

# “ALARA issues arising for safety and security of radiation sources and security screening devices” – Summary and recommendations of the 12th European ALARA network workshop

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**ABSTRACT** The 12th European ALARA Network (EAN) workshop on “ALARA issues arising for safety and security of radiation sources and security screening devices” took place in Vienna (Austria) in October 2009. The aim of that workshop was to consider how the implementation of ALARA<sup>3</sup>, in terms of planned and emergency situations, involving worker and public doses, is affected by the introduction of security-related measures. In the case of new equipment and procedures, there was also the question of whether exposures arising from security screening devices can be justified and optimised. This workshop consisted of invited oral presentations, which highlighted the main issues, and half of the programme was devoted to discussions within working groups on specific topics. During their discussions, the working groups identified recommendations dealing with the following topics: the implementation of the Code of Conduct and HASS<sup>4</sup> – ensuring ALARA; balancing security and safety – how to achieve an optimum solution; the management of an emergency exposure situation from an ALARA perspective; the justification and optimisation of the use of security devices. The objective of this paper is to present the main conclusions and recommendations produced during the workshop. *Individual presentations (papers and slides) as well as the reports from the working groups are available to download on the EAN website (<http://www.eu-alara.net>).*

**Keywords:** ALARA / safety / security / radioactive sources / recommendations

**RÉSUMÉ** « Prise en compte du principe ALARA dans le domaine de la sûreté et la sécurité des sources radioactives, et dans l'utilisation de dispositifs de contrôle pour la sécurité » – Résumé et recommandations du 12<sup>e</sup> séminaire du réseau ALARA européen.

Le 12<sup>e</sup> séminaire du réseau ALARA européen (EAN) sur la « *Prise en compte du principe ALARA dans le domaine de la sûreté et la sécurité des sources radioactives, et dans l'utilisation de dispositifs de contrôle pour la sécurité* » s'est tenu à Vienne (Autriche) en octobre 2009. Le but de ce séminaire était d'examiner la compatibilité de la mise en œuvre du principe ALARA avec l'introduction croissante de nouvelles

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<sup>3</sup> As Low As Reasonably Achievable

<sup>4</sup> High Activity Sealed Sources

mesures de sécurité. Les différentes situations d'exposition (du public ou des travailleurs), qu'elles soient planifiées ou d'urgence, ont été examinées. Par ailleurs, les questions de la justification et de l'optimisation des expositions induites par les nouveaux dispositifs, équipements et procédures de contrôle de sécurité ont été abordées. Cet article synthétise les discussions et les recommandations émanant des présentations orales et de la restitution des travaux en groupes réalisés à l'occasion du séminaire. Elles portent en particulier sur les thématiques suivantes : la mise en œuvre du code de conduite de l'AIEA et de la Directive européenne sur les sources scellées de haute activité (HASS) ; les compromis entre les principes de sûreté, de sécurité et d'optimisation ; l'optimisation de la radioprotection dans le cadre de la gestion des situations d'exposition d'urgence ; les principes de justification et d'optimisation dans l'utilisation de dispositifs de contrôle pour la sécurité. *Les présentations orales (articles et diapositives) et les conclusions des groupes de travail organisés à l'occasion du séminaire peuvent être téléchargées depuis le site Internet du réseau EAN (<http://www.eu-alara.net>).*

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## 1. Workshop background, objectives and programme

Radiation protection has always included security-related provisions (for example, to prevent the unauthorised use of sources), which have contributed to the overall system of radiation safety. In recent years, however, interest in security issues has dramatically increased and the challenge is to ensure that safety and security measures are designed and implemented in an integrated manner so that security measures do not compromise safety and *vice versa*.

The aim of the workshop was to consider how the implementation of ALARA, in terms of planned and emergency exposure situations, involving worker and public doses, is affected by the introduction of security-related measures. In the case of new equipment and procedures, there is also the question of whether exposures arising from security screening devices can be justified and optimised. In addressing these issues, the workshop tried to consider how an optimum balance between protection, safety and security can be achieved.

As with previous workshops, half the programme time was devoted to presentations, and half to working group discussions and their findings. Participants had the opportunity to consider the findings of each group, contribute to discussions, and formulate the final conclusions and recommendations of the workshop. There were 56 participants from 16 different countries, and a total of 24 oral presentations and 2 posters, arranged under the following sessions:

- Introduction and scene-setting;
- Security and safety measures;
- Planned exposure situations;
- Emergency situation management (especially due to malevolent acts);
- Justification and optimisation of doses in the use of security devices.

Two afternoon sessions were set aside for working group discussions, based on the following topic areas:

- Implementation of the Code of Conduct and HASS – ensuring ALARA;
- Balancing security and safety – how to achieve an optimum solution;
- Management of emergency exposure situations from an ALARA perspective;
- Justification and optimisation of the use of security devices.

On the final day, the reports from the groups were presented and discussed, and form the workshop conclusions and recommendations described later. Individual presentations (papers and slides) and the working group reports are available to download from the EAN website (<http://www.eu-alara.net/>).

## 2. Themes and issues arising

The introductory session focused on international developments, in particular from the European Commission (*e.g.*, security of HASS<sup>5</sup>; plan on countering CBRN<sup>6</sup> threats; European Commission, 2003; Tanner, 2009; Stoppa and Seifzig, 2009), IAEA (*e.g.*, the Code of Conduct on the Safety and Security of Radioactive Sources; IAEA, 2004; Mansoux, 2009) and from ICRP recommendations (Publications 103, 109, and 111; ICRP, 2007, 2009a, 2009b; Lochard, 2009). The first two of these have largely been implemented successfully. It was noted that many security-related documents were originally issued as stand-alone documents, but the trend now was to integrate safety and security requirements, either into the same document, or at least into comparable document structures. Further integration is envisaged through the eventual harmonisation of HASS thresholds and IAEA D-values (IAEA, 2006; Häusler, 2009).

The new ICRP system of exposure situations was presented (Lochard, 2009), for which dose constraints (for planned exposure situations) and dose reference levels (for emergency and existing exposure situations) should be set as an upper bound on the optimisation process. The message from the workshop is that there is still much work to do in terms of implementing these recommendations in practice. For example, there are questions about when the different exposure situations apply, what the actual values of dose constraints and reference levels should be, and how to apply optimisation below these values. There is now the opportunity to provide feedback to international bodies on many of these issues, and it was suggested that EAN should help by collating comments from its members.

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<sup>5</sup> HASS: High Activity Sealed Source.

<sup>6</sup> CBRN: Chemical, Biological, Radiological, and Nuclear.

The 2nd session raised a number of interesting issues on the balancing of safety and security measures. Although both can be said to share a common goal – protecting people from harm – there is a difference in approach. Safety mostly focuses on the control of the source, whereas security is concerned with controlling the actions of (certain) people. These differences have practical implications; for example, safety relies on sharing information and mutual trust, whereas security may require the opposite (Hardeman and Vermeesch, 2009). The workshop contained a number of presentations on the security measures being applied to different practices (Øvergaard and Hustveit, 2009; Hutton *et al.*, 2009; Kopp, 2009; Redmer *et al.*, 2009; Fasten, 2009). Most of these described source-related controls (*e.g.*, physical security measures), for which there would seem to be a good synergy between safety and security, even though the approach does have to be tailored to different sectors.

In contrast, people-related controls (*e.g.*, security checks and surveillance) were not discussed in any detail, and this may well be an area where there is more potential for conflicting requirements.

The session on planned exposure situations encompassed both normal operations (*i.e.* in which measures are taken to counter security threats; Dimitriou, 2009) and the recovery of orphan sources (Chelidze and Nabakthiani, 2009; Ortiz, 2009). Examples were given of training programmes for staff involved in both these activities (Dimitriou, 2009; Strobl *et al.*, 2009; Strelb and Schwaiger, 2009). Such programmes can involve large numbers of persons and require much greater resources than have traditionally been devoted to radiation safety training – perhaps a reflection of the societal importance assigned to security issues.

Dose constraints for security-related staff were mentioned several times; with the consensus being that 1 mSv per year was appropriate in most cases (Dimitriou, 2009; Prlić *et al.*, 2009). There was less information on dose constraints for recovery staff; further developments and exchanges of information in this area would be useful.

The same issues – staff training and dose reference levels – were raised in the 4th session in relation to emergency situation management (Blaickner and Geringer, 2009). In this context, training is important not only for radiation protection purposes but also to ensure that the emergency response is proportionate, and that the level of risk (especially to the public) is communicated in a consistent manner (Kröger and Maier, 2009a). More generally, as recommended in ICRP publication 109, the national authorities should prepare plans for all types of emergency exposure situations, and relevant stakeholders should be consulted during this process (Lochard, 2009; Buglova, 2009; Vermeesch *et al.*, 2009). Dose reference levels for emergency responders are beginning to emerge – these are

within the range of values recommended by ICRP, although there are significant differences in the values being proposed in different countries (Kröger and Maier, 2009b). There is also an operational need for derived reference levels, in terms of dose rate and contamination levels, to help guide the optimisation process on the ground (Tattersall, 2009). Again, further developments and information exchange in these areas would be useful.

The final oral session considered radiation sources used for security purposes, which continue to increase in type and number. In many cases, these new practices can be managed through the normal requirements for planned exposure situations (Prlić *et al.*, 2009), although there are some reservations in relation to the safe use of certain types of portable equipment (Neumaier *et al.*, 2009). Special attention was given to the introduction of X-ray security screening devices (“body scanners”) at airports and other locations (MacDonald, 2009). The consensus was that such devices must still be subject to controls, even if the dose per scan is extremely low (*e.g.*, as is the case with backscatter scanners). Furthermore, each type of use/location should be subject to the justification principle, to prevent widespread and indiscriminate scanning of the public.

### **3. Workshop conclusions and recommendations**

As mentioned above, the working group reports, containing details of the discussions, conclusions and recommendations, are available at <http://www.eu-alara.net/>. A brief summary of these is given below.

#### ***3.1. Implementation of the Code of Conduct and HASS – ensuring ALARA***

- EAN should assist in compiling feedback for the EC on the practical implementation of the HASS directive.
- Better cooperation and information exchange between EU regulatory authorities on the movement of sources between Member States is necessary.
- EC Regulation 1493/93 should be reviewed to ensure that it is consistent with IAEA guidance on import/export of radioactive sources.

#### ***3.2. Balancing security and safety – how to achieve an optimum solution***

- The justification of a practice is a safety judgement, but security should be considered as an integral part of the licensing and inspection process.
- Safety and security can be integrated and made to work in practice, and both should be proportionate based on realistic assessments of the credible risks, both due to accidents and malevolent acts.
- As experience is gained, more could be done to establish harmonised international security levels and controls for different categories of sources.

### ***3.3. Management of emergency exposure situations from an ALARA perspective***

- The potential radiation exposures to different persons (responders, public, etc.) from different emergency scenarios should be assessed in order that a proportionate response, including practical protection and communication strategies, can be planned.
- Plans must be flexible. In the event of an emergency it is important for the actual radiological conditions to be assessed as soon as possible, to help direct the response and facilitate information exchange between the agencies involved.
- Training of responders is essential and, where possible, should be harmonised so as to develop a “common language” of protection.

### ***3.4. Justification and optimisation of the use of security devices***

- The use of ionising radiation for security purposes should not be trivialised. Thus, even when individual doses are low, the use of security screening devices should still be subject to regulatory control, with different types of use subject to specific justification.
- Public doses should be below the 0.3 mSv/y dose constraint, with a requirement for further optimisation below this dose. In practical terms this requires much lower reference doses for individual scans, with further optimisation applied through the correct setting up, operation and quality assurance of scanning systems. To this end, draft IEC standard 62463 should be agreed and adopted.
- Where possible, persons should be informed prior to being scanned, and an alternative to X-ray scanning should be available upon request.

The next EAN Workshop, on “ALARA in the Medical Sector”, is planned for 7-10 of June 2011, in Norway. Details will be announced on the EAN website.

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