Additive Manufacturing in RF and Microwave Technology

Internship / Master Thesis Work

Background and Motivation

Additive manufacturing (aka. generative manufacturing, rapid prototyping and 3D printing) is used in many areas today to produce prototypes or templates, for example for casting moulds. The principle of additive manufacturing, on which 3D printing is based, is simple: a machine creates three-dimensional workpieces layer by layer (additively) from one or more liquid or solid materials according to digitally specified dimensions and shapes, such as those created using a CAD system. Among other things, users benefit from the ability to produce complex shapes and material combinations that cannot be realised with conventional processes, or only to a limited extent.

The use of these new manufacturing options is particularly interesting for applications in the field of radar and high-frequency technology. In addition to the fast and direct production of samples, the combination of suitable materials and shapes also opens up completely new application possibilities that could not be realised with previous methods or only with great effort, e.g. multilayer printed circuits with RF components, conformal three-dimensional feed networks or frequency-selective radomes or planar RF lenses with variable permittivity.

Tasks

The aim of the proposed work is to assess the potential of additive manufacturing processes for applications in high-frequency technology and the capabilities of current / expected future systems.

This includes the investigation and documentation of the following questions:

- What are the capabilities of currently available devices and service providers in the industrial and research sectors?
- Which materials and material combinations can be processed and what are their electromagnetic properties in the relevant frequency ranges?
- How can electrically conductive materials and insulators be combined with each other, especially in the HF range?
- Which applications in the field of high-frequency technology have been investigated or are conceivable in the future?

As part of the work, samples of the developed components will be built using the extensive 3D printing capabilities of Fraunhofer FHR and measured for experimental verifcation.

Prototype of a monopulse horn antenna with feed network, manufactured using 3D printing technology and metal-coated by electroplating

Requirements

Good knowledge of high-frequency, radar technology

Creativity and interest to do independent scientific work

Contact

Prof. Dr.-Ing. Peter Knott
Chair of Radar Systems Engineering (RST)

Email: knott@ihf.rwth-aachen.de

Institute of High Frequency Technology
RWTH Aachen University
Melatener Straße 25 | 52074 Aachen
GERMANY
www.ihf.rwth-aachen.de
Telephone: +49 241 80-27932
Fax: +49 241 80-22641