

# Radiological Instrumentation for Border Monitoring in Belarus

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## Introduction

Illicit trafficking of nuclear material. EU nuclear security programme. EU frontier security. Frontier policies and monitoring equipment for bordering 'buffer' countries. European Commission. Joint Research Centre.

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## Objectives

To facilitate the procurement and deployment of Radiation Portal Monitors (RPMs) and mobile laboratories to increase the number of protected checkpoints along the 1250 km border that Belarus shares with EU countries (Poland, Lithuania and Latvia).



Fig 1: Belarusian Borders

The EU aims to protect EU external frontiers by providing non-repayable technical assistance to qualifying 'buffer' countries such as Belarus. AMEC provided technical support to the Nuclear Safeguards Unit of the Joint Research Centre in the derivation of technical specifications for the purchase of radiometric monitoring instrumentation.

Illegal transit through Belarus are mainly via arterial roads:

- Poland - Russian Federation
- Lithuania - Ukraine
- Ukraine - Russian Federation (via Belarus)

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## The Problem

Trying to detect: Illicit radioactive and nuclear materials; fissile material, actinides; alpha, beta, gamma, neutron; radioactive sources; alpha, beta, gamma, neutron (AmBe sources, gauging sources).

But also likely to detect: Gamma background (can vary with meteorological conditions, e.g. rain increasing radon washout); NORM in containers – e.g. bricks, porcelain, fruit; contaminated scrap; legitimate transport of radioactive materials.

False alarms are an issue as each detection event must be fully investigated! Some events display complex gamma spectra which require the support of external experts to resolve.

During 2009-2010 the Border Guard Service specialists detected and investigated more than 270 radiation alarm events.



Fig 2: Legitimate materials

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## Instrumentation Requirements

Border Control Points are to be provisioned with additional vehicle radiation portal monitors (RPMs) and personal radiation detectors (PRDs).

Mobile quick-response laboratories are to be deployed following an alarm at the Border Control Point and are to be equipped with personal radiation detectors, radiation identification devices, portable radiation scanners and personal dosimeters.

Considerations:

- Radiological performance – radiation type/energy, efficiency, size, spectroscopic information
- Environmental factors – temperature, humidity, condensation, corrosion, microphonics (strong winds)
- Operational Parameters and System Security – user/expert menus, constraints on vehicle speed
- Maintenance and Serviceability – function checks, ease of repairs, failure rate, warranty period, future availability of spares

In order to correctly identify radioactive material, a range of instruments is often needed. In addition to deploying the correct equipment, it is also important that the individuals responsible for using the instruments have a good understanding of radiation, the strengths and limitations of each instrument, and of how to interpret and respond to any alarm signals.



Fig 3: Border checkpoint



Fig 4: Mobile laboratory

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## Technical Specifications

The technical specifications were based upon the following standards and guidance: Installed:

- IAEA Technical Guidance Reference Manual Nuclear Security Series No. 1 Technical and Functional Specifications for Border Monitoring Equipment (2006) [under revision];
- IEC 62244 – Installed radiation monitors for the detection of radioactive and special nuclear materials at national borders;
- IEEE ANSI N42.35-2006 Evaluation and performance of radiation detection portal monitors for use in homeland security.

Portable:

- IAEA Technical Guidance Reference Manual Nuclear Security Series No. 1 Technical and Functional Specifications for Border Monitoring Equipment (2006);
- IEC 62401 – Alarming personal radiation detectors for detection of illicit trafficking of radioactive material;
- BS EN 61526:2007 - Radiation protection instrumentation, Measurement of personal dose equivalents Hp(10) and Hp(0,07) for X, gamma, neutron and beta radiations, Direct reading personal dose equivalent meters and monitors, (IEC 61526:2005, modified);
- IEC 62327 – Hand held instruments for the detection and identification of radioactive isotopes and additionally for the indication of ambient dose equivalent rate from photon radiation;
- BS IEC 62534:2010: Highly sensitive hand-held instruments for neutron detection of radioactive material, BS IEC 62533:2010: Highly sensitive hand-held instruments for photon detection of radioactive material.

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## Further Information

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