INTERNATIONAL STANDARD

ISO 11452-9

Second edition
2021-10

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

Part 9: Portable transmitters

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

Partie 9: Émetteurs portables

Reference number
ISO 11452-9:2021(E)

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Published in Switzerland

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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).

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

This second edition cancels and replaces the first edition (ISO 11452-9:2012), which has been technically revised.

The main changes are as follows:

— change of the frequency range from 26 MHz – 5,85 GHz to 142 MHz – 6 GHz;

— suppression of test methodology with commercial transmitters;

— use of modulation from ISO 11452-1;

— modifications of ground plane dimensions;

— introduction of additional artificial networks (HV-AN, AMN, AAN) for DUT powered by a shielded power system;

— addition of test set-up descriptions and figures for HV power supply system;

— addition of wording for DUT, connector and harness testing;

— addition of new Annex A with description of test methodology for net power characterization procedure;

— addition in Annex C of microwave broadband dipole antenna and HF broadband sleeve antenna;

— addition of Annex F on broadband noise source with arbitrary waveform generator.

A list of all parts in the ISO 11452 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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

Part 9: Portable transmitters

1 Scope

This document specifies test methods and procedures for testing electromagnetic immunity of electronic components for passenger cars and commercial vehicles to portable transmitters in close proximity, regardless of the propulsion system (e.g. spark-ignition engine, diesel engine, electric motor). The device under test (DUT), together with the wiring harness (prototype or standard test harness), is subjected to an electromagnetic disturbance generated by portable transmitters inside an absorber-lined shielded enclosure, with peripheral devices either inside or outside the enclosure. The electromagnetic disturbances considered are limited to continuous narrowband electromagnetic fields.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 11452-1, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology*

Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). International Commission on Non-Ionizing Radiation Protection (ICNIRP)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11452-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
reference position
geometrical centre of the radiation pattern of the antenna, which is determined by the manufacturer based on near field measurement

4 Test conditions

The applicable frequency range of the test method is 142 MHz to 6 GHz.

The user of this document shall specify the test severity level or levels over the frequency bands. The test severity level shall take into account:

— typical portable transmitter characteristics (frequency bands, power level and modulation), and

— the characteristics of the antenna(s) used for this test.

The user shall specify the test severity level(s) over the frequency range. Suggested test levels are included in Annex D.

Standard test conditions are given in ISO 11452-1 for the following:

— test temperature;

— supply voltage;

— dwell time;

— test signal quality;

— frequency steps;

— modulation.

NOTE Alternate modulations, if required, can be found in Annex B. Users of this document are advised that Annex B is for information only and cannot be considered as an exhaustive description of various portable transmitters available in all countries.

5 Test location

The test shall be performed in an absorber lined shielded enclosure (ALSE).

6 Test instrumentation

6.1 General

The field-generating device shall be simulated portable transmitters, with a broadband amplifier connected to a transmit antenna.

Test personnel shall be protected in accordance with ICNIRP Guidelines.

NOTE National or other regulations can apply.

6.2 Simulated portable transmitters

6.2.1 General

The following equipment is used:

— ground plane;

— radio frequency (RF) generator with internal or external modulation capability;

— power amplifier;

— power measuring instrumentation to measure the forward and reverse power;

— dual directional coupler;

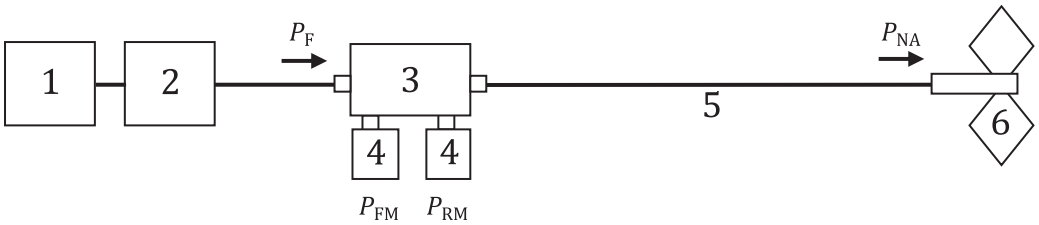
— low loss coaxial cables;

— vector network analyser (VNA);

— transmit antenna;

— artificial networks (AN), and/or high voltage artificial networks (HV-AN), and/or artificial mains networks (AMN), and/or asymmetric artificial networks (AAN).

Figure 1 illustrates the basic setup for the RF generation equipment. Testing is based on a required net power (P_{NA}) applied to the test antenna. The net power level is derived from the forward power (P_{FM}) measured at the directional coupler, which is remotely connected to the transmit antenna via low loss coaxial cable. Requirements on directional coupler, cable and power sensors are listed in 6.2.2 to 6.2.4. The procedures delineated in Annex A shall be used determine the required forward power to achieve the net power levels listed in Annex A or within the test plan. Although not required, it is highly recommended to use a single directional coupler to cover the entire frequency band.



Key

1	RF signal generator	P_{FM}	measured forward power at the directional coupler
2	RF amplifier	P_{RM}	measured reverse power at the directional coupler
3	dual directional coupler	P_{NA}	net power delivered to antenna
4	power sensor or measurement receiver		
5	low loss coaxial cable with transmission loss		
6	transmit antenna		

Figure 1 — RF generation equipment setup

6.2.2 Dual directional coupler

The coupler shall exhibit the following characteristics:

— coupling factor: >20 dB (40 dB recommended),

— mainline port VSWR: <1,3,

— coupling port VSWR: <1,5,

— mainline transmission loss: <0,5 dB,

— directivity: >18 dB.

Selection of coupling factor (20 – 40 dB) shall be compatible with the sensitivity of the measurement equipment used to measure forward and reflected power (see 6.2.3 for details).

6.2.3 Power monitoring

Either power sensors or a spectrum analyser (or measurement receiver) shall be used for measurement of the forward and reflected power at the dual directional coupler.

When power sensors are used to measure forward and reflected power:

— CW or AM signal shall be measured either with an average or peak power sensor (peak conservation may be applied for AM per ISO 11452-1);