

French-Russian Seminar.
Sources and detectors of terahertz radiation based on semiconductor nanostructures.

5th and 6th June 2007.
Laboratoire des Champs Magnétiques Pulsés, Toulouse.

Objectives of the seminar:

One important nowadays challenge of solid state physics and technology is related to so called "Terahertz gap". In terms of the frequency of electromagnetic radiation this gap extends from 0.3 THz to 10 THz. This frequency region still lacks of convenient compact solid state devices that could emit or detect THz radiation in a selective and/or tunable way. Such sources are necessary for emerging applications such as THz medical imaging, chemical and biological sensing, wide-band telecommunications systems, etc.

The "Terahertz gap" can also be seen as a frontier between optics and electronics. The cut-off frequency of nanometer transistors was recently pushed up to a few hundreds GHz and the THz limit becomes realistic for electronic devices. From the high frequency (optics) side the semiconductor lasers (quantum cascade lasers) show possibility of the efficient operation not only in traditional 30 THz range but also in the frequency down to 2-4 THz range.

The main objective of the seminar is to intensify the scientific collaboration between French and Russian research groups in the field of terahertz response of semiconductor nanostructures. The seminar is conceived with the purpose to merge the competences of different scientific teams, to exchange ideas, to discuss the results of the experiments already carried out as well as to plan future joint studies with the exchange of experimental means between French and Russian teams and between adjacent sub-domains of THz research. It is focused on stimulating information exchange and collaborations including exchange research visits of scientists and PhD students.

5th June 2007

9H15 **Opening**

THz Detection

- 9H30 Plasmon enhanced electron drag and terahertz photoconductance in a grating-gated field-effect transistor with two-dimensional electron channel.
G. R. Aizin,¹ **V. V. Popov**,² O. V. Polischuk²
(¹Kingsborough College University of New York, ²Saratov Division of IRE RAS)
- 9H50 Hot electron bolometer mixers and ultrafast detectors for terahertz frequency range.
Gregory Gol'tsman (MPSU, Moscow)
- 10H10 The frequency and power investigations of terahertz radiation with help of nonstationary Josephson effect in high-T_c superconductors.
L.N. Zherikhina, A.M.Tskhovrebov, V.N.Murzin (Lebedev Institute, Moscow)
- 10H30 THz detection by nanotransistors.
Frederic Teppe (GES, Montpellier)
- 10H50 **Pause**

- 11H30 Coherent detection of terahertz radiation with non-resonant antennas.
S. Winnerl, F. Peter, S. Nitsche A. Dreyhaupt, O. Drachenko, H. Schneider, and M. Helm, K. Köhl, (FZD, Dresden),
- 11H50 Integration of quantum wells structures into a p- type silicon BIB structure for THz detection.
Thomas Fromherz, (ISSP, Linz)
- 12H10 THz Blocked Impurity Band Detectors.
Jean Léotin, (LNCMP, Toulouse)
- 12H30 **Lunch**

THz Emission

- 15H00 THz generation by Quantum Cascade Lasers.
Carlo Sirtori, (Thales, Université D. Diderot)
- 15H20 Picosecond's kinetics of photocarriers in GaAs with aluminum nanoclusters
V.Ya.Aleshkin, **Z.F.Krasil'nik**, D.I.Kuritsyn (IPM RAS, Nizhny Novgorod)
- 15H40 THz response of GaAsN and GaAs/AlGaAs nanostructures.
D.A.Firsov, (Saint Petersburg State Polytechnic University).
- 16H00 Molecular beam epitaxial growth of the Sb-and As-based III-V nanoheterostructures for applications in the terahertz and mid-IR spectral ranges
A.N. Semenov, V.A. Solov'ev, B.Ya. Meltser, O.G. Lyublinskaya, Ya.V. Terent'ev, S.V. Ivanov (Ioffe Physico-Technical Institute, St. Petersburg)
- 16H20 **Pause**
- 16H50 THz emission from nanotransistors.
Wojciech Knap, (GES, Montpellier)
- 17H10 Terahertz emission in resonant-tunneling superlattices under vertical electric fields
S.A.Savinov, N.V. Dyakonova+, O.A.Klimenko, W.Knap+, Yu.A.Mityagin, V.N. Murzin,(P.N.Lebedev Institute, Moscow,+ GES Montpellier)
- 17H30 THz activity at IRE Russian Academy of Sciences
M. Kagan (Institute of Radio Engineering and Electronics-Laboratory of non-equilibrium electronic processes in Semiconductors, Moscow, Russia)
- 17H50 IEMN technological facilities for THz applications
Sylvain Bollaert (IEMN-DHS, Université de Lille 1, Villeneuve d'Ascq)

6th June 2007

THz Spectroscopy

- 9H30 Resonant tunneling in weakly coupled superlattices in transverse magnetic fields.
V.N. Murzin, Yu.A. Mityagin (Lebedev Institute, Moscow).
- 9H50 Cyclotron resonance of 2D electrons and holes in high magnetic fields.
Vladimir Gavrilenko (IPM RAS, Nizhny Novgorod).

- 10H10 THz spectroscopy of the electron subbands in AIP QWs under high pulsed magnetic fields.
Michel Goiran, (LNCMP, Toulouse).
- 10H30 The impact of a donor and/or acceptor strength of the pi-electron molecular systems on the THz range transitions efficiency and nonlinear-optical response..
Alexander Shkurinov (Lomonosov MSU, Moscow).
- 10H50 **Pause**
- 11H30 **Visit of the LNCMP facility.**
- 12H15 **Lunch**
- 14H30 **Round table and closing session**