The NATO Science for Peace and Security Programme

CountryFlyer 2021

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Developing Practical Cooperation through Science

Belarus has been actively engaged within the framework of the NATO Science for Peace and Security (SPS) Programme since 1992.

The NATO SPS Programme enables close collaboration on issues of common interest to enhance the security of NATO and partner nations by facilitating international efforts to meet emerging security challenges, supporting NATO-led operations and missions, and advancing early warning and forecasting for the prevention of disasters and crises.

Current SPS Key Priorities include:

- *Counter-Terrorism;*
- *Energy Security;*
- *Cyber Defence;*
- *Defence against CBRN Agents;*
- *Environmental Security;*
- *Security-related Advanced Technology;*
- *Border and Port Security;*
- *Human and Social Aspects of Security*.

Additionally, the SPS Programme helps to promote *regional security* through scientific cooperation among partners. The Programme also helps to *prepare* interested eligible nations for NATO membership. SPS activities often have a high *public diplomacy* value.

BELARUS

Belarus has completed several activities with the SPS Programme. The leading areas for cooperation include **Security-related Advanced Technology, Defence against CBRN Agents,** and **Environmental Security**. Below are some examples of activities led by Belarus within the framework of the NATO SPS Programme.

Cooperative Activities

ACOUSTIC MULTI-FUNCTIONAL COMPOSITES FOR ENVIRONMENTAL RISKS AND HEALTH HAZARDS REDUCTION

This Multi-Year Project (MYP) aims to advance state-of-the-art material science and nanotechnology for the production of sound-insulating and sound-absorbing materials to reduce the energy of acoustic radiation. This project will significantly reduce the noise levels in specific frequencies and temperature ranges, allowing for the assessment of new properties in acoustic composites and their absorption of electromagnetic radiation on a microwave range. Through this MYP, new scientific data on the effect of nanoscale particles on the loss of sound energy will be obtained. The results will be implemented in the frame of industrial technology. *This activity is led by Belarus and Bulgaria.* [ref. G5790].

LIGHT-MATTER INTERACTIONS TOWARDS THE NANOSCALE

This Advanced Study Institute (ASI) introduced participants to the fields of research that utilize light-matter interactions on the nanoscale, and provided a comprehensive overview of experiments and theory, basic physics and applications, as well as nanofabrication and optical characterization. Speakers introduced participants to the fundamentals of their field before presenting the latest research and practical applications. Participants had the opportunity to interact with lecturers, both formally and informally, over a two-week period. *This activity was led by Belarus and the United States. It took place in Sicily from July to August 2019.* [ref. G5540].

FUNDAMENTAL AND APPLIED NANO-ELECTROMAGNETICS II: TERAHERTZ CIRCUITS, MATERIAL, DEVICES

Nano-electromagnetics is a brand new field of study in the area of nanotechnology, and as such, its potential for defence and security applications has yet to be fully explored. This Advanced Research Workshop (ARW) focused on terahertz applications for nano-electromagnetics, and brought together a network of high-level scientists. The ultimate goal of this workshop was to create links between experts in this new discipline, and to establish the potential for nano-electromagnetics in the defence and security fields. *This activity was led by scientists and experts from Belarus and Italy. It took place in Minsk in June 2018.* [ref. G5409]

QUANTUM NANO-PHOTONICS

The goal of this ASI was to provide young scientists from NATO and partner nations with a clear exposition of the principles of nano-photonics, and the application of nanotechnology to mold the flow of light and control the interactions between light and matter. This helped enable participants to pursue research activities in this field, and to facilitate efforts to move from basic theory to applications, particularly those that are relevant to the defence and security fields. During the ASI, a number of topics related to basic principles and applications were presented. *This activity was led by Belarus and the United States. It took place in Sicily from July-August 2017.* [ref. G5187].

RADIOACTIVE CONTAMINATION IN THE POLESSIE STATE RADIATION-ECOLOGICAL RESERVE

This Multi-Year Project (MYP), which assessed the hazards of radioactive contamination, included the analysis of archival material on contamination levels and field measurements. The primary objective was to develop uniform methods for the sampling and measurement of a number of isotopes in soil and water, and the level of contamination within the Chernobyl exclusion zone and the Khoiniki District of the Reserve. The project teams used data from recent soil samples to study the migration and transport of the contamination through the atmosphere and water. The Ministry of Emergency Situations and Ministry of Environmental Safety and Natural Resources of Belarus have been the main end-users of the project's results. *This activity was led by Belarus, Ukraine, and Norway. [ref. 983057].*

2D MATERIAL-BASED LOW COST SENSOR FOR AGGRESSIVE SUBSTANCES (2DSENSE)

This project aims to develop low-cost sensors for real-time detection of toxic and warfare chemical substances, based on a novel electrical impedance spectroscopy technology. The sensors are based on sensitive nano-membranes composed of 2D graphene structures, which will be integrated into a customized printed circuit board and mounted on chip as, for example, the payload of an Unmanned Aircraft System (UAS). The sensors will target two classes of substances: aggressive warfare agents such as Sarin gas, and heavily toxic industrial pollutants, for instance acetonitrile. An early and reliable detection of such threats is still an open challenge for current conventional solutions. These novel sensors will provide early remote detection of chemical agents in the event of an accident, catastrophe or attack that is paramount for the defence of facilities, infrastructures and the population. *This project is led by scientists from Italy, Belarus and Finland.* [ref. G5777]