

「二次元電子系のプラズマ物理とテラヘルツナノデバイス応用」に関するセミナーのご案内

各位、

時下ますますご清祥のこととお慶び申し上げます。

電気通信研究所客員教授として本学滞在中の、Vyacheslav POPOV 教授、ならびに、日本学術振興会海外招へい研究者として本学滞在中の Abdelouahad El Fatimy 博士を講師として、以下の日程で「二次元電子系のプラズマ物理とテラヘルツナノデバイス応用」に関するチュートリアル&セミナーを開催することとなりました。目覚ましい進展を遂げている本分野の基礎から研究の最前線までを初学者にもわかりやすくご講演いただく予定です。つきましては、本分野にご興味をお持ちの学生、研究者、教職員の皆様におかれましては、多数ご参加をいただきますよう、お願い申し上げます。

講師：

1. RIEC Visiting Prof. Vyacheslav POPOV (Prof. Salatov Univ., Russian Academy of Science)
2. JSPS Research Fellow, Dr. Abdelouahad El Fatimy (CNRS, Univ. Boldeaux, France)

言語：英語

日時：2009年2月12日(木) 10:00～17:00

会場：電気通信研究所 2号館 4階大会議室

プログラム

午前の部

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1. Tutorial by Prof. V. Popov 10:00～11:00

Title: Electrodynamics of Plasma Oscillations in Micro-Structures and Micro-Devices with Two-Dimensional Electron Channels

Abstract: Physical properties and potential applications of two-dimensional (2D) plasma oscillations in microstructures and microdevices will be discussed. It will be explained why the electromagnetic effects are important in such structures. Theoretical electromagnetic approach, which can be used for modeling the plasmonic phenomena in different types of microstructures and microdevices, will be outlined. Basic features of terahertz plasma oscillations in diode and transistor devices with 2D electron channels will be considered. Unusual damping mechanism of plasmons due to the intermode plasmon-plasmon scattering will be discussed. The band structure of plasmonic spectra in spatially periodic systems will be addressed. It will be shown that plasmonic effects can be considerably enhanced in periodic arrays of plasmonic-device units and in large-area grating-gate plasmonic structures. The condition for strong coupling between the plasmon and electromagnetic (terahertz) radiation will be formulated and discussed.

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2. Seminar by Prof. V. Popov 11:15～12:15

Title: Terahertz Photoconductivity in Grating-Gated and Density-Modulated Two-Dimensional Electron Channels

Abstract: It is known that hydrodynamic non-linear electronic effects in two-dimensional (2D) electron systems may be resonantly enhanced by exciting plasma oscillations, which can be used for detection, generation, and frequency conversion of terahertz radiation. In large-area plasmonic structures, all players in this non-linear arena involving terahertz wave, plasmons, and electrons interact in coherent way over long distances, which brings a new flavor into the non-linear phenomena. At this seminar two new plasmon-assisted mechanisms for terahertz photoconductivity will be discussed. The first mechanism is due to the electron drag by 2D plasmons excited in a large-area grating-gate structure by incoming terahertz radiation. This mechanism is active in both homogeneous and spatially modulated 2D electron plasma. The second mechanism to be considered at this seminar is caused by the electrostriction effect in spatially periodic 2D electron plasma. It is shown that the latter mechanism can produce much more sensitive detection of terahertz radiation.

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お昼休み

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午後の部
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3. Seminar by Dr. A. El Fatimy 15:00 ~ 16:30

Title: Field Effect Transistors for Terahertz Detection/Emission:physics and first imaging applications

Abstract: The physics and first imaging application of the field effect transistors working at THz range are presented. Resonant frequencies of the two-dimensional plasma in field effect transistors increase with reduction of the channel dimensions and can reach the terahertz (THz) range. They are shown to be responsible for resonant and voltage tuneable detection/emission in sub-THz and Terahertz range. Also, non-resonant/damped or over-damped plasma can be active in Terahertz range providing a new efficient mechanism of the broadband detection. This work presents main theoretical and experimental results on THz detection/emission by field effect transistors in the context of their possible application for THz imaging.
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