

中華民國國家標準	車輛、船體及由內燃機引擎驅動裝置之 無線電擾動特性—保護車載接收機之 限制值與量測方法	總號	
CNS		類號	
<p>Vehicles, boats and internal combustion engines –Radio disturbance characteristics – Limits and methods of measurement for the protection of on-board receivers</p> <p>1 Scope</p> <p>1. 適用範圍</p> <p>This International Standard contains limits and procedures for the measurement of radio disturbances in the frequency range of 150 kHz to 2 500 MHz. The standard applies to any electronic/electrical component intended for use in vehicles, trailers and devices. Refer to International Telecommunications Union (ITU) publications for details of frequency allocations. The limits are intended to provide protection for receivers installed in a vehicle from disturbances produced by components/modules in the same vehicle. The method and limits for a complete vehicle are in Clause 5 and the methods and limits for components/modules are in Clause 6. Only a complete vehicle test can be used to determine the component compatibility with respect to a vehicle's limit.</p> <p>本標準包含頻率範圍 150 kHz~2500 MHz 之無線電擾動限制值及量測程序，適於任何用於車輛、拖車及裝置之電子/電機組件，並參照國際電信聯盟(International Telecommunications Union (ITU))出版之頻率指配詳細說明。本限制值旨在為車載接收機受同一車輛之組件/模組產生的擾動提供保護，整車之試驗方法及限制值參照第 5 節，組件/模組之試驗方法及限制值參照第 6 節，僅整車試驗可用於判定與車輛限制值有關之組件相容性。</p> <p>The receiver types to be protected are, for example, broadcast receivers (sound and television), land mobile radio, radio telephone, amateur, citizens' radio, Satellite Navigation (GPS, etc.) and Bluetooth. For the purpose of this standard, a vehicle is a machine, which is self-propelled. Vehicles include (but are not limited to) passenger cars, trucks, agricultural tractors and snowmobiles. Annex A provides guidance in determining whether this standard is applicable to particular equipment.</p> <p>所保護之接收機類型舉例為廣播接收機(聲音及電視)、陸地行動無線電、無線電話、業餘及民間電台、衛星導航(GPS 等)及藍芽；基於本標準之目的，車輛為自我推進之機器，包含(但不限於)小客車、貨車、農用曳引機、及雪車，並於附錄 A 提供本標準適用特殊設備與否之判定準則。</p> <p>The limits in this standard are recommended and subject to modification as agreed between the vehicle manufacturer and the component supplier. This standard is also intended to be applied by manufacturers and suppliers of components and equipment</p>			
公 布 日 期 年 月 日	經濟部標準檢驗局印行		(共 頁) 修 訂 公 布 日 期 年 月 日

which are to be added and connected to the vehicle harness or to an on-board power connector after delivery of the vehicle.

本標準之限制值依車輛製造商及組件供應商間之協議建議及修改，亦旨在提供車輛售後加於車輛線束及車載電源連接器之組件及設備的製造商及供應商應用。

This International Standard does not include protection of electronic control systems from radio frequency (RF) emissions, or from transient or pulse-type voltage fluctuations. These subjects are included in ISO publications.

本標準不包含保護電子控制系統免於射頻發射、暫態或脈衝形式電壓波動之影響，此類規定包含於其他 CNS 標準中。

Since the mounting location, vehicle body construction and harness design can affect the coupling of radio disturbances to the on-board radio, Clause 6 of this standard defines multiple limit levels. The level class to be used (as a function of frequency band) is agreed upon between the vehicle manufacturer and the component supplier.

由於安裝位置、車體結構及線束設計可影響車載無線電擾動之耦合，本標準第 6 節定義數個限制值位準，所用之位準等級(為頻帶之函數)依車輛製造商及組件供應商協議而定。

CISPR 25 defines test methods for use by vehicle manufacturers and suppliers, to assist in the design of vehicles and components and ensure controlled levels of on-board radio frequency emissions.

本標準定義車輛製造商及供應商所用之試驗方法，以輔助車輛及組件設計，並確保車載射頻發射位準之控制。

Vehicle test limits are provided for guidance and are based on a typical radio receiver using the antenna provided as part of the vehicle, or a test antenna if a unique antenna is not specified. The frequency bands that are defined are not applicable to all regions or countries of the world. For economic reasons, the vehicle manufacturer must be free to identify what frequency bands are applicable in the countries in which a vehicle will be marketed and which radio services are likely to be used in that vehicle.

車輛試驗限制值係作為準則，並設定使用車體內嵌天線、或未指定之特殊天線的典型無線電接收機，定義之頻帶未必適於世界上所有地區或國家，為了經濟考量，車輛製造商須依車輛之將銷售國家及車輛無線電服務用途自行定義適用頻帶。

As an example, many vehicle models will probably not have a television receiver installed; yet the television bands occupy a significant portion of the radio spectrum. Testing and mitigating noise sources in such vehicles is not economically justified.

舉例而言，許多車型極可能未安裝電視接收機，即使電視頻帶於無線電頻譜上佔了一個很大頻段，但以該車輛進行試驗及降低雜訊來源並不經濟。

The vehicle manufacturer should define the countries in which the vehicle is to be marketed, then choose the applicable frequency bands and limits. Component test parameters can then be selected from CISPR 25 to support the chosen marketing plan.

車輛製造商須定義車輛銷售國家，隨後選擇適用之頻帶及限制值，接著可由本標準

選擇組件試驗參數以支持選定之銷售計畫。

The World Administrative Radio communications Conference (WARC) lower frequency limit in region 1 was reduced to 148,5 kHz in 1979. For vehicular purposes, tests at 150 kHz are considered adequate. For the purposes of this standard, test frequency ranges have been generalized to cover radio services in various parts of the world. Protection of radio reception at adjacent frequencies can be expected in most cases.

世界無線電通信管理會議(WARC)於 1979 將第 1 區之頻率下限降低至 148.5 kHz，但對於車輛用途而言，150 kHz 之試驗已視為足夠；基於本標準之使用目的，試驗頻率範圍已可涵蓋世界上各種無線電服務，並可預期對於無線電接收鄰近頻率之保護。(本段建議刪除，台灣為第 3 區)

Annex H defines a qualitative method of judging the degradation of radio communication in the presence of impulsive noise.

附錄 H 定義判定無線電通訊遇到脈衝雜訊以致劣化之定性方法。

Annex I lists work being considered for future revisions.

附錄 I 列出未來版本進行之工作。

2 Normative references

2. 引用標準

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.

下列標準因本標準所引用，成為本標準之一部分。有加註年分者，適用該年分之版次，不適用於其後之修訂版(包括補充增修)。無加註年分者，適用該最新版(包括補充增修)。

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

Amendment 1:1997

Amendment 2:1998

CNS 14299 : 1999，*電磁相容性詞彙*

CISPR 12:2007, *Vehicles, motorboats, and internal combustion engine-driven devices – Radio disturbance characteristics – Limits and methods of measurement for the protection of receivers except those installed in the vehicle/boat/device itself or in adjacent vehicles/boats/devices.*

CNS 14434 : 2008，*車輛、船體和由內燃機引擎驅動裝置之無線電擾動特性—保護接收機之限制值與量測方法(不含內建或鄰近於車輛、船體、裝置之接收機)*

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*

Amendment 1:2006

Amendment 2:2007

CNS 13306-1-1:2007, 射頻擾動和免疫力量測設備與量測方法—第 1—1 部：射頻擾動和免疫力量測設備—量測設備(無調和 Amendment 1:2006、Amendment 2:2007)

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*

Amendment 1:2004

Amendment 2:2006

CNS 13306-1-2:2007, 射頻擾動和免疫力量測設備與量測方法—第 1—2 部：射頻擾動和免疫力量測設備—輔助設備—傳導干擾

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*

Amendment 1:2007

CNS 13306-1-4:2007, 射頻擾動和免疫力量測設備與量測方法—第 1—4 部：射頻擾動和免疫力量測設備—輔助設備—輻射擾動(為本國際標準舊版)

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*

CNS 13306-2-3:2007, 射頻擾動和免疫力量測設備與量測方法—第 2—3 部：擾動和免疫力量測方法—輔助設備—輻射擾動量測

ISO 11452-4:2005 - *Road vehicles – Component test methods for electrical disturbances from narrowband radiated electromagnetic energy – Part 4: Bulk current injection (BCI)*

CNS 15207-4:2008, 道路車輛—窄頻輻射電磁能量之電擾動組件試驗法—第 4 部：大電流注入

SAE ARP 958.1 Rev D:2003-02 – *Electromagnetic Interference Measurement Antennas; Standard Calibration Method*

3 Terms and definitions

3. 用語及定義

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

下列用語及定義適用於本標準。

3.1 absorber lined shielded enclosure (ALSE)

3.1 內襯吸波材料屏蔽圍體(absorber lined shielded enclosure, 縮寫為 ALSE)

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

於內部天花板及牆壁安裝射頻吸波材料之屏蔽圍體/遮蔽室

3.2 antenna factor

3.2 天線因子(antenna factor)

the factor which is applied to the voltage measured at the input connector of the measuring instrument to give the field strength at the antenna

為提供場強予天線，應用於量測儀器輸入連接器電壓量測之因子

3.3 antenna matching unit

3.3 天線匹配單元(antenna matching unit)

a unit for matching the impedance of an antenna to that of the 50 Ω measuring instrument over the antenna measuring frequency range

在天線之量測頻率範圍內，用以將天線阻抗匹配至 50 Ω 量測儀器的單元

3.4 class

3.4 等級(class)

a performance level agreed upon by the purchaser and the supplier and documented in the test plan

經由買方與供應商同意，且記錄於試驗計畫之性能位準

3.5 component continuous conducted emissions

3.5 組件連續傳導發射(component continuous conducted emissions)

the noise voltages/currents of a steady-state nature existing on the supply or other leads of a component/module which may cause disturbance to reception in an on-board receiver.

存於組件/模組之電源或其他引線的本質穩態雜訊電壓/電流，可導致車載接收機之接收擾動

3.6 compression point

3.6 壓縮點(compression point)

the input signal level at which the gain of the measuring system becomes non-linear such that the indicated output deviates from an ideal linear receiving system's output by the specified increment in dB

使量測系統之增益變成非線性之輸入信號位準，此顯示以 dB 為增量單位之輸出偏離理想線性接收系統輸出

3.7 device

3.7 裝置(device)

a machine driven by an internal combustion engine which is not primarily intended to carry persons or goods.

以內燃機傳動，並不主要用於載人或載貨物之機械

NOTE Devices include, but are not limited to, chainsaws, irrigation pumps, snow blowers, air compressors, and landscaping equipment.

備考：裝置包含但不限於鍊鋸、灌溉泵浦、吹雪器、空壓機及景觀美化設備

3.8 receiver terminal voltage (antenna voltage)

3.8 接收機終端電壓(天線電壓)(receiver terminal voltage (antenna voltage))

the voltage generated by a source of radio disturbance and measured in dB (μ V) by a radio disturbance measuring instrument conforming to the requirements of CISPR 16

無線電擾動源產生之電壓，以符合 CNS 13306 要求之無線電擾動量測設備量測，單位為 dB (μ V)

3.9 RF boundary

3.9 射頻邊界(RF boundary)

an element of an EMC test set-up that determines what part of the harness and/or peripherals are included in the RF environment and what is excluded. It may consist of, for example, ANs, filter feed-through pins, RF absorber coated wire, and/or RF shielding

電磁相容試驗設置之要素，以判定線束及/或周邊中何者包含及排除於射頻環境中，可包含例如人工網路、濾波器穿心接腳、披覆射頻吸波材料之導線及/或射頻屏蔽

3.10 artificial network (AN) ; line impedance stabilization network (LISN¹)

3.10 人工網路 (artificial network (AN)) ; 電源阻抗穩定網路 (line impedance stabilization network (LISN))

a 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 may isolate the apparatus from the supply or signal sources/loads in that frequency range

[IEV 161-04-05, modified]

¹ USA

連接待測設備電源引線或信號/負載之網路，提供擾動電壓量測之指定頻率範圍及負載阻抗，可為設備於該頻率範圍隔離電源或信號源/負載

3.11 average detector

3.11 平均值檢波器(average detector)

a detector, the output voltage of which is the average value of the envelope of an applied signal

NOTE The average value must be taken over a specified time interval.

[IEV 161-04-26]

輸出電壓為信號封包平均值之檢波器

備考：該平均值須於指定時間區間計算而得。

3.12 bandwidth

3.12 頻寬

3.12.1 bandwidth (of an equipment)

3.12.1 設備頻寬(bandwidth (of an equipment))

the width of a frequency band over which a given characteristic of an equipment or transmission channel does not differ from its reference value by more than a specified amount or ratio

NOTE The given characteristic may be, for example, the amplitude/frequency characteristic, the phase/frequency characteristic or the delay/frequency characteristic.

[IEV 161-06-09, modified]

不因特定量或比例而改變設備或傳輸頻道指定特性基準值之頻帶寬度

備考：所指定之特性如振幅/頻率特性、相位/頻率特性或延遲/頻率特性。

3.12.2 bandwidth (of an emission or signal)

3.12.2 發射或信號頻寬(bandwidth (of an emission or signal))

the width of the frequency band outside which the level of any spectral component does not exceed a specified percentage of a reference level
[IEV 161-06-10]

頻寬之外的任何頻譜成份之位準皆不超出參考位準特定百分比

3.13 broadband emission

3.13 寬頻發射(broadband emission)

an emission which has a bandwidth greater than that of a particular measuring apparatus or receiver
[IEV 161-06-11, modified]

NOTE An emission which has a pulse repetition rate (in Hz) less than the bandwidth of a particular measuring instrument can also be considered as a broadband emission.

頻寬大於特定量測設備或接收機之發射

備考：脈衝重複率(單位為 Hz)小於特定量測儀器頻寬之發射亦可視為寬頻發射。

3.14 disturbance suppression

3.14 擾動抑制(disturbance suppression)

action which reduces or eliminates electromagnetic disturbance
[IEV 161-03-22]

降低或消除電磁擾動之措施

3.15 disturbance voltage; interference voltage (deprecated in this sense)

3.15 擾動電壓(disturbance voltage)；干擾電壓(interference voltage，不建議使用)

voltage produced between two points on two separate conductors by an electromagnetic disturbance, measured under specified conditions
[IEV 161-04-01]

在指定條件下，量測電磁擾動產生在二個獨立導體上之二點間的電壓

3.16 electromagnetic environment

3.16 電磁環境(electromagnetic environment)

the totality of electromagnetic phenomena existing at a given location
[IEV 161-01-01]

一指定位置中所存在之所有電磁現象

3.17 ground (reference) plane

3.17 接地(參考)平面(ground (reference) plane)

a flat conductive surface whose potential is used as a common reference.
[IEV 161-04-36]

其電位用以作為共同參考基準之平坦導電表面

3.18 narrowband emission

3.18 窄頻發射(narrowband emission)

an emission which has a bandwidth less than that of a particular measuring apparatus or receiver
[IEV 161-06-13]

NOTE An emission which has a pulse repetition rate (in Hz) greater than the bandwidth of a particular measuring instrument can also be considered as a narrowband emission.

頻寬小於特定量測設備或接收機之發射

備考：脈衝重複率(單位為 Hz)大於特定量測儀器頻寬之發射亦可視為窄頻發射。

3.19 peak detector

3.19 峰值檢波器(peak detector)

a detector, the output voltage of which is the peak value of an applied signal

[IEV 161-04-24]

輸出電壓為信號峰值之檢波器

3.20 quasi-peak detector

3.20 準峰值檢波器(quasi-peak detector)

a detector having specified electrical time constants which, when regularly repeated identical pulses are applied to it, delivers an output voltage which is a fraction of the peak value of the pulses, the fraction increasing towards unity as the pulse repetition rate is increased

[IEV 161-04-21]

具特定電機時間常數之檢波器，當輸入規律重複之相同脈衝時，產出該脈波峰值之某一比例輸出電壓，該比例隨脈衝重複率增加而接近於 1

3.21 shielded enclosure; screened room

3.21 屏蔽圍體(shielded enclosure)；遮蔽室(screened room)

a mesh or sheet metallic housing designed expressly for the purpose of separating electromagnetically the internal and the external environment

[IEV 161-04-37]

以金屬網或金屬板製造，設計用來分隔內部與外部電磁環境之房間

4 Requirements common to vehicle and component/module emission measurement

4.車輛及組件/模組發射量測之共同要求

4.1 General test requirements and test plan

4.1 試驗要求及試驗計畫通則

4.1.1 Categories of disturbance sources (as applied in the test plan)

4.1.1 擾動源分類(亦適用於試驗計畫)

Electromagnetic disturbance sources can be divided into two main types:

- Narrowband sources (examples of narrowband disturbance sources are vehicle electronic components which include clocks, oscillators, digital logic from microprocessors and displays).

- Broadband sources (examples of broadband disturbance sources are electrical motors and ignition system).

電磁擾動源可分為二種主要類型：

- 窄頻源(窄頻擾動源例如車輛電子組件包含時脈、震盪器、微處理器及顯示器之數位邏輯)

- 寬頻源(寬頻擾動源如電動馬達及點火系統)

NOTE 1 While most vehicle or electrical/electronic components are a source of both narrowband and broadband disturbances, some may be a source of only one type of disturbance.

備考 1. 當多數車輛或電氣/電子組件同時具有窄頻及寬頻擾動源時，某些可能僅為單一類型之擾動源。

NOTE 2 Broadband sources can be classified in short-duration broadband (examples are washer pump, door mirror, electrical windows) and long-duration broadband (examples are front wiper motor, heater blower, engine cooling).

備考 2. 寬頻源可以分為短時間寬頻(例如清洗泵浦、外後視鏡及電動窗)及長時間寬頻(例如前雨刷馬達、暖氣鼓風機、引擎冷卻)

For the purposes of this standard, categorization of the disturbance type is used only in simplifying the testing demands by potentially reducing the number of detectors that shall be used (i.e. eliminating the average detector if the device is known to be broadband-type of source, such as a d.c. brush commutated motor). Otherwise, this standard requires that sources comply with limits based upon both types of measurement detectors and not the type of disturbance.

基於本標準之使用目的，擾動類型之分類僅以降低可能應用之檢波器數目來簡化試驗要求(若裝置已知為寬頻擾動源類型，例如直流有刷換向馬達，即是免除平均值檢波器)，否則，本標準將會要求擾動源依二種量測檢波器類型來符合限制值，而非依擾動類型。

4.1.2 Test plan

4.1.2 試驗計畫

A test plan shall be established for each item to be tested. The test plan shall specify the

- frequency range to be tested,
- the emissions limits,
- antenna types and locations,
- test report requirements,
- supply voltage and other relevant parameters.

針對試驗的各個項目都應擬定試驗計畫，並指定

- 試驗頻率範圍，
- 發射限制值，
- 天線類型及位置，
- 試驗報告要求，
- 供應電壓及其他相關參數。

The test plan shall define for each frequency band whether the conformance can be obtained with average and peak limits or with average and quasi-peak limits.

試驗計畫應定義各頻帶是否可符合平均值及峰值限制值，或符合平均值及準峰值限制值。

4.1.3 Determination of conformance of EUT with limits

4.1.3 待測設備(EUT)符合限制值之判定

In all cases the EUT shall conform with the average limit.

所有待測設備應符合平均值限制值。

The EUT shall also conform with either peak or quasi-peaks limits as follows.

- For frequencies where both peak and quasi-peak limits are defined, the EUT shall conform with either the peak or the quasi-peak limits (as defined in the test plan).
- For frequencies where only peak limits are defined, the EUT shall conform with the peak limit.

待測設備亦應符合峰值或準峰值，如下：

- 對於峰值及準峰值均定義之頻率，待測設備應符合峰值或準峰值限制值(依試驗計畫定義)
- 對於僅定義峰值限制值之頻率，待測設備應符合峰值限制值。

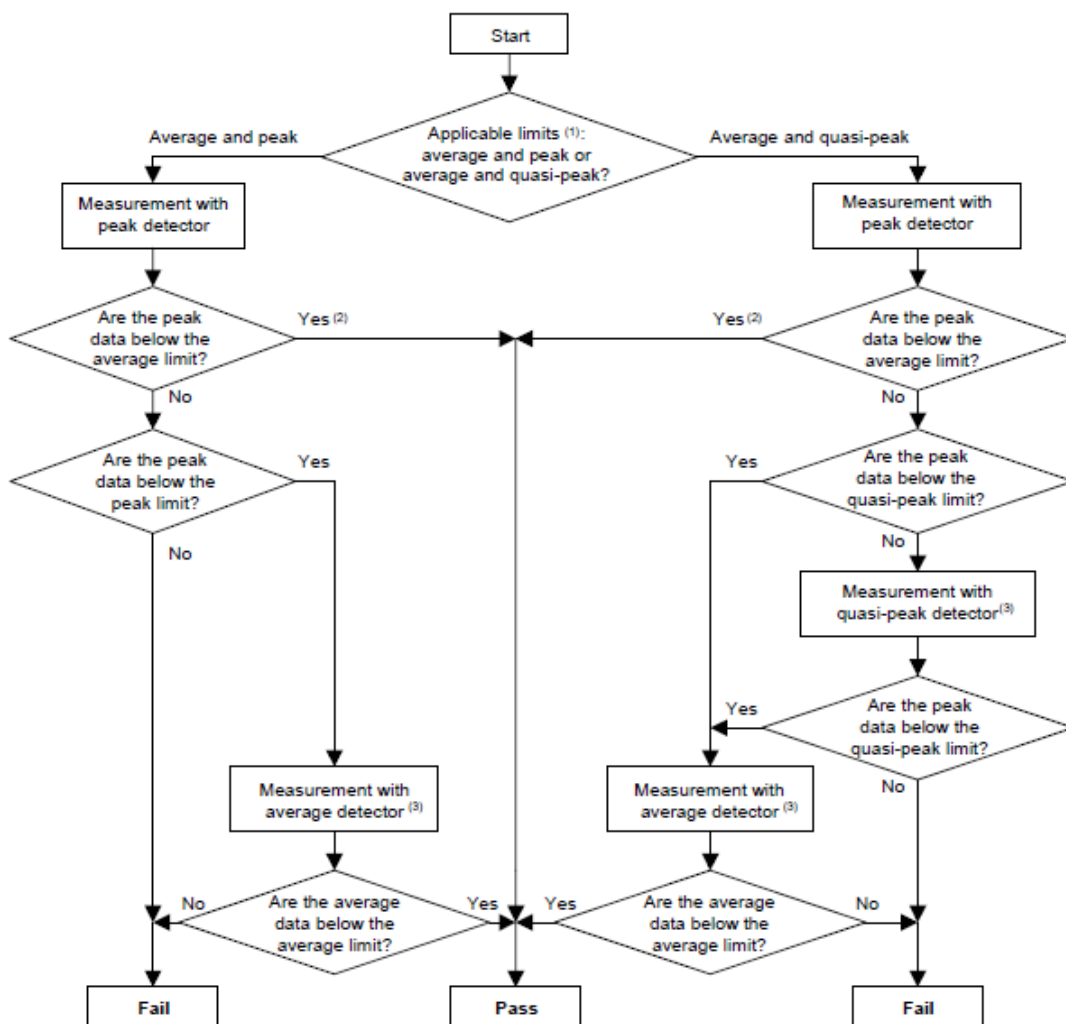
The general procedure applicable for all frequency bands is described in Figure 1.

適用所有頻帶之共通流程參照圖 1。

The limits given in this standard take into account uncertainties.

本標準規定之限制值考量不確定度(uncertainties)。

Figure 1 – Method of determination of conformance for all frequency bands



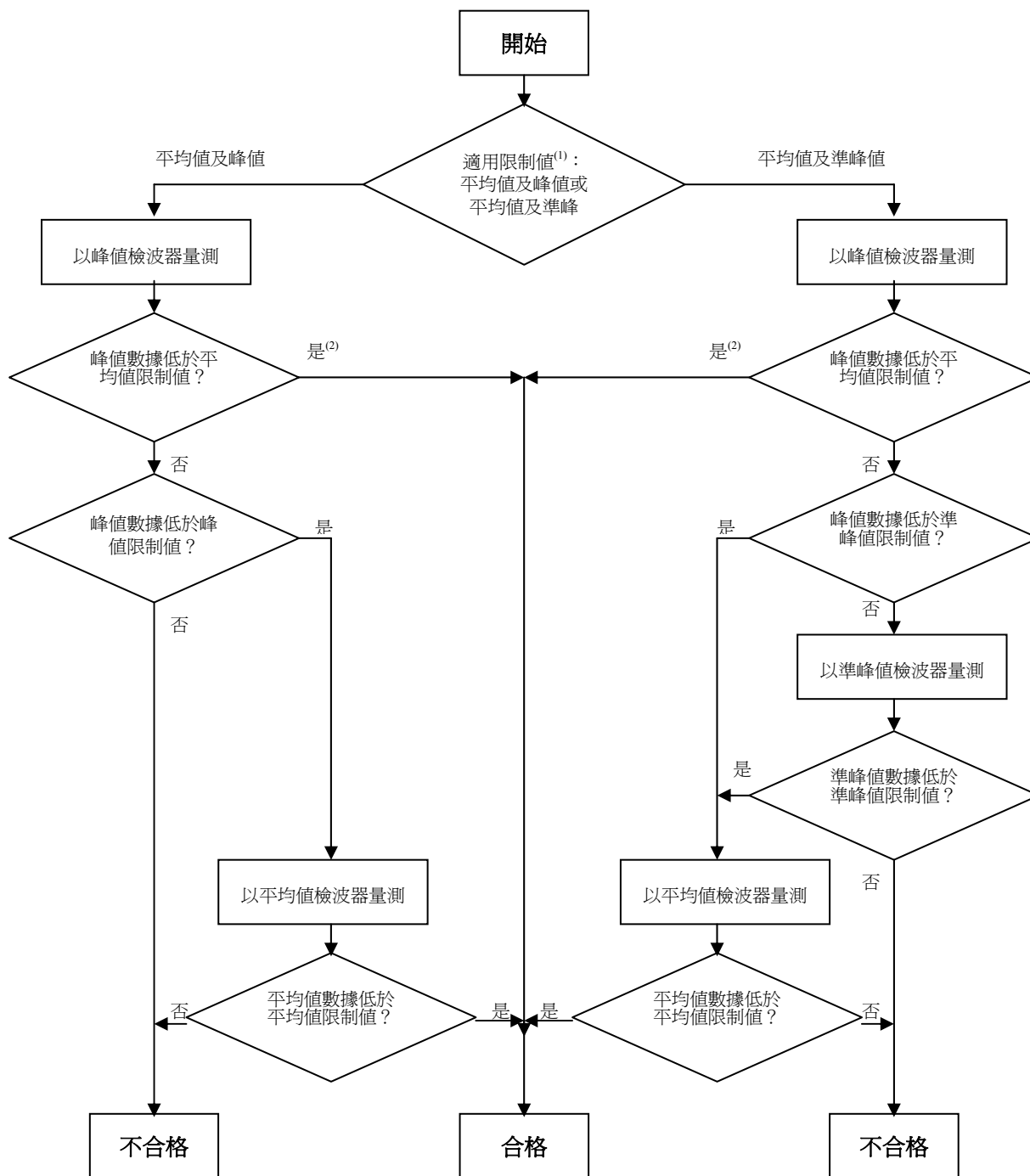
IEC 353/08

NOTE 1 The conformance should normally be obtained by compliance to both average and peak limits or both average and quasi-peak limits unless the test plan defines that conformance can be obtained by compliance to the single appropriate limit (depending on the case, peak, or average, or quasi-peak).

NOTE 2 Because measurement with peak detector is always higher or equal to measurement with average detector and applicable peak limit is always higher or equal to applicable average limit, this single detector measurement can lead to a simplified and quicker conformance process.

NOTE 3 This flow-chart is applicable for each individual frequency, e.g. only frequencies that are above the applicable limit need be remeasured with average or quasi-peak detector.

圖 1 判定所有頻帶符合之方法



備考 1. 正常下情況下，須皆遵守平均值及峰值限制值，或皆遵守平均值及準峰值限制值來取得符合性，除非試驗計畫定義可以遵守單一適用限制值來取得符合性(依個案取峰值、平均值或準峰值)

備考 2. 由於峰值檢波器量測總是高於或等於平均值檢波器量測，所用之峰值限制值總是高於或等於平均值限制值，故此種單一檢波器量測可使得符合過程更簡化並更迅速。

備考 3. 本流程圖適用各單獨頻率，即僅高於適用限制值之頻率需以平均值或峰值檢波器量測。

4.1.4 Operating conditions

4.1.4 操作條件

Different operating conditions of the EUT can influence emission measurement results. When performing component/module tests, the EUT shall be made to operate under typical loading and other conditions as in the vehicle such that the maximum emission state occurs. The operating conditions shall be specified in the test plan.

待測設備之不同操作條件可影響發射量測結果，當執行組件/模組試驗，應使待測設備於典型負載及行車中其他條件下操作，以令最大發射狀態發生，且操作條件應於試驗計畫中指定。

To ensure correct operation of components/modules during test, a peripheral interface unit shall be used which simulates the vehicle installation. Depending on the intended operating modes, all significant sensor and actuator leads of the EUT shall be connected to a peripheral interface unit. The peripheral interface unit shall be capable of controlling the EUT in accordance with the test plan.

為確保組件/模組於試驗中正確操作，應使用周邊介面單元以模擬車上之安裝，並依意圖操作模式。待測裝置所有重要之感測器及致動器引線應連接至周邊介面單元，且周邊介面單元應可依據試驗計畫控制待測設備。

The peripheral interface unit may be located internal or external to the shielded enclosure. If located in the shielded enclosure, the disturbance levels generated by the peripheral interface unit shall be at least 6 dB below the test limits specified in the test plan.

周邊介面單元可置於屏蔽圍體內部或外部，若置於屏蔽圍體內部，周邊介面單元產生之擾動位準應低於試驗計畫指定之試驗限制值至少 6 dB。

4.1.5 Test report

4.1.5 試驗報告

The report shall contain the information agreed upon by the customer and the supplier, e.g.

- sample identification,
- date and time of test,
- bandwidth,
- step size,
- required test limit,
- ambient data
- test data.

報告應包含客戶及供應商議定之資訊，即

- 樣品識別，
- 試驗日期及時間，

- 頻寬，
- 步階大小，
- 試驗限制值要求，
- 環境數據，
- 試驗數據。

4.2 Shielded enclosure

4.2 屏蔽圍體

The ambient electromagnetic noise levels shall be at least 6 dB below the limits specified in the test plan for each test to be performed. The shielding effectiveness of the shielded enclosure shall be sufficient to ensure that the required ambient electromagnetic noise level requirement is met.

環境電磁雜訊位準應低於每項執行之試驗的試驗計畫指定限制值至少 6 dB，屏蔽圍體之屏蔽效率應足以確保滿足環境電磁雜訊位準要求。

NOTE Although there will be reflected energy from the interior surfaces of the shielded enclosure, this is of minimal concern for the measurement of conducted disturbances because of the direct coupling of the measuring instrument to the leads of the EUT. The shielded enclosure may be as simple as a suitably grounded bench-top screened cage.

備考：雖然能量會由屏蔽圍體之內表面反射，但由於傳導擾動量測中之量測儀器係直接耦合至待測設備引線，故僅被微幅考量，且屏蔽圍體可儘簡易如適當接地之試驗台遮蔽籠。

4.3 Absorber-lined shielded enclosure (ALSE)

4.3 內襯吸波材料屏蔽圍體(ALSE)

For radiated emission measurements, however, the reflected energy can cause errors of as much as 20 dB. Therefore, it is necessary to apply RF absorber material to the walls and ceiling of a shielded enclosure that is to be used for radiated emissions measurements. No absorber material shall be placed on the floor for vehicle or component level tests. The following ALSE requirements shall also be met for performing radiated RF emissions measurements.

然而對於輻射發射量測，反射能量可導致最高 20 dB 之誤差，因此，輻射發射量測需使用牆面及天花板具射頻吸波材料之屏蔽圍體，且車輛及組件位準試驗之地板不應裝設吸波材料，執行輻射射頻發射量測之內襯吸波材料屏蔽圍體應符合以下要求。

4.3.1 Reflection characteristics

4.3.1 反射特性

Performance of the absorption material shall be greater than or equal to 6 dB in the 70 MHz to 2 500 MHz frequency range.

吸波材料之性能應於 70 MHz 至 2500 MHz 大於或等於 6 dB。

NOTE A test method is described in IEEE STD 1128-1998: IEEE recommended

practice for radio frequency (RF) absorber – Evaluation in the range of 30 MHz to 5 GHz.

備考：試驗方法描述參見 IEEE STD 1128-1998：IEEE recommended practice for radio frequency (RF) absorber – Evaluation in the range of 30 MHz to 5 GHz。

4.3.2 Size

4.3.2 尺寸大小

For radiated emissions tests, the shielded enclosure shall be of sufficient size to ensure that neither the vehicle/EUT nor the test antenna shall be closer than 1 m from the walls or ceiling, or to the nearest surface of the absorber material used thereon.

對於輻射發射試驗，屏蔽圍體應具足夠尺寸，以確保車輛/待測設備及天線皆不與牆面、天花板或吸波材料最近表面相距小於 1 m。

4.3.3 Objects in ALSE

4.3.3 內襯吸波材料屏蔽圍體中之物體

For radiated emissions measurements in particular, the ALSE shall be cleared of all items not pertinent to the tests. This is required in order to reduce any effect they may have on the measurement. Included are unnecessary equipment, cable racks, storage cabinets, desks, chairs, etc. Personnel not actively involved in the test shall be excluded from the ALSE.

特別對於輻射發射量測，應清除內襯吸波材料屏蔽圍體中不與試驗相關之物品，包含非必要的設備、纜線機櫃、儲藏櫃、桌子及椅子等，本要求旨在減少發生於量測之任何可能影響，試驗之非主要參與人員亦不應在內襯吸波材料屏蔽圍體內。

4.4 Measuring instrument

4.4 量測儀器

The measuring instrument shall comply with the requirements of CISPR 16-1-1. Either manual or automatic frequency scanning may be used. However Annex D of CISPR 16-2-3 explains the differences between the CISPR AV detector and an AV detector (complying with CISPR 16-1:1999). For the purpose of this standard either detector may be used, since the pulse repetition rate for internal combustion engines is above 10 Hz.

量測儀器應符合 CNS 13306-1-1 之要求，並可使用手動或自動頻率搜尋。然而 CNS 13306-2-3 附錄 D 中解釋關於 CISPR 平均值檢波器及平均值檢波器(遵守 CNS13306-1；民國 92 年，已廢止)之差異，基於本標準之使用目的，由於內燃機脈衝重複率大於 10 Hz，二種檢波器皆可使用。

NOTE 1 Spectrum analysers and scanning receivers are particularly useful for disturbance measurements. The peak detection mode of spectrum analysers and scanning receivers provides a display indication which is never less than the quasi-peak indication for the same bandwidth. It may be convenient to measure emissions using peak detection because of the faster scan possible than with quasi-peak detection.

備考 1. 頻譜分析儀及搜尋接收機特別適用於擾動量測，對於相同頻寬，頻譜分析儀及搜尋接收機之峰值檢波器模式顯示值不會小於準峰值之顯示值，此將便於發射量測採用較準峰值檢波器搜尋快速之峰值檢波器。

NOTE 2 A preamplifier may be used between the antenna and measuring instrument in order to achieve the 6 dB noise floor requirements. If a preamplifier is used to achieve the 6 dB noise floor requirement, the laboratory should establish a procedure to avoid overload of the preamplifier, such as using a step attenuator.

備考 2. 前置放大器可用於天線及量測儀器間，以達成背景雜訊低於 6 dB 之要求。當採用前置放大器以令背景雜訊低於 6 dB 時，實驗室須建立避免前置放大器過載之程序，像是使用可調式衰減器。

NOTE 3 In particular cases, because of very low average detector limits and/or instrumentation limitations, the 6 dB noise floor requirements may not be fulfilled. In this case and if an appropriate preamplifier has been used, alternatives such as RBW/BW reduction with appropriate step size changes may be used. These measures should be documented in the test report.

備考 3. 在特殊情況下，由於平均值檢波器限制值很低及/或儀器限制，低於背景雜訊 6 dB 可能無法達成，在此情況下，若使用適當之前置放大器，可選擇使解析頻寬(RBW)/頻寬降低並改變適用步階大小，且這些量測須記錄於試驗報告中。

4.4.1 Spectrum analyser parameters

4.4.1 頻譜分析儀參數

The scan rate of the spectrum analyser shall be adjusted for the CISPR frequency band and detection mode used.

頻譜分析儀之搜尋率應依使用之 CISPR 頻帶及檢波器模式而調整。

Spectrum analysers may be used for performing compliance measurements to this standard providing the precautions cited in CISPR 16-1-1 on the use of spectrum analysers are adhered to and that the broadband emissions from the product being tested have a repetition frequency greater than 20 Hz.

頻譜分析儀可用於執行本標準規定之符合性量測，並遵守載於 CNS 13306-1-1 之頻譜分析儀注意事項，且來自於待測產品之試驗寬頻發射具大於 20 Hz 之重複頻率。

The minimum scan time and recommended bandwidth are listed in Table 1.

最小搜尋時間及建議頻寬如表 1 所列。

The bandwidth of the spectrum analyser shall be chosen such that the noise floor is at least 6 dB lower than the applicable limits.

應選擇頻譜分析儀頻寬以使得背景雜訊低於所用限制值至少 6 dB。

NOTE See 4.4, Notes 2 and 3.

備考：參照 4.4 備考 2 及 3。

Table 1 – Spectrum analyser parameters

Service / Frequency range MHz	Peak detection		Quasi-peak detection		Average detection	
	RBW at -3 dB	Scan time	RBW at -6 dB	Scan time	RBW at -3 dB	Scan time
AM broadcast and mobile services 0,15 - 30	9/10 kHz	10 s / MHz	9 kHz	200 s / MHz	9/10 kHz	10 s / MHz
FM broadcast 76 - 108	100/120 kHz	100 ms / MHz	120 kHz	20 s / MHz	100/120 kHz	100 ms / MHz
Mobile services 30 - 1 000						
TV Band I 41- 88						
TV Band III 174 - 230						
TV Band IV/V 470- 890						
DAB 171- 245						
DTTV 470 - 770	100/120 kHz	100 ms / MHz	Does not apply	Does not apply	100/120 kHz	100 ms / MHz
Mobile service 1 000 - 2 500	100/120 kHz	100 ms / MHz	Does not apply	Does not apply	100/120 kHz	100 ms / MHz
GPS L1 civil 1 567 – 1 583	Does not apply	Does not apply	Does not apply	Does not apply	9/10 kHz	1 s / MHz

When a spectrum analyser is used for measurements, the video bandwidth shall be at least three times the resolution bandwidth (RBW).

表 1 頻譜分析儀參數

服務/頻率範圍 MHz	峰值檢波器		準峰值檢波器		平均值檢波器	
	-3 dB 之解析頻寬	搜尋時間	-6 dB 之解析頻寬	搜尋時間	-3 dB 之解析頻寬	搜尋時間
AM 廣播及行動服務 0.15~30	9/10 kHz	10 s/MHz	9 kHz	200 s/MHz	9/10 kHz	10 s/MHz
FM 廣播 76~108	100/120 kHz	100 ms/MHz	120 kHz	200 s/MHz	100/120 kHz	100 ms/MHz
行動服務 30~1000						
電視頻道 I 41~88						
電視頻道 III 174~230						
電視頻道 IV/V 470~890						
數位音訊廣播 171~245	100/120 kHz	100 ms/MHz	不適用	不適用	100/120 kHz	100 ms/MHz
數位電視 470~770						
行動服務 1000~2500	100/120 kHz	100 ms/MHz	不適用	不適用	100/120 kHz	100 ms/MHz
全球定位系統 (GPS) L1 民用 1567~1583	不適用	不適用	不適用	不適用	9/10 kHz	1 s/MHz

當使用頻譜分析儀量測，視訊頻寬(video bandwidth)應至少為解析頻寬(resolution bandwidth, RBW)之 3 倍。

4.4.2 Scanning receiver parameters

4.4.2 搜尋接收機參數

The dwell time of the scanning receiver shall be adjusted for the CISPR frequency band and detection mode used. The minimum dwell time, maximum step size and recommended bandwidth (BW) are listed in Table 2.

搜尋駐留時間應針對 CISPR 頻帶及所用之檢波器模式調整，最小駐留時間、最大步階大小及建議頻寬參照表 2 所列。

The bandwidth of the scanning receiver shall be chosen such that the noise floor is at least 6 dB lower than the applicable limits.

應選擇搜尋接收機之頻寬以令背景雜訊低於適用限制值至少 6 dB。

NOTE See 4.4, Notes 2 and 3.

備考：參照 4.4 備考 2 及 3。

Table 2 – Scanning receiver parameters

Service / Frequency range MHz	Peak detection			Quasi-peak detection			Average detection		
	BW at -6 dB	Step size	Dwell time	BW at -6 dB	Step size	Dwell time	BW at -6 dB	Step size	Dwell time
AM broadcast and mobile services 0,15 - 30	9 kHz	5 kHz	50 ms	9 kHz	5 kHz	1 s	9 kHz	5 kHz	50 ms
FM broadcast 76 - 108	120 kHz	50 kHz	5 ms	120 kHz	50 kHz	1 s	120 kHz	50 kHz	5 ms
Mobile services 30 to 1 000									
TV Band I 41 – 88									
TV Band III 174 – 230									
TV Band IV/V 470 – 890									
DAB 171 - 245									
DTTV 470 - 770	120 kHz	50 kHz	5 ms	Does not apply	Does not apply	Does not apply	120 kHz	50 kHz	5 ms
Mobile service 1 000 - 2 500	120 kHz	50 kHz	5 ms	Does not apply	Does not apply	Does not apply	120 kHz	50 kHz	5 ms
GPS L1 civil 1 567 – 1 583	Does not apply	Does not apply	Does not apply	Does not apply	Does not apply	Does not apply	9 kHz	5 kHz	5 ms

NOTE For emissions generated by brush commutator motors without an electronic control unit, the maximum step size may be increased up to 5 times the bandwidth.

表 2 搜尋接收機參數

服務/頻率範圍 MHz	峰值檢波器			準峰值檢波器			平均值檢波器		
	-6 dB 之解析頻寬	步階大小	駐留時間	-6 dB 之解析頻寬	步階大小	駐留時間	-6 dB 之解析頻寬	步階大小	駐留時間
AM 廣播及行動服務 0.15~30	10 kHz	5 kHz	50 ms	9 kHz	5 kHz	1 s	9 kHz	5 kHz	50 ms
FM 廣播 76~108	120 kHz	50 kHz	5 ms	120 kHz	50 kHz	1 s	120 kHz	50 kHz	5 ms
行動服務 30~1000									
電視頻道 I 41~88									
電視頻道 III 174~230									
電視頻道 IV/V 470~890									
數位音訊廣播(DAB) 171~245									
數位電視 (DTTV) 470~770	120 kHz	50 kHz	5 ms	不適用	不適用	不適用	120 kHz	50 kHz	5 ms
行動服務 1000~2500	120 kHz	50 kHz	5 ms	不適用	不適用	不適用	120 kHz	50 kHz	5 ms
全球定位系統 (GPS) L1 民用 1567~1583	不適用	不適用	不適用	不適用	不適用	不適用	9kHz	5 kHz	5 ms

備考：不具電子控制單元之有刷換向馬達產生的擾動，其最大步階大小可增至 5 倍頻寬。

4.5 Power supply

4.5 電源供應器

The power supply shall have adequate regulation to maintain the supply voltage U_s

within the ranges specified:

Vehicle tests: Ignition on, engine off

$$U_s = (12^{+2}_{-1})V \text{ for systems with 12 V nominal supply voltage}$$

$$U_s = (24^{+4}_{-2})V \text{ for systems with 24 V nominal supply voltage}$$

Vehicle tests: Engine running

$$U_s = (13^{+3}_{-0})V \text{ for systems with 12 V nominal supply voltage}$$

$$U_s = (26^{+6}_{-0})V \text{ for systems with 24 V nominal supply voltage}$$

電源供應器應具適當整流以保持供應電壓 U_s 介於規定範圍：

車輛試驗：點火開啟，引擎關閉

$$U_s = (12^{+2}_{-1})V \text{ 對標稱 12 V 電壓供應系統}$$

$$U_s = (24^{+4}_{-2})V \text{ 對標稱 24 V 電壓供應系統}$$

車輛試驗：引擎運轉

$$U_s = (13^{+3}_{-0})V \text{ 對標稱 12 V 電壓供應系統}$$

$$U_s = (26^{+6}_{-0})V \text{ 對標稱 24 V 電壓供應系統}$$

NOTE Most of the vehicle tests will be performed without the engine running, but with the ignition switched on, therefore care must be taken to ensure that the battery is sufficiently well charged.

備考：多數車輛試驗不於引擎運轉下執行，但此時點火開關開啟，故須注意以確保電瓶充電充足。

Component/module tests:

Unless otherwise stated in the test plan the values below shall be used.

$$U_s = (13^{+1}_{-1})V \text{ for systems with 12 V nominal supply voltage}$$

$$U_s = (26^{+2}_{-2})V \text{ for systems with 24 V nominal supply voltage}$$

組件/模組試驗：

除於試驗計畫中陳述，應依採用如下數值：

$$U_s = (13^{+1}_{-1})V \text{ 對標稱 12 V 電壓供應系統}$$

$$U_s = (26^{+2}_{-2})V \text{ 對標稱 24 V 電壓供應系統}$$

The power supply shall also be adequately filtered such that the RF noise produced by the power supply is at least 6 dB lower than the limits specified in the test plan.

電源供應器亦應作適當濾波，以令電源供應器產生之射頻雜訊低於試驗計畫規定之限制值至少 6 dB。

When specified in the test plan, a vehicle battery shall be connected in parallel with the power supply.

若試驗計畫規定，車輛電瓶應與電源供應器並聯連接。

5 Measurement of emissions received by an antenna on the same vehicle

5.於同一車輛上之天線接收的發射量測

5.1 Antenna measuring system

5.1 天線量測系統

5.1.1 Type of antenna

5.1.1 天線類型

An antenna of the type to be supplied with the vehicle shall be used as the measurement antenna for the bands for which it is designed to be used for radio reception.

針對無線電接收之頻帶，車輛有提供該型式接收天線時，應使用該天線做為量測天線。

If no antenna is to be furnished with the vehicle (as is often the case with a mobile radio system), the antenna types in Table 3 shall be used for the test. The antenna type and location shall be included in the test plan.

若車輛無配備天線(通常會備有行動無線電系統)，應於試驗使用表 3 之天線類型，且試驗計畫應載明天線類型及位置。

If an active antenna is used, the noise floor of the measured signal at the radio antenna connector may increase (see also the note in 5.3).

若使用主動式天線，於無線電天線連接器之信號背景雜訊量測可能增加(亦參照 5.3 之備考)。

Table 3 – Antenna types

Frequency MHz	Antenna type
0,15 to 6,2	1 m monopole
26 to 54	Loaded quarter-wave monopole
68 to 1 000	Quarter-wave monopole
1 000 to 2 500	As recommended by the vehicle manufacturer

表 3 天線類型

頻率 MHz	天線類型
0.15~ 6.2	1 m 單極
26~ 54	加負載之四分之一波長單極
68~ 1000	四分之一波長單極
1000~ 2500	如車輛製造商建議

5.1.2 Measuring system requirements

5.1.2 量測系統要求

5.1.2.1 Broadcast bands

5.1.2.1 廣播頻帶

For each band, the measurement shall be made with instrumentation which has the following specified characteristics.

對各頻帶，應以具如下規定特性之儀器作量測。

5.1.2.1.1 AM broadcast:

5.1.2.1.1 AM 廣播

Long wave (0,15 MHz to 0,3 MHz)

Medium wave (0,53 MHz to 1,8 MHz)

Short wave (5,9 MHz to 6,2 MHz)

長波 (0.15 MHz~0.3 MHz)

中波 (0.53 MHz~1.8 MHz)

短波 (5.9 MHz~6.2 MHz)

The measuring system shall have the following characteristics:

- output impedance of impedance matching equipment: 50 Ω resistive;
- gain: The gain (or attenuation) of the measurement antenna system shall be known with an accuracy of $\pm 0,5$ dB. The gain of the equipment shall remain within a 6 dB envelope for each frequency band as shown in Figure 2. Verification shall be performed in accordance with Annex B;

量測系統應具下列特性：

- 阻抗匹配設備之輸出：50 Ω 電阻性；
- 增益：量測天線系統之增益(或衰減)應已知具 0.5 dB 之精確度，設備於各頻帶之增益應維持在 6 dB 封包之內，如圖 2 所示，並應依附錄 B 執行驗證。

Figure 2 – Example of gain curve

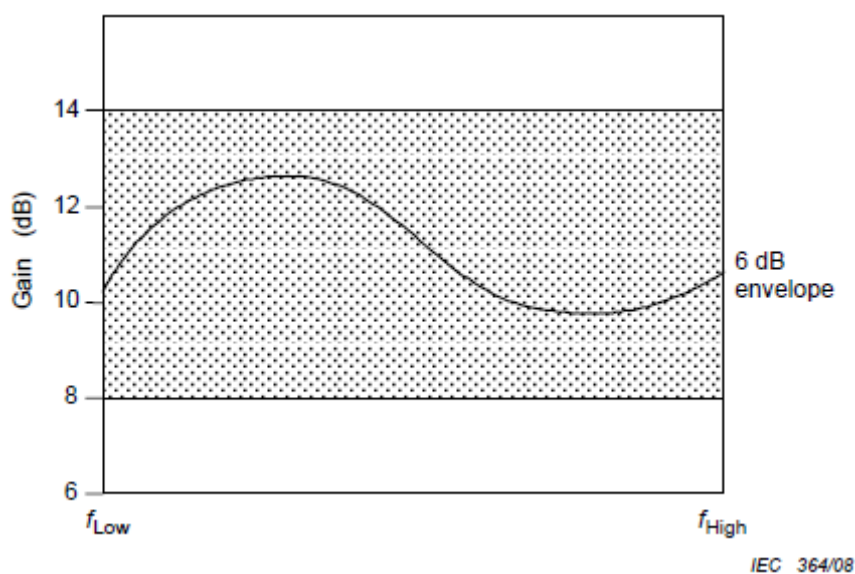
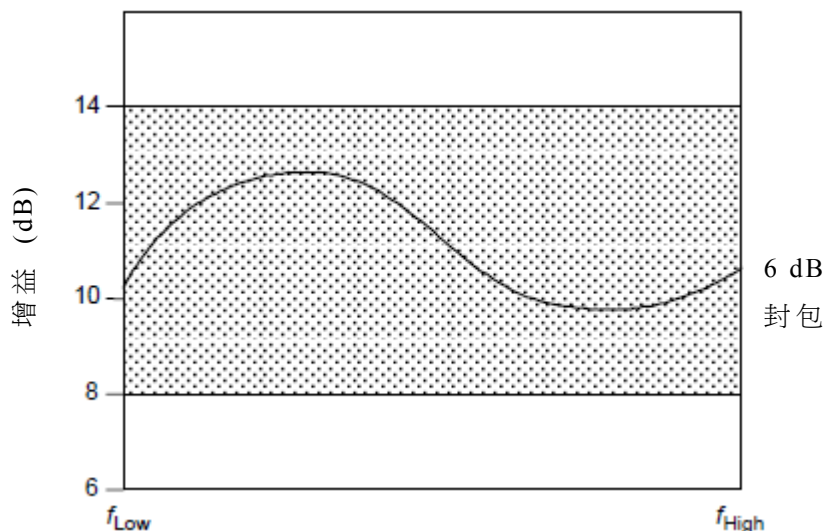


圖 2 增益曲線範例



- compression point: The 1 dB compression point shall occur at a sine wave voltage level greater than 60 dB(μ V);
- measurement system noise floor: The noise floor of the combined equipment including measuring instrument, impedance matching equipment, and preamplifier (if used) shall be at least 6 dB lower than the applicable limits;
- dynamic range: from the noise floor to the 1 dB compression point;
- input impedance: the impedance at the input of the matching network shall have a resistance of at least 100 k Ω in parallel with a maximum capacitance of 10 pF.
- 壓縮點：1 dB 壓縮點應發生在正弦波電壓位準大於 60 dB(μ V)時；
- 量測系統之背景雜訊：複合設備包含量測儀器、阻抗匹配設備及前置放大器(若使用)之背景雜訊應低於適用限制值至少 6 dB；
- 動態範圍：由背景雜訊至 1 dB 壓縮點；
- 輸入阻抗：匹配網路輸入端之阻抗應至少為 100 k Ω ，且具並聯最大電容 10 pF。

5.1.2.1.2 FM broadcast (76 MHz to 108 MHz) and TV broadcast

5.1.2.1.2 FM 廣播(76 MHz~108 MHz)及電視廣播

Measurements shall be taken with a measuring instrument which has an input impedance of 50 Ω . If the standing wave ratio (SWR) is greater than 2:1 an input matching network shall be used. Appropriate correction shall be made for any attenuation/gain of the matching unit.

應以輸入阻抗 50 Ω 之量測儀器進行量測，若駐波比(SWR 大於) 2:1，應使用輸入匹配網路，並應為匹配單元之衰減/增益作適當修正。

5.1.2.2 Mobile services (26 MHz to 2 500 MHz)

5.1.2.2 行動服務(26 MHz~2 500 MHz)

The test procedure assumes a 50 Ω measuring instrument and a 50 Ω antenna in the frequency range 26 MHz to 2 500 MHz. If a measuring instrument and an antenna with differing impedances are used, an appropriate network and correction factor shall be used.

試驗程序於 26 MHz~2 500 MHz 假設為 50 Ω 量測儀器及 50 Ω 天線，若使用阻抗不同之量測儀器及天線，應採用適當網路及修正因子。

5.2 Method of measurement

5.2 量測方法

The disturbance voltage shall be measured at the receiver end of the antenna coaxial cable using the ground contact of the connector as reference. The antenna connector shall be grounded to the housing of the on-board radio. The radio housing shall be grounded to the vehicle body using the production harness. A coaxial bulkhead connector shall be used for connection to the measuring instrument outside the shielded room. See Figure 3. In the case of an active vehicle antenna, which is fed by the radio via the antenna cable (phantom network), a decoupling network similar to that used in the radio shall be installed at the antenna connector to feed the active antenna from the vehicle supply voltage.

應於以連接器作參考接地之天線同軸纜線接收機端量測擾動電壓，天線連接器應與車載無線電外殼接地，無線電外殼應以量產線束接地至車體，並應使用同軸艙壁連接器連接屏蔽室外之量測儀器，參照圖 3。若使用主動式車輛天線，其由無線電透過天線纜線饋入(幻通網路，phantom network)，類似用於無線電之去耦合網路，應安裝於天線連接器已由車輛供應電壓饋入主動天線。

When making measurements in the AM broadcast bands (LW, MW, SW), the vehicle/matching unit ground and ground of the ALSE shall be electrically isolated from each other by means such as an isolation transformer, sheath-current suppressor, battery-powered measurement instrumentation, fiber optics, etc. Appropriate correction shall be made for the insertion loss of any isolation network. (See Annex C for an example of a sheath-current suppressor.)

於 AM 廣播頻帶(長波、中波及短波)做量測時，車輛/匹配單元與內襯吸波材料屏蔽圍體之接地應以隔離變壓器、披覆電流抑制器、電池電力量測儀器及光纖等做相互電氣隔離，並應為任何隔離網路之插入損失做適當修正。

NOTE The use of a high-quality coaxial cable e.g. double-shielded cable for connection to the measuring instrument is recommended as well as the use of ferrite rings on the cable for suppression of surface currents.

備考：建議使用高品質同軸纜線，即雙重屏蔽纜線連接量測儀器，並使用磁環以抑制纜線之表面電流。

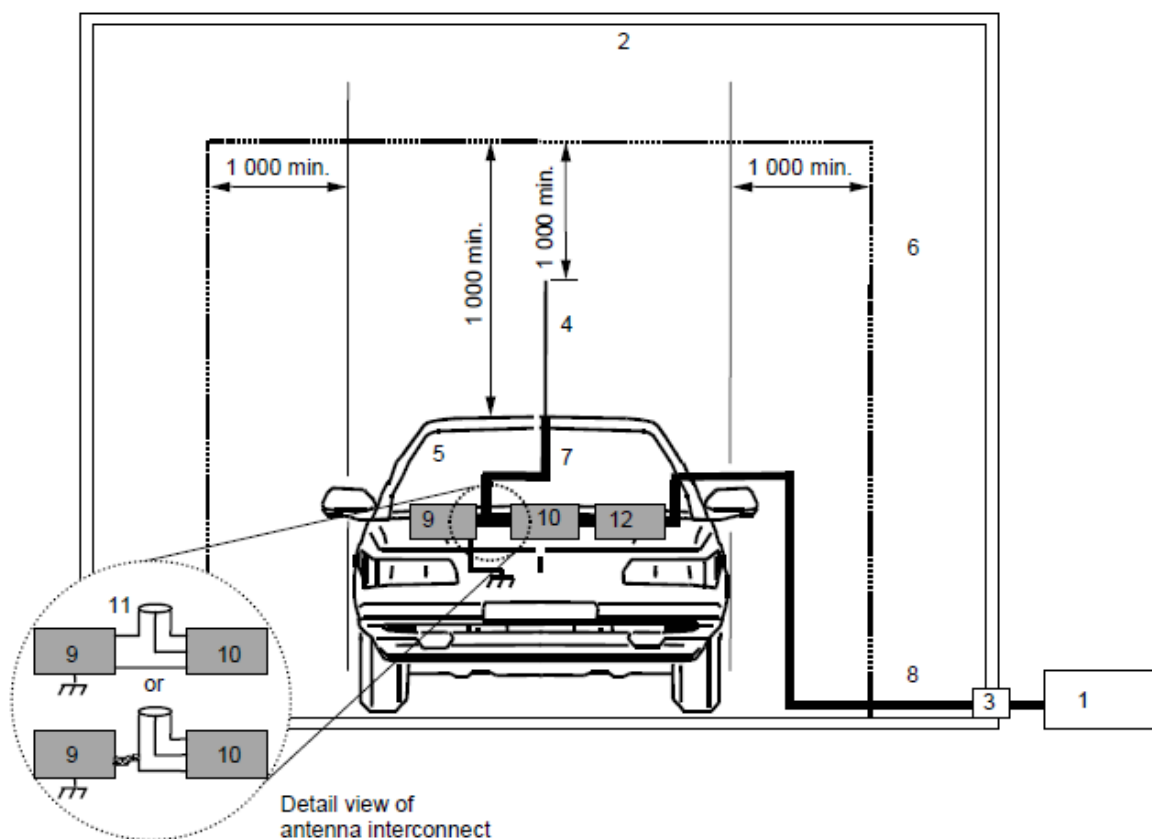
Some vehicles may allow a receiver to be mounted in several locations (e.g. under the instrument panel, under the seat, etc.). In these cases a test shall be carried out as specified in the test plan for each receiver location.

某些車輛可能允許接收機安裝在數個位置(如於儀表板、於座椅等)，此情況應依試驗計畫規定在各個接收機位置執行試驗。

When vehicle measurements are made without the engine running, the power supply of 4.5 shall be used, when needed, to maintain the system voltage within its required range.

當車輛不於引擎運轉中做量測時，應視需要使用 4.5 之電源供應器，以維持系統電壓於要求範圍。

Figure 3 – Vehicle-radiated emissions – Example for test layout
(end view with monopole antenna)

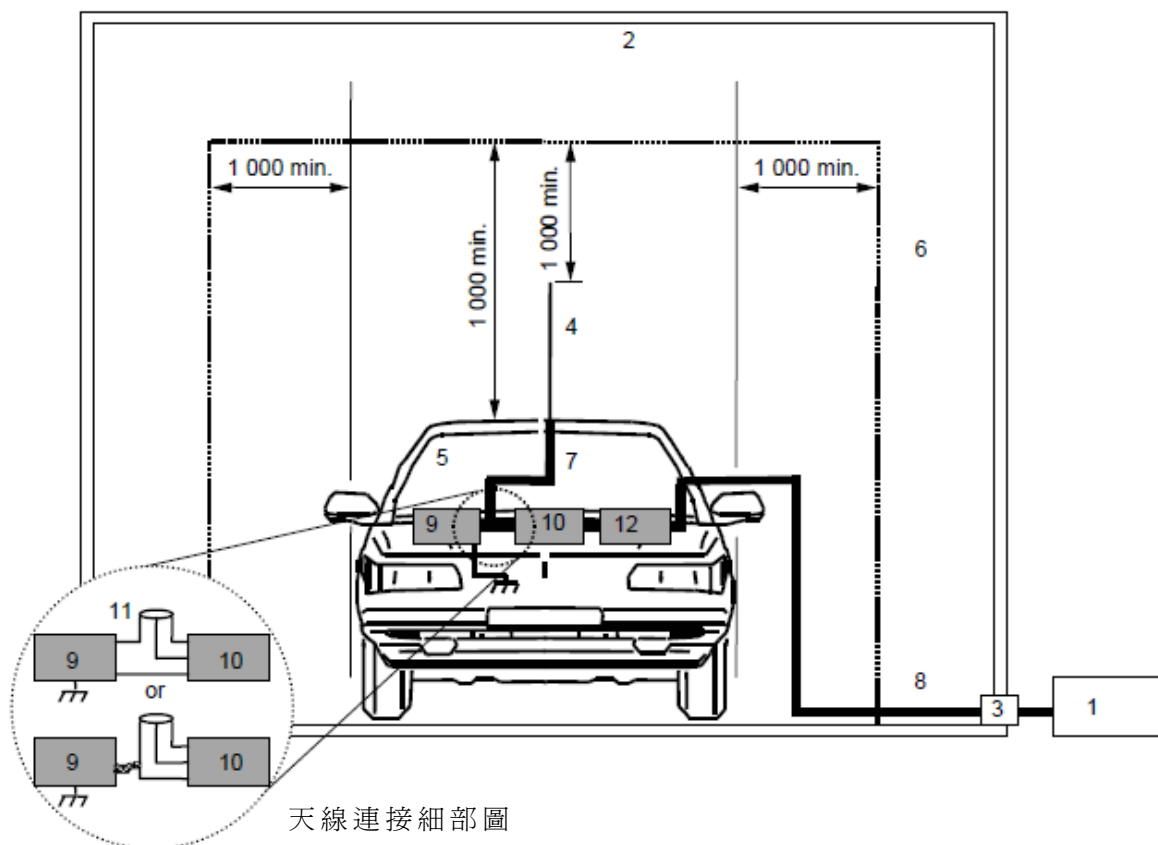


IEC 365/08

Key

- 1 Measuring instrument
- 2 ALSE
- 3 Bulkhead connector
- 4 Antenna (see 5.1)
- 5 Vehicle
- 6 Typical absorber material
- 7 Antenna coaxial cable
- 8 High-quality coaxial cable e.g. double-shielded (50 Ω)
- 9 Housing of on-board radio
- 10 Impedance matching unit (when required)
- 11 Modified coaxial "T" connector
- 12 AM broadcast band ground isolation network (when required)

圖 3 車輛輻射發射—試驗佈局範例



說明

1. 量測儀器
2. 內襯吸波材料屏蔽圍體
3. 艙壁連接器
4. 天線(參照 5.1)
5. 車輛
6. 典型吸波材料
7. 天線同軸纜線
8. 高品質同軸纜線，即雙重屏蔽(50 Ω)
9. 車載無線電外殼
10. 阻抗匹配單元(若需要)
11. 改良型同軸 T 型網路
12. AM 廣播頻帶接地隔離網路(若需要)

5.3 Examples of limits for vehicle radiated disturbances

5.3 車輛輻射擾動限制值範例

It is recommended for acceptable radio reception in a vehicle using typical radio receivers, that the disturbance voltage at the end of the antenna cable should not exceed the values shown in Table 4. Where different receivers are used or different coupling models for the propagation of disturbances are valid, the limits

may be changed and detailed in the vehicle manufacturer's own specification.

此為使用典型無線電接收機之可接受的無線電接收建議，天線纜線端之擾動電壓須不超過表 4 所示之數值，由於使用不同之接收機，或是存在不同之擾動傳播耦合模式，限制值可被變更，並詳細記載於車輛製造商自訂之規範中。

Table 4 – Example for limits of disturbance – Complete vehicle

Service / Band ^a	Frequency MHz	Terminal disturbance voltage at receiver antenna terminal in dB (μV)		
		Peak	Quasi-peak	Average
BROADCAST				
LW ^b	0,15 - 0,30	26	13	6
MW ^b	0,53 - 1,8	20	7	0
SW ^b	5,9 - 6,2	20	7	0
FM ^b	76 - 108	26	13	6
TV Band I ^c	41 - 88	16	-	6
TV Band III ^c	174 - 230	16	-	6
DAB III	171 - 245	10	-	0
TV Band IV/V ^c	468 - 944	16	-	6
DTTV	470 - 770	20 ^d	-	10 ^d
DAB L band	1 447 - 1 494	10	-	0
SDARS	2 320 - 2 345	16	-	6
MOBILE SERVICES				
CB ^b	26 - 28	20	7	0
VHF ^b	30 - 54	20	7	0
VHF ^b	68 - 87	20	7	0
VHF ^b	142 - 175	20	7	0
Analogue UHF ^b	380 - 512	20	7	0
RKE ^f	300 - 330	20	-	6
RKE ^f	420 - 450	20	-	6
Analogue UHF ^b	820 - 960	20	7	0
GSM 800	860 - 895	26	-	6
EGSM/GSM 900	925 - 960	26	-	6
GPS L1 civil ^e	1 567 - 1 583	-	-	0
GSM 1800 (PCN)	1 803 - 1 882	26	-	6
GSM 1900	1 850 - 1 990	26	-	6
3G / IMT 2000	1 900 - 1 992	26	-	6
3G / IMT 2000	2 010 - 2 025	26	-	6
3G / IMT 2000	2 108 - 2 172	26	-	6
Bluetooth/802.11	2 400 - 2 500	26	-	6

- a LW: Long wave, MW: Medium wave, SW: Short wave (amplitude modulation, AM)
VHF: Very high frequency, UHF: Ultra high frequency (frequency modulation, FM)
DAB: Digital audio broadcasting, TV: Television, DTTV: Digital Terrestrial Television
RKE: Remote keyless entry, GPS: Global positioning system, GSM: Global system mobile
3G: Third generation
- b In this analogue service the peak and quasi-peak limits can be relaxed by 6 dB for short duration disturbances (e.g. short duration PK (or QPK) limit = PK (or QPK) limit + 6 dB).
- c Analogue TV only.
- d This limit is less stringent than the analogue limit and should only be applied where analogue TV is no longer in use.
- e The bandwidth and frequency steps to be used for the GPS L1 civil band are respectively 9 kHz and 5 kHz rather than the bandwidth and frequency steps defined in Table 1 and Table 2 for services above 30 MHz.
- f RKE limits are defined over a large frequency band. Any modification of the average limit around the operating frequency due to sensitivity of RKE systems should be defined in the test plan.

NOTE 1 Stereo signals may be more susceptible to disturbance than monaural signals in the FM broadcast band. This phenomenon has been factored into the FM (76 MHz to 108 MHz) limits.

NOTE 2 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.

表 4 擾動限制值範例—整車

服務/頻帶 ^a	頻率 MHz	接收機天線終端之終端擾動電壓， 單位為 dB(μ V)		
		峰值	準峰值	平均
廣播				
LW ^b	0.15~0.30	26	13	6
MW ^b	0.53~1.8	20	7	0
SW ^b	5.9~6.2	20	7	0
FM ^b	76~108	26	13	6
TV Band I ^c	41~88	16	-	6
TV Band III ^c	174~230	16	-	6
DAB III	171~245	10	-	0
TV Band IV/V ^c	468~944	16	-	6
DTTV	470~770	20 ^d	-	10 ^d
DAB L band	1447~1494	10	-	0
SDARS	2320~2345	16	-	6
行動服務				
CB ^b	26~28	20	7	0
VHF ^b	30~54	20	7	0
VHF ^b	68~87	20	7	0
VHF ^b	142~175	20	7	0
Analogue UHF ^b	380~512	20	7	0
RKE ^f	300~330	20	-	6
RKE ^f	420~450	20	-	6
Analogue UHF ^b	820~960	20	7	0
GSM 800	860~895	26	-	6
EGSM/GSM 900	925~960	26	-	6
GPS L1 civil ^e	1567~1583	-	-	0
GSM 1800 (PCN)	1803~1882	26	-	6
GSM 1900	1850~1990	26	-	6
3G/IMT 2000	1900~1992	26	-	6
3G/IMT 2000	2010~2025	26	-	6
3G/IMT 2000	2108~2172	26	-	6
Bluetooth/802.11	2400~2500	26	-	6

備考 1. 比起單聲道信號，立體聲信號可能對 FM 廣播頻段之擾動更為敏感，已依此現象為 FM(76 MHz ~ 108 MHz)限制值參數做修正。

備考 2. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中應定義所應用之限制值。

^a LW：長波，MW：中波，SW：短波（以上皆為振幅調變），

VHF：特高頻，UHF：超高頻（以上皆為頻率調變），

DAB：數位音訊廣播，TV：電視，DTTV：衛星電視，SDARS：衛星數位音訊無線電服務

CB：民用頻帶，RKE：遙控門鎖，GSM：全球行動通訊系統，EGSM：增強型全球行動通訊系統，

GPS：全球定位系統，PCN：個人通訊網路，3G：第三代，IMT：國際行動電信，Bluetooth：藍芽，802.11：指無線網路系統。

^b 在此類比服務，峰值和準峰值限制值若為為短持續時間擾動，可放寬 6 dB(即短持續時間之峰值(或準峰值)限制值=峰值(或準峰值)限制值+6 dB)。

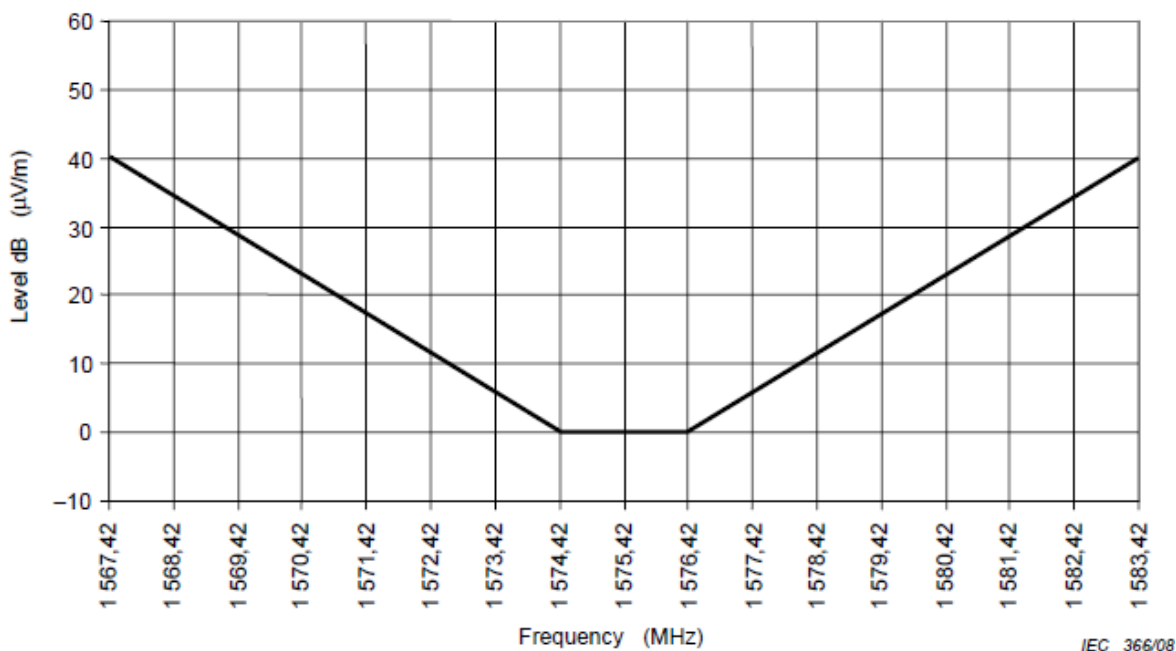
^c 僅指類比電視。

^d 此限制值較類比限制值不嚴格，且僅於類比電視停用後適用。

^e 全球定位系統(GPS)L1 民用採用之頻寬及頻率步階分別為 9 kHz 及 5 kHz，而非定義於表 1 及表 2，超過 30 MHz 之服務的頻寬及頻率步階。

^f 遙控門鎖(RKE)限制值定義於很寬的頻帶，任何由遙控門鎖系統靈敏度造成之平均限制值變更須定義在試驗計畫中。

Figure 4 – Average limit for radiated disturbances from vehicles GPS band
1 567,42 to 1 583,42 MHz

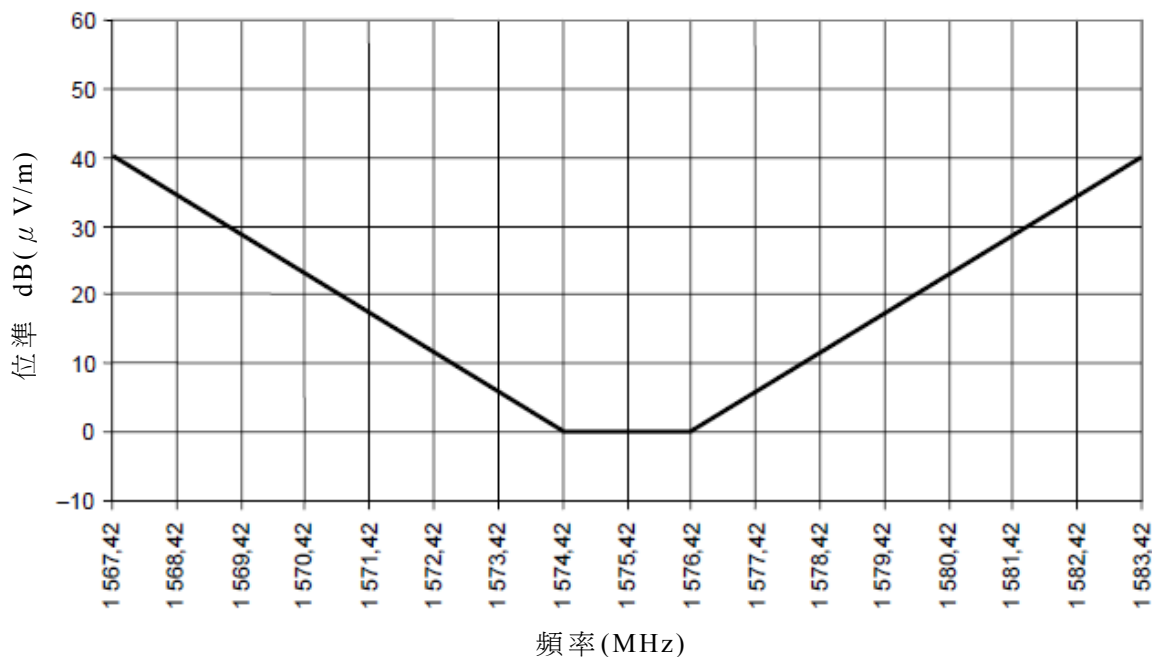


NOTE If an active antenna is used, the noise floor may increase. The additional noise floor depends on the type of antenna and must be subtracted from the measured value to determine the real value of the disturbance using the following formula (all terms in µV):

$$U_{real\ Disturbance} = \sqrt{U^2_{Measured} - U^2_{Antenna\ noise}}$$

A relaxation of the limit because of the active antenna noise floor does not guarantee compliance. Subsequent changes to the active antenna design may result in non-compliance. This topic remains under study. Annex D describes a method to determine the noise floor of an active antenna.

圖 4 車輛全球定位系統(GPS)頻帶及 1567.42 MHz~1583.42 MHz 之輻射擾動平均值限制值



備考：若使用主動式天線，背景雜訊可能增加，額外之背景雜訊視天線類型產生，且須由以下公式(單位皆為 μV)從量測值減去，以判定擾動之實際值：

$$U_{real\ Disturbance} = \sqrt{U^2_{Measured} - U^2_{Antenna\ noise}}$$

由於未能保證主動式天線背景雜訊之符合性(compliance)，故放寬其限制值，且主動式天線設計之相關變更亦可能導致違反符合性。因本議題仍在研究中，附錄 D 描述判定主動式天線背景雜訊之方法。

6 Measurement of components and modules

6. 組件及模組之量測

6.1 Test equipment

6.1 試驗設備

6.1.1 Ground plane

6.1.1 接地平面

The ground plane shall be defined as the top metallic surface of the test bench/table.

接地平面應定義為試驗台/桌之上金屬表面。

The ground plane shall be made of 0,5 mm thick (minimum) copper, brass, bronze or galvanized steel.

接地平面應以 0.5 mm 厚(最小值)之銅、黃銅、青銅或鍍鋅鋼板製成。

The minimum size of the ground plane for conducted emissions shall be 1 000 mm × 400 mm.

傳導發射用之接地平面最小尺寸應為 1000 mm×400 mm。

The minimum width of the ground plane for radiated emissions shall be 1 000 mm.

The minimum length of the ground plane for radiated emissions shall be 2 000 mm, or underneath the entire equipment plus 200 mm, whichever is larger.

輻射發射用之接地平面最小寬度應為 1000 mm，最小長度應為 2000 mm，或在整個設備下方增加 200 mm，以上二者中取較大者。

The height of the ground plane (test bench) shall be (900 ± 100) mm above the floor.

接地平面(試驗試驗台)之高度應高於地板(900 ± 100) mm。

The ground plane shall be bonded to the walls or the floor of the shielded enclosure such that the d.c. resistance shall not exceed 2,5 mΩ. The distance from the edge of the ground strap to the edge of the next strap shall not be greater than 300 mm. The maximum length to width ratio for the ground straps shall be 7:1.

接地平面應搭接至屏蔽圍體之牆面或地板，其直流電阻值應不超過 2.5 mΩ，接地帶邊緣間之距離應不大於 300 mm，且接地帶之長度對寬度比最大應為 7:1。

NOTE Because of resonances of the ground plane the location, width and length of the bond straps may influence the measurement results. A sufficient number of low inductive bond straps are necessary to ensure a low impedance connection to the shielded room.

備考：由於接地平面之共振，搭接帶之位置、寬度及長度可能影響量測結果，故必須使用足夠數量之低電感性搭接帶，以確保對屏蔽室連接之低阻抗性。

6.1.2 Power supply and AN

6.1.2 電源供應器及人工網路(AN)

For the tests defined in 6.2, 6.3, 6.4, 6.5 and 6.6, each EUT power supply lead shall be connected to the power supply through an artificial network. For the TEM cell emissions tests of 6.5, an AN with a coaxial connector will facilitate connection to the TEM cell EUT power connector. The AN shall have a nominal 5 μH inductance. The impedance characteristics and a suggested schematic are shown in Annex E.

對 6.2、6.3、6.4、6.5 及 6.6 定義之試驗，各待測設備之電源供應引線應透過人工網路連接至電源供應器；對於 6.5 之橫向電磁波室發射試驗，附有同軸連接器之人工網路將有助於與橫向電磁波室待測設備電源連接器之連接，且人工網路之標稱電感值應為 5 μH，其阻抗特性及建議電路參照附錄 E。

Power supply is assumed to be negative ground. If the EUT utilizes a positive ground then the test set-ups shown in the Figures need to be adapted accordingly. Depending on the intended EUT installation in the vehicle:

- EUT remotely grounded (vehicle power return line longer than 200 mm): two artificial networks are required, one for the positive supply line and one for the power return line.
- EUT locally grounded (vehicle power return line 200 mm or shorter): one artificial network is required, for the positive supply.

電源供應器假設為負極接地，若待測設備採用正極接地，圖中所示之試驗設置需適當對應，且視車輛上之待測設備安裝目的：

- 待測設備遠端接地(車輛電源回線大於 200 mm)：需要二個人工網路，一個接到正極電源線，一個接到電源回線。
- 待測設備近端接地(車輛電源回線為 200 mm 或較短)：需要一個人工網路接到正極電源線。

The AN(s) shall be mounted directly on the ground plane. The case(s) of the AN(s) shall be bonded to the ground plane.

人工網路應直接架設於接地平面上，且人工網路之外殼應搭接至接地平面。

The power supply return shall be connected to the ground plane (between the power supply and the AN(s)).

電源供應器回線應連接至接地平面(介於電源供應器及人工網路間)。

The measuring port of the AN not connected to the measuring instrument shall be terminated with a 50 Ω load.

未連接至量測儀器之人工網路量測埠應終接 50 Ω 負載。

6.1.3 Load simulator

6.1.3 負載模擬器

The load simulator includes sensors and actuators, and terminates the test harness connected to the EUT.

負載模擬器包含感測器及致動器，並以線束終接至待測設備。

To ensure sufficient reproducibility the same termination must be used for each measurement either by using special termination equipment (e.g. artificial networks, filters) – located at the RF boundary – or by using the same load simulator.

為確保足夠之再現性，須在每次量測時使用相同之終端，可於射頻邊界裝置特殊終端設備(如人工網路、濾波器)，或使用相同之負載模擬器。

6.1.4 Signal/control line filters

6.1.4 信號/控制線濾波器

In the TEM cell test method using the coaxial connectors for EUT leads each lead shall pass through a filter which has impedance characteristics similar to that of the AN defined above.

於橫向電磁波室試驗法中，使用同軸連接器連接待測設備引線，各引線應透過與上述人工網路阻抗特性近似之濾波器連接。

The attenuation of the filters shall be specified for the whole frequency range of the intended component/module test (see 6.2 to 6.6) according to the requirements shown in Figure 5. The minimum attenuation shall be more than 40 dB from 30 MHz up to the upper cut-off frequency (f_c), which depends on the intended test method. Figure 5 shows e.g. an upper cut-off frequency (f_c) of the chosen test method of 400 MHz.

應依圖 5 之要求，於組件/模組意圖試驗(參照 6.2~6.6)之整個頻率範圍定義濾波器之衰減量，視意圖試驗法而定，30 MHz 至截止頻率(f_c)上限之最小衰減量應大於 40 dB，圖 5 為所選試驗法之截止頻率(f_c)上限範例。

NOTE Other low pass RF filter configurations may be used if the filter characteristics are not applicable to special wanted signals of the EUT's inputs or outputs (e.g. high speed network data interfaces). The filters shall be specified in the test plan.

備考：若濾波器特性不適用待測設備輸入或輸出端(例如高速網路數據介面)之特殊需求信號，可使用其他低通射頻濾波器設置，且應於試驗計畫指定。

Figure 5 – Example for the required minimum attenuation of the signal / control line filters

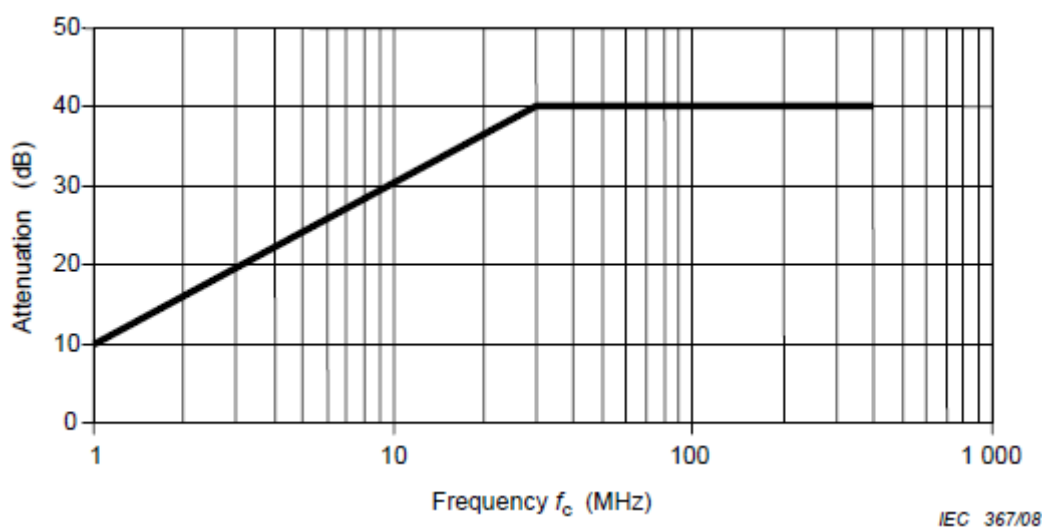
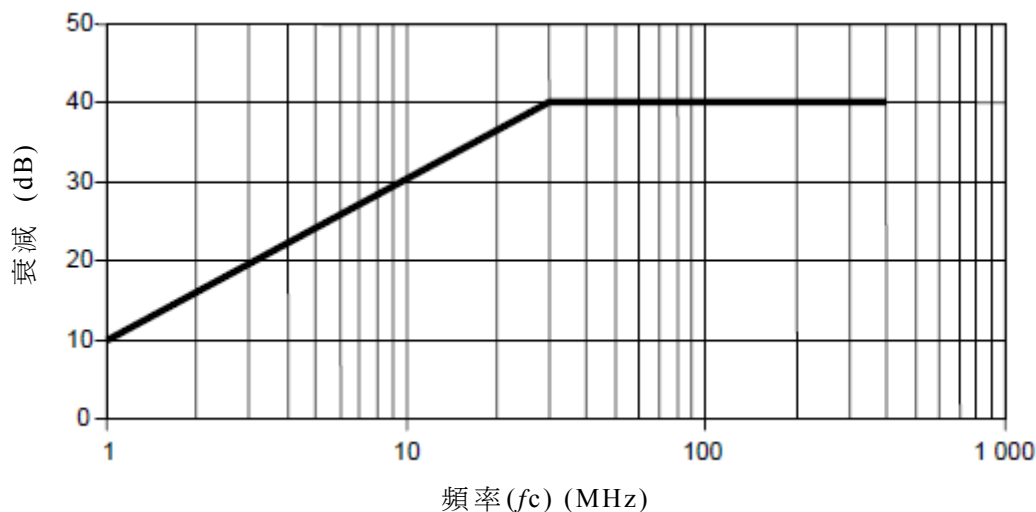


圖 5 信號/控制線濾波器之最小衰減要求範例



6.2 Conducted emissions from components/modules – Voltage method

6.2 組件/模組之傳導發射—電壓法

6.2.1 General

6.2.1 通則

Voltage measurements are able to characterize the emissions on single leads only. The test method is not usable to characterize the radiated emission transmitted e.g. by different antenna structures on the printed board of electronic components or to characterize the efficiency of shielding. Therefore, voltage measurements are not able to characterize the complete EUT emission. At lower frequencies (e.g. in the AM-bands) voltage measurements usually ensure more dynamic range than radiated measurements.

電壓量測僅能判定單一引線之特性，本試驗法不可用於判定輻射發射傳播之特性，如電子組件印刷電路板之不同天線結構，或屏蔽效率特性。因此，電壓量測不可用於判定整個待測設備之發射，且低頻頻段(如 AM 頻帶)之電壓量測通常需確保比輻射量測較大之動態範圍。

6.2.2 Ground plane arrangement

6.2.2 接地平面配置

6.2.2.1 Test set-up

6.2.2.1 試驗設置

6.2.2.1.1 Location of the EUT

6.2.2.1.1 待測設備之位置

The EUT shall be placed on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1,4$), at (50 ± 5) mm above the ground plane.

待測設備應置於高於接地平面 (50 ± 5) mm 之非導電性、低相對介電常數材料($\epsilon_r \leq 1.4$)上。

The case of the EUT shall not be grounded to the ground plane unless it is intended to simulate the actual vehicle configuration.

待測設備之外殼不應接地至接地平面，除非為模擬實際之車輛組態。

All sides of the EUT shall be at least 100 mm from the edge of the ground plane. In the case of a grounded EUT, the ground connection point shall also have a minimum distance of 100 mm from the edge of the ground plane.

待測設備各邊應距接地平面邊緣至少 100 mm，若待測設備接地，接地連接點亦應與接地平面邊緣有最小距離 100 mm。

6.2.2.1.2 Location of the test harness

6.2.2.1.2 試驗線束之位置

The power supply line(s) between the connector of the AN(s) and the connector(s) of the EUT (I_p) shall have a standard length of (200^{+200}_0) mm.

介於人工網路及待測設備連接器間之電源供應線應為標準長度 (200^{+200}_0) mm。

The harness shall be placed in a straight line on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1,4$), at (50 ± 5) mm above the ground plane.

線束應筆直置放在高於接地平面(50 ± 5) mm 之非導電性、低相對介電常數材料($\epsilon_r \leq 1.4$)上。

If, for particular EUTs (multi-connectors, special connectors, etc.), this standard length for the power supply line(s) cannot be met, the minimum necessary length to be used shall be defined in the test plan. This minimum length shall satisfy the requirement of $f_c \geq 108$ MHz, or the measurements shall be limited to f_c .

若對於特殊待測設備(多重連接器、特殊連接器等)，電源供應線無法達到本標準長度，其適用之最小所須長度應於試驗計畫中指定，此最小長度應滿足 $f_c \geq 108$ MHz 之要求，或以 f_c 為量測上限。

The following equation defines f_c :

$$f_c \approx 30 / l_p \quad (2)$$

where

f_c is the frequency in MHz

l_p is the length in m

(This equation is based on $l_p \leq \lambda_{\min} / 10$).

以下方程式定義 f_c :

$$f_c \approx 30 / l_p \quad (2)$$

f_c 表示頻率，單位 MHz

l_p 表示長度，單位 m

(本方程式基於 $l_p \leq \lambda_{\min} / 10$)。

To minimize the coupling between power and input/output leads, the space between those lead types shall be maximized (≥ 200 mm from or perpendicular to the power supply lines connecting the AN(s) and the EUT).

為使電源及輸入/輸出引線之耦合最小，這些引線類型間之空間應最大化(垂直或距連接人工網路及待測設備之電源供應線 ≥ 200 mm)。

The total length of the test harness (excluding power lines) shall not exceed 2 m. The wiring type is defined by the actual system application and requirement.

試驗線束(不含電源線)之總長不應超過 2 m，並依實際系統應用及要求以定義佈線類型。

All leads and cables shall be located at a minimum distance of 100 mm from the edge of the ground plane.

所有引線及纜線距接地平面邊緣之距離最小應為 100 mm。

6.2.2.1.3 Location of the load simulator

6.2.2.1.3 負載模擬器之位置

Preferably, the load simulator shall be placed directly on the ground plane. If the load simulator has a metallic case, this case shall be bonded to the ground plane.

負載模擬器應直接置於接地平面上為佳，若負載模擬器具金屬外殼，該外殼應與接地平面搭接。

NOTE Alternatively, the load simulator may be located adjacent to the ground plane (with the case of the load simulator bonded to the ground plane) or outside of the test chamber, provided the test harness from the EUT passes through an RF boundary bonded to the ground plane.

備考：或者，負載模擬器可置於鄰近接地平面處(負載模擬器之外殼搭接至接地平面)，或提供由待測設備經射頻邊界之試驗線束，於試驗室外搭接至接地平面。

When the load simulator is located on the ground plane, the d.c. power supply lines of the load simulator shall be connected directly to the power supply and not through the AN(s).

當負載模擬器置於接地平面，負載模擬器之直流電源供應線應經由人工網路直接連接至電源供應器。

6.2.2.2 Test procedure

6.2.2.2 試驗程序

The general arrangement of the disturbance source (EUT), connecting harnesses, etc. represents a standardised test condition. Any deviations from the standard test harness length, etc. shall be agreed upon prior to testing and recorded in the test report.

擾動源(待測設備)、連接線束等一般配置為標準試驗條件，任何標準試驗線束長度等之偏差，應於試驗前協議，且記錄於試驗報告中。

The EUT shall be made to operate under typical loading and other conditions as in the vehicle such that the maximum emission state occurs. These operating conditions must be clearly defined in the test plan to ensure supplier and customer perform identical tests.

待測設備應可於典型負載及其他車上相容條件下操作，以令最大發射狀態產生，這些操作條件需於試驗計畫上清楚定義，以確保供應商及客戶執行等同一之試驗。

- For EUT remotely grounded (vehicle power return line longer than 200 mm), the voltage measurements shall be made on each lead (supply and return) relative to the ground plane.

- 對遠端接地之待測設備(車輛電源回線長於 200 mm)，電壓量測時應使各引線(供應線及回線)參考至接地平面。

- For EUT locally grounded (vehicle power return line 200 mm or shorter), voltage measurements on power supply leads shall be made relative to the ground plane.

- 對近端接地之待測設備(車輛電源回線短於 200 mm)，電源供應引線之電壓量測應參考至接地平面。

- Generators/alternators shall be loaded with a battery and parallel resistor

combination, and connected to the artificial network in the manner shown in Figure 8. The load current, operating speed, harness length and other conditions shall be defined in the test plan.

- 直流發電機/交流發電機應以電瓶及並聯電阻組成負載，並以圖 8 之方式連接至人工網路，其負載電流、操作速度、線束長度及其他條件應定義於試驗計畫。

The conducted emissions on power lines are measured successively on positive power supply and power return by connecting the measuring instrument on the measuring port of the related AN, the measuring port of the AN in the other supply lines being terminated with a 50 Ω load.

電源線之傳導發射係將量測儀器連接至相關人工網路之量測埠，以相繼量測正電源供應及電源回線，另一電源供應線之人工網路量測埠則以 50 Ω 負載終接。

NOTE For EUT's with multiple positive power supply connections and/or multiple power return connections, the measurements (on power supply and on power return) may be performed with all power supply connections tied together at the AN and all power return connections tied together at the other AN.

備考：對於具數個正電源供應連接及/或數個電源回線連接之待測設備，其電源供應及電源回線之量測可於所有電源供應一起連接至一人工網路，所有電源回線一起連接至另一人工網路下執行。

The configuration shall be defined in the test plan.

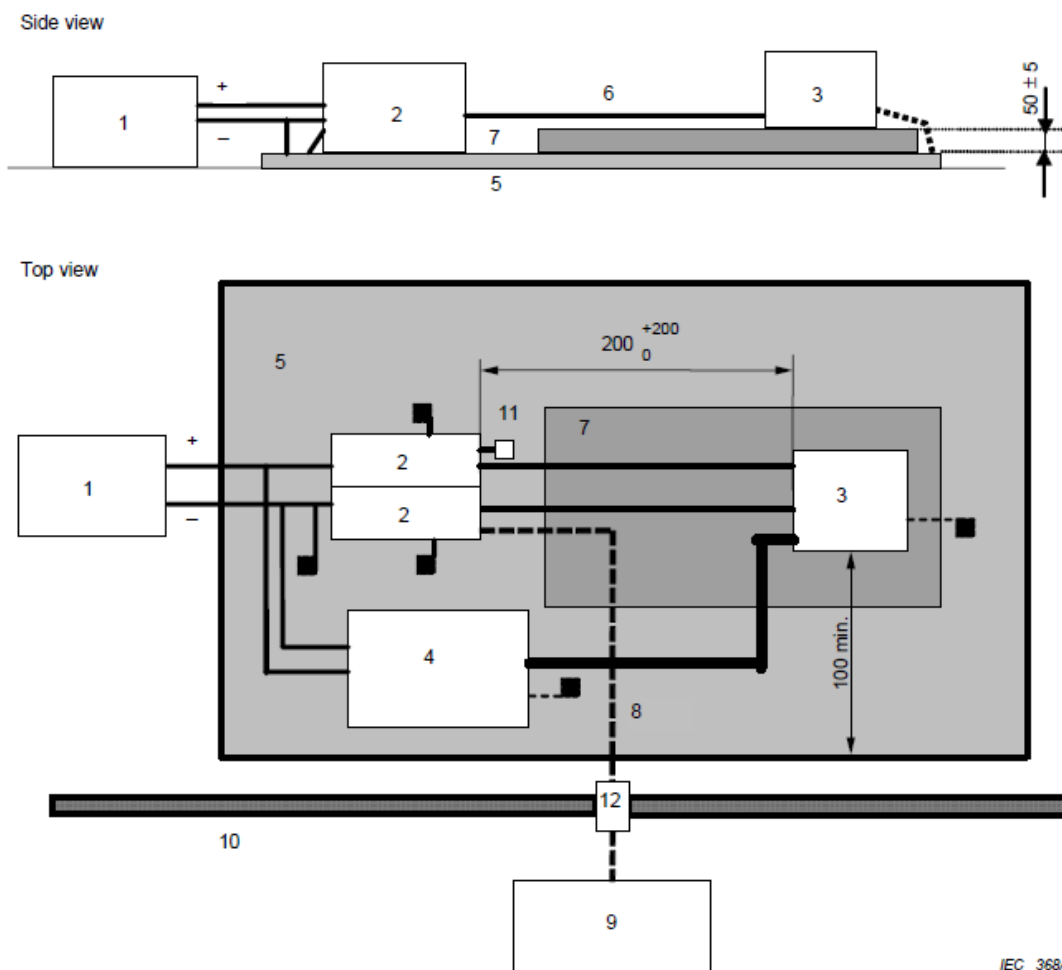
試驗設置應定義於試驗計畫中。

For voltage measurements, the arrangement of the EUT and measuring equipment shall be as shown in Figures , 6, 7 8 and 9 depending on the intended EUT installation in the vehicle.

對於電壓量測，試驗設備及量測設備之配置應視意圖待測設備之車上安裝狀況如圖 6、7、8 及 9 所示。

Figure 6 – Conducted emissions – EUT with power return line remotely grounded.

Dimensions in millimetres – not to scale



IEC 368/08

Key

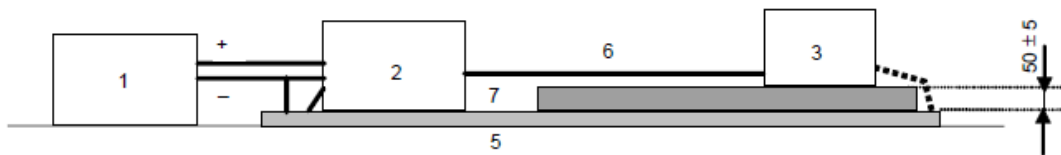
- 1 Power supply (may be placed on the ground plane)
- 2 Artificial network
- 3 EUT (housing grounded if required in test plan)
- 4 Load simulator (metallic casing grounded if required in test plan)
- 5 Ground plane
- 6 Power supply lines
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 High-quality coaxial cable e.g. double-shielded (50 Ω)
- 9 Measuring instrument
- 10 Shielded enclosure
- 11 50 Ω load
- 12 Bulkhead connector

NOTE The EUT housing ground lead, when required in the test plan, should not be longer than 150 mm.

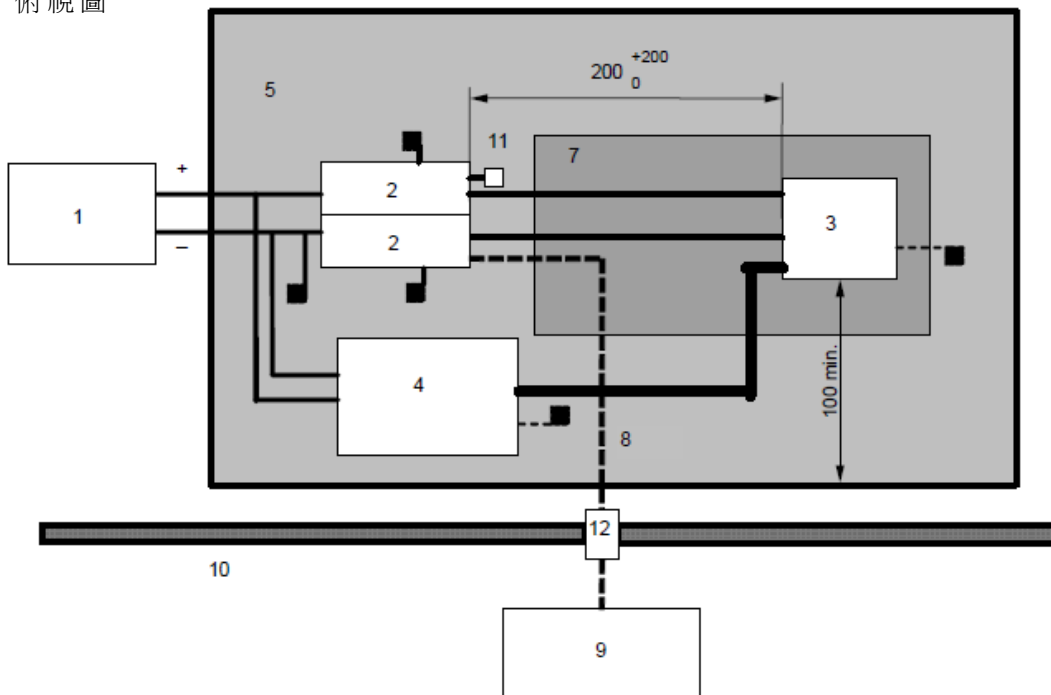
圖 6 傳導發射—電源回線遠端接地之待測設備

單位：mm，未依比例繪製

側視圖



俯視圖



說明

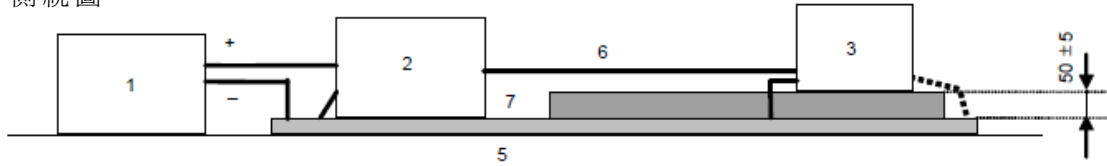
1. 電源供應器(可置於接地平面上)
2. 人工網路
3. 待測設備(若試驗計畫要求則外殼接地)
4. 負載模擬器(若試驗計畫要求則金屬外殼接地)
5. 接地平面
6. 電源供應線
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 高品質同軸纜線，如雙屏蔽線(50 Ω)
9. 量測儀器
10. 屏蔽圍體
11. 50 Ω 負載
12. 艙壁連接器

備考：若試驗計畫要求，待測設備外殼接地引線不應超過 150 mm

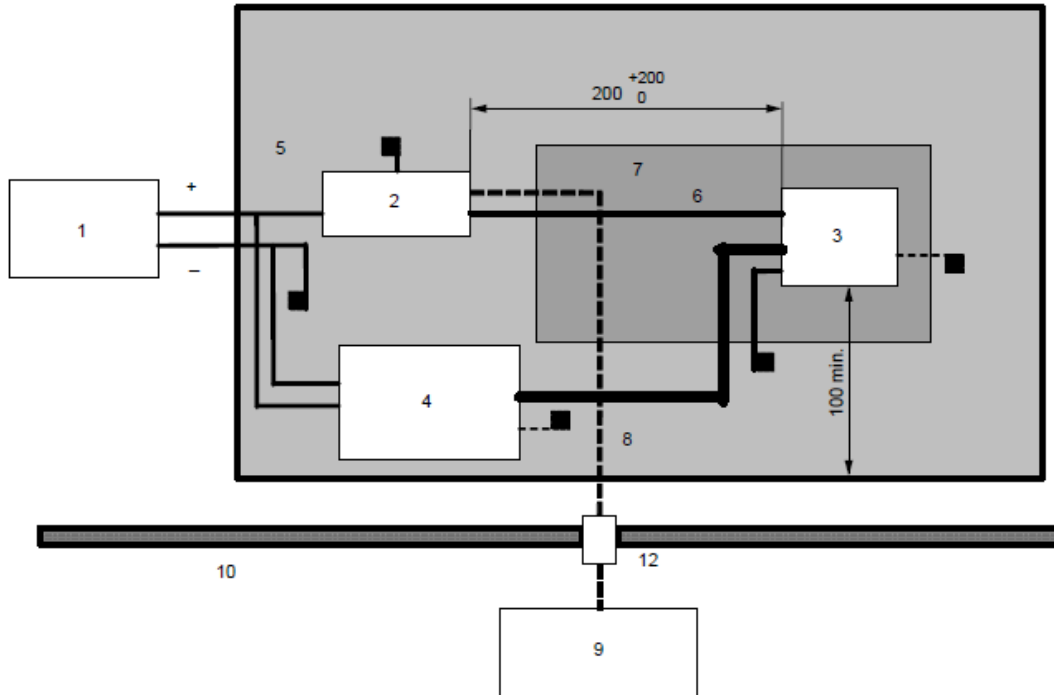
圖 7 傳導發射—電源回線近端接地之待測設備

單位：mm，未依比例繪製

側視圖



俯視圖

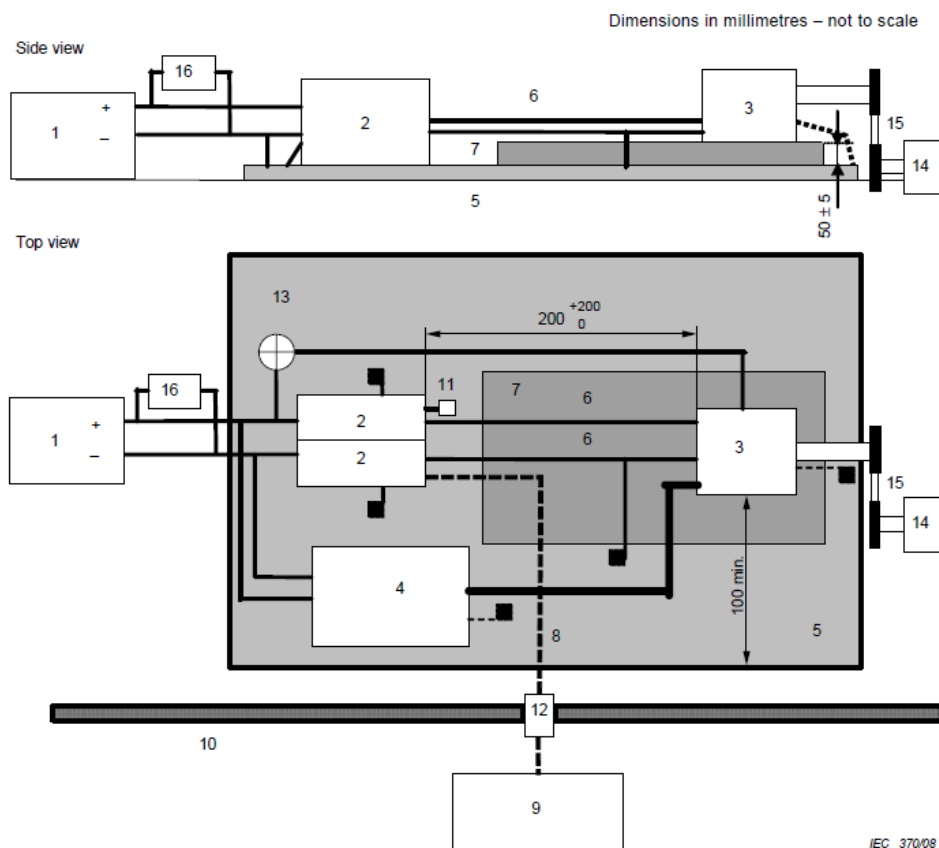


說明

1. 電源供應器(可置於接地平面上)
2. 人工網路
3. 待測設備(若試驗計畫要求則外殼接地)
4. 負載模擬器(若試驗計畫要求則金屬外殼接地)
5. 接地平面
6. 電源供應線
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 高品質同軸纜線，如雙屏蔽線(50 Ω)
9. 量測儀器
10. 屏蔽圍體
12. 艙壁連接器

備考：若試驗計畫要求，待測設備外殼接地引線不應超過 150 mm

Figure 8 – Conducted emissions – Test layout for alternators and generators

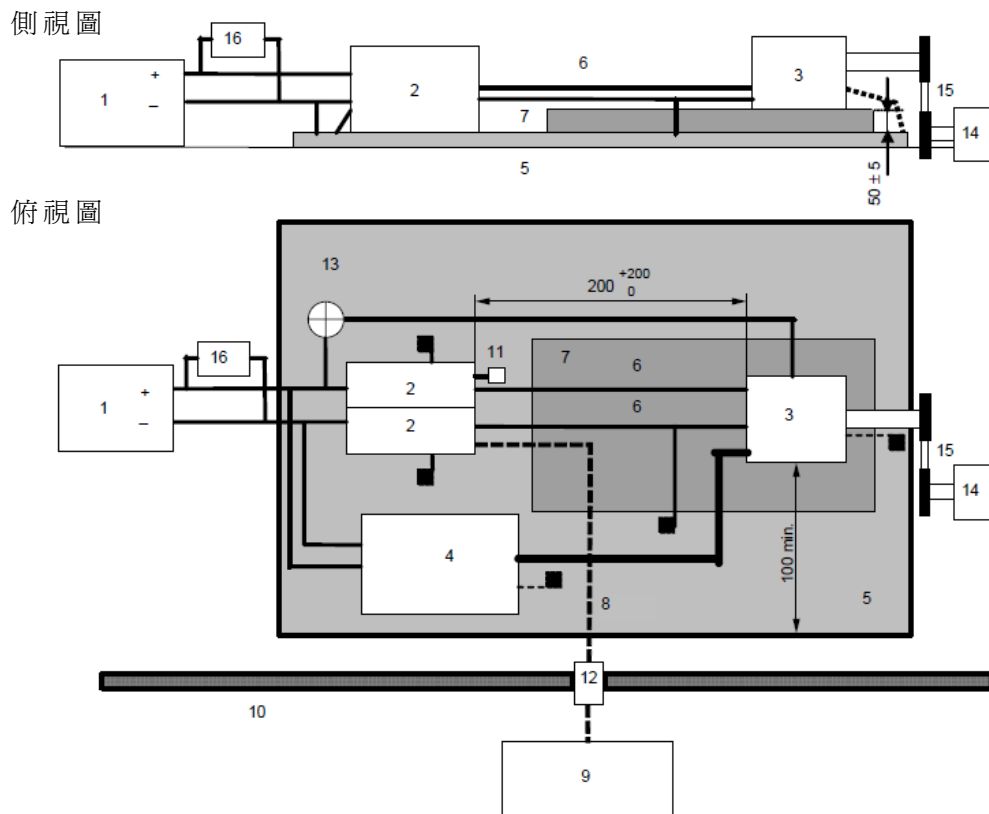


Key

- 1 Battery (may be placed on the ground plane)
 - 2 Artificial network
 - 3 EUT
 - 4 Load simulator (metallic casing grounded if required in test plan)
 - 5 Ground plane
 - 6 Power supply lines
 - 7 Low relative permittivity support ($\epsilon_r \leq 1,4$) – typically not installed
 - 8 High-quality coaxial cable e.g. double-shielded (50 Ω)
 - 9 Measuring instrument
 - 10 Shielded enclosure
 - 11 50 Ω load
 - 12 Bulkhead connector
 - 13 Indicator lamp/control resistor (if applicable)
 - 14 Motor (Air/Low Emissions)
 - 15 Non-conductive belt/coupler
 - 16 Load resistor
- NOTE The EUT housing ground lead, when required in the test plan, should not be longer than 150 mm.

圖 8 傳導發射—交流及直流發電機之試驗佈局

單位：mm，未依比例繪製



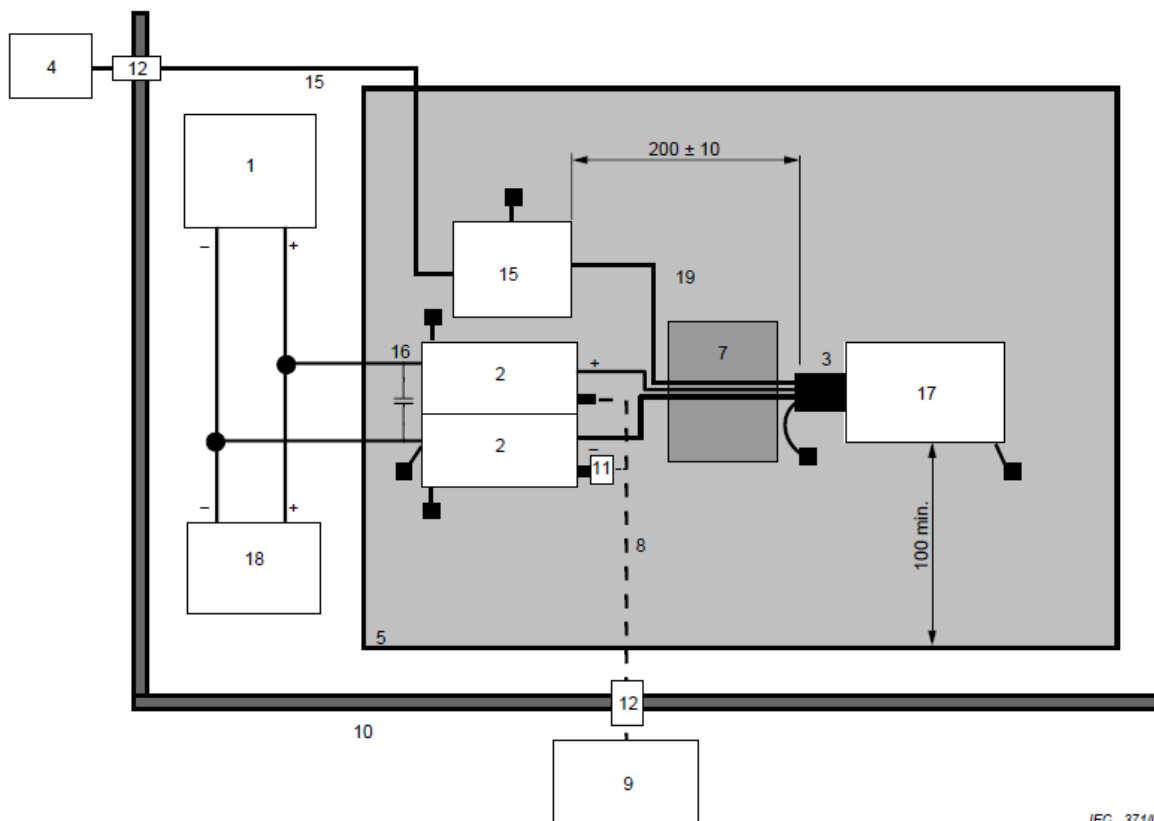
說明

1. 電瓶(可置於接地平面上)
2. 人工網路
3. 待測設備
4. 負載模擬器(若試驗計畫要求則金屬外殼接地)
5. 接地平面
6. 電源供應線
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)—典型不裝設
8. 高品質同軸纜線，如雙屏蔽線(50Ω)
9. 量測儀器
10. 屏蔽圍體
11. 50Ω 負載
12. 艙壁連接器
13. 指示燈/控制電阻(若適用)
14. 馬達(空氣/低發射)
15. 非導電性皮帶/耦合器
16. 負載電阻

備考：若試驗計畫要求，待測設備外殼接地引線不應超過 150 mm

Figure 9 – Conducted emissions – Test layout for ignition system components

Dimensions in millimetres – not to scale



IEC 371/08

Key

- 1 Power supply (may be placed on the ground plane)
- 2 Artificial network
- 3 Pencil coil
- 4 ECU simulator (metallic casing grounded if required in test plan)
- 5 Ground plane
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 High-quality coaxial cable e.g. double-shielded (50Ω)
- 9 Measuring instrument
- 10 Shielded enclosure
- 11 50Ω load
- 12 Bulkhead connector
- 15 Optical fibre converter
- 16 $1\ 000 \mu\text{F}$ capacitor
- 17 Engine simulator
- 18 Battery
- 19 Signal line

NOTE The pencil coil housing ground lead, when required in the test plan, should not be longer than 150 mm.

6.2.3 組件/模組傳導擾動之限制值—電壓法

The level class to be used (as a function of the frequency band) shall be agreed upon between the vehicle manufacturer and the component supplier. When using the provided limits, no correction factors for the AN shall be used.

使用之位準等級(為頻帶之函數)應由車輛製造商及組件供應商議定，當使用本標準限制值時，不應採用修正因子。

NOTE It is recommended for acceptable radio reception in a vehicle that the conducted noise should not exceed the values shown in Tables 5 and 6, peak and average or quasi-peak and average, respectively. Since the mounting location, vehicle body construction and harness design can affect the coupling of radio disturbances to the on-board radio, multiple limit levels are defined.

備考：為了讓車上無線電可以適當的接收，建議傳導雜訊不應超過表 5 及 6 之數值，分別為峰值及平均值，或準峰值及平均值。由於架設位置，車體結構及線束設計可影響無線電擾動至車載無線電之耦合，故定義數個限制值位準。

Table 5 – Examples of quasi-peak or peak limits for conducted disturbances – Voltage method

Service / Band	Frequency MHz	Levels in dB(μ V)									
		Class 1		Class 2		Class 3		Class 4		Class 5	
		Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak
BROADCAST											
LW	0,15 - 0,30	110	97	100	87	90	77	80	67	70	57
MW	0,53 - 1,8	86	73	78	65	70	57	62	49	54	41
SW	5,0 - 6,2	77	64	71	58	65	52	59	46	53	40
FM	76 - 108	62	49	56	43	50	37	44	31	38	25
TV Band I	41 - 88	58	-	52	-	46	-	40	-	34	-
TV Band III	174 - 230	Conducted emission – Voltage method Not applicable									
DAB III	171 - 245										
TV Band IV/V	468 - 944										
DTTV	470 - 770										
DAB L band	1447 - 1494										
SDARS	2320 - 2345										
MOBILE SERVICES											
CB	26 - 28	68	55	62	49	56	43	50	37	44	31
VHF	30 - 54	68	55	62	49	56	43	50	37	44	31
VHF	68 - 87	62	49	56	43	50	37	44	31	38	25
VHF	142 - 175	Conducted emission – Voltage method Not applicable									
Analogue UHF	380 - 512										
RKE	300 - 330										
RKE	420 - 450										
Analogue UHF	820 - 960										
GSM 800	860 - 895										
EGSM/GSM 900	925 - 960										
GPS L1 civil	1567 - 1583										
GSM 1800 (PCN)	1803 - 1882										
GSM 1900	1850 - 1990										
3G / IMT 2000	1900 - 1992										
3G / IMT 2000	2010 - 2025										
3G / IMT 2000	2108 - 2172										
Bluetooth/802.11	2400 - 2500										
NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.											
NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.											

表 5 傳導擾動之準峰值或峰值限制值範例—電壓法

服務/頻帶	頻率 MHz	位準，單位為 dB(μV)									
		等級 1		等級 2		等級 3		等級 4		等級 5	
		峰值	準峰值	峰值	準峰值	峰值	準峰值	峰值	準峰值	峰值	準峰值
廣播											
LW	0.15~0.30	110	97	100	87	90	77	80	67	70	57
MW	0.53~1.8	86	73	78	65	70	57	62	49	54	41
SW	5.9~6.2	77	64	71	58	65	52	59	46	53	40
FM	76~108	62	49	56	43	50	37	44	31	38	25
TV Band I	41~88	58	—	52	—	46	—	40	—	34	—
TV Band III	174~230	傳導發射—電壓法 不適用									
DAB III	171~245										
TV Band IV/V	468~944										
DTTV	470~770										
DAB L band	1447~1494										
SDARS	2320~2345										
行動服務											
CB	26~28	68	55	62	49	56	43	50	37	44	31
VHF	30~54	68	55	62	49	56	43	50	37	44	31
VHF	68~87	62	49	56	43	50	37	44	31	38	25
VHF ^b	142~175	傳導發射—電壓法 不適用									
Analogue UHF	380~512										
RKE	300~330										
RKE	420~450										
Analogue UHF	820~960										
GSM 800	860~895										
EGSM/GSM 900	925~960										
GPS L1 civil	1567~1583										
GSM 1800 (PCN)	1803~1882										
GSM 1900	1850~1990										
3G/IMT 2000	1900~1992										
3G/IMT 2000	2010~2025										
3G/IMT 2000	2108~2172										
Bluetooth/802.11	2400~2500										
備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。											
備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。											

Table 6 – Examples of average limits for conducted disturbances – Voltage method

Service / Band	Frequency MHz	Levels in dB(μ V)				
		Class 1	Class 2	Class 3	Class 4	Class 5
		AVG	AVG	AVG	AVG	AVG
BROADCAST						
LW	0,15 - 0,30	90	80	70	60	50
MW	0,53 - 1,8	66	58	50	42	34
SW	5,9 - 6,2	57	51	45	39	33
FM	76 - 108	42	36	30	24	18
TV Band I	41 - 88	48	42	36	30	24
TV Band III	174 - 230	Conducted emission – Voltage method Not applicable				
DAB III	171 - 245					
TV Band IV/V	468 - 944					
DTTV	470 - 770					
DAB L band	1447 - 1494					
SDARS	2320 - 2345					
MOBILE SERVICES						
CB	26 - 28	48	42	36	30	24
VHF	30 - 54	48	42	36	30	24
VHF	68 - 87	42	36	30	24	18
VHF	142 - 175	Conducted emission – Voltage method Not applicable				
Analogue UHF	380 - 512					
RKE	300 - 330					
RKE	420 - 450					
Analogue UHF	820 - 960					
GSM 800	880 - 895					
EGSM/GSM 900	925 - 960					
GPS L1 civil	1567 - 1583					
GSM 1800 (PCN)	1803 - 1882					
GSM 1900	1850 - 1990					
3G / IMT 2000	1900 - 1992					
3G / IMT 2000	2010 - 2025					
3G / IMT 2000	2108 - 2172					
Bluetooth/802.11	2400 - 2500					
NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.						
NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.						

表 6 傳導擾動之平均值限制值範例－電壓法

服務/頻帶	頻率 MHz	位準，單位為 dB(μV)				
		等級 1	等級 2	等級 3	等級 4	等級 5
		平均值	平均值	平均值	平均值	平均值
廣播						
LW	0.15~0.30	90	80	70	60	50
MW	0.53~1.8	66	58	50	42	34
SW	5.9~6.2	57	51	45	39	33
FM	76~108	42	36	30	24	18
TV Band I	41~88	48	42	36	30	24
TV Band III	174~230	傳導發射－電壓法 不適用				
DAB III	171~245					
TV Band IV/V	468~944					
DTTV	470~770					
DAB L band	1447~1494					
SDARS	2320~2345					
行動服務						
CB	26~28	48	42	36	30	24
VHF	30~54	48	42	36	30	24
VHF	68~87	42	36	30	24	18
VHF ^b	142~175	傳導發射－電壓法 不適用				
Analogue UHF	380~512					
RKE	300~330					
RKE	420~450					
Analogue UHF	820~960					
GSM 800	860~895					
EGSM/GSM 900	925~960					
GPS L1 civil	1567~1583					
GSM 1800 (PCN)	1803~1882					
GSM 1900	1850~1990					
3G/IMT 2000	1900~1992					
3G/IMT 2000	2010~2025					
3G/IMT 2000	2108~2172					
Bluetooth/802.11	2400~2500					
備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。						
備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。						

6.3 Conducted emissions from components/modules – current probe method

6.3 組件/模組之傳導發射－電流探棒法

6.3.1 Test set-up

6.3.1 試驗設置

6.3.1.1 Location of the EUT

6.3.1.1 待測設備之位置

The EUT shall be placed on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1.4$), at (50 ± 5) mm above the ground plane.

試驗設備應置於高於接地平面(50 ± 5) mm 之非導電性、低相對介電常數材

料($\epsilon_r \leq 1.4$)上。

The case of the EUT shall not be grounded to the ground plane unless it is intended to simulate the actual vehicle configuration.

待測設備之外殼不應接地至接地平面，除非為模擬實際之車輛組態。

The EUT shall be at least 100 mm from the edge of the ground plane. The test plan shall simulate the actual vehicle configuration and shall specify: remote versus local grounding, the use of an insulating spacer, and the electrical connection of the EUT case to the ground plane.

待測設備應距接地平面邊緣至少 100 mm，試驗計畫應模擬實際車輛組態並指定遠端或近端接地、絕緣板之使用，以及待測設備外殼至接地平面之電氣連接。

The measuring equipment shall be as shown in Figure 10.

量測設備應參照圖 10。

6.3.1.2 Location of the test harness

6.3.1.2 試驗線束之位置

The test harness shall be (1700^{+300}_0) mm long (or as agreed upon in the test plan), and shall be placed on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1.4$), positioned (50 ± 5) mm above the ground plane. The test harness wires shall be nominally parallel and adjacent unless otherwise defined in the test plan.

試驗線束長度應為 (1700^{+300}_0) mm (或議定於試驗計畫)，並置放在高於接地平面 (50 ± 5) mm 之非導電性、低相對介電常數材料 ($\epsilon_r \leq 1.4$) 上；試驗線束一般應平行且緊鄰，除非試驗計畫上另有定義。

6.3.2 Test procedure

6.3.2 試驗程序

The probe (see CISPR 16-1-2) shall be mounted around the complete harness (including all wires).

探棒(參照 CNS 13306-1-2)應架設環繞於全部線束(包含所有電線)。

Measure the emissions with the probe positioned 50 mm and 750 mm from the EUT.

將探棒置於離待測設備 50 mm 及 750 mm 之處以量測發射。

In most cases, the position of maximum emission will be as close to the EUT connector as possible. Where the EUT is equipped with a metal shell connector, the probe shall be clamped to the cable immediately adjacent to the connector shell, but not around the connector shell itself. The EUT and all parts of the test set-up shall be a minimum of 100 mm from the edge of the ground plane.

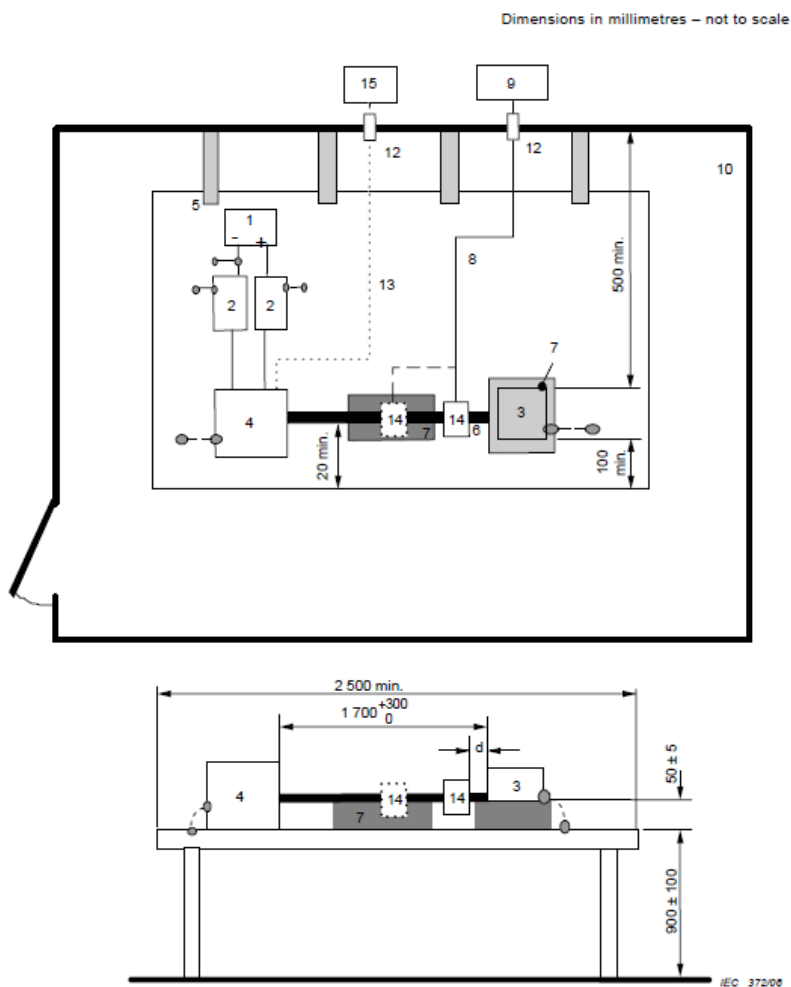
在多數狀況下，最大發射的位置會非常靠近待測設備連接器；由於待測設備具金屬外殼連接器，探棒應夾在緊鄰連接器外殼之纜線處，而非環繞於連接器外

殼本身，試驗設置中之待測設備及所有零件應距接地平面邊緣至少 100 mm。

NOTE Some additional measurements may be defined in the test plan with only the positive supply wire in the probe and/or only the negative supply wire in the probe. For these test configurations limits should be defined in the test plan.

備考：某些額外量測可定義於試驗計畫中，僅以探棒環繞正極電源線或僅以探棒環繞負極電源線，這些試驗組態之限制值須定義於試驗計畫。

Figure 10 – Conducted emissions – Example of test layout for current probe measurements

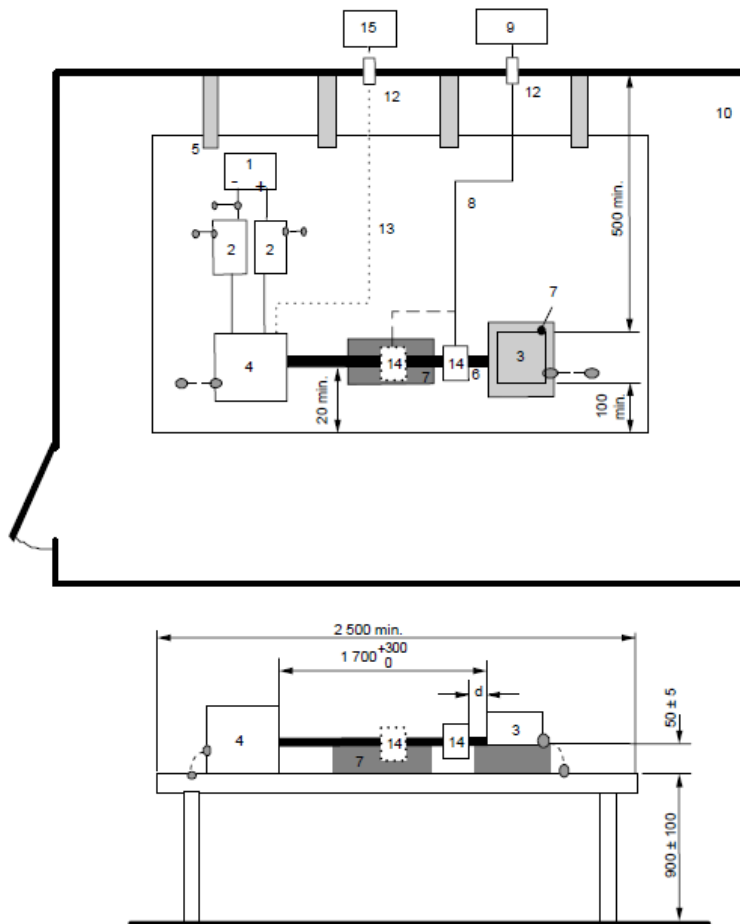


Key

- 1 Power supply
- 2 Artificial network
- 3 EUT (connected to ground if specified in the test plan)
- 4 Load simulator (placement and ground connection according to ISO 11452-4)
- 5 Ground plane
- 6 Wiring harness
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 High-quality coaxial cable e.g. double-shielded (50Ω)
- 9 Measuring instrument
- 10 Shielded enclosure
- 12 Bulkhead connector
- 13 Optical fibers
- 14 Current probe (represented at 2 positions)
- 15 Stimulation and monitoring system
- d The distance from the EUT to the closest probe position

圖 10 傳導發射—電流探棒量測之試驗佈局範例

單位：mm，未依比例繪製



說明

1. 電源供應器
2. 人工網路
3. 待測設備(若試驗計畫要求則外殼接地)
4. 負載模擬器(置放及接地連接參照 CNS 15207-4)
5. 接地平面
6. 線束
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 高品質同軸纜線，如雙屏蔽線(50 Ω)
9. 量測儀器
10. 屏蔽圍體
12. 艙壁連接器
13. 光纖
14. 電流探棒(表示 2 個位置)
15. 啟動及監控系統

^d 待測設備至探棒最近位置之距離

6.3.3 Limits for conducted disturbances from components/modules – Current probe method

6.3.3 組件/模組傳導擾動之限制值—電流探棒法

The level class to be used (as a function of the frequency band) shall be agreed upon between the vehicle manufacturer and the component supplier.

使用之位準等級(為頻帶之函數)應由車輛製造商及組件供應商議定。

NOTE It is recommended for acceptable radio reception in a vehicle that the conducted noise should not exceed the values shown in Tables 7 and 8, peak and average or quasi-peak and average limits, respectively. Since the mounting location, vehicle body construction and harness design can affect the coupling of radio disturbances to the on-board radio, multiple limit levels are defined.

備考：此處建議車輛上可接受的無線電接收，其輻射雜訊不應超過表 7 及 8 之數值，分別為峰值及平均值，或準峰值及平均值。由於架設位置，車體結構及線束設計可影響無線電擾動至車載無線電之耦合，故定義數個限制值位準。

Table 7 – Examples of quasi-peak and peak limits for conducted disturbances –
Control/signal lines – Current probe method

Service / Band	Frequency MHz	Levels in dB(µA)									
		Class 1		Class 2		Class 3		Class 4		Class 5	
		Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak
BROADCAST											
LW	0,15 - 0,30	90	77	80	67	70	57	60	47	50	37
MW	0,53 - 1,8	58	45	50	37	42	29	34	21	28	13
SW	5,9 - 6,2	43	30	37	24	31	18	25	12	19	6
FM	76 - 108	28	15	22	9	16	3	10	-3	4	-9
TV Band I	41 - 88	24	-	18	-	12	-	6	-	0	-
TV Band III	174 - 230	Conducted emission – control/signal lines Not applicable									
DAB III	171 - 245										
TV Band IV/V	468 - 944										
DTTV	470 - 770										
DAB L band	1447 - 1494										
SDARS	2320 - 2345										
MOBILE SERVICES											
CB	26 - 28	34	21	28	15	22	9	16	3	10	-3
VHF	30 - 54	34	21	28	15	22	9	16	3	10	-3
VHF	68 - 87	28	15	22	9	16	3	10	-3	4	-9
VHF	142 - 175	Conducted emission – control/signal lines Not applicable									
Analogue UHF	380 - 512										
RKE	300 - 330										
RKE	420 - 450										
Analogue UHF	820 - 960										
GSM 800	860 - 895										
EGSM/GSM 900	925 - 960										
GPS L1 civil	1567 - 1583										
GSM 1800 (PCN)	1803 - 1882										
GSM 1900	1850 - 1990										
3G / IMT 2000	1900 - 1992										
3G / IMT 2000	2010 - 2025										
3G / IMT 2000	2108 - 2172										
Bluetooth/802.11	2400 - 2500										
<p>NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.</p> <p>NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.</p>											

表 7 傳導擾動之準峰值或峰值限制值範例—控制/信號線—電流探棒法

服務/頻帶	頻率 MHz	位準，單位為 dB(μ A)									
		等級 1		等級 2		等級 3		等級 4		等級 5	
		峰值	準峰 值	峰值	準峰 值	峰值	準峰 值	峰值	準峰 值	峰值	準峰 值
廣播											
LW	0.15~0.30	90	77	80	67	70	57	60	47	50	37
MW	0.53~1.8	58	45	50	37	42	29	34	21	26	13
SW	5.9~6.2	43	30	37	24	31	18	25	12	19	6
FM	76~108	28	15	22	9	16	3	10	-3	4	-9
TV Band I	41~88	24	—	18	—	12	—	6	—	0	—
TV Band III	174~230	傳導發射—控制/信號線 不適用									
DAB III	171~245										
TV Band IV/V	468~944										
DTTV	470~770										
DAB L band	1447~1494										
SDARS	2320~2345										
行動服務											
CB	26~28	34	21	28	15	22	9	16	3	10	-3
VHF	30~54	34	21	28	15	22	9	16	3	10	-3
VHF	68~87	28	15	22	9	16	3	10	-3	4	-9
VHF ^b	142~175	傳導發射—控制/信號線 不適用									
Analogue UHF	380~512										
RKE	300~330										
RKE	420~450										
Analogue UHF	820~960										
GSM 800	860~895										
EGSM/GSM 900	925~960										
GPS L1 civil	1567~1583										
GSM 1800 (PCN)	1803~1882										
GSM 1900	1850~1990										
3G/IMT 2000	1900~1992										
3G/IMT 2000	2010~2025										
3G/IMT 2000	2108~2172										
Bluetooth/802.11	2400~2500										

備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。

備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。

Table 8 – Examples of average limits for conducted disturbances – Control/signal lines – Current probe method

Service / Band	Frequency MHz	Levels in dB(μA)				
		Class 1	Class 2	Class 3	Class 4	Class 5
		AVG	AVG	AVG	AVG	AVG
BROADCAST						
LW	0,15 - 0,30	70	60	50	40	30
MW	0,53 - 1,8	38	30	22	14	6
SW	5,9 - 6,2	23	17	11	5	-1
FM	76 - 108	8	2	-4	-10	-16
TV Band I	41 - 88	14	8	2	-4	-10
TV Band III	174 - 230	Conducted emission – control/signal lines Not applicable				
DAB III	171 - 245					
TV Band IV/V	468 - 944					
DTTV	470 - 770					
DAB L band	1447 - 1494					
SDARS	2320 - 2345					
MOBILE SERVICES						
CB	26 - 28	14	8	2	-4	-10
VHF	30 - 54	14	8	2	-4	-10
VHF	68 - 87	8	2	-4	-10	-16
VHF	142 - 175	Conducted emission – control/signal lines Not applicable				
Analogue UHF	380 - 512					
RKE	300 - 330					
RKE	420 - 450					
Analogue UHF	820 - 960					
GSM 800	880 - 895					
EGSM/GSM 900	925 - 960					
GPS L1 civil	1567 – 1583					
GSM 1800 (PCN)	1803 - 1882					
GSM 1900	1850 - 1990					
3G	1900 - 1992					
3G	2010 - 2025					
3G	2108 - 2172					
Bluetooth/802.11	2400 - 2500					
<p>NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.</p> <p>NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.</p>						

表 8 傳導擾動之平均值限制值範例—控制/信號線—電流探棒法

服務/頻帶	頻率 MHz	位準，單位為 dB(μ A)				
		等級 1	等級 2	等級 3	等級 4	等級 5
		平均值	平均值	平均值	平均值	平均值
廣播						
LW	0.15~0.30	70	60	50	40	30
MW	0.53~1.8	38	30	22	14	6
SW	5.9~6.2	23	17	11	5	-1
FM	76~108	8	2	-4	-10	-16
TV Band I	41~88	14	8	2	-4	-10
TV Band III	174~230	傳導發射—控制/信號線 不適用				
DAB III	171~245					
TV Band IV/V	468~944					
DTTV	470~770					
DAB L band	1447~1494					
SDARS	2320~2345					
行動服務						
CB	26~28	14	8	2	-4	-10
VHF	30~54	14	8	2	-4	-10
VHF	68~87	8	2	-4	-10	-16
VHF ^b	142~175	傳導發射—控制/信號線 不適用				
Analogue UHF	380~512					
RKE	300~330					
RKE	420~450					
Analogue UHF	820~960					
GSM 800	860~895					
EGSM/GSM 900	925~960					
GPS L1 civil	1567~1583					
GSM 1800 (PCN)	1803~1882					
GSM 1900	1850~1990					
3G/IMT 2000	1900~1992					
3G/IMT 2000	2010~2025					
3G/IMT 2000	2108~2172					
Bluetooth/802.11	2400~2500					
備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。						
備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。						

6.4 Radiated emissions from components/modules - ALSE method

6.4 組件/模組之輻射發射—內襯吸波材料屏蔽圍體法

6.4.1 General

6.4.1 通則

Measurements of radiated field strength shall be made in an ALSE to eliminate the high levels of extraneous disturbance from electrical equipment and broadcasting stations.

輻射場強之量測應於內襯吸波材料屏蔽圍體內執行，以消除來自外部電氣設備及廣播電台之高位準擾動。

NOTE 1 Conducted emissions will contribute to the radiated emissions

measurements because of radiation from the wiring in the test set-up. Therefore, it is advisable to establish conformance with the conducted emissions requirements before performing the radiated emissions test.

備考 1. 由於來自試驗設置佈線之輻射，傳導發射對輻射發射量測將產生貢獻，因此建議於輻射發射試驗執行前確認傳導發射符合要求。

NOTE 2 Disturbance to the vehicle on-board receiver can be caused by direct radiation from one or more leads in the vehicle wiring harness. This coupling mode to the vehicle receiver affects both the type of testing and the means of reducing the disturbance at the source.

備考 2. 來自線束中之一或數條引線之直接輻射可引起車載接收機的擾動，車載接收機之耦合模式對於試驗類型及降低擾動源之方式皆有影響。

NOTE 3 Vehicle components which are not effectively grounded to the vehicle by short ground leads, or which have several harness leads carrying the disturbance voltage, will have radiated emissions that do not correlate well with its conducted emissions. This has been shown to give better correlation with the complete vehicle test for components installed in this way.

備考 3. 未以短接地引線有效接地至車輛，或是其數條線束引線帶有擾動電壓之車輛組件，其輻射發射未必與傳導發射具良好相關，但已被證實在相同方法安裝下，與該組件之整車試驗具較好的相關性。

Examples of component installations for which this test is applicable include, but are not limited to:

- electronic control systems containing microprocessors;
- two speed wiper motors with negative supply switching;
- suspension control systems with strut-mounted actuator motors;
- engine cooling and heater blower motors mounted in plastic or other insulated housings.

以下為適用本試驗之組件安裝範例，但不限於此：

- 包含微處理器之電子控制系統；
- 具負極電源開關之二段兩刷馬達；
- 支柱桿內含致動馬達之懸吊控制系統；
- 裝在塑膠或其他絕緣箱內之引擎冷卻及暖氣鼓風機馬達。

6.4.2 Test set-up

6.4.2 試驗設置

For radiated emissions measurements, the arrangement of the EUT, test harness, load simulator and measuring equipment shall be equivalent to the examples shown in Figures 12 to 15.

對於輻射發射量測，其待測設備、試驗線束、負載模擬器及量測設備應等同圖 12~15 所示之範例。

6.4.2.1 Antenna systems

6.4.2.1 天線系統

Measurements shall be made using linearly polarised electric field antennas that have a nominal 50 Ω output impedance.

應使用具 50 Ω 標稱輸出阻抗之線性極化電場天線執行量測。

NOTE 1 To improve consistency of results between laboratories, the following antennas are recommended:

- a) 0,15 MHz to 30 MHz 1 m vertical monopole (where this is not 50 Ω , a suitable antenna matching unit must be used);
- b) 30 MHz to 300 MHz a biconical antenna;
- c) 200 MHz to 1 000 MHz a log-periodic antenna;
- d) 1 000 MHz to 2 500 MHz a horn or log-periodic antenna.

備考 1. 為提高實驗室間試驗結果之一致性，建議使用下列天線：

- (a) 0,15 MHz~30 MHz 使用 1 m 垂直單極天線(若非 50 Ω ，須使用適當之天線匹配單元)
- (b) 30 MHz~300 MHz 使用雙錐形天線；
- (c) 200 MHz~1 000 MHz 使用對數週期天線；
- (d) 1 000 MHz~2 500 MHz 使用號角或對數週期天線。

The method to be used for characterization of the vertical monopole (rod) antenna is given in CISPR 16-1-4.

用於確認垂直單極(桿型)天線特性之方法參照 CNS 13306-1-4。

NOTE 2 Use the 1 m method in SAE ARP 958.1 Rev D February 2003 for determining biconical, log-periodic and horn antenna factors.

備考 2. 使用 SAE ARP 958.1(版別 D，2003 年 2 月)之 1 m 方法判定雙錐形、對數週期及號角天線因子。

NOTE 3 Biconical antennas usually have a SWR of up to 10:1 in the frequency range of 30 MHz to 80 MHz. Therefore an additional measurement error may occur when the receiver input impedance differs from 50 Ω . The use of an attenuator (3 dB minimum) at the receiver's input or the input of an additional preamplifier (if possible) will keep this additional error low.

備考 3. 雙錐形天線在 30 MHz~80 MHz 之駐波比(SWR)通常可達 10:1，因此接收機輸入阻抗非 50 Ω 時可能產生額外之量測誤差，在接收機輸入端，或額外之前置放大器輸入端使用衰減器(最小 3 dB)，將可維持低的額外誤差。

6.4.2.2 Antenna matching unit for monopole antenna

6.4.2.2 單極天線之天線匹配單元

Correct impedance matching between the antenna and the measuring instrument of 50 Ω shall be maintained in the frequency ranges selected for the test. There shall be a maximum SWR of 2:1 at the output port of the matching unit. Appropriate correction shall be made for any attenuation/gain of the antenna

system from the antenna to the receiver.

應在天線及量測設備間，於試驗選定之頻率範圍維持 $50\ \Omega$ 之阻抗匹配修正，令匹配單元輸出埠之最大駐波比為 2:1，且應為天線及接收機間之天線系統的任何衰減/增益做適當修正。

NOTE Care should be taken to ensure that input voltages do not exceed the pulse input rating of the unit or overloading may occur. This is particularly important when active matching units are used.

備考：須謹慎以確保輸入電壓未超過單元之額定輸入脈衝，以致可能發生過載，在使用主動匹配單元時尤其重要。

6.4.2.3 Location of the EUT

6.4.2.3 待測設備之位置

The EUT shall be placed on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1.4$), at (50 ± 5) mm above the ground plane.

待測設備應置於高於接地平面 (50 ± 5) mm 之非導電性、低相對介電常數材料 ($\epsilon_r \leq 1.4$) 上。

The case of the EUT shall not be grounded to the ground plane unless it is intended to simulate the actual vehicle configuration.

待測設備之外殼不應接地至接地平面，除非為模擬實際之車輛組態。

The side of the EUT, which is nearest to the front edge of the ground plane, shall be located at a distance of (200 ± 10) mm from the front edge of the ground plane.

待測設備最接近接地平面前緣之一邊，應與接地平面前緣距 (200 ± 10) mm。

6.4.2.4 Test harness and location

6.4.2.4 試驗線束及其位置

The total length of the test harness between the EUT and the load simulator (or the RF boundary) shall not exceed 2 000 mm (or as defined in the test plan).

The wiring type is defined by the actual system application and requirement.

待測設備及負載模擬器(或射頻邊界)之試驗線束總長應不超過 2000 mm(或依測試計畫定義)，並依實際系統應用及要求以定義佈線類型。

The test harness shall be placed on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1.4$), at (50 ± 5) mm above the ground plane.

試驗線束應置於高於接地平面 (50 ± 5) mm 之非導電性、低相對介電常數材料 ($\epsilon_r \leq 1.4$) 上。

The length of test harness parallel to the front of the ground plane shall be (1500 ± 75) mm.

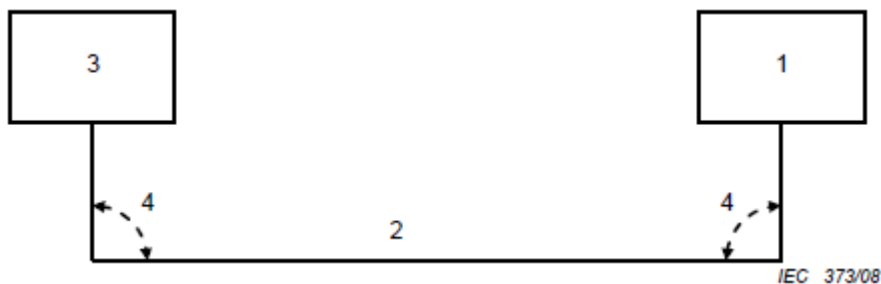
平行接地平面前緣之線束長度應為 (1500 ± 75) mm。

The long segment of test harness shall be located parallel to the edge of the ground plane facing the antenna at a distance of (100 ± 10) mm from the edge.

Location of the EUT and load simulator requires that the harness bend angle shall be (90^{+45}_0) degrees as shown in Figure 11.

試驗線束之長邊應與接地平面邊緣平行，朝向天線且距邊緣 (100 ± 10) mm，並要求待測設備及負載模擬器之位置應與線束呈 (90^{+45}_0) 度彎角，如圖 11 所示。

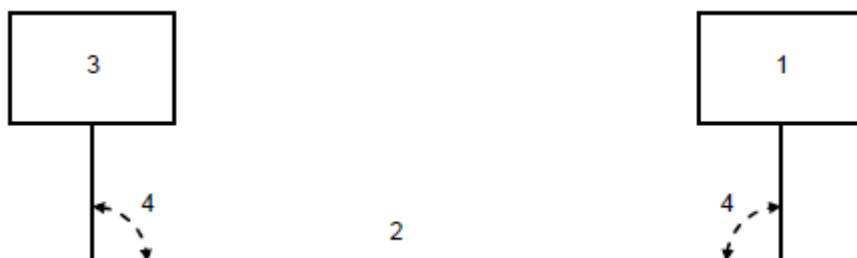
Figure 11 – Test harness bending requirements



Key

- 1 EUT
- 2 Test harness
- 3 Load simulator
- 4 Angle (90^{+45}_0) degrees

圖 11 試驗線束彎角要求



說明

- 1. 待測設備
- 2. 試驗線束
- 3. 負載模擬器
- 4. (90^{+45}_0) 度角

6.4.2.5 Location of the load simulator

Preferably, the load simulator shall be placed directly on the ground plane. If the load simulator has a metallic case, this case shall be bonded to the ground plane.

負載模擬器應直接置於接地平面上為佳，若負載模擬器具金屬外殼，該外殼應與接地平面搭接。

Alternatively, the load simulator may be located adjacent to the ground plane (with the case of the load simulator bonded to the ground plane) or outside of the test chamber, provided the test harness from the EUT passes through an RF boundary bonded to the ground plane.

或者，負載模擬器可置於鄰近接地平面處(負載模擬器之外殼連搭接至接地平面)，或提供由待測設備經射頻邊界之試驗線束，於試驗室外搭接至接地平面。

When the load simulator is located on the ground plane, the d.c. power supply lines of the load simulator shall be connected through the AN(s).

當負載模擬器置於接地平面，負載模擬器之直流電源供應線應經由人工網路連接。

6.4.2.6 Location of the measuring antenna

6.4.2.6 量測天線之位置

The phase centre of the measuring antenna shall be (100 ± 10) mm above the ground plane for the biconical, log-periodic and horn antennas.

對於雙錐形、對數週期及號角天線，量測天線之相位中心應高於接地平面 (100 ± 10) mm。

The height of the counterpoise of the rod antenna shall be $(+10 / -20)$ mm relative to the ground plane and shall be bonded to the ground plane.

桿型天線之地網高度應相對於接地平面 $(+10 / -20)$ mm，並應與接地平面搭接。

For radiated emissions tests, the shielded enclosure shall be of sufficient size to ensure that neither the EUT nor the test antenna shall be closer than 1 m from the walls or ceiling, or to the nearest surface of the absorber material used thereon. No part of any antenna radiating element shall be closer than 250 mm to the floor.

對於輻射發射試驗，屏蔽圍體應具足夠尺寸，以確保待測設備及試驗天線距牆面、天花板或所用吸波材料最近表面不小於 1 m，且任何天線輻射元件距地板不應小於 250 mm。

The distance between the longitudinal part (1 500 mm length) of the wiring harness and the reference point of the antenna shall be $(1\ 000 \pm 10)$ mm.

線束佈線之縱軸部分(長度 1500 mm)與天線參考點間之距離應為 (1000 ± 10) mm。

The reference point of the antenna is defined as:

- the vertical monopole element for rod antennas,
- the phase centre (mid-point) for biconical antennas,
- the tip for antennas with log-periodic elements (including biconilog antennas),
- the front aperture for horn antennas.

天線之參考點定義如下：

- 桿型天線之垂直單極元件，

- 雙錐形天線之相位中心(中點) ,
- 具對數週期元件之天線尖端(包含雙錐對數天線)
- 號角天線之前方孔徑。

Each antenna (excluding the rod antenna) shall be calibrated for this reference point for a 1 000 mm measuring distance.

各天線(不含桿型天線)應於距參考點 1000 mm 之量測距離做校正。

NOTE 1 The rod antenna is excluded because calibration is achieved by using the method defined in CISPR 16-1-4.

備考 1. 由於桿型天線使用 CNS 13306-1-4 定義之方法執行校正，故不適用本方法。

The phase centre of the antenna shall be in line with the centre of the longitudinal part of the wiring harness for frequencies up to 1 000 MHz.

至頻率上限 1000 MHz，天線之相位中心應正對線束佈線之縱軸部分中心。

The phase center of the antenna for frequencies above 1 000 MHz shall be in line with the EUT.

頻率高於 1000 MHz 時，天線之相位中心應正對試驗設備。

NOTE 2 The users of this standard should be aware that antenna manufacturers may give:

- Independent antenna factors for horizontal and vertical polarisations: in this case the appropriate antenna factor should be used for measurement in each polarisation.
- A single antenna factor: in this case this antenna factor should be used for measurements in both polarisations.

備考 2. 本標準之使用者須留意天線製造商可提供下列資訊：

- 水平及垂直極化之獨立天線因子：若此，須使用適當之天線因子做各極化之量測。
- 單一天線因子：若此，該天線因子須用於二種極化之量測。

6.4.3 Test procedure

6.4.3 試驗程序

The general arrangement of the disturbance source and connecting harnesses, etc. represents a standardised test condition. Any deviations from the standard test harness length, etc. shall be agreed upon prior to testing and recorded in the test report.

擾動源及連接線束等一般配置為標準試驗條件，任何標準試驗線束長度等之偏差，應於試驗前協議，且記錄於試驗報告中。

The EUT shall be made to operate under typical loading and other conditions as in the vehicle such that the maximum emission state occurs. These operating conditions shall be clearly defined in the test plan to ensure supplier and customer can perform identical tests. The orientation(s) of the EUT for radiated

emission measurements shall be defined in the test plan.

待測設備應可於典型負載及其他車上相同條件下操作，以令最大發射狀態產生，這些操作條件需於試驗計畫上清楚定義，以確保供應商及客戶執行等同之試驗，試驗計畫上亦應定義試驗設備在輻射發射量測之方位。

From 150 kHz to 30 MHz measurements shall be performed in vertical polarisation only.

150 kHz~ 30 MHz 之量測應僅執行垂直極化。

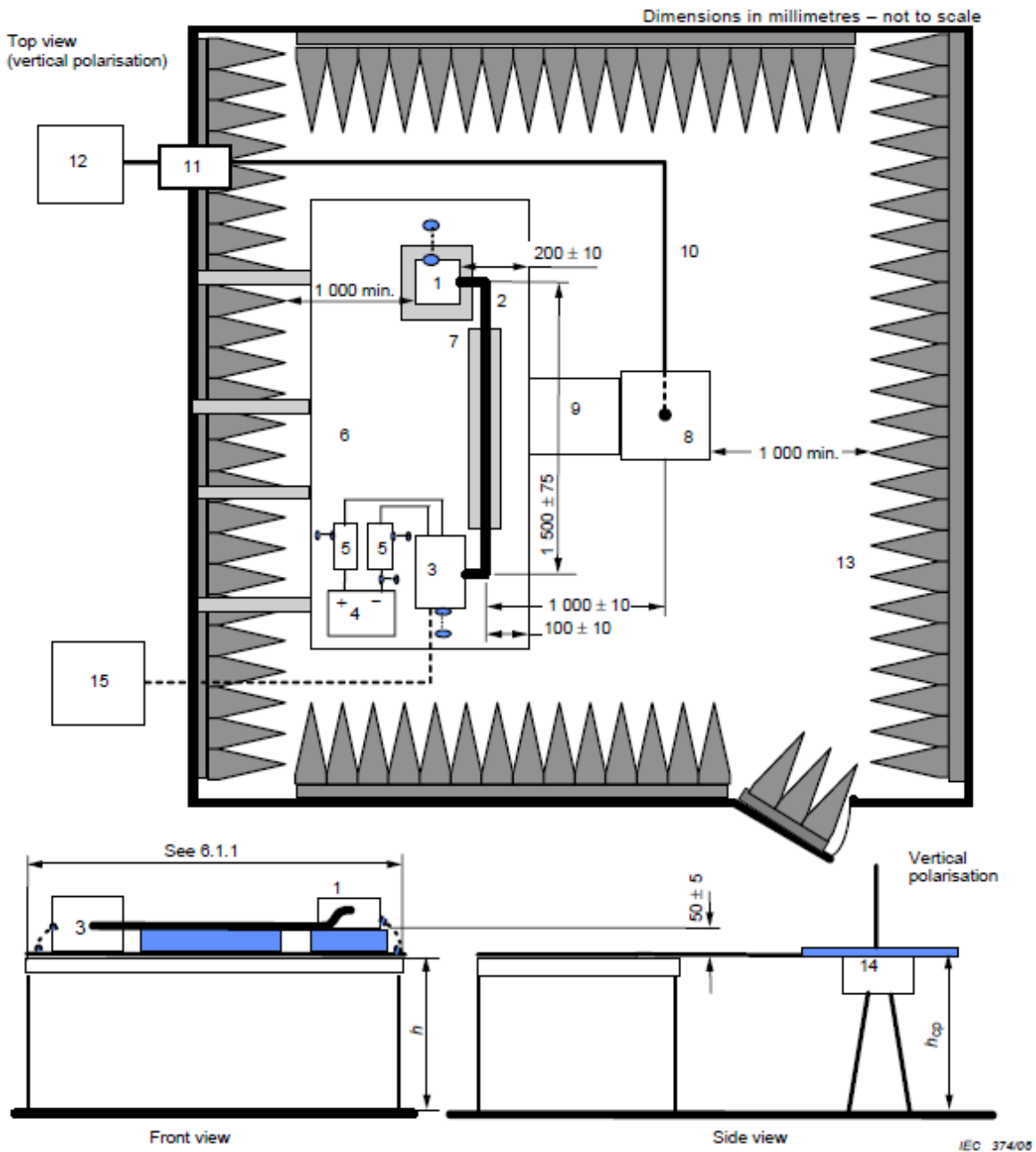
From 30 MHz to 2 500 MHz measurements shall be performed in vertical and horizontal polarisations.

30 MHz~2 500 MHz 之量測應執行垂直及水平極化。

For radiated emission measurements, the arrangement of the EUT and measuring equipment shall be functionally equivalent to the examples shown in Figures 12 to 15.

對於輻射發射量測，待測設備及量測設備之配置應與圖 12~15 所示之範例在功能上等同。

Figure 12 – Example of test set-up – rod antenna



Key

- 1 EUT (grounded locally if required in test plan)
- 2 Test harness
- 3 Load simulator (placement and ground connection according to 6.4.2.5)
- 4 Power supply (location optional)
- 5 Artificial network (AN)
- 6 Ground plane (bonded to shielded enclosure)
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 Rod antenna with counterpoise (dimensions: 600 mm by 600 mm typical)
- $h = (900 \pm 100) \text{ mm}$
- $h_{cp} = h + (+10 / -20) \text{ mm}$
- 9 Grounding connection (full width bond between counterpoise and ground plane)
- 10 High-quality coaxial cable e.g. double-shielded (50 Ω)

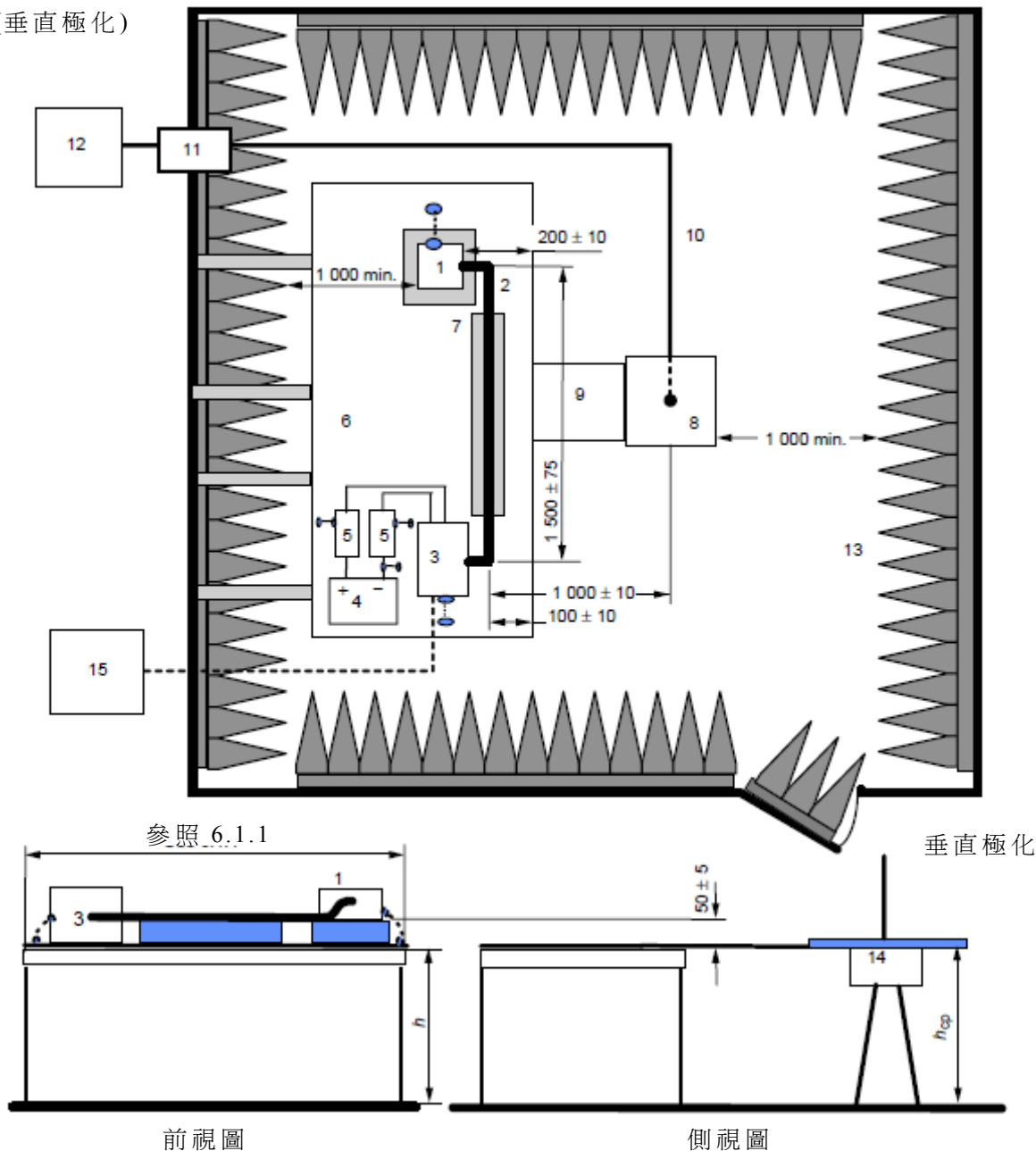
- 11 Bulkhead connector
- 12 Measuring instrument
- 13 RF absorber material
- 14 Antenna matching unit (the preferred location is below the counterpoise; if above the counterpoise then the base of the antenna rod shall be at the height of the ground plane)
- 15 Stimulation and monitoring system

圖 12 試驗設置範例一桿形天線

俯視圖

單位：mm，未依比例繪製

(垂直極化)



說明

1. 待測設備(若試驗計畫要求則近端接地)
2. 試驗線束
3. 負載模擬器(置放及接地連接參照 6.4.2.5)
4. 電源供應器(位置可選擇)
5. 人工網路(AN)
6. 接地平面(搭接至屏蔽圍體)
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 具地網之桿型天線(典型大小為 600 mm X 600 mm)

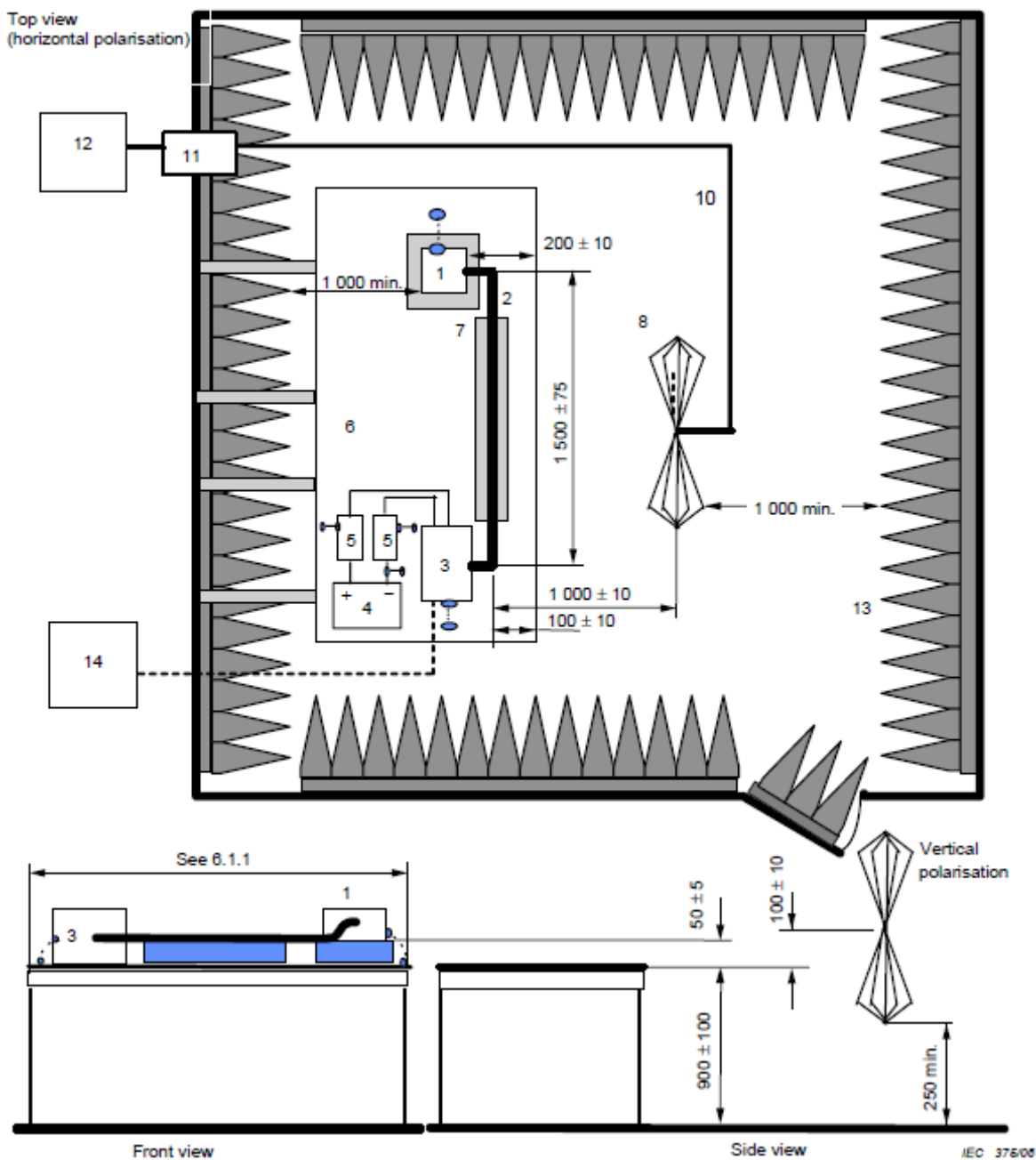
$$h = (900 \pm 100) \text{ mm}$$

$$h_{cp} = h + (+10 / -20) \text{ mm}$$

9. 接地連接(整個寬度搭接於地網及接地平面間)
10. 高品質同軸纜線，如雙屏蔽線(50 Ω)
11. 艙壁連接器
12. 量測儀器
13. 射頻吸波材料
14. 天線匹配單元(置於地網下方為佳；若於地網上方，則天線桿基座應與接地平面等高)
15. 啟動及監控系統

Figure 13 – Example of test set-up – biconical antenna

Dimensions in millimetres – not to scale



Key

- 1 EUT (grounded locally if required in test plan)
- 2 Test harness
- 3 Load simulator (placement and ground connection according to 6.4.2.5)
- 4 Power supply (location optional)
- 5 Artificial network (AN)
- 6 Ground plane (bonded to shielded enclosure)
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 Biconical antenna
- 10 High-quality coaxial cable e.g. double-shielded (50Ω)
- 11 Bulkhead connector

12 Measuring instrument

13 RF absorber material

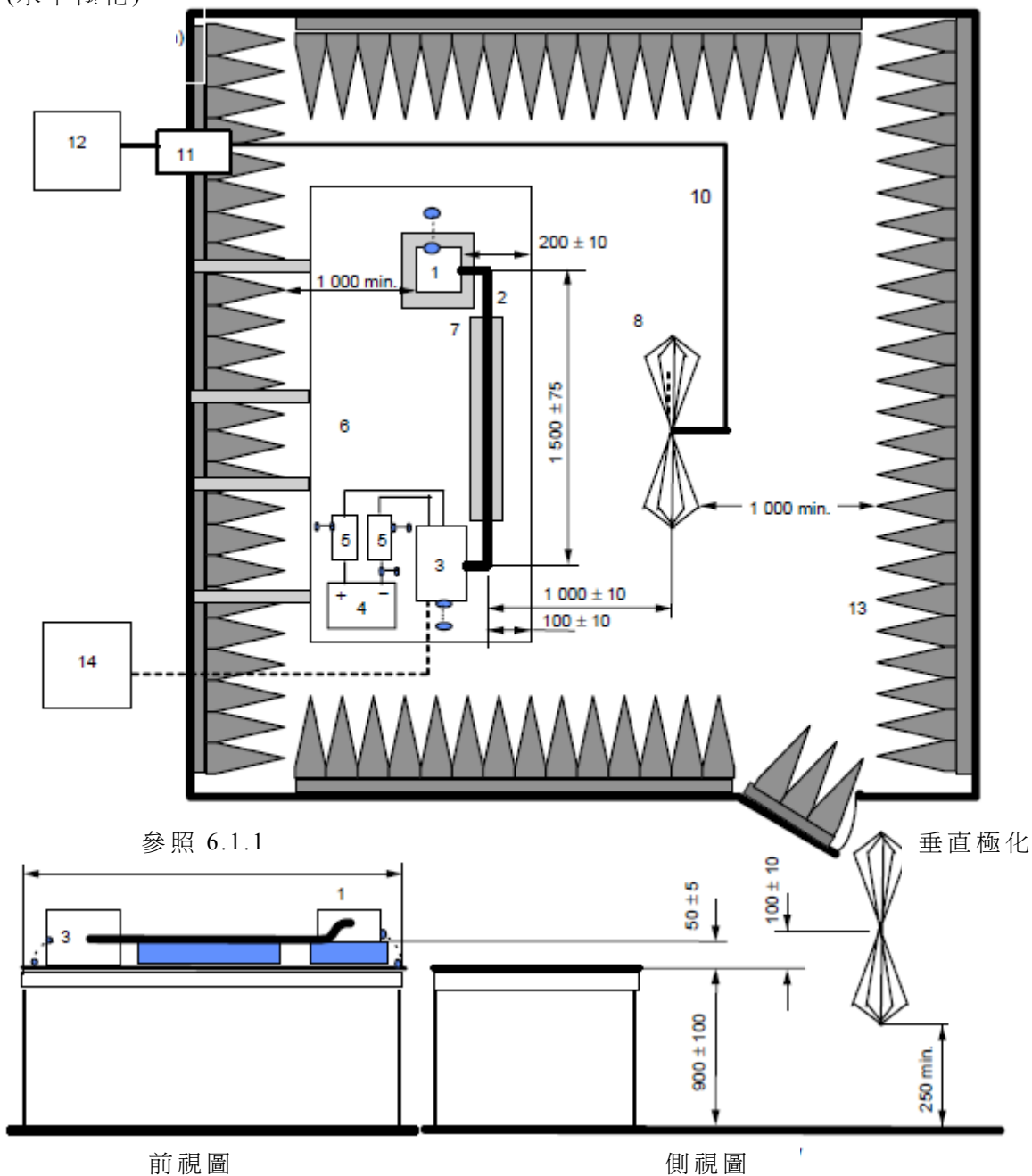
14 Stimulation and monitoring system

圖 13 試驗設置範例—雙錐形天線

俯視圖

單位：mm，未依比例繪製

(水平極化)



參照 6.1.1

垂直極化

前視圖

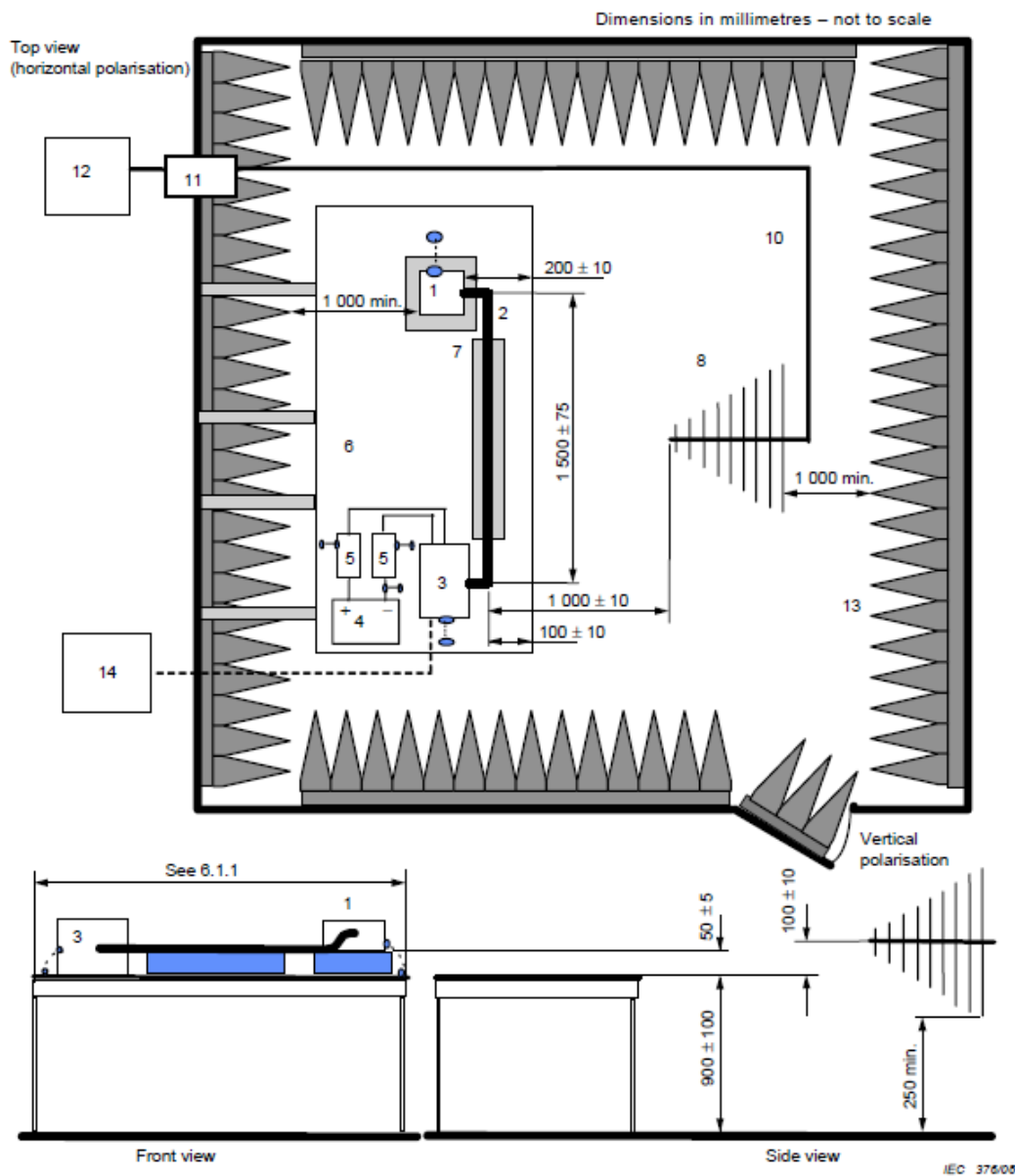
側視圖

說明

1. 待測設備(若試驗計畫要求則近端接地)
2. 試驗線束
3. 負載模擬器(置放及接地連接參照 6.4.2.5)
4. 電源供應器(位置可選擇)
5. 人工網路(AN)
6. 接地平面(搭接至屏蔽圍體)
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 雙錐形天線
10. 高品質同軸纜線，如雙屏蔽線(50 Ω)

11. 艙壁連接器
12. 量測儀器
13. 射頻吸波材料
14. 啟動及監控系統

Figure 14 – Example of test set-up – log-periodic antenna



Key

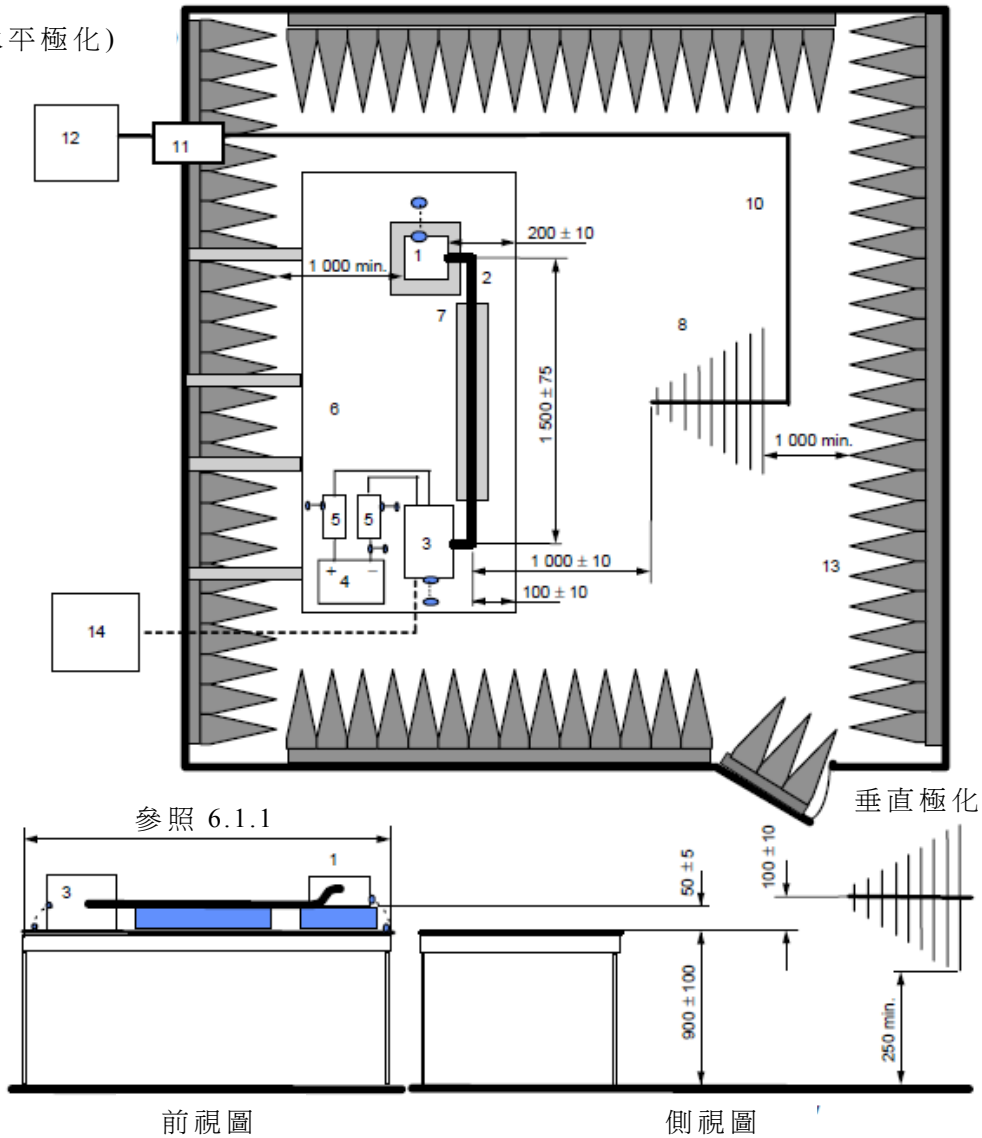
- 1 EUT (grounded locally if required in test plan)
- 2 Test harness
- 3 Load simulator (placement and ground connection according to 6.4.2.5)
- 4 Power supply (location optional)
- 5 Artificial network (AN)
- 6 Ground plane (bonded to shielded enclosure)
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 Log-periodic antenna
- 10 High-quality coaxial cable e.g. double-shielded (50Ω)
- 11 Bulkhead connector
- 12 Measuring instrument
- 13 RF absorber material
- 14 Stimulation and monitoring system

圖 14 試驗設置範例—對數週期天線

俯視圖

單位：mm，未依比例繪製

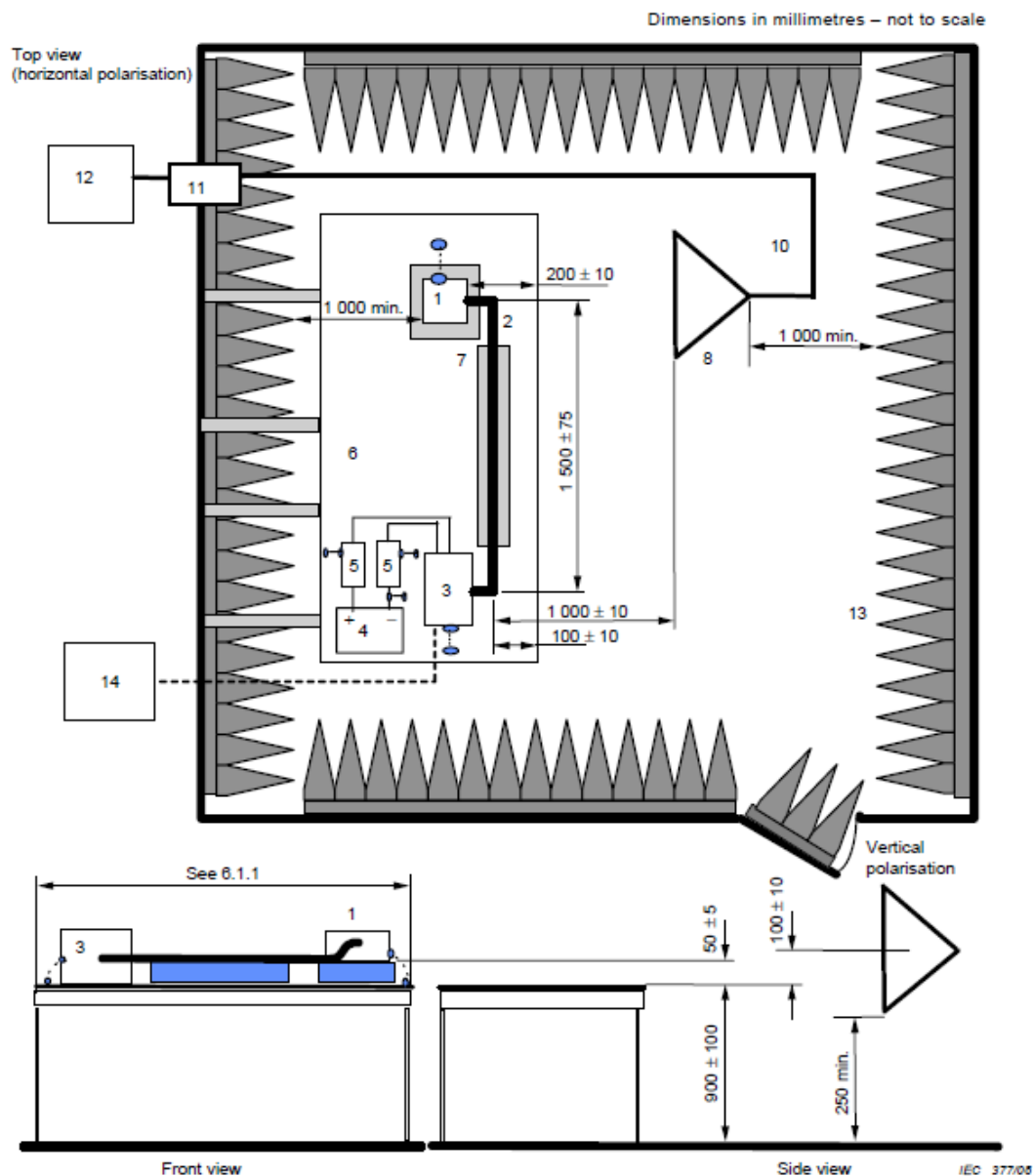
(水平極化)



說明

1. 待測設備(若試驗計畫要求則近端接地)
2. 試驗線束
3. 負載模擬器(置放及接地連接參照 6.4.2.5)
4. 電源供應器(位置可選擇)
5. 人工網路(AN)
6. 接地平面(搭接至屏蔽圍體)
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 對數週期天線
10. 高品質同軸纜線，如雙屏蔽線(50 Ω)
11. 艙壁連接器
12. 量測儀器
13. 射頻吸波材料
14. 啟動及監控系統

Figure 15 – Example of test set-up – above 1 GHz

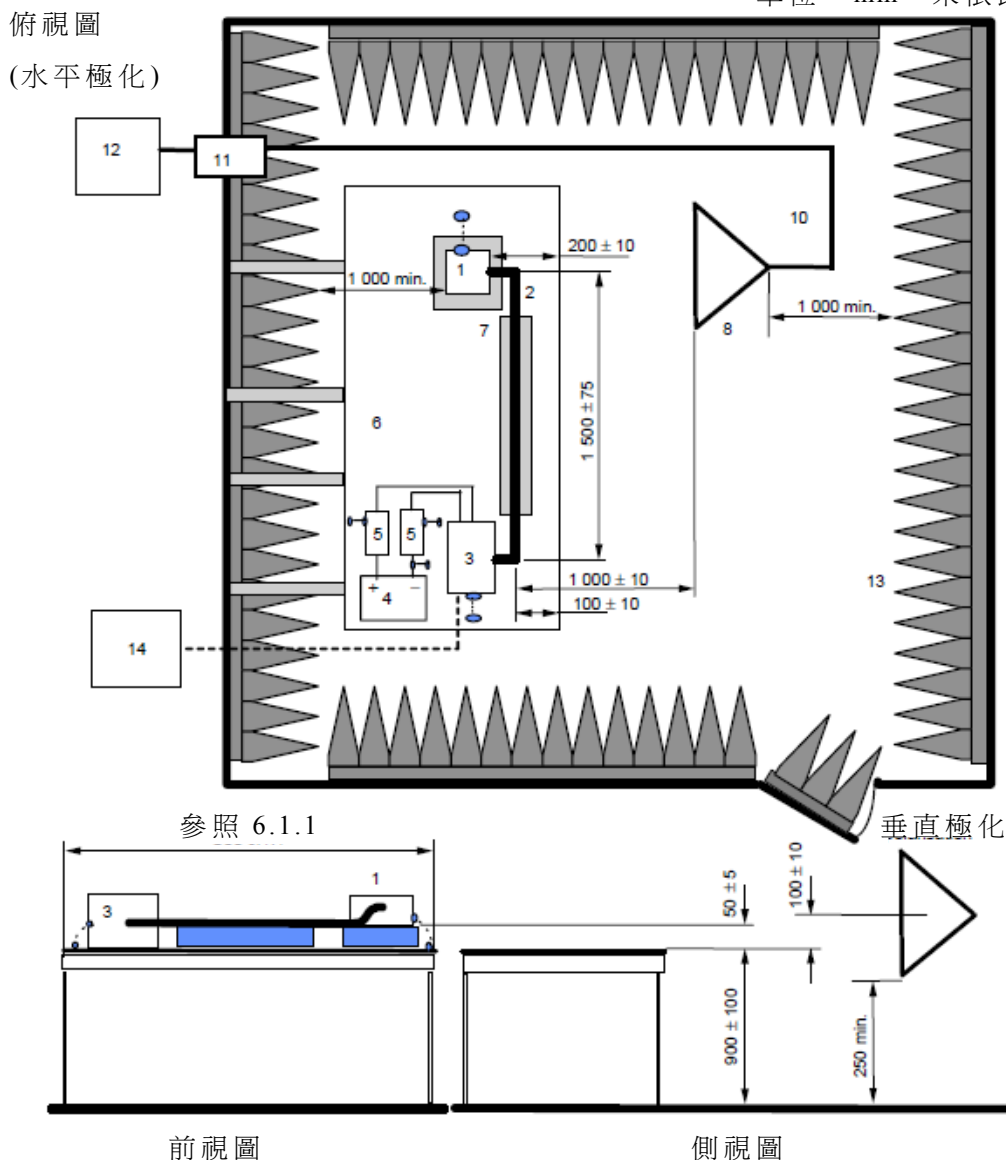


Key

- 1 EUT (grounded locally if required in test plan)
- 2 Test harness
- 3 Load simulator (placement and ground connection according to 6.4.2.5)
- 4 Power supply (location optional)
- 5 Artificial network (AN)
- 6 Ground plane (bonded to shielded enclosure)
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 Horn antenna
- 10 High-quality coaxial cable e.g. double-shielded (50 Ω)
- 11 Bulkhead connector
- 12 Measuring instrument
- 13 RF absorber material
- 14 Stimulation and monitoring system

圖 15 試驗設置範例—高於 1 GHz

單位：mm，未依比例繪製



說明

1. 待測設備(若試驗計畫要求則近端接地)
2. 試驗線束
3. 負載模擬器(置放及接地連接參照 6.4.2.5)
4. 電源供應器(位置可選擇)
5. 人工網路(AN)
6. 接地平面(搭接至屏蔽圍體)
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 號角天線
10. 高品質同軸纜線，如雙屏蔽線(50 Ω)
11. 艙壁連接器
12. 量測儀器
13. 射頻吸波材料
14. 啟動及監控系統

6.4.4 Limits for radiated disturbances from components/modules – ALSE method

6.4.4 組件/模組輻射擾動之限制值—內襯吸波材料屏蔽圍體法

The level class to be used (as a function of the frequency band) shall be agreed upon between the vehicle manufacturer and the component supplier.

使用之位準等級(為頻帶之函數)應由車輛製造商及組件供應商議定。

NOTE It is recommended for acceptable radio reception in a vehicle that the radiated noise should not exceed the values shown in Tables 9 and 10, peak and average or quasi-peak and average limits, respectively. Since the mounting location, vehicle body construction and harness design can affect the coupling of radio disturbances to the on-board radio, multiple limit levels are defined. For the GPS band a specific limit characteristic is recommended. This is shown in Figure 16.

備考：此處建議車輛上可接受的無線電接收，其輻射雜訊不應超過表 9 及 10 之數值，分別為峰值及平均值，或準峰值及平均值。由於架設位置，車體結構及線束設計可影響無線電擾動至車載無線電之耦合，故定義數個限制值位準。亦對全球定位系統(GPS)頻帶提出特別之限制值特性建議，參照圖 16 所示。

Table 9 – Examples of quasi-peak or peak limits for radiated disturbances – ALSE

Service / Band	Frequency MHz	Levels in dB(μV/m)									
		Class 1		Class 2		Class 3		Class 4		Class 5	
		Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak
BROADCAST											
LW	0,15 - 0,30	86	73	76	63	66	53	56	43	46	33
MW	0,53 - 1,8	72	59	64	51	56	43	48	35	40	27
SW	5,9 - 6,2	64	51	58	45	52	39	46	33	40	27
FM	76 - 108	62	49	56	43	50	37	44	31	38	25
TV Band I	41 - 88	52	-	46	-	40	-	34	-	28	-
TV Band III	174 - 230	56	-	50	-	44	-	38	-	32	-
DAB III	171 - 245	50	-	44	-	38	-	32	-	26	-
TV Band IV/	468 - 944	65	-	59	-	53	-	47	-	41	-
DTTV	470 - 770	69	-	63	-	57	-	51	-	45	-
DAB L band	1447 - 1494	52	-	46	-	40	-	34	-	28	-
SDARS	2320 - 2345	58	-	52	-	46	-	40	-	34	-
MOBILE SERVICES											
CB	26 - 28	64	51	58	45	52	39	46	33	40	27
VHF	30 - 54	64	51	58	45	52	39	46	33	40	27
VHF	68 - 87	59	46	53	40	47	34	41	28	35	22
VHF	142 - 175	59	46	53	40	47	34	41	28	35	22
Analogue UHF	380 - 512	62	49	56	43	50	37	44	31	38	25
RKE	300 - 330	56	-	50	-	44	-	38	-	32	-
RKE	420 - 450	56	-	50	-	44	-	38	-	32	-
Analogue UHF	820 - 960	68	55	62	49	56	43	50	37	44	31
GSM 800	880 - 895	68	-	62	-	56	-	50	-	44	-
EGSM/GSM 900	925 - 960	68	-	62	-	56	-	50	-	44	-
GPS L1 civil	1567 - 1583	-	-	-	-	-	-	-	-	-	-
GSM 1800 (PCN)	1803 - 1882	68	-	62	-	56	-	50	-	44	-
GSM 1900	1850 - 1990	68	-	62	-	56	-	50	-	44	-
3G / IMT 2000	1900 - 1992	68	-	62	-	56	-	50	-	44	-
3G / IMT 2000	2010 - 2025	68	-	62	-	56	-	50	-	44	-
3G / IMT 2000	2108 - 2172	68	-	62	-	56	-	50	-	44	-
Bluetooth/802.11	2400 - 2500	68	-	62	-	56	-	50	-	44	-

NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.

NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.

表 9 輻射擾動之準峰值或峰值限制值範例—內襯吸波材料屏蔽團體法

服務/頻帶	頻率 MHz	位準，單位為 dB(μ V/m)									
		等級 1		等級 2		等級 3		等級 4		等級 5	
		峰值	準峰 值	峰值	準峰 值	峰值	準峰 值	峰值	準峰 值	峰值	準峰 值
廣播											
LW	0.15~0.30	86	73	76	63	66	53	56	43	46	33
MW	0.53~1.8	72	59	64	51	56	43	48	35	40	27
SW	5.9~6.2	64	51	58	45	52	39	46	33	40	27
FM	76~108	62	49	56	43	50	37	44	31	38	25
TV Band I	41~88	52	—	46	—	40	—	34	—	28	—
TV Band III	174~230	56	—	50	—	44	—	38	—	32	—
DAB III	171~245	50	—	44	—	38	—	32	—	26	—
TV Band IV/V	468~944	65	—	59	—	53	—	47	—	41	—
DTTV	470~770	69	—	63	—	57	—	51	—	45	—
DAB L band	1447~1494	52	—	46	—	40	—	34	—	28	—
SDARS	2320~2345	58	—	52	—	46	—	40	—	34	—
行動服務											
CB	26~28	64	51	58	45	52	39	46	33	40	27
VHF	30~54	64	51	58	45	52	39	46	33	40	27
VHF	68~87	59	46	53	40	47	34	41	28	35	22
VHF ^b	142~175	59	46	53	40	47	34	41	28	35	22
Analogue UHF	380~512	62	49	56	43	50	37	44	31	38	25
RKE	300~330	56	—	50	—	44	—	38	—	32	—
RKE	420~450	56	—	50	—	44	—	38	—	32	—
Analogue UHF	820~960	68	55	62	49	56	43	50	37	44	31
GSM 800	860~895	68	—	62	—	56	—	50	—	44	—
EGSM/GSM 900	925~960	68	—	62	—	56	—	50	—	44	—
GPS L1 civil	1567~1583	—	—	—	—	—	—	—	—	—	—
GSM 1800 (PCN)	1803~1882	68	—	62	—	56	—	50	—	44	—
GSM 1900	1850~1990	68	—	62	—	56	—	50	—	44	—
3G/IMT 2000	1900~1992	68	—	62	—	56	—	50	—	44	—
3G/IMT 2000	2010~2025	68	—	62	—	56	—	50	—	44	—
3G/IMT 2000	2108~2172	68	—	62	—	56	—	50	—	44	—
Bluetooth/802.11	2400~2500	68	—	62	—	56	—	50	—	44	—

備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。

備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。

Table 10 – Examples of average limits for radiated disturbances – ALSE

Service / Band	Frequency MHz	Levels in dB(µV/m)				
		Class 1	Class 2	Class 3	Class 4	Class 5
		AVG	AVG	AVG	AVG	AVG
BROADCAST						
LW	0,15 - 0,30	66	56	46	36	26
MW	0,53 - 1,8	52	44	36	28	20
SW	5,9 - 6,2	44	38	32	26	20
FM	76 - 108	42	36	30	24	18
TV Band I	41 - 88	42	36	30	24	18
TV Band III	174 - 230	46	40	34	28	22
DAB III	171 - 245	40	34	28	22	16
TV Band IV/V	468 - 944	55	49	43	37	31
DTTV	470 - 770	59	53	47	41	35
DAB L band	1447 - 1494	42	36	30	24	18
SDARS	2320 - 2345	48	42	36	30	24
MOBILE SERVICES						
CB	26 - 28	44	38	32	26	20
VHF	30 - 54	44	38	32	26	20
VHF	68 - 87	39	33	27	21	15
VHF	142 - 175	39	33	27	21	15
Analogue UHF	380 - 512	42	36	30	24	18
RKE	300 - 330	42	36	30	24	18
RKE	420 - 450	42	36	30	24	18
Analogue UHF	820 - 960	48	42	36	30	24
GSM 800	860 - 895	48	42	36	30	24
EGSM/GSM 900	925 - 960	48	42	36	30	24
GPS L1 civil	1567 - 1583	34	28	22	16	10
GSM 1800 (PCN)	1803 - 1882	48	42	36	30	24
GSM 1900	1850 - 1990	48	42	36	30	24
3G / IMT 2000	1900 - 1992	48	42	36	30	24
3G / IMT 2000	2010 - 2025	48	42	36	30	24
3G / IMT 2000	2108 - 2172	48	42	36	30	24
Bluetooth/802.11	2400 - 2500	48	42	36	30	24
<p>NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.</p> <p>NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.</p>						

表 10 輻射擾動之平均值限制值範例—內襯吸波材料屏蔽圍體法

服務/頻帶	頻率 MHz	位準，單位為 dB(μ V/m)				
		等級 1	等級 2	等級 3	等級 4	等級 5
		平均值	平均值	平均值	平均值	平均值
廣播						
LW	0.15~0.30	66	56	46	36	26
MW	0.53~1.8	52	44	36	28	20
SW	5.9~6.2	44	38	32	26	20
FM	76~108	42	36	30	24	18
TV Band I	41~88	42	36	30	24	18
TV Band III	174~230	46	40	34	28	22
DAB III	171~245	40	34	28	22	16
TV Band IV/V	468~944	55	49	43	37	31
DTTV	470~770	59	53	47	41	35
DAB L band	1447~1494	42	36	30	24	18
SDARS	2320~2345	48	42	36	30	24
行動服務						
CB	26~28	44	38	32	26	20
VHF	30~54	44	38	32	26	20
VHF	68~87	39	33	27	21	15
VHF ^b	142~175	39	33	27	21	15
Analogue UHF	380~512	42	36	30	24	18
RKE	300~330	42	36	30	24	18
RKE	420~450	42	36	30	24	18
Analogue UHF	820~960	48	42	36	30	24
GSM 800	860~895	48	42	36	30	24
EGSM/GSM 900	925~960	48	42	36	30	24
GPS L1 civil	1567~1583	34	28	22	16	10
GSM 1800 (PCN)	1803~1882	48	42	36	30	24
GSM 1900	1850~1990	48	42	36	30	24
3G/IMT 2000	1900~1992	48	42	36	30	24
3G/IMT 2000	2010~2025	48	42	36	30	24
3G/IMT 2000	2108~2172	48	42	36	30	24
Bluetooth/802.11	2400~2500	48	42	36	30	24

備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。

備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。

Figure 16 – Example of average limit for radiated disturbances from components GPS band 1 567,42 to 1 583,42 MHz – Class 5

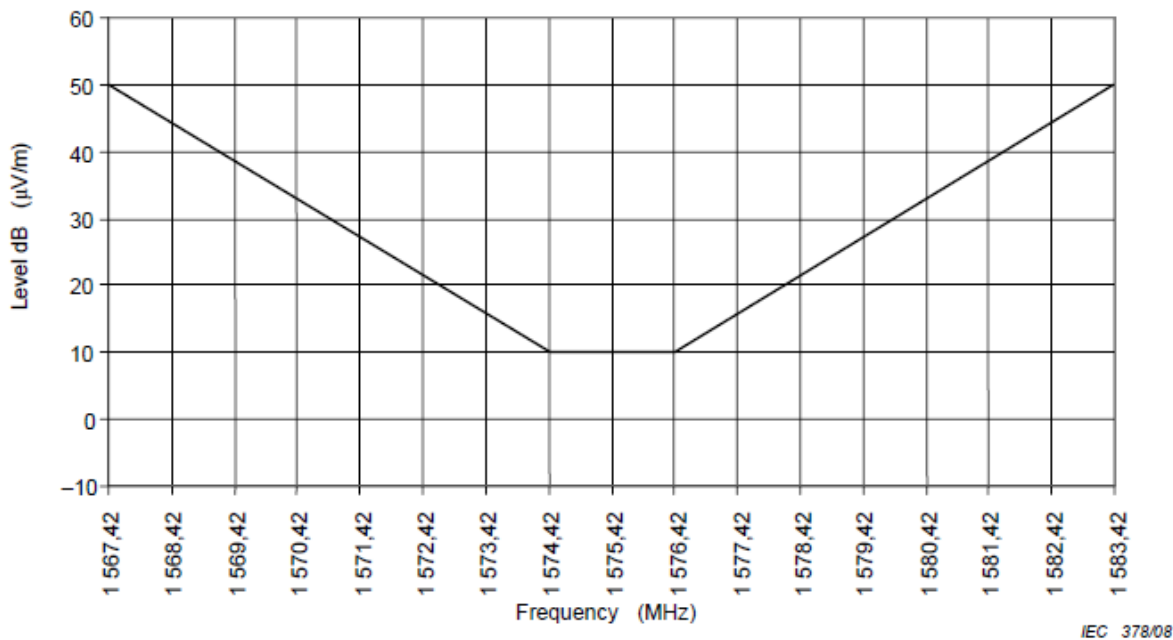
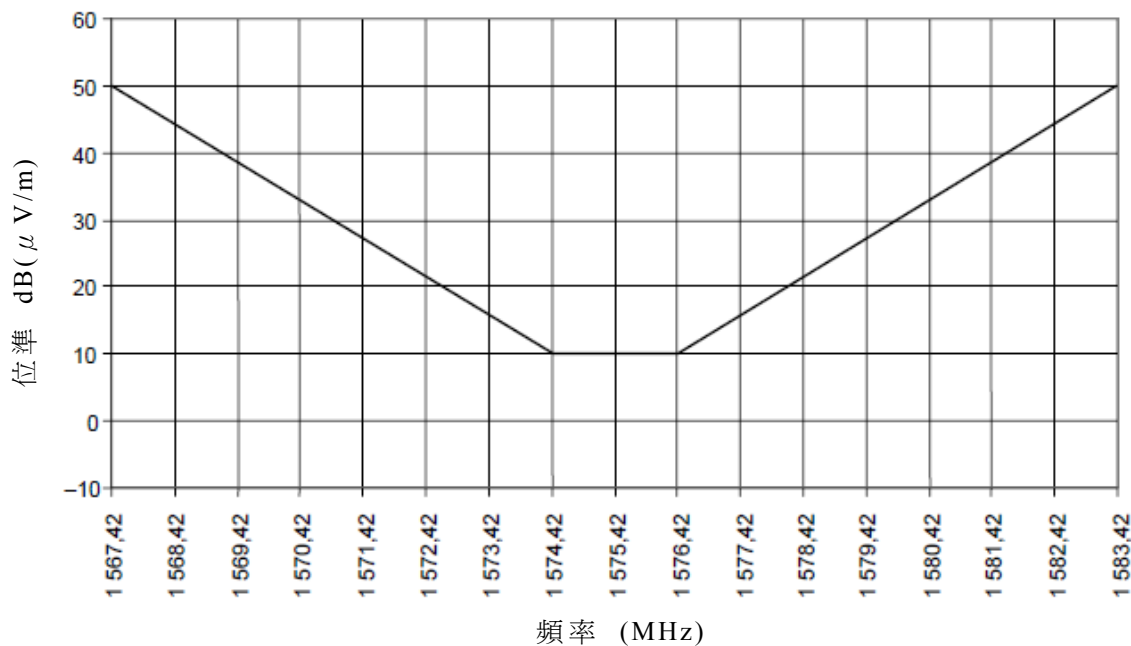


圖 16 全球定位系統(GPS)組件於 1567.42~1583.42 MHz 頻帶之輻射擾動平均值限制值範例一等級 5



6.5 Radiated emissions from components/modules – TEM cell method

6.5 組件/模組之輻射發射—橫向電磁波室法

6.5.1 General

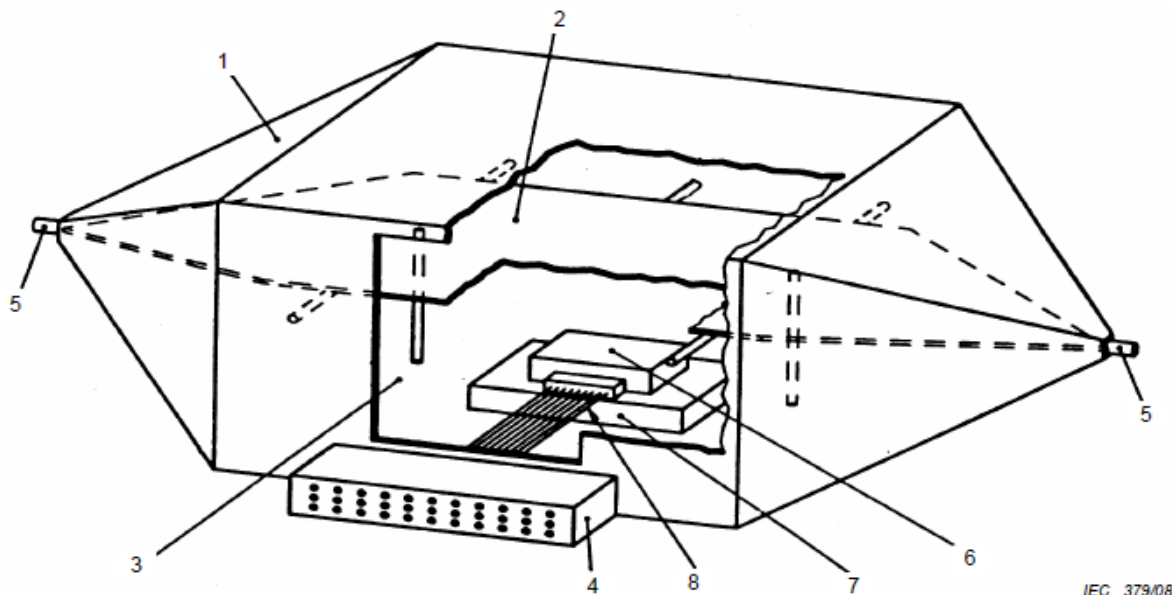
6.5.1 通則

Measurements of radiated field strength shall be made in a shielded enclosure to eliminate the high levels of extraneous disturbance from electrical equipment and radiated fields from nearby broadcast and other radio transmitters. The TEM cell works as a shielded enclosure. An example of a TEM cell is shown in Figure 17.

Information relating to the size and construction of a TEM cell for component measurement is given in Annex F.

輻射場強之量測應於屏蔽圍體內執行，以消除來自外部電氣設備之高位準擾動，以及鄰近廣播電台與其他無線電發射機之輻射場。橫向電磁波室之功用類似一屏蔽圍體，範例如圖 17 所示，與組件量測用之橫向電磁波室的尺寸及結構相關之資訊參照附錄 F。

Figure 17 – TEM cell (example)

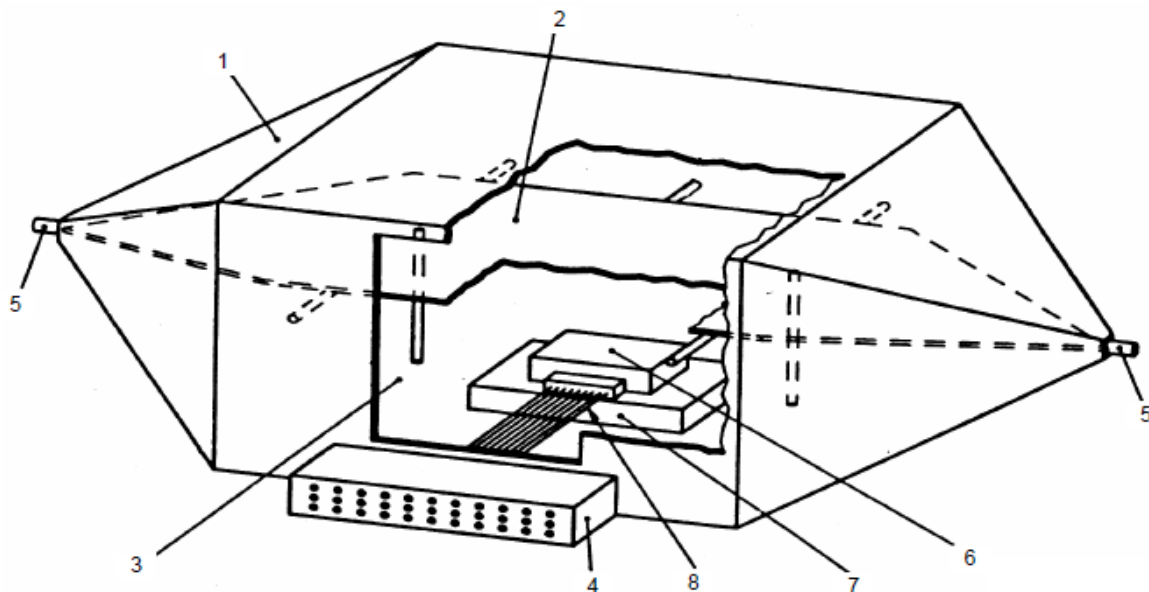


Key

- 1 Outer shield
- 2 Septum (inner conductor)
- 3 Access door
- 4 Connector panel (optional)
- 5 Coaxial connectors
- 6 EUT
- 7 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 8 Artificial harness

NOTE The connectors on the connector panel should be coaxial RF connectors if the RF boundary extends outside of the TEM cell.

圖 17 橫向電磁波室(範例)



說明

1. 外屏蔽導體
2. 隔板(內導體)
3. 開口
4. 連接器面板(選項)
5. 同軸連接器
6. 待測設備
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
8. 人工線束

備考：若射頻邊界超出橫向電磁波室之外，連接器面板上之連接器須為同軸射頻連接器。

The upper frequency limit of this test method is a direct function of the TEM cell dimensions, the dimensions of the components/module (arrangement included), and the RF filter characteristic. Measurements shall not be made near the TEM cell resonance frequencies.

本試驗法之頻率上限且為橫向電磁波室尺寸、組件/模組(包含配置)尺寸、射頻濾波器特性之直接函數，不應於接近橫向電磁波室之共振頻率執行量測。

A TEM cell is recommended for testing automotive electronic systems in the frequency range from 150 kHz to 200 MHz. The TEM cells boxed in Annex F, Table F.1, are typical of those used in automotive work.

汽車電子系統於橫向電磁波室試驗之建議頻率範圍為 150 kHz~200 MHz，汽車業典型使用之橫向電磁波室如附錄 F 及表 F.1 所示。

In order to achieve reproducible test results the EUT and the test harness shall be placed in the TEM cell in the same position for each repeated measurement.

為達成試驗結果之可再現性，待測設備及試驗線束於各重複量測中應置於橫向

電磁波室中之相同位置。

For the purpose of this test, the septum of the TEM cell functions in a similar way to a receiving antenna.

基於本試驗之目的，橫向電磁波室隔板之功能近似於接收天線。

6.5.2 Test set-up

6.5.2 試驗設置

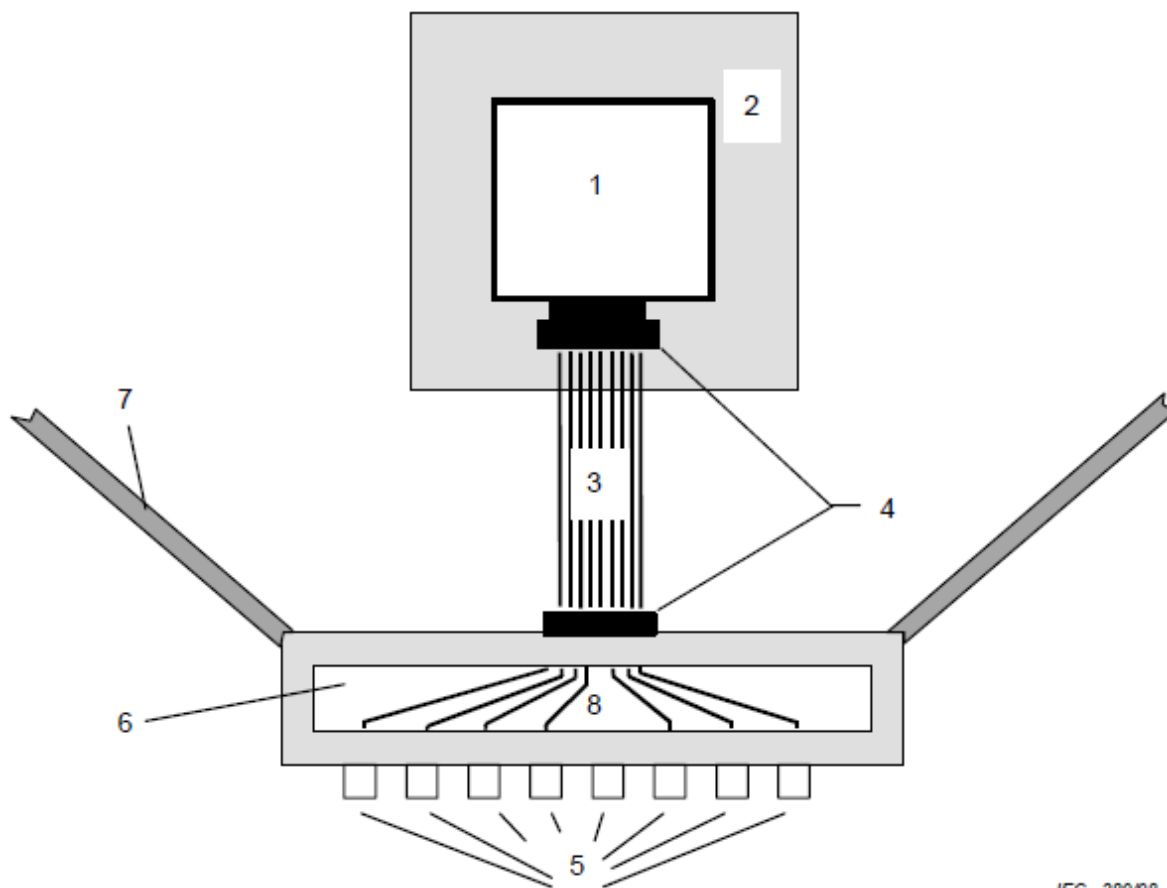
6.5.2.1 Set-up with major field coupling to the wiring harness

6.5.2.1 主要場耦合至繞線線束之設置

The TEM cell shall have a connector panel connected as close as possible to a plug connector (see Figures 18 and 19).

橫向電磁波室應具一連接器面板，並盡可能接近連接器插頭(參照圖 18 及 19)。

Figure 18 – Example of arrangement of leads in the TEM cell and to the connector panel



IEC 380/08

Key

- 1 EUT
- 2 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 3 Printed circuit board or wiring harness
- 4 Connector
- 5 Coaxial connectors

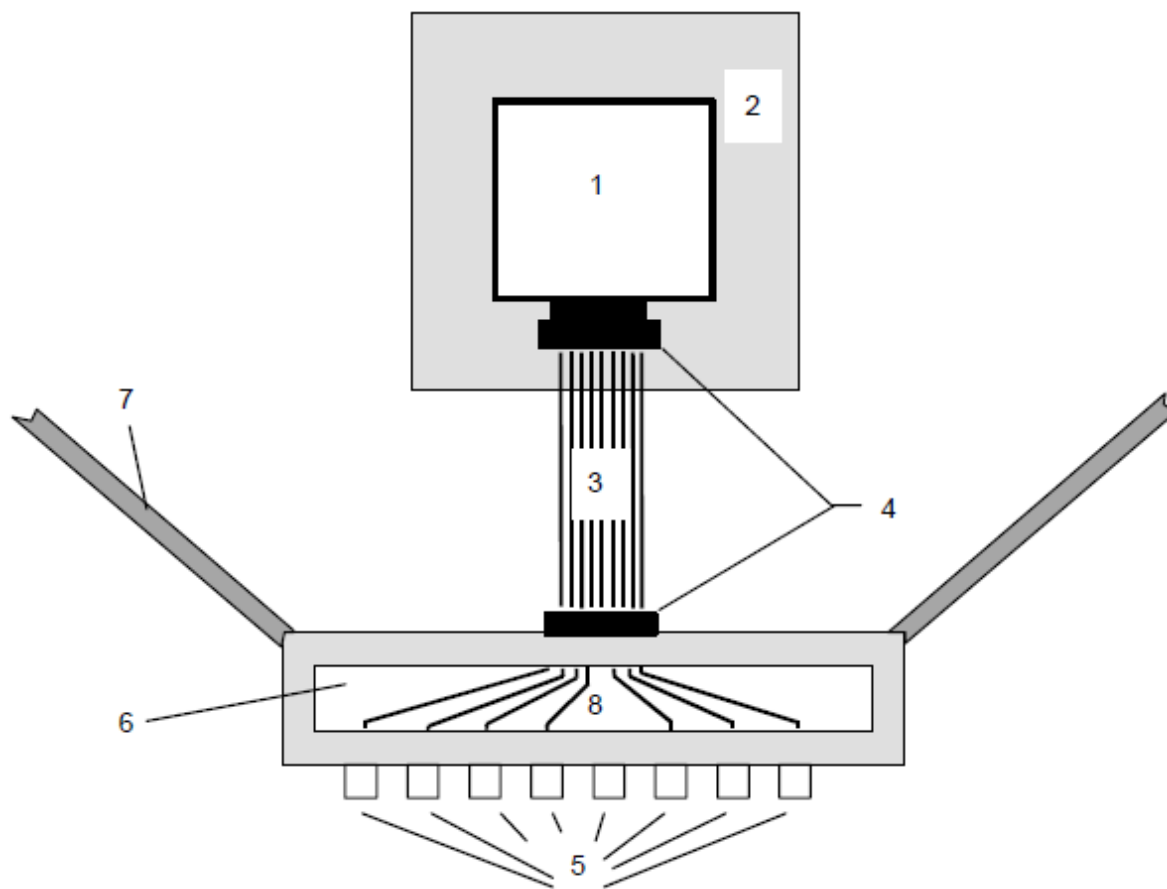
6 Connector panel (optional)

7 TEM cell wall

8 RF coaxial cables

NOTE All leads to the EUT shall pass through an RF boundary. The RF boundary is either at the wall of the TEM cell or extended through RF coaxial cable (8) and coaxial connectors (5). The boundary is terminated by RF-filter which can be connected inside the connector panel (6) or directly outside to the coaxial connectors (5). The cables in the connector panel should be coaxial if the RF-filters are connected to the coaxial connectors (5).

圖 18 橫向電磁波室引線及至連接器面板之配置範例



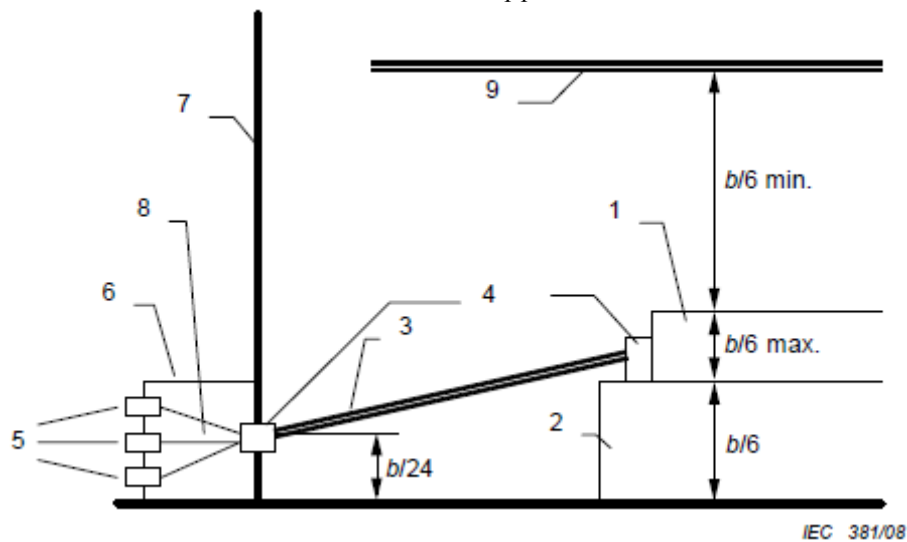
說明

1. 待測設備
2. 低相對介電常數支撐板 ($\epsilon_r \leq 1.4$)
3. 印刷電路板或繞線線束
4. 連接器
5. 同軸連接器
6. 連接器面板(選項)
7. 橫向電磁波室牆面
8. 射頻同軸纜線

備考：所有引線應通過射頻邊界連接待測設備，射頻邊界應位於橫向電磁波室牆面

或藉由射頻同軸纜線(8)及同軸連接器(5)延伸出去。為終端邊界之射頻濾波器可連接至連接器面板(6)內部或直接連接至同軸連接器(5)外部，若射頻濾波器與同軸連接器連接，連接器面板上之纜線須為同軸。

Figure 19 – Example of the arrangement of the connectors, the lead frame and the dielectric support



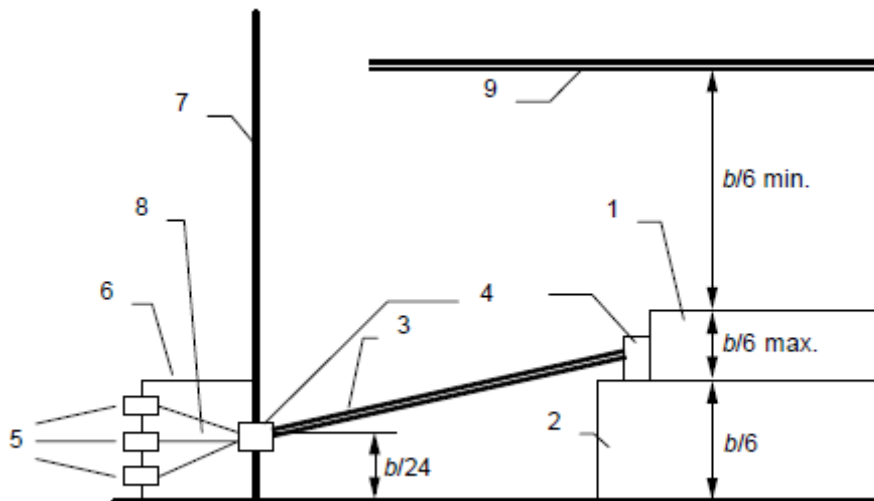
Key

- 1 EUT
- 2 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 3 Printed circuit board (no ground plane) or wiring harness, not shielded
- 4 Connector
- 5 Coaxial connectors
- 6 Connector panel (optional)
- 7 TEM cell wall
- 8 Cables
- 9 Septum

b is the TEM cell height (see Annex F)

NOTE The connectors on the connector panel should be coaxial RF connectors if the RF boundary extends outside of the TEM cell.

圖 19 連接器、引線架及介電支撐板之配置範例



說明

1. 待測設備
2. 低相對介電常數支撐板 ($\epsilon_r \leq 1.4$)
3. 印刷電路板(無接地平面)或繞線線束，非屏蔽
4. 連接器
5. 同軸連接器
6. 連接器面板(選項)
7. 橫向電磁波室牆面
8. 纜線
9. 隔板

b 為橫向電磁波室高度(參照附件 F)

備考：若射頻邊界超出橫向電磁波室之外，連接器面板上之連接器須為同軸射頻連接器。

All supply and signal leads from the EUT are directly connected to the artificial harness (e.g. a lead frame). The plugs at the connector panel which are not required shall be sealed so that they are RF-tight.

待測設備所有供應及信號引線直接與人工線束(如引線架)連接，連接器面板之插頭未必需要，但應以射頻緊度密封。

The connection of the positive power lead shall be through the AN (see 6.1.2), direct at the connector panel.

正電源引線應經由人工網路(參照 6.1.2)直接連接至連接器面板。

It is not permitted to ground the EUT directly to the TEM cell floor. The grounding shall be done at the connector panel.

不允許待測設備直接接地至橫向電磁波室地板，該接地應接至連接器面板。

6.5.2.2 Set-up with major field coupling to the EUT

6.5.2.2 主要場耦合至待測設備之設置

The test set-up is similar to the method shown above, except that the leads to the EUT are positioned and shielded to minimise electromagnetic radiation from the leads. This is accomplished by positioning the leads flat across the bottom of the TEM cell and bringing them vertically to the EUT. The use of a sealed battery and shielded wiring in the TEM cell will further reduce the electromagnetic radiation from power and signal leads. To minimise the radiation from the wiring further, shielding foil tape can be applied over the leads.

試驗設置近似上述方法，除了藉由將引線平放固定通過橫向電磁波室底部，並垂直連接至待測設備，以固定及屏蔽至待測設備之引線，使來自引線之電磁輻射降至最小；在橫向電磁波室使用密封之電瓶及屏蔽之繞線將可進一步的降低來自電源及信號引線之電磁輻射，而對整個引線以銅箔膠帶屏蔽，可更進一步將來自繞線之輻射降至最小。

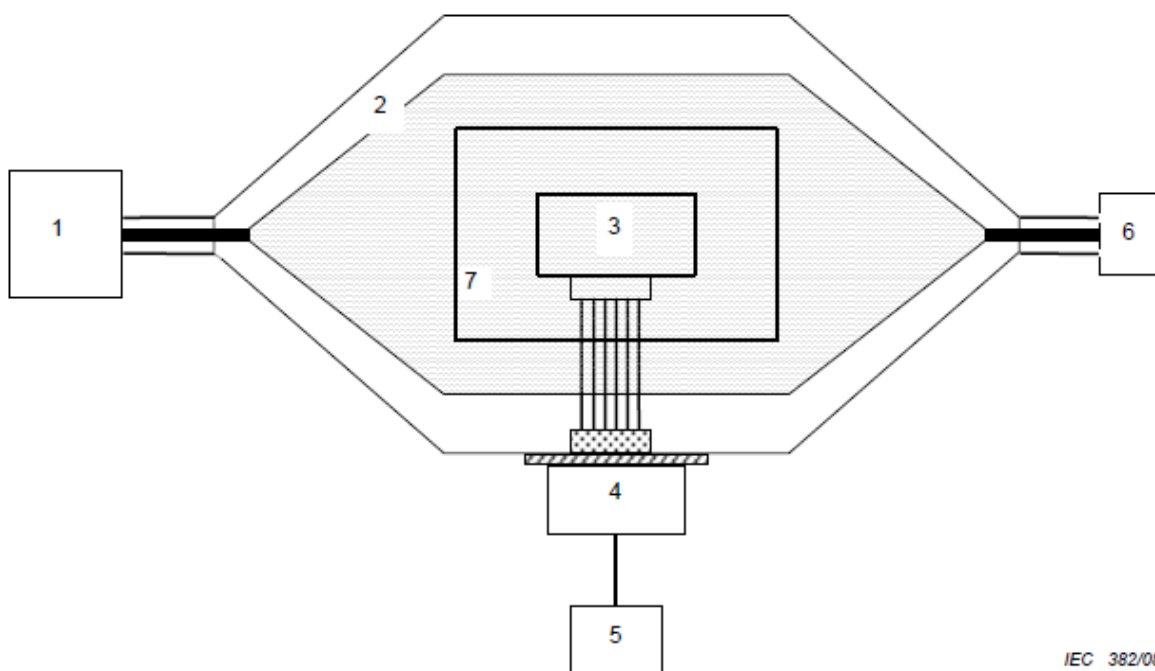
6.5.3 Test procedure

6.5.3 試驗程序

An example of the TEM cell method test layout is given in Figure 20. The general arrangement of the EUT, the harness, the filter system at the TEM cell's wall, etc., represent a standardised test condition. Any deviations from the standard test configuration shall be agreed upon prior to testing and recorded in the test report.

橫向電磁波室法之試驗佈局範例參照圖 20，待測設備、線束及橫向電磁波室牆面之濾波器系統等一般配置為標準試驗條件，任何標準試驗組態之偏差，應於試驗前協議，且記錄於試驗報告中。

Figure 20 – Example of the TEM cell method test layout



Key

1 Measuring instrument

2 TEM cell

3 EUT

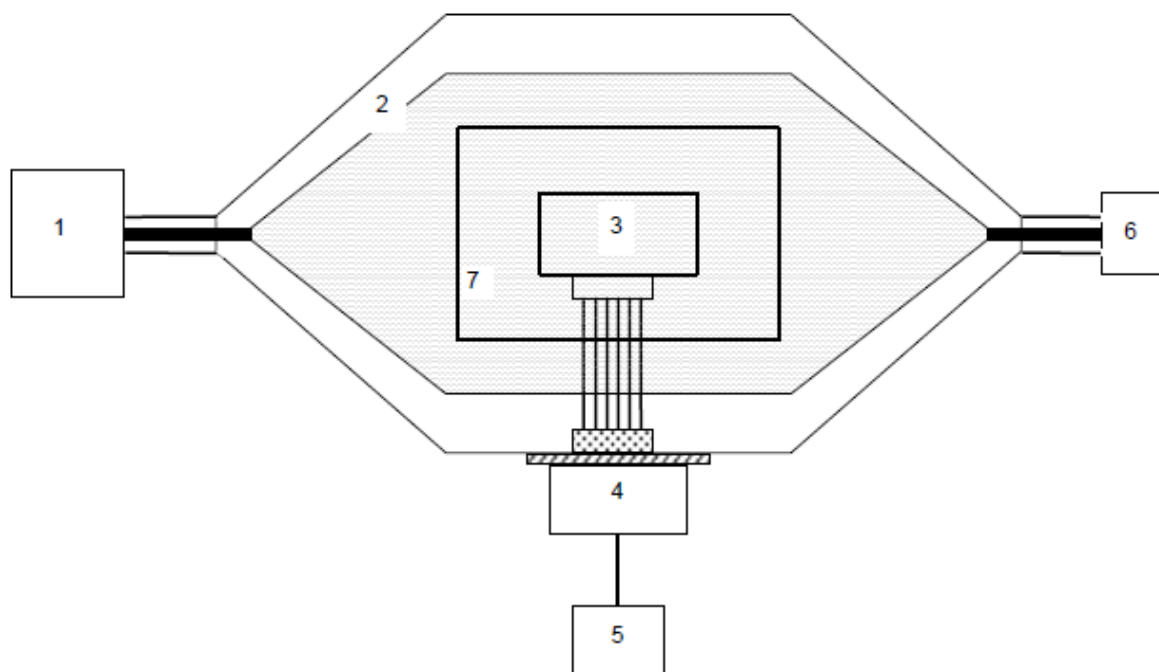
4 AN (see 6.1.2)

5 Power supply

6 50 Ω termination resistor

7 Low relative permittivity support ($\epsilon_r \leq 1,4$)

圖 20 橫向電磁波室法試驗佈局範例



說明

1. 量測儀器
2. 橫向電磁波室
3. 待測設備
4. 人工網路(參照 6.1.2)
5. 電源供應器
6. 50 Ω 終端電阻
7. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)

The EUT shall be supported $b/6$ (see Figure 19) above the TEM cell floor by non-conductive, low relative permittivity material ($\epsilon_r \leq 1.4$) in the allowed working region. The length of the artificial harness (e.g. a lead frame) shall be 450 ± 45 mm and positioned as shown in Figures 18 and 19.

待測設備應受支撐於高於橫向電磁波室地板 $b/6$ (參照圖 19)之非導電性、低相對介電常數材料($\epsilon_r \leq 1.4$)上的測試容區中，人工線束(如引線架)之長度應為 450 ± 45 mm，且固定如圖 18 及 19 所示。

The wiring arrangement of the artificial harness, the design and the overall height of the EUT's connector constitute electrical coupling loops and dipoles which have influence on the test results. All connections between the plug and contacts of the EUT's (multipole) connector and the artificial harness shall be as short as possible. Repeat measurements shall be performed using the same arrangement of the artificial harness, the same overall height of the EUT's connector and the same pin assignment on both connectors. Care shall be taken, if the size of the EUT and the allowed working region is nearly the same. In such a case, special care should be taken to define and document the test layout in the

test plan.

人工線束之繞線配置、待測設備連接器之設計及總高度形成電氣耦合回路及偶極，遂影響試驗結果，故所有待測設備(多極)連接器之插頭及接點與人工線束間之連接應盡可能短，並應使用相同之人工線束配置、相同之待測設備連接器總高度，及二個連接器之相同接腳指配以執行重複量測。若待測設備及測試容區之尺寸接近，應特別謹慎並於試驗計畫中載明試驗佈局。

The EUT shall be installed to operate under typical loading and other conditions in the vehicle in such a way that the maximum emission state occurs. These operating conditions must be defined in the test plan to ensure supplier and customer can perform identical tests.

待測設備應可於典型負載及其他車上相同條件下操作，以令最大發射狀態產生，這些操作條件需定義於試驗計畫，以確保供應商及客戶執行等同之試驗。

NOTE Different orthogonal orientations of the EUT could lead to different levels of measured electromagnetic energy.

備考：待測設備之不同正交方位可能導致不同之電磁能量量測位準。

The positive supply line shall have an RF filter at the TEM cell input. The artificial network (AN) of 6.1.2 shall be used as this filter. The AN shall be connected directly to the TEM cell and shall be screened, so that the negative supply line is grounded at the connector panel. The RF sampling port of the AN shall be terminated with a 50 Ω load.

正極電源線於橫向電磁波室輸入端應具射頻濾波器，6.1.2 之人工網路應作為濾波器使用，人工網路應直接連接至橫向電磁波室且應遮蔽，其負極電源線則接地至連接器面板，且人工網路之射頻取樣埠應以 50 Ω 負載終接。

All sensor and actuator leads of the EUT shall be connected to a peripheral interface, which simulates the operation in the vehicle.

待測設備之所有感測器及作動器引線應連接至模擬車上操作之周邊及介面。

To minimise influences of the wiring outside the TEM cell, low pass filters shall be used, which shall be connected directly to the BNC panel. The performance of the filters depends on the frequency range of the EUT's wanted signals. If no other configuration is specified in the test plan the filters shall perform like the artificial network with a 50 Ω impedance as described in Annex E.

為將橫向電磁波室外部繞線之影響最小化，應使用直接連接至 BNC 面板之低通濾波器，濾波器之性能依待測設備需求信號之頻率範圍而不同；若未於試驗計畫中指定其他組態，該濾波器應如附錄 E 描述，功用表現如阻抗 50 Ω 之人工網路。

To eliminate influences of its length and arrangement the wiring inside the connector panel shall be as short as possible via 50 Ω coaxial cables if a BNC connector panel is used. The shielding (outer conductor) of the cables shall be grounded at both ends.

為消除長度及配置之影響，若使用 BNC 連接器面板，連接器面板內之繞線應以

50 Ω 纜線且儘可能短，且該纜線之屏蔽(外導體)應於二端接地。

Repeat measurements shall be performed using the same RF port of the TEM cell, with the opposite port terminated by a 50 Ω impedance.

做重複量測時，應使用相同之橫向電磁波室上的射頻埠，並以 50 Ω 阻抗終接另一端。

6.5.4 Limits for radiated disturbances from components/modules – TEM cell method

6.5.4 組件/模組輻射擾動之限制值—橫向電磁波室法

The level class to be used (as a function of the frequency band) shall be agreed upon between the vehicle manufacturer and the component supplier.

使用之位準等級(為頻帶之函數)應由車輛製造商及組件供應商議定。

NOTE Recommended limits for radiated disturbances from components (both the set-up with major field coupling to the wiring harness (6.5.2.1) and the set-up with major coupling to the EUT (6.5.2.2)) are given in Tables 11 and 12. Since the mounting location, vehicle body construction and harness design can affect the coupling of radio disturbances to the on-board radio, multiple limit levels are defined.

備考：表 11 及 12 為來自組件之輻射擾動限制值建議(主要場耦合至線束之設置(6.5.2.1)及主要場耦合至待測設備之設置(6.5.2.2)皆適用)。由於架設位置，車體結構及線束設計可影響無線電擾動至車載無線電之耦合，故定義數個限制值位準。

Table 11 – Examples of quasi-peak or peak limits for radiated disturbances – TEM cell

Service / Band	Frequency MHz	Levels in dB(µV)									
		Class 1		Class 2		Class 3		Class 4		Class 5	
		Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak
BROADCAST											
LW	0,15 - 0,30	66	53	56	43	46	33	36	23	26	13
MW	0,53 - 1,8	52	39	44	31	36	23	28	15	20	7
SW	5,9 - 6,2	44	31	38	25	32	19	26	13	20	7
FM	76 - 108	50	37	44	31	38	25	32	19	26	13
TV Band I	41 - 88	40	-	34	-	28	-	22	-	16	-
TV Band III	174 - 230	40	-	34	-	28	-	22	-	16	-
DAB III	171 - 245	34	-	28	-	22	-	16	-	10	-
TV Band IV/V	468 - 944	Radiated emission – TEM cell Not applicable									
DTTV	470 - 770										
DAB L band	1447 - 1494										
SDARS	2320 - 2345										
MOBILE SERVICES											
CB	26 - 28	44	31	38	25	32	19	26	13	20	7
VHF	30 - 54	44	31	38	25	32	19	26	13	20	7
VHF	68 - 87	44	31	38	25	32	19	26	13	20	7
VHF	142 - 175	44	31	38	25	32	19	26	13	20	7
Analogue UHF	380 - 512	Radiated emission – TEM cell Not applicable									
RKE	300 - 330										
RKE	420 - 450										
Analogue UHF	820 - 960										
GSM 800	860 - 895										
EGSM/GSM 900	925 - 960										
GPS L1 civil	1567 - 1583										
GSM 1800 (PCN)	1803 - 1882										
GSM 1900	1850 - 1990										
3G / IMT 2000	1900 - 1992										
3G / IMT 2000	2010 - 2025										
3G / IMT 2000	2108 - 2172										
Bluetooth/802.11	2400 - 2500										
<p>NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.</p> <p>NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.</p>											

表 11 輻射擾動之準峰值或峰值限制值範例—橫向電磁波室法

服務/頻帶	頻率 MHz	位準，單位為 dB(μ V)									
		等級 1		等級 2		等級 3		等級 4		等級 5	
		峰值	準峰 值	峰值	準峰 值	峰值	準峰 值	峰值	準峰 值	峰值	準峰 值
廣播											
LW	0.15~0.30	66	53	56	43	46	33	36	23	26	13
MW	0.53~1.8	52	39	44	31	36	23	28	15	20	7
SW	5.9~6.2	44	31	38	25	32	19	26	13	20	7
FM	76~108	50	37	44	31	38	25	32	19	26	13
TV Band I	41~88	40	—	34	—	28	—	22	—	16	—
TV Band III	174~230	40	—	34	—	28	—	22	—	16	—
DAB III	171~245	34	—	28	—	22	—	16	—	10	—
TV Band IV/V	468~944	輻射發射—橫向電磁波室法 不適用									
DTTV	470~770										
DAB L band	1447~1494										
SDARS	2320~2345										
行動服務											
CB	26~28	44	31	38	25	32	19	26	13	20	7
VHF	30~54	44	31	38	25	32	19	26	13	20	7
VHF	68~87	44	31	38	25	32	19	26	13	20	7
VHF	142~175	44	31	38	25	32	19	26	13	20	7
Analogue UHF	380~512	輻射發射—橫向電磁波室法 不適用									
RKE	300~330										
RKE	420~450										
Analogue UHF	820~960										
GSM 800	860~895										
EGSM/GSM 900	925~960										
GPS L1 civil	1567~1583										
GSM 1800 (PCN)	1803~1882										
GSM 1900	1850~1990										
3G/IMT 2000	1900~1992										
3G/IMT 2000	2010~2025										
3G/IMT 2000	2108~2172										
Bluetooth/802.11	2400~2500										

備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。

備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。

Table 12 – Examples of average limits for radiated disturbances – TEM cell

Service / Band	Frequency MHz	Levels in dB(μV)				
		Class 1	Class 2	Class 3	Class 4	Class 5
		AVG	AVG	AVG	AVG	AVG
BROADCAST						
LW	0,15 - 0,30	46	36	26	16	6
MW	0,53 - 1,8	32	24	16	8	0
SW	5,9 - 6,2	24	18	12	6	0
FM	76 - 108	30	24	18	12	6
TV Band I	41 - 88	30	24	18	12	6
TV Band III	174 - 230	30	24	18	12	6
DAB III	171 - 245	24	18	12	6	0
TV Band IV/V	468 - 944	Radiated emission – TEM cell Not applicable				
DTTV	470 - 770					
DAB L band	1447 - 1494					
SDARS	2320 - 2345					
MOBILE SERVICES						
CB	26 - 28	24	18	12	6	0
VHF	30 - 54	24	18	12	6	0
VHF	68 - 87	24	18	12	6	0
VHF	142 - 175	24	18	12	6	0
Analogue UHF	380 - 512	Radiated emission – TEM cell Not applicable				
RKE	300 - 330					
RKE	420 - 450					
Analogue UHF	820 - 960					
GSM 800	860 - 895					
EGSM/GSM 900	925 - 960					
GPS L1 civil	1567 - 1583					
GSM 1800 (PCN)	1803 - 1882					
GSM 1900	1850 - 1990					
3G / IMT 2000	1900 - 1992					
3G / IMT 2000	2010 - 2025					
3G / IMT 2000	2108 - 2172					
Bluetooth/802.11	2400 - 2500					
<p>NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.</p> <p>NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.</p>						

表 12 輻射擾動之平均值限制值範例—橫向電磁波室法

服務/頻帶	頻率 MHz	位準，單位為 dB(μ V)				
		等級 1	等級 2	等級 3	等級 4	等級 5
		平均值	平均值	平均值	平均值	平均值
廣播						
LW	0.15~0.30	46	36	26	16	6
MW	0.53~1.8	32	24	16	8	0
SW	5.9~6.2	24	18	12	6	0
FM	76~108	30	24	18	12	6
TV Band I	41~88	30	24	18	12	6
TV Band III	174~230	30	24	18	12	6
DAB III	171~245	24	18	12	6	0
TV Band IV/V	468~944	輻射發射—橫向電磁波室法 不適用				
DTTV	470~770					
DAB L band	1447~1494					
SDARS	2320~2345					
行動服務						
CB	26~28	24	18	12	6	0
VHF	30~54	24	18	12	6	0
VHF	68~87	24	18	12	6	0
VHF ^b	142~175	24	18	12	6	0
Analogue UHF	380~512	輻射發射—橫向電磁波室法 不適用				
RKE	300~330					
RKE	420~450					
Analogue UHF	820~960					
GSM 800	860~895					
EGSM/GSM 900	925~960					
GPS L1 civil	1567~1583					
GSM 1800 (PCN)	1803~1882					
GSM 1900	1850~1990					
3G/IMT 2000	1900~1992					
3G/IMT 2000	2010~2025					
3G/IMT 2000	2108~2172					
Bluetooth/802.11	2400~2500					
備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。						
備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。						

6.6 Radiated emissions from components/modules – Stripline method

6.6 組件/模組之輻射發射—帶線法

Refer to Annex G.

參考附錄 G。

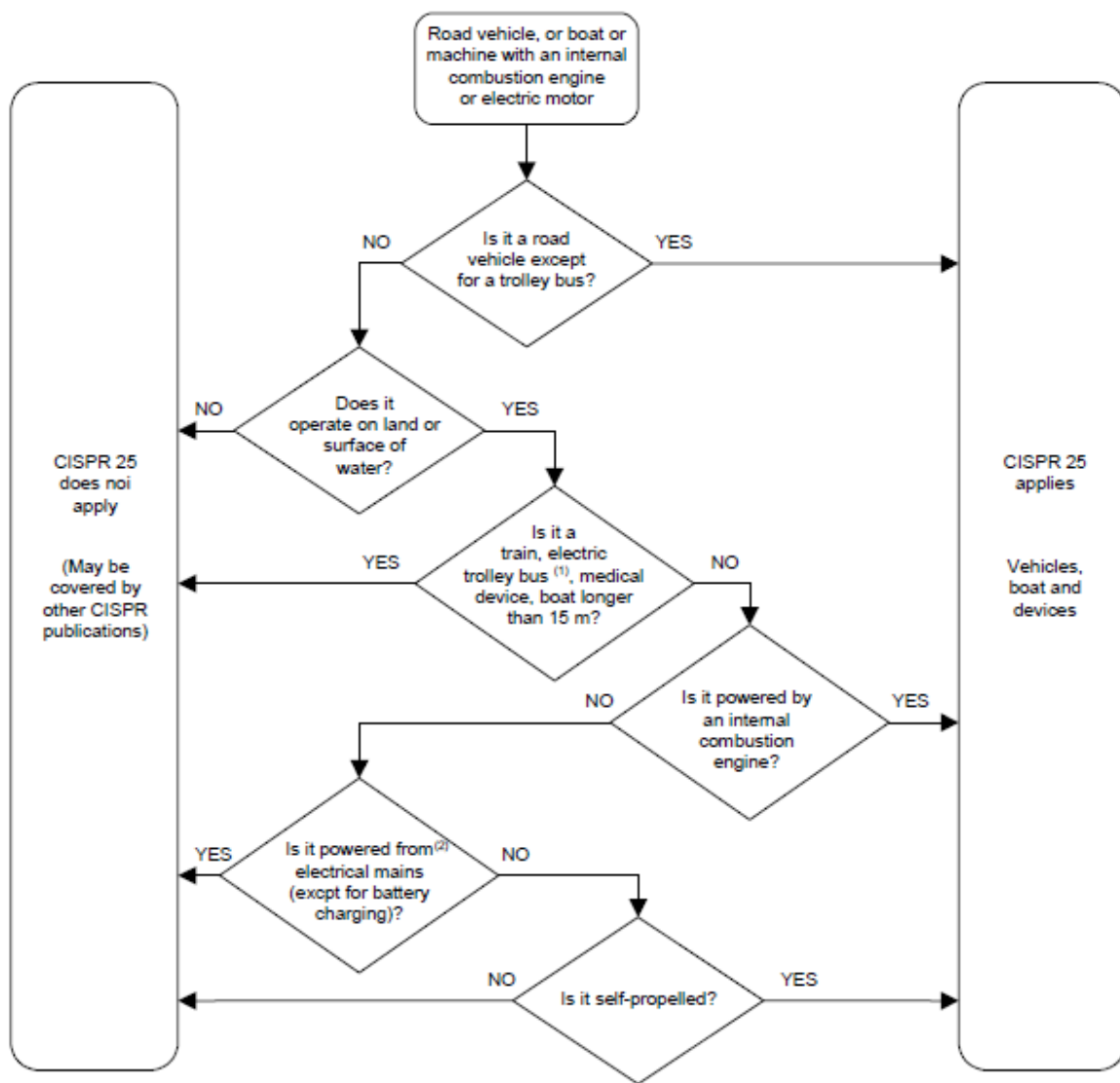
Annex A
(informative)

Flow chart for checking the applicability of CISPR 25

附錄 A

(參考)

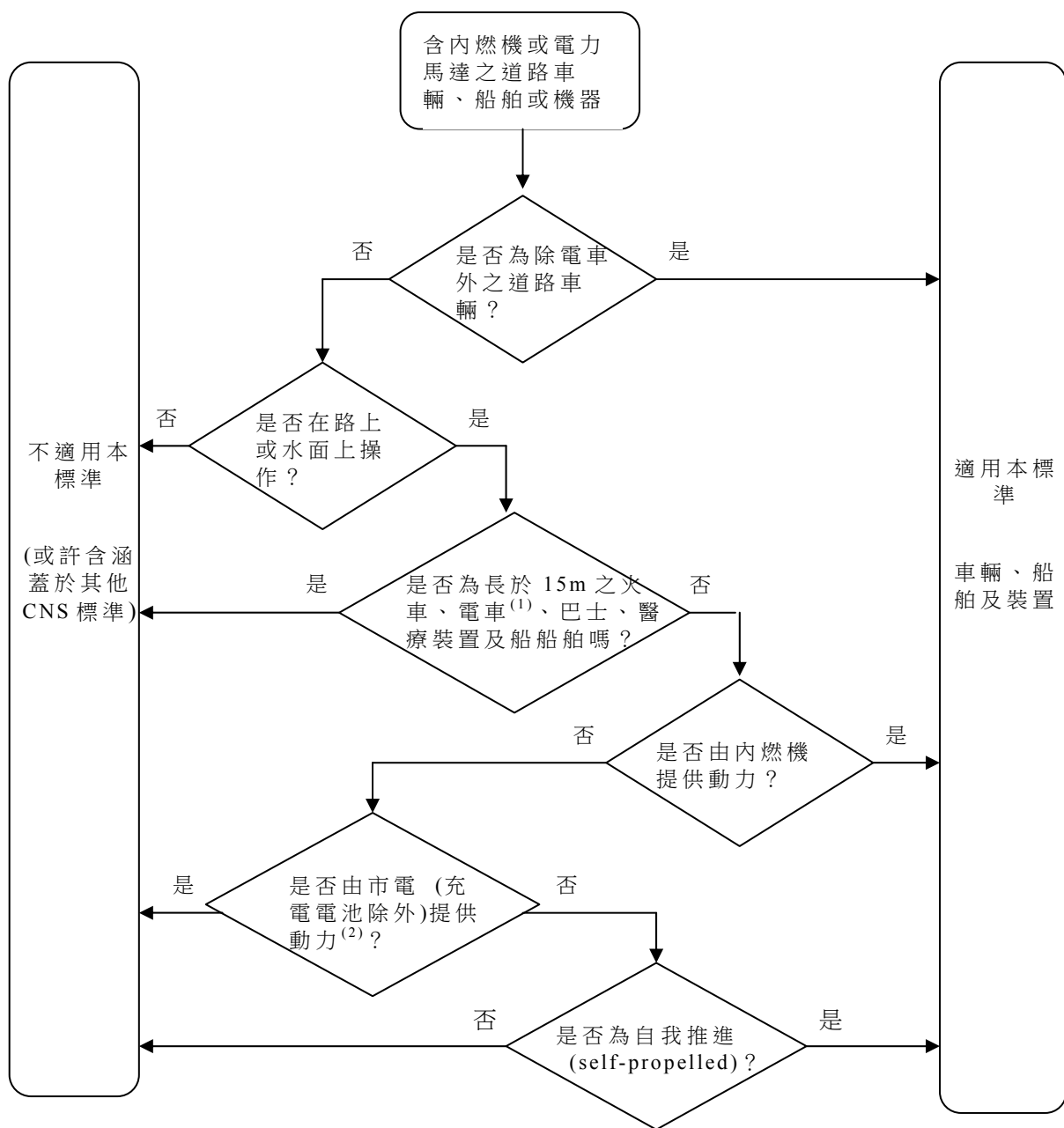
確認本標準之適用性流程圖



IEC 303/00

(1) 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 a.c./d.c. mains portion of the vehicle propulsion system shall be excluded from this standard.

(2) Connection to the electrical mains is the work of another CISPR subcommittee.



(1) 對於雙重模式之電車(如以交/直流市電或內燃機推進), 該車輛推進系統之交/直流市電部分應排除於本標準之外。

(2) 連接至市電參照其他 CNS 標準。

This chart is intended to assist with determining whether a particular product is covered by this publication. In case of conflict between this chart and Clause 1, Scope, Clause 1 shall take precedence.

本圖旨在輔助判定特殊產品是否涵蓋於本標準, 若與第 1 節適用範圍有所抵觸, 則以第 1 節為準。

Annex B
(normative)

Antenna matching unit – Vehicle test

附錄 B
(規定)

天線匹配單元－車輛試驗

B.1 Antenna matching unit parameters (150 kHz to 6,2 MHz)

B.1 天線匹配單元之參數(150 kHz to 6,2 MHz)

The requirements for the measurement equipment are defined in 5.1.2.1.
量測設備之要求定義於 5.1.2.1。

B.2 Antenna matching unit – verification

B.2 天線匹配單元－驗證

The 10 pF and 60 pF values for the artificial antenna network of Figure B.1 are used to represent a conventional antenna, e.g., 1 m rod, 2 m coax. The 60 pF capacitor represents the capacitance of the coaxial cable between the vehicle antenna and the input of the vehicle radio.

圖 B.1 人工天線網路之 10pF 及 60pF 用於代表傳統 1 m 桿形天線及 2 m 同軸電纜，60 pF 電容代表車輛天線及車輛無線電輸入端間之同軸電纜線電容值。

NOTE Actual values with on-glass antennas and diversity systems may vary greatly.

備考：窗上(on-glass)天線及全向性(diversity)系統之實際數值可能變化很大。

B.2.1 Gain measurement

B.2.1 增益量測

The antenna matching unit shall be measured to determine whether its gain meets the requirements of 5.1.2.1 using the test arrangement shown in Figure B.1.

應以圖 B.1 試驗配置量測天線匹配單元，以判定其增益是否符合 5.1.2.2 之要求。

B.2.2 Test procedure

B.2.2 試驗程序

a) Set the signal generator 40 dB(μ V) output level.

(a) 設定信號產生器輸出位準為 40 dB(μ V)。

b) Plot the gain curve for each frequency segment.

(b) 依每一段頻率繪製增益曲線。

NOTE For more precise calibration, the actual values of the components used in the artificial antenna network (AAN) and the input parameters of the matching network may be measured. The actual attenuation for the specific measuring equipment can be calculated and used to obtain the matching network gain with greater precision.

備考：為達較精確的校正，可量測人工天線網路所使用之零件及匹配網路輸入參數的實際值。特殊量測設備之實際衰減值可計算而得，並用於使匹配網路之增益更為精確。

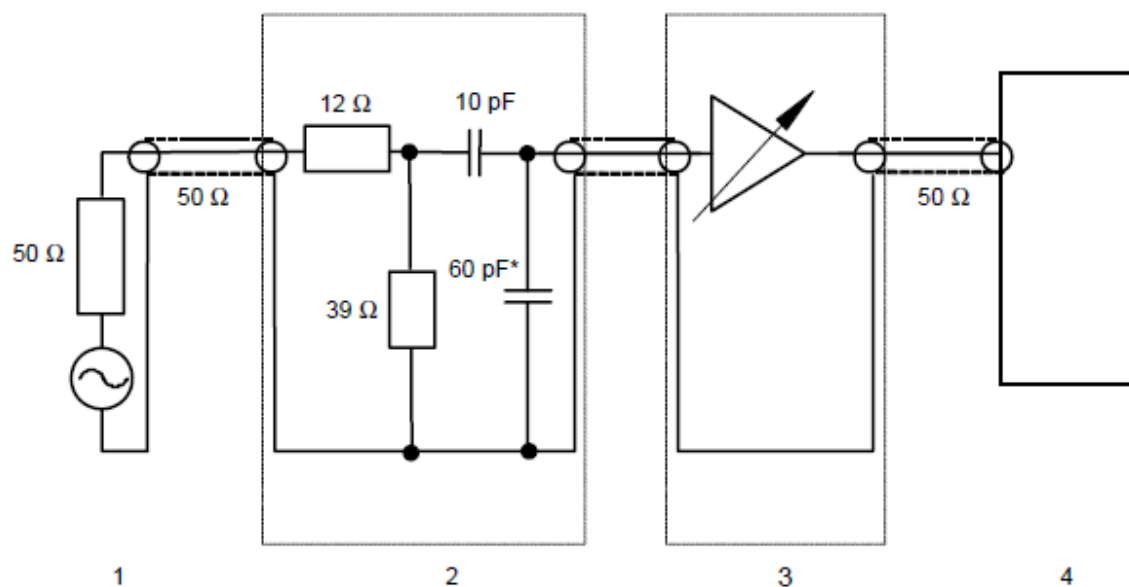
B.3 Impedance measurement

B.3 阻抗量測

Measurement of the output impedance of the antenna matching unit with the antenna attached shall be made with a vector impedance meter (or equivalent test equipment). The output impedance shall lie within a circle on a Smith chart crossing $(100 + j0) \Omega$, having its centre at $(50 + j0) \Omega$ (e.g. SWR less than 2:1).

應以向量阻抗表(或等同之試驗設備)量測連接天線之天線匹配單元的輸出阻抗，該輸出阻抗應在以 $(50 + j0) \Omega$ 為史密斯圖圓心， $(100 + j0) \Omega$ 的圓圈範圍內(例如：駐波比小於 2 : 1)。

Figure B.1 – Verification set-up



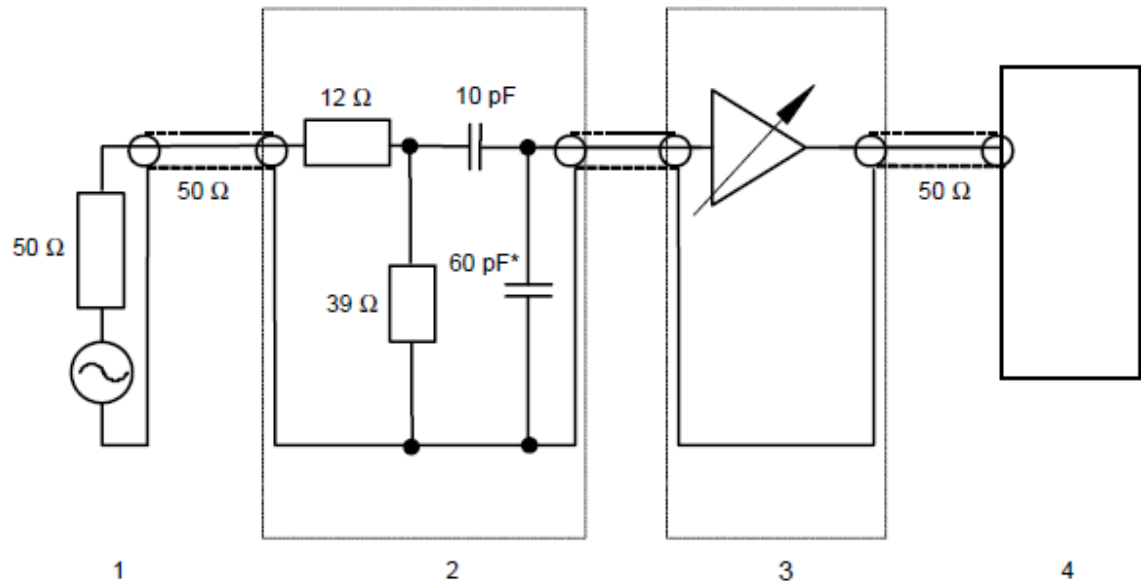
IEC 384/08

Key

- 1 Signal generator
- 2 Artificial antenna network
- 3 Antenna matching unit
- 4 Measuring instrument

* Includes connector capacitance and, if used, cable capacitance

圖 B.1 驗證設置



說明

1. 信號產生器
2. 人工天線網路
3. 天線匹配單元
4. 量測儀器

* 包含連接器電容值，及纜線電容值(若使用)。

Annex C
(informative)
Sheath-current suppressor

附錄 C
(參考)
披覆電流抑制器

C.1 General

C.1 通則

This Annex provides information on a proposed performance and verification of a sheath-current suppressor recommended for use when measuring vehicle antenna terminal voltage in the AM broadcast bands (LW, MW, SW). This suppressor electrically-isolates the ALSE from the vehicle ground.

本附錄提供於 AM 廣播頻帶(LW、MW 及 SW)量測車輛天線終端電壓時，建議使用之披覆電流抑制器的性能及驗證資訊提議，本抑制器電氣隔離了內襯吸波材料屏蔽圍體及車輛接地。

C.2 Suppressor construction

C.2 抑制器結構

The performance curve below (Figure C.1) shows the attenuation of the sheath currents using 20 turns of a coaxial cable around a ferrite toroidal core:

Material: N30; $A_l = 5\,400\text{ nH}$

Size: Toroidal core $58\text{ mm} \times 40\text{ mm} \times 17\text{ mm}$

Manufacturer: Siemens Order No.: B64290-A40-X830

Number of turns: 20 (coaxial cable)

以下性能曲線(圖 C.1)顯示使用 20 圈同軸電纜環繞亞鐵鹽環形線圈之表皮電流之衰減：

材料：N30； $A_l = 5400\text{ nH}$

尺寸：環形線圈 $58\text{ mm} \times 40\text{ mm} \times 17\text{ mm}$

製造商：西門子(Siemens)，訂購序號(Order No.)：B64290-A40-X830

圈數：20(同軸纜線)

NOTE To increase the attenuation, two sheath-current suppressors may be placed in series or more turns may be added to the single core.

備考：為增加衰減，可串聯二個披覆電流抑制器，或增加單一線圈之圈數。

Figure C.1 – Attenuation vs. frequency

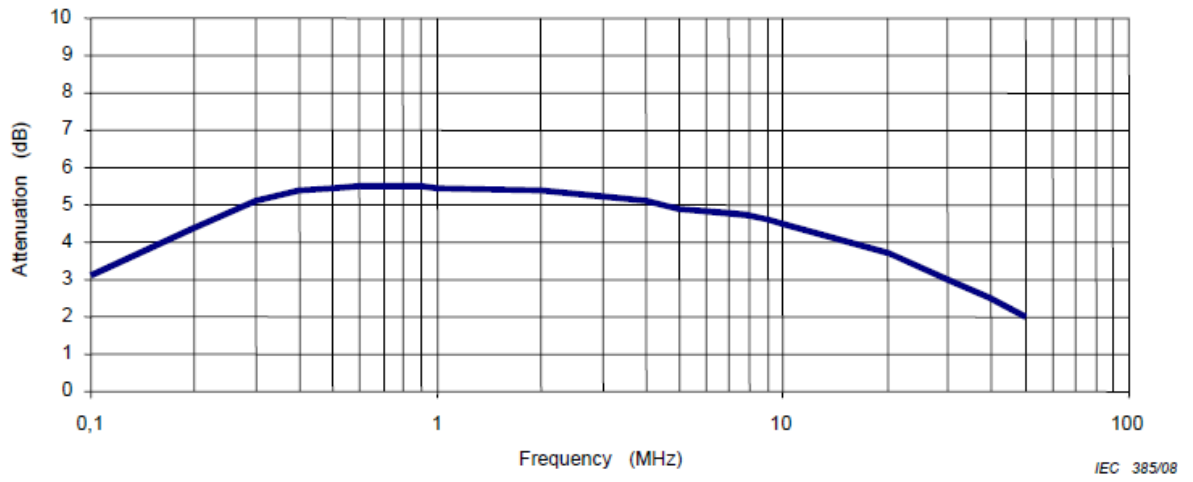
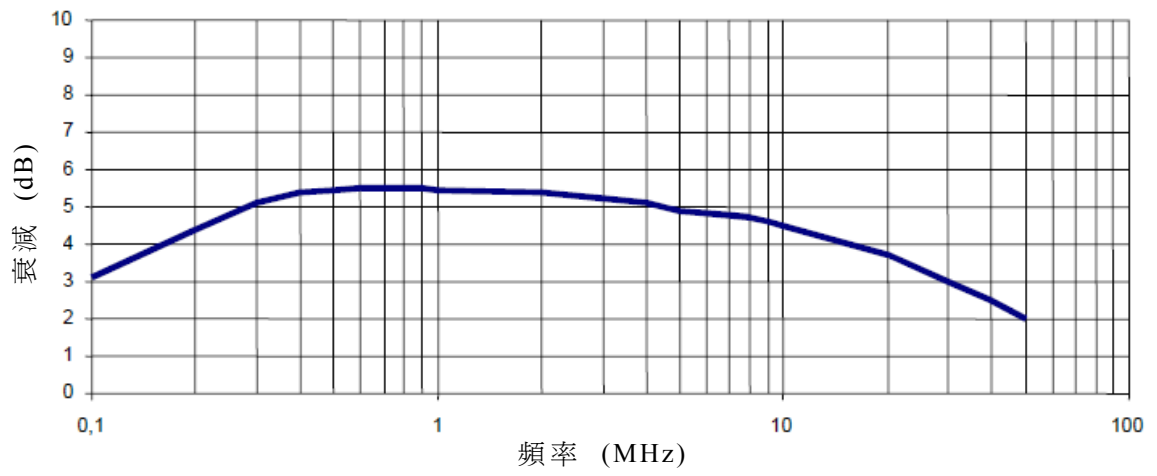


圖 C.1 衰減對頻率



Annex D
(informative)

Guidance for the determination of the noise floor of active vehicle antennas in the AM
and FM range

附錄 D

(參考)

於 AM 及 FM 範圍判定主動車輛天線背景雜訊之指導原則

Three steps are necessary to determine the noise floor of an active antenna installed in the vehicle:

判定安裝於車輛之主動天線的背景雜訊需以下列三個步驟：

1) Measurement of the noise floor of the test equipment (measuring receiver plus impedance converter) with coaxial cable impedance termination at the impedance converter RF-input in the AM- and FM-range. ($U_{\text{Equipment noise}}$) (Test set-up see Figure D.1).

(1)於 AM 及 FM 範圍，量測試驗設備之背景雜訊(量測接收機加上阻抗轉換器)，該設備於阻抗轉換器射頻輸入端以同軸纜線作阻抗終端。 $(U_{\text{Equipment noise}})$ (試驗設置參照圖 D.1)

2) Measurement of the noise floor of the active vehicle antenna including the noise floor of the test equipment. ($U_{\text{Equipment noise plus antenna noise}}$)(Test set-up see Figure D.2).

(2)量測主動車輛天線包含試驗設備之背景雜訊。(試驗設置參照圖 D.2)

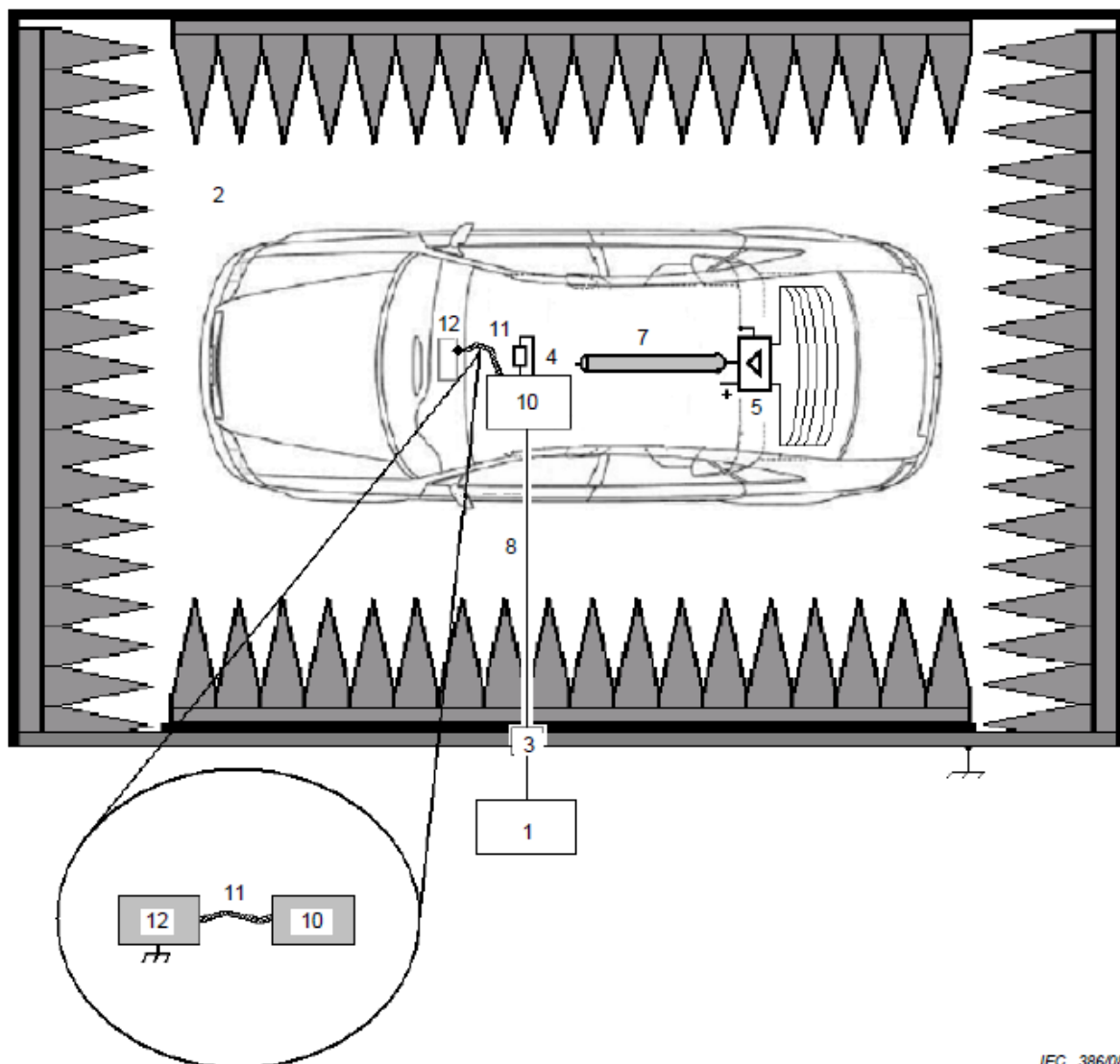
3) Calculation of the active antenna noise floor with formula (D.1) (all terms in μV):

$$U_{\text{Antennanoise}} = \sqrt{U_{\text{Equipmentnoisepusantennanoise}}^2 - U_{\text{Equipmentnoise}}^2} \quad (\text{D.1})$$

(3)以方程式(D.1)(單位為 μV)計算主動天線背景雜訊：

$$U_{\text{Antennanoise}} = \sqrt{U_{\text{Equipmentnoisepusantennanoise}}^2 - U_{\text{Equipmentnoise}}^2} \quad (\text{D.1})$$

Figure D.1 – Vehicle test set up for equipment noise measurement in the AM/FM range

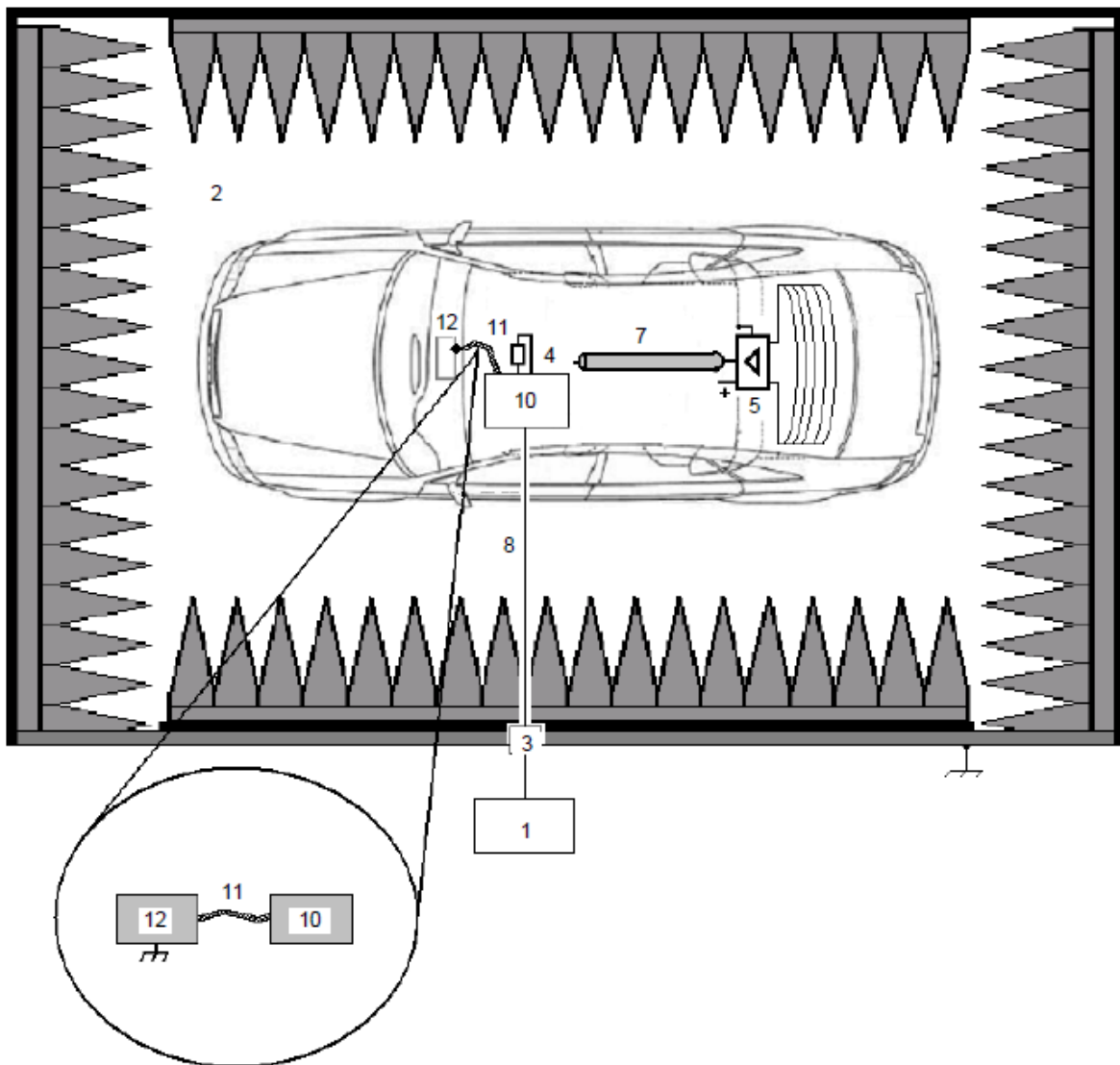


IEC 386/08

Key

- 1 Measuring instrument
- 2 ALSE
- 3 Bulkhead connector
- 4 Resistor according to coaxial cable impedance
- 5 Vehicle antenna amplifier
-
- 7 Antenna coaxial cable
- 8 High-quality double-shielded coaxial cable (50 Ω)
-
- 10 Impedance matching unit
- 11 Short connection to the housing of the on-board radio
- 12 Housing of on-board radio

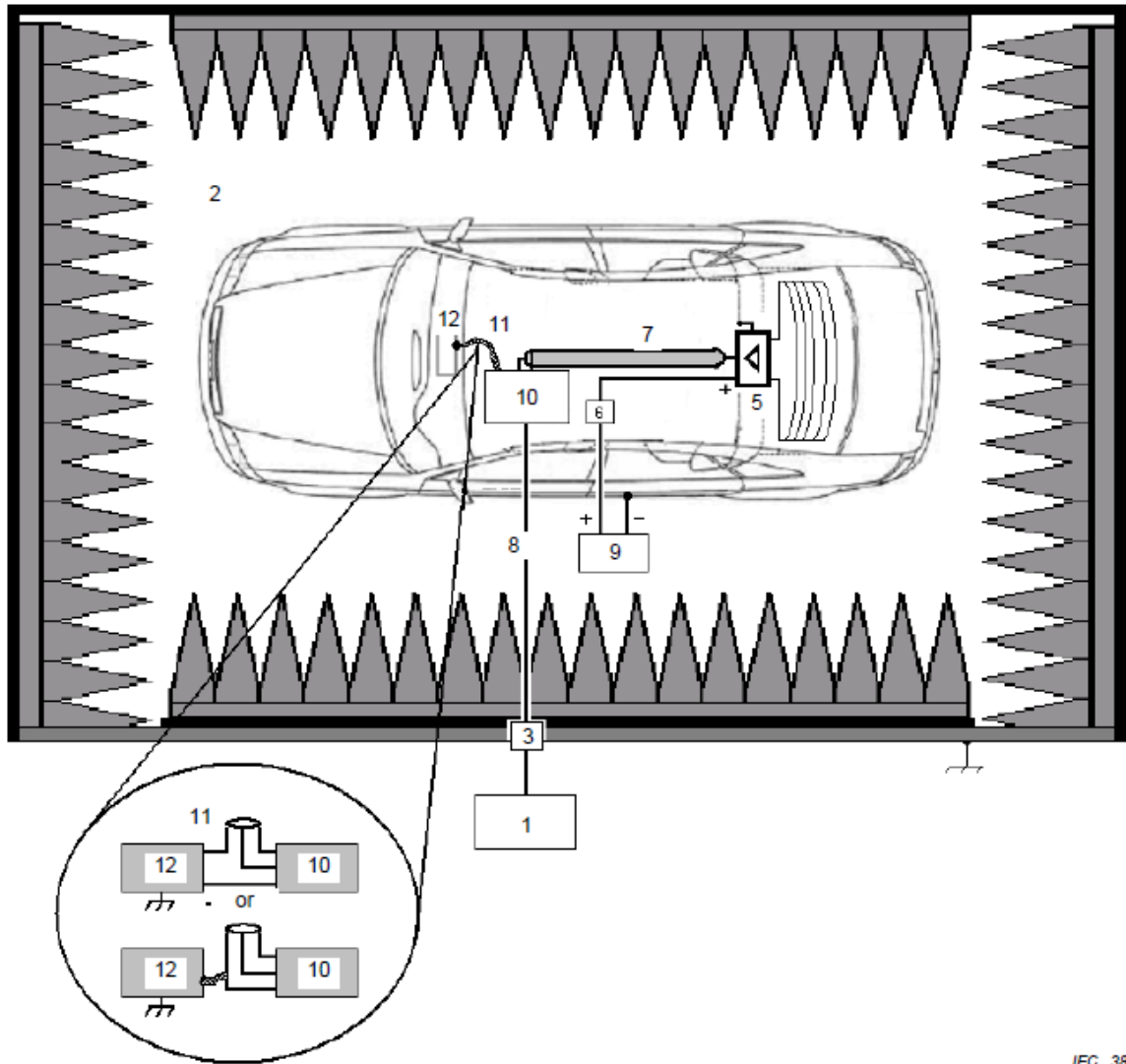
圖 D.1 AM/FM 範圍之車輛設備背景雜訊量測的試驗設置



說明

1. 量測儀器
2. 內襯吸波材料屏蔽圍體
3. 艙壁連接器
4. 與同軸纜線阻抗相關之電阻
5. 車輛天線放大器
-
7. 天線同軸纜線
8. 高品質雙重屏蔽同軸纜線(50 Ω)
-
10. 阻抗匹配單元
11. 車載無線電對外殼之短接線
12. 車載無線電外殼

Figure D.2 – Vehicle test set up for antenna noise measurement in the AM/FM range

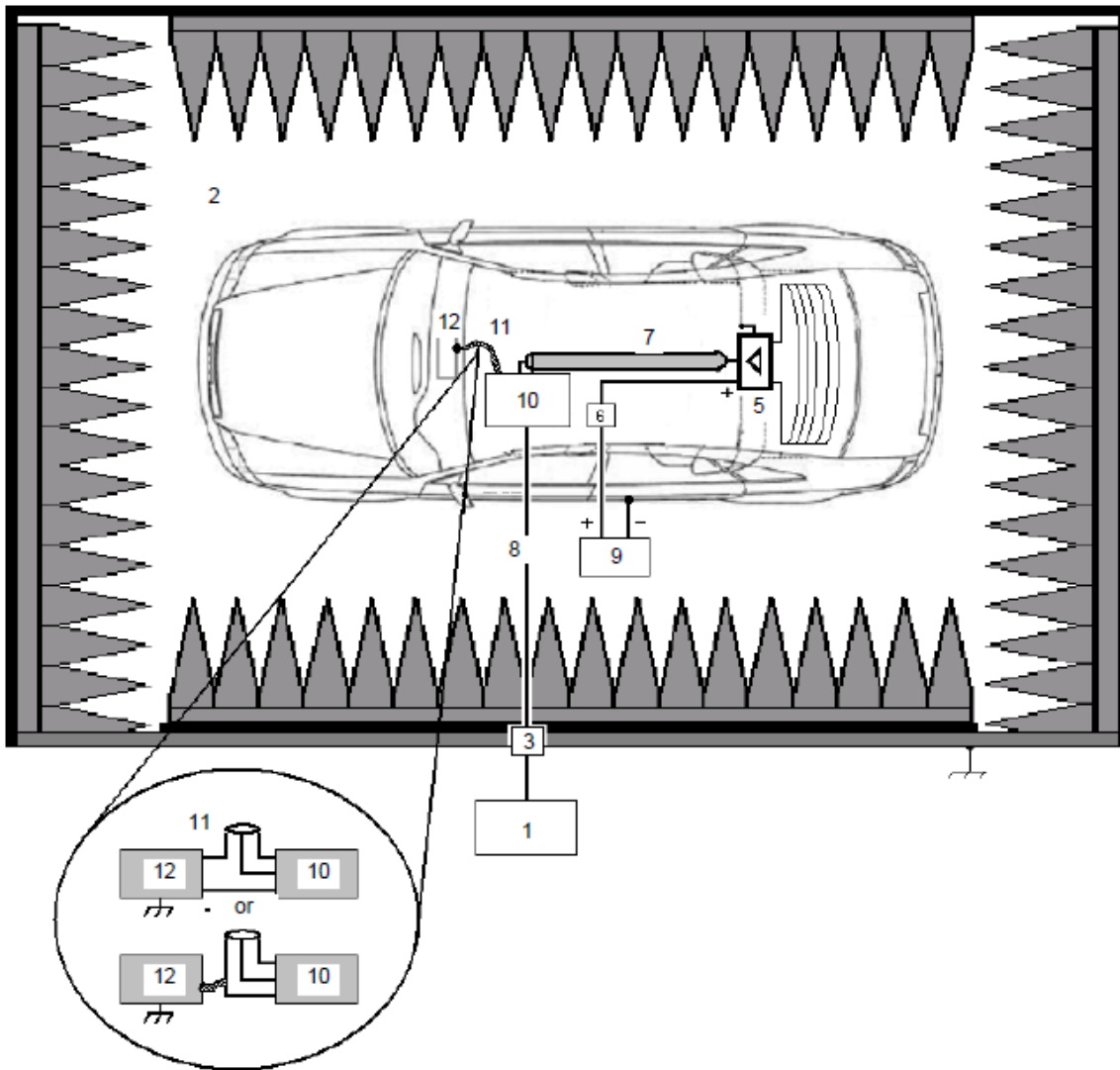


IEC 387/08

Key

- 1 Measuring instrument
- 2 ALSE
- 3 Bulkhead connector
-
- 5 Vehicle antenna amplifier
- 6 Antenna amplifier power plug
- 7 Antenna coaxial cable
- 8 High-quality coaxial cable e.g. double-shielded (50 Ω)
- 9 External 12V battery
- 10 Impedance matching unit
- 11 Modified coaxial "T" connector or short connection to the housing of the on-board radio
- 12 Housing of on-board radio

圖 D.2 AM/FM 範圍之車輛設備背景雜訊量測的試驗設置



說明

1. 量測儀器
2. 內襯吸波材料屏蔽團體
3. 艙壁連接器
-
5. 車輛天線放大器
6. 天線放大器電源插頭
7. 天線同軸纜線
8. 高品質雙重屏蔽同軸纜線(50 Ω)
9. 外部 12V 電瓶
10. 阻抗匹配單元
11. 同軸修整 T 型連接器或車載無線電對外殼之短接線
12. 車載無線電外殼

Annex E
 (normative)
 Artificial network
 附錄 E
 (規定)
 人工網路

The AN impedance Z_{PB} (tolerance $\pm 20\%$) in the measurement frequency range of 0,1 MHz to 100 MHz is shown in Figure E.1. It is measured between the terminals P and B (of Figure E.2) with a $50\ \Omega$ load on the measurement port with terminals A and B (of Figure E.2) shortcircuited.

人工網路在量測頻率範圍 0.1MHz~100MHz 之阻抗 Z_{PB} (許可差 $\pm 20\%$) 如圖 E.1 所示，此量測值為量測埠接 $50\ \Omega$ 負載及端點 A 和 B(圖 E.2) 短路下，量測端點 P 和 B(圖 E.2) 所得之值。

Figure E.1 – Characteristics of the AN impedance

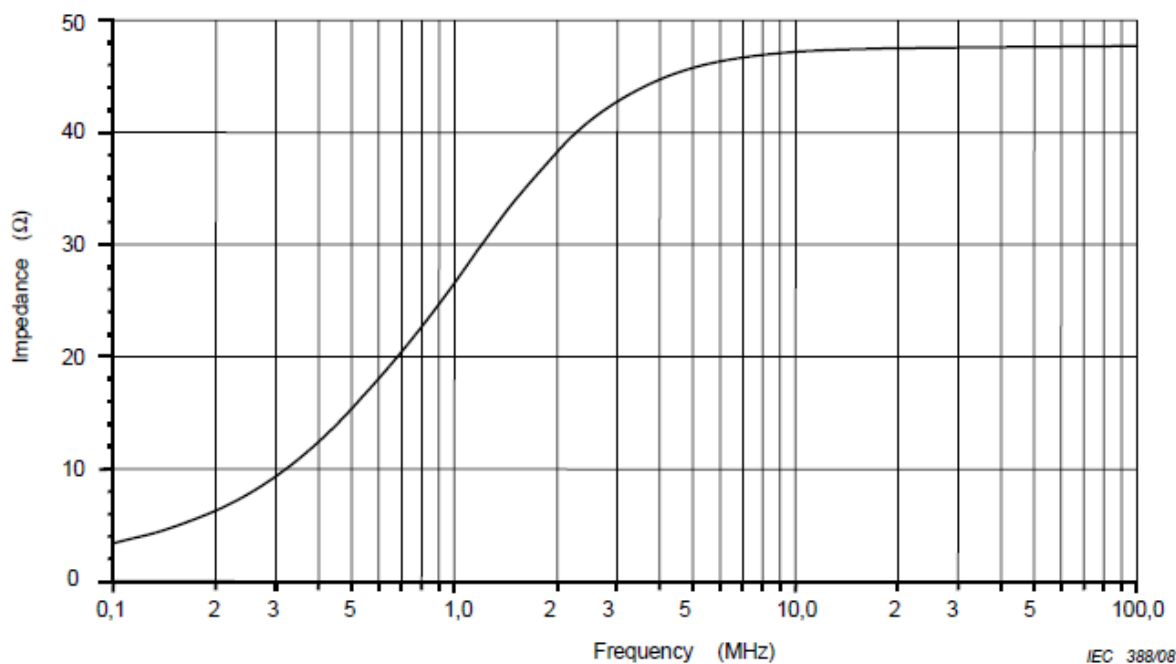


圖 E.1 人工網路阻抗特性

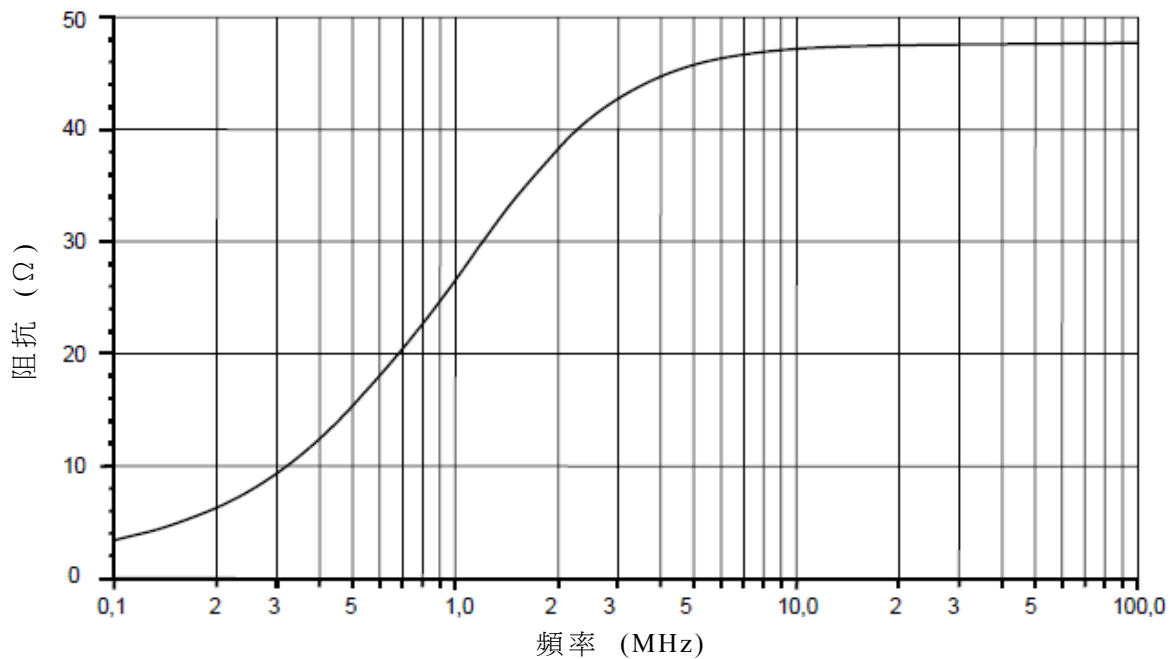


Figure E.2 - Example of 5 μH AN schematic

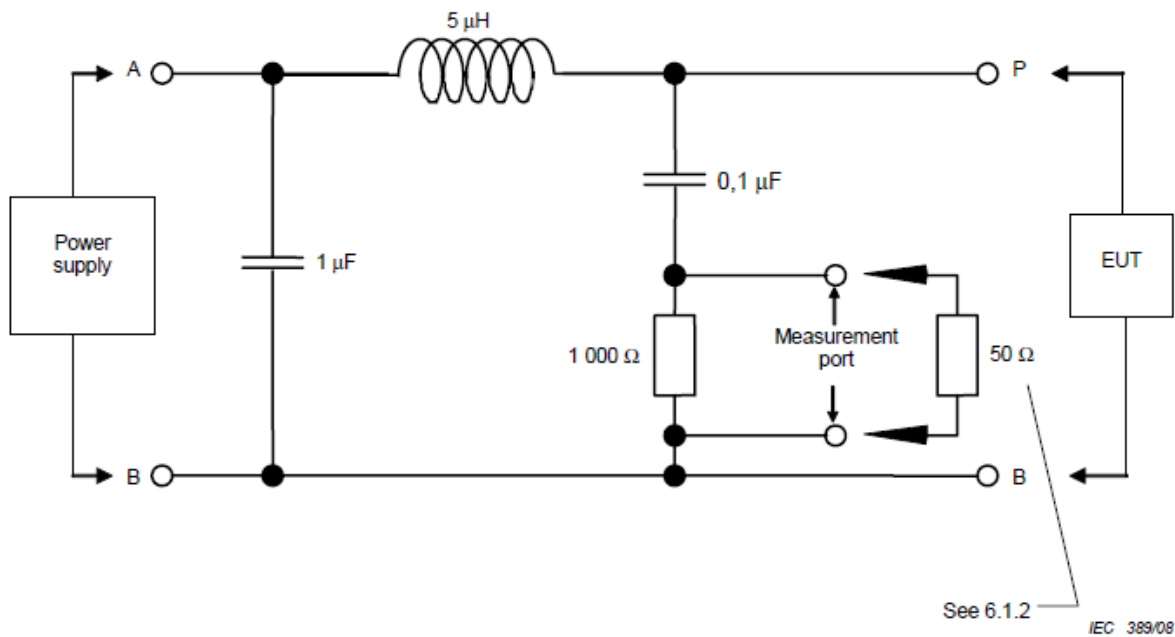
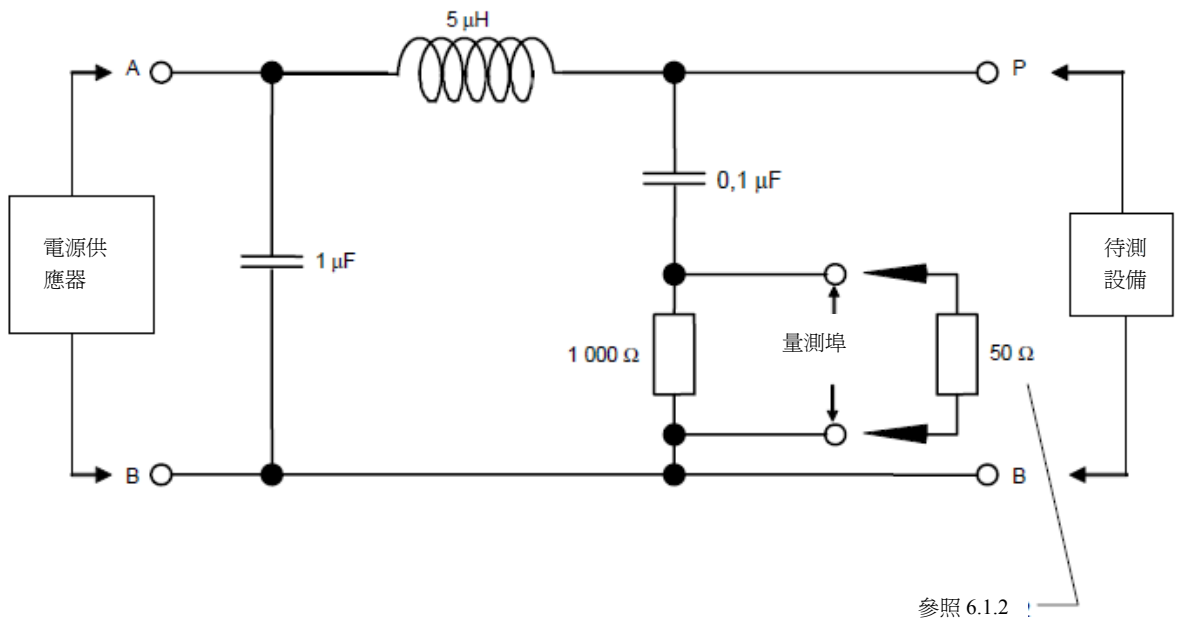


圖 E.2 5 μ H 人工網路之電路範例



Annex F
 (informative)
 TEM cell dimensions
 附錄 F
 (參考)
 橫向電磁波室尺寸

The dimensions of a TEM cell are shown in the Figure F.1 and given in Table F.1.
 橫向電磁波室尺寸如參照圖 F.1 及表 F.1 所示。

Figure F.1 – TEM cell

Figure F.1a – Horizontal section view at septum

Dimensions in millimetres

Drawing not to scale

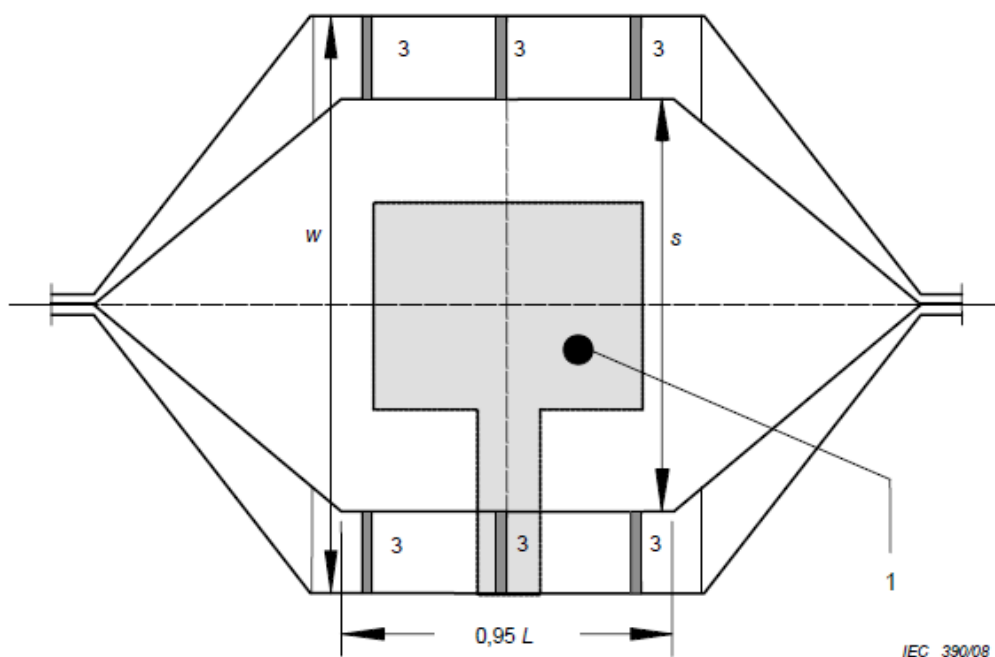
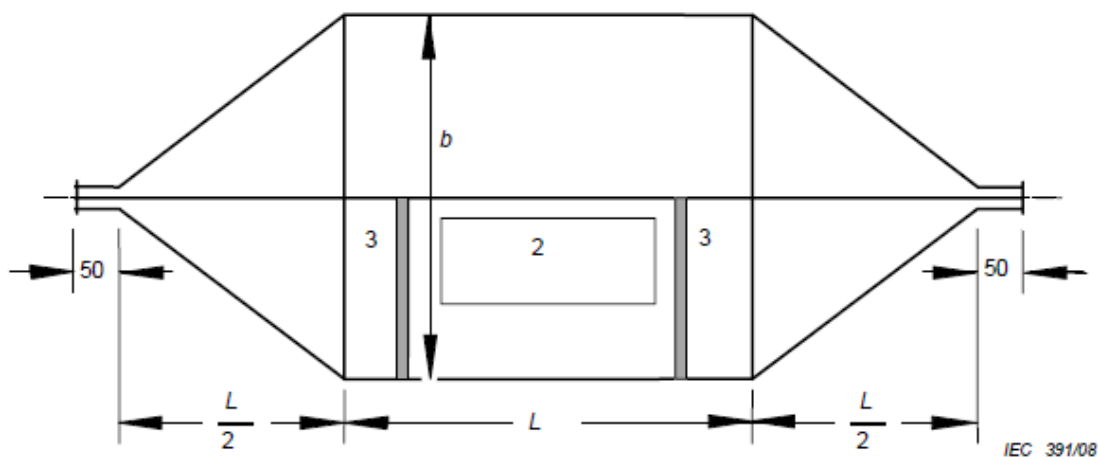


Figure F.1b – Vertical section view at septum



Key

1 Allowed working region: 0,33 W, 0,60 L

2 Access door

3 Dielectric supports

圖 F.1 橫向電磁波室

圖 F.1a 隔板部位之水平剖面視圖

單位：mm

未依比例繪製

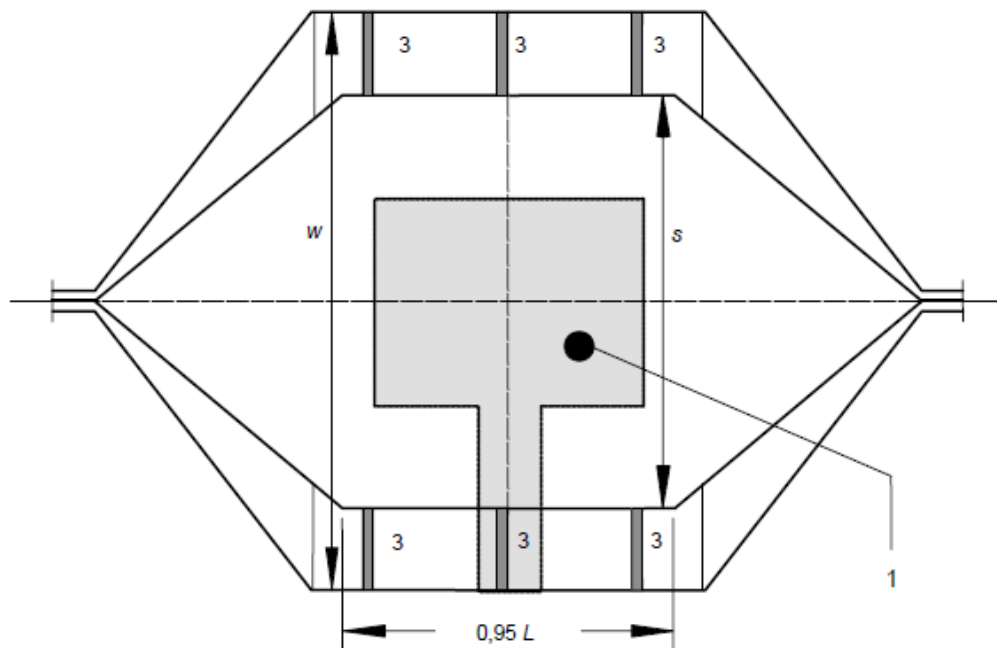
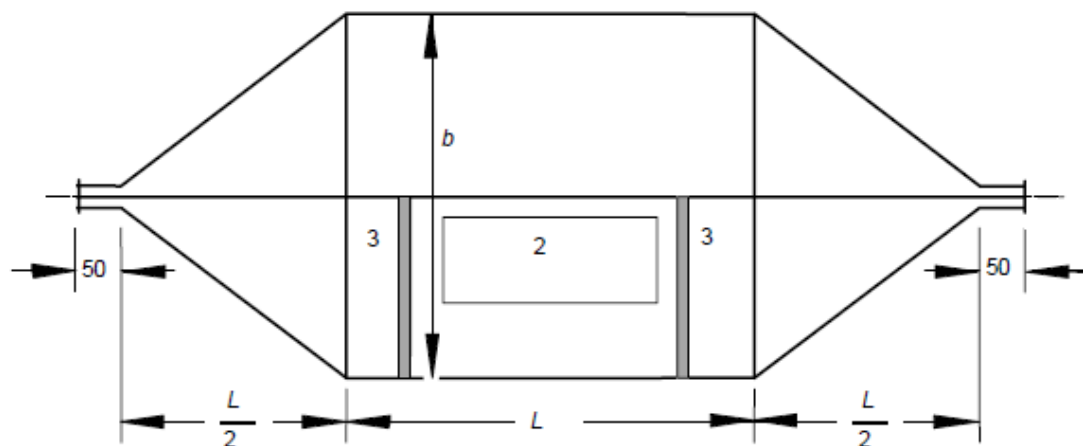


圖 F.1b 隔板部位之垂直剖面視圖



說明

1. 測試容區：寬 0.33，長 0.60
2. 開口
3. 介電支撐板

Table F.1 shows the dimensions for constructing TEM cells with specific upper frequency limits.

具規定頻率上限之橫向電波暗室構造尺寸參照表 F.1 所示。

Table F.1 – Dimensions for TEM cells

Upper frequency MHz	Cell form factor <i>W/b</i>	Cell form factor <i>L/W</i>	TEM cell height <i>b</i> mm	Septum width <i>S</i> mm
100	1,00	1,00	1 200	1 000
200	1,69	0,66	560	700
200	1,00	1,00	600	500
300	1,67	1,00	300	360
500	1,50	1,00	200	230

NOTE The TEM cells in the box are typical for automotive component testing. For integrated circuit testing, even smaller TEM cells may be applicable for testing up to and above 1 GHz.

表 F.1 橫向電磁波室尺寸

頻率上限 MHz	電磁波室尺寸 比列 <i>W/b</i>	電磁波室尺寸 比列 <i>L/W</i>	橫向電磁波室 高度 <i>b</i> mm	隔板寬度 <i>s</i> mm
100	1.00	1.00	1200	1000
200	1.69	0.66	560	700
200	1.00	1.00	600	500
300	1.67	1.00	300	360
500	1.50	1.00	200	230

備考：方框中之橫向電磁波室係典型用於汽車組件試驗，對於積體電路試驗，可適用甚至更小之橫向電磁波室執行低於及超過 1 GHz 之試驗。

Annex G
(informative)

Radiated emissions from components/modules – Stripline method

附錄 G

(參考)

組件/模組之輻射發射—帶線法

G.1 General

G.1 通則

The stripline is an open waveguide, which consists of a ground plane and an active conductor (septum) and has characteristic impedance. Commonly used values for characteristic impedances are 50 Ω and 90 Ω . Information relating to the size and construction of a stripline is given in Figure G.2 and Figure G.3.

帶線係包含接地平面及主動導體(隔板)，具特性阻抗之開路波導，常用之特性阻抗數值為 50 Ω 及 90 Ω ，與帶線尺寸及結構相關之資訊參照圖 G.2 及圖 G.3。

Users are encouraged to study and experiment with the test method to increase the body of knowledge with the aim of reaching consensus on including it in the main body of this standard at a future date.

在此鼓勵使用者對本方法進行研究及實驗，以增進相關知識之共識，並以未來列入本標準正文為目的。

The stripline may be used in the frequency range from 150 kHz to 400 MHz where the harness is the primary radiating/coupling element.

帶線可用於頻率範圍 150 kHz~400 MHz，此情況下線束為主要輻射/耦合元件。

The limits of the frequency range can be extended up to 1 000 MHz, if:

- the dominance of TEM mode can be shown ¹⁾;
- and the EUT is located under the septum;
- and the height of the EUT is limited to 1/3 of the septum height.

當以下條件，頻率範圍上限可延伸至 1000 MHz：

- 可顯示橫向電磁波為主要模式⁽¹⁾；
- 待測設備至於隔板下；
- 待測設備高度限於 1/3 之隔板高度。

¹⁾ For the design shown in figure G.2 it is presumed that the TEM mode is dominant up to 400 MHz. For the design shown in figure G.3 it is presumed that the TEM mode is dominant up to 1 000 MHz.

⁽¹⁾已推知圖 G.2 所示設計之主要橫向電磁波模式上限為 400 MHz，圖 G.3 所示設計之主要橫向電磁波模式上限為 1000 MHz。

Measurements shall be made in a shielded enclosure to eliminate high levels of external disturbances. For further details see Figure G.1.

量測應於屏蔽圍體執行，以消除外部擾動之高位準，進一步細節參照圖 G.1。

NOTE The influence of the shielded enclosure on the measured impedance (i.e.

reflection coefficient as measured with a network analyser) of the stripline should be less than 6 dB compared with an open field test site. To realize this it might be necessary to equip the shielded enclosure partially with absorbers. An example is shown in Figure G.1.

備考：屏蔽圍體對於量測帶線阻抗(即以網路分析儀測得之反射係數)之影響，與開放場試驗場地相較，須小於 6 dB，並可能需於屏蔽圍體某些地方裝設吸波體以達成，範例如圖 G.1 所示。

G.2 Test set-up

G.2 試驗設置

For radiated emissions measurements, the arrangement of the EUT, test harness, load simulator and measuring equipment shall be equivalent to the example shown in Clause G.1.

對於輻射發射量測，待測設備、試驗線束、負載模擬器及量測設備應與 G.1 所示之範例等同。

Deviations of the location and length of the test harness (e.g. the original vehicle harness) and the location of the EUT have to be agreed between customer and supplier.

客戶及供應商需就試驗線束(如原始車輛線束)之位置及長度之偏差，以及試驗設備之位置達成協議。

In order to achieve reproducible test results the EUT and the test arrangement shall be located at the same position in the stripline for each repeated measurement.

為達成試驗結果之可再現性，待測設備及試驗線束於各重複量測中應置於帶線中之相同位置。

G.2.1 Stripline impedance matching

G.2.1 帶線阻抗匹配

Correct impedance matching between the stripline and the measuring instrument of 50 Ω shall be maintained for all frequencies. This can be achieved by using lossless transmission line transformers (non-linear shape of the septum tapers or an additional external waveguide) or lumped passive network.

應維持帶線及量測儀器於所有頻率之正確阻抗匹配，可使用無損耗傳輸線變壓器(隔板錐形之非線性形狀或額外之外部波導)或是集總被動網路。

If the matching unit is a lumped passive network, appropriate correction of measurement results shall be made for any insertion loss.

若匹配單元為集總被動網路，應為任何量測結果之插入損耗做適當修正。

G.2.2 Location of the EUT

G.2.2 待測設備之位置

The EUT shall be placed (50 ± 5) mm above the ground plane on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1.4$) and shall be located on the same side as the 50Ω load of the stripline as shown in Figure G.1. The case of the EUT shall not be grounded to the ground plane unless it is intended to simulate the real vehicle configuration. In the case that the EUT is not located under the septum, the EUT shall be located at a distance of (200_0^{+50}) mm from the edge of the septum.

待測設備應置放在高於接地平面 (50 ± 5) mm 之非導電性、低相對介電常數材料($\epsilon_r \leq 1.4$)上，且應置於帶線同一側並接上 50Ω 負載，如圖 G.1 所示。待測設備之外殼不應接地至接地平面，除非意圖模擬實際車輛組態，若待測設備不置於隔板之下，待測設備應置於距隔板邊緣 (200_0^{+50}) mm 之處。

G.2.3 Location and length of the test harness

G.2.3 試驗線束之位置及長度

The length of test harness parallel to the septum shall be $(1\ 000 \pm 50)$ mm.

試驗線束平行隔板之長度應為 (1000 ± 50) mm。

The total length of the test harness between the EUT and the load simulator (or the RF boundary) is typical $1\ 700$ mm and shall not exceed $2\ 000$ mm. The same test harness can be used as with the ALSE test method (see 6.4).

試驗線束在待測設備及負載模擬器(或射頻邊界)之總長度典型為 $1\ 700$ mm，且不應超過 $2\ 000$ mm，同一試驗線束可用於內襯吸波材料屏蔽團體試驗法(參照 6.4)。

The long segment of the test harness shall be within the inner one-third of the width of the septum. Ideally, it is placed under the centreline of the septum.

試驗線束之長邊應置於隔板內三分之一寬度之內，理想上是置於隔板中心。

The wiring type is defined by the intended system application and requirement. The test harness shall be placed on a non-conductive, low relative permittivity material ($\epsilon_r \leq 1.4$), (50 ± 5) mm above the ground plane. The locations of the EUT and load simulator require a harness bend angle of (90 ± 15) degrees.

繞線類型依系統意圖之應用及要求而定，試驗線束應置放在高於接地平面 (50 ± 5) mm 之非導電性、低相對介電常數材料($\epsilon_r \leq 1.4$)上，並要求待測設備及負載模擬器之位置應與線束呈 (90 ± 15) 度彎角。

G.2.4 Location of the load simulator

G.2.4 負載模擬器之位置

The load simulator should be located at a distance of (200_0^{+50}) mm from the edge of the septum. If this cannot be met, the actual location of the load simulator shall be documented in the test report.

負載模擬器須置於距隔板邊緣 (200_0^{+50}) 處，若無法符合，應於試驗報告上記錄實際位置。

The load simulator shall be placed directly on the ground plane. If the load simulator has a metallic case, this case shall be bonded to the ground plane. Alternatively, the load simulator may be located adjacent to the ground plane (with the case of the load simulator bonded to the ground plane) or outside of the test chamber, provided the test harness from the EUT passes through an RF boundary bonded to the ground plane. When the load simulator is located on the ground plane, the d.c. power supply lines of the load simulator shall be connected through the AN(s) (see 6.1.2).

負載模擬器應直接置於接地平面上，若負載模擬器具金屬外殼，該外殼應搭接至接地平面，或者，負載模擬器可置於鄰近接地平面處(負載模擬器之外殼搭接至接地平面)，或提供由待測設備經射頻邊界之試驗線束，於試驗室外搭接至接地平面。當負載模擬器置於接地平面，負載模擬器之直流電源供應線應經由人工網路連接(參照 6.1.2)。

G.3 Test procedure

G.3 試驗程序

The general arrangement of the EUT, the harness and the peripherals, represents a standardized test condition. Any deviations from the standard test configuration shall be agreed between customer and supplier prior to testing and recorded in the test report.

待測設備、線束及週邊等一般配置為標準試驗條件，對於任何標準試驗組態之偏差，客戶及供應商應於試驗前協議，且記錄於試驗報告中。

The EUT shall be installed to operate under typical loading and operating conditions in the vehicle in such a way that the maximum emission state occurs. These operating conditions have to be defined in the test plan to ensure that customer and supplier are performing identical tests.

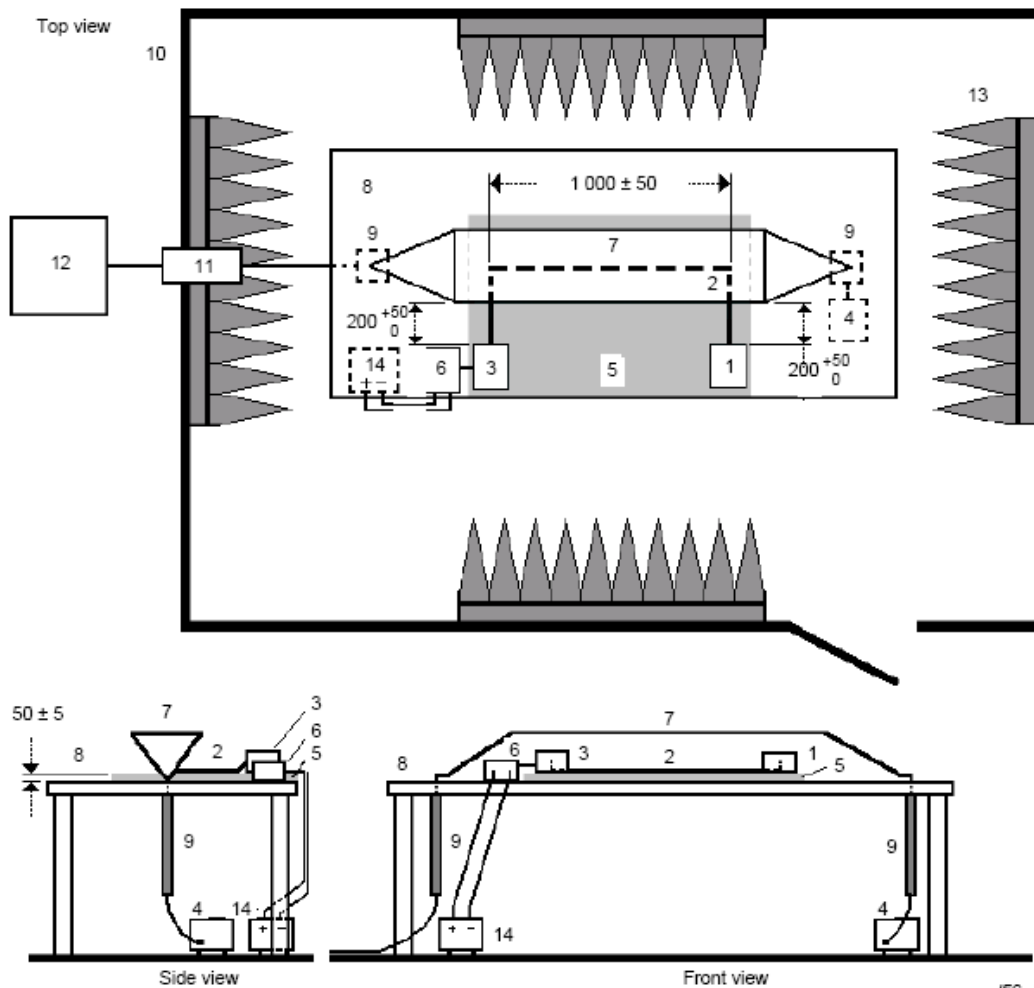
待測設備應依典型負載及車上操作條件之操作需求來安裝，以令最大發射狀態產生，這些操作條件需於試驗計畫上清楚定義，以確保供應商及客戶執行等同之試驗。

The arrangement of the EUT as well as the measuring equipment shall be functionally equivalent to the example shown in Figure G.1 and shall be defined in the test plan.

待設備及量測設備之配置應與圖 G.1 所示之範例在功能上等同，且定義於試驗計畫。

Figure G.1 – Example of a basic stripline test setup in a shielded enclosure

Dimensions in millimetres



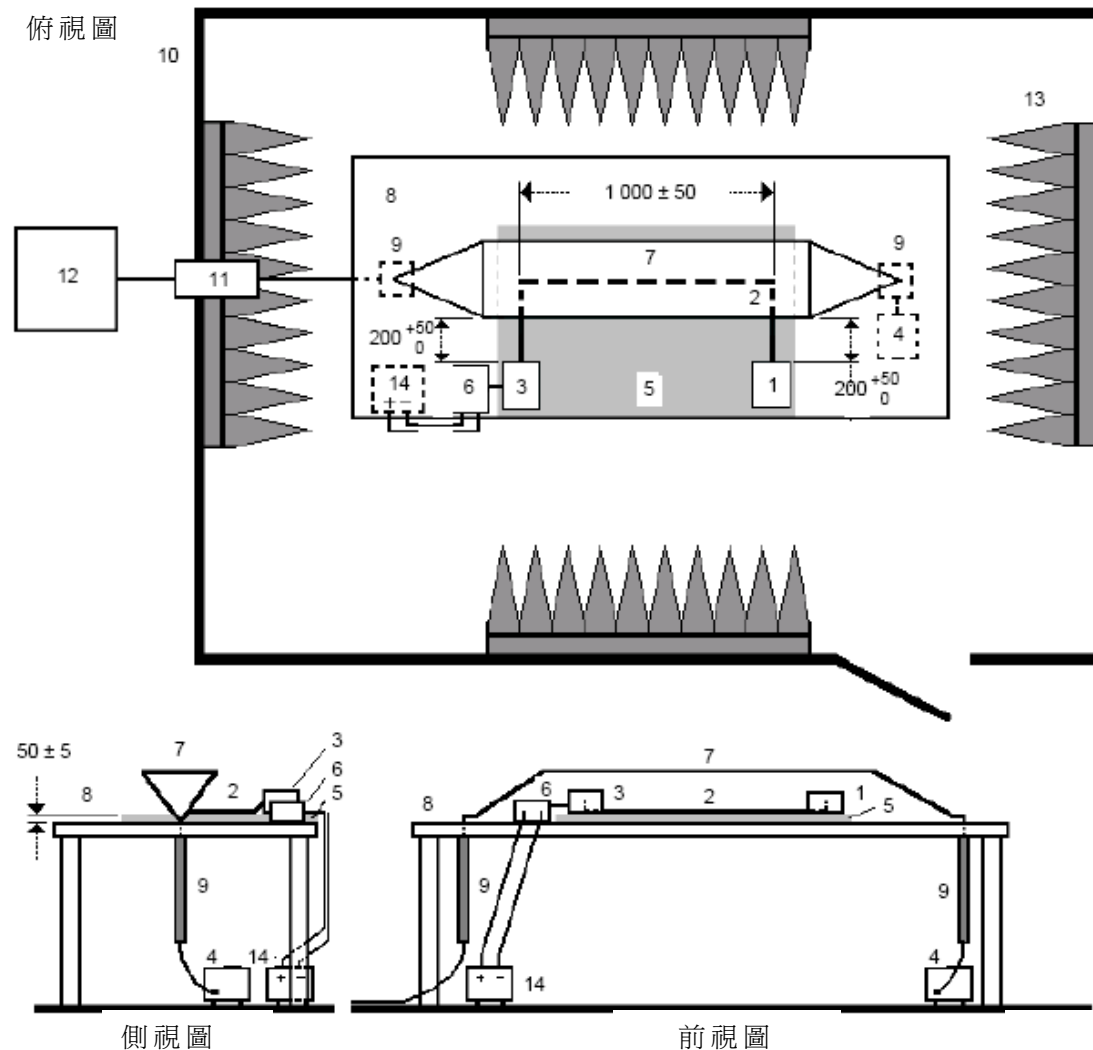
IEC 302/08

Key

- 1 EUT
- 2 Test harness
- 3 Load simulator
- 4 50 Ω load (location optional)
- 5 Low relative permittivity support ($\epsilon_r \leq 1,4$)
- 6 Artificial network (AN)
- 7 Septum
- 8 Ground plane
- 9 Matching unit (if necessary)
- 10 Wall of shielded room
- 11 Bulkhead connector
- 12 Measuring instrument
- 13 Absorbers (if necessary)
- 14 Power supply (location optional)

圖 G.1 屏蔽圍體中之基本帶線試驗設置範例

單位：mm



說明

1. 待測設備
2. 試驗線束
3. 負載模擬器
4. 50 Ω 負載(位置可選擇)
5. 低相對介電常數支撐板($\epsilon_r \leq 1.4$)
6. 人工網路(AN)
7. 隔板
8. 接地平面
9. 匹配單元(若需要)
10. 屏蔽室牆面
11. 艙壁連接器
12. 量測儀器
13. 射頻吸波材(若需要)
14. 電源供應器(位置可選擇)

G.4 Limits for radiated emissions from components/modules – Stripline method

G.4 組件/模組輻射擾動之限制值—帶線法

Some disturbance sources are continuous emitters and require a lower limit than a disturbance source which operates only periodically or for short intervals.

部分擾動源係連續發射器，故需要比僅週期性或短時間操作之擾動源更低的限制值。

The limits of the radiated electromagnetic energy may be different for each disturbance source and arrangement (coupling between antenna and electronic equipment in the vehicle).

每一擾動源及配置(天線及車上電子設備之耦合)之輻射電磁能量限制值可能不同。

For evaluation of radiated emissions from components/modules the RF voltage at the stripline output is to be measured.

為評估來自組件/模組之輻射干擾，將量測帶線輸出端之射頻電壓。

Table G.1 – Examples of quasi-peak or peak limits for radiated disturbances – Stripline

Service / Band	Frequency MHz	Levels in dB(μ V)									
		Class 1		Class 2		Class 3		Class 4		Class 5	
		Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak	Peak	Quasi-peak
BROADCAST											
LW	0,15 - 0,30	87	74	77	64	67	54	57	44	47	34
MW	0,53 - 1,8	73	60	65	52	57	44	49	36	41	28
SW	5,9 - 6,2	65	52	59	46	53	40	47	34	41	28
FM	76 - 108	56	43	50	37	44	31	38	25	32	19
TV Band I	41 - 88	46	-	40	-	34	-	28	-	22	-
TV Band III	174 - 230	46	-	40	-	34	-	28	-	22	-
DAB III	171 - 245	40	-	34	-	28	-	22	-	16	-
TV Band IV/V	468 - 944	46	-	40	-	34	-	28	-	22	-
DTTV	470 - 770	50	-	44	-	38	-	32	-	26	-
DAB L band	1447 - 1494	Radiated emission – Stripline									
SDARS	2320 - 2345	Not applicable									
MOBILE SERVICES											
CB	26 - 28	64	52	58	46	52	40	47	34	41	28
VHF	30 - 54	56	43	50	37	44	31	38	25	32	19
VHF	68 - 87	50	37	44	31	38	25	32	19	26	13
VHF	142 - 175	50	37	44	31	38	25	32	19	26	13
Analogue UHF	380 - 512	50	37	44	31	38	25	32	19	26	13
RKE	300 - 330	44	-	38	-	32	-	26	-	20	-
RKE	420 - 450	44	-	38	-	32	-	26	-	20	-
Analogue UHF	820 - 960	50	37	44	31	38	25	32	19	26	13
GSM 800	860 - 895	56	-	50	-	44	-	38	-	32	-
EGSM/GSM 900	925 - 960	56	-	50	-	44	-	38	-	32	-
GPS L1 civil	1567 - 1583	Radiated emission – Stripline Not applicable									
GSM 1800 (PCN)	1803 - 1882										
GSM 1900	1850 - 1990										
3G / IMT 2000	1900 - 1992										
3G / IMT 2000	2010 - 2025										
3G / IMT 2000	2108 - 2172										
Bluetooth/802.11	2400 - 2500										
NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.											
NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.											

表 G.1 輻射擾動之準峰值或峰值限制值範例—帶線法

服務/頻帶	頻率 MHz	位準，單位為 dB(μ V)									
		等級 1		等級 2		等級 3		等級 4		等級 5	
		峰值	準峰值	峰值	準峰值	峰值	準峰值	峰值	準峰值	峰值	準峰值
廣播											
LW	0.15~0.30	87	74	77	64	67	54	57	44	47	34
MW	0.53~1.8	73	60	65	52	57	44	49	36	41	28
SW	5.9~6.2	65	52	59	46	53	40	47	34	41	28
FM	76~108	56	43	50	37	44	31	38	25	32	19
TV Band I	41~88	46	—	40	—	34	—	28	—	22	—
TV Band III	174~230	46	—	40	—	34	—	28	—	22	—
DAB III	171~245	40	—	34	—	28	—	22	—	16	—
TV Band IV/V	468~944	46	—	40	—	34	—	28	—	22	—
DTTV	470~770	50	—	44	—	38	—	32	—	26	—
DAB L band	1447~1494	輻射發射—帶線法 不適用									
SDARS	2320~2345										
行動服務											
CB	26~28	64	52	58	46	52	40	47	34	41	28
VHF	30~54	56	43	50	37	44	31	38	25	32	19
VHF	68~87	50	37	44	31	38	25	32	19	26	13
VHF ^b	142~175	50	37	44	31	38	25	32	19	26	13
Analogue UHF	380~512	50	37	44	31	38	25	32	19	26	13
RKE	300~330	44	—	38	—	32	—	26	—	20	—
RKE	420~450	44	—	38	—	32	—	26	—	20	—
Analogue UHF	820~960	50	37	44	31	38	25	32	19	26	13
GSM 800	860~895	56	—	50	—	44	—	38	—	32	—
EGSM/GSM 900	925~960	56	—	50	—	44	—	38	—	32	—
GPS L1 civil	1567~1583	輻射發射—帶線法 不適用									
GSM 1800 (PCN)	1803~1882										
GSM 1900	1850~1990										
3G/IMT 2000	1900~1992										
3G/IMT 2000	2010~2025										
3G/IMT 2000	2108~2172										
Bluetooth/802.11	2400~2500										
備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。											
備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。											

Table G.2 – Examples of average limits for radiated disturbances – Stripline

Service / Band	Frequency MHz	Levels in dB(μ V)				
		Class 1	Class 2	Class 3	Class 4	Class 5
		AVG	AVG	AVG	AVG	AVG
BROADCAST						
LW	0,15 - 0,30	67	57	47	37	27
MW	0,53 - 1,8	53	45	37	29	21
SW	5,9 - 6,2	45	39	33	27	21
FM	76 - 108	36	30	24	18	12
TV Band I	41 - 88	36	30	24	18	12
TV Band III	174 - 230	36	30	24	18	12
DAB III	171 - 245	30	24	18	12	6
TV Band IV/V	468 - 944	36	30	24	18	12
DTTV	470 - 770	40	34	28	22	16
DAB L band	1447 - 1494	Radiated emission – Stripline Not applicable				
SDARS	2320 - 2345					
MOBILE SERVICES						
CB	26 - 28	45	39	33	27	21
VHF	30 - 54	36	30	24	18	12
VHF	68 - 87	30	24	18	12	6
VHF	142 - 175	30	24	18	12	6
Analogue UHF	380 - 512	30	24	18	12	6
RKE	300 - 330	30	24	18	12	6
RKE	420 - 450	30	24	18	12	6
Analogue UHF	820 - 960	30	24	18	12	6
GSM 800	860 - 895	36	30	24	18	12
EGSM/GSM 900	925 - 960	36	30	24	18	12
GPS L1 civil	1567 - 1583	Radiated emission – Stripline Not applicable				
GSM 1800 (PCN)	1803 - 1882					
GSM 1900	1850 - 1990					
3G / IMT 2000	1900 - 1992					
3G / IMT 2000	2010 - 2025					
3G / IMT 2000	2108 - 2172					
Bluetooth/802.11	2400 - 2500					
NOTE 1 All values listed in this table are valid for the bandwidths in Tables 1 and 2. If measurements have to be performed with different bandwidths than those specified in Tables 1 and 2 because of noise floor requirements, then applicable limits should be defined in the test plan.						
NOTE 2 Where multiple bands use the same limits the user shall select the appropriate bands over which to test. When the test plan includes bands that overlap the test plan shall define the applicable limit.						

表 G.2 輻射擾動之平均值限制值範例—帶線法

服務/頻帶	頻率 MHz	位準，單位為 dB(μV/m)				
		等級 1	等級 2	等級 3	等級 4	等級 5
		平均值	平均值	平均值	平均值	平均值
廣播						
LW	0.15~0.30	67	57	47	37	27
MW	0.53~1.8	53	45	37	29	21
SW	5.9~6.2	45	39	33	27	21
FM	76~108	36	30	24	18	12
TV Band I	41~88	36	30	24	18	12
TV Band III	174~230	36	30	24	18	12
DAB III	171~245	30	24	18	12	6
TV Band IV/V	468~944	36	30	24	18	12
DTTV	470~770	40	34	28	22	16
DAB L band	1447~1494	輻射發射—帶線法 不適用				
SDARS	2320~2345					
行動服務						
CB	26~28	45	39	33	27	21
VHF	30~54	36	30	24	18	12
VHF	68~87	30	24	18	12	6
VHF ^b	142~175	30	24	18	12	6
Analogue UHF	380~512	30	24	18	12	6
RKE	300~330	30	24	18	12	6
RKE	420~450	30	24	18	12	6
Analogue UHF	820~960	30	24	18	12	6
GSM 800	860~895	36	30	24	18	12
EGSM/GSM 900	925~960	36	30	24	18	12
GPS L1 civil	1567~1583	輻射發射—帶線法 不適用				
GSM 1800 (PCN)	1803~1882					
GSM 1900	1850~1990					
3G/IMT 2000	1900~1992					
3G/IMT 2000	2010~2025					
3G/IMT 2000	2108~2172					
Bluetooth/802.11	2400~2500					
備考 1. 依表 1 及表 2 之頻寬，本表所列之數值為有效，若因背景雜訊要求，需以與表 1 及表 2 不同之頻寬執行量測，試驗計畫中須定義所應用之限制值。						
備考 2. 其中數個頻帶採用相同限制值，使用者應選擇適當之頻帶以涵蓋整個試驗；當試驗計畫包含之頻帶重疊，試驗計畫應定義應用之限制值。						

These limits have been established for a 90 Ω stripline design as shown in Figure G.3. In case of using other stripline impedance characteristics than 90 Ω, the limits have to be adapted in accordance with the following formula G.1:

$$K_{\frac{90\Omega}{Z_2}} = 20 \lg \sqrt{\frac{90\Omega}{Z_2}} \text{ dB} \tag{G.1}$$

以上限制值依圖 G.3 設計之 90 Ω 帶線建立，若使用非 90Ω 阻抗特性之帶線，其限制值須依下列公式 G.1 調整：

$$K_{\frac{90\Omega}{Z_2}} = 20 \lg \sqrt{\frac{90\Omega}{Z_2}} \text{ dB} \tag{G.1}$$

Example for a stripline with 50 Ω characteristic impedance:

$$K_{\frac{90\Omega}{50\Omega}} = 20 \lg \sqrt{\frac{90\Omega}{50\Omega}} = 2.54 \text{ dB} \quad (\text{G.2})$$

Limits $Z_{50\Omega} = \text{Limits } Z_{90\Omega} - K_{90\Omega/50\Omega} = \text{Limits } Z_{90\Omega} - 2.54 \text{ dB}$

where

K is the correction factor for limits in dB;

Z is the characteristic impedance of stripline in Ω.

50 Ω 特性阻抗之帶線範例：

$$K_{\frac{90\Omega}{50\Omega}} = 20 \lg \sqrt{\frac{90\Omega}{50\Omega}} = 2.54 \text{ dB} \quad (\text{G.2})$$

$Z_{50\Omega}$ 之限制值 = $Z_{90\Omega}$ 之限制值 - $K_{90\Omega/50\Omega} = Z_{90\Omega}$ 之限制值 - 2.54 dB

其中，

K 為限制值之修正因子，單位為 dB；

Z 為帶線之特性阻抗，單位為 Ω。

G.5 Stripline design

G.5 帶線設計

An example of a 50 Ω stripline construction is shown in Figure G.2 and for a 90 Ω stripline in Figure G.3. The ratio of b/h determines the characteristic impedance. If dimension b is greater than h, the following equation G.3 applies:

$$z = \frac{120 \times \pi}{\frac{b}{h} + 2.42 - 0.44 \times \frac{h}{b} + \left[1 - \frac{h}{b}\right]^6} \quad (\text{G.3})$$

where

Z is the characteristic impedance of the stripline in Ω;

b is the stripline septum width in mm;

h is the stripline septum height above the ground plane in mm;

$\pi = 3,14159$.

圖 G.2 及圖 G.3 分別表示 50 Ω 及 90 Ω 之帶線結構範例，b/h 之比例決定了特性阻抗，若尺寸 b 大於 h，則應用以下公式 G.3：

$$z = \frac{120 \times \pi}{\frac{b}{h} + 2.42 - 0.44 \times \frac{h}{b} + \left[1 - \frac{h}{b}\right]^6} \quad (\text{G.3})$$

其中，

Z 為帶線之特性阻抗，單位為 Ω；

B 為帶線隔板寬度，單位為 mm；

H 為帶線隔板在接地平面上之高度，單位為 mm；

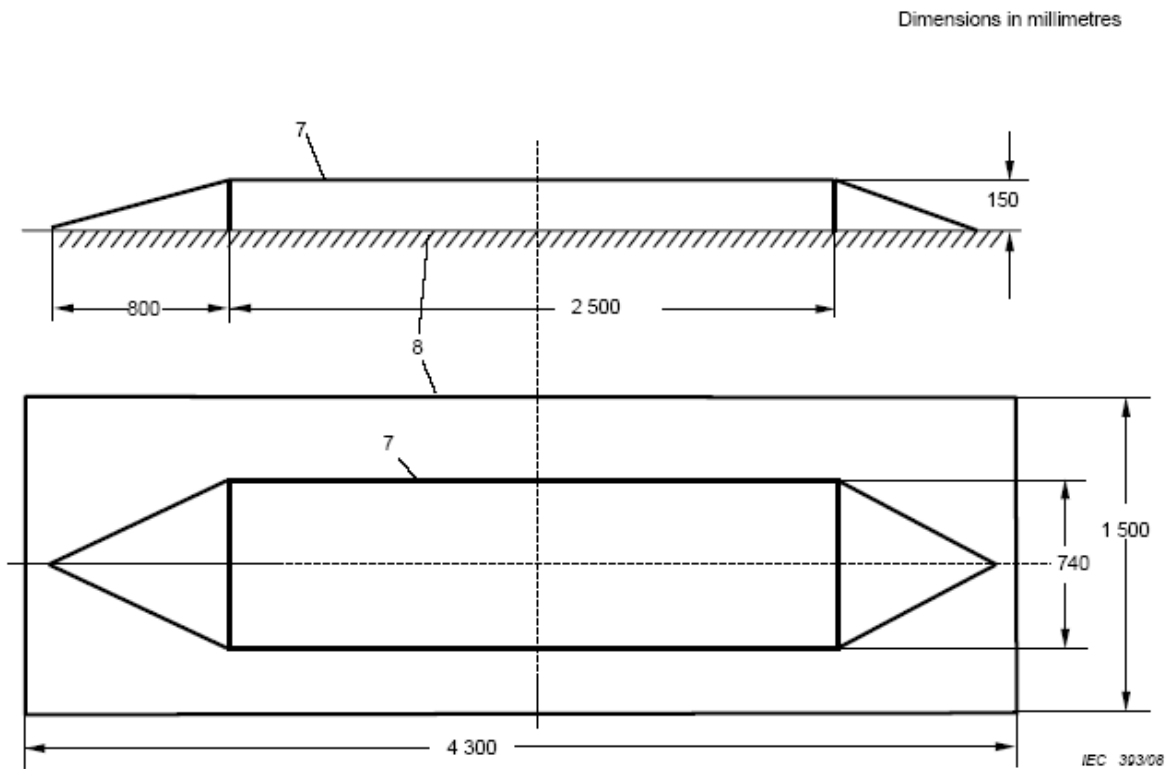
$\pi = 3,14159$ 。

NOTE Typical striplines are constructed to have an impedance of either 50 Ω or 90

Ω with b/h equal to 5 and 1,83, respectively. The termination may be either a resistive load or a tapered matching section terminated in a 50Ω coaxial resistive load. A resistive load may be constructed of carbon resistors, conductive strips, thick film on a ceramic substrate, etc., in such a way that it matches the characteristic impedance of the stripline and minimizes the standing waves ratio.

備考：典型之帶線結構具阻抗 50Ω 或 90Ω ，其 b/h 值分別為 5 及 1.83。其終端可為電阻性負載，或終接 50Ω 同軸電阻性負載之錐形匹配部分。電阻性負載可以碳質電阻器、導電帶、陶瓷基板上之厚膜等製成，只要與帶線之特性阻抗匹配，並將駐波比最小化即可。

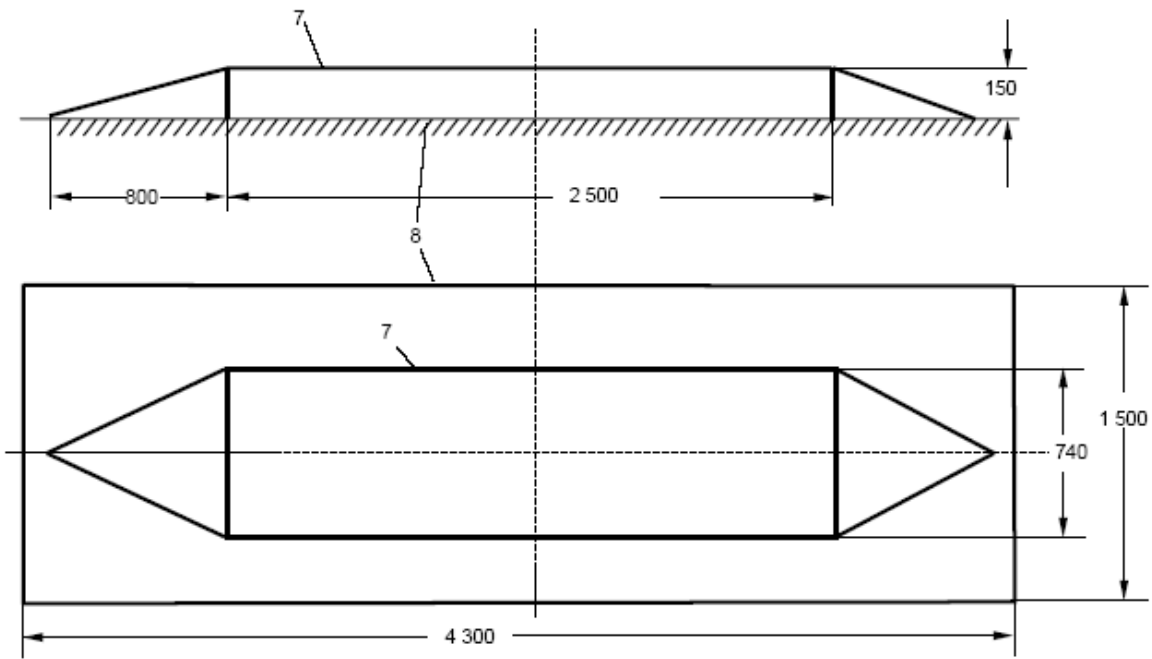
Figure G.2 – Example for a 50Ω stripline



- Key
- 7 Septum
 - 8 Ground plane

圖 G.2 50 Ω 帶線範例

單位：mm



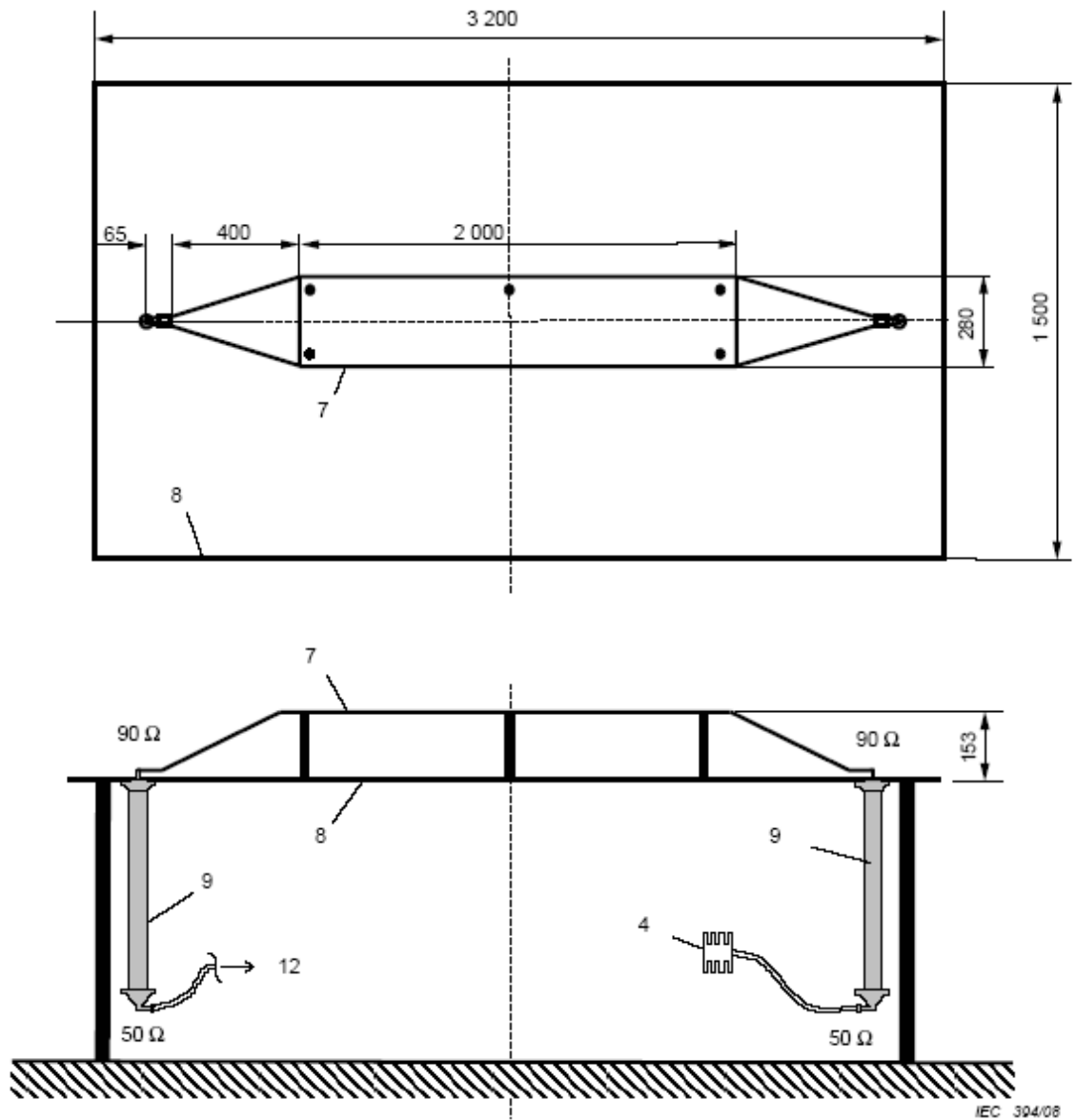
說明

7. 隔板

8. 接地平面

Figure G.3 – Example for a 90 Ω stripline

Dimensions in millimetres

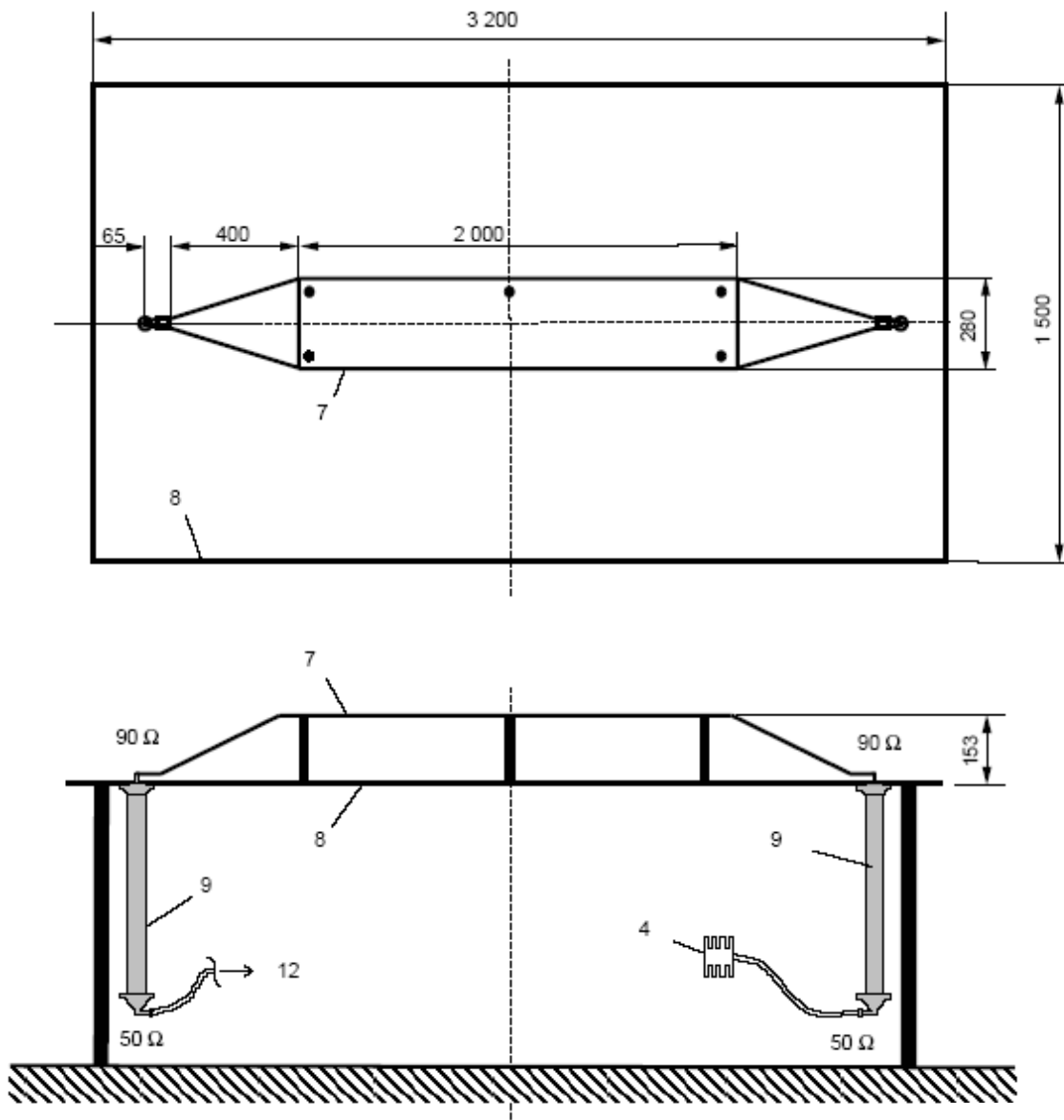


- Key
- 4 50 Ω load
 - 7 Septum
 - 8 Ground plane
 - 9 Matching unit
 - 12 Measuring instrument

IEC 394/08

圖 G.3 90 Ω 帶線範例

單位：mm



說明

- 4. 50 Ω 負載
- 7. 隔板
- 8. 接地平面
- 9. 匹配單元
- 12. 量測儀器

Annex H
(informative)

Interference to mobile radio communication in the presence of impulsive noise –
Methods of judging degradation

附錄 H
(參考)

脈衝雜訊對於行動無線電通訊之干擾—劣化判定方法

H.1 Introduction

H.1 簡介

This annex provides methods of judging the degradation of radio communication in the presence of impulsive noise.

本附錄提供脈衝雜訊對無線電通訊干擾之劣化判定方法。

H.2 Survey of methods of judging degradation to radio channel

H.2 無線電頻道劣化判定方法之調查

Test programs have been conducted in the United States of America by the Federal Communications Commission (FCC) and the Motor Vehicle Manufacturers Association (MVMA, later the American Automobile Manufacturers Association, AAMA, now disbanded). These test programs were directed toward providing a better understanding of the effects of motor vehicles on mobile communications reception.

試驗專案由聯邦通訊委員會(Federal Communications Commission, FCC)及汽車製造商協會(MVMA, 前身為美國汽車製造商協會(American Automobile Manufacturers Association, AAMA), 現已解散)於美國執行, 這些試驗專案直接針對汽車行動通訊接收的影響提供更佳之瞭解。

The tests measured the degradation to communications systems subjectively and objectively at numerous receiver frequencies using several classes of automotive ignition noise sources such as a traffic stream and a controlled matrix of vehicles. Correlation between various objective and subjective measures of degradation was studied using rating scales employed by the FCC and MVMA for grading communication quality.

本試驗主觀及客觀地在一些接收機頻段, 使用數個汽車點火雜訊源等級, 例如交通流(traffic stream)及車輛控制矩陣, 進行通訊系統劣化之量測。聯邦通訊委員會及汽車製造商協會對通訊品質分級導入使用量表(rating scales), 以進行各種客觀及主觀之劣化量測間的相關性研究。

H.2.1 Subjective tests

H.2.1 主觀性試驗

H.2.1.1 Subjective tests of annoyance

H.2.1.1 惱人度之主觀性試驗

Subjective degradation tests were conducted by the FCC using a single vehicle and groups of vehicles simulating traffic patterns. The FCC proposed and used a subjective jury rating scale based upon annoyance which had been used traditionally to determine the effects of ambient noise on job performance, accident rate, and fatigue of personnel.

聯邦通訊委員會使用單一及一組車輛模擬交通模式，以進行主觀性劣化試驗，聯邦通訊委員會提出並使用基於惱人程度之主觀評價量表，傳統上係用於判定環境雜訊對人員之工作表現、事故率及疲勞的影響。

Grade	Interfering effect was
5	almost nil
4	noticeable
3	annoying
2	very annoying
1	so bad the presence of speech was barely discernible

等級	干擾影響為
5	幾乎為零
4	可注意到
3	惱人的
2	非常惱人的
1	劣化至難以分辨語音存在

This grade system is very nearly the same as that given in ITU-R Recommendation ITU-R BS.1284 which should be used for future work if annoyance testing is conducted.

本等級系統非常近於 ITU-R 建議之 ITU-R BS.1284，該方法須用於未來執行惱人度試驗之時。

Quality	Impairment
5 excellent	5 imperceptible
4 good	4 perceptible, but not annoying
3 fair	3 slightly annoying
2 poor	2 annoying
1 bad	1 very annoying

品質	損害
5 極好	5 不易察覺的
4 好	4 可察覺，但不惱人
3 普通	3 輕微惱人的
2 差	2 惱人的

1 極差 1 非常惱人的

Annoyance is a highly subjective psychological reaction. The degree of annoyance caused by audible noise has been found to be influenced by a large number of variable physical and psychological factors (including illness, fatigue, status of interpersonal relations, and family problems).

惱人係高度主觀之心理反應，由聽覺雜訊引起之惱人程度已知受大量不同的物理及心理因子影響(包含疾病、疲勞、人際關係狀態及家庭問題)。

H.2.1.2 Subjective tests of intelligibility

H.2.1.2 理解度之主觀性試驗

H.2.1.2.1 General

H.2.1.2.1 通則

Since land mobile communication systems are used primarily to transmit voice messages, the performance of such systems should be based primarily on the intelligibility of the received signal in the presence of ignition noise.

由於陸地行動通訊系統主要用於傳遞聲音訊息，故此系統之性能須主要建立在接收信號遇到點火雜訊之理解度上。

The most common procedure for determining the intelligibility of a voice channel is a subjective method involving trained speakers and listener jury panels that directly score the percentage of speech that is intelligible. These schemes have the merit of producing repeatable results. Unfortunately, subjective scoring methods are expensive and timeconsuming. As a result, they are not widely used.

最普遍之判定聲音頻道的程序係一主觀性方法，以包含訓練有素之發言者及聆聽者為評審團，直接依發言之理解百分比進行評分。這些程序具有產生重複性結果之優點，但不理想的是主觀評分法昂貴且耗費時間，故並不廣泛使用。

The subjective scale for intelligibility proposed by the MVMA is:

Grade	Description
5	could understand the message extremely well
4	could understand the message fairly well
3	think I understood, but had to guess at some words
2	could barely discern the message
1	could not detect speech at all

由汽車製造商協會提出之理解度主觀性量表如下：

等級	描述
5	可非常良好地瞭解訊息
4	可不錯地瞭解訊息

- | | |
|---|-----------------|
| 3 | 認為我已瞭解，但須猜測部分字詞 |
| 2 | 很難辨識訊息 |
| 1 | 完全無法聽到語音 |

H.2.1.2.2 Intelligibility test method

H.2.1.2.2 理解度試驗方法

Beginning at 20 dB quieting with the vehicle ignition noise source off, the radio frequency input level was reduced by 1 dB decrements and scored at each decrement by the jury until the jury reached Grade 1 (worst). Then the radio frequency input level was increased by 1 dB increments until the 20 dB quieting level was again reached.

由車輛點火雜訊源關閉之 20 dB 安靜位準開始，射頻輸出位準以 1 dB 之遞減量下降，並由評審團在每個遞減量評分，直至評審團評定達到等級 1(最差)，接著射頻輸出位準以 1 dB 之遞增量增加，至重新達到 20 dB 之安靜位準為止。

The radio frequency input level was then increased by 3 dB increments until the jury rated the quality Grade 5 (best). The radio frequency input level was then decreased by 3 dB decrements until the 20 dB quieting level was reached.

射頻輸出位準接著以 3 dB 遞增量增加，至評審團評判為等級 5(最佳)之品質，接著射頻輸出位準以 3dB 遞減量下降，至達到 20 dB 之安靜位準為止。

The entire process was repeated with the vehicle noise source in operation.

於車輛雜訊源操作時重複整個程序。

The results of the two tests (noise source off / noise source on) were then compared and the difference in radio frequency level for a particular quality grade (in decibels) was reported as the subjective degradation.

之後比較二項試驗(雜訊源關閉/雜訊源啟動)之結果，並記錄特定品質等級(單位為 dB)在射頻位準之差異為主觀性劣化。

H.2.2 Objective tests

H.2.2 客觀性試驗

H.2.2.1 General

H.2.2.1 通則

Uncertainty in subjective measurements arises from ambiguity of the rating scale definition, and variability of juror judgement. The latter source of error is largely caused by psychological factors. Objective measurements should have uncertainties less than those obtained from subjective tests.

主觀性量測之不確定度來自於量表定義之模糊性及評審員評價之變異性，後者之誤差源大部分來自於心理因子，故客觀性量測之不確認度較來自主觀性之試驗為少。

A study carried out by the Institute for Telecommunication Sciences [1] develops a method of obtaining an objective intelligibility measure giving good results for speech sent through both analogue and digital noise-corrupted communication channels. The distortion measure is obtained using Linear Predictive Coding (LPC), a mathematical technique widely known for its application to the analysis and synthesis of speech.

由電信科學研究院[1]進行之研究，發展出獲取客觀理解度之量測方法，對於受雜訊損壞之類比及數位通訊頻道語音傳遞具良好之結果，此失真(distortion)量測係藉由使用線性預估編碼(Linear Predictive Coding ,LPC)獲得，此數學技術以其在語音分析及合成之應用廣為人知。

H.2.2.2 Objective test method

H.2.2.2 客觀性試驗方法

To develop an objective intelligibility measure for corrupted speech, a comparison must be performed between the distorted speech and the original noise-free speech. A subjective intelligibility measure of the distorted speech must also be available in order to judge the quality of the objective measure being used. Both of these requirements are met by first making a noise-free master tape of preselected speech, then sending it through the voice communication channels to be tested and making a recording of the speech at the channel outputs. The latter recording can be subjectively scored for intelligibility, and also compared with the original speech by a mathematical technique to obtain an objective score.

為發展損壞語音之客觀理解度量測，需對失真語音及原始無雜訊語音進行比較，亦需採用失真語音之主觀性理解度量測，以判定所用客觀量測之品質，以上要求皆需於首次為預選語音製作無雜訊錄音母帶時符合，接著將其透過待測聲音通訊頻道傳送，且於頻道輸出端錄製語音，可為後者之錄製作主觀理解度評分，亦可以數學技術與原始語音對照獲得客觀性評分。

The preselected speech to be sent over a voice channel for intelligibility scoring consists of phonetically balanced groups of isolated words, as opposed to complete sentences or nonsense syllables. These phonetically balanced words were used because subjective scores have been shown to be repeatable, which is a necessary criterion for this study. (During tests employing vehicles as a noise source, subjective scoring by listener panels was conducted and compared to the objective scores, resulting in good correlation.)

此預選語音透過聲音頻道傳送以作理解度評分，包含孤立單詞之音素平衡(phonetically balanced)群組，而非完整句子或無意義音節，使用這些音素平衡單詞係由於主觀評分已知為可重複的，亦因此為此研究之必要標準。(試驗中採用車輛為雜訊源，由聆聽者評審團進行主觀評分，並與客觀評分比較，結果顯示良好之相關性。)

H.2.3 Conclusions relating to judgement of degradation

H.2.3 與劣化判定相關之結論

Numerous studies have been conducted over the years to develop a simple, inexpensive, objective method of measuring land mobile receiver degradation in the presence of ignition noise. Linear Predictive Coding (LPC) is neither simple nor inexpensive (when compared to the equipment used for CISPR 12 and CISPR 25 measurements), but it is technically a good objective method for measuring receiver degradation.

近幾年許多研究進行以發展出簡易、廉價、客觀之方法，以量測陸地行動接收機遇到點火雜訊之劣化，線性預估編碼既不簡易亦不廉價(當與 CNS 14434 及本標準量測所用之設備比較)，但以技術角度而言，確為良好之接收機劣化量測的客觀方法。

Subjective tests have proved to be effective in rating mobile receiver degradation. Of the two subjective rating methods in use, intelligibility was determined to be superior to annoyance in characterizing the effect of radio noise on a communication link. Most objective measurements taken during the subjective testing, however, showed poor correlation. The Linear Predictive Coding (LPC) method showed good correlation with the subjective intelligibility test method. Subjective tests are preferred, however, because of their reduced complexity and resulting lesser cost.

主觀性試驗已證實可有效評定行動接收機之劣化，在二種主觀評定所用之方法中，理解度法由於可將通訊連接之射頻雜訊效應特性化，被認定優於惱人度法。大多數之客觀性量測在主觀性量測時進行，然而顯示不佳之相關性，而線性預估編碼法顯示與主觀理解度試驗法良好之相關性。故以使用主觀試驗為佳，係由於此方法之複雜度低且花費較低。

Considering only the subjective test methods, and as a result of the numerous tests conducted, it is recommended that intelligibility be used as the index of communications system performance rather than annoyance.

若僅考量主觀性試驗法，且作為許多試驗執行之結果，建議使用理解度法而非惱人度法，以作為通訊系統性能之指標。

H.3 Reference document

H.3 參考文件

- [1] GAMAUF K. J. and HARTMAN W. J., Objective Measurement of Voice Channel Intelligibility, October 1977; available from the National Technical Information Service, Springfield, Virginia 22151, USA, reference number FAA-RD-77-153.

Annex I
(informative)

Items under consideration

附錄 I

(參考)

研究中之項目

I.1 Introduction

I.1 簡介

This annex contains future work items that are under consideration.

本研究包含研究中之未來工作項目。

I.1.1 Peak, average, quasi-peak and CISPR average measurements and limits

I.1.1 峰值、平均值、準峰值與 CISPR 平均值量測及其限制值

As further work progresses in subcommittees CISPR A and CISPR H this will be reviewed and CISPR 25 updated accordingly.

CISPR A 及 CISPR H 分組正進行進一步之工作以檢視本項目，本標準亦將依此更新。

I.1.2 Measurement uncertainty

I.1.2 量測不確定度

This topic will be considered for future revisions of this standard.

本議題將於本標準之未來版本所考量。

I.1.3 Attenuation measurement method

I.1.3 衰減量測法

The method of measuring the attenuation defined in Figure 5 needs to be defined.

圖 5 所示之衰減量測法需將定義。

I.1.4 Average measurements

I.1.4 平均值量測

Further precision is required when using a spectrum analyser to make average measurements i.e. small video bandwidth.

當使用頻譜分析儀進行平均值量測時，需要更佳之精確度，即較小之視訊頻寬。

I.1.5 Chamber characterization

I.1.5 試驗室特性

A JTF has been initiated to study chamber characterization and correlation. The results of the study will be considered for a future edition.

JTF 已開始進行試驗室之特性及相關性研究，此研究結果將包含於未來版本中。

Bibliography

CISPR 16-1:1999, Specification radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus

參考文獻

CNS 13306-1:民國 87 年，*無線電干擾和耐受性測量儀器及量測方法—第一部：無線電干擾和耐受性測量儀器(已廢止)*

相對應國際標準

CISPR 25:2008 Vehicles, boats and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of on-board receivers

編訂說明：本案建議案號為「建-修 1000255」，草案編號為「草-修 1000381」，本草案係參考 CISPR 25:2008 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。