



Exponent[®]
Engineering & Scientific Consulting

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Professional Profile

Dr. Piper is an electrical engineer who applies her expertise in failure analysis of electronic systems down to the component level to solve complex design, safety, and product recall problems for her clients. She assists clients by efficiently determining the root causes of product failures and by assessing safety risks of manufacturing tolerances. This helps them better characterize, understand, and mitigate consumer product risk.

Dr. Piper has extensive experience in the characterization and failure analysis of lithium-ion battery packs and the circuits with which they interact. She has performed site inspections and failure analysis on high power switching devices such as electric vehicle chargers and solar inverters. She has performed extensive testing and failure analysis of optical and opto-electronic devices including LED overhead lighting and pulsed lasers for LIDAR systems. She has performed eye safety analysis of consumer electronics products using lamps, LEDs, and lasers. She is also proficient with high-speed electrical measurements including the use of time domain reflectometry (TDR) for flex cable failure analysis.

Dr. Piper completed her Ph.D. at Stanford University focusing on theory and simulation of nanophotonic devices. Her previous work experience included modelling and design of laser-assisted hard disk write heads and designing and manufacturing battery-powered synthesizers for experimental music. Prior to earning her BSEE degree, Dr. Piper worked for several years in an electronics repair shop where she performed failure analysis and repair on a variety of musical equipment. The equipment was manufactured from the 1940's through the 2000's and included antique guitar amplifiers using vacuum tubes, 1970's-era synthesizers and keyboards, and high-power (multi-kW) solid state power amplifiers.

Academic Credentials & Professional Honors

Ph.D., Electrical Engineering, Stanford University, 2016

M.S., Electrical Engineering, Stanford University, 2012

B.S., Electrical Engineering, University of Massachusetts, Boston, summa cum laudex, 2010

M.F.A., Music/Sound, Bard College, 2003

Stanford Graduate Fellow in Electrical Engineering, 2011-2013

Licenses and Certifications

Licensed Professional Electrical Engineer, California, #22643

Certified Fire and Explosion Investigator (CFEI) in accordance with the National Association of Fire Investigators, National Certification Board

Certified Vehicle Fire Investigator (CVFI) in accordance with the National Association of Fire Investigators, National Certification Board

Prior Experience

Optical Design Intern, Western Digital Corporation, 2010-2014

Network Engineer, Mitre Corporation, 2010

Owner, Flower Electronics, 2006-2010

Languages

French

Mandarin Chinese

Publications

Piper JR, Fan S. Broadband absorption enhancement in solar cells with an atomically thin active layer. ACS Photonics 2016; 3(4), 571-577. doi:10.1021/acsp Photonics.5b00510

Liu Y, Chadha A, Zhao D, Piper JR, Jia Y, et al. Approaching total absorption at near infrared in large area monolayer graphene by critical coupling. Applied Physics Letters 2014; 105(18):81105. doi:10.1063/1.4901181.

Wang KX, Piper JR, Fan S. Optical impedance transformer for transparent conducting electrodes. Nano Letters 2014; 14(5):2755-2758. doi:10.1021/nl500741f.

Piper JR, Liu V, Fan S. Total absorption by degenerate critical coupling. Applied Physics Letters 2014; 104(25):251110. doi:10.1063/1.4885517.

Piper JR, Fan S. Total absorption in a graphene monolayer in the optical regime by critical coupling with a photonic crystal guided resonance. ACS Photonics 2014; 1(4):347-353. doi:10.1021/ph400090p.

Piper JR, Sprott JC. Simple autonomous chaotic circuits. IEEE Transactions on Circuits and Systems II: Express Briefs 2010; 57(9):730-734. doi:10.1109/TCSII.2010.2058493.

Presentations

Piper JR. Enhancing absorption in 2d materials using photonic structures. Stanford SystemX Alliance, Stanford CA, November 2015.

Piper JR, Liu V, Fan S. Total absorption by degenerate critical coupling. SPIE Photonics West, San Francisco CA, February 2015.

Piper JR, Fan S. Total absorption in a graphene monolayer in the optical regime by critical coupling with a photonic crystal guided resonance. Near Field Optics 13, Salt Lake City UT, September 2014.

Piper JR, Fan S. Total absorption in a graphene monolayer in the optical regime by critical coupling with a photonic crystal guided resonance. SPIE Optics + Photonics, San Diego CA, August 2014.

Piper JR, Hansen P, Hesselink L. Fundamentals of excitation and resonance of a near-field transducer in the presence of a conductive magnetic recording medium. SPIE Photonics West, February 2012.

Project Experience

50+ multiparty legal inspections related to the failure analysis of lithium-ion battery cells used in e-cigarette devices

Characterization and analysis of protection circuits for lithium-ion battery packs used in personal transportation devices (e-scooters, e-bikes, etc.)

Characterization and testing of battery protection circuitry for portable consumer electronic devices

Failure analysis and recreation testing of 25 kW electric vehicle charger explosion

Site inspection and failure analysis of solar inverters with water intrusion

Characterization and testing of pulsed laser emitters and diode receivers for LIDAR systems

Eye safety analysis of spinning-puck LIDAR system

Eye safety analysis of heating element for electric oven

Design review of electrical controller for adjustable bed potentially implicated in a fatal house fire

Flex cable failure analysis using time domain reflectometry (TDR)

Factory visits for TDR equipment setup and training

Peer Reviewer

Applied Physics Letters

ACS Photonics

IEEE Photonics Technology Letters

Nanoscale