



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

SEMINAR

The Magic Behind Radio Frequency Heating: The Microwave Oven

Massimiliano Cucina, MSc
Adv. Solution Manager, Intelligent Systems - Electronics
Gabriele Manili, PhD
Consultant/Engineer – EILiS
Riccardo Moro, PhD
Consultant/Engineer – EILiS

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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: **Massimiliano Cucina** received the M. Sc. Degree in Electronics Engineering from the University of Rome “Tor Vergata” in 2003. From 2003 to 2005 he was involved in several projects as project leader for Accenture Italia SpA. From 2005 to 2009 worked in Elettronica Spa as hardware and digital engineer up to be the owner of the ultra-wide band receiver in 2009. From 2009 to 2015 was in a first stage Head of System Engineering and then Head of Aerospace & Defence Business Unit for Interconsulting Srl. From 2015 it works as Advanced Solution Manager in Altran Italia Spa for Electronics. His activity is focused on business & sales and delivery management. **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 Italia. His activity is focused on the analyses and design of RF systems.

Organizers
Prof. Marco Pasian

Ph.D. Coordinator
Prof. Paolo Di Barba

Seminar in English

For more information: marco.pasian@unipv.it