

A Terahertz Time-Domain Reflectometer

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Abstract— We have built a Terahertz Time-Domain Reflectometer based on a Michelson interferometer, where the device under test replaces the stationary mirror. This way, the reflectometer is sensitive to both the phase and amplitude properties of the device under test. Measuring in the time domain also makes it straightforward to separate different contributions in the optical path, and for the same reason facilitates calibration.

This setup is built to characterize different loads at 4 K in the terahertz frequency range. This is important, since it was recently found that 2SB SIS receivers are extremely sensitive to standing waves in RF waveguide structure [1]. Part of which is caused by reflections from the loads. Understanding the behaviour of the loads is a prerequisite for optimizing the performance of the receivers.

In an additional investigation, the reflectometer is used to measure the RF properties of superconducting NbTiN films, particularly, the gap frequency, which is crucial for the development of SIS receivers at frequencies around 1THz.

The the latest results of these measurements will be presented at the conference.

[1] R. Hesper, A. Khudchenko, A.M. Baryshev, J. Barkhof and F.P. Mena, *A new high-performance sideband-separating mixer for 650GHz*, Proc. SPIE 9914, 99140G-99140G-11 (2016)