



University of Pavia

Ph.D. School of Electrical and Electronics Engineering and Computer Science

SEMINAR

The Magic Behind Radio Frequency Heating: The Microwave Oven

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Abstract: Microwave ovens are today widespread home appliances: since their invention back in the 50s they can nowadays be found in every home. Its ease of use and cooking speed, together with a significant reduction of prices during the years, contributed to an exponential diffusion of this product. Despite its widespread availability, its physical principle of operation and design guidelines are still a mystery for many.

How do microwaves cook? Why is there a rotating turntable inside the cavity? Why is it so hard to get a good defrost? How are microwaves sealed inside the cavity? What is the principle of operation of the magnetron, the microwave source?

Altran Italia addresses these and many other questions in the technical seminary “The Magic Behind Radio Frequency Heating: The Microwave Oven”: the lecture gives an introduction to the invention of the microwave oven and explains the impact of dielectric properties of foodstuff on the heating. It covers the physical principles of operation and design guidelines of the resonant cavity, and the techniques of impedance matching of the magnetron, the microwave generator. The last paragraph touches safety aspects of microwave ovens.

Bio: **Gabriele Manili** received the M. Sc. and the Ph.D. degree in Telecommunications Engineering from the University of Brescia, Italy, in 2009 and 2013 respectively. As a Ph.D. student he focused on Nonlinear Optics, and more specifically on Supercontinuum Generation in Microstructured Optical Fibers. Since Sept. 2012 he is Consultant/Engineer within Altran Italia, dealing with innovative projects related to Electromagnetic Fields and Microwaves. **Riccardo Moro** received the M. Sc. and Ph.D. degree in Electronics Engineering from the University of Pavia, Italy, in 2010 and 2014 respectively. In 2014 he was PostDoc of the Microwave Laboratory at the University of Pavia working on the implementation of radio systems in substrate-integrated waveguide (SIW) technology based on innovative eco-friendly materials. From 2015 he is with Altran Italy. His activity is focused on the analyses and design of RF systems.

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