Wireless secured authentication via RF link

Context:

Identification and authentication are major challenges in our society. With the idea of guaranteeing a maximum level of security, these functions are conventionally carried out using dedicated digital circuits (crypto-processor, trusted platform module) in CMOS-type technology. These technologies have been proven but remain complex and expensive for low-cost devices.

In the context of the Internet of Things, many applications need to exchange data in a safe and secured manner. However, issues related to the costs of hardware components as well as energy consumption and conversion between the analog and digital domains are at the heart of the deployment of these devices and limit their acceptance by the end user. To reduce the cost and complexity of these devices while guaranteeing an infinite lifespan, this internship will explore an innovative solution, aiming for the first transponder based on chaos capable of carrying out the functions of authentication while being entirely passive.

Internship:

This internship will enable to tackle the different facets of this transponder. On the one hand, an RF energy harvesting system and a load modulator will need to be designed to both supply the transponder and enable battery-less data transmission. In particular, the energy harvester will convert a wave in the ISM band into DC power, while the modulator will use the principle of back-modulation [1] to communicate with the reader. On the other hand, a chaotic system will need to be integrated to the transponder which will enable disruptive secured authentication. This system will consist either of an electrical circuit [2] or a mechanical structure [3], presenting great applications in cryptography. During the internship, the student will be able to address both topics and will be at the core of a collaboration between LCIS and TIMA laboratories.

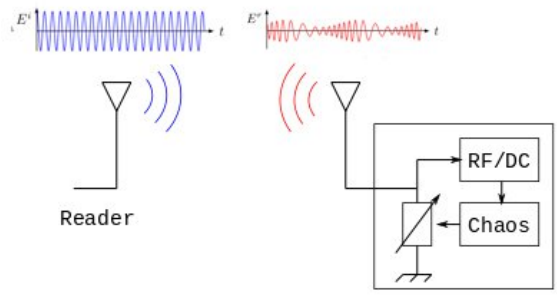

Figure 1: Principle of the proposed transponder to realize authentication.

Student:

In last year of engineering school or Master 2, the candidate should have solid knowledge in RF systems and signal processing. Basic knowledge on nonlinear systems would be beneficial. The internship will last 5 months at LCIS laboratory (Valence) with a strong collaboration with TIMA laboratory (Grenoble), and is meant to be followed by a thesis.

Contact:

Nicolas Barbot
nicolas.barbot@lcis.grenoble-inp.fr

Martial DEFOORT
martial.defoort@univ-grenoble-alpes.fr

Bibliography :

[1] S. A. Ahson and M. Ilyas, *RFID Handbook: Applications, Technology, Security, and Privacy*. CRC Press, 2017.
[2] L. O. Chua et al. , « Chaos synchronization in chua's circuit », *J. Circuits Syst. Comput.*, vol. 03, nº 01, Art. nº 01, 1993.
[3] M. Defoort et al., « A dynamical approach to generate chaos in a micromechanical resonator », *Microsyst. Nanoeng.*, vol. 7, nº 1, Art. nº 1, 2021.