

Duration: 08:30 - 17:50

Room: Prag

WM-02

Electromagnetic Sensors for Life Science Applications

Organisers:

Christian Damm, University of Ulm, Germany

Norbert Klein, London Imperial College, UK

Abstract

This workshop will present medical applications based on electromagnetic sensors from the molecular to the cellular and tissue level. The characteristic interaction between electromagnetic waves in the micro-, mm- wave and Terahertz region and single molecules, separated cells or tissues promises manifold applications and is discussed in great detail. The applications range from integrated Lab-on-Chip solutions with a broad range of applications up to very specific detection of single pathogens in a well-defined lab environment.

Among the addressed applications is the detection of tumors using different approaches and even the combination of detection and treatment within a single theranostic device, the analysis of breath gas, general dielectric spectroscopy in different frequency ranges and from the molecular to cellular samples. Furthermore, the detection of African Trypanosomiasis and blood sugar analysis are presented as very specific application with great importance to the society on the way to cost effective point-of-care applications.

Programme

08:30 - 09:15 Integrated Lab-on-Chip Terahertz Spectroscopy Platform in BiCMOS Technology

Dietmar Kissinger, Defu Wang, Mesut Inac, Canan Baristiran Kaynak, Matthias Wietstruck, Mehmet Kaynak, Bernd Tillack, IHP, Frankfurt/Oder, Germany

09:15 - 10:00 Integrated Microstructures for Marker Free Detection of Conformal Changes of Membrane Proteins using Plasmon-Enhanced THz Spectroscopy

Maximilian Bettenhausen¹, Subhajit Guha², Marcin Kazmierczak², Julia Flesch³, Chang You³, Thomas Schröder², Jacob Piehler³, Bernd Witzigmann¹, ¹University of Kassel, Germany, ²IHP, Frankfurt/Oder, Germany, ³University of Osnabrueck, Germany

10:10 - 10:50 Break

10:50 - 11:35 Ultra-Sensitive Marker-Free Biomolecular THz Detection for Tumor Analysis

Christian Weisenstein¹, Dominik Schaar², Heiko Schäfer-Eberwein¹, Anja K. Bosserhoff², Peter Haring Bolívar¹, ¹University of Siegen, Germany, ²Friedrich-Alexander-University Erlangen-Nürnberg, Germany

11:35 - 12:20 Highly Sensitive and Highly Selective Breath Gas Sensor

Based on mm-Wave Molecular Spectroscopy

Heinz-Wilhelm Hübers¹, Nick Rothbart¹, Klaus Schmalz², Johannes Borngräber², Dietmar Kissinger², ¹HU Berlin, Germany and DLR, Berlin-Adlershof, Germany, ²IHP, Frankfurt/Oder, Germany

12:30 - 13:50 Break

13:50 - 14:20 Microwave Sensors and Actuators for Blood Glucose Measurements and Rapid Bacteria Identification

Adrian Porch, Cardiff University, UK

14:20 - 14:50 Microwave Dielectric Spectroscopy as an Analytic Technique for Reproducible Cell and Molecule Sensing

Katia Grenier, David Dubuc, National Scientific Research Center, France

14:50 - 15:20 Lab-on-Chip Microwave-to-Terahertz Single Cell Detection: Towards Liquid Biopsy

Norbert Klein, Clare Watts, Stephen M. Hanham, Imperial College London, UK

15:30 - 16:10 Break

16:10 - 16:40 Synchronizing Broadband Dielectric Spectroscopy with Fluorescence Microscopy for Biological Material Characterisation

Ilja Ocket, Bart Nauwelaers, imec, Belgium

16:40 - 17:10 Dual Mode Microwave Applicator for Diagnosis and Thermal Ablation Treatment of Organic Tissue

Carolin Reimann¹, Margarita Puentes¹, Thomas Vogl², Rolf Jakoby¹, ¹TU Darmstadt, Germany, ²Goethe University, Frankfurt am Main, Germany

17:10 - 17:40 Electromagnetic mm-Wave and THz Sensors for the Detection of African Trypanosomiasis using RNA Aptamer Derivatized Surfaces

Mario Müh¹, Matthias Maasch¹, H. Ulrich Göringer², Christian Damm¹, ¹University of Ulm, Germany, ²TU Darmstadt, Germany

17:40 - 17:50 Podium Discussion Between All Presenters and the Audience

Chaired and guided by Christian Damm, Norbert Klein