S4-I1

Terahertz Beam Shaping with Diffractive Optics for medical applications with examination of scattering effects

Adrianna Nieradka[1], Rusnė Ivaškevičiūtė-Povilauskienė[2], Lukas Stacevičius[2], Mateusz Kaluza[1], Ignas Grigelionis[1], Gintaras Valušis[3], Linas Minkevičius[2] and Agnieszka Siemion[1,4]

[1]*Faculty of Physics, Warsaw University of Technology, Koszykowa 75, 00-662, Warsaw, Poland*
[2]*Department of Optoelectronics, Center for Physical Sciences and Technology, Saulėtekio Ave. 3, 10257 Vilnius, Lithuania.*
[3]*Institute of Photonics and Nanotechnology, Faculty of Physics, Vilnius University, Saulėtekio Ave. 3, 10257 Vilnius, Lithuania*
[4]*Center for Advanced Materials and Technologies CEZAMAT, Warsaw University of Technology, Poleczki 19, 02-822 Warsaw, Poland*
Email: agnieszka.siemion@pw.edu.pl

Terahertz (THz) radiation has emerged as a promising tool for non-invasive medical diagnostics, particularly in the context of skin cancer detection, owing to its sensitivity to water content and tissue composition. Skin tissue phantoms — controlled, repeatable models of biological tissue — provide a practical foundation for developing and validating THz-based diagnostic techniques prior to in vivo testing. Since scattering plays a critical role in the interaction of THz radiation with such heterogeneous biological media, a time domain spectroscopy together with specially designed in-reflection setup was used. Additionally for samples that are scattering not only spectroscopy but also a holographic approach was adopted to examine and characterize these scattering effects with high precision.

In case of in-reflection system diffractive optical elements (DOEs) offer compact and flexible solutions for THz beam shaping, enabling miniaturization of the optical setup [1]. For the holographic method a 4-step phase shifting algorithm was used to extract the phase information properly. The reconstruction methods allow determination of changes in the refractive index and absorption coefficient of the examined samples, supporting the characterization of tissue-mimicking phantoms for future THz diagnostics for dermatological applications.

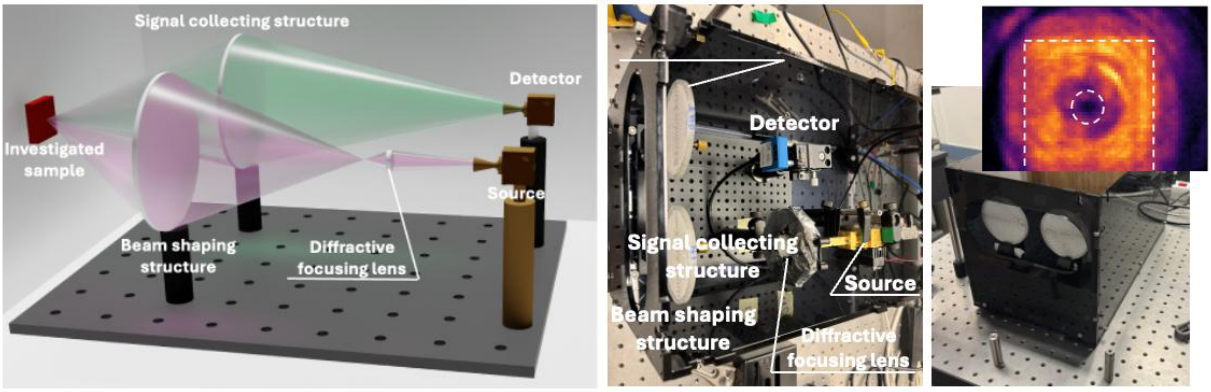

Fig. 1. Scheme of the in-reflection setup with it's photograph inside a demonstrator and exemplary scan.

REFERENCES

[1] A. Siemion; *Journal of Infrared, Millimeter, and Terahertz Waves* **40** (2019) pp. 477–499.