Tohoku University
RIEC Seminar
90th Nano-Spin Engineering Workshop
- Distinguished Lectures in the Field of Terahertz Semiconductor Plasmons by Prof. Knap

Date&Time: 14:30 pm - 17:30 pm
Dec. 12th (MON), 2016

Venue: A401 Room, Nano-Spin Laboratory Building 4F
RIEC: Research Institute of Electrical Communication, Tohoku University
2-1-1, Katahira, Aoba-ku, Sendai, 980-8577 Japan

Lecturer: Professor Wojciech KNAP
Visiting Professor at RIEC, Tohoku University
on leave from Charles-Coulomb Laboratory, CNRS-Univ. Montpellier II, France

Short Biography: Prof. Wojciech Knap got his Ph.D in 1985 at Univ. Warsaw, Poland, and Habilitation in condensed matter physics in 1997 at Univ. Montpellier II, France. After accumulating academic carriers in Poland and France, he joined CNRS-Univ. Montpellier II, France in 1992, having been a Research Director since 2001. He was awarded as a JSPS Research Fellow and spent a year at Tohoku University in 2007-2008. His main scientific interests are : i) Terahertz properties of semiconductors, ii) Quantum phenomena in transport and iii)Terahertz Plasmons in low dimensional structures. He authored and co-authored more then 100 peer-reviewed journal papers (h-index: above 35).

Program:

14:30 - 15:45 **"2-dimensional plasmons in semiconductor heterostructures -Device physics and THz applications"**

ABSTRACT: 2D plasmons, quanta of the collective charge density waves of the 2D electrons, in semiconductor heterostructures like a quantum-well channel in a high-electron mobility transistors (HEMTs) exhibits interesting nonlinear behaviors due to their hydrodynamic properties. They give various interesting dynamics like rectifications as well as instabilities as a result of its functions that can couple the THz radiation with the current-voltage characteristics in nonlinear natures. The lecture gives fundamentals of the 2D plasmon physics and their dynamics to be practially exploitable to various THz functional devices.

15:45 - 16:00 **(Coffee Break)**

16:00 - 17:15 **"Field Effect Transistors for Terahertz Detection: Physics and Industrial Imaging Applications"**

ABSTRACT: Resonant frequencies of the two-dimensional plasma in FETs increase with the reduction of the channel dimensions and can reach the THz range for sub-micron gate lengths. Nonlinear properties of the electron plasma in the transistor channel can be used for the detection and mixing of THz frequencies. At cryogenic temperatures resonant and gate voltage tunable detection related to plasma waves resonances, is observed. At room temperature, when plasma oscillations are overdamped, the FET can operate as an efficient broadband THz detector. We present the main theoretical and experimental results on THz detection by FETs in the context of their possible application for industrial THz imaging instrumentaions.

17:15 - 17:30 **Wrap-up and Closing**

Organizer: RIEC Nano-Spin Engineering Workshop Committee, Tohoku University

Contact: Taiichi Otsuji, Professor
RIEC, Tohoku Univ.
TEL&FAX 022-217-6104
Email otsuji@riec.tohokua.c.jp