IEEE IMS 2026: Where The Future Of RF And Microwave Engineering Takes Shape

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Every year, the RF and microwave community gathers for one event that sets the tone for the technologies, products, and research that will influence the industry for years to come. In 2026, that gathering was in Boston, Massachusetts at the Thomas M. Menino Convention and Exhibition Center, where the IEEE MTT-S International Microwave Symposium (IMS 2026) continued its decades long legacy as the premier international conference and exhibition dedicated to RF, microwave, millimeter-wave, and terahertz technologies.

Inside the IMS 2026 plenary session (Image courtesy of IMS).

Organized by the IEEE Microwave Theory and Techniques Society (MTT-S), the symposium provides an unparalleled forum for presenting breakthrough research, showcasing commercial innovations, and fostering collaboration across academia, industry, and government organizations. IMS2026 welcomed thousands of engineers, researchers, system architects, technology executives, educators, and students from around the world.

I enjoyed the practical aspects of the event including the outstanding ham-amateur radio reception which welcomed not only us existing amateurs but also curious students and others wanting to learn more about the hobby. At this reception, we were offered an outstanding presentation on the development of a new RF amplifier for the Aurora transceiver from Flex Radio—it's a highly efficient 300-W broadband RF power amplifier which employs switching power techniques at higher frequencies.

This leads to me to some observations about the strong link between the power electronics and the RF-microwave industries. Both industries depend on the PCB to be a big part of the design due to the frequencies and power levels used. Moreover, the success of the RF design depends on that of the power supply design.

For instance, RF power amplifiers need to be fed lots of clean dc power. And at low power, since both power and RF circuits both work in the analog domain, very clean small signal power is needed. Otherwise, noise on the dc line will be amplified and coupled into the RF stages. So, it's essential that we in the power electronics community work closely with our RF counterparts.

As in the power electronics field, in the RF-microwave field, there are larger application trends that drive the industry. As wireless communications, aerospace systems, autonomous vehicles, satellite networks, and quantum technologies continue to evolve, IMS2026 arrives at a pivotal moment. The demand for higher frequencies, greater bandwidth, higher throughput, anywhere connectivity, wireless power transfer, lower latency, improved efficiency, and intelligent system architectures has never been greater. The innovations presented throughout the week will help define the next generation of electronic systems.

Additionally, the acceleration of the market needs requires CAD and simulation support for components and systems including advancing test and measurement technologies. These technologies were all represented at IMS.

Viewing the conference through the lens of power electronics, I observed an RF-and-microwave-world with widely varying power requirements. These range from applications drawing microamps such as wake up systems that detect when they need to function, for example, in toll tags and battery-powered RF systems, all the way up to RF power amplifiers consuming multiple kilowatts of power.

The RF applications also include such things as RF-wireless power transfer which again spans a wide range of power levels: from low-power systems with tiny batteries to high-power electric vehicles with very large

batteries. In both cases, the batteries are recharged through wireless power transfer. These are obviously at two extremes of the power spectrum. Such systems can also vary widely in terms of physical requirements. In the case of the EVs, the chargers may even be embedded in roadways.

Additionally—and you can see the connection between these topics—there were several interesting papers at IMS on isolation in power electronics applications for high-speed data links using RF and inductive coupling technologies. You can imagine these topics are very relevant for power electronics systems where data rates are rising.

IMS has earned its reputation over more than six decades by bringing together every segment of the high-frequency ecosystem. Unlike highly specialized conferences that focus on a single discipline, IMS offers a comprehensive view of the technologies that enable modern wireless infrastructure and advanced electronic systems from a practical standpoint. This unique combination of research, product development, and commercial deployment makes IMS one of the most influential technical events in the electronics industry—not just in the RF field.

One of the defining characteristics of IMS 2026 is the introduction of a newly organized technical program that reflects the convergence of modern RF engineering disciplines.

The symposium now organizes its content into complementary focus areas that better align with today's design approaches:

- RFIC Symposium emphasizes integrated circuit design, semiconductor processes, mixed-signal technologies, and highly integrated RF solutions.
- RF Systems & Applications (RFSA) highlights complete communication systems, radar, sensing, aerospace platforms, satellite communications, and emerging wireless applications.
- RF Technology & Techniques (RFTT) explores passive components, antennas, packaging, materials, manufacturing technologies, modeling, simulation, and advanced measurement techniques. There were even sessions on sustainability.

Complementing these technical tracks is the Automatic RF Techniques Group (ARFTG) Microwave Measurement Conference, which continues to serve as one of the industry's leading forums for RF and microwave measurement science, calibration methodologies, and metrology.

The revised structure acknowledges that today's RF products require expertise spanning integrated circuits, system architecture, advanced packaging, software, manufacturing, and precision measurement instrumentation. By organizing the symposium around these interconnected disciplines, IMS2026 encourages attendees to move beyond traditional technical silos.

Perhaps no technology sector demonstrates the importance of RF engineering more clearly than wireless communications.

While commercial deployment of 5G continues worldwide, research efforts have rapidly shifted toward the requirements of future 6G networks. Engineers are exploring frequencies extending into millimeter-wave and sub-terahertz bands to deliver dramatically higher data rates while enabling new applications such as immersive extended reality, intelligent transportation systems, industrial automation, and AI-native communications. Of course, the power systems for 6G and beyond are also a proximate consideration.

Meeting these ambitious performance goals requires advances throughout the RF signal chain.

Power amplifiers must deliver higher efficiency while maintaining exceptional linearity. Low-noise amplifiers require greater sensitivity. Data converters must continue pushing sampling speeds higher. Advanced beamforming architectures are necessary to support increasingly complex antenna arrays. Packaging technologies have to reduce losses while improving thermal management. Every component must contribute to higher overall system performance.

IMS2026 offered a comprehensive view of these developments, allowing attendees to evaluate technologies that are moving from research laboratories into commercial products.

Artificial Intelligence Meets RF Design

Artificial intelligence has become one of the most transformative forces affecting engineering methodologies, and RF design is no exception.

Machine learning algorithms are increasingly being incorporated into electromagnetic simulation, automated circuit optimization, design-space exploration, predictive maintenance, manufacturing inspection, and adaptive wireless systems, CAD–CAE tools and more.

Rather than replacing engineering expertise, AI is becoming a powerful design assistant capable of accelerating development cycles while reducing the number of costly design iterations. I like to think of it as augmenting and accelerating the engineering function while reducing or eliminating some of the boring aspects.

Conference sessions explored how AI supports antenna synthesis, electromagnetic modeling, signal processing, spectrum management, digital predistortion, CAD and CAE tools and automated test environments. The intersection between AI and RF engineering represents one of the fastest-growing areas of research and commercial development including what a major portion of the plenary session covered, namely quantum computing.

Semiconductor Technologies Continue To Advance

Underlying every RF system are semiconductor technologies that continue to push performance boundaries. Many of these technologies conversely impact the power system requirements and voltage rails needed in the systems.

On the higher-power RF side, the devices are changing. LDMOS RF power transistors have been the long-time leader in RF power and they are being discontinued and are now end of life. These devices ran at 48-V nominal thus many power systems have been standardized around 48 V including cellular base stations. However, this is changing as the new RF wide-bandgap devices are moving towards 150 V which has an added benefit of lowering the needed current requirements for a given power output. In fact, the RF industry embraced and used wide-bandgap technologies much earlier than the power electronics industry and implemented them in products that shipped much earlier than their counterparts in power electronics.

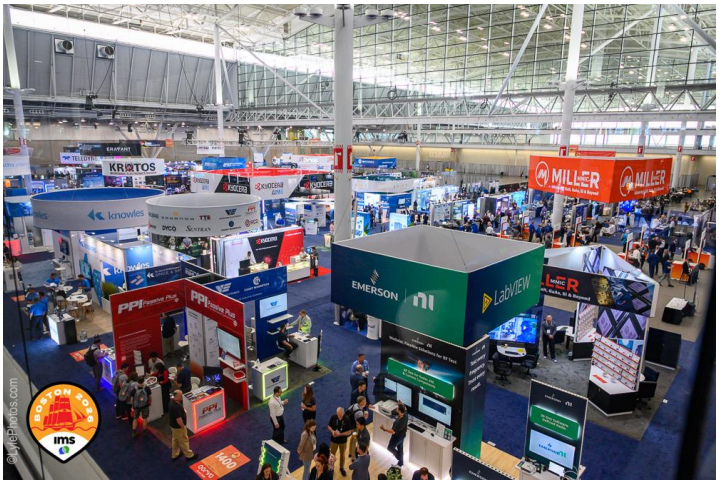
Gallium nitride (GaN) remains the preferred technology for high-power applications in RF including radar, electronic warfare, and satellite communications. Gallium arsenide (GaAs) continues serving numerous high-frequency commercial applications, while silicon germanium (SiGe) and advanced CMOS processes enable highly integrated, low-power wireless devices.

As heterogeneous integration becomes increasingly common, designers are combining multiple semiconductor technologies within advanced packages to achieve performance levels that would be impossible using a single process technology. In the realm of small-signal lower-power RF, IMS 2026 provided an opportunity to examine the latest fabrication processes, packaging innovations, and integration techniques that support next-generation RF systems.

As touched on previously, in the small signal region of RF, the power rails must be clean and noise free as any artifact become amplified and coupled into the RF systems. So, any noise injected by the power supplies impacts the overall performance of the RF systems.

Measurement: The Foundation Of Innovation

No engineering breakthrough reaches commercialization without accurate test and measurement. Modern RF systems routinely operate well into millimeter-wave frequencies where measurement uncertainty, calibration complexity, connector repeatability, and signal integrity become increasingly challenging. Advances in vector network analyzers, spectrum analyzers, signal generators, oscilloscopes, load-pull systems, and automated test platforms continue enabling engineers to characterize increasingly sophisticated devices.



A scene from the IMS 2026 exhibition (image courtesy of IMS).

The ARFTG Conference complemented IMS by focusing specifically on measurement science, providing practical solutions that improve confidence in high-frequency testing and validation. As frequencies continue increasing

toward sub-terahertz operation, accurate measurement remains one of the industry's most critical enabling technologies and constant R&D is fueled by higher and higher frequency applications.

The Exhibition Floor

While technical papers reveal tomorrow's ideas, the IMS exhibition demonstrates today's commercial reality and products you can buy now. Hundreds of exhibitors showcased the latest innovations across semiconductor devices, RF components, antennas, connectors, cables, electronic design automation software, manufacturing equipment, test instrumentation, packaging technologies, thermal management solutions, and complete system platforms.

For many attendees, the exhibition represented the most efficient opportunity of the year to compare competing technologies, discuss technical challenges directly with product developers, and evaluate solutions before making investment decisions—all in real time.

Live demonstrations provided insights unavailable through specifications alone, allowing engineers to observe real-world performance under practical operating conditions. Demos were everywhere on the exhibit floor and it took a great deal of time to take it all in.

Building The Next Generation Of Engineers

IMS has long recognized that sustaining technological leadership requires investing in future talent.

Student paper competitions, design contests, Young Professional activities, Women in Microwaves programs, and educational workshops provided opportunities for early-career engineers to engage with internationally recognized experts. The ham radio reception also presented an opportunity for engineering students to get exposure to how they can design and build equipment to get on the air, solve real world problems and accelerate learning. Plus, experience with ham radio puts something great and practical on their resumes.

At the ham radio reception (image courtesy of IMS).

All these initiatives aimed at younger engineers fostered mentorship, encouraged collaboration, and helped bridge the gap between academic research and industrial practice.

As workforce development becomes increasingly important across engineering disciplines, these programs contribute significantly to strengthening the global RF community. In fact, it seems that the RF community is better at these things than other segments of the electronics industry. Perhaps it's because—like in power electronics—if it's not right, it doesn't work.

Boston offered a fitting backdrop for IMS2026. Home to world-renowned universities, leading hospitals, innovative startups, and global technology companies, VC organizations and more, the city has long been recognized as one of the world's foremost centers for scientific research and engineering innovation. Its concentration of expertise in semiconductors, photonics, aerospace, biotechnology, robotics, artificial intelligence, and advanced manufacturing creates an environment where new partnerships naturally emerge.

Beyond the conference, attendees experienced Boston's rich history, vibrant neighborhoods, renowned museums, and thriving innovation ecosystem which made IMS 2026 both a professional and cultural destination.

Looking Beyond 2026

The RF industry stands at an inflection point. Communications are becoming increasingly intelligent. Space-based networks are expanding rapidly. Automotive radar continues evolving toward higher resolution. Quantum

technologies are transitioning from research laboratories to commercial applications. Defense systems demand greater performance under increasingly complex operational conditions.

Meanwhile, material science, packaging and semiconductor device complexity is accelerating while innovation is moving at a faster rate than ever before. These challenges cannot be addressed through incremental improvements alone. They require new materials, innovative circuit architectures, advanced measurement techniques, AI-assisted design methodologies, and closer collaboration across scientific disciplines.

That collaborative spirit has always been the defining characteristic of the International Microwave Symposium.

As the global engineering community convened in Boston this June, IMS 2026 provided a glimpse into innovations that will shape the next decade of wireless connectivity, sensing, measurement, and high-frequency electronics. You won't have to wait too long for another opportunity to observe the industry's progress in these areas as IEEE IMS 2027 will be in San Antonio next year, May 23-28. For more information on next year's conference, see the IMS website.