Powermeter (or equivalent measuring instrument) to measure forward power and reflected power.

6.1 Field generating device

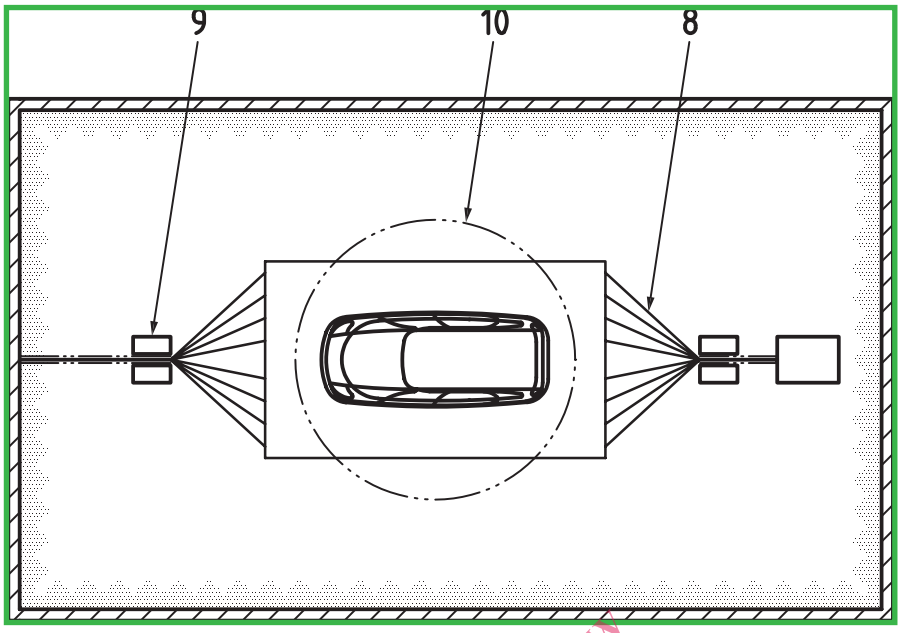
The field generating device can be an antenna or a TLS.

~~Field generating device~~The construction and~~, which may be an antenna or antennas, or a TLS, and whose construction and orientation~~ orientation of any field generating device shall be such that the generated field can be polarized in the mode specified in the test plan (see ~~9.2~~8.1). An example of a parallel-plate TLS is shown in Figure 2. Multiple antennas, amplifiers and directional couplers could be necessary to cover the complete frequency range.

~~See Figure 2 for an example of a parallel-plate TLS. Multiple antennas, amplifiers and directional couplers could be necessary to cover the complete frequency range.~~



a) Side view



b) Top view

Key

1	shielded enclosure (absorbers permitted)	6	coaxial cable
2	conductive plate or set of wires	7	load
3	non-metallic supports	8	conductive wires
4	shielded enclosure floor	9	signal source feed connection
5	signal source feed line (coaxial cable)	10	turntable (not required for this test)

Figure 2 — Example of parallel-plate TLS

6.2 Field probes

~~field probe(s)~~Field probes~~, which~~ shall be electrically small in relation to the wavelength and isotropic. The communication lines from the probes shall be fibre optic links.

~~The communication lines from the probes shall be fibre optic links.~~

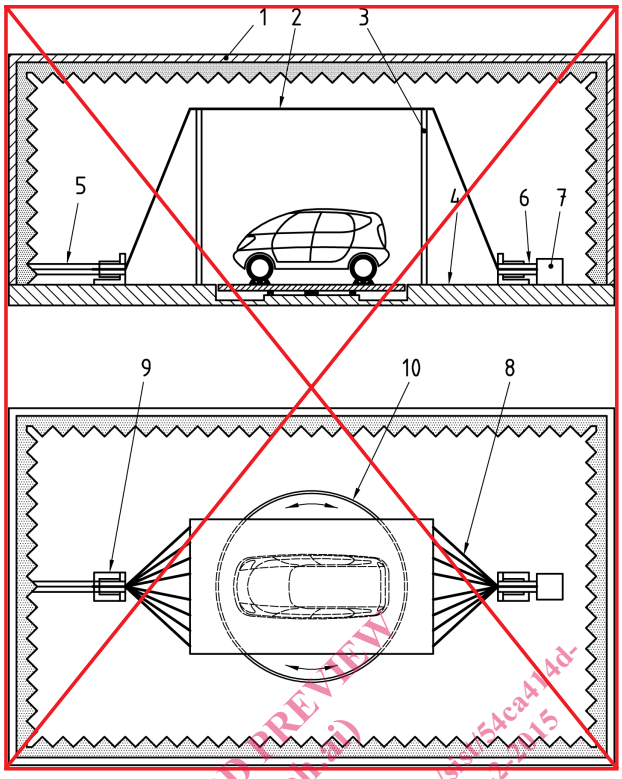
~~**6.3 RF signal generator**, with internal or external modulation capability.~~

~~**6.4 High power amplifier(s)**.~~

~~6.5~~6.3 Stimulation and monitoring of the device under test (DUT)

The vehicle shall be operated as required in the test plan by using actuators which have a minimum effect on the electromagnetic characteristics, e.g. plastic blocks on the push-buttons, pneumatic actuators with plastic tubes.

~~Powermeter~~Connections ~~(or equivalent measuring instrument), for measuring forward and reflected power~~to equipment monitoring electromagnetic interference reactions of the vehicle may be accomplished by using fibre-optics, or high resistance leads. Other type of leads can be used but require extreme care to minimize interactions. The orientation, length, and location of such leads shall be carefully documented to ensure repeatability of test results.



Key

1 shielded enclosure (absorbers permitted)
2 conductive plate or set of wires
3 non-metallic supports
4 shielded enclosure floor
5 signal source feed line (coaxial cable)
6 coaxial cable
7 load
8 conductive wires
9 signal source feed connection
10 turntable (not required for this test)

Figure 2 — Example of parallel plate TLS

Any electrical connection of monitoring equipment to the vehicle can cause malfunctions of the vehicle. Extreme care shall be taken to avoid such an effect.

7 Stimulation and monitoring of vehicle

WARNING — Any electrical connection of monitoring equipment to the vehicle could cause malfunctions of the vehicle. Extreme care shall be taken to avoid such an effect.

The vehicle (the device under test or DUT) shall be operated as required in the test plan by using actuators which have a minimum effect on the electromagnetic characteristics, e.g. plastic blocks on the push-buttons, pneumatic actuators with plastic tubes.

Connections to equipment monitoring electromagnetic interference reactions of the vehicle may be accomplished by using fibre-optics or high-resistance leads. Other type of leads may be used but require extreme care to minimize interactions. The orientation, length and location of such leads shall be carefully documented to ensure repeatability of test results.