PhD Offer
(IETR/IPR, Rennes, France)

**Optically-Reconfigurable Transmitarray Antennas at Millimeter Waves**

- **Key words**
  Transmitarray antennas, Reconfigurable antennas, Optical control

- **Context and overview of the problem**
  Transmitarray antennas have become very popular for a plethora of millimeter-wave applications (like in Ka-band around 20/30 GHz for satellite communications and broadband internet access, or ultra-high speed point-to-point links and heterogeneous wireless networks in the 60- and 70/80-GHz bands); they offer unique advantages in terms of performance and flexibility. Transmitarrays are formed typically by an arrangement of half-wavelength unit-cells which collimate the radiation of a focal source by locally shifting the phase of the transmitted waves. If this phase shift is controlled electronically, a reconfigurable antenna is obtained with beam-forming and beam-steering capabilities.
  Nevertheless, for many applications, especially at very high frequencies, integrating and routing the bias lines to control *electrically* the transmission phase becomes extremely challenging at millimeter waves, even impossible. For this reason, alternative control solutions must be invented.
  The solution selected here consists in integrating optically-controlled photoconductive microwave materials in the unit-cell to control its transmission phase, thus the radiation performance of the entire antenna array. IETR ([www.ietr.fr](http://www.ietr.fr)) and IPR ([https://ipr.univ-rennes1.fr/](https://ipr.univ-rennes1.fr/)) have been cooperating on this ambitious and challenging research project for several years in tight collaboration with Drexel University, Philadelphia, USA.

- **Description of work**
  The aim of this PhD project is to carry on with the design, optimization, prototyping and characterization of advanced unit-cells and optically-reconfigurable transmitarray antennas at millimeter waves. The thesis is organized into four main steps:
  - Detailed bibliography study on optically-reconfigurable antennas and interaction laser matter,
  - Design and characterization of advanced transmitarray unit-cells,
  - Design and characterization of a fully reconfigurable transmitarray antenna with integrated optical control of the antenna performance for multiple beam and beam shaping applications,
  - Investigation of possible new alternatives.

- **Candidate profile**
  The PhD candidate should hold a Master degree (M2R) or an equivalent title recognized by the doctoral school MATISSE ([http://matisse.ueb.eu/eng/](http://matisse.ueb.eu/eng/)), in electrical engineering (microwaves) with good competences in optics. In particular, the candidate should master electromagnetic theory, microwave theory, antennas and circuit analysis, semiconductor physics, fiber optics, and should have basic knowledge in laser physics. A good level of spoken and written English is required.

- **How to apply?**
  Interested candidate should send a detailed CV, a motivation letter, a recommendation letter by email to:
  ➞ Ronan SAULEAU, IETR ([www.ietr.fr](http://www.ietr.fr)), université de Rennes 1 (Ronan.Sauleau@univ-rennes1.fr)
  
  Deadline to apply: May 31, 2016