



# IEEE Journal of Microwaves

*"Expanding science, technology and connectivity across the globe."*

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY

## CONTENTS

Vol. 1, No. 1  
JANUARY 2021

---

### Editorial Paper

- 5 **Introduction to the IEEE JOURNAL OF MICROWAVES**  
*by P. H. Siegel*

---

### Special Series Papers

- 14 **Microwaves Are Everywhere "CMB: Hiding in Plain Sight"**  
*by P. H. Siegel*
- 25 **Microwave Pioneers: John C. Mather "A Singular Purpose"**  
*by P. H. Siegel*

---

### Special Invited Papers

- 32 **Microwaves in Chemistry**  
*by D. R. Slocombe and A. Porch*
- 43 **Instrumentation for THz Spectroscopy in the Laboratory and in Space**  
*by J. C. Pearson, B. J. Drouin, and S. Yu*
- 55 **Innovative RFID Sensors for Internet of Things Applications**  
*by P. Mezzanotte, V. Palazzi, F. Alimenti, and L. Roselli*
- 66 **Sensing of Life Activities at the Human-Microwave Frontier**  
*by C. Li, V. M. Lubecke, O. Boric-Lubecke, and J. Lin*

---

### Special Editorial Paper

- 79 **On the Shoulders of Giants: Reflections on the Creators and Uses of Radio**  
*by T. Lewis*
- 

(IJMEMX)  
(ISSN 2692-8388)

---

## Special Invited Papers

- 86      **Implementation Challenges and Opportunities in Beyond-5G and 6G Communication**  
*by U. Gustavsson, P. Frenger, C. Fager, T. Eriksson, H. Zirath, F. Dielacher, C. Studer, A. Pärssinen, R. Correia, J. N. Matos, D. Belo, and N. B. Carvalho*
- 101     **The Role of Millimeter-Wave Technologies in 5G/6G Wireless Communications**  
*by W. Hong, Z. H. Jiang, C. Yu, D. Hou, H. Wang, C. Guo, Y. Hu, L. Kuai, Y. Yu, Z. Jiang, Z. Chen, J. Chen, Z. Yu, J. Zhai, N. Zhang, L. Tian, F. Wu, G. Yang, Z.-C. Hao, and J. Y. Zhou*
- 123     **Packaging and Antenna Integration for Silicon-Based Millimeter-Wave Phased Arrays: 5G and Beyond**  
*by X. Gu, D. Liu, and B. Sadhu*
- 135     **Automotive Radar—From First Efforts to Future Systems**  
*by C. Waldschmidt, J. Hasch, and W. Menzel*
- 149     **Coherent Automotive Radar Networks: The Next Generation of Radar-Based Imaging and Mapping**  
*by M. Gottinger, M. Hoffmann, M. Christmann, M. Schütz, F. Kirsch, P. Gulden, and M. Vossiek*
- 164     **RF Systems Design for Simultaneous Wireless Information and Power Transfer (SWIPT) in Automation and Transportation**  
*by D. Masotti, M. Shanawani, G. Murtaza, G. Paolini, and A. Costanzo*
- 176     **Microwave Photonic Array Radars**  
*by S. Pan, X. Ye, Y. Zhang, and F. Zhang*
- 191     **Microwave Imaging in Security—Two Decades of Innovation**  
*by S. S. Ahmed*
- 202     **Micrometer Sensing With Microwaves: Precise Radar Systems for Innovative Measurement Applications**  
*by F. Michler, B. Scheiner, T. Reissland, R. Weigel, and A. Koelpin*
- 218     **History and Innovation of Wireless Power Transfer via Microwaves**  
*by N. Shinohara*
- 229     **Microwave and Millimeter Wave Power Beaming**  
*by C. T. Rodenbeck, P. I. Jaffe, B. H. Strassner II, P. E. Hausgen, J. O. McSpadden, H. Kazemi, N. Shinohara, B. B. Tierney, C. B. DePuma, and A. P. Self*
- 260     **Russian Gyrotrons: Achievements and Trends**  
*by A. G. Litvak, G. G. Denisov, and M. Y. Glyavin*

---

## Special Series Paper

- 269     **Carver Mead: “It’s All About Thinking,” A Personal Account Leading up to the First Microwave Transistor**  
*by P. H. Siegel*
-

## Special Invited Papers

- 275 **CNTFET Technology for RF Applications: Review and Future Perspective**  
*by M. Hartmann, S. Hermann, P. F. Marsh, C. Rutherglen, D. Wang, L. Ding, L.-M. Peng, M. Claus, and M. Schröter*
- 288 **SiGe HBTs and BiCMOS Technology for Present and Future Millimeter-Wave Systems**  
*by T. Zimmer, J. Böck, F. Buchali, P. Chevalier, M. Collisi, B. Debaillie, M. Deng, P. Ferrari, S. Fregonese, C. Gaquiere, H. Ghanem, H. Hettrich, A. Karakuzulu, T. Maiwald, M. Margalef-Rovira, C. Maye, M. Möller, A. Mukherjee, H. Rücker, P. Sakalas, R. Schmid, K. Schneider, K. Schuh, W. Templ, A. Visweswaran, and T. Zwick*
- 299 **Millimeter-Wave Power Amplifier Integrated Circuits for High Dynamic Range Signals**  
*by H. Wang, P. M. Asbeck, and C. Fager*
- 317 **Emerging Trends in Techniques and Technology as Applied to Filter Design**  
*by R. V. Snyder, G. Macchiarella, S. Bastioli, and C. Tomassoni*
- 345 **Substrate Integrated Transmission Lines: Review and Applications**  
*by K. Wu, M. Bozzi, and N. J. G. Fonseca*
- 364 **Connecting Chips With More Than 100 GHz Bandwidth**  
*by W. Heinrich, M. Hossain, S. Sinha, F.-J. Schmückle, R. Doerner, V. Krozer, and N. Weimann*
- 374 **Microwave Huygens' Metasurfaces: Fundamentals and Applications**  
*by V. G. Ataloglou, M. Chen, M. Kim, and G. V. Eleftheriades*
- 389 **Microwave Superconductivity**  
*by S. M. Anlage*
- 403 **Microwaves in Quantum Computing**  
*by J. C. Bardin, D. H. Slichter, and D. J. Reilly*
- 428 **MID-Radio Telescope, Single Pixel Feed Packages for the Square Kilometer Array: An Overview**  
*by A. Pellegrini, J. Flygare, I. P. Theron, R. Lehmensiek, A. Peens-Hough, J. Leech, M. E. Jones, A. C. Taylor, R. E. J. Watkins, L. Liu, A. Hector, B. Du, and Y. Wu*
- 438 **Microwave Magnetics and Considerations for Systems Design**  
*by M. Geiler, S. Gillette, M. Shukla, P. Kulik, and A. L. Geiler*
- 447 **Non-Magnetic Non-Reciprocal Microwave Components—State of the Art and Future Directions**  
*by A. Nagulu and H. Krishnaswamy*
- 457 **On the Benefits of Glide Symmetries for Microwave Devices**  
*by O. Quevedo-Teruel, Q. Chen, F. Mesa, N. J. G. Fonseca, and G. Valerio*
- 470 **Sommerfeld Integrals and Their Relation to the Development of Planar Microwave Devices**  
*by J. R. Mosig and K. A. Michalski*

---

## Special Invited Papers

- 481      **Advanced RF and Microwave Design Optimization: A Journey and a Vision of Future Trends**  
*by J. E. Rayas-Sánchez, S. Koziel, and J. W. Bandler*
- 494      **Simulation and Automated Modeling of Microwave Circuits: State-of-the-Art and Emerging Trends**  
*by Q. J. Zhang, E. Gad, B. Nouri, W. Na, and M. Nakhla*
- 

## Contributed Paper

- 508      **Supply Modulation Behavior of a Doherty Power Amplifier**  
*by D. Fishler, Z. Popović, and T. Barton*
-