

Visualization of Transient Electromagnetic Phenomena

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The conference consists of two different parts but with the common factor that in both are explained visually, reducing mathematical details to a minimum (which can be found in the referred bibliography below), phenomena related to electromagnetic radiation through images and videos obtained either by analytical, numerical or experimental methods.

The first part is focused on explaining, from a time domain point of view, basic aspects of how, where and why electromagnetic radiation is produced. Examples of application in the design of antennas are shown.

The second part shows a selection of results obtained from some of the projects in which the lecturer and his research group have participated with national and international companies in the field of the aeronautical industry and, more specifically, in the field of electromagnetic compatibility (EMC) where the possible effects of external electromagnetic radiation on the safety of air navigation are studied, including the possible consequences of the incidence of lightning on aircraft.

Bibliography

- [1] R. Gómez Martín “Campo Electromagnético para Físicos e Ingenieros: Radiación y Propagación” Editorial Universidad de Granada. Colección Manuales. Granada 2021.
- [2] R. Gómez Martín; J. A. Morente and A. Rubio Bretones “An Approximate Analysis of Transient Radiation From Linear Antennas” Int. J. Electronics, vol. 61, No 3, pp 343-353. 1986.
- [3] R. Gómez Martín; J. A. Morente; A. Rubio Bretones “Array of Matched linear Antennas Fed by Pulses Signals” Int. J. Electronics, vol. 61, No 5, pp 639-646. 1986.
- [4] R. Gómez Martín; A. Rubio Bretones and S. González García “Some Thoughts about Transient Radiation by Straight thin wires” IEEE Antennas and Propagation Magazine, Vol. 41, Issue: 3, June 1999.
- [5] R. Gómez Martín; A. Rubio Bretones; M. Fernández Pantoja. Radiation “Characteristics of Thin-Wire V-Antennas Excited by Arbitrary Time-Dependent Currents” IEEE Transactions on Antennas and Propagation. 49 - 12, pp. 1877 - 1880. 2001.
- [7] R. Gómez Martín, A. Salinas and A. Rubio Bretones “Time-Domain Integral Equation Methods for Transient Analysis” Antenna and Propagation Magazine Vol. 34, no, 3, June 1992.
- [6] R. Gómez Martín; A. Rubio Bretones and S. González García “Time-Domain Analysis of Magnetic-Coated Wire Antennas” IEEE Trans. On Antennas and Propagation vol. 43, No. 6, 1995.
- [8] C.M. De Jong Van Coevorden; A.R. Bretones; M.F. Pantoja; F.J. García Ruiz; S.G. García; R.G. Martín. GA design of a thin-wire bow-tie antenna for GPR applications. IEEE Transactions on Geoscience and Remote Sensing. 44 - 4, pp. 1004 - 1009. 2006.
- [9] M.F. Pantoja; F.G. Ruiz; A.R. Bretones; R.G. Martín; J.M. González-Arbesú; J. Romeu; J.M. Rius. “GA design of wire pre-fractal antennas and comparison with other euclidean geometries”. IEEE Antennas and Wireless Propagation Letters. 2, pp. 238 - 241. 2003.
- [10] M.F. Pantoja; A.R. Bretones; A. Monorchio; R.G. Martín. “Time domain optimization of wire antennas loaded with passive linear elements using GA” Engineering Analysis with Boundary Elements. 27 - 4, pp. 345 - 349. 2003.
- [11] A. Rubio Bretones; R. Mitra; R. Gómez Martín. “A Hybrid Technique Combining the Method of Moments in the Time Domain and FDTD”. IEEE Microwave and Guided Wave Letters. 8 - 8, pp. 281 - 283. 1998.

- [11] S. González García , A. Rubio Bretones , B. García Olmedo , R. Gómez Martín “Finite difference time domain methods” WIT Press January 2003
- [12] Doohwan L, Hirofumi S. and others “Orbital Angular Momentum (OAM) Multiplexing: An Enabler of a New Era of Wireless Communications” EICE Trans. Communication, Vol. 7, pp 1044-1063
- [13] Miguel R. Cabello; Sergio Fernández; Marc Pous; A. Rubio Bretones; Rafael Trallero; Luis Nuño; David Escot; R. Gómez Martín; Salvador G. Garcia and other authors, “A Case Study for the EMC Analysis of Composite Air Vehicles”. IEEE Transactions on Electromagnetic Compatibility. 59 - 4, pp. 1103 - 1113. IEEE, 2017.
- [14] R. Chen, H. Zhou, M. Moretti, X. Wang and J. Li, "Orbital Angular Momentum Waves: Generation, Detection, and Emerging Applications" IEEE Communications Surveys & Tutorials, vol. 22, no. 2, pp. 840-868, 2020.
- [15] M. Fernández Pantoja; F. García Ruiz; A. Rubio Bretones; S. González García; R. Gómez Martín; J.M. González Arbesú; J. Romeu; J.M. Rius; P.L. Werner; D.H. Werner, “GA design of small thin-wire antennas: Comparison with Sierpinsky-type prefractal antennas. IEEE Transactions on Antennas and Propagation” 54 - 6, pp. 1879 - 1882.
- [16] E. Pascual and D. García Gómez “Analysis of induced currents and voltages during an Air-to-Air Refueling operation due to on-board High Frequency radio transmissions using advanced simulations in time domain” 2019 International Symposium on Electromagnetic Compatibility - EMC EUROPE.