Karlsruhe Institute of Technology

ENETRAP II

ENETRAP II – WP8

3rd EUTERP Workshop, 28 - 30 March 2011, Cyprus

FTU Training Centre, KIT Karlsruhe
Siegurd Möbius

Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft

Universität Karlsruhe (TH) Forschungsuniversität • gegründet 1825

Organization of the

RPE Reference Training Scheme

Pilot Sessions

-Test methodologies and effectiveness-

WP8: Agenda and Work Plan

First Phase:

- **Identifying suitable existing training activities for RPEs**
- **Organisation of selected pilot modules (training materials, advertisement)**
- **Performance, monitoring and evaluation (assessment, questionnaire)**
- **To recommend improvements for further performance - if applicable -**

WP8: Preconditions for RPE Training Events

- Subjects and Time Frame according to draft ERPT Scheme (ENETRAP FP6)
- Modular training events
- QM criteria should apply to training providers and lecturers (systematic approach to learning, LO, training materials)
- Laboratory Exercises, Workshops and Technical Visits are imperative

WP8

- **Suitable existing training activities at FTU-KIT:**

  - **Radioisotope Training Course (SA210, 3 w)**
    „Radioisotopenkurs“
  - **TC for Requisite Competence of „SSB“ in NPPs (SK300, 5 w)**
    „Strahlenschutzkurs für SSB in KKWs“

need to be rearranged into modules

WP8: Pilot Sessions (1 / 2011)

Common Basis

- **Module 1: Basics**
  KIT Karlsruhe, Germany
  14/03-18/03/2011
- **Module 2: Foundation**
  KIT Karlsruhe, Germany
  21/03-25/03/2011
- **Module 3: Occupational**
  KIT Karlsruhe, Germany
  28/03-30/03/2011

Optional Modules

- **Module 4: NPP and Research Reactors**
  KIT Karlsruhe, Germany
- **Module 5: Waste Management**
  (Karlsruhe, June 2008)
- **Module 6: Unsealed Sources, Research and Non-Nuclear**
  KIT Karlsruhe, Germany 30/03-01/04/2011
- **Module 7: Medical Domain**
  ITN Lisbon, Portugal not yet defined
- **Module 8: NORM**
  NRG Petten, The Netherlands 23-26/05/11
  HPA, UK 2011

WP8: ENETRAP Training Scheme for RPE

COMMON BASIS									OPTIONAL MODULES															
Module 1 BASICS			**Module 2** FOUNDATION			**Module 3** FOUNDATION + (occupational)			**Module 4** NPP, Research Reactors			**Module 5** WASTE MANAGEMENT DECOMMISSIONING			**Module 6** NON-NUCLEAR, RESEARCH, Oil & Gaz			**Module 7** MEDICAL			**Module 8** NORM		
	L	E		L	E		L	E		L	E		L	E		L	E		L	E		L	E
Radioactivity	6	3	RP and External Dosimetry	3		Transport	3		Reactor types	5		Waste Management	8		Irradiators/generalors/Accelerators/Gauges	6	3	Equipment	6		NORM activities	6	
Interactions	4,5	1,5	Prot. against external Expos.	3	3	Design Issues	3		Fusion	1		Decommissioning	4	2,5	Industrial Radiography	3	3	Occupational RP	16,5	4,5	Dose of workers	6	
Quantities and Units	4,5		Prot. against internal Expos.	3	3	Accidents & Emergency Issues	3		Fuel Cycle	3		Ventilation, filtration	5	6	Unsealed sources	6	6	Accidental situations	3		Dose of population	3	
Basic biology & Bio. Effects	3		Dose monitoring (area + individ)	10,5	3	Safety Culture	3		Dose Monitoring/Regulalory control	3		Transport	3	1,5	Accidental situations	3					Protective measures, corrective actions	6	
Physical Principles of Detection	7,5	1,5	Regulatory Framework	6	3	ALARA	3		Safety Culture	9													
Applications of Ioni. Radiation (overview)	3		Natural sources	6		Decommission. principles	3		Accidental situations, Criticality	9													
			Public/Environmental	3		Waste Management principles	3																
			Ethical consideralions	3		Communication public, medias	6																
Hours	28,5	6		37,5	12		27	0		30	0		20	10		18	12		25,5	4,5		21	
OJT			5 days OJT						10 days OJT + Visits			5 days OJT + Visits			5 days OJT + visits			10 days OJT + Visits			5 days OJT + visits		
Hours	34,5			49,5			27			30			30			30			30			21	
Days	5,75			8,25			4,5			5			5			5			5			3,5	
Weeks	1,2			1,65			0,9			1			1			1			1			0,7	

Total hours	252
Total days	42
Total Weeks	8,4

WP8: Time Frame for Pilot Modules in Karlsruhe

Week	1	2	3/1	3/2	4
Date	14.-18.3.	21.-25.3.	28.-30.3.	30.3.-1.4.	
Module SA210 Eng	1 Basics	2 Foundation	3 Occupational	6 Unsealed Sources	4 NPP
	Common Basis			Optional	Optional
SA210 Ger					
Exercises	Jointly				

Agenda (1)

SA210E
Date: 14/3 – 1/4/2011
Location: Fortbildungszentrum für Technik und Umwelt - KIT
Lecture Room: 221, 207, 208
Course Director: S. Möbius, B. Breustedt

Module 1: Basics

	8.45 – 9:30	9:45 – 10:30	11:00 – 11:45	11:45 – 12:30	13:30 – 14:15	14:30 – 15:15	15:30 – 16:30
Monday 14/3 **Module 1**	9:00: Opening, ENETRAP and ERPTS	Nucleonics and Radioactivity		Decay Modes	Radiation Detection, Principles - Gas Counters		Exercise: Statistics, Calibration Measurements
	Möbius, Breustedt	Fischer		Fischer	Wilhelm		S. Möbius, T. Möbius
Tuesday 15/3	Chart of Nuclides Gamma Emission and Internal Conversion Use of Nucleonica		Interaction of Radiation with Matter		Demonstration: Interaction of Neutrons, Moderation Absorption	Exercise: Attenuation of Gamma-Radiation, Square Law of Distance	RP and Safety Instructions
	Magill		Geckeis		S. Möbius	Sitter, Letsch, Kuglstatter	S. Möbius
Wednesday 16/3	Quantities and Units		Radiation Detection, Principles - Scintillation Counters and Semiconductors - Spectrometry		Exercise: - High Resolution Gamma-Spectrometry - Identification of Unknown Gamma-Emitters - Aerosol Measurement by Gamma-Spectrometry		
	Breustedt		Frenzel		S. Möbius, T. Möbius, Kuglstatter		
Thursday 17/3	Radioactive Decay and Ingrowth With Exercise		Nuclear Reactions, Cross Section, n-Activation, Nuclear Fission	Nuclear Forensic and Safeguards - Fingerprinting of Radioactive Materials	Radiochemical Methods, Adsorption and Scavenging - Demonstration		Exercise: Carrier Precipitation, Half-Life Determination
	S. Möbius, T. Möbius		Walenius	Walenius	S. Möbius, T. Möbius		S. Möbius, T. Möbius
Friday 18/3	Biological Effects		Production of Artificial Radioactive Substances - Medical, Industrial Purposes, Generators		Shielding of Ionising Radiation - Seminar		Assessment and Module Evaluation
	Welbezahn		Wendel		Magill		S. Möbius, Breustedt

Agenda (2)

Stand: 4. März 2011 / Kursprogramm - Seite 1 von 1

SA210E
Date: 14/3 – 1/4/2011
Location: Fortbildungszentrum für Technik und Umwelt - KIT
Lecture Room: 221, 207, 206
Course Director: S. Möbius, B. Breustedt

Module 2: Foundation

	8:45 – 9:30	9:45 – 10:30	11:00 – 11:45	11:45 – 12:30	13:30 – 14:15	14:30 – 15:15	15:30 – 16:30
Monday 21/3 **Module 2**	Ethics of Radiological Risk Governance (ALARA, Safety Culture etc.)		Measurement of Personal Dose (Beta, Gamma, Neutron)		Hand-held Measuring Devices in Radiation Protection, Functionality Control and Errors	Exercise: - Dose Rate Measurements and Contamination Control - Decontamination of Materials	
	Meskens		Breustedt		Naber	S. Möbius, Wendel	
Tuesday 22/3	Biokinetic Models and Behaviour		Incorporation Measurements and Control		Radiation Exposure in the Environment, Radioecology	Visit of Body and Lung Counter	Visit of Toxicological Laboratory
	Breustedt		Breustedt		Kaiser	Breustedt	Stuhlfauth-Vonderau
Wednesday 23/3	Regulatory Context: International Legislation in Radiation Protection, Recommendation and Guidelines (ICRP, IAEA, EC-Directives, National Regulations)		Precautionary Measures for Occupationally Exposed Personel, Role of Medical and Tox. Labs	Decontamination of Personal	Nuclear Emergency Preparedness and Response, Counter Measures in Case of Accidents	Visit of Nuclear Emergency Response Assistance Team, Personal Protective Equipment	
	Schmitt-Hannig		List	List	Gustmann	Gustmann, Pruessmann	
Thursday 24/3	Radiation Protection Safety and Technology: RP Planning, RP Organisation etc.		Storage and Security of Radioactive Materials	Natural and Man-Made Radiation Exposures	Determination of Natural Radionuclides by Liquid Scintillation	Exercise: Liquid Scintillation Spectrometry, Determination of Radon in Water	
	Pruessmann		Zwememann	Koelzer	S. Möbius	S. Möbius, T. Möbius	
Friday 25/3	Waste Management	Seminar: Dose Calculation for NORM Articles	The German Atomic Energy Act (AtG) and the Radiation Protection Ordinance (StrlSchV), Status, Tasks and Duties of RPE/		Contractors Personnel in Nuclear Installations, Radiation Passbook	Assessment and Module Evaluation, Wrap-up	
	Graf	Liebe, Kuglstatter	Aures		Melzer	S. Möbius, Breustedt	

WP8: Leaflet

Subject

A syllabus has been developed as ENETRAP Training Scheme. Based on a modular approach, it foresees a general "Common Basis" and a series of specialised "Optional Modules" on occupational radiation protection in different installations where ionising radiation is applied. The modules offered comprise nuclear power plants, research reactors and fuel cycle industry and unsealed sources for non-nuclear industry and research laboratories.

Special features of the courses are active involvement of the participants by means of practice-oriented laboratory exercises, workshops and technical visits. A certificate will be issued upon successful completion of a training module. The certificates will be mutually recognised within the European Community facilitating international exchange of RP personnel.

The modules offered can be booked separately or as a complete European Radiation Protection Training Course ERPTC.
The participation in the whole ERPTC block meets the training needs of the European RPEs, e.g. Module 1 to 4 for RPEs in NPPs and Research Reactors, and Module 1 to 3 and 6 for RPEs in Non-Nuclear Industry and Research.
Not included is the On-the-Job Training part which might be offered on request.

Lecturers

Lectures will be given by internationally recognised experts from Karlsruhe Institute of Technology, the Nuclear Industry and other European organisations.

Target Group

The courses are designed for radiation protection professionals such as Radiation Protection Experts (RPE) and Radiation Protection Officers (RPO) who want to be trained according to the agreed standards or improve their knowledge in RP generally and/or with regard to occupational RP.

Learning Objectives and Outcomes

The **"Common Basis"** is constituted of three modules, lasting each about 1 week. By the end of the course, the participant will be able among others:

Module 1: to understand the physical aspect of ionising radiations, the biological basis of radiological protection;
to describe and use the principal type of radiation detectors.
Module 2: to estimate the dose rate from a radioactive source vs distance; to determine the collective and individual protective means for external and internal exposure;
to assess individual doses; to determine a dose monitoring program according to recommendations and regulations.
Module 3: to know the regulatory process for transportation of radioactive material;
to mitigate the consequences of an accident or emergency issues; to integrate the ALARA principles and safety cultures;
to know the principles of waste management and decommissioning.

The **"Optional Modules"**, each lasting about 1 week, concern Radiation Protection in the different wide domains of activity.
Module 4: Radiation Protection in the domain of nuclear power plants and research reactors
Module 5: Waste Management and Decommissioning (on request)
Module 6: Unsealed Sources, Research and non-nuclear domains

Agenda (3)

Date: 14/3 – 1/4/2011
Location: Fortbildungszentrum für Technik und Umwelt - KIT
Lecture Room: ISF R318
Course Director: S. Möbius, B. Breustedt

SA217-1 **Module 3: Occupational RP**

SA218-1 **Module 6: Unsealed Sources, Research and Non-Nuclear**

	8.30 - 9.15	9.30 - 10.15	10.45 - 11.30	11.30 - 12.15	13.15 - 14.00	14.30 - 15.15	15.15 - 16.00	16.00 - 16.45
Monday 28/3 **Module 3**	Communication of Nuclear Issues to the Public and Media With Exercise		Principles of Waste Management - Waste Streams, Waste Classifications, Strategies for Waste Conditioning, Waste Preparation and Collection, Waste Minimisation		Release of Materials from Controlled Areas, Clearance	Exercise: Detection and Securing of Orphan Sources		Application of in-situ gamma spectrometry
	Meskens		Rittmeyer		Naber	Liebe, Breustedt, Kugistatter, Mayer		Naber
Tuesday 29/3	Emergency Planning and Procedures, Actions and Behaviour in Case of Incidents and Accidents, Lessons Learned from Radiological Accidents		Medical Management in Accidental Situations, Medical Treatment in Case of Increased Radiation Exposure		RP Principles During Decommissioning, - Operative RP in the Central Decontamination Department - Release of Buildings		Optimisation During Decommissioning - Radiation Protection Planning - Preparation of Work - Dose Estimation	
	Tschilinski		List		Vilgis		Reichert	
Wednesday 30/3 **Module 3 / 6**	Packing and Transport - Regulations, Responsibilities, Types of Packages, Transport Indices, Signalisation and Labelling, Lessons Learnt from Accidents		Case Study: Preparation for Radioactive Transport, Classification, Packing, Signalisation and Documentation, Shipping Documents		Possibility to Visit Installations under Radiation Protection Aspects at the Karlsruhe Institute of Technology - Decontamination Facilities, Release Measurements, MZFR Vilgis, Schwämmle Radiochemistry Laboratories Hoeppener - Accelerator Hagelstein			Assessment, Wrap-up and Evaluation of Core Modules
	Brand		Brand					
Thursday 31/3	Gammagraphy and X-ray Generators		Exercise: Monitoring of Fission Nuclides (Cs), Analysis of Radium in Water		Technical Visit to Heidelberg DKFZ: - Nuclear Medicine (Storage Facility) - HIT- C- Accelerator and others			
	Kaps		Wendel, T. Möbius		Knoch			
Friday 1/4	Management of Unsealed Sources - Duties and Responsibilities	Design Issues, Radionuclide Laboratory and Equipment (Hot Cells, Glove Boxes, Work Places)	Ventilation and Air Filtration		NORM: Oil and Gas Industry - Origination,Quantities and Safety Measures NORM: Dwellings and Water Treatment - Rn in Air/Water, Ra in Drinking Water		Assessment and Wrap-up	
	Wendel		Paffrath		R. Möbius, S. Möbius			

WP8: Programme

Active involvement of the participants by practice oriented exercises, workshops and Technical Visits:

- Decontamination of Personel (MED)
- Body and Lung Counter (KSM)
- Toxicological Laboratory (TOX)
- Nuclear Emergency Response Assistance Team (KHG)
- Waste Management and Decontamination Facilities (HDB)
- Clearance Facility (WAK)
- Decommissioning of Research Reactors (MZFR)
- Accredited Radiochemical and Measurement Laboratory (HDB)
- Synchrotron Radiation Facility
- Cancer Research Center (DKFZ):
  - Waste Storage Facility
  - HIT C-Irradiator

WP8: Advertisement

- IRPA Poster Presentation
- Leaflets (Flyers)

E-mailings

- **EUTERP national contact points**
- **ENEN Database, ENS-Newsletter**
- **Participants from IRPA Congress**

Practically no response!

- **FTU relations**

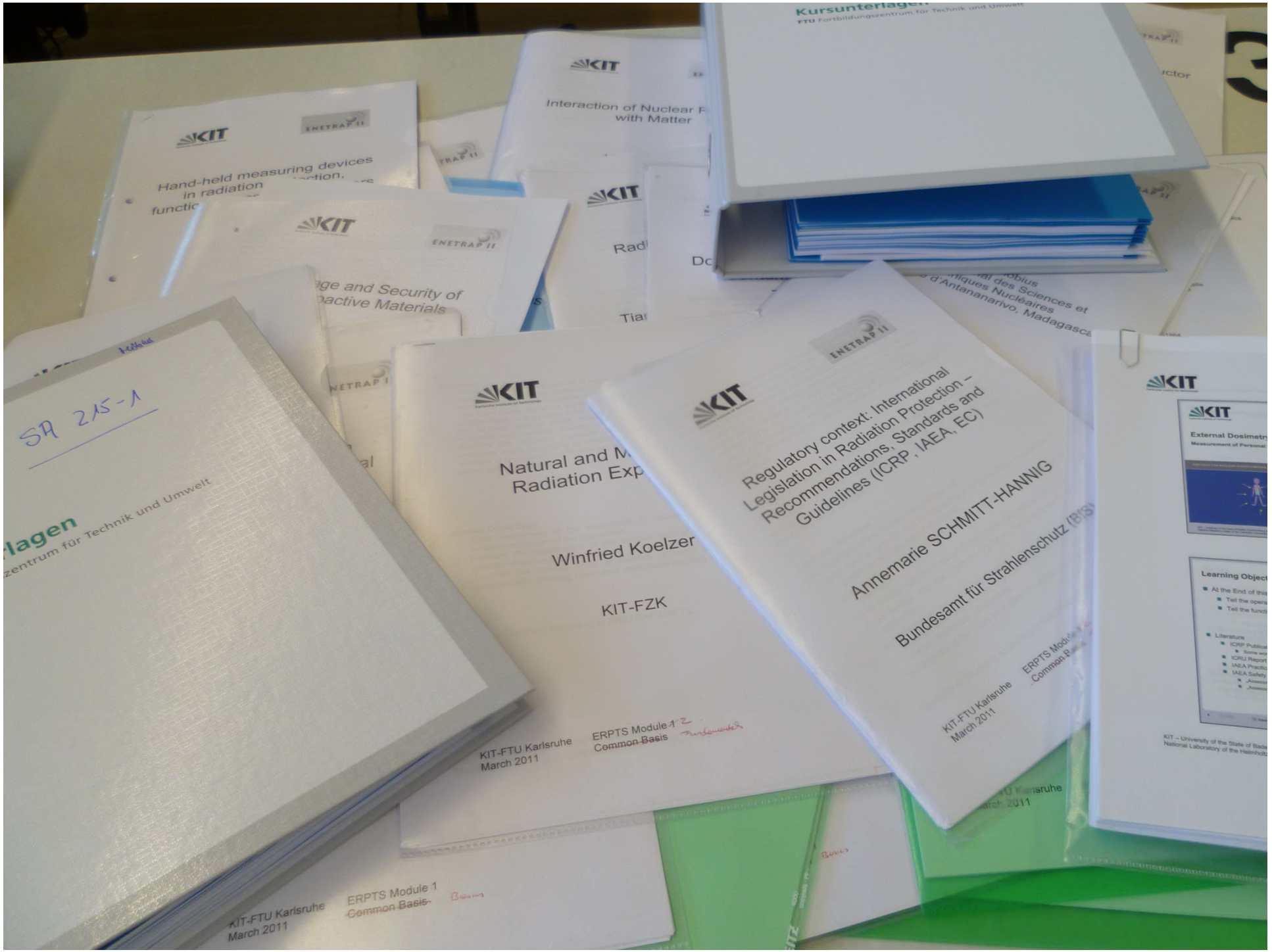
WP8: Participants

- **Scientists and responsible persons for RP from the following countries:**

  France, Germany, Italy, Romania, Mexico, Sweden, Switzerland

  Majority from EC Joint Research Centre ITU on KIT Camus as institution with a high mobility of scientists and RPE personnel;

  Most of them are following all Modules 1 to 3 and 6.


KIT
ENETRAP II
Hand-held measuring devices in radiation
Interaction of Nuclear
with Matter
Natural and
Radiation Exp
Winfried Koelzer
KIT-FZK
KIT-FTU Karlsruhe
March 2011
ERPTS Module 1
Common Basis
Regulatory context: International Legislation in Radiation Protection – Recommendations, Standards and Guidelines (ICRP, IAEA, EC)
Annemarie SCHMITT-HANNIG
Bundesamt für Strahlenschutz (BfS)
KIT-FTU Karlsruhe
March 2011
ERPTS Module 2
Common Basis
SA 215-1
Kursunterlagen
FTU Fortbildungszentrum für Technik und Umwelt
External Dosimetry
Measurement of Personal
Learning Objectives
Literature

WP8: Training Materials

Summary

The physical properties of neutrons with respect to moderation and absorption are reviewed. The different production modes are explained. Biological effects and risks to the human tissue are summarised. The operation of a boron detector and neutron dose rate meter is explained and their handling is shown.

A suitable shielding for a Ra-Be neutron source is developed. It consists of paraffin, boron or cadmium and lead for gamma attenuation.

Learning Objectives (Outcomes)

- Identify the interaction of neutrons with respect to moderation, absorption and measurement
- Describe the usage and operation of neutron detectors
- Raise awareness of the importance of shielding neutron sources
- Help practitioners identifying threats and risks associated with neutron sources

Contents of Teaching according to ENETRAP ERPTS:
1.32., **2.1.2., 2.2.**

Evaluation of the Effectiveness

During

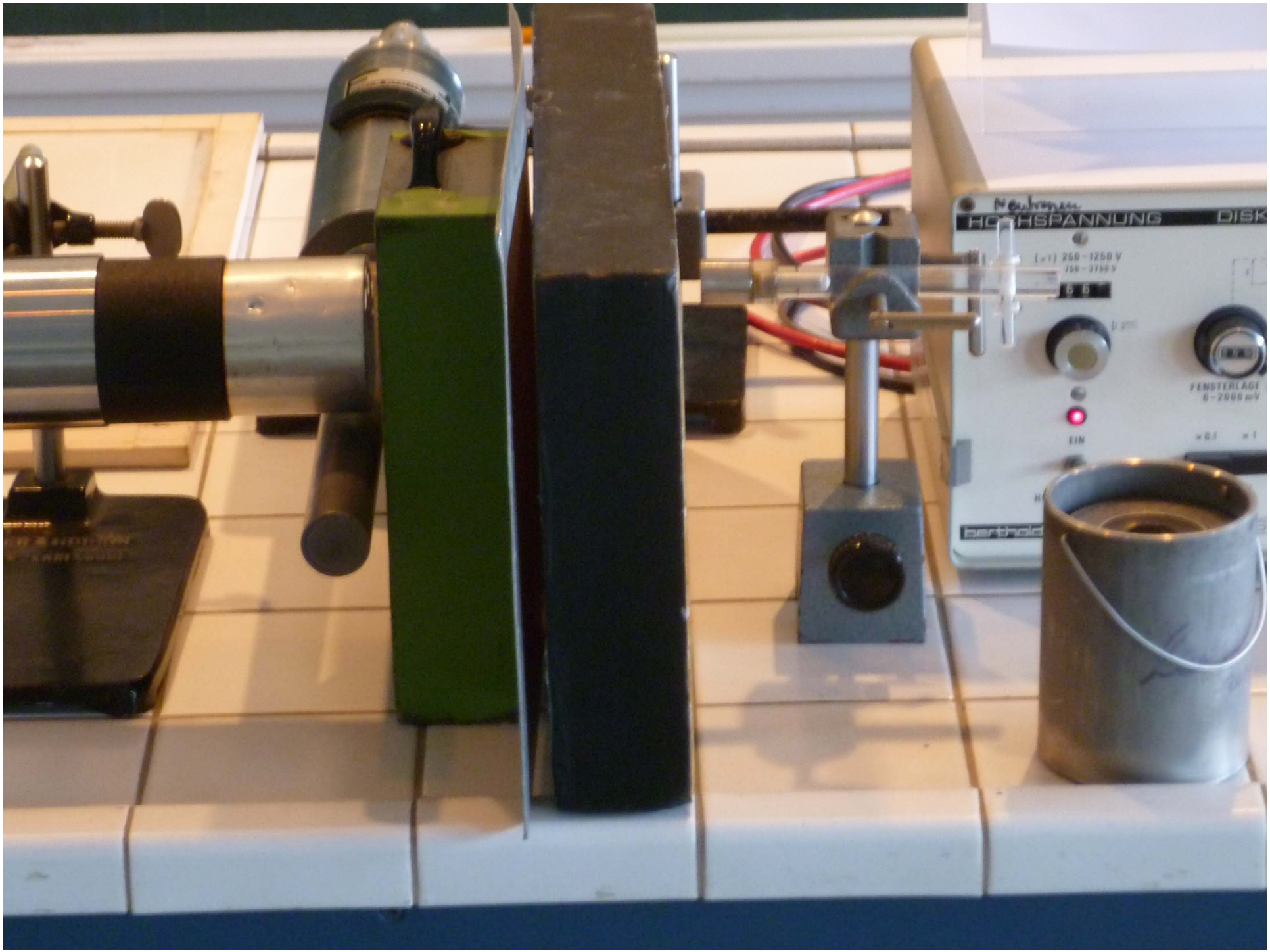
- **Assessment, Learning Outcomes**

  Discussion with participants (ERPTS, modules, mutual recognition, lectures)

After

- **Module/Course Evaluation:**

  Questionnaires, Outcomes foreseen met?


HOCHSPANNUNG
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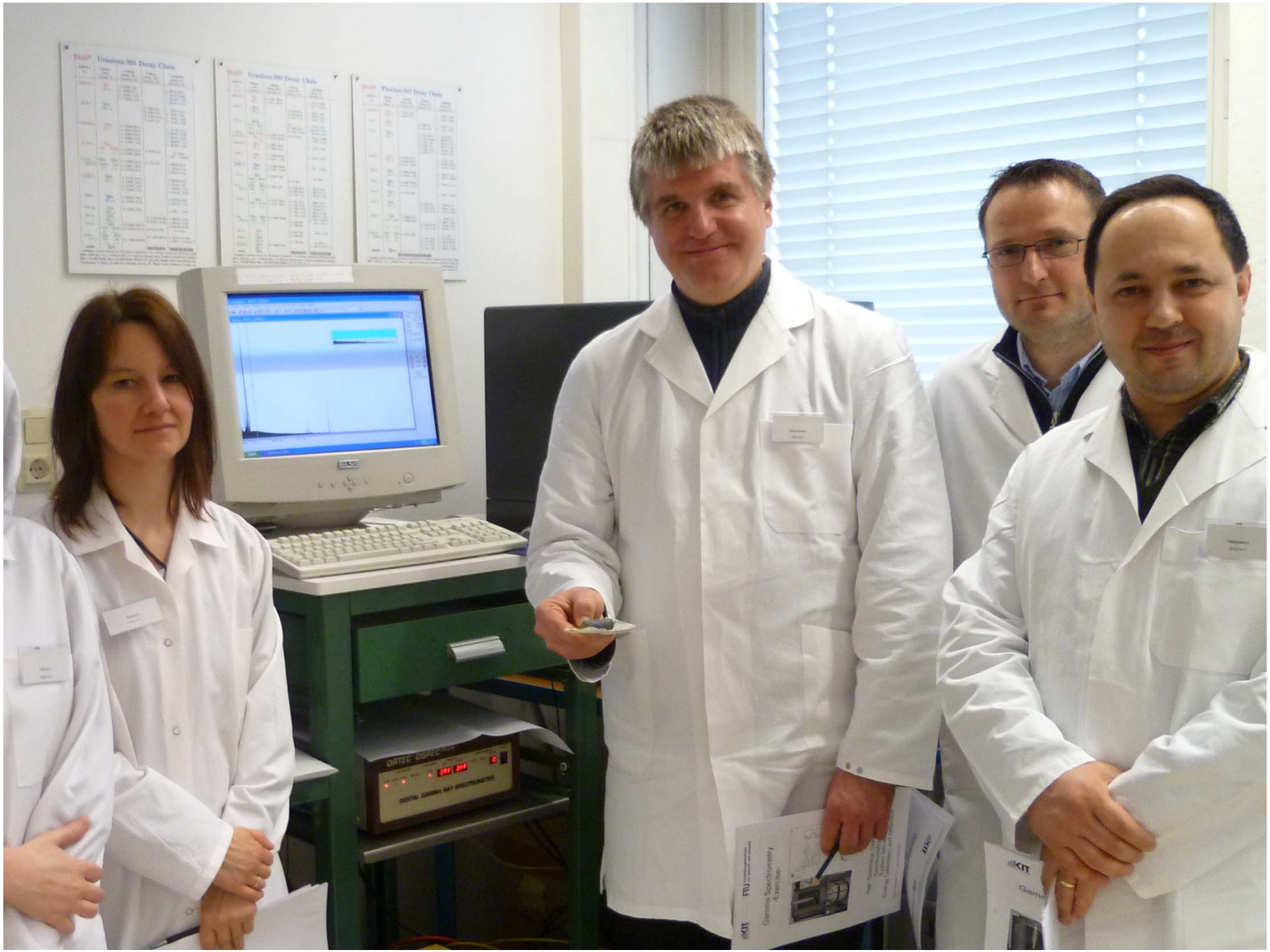
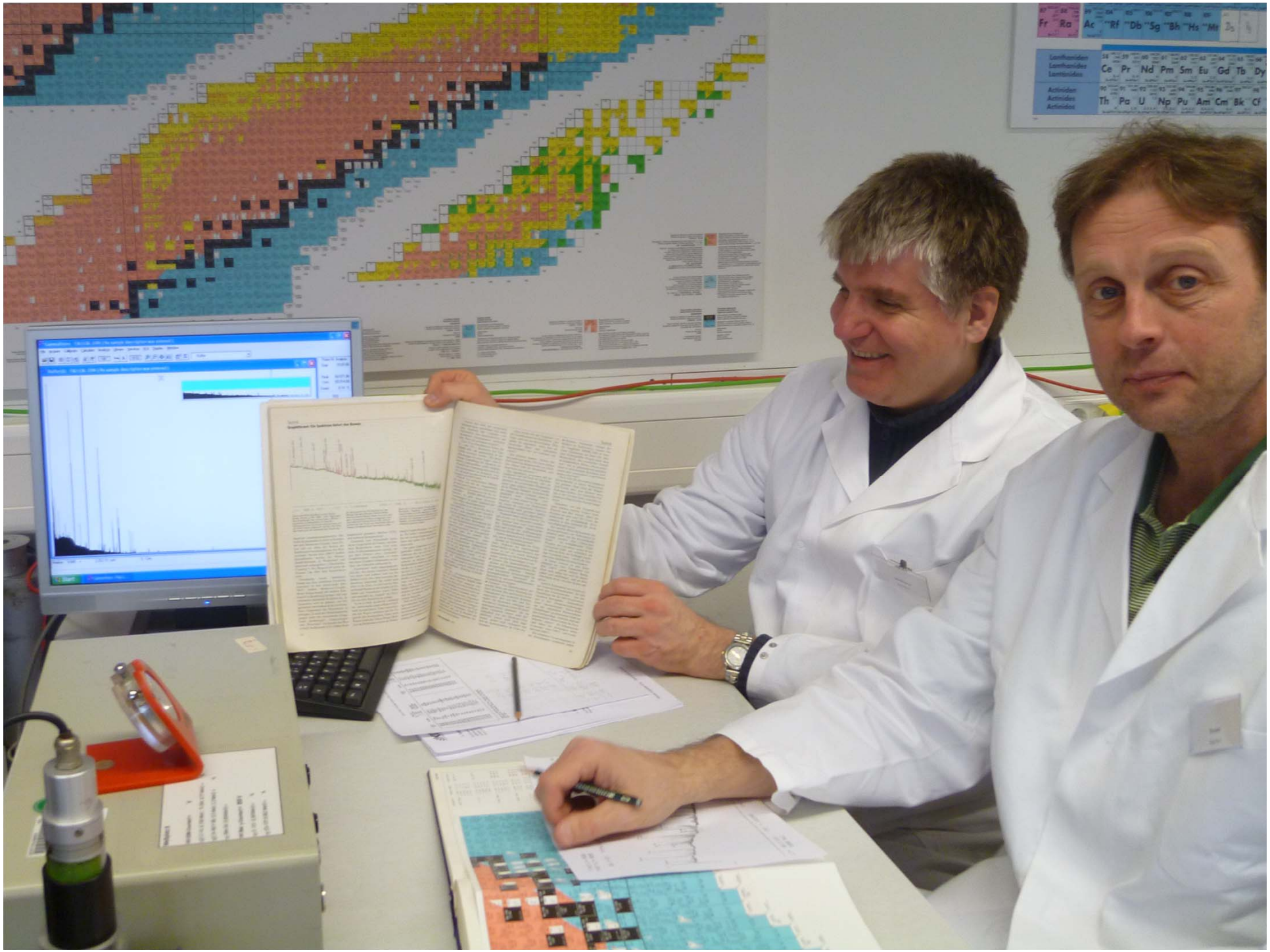
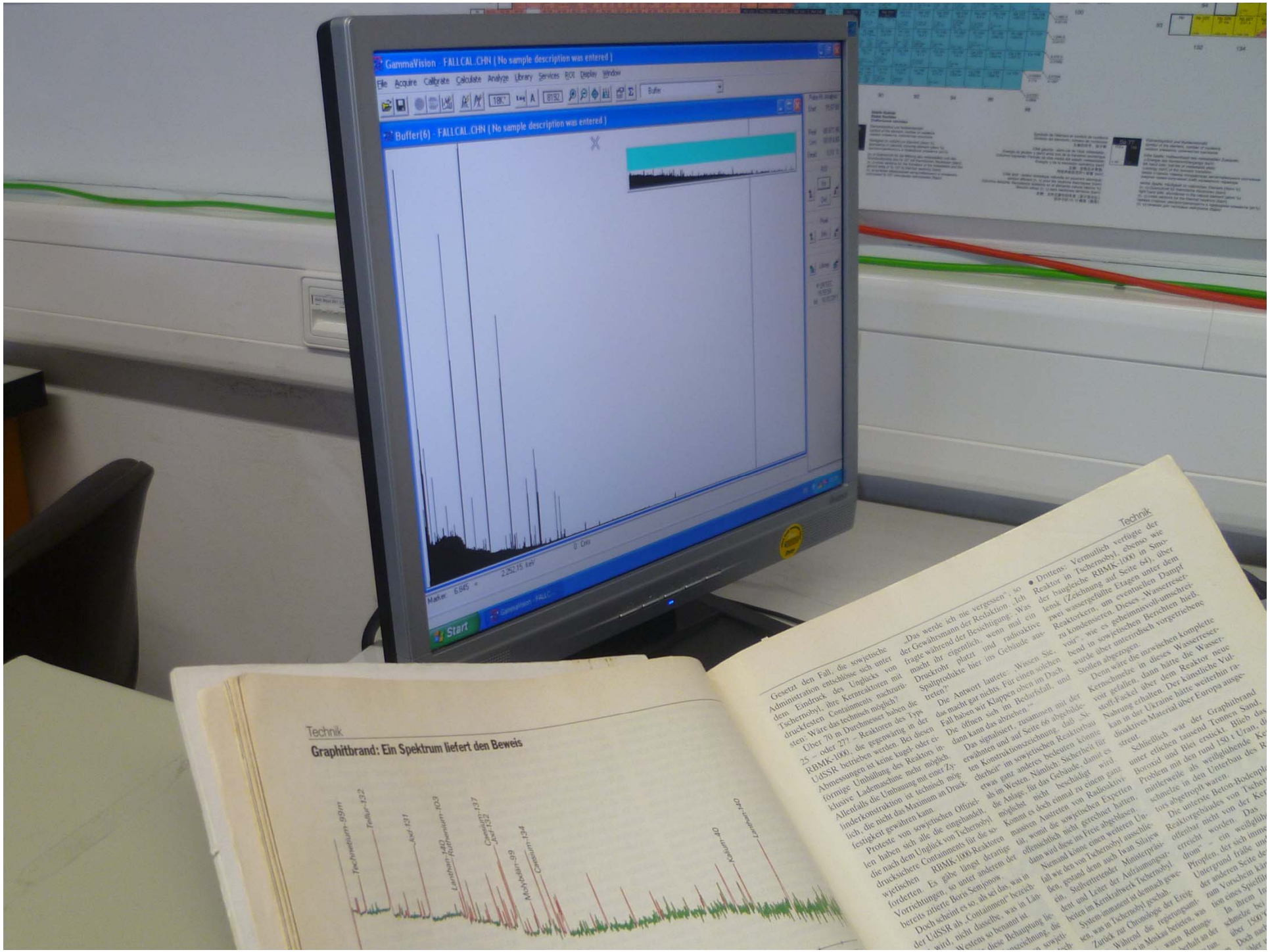

Uranium-235 Decay Chain
Uranium-238 Decay Chain
Thorium-232 Decay Chain
ORTEC DSPEC
DIGITAL GAMMA RAY SPECTROMETER
Gamma Spectrometry
Exercise
FZU
KIT


ABC &BS WE/Physik

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Technik
Graphitbrand: Ein Spektrum liefert den Beweis
Technetium-99m
Tellur-132
Jod-131
Lanthan-140
Ruthenium-103
Cäsium-137
Jod-132
Molybdän-99
Cäsium-134
Kobalt-60
Lanthan-140
Technik

ESC
Co-60
Dosisleistung
Kontaminationsmonitor
Wischtest
µSv/h
imp/sec
Bq/cm²
imp/min
Bq/cm²
I
II
III
Fl0 = 166 cm²
η0 = 0.2 → 20%
FlWT = 166 cm²
ηWT = 10 %
η0 = 2,62

WP8: Evaluation

Questionnaire:

- Harmonization E&T?
- Definitions RPE, RPO, acceptable?
- ERPTS, modular, training courses and OJT?
- Selection of modules?
- Time frame, overall and modules?
- Learning objectives met?
- e- and b-learning modules?
- Assessment, thoeretical and practical?

WP8: Conclusions

As pilot session for RPE a remodelled modular radioisotope training event in Karlsruhe has been chosen (Modules 1,2,3,6).

- The participation in the whole ERPTC block (3/4 weeks) meets the training needs of a European RPE (Module 1 to 3, 6 for RPEs in Non-Nuclear Industry and Research).
- Modules could be booked separately.

- A poster contribution and leaflets have been developed for acquisition.
- Most participants were from ITU of JRC-EC as institution with high mobility of scientists and RPE personnel.
- A primary evaluation of module 1 and 2 demonstrates the succss of the initiated steps for harmonization of training for RPEs in Europe.
- Care should be given to facilitate as well OJT for participants from countries not having the appropriate facilities

WP8: Future Work Plan

- Module 8 NORM; repetition of Modules 1 to 3 and additionnally 4 in 3rd Quarter 2011 with improvements according to evaluation

  (if requested!)
- Design of training events for RPOs according to the outcome of WP3

Karlsruhe Institute of Technology

Thank You

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