

Luxondes: Visualising electromagnetic waves

The Luxondes start-up, a spin-off of IFSTTAR has developed a slab that enables electromagnetic waves to be visualised in real-time, a precious tool for laboratories and industrial players, both from a scientific and a pedagogical point of view.

François Hollande and Cédric Villani were quite impressed by this new device! Luxondes' electromagnetic slab is indeed a fascinating achievement as it makes it possible to directly visualise electromagnetic fields, such as radio or WiFi waves. This slab was developed by Jean Rioult, in charge of an electromagnetic compatibility platform at LEOST (laboratory on electronics, waves and signal processing for transport) at Villeneuve-d'Ascq IFSTTAR site. It was actually meant to meet the internal needs of the laboratory initially. *"To study electromagnetic compatibility, that is the way electromagnetic sources mutually interfere with one another, we need to measure and map out the radiations of electronic boards, cables, etc., recalls Jean Rioult. We thought that if we could directly view these electromagnetic waves it would save us a lot of time."*

It is in 2006 that the idea of a specific device came about: the Gyroscanfield. A patent was filled and in 2011 a start-up was set up: Luxondes. The slab is a 2D version of the Gyroscanfield (which is a 3D system). The way it works is that 400 sensors are arranged on a plane to convert the energy of electromagnetic waves into shades of colours. The visible frequency range is comprised between 50 MHz and 3 GHz, which allows visualising the energy emitted by 2G, 3G, 4G telephony or WiFi...

This slab has equally attracted interest from public laboratories, such as Institut Langevin in Paris or INSA in Rennes, as from industrial operators. Orange Lab, for instance, uses it to fine-tune its research on the new technologies associated with 5G, but also to show concretely that its "boxes" focus energy in a pre-determined direction.

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Bottom: demonstration of the slab on the Orange booth at the MWC2016 (Mobile World Congress) trade fair in Barcelona in the presence of Mr Stéphane Richard, CEO of the Orange group.
Top left: Visualisation of the electromagnetic radiation of a 4G cell phone in operation.
Top centre: coupling of two slabs for a 2m² surface.
Top right: inauguration of Orange Gardens in the presence of the French President.

PHILIPPE BESNIER,
head of CNRS research
at the Institute of electronics
and telecommunications
of Rennes



**COULD YOU TELL US
THE REASONS WHY YOUR
LABORATORY BOUGHT
A LUXONDES SLAB?**

"Rapidly identifying the spatial structure of electromagnetic fields"

P. B.: First of all, for pedagogical purposes, it has didactic virtues, in a fun way so to speak: the students can more easily grasp the way an antenna radiates, and the colour visualisation helps them better understand the phenomena.

**IS IT ALSO USED IN YOUR
RESEARCH WORK?**

P. B.: Yes. We are working on techniques aiming to focus electromagnetic waves within a very limited area and for a very short time. The slab allows us to check instantly that the focusing is indeed taking place, the dimension of the focal spot, its intensity... We also work on complex propagation backgrounds where the electromagnetic field is difficult to anticipate. Within a few centimetres' difference, the field may sometimes fluctuate between low and high amplitudes, and seemingly in a random fashion. There again the slab allows us to expediently determine the structure of these fields by measuring them simultaneously across an entire zone. And from these measurements we may also originate ideas for new applications.

COULD IT BE IMPROVED?

P. B.: We would like to directly retrieve the data and not only visualise them. We are currently working on it with Luxondes. We acquired this research tool just last July actually, but we already mean to go much further with it. ■