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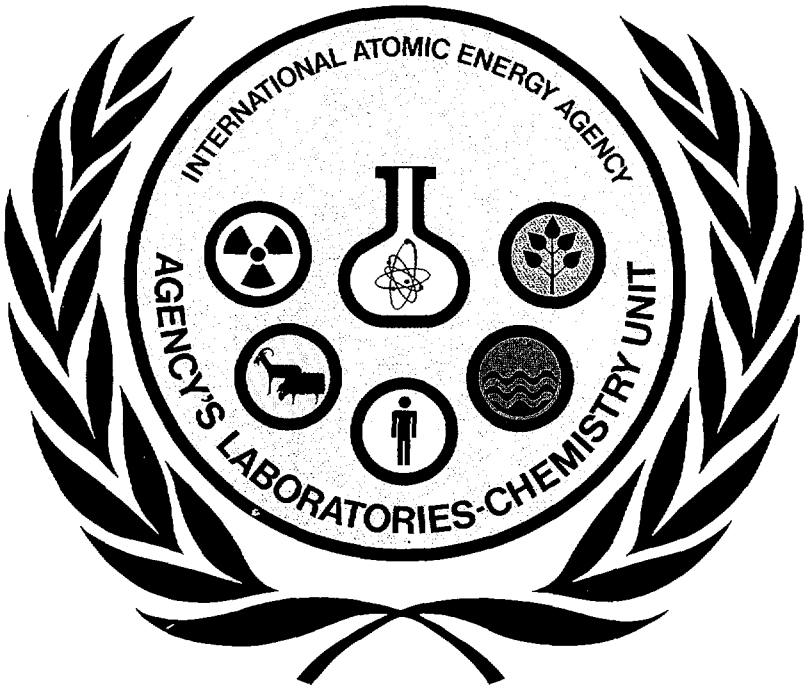
REPORT OF THE FIRST RESEARCH CO-ORDINATION MEETING ON THE

CO-ORDINATED RESEARCH PROGRAMME: DEVELOPMENT AND SELECTION OF ANALYTICAL TECHNIQUES FOR MEASURING ACCIDENTALLY RELEASED RADIONUCLIDES IN ENVIRONMENT

FOOD AND ENVIRONMENT CONTROL CENTRE
ABU DHABI MUNICIPALITY
ABU DHABI, U.A.E.
04 - 07 DECEMBER 1994



Report

of the

First Research Co-ordination Meeting

on the

Co-ordinated Research Programme:

Development and Selection of Analyical Techniques for Measuring Accidentally Released Radionuclides in Environment

Food and Environment Control Centre
Abu Dhabi Municipality
Abu Dhabi, U.A.E.
04 - 07 December 1994

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Attachments

I. OBJECTIVES OF THE RESEARCH CO-ORDINATION MEETING

The participants at the second Research Co-ordination Meeting (Vienna, 12-16 August 1991) of the CRP on "Rapid Instrumental and Separation Methods for Monitoring Radionuclides in Food and Environmental Samples"[1], recommended that a new CRP be established. The current CRP on "Development and Selection of Analytical Techniques and Procedures for Measuring Accidentally Released Radionuclides in Environment" was established based on this recommendation. The objectives of this CRP are to conduct research and development on applicable methodologies for response to accidental releases, and to improve and maintain the capabilities of the network of laboratories and provide training of individuals within member states. Thus, the CRP serves as a vehicle to maintain contact within the network of laboratories, while developing and transferring analytical techniques and procedures for measuring accidentally released radioactivity.

The purpose of the Research Co-ordination Meeting is to discuss the proposed research programs, the status to date and the work planned for the duration of the CRP. The meeting also provides the opportunity for the CRP participants to exchange ideas and possibly develop collaborations in their research.

The members of the CRP also need to discuss issues related to the previous CRP on Rapid methods. These include: the preparation of the final report of the previous CRP, the preparation of an addendum to TRS-295 and the ultimate revision or updating of TRS-295.

Finally, it is intended that the members of the CRP should discuss the mandate and scope of work of the network of analytical laboratories and the steps needed to firmly establish this network.

II. AGENDA

Sunday: 04 December, 1994

08:30 h — Registration

- Opening Session

  P.R. Danesi, Director, RIAL, IAEA
  V. Valkovic, Head, PCI at RIAL, IAEA,(Scientific Secretary)
  A. Yousif, Director, FECC, Municipality of Abu Dhabi, U.A.E.
- Self-Introduction of Participants
  - activities and problems encountered in their laboratories or organizations in the field of environmental work
  - co-ordination and collaboration with the IAEA
  - requirements for international guidelines and QA/QC procedures

- Election of Chairman (R. Schelenz)
- Nomination of Rapporteur (E. L. Cooper)
- Adaption of the Agenda

11:00 h — Session I

Background Information and Terms of Reference of the Meeting

P.R. Danesi: "Role of the Agency's Laboratory in Monitoring Environmental Radioactivity"

V. Valkovic: Status Report of the Agency's Programme on "Development and Selection of Analytical Techniques for Measuring Accidentally Released Radionuclides in the Environment"

General discussion on:
- topics arising from previous meetings
- preparation of final report of the CRP on "Rapid Methods"
- "Network" of analytical laboratories

Monday 05 December, 1994

08:30 h — Session II

Review of the results of the CRP on "Rapid Methods" and the running CRP on "Development and Selection of Analytical Techniques (E.L. Cooper)

General Discussion

10:30 h — Session III

V. Pugatch: "Rapid Supersensitive Laser-Semiconductor Monitoring System of Alpha-Radionuclides"

E.L. Cooper: "Separation of Low Levels of Actinides by Selective Oxidation/Reduction and Co-precipitation with Neodymium Fluoride"

P. Zombori: "Mobile Laboratory Methodology for Rapid Assessment of Environmental Contamination after Major Nuclear Accidents"

14:00 h — Session IV

Visit of the Radioanalytical Laboratories of the Food and Environmental Control Centre (FECC), Abu Dhabi Municipality, U.A.E.

Tuesday 06 December, 1994

08:00 - 19:30 h — Session V

Scientific Visit to Food Control Laboratory, Al Ain, U.A.E., hosting one of the four air radiation monitors of the Early Warning Environmental Radiation Monitoring System (EWERMS) in the U.A.E.

Wednesday 07 December, 1994

08:30 h

Session III (cont'd)

Presentation of the Participant's Research

E. Holm: "Studies of Radiocaesium Sorption on Ammonium-molybdato-phosphate (AMP) and Copper-ferrocyanide; A Comperative Study"

"The Effect of Dialysis on Radiocaesium in Man. A Method for Decontamination at Accidental Internal Contamination"

"Multielement Actinide Separations Using Polar Solvents"

O.V. Singh: "Monitoring of Radioactivity in Food and Environment at FECC, Abu Dhabi Minicipality"

R. Schelenz: "Interpretation of Environmental Monitoring Data"

10:30 h

Session VI

General Discussion:
Accomplishments of the meeting and Future Actions
- Technical Document or Report of CRP on "Rapid Methods"?
- Addendum to Technical Reports Series No. 295, Technical Report of Document ?
- Interim status of running CRP, Technical Document ?

Session VII

NETWORK OF ANALYTICAL LABORATORIES

Discussion topics:
- natural radioactivity (industrial processes, radon)
- sampling techniques (terrestrial, marine)
- noble gases and aerosols
- radioactive waste
- remediation of contaminated areas
- unidentified or unauthorized radioactive materials in transit/storage
- emergency response (airborne team)
- non-radiometric methods (e.g. ICP-MS)
- non-radioactive pollutants (pesticides, heavy metals)

- mandate
- scope of Work
- establishing Core of Laboratories

13:00 h

Recommendations
Drafting, Discussion and Adoption

Closing of the Meeting

III. LIST OF PARTICIPANTS

Mr. E. L. Cooper (Rapporteur)	AECL Research Chalk River Laboratories Chalk River, Ontario Canada, KOJ 1JO
Mr. R. Schelenz (Chairman)	Nuclear Research Centre Karlsruhe Building 325, BFE P.O.Box 3640, D-76021 Karlsruhe Germany
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Mr. A. M. Yousif	Food & Environment Control Centre Abu Dhabi Municipality P.O.Box 263 Abu Dhabi United Arab Emirates
Mr. O. M. Singh	Radiation Laboratory Abu Dhabi Municipality P.O.Box 263 Abu Dhabi United Arab Emirates
Mr. V. Pugatch	Institute for Nuclear Research Prospekt Nauki, 47 252028, Kiev - 28 Ukraine

Participants of the International Atomic Energy Agency:
Mr. P. R. Danesi, RIAL
Mr. V. Valkovic (Scientific Secretary), RIAL

IV. HIGHLIGHTS OF THE MEETING

A. Opening

The opening was initiated by Mr. P. Danesi, Director of RIAL, who emphasized the need to consider other pollutants and radioactive releases from other sources of energy production, such as burning coal. He was followed by Mr. V. Valkovic, Head of Physics, Chemistry and Instrumentation at RIAL, who was the Scientific Secretary for the meeting. Mr. Valkovic suggested that the participants should try to complete as many outstanding tasks as possible at the meeting. He also emphasized the need to consider other pollutants, as well as elevated sources of natural radioactivity. Mr. A. Yousif, representing the local host, welcomed the participants. Mr. Yousif, who is Head of the Food and Environment Control Centre (FECC) for the Municipality of Abu Dhabi, outlined the development and the work of the Centre.

Each of the participants then introduced himself, giving a brief outline of his own background and the work of his institution.

B. Election of a Chairman

Mr. R. Schelenz was elected as chairman of the meeting. Mr. E. Cooper was nominated as rapporteur.

C. Objectives of the CRP

The participants of the IAEA programme on "Fallout Radioactivity Monitoring in Environment and Food (MEF)", as part of the IAEA Supplementary Programme on Nuclear Safety (SPNS), saw the need to publish a Guide Book, titled "Measurement of Radionuclides in Food and the Environment" [2], as part of their aim to provide national authorities of the Member States and other International Organizations (e.g. FAO, UNSCEAR, WHO, WMO) with reliable analytical techniques to assess accidental releases of radionuclides from different sources. Although this Guide Book contains essential information on the facilities and analytical equipment required to determine the concentration of radionuclides in environmental samples and food, it does not contain rapid monitoring methods. The participants of the MEF program recognized that, in order to minimize exposure to the general public, rapid monitoring methods for radionuclide assessment in both environmental samples and foodstuffs must be enacted soon after a nuclear accident. In addition, this rapid monitoring capability must extend into the intermediate and late post-accident phases following an accidental release, to ensure quick and reliable assessment of the contamination as the radionuclides migrate through the environment and foodchain.

It was out of their concern for "collecting and developing, as necessary, rapid methods for measuring radioactivity in food and environmental samples" ... that the participants recommended a CRP. This CRP, titled "Rapid Instrumental and Separation

Methods for Monitoring Radionuclides in Food and Environmental Samples", was planned, in detail, at a Consultants' Meeting held from 5-9 September 1988 at IAEA Headquarters, Vienna [3].

The scope of the CRP on "Development and Selection of Analytical Techniques and Procedures for Measuring Accidentally Released Radionuclides in the Environment" was developed during the RCM of the CRP on "Rapid Methods", which was held 12-16 August 1991 at IAEA Headquarters in Vienna[1]. The recommendations were subsequently incorporated into the proposal for the CRP. The participants had a strong desire to maintain the network of monitoring laboratories, which had been assembled in response to the IAEA's request for assistance with the International Chernobyl Project. The primary objectives of the current CRP are to conduct research and development on applicable methodologies for response to accidental releases and to improve and maintain the capabilities of the network of laboratories and provide training of individuals within Member States.

D. Presentation of the Participants' Research

The participants presented the results of their research during the sessions on Monday and Wednesday mornings. Each presentation was followed by a discussion period. The projects are summarized in Attachment I. Each participant tabled a manuscript describing the results of his research.

E. Visit to the Radioanalytical Laboratories of the Food and Environment Control Centre (FECC), Aba Dhabi Municipality

The participants toured these laboratories on Monday afternoon. The tour was conducted by Mr. A. Yousif, Dr. O. Singh, and Mr. Zhu. The laboratory is equipped to analyze samples by gamma- and alpha-spectrometry, as well as by beta counting and liquid scintillation counting. At the end of the tour, the participants had a detailed discussion with Mr. A. Yousuf on matters related to monitoring radioactivity in food and the environment. Since more than 85% of foodstuffs are imported into the Emirate from different parts of the world, monitoring of foodstuffs has proved very important. A large number of food samples are regularly checked for Cs-137 and Cs-134 by gamma spectrometry and for Sr-90 by liquid scintillation counting after radiochemical separation. Several thousand samples have been tested. Milk and milk products accounted for most of the samples, followed by fruits, vegetables and tea. A number of these samples showed the presence of radiocaesium.

F. Visit to the Food Control Centre Laboratory, Al Ain

On Tuesday the participants travelled to Al Ain for this visit. The tour of the laboratories was conducted by Mr. Mohamed O. El Obeid. The laboratories are located in cramped quarters, but they are organized very efficiently. The laboratories are very well

equipped with modern analytical instruments. They will soon be moving into more spacious, modern laboratories, which are in the last phase of construction. The participants also saw the air radiation monitor (SAPOS 90M), which is one of the four stations in the Early Warning Environmental Radiation Monitoring System (EWERMS). The other stations are at Abu Dhabi, Ras Al Kaimah and Silaa.

G. Discussion of Issues Associated with the CRP

These discussions took place on Sunday, Monday and Wednesday morning.

1) Mandate and Scope of the Network of Analytical Laboratories.

It was decided that the mandate should be twofold: i) conduct research and development related to the scope of work, ii) respond to requests for assistance from the IAEA. The scope of work is outlined in Attachment II.

2) Scope of Work and Final Report of the CRP on "Rapid Methods"

After the meeting on Sunday, Mr. Cooper reviewed the reports submitted by the participants in the CRP on "Rapid Methods" and compiled a list (Attachment III). Copies of the list were distributed to the participants at the meeting. The possibility of preparing the final report as a Technical Document was discussed, but it was felt that most of the reports in the list required extensive review and revision before they would be acceptable for inclusion in an Appendix to a Technical Document. Thus, it was agreed to prepare the final report as an AL series report. The preparation will be done by RIAL. They will prepare an introduction, based on the reports of the RCMs [1,4] and ask the participants in the CRP to review their final reports for accuracy and completeness so that they can be included in an Appendix to the final report.

3) Scope of Work of the Current CRP

Mr. Cooper also reviewed the reports submitted by participants in the current CRP and compiled a list (Attachment IV) . Copies of the list were distributed to the participants at the meeting. Additional manuscripts were submitted by the participants present at the meeting. The scope of this CRP was not discussed further; however, copies of a project summary sheet were distributed and the participants were requested to fill them in and send them to Mr. Valkovic. These are included in Attachment I.

4) Preparation of an Addendum to TRS-295

The possibility of preparing the final report of the CRP on "Rapid Methods" as a Technical Document and using this as the addendum to TRS-295 was discussed in some detail, but finally the idea was rejected in the short term, for the reasons outlined in 2); however, there is the option of preparing a Technical Document in the future. It was agreed to use the published papers from the work of the two

CRPs to prepare an interim addendum to TRS-295. Preparation of this addendum will be done by RIAL.

5) Revision or Updating of TRS-295

Preparation of a Technical Document on "Rapid Methods" to supplement TRS-295 was discussed at the Consultants' Meeting on "Monitoring Accidentally Released Radionuclides in the Environment", which was held 13-17 December 1993 in Vienna. Attachment VI of the report of the meeting[5] (Attachment V) outlines the contents proposed for this document.

Revision or updating of TRS-295 was further discussed at the current meeting. It was felt that updating should be an ongoing process, so that the latest information would be available. It was suggested that the information in TRS-295 is still current, but a TRS document should be prepared to supplement it with more recent information, particularly on rapid methods. The TRS document could also cover: non-radiological methods, mobile laboratories, monitoring of airborne activity and low-level measurements. Preparation of a TRS document would require extensive effort and would involve several consultants' meetings.

H. Recommendations

Recommendations Regarding the First CRP on Rapid Methods and the Current CRP

1. A final report of the CRP on Rapid Methods should be prepared from the submissions from the participants. The preparation should be arranged by RIAL. An introduction will have to be prepared, using the information in the 2 RCM reports[1,4], and the participants should be requested to review their submissions to ensure they are complete and accurate.

2. The scope of work of the current CRP should include an increased emphasis on sampling techniques, but should not include Health Physics aspects. The scope should include enhanced, natural, as well as artificial radioactivity.

3. An interim addendum to TRS-295 should be prepared from the published papers of the participants in both CRPs. An introduction should be included. Preparation of the addendum should be arranged by RIAL.

4. A revision or update of TRS-295 should be prepared in the future as a Technical Report. This will be a major task requiring considerable effort and a number of Consultants' Meetings. Revision of TRS-295 should be an on-going task to ensure that the information remains current. Rapid methods should be included in the revision.

5. The participants strongly felt that a conference on new developments in monitoring environmental radioactivity should be organized for 1996. The conference need not necessarily be organised by the IAEA.

Recommendations Regarding the Network of Laboratories

1. A network of monitoring laboratories should be established with a core set of laboratories. The laboratories represented at this RCM could form the required core. The core could subsequently be expanded to cover gaps in the capabilities of the network.

2. The participants felt that the network of laboratories should be co-ordinated through the IAEA. Furthermore, it was felt that co-ordination through RIAL would be most appropriate.

3. *Communications on a technical level between the IAEA and the laboratories in the* network should be as direct and informal as possible. Efficient communication channels should be established and approved.

4. The scope of work of the network should be extended to include natural radioactivity.

5. The scope of work of the network should include detection of airborne radioactive releases in the form of μm sized aerosols, as well as gases.

6. The scope of work should be extended to include detection of unidentified or unauthorized radioactive materials in transit or storage.

7. The scope of work may be optionally extended to include other pollutants (organics,pesticides, heavy metals, etc.) where the effects of these may be related to those of radioactive contamination.

8. Both radiometric and non-radiometric methods should be subjects of research by the network.

9. The activities of the network of laboratories should be publicised so that other sections of the IAEA, as well as the Member States, will remain aware of its existence and capabilities.

REFERENCES

1. IAEA Report (IAEA/AL/056), "Report of the Second Research Co-ordination Meeting on the Co-ordinated Research Programme: Rapid Instrumental and Separation Methods for Monitoring Radionuclides in Food and Environmental Samples", IAEA, Vienna, 1991.

2. IAEA report TRS-295, "Measurement of Radionuclides in Food and Environment, A Guidebook". IAEA, Vienna, 1989.

3. IAEA Report (IAEA/AL/019), "Report of the Consultants' Meeting on Rapid Instrumental and Separation Methods for Monitoring Radionuclides in Food and Environmental Samples", IAEA, Vienna, 1988.

4. IAEA Report (IAEA/AL/043), "Report of the First Research Co-ordination Meeting on the Co-ordinated Research Programme: Rapid Instrumental and Separation Methods for Monitoring Radionuclides in Food and Environmental Samples", IAEA, Vienna, 1989.

5. IAEA Report (IAEA/AL/081), "Report of the Consultant's Meeting on Monitoring Accidentally Released Radionuclides in the Environment", IAEA, Vienna, 1993.

ATTACHMENT I

Project Summary

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Project Title: **Rapid and Stream-lined Methods for Analysis of Actinides in Environmental Samples**

1) **Project Summary:**

A systematic study of separating the actinides from each other in 1 M hydrochloric acid media has been carried out using selective oxidation/reduction processes followed by co-precipitation with neodymium fluoride. We have optimized two such procedures, one with bromate and another with permanganate, for the sequential separation of Am, Pu, Np, and U isotopes. The first procedure involves oxidation of Pu, Np and U to +6 state in 1 M HCl media at 85°C with 30% $NaBrO_3$ and separation from trivalent Am by collecting the latter on the first NdF_3 co-precipitated source. Plutonium is then reduced and converted to +4 oxidation state with 40% $NaNO_2$ at 85°C, while Np and U are kept oxidized with additional bromate in solution at 50-70°C, thus separating Pu by collection on a second NdF_3 source. At this stage, Np present in the filtrate is reduced with hydroxylamine hydrochloride and separated from U by collecting on a third source. Subsequently, U is reduced with 30% $TiCl_3$ and co-precipitated on a final source. The second procedure, which employs $KMnO_4$ in 1 M HCl media at 60-85°C for oxidizing Pu, Np and U, and separating from Am, produces MnO_2 which is collected along with Am on the co-precipitated NdF_3. This MnO_2 is dissolved on the filter itself with 1 ml of acidified 1.5% H_2O_2 without any degradation of the α-spectra. After evaporating the filtrate to destroy H_2O_2, Pu, Np and U are separated by following steps similar to those in the bromate procedure. The recoveries of the actinides with both procedures are > 99%. The decontamination factors are between 10^3 and 10^4.

2) Summary of Proposed Work for the Next Year:

Now that the separation procedure has been developed, we will begin to incorporate it into rapid and steam-lined procedures for samples, such as water, air filters and environmental materials.

Project Summary

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Project Title: **Development of Mobile Laboratory Methodology and Data Interpretation of Environmental Radiological Situation after Major Nuclear Accidents**

1) Project Summary:

The main objective of the work for the recent year was the development of a software package supporting on-site data evaluation and preparation for decision making. This software expert system consists of the following items:

- A new version of ERIDANUS for the geographical presentation of the data measured by the route monitoring system.
- A programme for flexible, interactive human dose prediction calculations based on measured and assumed radionuclide concentrations.
- A code for optimum estimation of the radiological parameters by using all available data measured by mobile laboratory.

2) Summary of Proposed Work for the Next Year:

Certain features of the above software are not completed yet, further work is needed to finish them during 1995. In addition, some technical development of the mobile laboratory is planned to solve the transmission of the data from the mobile unit to the evaluation centre. This task will be solved by establishing digital data transfer using radiotelefone connection between on-board and central PC's.

Project Summary

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1) Project Title: a) In Situ Sorbtion Techniques for Radiocaesium.
b) Rapid Group Separation and Measurement of Actinides.

a) A technique for impregnation of filters with copperferrocyanide has been developed. The sorbtion of radiocaesium has been tested on different types of liquids containing radiocaesium; urine (1-2 l), lake, river and sea water (100 - 2000 l) and dialysis liquid (120 l).

The efficiency and analytical results were investigated and compared with results using ammonium molybdophosphate for sorbtion of caesium. Results are in good agreement with volumes not exceeding 500 l using two consecutive filters. Assessment of radiocaesium in large groups of people can be done rapidly by sorbtion from urine. Persons with malfunctioning kidneys and undergoing regular dialysis do not constitute a critical group. Dialysis is an effective method for cleaning the blood from radiocaesium.

b) Actinides can be group separated from the bulk of solids using anion exchange from polar solvent-mineral acid media. This method is known since long. In combination with new techniques for source preparation using fluoride precipitation and new measurement techniques, mass spectrometry, laser excitation or gridded ion chambers (if sources have to be large) offers a possibility to shorten the analytical method.

2) Proposed Work for the Next Year:

Decontamination of iodine (^{131}I) from the body using dialysis will be investigated. Also other radiologically important radionuclides, ^{210}Po and ^{226}Ra will be investigated with this emphasis.

Source preparation by floride precipitation and large area sources measured with gridded ionization chamber will be executed.

Project Summary

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1) Project Title: Rapid Supersensitive Laser-Semiconductor Monitoring System
Time Period Covered: Dec. 15, 1993 - Dec. 15, 1994

a) Scientific Background and Scope of Project

The creation of the rapid and sensitive system for the determination of the Alpha-radioactivity in the Environmental samples has been determined as the main goal of the Research Contract No. 7200RO/RB. As a result of the first stage of the research accomplished in the year 1993, the prototype of the system based on the combination of the laser photoionization mass spectrometry and many-channel alpha-spectrometer has been built and tested.

To improve the sensitivity it was proposed to add one more stage to the laser photoionization mass-spectrometer. To develop the high position sensitivity of the system it was proposed to include into the alpha-radiometer SI strip-detector with submicron position sensitivity.

b) Results Obtained

- Hardware and software for the laser-semiconductor monitoring system of alpha-radionuclides in the environment have been further developed and tested in frames of the IAEA Research Contract No. 7200/R1/RB.

- Optimization of the sample evaporation with one more stage of photoionization has been successfully performed in the laser photoionization mass-spectrometer. The automatization of the measurement procedure is under way by means of the IBM PC-386 and specially designed electronic units. The evaluated sensitivity of the new set-up is in the range of 1.0 Bq/kg.

- A bulk measurement of the alpha-radioactivity concentration in soil samples from the Chernobyl region (100 km) have been performed by means of thick samples method and built under this contract alpha-radiometer with large area SI semiconductor detectors. The lowest detectable level was in the range 100 Bq/kg without any radiochemical separation. Comparison with the data obtained for the same probes by means of the thin samples (with radiochemical separation) has shown higher Pu-concentration values obtained by means of the thick samples.

- For the first time the SI-strip-detector with 128 channels has been applies for the alpha-radiometry purposes. Different read-out electronics (including the most sophisticated one used in high energy physics experiments) has been studied and tested. The most suitable set (preamplifier, shaper, discriminator) of electronics has been found and built for the test measurements with the 128-channel SI-strip-detector produced for the purposes of the alpha-radiometry by Kiev firm "Detector".

- The studies have been performed to use for the alpha-radiometry purposes sub-micron position sensitivity of the SI-strip-detector. Such high accuracy of the position measurements could be useful for some radiobiological applications if the cell level accuracy of the tracer radioactive element position is concerned. Another application of the SI-strip-detectors for alpha-radiometry purposes could be realized for the detection of the radioactive contamination spots with high position accuracy.

2) **Proposed Work for the Next Year**

The main goal of the proposed work is to make all necessary hardware and software modifications of the created system for its implementation at the Chernobyl Research Center.

In particular, sample preparation procedure, spectra evaluation and, finally, isotope concentration determination have to be certified and tested for different environmental probes.

Two laser-photoionization mass-spectrometers in combination with the semiconductor large area alpha-radiometer are planned to be used for independent measurements of alpha-radioactive isotope concentrations to make the calibration procedure reliable.

Another effort will be paid to modify the created system to make it transportable and compatible with the computors at the Chernobyl Research Center.

3) **Papers Published on Work done under the Contract**

1. V.M. Pugatch, Yu.N. Pavlenko, G.V. Pitatelev et al.,
Laser-Semiconductor Monitoring system for low-level alpha-radioactivity in the environment. - Seminar talk given at the Third International School on low-level measurements of radioactivity in the environment. (September 20 - October 2, 1993, Huelva, Spain).

2. V.M. Pugatch, Yu. N. Pavlenko, G.V. Pititelev et al.,
Rapid-sensitive-laser-semiconductor monitoring system of alpha-radionuclides. - Abstracts of the International Seminar "Nuclear Methods in the Environment". (September 6-11, 1993, Kiev, Ukraine), Kiev 1993, P. 33-34.

3. A.A. Klipenstein, Yu. N. Pavlenko, V.M. Pugatch,
Monte-Carlo simulation for spectra of alpha-particles emitted by thick samples of a soil. - IBID., P.46-47.

4. G.V. Pitatalev, M. Yu. Marchenko, I.A. Mozalevska,
Laser photoionization mass-spectroscopic ultrasensitive detection of rare isotopes. - "Physics in Ukraine". Proceedings of the International Conference, June 22 - 27, 1993, Kiev, Part : Radiophysics and Electronics, P. 215 - 218.

5. M.Yu. Marchenko, I.A. Mozalevskaya, G.V. Pitatelev,
Laser Photoionization mass-spectroscopic ultrasensitive detection of heavy elements. Description of the system. Seminar given at the Institute for Nuclear Research, April 20, 1994 (to be published in the Ukranian Physical Journal).
G.V. Pitatelev "Rims-detection of Pu-isotopes with Laser Evaporation of Samples" abstracts of the 7th International Symposium on Resonant Ionization Spectroscopy, RIS'94. Bernkastell-UESS, Germany, 1994. P.1.

6. V.M. Pugatch, Sub-Micron position sensitivity of strip-detectors and its radiation dependence. - The talk given at the 3-D Workshop on Vertex detectors (Bloomington, Indiana, USA May 8-13, 1994) .

Project Summary

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Project Title: **Radioactive Food and Environment Contamination**

1) **Project Summary:** See Appendix A

2) **Summary of Proposed Work for the Next Year:**

Radon measurements in homes of Abu Dhabi residents would be undertaken to assess the radon levels relative to other places. The seasonal variation in radon levels would be investigated to estimate its contribution in average yearly dose. Ra-226 is also proposed to be determined in drinking water resources of United Arab Emirates.

APPENDIX A

MONITORING OF RADIOACTIVITY AND ENVIRONMENT AT FECC, ABU DHABI MINICIPALITY

The Food and Environment Control Centre of Abu Dhabi Municipality with the help of IAEA has established facilities for regular monitoring of food and environmental samples for radioactive contamination. The Centre is now capable of measuring gamma, beta as well as alpha activity in different types of samples. The main activities in the area of food monitoring are as follows:

-General monitoring of food gamma radionuclides in foodstuffs by high resolution gamma spectrometry;

-Determination of specific gamma radionuclides in foodstuffs by high resolution gamma spectrometry;

-Radiochemical determination of Sr-90 using liquid scintillation analyzer or by gas flow proportional counter;

-Measurement of gross alpha activity in drinking water.

Since more than 85 % of foodstuffs are imported into U.A.E. from different parts of the world, monitoring of food samples has proved very fruitful. A large number of food samples are now regularly checked for a possible radioactive contamination. Gamma ray spectrometers with Ge or Nal detectors and LB200 Bacquerel monitors are being used for this purpose. Sr-90 determined by radiochemical separation of its daughter product Y-90 using TBP extraction method. The activity due to Y-90 is measured by liquid scintillation analyzer. Several thousand samples of a variety of foodstuffs have been tested in the radiation laboratory since the establishment of facilities at the FECC. The maximum numbers of samples were those of milk and milk products followed by fruits, vegetables and tea. Quite a significant number of these showed the presence of radiocaesium. A few of them were found to have quite high content of Cs-137 and Cs-134, for example, in 1992 one truckload of a food sample was found to have more than 800 Bq/kg of total radiocaesium and the ratio of Cs-137 ro Cs-134 in this sample strongly indicated that the source of contamination was of Chernobyl accident origin. Drinking water resources are being screened for gross alpha activity and if the alpha activity is found to exceed 0.185 Bq/l, the water samples would be analysed for Ra-226.

Our activities on environmental radiation monitoring are given below:

- Early Warning Environmental Radiation Monitoring System (EWERMS) - continuous monitoring of gamma radiation dose rate in air at different stations throughout the country.

- Monitoring of particulate matter in ambient air.

- Measurement of fallout activity in soil.

Air radiation monitors (SAPOS 90M) stationed at four different places - namely, Abu Dhabi, Al Ain, Ras Al Khaimah and Silaa are presently functioning and are connected to a central computer in radiation laboratory at FECC. Average dose rates ranging from 5 to 9 μR/h have been recorded at different stations. To keep further vigil on atmospheric radioactivity at our place we regularly monitor particulate matter in ambient air for gamma emitters. A high volume air sampler (STAPLEX) is used to collect particulate material on the filter. Cs-137 in soil as a result of fallout has also been measured at some places. The studies on soil will include assessment of naturally occuring radionuclides. Measurement of radon in homes is also proposed to be undertaken shortly.

ATTACHMENT II

Mandate and Scope of Work of the Network of Analytical Laboratories

Introduction

A permanently established network of analytical laboratories that are able to respond to requests for assistance will be a great asset to the IAEA when it has to respond to requests from Member States, such as the request from the former Soviet Union in 1989, which led to the International Chernobyl Project.

Mandate

The mandate of the network of analytical laboratories is:

1. To carry out research and development related to the scope of work below.

2. To respond to requests for assistance from the IAEA when the need for analytical support arises.

Scope of work

The scope of work for the network should include:

1. Participating in intercomparisons organised by AQCS.

2. Providing training to staff from laboratories in developing Member States to achieve manpower development.

3. Providing a roster of experts for TC missions.

4. Evaluating TC projects.

5. Transferring technology to laboratories in developing Member States to achieve capacity building.

6. Publicizing the activities of the network.

Furthermore, the participants recommended that:

The scope should be extended to releases of natural, as well as artificial radionuclides and that enhancement in industrial processes should also be considered.

The scope should include sampling techniques, but not Health Physics aspects. There should not be a division into terrestrial and marine components.

The scope should include detection of releases of radioactive noble gases and μm-sized aerosols to the atmosphere and long distance transport of these releases.

The scope should be extended to include detection of unidentified or unauthorized radioactive materials in transit or storage.

The scope should include both radiometric and non-radiometric methods.

The scope should include releases from disposal of radioactive wastes and analytical support for remediation of contaminated sites.

The scope could optionally be extended to non-radioactive pollutants (organics, pesticides, heavy metals, etc.), where the effects may be related to those of radioactive contamination.

The network of laboratories should be established with a small core of laboratories represented at the present RCM. Later, additional laboratories could be invited to join, in order to expand the capabilities of the network, as required.

ATTACHMENT III

SCOPE OF WORK OF THE CRP ON RAPID METHODS

Research Reports/Publications Compiled by RIAL

a) Determination of Radiostrontium in Soil Samples Using a Crown Ether, N. Vajda, A. Ghods-Esphahani, P.R. Danesi.

b) Rapid Methods for Strontium Determination in Environmental Samples, Karl Buchtela.

c) ^{137}Cs Pre-Concentration Method for Large Volume Water Samples Using Prussian-Blue Impregnated Ion-Exchanger, J.M. Godoy, J.R.D. Guimaraes, Z.L. Carvalhe.

d) Rapid Correlation Assessment of Sr in Fallout by Gamma-Spectroscopy, F.I. Vapjrev, A.V. Hristova.

e) Rapid Determination of ^{90}Sr by TBP Extraction, Zhu Shuzhong, Long Shaoxian, Xiao Zhenhong.

f) Rapid Determination of Plutonium by Extraction and Grid Ionization Chamber, Zhu Shuzhong.

g) Guidelines for Planning and Design of Mobile Radiological Units, R. Schelenz.

h) Rapid In Situ Gamma Spectrometric Determination of Fallout Radioactivity in the Environment, P. Zombori.

i) An Instrument Based on an Insertion Probe for Monitoring Radionuclides in Bulk Foodstuffs, E.L. Cooper, R.J. Cornett, P. Wong.

j) Quick Estimation of Separate Radionuclides Activity in Spectrometrically Measured Samples, A. Pietruszewskii, J. Jagielak, K. Isajenko, M. Birski.

k) Semi-Empirical Method of Germanium Detectors Efficiency Calculations, A. Pietruszewskii, J. Jagielak, K. Isajenko, M. Birski.

l) Rapid Monitoring of Radiocaesium in Living Animals, Per Strand.

m) Rapid Determination of Strontium-89 and Strontium-90 in Food and Environmental Samples by Cerenkov Counting, Judith Melin and Jorma Suomela.

n) Rapid Instrumentation and Separation Methods for Monitoring Radionuclides in Food and Environmental Samples, M.H. Beach.

o) Application of ICP/MS Techniques to Radionuclide Analysis, M.R. Smith and D.W. Koppenaal.

Drum Assayer for Measuring Radionuclides in Foods, R.L. Bradzinski.

A Rapid Procedure for the Measurement of the Transuranic Elements and Thorium, C.W. Thomas.

p) Development of Rapid Analytical Methods for Am-241, A.R. Byrne, A. Komosa, M. Dermelj, P. Stegnar, M.C. Sklodowska.

q) In Situ Gamma Spectrometric Measurement of the Contamination in Some Selected Settlements of Byelorussia (BSSR), Ukraine (USSR), and the Russian Federation (RSFSR), P. Zombori, I. Nemeth, A. Andrasi, H. Lettner.

ATTACHMENT IV

SCOPE OF WORK AND PARTICIPANTS IN THE CURRENT CRP

List of Reports Submitted to V. Valkovic

1. **KFKI Atomic Energy Research Institute**
(Peter Zombori)

Development of Mobile Laboratory Methodology and Data Interpretation of Environmental Radiological Situation after Major Nuclear Accidents.

2. **Institute de Pesquisas Energétices e Nucleares**
(Dra. Ieda Irma Lamas Cunha)

Development of Radiochemical Methods for Measuring Artificial Radionuclides in the Environment.

3. **Institute for Nuclear Research of the Ukrainian Academy of Science**
(Prof. Valery Pugatch)

Rapid-Supersensitive-Laser- Semiconductor Monitoring system of Alpha-Radionuclides.

4. **Institute for Nuclear Research of the Ukrainian Academy of Science**
(Prof. Valery Pugatch)

Sub-micron Position Sensitivity of Strip-Detectors and its Radiation Dependence.

5. **Beijing Research Institute of Chemical Engineering and Metallurgy**
(Tianyia Zhu, Weiqun Li)

Stability of Ra-226 Concentration in Liquid Samples of Uranium-Ore Processing.

6. **Comissao de Energia Nuclear, Instituto de Radioproteção de Dosimetrio**
(J.M. Godoy)

Development of a So-Called Hour Method for Analysis of Plutonium in Soil Samples.

ATTACHMENT V

Proposed Contents of a Technical Document on CRP on "Rapid Methods"
(Attachment VI of the 1993 December 13-17 Consultants' meeting in Vienna)

Recommendations for how to develop a technical document on the CRP on rapid methods:

1) Safety Series 18 and Technical Report Series No. 95 should be used as the basis for a new document.

2) Achievements of the CRP are presented in IAEA Reports AL/043 and AL/056.

3) An outline for the proposed technical document is presented in IAEA/AL/019 (Attachment II) and IAEA/AL/043 (Attachment III); in particular, the tables presented in IAEA/AL/043 will be useful for the workplan followed.

4) A general outline of table of contents would be:

I. Introduction
II. Sample Preparation
III. Mobile Laboratories
IV. Instrumental Methods
V. Separation Methods for Strontium and Tritium
VI. Separation Methods for Transuranics
VII. Future Needs

An additional unit on Quality Control could be added.

5) Laboratories should be contacted to update Attachment III of report IAEA/AL/056, so that 2) Summary of Proposed Work for Next Year would give instead 2) Summary of Accomplishments. Copies of papers from the literature should be requested. The completion of part 2 is highly desirable in cases where the research has not been published since the last RCM.

6) These summary sheets and the reports from the research contract would then form the basis for several annexes (as per Technical Reports Series No. 295). Reports from RIAL, members with research agreements, and related reports from the participating institutes could also be included.

7) Section I. Introduction. This section should be compiled from reports IAEA/AL/019, Attachment II and IAEA/AL/043, Attachment III. This section should address as a minimum, accident scenarios to be considered and nuclides and matrices of interest. Further references can be made to the detailed information provided in Technical Reports Series No. 295 (MEF).

8) Section III. Mobile Laboratories. This section can be developed from the Attachment II of this report and the report from Mr. Schelenz provided in the Annex to report IAEA/AL/056. Mobile laboratories should be considered as a rapid method in itself. The Consultants recommended that the use of mobile (van, plane, boat) facilities be highlighted and emphasized in its own section.

9) Section VII. Future Needs. Identificaiton of methods that have not been addressed but are desirable can be developed from the charts developed at the Warsaw RCM, report IAEA/AL/043. In addition, recommendations are provided in Attachment III, IAEA/AL/043. Additional input to the tables is provided in Attachment V of this document.

10) The consultants recommended that this report on rapid methods be developed as an Agency document similar to the Guidebook (Techn. Rep. Ser. No. 295) since the research reflects the interest only of the CRP participants. A one year time frame for completion is recommended. The invitation of an external expert for the editing and all technical work in connection with the final report is proposed by the Consultants.

11) A bibliography of other published papers on rapid methods could be included.