Effect of rotational stirrer location on field uniformity inside a reverberation chamber

鄒騰億、林漢年

E-mail: 9315093@mail.dyu.edu.tw

ABSTRACT

In recent years, people are more and more relied on the electrical and electronic devices in daily life. Besides the functional performance is concerned, people also care about if its electromagnetic compatibility characteristic is certified by authority. Several international committee and national authorities have published a variety of the electromagnetic interference and electromagnetic susceptibility standards for the various categories of electrical and electronic equipment and devices used in military, industry, and consumer levels respectively, and require the electrical and electronic products pass the related test to be eligible on the market. As the trend keeps wide-spreading around the world, the request for the EMC test facility is therefore growing day by day. A reverberation chamber is an electrically large, highly conductive enclosed cavity with paddles built-in. It is used to conduct electromagnetic measurements for both emissions and immunity tests on electric and electronic equipment. It should be operated with required field uniformity. This article investigates what kind of the influence of changing the location of rotational stirrers in reverberation chambers on the field uniformity in working volume it is, and uses simulating software and practical measurement to investigate the situation of the field uniformity in working volume of chambers.

Keywords : reverberation chamber ; electromagnetic interference ; electromagnetic susceptibility ; field uniformity ; IEC 61000-4-21 ; working volume ; quality factor ; lowest useable frequency

Table of Contents

REFERENCES

[1]J F Dawson, University of York, UK; M O Hatfield, Naval Surface Warfare Center, USA; L Arnaut, National Physical Laboratory, UK; N Eulig, Institut fur EMV, Braunschweig, Germany“ Reverberation （Mode-Stirred） Chambers for Electromagnetic Compatibility ” [2]IEC61000-4-21, ” Electromagnetic compatibility (EMC)-part4-21 testing and measurement techniques-Reverberation chambers test methods ”,1995 [3]林漢年等,“ 電波迴響室內電磁場分佈之數值模擬研究分析 ”, 2002台灣電磁相容研討會 [4]Katsushige Harima and Yukio Yamanaka,“ Evaluation of E-field uniformity for radiated Immunity testing in a reverberation chamber ” [5]David K. Cheng,“ Field and Wave Electromagnetics ” 2/e [6]DAVID M. POZAR,“ MICROWAVE ENGINEERING ” [7]D. A. Hill, A reflection coefficient derivation for the Q of a reverberation chamber, IEEE Transactions on Electromagnetic Compatibility. Vol38. No.4 November 1996 [8]M. Petirsch, I. Sotriffer, A. Schwab,“ ELECTROMAGNETIC SUSCEPTIBILITY MEASUREMENTS IN A MODE-STIRRED CHAMBER ” [9]Karl S. Kunz Raymond J. Luebbers,“ Finite Difference Time Domain Method for Electromagnetics ” [10]Allen Taflove,“ Computational Electrodynamics : The Finite- difference Difference Time Domain Method ” [11]謝其君,“ 迴旋扇葉結構對電波迴響室場強均勻度影響之研究 ” [12]Yee, K . S. , ” Numerical solution of initial boundary value problems involving Maxwell ’ s equations in isotropic media , ” IEEE Transmission. Antennas and Propagation, Vol.14,00.302-307,1966 [13] 林振華,“ 電磁場與天線分析使用時域有限差分法（FDTD） ” 全華科技圖書股份有限公司發行 [14]Gerrit Mur ,“ Total-field absorbing boundary conditions for the time-domain electromagnetic field equations ”,IEEE transactions on

electromagnetic compatibility.No2.May,1998 [15]Gerrit Mur , ” Absorbing boundary conditions for the finite- difference approximation of the time-domain electromagnetic field equations ”, IEEE Trans. Electromagnetic Compatibility ,Vol. EMC -23,pp.377-382,Nov.1981.
[16]Yee. K. S. , “ Conformal finite-different time-domain (FDTD) with overlapping grids ”, IEEE transactions on Antennas Propagation Vol40. No9. September , 1992 [17]Navarro, E.A. ,N. T. Sangary ,and J. Litva, ” Some considerations on the accuracy of the non-uniform FDTD method and its application to wave-guide analysis when combined with the perfectly matched layer technique , ” IEEE Trans. Microwave Theory Tech., Vol.44 ,pp.1115-1124 ,July 1996 [18]Okoniewski, Michal , E. Okoniewska , and M. A. Stuchly, “ Three- dimensional sub-gridding algorithm for FDTD, ” IEEE Transmission. Antennas and Propagation. , Vol.45, pp.422-429, Mar.1997.
[19]Jurgens , T. G, and A. Taflove , “ Three-Dimension of Scattering from Single and Multiple Bodies, ” EEE Trans. Antennas Propagation . ,Vol.41,pp.1703-1708,Dec.1993 [20]Allen Taflove, “ Computational Electrodynamics : The Finite-Difference Time Domain Method ”, p93-105.
[21]Karl S. Kunz Raymond J. Luebbers, “ Finite Difference Time Domain Method for Electromagnetics ”, p335-346 [22]Michael O. Hatfield Naval Surface Warfare Center Dahlgren VA, “ A CALIBRATION PROCEDURE FOR REVERBERATIONS ” [23]IEC61000-4-3, ” Electromagnetic compatibility (EMC)-part4-3 testing and measurement techniques-Radiated, radio-frequency, electro- magnetic field immunity test ” ,1995 [24]N. Eulig, A. Enders, H. G. Krauhauser, and J. Nitsch, “ Achievable field strength in reverberation chambers ”, Advances in Radio Science（2003）1:53-56