Numerical Study of the Electromagnetic Behavior of Multilayer Chiral Honeycombs.

Ismael Barba*, Ana Grande, Ana C. López-Cabeceira, José Represa
Universidad de Valladolid, Spain
corresponding author: ibarba@ee.uva.es

Honeycomb structures have been widely used in different sectors, such as aerospace, construction, packaging, etc., due to their mechanical properties. They also have been proposed in order to use their electromagnetic properties, for example, to perform metamaterial structures. In some cases, structures, which geometrically are chiral in a two-dimensional plane, have been used too. Some authors have studied their electromagnetic behavior, in order to check whether their structural chirality translates into chiral electromagnetic behavior [1,2], with negative results. It is worth of noticing that they characterize single layers of the honeycomb. Since the electromagnetic effects of chirality (electromagnetic activity or circular dichroism) take place in the 3D space, it is logic that they are not found when checking a 2D structure [3].

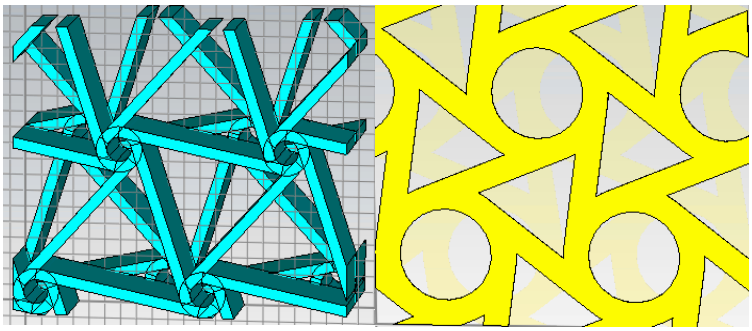

Fig. 1. Different bi-layered chiral honeycombs. The first ([1]) is made of a dielectric polymer; the second is a copper metallization on PCB.

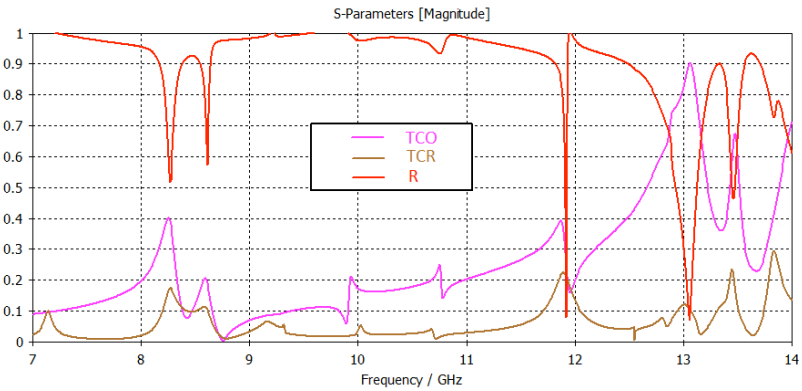

Fig. 2. Scattering parameters (Co-polarization Transmission, Cross-Polarization Transmission and Reflection Coefficients) for a plane wave linearly polarized parallel to the y-axis and normally incident over the structure defined in Fig. 1 right.

In this work, we study the behavior of different combinations of two layered chiral honeycombs using CST Studio. The second layer is the specular image of the first one, so the 3D-chirality is achieved; in this case, some electromagnetic activity is observed.

REFERENCES

1. R. Ciobanu et al., Investigation of the Hexachiral Honeycomb EMC Properties by Full Wave Electromagnetic Simulation, *23 European Conference on Modelling and Simulation*, Madrid, 2009
2. P. Kopyt et al., Dielectric properties of Chiral Honeycombs: Modelling and experiment, *Composite Science and Technology*, 70, pp. 1080-1088, 2010.
3. I. Barba et al., Electromagnetic waves Propagation in Complex Matter. Chapter 4: Quasi-planar Chiral Materials for Microwave Frequencies, Intech, 2011 (Ed: A. Kishk).