

**The IAEA's Programme on
Environmental Modelling for Radiation Safety
(EMRAS II)**

**EMRAS II
Approaches for Assessing Emergency Situations
Working Group 9
"Urban" Areas**

MINUTES

**of the Fourth WG9 Meeting held at the University of Seville, Spain
8–10 June 2010**

IAEA Scientific Secretary	Working Group Leader
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Attending	
Name / Initials* / Email	Organization / Country
Mr Kasper G. Andersson (KGA) (kasper.andersson@risoe.dk)	Technical University of Denmark (DTU), DENMARK
Mr Govert de With (GDW) (g.dewith@nrg.eu / dewithgovert@yahoo.co.uk)	Nuclear Research & Consultancy Group (NRG), NETHERLANDS
Mr Vladimir Fuka (VF) (vladimir.fuka@gmail.com)	Charles University, CZECH REPUBLIC
Mr Jan Helebrant (JH) (jan.helebrant@suro.cz)	National Radiation Protection Institute (SÚRO), CZECH REPUBLIC
Mr Petr Kuca (PK) (petr.kuca@suro.cz)	National Radiation Protection Institute (SÚRO), CZECH REPUBLIC
Mr Francesco Mancini (FM) (fmancini@sogin.it)	SOGIN S.p.A, ITALY
Mrs Emilie Navarro (EN) (emilie.navarro@irsn.fr)	Institut de Radioprotection et de Sûreté Nucléaire (IRSN), FRANCE
Mr Raúl Periañez (RP) (rperianez@us.es)	University of Seville, SPAIN
Mr Gert Sdouz (GS) (gert.sdouz@ait.ac.at)	Austrian Institute of Technology (AIT), AUSTRIA
Mr Dejan Trifunovic (DT) (dejan.trifunovic@dzns.hr)	State Office for Nuclear Safety, CROATIA
Ms Laura Urso (LU) (Laura.Urso@helmholtz-muenchen.de)	Helmholtz-Zentrum München GmbH, German Research Center for Environmental Health, GERMANY
Mr Hartmut Walter (HW) (hwalter@bfs.de)	Bundesamt für Strahlenschutz (BfS), GERMANY

* Initials used to refer to participants within minutes and actions as appropriate.

Background

The EMRAS II Theme entitled “Approaches for Assessing Emergency Situations”, includes three areas of interest in connection with emergencies or accidental releases of radionuclides. These areas include urban situations (dispersion and retention of radionuclides in urban environments), environmental sensitivity of various non-urban or rural situations, and tritium accidents. The Urban Areas Working Group (WG9) is continuing with and building on the work done by the Urban Remediation Working Group of the first phase of the EMRAS Programme. In particular, WG9’s goal is to test and improve the capabilities of models used in assessment of radioactive contamination in urban settings, including dispersion and deposition events, short- and long-term contaminant redistribution following deposition events, and potential countermeasures or remediation efforts for reducing human exposures and doses.

At its initial meeting in January 2009, the Working Group identified three modelling exercises to be developed and carried out by the group:

- (a) Atmospheric dispersion, short-range;
- (b) Atmospheric dispersion, mid-range; and
- (c) Contaminant transport and countermeasures.

At this meeting, WG9 discussed the first two modelling exercises, including preliminary modelling results, progress to date, and plans for continuing work. Most of the participants interested in the third modelling exercise were unable to attend this meeting, so discussion of that exercise was postponed until the January 2011 meeting.

Working Group attendance

The fourth meeting of WG9 was hosted by Raúl Periañez of the University of Seville, Spain, at the University's Centro de Investigacion Tecnologica e Innovacion (CITIUS). Thirteen participants from 10 countries attended the fourth meeting of WG9. The sessions were moderated by *KMT*, and *VB* served as the IAEA’s Scientific Secretary. A list of the attending participants is provided above.

Scope and objectives of the meeting

The main objectives of the meeting were to:

- (1) discuss the status of each of the two modelling exercises dealing with atmospheric dispersion and identify any remaining information needs;
- (2) present and discuss modelling approaches and preliminary modelling results for each of these exercises; and
- (3) establish appropriate schedules for completing these two modelling exercises.

A copy of the WG9 Agenda for this meeting is provided at the end of these Minutes.

Work performed

Most of the meeting time was spent discussing preliminary modelling results for the two modelling exercises dealing with atmospheric dispersion, together with plans for their completion. Several participants provided presentations about the exercises, their models or modelling approaches for a given exercise, or preliminary modelling results.

Outcomes of the Meeting

Short-range atmospheric dispersion exercise

The short-range atmospheric dispersion exercise is based on data from experimental explosions contributed by Jiří Hůlka and colleagues at SÚRO, Czech Republic. This exercise permits comparison of model predictions with measurements for several endpoints, including surface contamination, time-

integrated air concentrations, and dose rates, up to 50 m downwind. Intercomparisons of model predictions are possible for additional endpoints, including surface contamination, time-integrated air concentrations, and dose rates at distances greater than 50 m; estimates of a 95% contamination zone; the effects of structures on the predicted dose rates; and validation of location factors.

The initial version of the Scenario Description requested blind modelling tests of two explosion events (December 2007 and May 2008). During the Second WG9 Meeting (held at SÚRO Headquarters, Prague, Czech Republic, 13–15 July 2009), it was decided to use these first two events for model calibration purposes and to carry out blind testing of models for two subsequent explosion events (May 2009 and July 2009). During the third meeting (January 2010), the modelling domain was extended beyond the range for which measurements are available (50 m downwind), out to 2000 m downwind and 100 m upwind.

At this meeting, **JH** and **PK** presented a video of additional tests (with and without radioactivity) that have been carried out by SÚRO since the July 2009 test. Presentations of modelling approaches and preliminary calculations for earlier tests (2007–2009) were made by **RP**, **HW**, **GDW**, **VF** and **DT**. Presentations were also received from Tom Charnock (United Kingdom) and Sohan Chouhan (Canada), who were unable to attend the meeting. **LU** contributed a presentation comparing data from two of the tests with values expected using a Gaussian model. All of these presentations are now available in the WG9 web folder (<http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-nine.asp?s=8>).

The WG decided to pursue two approaches to the modelling for this scenario: Approach 1, with several parameters specified (see Table 1 below), and Approach 2, with the modeller's choice of parameters as desired, in accordance with individual opinions or interests. The target date for specification of the parameters is the end of June 2010. Model calculations are requested by the end of November 2010, in advance of the next (fifth) WG9 Meeting in January 2011. At the next WG9 Meeting, the discussion will include comparisons of the model predictions with each other and with the available measurements.

WG9 would like to acknowledge the very important contribution made to the Working Group efforts by Jiří Hůlka, Petr Kuca, Jan Helebrant, and their colleagues at SÚRO. Their experimental efforts, and their willingness to share their data, have made possible this unique modelling exercise, which is of great importance to a number of organizations and countries in their ongoing efforts to understand dispersion and deposition of radioactivity in the aftermath of an explosion. We encourage SÚRO to continue these experimental efforts, and we encourage continued support of SÚRO's efforts by their funding agencies.

Mid-range atmospheric dispersion exercise

The mid-range atmospheric dispersion exercise is based on a hypothetical NPP accident and the resulting predicted deposition in an urban environment. **EN** provided an accident scenario previously developed in France for use as source term information, and **RP** provided relevant geographic data for the Trillo NPP in Spain, including nearby urban areas. This is a model intercomparison exercise for all endpoints, including deposition on a reference lawn surface at selected locations and time-integrated air contamination.

The scenario is based on a 1 hour release from a hypothetical rupture of a steam generator tube. Although several radionuclides would be released, the modelling exercise concentrates on ¹³¹I and ¹³⁷Cs. Modellers may use the release data either in terms of the time-dependent release or the total release.

Presentations of modelling approaches and preliminary calculations for the mid-range scenario were made by **RP**, **GS**, **FM** and **DT**. The point was made that various models should be considered with respect to their stated purposes and associated limitations. All calculations for this exercise (including revised calculations and any additional calculations) are requested by the end of November 2010, in advance of the next (fifth) WG9 Meeting.

Contaminant transport and countermeasures exercise

The contaminant transport and countermeasures exercise starts with a defined (hypothetical) radionuclide concentration in air, in parts of a city (Seoul) for which detailed geographic and building information is available. The scenario starts with a radionuclide concentration in air (^{60}Co or ^{239}Pu), with deposition for each site to be predicted based on weather conditions (i.e., dry, light rain, heavy rain). This is a model intercomparison exercise for all endpoints, including dose rates, countermeasure effectiveness, and doses for specified reference individuals. A revised Scenario Description was distributed soon after the third WG9 Meeting. Most of the participants interested in this modelling exercise were unable to attend this meeting, so discussion of the exercise was postponed until the January 2011 meeting. All calculations for this exercise are requested by the end of November 2010, in advance of the next (fifth) WG9 Meeting.

Future plans and next meeting

The next (fifth) WG9 Meeting will take place as part of the Third EMRAS II Technical Meeting, being held at IAEA Headquarters in Vienna, 24–28 January 2011. As described above, calculations for all three modelling exercises are requested in advance for discussion at the meeting.

Table 1. Parameter specification for the short-range modelling exercise*.

Parameter	Description
Column (plume) height	Based on experimental data for each test (other dimensions might be different at different heights).
Column position	Based on experimental data for each test (time of the position also must be specified).
Distribution of activity within the plume	According to Hotspot rules, with total activity as measured.
Wind speed and direction	As measured (or 5-minute average if desired).
Stability class	SÚRO will try to obtain from Czech meteorological service; HW will also look at it.
Aerosol diameter distribution	Tables 3 and 6 in Scenario Description. PK will ask if more detail is available. KA and GDW will estimate average diameter for each range of diameters.
Deposition velocity	KH and GDW will assign values for each category (range) of diameters.
Near/farther zones (for endpoints)	50 m and up to 1–2 km. Use contour plots instead of centerline deposition and activity.
Time-integrated concentrations (endpoint)	$\text{Bq/m}^3 \text{ min}$, at 5 minutes, 10 minutes, and 15 minutes from the explosion, each at a height of 5 m, 10 m, and 15 m above ground.

* To be completed by the end of June 2010, if possible.

WG9 MEETING AGENDA

Tuesday, 8 June 2010

	Welcome	Raúl Perriñez, host (Universidad de Sevilla, Spain) Kathy Thiessen, WGL (SENES Oak Ridge, USA) Volodymyr Berkovskyy (IAEA Scientific Secretary)
	Overview of meeting: Scope, objectives and expected outcomes	Kathy Thiessen, WGL
09:30–13:30	“Short-range” scenario – Current status	Petr Kuca / Jan Helebrant (SURO, Czech Republic)
	“Short-range” scenario – Preliminary modelling results:	
	*Short range radionuclide dispersion and deposition modelling	Raúl Perriñez (Spain)
	Simulation of “Kamenna-experiments” test 1–4 with the decision support model *LASAIR	Hartmut Walter (Germany)
	*CDF calculations of the test 2–4 experiments	Govert de With (Netherlands)
	*Short scale scenario	Vladimir Fuka (Czech Republic)
13:30–15:00	LUNCH BREAK	
	“Short-range” scenario – Preliminary modelling results (continued)	
15:00–17:30	*Comparison between test field data and Gaussian plume model	Laura Urso (Germany)
	Short-range scenario, *Test 2	Dejan Trifunovic (Croatia)

Wednesday, 9 June 2010

	“Short-range” scenario – Preliminary modelling results (continued)	
	Modelling of Scenario 1 experimental explosion with *Hotspot v. 2.07	*Tom Charnock (UK)
09:30–13:30	*ADDAM in short-range dispersion and deposition scenario	*Sohan Chouhan (Canada)
	Identification of information needed for completion	All WG Participants
	Plans and schedule for “short-range” modelling exercise	All WG Participants
13:30–15:00	LUNCH BREAK	
	“NPP” scenario – Preliminary modelling results	
	Modelling mid-range radionuclide dispersion and deposition from an hypothetical NPP accident: *Trillo NPP scenario	Raúl Perriñez (Spain)
	Results for EMRAS-Scenario 2: Mid-range dispersion scenario for *NPP Trillo	Gerd Sdouz (Austria)
15:00–17:30	Modelling mid-range radionuclide dispersion and deposition from an *hypothetical NPP accident	Francesco Mancini (Italy)
	Hotspot *mid-range	Dejan Trifunovic (Croatia)
	Identification of information needed for completion	All WG Participants
	Plans and schedule for “NPP” modelling exercise	All WG Participants

Thursday, 10 June 2010

09:30–13:30	General discussion of modelling exercises and Working Group plans	All WG Participants
13:30	Close of meeting	Kathy Thiessen

* Indicates the name of the presentation given on the WG9 web page (<http://www-ns.iaea.org/projects/emras/emras2/working-groups/working-group-nine.asp?s=8>).

^ Presentation submitted, but participant absent from the meeting.