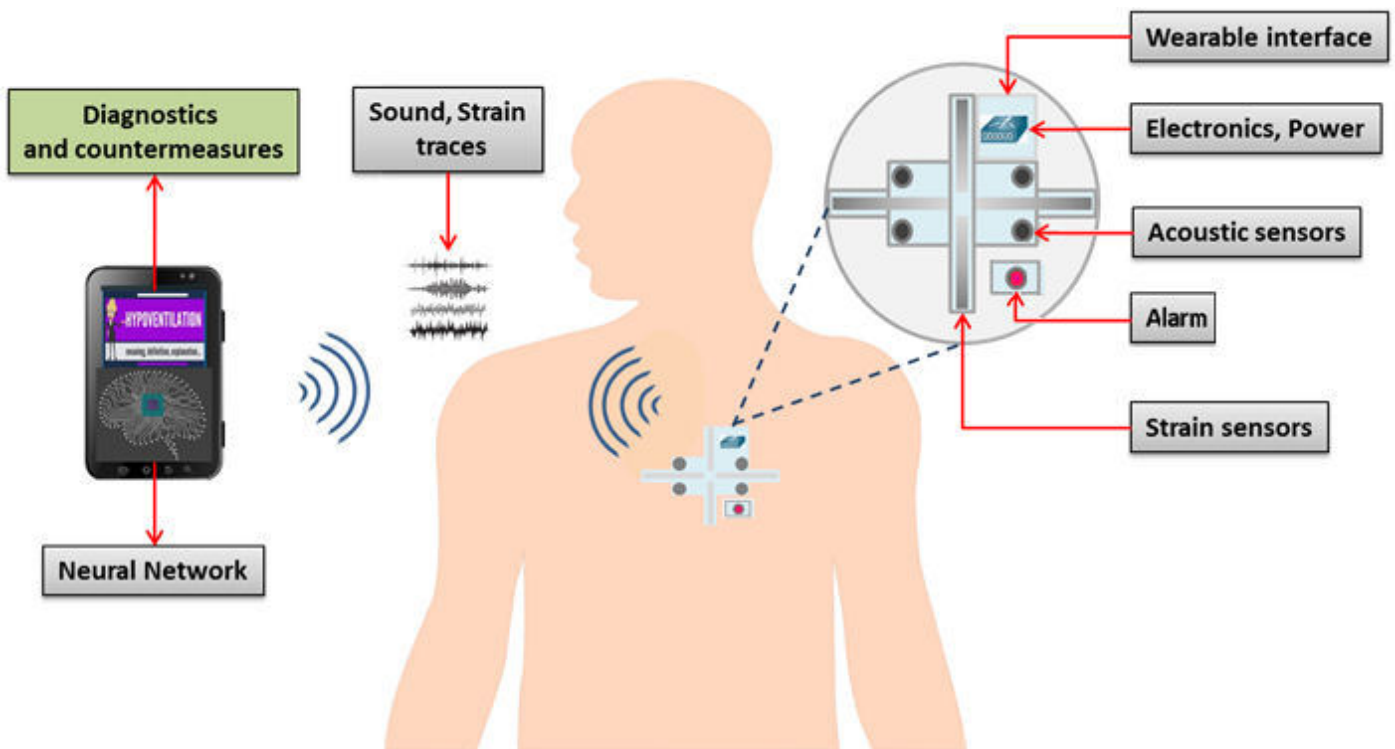


NATO Emerging Security Challenges Division
Science for Peace and Security (SPS) Programme

“Smart Patch for Life Support Systems (SP4LIFE)” – Project G-5825

Kick-off meeting

Wednesday, 10th March 2021, 2:45 PM - 4:45 PM (CET) – Videoconference



NATO SPS Multi-Year Project “Smart Patch for Life Support Systems - SP4LIFE”

AGENDA

Join ZOOM <https://zoom.us/j/98096100711?pwd=UStLV0tpbUJyaVVUK3FHb3Y5WXJoQT09>

(Virtual meeting ID: 980 9610 0711, Passcode 825067)

Institute of Measurement Science, Slovak Academy of Sciences, Dúbravská cesta 9, 841 04 Bratislava, Slovakia

Moderator: Assoc. Prof. Milan Tyšler

2:45 PM	Welcome	Assoc. Prof. Viktor Witkovský – <i>Institute of Measurement Science, Slovak Academy of Sciences, director</i>
2:50 PM	NATO Science for Peace and Security Programme: a common commitment and global challenges	Dr. Eyup Turmus – <i>SPS Advisor and Programme Manager, NATO</i>
3:05 PM	NATO SPS Programme: project evaluations	Assoc. Prof. Karol Nemoga – <i>NATO SPS Independent Scientific Evaluation Group (ISEG) member</i>
3:15 PM	Introduction to objectives, activities and project plan of SPS MYP SP4LIFE	Assoc. Prof. Milan Tyšler – <i>Institute of Measurement Science, Slovak Academy of Sciences, Bratislava, Slovakia & NPD</i>
3:30 PM	PPD SP4LIFE	Dr. Marko Spasenović - <i>Institute for Chemistry, Technology and Metallurgy, Centre for Microelectronic Technologies, Beograd, Serbia</i>
3:40 PM	NPD SP4LIFE	Dr. Carlo Saverio Iorio – <i>Université libre de Bruxelles, Bruxelles, Belgium</i>
3:50 PM	NPD SP4LIFE	Dr. Ana Madevska Bogdanova – <i>Faculty of Computer Sciences and Engineering, Sts Cyril and Methodius, Skopje, North Macedonia</i>
4:00 PM	NPD SP4LIFE	Prof. MD PhD. Oto Masár – <i>Faculty of Medicine in Bratislava, Comenius University in Bratislava, Bratislava, Slovakia</i>
4:10 PM	End users representatives (if present) SP4LIFE	Guillaume Fichet – <i>FlexEnable LTD, UK, Project Manager</i> Dr. Daniel Müller – <i>MyBiotech GmbH, Germany, Director</i> Col. Ing. Pavol Mikulášek – <i>Fire and Rescue Corps, Slovakia, President</i>
4:25 PM	Debate and final remarks	Dr. Eyup Turmus - <i>SPS Advisor and Programme Manager, NATO</i> Assoc. Prof. Milan Tyšler – <i>Institute of Measurement Science, Slovak Academy of Sciences, Bratislava, Slovakia & NPD</i>



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PROJECT OVERVIEW	
<p>The problem and the proposed solution</p>	<p>A wearable patch-like devices capable to collect and analyze information on vital health parameters such as respiration, heart rate, SpO2, ECG, blood pressure and body temperature can help first responders and remote personnel to rapidly implement countermeasures in time of critical events in military and civil scenarios as a result of terrorist attacks, IEDs’ explosions or during rescue operations.</p> <p>The project addresses real-time analysis of individual’s health status in action (e.g. rescuers, emergency crews) and the prompt communication to a team leader that can have critical impact on the outcome of the crisis event. Early diagnosis of the onset of respiratory disorders or cardiac events can help decision-making and improve resource allocation in critical situations.</p> <p>The project is also enhancing reactions in the treatment of wounded victims in order to increase the chance of their survival after a large-scale attack. The device, after the first triangle, will be placed by emergency crews on the chests of yellow- and green-labeled victims. It then generates an alert at the moment the victim’s medical status changes from green-to-yellow or yellow-to-allowing prioritization in medical treatment and ultimately increasing survival probability.</p>
<p>Goals</p>	<p>The objectives of the project are:</p> <ul style="list-style-type: none"> • to develop wearable monitoring platforms with: a.) sensitive respiration, heartbeat and auditory sensors based on graphene, and b.) ECG, SpO2, BP and body temperature sensor modules, • to create a biocompatible wearable body-sensing interface hosting electronics, alarm, low-power transmission for light-weight, portable applications, • to create a software that will generate alert in real time, at the moment of critical physiological parameter changes or changes of the triage medical status according to the START (Simple Triage and Rapid Treatment) algorithm, • to use artificial Intelligence to create unsupervised software capable of real-time diagnostics and rapid countermeasures’ selection, • to analyze existing (AS-IS) processes and consider their re-design (TO-BE processes) in organization of patient management on the site of accident with respect to wearable monitoring technology being developed, • to create a network of young scientists training in soft and hard skills in the wearable electronics for biomedical applications.
<p>Expected Results</p>	<p>The novelty of the proposed solution are the integrated sensors monitoring the heart rate, breathing, temperature and other vital health parameters at once while generating alerts in critical moments when the patient’s health status in the triage process deteriorates. This solution integrates artificial intelligence for a new generation of health monitoring solutions. Within this context, the main expected outcomes of the project are:</p> <ol style="list-style-type: none"> i) innovative types of graphene-based sensors, ii) wearable platform optimized for remote wireless health parameter monitoring, iii) immediate response of the patch-like-device in case of health changes of the emergency crew members or health deterioration of the victim/patient, iv) a database of vital parameters in normal and abnormal bodily functioning, v) updated processes in organization of patient management on the site of accident with respect to the wearable monitoring technology, and vi) new algorithms using AI for predictive modelling of respiratory and cardiac behaviour.



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PARTICIPATING INSTITUTIONS

Institute of Measurement Science, Slovak Academy of Sciences, Bratislava, Slovakia (IMS)

The Institute (<https://www.um.sav.sk>) is oriented to basic research in measurement science and mathematical methods for processing of measured data. It is concentrated to research and development of new methods and systems for measurement in biomedicine and material science. The Institute also offers advisory and expert services related to its research activities, performs postgraduate education, publishes the on-line journal Measurement Science Review and organizes national and international conferences.

With respect to the proposed NATO project there is a long term experience in the Department of Biomeasurements specifically oriented to new measurement technologies and model-based diagnostics of the cardiac electrical activity. Recently this research was supported by two grants from the national grant agency APVV (“Measuring, communication and information systems for monitoring of the cardiovascular risk in hypertension patients”, “Noninvasive localization of ectopic arrhythmias of heart ventricles using ECG mapping and its use for causal therapy”) and two grants from the VEGA grant agency (“Methods and systems for multichannel measurement and evaluation of bioelectric signals of the heart and brain”, “Methods and systems for measurement, displaying and evaluation of the cardiac electrical field at hypertension and hypertrophy”.

The Institute for Chemistry, Technology and Metallurgy in Belgrade, Belgrade, Serbia (ICTM)

ICTM (<https://ihtm.bg.ac.rs/en/>) is the oldest scientific institution in the country, established in 1859 as the State Chemical Laboratory. Having undergone several transformations, ICTM now consists of seven departments performing a broad span of research in chemistry and material science. In 2018 ICTM became one of only five National Institutes, which is a title of highest ranking awarded by a special decree of the government.

The Centre for Microelectronic Technologies (CMT) is a multidisciplinary department with research geared towards fundamental discovery and applications in the fields of sensors, microelectromechanical systems (MEMS), nanoscience and nanotechnology, photonics and plasmonics, as well as semiconductor science and technology. Having developed sensing components from theory to packaging, CMT deployed its sensors to customers in several industries, including gas and oil transportation and electrical power generation. Most recently, since the arrival of the PPD, graphene has become a material of interest with applications in all research directions of the CMT. In particular, graphene microphones and applications of liquid-phase-exfoliated graphene to chemical sensors have gained momentum and ICTM has joined the Graphene Flagship FET project as Associate Member.

Universite Libre of Brussels, Brussels, Belgium (ULB)

The University (<https://www.ulb.be/en/ulb-homepage>), with its central location in Europe, is a multicultural private university. It has currently more than 1600 PhD in progress and is an active member in the Research area that is involved in 130 projects supported by the 7th European Framework Programmes. Among the different laboratories, the Department of Physical-Chemistry of the Faculty of Engineering has many collaboration projects in the field of physics of multi-scale, multi-phase and multi-component fluid systems with a particular emphasis on the processes of heat and mass transfer through fluid interfaces. Collaborations with the European Space Agency represent one of the core activities of the laboratory microgravity applications.

New collaborations have been instituted on sensing platforms based on stretchable biopolymers for biomedical applications. Besides the standard chemical bench facilities, including a chemical hood, the laboratory is equipped with manufacturing tools for rapid prototyping: 3D printer, CO2 engraver Laser, bench cutter. It also offers the software resources for designing and modelling both flow and mechanical parts.



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University “Ss Cyril and Methodius”, Faculty of computer science and engineering, Skopje, North Macedonia (FCSE)

The Faculty of computer science and engineering (<https://www.finki.ukim.mk>) has been and currently is a part of several international and a lot of national R&D projects. FSCE was a part of the NATO project - Science for Peace and Security – SIARS (Smart I (eye) Advisory Rescue System) SfP 984753, 2015-2018. SIARS is about modelling, developing and integration with selected existing Information Systems of a new state-of-the-art telemedical Information Systems that allows saving more injured patients.

Being the largest technical faculty in Republic of N. Macedonia, the FSCE offers wide range of selective courses to its students making different profiles capable to cope with different professional challenges. The FSCE students are familiar with English and the languages of the region. Those facts, with combination with HD video conferencing resources that are on FSCE disposal, ease intensive collaboration with foreign Universities. FCSE is open for collaboration on international projects on different Computer science domains.

Faculty of Medicine in Bratislava, Comenius University in Bratislava, Slovakia (FM)

The Faculty of Medicine (<https://www.fmed.uniba.sk/en/>), which has been developing since 1919, is the first and founding faculty of the Comenius University in Bratislava. The Faculty of Medicine in Bratislava is the largest and oldest medical faculty in Slovakia. From the beginning, the Faculty of Medicine was focused on two tightly interconnected activities, education and research. In the last decade, the research at the Faculty of Medicine is focused on four main research areas: neuroscience, cardiovascular diseases, oncological diseases, metabolic, endocrine, and inflammatory diseases.

In this project the medical experts from emergency medicine clinics of the medical faculty will be involved. Recently the research was supported by several VEGA grants, grants from national grant agency APVV and from Ministry of Health of the Slovak Republic.



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ABOUT THE SCIENCE FOR PEACE AND SECURITY (SPS) PROGRAMME

The NATO Science for Peace and Security (SPS) Programme has been contributing to the core goals of the Alliance for more than six decades. It is one of the largest and most important NATO partnership programmes addressing 21st century security challenges, particularly cyber defence, advanced technologies, counter-terrorism, energy security, and defence against chemical, biological, radiological and nuclear agents. As part of NATO’s Emerging Security Challenges (ESC) Division, the SPS Programme promotes practical scientific cooperation and capacity-building between researchers, experts and officials from NATO and partner countries. By supporting security-relevant activities in the form of grants for multi-year projects, advanced research workshops, advanced training courses, and advanced study institutes, SPS fosters the creation and expansion of networks of international experts, the sharing of best practices, and the exchange of expertise and know-how among scientific communities in NATO and partner countries.

The Programme involves partners across all of NATO’s partnership frameworks (including the Partnership for Peace, the Mediterranean Dialogue, the Istanbul Cooperation Initiatives and cooperation with partners across the globe), through engagements with approximately 2000 experts every year. The Programme also invests in the development of the next generations of researchers, by actively supporting the participation and training of young scientists in its activities. As a testament to the scientific excellence supported by SPS, 21 Nobel Laureates have been involved in its activities since its creation.

The NATO Science for Peace and Security Programme also, provides the Alliance with separate, non-military communication channels by bringing together experts from NATO and partner countries, often in situations or regions where other forms of dialogue more focused on defense and security are difficult to establish. Accordingly, the Programme enables NATO to become involved in such regions, often serving as the first concrete link between NATO and new partners, based on partners’ request for cooperation.

CONTACTS

For more information, please visit the SPS website at www.nato.int/science and follow us on Twitter at @NATO_SPS.

For questions about the SPS Programme, please contact: sps.info@hq.nato.int

For media inquiries, please contact: MOC@hq.nato.int.



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