SUPERCONDUCTING HOT-ELECTRON BOLOMETER MIXER FOR TERAHERTZ HETERODYNE RECEIVERS

Alexei D. Semenov[a], Heinz-Wilhelm Hübers[a], Heiko Richter[a], Konstantin Smirnov[c], Gregory N. Gol'tsman[c], and Boris M. Voronov[c]

[a] DLR Institute of Planetary Research, 12489 Berlin, Germany
[c] Moscow State Pedagogical University, 119891 Moscow, Russia

A number of on-going astronomical and atmospheric research programs are aimed to the Terahertz (THz) spectral region. At frequencies above about 1.4 THz heterodyne receivers planned for these missions will use superconducting hot-electron bolometers as a mixers.

We present current results on the development of superconducting NbN hot-electron bolometer mixer and quasioptical radiation coupling scheme for GREAT (German Receiver for Astronomy at Terahertz Frequencies, to be used aboard of SOFIA) and TELIS (Terahertz Limb Sounder). The mixer is incorporated into hybrid antenna consisting of a planar feed antenna, which has either logarithmic spiral or double-slot configuration, and hyperhemispherical silicon lens. For the log-spiral feed antenna, the double side-band receiver noise temperature of 5500 K was achieved at 4.3 THz. The noise temperature shows less than 3 dB increase in the intermediate frequency band from 4 GHz to 7 GHz. The hybrid antenna had almost frequency independent and symmetric radiation pattern with the beam-width slightly broader than expected for a diffraction limited pattern. Results of FTS measurements in the direct detection regime agreed with the spectral dependence of the noise temperature for spiral antennas with different spacing of inner terminals.

Presenting author

Alexei Semenov
DLR Institute of Space Sensor Technology and Planetary Exploration
Rutherfordstrasse 2
12489 Berlin
Germany

Tel. +49 (30) 670 55-505
Fax +49 (30) 670 55-507
E-mail: Alexei.Semenov@dlr.de

Presentation form: Oral, if possible