

# Zhengyu Peng

SENIOR RADAR SYSTEMS ENGINEER · PH.D.

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## Summary

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A highly skilled senior radar systems engineer with expertise in electrical engineering, automotive radar, radar signal processing, and mm-wave and microwave systems, as well as editorial experience as an associate editor for the IEEE Transactions on Instrumentation and Measurement and a member of the SPIE Defense+Commercial Sensing Radar Sensor Technology Committee.

## Experience

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### Aptiv

[Carmel, IN](#)

SENIOR RADAR SYSTEMS ENGINEER

Jun. 2018 - PRESENT

- Design and develop next-generation, high-resolution imaging radar systems to enhance active safety and enable autonomous vehicle capabilities

### IEEE Transactions on Instrumentation and Measurement

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ASSOCIATE EDITOR

Dec. 2020 - PRESENT

- Associate editor for *IEEE Transactions on Instrumentation and Measurement (IEEE TIM)*

### MDPI Remote Sensing Journal

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GUEST EDITOR

Mar. 2019 - Jun. 2020

- Guest editor for *Remote Sensing* journal special issue: Radar Remote Sensing on Life Activities

### Mitsubishi Electric Research Labs. (MERL)

[Cambridge, MA](#)

RESEARCH INTERNSHIP

May 2017 - Aug. 2017

- Designed novel digital beamforming transmitter architectures for radars and communication systems aiming to reduce hardware complexity and power consumption
- Completed simulation evaluation and initial schematic design
- Granted 2 patents, published 1 conference paper

## Education

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### Texas Tech University

[Lubbock, TX](#)

PH.D. IN ELECTRICAL ENGINEERING

Aug. 2014 - May 2018

### Zhejiang University

[Hangzhou, China](#)

M.SC. IN INFORMATION SCIENCE AND ELECTRONIC ENGINEERING

Aug. 2011 - Mar. 2014

### Zhejiang University

[Hangzhou, China](#)

B.SC. IN INFORMATION SCIENCE AND ELECTRONIC ENGINEERING

Aug. 2007 - Jun. 2011

## Skills

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**Actively Using** Python, MATLAB, C++, CUDA, Git, CANape

**Experience With** Java, C, Verilog, CST Microwave Studio, Keysight ADS, Cadence Virtuoso/Allegro

## Projects

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Featured research projects at Aptiv

**FLR7HD** Next generation high resolution 4D imaging radar.

**FLR4+** Aptiv's first 4D imaging radar in production for active safety and autonomous driving.

**ISR** Interior sensing radar for detecting small child or baby being left inside a vehicle.

Featured research projects at Texas Tech University (details on <https://zpeng.me>)

**3D MIMO radar** A portable 24-GHz 3D MIMO radar system.

**Phased array radar** A short-range localization radar with beamforming capability in K-band.

**Multi-Mode Radar** A portable K-band radar for short-range localization and vital sign detection.

Featured personal projects (details on <https://zpeng.me>)

**RadarSimPy** A radar simulator built with Python and C++.

**SensorView** A lightweight sensor data visualization and analysis tool.

**Antenna array analysis** A simple GUI tool for antenna array analysis.

## Honors & Awards

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|------|---|--------------------------|
| 2018 | <b>Outstanding Reviewer</b> , IEEE Instrumentation and Measurement Society                      | –                        |
| 2018 | <b>Travel Fellowship</b> , U.S. National Committee for the International Union of Radio Science | <i>Boulder, CO</i>       |
| 2017 | <b>Horn Professor's Graduate Achievement Award</b> , Texas Tech University                      | <i>Lubbock, TX</i>       |
| 2016 | <b>Graduate Fellowship</b> , IEEE Microwave Theory and Techniques Society                       | <i>San Francisco, CA</i> |
| 2016 | <b>Finalist</b> , IEEE Radio Wireless Week Student Paper Competition                            | <i>Austin, TX</i>        |
| 2016 | <b>Excellent Demo Track</b> , IEEE Radio Wireless Week  | <i>Austin, TX</i>        |
| 2015 | <b>Third Place</b> , IEEE IMS High Sensitivity Radar Competition                                | <i>Phoenix, AZ</i>       |

## Professional Activities

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### JOURNAL REVIEWER

• Scientific Reports • IEEE Sensors Letters • IEEE/ASME Transactions on Mechatronics • IEEE Transactions on Biomedical Engineering • International Journal of Microwave and Wireless Technologies • IEEE Access • IEEE Transactions on Microwave Theory and Techniques • IEEE Transactions on Instrumentation and Measurement • IEEE Transactions on Circuits and Systems I: Regular Papers • IEEE Transactions on Circuits and Systems II: Express Briefs • IEEE Transactions on Mobile Computing • IEEE Transactions on Vehicular Technology • IEEE Antennas and Wireless Propagation Letters • IEEE Microwave and Wireless Components Letters • IEEE Microwave Magazine • IEEE Sensors Journal • IEEE Journal of Electromagnetics, RF, and Microwaves in Medicine and Biology • IEEE Journal on Emerging and Selected Topics in Circuits and Systems • IETE Journal of Research • Sensors and Actuators A: Physical • Sensors • Electronics • Remote Sensing • Algorithms • Applied Sciences • Symmetry • Information • Mathematical and Computational Applications • Advances in Science, Technology and Engineering Systems Journal • Computers in Biology and Medicine • Engineering Applications of Artificial Intelligence • Expert Systems With Applications • AEÜ - International Journal of Electronics and Communications • Wind Energy • ACES Journal

### CONFERENCE TECHNICAL PROGRAM COMMITTEE REVIEWER

• 2023 SPIE Defense+Commercial Sensing Radar Sensor Technology Committee • 2022 IEEE International RF and Microwave Conference (RFM) • 2022 IEEE International Microwave Biomedical Conference (IM-

BioC 2022) • 2020 IEEE International RF and Microwave Conference (RFM) • 2019 International Applied Computational Electromagnetics Society (ACES) Symposium • 2018 IEEE International RF and Microwave Conference • 2018 World of Multidisciplinary Research and Application Conference • 2018 Advanced Research in Eng. and Info. Technology International Conference • 2018 Symposium on Islamic Sciences and Technology • 2018 World Congress on Circuits and Systems Conference • 2017 Asia Pacific Microwave Conference

## Publications

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Citations: 1249, h-index: 20, i10-index: 29 (Recorded on Nov. 19, 2022)

### Book

- [1] **Z. Peng**, C. Li, and F. Uysal, Eds., *Modern Radar for Automotive Applications* (Radar, Sonar and Navigation). SCITECH PUB, 2022, ISBN: 9781839534355.

### BOOK CHAPTERS

- [1] **Z. Peng**, C. Li, J.-M. Muñoz-Ferreras, and R. Gómez-García, “Chapter 9: Hardware Development and Applications of Portable FMCW Radars,” in *Micro-Doppler Radar and its Applications*, F. Fioranelli, H. Griffiths, M. Ritchie, and A. Balleri, Eds. Raleigh, NC: SCITECH PUB, 2020.
- [2] **Z. Peng**, C. Li, R. Gómez-García, and J.-M. Muñoz-Ferreras, “Chapter 5: FMCW Radar System for Short-Range Micro-Motion Sensing,” in *Short-Range Micro-Motion Sensing: Hardware, signal processing, and machine learning*, C. Gu and J. Lien, Eds. Raleigh, NC: SCITECH PUB, 2019.
- [3] R. Gómez-García, D. Psychogiou, **Z. Peng**, J.-M. Muñoz-Ferreras, and C. Li, “Chapter B.3: Adaptive RF multi-interference suppression for radar/wireless-communication wideband receivers,” in *Radar and Communications Spectrum Sharing*, S. Blunt and E. Perrins, Eds. Raleigh, NC: SCITECH PUB, 2018.

### JOURNAL ARTICLES

- [1] D. Tang, J. Wang, W. Hu, **Z. Peng**, Y.-C. Chiang, and C. Li, “A DC-coupled high dynamic range biomedical radar sensor with fast-settling analog DC offset cancellation,” *IEEE Transactions on Instrumentation and Measurement*, vol. 68, no. 5, pp. 1441–1450, May 2019.
- [2] **Z. Peng** and C. Li, “Portable microwave radar systems for short-range localization and life tracking: A review,” *Sensors*, vol. 19, no. 5, p. 1136, Mar. 2019.
- [3] Y. Li, **Z. Peng**, R. Pal, and C. Li, “Potential active shooter detection based on radar micro-Doppler and range-doppler analysis using artificial neural network,” *IEEE Sensors Journal*, vol. 19, no. 3, pp. 1052–1063, Feb. 2019.
- [4] J. Yan, **Z. Peng**, H. Hong, C. H. X. Zhu, and C. Li, “Vital-SAR-imaging with a drone-based hybrid radar system,” *IEEE Transactions on Microwave Theory and Techniques*, vol. 66, no. 12, pp. 5852–5862, Dec. 2018.
- [5] **Z. Peng** and C. Li, “A portable K-band 3-D MIMO radar with non-uniformly spaced array for short-range localization,” *IEEE Transactions on Microwave Theory and Techniques*, vol. 66, no. 11, pp. 5075–5086, Nov. 2018.
- [6] **Z. Peng**, L. Ran, and C. Li, “A K-band portable FMCW radar with beamforming array for short-range localization and vital-Doppler targets discrimination,” *IEEE Transactions on Microwave Theory and Techniques*, vol. 65, no. 9, pp. 3443–3452, Sep. 2017.

- [7] J.-M. Muñoz-Ferreras, **Z. Peng**, R. Gómez-García, and C. Li, "Review on advanced short-range multimode continuous-wave radar architectures for healthcare applications," *IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology*, vol. 1, no. 1, pp. 14–25, Aug. 2017.
- [8] C. Li, **Z. Peng**, T.-Y. Huang, *et al.*, "A review on recent progress of portable short-range non-contact microwave radar systems," *IEEE Transactions on Microwave Theory and Techniques*, vol. 65, no. 5, pp. 1692–1706, May 2017.
- [9] **Z. Peng**, J.-M. Muñoz-Ferreras, Y. Tang, R. Gómez-García, L. Ran, and C. Li, "A portable FMCW - interferometry radar with programmable low-IF architecture for localization, ISAR imaging and vital-sign tracking," *IEEE Transactions on Microwave Theory and Techniques*, vol. 65, no. 4, pp. 1334–1344, Apr. 2017.
- [10] J.-M. Muñoz-Ferreras, **Z. Peng**, Y. Tang, R. Gómez-García, D. Liang, and C. Li, "Short-range Doppler-radar signatures from industrial wind turbines: Theory, simulations, and measurements," *IEEE Transactions on Instrumentation and Measurement*, vol. 65, no. 9, pp. 2108–2119, Sep. 2016.
- [11] H. Hong, H. Zhao, **Z. Peng**, *et al.*, "Time-varying vocal folds vibration detection using a 24 GHz portable auditory radar," *Sensors*, vol. 16, no. 8, p. 1181, Aug. 2016.
- [12] C. Gu, **Z. Peng**, and C. Li, "High-precision motion detection using low-complexity Doppler radar with digital post-distortion technique," *IEEE Transactions on Microwave Theory and Techniques*, vol. 64, no. 3, pp. 961–971, Mar. 2016.
- [13] **Z. Peng**, J. Chen, Y. Dong, *et al.*, "Radio frequency beamforming based on a complex domain frontend," *IEEE Transactions on Microwave Theory and Techniques*, vol. 64, no. 1, pp. 289–298, Jan. 2016.
- [14] J.-M. Muñoz-Ferreras, **Z. Peng**, R. Gómez-García, G. Wang, C. Gu, and C. Li, "Isolate the clutter: Pure and hybrid linear-frequency-modulated continuous-wave (LFMCW) radars for indoor applications," *IEEE Microwave Magazine*, vol. 16, no. 4, pp. 40–54, May 2015.
- [15] R. Wang, D. Ye, S. Dong, *et al.*, "Optimal matched rectifying surface for space solar power satellite applications," *IEEE Transactions on Microwave Theory and Techniques*, vol. 62, no. 4, pp. 1080–1089, Apr. 2014.
- [16] **Z. Peng**, T. Hu, W. Cui, J. Huangfu, C. Li, and L. Ran, "Unconventional beamforming for quasi - hemispheric coverage of a phased array antenna," *IEEE Antennas and Wireless Propagation Letters*, vol. 12, pp. 1654–1657, Dec. 2013.

#### CONFERENCE PROCEEDINGS

- [1] X. Chen, Z. Li, B. Chen, Y. Zhu, C. Lu, **Z. Peng**, F. Lin, W. Xu, K. Ren, and C. Qiao, "MetaWave: Attacking mmwave sensing with meta-material-enhanced tags," in *The Network and Distributed System Security (NDSS) Symposium 2023*, San Diego, California, Feb, 27 - Mar. 3, 2023, under review.
- [2] C. Li, J. Wang, D. Rodriguez, A. Mishra, **Z. Peng**, and Y. Li, "Portable Doppler/FSK/FMCW radar systems for life activity sensing and human localization," in *14th International Conference on Advanced Technologies, Systems and Services in Telecommunications (TELSIKS)*, Nis, Serbia, Oct. 23-25, 2019.
- [3] J.-M. Muñoz-Ferreras, J. Wang, **Z. Peng**, C. Li, and R. Gómez-García, "FMCW-radar-based vital-sign monitoring of multiple patients," in *IEEE MTT-S International Microwave Biomedical Conference (IMBioC)*, Nanjing, China, May 6-8, 2019.

- [4] J.-M. Muñoz-Ferreras, **Z. Peng**, J. Wang, C. Li, and R. Gómez-García, "Coherent deramping-based multi-FMCW radar architecture," in *IEEE Topical Conference on Wireless Sensors and Sensor Networks (WiSNet)*, Orlando, FL, Jan. 20-23, 2019.
- [5] **Z. Peng**, P. Nallabolu, and C. Li, "Design and calibration of a portable 24-GHz 3-D MIMO FMCW radar with a non-uniformly spaced array and RF front-end coexisting on the same PCB layer," in *13th IEEE Dallas Circuits and Systems Conference 2018 (DCAS)*, Dallas, TX, Nov. 12, 2018.
- [6] Z. Li, Z. Yang, C. Song, C. Li, **Z. Peng**, and W. Xu, "E-eye: Hidden electronics recognition through mm-wave nonlinear effects," in *Proceedings of the 16th ACM Conference on Embedded Networked Sensor Systems (SenSys '18)*, Shenzhen, China, Nov. 4-7, 2018.
- [7] S. Luo, T. Jiao, **Z. Peng**, Y. Li, and C. Li, "Mutual decoupling of four-element transmit-receive (T-R) antenna arrays based on a metamaterial isolation structure," in *2018 International Applied Computational Electromagnetics Society Symposium in China (ACES-China)*, Beijing, China, Jul. 29-Aug. 1, 2018.
- [8] T. Jiao, **Z. Peng**, S. Luo, Y. Li, and C. Li, "Mutual coupling reduction in a T/R array with T-resonate cavity EBG (TRC-EBG)," in *IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (AP-S/URSI)*, Boston, MA, Jul. 8-13, 2018.
- [9] J.-M. Muñoz-Ferreras, J. Wang, **Z. Peng**, R. Gómez-García, and C. Li, "From Doppler to FMCW radars for non-contact vital-sign monitoring," in *2nd URSI Atlantic Radio Science Meeting (AT-RASC)*, Meloneras, Spain, May 28-Jun. 1, 2018.
- [10] D. Tang, J. Wang, **Z. Peng**, Y.-C. Chiang, and C. Li, "A DC-coupled biomedical radar sensor with analog DC offset calibration circuit," in *IEEE International Instrumentation and Measurement Technology Conference (I2MTC)*, Houston, TX, May 14-17, 2018.
- [11] **Z. Peng**, A. Mishra, J. Davis, J. Bridge, and C. Li, "Long-time non-contact water level measurement with a 5.8-GHz DC-coupled interferometry radar," in *IEEE International Instrumentation and Measurement Technology Conference (I2MTC)*, Houston, TX, May 14-17, 2018.
- [12] J. Wang, **Z. Peng**, and C. Li, "An efficient and extended range tracking method using a hybrid FSK-FMCW system," in *IEEE MTT-S International Wireless Symposium (IWS)*, Chengdu, China, May 6-10, 2018.
- [13] **Z. Peng**, K. Kim, P. Wang, *et al.*, "Code-division multiplexing based hardware reduction for a digital beamforming transmitter array," in *12th European Conference on Antennas and Propagation (EuCAP)*, London, UK, Apr. 9-13, 2018.
- [14] **Z. Peng** and C. Li, "Intermodulation FMCW (IM-FMCW) radar for non-linear wearable targets detection," in *United States National Committee of URSI National Radio Science Meeting (USNC-URSI NRSM)*, Boulder, CO, Jan. 4-7, 2017.
- [15] J. Yan, **Z. Peng**, H. Hong, *et al.*, "Indoor range-direction-movement sar for drone-based radar systems," in *IEEE Asia Pacific Microwave Conference (APMC)*, Kuala Lumpur, Malaysia, Nov. 13-16, 2017.
- [16] **Z. Peng**, D. Psychogiou, and C. Li, "Investigation of the roles of filters for a harmonic FMCW radar," in *International Applied Computational Electromagnetics Society (ACES) Symposium*, Suzhou, China, Aug. 1-4, 2017.
- [17] J.-M. Muñoz-Ferreras, **Z. Peng**, R. Gómez-García, and C. Li, "Tone-ranging-inspired architecture for short-range radars: Theory and simulations," in *International Applied Computational Electromagnetics Society (ACES) Symposium*, Suzhou, China, Aug. 1-4, 2017.
- [18] Y. Li, **Z. Peng**, and C. Li, "Potential active shooter detection using a portable radar sensor with micro-Doppler and range-Doppler analysis," in *International Applied Computational Electromagnetics Society (ACES) Symposium*, Suzhou, China, Aug. 1-4, 2017.

- [19] **Z. Peng**, J.-M. Muñoz-Ferreras, C. Li, and R. Gómez-García, "An FMCW radar sensor for human gesture recognition in the presence of multiple targets," in *IEEE International Microwave Bio-Conference (IMBioC)*, Göteborg, Sweden, May 15-17, 2017.
- [20] J.-M. Muñoz-Ferreras, **Z. Peng**, Y. Tang, R. Gómez-García, and C. Li, "Doppler-radar-based short-range acquisitions of time-frequency signatures from an industrial-type wind turbine," in *IEEE Wireless Sensors and Sensor Networks (WiSNet)*, Phoenix, AZ, Jan. 15-18, 2017.
- [21] J.-M. Muñoz-Ferreras, **Z. Peng**, R. Gómez-García, and C. Li, "A frequency-multiplexed Doppler-plus-FMCW hybrid radar architecture: Theory and simulations," in *IEEE Wireless Sensors and Sensor Networks (WiSNet)*, Phoenix, AZ, Jan. 15-18, 2017.
- [22] Y. Tang, **Z. Peng**, and C. Li, "An experimental study on the feasibility of fall prevention using a wearable K-band FMCW radar," in *United States National Committee of URSI National Radio Science Meeting (USNC-URSI NRSN)*, Boulder, CO, Jan. 4-7, 2017.
- [23] Y. Tang, **Z. Peng**, L. Ran, and C. Li, "iPrevent: A novel wearable radio frequency range detector for fall prevention," in *IEEE International Symposium on Radio-Frequency Integration Technology (RFIT)*, Taipei, Taiwan, Aug. 24-26, 2016.
- [24] H. Zhao, **Z. Peng**, H. Hong, X. Zhu, and C. Li, "A portable 24-GHz auditory radar for non-contact speech sensing with background noise rejection and directional discrimination," in *IEEE International Microwave Symposium (IMS)*, San Francisco, CA, May 22-27, 2016.
- [25] **Z. Peng**, J.-M. Muñoz-Ferreras, R. Gómez-García, and C. Li, "FMCW radar fall detection based on ISAR processing utilizing the properties of RCS, range, and Doppler," in *IEEE International Microwave Symposium (IMS)*, San Francisco, CA, May 22-27, 2016.
- [26] **Z. Peng**, J.-M. Muñoz-Ferreras, R. Gómez-García, L. Ran, and C. Li, "24-GHz biomedical radar on flexible substrate for ISAR imaging," in *IEEE International Wireless Symposium (IWS)*, Shanghai, China, Mar. 14-16, 2016.
- [27] J.-M. Muñoz-Ferreras, **Z. Peng**, C. Li, and R. Gómez-García, "Effects and mitigation of interference tones on coherent FMCW short-range radars," in *IEEE International Wireless Symposium (IWS)*, Shanghai, China, Mar. 14-16, 2016.
- [28] **Z. Peng**, J.-M. Muñoz-Ferreras, Y. Tang, R. Gómez-García, and C. Li, "Portable coherent frequency-modulated continuous-wave radar for indoor human tracking," in *IEEE Topical Conference on Bio-medical Wireless Technologies, Networks, and Sensing Systems (BioWireless)*, Austin, TX, Jan. 24-27, 2016.
- [29] J.-M. Muñoz-Ferreras, **Z. Peng**, R. Gómez-García, and C. Li, "Random body movement mitigation for FMCW-radar-based vital-sign monitoring," in *IEEE Topical Conference on Bio-medical Wireless Technologies, Networks, and Sensing Systems (BioWireless)*, Austin, TX, Jan. 24-27, 2016.
- [30] J.-M. Muñoz-Ferreras, **Z. Peng**, Y. Tang, R. Gómez-García, D. Liang, and C. Li, "A step forward towards radar sensor networks for structural health monitoring of wind turbines," in *IEEE Radio and Wireless Symposium (RWS)*, Austin, TX, Jan. 24-27, 2016.
- [31] **Z. Peng** and C. Li, "A portable 24-GHz FMCW radar based on six-port for indoor human tracking," in *IEEE MTT-S International Microwave Workshop Series on RF and Wireless Technologies for Biomedical and Healthcare Applications (IMWS-BIO)*, Taipei, Taiwan, Sep. 21-23, 2015.
- [32] **Z. Peng**, L. Ran, and C. Li, "A 24-GHz low-cost continuous beam steering phased array for indoor smart radar," in *IEEE 58th International Midwest Symposium on Circuits and Systems (MWSCAS)*, Fort Collins, CO, Aug. 2-5, 2015.

## PATENTS

- [1] **Z. Peng**, Z. Li, and C. Gianelli, “Slow-time modulation for multiple radar channels,” US US20220260699A1, Aug. 2022.
- [2] **Z. Peng**, J. F. Searcy, and A. Rahman, “Frequency-modulated continuous-wave (FMCW) radar-based detection of living objects,” US 11 385 344, Jul. 2022.
- [3] **Z. Peng** and J. F. Searcy, “Object detection sensor with radome cover configuration to reduce transmitter-receiver couplings,” US 11 209 519, Dec. 2021.
- [4] **Z. Peng**, C. Li, and L. Ran, “Complex domain beamforming system and methods relating thereto,” US 10 958 295, Mar. 2021.
- [5] B. Wang, **Z. Peng**, K.-J. Kim, P. Wang, R. Ma, and K. H. Teo, “Digital beamforming transmitter array system with hardware sharing and reduction,” US 10 270 510, Apr. 2019.
- [6] K.-J. Kim, **Z. Peng**, B. Wang, and K. H. Teo, “Beamforming transmission with analog hardware resource sharing,” US 10 218 550, Feb. 2019.
- [7] **Z. Peng**, L. Ran, and J. Huangfu, “A method for array antenna beam to achieve omnidirectional coverage,” CN 103 579 759, Aug. 2015.
- [8] **Z. Peng**, L. Ran, and J. Huangfu, “Adaptive array antenna,” CN 103 579 779, Jul. 2015.
- [9] **Z. Peng** and J. Huangfu, “Near-field and far-field universal wireless charging tray antenna,” CN 102 544 756, Oct. 2013.