



# Preliminary Program

**Conference Chair:**

Einar Halvorsen

University of South-Eastern Norway, NORWAY

**Technical Program Chair:**

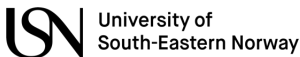
Hamed Salmani

University of South-Eastern Norway, NORWAY

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# TECHNICAL PROGRAM INFORMATION

## Guide to Understanding Paper Numbering

Each paper in the technical program is assigned a unique number (**T1A-03**) which indicates when the paper is presented. The number of each paper is shown before the paper title.

The first letter (i.e. **T**) indicates the day of the Conference:

T = Tuesday

W = Wednesday

Th = Thursday

The second number (i.e., **1**) indicates the session.

The third letter (i.e., **A**) indicates which room the session is held.

The fourth number (i.e. 04) indicates the number of the paper in the session.

## Guide to Understanding Poster Numbering

Each poster is also assigned a unique number (**P01a**).

The number (i.e., **01**) indicates the poster position.

The last character (i.e., **a**) shows the classification of the poster.

- a** Biochemical and Bio-Inspired Power/Energy Systems
- b** Energy Harvesting and Power Transfer (Mechanical, Thermal, Solar, Bio, Triboelectric, RF, Acoustic, etc.)
- c** General Energy Conversion and Transfer
- d** Implantable or Wearable Devices and Miniature Energy Systems
- e** Materials for Miniature Energy Systems
- f** Power Transfer
- g** Ultra-Low- Power Sensors and Systems

# Monday, 18 November

All indicated times are Central European Time (CET).

09:00 **PowerMEMS School**

16:50 Auditorium A1-32 Sandefjord USN Campus Vestfold

09:00 - 10:00

## **Device/Circuit**

Adrien Badel

Université Savoie Mont Blanc, FRANCE

10:05 - 11:05

## **Triboelectrics**

Philippe Basset

ESIEE Paris, FRANCE

11:10 - 12:10

## **Wearables and Systems**

Shad Roundy

University of Utah, USA

12:10 **Lunch**

13:40 - 14:40

## **Electret-Based Energy Harvester/ AI-Related Technology/ International Standardization**

Yuji Suzuki

University of Tokyo, JAPAN

14:45 - 15:45

## **Storage**

Xiaohong Wang

Tsinghua University, CHINA

15:50 - 16:50

Ryoto Yanagisawa

University of Tokyo, JAPAN

# Tuesday, 19 November

All indicated times are Central European Time (CET).

## 08:45 **Conference Welcome**

Ormen 1&2

### **Conference Chair:**

Einar Halvorsen, *University of South-Eastern Norway, NORWAY*

### **Technical Program Chair:**

Hamed Salmani, *University of South-Eastern Norway, NORWAY*

## 09:00 **Plenary Presentation I**

Chair: Einar Halvorsen, *University of South-Eastern Norway, NORWAY*

## TPA-1 **POWER MEMS AND SILICON PHOTONICS – AN ENABLING COMBINATION**

Olav Solgaard

Stanford University, USA

## 10:00 **Session T1A - Energy Harvesting and Power Transfer I**

Chair: Sebastian Bader, *Mid Sweden University, SWEDEN*

10:00 - 10:20

## T1A-1 **WIRELESS ELECTRODYNAMIC POWER TRANSFER: MODELING AND DISCUSSION OF A DUAL-MODE RECEIVER**

Adrien Ameye<sup>1</sup>, Adrien Morel<sup>1</sup>, Rémi Recoquillé<sup>1,2</sup>,  
Nicolas Garraud<sup>2</sup>, Pierre Gasnier<sup>2</sup> and Adrien Badel<sup>1</sup>

<sup>1</sup>Université Savoie Mont Blanc, FRANCE and

<sup>2</sup>CEA Leti, FRANCE

10:20 – 10:40

## T1A-2 **OPTIMISING THE ELECTRODE CONFIGURATION TO MAXIMISE THE POWER OUTPUT OF DROPLET TRIBOELECTRIC NANOGENERATORS**

Oliver Prendergast, Giulio Fatti, Andrew Holmes and  
Tom Reddyhoff

Imperial College London, UK

10:40 – 11:00

**T1A-3 DEVELOPMENT OF DETACHABLE TRIBOELECTRIC NANOGENERATOR FOR TIRES**

Hiroshi Tani, Shohei Kawada, Renguo Lu,  
and Shinji Koganezawa<sup>1</sup>  
Kansai University, JAPAN

11:00 – 11:20

**T1A-4 ELECTROMECHANICAL COUPLING COEFFICIENT: NEW APPROACH TO STUDY AUXETIC PIEZOELECTRIC HARVESTERS**

Grégoire Forges<sup>1,2</sup>, David Gibus<sup>1</sup>, Adrien Morel<sup>1</sup>, Adrien Badel<sup>1</sup>,  
and H el ene Deb eda<sup>2</sup>

<sup>1</sup>Universit  Savoie Mont-Blanc, FRANCE and

<sup>2</sup>Universit  de Bordeaux, FRANCE

**11:30 Refreshment Break**

Lobby

<b>Session T2A Energy Harvesting and Power Transfer II</b>	<b>Session T2B Materials and Fabrication I</b>
Chair: Hiroyuki Mitsuya, Saginomiya Seisakusho, Inc., JAPAN	Chair: Fei Wang, Southern University of Science and Technology, CHINA
12:00 - 12:20	
<b>T2A-1 ELECTRET-BASED WIND ENERGY HARVESTER WITH ULTRA-LOW CUT-IN VELOCITY</b> Tomoya Miyoshi <sup>1</sup> , Jiaming Yao <sup>1</sup> , Quentin Bruiant <sup>2</sup> , and Yuji Suzuki <sup>1</sup> <sup>1</sup> University of Tokyo, JAPAN and <sup>2</sup> Universit� Savoie Mont Blanc, France	<b>T2B-1 WAFER-SCALE FABRICATION OF MESOPOROUS TUNGSTEN- BASED MICRO- SUPERCAPACITORS WITH HIGHLY ORIENTED NANOSTRUCTURE</b> Jiyong Zhou <sup>1</sup> , Jianyou Dai <sup>1</sup> , Zhanpeng Shi <sup>1</sup> , Yier Xia <sup>2</sup> , Minghao Xu <sup>2</sup> , Lei Shan <sup>1</sup> , Xiaohong Wang <sup>2</sup> , and Sixing Xu <sup>1</sup> <sup>1</sup> Hunan University, CHINA and <sup>2</sup> Tsinghua University, CHINA

12:20 – 12:40

**T2A-2**

**ELECTRICAL CHARACTERIZATION AND MODELLING OF AN ULTRASOUND-POWERED TRIBOELECTRIC GENERATOR FOR IMPLANTABLE APPLICATIONS**

Thomas Baudin<sup>1</sup>, Armine Karami<sup>1</sup>, Dabin Kim<sup>2</sup>, Sera Jeon<sup>2</sup>, Dimitri Galayko<sup>3</sup>, Jean-Marc Laheurte<sup>1</sup>, Sang-Woo Kim<sup>2</sup>, and Philippe Basset<sup>1</sup>  
<sup>1</sup>Université Gustave Eiffel, FRANCE, <sup>2</sup>Yonsei University, KOREA, and <sup>3</sup>Sorbonne Université, FRANCE

**T2B-2**

**INVESTIGATION OF STRUCTURE AND BANDGAP DEPENDENCE OF INGAAS SOLAR CELL DESIGN FOR THERMOPHOTOVOLTAIC APPLICATIONS**

Xinyi Ma, Shipei Zhang, Shengyu Sun, and Xiawa Wang  
Duke Kunshan University, CHINA

12:40 – 13:00

**T2A-3**

**AN EFFICIENT ACOUSTIC POWER TRANSFER USING A SELF-BIASED ELECTROSTATIC MEMS TRANSDUCER**

Paul Roche<sup>1</sup>, Kevin Nadaud<sup>1</sup>, Dimitri Galayko<sup>2</sup>, Samuel Callé<sup>1</sup>, Jean-Charles Lebunetel<sup>1</sup>, Dominique Certon<sup>1</sup>, and Guylaine Poulin-Vittrant<sup>1</sup>  
<sup>1</sup>University of Tours, CNRS, INSA CVL, FRANCE and <sup>2</sup>Sorbonne Université, CNRS, FRANCE

**T2B-3**

**CHARACTERIZATION AND OPTIMIZATION OF LIGHTWEIGHT FOAMED PLA CANTILEVERS FOR LOW-VACUUM ENERGY HARVESTING APPLICATIONS**

Giacomo Clementi<sup>1</sup>, Francesco Bonacci<sup>1</sup>, Silvia Caponi<sup>2</sup>, Francesco Cottone<sup>1</sup>, Alessandro Di Michele<sup>1</sup>, Luca Gammaitoni<sup>1</sup>, Maurizio Mattarelli<sup>1</sup>, Valentin D. Paccio<sup>1</sup>, Gabriele Perna<sup>1</sup>, Flavio Travasso<sup>3</sup>, and Igor Neri<sup>1</sup>  
<sup>1</sup>University of Perugia, ITALY, <sup>2</sup>IOM-CNR, ITALY, and <sup>3</sup>University of Camerino, ITALY

13:00

**Lunch**

Restaurant Lindahl

<b>Session T3A</b> <b>Energy Harvesting and Power Transfer III</b>	<b>Session T3B</b> <b>Biochemical and Bio-Inspired Power/Energy Systems &amp; Applications and Innovations in Micro Energys</b>
Chair: Xiaohong Wang, Tsinghua University, CHINA	Chair: Yuji Suzuki, University of Tokyo, JAPAN
14:30 – 14:50	
<p style="text-align: center;"><b>T3A-1</b></p> <p><b>IN-EAR THERMAL POWER CAPABILITY AND THERMOELECTRIC ENERGY HARVESTING APPROACHES</b></p> <p>Tigran Avetissian<sup>1</sup>, David Niederhauser<sup>1</sup>, Léa Grima<sup>1</sup>, Aidin Delnavaz<sup>1</sup>, Adrien Morel<sup>2</sup>, Adrien Badel<sup>2</sup>, and Jérémie Voix<sup>1</sup></p> <p><sup>1</sup>École de Technologie Supérieure, CANADA and <sup>2</sup>Université Savoie Mont Blanc, FRANCE</p>	<p style="text-align: center;"><b>T3B-1</b></p> <p><b>SELF-POWERED ELECTRIC FIELD SENSOR BASED ON DROPLET ELECTRICITY GENERATOR</b></p> <p>Jiaxing Xu<sup>1</sup>, Ling Bu<sup>1</sup>, and Xiaohong Wang<sup>2</sup></p> <p><sup>1</sup>China University of Geosciences, CHINA and <sup>2</sup>Tsinghua University, CHINA</p>
14:50 – 15:10	
<p style="text-align: center;"><b>T3A-2</b></p> <p><b>MULTI-PHASE VARIABLE RELUCTANCE ENERGY HARVESTER FOR SMART BEARING HUB UNITS</b></p> <p>Mengfei Wu, Ye Xu, and Sebastian Bader</p> <p>Mid Sweden University, SWEDEN</p>	<p style="text-align: center;"><b>T3B-2</b></p> <p><b>SELF-POWERED LIVING SENSOR DISPLAY IMPLANTED ON SKIN FOR LONG-TERM BIOMARKER MONITORING</b></p> <p>Jun Sawayama<sup>1</sup>, Yuki Takayama<sup>1,3</sup>, Shogo Nagata<sup>1</sup>, Hoshimi Aoyagi<sup>1</sup>, Aki Takimoto<sup>1</sup>, Miki Takase<sup>2</sup>, Miho Ogawa<sup>2</sup>, Makoto Takeo<sup>2</sup>, Koji Yano<sup>3</sup>, Shoji Takeuchi<sup>1</sup>, Takashi Tsuji<sup>2</sup>, and Hiroyuki Fujita<sup>3,4</sup></p> <p><sup>1</sup>University of Tokyo, JAPAN, <sup>2</sup>Riken, JAPAN, <sup>3</sup>Canon Medical Systems Co., JAPAN, and <sup>4</sup>Tokyo City University, JAPAN</p>

15:10 – 15:30

**T3A-3**

**A CONTACTLESS MAGNETIC  
FREQUENCY-BOOSTING  
MECHANISM FOR WIND  
ENERGY HARVESTING**

Yunfei Li<sup>1,2</sup>, Manjuan Huang<sup>2</sup>,  
Tianyi Tang<sup>1,2</sup>, Heng Zhao<sup>2</sup>,  
Lining Sun<sup>1,2</sup>, and Huicong Liu<sup>2</sup>  
<sup>1</sup>Harbin Institute of Technology,  
CHINA and <sup>2</sup>Soochow University,  
CHINA

**T3B-3**

**A POWER SIMULATION TOOL  
FOR THE OPTIMIZATION OF  
WIRELESS SENSOR NODES**

Prateek Asthana<sup>1</sup>, Mario  
Costanza<sup>1</sup>, Eoin Ahern<sup>1</sup>, John  
Flannery<sup>1</sup>, Paul Geoghegan<sup>2</sup>,  
Andrea Ingenito<sup>3</sup>, and  
Mike Hayes<sup>1</sup>  
<sup>1</sup>Tyndall National Institute,  
IRELAND, <sup>2</sup>NetFeasa, IRELAND,  
and <sup>3</sup>CSEM, SWITZERLAND

**15:30 Refreshment Break**

Lobby

**16:00 Poster Session**

Ormen 1&2

**a - Biochemical and Bio-Inspired Power/Energy Systems**

**P01a A SCALABLE AND FLEXIBLE TWISTED YARN BIOFLUID-  
ACTIVATED BATTERIES FOR ENERGY SYSTEMS**

Sheng Yong, Jidong Liu, Stephen Beeby  
University of Southampton, UK

**P02a INCLINED-LEGS ACTUATOR INSPIRED BY SETARIA VIRIDIS**

Shinji Koganezawa, Takaaki Ichien, Hotaka Tsuboi, Hiroshi Tani,  
Renguo Lu, and Shouhei Kawada  
Kansai University, JAPAN



**b - Energy Harvesting and Power Transfer (Mechanical, Thermal, Solar, Bio, Triboelectric, RF, Acoustic, etc.)**

- P03b A MAGNETIC SOFTENING RESONATOR WITH FLAT POWER GENERATION FOR NONLINEAR VIBRATION ENERGY HARVESTING**  
Taiga Yanase, Yu Yoshida, Motoaki Hiraga, Nanako Miura and Arata Masuda  
Kyoto Institute of Technology, JAPAN
- P04b A PRECISION MEASUREMENT SYSTEM FOR TRIBOELECTRIC MATERIALS**  
Björn N. Ewald, Peter Woias and Uwe Pelz  
University of Freiburg, GERMANY
- P05b AN ANALYTICAL SOLUTION FOR PIEZOELECTRIC ENERGY HARVESTER BEAMS WITH LINEARLY VARYING CROSS SECTION**  
S.A. Hosseini Kordkheili<sup>1</sup>, Hadis Naghian<sup>1</sup>, and Hamed Salmani<sup>2</sup>  
<sup>1</sup>Sharif University of Technology, IRAN and  
<sup>2</sup>University of South-Eastern Norway, NORWAY
- P07b COIL VIBRATION TYPE ELECTROMAGNETIC ENERGY HARVESTER FOR VEHICLE VIBRATION ENERGY HARVESTING**  
Dae-Sung Kwon, Ilseon Yoo, Sanghyeok Yang, and Hyunsoo Kim  
Hyundai Motor Company, KOREA
- P08b CREATING THERMALLY STABLE P-TYPE CARBON NANOTUBES VIA COORDINATION CHEMISTRY FOR THERMOELECTRIC MATERIALS**  
Kaho Kawasaki<sup>1</sup>, Yasuko Koshiba<sup>1</sup>, Kouki Akaike<sup>2</sup>, Qingshuo Wei<sup>2,3</sup>, Masahiro Funahashi<sup>1</sup>, Kenji Ishida<sup>1,4</sup>, and Shohei Horike<sup>1,2</sup>  
<sup>1</sup>Kobe University, JAPAN, <sup>2</sup>National Institute of Advanced Industrial Science and Technology, JAPAN, <sup>3</sup>University of Tsukuba, JAPAN, and <sup>4</sup>Kyushu University, JAPAN
- P09b DEVELOPMENT OF LOW FREQUENCY HYBRID HARVESTER FOR VEHICLE VIBRATION ENERGY HARVESTING**  
Ilseon Yoo, Dae-Sung Kwon, Sanghyeok Yang and Hyunsoo Kim  
Hyundai Motor Company, KOREA

- P10b**      **LARGE FREQUENCY RANGE ELECTRODYNAMIC HARVESTER BASED ON FREQUENCY-UP RESONANT CONVERTER FOR ROTATIONAL MOVEMENTS**  
Pierre Gasnier<sup>1</sup>, Corentin Bréal<sup>1</sup>, Andy Falda<sup>1</sup>, Baptiste Alessandri<sup>2</sup>, Sébastien Boisseau<sup>1</sup> and Nicolas Garraud<sup>1</sup>  
<sup>1</sup>CEA-Leti, University Grenoble Alpes, FRANCE and  
<sup>2</sup>DAVIDSON, FRANCE
- P11b**      **PERFORMANCE ENHANCEMENT OF DROPLET-BASED ELECTRICITY GENERATORS USING ROTARY MECHANISMS**  
Shanghao Gu, Guangxia Lui, Weihang Xu and Fei Wang  
Southern University of Science and Technology, CHINA
- P12b**      **THERMOELECTRICITY TO POWER WIRELESS SENSORS: AN INDUSTRIAL APPLICATION.**  
Vincent Boitier<sup>1</sup>, Lionel Segulier<sup>1</sup>, Bruno Estivals<sup>1</sup>, Clément Arnaud<sup>2</sup>, Thibault Anfrue<sup>2</sup>, and Cedric Maurin<sup>2</sup>  
<sup>1</sup>Université de Toulouse, CNRS, UPS, FRANCE and  
<sup>2</sup>Arcelor Mittal, Fos Sur Mer, FRANCE
- P13b**      **TIRE PRESSURE MONITORING SYSTEM (TPMS): RECENT ADVANCEMENT AND POTENTIAL ENERGY HARVESTING SOLUTIONS**  
Félix Barkoum Betra<sup>1,2</sup>, Vincent Boitier<sup>1</sup>, and Amine Defous<sup>2</sup>  
<sup>1</sup>RD EE TIS Team Continental, FRANCE and  
<sup>2</sup>University de Toulouse, CNRS, UPS, FRANCE

## **c - General Energy Conversion and Transfer**

- P14c**      **IMPACT-INDUCED FREQUENCY UP-CONVERSION VIBRATION ENERGY HARVESTER BASED ON METAL-SUBSTRATE PIEZOELECTRIC THICK FILM**  
Kaijun Lin<sup>1</sup>, Manjuan Huang<sup>1</sup>, Xiaowei Feng<sup>1</sup>, Zhenming Li<sup>2</sup>, Wei Liu<sup>2</sup>, and Huicong Liu<sup>1</sup>  
<sup>1</sup>Soochow University, CHINA and <sup>2</sup>China Electric Power Research Institute, CHINA

## **d - Implantable or Wearable Devices and Miniature Energy Systems**

**P15d DEVELOPMENT OF MICRO-STRUCTURAL WASTE HEAT UTILIZED POWER GENERATOR WITH SILICON AND REFRIGERANT**

Minami Kaneko, Kenji Kofu, and Fumio Uchikoba  
Nihon University, JAPAN

## **e - Materials for Miniature Energy Systems**

**P17e ENHANCED ENERGY HARVESTING IN PVDF/ZNO NANOGENERATORS: A COMPARATIVE INVESTIGATION OF FABRICATION METHODS**

Md. Jahirul Islam, Hyeji Lee, Jinseo Ha, Subin Lee, Songsu Kim, Young-Gun Kwon, Wolyoung Kim, Seokyu Kim, Kihak Lee and Bonghwan Kim  
Daegu Catholic University, KOREA

## **f - Power Transfer**

**P18f BISTABLE ELECTROMECHANICAL RECEIVER FOR ULTRA-LOW FREQUENCY WIRELESS POWER TRANSFER**

Léo-Scott Macke<sup>1</sup>, Adrien Morel<sup>1</sup>, Aya Benhemou<sup>1</sup>, Timotéo Payre<sup>2</sup>, Luc Marechal<sup>1</sup> and Ludovic Charleux<sup>1</sup>  
<sup>1</sup>Université Savoie Mont Blanc, FRANCE and  
<sup>2</sup>Cedrat Technologies, FRANCE

**P19f COMPARATIVE ANALYSIS OF CLASS-E AND CLASS-Φ2 INVERTERS FOR 13.56 MHZ WIRELESS POWER TRANSFER SYSTEMS**

Hieu L.Q. Nguyen, Nathis Côte, Nicolas Garraud, Léo Sterna and Sébastien Boisseau  
CEA-Leti, FRANCE

## **g – Ultra-Low- Power Sensors and Systems**

**P20g MODAL SHIFT CHARACTERIZATION OF LINBO3 THICK-FILM SURFACE ACOUSTIC WAVE TEMPERATURE SENSOR**

Yukang Shi<sup>1</sup>, Ling Bu<sup>1</sup> and Xiaohong Wang<sup>2</sup>  
<sup>1</sup>China University of Gensciences, CHINA and  
<sup>2</sup>Tsinghua University, CHINA

<b>Session T4A</b> <b>Energy Harvesting and Power Transfer IV</b>	<b>Session T4B</b> <b>Energy Conversion and Power Transfer</b>
Chair: Takayuki Fujita, University of Hyogo, JAPAN	Chair: Adrien Morel, Savoie Mont Blanc University, FRANCE
17:00 – 17:20	
<p style="text-align: center;"><b>T4A-1</b></p> <p><b>FIVE-TERMINAL DUAL-POLARITY MEMS ELECTROSTATIC TRANSDUCER FOR NEAR-LIMITS KINETIC ENERGY HARVESTING FROM IRREGULAR VIBRATIONS</b></p> <p>Moein Rahmani<sup>1</sup>, Armine Karami<sup>1</sup>, Francisco Ambia<sup>2</sup>, Alexis Brenes<sup>2</sup>, Dimitri Galayko<sup>3</sup>, Elie Lefevre<sup>2</sup> and Philippe Basset<sup>1</sup></p> <p><sup>1</sup>Université Gustave Eiffel, FRANCE, <sup>2</sup>University Paris Saclay, FRANCE, and <sup>3</sup>Sorbonne Université, FRANCE</p>	<p style="text-align: center;"><b>T4B-1</b></p> <p><b>MULTI-COIL-BASED INDUCTIVE POWER TRANSFER SYSTEM FOR IN-SITU SOIL SENSING APPLICATION</b></p> <p>Sheng Ding<sup>1</sup>, John Sanchez<sup>1</sup>, Shad Roundy<sup>1</sup>, Ramesh Goel<sup>1</sup>, Cody Zesiger<sup>2</sup>, and Darrin Young<sup>1</sup></p> <p><sup>1</sup>University of Utah, USA and <sup>2</sup>Utah State University, USA</p>
17:20 – 17:40	
<p style="text-align: center;"><b>T4A-2</b></p> <p><b>INVESTIGATING THE EFFECT OF SURFACE TOPOLOGY MODIFICATIONS ON THE OUTPUT PERFORMANCE OF TENGs USING A STANDARDIZED SET-UP</b></p> <p>Fiza Asif and Peter Woias            University of Freiburg, GERMANY</p>	<p style="text-align: center;"><b>T4B-2</b></p> <p><b>HIGH EFFICIENCY 2.496 GHZ CLASS E POWER AMPLIFIER FOR SPACE BASED SOLAR POWER APPLICATIONS</b></p> <p>Nunzio Pucci<sup>1</sup>, Martin Prusa<sup>1</sup>, Vladimir Marinov<sup>1</sup>, Hossein Mardani<sup>2</sup>, Neil Buchanan<sup>2</sup>, and Paul D. Mitcheson<sup>1</sup></p> <p><sup>1</sup>Imperial College London, UK and <sup>2</sup>Queen's University Belfast, UK</p>

17:40 – 18:00

**T4A-3**

**A WAVE ENERGY HARVESTER WITH VERTICAL PENDULUM AND MAG-BOOST MECHANISM**

Tianyi Tang<sup>1,2</sup>, Yunfei Li<sup>1,2</sup>, Heng Zhao<sup>2</sup>, Lining Sun<sup>1,2</sup> and Huicong Liu<sup>2</sup>

<sup>1</sup>Harbin Institute of Technology, CHINA and

<sup>2</sup>Soochow University, CHINA

**T4B-3**

**A COMPARISON OF CURRENT-CARRYING COIL VERSUS ROTATING MAGNET TRANSMITTER FOR ELECTRODYNAMIC WIRELESS POWER TRANSMISSION**

Vernon S. Crasto and

David P. Arnold

University of Florida, USA

18:00 – 18:20

**T4A-4**

**GRADED MICRO-RESONATORS FOR ENHANCED SENSING AND ENERGY HARVESTING IN MEMS WITH LEAD-FREE PIEZOELECTRIC MATERIALS**

Jacopo M. De Ponti<sup>1</sup>, Luca Iorio<sup>1</sup>, Michele Rosso<sup>1</sup>, Federico Maspero<sup>1</sup>, Annachiara Esposito<sup>2</sup>, Tarek Afifi Afifi<sup>2</sup>, Manuel Riani<sup>2</sup>, Gabriele Gattere<sup>2</sup>, Andrea Di Matteo<sup>2</sup>, Alberto Corigliano<sup>1</sup> and Raffaele Ardito<sup>1</sup>

<sup>1</sup>Politecnico di Milano, ITALY and

<sup>2</sup>STMicroelectronics, ITALY

**T4B-4**

**OPTIMIZATION OF AN ELECTROMAGNETIC HALBACH ARRAY FOR WIRELESS POWER TRANSFER**

Dibin Zhu<sup>1</sup>, Xianghe Luo<sup>1</sup>, and Tamuno-Omie Gogo<sup>2</sup>

<sup>1</sup>Shanghai Jiao Tong University, CHINA and

<sup>2</sup>University of Exeter, UK

**18:20 Adjourn for the day**

# Wednesday, 20 November

All indicated times are Central European Time (CET).

**08:50** **Conference Announcements**

**09:00** **Plenary Presentation II**

Chair: Daisuke Yamane, Ritsumeikan University, JAPAN

**WPA-1** **PRACTICAL USE OF MEMS VIBRATIONAL ENERGY HARVESTER BASED ON SOLID ION ELECTRET**

Hiroyuki Mitsuya

Saginomiya Seisakusho, Inc., JAPAN

**10:00** **Session W5A - Energy Harvesting and Power Transfer V**

Chair: Sixing Xu, Hunan University, CHINA

10:00 – 10:20

**W5A-1** **FULLY 3D-PRINTED ROTATIONAL ENERGY HARVESTER BASED ON BIPOLAR CHARGED PLA ELECTRETS**

Dennis Flachs<sup>1</sup>, Levin Bernhard<sup>1</sup>, Sergey Zhukov<sup>2</sup>,  
Heinz von Seggern<sup>2</sup>, Alexander A. Altmann<sup>2</sup>, Mario Kupnik<sup>2</sup>,  
and Christiane Thielemann<sup>1</sup>

<sup>1</sup>Technische Hochschule Aschaffenburg, GERMANY and

<sup>2</sup>Technische Universität Darmstadt, GERMANY

10:20 – 11:30

**W5A-2** **DESIGN OF MEMS VIBRATIONAL ENERGY HARVESTERS USING MICRO-CAVITY STRUCTURES WITH SELF-ASSEMBLED ELECTRETS**

Yuichiro Sunagawa<sup>1</sup>, Ruichen Li<sup>1</sup>, Kyoichi Kakuno<sup>1</sup>,  
Satoru Hosoi<sup>1</sup>, Ayato Jingu<sup>2</sup>, Aoi Ito<sup>2</sup>, Yuya Tanaka<sup>2</sup>,  
and Daisuke Yamane<sup>1</sup>

<sup>1</sup>Ritsumeikan University, JAPAN and <sup>2</sup>Gunma University, JAPAN

12:40 – 13:00

**W5A-3 CAM-DRIVEN FREQUENCY UP-CONVERSION MECHANISM FOR KINETIC ENERGY HARVESTING**

Heng Zhao<sup>1</sup>, Tianyi Tang<sup>1,2</sup>, Yunfei Li<sup>1,2</sup>, Mingqi Mei<sup>1</sup>  
and Huicong Liu<sup>1</sup>

<sup>1</sup>Soochow University, CHINA and

<sup>2</sup>Harbin Institute of Technology, CHINA

**11:00 Refreshment Break**

Lobby

<b>Session W6A</b> <b>Energy Harvesting and Power Transfer VI</b>	<b>Session W6B</b> <b>Electrical Conditioning, Power Management and Energy Storage</b>
Chair: Daisuke Yamane, Ritsumeikan University, JAPAN	Chair: Adrien Badel, Université Savoie Mont Blanc, FRANCE
11:30 – 11:50	
<b>W6A-1</b> <b>VIBRATION ENERGY CONVERTER WITH DOUBLE FREQUENCY-UP CONVERSION FOR ENHANCED SELF-POWERED HUMAN MOTION SENSING</b> Guoliang Zhong <sup>2</sup> , Riliang Li <sup>2</sup> , Anxin Luo <sup>2</sup> and Fei Wang <sup>1</sup> <sup>1</sup> Southern University of Science and Technology, CHINA and <sup>2</sup> Dongguan University of Technology, CHINA	<b>W6B-1</b> <b>ON THE OPTIMAL CHOICE OF ELECTRICAL CONDITIONING CIRCUITS FOR TRIBOELECTRIC NANOGENERATORS</b> Hachem Mortada <sup>1</sup> , Armine Karami <sup>1</sup> , Delaram Haghghi-Talab <sup>1</sup> , Ahmad Delbani <sup>1</sup> , Dimitri Galayko <sup>2</sup> , and Philippe Basset <sup>1</sup> <sup>1</sup> Université Gustave Eiffel, FRANCE and <sup>2</sup> Sorbonne Université, FRANCE

11:50 – 12:10

**W6A-2**

**DOUBLE PENDULUM-BASED  
NONLINEAR ROTATIONAL  
ENERGY HARVESTING FROM  
LOW-FREQUENCY HUMAN  
MOTION FOR SELF-POWERED  
SENSING**

Ziyu Wang<sup>1</sup>, Ze Wei<sup>1</sup>, Haopeng  
Xie<sup>1</sup>, Hailing Fu<sup>1</sup>, Nikolaos  
Chrysochoidis<sup>2</sup>, and Fang Deng<sup>1</sup>  
<sup>1</sup>Beijing Institute of Technology,  
CHINA and <sup>2</sup>University of Patras,  
GREECE

**W6B-2**

**LOW SUPPORT-LOSS  
MINIATURIZED ROSEN  
TRANSFORMER ON 128° Y-CUT  
LITHIUM NIOBATE**

Justin R. Phelps  
and Reza Abdolvand  
University of Central Florida, USA

12:10 – 12:30

**W6A-3**

**DEMONSTRATION OF LOW  
FREQUENCY AND HIGH-POWER  
DENSITY ALN-BASED  
PIEZOELECTRIC VIBRATION  
ENERGY HARVESTERS USING  
HIGH DENSITY TUNGSTEN  
PROOF MASSES**

André Dompierre,  
Mostafa Keshavarzi, Amrid  
Amnache, and Luc G. Fréchette  
Université de Sherbrooke, CANADA

**W6B-3**

**BOOST THE EFFICIENCY OF  
STEP-DOWN CONVERTORS  
WITH SWITCHING ORDER  
OPTIMIZATION IN POWER  
MANAGEMENT FOR HIGH-  
VOLTAGE ENERGY  
HARVESTERS**

Zerui Xu<sup>1</sup>, Xiangyu Zhao<sup>1</sup>, Ziyang  
Ou<sup>1</sup>, Sixing Xu<sup>2</sup>, and Xiaohong  
Wang<sup>1</sup>  
<sup>1</sup>Tsinghua University, CHINA and  
<sup>2</sup>Hunan University, CHINA

12:30 – 12:50

**W6A-4**

**HARVESTING OF KINETIC  
ENERGY OF THE DROPLETS BY  
MEMS DEVICE**

Hiroki Narita, Kensuke Kanda, and  
Kazusuke Maenaka  
University of Hyogo, JAPAN

**W6B-4**

**POST-TREATMENT OF CARBON  
NANOTUBES BASED  
ELECTRODES TO REALIZE LOW  
SELF-DISCHARGE  
SUPERCAPACITORS**

Ulzhan Bassebek<sup>1</sup>, Omar Saif<sup>2</sup>,  
Diani Muhandiram<sup>2</sup>, Raghunandan  
Ummethala<sup>2</sup>, Nayereh Soltani<sup>2</sup>,  
Per Ohlckers<sup>2</sup>, and Pai Lu<sup>1</sup>  
<sup>1</sup>University of South-Eastern  
Norway, NORWAY and  
<sup>2</sup>nanoCaps AS, NORWAY



13:00

**Lunch**

Restaurant Lindahl

<b>Session W7A</b> <b>Energy Harvesting and Power Transfer VII</b>	<b>W7B</b> <b>Ultra-Low- Power Sensors and Systems</b>
Chair: Tomoya Miyoshi, University of Tokyo, JAPAN	Chair: Yu Jia, Aston University, UK
14:30 – 14:50	
<p style="text-align: center;"><b>W7A-1</b></p> <p><b>POTENTIAL-BASED DESIGN OF ELECTRET-DIELECTRIC ELASTOMER LAMINATED ENERGY HARVESTER</b></p> <p>Kenta Ichikawa, Seiya Fujino, Kenta Itani, Wataru Hijikata, and Kohji Mitsubayashi            Institute of Science Tokyo, JAPAN</p>	<p style="text-align: center;"><b>W7B-1</b></p> <p><b>ENHANCING SENSITIVITY USING FREQUENCY LOCALIZATION FACTOR IN GAS SENSOR ANTISYMMETRIC WEAKLY COUPLED RESONATORS</b></p> <p>Haythem Draoui<sup>1</sup>, Zhengliang Fang<sup>1</sup>, Stephanos Theodossiades<sup>1</sup>, Antonio Di Buono<sup>2</sup>, and Amal Z. Hajjaj<sup>1</sup>  <sup>1</sup>Loughborough University, UK and <sup>2</sup>National Nuclear Laboratory, UK</p>
14:50 – 15:10	
<p style="text-align: center;"><b>W7A-2</b></p> <p><b>GRAVITY AND MAGNET-INDUCED BI-STABILITY FOR BROADBAND ROTATIONAL ENERGY HARVESTING</b></p> <p>Md Shamim Ahmed<sup>1</sup>, Mark Longden<sup>2</sup>, Xianghong Ma<sup>1</sup>, and Yu Jia<sup>1</sup>  <sup>1</sup>Aston University, UK and <sup>2</sup>RL Automotive Ltd, UK</p>	<p style="text-align: center;"><b>W7B-2</b></p> <p><b>POROUS SILICONE-BASED STRETCHABLE TRIBOELECTRIC NANOGENERATOR FOR WEARABLE SELF-POWERED BIOMOTION MONITORING</b></p> <p>Anamika Barua<sup>1</sup>, Tamanna Yasmin<sup>2</sup>, Kamaruzzaman<sup>1</sup>, and S M Sohel Rana<sup>1</sup>  <sup>1</sup>Noakhali Science and Technology University, BANGLADESH and <sup>2</sup>Korea Institute of Science and Technology, KOREA</p>

15:10 – 15:30

**W7A-3**

**ELECTRODYNAMIC WIRELESS  
POWER TRANSFER USING  
ROTATING RESONANT  
RECEIVER WITH HIGHLY  
NONLINEAR BEHAVIOR**

Rémi Recoquillé<sup>1,2</sup>, Nicolas  
Garraud<sup>1</sup>, Pierre Gasnier<sup>1</sup>, and  
Adrien Badel<sup>2</sup>

<sup>1</sup>CEA-Leti, FRANCE and

<sup>2</sup>University Savoie Mont Blanc,  
FRANCE

**15:30 Refreshment Break**

Lobby

**Session W8A  
Energy Harvesting and  
Power Transfer VIII**

Chair: Ryoto Yanagisawa,  
University of Tokyo, JAPAN

**Session W8B  
Materials and Fabrication II**

Chair: Christophe Gissinger,  
Ecole Normale Supérieure (ENS),  
FRANCE

16:00 – 16:20

**W8A-1**

**A WRIST-WORN ELECTRET  
ENERGY HARVESTER  
ENHANCED BY INTERMITTENT  
SWITCHING TO THE MOTOR  
MODE**

Zehan Shi<sup>1</sup>, Tomoya Miyoshi<sup>1</sup>,  
Adrien Morel<sup>2</sup>, Adrien Badel<sup>2</sup>, and  
Yuji Suzuki<sup>1</sup>

<sup>1</sup>University of Tokyo, JAPAN and

<sup>2</sup>University of Savoie Mont Blanc,  
FRANCE

**W8B-1**

**HIGH OUTPUT  
MICROGENERATOR USING  
MgHfAlN FILM**

Hiroki Kuwano<sup>1,2</sup>, Hung H.  
Nguyen<sup>1,2</sup>, Le V. Minh<sup>1</sup>, and  
Yosuke Takayama<sup>1,2</sup>

<sup>1</sup>Tohoku University, JAPAN and

<sup>2</sup>Sendai Smart Machines, JAPAN

16:20 – 16:40

**W8A-2**

**CHALLENGES IN PRINTING  
AND SHAPING SOFT  
MAGNETIC FLUX GUIDES**

Steven W. Wright<sup>1</sup>,  
Michail E. Kiziroglou<sup>1,2</sup>, and  
Eric M. Yeatman<sup>1</sup>  
<sup>1</sup>Imperial College London, UK  
<sup>2</sup>International Hellenic University,  
Greece

**W8B-2**

**3D-PRINTED SOFT MAGNETIC  
CORES FOR COMPACT  
ELECTROMECHANICAL  
DEVICES VIA MATERIAL  
EXTRUSION**

Jorge Cañada<sup>1</sup>, Steven F. Nagle<sup>1</sup>,  
Neus Vidal<sup>2</sup>, José M. López-  
Villegas<sup>2</sup> and Luis F. Velásquez-  
García<sup>1</sup>  
<sup>1</sup>Massachusetts Institute of  
Technology, USA and <sup>2</sup>University  
of Bcelona, SPAIN

16:40 – 17:00

**W8A-3**

**TUNING NON-LINEARITY IN  
CASCADED TAPERED SPRING  
TOPOLOGIES OF EM-VEHS  
WITH ENHANCED FIGURE OF  
MERIT**

Karan Roy<sup>1,2</sup>, Andreas Amann<sup>2</sup>,  
and Saibal Roy<sup>1,2</sup>  
<sup>1</sup>Tyndall National Institute,  
IRELAND and <sup>2</sup>University College  
Cork, IRELAND

**17:00     Adourn for the day**

**19:00-  
21:45     Conference Banquet  
              (included in registration)**

# Thursday, 21 November

All indicated times are Central European Time (CET).

**08:50** **Conference Announcements**

**09:00** **Plenary Presentation III**

Chair: Philippe Basset, ESIEE Paris, FRANCE

**ThPA-1** **THERMOELECTRICITY AT A LIQUID METAL INTERFACE**

Christophe Gissinger

Ecole Normale Supérieure (ENS), FRANCE

**10:00** **Session Th9A - Energy Harvesting  
and Power Transfer IV**

Chair: Philippe Basset, ESIEE Paris, FRANCE

10:00 – 10:20

**Th9A-1** **A VERSATILE MEMS ELECTROSTATIC TRANSDUCER  
STRUCTURE TO ACHIEVE NEAR-ZERO STIFFNESS FOR  
LOW-FREQUENCY ENERGY HARVESTING**

Shengkai Su<sup>1</sup>, Binh Duc Truong<sup>2</sup>, Snorre Aunet<sup>1</sup>,  
and Cuong Phu Le<sup>1</sup>

<sup>1</sup>Norwegian University of Science and Technology, NORWAY  
and <sup>2</sup>University of Michigan, USA

10:20 – 10:40

**Th9A-2** **ENHANCED THERMOPOWER IN THERMOGALVANIC CELLS  
USING D2O AS A SOLVENT**

Lixian Jiang<sup>1</sup>, Shohei Horike<sup>2</sup>, Vikas Nandal<sup>1</sup>, Kazuhiko Seki<sup>1</sup>,  
and Qingshuo Wei<sup>1</sup>

<sup>1</sup>National Institute of Advanced Industrial Science and  
Technology, JAPAN and <sup>2</sup>Kobe University, JAPAN

**10:40** **Refreshment Break**

Lobby

<b>Session Th10A Implantable or Wearable Devices</b>	<b>Session Th10B Actuation and Micro-Propulsion</b>
Chair: Shad Roundy, University of Utah, USA	Chair: Dibin Zhu, Shanghai Jiao Tong University, CHINA
11:20 – 11:40	
<p style="text-align: center;"><b>Th10A-1</b></p> <p><b>NOVEL NI-SN ANODE/LIFEOP4 CATHODE NANOSTRUCTURES VIA ENHANCED DEPOSITION FOR ON-CHIP LITHIUM-ION MICRO BATTERIES</b></p> <p>Siyao Jiang, Bingmeng Hu, Zerui Xu, and Xiaohong Wang Tsinghua University, CHINA</p>	<p style="text-align: center;"><b>Th10B-1</b></p> <p><b>FORCE SENSING EVALUATION FOR A PIEZOELECTRIC- ACTUATED COMPLIANT ROBOT WITH ONBOARD VISUAL SERVOING</b></p> <p>Xu Chen<sup>1</sup>, Linchuan Zhao<sup>1,2</sup>, Michail E. Kiziroglou<sup>1,3</sup>, and Eric M. Yeatman<sup>1</sup></p> <p><sup>1</sup>Imperial College London, UK, <sup>2</sup>Shanghai Jiao Tong University, CHINA, and <sup>3</sup>International Hellenic University, GREECE</p>
11:40 – 12:00	
<p style="text-align: center;"><b>Th10A-2</b></p> <p><b>POWER TRANSFER AND 5D POSITION CONTROL OF AN ENDOSCOPIC CAPSULE ROBOT</b></p> <p>Anh-Tuan Vo and Nicolas Garraud CEA-Leti, FRANCE</p>	<p style="text-align: center;"><b>Th10B-2</b></p> <p><b>ELECTROMAGNETIC MICROPUMPS BASED ON MULTI-MATERIAL 3D PRINTING</b></p> <p>Chen Lin, Michail E. Kiziroglou, and Eric M. Yeatman Imperial College London, UK</p>

**12:00 Award Ceremony & Closing Remarks**

Ormen 1&2

**12:30 Lunch**

Restaurant Lindahl

**13:30 Conference Adjourns**