應用於高解析度微波影像系統之高指向性超寬頻天線設計

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摘 要

高解析度微波影像運用在影像診斷上之效益如下：以低功率低輻射的環境將減少對人體的傷害，減少醫療設備成本及花費，提昇國內的醫療技術，降低對國外醫療設備之依賴，以及提高國家在醫療儀器上的競爭性等。 為了提高微波影像之解析度，本論文將開發應用於醫療檢測方面之超寬頻天線。文中設計出一能用於水中輻射之高指向性超寬頻天線，此一天線由橫向電磁波號角天線與寬頻阻抗匹配器組合而成。在應用上透過模擬及實際量測，探討電波在水中與空氣中傳播的特性，以驗證天線的效能。

關鍵詞 : 微波影像 ; 解析度 ; 超寬頻天線

目錄

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參考文獻

[1] J.Young and L.Peters，A brief history of GPR fundamentals and application，Proc 6th Int Conf Ground Penetrating Radar，Sendai， Japan，1996，pp.5-14.

[2] E.Guillanton，J.Y.Dauvignac，C.Pichot，and J.Cashman，A new design tapered slot antenna for ultra-wideband applications，Microwave Opt Technol Lett 19（1988），286-289.

[3] 劉明彥，平面型超寬頻天線之設計，碩士論文，大葉大學電信所，2005年6月 [4] Nguyen C,Jeong-Soo Lee,and Joong-Suk Park,“ Ultra-wideband microstrip quasi-horn antenna, ” Electronics Letters, Volume: 37 , Issue: 12 , 7 Jun 2001 Pages:731- 732 [5] Li-Chung; Chang, T.; Burnside, W.D.; ” An ultrawide-bandwidth tapered resistive TEM horn antenna ” Antennas and Propagation, IEEE Transactions on , Volume: 48 , Issue: 12 , Dec. 2000 Pages:1848 – 1857 [6] Lee, R.T.; Smith, G.S.; ” A design study for the basic TEM horn Antenna ” Antennas and Propagation Magazine, IEEE ,Volume: 46 , No. 5 ,Feb 2004 Pages:81 – 87 [7] C. Nguycn, J. S. Lee, J. S. Park,“ Ultra-wideband Microstrip quasi-Ham Antenna, ” IEE Electronics Letters, vol. 37 nu. 12 , June 2001, pp. 731-732 [8] Kyung-Ho Chung; Sung-Ho Pyun; Chung, S.-Y.; Jae-Hoon oi;“ Design of a wideband TEM horn antenna ” Antennas and Propagation Society International Symposium, 2003. IEEE , Volume: 1 , 22-27 June 2003 Pages:229 - 232 vol.1 [9] K. L Shlager, G S. Smith, J. G Maloney,“ TEM hom antenna for pulse radiation: An improved design, ” Microwave Optic. Techno. Letf., vol. 12, no. 2, June 5, 1996, pp. 86-90 [10] Lai A.K.Y Sinopoli A.L and Burnside W.D,“ A noval antenna for Ultra-wideband applications, ” Antennas and Propagation, IEEE Transactions on , Volume: 40 , Issue: 7 , July. 1992 Pages:755- 760 [11] K. L. Shlager, G. S. Smith,and I. G. Maloney, ” Accurak anallysix of TEM horn antennas far pulrc radiation ” IEEE Transactions on Electromagn Compat , Volume: 38 , no.3 , Aug. 1996 Pages:414 – 423 [12] Majid Manteghi and Yahya Rahmat-Samii; ” A novel UWB feeding mechanism for the TEM horn antenna, reflector IRA, and the vivaldi antenna ” Antennas and Propagation Magazine,IEEE ,Volume: 46 ,Issue: 1 ,Oct. 2004 Pages:86 – 92 [13] Hyoungjin Cho and Sengseol Lee,“ Design of an exponentially- tapered TEM horn antenna for the wide broadband communication , ” Microwave and Optical Technology Letters,Volume 40,Issue 6,Date:20 March 2004, pp. 531-534 [14] Ahemt Serdar Turk,“ Ultra-wideband TEM horn design for groundPenetrating impulse radar systems, ” Microwave and Optical Technology Letters,Volume 41,Issue 5,Date:5 June 2004, pp. 333- 336 [15] Ivor L Morrow,“ TEM horn optimized for transient radiation, ” Microwave and Optical Technology Letters,Volume 30,Issue 3,Date:5 Augest 2001, pp. 161-164 [16] 李志宏，寬頻天線之開發及其在天線量測場之應用，碩

士論文，大葉大學電信所， 2005年6月 [17] C. A. Balanis, Antenna Theory: Analysis and Design, SecondEdition, New York, John Wiley & Sons, 1997.
[18] H. RICHARD PHELAN, ” A Wide-Band Parallel-Connected Balun ” IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, MAY 1970, Pages:259 – 263 [19] YUUK1 SHIMADA, ” Input Impedance Analysis of 1:1 Balun ” IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, VOL. MTT-18, NO. 5, MAY 1970, Pages:264 - 269 [20] 薛立群，高頻天線巴倫之設計與應用，碩士論文，大葉大學電信所，2004年2月 [21] GORDON .J. LAUGHLIN, ” A New Impedance-Matched Wide-Band Bakn and Magic Tee ” IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, VOL. MTr-24, NO. 3, MARCH 1976, Pages:135 – 141 [22]John, D.K.; Ronald J.M.; ” Antennas for all applications ” 3rd edition, Mc Graw Hill [23] J. W. Duncan, V. P. Minerva, “ 100:1 Bandwidth Balun Transformer , ” IEE Proc. , vol. 48, no. 2, Feb. 1960,pp. 156-164[24] K.M.P. Aghdam, R. Faraji-Dana, and J. Rashed-Mohassel, ” Optimization of microstrip tapered balun for sinuous antenna feeding circuits ” , Antem Conf, 2004, pp. 209-212.
[25] 袁帝文，王岳華，謝孟翰，王弘毅，“ 高頻通訊電路設計 ”，高立圖書有限公司， pp.254-276 [26] Kyung-Ho Chung; Sung-Ho Pyun; Jae-Hoon Choi; “ The design of a wideband TEM horn antenna with a microstrip-type balun ” Antennas and Propagation Society Symposium, 2004. IEEE , Volume: 2 , 20- 25 June 2004 Pages:1899 - 1902 Vol.2 [27] P. R. Foster, Soe Min Tun, “ A Wideband Balun from Coaxial Line to TEM Line, ” IEEE Anfennas and Propagation ICAP ‘ 95 Intemafional Symposium, vol. 1, April 1995, pp. 286-290 [28] David M.Pozar; ” Microwave Engineering ” 2nd edition, John Wiley and Sons,1990, Pages:288 - 295 [29] 陳彥君，寬頻天線設計與應用-在各式介質之傳播特性分析，碩士論文，大葉大學電 信所，2006年6月 [30] Dau-Chyrh Chang, Ph.D., Antenna Engineering 9th edition