Solutions to Tailor the Radiation Patterns of 2D and 3D Multiband Antennas based on the Sierpinski Fractal

J. Soler, C.Puente and J.Anguera

Technology Department, Fractus S.A.
c/ Alcalde Barnils 64-68. Edifici Testa
Mòdul C, 3ª planta. Parc Empresarial Sant Joan
08190 Sant Cugat del Vallès (Barcelona), Spain
jordi.soler@fractus.com www.fractus.com

There is a considerable interest in developing multiband antennas since they permit telecom operators to reduce their costs and to minimize the environmental impact. In base station networks, for instance, this implies that they reduce their costs, specially in terms of the logistic of introducing news bands (searching for new sites, applying for permissions to add the new antennas on top of the existing towers, etc). Therefore it is clear that a single-port unique-element multiband antenna represents an optimum solution for those sites where a similar coverage is simultaneously required at different frequency bands. Multilevel-shaped antennas (Multilevel Antennas, Invention Patent WO0122528) represent a good and efficient solution to design these type of multiband antennas.

Although it has already been reported how some Sierpinski fractal designs can be modified to adjust their input parameters, less work has been done on techniques to adjust the antenna patterns at the different frequency bands.

In (C.Puente, M.Navarro, J.Romeu, R.Pous, Variations on the Fractal Sierpinski Antenna Flare Angle, IEEE Antennas and Propagation Society International Symposium, Atlanta, June 1998) it was shown that a variation on the Sierpinski antenna's flare angle was translated into its input parameters, but also into the shape of its radiation patterns. As an extension of that work, a dual-band antenna design based on the Sierpinski fractal with a bi-directional pattern is described. The procedure design to find the optimum antenna geometry is also explained. Moreover, the antenna is mounted with a reduced-sized ground plane so as to provide a compact performance.

In addition, a 3D antenna structure using two planar elements derived from the classical Sierpinski gasket is presented, Fig.1. The results of this novel antenna show how a 3D geometry can be used to tailor the radiation patterns at the different frequency bands.

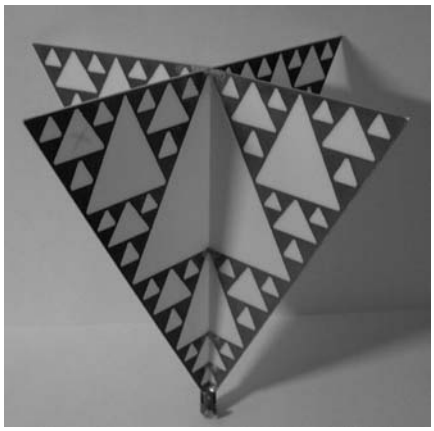

Fig 1 3D antenna solution used to tailor the antenna patterns at the different frequency bands. The antenna is built with two planar structures based on the Sierpinski fractal