PhD subject: Design of a high efficiency voltage converter for HIFU

High Intensity Focused Ultrasound (HIFU) is a very promising treatment tool and will be increasingly used in the years to come. Compared to conventional treatments, HIFU-based treatments have enormous advantages: non-invasive, reduced side effects and a selective treatment area. The combination between the use of HIFU and conventional approaches can only bring more effectiveness. By exploiting the thermal effect of HIFU, a local rise in temperature at the focal point of the ultrasound emitted allows the ablation of the cancer cell. In this context, we have proposed a research project, which benefits a funding from the national research agency (ANR).

In this PhD study, which is part of this research project and is funded by the ANR, the design of an oscillating voltage converter with high energy conversion efficiency will be requested. An exhaustive search of converter structures published in the literature will be the first step to consider. Based on the structures deemed exploitable, an in-depth analysis will be carried out in order to distinguish the advantages and disadvantages of different structures and to identify the possibility of exploiting them for our application. Electrical simulations of the selected structures will make it possible to quantify the performance of different structures. An improvement in performance or even a proposal for an innovative structure will always be part of the expected results of a research project. In order to verify the performance obtained from the designed circuits, PCB (Printed Circuit Board) designs will be implemented, tested and evaluated before further investigations for optimization design.

This PhD study will be carried out in the C2N laboratory (Center of Nanosciences and Nanotechnologies, Palaiseau, France). Potential candidates are asked to send a CV accompanied by M2 grades or equivalent to Ms. Ming Zhang (ming.zhang@university-paris-saclay.fr). More specific requests for candidates: good knowledge of electronics is desired and good English level will be appreciated. Some experience with CAD tools such as Cadence, Spice, Altium Designer will be welcome.