MASTER THESIS PROPOSAL

MASTER IN ADVANCED MATHEMATICS

ACADEMIC YEAR: 2018/19.

TITLE: Modelization and Numerical Simulation of Thermal Ablation Treatments in Heart Arrythmia.

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SUMMARY: Catheter ablation is a procedure that is used to treat cardiovascular diseases, specially arrhythmias. A catheter, that is inserted through a vein, is placed in the affected area of the heart, and an electric shock is applied in order to destroy the abnormal tissue. If the temperature of the cardiac tissue exceds a certain threshold ($\sim 90^{\circ}$C) stream pops occur, and this phenomenon can lead to serious complications.

The main objective of the present Master Thesis is to develop a realistic mathematical model of the procedure described above. The influence of the applied voltage and the discharge time in the temperature distribution of the cardiac tissue will be one of the aspects to consider.

References

[1] Fasano, A. and Sequeira, A. (2017). «Hemomath: The Mathematics of Blood». Springer Series on Modeling, Simulations and Applications, Volume 18.

[2] Pop, M., Molckovski, A., Chin, L., Kolios, M. C., Jewett, M. A. S. and Sherar, M. D. (2003). «Changes in Dielectric Properties at 460kHz of Kidney and Fat During Heating: Importance for Radio-Frequency Thermal Therapy». In: *Physics in Medicine and Biology, Vol. 48, pp. 2509-2536.*.

[3] Schutt, D., Berjano, E. and Haemmerich, D. (2009). «Effect of Electrode Thermal Conductivity in Cardiac Radiofrequency Catheter Ablation: A Computational Modeling Study». In: *International Journal of Hyperthermia Vol. 25, No. 2, pp. 99-107.*