

# S e m i n a r

## “Gunn Diode Oscillations in Time-Delay Circuits: Chaos, Trains of Pulses, and Hysteresis of Excitation”

**Speaker: Prof. Dr. Vladimir Yurchenko**

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Institute of Radiophysics and Electronics of the National Academy of Sciences of Ukraine,  
Kharkov, Ukraine  
&  
TUBITAK Visiting Scientist at the Gazi University, Ankara, Turkey

### **Part 1:**

GHz & THz radiation sources. Physics of Gunn diodes and oscillators. Modes of oscillations. Extended microwave circuits. Dynamical chaos, power combining, and time-delay issues.

**Room: 326 (Seminar Room)**

**Time: 15:00, February 20, 2014 (Thursday)**

### **Part 2:**

Diversity of time-frequency effects. Zero-impedance excitation condition. Emergence of trains of high-frequency pulses. Hysteresis and bistability of switching and excitation

**Room: 326 (Seminar Room)**

**Time: 15:00, February 27, 2014 (Thursday)**

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### **Abstract**

New effects of nonlinear excitation of active GHz and THz devices (specifically, Gunn diodes) will be presented that have been studied through computer simulations of extended microwave circuits (series or parallel networks of transmission lines with active devices) under the conditions of time-delay feedback.

New modes of oscillations will be considered that emerge due to time-delay coupling and could be used for potential applications, e.g., power combining, short-pulse generation, broadband dynamical chaos, etc.

Specific properties of time-delay oscillators will be discussed such as diversity of time and frequency effects, conditions for non-conventional regimes of oscillations, generation of trains of high-frequency pulses, hysteresis and bistability of switching and excitation.

***Prof. V. Yurchenko***  
***Short Biography & Research Interests***

**Degrees:** MSc, 1980 – Kharkov Polytechnical Institute, Kharkov, Ukraine, USSR  
PhD, 1984 – Kharkov Polytechnical Institute, Kharkov, Ukraine, USSR  
DSc, 1994 – Institute of Radiophysics and Electronics of the National  
Academy of Sciences of Ukraine (IRE NASU), Kharkov, Ukraine

**1980-1995:** Kharkov State Polytechnical Institute, Kharkov, Ukraine, USSR,  
later called: National Technical University “KhPI”, Kharkov, Ukraine

Theory of Semiconductors & Electronic Devices. Hot-Electron Transport & Instabilities.  
Photovoltaics & Thermoelectrics.

**1996-1999:** EEE Dept, Bilkent University, Ankara, Turkey &  
IRE NASU, Kharkov, Ukraine

High-Frequency Electromagnetics & Electronic Devices. EM Wave Propagation, Scattering, and  
Diffraction. Nonlinear Dynamics of Electronic Systems.

**2000-2007:** National University of Ireland, Maynooth, Ireland &  
IRE NASU, Kharkov, Ukraine

Simulations of antenna beams of dual-reflector sub-mm-wave radio telescope on the ESA  
PLANCK Surveyor, a deep-space satellite for measuring temperature and polarization of the  
Cosmic Microwave Background.

**2008 - p.t.:** IRE NASU, Kharkov, Ukraine &  
Gazi University, Ankara, Turkey

Microwave Technology and Electronic Devices. Quasi-Optical GHz & THz Components.  
Active Devices & Photonic Structures for GHz & THz Beam Processing. Electromagnetic  
Material Characterization.