

# Beam-scanning antenna design for 60 GHz non-contact vital sign estimation

*1-year Post-Doc position at Sorbonne University*

**Keywords:** 60 GHz, Leaky-wave antenna, electromagnetics design and characterization

## Context

The offered position takes place within an Indo-French project NOVIS60 (Non-contact vital sign estimation with 60 GHz radar technology) in collaboration between Sorbonne University (SU) and IIT Bombay. The goal of the project is to develop an innovative electronic system capable of detecting people's vital signs (namely, respiration and heartbeat rate) in a remote and contactless way. Multiple needs in today's society motivate such a device and the fact that NOVIS60 does not require the person to be monitored to wear sensors opens new perspectives. Hospitals could benefit from a continuous and seamless monitoring solution that would lead to more comfort for the patient while offering a cost-effective solution since there would be no need to replace the sensors between each patient (non-contact approach). Monitoring respiration and heartbeat rate can also enable detecting emergency situations such as stress or falling asleep for airplane's pilot or bus's driver for instance.

NOVIS60's solution is based on a Doppler radar operating in the license-free 60 GHz band. A radio-frequency wave will selectively illuminate a person, whose vital signatures will be responsible for micro-movements of the body. These movements will affect in turn the reflected wave, which will be received and processed by the system in order to extract vital signs information. Due to the directive illumination of the system, it is possible to monitor several people simultaneously, and to recognize possible situations of stress/danger. A first proof of concept has been obtained and the goal is now to develop a demonstrator to assess such a radar in real situations. This demonstrator will include a novel beam-scanning antenna (SU task) and its dedicated 60 GHz transceiver (IIT task), which will therefore enable drawing the fundamental limitations of this approach while better highlighting its potential.

## L2E

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## About the Post-doc

The goal of the post-doc is to design an antenna operating in the 60 GHz band using printed planar technology. The solution will be based on leaky-wave principle in order to exhibit a beam scanning with frequency. The proposed design should take into account the requirements of the fabrication process at SU (LPKF laser etching, through-hole plating machine, multilayer press).

The considered tasks for the post-doc are:

1. Assessment of different planar technologies to produce leaky-wave radiation
2. Design and optimization to achieve large angular range scanning capabilities
3. Realization of antenna prototypes including the feeder
4. Experimental validations: radiation measurements in anechoic chamber and radar measurements

Interactions with the team from IIT will be necessary to ensure the compatibility between the antenna system and the active hardware.

## Notes

- The applicant will work at the L2E lab (<http://www.l2e.upmc.fr/en>) of Sorbonne University ([www.sorbonne-universite.fr/en](http://www.sorbonne-universite.fr/en)), located in Paris, France.
- The applicant should hold a PhD degree in the field of antennas, or at least in an electromagnetic field that is closely related. A high degree of self-motivation and excellent communication skills are expected.
- The applicant should be very comfortable with software such as CST Microwave studio or/and HFSS.
- Duration: 1-year position, starting between April 2019 and September 2019.

## Contact

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