



# Project: NanoImpuls

**Project name:** NANOIMPULS

**Subject:** Generation of core-shell nanomaterials using pulsed electric fields

**Start date:** June 25, 2016

**End date:** June 25, 2017

**Coordinator:** IPREM - ECP

**Scientific manager at the SIAME:** Laurent PECASTAING

**Permanent members of the SIAME involved:** Marc RIVALETTO, Antoine SILVESTRE de FERRON

**Type of contract:** UPPA incentive-based call for projects

**Partner(s):** IPREM - LCABIE

## Project description

Nanoshells are now considered as good potential candidates for photodynamic therapy for cancer owing to their optical resonance properties and a photothermal effect that kills the cancer cells by laser radiation. However, relatively large nanoparticles (of more than 50 nm) are required for good optical efficiency, but this affects the quality of cell absorption. To solve this problem, reversible electroporation – that consists of making the cells permeable (penetration of the agents) before allowing them to resume their initial permeability – can be considered as a promising tool to increase the absorption of nanoparticle cells. In this context, the “INTERFACES NANO” (nano-interfaces) project focuses on:

- \* The synthesis of hierarchical core-shell nanomaterials. The study concentrates on the shaping of the nanoparticles (as a film) in order to characterize the interfaces with the help of cross-sections, photoelectron spectroscopy (XPS, Ager) and electron microscopy analyses (SEM, TEM) of the materials.
- \* The design of pulsed electric field generators, so that the cells can be submitted to a configurable electric field (from around 1 to 10 kV/cm for periods of 1 to several tens of  $\mu$ s).
- \* Based on biological tests, the study of how the nanoparticles interact with the cancerous cells when pulsed electric fields are applied, allowing reversible electroporation of the cells owing to ICP-MS characterization of the nanomaterials in biological media.