



MARK MCFARLAND, PE

ELECTRICAL & TELECOM ENGINEER STATISTICIAN

- ✉ Mark@DiscoveryEngineering.net
- ☎ (720) 593-1640
- 📍 Boulder, Colorado
- 🌐 www.DiscoveryEngineering.net

LICENSED & BOARD CERTIFIED

Practice Areas

- ★ Electrical & Electronics Engineering
- ★ Telecommunications Engineering
- ★ Wireless Engineering
- ★ GPS & Cellular Evidence Analysis
- ★ Quality Sciences & Applied Research

Credentials

- ★ Diplomate in Forensic Engineering
- ★ Nationally Recognized Expert
- ★ Published in National & International Peer-Reviewed Journals
- ★ Speaker at National & International Technical Conferences
- ★ BS, Electrical Engineering
- ★ MEng, Telecommunications
- ★ MEng, Engineering Management
- ★ Certified Expert in the Quality Sciences (*Six Sigma Master Black Belt*)
- ★ Thirty+ Years of Experience



Forensic Engineering & Applied Research Expertise ⚖️

Electrical and Electronics Engineering ⚡

I investigate electrical and electronic components, equipment, systems, & devices to support litigation related to design, use, defects, malfunctions, modifications, and equipment breakdown for civil and criminal matters.

Wireless and Telecommunications Engineering 📶

Over 25 years of experience in research, design, analysis, & measurement of cellular, GPS, 3G-5G, LTE, public safety comm systems, satellite, Internet, wireless, RF, Wi-Fi, radar, networks, data communications, communications protocols and standards, instrumentation, control systems, and software.

GPS and Cellular Evidence Analysis 📶

Understanding GPS, cell phone, & base station evidence is critical. I present data and uncertainties in easy to understand maps, animations, timelines, and tables. These can show patterns of communications, whereabouts, and activity. I map & analyze records from all manufacturers and carriers.

Quality Sciences and Applied Research ⚙️

Understanding *variability* is crucial to improving and controlling any process. I bring scholarship & practical experience in applied research & quality sciences to help clients understand variability and improve outcomes.

Studies show that most published scientific research cannot be reproduced (NAS, 2018). The scientific, financial, and legal consequences of irreproducible research, from arbitrary research methods to improper analyses, are enormous. I ensure that solid and defensible methods inform your decisions.

Education 🎓

2017	Master of Engineering Engineering Management	University of Colorado
2015	Six Sigma Master Black Belt Quality Sciences: 24 graduate credit hours in applied research & statistics	University of Colorado
2007	Master of Engineering Telecommunications	University of Colorado
1996	Bachelor of Science Electrical Engineering	Lehigh University

Employment History 🏢

Since 2023	Electronics Engineer/Telecom Specialist Chickasaw Nation Industries	Remote
Since 2015	Founder & CEO, Principal Investigator Discovery Engineering, PLLC	Colorado
2002-2023	Electronics Engineer US Department of Commerce Institute for Telecommunication Sciences	Colorado
2000-2001	Software Engineer Motorola Broadband Communications	Pennsylvania
1996-2000	Antenna Engineer Lockheed Martin Missiles and Space	Pennsylvania



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Licenses and Certifications

2006	Professional Engineer	PE-0040278	State of Colorado
2022	Professional Engineer	E-24276	State of California
2016	Six Sigma Master Black Belt (Quality Sciences)		University of Colorado
2016	Competent Communicator		Toastmasters International
2022	Diplomate in Forensic Engineering		Nat'l Academy of Forensic Engineers

Selected Litigation History

- Communication System Failure** Investigated underground mine communication system failure resulting in serious personal injury.
- Automotive Wireless** Investigated insurer's claim that vehicle anomalies were caused by insured/claimant using a hidden wireless key fob.
- Securities Fraud** Investigated high-volume stock trades (*cross-trading*) resulting in \$40M deficit to broker. At issue: trades initiated on a private network with computers having allegedly spoofed MAC addresses. (FINRA Arbitration)
- Electrification** Investigated a hotel circuit breaker panel which caused an electric shock, leading to a fall and personal injury.
- Cellular Records** Provided opinion on the whereabouts of an individual's cell phone based upon service provider records for criminal murder appeal.
- Mobile Phone Records** Analyzed alleged distracted driver's mobile phone records to quantify voice, SMS, & data usage at time of auto accident.
- Cellular GPS** Provided opinion on the whereabouts of individual's cell phone based upon cellular carrier's GPS records (criminal home invasion appeal).
- Google GPS Location History** Tabulated, analyzed, and mapped an individual's Google GPS location history record. Provided an opinion on an individual's whereabouts and activity over a three month period for sex trafficking case.
- Consumer Electronics** Investigated electronic audio equipment which exposed individual to hazardous sound levels.
- Medical Electronics** Investigated hospital nurse call button and bed alarm systems to provide opinion on the cause of a malfunction leading to severe personal injury.
- Utility Installations** Investigated utility poles, wires, cables, and other equipment spanning roadway which contributed to death of motorist.
- Home Wiring** Inspected home wiring and electrical devices exposed to fire and/or smoke to determine suitability for continued use.

Professional Affiliations

Since 2008	National Society of Professional Engineers (NSPE) President, Vice President, Director, Secretary, Member
Since 2018	NSPE-Colorado Education Foundation Trustee
Since 2022	Institute of Electrical and Electronics Engineers (IEEE) Member
Since 2022	National Academy of Forensic Engineers (NAFE) Member
2022–2023	Journal of the National Academy of Forensic Engineers Associate Editor
Since 2023	Claims and Litigation Management Alliance (CLMA) Member



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Committees

- 2002–2003 **Telecommunications Industry Association (TIA)**
TR-8 Mobile and Personal Private Standards Committee
- 2024 **National Society of Professional Engineers (NSPE)**
Candidate Screening Committee

Presentations and Talks

1. *Cellular Evidence in Civil and Criminal Cases: Four Case Studies*, Presented to lawyer groups in San Fernando Valley, Westlake, San Francisco, Los Angeles, and Silicon Valley, CA. 2022–2023, Qualified for CA Bar continuing education credit.
2. *Distracted Driving: Determining Cell Phone Usage from Forensic Cellular Records*, National Academy of Forensic Engineering. July 2023, St. Louis.
3. *Insurance Implications of Cellular and GPS Evidence: Four Case Studies*, Colorado Chartered Property Casualty Underwriter Society. January 2023, online. Continuing education credit in CO, TX, & WY.
4. *Verizon's Wireless Lease Agreement: What Is It, and What Does It Mean to the Residents of Leyden Rock?*, Leyden Rock Metropolitan District Special Meeting. December 2019, Arvada, CO.
5. *Screening Experiments in Mobile Channel Measurements*, International Symposium on Advanced Radio Technologies. July 2018, Broomfield, CO.
6. *Six Sigma Techniques to Validate and Generalize In-Building Path Loss Models*, International Union of Radio Science (URSI). January 2018, Boulder, CO.
7. *Statistical Learning to Classify Six In-Building Propagation Environments*, International Union of Radio Science (URSI). January 2018, Boulder, CO.
8. *Cell Towers: Their Present, Their Future*, Broomfield City Council meeting. March 2016, Broomfield, CO.
9. *In-Building Path Loss Model Analysis: Testing Assumptions and Identifying Outliers in Propagation Models*, International Union of Radio Science (URSI). January 2016, Boulder, CO. (session co-chair)
10. *In-Building Path Loss Modeling: An Application of Simple Linear Regression Analysis*, University of Colorado Boulder, Guest lecturer for graduate course in applied statistics. March 2015, Boulder, CO. (invited talk)
11. *A Fast-Fading Mobile Channel Measurement System*, IEEE Antenna Measurement Techniques Association. April 2013, San Diego, CA. (Presented by B Johnk)
12. *Characterizing an S-band Marine Radar Receiver in the Presence of Interference*, IEEE International Symposium in Electromagnetic Compatibility. August 2012, Pittsburgh, PA.
13. *Engineering Licensure: from Point A to P.E.*, Metropolitan State College of Denver, Tau Alpha Pi National Honor Society 35th Annual Dinner and Awards Program. April 2012, Denver, CO. (invited talk)
14. *Assessing the Quality of Recorded Surveillance Video*, US Department of Homeland Security. February 2009, Boulder, CO. (invited talk)
15. *A Subjective Video Quality Test Method for the Assessment of Recorded Surveillance Video*, American Academy of Forensic Sciences. February 2009, Denver, CO
16. *Assessing the Quality of Recorded Surveillance Video*, Scientific Working Group on Imaging Technology. January 2007, Orlando, FL. (invited talk)



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Refereed Publications

1. M. McFarland, "Distracted Driving: Determining Cell Phone Usage from Forensic Cellular Records," *Journal of the National Academy of Forensic Engineers*, July 2024. Available <https://journal.nafe.org/ojs/index.php/nafe/article/view/893>
2. R. T. Johnk, M. Powell, J. Griffith, M. McFarland, K. Baker, P. Daithanker, S. Samdian, L. Gopal, and S. Gavva, "In-building LTE testing at the University of Colorado," National Telecommunications and Information Administration (NTIA), U.S. Dept. of Commerce, NTIA Report TR-15-518, July 2015. Available: <http://www.its.bldrdoc.gov/publications/2807.aspx>
3. R. Achatz, M. McFarland, R. Dalke, P. McKenna, F. Sanders, and G. Sanders, "Effects of broadband radio service reallocation on S-band marine radars: Front-end overload," National Telecommunications and Information Administration (NTIA), U.S. Dept. of Commerce, NTIA Report TR-15-515, April 2015. Available: <http://www.its.bldrdoc.gov/publications/2798.aspx>
4. M. McFarland and R. Johnk, "Characterizing an S-band marine radar receiver in the presence of interference," in *Electromagnetic Compatibility (EMC), 2012 IEEE International Symposium on*, August 2012, pp. 579–583. Available: <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?partnum=6350926&searchProductType=IEEE%20Conferences>
5. R. Johnk, C. Hammerschmidt, M. McFarland, and J. Lemmon, "A fast-fading mobile channel measurement system," in *Electromagnetic Compatibility (EMC), 2012 IEEE International Symposium on*, August 2012, pp. 584–589. Available: <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?partnum=6350925&searchProductType=IEEE%20Conferences>
6. M. McFarland, M. Pinson, C. Ford, A. Webster, W. Ingram, S. Hanes, and K. Anderson, "Relating audio and video quality, using CIF video," National Telecommunications and Information Administration (NTIA), U.S. Dept. of Commerce, NTIA Technical Memorandum 10-472, September 2010. Available: <http://www.its.bldrdoc.gov/publications/2547.aspx>
7. R. Johnk, J. Ewan, N. DeMinco, R. Carey, P. McKenna, C. Behm, T. Riley, S. Carroll, M. McFarland, and J. Leslie, "High-resolution propagation measurements using biconical antennas and signal processing," in *Electromagnetic Compatibility (EMC), 2010 IEEE International Symposium on*, July 2010, pp. 85–90. Available: <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?reload=true&arnumber=5711252&contentType=Conference+Publications>
8. DHS Public Safety Communications, "Task-based tactical and surveillance video quality tests," Statement of Requirements, US Department of Homeland Security, DHS Technical Report DHS-TR-PSC-10-07, July 2010. Available: <https://www.hsd1.org/?abstract&did=16117>
9. C. Ford, M. McFarland, A. Webster, S. Hanes, M. Pinson, A. Webster, and K. Anderson, "Multimedia synchronization study," National Telecommunications and Information Administration (NTIA), U.S. Dept. of Commerce, NTIA Technical Memorandum 10-464, February 2010. Available: <http://www.its.bldrdoc.gov/publications/2501.aspx>
10. F. Sanders, R. Johnk, M. McFarland, and R. Hoffman, "Emission measurement results for a cellular and PCS signal-jamming transmitter," National Telecommunications and Information Administration (NTIA), U.S. Dept. of Commerce, NTIA Technical Report 10-465, February 2010. Available: <http://www.its.bldrdoc.gov/publications/2503.aspx>
11. M. McFarland, "A subjective video quality test method for the assessment of recorded surveillance video," in *Proceedings of the American Academy of Forensic Sciences*, vol. 15, February 2009, p. 158. Available: <http://www.aafs.org/sites/default/files/pdf/ProceedingsDenver2009.pdf>



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Refereed Publications (continued)

12. C. Ford, M. McFarland, and I. Stange, "Subjective video quality assessment methods for recognition tasks," in *Proceedings of the SPIE*, vol. 7240, February 2009. Available: <http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=811708>
13. ITU-T, *Subjective Video Quality Assessment Methods for Recognition Tasks*, International Telecommunications Union– Telecommunication Standardization Sector Recommendation P.912, August 2008. Available: <https://www.itu.int/rec/T-REC-P.912-200808-S/en>
14. M. McFarland, M. Pinson, and S. Wolf, "Batch video quality metric (BVQM) user's manual," National Telecommunications and Information Administration (NTIA), U.S. Dept. of Commerce, NTIA Handbook 06-441a, December 2006. Available: <http://www.its.bldrdoc.gov/publications/2476.aspx>
15. M. McFarland, "Batch Video Quality Metric Release Notes," National Telecommunications and Information Administration (NTIA), U.S. Dept. of Commerce, NTIA Software & Data SD-06-443, August 2006. Available: <https://www.its.bldrdoc.gov/publications/2480.aspx>

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