



From the Editor's Desk

Focus on Wireless Communications

■ Robert H. Caverly 

When the general public hears the term *wireless communications*, they might think of applications such as their wireless Internet connection, wireless earbuds, or perhaps the satellite radio receiver in their cars. Wireless technology is exceedingly reliable, and therefore, the general public takes it as a given that it works as soon as they need it and assumes that it will provide the needed service without giving it much thought. It is also a human trait that if something works well, they will inevitably ask “Can it work better (and cheaper and with a smaller footprint)?” Again, the general public assumes that these improvements will occur, given time and funding, and that applications such as high-definition video can be delivered to their mobile devices. Microwave and optical engineers know, though, that the robust and reliable technology required (and still requires) enormous time and effort to design, fabricate, and exhaustively test the systems to provide the functional-



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ity and reliability the general public expects. Wireless communication is a pervasive technology with a continued bright future as enhancements are built on previous technologies, with new applications yet to be envisioned. Because of this importance to society in general, the MTT-S has, among its 26 technical committees (TCs), a dedicated Wireless Communications Committee (TC-23).

This month's issue of *IEEE Microwave Magazine* is a focus issue developed by TC-23 to highlight some of the

work in this specific area of microwave engineering. This focus issue was organized by then-TC-23 chair, Robert Gómez García; I would like to thank him for working with the authors and our editorial staff to bring the focus issue to fruition. The first feature, by Callebaut et al. [A1], clarifies the requirements for 6G radio testbeds, reveals trends, and introduces approaches toward their development. The next feature, by Komatsuzaki et al. [A2], looks at enabling technologies and artificial intelligence-based

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optimization, including neural network digital predistortion techniques that can create development toward more flexible and efficient wireless communication. The final feature within the “Wireless Communication” focus is by Kolodziej and Popovic [A3]. Here, the authors review the state of the art in in-band full-duplex phased-array implementations that could be used to create simultaneous-multifunction systems, with a number of array architectures presented. To round out the technical features, Kazemi and Fathy [A4] provide an overview of X-band power combiners, beginning with an introduction to power combining. The reader is then guided through design and performance metrics as well as examples of several radial power combiners. This month, we also have an “Applications Note” column by Rakesh Sinha [A5] that builds on the traditional coupler theory taught in microwave textbooks and expands into various modifications to improve one or more performance metrics.

As I mentioned in last month’s “From the Editor’s Desk” column, IEEE has several affinity groups within IEEE Member and Geographic Activities. In this month’s “President’s Column” column, MTT-S President Maurizio Bozzi [A6] focuses on the Young Professionals Affinity Group as well as another group important to the future vitality of the Society: students. Speaking of students, look for the announcement for the Undergraduate/Pre-graduate Scholarship Program, with a 15 April application deadline.

In his “MicroBusiness” column, Fred Schindler [A7] discusses the ongoing transition occurring in the workplace and in people’s perceptions as we return to a more prepandemic way of life.

Though this month’s technical features focus on the work in the TC-23 field, you can also read about the technical activities of the last two years from another MTT-S TC, TC-11, the Microwave Low-Noise Techniques Committee, in our “MTT-S Society News” column [A8]. Whether you found yourself able to attend 2023 European Microwave Week (EuMW) or not, you will enjoy reading an extensive summary of the activities of the week in our “Around the Globe” column [A9]. The “Conference Calendar” column [A10] by EuMW organizers discusses the highlights of the week in the three sister conferences. In the Women in Microwaves column, Sherry Hess [A11] talks about the accomplishments of the committee over the years and presents a call to action on how women can champion each other at work. Rounding out the issue is another challenging “Enigmas, etc.” column [A12] and an “Educator’s Corner” column [A13] that focuses on calculating waveguide fields that differs from standard textbook approaches.

We hope that you enjoy the issue!

Appendix: Related Articles

[A1] G. Callebaut, L. Liu, T. Eriksson, L. Van der Perre, O. Edfors, and C. Fager, “6G radio testbeds: Requirements, trends, and approaches,” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 14–31, Apr. 2024, doi: 10.1109/MMM.2024.3351970.

- [A2] Y. Komatsuzaki, S. Sakata, K. Saiki, A. Yamashita, S. Shinjo, and K. Yamanaka, “Advanced GaN wideband/multiband power amplifier for sub-6 GHz 5G and beyond wireless communication: Toward future flexible base station by AI-based digital assisted PA,” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 32–43, Apr. 2024, doi: 10.1109/MMM.2024.3351977.
- [A3] K. E. Kolodziej and Z. Popovic, “Simultaneous-multifunction phased arrays: Enabled by in-band full-duplex technology,” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 44–63, Apr. 2024, doi: 10.1109/MMM.2024.3351978.
- [A4] R. Kazemi and A. E. Fathy, “Radial power combiners—An overview: A comprehensive analysis of power combiners, their structures and evolution from their inception to the present,” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 64–85, Apr. 2024, doi: 10.1109/MMM.2024.3351979.
- [A5] R. Sinha, “Solutions for quadrature/nonquadrature branch line coupler with equal/unequal power division,” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 86–95, Apr. 2024, doi: 10.1109/MMM.2023.3329691.
- [A6] M. Bozzi, “Students and young professionals are the future! [President’s Column],” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 9–11, Apr. 2024, doi: 10.1109/MMM.2024.3351968.
- [A7] F. Schindler, “Back to the before times? [MicroBusiness],” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 12–13, Apr. 2024, doi: 10.1109/MMM.2024.3351969.
- [A8] V. Issakov, S. Montazeri, and J. C. Bardin, “TC-11 microwave low-noise techniques committee report [MTT-S Society News],” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 96–98, Apr. 2024, doi: 10.1109/MMM.2024.3351972.
- [A9] T. Zwick, I. Rolfes, F. Gerfers, C. Waldschmidt, and I. Kallfass, “The 26th European microwave week, in Berlin, Germany [Around the Globe],” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 99–106, Apr. 2024, doi: 10.1109/MMM.2024.3351973.
- [A10] “Conference calendar,” *IEEE Microw. Mag.*, vol. 25, no. 4, p. 114, Apr. 2024, doi: 10.1109/MMM.2024.3351976.
- [A11] S. Hess, “Six ways women can champion one another and how WIM supports these calls to action [Women in Microwaves],” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 107–109, Apr. 2024, doi: 10.1109/MMM.2024.3351974.
- [A12] T. Ohira, “Solution to last month’s quiz [Enigmas, etc.],” *IEEE Microw. Mag.*, vol. 25, no. 4, p. 113, Apr. 2024, doi: 10.1109/MMM.2024.3351975.
- [A13] R. G. Kulkarni, “Fields inside a waveguide: A different approach [Educator’s Corner],” *IEEE Microw. Mag.*, vol. 25, no. 4, pp. 110–112, Apr. 2024, doi: 10.1109/MMM.2024.3351971.

