

Speaker: Antonio Fasano

Professor Emeritus, Dipartimento di Matematica e Informatica U. Dini, Univ. Firenze, Italy

R&D Director, FIAB SpA, Firenze, Italy

Associated to IASI-CNR, Roma, Italy

Title: Monitoring esophageal temperature during ablation procedures for the cure of atrial fibrillation: how mathematics can help saving lives.

Abstract:

Atrial fibrillation refractory to drugs therapies is treated by "burning" sites at the ostia of pulmonary veins to eliminate electrical connections that went out of control. Such an ablation is performed either by the application of radiofrequency sources or by strong cooling. In both cases various organs can be damaged, including the esophagus, particularly when it happens to run close to the left atrium, where the ablator tool is introduced. Lesions can be serious, with the limit case of the atrio-esophageal fistula, which is lethal.

Hence the importance of monitoring the esophageal temperature, which is done by means of suitable probes. However, only the luminal temperature can be detected, while lesions are likely to start forming at the outer surface. A mathematical model allows to understand that the temperature reached outside can be very different, even in a dangerous way, suggesting new standards in the definition of a safe luminal temperature. Calculating the entire thermal and electromagnetic field in the relevant region shows many more interesting details that open new perspectives in the delicate question of how to use esophageal thermal probes and to interpret their data so to prevent major damages to the patient.