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# MICHAEL S. MCCORQUODALE, PH.D.

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## CONTACT

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- im: *mobiusmicro*
- www: [www.eecs.umich.edu/~mmccorq](http://www.eecs.umich.edu/~mmccorq)

## HIGHLIGHTS

- Founder of *Mobius Microsystems*, an analog semiconductor component start-up company based on dissertation research; brought technology to volume production, with over 10M units shipped, and generated original revenue on \$2M in IP business model; subsequently secured over \$28M in debt and equity financing to build fabless semiconductor component company
- Published over 25 refereed journal, conference, symposium and workshop articles; inventor on over 30 issued and pending U.S. patents and foreign counterparts thereof
- Recognized for developing and commercializing the most accurate and precise solid-state oscillator technology to date and the only such technology to rival piezoelectric quartz oscillators
- Awarded in 4 academic IC design competitions, including a best paper award at *DAC*, and 11 academic business development competitions including 6 1<sup>st</sup> place awards amounting to \$170k; recognized for technology business development including 2 awards from the Governor of MI
- Strong teaching background including experience organizing and instructing a graduate-level course in EE on process technology and device physics; long history of voluntary student mentorship; multiple panel appears on engineering education reform and entrepreneurship

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## ACADEMIC BACKGROUND: RESEARCH, TEACHING AND PUBLICATION RECORD

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### EDUCATION

**THE UNIVERSITY OF MICHIGAN, ANN ARBOR, MI, 1998–2004**

- Doctor of Philosophy (Ph.D.) in Electrical Engineering, Aug. 2004
- Master of Science (M.S.) in Electrical Engineering, Dec. 2000
- Major: Circuits and Microsystems; Minor: Communication Systems

**THE UNIVERSITY OF ILLINOIS, URBANA–CHAMPAIGN, IL, 1993–1997**

- Bachelor of Science (B.S.) in Electrical Engineering with Honors, May 1997
- Major: Communication Systems and Digital Signal Processing

### RESEARCH EXPERIENCE

**THE UNIVERSITY OF MICHIGAN, ANN ARBOR, MI, 1998–2004**

*Graduate Student Research Assistant and AFCEA Fellow, NSF Engineering Research Center (ERC) in Wireless Integrated MicroSystems (WIMS), Micropower Circuits Thrust*

**Dissertation Title:** *Monolithic and Top-Down Clock Synthesis with Micromachined RF Reference*  
**Committee:** *R. Brown (Chairman), M. Flynn, K. Najafi, N. Perkins and K. Wise*

- **Responsibilities:** pursue independent research in RF integrated circuit and MEMS design to develop and prototype a Si-based replacement technology for piezoelectric quartz frequency references, publish, develop IP and support lab infrastructure
- **Independent research:** developed a high-accuracy and low-jitter MEMS-based monolithic clock generation technology for embedded processors and successfully demonstrated technology as both a discrete monolithic component and as the sole clock reference in a 16b mixed-signal microcontroller; specified, designed, fabricated and tested 5 IC designs: 4 at *TSMC* through the *MOSIS* MEP and 1 at *IBM* through a collaborative research agreement; developed CMOS-

compatible micromachining process for RF MEMS varactors and inductors; designed, fabricated and tested RF MEMS devices including micromachined varactors, suspended inductors and microresonators; co-developed an ECAD package, entitled *NEWTON*, for the direct synthesis of RF MEMS devices from performance specification to physical design

- **Publishing and IP development:** 12 conference and journal papers; 4 issued patents
- **Infrastructure development:** specified, procured, calibrated and supported test equipment including RF probing, RF frequency synthesis and logic/network/spectrum analysis for new testing lab at U. of Michigan

**THE UNIVERSITY OF ILLINOIS, URBANA–CHAMPAIGN, IL, 1994–1997**

*Undergraduate Research Assistant, Illinois State Water Survey, Atmospheric Sciences Division*

- **Responsibilities:** electronic hardware and software development for atmospheric science experiments investigating spontaneous freezing due to the collision of super-cooled water drops
- **Hardware development:** designed, assembled and tested an original 8051-based embedded microcontroller system for temperature data acquisition using thermocouple and infrared sensing techniques; successfully deployed the developed system in experimental thermal column in which the thermal profile of super-cooled water drops was sensed prior to collision
- **Software development:** developed a custom software framework to interface with the temperature acquisition system including the ability to set acquisition rate, capture real-time data and provide remote TCP/IP-based access of data including captured video of experiments

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**TEACHING  
EXPERIENCE**

**THE UNIVERSITY OF MICHIGAN, ANN ARBOR, MI, WINTER TERM 2007**

*Adjunct Lecturer, EECS 523: Digital Integrated Circuit Technology*

- Organized and instructed graduate-level course in electrical engineering with 36 students covering CMOS process technology, short-channel device physics, device reliability and current research in CMOS process scaling
- Instructed from material sourced from current faculty and added significant original content further covering short-channel effects and device reliability
- Responsible for lecturing 3 times per week, office hours and preparing homework and exams

**THE UNIVERSITY OF ILLINOIS, URBANA–CHAMPAIGN, IL, 1996–1997**

*Teaching Assistant, ECE 342: Microelectronic Circuits*

- Responsible for grading assignments and holding office hours twice a week for an undergraduate course in BJT and CMOS analog circuits

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**REFEREED JOURNAL  
ARTICLES AND LETTERS**

- **Michael S. McCorquodale, et al.**, “A 25MHz Self-Referenced Solid-State Frequency Source Suitable for XO-Replacement,” *IEEE Transactions on Circuits and Systems-I: Regular Papers (Special Issue on ISCAS 2008)*, vol. 56, no. 5, May 2009, pp. 943–956, [Invited: 1 of 20 accepted from 45 invited from 815 accepted from 1751 submitted to ISCAS '08: 1%].
- **Michael S. McCorquodale, et al.**, “A Monolithic and Self-Referenced RF LC Clock Generator Compliant with USB 2.0,” *IEEE J. of Solid State Circuits*, vol. 42, no. 2, Feb. 2007, pp. 385–399.
- Arthur Nieuwoudt, **Michael S. McCorquodale**, Ruba T. Borno and Yehia Massoud, “Integrated Spiral Inductor Modeling Techniques for Efficient Design Space Exploration,” *IEEE Electron Device Letters*, vol. 27, no. 12, Dec. 2006, pp. 998–1001.
- **Michael S. McCorquodale** and Richard B. Brown, “Academic and Professional Resources for Student-Led Technology Ventures,” *IEEE Antennas & Propagation*, vol. 46, issue 4, Aug. 2004, pp. 125–131.

- **Michael S. McCorquodale**, “Current & Future Trends in Frequency Generation, and Applicable Jitter and Link Performance Analysis with Real-Time and Sampling Oscilloscopes,” *DesignCon*, Santa Clara, CA 2010.
- **Michael S. McCorquodale** and Richard B. Brown, “On Modern and Historical Short-Term Frequency Stability Metrics for Frequency Sources” *European Time and Frequency Forum and International Frequency Control Symposium (EFTF-IFCS)*, Besançon, France 2009.
- **Michael S. McCorquodale** and Dongtai Liu, “Performance of Wireline Links Synchronized to Self-Referenced Solid-State Frequency Sources,” *European Time and Frequency Forum and International Frequency Control Symposium (EFTF-IFCS)*, Besançon, France 2009.
- **Michael S. McCorquodale**, “Self-Referenced, Trimmed and Compensated RF CMOS Harmonic Oscillators as Monolithic Frequency Generators,” *IEEE International Frequency Control Symposium (IFCS)*, Honolulu, HI 2008.
- **Michael S. McCorquodale, et al.**, “A 25MHz All-CMOS Reference Clock Generator for XO-Replacement in Serial Wire Interfaces,” *IEEE International Symposium on Circuits and Systems (ISCAS)*, Seattle, WA 2008. [1 of 815 selected from 1751: 47%]
- **Michael S. McCorquodale, et al.**, “A 0.5–480MHz Self-Referenced CMOS Clock Generator with 90ppm Total Frequency Error and Spread Spectrum Capability,” *International Solid State Circuits Conference (ISSCC) Dig. of Tech. Papers*, San Francisco, CA 2008. [1 of 237 selected from 656: 36%]
- **Michael S. McCorquodale** and Richard B. Brown, “Mobius Microsystems: A Case Study in the Commercialization of Graduate Research in Electrical Engineering,” *American Society of Engineering Education (ASEE) Annual Conference & Exposition*, Honolulu, Hawaii 2007.
- Robert M. Senger, Eric D. Marsman, Gordon A. Carichner, Sundus Kubba, **Michael S. McCorquodale**, and Richard B. Brown, “Low-Latency, HDL-Synthesizable Dynamic Clock Frequency Controller with Self-Referenced Hybrid Clocking,” *IEEE International Symposium on Circuits and Systems (ISCAS)*, Kos, Greece 2006. [1 of 1439 selected from 2429: 59%]
- Eric D. Marsman, Robert M. Senger, Gordon A. Carichner, Sundus Kubba, **Michael S. McCorquodale**, and Richard B. Brown, “A DSP Architecture for Cochlear Implants,” *IEEE International Symposium on Circuits and Systems (ISCAS)*, Kos, Greece 2006. [1 of 1439 selected from 2429: 59%]
- **Michael S. McCorquodale**, James L. McCann, Richard B. Brown, “*NEWTON*: A Library-Based Analytical Synthesis Tool for RF-MEMS Resonators,” *Asia and South Pacific Design Automation Conference (ASP-DAC)*, Yokohama, Japan 2006. [1 of 135 selected from 424: 32%]
- R. M. Senger, E. D. Marsman, **M. S. McCorquodale**, R. B. Brown, “A 16-Bit, Low-Power Microsystem with Monolithic MEMS-LC Clocking,” *Asia and South Pacific Design Automation Conference (ASP-DAC)*, Yokohama, Japan 2006. [1 of 135 selected from 424: 32%]
- **Michael S. McCorquodale, et al.**, “A 9.2mW 528/66/50MHz Monolithic Clock Synthesizer for Mobile  $\mu$ P Platforms,” *IEEE Custom Integrated Circuits Conference (CICC)*, San Jose, CA 2005. [1 of 134 selected from 350: 38%]
- A. Nieuwoudt, **M. S. McCorquodale**, R. T. Borno, and Y. Massoud, “Efficient Analytical Modeling Techniques for Rapid Integrated Spiral Inductor Prototyping,” *IEEE Custom Integrated Circuits Conference (CICC)*, San Jose, CA 2005. [1 of 134 selected from 350: 38%]
- E. D. Marsman, R. M. Senger, **M. S. McCorquodale**, M. R. Guthaus, R. A. Ravindran, G. S. Dasika, S. A. Mahlke, R. B. Brown, “A 16-Bit Low-Power Microncontroller with Monolithic MEMS-LC Clocking,” *IEEE International Symposium on Circuits and Systems (ISCAS)*, Kobe, Japan 2005. [1 of 1622 from 2351: 69%]
- **Michael S. McCorquodale** and Richard B. Brown, “UMIPS: A Semiconductor IP Repository for IC Design Research and Education,” *American Society of Engineering Education (ASEE) Annual Conference & Exposition*, Salt Lake City, UT 2004.
- **Michael S. McCorquodale, et al.**, “Microsystem and SoC Design with UMIPS,” *IFIP VLSI-SoC*, Darmstadt, Germany 2003. [1 of 57 selected from 142: 40%]

- **Michael S. McCorquodale**, *et al.*, “Bottom-Up and Top-Down Approaches to Stable Clock Synthesis,” *International Conference on Electronic Circuits and Systems (ICECS)*, Sharjah, U.A.E. 2003. [1 of 333 selected from 551: 60%]
- **Michael S. McCorquodale** and Richard B. Brown, “Academic and Professional Resources for Student-Led Technology Ventures,” *American Society of Engineering Education (ASEE) Annual Conference & Exposition*, Nashville, TN 2003.
- **Michael S. McCorquodale**, *et al.*, “A CMOS Voltage-to-Frequency Linearizing Preprocessor for Parallel Plate RF MEMS Varactors,” *Radio Frequency Integrated Circuits (RFIC)*, Philadelphia, PA 2003. [1 of 155 selected from 256: 61%]
- **Michael S. McCorquodale**, *et al.*, “Study and Simulation of CMOS LC Oscillator Phase Noise and Jitter,” *IEEE International Symposium on Circuits and Systems (ISCAS)*, Bangkok, Thailand 2003. [1 of 1141 selected from 1812: 63%]
- **Michael S. McCorquodale**, *et al.*, “A Top-Down Microsystems Design Methodology and Associated Challenges,” Designer’s Forum, *Design Automation and Test Europe (DATE)*, Munich, Germany 2003. [1 of 237 selected from 590: 40%]
- Richard B. Brown and **Michael S. McCorquodale**, “Analog Mixed-Signal Low-Power Microcontrollers,” *Computer Aided Network Design (CANDE) Workshop*, Taos Ski Valley, NM 2003.
- Robert M. Senger, Eric D. Marsman, **Michael S. McCorquodale**, Fadi H. Gebara, Keith L. Kraver, Matthew R. Guthaus, and Richard B. Brown, “A 16-Bit Mixed-Signal Microsystem with Integrated CMOS-MEMS Clock Reference,” *Design Automation Conference (DAC)*, Anaheim, CA 2003. [1 of 152 selected from 628: 24%]
- Steven M. Martin, Robert M. Senger, Eric D. Marsman, Fadi H. Gebara, **Michael S. McCorquodale**, Keith L. Kraver, Matthew R. Guthaus, and Richard B. Brown, “A Low-Power Microinstrument for Chemical Analysis of Remote Environments,” *NASA Symposium on VLSI Design*, Coeur d’Alene, ID 2003.

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**ACADEMIC SEMINARS  
AND WORKSHOPS**

- **Michael S. McCorquodale**, “Growing Innovative Engineers: Students With Startups,” *National Science Foundation (NSF) Engineering Research Centers (ERC) Annual Meeting*, Bethesda, MD, to be presented Dec. 3, 2009.
- **Michael S. McCorquodale**, “Silicon Challenges Quartz: Precision Self-Referenced Solid-State Oscillators for Frequency Control and Generation,” *Toronto Solid-State Circuits Society (SSCS) Chapter Lecture*, U. of Toronto, Toronto, Canada, to be presented Oct. 22, 2009.
- **Michael S. McCorquodale**, “Straight Down the Crooked Path: The Dynamic Process of Commercializing Research,” *Distinguished Lecture in Electrical Engineering and Computer Science*, U. of Michigan, Ann Arbor, MI, Sept. 25, 2009. [Invited in honor of receiving the College of Engineering Recent Graduate Alumni Award]
- **Michael S. McCorquodale**, “Self-Referenced CMOS Oscillators,” Workshop on “Current and Future Trends in Frequency Generation Circuits,” *Radio Frequency Integrated Circuit Conference (RFIC)*, Boston, MA, Jun. 7, 2009.
- **Michael S. McCorquodale**, “On Modern and Historical Short-Term Frequency Stability Metrics for Frequency Sources” *European Time and Frequency Forum and International Frequency Control Symposium (EFTF-IFCS)*, Besançon, France, April, 2009.
- **Michael S. McCorquodale**, “Self-Referenced, Trimmed and Compensated RF CMOS Harmonic Oscillators as Monolithic Frequency Generators,” *IEEE International Frequency Control Symposium (IFCS)*, Honolulu, HI, May 20, 2008.
- **Michael S. McCorquodale**, “From U. of M. to Silicon Valley: A Critical Discussion on Commercializing Research from the Experience of ‘Doing It’,” *Entrepreneurship Hour: Distinguished Innovator Series Speaker*, Center for Entrepreneurship (CFE), College of Engineering, University of Michigan, Ann Arbor, MI, March 21, 2008.
- **Michael S. McCorquodale**, “Developing Future Engineers,” *National Science Foundation (NSF) Engineering Research Centers (ERC) Annual Meeting*, Bethesda, MD, 2007.

- **Michael S. McCorquodale**, “The Race to Replace Quartz,” *VLSI Seminar Series*, U. of Texas, Austin, TX, Nov. 2, 2007.
- **Michael S. McCorquodale**, “Mobius Microsystems: A Case Study in the Commercialization of Graduate Research in Electrical Engineering,” *American Society of Engineering Education (ASEE) Annual Conference & Exposition*, Honolulu, HI, 2007.
- **Michael S. McCorquodale**, “The Race to Replace Quartz,” *WIMS ERC Seminar Series*, U. of Michigan, Ann Arbor, MI, Apr. 9, 2007.
- **Michael S. McCorquodale**, “USF Contest Alumni Winners’ Perspectives,” The 3<sup>rd</sup> Annual San Francisco–Silicon Valley Global Entrepreneurship Research Conference and 5<sup>th</sup> Annual USF-PSI International Business Plan Competition, San Francisco, CA, 2007.
- **Michael S. McCorquodale**, “The Race to Replace Quartz,” *Berkeley Wireless Research Center (BWRC) Seminar Series*, U. of California, Berkeley, CA, Feb. 2, 2007.
- **Michael S. McCorquodale**, “Building Entrepreneurial Engineering Leaders for the Global Environment,” *National Science Foundation (NSF) Engineering Research Centers (ERC) Annual Meeting*, Bethesda, MD, 2006.
- **Michael S. McCorquodale**, “NEWTON: A Library-Based Analytical Synthesis Tool for RF-MEMS Resonators,” *Asia and South Pacific Design Automation Conference (ASP-DAC)*, Yokohama, Japan, 2006.
- **Michael S. McCorquodale**, “Entrepreneurship and the Commercialization of University Research in Engineering,” *WIMS ERC Seminar Series*, U. of Michigan, Jan. 2006.
- **Michael S. McCorquodale**, “A 9.2mW 528/66/50MHz Monolithic Clock Synthesizer for Mobile  $\mu$ P Platforms,” *IEEE Custom Integrated Circuits Conference (CICC)*, San Jose, CA, 2005.
- **Michael S. McCorquodale**, “CMOS and MEMS Approaches to Monolithic Timing and Frequency Synthesis,” *Utah Microfabrication Laboratory Seminar Series*, U. of Utah, Mar. 2005.
- **Michael S. McCorquodale**, “UMIPS: A Semiconductor IP Repository for IC Design Research and Education,” *ASEE National Conference*, Salt Lake City, UT, 2004.
- **Michael S. McCorquodale**, “Monolithic and Top-Down Clock Synthesis with Micromachined RF Reference,” Ph.D. Defense, University of Michigan, Apr. 9, 2004.
- **Michael S. McCorquodale**, “Microsystem and SoC Design with UMIPS,” *IFIP VLSI-SoC*, Darmstadt, Germany, 2003.
- **Michael S. McCorquodale**, “Bottom-Up and Top-Down Approaches to Stable Clock Synthesis,” *IEEE International Conference on Electronic Circuits and Systems (ICECS)*, Sharjah, U.A.E., 2003.
- **Michael S. McCorquodale**, “Academic and Professional Resources for Student-Led Technology Ventures,” *American Society of Engineering Education (ASEE) Annual Conference & Exposition*, Nashville, TN, 2003.
- **Michael S. McCorquodale**, “Study and Simulation of CMOS LC Oscillator Phase Noise and Jitter,” *IEEE International Symposium on Circuits and Systems (ISCAS)*, Bangkok, Thailand, 2003.
- **Michael S. McCorquodale**, “A Top-Down Microsystems Design Methodology and Associated Challenges,” *Design Automation and Test Europe (DATE)*, Munich, Germany, 2003.
- **Michael S. McCorquodale**, R. Senger, and E. Marsman, “High Yield Integrated Circuit Design Using the MOSIS Service,” U. of Michigan, Oct. 2003.
- **Michael S. McCorquodale**, “Michigan Entrepreneurs, A Showcase of Entrepreneurship: Start-ups by U of M Students,” U. of Michigan, Oct. 2002.

**INVITED COURSE  
PRESENTATIONS**

- **Michael S. McCorquodale**, “On Managing the Growth Stages of Mobius Microsystems,” *Entrepreneurial Studies 569: Managing the Growth of New Ventures*, Ross School of Business, University of Michigan, Ann Arbor, MI, March 31, 2009.

- **Michael S. McCorquodale**, “From U. of M. to Silicon Valley: A Critical Discussion on Commercializing Research from the Experience of ‘Doing It’,” *Electrical Engineering and Computer Science 628: Advanced High-Performance VLSI Design*, Department of EECS, University of Michigan, Ann Arbor, MI, October 1, 2008.

#### INTEGRATED CIRCUIT DESIGN COMPETITIONS

- R. M. Senger, E. D. Marsman, **M. S. McCorquodale**, R. B. Brown, “A 16-Bit, Low-Power Microsystem with Monolithic MEMS-LC Clocking,” *Asia and South Pacific Design Automation Conference (ASP-DAC) LSI Design Competition*, Finalist, Yokohama, Japan, 2006.
- Robert M. Senger, Eric D. Marsman, **Michael S. McCorquodale**, Fadi H. Gebara, Keith L. Kraver, Matthew R. Guthaus, and Richard B. Brown, “A 16-Bit Mixed-Signal Microsystem with Integrated CMOS-MEMS Clock Reference,” *Design Automation Conference and International Solid State Circuits Conference (DAC/ISSCC) Student Design Competition*, 1<sup>st</sup> Place Conceptual Category, Anaheim, CA, 2003.
- **Michael S. McCorquodale**, *et al.*, “An Integrated MEMS-BiCMOS SINGARS Transceiver,” *Design Automation Conference (DAC) International Student Design Contest*, 1<sup>st</sup> Place Conceptual Category and Judge’s Best Paper, Los Angeles, CA, 2000.
- **Michael S. McCorquodale**, *et al.*, “Programmable Commercial Band Stereo FM Transmitter,” *National VLSI Contest*, 1<sup>st</sup> Place Novice Category, Ann Arbor, MI, 1999.

#### PROFESSIONAL EXPERIENCE

#### PROFESSIONAL EXPERIENCE

**MOBIUS MICROSYSTEMS INC.**, ANN ARBOR/DETROIT, MI AND SUNNYVALE, CA, 4/2004–PRESENT

*Founder, Chief Technical Officer and Board Member (4/2004–present)*

*Chief Executive Officer (4/2004–6/2005)*

*Acting Vice President of Engineering (7/2007–4/2008)*

- **Responsibilities:** engineering management, corporate leadership, IP development, fundraising and recruiting
- **Management:** managed 10 person design team in 2 locations (Ann Arbor/Detroit and Sunnyvale); managed multiple development tracks including product development, automatic test program development, core technology performance scaling and product qualification; reported directly to the CEO and the Board of Directors
- **Corporate leadership:** led company to build offices in downtown Detroit and received over \$5M in state and city tax abatements including the Michigan High-Tech MEGA; led direct sales effort and secured 2 IP customers within 4 months of seed financing; awarded over \$170k in grants and business plan competition prizes to establish the company
- **IP:** co-developed and managed patent portfolio with over 25 positions now issued or pending; developed founding technology and patent portfolio with advisor as part of dissertation research
- **Fundraising:** raised over \$21M in debt and equity financing from tier-1 VCs for fabless semiconductor business plan; raised over \$2M from angel and seed investors for IP business plan
- **Recruiting:** recruited engineering staff, world-class advisory board and executive management team; recruited initial seed team through the entrepreneurial institute at U. of Michigan

**HUGHES SPACE AND COMMUNICATIONS COMPANY**, EL SEGUNDO, CA, 6/1997–8/1998

*Member of Technical Staff, Government Electronics Business Unit, High Speed ASIC Program*

- **Responsibilities:** high-speed integrated circuit design, test, characterization, debug and software development
- **IC design:** designed (front to back end) and tested 4 and 20GHz current-mode logic (CML) ring-oscillator clock ASICs in *Hughes Research Lab*’s HBT InP and *IBM*’s SiGe technologies
- **Test/Characterization/Debug:** responsible for test plan development, equipment procurement, software development, test fixture development and test of InP and SiGe high-I/O CML ASICs at up to 20Gbps using *Anritsu* pattern generators, *HP* logic analyzers and *Cascade Microtech* RF membrane probes and probe stations; successfully and rapidly debugged design errors through

test of several high-speed ASICs including a 20Gbps 256:1 MUX/DeMUX, a 20Gbps 4:1 MUX and 4/20GHz ring oscillators; recommended design modifications led to success with next design iteration

- **Software development:** Developed software to generate test vectors, program equipment and process test results from ASICs; developed DSP firmware for Digital Transceiver Program
- **Other:** Secret Level security clearance from the Department of Defense

*Member of Technical Staff, Payload Systems Engineering*

- **Responsibilities:** system-level management and link budget analysis
- **Management:** co-managed subsystem engineering activities on the beam-steering multiple access (MA) antenna panel for NASA's TDRS H, I and J satellite programs
- **Link budget analysis:** performed link budget analysis for satellite communication systems; simulated and analyzed digital communication system performance in SPW

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**INVITED INDUSTRIAL  
SEMINARS**

- **Michael S. McCorquodale**, "Current & Future Trends in Frequency Generation, and Applicable Jitter and Link Performance Analysis with Real-Time and Sampling Oscilloscopes," *DesignCon*, Santa Clara, CA to be presented Feb. 1–4, 2010.
- **Michael S. McCorquodale**, "Frequency Sources for Flash Memory Applications," *Flash Memory Summit*, Santa Clara, CA, August 13, 2008.
- **Michael S. McCorquodale**, "Logic NVM for Precision Analog and Timing Circuits in CMOS," *Logic NVM Event*, Santa Clara, CA, June 18, 2008.
- **Michael S. McCorquodale**, "Mobius Microsystems," *AeA Fall Venture Forum*, Palo Alto, CA, Sept. 2005.
- **Michael S. McCorquodale**, "Mobius Microsystems," *Midwest Venture Summit*, Chicago, IL May 2005.
- **Michael S. McCorquodale**, "Monolithic and Top-Down Clock Synthesis with Micromachined RF Reference," *IBM Austin Research Laboratories*, Austin, TX, Apr. 20, 2004.

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**ISSUED PATENTS:  
UNITED STATES**

- **Michael S. McCorquodale**, Scott M. Pernia, and Amar S. Basu, "Monolithic clock generator and timing/frequency reference," U.S. Patent 7,548,132 B2, June 16, 2009.
- Gordon Carichner, **Michael S. McCorquodale**, Scott M. Pernia, and Sundus Kubba, "Frequency calibration for a monolithic clock generator and timing/frequency reference," U.S. Patent 7,548,125 B2, June 16, 2009.
- **Michael S. McCorquodale** and Scott M. Pernia, "Transconductance and current modulation for resonant frequency control and selection," U.S. Patent 7,545,231, June 9, 2009.
- Scott M. Pernia, **Michael S. McCorquodale**, and Sundus Kubba, "Low-latency start-up for a monolithic clock generator and timing/frequency reference," U.S. Patent 7,545,227, June 9, 2009.
- **Michael S. McCorquodale**, Scott M. Pernia, and Sundus Kubba, "Inductor and capacitor-based clock generator and timing/frequency reference," U.S. Patent 7,504,899, Mar. 17, 2009.
- **Michael S. McCorquodale**, Scott M. Pernia, and Sundus Kubba, "Frequency controller for a monolithic clock generator and timing/frequency reference," U.S. Patent 7,456,699, Nov. 25, 2008.
- **Michael S. McCorquodale**, Scott Pernia, Sundus Kubba, Justin O'Day, and Gordon Carichner, "Integrated clock generator and timing/frequency reference," U.S. Patent 7,365,614 B2, Apr. 29, 2008.
- **Michael S. McCorquodale**, Scott Pernia, Sundus Kubba, Justin O'Day, and Gordon Carichner, "Discrete clock generator and timing/frequency reference," U.S. Patent 7,358,826 B2, Apr. 15, 2008.

- Scott M. Pernia, **Michael S. McCorquodale**, and Sundus Kubba, “Low-latency start-up for a monolithic clock generator and timing/frequency reference,” U.S. Patent 7,307,486, Dec. 11, 2007.
- **Michael S. McCorquodale**, Scott M. Pernia, Sundus Kubba, and Amar S. Basu, “Frequency calibration for a monolithic clock generator and timing/frequency reference,” U.S. Patent 7,248,124, Jul. 24, 2007.
- **Michael S. McCorquodale** and Scott M. Pernia, “Transconductance and current modulation for resonant frequency control and selection,” U.S. Patent 7,227,424, Jun. 5, 2007.
- **Michael S. McCorquodale**, Scott M. Pernia, and Amar S. Basu, “Monolithic clock generator and timing/frequency reference,” U.S. Patent 7,227,423, Jun. 5, 2007.
- **Michael S. McCorquodale** and Richard B. Brown, “MEMS-Based, computer systems, clock generation and oscillator circuits and LC-tank apparatus for use therein,” U.S. Patent 7,157,984, Jan. 2, 2007.
- **Michael S. McCorquodale**, Richard B. Brown, and Mei Kim Ding, “Linearizing apparatus and method,” U.S. Patent 7,132,874, Nov. 7, 2006.
- **Michael S. McCorquodale** and Richard B. Brown, “MEMS-Based, computer systems, clock generation and oscillator circuits and LC-tank apparatus for use therein,” U.S. Patent 6,972,635, Dec. 6, 2005.
- Clark T.-C. Nguyen, **Michael McCorquodale**, and Kun Wang, “Device including a micromechanical resonator having an operating frequency and method of extending the same,” U.S. Patent 6,249,073, June 19, 2001.

**PENDING PATENTS:  
UNITED STATES**

- William E. Armstrong, **Michael S. McCorquodale**, Vidyabhusan Gupta, Justin O'Day, Nader Fayyaz, and Gordon Carichner, “Environmentally Stable and Die-Integrable Clock, Frequency Reference, and Other Reference Signal Generator,” U.S. Patent Application 61/226,702, July 18, 2009.
- **Michael S. McCorquodale**, Scott M. Pernia, Vidyabhusan Gupta, Nathaniel C. Gaskin, and Nader Fayyaz, “Clock, Frequency Reference, and Other Reference Signal Generator with Frequency Stability Over Temperature Variation,” U.S. Patent Application 61/172,570, Apr. 24, 2009.
- **Michael S. McCorquodale**, Scott M. Pernia, and Sundus Kubba, “Inductor-Capacitor Based Clock Generator and Timing/Frequency Reference,” U.S. Patent Application 12/345,280, Dec. 29, 2008.
- **Michael S. McCorquodale**, Scott M. Pernia, and Sundus Kubba, “Frequency Controller for a Monolithic Clock Generator and Timing/Frequency Reference,” U.S. Patent Application 12/258,216, Oct. 24, 2008.
- **Michael S. McCorquodale**, Scott M. Pernia, Sundus Kubba, Justin D. O'Day and Gordon Carichner, “Integrated Clock Generator and Timing/Frequency Reference,” U.S. Patent Application 12/036,185, June 19, 2006.
- **Michael S. McCorquodale**, Scott M. Pernia, Sundus Kubba, Justin D. O'Day and Gordon Carichner, “Discrete Clock Generator and Timing/Frequency Reference,” U.S. Patent Application 12/036,165, June 26, 2008.
- Justin D. O'Day, **Michael S. McCorquodale**, Scott M. Pernia, Nam Duc Nguyen, Ralph Beaudouin, and Sundus Kubba, “Clock, Frequency Reference, and Other Reference Signal Generator with a Controlled Quality Factor,” U.S. Patent Application 12/013,440, Jan. 12, 2008.
- Scott M. Pernia, Nam Duc Nguyen, **Michael S. McCorquodale**, Justin D. O'Day, Ralph Beaudouin, and Sundus Kubba, “Control Voltage Generator for a Clock, Frequency Reference, and Other Reference Signal Generator,” U.S. Patent Application 12/013,438, Jan. 12, 2008.
- Nam Duc Nguyen, **Michael S. McCorquodale**, Scott M. Pernia, Justin D. O'Day, Ralph Beaudouin, and Sundus Kubba, “Common Mode Controller for a Clock, Frequency Reference, and Other Reference Signal Generator,” U.S. Patent Application 12/013,437, Jan. 12, 2008.

- **Michael S. McCorquodale**, Nam Duc Nguyen, Scott M. Pernia, Justin D. O’Day, Ralph Beaudouin, and Sundus Kubba, “Amplitude Controller for a Clock, Frequency Reference, and Other Reference Signal Generator,” U.S. Patent Application 12/013,435, Jan. 12, 2008.
- Scott M. Pernia, Gordon Carichner, Eric Marsman, and **Michael S. McCorquodale**, “Spread Spectrum Clock and Reference Signal Generator,” U.S. Patent Application 11/967,234, Dec. 30, 2007.
- Scott M. Pernia, **Michael S. McCorquodale**, Nam Duc Nguyen, Justin D. O’Day, Ralph Beaudouin, and Sundus Kubba, “Clock, Frequency Reference, and Other Reference Signal Generator,” U.S. Patent Application 11/950,707, Dec. 5, 2007.
- Scott M. Pernia, **Michael S. McCorquodale**, and Sundus Kubba, “Low-latency startup for a monolithic clock generator and timing/frequency reference,” U.S. Patent Application 11/926,013, Oct. 28, 2007.
- Scott M. Pernia, **Michael S. McCorquodale**, Sundus Kubba, Justin D. O’Day, Cordon Carichner, and Eric D. Marsman, “Multi-terminal harmonic oscillator integrated circuit with frequency calibration and frequency configuration,” U.S. Patent Application 11/805,368, May 23, 2007.
- **Michael S. McCorquodale** and Scott M. Pernia, “Transconductance and current modulation for resonant frequency control and selection,” U.S. Patent Application 11/796,820, April 28, 2007.

## AWARDS AND RECOGNITION

### CORPORATE BUSINESS DEVELOPMENT AWARDS

- “Hot 100 Products’ for 2008: MM8511 is World’s First Fully-Integrated Frequency Source for SSCG; Monolithic CMOS Device Lowers EMI and Eliminates Crystals and PLLs,” *EDN*, March 16, 2009. [1 of 100 products recognized by *EDN* in 2008]
- Michigan Small Business Association and Michigan Small Business & Technology Center, Technology Innovation of the Year, *Michigan Celebrates Business Awards Banquet*, Lansing, MI 2006. [Sole state-wide recipient]
- Michigan Economic Development Corporation and Governor’s award for the Potential to Create the Most High-Tech Jobs in Michigan, Lansing, MI 2005. [Sole state-wide recipient]
- Nominee, Start-up to Watch, Fabless Semiconductor Association (FSA), *FSA Awards Dinner*, Santa Clara, CA 2006. [1 of 3 of all FSA start-up members]
- Edward Lowe Foundation, *1 of 50 Companies to Watch in MI*, Lansing, MI 2006.

### ACADEMIC ENGINEERING AWARDS

- Recent Engineering Graduate Award, *College of Eng. Alumni Society Board*, U. of Michigan, Ann Arbor, MI, 2009. [Sole college-wide recipient from alumni base under 35 years old]
- Young Alumni Achievement Award, *Department of Electrical and Computer Engineering Alumni Society Board*, U. of Illinois at Urbana-Champaign, IL, 2009. [Sole department-wide recipient from alumni base under 40 yrs. old]
- College of Engineering Harry Benford Award for Entrepreneurial Leadership, U. of Michigan, 2003. [Sole recipient in College of Engineering at the U. of Michigan]
- Honorable Mention, CEO Technology Entrepreneurship Competition, Chicago, IL 2003.
- College of Engineering Distinguished Achievement Award, U. of Michigan, 2002. [Sole recipient from the Department of Electrical Engineering at the U. of Michigan]
- Recipient, Armed Forces Communications and Electronics Association (AFCEA) Doctoral Fellowship, Fairfax, VA 2002. [Sole nationwide recipient]
- James Scholar in Engineering, U. of Illinois, 1997.
- College Honors, U. of Illinois, 1997.
- Invited Member, Eta Kappa Nu Electrical Engineering Honor Society, 1996.

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**ACADEMIC BUSINESS  
DEVELOPMENT  
AWARDS**

- 1<sup>st</sup> Place, Ohio State U. Fisher College of Business Deloitte & Touche Business Plan Competition, Columbus, OH May 21, 2003. [1<sup>st</sup> Place amongst 77 teams: \$50k prize]
- Winner: NASDAQ Challenge, *Global Moot Corp Business Plan Competition*, U. of Texas, Austin, TX 2003. [Winner (1<sup>st</sup> Place) in 1 of 5 divisions with 6 semi-finalist teams selected from 30 international MBA programs: \$5k prize]
- Grand Champion and Best Pitch, *U. of San Francisco International Business Competition*, San Francisco, CA 2003. [Grand Champion (1<sup>st</sup> Place) and Best Pitch amongst 5 finalists selected from 80 teams from 55 international MBA programs: \$10k + \$1k prize]
- Best Business Opportunity and Best Written Plan, *U. of Michigan Pryor-Hale Business Plan Competition*, Ann Arbor, MI 2003. [Best Business Opportunity (1<sup>st</sup> Place) and Best Written Plan amongst 6 university-wide finalists: \$10k + \$1.5k prize]
- Statewide Finalist and Runner-Up (Phase II), *Great Lakes Entrepreneurial Quest (GLEQ)*, Ann Arbor, MI Apr. 8, 2003. [Runner-Up amongst 6 statewide finalists selected from 40 state-wide teams: \$25k prize]
- Grand Champion, *MBA Jungle Business Plan Competition*, New York, NY 2003. [Grand Champion (1<sup>st</sup> Place) amongst 8 finalists selected from 164 teams from 100 international MBA programs: \$30k prize]
- 1<sup>st</sup> Place, *Indiana U. Spirit of Enterprise Business Competition*, Indianapolis, IN Mar. 19, 2002. [1<sup>st</sup> Place amongst 9 invited finalists from 9 MBA programs: \$10k prize]
- Awardee, *Dare to Dream Grant Program*, Sam Zell and Robert Lurie Entrepreneurial Institute, U. of Michigan Business School, Oct. 22, 2002. [1 of 6 awards granted amongst 24 university-wide teams: \$20k prize]
- East Region Runner-Up (Phase I), *Great Lakes Venture Quest (GLVQ)*, Grand Rapids, MI Dec. 5, 2001. [Runner-Up amongst 3 finalists selected from 46 teams: \$5k prize]
- Finalist, *U. of Michigan Pryor-Hale Business Plan Competition*, Ann Arbor, MI Apr. 18, 2001. [1 of 4 university-wide finalists]
- Finalist and Runner-Up, *Babcock/Eno River Capital Elevator Pitch Competition*, Winston-Salem, NC Mar. 30, 2001. [Runner-Up amongst 5 finalists selected from 28 teams]
- 1<sup>st</sup> Place, *Michigan Innovators Business Pitch Competition*, Ann Arbor, Feb. 26, MI 2001. [1 of 3 university-wide finalists: \$3.5k prize]

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**SERVICE AND DIVERSIONS**

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**PROFESSIONAL  
SERVICE****CONFERENCE AND JOURNAL REVIEWS**

- *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control (TUFFC)*: 2009
- *IEEE Electron Device Letters: (EDL)*: 2009
- *IEEE Journal of Solid State Circuits (JSSC)*: 2009, 2008
- *IET Electronics Letters*: 2009
- *IEEE Transactions on Circuit and Systems I: (TCAS-I)* 2008
- *Design Automation Conference (DAC)*: 2007
- *IEEE Transactions on CAD (TCAD)*: 2006
- *IEEE Transactions on VLSI Systems (TVLSI)*: 2008–2005
- *ASEE Annual Conference & Exhibition (ASEE)*: 2006, 2005
- *International Symposium on Circuits and Systems (ISCAS)*: 2005, 2004

**PANEL APPEARANCES**

- Moderator and Panelist (Plenary Session), “Growing Innovative Entrepreneurs: Students With Startups,” *National Science Foundation (NSF) Engineering Research Centers (ERC) Annual Meeting*, Bethesda, MD, 2009.

- Panelist, “Frequency Sources for Flash Memory Applications,” *Flash Memory Summit*, Santa Clara, CA, August 13, 2008.
- Panelist, “Tapping Michigan Resources” *Annual Collaboration for Entrepreneurship (ACE)*, Ann Arbor, MI, Jan. 2008.
- Panelist, “Developing Future Engineers,” *National Science Foundation (NSF) Engineering Research Centers (ERC) Annual Meeting*, Bethesda, MD, 2007.
- Panelist, “Building Entrepreneurial Engineering Leaders for the Global Environment,” *National Science Foundation (NSF) Engineering Research Centers (ERC) Annual Meeting*, Bethesda, MD, 2006.
- Panelist, “10 Steps to Landing Your First (Paying) Customer,” *New Enterprise Forum (NEF)*, Ann Arbor, Oct. 2005.
- Panelist, “The New Face of Economic Development,” *Leadership Detroit XXVI*, Compuware World Headquarters, Detroit, Nov. 2004.

#### **VOLUNTARY PROFESSIONAL ENDEAVORS**

- Industrial Advisory Board Member, National Science Foundation (NSF) Engineering Research Center (ERC) in Wireless Integrated MicroSystems (WIMS), 2004–2008.
- Co-Founder, U. of Michigan Intellectual Property Source (UMIPS), a semiconductor IP repository for the academic community, 2003.
- New Venture Participant, Venture Capital Investment Competition, Central Region, U. of Michigan Business School, 2003.

#### **STUDENT MENTORSHIP**

- Mentor, MPowered Entrepreneurship Program, Ann Arbor, MI, 2008–present: Mentor for students in engineering interested in entrepreneurship
- Mentor, U. of Michigan Undergraduate Research Opportunities Program (UROP), Ann Arbor, MI, 2002: Mentor for two undergraduate students; directed research led to two published papers and one patent with authorship including undergraduate students
- Graduate Student Mentor, EECS Microsystems, Ann Arbor, MI, 2000–2002: Mentor for new Electrical Engineering & Computer Science grad. students majoring in Circuits & Microsystems
- Graduate Student Mentor, NASA Sharp Student Program, Ann Arbor, MI, Summer 2001: Responsible for coordinating a summer of research activities for one minority high school student
- Graduate Student Mentor, SRC Undergraduate Research Initiative, Ann Arbor, MI, 2000: Responsible for research activities for Undergraduate students

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#### **COMMUNITY SERVICE**

#### **COMMUNITY SERVICE**

- Volunteer, Greening of Detroit, Detroit, MI, 2005: Tree planting at a metropark in Detroit
- IEEE Judge, Detroit Future City Competition, MI, 2003. 2001: Junior high science competition
- Graduate Forum Representative, Ann Arbor, 2002: Represent needs of EECS students to College
- Volunteer, Yalla Vote!, Dearborn, MI 2002: Voting awareness campaign for Arab-Americans
- Volunteer, UM Tech Day, Ann Arbor, 2002: Demo of research at UM for prospective students
- Volunteer, Henry Ford Hospital, Detroit, MI, 2001–2002: Pediatric emergency medicine
- Volunteer, H.U.G. Belle Isle Day, Detroit, MI, 2001: Part of clean-up effort in Detroit metro park
- Volunteer, A Tree at Every School, Detroit, MI, 2001: Tree planting at every school in Detroit
- Volunteer, Clean Sweep Detroit, Detroit, MI, 1999, 2000, 2001: Part of city-wide clean up effort
- Volunteer, The Detroit Project, Detroit, MI 2000–2001: Variety of community service activities
- Volunteer, Angel’s Night, Detroit, MI, 2000, 2001: City-wide anti-arson campaign on Halloween
- Volunteer, Michael Reese Hospital, Chicago, IL, 1994: Prenatal diagnosis in medical genetics

**MENTOR, THE EDUCATION PROJECT FOR HOMELESS YOUTH, YPSILANTI, MI, 2001–2002**

Responsible for mentoring and tutoring a homeless child weekly in math and science

**ELECTED DISTRICT COUNCILMAN, SOUTHEAST DETROIT, MI 2001**

Responsible for representing needs of the Southeast Detroit community to the city administration

**EDUCATION COORDINATOR, THE DETROIT PROJECT, U. OF MICHIGAN, 2000–2001**

Responsible for education exercises and literature dissemination for volunteers and planning team members to promote a better understanding and increased awareness of urban issues as they pertain to the city of Detroit and other blighted urban areas

**ELECTED REPRESENTATIVE, RACKHAM STUDENT GOVERNMENT, U. OF MICHIGAN, 1999–2001**

Responsible for representing the needs of the graduate student community to the university as well as making student organization funding decisions, appointing persons to university committees, and pursuing initiatives to better the state of graduate student life

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**PROFESSIONAL  
MEMBERSHIPS**

- Member, Institute of Electrical and Electronics Engineers (IEEE)
- Invited Member, Eta Kappa Nu Electrical Engineering Honor Society (HKN)
- Professional Member, American Association for the Advancement of Science (AAAS)

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**PERSONAL INTERESTS**

**FOREIGN LANGUAGES**

- Conversational Spanish
- Basic Arabic including reading and writing

**DIVERSIONS**

- Foreign travel and foreign languages
- American politics, Middle East politics and history
- Economic development and legislation, poverty, American urban history and development
- Literature, arts, theater, symphony and opera
- Day trading

**PUBLISHED SHORT FICTION**

- “mad world,” *Rustlings of the Wind*, Altiloquent Issue, 4<sup>th</sup> Quarter, 2001, ISSN 1524-7066.
- “passion detroit,” *Rustlings of the Wind*, Interlocution Issue, 3<sup>rd</sup> Quarter, 2001, ISSN 1524-7066.

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**REFERENCES**

Available upon request