# STSM REPORT

STSM Application number: COST-STSM-ECOST-STSM-BM1205-170416-072254
STSM Grantee: Janis Spigulis
STSM title: Multispectral imaging for skin cancer detection: phantom measurements and development of algorithms for image processing
Home Institution: University of Latvia, Institute of Atomic Physics and Spectroscopy
Host Institution: University of Oulu, Optoelectronics and Measurement Technique Lab
STSM period: 17/04/2016 – 23/04/2016
STSM purpose: Joint studies of skin structures

Description of the work carried out during the STSM:
During this visit the main emphasis was on analysis of the role of different skin chromophores in development of cancerous processes. Spectral images of a number of skin phantoms with calibrated concentrations of chromophores were taken by three different devices – Rikola Hyperspectral Imager available in Oulu and two experimental prototypes developed in Riga – multimodal imaging device "SkImager" and RGB-LED illumination device joined with the Nexus5 smartphone. Options for skin multispectral imaging aiming at detection of skin cancer (melanoma) were analyzed. Besides, theoretical models and algorithms for diffuse-reflected light propagation in skin structures containing different chromophores were considered and discussed.

Description of the main results obtained:

1. A large amount of spectral images of skin phantoms with calibrated chromophore content and scatterer concentrations have been captured. The image analysis will take at least several weeks; preliminary data obtained by the Rikola device with carotene phantoms are presented below:
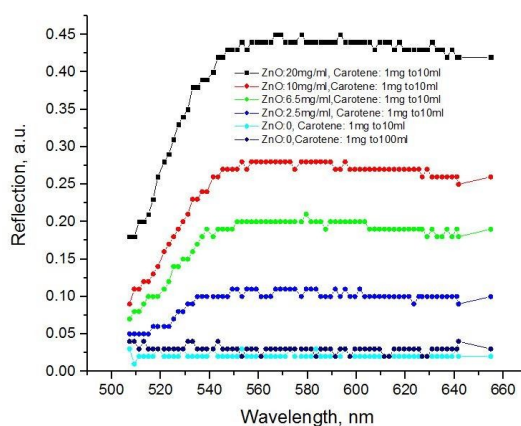
2. Optimized conditions for skin melanoma detection by means of multispectral imaging have been evaluated.
3. Importance of spectral imaging of skin in the 400-500nm region was confirmed.
4. The most appropriate algorithms for better understanding of chromophore role in structural changes of skin have been selected.
5. Technology approaches of both partners were compared and the options providing the highest sensitivity/specificity of the skin cancer detection have been outlined.
6. Plans for further collaboration agreed: return STSM visit to Riga during mid-June and training of a Master student from Riga group on skin Monte Carlo simulations in Oulu in fall semester.

Mutual benefits for the Home and Host institutions:
The partner's approaches and technologies for optical skin assessment are slightly different, so this visit helped to find the optimal ways to proceed in the related projects of both parties

Future collaboration with the Host institution (if applicable):
Return STSM visit of Dr. A.Bykov to Riga during mid-June; training of Master student G.Tunens from Riga group on skin Monte Carlo simulations in Oulu; joint participation at the next COST events.

Foreseen journal publications or conference presentations expected to result from the STSM (if applicable): eventually possible after the results will be processed

Connect also this to the results.

x *Innovative knowledge resulting from COST networking through the Action. (Specific examples of Results vs. Objectives)*

ɤ *Significant scientific breakthroughs as part of the COST Action. (Specific examples)*

x *Tangible medium term socio-economic impacts achieved or expected. (Specific examples)*

Connect this to the results.

STSM outcome form STSM application number	Home institution & country	Host institution & country	BM1205 WG	Objective of the collaboration	Results of the collaboration
COST-STSM-ECOST-STSM-BM1205-170416-072254	University of Latvia, Latvia	University of Oulu, Optoelectronics and Measurement Technique Lab, Finland	WG4 Validation and evaluation of combined sensing modalities	Joint studies of multispectral imaging technologies and algorithms for skin cancer detection	Progress both in hardware and software solutions for skin diagnostic multispectral imaging