

**Conférence, 25 Mars à 10h30  
Salle F200**

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**Investigation of Emission and Capture Processes in HEMT Structures  
Based on GaN by Deep Level Transient Spectroscopy**

Gallium nitride is a potential candidate to replace silicon in many fields, such as power and RF electronics. As the research progresses, new areas are explored, e.g. vertical transistors, with some properties better than standard High Electron Mobility Transistors (HEMTs). For these applications, high quality layers and interfaces are required. Fabrication technologies are imperfect and introduce many defects that have significant impact on the devices electrical properties. The relaxation phenomenon, such as emission processes, must be identified and understood for future device improvement. The standard Deep Level Transient Spectroscopy (DLTS) is one of the classical methods used to study the emission and capture processes in barrier structures. It is a spectroscopic, non-destructive, and highly sensitive method. It can identify the most important electrically active defect parameters: the activation energy and the capture cross-section. This analysis plays a key role in the semiconductor materials and device research, since it supports an optimization of device fabrication technologies. The aim of this seminar is to explain the emission and capture processes on deep levels in the barrier semiconductor structures with focus on the mysterious GaN. The basic principles of the standard Deep Level Transient Spectroscopy (DLTS) will be discussed and compared with modification DLTS method – the Deep Level Transient Fourier Spectroscopy (DLTFS) as a one of digital DLTS methods. We will point out the strength and weakness of DLTFS to stress the unique approach of this methodology. Furthermore, we will discuss the limiting factors of reliability and methodical challenges in terms of complicated structure analysis. The last but not least will be summarized results of DLTFS study of charge emission and capture processes in HEMT structures based on GaN investigated on the Institute of Electronics and Photonic, the Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava.

**Biography**

Prof. Ľubica Stuchlíková graduated from the Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava (STU) in 1990, received the PhD degree in 1996 and was appointed associate professor in 2006. Since 2016 she works as a full professor at the Institute of Electronics and Photonics. Her fields of interest have been constantly widening during her career; electrical characterization of semiconductor structures, devices and materials (Si, Black Silicon, GaAs, InGaAsN, GaN, SiC, organic semiconductors) and semiconductor defects characterization (Deep Level Transient Spectroscopy) since 1990, computer aided engineering education, retraining, lifelong learning since 2000 and gamification and design of education games since 2011.