

Chulsoon Hwang

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Research Interest

High-speed Digital System Design, RF/digital Integration (RF Desensitization), Machine Learning in Hardware Design, Electromagnetic Interference (EMI), Hardware Security/Intentional EMI, and Electromagnetics

Work Experience

- 09/2023 – present Woodard Associate Professor for Excellence, Dept. Electrical and Computer Engineering, Missouri University Science and Technology, Rolla, MO (Formerly the University of Missouri Rolla, UMR)
- 09/2022 – 08/2023 Associate Professor, Dept. Electrical and Computer Engineering, Missouri University Science and Technology, Rolla, MO
- 09/2016 – 08/2022 Assistant Professor, Dept. Electrical and Computer Engineering, Missouri University Science and Technology, Rolla, MO
- 07/2015– 08/2016 Post-Doctoral Fellow, Dept. Electrical and Computer Engineering, Missouri University of Science and Technology, Rolla, MO
- 07/2012– 06/2015 Senior Engineer, HSI & Advanced Electromagnetic Compatibility Lab., Samsung Electronics Co., Ltd, Suwon, Korea
- 03/2007–06/2012 Graduate Research Assistant, Terahertz Laboratory, Dept. Electrical Engineering, KAIST, Daejeon, Korea

Education

- 03/2009–06/2012 Ph. D. Dept. Electrical Engineering, KAIST, Daejeon, Korea (Advisor: Prof. Joungho Kim)
Thesis: On-chip Electromagnetic Bandgap Structures for Suppression of Simultaneous Switching Noise Coupling in on-chip Power Distribution Networks
- 03/2007– 02/2009 M.S. Dept. Electrical Engineering, KAIST, Daejeon, Korea (Advisor: Prof. Joungho Kim)
Thesis: Wideband Narrow Pitch Via Electromagnetic Bandgap Structure for Suppression of P/G Noise Coupling to Signal in SiP
- 03/2001– 02/2007 B.S. Dept. Electrical Engineering, KAIST, Daejeon, Korea
(Served two years in the South Korean Army)

Professional Service and Society Memberships

- Technical Committee Officer, Vice Chair, IEEE EMC Society SC5 - Power Electronics EMC 2020 ~ present
Secretary, IEEE EMC Society SC5 - Power Electronics EMC 2016 ~ 2020
- Associate Editor, IEEE Transactions on Signal and Power Integrity, 2021 ~ present
- Technical Program Committee, Asia-Pacific International Symposium on EMC 2022
- Reviewer, IEEE Transactions (T-EMC, T-MTT, T-SIPI, T-VLSI, T-CAS1, T-CPMT, MWCL, and Access)
Conferences: IEEE Int. Symp. on EMC+SIPI 2016-2022, Asia-Pacific Int. Symp. on EMC 2016-2022, Asia-Pacific Microwave Conference (APMC) 2019-2021, IEEE Electrical Design and Advanced Packaging & systems (EDAPS), IEEE EMC Magazine, ICPE 2019-ECCE Asia, IEEE Int. Symp. on Circuits & Systems (ISCAS) 2021.
- Session Organizer/Workshop Organizer at IEEE Int. Symp. on EMC+SIPI 2018-2022, Asia-Pacific Int. Symp. on EMC 2016-2019, 2022
- Senior Member, IEEE, 2018
- IEEE-HKN, 2019

Honors & Awards

- Missouri S&T
 - CEC Dean’s Scholar, 2022-2023
 - Outstanding Teaching Commendation, 2021
 - Faculty Research Award, 2019, 2021
- Best Paper/Best Student Paper Awards
 - Best SIPI Paper Award, *IEEE Int. Symp. EMC+SIPI*, 2023
 - Best EMC Student Paper Award, *IEEE Int. Symp. EMC+SIPI*, 2023 (last author)
 - Best SIPI Student Paper Award, *IEEE Int. Symp. EMC+SIPI*, 2023
 - Best SIPI Student Paper Award Runner-Up, *IEEE Int. Symp. EMC&SIPI*, 2023 (last author)
 - Best Student Paper Award, *Asia-Pacific International Symposium on EMC*, 2023 (last author)
 - Best EMC Paper Award, *IEEE Int. Symp. EMC+SIPI*, 2022 (last author)
 - Best EMC Paper Runner-Up, *IEEE Int. Symp. EMC+SIPI*, 2022
 - Best SIPI Student Paper Runner-Up, *IEEE Int. Symp. EMC+SIPI*, 2021 (last author)
 - Best Student Paper Award, *Asian Electromagnetics Conference (ASIAEM)*, 2019 (last author)
 - Best SIPI Paper Award, *IEEE Int. Sym. EMC&SIPI*, 2019 (last author)
 - Best Paper Award, *DesignCon*, 2019
 - Best Paper Award, *DesignCon*, 2018 (last author)
 - Best Paper Award, *Asia-Pacific International Symposium on EMC*, 2017 (first author)
- IEEE EMC Society Technical Achievement Award, *IEEE EMC Society*, 2023
- Distinguished Reviewer of the IEEE Transactions on EMC for the year 2019, *IEEE T-EMC*, 2020
- Google Faculty Research Award, *Google*, 2020
- APEMC Young Scientist Award, *Joint IEEE International Symposium on EMC & Asia-Pacific Symposium on EMC*, 2018

Awards received by advised students

- IEEE EMC Society President’s Memorial Award, received by Shengxuan Xia, *IEEE EMC Society*, 2023
- Outstanding Graduate Student Award, received by Shengxuan Xia, *IEEE St. Louis Section*, 2022
- IEEE James C. Klouda Memorial Scholarship Award, received by Anfeng Huang, *IEEE EMC Society*, 2021
- IEEE James C. Klouda Memorial Scholarship Award, received by Yin Sun, *IEEE EMC Society*, 2020
- Student Hardware Design Contest 1st place, received by Omid Hoseini Izadi, *IEEE Int. Symp. EMC&SIPI*, 2020

Teaching

[Evaluation scale: 0.0-4.0, university average: 3.0-3.1, department average: 3.1-3.2]

Course Title	Course Number	Terms	Enrolled	Evaluation	Percent response
SI	EE/CpE 5620	SP2023	18	3.30	72.3%
SI (DIS)	EE/CpE 5620	SP2023	6	2.75	66.7%
Introduction to VLSI Design	CpE 5210	FS2022	14	3.54	78.6%
SI	EE/CpE 5620	SP2022	20	3.41	65.0%
SI (DIS)	EE/CpE 5620	SP2022	4	3.00	75%
Introduction to VLSI Design	CpE 5210	FS2021	13	3.40	76.9%
Introduction to VLSI Design (DIS)	CpE 5210	FS2021	6	2.33	50%
SI (Hybrid)	EE/CpE 5620	SP2021	13	3.58	38.5%

SI (DIS)	EE/CpE 5620	SP2021	5	3.00	20%
Introduction to VLSI Design (Hybrid)	CpE 5210	FS2020	20	3.75	60%
SI	EE/CpE 5620	SP2020	26	3.48	69.3%
Introduction to VLSI Design (DIS)	CpE 5210	FS2019	5	3.00	40%
Introduction to VLSI Design	CpE 5210	FS2019	10	3.00	30%
Introduction to Electronic Devices	EE 2200	SP2019	27	3.16	70.4%
Introduction to VLSI Design	CpE 5210	FS2018	20	2.53	95%
Introduction to Electronic Devices	EE 2200	SP2018	35	2.84	88.6%
Introduction to VLSI Design	CpE 5210	FS2017	26	2.91	84.6%
Introduction to Electronic Devices	EE 2200	SP2017	41	1.71	75.6%
Introduction to VLSI Design	CpE 5210	FS2016	10	2.25	80%

Advising & Mentoring

▪ Graduated Advisees: 7 Ph.D., 8 M.S.

Ph.D.: Muqi Ouyang (2022), Ruijie He (2022), Anfeng Huang (2021), Jiayi He (2021), Ling Zhang (2021), Yin Sun (2020), Omid Hoseini Izadi (2020)

M.S.: Kalkidan Woldemariam (2023), Jack Juang (2022), Tanner Fokkens (2022), Xin Fang (2022), Woncheol Song (2021), Shun Liu (2021), Yang Zhong (2019), Harsh Shrivastav (2019)

▪ Current Graduate Students: 9 Ph.D., 3 M.S.

Ph.D.: Shengxuan Xia, Junho Joo, Xiangrui Su, Yifan Ding, Jiahuan Huang, Hanyu Zhang, Haran Manoharan, Wenchang Wang, Zahra Razavi

M.S.: Jongsuk Hyun, Neil Lawhead, Faye Squires (Accelerate BS/MS)

▪ Undergraduate Research: Pablo Espindola Chavarria (2023), Alec Fitzmaurice (2023), Sumin Hwang (2022-2023), Mark Mitchell (2022-2023), Nicolas Spears (2019), Jack Juang (2019), William Ong (2019)

▪ Postdoctoral Fellows: Dr. Hyunwook Park (Jun. 2023 – present), Dr. Reza Yazdani (Jan. 2022 – present), Dr. Seungtaek Jeong (Apr. 2021 – Nov. 2022), Dr. Taelim Song (Jan. 2020 – Nov. 2021), Dr. Zhifei Xu (July 2020 – Dec. 2020)

▪ Visiting Scholars: Seunghun Ryu (Mar. 2022 – Sep. 2022), Dr. Jonghwa Kwon (Sep. 2021 – Aug. 2022), Jaesik Moon (July 2021 – Aug. 2021), Yutao Tang (Oct. 2019 – Oct. 2020), Dr. Jongjoo Lee (Apr. 2019 – Feb. 2020), Cheolhan Kim (Aug. 2018 – Aug. 2019), Youngmin Ku (Jan. 2018 – Jan. 2019)

▪ Ph.D. Thesis Titles:

Muqi Ouyang: Accuracy Improvement of Cable Harness Modeling & Analytical Modeling of Multi-Reflections in High-Speed Signal Channels

Ruijie He: Modeling Methods for EMI Filter and Flyback Transformer

Anfeng Huang: Characterizing and Modeling Methods for Power Converters

Jiayi He: Machine Learning Based Modeling Techniques in EMC/SI and EMI Characterization for Power Supplies

Ling Zhang: PDN Modeling for High-Speed Multilayer PCB Boards and Decap Optimization Using Machine Learning Techniques

Omid Hoseini Izadi: Investigating the Effect of Operating Condition on ESD-induced Soft Failures

Yin Sun: Analysis and Characterization of Power Supply Induced Jitter (PSIJ) for High-speed Driver

Research Expenditures

Total Awards: \$10.2M Shared credit: \$3.0M Expenditures: \$2.3M

FY	2018	2019	2020	2021	2022	2023
Total Awarded	\$1,359,840	\$1,842,626	\$1,676,324	\$2,501,480	\$1,676,264	

Shared credit	\$322,309	\$506,794	\$469,739	\$888,148	\$684,375	
Expenditures	\$239,023	\$337,675	\$408,097	\$610,766	\$665,204	

Research Grants and Contracts

PI

- KAIST, “Research on 5I to improve the performance and reliability of semiconductors, packages, and modules”, \$180,000 (100%), 07/01/2022-06/30/2025
- Google, “Behavior Modeling of Multi-Phase Buck Converters”, \$120,000 (100%), 06/09/2023-06/08/2024
- SK Hynix, “Radiated Emission Improvement through EMI Source Modeling”, \$70,000 (100%), 09/01/2022-08/31/2023
- Google, “Studying Cellphone Tx Desense due to Loose Metal Contact”, \$260,000 (65%), 3/18/2021-4/04/2023
- Google, “Establishing a Parameterized Model of PMICs”, \$120,000 (100%), 11/17/2021-11/16/2022
- Hyundai Mobis, “Chamber-less Radiated Emission Estimation”, \$70,000 (100%), 11/10/2020-11/09/2021
- SK Hynix, “Component-level Assessment Techniques for RF Desense”, \$200,000 (100%), gift
- Google, “Studying Cellphone Tx Desense due to Loose Metal Contact”, \$110,000 (100%), 3/18/2020-3/17/2021
- Google, Faculty Research Award, “Machine Learning Based Design of Power Distribution Networks”, \$42,928 (100%), gift
- SK Hynix, “System-level Power Supply Induced Jitter Optimization”, \$70,000 (100%), gift
- Ford Motor Company, “Assessment of IEMI Threats on Automobiles”, \$70,000 (77%), gift
- Hyundai Motor Company, “Defensive Technologies against Intentional EMI of Automotive”, \$100,000 (100%), 08/01/2018-07/31/2019
- Samsung Electronics Co., Ltd., “Numerical Method of Electromagnetic Interference in High-Speed Serial Link Systems”, \$120,000 (100%), 01/01/2018-12/31/2018
- NSF I/UCRC CEMC, “Center for EMC Membership”
 - Meta (PIM), \$80,000 / year (50%), 02/01/2023 – Present
 - Clear Signal Solution, \$35,000 / year (60%), 01/01/2023 – Present
 - Meta (RFI), \$70,000 / year (60%), 12/08/2022 – Present
 - Google, \$70,000 / year (60%), 8/15/2022 – Present
 - Amazon, \$70,000 / year (60%), 05/20/2021 – Present
 - Cisco (PDN), \$70,000 / year (60%), 11/01/2021 – Present
 - Apple Computer, \$70,000 / year (60%), 09/28/2020 – Present
 - IBM, \$70,000 / year (60%), 04/01/2020 – Present
 - Asustek Computer Inc., \$70,000 / year (60%), 02/01/2017 – Present
 - Kemet, \$35,000 / year (60%), 04/02/2020 – 04/01/2023
 - SONY EMCS Corp. (RFI), \$70,000 / year (60%), 04/01/2017 – 03/31/2023
 - Samsung (Mobile), “Center for EMC Membership”, \$70,000 / year (50%), 03/12/2021-3/11/2022
 - Google, \$70,000 / year (50%), 11/01/2020 – 10/31/2021
 - Deere and Company, \$70,000 / year (50%), 03/24/2017 – 03/23/2021
 - Samsung Electronics (Mobile), \$70,000 (50%), 04/15/2019-04/14/2020
 - Juniper Networks Inc., \$70,000 (50%), 04/12/2019-04/11/2020
 - Samsung Electronics (GTC), \$70,000 (50%), 03/11/2019-03/10/2020

- Samsung Electronics (GTC), \$60,000 (20%), 05/01/2017-04/30/2018
- Shenzhen Yichong Wireless Power Technology, \$30,000 (50%), 10/01/2016 - 09/30/2017

Co-PI

- NSF, “S-STEM: APEX: An Accelerated Pipeline to Graduate Excellence in Electrical and Computer Engineering, \$1,499,991 (10%), 10/01/2022-09/30/2028 (PI: Sahra Sedigh Sarvestani).
- DoE, Graduate Assistance in Areas of National Need (GAANN), “Doctoral Research and Training in Cybersecurity through Electromagnetic Compatibility”, \$608,760 (21%), 10/01/2021-09/30/2024 (PI: Sahra Sedigh Sarvestani)
- NSF, “EAGER: SARE: Security and Functionality of Energy Storage Devices from an External Electromagnetic Attack”, \$300,000 (50%), 09/01/2020-08/31/2022 (PI: Jonghyun Park) CCSS-2028992
- NSF, Phase III I/UCRC Missouri S&T: Center for Electromagnetic Compatibility, \$500,000 (33%), 12/15/2019-12/14/2024 (PI: Daryl Beetner)
- DoE, Graduate Assistance in Areas of National Need (GAANN), “A Doctoral Program on Data-Enabled Assurance of Electromagnetic Compatibility”, \$597,000 (10%), 10/01/2018-09/30/2021 (PI: Sahra Sedigh Sarvestani)
- Boeing Co., “Task4 - 5G Wireless Integration Study/Analysis”, \$20,000 (20%), 09/02/2019-12/30/2020 (PI: Victor Khilkevich)
- Boeing Co., “Task 5 - Mission Optimized RF System Operation”, \$20,000 (20%), 09/02/2019-12/30/2020 (PI: Maciej Zawodniok)
- Amazon.com INC, “TV Noise Source Reconstruction”, \$35,000 (40%), 05/01/2019-08/31/2019 (PI: Jun Fan)
- NSF, Phase II I/UCRC Missouri S&T: Center for Electromagnetic Compatibility, \$166,680 (10%), 09/25/2017-07/31/2019 (PI: Jun Fan)
- Center for EMC Membership, about \$1M/year (roughly 15-20% share of credit), 09/01/2016-present
Current members: Cisco, Deere, IBM, Intel, Sony, Juniper, Boeing, Asustek, Apple, LG, NExperia, Google, Samsung, Cadence, and the Army

Department and University Service

- S&T Undergraduate Research Conference Judge, 4/13/2023
- Faculty Search Committee for ECE Kummer Professor, 2022
- EE Undergraduate Studies/Curriculum Committee (department), 2020 ~ present
- Faculty Research Award Committee (university), 2020
- Library & Learning Resources Committee (university), 2019 ~ present
- NTT EMC Assistant Research Professor Search Committee (department), 2019
- Faculty Search Committee for Assistant Professor in Electromagnetics Position (department), 2019
- S&T Undergraduate Research Conference Judge, 4/16/2019
- NTT EMC Associate Research Professor Search Committee (department), 2018
- Graduate Research Showcase (GRS) Judge, 04/10/ 2017

Patent

- [1] C. Hwang, Z. Xu, and J. Fan, “Inaudible Voice Command Injection”, U.S. patent, App. 17349268.
- [2] E. Song, Y. Kwon, W. Kim, H. Park, H. Yun, E. S. Hong, and C. Hwang, “Passive Equalizer Design for High-speed Digital Signal Transmission”, U.S. patent. US9094240, April 21, 2014
- [3] C. Hwang, J. Ha, K. Kim, and K. Go, “Wireless charging apparatus,” Korea patent, P2013-0064890, June 5, 2013.

Tutorials and Lectures

- [1] “PCB Decoupling”, *Tutorial in IEEE Symposium on EMC&SIPI*, Grand Rapid, MI, 7/31/2023

- [2] “RF Desense/EMI boot camp”, *Amazon Wireless Technology Group*, 8/15/2022-8/19/2022 (online)
- [3] “Power Integrity”, *C.P. Global University in IEEE Symposium on EMC&SIPI*, Spokane, WA, 8/03/2022
- [4] “Power Integrity”, *C.P. Global University in IEEE Symposium on EMC&SIPI*, Virtual Conference, 7/28/2021
- [5] “Power Integrity”, *C.P. Global University in IEEE Symposium on EMC&SIPI*, Virtual Conference, 7/29/2020
- [6] “Transmission Lines and Signal Integrity”, *C.P. Global University in IEEE Symposium on EMC&SIPI*, New Orleans, LA, 7/24/2019
- [7] “PCB Decoupling”, *Tutorial in IEEE Symposium on EMC&SIPI*, New Orleans, LA, 7/22/2019
- [8] “Statistical Analysis of HBM Channel Performance”, *Tutorial in IEEE EDAPS Symposium*, Chandigarh, India, 12/16/2018

Invited Presentations

- [1] “Modeling and Mitigation of RF Desensitization for Wireless Devices” *IIT Kharapur*, Kharagpur, India, 5/19/2023
- [2] “Machine Learning Applications in Hardware Design” *Google Tech Talk*, Mountain View, CA, 4/27/2023
- [3] “Modeling and Mitigation of RF Desensitization for Wireless Devices” *Worcester Polytechnic Institute* (online), 2/8/2023
- [4] “HSpice Compatible Non-linear VRM Model for PI Simulation”, *Microsoft Tech Talk* (online), 11/09/2022
- [5] “Minimizing Number of Decoupling Capacitors with Genetic Algorithm Optimization”, *Microsoft Tech Talk* (online), 10/07/2022
- [6] “An Analysis on the Effectiveness of 2 and 3 Terminal Capacitors in PDN Design”, *EDI CON Online* (webinar), 10/05/2022
- [7] “RF Interference Modeling and Mitigation in Wireless Devices”, *Asia-Pacific Symposium on EMC 2022*, Beijing, China, 09/01/2022
- [8] “Efficient I-EMI Simulation”, *Chungnam National University*, Deajeon, Korea, 07/19/2022
- [9] “Board-level Shielding Can Shielding Effectiveness Measurement and Set Correlation”, *KTL*, Seoul, Korea, 07/15/2022
- [10] “Machine Learning Based Source Reconstruction for EMI Modeling and Analysis”, *EMC Korea*, Seoul, Korea, 07/14/2022
- [11] “Latest Trends in EMC – Consumer/Automotive Industry”, *Amazon Wireless Summit 2022*, 6/7/2022 (webinar)
- [12] “Machine Learning based Decoupling Capacitor Placement Optimization”, *Samsung*, 10/12/2021 (webinar)
- [13] “Machine Learning Applications in EMI/PI”, *Samsung*, 7/7/2021 (webinar)
- [14] “Inaudible Command Injection to Voice-Controlled Devices using EMI”, *MUELAN tech talk*, 08/31/2020 (webinar)
- [15] “IC/package Radiation Mechanism for RF Desense Analysis”, *EMC Korea 2020*, Seoul, Korea, 07/21/2020 (webinar)
- [16] “RF Desense in Wireless Devices”, *Samsung*, Hwasung, Korea, 06/10/2019
- [17] “Threats of Intentional EMI and Hardware Security”, *Mando R&D Center*, Pangyo, Korea, 5/31/2019
- [18] “Threats of Intentional EMI and Hardware Security”, *Samsung*, Suwon, Korea, 5/30/2019
- [19] “D-dot sensor and Intentional EMI”, *National Security Research Institute*, Daejeon, Korea, 5/28/2019
- [20] “RF/Digital Integration in IoT Devices”, *Sungkyunkwan University*, Suwon, Korea, 5/23/2019
- [21] “D-dot sensor and Intentional EMI”, *Replex*, Seoul, Korea, 5/22/2019
- [22] “RF Desense in Wireless Devices”, *KAIST*, Daejeon, Korea, 12/21/2018
- [23] “Exploration of Machine Learning in EMC Applications”, *Aju University*, Suwon, Korea, 12/20/2018
- [24] “Coupling Path Visualization Technique”, *EMC Workshop in Samsung Electronics*, Suwon, Korea, 12/19/2018
- [25] “Research in Electromagnetic Compatibility”, *IEEE Emphasis Area Workshop, Missouri S&T*, 11/14/2018
- [26] “Analysis and Modeling of RF Desense in Mobile Devices”, *Google*, Mountain View, CA, 08/27/2018
- [27] “PAM-4 Signaling Fundamentals and Challenges”, *Samsung EMC Conference 2018*, Yongin, Korea, 08/14/2018
- [28] “High-speed Channel Design for RF desense”, *Samsung EMC Conference 2018*, Yongin, Korea, 08/14/2018
- [29] “Fast and Accurate RFI Analysis for Wireless Devices”, *Samsung Electronics*, Hwasung, Korea, 08/13/2018
- [30] “Power Integrity Concepts for High-Speed Design on Multi-Layer PCBs”, *Workshop in IEEE Symposium on EMC*, Long Beach, CA, 08/03/2018
- [31] “Fast and Accurate RFI Analysis for Wireless Devices”, *Sungkyunkwan University*, Suwon, Korea, 12/22/2017
- [32] “Fast and Accurate RFI Analysis for Wireless Devices”, *Yonsei University*, Seoul, Korea, 12/21/2017
- [33] “Fast and Accurate RFI Analysis for Wireless Devices”, *Workshop in Samsung Electronics*, Suwon, Korea, 12/19/2017
- [34] “Source Reconstruction and RFI Estimation”, *Amazon*, CA, 10/16/2017
- [35] “Analysis and Modeling of RF Desensitization in Mobile Devices”, *UNIST*, Ulsan, Korea, 07/04/2017

- [36] “System Level Approach for RF Desensitization”, *ETRI*, Daejeon, Korea, 06/30/2017
- [37] “Mechanism and Modeling of Noise Source and Coupling for RF Desensitization”, *Samsung Electronics*, Hwasung, Korea, 06/28/2017
- [38] “Analysis and Modeling of RF Desensitization in Mobile Devices”, *Kwangwoon Univ.*, Seoul, Korea, 06/23/2017
- [39] “Mechanism and Modeling of Noise Source and Coupling for RF Desensitization”, *EMC Workshop in Samsung Electronics*, Suwon, Korea, 06/19/2017
- [40] “Analysis and Modeling of RF Desensitization in Mobile Devices” *UESTC*, Chengdu, China, 06/15/2017

Publications

▪ Book/Chapters

- [1] C. Hwang, “RF Desensitization in Wireless Devices”, in *RF Systems, Circuits, and Components*, editor Xi Sung Loo, Intech, ISBN 978-953-51-6250-6, Nov. 2018.
- [2] C. Hwang, J. Kim, J. Fan, J. Kim, and J. L. Drewniak, “Modeling of On-Chip Power Distribution Network”, in *Noise Coupling in System-on-Chip*, editor Thomas Noulis, CRC Press, ISBN 9781498796774, Dec. 2017, Chapter 5, pp. 93 -138.

▪ Magazine

- [1] C. Hwang and J. Fan, “Modeling and Mitigation of Radio Frequency Interference for Wireless Devices” *IEEE EMC Magazine*, vol. 12, no.1, pp.87-92, May 2023
- [2] C. Hwang, “Mitigating Self-generated EMI for Wireless Devices”, *The Bridge*, vol. 118, no. 2, pp. 24-28, May 2022

▪ Refereed Journal Articles

. ¹ - Corresponding Author, ² - Student, ³ - Former Advisor is Author, ⁴ - Other Faculty/Post Docs

2023

- [1] Y. Ding², Y. Sun², R. Wolff, Z. Yang, and C. Hwang, “IBIS Model Simulation Accuracy Improvement by Including Power Supply Induced Jitter Effect” submitted to *IEEE Trans. on Signal and Power Integrity*.
- [2] Y. Ding², J. Zhang, M. Xue, X. Hua, B. Leung, E. MacIntosh, and C. Hwang¹, “Equivalent Force Extraction Methodology for Electrical Component Induced PCB Vibration”, submitted to *IEEE Trans. on Electromagnetic Compatibility*.
- [3] J. Joo², H. Zhang², H. Wang, Z. Liang, L. Cao, J. S. Rentmeister, and C. Hwang¹, “Method for Transient Behavior Modeling of a Multiphase Voltage Regulator Module for End-to-End Power Integrity Simulation,” submitted to *IEEE Trans. on Signal and Power Integrity* (under revision).
- [4] J. Juang², L. Zhang², F. D. Paulis, and C. Hwang¹, “Improved Genetic Algorithm for Minimizing the Number of Decoupling Capacitors Through Augmented Population Generation” submitted to *IEEE Trans. on Signal and Power Integrity*. (under revision).
- [5] S. Jeong⁴, J. Kwon, D. Pai, J. Rajagopalan, and C. Hwang¹, “Visualization of Noise Coupling Paths based on Reciprocity Theorem” submitted to *IEEE Trans. on Electromagnetic Compatibility* (under revision).
- [6] X. Wang², M. Wu, J. Rajagopalan, A. Mohan, D. Kim, and C. Hwang¹, “Investigation of the Radiation Mechanism of Heatsinks based on Characteristic Mode Theory”, *IEEE Trans. on Electromagnetic Compatibility*, early access.
- [7] L. Zhang², L. Jiang, J. Juang⁴, Z. Yang, E.-P. Li, and C. Hwang¹, “Decoupling Optimization for Complex PDN Structures Using Deep Reinforcement Learning” *IEEE Trans. on Microwave Theory and Techniques*, early access.
- [8] S. Xia², H. Wang², Y. Wang, Z. Wu, C. Hwang, and J. Fan^{1,4}, “Dipole Moment Based Reciprocity for Practical Desensitization Identification and Mitigation” *IEEE Trans. on Electromagnetic Compatibility*, early access.
- [9] X. Wang², W. Zhang², X. Fang², T. Sekine, M. Murata, T. Enomoto, K. Araki, D. Kim⁴, J. Fan⁴, A. Ruehli⁴, and C. Hwang¹, “Methodology for Analyzing Coupling Mechanisms in RFI problems based on PEEC” *IEEE Trans. on Electromagnetic Compatibility*, vol.65, no. 3, pp. 761-769, June 2023
- [10] A. Huang², J. Sun², H. Kim⁴, A. Xu, S. Jin, S. Wu, Z. Yang, K. Qiu, J. Fan⁴, and C. Hwang¹, “Averaged Behavior Model of Current-Mode Buck Converters for Transient Power Noise Analysis” *IEEE Trans. on Electromagnetic Compatibility*, vol.65, no. 3, pp. 912-923, June 2023

2022

- [11] Y. Sun², M. Ouyang², X. Sun, and C. Hwang¹, “Prediction of Power Supply Induced Jitter with PDN Design Parameters” *IEEE Trans. on Electromagnetic Compatibility*, vol. 64, no. 6, pp. 2238-2248, Dec. 2022.

- [12] H. Park, M. Kim, S. Kim, K. Kim, H. Kim, T. Shin, K. Son, B. Sim, S. Kim, S. Jeong, C. Hwang, and J. Kim, “Transformer Network-based Reinforcement Learning Method for Power Distribution Network (PDN) Optimization of High Bandwidth Memory (HBM)” *IEEE Trans. on Microwave Theory and Techniques*, vol. 70, no. 11, pp. 4772-4786, Nov. 2022.
- [13] M. Ouyang², K. Cai, A. Gao, B. Pu, C. Li, B. Sen, C. Hwang, and D. Kim^{1,4}, “Novel Formulations of Multi-Reflections and Their Applications to High-Speed Channel Design” *IEEE Trans. on Signal and Power Integrity*, vol.1, pp 43-54, 2022.
- [14] W. Zhang², S. Xia², X. Fang², X. Wang², T. Enomoto, H. Shumiya, K. Araki, and C. Hwang¹, “A SPICE-compatible Model to Simulate Buzz Noise Problems in a Camera” *IEEE Trans. on Electromagnetic Compatibility*, vol. 64, no.4, pp. 987-998, Aug. 2022.
- [15] L. Zhang², J. Juang², Z. Kiguradze⁴, B. Pu⁴, S. Jin, S. Wu, Z. Yang, J. Fan⁴, and C. Hwang¹, “Efficient DC and AC Impedance Calculation for Arbitrary-shape and Multi-layer PDNs Using Boundary Integration” *IEEE Trans. on Signal and Power Integrity*, vol. 1, 2022.
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