



Institute of Electrical and Electronic Engineers



Circuits and Systems Society

# **Power and Energy Circuits and Systems Technical Committee**

## **Annual Report 2019**

May 2018 – May 2019

**Abdelali El Aroudi , TC Chair**

**May 22th, 2019**

Report contributed by Abdelali El Aroudi, Tyrone Fernando, Tsorng-Juu Liang, Giulia Di Capua, Ranmuthu Indumini , Aleksandra Lekic, Hiroo Sekiya, Ke-Horng Chen, Sharma, Anmol, Xiaozhe Wang, Junrui Liang and Guido Torelli.

## **1. Introduction**

This report is generated from the data received from 12 members, which represents only a fraction of the current membership and as such can only provide a sampling of the activities of the PECAS TC members. The report is organized as follows:

**Section I** presents a summary of significant events in the Technical Committee history through the year;

**Section II** highlights some initiatives or activities of the individual Technical Committee members in the framework of the TC activities and focus area;

**An Appendix** presents a detailed view on the individual members' contributions.

## **2. Summary of significant events in the Technical Committee**

### **A) Membership changes**

Some new members were accepted in the TC during the ISCAS 2018 meeting, including: Chi Tsun (Ben), Cheng, Hong Kong Polytechnic University, ctcheng@ieee.org, Yongxiang Xia, Zhejiang Univ. China, xiayx@zju.edu.cn, Suli Zou, ETH Zurich, Switzerland, sousu@control.ee.ethz.ch, Valentina Cecchi, UNC Charlotte, USA vcecchi@uncc.edu, Daniel Molzahn, Argonne National Laboratory dan.molzahn@gmail.com, Aleksandra Lekic, Belgrade University, lekc.aleksandra@etf.rs and Chi-Seng Lam, University of Macau, cslam@um.edu.mo.

### **B) Endorsement of Conferences and Workshops**

The following conference has been endorsed by the TC

2018 IEEE Dallas Circuits and Systems

The TC has endorsed the following tutorial and special sessions in the ISCAS 2019

Adrian Ioinovici, Holon Institute of Technology

TUTORIAL: Electronic Circuits for Smart Grids Supplied by Renewable Energy Sources

Giulia di Capua, University of Salerno,

SPECIAL SESSION: Enhanced Design of Power Converters with Non-Linear Power Components I

SPECIAL SESSION: Enhanced Design of Power Converters with Non-Linear Power Components II

### **C) IEEE Distinguished Lecturer Programme**

Prof. C.K. Tse has been named as a Distinguished Lecturer for the IEEE Circuits and Systems Society (CASS) for 2018-2019.

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Gabriel Alfonso Rincón-Mora has been named a Distinguished Lecturer for the IEEE Circuits and Systems Society (CASS) for 2018-2019.

### **B) Chairs of International Conferences**

1. Prof. Hiroo Sekiya and Dr. Abdelali El Aroudi were General Co-Chairs for 2018 International Symposium on Nonlinear Theory and Its Applications (NOLTA2018), Sep. 2-6, Tarragona, Spain.
2. Dr. Abdelali El Aroudi is a General Co-Chair for 2019 IEEE Conference on Power Electronics and Renewable Energy (CPERE2019), 23-25 October 2019, Aswan, Egypt.

### **D) Update of CASS EDICS**

Members from our TC contributed to the proposal of updated CASS EDICS in 2018.

## **3. Activity of the Technical Committee Members**

### **A) Involved activity at Conferences and Events**

During the reporting period, three members gave four keynote speeches at international conferences.

### **B) Editorial Services**

1. Members from our TC took different editorial roles in international journals, ranging from Editor-in-Chief (3), to the Associate and Guest Associate Editors (14)
2. Members from our TC took participation in the organization of workshop or conferences committees as Chair, Co-Chair, Advisory Co-Chair, Organizer, Committee Member.

### **C) Publications**

During the reporting periods, the TC members authored:  
60 (in fact, probably more) articles on major scientific journals  
50 (in fact, probably more) conference papers  
2 book chapters

### **D) Patents**

During the reporting period, three TC members has filed five patent applications.

### **E) Awards and Honors**

During the reporting period, five TC members received awards.

### **F) Other Services**

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## **Appendix: details on the members' activities**

### **A) Conferences or workshops where the PECAS TC or members of the TC were actively involved in Short Courses, Plenary Sessions, Keynote Speeches, Invited Lectures:**

Prof. C.K. Tse was a keynote speaker at the 4th Innovation Workshop on Smart Grid and Energy Conversion (SGEC), Beijing, China, Dec 1st, 2018.

Abdelali El Aroudi was a keynote speaker at the 4th Innovation Workshop on Smart Grid and Energy Conversion (SGEC), Beijing, China, Dec 1st, 2018.

Fernando Tyrone was a keynote speaker at 4th Innovation Workshop on Smart Grid and Energy Conversion (SGEC), Beijing, China, Dec 1st, 2018.

Fernando Tyrone was a keynote speaker at 2019 International Conference on Smart Power & Internet Energy Systems

Fernando Tyrone was a keynote speaker at 2018 Asia Conference on Energy and Environment Engineering

### **B) Editorial Service:**

1. C.K. Tse was the Editor-in-Chief for the IEEE Transactions on Circuits and Systems II: Express Briefs.
2. Eduard Alarcon was the Editor-in-Chief for IEEE Journal on Emerging and Selected Topics in Circuits and Systems.
3. Giulia di Capua Guest was Editor for the Special Issue "Selected Papers from PRIME 2019 and SMACD 2019", Integration, the VLSI Journal, Elsevier (in progress, 2019-2020).
4. Giulia di Capua was Guest Editor for the International Symposium on Integrated Circuits and Systems - ISICAS 2019, published as Special Issues of TCAS-I, TCAS-II, and TBioCAS, IEEE (in progress, 2019).
5. Giulia di Capua Guest was Editor for the Special Issue "Selected Papers from ISCAS 2019", IEEE Trans. on Circuits and Systems I: Regular Paper (TCAS-I), IEEE (in progress, 2019).
6. Giulia di Capua was Guest Editor for the Special Issue "Selected Papers from ISCAS 2018", published in IEEE Trans. on Circuits and Systems I: Regular Paper (TCAS-I), IEEE, Vol. 66, No. 5, May 2019.
7. Giulia di Capua was Guest Editor for the Special Issue "Selected Papers from PRIME 2017 and SMACD 2017", published in Integration, the VLSI Journal, ELSEVIER, vol. 63, pp. 273-274, Sept 2018.  
Abdelali El Aroudi has been and currently is an Associate Editor of Modelling and Simulation in Engineering (2012-to-date).
8. Abdelali El Aroudi has been and currently is an Associate Editor of IEE IET Power Electronics (2014-to-date).
9. Abdelali El Aroudi has been and currently is an Associate Editor of IEE IET
10. Electronics Letters (2015-to-date).
11. Abdelali El Aroudi has been a Guest Associate Editor of IEICE Transactions NOLTA 2018.
12. Abdelali El Aroudi has been an Associate Editor IET Circuits, Devices & Systems,
13. Ke-Horng Chen was Associate Editor, IEEE Transactions on Power Electronics, 2018, 2019.

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14. Ke-Horng Chen was Associate Editor, IEEE Transactions on Circuits and Systems I: Regular Papers, 2018, 2019.
15. Tsorng-Juu Liang was Deputy EiC for IEEE Journal of Emerging and Selected Topics in Power Electronics (IEEE JESTPE)
16. Tsorng-Juu Liang was Editor for IEEE Journal of Emerging and Selected Topics in Power Electronics (IEEE JESTPE)
17. Tsorng-Juu Liang was Fellow Evaluator , IEEE Industrial Electronics Society Fellow Evaluating Committee
18. Tsorng-Juu Liang was Associate Editor, IEEE Transactions on Power Electronics
19. Hiroo Sekiya was Associate Editor of TCAS-II
20. Hiroo Sekiya was Region Editor of IET Circuits, Devices & Systems
21. Hiroo Sekiya was Editor-in-Chief of IEICE Communication Express
22. Hiroo Sekiya was Editor of NOLTA, IEICE
23. Herbert Ho-Ching Iu has been and currently is an Associate Editor for IEEE Transactions on Circuits and Systems Part II (Since 2016).
24. Herbert Ho-Ching Iu has been and currently is an Associate Editor for IEEE Transactions on Power Electronics (Since 2016).
25. Herbert Ho-Ching Iu has been and currently is an Associate Editor for IEEE Transactions on Network Science and Engineering (Since 2017).
26. Herbert Ho-Ching Iu has been and currently is an Editor for IEEE Transactions on Smart Grid (Since 2017).
27. Herbert Ho-Ching Iu has been and currently is an Associate Editor for IEEE Access (Since 2015).
28. Fernando Tyrone has been and currently is an Associate Editor for IEEE Circuits and Systems Magazine (Since 2016).
29. Herbert Ho-Ching Iu has been and currently is an Associate Editor for IEEE Transactions on Circuits and Systems Part II (Since 2016).

**C) Publications (Journal Articles, Conference Papers, Books, Book Chapters):**

**C1) Journal Articles**

1. B. A. Martinez-Trevino, A. El Aroudi, A. Cid-Pastor and L. Martinez-Salamero, "Nonlinear Control for Output Voltage Regulation of a Boost Converter with a Constant Power Load," *IEEE Transactions on Power Electronics*, early access doi: 10.1109/TPEL.2019.2913570.
2. Eltaib Abdeen, Mahmoud Gaafar, Mohamed Orabi, Emad M. Ahmed, Abdelali El Aroudi, Multi-Input Ćuk-Derived Buck-Boost Voltage Source Inverter for Photovoltaic Systems in Microgrid Applications, *Energies*, 1019.
3. A. El Aroudi, M. Al-Numay, G. Garcia, K. Al Hossani, N. Al Sayari, "Analysis of Nonlinear Dynamics of a Quadratic Boost Converter Used for Maximum Power Point Tracking in a Grid-Interlinked PV System, *Energies*, 12 (1), 61, 1019.
4. A. El Aroudi, L. Benadero, E. Ponce, C. Olalla, F. Torres and L. Martínez-Salamero, "Nonlinear Dynamic Modeling and Analysis of Self-Oscillating H-Bridge Parallel Resonant Converter Under Zero Current Switching Control: Unveiling Coexistence of Attractors," *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 66, no. 4, pp. 1657-1667, April 2019.
5. A. El Aroudi, L. Benadero, E. Ponce, C. Olalla, F. Torres and L. Martínez-Salamero, "Suppression of Undesired Attractors in a Self-Oscillating H-Bridge Parallel Resonant

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- Converter Under Zero Current Switching Control," *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 66, no. 4, pp. 692-696, April 2019.
6. B. A. Martinez-Treviño, A. El Aroudi, E. Vidal-Idiarte, A. Cid-Pastor, L. Martinez-Salamero, Sliding-mode control of a boost converter under constant power loading conditions, *IET Power Electronics*, vol. 12, no. 3, pp. 521-539, 2018.
  7. R. Chilipi, N. Alsayari, A. El Aroudi, "Coordinated control of parallel operated renewable-energy-based DG systems," *IET Renewable Power Generation*, 12 (14), 1623-1632, 2018.
  8. J. Calvente, A. El Aroudi, R. Giral, A. Cid-Pastor, E. Vidal-Idiarte, L. Martinez-Salamero, "Design of Current Programmed Switching Converters Using Sliding-Mode Control Theory," *Energies*, 11 (8), 2034, 1, 2018.
  9. R. Errouissi, A. Al-Durra, S. M. Muyeen, and A. El Aroudi, "Robust Feedback Linearization Control of a Boost Converter Feeding a Grid-Tied Inverter for PV Applications," *IET Power Electronics*, vol. 11, no. , 20, pp. 557 – 565, 2018.
  10. A. El Aroudi, W.G. Lu, M. Al-Numay, and H. H. C. Iu, "Subharmonic Instability Boundary in DC-AC H-Bridge Inverters with Double Edge Modulation," *IEEE Transactions on Circuits and Systems-I*, vol. 65, no.7, pp. 2341-2351, 2018.
  11. P. Burrascano, G. Di Capua, N. Femia, S. Laureti, M. Ricci, A Pulse Compression procedure for power inductors modeling up to moderate non-linearity, *Integration the VLSI Journal*, doi: 10.1016/j.vlsi.2019.01.010, May 2019.
  12. A. Oliveri, G. Di Capua, K. Stoyka, M. Lodi, M. Storace, N. Femia, A Power-Loss-Dependent Inductance Model for Ferrite-Core Power Inductors in Switch-Mode Power Supplies, *IEEE Trans. on Circuits and Systems I: Regular Papers*, vol. PP, no. 99, (on-line), doi 10.1109/TCSI.2018.2889856
  13. K. Stoyka, G. Di Capua, N. Femia, A Novel AC Power Loss Model for Ferrite Power Inductors, *IEEE Trans. on Power Electronics*, vol. 34, no. 3, pp. 2680-2692, March 2019.
  14. E. Ozalevli, N. Femia, G. Di Capua, R. Subramonian, D. Du, J. Sankman, M. El Markhi, A Cost-Effective Adaptive Rectifier for Low Power Loosely Coupled Wireless Power Transfer Systems, *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 65, no. 7, pp. 2318 – 2329, July 2018.
  15. N. Petrovic, A. Lekic, D. Stipanovic, "Lyapunov Characterization and Analysis of the Operating Modes of the AC-DC Cuk Converter," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 7, no. 2, 2019 doi: 10.1109/JESTPE.2018.2875015
  16. A. Lekic, D. Stipanovic, N. Petrovic, "Controlling the Cuk Converter Using Polytopic Lyapunov Functions," *IEEE Transactions on Circuits and Systems II – Express Briefs*, vol. 65, no. 11, pp. 1678 – 1682, 2018 doi: 10.1109/TCSII.2017.2781621.
  17. Ke-Horng Chen, Yen-Ting Lin, Yan-Jiun Lai, Hung-Wei Chen, Wen-Hau Yang, Yu-Sheng Ma, Ying-Hsi Lin, Shian-Ru Lin and Tsung-Yen Tsai, "A Fully Integrated Asymmetrical Shunt Switched-Capacitor DC-DC Converter with Fast Optimum Ratio Searching Scheme for Load Transient Enhancement", *IEEE Transactions on Power Electronics*, Early Access, Dec. 2018. (DOI: <http://doi.org/10.1109/TPEL.2018.2889870>)
  18. Hsin Chen, Chao-Jen Huang, Chun-Chieh Kuo, Li-Chi Lin, Yu-Sheng Ma, Wen-Hau Yang and Ke-Horng Chen, "A Single-Inductor Dual-Output Converter with the Stacked MOSFET Driving Technique for Low Quiescent Current and Cross Regulation," *IEEE Transactions on Power Electronics*, vol. 34, no. 3, pp. 2758 – 2770, Mar. 2019 (DOI: <http://doi.org/10.1109/TPEL.2018.2845124> )
  19. Wen-Hau Yang, Chao-Jen Huang, Han-Hsiang Huang, Wei-Ting Lin, Ke-Horng Chen, Ying-Hsi Lin, Jian-Ru Lin and Tsung-Yen Tsai, "A Constant-on-time Control DC-DC Buck Converter with the Pseudowave Tracking Technique for Regulation Accuracy and Load Transient Enhancement," *IEEE Transactions on Power Electronics*, vol. 33, no. 7, pp. 6187 – 6198, Jul. 2018 (DOI: <http://doi.org/10.1109/TPEL.2017.2746659> )

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21. Hao Sheng, Xiaozhe Wang. Applying Polynomial Chaos Expansion to Assess Probabilistic Available Delivery Capability for Distribution Networks with Renewables. *IEEE Transactions on Power Systems*, 33(6):6726-6735, 2018.
22. Ilias Zenelis, Xiaozhe Wang. Wide-Area Damping Control in Power Grids Based on PMU Measurements. *IEEE Control Systems Letters*, vol. 2, no. 4, Oct. 2018.
23. Hao Sheng, Xiaozhe Wang. Probabilistic Power Flow Calculation using Non-intrusive Low-rank Approximation Method. To appear in *IEEE Transactions on Power Systems*, DOI: 10.1109/TPWRS.2019.2896219.
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25. M. Hayati, H. Abbasi, M. K. Kazimierczuk, and H. Sekiya, "Analysis and study of the duty ratio effects on the Class-E M Power amplifier including MOSFET nonlinear gate-to-drain and drain-to-source capacitances," *IEEE Transactions on Power Electronics*, vol. 33, no. 12, pp. 10550-10562, Dec. 2018
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28. S. Xu, A. Iwasaki, and H. Sekiya, "Experimental Evaluations of Thinned-Out and PDM Controlled Class-D Rectifier," 2018 International Conference on Smart Grid (icSmartGrid), pp. 76-81, 2018
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37. Ye, Z, Wang, T, Mao, S, Chen, A & Yu, D et al. 2019, 'A PWM Strategy Based on State Transition for Cascaded H-Bridge Inverter under Unbalanced DC Sources', *IEEE Journal of Emerging and Selected Topics in Power Electronics*, doi:10.1109/JESTPE.2019.2893936
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51. Ganganath, N, Cheng, C, Fernando, T, Iu, H & Tse, CK 2018, 'Shortest Path Planning for Energy-Constrained Mobile Platforms Navigating on Uneven Terrains', *IEEE Transactions on Industrial Informatics*, vol. 14, no. 9, pp. 4264–4272
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62. Yabin Liao and Junrui Liang, "Maximum power, optimal load, and impedance analysis of piezoelectric vibration energy harvesters," *Smart Materials and Structures*, vol. 27, no. 7, art. no. 075053, 2018.

## C2)Conference papers

1. L Benadero García-Morato, F Torres Peral, A El Aroudi, C Olalla Martinez, Delay effects on the limit cycling behavior in an H-bridge resonant inverter with zero current switching control strategy, *NOLTA-2018 International Symposium on Nonlinear Theory and its Applications*, September, 3rd-6th, 2018, Tarragona, Spain.
1. BA Martínez-Treviño, A El Aroudi, L Martínez-Salamero, Synthesis of constant power loads using switching converters under sliding mode control, *Circuits and Systems (ISCAS)*, 2018 IEEE International Symposium on, 1-5, 2018.
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### **C3) Authored Books and book chapters**

1. **H. Sekiya** (N. Shinohara ed.), "Inverter/rectifier technologies on WPT systems, Wireless Power Transfer: Theory, Technology, and Applications," The Institution of Engineering and Technology, 2018 ISBN-13: 978-1785613463
2. **Ke-Horng Chen**, "Chapter 2 Single-Inductor Multiple-Output Converter", Mona M. Hella, Patrick Mercier, Power Management Integrated Circuits, CRC Press, 2018

### **D) Patents**

1. D. Sannino, O. Sacco, V. Vaiano, D. Pilerci, G. Di Capua, N. Femia, G. Petrone, G. Spagnuolo, W. Zamboni, Purifying apparatus based on photocatalysis through modulation of light emission, University of Salerno. European Patent N. P1084EP00, 14/09/2018 (N. WO 2016/152858 A1 - PCT/IB20 16/05205 1).
2. **Ke-Horng Chen**, Shang-Hsien Yang and Tsung-Yen Tsai, "Envelope-Tracking Power Supply Modulator", US Patent 10,171,038, Jan. 2019.
3. Ranmuthu, Indumini BACK-TO-BACK POWER FIELD-EFFECT TRANSISTORS WITH ASSOCIATED CURRENT SENSORS [sole inventor]- USA
4. Ranmuthu, Indumini UNCLAMPED INDUCTOR SWITCHING TEST AT WAFER PROBE – USA.

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5. Ranmuthu, Indumini Semiconductor Structure and Method for Wafer Scale Chip Package - USA [2 other member]
6. Anmol Sharma, Franz Prexl, "Power Converter Controller". U.S. Patent 10,298,126, Date 05/21/2019 .

**E) Awards, Honors:**

1. Tsorng Juu (Peter) Liang received the Outstanding Contribution Award, Taiwan Power Electronics Association
2. Herbert Ho-Ching Iu was the co-recipient of 2019 Transactions on Very Large Scale Integration Systems Best Paper Award.
3. Herbert Ho-Ching Iu was the co-recipient of 2019 Best Paper Award of IEEE International Conference on Artificial Intelligence Circuits and Systems.
4. Ke-Horng Chen, Outstanding Professor, Chinese Institute of Engineers, 2019.
5. Ke-Horng Chen, Outstanding Research Award, Ministry of Science and Technology of Taiwan, 2019.
6. Ke-Horng Chen, Student IC Design Contest, Golden Silicon Award Bronze Prize for Outstanding Advisor, Macronix Corp., 2018.
7. Xiaozhe Wang, Second Prize in IEEE Women In Engineering Best Paper Competition held in IEEE CANADIAN CONFERENCE ON ELECTRICAL AND COMPUTER ENGINEERING (CCECE) May 2018
8. Tyrone Fernando Western, Australia IEEE PES 2018 Outstanding Engineer Award
9. Giulia Di Capua received a Honorable mention – Best Paper Award for the paper “Pulse Compression for Ferrite Inductors Modeling in Moderate Saturation”, presented at International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design, Prague, Czech Republic, July 2nd-5th, 2018.

**F) Other IEEE Service:**

1. Eduard Alarcon is Vice President Technical Activities IEEE Circuits and Systems Society
2. Tsorng Juu (Peter) Liang, BoG, IEEE Tainan Section

**G) Media and Popular Press:**

**H) Highlights on cooperation within the TC and with other TCs**

Abdelali El Aroudi had cooperation with

1. Federico Bizzarri from NCAS
2. Aleksandra Lekic from PECAS
3. Herbert Iu from PECAS and NCAS

Giulia Di Capua had cooperation with - Marco Storace and Alberto Olivieri from NCAS

Report contributed by Abdelali El Aroudi, Tyrone Fernando, Tsorng-Juu Liang, Giulia Di Capua, Ranmuthu Indumini , Aleksandra Lekic, Hiroo Sekiya, Ke-Horng Chen, Sharma, Anmol, Xiaozhe Wang, Junrui Liang and Guido Torelli.