

Testing of CBRNE detection systems – standardization is needed

Strebl, F.; Schröttner, T., Munoz, D., Wästerby, P., Broekhuijsen, M.,
Miller, M., Ewert, U., Osterloh, K.; Foghelin, J.

CREATIF Network



- 30-month FP7-funded coordination action
- Network of testing facilities for CBRNE detection systems
- Core group of testing facilities (network members)
- Advisory committee of stakeholders
 - End-users, manufacturers, policy makers, researchers
- No research - but:
 - Foster communication - discussion & knowledge exchange
 - Define needs for further development & propose further actions
 - Initiate actions (e.g. standardization projects)

CREATIF – Main objectives



- Collect information on facilities, capabilities, used protocols
- Develop best practise of testing
- Harmonisation of testing – improve comparability
- Standards for testing of detection systems
- Define intercomparison exercises
- Suggest improved protocols
→ Human factors & Operational testing
- Certification strategy for testing centers & products

CBRNE - definition



- **C** - chemical
- **B** - biological **threat**
- **RN** radiological/nuclear **substances**
- **E** – explosives

- Chemical warfare agents (CWA), toxic industrial chemicals (TICs)
- Bacteria, virus, spores (pathogens); biological warfare agents (BWA)
- Radionuclides (open/sealed sources; “dirty bomb”), fissile material
- Energetic materials, explosives or precursors

CBRNE detection systems



- Technologies differ based on intended function
 - Warning, monitoring & surveillance,
 - Point detection of threats,
 - Confirmation of threat & identification of substance
- Products differ based on the intended use / scenario
 - Hand-held devices
 - mobile (field) laboratory, truck-mounted
 - fixed systems (portals, stand-off sensor networks)
- Specifics of testing
 - Aerosol generation (C,B) / particle sizes / agent concentrations
 - Reference materials (simulants for B, C; E; sources for R/N)
 - Environmental conditions

Chemical detection systems



- Technologies currently in use for C threats:
 - Ion mobility spectrometry (IMS)
 - Colorimetric technology (colorimetric tubes, tapes)
 - Micro sensors (e.g. SAW, MEMS)
 - Electrochemical (EC) technology
 - Gas chromatography-Mass Spectrometry (GC-MS)
 - LIDAR (Light Detection and Ranging) stand off detection

Biological detection systems



- Technologies less mature, few systems on the market
- Unspecific monitoring/detection systems
 - Doppler Radar
 - LIDAR (Light Detection And Ranging)
 - LIBS (Laser Induced Breakdown Spectroscopy)
- Identification systems (sample analysis)
 - PCR / DNA based diagnosis of pathogens
 - Immunoassay (pathogen-specific antibody reaction)
 - Lab on a chip

Radiation detection systems



- Available types of detectors for R/N
 - **gas counter** (cheap, ruggedized), no identification
 - **scintillation** (good value for money → most popular)
 - **semiconductor** (expensive, very sensitive, delicate to handle)
- Many products on the market, fit to operational needs
- Standards for testing available (portals, hand-held)

Explosives detection systems



- Trace detection vs. bulk detection
- Technologies for **trace detection**
 - Ion Mobility Spectrometry (IMS)
 - Chemiluminescence (CL)
 - Amplifying Fluorescent Polymers (AFPs)
 - Energetic materials detection (EMD)
 - Quartz Microbalance (CM)
- Technologies for **bulk detection**
 - X-ray
 - Terra-Hertz

Standards for Testing - CBRNE



ECAC protocols (European Civil Aviation Conference)	
ASTM F 2069 – 00	Standard Practice for evaluation of explosives vapor detectors (withdrawn 01/2009)
ASTM E2520 – 07 (international/US)	Standard Practice for Verifying Minimum Acceptable Performance of Trace Explosive Detectors
DSTO-TR-2033 (Australia)	Standard Protocol for the Evaluation of Explosive Detection Equipment
NIJ Report 100-99 U.S. Dept. of Justice	Evaluation of a Test Protocol for Explosives Trace Detectors Using a Representative Commercial Analyzer

- NO European standards,
- for aviation accepted protocols

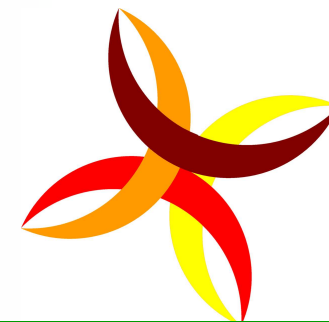
Standards for Testing - CBRNE



Nuclear Security Series 1 , IAEA, 2006	Technical and functional specification for border monitoring equipment: reference manual
10 ANSI Standards + 6 Draft standards	Alarm dosimeters – Spectroscopic systems Detectors for control of cargo and humans
3 IEC Standards (SC 45B) + 4 Draft standards	Detection systems against Illicit Trafficking hand-held and portal monitors

- Many standards for testing of detectors available
- European Standards in progress (IEC adopted by CENELEC)

Standards for Testing - CBRNE



-

No Standards available

- only internal protocols used for testing of equipment
- NO standards exist, need to be developed

Standards for Testing - CBRNE

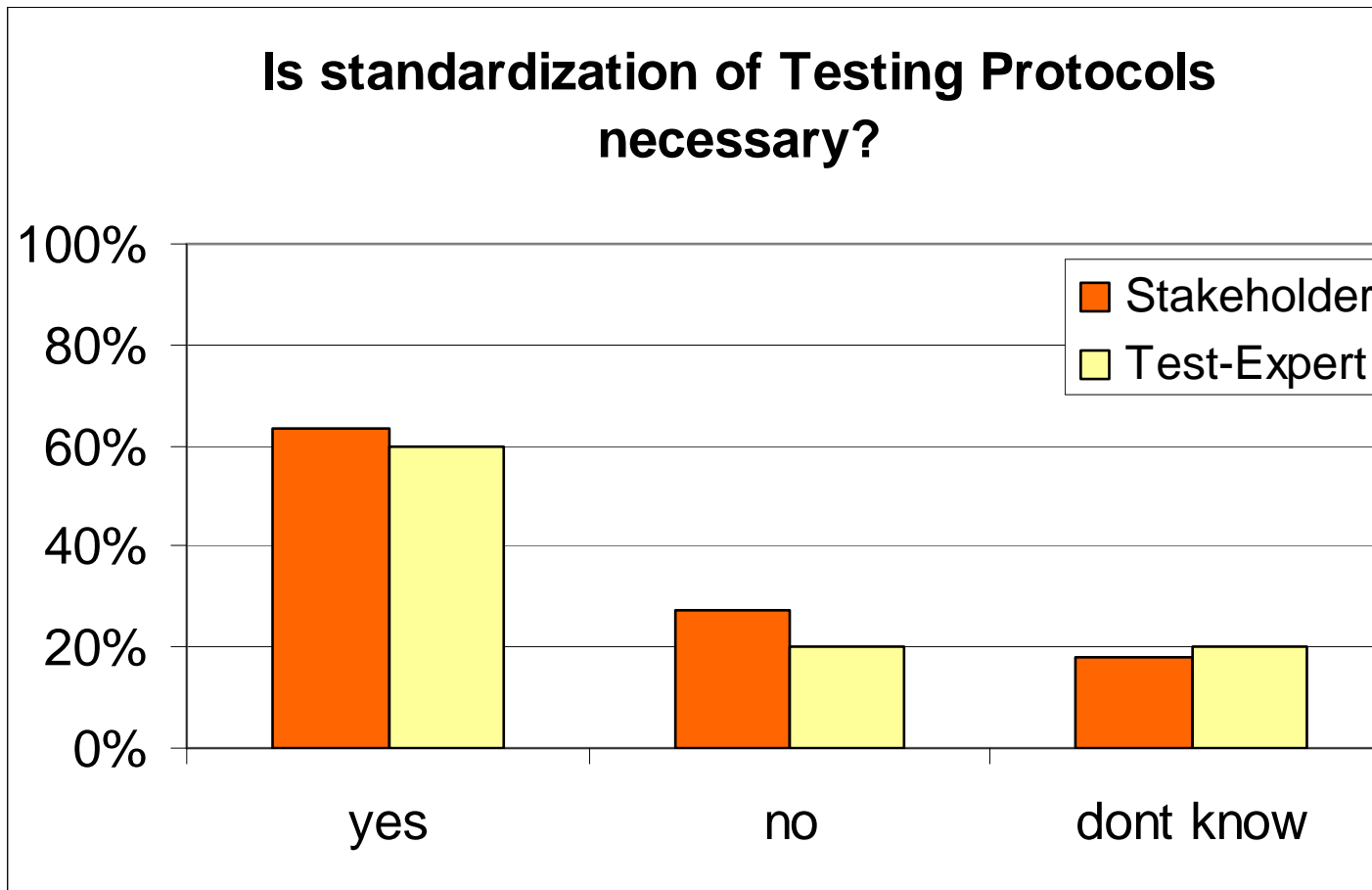


NATO requirements, OPCW recommendations (no public information!)

No standards available

- military protocols used for testing of equipment
- NO civilian standards exist

CREATIF – Results of Questionnaire



N = 25

Standardization needs



- R: many standards (ANSI, IEC, IAEA) available
 - Don't reinvent the wheel → transfer of existing standards to European (CEN/CENELEC) in progress
- C / E: develop European civilian standards
- B: start work on harmonization of protocols for testing (aerosol generation, simulat agents)
- Develop complementary testing standards
 - Human factors, usability, operational issues

Conclusions



- CBRNE is a cross-border / European issue
- European standards support
 - Interoperability across countries
 - Open the European market for tested products
 - Comparability of testing results
 - Trust of end-users in products & decision making supported by uniform testing results
- CBRNE detection testing open to profit from existing standardization knowledge (CEN; ETSI; CENELEC)

Contact



CREATIF co-ordinator:

friederike.strebl@seibersdorf-laboratories

More info:

<http://www.creatif-network.eu>