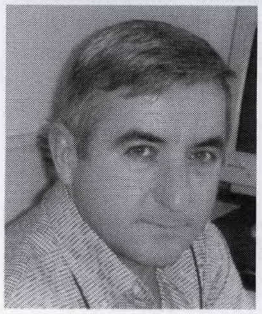

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Good news! Prof. Constantine A. Balanis has been negotiating with Wiley publishers about revising his *Advanced Engineering Electromagnetics* book [1], which originally was published in 1989. Although the book is doing extremely well, as he mentioned to me, he thinks that he can add few things to update it. His aim is to include some simulation/animation tools on the CD-ROM that will be part of the revised book. He also plans to include some figures that will illustrate novel concepts. One topic that he has been thinking about and seriously considering adding is at least a small section on some basic principles of metamaterials . He had just read our article on metamaterials [2], and is interested in using our two-dimensional (2D) FDTD-based virtual visualization tool for metamaterial-wave interaction and some of its outputs in the revised version of his book.

He requested that we produce some figures using our virtual tools related to reflection and transmission of plane waves incident upon infinite-extent double-positive (DPS) and double-negative (DNG) slabs, for both normal and oblique incidence. One scenario he wanted us to simulate was a uniform plane wave traveling in free space, incident along the normal upon a planar interface of a dielectric material. The other two scenarios belonged to oblique incidences with different polarizations, to show the effects of the Brewster and critical angles for specified sets of parameters (i.e., dielectric constants and incidence angles). Our correspondence of multiple e-mails triggered a question that might be interesting to the reader.

The Quiz for this Issue

Guided-wave propagation problems, such as transmission lines, waveguides with rectangular and/or circular cross sections, infinite-extent parallel-plate waveguides, etc., are best treated using simplified equations obtained from the longitudinal and transverse decomposition of Maxwell equations. This yields the well-known transverse electric (TE), transverse magnetic (TM), and transverse electromagnetic (TEM) representations, under different polarizations. These are classical topics, taught in almost every introductory level electromagnetic-wave course. However, it might be confusing to use different books, lecture notes, or papers, since:

- Some use perpendicular and parallel polarizations, while others prefer horizontal or vertical polarizations. How do you define polarization, and which polarization corresponds to which situation regarding terminology?
- For example, some use H_x, E_y, and H_z components for TE representations, but some others use H_x, H_y, and E_z components for the same TE representation. Which set is correct? How do you classify TE/TM representations?
- Suppose you have a TE-type FDTD simulator, based on the H_x, E_y, and H_z components. Can you use this simulator with the same three field components and simulate a TM-type problem? Can you use the *duality principle* for this purpose?

References

1. C. A. Balanis, *Advanced Engineering Electromagnetics*, New York, John Wiley & Sons, 1987.

2. M. Çakır, G. Çakır, and L. Sevgi, "A Two-dimensional FDTD-based Virtual Metamaterial – Wave Interaction Visualization Tool," *IEEE Antennas and Propagation Magazine*, **50**, 3, June 2008, pp. 166-175.