

Design and manufacturing of dielectric resonators via 3D printing of composite polymer/ceramic filaments

E. Paz Jiménez; F.J. Herraiz Martínez; P. Sofokleous

Abstract-

Rapid technological advancements in recent years have opened the door to innovative solutions in the field of telecommunications and wireless systems; thus, new materials and manufacturing methods have been explored to satisfy this demand. This paper aims to explore the application of low-cost, commercially available 3D-printed ceramic/polymer composite filaments to design dielectric resonators (DRs) and check their suitability for use in high-frequency applications. Three-dimensional printing was used to fabricate the three-dimensional dielectric resonant prototypes. The filaments were characterized in terms of their thermal and mechanical properties and quality of printability. Additionally, the filaments' dielectric properties were analyzed, and the prototypes were designed and simulated for a target frequency of ~2.45 GHz. Afterward, the DRs were successfully manufactured using the 3D printing technique, and no post-processing techniques were used in this study. A simple and efficient feeding method was used to finalize the devices, while the printed DRs' reflection coefficient (S_{11}) was measured. Results on prototype size, manufacture ease, printability, cost per volume, and bandwidth (BW) were used to evaluate the materials' suitability for high-frequency applications. This research presents an easy and low-cost manufacturing process for DRs, opening a wide range of new applications and revolutionizing the manufacturing of 3D-printed high-frequency devices.

Index Terms- additive manufacturing; material extrusion; 3D printing; dielectric resonators; polymers; ceramics

Due to copyright restriction we cannot distribute this content on the web. However, clicking on the next link, authors will be able to distribute to you the full version of the paper:

[Request full paper to the authors](#)

If your institution has an electronic subscription to Polymers, you can download the paper from the journal website:

[Access to the Journal website](#)

Citation:

Herraiz-Martínez, F.J.; Paz, E.; Sofokleous, P. "Design and manufacturing of dielectric resonators via 3D printing of composite polymer/ceramic filaments",

