

Post-Doctoral Position

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

ACTIVE ARRAY OF QUASI OPTICAL BEAMFORMERS

Context

The Institute of Electronics and Telecommunications of Rennes (IETR) in collaboration with THALES ALENIA SPACE (TAS-F) have developed a valuable know-how in the field of quasi-optical beam formers (QOBF). Antenna architectures based on these QOBF have been already proposed for civil and military missions. A bidirectional beamformer made from pillbox couplers in 'Substrate Integrated Waveguide' technology has been designed and validated, which is already patented jointly by TAS-F and IETR. This beamformer has been combined with an active network and an optical system with two reflectors, making it possible to increase the radiating aperture, and thus, to produce very directive beams.

These interesting properties have been investigated in the emerging context of Ka-band satellite constellation systems, requiring on-board antennas with large number of beams as well as low-profile terminal antennas allowing significant beam steering. Several lens-type beamformers have been developed and have resulted in mock-ups and three joint patents by TAS-F and the IETR. Bricks of complementary bases have been identified, which must be developed: polarizer, Rx / Tx filter at access level, etc.

Objectives

The post-doctoral research project is focused on associating the previous inventions, proposing an active antenna concept operating in Rx / Tx (reception / emission), and realizing a large number of beams over a wide angular sector. The proposed architecture is expected to be economical: electronic beam steering is carried out only along one axis, allowing for reconfiguration functionality while reducing hardware complexity. According to the other axis, the formation of beams is performed by the QOBF, which operates in emission and reception. The application targeted is both on board and ground antennas for satellite mega constellations.

This project also aims at addressing the appropriate manufacturing technologies. Indeed, for ground missions and systems of constellations of satellites, a very large number of antennas is envisaged. Cost control is essential. Plasturgy has changed considerably in recent times, notably thanks to the automotive sector. Preliminary evaluations at IETR have recently confirmed that plastic injection is relevant to the concepts of QOBF. Manufacturing constraints specific to plastics processing will be taken into account in all RF design stages.

Framework

The Post-Doctoral Researcher will work at the Institute of Electronics and Telecommunications of Rennes (IETR, www.ietr.fr). This is a collaborative project with TAS-F (<https://www.thalesgroup.com/en/worldwide/space/space>), one of the leaders in antennas for space applications, and MIP packaging (<http://mip-packaging.net/en/>) experts on plastic injection molding.

Candidate

Required education level: PhD or equivalent degree.

Duration: 12 months

Required background: waveguide-based antennas and components, antenna design, very good skills in the use of commercial electromagnetic softwares, numerical modeling. Knowledge of French is not required, but will be highly appreciated.

Deadline to apply: as soon as possible

Contact persons

To apply please send your motivation letter, CV, and the name or 2 references to Dr. Mauro ETTORRE, mauro.ettore@univ-rennes1.fr