Proficiency Test Program Involvement as a Tool for External Quality Control for Radiochemistry and Environmental Laboratory, Malaysian Nuclear Agency

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ABSTRACT

As the only Laboratory in Malaysia under the IAEA Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) Network, the Radiochemistry and Environmental Laboratory (RAS), Malaysian Nuclear Agency participates in the proficiency test programmes organised by ALMERA to achieve mutual acceptance of analytical data. The ALMERA has been providing quality support of proficiency tests using sets of different samples matrices and radionuclide levels typically encountered in environmental and food monitoring laboratories. The involvement of RAS laboratory in the IAEA proficiency tests gives opportunity to improve the laboratory's capability and personel skills in the field of radioactivity testing.

INTRODUCTION

RAS Laboratory is one of the 156 laboratories representing 85 countries around the world in the ALMERA Network. As the only Malaysian laboratory in the network, RAS regularly receives samples in different matrices from IAEA for proficiency test programme (Table 1). Samples received include water, soil, sediment, seaweed, grass, spinach, rice, flour, hay, aerosol, filter, and phosphogypsum, and for measurement of different radionuclides. Test results must be submitted to IAEA within the given time frames and the laboratory performance are reported in IAEA Analytical Quality in Nuclear Applications Series. The performances of our laboratory in past PTs are presented to indicate our competency and the success of QA practiced in RAS radioanalytical testing.

Table 1: PTs and interlaboratory comparisons involved by RAS laboratory

Year	Proficiency Test/ Interlaboratory comparison	RAS laboratory participation
2006	Gamma emitting radionuclides in water, soil and grass	Completed (Lab no:308)
2008	Naturally occurring radionuclides in phosphogypsum IAEA-CU-2008-04	Completed (Lab no: 266)
2012	Intercomparison exercise in the frame of IAEA RAS 7019 Harmonizing Nuclear and Isotopic Techniques for Marine Pollution Management at the Regional Level IAEA-RML-2012-01	Completed
2012	Natural and artificial radionuclides in water, hay and soil	Completed (Lab no:257)
2013	Seawater analyses of tritium, strontium-90 and caesium isotopes in relation to the accident at the Fukushima Daiichi nuclear power station IAEA-RML-2013-01	Completed
2014	Gamma-ray spectra evaluation exercise IAEA-RML-2014	Completed (Lab No:)
2015	Anthropogenic and natural radionuclides in water, brown rice and soil samples	Completed (Lab No: 22)
2015	Seawater analyses of tritium, strontium-90 and caesium isotopes in relation to the accident at the Fukushima Daiichi nuclear power station IAEA-RML-2015-02	Completed (Lab No: 3)
2016	Determination of natural and artificial radionuclides in water, vegetation and sediment samples	Completed (Lab No: 42)

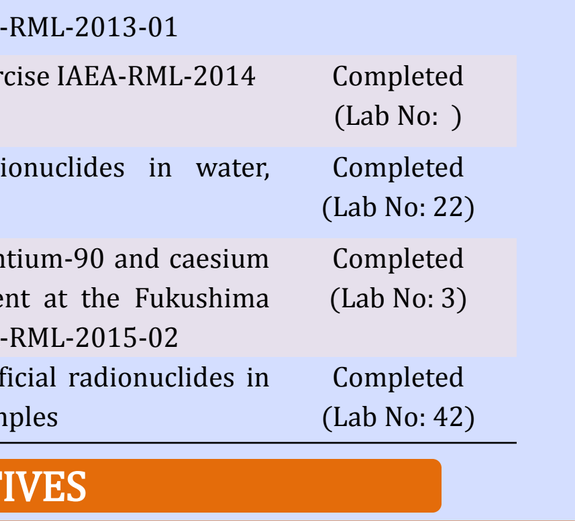
OBJECTIVES

1) To evaluate RAS performance and capability in the analysis of various radionuclide with different sample matrices
2) To identify gaps and problem areas where further development is needed

METHODS

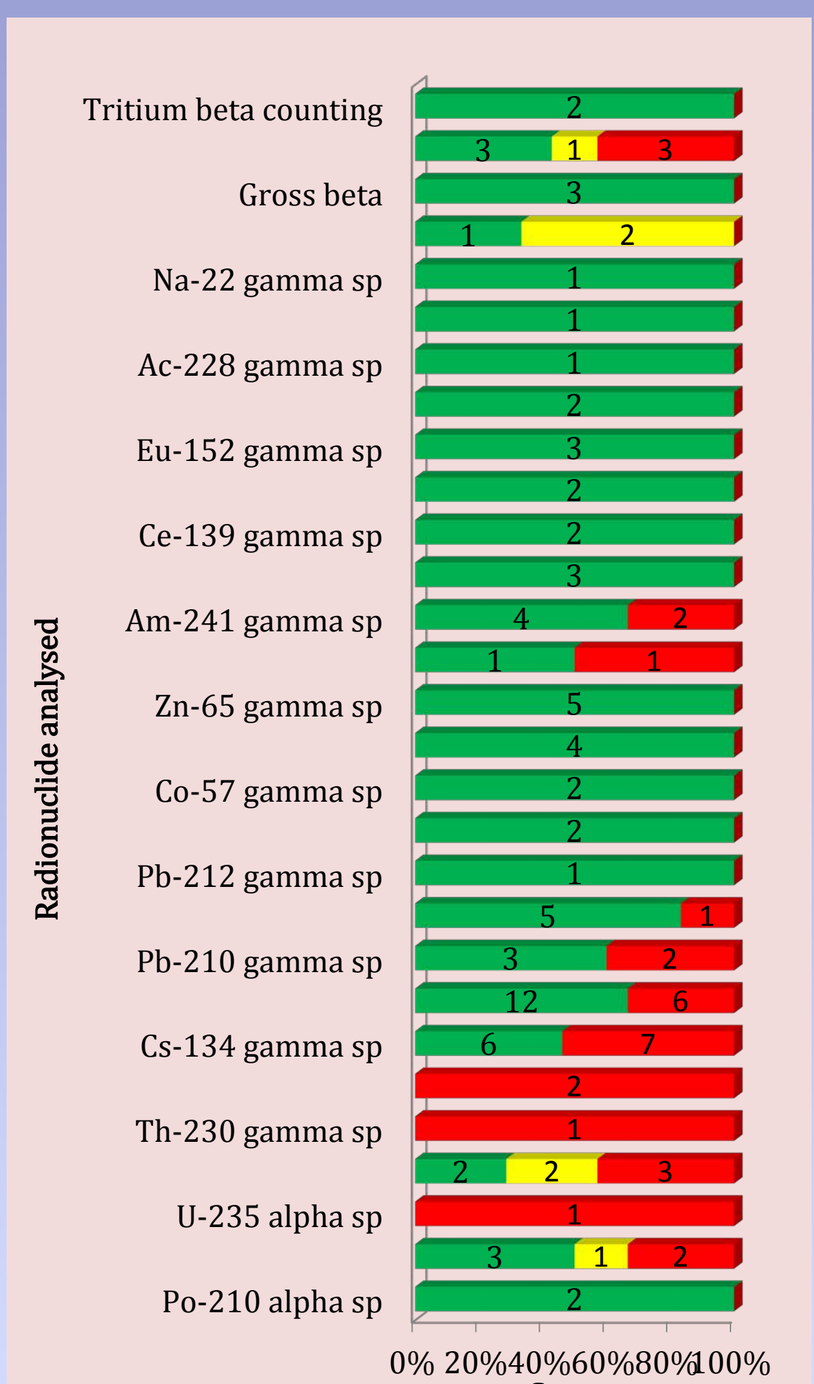
1. A result must pass accuracy and precision test to be awarded the status 'Accepted', otherwise it lies on the status 'Warning' or 'Not Accepted' (Fig 1).
2. PT results showed in graphical summary allowing an overview of the performance according to radionuclide and counting facilities (Fig 2).
3. Matrix analysis used as a tool to indicate the significant laboratory gaps for certain analytes (Fig 3).

Fig 1: The evaluation of PT results



RESULTS

Fig 2: Graphical summary

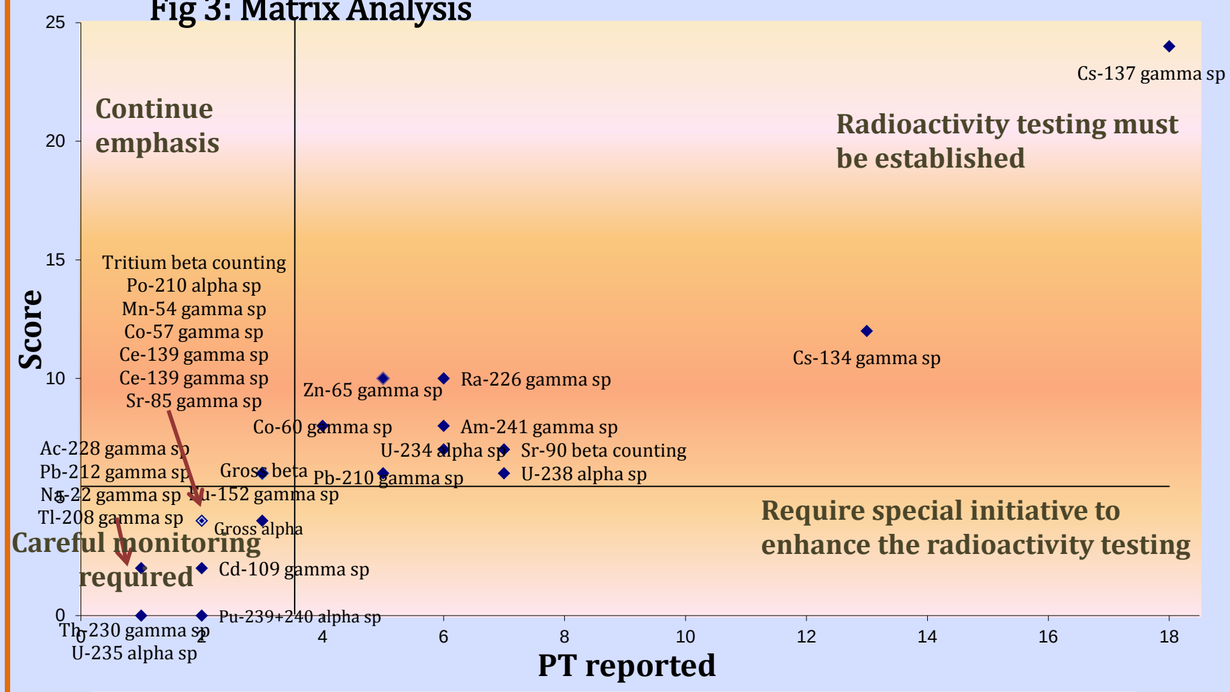


Colour coding: "accepted"– Green, "warning" – Yellow, "not accepted" – Red

Overall PT performance (2006-2015)

Score	Number, Percentage (%)
Accepted	76(67.0%)
Not accepted	31(27.5%)
Warning	6(5.5%)
Total	109

Fig 3: Matrix Analysis



Radionuclides	Good performance	Decrease performances
Gamma-ray emitting radionuclides	^{226}Ra, ^{241}Am, ^{137}Cs, ^{134}Cs, ^{65}Zn, ^{210}Pb, ^{60}Co, ^{152}Eu, ^{40}K, ^{22}Na, ^{208}Tl, ^{228}Ac, ^{212}Pb,	^{109}Cd, ^{230}Th
Gross alpha and gross beta	Gross beta and tritium analysis	Gross alpha analysis
Radionuclides require radiochemical separation analysis	^{210}Po, ^{234}U, ^{238}U, ^{90}Sr	$^{39+240}$Pu

CONCLUSION

Proficiency test results allow an assessment of the analytical difficulties encountered by RAS laboratory. Further efforts should be invested in the development of analytical techniques and method validation to improve analytical performance of RAS laboratory even though the performance of the instruments in the laboratory always controlled using the QA material. Continuous improvement is needed in conducting the analytical test to produce high quality analytical results.

ACKNOWLEDGMENT

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