Mr. James Neumann
Correspondence language: English

Contact Information

The primary information is denoted by (*)

Telephone

Email

Work (*)	jamesneumann@cmail.carleton.ca

Website

Personal	jamesneumann.ca
Social Media	https://www.youtube.com/@jamesneumann4633

Protected when completed

Mr. James Neumann

Language Skills

Language	Read	Write	Speak	Understand	Peer Review
English	Yes	Yes	Yes	Yes	Yes

Degrees

2024/9 (2028/6)

Doctorate, Doctor of Philosophy, Electrical and Computer Engineering, Carleton University
Degree Status: In Progress
Thesis Title: Ultrafast Laser Inscribed Periodic Structures in Optical Fibers for Nonlinear Optics and Quantum Applications
Transferred to PhD without completing Masters?: No

Areas of Research: Optics and Photonics, Laser, Optical Components, Optical Fibre

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Supervisors: Smelser, Christopher, 2024/9 - 2028/6

Fields of Application: Communication and Information Technologies, Industrial Manufacturing and Production, Foundations and Knowledge Acquisition

2015/9

Bachelor's Honours, Bachelor of Science (Hons.), Major in Physics, Queen's University at Kingston
Degree Status: Withdrawn

2021/9 - 2024/6

Master's Thesis, Master of Applied Science, Electrical and Computer Engineering, Carleton University
Degree Status: Completed
Thesis Title: Developing a Multi-axis Femtosecond Laser Micromachining Platform for Laser Induced Refractive Index Modification: Fiber Bragg Gratings, Waveguides, and Beyond

Areas of Research: Optics and Photonics, Laser, Optical Components, Optical Fibre

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Supervisors: Smelser, Christopher, 2021/9 - 2024/6

Fields of Application: Industrial Manufacturing and Production, Communication and Information Technologies

2016/9 - 2021/6

Bachelor's Honours, Bachelor of Science (Hons.), Experimental Physics, Carleton University
Degree Status: Completed
Thesis Title: Dielectric Breakdown Characterization in Liquid Xenon Using miniEXO: Exploring Transient-Breakdown Correlation

Supervisors: Gornea, Razvan, 2019/9 - 2020/4

Recognitions

2024/9 - 2025/8

Domestic Entrance Doctoral - 3,000 (Canadian dollar)
Carleton University
Prize / Award

Research Disciplines: Electrical Engineering and Electronic Engineering

2024/9 - 2025/8

Scholarship Departmental - 2,000 (Canadian dollar)
Carleton University
Prize / Award

Research Disciplines: Electrical Engineering and Electronic Engineering

2022/9 - 2023/8

Graduate Scholarship (Departmental) - 6,000 (Canadian dollar)
Carleton University
Prize / Award
This departmental scholarship was awarded again in 2022/23, the funding continued to support my master's thesis work on developing a femtosecond laser micromachining system and demonstrating the fabrication of high-precision Fiber Bragg Gratings (FBGs), advancing research in photonics and laser-based fabrication techniques.

Areas of Research: Optical Components, Optical Fibre, Optics and Photonics, Laser

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Fields of Application: Foundations and Knowledge Acquisition, Industrial Manufacturing and Production

2022/9 - 2023/8

Dr. Walter and Mary Chudobiak Entrepreneurship Award in Electrical Engineering - 10,000 (Canadian dollar)
Carleton University
Prize / Award
This award, jointly awarded by the Dean of the Faculty of Graduate and Postdoctoral Affairs and the Dean of the Faculty of Engineering and Design, recognizes students who have demonstrated entrepreneurial spirit, particularly in hardware design. I received this award for my work in developing advanced femtosecond laser-based fabrication techniques and establishing an independent laboratory where I conduct research on optical sensing technologies. The award supports my goal of commercializing innovative laser technologies for industrial and scientific applications.

Areas of Research: Optics and Photonics, Optical Components, Optical Fibre, Laser

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Fields of Application: Communication and Information Technologies, Industrial Manufacturing and Production, Foundations and Knowledge Acquisition

2021/9 - 2022/8

Graduate Scholarship (Departmental) - 6,000 (Canadian dollar)
Carleton University
Prize / Award
This departmental scholarship was awarded in recognition of my academic achievements and contributions to my research. The funding supported my master's thesis work on developing a femtosecond laser micromachining system and demonstrating the fabrication of high-precision Fiber Bragg Gratings (FBGs), advancing research in photonics and laser-based fabrication techniques

Areas of Research: Optical Components, Optical Fibre, Optics and Photonics, Laser

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Fields of Application: Foundations and Knowledge Acquisition, Industrial Manufacturing and Production

2020/9 - 2021/8

University Part-time Scholarship (Deans' Honour List) - 375 (Canadian dollar)
Carleton University
Distinction
In recognition of my exceptional academic performance during the 2020-2021 academic year, I was named to the Dean's Honor List at Carleton University. Along with this distinction, I was offered a scholarship as part of the award. However, I declined the scholarship when I transitioned into my Master’s degree, choosing to focus on advancing my research and academic pursuits at the graduate level as I transitioned from part time studies back to full time studies.

Areas of Research: Elementary Particles

Research Disciplines: Physics

2020/9 - 2021/4

Deans' Honour List
Carleton University
Distinction
The Dean's Honor List at Carleton University recognizes students for exceptional academic achievement. In 2020, I was named to the Dean's Honor List, awarded annually to students who achieve a Cumulative Grade Point Average (CGPA) of 10.0 or higher on Carleton's 12.0 scale, which corresponds to an A- average or better. This distinction acknowledges my academic dedication.

2019/5 - 2020/1

National Research Council of Canada's Attracting New Clients Award - 0 (Canadian dollar)
National Research Council Canada
Prize / Award
As part of the NRCan funded project entitled Novel distributed fiber optic sensing system for oil pipeline leak detection, Dr. Walker, Dr. Hnatovsky, Mr. Neumann, and Mr De Silva demonstrated the optical trigger technology they developed to Shawcor, a Canadian oil pipeline manufacturer. The CEO was very impressed with the demonstration and expressed a desire to partner with the NRC in the future in order to bring this technology to market.

Areas of Research: Optical Components, Optical Fibre, Optics and Photonics

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Fields of Application: Industrial Manufacturing and Production

User Profile

Researcher Status: Doctoral Student
Research Career Start Date: 2019/05/01

Engaged in Clinical Research?: No

Key Theory / Methodology: My research is grounded in the theory of ultrafast laser-matter interaction, particularly using femtosecond laser pulses for precision material modification. I apply nonlinear optics principles, focusing on second harmonic generation (SHG) and fiber Bragg grating (FBG) inscription in optical fibers and glass. My methodology combines experimental laser inscription with simulations to optimize phase-matching conditions and enhance nonlinear optical properties.

Research Interests: I am interested in exploring light-matter interactions, particularly using femtosecond lasers for modifying glass and fiber-based materials. My current focus includes enhancing second harmonic generation (SHG) in optical fibers, developing fiber Bragg gratings (FBGs), and studying laser-inscribed structures for nonlinear optics. Additionally, I am exploring methods to optimize laser cavity designs and beam stability for advanced photonics applications.

Research Experience Summary: I have extensive research experience in ultrafast optics, laser-based fabrication, and optical sensing technologies. My work focuses on femtosecond laser inscription of glass and optical fibers, including the development of second harmonic generating fibers and fiber Bragg gratings (FBGs). At the National Research Council (NRC), I worked on sensor readout electronics and FBG sensors. I have also contributed to the Enriched Xenon Observatory, where I gained experience in particle detection systems. My undergraduate research included experiments on dielectric breakdown, deepening my understanding of material properties under extreme conditions. I have designed laser-written structures to achieve optimal phase-matching for nonlinear optics and explored laser cavity designs to improve beam quality and stability. Combining experimental and theoretical methods, I use femtosecond lasers to fabricate and simulate optical components, contributing to peer-reviewed research in photonics.

Fields of Application: Communication and Information Technologies, Foundations and Knowledge Acquisition

Disciplines Trained In: Electrical Engineering and Electronic Engineering, Physics

Areas of Research: Optics and Photonics, Optical Components, Optical Fibre

Research Specialization Keywords: Ultrafast Optics, Femtosecond Laser Inscription, Nonlinear Optics, Optical Sensing Technologies

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Employment

2024/9

Department of Electronics Graduate Teaching Assistant (Doctoral)
Carleton University
Part-time
As a Graduate Teaching Assistant for ELEC 4709A (Integrated Sensors) in the Fall 2024 semester, I instruct lab sessions focused on the design, simulation, and measurement of integrated sensors. Responsibilities include guiding students through practical lab work such as characterizing piezoresistive pressure sensors, performing oscillometric blood pressure measurements, and using optical signal generation and sensing techniques. Labs require circuit design, simulation with NI Multisim, and finite element analysis (FEA) using COMSOL. I also assist students in understanding measurement principles, noise reduction, and sensor applications in consumer, biomedical, and industrial contexts. Additionally, I provide technical support, grading, and hold office hours to ensure student success in the course.

Research Disciplines: Electrical Engineering and Electronic Engineering

2024/9

Doctoral Research Assistant – Carleton Optical Innovation Laboratory (COIL)
Carleton University
As a Doctoral Research Assistant at the Carleton Optical Innovation Laboratory (COIL), I am advancing my previous work on femtosecond laser micromachining, focusing on second harmonic generation (SHG) and nonlinear optics. My research involves inscribing periodic structures in optical fibers to induce second-order nonlinearities and enhance SHG without poling. I use a femtosecond laser with a parametric amplifier to achieve precise refractive index modifications and optimize quasi-phase matching conditions. Building on my work with fiber Bragg gratings (FBGs), I aim to improve SHG efficiency and explore applications in quantum optics, such as photon-pair generation for quantum cryptography. I am also investigating dopants like GeO2 to enhance nonlinear conversion. This work integrates laser processing techniques with theoretical development to advance fiber-based nonlinear optics.

Fields of Application: Foundations and Knowledge Acquisition, Communication and Information Technologies

Areas of Research: Optics and Photonics, Optical Components, Optical Fibre, Laser

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

2021/1

Founder, Owner, and Lead Researcher
Independent Femtosecond Laser Laboratory
Full-time
I founded and operate an independent laboratory where I conduct advanced research on femtosecond laser-based material processing, nonlinear optics, and microfabrication for photonic applications. My work focuses on developing laser inscription methods and exploring nonlinear optical effects, closely paralleling my academic research. The lab also possesses microfabrication capabilities for producing custom coatings and devices using standard microfabrication techniques optimized for photonic devices. My research includes femtosecond laser systems with a long-term goal of commercializing innovative laser technologies. As the founder, I manage research direction, equipment procurement, business strategy, and scientific experiments aimed at advancing both scientific and industrial applications.

Areas of Research: Optics and Photonics, Laser, Optical Components, Optical Fibre

Research Disciplines: Physics, Electrical Engineering and Electronic Engineering

Fields of Application: Foundations and Knowledge Acquisition, Industrial Manufacturing and Production, Communication and Information Technologies

2020/10

Landlord and Real Estate Entrepreneur
Private Rental Business
Purchased my first property at age 22, fully managing an extensive renovation that included structural repairs and full interior design. Acted as my own general contractor, coordinating contractors, permits, and scheduling. I now operate a residential student rental business out of part of my home, managing tenants and property maintenance. This entrepreneurial endeavor has fostered leadership, budgeting, and project management skills in a dynamic real estate environment.

2024/5 - 2024/8

Research Volunteer - Carleton Optical Innovation Laboratory (COIL)
Carleton University
During Summer 2024, I volunteered at the Carleton Optical Innovation Laboratory (COIL), driven by my passion to continue advancing my research between my MASC and PhD. My work focused on enhancing second harmonic generation (SHG) in optical fibers through femtosecond laser-induced index modifications. This involved laser inscribing periodic structures to achieve quasi-phase matching. The research contributed directly to the development of my doctoral thesis and NSERC proposal, where I proposed using laser inscription to enhance nonlinear optical processes in fibers without poling. My work included experimental studies on refractive index modifications and optimizing laser parameters for SHG efficiency. These results laid the foundation for exploring further nonlinear effects in optical fibers for quantum and photonic applications.

Fields of Application: Foundations and Knowledge Acquisition

Areas of Research: Optics and Photonics, Laser, Optical Components, Optical Fibre, Quantum Phenomena

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

2023/7 - 2024/6

Technical Officer - Electronics Prototype Developer
National Research Council Canada
Full-time
As a Technical Officer at NRC, I provided support for the DRDC CSSP "Smart printable and wearable chemical & physical sensors for first responder PPE" project. My duties included establishing analog front-end electronic architecture for printed gas sensors, developing hardware interfaces for data acquisition and wireless transmission, and writing embedded code for Bluetooth communication. I demonstrated a functional prototype at DRDC Innovation Day 2023, which led to a feature in a Science.gc.ca blog. I also supported the AiP energy harvesting project, designing low-power motion sensors with indoor OPV energy harvesting systems. Additionally, I managed team procurement duties, developed LTSpice models to optimize power consumption, and authored project reports, documenting both hardware and software systems progress.

Areas of Research: Sensors and Devices, Micro and Nanoelectronics

Research Disciplines: Electrical Engineering and Electronic Engineering

Fields of Application: Security, Biomedical Aspects of Human Health, Communication and Information Technologies, Foundations and Knowledge Acquisition

2021/9 - 2024/4

Master’s Research Assistant - Carleton Optical Innovation Laboratory (COIL)
Carleton University
As a Research Assistant at the Carleton Optical Innovation Laboratory (COIL), I developed a multi-axis femtosecond laser micromachining platform for fabricating fiber Bragg gratings (FBGs) and waveguides. The system utilized a femtosecond laser and a parametric amplifier with tunable wavelengths. I demonstrated strong refractive index modifications by producing FBGs with high reflectivity and narrow bandwidths. Additionally, I conducted high-temperature annealing of FBGs to test their performance under extreme conditions. I successfully secured surplus Aerotech stages, saving the research group significant time and funds during the development phase. I programmed control software in AeroBasic to operate the micromachining system and integrated custom optical and mechanical components I fabricated, enabling precise laser material processing and enhancing the group’s research capabilities.

Fields of Application: Foundations and Knowledge Acquisition, Industrial Manufacturing and Production, Communication and Information Technologies

Areas of Research: Optical Components, Optical Fibre, Optics and Photonics, Laser

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

2021/9 - 2023/4

Department of Electronics Graduate Teaching Assistant (Master's)
Carleton University
Part-time
As a Graduate Teaching Assistant for the Department of Electronics at Carleton University I instructed students in two courses: ELEC 3908 (Physical Electronics) and ELEC 4702 (Fiber Optic Communications). In the Physical Electronics course, I led lab sessions on junction characterization of diodes, BJTs, and MOSFETs using semiconductor parameter analyzers interfaced with IC-CAP for remote data extraction. In the Fiber Optic Communications course, I taught students key concepts like fiber coupling, splicing, laser sources, optical transmission, and receivers. I guided labs involving Optical Time-Domain Reflectometry (OTDR) measurements, fiber splicing, testing, and signal analysis. My duties also included assisting with lab techniques, generating grading schemes and example reports, holding office hours, and marking reports, all while providing technical and academic support to ensure smooth lab sessions and student understanding.

Research Disciplines: Electrical Engineering and Electronic Engineering

2020/5 - 2020/8

Summer EXO Collaboration Internship - Carleton University HV R&D Team, Department of Physics
Physics, Science, Carleton University
Full-time
As a member of the EXO Collaboration High Voltage R&D Team at Carleton University, I conducted high-voltage experiments in a Class 100 cleanroom environment while adhering to COVID-19 protocols. I produced detailed electrical diagrams and SPICE models to simulate transients on high-voltage components of a liquid Xenon time projection chamber. I led weekly group meetings, collaborating remotely with team members to refine designs and improve SPICE models to meet project requirements. Additionally, I presented research updates to the EXO Collaboration, comprising 26 multinational universities. I sourced components and constructed transient voltage sensors for dielectric breakdown testing in an EXO-200 mock-up chamber. My work involved using oscilloscopes and DMMs to troubleshoot high-voltage systems, ensuring safe operation between EU and NA power standards.

Fields of Application: Foundations and Knowledge Acquisition

Areas of Research: Elementary Particles, Industrial and Power Electronics

Research Disciplines: Physics, Electrical Engineering and Electronic Engineering

2019/5 - 2019/12

Student Researcher
National Research Council Canada
Full-time
As an intern with the NRC Fiber Photonics Group, I designed and built an optomechanical fiber alignment jig to couple light into large core diameter and sapphire fibers for mode imaging experiments. I contributed to an industrial research project for Shawcor, focusing on developing an advanced pipeline monitoring system, while maintaining a client-oriented focus. I gained experience with trans-jacket Fiber Bragg Grating inscription using femtosecond lasers and phase mask techniques. I developed Python scripts to streamline data processing, improving efficiency for multiple researchers. I also conducted extensive patent and literature searches on fiber optic pipeline monitoring systems.

Areas of Research: Sensors and Devices, Optical Components, Optical Fibre, Laser

Research Disciplines: Electrical Engineering and Electronic Engineering, Physics

Fields of Application: Energy, Industrial Manufacturing and Production, Natural Resources

Research Funding History

Awarded [n=3]

2022/9 - 2023/8
Principal Applicant

Graduate Scholarship (Departmental), Scholarship
Clinical Research Project?: No
Project Description: This $6,000 departmental scholarship was awarded in recognition of my academic achievements and contributions to my research. The funding supported my master's thesis work on developing a femtosecond laser micromachining system and demonstrating the fabrication of high-precision Fiber Bragg Gratings (FBGs), advancing research in photonics and laser-based fabrication techniques.

Funding Sources:

2022/9 - 2023/8
Carleton University
Graduate Scholarship
Total Funding - 6,000 (Canadian dollar)
Portion of Funding Received - 6,000 (Canadian dollar)
Funding Competitive?: Yes

2022/9 - 2023/8
Principal Applicant

Dr. Walter and Mary Chudobiak Entrepreneurship Award in Electrical Engineering, Scholarship
Clinical Research Project?: No
Project Description: This award, jointly awarded by the Dean of the Faculty of Graduate and Postdoctoral Affairs and the Dean of the Faculty of Engineering and Design, recognizes students who have demonstrated entrepreneurial spirit, particularly in hardware design. I received this award for my work in developing advanced femtosecond laser-based fabrication techniques and establishing an independent laboratory where I conduct research on optical sensing technologies. The award supports my goal of commercializing innovative laser technologies for industrial and scientific applications.

Funding Sources:

2022/9 - 2023/8
Carleton University
Dr. Walter and Mary Chudobiak Entrepreneurship Award in Electrical Engineering
Total Funding - 10,000 (Canadian dollar)
Portion of Funding Received - 10,000 (Canadian dollar)
Funding Competitive?: Yes

2021/9 - 2022/8

Graduate Scholarship (Departmental), Scholarship

Principal Applicant

Clinical Research Project?: No
Project Description: This $6,000 departmental scholarship was awarded in recognition of my academic achievements and contributions to my research. The funding supported my master's thesis work on developing a femtosecond laser micromachining system and demonstrating the fabrication of high-precision Fiber Bragg Gratings (FBGs), advancing research in photonics and laser-based fabrication techniques.

Funding Sources:

2021/9 - 2022/8
Carleton University
Graduate Scholarship
Total Funding - 6,000 (Canadian dollar)
Portion of Funding Received - 6,000 (Canadian dollar)
Funding Competitive?: Yes

Declined [n=1]

2020/9 - 2021/8
Principal Applicant

University Part-time Scholarship (Deans' Honour List), Scholarship
Project Description: In recognition of my exceptional academic performance during the 2020-2021 academic year, I was named to the Dean's Honor List at Carleton University. Along with this distinction, I was offered a scholarship as part of the award. However, I declined the scholarship when I transitioned into my Master’s degree, choosing to focus on advancing my research and academic pursuits at the graduate level as I transitioned from part time studies back to full time studies.

Funding Sources:

2020/9 - 2021/8
Carleton University
University Part-time Scholarship
Total Funding - 375 (Canadian dollar)
Portion of Funding Received - 0 (Canadian dollar)
Funding Renewable?: No
Funding Competitive?: Yes

Event Administration

2024/9

Founder and Organizer – Carleton Photonics Journal Club, Carleton Photonics Journal Club, Seminar, James Neumann, 2024/9 -
I established and currently work to organize the Carleton Photonics Journal Club, a recurring bi-weekly seminar event where members of various research groups share and discuss recent photonics-related papers. My responsibilities include coordinating participant involvement, scheduling meetings, and facilitating discussions. This initiative fosters collaboration and keeps participants informed about the latest advancements in photonics research.

2024/9 — Acting President - SPIE Student Chapter, Carleton University SPIE Chapter, Association, James Neumann, 2024/9 -
As Acting President of Carleton’s SPIE Student Chapter, I am actively leading efforts to promote membership growth and engagement within the optics and photonics community. I initiated the Photonics Journal Club to provide a structured environment for students and faculty to present and discuss recent research. To encourage participation, I promote the club through Carleton’s SPIE network, reaching out to students in relevant fields, and facilitating discussions on our dedicated SPIE Discord channel. Beyond the journal club, I am working with the Acting SPIE leadership team to develop additional events, including fun and engaging networking opportunities for students, to expand our club’s influence and foster a collaborative research environment. This initiative not only strengthens Carleton's photonics community but also aligns with SPIE’s mission of advancing light-based technologies.

2023/7 - 2024/5 — Event Organizer – NRC QN Social Committee, Social Committee - Quantum and Nanotechnology Research Center, Club, 2023/7 - 2024/5
As a member of the NRC social committee for the Quantum and Nanotechnology research center, I contributed to organizing two major events: the summer BBQ celebrating the research centers' name change, attended by hundreds of employees, and the annual Christmas party. For the BBQ, I played a key role in event setup, ensuring a smooth experience for all attendees. My role in the Christmas party expanded to include event coordination, food planning, and managing guest logistics. These efforts contributed to enhancing employee engagement and fostering a sense of community at NRC.

Event Participation

2023/11 - 2023/11 — Research Contributor and Demonstrator, Defense Research and Development Canada's Canadian Safety and Security Program Innovation Day Event, Conference, 2023/11 - 2023/11
At Innovation Day, hosted by the Canadian Safety and Security Program in Ottawa on Nov. 16, 2023, I helped present a poster I co-authored, I also built a demonstration device showcasing progress towards printable and wearable chemical sensors developed at the National Research Council for first responders. I networked with key program partners, industry, and government representatives to discuss the application of our technology. A key component of my participation was engaging with first responders to better understand their needs and explore solutions to their operational challenges. As a result of this event, our contributions were featured in a blog post on Science.gc.ca.

Community and Volunteer Activities

2016/9 — Mentor – FIRST Robotics Team 3543, FIRST Robotics Canada
I have periodically mentored FIRST Robotics Team 3543 since 2015, offering guidance in areas such as robot design, strategy, and problem-solving. My involvement has included participating in events like the 2020 Infinite Recharge Kickoff Event, where I provided mentorship to the team and facilitated a research physics lab tour to give students real-world insight into STEM applications. Looking forward, I am enhancing my commitment for the 2024-2025 season, offering to lead workshops on soldering and electronics, and sourcing materials to support the team further. These efforts are aimed at equipping students with practical skills and knowledge for success in upcoming competitions.

2019/4 - 2019/5 Community Volunteer, Flood Relief Efforts – Ottawa Valley Flood 2019
In 2019, during the Ottawa Valley flood, I volunteered my time to assist local residents in my hometown of Arnprior, Ontario, near McLean Ave Beach by sandbagging to help protect homes from severe flooding. Alongside other community members, I worked to mitigate the damage caused by rising water levels. This effort was part of an informal but essential community response to support affected neighbors and prevent further loss of property.

Publications

Journal Articles

1. Mihailov, S; Walker, R; Neumann, J; De Silva, M; Grobnic, D; and Hnatovsky, C. (2020). Oil pipeline leak detection using through-the-coating written fiber Bragg grating sensors. Optical Fiber Sensors Conference 2020 Special Edition, OSA Technical Digest (Optica Publishing Group, 2020), paper Th4.12. : Th4.12. http://dx.doi.org/https://doi.org/10.1364/OFS.2020.Th4.12
Co-Author
Published, Optica Publishing Group,
Refereed?: Yes, Open Access?: No
Number of Contributors: 6
Editors: Cranch G, Wang A, Digonnet M, Dragic P
Contribution Percentage: 31-40
Description of Contribution Role: I helped design and fabricate sensor prototypes using FBGs inscribed through polyimide-coated optical fibers with a femtosecond laser. My work focused on creating preloaded tension release sensors that responded to hydrocarbon exposure by altering strain. I contributed to the sensor design, data analysis, and sensor integration into a demonstration array. I also provided extensive support in preparing figures and data for the manuscript.
Description / Contribution Value: This research developed an optical trigger system using fiber Bragg gratings (FBGs) inscribed through polyimide coatings via femtosecond lasers for oil pipeline leak detection. The optical trigger, distinct from traditional FBG-based sensors, responded to hydrocarbon exposure by altering the tension applied to the FBG. This innovation enhances the sensitivity and reliability of leak detection in pipeline systems, offering practical benefits for environmental protection and advancing the field of fiber optic sensing technology.

   Funding Sources: Natural Resources Canada

Thesis/Dissertation

1. Developing a Multi-axis Femtosecond Laser Micromachining Platform for Laser Induced Refractive Index Modification: Fiber Bragg Gratings, Waveguides, and Beyond. (2024). Carleton University. Master's Thesis. http://dx.doi.org/https://doi.org/10.22215/etd/2024-16014
   Number of Pages: 83 Supervisor: Smelser, Christopher
   Contribution Percentage: 91-100
   Description of Contribution Role: I designed, built, and integrated the femtosecond laser micromachining system. This involved designing and manufacturing custom components, assembling hardware and electronics, and procuring key sub-components such as the motion controller and Aerotech linear stages. Additionally, I programmed control software and conducted experiments to optimize laser parameters for inscribing Fiber Bragg Gratings (FBGs) and waveguides, while addressing system design challenges to ensure high-precision laser material processing.
   Description / Contribution Value: This research developed a multi-axis femtosecond laser micromachining platform for precise inscription of Fiber Bragg Gratings (FBGs) and waveguides using tunable laser wavelengths. The system achieved high reflectivity and strong refractive index modifications, advancing FBG fabrication techniques. This work contributes to high-precision laser material processing with applications in telecommunications, sensing, and nonlinear optics.

Online Resources

1. First Listed Author. James Neumann. Personal YouTube Channel https://www.youtube.com/@jamesneumann4633. (2023).
   Number of Contributors: 1
   Editors: James Neumann
   Contribution Percentage: 91-100
   Description of Contribution Role: As the sole creator, I handle all aspects of the channel, including filming, editing, and content production. My goal is build a library of content to break down complex scientific concepts into accessible but high level videos that promote understanding of advanced topics in laser physics and optics for both researchers and students.
   Description / Contribution Value: A YouTube channel dedicated to educational videos in science and technology, focusing on topics such as femtosecond laser systems hardware, photonics, and experimental research. The channel features demonstrations, explanations of complex laser physics concepts, and insights into laser-based fabrication techniques. The content is designed to provide otherwise unavailable information for both researchers and students, promoting understanding of advanced topics in optics and laser physics.