Microwave bandpass filter

Small external dimensions, big effect

Precision and complexity are indispensable in microwave technology. Antennas, filters, diplexers and the general miniaturization of waveguide components make a decisive contribution to advancing microwave applications in the millimetre-wave and even sub-terahertz range. With the help of micro laser sintering (MLS), the required components are flexibly adapted to the respective application and manufactured as needed. Size and shape are based on the specific requirements of the application.

What really matters?

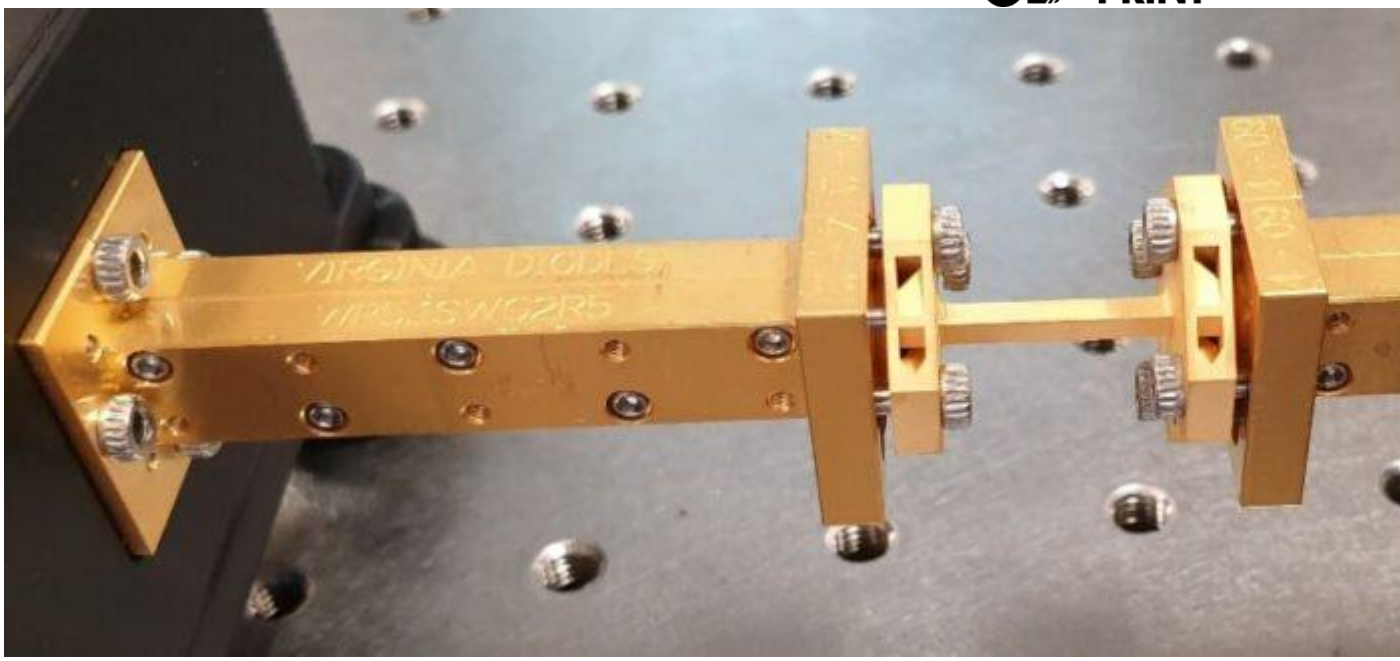
The basic function of most waveguide components is to transmit electromagnetic waves of different wavelengths while minimizing attenuation and distortion. 3D MicroPrint's MLS technology enables the monolithic production of waveguide subsystems in which many functions are integrated into a single mechanical component. This is particularly advantageous as it reduces assembly work and the associated risks.

A typical application example for the integration of waveguide components are antenna feed lines in terrestrial and satellite systems. These consist of several waveguide components such as polarizers, orthomode transducers (OMTs), filters, bends and twists. As a rule, conventionally manufactured components are used for this, whose geometric complexity is technologically limited and whose manufacturing costs are correspondingly high due to the required precision.

The general advantage of functional integration using 3D printing is the reduction in installation space and weight as well as the avoidance of passive intermodulation products, which can occur with oxidized flange connections.

Additive thinking

The ability to produce highly complex waveguides with very thin walls and tight tolerances without complex joining processes is one of the key strengths of microstructured 3D printing. The areas of application are correspondingly diverse: from straight or twisted waveguides, T-pieces, filters and diplexers to septum and horn antennas for a wide range of microwave applications. Compared to other available metal 3D printing processes, micro laser sintering offers decisive advantages: a significantly higher detail resolution for filigree structures and excellent surface quality directly after the construction process - which significantly reduces post-processing costs.



The application shown here is a monolithically constructed bandpass filter for the 180 GHz G-band, which was manufactured from stainless steel using micro laser sintering and then coated with gold to reduce the insertion loss to a minimum of 0.5 dB. The results impressively demonstrate the potential of high-precision 3D metal printing technology to produce complex geometries that are difficult to realize with conventional milling techniques - as well as the effectiveness of the coating process used.

"3D MicroPrint has the unique ability to print 3D metal waveguide components with high precision in the range of 5-10 micrometers - with excellent reproducibility and a large build platform of several centimeters. This high-precision multi-scale manufacturing is critical for the production of waveguide components in the millimeter-wave and even sub-terahertz range.
The ability to produce monolithic components is also highly desirable, as it reduces assembly and the associated risks.
Equally important to me is 3D MicroPrint's technical support - it is outstanding, thanks to their in-depth expertise and attention to detail."
(Prof. Yi Wang, University of Birmingham, UK)