

Chulsoon Hwang

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Research Interest

RF Desense, Signal and Power Integrity, EMI/EMC, Intentional EMI/Hardware Security, Machine-learning, and Electromagnetics

Work Experience

- 09/2016 – Present **Assistant Professor**, Dept. Electrical and Computer Engineering, Missouri University Science and Technology, Rolla, MO (Formerly University of Missouri Rolla, UMR)
- 07/2015– 08/2016 **Visiting Research Assistant Professor**, 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 Korea 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
- **Technical Program Committee**, Asia-Pacific International Symposium on EMC 2022
- **Reviewer**, IEEE Trans. Electromagnetic Compatibility (>10 papers/year), IEEE Access, IEEE Trans. Circuits and Systems I, IEEE Trans. Very Large Scale Integration Systems, IEEE Trans. Components, Packaging and Manufacturing Technology, IEEE Microwave and Wireless Components Letters, Microwave and Optical Technology Letters, Elsevier Measurement, Dutch Research Council, *Conferences*: IEEE Int. Symp. on EMC+SIPI 2016-2021, Asia-Pacific Int. Symp. on EMC 2016-2021, 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 2018-2021, Asia-Pacific Int. Symp. on EMC 2016-2019
- **Senior Member**, IEEE, 2018
- **IEEE-HKN**, 2019

Honors & Awards

- **Best SIPI Student Paper Runner Up**, *IEEE International Symposium on EMC&SIPI*, Aug. 2021
- **Distinguished Reviewer of the IEEE Transactions on EMC for the year of 2019**, *IEEE T-EMC*, 2020

- **Google Faculty Research Award**, *Google*, Mar. 2020
- **Faculty Research Award**, *Missouri University of Science and Technology*, Dec. 2019
- **Symposium Best Student Paper Award**, *Asian Electromagnetics Conference (ASIAEM)*, Xi'an, China, Sep. 2019
- **Symposium Best SIPI Paper Award**, *IEEE International Symposium on EMC&SIPI*, New Orleans, LA, July 2019
- **DesignCon Best Paper Award**, *DesignCon 2019*, Santa Clara, CA, Jan. 2019
- **APEMC Young Scientist Award**, *Joint IEEE International Symposium on EMC & Asia-Pacific Symposium on EMC*, Singapore, May 16, 2018
- **DesignCon Best Paper Award**, *DesignCon 2018*, Santa Clara, CA, Jan. 2018
- **Symposium Best Paper Award**, *Asia-Pacific International Symposium on EMC*, Seoul, Korea, June 2017

Awards received by advised students

- **IEEE James C. Klouda Memorial Scholarship Award**, received by **Anfeng Huang**, *IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity*, Aug. 2021
- **IEEE James C. Klouda Memorial Scholarship Award**, received by **Yin Sun**, *IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity*, Aug. 2020
- **Student Hardware Design Contest 1st place**, received by **Omid Hoseini Izadi**, *IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity*, Aug. 2020

Advising & Mentoring

▪ **Graduated Advisees: 4 Ph.D., 4 M.S.**

Ph.D.: Jiayi He (2021), Ling Zhang (2021), Yin Sun (2020), Omid Hoseini Izadi (2020)

M.S.: Woncheol Song (2021), Shun Liu (2021), Yang Zhong (2019), Harsh Shrivastav (2019)

▪ **Current Graduate Students: 10 Ph.D., 5 M.S.**

Ph.D.: Ruijie He, Anfeng Huang, Muqi Ouyang, Shengxuan Xia, Junho Joo, Xiangrui Su, Yifan Ding, Jiahuan Huang, Hanyu Zhang, Haran Manoharan

M.S.: Xin Fang, Jack Juang, Tanner Fokkens (Accelerated BS/MS), Wenchang Wang, Kalkidan Woldermarian

▪ **Undergraduate Research:** Connor Hallemann (2020), Nicolas Spears (2019), Jack Juang (2019), William Ong (2019)

▪ **Postdoctoral Fellows:** Dr. Seungtaek Jeong (Apr. 2021 – present), Dr. Taelim Song (Jan. 2020 – present), Dr. Zhifei Xu (July 2020 – Dec. 2020)

▪ **Visiting Scholars:** 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)

▪ **Thesis Committee Member:**

Ph.D.: Shaohui Yong, Jingdong Sun, Ali Mirala, Biyao Zhao, Giorgi Maghlakelidze, Qiaolei Huang, Sen Yang, Tamar Makharashvili

M.S.: Shuang Liang, Junda Wang, Ze Sun, Yuanzhuo Liu, Sameer Walunj, Jun Xu, Han Deng, Pranay Kumar

Teaching Evaluations

[Evaluation scale: 1.0-4.0, university average: 3.0-3.1, department average: 3.1-3.2]

Course Title	Course Number	Terms	Enrolled	Evaluation	Percent response
Signal Integrity (Hybrid)	CpE 5620	SP2021	7	3.50	28.6%
Signal Integrity (Hybrid)	EE 5620	SP2021	6	3.67	50%
Signal Integrity (DIS)	CpE/EE5620	SP2021	5	3.00	20%

Introduction to VLSI Design (Hybrid)	CpE 5210	FS2020	20	3.75	60%
Signal Integrity	CpE 5620	SP2020	8	3.75	50%
Signal Integrity	EE 5620	SP2020	18	3.36	77.8%
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%

Research Expenditures

- 2020 CY: \$433,234 FY: \$408,097
- 2019 CY: \$425,485 FY: \$337,675
- 2018 CY: \$264,227 FY: \$175,420
- 2017 CY: \$108,570 FY: \$65,151
- 2016 CY: \$11,476 FY: did not start

Total expenditures (shared credit): \$1,242,992 (CY2016~2020)

Research Grants and Contracts

Sole-PI

- **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”, \$100,000 (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
- **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

PI

- **Amazon**, “Center for EMC Membership”, \$70,000 / year (50%), 05/20/2021-present
- **Google**, “Studying Cellphone Tx Desense due to Loose Metal Contact” (2nd year), \$110,000 (65%), 3/18/2021-4/04/2022
- **Samsung**, “Center for EMC Membership”, \$70,000 / year (50%), 03/12/2021-present
- **Cisco**, “Center for EMC Membership: Cisco-PDN”, \$70,000 / year (50%), 11/01/2021 - present
- **Google**, “Center for EMC Membership”, \$70,000 / year (50%), 11/01/2020 - present
- **Apple Computer**, “Center for EMC Membership”, \$70,000 / year (50%), 09/28/2020 – present
- **Kemet**, “Center for EMC Associate Membership”, \$35,000 / year (50%), 04/02/2020- present
- **IBM**, “Center for EMC Membership”, \$70,000 / year (50%), 04/01/2020 - present

- **SONY EMCS Corp. (RFI)**, “Center for EMC Membership”, \$70,000 / year (50%), 04/01/2017 - present
- **Asustek Computer Inc.**, “Center for EMC Membership”, \$70,000 / year (50%), 02/01/2017 - present
- **Deere and Company**, “Center for EMC Membership”, \$70,000 / year (50%), 03/24/2017 – 03/23/2021
- **Samsung Electronics (Mobile)**, “Center for EMC Membership”, \$70,000 (50%), 04/15/2019-04/14/2020
- **Juniper Networks Inc.**, “Center for EMC Membership”, \$70,000 (50%), 04/12/2019-04/11/2020
- **Ford Motor Company**, “Assessment of IEMI Threats on Automobiles”, \$70,000 (77%), gift
- **Samsung Electronics (GTC)**, “Center for EMC Membership”, \$70,000 (50%), 03/11/2019-03/10/2020
- **Samsung Electronics**, “Center for EMC Membership”, \$60,000 (20%), 05/01/2017-04/30/2018
- **Shenzhen Yichong Wireless Power Technology**, “Center for EMC Membership”, \$30,000 (50%), 10/01/2016 - 09/30/2017

Co-PI

- **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

- 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] 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
- [2] **C. Hwang**, J. Ha, K. Kim, and K. Go, “Wireless charging apparatus,” Korea patent, P2013-0064890, June 5, 2013.

Invited Tutorials and Lectures

- [1] “Power Integrity”, *G.P. Global University in IEEE Symposium on EMC&SIPI*, Virtual Conference, 7/28/2021
- [2] “Power Integrity”, *G.P. Global University in IEEE Symposium on EMC&SIPI*, Virtual Conference, 7/29/2020
- [3] “Transmission Lines and Signal Integrity”, *G.P. Global University in IEEE Symposium on EMC&SIPI*, New Orleans, LA, 7/24/2019
- [4] “PCB Decoupling”, *Tutorial in IEEE Symposium on EMC&SIPI*, New Orleans, LA, 7/22/2019
- [5] “Statistical Analysis of HBM Channel Performance”, *Tutorial in IEEE EDAPS Symposium*, Chandigarh, India, 12/16/2018

Invited Presentations

- [1] “Machine Learning Applications in EMI/PI”, Samsung, Suwon, Korea, 7/7/2021 (webinar)
- [2] “Inaudible Command Injection to Voice-Controlled Devices using EMI”, MUELAN tech talk, 08/31/2020 (webinar)
- [3] “IC/package Radiation Mechanism for RF Desense Analysis”, *EMC Korea 2020*, Seoul, Korea, 07/21/2020 (webinar)
- [4] “RF Desense in Wireless Devices”, Samsung, Hwasung, Korea, 06/10/2019
- [5] “Threats of Intentional EMI and Hardware Security”, *Mando R&D Center*, Pangyo, Korea, 5/31/2019
- [6] “Threats of Intentional EMI and Hardware Security”, Samsung, Suwon, Korea, 5/30/2019
- [7] “D-dot sensor and Intentional EMI”, *National Security Research Institute*, Daejeon, Korea, 5/28/2019
- [8] “RF/Digital Integration in IoT Devices”, *Sungkyunkwan University*, Suwon, Korea, 5/23/2019
- [9] “D-dot sensor and Intentional EMI”, *Replex*, Seoul, Korea, 5/22/2019
- [10] “RF Desense in Wireless Devices”, *KAIST*, Daejeon, Korea, 12/21/2018
- [11] “Exploration of Machine Learning in EMC Applications”, *Aju University*, Suwon, Korea, 12/20/2018
- [12] “Coupling Path Visualization Technique”, *EMC Workshop in Samsung Electronics*, Suwon, Korea, 12/19/2018
- [13] “Research in Electromagnetic Compatibility”, IEEE Emphasis Area Workshop, *Missouri S&T*, 11/14/2018
- [14] “Analysis and Modeling of RF Desense in Mobile Devices”, *Google*, Mountain View, CA, 08/27/2018
- [15] “PAM-4 Signaling Fundamentals and Challenges”, *Samsung EMC Conference 2018*, Yongin, Korea, 08/14/2018
- [16] “High-speed Channel Design for RF desense”, *Samsung EMC Conference 2018*, Yongin, Korea, 08/14/2018
- [17] “Fast and Accurate RFI Analysis for Wireless Devices”, *Samsung Electronics*, Hwasung, Korea, 08/13/2018
- [18] “Power Integrity Concepts for High-Speed Design on Multi-Layer PCBs”, *Workshop in IEEE Symposium on EMC*, Long Beach, CA, 08/03/2018
- [19] “Fast and Accurate RFI Analysis for Wireless Devices”, *Sungkyunkwan University*, Suwon, Korea, 12/22/2017
- [20] “Fast and Accurate RFI Analysis for Wireless Devices”, *Yonsei University*, Seoul, Korea, 12/21/2017
- [21] “Fast and Accurate RFI Analysis for Wireless Devices”, *Workshop in Samsung Electronics*, Suwon, Korea, 12/19/2017
- [22] “Source Reconstruction and RFI Estimation”, *Amazon*, CA, 10/16/2017
- [23] “Analysis and Modeling of RF Desensitization in Mobile Devices”, *UNIST*, Ulsan, Korea, 07/04/2017
- [24] “System Level Approach for RF Desensitization”, *ETRI*, Daejeon, Korea, 06/30/2017
- [25] “Mechanism and Modeling of Noise Source and Coupling for RF Desensitization”, *Samsung Electronics*, Hwasung, Korea, 06/28/2017
- [26] “Analysis and Modeling of RF Desensitization in Mobile Devices”, *Kwangwoon Univ.*, Seoul, Korea, 06/23/2017
- [27] “Mechanism and Modeling of Noise Source and Coupling for RF Desensitization”, *EMC Workshop in Samsung Electronics*, Suwon, Korea, 06/19/2017
- [28] “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.

▪ Refereed Journal Articles

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

2021

- [1] A. Huang², X. Wang², H. Zhang², C. Hwang, D. Pommerenke⁴, and J. Fan^{1,4}, “Improved Current Shunt Characterization Method for Core Loss Measurement”, submitted to *IEEE Transactions on Power Electronics*.
- [2] 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” submitted to *IEEE Trans. on Electromagnetic Compatibility*.
- [3] S. Liu², X. Fang², T. Song⁴, and C. Hwang¹, “Field Coupling Mechanism of mm-Wave Magnetic Near-Field Probe” submitted to *IEEE Trans. on Instrumentation and Measurement*.
- [4] L. Zhang², H. Yang, Q. Huang, J. Rajagopalan, D. Pai, C. Hwang, and J. Fan^{1,4}, “Radio-Frequency Interference Estimation for Multiple Random Noise Sources” submitted to *IEEE Trans. on Electromagnetic Compatibility* (under major revision).
- [5] L. Zhang², J. Juang², Z. Kiguradze⁴, B. Pu⁴, S. Jin, S. Wu, Z. Yang, and C. Hwang¹, “Fast PDN Impedance Prediction using Deep Learning”, accepted to *International Journal of Numerical Modeling: Electronic Networks, Devices and Fields*.
- [6] T. Song⁴, J. Lee, and C. Hwang¹, “A Stub Equalizer for Bi-directional and Single-ended Channels in NAND Memory Storage Device System” *IEEE Trans. on Electromagnetic Compatibility*. early access, 10.1109/TEM.2021.3098481.
- [7] H. Shrivastav², T. Enomoto, S. Seto, K. Araki, and C. Hwang¹, “Near Field Scanning Based Shielding Effectiveness Extraction for Board Level Shielding Cans” *IEEE Trans. on Electromagnetic Compatibility*, vol. 63, no. 4, pp. 1035-1045, Aug. 2021.
- [8] Z. Xu⁴, Z. Wang, Y. Sun², C. Hwang, H. Delingette, and J. Fan^{1,4}, “Jitter Aware Economic PDN Optimization with Genetic Algorithm”, *IEEE Trans. on Microwave Theory and Techniques*, vol. 69, no. 8, pp. 3715-3725, Aug. 2021.
- [9] Y. Sun², J. Lee, and C. Hwang¹, “A Generalized Power Supply Induced Jitter Sensitivity Analysis Method Based on Power Supply Rejection Ratio Response” *IEEE Trans. on Very Large Scale Integration Systems*, vol. 29, no. 6, pp. 1052-1060, June 2021.
- [10] Z. Xu⁴, R. Hua², J. Juang², S. Xia², J. Fan⁴, and C. Hwang¹, “Inaudible Attack on Smart Speakers with Intentional Electromagnetic Interference” *IEEE Trans. on Microwave Theory and Techniques*, vol. 69, no. 5, pp. 2642-2650, May 2021.
- [11] Y. Zhong², T. Enomoto, S. Seto, K. Araki, and C. Hwang¹, “A New Reconstruction Method for the Source above A Non-ideal Ground Plane,” *IEEE Trans. on Electromagnetic Compatibility*, vol. 63, no. 2, pp. 627-630, April 2021.
- [12] Y. Sun², S. Wu, J. Zhang, C. Hwang, and Z. Yang¹, “Simulation Methodologies for Acoustic Noise Induced by Multilayer Ceramic Capacitors of Power Distribution Network in Mobile Systems”, *IEEE Trans. on Electromagnetic Compatibility*, vol. 63, no. 2, pp. 589-597, April 2021.
- [13] Q. Huang², L. Zhang², J. Rajagopalan, D. Pai, C. Chen, A. Gaikwad, C. Hwang, and J. Fan^{1,4}, “A Novel RFI Mitigation Method Using Source Rotation” *IEEE Trans. on Electromagnetic Compatibility*, vol. 63, no.1, pp.11-18, Feb. 2021.

2020

- [14] Y. Sun², J. Kim⁴, M. Ouyang², and C. Hwang¹, “Improved Target Impedance Concept with Jitter Specification” *IEEE Trans. on Electromagnetic Compatibility*, vol. 62. no.4, pp.1534-1545, Aug. 2020.
- [15] Y. Liu², J. Li², C. Hwang, and V. Khilkevich^{1,4}, “Near-Field Scan of multiple non-correlated sources using blind source separation”, *IEEE Trans. on Electromagnetic Compatibility*, vol. 62. no.4, pp.1376-1385, Aug. 2020.
- [16] Y. Zhong², W. Song², C. Kim, and C. Hwang¹, “Coupling Path Visualization and Its Application in Preventing Electromagnetic Interference” *IEEE Trans. on Electromagnetic Compatibility*, vol. 62. no.4, pp.1485-1492, Aug. 2020.
- [17] Y. Sun², S. Wu, J. Zhang, C. Hwang, and Z. Yang¹, “Measurement Methodologies for Acoustic Noise Induced by Multilayer Ceramic Capacitors of Power Distribution Network in Mobile Systems” *IEEE Trans. on Electromagnetic Compatibility*, vol. 62. no.4, pp.1515-1523, Aug. 2020.
- [18] Y. Sun², H. Lin, B. Tseng, D. Pommerenke⁴, and C. Hwang¹, “Mechanism and Validation of USB 3.0 Connector Caused Radio Frequency Interference” *IEEE Trans. on Electromagnetic Compatibility*, vol. 62. no.4, pp.1169-1178, Aug. 2020.
- [19] K. Kim, H.W. shim, and C. Hwang¹, “Analysis and Solution for RF Interference caused by PMIC Noise in Mobile Platforms,” *IEEE Trans. on Electromagnetic Compatibility*, vol. 62, no. 3, pp. 682-690, June 2020.

2019

- [20] Y. Ku, H. H. Park⁴, and C. Hwang¹, “Zero-Height and Broadband Magnetic Dipole Source Generation for Board-level Shield Can Evaluation,” *IEEE Trans. on Electromagnetic Compatibility*, vol. 61, no. 6, pp. 1860-1866, Dec. 2019
- [21] Q. Huang², T. Enomoto, S. Seto, K. Araki, J. Fan⁴, and C. Hwang¹, “A Transfer Function Based Calculation Method for Radio

Frequency Interference” *IEEE Trans. on Electromagnetic Compatibility*, vol. 61, no. 4, pp. 1280-1288, Aug. 2019.

2018

- [22] H. Kim⁴, J. Kim⁴, J. Fan⁴, and C. Hwang¹, “Precise Analytical Model of Power Supply Induced Jitter (PSIJ) Transfer Function at Inverter Chains” *IEEE Trans. on Electromagnetic Compatibility*, vol. 60, no. 5, pp. 1491-1499, Oct. 2018.
- [23] C. Hwang¹, D. Pommerenke⁴, J. Fan⁴, T. Enomoto, J. Maeshima, and K. Araki, “Wideband Noise Measurement Technique in Duplex Systems for RF Interference,” *IEEE Trans. on Electromagnetic Compatibility*, vol. 60, no. 4, pp. 1038-1044, Aug. 2018.
- [24] Q. Huang², L. Li², X. Yan², B. Bae, H. Park, C. Hwang, and J. Fan^{1,4}, “MoM Based Ground Current Reconstruction in RFI Application”, *IEEE Trans. on Electromagnetic Compatibility*, vol. 60, no. 4, pp. 1121-1128, Aug. 2018.
- [25] G. Maghlagelidze², X. Yan², L. Guan², S. Marathe², Q. Huang², B. Bae, C. Hwang, J. Fan⁴, and D. Pommerenke^{1,4}, “SNR Analysis and Optimization in Near-Field Scanning and EMI Applications”, *IEEE Trans. on Electromagnetic Compatibility*, vol. 60, no. 4, pp. 1087-1094, Aug. 2018.
- [26] K. Kim, H.W. Shim, A. C. Scogna, and C. Hwang¹, “SMPS Ringing Noise Modeling and Managing Methodology for RFI Solutions in Mobile Platforms” *IEEE Trans. on Components, Packaging and Manufacturing Technology*, vol. 8, no. 4, pp. 554-561, April 2018.
- [27] C. Hwang¹, M. Ouyang², and J. Fan⁴, "Return Path Discontinuity Analysis of an Edge Mount SMA Launch Structure in Multilayer Boards," *IEEE Trans. on Electromagnetic Compatibility*, vol. 60, no. 2, pp. 453-458, April 2018.
- [28] X. Chu⁴, C. Hwang, J. Fan⁴ and Y. Li⁴, "Analytic Calculation of Jitter Induced by Power and Ground Noise Based on IBIS I/V Curve," *IEEE Trans. on Electromagnetic Compatibility*, vol. 60, no. 2, pp. 468-477, April 2018.

2017

- [29] C. Hwang¹, D. Pommerenke⁴, J. Fan⁴, T. Enomoto, J. Maeshima, and K. Araki, “Modeling and Estimation of LCD Noise Modulation for Radio Frequency Interference” *IEEE Trans. on Electromagnetic Compatibility*, vol. 59, no. 6, pp. 1685-1692, Dec. 2017.
- [30] Q. Huang², F. Zhang², T. Enomoto, J. Maeshima, K. Araki, and C. Hwang¹, “Physics Based Dipole Moment Source Reconstruction for RFI on a Practical Cellphone,” *IEEE Trans. on Electromagnetic Compatibility*, vol. 59, no. 6, pp. 1693-1700, Dec. 2017.
- [31] Q. Wang², J. Cho⁴, N. Erickson², C. Hwang, F. De Paulis, S. Piersanti, A. Orlandi⁴, B. Achkir, and J. Fan^{1,4}, "Novel De-Embedding Methodology and Broadband Microprobe Measurement for Through-Silicon Via Pair in Silicon Interposer," *IEEE Trans. on Electromagnetic Compatibility*, vol. 59, no. 5, pp. 1565-1575, Oct. 2017.
- [32] G.Y. Cho, J. Jin, H.B. Park, H.H. Park, and C. Hwang¹, “Assessment of Integrated Circuits Emissions with an Equivalent Dipole Moment Method” *IEEE Tran. on Electromagnetic Compatibility*, vol. 59, no. 2, pp. 633-638, April 2017

▪ Refereed Conference Papers

2021

- [1] J. Joo², A. Huang², R. Hua², B.C. Tseng, H. Lin, and C. Hwang¹, “A Behavior Model of Voltage Regulator Module with Adaptive Voltage Positioning and PCB Parasitics for Power Distribution Network Design”, *IEEE EMC+ SIPI*, virtual conference, July 26-Aug.20, 2021.
- [2] J. Joo², Y. Sun², J. Lee, K. Kwon, S. Kong, S. Kang, I. Song, and C. Hwang¹, “Modeling of Power Supply Noise Generated by an On-Chip LDO Regulator and Package Power Distribution Network Parasitics”, *IEEE EMC+ SIPI*, virtual conference, July 26-Aug.20, 2021.
- [3] T. Fokkens², Z. Xu⁴, O. Hoseini Izadi², and C. Hwang¹, “Machine Learning Voice Synthesis for Intention Electromagnetic Interference Injection in Smart Speaker Devices”, *IEEE EMC+ SIPI*, virtual conference, July 26-Aug.20, 2021.
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