CENTERA

Analysis of basic characteristics and applications of terahertz radiation

The Centre is implementing a project entitled: „Center for Terahertz Research and Applications (CENTERA)". It was created to develop breakthrough technologies that use terahertz radiation (THz), such as rapid scanners and chemical composition analysers, which can be applied in various sectors of the economy and safety oversight. Practical application of THz radiation has not been previously possible because of the high costs and large size and energy consumption of existing THz transmiters and detectors. In order to introduce THz technology to the general market, CENTERA is conducting interdisciplinary research on possible ways of generating, emitting, processing, and receiving THz waves by systems based on well-known and cheap technologies for semiconductor equipment (transistors, integrated circuits).

Center for Terahertz Research and Applications

Prof. Wojciech Knap, PhD Hab. and Prof. Thomas Skotnicki, PhD Hab. Eng

Terahertz radiation, Dirac matter, terahertz vision, terahertz antennas, terahertz safety scanners and demonstrators

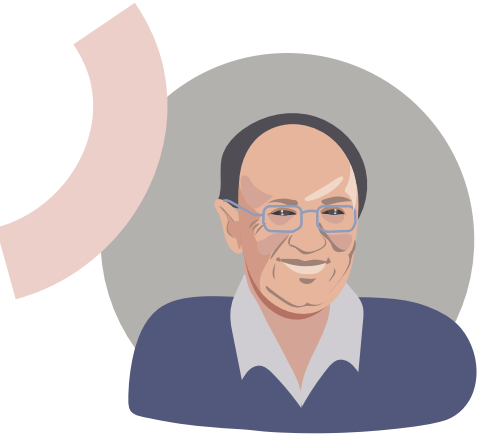
To study the basic and applied characteristics of terahertz radiation. To develop innovative terahertz equipment and technologies, and to generate interest among commercial partners in Poland and abroad

FNP Foundation for Polish Science

Quotes

THz waves have several very interesting characteristics, e.g. they easily penetrate most non-metal materials, such as plastic, paper, clothing, and wood, which makes them suitable for use in the analysis of the internal structures or composition of such items. Unlike X-rays and UV radiation, THz radiation is not dangerous for people or animals, and it propagates through the air, providing visibility under difficult weather conditions or communicating huge amounts of information. Therefore, in many scenarios it can replace X-rays or lead to some completely new applications – **Prof. Wojciech Knap, PhD Hab.**

We expect THz waves to have many exciting applications, e.g. in communication (to increase data transfer speed), in industry (for process monitoring and/or quality control), in safety (in visual systems for working in difficult weather conditions), and in security (for detecting potentially dangerous parcels) – **Prof. Wojciech Knap, PhD Hab.**



Prof. Wojciech Knap, PhD Hab. – graduated from the Faculty of Physics, University of Warsaw. For many years he has been associated with the University of Montpellier and the National Centre for Scientific Research (CNRS) in France. As part of the LIA-TERAMIR International Lab he has coordinated the activities of Terahertz Radiation Lab (TeraGaN) at the Institute of High Pressure Physics, Polish Academy of Sciences in Warsaw. He is the author and co-author of more than 200 articles in the international scientific journals, and author of several patents. Prof. Knap's scientific pursuits cover numerous fields, including the absorption and emission of terahertz light by free and trapped carriers in shallow dopant states, heterostructures involving GaN/AlGaN nitrides, plasma excitation in nanotransistors, and terahertz radiation of plasmonic structures.

Prof. Thomas Skotnicki, PhD Hab. Eng – he graduated from the Faculty of Electronics, Warsaw University of Technology, and teaches there. He obtained his PhD degree at the Institute of Electron Technology in Warsaw and postdoctoral degree at INPG (Grenoble). He is a world-class specialist in semiconductor devices and advanced microelectronic technologies. He has long-standing experience both as a scientist and as an entrepreneur. He has worked in the famous CNET research labs in France, and was the lecturer at the Ecole Polytechnique Federale in Lausanne (Switzerland), Institut Polytechnique de Grenoble (France), and SUPELEC in Rennes (France). He spent 19 years at Europe's leading electronics manufacturing company, STMicroelectronics, where he was Vice-President and Director for the Advanced Devices and Technologies Programme. He developed UTBB FDSOI, a leading CMOS technology at STMicroelectronics, implemented in Globalfoundries Dresden and in SAMSUNG. Author and co-author of 350 scientific articles, holder of over 85 patents. He is an IEEE Fellow and an STMicroelectronics Company Fellow.

Interesting facts

Terahertz waves have previously been used mainly by astronomers to observe distant parts of the Universe. But terahertz radiation can also be used to scan materials, such as plastic, paper, and fabrics, and to communicate information faster than the current 4G. Future 5G and 6G wireless communication will use terahertz waves as information media.

THz waves were first used for biological object imaging 25 years ago. The scanned object was a leaf, and the image showed its veins for transporting water, and the process of water loss/absorption during drying/watering. Today we know that THz waves can be used, e.g., to see how fat tissue levels change, and to distinguish between the normal and abnormal ones.

Project partners:
Goethe University Frankfurt (GUF, Germany), Institute of Electronics, Microelectronics and Nanotechnology (IEMN, France), Terahertz Centre Regensburg, KTH Royal Institute of Technology Stockholm; University of California, Riverside; ITMO University in Petersburg, Charles Coulomb Laboratory and the University of Montpellier (France), RIKEN THz Center (Japan), Tohoku University in Sendai (Japan), Osaka University (Japan)

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