



PhD THESIS

COMPACT AND WIDEBAND ANTENNA SOLUTIONS FOR NEXT GENERATION WIRELESS NETWORKS IN MM-Band

- **Laboratory**

- Institut d'Électronique et de Télécommunications de Rennes (IETR), UMR CNRS 6164. Rennes, France. www.ietr.fr
 - Département 'Antennes et Dispositifs Hyperfréquences' – Equipe BEAMS (Beam Antenna Arrays up to Millimeter and Submillimeter Waves)

- **Doctoral school:** MATISSE (<http://matisse.univ-rennes1.fr/>)

- **Keywords**

Connected arrays, wideband antennas, continuous transverse stub (CTS).

- **Context and overview of the problem**

Providing broadband wireless mobile communications to connect people, contents, clouds and things through the future Internet is a major objective of the Digital Agenda for Europe at the horizon of 2020.

The goal of the present PhD will be to address the analysis and design of wideband band multi-beam / beam scanning antennas to be used in next generation Satellite communications systems in Ka-band.

The technology of choice will be the Continuous Transverse Stub (CTS) [1] array. It is based is an array of broad continuous transverse radiating stubs, finite in height, extending from the upper conductive plate of an open parallel-plate transmission-line structure, and internally excited by a generic linear source. It offers outstanding performance with no other competing solutions in terms of bandwidth and scanning capabilities. The fabrication of such antenna systems involves advanced Printed Circuit Board technologies (multi-layer stack-up with SIW structures for instance). Less complex wideband antenna architectures will be also investigated during the PhD, especially those using quasi-optical beam forming networks in SIW technology (Rotman lenses, pillbox couplers, etc.).

- **Main goals**

The PhD project addresses three major goals:

- ⇒ To investigate and extend a Green's function approach developed at IETR for the analysis and design of CTS array. Losses, active reflection coefficient and scanning capabilities should be assessed.
- ⇒ To investigate the scanning capability and suitability of such antenna for next generation cellular networks and its integration in the overall systems based on the network requirements.
- ⇒ To prototype and validate experimentally the numerical results. Advanced PCB technologies and 3D printing will be envisaged for the manufacturing.

- **Location and supervision**

The PhD project will be held at the IETR, Rennes. The main supervisor of the PhD student will be Mauro ETTORRE IETR, CR1 CNRS (mauro.ettore@univ-rennes1.fr) and Ronan SAULEAU, IETR, Professor (Ronan.Sauleau@univ-rennes1.fr).

- **Candidate profile**

The PhD candidate should hold a MSc degree M2R in electrical engineering, physics or an equivalent title recognized by the doctoral school MATISSE. In particular, he should master electromagnetic theory, physics, mathematics, and circuit analysis. A good level of spoken and written English is required.

- **How to apply?**

Interested candidate should send a detailed CV, motivation letter and reference letter by email to Mauro ETTORRE (mauro.ettore@univ-rennes1.fr) and Ronan SAULEAU (ronan.sauleau@univ-rennes1.fr).

- **Example of references**

[1] W. W. Milroy, "The continuous transverse stub (CTS) array: basic theory, experiment, and application," Proc. 1991 Antenna Applications Symp., Rome Lab NY, 1991.