Performance of the Planar AlGaN/GaN Bow-Tie Diodes Developed for Terahertz Detection

Justinas Jorudas[1], Liudvikas Subačius[1], Gintaras Valušis[1], and Irmantas Kašalynas[1]

[1]THz photonics laboratory, Optoelectronics department, Center for Physical Sciences and Technology (FTMC), Saulėtekio av. 3, LT-10257, Vilnius, Lithuania
Email: justinas.jorudas@ftmc.lt

A compact and sensitive terahertz (THz) detector with a fast response time is highly desired for the THz imaging systems operating at the room temperature. Unique physical properties of gallium nitride (GaN) have triggered a breakthrough for the next generation of the THz electronic components [1–3].

In this work, performance of the AlGaN/GaN bow-tie (BT) diodes developed for THz detection is reported. The BT diodes were developed on two $Al_{0.25}Ga_{0.75}N$/GaN high electron mobility transistor (HEMT) structures grown on semi-insulating SiC substrates. HEMT structures slightly differed in the 2DEG sheet resistance values: about 430 Ω/sq. and 330 Ω/sq. for the samples S1 and S2, respectively. The sub-THz performance was studied considering the variation of the apex width of the BT diode. Response was studied at discrete microwave (9-11 GHz) and sub-THz frequencies (150-600 GHz). The current voltage characteristics measured in dc- and pulsed regimes were also investigated. The results demonstrated a new potential of AlGaN/GaN HEMT structures for applications in sub-THz frequencies.

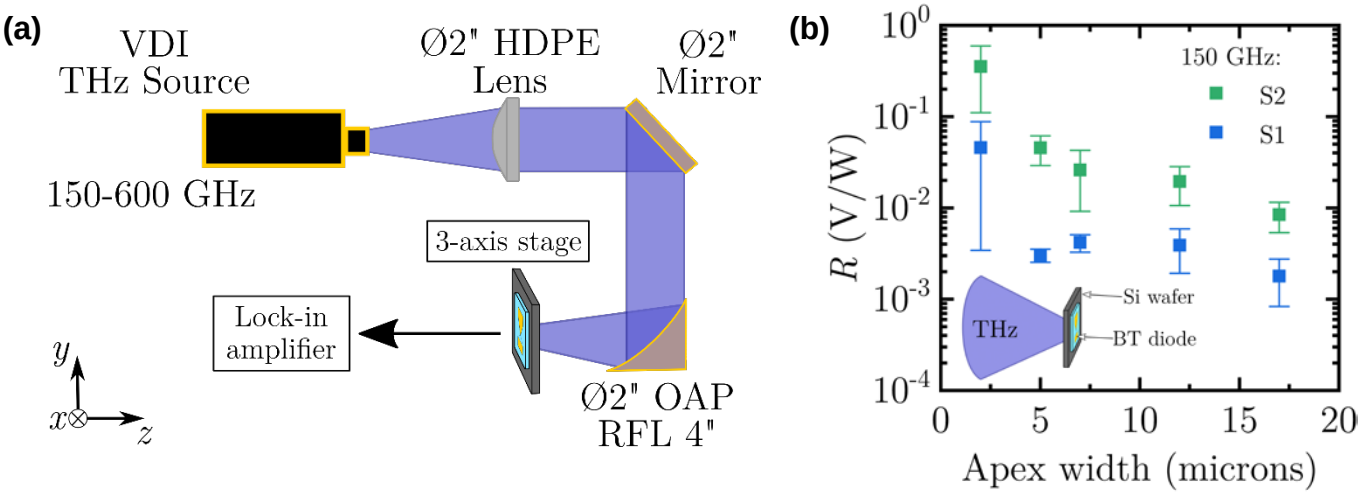

Fig. 1 **(a)** Setup of sub-THz detection experiment; **(b)** Responsivity *R* of the AlGaN/GaN BT diodes as a function of apex width at a frequency of 150 GHz.

ACKNOWLEDGEMENT

This research was supported by the Research Council of Lithuania (Lietuvos mokslo taryba) under the “TERAGANWIRE” project (Grant no. S-LL-19-1).

REFERENCES

[1] P. Sai et al., *Semicond. Sci. Technol.* **34**, (2019) pp. 024002. DOI: 10.1088/1361-6641/aaf4a7
[2] M. Bauer et al., *IEEE Trans. Terahertz Sci. Technol.* **9**, (2019) pp. 430-444. DOI: 10.1109/TTHZ.2019.2917782
[3] J. Jorudas et al., *44nd Int. Conf. Infrared, Millimeter, Terahertz Waves* (Paris, 2019).