

SPIE Photonics West

Conferences: 24-29 January 2009

San Jose Convention Center • San Jose, California USA



- **Getting Started**
- **Abstracts**
 - BIOS
 - LASE
 - MOEMS-MEMS
 - OPTO
- **Copyright**
- **Search**
- **Technical Program**
- **Exhibition Guide**



SPIE

Connecting minds. Advancing light.

Tuesday 27 January

SESSION 9

Room: Conv. Ctr. Room A2 Tues. 8:30 to 9:50 am

Fluorescence Imaging/Spectroscopy II (Small Animal Imaging)

Session Chair: **Eva Marie Sevick-Muraca**, Baylor College of Medicine

Topic: **Small animal fluorescence tomographic imaging with early-emitting photons: trading resolution for sensitivity?**, Mark J. Niedre, Eastern Univ. (United States); Vasilis Ntziachristos, Technische Univ. Muenchen (Germany) [7174-46]

Topic: **A high sensitivity multi-spectral three-dimensional fluorescence tomographic system for small animal imaging**, Changqing Li, Gregory T. Schell, Univ. of California, Davis (United States); Joyita Dutta, Sangtae Ahn, and M. Leahy, Univ. of Southern California (United States); Simon R. Cherry, Univ. of California, Davis (United States) [7174-47]

Topic: **Near infrared fluorescence imaging of small animals in-vivo with structural information**, Nrusingh C. Biswal, John K. Gamelin, Univ. of Connecticut (United States); Baohong Yuan, The Catholic Univ. of America (United States); Joseph M. Backer, SibTech, Inc. (United States); Quing Zhu, Univ. of Connecticut (United States) [7174-48]

Topic: **Fluorescence diffuse tomography for detection of marked tumors in small animals**, Mikhail S. Kleshnii, Ilya I. Fiks, Vladislav A. Kamensky, Vladimir I. Plehanov, Anna G. Orlova, Mikhail Y. Kirillin, Institute of Applied Physics (Russian Federation); Marina V. Shirmanova, Nizhny Novgorod State Univ. (Russian Federation); Alexander P. Savitsky, A.N. Bach Institute of Chemistry (Russian Federation); Ilya V. Turchin, Institute of Applied Physics (Russian Federation) [7174-49]

Exhibition Break 9:50 to 10:30 am

SESSION 10

Room: Conv. Ctr. Room A2 Tues. 10:30 to 11:50 am

Fluorescence Imaging/Spectroscopy III (Instrumentation)

Session Chair: **Robert R. Alfano**, City College/CUNY

Topic: **Application of time gated, intensified CCD camera for imaging of fluorescently labeled and fluorescent inclusions in optically turbid medium**, Piotr Wozniak, Norbert S. Zolek, Roman Maniewski, Adam Liebert, Institute of Photonics and Biomedical Engineering (Poland) [7174-50]

Topic: **Sensor optimization for fluorescence optical tomography by experimental design methods**, Manuel Freiberger, Hermann Scharfetter, Graz Univ. of Technology (Austria) [7174-51]

Topic: **Three-dimensional localization of discrete fluorescent inclusions in multiple tomographic projections in the time-domain**, Yves Bérubé, Julien Pichette, Univ. de Sherbrooke (Canada) [7174-52]

Topic: **Multi-projection based fluorescence optical tomography using a fiber-held probe based optical imager**, Jiajia Ge, Sarah J. L. Erickson, Anitha Godavarty, Florida International Univ. (United States) [7174-53]

Exhibition Break 11:50 am to 12:50 pm

SESSION 11

Room: Conv. Ctr. Room A2 Tues. 12:50 to 3:00 pm

Brain, Neuro, and Functional Imaging I

Session Chair: **David A. Boas**, Massachusetts General Hospital

Topic: **Optical characterization of near-infrared signals associated with electrical stimulation of peripheral nerves (Invited Paper)**, Sergio A. Srinivasan, Debbie K. Chen, Tufts Univ. (United States); Jeffrey M. Martin, Boston Univ. (United States); Angelo Sassaroli, Tufts Univ. (United States); Peter R. Tuchin, Boston Univ. (United States) [7174-01]

Topic: **Traveling waves of neuronal activity allow mapping of functional connectivity within the visual cortex using diffuse optical tomography**, Brian J. White, Joseph P. Culver, Washington Univ. in St. Louis School of Medicine (United States) [7174-02]

Topic: **Fast changes in near-infrared transmission and reflection spectra associated with neural activity in rat brain slices**, Jonghwan Lee, Jung-Hun Park, and June Kim, Seoul National Univ. (Korea, Republic of) [7174-03]

Topic: **Novel regression of superficial hemodynamics improves diffuse optical imaging of the brain in both adults and infants**, Nicholas M. Gregg, Washington Univ. in St. Louis School of Medicine (United States); Brian R. White, Steve M. Liao, Terrie E. Inder, Joseph P. Culver, Washington Univ. in St. Louis School of Medicine (United States) [7174-04]

Topic: **Atlas-guided diffuse optical tomography of human brain function**, David A. Boas, Massachusetts General Hospital (United States); Anna Custo, Massachusetts General Hospital, Harvard Medical School (United States); Sandy Wells, Brigham & Women's Hospital (United States) and Harvard Medical School (United States); Rickson Mesquita, Massachusetts General Hospital, Harvard Medical School (United States) [7174-96]

Topic: **Application of near-infrared spectroscopy for discrimination of mental workloads**, Angelo Sassaroli, Feng Zheng, Leanne Hirshfield, Audrey Girouard, Erin Treacy, Robert Jacob, Sergio Fantini, Tufts Univ. (United States) [7174-06]

Coffee Break 3:00 to 3:30 pm

SESSION 12

Room: Conv. Ctr. Room A2 Tues. 3:30 to 4:50 pm

Brain, Neuro, and Functional Imaging II

Session Chair: **David A. Boas**, Massachusetts General Hospital

Topic: **An adaptive general linear model for removal of physiological fluctuations in optical brain studies**, Farras Abdelnour, Theodore J. Huppert, Univ. of Pittsburgh Medical Ctr. (United States) [7174-07]

Topic: **Depth sensitivity and image reconstruction analysis of high-density imaging arrays for mapping brain function with diffuse optical tomography**, Hamid Dehghani, Univ. of Exeter (United Kingdom); Brian R. White, Joseph P. Culver, Washington Univ. School of Medicine in St. Louis (United States) [7174-08]

Topic: **Diffuse optical measurements of cerebral blood flow and oxygenation in patients after traumatic brain injury or subarachnoid hemorrhage**, Meeri N. Kim, Turgut Durduran, Univ. of Pennsylvania (United States); Suzanne Frangos, Hospital of the Univ. of Pennsylvania (United States); Erin M. Buckley, Chao Zhou, Guoqiang Yu, Univ. of Pennsylvania (United States); Heather Moss, Hospital of the Univ. of Pennsylvania (United States); Brian L. Edlow, Eileen Maloney-Wilensky, John A. Detre, Joel H. Greenberg, Univ. of Pennsylvania (United States); W. Andrew Kofke, Hospital of the Univ. of Pennsylvania (United States); Arjun G. Yodh, Univ. of Pennsylvania (United States); M. Sean Grady, Hospital of the Univ. of Pennsylvania (United States); John H. Woo, Ronald L. Wolf, Joshua Levine, Univ. of Pennsylvania (United States) [7174-09]

Topic: **Functional brain tomography using a time-gated ICCD camera**, Antonio Pifferi, Qing Zhao, Lorenzo Spinelli, Andrea Bassi, Gianluca Valentini, Davide Contini, Rinaldo Cubeddu, Alessandro Torricelli, Politecnico di Milano (Italy) [7174-10]

Tuesday 27 January

WORKSHOP

Fairmont: Garden Room Tues. 6:30 to 9:30 pm

A Novel Standardized Open-Source eXtensible Imaging Platform (XIP) for the Rapid Development of Advanced Applications

Workshop Organizers:

Gianluca Paladini, Siemens Corporate Research and
Fred S. Azar, Siemens Corporate Research

WS937 is FREE to registered attendees of Photonics West.
You must register in advance. See cashier to register.

See p. 21 for more information

Fast changes in near-infrared transmission and reflection spectra associated with neural activity in rat brain slices

Jonghwan Lee, Jung Hun Kim and Sung June Kim

100-word abstracts for early printed program:

To develop a new fast intrinsic optical neuroimaging technique, we investigated how the fundamental optical property of brain tissues varied with neural activity. In this study, while neural activity was electrically evoked and recorded in rat brain slices, near-infrared (NIR) transmission and reflection spectra were simultaneously monitored. Since the neural activity has a small time constant of several milliseconds, the optical spectra were recorded at over 1000 spectrum lines per second using our custom-made high-speed NIR spectrophotometry. As the result, we found optical changes with several milliseconds time delay, which was much smaller than that of the neurovascular coupling.

250-word abstracts for review:

Recently, intrinsic optical neuroimaging techniques have generated considerable interest in the fields of neuroscience and biophotonics. One of the most widely used optical techniques is the functional near-infrared spectroscopy (fNIRS), which has enabled many novel studies on brain function. However, it shows the time delay of several seconds because it employs the neurovascular coupling to detect neural activity. For this reason, we have tried to find an optical property of the brain tissue which fast changes by neural activity without the neurovascular coupling. This study monitored changes in the near-infrared (NIR) transmission and reflection spectra of brain tissues during neural activation. Rat brain slices were prepared as brain tissues which do not have the neurovascular coupling. While the neural activity was electrically evoked and recorded in rat brain slices, the two optical spectra were simultaneously monitored at the position between the electrical stimulation and recording sites. Since the neural activity has a small time constant of several milliseconds, the optical spectra were recorded at fast sampling rate of over 1000 spectrum lines per second using our custom-made high-speed NIR spectrophotometry. As the result, we found optical responses associated with

the neural activity. The optical spectra changed monophasically after the onset of the local field potential, and then relaxed more slowly than the electrical signal. The time delay of the optical changes was several milliseconds, which was much smaller than that of the neurovascular coupling. We will also briefly discuss about the origin of this optical response.

Keywords (up to 8 words or phrases):

Fast intrinsic optical neuroimaging

NIR transmission and reflection spectra

Optical response in brain slices