

Microfabrication Of Multilayer Liquid Metal-Based Flexible Band-Pass Frequency Selective Surfaces

ABSTRACT

This presentation reports a multilayer fabrication of gallium-based flexible liquid metal (LM) band-pass (BP) frequency selective surfaces (FSS). The BPFSS comprises of the inverter layer (IL) sandwiched between the top and bottom FSS layers. FSS-PDMS and IL-PDMS were replicated from the dry-etched FSS-Si and inverter-Si molds. The replicated FSS-PDMS layers created microfluidic channels of Jerusalem Cross (JC) surrounded by four floating patches in a 5 x 5 array. The pair of crossed dipoles of the JC measured 4.3 x 0.3 x 0.2 mm. The end loadings of the JC and fixed patches measured 2 x 1 x 0.2 mm. The 5 x 5 Kapton tape array measuring 4.3 x 4.3 x 0.2 mm replicated from the IL-PDMS was placed on the rear side of the bottom layer FSS covering the crossed dipoles. Encapsulation of LM in the microfluidic channels in the FSS-PDMS layers was done by an airbrush spraying at 36 psi for 20 seconds. The FSS-PDMS bottom layer was covered with a PDMS lid post spraying. The rear side of the composite bottom layer FSS was flipped over and covered with LM, by an airbrush spraying at 36 psi for 15 seconds. Post spraying and Kapton tape peeling the IL layer was covered with the uncured PDMS (10:1) and allowed to partially cure at room temperature. After 20 hours, the top layer LM encapsulated FSS-PDMS structure was placed over the IL and covered with a PDMS lid. The BPFSS had a center thickness of 3.17 mm.

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