計畫編號
MOTC-DGT-90-017

交通部電信總局委託研究計畫
研究報告

計畫名稱：修訂低功率射頻電機技術規範
計畫期限：自民國 90 年 05 月 17 日
至民國 90 年 12 月 16 日

委託機關：交通部電信總局
受託機關：財團法人台灣電子檢驗中心

中華民國九十年十二月三日

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一、 前言

頻譜乃有限之資源，而相對於無線電產品大量使用的今日，若不能有效管理與運用，非但無法享用無線電之便利，反而造成電波干擾之亂象或使人暴露於過量之電磁環境，進而引發潛在之危險，。目前世界各國無不對無線電產品，尤其是免執照之低功率無線電器材，詳加規劃已訂定適用而嚴謹之相關規範與認證辦法，而各先進國家，如歐美日各國，雖都已有完整之規範，但為因應推陳出新之無線電產品，仍定時修正或新增相關之規範。我國低功率射頻電機技術規範之修正自有其絕對之必要與重要性。

由於目前無線電產品發展迅速，而為一般大眾所廣泛使用之免執照低功率射頻器材更是日新月異，現有之規範原由美國規範 CFR 47 Part 15 Subpart C 部分引用，如今或有不足與不適之處。本計畫將擴充不足之規範並修正不適之處，以使原規範得以適用於現今以及未來之需求。所引入 ANSI C63.4、FCC CFR 47 Part 2、ETSI 等國際規範之相關檢測技術與要求，將使低功率射頻電機技術規範呈現應有之完整性與適用性。而針對較高功率或敏感頻率之發射機，亦有電波暴露安全之考量，藉此亦一並提出規定。

二、 內容

由於目前之規範即引用美國相關之規範，雖不完整且有少許誤用，但已使用多年，國內外廠商多已熟悉適應，若貿然全部更新，勢將造成極大之成本與輿論，而事實上，美國相關規範之嚴謹度與完整性極佳，應適用國內之使用情況。故若能修正原規範之誤，並引入缺少之部分以完整豐富本規範，應為佳策。

主要將引用美國相關之規範，視我國內情形加以修改，並加入相關適用之國際規範。

以下為完成此委託案之內容：

1. 分析與修正原規範不適條款
2. 新增與補充規範
3. 英文版本之建立
4. 建立參考之測試方法

詳細之編修內容請參考附件。

三、 成果

(1) 經濟效益

將使目前眾多之低功率型式認證有更明確依循之認證標準，減少因法源模糊而造成之延遲與漏洞，進而加速免執照低功率無線電器材之管理與因應社會需求，對於頻譜資源的管制與運用有莫大的助益。

(2) 學術貢獻

對於無線電產品之相關電磁波干擾規範與測試技術，國內少有學者或相關研究單位提出全面性而正確的著作，甚至許多電磁波實驗室亦無此相關之經驗，若能藉此規範之擴大修訂，實有助於相關單位之研究與實驗室之檢測技術的提升，對於無線電產品之廠商，亦能助其更進一步了解相關之國際規範。

(3) 標準連貫

原規範雖出自美國 FCC 之規範，然因基本規範部分引用有時會造成規範前後不連貫而形成灰色條款，對審核管理而言無異就是漏洞，而隨著新規範的增加，漏洞也就相對增加，這完全是因為規範沒有連貫的後果。因此，藉此次修訂低功率射頻電機技術規範，修補原規範遺漏之處以使規範能前後呼應的連貫，未來即便是新增產品規範，也能相對應用。

四、 遭遇之困難及解決途徑

由於產品實在是日新月異，無線電應用技術更是難以預料，所以對產品規範而言，是無法因應未來市場所有的需求，一則是因為頻譜的開放並非無限制，二則是前述之無線電應用技術的發展迅速。

頻譜的開放或許不易，但產品規範的更新卻是有跡可循，所以為能因應產品市場，應定期更新產品規範，如此至少可解決無適用之產品規範。

五、 重要參考文獻

[1] ANSI C63.4, “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”, The Institute of Electrical and Electronics Engineers, Inc., New York, 2000

[2] Code of Federal Regulations Title 47 Part 2, “FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS”, Federal Communications Commission, 2000

[3] Code of Federal Regulations Title 47 Part 15, “RADIO FREQUENCY DEVICES”, The Office of Federal Register, 2001

[4] Code of Federal Regulations Title 47 Part 74, “Experimental Radio, Auxiliary, Special Broadcast and Other Program Distributional Services ”, The Office of Federal Register, 2000

[5] Code of Federal Regulations Title 47 Part 90, “Private Land Mobile Radio Services”, The Office of Federal Register, 2000

[6] Code of Federal Regulations Title 47 Part 95, “Personal Radio Services”, The Office of Federal Register, 2000

[7] ETSI 300 220-1, “Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods”, European Telecommunications Standards Institute, 2000

[8] ETSI EN 300 422, “Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics and test methods for wireless microphones in the 25 MHz to 3 GHz frequency range”, European Telecommunications Standards Institute, 2000

[9] ETSI EN 300 440, “Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 1 GHz to 40 GHz frequency range”, European Telecommunications Standards Institute, 2000

六、 附件

附件一　編修一覽表

附件二　低功率射頻電機技術規範（中）

附件三　低功率射頻電機技術規範（英）

附件四　發射器測試步驟參考指引

附件五　直接序列展頻系統測試指引

附件六　頻率跳頻展頻系統測試指引

附件一　編修一覽表

低功率射頻電機技術規範新編修一覽表

章節索引	原規範內容	新修訂內容	修訂說明
1.11	無。	有效輻射功率(Effective Radiated Power)：傳送至天線之功率乘以天線最大增益(相較於半波偶極天線，half-wave dipole)。	為方便後續之章節參考。
2.2	低功率射頻電機之發射機或收發信機所使用之天線，除本規範章節中另有規定外，應為全固定、半固定式或以獨特之耦合(unique coupling)方式連接機體。製造者可設計供使用者因損壞而替換之天線，但不得設計或使用原認證以外之天線或可供引接各類電纜之標準天線插座或電氣連接頭，如：BNC、F type、N type、M type、UG type、RCA、SMA、SMB…等及其他各類工業或通訊標準接頭。	適用本規範之低功率發射器，其所使用之天線，應設計為可確保除原使用天線外，無其他天線可替用，使用永久連接或以獨特方式耦合(unique coupling)至機體，可視為符合本節之規定。製造者可設計供使用者因損壞而替換之天線，但不得使用可供引接各類電纜之標準天線插座或電氣連接頭，如：BNC、F type、N type、M type、UG type、RCA、SMA、SMB…等及其他各類工業或通訊標準接頭。 本節規定不適用於必須專業安裝之低功率發射器，例如週邊保護系統、某些場干擾感知器或其他必須在該設備之安裝現場測量，但安裝者有責任確保所使用之天線能符合本規範發射限制。 唯有認證授權使用於低功率發射器之天線方可用於該低功率發射器。	原規範遺漏。
2.7	任何低功率射頻電機之主波皆不得使用下表所列各頻帶內之頻率。	禁用頻段：除有特別規定外，只有混附發射可落於下表所列之頻段，任何出現在這些頻段的發射電場強度，必須符合2.8節的限制規定。	原規範遺漏。對落於禁用頻段之發射並無應有之嚴格規定。

2.8	低功率射頻電機之輻射電場強度，除本規範第三、四章內各使用特定頻率之器材另有放寬規定者外，不得超過下表之限值，且其不必要之發射皆不得大於主波發射強度。	低功率發射器之電場強度，除本規範其他章節有特別規定外，不得超過下表之限制值，且其不必要之發射皆不得大於主波發射強度。各頻段重疊處，以較嚴格之限制值為準。 上表規定之電場強度，除頻率落在 9-90kHz 千赫(kHz)、110-490 千赫(kHz)以及 1000 兆赫(MHz)以上外，皆須以 CISPR 準峰值(quasi-peak) 檢波器測量，而頻率落在前述之三個頻段內的發射測量必須以平均值檢波器為基準，且同時必須符合本規範 5.14 節之峰值規定；非以上表所指定之距離測量時必須符合本規範 5.4 節之規定，而輻射發射之量測頻率範圍必須符合本規範 5.11 節之規定。	原規範遺漏。原規範會使某些重疊處之限制值反而較為寬鬆。 除符合平均值限制值外，同時另須符合峰值限制值(5.14)。
2.9	上表規定之電場強度，頻率在 490 千赫(kHz)至 1000 兆赫(MHz)內，以 CISPR 準峰值(quasi-peak)測量，其他頻率應依 5.14.2 節之規定測量。	修正且合併入 2.8 節，如上所示。	
2.11	收、發信機為成套銷售者，收、發信機應一併送審；收信機之輻射電場強度不得超過 2.8 節之發射規定。	2.10 收、發信機為成套銷售者，收、發信機應一併送審或提供對應之收、發信機的已認證電波認證資料；收信機之輻射電場強度不得超過 2.8 節之發射規定。	原規範不完全適用。
3.1	註：本節之頻帶寬度指低於載波 6dB 處。	註：本節之頻帶寬度指低於調變載波 6dB 處。	原規範遺漏。
3.2 (3)	頻率容許差度：應維持在主波頻率之±0.01%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試。	頻率容許差度：應維持在主波頻率之±0.01%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，主要供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。	原規範遺漏。主要供應電壓乃指最初級之供應電壓，如使用 AC Adator 之 AC 電源；而電池操作者，另須符合最低工作電壓之要求(5.17)。

3.3 (1)	主波發射：以平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 10 毫伏/公尺(mV/M)。	主波發射：以平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 10 毫伏/公尺(mV/M)。且同時必須符合本規範 5.14 節之峰值規定。	原規範遺漏。
3.4.1	器材型式：防盜器 (perimeter protection systems)。	器材型式：任何發射型式之器材。	規範變動。
3.4.1 (2)	主波發射：採用平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 500 微伏/公尺(μV/M)。	主波發射：距 3 公尺處其主波電場強度不得超過 1000 微伏/公尺(μV/M)。或另一替代限制值，周邊防護系統(perimeter protection systems)可採用平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 500 微伏/公尺(μV/M)，且同時必須符合本規範 5.14 節之峰值規定。	原規範遺漏。
3.4.1 (4)	頻率容許差度：應維持在主波頻率之±0.01%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試。	頻率容許差度：應維持在主波頻率之±0.01%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，主要供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。	原規範遺漏。
3.4.2	器材型式：周期性(periodic)發射之器材。	器材型式：間歇性(remittent)或週期性(periodic)發射之器材。	原規範不完全適用。
3.4.2 (3)	在 40.66-40.70 兆赫(MHz)間作業者，其發射頻寬應限制於此頻帶邊緣，且在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度時，供應電壓在額定值之±15%內變化時，頻率容許差度應維持在主波頻率之±0.01%以內。以電池作業者，應以新電池測試。	在 40.66-40.70 兆赫(MHz)間作業者，其發射頻寬應限制在此頻帶範圍內，且在正常主要供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度時，主要供應電壓在額定值之±15%內變化時，頻率容許差度應維持在主波頻率之±0.01%以內。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。	原規範遺漏。
3.4.2	用於傳送控制訊號者，諸如：警報系統	用於傳送控制訊號者，諸如：警報系統(alarm	原規範誤譯。

(4) (4.1)	(alarm systems)、開門器(door openers)、遙控開關(remote switches)．．．等，但不得用於無線電遙控玩具或傳送聲音、影像及資料等連續性傳輸。手動發射器材需有一開關，按下此開關後5秒內自動停止發射。具自動控制裝置使每次發射時間少於5秒之週期性發射。不得使用預設固定間隔（regular perdetermined intervals）之週期性傳輸，但用於保全（security）或安全（safety）業務之輪詢或監督訊號者，允許每一發射器每一小時至多一次傳輸，傳輸時間不得大於1秒。	systems)、開門器(door openers)、遙控開關(remote switches)．．．等，但不得用於連續性傳輸，例如無線電遙控玩具或傳送聲音、影像及資料等。手動發射器材所使用之發射開關，必須在放開此開關後5秒內自動停止發射。具自動啟動發射之裝置，必須在啟動發射後5秒內停止發射。不得使用預設固定間隔（regular predetermined intervals）之週期性傳輸，但用於保全（security）或安全（safety）業務之輪詢或監督訊號者，允許每一發射器每一小時至多傳輸乙次，每次傳輸時間不得大於1秒。	
3.4.2 (5) (5.1)	(5.1)　符合本節(4.1)之規定者，除需符合2.9節之規定外，距3公尺處其電場強度限值(採用平均值檢波儀量測，CISPR準峰值檢測儀亦可接受)，如下表。	符合本節(4.1)之規定者，除需符合2.7節之規定外，距3公尺處其電場強度限值 (採用平均值檢波儀量測，CISPR準峰值檢測儀亦可接受)，如下表，各頻段重疊處，以較嚴格之限制值為準。	原規範遺漏。
3.4.2 (5) (5.1)	註： 2.不必要之發射的電場強度應低於主波最大容許值20dB以上。	註： 2.不必要之發射的電場強度應低於主波最大容許值20dB以上，或符合2.8節之限制，可取兩者中較寬鬆之規定；若使用平均值測量發射，同時亦必須符合本規範5.14節之峰值規定。	原規範遺漏。
3.4.2 (5) (5.2)	符合本節(4.2)之規定者，除需符合2.9節之規定外，距3公尺處其電場強度限值 (採用平均值檢波儀量測，CISPR準峰值檢測儀亦可接受)如下表。	符合本節(4.2)之規定者，除需符合2.7節之規定外，距3公尺處其電場強度限值 (採用平均值檢波儀量測，CISPR準峰值檢測儀亦可接受)如下表。各頻段重疊處，以較嚴格之限制值為準。	原規範遺漏。
3.4.2 (5)	註： 2.不必要之發射的電場強度應低於主波最大	註： 2.不必要之發射的電場強度應低於主波最大容許值	原規範遺漏。

(5.2)	容許值 20dB 以上。	20dB 以上，或符合 2.8 節之限制，可取兩者中較寬鬆之規定；若使用平均值測量發射，同時亦必須符合本規範 5.14 節之峰值規定。	
3.4.2 (6)	工作頻率在 40.66-40.70 兆赫(MHz)者，其頻率容許差度，應維持在主波頻率之±0.01%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，主要供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試。	此項刪除。	原規範重複。
3.4.3	器材型式：其他任何發射型式之器材(除符合(3.4.1)及(3.4.2)節規定之器材外)。	此節刪除。	原規範重複。
3.5.1 (1)	主波發射：採用平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 10 毫伏/公尺(mV/M)。	主波發射：採用平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 10 毫伏/公尺(mV/M)，且同時必須符合本規範 5.14 節之峰值規定。	原規範遺漏。
3.5.1 (2) (2.1.)	49.81-49.82 兆赫(MHz)間及 49.90-49.91 兆赫(MHz)間應比主波低 26dB 以上或符合 2.9 節之規定，取兩者中較寬鬆之限制值。	49.81-49.82 兆赫(MHz)間及 49.90-49.91 兆赫(MHz)間應比未調變主波低 26dB 以上或符合 2.8 節之規定，取兩者中較寬鬆之限制值。	章節變動。
3.5.1 (2) (2.3)	距 3 公尺處以具有平均值檢波器功能之儀器量測，大於 20 微伏/公尺(μV/M)之電場強度皆需紀錄，並於型式認證申請書內申報。	大於 20 微伏/公尺(μV/M)之電場強度皆需紀錄於測試報告中。	原規範誤譯。
3.5.1 (3)	自製器材應符合下列標準：	非市面販售之自用器材應符合下列標準：	原規範誤譯。
3.5.1 (3) (3.1)	主波及調變訊號皆應維持於 49.82-49.90 兆赫(MHz)頻帶內。	主波及其調變訊號皆應維持於 49.82-49.90 兆赫(MHz)頻帶內。	
3.5.1	在任何情況下，在電池或電力線電源端子處	在任何調變情況下，在電池或電力線電源端子處量	

(3) (3.2)	量測之總輸入功率不得超過 100 毫瓦(mW)。	測之總輸入功率不得超過 100 毫瓦(mW)。	
3.5.1 (3) (3.4)	帶外發射應比主波低至少 20dB。	帶外發射應比未調變主波低至少 20dB。	
3.6.1 (2)	頻帶寬度： 200 千赫(kHz)以內，其操作頻帶應落於 72.0 至 73.0 兆赫(MHz)範圍內。	頻帶寬度：必須限制在 200 千赫(kHz)以內，其操作頻帶應且必須完全落於 72.0 至 73.0 兆赫(MHz)範圍內。	原規範遺漏。
3.6.2	器材型式：除 3.6.1 節外，其他任何發射型式之器材。	此節刪除。	原規範重複。
3.7.1 (1)	主波發射：距 3 公尺處其主波電場強度不得超過 250 微伏/公尺(μ V/M) (採用平均值檢測儀量測)。	主波發射：距 3 公尺處其主波電場強度不得超過 250 微伏/公尺(μ V/M) (採用平均值檢測儀量測)，且同時必須符合本規範 5.14 節之峰值規定。	原規範遺漏。
3.8.1 (4)	無	本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。	原規範無此項。原因如前所述(2.8)。
3.8.2	器材型式：除 3.8.1 節外，其他任何發射型式之器材。	此節刪除。	原規範重複。
3.9.1 (2)	輸出功率：100 毫瓦(mW)以下（含）。	輸出功率(ERP)：100 毫瓦(mW)以下（含）。	原規範遺漏。ERP 方可對其所使用之天線有所限制進而限制其發射功率。
3.10.1 (2)	峰值輸出功率：不得超過 1 瓦(W)。除符合下列規定外，若發射天線之方向性增益超過 6dBi 時，應依所超過之 dB 數等量降低峰值輸出功率。	峰值輸出功率： (2.1) 操作於 2400-2483.5 兆赫(MHz)並至少使用 75 個跳頻頻道以及操作於 5725-5850 兆赫(MHz)之跳頻系統、與所有之直接序列系統：不得超過 1 瓦(W)。 (2.2) 其他所有操作於 2400-2483.5 兆赫(MHz) 之	原規範老舊。

		跳頻系統：0.125 瓦(W)。	
3.10.1 (3)	天線之規格不受 2.2 節規定之限制。	在此所指之固定式、點對點操作使用方式，並不包括使用點對多點之系統、全向性之應用以及發射相同資訊之共同安裝的多重發射機。展頻發射器之操作者或安裝者（若該設備需要專業安裝）有責任確認該系統是限用於固定式、點對點之操作，發射機隨附之使用手冊必須包含此訊息以告知使用者或安裝者須負之責任。	原規範遺漏。使原規範不受限制之天線接頭得以回歸正常管制。
3.10.1 (4)	發射限制： 使用頻率範圍外之任意 100 千赫 (kHz)內，由分散序列調變所生、資訊序列及載波頻率所產生之射頻電功率，應比在使用頻率範圍內包含訊號功率的最高準位之 100 千赫 (kHz)內之電功率，低至少 20dB 或符合 2.9 節之規定，取較高準位之限值。其他超出頻率範圍外之發射，應符合 2.9 節之規定。	不必要發射之限制： 使用頻帶範圍外之任意 100 千赫 (kHz)內，其由意圖輻射器所產生的射頻功率相較於使用頻帶範圍中包含最高所需功率之 100 千赫 (kHz)內的射頻功率，必須衰減 20 分貝(dB)，可以射頻傳導或輻射方式測量。此外，落於禁用頻段之輻射發射（見本規範之 2.7 節），應符合 2.8 節之規定。	原規範老舊。
3.10.1 (5) (5.1.4)	無	若頻率跳頻系統至少使用 15 個無重疊的頻道，該系統亦可應用 20dB 頻寬大於 1MHz 的跳頻頻道，其頻道之總和寬度應至少為 75MHz。在跳躍過所有頻道的週期時間內，任一頻道的佔用時間不可大於 0.4 秒，所有的跳頻頻道以平均而言必須均等使用。	原規範老舊。
3.10.1 (5) (5.2.3)	展頻處理增益(processing gain)至少應有 10dB。其展頻處理增益(以 dB 表示)之測量方法，取下列兩種之一：	建議刪除。	FCC 將取消此項測試要求。
3.10.1 (5)	由混合技術獲得之散頻處理增益至少應有 17dB。	建議刪除。	FCC 將取消此項測試要求。

(5.3.1)			
3.10.1 (5.4)	無	跳頻展頻系統在每次傳輸中無須使用所有可用之跳頻頻道；雖然此系統由發射機與接收機兩者所組成，必須設計以符合本節的所有規定而發射機應以連續的資料或資訊流傳送；此外，系統所使用的急速傳輸脈衝必須符合頻率跳頻系統的定義且必須分布其傳輸在本節所指定之最少的使用跳頻頻道數。	新版參考規範
3.10.1 (5.5)	無	跳頻展頻系統可以使用智慧裝置，其允許系統在操作頻普內辨認其他使用者而能個別獨立的選擇使用自己的跳頻組以避免跳至已被佔用的頻道。但頻率跳頻展頻系統不可使用任何方式的協調以快速避免多個發射機同時佔用個別之跳頻頻率。	新版參考規範
3.10.2 (2)	主波發射：距 3 公尺處其電場強度限值如下表，表內之發射在任何調變時其峰值電場強度皆不得超過最大容許平均值 20dB，除諧波外，表內指定頻帶外之發射應比主波低 50dB 以上或依 2.8 節之發射限制，兩者取其較鬆者：	發射限制：距 3 公尺處其電場強度限值如下表，除諧波外，指定頻帶外之發射應比主波低 50dB 以上或依 2.8 節之發射限制，兩者取其較鬆者：	引用有誤。
3.10.2 (3)	無	本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。	正確規定。
3.11.1	器材型式：電場擾動感測器(field disturbance sensors)，輻射一固定低準位電磁場，以偵測該電磁場內物體之移動，但不含防盜器。	器材型式：電場擾動感測器(field disturbance sensors)，輻射一固定低準位電磁場，以偵測該電磁場內物體之移動，但不含週邊保護系統。	原規範誤譯。
3.11.1 (4)	本節之電場強度係以平均值檢波儀器量測。	本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。	原規範遺漏。
3.11.2	器材型式：除 3.11.1 節外，其他任何發射型	此節刪除	原規範重複。

	式之器材。		
3.12.1 (5)	型式認證申請書應檢附下列資料：	型式認證測試報告應檢附下列資料：	原規範誤譯。
3.12.1 (5.3)	顯示全部掃頻信號及經校正之垂直及水平軸刻度之頻譜分析儀照片；頻譜分析儀之設定條件亦應標示於照片上。	顯示全部掃頻信號及經校正之垂直及水平軸刻度之頻譜分析儀照片或繪圖；頻譜分析儀之設定條件亦應標示於照片或繪圖上。	
3.12.2	器材型式：除 3.11.1 節外，其他任何發射型式之器材。	此節刪除。	原規範重複。
3.13	無。	工作頻率為 76.0 至 77.0 秭赫(GHz)者	電信總局要求新增。
4.1 (4)	無。	若連接至市電，需符合 2.3 節之規定。	原規範遺漏。
4.2 (3)	調變方式：任一非語音調變。	不得使用於語音傳輸。	原引用規範並無此項規定。
4.2 (4)	若連接至市電，需符合 2.4 節之規定。	若連接至市電，需符合 2.3 節之規定。	原規範誤印。
4.3.1 (3)	發射功率：無線電遙控器發射機之載波功率在任何調變情況下皆不得超過下列限值。	發射功率(ERP)：無線電遙控器發射機之載波功率在任何調變情況下皆不得超過下列限值。	原規範遺漏。
4.3.2 (2)	輸出功率：10 毫瓦(mW)以下。	有效輻射功率：10 毫瓦(mW) (ERP)以下。	原規範遺漏。
4.3.3 (2)	輸出功率：10 毫瓦(mW)以下。	有效輻射功率：10 毫瓦(mW) (ERP)以下。	原規範遺漏。
4.3.3 (6)	調變深度：±2.5 千赫(kHz)以內。	尖峰頻率偏移：±2.5 千赫(kHz)以內。	原規範誤譯。
4.3.4 (5)	收發信機之特性須以我國家標準(CNS)檢驗法檢驗，如無國家標準可適用者，得依美國 EIA、IEEE ANSI 檢驗法檢驗，須含	此項刪除。	已經有規定之測試方法。

	FCC/47CFR/2.985、2.987、2.989、2.991 及 2.995 等項目。		
4.3.4 (6)	收發信機為成套銷售者，其收發信機亦應一併認證。	此項刪除。	已有規定。
4.6.3 (4)	頻率穩定度（frequency stability）：5 ppm(含)以下。	頻率穩定度（frequency stability）：50 ppm(含)以下。	此裝置各國規範之要求皆為 50 ppm。
5.3	量測電源輸入功率或主波之發射強度時，應在正常額定供應電壓之 85%及 115%間變動之。若為電池供電之設備，應使用新電池測試	量測電源輸入功率或發射主波之輻射信號位準的變動時，應變動供應電壓在正常額定值之 85%及 115%間進行。若為電池供電之設備，應使用新電池測試。意圖輻射器之輻射測試應執行初步測試已決定最終測試的組態與條件，初步測試須評估以下三種情況： a. 若具備交流與直流（電池）兩種供應電源，兩種供電方式皆須評估測試。 b. 若載波之調變可設定，則具特定適當調變與未調變兩種條件皆須評估測試。 c. 若為手持式或穿戴式之裝置，應對其三個正交軸的方位評估測試。	原規範誤譯與遺漏。
5.4	儘可能依規定量測，所謂規定距離相當於測試天線至受測設備兩點間最短的水平距離。其支撐設備或接續電纜，限制於一圍繞容納設備系統之想像直線週邊所描繪之簡單幾何結構所定義之邊界內。受測設備，支撐設備及任一接續電纜接應包含在此邊界內。	儘可能依規定距離量測，此規定距離是指接收天線至最靠近受測設備邊緣的水平距離。	原規範引用有誤。
5.4.1	受測頻率高於或等於 30MHz 時，若其規定距離不是近場距離時，則量測距離得予縮短。當	受測頻率高於或等於 30MHz 時，若所做的測試非於近場內，或除非可證明該受測物的特性適用於近場	原規範變更。

	實測距離比規定距離近時，其量測結果應以與距離呈線性反比之外插係數(20dB/十倍距離)換算為規定距離值。除非負責人能證實由於設備之大小，位置或其他因素使得在規定距離內測試為不可行或該等測試確與某些大型器材及防盜系統之測試一樣，需在近場做，否則實測距離不能大於規定距離。實測距離不得大於 30 公尺，除非能證實在小於或等於 30 公尺處量測為不可行，且其量測地點之信號準位能被量測設備偵測到。當於規定距離之外執行量測時，該量測結果應以與距離成線性反比之內插係數(20dB/十倍距離)換算為規定距離值。	測試且可證明所欲量測的信號位準在該測試距離可被測試儀器偵測到，則可在非規定的測試距離進行。測距離不得大於 30 公尺，除非能進一步證實在小於或等於 30 公尺處量測為不可行。當於非規定距離執行量測時，該量測結果應以插補係數(20dB/十倍距離)換算至規定距離之值，電場量測為線性距離反比而電功率密度量測為線性距離平方反比。	
5.4.2	量測頻率低於 30 兆赫(MHz)時，得於規定距離之內執行；為應儘量避免於近場做測試。當於規定距離內量測時，應以與線性距離平方成反比之外插係數(40dB/十倍距離)換算成規定距離值。	量測頻率低於 30 兆赫(MHz)時，測試可在近於規範之指定距離進行，但儘可能試圖避免在近場做測試。當測試距離近於規範指定之距離，測試結果應以下述之插補係數換算至規定距離之值：對同一輻射方向最少兩個距離作量測以決定適當的插補係數或線性距離平方反比(40dB/十倍距離)。	原規範變更。
5.4.3	實測距離非為規定距離時，低功率射頻電機型式認證之申請者應於申請書內說明使用外插或內插法。	實測距離非為規定距離時，須於測試報告內說明所使用之外插或內插【插補】法。	原規範變更。
5.4.4	應環繞受測設備於期各輻射方向執行足夠數目量測以取得該設備所輻射之最大電場強度值。測得最大場強之頻率應於申請書內報告。	須測量足夠的受測物輻射方位以決定最大場強值的輻射發射方位，受測頻率點的最大場強值應紀錄於測試報告。	原規範誤譯。
5.4.5	無。	當規定之測試距離不大於 30 公尺時，本局將以規定之距離做驗證測試，除非在此距離測量會處於近場。	原規範遺漏。

		當規定之測試距離大於 30 公尺時，本局將以較勁之距離做驗證測試，一般而言為 30 公尺，而以上述之插補法換算至規定距離之值。	
5.5.1	無	桌上型受測物電源傳導測試之配置要求如下： a. 裝置間之連接纜線若離接地平面低於 40 公分，應以 30 至 40 公分之束綁於纜線中間，使該纜線最低點大約在測試桌面與接地平面中間。 b. 未連接至週邊裝置的 I/O 纜線應於其中間束綁以使纜線離接地平面約 40 公分，纜線端點可用正確之終端組抗終結。 c. LISN 至少距離受測物機殼最近的部位 80 公分。受測物電源線過長部分應於靠近中間部位束綁。非受測物之電源線無須束綁。 d. 受測物以及週邊裝置的背面，應與桌緣切齊排列，而此桌緣與垂直傳導平面距離 40 公分。	增補
5.5.2	無	落地型受測物電源傳導測試之配置要求如下： a. 過長之裝置間連接纜線應於其中間做不超過 40 公分之束綁。 b. LISN 距離所連接裝置之機殼最近的部位 80 公分。受測物與週邊裝置過長之電源線應於其中間做束綁使電源線成適當的長度。 c. 未連接至週邊裝置的 I/O 纜線應於其中間束綁，纜線端點可用正確之終端組抗終結。 d. 受測物以及所有纜線應以 3 至 12mm 厚度之絕緣物質與接地平面隔離。	增補

5.5.3	無	桌上型受測物輻射測試之配置要求如下： a. 裝置間之連接纜線若離接地平面低於 40 公分，應以 30 至 40 公分之束綁於纜線中間，使該纜線最低點大約在測試桌面與接地平面中間。 b. 未連接至週邊裝置的 I/O 纜線應於其中間束綁以使纜線離接地平面約 40 公分，纜線端點可用正確之終端組抗終結。 c. 受測物以及週邊裝置的背面，應與桌緣切齊排列。 d. 受測物與周邊裝置之電源線無須束綁，下垂至地面。	增補
5.5.4	無	落地型受測物輻射測試之配置要求如下： a. 過長之裝置間連接纜線應於其中間做不超過 40 公分之束綁。 b. 受測物與週邊裝置過長之電源線應於其中間做束綁使電源線成適當的長度。 c. 未連接至週邊裝置的 I/O 纜線應於其中間束綁，纜線端點可用正確之終端組抗終結。 d. 受測物以及所有纜線應以 3 至 12mm 厚度之絕緣物質與接地平面隔離。	增補
5.6	對於許多器材混合裝設於同一機箱或不同的機箱而以電纜或電線連接的復合系統之測試，應於該系統內各裝置皆動作時為之。系統若引用一支以上之天線或其他輻射源且這些輻射源係設計為同時發射者，其傳導與輻射發射	對於數個裝置裝設於同一機箱或不同的機箱而以電纜或電線連接的復合系統之測試，應於該系統內各裝置皆動作時為之。若低功率發射器具備多支天線或其他輻射源且設計用以同時發射，傳導與輻射測試應在所有的輻射源都發射的狀態下進行。載波電流系	

	之量測應連同所有用於發射之輻射源一起執行。	統組裝其他裝置，應分別獨立測其各所需符合之規範。	
5.7.1	無	測試時應選擇受測物典型之操作模式 纜線位置以及連接組態以確認所產生的最大發射。	新增
5.11	型式認證申請書內之頻率量測記錄須在其作業頻率範圍內依下表規定數量測試：	測量意圖輻射器或接收機，應依照下表所規定之頻率點進行，若有要求亦應說明受測物可操作的每個頻段：	原規範誤譯。
5.13.1	量測頻譜應從器材內所產生之最低無線電頻率(不必低於 9kHz)，至最高為主波之十倍諧波或 40 秭赫(GHz)止，兩者取頻率較低者。	若最高操作頻率低於 10GHz：至最高為主波之十倍諧波或 40 秭赫(GHz)止，兩者取頻率較低者。 若最高操作頻率不低於 10GHz 但低於 30GHz：至最高為主波之五倍諧波或 100 秭赫(GHz)止，兩者取頻率較低者。 若最高操作頻率不低於 30GHz：至最高為主波之五倍諧波或 200 秭赫(GHz)止，兩者取頻率較低者。	原規範遺漏。
5.14.1	任一低於或等於 1000 兆赫(MHz)頻率，若無特別指定，所示之限值係基於所用之量測儀器具有 CISPR 準峰值檢波器功能及相關的量測頻寬。其規格公佈在 IEC 發行之 CISPR Publication 16 內。測試時只要所用之儀器頻帶寬度和 CISPR 準峰值量測儀器相同，申請低功率射頻電機型式認證之負責人可自由選用具有峰值檢波器功能，且其係數經適當校正使對脈衝不敏感之量測設備做為 CISPR 準峰值量測儀器。	任一低於或等於 1000 兆赫(MHz)頻率，若無特別指定，所示之限值係基於所用之量測儀器具有 CISPR 準峰值檢波器功能及相關的量測頻寬。其規格公佈在 IEC 發行之 CISPR Publication 16 內。測試者可選用經適當校正某些因素而對脈衝不敏感之峰值檢波儀器作為替代量測 CISPR 準峰值，但測量頻寬必須與 CISPR 準峰值檢波器相同。	原規範誤譯。
5.14.2	任一高於 1000 兆赫(MHz)之頻率，所示之限值係基於所用之量側儀器具有平均值檢波器	任一高於 1000 兆赫(MHz)之頻率，所示之限值係基於所用之量側儀器具有平均值檢波器功能。當規定之	原規範誤譯與遺漏。

	功能。當規定之發射限度為平均值時(包括1000MHz 以下)，另一以具峰值檢波器功能之儀器測試時之限值，此峰值發射限制值相當於受測頻率之容許平均值再加 20dB。交流電力線傳導發射皆應使用 CISPR 準峰值檢波器測定，即使其規定之發射限制值為平均值。	發射限度為平均值時(包括 1000MHz 以下)，同時亦必須符合以峰值檢波器功能測量之限制值，此峰值發射限制值相當於受測頻率之容許平均值再加 20dB，除非本規範其他章節另有規定其不同峰值限制值。 若無其他特別指定，測量高於 1000 兆赫(MHz)之頻率測試儀器必須使用 1 兆赫(MHz)之解析頻寬執行。 交流電力線傳導發射皆應使用 CISPR 準峰值檢波器測定，即使其規定之輻射發射限制值為平均值。	
5.14.3	當規定之發射限度為平均值且採用脈衝式作業時，只要脈衝串不超過 0.1 秒，應以一含空閒期之完整脈衝串取其平均值表示所測得之電場強度。若發射時間超過 0.1 秒，或脈衝串超過 0.1 秒，則須以電場強度最大期間之 0.1 秒平均絕對電壓表示所測得之電場強度。用以計算平均電場強度之方法應隨同低功率射頻電機型式認證申請書一併提出，或與受測設備之測試資料一併存檔，俾供查證。	當規定之發射限度為平均值且採用脈衝式作業時，只要脈衝串不超過 0.1 秒，應以一含空閒期之完整脈衝串取其平均值表示所測得之電場強度。若發射時間超過 0.1 秒，或脈衝串超過 0.1 秒，則量測場強須取決於可得最大絕對平均電壓值之 0.1 秒期間。用以計算平均電場強度之方法應在測試報告中說明，俾供查證。	原規範誤譯。
5.15	無。	調變之使用：除個別之測試規範有指定或必須有調變以產生發射信號（如單旁波帶抑制載波之發射機）外，進行測試時無須使用調變。當個別之測試規範有指定加入調變時，可應用以下之規定： a. 只有語音調變（200Hz 到 3000Hz）之裝置，除無線話機外，調變信號為 1000Hz 之正弦波，強度為 100dB SPL（0dB SPL 為 20μPa），加於受測物之麥克風 10 公分處。	新增

		b. 無線話機，調變信號為 2500Hz 之正弦波，強度為可產生 85%之調變（例如最大調變為 5kHz 之頻移量，則 85%調變即為 4.25 kHz 頻移量），直接偶合於受測物之音頻輸入級。 c. 若調變信號源為受測物內部所產生者，使用其內部調變。 d. 若受測物具備外部調變之輸入端子，調變信號應使用標稱之最大位準與適當頻率，信號型態為正弦波。	
5.16	無。	測試時除非受測物操作有特別之要求範圍，周圍環境溫度應於 10^{O}C 到 40^{O}C 之範圍內，相對環境溼度應於 10%到 90%之範圍內。	新增
5.17	無。	電池操作端點電壓（Battery Operating End Point Voltage）：只適用於具電池操作之發射器，頻率穩定對供應電壓測試時，應以製造者所宣稱之電池操作端點電壓進行。	新增。
5.18	無。	頻率響應：若個別測試規範中有指定頻率響應測試，測試資料或數據須涵蓋音頻範圍 100 Hz 到 5000Hz。	新增。
5.19	無。	電波暴露量之評估：若個別之測試規範指定電波暴露量之評估，應符合以下之要求。	新增。
5.19 (a)	無。	若受測物於正常操作模式下，其發射機構會距離人體 20 公分以內須測試 SAR(Specific Absorption Rate)以證明其符電波暴露量之要求。	新增。
5.19 (b)	無。	若受測物於正常操作模式下，其發射機構會距離人體 20 公分以上可測試 MPE (Maximum Permissible Exposure)以證明其符電波暴露量之要求。	新增。

6	無。	參考檢驗技術	新增。

附件二 低功率射頻電機技術規範(中)

交通部電信總局
低功率射頻電機技術規範

中華民國九十年十一月

目 錄

低功率射頻電機技術規範

前　　言

本規範係依據電信法第五十條第一項及「低功率電波輻射性電機管理辦法」第六條第二項規定訂定之。本規範共分為五章，第一章解釋與本規範相關之專有名詞；第二章條列低功率射頻電機之使用頻率、輻射電場強度、性能及製造、裝設、持有、輸入、販賣等一般限制規定，本章所規範之低功率射頻電機不限定其用途，惟仍須符合其他法令規定；第三、四章為特別規格，依頻率及器材型式規定特定用途之低功率射頻電機其輻射電場強度及其頻率使用之限值，第三、四章未特別規定事項，悉依第二章之規定；第五章為辦理低功率射頻電機型式認證之檢驗規定。

1.　名詞解釋

1.1. 射頻能(radio frequency energy)：無線電頻譜中九千赫(kHz)至三百祄赫(GHz)間任何頻率之電磁能。

1.2. 主波(carrier)：低功率射頻電機未經調變時產生之射頻能，即未調變之主載波。

1.3. 混附發射(spurious emissions)：必需頻帶寬度以外之一個或數個頻率之發射，其強度減低不影響其訊息發送。混附發射包括諧波發射、寄生發射、及交互調變與頻率轉換所產生者，但帶外之發射不包括在內。

1.4. 帶外發射(out-of-band emissions)：混附發射除外，在必需頻帶寬度以外，因調變過程中所產生之一個或數個頻率之發射。

1.5. 不必要之發射(unwanted emissions)：包括混附發射及帶外發射。

1.6. 必需頻帶寬度(necessary bandwidth)：發射機在規定條件下為確保傳送之訊息以必要之速率與品質所需之頻帶寬度。

1.7. 瞬間頻率(instantaneous frequency)：相位(以弧度為單位)之時間變化率除以 2π，單位為赫(Hz)。

1.8. 尖峰頻率偏移(peak frequency deviation)：瞬間頻率之最大值與最小值之差值的一半。

1.9. 妨害性干擾(harmful interference)：指任何發射、輻射或感應之射頻能，危及無線電助航業務或其他安全業務之功能，或嚴重影響、妨礙、一再中斷作業中之合法無線電通信業務者。

1.10.　減輻波：無線電波之強度急遽上升並隨即遞降以至消失者。

1.11.　有效輻射功率(Effective Radiated Power, ERP)：傳送至天線之功率乘以天線最大增益(相較於半波偶極天線，half-wave dipole)。

1.12.　無線資訊傳輸設備(Unlicensed National Information Infrastructure, U-NII)之特別定義：

1.12.1　平均符號封包功率（average symbol envelope power）：信號符號集（signaling alphabet）中每個符號之封包功率之平均值。

1.12.2 數位調變（digital modulation）：依據數位調變函數（digital modulating function：參照標準 ANSI C63.17-1998）將載波之特性在一組事先設定之離散數值中變化之程序。

1.12.3 發射頻寬（emission bandwidth）：係量測信號兩點之間寬度而得，此兩點是載波中心頻率上下兩邊，相對於調變載波最高功率降低 26 分貝處。需使用峰值檢測（peak detector）功能及解析頻寬約等於受測物發射頻寬 1%之儀器。

1.12.4 峰值功率頻譜密度（peak power spectral density）：在設備操作頻段內，指定量測頻寬中之最高功率頻譜功率。

1.12.5 峰值發射功率（peak transmit power）：在所有調變狀況下，最多 30/B(B 是 26 分貝的發射頻寬)時間或設備傳輸脈衝持續時間（取較小者）中量測之最大發射功率。

1.12.6 功率頻譜密度（power spectral density）：發射功率在最高準位時，一脈衝或一序列脈衝，其單位頻寬的總輸出能量除以總脈衝持續時間，此總時間不包括發射功率關閉或低於其最高值時。

1.12.7 脈衝（pulse）：連續傳輸的一序列調變符號，此時，平均符號封包功率為常數。

1.12.8 發射功率（transmit power）：在最多 30/B（B 是 26 分貝的發射頻寬）時間或設備傳輸脈衝持續時間（取較小者）中總發射能量除以時間。

1.12.9 無線資訊傳輸設備：操作於 5.25-5.35 秭赫（GHz）及 5.725-5.825 秭赫之發射設備，應用寬頻數位調變技術，提供個人、商業及相關機構高資料傳輸速率之行動及固定通信。

2. 一般規定

2.1. 低功率射頻電機應裝設在完整之機殼內，其外部不得有任何足以改變本規範相關規定特性或功能之設備。

2.2. *適用本規範之低功率發射器，其所使用之天線，應設計為可確保除原使用天線外，無其他天線可替用，使用永久連接或以獨特方式耦合(unique coupling)至機體，可視為符合本節之規定。製造者可設計供使用者因損壞而替換之天線，但不得使用可供引接各類電纜之標準天線插座或電氣連接頭，如：BNC、F type、N type、M type、UG type、RCA 、SMA、SMB...等及其他各類工業或通訊標準接頭。*
本節規定不適用於必須專業安裝之低功率發射器，例如週邊保護系統、某些場干擾感知器或其他必須在該安裝現場測量之設備，但安裝者有責任確保所使用之天線能符合本規範發射限制。
唯有認證授權使用於低功率發射器之天線方可用於該低功率發射器。

2.3. 以市電為電源之低功率射頻電機，其傳導回電源線上頻率自 450 千赫(kHz)至 30 兆赫(MHz)之射頻電壓(在電源端子每一電源線對接地點)不得超過 250 微伏(CISPR 準峰值)。測量時應經過 50 微亨利(μH)及 50 歐姆(Ω)之電源線阻抗模擬網路(LISN)。

2.4. 低功率射頻電機不得發射減輻波。

2.5. 低功率射頻電機不得擅自改變頻率、加大功率、外接天線或變更原設計之特性及功能。

2.6. 低功率射頻電機之使用不得干擾合法通信；經發現有干擾現象發生時，應立即停用，並改善至無干擾時方得繼續使用。
低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機之干擾。

2.7. *禁用頻段：除有特別規定外，只有混附發射可落於下表所列之頻段，任何出現在這些頻段的發射電場強度，必須符合 2.8 節的限制規定。*

頻率(兆赫)	頻率(兆赫)	頻率(兆赫)
0.090 - 0.110	162.01 - 167.17	3500.0 - 4400.0
0.490 - 0.510	167.72 - 173.20	4500.0 - 5250.0
2.172 - 2.198	240.00 - 285.00	5350.0 - 5460.0
3.013 - 3.033	322.00 - 335.40	7250.0 - 7750.0
4.115 - 4.198	399.90 - 410.00	8025.0 - 8500.0
5.670 - 5.690	608.00 - 614.00	9000.0 - 9200.0
6.200 - 6.300	825.00 - 915.00	9300.0 - 9500.0
8.230 - 8.400	938.00 - 1240.0	10600 - 12700
12.265 - 12.600	1300.0 - 1427.0	13250 - 13400
13.340 - 13.430	1435.0 - 1626.5	14470 - 14500
14.965 - 15.020	1660.0 - 1710.0	15350 - 16200
16.700 - 16.755	1718.8 - 1722.2	17700 - 21400
19.965 - 20.020	2200.0 - 2300.0	22010 - 23120
25.500 - 25.700	2310.0 - 2390.0	23600 - 24000
37.475 - 38.275	2483.5 - 2500.0	31200 - 31800
73.500 - 75.400	2655.0 - 2900.0	36430 - 36500
108.00 - 138.00	3260.0 - 3267.0	38600 以上
149.90 - 150.05	3332.0 - 3339.0	

156.70 - 156.90	3345.8 - 3358.0	

2.8. *低功率發射器之電場強度，除本規範其他章節有特別規定外，不得超過下表之限制值，且其不必要之發射皆不得大於主波發射強度。各頻段重疊處，以較嚴格之限制值為準。*

頻　率(兆赫)	電場強度(微伏/公尺)	測距(公尺)
0.009 - 0.490	2,400/頻率(千赫)	300
0.490 – 1.705	24,000/頻率(千赫)	30
1.705– 30	30	30
30 – 88	100	3
88 - 216	150	3
216 - 960	200	3
960 以上	500	3

上表規定之電場強度，除頻率落在 9-90kHz 千赫(kHz)、110-490 千赫(kHz)以及 1000 兆赫(MHz)以上外，皆須以 CISPR 準峰值(quasi-peak) 檢波器測量，而頻率落在前述之三個頻段內的發射測量必須以.平均值檢波器為基準，且同時必須符合本規範 5.14 節之峰值規定；非以上表所指定之距離測量時必須符合本規範 5.4 節之規定，而輻射發射之量測頻率範圍必須符合本規範 5.11 節之規定。

2.9. 每一上市銷售之電機皆應隨附使用手冊或說明書，其樣本於申請型式認證時應隨申請書一併送審(草稿初稿皆可接受惟應於完稿時補送完稿複本)。使用手冊應包含所有必要之資訊以指導使用者正確的安裝及操作該電機，內容包括：

(1)不致造成違反低功率電波輻射性電機管理辦法之所有控制、調整及開關之使用方法。

(2)對任何可能造成違反上述管理辦法規定之調整予以警告，或建議由具有發射機維修專長之技術人員執行或由其直接監督及負責。

(3)對任何可能造成違反上述管理辦法之零件(晶體、半導體等)置換之警告。

(4)低功率電波輻射性電機管理辦法第十四條、第十七條、第二十條等條文。

2.10. 收、發信機為成套銷售者，收、發信機應一併送審或提供對應之收、發信機的已認證電波認證資料；收信機之輻射電場強度不得超過 2.8 節之發射規定。

3. 特別規格（依頻率範圍）

3.1. 工作頻率：1.705 至 10 兆赫(MHz)者

3.1.1. 器材型式：任何發射型式之器材。

(1) 主波發射：

(1.1) 若頻帶寬度(註)小於中心頻率之 10%，距器材 30 公尺處其電場強度不得超過 15 微伏/公尺(μV/M)或頻帶寬度(單位：千赫)除以中心頻率(單位：兆赫)微伏/公尺(μV/M)，取較高之發射值。

(1.2) 若頻帶寬度不小於中心頻率之 10%，距器材 30 公尺處，其主波輻射電場強度不得超過 100 微伏/公尺(μV/M) (採用平均值檢波儀量測)。

(2) *電場強度係以平均值檢波儀器量測，且同時必須符合本規範 5.14 節之峰值規定。*

(3) 不必要之發射：應符合 2.8 節之規定。

註：本節之頻帶寬度指低於調變載波 6dB 處。

3.2. 工作頻率為 13.553 至 13.567 兆赫(MHz)者

3.2.1. 器材型式：任何發射型式之器材。

(1) 主波發射：距 30 公尺處其主波電場強度不得超過 10 毫伏/公尺(mV/M)。

(2) 不必要之發射：應符合 2.8 節之規定。

(3) 頻率容許差度：應維持在主波頻率之±0.01%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，*一次(Primary)供應電壓在額定值之±15%內變化時*。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

3.3. 工作頻率為 26.29 至 27.28 兆赫(MHz)者

3.3.1. 器材型式：任何發射型式之器材。

(1) 主波發射：以平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 10 毫伏/公尺(mV/M)，*且同時必須符合本規範 5.14 節之峰值規定。*

(2) 不必要之發射：應符合 2.8 節之規定。

3.4. 工作頻率為 40.66 至 40.70 兆赫(MHz)及大於 70 兆赫(MHz)者

3.4.1. 器材型式：任何發射型式之器材。

(1) 工作頻率為 40.66-40.70 兆赫(MHz)。

(2) *主波發射：距 3 公尺處其主波電場強度不得超過 1000 微伏/公尺(μV/M)；或另一替代限制值，周邊防護系統(perimeter protection systems)可採用平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 500 微伏/公尺(μV/M) ，且同時必須符合本規範 5.14 節之峰值規定。*

(3) 不必要之發射：應符合 2.8 節之規定。

(4) 頻率容許差度：應維持在主波頻率之±0.01%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，*一次供應電壓在額定值之*

±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

3.4.2. 器材型式：間歇性(remittent)或週期性(periodic)操作之器材。

(1) 工作頻率為 40.66-40.70 兆赫(MHz)及大於 70 兆赫(MHz)。

(2) 在 70 兆赫(MHz)至 900 兆赫(MHz)間作業者，其發射頻寬限於中心頻率之 0.25%以內，在 900 兆赫(MHz)以上作業者，其發射頻寬限於中心頻率之 0.5%以內，頻寬係由低於經調變之主波 20dB 點求取。

(3) 在 40.66-40.70 兆赫(MHz)間作業者，其發射頻寬應限制*在此頻帶範圍內*，且在正常*一次供應電壓*下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度時，一次供應電壓在額定值之±15%內變化時，頻率容許差度應維持在主波頻率之±0.01%以內。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

(4) 操作方式：擇(4.1)或(4.2)之一操作方式

(4.1) 用於傳送控制訊號者，諸如：警報系統(alarm systems)、開門器(door openers)、遙控開關(remote switches)．．．等，*但不得用於連續性傳輸，例如無線電遙控玩具或傳送聲音、影像及資料等*。手動發射器材需有一開關，按下此開關後 5 秒內自動停止發射。具自動控制裝置使每次發射時間少於 5 秒之週期性發射。不得使用預設固定間隔（regular predetermined intervals）之週期性傳輸，但用於保全（security）或安全（safety）業務之輪詢或監督訊號者，允許每一發射器每一小時至多傳輸乙次，每次傳輸時間不得大於 1 秒。

(4.2) 具自動控制裝置使每次發射時間少於一秒，發射周期之休止時間大於十秒且為發射時間 30 倍以上。

(5) 電場強度限值：

(5.1) 符合本節(4.1)之規定者，除需符合 *2.7 節*之規定外，距 3 公尺處其電場強度限值 (採用平均值檢波儀量測，CISPR 準峰值檢測儀亦可接受)如下表。*各頻段重疊處，以較嚴格之限制值為準*。

主波頻率 (兆赫)	主波電場強度 (微伏/公尺)	不必要之發射 (微伏/公尺)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750(註 1)	125-375(註 1)
174-260	3750	375
260-470	3750-12500(註 1)	375-1250(註 1)
470 以上	12500	1250

註 1：使用線性插補法，最大容許電場強度之計算公式如下：

(1)130-174MHz(兆赫) == >56.81818×(工作頻率，單位：兆赫)-6136.3636

(2)260-470MHz(兆赫) == >41.6667×(工作頻率，單位：兆赫)-7083.3333

不必要之發射的電場強度應比主波最大容許值低至少 20dB，如上表所示，*或符合 2.8 節之限制，可取兩者中較寬鬆之規定；若使用平均值測量發射，同時亦必須符合本規範 5.14 節之峰值規定*。

(5.2) 符合本節(4.2)之規定者，除需符合 *2.7 節*之規定外，距 3 公尺處其電場強度限值 (採用平均值檢波儀量測，CISPR 準峰值檢測儀亦可接受)如下表。*各頻段重疊處，以較嚴格之限制值為準。*

主波頻率 (兆赫)	主波電場強度 (微伏/公尺)	不必要之發射 (微伏/公尺)
40.66-40.70	1000	100
70-130(含)	500	50
130(不含)-174(含)	500-1500(註 2)	50-150(註 2)
174(不含)-260(含)	1500	150
260(不含)-470(含)	1500-5000(註 2)	150-500(註 2)
470(不含)以上	5000	500

註 2：線性插補法，最大容許電場強度之計算公式如下：

(1) 130-174MHz(兆赫) == >22.72727×(工作頻率，單位：兆赫)-2454.545

(2) 260-470MHz(兆赫) == >16.6667×(工作頻率，單位：兆赫)-2833.3333

不必要之發射的電場強度應比主波最大容許值低至少 20dB，如上表所示，*或符合 2.8 節之限制，可取兩者中較寬鬆之規定；若使用平均值測量發射，同時亦必須符合本規範 5.14 節之峰值規定。*

3.5. 工作頻率為 49.82 至 49.90 兆赫(MHz)者

3.5.1. 器材型式：任何發射型式之器材。

(1) 主波發射：採用平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 10 毫伏/公尺(mV/M)。*且同時必須符合本規範 5.14 節之峰值規定。*

(2) 不必要之發射：

(2.1.) 49.81-49.82 兆赫(MHz)間及 49.90-49.91 兆赫(MHz)間應比*未調變*主波低 26dB 以上或符合 2.8 節之規定，取兩者中較寬鬆之限制值。

(2.2.) 小於 49.81 兆赫(MHz)(不含)及大於 49.91 兆赫(MHz)(不含)之頻率，依 2.8 節之規定。

(2.3.) 大於 20 微伏/公尺(μV/M)之電場強度皆需紀錄*於測試報告中*。

(3) *非市面販售之自用*器材應符合下列標準：

(3.1.) 主波及*其*調變訊號皆應維持於 49.82-49.90 兆赫(MHz)頻帶內。

(3.2.) 在任何*調變*情況下，在電池或電力線電源端子處量測之總輸入功率不得超過 100 毫瓦(mW)。

(3.3.) 天線須為 1 公尺以內之單節天線，且應永久固定裝置於機殼上。

(3.4.) 帶外發射應比*未調變*主波低至少 20dB。

3.6. 工作頻率為 72.0 至 73.0 兆赫(MHz)者

3.6.1. 器材型式：聽覺輔助器材(auditory assistance devices)，用於傳送聲音以輔佐殘障人士之電波收發信器材。該器材亦可供教育機構用於視聽訓練或於戲院、音樂廳、會議廳等公眾聚會場所供聽覺輔助用。

(1) 主波發射：採用平均值檢測儀量測，距 3 公尺處其主波電場強度不得超過 80 毫伏/公尺(mV/M)。

(2) 頻帶寬度：*必須限制在* 200 千赫(kHz)以內，其操作頻帶應*且必須完全*落於 72.0 至 73.0 兆赫(MHz)範圍內。

(3) 在 200 千赫(kHz)操作頻帶外之任何發射，距 3 公尺處量測，其電場強度不得大於 1500 微伏/公尺(μV/M)。

(4) *本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。*

3.7. 工作頻率為 88 至 108 兆赫(MHz)者

3.7.1. 器材型式：任何發射型式之器材。

(1) 主波發射：距 3 公尺處其主波電場強度不得超過 250 微伏/公尺(μ V/M) (採用平均值檢測儀量測)，*且同時必須符合本規範 5.14 節之峰值規定。*

(2) 頻帶寬度為 200 千赫(kHz)，其操作頻帶應落於 88-108 兆赫(MHz)範圍內。

(3) 在 200 千赫(kHz)操作頻帶外之任何發射，不得超過 2.8 節之規定。

3.8. 工作頻率為 174 至 216 兆赫(MHz)者

3.8.1. 器材型式：限用生理醫學遙測器材(biomedical telemetry devices)，傳送人類或動物生理現象量測值，限於醫院內使用。

(1) 主波發射：距 3 公尺處其電場強度不得超過 1500 微伏/公尺(μV/M)。

(2) 帶外發射：距 3 公尺處其電場強度不得大於 150 微伏/公尺(μV/M)。

(3) 頻帶寬度：200 千赫(kHz)以內，其操作頻帶應落於 174-216 兆赫(MHz)範圍內。

(4) *本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。*

3.9. 工作頻率為 216 至 217 兆赫(MHz)者

3.9.1. 器材型式：可發射語音或數據供下列用途使用，但禁止用於雙向語音通信。

- **聽覺輔助通信：例如助聽器材、聽障人士聽覺輔助器材、語言翻譯器材、教育聽覺輔助器材、及導覽聽覺輔助器材等。**
- **病患健康看護相關通信。**

(1)發射頻道：有下列三種劃分方式。

(1.1) 標準頻道：頻道編號 n=1 至 40，中心頻率分別為 216.0125+（n-1）×0.025 兆赫，頻道間隔 25 千赫 (KHz)，頻率容許差度 0.005%以內。

(1.2) 寬頻頻道：頻道編號 n=41 至 60，中心頻率分別為 216.025+（n-41）×0.05 兆赫，頻道間隔 50 千赫，頻率容許差度 0.005%以內。

(1.3) 窄頻頻道：頻道編號 n=61 至 260，中心頻率分別為 216.0025+（n-61）×0.005 兆赫，頻道間隔 5 千赫，許可頻寬（authorized bandwidth，即最大允許傳輸頻寬）4 千赫，頻率容許差度 0.00015%以內。

(2)輸出功率：100 毫瓦(mW) (ERP)以下（含）。

(3)不必要發射應衰減低於主波功率 P(以瓦(W)為單位)如下：

(3.1) 標準頻道發射機：

(3.1.1) 距離中心頻率 12.5 至 22.5 千赫：最少 30 分貝(dB)。

(3.1.2) 距離中心頻率大於 22.5 千赫：最少 43 +10 log（P）分貝。

(3.2)寬頻頻道發射機：

(3.2.1) 距離中心頻率 25 至 35 千赫：最少 30 分貝。

(3.2.2) 距離中心頻率大於 35 千赫：最少 43 +10 log（P）分貝。

(3.3)窄頻頻道發射機：

(3.3.1) 許可頻寬中任何頻率：0 分貝。

(3.3.2) 與中心頻率距離 f_d（以千赫為單位；$2<f_d<=3.75$）：30+20（f_d-2）分貝或 55+10 log（P）分貝或 65 分貝，取較小者。

(3.3.3) 距離中心頻率 3.75 千赫以外：最少 55+10 log（P）分貝。

(4) 本器材不得干擾合法通信。

(5) 本器材限於教學訓練場所、導覽場所、病患看護場所、家庭、或室內使用。

(6) 若本器材不完全在建築物內，則其天線最高點不得高於地面 30.5 公尺。

3.10. 工作頻率為 2400 至 2483.5 兆赫(MHz)，5725 至 5875 兆赫(MHz)，24.0 至 24.25 秭赫(GHz)者

3.10.1. 器材型式：採用跳頻(frequency hopping)及直接序列展頻(direct sequence spread spectrum)技術之展頻譜輻射器具。

(1) 使用頻率：

(1.1) 2400-2483.5 兆赫(MHz)

(1.2) 5725-5850 兆赫(MHz)

(2) 峰值輸出功率：

(2.1) *操作於 2400-2483.5 兆赫(MHz)並至少使用 75 個跳頻頻道以及操作於 5725-5850 兆赫(MHz)之跳頻系統、與所有之直接序列系統：不得超過 1 瓦(W)。*

(2.2) *其他所有操作於 2400-2483.5 兆赫(MHz) 之跳頻系統：0.125 瓦(W)。*

(3) *除符合下列規定外，若非固定式、點對點裝置之發射天線，其方向性增益超過 6dBi 時，應依所超過之 dB 數等量降低峰值輸出功率。*

2400-2483.5 兆赫(MHz)：僅用於固定式點對點操作，若使用之發射天線其方向性增益超過 6dBi，應於每超過 3dB 降低 1dB 之峰值輸出功率。

5725-5850 兆赫(MHz)：僅用於固定式點對點操作，若使用之發射天線其方向性增益

超過 6dBi，不需降低峰值輸出功率。
在此所指之固定式、點對點操作使用方式，並不包括使用點對多點之系統、全向性之應用以及發射相同資訊之共同安裝的多重發射機。展頻發射器之操作者或安裝者（若該設備需要專業安裝）有責任確認該系統是限用於固定式、點對點之操作，發射機隨附之使用手冊必須包含此訊息以告知使用者或安裝者須負之責任。

(4) 不必要發射之限制：

使用頻帶範圍外之任意 100 千赫 (kHz)內，其由意圖輻射器所產生的射頻功率相較於使用頻帶範圍中包含最高所需功率之 100 千赫 (kHz)內的射頻功率，必須衰減 20 分貝(dB)，可以射頻傳導或輻射方式測量。此外，落於禁用頻段之輻射發射（見本規範之 2.7 節），應符合 2.8 節之規定。

(5) 其他限制事項：

(5.1) 跳頻系統(Frequency hopping systems)：

(5.1.1) 至少須使用 75 個以上跳頻頻道(hopping channel)之載波頻率，其*頻道*間隔大於 25 千赫(kHz)或跳頻頻道之 20dB 頻寬，兩者取較寬者。每一跳頻頻道之 20dB 頻寬不得超過 1 兆赫(MHz)。

(5.1.2) 每一載波頻率在 30 秒週期內所佔用之平均時間不得超過 0.4 秒。

(5.1.3) 本系統之載波頻率係依虛擬亂數排列，以系統之跳頻速率在各頻率之跳頻頻道上跳躍。每一發射機必須均等的使用每一頻率。系統接收機應具有與發射機跳躍頻道頻寬相匹配之輸入頻寬，且應隨所發射的信號同步偏移接收頻率。

(5.1.4) *操作於 2400 至 2483.5MHz 頻帶之頻率跳頻系統若至少使用 15 個無重疊的頻道，該系統亦可應用 20dB 頻寬大於 1MHz 的跳頻頻道，其所有跳頻頻道所佔之頻帶寬度應至少為 75MHz。在跳躍過所有頻道的週期時間內，任一頻道的佔用時間不可大於 0.4 秒，所有的跳頻頻道以平均而言必須均等使用。*

(5.2) 直接序列系統(Direct sequence systems)：

(5.2.1) 6dB 頻寬至少應有 500 千赫(kHz)。

(5.2.2) 在使用頻率範圍內，任意 3 千赫(kHz)頻寬內，由發射機傳導至天線之峰值發射電功率密度在任意期間內，皆不得大於 8dBm。

(5.3) 採用直接序列及跳頻混合調變技術之複合系統(Hybrid systems)：

(5.3.1) *由混合技術獲得之散頻處理增益至少應有 17dB。【FCC 將取消此項測試要求】*

(5.3.2) 關閉直接序列作業時之跳頻作業，其每一載波頻率在週期等於所採用之跳頻頻率個數乘以 0.4 秒內所佔用之平均時間不得超過 0.4 秒。

(5.3.3) 關閉跳頻作業時之直皆序列作業功率密度，應符合本節其他限制事項(5.2)直接序列系統：(5.2.2.)項之發射電功率密度規定。

(5.4) *跳頻展頻系統在每次傳輸中無須使用所有可用之跳頻頻道；雖然此系統由發射機與接收機兩者所組成，必須設計以符合本節的所有規定而發射機應以連續的資料或資訊流傳送；此外，系統所使用的急速傳輸脈衝必須符合頻率跳頻系統的定義且必須分布其傳輸在本節所指定之最少的使用跳頻頻道數。*

(5.5) *跳頻展頻系統可以使用智慧裝置，其允許系統在操作頻譜內辨認其他使用者而能個別獨立的選擇使用自己的跳頻組以避免跳至已被佔用的頻道。但頻率跳頻展頻系統不可使用任何其他協調方式以快速避免多個發射機同時佔用個別之跳頻頻率。*

3.10.2. 器材型式：任何發射型式之器材。

(1) 使用頻率：

(1.1) 2400-2483.5 兆赫(MHz)

(1.2) 5725-5875 兆赫(MHz)

(1.3) 24.0-24.25 秭赫(GHz)

(2) 發射限制：距 3 公尺處其電場強度限值如下表，除諧波外，指定頻帶外之發射應比主波低 50dB 以上或依 2.8 節之發射限制，兩者取其較鬆者：

主波頻率 (兆赫)	主波電場強度 (毫伏/公尺)	諧波電場強度 (微伏/公尺)
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

(3) *本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。*

3.11. 工作頻率為 2435 至 2465 兆赫(MHz)，5785 至 5815 兆赫(MHz)，10500 至 10550 兆赫(MHz)，24075 至 24175 兆赫(MHz)者

3.11.1. 器材型式：電場擾動感測器(field disturbance sensors)，輻射一固定低準位電磁場，以偵測該電磁場內物體之移動，但不含週邊保護系統。

(1) 使用頻率：

(1.1) 2435-2465 兆赫(MHz)。

(1.2) 5785-5815 兆赫(MHz)。

(1.3) 10500-10550 兆赫(MHz)。

(1.4) 24075-24175 兆赫(MHz)。

(2) 主波發射及諧波發射，距 3 公尺處量測，其電場強度不得大於下表限制值。

主波頻率 (兆赫)	主波電場強度 (毫伏/公尺)	諧波電場強度 (毫伏/公尺)
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

(3) 不必要之發射：除諧波外，應低於主波至少 50dB 或符合 2.8 節之規格，取較寬鬆者。

(4) *本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。*

3.12. 工作頻率為 2.9 至 3.26 秭赫(GHz)，3.267 至 3.332 秭赫(GHz)，3.339 至 3.3458 秭赫(GHz)，3.358 至 3.6 秭赫(GHz)者

3.12.1. 器材型式：車輛識別系統(automatic vehicle identification systems，AVIS)，使用掃頻技術以識別通過該系統之車輛。

(1) 使用頻率：

(1.1) 2.9-3.26 秭赫(GHz)。

(1.2) 3.267-3.332 秭赫(GHz)。

(1.3) 3.339-3.3458 秭赫(GHz)。

(1.4) 3.358-3.6 秭赫(GHz)。

(2) 發射限制：

(2.1) 任一掃頻範圍內之頻率，距 3 公尺處任何方向量測，其電場強度限於 3000 微伏/公尺/兆赫(μV/Meter/MHz)以內。

(2.2) 當裝設於其作業處時，於水平面正負 10 度以內任何方向量測，其電場強度限於 400 微伏/公尺/兆赫(μV/Meter/MHz)以內。

(2.3) 除 2.7 節之規定外，任一掃頻範圍外之頻率，距 3 公尺處任何方向量測，其電場強度限於 100 微伏/公尺/兆赫(μV/Meter/MHz)以內，應由 30 兆赫(MHz)量測至 20 秭赫(GHz)。

(2.4) *本節之所有發射限制值係以平均值檢測儀量測，且同時必須符合本規範 5.14 節之峰值規定。*

(2.5) *應使 AVIS 只有在被識別車輛進入該系統之輻射場中時方有信號發射。*

(2.6) AVIS 裝置上須有永久標示之使用說明如下：”使用時天線不可指向在水平平面之± x x 角度內。”

其中之 xx 角度應由責任單位以須符合 (2.2)輻射限制規定與上述角度限制的天線指向角度代換。

(3) 發射天線：使用號角型或其他相容之指向性天線。

(4) 掃頻速率：限於每秒 4,000 次至 50,000 次間。

(5) *測試報告*應檢附下列資料：

(5.1) 沿著頻譜分析儀或相當的測試接收機中間頻率量測，並以微伏/公尺/兆赫(μ V/Meter/MHz)表示其電場強度。

(5.2) 距 3 公尺處量測，於最大電場強度方向及其衰減至 400 微伏/公尺/兆赫(μ V/Meter/MHz)時之夾角。

(5.3) 顯示全部掃頻信號及經校正之垂直及水平軸刻度之頻譜分析儀照片*或繪圖*；頻譜分析儀之設定條件亦應標示於照片*或繪圖*上。

(5.4) 除掃描頻帶外，30 兆赫(MHz)至 20 秭赫(GHz)間之混附及旁帶發射成份，量測儀器應盡量靠近受測元件。

3.13. 工作頻率為 76.0 至 77.0 秭赫(GHz)者

3.13.1 器材型式：限裝置於車輛之場強擾動感測器（vehicle-mounted field disturbance sensors），作為車輛雷達感測系統(vehicle radar systems)用。可傳送用於場強擾動感測器操作基本模式之資料。本器材不得於航空器或人造衛星上使用。

（1） 使用頻率：76-77GHz。

（2） 發射限值：

（2.1）車輛尚未移動時，自發射器表面三公尺外量測，此頻段之任何發射其功率密度（power density）不得超過 200nW/cm^2。

（2.2）前端場強擾動感測器，在車輛移動時，自發射器表面三公尺外量測，此頻段內之任何發射其功率密度（power density）不得超過 60mW/cm^2。

（2.3）兩側或尾端場強擾動感測器，在車輛移動時，自發射器表面三公尺外量測，此頻段之任何發射其功率密度（power density）不得超過 30mW/cm^2。

（3） 頻帶外之任何頻率應僅有混附發射，其功率密度（power density）發射限值如下：

（3.1）低於 40GHz 以下之任何輻射，應符合本規範第 2.8 節之規定。

（3.2）在使用頻率外及介於 40GHz 與 200GHz 間任何輻射，限值如下：

（3.2.1） 前端場強擾動感測器，自發射器表面三公尺外量測，不得超過 600pW/cm^2。

（3.2.2） 兩側或尾端場強擾動感測器，自發射器表面三公尺外量測，不得超過 300pW/cm^2。

（3.3）高於 200GHz 之發射，自發射器表面三公尺外量測，任何發射之功率密度（power density）不得超過 1000pW/cm^2。

（3.4）頻譜之量測頻率應達 231GHz。

（4） 峰值發射限制依 5.14.2 節之規定。

（5） 主要發射須包括此頻段之所有操作狀態。若無其他適當之說明，則預設操作溫度範圍自攝氏-20℃至＋50℃，輸入電壓變化為標稱輸入電壓之 85%至 115%。

（6） 依本節操作之裝置應符合 5.19 節電波暴露之要。

4. 特殊器材規格

4.1. 隧道無線電系統(tunnel radio systems)：供隧道內工作人員相互通信用之無線電收發信器材。

(1) 使用頻率：若符合以下之規定，可使用任何頻率。

(2) 設置限制：發射機及所有接線均應完全裝設在隧道內。

(3) 發射限制：洩漏到隧道外之任何輻射不得超過第 2.8 節之規定。*若連接至市電，需符合 2.3 節之規定。*天線之規格不受 2.2 節規定之限制。

4.2. 管線尋跡定位設備(cable locating equipments)：供經訓練之作業員查測掩埋於地下之電纜、管線及其類似之架構及元件。作業時將無線電信號耦合至纜線上，於地面以接收機偵測尋跡定位。

(1) 使用頻率：9 至 490 千赫。

(2) 峰值輸出功率：在任何調變情況下皆不得超過下列限值。

(2.1) 9-45 (不含)千赫頻段：10 瓦(W)。

(2.2) 45-490 千赫頻段：1 瓦(W)。

(3) 不得使用於語音傳輸。

(4) 若連接至市電，需符合 *2.3 節*之規定。

(5) 天線之規格不受 2.2 節規定之限制。

4.3. 無線電遙控器：含模型玩具無線電遙控器、工業用無線電遙控器及無線電數據傳送器三類。

4.3.1. 模型玩具無線電遙控器：適用於航空模型飛機遙控器(aircraft device)及在地面、水面作業之地表模型遙控器(model surface craft device)等電波收發訊器具。

(1) 限制事項：

(1.1) 限單向控制。

(1.2) 不得於機場及其飛航管制區內使用。

(1.3) 於軍事管制區內應依其管制規定使用。

(1.4) 使用航空模型飛機遙控器尚須符合其他有關無線電遙控航空模型飛機之管理規定。

(2) 使用頻率：

(2.1) 下列頻段可供任何形式之遙控器使用：

26.995、27.045、27.095、27.120、27.136、27.145、27.195、27.245 兆赫(MHz)。

(2.2) 下列頻段僅限航空模型飛機遙控器使用：

72.0 至 72.99 兆赫(MHz)，頻道間隔：20 千赫(kHz)。

(2.3) 下列頻段僅限地表模型遙控器使用：

75.41 至 75.99 兆赫(MHz)，頻道間隔：20 千赫(kHz)。

(3) 有效輻射功率(*ERP*)：無線電遙控器發射機之載波功率在任何調變情況下皆不得超過下列限值。

(3.1) 26 至 27 兆赫(MHz)頻段：地表模型遙控器：4 瓦(W) ，航空模型飛機遙控器：0.75 瓦(W)。

(3.2) 72 至 73 兆赫(MHz)頻段：0.75 瓦(W)。

(3.3) 75 至 76 兆赫(MHz)頻段：0.75 瓦(W)。

(4) 不得使用於語音傳輸。

(5) 頻帶寬度：±4 千赫以內。

(6) 頻率容許差度：

(6.1) 26-27 兆赫(MHz)頻段：應維持在主波頻率之±0.005%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，一次供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

(6.2) 72-76 兆赫(MHz)頻段：。應維持在主波頻率之±0.002%以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，一次供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

(7) 不必要之發射：

(7.1) 26-27 兆赫(MHz)頻段：

(7.1.1.) 距主波±4 千赫(不含)至±8 千赫(含)間衰減 25dB 以上。

(7.1.2.) 距主波±8 千赫(不含)至±20 千赫(含)間衰減 35dB 以上。

(7.1.3.) 距主波±20 千赫(不含)以上衰減 43+10log(最大輸出功率)dB 以上。

(7.2) 72-76 兆赫(MHz)頻段：

(7.2.1.) 距主波±4 千赫(不含)至±8 千赫(含)間衰減 25dB 以上。

(7.2.2.) 距主波±8 千赫(不含)至±10 千赫(含)間衰減 45dB 以上。

(7.2.3.) 距主波±10 千赫(不含)至±20 千赫(含)間衰減 55dB 以上。

(7.2.4.) 距主波±20 千赫(不含)以上衰減 56+10log(最大輸出功率)dB 以上。

4.3.2. 工業用無線電遙控器：限於廠房內使用，以電波傳送數據控制訊息之電波收發訊器材。

(1) 使用頻率：限於下列頻率。

頻道	頻率(兆赫)	頻道	頻率(兆赫)
1	480.050	7	480.200
2	480.075	8	480.225

3	480.100	9	480.250
4	480.125	10	480.275
5	480.150	11	480.350
6	480.175	12	480.400

(2) 有效輻射功率*(ERP)*：10 毫瓦(mW)以下。

(3) 調變方式：F1D,F2D。

(4) 頻帶寬度：8.5 千赫(kHz)以內。

(5) 頻率容許差度：4ppm 以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，一次供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

(6) 尖峰頻率偏移：±2.5 千赫(kHz)以內。

(7) 混附發射：低於主波 53 分貝(-53dBc)以上，或 2.5 微瓦(μW)*(ERP)*以內。

4.3.3. 無線電數據傳送器：限於建築物內使用，以電波傳送語音、影像、數據等訊息之電波發射器材。

(1) 使用頻率：限於下列 10 組頻率，第 10 組為控制頻率。

頻道	頻率(兆赫)	頻道	頻率(兆赫)
1	429.8125 / 449.7125	6	429.8750 / 449.7750
2	429.8250 / 449.7250	7	429.8875 / 449.7875
3	429.8375 / 449.7375	8	429.9000 / 449.8000
4	429.8500 / 449.7500	9	429.9125 / 449.8125
5	429.8625 / 449.7625	10	429.9250 / 449.8250

(2) 有效輻射功率*(ERP)*：10 毫瓦(mW)以下。

(3) 調變方式：F1D,F2D。

(4) 頻帶寬度：8.5 千赫(kHz)以內。

(5) 頻率容許差度：4ppm 以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，一次供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

(6) *最大尖峰頻率偏移*：±2.5 千赫(kHz)以內。

(7) 混附發射：低於主波 53 分貝(-53dBc)以上，或 2.5 微瓦(μW)*(ERP)*以內。

4.3.4. 型式認證要件。

(1) 發射機若附加可由使用者更換之插入式頻率檢出模組亦應做型式認證，每一模組應包含全部頻率檢出電路，包括振盪器。插入式振盪晶體不屬插入式頻率檢出模組，使用者不得更動。

(2) 發射機天線必須固定裝置於發射機上，不得外接天線，亦不得有增益(與半波偶

極天線比較)且應為垂直極化型。

(3) 發射機頻率應使用晶體控制。

(4) 說明書及警語：依 2.9 之規定。

4.4. 民用頻段無線電對講機(Citizens Band Radio Service)。

4.4.1. 發射機部分：

(1) 使用頻率：26.965-27.405 兆赫(MHz)，共 40 頻道(列表如下)。其中必須包含頻道 9，並特別標示供緊急呼救使用。

頻道	頻率(兆赫)	頻道	頻率(兆赫)	頻道	頻率(兆赫)	頻道	頻率(兆赫)
1	26.965	11	27.085	21	27.215	31	27.315
2	26.975	12	27.105	22	27.225	32	27.325
3	26.985	13	27.115	23	27.235	33	27.335
4	27.005	14	27.125	24	27.245	34	27.345
5	27.015	15	27.135	25	27.255	35	27.355
6	27.025	16	27.155	26	27.265	36	27.365
7	27.035	17	27.165	27	27.275	37	27.375
8	27.055	18	27.175	28	27.285	38	27.385
9	27.065	19	27.185	29	27.295	39	27.395
10	27.075	20	27.205	30	27.305	40	27.405

(2) 頻道間隔：10 千赫(kHz)。

(3) 頻率容許差度：±20ppm 以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，一次供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

(4) 有效輻射功率*(ERP)*：5 瓦特(W)以下。

(5) 調變方式：

(5.1) 調幅(A3E)：調幅±100%以下。

(5.2) 調頻(F3E)：最大頻率偏移±2.5 兆赫(kHz)以內。

(6) 鄰頻道功率：

(6.1) 調幅(A3E)：同(7.1)項。

(6.2) 調頻(F3E)：在正常測試條件下，不得超過 20 微瓦(nW)。

(7) 混附發射：

(7.1) 調幅(A3E)：

(7.1.1) 距主波±4 千赫(kHz)至±8 千赫(kHz)，應低於主波 25dB 以上。

(7.1.2) 距主波±8 千赫(kHz)至±20 千赫(kHz)，應低於主波 35dB 以上。

(7.1.3) 距主波±20 千赫(kHz)以上，應低於主波 $53+10\log_{10}$(輸出功率)dB 以上。

(7.2.) 調頻(F3E)：

(7.2.1) 在發射機工作時，下列頻道內不得超過 4 奈瓦（nW）*(ERP)*：

41-68 兆赫(MHz)，87.5-118 兆赫(MHz)，162-230 兆赫(MHz) ，470-862 兆赫(MHz)。

(7.2.2) 除(7.2.1)項外，在 25 兆赫(MHz)至 1 秭赫(GHz)間，不得超過 0.25 微瓦 (μW) (ERP) 。

(7.2.3) 除(7.2.1)及(7.2.2)項外，在 1-2 秭赫(GHz)間，不得超過 1 微瓦(μW) *(ERP)*。

(7.2.4) 待機時，在 25 兆赫(MHz)至 1 秭赫(GHz)間，不得超過 2 奈瓦（nW）*(ERP)*；在 1-2 秭赫(GHz)間，不得超過 20 奈瓦（nW）*(ERP)*。

4.4.2. 接收機部分：

(1.1.) 不必要之發射：應符合 2.8 節之規定。

4.5. 低功率無線電對講機（Family Radio Service）

4.5.1. 使用頻率：限於下列 14 個頻率（機體顯示之頻道數不得超過 14 個）。

頻道	頻率(兆赫)	頻道	頻率(兆赫)
1	467.5125	8	467.60
2	467.525	9	467.6125
3	467.5375	10	467.625
4	467.550	11	467.6375
5	467.5625	12	467.650
6	467.575	13	467.6625
7	467.5875	14	467.675

4.5.2. 有效輻射功率*(ERP)*：1 瓦(W)以下。

4.5.3. 調變方式：F3E。

4.5.4. 頻帶寬度：12.5 千赫(kHz)以內。

4.5.5. 頻率容許差度：3ppm 以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，一次供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

4.5.6. 尖峰頻率偏移：±2.5 千赫(kHz)以內。

4.5.7. 音頻響應：3.125 千赫(kHz)以內。

4.5.8. 發射機不必要之發射：50 微瓦(μW)以內*(ERP)*。

4.5.9. 接收機：20 奈瓦(n W)以內*(ERP)*。

4.5.10. 天線不可與機體分離且須為垂直偏極化。

4.5.11. 可使用外接電源，但有效輻射功率不可大於 1 瓦(W)。

4.5.12. 低功率無線電對講機限用於按壓式（push to talk）語音通訊，不得用於非語音通訊或傳輸數據、控制訊號。

4.5.13. 不得連接至公眾通信系統。

4.6. 低功率無線電麥克風（Low-Power Wireless Microphone）

4.6.1. 說明：低功率無線電麥克風係藉由無線電波傳送語音或音樂至遠端接收設備。

4.6.2. 使用頻率（frequency range）：

227.1MHz~227.4 MHz, 229.4MHz~230.0MHz, 231.0MHz~231.9MHz。

4.6.3. 發射機部分（transmitter part）：

(1) 頻道寬度（channel bandwidth）：小於等於 200kHz。

(2) 載波功率（ERP）：

頻　道　寬　度	載 波 功 率 限 值
50kHz(含)以下	10 mW (含)以下
200kHz 以下、50kHz(不含)以上	5 mW (含)以下

(3) 頻移量（frequency deviation）：小於等於±75kHz。

1. 頻率穩定度（frequency stability）：*50* ppm(含)以下。在正常一次供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，一次供應電壓在額定值之±15%內變化時。以電池作業者，應以新電池測試，亦須符合 5.17 之要求。

2. 混附發射（spurious emissions）*(ERP)*：

操作狀態	250nW(含)以下
待機狀態	2nW(含)以下

4.6.4. 接收機部分（receiver part）：

(1) 混附發射（spurious emissions）：2nW(含)以下*(ERP)*。

4.6.5. 天線不可與機體分離。

4.7. 無線資訊傳輸設備（Unlicensed National Information Infrastruture）

4.7.1.技術規格

(1)功率限值：

(1.1) 5.25-5.35 秭赫頻帶，在操作頻帶下之峰值發射功率不能超過 50 毫瓦或 4 分貝毫瓦（dBm）+10 log B (B 是 26-分貝發射頻寬，單位百萬赫)之較小者。此外，在任何 1 百萬赫頻帶中峰值功率頻譜密度不能超過 4 分貝毫瓦。如使用之發射天線之方向增益超過 6 dBi, 則峰值發射功率及峰值功率頻譜密度必須依天線超過 6 dBi 之增益值等量減少。

(1.2) 5.725-5.825 秭赫頻帶，在頻帶運作下之峰值發射功率不能超過 1 瓦或 17 分貝毫瓦+10 log B (B 是 26-分貝發射頻寬，單位百萬赫)中之較小者。此外，在任何 1 百萬赫頻帶中峰值功率頻譜密度不能超過 17 分貝毫瓦。如使用之發射天線之方向增益超過 6 dBi, 則峰值發射功率及峰值功率頻譜密度必須依天線超過 6 dBi 之增益值等量減少。不過，在此頻帶操作之固定式點對點無線資訊傳輸設備可使用方向增益不超過 23 dBi 之發射天線而不需相對應地減少發射器之峰值發射功率及峰值功率頻譜密度；如使用之發射天線之方向增益超過 23 dBi, 則峰值發射功率及峰值功率頻譜密度必須依天線超過 23 dBi 之增益值等量減少。固定式點對點操作，不包括點對多點系統、全方向性應用及多台共站發射機傳送相同資訊。無線資訊傳輸設備使用者或安裝者(如設備為專業之裝設)需確保高方向增益天線只應用於固定式點對點系統上。

(1.3) 峰值發射功率必須使用依據均方根等效電壓校準之儀器量測於任何連續傳輸之時段，量測結果須依儀器限制(如偵測器反應時間、相較於發射頻寬有限之解析頻寬能力，靈敏度等)調整得出正確之峰值量測以符合本段落所提之發射定義。

(1.4) 峰值功率頻譜密度量測是將已校準之儀器直接連接上被測試之設備作傳導發射量測，如設備不能直接連接，可選擇其他電信總局能接受之技術，量測定於 1 百萬赫頻寬或設備之 26 分貝發射頻寬之較小者。如果量測功率被整合(is integrated)以顯示量測頻寬中之總功率，可使用小於量測頻寬之解析頻寬。如解析頻寬與量測頻寬大致相同但大幅小於受測設備之發射頻寬，量測結果應作修正以考量測試儀器之解析頻寬與其實際雜訊頻寬之任何差異。

(1.5) 於任何 1 百萬赫頻寬或發射頻寬之較小者，其調變封包之峰值衝程（peak excursion）(使用峰值保持【peak hold】功能量測)與峰值發射功率之比率不能超過 13 分貝。

(2) 不需要發射之限值：除本節第 5 項之外，在操作頻帶外的峰值發射，應衰減至符合下列限值：

(2.1) 在 5.25-5.35 秭赫頻帶操作的發射器：所有在 5.25-5.35 秭赫頻率以外的發射其有效等向輻射功率（EIRP）不應超過 - 27 分貝毫瓦/百萬赫。

(2.2) 在 5.725-5.825 秭赫的頻帶操作的發射器：所有頻帶邊緣向外 10 百萬赫內頻率之發射，有效等向輻射功率不應超過 - 17 分貝毫瓦/百萬赫；所有頻帶邊緣外大於或等於 10 百萬赫的頻率之發射，其有效等向輻射功率不應超過 - 27 分貝毫瓦/百萬赫。

(2.3) 發射量測應使用之最低解析頻寬為 1 百萬赫。如果量測的能量被整合以顯示 1 百萬赫的總功率，則必要時頻帶邊緣附近可使用較低解析頻寬。

(2.4) 在 1 祙赫以下的不必要之發射，必須符合第二章第 2.8 節之一般場強限值，且任何使用交流市電的無線資訊傳輸設備亦須符合第二章第 2.3 節之傳導限值。

(2.5) 應符合第二章第 2.7 節之規定。

(2.6) 當測量發射限值時，應將宣稱的載波頻率調整到儘可能接近設備設計所允許的上、下頻率區域邊緣。

(3) 無線資訊傳輸設備應在”無資料傳輸”或”操作失效”時自動中斷傳輸，此規定並不預先排除傳送控制或信號（signaling）資訊或使用運用數位技術完成碼框或資料突發（burst）區間的重複碼（repetitive codes），申請人應在申請型式認證文件中提供如何符合本規範之說明。

(4) 在 5.25-5.35 祙赫頻帶內操作之無線資訊傳輸設備，限於室內使用。

(5) 無線資訊傳輸設備須忍受合法通信之干擾且不得干擾合法通信；如造成干擾，應立即停用，俟無干擾之虞，始得繼續使用。

(6) 無線資訊傳輸設備的製造廠商應確保頻率穩定性，如依製造廠商使用手冊上所述正常操作，發射的信號應維持於操作頻帶中。

5. 檢驗規定

5.1. 掃頻設備之測試應掃描並停留於各規定頻率上量測並記錄之。

5.2. 量測傳導入市電電源線之無線電發射功率應使用 50 歐姆/50 微亨利之電源線阻抗穩定網路(LISN)。

5.3. 輻射電場強度測試應儘可能在室外空曠場地(Open Field Site)執行，若測試場地經適當的校正使測試結果可與空曠場地所測相同者亦可採用。在僅能於設備架設處所執行測試的情況下; 例如：電力線電流載波系統即以洩漏電纜做為天線的系統，至少應選擇三個具代表該架設處所之地點量測。輻射測試應使用旋轉桌以測量受測物各邊之發射。

5.4. *量測電源輸入功率或發射主波之輻射信號位準的變動時，應變動供應電壓在正常額定值之 85%及 115%間進行。若為電池供電之設備，應使用新電池測試。此外，初步測試應執行如下所述之評估，決定會產生最大輻射的組態與條件以進行最終測試：*
a. 若具備交流與直流（電池）兩種供應電源，兩種供電方式皆須評估測試。
b. 若載波之調變可控制，則具特定適當調變與未調變兩種條件皆須評估測試。
c. 若為手持式或穿戴式之裝置，應對其三個正交軸的方位評估測試。

5.5. 儘可能依規定*距離量測，此規定距離是指接收天線至最靠近受測設備邊緣*的水平距離。

5.5.1. 受測頻率高於或等於 30MHz 時，*若所做的測試非於近場內，或除非可證明該受測物的特性適用於近場測試且可證明所欲量測的信號位準在該測試距離可被測試儀器偵測到，則可在非規定的測試距離進行。*測距離不得大於 30 公尺，除非能進一步證實在小於或等於 30 公尺處量測為不可行。當於非規定距離執行量測時，該量測結果應以*插補係數(20dB/十倍距離)換算至規定距離之值，電場量測為線性距離反比而電功率密度量測為線性距離平方反比。*

5.5.2. 量測頻率低於 30 兆赫(MHz)時，*測試可在近於規範之指定距離進行，但儘可能試圖避免在近場做測試。當測試距離近於規範指定之距離，測試結果應以下面之插補係數換算至規定距離之值：對同一輻射方向最少兩個距離作量測以決定適當的插補係數或線性距離平方反比(40dB/十倍距離)。*

5.5.3. 實測距離非為規定距離時，*須於測試報告*內說明所使用之*插補法。*

5.5.4. *須測量足夠的受測物輻射方位以決定最大場強值的輻射發射方位，受測頻率點的最大場強值應紀錄於測試報告。*

5.5.5. *當規定之測試距離不大於 30 公尺時，本局將以規定之距離做驗證測試，除非在此距離測量會處於近場。當規定之測試距離大於 30 公尺時，本局將以較近之距離做驗證測試，一般而言為 30 公尺，而以上述之插補法換算至規定距離之值。*

5.6. 受測設備於測試時應將很容易被消費者操作或企圖使其操作之控制器調整至最大發射準位。可供消費者引接之導線，測試時亦應接入。若已知搭配設備之導線長度，則應使用該長度之導線，否則應以 1 公尺長導線接入設備。相關周邊之連接若需更長之導線時亦可運用。

5.6.1 桌上型受測物電源傳導測試之配置要求如下：
a. 裝置間之連接纜線若離接地平面低於 40 公分，應以 30 至 40 公分之束綁於纜線中間，使該纜線最低點大約在測試桌面與接地平面中間。
b. 未連接至週邊裝置的 I/O 纜線應於其中間束綁以使纜線離接地平面約 40 公分，纜線端點可用正確之終端組抗終結。

c. LISN 至少距離受測物機殼最近的部位 80 公分。受測物電源線過長部分應於靠近中間部位束綁。非受測物之電源線無須束綁。

d. 受測物以及週邊裝置的背面，應與桌緣切齊排列，而此桌緣與垂直傳導平面距離 40 公分。

5.6.2 落地型受測物電源傳導測試之配置要求如下：

a. 過長之裝置間連接纜線應於其中間做不超過 40 公分之束綁。

b. LISN 距離所連接裝置之機殼最近的部位 80 公分。受測物與週邊裝置過長之電源線應於其中間做束綁使電源線成適當的長度。

c. 未連接至週邊裝置的 I/O 纜線應於其中間束綁，纜線端點可用正確之終端組抗終結。

d. 受測物以及所有纜線應以 3 至 12mm 厚度之絕緣物質與接地平面隔離。

5.6.3 桌上型受測物輻射測試之配置要求如下：

a. 裝置間之連接纜線若離接地平面低於 40 公分，應以 30 至 40 公分之束綁於纜線中間，使該纜線最低點大約在測試桌面與接地平面中間。

b. 未連接至週邊裝置的 I/O 纜線應於其中間束綁以使纜線離接地平面約 40 公分，纜線端點可用正確之終端組抗終結。

c. 受測物以及週邊裝置的背面，應與桌緣切齊排列。

d. 受測物與周邊裝置之電源線無須束綁，下垂至地面。

5.6.4 落地型受測物輻射測試之配置要求如下：

a. 過長之裝置間連接纜線應於其中間做不超過 40 公分之束綁。

b. 受測物與週邊裝置過長之電源線應於其中間做束綁使電源線成適當的長度。

c. 未連接至週邊裝置的 I/O 纜線應於其中間束綁，纜線端點可用正確之終端組抗終結。

d. 受測物以及所有纜線應以 3 至 12mm 厚度之絕緣物質與接地平面隔離。

5.7. 對於*數個裝置*裝設於同一機箱或不同的機箱而以電纜或電線連接的復合系統之測試，應於該系統內各裝置皆動作時為之。*若低功率發射器具備多支天線或其他輻射源且設計用以同時發射，傳導與輻射測試應在所有的輻射源都發射的狀態下進行。載波電流系統組裝其他裝置，應分別獨立測其各所需符合之規範。*

5.8. 若受測器材擬供外接附件之連接(包含外接之電氣輸入信號)，此器材應連接其附件一併測試，執行測試時該器材及附件應配置在正常作業條件下可預期的變動範圍內之最大發射。擬用於受測設備之界面或外接附件僅需擇一具代表性者作測試。毋需對設備之全部可能的組合作測試。連接於受測器材之付件或介面需為未經修改之市售設備。

5.8.1 測試時應選擇受測物典型之操作模式、纜線位置以及連接組態以確認所產生的最大發射。

5.9. 被包含一中央控制單元及一外接或(數個)內建配件(介面)並且至少有一附屬器材係用於該控制單元，該控制單元及/或(該等)附件之測試應採用由修改該設備或申請授權生產該設備之許可或裝配該中央控制單元之成員所產生或裝配之器材執行之。任一所需之其他器材不是由該成員生產或裝配者除外。若該成員並不產或裝配中央控制單元並且至少有一附屬器材係用於該控制單元，或是該成員能說明該中央控制單元及/或(該等)配件係準備分別銷售或可供其他用途之設備使用，中央控制單元及/或(該等)附件之測試應採用所擬上市或併用之特殊器材組合執行之。擬用於受測設備之界面或外接附件僅需擇一具代表性者作測試。毋需對設備之全部可能的組合作測試。連接於受測器材之付件或介面需為未經修飾之市售設備。

5.10. 復合系統內之個別器材若屬於不同的技術標準，各器材應遵守其特定的標準。復合系統之發射不得超過系統內個別元件所容許之最高準位。

5.11. *測量意圖輻射器或接收機，應依照下表所規定之頻率點進行，若有要求亦應說明受測*

物可操作的每個頻段：

作業頻率範圍	待測頻率數	待測頻率在作業範圍內之位置
小於等於 1 兆赫(MHz)	1	中間
1–10 兆赫(MHz)	2	一端近於頂端，另一近於底端
大於 10 兆赫(MHz)	3	一近於頂端，一近於底端，另一位近於中間

5.12. 除其他條文另有規定外，衰減至比容許值低至少 20dB 之混附發射毋需記錄。

5.13. 量測頻率範圍：

5.13.1. *若最高操作頻率低於 10GHz：至最高為主波之十倍諧波或 40 秭赫(GHz)止，兩者取頻率較低者。*
若最高操作頻率不低於 10GHz 但低於 30GHz：至最高為主波之五倍諧波或 100 秭赫(GHz)止，兩者取頻率較低者。
若最高操作頻率不低於 30GHz：至最高為主波之五倍諧波或 200 秭赫(GHz)止，兩者取頻率較低者。

5.13.2. 除對主波之諧波及次諧波應特別注意外，也應特別注意那些以振盪頻率倍乘而遠離該主波之頻率。各倍頻級之頻率亦須核對。

5.14. 量測儀器規格：除本規範其他條文另有規定外，傳導其輻射限制值係以符合下列規定之儀器所測者為基準。

5.14.1. 任一低於或等於 1000 兆赫(MHz)頻率，若無特別指定，所示之限值係基於所用之量測儀器具有 CISPR 準峰值檢波器功能及相關的量測頻寬。其規格公佈在 IEC 發行之 CISPR Publication 16 內。*測試者可選用經適當校正某些因素而對脈衝不敏感之峰值檢波儀器作為替代量測 CISPR 準峰值，但測量頻寬必須與 CISPR 準峰值檢波器相同。*

註： 脈波重複頻率不大於 20 赫(Hz)之脈衝調變裝置，若指定其量測為 CISPR 準峰值，須使用具有峰值檢波器功能，其係數經適當校正使對脈衝不敏感、量測頻寬與 CISPR 準峰值量測儀器相同之儀器。

5.14.2. 任一高於 1000 兆赫(MHz)之頻率，所示之限值係基於所用之量側儀器具有平均值檢波器功能。當規定之發射限度為平均值時(包括 1000MHz 以下)，*同時亦必須符合以峰值檢波器功能測量之限制值*，此峰值發射限制值相當於受測頻率之容許平均值再加 20dB，*除非本規範其他章節另有規定其不同峰值限制值。若無其他特別指定，測量高於 1000 兆赫(MHz)之頻率測試儀器必須使用 1 兆赫(MHz)之解析頻寬執行*。交流電力線傳導發射皆應使用 CISPR 準峰值檢波器測定，即使其規定之*輻射*發射限制值為平均值。

5.14.3. 當規定之發射限度為平均值且採用脈衝式作業時，只要脈衝串不超過 0.1 秒，應以一含空閒期之完整脈衝串取其平均值表示所測得之電場強度。若發射時間超過 0.1 秒，或脈衝串超過 0.1 秒，則*量測場強須取決於可得最大絕對平均電壓值之 0.1 秒期間*。用以計算平均電場強度之方法應*在測試報告中說明*，俾供查證。

5.15. 調變之使用：除個別之測試規範有指定或必須有調變以產生發射信號（如單旁波帶抑制載波之發射機）外，進行測試時無須使用調變。當個別之測試規範有指定加入調變時可應用以下之規定：
a. 只有語音調變（200Hz 到 3000Hz）之裝置，除無線話機外，調變信號為 1000Hz 之正弦波，強度為 100dB SPL（0dB SPL 為 20μPa），加於受測物之麥克風 10 公分處。
b. 無線話機，調變信號為 2500Hz 之正弦波，強度為可產生 85%之調變（例如最大調變

為 5kHz 之頻移量，則 85%調變即為 4.25 kHz 頻移量），直接偶合於受測物之音頻輸入級。

c. 若調變信號源為受測物內部所產生者，使用其內部調變。

d. 若受測物具備外部調變之輸入端子，調變信號應使用標稱之最大位準與適當頻率，信號型態為正弦波。

5.16. 測試時除非受測物操作有特別之要求範圍，周圍環境溫度應於 10°C 到 40°C 之範圍內，相對環境濕度應於 10%到 90%之範圍內。

5.17. 電池操作端點電壓（Battery Operating End Point Voltage）：只適用於具電池操作之發射器，頻率穩定對供應電壓測試時，應以製造者所宣稱之電池操作端點電壓進行。

5.18. 頻率響應：若個別測試規範中有指定頻率響應測試，測試資料或數據須涵蓋音頻範圍 100 Hz 到 5000Hz。

5.19. 電波暴露量之評估：若個別之測試規範指定電波暴露量之評估，應符合以下之要求。

(a) 若受測物於正常操作模式下，其發射機構會距離人體 20 公分以內須測試指定之比吸收率 (Specific Absorption Rate, SAR)以證明其符電波暴露量之要求。限制值如下：

人體位置	職業性/可控制之暴露 (W/kg)	一般人/不可控制之暴露 (W/kg)
人體全身	0.4	0.08
人體部分	8.0	1.6
手、手腕、腳、膝蓋	20.0	4.0

註 1：人體全身意指人體全身的平均量，人體部分意指 1 立方體為 1 公克之人體組織的平均量。手、手腕、腳、膝蓋之 SAR 限制值是以 1 立方體為 10 公克之人體組織的平均量。

註 2：SAR 限制值不適用於 6.0GHz 以上之操作頻率，而 MPE 之功率密度限制值可應用，但距離發射裝置為 5 公分或更遠。

(b) 若受測物於正常操作模式下，其發射機構會距離人體 20 公分以上可測試最大暴露允許值 (Maximum Permissible Exposure, MPE)以證明其符電波暴露量之要求。限制值如下：

b.1 職業性/可控制之暴露

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-3.0	614	1.63	*100	6
3-30	1842/f	4.89/f	*900/f^2	6
30-300	61.4	0.163	1.0	6
300-1500	-----	-----	f/300	6
15000-100,000	-----	-----	5.0	6

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位 MHz。

b.2 一般人/不可控制之暴露

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-3.0	614	1.63	*100	30
3-30	1842/f	4.89/f	*180/f^2	30
30-300	27.5	0.073	1.0	30
300-1500	-----	-----	f/1500	30
15000-100,000	-----	-----	1.0	30

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位 MHz。

附件三 低功率射頻電機技術規範(英)

交通部電信總局
低功率射頻電機技術規範
(Engilish Version)

中華民國九十年十一月

Contents

Technical Provisions for Low Power Radio devices

Preview

This specification is based on the second paragraph of Article 50 of TELECOMMMUNICATIONS ACT and the second paragraph of Article 6 of the Management Regulation for Low-power Radio-frequency Devices. There are five chapters: Chapter 1 explains the related terminology; Chapter 2 lists out the general limitation on the operating frequency, emission power, and features. The Low-power Radio-frequency Devices in this chapter are not restricted with their usage except otherwise regulated by other management codes. Chapter 3 and Chapter 4 are for special purpose specifications. In these two chapters, limitation on the operating frequency and emission power of these certain special-purpose Low-power Radio-frequency Devices is according to the frequency bands and the types of the devices. Those not specifically listed in Chapter 3 and Chapter 4 must comply with the provisions in Chapter 2; Chapter 5 is for the approval and certification procedures for the Low-power Radio-frequency Devices.

1. Terminology

1.1 Radio frequency energy : Electromagnetic energy at any frequency in the radio spectrum between 9 kHz and 300,000 MHz

1.2 Carrier : Radio frequency energy generated by the Low-power Radio-frequency Devices before modulation. That is the main carrier wave without been modulated.

1.3 Spurious Emissions: Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

1.4 Out-of-band emissions: Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

1.5 Unwanted emissions: Consist of spurious emissions and out-of-band emissions.

1.6 Necessary bandwidth: For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

1.7 Instantaneous frequency: The time rate of change in phase in radians divided by 2π, the unit is Hz.

1.8 Peak frequency deviation: The half the difference between the maximum and minimum values of the instantaneous frequency.

1.9 Harmful interference : Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with COMMUNICATION ACT.

1.10 Damped waves : The strength of the radio wave increases rapidly and then decreases gradually until nil.

1.11 Effective Radiated Power: The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.

1.12 Special Definitions for U-NII (Unlicensed National Information Infrastructure):

1.12.1 Average Symbol Envelope Power. The average symbol envelope power is the

average, taken over all symbols in the signaling alphabet, of the envelope power for each symbol.

1.12.2 Digital modulation. The process by which the characteristics of a carrier wave are varied among a set of predetermined discrete values in accordance with a digital modulating function as specified in document ANSI C63.17-1998.

1.12.3 Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

1.12.4 Peak Power Spectral Density. The peak power spectral density is the maximum power spectral density, within the specified measurement bandwidth, within the U-NII device operating band.

1.12.5 Peak Transmit Power. The maximum transmit power as measured over an interval of time of at most 30/B or the transmission pulse duration of the device, whichever is less, under all conditions of modulation.

1.12.6 Power Spectral Density. The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its peak or maximum level, divided by the total duration of the pulses. This total time does not include the time between pulses during which the transmit power is off or below its maximum level.

1.12.7 Pulse. A pulse is a continuous transmission of a sequence of modulation symbols, during which the average symbol envelope power is constant.

1.12.8 Transmit Power. The total energy transmitted over a time interval of at most 30/B (where B is the 26 dB emission bandwidth of the signal in hertz) or the duration of the transmission pulse, whichever is less, divided by the interval duration.

1.12.9 U-NII devices. Intentional radiators operating in the frequency bands 5.15 - 5.35 GHz and 5.725 - 5.825 GHz that use wideband digital modulation techniques and provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and institutions.

6. General Requirements

2.1. No control, switch or other type of adjustment which, when manipulated, can result in a violation of the rules shall be accessible from the transmitter operating panel or from exterior of the transmitter enclosure.

2.2. A low power intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the low power intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector, such as BNC、F type、N type、M type、UG type、RCA、SMA、SMB etc., is prohibited. This requirement does not apply to low power intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other low power intentional radiators which must be measured at the installation site.

However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.
Only the antenna with which an intentional radiator is authorized may be used with the intentional radiator.

2.3. For a low power intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

2.4. Intentional radiators that produce Class B emissions (damped wave) are prohibited.

2.5. For an authorized low power intentional radiator, any changes of the operational frequency and the original characteristics designed or enlarging the RF output power or being connected to an external antenna are prohibited.

2.6. The operation of the Low-power Radio-frequency Devices is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator. If interference is caused, the user must stop operating the device immediately and can't re-operate it until the harmful interference is clear.

2.7. Restricted Band: Except for specific requirement in other provision of this standard, only spurious emissions are permitted in any of the frequency bands listed below. The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 2.8.

Frequency(MHz)	Frequency(MHz)	Frequency(MHz)
0.090 - 0.110	162.01 - 167.17	3500.0 - 4400.0
0.490 - 0.510	167.72 - 173.20	4500.0 - 5250.0
2.172 - 2.198	240.00 - 285.00	5350.0 - 5460.0
3.013 - 3.033	322.00 - 335.40	7250.0 - 7750.0
4.115 - 4.198	399.90 - 410.00	8025.0 - 8500.0
5.670 - 5.690	608.00 - 614.00	9000.0 - 9200.0
6.200 - 6.300	825.00 - 915.00	9300.0 - 9500.0
8.230 - 8.400	938.00 - 1240.0	10600 - 12700
12.265 - 12.600	1300.0 - 1427.0	13250 - 13400
13.340 - 13.430	1435.0 - 1626.5	14470 - 14500
14.965 - 15.020	1660.0 - 1710.0	15350 - 16200
16.700 - 16.755	1718.8 - 1722.2	17700 - 21400
19.965 - 20.020	2200.0 - 2300.0	22010 - 23120
25.500 - 25.700	2310.0 - 2390.0	23600 - 24000
37.475 - 38.275	2483.5 - 2500.0	31200 - 31800
73.500 - 75.400	2655.0 - 2900.0	36430 - 36500
108.00 - 138.00	3260.0 - 3267.0	Above 38600
149.90 - 150.05	3332.0 - 3339.0	
156.70 - 156.90	3345.8 - 3358.0	

2.8. Except as provided in other paragraphs of this standard, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown on the table below. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. In the emission table above, the tighter limit applies at the band edges.

Frequency(MHz)	Electric Field Strength(uV/m)	Distance(m)
0.009 - 0.490	2,400/Frequency(kHz)	300
0.490 – 1.705	24,000/Frequency(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 - 216	150	3
216- 960	200	3
Above 960	500	3

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits shown on above table in these three bands are based on measurements employing an average detector and there are also peak limits have to be complied according to Section 5.14. The provisions in Sections 5.4 and 5.11 for measuring emissions at distances other than the distances specified in the above table and determining the frequency range over which radiated emissions are to be measured.

2.9. The Low-power Radio-frequency Devices on the market must be accompanied with operation manual or instructions. Sample copies for both should be sent for review together with the Low-power Radio-frequency Devices approval application (Draft of the manual is acceptable. The final copies must be sent afterwards.) The operation manual must contain all the necessary information for proper installation and operation of the device by the users. The necessary contents are :

(5) The operational ways of all control, adjustments, and switches that will not cause operation of the device in violation of the regulations. The control, adjust, and on/off operation of the device to meet the requirements of the regulation.

(6) Warnings against any adjustments to the device which may violate the regulation. The manual should suggest that all these adjustments should be carried out or be monitored by special technician.

(7) Warnings against any replacements of components (IC, transistors, and so on) which may lead to the violation to the regulations.

(8) The full contents of Article 14 、17 and 20 of the Management Regulation Low-power Radio-frequency Devices.

2.10. A low power intentional radiator and it's associated receiver being marketed in set shall be submitted to DGT for approval together, or providing the approved information of DGT for the associated transmitter or receiver. The emissions from any receivers shall not exceed the limits of Section 2.3 and Section 2.8.

7. Special Limits（According to Frequency Band）

7.1. Operational Frequency：1.705 to 10MHz

7.1.1. Device Type：Any Type.

(1) Fundamental Emission：

(1.3) If the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level.

(1.4) If the bandwidth of the emission is not less than 10% of the center frequency, the field strength of any emission within the band 1.705-10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters.

(2) The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 5.14 for limiting peak emissions also apply.

(3) The field strength of emissions outside of above operation band not exceed the general radiated emission limits in Section 2.8.

Note: For the purposes of this Section, bandwidth is determined at the points 6 dB down from the modulated carrier.

7.2. Operation within the band 13.553 - 13.567 MHz

7.2.1. Device Type：Any Type

(4) Fundamental Emission： The field strength of fundamental emissions within this band shall not exceed 10,000 microvolts/meter at 30 meters.

(5) The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits shown in Section 2.8.

(6) The frequency tolerance of the carrier signal shall be maintained within +0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery and shall also comply with Section 5.17.

7.3. Operational Frequency within 26.29 to 27.28MHz

7.3.1. Device Type：Any Type

(3) Fundamental Emission： The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 5.14 for limiting peak emissions also apply.

(4) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 2.8.

7.4. Operational Frequency within 40.66 to 40.70MHz and above 70MHz

7.4.1. Device Type： Any Type

(5) Operational Frequency within 40.66-40.70MHz。

(6) Fundamental Emission： The field strength of any emissions within this band shall not exceed 1000 microvolts/meter at 3 meters. As an alternative to the limit in paragraph (1), the field strength of any emissions within this band shall not exceed 500 microvolts/meter at 3 meters, as determined using measurement instrumentation employing an average detector. The provisions in Section 5.14 for limiting peak emissions also apply.

(7) The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits in Section 2.8.

(8) The frequency tolerance of the carrier signal shall be maintained within +0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery and shall also comply with Section 5.17.

7.4.2. Device Type：Periodic or Remittent Operation

(5) Operational Frequency within 40.66-40.70Mhz and above 70MHz。

(6) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

(7) Operation within 40.66-40.70MHz, The frequency tolerance of the carrier signal shall be maintained within +0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery and shall also comply with Section 5.17.

(8) Operation Type：(4.1) or (4.2)

(4.3) Restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, such as radio control of toys, voice or video, and data transmissions are not permitted. A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation. Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

(4.4) Devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

(6) Electric Field Strength Limits：

(5.3) For operations are applicable for paragraph (4.1), the field strength of emissions at a distance of 3 meters from intentional radiators shall not exceed the following table. The limits on the field strength of emissions, as shown in the below table, based on the average value of the measured emissions. Based on the use of a CISPR quasi-peak detector will be accepted. The tighter limits apply at the band edges.

Fundamental Frequency (MHz)	Fundamental Electric Field Strength (uV/m)	Unwanted Emissions (uV/m)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750(Note1)	125-375(Note1)
174-260	3750	375
260-470	3750-12500(Note1)	375-1250(Note1)
Above 470	12500	1250

Note1 ： linear interpolations, Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level as above table shown or shall be attenuated to the general limits shown in Section 2.8, whichever limit permits a higher field strength. If average emission measurements are employed, The provisions in Section 5.14 for limiting peak emissions also apply.

Further, compliance with the provisions of Section 2.7 is required and shall be demonstrated using the measurement instrumentation specified in that section.

(5.4) For operations are applicable for paragraph (4.2), the field strength of emissions at a distance of 3 meters from intentional radiators shall not exceed the following table. The limits on the field strength of emissions, as shown in the below table, based on the average value of the measured emissions. Based on the use of a CISPR quasi-peak detector will be accepted. The tighter limits apply at the band edges.

Fundamental Frequency (MHz)	Fundamental Electric Field Strength (uV/m)	Unwanted Emissions (uV/m)
40.66-40.70	1000	100
70-130	500	50
130-174	500-1500(Note2)	50-150(Note2)
174-260	1500	150
260)-470	1500-5000(Note2)	150-500(Note2)
Above 470	5000	500

Note2 ：linear interpolations, Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 22.72727(Frequency, MHz) – 2454.545; for the band 260-470 MHz, uV/m at 3 meters = 16.6667(Frequency, MHz) – 2833.3333.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level as above table shown or shall be attenuated to the general limits shown in Section 2.8, whichever limit permits a higher field strength. If average emission measurements are employed, The provisions in Section 5.14 for limiting peak emissions also apply.

Further, compliance with the provisions of Section 2.7 is required and shall be demonstrated using the measurement instrumentation specified in that section.

7.5. Operational Frequency within 49.82 to 49.90MHz

7.5.1. Device Type：Any Type

(3) The field strength of fundamental emission shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 5.14 for limiting peak emissions also apply.

(4) Unwanted Emissions:

(2.4.) The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section 2.8, whichever permits the higher emission levels.

(2.5.) The field strength of any emissions removed by more than 10 kHz from the band edges shall not exceed the general radiated emission limits in Section 2.8.

(2.6.) All signals exceeding 20 microvolts/meter at 3 meters shall be reported in the application for certification.

(4) For a home-built intentional radiator must comply with the following provisions:

(3.5.) The RF carrier and modulation products shall be maintained within the band 49.82-49.90 MHz.

(3.6.) The total input power to the device measured at the battery or the power line terminals shall not exceed 100 milliwatts under any condition of modulation.

(3.7.) The antenna shall be a single element, one meter or less in length, permanently mounted on the enclosure containing the device.

(3.8.) Emissions outside of this band shall be attenuated at least 20 dB below the level of the unmodulated carrier.

7.6. Operational Frequency within 72.0 to 73.0MHz

7.6.1. Device Type: The intentional radiator shall be restricted to use as an auditory assistance device for transmitting voice to assist disabled person or to use for the purpose of auditory assistance in the public occasion such as education organization, theater, auditorium, assembly hall etc.

(5) Fundamental Emission： The field strength of any emissions within the permitted 200 kHz band shall not exceed 80 millivolts/meter at 3 meters.

(6) Emission Bandwidth： Emission Bandwidth shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the

above specified frequency ranges.

(7) The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed 1500 microvolts/meter at 3 meters.

(8) The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 5.14 for limiting peak emissions also apply.

7.7. Operational Frequency within 88 to 108MHz

7.7.1. Device Type：Any Type

(7) The field strength of fundamental emissions shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 5.14 for limiting peak emissions also apply.

(8) Emissions from the intentional radiator shall be confined within a band 200 kHz wide and the 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

(9) The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 2.8.

7.8. Operational Frequency within 174 to 216MHz

7.8.1. Device Type： Operation under the provisions of this Section is restricted to biomedical telemetry devices for transmitting the measurement value of physical phenomenon and is restricted to use in a hospital..

(5) The field strength of any emissions radiated within the specified 200 kHz band shall not exceed 1500 microvolts/meter at 3 meters.

(6) 帶外發射： The field strength of emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed 150 microvolts/meter at 3 meters.

(7) Emission Bandwidth： Emissions from the device shall be confined within a 200 kHz band which shall lie wholly within the frequency range of 174-216 MHz.

(8) The emission limits in this Section are based on measurement instrumentation employing an average detector. The provisions in Section 5.14 for limiting peak emissions also apply.

7.9. Operational Frequency within 216 to 217MHz

7.9.1. Device Type：For the purpose of transmission of voice or data, two-way communications are prohibited. The applicable devices are listed below:

- **Auditory assistance communication：Such as audio description for the blind, simultaneous language translation y assistance equipment, assistant listening devices, and assistant guiding devices.**
- **Health care related communications for the ill.**

(1)Transmitting channels：There are three types of transmission Channels

(1.1) Standard Channel: channel number from n=1 to n=40, the center frequencies are 216.0125+（n-1）×0.025 MHz with a channel bandwidth of 25 kHz and the frequency tolerance is 0.005%.

(1.2) Wide-band Channel: channel number from n=41 to n=60, the center frequencies are 216.0125+（n-41）×0.05 MHz with a channel bandwidth of 50 kHz and the frequency stability is 0.005%.

(1.3) Narrow-band Channel: channel number from n=61 to n=260, the center frequencies are 216.0125+（n-61）×0.005 MHz with a channel bandwidth of 5 kHz and the frequency stability is 0.00015%.

(2) RF Output Power：No more than 100mW (ERP)

(3)Unwanted emissions shall be attenuated below to the fundamental power P(W) as following：

(3.1) Transmitters with standard-band channel (25kHz):

(3.1.1) Emissions 12.5 kHz to 22.5kHz away from the channel center frequency: at least 30 dB。

(3.1.2) Emissions more than 22.5kHz away from the channel center frequency: at least 43 +10 log（P）dB.

(3.2) Transmitters with wide-band channel (50kHz):

(3.2.1) Emissions 25 kHz to 35kHz away from the channel center frequency: at least 30 dB.

(3.2.2) Emissions more than 35kHz away from the channel center frequency: at least 43 +10 log（P）dB.

(3.3) Transmitters with narrow-band channel (5kHz):

(3.3.1) On any frequency within the authorized bandwidth: 0 dB.

(3.3.2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency f_d（in kHz） of more than 2 kHz up to and including 3.75 kHz: The lesser of 30 + 20(f_d –2) dB, or 55+10log(P) dB, or 65 dB.

(3.3.3) On any frequency beyond 3.75 kHz removed from the center of the authorized bandwidth: At least 55+10log(P) dB.

(10) The operation of this device shall not interfere with legal communications.

(11) The operational location of this device is limited to inside a building.

(12) If the device is not entirely within a building, the tip of the antenna shall not exceed 30.5m above the ground.

7.10. Operational Frequency within 2400 to 2483.5MHz，5725 to 5875MHz，24.0 to 24.25GHz

7.10.1. Device Type：Employing frequency hopping or direct sequence spread spectrum Technology

(2) Operational Frequency：

(1.3) 2400-2483.5MHz

(1.4) 5725-5850MHz

(4) Peak Output Power:

(2.3) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, all frequency hopping systems in the 5725-5850 MHz

band, and all direct sequence systems: 1 watt.

(2.4) For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(5) Except as shown below, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the above stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation, as used in above paragraphs, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(5) Unwanted Emissions:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in Section 2.7, must also comply with the radiated emission limits specified in Section 2.8.

(6) Other Limited Requirements

(5.2) For frequency hopping systems:

(5.1.5) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater and shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz.

(5.1.6) The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(5.1.7) The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(5.1.8) Frequency hopping systems in the 2400-2483.5 MHz band may utilize hopping channels whose 20 dB bandwidth is greater than 1 MHz provided the systems use at least 15 non-overlapping channels. The total span of hopping channels shall be at least 75 MHz. The time of occupancy on any one channel shall be no greater than 0.4 seconds within the time period required to hop through all channels and each of the hopping channels must be used equally on the average.

(5.3) For direct sequence systems:

(5.2.3) The minimum 6 dB bandwidth shall be at least 500 kHz.

(5.2.4) The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

(5.2.5) The processing gain of a direct sequence system shall be at least 10 dB. The processing gain represents the improvement to the received signal-to-noise ratio, after filtering to the information bandwidth, from the spreading / despreading function. The processing gain may be determined using one of the following methods:

(1) As measured at the demodulated output of the receiver: the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on.

(2) As measured using the CW jamming margin method: a signal generator is stepped in 50 kHz increments across the passband of the system, recording at each point the generator level required to produce the recommended Bit Error Rate (BER). This level is the jammer level. The output power of the intentional radiator is measured at the same point. The jammer to signal ratio (J/S) is then calculated, discarding the worst 20% of the J/S data points. The lowest remaining J/S ratio is used to calculate the processing gain, as follows: Gp = (S/N)o + Mj + Lsys, where Gp = processing gain of the system, (S/N)o = signal to noise ratio required for the chosen BER, Mj = J/S ratio, and Lsys = system losses. Note that total losses in a system, including intentional radiator and receiver, should be assumed to be no more than 2 dB.

(5.6) For hybrid systems:

(5.3.4) Hybrid systems that employ a combination of both direct sequence and frequency hopping modulation techniques shall achieve a processing gain of at least 17 dB from the combined techniques.

(5.3.5) The frequency hopping operation of the hybrid system, with the direct sequence operation turned off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

(5.3.6) The direct sequence operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (5.2.2) of this Section.

(5.7) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the

regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(5.8) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

7.10.2. Device Type：Any Type

(2) Operational Frequency：

(1.4) 2400-2483.5MHz

(1.5) 5725-5875MHz

(1.6) 24.0-24.25GHz

(3) Emission Limits： At a distance of 3 meters, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following table. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 2.8, whichever is the lesser attenuation.

Fundamental Frequency (MHz)	Fundamental Electric Field Strength (mV/m)	Harmonics Electric Field Strength (uV/m)
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

(4) The above field strength limits in this Section are based on average limits and The provisions in Section 5.14 for limiting peak emissions also apply.

7.11. Operational Frequency within 2435 to 2465MHz，5785 to 5815MHz，10500 to 10550MHz，24075 to 24175MHz

7.11.1. Device Type： Operation under the provisions of this Section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(3) Operational Frequency：

(1.5) 2435-2465MHz。

(1.6) 5785-5815MHz。

(1.7) 10500-10550MHz。

(1.8) 24075-24175MHz。

(4) The field strength of fundamental emissions from intentional radiators operated within these frequency bands at a distance of 3 meters shall comply with the following:

Fundamental Frequency (MHz)	Fundamental Electric Field Strength (mV/m)	Harmonics Electric Field Strength (mV/m)
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

(5) Unwanted Emissions： Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 2.8, whichever is the lesser attenuation.

(6) The above field strength limits in this Section are based on average limits and The provisions in Section 5.14 for limiting peak emissions also apply.

7.12. Operational Frequency within 2.9 to 3.26GHz，3.267 to 3.332GHz，3.339 to 3.3458GHz，3.358 to 3.6GHz

7.12.1. Device Type： Operation under the provisions of this Section is limited to automatic vehicle identification systems (AVIS) which use swept frequency techniques for the purpose of automatically identifying transportation vehicles.

(6) Operational Frequency：

(1.5) 2.9-3.26GHz。

(1.6) 3.267-3.332GHz。

(1.7) 3.339-3.3458GHz。

(1.8) 3.358-3.6GHz。

(7) Emission Limits：

(2.7) The field strength anywhere within the frequency range swept by the signal shall not exceed 3000 microvolts/meter/MHz at 3 meters in any direction.

(2.8) when in its operating position, shall not produce a field strength greater than 400 microvolts/meter/MHz at 3 meters in any direction within ± 10 degrees of the horizontal plane.

(2.9) In addition to the provisions of Section 2.7, the field strength of radiated emissions outside the frequency range swept by the signal shall be limited to a maximum of 100 microvolts/meter/MHz at 3 meters, measured from 30 MHz to 20 GHz for the complete system.

(2.10) The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

(2.11) Provision shall be made so that signal emission from the AVIS shall occur only

when the vehicle to be identified is within the radiated field of the system.

(2.12) A statement shall be attached permanently on the AVIS regarding operational conditions as follows:

"During use this device (the antenna) may not be pointed within ±xx degrees of the horizontal plane."

The xx above shall be replaced by the responsible party with the angular pointing restriction necessary to meet the horizontal emission limit specified in paragraph (2.2).

(8) Transmitting Antenna: shall employ a horn antenna or other comparable directional antenna for signal emission.

(9) Sweep Repetition Rate of the signal: shall not be lower than 4000 sweeps per second and shall not be higher 50,000 sweeps per second.

(10) The test report for application for type approval shall contain:

(5.5) Measurements of field strength per MHz along with the intermediate frequency of the spectrum analyzer or equivalent measuring receiver.

(5.6) The angular separation between the direction at which maximum field strength occurs and the direction at which the field strength is reduced to 400 microvolts/meter/MHz at 3 meters.

(5.7) A photograph of the spectrum analyzer display showing the entire swept frequency signal and a calibrated scale for the vertical and horizontal axes; the spectrum analyzer settings that were used shall be labeled on the photograph.

(5.8) The results of the frequency search for spurious and sideband emissions from 30 MHz to 20 GHz, exclusive of the swept frequency band, with the measuring instrument as close as possible to the unit under test.

7.13. Operational Frequency within 76.0 to 77.0GHz

Device Type: restricted to vehicle-mounted field disturbance sensors used as vehicle radar systems. The transmission of additional information, such as data, is permitted provided the primary mode of operation is as a vehicle-mounted field disturbance sensor. Operation under the provisions of this section is not permitted on aircraft or satellites.

(1) Operational Frequency: 76-77 GHz

(2) Radiated emission limits:

(2.1) If the vehicle is not in motion, the power density of any emission within the bands specified in this section shall not exceed 200 nW/cm2 at a distance of 3 meters from the exterior surface of the radiating structure.

(2.2) For forward-looking vehicle-mounted field disturbance sensors, if the vehicle is in motion the power density of any emission within the bands specified in this section shall not exceed 60 mW/cm2 at a distance of 3 meters from the exterior surface of the radiating structure.

(2.3) For side-looking or rear-looking vehicle-mounted field disturbance sensors, if the vehicle is in motion the power density of any emission within the bands specified in this section shall not exceed 30 mW/cm2 at a distance of 3 meters from the exterior surface of the radiating structure.

(3) The power density of any emissions outside the operating band shall consist solely of spurious emissions and shall not exceed the following:

(3.1) Radiated emissions below 40 GHz shall not exceed the general limits in Section 2.8 of this rule.

(3.2) Radiated emissions outside the operating band and between 40 GHz and 200 GHz shall not exceed the following:

(i) For forward-looking vehicle-mounted field disturbance sensors operating in the band 76-77 GHz: 600 pW/cm2 at a distance of 3 meters from the exterior surface of the radiating structure.

(ii) For side-looking or rear-looking vehicle-mounted field disturbance sensors operating in the band 76-77 GHz: 300 pW/cm2 at a distance of 3 meters from the exterior surface of the radiating structure.

(2.3) For radiated emissions above 200 GHz from field disturbance sensors operating in the 76-77 GHz band: the power density of any emission shall not exceed 1000 pW/cm2 at a distance of 3 meters from the exterior surface of the radiating structure.

(2.4) For field disturbance sensors operating in the 76-77 GHz band, the spectrum shall be investigated up to 231 GHz.

(4) The provisions in Section 5.14.2 for limiting peak emissions apply.

(5) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

(6) Devices operating under the provisions of this section shall comply with the radio frequency radiation exposure requirements specified in Section 5.19.

8. Limits for Special Radio Devices

8.1. Tunnel radio systems：Providing radio communication for persons working in the tunnel.

(4) Operational Frequency： A tunnel radio system may operate on any frequency provided it meets all of the following conditions.

(5) Operation of a tunnel radio system (intentional radiator and all connecting wires) shall be contained solely within a tunnel.

(6) Emission Limits： The total electromagnetic field from a tunnel radio system on any frequencies appearing outside of the tunnel shall not exceed the limits shown in Section 2.8 when measured at the specified distance from the surrounding structure, including openings. The conducted limits in Section 2.3 apply to the radio frequency voltage on the public utility power lines outside of the tunnel. The antenna type is not confined by the requirements of Section 2.2.

8.2. Used intermittently by trained operators to locate buried cables, lines, pipes and similar structures or elements. Operation entails coupling a radio frequency signal onto the cable, pipe, etc. and using a receiver to detect the location of that structure or element.

(3) Operational Frequency：9 to 490kHz。
A cable locating equipment may be operated on any frequency within the band 9 - 490 kHz.

(4) Peak Output Power：In any conditions of modulation the peak output power shall not exceed the limits below:

(2.3) within the frequency band 9 kHz, up to, but not including 45 kHz, the peak output power from the cable locating equipment shall not exceed 10 watts

(2.4) within the frequency band 45 kHz to 490 kHz, the peak output power from the cable locating equipment shall not exceed one watt.

(6) Type of modulation：Non-voice 。

(7) If provisions are made for connection of the cable locating equipment to the AC power lines, the conducted limits in Section 2.3 also apply to this equipment.

(8) The antenna type is not confined by the requirements of Section 2.2.

8.3. Radio control devices : including the remote controlled devices for model toys, for industrial purposes and also the radio data communications.

8.3.1. Radio remote controller for toy model： applicable for aircraft device and model surface craft device.

(2) Limitation on Operation：

(1.5) For one-way operation only.

(1.6) Must not be used in airport or aviation restriction area.

(1.7) Can be used in military area only within its regulations.

(1.8) Remote controlled for model aircraft device must also follow other related regulations.

(2) Operational Frequency：

(2.2) The following frequencies may only be used to operate a model surface craft device :

26.995、27.045、27.095、27.120、27.136、27.145、27.195、27.245MHz。

(2.3) The following frequencies may only be used to operate a model aircraft device :

72.0 - 72.99 MHz, channel bandwidth is 20 KHz.

(2.4) The following can be used only by remote controller for model surface craft device:

75.41 - 75.99 MHz, channel bandwidth is 20 kHz.

(3) Transmission power : The power of the carrier of the radio controlled devices under any modulation method shall not exceed the following limits:

(3.1) 26 -27 MHz : model surface craft device : 4 watts,
model aircraft device : 0.75 watts

(3.2) 72 - 73 MHz : 0.75 watts

(3.3) 75 - 76 MHz : 0.75 watts

(4) Modulation technique : any non-voice modulation method

(5) Channel bandwidth : within ± 4 KHz

(6) Frequency tolerance :

(6.1) 26 - 27 MHz : 0.005%

(6.2) 72 - 76 MHz : 0.002%

(7) unwanted radiation: emissions shall be attenuated below the unmodulated carrier in according with the following

(7.1) 26 – 27MHz :

(7.1.1) ± 4 KHz (exclusive) to ± 8 KHz from the channel center frequency : at least 25 dB.

(7.1.2) ± 8 KHz (exclusive) to ± 20 KHz f from the channel center frequency : at least 35 dB.

(7.1.3) more than ± 20 KHz (exclusive) from the channel center frequency : at least 43 + 10log (max. output power) dB.

(7.2) 72 -76 MHz

(7.2.1) ± 4 KHz (exclusive) to ± 8 KHz from the channel center frequency : at least 25 dB.

(7.2.2) ± 8 KHz (exclusive) to ± 10 KHz from the channel center frequency : at least 45 dB.

(7.2.3) ± 10 KHz (exclusive) to ± 20 KHz from the channel center frequency : at least 55 dB

(7.2.4) more than ± 20 KHz (exclusive) from the channel center frequency : at least 56 + 10log (max. output power) dB.

8.3.2. Radio controlled devices for industry : Radio frequency transmitter and receiver used only in the factory building for transmitting digital control signal.

(8) Operation Frequency:

CH	Frequency(MHz)	CH	Frequency(MHz)
1	480.050	7	480.200
2	480.075	8	480.225
3	480.100	9	480.250
4	480.125	10	480.275
5	480.150	11	480.350
6	480.175	12	480.400

(9) Output Power: less than 10 mW (ERP).

(10) Type of Modulation: F1D,F2D。

(11) Emission Bandwidth: no more than 8.5 kHz

(12) Frequency Tolerance: Within 4ppm.

(13) Peak Frequency Deviation: no more than ±2.5kHz

(14) Spurious Emissions: shall be attenuated more than 53 dB below the carrier (-53 dBc), or within 2.5 μ W.

8.3.3. Radio controlled devices for industry : Radio frequency transmitter and receiver used only in the factory building for transmitting digital control signal.

(8) Operation Frequency：The following 10 sets of frequencies only, the 10th frequency set is for controlling.

CH	Frequency(MHz)	CH	Frequency(MHz)
1	429.8125 / 449.7125	6	429.8750 / 449.7750
2	429.8250 / 449.7250	7	429.8875 / 449.7875
3	429.8375 / 449.7375	8	429.9000 / 449.8000
4	429.8500 / 449.7500	9	429.9125 / 449.8125
5	429.8625 / 449.7625	10	429.9250 / 449.8250

(2) Output power : under 10 mW
(3) Modulation method : F1D, F2D
(4) Bandwidth : within 8.5 KHz
(5) Frequency tolerance : within 4 ppm
(6) Peak frequency deviation : within ± 2.5 KHz
(7) Spurious emissions : more than 53 dB (-53 dBc) to the carrier, or within 2.5 μ W.

4.3.5. Requirements for type approval

(5) A transmitter which incorporates plug-in frequency determining modules which are

changed by the user must be certificated with the modules. Each module must contain all of the frequency determining circuitry including the oscillator. Plug-in crystals are not considered modules and must not be accessible to the user.

(6) The antenna must be an integral part of the transmitter. The antenna must have no gain (as compared to a half-wave dipole) and must be vertically polarized.

(7) All transmitters must be crystal controlled.

(8) Instruction Manual and Warning Statement: according to the requirements of section 2.9.

8.4. Citizens Band Radio Service

4.4.3. Transmitter:

(6) The operational frequency band is 26.965-27.405MHz which is divided into 40 channels. The channel 9 must be included and must be indicated as Call for help in emergency.

CH	Frequency(MHz)	CH	Frequency(MHz)	CH	Frequency(MHz)	CH	Frequency(MHz)
1	26.965	11	27.085	21	27.215	31	27.315
2	26.975	12	27.105	22	27.225	32	27.325
3	26.985	13	27.115	23	27.235	33	27.335
4	27.005	14	27.125	24	27.245	34	27.345
5	27.015	15	27.135	25	27.255	35	27.355
6	27.025	16	27.155	26	27.265	36	27.365
7	27.035	17	27.165	27	27.275	37	27.375
8	27.055	18	27.175	28	27.285	38	27.385
9	27.065	19	27.185	29	27.295	39	27.395
10	27.075	20	27.205	30	27.305	40	27.405

(7) Channel Separation：10kHz.

(8) Frequency Tolerance: Within ±20ppm.

(9) Peak Output Power：No more than 5W (ERP)。

(10) Modulation Type:

(5.3) A3E: ±100% below.

(5.4) F3E: Maximum Frequency Deviation within ±2.5kHz.

(8) Adjacent Channel Power:

(6.3) AM(A3E) : same as specified in (7.1) of this paragraph.

(6.4) FM(F3E) : no more than 20 nW under normal testing circumstances.

(9) Spurious Emissions:

(7.2) Amplitude Modulation (A3E) :

(7.1.4) ± 4 KHz to ± 8KHz from the channel center frequency : at least 25 dB.

(7.1.5) ± 8 KHz to ± 20 KHz from from the channel center frequency : at least 35 dB.

(7.1.6) more than ± 20 KHz from the channel center frequency : at least 53+10log10(output power) dB.

(7.3.) Frequency Modulation (F3E) :

(7.2.5) When the transmitter is operating, the spurious power in the following frequency bands should not be more than 4 nW :

41-68MHz，87.5-118MHz，162-230MHz ，470-862MHz。

(7.2.6) In addition to those specified in (7.2.1), the spurious power in the frequencies from 25 MHz to 1 GHz should not be more than 0.25 uW.

(7.2.7) In addition to those specified in (7.2.1) and (7.2.2), the spurious power in the frequencies from 1 GHz to 2 GHz should not be more than 1uW.

(7.2.8) When the transmitter is idle, the spurious power in the frequencies from 25 MHz to 1 GHz should not be more than 2 nW, and. in the frequencies from 1 GHz to 2 GHz should not be more than 20 nW.

4.4.4. Receiver：

(1.2.) Unwanted Emissions：Shall comply with the requirements of Section 2.8.

8.5. Family Radio Service

4.5.14. Operational Frequencies are restricted to below table.

CH	Frequency(MHz)	CH	Frequency(MHz)
1	467.5125	8	467.60
2	467.525	9	467.6125
3	467.5375	10	467.625
4	467.550	11	467.6375
5	467.5625	12	467.650
6	467.575	13	467.6625
7	467.5875	14	467.675

4.5.2. Effective radiated power: not exceeds 1 Watt.

4.5.3. Modulation technique: F3E.

4.5.4. Bandwidth: within 12.5 kHz

4.5.5. Frequency toleration：within 3ppm

4.5.6. Peak frequency deviation：within ±2.5 kHz

4.5.7. Audio response：within 3.125 kHz

4.5.8. Unwanted emissions：within 50μW

4.5.9. Receiver：within 20 n W

4.5.10. Antenna cannot be separated from the set and shall be vertical polarized.

4.5.11. Operation under connecting to the external power is allowed, but the effective radiated power shall not exceed 1 Watt.

4.5.12. Operation of the FRS transmitter is limited to the way of push-to-talk, and non-voice, such as data transmission or control signal, is prohibited.

4.5.13. The connection to public communication network is prohibited.

8.6. Low-Power Wireless Microphone

4.6.5. Explanation: A Low power wireless microphone is used for transmission of voice or music by radio waves to a remote receiving equipment.

4.6.6. Operational frequency range:

227.1MHz~227.4 MHz, 229.4MHz~230.0MHz, 231.0MHz~231.9MHz。

4.6.7. transmitter part:

(4) Channel bandwidth: no more than 200kHz.

(5) Carrier Power（ERP）:

Channel Bandwidth	Carrier Power
No more than 50kHz	No more than 10 mW
Below 200kHz and more than 50kHz	No more than 5 mW

(6) Frequency deviation: No more than ±75kHz。

1. Frequency stability: No more 50 ppm.

2. Spurious emissions:

Operation	No more than 250nW
Stnadby	No more than 2nW

4.6.8. Receiver part:

(2) Spurious emissions: 2nW below.

4.6.6. Antenna cannot be separated from the set.

8.7. Unlicensed National Information Infrastructure

4.7.1 Technical Specification

(1) Power Limits:

(1.1) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(1.2) For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10log B, where B is

the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(1.3) The peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the above definitions for the emission in question.

(1.4) The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

(1.5) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

(2) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this Section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(2.1) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(2.2) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

(2.3) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(2.4) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 2.8. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 2.3.

(2.5) The provisions of 2.7 of this standard apply to intentional radiators operating under this section.

(2.6) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

(3) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

(4) Within the 5.25-5.35 GHz band, U-NII devices will be restricted to indoor operations to reduce any potential for harmful interference to co-channel MSS operations.

(5) The U-NII devices shall accept any interference from legal communications and shall not interfere the legal communications. If interference is caused, the user must stop operating the device immediately and can't re-operate it until the harmful interference is clear.

(6) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

9. Inspection Requirments

5.1. For swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

5.2. Measurements of radio frequency emissions conducted to the public utility power lines shall be performed using a 50 ohm/50 uH line impedance stabilization network (LISN).

5.3. Field strength measurements shall be made, to the extent possible, on an open field site. Test sites other than open field sites may be employed if they are properly calibrated so that the measurement results correspond to what would be obtained from an open field site. In the case of equipment for which measurements can be performed only at the installation site, such as perimeter protection systems, carrier current systems, and systems employing a "leaky" coaxial cable as an antenna, measurements shall be performed at a minimum of three installations that can be demonstrated to be representative of typical installation sites. A continuously rotatable turntable shall be used for measuring radiated emissions from all sides of the EUT.

5.4. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery. A preliminary measurement should be performed to determine the configuration and condition that produces the highest emission for the final measurement as follows:
a. with the EUT powered in turn from both ac and dc(battery) power, if the device has these capability.
b. with the EUT supplied in turn with the appropriate modulation specified in 5.15 and without modulation, if the modulation of carrier can be controlled.
c. for hand-held or body-worn devices, the EUT shall be rotated through three orthogonal axes.

5.5. The distance specified corresponds to the horizontal distance between the measurement antenna and the closest point of the periphery of equipment under test.

5.5.6. At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

5.5.7. At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to

determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

5.5.8. When the measurement distance is other than the distance specified, the test report shall indicate the extrapolation method used during the measurement.

5.5.9. Measurements shall be performed at a sufficient number of radials around the equipment under test to determine the radial at which the field strength values of the radiated emissions are maximized. The maximum field strength at the frequency being measured shall be reported.

5.5.10. When measurement distances of 30 meters or less are specified in the regulations, the DGT will test the equipment at the distance specified unless measurement at that distance results in measurements being performed in the near field. When measurement distances of greater than 30 meters are specified in the regulations, the DGT will test the equipment at a closer distance, usually 30 meters, extrapolating the measured field strength to the specified distance using the methods shown in this Section.

5.12. Equipment under test shall be adjusted, using those controls that are readily accessible to or are intended to be accessible to the consumer, in such a manner as to maximize the level of the emissions. For those devices to which wire leads may be attached by the consumer, tests shall be performed with wire leads attached. The wire leads shall be of the length to be used with the equipment if that length is known. Otherwise, wire leads one meter in length shall be attached to the equipment. Longer wire leads may be employed if necessary to interconnect to associated peripherals.

5.6.1 For tabletop EUT, the requirements for configuration of powerline conducted emission test is as following:

a. Interconnecting cables that hang closer than 40cm to the ground plane should be folded forming a bundle 30 to 40cm long, hanging approximately in the middle between ground plane and test table.

b. I/O cable that are not connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance.

c. LISN at least 80cm from nearest part of EUT chassis. The excess power cord of EUT shall be bundled close to the center of the cord. Non-EUT equipment needs not to be bundled.

d. Rear of EUT, including peripherals, shall be all aligned and flush with rear of tabletop. Rear of tabletop shall be 40cm removed from the vertical conducting plane.

5.6.2 For floor-standing EUT, the requirements for configuration of powerline conducted emission test is as following:

a. Excess interconnecting cable shall be bundled in center and the bundling shall not exceed 40cm.

b. LISN is 80cm from nearest part of EUT chassis. The excess power cord of EUT and peripherals shall be bundled in center to appropriate length.

c. I/O cable that are not connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance.

d. EUT and all cables shall be insulated from ground plane by 3 to 12mm of insulating material.

5.6.3 For tabletop EUT, the requirements for configuration of radiated emission test is as following:

a. Interconnecting cables that hang closer than 40cm to the ground plane should be folded forming a bundle 30 to 40cm long, hanging approximately in the middle between ground plane and test table.

b. I/O cable that are not connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance.
c. Rear of EUT, including peripherals, shall be all aligned and flush with rear of tabletop.
d. The power cords of EUT and peripheral drape to the floor and need not to be bundled.

5.6.4 For floor-standing EUT, the requirements for configuration of radiated emission test is as following:
a. Excess interconnecting cable shall be bundled in center and the bundling shall not exceed 40cm.
b. The excess power cord of EUT and peripherals shall be bundled in center to appropriate length.
c. I/O cable that are not connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance.
d. EUT and all cables shall be insulated from ground plane by 3 to 12mm of insulating material.

5.13. For a composite system that incorporates devices contained either in a single enclosure or in separate enclosures connected by wire or cable, testing for compliance with the standards shall be performed with all of the devices in the system functioning. If an intentional radiator incorporates more than one antenna or other radiating source and these radiating sources are designed to emit at the same time, measurements of conducted and radiated emissions shall be performed with all radiating sources that are to be employed emitting. A device which incorporates a carrier current system, the device shall be tested for compliance with whatever rules would apply to the device were the carrier current system not incorporated, and the carrier current system shall be tested for compliance with the rules applicable to carrier current systems.

5.14. If the device under test provides for the connection of external accessories, including external electrical input signals, the device shall be tested with the accessories attached. The device under test shall be fully exercised with these external accessories. The emission tests shall be performed with the device and accessories configured in a manner that tends to produce maximized emissions within the range of variations that can be expected under normal operating conditions. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port. Only one test using peripherals or external accessories that are representative of the devices that will be employed with the equipment under test is required. All possible equipment combinations do not need to be tested. The accessories or peripherals connected to the device being tested shall be unmodified, commercially available equipment.

5.15. If the equipment under test consists of a central control unit and an external or internal accessory(ies) (peripheral) and the party verifying the equipment or applying for a grant of equipment authorization manufactures or assembles the central control unit and at least one of the accessory devices that can be used with that control unit, testing of the control unit and/or the accessory(ies) must be performed using the devices manufactured or assembled by that party, in addition to any other needed devices which the party does not manufacture or assemble. If the party verifying the equipment or applying for a grant of equipment authorization does not manufacture or assemble the central control unit and at least one of the accessory devices that can be used with that control unit or the party can demonstrate that the central control unit or accessory(ies) normally would be marketed or used with equipment from a different entity, testing of the central control unit and/or the accessory(ies) must be performed using the specific combination of equipment which is intended to be marketed or used together. Only one test using peripherals or accessories that are representative of the devices that will be employed with the equipment under test is required. All possible

equipment combinations are not required to be tested. The accessories or peripherals connected to the device being tested shall be unmodified, commercially available equipment.

5.16. If the individual devices in a composite system are subject to different technical standards, each such device must comply with its specific standards. In no event may the measured emissions of the composite system exceed the highest level permitted for an individual component.

5.17. Measurements on intentional radiators or receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1Mhz or less	1	Middle
1 to 10 Mhz	2	1 near the top and 1 near the bottom
More than 10 Mhz	3	1 near the top and 1 near the bottom and one near the center

5.14. The amplitude of spurious emissions that are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this standard.

5.15. Frequency Measurement Range:

5.13.3. The spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in follows:
If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

5.13.4. Particular attention should be paid to harmonics and subharmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

5.20. The conducted and radiated emission limits shown in this rule are based on the following, unless otherwise specified elsewhere in this rule :

5.14.2. On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function,

properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

5.14.4. On any frequency of frequencies above 1000 MHz, the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in the regulations, including emission measurements below 1000 MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. Measurement of AC power line conducted emissions are performed using a CISPR quasi-peak detector, even for devices for which average radiated emission measurements are specified.

5.14.5. Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with the test report.

5.21. Modulation Applied: Unless specified in the individual test instructions or when modulation is needed to produce a transmitted signal (e.g. single-sideband suppressed carrier transmitters), modulation does not need to be applied during testing. When modulation is specified in individual tests, the following provisions can be applied:
a. for voice-only modulated devices (200 to 3000 Hz) except cordless telephones, a 1000 Hz sine wave at 100 dB SPL (0 dB SPL is 20μPa) shall be applied 10 cm from the microphone.
b. for cordless telephone, a 2500 Hz sine wave of sufficient level of producing 85% modulation (e.g. if the maximum frequency deviation is determined to be 5 KHz, then the 85% modulation is frequency deviation of 4.25 kHz) shall be coupled directly to the audio input stage.
c. if the EUT is modulated from internal sources, then the internal sources shall be applied.
d. if the EUT is equipped with input terminals for external modulation, modulating signals of sine wave shall be applied at the maximum rated level and appropriate frequency.

5.22. Unless the operation of EUT requires different range, the ambient temperature and humidity shall be within the range of 10^{o}C to 40^{o}C and 10% to 90% respectively.

5.23. Battery Operating End Point: For battery operated only device, the frequency stability shall be measured with supplying the EUT primary voltage at the battery operating end point which is specified by the manufacturer and record the frequency.

5.24. Frequency response: if measurement of frequency response is specified in individual provision, the test data should cover a range of 100Hz to 5000 Hz.

5.25. RF Exposure Assessment: if RF Exposure Assessment is required in individual provision, the requirements are as following:

(a) Limits for Specific Absorption Rate (SAR)

Position	Occupational / Controlled Exposure (W/kg)	General Population / Uncontrolled Exposure (W/kg)
Whole-Body	0.4	0.08
Pertial-Body	8.0	1.6
hands, wrists, feet, ankles	20.0	4.0

Note 1: Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

Note 2: At frequencies above 6.0 GHz, SAR limits are not applicable and MPE limits for power density should be applied at 5 cm or more from the transmitting device.

(b) Limits for Maximum Permissible Exposure (MPE)

b1. Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-3.0	614	1.63	*100	6
3-30	1842/f	4.89/f	$*900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1500	-----	-----	f/300	6
15000-100,000	-----	-----	5.0	6

b2. Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-3.0	614	1.63	*100	30
3-30	1842/f	4.89/f	$*180/f^2$	30
30-300	27.5	0.073	1.0	30
300-1500	-----	-----	f/1500	30
15000-100,000	-----	-----	1.0	30

Note 1: f is frequency in MHz.

Note 2: Mark "*" means Plane-wave equivalent power density.

Note 3: The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters.

附件四　發射器之測試步驟參考指引

附件一

發射器之測試步驟參考指引

以下之測試程序可為參考指引，以用於決定操作頻率高於 30MHz 以上之發射器的符合，而測試可在具備某些規定條件之開放場地進行。

A1.交流電力線傳導配置

註：本測試只適用於可使用公共電力線之受測物。

(1) 交流電力線傳導干擾測試場地必須符合 CNS13306-1 之要求，量測儀器，包含 LISN，必須符合 CNS13306-1 之要求。

(2) 受測物擺設必須依據 CNS13438 之要求。若受測物使用可拆卸之天線，可使用合適之模擬負載連接至受測物之天線輸出端子或連接該天線進行此項測試。若該天線為可調整式，應調整至最大長度。

(3) 使用 5.6 節指定型態與長度之界面電纜線以連接至受測物之介面埠。界面電纜線須依照 5.6.1 節之規定個別束綁。束綁之固定須以膠帶或其他不影響測試之非傳導性材質。

(4) 連接受測物之電源線至 LISN 而將週邊或支援裝置之電源線連接至另一 LISN。所有 LISN 之電力由同一個交流電源供應。
若受測物之電源線長度足以束綁，該束綁之固定須以膠帶或其他不影響測試之非傳導性材質。非受測物之電源線無須束綁，由桌子的後緣垂下沿傳導測試場地的地面接至 LISN。
落地型之附件設備的電源線可以任何便利的型態置於接地平面上或 5.5.1 指定之絕緣物上。週邊設備之電源線不可垂過 LISN 的上端。請參考以下之配置圖。

(5) 應輸入適當的調變信號至受測物，若受測物只發射脈衝調變而具有編碼開關，則測試時應設定於產生最大工作週期的位置。

A2.交流電力線傳導發射測試

(1) 使用儀器內部校正器或外部信號產生器之已知位準確認之儀器校正。

(2) 建議使用頻譜分析儀或其他可提供頻譜顯示之儀器以進行交流電力線傳導初步測試。使用長度合宜之同軸電纜將測量儀器連接至供應電流至受測物之 LISN 的 RF 埠。其他未連接之 RF 埠以 50Ω 電阻終結。設定測量儀器之 6dB 頻寬不小於 10 kHz 而檢波器功能為峰值模式。設定測量儀器之控制得以觀察限制值所指定之頻率範圍。

(3) 啟動受測物以及測量儀器。受測物應設定於發射其標稱範圍內之任何合適的頻率。

(4) 依照 5.4 節之指定，使受測物運作所有的操作模式，連接至受測物的附件設備應個別運作。

(5) 以 5.8.1 節之程序決定受測物系統會產生相對於限制值之最高振幅發射的配置組態。可關閉與開啟受測物以決定來至受測物之發射。

(6) 重複步驟 5，但將測試儀器連接至供應受測物交流電源之 LISN 其他部分的 RF 埠。

註：只對連接至受測物 LISN 之 RF 埠的發射做測量。

(7) 選用可產生相對於限制值之最高振幅發射的受測物配置與操作模式進行交流電力線傳導發射的最終測試。若受測物是由初步測試場地移至最終測試場地，應依據 5.8.1 節再次確認最高之發射。依照所用規範之指定，設定測量儀器之頻寬與檢波功能，測量受測物之最終交流電力線傳導發射。

(8) 重複步驟 7，但將測試儀器連接至供應受測物交流電源之 LISN 其他部分的 RF 埠。

(9) 記錄受測物於交流電力線傳導發射最終測試時之狀態、配置與操作模式，以及介面纜線或接線之位置。此步驟可以繪圖或照片完成。

B1.輻射測試配置

(1) 量測儀器必須符合 CNS13306-1 之要求。

(2) 受測物須放置在 5.3 節所指定之旋轉桌，且如交流電力線傳導測試之配置。

(3) 受測物若使用交流電源，則將其與任何配件設備之電源線連接至位於旋轉桌的交流電源。受測物若使用電池，測試時應裝置新電池或完全充電的電池。受測物與配件設備之電源線無須束綁，桌面上受測設備的所有電源線由桌子的後緣垂下沿旋轉桌表面接至交流插座。落地型設備的交流電源線可以方便的型態走線。

(4) 若受測物只具備永久連接之可調整天線，測試時應將其調整至最大長度。若受測物具備連接外部天線的端子，則將正常使用於該受測物的天線連接到端子，並將天線置於典型的位置或方位。

(5) 依據 5.15 節輸入指定的調變信號至受測物，若受測物只發射脈衝調變而具有編碼開關，則測試時應設定於產生最大工作週期的位置。

B2.輻射發射測試

(1) 使用儀器內部校正器或外部信號產生器之已知位準確認之儀器校正。

(2) 建議使用頻譜分析儀或其他可提供頻譜顯示之儀器以進行輻射初步測試。頻率範圍可依據測量天線的標稱頻率範圍以分段或全段掃描（請參考以下之步驟 5）。設定測量儀器之 6dB 頻寬為 100 kHz 而檢波器功能為峰值模式。設定測量儀器上之顯示以能觀察欲量測之頻率範圍的發射。調整掃描速度以使儀器之顯示為已校正。測試時不使用視訊濾波。

註：

a. 背景之廣播電台或電視訊號太強或太近使得受測物之發射被隱藏，則掃描寬度控制可設為每格 10 MHz 或更小以辨認受測物的發射。而利用小於 100 kHz 的頻寬可能有所幫助。

b. 為了測得其最大峰值位準，測量儀器的頻寬必須比發射信號的脈衝頻率更寬。

(3) 啟動受測物以及測量儀器。若受測物操作於一頻率範圍，依據 5.11 節之指定，設定其頻率。

註：如果受測物具備交流與直流（電池）兩種供電方式，此兩種供電方式皆應執行初步測試，已決定何種供電會產生相對於限制值之最高發射。

(4) 依照 5.4 之指定，使受測物運作所有的操作模式，連接至受測物的附件設備應個別運作。

(5) 使用 5.8.1 節之程序使受測物之發射為最大，且註記受測物產生相對於限制值之最高發射的狀態、配置、操作模式以及介面纜線的位置。此外，手握式或身戴式之輻射發射初測，應包含旋轉受測物之三正交軸以確定會產生相對於限制值之最高發射的狀態。

註：輻射發射之初步掃描建議使用寬頻帶天線，為涵蓋測試之頻率範圍將需要更換其他測量天線。

(6) 調整頻譜分析儀至下一段所欲掃描之頻譜且重複步驟(3)到(5)，直到完成所有頻率範圍檢驗。
規範要求之輻射測試受在測物可調整至一個以上之頻率時，對每一增加之頻率重複步驟(3)到(5)。

(7) 由步驟(5) 選擇受測物產生相對於限制值為最高發射的狀態、配置、操作模式以及介面纜線位置以進行最終輻射測量。依照所用規範之指定，設定測量儀器之頻寬與檢波功能。

(8) 即使受測物非由初測場地移至終測場地，仍建議在進行終測前，能再依 5.8.1 節之程序使發射為最高，因為纜線或電線位置的輕微變動可能造成信號振幅的大變動，應須微量變動的移動纜線以再次使最高發射為最大。
註：在輻射發射終測場地應使用相同的測量天線及距離以得最大化之最高發射。

(9) 依據適用規範指定之距離放置測量天線與受測物。

*(10)*依據之程序與指定之頻率數以進行受測物之輻射發射最終測量。

註：為涵蓋測試之頻率範圍將需要更換其他測量天線。

當平均值檢波功能指定用於脈衝調變發射器，平均值位準可藉由量測發射之峰值位準與將其以工作週期更正求得。詳述如下：

a. 啟動發射器且使其持續發射脈衝序列。

b. 調整頻譜分析儀至發射器之載波頻率且設定頻譜分析儀足夠之解析頻寬以能包所有有效之頻譜分量，視訊頻寬至少應與解析頻寬相同。

c. 設定頻譜分析儀之垂直刻度（振幅）為線性模式，而分析儀之頻率範圍設定為 0Hz。若有需要，將接收天線移近受測物以獲得便利之信號位準。

d. 將頻譜分析儀之視訊輸出連接至儲存式示波器用以解調與偵測脈衝序列。

e. 調整示波器設定以能觀察脈衝序列與決定脈衝之數目與寬度、以及序列之週期。

f. 以決定脈衝上兩半電壓點間之時差測量脈衝寬度。

g. 當脈衝序列含無發射期間不大於 100ms 時，以平均一完整脈衝序列之脈衝寬度總合計算工作週期；或者，當脈衝序列超過 100ms 時，以平均可得最大平均值之 100ms 的脈衝寬度總合計算工作週期。工作週期即為一週期或 100ms 中的脈衝寬度總合除以該週期長度或 100ms 之值。

h. 以所測得的工作週期乘上使用脈衝調變之發射器的發射峰值檢波場強（以 uV/m 表示），可決定該發射相較於平均限制值的平均值檢波場強。

若適用規範沒有要求 1 GHz 以上之輻射測量，請進行步驟(13)，若有要求 1GHz 以上之輻射測量，應使用具備峰值與平均值檢波兩種功能的儀器，並設

定儀器頻寬為 1MHz 而檢波功能設為峰值模式。

*(11)*若 1 GHz 以上所有發射位準以峰值檢波功能測量符合適用規範指定之平均限制值，請進行步驟(13)。若有任何符合峰值限制值但超出平均限制值之發射位準，請進行步驟(12)。

*(12)*設定測量儀器之檢波功能為平均值模式，重新測量步驟(11)中何符合峰值限制值但超出平均限制值之發射。

*(13)*記錄受測物於輻射發射最終測試時之狀態、配置與操作模式，以及介面纜線或接線之位置。此步驟可以繪圖或照片完成。

*(14)*在受測物之輻射測量會多於一種操作頻率時，測試報告必須列出每一操作頻率所測量的主波場強、至少三個相對於限制值為最高諧波或混附波之場強、以及至少三個落於禁用頻帶中相對於限制值為最高發射之場強。

註：以本文件之用途，混附發射應包括常伴隨或產生於調變信號之帶外發射。

C. 測量操作頻率

(1)操作頻率測量可在環境室溫為+15 到+25℃ 範圍內進行，或者使用環境溫櫃設定為+20℃。若可行，則將天線連接至受測物之天線輸出接頭，因使用假性負載會影響受測物之輸出頻率。若受測物具備或使用長度可調整式之天線，應使其完全伸出。

(2)供應受測物標稱之交流電源或裝入全新或完全充電之電池於受測物。啟動受測物並耦合其輸出至計頻器或其他具足夠精度之頻率量測裝置，依受測物所必須符合的頻率差度衡量。

註：位此量測目的，可將測量天線近置於受測物（例如離 15cm）而以適當長度之同軸纜線連接至測量儀器。

諧調受測物至任何依 5.11 節指定之頻率，調整測量天線之位置及測量儀器上之控制以獲得合適之信號位準，即不使測量儀器過載而又有足夠強度以能測量受測物操作或主波頻率之位準。啟動受測物並於開始時、以及啟動後 2、5 與 10 分鐘測量受測物之操作頻率，共作四次測量。

(3)關閉受測物，而若有需要置之於環境溫櫃中，在繼續進行之前使溫櫃穩定在+20℃，約須 30 分鐘。

(4)若非只有單一操作頻率須測量，請關閉受測物且使其有足夠時間以回穩在環境溫度，然後依照 5.11 節之指定頻率，將受測物連續設定於其他新增

的操作頻率以重複步驟(3)。

D. 測量對溫度之頻率穩定性

(1) 將未供電之受測物置於環境溫櫃中，供應受測物標稱之交流電源或裝入全新或完全充電之電池於受測物。若可行，則將天線連接至受測物之天線輸出接頭。使用假性負載會影響受測物之輸出頻率。若受測物具備或使用長度可調整式之天線，應使其完全伸出。

(2)供應受測物標稱之交流電源或裝入全新或完全充電之電池於受測物。啟動受測物並耦合其輸出至計頻器或其他具足夠精度之頻率量測裝置，依受測物所必須符合的頻率差度衡量。

註：位此量測目的，可將測量天線近置於受測物（例如離 15cm）而以適當長度之同軸纜線連接至測量儀器。

諧調受測物至任何依 5.11 節指定之頻率，調整測量天線之位置及測量儀器上之控制以獲得合適之信號位準，即不使測量儀器過載而又有足夠強度以能測量受測物操作或主波頻率之位準。

(3)關閉受測物且置之於環境溫櫃中，設定至適用規範指定之最高溫度。對正常為持續操作之裝置，當置於溫櫃中時可使受測物運作。對具備震盪器加熱器之裝置，當置於溫櫃中時只可使加熱器線路運作。

(4)使溫櫃之溫度有足夠時間達到穩定，當溫櫃內維持在一定溫度時，啟動受測物，並於開始時、以及啟動後 2、5 與 10 分鐘測量受測物之操作頻率，共作四次測量。

(5)若只有單一操作頻率須測量，請進行步驟(6)，否則關閉受測物且使其有足夠時間以回穩在環境溫度，然後依照 5.11 節之指定，將受測物連續設定於其他新增的操作頻率以重複步驟(4)。

(6)重複步驟(4)與(5) 但溫櫃設定至適用規範指定之最低溫度。在進行此測量之前須確定使溫櫃到達穩定。

E.測量對輸入電壓之頻率穩定性

(1)本測量可在環境室溫為+15 到+25℃範圍內進行，或者使用環境溫櫃設定為+20℃。若有可能，則將天線連接至受測物之天線輸出接頭，因使用假性負載會影響受測物之輸出頻率。若受測物具備或使用長度可調整式之天線應使其完全伸出。

(2)供應受測物標稱之交流電源或裝入全新或完全充電之電池於受測物。啟動受測物並耦合其輸出至計頻器或其他具足夠精度之頻率量測裝置，依受測物所必須符合的頻率差度衡量。

註：位此量測目的，可將測量天線近置於受測物（例如離 15cm）而以適當長度之同軸纜線連接至測量儀器。

(3)諧調受測物至任何依 5.11 節指定之頻率，調整測量天線之位置及測量儀器上之控制以獲得合適之信號位準，即不使測量儀器過載而又有足夠強度以能測量受測物操作或主波頻率之位準。關閉受測物，而若有需要置之於環境溫櫃中，在繼續進行之前使溫櫃穩定在+20℃，約須 30 分鐘。啟動受測物並於開始時、以及啟動後 2、5 與 10 分鐘測量受測物之操作頻率，共作四次測量。

(4)若只有單一操作頻率須測量，請進行步驟(5)，否則關閉受測物且使其有足夠時間以回穩在環境溫度，然後依照 5.11 節之指定，將受測物連續設定於其他新增的操作頻率以重複步驟(3)。

(5)若受測物由交流電力線供電，供應其 85%的標稱交流電壓並重複步驟(3)與(4)。若受測物由電池供電，供應其標稱最低工作電壓。

(6)若受測物由交流電力線供電，供應其 115%的標稱交流電壓並重複步驟(3)與(4)。

F. 測量佔用頻寬

(1)使用儀器內部校正器或外部信號產生器之已知位準確認之儀器校正。

(2)建議使用頻譜分析儀或其他可提供頻譜顯示之儀器以進行本測試。測試佔用頻寬時不使用視訊濾波。

註：為精確測量發射器相對於限制值之頻寬，測量儀器的頻寬應小於最大許可頻寬。但在

某些狀況下，太小的頻寬會造成不適當的測量。因此，測量頻寬應設於比 5%許可頻寬大的值。若無指定之發射頻寬規格，可使用以下參考指引：

量測主波 (MHz)	*儀器最小頻寬 (kHz)*
0.009 to 30	*1*
30 to 1000	*10*
1000 to 4000	*100*

(3)供應受測物標稱之交流電壓或安裝全新或完全充電之電池於受測物內，開啟受測物並將其設定於操作範圍內之任何合適的頻率。設定測量儀上之參考位準，使其等於指定之頻寬或-26 dB。以調變頻率為考量，調整儀器之解析頻寬、掃描速率、以及掃頻範圍，使顯示為已校正。

(4)依照 5.15 節之指定輸入調變信號，並依低於步驟(3)所設定之參考位準的指定 dB 數測量受測物之已調變信號的頻率，此即為佔用頻寬。測量結果可以量測儀器上顯示幕之繪圖或照片完成。

G. 測量輸入功率

(1)若有可能，將天線連接至受測物之天線輸出接頭，因使用假性負載會影響受測物之輸出頻率。若受測物具備或使用長度可調整式之天線，應使其完全伸出。

(2)供應受測物標稱之交流電壓或安裝全新或完全充電之電池於受測物內。在本測試中，應使用典型之調變於受測物。

(3)開啟受測物並諧調受測物至任何依 5.11 節指定之合適頻率。對測量最後 RF 級的輸入功率，要在變動輸入調變源時用適當範圍之直流電壓表與電流表分別測量供應至受測物最後 RF 級的輸入電壓與電流，最後 RF 級的輸入功率即為兩值之積。對發射器輸入功率的測量，要用電壓表與電流表在交流電源線或電池輸入端，適當測量供應至該發射器之交流或直流電壓與電流，此輸入功率亦為兩值之積。

H. 有效輻射功率測試

1. 測試配置如場強輻射測試。
2. 依據 5.14.2 節設定儀器之解析頻寬，而視訊頻寬不小於解析頻寬，對每一測量頻率調整儀器足夠之頻率掃描範圍以檢測所欲測量之發射。
3. 在 1 到 4 米高度內上升下降水平極化之接收天線，將接收天線置於儀器顯示最高讀值時的高度，然後以 360 度轉動測試桌上的受測物，紀錄顯示在儀器上的最高值，以為參考位準。
4. 重複步驟 3，完成所有要測量的頻率。
5. 以垂直級化之接收天線重複步驟 4。
6. 以發射天（不大於 1GHz 為線諧調之偶極天線，1GHz 以上為號角型天線）取代受測物，並與接收天線之同為水平極化。將偶極天線連接至標準之信號產生器，信號產生器設定至前述步驟所得之頻率以及適當之輸出位準。上升下降接收天線以使測試儀器得最高值，並置於該高度。調整信號產生器之輸出位準以使測試儀器顯示與步驟 3 所得之值相同。紀錄此值以計算結果值。
7. 重複步驟 6，完成所有須測量的頻率。
8. 使發射天線與接收天線同為垂直級化，重複步驟 7。
9. 若受測物相對於偶極天線（或全向性天線）之天線增益為已知，則 ERP(或 EIRP)可由天線端子之傳導輸出功率與天線增益之積求得。

Appendix 1

Step-by-Step Guidance for Testing Intentional Radiators

The following procedure may be used as a guide for determining compliance of intentional radiators operating on frequencies above 30MHz that can be tested on an open field test site with certain regulatory requirements. The section numbers refer to sections or subsections in this standard.

A1. AC Powerline Conducted Setup

NOTE: Section I1 applies only to EUTs that operate on power from pubic utility powerlines.

(1) The ac powerline conducted test facility shall conform to the requirements of CNS13306-1. The measuring instruments, including the LISN, shall conform to the requirements in CNS13306-1.

(2) The EUT shall be configured in accordance with CNS13438. If the EUT uses a detachable antenna, ac powerline conducted measurements shall be made with a suitable dummy load connected to the EUT antenna output terminals; otherwise, these tests shall be made with the antenna connected and, if adjustable, fully extended.

(3) Use the type and length of interface cables and connect them to the interface ports on the EUT in accordance with 5.6. Interface cables shall be individually bundled as described in 5.6.1. The bundle should be secured with masking tape or any other nonconducting material that will not affect the measurements.

(4)Connect the EUT power cord to one LISN and connect the peripheral or support equipment power cords to a separate LISN. AC power for all LISNs is to be obtained from the same ac source.

If the EUT power cord is long enough to be bundled, the bundle should be secured with masking tape or any other nonconducting material that will not affect the measurements. Power cords of non-EUT equipment do not require bundling. Drape ac power cords of non-EUT equipment over the rear edge of the table and route them down onto the floor of the conducted test site to the second LISN. Power cords of floor-standing accessory equipment may be routed in any convenient fashion atop the ground plane or insulating material specified in 5.6.1. Power cords of peripheral equipment should not be draped over the top of an LISN. Refer to Figs below for typical test setups.

(5)The EUT shall be supplied with the appropriate modulation specified in 5.11.1.If the EUT transmits only pulsed modulation and has coding switches, these shall be set to the position that produces the maximum duty cycle during measurements.

A2. AC Powerline Conducted Emissions Testing

(1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal level from an external signal generator.

(2) A spectrum analyzer or other instrument providing a spectral display is recommended for preliminary ac powerline conducted measurements. Connect the measuring instrument to the RF port of a section of the LISN supplying current to the EUT using a suitable length of coaxial cable. Terminate all other RF ports of the LISN(s) in 50Ω resistive. Set the 6dB bandwidth of the measuring instrument to not less than 10kHz and the detector function to the peak mode. Set the controls on the measuring instrument to enable viewing the entire frequency range for which limits are specified.

(3) Activate the EUT and the measuring instrument. The EUT should be set to transmit on any one convenient frequency in its rated range.

(4) Exercise the EUT in all modes of operation as specified in 5.4. Accessory equipment connected to the EUT shall be exercised individually.

(5) Use the procedure in 5.8.1, while applying the appropriate modulating signal to the EUT, to determine the configuration of the EUT system that produces the emission with the highest amplitude relative to the limit. The EUT may be turned off and on to determine which emissions emanate from it.

(6) Repeat step 5 with the measuring instrument connected to the RF port of the other LISN section supplying the EUT with ac power..

NOTE: Measurements are to be made only on emanations available at the RF ports of the LISN connected to the EUT.

(7) Select the EUT configuration and mode of operation that produced the highest emission relative to the limit for final ac powerline conducted emissions measurements. If the EUT is moved to a final ac powerline conducted test site from a preliminary conducted test site, be sure to remaximize the highest emission according to 5.8.1. Set the bandwidth and the detector function of the instrument as specified by the procuring or regulatory agency to measure the final ac powerline conducted emissions from the EUT.

(8) Repeat step 7 with the measuring equipment connected to the RF port of the other LISN section supplying the EUT with ac power.

(9) Record the EUT attitude, configuration, mode of operation, and interconnect cable or wire positions used for final ac powerline conducted emissions tests. This can be done with either diagrams or photographs.

B1. Radiated Test Setup

(6) The measuring instruments shall conform to the requirements in CNS13306-1.

(7) The EUT shall be positioned on a turntable as specified in 5.3 and configured as in steps 2 and 3 of the I1 ac powerline conducted test setup.

(8) If operated from ac power, connect the power cord of the EUT (and of any accessory equipment) to the ac power source located on the turntable. If battery operated, begin the tests with a new or a fully charged battery installed in the EUT.
The ac power cords of the EUT and accessories do not require bundling. Drape all ac power cords of equipment tested on a tabletop over the rear edge of the table and route them down onto the turntable surface to the ac outlet. AC power cords of floor-standing equipment may be routed in any convenient fashion.

(9) If the EUT is provided only with an adjustable permanently attached antenna, it shall be tested with this antenna extended to its maximum length. If the EUT is provided with terminals for connection of an external antenna, connect the antenna normally used with the EUT to these terminals, and position it in a typical location or orientation.

(10) The EUT shall be supplied with modulation as specified in 5.15. If the EUT transmits only pulsed modulation and has coding switches, test shall be set to the position that produces the maximum duty cycle during measurements.

B2. Radiated Emissions Testing

*(15)*Check the calibration of the measuring instrument using either an internal calibrator or a known signal level from an external signal generator.

*(16)*A spectrum analyzer or other instrument providing a spectral display is recommended for preliminary radiated measurements. The frequency range may be scanned in segments or in its entirety depending upon the rated frequency range of the measurement antenna (see NOTE under step 5 below). Set the 6 dB bandwidth of the

measuring instrument to 100kHz and the detector function to the peak mode. Set the display on the measuring instrument to enable viewing of emissions in measured frequency band. Adjust the sweep speed control so the analyzer display is calibrated. Video filtering is not used during these tests.

NOTE:

(1)If ambient radio or TV signals are of such magnitude or spacing that emissions from the EUT may be hidden, the scan width control can be set to 10MHz per division or less to identify EUT emissions. Use of a bandwidth less than 100.kHz may be helpful.

(2)The bandwidth of the measuring instrument must be wider than the pulse repetition frequency of the transmitted signal in order to measure its maximum peak level.

*(17)*Activate the EUT and the measuring instrument. If the EUT operates over a range of frequencies, set it to one of the number of frequencies specified in section 5.11.

NOTE: These preliminary tests shall be run with the EUT powered in turn from both ac and dc(battery)power, if the device has these capabilities, to determine which power source produces the highest emission relative to the limit.

*(18)*Exercise the EUT in all modes of operation as specified in 5.4. Accessories connected to the EUT shall be exercised independently.

*(19)*Use a procedure such as that contained in 5.8.1 to maximize emissions from the EUT and note the EUT attitude, configuration, operating mode, and interconnect cable or wire positions that produce the highest emission relative the limit. In addition, preliminary radiated emissions testing of hand-held or body-worn devices shall include rotation of the EUT through three orthogonal axes to determine the attitude that produces the highest emission relative to the limit.

NOTE: A broadband antenna is recommended for preliminary scanning of radiated emissions. It will be necessary to change to other measurement antennas during this process to cover the complete frequency range of the test.

*(20)*Tune the spectrum analyzer to the next segment of the frequency spectrum to be scanned and repeat steps 3 through 5 until the frequency range of interest has been investigated.

Where the procuring or regulatory agency require radiated measurements with the EUT tuned to more than one frequency, repeat steps 3 through 5 for each additional frequency.

*(21)*Select the EUT attitude, configuration, operating mode, and interconnect cable or wire positions from step 5 that product the highest emission relative to the limit to use for final radiated measurements. Set the bandwidth and the detector function as specified by the procuring or regulatory agency.

*(22)*It is recommended that the highest emission relative to the limit be remaximized per 5.8.1 before performing final measurements, even if the EUT is not moved from a preliminary to a final radiated test site, because slight variations in cable or wire positions may cause large variations in signal amplitude. Only slight variation in cable

movements should be needed to remaximize the highest emission again.

NOTE: The same measurement antenna and distance should be used for remaximizing the highest emission at the final radiated emissions test site.

(23) Place the measurement antenna at the distance from the EUT specified in the appropriate regulations.

(24) Measure final radiated emissions from the EUT on the number of frequencies specified in 5.11.

NOTE: It will be necessary to change to other measurement antennas during this process to cover the complete frequency range of the test.

When average detector function limits are specified for a pulse-modulated transmitter, the average level of emissions may be found by measuring the peak level of the emissions and correcting them with the duty cycle as follows: (1) Turn on the transmitter and set it to transmit the pulse train continuously. (2) Tune a spectrum analyzer to the transmitter carrier frequency and set the spectrum analyzer resolution bandwidth wide enough to encompass all significant spectral components. The video bandwidth should be at least as wide as the resolution bandwidth. (3) Set the spectrum analyzer vertical scale (amplitude) to the linear mode and the analyzer frequency span to 0 Hz. If necessary, move the receiving antenna closer to the device to obtain a convenient signal level. (4) Connect a storage oscilloscope to the video output of the spectrum analyzer that is used to demodulate and detect the pulse train. (5) Adjust the oscilloscope settings to observe the pulse train and determine the number and width of the pulses, as well as the period of the train. (6) Adjust the transmitter controls, jumper wires, or software to maximize the transmitted duty cycle. (7) Measure the pulse width by determining the time difference between the two half-voltage points on the pulse. (8)When the pulse train is not more than 100 ms, including blanking intervals, calculate the duty cycle by averaging the sum of the pulse widths over one complete pulse train. Alternatively, or when the pulse train exceeds 100 ms, calculate the duty cycle by averaging the sum of the pulse widths over the 100 ms width with the highest average value. [The duty cycle is the value of the sum of the pulse widths in one period (or 100 ms), divided by the length of the period (or 100 ms)]. (9) Multiply the peak-detector field strength (expressed in uV/m) of an emission from a transmitter using pulsed modulation by the duty cycle just measured to determine the average detector field strength of that emission for comparison to the average detector limit. If regulations do not require radiated measurements above 1 GHz, proceed to step 13. If radiated measurements above 1 GHz are required, an instrument capable of measuring both peak and average detector function shall be used. Set the bandwidth of this instrument to 1 MHz and the detector function to the peak mode.

(25) If all of the emission levels above 1 GHz as measured with the peak detector function comply with the average limit specified by the appropriate regulations, proceed to step 13. If any of these emission levels exceed the average limit but comply with the peak limit, proceed to step 12.

(26) Set the detector function of the measuring instrument to the average mode and remeasure only those emissions from step 11 that complied with the peak limits but exceeded the average limits.

*(27)*Record the EUT attitude, configuration, operating mode, and cable or wire positions used for final radiated emissions measurements. This can be done with either diagrams or photographs.

*(28)*Where radiated measurements are required on an EUT on more than one operating frequency, the report shall list the field strength measured at the fundamental frequency, the field strength of at least the three highest harmonic or spurious emissions relative to the limit, and the field strength of at least the three highest restricted band emissions relative to the limit and the frequencies on which these were observed), for each operating frequency measured.

NOTE: For the purposes of this document, spurious emissions shall include out-of-band emissions typically associated with or generated by the modulating signal.

C. Measurements of Operating Frequency

(1) Operating frequency measurements may be made at ambient room temperature if it is within the range of +15 to +25 °C; otherwise, an environmental temperature chamber set for a temperature of +20 °C shall be used. If possible, an antenna should be connected to the antenna output connector of the EUT, because use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.

(2) Supply the EUT with nominal ac voltage or install an new or fully charged battery in the EUT. Turn the EUT on and couple its output to a frequency counter or other frequency-measuring device of sufficient accuracy, considering the frequency tolerance with which the EUT must comply.

NOTE: A measuring antenna connected to the measuring instrument with a suitable length of coaxial cable may be placed near the EUT (e.g., 15 cm away) for this purpose.

Tune the EUT to any one of the number of frequencies specified in 5.11. Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Turn the EUT on and measure the EUT operating frequency at star-up, and two, five, and ten minutes after startup. Four measurements in total are made.

(3) Turn the EUT off and place it inside an environmental chamber, if required, and allow the chamber to stabilize at +20℃(approximately 30 min) before proceeding.

(4) If measurements are not required on only one operating frequency, please turn the EUT off and allow sufficient time for it to stabilize at ambient temperature, then repeat step (3)with the EUT set successively to each of the additional operating frequencies specified in 5.11.

D. Measurements of Frequency Stability vs. Temperature

(1) Place the de-energized EUT in an environmental temperature test chamber. Supply the EUT with nominal ac voltage or install a new or fully charged battery in the EUT. An antenna should be connected to the antenna output connector of the EUT if possible. Use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.

(2) Turn the EUT on and couple its output to a frequency counter or other frequency-measuring device of sufficient accuracy, considering the frequency tolerance with which the EUT must comply.

NOTE: An antenna connected to the measuring instrument with a suitable length of coaxial cable may be placed near the EUT (e.g., 15 cm away) for this purpose.

Tune the EUT to one of the number of frequencies specified in 5.11 Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

(3) Turn the EUT off and place it inside an environmental chamber set to the highest temperature specified by the procuring or regulatory agency. For devices that are normally operated continuously, the EUT may be energized while inside the test chamber. For devices that have oscillator heaters, energize only the heater circuit while the EUT is inside the chamber.

(4) Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at startup, and two , five, and ten minutes after startup. Four measurements in total are made.

(5) If measurements are required on only one operating frequency, proceed to step 6; otherwise, successively tune the EUT to each of the additional operating frequencies specified in 5.11 and repeat step 4.

(6) Repeat steps (4) and (5) with the temperature chamber set to the lowest temperature specified by the procuring or regulatory agency. Be sure to allow the environmental chamber temperature to stabilize before performing these measurements.

E. Measurements of Frequency Stability vs. Input Voltage

(1) This test may be made at ambient room temperature if it is within the range +15℃ to +25℃; otherwise, an environmental temperature test chamber set for a temperature of +20℃ shall be used. If possible, an antenna shall be connected to the antenna output connector of the EUT, because use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.

(2) Supply the EUT with nominal ac voltage or install a new or fully charged battery in the EUT. Turn on the EUT and couple its output to a frequency counter or other frequency-measuring device of sufficient accuracy, considering the frequency tolerance with which the EUT must comply.

NOTE: An antenna connected to the measuring instrument with a suitable length of coaxial cable may be placed near the EUT(e.g., 15 cm away) for this purpose.

(3) Tune the EUT to any one of the number of frequencies specified in 5.11. Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Turn the EUT off and place it inside an environmental chamber, if required, and allow sufficient time (approximately 30 min) for the chamber to stabilize at +20℃ before proceeding. Turn the EUT on and measure the EUT operating frequency at startup, and two, five, and ten minutes after startup. Four measurements in total are made.

(4) If 5.11 requires measurements on only one operating frequency, proceed to step 5; otherwise, successively tune to the EUT to each of the additional operating frequencies specified in 5.11 and repeat step 3.

(5) If the EUT is powered from the ac powerlines, supply it with 85% nominal ac voltage and repeat steps (3) and (4). If the EUT is battery powered, supply it with the rated end-point voltage.

(6) If the EUT is powered from the ac powerlines, supply it with 115% nominal ac voltage and repeat steps (3) and (4).

F. Measurements of Occupied bandwidth

(1) Check to calibration of the measuring instrument using either and internal

calibrator or a known signal from an external signal generator.

(2) A spectrum analyzer or other instrument providing a spectral display is recommended for these measurements. Video filtering is not used during occupied bandwidth tests.

NOTE: The bandwidth of the measuring instrument should be small when compared with the maximum allowed bandwidth in order to accurately measure the bandwidth of the transmitter with respect to the limit. Too small of a bandwidth would result in inappropriate measurements in certain cases; therefore, the measuring bandwidth shall be set to a value greater than 5% of the allowed bandwidth. If no specifications for emission bandwidth are given, may use the following guidelines for reference:

Fundamental Frequency Measured (MHz)	*Minimum Instrument Bandwidth (kHz)*
0.009 to 30	*1*
30 to 1000	*10*
1000 to 4000	*100*

(3) Supply the EUT with nominal ac voltage or install a new or fully charged battery in the EUT. Turn on the EUT and set it to anyone convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the specified bandwidth or –26 dB. Adjust the instrument resolution bandwidth, sweep rate, and frequency scan with consideration to the frequencies used for modulation, so that the display is calibrated.

(4) Apply modulation signal(s) as specified in 5.15 and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB below the reference level set in step 3. This is the occupied bandwidth. The measured result may be done with plotted graphs or photographs of the measuring instrument display.

G. Measurements of Input Power

(1) If possible, connect an antenna to the output terminals of the EUT because use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.

(2) Supply the EUT with nominal ac voltage or install a new or fully charged battery in the EUT. Typical modulation shall be applied to the EUT during these tests.

(3) Turn the EUT on and tune it to any one convenient frequency specified in 5.11. For measurement of the input power to the final RF stage, while varying the input modulation sources, measure the voltage at the supply to the final RF stage of the

EUT, and the current in to that stage, using a dc voltmeter and ammeter of appropriate ranges respectively. The input power to the final RF stage is the product of these values. For input power measurements on an intentional radiator, use a voltmeter and ammeter and measure, as appropriate, either the ac or dc voltage and current at the ac power cord or battery input terminals of the intentional radiator. Again, the input power is the product of these values.

H. Measurement of Effective Radiated Power (ERP)

1. Setup the configuration as radiated emissions test.
2. Set the RBW of measurement instrument in accordance to Section 5.14.2 and VBW no less than RBW. Adjust the instrument for each frequency measured with frequency span enough to capture the emission measured.
3. Rise or lower the search (receiving) antenna over a height from 1 to 4 meters in horizontally polarized orientation. Position the search antenna at the highness when the highest value is indicated on the measurement instrument, then turn the EUT on test table over a range from 0^{o} to 360^{o}. Record the highest value indicated on instrument as reference level.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a transmitting antenna (tuned dipole antenna for frequency no more than 1GHz and horn antenna for frequency above 1 GHz) in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG). Tune SG to the frequency obtained from above steps as well as set SG at an appropriate output level. Rise and lower the search antenna to get the highest value on the measurement instrument, and then hold this position. Adjust the SG output to get an identical value derived from step 3 on measurement instrument. Record this value for result calculated.
7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both transmitting antenna and search antenna in vertical polarized orientations.
9. If the antenna gain of EUT relative to dipole antenna (or isotropic antenna) is known, then the ERP (or EIRP) can be derived from the product of conducted output power at antenna terminal and the antenna gain.

附件五 直接序列展頻系統之測量指引

附件二

直接序列展頻系統之測量指引

頻寬
測量時頻譜分析儀之解析頻寬為 100 kHz，視訊頻寬不小於解析頻寬。為求得精確的測量，頻率掃描範圍（Span）遠大於解析頻寬。

峰值輸出功率：
此為 RF 傳導測試，將發射機之天線埠經由適當之衰減直接連至測試儀器。設定儀器之解析頻寬大於 6 dB 發射頻寬或使用峰值功率表。

混附發射：
須做以下之測試：
(1) RF 天線傳導測試：設定解析頻寬為 100kHz，視訊頻寬大於解析頻寬，掃描至 10 次諧波。以解析頻寬為 100 kHz 測量時，所有諧波/混附波必須比許可頻段中之最高發射至少低 20dB。

(2) 輻射發射測試：適用於落在 2.7 節所列之禁用頻段的諧波/混附，許可之最大平均場強列於 2.8 節。此測試需要前置放大器（以及可能之高通濾波器）。1GHz 以上之測量，設定解析頻寬為 1MHz，視訊頻寬為 10Hz，而掃描時間為自動。若發射為脈衝調變，該裝置改為持續操作，使用上述之設定，將讀值以減去峰值-平均值校正因子校正。因子之計算請參考 5.14.3 節。

功率頻譜密度：
將發射機之天線埠經由適當之衰減直接連至測試儀器。找出發射峰值並擴展於通帶內於，設定解析頻寬為 3 KHz，視訊頻寬大於解析頻寬，掃描時間為頻率掃描範圍除以 3 KHz。所測得之峰值位準必須不大於+8dBm。若受測裝置之頻譜線間隔小於 3 KHz，測量時應將解析頻寬降低以使頻譜線間隔大於 3 KHz，所測得之數據再藉加總 3 KHz 頻帶內所有個別頻譜線之功率而標準化至 3 KHz 以決定是否符合。

替代之程序

如果該裝置不能進行天線傳導測試，可接受以輻射測試證明符合 3.10.1 節之各種傳導要求。如前所述，進行以下之測試必須使用前置放大器。

(1) 以下方程式用以計算發射機：

$$E = \frac{\sqrt{30PG}}{d}$$

在此：
E 為以最寬解析頻寬所測得之最大場強值，單位 V/m。
G 為發射天線相對於全向性輻射器之數值增益。
d 為測試場強的距離，單位 m。
p 為求得之功率，單位 W。

$$P = \frac{(Ed)^2}{30G}$$

(2) 以下用以測量功率頻譜密度：

a. 將頻譜儀調至最大主波發射之最高點，重新將頻譜儀設定為解析頻寬 3kHz，視訊頻寬大於解析頻寬，頻率掃描範圍 300 kHz，掃描時間 100 秒。
b. 將所得之峰值位準求得場強 E，利用上述之方程式計算功率位準與+8dBm 限制值相比較。

Appendix 2

Guidance on Measurements for Direct Sequence Spread Spectrum Systems

Bandwidth
Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) =100 kHz and video bandwidth >= RBW. In order to make an accurate measurement, set the span >> RBW.

Peak Output Power:
This is a RF conducted test. Use a direct connection between the antenna port of the transmitter and measurement instrument, through suitable attenuation. Set the RBW > 6dB bandwidth of the emission or use a peak power meter.

Spurious emissions:

The following tests are required:

(1)RF antenna conducted test: Set RBW=100kHz, Video bandwidth (VBW)>RBW, scan up through 10th harmonic. All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

(2)Radiated emission test: Applies to harmonics/spurs that fall in the restricted bands listed in Section 2.7.The maximum permitted average field strength is listed in section 2.8. A pre-amp (and possibly a high-pass filter) is necessary for this measurement. For measurements above 1GHz, set RBW=1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed modulation, modify the device for continuous operation, use the setting as shown above, then correct the reading by subtracting the peak-average correction factor. Calculation of the factor please see Section 5.14.3.

Power spectral density:
Use a direct connection between the antenna port of the transmitter and measurement instrument, through suitable attenuation. Locate and zoom in on emission peak(s) within the pass band. Set RBW=3KHz, VBW>RBW, sweep = (SPAN/3 kHz). The peak level measured must no greater than +8dBm. If devices with spectrum line spacing equal to or less man 3kHz, the resolution bandwidth must be reduced below 3kHz until the individual lines in the spectrum are greater than 3kHz. The measurement data must then be normalized to 3kHz by summing the power of all the individual spectral lines within a 3kHz band to determine compliance.

ALTERNATIVE TEST PROCEDURES

If antenna conducted tests cannot be performed on this device, radiated tests to show compliance with the various conducted requirements of Section 3.10.1 are acceptable. As stated previously, a pre-amp must be used in making the following measurements.

(1) Calculate the transmitter's peak power using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:
E = the measured maximum field strength in V/m utilizing the widest RBW.
G = the numeric gain of the transmitting antenna over an isotropic radiator.
d = the distance in meters from which the field strength was measured.
p = the power in watts for which you are solving:

$$P = \frac{(Ed)^2}{30G}$$

(2) Measure the power spectral density as follows:

a. Tune the analyzer to the highest point of the maximized fundamental emission. Reset the analyzer to a RBW = 3kHz, VBW > RBW, span = 300kHz, sweep = 100 seconds.

b. From the peak level obtained, derive the field strength, E. Using equations shown above, calculate a power level for comparison to the +8dBm limit.

附件六　　頻率跳頻展頻系統之測量指引

附件三

頻率跳頻展頻系統之測量指引

載波頻率間隔
受測物必須啟動跳頻功能，頻譜分析儀設定如下：
頻率掃描範圍寬度足以測得兩鄰近頻道之波峰，解析頻寬不小於 1%的頻率掃描範圍，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)，利用差值記號功能以決定兩鄰近頻道波峰之間隔。

跳頻頻率數目
受測物必須啟動跳頻功能，頻譜分析儀設定如下：
頻率掃描範圍為受測物之操作頻帶，解析頻寬不小於 1%的頻率掃描範圍，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)。

佔用時間（停留時間）
受測物必須啟動跳頻功能，頻譜分析儀設定如下：
頻率掃描範圍為零，中心頻率為跳頻頻道，解析頻寬為 1MHz，視訊頻寬不小於解析頻寬，掃描時間為足以測得每一個跳頻頻道之所有停留時間，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)，利用差值記號功能以決定停留時間。若該值會因不同操作模式而異，對不同模式重複此測試。

20 dB 頻寬
頻譜分析儀設定如下：
頻率掃描範圍約為 20dB 頻寬之 2 到 3 倍，中心頻率為跳頻頻道，解析頻寬不小於 20dB 頻寬的 1%，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)，受測物必須以最大資料傳輸率發射，利用記號至波峰(Mark to Peak)功能以標記波峰，利用差值記號功能以測量發射之 20dB 頻寬。若該值會因不同操作模式而異，對不同模式重複此測試。

峰值輸出功率
頻譜分析儀設定如下：
頻率掃描範圍約為 20dB 頻寬之 5 倍，中心頻率為跳頻頻道，解析頻寬大於 1%欲測試發射之 20dB 頻寬，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)，利用記號至波峰(Mark to Peak)功能以標記發射之波峰，所指示之位準為峰值輸出功率。請注意上述之測試有關之外接衰減與纜線損失。

頻帶邊緣符合 RF 傳導發射

頻譜分析儀設定如下：
頻率掃描範圍足以涵蓋操作在最靠近頻帶邊緣之頻道的發射波峰位準以及任何落於許可頻帶外之調變產物，解析頻寬大於 1%頻率掃描範圍寬度，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)，將標記設定於在頻帶邊緣上的發射，或將標記設定於最大之頻帶外調變產物上若其位準大於頻帶邊緣上的發射。啟動標記差值之功能，利用標記至波峰功能(Marker to Peak)功能以標記頻帶內發射之波峰，所顯示之標記差值必須符合指定之限制值。利用相同的儀器設定，使受測物操作於跳頻功能，以上述相同的程序決定由跳頻功能所產生的任何混附波是否亦符合指定的限制值。

混附波 RF 傳導發射
頻譜分析儀設定如下：
頻率掃描範圍足以檢測頻帶內的發射波峰位準以及由受測物產生之最低頻率到第 10 次諧波的所有混附發射，通常需要分幾段以涵蓋全部頻率範圍。解析頻寬為 100kHz，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)，將標記設定於任何欲紀錄之波峰上，所顯示之位準值值必須符合指定之限制值。

混附輻射發射
任何落於 2.7 節所列之禁用頻段的混附發射或調變產物須用本測試。本測試之進行必須以用於受測物何型態的最高增益天線。頻譜分析儀設定如下：
頻率掃描範圍足以完全檢測所欲測量的發射，解析頻寬對測量頻率不小於 1GHz 為 1MHz，而小於 1GHz 為 100kHz，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)。有關最測試發射之大化請依據附件一之參考測試指引。該讀取之發射峰值經天線因子、纜線損失與前置放大增益等之校正後即為峰值場強，其必須符合 5.14.2 節指定之限制。然後將視訊頻寬設定為 10Hz，而儀器其他設定維持不變，該峰值位準經校正後必須符合 2.8 節指定之限制。若跳頻信號每個頻道的停留時間小於 100ms，則以 10Hz 視訊頻寬所得的讀值可進一步以工作週期校正因子(Duty Factor)調整，用於證明符合 2.8 節指定之限制。

替代之測試程序
如果該裝置不能進行天線傳導測試，可接受以輻射測試證明符合 3.10.1(2) 節峰值輸出功率限制與 3.10.1(4) 節混附 RF 傳導發射限制。如前所述，進行以下之測試必須使用前置放大器與可能高通濾波器。

(1) 以下方程式用以計算發射機：

$$E = \frac{\sqrt{30PG}}{d}$$

在此：
E 為以最寬解析頻寬所測得之最大場強值，單位 V/m。
G 為發射天線相對於全向性輻射器之數值增益。
d 為測試場強的距離，單位 m。
P 為求得之功率，單位 W。

$$P = \frac{(Ed)^2}{30G}$$

(2) 用下頻譜儀設定以證明符合 3.10.1(4)節之 RF 混附傳導發射要求：
頻率掃描範圍足以完全檢測所欲測量的發射，解析頻寬為 100kHz，視訊頻寬不小於解析頻寬，掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)。
以此設定測量主波發射與所有混附發射。所有測得的混附發射場強必須依 3.10.1(4)節所指定之量低於主波之發射場強。此項只適用於非落於禁用頻段之混附發射。

標記差值方法
作輻射頻帶邊緣測試時，獲得有意義數值可能是個問題，因為依據第五章中測試程序所要求之解析頻寬，儀器調諧至頻帶邊緣頻率亦將檢測到頻帶內之信號。為修正此問題，以下之技術可用以決定頻帶邊緣的符合。
(1) 欲測量的頻率依照 5.14 節所規定之解析頻寬與檢波功能進行主波之帶內場強測試，對發射機操作在高於 1GHz 頻率，使用解析頻寬 1MHz，視訊頻寬 1MHz，與峰值檢波器。重複以平均值檢波器（即解析頻寬 1MHz，視訊頻寬 10Hz）測量。
註：對脈衝化發射，必須含其他因子。再者，依據 3.10.1 節，發射機之主波場強測試正常而言並不需要，而只是與本測試程序有關。

(2) 選擇頻譜儀之頻率掃描範圍以包含要檢測主波發射與頻帶邊緣發射兩者的波峰。設定頻譜儀的解析頻寬為 1%的總頻率掃描範圍，但不可小於 30kHz，視訊頻寬不小於解析頻寬。紀錄主波發射與相關頻帶邊緣發射的波峰位準。觀察儲存的訊號軌跡且測量主波發射峰值與頻帶邊緣發射峰值之振幅差。此測試只是相對測量，用以決定相對於最高主波發射位準，在頻帶邊緣發射降低的總量。

(3) 將步驟(1)所測量的場強值減去步驟(2)所測量的差值，此場強結果即用以決定頻帶邊緣是否符合 2.7 節的要求。

(4) 上述之差值測量技術，可用以測量離頻帶邊緣至 2 個標準頻寬的發射。在此標準頻寬為測量頻率依 5.14 節所指定的頻寬。

Appendix 3

Guidance on Measurements for Frequency Hopping Spread Spectrum Systems

Carrier Frequency Separation:

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels，Resolution Bandwidth (RBW) ≥ 1% of the span，Video (or Average) Bandwidth (VBW) ≥ RBW，Sweep = auto，Detector function = peak, Trace = max hold.
Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Number of Hopping Frequencies
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.

Time of Occupancy (Dwell Time)
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = zero span, centered on a hopping channel, RBW = 1 MHz, VBW ≥ RBW, Sweep = as necessary to capture the entire dwell time per hopping channel, Detector function = peak, Trace = max hold.
Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation, repeat this test for each variation.

20 dB Bandwidth
Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel, RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
The EUT should be transmitting at its maximum data rate. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down bandwidth of the emission. If this value varies with different modes of operation, repeat this test for each variation.

Peak Output Power
Use the following spectrum analyzer settings:
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel, RBW

> the 20 dB bandwidth of the emission being measured, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power. Please note above regarding external attenuation and cable loss.

Band-edge Compliance of RF Conducted Emissions
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
Set the marker on the emission at the band edge, or on the highest modulation product outside of the band if this level is greater than that at the band edge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the specified limit.

Now, using the same instrument settings, enable the hopping function of the EUT. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

Spurious RF Conducted Emissions
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the specified limit.

Spurious Radiated Emissions
This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 2.7. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
Follow the guidelines in Appendix 1 with respect to maximizing the emission. A pre-amp and a high pass filter may be required for this test, in order to provide the measuring system with sufficient sensitivity. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 5.14.2.
Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 2.8. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with

the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, in an effort to demonstrate compliance with Section 2.8 limit.

ALTERNATIVE TEST PROCEDURES
替代之測試程序
If antenna conducted tests cannot be performed on this device, radiated tests to show compliance with the peak output power limit specified in Section 3.10.1(2) and the spurious RF conducted emission limit specified in Section 3.10.1(4) are acceptable. As stated previously, a pre-amp, and, probably, a high pass filter, are required for the following measurements.

(1) Calculate the transmitter's peak power using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:
E = the measured maximum fundamental field strength in V/m.
G = the numeric gain of the transmitting antenna with reference to an isotropic radiator.
d = the distance in meters from which the field strength was measured.
P = the power in watts for which you are solving:

$$P = \frac{(Ed)^2}{30G}$$

(2) To demonstrate compliance with the spurious RF conducted emission requirement of Section 3.10.1(4), use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured, RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
Measure the field strength of both the fundamental emission and all spurious emissions with these settings. The measured field strength of all spurious emissions must be below the measured field strength of the fundamental emission by the amount specified in 3.10.1(4). This is only applied on spurious emissions not fall in restricted band.

Marker-Delta Method

In making radiated band-edge measurements, there can be a problem obtaining meaningful data since a measurement instrument that is tuned to a band-edge frequency may also capture some in-band signals when using the resolution bandwidth (RBW) required by measurement procedure in Chapter 5. In an effort to compensate for this problem, the following technique is for determining band-edge compliance.

(1) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function required by Section 5.14 for the frequency being measured. For transmitters operating above 1 GHz, use a 1 MHz RBW, a 1 MHz VBW, and a peak

detector. Repeat the measurement with an average detector (i.e., 1 MHz RBW with 10 Hz VBW).

Note: For pulsed emissions, other factors must be included. Also, please note that radiated measurements of the fundamental emission of a transmitter operating under 3.10.1 are not normally required, but they are necessary in connection with this procedure.

(2) Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission. Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is only a relative measurement to determine the amount by which the emission drops at the band-edge relative to the highest fundamental emission level.

(3) Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths are then used to determine band-edge compliance as required by Section 2.7.

(4) The above "delta" measurement technique may be used for measuring emissions that are up to two "standard" bandwidths away from the band-edge, where a "standard" bandwidth is the bandwidth specified by Section 5.14 for the frequency being measured.