

## STSM REPORT

**STSM Application number:** COST-STSM-BM1205-17629

**STSM Grantee:** Maurizio Dabbicco, prof

**Home Institution:** Dipartimento Interateneo di Fisica “M. Merlin”, Università degli Studi di Bari “Aldo Moro”, Bari, Italy

**Host Institution:** School of Information Technology and Electrical Engineering, University of Queensland, Brisbane, Australia

**STSM period:** 17<sup>th</sup> – 31<sup>st</sup> May, 2014

### **STSM purpose:**

- Designing targeted experiments finalised at distinguishing the role played by scattering, reflectivity and absorption in the actual profile of the LSM signal
- Defining common procedures for the LSM signal processing capable of retrieving the wealth of information on the target, conveyed by the optical feedback and displayed / hidden in the interference.

### **Description of the work carried out during the STSM:**

During this Short Term Scientific Mission, the applicant (prof. Maurizio Dabbicco) joined the group of prof. Aleksandar Rakic in the everyday research activity and laboratory practice. During the mission, the applicant also profited of topical and focussing group meetings. The main topics addressed in the meetings were :

- which would be the most informative and cross-platform (wavelength independent) way to analyse self-mixing imaging in order to extract information not visible to the visual inspection
- which would be the most appropriate chemical marker to perform functional analysis and imaging of healthy and diseased skin tissues
- which could be the actual implementation of self-mixing imaging in a realistic environment

The applicant also benefited of the Host institution extensive on-line library access to update the state-of-art in the field of optical (alternative to dermoscopy) investigation of skin cancer.

Among the scope of the STSM was also the exploration of possible collaborations between the Home and Host institutions related to postgraduate and PhD programs. The applicant had the opportunity to meet the coordinator of the Host institution outreach program and discuss about the actual opportunities offered by a joint PhD program and the way to define a specific agreement between the institutions. The applicant also met one of the coordinators of the innovative education program for undergraduate and master courses at ITEE-UQ and visited the didactics laboratories where tutoring and small groups self-learning are being experienced.

### **Description of the main results obtained:**

During the stay of the applicant at the Host institution, experiments were carried out to imaging ex-vivo skin tissues from laboratory animals by THz optical feedback interferometry. The data were analysed by different information retrieval algorithms in order to choose the most appropriate for each specific case. Clear evidences of the different sample content (in terms of density and stage of tumour cells) could be demonstrated well correlated with the independent assessment provided by the medical doctors.

Experimental data, previously acquired by a member of the Host institution, to investigate the

scattering and the speckle contribution to the self-mixing signal in a blood flow-imaging sensor were discussed and analysed in view of their possible publication.

An internal report about functional imaging of tissues in the mid-infrared spectral region will be prepared based on the bibliographic material collected during the STSM.

A joint experiment has been proposed and agreed about a novel application of a common path interferometer for diffuse reflectance imaging.

The topic of forthcoming collaborations in the framework of H2020 - EU call was defined.

**Mutual benefits for the Home and Host institutions:**

This scientific visit was aimed at sharing research ideas and defining pathways for future collaboration both at scientific and educational level.

During the time of STSM the grantee had the opportunity to visit the research laboratories of the host institution, to get an overview of the different experiments carried on and of the activities planned in the near future. On the other hand he gave a short presentation about the home institution and of the research group involved in feedback interferometry. A few ideas for future joint experimental and theoretical research within the field of terahertz and mid infrared imaging of tissues were discussed which could result in joint publications or conference presentations.

**Future collaboration with the Host institution:**

The collaboration between the institutions is expected to continue both at educational and at research level, with the prospective application to collaborative research funding scheme, particularly FET Open and H2020-PHC-2015-two-stage calls in the framework of the H2020 European program.

Also a joint PhD program is going to be defined between the home and host institutions, and the research group of the home institution will be considered among the hosting groups in the existing Erasmus Mundus program coordinated by Prof. Wilson, UQ, and in the forthcoming Erasmus Plus continuation of the network.

**Foreseen journal publications or conference presentations expected to result from the STSM:**

The proposed experiment will be carried out at the Home institution and jointly analysed by the two groups.

**Confirmation by the host institution of the successful execution of the STSM:**

I acknowledge that the described Short Term Scientific Mission was successfully carried out in the conditions here specified. We established good collaboration with the applicant and I believe that in future this will lead to joint work/publishing.

Brisbane, Australia, June 13<sup>th</sup>, 2014

Prof. Aleksandar Rakic



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Prof. Aleksandar Rakic

ITEE – University of Queensland, Australia

**Other Comments**

I would like to thank the COST Action BM1205 for the support in this exceptional STSM, the ITEE School administrative staff for their efficiency in making my stay as comfortable as at home and the whole group of laser self-mixing research at UQ, Aleks, Antony, Karl, Milan, Stephen, Thomas, Yah Leng for the much helpful discussions, collaborative spirit and coffee-break stimulating chats.