MEASUREMENT OF URANIUM CONCENTRATION IN SEA WATER

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ABSTRACT

This research was conducted at Pantai Jeram, Kuala Selangor. There are six sample of sea water were taken from 100 meter to 600 meter distance from the beach. U- 235 concentration are almost equal for all distances with only a little fluctuations. Intensity for U-235 is 9,500 CPS and for U-238 is 10,050 CPS.

ABSTRAK

Kajian ini dijalankan di Pantai Jeram, Kuala Selangor. Terdapat enam sampel air laut diambil dari jarak 100 meter hingga 600 meter dari pantai. Kepekatan U-235 hampir sama dengan semua jarak dengan sedikit perubahan. Intensitas untuk U-235 adalah 9,500 CPS dan untuk U-238 adalah 10,050 CPS.

Keywords: ***uranium, sea water, concentration.***

INTRODUCTION

Uranium is a heavy metal used as a source of concentrated energy for 60 years. Uranium exists in most rocks in concentrations of 2 to 4 parts per million. Uranium exists in seawater, and can be recovered from the oceans. The chemical symbol for uranium is U -238 and U- 235 . Exposure to radioactive substance has a very bad effect on humans. Radiation emitted from uranium is believed to be able to damage the human genetic system which leads to cancer and other illnesses over a long period of time. Objective of this work is to determine the uranium concentration in seawater samples of the Jeram coastal area. The study involved by taking sea water samples at Kuala Selangor beach, with up to 600 m from the beach. Measurement of uranium concentration in seawater samples is conducted with Hand- Held Radioisotope Identifiers machine . Data obtained are compared with others.

MATERIALS AND METHOD

Sample collection and preparation

Samples were taken by boat at 100 m, 200 m, 300 m, 400 m, 500 m, 600 m from the beach. Coordinate for each location were noted. Samples were put in bottles, then were brought to the laboratory at Malaysian Nuclear Agency, Bangi, Selangor.

Sample Preparation

Firstly, empty bottle weight was measured using the Lab Weighing Scales Balance (sartorius model Quintlx2102, see Figure 1. Sartorius Secura 2102-1S is a precision laboratory balance features a touch screen display that incorporates a graphical user interface optimized for users in pharmaceutical laboratories.

Secondly sea water was poured into each previous empty bottle and label were put on every bottle indicating the distance from 100 meter to 600 meter. Then, its weights was measured again. These steps were repeated for all samples collected.

All samples were then kept at room temperature (25°C) for three weeks before measurement was conducted.

Measurement with Hand-Held Radioisotope Identifiers (HHRIDs)

Samples were measured by using The ORTEC Detective-EX®-100T portable nuclide identifier which uses both a high-purity germanium (HPGe) detector for identification using gamma-ray emissions and a moderated neutron detector for detection of the neutron emissions. Each sample of seawater was measured for 12 hours.

Internal HPGe Detector

Crystal Nominal Dimensions: 65 mm diameter x 50 mm deep.

P-type high-purity germanium. Coaxial construction.

Gamma Dose Rate Detector

Two detectors determine the gamma dose rate over a wide range from <0.05 µSv/h to >10000 µSv/h, a dose rate range of around six decades. For low dose rates, below ~20 µSv/h, the dose rate is determined from the Ge detector spectrum. For dose rates above this value, the internal compensated GM tube is used. Instrument switches between the two automatically, see Figure 1.

Figure 1. ORTEC Detective-EX®-100T Detector.

Positioning The Sea Water Sample In The detector

Each sample was placed at a distance of 2 cm from the surface of the detectors probe, see Figure 2 and 4.

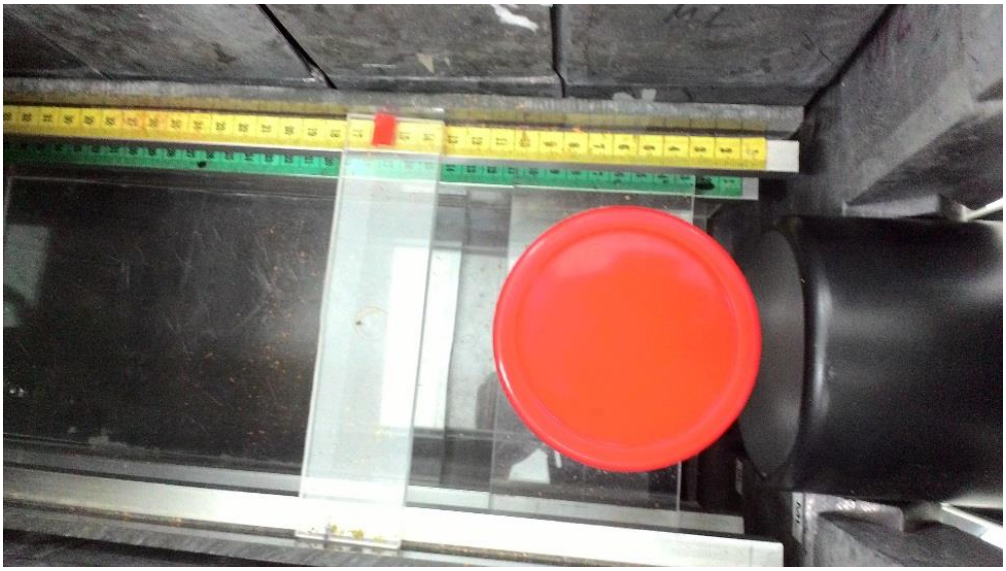

Figure 2. The Position Of The Seawater Sample Located in the detector.

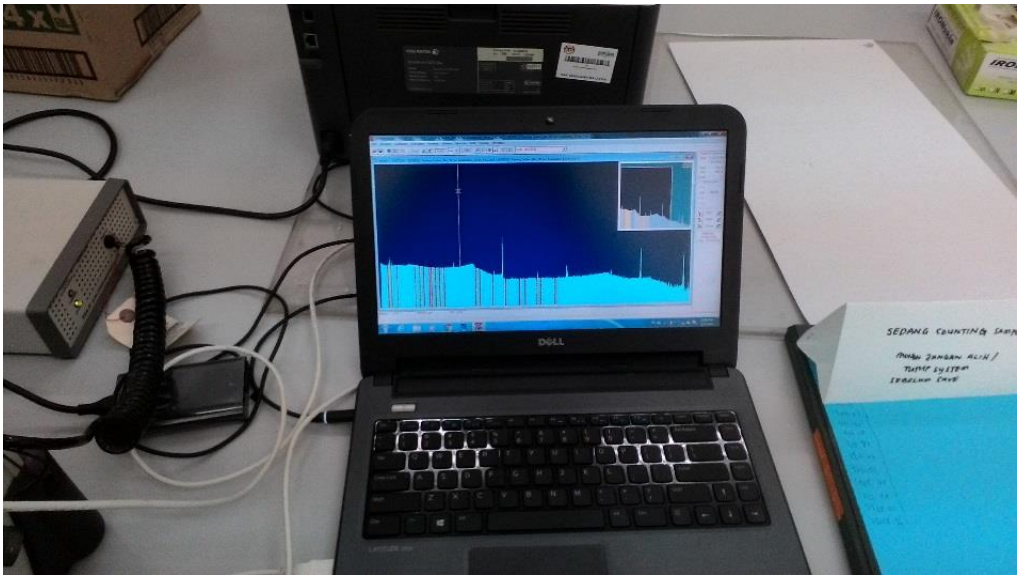

Figure 3. Result of Sample measurement.

RESULTS AND DISCUSSION

Figure 4 shows the peak energy for U-235 from 100 meter to 600 meter of distance. U-235 concentration is almost equal for all distances with only a little fluctuation. The peak for U-235 was obtained from the energy of 186 kilo electron Volt. The intensity for U- 235 is 9,500 CPS.

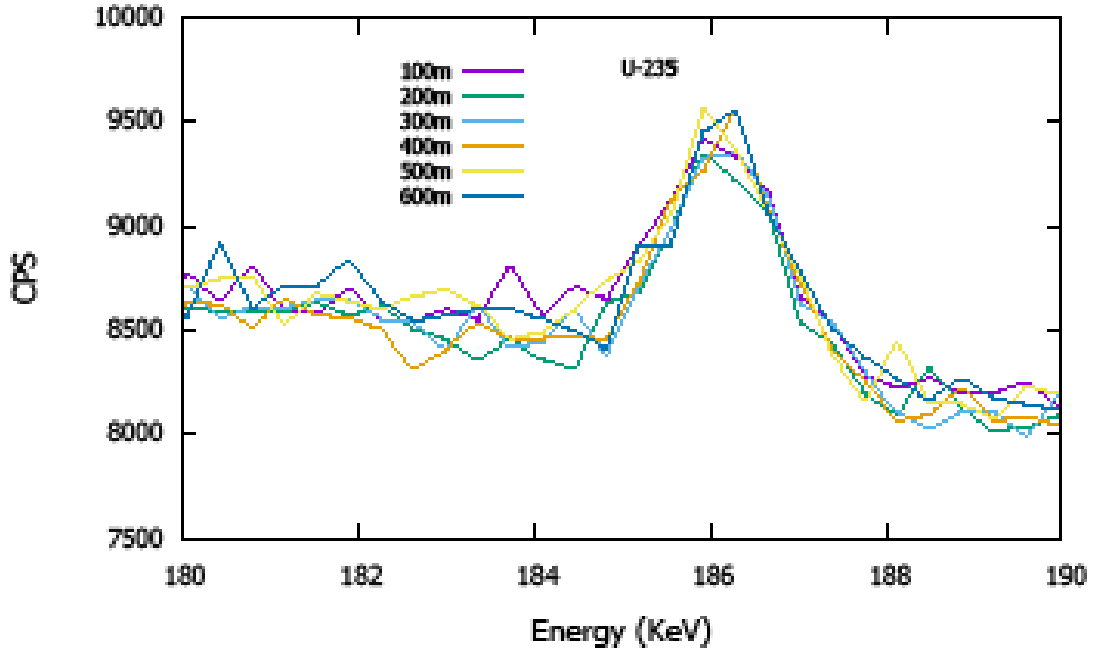

Figure 4. Peak energy for U- 235 for 100 meter to 600 meter distance.

Figure 5 shows the peak energy for all radionuclides obtained. There are U-235 at energy of 180 kilo electron volt, Th-232 at energy of 240 kilo electron volt, U- 238 at energy of 250 kilo electron volt, and Th- 232 at energy of 510 kilo electron volt. In addition, there are Th- 232 at energy of 590 kilo electron volt and U- 238 at energy of 610 kilo electron volt.

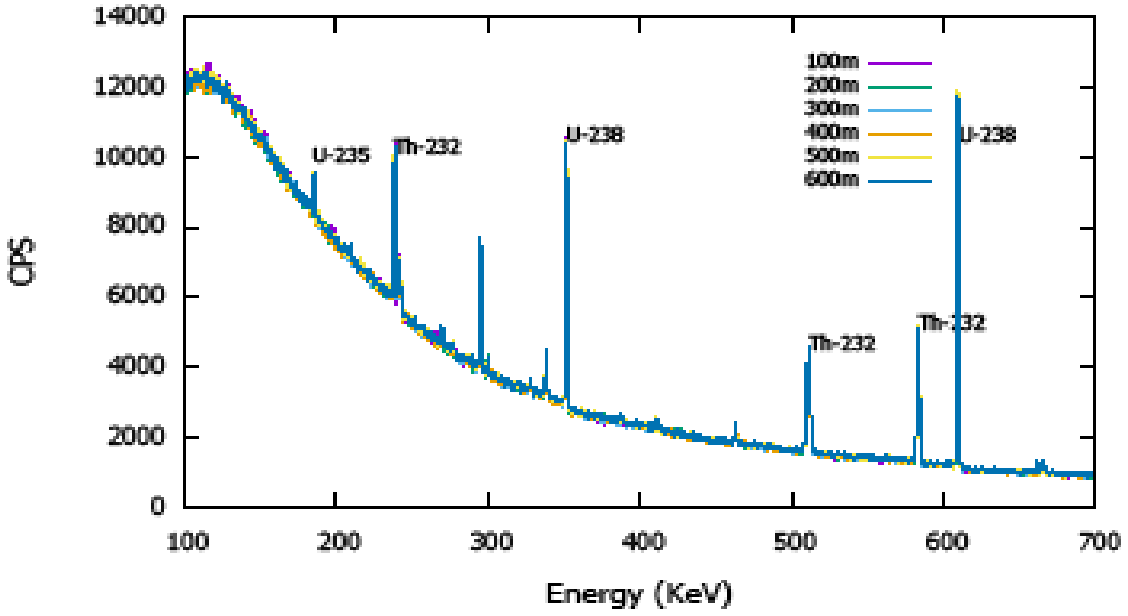

Figure 5. Peak energy for all radionuclides obtained.

Figure 6 shows the peak energy of U- 238 for 100 meter to 600 meter of distance. The peak for U- 238 was obtained from the energy of 352 kilo electron volt. Intensity for U- 238 is 10,050 CPS.

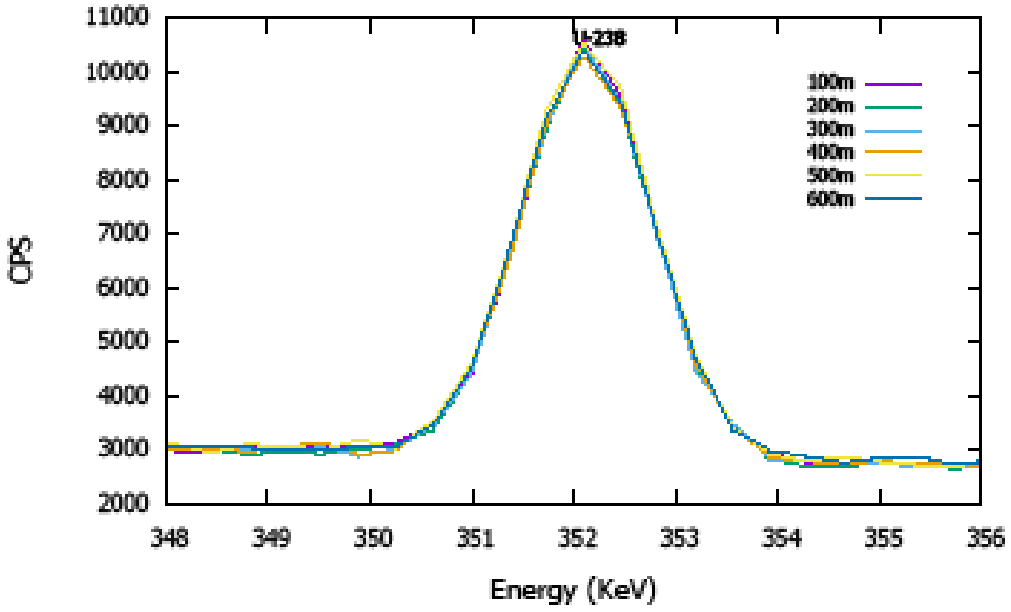

Figure 6. Peak energy for U- 238.

Figure 7 shows the second peak energy of U- 238. The peak was obtained from energy of 610 kilo electron volt. Intensity is 11,050 CPS.

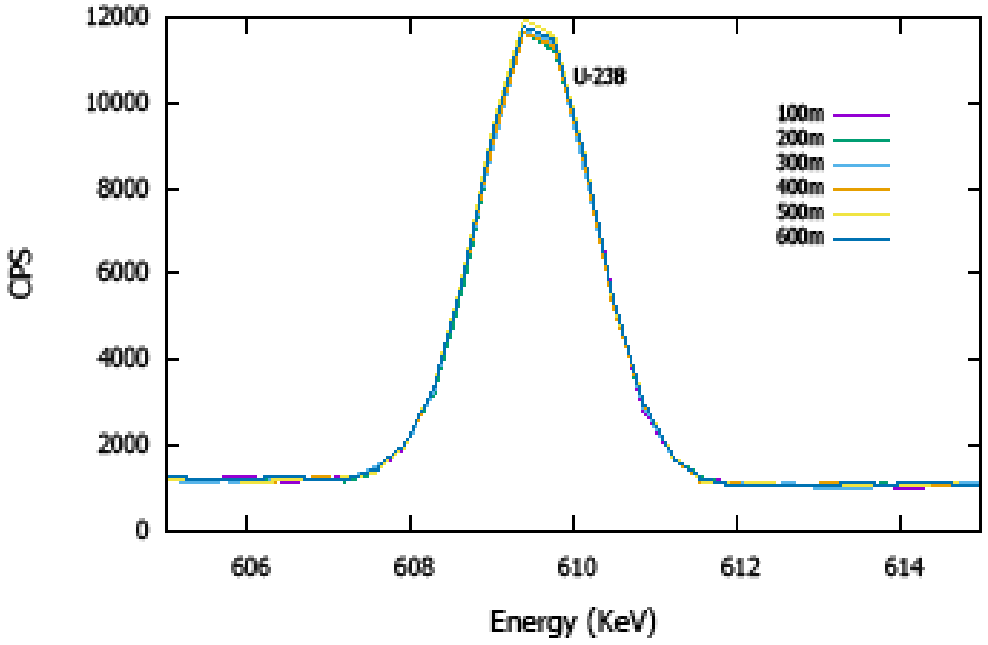

Figure 7: The second peak energy of U- 238.

CONCLUSION

U-238 and U-235 concentrations in sea water were measured and their ratio were observed to conformed to the worldwide standard. Distance from the beach did not affect their concentration. The intensity of U-235 is 9,500 CPS and U-238 is 10,050 CPS.

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