



European
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JRC SCIENTIFIC AND POLICY REPORTS

Instrument of pre-accession assistance – "Improving Chemical and Ionising Radiation Metrology" in Turkey

Final report

EMIT

Project Nr TR080209

Josephine McCourt

2013



Report EUR 25987 EN

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JRC81731

EUR 25987 EN

ISBN 978-92-79-30345-6 (print)

ISBN 978-92-79-30344-9 (PDF)

ISSN 1018-5593 (print)

ISSN 1831-9424 (online)

doi:10.2787/59433

Luxembourg: Publications Office of the European Union, 2013

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Printed in Belgium

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Executive summary

The project aims to contribute to the better functioning of the EU-Turkey Customs Union Agreement regarding the free movement of goods as well as to facilitate the implementation of the *acquis communautaire* in quality of life related areas such as environmental, health and consumer protection and food safety.

The following results were achieved:

- Preliminary
 - Establishment of the project office at TÜBİTAK UME
 - Identification of stakeholders in order to ensure awareness
 - Meetings with all relevant institutions to ensure awareness and confirm support
 - Contacts with other project teams
 - Gaps and needs analysis at TÜBİTAK UME, TAEK-ÇNAEM and TAEK-SANAEM
 - Planning of activities to be carried out
- Component 1: Institutional capacity building for TÜBİTAK-UME
 - Identification of requirements for production and certification of reference materials for country-specific products
 - Development of procedures and ISO Guide 34 management system, integration into quality system
 - Preparation of chemistry laboratories for CRM production and provision of international comparisons
 - Consulting on equipment needed for CRM production
- Component 2: Institutional capacity building for TAEK
 - Identification of requirements and consulting for secondary standardisation at TAEK institutes
 - Extension of the quality management systems at TAEK institutes to secondary level standardisation activities and support for preparation for participation in the CIPM MRA
 - Planning of the development of primary standardisation
- Component 3: Knowledge transfer and human resources development
 - Familiarising TÜBİTAK UME and TAEK researchers with metrology systems in EU member states with similar economic needs
 - Training for TÜBİTAK UME and TAEK researchers in matters of CRM, secondary standardisation and applicable quality systems
 - Organisation of seminars and workshops for end users
 - Co-operation with Turkish universities providing education in chemical and in ionising radiation metrology
 - Consulting to Turkish universities interested in joining Euromaster Joint Degree Programme in metrology
- Component 4: Networking and Raising Awareness
 - Promotion of TÜBİTAK UME and TAEK among scientific and metrological community at European level
 - Enhancement of relationships with direct and indirect users of CRM and metrology services
 - Enhancement of relationships with universities providing a master level education in measurement science
 - Organisation of national conferences and events
 - Support of TÜBİTAK UME and TAEK experts' participation in international events.

- Presentation of the final results of the project
A wrap-up event in order to present the final results of the project was held in June 2012. The aim of this was to underline the impact of the IPA project on the involved institutions and on the broader public. Invitees to this event included representatives from all beneficiary and partner institutions, other relevant ministries and state administrative bodies, the academic and legal professions, the business community, NGOs and members of the international donor community.

This final report provides an overview of the accomplishments during the full duration of the project. It also offers a summary of the lessons learned, of the Result Oriented Monitoring evaluations, of the financial audits carried out and a synopsis of TÜBİTAK UME and TAEK's strategic plans for the next three years.

The "Logical Framework" tables (see annex) summarise the status of the project to date in terms of completion of its objectives. However many of the objectives are split between:

- the consultant having to deliver advice, provide training, provide introductions to certain communities and
- the beneficiary (e.g. TÜBİTAK UME, TAEK-ÇNAEM, TAEK-SANAEM, control laboratories, universities....) having to demonstrate that they have used this successfully to reach the stated goals.

At the end of the project (30.09.2012), we still cannot see the entire outcome as some objectives take time e.g. recent Calibration and Measurement Capability (CMC) submissions won't be validated until mid 2014. The status of the parallel IPA (TR2009/0301.02 "Supply of Chemical Metrology Equipment to TÜBİTAK UME) is such that certain lots have had to be re-published. This will have a knock-on effect on the commencement and completion dates for some of TÜBİTAK UME's planned activities, e.g. CRM production and eventual release dates. This has already been taken into account in their strategic plan, the main points of which will be provided in section 4. The completion rate of JRC-IRMM's planned activities for each objective is shown in Figure 1. The status in mid 2011 and the status at the end of the project are both given to show that the achievement of nearly all objectives was being worked on throughout the project duration.

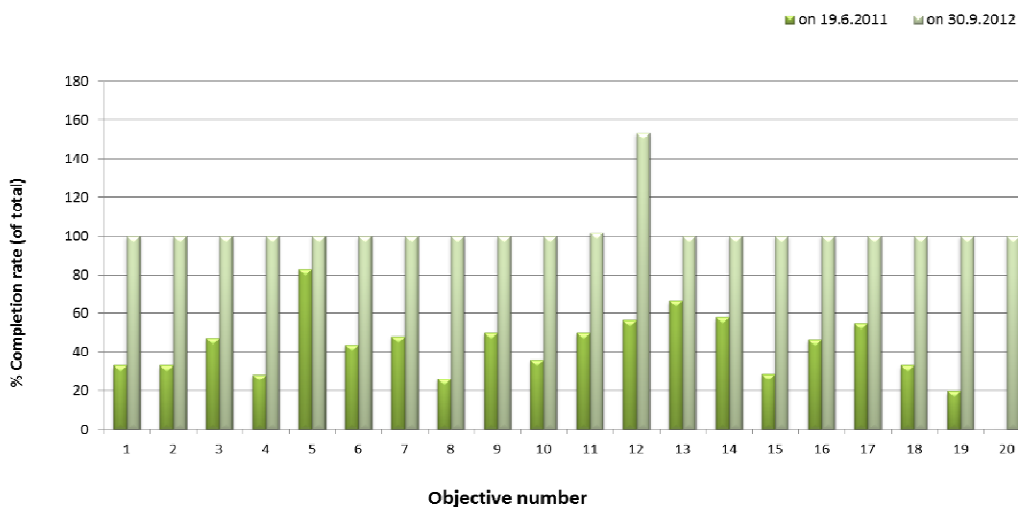


Figure 1: Completion rate (30.09.2012) of JRC-IRMM's planned activities

The hosting of long term trainees (16 in JRC-IRMM and two in PTB) had an important influence on the achievement of the objectives concerning capacity building in TÜBİTAK UME and TAEK. The knowledge gained by these long term trainees is summarised in section 2.2. Nearly all trainees expressed the fact that the new skills gained would help them implement new, or amended, methods and/or systems in their home laboratory.

The other very important means of achieving the project's objectives was by means of various types of short term training possibilities (89). A summary of the short term event status at the end of the project is presented in Figure 2. Short term training events comprised of scientific workshops, study visits, technical advice visits, seminar lectures, sessions in conferences, conference participations and non-training short term events included project management meetings (Steering Committee and Project Advisory Committee).

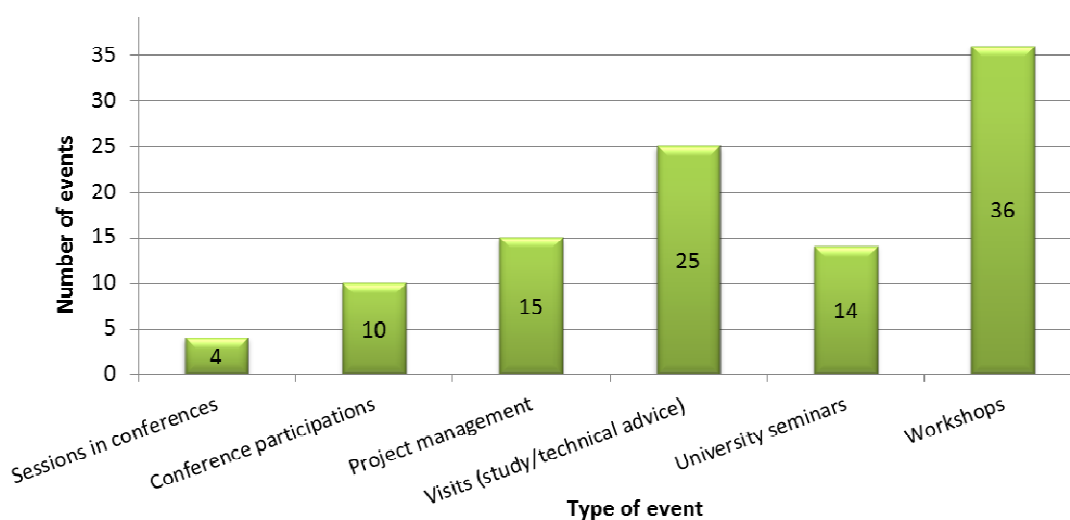


Figure 2: Short term event status at the end of the project (30.09.2012)

To gain an insight into how the training workshops were being perceived across the scientific community in Turkey, evaluation forms were handed out to the participants. The number of completed evaluation forms varies with every workshop¹. The number of participations in all types of training events from the beginning (01.10.2009 'til 30.09.2012) is 2334, one third of whom are individual scientists coming to different workshops.

A web diagramme (shown below in Figure 3) shows all 36 scientific workshops and the score they achieved by the attendees when they were asked how the "objectives were met" (%). As can be seen, the appreciation varied from 70-100% (when combining "very good" and "good" scores) for all workshops. Two workshops, the S03-11 Liquid Scintillation Counting and the S03-17 Radiochemical laboratory practice, each with a small group of five trainees scored 100% "very good" proving the point that the smaller the group being trained the more the course can be adapted to suit the needs of the trainees, resulting in high satisfaction.

On the other hand, it can be seen that when upper limits were not set for a maximum number of attendees (e.g. in one of the first S04 practical training courses), the outcome was less satisfactory (as too many people were in the groups for the practical exercises).

¹ The original individual evaluation sheets are available to the Project Steering Committee and the JRC-IRMM EMIT S&T guidance group, via the secure circa platform "JRC Metrology in Turkey".

This lesson was learned and put into practice thereafter, with fixed attendee limits when practical exercises were included in the workshop. The full set of individual scores for each workshop can be seen in Table 6.

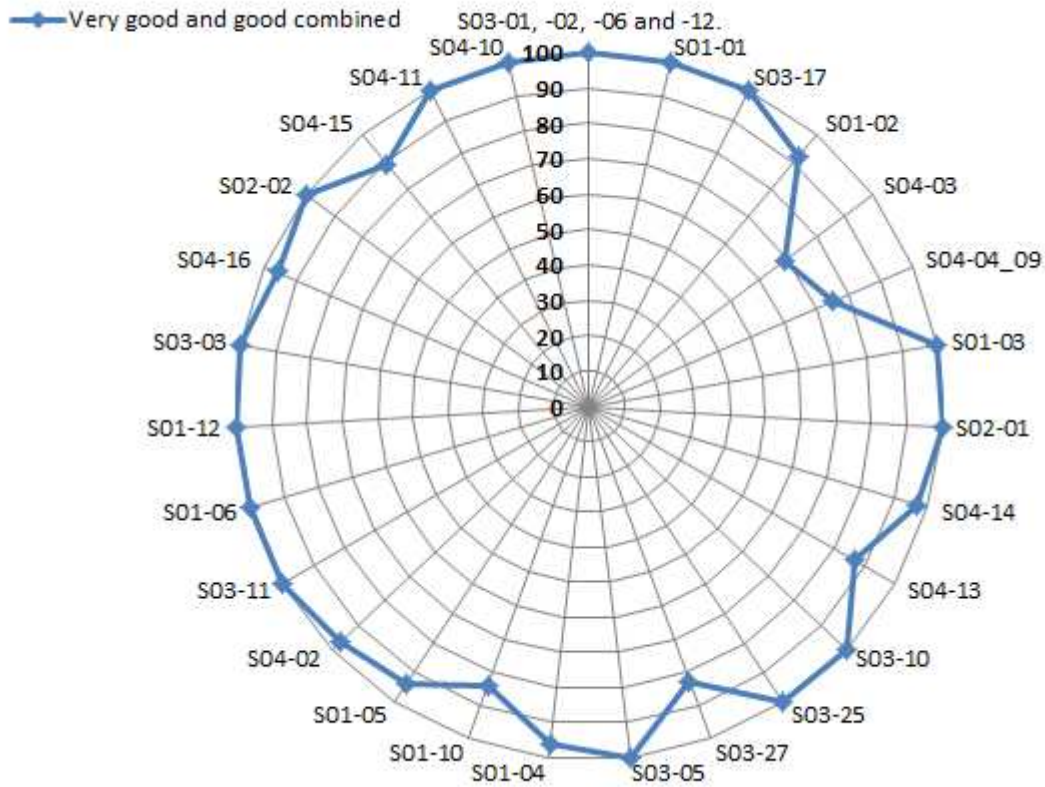


Figure 3: EMIT Training course evaluations: workshop code versus combined "very good" and "good" scores on "objectives being met and theme" (%).

All in all the appreciation of the entire project was very high. The "Result Oriented Monitoring" (ROM) evaluations resulted in the EMIT project being the highest scoring project of 46 on-going IPA projects in Turkey in 2011. See Table 1.

Table 1: Scores of Result Oriented Monitoring evaluations²

ASPECTS EVALUATED	ROM 1 30.06.2011	ROM 2 29.12.2011	ROM 3 11.07.2012	ROM 4 14.12.2012
1. RELEVANCE AND QUALITY OF DESIGN	A	A	B	A
2. EFFICIENCY OF IMPLEMENTATION TO DATE	B	B	B	A
3. EFFECTIVENESS TO DATE	B	B	B	B
4. IMPACT PROSPECTS	A	B	B	B
5. POTENTIAL SUSTAINABILITY	A	A	A	A

Apart from scoring very highly on the design and implementation, the fact that the project also scored very highly in terms of sustainability means that the investments in institutes and human resources were well founded and should continue to bear fruit, even without further EU intervention.

² A = Very good (The situation is considered highly satisfactory, largely above average and potentially a reference for good practice).
B = Good (The situation is considered satisfactory, but there is room for improvements). EuropeAid/128693/D/SER/TR.

EMIT reporting periods

PHASE		PERIOD	Publication date
INCEPTION PHASE		01.10.2009 to 31.12.2009	26.03.2010*
IMPLEMENTATION PHASE	1 ST INTERIM	01.01.2010 to 30.06.2010	30.06.2010*
	2 ND INTERIM	01.07.2010 to 31.12.2010	31.12.2010*
	3 RD INTERIM	01.01.2011 to 30.06.2011	30.06.2011*
	4 TH INTERIM	01.07.2011 to 31.12.2011	31.12.2011*
	5 TH INTERIM	01.01.2012 to 30.06.2012	30.06.2012*
FINAL PHASE		01.07.2012 to 30.09.2012	30.11.2012*
FINAL REPORT			31.03.2013*

* Publication dates are indicative.

List of abbreviations

ABBREVIATION	NAME IN FULL
CIPM MRA	International Committee for Weights and Measures Mutual Recognition Arrangement
CRM	Certified Reference Material
CMC	Calibration and Measurement Capability
EAL	Elemental Analysis Laboratories
ECTNA	European Chemistry Thematic Network Association
EMIT	Europe and Metrology in Turkey
EURAMET	European Association of National Metrology Institutes
HPLC	High Performance Liquid Chromatography
ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
ICP-OES	Inductively Coupled Plasma - Optical Emission Spectrometry
IM	Isotope Measurements Unit (of JRC-IRMM)
JRC	Joint Research Centre
JRC-IRMM	Joint Research Centre - Institute for Reference Materials and Measurements
LSC	Liquid Scintillation Counting
LTT	Long Term Trainee (or Traineeship)
NMI	National Metrology Institute
PAC	Project Advisory Committee
PTB	Physikalisch-Technische Bundesanstalt (German Physical and Technical Metrology Institute)
RM	Reference Materials Unit (of JRC-IRMM)
RN	Radionuclide Metrology Group (of JRC-IRMM)
SC	(Project) Steering Committee
SPE	Solid phase Extraction
STGG	(Project) Scientific and Technical Guidance Group
STT	Short Term Trainee (or Traineeship)
SSDL	Secondary Standardisation Dosimetry Laboratory
TAEK - ÇNAEM	Türkiye Atom Enerjisi Kurumu - Çekmece Nükleer Araştırma ve Eğitim Merkezi (Turkish Atomic Energy Authority - Çekmece Nuclear Research and Training Centre)
TAEK - SANAEM	Türkiye Atom Enerjisi Kurumu - Sarayköy Nükleer Araştırma ve Eğitim Merkezi (Turkish Atomic Energy Authority - Sarayköy Nuclear Research and Training Centre)
TÜBİTAK UME	Türkiye Bilimsel Ve Teknolojik Araştırma Kurumu Ulusal Metroloji Enstitüsü (Scientific and Technological Research Council of Turkey - National Metrology Institute)
VERMI	Virtual European Radionuclide Metrology Institute
WI	Work Instruction

Project synopsis

PROGRAMME	EMIT I - TURKEY
Project title	"Improving Chemical and Ionising Radiation Metrology" in Turkey
Project number	TR 080209
Overall objective	The overall objective of the project is to contribute to the better functioning of the EU-Turkey Customs Union Agreement regarding the free movement of goods as well as to facilitate the implementation of <i>acquis communautaire</i> (EU rules) in quality of life related areas such as environmental, health and consumer protection and food safety.
Specific objectives	The main purpose of this arrangement is to enhance institutional and measurement capacity in chemical and ionising radiation metrology to ensure that Turkish laboratories are able to produce traceable and comparable measurement results, leading to improvements in quality of life, and facilitating the adoption of the <i>acquis</i> related to the free movement of goods, by means of: <ul style="list-style-type: none"> ▪ improving institutional capacities of beneficiaries ▪ ensuring knowledge transfer in chemical and ionising radiation metrology ▪ further developing human resources at laboratories and at academia in Turkey ▪ strengthening networking and raising awareness.
Planned outputs	<p><u>Component 1: Institutional capacity building for TÜBİTAK UME</u> New metrological capabilities/services in the field of chemical metrology developed and supported by documented and implemented strategies</p> <ul style="list-style-type: none"> ▪ Integrated quality management system according to ISO Guide 34 ▪ TÜBİTAK UME chemistry laboratories advanced in their preparation for accreditation according to ISO Guide 34 as producer and supplier of CRMs to the proficiency test providers ▪ New calibration and measurement capabilities to support the implementation of the <i>acquis</i> are ready for submission to the CIPM MRA CMC database. <p><u>Component 2: Institutional capacity building for TAEK</u></p> <ul style="list-style-type: none"> ▪ New metrological capabilities/services in the field of ionising radiation metrology developed and supported by documented and implemented plans and programmes ▪ Secondary level standardisation procedures developed or improved ▪ TAEK institutes quality management systems extended and covering the new metrological services ▪ New calibration and measurement capabilities to support the implementation of the <i>acquis</i> are ready to submission to the CIPM MRA CMC database ▪ Preparation on the development of primary standardisation initiated and foreseen in TAEK institutes' strategies.

	<p><u>Component 3: Knowledge transfer and human resources development</u></p> <ul style="list-style-type: none"> ▪ TÜBİTAK UME and TAEK researchers familiar with functioning of metrology systems in EU Member States with similar economic needs ▪ TÜBİTAK UME and TAEK researchers skilled and ready to carry out the new metrological services ▪ Turkish laboratories' experts more knowledgeable on how to consider metrological aspects in their activities ▪ Interested Turkish universities more familiar with the alignment of EU university programmes in measurement science with Bologna requirements ▪ Turkish universities interested in joining Euromaster Joint Degree Programme in measurement science conform to requirements. <p><u>Component 4: Networking and raising awareness</u></p> <ul style="list-style-type: none"> ▪ European national metrology institutes (NMIs) familiarised with the development of TÜBİTAK UME and TAEK's capabilities ▪ Network of contacts in the field of metrology established, strengthened and operational ▪ Network of contacts with universities established and strengthened ▪ Chemical and ionising radiation metrology topics discussed with national experts and stakeholders ▪ International metrology community informed about TÜBİTAK UME and TAEK capabilities.
<p>Objectives</p>	<p><u>Component 1: Institutional capacity building TÜBİTAK UME</u></p> <ol style="list-style-type: none"> 1. JRC-IRMM to advise TÜBİTAK UME on their strategic plan for the production and certification of reference materials. 2. JRC-IRMM to provide consultation to TÜBİTAK UME on the development of procedures and management systems according to ISO Guide 34 and on their integration into the TÜBİTAK UME quality system. 3. JRC-IRMM to advise TÜBİTAK UME on the preparation of their chemistry laboratories as CRM producer and international comparisons provider in selected areas. 4. JRC-IRMM to provide recommendations on the necessary improvement of clean and climatic rooms at TÜBİTAK UME 5. JRC-IRMM to provide consultation to TÜBİTAK UME on the needed equipment and technical specifications for the equipment for the production of CRMs <p><u>Component 2: Institutional capacity building for TAEK</u></p> <ol style="list-style-type: none"> 6. JRC-IRMM to advise TAEK on their strategic plan for improving the capabilities for secondary standardisation at TAEK institutes. 7. JRC-IRMM to provide consultation to TAEK on the development/improvement of their secondary level standardisation procedures. 8. JRC-IRMM to provide consultation on the extension of the current quality management systems at TAEK institutes to the secondary level standardisation activities and support for preparation for participation in the CIPM MRA. 9. JRC-IRMM to advise TAEK on their strategic plan for the development of primary standardisation.

	<p><u>Component 3: Knowledge transfer and human resources development</u></p> <p>10. JRC-IRMM to help familiarise TÜBİTAK UME and TAEK researchers with the functioning of metrology systems in EU member states with similar economic needs.</p> <p>11. JRC-IRMM to organise short term and long term trainings for TÜBİTAK UME and TAEK researchers (18 * 1 yr LTTs).</p> <p>12. JRC-IRMM to organise seminars and workshops for the end users.</p> <p>13. JRC-IRMM to help familiarise Turkish universities providing education in chemical and (if any) in ionising radiation metrology with the status of alignment of EU university programmes in measurement science with the Bologna requirements.</p> <p>14. JRC-IRMM to provide consultation to Turkish universities interested in joining Euromaster Joint Degree Programme in measurement science.</p> <p><u>Component 4: Networking and raising awareness</u></p> <p>15. JRC-IRMM to help promote TÜBİTAK UME and TAEK amongst the scientific and metrological community at European level</p> <p>16. JRC-IRMM to help establish a network of direct and indirect users of CRMs and metrology services.</p> <p>17. JRC-IRMM to help establish a network of universities providing (or interested in providing) a master level university education in chemical and ionising radiation metrology.</p> <p>18. JRC-IRMM to organise national conference sessions and events.</p> <p>19. JRC-IRMM will support the participation of TÜBİTAK UME and TAEK experts in international events.</p> <p>20. The consultant (JRC-IRMM) and the contracting authority (EU Delegation, Ankara) will organise a final wrap-up event in order to present the final results of the project and to underline the impact of the IPA programme on the involved institutions and a broader public.</p>
Project starting date	01.10.2009
Project duration	36 months

1 Introduction

The instrument of pre-accession assistance (IPA) project TR080209 "Improving Chemical and Ionising Radiation Metrology" under the Transition Assistance and Institution Building Component for 2008 is based on the Administrative Arrangement IPA/2009/214672 – JRC - 31331 between Directorate General (DG) Enlargement and the Joint Research Centre (JRC), signed on 24th July, 2009. The project synonym is EMIT meaning "Europe and Metrology in Turkey".

The contracting authority for the project, acting on behalf of DG Enlargement, is the EU Delegation of the European Commission to Turkey, Ankara.

The overall objective of the project is to contribute to the better functioning of the EU - Turkey Customs Union Agreement regarding the free movement of goods as well as to facilitate the implementation of *acquis communautaire* in quality of life related areas such as environmental, health and consumer protection and food safety.

The main purpose of this arrangement is to enhance institutional and measurement capacity in chemical and ionising radiation metrology to ensure that Turkish laboratories are able to produce traceable and comparable measurement results, leading to improvements in the quality of life, and facilitating the adoption of the *acquis* related to the free movement of goods.

The Consultant support to EU Delegation Ankara and respectively to DG Enlargement aimed at:

- improving institutional capacities of beneficiaries
- ensuring knowledge transfer in chemical and ionising radiation metrology
- further developing human resources at laboratories and at academia in Turkey
- strengthening networking and raising awareness.

This final report provides an overview of the accomplishments during the full duration of the project. It also offers a summary of the lessons learned, of the Result Oriented Monitoring evaluations, of the financial audits carried out and a synopsis of TÜBİTAK UME and TAEK's strategic plans for the next three years.

2 Activities

In line with the initial planning in the inception report, all activities under this project are structured within three **major objectives**:

- Institutional capacity building for both TÜBİTAK UME and TAEK
- Knowledge transfer and human resources development
- Networking and raising awareness

The specific objectives (per component) are as follows:

Table 2: EMIT Objectives

Component 1: Institutional capacity building TÜBİTAK UME

- i. JRC-IRMM to advise TÜBİTAK UME on their strategic plan for the production and certification of reference materials.
- ii. JRC-IRMM to provide consultation to TÜBİTAK UME on the development of procedures and management systems according to ISO Guide 34 and on their integration into the TÜBİTAK UME quality system.
- iii. JRC-IRMM to advise TÜBİTAK UME on the preparation of their chemistry laboratories as CRM producer and international comparisons provider in selected areas.
- iv. JRC-IRMM to provide recommendations on the necessary improvement of clean and climatic rooms at TÜBİTAK UME
- v. JRC-IRMM to provide consultation to TÜBİTAK UME on the needed equipment and technical specifications for the equipment for the production of CRMs

Component 2: Institutional capacity building for TAEK

- vi. JRC-IRMM to advise TAEK on their strategic plan for improving the capabilities for secondary standardisation at TAEK institutes.
- vii. JRC-IRMM to provide consultation to TAEK on the development/improvement of their secondary level standardisation procedures.
- viii. JRC-IRMM to provide consultation on the extension of the current quality management systems at TAEK institutes to the secondary level standardisation activities and support for preparation for participation in the CIPM MRA.
- ix. JRC-IRMM to advise TAEK on their strategic plan for the development of primary standardisation.

Component 3: Knowledge transfer and human resources development

- x. JRC-IRMM to help familiarise TÜBİTAK UME and TAEK researchers with the functioning of metrology systems in EU Member States with similar economic needs.
- xi. JRC-IRMM to organise short term and long term trainings for TÜBİTAK UME and TAEK researchers (18 x 1 yr LTTs).

- xii. JRC-IRMM to organise seminars and workshops for the end users.
- xiii. JRC-IRMM to help familiarise Turkish universities providing education in chemical and (if any) in ionising radiation metrology with the status of alignment of EU university programmes in measurement science with the Bologna requirements.
- xiv. JRC-IRMM to provide consultation to Turkish universities interested in joining Euromaster Joint Degree Programme in measurement science.

Component 4: Networking and raising awareness

- xv. JRC-IRMM to help promote TÜBİTAK UME and TAEK amongst the scientific and metrological community at European level
- xvi. JRC-IRMM to help establish a network of direct and indirect users of CRMs and metrology services.
- xvii. JRC-IRMM to help establish a network of universities providing (or interested in providing) a master level university education in chemical and ionising radiation metrology.
- xviii. JRC-IRMM to organise national conference sessions and events.
- xix. JRC-IRMM will support the participation of TÜBİTAK UME and TAEK experts in international events.

Final

- xx. The consultant (JRC-IRMM) and the contracting authority (EU Delegation, Ankara) will organise a final wrap-up event in order to present the final results of the project and to underline the impact of the IPA programme on the involved institutions and a broader public.

The twenty objectives (as listed in Table 2) were, for the most part, achieved by carrying out a number of "events" which are listed in Annex 0. For practical reasons, each event was given a code and can be read as follows:

- Expert Group 1 Reference Materials events start with S01,
- Expert Group 2 Primary Methods of Measurement events start with S02,
- Expert Group 3 Ionising Radiation events start with S03,
- Expert Group 4 Quality & Metrology Education events start with S04 and finally
- General events start with the code S05.

The event list comprises short term training actions, such as scientific workshops, university seminars, study visits, technical advice visits, participations to conferences and JRC-IRMM co-organised sessions in national conferences in Turkey. The only deliverables not covered in the event list are long term traineeships (mostly 12 month duration) at JRC-IRMM (or PTB) and not all visits of JRC-IRMM experts to Turkey are listed either. The EMIT Project Management Meetings, such as the Project Advisory Committee and Steering Committee Meetings have also been added to the event list under S05 activities.

The methodology used to achieve EMIT objectives is summarised in Table 3.

Table 3: Methodology used to achieve EMIT objectives

METHODOLOGY	DESCRIPTION
A	Long term training (LTT) actions involving 18 trainees (LTTs) at JRC-IRMM or PTB
B	Technical advice visits – expert advice provided by JRC-IRMM staff to TÜBİTAK UME and/or TAEK.
C	Study visits to EU Member States - meant for Turkish scientists to come to JRC-IRMM or to EU NMIs
D	Participations in conferences - meant for Turkish scientists to attend conferences within the scope of EMIT
E	Workshops/seminars (\pm 20 participants) for TÜBİTAK UME and TAEK staff
F	Seminars/workshops (50-100 participants) for end-users (national laboratory staff, university staff, students.....)
G	Workshops (20-40 participants) for universities
H	Session in a conference - chemical metrology
I	Session in a conference - ionising radiation metrology
J	Session in a conference - education in metrology
K	Visits of JRC-IRMM experts to Turkey (other than code B)
L	Concluding conference
M	Project Advisory Committee Meetings
N	Project Steering Committee Meetings

2.1 Overview of activities

The overview in Table 4 is based on the previously elaborated reporting logic and summarises the results achieved during the entire project (01.10.2009 – 30.09.2012).

Table 4: Status of EMIT objectives at the end of the final phase

Del. Nr.	Deliverable type	Activity	Methodology	Status at the end of the project (%) ³
1	Capacity building for TÜBİTAK UME	JRC-IRMM to advise TÜBİTAK UME on their strategic plan for the production and certification of reference materials.	A, B, C, E, K, M, N	8 LTTs completed; (100% of objective achieved)
2		JRC-IRMM to provide consultation to TÜBİTAK UME on the development of procedures and management systems according to ISO Guide 34 and on their integration into the TÜBİTAK UME quality system.	A, B, C, E, K	8 LTTs completed; (100% of objective achieved)
3		JRC-IRMM to advise TÜBİTAK UME on the preparation of their chemistry laboratories as CRM producer and international comparisons provider in selected areas.	A, B, C, E, K	8 LTTs completed; (100% of objective achieved)
4		JRC-IRMM to provide recommendations on the necessary improvement of clean and climatic rooms at TÜBİTAK UME	A, K	8 LTTs completed; (100% of objective achieved)
5		JRC-IRMM to provide consultation to TÜBİTAK UME on the needed equipment and technical specifications for the equipment for the production of CRMs	A, B, C, K	8 LTTs completed; (133% of objective achieved.)
6	Capacity building for TAEK	JRC-IRMM to advise TAEK on their strategic plan for improving the capabilities for secondary standardisation at TAEK institutes.	A, B, C, E, K	10 LTTs completed; 100% of objective achieved.
7		JRC-IRMM to provide consultation to TAEK on the development/improvement of their secondary level standardisation procedures.	A, B, C, E, K	10 LTTs completed; 100% of objective achieved.
8		JRC-IRMM to provide consultation on the extension of the current quality management systems at TAEK institutes to the secondary level standardisation activities and support for preparation for participation in the CIPM MRA.	A, B, C, E, K	10 LTTs completed; 100% of objective achieved.
9		JRC-IRMM to advise TAEK on their strategic plan for the development of primary standardisation.	A, B, C, E, K	10 LTTs completed; 100% of objective achieved.
10	Knowledge transfer and human	JRC-IRMM to help familiarise TÜBİTAK UME and TAEK researchers with the functioning of metrology systems in EU member states with	A, B, C, E, K	18 LTTs completed; 100% of objective

³ Expressed as a percentage of planned activities.

Del. Nr.	Deliverable type	Activity	Methodology	Status at the end of the project (%) ³
	resources development	similar economic needs.		achieved.
11		JRC-IRMM to organise short term and long term trainings for TÜBİTAK UME and TAEK researchers (18 * 1 yr LTTs).	A, B, E	18 LTTs completed; 100% of objective achieved.
12		JRC-IRMM to organise seminars and workshops for the end users.	F	100% of objective achieved.
13		JRC-IRMM to help familiarise Turkish universities providing education in chemical and (if any) in ionising radiation metrology with the status of alignment of EU university programmes in measurement science with the Bologna requirements.	F, K	20 universities visited. 100% of objective achieved.
14		JRC-IRMM to provide consultation to Turkish universities interested in joining Euromaster Joint Degree Programme in measurement science.	F, K	20 universities visited. 100% of objective achieved.
15		JRC-IRMM to help promote TÜBİTAK UME and TAEK amongst the scientific and metrological community at European level	D	100% of objective achieved.
16		JRC-IRMM to help establish a network of direct and indirect users of CRMs and metrology services.	M, N	PAC-07 and SC-08 meetings /seminars 100% of objective achieved.
17	Networking and raising awareness	JRC-IRMM to help establish a network of universities providing (or interested in providing) a master level university education in chemical and ionising radiation metrology.	B, D, F, J	100% of objective achieved.
18		JRC-IRMM to organise national conference sessions and events.	H, I, J, L	3 conf. complete 100% of objective achieved.
19		JRC-IRMM to support the participation of TÜBİTAK UME and TAEK experts in international events.	D	100% of objective achieved.
20	Result communication	The consultant (JRC-IRMM) and the contracting authority (EU Delegation, Ankara) to organise a final wrap-up event in order to present the final results of the project.	L	100% of objective achieved.

2.2 Long term training opportunities (01.10.2009 – 30.09.2012)

There were more or less three intake periods (February 2010, October 2010 and September 2011) of the 18 long term trainees from TÜBİTAK UME, TAEK-ÇNAEM and TAEK-SANAEM. A summary of their training topics is provided in Table 5. 16 trainees had a one year traineeship and two trainees had a six month traineeship.

Table 5: Topics list of Long Term Trainees trained under EMIT (in chronological order)

Nr	Period of traineeship	Name of LTT & home institute.	Traineeship Institute & Unit	Supervisor	Training topic
1	01.02.2010 – 30.01.2011	Ms N. TOKMAN (TÜBİTAK UME)	JRC-IRMM (RM)	Dr H. Schimmel	Aspects of RM production - Food: Aflatoxins (B1, B2, G1 and G2) and Ochratoxin A in paprika and chilli powder matrices by HPLC-FLD.
2	01.02.2010 – 30.01.2011	Mr E. ENGIN (TÜBİTAK UME)	JRC-IRMM (RM)	Dr A. Held	Aspects of RM production - Environment: selected heavy metals (Hg content by cold vapour ETAAS) in soils.
3	01.02.2010 – 30.01.2011	Ms B. ARI (TÜBİTAK UME)	JRC-IRMM (IM)	Dr C. Quetel	Primary methods of measurement - ICP, ICP-MS and IDMS measurements for heavy metals in mineral feed.
4	12.02.2010 – 11.01.2011	Mr E. YELTEPE (TAEK-SANAEM)	JRC-IRMM (NP)	Dr M. Hult & Dr S. Pommé	Secondary and primary standardisation of radionuclides
5	22.03.2010 – 21.09.2010	Ms M. SEFERINOGLU (TAEK-SANAEM)	JRC-IRMM (NP)	Dr S. Pommé	Source preparation and alpha-particle spectrometry
6	05.10.2010 to 04.09.2011	Ms N. ASLAN (TAEK-SANAEM)	JRC-IRMM (NP)	Dr T. Altitzoglou	Liquid scintillation counting for standardisation of radionuclides
7	05.10.2010 to 04.09.2011	Mr N. SAHIN (TAEK-SANAEM)	JRC-IRMM (NP)	Dr M. Hult	Gamma-ray spectrometry - measurements of activity using both conventional and low-level gamma-ray spectrometry.
8	05.10.2010 to 04.09.2011	Mr D. YASAR (TAEK-ÇNAEM)	PTB	Dr H. Janssen	Ionising radiation dosimetry - improvement dosimetrical techniques and applications, calibration of instruments and dose meters”
9	08.10.2010 to 07.10.2011	Ms B. BINICI (TÜBİTAK UME)	JRC-IRMM (RM)	Dr M. Ricci	Characterisation of a candidate RM 'fish' regarding some POPs (persistent organic pollutants)
10	08.10.2010 to 07.10.2011	Mr T. GOKCEN (TÜBİTAK UME)	JRC-IRMM (RM)	Dr H. Schimmel	Aspects of RM production re selected organic contaminants in food commodities.

Nr	Period of traineeship	Name of LTT & home institute.	Traineeship Institute & Unit	Supervisor	Training topic
11	08.11.2010 to 07.11.2011	Mr S. CAN (TÜBİTAK UME)	JRC-IRMM (IM, RM)	Dr C. Quetel	Primary methods of measurement - Inorganic Chemical/Isotopic Reference Measurements – Trace elements in soya based baby food and Pb in clay.
12	01.06.2011 to 31.05.2012	Mr A. DIRICAN (TAEK-SANAEM)	JRC-IRMM (NP)	Dr S. Pommé	Standardisation of radionuclide activity and data decay measurements.
13	01.09.2011 to 31.08.2012	Mr E. KAPDAN (TAEK-ÇNAEM)	PTB	Dr H. Janssen	Metrology for dosimetry
14	05.09.2011 to 04.09.2012	Mr A. İŞLEYEN (TÜBİTAK UME)	JRC-IRMM (RM)	Dr J. Snell	Aspects of RM production - Trace elements in milk (Ref Mat)
15	05.09.2011 to 04.09.2012	Mr M. TUNÇ (TÜBİTAK UME)	JRC-IRMM (RM)	Dr C. Quetel	Trace elements in environmental matrices (ID ICP MS Ref. Meas.)
16	03.10.2011 to 30.09.2012	Mr H. DIKMEN (TAEK-SANAEM)	JRC-IRMM (NP)	Dr S. Pommé	Primary and secondary standardisation of radionuclide activity
17	03.10.2011 to 30.09.2012	Ms G. KAHRAMAN (TAEK-SANAEM)	JRC-IRMM (NP)	Dr T. Altizoglou	Secondary standardisation of radionuclide activity
18	06.02.2012 to 31.07.2012	Mr A. YÜKSEL (TAEK-ÇNAEM)	JRC-IRMM (NP)	Dr M. Hult	Secondary standardisation of radionuclide activity; gamma-ray spectrometry

2.2.1 TÜBİTAK UME Trainees

- Reference materials:

- ❖ Dr Nilgün Tokman: Designing and planning of certified reference material projects and method validation
 - Aflatoxins (B1, B2, G1 and G2) and Ochratoxin A in paprika and chilli powder matrices by HPLC-FLD.
- Lessons learned (extract from Ms Tokman's final report, 13.01.2011).

"I received new knowledge on the following:

 - *ISO Guide 34 management system and integration into quality system*
 - *the use of reference materials, quality control samples, quality control charts and proficiency testing schemes, the selection of reference materials, traceability of measurement results*
 - *project planning, filling of project planning form, selection and evaluation of collaborators*

- *planning and set up of homogeneity studies, selection and dispatch of samples, control of measurements, and evaluation of homogeneity study (ANOVA, outlier testing, estimation of uncertainty, minimum sample intake)*
- *planning of stability studies, evaluation short-term stability studies and long-term stability studies*
- *different characterisation principles*
- *the estimation of measurement uncertainty*
- *how to assign values (certified values and uncertainties),*
- *the certification process of reference material*
- *proper handling including quality assurance of reference material production, processing control, shipping and storage conditions,*
- *μHPLC systems, some parameters (column length, particle size, flow rate) that may affect the results, experiments to increase sensitivity,*
- *good laboratory practice on the quantification of aflatoxins and ochratoxin A in paprika powder. Improvement of the method for the determination of aflatoxins and ochratoxin A in paprika powder; preparation of working instruction and method validation plan; designing and carrying out of laboratory experiments according to the plan and evaluation of the resulting data.”*



Figure 4: Ms Tokman (left) being trained on sample preparation for mycotoxin analyses

- ❖ Dr Alper İşleyen: Characterisation and value assignment of a reference material
 - Trace and major elements in milk powders
- Lessons learned (extract from Mr İşleyen's final report, 16.11.2012).

“I received new knowledge on the following:

 - *training for working in the laboratories and using the instrumentation of the JRC-IRMM elemental analysis laboratories operating under the quality systems ISO 17025 and ISO guide 34 were all received as planned. Efficiency of these trainings were tested with the characterisation study of the candidate milk powder CRM's. Results obtained in this study have proven the success of the whole training.*

- *all key expected deliverables were satisfactorily provided by the trainee, with the exception of analysis of the long-term stability study, and consequent contribution to the certification report. These were unachievable due to a delay in processing before the start of the traineeship. In addition, the trainee provided extra contributions in performing a micro-homogeneity study, and developing new methods for the in-house characterisation of the CRMs*
- *according to plan, the trainee was able to organise the homogeneity, and the short- and long-term stability studies. For the short-term stability and homogeneity studies, results were assessed and summarised for inclusion in the certification report. However, it was not possible to complete the long-term stability study before the end of the period, for technical reasons. In addition, the trainee made a complete assessment of micro-homogeneity to establish the minimum sample intake. The trainee successfully organised the laboratory inter-comparison exercises, which included 11 external participants, for characterisation of the candidate CRMs. In addition, methodology was further refined for in-house characterisation measurements of the materials. New techniques were developed for measurement of selenium at lower levels than previously investigated, for potassium measurement, and for the accurate measurement of cadmium by isotope-dilution ICP-MS with solid-phase extraction.”*



Figure 5: Mr Isleyen (right) being trained on solid sampling Zeeman atomic absorption spectrometry

- ❖ Dr Erinç Engin: Characterisation and value assignment of a reference material
 - Environment: selected heavy metals (Hg content by cold vapour electrothermal atomic absorption spectrometry) in soils.
- Lessons learned (extract from Mr Engin's final report, 20.12.2010).
"I received new knowledge on the following:

- *issues with ISO 17025, ISO Guide 34, 35. My training on this subject was especially useful in terms of tackling with all kind of problems which can occur with collaborators.*
- *measurement of mercury by cold vapour atomic absorption spectrometry. It was a new system but old instrument and I had to discover all the features of it.*
- *measurement of trace mercury in soils and sludges is learned with every detail it can have. I feel confident after this training that I can perform these kind of analyses back home.*
- *it has also been a very good practice to work with CRMs to validate a method.*
- *method validation itself was one of the most important profits of this training. We are planning to produce CRMs at UME, we will need every details of this training in the end.*
- *trainings on how to produce CRMs, Estimation of Measurement Uncertainty, and ISO 17025, ISO Guide 34 were very useful and hopefully we will benefit a lot from these courses at UME."*



Figure 6: Mr Engin (back) being trained on cold vapour electrothermal atomic absorption spectrometry

- ❖ Ms Burcu Binici: Assignment of property values to a candidate CRM
 - Characterisation of a candidate RM 'fish' regarding some POPs (persistent organic pollutants)
- Lessons learned (extract from Ms Binici's final report, 28.09.2011).

"I received new knowledge on the following:

 - *RM unit quality management system*
 - *the use of reference materials and the estimation of measurement uncertainty (SURM Course)*
 - *familiarisation with all technical requirements of the ISO/IEC17025:2005*
 - *production of CRMs*
 - *use of GC-MS (Thermo Finnegan DSQ) and working with liquid nitrogen*

- *co-development of an analytical method for the determination of HCB and HCBD in fish tissue to be used in the characterisation study of a candidate reference material.”*



Figure 7: Ms Binici (left) being trained on GC-MS

- ❖ Mr Taner Gökçen: Method Validation for the characterisation of a CRM
 - Selected organic contaminants in food commodities.
 - Lessons learned (extract from Mr Gökçen's final report, 15.12.2011).
“I received new knowledge on the following:
 - *co-development of a GC-MS method for the determination of pesticides in soya bean*
 - *principles of CRM production according to ISO Guide 34*
 - *use of reference materials and estimation of measurement uncertainty*
 - *principles on production of certified reference materials*
 - *ISO 17025 training*
 - *hands on experience with GC-MS, Accelerated Solvent Extraction (ASE), Gel Permeation Chromatography (GPC) systems.”*



Figure 8: Mr Gokcen (front) being trained on GC-MS

- Primary methods of measurement - inorganic chemical / isotopic reference measurements:

- ❖ Ms Betül Ari: Independent reference measurements (by ICP, ICP-MS and IDMS)
 - of the mercury mass fraction in mineral feed for the IMEP-111 comparison
 - of the extractable cadmium and lead mass fractions in mineral feed for IMEP-111 (in support to the EU reference laboratory for heavy metals)
- Lessons learned (extract from Ms Ari's final report, 20.12.2010).

"I received new knowledge on the following:

 - *metrology in chemistry as applied to inorganic chemical reference measurements*
 - *isotopic research, isotopic measurements by ICPMS*
 - *development and application of isotopic methodology for reference measurements.*
 - *participated in a EU-RM-CRL project which was in progress in IM unit, ICPMS group.*
 - *designing, optimising and implementing methods for reference measurements using ELAN 6000 ICPMS instrument, a variation of which also owned by TUBITAK UME, were good experiences for me.*
 - *earned significant experience for evaluating results obtained from isotopic measurements*
 - *estimated uncertainties on GUM Workbench.*
 - *acquired practical experience on carrying out experiments in ultra clean chemical laboratory which will be constructed in UME in the near future."*



Figure 9: Ms Ari (left) being trained on sample preparation for ICP-MS in an ultra-clean chemical laboratory

- ❖ Dr Süleyman Z. Can: Independent reference measurements (by ICP, ICP-MS and IDMS)
 - of the cadmium and lead mass fractions in baby milk powder for the IMEP-113 comparison
- Lessons learned (extract from Mr Can's final report, 28.11.2011).

“My traineeship was designed to focus on gaining experience on isotope dilution mass spectrometry and the development of measurement methods for the establishment of IDMS based reference values. In particular, I was involved in a project to deliver the reference values for the mass fractions of Cd and Pb in baby food test material. The project required the preliminary experiments to optimize the measurement parameters before the reference measurements. Considering the progress throughout the training, the objectives of the project have been successfully reached. I have gained experience on inorganic ID-MS measurements as intended at the beginning. It was also a useful experience to be involved in a project proceeding progressively from beginning to the end.

The project required that sample preparation had to be performed in clean laboratory environment. It was a chance for me to work in the Ultra Clean Chemical Laboratories of JRC-IRMM to get experience in working in clean conditions as TÜBİTAK-UME plans to own a clean chemistry laboratory in the future.

After I joined the ICP-MS group at JRC-IRMM, the group administratively transferred from Isotope Measurements Unit to Reference Materials Unit. The change introduced differences in quality management systems of the two units, and it was a chance for me to observe how the issues are handled in two units. For example, the traceability to SI of the inorganic IDMS based reference measurements come for a large part from the gravimetric mixing operations performed prior to sample processing and ICPMS acquisitions. Metrological comparative weighing with calibrated weigh standards are performed by a specialist and a weighing certificate is issued for the work. Therefore, the weighing task needs to be assigned to a specialist before the final measurements. In our case, this assignment could not be arranged until to the last month or so of my stay. Between the preliminary investigations and the reference measurements, I made use of time by contributing to an ongoing project, EMRP ENG09 – Metrology for biofuels. However, if the reference measurements were finished couple of months earlier, I, presumably, could be involved in projects to gain further aspects of isotope measurements, e.g. reverse ID MS, isotope ratio etc.

I was also closely involved in the preparation and realisation of the EMIT S02-05 event (seminar lectures in three universities in Ankara and Izmir). Together with B. Ari, my predecessor as trainee at JRC-IRMM on the same topic, we presented some of the concepts, experience and project results acquired and achieved during our training period at JRC-IRMM. Preparing this lecture, under supervision at JRC-IRMM, and delivering it was part of my training."



Figure 10: Mr Can (right) being trained on IDMS

- ❖ Mr Murat Tunc: Independent reference measurements (by ICP-MS and IDMS)
 - Trace elements in environmental matrices
- Lessons learned (extract from Mr Tunc's final report, 24.07.2012).
"I received new knowledge on the following:
 - *metrology in chemistry applied to inorganic chemical reference measurements and isotopic measurements (isotopic ratio, isotope dilution) by ICPMS.*
 - *involved in two different projects which were the project aiming at establishing reference measurement values for the test material (soya based baby milk powder) of the IMEP 113 and EMRP ENV02-WP4 project "Providing underpinning traceability for mercury vapour measurement".*
 - *gained experience on inorganic isotopic measurements during this well designed training program.*
 - *training on planning, simulation and data evaluation for ID-MS was very important for the future certification works in TÜBİTAK UME.*
 - *opportunity to learn how to work under the conditions of an ultra clean chemical laboratory. This is also a very useful experience in the perspective of the construction in TÜBİTAK UME of the same type of facility."*



Figure 11: Mr Tunc (right) being trained on IDMS

2.2.2 TAEK Trainees

- Dosimetry (PTB host):

- ❖ Dr Doğan Yaşar: Ionising radiation dosimetry in PTB
 - Improvement of dosimetrical techniques and applications, calibration of instruments and dose meters, in accordance with IEC 61267 standard in SSDL
- Lessons learned (extract from Mr Yaşar's final report dated 22.08.2011).

"I received new knowledge on the following:

 - *quality control tests related to ^{60}Co irradiation systems with high activity*
 - *performance of charge and current calibrations for an electrometer (important for component calibration for a dosimeter)*
 - *evaluation and quantification of the uncertainty associated with the determination of absorbed dose during calibration of ^{60}Co gamma beam*
 - *implementation of a water calorimeter (used as a primary standard for absorbed dose to water). This experience will make a great contribution to the development of dosimetric philosophy concerning calorimetric techniques as well as ionometric techniques in our laboratory*
 - *protection and diagnostic radiological calibration and system quality tests (very important due to the fact that the extensive use of X-rays in diagnostic medicine represents the largest manmade source of public exposure to ionising radiation)*
 - *measurements using X-ray tube with a non-invasive device according to the IEC 61267 standard.*
 - *establishment of the RQR radiation qualities (in the SSDL X-ray beam laboratory) – important as it represents the incident beam on the patient in general radiography, fluoroscopy and dental applications*

- generation of the HVLs for narrow spectrum and high dose rate series in accordance with ISO 4037
- calibration of a spherical chamber in terms of air kerma for narrow series X-ray beam ^{137}Cs and ^{60}Co radiation beams
- source and chamber calibrations as needed in brachytherapy (HDR ^{192}Ir and well type chambers)
- comparison studies on the air kerma calibration coefficients for protection level dosimeters on X-ray beam potentials between 30 kV to 100 kV
- beta dosimetry - how to calibrate a beta survey meter (needed for monitoring the working place at a point in the radiation field)".



Figure 12: Mr Yaşar (right) being trained on dosimetry at PTB

- ❖ Mr Enis Kapdan: Ionising radiation dosimetry in PTB
 - Primary and secondary level calibration processes with ionising radiation
 - Lessons learned (extract from Mr Kapdan's final report dated 19.07.2012).
 - “I received new knowledge on the following:
 - the importance of primary calibrations in an NMI for the metrological work performed in an accredited SSDL to establish and maintain traceability to the international system of units (SI).
 - the use of water phantoms for the calibration of ionisation chambers in terms of absorbed dose to water at the ^{60}Co therapy radiation quality.
 - dealing with the case of medical clinics, not equipped with a water phantom but with a solid state phantom.
 - how to provide, not only the calibration factor but in addition a transfer factor from the water phantom to the solid state phantom.
 - this training would have been better for me, if the time of training was longer. I could have found a chance to improve myself at specific subjects more deeply with the expert physicists e.g. on Monte Carlo simulations”

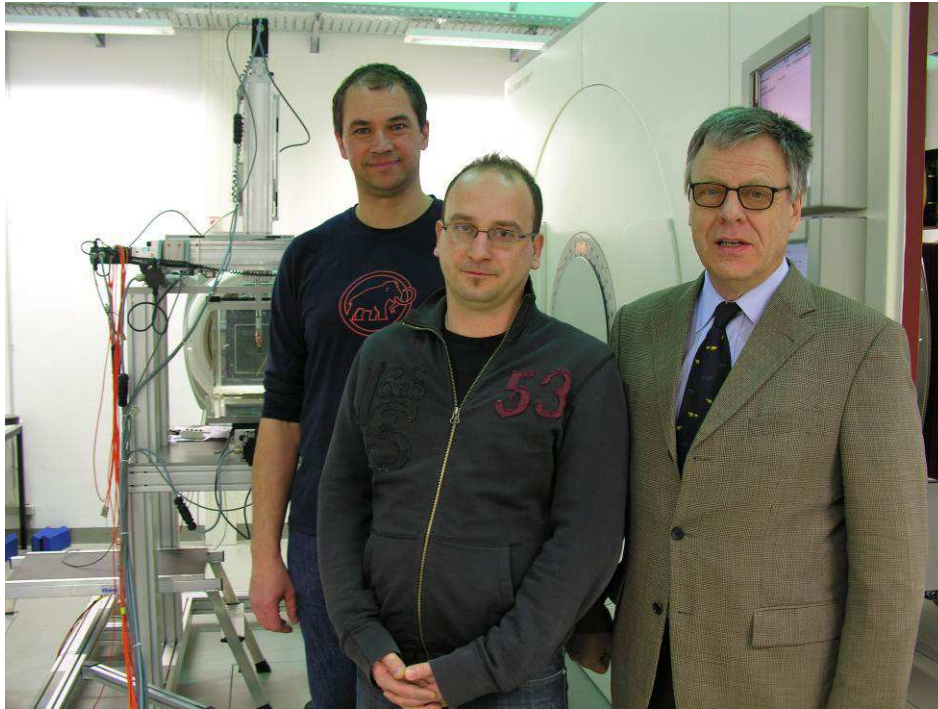


Figure 13: Mr Kapdan (centre) being trained on dosimetry at PTB

- Gamma ray spectrometry:

- ❖ Mr Namık Kemal Şahin
 - Measurements of activity using both conventional and low-level gamma-ray spectrometry.
 - Lessons learned (extract from Mr Şahin's final report dated 18.10.2011).

"The first period was a very good exercise on modular nuclear electronics and pulse processing. In addition setting up a Compton suppression system and an active shielding system with a plastic scintillator helped my understanding of how coincidence systems work. A similar Compton suppression system is being purchased by SANAEM and this work gave ideas how to order and set up this system.

In the second period, theoretical and practical studies on advanced gamma spectrometry including muon background reduction experiments and on high precision measurements including ^{176}Lu half-life measurements were very important and helped to make more accurate calculations. Also Monte-Carlo code EGS4 was learned and used in modelling several configurations.

In the third period ultra-low level gamma-ray measurements and according simulations and calculations were performed. Also ultra-low background techniques were studied. These measurements and calculations gave good ideas to plan and perform such works. In the final period some of the works which had started in the previous period were completed. Overall, the training was quite sufficient and satisfactory for me"

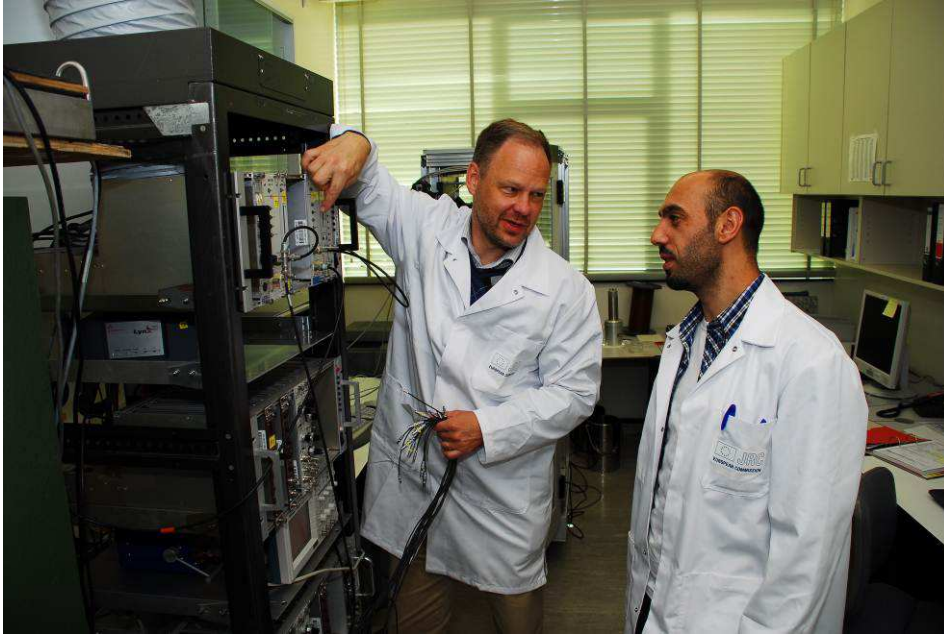


Figure 14: Mr Şahin (right) being trained on gamma-ray spectrometry

- ❖ Mr Ayhan Yüksel
 - Methods for measuring extremely low levels of radioactivity in materials
 - Lessons learned (extract from Mr Yüksel's final report dated 12.09.2012).

"In the first period, theoretical and practical studies on advanced gamma spectrometry, especially studies on background and stability analysis of gamma systems were provided. Learning EGS4 and using it for calculating true coincidence factors will be very useful to validate the results of some studies which were performed at ÇNAEM before.

The second period was a very good exercise on modular electronics and pulse processing. Setting up the pacman spectrometer and working on shielding of GeT5 helped better understanding of Compton suppression and active muon shielding. In an ongoing project at ÇNAEM, one of the objectives planned for 2013 is the muon shielding of a detector which is being used in the gamma spectrometry laboratory. This work gave ideas about ordering and setting up the components of an active muon shielding system for this purpose.

It would be have been good to find more time for electronics and electronics related problems about the coincidence setup used for muon shielding. Also more focussing on measurements of natural radioactivities, especially ^{235}U , ^{238}U and ^{226}Ra , would have been good too."



Figure 15: Mr Yüksel (left) being trained on gamma-ray spectrometry

- Liquid Scintillation Counting:

❖ Dr Nazife Aslan

- Standardisation of radionuclides

- Lessons learned (extract from Ms Aslan's final report dated 29.09.2011).

"My training started with the fundamentals of Liquid Scintillation Spectrometry and went on the various subjects such as source preparation, instrument efficiency calibration methods in Liquid Scintillation Counting, the CIEMAT/NIST efficiency tracing method, dual and triple label measurements, alpha/beta discrimination method, uncertainty budget, instrument performance assessment and the ⁹⁰Sr analysis in soil sample.

At the end of the training, I gained more experience in both theoretical and practical aspects. I will transfer this knowledge to my colleagues and I think all these experiences will contribute to a big improvement to the studies planned in SANAEM. I would like to express my thanks to my supervisor Dr Timotheous Altitzoglou for his help and support."

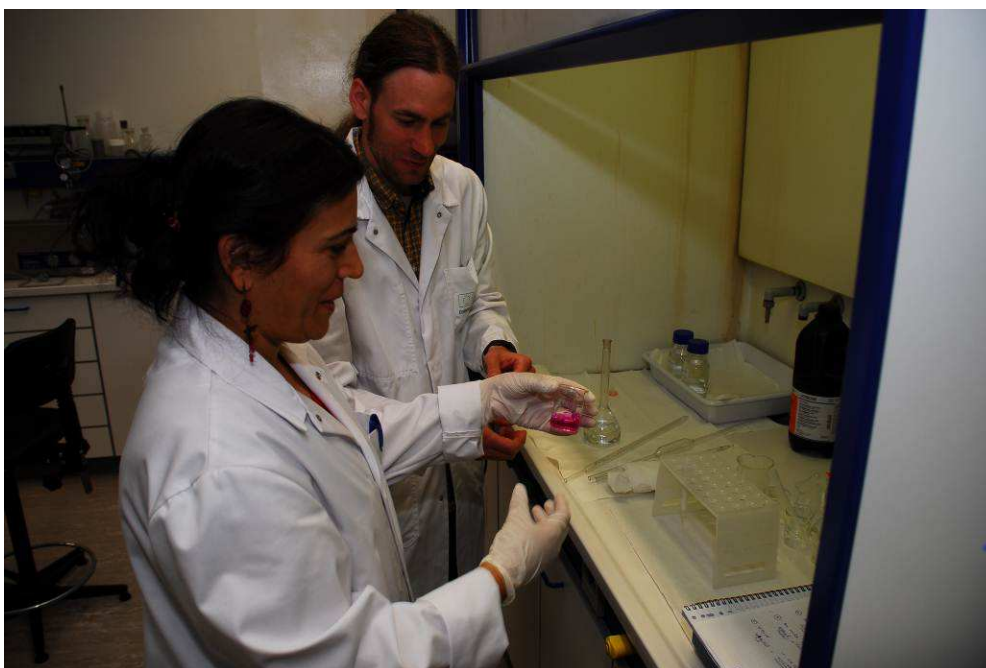


Figure 16: Ms Aslan (front) being trained on sample preparation for liquid scintillation counting

❖ Dr Gulden Kahraman

- Efficiency calibration using the CIEMAT/NIST efficiency tracing method
- Lessons learned (extract from Ms Kahraman's final report dated 10.08.2012).
 - *"The first part of the training was mainly focussed on the theory of Liquid Scintillation Counting, sample preparation (incl. gravimetric source preparation for standardisation), use of the Wallac 1220 Quantulus LSC, efficiency calibration-Quench curves, the CIEMAT/NIST efficiency tracing method. Firstly, the information about LSC theory and equipment, source preparation by using a microbalance, tritium quench curve establishment, data evaluation, theory of CIEMAT/NIST method and using the calculation programme were given. Then, measurements and calculations for ^{90}Sr and ^{63}Ni solutions were done by using the Wallac 1220 Quantulus LSC and the CIEMAT/NIST programme. Finally, the uncertainty budget table for Ni-63 solution was prepared.*
 - *The second period of the training was related to the theory of the dual- and triple-label radionuclide analysis method, mother-daughter relationships, alpha/beta pulse separation method. The laboratories of the RN Sector were temporarily unavailable due to the fire incident, so I couldn't do any experiments during the second part of my training. During this training period, I did calculations of the activity of each radionuclide in a multi-labeled sample by using previously measured data.*
 - *In the third part of my training, I participated in the gross alpha/beta activity measurements in drinking waters which are carried out for an EC interlaboratory comparison exercise reference materials. In this project, we determined the optimum measurement conditions for water samples in order to measure gross alpha/beta activity concentration in drinking water by using Liquid Scintillation Counting (LSC) method.*
 - *During the third part of the training, I participated at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Istanbul-Turkey which was held between 11 and 13 June, 2012. I gave an oral and poster presentation about the "Liquid Scintillation Counting: Efficiency Calibration using the CIEMAT/NIST Efficiency Tracing Method". In*

addition, I also participated to the EMIT S03-11 Workshop on Multi-label LSC, which was held at JRC-IRMM from June 18 to 29, 2012. Many experiments and calculations were done in this workshop.

- In the fourth period of my training, studies about determination of the optimum measurement conditions by using different water samples in order to measure gross alpha/beta activity concentration in drinking water by using LSC method continued. In addition, the activity and uncertainty of ^{60}Co solutions were calculated by using the CIEMAT/NIST method and the uncertainty budget table for the activity concentration measurement of ^{60}Co solution was prepared. Also, I learned how the new radionuclide can be added to the CIEMAT/NIST library.
- Consequently, during the entire training period, I learned very well the theory of LSC system and how the CIEMAT/NIST method is used to find activity and uncertainty of an unknown nuclide concentration. I gained a lot of experience about measurements, analysis and calculations for different radionuclides with LSC and the CIEMAT/NIST method of liquid scintillation counting. Now, I can calculate the activity of each radionuclide in the multi-labelled sample when there is a sample containing more than one β -emitting radionuclide. In addition, I learned how the alpha/beta pulse discrimination analysis method is used to find the activity of alpha and beta emitters in a mixed sample by using the optimum PSA level. I participated in the preliminary studies for the gross alpha/gross beta activity determination in drinking water by LSC. Thus, I worked in the preparation and measurement of actual samples to establish the reference value, which will be compared to that obtained by using gas flow proportional counter. This traineeship was a very good experience for me and will be useful for next project studies in Turkey."

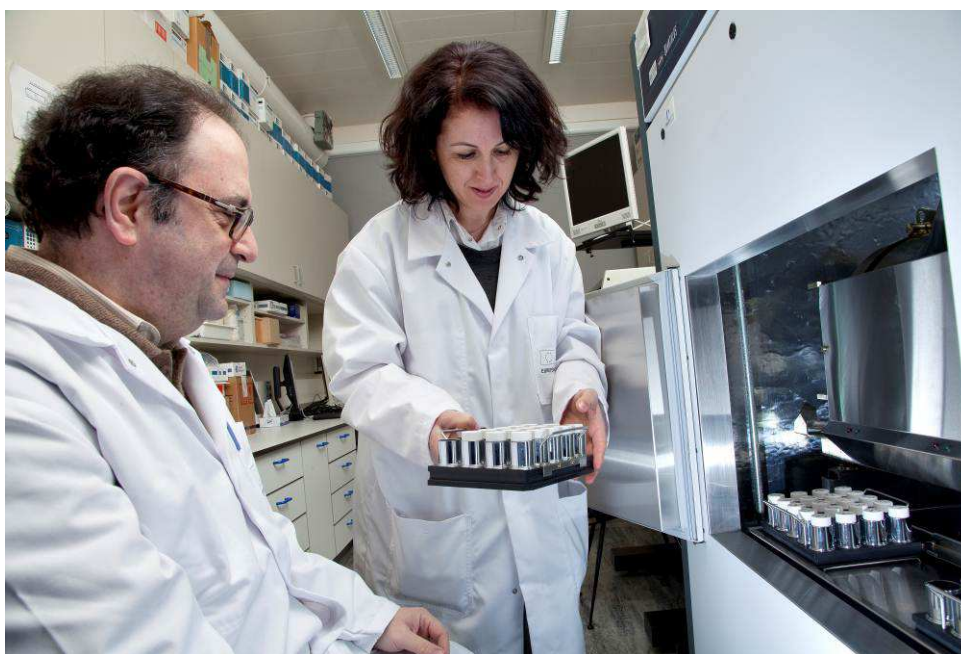


Figure 17: Ms Kahraman (right) being trained on liquid scintillation counting

- Primary Standardisation:

- ❖ Mr Emin Yeltepe
 - Half-life measurement of ^{177}Lu with a re-entrant gamma ionisation chamber and 4π -gamma counting with a well type NaI(Tl) detector
- Lessons learned (extract from Mr Yeltepe's final report dated 01.04.2011).

"The first term was a very good exercise on modular nuclear electronics and pulse processing. In addition setting up a Compton suppression system helped my understanding of how coincidence systems work. A similar system is being purchased by SANAEM and this work gave ideas how to order and set up this system. In the second term theoretical and practical information on primary standardisation methods opened new horizons on how to proceed establishing a radionuclide standardisation laboratory.

Knowing where to start and how to plan such work was actually one of the major problems and this training helped giving ideas on these problems. In the third term theoretical studies on counting statistics – a core part of radionuclide standardisation – were performed. This is best learned on real counting experiments. Actual setups were used to observe the behaviour of particle counting systems obeying Poisson statistics, to see the effects of dead time, pile up etc. Monte-Carlo simulations play an important role in radionuclide standardisation. Monte-Carlo code EGS4 was learned and used in modelling several actual systems. In the fourth term most of the training subjects were put into use in an actual standardisation study.

Overall, the training was quite sufficient and satisfactory."

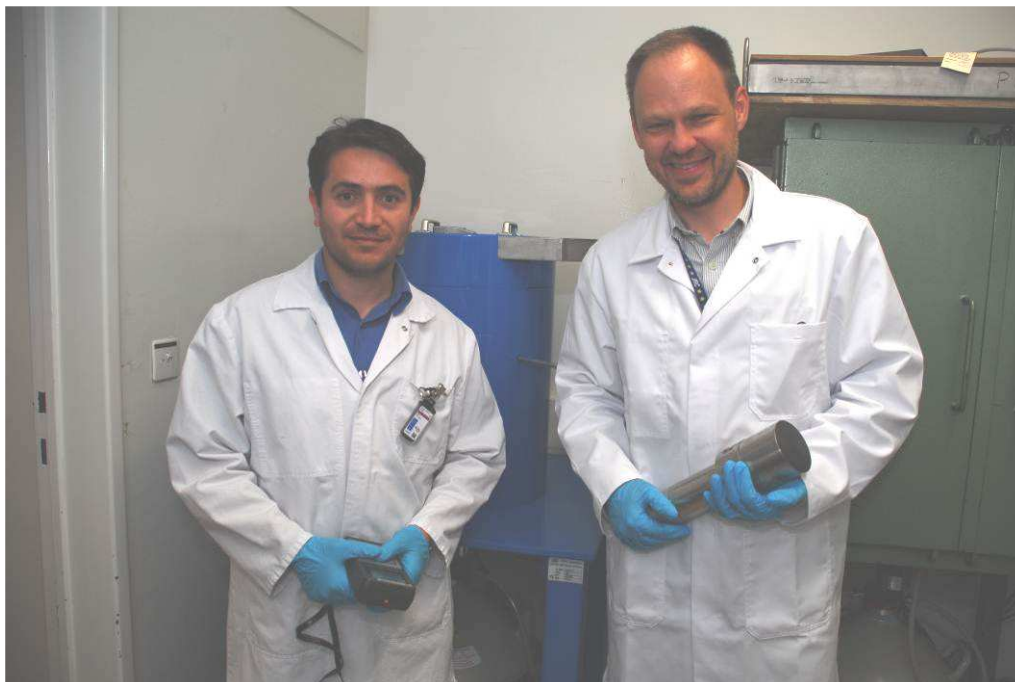


Figure 18: Mr Yeltepe (left) being trained on primary standardisation methods

- ❖ Dr Meryem Seferinoğlu
 - Source preparation and alpha-particle counting

- Lessons learned (extract from Ms Seferinoğlu's final report dated 30.09.2010).

"The first part of the training mainly concentrated on the activity measurements of radionuclide, determination of half-lives of uranium isotopes by using alpha-particle counting at a defined low solid angle (DSA) and high-resolution alpha-particle spectrometry (APS) set-ups. The DSA set-ups were used to perform primary standardisation measurements of the activity of ^{235}U sources and determine the half-life of ^{235}U . The solid angle subtended by the detector was varied by applying different diaphragm apertures and source-to diaphragm distances in the DSA set-up to obtain the optimum geometrical conditions. The geometry was kept simple using a 60.00(2) mm diameter of circular diaphragm between the source and detector and positioning the radioactive source at a distance of about 5 cm away from the diaphragm.

During the above mentioned training period I participated in several activities such as changing samples, operating the data acquisition software, performing distance measurements, source autoradiography and calculation of the radial activity distribution and the solid angle for the source in the DSA set-up. I learned how to prepare VYNS foils and how to cover a source with a VYNS foil.

The second period of training was mainly focussed on improving the quality of radioactive sources and optimisation of the source preparation methods in order to achieve successful radioactive source preparation for high precision measurements of radionuclide activity and half-life measurement by the alpha-particle counting systems. To that end, several thin ^{238}U sources were prepared by means of drop deposition technique by using the pycnometer method and also several thin homogeneous sources were made by electro-deposition and optimal conditions for activity and thickness were looked for. The quality of prepared sources was displayed by using methods such as autoradiography and alpha spectrometry.

During the second part of the training, I participated in preparing the quantitative radioactive source with drop deposition by applying pycnometer method and electro-deposition technique for DSA and APS set-ups, respectively, determining the mass of radioactive materials on a suitable source substrate, checking the quality of the prepared radioactive source and improving the source quality. I have also been involved with recovery and purification of ^{233}U from radioactive sources on the glass disc substrate.

Consequently, during the entire training period, several parameters of the DSA and APS set-ups were investigated to determine the optimal geometric conditions which allow the calculation of the solid angle and detection efficiency very accurately which in turn allows one to reach high levels of accuracy in activity measurements for primary standardisation."



Figure 19: Ms Seferinoglu (back) being trained on primary standardisation methods

- ❖ Dr Abdullah Dirican
 - Primary standardisation of activity and high-resolution alpha-particle spectrometry
 - Lessons learned (extract from Mr Dirican's final report dated 26.04.2012)

"My traineeship in JRC-IRMM was an outstanding experience. It gave me an opportunity to expand my experience in the primary standardisation of radioactivity, to carry out primary radioactivity measurements with specialised instrumentation and also to take part in on-going and new projects. I had the chance to enhance my knowledge of source preparation techniques for Defined Solid Angle (DSA) and high resolution Alpha Particle Spectrometry (APS) measurements.

JRC-IRMM has different primary standardisation techniques and the measurement systems used depend on the decay scheme of the considered radionuclide. Alpha particle counting at a defined solid angle, as implemented at JRC-IRMM is the most accurate method for measurement of alpha activity. The experience I obtained will help our metrological and standardisation studies and will accelerate the implementation of primary methods in the Turkish Atomic Energy Authority (TAEK)."



Figure 20: Mr Dirican (left) being trained on primary standardisation methods

- ❖ Mr Hasan Dikmen
 - Decay data measurements for ^{230}U , ^{225}Ac and daughter products
 - Lessons learned (extract from Mr Dikmen's final report dated 20.08.2012)

"I participated in the half-life measurements of ^{225}Ac . A set of measurements was performed and analysed to obtain a value of the ^{225}Ac half-life. In particular, I used an HPGe detector to measure, by gamma-ray spectrometry, the activity of a source as a function of time. Since a fire incident happened at the end of the first quarter of the training, the radionuclide metrology unit was relocated to another building and the experiments were interrupted for at least one month. The experimental setup was not moved. The sample was kept in the detector. The electricity was shut down for safety. After controlling and cleaning the building, the experiments were started up again but the air conditioning system was not functional in some of labs. The move back to the main building occurred in the middle of March, 2012.

During the second quarter, the experiments related with ^{225}Ac half-life measurements were finalised, concentrating on the final half-life value and its uncertainty calculations. The results of the measurements were published.

Within the context of the project related nuclear data determination of the radionuclides, Monte Carlo simulation of HPGe detector was introduced. Monte Carlo simulation is a powerful method for efficiency calculation, true coincidence correction and measurement equipment testing. Monte Carlo simulation software EGS4 was used. The results were compared with the experimental values. The measurements of ^{225}Ac source to reach the main goal of determining the photon emission probabilities for the main gamma rays following the decay of ^{225}Ac and daughters in equilibrium were finished. Analyses of the spectrums were partially finished when my traineeship ended."

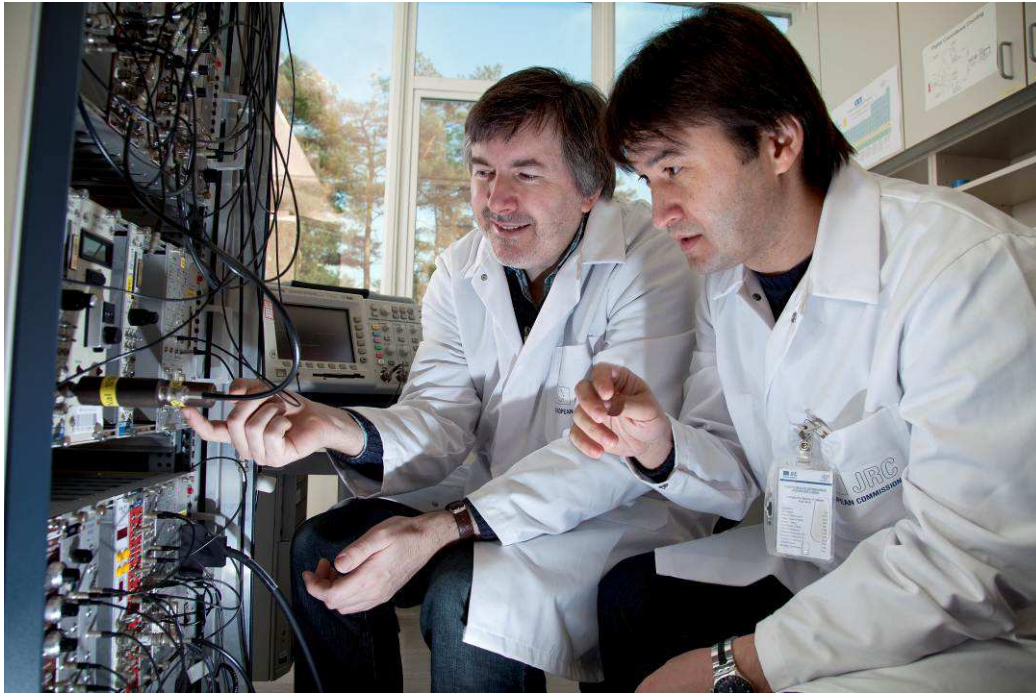


Figure 21: Mr Dikmen (left) being trained on primary standardisation methods

2.3 Short term training (01.10.2009 – 30.09.2012)

At the end of September, 2012, 89 scientific events (including five extra) had taken place, corresponding to (more than) 100% completion rate of JRC-IRMM's planned activities (broken down into 36 workshops, 14 university seminars, 20 study visits, five technical advice visits, ten conference participations, three sessions in conferences and one conference).

2.3.1 Workshops

- **EMIT S03-01,-02, -06 and -12 Workshops** on "Primary standardisation techniques in radionuclide metrology; gamma ray spectrometry; liquid scintillation, ion chambers and radionuclide calibrators".
 - Trainer(s): Mr Dirk Arnold (PTB), Mr Karsten Kossert (PTB), Ms Marie-Martine Bé (LNE-LNHB), Mr Philippe Cassette (LNE-LNHB), Mr Mike Woods (IRMC Ltd.), Mr Uwe Wätjen (IRMM) and Mr Stefaan Pommé (IRMM)
 - 1 – 6 November, 2009. TAEK Headquarters, Ankara
 - Participants: 26 Turkish scientists and 19 others (excluding lecturers)

The aim of this series of workshops was to cover five different topics: the metrology system for radioactivity measurements and an overview of primary standardisation techniques, gamma-ray spectrometry, liquid-scintillation counting, ionisation chambers and radionuclide calibrators, quality management in radionuclide laboratories. In addition to the lectures and exercises, a half day visit to the TAEK-SANAEM laboratory was organised.



Figure 22: Participants at the EMIT S03-01,-02, -06 and -12 workshops in TAEK HQ, Ankara

- **EMIT S01-01 Workshop** on “Use of certified reference materials and the estimation of measurement uncertainty.”
 - Trainers: Thomas Linsinger, Guy Auclair and Laszlo Majoros
 - 4 – 5 May, 2010. TÜBİTAK UME, Gebze, Istanbul
 - Participants: 39 (excluding lecturers)

The aim of this workshop was to:

- give the chance to the audience to become familiar with certified reference materials and
- provide the attendees with the knowledge on how to estimate measurement uncertainties.



Figure 23: Participants at the EMIT S01-01 event at TÜBİTAK UME, Gebze, Istanbul

- **EMIT S03-17 Workshop** on “Radiochemical laboratory practice”
 - Trainers: Ms Ljudmila Benedik, Mr Borut Smodiš and Mr Radojko Jaćimović, Ms Sara Jurečič and Mr Marko Štrok (Jožef Stefan Institute)
 - 10 – 21 May, 2010. Jožef Stefan Institute, Ljubljana, Slovenia
 - Participants: 5 (excluding lecturers)

The aim of this workshop was to teach best practice in the following topics:

- determination of ^{226}Ra and ^{228}Ra in water
- determination of uranium isotopes in water
- determination of ^{210}Pb and ^{210}Po in water



Figure 24: Participants at the EMIT S03-17 at the Jožef Stefan Institute, Ljubljana

- **EMIT S03-18 Workshop** on “Therapy level dosimetry”
 - Trainer(s): Prof. Dr Guenther Hartmann (German Cancer Research Center, Heidelberg), Dr Doğan Yaşar and Dr Volkan Şimşek (TAEK)
 - 20 - 22 May, 2010. TAEK-ÇNAEM (day 1) and Acibadem University Hospital, Istanbul (day 2)
 - Participants: 120 (excluding lecturers)

The aim of this workshop was to provide:

- information on "IAEA dose protocols and their applications"
- a tutorial on dose planning and cross-calibration of a plane-parallel ionisation chamber for electron dosimetry

The first day of the workshop was held at the TAEK-ÇNAEM premises outside Istanbul and included a study visit to the secondary standards dosimetry laboratory (SSDL). The second day of the workshop, including the tutorial, was held at the Acibadem University Hospital in Istanbul where the participants and the lecturers also had the opportunity to visit the radiotherapy clinic.

- **EMIT S01-02 Workshop** on "Processing of certified reference materials"
 - Trainers: Mr Hakan Emteborg, Mr Jean Charoud-Got and Mr Laszlo Majoros
 - 5-6th October, 2010. TÜBİTAK UME, Gebze, Istanbul
 - Participants: 33 (excluding lecturers)

The aim of this workshop was to provide information and teach best practices in:

- principles and practical aspects of the processing of reference materials - feasibility studies, initial characterisation of the starting material, refinement of the material (drying, crushing, milling etc.), mixing of various components, subdivision into individual sample units (filling / bottling / ampouling), containment and labelling, process control (water content and particle size analysis).



Figure 25: Participants at the EMIT S01-02 event at TÜBİTAK UME, Gebze, Istanbul

- **EMIT S04-03 Workshop** on "Roadmap for facilitating educational innovations in metrology in chemistry and ionising radiation"
 - Lecturers: Mr K. Maruszewski (EC DG JRC), Mr O. Cankur (TÜBİTAK UME), Ms E. Bulska (Warsaw University), Mr G. Van Goethem (EC DG RTD), Ms S. Onderoglu (Hacettepe University), Mr S. Musil (Slovak Institute of Metrology), Mr V. Gegevicus (EC DG JRC), Ms J. McCourt (EC DG JRC), Mr O. Ataman (METU) and Mr C. Güler (Ege University, Izmir)
 - 20 October, 2010. Middle East Technical University, Ankara
 - Participants: 38 (excluding lecturers)

The aim of this workshop was to:

- get university professors geared towards the (further) development of basic metrological competences of students (e.g. via the provision of a Euromaster in Measurement Science programme)
- promote innovative educational approaches and assessment methods
- facilitate the metrology knowledge transfer to universities
- familiarise Turkish universities with current status in the Bologna process
- promote the attractiveness of lifelong learning to industry
- bring together people interested in finding effective and novel ways of teaching.

- **EMIT S04-04_09 Workshops** on “Sampling, metrology in chemistry, internal QC, applied statistics, method optimisation, selection and use of RMs, inter laboratory comparisons...”
 - Trainers: P. Taylor, J. McCourt, V. Gegevicus (JRC-IRMM), E. Bulska (Warsaw University), N.Tokman (TÜBİTAK UME), F. Akçadag (TÜBİTAK UME), N. Majcen (MIRS), M. Patriarca (ISS), O. Cankur (TÜBİTAK UME)
 - 22-24 February, 2011. Karadeniz Technical University, Trabzon, Turkey
 - 58 participants (excluding lecturers)

The point of this workshop was to:

- provide university staff with training methodologies in this area
- provide all the other attendees with the actual content to enhance their knowledge in this area.

The lectures included: introduction to “metrology in chemistry”; the importance of sampling as part of a measurement procedure; method development; internal quality control; single laboratory validation of measurement procedures; inter-laboratory comparisons; traceability; uncertainty of measurement; use of mini case studies during the metrology in chemistry training process; statistics for analytical chemistry; selection and use of reference materials and a TrainMIC® exercise session ("Determination of polar pesticides by liquid chromatography mass spectrometry")



Figure 26: Participants at the EMIT S04-04_09 workshop at the Karadeniz University, Trabzon

- **EMIT S01-03 Workshop** on "Certification of reference materials".
 - Trainers: L. Majoros, R. Koeber, A. Lamberty (JRC-IRMM)
 - 1-2nd March, 2011. TÜBİTAK UME, Gebze
 - Participants: 35 (excluding lecturers)

The aim of this workshop was to provide detailed information on:

- planning a certification project
- designing homogeneity and stability assessments
- how to carry out characterisation studies and value assignments according to the ISO Guide 34.

After the theoretical introduction of homogeneity and stability studies, the participants had the possibility to put the acquired knowledge into practice in the exercise sessions. Specific advice on TÜBİTAK UME's accreditation as producer of RMs according to ISO Guide 34 was also provided by the IRMM experts.

- **EMIT S02-01 Workshop** on "Principles and application of isotopic methodology and metrology in chemistry to inorganic reference measurements"
 - Trainers: C. Quérel, EC-JRC-IRMM; E. Vasileva, IAEA, Monaco, J. L. Todoli, Univ. of Alicante, Spain; E. Ponzevera, IFREMER, France
 - TÜBİTAK UME, Gebze, Turkey. 15-17th March, 2011
 - Participants: 21 (excluding lecturers)

The aim of the workshop was to provide information on:

- Principles and application of isotopic methodology - isotope dilution ICP mass spectrometry
- Sample introduction and sample matrix effects during ICP mass spectrometry measurements
- Isotope ratio ICP mass spectrometry measurements: calibration and correction for instrumental biases
- Method validation and uncertainty of measurements – application to isotope ratio results
- Establishing traceable reference values by ID-ICPMS: a case study
- Accreditation ISO/IEC-17025 Flexible scope and research activities – how does it work at IRMM?

Hands-on training on experimental design, data processing, uncertainty estimation and method validation as applied in isotope dilution ICP mass spectrometry was also provided

- **EMIT S04-14 Workshop** on "Safety of food & feed – requirements of an analytical laboratory"
 - Trainers: M. Bickel, A. Boix, J. McCourt, U. Vincent (JRC-IRMM)
 - 4-5th April, 2011. Adiyaman University, Adiyaman
 - Participants: 106 (excluding lecturers)

The aim of the workshop was to provide information on:

- Quality requirements for a food / feed analytical laboratory.
- Ensuring confidence in measurements (method development and single-laboratory validation)
- Collaborative trial validated method to determine a marker - glyceroltriheptanoate (GTH) in animal by-products.
- Setting up control strategies for feed safety (two examples)
- Validated method for fluoroquinolone antibiotic determination.
- Management system and accreditation in a food / feed analytical laboratory.

There were representatives of five local universities (Adiyaman, Inonu, Bingol, Harran and Karamanoglu) and an accredited government food and feed laboratory (MAE <http://www.mae.gov.tr/>).



Figure 27: Participants at the EMIT S04-14 workshop at Adiyaman University, Adiyaman

- **EMIT S04-13 Workshop on "Metrology in nanotechnology"**
 - Lecturers: Dr K. Aschberger, Dr G. Lövestam, Dr J. McCourt, Dr G. Roebben (JRC), Dr G. Cakmak Demircigil, Dr C. Kocabaş and Dr U. Tamer (Turkish professors)
 - 24-25th May, 2011. Gazi University, Ankara
 - Participants: 36 (excluding lecturers)

The aim of the workshop was to disseminate knowledge in the field of metrology in nanotechnology, covering the following topics:

- Introduction to nanotechnology
- Use of nanotechnology today (in consumer products, in energy production, for the environment)
- Metrology in nanotechnology – methodology and standardisation.
- Public exposure to nanomaterials
- Nanotoxicology and risk assessment
- European Commission's work in the field of nanotechnology: the regulatory situation.

Included in the attendees were representatives of three local universities (Gazi, Bilkent and Hacettepe), representatives of the Ministry of Agriculture and Rural Affairs, Directorate of Ankara Provincial Control Laboratory and representatives of TÜBİTAK UME.



Figure 28: Participants at the EMIT S04-13 workshop at Gazi University, Ankara

- **EMIT S03-10 Workshop** on "Source preparation and instrument efficiency calibration in liquid scintillation counting"
 - Trainer: Dr T. Altitzoglou (JRC-IRMM)
 - Assistant: Dr N. Aslan (current LTT).
 - 6-8th June, 2011, TAEK-SANAEM, Ankara
 - Participants: 17 (restricted participation to a certain level of expertise in this field).

The aim of this workshop was to provide information on:

- liquid scintillation counting - mechanism and instrumentation
- source preparation for LSC - cocktail selection, quantitative source preparation, use of analytical balances, calibration, substitution method
- LSC efficiency calibration
- CIEMAT/NIST efficiency tracing method - theory, calculations, practice
- dual label measurements
- uncertainty budget
- examples and practical exercises



Figure 29: Participants at the EMIT S03-10 workshop in TAEK-SANAEM, Ankara

- **EMIT S03-25 Workshop** on "Contamination survey meter calibration"
 - Trainer(s): Dr Herbert Janßen, Dr Ole Nähle, Dr Karsten Kossert and Dr Rolf Simmer
 - 7 – 10th June, 2011, Physikalisch Technische Bundesanstalt (PTB) in Braunschweig, Germany
 - Participants: 5 (restricted)

The aim of this workshop was to provide information on:

- Concepts of surface contamination assessment in Germany (calibration vs. type testing, calibration and measurement methods)
- Particle flux, photon flux and activity

- Large-area proportional counters for alpha and beta radiation; measurement standard for photon emitting sources; digital auto radiography
- Homogeneity of calibration sources; analysis of auto radiography measurements
- Measurements of dose rates using contamination survey meters

The event also included the opportunity for the TAEK scientists to visit an industrial laboratory where sources are produced for industrial applications.



Figure 30: Participants at the EMIT S03-25 workshop at PTB, Germany

- **EMIT S03-27 Workshop on "QA/QC management in radiation therapy "**
 - Trainer(s): Prof. Dr Günther Hartmann (German Federal Cancer Research Center), Dr Murat Okutan (İstanbul University, Institute of Oncology); Dr Aydın Çakır (İstanbul University, Institute of Oncology); Mr Vildan Alpan, (American Hospital Radiation Oncology Dept.)
 - 17 – 18th June, 2011, TAEK-ÇNAEM and İstanbul University Hospital, İstanbul
 - Participants: 71

The aim of this workshop was to provide information on QA/QC for radiotherapy machines and treatment planning systems, covering:

- Linear accelerators
- Intensity Modulated Radiation Therapy
- Image Guided Radiation Therapy
- Treatment planning systems

The workshop was attended by medical physicists and students from universities and hospitals in İstanbul as well as TAEK personnel.



Figure 31: Participants at the EMIT S03-27 workshop at TAEK-ÇNAEM and Istanbul University hospital

- **EMIT S03-05 Workshop** on "Advanced gamma-ray spectrometry"
 - Trainers: Dr M. Hult (JRC-IRMM) and Dr T. Vidmar (SCK•CEN)
 - Assistants: Dr N. Sahin (current LTT) and Dr E. Yeltepe (ex-LTT)
 - 20 – 24th June, 2011, TAEK-SANAEM, Ankara
 - Participants: 20 (15 from TAEK-SANAEM and 5 from TAEK- ÇNAEM)

The aim of this workshop was to provide information on:

- Coincidence summing corrections
- Nuclear decay data
- Angular correlations
- Advanced detector systems such as compton suppression and muon shield
- Monte Carlo simulations
- Efficiency transfer
- Uncertainty calculations and detection limits



Figure 32: Dr M. Hult at the EMIT S03-05 workshop at TAEK-SANAEM, Ankara

- **EMIT S01-04 Workshop** on Use of certified reference materials.
 - Trainers: Dr A. Bernreuther, Dr G. Auclair and Dr L. Majoros (JRC-IRMM)
 - 5-6th September, 2011, TÜBİTAK UME, Gebze
 - Participants: 29 (excluding lecturers)

The aim of this workshop was to provide information on:

- Uncertainty estimation (What are the basic principles?; How to estimate uncertainty from validation data?; How can I use reference materials to estimate my measurement uncertainty?)
- Establishing traceability (What do I have to do to make my results traceable?; How can I establish traceability with reference materials?)
- Reference material selection (Where can I find reference materials?; Which material is the right one for me?)
- Reference material handling (How much of each material must I use?; How should I store my materials?; How do I correct for moisture?)
- Reference materials use (How can I demonstrate trueness?; How can I demonstrate my method proficiency?)
- Making full use of available information (What do the terms on a certificate mean?; What can I do with a certification report?)



Figure 33: Participants at the EMIT S01-04 workshop at TÜBİTAK UME, Gebze

- **EMIT S01-10 Workshop** on “Planning, preparation and certification of reference materials”
 - Trainers: Dr H. Emteborg, Dr R. Koeber and Dr L. Majoros (JRC-IRMM)
 - 20-22nd September, 2011, IRMM-JRC-EC, Geel, Belgium
 - Participants: 18 from TÜBİTAK UME

The aim of this workshop was to provide the opportunity for the future CRM processing team of TÜBİTAK UME to present their production plans for three potential CRMs and have IRMM experts advise on such.

During the three day event, the topics were divided as follows:

- Day 1 – Planning (covering three case studies - elemental content of hazel nuts, aflatoxin content in dried fig and SO₂ content in apricot)
- Day 2 – Processing (covering processing aspects of all three potential CRMs)
- Day 3 – Certification (covering certification aspects of all three potential CRMs)



Figure 34: Participants at the EMIT S01-10 workshop at EC-JRC-IRMM, Geel, Belgium

▪ **EMIT S01-05 Workshop** on "Preparation of certified reference materials"

- Trainers: Dr H. Emteborg, Mr Charoud-Got and Dr L. Majoros (JRC-IRMM)
- 4-5th October, 2011, TÜBİTAK UME, Gebze
- Participants: 19 (excluding lecturers)

The aim of this workshop was to:

- provide information on the principles and practical aspects of the processing of reference materials
- share case studies in different fields such as trace elements in soil, aflatoxins in plant materials and processing of nuts.



Figure 35: Participants at the EMIT S01-05 workshop at TÜBİTAK UME, Gebze

▪ **EMIT S04-02 Workshop** on "Integrated quality systems – an interpretation for universities"

- Trainers: Dr M. Bickel, Dr J. McCourt , Dr V. Gegevicus (JRC-IRMM), Dr Werner Bellmann, Key Expert, IPA SQIT; Dr Halil Ibrahim CETIN, Accreditation Department, TURKAK and Dr Nilgun Tokman, TÜBİTAK UME
- 18-20th October, 2011, Ulugdag University, Bursa

- Participants: 34 (excluding lecturers)

The aim of this workshop was to:

- provide theoretical and practical guidance on the requirements for integrated management systems and their possible interpretation in the universities.
- provide guidance on standards applied in integrated management systems.
- provide information on available quality control methods including proficiency testing schemes and interlaboratory comparisons.
- share experience on how (integrated) management systems can be assessed and improved.



Figure 36: Participants at the EMIT S04-02 workshop at the Ulugdag University, Bursa

- **EMIT S01-06 and S01-12 Workshops** on “Certification of reference materials” and “Assignment of the reference value for the CRM (statistical aspects)”
 - Trainer(s): Dr Andrée Lamberty, Dr Guy Auclair and Dr Laszlo Majoros
 - 31.01.2012 to 01.02.2012 TAEK-SANAEM, Ankara
 - Participants: 27 (excluding lecturers)

The aim of this workshop was to provide:

- insight into the underlying concepts of reference material certification
- sound knowledge on the practical steps that are necessary for the certification of a reference material
- information on compliant production of CRMs with regard to ISO Guide 34.



Figure 37: Participants at the EMIT S01-06 and S01-12 workshop in TAEK-SANAEM, Ankara

- **EMIT S03-03 Workshop** on “Advanced gamma-ray spectrometry”
 - S03 Trainers: M. Hult (PhD), EC-JRC-IRMM; T. Vidmar (PhD) SCK•CEN; M. Bruggeman (PhD), SCK•CEN
 - S03 Assistants: E. Yeltepe (MSc), TAEK-SANAEM; N. Sahin (MSc), TAEK-SANAEM
 - 12.03.2012 – 16.03.2012, TAEK-SANAEM, Ankara
 - Participants: 23 (excluding lecturers)

The aim of this workshop was to provide information on:

- Coincidence summing corrections
- Nuclear decay data
- Angular correlations
- Advanced detector systems such as compton suppression and muon shield
- Monte Carlo simulations
- Efficiency transfer
- Uncertainty calculations and detection limits



Figure 38: Participants at the EMIT S03-03 workshop in TAEK-SANAEM, Ankara

- **EMIT S04-16 Workshop** on “Auditing of integrated management systems”
 - Trainers: P. Bode (Dr Ir. Assoc. Prof), Nuclear Science and Engineering, TU Delft, The Netherlands; M. Bickel (PhD), V. Gegevičius (PhD), J. McCourt (PhD) - all EC-JRC-IRMM, Geel, Belgium and Dr Halil Ibrahim CETIN, Laboratory Accreditation Department, TURKAK
 - 20-23 March, 2012, Dokuz Eylul University, İzmir
 - Participants: 25 (excluding lecturers)

The aim of this workshop was:

- To help organisations which are already accredited (or striving for accreditation) according to ISO 17025 and/or for organisations, already certified (or striving for certification) according to the ISO 9001, ISO 14001 and OHSAS 18001 and who need to perform internal audits on their (integrated) management systems:
 - to learn how to prepare an integrated audit
 - to learn best behavioural practice for auditors
 - to learn how best to ask questions during an audit
 - to learn how to audit efficiently and effectively
 - to learn how to report effectively.



Figure 39: Participants at the EMIT S04-16 workshop in Dokuz Eylul University, İzmir

- **EMIT S02-02 Workshop** on “Isotopic methodology and metrology in chemistry to inorganic reference measurements”
 - S02-02 Trainers: Dr C. Quérel, EC-JRC-IRMM, Belgium, Dr E. Vassileva, IAEA, Monaco, Dr J. L. Todoli, Univ. Of Alicante, Spain and Dr E. Ponzevera, IFREMER, France
 - S02-02 Assistants: Ms B. Ari, TÜBİTAK UME and Dr O. Cankur, TÜBİTAK UME
 - 28-30 March, 2012, Erciyes University, Kayseri
 - Participants: 38 (excluding lecturers)

The aim of this workshop was to provide information on:

- isotopic research and principles behind isotopic reference measurements (isotopic ratios, isotope dilution)
- isotope ratio measurements by ICPMS, from sample introduction to correction for biases and data processing
- metrology in chemistry applied to inorganic reference measurements
- uncertainty estimation for isotopic measurements and validation of isotopic methodology
- the possibility of combining research activities with the metrological requirements of ISO/IEC-17025 for chemical analytical measurements



Figure 40: Participants at the EMIT S02-02 workshop in Erciyes University, Kayseri

- **EMIT S03-24 Workshop** entitled "X ray energy qualities, KAP meter calibration, CT ion chamber calibration"
 - Trainers: Dr Ludwig Büermann, Prof Dr Herbert Janßen, Dr Ulrike Ankerhold, Dr Stefan Neumaier, Dr Reinulf Böttcher, Dr Pavel Galimov, Dr Ralf-Peter Kapsch, Dr Achim Krauss, Dr Hans-Joachim Selbach and Dr Jana Klammer
 - 4-8th June, 2012, PTB, Braunschweig, Germany
 - Participants: 6

The aim of this workshop was to provide information on:

- Dosimetry at PTB (air kerma standards; calibration facilities)
- Dosimetry in radiology
- Calibration procedures and uncertainties (as applied in an underground dosimetry laboratory)
- Exercises - calibration procedures and testing equipment

The workshop also provided the opportunity for TAEK scientists to visit PTB's dosimetry laboratories.

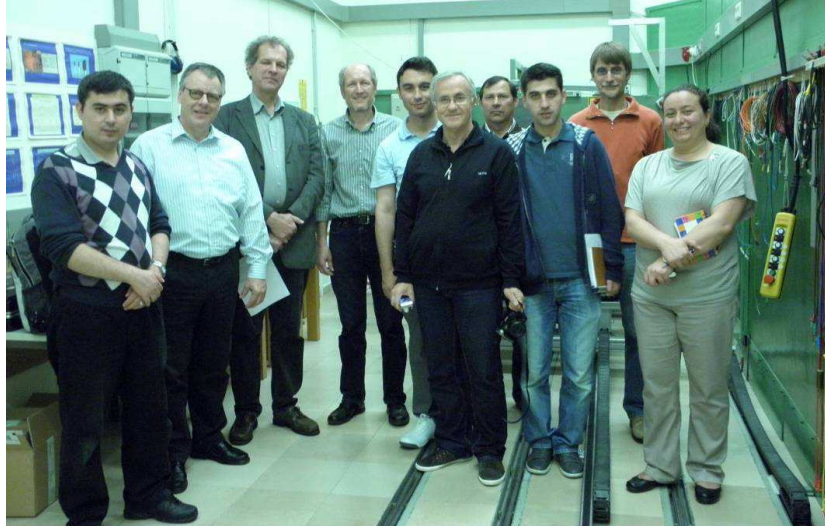


Figure 41: Participants at the S03-24 workshop in PTB, Braunschweig, Germany

- **EMIT S04-15 Workshop** on "Setting up your QM system - who to train, on what, when and how?"
 - Trainers: S. Holley (MSc), SH Training, U.K.; M. Bickel (PhD), V. Gegevičius (PhD), J. McCourt (PhD), L. van Nevel (MSc) - all EC-JRC-IRMM, Geel, Belgium
 - 5-7th June, 2012, Akdenis Üniversitesi, Antalya
 - Participants: 20 (excluding lecturers)

The aim of this workshop was to provide information to organisations, in the process of setting up their quality management systems, to help them to:

- recognise their training needs; set up a corresponding training schedule ; implement the training schedule.
- prepare, deliver and evaluate a training course
- decide which type of staff to train, on which subjects, using which methodology
- prepare for accreditation assessments



Figure 42: Participants at the EMIT S04-15 workshop at the Akdenis Üniversitesi, Antalya

▪ **EMIT S03-11 Workshop** on "Training in multi-label liquid scintillation counting"

- Trainer: Dr T. Altitzoglou
- 18 – 29th June, 2012, JRC-IRMM, Geel, Belgium
- Participants: 5 (excluding lecturer)

The aim of this workshop was to provide information on advanced topics in liquid scintillation counting:

- measurement and analysis of dual- and triple-label samples
- gravimetric source preparation
- instrument control
- instrument efficiency calibration (including the CIEMAT/NIST method)
- data analysis

▪ **EMIT S04-11 Workshop** on "Statistics and uncertainty determination for radionuclide applications"

- Trainer(s): Mr S. Pommé (PhD), Mr T. Altitzoglou (PhD), Mr U. Wätjen (PhD) (JRC-IRMM), Ms L. Benedik (PhD), Jožef Stefan Institute, Ljubljana, Slovenia, and Mr Paolo de Zorzi (PhD), Istituto Superiore per la Protezione e la Ricerca Ambientale, Roma, Italy
- 3 – 5 July, 2012. Institute of Nuclear Sciences, Ege Üniversitesi, Bornova, Izmir
- Participants: 35 (excluding lecturers)

The aim of this workshop was to provide scientists using radionuclide applications with training on the best approaches to statistical evaluations and uncertainty estimations in the specific fields of:

- alpha-particle spectrometry
- gamma-ray spectrometry
- radiochemistry
- liquid scintillation

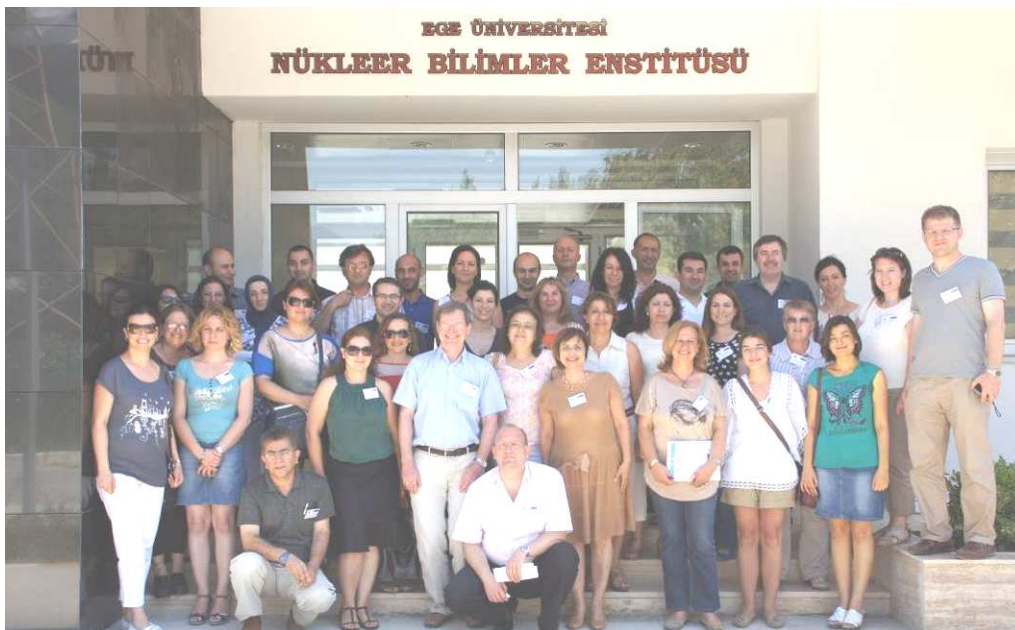


Figure 43: Participants at the EMIT S04-11 workshop in Ege Üniversitesi, Izmir

- **EMIT S04-10 workshop** on "Proficiency testing and statistical evaluation“
 - Trainers: Dr F. Cordeiro, Dr B. De la Calle, Dr P. Robouch, Dr J. McCourt (JRC-IRMM); Dr Ian Mann, SAS, Switzerland; Dr Ender Okandan, METU, Ankara and Dr Fatma Akçadağ, TÜBİTAK UME, Dr Halil Ibrahim Cetin, Accreditation Department, TURKAK
 - 10 - 11 September, 2012. TÜBİTAK BUTAL, Bursa
 - Participants: 39 (excluding lecturers)

The aim of this workshop was to provide information on:

- Introduction to Proficiency Tests (PT)
- What are the requirements of the ISO 17043?
- What do we need to know before participating in a PT?
- What do we need to do as a PT provider
- How do we evaluate PT results (statistical data treatment included)?



Figure 44: Participants at the EMIT S04-10 workshop in TÜBİTAK BUTAL, Bursa

Summary of EMIT workshops:

The appreciation of Turkish scientists for the workshops provided, primarily by JRC-IRMM staff and some external experts, is summarised in Table 6. This is also shown by the means of a web diagramme (Figure 45). The number of participations in training events (all types, not just the workshops listed below) from the beginning (01.10.2009 'til 30.09.2012) is 2334, one third of whom are individual scientists coming to different workshops.

All in all the appreciation of the entire project was very high. The "Result Oriented Monitoring" (ROM) evaluations resulted in the EMIT project being the highest scoring project of 46 on-going IPA projects in Turkey in 2011. For more detail see section 5.3.

Table 6: EMIT workshop appreciation by participants (%).

Workshop tally to date	Workshop code	Workshop title	Nr external participants (varying max nr of attendees).	Training course evaluations on "objectives being met" (%)			
				Very good	Good	Fair	Poor
4	S03-01, -02, -06 and -12.	VERMI 5 (Primary standardisation techniques in radionuclide metrology; gamma ray spectrometry; liquid scintillation, ion chambers and radionuclide calibrators)	48	42	58	0	0
5	S01-01	Use of certified reference materials and the estimation of measurement uncertainty	39	81	19	0	0
6	S03-17	Radiochemical lab practice	5	100	0	0	0
7	S03-18	Therapy level dosimetry	120	<i>Not requested</i>			
8	S01-02	Processing of certified reference materials	33	32	60	4	4
9	S04-03	Roadmap for facilitating educational innovations in metrology in chemistry and ionising radiation	38	7	62	31	0
15	S04-04_09	Sampling, metrology in chemistry, internal QC, applied statistics, method optimisation, selection and use of RMs, inter laboratory comparisons....	55	19	56	23	2
16	S01-03	Certification of reference materials	35	21	79	0	0
17	S02-01	Isotopic methodology and metrology in chemistry to	21	60	40	0	0

Workshop tally to date	Workshop code	Workshop title	Nr external participants (varying max nr of attendees).	Training course evaluations on "objectives being met" (%)			
				Very good	Good	Fair	Poor
		inorganic reference measurements					
18	S04-14	Safety of food & feed – requirements of an analytical laboratory	106	56	41	3	0
19	S04-13	Metrology in nanotechnology	36	43.5	43.5	13	0
20	S03-10	Sample preparation and instrument efficiency calibration in liquid scintillation counting	17	88	12	0	0
21	S03-25	Contamination survey meter calibration	5	40	60	0	0
22	S03-27	QA/QC management in radiation therapy	71	41.5	41.5	17	0
23	S03-05	Advanced gamma-ray spectrometry	20	67	33	0	0
24	S01-04	Use of certified reference materials	29	31	65	4	0
25	S01-10	Planning, preparation and certification of reference materials	20	15	69	15	0
26	S01-05	Preparation of reference materials	19	50	44	0	6
27	S04-02	Integrated quality systems: an interpretation for universities	43	36	61	3	0
28	S03-11	Multi-label liquid scintillation counting	5	100	0	0	0
29	S01-06	Certification of reference materials	27	40	60	0	0
30	S01-12	Assignment of the reference value for the CRM	23	61	39	0	0
31	S03-03	Advanced gamma-ray spectrometry	22	78	22	0	0
32	S04-16	Auditing of integrated management	25	56	40	4	0

Workshop tally to date	Workshop code	Workshop title	Nr external participants (varying max nr of attendees).	Training course evaluations on "objectives being met" (%)			
				Very good	Good	Fair	Poor
		systems					
33	S02-02	Isotopic methodology and metrology in chemistry to inorganic reference measurements	40	41	59	0	0
34	S04-15	Setting up your QM system - who to train, on what, when and how?	20	68	21	11	0
35	S04-11	Statistics and uncertainty determination for radionuclide applications	35	58	42	0	0
36	S04-10	Proficiency testing and statistical evaluation	39	53	47	0	0

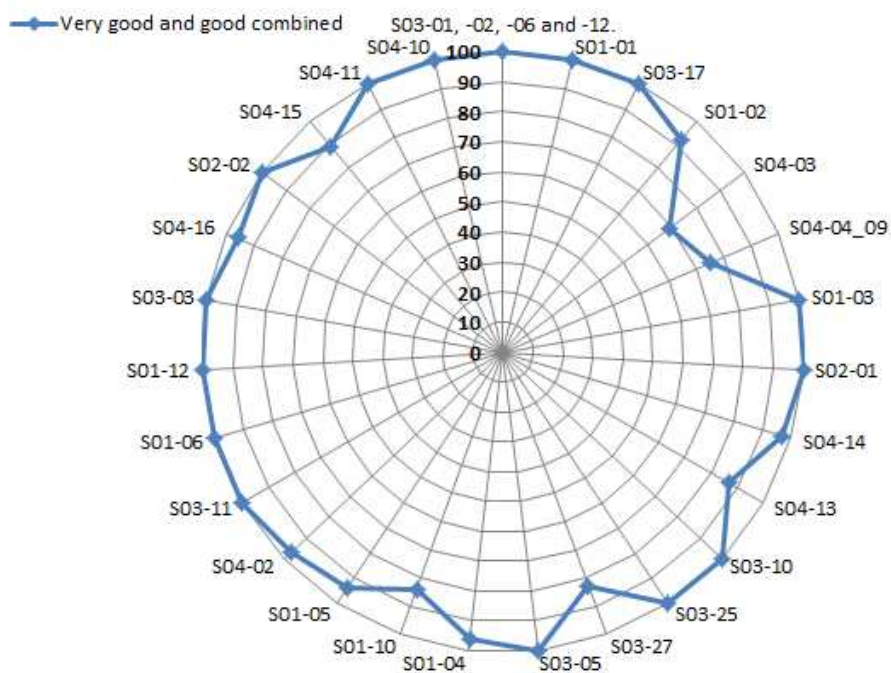


Figure 45: EMIT Training course evaluations: workshop code versus combined "very good" and "good" scores on "objectives being met and theme" (%).

2.3.2 Seminars

- **EMIT S01-07 Seminars** on "Use of reference materials"

- Lecturer: Dr L. Majoros (JRC-IRMM)
- 06 May, 2010. Marmara University and Yeditepe Universities, Istanbul
- Participants: 88

Disseminating this knowledge at both universities provided the audience with the chance to become familiar with certified reference materials and helped to facilitate future collaborations between these universities and JRC-IRMM and TÜBİTAK UME. The seminars have also the advantage to attract attention to metrology education, which is highly required in Turkey.

- **EMIT S01-08 Seminars** on "Certification of reference materials".

- Lecturer: Dr L. Majoros (JRC-IRMM)
- 3rd March, 2011. İstanbul Üniversitesi (IU) and İstanbul Teknik Üniversitesi (ITU)
- Participants: 26 at IU and 24 at ITU (total 50)

This lecture provided the audience with general knowledge on how to certify reference materials according to ISO Guide 34. Furthermore the use of reference materials was introduced as well as how the customers can benefit the most by using certified reference materials in their daily work in the laboratory. JRC-IRMM and the EMIT project activities were also introduced.

- **EMIT S01-16 Seminars** on the "Certification and use of reference materials"

- Lecturers: Dr L. Majoros and Dr E. Engin.
- 07/04/2011 Uludağ University Bursa
- 08/04/2011 Ege University and Izmir Institute of Technology, Izmir.
- Participants: 154 at Uludağ University, 13 at Ege University and 18 at the Institute of Technology (total 185).

Seminar lectures were provided at all three universities on the subject of "Certification and use of reference materials" to Turkish scientists by Dr Erinc Engin (ex-LTT) and Dr Laszlo Majoros (JRC-IRMM). The seminar covered the following topics: planning of a certification project, designing of homogeneity and stability assessments as well as explanation of characterisation studies according to ISO Guide 34.

- **EMIT S02-05 Seminars** on "Inorganic chemical isotopic reference measurements"

- Lecturers: C.R. Quétel (JRC-IRMM), B. Ari (TUBİTAK UME) and S. Can (TUBİTAK UME)
- 21-22nd June 2011, Ankara and İzmir, Turkey
 - Hacettepe University and the Middle East Technical University (METU) in Ankara
 - İzmir Institute of Technology (IYTE) in İzmir
- Participants: 31 at Hacettepe University; 21 at Middle East Technical University and 35 at İzmir Institute of Technology, totalling 87 participants for this series of lectures.

The objective of this EMIT event was to have lectures on the thematic S02 "primary method of measurement" delivered for the first time at universities and, for a part, in Turkish by former and

present EMIT LTTs. Seminar lectures were provided on “Isotopic methodology – isotope dilution mass spectrometry” and on “Isotope dilution mass spectrometry for traceable reference values in feed and food”.

▪ **EMIT S01-09 Seminars** on “Use and certification of reference materials”

- Lecturers: Dr L. Majoros (JRC-IRMM), Dr E. Engin (TUBİTAK UME)
- 6th October, 2011, Ondokuz Mayıs University, Samsun
- Participants: 109

The seminar covered the following topics: planning a certification project, designing homogeneity and stability assessments as well as explanation of characterisation studies according to the ISO Guide 34.

▪ **EMIT S01-17 Seminars** on "Analytical methods for the production of reference materials in organic matrices"

- Lecturers: Dr Laszlo Majoros (JRC-IRMM), Dr Burcu Binici (TUBİTAK UME) and Dr Erinc Engin (TUBİTAK UME).
- 21-22nd February, 2012, Çukurova University (Adana) and Mersin University (Mersin).
- Participants: 159 (46 + 113)

- Day 1: Çukurova University, Adana. The seminar (on analytical methods for the production of reference materials in organic matrices) was given to Turkish scientists by Dr Erinc Engin (TUBİTAK UME) and Dr Laszlo Majoros (JRC-IRMM). An introduction to the following topics was provided: planning of a certification project, designing of homogeneity and stability assessments as well as explanation of characterisation studies according to ISO Guide 34. Thereafter a GC-IDMS analytical method was presented including all steps of a method validation. The example was one from an actual project which is currently in the development phase at IRMM.

- Day 2: Mersin University, Mersin. The same seminar was given at Mersin University which was described above. The university had a completely new building equipped with analytical techniques such as NMR, GC-MS, HPLC-MS-MS, ICP-OES....

▪ **EMIT S03-20_23 Seminars** on "Protection level dosimetry“

- Lecturers: Dr Ludwig Büermann and Dr Stefan Neumaier (PTB).
- 01.03.2012 – 02.03.2012, TAEK-ÇNAEM, Istanbul
- Participants: 21 participants from TAEK

Two experts from PTB, Dr Ludwig Büermann and Dr Stefan Neumaier gave six lectures concerning topics related to ionising radiation dosimetry (i) determination of uncertainty in radiation protection measurements; ii) X-ray qualities used in therapy, diagnostic, protection and comparisons; iii) European intercomparisons of active dosimetry systems used in environmental radiation monitoring; iv) air kerma standards and application-specific dosimetric quantities in diagnostic radiology; v) calibration procedures of diagnostic dosimeters and their uncertainties and vi) type testing of cabinet X-ray systems in Germany).

- **EMIT S02-06 Seminars** in the field of inorganic chemical / isotopic reference measurements

- Lecturer: Dr C. Quétel (JRC-IRMM)
- Assistants: Dr S. Can and Mr M. Tunc
- 22-23rd May, 2012 Trakya University (Edirne, 22 May) and İstanbul University (İstanbul, 23 May)
- Participants: 56 (30 in Trakya and 26 in İstanbul)

The seminars included lectures on “Isotopic methodology – isotope dilution mass spectrometry” and “Isotope dilution mass spectrometry for traceable reference values in feed and food. Reference measurements for IMEP-113 (ultra-low levels of Cd and Pb in soja milk powder for babies)”

2.3.3 Visits (Study and Technical Advice)

- **EMIT S03-28a Study Visit:** Proficiency Testing Workshop, NPL, London, U.K. 20.01.2010.
 - Mr Abdullah DİRİCAN (Section Head, TAEK – SANAEM) attended this workshop whose focus was on data evaluation (zeta test, uncertainty outlier test and z-test) and Kiriplots of PT results. PT data evaluation techniques were examined. PT sample preparation techniques were learned. The performances of all laboratories were discussed statistically.
 - During the workshop the difficulties met by the analysts and the content of the next comparison exercise were discussed. This provided useful feedback and experience in our radionuclide metrology studies.
 - As a result of this training, improvements on PT sample preparation, inclusion of the missing aspects in radionuclide analyses and a review H-3 and C-14 analysis in TAEK's laboratories, will be carried out.
- **EMIT S04-01 Study Visit** to Yeditepe University and TÜBİTAK UME, İstanbul. 01.04.2010 to 02.04.2010.

The activities foreseen under Group S04 were presented by J. McCourt & V. Gegevičius. Professors from three Turkish universities - Orta Doğu Teknik Üniversitesi (Middle East Technical University, Ankara), Uludağ Üniversitesi (Bursa) and Yeditepe Üniversitesi (İstanbul) - presented education in metrology activities already on-going in the universities involved in the EMIT project. Discussions on how the EMIT knowledge transfer could best be deployed in the university out-reach part of the programme took place. The event also provided the opportunity for JRC-IRMM representatives to become better acquainted with some Turkish university facilities and personnel and as such meets one of the requirements of EMIT, which is to go to 20 universities all over Turkey, who provide, or want to provide, specific education in metrology.

- **EMIT S04-18 Visit** to Atatürk University for the 5th National Analytical Chemistry Congress, Erzurum, Turkey. 22-06-2010 to 24.06.2010.

Participants came from all over Turkey, representing 51 different universities attended this 3.5 day conference. Dr Vaidotas Gegevičius and Dr Josephine McCourt established personal contact with 74

(Turkish) scientists from 36 different (Turkish) universities, and explained the 2010-2012 EMIT training events which are open to them and how they should register.

Two oral presentations were made on:

- The objectives of the programme of pre-accession assistance "Improving chemical and ionising radiation metrology in Turkey" - Dr Josephine McCourt, Dr Oktay Cankur and Dr Mustafa Vural.
- "Roadmap for facilitating educational innovations in metrology in chemistry and ionising radiation" – Dr Vaidotas Gegevičius and Dr Josephine McCourt.

- **EMIT S01-13 Technical Advice Visit** to TÜBİTAK UME on "preparation and certification of CRMs" - 09.06.2010 to 10.06.2010.

The visit concerned an investigation of TÜBİTAK UME's needs for the preparation and certification of CRMs, including advice on technical requirements on CRM production equipment.

- Lectures and advice were provided by Mr Håkan EMTEBORG over a 2-day visit. Presentations of the CRM processing activities and design, construction and intended operation of the new reference material processing building at JRC-IRMM were covered as well as providing information on generic principles and material preparation.
- The meetings were attended by Mr Oktay Cankur and ten co-workers in the chemical metrology group including the acting director, Mr Sermet SÜER and Mr Şakir Baytaroğlu, TÜBİTAK UME.

- **EMIT S03-08 Technical Advice Visit** on "Liquid scintillation counting" – 13.09.2010 to 15.09.2010

Two experts (Dr Uwe Wätjen and Dr Timos Altitzoglou) visited TAEK-SANAEM to discuss training programmes for future long term and short term training courses in liquid scintillation counting, ion chambers and gamma-ray spectrometry. The visit resulted in further clarifications of both the long term training programme (in LSC) and the short term training contents of various scheduled events.

- **EMIT S03-16 Study Visit** to IRMM on the topic "Alpha spectrometry and defined solid angle counting" – 13.09.2010 to 23.09.2010

This study visit gave the opportunity for a TAEK scientist (Mr Abdullah Dirican) to become better acquainted with alpha spectrometry and defined solid angle counting.

- **EMIT S03-29 Study Visit** to the NMI – IAEA Seibersdorf Laboratory 19.07.2010 to 23.07.2010.

The study visit was attended by Ms Bengü Demircioğlu, Mr Hasan Dikmen from TAEK-ÇNAEM. Training on coincidence summing and geometry correction in gamma spectrometry was provided by six experts from IAEA.

- **EMIT S02-08 Study Visit** to LGC, UK. 08.11.2010 to 12.11.2010.

Practical laboratory training was given by Heidi Geonaga Infante and Christian Deitrich of LGC, London, UK.

- The study visit was attended by one scientist, Mr Alper Isleyen from TÜBİTAK ÜME.
 - The purpose of the study visit was for a scientist from TÜBİTAK ÜME to be trained on the use of isotope dilution HPLC-ICP-MS methodology (developed at LGC) for the speciation and quantification of selenium biomolecules in clinical samples (more precisely selenomethionine in serum samples). It was also foreseen that the trainee would participate in laboratory experiments including sample extraction and quantification.
- **EMIT S01-18 Study Visit** to the IRMM symposium entitled "The Future of Reference Materials - Science and Innovation". 23.11.2010 to 25.11.2010.
 - The study visit was attended by seven scientists from TÜBİTAK ÜME, one from TAEK-CNAEM and three advisors (two university professors and the director of TAEK-CNAEM). The conference was attended by 90 external experts in the field of CRMs and about 100 IRMM scientific staff. This made it a useful networking opportunity for the TÜBİTAK ÜME scientists as well as covering a topic that is very relevant to our main EMIT IPA beneficiary institutes.
 - The symposium covered current and future needs for reference materials in communities as diverse as: nutrition; food and feed (allergens, somatic cell counting in milk etc); environmental; nanotechnology communities; geological; occupational hygiene measurement; nuclear forensics; nuclear safeguards; healthcare (biomarkers, norovirus and hepatitis A virus).
 - **EMIT S02-07 a, b Technical Advice Visits** on the topic of TÜBİTAK ÜME's future clean rooms. 20.09.2010 to 21.09.2010 and 26.11.2010.

This technical advice was provided on two separate occasions during the 2nd interim period, namely via a visit of two IRMM experts (Mr C. Quetel and Ms C. Hennessy) in September 2010 and using the occasion of a visit of seven TÜBİTAK ÜME's scientists to the IRMM (RM) symposium in November, adding an extra half day and having another clean room technical advice meeting on the same topic.

- September 2010 (EMIT S02-07a). Lectures and advice were provided by Mr C. Quetel and Ms C. Hennessy over a 2 day visit to TÜBİTAK ÜME. Presentations of IRMM's ultra clean chemical laboratories (UCCL) in terms of lessons learned, UCCL operation and the importance of such a facility to IRMM projects on producing reference measurement values. Improvement proposals on the current drawings for TÜBİTAK ÜME's intended clean labs were also provided. The meetings were attended by Mr Oktay Cankur and ten co-workers in the chemical metrology group.
- November 2010: S02-07b - Five TÜBİTAK ÜME scientists were first given a detailed explanation on the technical aspects of IRMM's UCCL cellar, filter room and plenum. An engineer from IRMM's Infrastructure and site management unit (Mr D. Lewis) was invited so as to provide as much technical information as possible. Ms C. Hennessy once again went over the main aspects of operation and preventive maintenance of the UCCL and Mr C.

Quetel went over TÜBİTAK UME's amended plan pointing out issues that need further attention.

- **EMIT S01-13a,b Technical Advice Visits** on the topic of "CRM processing" for TÜBİTAK UME. 09.06.2010 to 10.06.2010 and 26.11.2010.

This technical advice was provided on two separate occasions, one at the end of the first interim period (S01-13a) and the second visit during the second interim period (S01-13b).

- June 2010 (EMIT S01-13a) - on the investigation of TÜBİTAK UME's needs for the preparation and certification of CRMs, including advice on technical requirements on CRM production equipment.
 - Lectures and advice were provided by Dr Håkan EMTEBORG over a 2 day visit. Presentations of the CRM Processing activities and design, construction and intended operation of the new RMPB building at IRMM were covered as well as providing information on generic principles and material preparation.
 - The meetings were attended by Dr Oktay Cankur and ten co-workers in the chemical metrology group including the acting director, Mr Sermet Süer and Dr Şakir Baytaroğlu, TÜBİTAK UME.
- November 2010 (EMIT S01-13b). Seven TÜBİTAK UME scientists (accompanied by six long term trainees at IRMM at that moment) were first given a full tour of the new Reference Material Processing Building (RMPB) by Mr H. Emteborg and Mr J. Charoud Got.

Precise advice was provided on raw material storage, (other) material storage, drying, freezing, milling, sieving, product storage, packaging (filling), process control equipment, weighing, homogenisation and useful accessories (e.g. pallet trucks). The TÜBİTAK UME scientists also visited the BCR soil lab, where detailed explanations of the soil processing equipment were provided by Dr H. Emteborg. Precise advice was provided on soil - drying, freezing, milling, sieving and product storage.

- **EMIT S01-21 Study Visit** entitled "Basic Essentials of GC-MS, Method Development & Troubleshooting Course for GC & GC-MS", Liverpool, UK. 27.09.2010 to 01.10. 2010.

This was an "instrument-independent" training course with lectures and practical laboratory exercises given by an internationally recognised GC expert, Dr Ricardo Correa, on behalf of Amoeba Sciences. It was attended by only 3 trainees, one of whom was Ms Mine Bilsel from TÜBİTAK UME, enhancing the learning opportunity, due to the amount of individual attention the trainees were able to receive.

- The following topics were treated:
 - GC module: Separation mechanisms, fundamental principles in gas chromatography, columns, injectors, detectors, quantification (external and internal standard)
 - GC-MS module: Introduction to GC-MS, principles of mass spectroscopy, ionisation techniques, detectors in mass spectroscopy, scan modes, (MS)ⁿ and chemical ionisation positive & negative chemical ionisation, identifying problems strategy, sample introduction (injection technique), selecting GC consumables and maintenance, MS maintenance

- Method development & troubleshooting module: global view of a method, sample introduction conditions, focussing, column selection, detector selection, chromatographic method and temperature, experimental parameter optimisation, quality control and quantitative evaluation of a method.

▪ **EMIT S03-30 Study Visit** to PTB.

- Hosts: Prof. Dr Janssen, Dr Peter Ambrossi, Dr Ole Jansnale, Dr Achim Krauss and Dr Peter Kapsch (PTB)
- 7-8th July, 2011, PTB, Germany
- Participants: Dr Nurdan Gungor (TAEK-ÇNAEM)

Prof. Dr Janssen showed Dr Gungor the “Environmental radioactivity laboratory” explaining which radioactivity measurements can be done in the range of a few milli becquerel up to some kilo becquerel. Thereafter Dr Peter Ambrossi highlighted type tests according to radiation protection ordinance and X-ray ordinance. This was followed by a visit to the “Activity” unit where Dr Ole Jansnale along with Prof. Janssen presented how to determine the activity of solid radioactive sources, the activity per unit mass of radioactive solution and how to prepare the activity standard.

On the second day, in the unit of "Absorbed dose to water", Dr Achim Krauss informed Dr Gungor about establishing a water calorimeter as a Primary Standard in the ⁶⁰Co reference field. Finally in the “High energy photon and electron radiation laboratories”, Dr Peter Kapsch gave general information about practical clinical dosimetry using an accelerator.

▪ **EMIT S04-21 Study Visit** to the Euromaster in Measurement Science – Summer school, Poznań (Poland).

- Hosts: Coordinated by the University of Warsaw and hosted by the Adam Mickiewicz University, Faculty of Chemistry, Grunwaldzka 6; 0-780 Poznań, Poland
- 10-23rd July, 2011, Poznań, Poland
- Participants: Ms Fulya Aydin, Mr Serkan Demir and Mr Hasan Yakan of Ondokuz Mayıs University, 55139 Kurupelit-Samsun

During this two week period, 43 students from thirteen countries participated in the 4th Measurement Science in Chemistry International Summer School in Poznań, Poland. Students came from Bulgaria, Estonia, Finland, France, Latvia, Poland, Portugal, Serbia, Slovenia, Spain, Turkey, Uganda and Ukraine. This event was not organised by the EMIT project but it was used as an opportunity for Turkish students to attend the Euromaster summer school in a "bottom up" approach to show the benefits of such harmonised training in measurement science at Master level.

Students learned about quality in analytical chemistry in the context of EN ISO/IEC-17025. Not only the theory (traceability, uncertainty, statistics, validation, use of reference materials), but also the practice. In a role playing game, they created their own company to perform analysis and they competed amongst themselves. They found out how to interact with clients. For one day, they become an accreditation technical assessor when they visited a real laboratory (the water laboratory Aquanet in Poznań). They will go out and take their own environmental samples in the Ecology Station of Jeziory. A JRC audio-visual is available via http://youtu.be/AaT_KoFqKUc.

▪ **EMIT S01-23 Study Visit** to the Dioxin 2011 Conference.

- Crowne Plaza, Brussels, Belgium
- 21-25th August, 2011
- Participant: Ms Burcu Binici (TÜBİTAK UME)

Dr Burcu Binici attended the Dioxin 2011 conference, as a study visit, during her long term traineeship at EC-JRC-IRMM. Dioxin 2011 focussed on the science of dioxins and other persistent organic pollutants following major advances in analytical determination, the understanding of emission, transport, fate, degradation, toxic behaviour, regulations, along with the growing attention in developing countries and global pollution issues. The 2011 symposium offered a high quality scientific programme, including keynote lectures, oral and poster presentations. Some 800-1000 delegates attended the symposium, with more than 800 abstracts presented in 5 parallel sessions during the 4 days of the conference.

Dr Binici was co-author of a poster entitled "Hexachlorobenzene and hexachlorobutadiene in fish tissue: method development for implementation of the water framework directive" presented at this symposium.

▪ **EMIT S03-32 Study Visit** to the ALMERA gamma spectrometry workshop.

- The workshop was entitled "Measurement of natural radionuclides in environmental samples, NORMs and TENORMs by gamma spectrometry: experimental challenges and methodologies" and took place at the IAEA Monaco Environment Laboratories, Monaco
- 5-9th December, 2011
- Participants: Mr Memduh Fatih ÇINAR and Mr Yücel Özer ÖZKÖK (TAEK-SANAEM)

The main purpose of this study visit was to use the IAEA workshop to refresh and up-date knowledge and skills in advanced aspects related to the determination of natural gamma emitting radionuclides.

This study visit resulted in knowledge gained in the following topics:

- Self-attenuation and coincidence summing for natural radionuclides
- Spectral interference for natural radionuclides
- Secular equilibrium and reference nuclides in the three natural decay series
- Detection limit and decision threshold for Ra-226 daughters in low-level samples
- NORMs and TENORMs
- Application of the concepts of exclusion, exemption and clearance for NORMs

▪ **EMIT S03-26 Study Visit** to the IAEA's "Postal thermoluminescence dosimetry comparison applications" calibration workshop

- Hosts: IAEA, Vienna, Austria
- 21-22nd May, 2012
- Participants: Mr Doğan Yaşar and Mr Muharrem Korkmaz (TAEK-ÇNAEM)

- Day 1: Nuclear Spectrometry Laboratory (hosted by Mr A. Markowicz)
Terrestrial Environment Laboratory (hosted by Mr M. Groening)
Food and Environmental Protection Laboratory (hosted by Mr A. Cannavan)
IAEA quality System (explained by Mr A. Fajgelj)

Dosimetry Laboratory (DOL) (hosted by Ms J. Izewska, Mr G. Azangwe and lab technicians)

- Day 2: IAEA HQ - Radiation, Transport and Waste Safety (NSRW monitoring lab.)
Dosimetry Laboratory (DOL), hosted by Ms J. Izewska and Mr G. Azangwe.

The attendees had the opportunity to gain an insight into how the IAEA is organised with respect to these activities, as well as gaining new knowledge on novelties and recent developments in these fields.

- **EMIT S01-22 Study Visit** entitled "XIII. International Chromatography School" LC-MS Training Course.
 - Trainer(s): N. Avdalović (Thermo Fisher Scientific, USA), J. Weiss (Thermo Fisher Scientific, GER), A. Gelemanović (Primalab, CRO), T. Tomić, (INA, CRO), V. Stankov (SP Laboratory, SRB), Š. Ukić (FCET, CRO), J. Zrostliková (Leco, CZE), O. Platiša (INA, CRO), S. Čavar (FS, BIH), L. Štajduhar (INA, CRO), H. Boiteux (Waters, FRA), M. Boras (Waters, AUT), Z. Majić (Vita Lab Nova, CRO), N. Rejc (Instrumentalia, SLO), J. Zrostliková (Leco, CZE), M. Zrnčić (FCET, CRO), A. Mornar (FPB, CRO), M. Sertić (FPB, CRO) and A. Drolc (NIC, SLO)
 - 18 – 19th June, 2012. Faculty of Chemical Engineering and Technology, University of Zagreb, Croatia
 - Participant: Dr Kevser Topal

The object of this training course was to give the attendee the opportunity to gain new knowledge in:

- novelties from the field of chromatography used for both scientific and routine analysis purposes.
 - recent developments in LC& GC analysis,
 - enhanced chromatography practice in analytical separations.
 - knowledge transfer from various European chromatography experts.
- **EMIT S03-09 Study Visit** "To compare the laboratory services and quality management systems at radioactivity measurement laboratories of SCK•CEN, IRMM and TAEK-SANAEM with the aim of identifying areas of improvement"
 - Visit hosts: Christian Hurtgen (Head of the Working Group on Low Radioactivity Measurements), Michael Bruggeman (Technical Manager) and Freddy Verrezen (Quality Coordinator) - SCK•CEN and T. Altitzoglou, H. Emteborg, C. Quetel, M. Tunc (JRC-IRMM)
 - 25 – 29th June, 2012. SCK•CEN and JRC-IRMM
 - Participants: Dr Ülkü Yücel and Dr Ruhsar Gürellier

The study visit included explanations by Christian Hurtgen (head of "Low radioactivity measurements" group), Michael Bruggeman (technical manager) and Freddy Verrezen (quality coordinator) on the work of SCK•CEN's radioactivity measurement groups. This was followed by detailed information on gamma measurement systems and the work done in the gamma spectrometry laboratory, quality control studies and quality system.

- **EMIT S04-22 Study Visit** to the Euromaster “Measurement Science in Chemistry” summer school
 - Trainers: 14 teachers (Euromaster Consortium professors and Dr P. Taylor)
 - Assistants: Dr V. Gegevicus and Dr J. McCourt
 - 15 - 28 July, 2012. Fatima, Portugal
 - Participants: Mr Engin Şimşek (Middle East Technical University, Ankara), Ms Özlem Yilmazcan (Uludağ Üniversitesi, Bursa) and Ms Elif Zengin (Bogaziçi Üniversitesi, Istanbul)

This was the 5th International summer school on "Measurement science in chemistry", hosted in Fatima, Portugal. 48 students from thirteen countries participated (Bosnia & Herzegovina, Bulgaria, China, Estonia, Finland, France, Jordan, Poland, Portugal, Romania, Serbia, Slovenia, Turkey).

The school was run by a consortium of nine universities (see <http://www.msc-euromaster.eu>) and the Portuguese partner (Faculty of Sciences of the University of Lisbon) acted as the local host. The programme is under the mentorship of the European Commission Joint Research Centre.

14 teachers from nine universities from seven countries provided training on: Challenges of analytical chemistry, traceability, statistics, good measurement science in chromatography, analytical chemistry in industry, method validation, measurement uncertainty, sampling and the use of certified reference materials. Students also learned about quality in analytical chemistry in the context of EN ISO/IEC-17025.

Students could use their new knowledge in practical exercises being divided into ten groups and taking part in a role playing game. They created their own company to perform analysis and they competed amongst each other's "companies". They learned how to work in a group of students from different countries and interact with clients. For one day, they become an accreditation technical assessor when they visited a real laboratory (the laboratory of CTIC in Alcanena).

Before obtaining a final ECTS mark for the Summer school, additional assignments will have to be completed (under the form of homework).

A JRC audio-visual is available via http://youtu.be/q_Qx2dRrQDA.

- **EMIT S03-09bis Study visit** "To compare the laboratory services and quality management systems at radioactivity measurement laboratories of SCK•CEN, JRC-IRMM and TAEK-ÇNAEM with the aim of identifying areas of improvement"
 - Visit hosts: Mr Christian Hurtgen (Head of Low Radioactivity Measurements group), Ms Leen Verheyen (gamma spectrometry laboratory) and Mr Freddy Verrezen (quality coordinator) - SCK•CEN and Mr S. Pommé (primary standardisation laboratories, JRC-IRMM)
 - 27 – 28th August, 2012 at SCK•CEN and JRC-IRMM
 - Participants: Ms Hilal Haznedaroglu and Ms Nurdan Güngör

After the course, Ms Güngör and Ms Haznedaroglu reported that the visit to the low level radioactivity measurement laboratories of SCK•CEN provided the opportunity to discuss sample preparation of total alpha and beta counting systems and alpha spectrometric analyses. The information provided by the quality manager of SCK•CEN's low level radioactivity measurement laboratories was also very useful for the TAEK visitors. Finally the visit to the primary standardisation laboratories of JRC-IRMM provided useful information on the optimal instruments/devices needed for these primary measurements. The TAEK staff concluded that this technical visit gave them a better

understanding about implementing a quality system. They also expressed that based on the information obtained they feel ready to perfect the development of their quality infrastructure.

- **EMIT S02-03bis Study Visit** at the 6th Analytical Chemistry Congress.
 - Visit hosts: Mustafa Kemal University, Hatay, Turkey
 - 3 – 7th September, 2012
 - Participants: Five scientists from TÜBİTAK UME (Ms B. Ari, Ms B. Binici, Mr S. Can, Mr O. Cankur and Mr E. Engin)

This study visit was one of the five extra STTs provided in place of the missed long term traineeship. It provided an opportunity for the UME scientists to attend the special session on isotopic methodology as well as the rest of the Analytical Chemistry Congress. After the visit, the scientists stated that the conference provided them with new knowledge on current trends and future directions in analytical chemistry in general and specifically on various applications of isotopic methodology and metrology in chemistry to inorganic reference measurements, which can and will be useful in TÜBİTAK UME's future work.

- **EMIT S03-13 Technical Advice Visits** to TAEK-ÇNAEM and -SANAEM.
 - Visit hosts: TAEK- ÇNAEM and TAEK-SANAEM
 - 10 - 11 September, 2012
 - Lead Key Expert: Mr Uwe Wätjen

Mr U. Wätjen visited the renewed laboratories and equipment that has been or is being developed by long-term trainees after their return to ÇNAEM and SANAEM. In particular, the development of the anti-muon shield for low background gamma-ray spectrometry at ÇNAEM (Mr A. Yüksel) and the completed alpha-particle defined solid angle equipment at SANAEM were explained (Ms M. Seferinoğlu).

- **EMIT S03-15 Study Visit** entitled "Ion chambers and RN calibrators"
 - Visit hosts: Ionising radiation division, PTB
 - 10-14th September, 2012. Physikalisch Technische Bundesanstalt (PTB), Braunschweig, Germany
 - Participants: Mr Namik Sahin and Mr Emin Yeltepe

The aim of this study visit was to provide two TAEK scientists with the opportunity to see how PTB deal with the selection, use, calibration, and quality control of radionuclide calibrators for use in nuclear medicine. How PTB do associated corrections, calculate uncertainties and carry out other standardisation techniques (applied in PTB) were also on the agenda.

- **EMIT S04-23 Study Visit** for a training course on "Proteomics"
 - Course provider: Bruker Daltonik Training Centre
 - 17-21st September, 2012 at Bruker Daltonik GMBH, Fahrenheitstrasse 4, 28359 Bremen, Germany

- Participant: Dr Merve Öztuğ Şenal (TÜBİTAK UME)

This training course was one of the five extra STTs provided in place of the missed long term traineeship. It was also one of the very few training courses for which JRC-IRMM did not use our own trainers as the topic was too specific. TÜBİTAK UME proposed a suitable candidate and JRC-IRMM arranged an individually tailored course, with the modules listed below, at Bruker Daltonik Training Centre.

- MicroTOF-Q-Proteomics course (2.5 days) comprising i) Instrument control; ii) data acquisition and processing; iii) sample preparation and iv) application specific training
- Quantitation using ESI-TOF (1.5 days)
- **EMIT S04-24 Study Visit** for a training course on "Gas Purity Analysis"
 - Course provider: VSL, Dutch Metrology Institute
 - 17-21 September, 2012 at VSL, Dutch Metrology Institute, Thijsseweg 11, 2629 JA Delft, The Netherlands
 - Participant: Dr Tanil Tarhan (TÜBİTAK UME)

This training course was one of the five extra STTs provided in place of the missed long term traineeship. It was also one of the very few training courses that JRC-IRMM did not use our own trainers for as the topic was too specific. TÜBİTAK UME proposed a suitable candidate and JRC-IRMM arranged an individually tailored course, with the modules listed below, at VSL's Training Centre.

- Gas Purity Analysis by Cavity Ring Down Spectroscopy (2.5 days) comprising i) theory and elaboration of measurement results; ii) practice and measurement in the lab
- Gas Purity Analysis by gas chromatography (GC) equipped with discharge helium ionisation detection (PDHID) and flame ionisation detection (FID) for trace concentrations (2.5 days) comprising i) theory and elaboration of measurement results and ii) practice and measurement in the lab.

2.3.4 Sessions in national conferences

- **EMIT S04-12 Session** in the 25th National Chemistry Congress
 - Invited speakers: Prof. Dr Eva Åkesson (Lund University), Dr Rolf Peter (HRK), Prof. Dr Reiner Salzer (European Chemistry Thematic Network Association) and Prof. Dr Mustafa Demir (Adnan Menderes University)
 - 29th June 2011, Erzurum
 - Participants: 38 participants in the special session

In the frame of the Europe and Metrology in Turkey project, a 0.5-day special session at the 25th National Chemistry Congress on the subject of "Education in Metrology in Chemistry and Ionising Radiation" was held in Ataturk University, Erzurum. 1614 scientists participated in the congress. 300 special session books of the abstracts were distributed amongst them and the EMIT poster was displayed during the analytical chemistry poster session to enhance awareness of the project's activities.

The lectures provided were:

- Introduction to JRC-IRMM and the EMIT project by Dr Josephine McCourt, EMIT Project Leader, EC-JRC-IRMM, Geel, Belgium.
- Changes in European Higher Education and the Bologna process by Prof. Dr Eva Åkesson, pro vice-chancellor at Lund University, Swedish National Team of Bologna Experts, Secretary of IUPAC Committee on Chemistry Education (CCE)
- Academic mobility and the role of Joint Degree Programmes by Dr Rolf Peter, Head of Section European Higher Education Reform, German Rectors' Conference (HRK)
- Quality Labels in Chemistry: Eurobachelor® and Euromaster® by Prof. Dr Reiner Salzer, European Chemistry Thematic Network Association
- "Bologna Process and Undergraduate Chemistry Education in Turkey" "Bologna Süreci ve Türkiye'de Kimya Lisans Eğitimi" (in Turkish) by Prof. Dr Mustafa Demir from Adnan Menderes University, Aydın, Turkey



Figure 46: Participants at the EMIT S04-12 conference session, held at the 25th National Chemistry Congress, Erzurum

▪ **EMIT S03-19 Session** in the XIII National Medical Physics Congress

- Invited speakers: Ralf-Peter Kapsch (PTB), Dr Achim Krauss (PTB) and Dr Doğan Yaşar (TAEK-SANAEM)
- 18th November, 2011, Çeşme Ilıca Hotel, İzmir
- Participants: 106 participants in the special session

In the frame of the Europe and Metrology in Turkey project, a 0.5-day special session on "Therapy level dosimetry" was held on the 18th November, 2011 at the XIII National Medical Physics Congress, Çeşme Ilıca Hotel, İzmir, Turkey. In total about 200 participants from universities and hospitals all over Turkey attended the conference. The main topics of the conference were: radiotherapy physics-radiotherapy applications; radiology physics – radiology applications; nuclear medicine physics-nuclear medicine physics applications; radiation physics; radiation safety and radiation protection; radiation biology; health physics; biomedical applications; medical informatics and magnetic resonance imaging.

The lectures provided as part of the EMIT session were:

- Correction for beam quality in ionising chamber dosimetry by Dr Ralf-Peter Kapsch (PTB).

- Calibration and quality control of reference dosimeters in radiation therapy by Dr Doğan Yaşar (TAEK-ÇNAEM).

Along with the special session, two oral contributions were also presented by TAEK-ÇNAEM scientists namely:

- "ÇNAEM SSDL'inin 0,6 cc hacimli iyon odaları için Ndw kalibrasyon faktörlerinin karşılaştırma metodları ile izlenebilirliği" by Hasan Erez, Tülin Zengin, Enis Kapdan, Selim Aydın And Muharrem Korkmaz (TAEK-ÇNAEM)
- "IEC 61267 Standardına Uygun olarak SSDL x ışını sisteminde diagnostik x ışını radyasyon kontrollerinin oluşturulması" by Doğan Yaşar, Tülin Zengin, Enis Kapdan, Hasan Erez (TAEK-ÇNAEM)



Figure 47: The speakers at the EMIT S04-12 conference session, held at the XIII National Medical Physics Congress, İzmir

- **EMIT S02-03 Session** at the 6th Analytical Chemistry Congress.
 - Invited speakers: Dr Christophe Quetel (JRC-IRMM) and Dr Heidi Goenaga-Infante (LGC, U.K.), Dr Josephine McCourt (JRC-IRMM), Dr Emirhan Nemutlu (Hacettepe Üniversitesi and Mayo Klinik, U.S.A); Dr Oktay Cankur (TÜBİTAK UME), Dr Serhat Döker (Çankırı Karatekin Üniversitesi) and Ms Betül Ari (TÜBİTAK UME).
 - 6th September, 2012, Mustafa Kemal University, Hatay, Turkey.
 - Participants: 35 (excluding lecturers)

The aim of this session, entitled "Application of isotopic methodology and metrology in chemistry to inorganic reference measurements", was for experts from the European Union and Turkey to provide a series of lectures on the subject of isotopic methodology and metrology in chemistry.

Two keynote lectures were provided, namely:

- "Isotopic methodology for the purpose of authentication, using multi-marker systems. Illustration with food products" by Dr Christophe Quetel (JRC-IRMM)
- "Challenges in the accurate quantification and identification of metallobiomolecules relevant to nutrition and cancer" by Dr Heidi Goenaga-Infante (LGC, UK)

The session was also used as a platform for communicating the EMIT project's achievements and for Turkish scientists to report on their work in the field of isotopic methodology and metrology in chemistry. This comprised of the following oral presentations:

-“Improving chemical and ionising radiation metrology in Turkey – Status, September 2012” by Josephine McCourt (JRC-IRMM)

-“Metabolik Oligofosfatların $^{18}\text{O}/^{16}\text{O}$ İzotop Değişim ve Döngü hızlarının: ESI-MS ve 2D ^{31}P NMR ile analizi” by Emirhan Nemutlu^{a,b}, Nenad Juranic^c, Song Zhang^b, Andre Terzic^b, Slobodan Macura^c and Petras P. Dzeja^b (^aHacettepe Üniversitesi, ^bMayo Klinik, U.S.A);

-“İçme Suyunda Eser Elementlerin Yüksek Çözünürlüklü ICP MS ile Tayini: SIM–QM.S2 Karşılaştırma Çalışması” by Emrah Uysal, Murat Tunç, Fatma Gonca Coşkun, Oktay Cankur (TÜBİTAK UME)

-“Kaya Tuzu ve Sofra Tuzu Örneklerindeki Bazı Eser Elementlerin ICP-MS ile Tayini” by Musa Uslu, Serhat Döker (Çankırı Karatekin Üniversitesi)

-“ICP-MS ile Şarap İçinde Kurşun Tayini: CCQM-K30.1 Karşılaştırma Çalışması” by Betül Ari, Süleyman Z. Can, Oktay Cankur (TÜBİTAK UME).

It should be noted that Ms Betul Ari, a scientist from TÜBİTAK UME, who spent a year at JRC-IRMM (as an EMIT long term trainee under Mr C. Quetel's supervision) won the prize for the best poster at the 6th National Chemistry Congress.



Figure 48: Participants at the EMIT S02-03 conference session held at Mustafa Kemal University, Hatay.

2.3.5 Conference organised by JRC-IRMM

- **EMIT S05-15 Concluding Conference on "Improving chemical and ionising radiation metrology in Turkey – the achievements"**
 - Invited speakers: 40 oral presentations (including 17 of the 18 LTTs).
 - 11-13th June, 2012. The conference took place at The Green Park Pendik Hotel & Convention Center, Eski Ankara Cad. No:204, 34890 Pendik Istanbul, Turkey.

- Participants: 85

The aim of this conference was to mark the successful completion of the EMIT Project lead by the European Commission's Joint Research Centre, IRMM.

The main objectives of the conference were to:

- provide a forum for the exchange of information on the outcome this uniquely tailored knowledge transfer project on enhancing Turkey's chemical and ionising radiation capacities.
- summarise what was involved in completing all 20 objectives of this knowledge transfer and capacity building project.
- hear how the stakeholders intend to build on this.
- hear how projects, such as this, can help further increase Turkey's trade volume with the EU and facilitate the adoption of the *acquis communautaire*.
- hear the views of Turkey's top executives and top scientists on the future of metrological matters in Turkey.



Figure 49: The participants at the EMIT S05-15 concluding conference, Istanbul

2.3.6 Participations at international conferences

- **EMIT S03-28a Conference participation:** IM2010, Athens, Greece.
 - Place: Megaron Athens International Conference Centre, Athens, Greece
 - 20th January, 2010
 - Participant Sema ŞEN (TAEK - SANAEM)

Ms Sema ŞEN attended this conference whose objective was to bring together scientists from regulatory authorities, individual monitoring services, research bodies, European networks and companies, for the purpose of facilitating the dissemination of knowledge, exchanging experiences and promoting new ideas in the field of individual monitoring.

SANAEM Dosimetry Service's infrastructure was compared with the other dosimetry services' infrastructure. New research on individual monitoring, developments in both external and internal dosimetry systems, applications of individual monitoring, education and training information of individual monitoring and experiences of emergency situation were also shared.

As a result of this training, improvements on the infrastructure of TAEK SANAEM's Dosimetry Service will be implemented.

- **EMIT S02-04a Conference participation** at the 12th International Conference on Environmental Science and Technology (CEST2011)
 - Place: Convention Centre "Marika Capsis 2000", Ixia, Rhodes Island, Dodecanisos, Greece.
 - 8-10th September, 2011
 - Participant: Erinc Engin (TÜBİTAK UME).

The conference topics were:

- Climate change and environmental dynamics
- Air pollution and control
- Water resources and river basin management
- Water treatment and reclamation
- Ecology and ecosystems management
- Wastewater and sludge treatment
- Solid waste management
- Clean energy and sustainability
- Health and environment
- Environmental management / environmental sustainability

Dr Engin was co-author of a poster entitled " Selective determination of total Hg in soil and sewage sludge by using the Hydrea system: removing Hg memory effects" presented at this conference.

- **EMIT S04-17a,b Conference participations** to EC2E2N (ACE 2012).
 - Place: EC2E2N at the University of Milan
 - 24-27th April, 2012, Milan, Italy
 - Participants: Prof. M. Demir (Adnan Menderes University) and Prof.Dr Timur Dogu (METU)

In this annual meeting of EC2E2N four plenary lectures were presented, workshops were performed and reports of 17 working groups were discussed.

The plenary lectures were on:

- "Knowledge Transfer Activities in Analytical Sciences" by Dr Philip Taylor (EC JRC IRMM),
- "Creativity in Chemistry" by Dr V. Balzani (Univ. Bologna)
- "The Education Audiovisual & Cultural Executive Agency (EACEA) and its functions" by Dr A. Prieto-Gonzales
- "Outcome Based Chemical Engineering Education" by Prof. M. Demir (Adnan Menderes University)

- **EMIT S02-04b, S01-15abc and S03-28bc Conference Participations** at the 13th International Symposium on Biological and Environmental Reference Materials (BERM 13)
 - Place: Vienna International Convention Center, Vienna, Austria
 - 25 – 29th June, 2012
 - Participants: Four scientists from TÜBİTAK UME and two scientists from TAEK

The aim of providing the opportunity for six Turkish scientists to attend this conference was to:

- To create opportunity to interact with key players who are involved in RM development, production, distribution and use.
- To provide a forum for the exchange of information on recent developments of new RMs;
- To address issues related to international standardization and accreditation in the area of RMs;
- To address scientific and technical developments related to methods that are used in RM production;
- To address issues related to the availability of RMs and their role in lowering barriers to trade, specifically in least developed and developing countries.

The full list of events is shown in the annex of this report.

3 Communication

Various means of communicating the EMIT project were employed throughout the project's three year duration. Specific sections were created on the consultant's and main partner institutes (TÜBİTAK UME and TAEK-ÇNAEM and TAEK-SANAEM) websites. Communication within the EMIT steering committee was achieved by twice yearly meetings, frequent emails and by a specially assigned interest group "JRC Metrology in Turkey" on the European Commission's secure file sharing platform. Other means employed for communication towards externals were the presentation of the EMIT training events (which were open to all stakeholders) with the means of a special poster and a flyer at as many as possible national scientific / quality / education events in Turkey.

Raising awareness of the EMIT project's work at various stages along the way and communicating upcoming events was done at every event verbally and by means of a project poster and event list flyers. Along with that, two EMIT newsletters were published in March 2011 and in June 2012 (in both Turkish and English). This was widely distributed by means of e-mailing the newsletter links (on the EMIT website⁴) and by distributing printed versions at our various events. The EMIT website was continuously adapted to suit the growing amount of information with upcoming events having been advertised 2-3 months before the event (along with emails to everyone on the EMIT contact list).

An invitation to present the status and achievements of the EMIT project was extended to JRC-IRMM by the parallel project "Strengthening the Quality Infrastructure in Turkey" (SQIT IPA) and this was done at the Turklab conference on the 13th Dec., 2011:

- McCourt J., "Improving chemical and ionising radiation metrology in Turkey – the scope and status after two years", Conformity Assessment Association of Turkey (UDDER) Journal nr 3, Dec., 2011. http://www.udder.org.tr/images/bultenler/bulten_sayi_03.pdf

The press reporting at our events helped with raising awareness of the EMIT project's activities. The texts describing the events were approved by EC-JRC-IRMM's communication team, after translation by TÜBİTAK UME, TAEK-ÇNAEM, TAEK-SANAEM or the EUD, depending on the subject. The following is a selection of news articles concerning the activities of the project:

⁴ <http://irmm.jrc.ec.europa.eu/Turkey>

12/06/2012: Press release of Delegation of the European Union to Turkey about the successful completion of the EMIT project: English, Turkish. <http://europa.eu/rapid/search.htm>
 13/12/2011: SQIT and EMIT article, http://www.udder.org.tr/images/bultenler/bulten_sayi_03.pdf.
 07/10/2011: Samsunhaber (www.samsunhaber.com)
 07/04/2011: Sertifikalı Referans Madde Üretimi Semineri (haberler.com)
 07/04/2011: Sertifikalı Referans Madde Üretimi Semineri (sondakika.com)
 07/04/2011: Sertifikalı referans madde üretimi semineri (haberdar.com)
 07/04/2011: Sertifikalı referans madde üretimi semineri (beyazgazete.com)
 27/10/2009: TÜBİTAK ve TAEK'ten radyasyon ölçümünde AB'ye uyum projesi (zaman.com.tr)
 27/10/2009: Radyasyon ölçümünde AB'ye uyum projesi (veteknoloji.com)
 27/10/2009: Press release of Delegation of the European Union to Turkey about new project: English, Turkish. <http://europa.eu/rapid/search.htm>

3.1.1 EMIT on JRC-IRMM web site

A dedicated section for the EMIT project was published on the JRC-IRMM website (see Figure 50 for a snapshot of the EMIT Events Tab (<http://irmm.jrc.ec.europa.eu/Turkey>)

JOINT RESEARCH CENTRE
 Institute for Reference Materials and Measurements (IRMM)

Commission > JRC > IRMM > Activities > Turkey

Font Size: [A](#) [A](#) [A](#)

Europe and metrology in Turkey

Home Events News Press Course content Project reports

Project Events

A series of training events (with typically 40-50 participants) will be open to Turkish beneficiaries. Download the [list of events here](#) [227Kb]. Certain rules for event registration will apply:

- Phase 1 - Registration for TÜBİTAK and TAEK: 15% of the possible places each.
- Phase 2 - Registration: 70% open to all other (Turkish) stakeholders/end-users, with the registration fee.
- Phase 3 - Confirmation: an applicant's place is confirmed by the event organiser.

Please consult the EMIT [website](#) regularly for registration details of the event you are interested in.

EMIT workshop S04-10: Proficiency testing and statistical evaluation

10 - 11 September, 2012
 Bursa, Turkey.
 In the frame of the Europe and Metrology in Turkey project, a two day workshop entitled "Proficiency testing and statistical evaluation" are available in the workshop [leaflet](#) [416Kb]. Registration will be possible from 4 June, 2012 via [the website](#).

EMIT conference session S02-03: Education in metrology in chemistry and ionising radiation

06 September, 2012
 Antakya, Hatay, Turkey.
 Experts from the European Union and Turkey will lecture at a special session of the 6th National Conference on Metrology. Further details are available via the [agenda](#) [248Kb].

EMIT workshop S04-11: Statistics and uncertainty determination for radionuclide applications

3 - 5 July, 2012
 İzmir, Turkey.

Figure 50: Snapshot of the EMIT webpage (events tab) on the 10.09.2012.

3.1.2 EMIT publications

There have been eleven publications (final total will be 13) on the project in general with details of the project's progress to date:

- six reports (Inception phase, First Interim, Second Interim, Third Interim, Fourth Interim and Fifth Interim)
 - McCourt J., Bickel M. Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. Inception phase report, JRC57848, European Union, 2010.
 - McCourt J., Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. First Interim Report, JRC61020, EUR 24549, ISBN 978-92-79-17080-5, European Union, 2010.
 - McCourt J., Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. Second Interim Report, JRC64333, EUR 24776, ISBN 978-92-79-19801-4, European Union, 2011.
 - McCourt J., Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. Third Interim Report, JRC67074, EUR 24957 EN, ISBN 978-92-79 21436- 3, European Union, 2011.
 - McCourt J., Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. Fourth Interim Report, JRC70957, EUR 25337 EN, ISBN 978-92-79-24987-7, European Union, 2012.
 - McCourt J., Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. Fifth Interim Report, JRC77733, EUR 25670 EN, ISBN 978-92-79-28066-5, European Union, 2012.
- two reports currently in press
 - McCourt J., Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. Final Phase Report, JRC81729, EUR xxxxx EN, ISBN xxx-xx-xx-xxxx-x, European Union, 2013.
 - McCourt J., Programme of pre-accession "Improving Chemical and Ionising Radiation Metrology" in Turkey. Final Report (this one), JRC81731, EUR xxxxx EN, ISBN xxx-xx-xx-xxxx-x, European Union, 2013.
- one general project poster
 - Gegevicus V., McCourt J., EMIT Events Poster, June, 2010
- two newsletters (two versions EN & TK)
 - McCourt J., Improving Chemical and Ionising Radiation Metrology" in Turkey. Newsletter 01, March 2011; EN and TK versions JRC 64366.
 - McCourt J., Schmitz P., Improving Chemical and Ionising Radiation Metrology" in Turkey. Newsletter 02, June 2012; EN and TK versions JRC 71698
- one article in a Turkish periodical
 - McCourt J., "Improving chemical and ionising radiation metrology in Turkey – the scope and status after two years", Conformity Assessment Association of Turkey (UDDER) Journal nr 3, Dec., 2011.
http://www.udder.org.tr/images/bultenler/bulten_sayi_03.pdf

- one oral presentation
 - McCourt J., "Improving chemical and ionising radiation metrology in Turkey – the scope and status after two years" at III Laboratory Quality Conference (TURKLAB), Istanbul, 13 Dec., 2011.
<http://www.labkalite2011.org/docs/lqc%20turklab%202011%20programme.pdf>

Though originally not foreseen, JRC-IRMM provides this final report, summarising the activities over the full three years in one document (avoiding the need to peruse seven reports).

There are also 18 final reports, prepared by the long term trainees and are exchanged between JRC-IRMM (or PTB) and the trainees' home institutes (TÜBİTAK UME, TAEK-ÇNAEM and TAEK-SANAEM).

Scientific publications⁵ published (or in press) from the beginning of the project until now are:

Articles:

1. "High-resolution alpha-particle spectrometry of the ²³⁰U decay series" M. Marouli, S. Pommé, J. Paepen, R. Van Ammel, V. Jobbagy, **A. Dirican***, G. Suliman, H. Stroh, C. Apostolidis, K. Abbas, A. Morgenstern. Appl. Radiat. Isot. (2012), 70(9):2270-4. doi: 10.1016/j.apradiso.2012.02.107. Epub 2012 Mar 6. *Trainee under the IPA TR080209 project - financed by the European Union.
2. "The use of solid angle for alpha detector efficiency in ²²⁶Ra analyses of soil samples" by **A. Dirican***, P. E. Erden, **M. Seferinoğlu***, S. Pommé. Appl. Radiat. Isot. (2012), 70(9):2260-2. doi: 10.1016/j.apradiso.2012.02.114. Epub 2012 Mar 5. *Trainee under the IPA TR080209 project - financed by the European Union.
3. "Measurement of the ¹⁷⁷Lu half-life" by S. Pommé, J. Paepen, T. Altitzoglou, R. Van Ammel, **E. Yeltepe***, Appl. Radiat. Isot. 69 (2011) 1267-1273. *Trainee under the IPA TR080209 project - financed by the European Union.
4. "Quantification of ²³⁸U in environmental samples using gamma-ray spectrometry", M. Hult, E. Andreotti, R. González de Orduña, S. Pommé, **E. Yeltepe***, Atti di Conferenze/Conference Proceedings (Società Italiana di Fisica/ Italian Physical Society) – EPJ Web of Conferences 24, 07005 (2012), <http://dx.doi.org/10.1051/epjconf/20122407005>. *Trainee under the IPA TR080209 project - financed by the European Union.
5. "Distribution of ⁶⁰Co in steel samples from Hiroshima" by M. Hult, G. Marissens, **N. Sahin***, M. Hoshi, H. Hasai, K. Shizuma, K. Tanaka and S. Endo. Appl Radiat Isot. (2012) 70(9):1974-6. doi: 10.1016/j.apradiso.2012.02.077. Epub 2012 Feb 25. *Trainee under the IPA TR080209 project - financed by the European Union.
6. "Search for α decay of ¹⁵¹Eu to the first excited level of ¹⁴⁷Pm using underground γ -ray spectrometry" by F.A. Danevich, E. Andreotti, M. Hult, G. Marissens, V.I. Tretyak and **A. Yüksel***, Eur. Phys. J. A(2012)48: 157, DOI 10.1140/epja/i2012-12157-7. *Trainee under the IPA TR080209 project - financed by the European Union.
7. "Comparison of background in underground HPGe-detectors in different lead shield configurations", by M. Hult, G. Lutter, **A. Yüksel***, G. Marissens, M. Misiaszek and U. Rosengård, Appl. Radiat Isot. (2013), S0969-8043(13)00171-1. doi: 10.1016/j.apradiso.2013.03.081. *Trainee under the IPA TR080209 project - financed by the European Union.
8. "A new versatile underground gamma-ray spectrometry system", by G. Lutter, M. Hult, G. Marissens, E. Andreotti, U. Rosengård, M. Misiaszek, **A. Yüksel*** and **N. Sahin***, Appl. Radiat Isot. (2013), <http://dx.doi.org/10.1016/j.apradiso.2013.03.079> *Trainee under the IPA TR080209 project - financed by the European Union.

⁵ Publications (including posters) arising from research carried out by the long term trainees whilst in JRC-IRMM, have an associated sentence "Trainee under the IPA TR080209 project - financed by the European Union" to acknowledge EU IPA funding.

9. "The importance of the sample preparation in setting up maximum limits in European legislation: the outcome of IMEP-33". Submitted to Food Additives and Contaminants, by F. Cordeiro, I. Baer, P. Robouch, H. Emteborg, J. Charoud-Got, **S. Can***, A. Krata, M. Zampella, C. Quételet, B. De la Calle, R. Hearn. *Trainee under the IPA TR080209 project - financed by the European Union.
10. "Measurement of the ^{225}Ac half-life", S. Pommé, M. Marouli, G. Suliman, **H. Dikmen***, R. Van Ammel, V. Jobbágy, A. Dirican*, H. Stroh, J. Paepen, F. Bruchertseifer, C. Apostolidis, A. Morgenstern, Appl. Radiat. Isot. 70 (2012) 2608-2614. *Trainee under the IPA TR080209 project - financed by the European Union.
11. "Decay data measurements on ^{213}Bi using recoil atoms", by M. Marouli, G. Suliman, S. Pommé, R. Van Ammel, V. Jobbágy, H. Stroh, **H. Dikmen***, J. Paepen, **A. Dirican***, F. Bruchertseifer, C. Apostolidis, A. Morgenstern. Submitted for publication in Applied Radiation and Isotopes. *Trainee under the IPA TR080209 project - financed by the European Union.
12. "Half-lives of ^{221}Fr , ^{217}At , ^{213}Bi , ^{213}Po and ^{209}Pb from the ^{225}Ac decay series", by G. Suliman, S. Pommé, M. Marouli, R. Van Ammel, H. Stroh, V. Jobbágy, J. Paepen, **A. Dirican***, F. Bruchertseifer, C. Apostolidis, A. Morgenstern. Submitted for publication in Applied Radiation and Isotopes. *Trainee under the IPA TR080209 project - financed by the European Union.

Reports:

1. "The certification of the mass fraction of the total content and the aqua regia extractable content of Hg in loam soil" by E. de Vos, **E. Engin***, A. Santoro, M. Ricci, A. Held, EUR 25141 EN 2011, ISBN 978-92-79-22563-5, doi:10.2787/55675, Publications Office of the European Union, Luxembourg, 2012. *Trainee under the IPA TR080209 project - financed by the European Union.
2. "IMEP-31: Total arsenic, cadmium, copper, lead and mercury, as well as extractable cadmium and lead in mineral feed" by I. Baer, B. de la Calle, I. Verbist, **B. Ari***, A. Krata, C. Quételet, P. Robouch; EUR 24819 EN 2011, 64 pp. *Trainee under the IPA TR080209 project - financed by the European Union.
3. "IMEP-111: Total cadmium, lead, arsenic, mercury and copper and extractable cadmium and lead in mineral feed" by B. de la Calle, A. Krata, **B. Ari***, C. Quételet, H. Emteborg, P. Robouch, I. Verbist; EUR 24758 EN 2011. *Trainee under the IPA TR080209 project - financed by the European Union.
4. "IMEP-33: Total cadmium and lead in baby food" by F. Cordeiro, I. Baer, P. Robouch, I. Verbist, B. Kortsens, H. Emteborg, J. Charoud-Got, C. Quételet, **S. Can***, B. de la Calle; EUR 25176 EN 2012. *Trainee under the IPA TR080209 project - financed by the European Union.
5. "IMEP-113: Determination of total cadmium and lead in baby food" by F. Cordeiro, I. Baer, P. Robouch, I. Verbist, B. Kortsens, K. Emteborg, J. Charoud-Got, C. Quételet, **S. Can***, B. de la Calle; EUR 25177 EN 2012. *Trainee under the IPA TR080209 project - financed by the European Union.
6. Certification Report: "Trace and Major Elements in Milk Powders; ERM BD 150 and ERM BD 151" (in preparation) by J. Snell, **A. Isleyen***, M. Dabrio. *Trainee under the IPA TR080209 project - financed by the European Union.

Oral presentations:

1. "Development of a new candidate certified reference material for biota monitoring of hexachlorobenzene and hexachlorobutadiene" by L. Majoros, M. Ricci, **B. Binici***, H. Emteborg, A. Held and H. Emons at Dioxin 2011, Brussels, Belgium, 21-25th August, 2011. *Trainee under the IPA TR080209 project - financed by the European Union.
2. "ÇNAEM SSDL'inin 0,6 cc hacimli iyon odaları için NdW kalibrasyon faktörlerinin karşılaştırma metodları ile izlenebilirliği" by H. Erez, T. Zengin, **E. Kapdan***, S. Aydın and M. Korkmaz (TAEK-ÇNAEM) at the XIII National Medical Physics Congress, İzmir, Turkey on 19.11.2011. *Trainee under the IPA TR080209 project - financed by the European Union.

3. "IEC 61267 Standardına Uygun olarak SSDL x ışını sisteminde diagnostik x ışını radyasyon kontrollerinin oluşturulması" by **D. Yaşar***, T. Zengin, **E. Kapdan***, H. Erez (TAEK-ÇNAEM) at the XIII National Medical Physics Congress, İzmir, Turkey on 19.11.2011. *Trainee under the IPA TR080209 project - financed by the European Union.
4. "Assignment of property values to a candidate CRM" by **B. Binici***, L. Majoros, M. Ricci, A. Held at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
5. "Designing and planning of certified reference material projects and method validation" by **N. Tokman***, B. Plutowska, G. Buttinger, S. Harbeck, A. Moseriti, H. Schimmel at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
6. "Method validation for the characterisation of a CRM" by **T. Gökçen***, F. Sandor, B. Sejerøe-Olsen, J. Huertas-Perez, M. Dabrio-Ramos, H. Schimmel at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
7. "Trace and major elements in milk powders" by **A. İşleyen***, J. Snell, H. Schimmel presented at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
8. "Characterisation and value assignment of a reference material" by **E. Engin***, A. Santoro, A. Held at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
9. "IDMS based independent reference measurements of the extractable cadmium and lead mass fractions in mineral feed for IMEP-111 (in support to the EU Reference Laboratory for Heavy Metals)" by **B. ARI***, **S. Z. Can***, A. Krata, C. R. Quetel at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
10. "The objectives and requirements of training in ionising radiation dosimetry in PTB" by **D. Yaşar***, O. Hupe, L. Büermann, R.P. Kapsh, H. Jansen, U. Rosengård at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
11. "Primary and secondary level calibration processes with ionising radiation" by **E. Kapdan***, H. Janssen at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
12. "Underground gamma-ray measurements for high precision and tracing former events" by **N. K. Şahin***, M. Hult, U. Rosengård and T. Vidmar at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
13. "Methods for measuring extremely low levels of radioactivity in materials" by **A. Yüksel***, M. Hult, G. Lutter at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
14. "Liquid scintillation counting for standardisation of radionuclides" by **N. Aslan***, T. Altitzoglou at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
15. "Liquid scintillation counting: efficiency calibration using the CIEMAT/NIST efficiency tracing method" by **G. Kahraman***, T. Altitzoglou at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
16. "Half-life measurement of ¹⁷⁷Lu with a re-entrant gamma ionisation chamber and 4π-gamma counting with a well type NaI(Tl) detector" by **E. Yeltepe*** and S. Pommé at the Europe &

- Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
17. "Source preparation and alpha-particle counting" by **M. Seferinoğlu***, S. Pommé at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
 18. "Primary standardisation of activity and high-resolution alpha-particle spectrometry" by **A. Dirican***, S. Pommé at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
 19. "Decay data measurements for ^{230}U , ^{225}Ac and daughter products" by **H. Dikmen***, S. Pommé at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
 20. "Isotope dilution mass spectrometry for traceable reference values in feed and food" by **B. Ari***, **S. Z. Can***, C. R. Quetel at the Isotopic Methodology and Metrology in Chemistry for Inorganic Reference Measurements workshop (S02-05), Ankara, Izmir (21-22 June, 2011). *Trainee under the IPA TR080209 project - financed by the European Union.
 21. "Isotope dilution mass spectrometry for traceable reference values in feed and food. Reference measurements for IMEP-113 (ultra-low levels of Cd and Pb in soja milk powder for babies)" by **S. Z. Can***, **M. Tunc***, C. R. Quetel at the seminar on Inorganic Chemical Isotopic Reference Measurements (EMIT S02-06), Edirne, Istanbul (22-23 May, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
 22. "Çme Suyunda Eser Elementlerin Yüksek Çözünürlüklü ICP MS ile Tayini: SIM-QM.S2 Karşılaştırma Çalışması" by E. Uysal, **M. Tunc***, F. Gonca Coşkun, O. Cankur at the Isotopic Methodology and Metrology in Chemistry for Inorganic Reference Measurements workshop (EMIT S02-03) of the VI. Ulusal Analitik Kimya Kongresi, Hatay (3-7 July, 2012). *Trainee under the IPA TR080209 project - financed by the European Union
 23. "ICP-MS ile Şarap İçinde Kurşun Tayini: CCQM-K30.1 Karşılaştırma Çalışması" by **B. Ari***, **S. Z. Can***, O. Cankur at the Isotopic Methodology and Metrology in Chemistry International Session (EMIT S02-03) of the VI. Ulusal Analitik Kimya Kongresi, Hatay (3-7 July, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
 24. "Towards SI traceability for measurements of Hg vapour" by C. R. Quetel, M. Zampella, R. J. C. Brown, H. Ent, M. Horvat, E. Paredes, **M. Tunc***, M. Vahcic at the 11th International conference on "Mercury as a global pollutant"; Special Session 'Traceability of Mercury measurements', Edinburgh, Scotland (28th July-2nd August, 2013). *Trainee under the IPA TR080209 project - financed by the European Union.

Posters:

1. "Hexachlorobenzene and hexachlorobutadiene in fish tissue: method development for implementation of the water framework directive" presented at Dioxin 2011, Brussels, Belgium, 21-25th August, 2011. **B. Binici***, L. Majoros, M. Ricci, A. Held, H. Emons. *Trainee under the IPA TR080209 project - financed by the European Union.
2. "Selective determination of total Hg in soil and sewage sludge by using the Hydrea system: removing Hg memory effects" presented at CEST 2011, Rhodes, Greece, 8-10th September, 2011. **E. Engin***, A. Santoro, M. Ricci, A. Held. *Trainee under the IPA TR080209 project - financed by the European Union.
3. "Quality assurance tools for pesticide analysis – an ambitious task" presented at 5th International Symposium on Recent Advances in Food Analysis (RAFA 2011), Prague, Czech Republic, 1-4 November 2011, M. Dabrio Ramos, A. R. Fernández-Alba, J. Fernando Huertas Pérez, **T. Gokcen***, F. Sandor, B. Sejerøe-Olsen, K. Teipel and H. Schimmel. *Trainee under the IPA TR080209 project - financed by the European Union.

4. "Tedavi düzeyli dozimetre sistemleri için doz hesaplamalarında kullanılan su fantomu-Kati fantom (RW3) Doz Düzeltme faktörünün belirlenmesi" by H. Erez, T. Zengin, **E. Kapdan***, S. Aydın and M. Korkmaz (TAEK-ÇNAEM).
5. "Bilgisayarlı Tomografilerde Hasta Dozu Yönetimi" by E. Güngör, B. Doğan and C. Özüağ (TAEK-ÇNAEM)
6. "First steps towards the production of a certified reference material for biota monitoring of hexachlorobenzene and hexachlorobutadiene" by L. Majoros, M. Ricci, **B. Binici***, H. Emteborg, A. Held and H. Emons presented at the ISEAC-2102, 22-25th May 2012 (International symposium on environmental analytical chemistry). *Trainee under the IPA TR080209 project - financed by the European Union.
7. "Determination of transfer factors for the roos type parallel plate therapy ionisation chambers if used in solid state phantoms" by **E. Kapdan***, H. Erez, L. Büermann, **D. Yaşar*** at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
8. "Independent reference measurements of the mercury mass fraction in mineral feed for the IMEP-111 comparison" by **B. Ari***, A. Krata, C. R. Quetel at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
9. "Independent reference measurements of the cadmium and lead mass fractions in baby milk powder for the IMEP-113 comparison" by **S. Z. Can***, A. Krata, M. Zampella, **M. Tunc***, C. R. Quetel at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 - 13 June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
10. "Establishment of diagnostic radiation qualities in accordance with IEC 61267 standard in SSDL" by **D. Yaşar***, L. Büermann, **E. Kapdan***, H. Erez at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
11. "Assignment of property values to a candidate CRM" by **B. Binici***, L. Majoros, M. Ricci, A. Held at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
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13. "Method validation for the characterisation of a CRM" by **T. Gökçen***, F. Sandor, B. Sejerøe-Olsen, J. Huertas-Perez, M. Dabrio Ramos, H. Schimmel at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
14. "Trace and major elements in milk powders" by **A. İşleyen***, J. Snell, H. Schimmel presented at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
15. "Characterisation and value assignment of a reference material" by **E. Engin***, A. Santoro, A. Held at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
16. "Underground gamma-ray measurements for high precision and tracing former events" by **N.K. Şahin***, M. Hult, U. Rosengård and T. Vidmar at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.

17. "Methods for measuring extremely low levels of radioactivity in materials" by **A. Yüksel***, M. Hult, G. Lutter at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
18. "Liquid scintillation counting for standardisation of radionuclides" by **N. Aslan***, T. Altitzoglou at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
19. "Liquid scintillation counting: efficiency calibration using the CIEMAT/NIST efficiency tracing method" by **G. Kahraman***, T. Altitzoglou at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
20. "Half-life measurement of ¹⁷⁷Lu with a re-entrant gamma ionisation chamber and 4π-gamma counting with a well type NaI(Tl) detector" by **E. Yeltepe*** and S. Pommé at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
21. "Source preparation and alpha-particle counting" by **M. Seferinoğlu***, S. Pommé at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
22. "Primary standardisation of activity and high-resolution alpha-particle spectrometry" by **A. Dirican***, S. Pommé at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
23. "Decay data measurements for ²³⁰U, ²²⁵Ac and daughter products" by **H. Dikmen***, S. Pommé at the Europe & Metrology in Turkey (EMIT) Concluding Conference (S05-15), Pendik, Istanbul (11 – 13th June, 2012). *Trainee under the IPA TR080209 project - financed by the European Union.
24. "Kalibrasyon Çözümlerinde Cr, Co ve Pb elementlerinin ICP-MS ile tayini: CCQM-K87 Karşılaştırma Çalışması" by **M. Tunc***, **B. Ari***, O. Cankur at the Isotopic Methodology and Metrology in Chemistry International Session (EMIT S02-03) of the VI. Ulusal Analitik Kimya Kongresi, Hatay (3-7 July, 2012). *Trainee under the IPA TR080209 project - financed by the European Union
25. "ICP-MS ile Biyoetanolda Bakır Tayini" by **S. Z. Can***, O. Cankur, **B. Ari*** at the Isotopic Methodology and Metrology in Chemistry International Session (EMIT S02-03) of the VI. Ulusal Analitik Kimya Kongresi, Hatay (3-7 July, 2012). *Trainee under the IPA TR080209 project - financed by the European Union
26. "Isotope dilution based measurements of saturated Hg vapour in air: a new approach" by M. Zampella, E. Paredes, **M. Tunc***, R. J. C. Brown, C. R. Quétel at the "11th International Conference on Mercury as a global pollutant"; Special session 'Traceability of Mercury measurements', Edinburgh, Scotland (28th July - 2nd August, 2013). *Trainee under the IPA TR080209 Project - financed by the European Union.

3.1.3 EMIT event list – open to all (ed 15)

Subject	Ref.	Date	Precise topic, duration and nr. participants foreseen.
01 RM	S01-02	2010-10-05	Workshop on preparation of certified reference materials (Turkey), 2 days, 40-50 participants.
04 QMET	S04-03	2010-10-20	Workshop "Roadmap for facilitating educational innovations in Metrology in Chemistry and Ionising Radiation" (Turkey), 1 day, 40-50 participants.
04 QMET	S04-04_09	2011-02-22	Workshop "Training methodologies in Metrology in Chemistry" (according to TrainMIC®) (Trabzon, Turkey), 2.5 days, 40-50 participants.
01 RM	S01-03	2011-03-01	Workshop "Certification of Reference Materials" in TÜBİTAK UME premises (Turkey), 2 days, 40-50 participants.
01 RM	S01-08	2011-03-03	Lectures on "Certification of Reference Materials". İstanbul Üniversitesi & İstanbul Teknik Üniversitesi, Turkey, 1 location, 40-50 participants.
02 PMM	S02-01	2011-03-15	Workshop "Principles and application of isotopic methodology and metrology in chemistry to inorganic reference measurements" in TÜBİTAK UME (Turkey), 2.5 days, 40-50 participants.
01 RM	S01-16	2011-04-07	Lectures on "Use and certification of reference materials". Bursa Uludağ University on 7th and 2 seminars in İzmir Teknoloji Institute on 8th, 40-50 participants.
04 QMET	S04-14	2011-04-04	Workshop on "Safety of food & feed – requirements of an analytical laboratory", Adiyaman (Turkey), 2 days, 40-50 participants.
04 QMET	S04-13	2011-05-24	Workshop on "Metrology in Nanotechnology" (Gazi University) (Turkey), 1 day, 40-50 participants.
02 PMM	S02-05	2011-06-21	Lectures in the field of Inorganic chemical/isotopic reference measurements (Turkey), METU & Hacettepe universities, Ankara and YTE university, İzmir, 40-50 participants.
04 QMET	S04-12	2011-06-29	Conference session on the subject of education in metrology in chemistry and ionising radiation at the 25th National Chemistry Congress (Erzurum, Turkey), 0.5 days, >50 participants.
01 RM	S01-04	2011-09-05	Workshop on the use of certified reference materials (Gebze, Turkey), 2 days, 40-50 participants.
01 RM	S01-05	2011-10-04	Workshop "Preparation of reference materials" (Gebze, Turkey), 2 days, 40-50 participants.
01 RM	S01-09	2011-10-06	Lectures on "Use and certification of reference materials". Ondokuz Mayıs University, Samsun (Turkey), 40-50 participants.
04 QMET	S04-02	2011-10-19	Workshop "Integrated Quality Systems: an interpretation for universities" (Uludağ University, Bursa, Turkey), 3 days, 40-50 participants.
03 IRM	S03-19	2011-11-17	Conference session on Therapy level dosimetry at the National Medical Physics Congress (Izmir, Turkey), 0.5 day, >50 participants.
01 RM	S01-06 & S01-12	2012-01-31	Workshop "Certification of reference materials" (TAEK-SANAEM, Ankara, Turkey), 2 days, 40-50 participants.
01 RM	S01-17	2012-02-21	Lectures on analytical methods for the production of reference materials in organic matrices, Çukurova University (Adana, 21 February) and Mersin University (Mersin, 22 February), Turkey, 40-50 participants.
03 IRM	S03-03	2012-03-12	Workshop (with practicals) in Advanced Gamma-ray spectrometry (TAEK-SANAEM, Ankara, Turkey), 5 days. Participation restricted to ~20 practitioners from universities and research institutes.
04 QMET	S04-16	2012-03-20	Workshop on "Auditing of integrated management systems", Dokuz Eylül Üniversitesi, 1 (Turkey), 3 days. Participation restricted to 25 practitioners from TURKAK and other accredited and/or certified organisations (ot those striving for accreditation and/or certification).
02 PMM	S02-02	2012-03-28	Workshop on Isotopic methodology and metrology in chemistry to inorganic reference measurements, Erciyes University (Kayseri), Turkey, 2.5 days. Participation restricted to practitioners from research labs, control labs, industrial labs and university labs.
02 PMM	S02-06	2012-05-22	Lectures on Inorganic chemical/isotopic reference measurements, Trakya University (Edirne) on 22nd May and İstanbul University (İstanbul) on 23rd May, Turkey, 40-50 participants.
04 QMET	S04-15	2012-06-05	Workshop on "Setting up your QM system - who to train, on what, when and how?", Akdeniz University, Antalya (Turkey), 3 days. Participation is restricted to those involved in QM in research labs, control labs, industrial labs and university labs.
05 GENERAL	S05-15	11-13 June, 2012	Concluding conference (İstanbul, Turkey), 3 days, ~300 participants. VIP day 11th June, 2012. See http://irmm.jrc.ec.europa.eu/activities/Turkey/Pages/ece_emit_concluding_event.aspx
04 QMET	S04-11	2012-07-03	Workshop with practicals "Statistics; Uncertainty Budget Determination for radionuclide metrology applications" (Ege University, İzmir, Turkey), 3 days. Participation restricted to practitioners from the Nuclear Institute and other rad chem labs.
02 PMM	S02-03	2012-09-06	Conference session on primary methods of measurement at the 6th Analytical chemistry congress (Mustafa Kemal University, Hatay, Turkey), 0.5 day - morning, >50 participants.
04 QMET	S04-10	2012-09-10	Workshop with practicals on proficiency testing and statistical evaluation, TÜBİTAK BUTAL, Bursa, Turkey, 2 days. Participation restricted to 40 scientists who will, or have already, take(n) part in a PT, are a PT provider or would like to be.

Abbreviations: RM = Reference Materials; PMM = Primary Methods of Measurement; IRM = Ionising Radiation Metrology; QMET = Quality, Metrology education and Training.

4 Strategic plans

Strategic plans are important for ensuring the sustainability of the project. An outline of TÜBİTAK UME , TAEK-ÇNAEM and TAEK-SANAEM's new capacities, their projected calendar of activities for the next 2-3 years and the level of financing which they are able to invest, are included. Both strategic plans include details on the following aspects:

- Human resource planning – how will the staff trained by the project be used? What are the plans for further training and improvement of qualifications? How will the staff trained by the EMIT project be used as trainers for the rest of the team in their respective organisations and in the immediate network of cooperating institutions?
- Infrastructure expansion plans – considerations as to whether what exists will suffice and for how long?
- Performance criteria i.e. a description of the demand for the services provided (current and predicted)?
- Supporting networks – how the created networks with the stakeholders will be sustained (e.g. by annual events, networking efforts such as newsletters, website, participation in conferences etc.)
- Targets – levels of financing needed to sustain the project outcomes?

4.1 TÜBİTAK UME

TÜBİTAK UME's strategic plan, as delivered to the consultant on the 31.10.2012, comprises information on their plans and includes details under each of the following topics:

1. Vision
2. Mission
3. Institutional structure, responsibilities and activities
4. TÜBİTAK UME chemistry laboratories (before restructuring)
5. TÜBİTAK UME's place in the world of metrology
6. Production of reference materials
7. Potential users of CRMs
8. Competence of TÜBİTAK UME chemistry laboratories
9. Infrastructure for the reference material production
10. Human resources
11. The performance criteria for the RM production projects
12. Networks to be used
13. Financing of the projects for the production of CRMs
14. Future expansion plans for both infrastructure as well as the staff
15. On-going reference material projects at TÜBİTAK UME
 - CRM project hazel nut CRM production plan for elemental content
 - CRM project dried fig CRM production plan for aflatoxin content
 - CRM project apricot CRM production plan for SO₂ content

For each CRM planned, there is a description of the project purpose, a work plan, a list of the processing equipment needed, the criteria for the success of the project and the associated risks. The complete strategic plan is available to the Steering Committee members via the secure file sharing platform.

4.2 TAEK

TAEK's strategic plan, as delivered to the consultant on the 31.10.2012, comprises information on their plans and includes details under each of the following topics:

1. Executive summary
2. Short history
 - a. Headquarters
 - b. Çekmece Nuclear Research and Training Center (ÇNAEM)
 - c. Sarayköy Nuclear Research and Training Center (SANAEM)
 - d. Radiation metrology activities in TAEK
3. Mission
4. Vision
5. Objectives
 - a. to validate and apply secondary standardisation methods in the field of radionuclide metrology
 - b. to validate and apply secondary standardisation methods in the field of dosimetric metrology
 - c. to submit data for the calibration and measurement capabilities (CMC) database of BIPM in the frame of radionuclide and dosimetry measurements to demonstrate equivalence of TAEK results to other NMI's
 - d. to organise proficiency tests for the interested laboratories in Turkey
 - e. to validate and apply primary standardisation methods in the field of radionuclide metrology
 - f. to validate and apply primary standardisation methods in the field of dosimetric metrology
 - g. to set up and make functional a secondary standardisation dosimetry laboratory in SANAEM
 - h. to be accredited according to ISO Guide 34
6. Physical infrastructure and human resources
7. Dissemination of expertise
8. Performance criteria by the end of 2013
 - a. Number of submitted CMC's (5)
 - b. Number of standardised radionuclides (5)
 - c. Number of trainings/workshops given (1)
 - d. Number of standardisation methods in use (4)
9. Periodic planning

TAEK's complete strategic plan is available to the Steering Committee members via the secure file sharing platform.

5 Conclusions and recommendations

5.1 Key assumptions

The following key assumptions, as laid out in the initial project plan, are:

- 1) Increased demand for metrological services in the field of chemical metrology and ionising radiation due to the implementation of EU regulations and directives
- 2) Dedication to the objectives of competent ministries and stakeholders indirectly involved in the project
- 3) The project is supported by a separate follow-up project by which CRMs for country specific materials are produced
- 4) Appropriate international comparisons will be timely organised
- 5) EURAMET will timely process TÜBİTAK UME's CMC entries submitted for inclusion into the CIPM MRA database
- 6) TURKAK will timely process TÜBİTAK UME's application for accreditation
- 7) Supply of equipment project is accepted and implemented
- 8) EURAMET will timely process TAEK institutes' CMC entries submitted for inclusion into the CIPM MRA database
- 9) TURKAK will timely process TAEK institutes' application for accreditation
- 10) Available and interested Turkish laboratories' experts
- 11) Enough interested Turkish universities for the metrology education aspects.
- 12) Key partnerships between existing institutions, laboratories and non-governmental organisations will be established
- 13) Awareness events will be well attended
- 14) Project teams of this and other EU financed projects in the fields of free movement of goods, food safety and environmental, health and consumer protection (if any) will cooperate and coordinate activities

At the time of the design of the project, it was considered that the failure of any of these would affect (to some degree) the successful and timely implementation of the planned activities.

Now at the end of the project, we can say that certain assumptions held true i.e. 1, 2, 4, 5, 8 – 14.

With respect to "6) TURKAK will timely process TÜBİTAK UME's application for accreditation", it has to be noted that this depends on which type of accreditation. Assessing TÜBİTAK UME for (expanded scope) compliance according to the EN ISO/IEC 17025 did not pose a problem for TURKAK as they have the necessary assessors. However towards the end of the project TURKAK were not yet ready to assess compliance according to the ISO Guide 34 (due to a lack of expert assessors for this standard). Assumption "7) Supply of equipment project is accepted and implemented" did not fully hold true as delays in the "Supply of chemical metrology equipment to TÜBİTAK UME" IPA (TR2009/0301.02) were experienced, delaying the full scale start-up of reference material processing at TÜBİTAK UME.

5.2 Lessons learned

- Lessons learned from the design phase:
 - The type of contract for hosting trainees needs to be assured for the entire duration of the project.
 - The means of inviting external experts (letter of invitation) needs to be assured for the entire duration of the project.
- Lessons learned from the implementation phase:
 - Limiting the number of places on training courses allowed for a better learning environment and more engagement by the participants.
 - Getting the LTTs who had already finished their traineeship at JRC-IRMM (or PTB) to assist in giving workshops or giving seminar lectures provided the opportunity for them to teach what they had learned, adding a level of consolidation to what they had learned. See section 2.2 for a summary of what each LTT learned during their traineeship.
 - Providing the opportunity to LTTs to present , both orally and in poster form, the outcome of their training at the EMIT Concluding Conference allowed them all to meet each other, create wider networks and learn what their colleagues are doing in the three institutes.
 - The good design of this project was intrinsic to its success.
 - Funding for stakeholders to attend Project Advisory meetings should be included in the budget.
 - Time is needed (about 6 months) to create awareness and confidence
 - The fact that training for Turkish auditors, from TURKAK, was included in the EMIT project design was a very good aspect. It allowed their technical assessors to carry out exercises during many workshops with analytical chemistry practitioners from national research centres, national control laboratories, university laboratories, industrial laboratories. This provided good opportunities for discussions on the measurement issues the laboratories face and for improving their understanding of each other's needs.
 - The fact that only 1% of our participants came from industry means that the appropriate bodies in Turkey need to convince industry that investing in training of their staff is a good idea and will give a “return” on their investment later.
 - Good trainers and good training material isn't enough. The trainees also need to be trained in the “art of training” and “entrepreneurial” skills and the beneficiary institutes will need to take this cost into account after the project ends.
 - The fact that JRC could use its own experts (or externals experts very well known to the JRC) was a big advantage in ensuring the success of this project.
 - The importance of gathering information on the applicant's existing expertise (before attending a course).

5.3 Summary of result oriented monitoring – evaluation exercise

The "Result Oriented Monitoring" (ROM) evaluation was carried out on four occasions, by an independent consultant company (Integration GmbH) on behalf of the Turkish Ministry for European Affairs.

The monitors, usually accompanied by sector experts from the Turkish Ministry for European Affairs, had the following approach:

- scoring on the accomplishment (or progress in early stages of the project) of the stated objectives and corresponding activities, relying on the "logical framework" and the "objectively verifiable indicators" contained therein
- interviewing concerned parties at a few levels in the beneficiary institutes
 - the directors, the sector heads and the long term trainees who had returned to their home institute were interviewed every time
- sector experts from the Turkish Ministry for European Affairs (who request the ROM)
- the project leader
- the sector expert in the EU Delegation, Ankara
- the contents of the interim reports
- the (future) sustainability of the project

The monitors not only judge the project's progress on facts such as numbers of training workshops carried out or numbers of attendees but also on the level of appreciation as expressed in evaluation forms by the training course attendees. They also rely on the verbally expressed appreciation of the people interviewed. The consultant mostly used very experienced people for this.

All in all the appreciation of the entire project was very high. The "Result Oriented Monitoring" (ROM) evaluations resulted in the EMIT project being the highest scoring project of 46 on-going Instruments of pre-accession assistance (IPA) in Turkey in 2011. See Table 7.

Table 7: Scores and sub-scores of the Result Oriented Monitoring evaluations

ASPECTS EVALUATED	ROM 1 30.06.2011	ROM 2 29.12.2011	ROM 3 11.07.2012	ROM 4 14.12.2012
1. RELEVANCE AND QUALITY OF DESIGN	A	A	B	A
1.1 What is the present level of relevance of the project?	a	a	a	a
1.2 As presently designed, is the intervention logic holding true?	a	a	b	a
1.3 Is the current design sufficiently supported by all stakeholders?	b	b	b	a
1.4 Is the current design sufficiently taking cross-cutting issues into account?	a	a	a	a
2. EFFICIENCY OF IMPLEMENTATION TO DATE	B	B	B	A
2.1 How well is the availability / usage of means / inputs managed?	b	b	b	b
2.2 How well is the implementation of activities managed?	a	b	b	b
2.3 How well are outputs achieved?	b	b	b	a
2.4 How well is the partner contribution / involvement working?	b	b	b	a
3. EFFECTIVENESS TO DATE	B	B	B	B
3.1 How well is the project achieving its planned results?	b	b	b	b
3.2 As presently implemented what is the likelihood of the Project Purpose (PP) to be achieved?	a	b	b	b

ASPECTS EVALUATED	ROM 1 30.06.2011	ROM 2 29.12.2011	ROM 3 11.07.2012	ROM 4 14.12.2012
4. IMPACT PROSPECTS	A	B	B	B
4.1 What are the direct impact prospects of the project at Overall Objectives level	a	b	b	b
4.2 To what extent does / will the project have any indirect positive and / or negative impacts?	a	b	a	a
5. POTENTIAL SUSTAINABILITY	A	A	A	A
5.1 Financial / economic viability?	a	a	a	a
5.2 What is the level of ownership of the project by target groups and will it continue after the end of external support?	b	a	a	a
5.3 What is the level of policy support provided and the degree of interaction between project and policy level?	a	b	b	a
5.4 How well is the project contributing to institutional and management capacity?	a	a	a	a

ROM Scoring⁶ :

- A (4) = Very good.
 - The situation is considered highly satisfactory, largely above average and potentially a reference for good practice. Recommendations focus on the need to adopt these good practices in other operations.
- B (3) = Good.
 - The situation is considered satisfactory, but there is room for improvements. Recommendations are useful, but not vital for the operation.
- C (2) = Problems.
 - There are issues which need to be addressed; otherwise the global performance of the operation may be negatively affected. Necessary improvements however do not require major revisions of the operations' strategy.
- D (1) = Serious deficiencies.
 - There are deficiencies which are so serious that, if not addressed, they can lead to failure of the operation. Major adjustments and revision of the strategy are necessary

5.4 Budget – Forecast versus actual

Due to the quality of the design of this project a very good estimation of what it would cost to achieve all of the objectives was made. The fact that the vast majority of the trainers used were JRC's own staff meant that we didn't have to pay expert's fees very often, thus allowing maximum value for money, on the part of the contractor (and to the benefit of the stakeholders).

⁶ ROM handbook 2012 (http://ec.europa.eu/europeaid/how/ensure-aid-effectiveness/documents/rom_handbook2011_en.pdf)

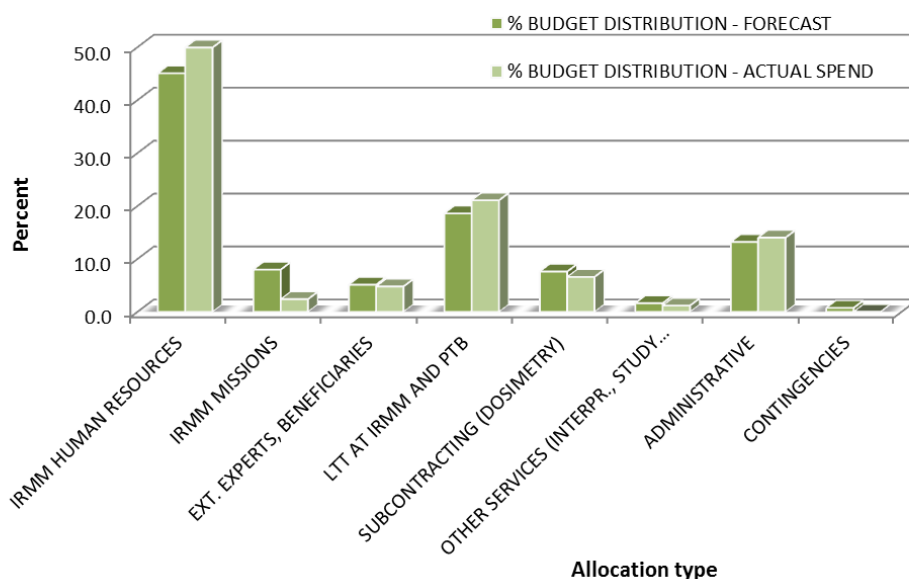


Figure 51: Comparison of forecasted versus actual expenditure on the IPA project "Improving Chemical and Ionising Radiation Metrology in Turkey".

5.5 Financial audits

As foreseen in Administrative Arrangement N° 31331, there were two financial audits carried out during the project, the first after 18 months and the second at the end.

The Internal Audit Unit of the Joint Research Centre of the European Commission were the body entitled to deliver financial audit certificates in respect to participation of the JRC within the context of the European Union's Instrument for pre-accession assistance (IPA).

The following is an excerpt from the final financial report (dated 30.11.2012):

The amount you declared in the Financial Statement per Activity, complies with the following cumulative conditions:

- ✓ *they are actual and answer to your economic environment, with the understanding that, the for last periods, personnel expenses;*
 - *are based on averages per Institute and per grade;*
 - *are calculated at the beginning of the year on the basis of the previous year's actual personnel costs increased with the estimated index;*
- ✓ *they are determined in accordance with your usual accounting principles;*
- ✓ *they have been incurred during the periods covered by the Financial Statement per Activity concerned by this audit certificate;*
- ✓ *they are recorded in your accounts on the date of the establishment of this audit certificate;*
- ✓ *they are exclusive of any non-eligible costs, which are:*
 - *any identifiable indirect taxes, including VAT or duties;*
 - *interest owed;*
 - *provisions for possible future losses or charges;*
 - *exchange losses;*
 - *costs declared, incurred or reimbursed in respect of another Community project;*

- return on capital;
- debt and debt service charges;
- excessive or reckless expenditure;
- ✓ Accounting procedures used in recording of your eligible costs and receipts respect the accounting rules of the European Union, as well as permit the direct reconciliation between the costs and receipts incurred for the implementation of the project covered by the above-mentioned European Commission contract, and the overall statement of accounts relating to your overall business activity.

Summary of section 5:

Based on the feedback from

- the individual scientists who attended our short term training events
- the beneficiary institutes' appreciation as expressed to the ROM monitors
- the ROM results when compared to the other IPAs going on in Turkey at the same time
- the JRC Internal Audit

it is perhaps safe to conclude that this project was a success from design to implementation and its sustainability looks very promising.

Acknowledgements

This project was an occasion when every scientific unit, one service unit and the Director's Office at the JRC-IRMM worked together, as equal partners, to achieve this success, namely:

- D.3 Knowledge Transfer & Standards for Security (KNOTSS)
- D.2 Standards for Innovation and sustainable Development (SID)
- D.4 Standards for Nuclear Safety, Security and Safeguards (SN3S)
- Director's Office – Institute Director was the EMIT Project Director and the institute Quality Manager acted as a trainer.
- B.8 Resource Management Unit Geel

We also had support from Standards for Food Bioscience (SFB) unit on two occasions, from JRC-IHCP for one workshop and crucial support from JRC.B when two issues were in danger of derailing the project.

- type of contract for hosting trainees
- means of inviting external experts

Thanks to all involved, both of these issues were solved as soon as possible allowing the project to continue and finish successfully.

The help and support received from the EU Delegation in Ankara and from the three main beneficiary institutes (TÜBİTAK UME, TAEK-SANAEM and TAEK-ÇNAEM) also contributed to the success of the project. Special appreciation also needs to be given to our hosts for the short term events, nearly all of whom provided their facilities free of charge. TÜBİTAK UME hosted STT events on 12 occasions, TAEK on ten occasions, universities (20 different ones) on 36 occasions and PTB on four occasions. Other hosts included EU conference centres, IAEA facilities, EU NMIs (other than PTB) on 20 occasions.

Annex 1: Logical Framework

LOGFRAME PLANNING MATRIX For The Project File		Programme name and number	Improving chemical and ionising radiation metrology	Status at the end of the Final phase (30.09.2012).
		Contracting period expires : FA + 2 years	Disbursement period expires: <i>3 years following the end date for contracting</i>	All 20 objectives have been completed.
		Total Budget: EUR € 3,930,000	IPA Budget: € 3,930,000	
Overall objective	Overall Indicators (OIs)	Sources of verifications		
The overall objective is to contribute to the better functioning of the EU-Turkey Customs Union Agreement regarding the free movement of goods as well as to facilitate the implementation of <i>acquis communautaire</i> in quality of life related areas such as environmental, health and consumer protection and food safety	<ul style="list-style-type: none"> - Improved implementation of harmonised legislation in the field of free movement of goods, food safety and environmental, health and consumer protection - The number of measurements linked problems related to export of products to EU countries decreased to one third of that encountered now - The number of measurements related problems reported for the domestic market decreased by one half 	<ul style="list-style-type: none"> - European Commission Country Progress Reports - Publications of Rapid Alert System for Food and Feed - Foreign Trade Secretariat Reports - Reports by both Governmental and Non-Governmental Organizations 		<ul style="list-style-type: none"> - The relevant reports (country progress, foreign trade) are not yet available (at the time of publishing this report).

Project Purpose	Overall Indicators (OIs)	Sources of verifications	Assumptions	
<p>To enhance institutional and measurement capacity in chemical and ionising radiation metrology to ensure that Turkish laboratories are able to produce traceable and comparable measurement results</p>	<ul style="list-style-type: none"> - TÜBİTAK UME and TAEK metrological capabilities support the implementation of the <i>acquis</i>, are improved and internationally recognised - Turkish laboratories in chemical measurements and ionising radiation fields and end users of CRMs better cope with measurement issues - Improved opportunities for academic education in chemical and ionising radiation metrology - Chemical metrology topics included in the curriculum program or in the analytical chemistry courses of at least 2 universities included - Available trainers for training people in chemical metrology - The number of laboratories accredited for the chemical analysis in the field of environmental, food safety and life quality doubled - Increased metrological activities and number of PT providers as well as number of test materials 	<ul style="list-style-type: none"> - CIPM MRA CMC database - EURAMET records - TURKAK records - Individual PT providers reports - Universities information and lecture notes 	<ul style="list-style-type: none"> - Increased demand for metrological services in the field of chemical metrology and ionising radiation due to the implementation of EU regulations and directives - Dedication to the objectives of competent ministries and stakeholders indirectly involved in the project; - The project is supported by a separate follow-up project by which CRMs for country specific materials are produced 	<ul style="list-style-type: none"> - The five newly submitted (2012) CMCs by TÜBİTAK UME and the four CMCs in preparation (1 submitted) for submittal by TAEK prove that these three institutes have gained new internationally recognised metrological capacities as a result of this project. - Regarding Turkish laboratories in chemical measurements ionising radiation fields being better able to cope with measurement issues: see annexed strategic plans for assurance of improved measurement capability in both TÜBİTAK UME and TAEK (SANAEM and ÇNAEM). - Chemical and ionising radiation metrology are included in the curriculum of more than two universities in Turkey (presented by Prof. Demir at the EMIT S04-12 session in the national conference "25th National Chemistry Congress", Erzurum (June 2011). - 18 scientists from TÜBİTAK UME and TAEK have gained new skills and already practiced disseminating their new knowledge throughout Turkey (along with IRMM experts). All in all about 750 individual Turkish scientists received targeted training and can use this to train

				<p>their colleagues.</p> <ul style="list-style-type: none"> - As a result of a parallel IPA (Strengthening the Quality Infrastructure in Turkey) 20 new PT providers have been created.
Deliverables	Specific Indicators (SIs)	Sources of verifications	Assumptions	Status of deliverable
<p>Component 1: Institutional capacity building for TÜBİTAK UME:</p> <p>1.1 New metrological capabilities/services in the field of chemical metrology developed and supported by documented and implemented strategies.</p> <p>1.2 TÜBİTAK UME quality system integrated with a management system developed according to ISO Guides 30-35</p> <p>1.3 TÜBİTAK UME chemistry laboratories prepared for accreditation as producer and supplier of CRMs to the PT providers</p> <p>1.4 New calibration and measurement capabilities to support the implementation of the acquis are ready for submission to the CIPM MRA CMC database</p>	<ul style="list-style-type: none"> - Validation of 5 new measurement methods developed in TÜBİTAK UME chemistry laboratories - Increased number of TÜBİTAK UME services and CMCs - New or revised quality management procedures - Submitted to EURAMET minimum 5 CMC entries for inclusion into the CIPM MRA CMC database - At least two candidate CRMs from the identified production scope released by UME - Submitted application for TÜBİTAK UME's accreditation according to ISO Guides 30-35 	<ul style="list-style-type: none"> - TÜBİTAK UME strategy, quality management system, list of services and reports - TURKAK database - EURAMET information and the CIPM MRA CMC database 	<ul style="list-style-type: none"> - Appropriate international comparisons will be timely organized - EURAMET will timely process TÜBİTAK UME's CMC entries submitted for inclusion into the CIPM MRA database - TURKAK will timely process TÜBİTAK UME's application for accreditation - Supply of equipment project is accepted and implemented 	<p>1.1 Final strategic plan was submitted (to JRC-IRMM and EUD) on the 31st Oct., 2012). The project plans for the Elemental content in Hazelnuts, the Aflatoxin content in Dried Fig and the SO₂ content in Apricots have been elucidated (feasibility study of one carried out using pilot equipment at MAM).</p> <p>1.2 About 75% of the TÜBİTAK UME Quality Manual has been prepared. TÜBİTAK UME are planning to carry out internal audits according to the ISO Guide 34 before they have a fully operational RM processing section. TURKAK plan to become ready to audit according to the ISO Guide 34 during the same period (2013) that TÜBİTAK UME are getting started with RM processing.</p> <p>1.3 Lots 4 and 5 of the Equipment (from the Supply IPA) are expected to be operational in Spring 2013 (as the orders were signed in Dec. 2012) Construction of the clean room to begin in June 2013 after the finalisation of the re submitted tendering procedure (April 2013).</p>

				<p>JRC-IRMM's duty with respect to providing advice on the technical specifications of the equipment was finalised in 2011.</p> <p>1.4 Due (or partially due) to LTTs new knowledge, four new methods are at various stages of development, namely a) the determination of Pb, Co and Cr in inorganic calibration solutions by isotope dilution measurements (for Pb) and direct calibration using gravimetric dilution (for Co and Cr) and isotope ratio measurements for Pb, b) the determination of isotopic composition of Pb in bronze – for use in an interlaboratory comparison using isotopic ratio measurements, c) the determination of Pb in wine (isotope dilution measurements) and d) the determination of Cu in ethanol (direct calibration and isotope dilution measurements). One CMC is being prepared (Co in calibration solution, based on method a).</p> <p>Apart from that, the knowledge gained by the LTTs is being put to use in developing new methods and the know-how of working in an ultra clean chemical laboratory is also being put to good use.</p>
Deliverables	Specific Indicators (SIs)	Sources of verifications	Assumptions	Status of deliverable
Component 2: Institutional capacity building for TAEK:	– Validation of minimum two new radioactivity	- TAEK institutes' strategies, quality management	- Appropriate international comparisons will be timely	TAEK (SANAEM & ÇNAEM): 2.1 Final strategic plan was

<p>2.1 New metrological capabilities/services in the field of ionising radiation metrology developed and supported by documented and implemented plans and programmes</p> <p>2.2 Secondary level standardisation procedures developed or improved</p> <p>2.3 TAEK institutes quality management systems extended and cover the new metrological services</p> <p>2.4 New calibration and measurement capabilities to support the implementation of the <i>acquis</i> are ready to submission to the CIPM MRA CMC database</p> <p>2.5 Preparation on the development of primary standardisation available and foreseen in TAEK institutes' strategies.</p>	<p>measurement methods at TAEK radioactivity measurement laboratories.</p> <ul style="list-style-type: none"> – Validation of minimum two dosimetric measurement methods at TAEK SANAEM dosimetry laboratories – Developed/Increased number of TAEK radioactivity measurement services – Improving two radioactivity measurement methods to secondary standard level. – Improving two dosimetric measurement methods to secondary standard level – Submitted applications for the extension of accreditation of TAEK laboratories according to ISO 17025 – Submitted to EURAMET minimum 4 CMC entries for inclusion into the CIPM MRA CMC database 	<p>systems, lists of services and reports</p> <ul style="list-style-type: none"> - TURKAK database - EURAMET information and the CIPM MRA CMC database 	<p>organized</p> <ul style="list-style-type: none"> - EURAMET will timely process TAEK institutes' CMC entries submitted for inclusion into the CIPM MRA database - TURKAK will timely process TAEK institutes' application for accreditation 	<p>submitted (to JRC-IRMM and EUD) on the 31st Oct., 2012).</p> <p>2.2 TURKAK Surveillance assessment on "Tritium analysis in drinking water with LSC", "¹³⁴Cs and ¹³⁷Cs analysis of foodstuff" and "Radioactivity analysis of ²²⁶Ra, ²³²Th, ⁴⁰K and ¹³⁷Cs in soil and construction materials" was performed on successfully 2 July 2012. TURKAK extension assessment on "Gross alpha and beta analysis in drinking water in accordance with Epa 900.0" and "²³⁴U and ²³⁸U determination by alpha spectrometry in drinking water (self-developed method" was performed on 2 July 2012. TURKAK surveillance assessment on "Air kerma calibration at ⁶⁰Co beam for Therapy level dosimeters" and "Calibration of absorbed dose to water at ⁶⁰Co beam for Therapy level dosimeters" was performed on 26 Nov 2012.</p> <p>2.3 QM system in constant evolution with non-conformities being tackled and ever more methods becoming accredited</p> <p>2.4 New methods & new CMCs: ÇNAEM- ³H, ²²⁶Ra and ⁹⁰Sr measurements by CIEMAT NIST method for different matrix are planned to be started in 2014. "²²⁶Ra determination by alpha spectrometry in drinking water" measurements already started. Two</p>
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				<p>additional test methods for “Gross alpha and beta analysis in drinking water in accordance with EPA 900.0” and “^{234}U and ^{238}U determination by alpha spectrometry in drinking water (self-developed method) have been accredited by TURKAK. ^{210}Po analysis in different matrix such as sediment, biota, water and soil were started. ^{210}Pb determination by liquid scintillation spectrometry in sediment sample has started.</p> <p>SANAEM- Application of CIEMAT-NIST Method for determination of ^{90}Sr in bilberry as well as secondary standardisation studies with ionisation chamber have begun.</p> <p>ÇNAEM-CMC tables have been performed for “Air kerma calibration at ^{60}Co beam for Therapy level dosimeters” and “Calibration of absorbed dose to water at ^{60}Co beam for Therapy level dosimeters” and sent to the contact person of TAEK for EURAMET Technical Committee. Approval process takes about 1.5 years.</p> <p>SANAEM- The CMC applications for ^{40}K, ^{137}Cs and ^{90}Sr in foodstuffs will be done after the submission of the final report of the supporting comparison (CCRI(II)-S8 Radionuclide activity measurements (^{40}K, ^{137}Cs and ^{90}Sr in bilberry reference materials) to BIPM by the pilot laboratory.</p>
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Deliverables	Specific Indicators (SIs)	Sources of verifications	Assumptions	Status of deliverable
<p>Component 3: Knowledge transfer and human resources development</p> <p>3.1 TÜBİTAK UME and TAEK researchers familiar with functioning of metrology systems in EU member states with similar economic needs</p> <p>3.2 TÜBİTAK UME and TAEK researchers skilled and ready to carry out the new metrological services</p> <p>3.3 Turkish laboratories' experts knowledgeable how to consider metrological aspects in their activities</p> <p>3.4 Turkish universities familiar with the alignment of EU university programmes in measurement science with Bologna requirements</p> <p>3.5 Turkish universities interested in joining Euromaster Joint Degree Programme in measurement science conform to requirements</p>	<ul style="list-style-type: none"> - 9 study visits to at least 2 EU Member States and prepared mission reports and presentations for each visit - 51 short-term trainings and consultations for TÜBİTAK UME and TAEK and for each training, a training feedback or mission reports prepared - 6 experts from TÜBİTAK UME and TAEK annually on a long-term training at JRC-IRMM and for dosimetry field, at an EU NMI - 18 seminars/workshops for the end-users and published proceedings - 10 workshops for the universities and published proceedings - Invitations to at least 20 universities on consultation of their curriculum programmes 	<ul style="list-style-type: none"> - TÜBİTAK UME and TAEK reports and presentations - Reports from training providers - Workshop and seminar documents - TURKAK database - Universities' information database 	<ul style="list-style-type: none"> - Available and interested Turkish laboratories' experts - Interested Turkish universities 	<p>2.5 Plans for the development of primary standardisation in TAEK institutes' strategies is apparent and contained in the final Strategic Plan.</p> <p>3.1 LTTs (from UME and TAEK) hosting: 16 hosted at JRC-IRMM and 2 at PTB. Final reports by 18 LTTs completed. See section 3.3.2 for a full list of the scientific output of the LTTs (as on the 30.09.2012); comprising 12 peer-reviewed articles, 5 reports, 23 oral presentations and 25 posters. STTs: Short term events comprised of 4 conference sessions, 10 conference participations for TÜBİTAK UME and TAEK scientists, 20 study visits / 5 technical advice visits; 14 seminar lectures and 36 workshops.</p> <p>3.2 and 3.3 Judging by the number of newly accredited methods, newly submitted CMCs, peer reviewed publications and oral contributions at conferences, with JRC-IRMM and PTB staff, it is clear that TÜBİTAK UME and TAEK researchers have become more skilled and ready to carry out the new metrological services (as a result of the EMIT project).</p> <p>3.4 and 3.5 EMIT Objectives 14 and 17 specifically relate to our duty to</p>

				<p>help Turkish universities interested in joining a Euromaster Joint Degree Programme. We tackled this using a top down and bottom up approach. An explanation was made before every seminar and every workshop, held in universities, about the Euromaster programme, meetings were held with senior professors, two professors were sent to the ACE conf in Milan, 2012 (on this topic) and finally, using the bottom up approach, a total of six students were sent to the two Summer schools (2011 and 2012) with the aim of giving these students from four different universities (Ondokuz Mayıs, Middle East Technical, Uludağ and Bogaziçi Universities), the chance to experience what the Summer School entails and thus what the benefits of having either a National Joint Masters in Measurement Science (or joining a European Consortium) would / could be. This approach was equally effective as top down. ECTNA made a very positive remark at the most recent Euromaster Graduation Ceremony (Nov 2012) with respect to the effectiveness of both approaches being used in tandem.</p>
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Deliverables	Specific Indicators (SIs)	Sources of verifications	Assumptions	Status of deliverable
<p>Component 4: Networking and Raising Awareness</p> <p>4.1 European NMIs familiarised with the development of TÜBİTAK UME and TAEK's capabilities</p> <p>4.2 Network of contacts in the field of metrology established, strengthened and operational</p> <p>4.3 Network of contacts with universities established and strengthened</p> <p>4.4 Chemical and ionising radiation metrology topics discussed with national experts and stakeholders</p> <p>4.5 International metrology community informed about TÜBİTAK UME and TAEK capabilities</p>	<ul style="list-style-type: none"> - Information about the development of TÜBİTAK UME and TAEK's capabilities presented to EURAMET at TC meetings - 2 proposed joint research projects with partner organisations (other NMIs) in the field of chemical metrology - 8 coordination meetings with stakeholders in chemical and ionising radiations metrology - Number of partner universities - 4 national conferences in chemical and ionizing radiations metrology organised - At least 10 participations of Turkish experts in international conferences and events 	<ul style="list-style-type: none"> - EURAMET Technical Committees on Ionizing Radiations (TC-IR) and Metrology in Chemistry (TC-MC) - Minutes from the stakeholders' meetings - Minutes from meetings with universities - Conference materials - Symposiums and workshops 	<ul style="list-style-type: none"> - Key partnerships between existing institutions, laboratories and non-governmental organisations will be established - Awareness events will be well attended - Project teams of this and other EU financed projects in the fields of free movement of goods, food safety and environmental, health and consumer protection (if any) will cooperate and coordinate activities 	<p>4.1 Joint publications, oral presentations between JRC-IRMM (or PTB) and TÜBİTAK UME / TAEK staff have helped to show the development of TÜBİTAK UME and TAEK's new capabilities to the international metrological community.</p> <p>4.2 The five newly submitted (2012) CMCs by TÜBİTAK UME and the four CMCs in preparation (1 submitted) for submittal by TAEK prove that these three institutes have gained new capacities as a result of their tight bonds with JRC-IRMM and PTB – resulting in strengthened capacities.</p> <p>4.3 The 20 universities with which TÜBİTAK UME and TAEK have now strengthened contacts with as a result of EMIT workshops, seminars and conference sessions are: 1)METU, Ankara, 2) KTU, Trabzon, 3) IU, Istanbul,4) ITU, Istanbul, 5) Uludag, Bursa, 6) Ege, Izmir, 7) Adiyaman, 8) Gazi, Ankara, 9) Hacettepe, Istanbul, 10) YTE, Izmir, 11)Ataturk, Erzurum, 12) OMU, Samsun, 13) University Hospital, Izmir, 14) Çukurova, Adana, 15) Mersin, 16) DEU, Izmir, 17) Erciyes, Kayseri, 18) Trakya, Edirne, 19) Akdeniz, Antalya and 20) MKU, Hatay.</p>

				<p>4.4 Three conference sessions were held (QMET topics at S04-12, IR topics at S03-19 and PMM topics at S02-03). As an extra opportunity, 11 Turkish scientists (TÜBİTAK UME, TAEK and two university professors) were invited and attended the RM conference held in JRC-IRMM (Nov., 2010).</p> <p>4.5 There were ten participations (one week duration in nearly all cases) of Turkish experts in international conferences and events</p>
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Annex 2: EMIT Event List

Subject	Ref. in Gantt chart	Date	Precise topic	Event type (workshop with practicals/seminar lectures/visit....)	Duration (days)	Participant origin
03 Ionising Radiation Metrology	S03-01	2009-11-25	Primary standardisation techniques in RN metrology	Workshop in Turkey	1	TAEK & from universities
03 Ionising Radiation Metrology	S03-02	2009-11-25	Gamma-ray spectrometry	Workshop in Turkey	1	TAEK & from universities
03 Ionising Radiation Metrology	S03-06	2009-11-25	Liquid scintillation	Workshop in Turkey	1	TAEK & from universities
03 Ionising Radiation Metrology	S03-12	2009-11-25	Ion chambers + RN calibrators	Workshop in Turkey	1	TAEK & from universities
03 Ionising Radiation Metrology	S03-28a	2010-01-20	Conference participations for TAEK staff (max 3); a) Proficiency Testing Workshop , NPL, London, U.K.	Meant for Turkish scientists (3 x 1 person at each conf.)	1	TAEK
03 Ionising Radiation Metrology	S03-28b	2010-03-08	Conference participations for TAEK staff (max 3) b) IM2010 , Athens, Greece.	Meant for Turkish scientists (3 x 1 person at each conf.)	5	TAEK
04 Quality, metrology education and Training.	S04-01	01/04/2010 and 02/04/2010	Visit to establish contact with university co-ordinator of the "out-reach to universities" part of EMIT.	Visit	2	TUBITAK UME & university
01 Reference Materials	S01-01	2010-05-04	Use of certified reference materials	Workshop in Turkey (by L. Majoros,)	2	TÜBİTAK - 7; TAEK -9; National control labs - 8; universities -11, industry -4
01 Reference Materials	S01-07	2010-05-06	Use of certified reference materials	1 day training visit to Marmara university and Yeditepe university	2	Professors, lecturers and students: 59 at Marmara university and 22 at Yeditepe university
03 Ionising Radiation Metrology	S03-17	2010-05-10	Radiochemical lab practice (in IJS labs)	Short term training on practical lab techniques	10	TAEK & from universities (8 partic)
03 Ionising Radiation Metrology	S03-18	2010-05-20	Therapy level dosimetry	Workshop on IAEA dose protocols,	3	Medical physicists from radiotherapy centers
01 Reference Materials	S01-13	2010-06-09	Technical advise (Study Visit) of IRMM expert to TÜBİTAK UME for the investigation of their needs for the preparation and certification of CRMs (including info on technical requirements of CRM production equipment).	Training visit by IRMM expert TÜBİTAK UME by H. Emteborg	2	TÜBİTAK UME and TÜBİTAK MAM Experts
04 Quality, metrology education and Training.	S04-18a	2010-06-22	University outreach meeting -2/20 (Erzurum University)	Visit	3	TÜBİTAK UME & 51 Turkish universities represented (74 Turkish scientists personally addressed)
03 Ionising Radiation Metrology	S03-08	2010-09-13	Liquid scintillation	Study visit to IRMM (1 participant)	3	SANAEM
03 Ionising Radiation Metrology	S03-16	2010-09-13	Alpha-spectrometry + DSA counting	Study visit to IRMM (1 participant)	10	SANAEM
02 Primary Methods of Measurement	S02-07	2010-09-20	Advise on ToR for the clean rooms	Training visit by 2 IRMM (IM) experts to TÜBİTAK UME.	3	TÜBİTAK
01 Reference Materials	S01 - 21	2010-09-27	GC MS Course, Liverpool, U.K.	Workshop provided by external body (Amoeba Sciences) (1 trainee)	5	TÜBİTAK
01 Reference Materials	S01-02	2010-10-05	Processing of certified reference materials	Workshop in TÜBİTAK UME	2	Mostly TÜBİTAK participants expected (due to topic) but open places also available.
S05 GENERAL	S05-05	2010-10-05	PAC Seminar - EMIT Project status and FSQ talk.	PAC-03 Seminar in Yeditepe University, Istanbul. (2 IRMM experts)	1	Mostly PAC and university participants.
04 Quality, metrology education and Training.	S04-19	2010-10-06	Visit to Ataturk University, Erzurum (to prepare S04-12 Conference session).	Visit	1	Conference organising committee
S05 GENERAL	S05-06	2010-10-19	Steering Committee Meeting (2 from IRMM)	SC-04 in Ankara (TAEK-SANAEM premises).	1	Steering Committee members
04 Quality, metrology education and Training.	S04-03	2010-10-20	Roadmap for facilitating educational innovations in Metrology in Chemistry and Ionising Radiation	Workshop in Turkey (1 day)	1	2/3 places will be open for free registration (for any relevant institution or university in Turkey)
04 Quality, metrology education and Training.	S04-20	2010-10-21	IRMM participation in Turkish TrainMic (2 from IRMM)	Turkish TrainMic event	2	TUBITAK UME (71 participants - not counted in EMIT as this was organised by the National TrainMic team)
01 Reference Materials	S01-18	2010-11-23	"The Future of Reference Materials - Science & Innovation" IRMM Symposium participations for TUB & TAEK staff.	Seminars (F) or Workshop (E) (11 EMIT participants)	3	TÜBİTAK and TAEK scientists.

Subject	Ref. in Gantt chart	Date	Precise topic	Event type (workshop with practicals/seminar lectures/visit....)	Duration (days)	Participant origin
04 Quality, metrology education and Training.	S04-04_09	22/02/2011 - 24/02/2011	Sampling, Metrology in Chemistry, Internal QC, Applied Statistics, Method optimisation, Sel. & Use of RMs, Inter Lab comparisons....	Workshop in Karadeniz University, Trabzon, Turkey (2.5 days for 40 participants)	2.5	2/3 places will be open for free registration (for any relevant institution or university in Turkey).
01 Reference Materials	S01-03	2011-03-01	CERTIFICATION of reference materials (Trainers L. Majoros, R. Koeber, A. Lamberty).	Workshop in Turkey in TÜBİTAK UME premises	2	2/3 places will be open for free registration (for any relevant institution or university in Turkey)
01 Reference Materials	S01-08	2011-03-03	Lectures on "Certification of reference materials".	İstanbul Üniversitesi & İstanbul Teknik Üniversitesi, Turkey.	1	Open
02 Primary Methods of Measurement	S02-01	2011-03-15	PMM topics - Uncertainty, Method validation (IDMS perspective), Prim. Meth. Meas (e.g. ICP-ID-MS), Accreditation (flexible scope), Innovations in ICP-MS....	Workshop in TUBITAK UME, Gebze, Turkey	2.5	2/3 places will be open for free registration (for any relevant institution or university in Turkey)
01 Reference Materials	S01-16	2011-04-07	Lectures on "Use and certification of reference materials". (L. Majoros and E. Engin).	Seminars (F); Bursa Uludağ University on 7th and 2 seminars in İzmir Teknoloji Enstitüsü on 8th.	3	Universities & other end-users.
04 Quality, metrology education and Training.	S04-14	2011-04-04	Workshop on "Safety of food & feed – requirements of an analytical laboratory"	Workshop, Adiyaman University.	2	Universities & other end-users.
S05 GENERAL	S05-07	2011-04-06	PAC Seminar - Host speakers	PAC-04 Seminar in Adiyaman University, Adiyaman	1	Mostly PAC and university participants. 34 at seminar lectures and 17 at PAC meeting (restricted attendance).
04 Quality, metrology education and Training.	S04-13	2011-05-24	Workshop on "Metrology in Nanotechnology" (Gazi University)	Workshop	1.5	Universities & other end-users.
03 Ionising Radiation Metrology	S03-10	2011-06-06	Sample preparation and Instrument efficiency calibration in LSC	Workshop at SANAEM	3	ÇNAEM + SANAEM (restricted participation).
03 Ionising Radiation Metrology	S03-25	2011-06-07	Contamination survey meter calibration	Short term training at PTB (when LTT there) - 3 ÇNAEM staff	4	ÇNAEM
03 Ionising Radiation Metrology	S03-27	2011-06-17	QA/QC for therapy and diagnostic irradiation systems	Workshop /short term training	2	ÇNAEM, QA, QC responsables from hospitals
03 Ionising Radiation Metrology	S03-05	2011-06-20	Advanced Gamma-ray spectrometry, 1 - True/Chance coincidence correction methods	Short term training (at TAEK-SANAEM)	4	ÇNAEM + SANAEM (restricted participation to 15).
02 Primary Methods of Measurement	S02-05	2011-06-21	Lectures in the field of Inorganic chemical/isotopic reference measurements. C. Quétel, S. Can, B. Ari.	Seminar lectures, Ankara, Izmir, Turkey. 40-50 participants.	2.5	Universities & other end-users.
04 Quality, metrology education and Training.	S04-12	2011-06-29	Conference (0.5 d session at the 25th National Chemistry Congress, Erzurum, Turkey)	Experts from EU and Turkey will lecture at a special session of the 25th National Chemistry Congress, Erzurum.	3	Universities, other end-users & Turkish institutes
03 Ionising Radiation Metrology	S03-30	2011-07-07	Dosimetry	Study visit to PTB (1 participant)	1	ÇNAEM
04 Quality, metrology education and Training.	S04-21	2011-07-10	Euromaster in Measurement Science Summer school.	Summer school, Poznan, Poland.	10	Post-graduate students from a Turkish university.
01 Reference Materials	S01-23	2011-08-21	Dioxin 2011, Brussels, Belgium (1 person)	Study visit (in Belgium).	5	LTT from TÜBİTAK UME (B. Binici)
01 Reference Materials	S01-04	2011-09-05	USE of certified reference materials (Trainers LM, TL, GA)	Workshop in Turkey	2	TÜBİTAK UME and TÜBİTAK MAM Experts (20-30 people)
02 Primary Methods of Measurement	S02-04(a)	2011-09-08	Conference participations for TUB staff : CEST 11, Rhodes, Greece. (1 person).	Conference attendance	3	TÜBİTAK UME and TÜBİTAK MAM Experts
01 Reference Materials	S01-10	2011-09-20	Planning, Preparation and Certification of reference materials.	Workshop at IRMM (21 participants)	3	TÜBİTAK UME and TÜBİTAK MAM Experts.
01 Reference Materials	S01-05	2011-10-04	PREPARATION of reference materials (PHE, JCG, LM)	Workshop in Turkey	2	TÜBİTAK UME and TÜBİTAK MAM Experts (20-30 people)
01 Reference Materials	S01-09	2011-10-06	Lectures on "Use and certification of reference materials".	3 x 1 day training visits to different places in (Samsun) Turkey (by L. Majoros, IRMM expert) Seq. 3 of 3	1	TÜBİTAK UME and TÜBİTAK MAM Experts, Universities and End Users
04 Quality, metrology education and Training.	S04-02	2011-10-18	Integrated Quality Systems: an interpretation for universities	Workshop in Uludag University, Bursa.	3	UME, MAM, universities & TAEK
S05 GENERAL	S05-09	2011-10-20	PAC Seminar - Host speakers	PAC-05 Seminar in Uludag University, Bursa.	1	Mostly PAC and university participants.
S05 GENERAL	S05-10	2011-10-27	Steering Committee Meeting (2 from IRMM)	SC-06 in TAEK-ÇNAEM, Istanbul.	1	Steering Committee members
03 Ionising Radiation Metrology	S03-19	2011-11-17	Conference (session) - Therapy level dosimetry	2 NMI and 2 TAEK will lecture in National Medical Physics Congress in Izmir (17-19 Nov., 2011)	5	Medical physicists from radiotherapy centers (including staff/students from universities, other end-users & Turkish institutes)

Subject	Ref. in Gantt chart	Date	Precise topic	Event type	Duration (days)	Participant origin
01 Reference Materials	S01-06	2012-01-31	CERTIFICATION of reference materials	Workshop in Turkey (by L. Majoros, ...)	3.5	TÜBİTAK UME and TÜBİTAK MAM Experts, universities and other endusers (30-40 people)
01 Reference Materials	S01-12	2012-02-02	Assignment of the reference value for the CRM (statistical aspects)			TÜBİTAK UME and TÜBİTAK MAM Experts
01 Reference Materials	S01-17	2012-02-21	Lectures on dissemination of knowledge in the field of analytical methods for the production of reference materials in organic matrices	Seminar lectures, Çukurova University (Adana) and Mersin University (Mersin), Turkey, 40-50 participants.	2	Universities & other end-users.
03 Ionising Radiation Metrology	S03-20_23	2012-03-01	Protection level dosimetry	Lecture on portable survey meters at ÇNAEM	2	Industrial radiography workers, medical workers, TAEK staff.
03 Ionising Radiation Metrology	S03-03	2012-03-12	Workshop on Advanced Gamma-ray spectrometry	One workshop with practicals (TAEK-SANAEM labs)	5	Universities
04 Quality, metrology education and Training.	S04-16	2012-03-20	Workshop on "Auditing of integrated management systems",	Dokuz Eylül University, İzmir (Turkey), 3 days, 25 participants.	3	Practitioners from accredited/certified labs are the target audience.
S05 GENERAL	S05-11	2012-03-22	PAC Seminar - Host speakers	PAC-06 Seminar in Dokuz Eylül University, İzmir (Turkey).	1	Mostly PAC, control lab, industry and university participants.
02 Primary Methods of Measurement	S02-02	2012-03-28	Workshop on Isotopic methodology and metrology in chemistry to inorganic reference measurements	Erciyes University (Kayseri), Turkey, 2.5 days, 40-50 participants.	3	Practitioners from control labs, industrial labs and university labs (incl TÜBİTAK UME & TÜBİTAK MAM) are the target audience.
04 Quality, metrology education and Training.	S04-17(a,b)	2012-04-25	Conference participations for Turkish univ. profs (a&b=max 2); Prof. M. Demir and Prof. Dr. Timur Dogu. EC2E2N (ACE 2012), Milan.	Meant for Turkish univ. profs	4	Conf. participants.
03 Ionising Radiation Metrology	S03-26	2012-05-21	Postal Thermoluminescence dosimetry comparison applications, calibration	Study visit to IAEA Vienna (4 people)	2	ÇNAEM
02 Primary Methods of Measurement	S02-06	2012-05-22	Lectures in the field of Inorganic chemical/isotopic reference measurements	Seminar lectures, Trakya University (Edirne, 22 May) and Istanbul University (Istanbul, 23 May), Turkey, 40-50 participants.	2.5	Universities & other end-users.
03 Ionising Radiation Metrology	S03-24	2012-06-04	X ray energy qualities, KAP meter calibration, CT ion chamber calibration	Workshop /short term training at PTB (5 trainees)	5	ÇNAEM
04 Quality, metrology education and Training.	S04-15 & extra STT 01	2012-06-05	Workshop on "Setting up your QM system - who to train, on what, when and how?";	Akdeniz University, Antalya (Turkey). Participation is restricted to those involved in QM in research labs, control labs, industrial labs and university labs.	3	Universities & other end-users.
S05 GENERAL	S05-12	2012-06-08	Steering Committee Meeting (2 from IRMM)	SC-07 in TÜBİTAK UME, Gebze (Turkey).	1	Steering Committee members
S05 GENERAL	S05-15	2012-06-11	CONCLUDING CONFERENCE	One conference in Turkey (3 days)	3	Participants - 300
03 Ionising Radiation Metrology	S03-11	2012-06-18	Liquid scintillation, 2 - Double energetic window method for Sr-90, Pb-210 analysis with LSC	Short term training (in IRMM)	10	ÇNAEM + SANAEM
01 Reference Materials	S01 - 22	2012-06-18	LC-MS Course, Amoeba Sciences (Berlin, Germany).	Workshop provided by external body (1 trainee)	5	TÜBİTAK
03 Ionising Radiation Metrology	S03-09	2012-06-25	Liquid scintillation	Study visit to SCK & IRMM (2 people)	5	SANAEM
02 Primary Methods of Measurement	S02-04(b)	2012-06-25	Conference participations for TUB staff : BERM 13, Vienna, 2012 (4 people)	Conference attendance	5	TÜBİTAK UME and TÜBİTAK MAM Experts
01 Reference Materials	S01-15(b,c)					
03 Ionising Radiation Metrology	S03-28 bc	2012-06-25	Conference participations for TAEK staff (BERM 13, Vienna, 2012, 2 people)	Conference attendance	5	TAEK
04 Quality, metrology education and Training.	S04-11	2012-07-03	Statistics; Uncertainty Determination and Budget for radionuclide metrology applications (+ expert Benedik...)	One workshop in Turkey with practicals	3	Universities & TAEK
04 Quality, metrology education and Training.	S04-22	2012-07-12	Euromaster in Measurement Science Summer school	3 x Study visit - Summer school, Fatima, Portugal.	10	Post-graduate students from a Turkish university.
03 Ionising Radiation Metrology	S03-09bis extra STT 03	end August	Laboratory services and QM systems at Rad Meas labs of SCK-CEN	Study visit to SCK (2 people from TAEK-ÇNAEM)	2	ÇNAEM
02 Primary Methods of Measurement	S02-03	06 or 07/09/2012	Conference (0.5 d session at 6th National Congress of Analytical Chemistry, Turkey).	Experts from EU (NMI and/or IRMM) and UME will lecture in 6th National Congress of Analytical Chemistry, Mustafa Kemal University, Hatay, Turkey	5	Universities, other end-user labs & Turkish institutes
02 Primary Methods of Measurement	S02-03 extra STT 02	2012-09-03	Study visit at 6th National Congress of Analytical Chemistry, Turkey	Scientists (4-5) to attend the 6th National Congress of Analytical Chemistry, Mustafa Kemal University, Hatay, Turkey (as an extra STT in lieu of 1 LTT)	5	Universities, other end-user labs & Turkish institutes
S05 GENERAL	S05-13	2012-09-07	PAC Seminar - Host speakers	PAC-07 Seminar in Mustafa Kemal University, Hatay, Turkey (from IRMM & UME)	1	Mostly PAC and university participants.
03 Ionising Radiation Metrology	S03-13	2012-09-10	Ion chambers + RN calibrators	One expert visit from IRMM (discussion of achievements and future planning, SANAEM and ÇNAEM)	3	TAEK
03 Ionising Radiation Metrology	S03-14	2012-07-01	Ion chambers + RN calibrators	Actual calibration of TAEK SANAEM's ionisation chamber at PTB - specific contract with PTB for that (U.R.)	NA	SANAEM
03 Ionising Radiation Metrology	S03-15	2012-09-10	Ion chambers + RN calibrators	Study visit to PTB (2 participants, Yeltepe and Sahin)	5	SANAEM
04 Quality, metrology education and Training.	S04-10	2012-09-10	Workshop on Proficiency testing and statistical evaluation	TÜBİTAK Butal, Bursa, Turkey, 2 days, 40-50 participants.	2	Practitioners from control labs, industrial labs and university labs (incl TÜBİTAK UME & TÜBİTAK MAM) are the target audience.
S05 GENERAL	S05-14	2012-09-12	Steering Committee Meeting (2 from IRMM)	SC-08 in TAEK-SANAEM (McCourt & Waetjen)	1	Steering Committee members
04 Quality, metrology education and Training.	S04-23 extra STT 04	2012-09-17	Training course on MicroTOF-Q-Proteomics and ESI Quantitation	One scientist from TÜBİTAK UME (Merve Oztug Senal) at Bruker Chemical Analysis, Goes, NL.	5	TÜBİTAK UME
04 Quality, metrology education and Training.	S04-24 extra STT 05	2012-09-17	Training course on Gas Purity Analysis	One scientist from TÜBİTAK UME (Tanil Tarhan) at an EU course provider (3 RITT nec)	5	TÜBİTAK UME

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European Commission
EUR 25987 EN – Joint Research Centre – Institute for Reference Materials and Measurements

Title: Instrument of pre-accession assistance –"Improving Chemical and Ionising Radiation Metrology" in Turkey - Final report.

Author(s): Josephine McCourt

Luxembourg: Publications Office of the European Union

2013 – 107 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1018-5593 (print), ISSN 1831-9424 (online)

ISBN 978-92-79-30345-6 (print)

ISBN 978-92-79-30344-9 (PDF)

doi:10.2787/59433

Abstract

The overall objective of the Europe and Metrology in Turkey (EMIT) project is to contribute to the better functioning of the EU-Turkey Customs Union Agreement regarding the free movement of goods as well as to facilitate the implementation of the *acquis communautaire* in quality of life related areas such as environmental, health and consumer protection and food safety.

To achieve this goal the project consisted of an inception phase (complete since 31.12.2009) and four components, which are associated with certain interventions, during the implementation phase (01.01.2010 to 30.06.2012) with the project being consolidated during the final phase (01.07.2012 to 30.09.2012).

This final report provides an overview of the accomplishments during the full duration of the project. It also offers a summary of the lessons learned, of the Result Oriented Monitoring evaluations, of the financial audits carried out and a synopsis of TÜBİTAK UME and TAEK's strategic plans for the next three years.

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Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security, including nuclear; all supported through a cross-cutting and multi-disciplinary approach.

doi:10.2787/59433



Publications Office

ISBN 978-92-79-30344-9

