

Thomas W. Kenny

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Education

- University of California, Berkeley
Ph D Physics June 1989
- University of Minnesota, Minneapolis
BS Physics March 1983

Experience

Senior Associate Dean of Engineering for Student Affairs, Stanford. 7/15-present.

Director, Founder, BoD Member, Applaud Medical 11/14-present.

- Non-invasive therapy for Kidney Stones using unfocused energy and Acoustic Enhancer
- Appointed as CEO 2/2020, leading effort to launch Pivotal FDA Clinical Trial.

Founder, Member, Board of Directors, Chair of Technical Advisory Board, SiTime 8/04-11/14

- CMOS-Compatible MEMS Resonators for Electronic Products.
- SITM on Nasdaq, >\$2B Market Cap, World-leading supplier of MEMS-based oscillators

CTO and Founder Cooligy, 6/02-3/05

- Liquid cooling of microprocessors and other high power-density electronic devices.

Program Manager, DARPA Microsystems Technology Office, 10/06-10/10

- Launched \$250M program on Nanotechnology, Thermal Management and Nanomanufacturing.

Professor, Department of Mechanical Engineering, Stanford University, 1/94-Present

- Leading Micromechanical Systems Research Group, with emphasis on development of high-performance microsensors, and measurements of fundamental properties of microstructures.
- Active research in Micromechanical Resonators for Time References, Encapsulated Inertial Sensors, Optimal Design of MEMS Structures, Wafer-Scale Packaging of MEMS Devices.
- Teaching Mechatronics, Sensors and Measurement, and others

Staff Scientist, Technical Group Leader, Jet Propulsion Laboratory, 7/89-1/94.

- Led the design, construction, and characterization of novel micromachined Si infrared detectors magnetometers and accelerometers based on an electron tunneling displacement transducer. Fully packaged tunneling sensors were delivered to collaborators for characterization.
- Participated in development of meteorological instrumentation (pressure, wind, temperature, humidity,...), seismological instrumentation, deformable optical elements, instrumented neurological probes, soil chemistry apparatus, calibration parts for space telescopes,...

Research Assistant, Physics Department, University of California, Berkeley. 1/84-7/89.

- Measured of the heat capacity of ^4He submonolayers on metallic films, showing them to be in a 2-dimensional Bose gas phase, in contradiction to similar measurements on other substrates.

Honors

- Recipient Elected to the National Academy of Engineering 2/22
- Recipient Stanford Presidential Award for Excellence in Diversity 6/19
- Recipient Tau Beta Pi Teaching Honor Roll 6/19
- Recipient IEEE Daniel Noble Award for Emerging Technologies 9/18
- Recipient IEEE Sensors Council Technical Achievement Award 9/11
- Winner Coed Ultimate Frisbee National and World Champion 11/98, 11/99
- Recipient NSF CAREER Award 7/95
- Recipient R+D 100 Award 5/93
- Recipient Distinguished Teaching Award 6/89
- Recipient AT&T Bell Laboratories Fellowship 8/86-6/89

Litigation Experiences

- 2021 retained as Expert Witness in cases involving use of sensors for monitoring of movement of a human for training purposes. This case is pending decisions on institution by the board.
- 2020 retained as Expert Witness in multiple patents related to design of optical physiological monitors. IPRs were instituted against all thirteen. challenged patents. Subsequent work included preparation and submission of reports and responses, and numerous depositions. In a string of final written decisions that issued from February through May 2022, the patent board invalidated all but one challenged claim of the thirteen patents.
- 2019 retained as Expert witness in case related to wearable baby monitors, including motion and temperature sensors. Case settled during drafting of expert infringement report.
- 2018, retained as Expert witness by attorneys representing Apple in a case related to algorithms for sensing motion and other physiological parameters in wearable devices,. Case settled after going on hold for IPR evaluation of IP.
- 2016, Expert Witness in case involving optical proximity sensors in smartphones. I was retained by HTC America and Capella, who were defendants in the case. I was compensated by defendants for work involving Invalidity and Non-Infringement reports, and was deposed after expert reports on invalidity and non-infringement. This case settled just a few weeks before trial in march 2017. This was Case Action No. 2:15-cv-1524-JRG in Marshall Texas.
- 2015, Expert Witness in Mayfonk –vs- Nike patent infringement suit brought by Mayfonk. I prepared expert reports on validity and non-infringement. The case settled just before depositions were taken. I was compensated by Nike for this work. This was case # Civil No.3:14-cv-00423-MO in the District of Oregon.
- 2013-2014, Expert Witness in ST Microelectronics –vs- Invensense patent infringement suit brought by ST. I assisted in claim construction, prepared expert reports on claim construction, validity and infringement, and provided deposition testimony. I was compensated by Invensense for this work. This was ITC Investigation # 337-TA-876.
- 2011-2012, Expert Witness in St. Jude Medical-vs-Volcano Corp patent infringement suit and counter suit. Assisted in claim construction, prepared expert reports, provided deposition testimony and trial testimony. I was compensated by Volcano Corporation for this work.
- 2011, Retained by Maxim Integrated Systems to examine documents and prepare opinions as to the value of certain documents in the possession of former employees of ST Microelectronics. I was compensated by Maxim for this work. This was Italian proceeding Rg. 50253/2011.

Books :

J.E. Carryer, M.Ohline and T.W. Kenny, “Introduction to Mechatronic Design”, Pearson (2011).

Refereed Journal Publications:

1. **J.M.L. Miller, A. Gomez-Franco, D.D. Shin, H-K Kwon**, and T.W. Kenny, “Amplitude stabilization of micromechanical oscillators using engineered nonlinearity” Physical Review Research 3, 033268 (2021).
2. S. Shin, **H-K Kwon, G.D. Vukasin**, T.W.Kenny and F. Ayazi, “A temperature compensated biaxial eFM accelerometer in Epi-seal process” Sensors and Actuators A 330, 112860 (2021).
3. Y. Wang, Y.W. Lin, **J. Glaze, G.D. Vukasin, D.D. Shin, Hyun-Keun Kwon, D.B. Heinz, Y. Chen, D.D. Gerrard**, T.W. Kenny, Andrei M Shkel, “Quantification of Energy Dissipation Mechanisms in Toroidal Ring Gyroscope”, JMEMS 30, 193 (2021).
4. J.S. Katz, C. Zhang, M.T. Barako, **H.J.K. Kim**, M. Asheghi, T.W. Kenny, and K.E. Goodson, “Bicontinuous Mesoporous Metal Foams with Enhanced Conductivity and Tunable Pore Size and Porosity via Electrodeposition for Electrochemical and Thermal Systems”, ACS Appl. Nano Mater. 2020, 3, 12, 12408 (2020)
5. V. Zega, G. Gattere, **S. Koppaka, A. Alter, G.D. Vukasin**, A. Frangi, and T.W. Kenny, “Numerical Modelling of Non-Linearities in MEMS Resonators”, JMEMS 29, 1443 (2020).
6. **A.L. Alter, I.B. Flader, Y. Chen, L.C. Ortiz, D.D. Shin**, and T.W. Kenny, “Characterization of Accelerated Fatigue in Thick Epi-Polysilicon Vacuum Encapsulated MEMS Resonators”, JMEMS 29, 1483 (2020).
7. J.S. Katz, C. Zhang, M.T. Barako, **H.J.K. Kim**, M. Asheghi, T.W. Kenny, and K.E. Goodson, “Bicontinuous Mesoporous Metal Foams with Enhanced Conductivity and Tunable Pore Size and Porosity via Electrodeposition for Electrochemical and Thermal Systems”, ACS Appl. Nano Mater. 2020, 3, 12, 12408 (2020)
8. V. Zega, G. Gattere, **S. Koppaka, A. Alter, G.D. Vukasin**, A. Frangi, and T.W. Kenny, “Numerical Modelling of Non-Linearities in MEMS Resonators”, JMEMS 29, 1443 (2020).
9. **A.L. Alter, I.B. Flader, Y. Chen, L.C. Ortiz, D.D. Shin**, and T.W. Kenny, “Characterization of Accelerated Fatigue in Thick Epi-Polysilicon Vacuum Encapsulated MEMS Resonators”, JMEMS 29, 1483 (2020).
10. **J.M.L. Miller, H. Zhu, S. Sundaram, G.D. Vukasin, Y. Chen, I.B. Flader, D.D. Shin**, and T.W. Kenny, “Limits to Thermal-Piezoresistive Cooling in Silicon Micromechanical Resonators”, JMEMS 29, 677 (2020).
11. **H.K. Kwon, G.D. Vukasin, N.E. Bousse**, and T.W. Kenny, “Crystal Orientation Dependent Dual Frequency Ovenized MEMS Resonator With Temperature Stability and Shock Robustness”, JMEMS 29, 1130 (2020).

12. **G.D. Vukasin, V.K. Sanchez, J. Glaze, N.E. Bousse, N. Bissel, D.D. Shin, H.K. Kwon, D. Heinz, E.T-T Yen, and T.W. Kenny**, “Anchor Design Affects Dominant Energy Loss Mechanism in a Lamé Mode MEM Resonator”, JMEMS 29, 860 (2020).
13. **J.M.L. Miller, D.D. Shin, H.K. Kwon, S.W. Shaw, and T.W. Kenny**, “Spectral narrowing of parametrically pumped thermomechanical noise”, Applied Physics Letters 117, 033504 (2020).
14. **A.L. Alter, I.B. Flader, Y. Chen, D.D. Shin, and T.W. Kenny**, “Nonlinear Dissipation in Epitaxial SCS and Polysilicon MEMS Driven at Large Amplitudes”, JMEMS 29, 1118 (2020).
15. **N.E. Bousse, J.M.L. Miller, A.L. Alter, C.P. Cameron, H.K. Kwon, G.D. Vukasin, and T.W. Kenny**, “Negative Nonlinear Dissipation in Microelectromechanical Beams”, JMEMS 29, 954 (2020).
16. **A.L. Alter, D.D. Gerrard, H.K. Kwon, G.D. Vukasin, and T.W. Kenny**, “Quality Factor Extraction and Enhancement Across Temperature in Ring Resonators”, JMEMS 29, 1124 (2020).
17. **Z. Mohammadi, T.L. Heugel, J.M.L. Miller, D.D. Shin, H.K. Kwon, T.W. Kenny, R. Chitra, Oded Zilberberg, and L.G. Villanueva**, “On the effect of linear feedback and parametric pumping on a resonators frequency stability”, arXiv preprint arXiv:2006.00650 (2020).
18. **L.C. Ortiz, H.K. Kwon, J. Rodriguez, Y. Chen, G.D. Vukasin, D.B. Heinz, D.D. Shin, and T.W. Kenny**, “Low-Power Dual Mode MEMS Resonators With PPB Stability Over Temperature”, JMEMS 29, 190 (2020).
19. **N.E. Bousse, J.M.L. Miller, H.K. Kwon, G.D. Vukasin, and T.W. Kenny**, “Quality factor tuning of micromechanical resonators via electrical dissipation”, Applied Physics Letters 116, 023506 (2020).
20. **X. Zhou, C. Zhao, D. Xiao, J. Sun, G. Sobreviela, D.D. Gerrard, Y. Chen, I. Flader, T.W. Kenny, X. Wu, and A.A. Seshia**, “Dynamic modulation of modal coupling in microelectromechanical gyroscopic ring resonators”, Nature Communications 10, 1 (2019).
21. **J.M.L. Miller, D.D. Shin, H.K. Kwon, S.W. Shaw, and T.W. Kenny**, “Phase Control of Self-Excited Parametric Resonators”, Physical Review Applied 12 (4), 044053 (2019).
22. **J.M.L. Miller, N.E. Bousse, D.B. Heinz, H.J. Kim, H.K. Kwon, G.D. Vukasin and T.W. Kenny**, “Thermomechanical-Noise-Limited Capacitive Transduction of Encapsulated MEM Resonators”, JMEMS 28, 965 (2019).
23. **Y. A. Pishchalnikov, W. M. Behnke-Parks, K. Schmidmayer, K. Maeda, T. Colonius, T.W. Kenny, D.J. Laser**, “High-speed video microscopy and numerical modeling of bubble dynamics near a surface of urinary stone”, The Journal of the Acoustical Society of America 146, 516 (2019).
24. **I.B. Flader, Y. Chen, Y. Yang, E.J. Ng, D.D. Shin, D.B. Heinz, L. Comenencia Ortiz, A.L. Alter, W. Park, K.E. Goodson, T.W. Kenny**, “Micro-Tethering for Fabrication of Encapsulated Inertial Sensors with High Sensitivity”, JMEMS 28, 372 (2019).

25. **H.J. Kim, K. Kaplan, P. Schindler, S. Xu, M.M. Winterkorn, D. Heinz, T. English, J. Provine, F.B. Prinz, T. Kenny**, “Electrical Properties of Ultrathin Platinum Films by Plasma Enhanced Atomic Layer Deposition”, ACS Applied Materials and Interfaces, 11, 9594 (2019).
26. **J. Rodriguez, S.A.Chandorkar, C.A. Watson, G.M, Glaze, C.H. Ahn, E.J. Ng, Y. Yang, T.W. Kenny**, “Direct Detection of Akhiezer Damping in a Silicon MEMS Resonators”, Scientific Reports 9, 2244 (2019).
27. **J.M.L. Miller, A. Ansari, D.B. Heinz, Y. Chen, I.B. Flader, D.D. Shin, L.G. Villanueva and T.W. Kenny**, “Effective Quality Factor Tuning Mechanisms in Micromechanical Resonators”, Applied Physics Reviews 5, 041307 (2018).
28. **J.M.L. Miller, H. Zhu, D.B. Heinz, Y. Chen, I.B. Flader, D.D. Shin, J.E-Y. Lee, T.W. Kenny**, “Thermal-Piezoresistive Tuning of the Effective Quality Factor of a MicroMechanical Resonator”, Physical Review Applied, 10, 044055 (2018).
29. **J. Rodriguez, S.A.Chandorkar, G.M, Glaze, D.D. Gerrard, Y. Chen, D.B. Heinz, I.B. Flader, T.W. Kenny**, “Direct Detection of Anchor Damping in MEMS Tuning Fork Resonators”, JMEMS 27, 1 (2018).
30. **M. Mellema, W. Behnke-Parks, A. Luong, M. Hopcroft, Claire Mills, S. Ho, R. Hsi, D. Laser, T. Kenny, R. Grubbs, M. Stoller**, “Absence of Ureteral/Renal Injury Following Low-Intensity Extracorporeal Acoustic Energy Lithotripsy with Stone-Targeting Microbubbles in an in-vivo Swine Model”, The Journal of Urology 199,4 pe479, (2018).
31. **L. Comenencia Ortiz, D.B. Heinz, I.B. Flader, A.L. Alter, D.D. Shin, Y. Chen and T.W. Kenny**, “Assessing failure in epitaxially encapsulated micro-scale sensors using micro and nano x-ray computed tomography”, MRS Communications 8, 275 (2018).
32. **M.T. Barako, T.S. English, S. Roy-Panzer, T.W. Kenny and Kenneth E Goodson**, “Dielectric barrier layers by low-temperature plasma-enhanced atomic layer deposition of silicon dioxide”, Thin Solid Films 649, 24 (2018).
33. **Y. Chen, I.B. Flader, D.D. Shin, C.H. Ahn, J. Rodriguez and T.W. Kenny**, “Robust Method of Fabricating Epitaxially Encapsulated MEMS Devices with Large Gaps”, JMEMS 26, 1235 (2017).
34. **W. Park, D.D. Shin, S.J. Kim, J.S. Katz, J. Park, C.H. Ahn, T. Kodama, M. Asheghi, T.W. Kenny, K.E. Goodson**, “Phonon Conduction in Silicon Nanobeams”, Appl. Phys. Lett. 110, 213102 (2017).
35. **F. Purkl, A.Daus, T. English, J Provine, A. Feyh, G. Urban, T. Kenny**, “Measurement of Young's modulus and residual stress of atomic layer deposited Al₂O₃ and Pt thin films”, J. Micromech. Microeng. 27, 085008 (2017)
36. **G.Agarwal, T. Kazior, T. Kenny, D. Weinstein**, “Modeling and analysis for thermal management in Gallium Nitride HEMTs using microfluidic cooling”, Journal of Electronic Packaging 139, 11001 (2017).
37. **J. Atalaya, T.W. Kenny, M.L Roukes, M.I Dykman**, “Nonlinear damping and dephasing in nanomechanical systems”, Physical Review B, 94, 15440 (2016).
38. **O. Shoshani, D. Heywood, Y. Yang, T.W. Kenny, and S.W. Shaw**, “Phase Noise Reduction in an MEMS Oscillator Using a Nonlinearly Enhanced Synchronization Domain”, JMEMS 25 (2016).

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