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## Title of the lecture: Quantum Nanostructures for Terahertz Devices and Applications

**Abstract**
Terahertz (THz) waves refer to the electromagnetic radiation in the frequency range from 0.1 to 10 THz, which corresponds to the wavelengths from 3 mm to 30 μm, respectively. This spectral region, called also as "T-gap", is important for many practical applications, including THz imaging, chemical and biological sensing, high-speed telecommunication, security and medical applications. Here we report the results of a numerical study of quantum transport in ZnO-based resonant-tunneling diodes (RTDs) and quantum cascade lasers (QCLs) with different design schemes. We found that by varying and optimizing constituent layer widths and doping level these quantum structures, high power performance of THz RTDs and QCLs can be achieved at room temperature. Moreover, it was established also that the ZnO-based terahertz sources can cover the spectral region of 5-12 THz, which is very important for THz imaging and detection of explosive materials, and which could be not covered by conventional GaAs-based terahertz devices.

**Acknowledgments**
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**Reference:**
[1] V.P. Sirkeli, and H.L. Hartnagel, Opto-Electronics Review 27, 119-122 (2019).

**Biography**
Prof. Dr. Vadim Sirkeli (1978) received the Dipl. Phys. degree and the Ph.D. degree in semiconductor physics and engineering from Moldova State University, Moldova, in 2000 and 2005, respectively. From 2005 to 2016 was a Post-Doctoral Researcher, Senior Researcher and Associate Professor with University of Turku (Finland), Moldova State University and Comrat State University (Moldova). From 2016 to 2018 he has been the Alexander von Humboldt Fellow in the Institute for Microwave Engineering and Photonics, Technische Universität Darmstadt, Germany. Currently is an Associate Professor at the Faculty of Physics and Engineering, Moldova State University, Moldova, leading the Terahertz Technology Group. He has authored or coauthored more than 50 journal papers and conference contributions. His research interests include the development of semiconductor-based THz sources and detectors, including resonant tunneling diodes and quantum cascade lasers.