



**Organized by the Industrial Microwave Modeling Group (IMMG),
Center for Industrial Mathematics & Statistics (CIMS),
Department of Mathematical Sciences,
Worcester Polytechnic Institute, Worcester, MA, USA**

**Co-organized by the Institute for Pulsed Power and Microwave Technology (IHM),
Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany**

In cooperation with Society for Industrial and Applied Mathematics (SIAM)

Multiphysics Models and Material Properties



**Karlsruhe, Germany
May 12-13, 2014**

**16th Seminar
“Computer Modeling in Microwave Power Engineering”**

Program & Proceedings



SEMINAR ORGANIZERS

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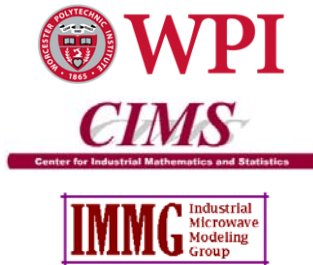
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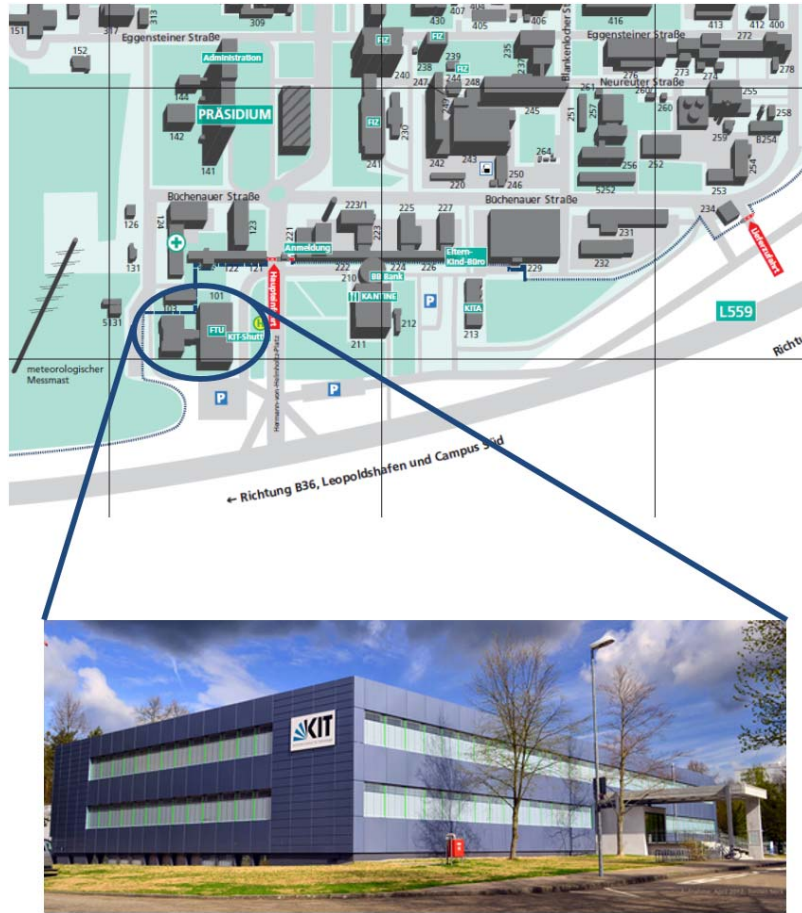


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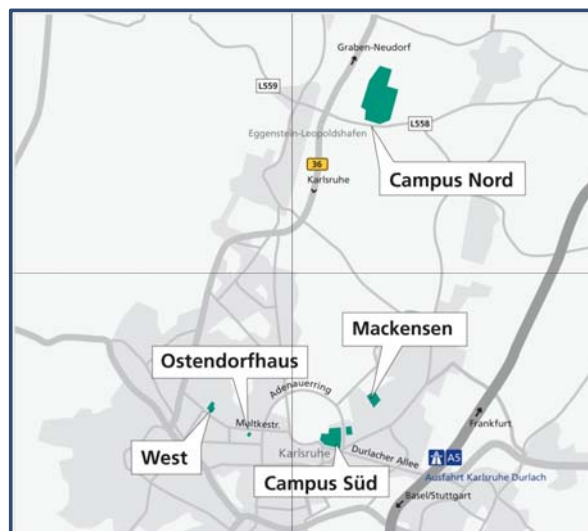
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KIT Campus North, FTU (Fortbildungszentrum-Technik und Umwelt), Hermann-von-Helmholtz-Platz 1, Eggenstein-Leopoldshafen, Germany

LOCATION



SEMINAR PROGRAM

Monday, May 12, 2014

8:15 Bus departs from Hotel Kübler to KIT Campus North

8:45-11:15 **Excursion to KIT Campus North, Karlsruhe Institute of Technology**

8:45 Arrival to KIT Campus North, Eggenstein-Leopoldshafen

9:00 Tour over the bioliq® facility

10:00 Visit to the high power gyrotron test stand

10:30 Visit to the HEPHAISTOS Experimental Center

11:15 Arrival to the Seminar venue

11:15-11:45 **On-site registration: KIT Campus North, FTU (Building No 101), Seminar Room “Mittlerer Hoersaal”**

11:45-12:05 **Welcome & Opening remarks**
G. Link, Seminar Vice-Chair, Local Organization
Karlsruhe Institute of Technology, Karlsruhe, Germany

Introduction to the Seminar
V.V. Yakovlev, Seminar Founder and Chair
Worcester Polytechnic Institute, Worcester, MA, USA

12:05-13:00 **Lunch**

<i>Multiphysics Modeling Workshop</i> Chair: <i>G. Link</i>	FTU, Mittlerer Hoersaal
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13:00-13:50 **Multiphysics Simulations with *COMSOL Multiphysics* in Microwave Applications**

N. Strah

COMSOL Multiphysics GmbH, Göttingen, Germany

13:50-14:40 **Coupled Electromagnetic-Thermal Simulations with *CST MPHYSICS STUDIO***

U. Becker

CST, Darmstadt, Germany

14:40-15:00 *Coffee break*

15:00-15:50 **Fast 3D FDTD Modelling Using *EMPIRE***

A. Wien

IMST GmbH, Kamp-Lintfort, Germany

15:50-16:40 **Virtual Prototyping of Microwave Heating Systems with *QuickWave 2014* Multiphysics Software**

A. Raniszewski

Novel, Fast, and Affordable Measurement Techniques for Complex Permittivity of Materials at Microwave Frequencies

P. Korpas

QWED, Warsaw, Poland

Industrial Session and Exhibition I

FTU, Mittlerer Hoersaal

16:45-17:30

Flash Presentations

COMSOL Multiphysics GmbH

CST

MKS Instruments - Alter Products

16:45-17:00 M. Garuti

Muegge GmbH

17:00-17:15 M. Reichmann

Vötsch Industrietechnik GmbH

17:15-17:30 S. Betz

17:45-24:00 **Seminar Banquet (Vinery Marienhof, Flemlingen, Palatinate)**

17:45: Bus departure to Flemlingen

18:45: Vinery Marienhof

23:00: Bus departure from Flemlingen

24:00: Arrival to Hotel Kübler, Karlsruhe

Tuesday, May 13, 2014

8:30

Bus departs from Hotel Kübler to KIT Campus North

Session I: *Multiphysics Modeling*

FTU, Mittlerer Hoersaal

Chair: *J. Jelonnek*

9:00-9:20 **FDTD Modeling of Microwave Heating of Spherical Ceria Particles and Examination of Three Microwave Cavities**

H. Hammoud^{1,2}, S. Vaucher¹, and F. Valdivieso²

¹ Swiss Federal Laboratories for Materials Science and Technology (EMPA), Thun, Switzerland

² Laboratoire Georges Friedel CNRS UMR 5307, St-Etienne, France

- 9:20-9:40 **A Drying and Thermoelastic Model of Fast Microwave Heating of Concrete**
B. Lepers, G. Link, and J. Jelonnek
Karlsruhe Institute of Technology, Karlsruhe, Germany
- 9:40-10:00 **Modeling of Microwave Heating of Ceramic Materials with Respect to Changes in Sample Size**
A. Rosin and M. Willert-Porada
Chair of Materials Processing, University of Bayreuth, Bayreuth, Germany
- 10:00-10:20 *Coffee break*

Session II:	<i>New Techniques of Math Modeling</i>	FTU, Mittlerer Hoersaal
Chair:	<i>J. Catalá-Civera</i>	

- 10:20-10:40 **Frequency-Dependent Complex Permittivity Reconstruction of Layered Diaphragm in a Rectangular Waveguide: Comparison with Experiment**
Yu.G. Smirnov¹, Yu.V. Shestopalov², and E.D. Derevyanchuk¹
¹ Penza State University, Penza, Russia
² University of Gävle, Gävle, Sweden
- 10:40-11:00 **Goubau Line Revisited: Refined Properties of Surface Waves**
Yu.V. Shestopalov¹ and E.A. Kuzmina²
¹ University of Gävle, Gävle, Sweden
² Moscow State Institute of Radio Engineering, Electronics, and Automation, Moscow, Russia
- 11:00-11:20 **Scattering and Generation Properties on a Nonlinear Layer and Eigen-Modes of the Linearized Problems**
L. Angermann¹ and V.V. Yatsyk²
¹ TU Clausthal, Clausthal-Zellerfeld, Germany
² Usikov Institute for Radiophysics and Electronics NASU, Kharkiv, Ukraine

<i>Industrial Session and Exhibition II</i>	FTU, Mittlerer Hoersaal
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- 11:25-12:10 Flash Presentations
- | | |
|---|------------------------------|
| COMSOL Multiphysics GmbH | 11:25-11:40 <u>N. Strah</u> |
| CST | 11:40-11:55 <u>U. Becker</u> |
| MKS Instruments - Alter Products | |
| Muegge GmbH | |
| Vötsch Industrietechnik GmbH | |
- 12:10-13:20 *Lunch*

Session III	Determination of Material Properties	FTU, Mittlerer Hoersaal
Chair:	Yu. Shestopalov	

- 13:20-13:40 **Time- and Temperature-Dependent Dielectric Measurements of Thermosetting Resins**
D. Prastiyanto^{1,2}, G. Link¹, U. Arnold¹, M. Thumm¹, and J. Jelonnek¹
¹ Karlsruhe Institute of Technology, Karlsruhe, Germany
² State University of Semarang, Indonesia
- 13:40-14:00 **High Temperature Dielectric Measurements of Concrete with Cavity the Perturbation Method**
S. Soldatov, M. Umminger, A. Heinzl, T. Kayser, G. Link, T. Seitz, S. Layer, and J. Jelonnek
Karlsruhe Institute of Technology, Karlsruhe, Germany;
- 14:00-14:20 **Design and Development of a System for In-Situ Dielectric and Calorimetric Measurements during Microwave Curing of Resins**
V. Ramopoulos, S. Soldatov, G. Link, T. Kayser, and J. Jelonnek
Karlsruhe Institute of Technology, Karlsruhe, Germany
- 14:20-14:40 *Coffee break*

Session IV:	Modeling Technologies	FTU, Mittlerer Hoersaal
Chair:	A. Wein	

- 14:40-15:00 **Advanced Temperature Control of Distributed Microwave Coupling Systems**
Y. Sun, T. Kuehner, G. Link, T. Kayser, and J. Jelonnek
Karlsruhe Institute of Technology, Karlsruhe, Germany
- 15:00-15:20 **Phase-Shift-Based Efficiency Optimization in Microwave Processing of Materials with Solid-State Sources**
P. Korpas, M. Krysicki, and A. Wieckowski
Warsaw University of Technology, Warsaw, Poland
- 15:20-15:40 **SiC Joining by Microwave-Assisted Combustion Synthesis**
R. Rosa¹, P. Veronesi¹, S. Han², V. Casalegno³, M. Salvo³,
E. Colombini¹, M. Ferraris³, and C. Leonelli¹
¹ University of Modena and Reggio Emilia, Italy
² Fuzhou University, China
³ Politecnico di Torino, Italy
- 15:40-16:00 **Synthesis of Luminescent Nanoparticles of Rare-Earth Compounds Using Microwave-Hydrothermal Treatment**
A. Vanetsev, E. Samsonova, A. Popov, K. Keevend, I. Sildos, and Yu. Orlovskii
University of Tartu, Tartu, Estonia

Session V:	<i>Industrial Modeling</i>	FTU, Mittlerer Hoersaal
Chair:	<i>G. Link</i>	

16:10-16:40 **The Role of Modeling in Designing Industrial Microwave Heating Systems**
L. Musiol

Fricke and Mallah Microwave Technology GmbH, Peine, Germany

16:40-16:50 **Photo session**

16:50-17:30 **General discussion. *Best Student Paper* Award. Concluding remarks**

S E M I N A R W E B P A G E

<http://www.wpi.edu/+CIMS/IMMG/Seminars/>