The RadAssessor Manual

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Contents

1	Introduction.....	1
1.1	History of RadAssessor.....	1
1.2	What is RadAssessor?.....	2
1.3	Identification Categorization	4
1.4	RadAssessor System Architecture	7
2	RadAssessor Basics	9
2.1	Getting Started	9
2.2	System Requirements.....	9
2.3	Request an Account	10
2.4	Log In.....	11
2.5	RadAssessor Page Layout.....	14
2.6	Menus.....	17
2.7	Online Tutorial.....	17
3	Identification Results	19
3.1	Selection Pages	19
3.2	Check Boxes	20
3.3	Download Images	20
3.4	“Spectrum” Queries	21
3.4.1	To Open the Spectrum Page	21
3.4.2	Select Spectra to Display	22
3.4.3	“Display Spectrum” Results	23
3.5	“Identification Performance” Queries.....	24
3.5.1	To Open the Identification Performance Page.....	24
3.5.2	How to Use the Identification Performance Query.....	25
3.5.3	Display the Identification Performance Pie Chart	26
3.6	“Known Source Isotope” Queries.....	28
3.6.1	To Open the Known Source Isotope Page	28
3.6.2	How to Use the Known Source Isotope Query	29
3.6.3	Display Known Source Isotope Results.....	30
3.7	“Known Instrument Identification” Queries.....	31
3.7.1	To Open the Known Instrument Identification Page	31
3.7.2	How to Use the Select Known Instrument Identification Query	32
3.7.3	Display Known Instrument Identification Results.....	33
4	Additional Information	35
4.1	Filter Section.....	35
4.1.1	Alphanumeric Filter	37
4.1.2	Numeric Filter	38
4.1.3	Searching for Wildcards as Literals	38
4.2	Sorting Results	39
4.3	“Instrument Models” Query.....	40
4.3.1	To Open the Instrument Models Page	40

4.3.2	To View All Instrument Models	41
4.3.3	To Filter Instrument Models	42
4.3.4	To Select an Instrument Model to Display	43
4.4	“Model Distributors” Query	44
4.4.1	To Open the Model Distributors Page	44
4.4.2	To View All Instrument Model Distributors	45
4.4.3	To Filter the Model Distributors	46
4.5	“Shielding” Query.....	47
4.5.1	To Open the Shielding Page	47
4.5.2	To View All Shielding	48
4.5.3	To Filter Shielding	49
4.5.4	To Select a Shielding Material to Display	50
4.6	“Category 12 MAIs” Query	51
4.6.1	To Open the Category 12 MAIs Page.....	51
4.6.2	To View all Categories	52
4.6.3	To Filter Category 12 MAIs	53
4.6.4	To Select a Single Category 12 MAI to Display	54
5	Your Account.....	55
5.1	Log In.....	55
5.1.1	To Open the Log In Page	55
5.1.2	To Log In	56
5.1.3	Log In Problems.....	57
5.2	Log Out	59
5.2.1	To Log Out of RadAssessor.....	59
5.3	Lost Username or Password.....	60
5.3.1	To Open the Lost Username or Password Page.....	60
5.3.2	To Get Your Username or Set a New Password.....	61
5.3.3	Reset Password Page.....	62
5.4	Change Account.....	63
5.4.1	To Open the Change Account Page	63
5.4.2	To View or Change Account Information	64
6	Help.....	65
6.1	Documentation	65
6.1.1	To Open the RadAssessor Online Tutorial	65
6.1.2	To Use the Online RadAssessor Tutorial.....	66
6.2	Contact Developers	68
6.2.1	To Open the Contact Developers Page	68
6.3	About.....	69
6.3.1	To Open the About Page.....	69
	Resources and Additional Reading	71
	Index	76

THIS manual will describe the functions and capabilities that are available from the RadAssessor database and will demonstrate how to retrieve and view its information. You'll learn how to start the database application, how to log in, how to use the common commands, and how to use the online help if you have a question or need extra guidance. RadAssessor can be viewed from any standard web browser. Therefore, you will not need to install any special software before using RadAssessor.

1.1 History of RadAssessor

The RadAssessor database system was developed to characterize data accumulated from commercial handheld radiation detectors and evaluate the radiation detection performance of the instruments (Figure 1). Previously, performance data from these handheld isotope-identifying instruments was unmethodically collected in laboratory notebooks, instrument memory, spreadsheets, data files, publications, or within an operator's memory, and it frequently had not been interpreted. It appeared in different formats, some of which were proprietary. Therefore, it was difficult to assimilate, interpret, or disseminate the detector performance data that had been compiled. It was almost impossible to compare data among different instruments.

As more and more commercial instruments became available, the number of measurements being taken grew larger and so did the number of radiation sources being measured. However, the sources that were being measured in experimental laboratories were not readily available to outside agencies that needed the results. Clearly, a solution was needed that could address all of these challenges.

Figure 1. Data acquisition using several different detector models (left). One of the radioactive sources used during data acquisition was 4.5 kg of ^{239}Pu .

In response, the RadAssessor database system was created. Existing and newly acquired data was assembled in the database, and measurement findings were evaluated. These findings have been integrated into a single, central repository that provides easy access to authorized users. Users can log in using a standard web browser and easily build queries based on the data, including information about particular detectors, isotopes, or shielding combinations.

1.2 What is RadAssessor?

The RadAssessor database is a central repository for information collected from handheld radiation detectors. There are countless ways this information can be used. For example, you can compare a particular detector with another detector. Or you can compare a detector's performance with special nuclear material to its performance with naturally-occurring radiation.

RadAssessor is a tool to help you determine a radioactive threat level by giving you known information about an instrument's performance and its radioactive source measurements. Handheld radiation detectors are important in first-responder programs for detecting illegal radioactive materials and reducing the threat of a terrorist attack. However, to prevent a radiological terrorism attack, you must be able to find the radiological material and distinguish it from legitimate radioactive sources.

It is also necessary to identify the isotopes in interdicted radioactive material. Handheld isotope-identifying instruments can be used to reveal the presence of radioactive material, localize the material, identify the radioactive isotopes, and determine the threat level. RadAssessor summarizes the performance of different handheld isotope-identifying instruments by compiling their radiation detection and identification results. A comprehensive understanding of each instrument's performance makes it easier to rapidly and accurately interpret the data and assess the threat.

Few commercial radiation detectors consistently interrogate questionable cargo accurately, and no detector has yet been able to meet all of the first responder's needs. Therefore, until technology provides a convenient, affordable, and robust instrument that can identify isotopes in a wide variety of circumstances when operated by responders with varying levels of training, it will remain important to carefully evaluate your intended use of an instrument and the conditions under which it will operate before selecting one. Studying the responses of various detectors to various sources of radiation is a good way to help you determine which instrument to buy.

In addition to previously acquired performance data, measurements taken under laboratory conditions have expanded both the number of instruments tested and the sources measured. Gamma-isotope identification and neutron-response findings have also been added. The instrument performance data and findings currently available in RadAssessor include information about radiation detectors, radioactive sources, shielding, experiments, detailed measurement results, spectra, and measurement performance categorizations, shown in Figure 2.

Figure 2. Major components of the RadAssessor database.

Measurement performance categorizations are used to categorize gamma identification results and are based on defining the most abundant isotopes (MAIs) identified during a measurement. There are currently two categorizing systems that provide an initial high-level understanding of an instrument's performance and a more detailed understanding with additional granularity. (See section 1.3, Identification Categorization, below, for additional information.)

<div> RadAssessor Instrument Identifications Based on Known Source Isotope </div> <div> Sharon Seltz is logged in Logout UNCLASSIFIED </div> <div> RadAssessor Home Identification Results Additional Information Your Account Help </div>			
Instrument Identifications Based on Known Source Isotope			
Generated list of all Instrument Findings that have been reported when the Instrument was asked to identify the selected Source Isotope(s).			
Instrument Model	Source Isotope	Instrument Findings	Number of Occurrences (Total= 206)
Instrument A	Pu-239	Unknown	36
Instrument B	Pu-239	Am-241	23
Instrument A	Pu-239	Am-241	16
Instrument A	Pu-239	Pu-239	16
Instrument A	Pu-239	Unknown Isotope	15
Instrument B	Pu-239	Cs-137	13
Instrument A	Pu-239	No Nuclide Found	11
Instrument A	Pu-239	I-131	10
Instrument B	Pu-239	Pu-239	10
Instrument A	Pu-239	Cs-137	8

Figure 3. RadAssessor generated measurement results when the instrument was measuring a ^{239}Pu source.

RadAssessor features a web-based interface for selecting instruments, isotopes, and shielding combinations. Dynamically generated screens are based on the most recent data that has been added into the database. Graphics and textual results are generated and presented instantaneously. Figure 3 shows what an instrument might report when measuring a known radiation source, information that could be vital for quickly identifying a potential threat.

1.3 Identification Categorization

A detailed categorization system that grades the accuracy of an instrument's gamma identification has been added to RadAssessor. There are two ways to get measurement performance results—by the five-category system or the twelve-category system.

In the five-category categorization system, the categories are Correct, Conditionally Correct, Minor Daughter, False Negative, and False Positive. This system will provide a high-level understanding of an instrument's performance.

However, when a more detailed understanding of measurement performance is desired, the 12-category system is available. As an example, the additional categories would help differentiate between an identification failure caused by the absence of an isotope in the instrument's library and a failure where the isotope was in the library. If the additional granularity is not needed, the 12-category system can easily collapse back into the five-category system.

Both category systems rely on defining the MAIs. If the radiation source is a single object, the MAIs are the radioisotopes that are present with an atomic abundance of at least 10%. If the radiation source consists of two or more individual objects, the atomic abundance used to define the MAIs is the gamma-ray flux (at the detector) weighted average of the atomic abundances of each individual object. For example, if two individual isotope button sources such as ^{137}Cs and ^{60}Co were placed so that the gamma-ray flux at the detector is the same for each, they would both be considered to have 50% abundance and, therefore, both would be considered as the MAIs.

The grading approach, or method used to assign grades to the detectors' performance, is shown in Table 1. The grading approach for isotope-identifying instruments is based upon the type of source being measured, whether any or all MAIs were found, and the instrument identifications reported.

Table 1. Grading Approach for Isotope-Identifying Instruments

Source	Instrument Identifications Reported	Grade
Background		
	ALL (Background, NoID, or MD)	C2
	Any Incorrect ID	FP1
Non-Background		
All MAIs Found	MAIs BOGUS or MD or BKG	C2
All MAIs Found	MD or BKG Any MAI BOGUS	C2
All MAIs Found	MAI MD or BKG MAI	C2
All MAIs Found	BOGUS or NoID ALL MAIs	CC2
NOT All MAIs Found	MAI BOGUS or MD or NoID or BKG MAI	C1
NOT All MAIs Found	MAI BOGUS or MD or NoID or BKG	C1
NOT All MAIs Found	MD or BKG MAI	C1
NOT All MAIs Found	BOGUS or NoID MAI	CC1
Not C or CC	Any MD	MD
	ALL NoIDs or Empty (at least 1 MAI in LIB)	FN1
	ALL NoIDs (MAI not in LIB)	FN2
	ALL NoIDs or Background (at least 1 MAI in LIB)	FN3
	ALL NoIDs or Background (MAI not in LIB)	FN4
	BOGUS or Background (at least 1 MAI in LIB)	FP2
	BOGUS or Background (MAI not in LIB)	FP3

Below are the definitions of the 12 categories.

- Correct 2 (C2) means the instrument correctly identified all MAIs present as the isotopes identified with the most confidence or with confidence less than only a Minor Daughter (see definition below). Or, in the case of background, it means it identified either nothing or only ^{40}K (which occurs naturally in the environment).
- Correct 1 (C1) means the instrument correctly identified at least one MAI present when there was more than one, but not all MAIs with the highest confidence or with confidence less than a Minor Daughter (see definition below).
- Conditionally Correct 2 (CC2) means all MAIs present were correctly identified with less confidence than something that was not present or could not be identified.
- Conditionally Correct 1 (CC1) means at least one MAI, but not all MAIs present, was correctly identified, but with less confidence than something that was not present or could not be identified.

- Minor Daughter (MD) means that the instrument identified either a daughter of an MAI, a nonpresent parent of an MAI, or a radioisotope known to be present with less than 10% abundance, but the instrument failed to identify an MAI. Examples of identifying MDs would be identifying ^{226}Ra when the source was ^{238}U or identifying ^{232}Th when the source was ^{228}Th .
- False Negative 1 (FN1) means the instrument gave no identification when a radionuclide contained in the instrument's library was present.
- False Negative 2 (FN2) means the instrument gave no identification when a radionuclide NOT contained in the instrument's library was present.
- False Negative 3 (FN3) means the instrument only identified ^{40}K when a radionuclide contained in the instrument's library was present.
- False Negative 4 (FN4) means the instrument only identified ^{40}K when a radionuclide NOT contained in the instrument's library was present.
- False Positive 1 (FP1) means the instrument incorrectly reported one or more radionuclides as being present in a background measurement.
- False Positive 2 (FP2) means the instrument incorrectly reported one or more radionuclides as being present without making any correct identification other than ^{40}K when at least one MAI was in the instrument's library.
- False Positive 3 (FP3) means the instrument incorrectly reported one or more radionuclides as being present without making any correct identification other than ^{40}K when no MAI was in the instrument's library.

In cases where only one MAI is present, the divisions of C into C1 and C2, and of CC into CC1 and CC2 are unnecessary. It should be noted that when ^{40}K is used in the above categories, it is generally used to represent naturally occurring radioactive materials. In our experience, ^{40}K is the only background isotope routinely reported by identifiers.

1.4 RadAssessor System Architecture

Figure 4 illustrates how RadAssessor runs on a Windows® platform using Apache Web Server integrated with PHP: Hypertext Preprocessor as the front-end user interface. A relational database, currently Microsoft Access®, sits at the back end as the final data repository serving up user query results. Secure Sockets Layer (SSL) protocol creates a secure encrypted connection between the client and the server. As a result, all authorized end users have secure access to RadAssessor through the Internet using any standard Internet browser.

The RadAssessor database is flexible enough to expand as new instruments and radioactive sources are added and is scalable to include various radiation measurement types such as gamma-isotope identification and neutron-response findings. Instrument performance data and findings that can be found within RadAssessor include data for radiation detectors, radioactive sources, source uses, isotope elements, shielding, experiments, detailed measurement results, spectra, and measurement performance categorizations. Detector information also includes detection materials, individual libraries, model details, and model distributors. User information is designed into a normalized structure of Users, Company, and Permissions. Numerous lookup tables are used throughout the system.

Figure 4. RadAssessor's system architecture provides secure, encrypted access control. Authentication and authorization requires a username and password with group privileges.

THIS chapter gives step-by-step instructions about where to find RadAssessor and how to use the menus and commands within the RadAssessor database. It also describes how to get an account started and how to use your account.

2.1 *Getting Started*

RadAssessor is an “**Official Use Only**” database that can be accessed only by authorized users with a “need-to-know”. To access the RadAssessor database, you must have a username and password for an account created by the Los Alamos National Laboratory RadAssessor team (see section 2.3, Request an Account, below).

The RadAssessor team will need to know your computer network location because only preauthorized Internet domains are allowed to access RadAssessor. If necessary, we can work with your system administrator to locate your Internet Protocol (IP) address or subnet. If you experience any problems with RadAssessor, please email the RadAssessor team at radassessor@lanl.gov.

2.2 *System Requirements*

The RadAssessor database is easily accessible with minimal system requirements. RadAssessor operates from any computer through a standard web browser when you are connected to the Internet. There is no need to compile anything nor do you need to install any extra tools to run RadAssessor.

Although your personal web browser settings may affect the look of the RadAssessor pages, they will not affect its functionality. For example, if you change your browser text size to “Large” it will not affect your usage, but the RadAssessor text may be shifted and not look optimal.

Your Internet connection speed will have an effect on your results and interaction with RadAssessor. Broadband is recommended. See your local network administrator for assistance with your connection speeds.

You may use any standard web browser to access RadAssessor. However, the following web browsers and versions have been fully tested and should be considered minimum requirements:

- Microsoft Internet Explorer, version 6.0
- Mozilla Firefox, version 1.5.0.4 and 1.5.0.5
- Netscape, version 7.2
- Opera, version 9.01
- Safari, version 2.0.4

RadAssessor requires the use of session validation through “cookies”. The default for most browsers is “cookies enabled”. To find out whether your browser is set to allow cookies, see Table 2 below.

Table 2. How to Set Your Browser to Allow Cookies

	Internet Explorer	Mozilla Firefox	Netscape	Opera	Safari
1	Click “Tools”	Click “Tools”	Click “Tools”	Click “Tools”	Click “Safari”
2	Select “Internet Options...”	Select “Options...”	Select “Cookie Manager”	Select “Advanced”	Select “Preferences...”
3	Click “Privacy” tab	Click “Privacy” icon on top	Select “Use Default Cookie Permissions”	Click “Cookies...”	Click “Security” icon on top
4	Set privacy to “Medium”	Click “Cookies” tab	If you do not want default cookies enabled as shown in the previous step, select “Allow Session Cookies from this Site” or “Allow Cookies from this Site”	In the Server manager window, click “Edit...” button	Find “Accept Cookies” and either choose “Always” or “Only from sites you navigate to”
5	If privacy is set higher than Medium, click “Advanced...” button	Check “Allow sites to set Cookies” box or use “Exceptions” button		In the Site preferences window, click “Cookies” tab	
6	If privacy is set higher than Medium, make sure “First-party Cookies” is set to “Accept” , or check “Always allow session cookies”			Click “Accept cookies” or “Accept only cookies from the site I visit”	

2.3 Request an Account

To request an account, send an email to radassessor@lanl.gov. You may be asked for more information to validate your need-to-know. The RadAssessor team will generate an account for you and will send you an email confirmation with your username and temporary password.

RadAssessor email:
radassessor@lanl.gov

The email confirmation will direct you to the RadAssessor login page, where you will log in for the first time (see section 2.4, Log In, below). You will then be directed to your personal account page where you will change your password and can either validate or change your account information.

2.4 Log In

After you receive your confirmation email, log in to RadAssessor. The first time you use your username and temporary password, RadAssessor will redirect you to your account page, where you will be asked to change your password and validate your account information (see steps below).

RadAssessor web site:
<https://radassessor.lanl.gov>

To log in to RadAssessor

1. Type in <https://radassessor.lanl.gov> to direct your web browser to the RadAssessor log-in page.

The screenshot shows the RadAssessor Log In page. At the top, the title "Log In" is centered. Below it, a dark blue header bar contains the text "Existing RadAssessor users please log in". The main form area has two input fields: "Username:" and "Password:". Below the password field is a "Login" button. At the bottom of the form, there is a link: "[Lost your username or password?](#) or having [login problems?](#)".

2. In "**Username**", enter your valid username.
3. In "**Password**", enter your valid password (or temporary password from your confirmation email).
4. Click the "**Login**" button or press the "**Enter**" key.

This screenshot shows the same RadAssessor Log In page, but with sample data entered. The "Username:" field contains "MyUserNameHere" and the "Password:" field contains a series of dots. A mouse cursor is pointing at the "Login" button. The link at the bottom remains the same: "[Lost your username or password?](#) or having [login problems?](#)".

RadAssessor will validate your user information and will display the message shown in Figure 5 if the login attempt is successful.

- Click the “OK” button to acknowledge that you have accepted the Official Use Only terms.

Figure 5. “Official Use Only” acceptance page. Click “OK” to continue.

- The first time you log in, you will be directed to the “**Your Account Information**” page (Figure 6). From here you must change your temporary password and may update your account information (see chapter 5, Your Account, below).

Figure 6. As a first-time user, you must change your temporary password.

- RadAssessor will validate your information and take you to the RadAssessor Home Page (Figure 7). From the Home Page, you'll have access to the entire RadAssessor database.

Figure 7. RadAssessor Home page displays upon successful log in.

2.5 RadAssessor Page Layout

RadAssessor has a consistent user interface to help you learn and maneuver through the application quickly. The user interface, accessed through your web browser, provides

- quick and easy access,
- freedom from any software installations on your local hard drive,
- a guarantee that you will be using the latest data and software versions,
- consistent system performance regardless of your local operating system,
- the ability to access RadAssessor from almost anywhere, and
- the ability to update and maintain RadAssessor without distributing and installing software on numerous computers and without disrupting your work.

The main window or page (Figure 8) has consistent header and footer sections at the top and bottom of each page, above and below the body of the page. The body section, the middle part of a page, may contain text or controls, such as buttons, text fields, or check boxes.

Figure 8. RadAssessor takes advantage of your web browser by providing a consistent user interface. Every RadAssessor page has the same standard header and footer sections.

The **header section** gives a quick reference for where you are in the application, and identifies you as the user currently logged in. Figure 9 shows the specific areas of the header section, described below.

1. **Link to LANL:** Link to the Los Alamos National Laboratory (LANL) home page.
2. **Application title:** Name of the application you are using (RadAssessor).
3. **Page title:** Name of the page you are currently viewing.
4. **User name:** First and last name of the user currently logged into RadAssessor.
5. **Logout link:** Click to log out of RadAssessor.
6. **Menu bar:** Click on items shown to view their related pages.
7. **Classification of the application:** RadAssessor is classified as “**Official Use Only**”. As a user of this system, you agree to not release any information contained in the database without prior approval from the developers.

Figure 9. RadAssessor takes advantage of your web browser by using a consistent user interface. Every page within RadAssessor has the same standard header and footer.

The footer section (Figure 9) provides more static information about the RadAssessor application and general copyright information. The footer contains

1. **Application name and version.**
2. **Date RadAssessor data was updated:** The date when the most recent data was added or modified.
3. **Publication identification:** Identifying publication number assigned by LANL.
4. **Classification of the application:** Repeat of the classification in the header (OUO).
5. General links to LANS, DOE, and NNSA.
6. Links to application copyrights and disclaimers.
7. **Email address:** RadAssessor email address.

Please feel free to use the email address radassessor@lanl.gov to communicate with the RadAssessor developers about any topic relevant to system capabilities or instrument performance. The backend database contains much more data than what is actually seen in the standard queries, as you will see later in this document. If you need additional information, it is possible that we may already have the data and can easily make it available.

2.6 Menus

The menu bar near the top of each RadAssessor page (Figure 10) reveals the menu structure that will allow you to seamlessly navigate through the pages in the database. The menu bar shows first-level menu titles: the RadAssessor Home, Identification Results, Additional Information, Your Account, and Help pages. If you move the mouse over one of these menu titles (no need to click the mouse), it will become highlighted, and a drop-down list of second-level menu items or commands will appear. In Figure 10, the mouse is hovering over the Your Account menu title. The mouse changes automatically to a hand (as if choosing an item), and the menu title becomes highlighted. Select one of the menu items to perform the desired task.

Some items in the dropdown menu perform an action directly; for example, Log Out under the Your Account menu title logs you, the current user, out of RadAssessor and redirects you back to the Log-In page. Other menu items may display other windows or pages that require you to supply information needed by RadAssessor to perform the requested action.

Figure 10. The RadAssessor menu bar contains first-level selections. When your mouse hovers over a menu title, a list of second-level items or commands drops down for selection.

2.7 Online Tutorial

Most of the information contained in this manual is also available online from the RadAssessor Online Tutorial located at <https://radassessor.lanl.gov/tutorials/>. If you are already logged into RadAssessor, you will find the online tutorial under the Help menu by clicking on Documentation.

RadAssessor online tutorial:
<https://radassessor.lanl.gov/tutorials/>

“**IDENTIFICATION Results**”, the menu title located in the menu bar at the top of the page between “RadAssessor Home” and “Additional Information”, will probably contain most of the information of interest to you. In this chapter, we will describe the overall purpose of Identification Results, and we will investigate each submenu query that can be accessed from that menu item. The queries can be customized based on predefined data fields. The four possible queries are

- Spectrum,
- Identification Performance,
- Known Source Isotope, and
- Known Instrument ID.

3.1 Selection Pages

Each of the queries listed in the submenu will take you to a selection page, where you will choose or enter the information RadAssessor needs to generate results for your query. The results will be displayed on a subsequent results page(s), as shown in Figure 11.

The selection pages are created dynamically based on the data in the database at that precise moment. Whenever measurements are acquired with a new instrument, that instrument will automatically be included in the instrument model list and will be available the next time the list is accessed.

Figure 11. Selection pages let you determine what selection criteria will be used to search the database for results. Results may be shown in various formats such as text, graphical charts, and raw data.

3.2 Check Boxes

Check boxes are used to determine which data will be accessed. Figure 12 demonstrates how the check-box lists are used. In this example, the list is shown initially with no instruments checked or selected, then with “**All Instrument Models**” checked, and finally with all of the models selected except for the GN (Firmware Version . . .). Check boxes are on/off toggle switches. After you have checked the items you are interested in, click “**Submit**” to process the query based on those items.

Figure 12. Selection pages show dynamic data as a list of check-box items. This list of instrument models first shows no instruments selected. Then, the user has chosen the entire list of instruments, and finally has unchecked only the GN model.

3.3 Download Images

Some of the images in the result pages can be downloaded to your computer. To download an image, either (a) move the mouse over the image and click the disk icon in the upper left corner, or (b) right click the mouse anywhere inside the image and select the “**Save Picture As...**” option. Both methods, shown in Figure 13, will allow you designate the file name and location of the saved image.

Figure 13. Two methods to save images to your computer.

3.4 “Spectrum” Queries

The “Spectrum” query, accessed from the Identification Results menu, will display the actual isotopic spectra collected from the measurements made with a detector. You choose which instrument model(s), source isotope(s), and shielding combinations will be used to generate the spectra and measurement details. The steps are described below.

3.4.1 To Open the Spectrum Page

1. Move your mouse over the “**Identification Results**” menu option. (You do not need to click the mouse.)
2. Single click “**Spectrum**” to open the Spectrum selection page.

3.4.2 Select Spectra to Display

1. Under “**1. Select Instrument Model(s)**”, select the instrument(s) to evaluate. (You must select at least one.)
2. Under “**2. Select Isotope(s)**”, select the source isotope(s) to use in the evaluation. (You must select at least one.)
3. Under “**3. Select Shielding and Thickness**”, select the shielding and thickness(es) to use in the evaluation.
4. Click “**Submit**” button. (“**Reset**” will change all of your selections back to their original settings.)

Spectrum

Submit

Reset

1. Select Instrument Model(s):

☐ All Instrument Models

☐ Detector A (Firmware Version: 5)
☐ Detector B (Firmware Version: 1.24; 1.25; 1.26; 2.0)
☒ Detector C (Firmware Version: 3:826A 2F797 and M.:3:846E)
☐ Detector D (Firmware Version: 02.07.02 90235)
☐ Detector E (Firmware Version: 3.12)
☐ Detector F (Firmware Version: 5.15)
☐ Detector G (Firmware Version: E 01033)
☐ Detector H (Firmware Version: 1.1a and 2.0)
☐ Detector J (Firmware Version: 1.0; 1.1)
☐ Detector K (Firmware Version: 1.26 and 1.45)
☐ Detector M (Firmware Version: 1.1a; 3.21)
☐ Detector N
☐ Detector P
☐ Detector T

2. Select Isotope(s):

☐ All Isotopes

Isotope
☐ Pb-210 (Lead)
☐ Pm-147 (Promethium)
☐ Pu-238 (Plutonium)
☒ Pu-239 (Plutonium)
☐ Pu-240 (Plutonium)
☐ Ra-226 (Radium)
☐ Rn-220 (Radon)
☐ Rn-222 (Radon)
☐ Ru-104 (Ruthenium)
☐ Sb-125 (Antimony)
☐ Se-75 (Selenium)
☐ Sm-153 (Samarium)
☐ Sr-82 (Strontium)
☐ Sr-85 (Strontium)
☐ Sr-90 (Strontium)
☐ Tc-99 (Technetium)

3. Select Shielding and Thickness:

☒ Any Shielding (Uncheck to explicitly state No Shielding)

☒ Agar (Agar)
☒ Al (Aluminum)

☒ Any Agar Thicknesses

☒ 2.0in

☒ Any Al Thicknesses

☒ Not recorded
☒ 0.5in

3.4.3 “Display Spectrum” Results

After clicking “**Submit**”, all spectra matching your selection criteria will be displayed (Figure 14). The results can be downloaded to your computer either as raw data or as a JPEG image. The column headings from this screen are described below.

Figure 14. Graphical RadAssessor spectra results can be downloaded as a raw data file or a JPEG image.

Instrument Model

Name and model of the instrument that took the measurement. The detection material used by the instrument is shown beneath its name.

MAI Source Isotope(s)

Displays the most abundant isotope (MAI) source isotope(s) measured. Shielding material and thickness will also be listed in this column.

Spectrum

Actual isotopic spectrum generated from the measurements taken by the instrument. To save the image to your computer, move the mouse over the spectrum, right click the mouse, and choose “**Save Picture As...**”. Click the “**Download Spectrum (raw data file)**” link to download the original spectrum file saved from the instrument to your computer.

Instrument Findings (Message, Confidence)

The final isotope identification or other conclusion reported by the detector based on the measurements it collected. Findings are displayed with a number that represents the confidence the instrument has in its conclusion. (The Detective is the only detector that doesn’t use numeric confidence values for specific isotope identifications. Therefore, the Detective was assigned a 1, 2, or 3 confidence value to correspond with its Possible, Suspect, or Found messages, respectively.)

3.5 “Identification Performance” Queries

The “Identification Performance” menu item, accessed from the Identification Results menu, rates the performance of an instrument(s) based on the accuracy of its isotope identification. A pie chart will show either 5 or 12 categories that form the basis for the rating. The dynamically generated pie chart can be downloaded to your computer.

NOTE: A comparison with previously reported results shows overall improvement in instrument performance. This is primarily due to two factors. First, the current results include newer instruments with improved identification abilities. Second, the new results include a significant number of radiopharmaceutical measurements. Because of the widespread use of radionuclides in medical applications, many of the instruments have been designed to correctly identify the most popular radiopharmaceuticals.

You can choose the title for your pie chart, the source use(s), whether to display the 5 or 12 category system, and which instruments will be used to generate the pie chart. The steps are described below.

3.5.1 To Open the Identification Performance Page

1. Move your mouse over the “Identification Results” menu option. (You do not need to click the mouse.)
2. Single click “**Identification Performance**” to open the Identification Performance selection page.

3.5.2 How to Use the Identification Performance Query

1. Under “**Enter Pie Chart Title**”, type in a title for your pie chart. If you do not enter a title, RadAssessor will attempt to generate an appropriate title based on your criteria selections.
2. Under “**Select Source Use(s)**”, select the source(s) to use in the evaluation. (You must select at least one.) Source Use is the common application for that source throughout the world. A specific source may have many applications and may therefore fall into several of the “Source Use” categories shown.
3. Under “**Select Category System**”, choose either the 5- or 12-category system. (The default is the 5-category system of Correct, Conditionally Correct, Minor Daughter, False Negative, and False Positive.) The wedges in your pie chart will correspond to the categories from the system you select.
4. Under “**Select Instrument Model(s)**”, select the instrument(s) to evaluate. (You must select at least one.)
5. Click the “**Submit**” button. (“**Reset**” will change all of your selections back to their original settings.)

Identification Performance	
<div>SubmitReset</div>	
Enter Pie Chart Title:	<div>Total Identification Results for All InstrumentsLine One</div> <div>Line Two</div>
Select Source Use(s):	<div>☒ All Source Uses</div> <div>☒ Activation Product (Neutron Activation Foils, etc.)</div> <div>☒ Beta Source</div> <div>☒ Fission Product</div> <div>☒ Industrial</div> <div>☒ Medical (Radio Pharmacology)</div> <div>☒ Neutron Source</div> <div>☒ NORM (Naturally Occurring Radioactive Material)</div> <div>☒ Other</div> <div>☒ SNM (Special Nuclear Material)</div>
Select Category System:	<div>5 Categories - Correct, Conditionally Correct, Minor Daughter, False Negative, False Positive</div> <div>Show Category Details</div>
Select Instrument Model(s):	<div>☒ All Instrument Models</div> <div>☒ Detective (Firmware Version: 5)</div> <div>☒ GN (Firmware Version: 1.1a; 3.21)</div> <div>☒ GR130 (Firmware Version: 5.15)</div> <div>☒ GR135 (Firmware Version: 1.24; 1.25; 1.26; 2.0)</div> <div>☒ ICS-4000</div>

3.5.3 Display the Identification Performance Pie Chart

After you click “**Submit**”, your pie chart will be generated using the criteria you selected (Figure 15). Components of the display are described below.

Figure 15. Gamma identification performance results generated by RadAssessor using the 5-category system. Graphical RadAssessor results allow you to download the JPEG image to your computer.

Performance Title

The title of the pie chart, either entered by you or generated by RadAssessor.

Date

The current date will be displayed in the upper left corner.

Pie Chart

The pie chart is generated based on the criteria you specified, using all the matching measurements in the current database. Each colored wedge indicates the category identification (e.g., C for Correct) and the percentage of the total measurements that fall into that category (Figure 15).

Figure 16 shows the chart from the 12-category system for all measurements, instruments, and source uses combined. In this chart, C2 is much larger than C1 because only one MAI was present in most experiments; therefore, C1 does not apply in those cases (see section 1.3, Identification Categorization, above).

Figure 16. Gamma identification performance results generated by RadAssessor using the 12-category system.

3.6 “Known Source Isotope” Queries

The “Known Source Isotope” menu item, accessed from the Identification Results menu, displays all the findings (conclusions) that an instrument has reported to date for a selected source isotope(s). If you already know the isotope(s) that is being inspected, use this Known Source Isotope screen. For example, if you were inspecting a truck with a shipping manifest stating the specific isotopes onboard, you might be interested in knowing what instrument findings you could expect to see when you measure those known isotopes. If you select the instrument, the isotope(s) of interest, and the shielding (if any), the database will list all of the instrument’s findings that have occurred to date.

3.6.1 To Open the Known Source Isotope Page

1. Move your mouse over the “Identification Results” menu option. (You do not need to click the mouse.)
2. Single click “**Known Source Isotope**” to open the Known Source Isotope selection page.

3.6.2 How to Use the Known Source Isotope Query

1. Under “**1. Select Instrument Model(s)**”, select the instrument(s) to evaluate. (You must select at least one.)
2. Under “**2. Select Source Isotope(s)**”, select the source isotope(s) to use in the evaluation. (You must select at least one.) The resulting list will show all of the findings (conclusions) that an instrument has reported when it was asked to identify the selected isotope(s) .
3. Under “**3. Select Shielding and Thickness**”, select the shielding and thickness(es) to use in the evaluation.
4. Click the “**Submit**” button. (“**Reset**” will change all of your selections back to their original settings.)

Known Source Isotope

If you already know the identity of a Source Isotope:

Use this screen to show the Instrument Findings known to have been reported for the selected Source Isotope(s).

1. Select Instrument Model(s):

- ☐ All Instrument Models
- ☐ Detector A (Firmware Version: 5)
- ☐ Detector B (Firmware Version: 1.24; 1.25; 1.26; 2.0)
- ☐ Detector C (Firmware Version: 3:826A 2F797 and M.:3:846E)
- ☐ Detector D (Firmware Version: 02.07.02 90235)
- ☐ Detector E (Firmware Version: 3.12)
- ☐ Detector F (Firmware Version: 5.15)
- ☐ Detector G (Firmware Version: E 01033)
- ☐ Detector H (Firmware Version: 1.1a and 2.0)
- ☐ Detector K (Firmware Version: 1.26 and 1.45)
- ☐ Detector M (Firmware Version: 1.1a; 3.21)
- ☐ Detector N
- ☒ Detector P
- ☐ Detector R

2. Select Source Isotope(s):

- ☐ All Isotopes

Isotope
☐ Pm-147 (Promethium)
☐ Pu-238 (Plutonium)
☒ Pu-239 (Plutonium)
☐ Pu-240 (Plutonium)
☐ Ra-226 (Radium)
☐ Rn-220 (Radon)
☐ Rn-222 (Radon)
☐ Ru-104 (Ruthenium)
☐ Sb-125 (Antimony)
☐ Se-75 (Selenium)
☐ Sm-153 (Samarium)
☐ Sr-82 (Strontium)
☐ Sr-85 (Strontium)
☐ Sr-90 (Strontium)
☐ Tc-99 (Technetium)
☐ Tc-99m (Technetium)

3. Select Shielding and Thickness:

☒ Any Shielding (Uncheck to explicitly state No Shielding)

- ☒ Agar (Agar)
- ☒ Al (Aluminum)

☒ Any Agar Thicknesses

- ☒ 2.0in

☒ Any Al Thicknesses

- ☒ Not recorded
- ☒ 0.5in

3.6.3 Display Known Source Isotope Results

After clicking “**Submit**”, all instrument findings (conclusions) will be displayed based on the criteria you selected (Figure 17). Components of the display are described below.

Figure 17. Known instrument findings when measuring ^{239}Pu . There were 21 instrument findings from 8 separate measurements.

Total Unique Measurements

The total number of measurements taken by a particular instrument(s) that match the criteria you specified.

Instrument Model

Name and model of the instrument that took the measurement.

Source Isotope

The actual isotope(s) that was measured.

Instrument Findings

The final isotope identification or other conclusion reported by the detector based on the measurements it collected.

Number of Findings (Total=...)

The number of times the instrument reported this finding.

3.7 “Known Instrument Identification” Queries

“Known Instrument Identification” is used to display the Source Isotope(s) that have been known to generate the Instrument Findings selected. When you know the message of the instrument(s) used then use this Known Instrument Identification screen. For example, you may not know what radioactive materials may be on board a vessel, but may only see what the instrument findings are from measuring the vessel. You would then be interested in knowing what isotopes are known to elicit a particular identification from an instrument. If you select the instrument, instrument findings, and shielding of interest (if any), the database will display all known isotopes to have generated the identification of interest. The tasks include:

3.7.1 To Open the Known Instrument Identification Page

1. Move your mouse over the “Identification Results” menu option. (You do not need to click the mouse.)
2. Single click the “**Known Instrument ID**” option to open the Known Instrument Identification selection page.

3.7.2 How to Use the Select Known Instrument Identification Query

1. Under “**1. Select Instrument Model(s)**”, select the instrument(s) to evaluate. (You must select at least one.)
2. Under “**2. Select Instrument Finding(s)**”, select the finding(s) shown on your instrument to use in the evaluation. (You must select at least one.) This finding will be used to generate a list of all source isotopes that have elicited the same finding.
3. Under “**3. Select Shielding and Thickness**”, select the shielding and thickness(es) to use in the evaluation.
4. Click the “**Submit**” button. (“**Reset**” will change all of your selections back to their original settings.)

Known Instrument Identification

If the Instrument has displayed a Message:

Use this screen to show what Source Isotope(s) have been known to generate the same Instrument Findings selected below.

Submit

Reset

1. Select Instrument Model(s):

☐ All Instrument Models

☒ Detector A (Firmware Version: 5)
☐ Detector B (Firmware Version: 1.24; 1.25; 1.26; 2.0)
☐ Detector C (Firmware Version: 3:826A 2F797 and M.:3:846E)
☐ Detector D (Firmware Version: 02.07.02 90235)
☐ Detector E (Firmware Version: 3.12)
☐ Detector F (Firmware Version: 5.15)
☐ Detector G (Firmware Version: E 01033)
☐ Detector H (Firmware Version: 1.1a and 2.0)
☐ Detector K (Firmware Version: 1.26 and 1.45)
☐ Detector M (Firmware Version: 1.1a; 3.21)
☐ Detector N
☐ Detector P
☐ Detector R

2. Select Instrument Finding(s):

☐ All Instrument Messages

Isotope
☐ Pb-214 (Lead)
☐ Pd-103 (Palladium)
☐ Po-210 (Polonium)
☐ Pr-144 (Praseodymium)
☐ Pu-238 (Plutonium)
☒ Pu-239 (Plutonium)
☐ Pu-240 (Plutonium)
☐ Ra-224 (Radium)
☐ Ra-226 (Radium)
☐ Ra-227 (Radium)
☐ Rb-82 (Rubidium)
☐ Residual (Residual)
☐ Rh-106 (Rhodium)
☐ Ru-103 (Ruthenium)
☐ Ru-106 (Ruthenium)
☐ Sb-122 (Antimony)

3. Select Shielding and Thickness:

☒ Any Shielding (Uncheck to explicitly state No Shielding)

☒ Agar (Agar)
☒ Al (Aluminum)

☒ Any Agar Thicknesses

☒ 2.0in

☒ Any Al Thicknesses

☒ Not recorded
☒ 0.5in

3.7.3 Display Known Instrument Identification Results

After clicking “**Submit**”, all possible source isotopes will be displayed based on the criteria you selected (Figure 18). Components of the display are described below.

Figure 18. Source Isotopes identified by the Detective when asked to show ²³⁹Pu instrument finding. There were 14 instrument findings from 13 separate measurements.

Total Unique Measurements

The total number of measurements taken by a particular instrument(s) that match the criteria you specified.

Instrument Model

Name and model of the instrument that took the measurement.

Instrument Findings

The final isotope identification or other conclusion reported by the detector based on the measurements it collected.

Source Isotope

The actual isotope(s) that was measured.

Number of Findings (Total=...)

The number of times the instrument reported this finding.

Additional Information

“**A**DDITIONAL Information”, located in the menu bar between “Identification Results” and “Your Account”, provides details about the instrument models, the distributors for the instruments, shielding used in the measurements, and performance category descriptions. These pages let you view, re-sort, and filter data based on the criteria you select and also allow you to view the data in greater detail. We will explore how these pages use the filter and sort functions and will learn how each of the following four query screens is used:

- Instrument Models,
- Model Distributors,
- Shielding, and
- Category12MAIs (most abundant isotopes).

4.1 Filter Section

Each of the four queries within Additional Information will initially display all of the records for that topic. If you want to narrow your results, you can use the filter section located at the top of the page. Each query screen has a filter section with filter fields for you to complete. These allow you to limit your search to specific information. The filter searches the entire set of records and returns only the results that match the information you have typed into the filter fields. Figure 19 shows the filter section in the Instrument Models screen.

Instrument Models

Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> > <input type="text"/> AND <input type="text"/> < <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="button" value="Filter"/>			<input type="button" value="Reset Filter"/>				
☐	1401 KE	TSA Systems Previous Primaster	Yes	7900.0	9.5 x 2.4 x 2.5 in		Pack of Cigarettes BUT Smaller than Car Battery
☐	Detective	Ortec	Yes	55000.0	35h x 16w x 32d (cm)		Larger than Car Battery
☐	GN	LANL N-2	No		13h x 15w x 40d (cm)		Larger than Pack of Cigarettes BUT Smaller than Car Battery

Figure 19. The filter searches the entire set of records, in this case Instrument Models, to narrow the results that are displayed in the lower section.

To use the filter, begin with the page of data that appears when a query screen is selected, as shown in Figure 20. Complete all of the filter fields that apply to your query, and press “**Enter**” or click the “**Filter**” button. RadAssessor will display only those items that meet your criteria.

RadAssessor uses two basic types of filter fields: alphanumeric and numeric. Each will be further examined in the following sections.

A. Query page initially displays all records.

Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
1401 KE	TSA Systems Previously Polmaster	Yes	7900.0	9.5 x 2.4 x 2.5 in		Larger than Pack of Cigarettes BUT Smaller than Car Battery
Detective	Ortec	Yes	55000.0	35h x 16w x 32d (cm)		Larger than Car Battery
GM	...	...	...	13h x 15w x ...		Larger than Pack of Cigarettes

B. You specify filter criteria in filter fields.

Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
%[0-5]	*	*	> 9000 AND < 15000	*	*	*

Filter button is pressed.

C. RadAssessor displays only the records that meet the filter criteria.

In this example, only Model Names that end in 0 through 5 and have an Est. Cost that is more than 9000 but less than 15000 are displayed.

Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
GR135	Exploranium	Yes	10000.0	17.2 x 22.9 x 10.2 cm		Larger than Pack of Cigarettes BUT Smaller than Car Battery
SAM 935	Berkeley Nucleonics Corp.	Yes	9700.0	12 x 8.6 x 2 in		Larger than Pack of Cigarettes BUT Smaller than Car Battery

Figure 20. In this example, the filter produces the models with names that end in 0 through 5 and cost between 9000 and 15000 (\$).

4.1.1 Alphanumeric Filter

If a filter field has a single asterisk (*) inside the filter box, the field is an alphanumeric filter. The alphanumeric filter searches for data based upon combinations of letters and numbers (the upper- and lower-case alphabetic characters and the numeric characters 0–9) and special characters, such as the symbols \$, #, and @, mathematical symbols, and punctuation marks.

Alphanumeric Filter

*

Several characters have special meanings to the filter. For example, the percent sign (%) is a wildcard that essentially means “any number of characters may go here”. The % sign can be used with known characters to represent the unknown characters. For example, to find model names ending in “5”, you would use “%5”; or if you wanted the “5” in the middle of the model name, you could use “%5%”.

Table 3 shows wildcard characters that can be used to search RadAssessor. These wildcards can be combined to produce the results you need.

Table 3. Alphanumeric Wildcards and Descriptions

Wildcard	Name	Description
*	Asterisk	Matches zero or more alphanumeric characters. For example, “L*” will find anything that begins with the letter “L”.
-	Hyphen	Matches any one of the alphanumeric characters specified in the range. For example, if your data contains the words “bat, cat, cats, cop, cot, and cut”, then “c[a-p]t” will locate every word beginning with “c”, ending with “t”, and containing any letter from “a” to “p”, inclusive. Therefore, it will find “cat” and “cot”.
%	Percent	Matches zero or more alphanumeric characters.
[]	Square brackets	Matches any one of the alphanumeric characters in the brackets. For example, if your data contains the words “blam, slam, slams, slim, slum, and slums”, then “sl[iau]m” will locate “slim”, “slam”, and “slum”.
_	Underscore	Matches any single alphanumeric character found in that location. For example, if your data contains the words “bat, cat, cats, cop, cot, and cut”, then “c_t” will locate “cat”, “cot”, and “cut”.

4.1.2 Numeric Filter

Numeric filters are applied to fields in the database that store only numeric values. A numeric filter will find records where the numeric field is equal to a specific value or records where the numeric field is found between two values, called a range. Use the pull-down menus (down arrow) to select “<”, “=”, or “>”.

Numeric Filter	
>	
AND	
<	

In Figure 20, the Estimated Cost fields are numeric. If you use the greater than (>) and less than (<) characters, notice that the range is noninclusive. For example, in Figure 21, the filter is requesting models that cost *between* 9000 and 55000 (\$). Thus, an actual cost of either 9000 or 55000 will not be included. The range of numbers included is actually 9000.01 to 54999.99.

Est. Cost (\$)	
>	9000
AND	
<	55000

Figure 21. Numeric filter.

Now look at Figure 22. This shows the filter asking for costs that are equal to 9000 and, at the same time, greater than 55000. This is impossible and, therefore, will not return any results.

Est. Cost (\$)	
=	9000
AND	
>	55000

Figure 22. Filter will not return any results.

4.1.3 Searching for Wildcards as Literals

If you are looking for a value that contains a literal wildcard character, use the square brackets to “delimit” the special character. This tells the filter to treat everything inside the square brackets as a literal character instead of as a character with special meaning. For example, if you want to find a percent sign anywhere within a field, you would use %[%]% or *[%]*.

4.2 Sorting Results

Figure 23 shows a sample of the lower portion of the Instrument Models screen, called the results. The results will initially contain all records sorted by some default field. For example, the Instrument Models page initially defaults to “sort by Model Name in ascending order”.

	Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
☐	GR130	Exploranium	No		17.2 x 22.9 x 10.2 cm		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	GR135	Exploranium	Yes	10000.0	17.2 x 22.9 x 10.2 cm		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	Guardian	NucSafe Inc.	Yes		50 x 36 x 10 cm		Larger than Car Battery

Figure 23. Initial results are displayed using a sort; in this case, by Model Name.

To change the sort, click on the column heading that you want to sort on, as seen here in Figure 24. Clicking the same column heading again will toggle the sort between ascending and descending order.

	Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
☐	MKC-A03	Aspect			28 x 13 x 18.1 cm		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	MKC-A02	Aspect			310 x 160 x 135 mm		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	PPCZT	eV Products	I Don't Know				Larger than Pack of

	Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
☐	Rad-ID	D-Test Systems	Yes		7.4 x 5.4 x 11.1 in		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	Ranger	Quantrac Sensor or Biocentric Solutions	Yes	12470.0	6.5 x 13.25 x 2.75 in		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	InSpector 1000	Canberra	Yes	8700.0	22 x 18 x 7 cm		Larger than Pack of Cigarettes BUT Smaller than Car Battery

Figure 24. Click the column headings to sort. Here we first clicked on Available for Purchase to sort in ascending (alphabetical) order. Then we clicked the Available for Purchase heading again to sort in descending order.

4.3 “Instrument Models” Query

The Instrument Models query allows you to view all the models that have been used for RadAssessor measurements. You can narrow your results by using the filter section (e.g., to display only the models with a specific manufacturer or whose model name begins with “m”). You can select a single instrument model using the radio button on the left of the list. Click the “**View**” button to the right of the table to display all the available details about that instrument model. The steps for using this query are described below.

4.3.1 To Open the Instrument Models Page

1. Move your mouse over the “Additional Information” menu option. (You do not need to click the mouse.)
2. Single click “**Instrument Models**” to open the Instrument Models selection page.

The initial view of the Instrument Models query page will display all instrument models that are listed in RadAssessor (Figure 25). This page defaults to “sort by Model Name”.

- ## Instrument Models
	Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
	____	____	____	> v ____	____	____	____
				AND	____	____	____
				v v ____			
Filter				Reset Filter			
-
	Model Name	Manufacturer	Avail. For Purchase	Est. Cost (\$)	Dimensions	Picture	Size Category
☐	GR130	Exploranium	No		17.2 x 22.9 x 10.2 cm		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	GR135	Exploranium	Yes	10000.0	17.2 x 22.9 x 10.2 cm		Larger than Pack of Cigarettes BUT Smaller than Car Battery
☐	Guardian	NucSafe Inc.	Yes		50 x 36 x 10 cm		Larger than Car Battery
☐							Larger than Pack of Cigarettes BUT Smaller than Car Battery
- [View](#)

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41

4.3.4 To Select an Instrument Model to Display

1. Select which Instrument Model you want to see by clicking the radio button to the left of the Model Name.

Model Name	Manufacturer	Firm Ware Version	Avail. For Purchase	Est. Cost	Image	Size Category
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> > AND <input type="text"/> < <input type="text"/>	<input type="text"/>	<input type="text"/>
Filter				Reset Filter		
<u>Model Name</u>	<u>Manufacturer</u>	<u>Firm Ware Version</u>	<u>Avail. For Purchase</u>	<u>Est. Cost</u>	<u>Image</u>	<u>Size Category</u>
☐ GR130	Exploranium	5.15	No			Larger than Pack of Cigarettes BUT Smaller than Car Battery
☒ GR135	Exploranium	1.24	Yes	10000.0		Larger than Pack of Cigarettes BUT Smaller than Car Battery

2

2. Click the “View” button to the right of the table above to display additional features of the selected model.

Instrument Models

View Record

Model Name : GR135
Model Rad Type : Gamma, Neutron
Manufacturer : Exploranium
Manufacturer Phone : 1-906-670-7071
Manufacturer Web Address : www.exploranium.com
Distributor : SAIC (http://www.saic.com/)

Serial Numbers :
Firm Ware Version : 1.16, 1.24
Avail. For Purchase : Yes
Est. Cost (\$): 10000.0
Dimensions : 17.2 x 22.9 x 10.2 cm
Picture :

Additional Pictures :

Size Category : Larger than Pack of Cigarettes BUT Smaller than Car Battery

Weight : 2.0

Weight Unit : kg

Physical Description : White with Black on top; Handle on top; Display on top; 1 Button

Dynamic Range : -14°F to 122°F

Energy Range (MeV) : 0.05 to 3.0 MeV

Calibration Type : External

Calibration Source : Cs-137

Multiplexer Fields :

Battery Type : D Cell

Number Of Batteries : 2

Battery Life : 15 hours

Audible Tone : Yes; Earphone w/ volume control

Model Color : Black; Silver; Ivory; White

LED Color : None

Backlight Color :

Cabled Detector : Yes

Cable Type : RS232 Serial

Detector Material : CZT (Cadmium Zinc Telluride) - Gamma; NaI (Sodium Iodide) - Gamma; LiI (Lithium Iodide) - Neutron

Detector Material Size : NaI-1.5x2.2 in; GM-1/2inDiamx2inLength; LiI-.7inDiam.x8.6inLength; CZT-unknown

Production Dates :

Comments : 3 Functions, 2 Modes; Rechargeable batteries; Detection Material – Sodium Iodide (NaI), CZT (optional), Neutron-solid state (optional); Continuously calibrates when in docking station; Four pre-defined Libraries with 200 nuclides; Custom libraries available upon request; Operating temperature is -10 to 50 degrees C; Display size is 6.5cm x 6.5cm; Large display w/ backlighting; Weatherproof, water resistant aluminum case; Energy Range is From .03 keV to 3.0 MeV; Multichannel Analyzer is 1024 MCA; Data Transfer is integrated into the docking station; Data Storage is >40,000 dose measurements; >187.3 MeV spectra; Cost is Gamma only: 8,900.00, Gamma neutron: 10,900.00, Gamma Neutron CZT: 15,900.00 (possible discounts); Delivery Time is Gamma 4-6 weeks, Neutron and Neutron CZT 8 weeks, bulk purchases may take longer.

4.4 “Model Distributors” Query

The Model Distributors query allows you to view all of the current distributors for the instruments you select. You can narrow your results by using the filter section (e.g., to find information about all models whose names begin with “m”).

4.4.1 To Open the Model Distributors Page

1. Move your mouse over the “Additional Information” menu option. (You do not need to click the mouse.)
2. Single click “**Model Distributors**” to open the Model Distributors selection page.

4.4.2 To View All Instrument Model Distributors

The initial view of the Instrument Model Distributors query page will display all distributors for the instruments in the RadAssessor database (Figure 26). This page defaults to “sort by Model Name” and then by “Distributor”.

- To view all models again after the filter has narrowed the results, click “**Reset Filter**” button to clear the filters.
- Click on any column heading to re-sort the list in either ascending or descending order by that column. Each click will toggle the sort order between ascending and descending.

Instrument Model Distributors		
	Model Name	Distributor
	<input type="text" value="*"/>	<input type="text" value="*"/>
	Filter	Reset Filter
	Model Name	Distributor
	1401 KE	Polimaster
	GR130	SAIC
	GR135	SAIC
	Guardian	NucSafe Inc.
	ICS-4000	Seltec
	IdentiFINDER-FieldSPEC	Thermo Electron Corp.
	InSpector 1000	Canberra
	LB125	Berthold
	PPCZT	LANL
	Rad-ID	LAURUS Systems Inc.

Figure 26. The Instrument Model Distributors page will initially show all distributors in ascending order by Model Name then Distributor.

4.4.3 To Filter the Model Distributors

The Filter capability uses standard query notations (e.g., * is wild meaning any number of characters).

1. Enter the information you will use to limit your search into the appropriate field. For example, we have entered “s*” in the Distributor filter field to find all distributor names that begin with the letter “s”.
2. Single click the “**Filter**” button to display all the information that meets the criteria.
3. RadAssessor returns the distributors whose names begin with “s”.

Model Name	Distributor
GR130	SAIC
GR135	SAIC
ICS-4000	Seltec
Radsmart	SAIC

4.5 “Shielding” Query

The Shielding query allows you to view all shielding used in RadAssessor measurements. You can narrow your results by using the filter section (e.g., to display only the shielding with a specific material or where comments contain the word “green”). You can select a single shielding material by using the radio button on the left of the list. Click the “**View**” button to display all the available details about that selected shielding. Steps for using the Shielding query are described below.

4.5.1 To Open the Shielding Page

1. Move your mouse over the “Additional Information” menu option. (You do not need to click the mouse.)
2. Single click “**Shielding**” to open the Shielding selection page.

4.5.2 To View All Shielding

The initial view of the Shielding query page will display all shielding that has been used in any measurements made by the detectors listed in the RadAssessor database (Figure 27).

- To view all shielding again after the filter has narrowed the results, click “**Reset Filter**” button to clear the filters.
- Click on any column heading to re-sort the list in either ascending or descending order by that column. Each click will toggle the sort order between ascending and descending.

Shielding			
Shielding ID	Shielding Material Z	Comments	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
Filter		Reset Filter	
Shielding ID	Shielding Material Z	Comments	View
☐ Agar	Agar		<div>View</div>
☐ Air	Air		
☐ Al	Aluminum	13	
☐ Candle	Candle		
☐ Cardboard	Cardboard		
☐ Cd	Cadmium	48	
☐ Cu	Copper	29	
☐ DU	Depleted Uranium U-238	U-238	
☐ Fe	Iron/Steel	26	
☐ HE	High Explosives		

Figure 27. The Shielding page will initially show all shielding in ascending order by Shielding ID.

4.5.3 To Filter Shielding

The filter uses standard query notations such as “*” (wildcard). See section 4.1, Filter Section, for more information about wildcards.

1. Enter the information you will use to limit your search into the appropriate field. For example, we have entered “*238*” in the Shielding Material Z filter field to find all types of shielding that have the numbers “238” in the shielding material’s name.
2. Single click the “**Filter**” button to display all the information that meets the criteria.
3. RadAssessor returns the shielding materials with “238” in their names.

Shielding ID	Shielding Material Z	Comments
*	*238*	*

Filter Reset Filter

Shielding ID	Shielding Material Z	Comments
DU	Depleted Uranium U-238	U-238

4.5.4 To Select a Shielding Material to Display

1. Select which shielding material you want to see by clicking the radio button to the left of the Shielding ID.

Shielding ID	Shielding Material Z	Comments
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="button" value="Filter"/>		<input type="button" value="Reset Filter"/>

Shielding ID	Shielding Material Z	Comments
☐ Agar	Agar	
☐ Air	Air	
☐ Al	Aluminum	13
☐ Candle	Candle	
☐ Cardboard	Cardboard	
☐ Cd	Cadmium	48
☐ Cu	Copper	29
☒ DU	Depleted Uranium U-238	U-238
☐ Fe	Iron/Steel	26

1

2

View

2. Click the “**View**” button to the right of the table above to display additional features of the selected shielding material.

Shielding

View Record

Shielding ID : DU
Shielding Material Z : Depleted Uranium U-238
Comments : U-238

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4.6 “Category 12 MAIs” Query

The Category 12 MAIs query allows you to view all of the categories from the 5- and 12-category systems used to grade the measurements from each detector (see also section 3.5 above). You can narrow your results by using the filter section (e.g., to display only the Category 12 Names that begin with a specific letter). To see the details about a single category, click the radio button on the left side of the list, then click the “**View**” button to the right of the table. The steps for using this query are described below.

4.6.1 To Open the Category 12 MAIs Page

1. Move your mouse over the “Additional Information” menu option. (You do not need to click the mouse.)
2. Single click “**Category 12 MAIs**” to open the Category 12 MAIs selection page.

4.6.2 To View all Categories

The initial view of the Category 12 MAIs query page will display all the categories that are used to grade RadAssessor measurements (Figure 28).

- To view all shielding again after the filter has narrowed the results, click “**Reset Filter**” button to clear the filters.
- Click on any column heading to re-sort the list in either ascending or descending order by that column. Each click will toggle the sort order between ascending and descending.

Category 12 Most Abundant Isotopes (MAIs)							
Category 12 Letter	Category 12 Name	Category 5 Letter	Description	Report Order	Color	Comments	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<div>> <input type="button" value="v"/> AND < <input type="button" value="v"/></div>	<input type="text"/>	<input type="text"/>	
			Filter	Reset Filter			
Category 12 Letter	Category 12 Name	Category 5 Letter	Description	Report Order	Color	Comments	View
☐	C1	Correct1	C	Instrument correctly identified at least one most abundant isotopes (MAI) present when there is more than one, but not all MAIs with the highest confidence or with confidence less than a minor daughter.	2	Lime	
☐	C2	Correct2	C	Instrument correctly identified ALL most abundant isotopes (MAI) present as the isotopes identified with the most confidence or with confidence less than only a minor daughter (see definition below). Or, in the case of background, it means it identified either nothing or only K-40 (which is naturally in the	1	DarkGreen	

Figure 28. The Category 12 MAIs page will initially show all categories in ascending order by Category 12 Letter.

4.6.3 To Filter Category 12 MAIs

The filter uses standard query notations such as “*” (wildcard). See section 4.1, Filter Section, for more information about wildcards.

1. Enter the information you will use to limit your search into the appropriate field. For example, we have entered “> 3 AND < 10” (greater than 3 and less than 10) in the Report Order filter field to find all categories ranked from 4 through 9.
2. Single click the “**Filter**” button to display all the information that meets the criteria.
3. RadAssessor returns only the categories that have a report order whose rank is between 3 and 10.

Category 12 Letter	Category 12 Name	Category 5 Letter	Description	Report Order	Color	Comments
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<div><div>></div><div>3</div><div>AND</div><div><</div><div>10</div></div>	<input type="text"/>	<input type="text"/>
				Filter	Reset Filter	

Category 12 Letter	Category 12 Name	Category 5 Letter	Description	Report Order	Color	Comments	
☐	CC1	Conditionally Correct1	CC	At least one most abundant isotopes (MAI) present but not all MAIs were correctly identified, but with less confidence than something that was not present or could not be identified.	4	Yellow	
☐	FN1	False Negative1	FN	The instrument gave no identification when a radionuclide contained in the instrument's library was present as an MAI.	6	DeepSkyBlue	
☐	FN2	False Negative2	FN	The instrument gave no identification when a radionuclide NOT contained in the instrument's library was present as an MAI.	7	SteelBlue	

4.6.4 To Select a Single Category 12 MAI to Display

1. Select which category you want to see by clicking the radio button to the left of the Category 12 Letter column.

Category 12 Letter	Category 12 Name	Category 5 Letter	Description	Report Order	Color	Comments	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="button" value="v"/> <input type="button" value="AND"/> <input type="button" value="v"/>	<input type="text"/>	<input type="text"/>	
			Filter	Reset Filter			
☐	C1	Correct1	C	Instrument correctly identified at least one most abundant isotopes (MAI) present when there is more than one, but not all MAIs with the highest confidence or with confidence less than a minor daughter.	2	Lime	
☒	C2	Correct2	C	Instrument correctly identified ALL most abundant isotopes (MAI) present as the isotopes identified with the most confidence or with confidence less than only a minor daughter (see definition below). Or, in the case of background, it means it identified either nothing or only K-40 (which is naturally in the	1	DarkGreen	

2

View

2. Click the “**View**” button to the right of the table above to display additional details about the selected category.

Category 12 Most Abundant Isotopes (MAIs)

View Record

Category 12 Letter : C2
 Category 12 Name : Correct2
 Category 5 Letter : C

Description : Instrument correctly identified ALL most abundant isotopes (MAI) present as the isotopes identified with the most confidence or with confidence less than only a minor daughter (see definition below). Or, in the case of background, it means it identified either nothing or only K-40 (which is naturally in the environment).

Report Order : 1
Color : DarkGreen

Comments :

“**Y**OUR Account”, the menu title located in the menu bar at the top of the page between “Additional Information” and the “Help” option, will allow you to log in or out of the database, to get your Username or a new password if you have forgotten your old one, and to edit your account information. The four menu items in “Your Account” are

- Log In,
- Log Out,
- Lost Username or Password, and
- Change Account.

5.1 Log In

The Log In screen allows you to sign in to RadAssessor with your Username and password. The RadAssessor system uses Secure Sockets Layer (SSL) with a site certificate from VeriSign to provide encryption before transmission for enhanced security. RadAssessor uses a first-party “cookie” that will be saved to your local computer for session identification to help validate and authenticate users of RadAssessor. This cookie will be deleted when you log out or end the session.

5.1.1 To Open the Log In Page

1. Move your mouse over “**Your Account**” menu option. (You do not need to click the mouse.)
2. Single click “**Log In**” to open the Log In page.

5.1.2 To Log In

To log in to RadAssessor

1. In “**Username**”, enter your valid username.
2. In “**Password**”, enter your valid password.
3. Click the “**Login**” button or press the “**Enter**” key.

The image shows a web form titled "Log In". Below the title is a header bar that says "Existing RadAssessor users please log in". The form contains two input fields: "Username:" with the text "MyUserNameHere" and "Password:" with masked characters (dots). Below the password field is a "Login" button. At the bottom of the form, there is a link: "Lost your username or password? or having login problems?".

If another user was already logged into RadAssessor, they will automatically be logged out so that you, as a new user, may log in.

RadAssessor will authenticate your account before allowing access. The “**Official Use Only**” acceptance page will be displayed if the login attempt is successful.

- Click the “**OK**” button to acknowledge that you have accepted the Official Use Only terms.

After you accept the “Official Use Only” terms, RadAssessor will direct you to the RadAssessor Home Page (Figure 29). Your first and last name is displayed in the upper left corner to identify you as the current user. You now have access to the entire RadAssessor database and may navigate through the system via the main menu.

Figure 29. RadAssessor Home page displays upon successful log in.

5.1.3 Log In Problems

If you have any problems with the log in process, there is a link to possible solutions in the lower right corner of the Log In page (Figure 30).

- Click the “**login problems?**” link in the lower right corner of the Log In box.

Figure 30. Click “login problems?” to find assistance with the log in process.

This will connect you to the suggested solutions shown in Figure 31. If none of these solutions solves your login problems, email the RadAssessor team at radassessor@lanl.gov for additional assistance.

The most common problem encountered when logging in is that the browser is not set to accept cookies. RadAssessor requires the use of session validation through cookies. If you are having trouble accessing RadAssessor, start by following the instructions in Figure 31 for allowing cookies. Section 2.2 above provides additional details on setting your browser to accept cookies.

Login Solutions

If you are having problems logging into RadAssessor, please try the following solutions.

1. Delete temporary internet files.

From Internet Explorer, click "Tools", select "Internet Options...". Click the "General" tab. Inside the "Temporary Internet files" frame, click the "Delete Files..." button. Check the "Delete all offline content" box. Press the "OK" button.
2. Clear your browser's history folder.

From Internet Explorer, click "Tools", select "Internet Options...". Click the "General" tab. Inside the "History" frame, click the "Clear History" button. Press "Yes" when asked "Are you sure you want Windows to delete your history of visited Web sites?".
3. Make sure your browser allows "cookies" for session validation.

From Internet Explorer, click "Tools", select "Internet Options...". Click the "Privacy" tab. Set privacy to "Medium". If privacy is set to higher than medium, then make sure that "first-party Cookies" are accepted.
4. Make sure that the date and time on your computer are set correctly.

If you still cannot login, write to radassessor@lanl.gov

Figure 31. Solutions to login problems.

5.2 Log Out

There are three ways to log out of RadAssessor. Logging out will ensure that unauthorized individuals do not gain access to RadAssessor from your computer or access your user information.

5.2.1 To Log Out of RadAssessor

Choose one of the three following ways to close the RadAssessor database.

- Click “**Logout**” next to your name in the upper left corner above the menu bar.

Or

- Move your mouse over the “**Your Account**” menu option. (You do not need to click the mouse.)
- Single click “**Log Out**” to log out of RadAssessor.

Or

- Close your browser window which will automatically log you out of RadAssessor.

The Log In page appears when you have logged off RadAssessor and have not closed your browser window.

A screenshot of the Log In page. The title is "Log In". Below it is a dark blue bar with the text "Existing RadAssessor users please log in". There are two input fields: "Username:" and "Password:". Below the "Password:" field is a "Login" button. At the bottom, there is a link: "Lost your username or password? or having login problems?".

5.3 Lost Username or Password

If you forget your username or password, you can set a new password through the “Lost Username or Password” page. RadAssessor will send you an email with your username and a web address where you can reset your password.

5.3.1 To Open the Lost Username or Password Page

There are two ways to open the Lost Username or Password page.

- From the “**Log In**” page, click the “**Lost your username or password?**” link in the lower left corner.

Or

1. Move your mouse over the “**Your Account**” menu option. (You do not need to click the mouse.)
2. Single click “**Lost Username or Password**” to open the Lost Username or Password page.

5.3.2 To Get Your Username or Set a New Password

When the “Lost Username or Password” page appears

1. In “**Email**”, enter your email address.
2. Click the “**Submit**” button.

The screenshot shows a web page titled "Lost Username or Password". It contains a form with the following text: "Please enter your email address below." followed by "A temporary password will be created and emailed to your email address on file." Below this is a label "Email:" next to a text input field containing "myEmail@mail.gov". At the bottom of the form is a "Submit" button with a mouse cursor hovering over it.

Your email address will be validated by RadAssessor, an email will be sent with further instructions, and a confirmation notice will be displayed on the screen.

1. Click the “**OK**” button.
2. Check your email and follow the instructions.

The email will tell you your Username, and you can log in, if that was all you forgot.

If you forgot your password, follow the instructions below and in the email you receive to reset your password before attempting to log in. **You will have 60 minutes to reset your password.** If more than 60 minutes passes before you are able to reset your password, return to the “**Lost Username or Password**” page and enter your email address again. You will receive another email message with new instructions and you will have 60 minutes to reset your password.

5.3.3 Reset Password Page

The email message from RadAssessor with your Username and the instructions to reset your password will direct you to a temporary Set New Password screen. Read the directions for choosing an appropriate password and follow the instructions below to set a new password.

1. Enter your new password in the “**New Password**” field. *Your password must have at least eight characters and contain at least three of the four elements as shown.*
2. Enter your new password again in the “**Verify New Password**” field.
3. Click “**Set New Password**”.

The screenshot shows a web form titled "Set New Password" in a large, bold, black font at the top center. Below the title, a paragraph of instructions states: "Passwords must be a minimum of 8 characters and contain at least three of the following four elements:". This is followed by a bulleted list of requirements: English upper-case letters (e.g., A, B, C, etc.), English lower-case letters (e.g., a, b, c, etc.), Arabic numerals (e.g., 1, 2, 3, etc.), and Non-alphanumeric characters (e.g., !, <, \$, etc.). Below the list are two input fields. The first is labeled "New Password :" and the second is labeled "Verify New Password :". Both fields contain eight black dots to represent masked characters. At the bottom center of the form is a button labeled "Set New Password". A mouse cursor is shown clicking on the button.

5.4 Change Account

“Change Account” allows you to view and update your account information, such as your name, phone, email, company, and password.

5.4.1 To Open the Change Account Page

1. Move your mouse over the “**Your Account**” menu option. (You do not need to click the mouse.)
2. Single click “**Change Account**” to open the Change Account page.

5.4.2 To View or Change Account Information

You can review and change information in your RadAssessor account from the “Your Account Information” page.

To update your account information

1. Make the desired changes.
2. Click the “**Submit**” button.

Press the “**Cancel**” button to return to the RadAssessor Home page without making any changes.

Your Account Information

Edit Your Account

All fields are required.

UserName : testuser

New Password :

Verify New Password :

Company :

First Name :

Last Name :

Phone Number :

Email Address :

Passwords must be a minimum of 8 characters and contain at least three of the following four elements:

- English upper-case letters (e.g., A, B, C, etc.)
- English lower-case letters (e.g., a, b, c, etc.)
- Arabic numerals (e.g., 1, 2, 3, etc.)
- Non-alphanumeric characters (e.g., !, <, \$, etc.)

“**H**ELP” provides a RadAssessor online tutorial, the names of the developers and an email address for contacting them, and copyright details for the RadAssessor database system.

6.1 Documentation

The “Documentation” menu item will open an online tutorial in a new browser window, allowing you to continue navigating in RadAssessor while viewing the tutorial.

6.1.1 To Open the RadAssessor Online Tutorial

1. Move your mouse over the “**Help**” menu option. (You do not need to click the mouse.)
2. Single click “**Documentation**” to open the RadAssessor online tutorial.

6.1.2 To Use the Online RadAssessor Tutorial

The RadAssessor tutorial pages are displayed in a new browser window to allow you to continue to use RadAssessor while viewing the online tutorial (Figure 32).

Figure 32. A new browser window displays the RadAssessor online tutorial.

On the left side of the window is the navigation section where you can click on any of the links to see instructions displayed in the main window to the right (Figure 33).

Figure 33. Click the Spectrum link in the navigation section.

For example, if you click the “**Spectrum**” link under “Identification Results” in the left section, the Spectrum tutorial will appear in the right section, where you may scroll down to view all of the entire information about how to use the Spectrum query (Figure 34).

Tutorial Navigation

Identification Results

- [Spectrum](#)
- [Identification Performance](#)
- [Known Source Isotope](#)
- [Known Instrument ID](#)

Additional Information

- [Instrument Models](#)
- [Instruments](#)
- [Model Distributors](#)
- [Shielding](#)
- [Category 12MAls](#)

Your Account

- [Log In](#)
- [Log Out](#)
- [Lost Username or Password](#)
- [Change Account](#)

Help

- [Documentation](#)
- [Contact Developers](#)
- [About](#)

RadAssessor Tutorial: Spectrum

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The Spectrum page is used to display the actual Spectra collected from measurements. You may choose which Instrument Models, Source Isotopes, and Shielding combinations should be used to generate the resulting Spectra to be displayed.

- [Open the Spectrum Page](#)
- [Select Spectra to Display](#)
- [Display Spectra Records](#)

Open the Spectrum Page

- Move your mouse over the "Identification Results" menu option. You do not need to click the mouse.
- Single click the "Spectrum" option to open the Spectrum page.

RadAssessor: RadAsses

Sharon Seltz is logged in [Logout](#)

RadAssessor Home	Identification Results	Addition
	Spectrum	
	Identification Performance	
	Known Source Isotope	
	Known Instrument ID	

Welcome to the RadAssessor Databases

Please use the toolbar above to perform as viewing Spectra for a specific Identification Results.

RadAssessor provides handheld isotope performance by compiling radiation detection results from various instruments.

Figure 34. When you click a link in the navigation section, you’ll see that tutorial appear on the right.

6.2 Contact Developers

The “Contact Developers” page contains information about how to communicate with the RadAssessor authors and investigators.

6.2.1 To Open the Contact Developers Page

1. Move your mouse over the “**Help**” menu option. (You do not need to click the mouse.)
2. Single click “**Contact Developers**” to open the Contact Developers page.

The RadAssessor email address and developers’ names are displayed.

6.3 About

The “About” page contains RadAssessor copyright and version information.

6.3.1 To Open the About Page

1. Move your mouse over the “**Help**” menu option. (You do not need to click the mouse.)
2. Single click “**About**” to open the About RadAssessor Database page.

The latest RadAssessor software and data versions are displayed in the About RadAssessor Database page. Copyright and publication information is also shown.

Resources and Additional Reading

The following works are useful resources for those who would like additional information about the topics covered in this manual.

- Bailey, Paul. "A First Responders Guide to Purchasing Personal Radiation Detectors (PRDs) for Homeland Security Purposes." Version 2. Springfield, VA: Technology Administration of the U.S. Department of Commerce, Environmental Measurements Laboratory, U.S. Department of Homeland Security, November 2004. <http://www.eml.st.dhs.gov/Standards/gateway/guide/gen/RadPaggers.pdf>
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- Blackadar, John M. "Automatic Isotope Identifiers and Their Features." *IEEE Sensors Journal* 5 (August 2005): 589–592. <http://www.ieee.org/> Los Alamos National Laboratory document LA-UR-04-2852 (2004).
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Index

-	
- hyphen	37

%	
% percent	37, 38

*	
* asterisk	37, 38, 42, 46, 49, 53

[	
[] square brackets	37

_	
_ underscore	37

<	
< less than	38, 53

=	
= equal to	38

>	
> greater than	38, 53

A	
About	69
abundance, atomic	4, 6
acceptance page, OUO	56
access control	7
account	9, 10, 11, 55, 56, 64
account information	10, 11, 63, 64
account page	64
account started, how to get an	9
account, how to use	9
account, request an	10
accuracy of instrument, grades the	4
accurately interrogate	2
action, menu	17

Additional Information	17, 35, 40, 44, 47, 51
additional information from database	16
address	60
address, Internet Protocol (IP)	9
address, RadAssessor email	16, 68
administrator, local network	9
administrator, system	9
affordable instrument identifications	2
allow cookies	10
alphabetic characters	37
alphanumeric filter	36, 37
Apache	7
application	14, 15, 16, 25
application name	16
application title	15
application version	16
application, database	1
approaches, grading	4
approval to release information	15
ascending	39, 41, 45, 48, 52
assess threat	2
assimilate results	1
atomic abundance	4, 6
attack, prevent terrorism	2
attacks, reduce terrorist	2
authenticate	56
authenticate users	55
authentication	7
authorization	7
authorized	7, 9
authorized users	1, 9
automatically, mouse changes	17

B	
backend	7
backend database	16
background	5
background isotope	6
background measurement	6
body section	14
broadband	9
browser	1, 9, 10, 11, 14
browser not set	58
browser window	65, 66
browser, Internet	7
buttons	14

C	
Cancel button	64
capabilities of RadAssessor	1
capabilities, system	16
cargo	2

categories	6, 51, 52, 53
categories, Source Use	25
categorization system	4
categorizations	7
categorizations, measurement performance	2
category	51, 54
Category 12 Letter	54
Category 12 MAI	54
Category 12 MAIs	35, 51, 52
category descriptions, performance	35
category identification	26
category system	24, 25
category systems	3, 4
central repository	1, 2
challenges addressed	1
change account	64
Change Account	55, 63
character with special meaning	38
check boxes	14, 20
classification	15, 16
client	7
column heading, sort	39, 41, 45, 48, 52
commands	9, 17
commands, how to use	1
commercial detectors	1
commercial handheld radiation detectors	1
company	7, 63
compare instruments	1
compile, no need to	9
computer	9, 14
computer access	59
computer network	9
computer, save image to	20, 23
computer, session cookie saved to	55
conclusion	23, 30, 33
conclusions, instrument	30
Conditionally Correct	4, 25
Conditionally Correct 1	5
Conditionally Correct 2	5
confidence	5, 23
Confidence, Instrument	23
confirmation email	11
confirmation notice	61
confirmation, email	10
connection speed, internet	9
connection speeds	9
connection, encrypted	7
connection, internet	9
connection, secure	7
consistent system performance	14
consistent user interface	14
Contact Developers	68
controls	14
convenient instrument identifications	2
cookie	55
cookies	10, 58
cookies enabled	10
copyright	16, 65, 69
Copyright	69
copyrights	16
Correct	4, 25, 26
Correct 1	5

Correct 2	5
criteria	25, 26, 30, 33
criteria, filter	35
criteria, information that meets	42, 46, 49, 53
criteria, pie chart based on	26
criteria, selection	19, 23, 33
current user	17
customized queries	19

D

data access	9
data added, date	16
data fields, predefined	19
data file, raw spectrum	23
data files	1
data in database	19
data in different formats	1
data interpretation	2
data loaded, most recent	3
data repository	7
data version	69
data version, latest	14
data, filter	35
data, instrument performance	7
data, page of	36
data, re-sort	35, 41, 45, 48, 52
data, search	37
data, transferred existing	1
data, view	35
database	1, 3, 7, 9, 28, 31, 38
database access	13
database data	19
database navigation	17
database, backend	16
database, current	26
database, log in and log out of	55
database, radiation detector	1
database, relational	7
date data added	16
date, current	26
descending	39, 41, 45, 48, 52
detailed measurement results	7
detect illegal material	2
detection material	23
detection materials	7
detection results, radiation	2
Detective	23
detector	2, 4
detector information	7
detector performance	2
detectors	1
detectors compared	2
detectors, commercial radiation	2
detectors, radiation	2, 7
developer contact information	65
developer names	68
developers	65
developers, RadAssessor	15, 16
disclaimers	16
disk icon	20

display details	35
Display Spectrum.....	23
disseminate results	1
distinguish radiological material from legitimate.....	2
distribute software, no need to	14
distributor name	46
distributors	35, 46
Distributors	35, 44, 45
Documentation.....	17, 65
documentation, online.....	65, 66
DOE.....	16
domains, internet.....	9
Download Images	20
download pie chart.....	24
Download Spectrum	23
downloaded, images.....	20
dynamically built pages	19
dynamically generated pie chart.....	24
dynamically generated screens.....	3

E

email	10, 63
email address	61
email address validated	61
email address, RadAssessor	9, 10, 16, 58, 68
email confirmation.....	10
email from RadAssessor, receive.....	62
email with instructions.....	61
email, confirmation	11
encrypted connection	7
encryption	7
experience	6, 9
experimental laboratories.....	1
experiments.....	2, 7

F

failure, identification.....	4
False Negative	4, 25
False Negative 1.....	6
False Negative 2.....	6
False Negative 3.....	6
False Negative 4.....	6
False Positive	4, 25
False Positive 1	6
False Positive 2	6
False Positive 3	6
file name, saved image.....	20
filter	36, 41, 42, 45, 48, 49, 52, 53
Filter button	36, 42, 46, 49, 53
filter Category 12 MAIs.....	53
filter criteria	35
filter data	35
filter field	42, 46, 49, 53
filter fields.....	36
filter functions.....	35
filter Instrument Models	42
filter Model Distributors	46
filter section	35, 40, 44, 47, 51

Filter section.....	35, 42, 49, 53
filter Shielding.....	49
filter using wildcards.....	37
filter, alphanumeric	37
filter, numeric.....	38
find alphanumeric.....	37
find literal wildcard	38
find radiological material	2
finding.....	32
findings, instrument.....	28, 30, 31
findings, Instrument	30, 31, 33
Findings, Instrument.....	23
findings, integrated data	1
findings, list instrument.....	28, 29, 32
findings, measurement	1
findings, neutron-response	2, 7
Firefox.....	9
first name.....	15, 57
first responder needs.....	2
first time use.....	11, 12
first-party cookie	55
first-responder programs	2
first-time user log in	12
five categories	24, 51
five-category system	4, 24, 25, 26
footer contains	16
footer section.....	14, 16
Found message, Detective	23
found numeric	38
functions of RadAssessor	1
functions, filter and sort	35

G

gamma identification.....	4
gamma identification results	3
gamma-isotope identification	2, 7
gamma-ray flux	4
generate an account	10
generate findings	31
generate pie chart	24, 26
generate spectra results.....	21
generate title	25
generated identification	31
generated pie chart	26
generated pie chart, dynamically.....	24
generated screens, dynamically	3
generated title.....	26
generated, textual and graphics results	3
grades the accuracy of.....	4
grading approach.....	4
grading, measurement	51
graphics results.....	3

H

handheld isotope-identifying instruments.....	1, 2
handheld radiation detectors.....	1, 2
hard drive	14
header section.....	14, 15

Help	17, 65
Help menu.....	17, 65, 68, 69
help, online	1
Help, online.....	65, 66
high-level understanding.....	3
high-level understanding of performance	4
Home	13, 17, 57, 64

identification	6, 31
Identification Categorization.....	4
identification failure.....	4
Identification Performance.....	19, 24, 25, 26
Identification Performance queries	24
identification results.....	2
Identification Results	17, 19, 21, 24, 28, 31
identification results, gamma	3
identification, gamma	4
identification, gamma-isotope.....	2, 7
identification, incorrect.....	6
identification, isotope.....	24
identification, publication	16
identifications, perform isotope	2
illegal radioactive materials	2
image, mouse over	20
image, save	23
images, download	20
information from database, additional	16
information needed, supply.....	17
information of interest.....	1
information, account.....	63, 64
information, detector.....	7
information, not release	15
information, static	16
information, user account.....	64
information, validate	13
information, validation.....	10
install software, no need to	1, 9, 14
instrument	23, 24, 28
Instrument	20, 25, 31
instrument comparisons	1
instrument conclusions.....	30
instrument correctly identify.....	5
instrument failed to identify	6
Instrument finding.....	32
instrument findings	28, 30, 31
Instrument findings	30, 31, 33
Instrument Findings	23
instrument findings, list	28, 29, 32
Instrument Identification, Known	19, 31, 32
instrument identifications, affordable, convenient, and robust	2
instrument identified ⁴⁰ K.....	6
instrument identify	6
instrument incorrectly reported.....	6
instrument library.....	4, 6
instrument memory	1
instrument might report.....	3
instrument model	21, 40
Instrument Model.....	23, 30, 33

instrument model details	40
instrument model list.....	19
instrument models	35
Instrument Models	20, 35, 39, 40, 41
instrument no identification.....	6
instrument performance.....	2, 4, 16
instrument performance data	2, 7
instrument performance findings.....	2
instrument performance, understanding of.....	3
instrument used, message of.....	31
instrument, accuracy of	4
instrument, new	19
instrument, operate.....	2
instrument, select.....	22, 29, 32
instruments	7, 27, 44, 45
instruments performance	24
instruments selected	20
instruments tested	2
instruments, commercial	1
instruments, isotope-identifying.....	1, 2
instruments, selecting	3
integrated data findings	1
interdicted radioactive material	2
interface.....	3
interface, user	7, 14
Internet browser	7
internet connection	9
internet connection speed.....	9
internet domains	9
Internet Explorer	9
Internet Protocol (IP).....	9
interpret data	2
interpret results.....	1
IP, Internet Protocol	9
isotope being inspected	28
isotope button	4
isotope elements	7
isotope identification.....	24
isotope identification, gamma-	7
isotope identifications, perform.....	2
isotope in library	4
isotope of interest	28
Isotope Results	30
isotope, background	6
isotope, identification	2
isotope, selected source	28
isotope, source.....	21
isotope-identifying instruments	1, 2
isotopes	1
isotopes identified	5
isotopes known.....	31
isotopes present, identity of.....	2
isotopes, identifying radioactive.....	2
isotopes, most abundant	3, 4
isotopes, selecting	3
isotopes, shipping manifest	28
isotopic spectra.....	21
isotopic spectrum	23
items checked	20
items that meet criteria	36

J

JPEG image23

K

Known Instrument Identification 19, 31, 32, 33
 known radiation source3
 Known Source Isotope 19, 28, 29, 30

L

laboratory notebooks.....1
 LANL.....15
 LANS16
 last name 15, 57
 legitimate radioactive sources2
 level, radioactive threat2
 levels of training2
 libraries, individual7
 library6
 library, instrument.....4
 list instrument findings28
 list, instrument model.....19
 literal character38
 literal wildcard38
 location of saved image20
 log in 1, 11, 55, 56, 61
 Log In 11, 17, 55, 56, 57, 60
 log in problems57
 Log In Problems.....57
 log in, first-time user.....12
 log in, how to1
 log out.....17
 Log Out..... 17, 55, 59
 logged in, user.....15
 logged into 15, 56
 Login button..... 11, 12, 56
 login page10
 login problems, solutions to58
 Logout.....59
 logout link.....15
 Los Alamos National Laboratory9, 15
 lost username or password60, 61
 Lost Username or Password.....55, 60, 61

M

MAI3, 4, 5, 6, 27
 MAI present, one6
 MAI Source Isotope23
 MAI, Category 1254
 MAI, correctly identified one.....5
 main area of interest.....19
 main menu57
 main window14
 maintain RadAssessor14
 MAIs Category 1251
 MAIs present, all.....5

MAIs present, not all 5
 MAIs, Category 12 51, 52
 MAIs, correctly identified 5
 MAIs, not all 5
 manufacturer40
 manufacturer name.....42
 material, interdicted radioactive 2
 material, localize 2
 material, radioactive2
 material, shielding 23, 47
 mathematical symbols 37
 measurement 3, 23, 30, 33
 measurement details 21
 measurement findings 1
 measurement grading 51
 measurement performance 4
 measurement performance categorizations..... 2, 7
 measurement performance results 4
 measurement results 7
 measurement, background.....6
 measurement, radiation 7
 measurements27, 40, 47, 52
 measurements acquired 19
 measurements, collected from 21
 measurements, detailed 2
 measurements, matching 26
 measurements, number of..... 1, 30, 33
 measurements, radioactive source 2
 memory, instrument 1
 menu action 17
 menu bar..... 15, 17
 menu item..... 17, 24
 menu items 17
 menu structure 17
 menu title..... 17
 menu titles 17
 menu, Help17, 65, 68, 69
 menu, main 57
 menus 9
 Message..... 23
 Microsoft 7, 9
 Microsoft Access..... 7
 minimum password length 62
 minimum requirements 9
 Minor Daughter 4, 5, 6, 25
 model.....43
 Model23, 25, 30, 33, 39, 43
 model details 7
 model distributors..... 7
 Model Distributors 35, 44, 45
 model list, instrument..... 19
 model name 40
 Model Name..... 41, 43, 45
 models 40, 42, 44
 Models..... 39
 most abundant isotope 23
 most abundant isotopes 3, 4
 mouse changes automatically 17
 mouse over ... 17, 21, 24, 28, 31, 40, 44, 47, 51, 55, 59,
 60, 63, 65, 68, 69
 mouse over image 20
 mouse over spectrum 23

Mozilla.....9

N

name63
name, application16
name, distributor46
name, first15, 57
name, first and last15, 57
name, last15, 57
name, manufacturer42
name, model40
name, saved image file20
narrow the results35, 40, 44, 47, 51
naturally occurring radioactive materials6
naturally-occurring radiation2
needs, first responder2
need-to-know9
need-to-know, validate10
Netscape9
network administrator9
network location9
neutron-response7
neutron-response findings2
NNSA16
normalized structure7
notebooks1
Number of Findings30, 33
numeric38
numeric characters37
numeric filter36, 38

O

object, single source4
objects, atomic abundances of4
objects, source4
Official Use Only9, 15, 16, 56
OK button12, 56, 61
online documentation65, 66
online Help65
online help, how to use1
online tutorial17
online, manual17
Opera9
operator memory1
OUO9, 15, 16, 56

P

page of data36
page title15
page, Home13, 17, 57, 64
page, login10
page, main14
page, selection19
page, Your Account12
password9, 11, 55, 56, 60, 63
password, first time use11
password, lost60, 61

password, minimum length62
password, reset61, 62
password, set new62
password, temporary10
password, verify new62
performance categorizations, measurement2, 7
performance category descriptions35
performance comparisons1
performance data1, 2
performance data, instrument7
performance findings, instrument2
performance of instrument24
performance results, measurement4
Performance Title26
performance with naturally-occurring radiation2
performance, consistent system14
performance, detector2
performance, instrument2, 16
performance, measurement4
performance, understanding of instrument3
permissions7
Permissions, Cookie10
phone63
PHP Hypertext Preprocessor7
pie chart24, 26
pie chart title26
pie chart, dynamically generated24
pie chart, generate performance24, 26
pie chart, title of24, 25
pie wedges25
Possible message, Detective23
potential threat3
predefined data fields19
privacy10
problem, most common58
problems with RadAssessor9
problems, log in57
process selected items20
programs, first-responder2
protocol, SSL7
publication identification16
publication information69
publications1
punctuation marks37

Q

queries19, 35
queries, build1
queries, semi-customized19
queries, standard16
query notations, standard42, 46, 49, 53
query results, user7
questionable cargo2

R

RadAssessor database system1
RadAssessor email address10, 16, 58, 68
RadAssessor Home17

RadAssessor online tutorial	17
RadAssessor problems	9
RadAssessor, application title	15
RadAssessor, sign in to	55
radiation	4
radiation detection results	2
radiation detectors	1, 2, 7
radiation measurement	7
radiation source, known	3
radiation sources	1
radio button	40, 43, 47, 50, 51, 54
radioactive	31
radioactive isotopes, identifying	2
radioactive materials	2, 6
radioactive materials, detecting illegal	2
radioactive source measurements	2
radioactive sources	2, 7
radioactive sources, legitimate	2
radioactive threat level	2
radioisotope present	6
radioisotopes present	4
radiological material, finding	2
raw data file	23
redirect to Log In	17
redirect to Your Account	11
reference, quick	15
relational database	7
repository, central	1, 2
repository, final data	7
requirements, minimal system	9
requirements, minimum	9
Reset button	22, 25, 29, 32
Reset Filter button	45, 48, 52
reset password	60, 61, 62
re-sort data	35, 41, 45, 48, 52
responder needs, first	2
responder programs, first-	2
response findings, neutron-	2, 7
responses, detector	2
result pages	20
results	39
results – none returned	38
results, assimilate, interpret or disseminate	1
results, connection speed effect on	9
results, detailed measurement	7
results, gamma identification	3
results, graphics and textual	3
results, identification	2
results, measurement performance	4
results, narrow the	35, 40, 44, 47, 51
results, radiation detection	2
results, selection criteria	19
results, spectra	21
results, user query	7
results, wildcards and	37
retrieve information, how to	1
review account	64
robust instrument identifications	2

S

Safari	9
save image to computer	20
Save Picture As	20, 23
save spectrum image	23
saved image file name and location	20
saved to computer	55
scalable	7
screens, dynamically generated	3
search data	37
search for literal wildcard	38
search using wildcards	37
search, limit or narrow	35
search, use filter to	35
section, body	14
section, filter	35, 40, 44, 47, 51
section, footer	14, 16
section, header	14, 15
section, navigation	66
section, tutorial in right	67
secure connection	7
Secure Sockets Layer	7, 55
select instrument	22, 29, 32
select instrument, isotope, and shielding	3
select menu item	17
selected items, process	20
selected source isotope	28, 29
selected, instruments	20
selecting a particular instrument	2
selection criteria	19, 23, 25
selection page	19
selections, reset	22, 25, 29, 32
semi-customized queries	19
server	7
Server manager	10
Server, Web	7
session cookie	55
session cookies	10
session ended	55
session identification	55
session validation	10, 58
shielding	1, 2, 7, 21, 22, 29, 32, 35, 47
Shielding	35, 47, 48, 50
shielding material	23, 47, 50
shielding material, select	47
shielding materials	49
shielding of interest	28, 31
shielding thickness	22, 23, 29, 32
shielding used, all	48
shielding, selecting	3
shipping manifest	28
software version	69
software version, latest	14
software, no need to install	1, 9, 14
solutions to login problems	58
sort	39
sort functions	35
sort order	41, 45, 48, 52
source isotope	21, 22, 29
Source Isotope	23, 30, 31, 33

Source Isotope, Known	19, 28, 29
source isotopes	32, 33
source use	24
Source Use	25
source uses	7, 27
sources being measured, radiation	1
sources measured	2
sources, isotope button	4
sources, radiation	2
sources, radioactive	7
special characters	37
special nuclear material	2
spectra	2, 7, 23
Spectra	22
spectra, isotopic	21
Spectrum	19, 21, 23, 67
Spectrum queries	21
spectrum, isotopic	23
spreadsheets	1
SSL	7, 55
standard queries	16
standard query notations	42, 46, 49, 53
static information	16
Submit button	20, 22, 25, 29, 32, 61, 64
subnet	9
supply information needed	17
Suspect message, Detective	23
symbols	37
system administrator	9
system capabilities	16
system developers	65
system for measurement performance	4
system performance	14
system requirements, minimal	9
system, category	24
system, log in and log out of	55
system, sign in to	55

T

tables, lookup	7
temporary password	10, 11
terrorism, prevent radiological	2
terrorist attacks, reduce	2
tested, browsers and versions	9
tested, instruments	2
text	14
text fields	14
text size, browser	9
textual results	3
thickness, shielding	23
threat assessment	2
threat level, determine	2
threat level, radioactive	2
threat, potential	3
title of page	15
title of pie chart	24, 25, 26
title, application	15
title, generate	25
title, generated	26
titles, menu	17

trouble accessing RadAssessor	58
truck	28
tutorial	65, 66
tutorial in new browser, online	66
tutorial, online	17
tutorial, Spectrum	67
twelve categories	5, 24, 51
twelve-category system	4, 24, 25, 27

U

unauthorized	59
update account	63, 64
update RadAssessor	14
user account	64
user information	59
user information in database	7
user interface	7, 14
user log in, first-time	12
user logged in	15
user logged into	15
user name	15
user navigation	65
user of the system	15
user query results	7
user, current	17
username	9, 10, 11, 55, 56, 60, 61
username, first time use	11
username, lost	60, 61
users	7
users log in	1
users, authorized	1, 7, 9
users, validate and authenticate	55

V

validate account information	10, 11
validate information, RadAssessor	13
validate need-to-know	10
validate user	12
validate users	55
validated by RadAssessor	61
validation of session	10, 58
verify new password	62
VeriSign	55
version	9, 69
version, application	16
versions tested, browsers and	9
versions, latest	14
versions, software and data	69
vessel	31
view account	63
view all current distributors	44
view all five and twelve categories	51
view all models	40
view all shielding	47
View button	40, 43, 47, 50, 51, 54
view data	35
view information, how to	1
view online documentation	65, 66

view RadAssessor copyright and version.....	69
view the Spectrum tutorial	67
view, scroll to.....	67

W

web	3, 9, 14, 60
web browser.....	1, 9, 11
Web Server	7
wildcard	37

wildcard characters.....	37
wildcard, literal	38
window, browser	65, 66
window, main.....	14
window, navigation portion of	66

Y

Your Account.....	12, 17, 55, 59, 60, 63
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