



Innovative Filter Structure in 3D Printing Technology

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Additive Manufacturing (AM) has proven to be a key technology for a wide range of applications [1, 2]. In this paper, we describe the design and manufacturing of a new class of filters for application to communication and aerospace systems. A stereolithographic (SLA) 3D printer has been used for the plastic mechanical part of the filters, while the conductive coating is obtained by electrodeposition of a pure copper film as detailed in [3]. The 3D printing process enables one to manufacture complicated and unique geometries and leads to the design of innovative filter structures, in addition to the traditional ones. The latter can be used as a reference in order to evaluate the performance of the filters and, in general, the waveguide components manufactured by 3D printing technology versus the same components manufactured using conventional milling machines. The 3D printing process by SLA and copper electrodeposition can quickly produce accurate prototypes at very low costs. Unfortunately no qualification of the process has been performed yet for the final production. The capability to produce in very short times low cost prototypes is nevertheless invaluable.

We have studied an innovative structure composed of mushroom-shaped resonators that allow the design of very compact low-frequency filters [4]. The coupling between the resonators is realized by 3D printed rods directly connecting the resonators. Optimization of the position and the length of the rods can easily be obtained from the couplings adopted by the filter designer. We have designed a number of such filters up to the fourth order producing a large number of responses. The performances of the filters in terms of insertion loss and frequency mask are excellent. The design procedure, fabrication and results obtained along with a discussion on the future perspective of this technology will be presented in the final paper.

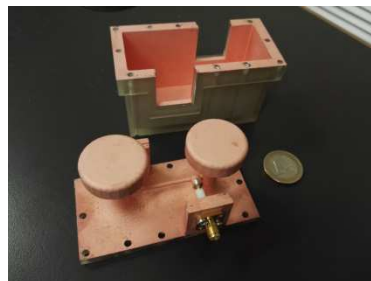


Figure 1. Copper metallized SLA printed Mushroom resonator filter

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