

Exponent®
Engineering & Scientific Consulting

Matthew Davis, Ph.D., P.E.

Managing Engineer | Electrical Engineering
Bowie
+1-301-291-2505 | msdavis@exponent.com

Professional Profile

Dr. Davis is an engineering scientist with over 15 years of experience applying electromagnetics principles to real world applications in both industry and academic research. Dr. Davis has expertise with electromagnetic field (EMF) modeling and measurements of systems. This experience encompasses the performance of tasks such as electromagnetic compatibility (EMC), EMC risk assessments, phase optimization of AC power transmission lines, and calculations of electric and magnetic field power transmission lines.

Furthermore, Dr. Davis is experienced in the prosecution of patent applications for various electronic, optical, and software technologies. He has drafted and prosecuted many patent applications and is adept at validity and infringement analysis.

Dr. Davis has extensive experience in a variety of radio-frequency (RF), microwave, and public safety technologies. Specific experiences include spectrum management and design of wireless public safety systems, software construction to interface with RF measurement tools, and field-testing and analysis of radar systems.

Dr. Davis also researched nanophotonic systems at the Center for Nanoscale Science and Technology at the National Institute for Standards and Technology in Gaithersburg MD. He developed nano-scale plasmonic structures with exotic optical properties not found in nature. As part of his research, Dr. Davis developed expertise in the design of optical structures, such as plasmonic devices, using modeling scripts (e.g., C++, Matlab, Python) and numerical solvers such as finite-difference-time-domain (FDTD) simulations. To bring optical structure designs into the real world, Dr. Davis further developed expertise in the use of nanofabrication tools such as scanning-electron-beam microscopy, focused-ion-beam milling and microscopy, sputter deposition, electron beam deposition, atomic-layer deposition, electron-beam-lithography, and UV lithography.

Prior to joining Exponent, Dr. Davis spent several years serving communities in NY and MD driving and riding on ambulances as a volunteer emergency-medical-technician (EMT). He gained extensive hands-on field experience using medical devices such as automated-external-defibrillators (AED), pulse oximeters, glucometers, stethoscopes, and blood pressure monitor devices (automated and manual).

Academic Credentials & Professional Honors

Ph.D., Electrical and Computer Engineering, Syracuse University, 2018

B.S., Physics, Illinois State University, 2006

META Conference Poster Competition: Best Poster Winner, 1st Place, Malaga Spain, 2016.

META Conference Poster Competition: Finalist, NYC 2015.

Science, Mathematics, and Research for Transformation (SMART) Scholarship, 2014 (Declined).

Nunan Research Day Poster Competition, Syracuse University, Departmental Winner, 2014.

Licenses and Certifications

Professional Engineer Electrical and Computer, California, #25577

Prior Experience

Technical Specialist, Banner Witcoff, 2020 – 2021

Postdoctoral Researcher, University of Maryland, 2018 – 2020

Graduate Research Assistant, University of Maryland, 2015 – 2018

Graduate Teaching Assistant, Syracuse University, 2010 – 2013

Graduate Research Assistant, Syracuse University, 2013 – 2015

Systems Engineer, SRC Inc., 2006 - 2014

Undergraduate Research Assistant, Illinois State University, 2005 – 2006

Professional Affiliations

The Optical Society of America (OSA) – Member

Institute of Electrical and Electronics Engineers (IEEE) - Member

American Intellectual Property Law Association – Technical Advisor Associate

Publications

W. Zhu, S. Divitt, M. S. Davis, C. Zhang, H. J. Lezec, and A. Agrawal. 'Plasmon Lasers', in Encyclopedia of Applied Physics, (Wiley-VCH 2020).

M.S. Davis, J. Strait, W. Zhu, J.K. Lee, H.J. Lezec, and A. Agrawal, "Chiroptical response of aluminum nanocrescents at ultraviolet wavelengths,"Nano Letters, 3656-3662 (2020).

K. Zhang, A. P. Lawson, C. T. Ellis, M. S. Davis, T. E. Murphy, H. A. Bechtel, J. G. Tischler, and O. Rabin, "Plasmonic nanoarcs: a versatile platform with tunable localized surface plasmon resonances in octave intervals," Optics Express, vol. 28 (21), 30889, (2020).

M.S. Davis, J.K. Lee, H.J. Lezec, and A. Agrawal, "Microscopic origin of the chiroptical response of optical media," Science Advances, vol. 5 no. 10, (2019).

M.S. Davis, J.K. Lee, T. Xu, C.D. Bohn, H.J. Lezec and A. Agrawal, "Aperiodic nanoplasmonic devices for directional colour filtering and sensing," Nature Communications, 1347 (2017).

C. D. Bohn, A. Agrawal, Y. Lee, C. J. Choi, M.S. Davis, P. M. Haney, H. J. Lezec and V. A. Szalai, "Design Considerations for Enhancing Absorption in Semiconductors on Metals with Surface Plasmon

Polaritons," Phys. Chem. Chem. Phys. 16 (13), 6084–6091 (2014).

M.S. Davis, N.G. Nutter and E. Rosa Jr., "Driving Phase Synchronous Plasma Discharges with Superimposed Signals," Int. J. Bifurcation Chaos 17, 3513 (2007).

Presentations

M.S. Davis, W. Zhu, J.K. Lee, H.J. Lezec, and A. Agrawal, "Microscopic origin of the chiroptical response of plasmonic media," Oral presentation at CLEO 2018, San Jose CA, 2018.

M.S. Davis, J. Strait, W. Zhu, J.K. Lee, H.J. Lezec, and A. Agrawal, "Predicting the circular polarization response of a plasmonic meta-surface," Poster presentation at META 2017, Incheon-Seoul, Korea, 2017.

M.S. Davis, J. Strait, W. Zhu, S. Blair, J.K. Lee, H.J. Lezec, and A. Agrawal, "UV Circular Polarization Selection using Aluminum Nano-spirals," Poster presentation at META 2016, Malaga Spain, 2016.

M.S. Davis, J. Strait, W. Zhu, S. Blair, J.K. Lee, H.J. Lezec, and A. Agrawal, "Circular Polarization Selective Aluminum Nano-spirals at Ultraviolet Wavelengths," Oral presentation at CLEO 2016, San Jose CA, 2016.

M.S. Davis, W. Zhu, T. Xu, A. Agrawal, and H.J. Lezec, "An algorithmic approach to plasmonic filter design with applications to 3D directional light sensors," Poster presentation at META 2015, NYC NY, 2015.

M. Davis, W. Zhu, T. Xu, A. Agrawal, and H.J. Lezec, "Filter Design Method for Construction of 3D Plasmonic Directional Light Sensors," Oral presentation at CLEO 2015, San Jose CA, 2015.

M.S. Davis, T. Xu, C.D. Bohn, H.J. Lezec, and A. Agrawal, "An Aperiodic Angle-Modulated Plasmonic Color Sorter and Angle Sensor," Oral presention at CLEO 2014, San Jose CA, 2014.

M.S. Davis, N.G. Nutter and E. Rosa Jr., "Driving Phase Synchronous Plasma Discharges with Superimposed Signals," Oral presention at Annual Argonne Symposium for Undergraduates, Argonne, IL, 2006.

Project Experience

Transmission line electromagnetic field calculations and phase optimization

Electromagnetic field studies for public power utilities

Compliance testing and risk analysis of wireless devices

Patent validity and invalidity analysis

Software development

Additional Education & Training

Community Emergency Response Team Certificate (CERT, 2021), Montgomery County Fire and Rescue Services