

Research and Development of Terahertz Spectroscopic Techniques Using Femtosecond Lasers

Masahiko Tani

Research Center for Development of Far-Infrared Region, University of Fukui, 3-9-1 Bunkyo, Fukui 910-8507, Japan

E-mail: tani@fir.u-fukui.ac.jp

The Terahertz Science Research Group [1] in Research Center for Development of Far-Infrared Region, University of Fukui (FIR UF), has been working on research and development for terahertz (THz) spectroscopy from 2008.

In this paper, the author summarize their recent research activities and collaborative researches with other research groups. The research topics to be presented are listed below:

- i) Focusing of THz waves beyond diffraction limit by using tapered parallel plate waveguides
- ii) Electro optic (EO) sampling of THz waves in non-collinear phase matching scheme
- iii) Study of photoconductivity by sub-bandgap optical excitation and its application to photoconductive sampling of THz waves
- iv) Spintronic THz emitters
- v) Optical-pump and THz probe spectroscopy of semiconductors and composite materials
- vi) Nonlinear THz frequency conversion
- vii) THz time-domain coherent Raman spectroscopy
- viii) High-frequency resolution THz spectroscopy of gaseous molecules

In the last several years, the research group is especially devoted for development of emitters and detectors, which can be used in the THz time-domain spectroscopy with 1.55- μm optical pump, since at this communication wavelength cost-effective and stable fs-fiber lasers are available as the pump light source. For some of the above research topics, the details of the recent results will be illustrated.

Reference

- [1] The group's homepage: <http://fir.u-fukui.ac.jp/thzlab/en/home.html>

Masahiko TANI

Scientist Profile:

Professor and Director of Research Center for Development of Far-Infrared Region, University of Fukui
President of Terahertz Technology Forum , Japan
Executive board member of the Spectroscopical Society of Japan



1987 Graduated from Kyoto University (Department of Physics Engineering)

1989 MD from Kyoto University in Engineering

1992 Ph.D. from Kyoto University in Engineering

1992 Research Official with Kansai Advanced Research Center (KARC), Communications Research Laboratory, Japan

1997 Senior Research Official with Kansai Advanced Research Center, Communications Research Laboratory, Japan

2000 Associate Prof. with Research Center for Superconductor Photonics, Osaka University

2004 Associate Prof. with Institute of Laser Engineering, Osaka University

2008 – present Prof. with Research Center for Development of Far-Infrared Region, University of Fukui

2014 – present Director of Research Center for Development of Far-Infrared Region, University of Fukui