Education of Health Physicists and Health Physics Technicians at Danish Decommissioning

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DANSK DEKOMMISSIONERING

Radiation Protection

- Safety of the environment
- Safety of the workforce
- Reassurance of workers

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ETRAP 2009

Radiation Protection Personel
at Danish Decommissioning

Health Physics Technicians (RPO?)

- Laboratory Technicians

Health Physicist (RPE?)

- University degree in Science

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Health Physics Technicians

- **24 weeks with 2 – 3 lessons a week**

  Each lesson last three hours

- **20 laboratory exercises**

- **Co-worker training**

Written and oral examinations after 26 weeks

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Health Physics Technicians

Subject	Lessons
Basic mathematics	7
Atom and molecules, Nuclear decay processes	7
Radiation interactions with matter	5
Radiation fields and radiation doses	6
Radiation instruments, dose-meters, and measurement techniques	10
External and internal radiation doses	5
Radiation biology	4
Radiation protection norms	3
Radiation shielding	3
Natural occurring and man made radiation	2
Radiation doses from accidents	2
Radiation hygiene	3
Nuclear facilities at DD, doses from environmental releases, and radiological emergency response	6
Clearance methodology	3
Organisation, documentation, waste documentation system	2

Health Physics Technicians

Tuesday

Devices producing radiation (2 of 3)
- **Accelerators**

Wednesday

Radiation fields and radiation doses (6 of 6)
- **Equivalent dose**
- **Risk factors and Tissue weighting factors**
- **RBE**
- **Collective dose**
- **Operational quantities (H*(10),Hp(0.07), etc.)**

Thursday

Instruments and dose meters (3 of 5)
- **Detectors made of semiconducting materials**

Exercise

Energy and efficiency calibration of the Ge-detector at the laboratory

Health Physics Technicians

Health Physics Technicians

Text book

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Health Physics Technicians
Laboratory exercises

- Five exercises dealing with germanium detectors
  energy calibration
  efficiency calibration
  evaluation of results
- Four exercises dealing with gas detectors
  efficiency calibration
  general use of the equipment
- Contamination monitors
- Shielding
- Mapping of radiation fields
- Dose meters
- Counting statistics
- Instruments for measuring discharges
- Calculation of internal doses
- Clearance measurements

Health Physics Technicians
Co-worker training

- Daily routines
  smear samples
  radiation measurements
  determining discharges of tritium
- Participating in planning of decommissioning projects
- Supervising operations
- Calibration of instruments
- Emergency preparedness

Health Physics Technicians Examinations

Before the start of an operation at the Hot Cell facility an air sample is taken over 10 minutes. The flow rate is 45 ℓ/min and the collection efficiency is 100 %. The sample is measured in the laboratory and show 100 Bq of ^{239}Pu. The planned operation will take 2 hours.

- ***The inhaled amount of ^{239}Pu-239 during the operation?***
- ***The committed effective dose from the inhaled Pu-239 (e(50) is $5 \cdot 10^{-5}$ Sv/Bq)?***
- ***Is this operation justified?***

Health Physicist

- One year with about one session a week
  Each session last three hours
- 20 laboratory exercises
- Co-worker training and participating in decommissioning projects
- Course at University of Copenhagen

Health Physicist

Subject	Lessons
Radioactivity and ionising radiation	1
Radiation interactions with matter	2
Radiation fields and radiation doses	4
Radiation instruments, dose-meters, and measurement techniques	7
External and internal radiation doses	6
Radiation biology	4
Radiation shielding	4
Radiation protection norms	3
Natural occurring and man made radiation	2
Organisation, documentation, waste documentation system	4
Radiation doses from accidents	2
Radiation hygiene	3
Nuclear facilities at DD, doses from environmental releases, and radiological emergency response	13
Clearance methodology	3
Software (radiation transport, radiation risk, dose calculations etc)	4

Health Physicist

Laboratory exercises focussing at the various instruments at the DD-site

- Gas-detectors
- Radiation monitors
- Contamination monitors
- Instruments for measuring discharges and airborne contamination
- Ge-detectors
- etc.

Health Physicist

Co-worker training and participation in decommissioning projects

- Calculating internal doses
- Whole body counting
- Clearance measurements

Health Physicist

Course at the University of Copenhagen

"Radioactive isotopes and ionizing radiation"

Duration:

8 weeks, two days a week with lessons and laboratory exercises

Three hours of written examination

Finally!

School is over!