

General Training report on Radiation Health Hazards and Protection

Presenter: Dr. Sariful Haque Bhuiya

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General Information

- **Trainee:** *Dr. Sariful Haque Bhuiya*
- **Title:** *Radiation Health Hazards and Protection*
- **Supervisor:** *Dr. Wan Saffiey Wan Abdullah*
- **Funded by:** *SRSD project, BINA*
- **Place of Training held:** *Health and Safety Division, Malaysian Nuclear Agency, Bangi, Selangor*
- **Duration:** *20 June – 19 December, 2016 (6 months)*

Objective of Training

- **To become a skilled health physicist (RCO/RPO)**
- **To create and maintain a safe laboratory environment**
- **To assess risks of radiation and biological effects and eliminate those risks**
- **To manage radiological effluents and waste streams associated with agricultural and related research laboratories**
- **To understand national and IAEA regulatory requirements, standards and recommendations.**

Established in 1975

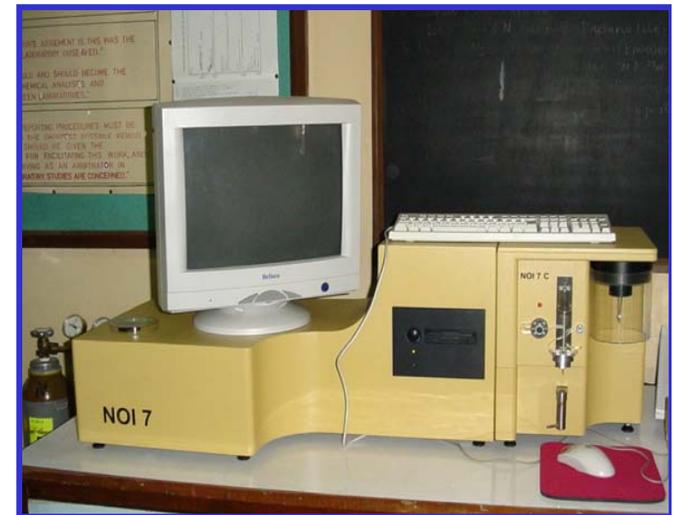
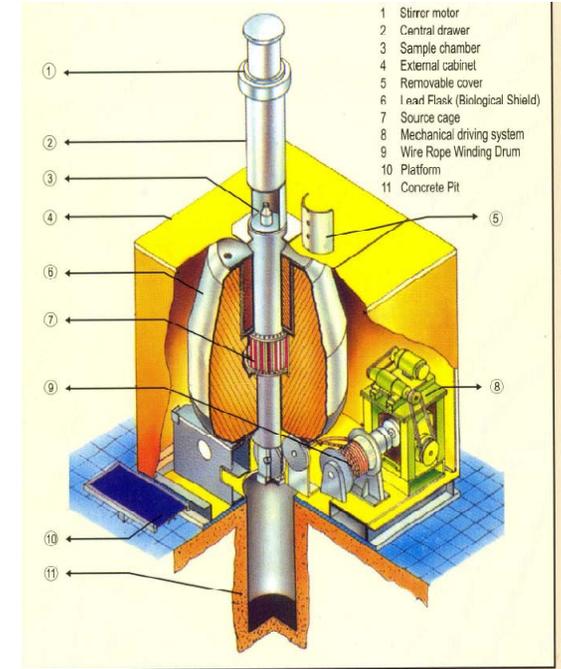


Mandate of BINA

Undertake *agricultural research adopting peaceful nuclear techniques* in order to

- **Ensure a stable and productive agriculture.**
- **Develop new varieties of crops**
- **Scientific management of land and water.**
- **Develop appropriate technology for improving quality and quantity of crops.**
- **Develop methods for control of disease and insect as well as management of pest.**

Major Nuclear facilities at BINA



Radiation Monitoring facilities at BINA



Duties and responsibilities at BINA

➤ Nuclear Instrumentation

➤ Radiation Safety and Health:

Responsible for the peaceful use of nuclear energy in the field of agriculture. Engaged on radiation protection and safety measures against radiation comes from different Nuclear facilities and radio-isotopes used as tracer techniques as well as security and safe guard.

➤ Radiation Control Officer (RCO)

Scopes of Training

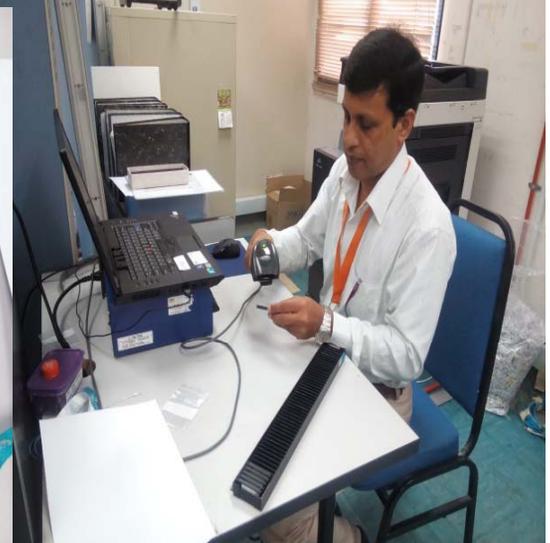
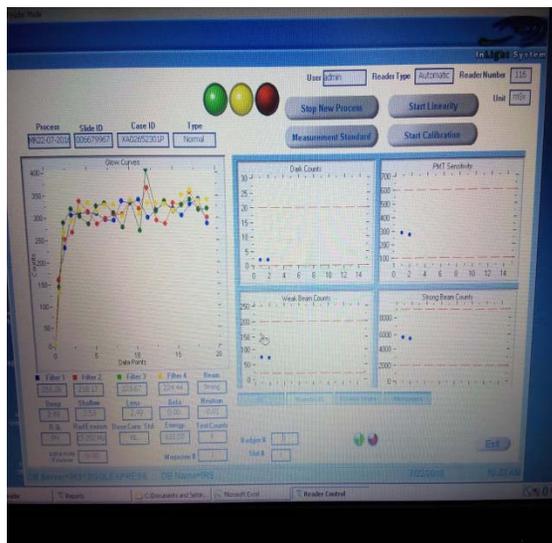
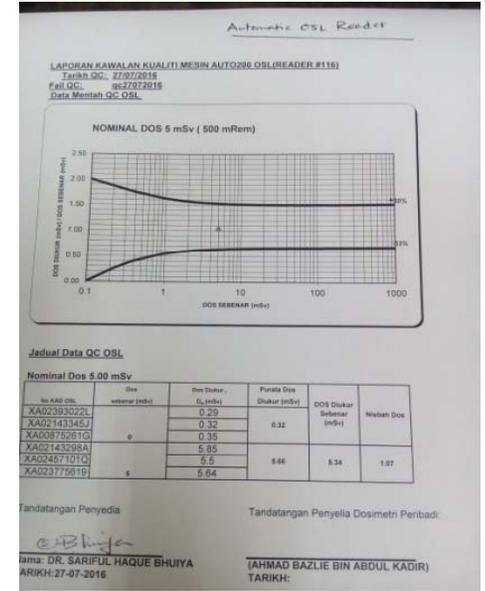
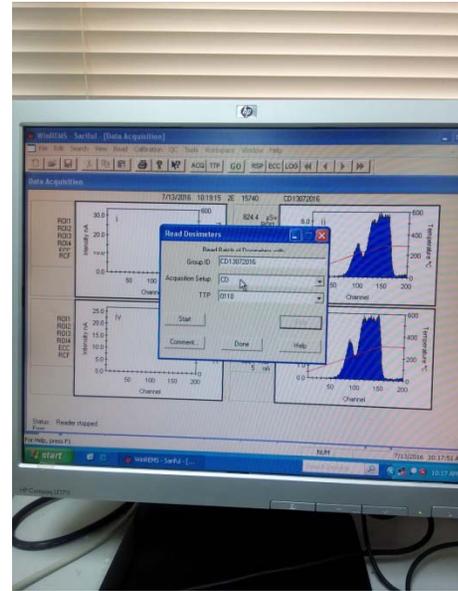
General: *Radiation protection and dosimetry aspect*

| Sl. No. | Field of Training | Personnel Resource |
|---------|--------------------------|--|
| 1. | SSDL | Mr. Hasan, Mr. Toufik, Mr. Jhon, Mr. Bazlie |
| 2. | Medical Physics | Mr. Khalid, Ms. Asmaliza, Mrs. Norriza, Ms. Norhayati |
| 3. | Safety and Environment | Mrs. Azimawati, Mrs. Suzilawati, Mr. Faysal Azrin, Mr. Fazlie, Mr. Noor Faysal |
| 4. | Biodosimetry | Dr. Rodzi |
| 5. | Waste management | Dr. Norsalwa |
| 6. | NDT | Mr. Shaharuddin |
| 7. | Irradiator & Accelerator | Dr. Siti A'iasa, Mr. Ahsanul, Mr. Sofian, Mr. Azfar |
| 8. | Isotope production | Mr. Anuar, Mr. Zakaria |
| 9. | TRIGA PUSPATI Reactor | Dr. Rawi |
| 10. | NIR | Mrs. Roha |
| 11. | Rules & Regulation | - |

SSDL (Personal Monitoring)

- **Performed individual and group calibration of TLD**
- **Linearity, reproducibility, energy dependence and accuracy tests of TLD badges.**
- **Calculation and dose evaluation of TLD badges based on the personal dose equivalent i.e. $H_p(10)$ and $H_p(0.07)$**
- **Performance testing of personal dosimeter based on the trumpet curve.**
- **Demonstration of OSLD reading using Microstar reader and auto 200 reader.**
- **Performed linearity test (Supra linear) of OSL for 1-50Sv of Gamma source.**
- **Performed linearity tests of OSLD using single sources: X-ray, Gamma & Beta; and mixed sources: X-ray + Beta , Beta+ Gamma, Gamma + Beta and X-ray + Gamma +Beta sources.**

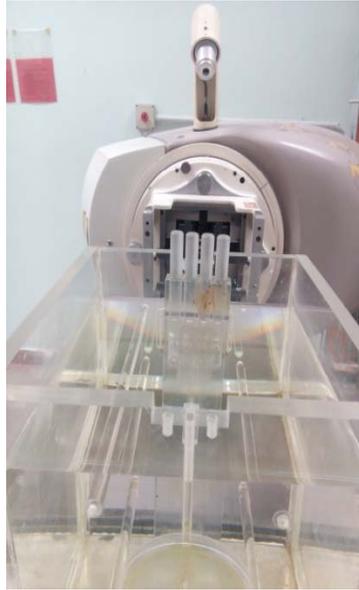
SSDL (Personal Monitoring)



SSDL (High Dose Dosimetry)

- **Prepared Fricke solution with standard method and evaluated it using Gamma Irradiation**
- **Prepared Ceric-cerous solution for high dose dosimetry using standard method**
- **Dose mapping of gamma Irradiator (high dose dosimetry) using Gamma chrome and Ceric-cirous**
- **Evaluation of Central dose rate (CDR) of Gamma Irradiator of BINA using Ceric-cirous and gamma chrome.**

SSDL (High Dose Dosimetry)



SSDL (Instrument calibration)

- **Determination of air kerma rate for standard & working ion chamber (Cs-137 and Co-60 sources are used) at Bunker-3**
- **Determination of air kerma rate of working ion chamber at different conditions (Cs-137 without collimator, with collimator and OB 85) at Bunker-2**
- **Determination of air kerma rate of working ion chamber (Co-60 without collimator) at Bunker-2**
- **Calibration of different type of survey meters using Cs-137 and Co-60 sources**
- **Evaluation of HVL for narrow beam of x-ray (60 & 150KV) using disk filters A & B at Bunker-3.**
- **Determination of dose rate for PTW extrapolation Chamber Model 30-360 using Sn-90 source.**

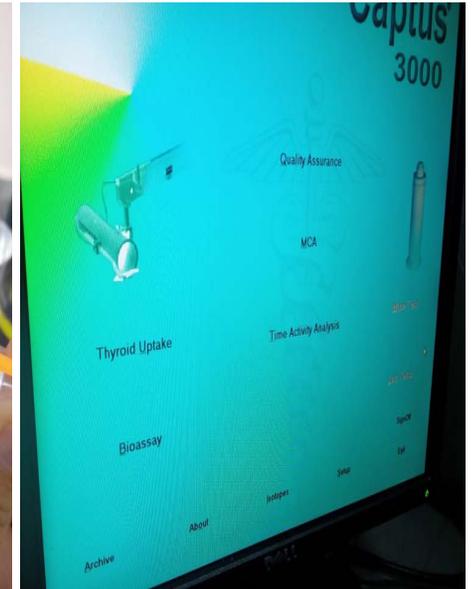
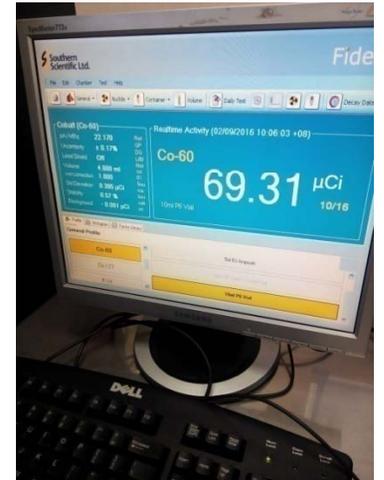
SSDL (Instrument Calibration)



Medical Physics

- **Performed Calibration and QC of general radiography (X-ray)**
- **Performed Calibration and QC of Thyroid counter**
- **Establishment of beam quality of X-ray machine (Model-165, Phillips)**
- **Calibration of Dose calibrator for medical purpose**

Medical Physics



QA & QC

- SSDL experience in the implementation of ISO/IEC 17025:2005
- The Importance of Documentations
- Understanding the elements of ISO/IEC 17025:2005 (Technical)
- Quality Control Measures in Nuclear Research Laboratories.

Health, Safety & Environment

- **Assessment of intake radionuclide using WBC**
- **Radiation protection and emergency preparedness of MNA**
- **Analysis of tritium for environmental samples using LSC**
- **Determination of gross Beta and gross Alpha of environmental samples**
- **Performed operation and maintenance of CTBTO of Malaysia**

Health, Safety Environment



Biodosimetry

- **Introduction of Bio-dosimetry lab, Nuclear Malaysia**
- **Radiation risk in Malaysia: Safety, Health and Protection**
- **Dicentric chromosome technique and analysis**
- **Radiation health effects and biological analysis**

Biodosimetry



Radioactive waste management

- **DSRS and Borehole disposal system**
- **Liquid & solid waste management and storage**
- **Design and fabrication of mobile hot cell**
- **Pilot project of radioactive waste treatment using Plasma**

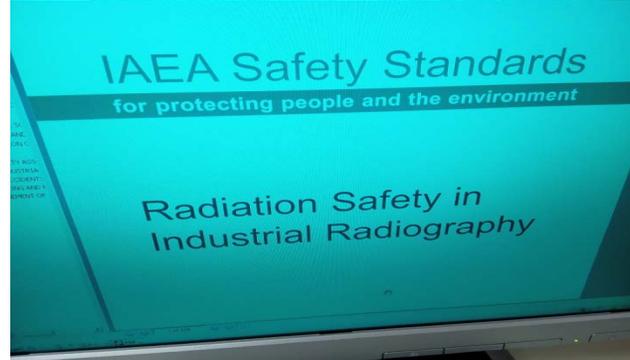
Radioactive Waste Management



NDT Practice

- **Code of practice on radiation protection in industrial radiography**
- **Performed radiography using X-ray with safety measures**
- **Performed radiography using Ir-192 with safety measures**

NDT Practices (X-ray & Gamma Radiography)



Gamma Irradiation and Accelerator

- **Processing and sterilization of agricultural, medical and rubber latex products using SINAGAMA and RVNRL with safety and protection**
- **Baby Electron Beam Accelerator developed by MNA**
- **Cross linking of wire and cable using EBA with safety measures**
- **Application of Gamma green house with safe operation**

Gamma Irradiation and Accelerator



Radio Isotope production

- **Production of Tc-99m in hot cell for medical diagnosis**
- **Production of Tc-99m in hot cell industrial practice**
- **Unloading of old Ir-192 from hot cell for waste management.**
- **Safety measures/Radiation Protection performed by the Health Physicist's during Radio isotope production**

Isotope Production (Tc-99m & Ir-192)



TRIGA PUSPATI Reactor (RPI)

- **Introduction and radiological protection programme in RPT**
- **Neutron beam application and core management of RPT**
- **Neutron Activation Analysis**

TRIGA PUSPATI Reactor (RPI)



Non-Ionizing Radiation (NIR)

- **Introduction and different sources of NIR**
- **Activities of NIR group**
- **Orientation/visit of different laboratories**

Rules and Regulations

**IAEA Safety guide and recommendations , Acts
and Regulations of Malaysia**

Attended Seminar/Workshops/Innovation

- (i) Research and Development workshop of Nuclear Malaysia, 2016**
- (ii) Annual program (seminar) of Radiation Health and Safety Division**
- (iii) Innovation program of Nuclear Malaysia**

Visited/ attended in different parties

- (i) Visited different tourist places of Malaysia like, KLCC, Genting Highland, Cameron Highland, Batu cave, Melaka as well as Singapore.**
- (ii) Study tours: Asian Lab., APC SND., UPM, UKM etc.**
- (iii) Dinner party arranged by honorable supervisor Dr. Wan Saffiey Wan Abdullah.**
- (iv) Lunch party arranged by Sabarial Bin Kader, In-Change, Training section, Nuclear Malaysia.**

Opinion about training

- **The training program was most comprehensive**
- **It was target oriented which complied my objectives and requirements**
- **It developed my knowledge and science as well**
- **Training place was nice and laboratory facilities were distinctively arranged**
- **The interaction and discussion with different resource persons were cordial and invaluable.**
- **It was hand to hand training, so I think, I really got remarkable benefit from this training course.**

Conclusions

The main objective of this training program was to develop myself as a skilled Health Physicist. The knowledge and skills that I gained from this training program with various facilities, I hope, I would be able to significantly improve the safety procedures in the existing facility of my Institute. I am confident enough that I will be able to design and implement a radiation protection program at my organization. Also, I will be able to provide a safe working environment i.e. safe operation and handling of radioactive equipment & materials, application, monitoring and disposal of radioactive materials and protect employees' health and environment in a more organized way than previous one.

Acknowledgements

All praises go to Allah, the almighty, for the successful completion of this training.

I gratefully acknowledge to the Director General, BINA, for nominating me and Ministry of Agriculture for giving the official permission (deputation) for 6 months training program. I am also thankfully indebted to the Project Director of SRSD project, BINA, in providing the financial support for this training program.

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I gratefully acknowledge and express sincere thanks to all the resources personnel for their kind help and cooperation during my training program.

I would like to express my sincere thanks to all technical & administrative personnel for extending their support, help and cooperation during my training program.

THANK YOU ALL

