埋藏複合材料之多層旋光性平板的電磁分析:Electromagnetic analysis of multiayered chiral slabs embedded with composite ....

郭記華、許崇宜

E-mail: 9607726@mail.dyu.edu.tw

摘 要

本文主要是討論在空氣中一平面波正向入射至一披覆多層複合材料之多層旋光性介質平板之電磁反射與透射。我們以遞迴方式處理旋光性平板層與層之間的反射及透射係數，並利用波傳遞矩陣的方法處理複材的層與層之間的電磁場。由這個嚴謹的方法所計算得到的反射與透射矩陣結果，與狀態方程式的解析結果相當吻合。研究發現，若入射波為右旋圓極化波，則從多層旋光性平板反射與透射的分別只有左旋與右旋圓極化波，在旋光性平板披覆具非等向性特性的複合材料之後，則反射與透射的波兩者皆同時包含左旋與右旋圓極化波，這個特性在設計遮蔽或抗反射結構時提供更大的彈性。

關鍵詞 : 旋光性物質 複合材料 波傳遞矩陣

目錄

參考文獻

[1]I. V. Lindell, A. H. Sihvola, S. A. Tretyakov, and A. J. Viitanen, Electromagnetic Waves in Chiral and Bi-Isotropic Media. Boston-London: Artech House, 1994.

[2]A. Lakhtakia, V. K. Varadan, V. V. Varadan, Time-Harmonic Electromagnetic Fields in Chiral Media. New York: Springer-Verlag, 1994.

[3]D. L. Jaggard and N. Engheta,“ Chirosorb as an invisible medium, ” Electron. Lett., vol. 25, no. 3, pp. 173-174, Feb. 1989.

[4]I. A. Khan, S. C. Raghavendra, and A. B. Kulkarni,“ Polyester-based chiral materials for microwave absorption applications, ” International J. Electronics, vol. 90, pp. 159-166, Mar. 2003.

[5]D. L. Jaggard, N. Engheta, and J. C. Liu,“ Chiroshield: a Salisbury/Dallenbach shield alternative, ” Electron. Lett., vol. 26, no. 17, pp. 1332-1334, Aug. 1990.

[6]A. K. Bhattacharyya,“ Control of radar cross-section and cross polarization characteristics of an isotropic chiral sphere, ” Electron. Lett., vol. 26, no. 14, pp. 1066-1067, July 1990.

[7]I. V. Lindell and A. H. Sihvola,“ Plane-wave reflection from uniaxial chiral interface and its application to polarization transformation, ” IEEE Trans. Antennas Propagat., vol. 43, pp. 1397-1404, Dec. 1995.

[8]C. N. Chiu,“ Electromagnetic Twist-Polarizer Effect of an Advanced Composite slab coated with a Bi-Isotropi medium, ” International J. Elec. Eng., vol. 12, pp. 177-182., May 2005.

[9]A. Semichaevsky, A. Akyurtlu, D. Kern, D. H. Werner, and Bray. M. G,“ Novel BI-FDTD approach for the analysis of chiral cylinders and spheres, ” IEEE Trans. Antennas Propagat., vol.54, pp.925-932, Mar. 2006.

[10]C.-I G. Hsu and C.-N. Chiu,“ Oblique plane-wave scattering from a general bi-isotropic cylindrical shell with an interior advanced

composite-material backing, ” IEEE Trans. Electromagn. Compat., vol. 48, pp. 614-620, Nov. 2006.
[11]M. S. Lin, C. M. Lin, R.B. Wu, and C. H. Chen, “ Transient propagation in anisotropic laminated composites, ” IEEE Trans. Electromagn. Compat., vol. 35, pp. 357-365, Aug. 1993.
[12]M. S. Lin and C. H. Chen, “ Plane-wave shielding characteristics of anisotropic laminated composites, ” IEEE Trans. Electromagn. Compat., vol. 35, pp. 21-27, Feb.1993.
[13]M. S. Lin, “ Propagation effects of laminate composite materials, ” Ph.D. Diss., Dept. of Elec. Eng., National Taiwan Univ., 1993.
[14]C. L. Holloway, M. S. Sarto, and M. Johansson, “ Analyzing carbon-fiber composite materials with equivalent-layer models, ” IEEE Trans. Electromagn. Compat., vol. 47, pp. 833-844, Nov. 2005.
[15]L. A. Pilato and M. J. Michno, Advanced Composite Materials. Berlin: Springer-Verlag, 1994.
[16]I.V Lindell, , A.H Sihvola and J Kurkijarvi, “ The Last Hertizan,and a Harbinger of Electromagnetic Chirality, ” IEEE Antennas Propagat. Magazine, vol.34, pp. 24-30, June. 1992.
[17]J. B. Tichener and J. R. Willis, “ The reflection of electromagnetic waves from stratified anisotropic media, ” IEEE Trans. Antennas Propagat., vol.39, pp. 35-39, Jan. 1991.
[18]洪澍淋， “ Electromagnetic Analysis of Chiral- and Composite-Material Cylinders ”， 大葉大學電信工程研究所，2004。