小型電波暗室特性之模擬與量測

紀家銘、林明星 ; 許崇宜

E-mail: 9605049@mail.dyu.edu.tw

摘 要

本論文的目的為在建立電磁相容(EMC)與天線量測用之電波暗室的模擬與比對技術。在電波暗室模擬方面，利用映像原理、光線追蹤與斯涅爾定理，建立Matlab模擬程式，用以分析電波暗室正規化場地衰減(NSA)、正規化場地傳輸損失(NSTL)、場均勻度與反射率之特性。在電波暗室的比對方面，利用雲科大電磁相容實驗室現有的電波暗室, 進行與神達電腦與耕興股份有限公司實驗室之電磁干擾(EMI)與天線量測比對。 針對雲科大電波暗室，吾人先進行電波暗室本身背景雜訊之探討與抑制，並利用標準輻射源與神達標10m電波暗室做比對，以取得修正因子，以改善雲科大電波暗室之輻射放射量測數據。在天線量測方面，利用標準天線與耕興天線量測場地做比對，以取得修正因子，以改善雲科大電波暗室之天線場型量測數據。 最後利用所建立之電波暗室模擬程式，進行正規化場地衰減(NSA)與正規化場地傳輸損失(NSTL)之模擬，正規化場地衰減(NSA)與漢翔航空工業股份有限公司量測值做比較，結果顯示，除了在頻率低於40MHz時模擬的垂直極化之外，其他模擬與量測值皆通過ANSI C63.4的規範，且若9-6-6半電波暗室總吸收特性低於20dB，則必須考慮二次反射波所造成之影響。若將模擬之正規化場地傳輸損失(NSTL)與環隆電氣量測值做比較，則發現兩者皆符合Friis理論值。

關鍵詞 : 電波暗室 ; 光線追蹤 ; 正規化場地衰減 ; 正規化場地傳輸損失 ; 場地校正因子 ; 輻射源

目錄

參考文獻

[1]. EN6100-4-2, ” Electromagnetic compatibility(EMC)-part 4-2:Testing and measurement techniques – Electrostatic Discharge Immunity Test ” [2]. EN6100-4-4, ” Electromagnetic compatibility(EMC)-part 4-4:Testing and measurement techniques – Electrical fast transient/burst immunity test ” [3]. EN6100-4-5, ” Electromagnetic compatibility(EMC) -part 4-5:Testing and measurement techniques – Surge immunity test ” [4]. EN6100-4-11, ” Electromagnetic compatibility(EMC) - part 4-11:Testing and measurement techniques – Voltage dips,short interruptions and voltage variation immunity test ” [5]. ANSI C63.4-1992, ” American National Standard : Methods of Measurement of Radio-Noise Emissions from Low Voltage Electric and Electronic Equipment in the Range of 9KHz to 40GHz ” ,2001 [6]. Stephen Clay; ” Improving the Correlation between OATS,RF Anechoic Room and GTEM Radiated Emissions Measurement for Directional Radiators at Frequencies between approximately 150MHz and 10 GHz ” ,IEEE International Symposium,1998 ,paes:1119-1124 [7]. Leland H. Hemming, ” Electromagnetic Anechoic Chambers A Fundamental Design and Specification Guide ” ,A Wiley Interscience Publication, 2002.

[8]. A.A.Smith, R.F.German, and J.B.Pate, “ Calculation of Site Attenuation From Antenna Factors ” , IEEE Trans. On Electromagnetic Compatibility, vol. EMC-24, No. 3,August 1982. , pp. 301-316 [9]. Alessandro Beggio,Giancarlo Borio,Riccardo Enrico Zich; ” On the Unwanted effects on the Radiated Emissions and Susceptibility Measurement due to the Introduction of a Wooden table ” , IEEE International Symposium,May 1999,pp.252-255 [10]. EN6100-4-3, ” Electromagnetic compatibility(EMC) -part 4-3:Testing and measurement techniques

– Radiated , radio-frequency,electromagnetic field immunity test ” [11]. Clayton R Paul, ” introduction to Electromagnetic Compatibility ” ,A Wiley Interscience Publication ,1992.
[12]. K. Bullington, ” Radio propagation at frequencies above 30 megacycles, ” Proc. IRE, Oct. 1947, pp. 1 122-1 136 [13]. Xiao Li, ” The evaluation for emission measurements above 1 GHz ” ,Asia-Pacific Conference,2000 [14]. EN 50147 Part 3: ” Electromagnetic Compatibility Basic Emission Standard Part 3: Emission Measurements in Fully Anechoic Rooms ” ,CENELEC, TC 210, WG 4-9905, January 1999.
[15]. IEEE Std 1128, ” IEEE Recommended Practice for Radio-Frequency(RF) Absorber Evaluation in the Range of 30MHz to 5GHz ” ,1998
[16]. 陳建宏, ” 電磁相容電波暗室之特性的模擬與分析 ” ,大葉大學碩士論文,6月2005 [17]. ANSI/IEEE Std 149- ” IEEE Standard Test Procedures for Antennas ” ,1979 [18]. ETSI TR 102 273-2: “ Electromagnetic compatibility and Radio spectrum Matters (ERM);Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties; Part 2: Anechoic chamber ” ,2001 [19]. Shastry, S.V.K.; Nagesh, S.K.; Binu, D.; “ Reflectivity Level of RFShielded Anechoic Chamber ” , Electromagnetic Compatibility,1995. Symposium Record. 1995 IEEE International Symposium on , 14-18 Aug. 1995, Pages:578 – 583 [20]. V. F. Fusco, Foundations of Antenna Theory and Tchniques, Pearson Education Limited, 2005.
[21]. Christos L. Kinezos, ” A study on ultra-wideband microstrip Archimedean spiral antenna with a terminating load and conversion from EMC chamber to emulate antenna chamber ” ,Florida Atlantic University,Boca Raton,Florida,August 2003 [22]. Roger F. Harrington, ” Time-Harmonic Electromagnetic Fields ” , McGRAW-HILL Publication,1993.
[23]. Constantine A. Balanis, “ Antenna Theory Analysis and Design ” ,Wiley, New York, 1997, 2nd