

# **General Training report on Radiation Health Hazards and Protection**

***Presenter: Dr. Sariful Haque Bhuiya***

**16 December, 2016**

# 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



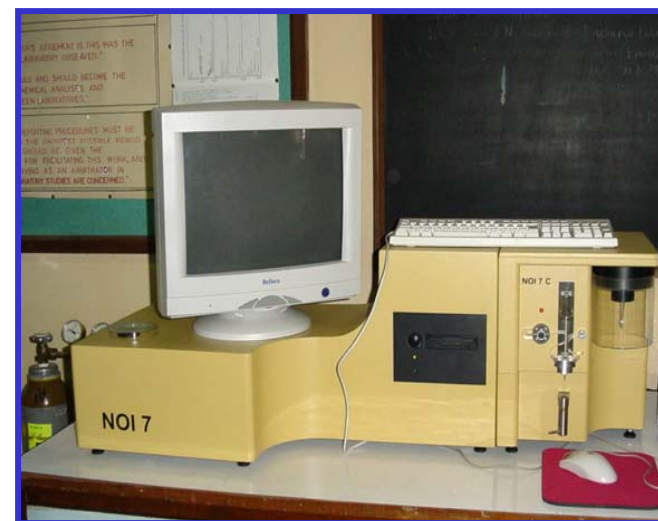
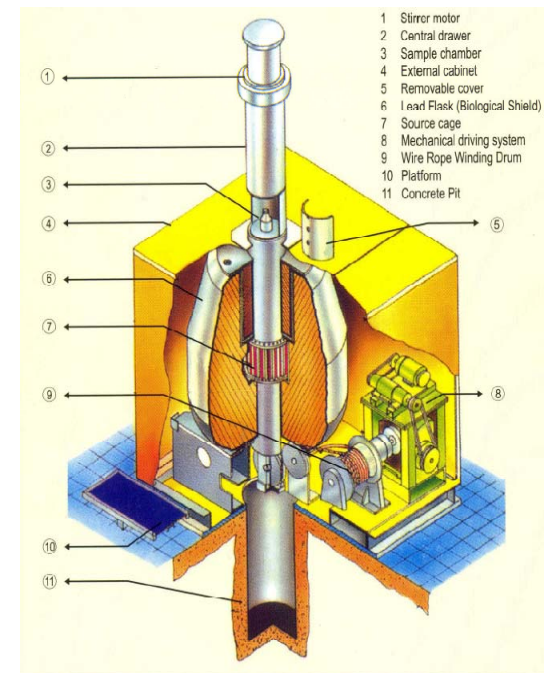
# Mandate of BINA

**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

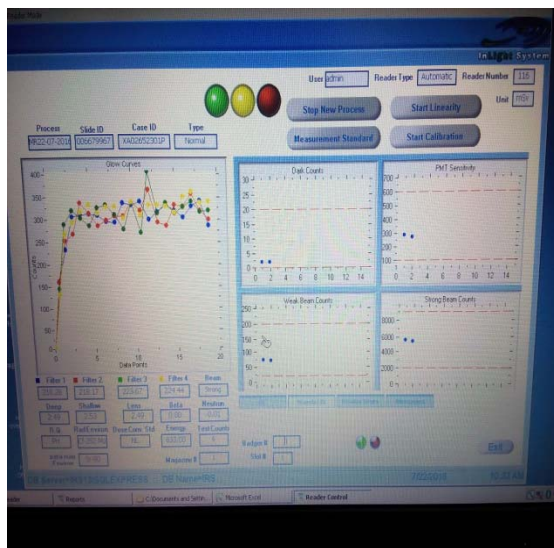
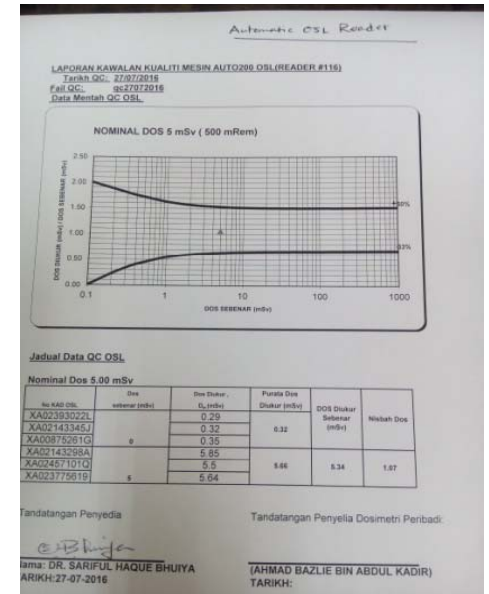
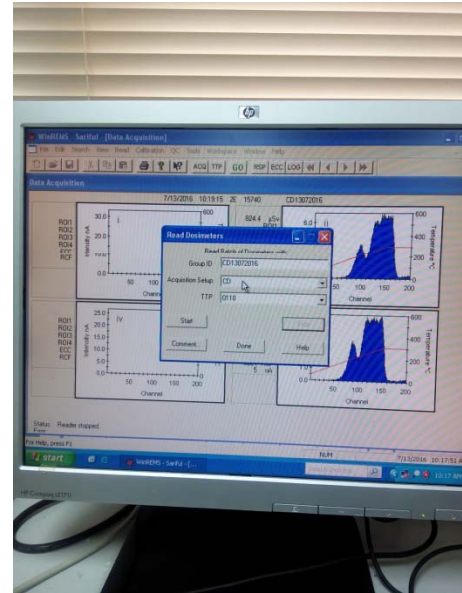
**General:** *Radiation protection and dosimetry aspect*

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'Iasha, 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)

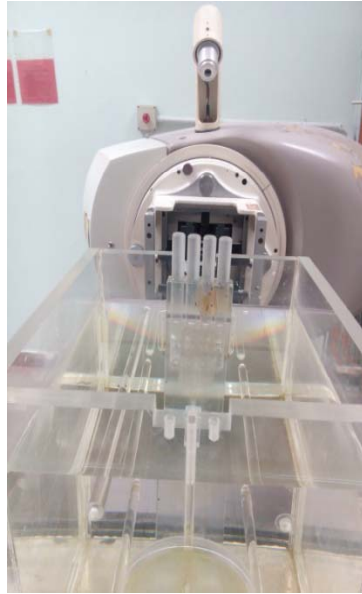


## **SSDL (High Dose Dosimetry)**

- **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)

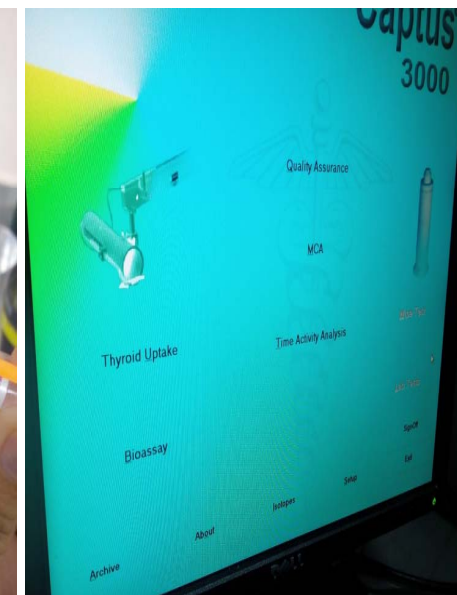
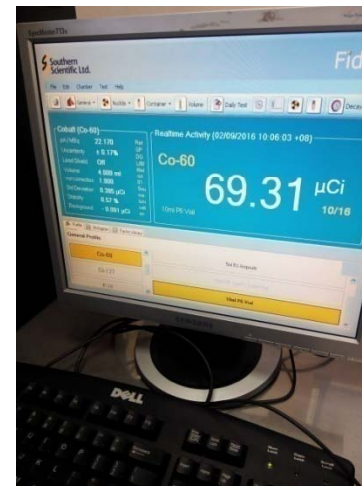


# Medical Physics

- **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

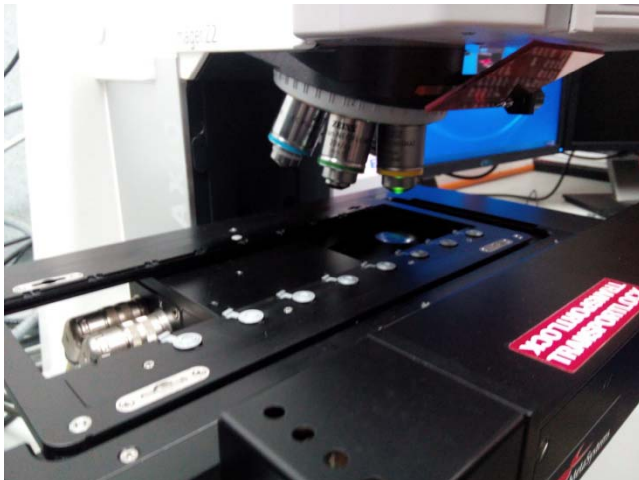
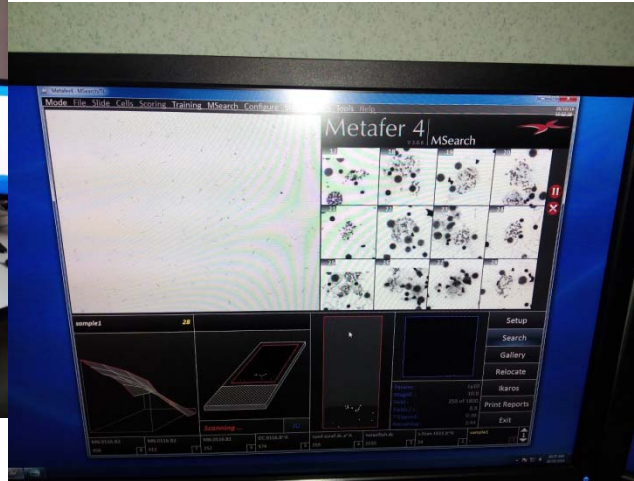


# **Biodosimetry**

- **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

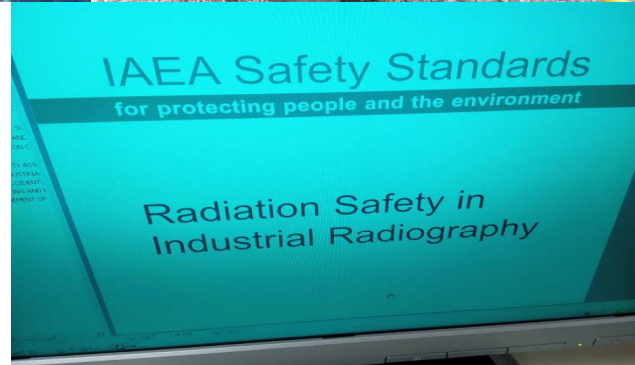


# **NDT Practice**

- **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.**

**I would like to express my sincere appreciation, heartfelt gratitude and cordial thanks to my honorable supervisor, Dr. Wan Saffiey Wan Abdullah, for his continuous guidance, invaluable instructions and thoughtful advice during the 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

