

THE WAVE



The newsletter publication of the International Microwave Power Institute

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IMPI Prepares for 57th Annual Symposium in Denver: January 20, 2023 Call for Papers Deadline Approaches

As 2022 draws to a close, preparations for the 57th Annual Microwave Power Symposium (IMPI 57) are in full swing. IMPI 57 will take place June 27-29, 2023 at the Curtis Hotel in downtown Denver, Colorado, USA.

Under the leadership of Dr. Candice Ellison, USDA-ARS and Dr. Reeja Jayan, Carnegie Mellon University, the Technical Program Committee is securing Keynote & Invited Speakers this month. IMPI Members are encouraged to submit abstracts by the January 20, 2023 deadline to be considered for an oral or poster presentation. Details on the five (5) Special Sessions, Categories & Topic Areas and templates are [available here](#).

IMPI Members are encouraged to [register early](#) for the best rate; the early-bird Member rate is \$675 and Student Member rate is \$445. The registration fee covers all in-person sessions, a Welcome Reception, two continental breakfast & luncheons, four coffee breaks, a copy of the conference Proceedings and unprecedented networking opportunities. [Book your hotel room](#) soon to secure the \$195 group rate.

Similar to previous Symposia, Short Courses will be offered on Tuesday, June 27th and IMPI 57 will feature a Student Competition & Exhibitor Showcase. Muegge Gerling will serve as the Platinum Sponsor of the event. Details on [Exhibition & Sponsorship Packages](#) are available for download.

Stay up to date with the latest IMPI developments [here](#).

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*Cover Photo: Downtown Denver,
Colorado, USA*

PRESIDENT'S MESSAGE

We often wonder, speculate, predict, even wager what will be the next “killer app” for microwave/RF technology. While this term was originally defined as a software program that is so necessary or desirable that it generates strong demand for the computers on which it operates (source: Wikipedia), rapid cooking was perhaps the first killer app for microwave/RF heating in the form of microwave ovens. In turn, the consumer microwave oven was no doubt a huge killer app (albeit not the first) for magnetrons.

Currently we are seeing a great deal of activity in application development that has created or may soon create strong demand for industrial microwave generators and systems. Lab-grown diamond arguably has become a killer app generating demand for microwave generators in the thousands (maybe even tens of thousands) annually. The majority of these are 2450 MHz generators, the magnetrons for which have been in critically short supply and will continue to be in the near term. Other emerging applications indicate the potential for equally strong demand for 915 MHz generators. A back-of-the-envelope estimate of the total numbers is staggering! But while equipment manufacturers may be salivating at the opportunities, they are also daunted by the logistics of ramping production capacity to meet the demand.

Of course, likely not all of these applications will achieve such commercial success. Even so, a conservative estimate will require 915 MHz generator manufacturers to double or triple their current production capacity within the next few years. To complicate matters, their supply chains may also need to ramp production similarly. In the case of magnetrons, a “consumable” component having an expected operating life, demand increases exponentially with the increase in the installed base of generators. Few viable manufacturers of high power 915 MHz magnetrons exist in the world today, and their resources may be stretched thin as they ramp to meet the ever-increasing demand.

Both generator and magnetron manufacturers will want to make a “business case” of investing in any such increase in production capacity. Given the uncertainty of any given application achieving commercial success, my guess is few will be willing to take huge risks and make the investment on their own before receiving firm purchase orders. By then, though, they might well have missed the opportunity. Application developers must recognize this dilemma and be willing to share the risks with manufacturers. But with multiple emerging applications, such a partnership with any single application developer may not be sufficient. A more practical approach may be to form a consortium of application developers and equipment manufacturers that all share in the investment to ramp production capacity and the inherent risks associated with the endeavor. Such a consortium would be viewed favorably by government agencies that might recognize the need to help fund the investment. Similarly, IMPI would likely offer whatever assistance it can in the form of logistical support.

Not surprisingly, some might view this challenge for magnetron-based industrial equipment as an opportunity for solid state RF technology. For some applications, indeed it will be or already is! However, I predict the increase in demand for high power generators will far outpace the progress solid state is making to become an economically viable alternative to magnetrons for most industrial applications emerging in the near term. But don't lose faith. Your day will come!



John F. Gerling
President, IMPI



IMPI SOLID STATE RF ENERGY SECTION

Annual Business Meeting: The Section held their Annual Business Meeting, November 1st, 2pm-4pm CST, at Odyssey Technical Solutions, Round Rock Texas. In addition to discussing the plans and budget for 2023, the Section held their elections and the results are as follows:

Chairman and Director (Europe): Klaus Werner, pinkRF
Director (Americas): John Mastela, EliteRF
Director (AsiaPac): Sanghun Lee, WavePIA
Treasurer: Brian Blackwell, Odyssey Technical Solutions
Secretary: Adam Jones, Crescend Technologies

Membership in the Section is open to all IMPI Members. Please contact alicia.standridge@impi.org to join the Section.

Welcome to IMPI's New Corporate Member!

Panasonic

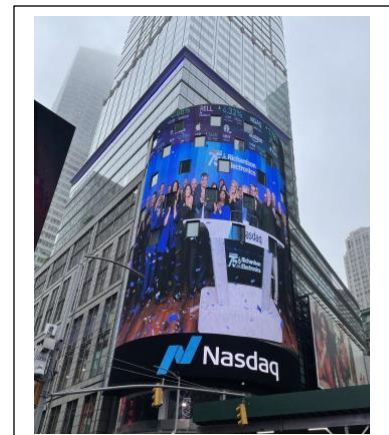
Consumer Microwaves: <https://shop.panasonic.com/kitchen-and-home/microwaves-and-multi-ovens/>

Food Service: <https://na.panasonic.com/us/commercial-appliances>

MEMBER NEWS

Congratulations to IMPI Corporate Member, **Richardson Electronics**, who celebrated their 75th Anniversary by [ringing the NASDAQ Closing Bell](#), on October 24th!

Richardson, based outside of Chicago, will serve as the host for IMPI's Fall Seminar in early October 2023. More details will be forthcoming.



A Look Back at IMPI's Fall 2022 Events

IMPI wishes to express our gratitude to Odyssey Technical Solutions for hosting IMPI's Fall Seminar, **"The Future of Microwave/RF: Fundamentals, Features & Food Safety"** in Round Rock, Texas, November 1st - 3rd! Special thanks to Larry Broome & Brian Blackwell for their leadership & support the past several months.



We would also like to thank the National Energy Technology Laboratory for an excellent 3-Part Fall 2022 Webinar Series on **"The Role of Microwaves in Industrial Decarbonization."** We are especially grateful to Dr. Pranjali Muley of NETL & Dr. Sean McKeown of Graphic Packaging International for planning and executing this series!

Parameters	Thermal reactor	MW reactor
Temperature (°C)	700	700
Average power (kW)	127.246	137.394
Total energy (kWh)	1.756	0.628
Reaction efficiency (mol/kWh)	0.00326	0.014056

Journal of Microwave Power & Electromagnetic Energy News

The IMPI Board of Governors wishes to thank Editor-in-Chief, Dr. Juan Aguilar-Garib, University of Nuevo Leon, for his stellar work on JMPEE again this year.



JMPEE, Vol 56, Issue 4, is now available:

Editor's message: Pondering hard and soft data in research and knowledge generation, by Juan Antonio Aguilar Garib

[1] Dielectric properties of cereal stubble infected with *Bipolaris sorokiniana*, *Fusarium pseudograminearum* and *Pyrenophora teres* in the microwave frequency range, by Toni Petronaitis; Graham Brodie; Steven Simpfendorfer; Richard J Flavel; and Nigel WM Warwick

[2] Calculation of microwave heating temperature distribution based on SVD truncation, by Biao Yang; Hongbin Huang; Hongtao Ma; Liexing Zhou; and Qingzhi Du

[3] Use of Dielectric Properties Measurements at Microwave Frequencies for Real-Time monitoring of Water Activity in Almonds, by Samir Trabelsi

[4] Drops deformation influence on the microwaves interaction with a magnetodielectric emulsión, by Sergey Turkin; Yuri Dikansky; and Arthur Zakinyan.

JMPEE, Vol. 56, Issue 3, was published in Q3 of 2022, as follows:

Editor's message: Highlighting the importance of transcendent conferences, by Juan Antonio Aguilar Garib

[1] Dielectric behavior of soil as a function of Frequency, Temperature, Moisture content and Soil texture: A Deep Neural Networks Based Regression Model, by Prachi Palta; Prabhdeep Kaur; and Kuldip Singh Mann

[2] Self-Sensing Reinforced Concrete for Damage Assessment and Real Time Strength Development in Smart Structures, by Murat Öztürk

[3] Dielectric Properties of Eggshell Powder at 2.45 and 5.8 GHz Relevant to Dielectric Heating, by Prem Pankaj; Prabhdeep Kaur; and Kuldip Singh Mann

[4] Feasibility Study of Patch Antenna for Monitoring Moisture Content of Made Tea, by VD Shivling; Amandeep Singh; Baban K. Bansod; Urvashi Nag; and DL Meena

[5] Evaluation of Graphite and TiO₂ as susceptors for microwave dewaxing in ceramic shell casting processes of artworks, by Itahisa Pérez Conesa, J. Fayos-Fernández, J. A. Aguilar Galea, J. Monzó-Cabrera, and R. Pérez-Campos.

A friendly reminder, JMPEE is available, at no additional cost, to IMPI Members who “opt-in” to receive this benefit each year. **If you would like access to JMPEE in 2023, please take a moment to [complete this 3-question survey](#) by January 15, 2023.** If you have any questions, please contact alicia.standridge@impi.org

PARTNER NEWS & EVENTS

Our friends at *The Spoon* are hosting **The Food Tech Exhibition & The CES Food Tech Conference** in Las Vegas, Nevada beginning January 5-8, 2023. [Learn more here.](#)

The **AMPERE 2023** conference will be held in Cardiff, United Kingdom from September 11-14, 2023. More details, and Call for Papers, coming soon here: www.ampere2023.com

The **MTA-UK** just released their Winter Newsletter which [is available here.](#)

CALENDAR OF EVENTS

Stay up to date with IMPI Events by visiting our [Calendar of Events page](#). If you have an event you would like to add to the Calendar, please contact molly.poisant@impi.org

On behalf of all of us at IMPI, Happy Holidays to you and your loved ones! We look forward to working with you in 2023!



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