An Analysis of Radionuclide Laboratory Operations in Future Integrated Field Exercises

JI Friese1, J Kastlander2, A Rizzo3, P Thompson4
1Pacific Northwest National Laboratory, 2Swedish Defense Research Agency (FOI), 3ENEA Italy, 4Atomic Weapons Establishment, U.K.

One major goal of an integrated field exercise (IFE) is to learn technical lessons from the experiences of the participants. The author had the opportunity to spend a number of hours in the Base of Operations (BOO) radionuclide (RN) laboratory during Integrated Field Exercise 2014 (IFE14). During this experience, many lessons were learned. While there were many aspects of the laboratory operations that went well, some aspects could be improved. Ultimately, the IFE experience offered an opportunity to reevaluate what laboratory operations should look like in future exercises and during an On-Site Inspection (OSI) itself. This poster presents the analysis of how a future laboratory could operate based on these experiences at IFE14. This includes procedures and equipment needed for the successful operation of an RN laboratory for OSI as well as the type of training needed for the inspectors.

Standard Software Solutions

The analysis of spectra in an OSI should be standardized and offer few issues to the analysis. The inspector should be familiar with all aspects of the software.

The OSI RN laboratory should utilize standard commercial software analysis tools. Most inspectors in the RN laboratories only perform OSIs periodically and operate gamma-counting software at their home institutions using commercial software. This should be the same software used in the RN laboratory as in an OSI.

Examples of Commercial Software

Examples of Commercial Portable HPGe

Laboratory Detectors Used in IFE14

<table>
<thead>
<tr>
<th>Detector ID</th>
<th>Entrance Window Thickness</th>
<th>Crystal Diameter</th>
<th>Crystal Length</th>
<th>Core diameter</th>
<th>Core length</th>
<th>Endcap Material</th>
<th>Ge distance from window</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN01</td>
<td>1.3 mm</td>
<td>74 mm</td>
<td>65 mm</td>
<td>11.5 mm</td>
<td>51 mm</td>
<td>Aluminum</td>
<td>1.5 mm</td>
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<tr>
<td>CAN02</td>
<td>1.3 mm</td>
<td>74 mm</td>
<td>65 mm</td>
<td>11.5 mm</td>
<td>51 mm</td>
<td>Aluminum</td>
<td>6 mm</td>
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<tr>
<td>ORT01</td>
<td>3.2 mm</td>
<td>87.9 mm</td>
<td>96.1 mm</td>
<td>14.2 mm</td>
<td>90.7 mm</td>
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<td>ORT02</td>
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<td>85.6 mm</td>
<td>105.1 mm</td>
<td>12.1 mm</td>
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<td>Aluminum</td>
<td>5 mm</td>
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<td>ORT03</td>
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<td>89.4 mm</td>
<td>76 mm</td>
<td>11.9 mm</td>
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<td>ORT04</td>
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<td>82 mm</td>
<td>105.5 mm</td>
<td>9.1 mm</td>
<td>91.7 mm</td>
<td>Aluminum</td>
<td>1.5 mm</td>
</tr>
</tbody>
</table>

Operations and Troubleshooting the RN Lab

Field environments are sometimes harsh and often unpredictable. The laboratory provided for IFE14, as contribution in kind from the United Kingdom, was generally a good environment for a field RN laboratory for the exercise (e.g., good shielding, air conditioning). Tools needed for trouble shooting detector systems are needed in an OSI. This may include but is not limited to oscilloscopes, hot single isotope standards, and extra equipment including cables and connectors.

Conclusions

IFE14 offered a unique location to test equipment in a field setting. Many aspects were tested and two main aspects were identified for improvement. First, using standard software suites that are commonly available in gamma-ray measurement laboratories world-wide would aid in the speed and quality of analysis. Secondly, it was observed that the only detectors that were operating to manufacturer’s specifications were the portable detectors. These robust detectors were better suited to operate in the field setting and should be considered for use in the BOO laboratory in addition to field teams.

Dr. Judah Friese
Pacific Northwest National Laboratory
P.O. Box 999, MSIN J4-65Richland, WA 99354
(509) 375-1778 Judah.Friese@pnnl.gov

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