



3RD WORLD CONGRESS ON

# Microwave & Radio Frequency Applications

Bridging Science, Technology & Applications

22 - 26 SEPTEMBER 2002

SYDNEY CONVENTION & EXHIBITION CENTRE, SYDNEY, AUSTRALIA

## Workshop on Electromagnetic Modeling for Microwave Processing

Tutors: M. Celuch and V. Yakovlev

### A G E N D A

**8:30 – 9:00:** Installation of *QuickWave-3D* on the participants' laptops

#### 1. Basics in Computational Electromagnetics and Modeling of Microwave Heating

**9:00-9:10:** Introduction to the course (VY)

**9:10-9:50:** Review of numerical methods of EM modeling. Advantages of FDTD over FEM, discretization, why time domain, finite differences in time domain, conforming to curvilinear surfaces, etc. Error analysis. (MC)

#### 2. Overview of EM Simulators & Special Regimes of Modeling

**10:00-10:25:** Database of EM software applicable to modeling of microwave heating. Test problem solved by different simulators. (VY)

**10:25-10:50:** Special models and algorithms: absolute and average values of the field, average heating patterns, varying media parameters, freeze of state of the EM simulator, load rotation/shift, etc. (MC)

#### 3. Simulation with *QuickWave-3D*: What's and Why's & User's Resources

**11:00-11:30:** Computational strategy of FDTD modeling of microwave heating. Examples of modeled applicators and subsystems. Conceptual and technical issues in modeling of microwave heating. (VY)

**11:30-12:00:** Practical work with *QuickWave-3D*: elements and objects, building scenarios out of parameterized libraries, import of CAD files, modal excitation, post-processing, etc. (MC)

**12:00-13:00:** L u n c h

#### 4. Examples of Modeling

Practical exercises for the workshop attendants: live demonstration of *QuickWave-3D* simulations of scenarios in microwave thermal processing – cavities, closed and open structures, and other applicators.

**13:00-13:20:** Heating of frozen and defrosted beefburger in a domestic oven (MC)

**13:20-13:40:** Microwave drill (VY)

**13:40-14:00:** Power dissipated in a cylindrical body as a function of wave polarization (MC).

#### 5. Issues in System Design and Optimization

Building the models and running simulations for the applied problems

**14:00-14:30:** Design of a customer waveguide junction (suggested by ETAC, USA). Options in optimization of microwave structures. (VY)

**14:30-15:00:** Optimization of a high-power coax-to-waveguide transition. (MC)

**15:00-16:00:** General Discussion and Conclusion