Master's thesis project at GARD, the Department of Space, Earth and Environment

Improved Wideband MM-wave and THz waveguide components incorporating substrate-based wideband matched loads.

Background: MM-wave applications for instrumentation and industry need novel and compact wideband components. Such components could be used in power applications (transmitters) or receivers (multi-band, quadrature). Pure substrate-based components employing, e.g., microstrip lines have excessive insertion loss at mm-waves, while matching waveguide components over a wide frequency band is challenging due to the dispersive nature of their propagation constant. An approach of using a combination of waveguide structures and substrate-based-load elements has proved to be crucial to the realisation of wideband passive components with improved performances [1].

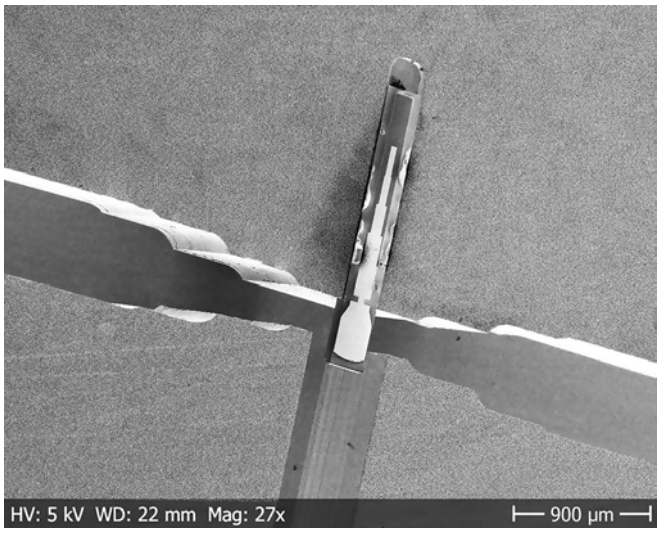

Fig.1 Illustration of a wideband power divider employing an advanced internal load for excellent output port isolation.

Thesis project: The work is based on a recently published design as a starting point, and aims to understand, simulate and create substrate-based matched loads as well as to demonstrate their usefulness in the realisation of improved power dividers and combiners a THz frequencies in the range of 150…400 GHz. The work will include:

- Literature survey
- Microwave circuit design and simulation (ADS+HFSS) of substrate-based loads.
- Microwave circuit design and simulation (ADS+HFSS) of hybrids and dividers at 211-375 GHz.
- Circuit mechanical and photomask design
- Tests of a prototype, 211-375 GHz

Prerequisites
Course in Microwave engineering, skill in ADS and HFSS
THz electronics, Course in Superconductivity, low temperature physics, are not required, but very useful

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References
[1] A. Gouda, Master Thesis at Chalmers University 2020.