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Use of Space-Filling Curves for Additive Manufacturing of Three Dimensionally Varying Graded Dielectric Structures Using Fused Deposition Modeling

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Abstract

In this paper the authors present a novel design tool for realizing dielectric structures with spatially varying electromagnetic properties via additive manufacturing (AM). To create tool paths ideal for AM processes, space-filling curves were utilized. Using fused deposition modeling (FDM), spatially varying structures were printed that produced a spatially varying relative permittivity. A wide range of varying fill fractions were printed and evaluated, demonstrating good agreement between the simulated and measured results. Furthermore, the authors verified that this design tool can be applied to practical structures by designing, printing and testing a gradient index flat lens.

1. Introduction

Electromagnetic (EM) structures with spatially graded dielectric properties have a variety of practical applications including passive beam steering, graded index lenses (GRIN) [1] and antireflective

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