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**1. BASICS: THZ SPECTRUM AND INTERACTION WITH MATTER (MASTER LEVEL)**

In the first lecture, a general introduction on THz science and applications will be given. The interest in studying this part of the electromagnetic spectrum will be justified. The basic properties of the interaction of THz waves with matter will be described, including molecules, metal and semiconductors, as well as dielectrics.

**2. A REVIEW OF THZ SOURCES AND DETECTORS**

A big issue to transfer THz science from the laboratories to industry and daily life is related to the lack of efficient, compact and reliable sources and detectors. Therefore, many devices and new solutions are explored, and it is quite difficult to compare them and to know which one will be the most promising. During this lecture, an overview of the main sources and detectors will be presented. The lecture will not talk about time-domain devices and systems that will be addressed during lecture 3.

**3. TERAHERTZ TIME-DOMAIN SPECTROSCOPY**

This is certainly the more popular THz technique, at least in research laboratories. The lecture will start with the description of sources and detectors of THz pulses. It will be followed by the principle of terahertz time-domain spectroscopy (THz-TDS), and then with the performances and limitation of the technique. Examples of characterization of materials and devices will be given.

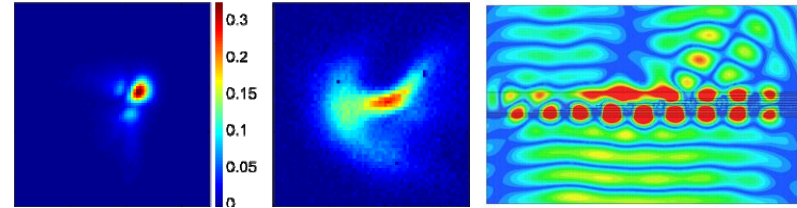
**4. THZ AND METALS; ELECTRO-OPTIC SAMPLING**

This lecture is twofold. In a first part, the focus will be on interaction between metals and THz waves. Especially, nonlinear optical equations in metals resemble the ones describing 2D-electron dynamics in nanotransistors developed in Prof. Otsuji lab at RIEC. In a second part, the technique and applications of electro-optic sampling will be presented.

**5. THZ RESEARCH ACTIVITIES AT UNIVERSITY OF SAVOIE**

During this last lecture, the activities related to Terahertz Optoelectronics performed at University of Savoie, France, will be presented. Today, these researches include THz-TDS of absorbing materials, THz metamaterials, surface plasmons, scattering by heterogeneous materials, diffractive optics... The lecture will end by a presentation of the works performed in the common Japan-France JST-ANR project WITH.

## TERAHERTZ ELECTROMAGNETIC WAVES: SOME FEATURES OF CURRENT RESEARCH



Lecture 1: May 2, 15:30 ~ 17:30

Lecture 2: May 7, 15:30 ~ 17:30

Lecture 3: May 10, 15:30 ~ 17:30

Lecture 4: May 14, 15:30 ~ 17:30

Lecture 5: May 16, 15:30 ~ 17:30

Place: Research Institute of Electrical Communication,  
Nanospin building, Room A508