Final Defense

PhD Course in Bioengineering – Final Thesis Defense

PhD Candidate: MARTA BONATO
Advisor: Prof. Marta Parazzini

22.06.2021
h. 10:30
@ Microsoft Teams

Thesis: FROM LOW FREQUENCY TO RADIO FREQUENCY: ASSESSMENT OF HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS BY DETERMINISTIC AND STOCHASTIC METHODS IN NEW AND HIGHLY VARIABLE REALISTIC EXPOSURE SCENARIOS

COMMITTEE MEMBERS

Prof. Sam Aerts	Prof. Gyorgy Thuroczy	Prof. Luca Mainardi
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SCHEDULE OF THE DAY

10:30 – 10:45	Committee Meeting
10:45 – 11:45	Thesis presentation – Discussion
11:45 – 12:00	Committee meeting
12:00	Award Ceremony

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PhD in Bioengineering

Final Defense

POLITECNICO MILANO 1863

PhD student: MARTA BONATO – XXXIII Cycle

Thesis title: **FROM LOW FREQUENCY TO RADIO FREQUENCY: ASSESSMENT OF HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS BY DETERMINISTIC AND STOCHASTIC METHODS IN NEW AND HIGHLY VARIABLE REALISTIC EXPOSURE SCENARIOS**

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Abstract:

The recent years have seen a massive diffusion of man-made electromagnetic field (EMF) sources working at several frequencies, primarily thanks to the current technological innovations and the drastic changes in working and social habits. This trend seems not to stop, on the contrary, the recent deployment of 5th generation mobile networks has caused even more the diffusion of new devices and new infrastructures based on wireless communications.
Although this process is relentless, it is also causing an ever-increasing public concern about the health effects due to EMF exposure. This has induced the main International Organizations for health protection to encourage the scientific community to focus on broaden the knowledge about the human EMF exposure assessment. This includes also the necessity to investigate new methods for the quantification of the exposure variability in real environments.
In the light of above, this dissertation aims to further expand the knowledge about human EMF exposure assessment at Low Frequency (LF) and Radio Frequency (RF) ranges, with a particular focus on the more susceptible category to EMF exposure, i.e. the children's category.
Furthermore, in this dissertation the use of innovative stochastic approaches coupled with the deterministic computational methods will be deeply investigated, in order to assess the variability of EMF exposure in real environments, not limiting the analysis only on worst-case exposure scenarios.
In details the various Chapters will address:
1. the LF-EMF exposure characterization in children using a new stochastic approach developed starting from personal exposure measurements;
2. the LF-EMF exposure variability in children considering electric domestic appliances as EMF sources and using an approach based on stochastic dosimetry, called Polynomial Chaos theory (PC);

3. the RF-EMF exposure assessment in adults and children considering the technology innovations due to the deployment of 5G networks through deterministic computational methods;
4. the RF-EMF exposure variability in children considering the incoming 5G exposure scenarios using an innovative approach based on stochastic dosimetry, called Polynomial Chaos Kriging method.

The results showed, at both low frequency and high frequency ranges, exposure values significantly lower than the limits indicated by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Furthermore, more interestingly, the effectiveness and validity of different stochastic approaches were demonstrated. Indeed, stochastic dosimetry seems more and more a promising tool to broaden in future the knowledge on EMF exposure assessment, taking into account the increasing variability and heterogeneity that characterize the real world.