Postdoctoral Fellowship

At the Institute of Electronics and Telecommunications of Rennes (IETR), France

NOVEL ANTENNA ARCHITECTURES FOR HIGH SPEED WIRELESS AT 300 GHZ

Project context

A more efficient use of the available spectrum does not suffice to reach the bandwidths (BWs) of several tens of GHz required by future wireless systems. Thus, the use of the ***275-350 GHz frequency range*** is the ***key to enable ultra-large BW wireless***, owing to the following advantages: *a)* it has not yet been allocated; *b)* it presents atmospheric attenuation windows, which enable mid-range links and small cell deployment; *c)* the short wavelengths favor integration and packaging; and *d)* THz links are less susceptible than optical wireless to air turbulence and humidity, fog, smoke, and rain.

The main challenge in THz wireless communications consists in ***designing low-profile high-gain antennas efficiently coupled to continuous-wave THz sources at room temperature***, to compensate for the propagation loss. Moreover, ***appropriate radiation patterns*** must be tailored for the antennas ***according to the needs of each THz wireless system***.

The ***carrier in the transmitter will be generated using optical heterodyning*** by mixing two optical wavelengths on a photodiode, which presents an output electrical signal in the THz range, equal to the wavelength spacing of the two optical tones. This ***photonic approach is particularly convenient for communications due to its wide bandwidth, tunability and stability***. It also allows one to stablish a direct bridge between 1.55µm data flows in optical fibers and THz radio.

Objectives of the fellowship

First, we will investigate the ***efficient radiation of the photocurrent generated in the photodetector, overcoming the impedance mismatch between antenna and photomixer***. Our goal will be to obtain conjugate matching for broad bandwidths. In photodetectors integrated with planar wideband antennas, we will explore multilayer structures. As an alternative, we will study planar-circuit to rectangular waveguide (RW) transitions. Second, ***appropriate radiation patterns must be tailored for the antennas in each THz wireless system***. For instance, directive pencil beams will suffice for point-to-point links, whereas small cells will demand broader angular cover-age. Hence, ***we will pursue photoconductive antenna arrays with agile radiation patterns***.

Last but not least, special attention must will be paid to ***finding the most appropriate materials and fabrication techniques*** for the photoconductive antenna arrays. The manufactured ***prototypes will be measured*** in the newly established space at IETR for testing this class of antennas.

Contract

Duration: 18 months. *Approximate net salary*: 2100€/month.

Candidate

Required education level: Ph.D. degree.

Required background: antenna theory, microwave engineering, numerical modeling, periodic structures.

The candidate must have worked ***at least 12 months outside France during the last 3 years***, as required by Britany Region.

Deadline to apply: as soon as possible.

Contact persons

To apply please send your motivation letter, CV, and two reference letters by email to:

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Due to the large number of received applications, we will contact only the short-listed candidates