OPTIX Report Summary

Project reference: 218037
Funded under: FP7-SECURITY
Country: Spain

Periodic Report Summary - OPTIX (Optical technologies for the identification of explosives)

Project Context and Objectives:

Terrorism, as evidenced by recent tragic events (Madrid 2004, London 2005, New York 2001) is a real and growing threat to Europe and the world. Attacks using improvised explosive devices (IEDs) appear in the news every day. More than 60 % of terrorist attacks are carried out by the use of such explosive devices.

Security forces demand new tools to fight against this threat. One of the most demanded capabilities by end users is that of standoff detection and identification of explosives. Today's technologies are not able to provide these capabilities with the required minimum reliability.

The objective of the project is to contribute to increasing the security of the European citizens by the development of a transportable system for the standoff detection and identification of explosives in real scenarios at distances of around 20 m (sensor to target), using alternative or simultaneous analysis by three different complementary optical technologies such as laser induced breakdown spectroscopy (LIBS), Raman and infrared (IR).

The impact of OPTIX should be reflected in new tools and increased capabilities for first responders (i.e. bomb squads) against the threat imposed by terrorism through the use of explosives. Specific applications of the technology developed in OPTIX will be assessed by end users in the final stages of the project.

Project Results:

The project activities of OPTIX have been initially broken down in 10 work packages (WPs) and distributed along 42 months, an extension of one additional year for the duration of the project has been requested in 2011 due to technical difficulties in the project. The extension has been granted by the Commission and the total duration of the project is 54 months with four reporting periods.

OPTIX will perform important progress beyond the state of the art in three different ways:

1. specific developments regarding the individual core technologies (LIBS, Raman and IR) for standoff detection and identification of explosives
2. specific developments of the enabling technologies being addressed in the project: lasers, spectrometry, optics and data fusion and analysis
3. integration of all technological developments onto a single system, to leverage and enhance the individual capabilities for the standoff detection and identification of explosives.

First stage will be dedicated to the system definition. The project consortium will perform a focussed research on the core optical technologies addressed by the project. Scenarios and system requirements will be defined. This is a key stage for the success and final usefulness of the system from the end user point of view. Workshops with end users will be organised.

Technology development of LIBS, Raman, IR (core technologies) and laser, spectrometry, optics and data fusion (enabling technologies) will follow.

Phase three is system integration and testing, where a single platform will be developed.

Testing will be carried out in laboratories and also in real environment scenarios, adequately supported by end users. Evaluation of results will follow.

Dissemination and exploitation will provide information of the project activities, performance and results, both at public and restricted levels, as well as definition and carrying out the initial exploitation of the outcomes and foreground of

OPTIX. Workshops with end users and other potential stakeholders will take place.

During the third reporting period, the works have been focussed on the following:

LIBS technology

The LIBS system has been integrated in the platform. The main achievements during this period were:

1. the prototype was optimised to work with 532 nm laser to improve the analysis capability
2. improvement of the focussing capabilities of the system in order to induce higher energetic plasma at 20 m
3. good stand-off spectra were achieved with the improved irradiance at target
4. difficulties on the discrimination between elements were identified on LIBS technology
5. redesign of chemometrics analisys of LIBS data due to unexpected changes in the reference spectra when using a different set of spectrometers.

Raman spectroscopy

The Raman sub-system has been fully integrated on the prototype. Its performance has been characterised and good end-spectra has been obtained. Last efforts on chemometrics need to be carried out to obtain a fully automatic response system.

Experimentation with 100 m stand-off prototype owned by Tuwien has continued during this period and the gained knowledge is reported.

IR spectrometry

The main objective for this period was to complete the design and manufacturing of the IR sensor technology for detection of explosive residues on solid surfaces at 20 m.

Although the period has been dominated by technical problems with the quantum cascade laser (QCL) cooling device and the nitrogen dioxide (NO2) probing QCL, finally a laboratory experiment has been set up enabling the investigation of samples in stand-off configuration. Now, the IR prototype is finished and has successfully been tested with nitrogen monoxide (NO) and NO2 test atmospheres.

System

Control software (SW) for automated performance of the prototype was implemented.

Results achieved

The results achieved up to now, in the third reporting period, are summarised in the following bullets:

1. system specification has been reviewed and updated
2. submission to the REA of the deliverables until month 42
3. LIBS and Raman technologies have been integrated into the OPTIX prototype that is available at the University of Malaga
4. different configurations of spectrometers have been tested to try to improve the LIBS response of the system at 20 m
5. the laser delivery system has been reworked in order to meet the irradiance requirements of OPTIX
6. IR prototype is finished and has successfully been tested with NO and NO2 test atmospheres. The subsystem has been optimised by the University of Clausthal in parallel with the integration of LIBS and Raman although problems with the performance of QCL prevented the integration of the IR prototype into the OPTIX systems.

Potential Impact:

Final expected results:

1. improved capabilities of LIBS, Raman and IR for the detection of explosives at standoff distances
2. enhanced spectrometrics for an integrated OPTIX system
3. advanced data fusion and chemometrics algorithms
4. a technology demonstrator capable of detecting explosive traces at distances of 20 m
5. demonstrated capabilities of the developed system to end users and to additional stakeholders as needed.

List of Websites:

http://www.fp7_optix.eu

Contact

Serrano Olabarri, Leire (Deputy Project Manager)
Tel.: +34 91 480 83 97
Fax: +34 914806031

Subjects

Security

Information source: SESAM
Collaboration sought: N/A

Last updated on 2013-08-14
Retrieved on 2016-07-20

Permalink: http://cordis.europa.eu/result/rcn/57828_en.html