Symposium on
Plasma And Nuclear Systems

SPANS-2015

Friday, August 21, 2015, 9 am to 4 pm

Room: UA 2130

UOIT – Oshawa, ON, Canada

Sponsors: IEEE-Toronto, NPSS Chapter, CNS – UOIT Chapter,
CNS – Fusion Science and Technology Division, CAP – Plasma Physics Division, IEEE-Canada

Chair: Professor Hossam A.Gabbar (UOIT),
Contacts: Hossam.Gabbar@uoit.ca

Information and updates, visit: www.sege-conference.com/SPANS.PDF

Canadian Nuclear Society, SEGE

Message from SPANS Chair, Dr. Hossam A.Gabbar

Professor in the Faculty of Energy Systems and Nuclear Science, and cross appointed in the Faculty of Engineering and Applied Science, UOIT

UOIT is welcoming all attendees at SPANS-2015. IEEE NPSS (Nuclear and Plasma Sciences Society), Toronto Chapter has been active in organizing workshops in plasma and nuclear systems since its establishment. The recent workshop was on Real Time Measurement, Instrumentation, and Control (RTMIC). This has been extended with the collaboration with CNS-Fusion Science and Technology Division, CAP – Plasma Physics Division to organize SPANS or Symposium on Plasma and Nuclear Systems. This symposium provides a unique opportunity for fruitful discussions and collaboration between industries and academia. In addition it provides great opportunities for students to present their work and have closer discussions with researchers, scientists, and professionals from industries to add great values to their skills and awareness of real industrial projects.

TOPICS

- **Plasma Devices and Applications.**
- **Plasma Experiments, Diagnostics and Control.**
- **Plasma Simulation and Modeling.**
- **Nuclear Power Plant Safety Systems.**
- **Nuclear Power Plant Control Systems.**
- **Nuclear Power Plant Monitoring and Measurement Systems.**

Objectives of Symposium

- **This symposium is providing forum for researchers from academia and industry to present and discuss latest research innovations in nuclear and plasma systems.**
- **SPANS will provide attendees with state-of-the-art research and technologies and engage in active discussions with industry. Also it will provide industry with opportunities to promote their products and business cases.**
- **Attendees from regulators and standards will engage in fruitful discussions on how R&D is linked with regulations and standards.**

Agenda

8:15	9:00	Registration/Coffee	
9:00	9:10	Opening Message	Dr. Hossam A. Gabber, SPANS Chair
9:10	9:20	Welcome Message	Dr. Ed Waller, FESNS Dean, UOIT
9:20	9:40	Dr. Hossam A.Gabber, Director of ESCL, UOIT	
9:40	10:30	Dr. Evan Sengbusch, Phoenix Nuclear Labs	
10:30	11:00	Break	
11:00	11:50	Dr. T.(Nithy) Nitheanandan, Fuel & Fuel Channel Safety Branch	
11:50	12:30	Mr. Nicholas Dzuba, TEGSS Nuclear Cooling Solutions Inc.	
12:30	12:50	Dr. Lingzhi Xia, UOIT	
12:50	13:50	Lunch	
13:50	14:10	Manir Isham, UOIT	
14:10	14:30	Emmanuel Boafo, UOIT	
14:30	14:50	Daniel Bondarenko, UOIT	
14:50	15:10	Luping Zhang, UOIT	
15:10	15:30	Anas Abdel rihem, UOIT	
15:30	16:00	Discussions	
16:00	16:05	Closing	

Introduction for Opening Speakers

Name	Position
Dr. Hossam A. Gabber	Professor in the Faculty of Energy Systems and Nuclear Science, and cross appointed in the Faculty of Engineering and Applied Science, University of Ontario Institute of Technology
Dr. Ed Waller	Dean, Faculty of Energy Systems and Nuclear Science, University of Ontario Institute of Technology

Ed Waller

Biography

Dr. Ed Waller is the Dean of Faculty of Energy Systems and Nuclear Science, at the University of Ontario Institute of Technology (UOIT), Oshawa, Ontario, Canada and am currently an NSERC/UNENE Industrial Research Chair in Health Physics and Environmental Safety, collaborating with the Senior Chair holder, Dr. Anthony Waker. He earned his BSc in Physics (Hons) and MScE in Chemical Engineering at the University of New Brunswick (UNB), Fredericton, New Brunswick and my PhD in Nuclear Engineering and Science at Rensselaer Polytechnic Institute, New York (RPI). He worked for over 15 years in industry for Science Applications International Corporation, primarily in threat assessment, health , physics and applications of radiation. He also holds a number of certifications, such as Professional Engineer, Ontario (PEng), Certified Associate Industrial Hygienist (CAIH) and Certified Health Physicist (CHP). Dr. Ed Waller teaches a variety of courses including radiation protection, health physics, environmental effects of radiation, environmental modeling, Monte Carlo methods and nuclear forensics at UOIT. Dr. Ed Waller's research is in areas of emergency response, radiation dosimetry (internal and external), applied health physics, radiation safety, counterterrorism and threat assessment.

Introduction for Speakers

Name	Position	Title
Hossam A. Gabber	Professor in the Faculty of Energy Systems and Nuclear Science, and cross appointed in the Faculty of Engineering and Applied Science, UOIT	**Advanced Research in Plasma and Nuclear Systems at Energy Safety and Control Lab (ESCL)**
Evan Sengbusch	Vice President of Phoenix Nuclear Labs	**Recent Progress with High-Yield Accelerator-Based Neutron Generators at Phoenix Nuclear Labs**
Andranik Sarkissian	President and chief technology officer of PLASMIONIQUE Inc	**Plasma Technology and its Potential Applications to Power Generation and Energy Storage**
Lingzhi Xia	Research assistant in UOIT	**Development of A New Neutronic Signal Processing System to Improve The CANDU Reactor SDS1 Performance during Large Break of LOCA Events**
Manir U. Isham	Research assistant in UOIT	**Development of a New Signal Processing System to Improve the Performance of SDS1 of CANDU Reactors During Large Break LOCA Events**
Nicholas Dzuba	President in TEGSS Nuclear Cooling Solutions Inc.	**TEGSS: Thermoelectric Generator Safety System**
T. (Nithy) Nitheanandan	Manager, Fuel & Fuel Channel Safety Branch Canadian Nuclear Laboratories	**Introduction to the Centre of Excellence - Nuclear Safety, Security, and Risk Management**

Hossam A.Gabbar

Biography

Dr. Hossam A. Gabbar is a professor in the Faculty of Energy Systems and Nuclear Science, and cross appointed in the Faculty of Engineering and Applied Science, University of Ontario Institute of Technology (UOIT). He obtained his Ph.D. degree (Energy Process Safety) from Okayama University (Japan), while his undergrad degree (B.Sc., with First Class of Honor) and Master degree courses are in the area of automatic control from Alexandria University, Egypt. He is specialized in clean energy systems and smart energy grids with focus on safety, protection, and control engineering. Since 2004, he was an Associate Professor in the Division of Industrial Innovation Sciences at Okayama University, Japan. And from 2001, he joined Tokyo Institute of Technology and Japan Chemical Innovative Institute (JCII), where he participated in national projects related to advanced distributed control and safety systems for green energy and production systems. He is the founding general chair of the annual international conference on smart energy grid engineering, which is held at UOIT. He is the founding Editor-in-chief of International Journal of Process Systems Engineering (IJPSE). He is regularly invited to give talks in scientific events and conferences, tutorials, and industrial development programs in the area of energy safety and control. Dr. Gabbar is the author of more than 210 publications, including books, book chapters, patents, and papers in the area of smart energy grids, safety and control engineering.

Advanced Research in Plasma and Nuclear Systems at Energy Safety and Control Lab (ESCL)

Hossam A. Gabbar

Abstract

This talk will discuss aspects of advanced research and recent ESCL projects in the following areas:

- Advanced Plasma Simulation and Experimentation for Clean Fusion Energy
- Advanced Shutdown Safety Systems for Nuclear Power Plants
- Real Time Fault Diagnosis and Safety Verification for Nuclear Power Plants

This talk will highlight current research and future expansion with industrial collaboration in these potential areas.

Evan Sengbusch

Biography

Dr. Evan Sengbusch is the Vice President of Phoenix Nuclear Labs. He received a BS in Physics and in Mathematics from the University of Iowa and an MS and PhD in Medical Physics, and an MBA in Technology Management, from the University of Wisconsin-Madison. His doctoral work focused on particle accelerator design and dose distribution optimization for proton radiation therapy for cancer treatment. Evan has extensive experience with computational modeling of radiation dose distributions in cancer patients, ion beam transport simulations, and particle accelerator design. He is a past recipient of a DoD National Defense Science and Engineering Graduate Research Fellowship, an NSF Graduate Research Fellowship, and a National Institutes of Health Biotechnology Training Grant. He has technical experience working in accelerator physics at CERN, plasma physics at the University of Iowa, and medical physics at the University of Wisconsin-Madison. He also previously spent several years working in the venture capital industry evaluating early stage technology companies.

Evan Sengbusch

Recent Progress with High-Yield Accelerator-Based Neutron Generators at Phoenix Nuclear Labs

Abstract

Phoenix Nuclear Labs (PNL) has developed an accelerator-based high-yield neutron generator. This system utilizes a microwave ion source (MWS), 300kV DC accelerator, magnetic solenoid focus element, differential pumping system, and gaseous deuterium target to achieve neutron yields of $3x10^{11}$ n/s. Lower-yield variations of the device have been built using a solid titanium target, and design for a DT version of the gas target system is underway that will increase neutron yield to $5x10^{13}$ n/s. PNL has delivered a number of systems to government and commercial customers and has identified a number of longer-term commercial applications for this high-yield neutron generator. These include medical isotope production, neutron radiography, active interrogation for explosives and SNM detection, and Cf-252 replacement. Most applications require the development of specialized moderator assemblies and fixtures to meet customer requirements. This presentation will discuss the base neutron generator technology and custom variations and will address a number of the commercial applications in which PNL neutron generators are currently being utilized.

Andranik Sarkissian

Biography

Dr. Andranik Sarkissian is the president and chief technology officer of PLASMIONIQUE Inc, a Canadian company, and its affiliate PLASMIONIC Technologies LLC in USA. Prior to founding PLASMIONIQUE in 1999, Dr. Sarkissian was an associate professor at Energy and Material division of the Institut National de la Recherche Scientifique (INRS-EM), Université du Québec, where he initiated the Canadian research program on plasma based ion implantation for applications to plasma surface engineering. Concurrently he was scientific member of the CCFM, the former Canadian national center for nuclear fusion research, from 1990 to 1999, where he was responsible for development of various advanced plasma diagnostics, and he pursued his scientific interests on study of physical processes related to plasma confinement in magnetically confined nuclear fusion reactors and impurity transport following reactor plasma-wall erosions. Dr. Sarkissian received his MSc in 1981 from North London Polytechnique, UK, in Physical Basis of Electronics, his PhD from the University of Saskatchewan, in 1988, in Plasma Physics and Thermonuclear Fusion, and his MBA from McGill University. He is an accredited professional physicist, an active member of Canadian Association of Physicists, where he also served as director of corporate members for two terms. He has been author and co-author of numerous scientific publications, conference presentations, including invited speaker in national and international forums on topics related to applications of plasma technology to advance surface and interface engineering, nanomaterial synthesis and energy.

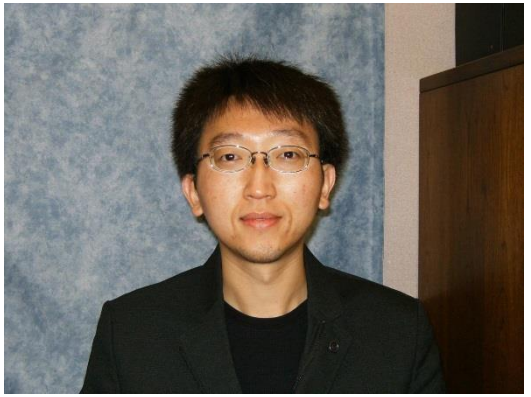
Andranik Sarkissian

Plasma Technology and its Potential Applications to Power Generation and Energy Storage

Abstract

Plasma, known as the fourth state of matter, constitutes over 99.9% of our universe; however, it is a rare occurrence on Earth. The plasma technology is increasingly becoming an important processing tool in various industrial fields. Its proliferation is driven by various economic and regulatory factors, including quest for improved quality, efficiency and lower cost of production. It is also poised to substitute some of the existing technologies that do not meet environmental regulatory standards that are taking effect gradually. In this talk I will present the state of the art of the plasma technology, with some examples of their applications, including their direct and indirect applications to power generation and energy storage.

Lingzhi Xia



Biography

Dr. Lingzhi Xia is a Research Assistant in Faculty of Energy Systems and Nuclear Science at University of Ontario Institute of Technology. He received his B.eng and Ms.c. in Nuclear Engineering from Xi'an Jiaotong University, China, and his Ph.D. in Electrical and Computer Engineering from the University of Western Ontario, London, Ontario, Canada. His doctoral work focused on CANDU reactor 3D neutronic kinetic modeling and advanced control. Lingzhi has extensive experience with reactor physics design, instrument and control, thermal-hydraulic and safety analysis. He is a past safety analyst of CANDU Energy Inc., Mississauga, Ontario, where his work is mainly about the deterministic safety analysis on CANDU postulated accident events such as LOCA, Loss of Flow, Loss of Reactivity Control, and so on. He also worked on development of the advanced CANDU nuclear power plant simulators.

Development of A New Neutronic Signal Processing System to Improve The CANDU Reactor SDS1 Performance during Large Break of LOCA Events

Lingzhi Xia, Manir Isham, Vladimir Ponomarev, Hossam A.Gabbar

Abstract

For CANDU reactors, several options to improve CANDU power plant operation safety margin have been investigated in this paper. A particular attention is paid to the response time of CANDU shutdown system number 1 (SDS1) in case of large break loss of coolant accident (LLOCA). Based on point kinetic method, a systematic fundamental analysis is performed to CANDU LLOCA event, and the power transient signal is generated. In order to improve the SDS1 response time during LLOCA events, an innovative power measurement and signal processing system is specifically designed. The new signal processing system is implemented with the input of the LLOCA power transient, and the simulation results of the reactor trip time and signal are compared to those of the existing system in CANDU power plants. It is demonstrated that the new signal processing system can not only achieve a shorter reactor trip time than the existing system, but also accommodate the spurious trip immunity. This will significantly enhance the safety margin for the power plant operation, or bring extra economical benefits to the power plant units.

Manir U. Isham

Biography

Manir U. Isham graduated with a Bachelor of Science (Hons), Health Physics and Radiation Science degree, he graduated with an MEng. in Nuclear Engineering, he graduated with an MASc. in Electrical and Computer Engineering from University of Ontario Institute of Technology (UOIT), he also has an MBA degree from IBA, University of Dhaka.

Development of a New Signal Processing System to Improve the Performance of SDS1 of CANDU Reactors During Large Break LOCA Events

Manir Isham, Hossam A.Gabbar, Lingzhi Xia, Vladimir Ponomarev

Abstract

Shutdown system (SDS) is an integral part of nuclear reactors. In case of emergencies, response time of SDS is very critical. A signal processing system design for improved shutdown system of CANDU reactor in emergencies such as large break LOCA events is being investigated. The new signal processing system is investigated with the input of the large break LOCA power transient, and the Simulink simulation results of the reactor trip time and signal are compared to those of the existing system in CANDU power plants. It is demonstrated that the algorithm used in the new signal processing system can not only achieve a shorter reactor trip time than the existing system, but also accommodate the spurious trip immunity.

Nicholas Dzuba

Biography

Mr. Nicholas Dzuba is a graduate from the University of Windsor with a degree in Electrical Engineering and has 7 years of experience in design and project management relating to nuclear power plants. The main inspiration of Nicholas is to aid in preventing future nuclear disasters by increasing safety and reliability.

Nicholas Dzuba

TEGSS: Thermoelectric Generator Safety System

Abstract

Nuclear safety has become a key topic related to public welfare due to the recent radiological release in Japan. The Thermoelectric Generator Safety System for nuclear plants will enhance safety by providing power during an accident scenario. The accident scenario in consideration is a total loss of grid and on-site power. The power produced is derived by converting the heat energy that needs to be dissipated during a reactor trip into DC power utilizing Thermoelectric Generators (TEG's). This power can be used for equipment in the control room or other areas as required. The main benefit of the TEGSS is that it provides an independent power source to the facility as long as there is heat within the reactor. This system will provide an additional level of defence at nuclear facilities to ensure that their vital safety functions remain operational over a sufficient period of time and maintain control over the facility.

T. (Nithy) Nitheanandan

Biography

T. (Nithy) Nitheanandan is the Manager of Fuel and Fuel Channel Safety Branch at the Canadian Nuclear Laboratories, Chalk River. He has been with AECL/CNL for the last 23 years mainly working in Severe Accidents, Safety R&D, Canadian Supercritical Water Reactor experiments, and Thermalhydraulic analysis.

T. (Nithy) Nitheanandan

Introduction to the Centre of Excellence - Nuclear Safety, Security, and Risk Management

Abstract

Since its creation over 60 years ago, AECL has been Canada's premier nuclear Science and Technology (S&T) organization. AECL's contributions to the Canadian nuclear S&T community over the years have been extensive. In the context of maintaining and enhancing AECL/CNL's role as Canada's premier nuclear S&T organization, CNL has established Capability Management as a key component, where Capability Management is focussed on strategically sustaining and developing the expertise, tools, and technologies. To support the Capability Management, CNL has established ten "Centres of Excellence" (CoE). This talk will highlight one of the Centres of Excellence - the CoE on Nuclear Safety, Security and Risk Management. This CoE is a collection of knowledge, expertise, skills and facilities that provide unique capabilities to understand and mitigate risks associated with nuclear activities in Canada and internationally in the areas of power and research reactor operation, waste management, handling of nuclear materials, nuclear fuel fabrication, transport and protection of nuclear materials.

Introduction for Students

Name	Position	Title
Emmanuel Boafo	PhD student	**Integrating FSN in Design for Experiments for Application to Safety Verification of Nuclear Fuel**
Daniel Bondarenko	Graduate student	**Plasma Modeling of Laser Wake Field Acceleration and Benchmarking with Respect to the Particle-in-Cell Codes**
Luping Zhang	Graduate student	**Study of MHD and Monte Carlo Simulation of High-Current Plasma Beams in Industrial Applications**
Anas Abdel Rihem	Undergraduate student	**LENR/LANR: A Possible Alternative to Hot Fusion for Harnessing Nuclear Energy**

Emmanuel Boafo

Biography

Ph.D. student in the University of Ontario Institute of Technology (UOIT). He got his Master of Philosophy in Nuclear Engineering in 2010. He has conducted research in the area of Reactor Physics, Heat Transfer and Fluid Flow, Types of Reactors, Reactor Dynamics, Reactor statics and Fuel Management. He was a teaching assistant at the School of Nuclear and Allied Sciences, University of Ghana (University) Accra (Ghana). In 2006, he got his Bachelor of Science in Mathematics. From 2010 till 2014 he worked as a research scientist in Ghana Atomic Energy Commission, Ghana. He has published a number of articles in the area of nuclear physics and safety.

Integrating FSN in Design for Experiments for Application to Safety Verification of Nuclear Fuel

Emmanuel Boafo, Hossam A. Gaber

Abstract

The safety of Nuclear Power Plants (NPPs) is an important issue that is of concern to all including; regulators, operators and the general public. Assuring the safety of a NPP is a primary objective by all stakeholders. Faults are abnormal conditions that may occur in a system and accurate fault diagnosis and propagation analysis is essential in preventing and mitigating accidents in NPP. The use of simulation in NPP is essential for fault prediction, understanding fault propagation scenarios and to aid in the prevention of hazardous scenarios. It is however known that simulation results do not match real time plant data. In this study, co-simulation with reduced error between simulation models and real time data is proposed for improved fault diagnosis and fault propagation analysis as well as for safety verification of NPP. This would be achieved using Fault Semantic Network (FSN) together with other methods for fault propagation analysis in determining time delays, probabilities and establishing rules between process variables and system states. Some case studies considered for the application of the proposed method have been described.

Daniel Bondarenko

Biography

Daniel Bondarenko is a MASc student and a research assistant at UOIT's Energy Safety and Control Lab. He graduated with BEng major in Mechanical Engineering and minor in Business and Management at UOIT, with focus on energy resources, management, and conversion. The research topics encompassing Daniels work include dynamic fault diagnostic and prevention in industrial plants based through sensor arrays, process and product safety, plasma generators, plasma modeling, power electronics, and adaptive manufacturing technologies. Presently compiling thesis on efficient plasma generation for industrial applications.

Plasma Modeling of Laser Wake Field Acceleration and Benchmarking with Respect to the Particle-in-Cell Codes

Daniel Bondarenko, Hossam A. Gabber

Abstract

The Laser Wake Field Acceleration (LWFA) has been simulated using the ElmerFEM software with a hybrid mesh adaptive MHD plasma model, and the Large Eddy Simulation approach for the turbulence tracking. The intention of such simulation was to evaluate the computational performance of ElmerFEM with respect to some of the existing particle-in-cell codes and to evaluate its usability for high energy plasma phenomena. Furthermore, upon the verification with the existing benchmarked software the model is evaluated with respect to the existing works on the LWFA and compared in terms of the deviation from the established results.

Luping Zhang

Biography

Luping Zhang is a master student in Faculty of Engineering and Applied Science in the University of Ontario Institute of Technology (UOIT). In 2014, she received her Bachelor in Measurement and Control Technology & Instrument in the Department of Mechanical from Shandong University of Technology, China. During her graduate study, she focuses on plasma simulation from two different views: One-fluid theory and statistical approach. For the first approach, she uses CFD's MHD module and pro/post-processing software, such as Gambit and Tecplot 360. For the second approach, she uses Monte Carlo method and particle simulation software, such as PHITS and SimpleGeo. In 2014-2015, Luping Zhang received Dean's scholarship in UOIT and she was also a teaching assistant and graduate research assistant in UOIT.

Study of MHD and Monte Carlo Simulation of High-Current Plasma Beams in Industrial Applications

Luping Zhang, Hossam A. Gabber

Abstract

High-current plasma has been widely applied in industrial applications recent years, such as plasma gasification, fusion power generation. High current is regarded as an important parameter to be studied in plasma simulation aspect so that people can use and control plasma easily and keep themselves safe. Computational modelling of plasma and industrial applications are of great importance due to its proved benefits. In this study, high-current plasma beams are evaluated using two methods: Magnetohydrodyanmics (MHD) and Monte Carlo (MC) methods. For MHD method, the velocity, pressure, magnetic field of high-current plasma beams are computed by solving conservation equations of mass, momentum, and energy, as well as part of Maxwell's equations. For MC method, MC code is developed for calculation of particle tracks and flux, heat and energy deposited by plasma beams. Transport process of electron and collisions between particles are simulated in electromagnetic field based on MC theory. Details of assumptions, equations, boundary conditions and parameters for high-current plasma beams simulation have been analyzed. This research utilizes modeling and simulation of plasma beam to support design and implementation on industrial applications. Two specific cases have been discussed: waste-to-energy technology and fusion energy generation. Plasma simulation will help us explore complex and coupled phenomena surrounding the plasma and it will be used to better understand physical processes involved in industrial applications and operations of plasma beams.

Anas Abdel Rihem

Biography

Anas Abdel Rihem is a 4th year Nuclear Engineering student at UOIT. I am the student Board of Director for the Faculty of Energy Systems and Nuclear Science at the school. I have been a Research Assistant beneath the mentor-ship of Professor Hossam Gaber for a year, working closely on projects that included controlled nuclear fusion, plasma gasification and an array of plasma diagnostic methodologies, including Thomson scattering. I aspire to be an engineer that looks to thrive in the field of Nuclear Science and am keenly interested in professionally contributing to the vast disciplines of Plasma and Nuclear Engineering. I have been motivated to pursue advanced commercialized ventures in innovation surrounding these fields, and am currently participating in an endeavor that may open this path fruitfully, beneath the title of LENR/LANR (Low-Energy-Nuclear-Reactions or Lattice-Assisted-Nuclear-Reactions).

LENR/LANR: A Possible Alternative to Hot Fusion for Harnessing Nuclear Energy

Anas Abdel Rihem, Hossam A.Gabbar

Abstract

The endeavor of harnessing nuclear energy has always been seen by scientists and engineers as the path to the groves of renewable, sustainable energy. In retrospect to all other methods of energy generation, nuclear fusion stands as one of the pinnacles in terms of theoretical outputs and practical understanding, our star being the most obvious example. This path however, has been no easy journey. With the high walls of the coulomb barrier obstructing the reaction from occurring, intense temperatures and pressures are required in order overcome this process. Due to this, it has been long understood that nuclear fusion reactions involving deuterium could only be done with large capacity equipment and millions of dollars in funding. However, herein we would like to illustrate that it has been recently shown this does not have to be the case. There has been a buzz in the scientific community since the 1960‘s, which has now transformed into an intellectual wave growing at a rate that would depreciate what we consider a monsoon. It is about the possibility of fusing two nuclei together at low temperatures and pressures, by changing the environment the nuclear reaction takes place in, such as a metal lattice, which when interacting with the embedded nuclei, causes the coulomb barrier to theoretically lower, akin to what a catalyst does. A thorough history, claims, recent experiments, data to support analyses about these experiments, and theoretical proposals will be discussed, which will be hereon forth called LENR/LANR (Low-Energy-Nuclear-Reaction or Lattice-Assisted-Nuclear-Reaction).

Participants

- **Mickey Masuda**, HOPE Innovations Inc
- **Willy Liu**, HOPE Innovations Inc
- **Minh Nguyen**, Nuclear engineering student in UOIT
- **Shraddhey Jani**, Nuclear engineering student in UOIT
- **Matthew Johnson**, UOIT student
- **C. A. Barry Stoute**
- **Frank Tarsitano**
- **Stefan Sirakov**
- **Alberto Fernandez Sanz**
- **Muthanna Al-Khishali**
- **Larissa Fernandes**

Public Transportation

- From Toronto:
  GO Train from Union Station to Ajax GO Station,
  Durham Transit Bus (No. 915 East) from Ajax Station direct to UOIT Campus.

  Train and Bus schedules are available at:
  GO Schedule
  Durham Transit
  Select schedules from Toronto to Oshawa and vice versa. Choose "Lakeshore East" from the pull down menu.

Public Transportation

- From Airport:
  You can use public transportation to move from airport to reach UOIT: See Details

SPANS-2015

Registration Fees: $50

(Discount fee of $30 for students, IEEE, CNS, and CAP Members)

Space is Limited (60 to 100 max)

Registration Deadline

17-Aug, 2015

For Registration: www.sege-conference.com/SPANS.html