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USA

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SUMMARY OF QUALIFICATIONS

Experienced Ph.D. with a solid background in Silicon/III-V photonics design, characterization and prototyping, Photonic Integrated Circuits, Nanofabrication and Measurements.

- ◊ 4+ years of experience in Integrated Photonic Device Design, Simulation and Characterization, and Plasmonics
- ◊ 4+ years of experience in Data Analysis, Failure Analysis, Project Management
- ◊ 3+ years of hands-on experience in Silicon/CMOS Nanofabrication, Optical Metrology, and Material Characterization
- ◊ Assisted PI in securing *US Presidential early carrier award* (PECASE 2019) by securing competitive research grants from AFOSR, ARO, ONR, DoD, NSF, etc.
- ◊ Collaborated with 30+ faculties and researchers with effective teamwork skills
- ◊ Problem solver, self-starter, quick learner, self-motivated creative thinker

EDUCATION

Ph.D. in Electrical Engineering, *Photonics, Electronics and MEMS*, May 2020 [GPA: 3.94/4.00]
OPEN Lab, ECE Dept. The George Washington University, Washington D.C. 20052, USA.

B.Sc. in Electronics and Telecommunications Engineering, 2012 [CGPA: 3.80/4.00; *'Summa Cum Laude'*]
North South University, Dhaka, Bangladesh.

RESEARCH INTERESTS

Opto-Electronics & Photonics, Plasmonics, Nano-photonics, Semiconductor Photonics, Electro-Optic Modulators, Solid State Devices, Transparent Conductive Oxides, Optical Cavities, Thin films, Light-Matter Interaction, Non-linear Optics, RF, Microwave antennas etc.

SKILLS & TRAINING

◊ **INTEGRATED PHOTONICS**
Electro-optic modulators, Mach Zehnder interferometers, Ring resonators, Photonic crystal cavities, Directional couplers, Switch, Photodetectors, Grating couplers, NoC

◊ **DESIGN & SIMULATION**
Lumerical FDTD, Mode, COMSOL Multiphysics (FEM), Matlab, LabView, KLayout, CAD, PDK, DRC

◊ **NANOFABRICATION**
Electron beam lithography (EBL), Contact photolithography, Atomic layer deposition (ALD)–Hydrophobic/philic surface, PVD, PECVD, Sputtering, Ion beam deposition (IBD), ICP, RIE, FIB, RTA

◊ **MEASUREMENT & TESTING**
SEM, FIBSEM, AFM, TEM, Electrical/Optical Probing, Optical Alignment, Visible/IR Camera Measurement, I-V, Tx Line, Cutback, Free-space Measurement, Optical Metrology, Spectroscopic Ellipsometry (Transmission/Reflection), Profilometry, Thin-Film Characterization, Tunable Laser, Optical Spectrum Analyzer, BERT, VNA, Statistical Data Analysis

- ◊ Class 100 cleanroom basics and safety course (NIST)
- ◊ AIM Photonics: Fundamentals of Integrated Photonics (MIT, Cambidge, MA, 2017)
- ◊ COMSOL Day Training Course (Bethesda, MD, 2018)
- ◊ Plasma-Therm: Fundamentals of Plasma Processing – Etching & deposition (Washington, DC, 2018)
- ◊ Heidelberg Instruments & Raith: Direct Write, Optical & E-beam Lithography (Washington, DC, 2019)
- ◊ JAWoollam Spetroscopic Ellipsometry Certificate Course (Gaithersburg, MD, 2019)

SELECTED JOURNAL PUBLICATIONS

- ◊ **R. Amin**, R. Maiti, Y. Gui, C. Suer, M. Miscuglio, E. Heidari, R. T. Chen, H. Dalir, and V. J. Sorger, "*Sub-wavelength GHz-fast broadband ITO Mach–Zehnder modulator on silicon photonics*," Optica **7**(4), 333-335 (2020).
- ◊ **R. Amin**, R. Maiti, J. K. George, X. Ma, Z. Ma, H. Dalir, M. Miscuglio, and V. J. Sorger, "*A lateral MOS-capacitor-enabled ITO Mach–Zehnder modulator for beam steering*," J. Lightwave Technol. **38**(2), 282-290 (2020).
- ◊ **R. Amin**, J. George, S. Sun, *et al*, "*ITO-based Electro-absorption Modulator for Photonic Neural Activation Function*," APL Materials **7**(8), 081112 (2019).
- ◊ **R. Amin**, R. Maiti, C. Carfano, Z. Ma, M. H. Tahersima, Y. Lilach, D. Ratnayake, H. Dalir, and V. J. Sorger, "*0.52 V mm ITO-based Mach-Zehnder modulator in silicon photonics*," APL Photonics **3**(12), 126104 (2018).
- ◊ **R. Amin**, J. B. Khurgin, and V. J. Sorger, "*Waveguide-based electro-absorption modulator performance: comparative analysis*," Opt. Express **26**(12), 15445-15470 (2018). **(Editor's pick √)**
- ◊ **R. Amin**, Z. Ma, R. Maiti, S. Khan, J. B. Khurgin, H. Dalir, and V. J. Sorger, "*Attojoule-efficient graphene optical modulators*," Appl. Opt. **57**(18), D130-D140 (2018).
- ◊ **R. Amin**, C. Suer, Z. Ma, I. Sarpkaya, J. B. Khurgin, R. Agarwal, and V. J. Sorger, "*Active material, optical mode and cavity impact on nanoscale electro-optic modulation performance*," Nanophotonics **7**(2), 455-472 (2017).

RESEARCH EXPERIENCES

◊ *Electro-Optic Modulators (EOMs):*

Ph.D. Advisor: Prof. Dr. Volker J. Sorger — *Fall 2015 – Present*
ECE Dept., Science & Engineering Hall (SEH),
The George Washington University, Washington D.C.

Miniature modulators of light

Worked on theory, design and fabrication of nanoscale electro-optic modulators; contrasting between phase and absorption modulation dictated by the fundamental Kramers-Kronig relations for different schemes, active materials

including free carrier dispersion in indium tin oxide (ITO), low-dimensional materials (e.g. graphene, transition metal dichalcogenides), III-V quantum wells etc. Worked in funded projects from AFOSR, NSF, ARO, SBIR and SRC.

Design, fabrication, simulation, measurement and optimization of electro-optic (EO) devices:

- ◊ Developed an ITO thin film process using IBD with 4Wave Cluster sputter and subsequent characterization in ***spectroscopic ellipsometry*** (JAWoollam M2000) and gated capacitive measurements.
- ◊ Demonstrated the **1st ITO-based Mach-Zehnder modulator** on Si platform; complete fabrication process of photonic and plasmonic modulators on SOI, including wafer preparation, lithography, material deposition, quality control, error analysis, related measurements and testing methods.
- ◊ Demonstrated **record-low $V_\pi L$** = 0.06 V-mm MZI modulator ITO plasmon on Silicon photonics.
- ◊ Developed photonic neuromorphic nonlinear activation function using electro-optic modulators.
- ◊ Developed a solid state beam steering platform for LiDAR using ITO phase-shifters on Silicon platform.
- ◊ Conducted *ab-initio* holistic theoretical study for different active materials for electro-absorption modulators and developed a unique metric 'Energy-Bandwidth ratio (EBR)' for cross-platform comparison.
- ◊ Developed a method for solid state tunable cavity in 1-D photonic crystal using ITO on Si slot waveguides.
- ◊ Demonstrated GHz-fast sub-wavelength ITO plasmon phase-shifter based Mach-Zehnder interferometer.
- ◊ Demonstrated Graphene-oxide-ITO heterogeneous integration on Silicon waveguide and tunable absorption leading to rectified linear behavior exhibiting ReLU activation function for photonic neural networks.

◊ *Semiconductor (III-V) Lasers:*

Thesis Advisor: Prof. Dr. Saiful Islam — *Dec. 2010 – Sep. 2011*
EEE Dept. Bangladesh Uni. of Engg. & Tech. (BUET)

- ◊ Developed a design for 450 nm and 488 nm edge emitting MQW Lasers using *InGaN/AlGaN* active layer by bandgap alterations of alloy compositions of corresponding III-V nitrides and analyzed their performance characteristics. Correspondingly coupled both the Lasers with similar SOA and analyzed the performance.

PROFESSIONAL EXPERIENCES

◊ *Research Associate* — *May 2017 - Present*
National Institute of Standards and Technology (NIST)
Center for Nanoscale Science and Technology (CNST)
100 Bureau Drive, Gaithersburg, MD 20899

◊ *Research Associate* — *May 2017 - Present*
GW Nanofabrication & Imaging Center (GWNIC)
Science & Engineering Hall (SEH), 800 22nd St., Washington D.C. 20052

◊ *Graduate Research Assistant (GRA)* — *Summer 2017 – Present*
Orthogonal Physics Enabled Nanophotonics (OPEN) Lab — *PI : Prof. Dr. Volker J. Sorger*
Department of Electrical & Computer Engineering
The George Washington University, Washington D.C. 20052

◊ *Graduate Teaching Assistant (GTA)* — *24 Aug 2015 – Present*
Department of Electrical & Computer Engineering — *Courses : Circuit Theory (ECE 2110), Engineering Electronics (ECE 2115), Intro to ECE (ECE 1010)*
School of Engineering & Applied Sciences (SEAS)
The George Washington University, Washington D.C. 20052

◊ *Assistant Engineer* — *10 Jun 2012 – 14 July 2015*
Operation & Maintenance: Network Operations Center (NOC) — *Operation & maintenance of NGN equipment HUAWEI Softx3000, UMG 8900, SE2300, and Dialogic Soft switches*
Mir Telecom – The1st IGW Operator of Bangladesh
71-72, Old Elephant Rd, Dhaka, Bangladesh.

◊ *Teaching Assistant (UGA)* — *25 Jan 2010 – 27 Apr 2010*, *18 May 2010 – 25 Aug 2010*
Department of Electrical Engineering & Computer Science, — *Course: Electromagnetic Fields & Waves (ETE 361)*
School of Applied Sciences, North South University, Dhaka, Bangladesh.

CONFERENCES

Presented (both oral and poster) invited and contributed submissions at topical conferences including OSA FiO+LS [2017-19], OSA CLEO [2017-20], IEEE RAPID [2019], OSA OFC [2018], SPIE Photonics West [2018], etc.

PATENT

Rubab Amin, and Volker J. Sorger, Transparent Conductive oxide-based Mach-Zehnder Modulator in Silicon Photonics, USPTO 16/545.733, Filed 2019; *Patent pending*.

REVIEWER

Reviewed for prestigious journals in relevant field including Applied Physics Letters (APL), Optics Letters, Applied Optics, Journal of Physics D: Applied Physics, Semiconductor Science and technology, JOSA B, Journal of Selected Topics in Quantum Electronics (JSTQE), Photonics Research, etc.

ACADEMIC HONORS

- ◊ *SPIE* Optics and Photonics Education Scholarship, 13th Aug. 2019
- ◊ ECE Dept. Best Poster Runner-up, GW SEAS R&D Showcase, 25th Oct. 2019
- ◊ AccelerateGW I-Coprs **National Science Foundation (NSF)** Award, 25th Oct. 2019
- ◊ GWNIC Best Poster Award, GW Research Days, 9th Apr. 2019
- ◊ ***University Fellowship (Stipend + Tuition Award)*** from *The George Washington University*, Department of Electrical and Computer Engineering, for the 2015-17 academic years.
- ◊ *International Amigo Scholarship*, University of New Mexico, Albuquerque, NM 2015-16.
- ◊ Graduated ***'Summa Cum Laude'***, distinction based on academic excellence in Bachelors' degree.

PROFESSIONAL AFFILIATION

◊ Vice-President, GWU OSA Student Chapter (Oct 2017 – Present) ◊ Student Member: OSA, APS, SPIE
◊ MicroSoft Developer Network Academic Alliance (MSDNAA)