

<div>中華民國國家標準</div> <div>CNS</div>	<div>道路車輛－窄頻輻射電磁能量之電擾動組件試驗</div> <div>法－第 10 部：音頻延伸範圍之傳導擾動免疫力</div>	<div>總號</div> <div>類號</div>	
<div>Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 10: Immunity to conducted disturbances in the extended audio frequency range</div> <div>1 Scope</div> <div><p>This part of ISO 11452 specifies a conducted voltage test method and procedure for determining the immunity of electronic components of passenger cars and commercial vehicles, regardless of the propulsion system (e.g. spark-ignition engine, diesel engine, electric motor). The method is applied to each individual device under test (DUT) lead and is applicable to all power and output leads, as well as low frequency analogue leads. The method is particularly useful in evaluating DUTs with acoustic or visible display functions.</p><p>1.適用範圍</p><p>本標準規定傳導電壓試驗方法及程序，以判定與推進系統無關(如點火引擎、柴油引擎、電動馬達)之小客車及商用車的電子組件免疫力。本方法適用各個獨立待測裝置，並可適於所有電源及輸出引線，亦適於低頻類比引線，並對具聲音或影像顯示功能之待測裝置的評估特別有用。</p><p>The disturbances considered in this part of ISO 11452 are limited to continuous narrowband electric voltage waveforms.</p><p>本標準所考量之擾動僅限連續窄頻電壓波形。</p><div>2 Normative references</div><div>2.引用標準</div><p>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.</p><p>下列標準因本標準所引用，成為本標準之一部分。下列引用標準適用最新版(包括補充增修)。</p><p><i>ISO 11452-1, Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology</i></p><p><i>CNS 15207-1 道路車輛－窄頻輻射電磁能量之電擾動組件試驗法－第 1 部：通則及詞彙</i></p><div>3 Terms and definitions</div><div>3.用語及定義</div><p>For the purposes of this document, the terms and definitions given in ISO 11452-1</p></div>			
<div>公 布 日 期</div> <div>年 月 日</div>	<div>經濟部標準檢驗局印行</div>		<div>(共 頁)</div> <div>修 訂 公 布 日 期</div> <div>年 月 日</div>

apply.

下列用語及定義適用於本標準。

4 Test conditions

4.試驗條件

The applicable frequency range of the test method is 15 Hz to 250 kHz.

本試驗方法適用之頻率範圍為 15 Hz～250 kHz。

The user of this part of ISO 11452 shall specify the test severity level or levels over the frequency bands. Typical test levels are given for information purposes in Annex A.

本標準的使用者應對整個頻帶指定嚴酷位準，典型之試驗位準於附錄 A 給定以供參考。

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

- test temperature;
- supply voltage;
- dwell time;
- test signal quality.

Unless otherwise specified, the tolerance on all parameters is $\pm 10\%$.

於 CNS 15207-1 規定如下標準試驗條件：

- 試驗溫度；
- 供應電壓；
- 駐留時間；
- 試驗信號品質。

除非另外指定，所有參數之許可差為 $\pm 10\%$ 。

5 Test location

5.試驗場地

For the frequency range of this test, there are no special grounding or shielding requirements.

基於本試驗之頻率範圍，無特殊接地或屏蔽要求。

6 Test apparatus

6.試驗設備

6.1 General

6.1 通則

The primary functional requirement is that the apparatus provide a source impedance of less than $0,5\ \Omega$ from 15 Hz to 50 kHz and less than or equal to $2\ \Omega$ from 50 kHz to 250 kHz at the signal source (i.e. at the output of the isolation transformer) over the test frequency range. Annex B details a procedure for verifying the source impedance of the test apparatus. The frequency range of the apparatus used for the test shall meet the test plan frequency range requirements.

主要功能要求為設備可在整個試驗頻率範圍於信號源(即隔離變壓器之輸出端)提供小於 $0,5\ \Omega$ (15 Hz～50 kHz)及小於等於 $2\ \Omega$ (50 kHz～250 kHz)之源阻抗，附錄 B 詳

述驗證試驗設備源阻抗之程序，試驗所用設備之頻率範圍應符合試驗計畫頻率範圍要求。

NOTE 1 The upper frequency limit for the apparatus in 6.2.1, 6.2.2 and 6.2.3 can be reduced in accordance with the user's frequency range requirements.

備考 1. 6.2.1、6.2.2 及 6.2.3 之設備頻率上限可依使用者的頻率範圍要求降低。

NOTE 2 It is recognized that other types of apparatus can produce equivalent signals, e.g. a power oscillator can replace the oscillator and amplifier, a power operational amplifier can replace the amplifier and power supply, etc.

備考 2. 其他種類之設備，只要能產生相同之信號，亦可使用，如功率震盪器可替代震盪器及放大器，功率運算放大器可替代放大器及電源供應器等。

The test apparatus consists of the following:

- an audio oscillator or signal generator,
- an extended range audio amplifier,
- an isolation transformer,
- a voltage measuring instrument,
- a current measuring instrument,
- a power supply, and
- a capacitor.

試驗設備包含如下：

- 音頻震盪器或信號產生器，
- 延伸範圍之音頻放大器，
- 隔離變壓器，
- 電壓量測儀器，
- 電流量測儀器，
- 電源供應器，及
- 電容。

6.2 Apparatus

6.2 設備

6.2.1 Audio oscillator, 15 Hz to 250 kHz frequency range.

6.2.1 音頻震盪器，頻率範圍為 15 Hz～250 kHz。

6.2.2 Audio power amplifier, 15 Hz to 250 kHz frequency range; 50 W output power minimum with output impedance equal to or less than 2,0 Ω (capable of delivering 50 W into a 0,5 Ω resistive load connected across the specified isolation transformer secondary).

6.2.2 音頻功率放大器，頻率範圍為 15 Hz～250 kHz；最小輸出功率為 50 W，其輸出阻抗等於小於 2.0 Ω (足以傳遞 50 W 至與指定隔離變壓器二次側並聯之 0.5 Ω 電阻性負載)

The amplifier shall be capable of operating open circuit without damage.

放大器應可於開路中操作而無損毀。

6.2.3 Isolation transformer, 15 Hz to 250 kHz frequency range; 4:1 impedance ratio;

secondary as connected shall be capable of handling the total lead (supply plus test signal) current flow without saturating the core.

- 6.2.3 隔離變壓器，頻率範圍為 15 Hz～250 kHz；阻抗比為 4:1；連接之二次側應足以承受全部引線(電源供應加上試驗信號)電流，且其磁芯不飽和。

NOTE It has been verified that at least one commercially available 30 Hz to 250 kHz transformer satisfies the extended frequency requirements of this part of ISO 11452.

備考：至少一型商用變壓器經驗證可用於 30 Hz～250 kHz，以滿足本標準的頻率延伸要求。

- 6.2.4 Voltage measuring instrument, i.e. oscilloscope, a.c. voltmeter, or other suitable high impedance meter.

- 6.2.4 電壓量測儀器，即示波器、交流電表、或其他適用之高阻抗表。

- 6.2.5 Current measuring instrument, i.e. negligible series impedance inducing probe with appropriate magnitude capability.

- 6.2.5 電流量測儀器，即具適當讀值大小且可忽略串聯阻抗之感應探針。

NOTE A clip-on Hall effect probe is suitable.

備考：夾式霍爾效應探針適用。

- 6.2.6 The power supply defined in ISO 11452-1 shall be used for this test method.

- 6.2.6 CNS 15207-1 定義之電源供應器應用於本試驗方法。

- 6.2.7 A 100 μ F capacitor may be used (for lines other than power lines) to shunt the source end of the isolation transformer to ground if difficulty is encountered in obtaining sufficient test voltage.

若難以獲得足夠試驗電壓時，可使用 100 μ F 電容(對非電源線)將隔離變壓器之一次側並聯接地。

Verification shall be made that desired signals are not excessively disturbed by the inclusion of the 100 μ F capacitor.

應執行驗證以確認所需信號未被 100 μ F 過渡干擾。

7 Test set-up

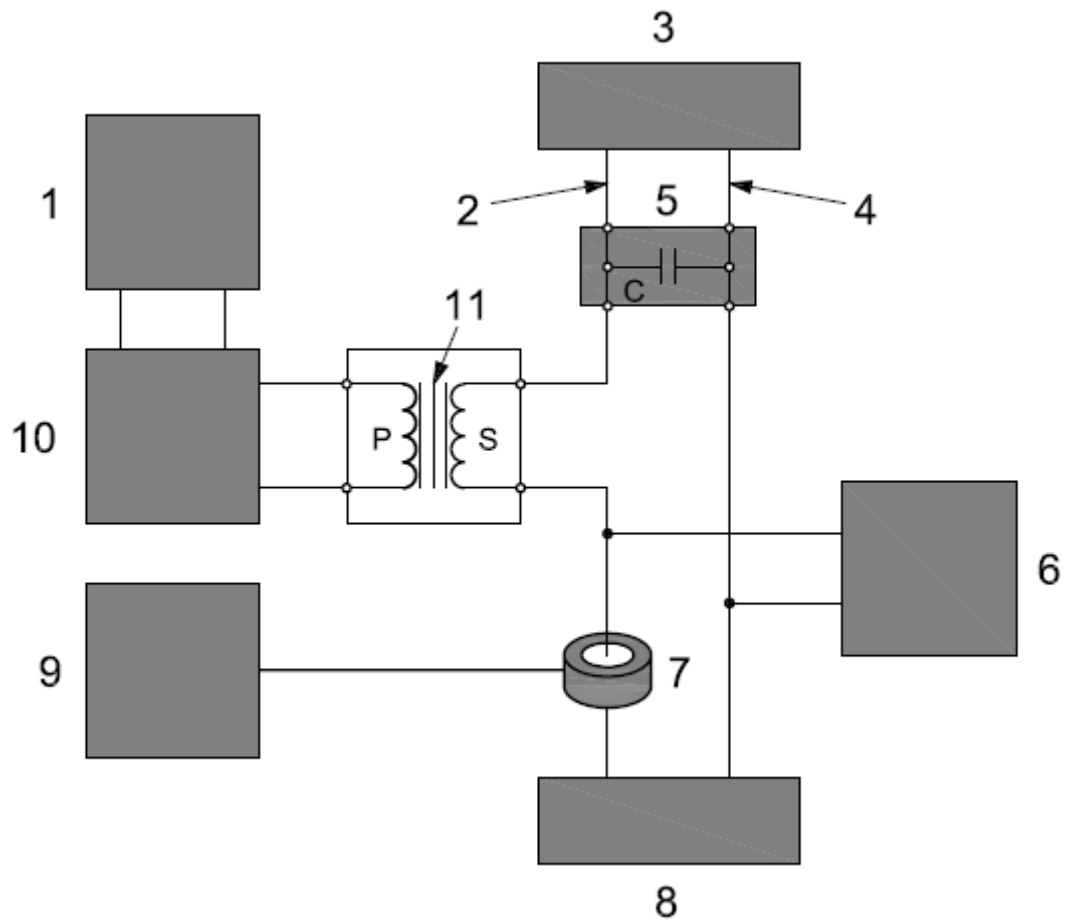
7.試驗設置

The test set-up is shown in Figure 1. A d.c. power amplifier that satisfies the source impedance requirement of this part of ISO 11452 and can supply the power required by the DUT may be substituted for the power amplifier and isolation transformer for power supply lead testing.

試驗設置參照圖 1。滿足本標準之源阻抗要求，並可供應待測裝置所需功率之直流功率放大器，可替代電源供應引線試驗中之功率放大器及隔離變壓器。

Figure 1 — Test set-up for measuring conducted immunity, 15 Hz to 250 kHz

圖 1 傳導免疫力量測之試驗設置，15 Hz~250 kHz



Key

- 1 audio oscillator
- 2 test wire
- 3 connection to power supply or sensor or load
- 4 ground wire
- 5 capacitor (see 6.2.7)
- 6 voltage measuring instrument
- 7 current probe
- 8 device under test (DUT)
- 9 current measuring instrument
- 10 power amplifier
- 11 isolation transformer

說明

- 1. 音頻震盪器
- 2. 試驗纜線
- 3. 連接至電源供應器或感應器或負載
- 4. 接地纜線

5. 電容(參照 6.2.7)
6. 電壓量測儀器
7. 電流探針
8. 待測裝置(DUT)
9. 電流量測儀器
10. 功率放大器
11. 隔離變壓器

8 Test method

8. 實驗方法

8.1 General

8.1 通則

For the frequency range of this test, the impedances seen by the signal, load and power supply leads are generally known and can be treated as lumped constants. In this test, a wide range audio voltage source is coupled through a transformer in differential mode to each specified pin of the DUT. The signal source impedance must be low in comparison to the impedance of the circuit being tested. Experience has shown that a signal source impedance as defined in Clause 6 is adequate for the test. The DUT should be connected such that it will operate in its normal manner. Actual loads and sources should be used where appropriate or may be simulated.

在本試驗之頻率範圍，由信號、負載及電源供應器引線側觀測之阻抗通常為已知且視為集總常數。本試驗中之寬範圍音頻電壓源藉由變壓器以差模方式耦合至待測裝置之各指定接腳，相較之下，信號源阻抗須低於試驗電路阻抗，經驗顯示第 6 節定義之信號源阻抗適用於本試驗。待測裝置須於正常方式連接操作，實際負載及電源須適當使用或可用模擬。

Filters incorporated into DUTs may experience excessive and potentially damaging current flow. To prevent this type of over stress in the DUT, a current probe is included in the test set-up.

含濾波器之待測裝置可能遭遇過量及潛在之破壞性電流，為預防待測裝置之此類過度應力，試驗設置中包含電流探針。

The impedance characteristics of the DUT line being tested may cause distortion to the test signal. This complicates the use of an a.c. voltmeter. A method of addressing this phenomenon is included in the test procedures.

試驗用之待測裝置線束阻抗特性可能造成試驗信號失真，故使用交流電壓表會使測試較複雜，且此現象之處理方法包含於試驗程序中。

8.2 Test plan

8.2 試驗計畫

Prior to performing the tests, a test plan shall be generated which shall include:

— test set-up;

- frequency range;
- test frequencies or step sizes;
- DUT leads to be tested;
- DUT mode of operation;
- DUT acceptance criteria;
- test severity levels;
- DUT monitoring conditions;
- test report content.

執行試驗前，應擬定試驗計畫且應包含下列項目：

- 試驗設置；
- 頻率範圍；
- 試驗頻率或步階大小；
- 試驗用之待測裝置引線；
- 待測裝置操作模式；
- 待測裝置判定基準；
- 試驗嚴酷位準；
- 待測裝置監控條件；
- 試驗報告內容。

8.3 Test procedure

8.3 試驗程序

8.3.1 Power supply voltage

8.3.1 電源供應電壓

The system power supply voltage shall be set as specified in the test plan and shall be measured at the DUT to account for voltage drop in the isolation transformer secondary winding.

系統電源供應電壓應依試驗計畫設定，並於待測裝置處量測，以測得隔離變壓器二次側之壓降。

NOTE The voltage drop across the transformer secondary can become significant at higher currents.

備考：對於大電流而言，通過變壓器二次側之壓降可能變得顯著。

8.3.2 Audio oscillator

8.3.2 音頻震盪器

The audio oscillator shall be tuned through the required frequency range as specified in the test plan.

應依試驗計畫規定對整個所需頻率範圍調整音頻震盪器。

8.3.3 Test signal injection

8.3.3 試驗信號注入

The injected signal level shall be progressively increased toward the level specified in the test plan.

應漸進增加注入信號位準至試驗計畫指定之位準。

Alternatively, the test signal may be held at a specified test level and, if an effect on the DUT is detected, the test voltage reduced to determine the threshold.

或以另一方式，試驗信號維持在一指定試驗位準，當偵測到對待測裝置產生影響時，降低電壓以判定臨限值。

The lead current shall be simultaneously monitored to ensure that the injected test current does not exceed a root mean square current, I_{rms} , of 1 A.

應同時監控引線電流以確保試驗注入電流之均方根值(I_{rms})不超過 1 A。

8.3.4 DUT monitoring

8.3.4 待測裝置之監控

The DUT shall be monitored for malfunction, degradation of performance or deviation of parameters beyond tolerances indicated in the apparatus specification or the test plan.

待測裝置應被監控，以確認是否有故障、功能劣化或參數之變異超出設備規格或試驗計畫之許可差。

8.3.5 Test signal amplitude

8.3.5 試驗信號大小

Where the impedance of the DUT lead causes significant distortion of the test signal, a suggested method of measuring the amplitude of the test signal is to connect a 4 Ω non-inductive load in place of the DUT lead. This will allow an accurate reading to be taken in the substitute configuration.

當待測裝置引線阻抗導致試驗信號顯著失真，建議連接 4 Ω 之非電感性負載替代待測裝置引線以量測試驗信號大小，此替代設置將可產生精確讀值。

Do not change the signal generator or amplifier controls when:

- substituting the DUT lead in place of the 4 Ω resistor when setting the level;
- substituting the 4 Ω resistor in place of the DUT lead when determining the threshold level.

以下情況發生時勿改變信號產生器及放大器之控制：

- 設定位準時，以 4 Ω 電阻替代待測裝置引線；
- 判定臨限值時，以待測裝置引線替代 4 Ω 電阻。

8.3.6 Test signal frequency and threshold level

8.3.6 試驗信號頻率及臨限值

The effects resulting from the injection of electromagnetic energy, the frequency and the threshold level shall be recorded.

應記錄注入電磁能量導致之影響、頻率及臨限值。

8.4 Test report

As required in the test plan, a test report shall be submitted detailing information regarding the test apparatus, test set-up, systems tested, frequencies, power levels, system interactions and any other relevant information regarding the test.

8.4 試驗報告

依試驗計畫要求，試驗報告應提交關於試驗設備、試驗設置、頻率、功率位準、系統交互作用及任何試驗有關之詳細資訊。

Annex A
(informative)
Function performance status classification (FPSC)
附錄 A
(參考)
功能性能狀態分級(FPSC)

A.1 General

A.1 通則

This annex gives examples of test severity levels which should be used in line with the principle of function performance status classification (FPSC) described in ISO 11452-1.

本附錄提供須與 CNS 15207-1 所述之功能性能狀態分級(function performance status classification，縮寫為 FPSC)原則一致之試驗嚴酷位準範例。

A.2 Classification of test severity level

A.2 試驗嚴酷位準分級

The suggested test severity levels are given in Table A.1.

建議之試驗嚴酷位準參照表 A.1。

Table A.1 — Example of test severity levels for conducted immunity test

Test severity levels Volt peak to peak	Category 1	Category 2	Category 3
L_{4i}	3,0	3,0	3,0
L_{3i}	3,0	3,0	3,0
L_{2i}	0,50	1,0	3,0
L_{1i}	0,15	0,50	1,0 ^{a, b}
^a The user may elect to reduce the frequency range to 30 Hz to 50 Hz for conducted noise simulation.			
^b L_{1i} and L_{2i} may best represent cross coupling conducted noise simulation.			

表 A.1 傳導免疫力之試驗嚴酷位準範例

試驗嚴酷位準 峰值對峰值電壓	類型 1	類型 2	類型 3
L_{4i}	3.0	3.0	3.0
L_{3i}	3.0	3.0	3.0
L_{2i}	0.50	1.0	3.0
L_{1i}	0.15	0.50	1.0 ^{a, b}
^a 傳導雜訊模擬試驗時，使用者可選擇降低頻率範圍至 30 Hz～50 Hz。			
^b L_{1i} 及 L_{2i} 可為最佳表示耦合傳導雜訊模擬試驗之位準。			

Annex B
(informative)

Verification procedure for source impedance

附錄 B

(參考)

源阻抗之驗證程序

The following procedure can be used to verify the signal source impedance at the isolation transformer secondary terminals.

以下程序可用於驗證隔離變壓器二次側終端之信號源阻抗。

a) Set a voltage level at the primary terminals and measure the open circuit secondary voltage, V_{oc} .

(a) 設定一次側終端電壓位準，量測二次側開路電壓 V_{oc} 。

b) Connect a known non-inductive load, R_L , of 0,5 Ω value across the secondary and measure the closedcircuit secondary voltage, V_{cc} . The resistance value shall be known to at least two significant figures.

(b) 於二次側跨接一 0.5 Ω 的非電感性已知負載 R_L ，量測閉路感應電壓 V_{cc} ，並應至少使用 2 個有效之已知電阻值。

c) The impedance, Z , expressed in Ω , shall be calculated according to Equation (B.1):

$$Z = \frac{R_L(V_{oc} - V_{cc})}{V_{cc}} \quad (B.1)$$

(c) 阻抗 Z ，單位為 Ω ，應依公式(B.1)計算：

$$Z = \frac{R_L(V_{oc} - V_{cc})}{V_{cc}} \quad (B.1)$$

d) Repeat the previous procedure at one frequency per decade from 15 Hz and 250 kHz (including 15 Hz and 250 kHz).

(d) 於 15 Hz～250 kHz(含 15 Hz 及 250 kHz)每十進位擇一頻率重複上述程序。

e) The measured impedance should be less than or equal to 0,5 Ω from 15 Hz to 50 kHz and less than or equal to 2 Ω from 50 kHz to 250 kHz.

(e) 量測阻抗於 15 Hz～50 kHz 須小於等於 0.5 Ω ，於 50 kHz～250 kHz 須小於等於 2 Ω 。

相對應國際標準

ISO 11452-10:2009 Road vehicles – Component test methods for electrical disturbances from narrowband radiated electromagnetic energy – Part 10: Immunity to conducted disturbances in the extended audio frequency range

編訂說明：本案建議案號為「建-制 1000259」，草案編號為「草-制 1000381」，本草案係參考 ISO 11452-10:2009 並委託財團法人車輛研究測試中心編擬而成，依程序辦理徵求意見，敬請 惠賜卓見。