Contribution ID: **11** Type: **Oral presentation**

The SiPM revolution in time-domain diffuse optics

Friday, 4 October 2019 09:00 (40 minutes)

Time-domain diffuse optics is a powerful non-invasive, non-ionizing and label-free technique based on the use of picosecond pulsed laser light to probe highly scattering media like biological tissues down to a depth of few centimeters to obtain functional and compositional information. This technique is opening new perspectives in various fields spanning from oncology (e.g. characterization of breast or thyroid lesions, etc.) to neurology (e.g. diagnosis and monitoring of traumatic brain injuries, functional brain imaging, etc.), as well as in non-biomedical fields (e.g. characterization of fruits, wood, etc.). Time-domain diffuse optics is nowadays undergoing fascinating technology advancements, permitting for the first time the design of low-cost compact/wearable high performance systems. This revolution has been made possible also taking advantage from Silicon PhotoMultiplier (SiPM) progresses, originally driven by other applications, since time-domain diffuse optics is highly demanding in terms of performance, in particular requiring single-photon detectors with large collection area, high fill-factor, high single-photon timing resolution, low power dissipation and compact high-throughput front-end electronics. This presentation will review the recent advancements introduced by SiPMs in time-domain diffuse optics, mostly thanks to the support of different running EU H2020 projects (e.g. SOLUS -G.A.731877-, LUCA -G.A.688303-, BITMAP -G.A.675332-, ATTRACT -G.A.777222-, Laserlab-Europe -G.A.654148-), showing their present performances in this field, the inherent advantages that allowed the design of innovative diffuse optical imaging systems, as well as highlighting their present limitations in order to push forward the research towards the perfect SiPM for time-domain diffuse optics.

Primary authors: Prof. DALLA MORA, Alberto (Politecnico di Milano - Dipartimento di Fisica); Dr DI SIENO, Laura (Politecnico di Milano - Dipartimento di Fisica); Mr BEHERA, Anurag (Politecnico di Milano - Dipartimento di Fisica); Prof. TARONI, Paola (Politecnico di Milano - Dipartimento di Fisica; Consiglio Nazionale delle Ricerche - Istituto di Fotonica e Nanotecnologie); Prof. CONTINI, Davide (Politecnico di Milano - Dipartimento di Fisica); Prof. TORRICELLI, Alessandro (Politecnico di Milano - Dipartimento di Fisica; Consiglio Nazionale delle Ricerche - Istituto di Fotonica e Nanotecnologie); Prof. PIFFERI, Antonio (Politecnico di Milano - Dipartimento di Fisica; Consiglio Nazionale delle Ricerche - Istituto di Fotonica e Nanotecnologie)

Presenter: Prof. DALLA MORA, Alberto (Politecnico di Milano - Dipartimento di Fisica)

Session Classification: Medical applications