Eun Sok Kim

Ming Hsieh Dept. of Elec. and Comp. Engr.
University of Southern California
Los Angeles, CA 90089-0271
(213) 740 – 4697
email: eskim@usc.edu
http://mems.usc.edu

Education: University of California, Berkeley, California
Ph.D. EECS, Solid State Devices (Integrated Sensors), 11/90

University of California, Berkeley, California
M.S. EECS, Solid State Devices (IC-Processed Piezoelectric Microphone), 5/87

University of California, Berkeley, California
B.S. EECS with High Honors, Electronics Specialization, 6/82

Experience:

9/99-Present Ming Hsieh Department of Electrical and Computer Engineering, Univ. of Southern California, Los Angeles, CA
William M. Hogue Professor in Electrical and Computer Engineering: Research interests include microelectromechanical systems (MEMS) technology, acoustic and piezoelectric MEMS, electromagnetic vibration-energy harvesting, inertial sensing, resonant mass sensing, and their applications to biomedicine and information technology. Typically teaches a graduate-level course on MEMS and a senior-undergraduate-level course on analog integrated circuits.
Department Co-Chair (from 7/09 to 6/18): Chaired the Electrophysics division of the department, and oversaw a net tenure-track-faculty growth of 2.5 (from 15.25 to 17.75), 6.5 new tenure-track-faculty hires, a net non-tenure-track-faculty growth of 4 (from 4 to 8), a net Budget-Analysts growth of 2 (from 3 to 5), and lab space growth of 4,206 sq. ft. (from 26,833 to 31,039 sq. ft.). Additionally, made 4 new tenure-track-faculty offers and got 3 acceptances in the last year as the chair. During his tenure as the chair, US News' ranking raw score on USC EE's Graduate Program rose from 3.9 to 4.2 (out of 5.0). Faculty's anonymous evaluations on his overall chair performance in 2015 and 2018 were 4.58 and 4.60 (out of 5.00), respectively.

1/91-1/01 Electrical Engineering Department, University of Hawaii, Honolulu, Hawaii
Associate Professor (from 7/95): Taught Advanced Solid State Devices I and II (EE621 & EE625), Microsensors/Microactuators I and II (EE624 & EE626), Linear Electronics (EE326), Device Physics for IC (EE324), Field and Waves I (EE371), and Microfabrication Processing Technology (EE328). Proposed and developed two new graduate courses on microsensors and microactuators. Developed and established a well-funded research program on acoustic and piezoelectric MEMS.

8/84-12/90 University of California, Berkeley, California

Research Assistant: Developed and fabricated a miniature microphone using IC processes, which was reported in various news media including The Wall Street Journal and Business Week in 1987. Designed, laid out, fabricated, and demonstrated integrated microphones with CMOS amplifiers on a single chip for the first time.

Summer 1984 — Xicor, Inc., Milpitas, California
CMOS Device Engineer: Characterized newly developed CMOS devices.

8/83-5/84 — University of California, Berkeley, California
Teaching Assistant: Taught discussion sessions for Integrated-Circuit Devices course and laboratory sessions for Digital Integrated Circuits course.

7/82-8/83 — NCR Corp., San Diego, California
Associate Engineer-Design: Designed a control, monitor and maintenance panel for a fault-tolerant power system of a mainframe computer.

7/81-12/81 — IBM Research Lab., San Jose, California
College Student Engineer: Characterized experimental magnetic bubble memory chips and documented the measurement results.

Honors and Awards:

Fellow of the National Academy of Inventors (NAI), 2023

Fellow of the Institute of Electrical and Electronics Engineers (IEEE), 2011

Fellow of the Institute of Physics (IOP), 1996

IEEE Transactions on Automation Science and Engineering 2006 Best New Application Paper Award on “In-situ DNA Synthesis on Glass Substrate for Microarray Fabrication Using Self-Focusing Acoustic Transducer,” by J.W. Kwon, S. Kamal-Bahl and E.S. Kim, April 2006, pp. 152-158.

Outstanding EE Faculty of the Year Award (voted by UH IEEE student chapter), 1996

Faculty Early Career Development (CAREER) Award from National Science Foundation (NSF), 1995

Research Initiation Award from National Science Foundation, 1991

Research & Training Revolving Fund Award from UH, 1991

University of California, Berkeley, California
B.S. EECS with High Honors, Electronics Specialization, 6/82

Member of Tau Beta Pi (Engineering Honor Society) and Eta Kappa Nu (Electrical Engineering Honor Society)

Editorial and Review:

Editor for IEEE/ASME Journal of Microelectromechanical Systems (from 2011)

Editor for Journal of Semiconductor Technology and Science (from 2000)

Editorial Board for Journal of Micromechanics and Microengineering (1995 - 2016)

Associate Editor for IEEE Transactions on Automation Science and Engineering (2006 – 2011)

Editorial Board for Micro and Nano Systems Letters (from 2013)

Reviewer of National Institute of Health, National Science Foundation, IEEE/ASME Journal of Microelectromechanical Systems, Sensors and Actuators, Applied Physics Letters, IEEE Transactions on Electron Devices, Applied Surface Science, Journal of Materials Research, and IEEE Trans. on Circuits and Systems II.

Guest Editor for Special Issue on Automation for the Life Sciences in IEEE Transactions on Automation Science and Engineering

Active NSF and NIH Research Grants:

NSF Award Search (https://www.nsf.gov/awardsearch/) for Eun Kim in California
https://www.nsf.gov/awardsearch/simpleSearchResult?queryText=eun+kim&ActiveAwards=true

Acoustic Propulsion in Liquid and Air
Award Number:2017926; Principal Investigator:Eun Kim; Co-Principal Investigator:; Organization:University of Southern California;NSF Organization:ECCS Start Date:09/15/2020; Award Amount:$389,904.00; Relevance:42.34;

MEMS-Based Power Generation from Human Walking Motion
Award Number:1911369; Principal Investigator:Eun Kim; Co-Principal Investigator:; Organization:University of Southern California;NSF Organization:ECCS Start Date:07/01/2019; Award Amount:$385,218.00; Relevance:42.34;

Microfluidic Cell Sorting and Manipulation Based on Bulk Acoustic Waves
Award Number:2129856; Principal Investigator:Eun Kim; Co-Principal Investigator:; Organization:University of Southern California;NSF Organization:DBI Start Date:02/01/2022; Award Amount:$404,995.00; Relevance:42.34;

SaTC: CORE: Small: Battery-less Tamper Detector for Semiconductor Chip Authenticity
Award Number:2302182; Principal Investigator:Eun Kim; Co-Principal Investigator:; Organization:University of Southern California;NSF Organization:CNS Start Date:10/01/2023; Award Amount:$218,862.00; Relevance:42.27;

NIH RePORTER (https://reporter.nih.gov/) for Eun Kim at University of Southern California
https://reporter.nih.gov/search/Ci4qzDm2R0S9nuUA6jKbhA/projects

T Act Project	Year	Sub	Principal Investigator(s)/ Project Leader(s)	Organization	Fiscal Year	Admin IC	Funding IC	FY Total Cost by IC
Ultrasonic Neural Stimulation for Neuromodulation Therapeutics								
5 R01 EB026284	04		KIM, EUN SOK	UNIVERSITY OF SOUTHERN CALIFORNIA	2021	NIBIB	NIBIB	$407,597
MEMS Acoustic Tweezers for Micromanipulation of Living Cells								
5 R01 GM134352	04		KIM, EUN SOK	UNIVERSITY OF SOUTHERN CALIFORNIA	2022	NIGMS	NIGMS	$337,970
Damage-Free, Ultrasonic Cell Isolation from Retinal Pigment Epithelium (RPE) Monolayers								
1 R01 EY035281	01		KIM, EUN SOK ZHONG, JOHN	UNIVERSITY OF SOUTHERN CALIFORNIA	2023	NEI	NEI	$566,755
Wearable, Always-on Stethoscope for Early Detection of Asthma Attack								
5 R01 HL165138	02		KIM, EUN SOK	UNIVERSITY OF SOUTHERN CALIFORNIA	2023	NHLBI	NHLBI	$695,250

Issued Patents:

[IP19] *Focused Ultrasound Transducer with Electrically Controllable Focal Length*, E.S. Kim and L. Zhao, U.S. Patent Number 11,623,248.

[IP18] *Wearable Respiratory Monitoring System Based on Resonant Microphone Array*, E.S. Kim and A. Shkel, U.S. Patent Number 11,547,381

[IP17] *Ferrofluid Liquid Spring with Magnets between Coils Inside an Enclosed Chamber for Vibration Energy Harvesting*, E.S. Kim and Y. Wang, U.S. Patent Number 10,720,823

[IP16] *Energy Harvester with Magnets and Self-assembled Ferrofluid Liquid Bearing*, E.S. Kim and Y. Wang, U.S. Patent Number 10,418,890

[IP15] *Acoustic Tweezers*, E.S. Kim, Y. Choe, J.W. Kim and K.K. Shung, U.S. Patent Number 10,106,397

[IP14] *Electromagnetic Energy Conversion through Coil and Magnet Arrays*, E.S. Kim and Q. Zhang, U.S. Patent Number 9.231.461.

[IP13] *Self Focusing Acoustic Transducers with Fresnel Reflector/Absorber Lens,* E.S. Kim, H. Yu and C. Lee, U.S. Patent Number 7,719,170.

[IP12] *MEMS Vascular Sensor*, T. K. Hsiai, G. Soundararajan, E. S. Kim, H. Yu, M. Rouhanizadeh, and T. Lin, U.S. Patent Number 8,216,434.

[IP11] *MEMS Vascular Sensor*, T. K. Hsiai, G. Soundararajan, E. S. Kim, H. Yu, M. Rouhanizadeh, and T. Lin, U.S. Patent Number 7,367,237.

[IP10] *Silicon Inertial Sensors Formed Using MEMS*, E.S. Kim and Q. Zou, U.S. Patent Number 7,481,112 B2.

[IP9] *Silicon Inertial Sensors Formed Using MEMS*, A. Madni, Q. Zou, E.S. Kim, L. Costlow, J. Voung, and R. Wells, U.S. Patent Number 7,360,422.

[IP8] *DNA Probe Synthesis on Chip on Demand by MEMS Ejector Array*, E.S. Kim and J.W. Kwon, U.S. Patent Number 7,332,127.

[IP7] *Method for Fabricating a Micromachined Piezoelectric Microspeaker*, S.H. Yi and E.S. Kim, U.S. Patent 7,089,638.

[IP6] *Micromachined Piezoelectric Microspeaker and Fabrication Method Thereof*, S.H. Yi and E.S. Kim, U.S. Patent Number 7,003,125.

[IP5] *Method of Forming Parylene-diaphragm Piezoelectric Acoustic Transducers*, C.H. Han and E.S. Kim, U.S. Patent Number 6,857,501.

[IP4] *Acoustic Wave Micromixer Using Fresnel Annular Sector Actuators*, V. Vivek, E.S. Kim and Y. Zeng, U.S. Patent Number 6,682,214.

[IP3] *Self-limiting Isotropic Wet Etching Process*, E.S. Kim and C.H. Han, U.S. Patent Number 6,379,573.

[IP2] *IC Processed Piezoelectric Microphone*, R.S. Muller and E.S. Kim, U.S. Patent Number 4,816,125.

[IP1] *IC Processed Piezoelectric Microphone*, R.S. Muller and E.S. Kim, U.S. Patent Number 4,783,821.

Pending Patents:

[PP5] *Vortex-Beam Acoustic Transducer*, E.S. Kim, J. Lee and K. Sadeghian Esfahani, U.S. Patent Pending.

[PP4] *Pick and Placement of Semiconductor Chips Based on Nozzleless Self-Focusing Acoustic Droplet Ejector*, E.S. Kim and Y. Tang, U.S. Patent Pending.

[PP3] *Contactless, Damage-Free, High-Precision Cell Extraction and Transfer through Acoustic Droplet Ejection*, E.S. Kim and Y. Tang, J.F. Zhong and X. Chen, U.S. Patent Pending.

[PP2] *Ultrasound Transducer with Electrically Controllable Focal-Point Location*, E.S. Kim and L. Zhao, U.S. Patent Pending.

[PP1] *Electrical Tuning of Focal Size with Single-Element Planar Focused Ultrasonic Transducer*, E.S. Kim and Y. Tang, U.S. Patent Pending.

Publications:

Textbook

"Fundamentals of Microelectromechanical Systems (MEMS)," E.S. Kim, Published April 2021 by McGraw Hill, Edition: 1, ISBN: 9781264257584, Format: Print, Pages: 416.

"Look inside" with the table of contents, preface, introduction, substantial part of Ch. 1, last five pages of Ch. 10, and index is available through the following site.
https://www.amazon.com/Fundamentals-Microelectromechanical-Systems-MEMS-Eun/dp/1264257589

Errata and instructor resources are available through the following site.
https://www.mhprofessional.com/fundamentals-of-microelectromechanical-systems-mems-9781264257584-usa

Book Chapter

"Patch Clamp Technology for Focused Ultrasonic (FUS) Neuromodulation," E.S. Kim and S.Y. Chang, 3rd Ed. Biosensors and Biodetection, to be published in 2022, A. Rasooly, and B, Prickril (Eds.).

Refereed Journal Papers

95

[J95] H. Liu, M. Barekatain, A. Roy, S. Liu, Y. Cao, Y. Tang, A. Shkel and E.S. Kim, "*MEMS Piezoelectric Resonant Microphone Array for Lung Sound Classification*," Journal of Micromechanics and Microengineering, Vol. 33, No. 4, 044003, 2023.

[J94] Y. Tang and E.S. Kim, "*Simple Sacrificial-Layer-Free Microfabrication Processes for Air-Cavity Fresnel Acoustic Lenses (ACFALS) With Improved Focusing Performance*," Microsystems & Nanoengineering, vol. 8, Article number 75, 2022. https://doi.org/10.1038/s41378-022-00407-w

[J93] M. Barekatain, H. Liu, and E.S. Kim, "*Wireless and Battery-less Tamper Detection with Pyroelectric Energy Converter and High-overtone Bulk Acoustic Resonator*," IEEE Sensors Journal, vol. 22, no. 14, pp. 14639-14646, 2022. doi: 10.1109/JSEN.2022.3182940.

[J92] Y. Tang, L.-Y. Chen, A. Zhang, C.-P. Liao, M.E. Gross, and E.S. Kim, "*In Vivo Non-Thermal, Selective Cancer Treatment with High-Frequency Medium-Intensity Focused Ultrasound*," IEEE Access, vol. 9, pp. 122051-122066, 2021.

[J91] Y. Tang and E.S. Kim, "*Nozzleless Acoustic Droplet Ejector with Electrically Tunable Droplet Size for Picking and Placing Semiconductor Chips*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 30, no. 2, pp. 262-270, 2021.

[J90] H. Liu, S. Liu, A.A. Shkel and E.S. Kim, "*Active Noise Cancellation with MEMS Resonant Microphone Array*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 29, no. 5, pp. 839-845, 2020.

[J89] Y. Tang and E.S. Kim, "*Ring-Focusing Fresnel Acoustic Lens for Long Depth-of-Focus Focused Ultrasound and Multiple Trapping Acoustic Beams*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 29, no. 5, pp. 692-698, 2020.

[J88] L. Zhao and E.S. Kim, "*Analytical Dual-Charged-Surfaces Model for Permanent Magnet and Its Application in Magnetic Spring*," IEEE Transactions on Magnetics, vol. 56, no. 9, pp. 1 – 7, 2020.

[J87] A. Shkel and E.S. Kim, "*Continuous Health Monitoring with Resonant-Microphone-Array-Based Wearable Stethoscope*," IEEE Sensors Journal, vol. 19, no. 12, pp. 4629-4638, 2019.

[J86] L. Wang, A. Lin and E.S. Kim, "*Miniature Sensing System with FBAR-based Oscillators and Frequency Shift*," IEEE Sensors Journal, vol. 18, no. 18, pp. 7633 – 7637, 2018.

[J85] Y. Wang, Q. Zhang, L. Zhao and E.S. Kim, "*Non-Resonant, Electromagnetic Broad-Band Vibration-Energy Harvester Based on Self-Assembled Ferrofluid Liquid Bearing*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 26, no. 4, pp. 809 – 819, 2017.

[J84] Y. Wang, Q. Zhang, L. Zhao, Y. Tang, A. Shkel and E.S. Kim, "*Vibration Energy Harvester with Low Resonant Frequency Based on Flexible Coil and Liquid Spring*," Applied Physics Letter, 109, 203901 (2016); doi: 10.1063/1.4967498.

[J83] S. Cong, Y. Cao, X. Fang, Y. Wang, Q. Liu, H. Gui, C. Shen, X. Cao, E.S. Kim, and C. Zhou, "*Carbon Nanotube Macroelectronics for Active Matrix Polymer-Dispersed Liquid Crystal Displays*," ACS Nano, 10 (11), pp. 10068–10074, 2016.

[J82] Q. Zhang, Y. Wang, L. Zhao and E.S. Kim, "*Integration of Microfabricated Low Resistance and Thousand-turn Coils for Vibration Energy Harvesting*," Journal of Micromechanics and Microengineering, vol. 26, no. 2, 025019 (10pp), 2016.

[J81] Q. Zhang and E.S. Kim, "*Microfabricated Electromagnetic Energy Harvesters with Magnet and Coil Arrays Suspended by Silicon Springs*," IEEE Sensors Journal, vol. 16, no. 3, pp. 634 - 641, 2016.

[J80] D.A. Thomas, L. Wang, B. Goh, E.S. Kim, J. L. Beauchamp, "*Mass Spectrometric Sampling of a Liquid Surface by Nanoliter Droplet Generation from Bursting Bubbles and Focused Acoustic Pulses: Application to Studies of Interfacial Chemistry*," Analytical Chemistry, vol. 87, no. 6, pp 3336–3344, 2015.

[J79] Q. Zhang, Y. Wang and E.S. Kim, "*Electromagnetic Energy Harvester with Flexible Coils and Magnetic Spring for 1 – 10 Hz Resonance*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 24, no. 4, pp. 1193 - 1206, 2015.

[J78] Q. Zhang and E.S. Kim, "*Micromachined Energy-Harvester Stack with Enhanced Electromagnetic Induction through Vertical Integration of Magnets*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 24, no. 2, pp. 384 - 394, 2015.

[J77] Q. Zhang and E.S. Kim, "*Vibration Energy Harvesting Based on Magnet and Coil Arrays for Watt-Level Handheld Power Source*," Proceedings of the IEEE, vol. 102, no. 11, pp. 1747 – 1761, 2014.

[J76] Q. Zhang, Y. Wang, and E.S. Kim, "*Power Generation from Human Body Motion through Magnet and Coil Arrays With Magnetic Spring*," Journal of Applied Physics, vol. 115064908 (5pp), 2014.

[J75] Y. Choe, S.-J. Chen and E.S. Kim, "*Peptide Synthesis on Glass Substrate Using Acoustic Droplet Ejector*," IEEE Transactions on Biomedical Engineering, vol. 61, no. 3, pp. 705-710, March 2014. Selected to be one of the journal's three featured articles in March 2014

[J74] Y. Choe and E.S. Kim, "*Valveless Micropump Driven by Acoustic Streaming*," Journal of Micromechanics and Microengineering, vol. 23, 045005 (8pp), 2013.

[J73] L. Wang, Y.-J. Li, A. Lin, Y. Choe, M.E. Gross, and E.S. Kim, "*A Self Focusing Acoustic Transducer that Exploits Cytoskeletal Differences for Selective Cytolysis of Cancer Cells*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 22, no. 3, pp. 542-552, 2013.

[J72] K.H. Lam, H.-S. Hsu, Y.Li, C. Lee, A. Lin, Q. Zhou, E.S. Kim, K.K. Shung, "*Ultrahigh Frequency Lensless Ultrasonic Transducers for Acoustic Tweezers Application*," Biotechnology and Bioengineering, vol. 110, no. 3, pp. 881-886, 2013.

[J71] L. Baumgartel, A. Vafanejad, S.-J. Chen, and E.S. Kim, "*Resonance Enhanced Piezoelectric Microphone Array for Broadband or Pre-filtered Acoustic Sensing*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 22, pp. 107-114, 2013.

[J70] S.C. Ur, E.S. Kim, and S.H. Yi, "*The Effects of Residual Stresses in the Composite Diaphragm on the Performance of Piezoelectric Microspeakers*," Electronic Materials Letters, vol. 9, no. 1, pp. 119-123, 2013.

[J69] F. Yu, J. Lee, N. Jen, X. Li, Q. Zhang, R.Tang, Q.Zhou, E.S. Kim, T.K.Hsiai, "*Elevated Electrochemical Impedance in the Endoluminal Regions with High Shear Stress: Implication for Assessing Lipid-rich Atherosclerotic Lesions*," Biosensors and Bioelectronics, vol. 43, pp. 237-244, 2013

[J68] S.-J. Chen, Y. Choe, L. Baumgartel, A. Lin, and E.S. Kim, "*Edge-released, Piezoelectric MEMS Acoustic Transducers in Array Configuration*," Journal of Micromechanics and Microengineering, vol. 22, 025005 (2012).

[J67] W. Pang, H. Zhao, E.S. Kim, H. Zhang, and H. Yu, "*Piezoelectric Microelectromechanical Resonant Sensors for Chemical and Biological Detection*," Lab on a Chip, vol. 12, pp. 29-44, 2012.

[J66] Y. Choe, J.W. Kim, K.K. Shung, and E.S. Kim, "*Microparticle Trapping in An Ultrasonic Bessel Beam*," Applied Physics Letter, vol. 99, 233704 (2011).

[J65] Z. Wang, X. Qiu, J. Zhu, J. Oiler, S.-J. Chen, J. Shi, E.S. Kim, and H. Yu, "*Directional Acoustic Underwater Thruster*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency, vol. 58, no. 6, pp. 1114-1117, 2011.

[J64] S.-J. Chen, C.Y. Lee, and E.S. Kim, "*Integration of Piezoelectric Tunable Capacitors and Bonded-wire Inductors for Contactless RF Switch and Tunable Filter*," Sensors and Actuators A: Physical, vol. 165, no. 1, pp. 73-78, 2011.

[J63] F. Yu, R. Li, L. Ai, C. Edington, H. Yu, M. Barr, E.S. Kim, and T.K. Hsiai, "Electrochemical Impedance Spectroscopy to Study Vascular Oxidative Stress," Annals of Biomedical Engineering, vol. 39, no. 1, pp. 287-296, 2011.

[J62] H. Zhang, W. Pang and E. S. Kim, "Miniature High Frequency Longitudinal Wave Mass Sensors in Liquid," IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, vol. 58, no. 1, pp. 255-258, 2010.

[J61] H. Zhang, W. Pang, E. S. Kim and H. Yu, "Micromachined Silicon and Polymer Probes Integrated with Film Bulk Acoustic Resonator Mass Sensors," Journal of Micromechanics and Microengineering, vol. 20, no. 12, pp. 125008 (9pp), 2010.

[J60] W. Pang, H. Zhang, R.C. Ruby, H. Yu, and E.S. Kim, "*Analytical and experimental study on the second harmonic mode of bulk acoustic wave resonator*," Journal of Micromechanics and Microengineering, vol. 20, no. 11, pp. 115015 (10pp), 2010.

[J59] H. Zhang, W. Pang, M.S. Marma, C.Y. Lee, S. Kamal-Bahl, E.S. Kim, and C.E. McKenna, "*Label-Free Detection of Protein-Ligand Interactions in Real Time Using Micromachined Bulk Acoustic Resonators*," Applied Physics Letter, vol. 96, no. 12, 123702, 2010.

[J58] J. Zhu, C. Lee, E.S. Kim, D. Wu, C. Hu, Q. Zhou, K.K. Shung, and H. Yu, "*High-overtone Self-Focusing Acoustic Transducers for High Frequency Ultrasonic Doppler*," Ultrasonics, vol. 50, no. 6, pp. 544-547, 2010.

[J57] J. Lo, P. Butte, Q. Fang, S.-J. Chen, T. Papaioannou, E.S. Kim, M. Gundersen, and L. Marcu, "Multilayered MOEMS Tunable Spectrometer for Fluorescence Lifetime Detection," IEEE Photonics Technology Letters, vol. 22, no. 7, pp. 486 – 488, 2010.

[J56] L. Ai, H. Yu, A. Paraboschi, F. Yu, E.S. Kim, R. Li and T.K. Hsiai, *"Optimization of Intravascular Shear Stress Assessment in Vivo,"* Journal of Biomechanics, vol. 42, no. 10, pp. 1429-1437, 2009.

[J55] J. Lo, S.-J. Chen, Q. Fang, T. Papaioannou, E.S. Kim, M. Gundersen and L. Marcu, "Performance of Diaphragmed Microlens for a Packaged Microspectrometer," Sensors, vol. 9, no. 2, pp. 859-868, 2009.

[J54] H. Yu, C. Lee, W. Pang, H. Zhang, A. Brannon, J. Kitching, and E.S. Kim, "*HBAR-Based 3.6 GHz Oscillator with Low Power Consumption and Low Phase Noise*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency, vol. 56, no. 2, pp. 400 – 403, 2009.

[J53] C.Y. Lee, H. Yu, S.C. Hill, W. Pang, and E.S. Kim, "*Airborne particle generation through acoustic ejection of particles-in-droplets,*" Aerosol Science & Technology, vol. 42, no. 10, pp. 832-841, 2008.

[J52] C.Y. Lee, W. Pang, H. Yu, and E.S. Kim, "*Subpicoliter Droplet Generation Based on a Nozzle-free Acoustic Transducer,*" Applied Physics Letters, vol. 93, 034104, 2008.

[J51] H. Yu, L. Ai, M. Rouhanizadeh, D. Patel, E.S. Kim, and T.K. Hsiai, "*Flexible Polymer Sensors for In Vivo Intravascular Shear Stress Analysis*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 17, no. 5, pp. 1178 – 1186, 2008.

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[J49] C.Y. Lee, W. Pang, S. Chen, D. Chi, H. Yu, and E.S. Kim, "*Surface Micromachined, Complementary-Metal-Oxide-Semiconductor Compatible Tunable Capacitor with 14:1 Continuous Tuning Range,*" Applied Physics Letters, vol. 92, 044103, 2008.

[J48] C.Y. Lee, H. Yu, and E.S. Kim, "*Droplet-Based Microreactions with Oil Encapsulation*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 17, no. 1, pp. 147 - 156, 2008.

[J47] Q. Zou, W. Tan, E.S. Kim and G.E. Loeb, "*Single-axis and Tri-axis Piezoelectric Bimorph Accelerometer*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 17, no. 1, pp. 45 – 57, 2008.

[J46] H. Zhang, M.S. Marma, S. Kamal-Bahl, E.S. Kim, and C.E. McKenna, "*Sequence Specific Label-Free DNA Sensing Using Film-Bulk-Acoustic-Resonators*," IEEE Sensors Journal, vol. 7, no 12, pp. 1587-1588, 2007.

[J45] H. Yu, W. Pang, H. Zhang and E.S. Kim, "*Ultra Temperature-Stable Bulk-Acoustic-Wave Resonators with SiO2 Compensation Layer*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency, vol. 54, no. 10, pp. 2102 – 2109, 2007.

[J44] W. Pang, H. Zhang, H. Yu and E.S. Kim, "*Electrical Frequency Tuning of Film Bulk Acoustic Resonator*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 16, no. 6, pp. 1303 – 1313, 2007.

[J43] C.Y. Lee, S. Kamal-Bahl, H. Yu, J.W. Kwon and E.S. Kim, "*On-Demand DNA Synthesis on Solid Surface by Four Directional Ejectors on a Chip*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 16, no. 5, pp. 1130-1139, 2007.

[J42] H. Zhang, M.S. Marma, E.S. Kim, C.E. McKenna and M.E. Thompson, "*Mercuric Ion Sensing by Film-Bulk-Acoustic-Resonator*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, vol. 54, no. 9, pp. 1723-1725, 2007.

[J41] Q.F. Zhou, C. Sharp, J.M. Cannata, K.K. Shung, G.H. Feng and E.S. Kim, "*Self-focusing High Frequency Ultrasonic Transducers Based on ZnO Piezoelectric Films*," Applied Physics Letters, vol. 90, 113502, 2007.

[J40] H. Yu, Q. Zou, J.W. Kwon, D. Huang and E.S. Kim, "*Liquid Needle*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 16, no. 2, pp. 445 - 453, 2007.

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Refereed Conference Papers

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[C173] B. Neff, K. Sadeghian Esfahani, A. Roy, M. Barekatain, and E.S. Kim, "Translation and Electrically Controlled Rotation of Large Zebrafish Embryo by Acoustic Tweezers," Hilton Head Workshop 2024: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, June 2 - 6, 2024, Accepted as an oral presentation.

[C172] J. Wang, A. Zhang, D. Cantini, and E.S. Kim, "Non-Resonant Vibration Energy Harvester for Sub-Hertz and Sub-G Vibration," Hilton Head Workshop 2024: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, June 2 - 6, 2024, Accepted as a poster presentation.

[C171] A. Sengupta, A. Roy, H. Gao, M. Barekatain, H. Liu, and E.S. Kim, "*Wearable Stethoscope Based on Resonant Microphone Array with Wireless Data Transfer*," The 37th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2024), Austin, TX, January 21-25, 2024, pp. 101 - 104. Outstanding Student Paper Award Finalist.

[C170] B. Neff, A. Roy, K. Esfahani, and E.S. Kim, "*Mixing, Trapping, and Ejection of Single Microparticle with Size and Material Selectivity using Acoustic Tweezers*," The 37th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2024), Austin, TX, January 21-25, 2024, pp. 340 - 343.

[C169] K. Sadeghian Esfahani, B. Neff, A. Roy, M. Barekatain, and E.S. Kim, "*3D Fluorescence Imaging of Late-Stage Zebrafish Embryo with Acoustic Tweezers*," The 37th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2024), Austin, TX, January 21-25, 2024, pp. 344 - 347.

[C168] J. Lee, K. Sadeghian Esfahani, M. Barekatain and E.S. Kim, "*Lens-Less Acoustic Tweezers Based on Spiral-Arm Vortex-Beam Transducers Capable of Levitating, Trapping, and Manipulating Large and Heavy Particles*," Transducers '23, The 22nd International Conference on Solid-State Sensors, Actuators and Microsystems, Kyoto, Japan, June 25 - 29, 2023, pp 405 - 408.

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Recent New Course Development:

- Proposed and developed a new 4-unit graduate-level course on Wearable Technology at USC.
  - Taught the course in Fall 2021, up to which point there had been no formal course on wearable technology in the nation, nor any good textbook on it. Developed a total of 592 PowerPoint Slides along with 5 homework problem sets to teach, for the first time, wearable technology with focus on sensing, signal processing (analog and digital), RF communication, power sources, power management, energy harvesting, flexible substrate technology, and wearable algorithms; with the following weekly topics.

Week	Topic
1	Introduction to Wearable Technology (25 Slides)
2 – 4	Wearable Sensors for Acceleration, Angular Velocity, Ambient Pressure, Audio, Magnetic Field, Light, Infrared Imaging, Vapors, etc. (112 Slides)
5 - 6	Sensing Technologies (Capacitive, Piezoresistive, Piezoelectric, etc.), Flexible and Stretchable Substrate Technology, Lab on Skin, RF Communication, etc. (103 Slides)
7	Batteries, Energy Harvesting, and Power Management for Wearable Technology (41 Slides)
8 - 9	Wearable Hardware Platforms, Wearable Algorithms, Feature Extraction, Training and Classification, Minimum-Cost Action Coverage, Dimensionality Reduction, etc. (99 Slides)
10 - 12	Digital Signal Processing, Difference Equation, Convolution, Z Transform, DFT, FFT, Signal Modulation, Rules of Probability, Kalman Filter, Hidden Markov Model, etc. (136 Slides)
13 - 14	Wearable Technology for Healthcare: Heart Rate Sensing, Blood Oxygen Sensing, Electrocardiogram, Body Sensor Network, Algorithms to Mitigate Artifacts, etc. (76 Slides)