

STSM REPORT

STSM Application number: COST-STSM-BM1205-19121

STSM Grantee: Lukasz Surazynski

STSM title: Development of the skin metabolism screening method

Home Institution: Gdansk University of Technology

Host Institution: University of Oulu

STSM period: 16.05.2014 – 29.05.2014

STSM purpose: Development and expanding the capabilities of Near-Infrared Spectroscopy in field of tissue screening

Description of the work carried out during the STSM:

Department of Optoelectronics and Measurement Techniques, held on University of Oulu is an owner of self-designed and build Near-Infrared Spectroscopy. Equipment was widely used in field of biomedical measurements as brain related measurements. Previous studies under COST grant have proven it can be also used in field of tissue screening. Despite of several modifications and upgrades, which were made over the years, there are still possible changes, which could improve the device, especially in field of tissue screening and future skin cancer detection.

Device bases on the High Power Light Emitting Diodes, different kind of filters (LPF, HPF, and BPF), waveform generators and different kind of detectors. Despite of wide spectrum of applications, some changes of inner parts need to be done. It will lead to reduction of the size of apparatus and extend capabilities. Some of those changes were designed to assist tissue screening.

Metabolism of healthy and unhealthy cells is different. Basis on this fact we can conclude that measurements with NIRS in field of lesions detection may be promising. Thus measurement setup was rebuilt and tested.

Description of the main results obtained:

Near-Infrared Spectroscopy is a setup, which may provide wide capabilities and field for changes and testing. Firstly there is wide variety of wavelengths, which can be utilized. During the COST mission several wavelengths were tested. Research was started from visible light spectrum (around 590 nm) and was eventually stopped at deep infra-red.

Measurement of the new setup was tested on healthy skin, particularly nevus, which was located on the Stomach with size about 1 cm x 1 cm. The following results were obtained with 660 [nm] and 850 [nm]. There were around 200 mW of power difference between them, when 660 nm was significantly higher and had around 600 mW.

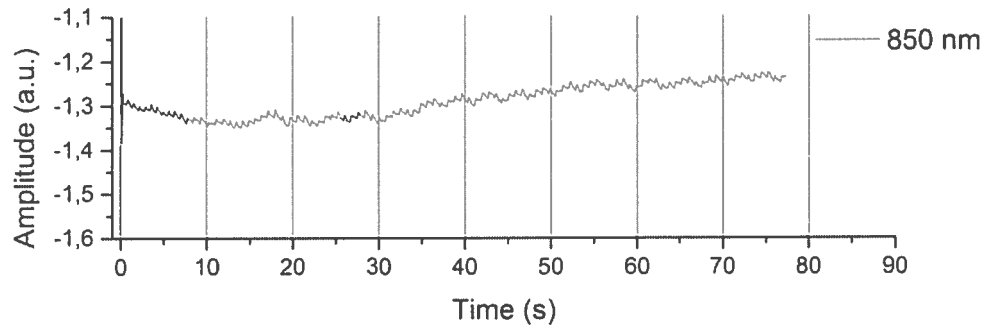
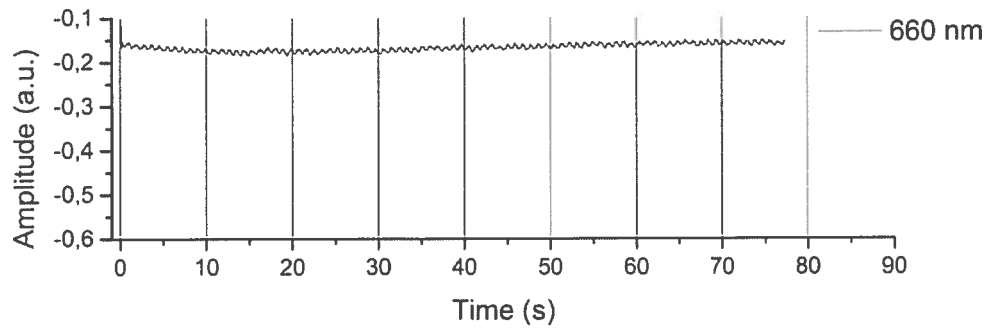


Figure 1a Healthy skin, stomach 660 nm; 1b Healthy skin, stomach 850 nm

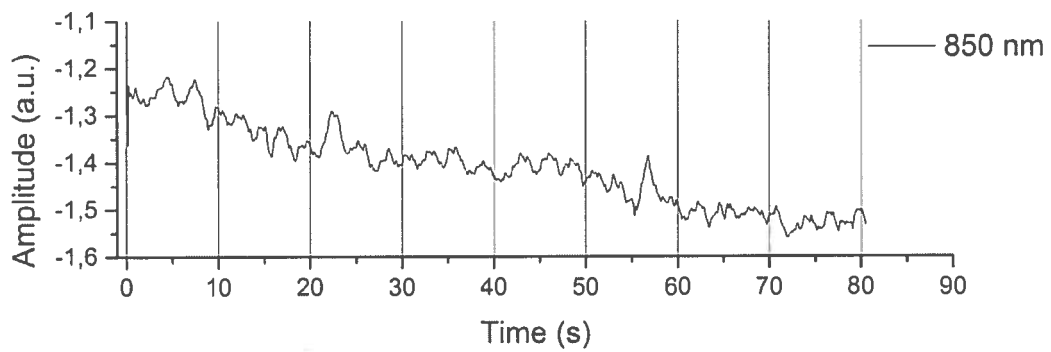
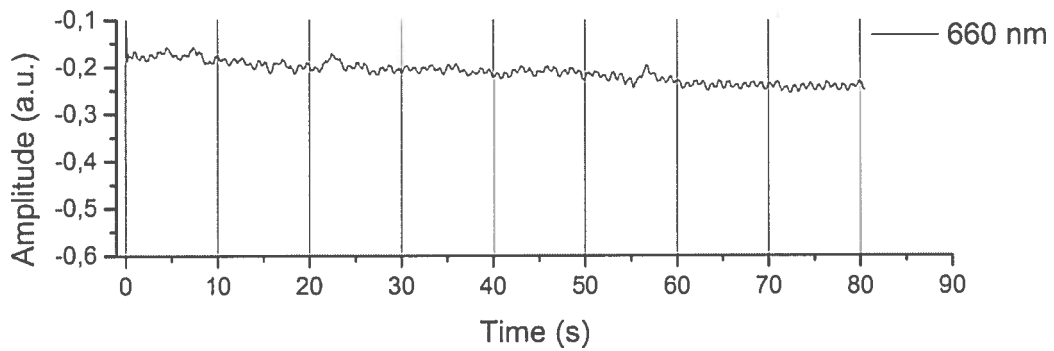


Figure 2a Nevus, stomach 660 nm, 2b Nevus stomach 850 nm

There are differences between healthy skin and nevus in the obtained data. Backscattered light seems to be 'smoother' for skin without nevus but more irregular for nevus. It is too early for final conclusions, we assume that the metabolism of the healthy skin regions and nevus is different. There are also two peaks in 23 and 57 s of the measurement, visible both for 660 nm and 850 nm. The differences can be noticed even with bare eyes, however further investigation and larger group of lesions need to be measured in order to present wider conclusions.

Mutual benefits for the Home and Host institutions: Among all of the benefits, which are cooperation between Departments, increase of the knowledge, future publication the most significant one is expanding the capabilities of the Near-Infrared Spectroscope. The COST mission has also shown completely new application and allowed on improvement of the device.

Future collaboration with the Host institution (if applicable): There will be further work put on utilizing NIRS in field of tissue screening. We hope it will eventually lead to publication and cooperation with City Hospital in Oulu. According to previous section and basing on benefits there will be further work under attaching NIRS to skin cancer measurement. The next step contains measurement of patients with skin cancer, finalization of the article and further improvement of the device.

Foreseen journal publications or conference presentations expected to result from the STSM (if applicable): Yes, further investigation and articles are planned.

STSM outcome form

STSM application number	Home institution & country	Host institution & country	BM1205 WG	Objective of the collaboration	Results of the collaboration
COST-STSM-BM1205-19121	Gdansk University of Technology, POLAND	University of Oulu, FINLAND	WG 4	Development and expanding the capabilities of Near-Infrared Spectroscope in field of tissue screening.	Major changes in the Spectroscope, preparation for skin changes and cancer measurement.

Confirmation

Herewith I would like to confirm the completion of the STSM within the Development of the skin metabolism screening method applied by Lukasz Surazynski.

He has worked on this project at the Laboratory of Optoelectronics and Measurement Techniques from 16st to 29th of May 2014 and fulfilled the objectives of the STSM work plan. During that time he was responsible for modifications of Near-Infrared Spectroscope, which includes designing, testing and troubleshooting.

The purpose of the development was to improve and prepare the device to skin metabolism measurement.



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(Matti Kinnunen,
Head of the Laboratory of Optoelectronics
and Measurement Techniques, University of Oulu)