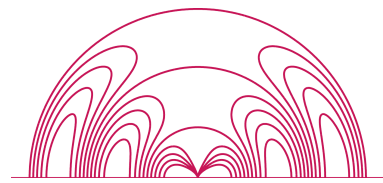


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- 13:00 Artificial Doppler and Micro-Doppler Effect Induced by Time-modulated Metasurface
Ziyang Lai (Nanjing University of Science and Technology); Xinyu Fang (Nanjing University of Science and Technology); Mengmeng Li (Nanjing University of Science and Technology); Da-Zhi Ding (Nanjing University of Science and Technology); Rushan Chen (Nanjing University of Science and Technology);
- 13:15 A Hybrid Domain Decomposition Method to Accelerate the Scattering Analysis from Multiple Moving Objects
Xiong Yang (University of Electronic Science and Technology of China); Jun Hu (University of Electronic Science and Technology of China);
- 13:30 An Efficient Hybrid Method for Analysis of Large Antenna Arrays
Haifeng Liang (Ningbo University); Hanru Shao (Ningbo University);
- 13:45 A Novel Approach to Analyse the Band Gap of Mushroom-like Electromagnetic Band Gap Structure
Guanya Li (University of Electronic Science and Technology of China); Hai-Yan Chen (University of Electronic Science and Technology of China); Qingting He (University of Electronic Science and Technology of China); Yunqiang Huang (University of Electronic Science and Technology of China); Li Zhang (University of Electronic Science and Technology of China); Linbo Zhang (University of Electronic Science and Technology of China); Xiao Long Weng (University of Electronic Science and Technology of China); Jianliang Xie (University of Electronic Science and Technology of China); Difei Liang (University of Electronic Science and Technology of China); Long-Jiang Deng (University of Electronic Science and Technology of China);
- 14:00 Passive Monopulse Amplitude-comparison Three-dimensional Direction-finding Based on Six-element Antenna Array
Qilun Yang (Science and Technology on Electronic Information Control Laboratory); Longbiao Hu (Science and Technology on Electronic Information Control Laboratory); Xuying Zhang (Science and Technology on Electronic Information Control Laboratory); Yanfei Li (Science and Technology on Electronic Information Control Laboratory);
- 14:15 Beyond-5G Wireless Systems: An Opportunity for Applied Electromagnetics and Metamaterials Communities
Filiberto Bilotti ("Roma Tre" University); Mirko Barbutto ("Niccolò Cusano" University); Michela Longhi (Niccolò Cusano University); Angelica Viola Marini ("Roma Tre" University); Alessio Monti (Niccolò Cusano University); Davide Ramaccia ("Roma Tre" University); Luca Stefanini ("Roma Tre" University); Alessandro Toscano ("Roma Tre" University); Stefano Vellucci ("Roma Tre" University);
- 14:40 Optical Properties of Nanoporous Gold Sponges Using Model Structures Obtained from Three-dimensional Phase-field Simulation
Sebastian Bohm (Technische Universität Ilmenau/Institute of Physics and Institute of Micro- and Nanotechnologies); Malte Grunert (Technische Universität Ilmenau); Hauke Lars Honig (Technische Universität Ilmenau); Dong Wang (Technische Universität Ilmenau); Peter Schaaf (Technische Universität Ilmenau); Erich Runge (Technische Universität Ilmenau); Jinhui Zhong (University of Oldenburg); Christoph Lienau (Carl von Ossietzky Universität Oldenburg);
- 14:50 Realistic 3D Channel Model for Chipless RFID System Considering RFID Tag RCS and Multipath Components
Mohamed El-Hadidy (The University of Duisburg-Essen); T. Ould Mohamed (IMST GmbH);
- 15:30 Coffee Break
-
- Session 1P16b
- SC4: Microwave/Millimeter Wave Circuits and Systems for Emerging Applications**
-
- Monday PM, April 25, 2022
- Online ROOM 16
- Organized by Yongchae Jeong, Girdhari Chaudhary**
- Chaired by Yongchae Jeong, Girdhari Chaudhary**
-
- 16:00 Compressive Direction of Arrival Estimation with Wavechaotic Antennas
Okan Yurduseven (Queen's University Belfast); T. V. Hoang (Queen's University Belfast); M. A. B. Abbasi (Queen's University Belfast); V. Fusco (Queen's University Belfast);
- 16:10 **The Design of Class-F Power Amplifier by Using Asymmetrical Composite Right-/Left-handed Transmission Line**
Phanam Pech (Jeonbuk National University); Suyeon Kim (Jeonbuk National University); Daehan Lee (Jeonbuk National University); Muhammad A. Chaudhary (Ajman University); Yongchae Jeong (Jeonbuk National University);
- 16:20 Design of Matching Networks with Bandpass Filtering Response Using Stepped Impedance Resonator
Jaehun Lee (Jeonbuk National University); Phanam Pech (Jeonbuk National University); Girdhari Chaudhary (Jeonbuk National University); Jongsik Lim (Sooncheonhyang University); Yongchae Jeong (Jeonbuk National University);
- 16:30 Low Profile Patch Antenna Surrounded by Mushroom-type Resonators for Highly Integrated Wireless Devices at 60 GHz
I. Kaid Omar (Université Paris-Saclay); Frederic Aniel (Univ. Paris-Sud); Nicolas Zerounian (Univ. Paris 11); Badreddine Ratni (Univ. Paris 11);

The Design of Class-F Power Amplifier by Using Asymmetrical Composite Right-/Left-handed Transmission Line

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Abstract— Power amplifiers (PAs) are the essential circuit in a variety of microwave and radar systems. It is well known that the PA is critical in the efficiency of the overall system. Typically, the efficiency of PA is sacrificed because the PA should be operated under the backed-off conditions to assure linear operation for any instantaneous input power level. For further efficiency improvement, the harmonic controlling circuit was presented in PA design [1]. However, the addition of the harmonic controlling circuit could increase the size and cost of PA. On the other hand, the matching networks are very important in PA design. Recently, the synthesis of complex termination impedance bandpass filter was presented in [2] which suitable to apply as the matching networks of PA.

This paper presents the design of a class-F power amplifier in which the second- and third- harmonics are controlled by asymmetrical composite right-/left-handed transmission line (CRLH-TL). The class-F PA is designed at the fundamental frequency (f_0) of 1.96 GHz with a 10 W GaN HEMT transistor from Wolfspeed. The DC is feed from the inductor L_1 of CRLH-TL-1. The CRLH-TL-1 can be operated as the bias circuit with harmonic control that provides open-impedance at f_0 and short-impedances at $2f_0$ and $3f_0$ which known as the second and third harmonic, respectively. The CRLH-TL-2 operates as the quarter-wavelength ($\lambda/4$) impedance transformer which transforms the short-impedances mentioned above to short- and open-impedances at $2f_0$ and $3f_0$, respectively. In this work, the input matching network is realized by using the stepped-impedance resonator (SIR) which can provide the frequency selectivity response and high out-of-band signal suppression. The output matching network is realized by using the conventional TLs. The proposed PA provides more than 13 dB, 42 dBm, and 70% of power gain, output power, and drain efficiency, respectively. Since the electrical length, θ and θ_2 of TL in CRLH-TLs are much smaller than $\lambda/4$, therefore the circuit size of the proposed PA is expected to be reduced.

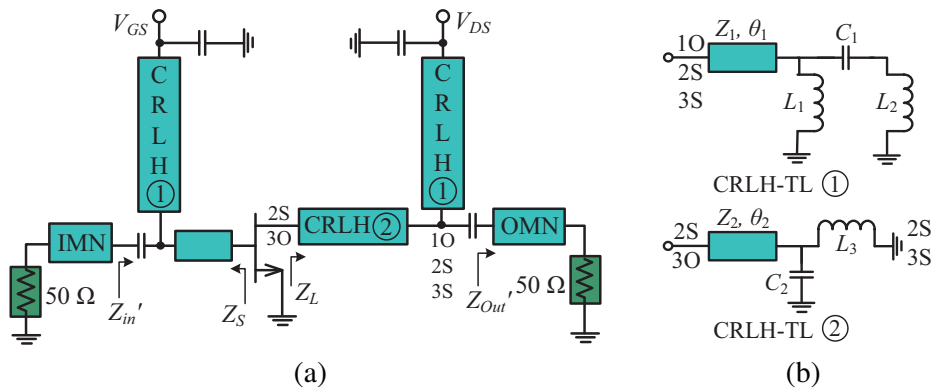


Figure 1: Structure of: (a) proposed class-F PA and (b) harmonic control circuits.

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REFERENCES

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2. Kim, P. and Y. Jeong, "A new synthesis and design approach of a complex termination impedance bandpass filter," *IEEE Trans. Microw. Theory Techn.*, Vol. 67, No. 6, 2346–2354, Jun. 2019.