Geometrical Desensitization for 3-D Printed Dual-mode Filters using Shaped Ellipsoid Resonators

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Abstract- Dual-mode filters are essential devices in RF front-end systems such as satellite communications. Conventionally, fabrication of such devices requires the multiple parts of a dual-mode filter been fabricated separately and then assembled, manual tuning is generally required, this is extremely costly. In recent years, additive manufacturing, also known as 3-D printing, has offered a time and cost-efficient pathway for fabricating geometrically complex microwave/millimeter-wave waveguide devices monolithically. In our previous works, 4th order and 8th order dual-mode filters based on spherical as well as cylindrical resonators were designed and fabricated in one piece and good results were obtained [1]-[2]. However, the filter performances are still extremely sensitive to the tuning posts, namely, post-tuning was still required. In this work, we are focusing on the geometrical desensitization for 3-D printed dual-mode waveguide filters based on shaped ellipsoid resonators. The tuning screws (or posts) as well as the coupling posts were replaced by the ellipsoid resonator itself (to tune the frequency) and it’s geometrical shaping (to create couplings). Sensitivity analysis for the old and new design were performed and for the same fabrication tolerance (100um), the new design is more robust and the $S_{11}$ degradation is alleviated.

REFERENCES
