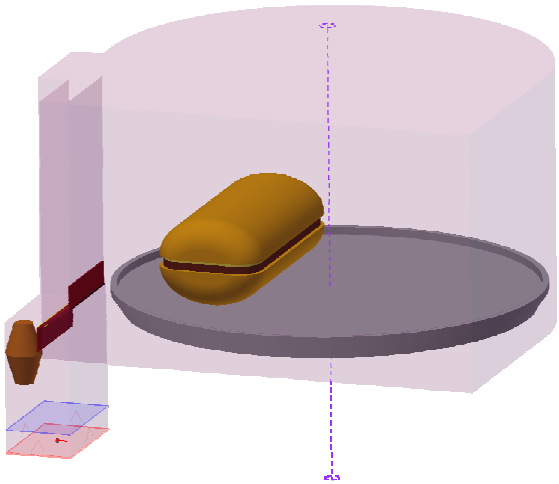
MICROWAVE HEATING
QW-BHM

BASIC HEATING MODULE

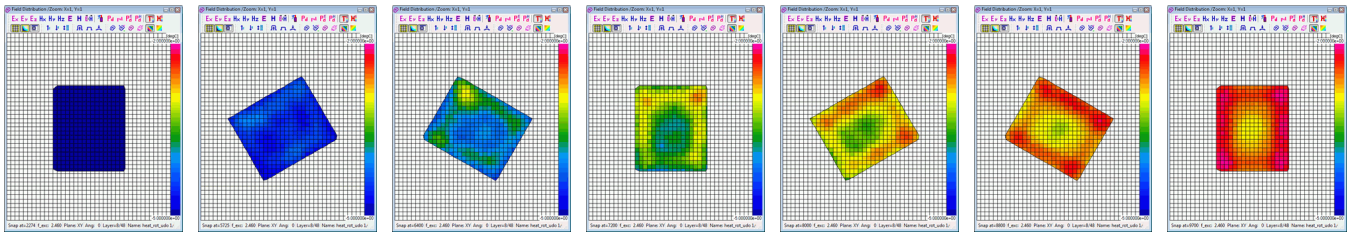
QW-BHM (Basic Heating Module) for *QuickWave* provides a novel regime of operating the FDTD solver, with modification of media parameters as a function of dissipated energy. It also facilitates load movement and rotation, heat flow analysis through the *QW-HFM* (Heat Flow Module) module, excitation changing during simulation and provides a regime of manual and automatic tuning of the source to the deepest in-band resonance.



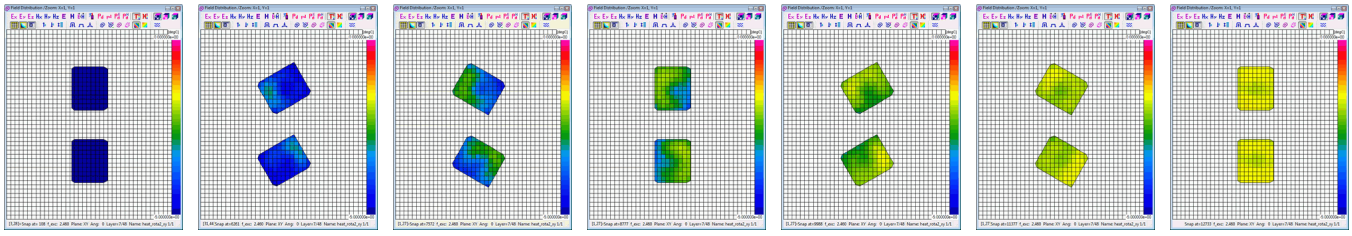
***QW-BHM* automatically modifies media parameters in thousands of FDTD cells filled with different media and heated up differently - all accomplished in a matter of seconds!**
Each ”thermal” iteration requires many FDTD iterations to reach the new electromagnetic steady state starting from the previous steady state - but less than would be needed to reach the new steady state starting from the initial zero field distribution.

HEATING OF ROTATING LOADS

In a typical domestic microwave oven a more uniform temperature distribution within the load is obtained through rotating of the load during heating. Such slow movement of the heated object may to a great extent affect the temperature field. The load rotation mechanism lets to simulate heating of arbitrarily shaped objects rotating around any point chosen on the XY plane.



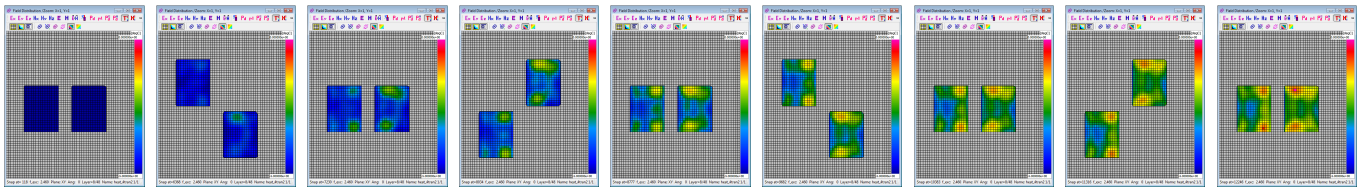
HEATING OF MULTIPLE ROTATING LOADS



QWED Sp. z o.o. ul. Krzywickiego 12 lok. 1 02-078 Warsaw Poland tel. +48 22 625 73 19 fax: +48 22 621 62 99 www.qwed.eu info@qwed.eu

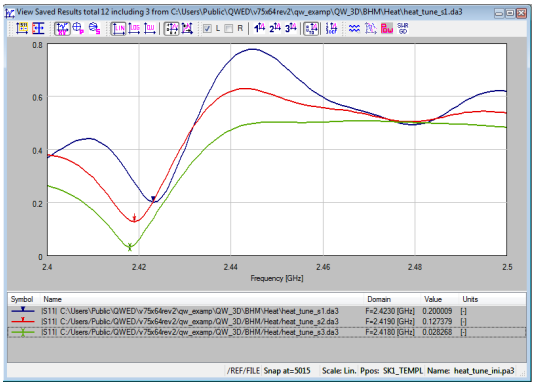
HEATING OF MOVING LOADS

Load rotation is the most popular temperature-equalising mechanism in domestic microwave oven. However, different types of load movements are also used in the engineering practice or experimented with in research i.e. linear translation is widespread in industrial tunnel installations. This regime, due to the translation mechanisms, allows movement in all planes of many items independently.



AUTOMATIC AND MANUAL SOURCE TUNING

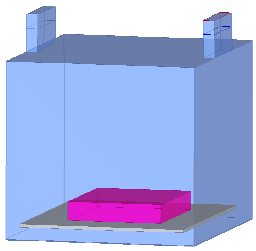
The most widespread microwave power source, a magnetron, is an imperfect device gradually changing its frequency during the heating, and in fact, it may even ”jump” from one frequency to another. This regime will mimic the physical behaviour of various real power sources under various conditions. It assumes that the source tunes automatically to the deepest resonance in the considered frequency band. Present assumption perfectly suits microwave power applications with solid state power sources, where the return loss versus frequency can be monitored in time, and the source frequency can be automatically tuned to the deepest resonance by the controller, so as to maximise the matching, or manually to an arbitrary value.



Automatic resonance searching

AUTOMATIC MODIFICATION OF SOURCE PARAMETERS

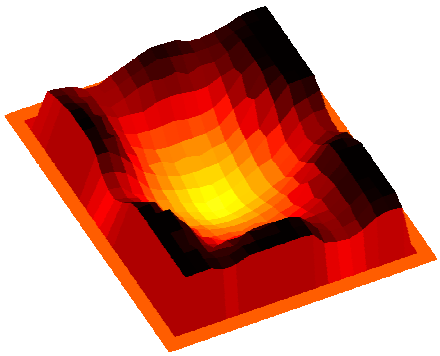
This regime is dedicated to microwave heating scenarios with solid-state sources characterized by different frequencies, amplitudes, and phases. New settings of excitation (frequency, amplitude, and phase) are defined by the user separately for each source. Excitation change occurs after each step of heating.



HEAT FLOW MODULE

The *QW-BHM* module has been developed in a way that leaves open the possibility to communicate with external applications. Such tools can be used to model effects, which are not supported in the standard version of the *QW-BHM*. The *QW-HFM* module is an example external tool that supplements the *QW-BHM* in modelling of the heat transfer effect. New *Heat Flow Module* (also in OMP and x64 version) integrated with *QW-Simulator* allows faster heat flow simulations and taking into account divided cells (without boundary conditions).

A full-fledged external CFD package (i.e. Fluent) can be coupled with the *QuickWave* package.



QWED Sp. z o.o. ul. Krzywickiego 12 lok. 1 02-078 Warsaw Poland tel. +48 22 625 73 19 fax: +48 22 621 62 99 www.qwed.eu info@qwed.eu