



Workshop on Emerging Electromagnetic and RF Systems for Health Monitoring and Therapy

15th-16th of October, 2018

Chairs: **Clément Jany (CEA Leti) &**

Prof. Amin Arbabian (Stanford University)

Venue: **AllenX Auditorium, Stanford University**

Funded by: **France-Stanford Center for Interdisciplinary Studies**

Abstract

The study of electromagnetic (EM) waves effects on the human body has been of growing importance as wireless communication systems have become pervasive. Such studies have investigated the interactions between the human body and electromagnetic waves and established, for instance, a legal maximum specific absorption rate (SAR) for cellphones. Today, we witness a second evolution in human body exposition to EM waves since, under the influence of the exponentially expanding IoT, more and more communicant objects surround us, and they get closer and closer (wearables) or even inside the body (capsule endoscopy, ingestibles, implants). The challenge now is to deeply understand how EM waves interact with the human body, not only for suppressing its negative effects but also for optimizing the wave propagation inside and at the surface of the human body for communication purposes. Also, high energy EM waves have been extensively used for diagnostic (radiography) or treatment (radiotherapy) and new applications have emerged at lower frequencies. This Workshop aims at establishing a link between the medical field on one side and the EM science and engineering on the other side, for exploring propagation, communications, imaging, and emerging applications.

Available online at https://francestanford.stanford.edu/content/2018_2019_conferences

Keynote speakers **Emeritus Professor Jean-Charles Bolomey**, University of Paris-Sud, France
Professor E.J. Chichilnisky, Stanford University

Program at a glance

See next page for detailed program

| | | |
|--------------------------|-----------|---|
| Monday 15 th | Morning | Session 1 Emerging EM-based techniques for diagnostics and screening |
| | Afternoon | Session 2 Communication inside and around the body |
| Tuesday 16 th | Morning | Session 3 Emerging EM-based techniques for treatment |

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Detailed Program

Keynote 1 Microwave Dosimetry and Medical Imaging

8:30 – 9:15

By Emeritus Professor Jean-Charles Bolomey
University of Paris-Sud, France

Session 1 Emerging EM-based techniques for diagnostics and screening

| time | Theme | Speaker | |
|-------|---|--------------------|----------------------------|
| | | Name | Affiliation |
| 9:15 | Nyquist-Rate Healthcare with Next-Generation Imaging and Sensing Systems | Prof Amin Arbabian | Stanford University |
| 9:45 | Lensfree-microscopy, a new framework for the imaging of cells, 3D cell culture and tissue | Cedric Allier | CEA LETI, Grenoble, France |
| 10:15 | Coffee break | | |
| 10:45 | Thermo-Acoustic Ultrasound for Detection of RF-Induced Device Lead Heating in MRI | Greig Scott | Stanford University |
| 11:15 | Microwave Lab-on-CMOS: an ultra-sensitive dielectric spectrometer for flow cytometry and biosensing | Jun Chau Chien | Stanford University |
| 12:00 | Lunch break | | |

Session 2 Communications inside and around the body

| time | Theme | Speaker | |
|-------|---|---------------------|----------------------------------|
| | | Name | Affiliation |
| 13:45 | WIMAGINE: Wireless 64-Channel ECoG Recording Implant for Long Term Clinical Applications | Fabien Sauter | CEA Clnatec, Grenoble, France |
| 14:15 | Ultrasonic capsule: a wireless disposable imager enabling widespread screening and access to large imaging datasets | Spirodon Baltasvias | Stanford University |
| 14:45 | Dielectric microwave spectroscopy for non destructive and non invasive analysis of molecules, cells and tissues. | Prof. Katia Grenier | LAAS CNRS, Toulouse, France |
| 15:15 | Coffee break | | |
| 15:45 | Radiation efficiency and safety considerations of body-implanted devices for biotelemetry and neural interfaces | Denys Nikolayev | Ghent University / IMEC, Belgium |
| 16:15 | Body Area Networks : from radio channel modeling to system design | Raffaele D'Errico | CEA Leti, Grenoble, France |
| 16:45 | reception | | |

Monday, October 15th

Keynote 2 Retinal prosthesis - Vision, Roadmap, Technology (temporary title)

8:30 – 9:15

By Professor E.J. Chichilnisky
Stanford University

Session 3 Emerging EM-based techniques for treatment

| time | Theme | Speaker | |
|-------|---|---------------------|------------------------------------|
| | | Name | Affiliation |
| 9:15 | Millimetric waves (MMW), from less lethal weapons to biological applications : historical background | Jean Claude Debouzy | IRBA, Grenoble France |
| 9:45 | Millimeter-Wave in pain management: Knowledge and clinical trial | David Crouzier | Remedee Labs, Grenoble France |
| 10:15 | Coffee break | | |
| 10:45 | Electroporation applications in medicine: from fundamentals to the clinics | Lluís Mir | University of Paris-Saclay, France |
| 11:15 | Obstacle detection portable system : why do we integrate a UWB RF radar ? Application to a smart white cane for VIB people (INSPEX H2020 project) | Suzanne Lesecq | CEA Leti, Grenoble, France |

Tuesday, October 16th