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ARYAN NAVABI

Portland, OR

PROFESSIONAL SUMMARY

Full-time engineer at Intel working in device and integration development. PhD graduate from UCLA's Electrical Engineering Department, worked in the field of device physics and spintronics. Ten years of experience in device characterization and fabrication in cleanroom with proficiency in device design and physics, test measurement setups, data analysis, and modelling.

EDUCATION

University of California, Los Angeles (Cumulative GPA 3.71) **June 2018**
Ph.D. and Masters in Electrical Engineering, Physical and Wave Electronics at Device Research Laboratory.

University of British Columbia (GPA 81%) **April 2010**
Bachelor of Applied Sciences in Electrical Engineering, Microsystems and Nanotechnology Option.

Courses
Graduate level

Semiconductor Physics, Solid State Physics, Semiconductor Device Lab, Electron Microscopy, Microwave Semiconductor Devices, Integrated Circuits Fabrication Processes, Laser Theory, Microwave and Wireless Design

TECHNICAL SKILLS

Equipment

- Flash memory reliability and test
- Test equipment such as network analyzer, signal generator, spectrum analyzer, function generator, pulse generator, oscilloscope
- Micro/Nano fabrication using cleanroom facilities
- Thin film processes and characterization, CVD, ALD, e-beam evaporation, ICP etching, sputtering
- RF/Microwave device fab and test
- SEM, AFM, Veeco Wyko optical profiler, SQUID , Raman Spectroscopy, FMR
- Quantum Design Physical Properties Measurements System
- Graphene, MoS_2, and other 2D material processing

Software

MatLab, LabView, DesignCAD, COMSOL, Advanced Design Systems, Layout Editor

TECHNICAL EXPERIENCE

Device and Integration Development Engineer at *Intel Corporation* — August 2018 to Present

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Device Engineer Intern at *Western Digital Corporation* — June 2017 to September 2017

- Qualified and tested 128 Gb 3D NAND flash memory dies for strategic customer's mobile products
- Performed reliability measurements on several hundred NAND flash memory dies using test chambers
- Calibrated temperature of test chambers using thermocouples and LabView program along with temperature data collected by the memory controller to ensure accurate test environment
- Measured memory parameters including throughput, bad blocks, and latency under start and end-of-life conditions
- Analyzed memory block conditions after data retention, read disturb, and X-ray exposure

Process Engineer Intern at *Active Layer Parametrics Inc.* — July 2015 to March 2016

- Prepared samples for a patented system which characterized semiconductor electrical parameters such as mobility and carrier density with respect to junction depth with Angstrom resolution
- Utilized ICP for etching III-V semiconductors such as GaAs and GaN
- Characterized electrical properties, surface roughness, mesa steps of thin films using Keithley 4200, Veeco Wyko optical profiler, AFM, and Dektak stylus profiler

Research Assistant at *UBC Quantum Devices Group* — May 2010 to May 2011

- Worked on a method for fabricating a nano-scale, all-Carbon based, transistor
- Utilized carbon nanotubes and graphene to pattern graphene in to nanometer scale channels
- Developed a process to fabricate a BN-graphene stack for electron mobility enhancement on graphene

PROJECT AND RESEARCH EXPERIENCE

Enhancement of Spin-Wave Propagation Length in Planar YIG Devices — January 2016 to June 2018

- Fabricated micrometer sized planar YIG/Pt and YIG/Topological Insulator (TI) heterostructures devices
- Used RF/Microwave tools such as VNA, spectrum analyzer, and signal generator to analyze device performance
- Devised and prepared experimental setup and LabView program to analyze spin-wave propagation
- Utilized spin current in Pt and TI to enhance the output signal power by 6 dB through the spin-orbit torque (SOT)
- Wrote a MatLab code to automate the data analysis of spin-wave propagation and the effect of TI
- Used theoretical models and collaborated with physicists to analyze and understand experimental data
- Performed COMSOL simulations to characterize excitation from coplanar waveguides
- Investigated using other materials such as anti-ferromagnets to increase spin-wave propagation length in YIG filters

Efficient Excitation of Exchange-Dominated Spin-Waves — January 2016 to February 2017

- Developed a new and efficient method to characterize exchange stiffness in ferromagnetic materials
- Fabricated spin-wave devices based on CoFeB and YIG films and utilized VNA to determine S parameters
- Achieved reducing the required magnetic bias field by an order of magnitude to excite spin-waves at 20 to 25 GHz
- Collaborated with other research groups to build a model for simulating magnetic oscillations in developed devices

THz Radiation and Plasmonic Absorption by Graphene — April 2013 to December 2015

- Established a new method for fabricating highly periodic sinusoidal silicon oxide substrate with periodicities as low as 500 nm and depths of 200 nm
- Achieved formation of sinusoidal graphene by transferring CVD graphene film on sinusoidal silicon oxide using heating methods for graphene conformation to substrate
- Analyzed radiation and plasmonic absorption of sinusoidal graphene in THz frequencies using silicon bolometer and studying electron transport, optical, and mechanical properties

Chemical Vapor Deposition of Graphene on Copper Film and Optimization of Graphene Quality — February 2013 to June 2015

- Installed a furnace and the vacuum system for growth of monolayer graphene through chemical vapor deposition
- Optimized graphene film quality by tuning growth parameters
- Utilized Raman spectroscopy and electrical characterization to determine graphene quality
- Deposited thin oxide layer on graphene using ALD to modulate current and used data to determine carrier mobility
- Improved graphene carrier mobility from 300 $cm^2/V.sec$ to 2000 $cm^2/V.sec$
- Performed low temperature measurements at 77 K to characterize carrier mobility at low temperatures
- Reduced intrinsic carrier concentration from 10^{13} cm^{-2} to 10^{11} cm^{-2}, which is an indication of low impurities
- Increased graphene crystal grain size from 1 μm to nearly 50 μm

Fabrication and Characterization of an All-Carbon Transistor — May 2010 to May 2011

- Developed a method for fabricating a nano-scale graphene transistor
- Utilized carbon nanotubes and graphene to pattern graphene in to nanometer scale channels
- Used AFM to manipulate and reposition carbon nanotubes on the graphene channel to act as gate
- Developed a process to fabricate a BN-graphene stack for electron mobility enhancement on graphene

TEACHING EXPERIENCE

Introduction to Nanoelectronics, Teaching Assistant — Spring 2014 and Winter 2015

- Covered topics such as quantum mechanics, electron tunneling, RTD, single electron transistor, and spintronics
- Led discussion sessions for students, answered students' questions on subjects covered in class
- Taught additional course subjects and supplementary materials

LEADERSHIP ROLES

- Co-founder of UCLA Electrical Engineering Graduate Students and Post-Docs Society (Since April 2016)
- Chairman of UBC IEEE Student Branch (September 2008 to April 2010)

SELECTED PUBLICATIONS, PRESENTATIONS, AND PATENT

- S. Cakmakyapan, P. K. Lu, **A. Navabi**, M. Jarrahi, "Gold-Patched Graphene Nano-Stripes for High-Responsivity and Ultrafast Photodetection from the Visible to Infrared Regime," to be published in *Light: Science and Applications*, April 2018

• **A. Navabi**, Y. Liu, P. Upadhyaya, K. Murata, F. Ebrahimi, G. Yu, B. Ma, Y. Rao, M. Yazdani, M. Montazeri, L. Pan, I. N. Krivorotov, I. Barsukov, Q. Yang, P. Khalili Amiri, Y. Tserkovnyak, K. L. Wang, "Control of Spin-Wave Damping in YIG Using Surface Spin Currents from Topological Insulators," Submitted to *ACS Nano Letters*, March 2018

• **A. Navabi**, Y. Liu, P. Upadhyaya, G. Yu, M. Yazdani, K. Murata, M. Montazeri, F. Ebrahimi, P. Khalili Amiri, K. L. Wang, "Enhancement of Spin-wave Propagation Using Topological Insulators," *American Physical Society March Meeting*, Los Angeles CA, March 2018

• X. Zhu, S. Lei, S. H. Tsai, X. Zhang, J. Liu, G. Yin, M. Tang, C. M. T. Jr., **A. Navabi**, Z. Jin, S. P. Tsai, H. Qasem, Y. Wang, R. Vajtai, R. K. Lake, P. M. Ajayan, and K. L. Wang, "A Study of Vertical Transport through Graphene toward Control of Quantum Tunneling," *Nano Letters 18 (2)*, January 2018

• **A. Navabi**, Y. Liu, P. Upadhyaya, G. Yu, M. Yazdani, K. Murata, M. Montazeri, F. Ebrahimi, P. Khalili Amiri, K. L. Wang, "Spin-wave Amplification in YIG/Pt System: Frequency and Bias Magnetic Field Dependencies," To be presented at *Magnetism and Magnetic Materials Conference*, Pittsburg PA, November 2017

• **A. Navabi**, Y. Liu, P. Upadhyaya, G. Yu, M. Yazdani, K. Murata, M. Montazeri, F. Ebrahimi, P. Khalili Amiri, K. L. Wang, "Spin-wave Amplification in YIG/Pt System: Frequency and Bias Magnetic Field Dependencies," To be presented at *Magnetism and Magnetic Materials Conference*, Pittsburg PA, November 2017

• J. Li, G. Yu, C. Tang, Y. Liu, Z. Shi, Y. Liu, **A. Navabi**, M. Aldosary, Q. Shao, K. L. Wang, R. Lake, and J. Shi, "Deficiency of the bulk spin Hall effect model for spin-orbit torques in magnetic-insulator/heavy-metal heterostructures," *Physical Review B* 95, 241305(R), June 2017

• T. Suhara, K. Murata, **A. Navabi**, K. O. Hara, Y. Nakagawa, C. T. Trinh, Y. Kurokawa, T. Suemasu, K. L. Wang, Noritaka Usami, "Postannealing effects on undoped BaSi2 evaporated films grown on Si substrates," *Japanese Journal of Applied Physics*, 56, 5S1, 05DB05, April 2017

• Q. Shao, C. Tang, G. Yu, **A. Navabi**, H. Wu, C. He, J. Li, P. Upadhyaya, S. A. Razavi, Q. L. He, Y. Liu, L. Pan, X. Han, Y. Tserkovnyak, J. Shi, K. L. Wang, "Saturation magnetization dependent spin torque efficiency in tungsten/magnetic insulator bilayers," Under Review in *Physical Review Letters*, March 2017

• **A. Navabi**, C. Chen, A. Barra, M. Yazdani, G. Yu, M. Montazeri, M. Aldosary, J. Li, K. Wong, Q. Hu, J. Shi, G. P. Carman, A. E. Sepulveda, P. K. Amiri, and K. L. Wang, "Efficient Excitation of High-Frequency Exchange-Dominated Spin Waves in Periodic Ferromagnetic Structures, " *Physical Review Applied*, 7, 34027, February 2017

• H. Medina, J.G. Li, T.Y. Su, Y.W. Lan, S.H. Lee, C.W. Chen, Y.Z. Chen, A. Manikandan, S. Tsai, **A. Navabi**, X. Zhu, Y.C. Shih, W.S. Lin, J.H. Yang, S. R. Thomas, B.W. Wu, C.H. Shen, J.M. Shieh, H.N. Lin, A. Javey, K. L. Wang, Y.L. Chueh, "Wafer-Scale Growth of WSe2 Monolayers Toward Phase-Engineered Hybrid WO x/WSe2 Films with Sub-ppb NO x Gas Sensing by a Low-Temperature Plasma-Assisted Selenization Process," *Chemistry of Materials*, 29, 4, 1587, February 2017

• C. He, **A. Navabi**, Q. Shao, G. Yu, D. Wu, W. Zhu, C. Zheng, X. Li, Q.L. He, S.A. Razavi, K.L. Wong, Z. Zhang, P.K. Amiri, and K.L. Wang, "Spin-torque ferromagnetic resonance measurements utilizing spin Hall magnetoresistance in W/Co40Fe40B20/MgO structures," *Applied Physics Letters* 109, 202404, November 2016

• **A. Navabi**, M. Yazdani, P. Khalili, K. Wang, "Efficient Excitation of Perpendicular Standing Spin-Waves in CoFeB and YIG Films," *Magnetism and Magnetic Materials Conference*, New Orleans LA, November 2016

• **A. Navabi**, M. Yazdani, P. Khalili Amiri, K. L. Wang, "Devices and Methods of Fabrication of Sinusoidal Patterned Silicon Dioxide Substrates," *U.S. Provisional Patent*, Ser. No. 62/083,225, filed November 2015

HOBBIES AND OTHER ACTIVITIES

Cycling, Scuba Diving, Hiking, Swimming, Snowboarding