電波迴響室的均勻性與等向性對天線輻射特性之影響分析

徐瑞鴻、邱政男 ; 林漢年

E-mail: 9706746@mail.dyu.edu.tw

摘 要

近年來，電磁相容測試領域不斷研究開發更可靠、重複性高及低成本的測試技術，對於相關輻射干擾與耐受性測試而言，電波迴響室(RC)(又稱模態攪拌室)的技術越來越受重視，逐漸成為開放測試場地(OATS)、半(全)電波暗室(AC)或橫向電磁波室(TEM-cells)…等的替代測試設施。電波迴響室主要是由一金屬空腔及一個或數個金屬迴旋扇葉所構成，使在空腔裡激發的高場強，可利用金屬迴旋扇葉不停地轉動和攪拌來改變電磁場邊界條件，藉由多重路徑反射造成空間中特定區間內產生建設性和破壞性的干擾而將電磁場均勻打散，使其在空腔中重新分佈，以產生足夠且有效的共振模態數目，而形成一個均勻的電磁場區，並達到測試區域有統計上的場均勻度、等向性以及隨機極化的電磁測試環境。當電子裝置具有複雜的電磁干擾輻射場型時，電波迴響室測試技術被認為將會比傳統的開放測試場或電波無響室測試法得到更嚴謹且精確的量測結果。 本論文主要針對改變測試區域大小，並利用經模擬分析而已知特性之發射及接收天線來探討測試區域的場均勻度、等向性以及隨機極化的測試環境對天線輻射特性的影響，並利用電磁場數值分析軟體與實際量測作比較分析。

關鍵詞 : 電波迴響室 ; 輻射干擾與耐受 ; 測試區域 ; 場均勻度

目錄

參考文獻

[1] Teng-Yi Zou, Da-Yeh University, Taiwan,“ Effect of Rotational Stirrer Location on Field Uniformity inside Reverberation Chamber ”.

[2] Yin-Ru Huang, Da-Yeh University, Taiwan,“ Effect of Rotational Stirrer Shape on Field Uniformity inside a Reverberation Chamber ”.

[3] C. J. Ko, Da-Yeh University, Taiwan,“ Analysis of Field Uniformity and Isotropicity inside a Reverberation Chamber. ”.

[4] Po-Hsun Huang, Da-Yeh University, Taiwan,“ Effect of Radiation Source Location on Field Uniformity and Isotropicity inside Reverberation Chamber ”.

[5] IEC International 61000-4-21 Standard,“ Electro-magnetic compatibility (EMC)-part 4-21: Testing and measurement techniques-Reverberation chambers test methods ”,1995.

[6] IEC 61726 – cable Assemblies, Cables, Connectors and passive Microwave Components – Screening Attenuation Measurement by the Reverberation Chamber Method, International Electrotechnical Commission (IEC), Geneva, Switzerland Int. Std., IEC SC 46A, Nov. 1999 [7] Lehman, Th. A statistical theory of electromagnetic fields in complex cavities. Note 494, USAF Phillips Laboratory Interaction Note Series, May 1993.
[8] Katsushige HARIMA, Yukio YAMANAKA, " Evaluation of Electric-Field Uniformity in a Reverberation Chamber for Radiated Immunity Testing. ", IEICE Trans. Commun., VOL.E84-B, NO.9, pp.2618-2621, September 2001.
[9] Arnaut, Lr. Compound exponential distributions for undermoded reverberation chambers. Accepted for publication in IEEE Trans. EMC (2002).
[10] David M. Pozar, Microwave Engineering 2nd ed., John Wiley & Sons, 1998, ISBN 0-471-17096-8.
[11] Liu, B.H., Chang, D.C., Ma, M.T.: Eigenmodes and the Composite Quality Factor of a Reverberating Chamber, NBS Technical Note 1066, National Bureau of Standards, Boulder, CO., August 1983.
[12] Per-Simon Kildal, Yngve Hamnerius, " Accurate Measurement of Small Antennas and Radiation form Mobile Phones in Small Reverberation Chambers ".
[13] X.C. Wei., Er-Ping Li , " Transmitting Antenna's Reflected Power and its Influence on Reverberation Chamber Calibration ", Electromagnetic Compatibility, IEEE Transactions on Volume 49, Issue 1, Feb. 2007 Page(s):192 - 194 [14] Christian Bruns, Ruediger Vahldieck , " A Closer Look at Reverberation Chambers-3D simulation and Experimental Verification ", Electromagnetic Compatibility, IEEE Transactions on Volume 47, Issue 3, Aug. 2005 Page(s):612 - 626 [15] Alyse Coates, Alistair P. Duffy , " Maximum Working Volume and Minimum Working Frequency Tradeoff in a Reverberation Chamber ", Electromagnetic Compatibility, IEEE Transactions on Volume 49, Issue 3, Aug. 2007 Page(s):719 - 722 [16] Niklas Wellander, Olof Lunden, and Mats Backstrom " Experimental Investigation and Mathematical Modeling of Design Parameters for Efficient Stirrers in Mode-Stirred Reverberation Chambers ", Electromagnetic Compatibility, IEEE Transactions on Volume 49, Issue 1, Feb. 2007 Page(s):94 - 103 [17] Jinliang He, Zhiyong Yuan, Rong Zeng, Fan Wu, " Evaluation of Test Reproducibility of Calibration in Reverberation Chamber " Electromagnetic Compatibility, 2007. EMC 2007. IEEE International Symposium on 9-13 July 2007 Page(s):1 – 4
[18] Zhiyong Yuan, Shuiming Chen, Jinliang He, Rong Zeng, and Tun Li, " Evaluation of Transmit Antenna Position in Reverberation Chamber ", Electromagnetic Compatibility, IEEE Transactions on Volume 49, Issue 1, Feb. 2007 Page(s):86 - 93