

THE WAVE



The newsletter publication of the International Microwave Power Institute
April 2019



IMPI Prepares for 53rd Annual Microwave Power Symposium

Ten weeks from today, the [53rd Annual Microwave Power Symposium \(IMPI 53\)](#) will take place at the iconic Caesars Palace in Las Vegas, Nevada, USA. There are already [over 65 attendees from](#) 12 countries registered for our flagship event.

Over 60 presentations are planned during the 2 ½ day event. The full Schedule of Events is available [here](#). Registration rates will increase by \$100 on April 18th and IMPI members are encouraged to [register today](#).

The Symposium will kick off with two optional short courses on Solid State Technologies; attendees may choose from a Fundamentals or Advanced Course the morning of June 18th.

New this year, IMPI 53 will feature an Exhibitor Showcase the afternoon of Tuesday, June 18th. Attendees will have the opportunity to attend up to nine booth-side demonstrations and presentations conducted by our record number 18 exhibitors! The Welcome Reception will take place that evening.

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Cover Photo: Caesars Palace 1

President's Message

We all know what kilo 10^3 , mega 10^6 , and giga 10^9 , as well as milli 10^{-3} , micro 10^{-6} and nano 10^{-9} , mean, but how many know what ronna and quecca mean? They stand for 10^{27} & 10^{30} , while ronto and quecto stand for 10^{-27} & 10^{-30} respectively, or I should say will have those meanings if approved at a meeting of the International Bureau of Weights and Measures (BIPM) in Paris. What's the need for these new prefixes? Well, it's because the amount of the information that's being generated daily creates a need for the growth in global storage forecasted to reach 1 yottabyte (10^{24})—the top of the existing scale, by 2030. This was the subject of a fascinating article in the journal *Science* (February 14, 2019). A reminder that the world of science is expanding in a way that we might not have expected 10 years ago.

We are also seeing major changes in metrics, away from tangible items, such as the platinum/iridium cylinder housed in Paris used to define the kilogram (the Big K), into definitions that represent unalterable features of the universe, i.e. the speed of light, time, and Planck's constant (the approximate numerical value of Planck's constant is 6.626×10^{-34} joule-second.) For example, the originators of the metric system based the length of a meter on the globe itself, with the meter described as one 10-millionth of the distance from the North Pole to the equator. For a long time, the meter was literally a metal bar in France; but now scientists are able to ditch the metal bar and define the meter in terms of the distance that light can travel through a vacuum in about one 300-millionth of a second.

How about time? Although the historical definition of the unit was based on a division of the Earth's rotation cycle, the formal definition in the International System of Units (SI) is a much steadier timekeeper: 1 second is defined to be exactly "the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom" (at a temperature of 0 K)*

The kilogram: Starting May 2019, a kilogram will be defined in terms of Planck's constant, the fundamental constant in quantum physics that links the amount of energy a photon carries with the frequency of its electromagnetic wave. One upside to the change is decentralization. Soon, anyone will be able to derive the exact definition of a kilogram, while in the past you needed to directly compare the mass of an object to the Big K, or one of its copies, to exactly measure a kilogram. Now, you just need a Kibble balance, which, in simplified terms, can find Planck's constant by translating the mechanical energy produced by the mass of an object into an equivalent amount of electrical energy. The Kibble balance is a highly expensive and complicated instrument, but they could become cheaper and more accessible in the future. **

Other new definitions:

- The ampere – will be defined by the elementary electrical charge (e)
- The kelvin – will be defined by the Boltzmann constant (k)
- The mole – will be defined by the Avogadro constant (NA)

what we are seeing is the effect of the changes in science brought about by a the need for ever more exacting standards and definitions. An article I read yesterday referred to wires in a device being so thin that 100 could be laid side-by-side to equal the thickness of a human hair. On the other hand, there is the extraordinary space exploration around planets requiring incredibly accurate analysis of distance and orbits. As one who grew up at a time when no one owned a television set, I remain astonished every day as I peruse the scientific literature. Much of what I read would've been considered science-fiction only a few years ago, but this is today's reality. And as I write this, I realize that tomorrow's reality will be different from today's. It absolutely boggles the mind! And, this is why scientific societies, such as IMPI and its annual symposia, are so important – they permit the free exchange of the latest information and discoveries. In our case, it's especially exciting because IMPI is an eclectic organization that covers areas as the diverse as plasmas and solid-state physics to microwave ovens, foods and packaging. I've often said to people that being a scientist is like being allowed to play in the sandbox all your life, at least that's been my experience.

Continued on Page 3

PRESIDENT MESSAGE Continued....

I hope to see all of you in Las Vegas for the exciting IMPI 53 symposium.



Bob Schiffmann

* <https://en.wikipedia.org/wiki/Second>

** <https://bigthink.com/surprising-science/new-kilogram-definition>

Spring Webinar Series 2019: "Microwave Fundamentals: Parts 1 & 2"

Instructor: Bob Schiffmann, President, RF Schiffmann Associates Inc. and IMPI President.

Part I: Tuesday, April 16th from 11am-12pm EST

Part II: Tuesday, May 14th from 11am-12pm EST

Webinar Description: This two part webinar will cover a non-mathematical discussion of the basic fundamentals of microwave heating, and will cover:

- *what microwaves are*
- *why microwaves heat*
- *how microwaves interact with materials*
- *the microwave power equation and penetration depth.*

Register today in the IMPI ONLINE STORE. Webinars are *free of charge to all IMPI Members! Non-members: \$99 for one webinar, \$159 for series*

IMPI 53 Symposium Continued...

Keynote speakers at IMPI 53 include Dr. Kenneth Foster, Professor of Bioengineering at the University of Pennsylvania, and a world-renowned expert in electromagnetic exposure, will share his perspective on **"What's New in the Microwave Debate."** Mr. Michael Wolf, Founder of the Smart Kitchen Summit and Publisher of The Spoon will explore the rapidly changing technology in both consumer and industrial kitchens, through his talk, **"The Intelligent Kitchen: The Digital Cooking Revolution."**

Hotel rooms at Caesars Palace are available at the special group rate of [\\$139 per night here](#). Hotel rooms at the group rate are only available until May 1, so book your room today.

Congratulations to the Student Travel Scholarship winners: Chuting Gong, Hanjin Zhang and Ali Taqi!

IMPI's Technical Program Committee is being led by Dr. Graham Brodie of the University of Melbourne and Mr. Roger Williams of Ampleon The Food Science and Technology Committee is chaired by Dr. Ulrich Erle of Nestle.

At IMPI 53, our main ballroom, breakout room and exhibit hall will all be adjacent to one another. All companies interested in Sponsorship or Exhibition should secure their package as soon as possible. Contact molly.poisant@impi.org or visit <http://impi.org/symposium-short-courses/> for more details.

Meet the New Members

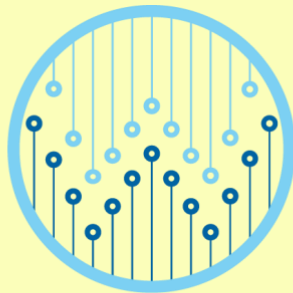
Since January 1, 2019, IMPI has welcomed 8 new corporate members! This marks the largest increase in IMPI membership in more than a decade. In our January newsletter, we featured four new corporate members that came to us via the RF Energy Alliance. Since that time, TurboChef (USA), Macom (USA), WAVE PIA (South Korea) and Crescend Technologies (USA) have come on board. Please join us in welcoming them to the IMPI family!



www.turbochef.com



www.macom.com



WAVE PIA

I C D E S I G N

www.wavepia.com



www.crescendtech.com

IMPI PROPOSES NEW BY LAWS

There is less than one week left for IMPI Members to vote on the Proposed By Laws presented to the IMPI Membership in late March.

The Proposed By Laws and all background information [is available here](#).

Please cast your vote, by sending an email with your name and YES or NO vote, to info@impi.org no later than Monday, April 15. Thank you for your cooperation in this important matter!

FROM THE IMPI ARCHIVE

Dear Reader:

During its 53-year history, IMPI has published more than just the Journal of Microwave Power (JMPEE); two of the major publications were the Microwave Energy Applications Newsletter and Microwave World – the latter was published for over 20 years. Both contain many interesting articles that are still relevant today. Throughout the year, we plan to share these articles from the IMPI Archive.

Many of us spend a considerable amount of time answering and correcting misinformation and myths that are spread on the Internet. One such myth is that microwave ovens affect pacemakers. For many years, it was not uncommon to see a sign at a restaurant that read: “Warning – Microwave Oven in Use.” In 1995, our distinguished IMPI Member and Fellow, Dr. John M. Osepchuk wrote one of the best rebuttals of this myth and it remains one of our favorite Microwave World articles to date. We hope you enjoy the second article in this series:

[Debunking a Mystical Hazard](#)

Microwave World, Volume 16, Number One (1995) Issue 2

by Dr. John M. Osepchuk

WE NEED YOU!

IMPI is seeking volunteers to serve on our Planning Committee for the 2019/2020 Fall Short Courses and Webinar Series. This Committee will play a key role in identifying topics and potential speakers for our events in 2019 and 2020. Committee Members will meet by phone for 1-hour a month and the remainder of the work will be done electronically. If you are interested in serving on this committee, please contact molly.poisant@impi.org by April 15th.

Journal of Microwave Power and Electromagnetic Energy (JMPEE)

On March 31, 2019 Volume 53, Issue 1 of IMPI's peer-reviewed scientific journal was published by Taylor and Francis. As a reminder, all IMPI members receive, as part of their membership benefits, complimentary online access to the current Volume of JMPEE as well as the full Archive. If you need assistance with your log in details, please contact Alicia Standridge at admin@impi.org

Volume 53, Issue 1 of JMPEE includes the following articles:

Editor's message: Computer simulation and scaling-up.

Juan Aguilar

Investigations on physical properties of Mg ferrite nanoparticles for microwave applications.

Sivkumar Pendyala, Thyagarajan K, GuruSampath Kumar A, Obulapathi L

Microwave drying of fabrics.

Wenjie Fu, Jiewen Deng, Xiaoyun Li

Numerical modeling of microwave heating of a porous catalyst bed.

Dorin Boldor, Pranjali Muley, Krishnaswamy Nandakumar

Dielectric characterization of common edible oils in the higher microwave frequencies using cavity perturbation.

AV Praveen Kumar, Akshit Goel, Ritish Kumar, Anuj Kumar Ojha, Jose Kurian John, Jose Joy

Extraction of colchicine from *Gloriosa superba* tubers- a comparison of conventional and microwave-assisted extraction.

Poonam Agrawal Kirti Laddha

CALENDAR OF EVENTS

IMPI Spring Webinar Series: Microwave Fundamentals Part 1 & 2

April 16 & May 14, 2019 – FREE for IMPI Members – [REGISTER HERE](#)

53rd Annual Microwave Power Symposium (IMPI 53)

June 18-20, 2019, Caesars Palace, Las Vegas, Nevada, USA

<http://impi.org/symposium-short-courses/>

AMPERE 2019

September 9-12, 2019, Valencia, Spain

<http://ampere2019.com>

IMPI's Fall Short Course

November 6-8, 2019, TurboChef Headquarters, Carrollton, Texas, USA

<http://impi.org/symposium-short-courses/>

4th Global Congress on Microwave Energy Applications (4GCMEA)

August 17-20, 2020 in Chengdu, China

NEWS FROM AROUND THE WEB

[Cook-in-Bag Market](#) to Grow at 6 Percent CAGR to 2023

Using neutrons, materials scientists [develop a method](#) that goes below the surface

Scientists envision [solar power station](#) in space

RF Engineer Opportunity [with TurboChef](#)

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Twitter: <https://twitter.com/IntlMwPowerInst>

Linkedin: <https://www.linkedin.com/company/international-microwave-power-institute>

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