BERKELEY NUCLEONICS CORPORATION

USER MANUAL

MODEL SAM 940+

USER MANUAL

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CHAPTER 1. INTRODUCTION

The new, third generation, SAM 940+, meets the increasing demand for portability with a lightweight (1.2 Kg) unit that sacrifices neither speed nor quality of radionuclide identification. It is also designed to meet the requirements of ANSI 42.34 criteria for hand-held instruments.

BNC's decades long experience in innovative RIID design drives a RIID that leverages the most advanced technologies available to deliver features such as: (a) source-less auto-stabilization; (b) real time reach-back; (c) detachable external probes. Features such as high-resolution camera, multi-channel GPS, Gyro sensor, and a hot swappable battery pack complete a state-of-the-art unit.

The features of this new design assure the user of excellent performance that exceeds the demanding requirements of Homeland Security in the USA and beyond.

Figure 1.1.0. SAM 940+

1.1. SAM 940+ EVOLUTION

The 3rd generation SAM 940+ is the most compact and lightweight hand-held RIID product ever produced. Volume and weight are a third less than previous models and yet advanced features such as multi-media support are included.

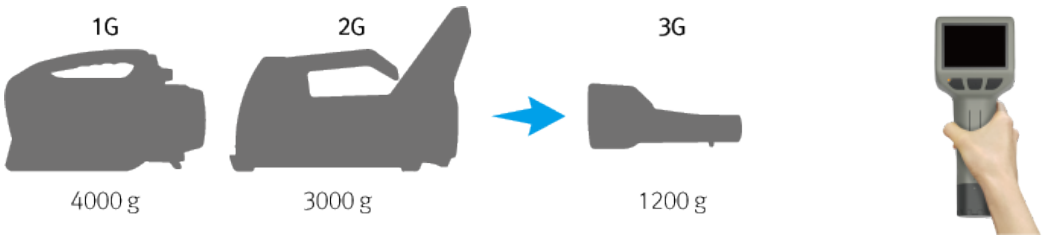

Figure 1.1.1. The 3rd Generation Hand-Held RIID and its Evolution

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1.2. IMPORTANT SAFETY INFORMATION

The SAM 940+ has been meticulously engineered to provide safe, dependable, high performance for years. As with any kind of electrical equipment, following instructions and taking basic precautions will prevent harm to the operator and to the equipment.

Prior to using this equipment, you should:

- ✓ Read and understand this manual thoroughly, especially the chapter on safety **(Chapter 2)**.
- ✓ Read and understand thoroughly all warning labels on the equipment.
- ✓ Store all documents provided with the equipment in a safe place for future reference.

1.3. PRODUCT WARRANTY

Description of BNC's warranty for the SAM 940+ handheld RIID systems:

- ✓ The unit is warranted to be free of defects in material and workmanship. This includes parts, labor and all unit elements.
- ✓ Unless otherwise indicated, the warranty period is **12 months** after delivery to the original buyer only.
- ✓ Additional Warranty Services and Maintenance Agreements are available, contact the factory for details at 800-234-7858 or info@berkeleynucleonics.com.

1.4. NOTIFICATION OF COPYRIGHT

The software in this device is protected by copyright laws and international treaties. You must treat the software like any other copyrighted material. Copyright laws prohibit making additional copies of the software for any reason other than specifically described in this manual. You may not copy the written materials accompanying the product without prior written consent from BNC.

CHAPTER 2. SAFETY

2.1. CAUTIONS AND NOTES

The following warnings and instructions are vital to the optimal operation of the SAM 940+ unit and should be made readily accessible for reference. Follow these warnings and instructions thoroughly to use the unit correctly and to protect the safety of the users.

⚠ Handling Instructions:

- ✓ The maintenance service of the unit should only be handled by qualified/trained personnel
- ✓ Cleaning the Camera**:** Clean the window with a soft, moist cloth to keep it clean and clear. Turn off the power before cleaning.

⚠ Safety Hazard Warnings:

- ✓ It can be very hazardous to open the unit due to the high voltage inside the unit (high voltage in the detector is up to 1000 Volts). Be sure to refer all servicing to qualified/trained personnel.

⚠ Disposal Instructions:

- ✓ If/when disposing the unit: observe local and national regulations for the disposal of units containing a lithium battery.
- ✓ Do not use household or municipal waste collection services for disposal of electrical and electronic equipment. EU countries require the use of separate recycling collection services. Check with local regulations.

⚠ WARNING:

- ✓ External equipment intended for connection to signal input, signal output or other connectors, shall comply with relevant EN Standard (e.g., EN 61326-1:2013, EN 301 489-1 V1.9.2 and EN 301 489-17 V2.2.1).
- ✓ If unsure, please contact a qualified technician or your Berkeley Nucleonics representative.

The SAM940+ Contains the Following FCC ID #U8D-FB155BC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operations.

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2.2. CLASSIFICATION

- ✓ EMC: Comply with EN 61326-1: 2013, EN 301 489-1 V1.9.2 and EN 301 489-17 V2.2.1)
- ✓ FCC Class**:** Class B Equipment (FCC CFR 47 part 15 subpart B, Section 15.101)
- ✓ Degree of protection against electric shock: Type BF Applied Part
- ✓ Degree of protection against the ingress of water: IP 65
- ✓ Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.

2.3. LABELS

The label providing the manufacturer information and serial number of the system is located on the bottom of the unit (Figure 2.3.1.).

Figure 2.3.1. Label

CHAPTER 3. SYSTEM DESCRIPTION

3.1. SYSTEM COMPONENTS

The physical components of the SAM 940+ are listed in figure 3.1.1. The two software programs used with the SAM 940+ are described in **Chapter 4 and 7**. Also included are USB cables with universal adapters for charging the battery and connecting the SAM 940+ to a PC. The SAM 940+ also includes a ruggedized carrying case which houses the SAM 940+ and all needed components. The case contains custom-made sponge foam as shown in figure 3.1.2.

①	Gamma detector	②	LCD display	③	Neutron detector (optional)	④	Replaceable battery pack
⑤	AA battery holder	⑥	Universal adaptor	⑦	Belt holster	⑧	Camera

Figure 3.1.1. SAM 940+ Components

Figure 3.1.2. SAM 940+ Components Packed in a Carrying Case

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① SAM 940+ detector unit
② Universal power adaptor for SAM 940+
③ Replaceable battery pack (2 ea.) and emergency AA battery holder (1 ea.)
④ OTG communication USB cable
⑤ USB cable for battery charger
⑥ Belt holster, hand strap and battery charger
⑦ Heavy duty carrying case

WARNING: High current (3A) power adaptor and corresponding USB cables are provided for fast battery charging. Do not use any other power adaptor and USB cables. Using inappropriate adaptors and/or cables may slow down charging time and reduce performance.

3.2. HIGH RESOLUTION CAMERA

Multi-media support is one of the key features in the SAM 940+. Having visual information of sites and target objects greatly improves situational awareness for reachback teams or management support. Alarm mitigation is supported by visual imagery of the alarming target.

The SAM 940+ is equipped with a built-in camera (CMOS 8M pixel) module for recording media information that can be attached to the event files along with spectroscopic and user data (GPS, etc).

Figure 3.2.1. Built-in Camera Location and Protective Cover.

The camera lens is located as shown in figure 3.2.1. (red circle). The lens is water protected by a special optical cover. Keep the optical cover as clean as possible.

3.3. BELT HOLSTER AND HAND STRAP

The compact and light weight design enables easy transport of the SAM 940+ in a belt holster. The belt holster is designed to monitor the display of SAM 940+ without unstrapping the instrument from the body. The hand strap prevents the SAM 940+ from slipping out of your hand.

Figure 3.3.1. Belt Holster and Hand Strap

3.4. POWER AND BATTERY CHARGE GUIDE

There are several ways to charge the SAM 940+ battery pack. The most effective ways are using the dedicated charger station provided or using a USB cable directly to the battery. A full charge may take up to 3 hours for each battery.

3.4.1. Remove/Insert a Battery From/To the SAM 940+

SAM 940+ provides two rechargeable batteries. Following are instructions for removing/inserting the battery from/to the SAM 940+ unit.

3.4.1.1. Opening the End Cap and Removing the Battery.

1. Twist the end cap clock wise and take out the end cap. (figure 3.4.1.)

Figure 3.4.1. Open the End Cap

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2. Tilt down the SAM 940+. The battery should slide out with its own gravitational weight. If it does not slide out easily, it may have been jammed or twisted unnecessarily. Verify the battery is operational by charging it.

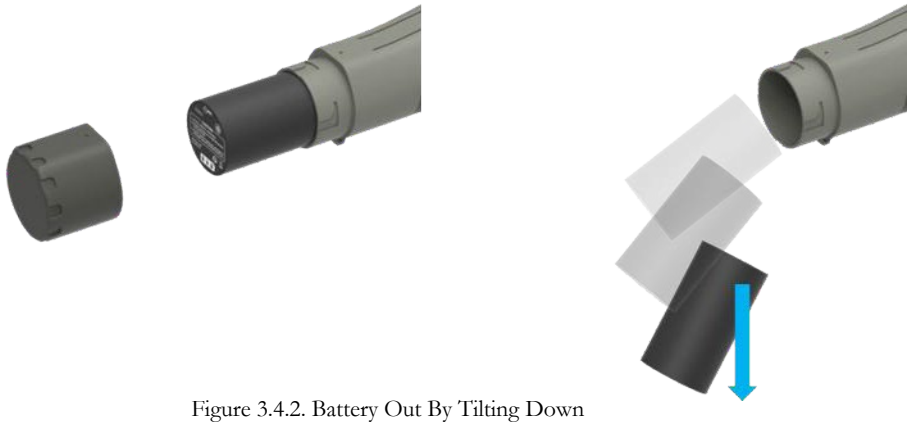

Figure 3.4.2. Battery Out By Tilting Down

3.4.1.2. Inserting the Battery and Closing the End Cap.

1. Inserting the battery as shown in figure 3.4.3. (LED side is down).

Figure 3.4.3. Insert Battery

2. Close the cap by twisting it counter-clock wise. The two red dots should be aligned (figure 3.4.4.)

Figure 3.4.4. Close the End Cap

3.4.2. Directly Charge to the Battery

The swappable battery has a micro 5 pin USB port and battery status indicator LEDs. Using the port, the battery can be charged independently. The battery indicator LED shows the level of charging status when the LED power button is pressed.

Figure 3.4.5. Power Switch and Battery Charger

The SAM 940+ battery has a built-in power protection circuit (PCM) which prevents the battery from both overcharging and over-discharging. The battery power indicator LEDs are turned on sequentially. All three LED is will light when the battery is fully charged and you press the 'check' button as shown in figure 3.4.5.

3.4.3. Charging Battery Using a Dedicated Charge Station

The SAM 940+ comes with a dedicated battery charging station as shown in figure 3.4.6. The battery can be docked into the station in any azimuth angle. No alignment is needed.

The battery has a smart contact design that enables docking the battery into the charge station without worrying about alignment.

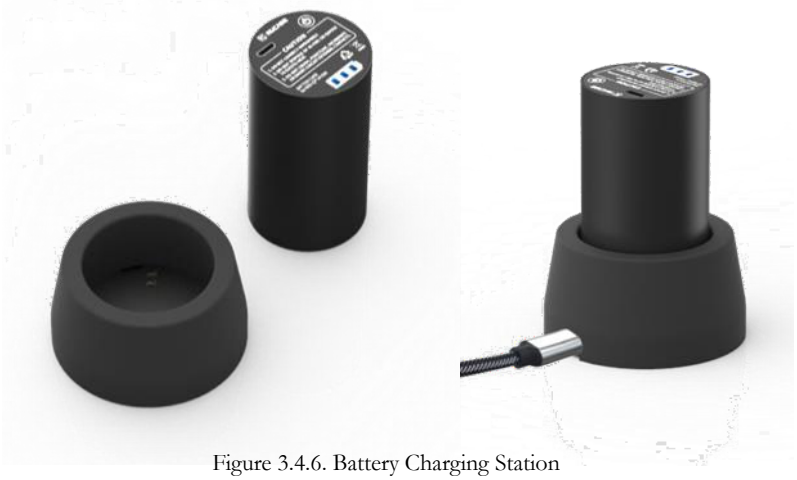

Figure 3.4.6. Battery Charging Station

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3.4.4. Charging Through the SAM 940+

The battery can be charged without taking the battery out from the unit using the mini 5 pin USB port on the front face of the SAM 940+ as shown in figure 3.4.7.

Figure 3.4.7. USB Port can be used to Charge the Battery

The SAM 940 + comes with two different USB cables: a micro 5 pin and mini 5 pin, as shown in figure 3.8. Be aware of the difference and use the appropriate cable. The micro USB cable is for charging the battery and the mini USB is for communication between the SAM 940 + and a PC.

Figure 3.4.8. Micro USB vs. Mini USB Cables.

The charging time might be longer than other methods if the unit is turn ON consuming power for operation or stand-by.

3.4.5. Power by Alkaline Batteries

Off-the-shelve **Alkaline Batteries** can be used for emergency cases when you are running out of power using both battery pack and you don't have access to DC power. A total of 4 AA size Alkaline batteries are needed to operate the SAM 940+ using the battery holder provided. The maximum stand-by operation time of the SAM 940+ with the 4 AA battery is about two hours.

Figure 3.4.9. AA Battery Holder

Hazard: Internal high voltage (up to 1,000 volts)! Do not disassemble the unit. Servicing of the unit should be performed by BNC qualified personnel.

3.5. SAM 940+ CONNECTIVITY

Another advanced features in SAM 940+ that is unusual within the field of small, compact RIIDs, is the ability to connect to external devices. The SAM 940+ supports connections to external detectors, network adaptor for 4G/LTE network, high resolution GPS devices and other devices via its USB port or a LIMO connector.

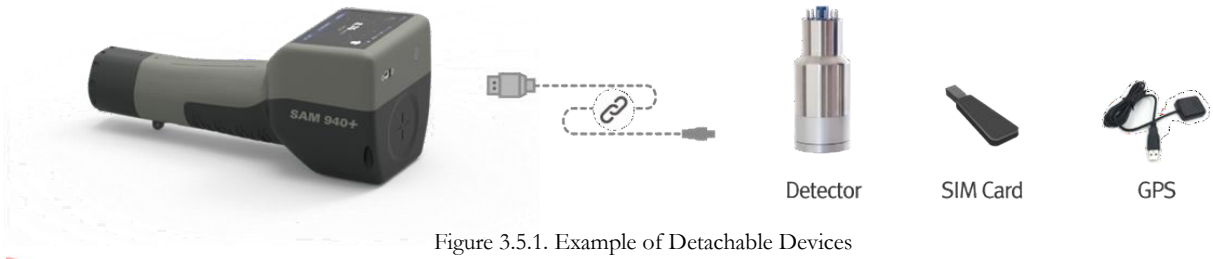

Figure 3.5.1. Example of Detachable Devices

Using detachable device with the SAM 940+ requires standard communication protocols. Consult with a BNC engineer for details and feasibility.

3.6. SAM 940+ SOFTWARE

The SAM 940+ system includes two dedicated software programs for conducting surveys and analyzing results on a computer.

3.6.1. PeakAbout IV operates on the Detector Unit

- PeakAbout IV is used for configuring and calibrating the system, and for real-time measurement and analysis of data acquired by the detector unit. It is based on the Android OS.
- Detailed instructions for operating PeakAbout IV are in **Chapter 4**.

3.6.2. PeakID IV for the PC

- PeakID supports management of Event Log files, data analysis including integration of data from multiple units, and data backup. It is compatible with PCs that run Windows 10 or higher.
- Detailed instructions for installing and operating PeakID IV are in **Chapter 7**.

3.7. PREREQUISITES FOR THE OPERATION OF THE SAM 940+

3.7.1. Update Configuration Parameters

There are few critical configuration parameters that are important in the operating of the SAM 940+. The SAM 940+ unit is delivered with configuration parameters set by factory by default. However, we suggest that each user edits the customized parameters before operation of the unit.

PeakAbout IV SW itself allows user to edit some of configurable parameters. However, using PeakID IV SW installed in a PC with a mouse and a keyboard allows for easier editing. In addition, all the configurable parameters can be accessed/edited by PeakID IV SW.

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There are two ways to upload configuration parameters from a PC to the SAM 940+, i.e., using USB memory device or using WiFi network. The former is easier method while the later method requires a pairing procedure between the SAM 940+ and a PC.

3.7.1.1. Using a USB

1. Edit configuration parameters using the PeakID IV application SW installed in a PC. **Refer to the section 7.9.3. User setup and 7.9.4. Administrator setup for instructions.**
2. Copy the configuration to an USB memory device (Refer to section 7.9.2.)
3. Upload the configuration into the SAM 940+. (Refer to the section 6.3.4.4.)

3.7.1.2. Using WiFi Network

2. Edit parameters using the PeakID IV application SW installed on a PC. **Refer to the section 7.9.3. User setup and 7.9.4. Administrator setup.**
3. Paring the SAM 940+ and a PC. (Refer to the section 6.3.4. Paring)
4. Upload edited configuration to the SAM 940+. Refer to the section **7.9.3. Upload/download configuration via WiFi network**.

3.7.1.2. Factory Default Parameters and corresponding Values

Factory default parameters are summarized in table 3.7.1.

Privilege	Parameter	Factory default	Note
USER	User Name	BNC	
	User Location	BNC	
	Detector Info	TBD	Device dependant information
	SW version	TBD	Currently installed SW version
	Alarm Ringtone	Siren	
	Alarm Volume	100%	
ADMIN.	Isotope Library	ANSI NaI	
	Sleep mode time	120 sec.	
	Manual ID Time	120 sec.	
	Increment Time	10 sec.	
	Background Time	120 sec.	
	Calibration Counts	200,000 cnt.	
	Doserate Unit	Urem/h	
	Display Option	Linear	
	Alarm mode	FIX	
	Alarm Theshold	1000 cps.	
	Health Alarm	10 mSv/h	
	Neutron Alarm	0.8	
	Reachback Account	none	Reachback email information
	RadResponder Account	BNC	
	Device WiFi	none	
	Admin Password	1234	
	Time Zone	USA/LA	
	Sequential mode	Off	
	Seq. measurement	300	
	Seq. pause time	3	
	Seq. repeat	5	

Table 3.7.1. Factory Default Parameters

CHAPTER 4. PEAKABOUT IV

4.1. INTRODUCTION

The main functions of the PeakAbout IV application software on the instrument are to provide the dose (and count) rate data for alarming gamma-ray activity. In addition, PeakAboutIV provides the operator with a convenient graphic status display and access to several analytical tools (QCC or Linear Spectrum, isotope specific dose rate, historical counts, etc). It also manages the configuration and calibration of the paired SAM 940+ unit.

Intuitive, simple, and hierarchical structure design of the new PeakAbout IV software make the operation of SAM 940+ easy and flawless. In addition, function buttons on the handle provides extra convenience in handling the unit with wearing gloves. Details of application software functions are described in the following sub sections.

Figure 4.1.1. Gauge Screen

4.2. FUNCTION BUTTONS

4.2.1. Function Buttons

The function buttons of SAM 940+ on its neck provides a natural grip with convenient control and operation of the unit. A user can operate the buttons with wearing gloves, with RIGHT or LEFT hand. Each function keys performs actions corresponding to the soft-key above the button For example, **FINDER** ①, **MANUAL ID** ②, and **EVENT LOG** ③ actions are executed when the function button left, middle, and right are pressed, respectively.

Figure 4.2.1. Function Buttons on the Handle.

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4.2.2. Double Action Function Button.

In some menu screen, the function button does two actions. For the example below (this is the password screen for administrative access), each function button does two actions, i.e., LEFT/UP, OK/DONE and RIGHT/DOWN.

The second action, i.e., UP, DONE, and DOWN, can be selected by pressing the corresponding button and **holding it for about 2-3 seconds.** The corresponding action becomes active when the button is released. After a few attempts to click quickly or hold for 2-3 seconds, this becomes natural.

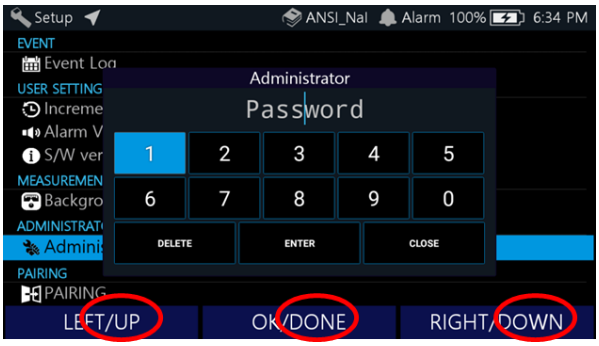

Figure 4.2.2. Double Action Example.

4.3. GAUGE SCREEN

PeakAbout IV's "home screen" is the Gauge screen. The screen's main function is to display dose rate and count rate data for gamma-ray energy in real time, and neutron count rate data (if so equipped) as well. In addition to displaying dose rate and count rate data on a logarithmic scale gauge, the screen gives information on the system's operating status (Figure 4.3.1).

All real-time operations and menu access begin at the Gauge screen.

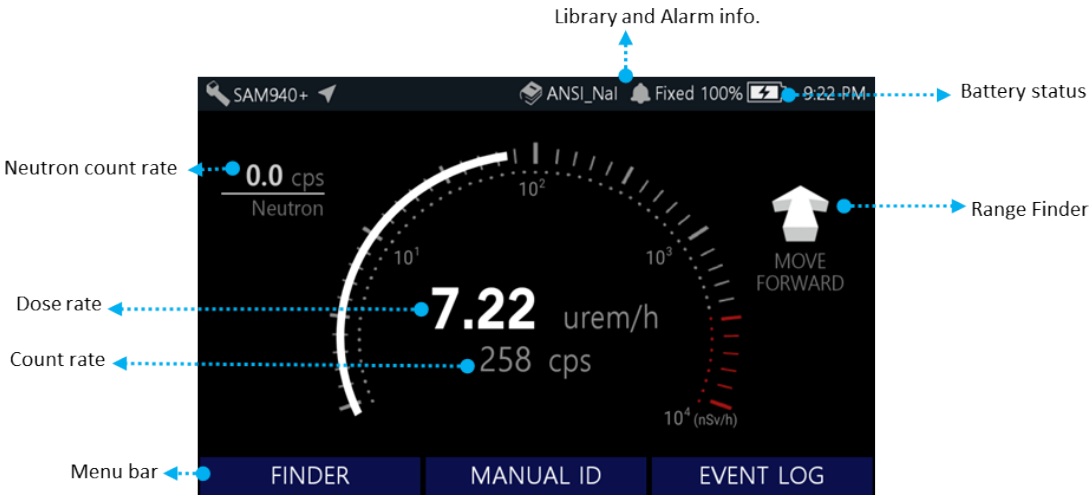

Figure 4.3.1. Gauge Screen Example.

4.4. MENU HIERARCHY

PeakAbout IV's menu hierarchy is summarized in figure 4.4.1**. FINDER**, **MANUAL ID** and **EVENT LOG** menu can be accessed from **HOME** screen. **SETUP** menu is hidden from the **MAIN** but it can be accessed by pressing **EVENT LOG** button for 2 seconds. (SETUP may be a 2nd Function on the Home Screen)

The **FINDER** menu is divided into **LOCATOR** and **REALTIME**. The **LOCATOR** screen is the primary display when **FINDER** menu is selected. **LOCATOR** and **READTIME** screens can be toggled back and forth.

The **MANUAL ID** menu is divided into **SPECTRUM** and **CLASSIFIER**. The **SPECTRUM** screen is the primary. The two screens can be toggled back and forth. When the **MANUAL ID** is completed, the **EVENT REPORT** screen appears automatically. **REACHBACK** and **CAMERA** menus can be accessed from the **EVENT REPORT** screen.

The **EVENT LOG** menu is divided into **EVENT ID** and **EVENT INFO**. The two screens can be toggled back and forth. The primary screen is the **EVENT ID** screen and the **REACHBACK** screen can be accessed from the middle softkey. The **CAMERA** screen can be accessed from the **EVENT INFO** screen as well, using the right softkey.

The **SETUP** menu consists of **USER** setup, Measurement, Administrator setup and Paring.

Details of each menu is described in **chapter 5 and 6**.

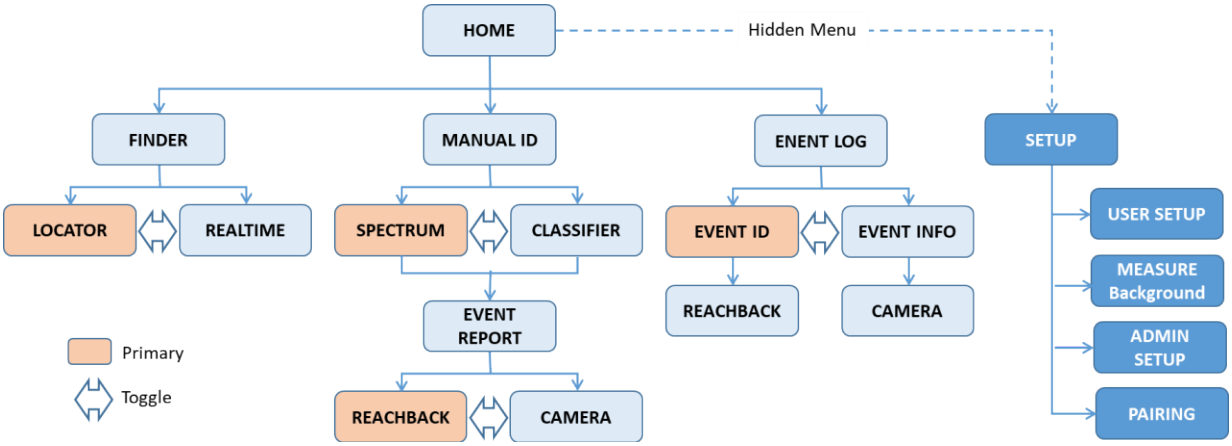

Figure 4.4.1. Menu Structure

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CHAPTER 5. BASIC OPERATING INSTRUCTIONS

5.1. PREPARING EQUIPMENT FOR OPERATION

5.1.1. Charge the Battery

Charge the battery (refer to section **3.4. Power and Battery Charger**). You may check the battery indicator for power status as shown in figure 5.1.1.

Figure 5.1.1. SAM 940+ Power Up Example

5.1.2. Turn Power On

Turn the power switch on. The power switch is located on the left side of the unit. Press the red button and hold until an orange LED lights on the front left button. (Figure 5.1.2).

Figure 5.1.2. Power Switch Location

5.2. AUTO CALIBRATION

The Auto Calibration and Auto Stabilization features adjust the calibration parameters of the SAM 940+ to correct for drift caused by environmental changes in ambient temperature. Auto Calibration and Auto Stabilization can recover peak shift up to ±20%. If drift of more than ±20% between the stabilized peak and the original peak (Cs-137 calibration peak) occurs, then you must perform a manual calibration using a Cs-137 source.

Auto Stabilization begins immediately after the completion or cancellation of Auto Calibration and executes again every three minutes, except when the system is in an alarm condition or when performing Manual Identification.

When Auto Calibration or Auto Stabilization is executed, the system automatically adjusts its gain using the 1461 keV energy peak emanated by the K-40 radionuclide from natural background and no other calibration source is needed. If necessary, such as in the rare case you find yourself in a location where levels of potassium are unnaturally low (in a boat surrounded by water for instance), supplemental KCL (Potassium chloride) powder can be used to achieve stabilization more quickly.

Auto Calibration automatically executes when PeakAbout IV is initiated. We recommend waiting for Auto Calibration to complete (100%) before proceeding, Auto Calibration can be stopped by pressing Cancel if necessary. A pop-up massage appeares when the auto-calibration is completed. (figure 5.2.1).

Make sure that there are no radiation sources in the vicinity during Auto Calibration.

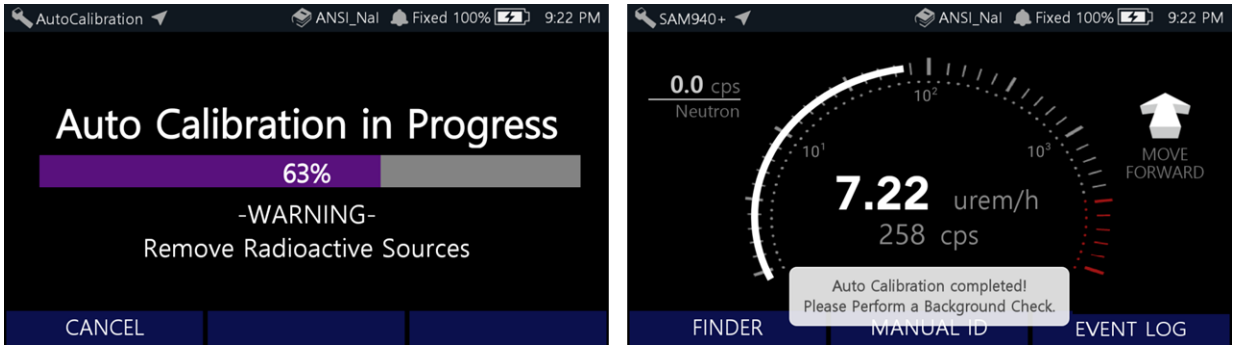

Figure 5.2.1. Auto Calibration Example

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5.3. PERFORM BACKGROUND MEASUREMENT

Reliable background information is critical to good nuclide identification and alarm performance. PeakAbout IV uses an advanced NORM rejection algorithm to minimize false alarms due to fluctuations of Naturally Occurring Radioactive Material in the background.

1. Make sure there are no radiation sources near the SAM 940+
2. Move to SETUP screen by selecting EVENT LOG and hold for 2 seconds. ①
3. Select /Measurement/Background ②

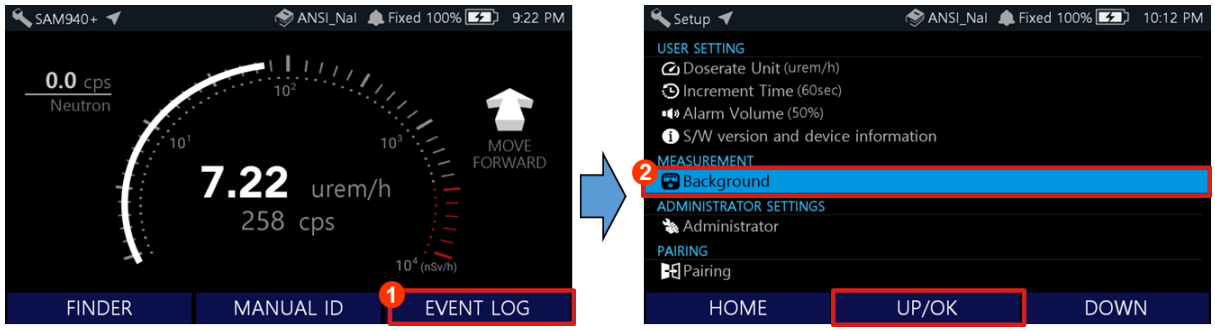

Figure 5.3.1. Background Measurement

4. A spectrum will begin and will automatically update during the measurement (Figure 5.3.2.)
5. To cancel background measurement select **BACK** button.

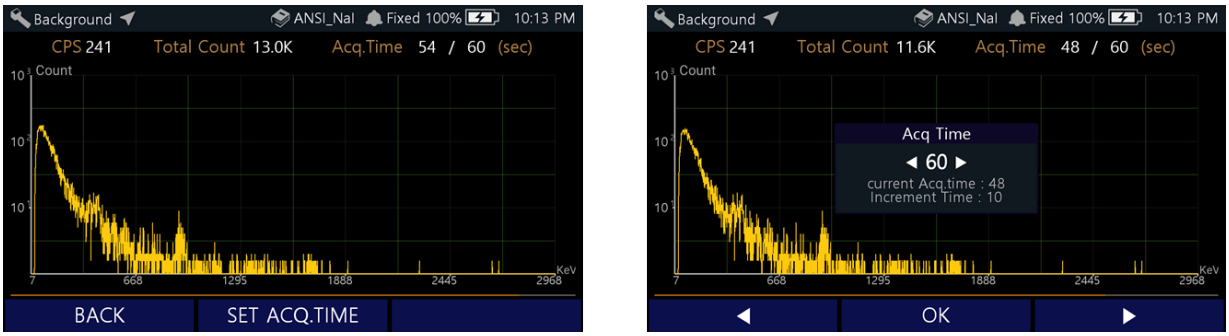

Figure 5.3.2. Background Measurement and Time Setup

In some user versions, the **SETUP** menu may be hidden from the Gauge screen menu bar. To access, press and hold the **EVENT LOG** button for 2 seconds.

The background spectrum (displayed in yellow) is automatically updated during the measurement. Measurement time is defined in the Setup menu. The default time is 120 seconds. To change this setting, you must use the **PeakID IV**.

Refer to **Section 7.9.4.6. Background Measurement Time.** SET ACQ. TIME allows user to manually increase/decrease background measurement as shown in figure 5.3.2.

5.4. BEGIN MONITORING RADIATION

The SAM 940+ automatically begins monitoring radiation when the Gauge screen opens.

1. Look at the alarm mode area on the status bar (Figure 5.4.1.). If Variable Alarm Mode is in effect, allow about 20 seconds for the unit to collect background and threshold data before surveying.

Figure 5.4.1. Status Bar Example with Fixed Alarm Mode in Effect

2. The gauge displays both the dose rate (rem/h or Sv/h) and count rate (counts per second (cps)) of gamma activity. If equipped, the count rate for neutron activity is also displayed on the Gauge screen. The gamma dose rate scale is logarithmic. PeakAbout IV automatically scales to µrem/h or mrem/h (µSv/h or mSv/h) according to the detected activity level.

3. You may choose **FINDER** to view the **LOCATOR** or **REALTIME** screen during monitoring instead of the Gauge screen (Figure 5.6). The Realtime screen emphasizes count rate rather than dose rate information. Counts per second (cps) are displayed on a graph that moves to the left as it updates every second. The full graph represents the most recent 60 seconds of cps.

4. You might prefer to use the **REALTIME** ③ screen because the graph can alert you to a momentary increase in activity more effectively than the rapidly changing numerals on the Gauge screen. With the Finder screen, you also have a second chance to observe evidence of a source that you might not notice otherwise. The system will alarm regardless of which of these screens is enabled when the alarm threshold is exceeded.

5. **LOCATOR** ② provides directional information of detected isotopes. A combination of radiation event and internal gyro sensor response, PeakAbout IV estimates the direction of gamma source. The details of instruction of **LOCATOR** feature is described in **5.8. Find Directional Information of Isotopes** section.

The dose rate unit (rem/h or Sv/h) is defined in the **PeakID IV Setup** menu. To change this setting, you must first log in as Administrator.

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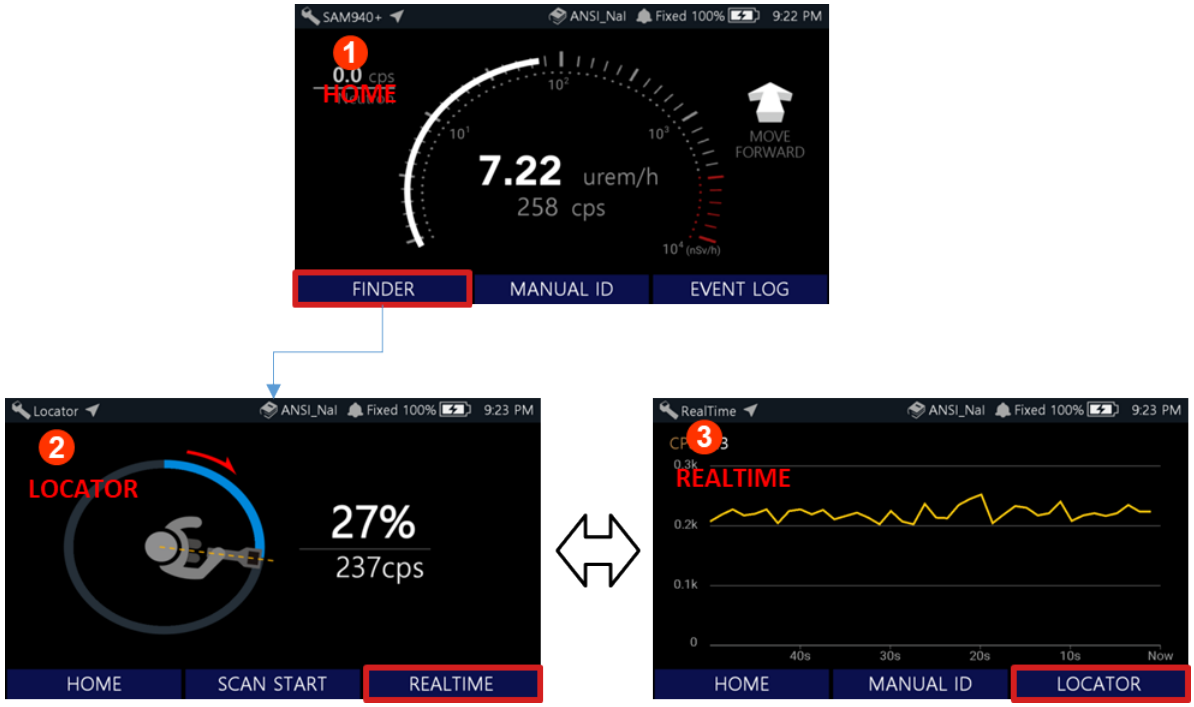


Figure 5.4.2. Example of Gauge Screen and Finder Screen

5.5. WHEN THE SAM 940+ HAS ALARMED

When the system detects radioactivity, the readout on the gauge changes from white to red (Figure 5.5.1), and the audible alarm sounds. **There is no reason to panic when this happens**, as the alarm merely indicates that detected activity has only exceeded normal background dose rate or count rate. For concerns about personal safety, refer to **Section 7.9.4.9. Select Alarm Mode and Alarm Threshold**.

Figure 5.5.1. Alarm Example

PeakAbout IV displays a helpful Range Finder (Table 5.5.1) on the Gauge screen. Use it to better locate the gamma source. To measure and record this kind of event, Manual ID must be performed. When the "IN

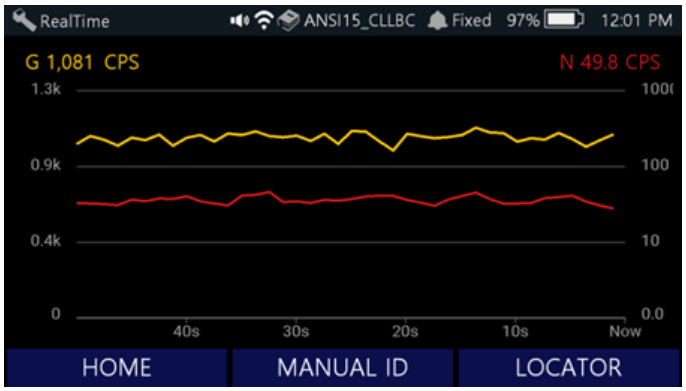
RANGE" message displays, it is a good time to perform Manual ID.
Refer to **Section 5.6. Perform Manual ID**.

Range Finder Message	What It Means
	IN RANGE: Count rate/dose rate is within the optimal range for isotope identification. Manual ID should be performed in this range.
	MOVE FORWARD: Count rate/dose rate level is too low for isotope identification. Move closer to the radiation source.
	MOVE BACK: Count rate/dose rate level is higher than optimal for isotope identification. Move away from the radiation source.
	**DANGER: Activity level is extremely high. Move back to a distance with a safer level or leave the area immediately.**

Table 5.5.1. Range Finder Messages

Variable Intensity of "Beep" Sound

In real-time mode, "Beep" is the default ring tone because it's sound varies with the intensity of the radiation.



5.6. PERFORM MANUAL ID

To measure and record an event, Manual Isotope Identification must be performed. Manual ID can be performed whether the SAM 940+ is in an alarm condition or not.

Figure 5.6.1. shows graphical illustration of ways to toggle between Gauge screen and Manual ID screen using function buttons.

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Figure 5.6.1. Toggle between Gauge and Manual ID Screen Using the Function Buttons.

5.6.1. Initiate Manual ID

Initiate Manual ID by Selecting MANUAL ID Button on the Gauge Screen. (figure 5.6.2)

Figure 5.6.2. Initiate Manual ID.

When Manual ID is initiated, PeakAbout IV begins recording an event spectrum (Figure 5.6.3). The default measurement time is 120 seconds. While the Manual ID is running, you may decide that you will need to record a longer measurement. Without interrupting or restarting your Manual ID, you can extend or reduce the measurement time in increments of 10 seconds. Default measurement times can be set in PeakID. (Refer to **7.9.4. Administrator setup**).

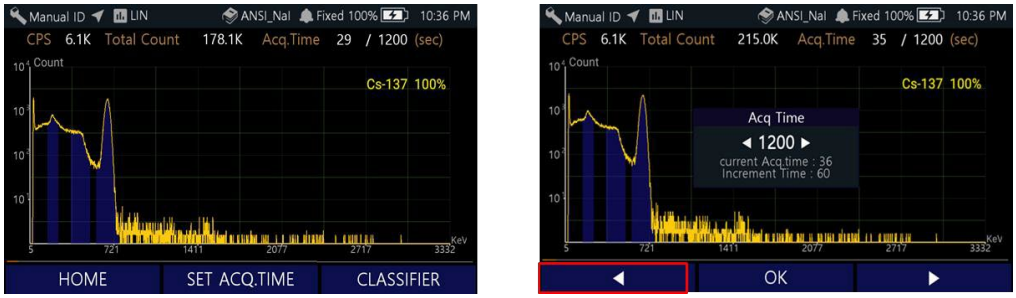

Figure 5.6.3. Manual ID Screen and Setup Acquisition Time

5.6.2. Toggle Between Spectrum Screen and its Classification Screen

Up to 10 isotopes can be identified simultaneously and presented on the Spectrum and Classification screens. The Spectrum screen displays the event spectrum. On the Classification screen, identified isotopes are displayed on a color-coded bar graph.

Figure 5.6.4. Manual ID Screen and Analysis Screen

5.6.3. Spectrum Screen

The Spectrum screen is shown in figure 5.6.5. and its contents are summarized in the table below.

You can cancel an event before the measurement time has elapsed by touching the HOME key. The event data will not be saved, and you will return to the Gauge screen

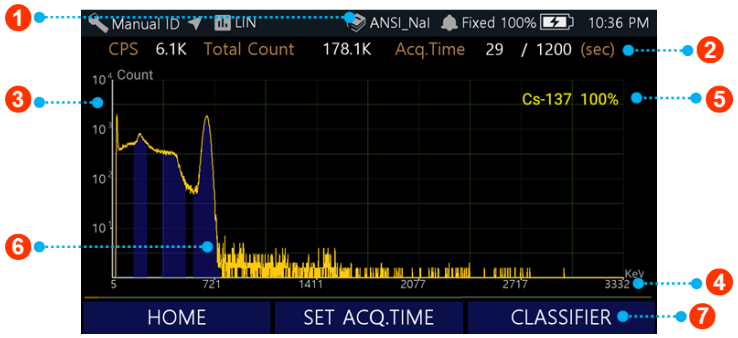

Figure 5.6.5. Manual ID Screen

1	Status bar (right)	Displays battery indicator and time
2	Acquisition time	Allows user to increase/decrease capture time and displays progress
3	Counts	Y axis displays counts on a self-adjusting, logarithmic scale
4	Channel/Energy	X axis displays energy on a linear or QCC scale
5	Nuclide name	Displays identity and confidence level of identified nuclide(s)
6	Photo peak	Color-coding corresponds to Classification screen (see Figure 5.6.6.)
7	Classifier	Toggle between Spectrum screen and Classification screen

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5.6.4. Isotope Classification Screen.

The Isotope Classification screen is shown in figure 5.6.6. below. In this mode, the real-time Dose Rate measurement of identified nuclides is graphically displayed in a horizontally oriented bar graph. If multiple isotopes are identified, PeakAbout IV will place the most significant isotope (highest contributing dose rate) as the top-most bar, and the remaining isotopes in descending order to the least significant isotope (lowest contributing dose rate). Each bar will be named and displayed with the corresponding classification color as shown in figure 5.6.6. ④

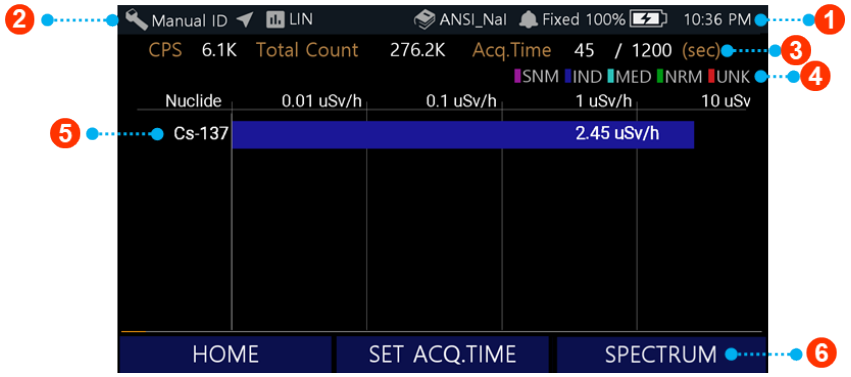

Figure 5.6.6. Isotope Identification Screen

1	Status bar (right)	Displays battery indicator and time
2	Status bar (left)	Displays unit name, selected library, and alarm mode
3	Classification	Classifies identified isotopes as: SNM – Special Nuclear Material – magenta IND – Industrial Isotopes – blue MED – Medical Isotopes – cyan NRM – Naturally Occurring Radioactive Material – green UNK – Unknown Material – red
4	Event time and CPS	Time during event, acquisition time, and counts per second (CPS)
5	Dose rate	Displays dose rate of classified isotope on color-coded, logarithmic bar graph
6	Spectrum screen	Toggle between Classification screen and Spectrum screen

NORM	K40, Ra226 and daughters, Th232 and daughters
Medical	F18, Cr51, Ga67, Mo99, Tc99m, Pd103, In111, I123, I125, I131, Xe133, Sm153, Tl201
Industrial	Na22, Co57, Co60, Se75, Rh106, I132, I133, Ba133, Cs134, Cs137, Eu152, Ir192, Am241
SNM	U233, U235, U238, Pu239, Pu241, Np237

Figure 5.6.6.1 Detectable Idotope List

5.6.5. Event Report Screen

When the measurement time has elapsed, PeakAbout IV displays the Event Report (Figure 5.6.7.). In this screen, you may send the event to reach-back or take photos.

Figure 5.6.7. Event Report Example

1	Status bar (right)	Displays selected library, and alarm mode, battery indicator and time
2	Event Information	Total count, count rate and Acq. Time (ID progress)
3	Detected Nuclide	Displays identified isotope(s) with classification, dose rate, and confidence level
4	Media list	Allows review of attached photo(s)

To be identifiable, the isotopes must be in the selected isotope library (the name of the selected library appears on the status bar; see Figure 5.6.7.). The library setting is defined in the Administrator Settings menu in PeakID IV. To change this setting, you must first log in as Administrator. Refer to **Section 7.9.5. Library Setup**.

The default measurement time is defined in the Administrator Settings of PeakID IV. **Section 7.9.4. Administrator Setup**. The increment by which measurement time can be extended or reduced is defined under **Section 7.6: Manual Identification Adjustment Time**. To access, and change these settings, you must be logged in as the Administrator.

5.6.6. Sequential Mode

The purpose of Sequential Mode is to generate a series of measurements separated by short pauses, one right after the other. The sequence of measurements is generated by a single keypress, instead of requiring the operator to manually begin each individual Event. All Events in the sequence have the same Measurement Time, and the Pause Time between Events is the same. The sequence continues for a specified Number of Measurements or until the user interrupts and cancels the sequence. Sequential Mode is useful for plotting a series of Events while the SAM 940+ moves along a continuous path.

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For each Event in the sequence, the SAM 940+ collects the date, time, GPS position, overall count rate, overall dose rate, count rate and dose rate for each identified isotope, and other typical event data (including the identified neutron rate if the neutron detection option is installed). After the survey, all the spectral data from the entire sequence may be batch processed (to a spreadsheet, for example) with a single command.

Refer to the section 7.9.4.16. Sequential Mode configuration.

5.7. TRANSMIT EVENT DATA TO REACH-BACK

When operating within range of Wi-Fi, the SAM 940+ allows you to transmit spectrum and event data directly to a prearranged location such as a U.S. DOE reach-back facility, group leader, command center, etc.

5.7.1. Transmit Event to Reach-back When Manual ID is Completed

Data from an Event that you select is emailed in N42-compatible XML format to the specified recipient.

1. Select **REACHBACK** button when manual ID is completed.
2. A dialog box will appear to select transfer method. Select ReachBack
3. ReachBack is highlighted and sender/receiver account are shown (Figure 5.7.1)
4. Transmit success message is appeared when transmission is completed.

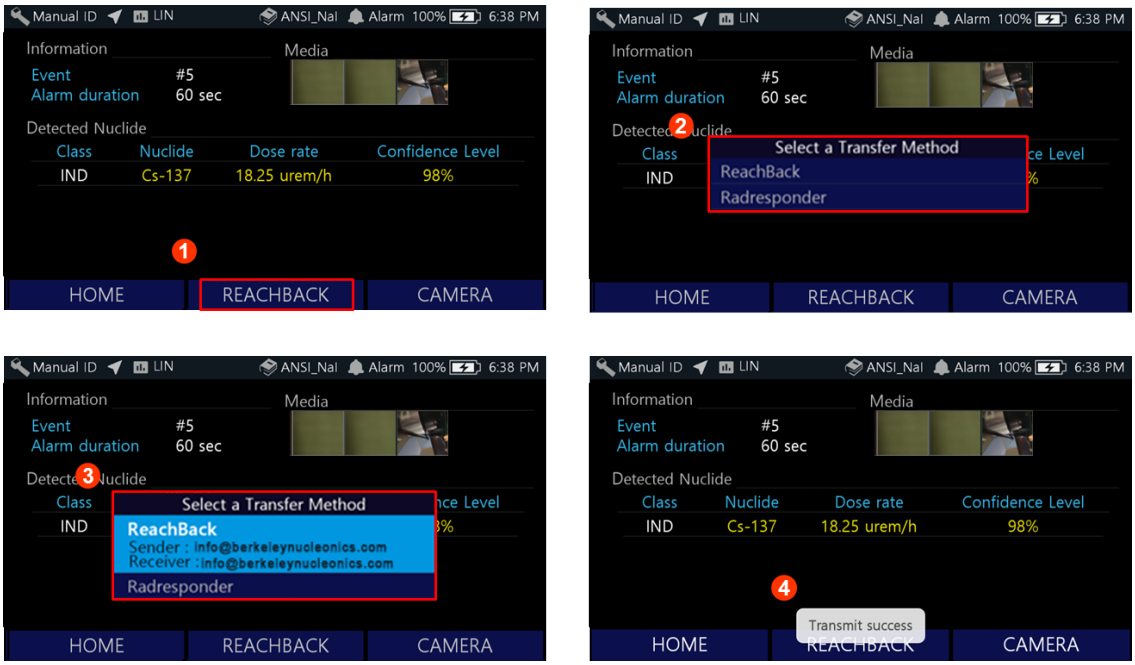

Figure 5.7.1. Transmit Event Report to Reach-back

Reach-back transmission can also be initiated from the Event Log. Refer to the instructions in **Section 6.2 : Use the Event Log to Transmit Event Data to Reach-back**.

Instructions for configuring Email Account settings are described in **Section 7.9.4.11. Reach-Back Email Account**.

5.7.2. Transmit Event to RadResponder When Manual ID is Completed

In the United States, we have partnered with FEMA to implement RadResponder, a free network for the rapid collection and management of radiological data during an emergency. When the SAM 940+ is operating within range of Wi-Fi, spectrum and event data can be uploaded to the RadResponder cloud in the appropriate format. RadResponder can be accessed on PDAs, smartphones, tablets, or any computer connected to the web, allowing it to be seamlessly employed at all levels of government during a radiological or nuclear emergency.

1. Select **REACHBACK** button when manual ID is completed.
2. A dialog box will appear to select transfer method. Select RadResponder
3. RadResponder is highlighted and Sponsor/Event type information are shown (Figure 5.7.2)
4. Transmit success message is appeared when transmission is completed.

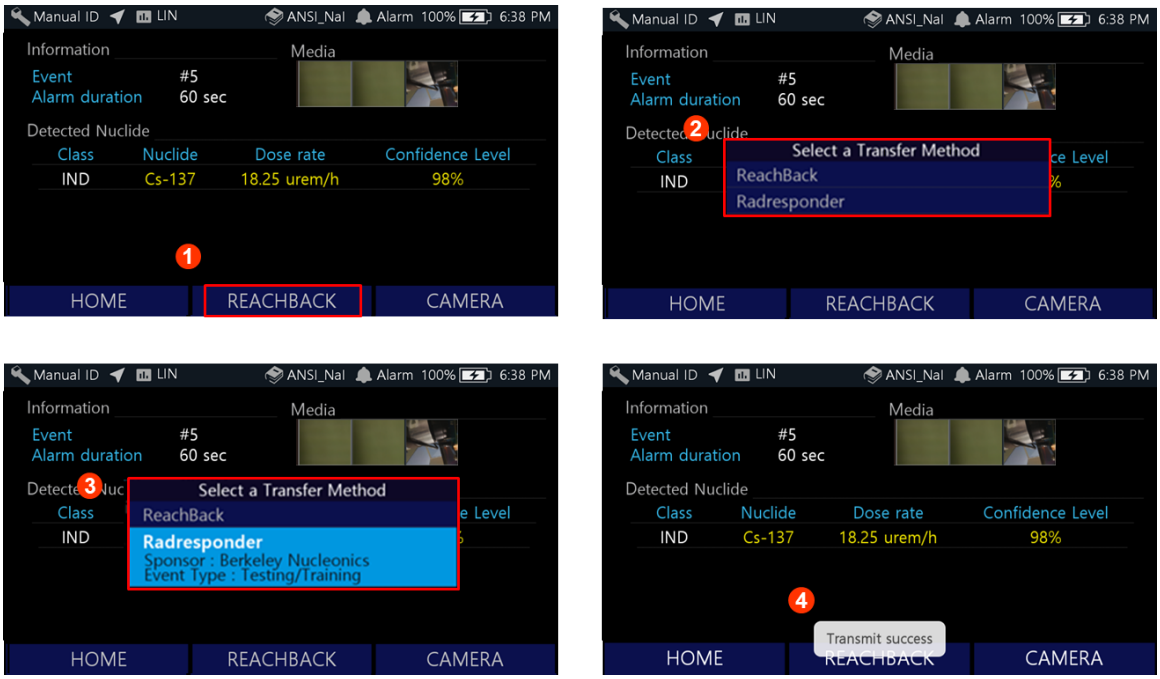

Figure 5.7.2. Transmit Event Report to RadResponder

Before you can upload spectrum and event data to RadResponder, you must already have established a RadResponder account at www.RadResponder.net, and you must set up RadResponder Mode in PeakID IV.

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5.8. ATTACH PHOTO IMMEDIATELY AFTER AN EVENT

Immediately upon completion of Manual Identification, the Event Report allows you to attach photos to the data that has been automatically saved in the Event file. (For instructions on adding media to a previously saved Event, refer to **Section 6.1. Use the Event Log to Access Event Data**).

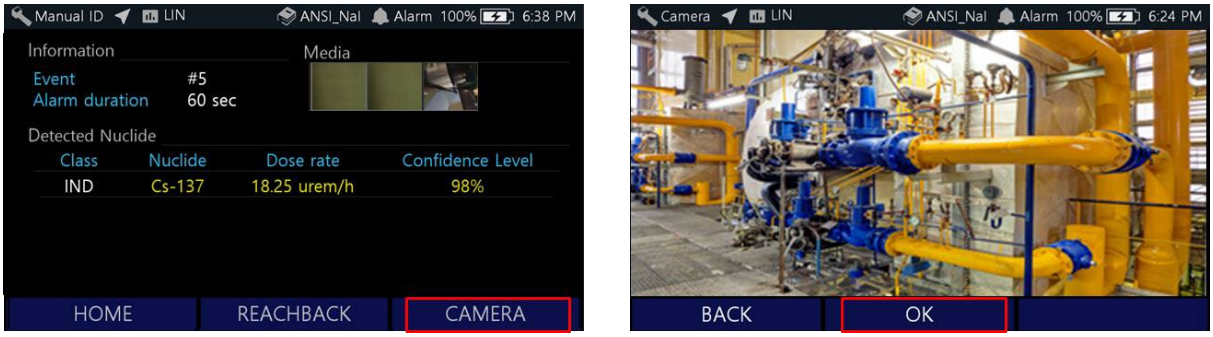

Figure 5.8.1. Attach Photo to an Event

5.8.2. Start Scan

1. Selecting SCAN START
2. Hold the SAM 940+ firmly and position it in front of your body
3. Slowly turn around yourself full 360 degree either clockwise or counter clockwise.

The progress status ① and count rate ② at the given direction will be displayed as shown in figure 5.8.2. To cancel the scan, select SCAN STOP.

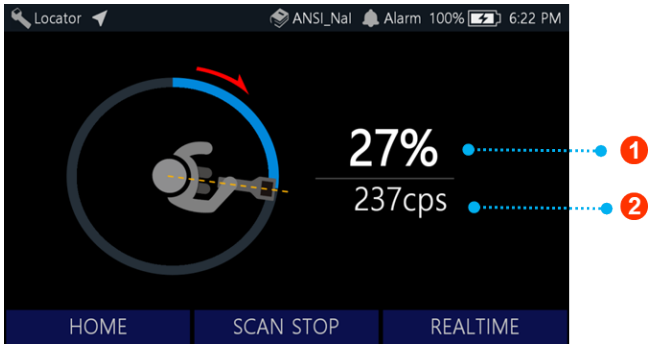

Figure 5.8.2. Scan Progress Status and Count RSate

5.8.3. Locator Report

Immediately upon completion of scan, the direction of isotope is displayed as an arrow, as shown in figure 5.8.3. In addition to graphical indicator of the location, the location is described as a clock indicator. For instance, 2 o'clock means the source is located at the 2 o'clock direction by defining your starting position as 12 o'clock.

5.8.4. Search Fail Cases

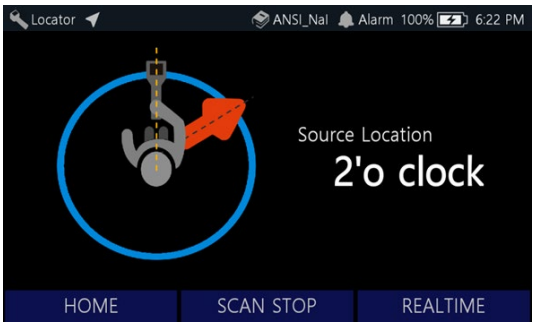

Figure 5.8.3. Scan Result in Red Arrow

The SAM 940+ is unable to find the location of isotopes in cases of either activity that is too low or scan that was performed too fast. Figure 5.8.4. shows fail examples.

The activity of isotope should be greater or equal to double the background activity. Your rotation speed will also affect the result. The suggested speed is about 10 seconds per full 360 degree scan.

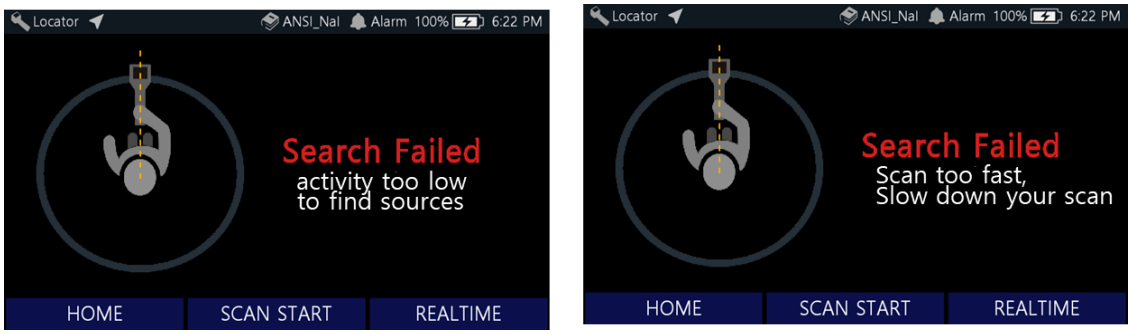

Figure 5.8.4. Search Fail Examples

5.9. FIND DIRECTIONAL INFORMATION OF ISOTOPES

The SAM 940+ provides directional information of identified isotope using the **LOCATOR** feature. With the combination of radial radiation activities and internal gyro sensor response, PeakAbout IV estimates the direction of gamma source. The **LOCATOR** screen can be accessed by selecting FINDER button from the gauge screens. The details of instruction of Locator feature is described in following section.

5.9.1. Access to Locator Screen

1. Access to **LOCATOR** screen by selecting **FINDER** button as shown in figure 5.9.1.

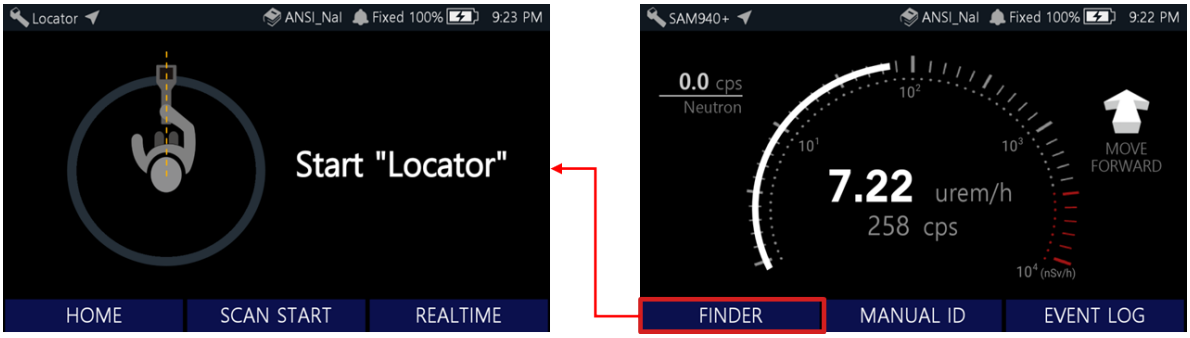

Figure 5.9.1. Access to LOCATOR Screen

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5.10. FAVORITE EVENT

The Favorite Event feature allows the user to tag an Event and find it later as a favorite.

5.10.1. Add Favorite Event

1. At the end of Manual ID, the ID report screen is showed up as shown in figure 5.10.1.
2. Select and hold the REACBACK button for 2 second.
3. The star icon is filled with blue color. And "add favorite" message will appear.

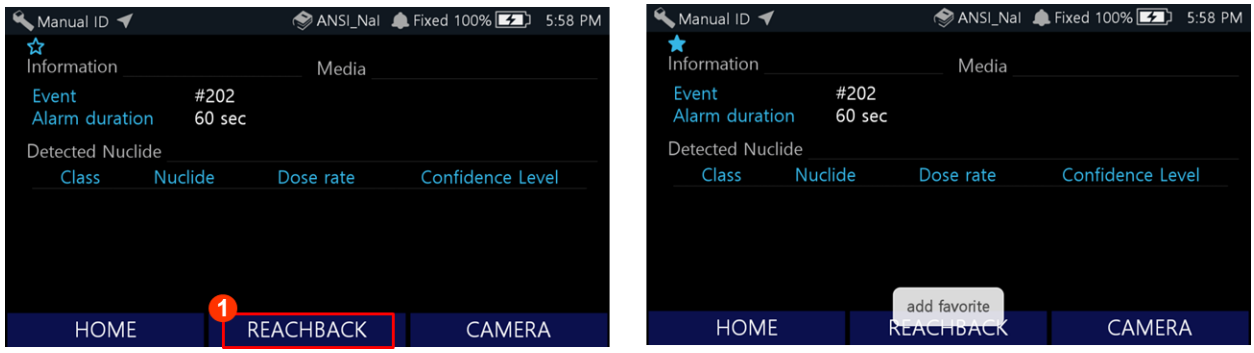


Figure 5.10.1. Add Favorite Example

5.10.1. Remove Favorite Event

1. Select and hold the REACBACK button for 2 second.
2. The star icon is turned to normal. And "Remove Favorite" message will appear.

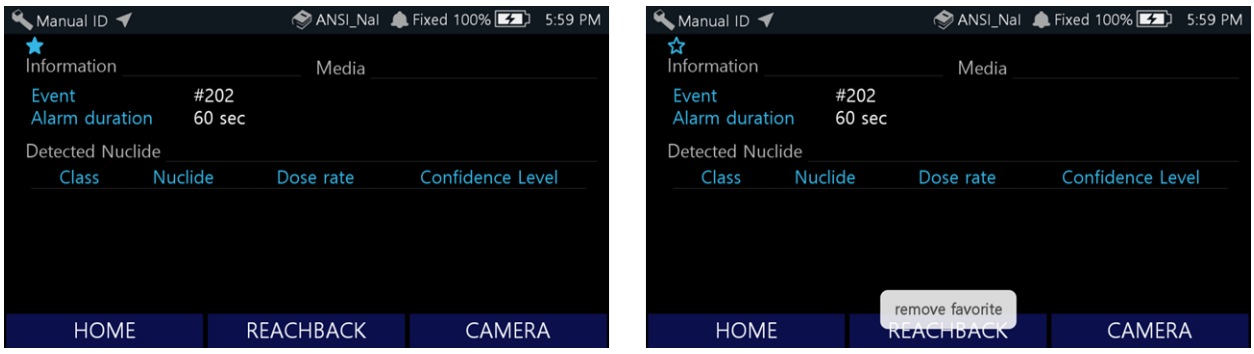


Figure 5.10.2. Remove Favorite Example

The favorite event is displayed in yellow in the event log list as shown in figure 5.10.3.

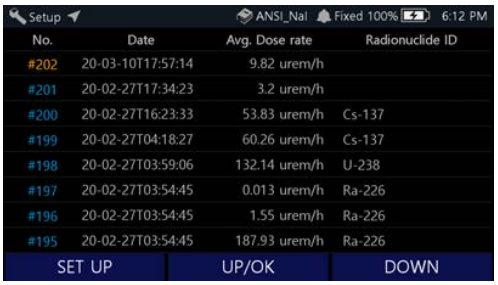


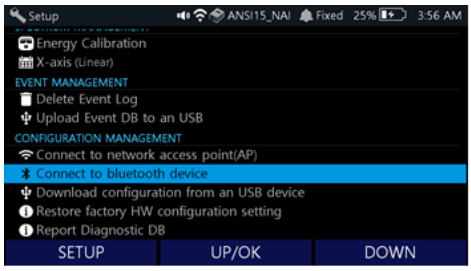
Figure 5.10.3 Favorite Events (multiple allowed)

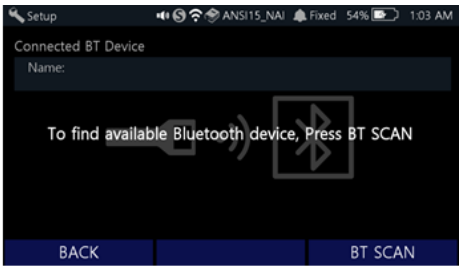
5.11. BLUETOOTH CONNECTION

An earphone connection should be available to enable use of the audible function in a high-noise environment. (Bluetooth earphone added)

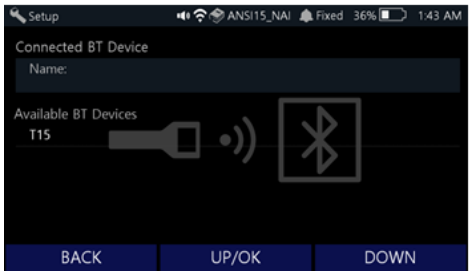
5.11. Add Bluetooth Connection

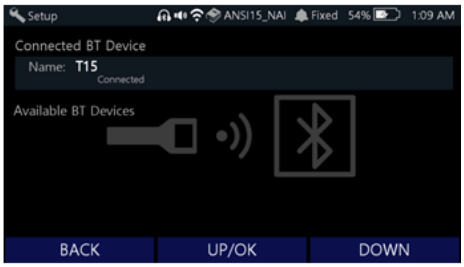
Bluetooth
Earphone





Connection is Successful. Earphone icon will appear

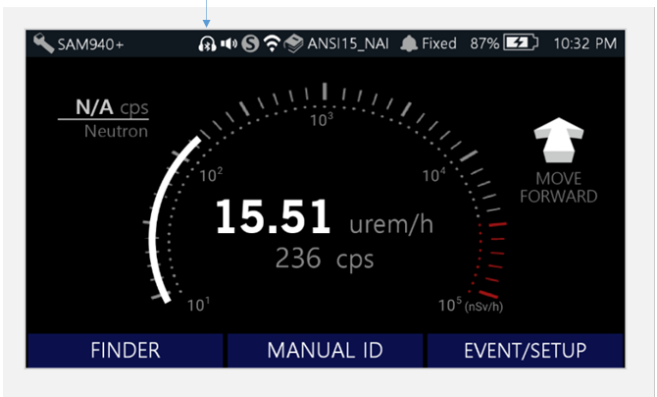




Following is the Bluetooth earphone setup procedure

1. Select 'Connect to Bluetooth Device' from Setup Menu
2. Scan for available Bluetooth Devices: click 'BT SCAN' button.
3. Select a desired Bluetooth earphone.

Bluetooth Icon: Connected



Note: Bluetooth earphones are disconnected automatically when the charger case is closed.

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5.12. AUDIO RINGTONE OFF/ON

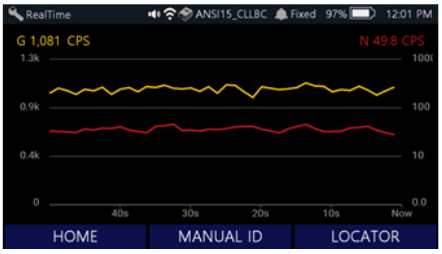
5.12.1. Audio ring-tone off/on

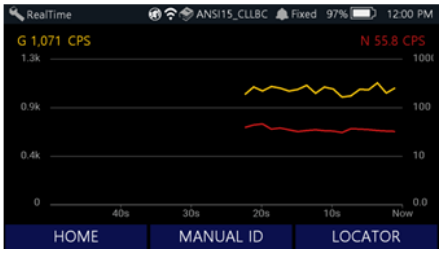
Audible ring-tone can be off/on in "main" or "real-time" screen.
Press/hold left key button for 2-3 seconds (ON → OFF)

Variable Intensity of "Beep" Sound

In real-time mode, "Beep" is the default ring tone and its sound varies with the intensity of the radiation.

Audio icon changed

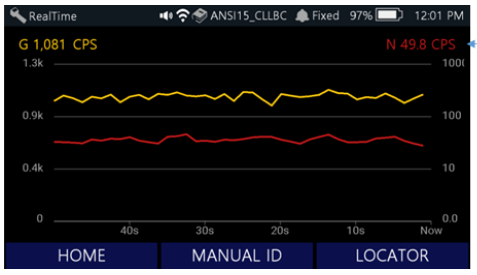




Gamma/Neutron Simultaneous Display in Real-time Screen

If neutron option is available, the real-time screen displays both gamma and neutron simultaneously.

Left x-axis:
Gamma
(yellow graph)



Right x-axis:
Neutron
(red graph)

The gauge displays both the dose rate (rem/h or Sv/h) and count rate (counts per second (cps)) of gamma activity. If equipped, the count rate for neutron activity is also displayed on the Gauge screen. The gamma dose rate scale is logarithmic. PeakAbout IV automatically scales to µrem/h or mrem/h (µSv/h or mSv/h) according to the detected activity level.

5.13. SLEEP MODE AND TURN OFF AFTER OPERATION

The SAM 940 + falls into "sleep mode" automatically when it is not in use for certain time (setup sleep mode time is defined in section 7.6). The sleep mode LED shown in figure 5.13.1. is turned on (yellow LED). It wakes up by pressing any functions keys.

The Sleep Mode also wakes up for any alarm condition.

It is recommended to turn off the SAM 940+ after operations are completed in order to reduce power drawn from the SAM 940+ battery.

Figure 5.13.1. Sleep Mode LED and Power Switch

CHAPTER 6. OPERATING INSTRUCTIONS: EVENT LOG AND SETUP MENUS

The Event Log and Setup Menus are intentionally hidden from the main tasks such as Radiation Monitoring and Manual ID to maximize ease-of-use during operation. This section discusses how to access and use these features.

6.1. USE THE EVENT LOG TO ACCESS EVENT DATA

When Manual ID is performed, PeakAbout IV automatically generates and saves an Event file that contains the results. Just as with a live Event Report, opening a saved Event allows you to analyze the saved spectrum; attach photos and transmit Event data.
Saved event files can be assessed by selecting the **EVENT LOG** as shown in figure 6.1.1.

Event data can be downloaded by connecting the SAM 940+ to a PC that has PeakID IV installed on it (see Chapter 7.3.2. Connecting the SAM 940+ to a PC). Once the event data has been downloaded to the PeakID IV database, you can choose to automatically delete it from the SAM 940+.

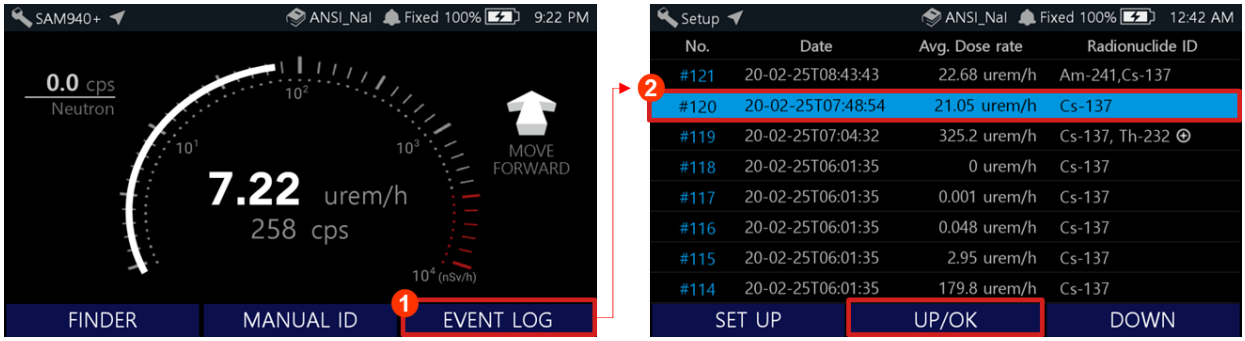


Figure 6.1.1. Access to Event Log

Once an event is selected from the Event Log list and opened by selecting the OK button, the screen will switch to EVENT ID screen ② or toggle to EVENT INFO ③. The EVENT ID screen displays spectrum information along with detected nuclides, and count rate. In this screen, reach back service is available. EVENT INFO, ③ contains user information, location and average dose rate and maximum dose rate, and photo. Camera option is available from this screen.

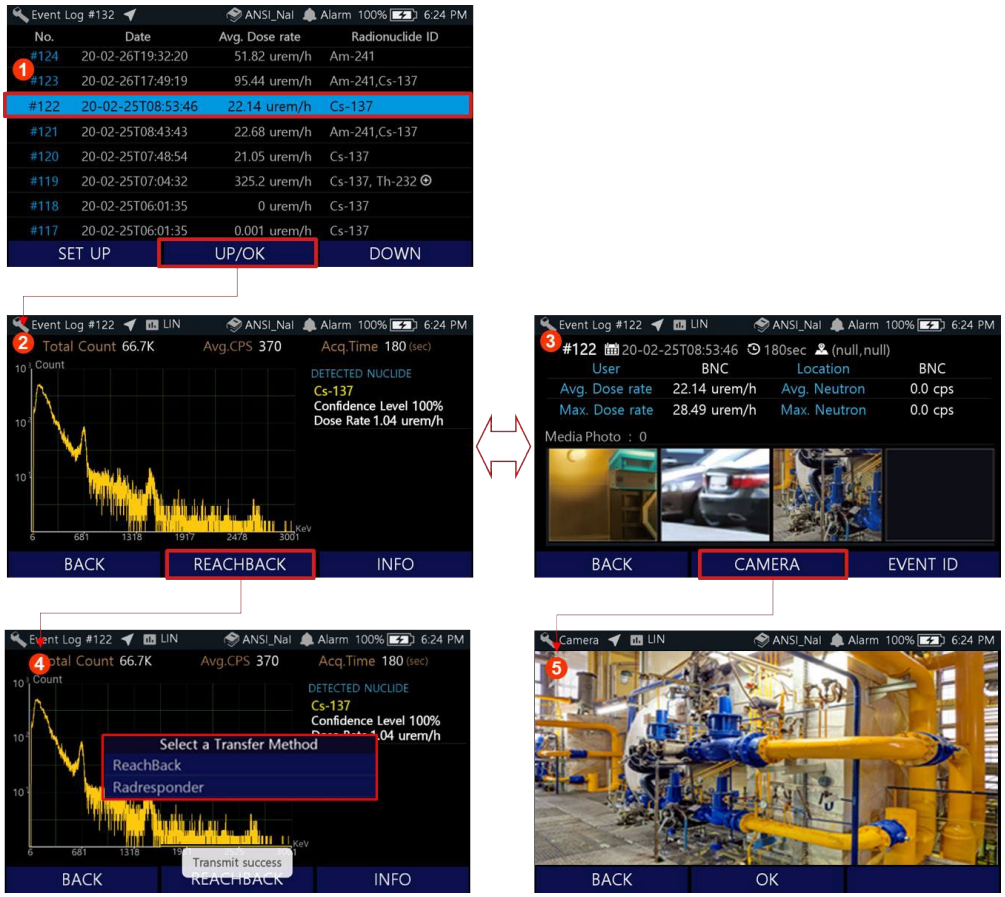


Figure 6.1.2. EVENT ID and EVENT INFO Screen

6.2. USE THE EVENT LOG TO TRANSMIT EVENT DATA TO REACH BACK

Reach-back transmission can also be initiated from the Event Report. Instruction for configuring necessary settings are described in section 7.9.1 .

6.2.1. Transmit Event to Reach-back

1. To open the Event Log, select **EVENT LOG** from the Gauge Screen (Figure 6.1.1.):
2. To locate an Event, scroll up/down using the function button and select desired event by press OK button (hold for 2 seconds). Refer to figure 6.1.2.
3. To transmit the Event, select REACHBACK button.
4. Select ReachBack

6.2.2. Transmit Event to RadResponder

1. To open the Event Log, select **EVENT LOG** from the Gauge Screen (Figure 6.1.1.):
2. To locate an Event, scroll up/down using the function button and select desired event by press OK button (hold for 2 seconds). Refer to figure 6.1.2.
5. To transmit the Event, select REACHBACK button.
6. Select RadResponder.

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6.3. USE THE SETUP MENU FOR USER SETTING

Setup Menus are intentionally hidden from the main tasks such as Radiation Monitoring and Manual ID to maximize ease-of-use during operation. This section discusses how to access and use these features.

For the convenience of user, PeakAbout IV allows the operator permission to access basic setup called User setting and some of advanced features which requires administrator login.

All the setup parameters not listed in PeakAbout IV are managed by PeakID IV application software. (Refer to **7.9. Configuration Menu GUI**).

The SETUP screen in PeakAbout IV is shown in figure 6.3.1. and the features managed by PeakAbout IV are summarized in figure 6.3.1.

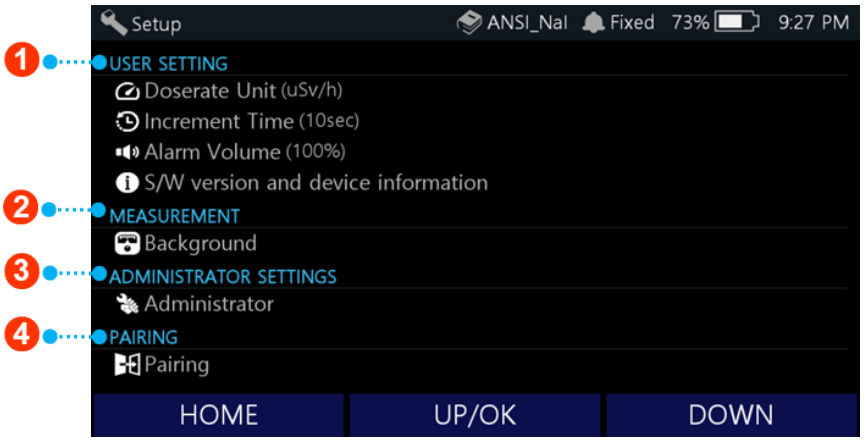

Figure6.3.1. SETUP Screen

1	USER Setting	Set increment time, alarm volume, S/W Update
2	Measurement	Perform Background measurement and Energy Calibration
3	Administrator	Set display option, password, calibration measurement and restore factory HW configuration.
4	Paring	WiFi connection to Windows program in a PC (PeakID SW)

6.3.1. User Setting

6.3.1.1. *Doserate Unit:*

The user can define doserate units displayed in either urem/h or uSv/h as shown in figure 6.3.2.

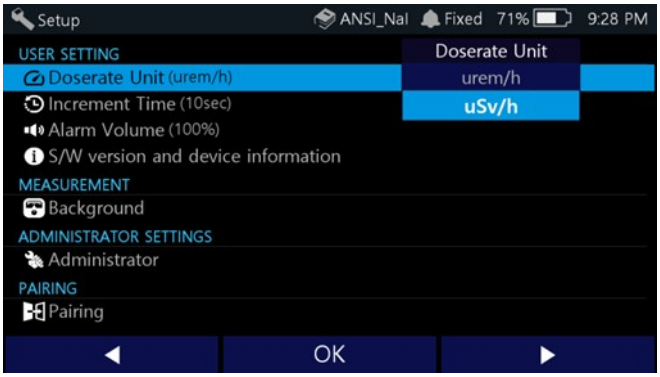

Figure 6.3.2. Increment Time Setup

6.3.1.2. *Increment Time:*

The user can define increment time for measurements for Manual ID and Background measurement as shown in figure 6.3.3.

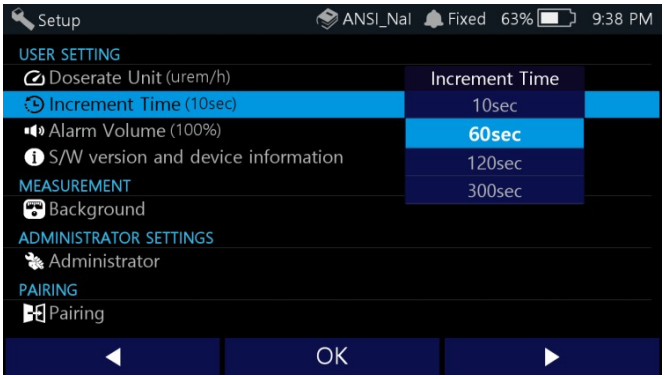

Figure 6.3.3. Increment Time Setup

6.3.1.3. *Alarm Volume*

User can define alarm volume. 0 volume represents vibration only mode.

Alarm ringtones can be selected by the PeakID IV application software.

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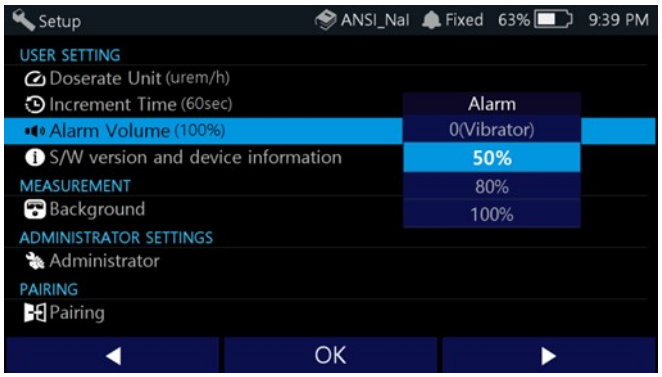

Figure 6.3.4. Alarm Volume Setup

6.3.1.4. SW Version and Device Information:

The User Settings menu includes a Device Information sub-menu which contains detailed reference about your SAM 940+ and PeakAbout IV upgrade. Instructions for upgrading software are described in **Section 7.1 and Section 7.2**.

Figure 6.3.5. SW Version and Device Information

UPDATE: SW update notification messages are automatically sent and displayed when the latest SW version is available. However, when the SAM 940+ is operating within range of Wi-Fi Internet, you can upgrade PeakAbout IV manually if an upgrade is necessary.

6.3.2. Measurement

6.3.2.1. *Background:*

For instructions, refer to **Section 4.3.3: Perform Background Measurement** (Figure 6.3.6.).

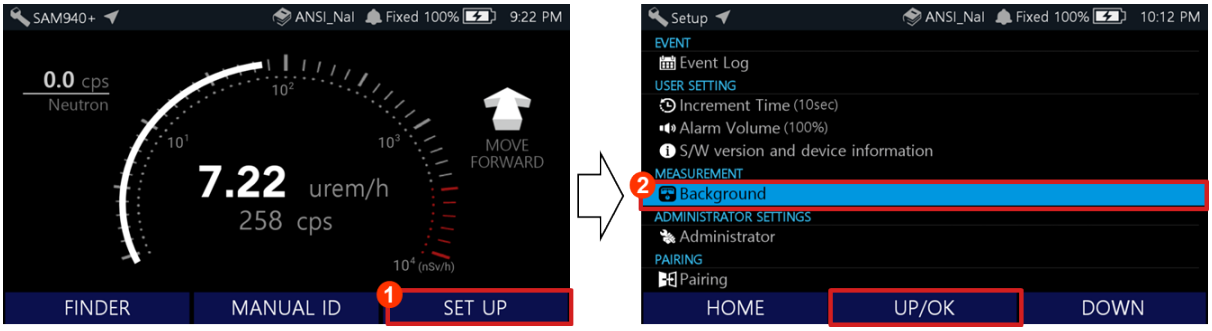

Figure 6.3.6. Background Measurement

6.3.3. Access to Administrator Setup

You may access some of the advanced features with Administrator privileges. The administrator password is required to access this feature.

Some configurations are only accessed with administrator's privilege. The administrator's password set in the factory is '1234'. Please change it to a more secured combination when you received the unit. The password may be changed in Administrator/New Password (refer to 7.9.2. **Administrator Setup**).

Type in password by using the function button and select ENTER as shown in figure 6.3.7.

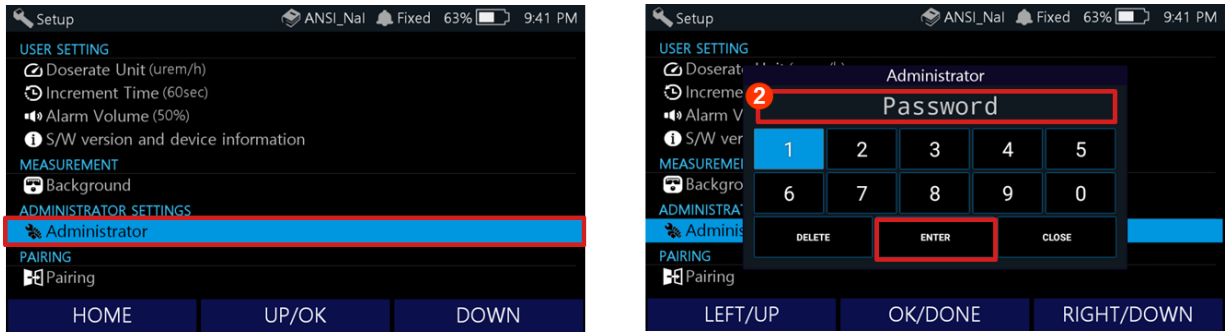

Figure 6.3.7. Administrative Access

6.3.4. Administrator Setup Parameters

The administrator can manage some of configuration parameters listed in figure 6.3.8. They are categorized into spectrum, event and configuration management.

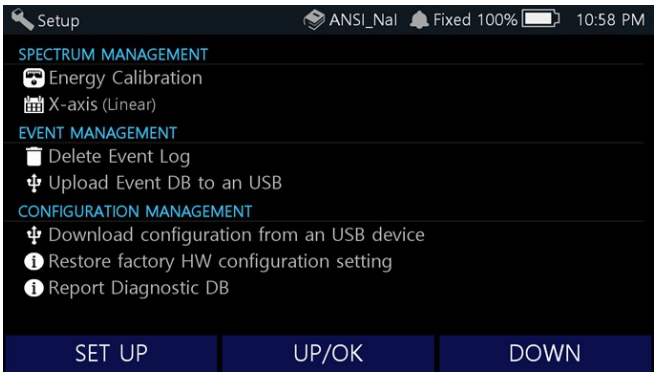

Figure 6.3.8. Administrative Setup Parameters

6.3.4.1. *Spectrum Management: Energy Calibration*

While we recommend performing manual energy calibration to ensure optimal results, most normal operations can be conducted without this step. If a Cs-137 source is not available, skip this section.

1. Place a Cs-137 source in front of the detector and Initiate **Energy Calibration**
2. Remove the Cs-137 source and return to the Gauge screen.

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Ideally, the Cs-137 source is active enough to generate approximately 2500 counts per second (cps). If the count rate is too high, increase the distance between the source and the detector unit. Decrease the distance if the count rate is low.

We recommend that total integrated counts in the manual calibration spectrum be no less than 100,000. The number of counts is defined in the Administrator Settings menu. Refer to Section **4.4.6.6 Calibration Measurement Count**

If necessary, the calibration count can be adjusted using the **SET COUNT** function -see figure 6.3.9.

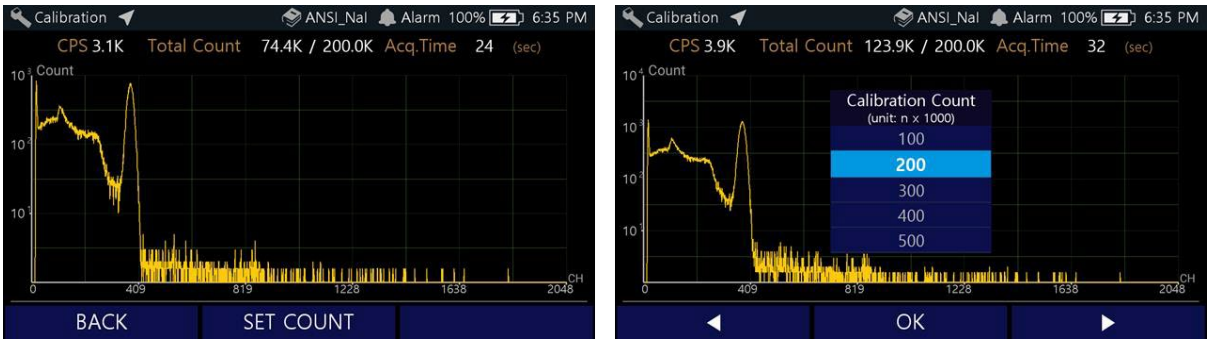

Figure 6.3.9. Adjust Measurement Counts

6.3.4.2. *Spectrum Management: Spectrum Display*

The SAM 940+ provides a special display called QCC (Quadratic Compression Conversion) along with a typical linear scale display. QCC is one of several adaptive display methods that stretch/ compress vertical values such that high energy are compressed and low energies stretched.

Linear and QCC displays can be toggled by selecting X-axis display options as shown in figure 6.3.10.

Figure 6.3.10. Linear and QCC Spectrum Display

6.3.4.3. *Event Management: Delete Event Log*

All measured events in the Event DB can be deleted by selecting this option.

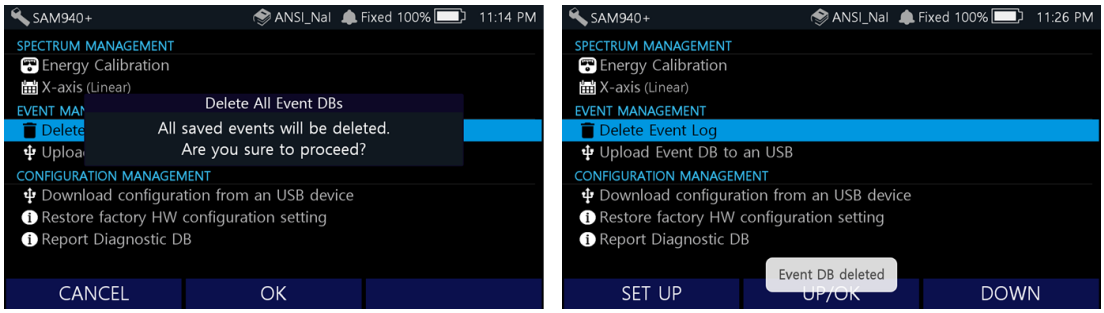

Figure 6.3.11. Delete Event Log

6.3.4.4. Event Management: Upload Event DB to a USB Device

The user can upload a 940+ Event DB to a USB and upload it to a PC. In order to perform this, insert a USB and select 'Upload Event DB to a USB'. The user will now be able to analyze the Event DB using PeakID IV software. As shown in Figure 6.3.12.

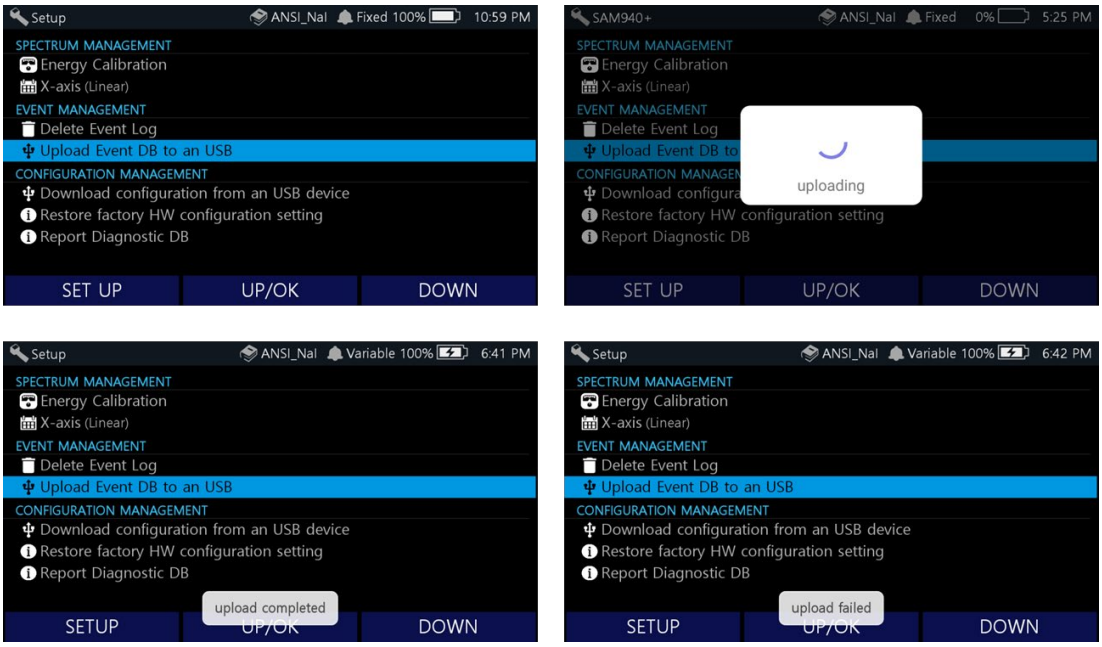

Figure 6.3.12. Event Management Upload

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6.3.4.5. Configuration Management: AP Setup

Follow the procedures below to setup network AP address.

1. Select 'Connect to network access point (AP)
2. Press "WIFI SCAN" button. Available WiFi access points are listed as shown in figure 6.3.13.
3. Select desired WiFi AP.
4. Enter a password for the selected WiFi AP.
5. The AP name appears with IP address assigned.

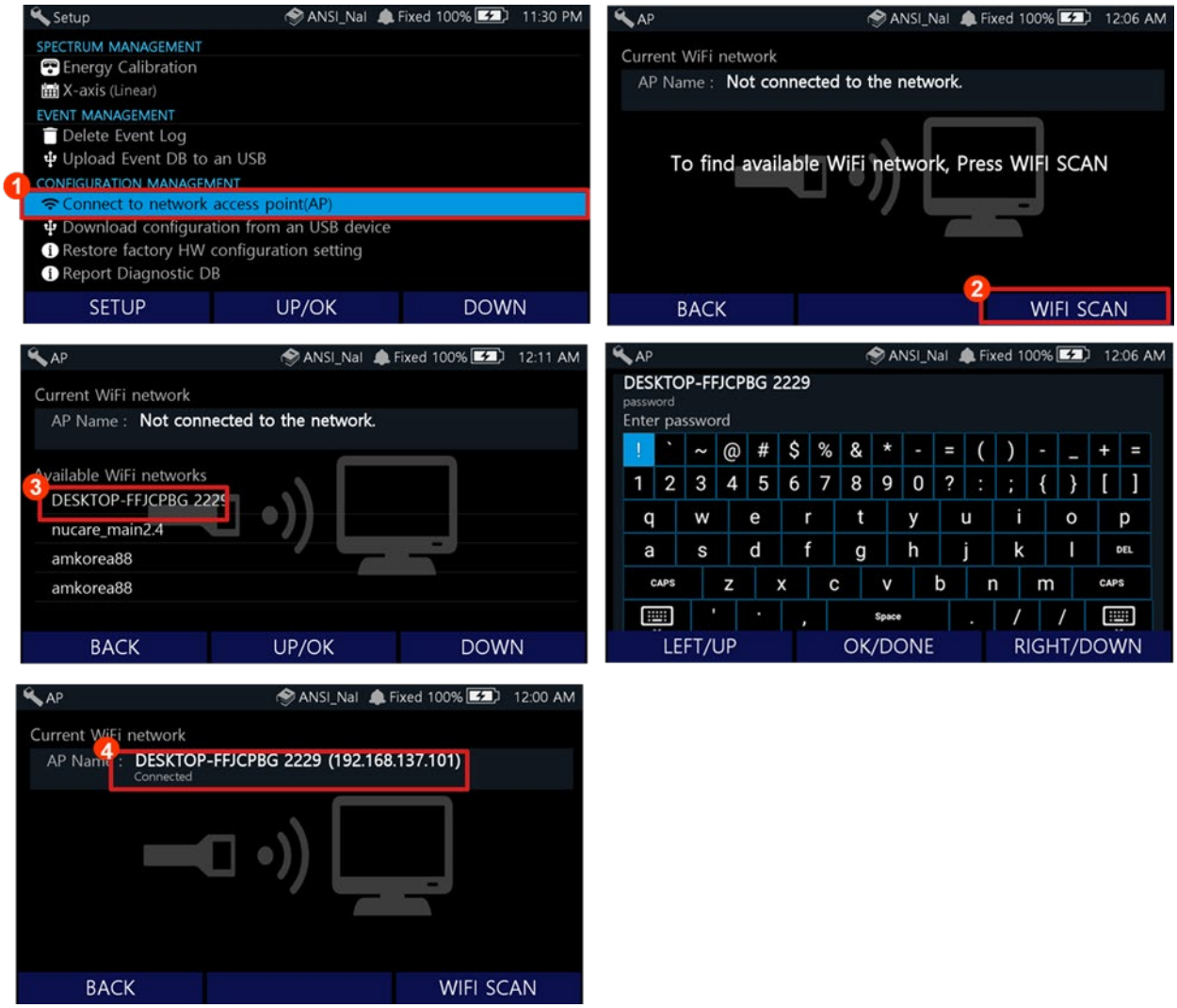

Figure 6.3.13. Wifi Scan and AP Setup

6.3.4.6. Configuration Management: Download Configuration from a USB Device

The configuration parameters saved in PeakID IV in a PC can be downloaded from an USB. Insert a USB and select 'Download configuration from an USB device'.

6.3.4.7. Configuration Management: Return Factory HW Configuration Setting

The Restore Factory HW Configuration setting is used to reset parameters like calibration and high voltage bias for the installed detector. Situations in which this operation is useful are extremely rare, and the procedure should only be performed by a factory technician. Contact Berkeley Nucleonics before performing this operation. As shown in Figure 6.3.14.

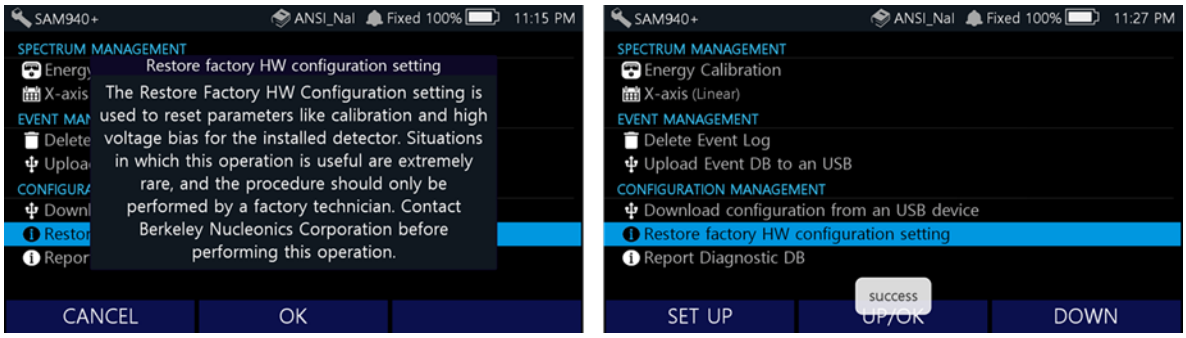

Figure 6.3.14. Restore Factory Configuration

6.3.4.8. Configuration Management: Report Diagnostic DB

In case of scheduled check-ups, malfunctioning units and/or prevention of failures, a user can send diagnostic information to the manufacturer. By selecting 'Report Diagnostic DB', the diagnostic information from your instrument will be automatically transferred to a technician in BNC's service department. As shown in Figure 6.3.15.

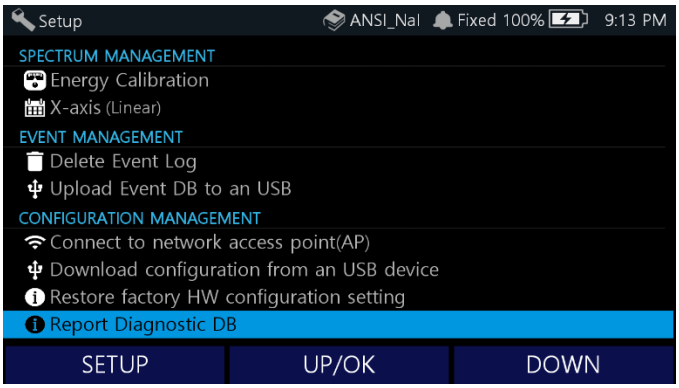

Figure 6.3.15. Report Diagnostic DB

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6.3.4.9. Pairing

The SAM 940+ unit has to be connected to a WiFi network to communicate with the PeakID IV application software and/or upgrade to the latest SW.

Following is the WiFi connection procedure. Refer to the figure 4.2 below.

1. Select **SET UP** menu ①
2. Highlight **PAIRING** by move UP or DOWN button ②
3. Select **PAIRING** by holding the OK button for about 2 seconds and release.
4. Search for available WiFi network by selecting **WIFI SCAN** button. ③
5. Select desired WiFi network and type in password ④
6. Select 'DONE' button. The connection message will be appeared if successful. ⑤

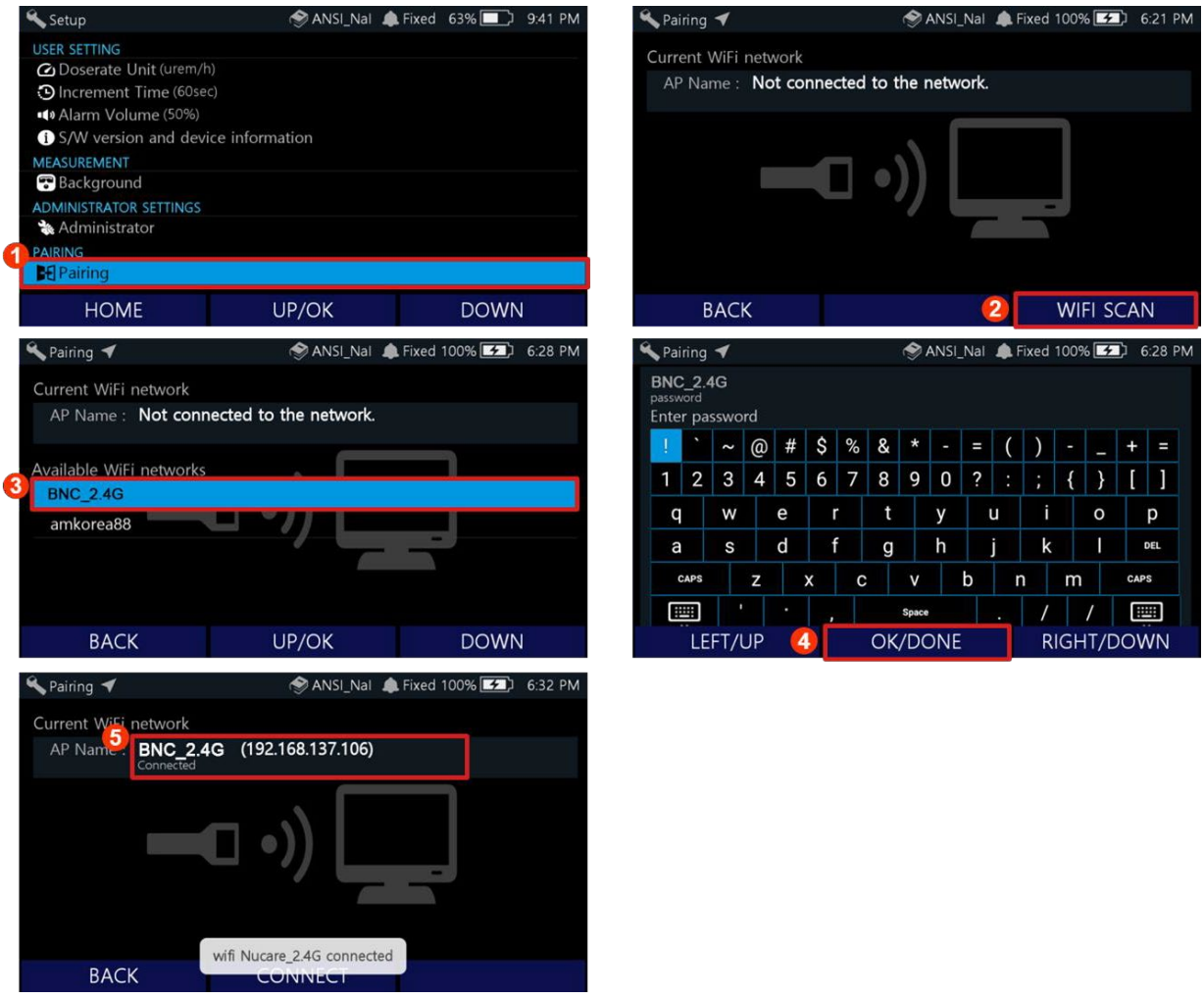

Figure 6.3.16. Pairing

CHAPTER 7. PEAKID IV APPLICATION

PeakID IV application SW remotely controls the SAM 940+ in a similar fashion as the PeakAbout IV does. In addition, PeakID IV supports management of the library, Event files, data analysis including integration of data from multiple units, and data backup procedures. It is compatible with PCs that run Windows 10 or higher. The PeakID IV Installer can also be downloaded onto a PC from the Internet.

7.1. DOWNLOADING PEAKID IV

1. Using an Internet browser (Internet Explorer, Firefox, Chrome, etc.), type the following URL (Figure 7.1) address to open the BNCSAM web page:
   http://www.bncsam.com/SAM940PLUS.html

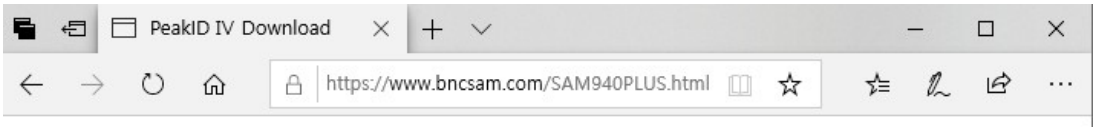

Figure 7.1.1. PeakID URL

2. Enter the serial number from the label on the detector unit, then click **PeakID IV** (Figure 7.1.2.).

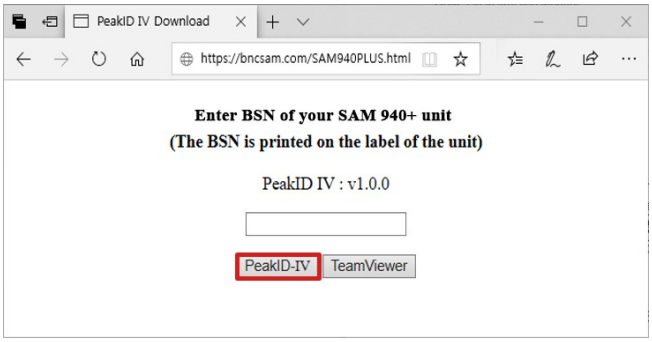

Figure 7.1.2. PeakID Download Page

3. Save the PeakID IV Installer on the PC (Figure 7.1.3).

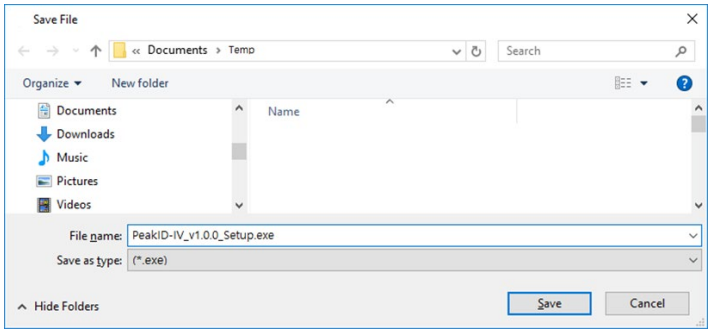

Figure 7.1.3. Save PeakID Installer

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7.2. INSTALLING PEAKID IV

7.2.1. Installing PeakID IV

Installing PeakID IV on the PC is a simple process that makes use of an automated installer.

1. Go to the location where the PeakID IV Installer is saved. Click on PeakID IV.exe.
2. Follow the prompts in the InstallShield Wizard (Figure 7.2.1).

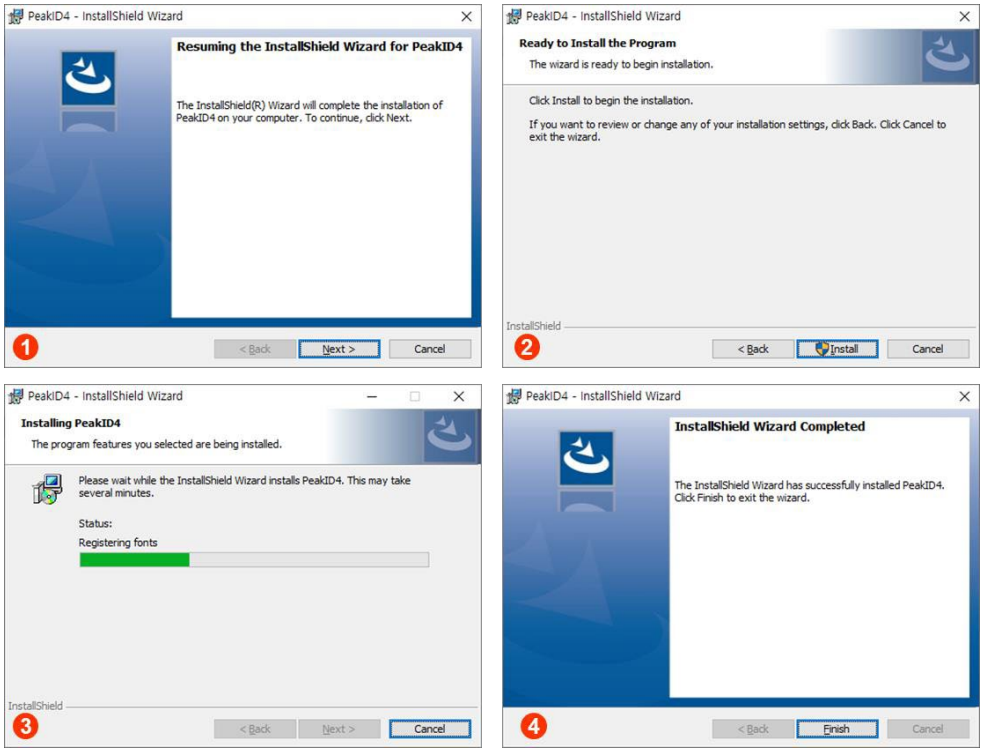


Figure 7.2.1. InstallShield Wizard for PeakID (initial screen)

7.3. CONNECTING SAM 940+ AND PC

The SAM 940+ can be paired to a PC via a Wi-Fi network connection. Once the SAM 940+ is paired to a PC, manual ID, Event analysis, and Configuration settings can be changed.

It is important that both the SAM 940+ and the PC are on the same Wi-Fi network with appropriate IP addresses.

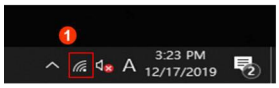
7.3.1. Setting IP Address of a PC

7.3.1.1. Select the Same Wi-Fi Network where the SAM 940+ is Connected.

① Click Wi-Fi Network icon on the taskbar.

② Navigate to available Wi-Fi list and select the same Wi-Fi network in which the SAM 940+ is connected.

③ Select Network and Internet settings.



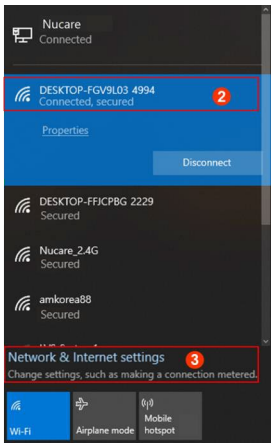


Figure 7.3.1. Wi-Fi Network Selection

7.3.1.2. Open Wi-Fi Status Screen

④ Select Network and Sharing center.

⑤ Select Wi-Fi network selected to open Wi-Fi Status screen

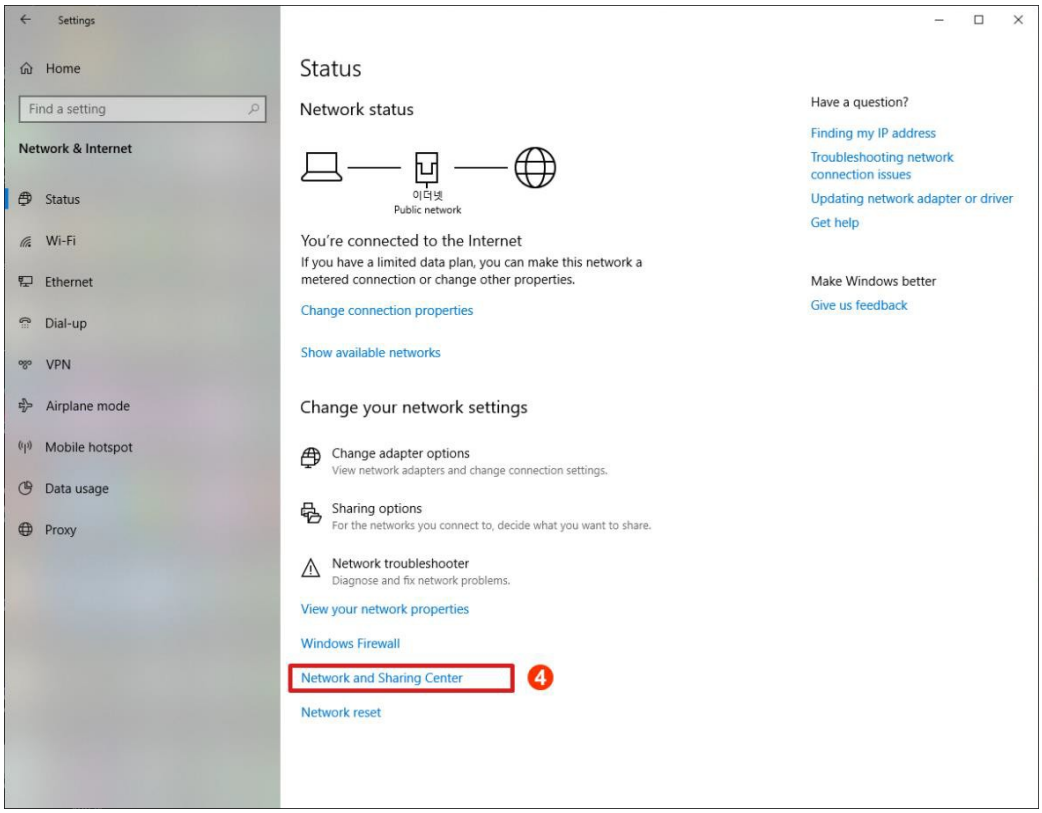


Figure 7.3.2. Select Network and Sharing Center

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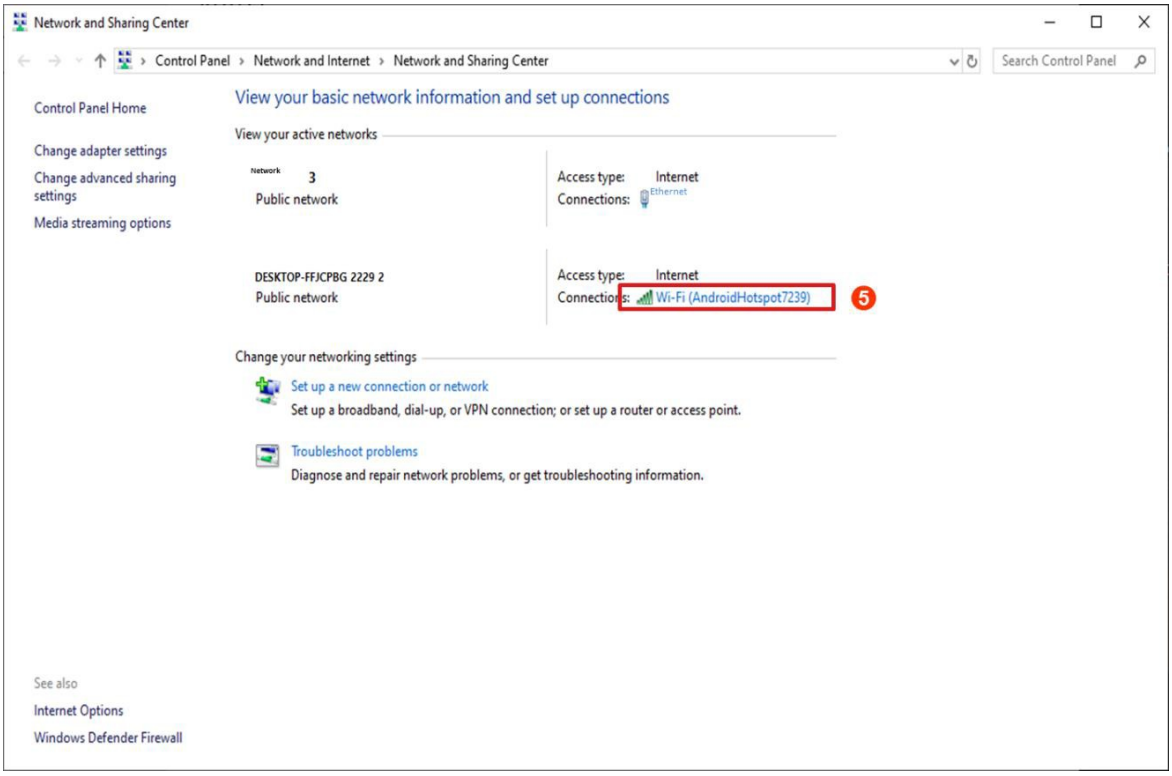


Figure 7.3.3. Select Wi-Fi Network Connected

7.3.1.3. Set IP Address

⑥ Click Properties in General menu.

⑦ Select Internet Protocol Version 4 (TCP/IP v4) and click Properties.

⑧ Set IP address: The last digit must be 99.

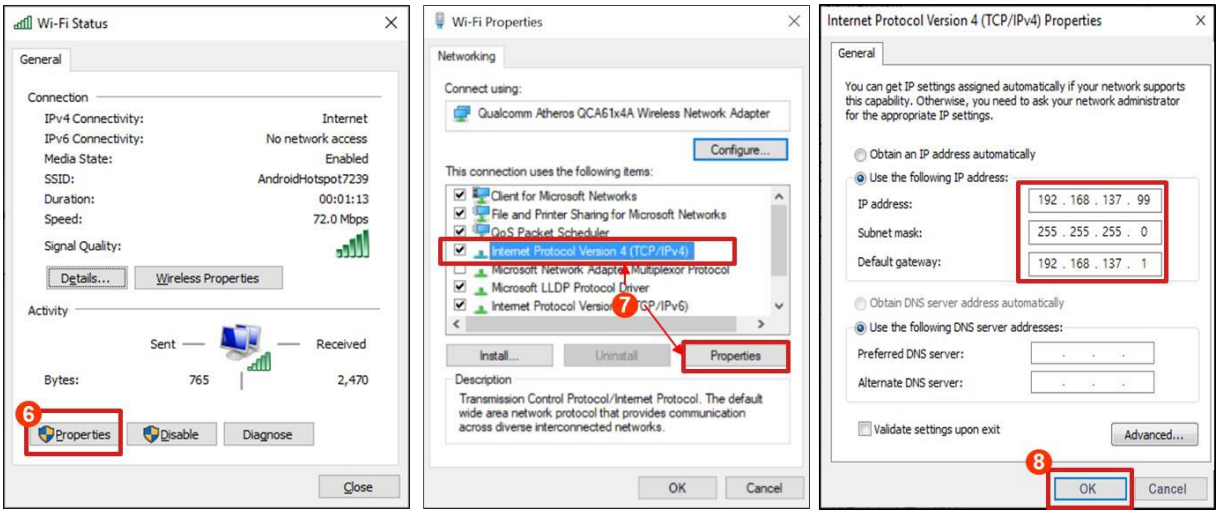
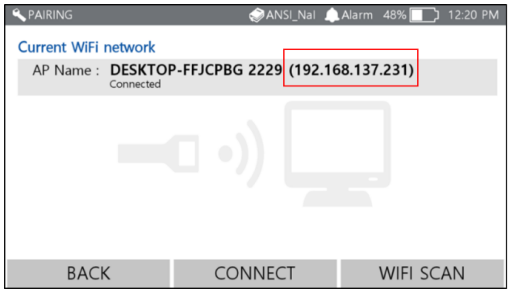


Figure 7.3.4. IP Setting

It is important to have the SAM 940+ and the PC on the SAME Wi-Fi network with a predefined host IP address assigned to the PC. For example below, if the assigned IP address of SAM 940+ is 192.168.137.231, the host PC IP address should be 192.168.137.99.

Refer to 6.3. SETUP/Pairing section for checking the IP address of the SAM 940+.



- **PC IP address Setting**

IP Address	**192. 168. 137. 99**
Subnet mask	255. 255. 255. 0
Default gateway	192. 168. 137. 1

Figure 7.3.5. IP Address Setting Example

7.3.2. Connecting the SAM 940+ to a PC

Once IP address setup for the PC is completed, the SAM 940+ is ready to pair with the PC. Follow the instructions below to connect the SAM 940+ to a PC.

1. Click **Paired Status** bar ① located at the bottom of PeakID IV main GUI as shown in figure 7.10. The status of the connection will be changed from Disconnected to Waiting until the SAM 940+ is paired.

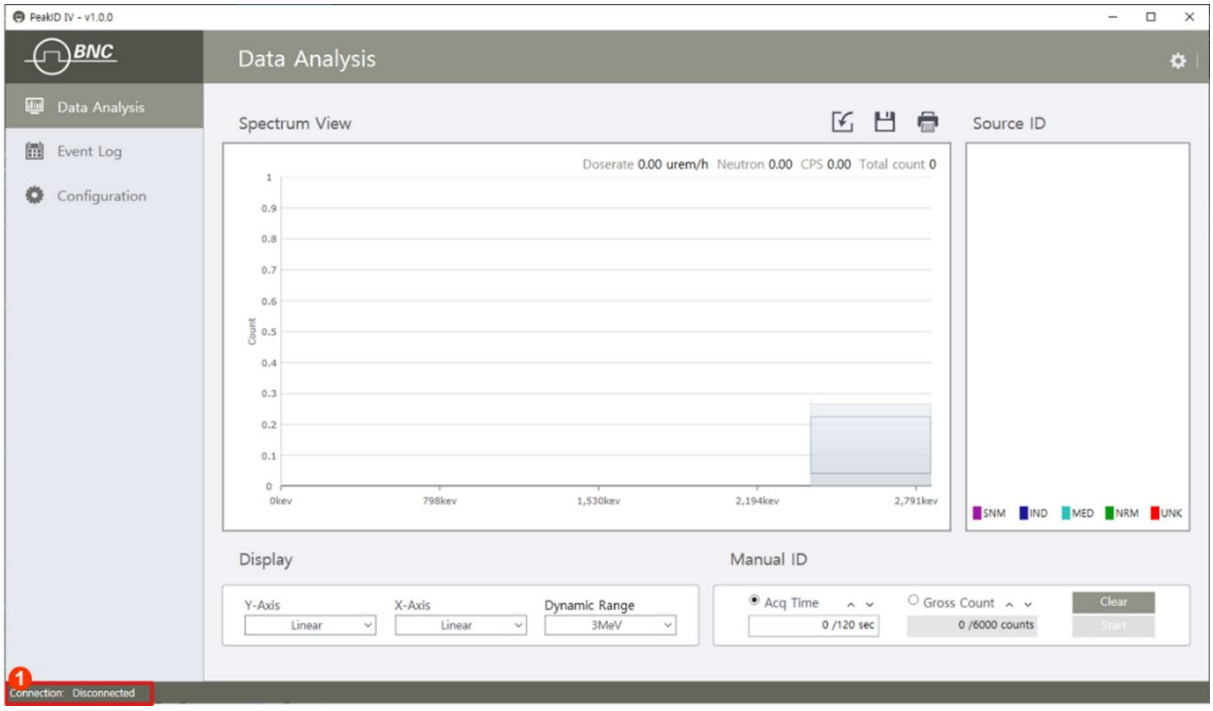


Figure 7.3.6. Connection Bar

2. Select **CONNECT** ② button on the SAM 940+.
3. The status of connection will be changed from Waiting to Connected.

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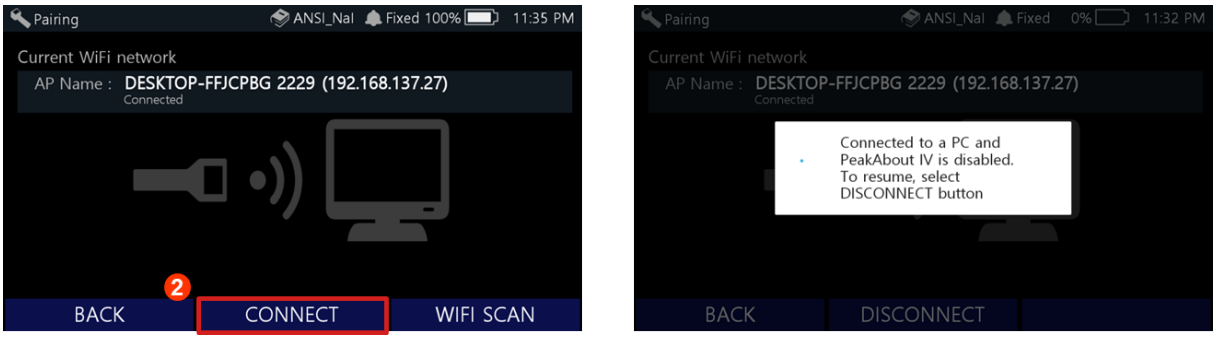

Figure 7.3.7. Connection Button on the SAM 940+

The PeakAbout IV is disabled temporally while the SAM 940+ is connected to a PC. To resume to normal operation, disconnect the SAM 940+ from the PC by selecting the **DISCONNECT** button.

7.4. NAVIGATING THE PEAKID IV GUI & STRUCTURE

The home GUI (graphic user interface) of PeakID IV is shown in figure 7.4.1. It consists of a tab menu bar on the left side of screen ① and several partitioned windows for spectrum display, command functions, and other information. The partitioned windows and its contents are changed depending on the selected menu.

PeakID IV's main menu is divided into Data analysis, Event Log, and Configuration. The details of each menu is described in the following sections.

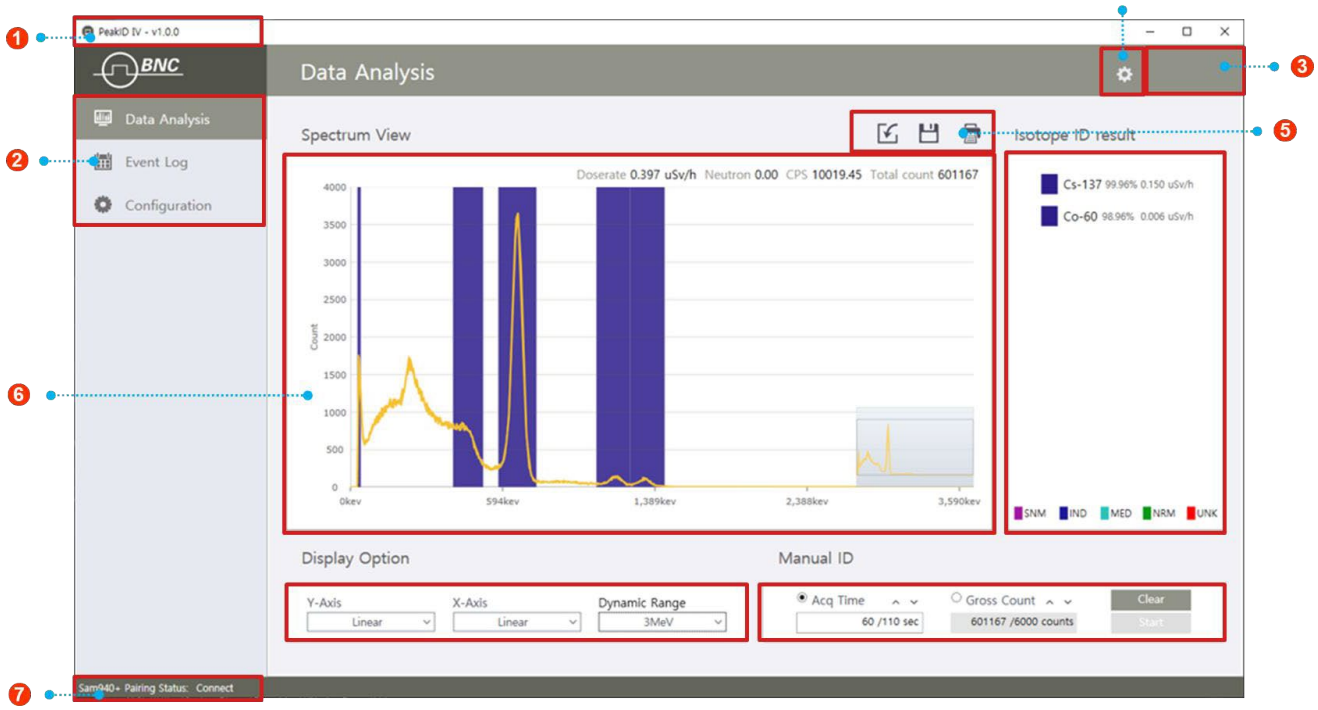

Figure 7.4.1. PeakID GUI

1	PeakID SW version	Information of PeakID IV SW version
2	Main Menu	Main menus of PeakID IV: Data Analysis, Event Log, and Configuration
3	Device Name	Paired device name: serial number of SAM 940+
4	Configuration	General configuration for PeakID IV
5	Function icons	Function icons
6	Partitioned Windows	Partitioned windows
7	Connection Status	Connection Status of paired device

7.5. SPECTRUM MANIPULATION

Spectrum View window is an active screen that interacts with a mouse function. PeakID IV provides easy ways of manipulating spectrum using the combination of active window and mouse actions. In addition, **"index curser"** supports an operator in analyzing the details of spectrum data.

7.5.1. Zoon In/Out

Zoom in and out manipulation can be done using a mouse and its wheel (figure 7.5.1.).

1. Place mouse cursor at the ROI (region of interest) ①.
2. Zoom in: scroll the mouse wheel up ②.
3. Zoom out: scroll the mouse wheel down.

Spectrum View window includes a mini window at the bottom right cover called **"Chart Navigator"**. It is a replica of Spectrum View in full dynamic range so that the zoom in region is marked with a ROI box (figure 7.5.1.).

The **Chart Navigator** is also an active window. The Zoom in region can be moved by synchronizing the movement of the ROI box on the chart navigator window.

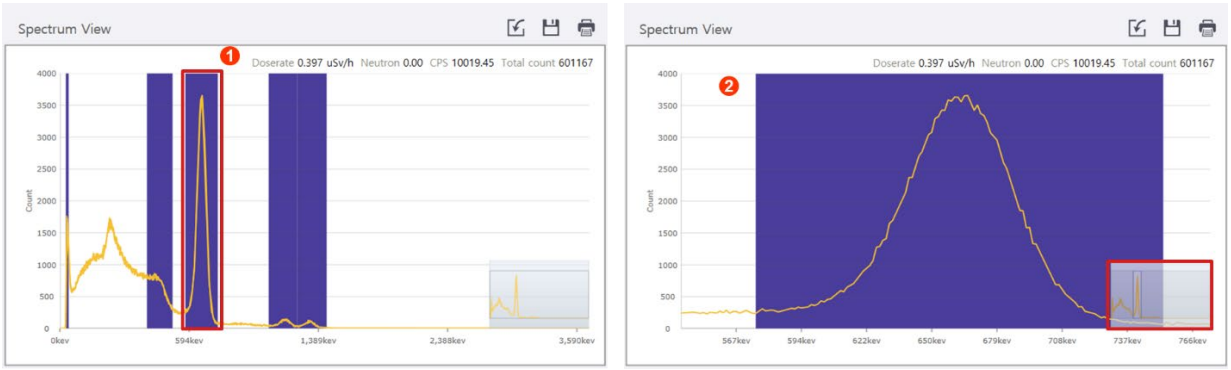

Figure 7.5.1 Spectrum Zoom in Example

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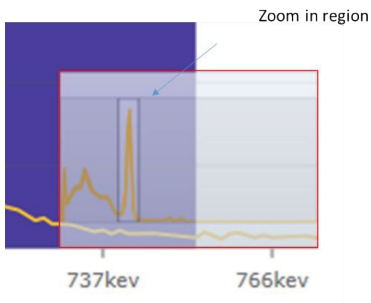

Figure 7.5.2. Chart Navigator Example

7.5.2. Index Cursor

Two thin cross lines, called **"index cursor"** show up automatically along with an information box as shown in figure 7.5.3., when the mouse cursor is on the **Spectrum view** area. The information box contains count, energy, and channel value at the cross point of the spectrum.

The **Index Cursor** is moving along the spectrum contour when the mouse cursor is moving left/right.

1. Place mouse cursor at the ROI region.
2. Move the cross point at the desired point.

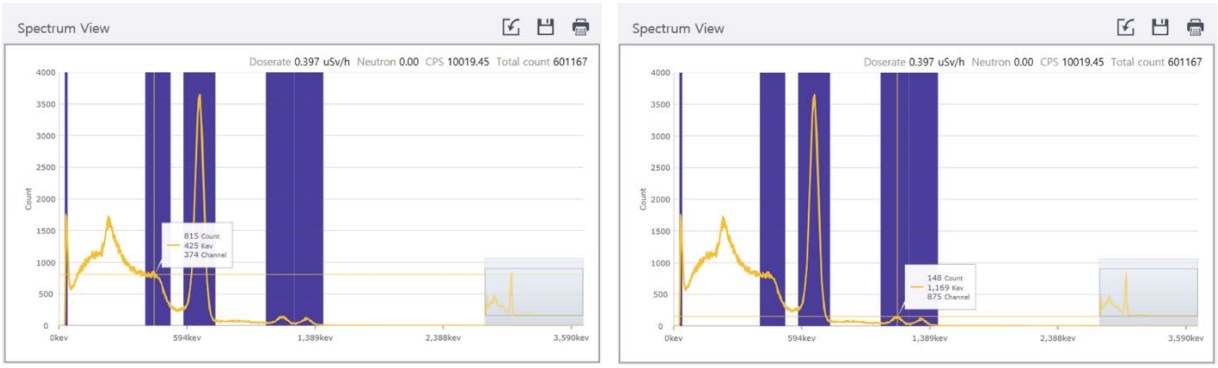

Figure 7.5.3. Index Cursor Example

7.6. PEAKID CONFIGURATION

7.6.1. Open Configuration Screen

Configurable parameters for PeakID application software can be accessed by selecting the configuration icon on the top right of the PeakID GUI.

1. Select configuration icon ①.
2. Type in Administrator's password ②.
3. PeakID IV Configuration window ③ will pop up as shown in figure xx.
4. Set configuration parameters.

PeakID IV has two configuration menus. One is for PeakID IV itself and the other is for PeakAbout IV configuration. Refer to the **7.6. Administrator Setup** section for PeakAbout IV settings.

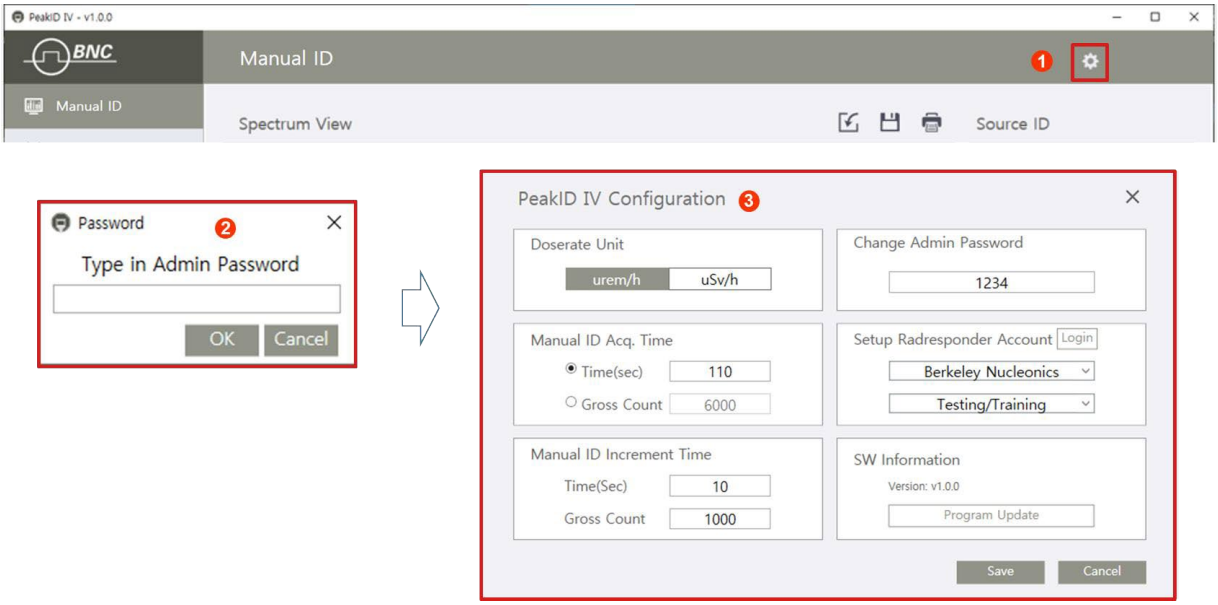

Figure 7.6.1. Configuration Menu for PeakID

7.6.1. PeakID IV Configuration

PeakID IV configuration includes 6 setup parameters. Functions of each parameter and usage are described in the following sections.

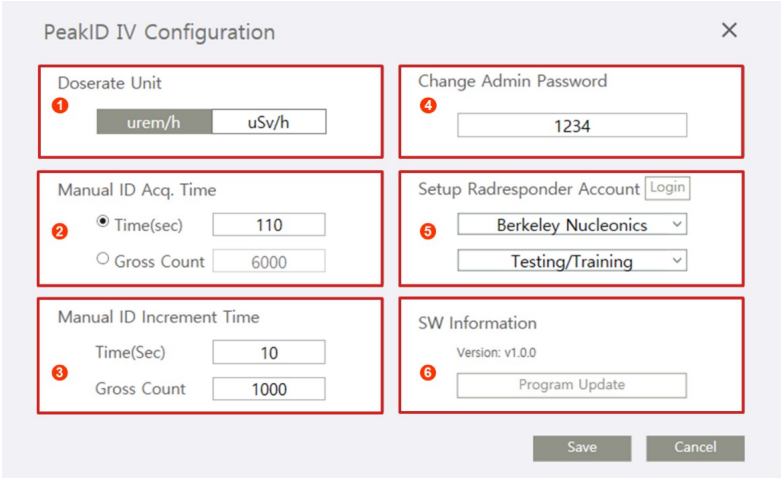

Figure 7.6.2. PeakID IV Configuration Category

1	Doserate Unit	Define Doserate unit
2	Manual ID Acq. Time	Manual ID acquisition time or count setup
3	Manual ID Increment Time	Define increment time for manual ID.
4	Change Admin. Password	Change new password for admin.
5	RadResponder	Radresponder accounting setup
6	SW Information	SW information and manual update

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7.6.1.1. Dose Rate Unit

Rem/h or Sv/h unit can be used for dose rate unit.
Note: Default dose rate unit is rem/h.

7.6.1.2. Manual ID Acq. Time

Manual ID Acq. Time determines measurement time for manual ID. Either elapse time or total measured count can be used for measurement time.
Note: Default measurement time is 60 seconds.

7.6.1.3. Manual ID Increment Time

Define increment time for manual ID.
Note: Default increment time is 10 seconds.

7.6.1.4. Change Admin. Password

Change administrator's password.
Note: Factory setup is 1234. It is recommended to change it to a more secure combination.

7.6.1.5. RadResponder Account

RadResponder is a free network for the rapid collection and management of radiological data during an emergency. When the SAM 940+ is operating within range of Wi-Fi, spectrum and event data can be uploaded to the RadResponder cloud in the appropriate format. RadResponder can be accessed on PDAs, smartphones, tablets, or any computer connected to the web, allowing it to be seamlessly employed at all levels of government during a radiological or nuclear emergency.

Before you can upload spectrum and event data to RadResponder, you must already have established a RadResponder account at www.RadResponder.net, and you must set up RadResponder Mode in PeakAbout IV.

The RadResponder set up is defined in the PeakID IV Settings menu (figure 7.6.3).

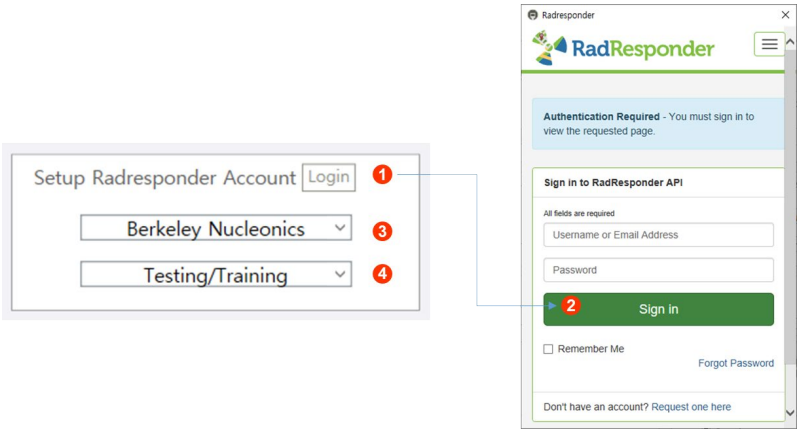

Figure 7.6.3. RadResponder Settings Example

1. Click Login button ①. RadResponder Sign In API will pop up as shown in figure 7.18
2. Sign in with user name and password ② (It should be RadResponder Account).
3. Select Sponsor name from the pop-up list ③.
4. Select type of event from the pop-up list ④.

RadResponder requires users to define **"Sponsor"** and **"Type of Event"** so that the information is attached together with event data when it is uploaded to the RadResponder cloud. The Sponsor list and type of event are different from each RadResponder account.

Once you signed in RadResponder, PeakID IV automatically extracts **"Sponsor list"** and **"types of event"** information assigned to the signed in user so that the Sponsor and type of event can be selected after login is done.

Event type should be determined in configuration (**refer to 7.9.4.12. RadResponder Account**) so that transmitting spectrum and event data to RadResponder is a **defined Event type**. An Event that is transmitted as an Emergency Response will trigger an actual emergency response by RadResponder. This is not to be taken lightly. This setting should only be selected when the user will be monitoring actual emergency responses or environmental conditions. An Event that is transmitted as Testing Training will be acknowledged and recorded in your RadResponder without triggering an emergency response. This setting is recommended when the user is performing equipment testing or participating in training exercises.

7.6.1.6. SW Information

To upgrade to the latest PeakID software, follow the instructions in **Sections 7.1** and **7.2** to download and install the file **PeakID IV (vx.x.x).exe** to your PC.

7.7. DATA ANALYSIS MENU GUI

PeakID IV can remotely control the SAM 940+ when the unit is paired with a PC. The **Data Analysis** menu GUI is the gateway to perform remote manual ID, spectrum display, and event analysis in real time.

Figure 7.7.1. shows major components and function buttons for **Data Analysis** menu GUI.

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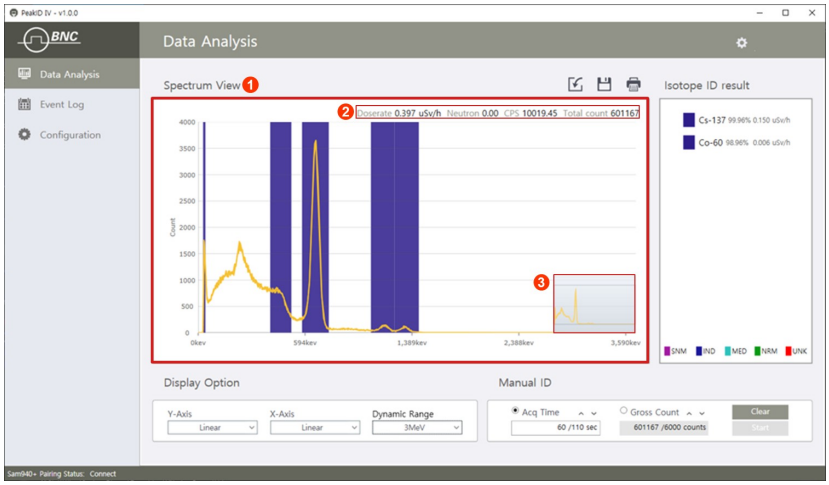

Figure 7.7.1. Data Analysis GUI

1	Spectrum View	Displays spectrum and count information
2	Isotope ID	Isotope ID results with classification color
3	Display Option	Setup X and Y-axis unit and dynamic range
4	Manual ID	Manual ID stop/start and Acq. Time or count setting
5	Function icons	Function icons for importing/exporting XML and print
6	Char Navigator	Duplicate of spectrum view in miniature scale

7.7.1. Spectrum View Window

Spectrum View window ① consists of spectrum view window, count rate information ②, and chart navigator ③. It displays spectrum from a real time event measured from the SAM 940+. Count rate information is displayed on the top-right corner ② and chart navigator provides a duplicate of spectrum view in miniature scale ③.

Note: refer to the 7.5.1. section for manipulation of spectrum and usage of chart navigator.

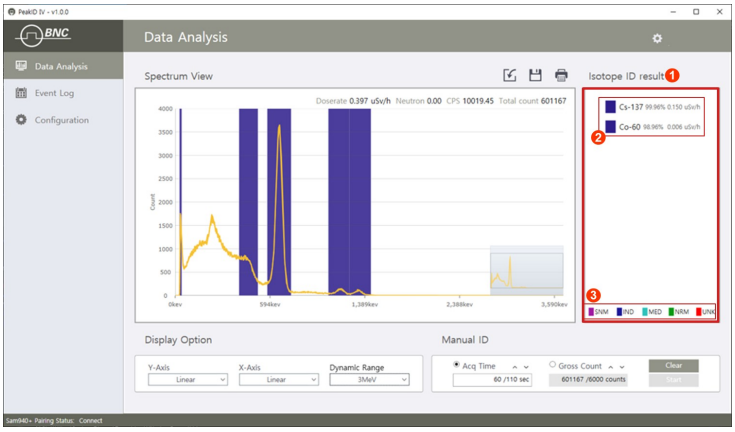

Figure 7.7.3. Isotope ID Result Window Example

7.7.2. Isotope ID Result Window

Isotope ID window ① shows the ID result along with classification information, confidence level and dose rate ②. The bottom of the ID window displays index color scheme of classification ③.

7.7.3. Display Option Window

Display Option manages display option of **Spectrum view**. X and Y axis have two display options each and a total of 4 combinations of display options can be offered. Details of each display option is described in the following sections.

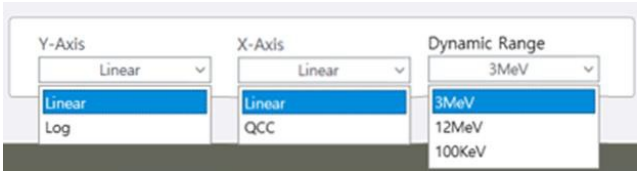

Figure 7.7.4. Options for X and Y-axis Unit and Dynamic Range

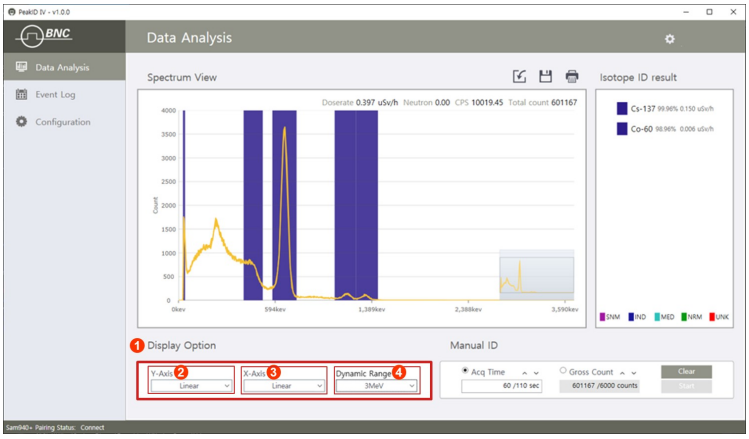

Figure 7.7.5. Display Option Example

2	Y-Axis	Display option for Y-axis
3	X-Axis	Display option for X-axis
4	Dynamic Range	Dynamic Range selection

7.7.3.1. Y-axis Display Option

Spectral data can be displayed on either a linear or a logarithmic scale (Figure 7.7.6). To change between the two displays, click the Y-Axis option and select the desired display option.

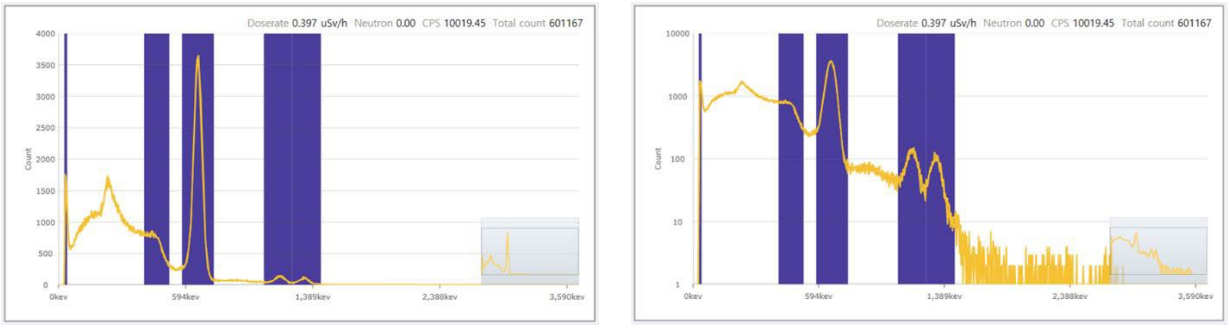

Figure 7.7.6. Linear vs. Logarithmic Scale Display Example

7.7.3.2. X-axis Display Option

X-axis unit can be selected either as Linear or QCC (Quadratic Compress Conversion) (figure 7.7.7). Refer to the details of QCC spectrum display in Chapter 6. To change between the two displays, click the X-Axis option and select the desired display option.

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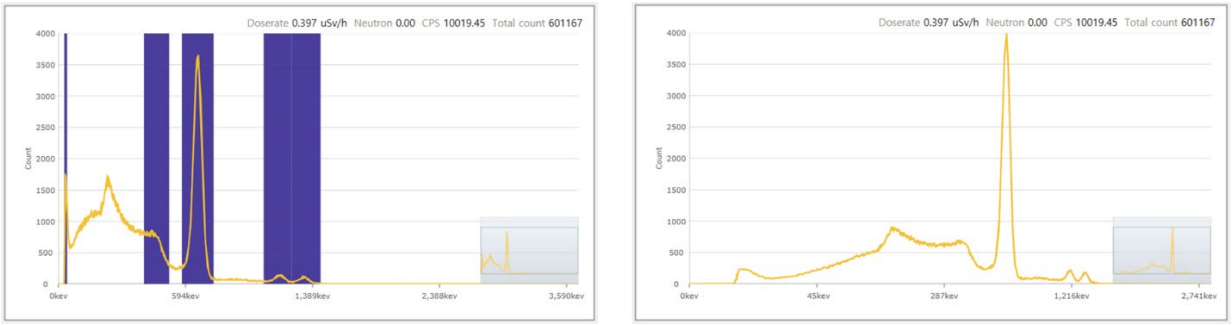

Figure 7.7.7. Linear vs. QCC Display Example

7.7.3.3. Y-axis Display Option

Specially designed high voltage divider scheme enables the SAM 940+ handle gamma energy up to 10 MeV. Dynamic range option offers three DR selections: up to 150 KeV, 3 MeV, and 10 MeV.

Figure 7.7.8. shows examples of each different dynamic selection case.

Note: 3MeV DR is the typical dynamic range setup for normal use. 100 KeV DR is for analyzing details of low energy regions while 10 MeV DR is for high energy physics application cases.

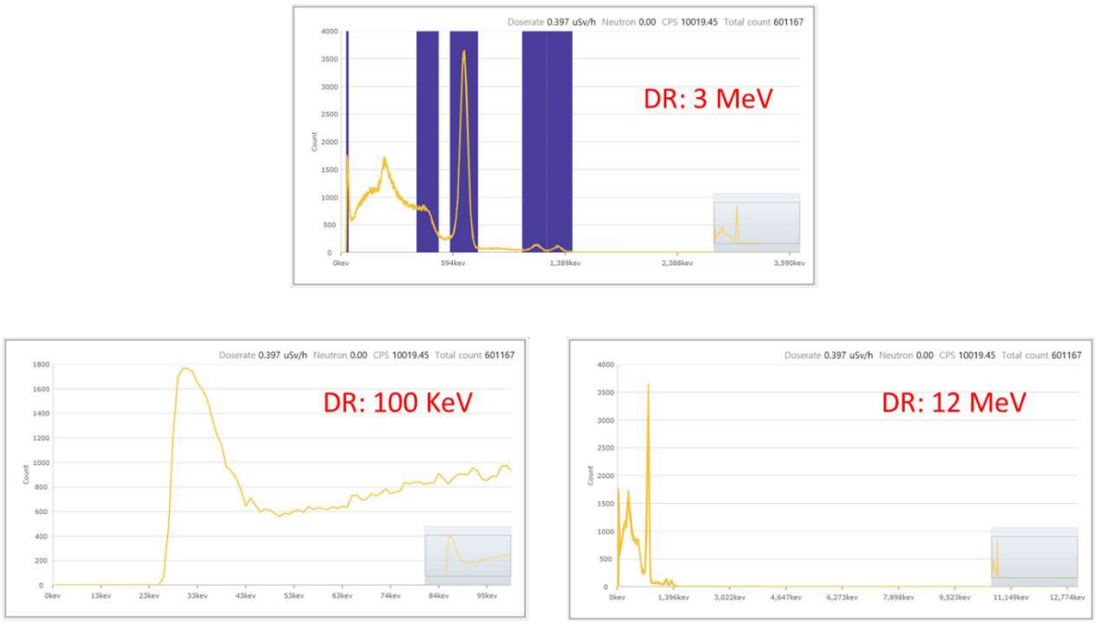

Figure 7.7.8. Dynamic Range Example

7.7.4. Manual ID Window

Manual ID window consists of measurement time setup and command buttons for manual ID. Acquisition time is either defined by total elapsed time ② or gross count ③. Manual ID start/stop or discard command can be executed by selecting a corresponding function button ④.

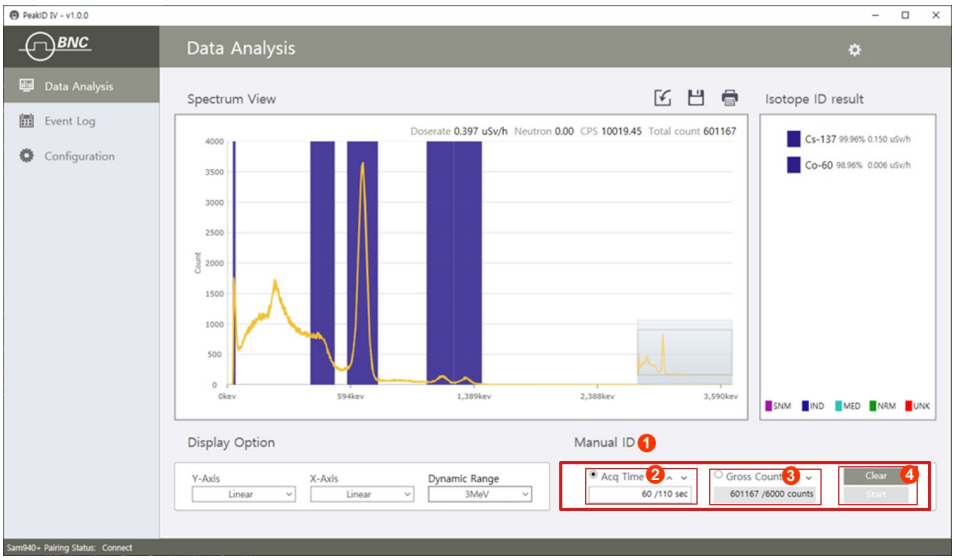

Figure 7.7.9. Manual ID Command Window

Increment/decrement time or gross count can be set by clicking the up/down arrow as shown in figure 7.7.10.

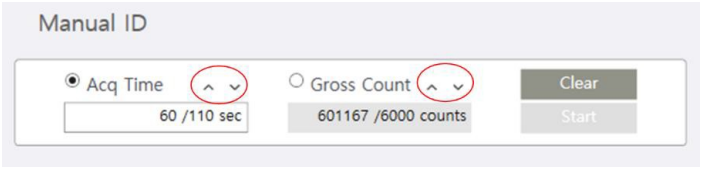

Figure 7.7.10. Increment/Decrement Time or Gross Count

7.7.5. Function Icons for Data Analysis Menu GUI

Function icons ① of the Data Analysis menu GUI provides importing/exporting XML file and print features. Details of each feature is described in the following section.

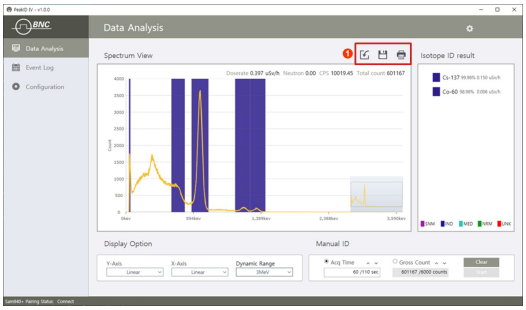

Figure 7.7.11. Data Analysis Menu Function Buttons

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7.7.5.1. Import XML File Format Event

PeakID IV allows user to import XML file format specified in the ANSI 42.42 standard.

1. Click the  icon opens Explore window will appear as shown in figure 7.30.
2. Select the XML event from the list
3. Click the Open button.

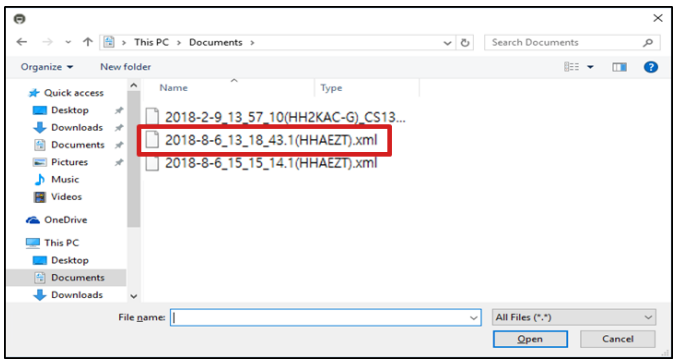
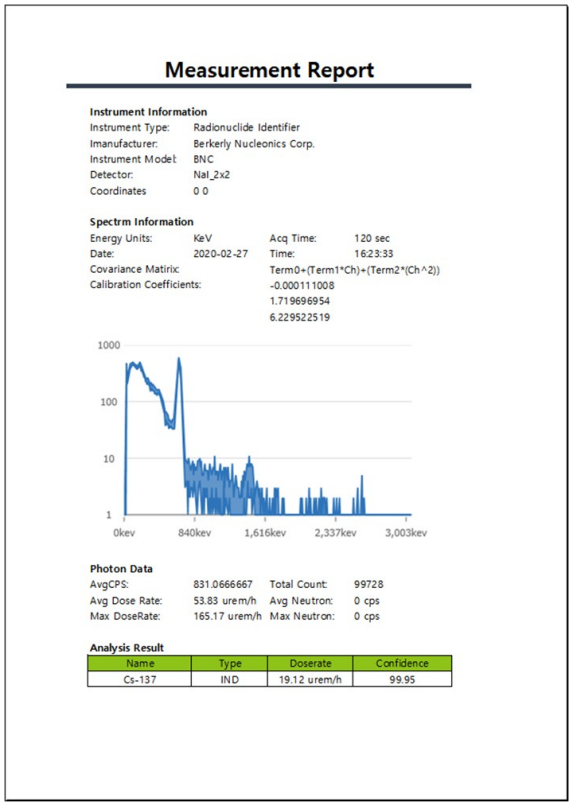


Figure 7.7.12. Import XML Event Example

7.7.5.2. Saving Event Data in XML Format (ANSI 42.42)

The spectrum and relevant data from an Event can be saved in the XML file format specified in the ANSI 42.42 standard.

1. Click the disk icon  (Figure 7.7.11.). The directory screen will appear.



Measurement Report

Instrument Information

Instrument Type:	Radionuclide Identifier
Imanufacturer:	Berkerly Nucleonics Corp.
Instrument Model:	BNC
Detector:	Nal_2x2
Coordinates	0 0

Spectrm Information

Energy Units:	KeV	Acq Time:	120 sec
Date:	2020-02-27	Time:	16:23:33
Covariance Matirix:		Term0+(Term1*Ch)+(Term2*(Ch^2))	
Calibration Coefficients:		-0.000111008	
		1.719696954	
		6.229522519	

Photon Data

AvgCPS:	831.0666667	Total Count:	99728
Avg Dose Rate:	53.83 urem/h	Avg Neutron:	0 cps
Max DoseRate:	165.17 urem/h	Max Neutron:	0 cps

Analysis Result

Name	Type	Doserate	Confidence
Cs-137	IND	19.12 urem/h	99.95

Figure 7.7.13. Printed Measurement Report Example

7.8. EVENT LOG GUI

PeakID allows the user to access event data that has been downloaded to PeakID from the SAM 940+ or retrieved from a database previously saved on the PC.

7.8.1. Navigating the Event Log Menu GUI

The Event Log menu GUI provides Event list, spectrum windows and several configurations, and analytical windows. Details of each window and its functions are described in the following sections.

In addition, PeakID IV can replay the event under various display conditions and calibration configurations.

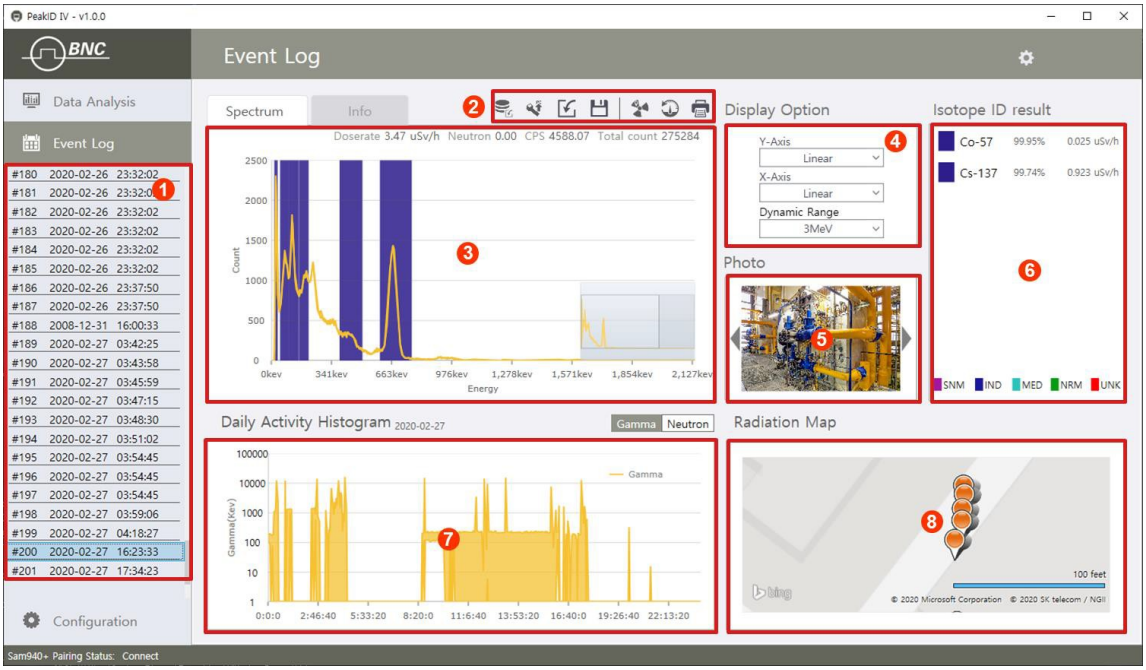


Figure 7.8.1. Event Log Menu GUI Example

Spectrum view and Event information windows can be toggled by selecting the menu tab. Figure **7.8.2.** shows spectrum and Info window.

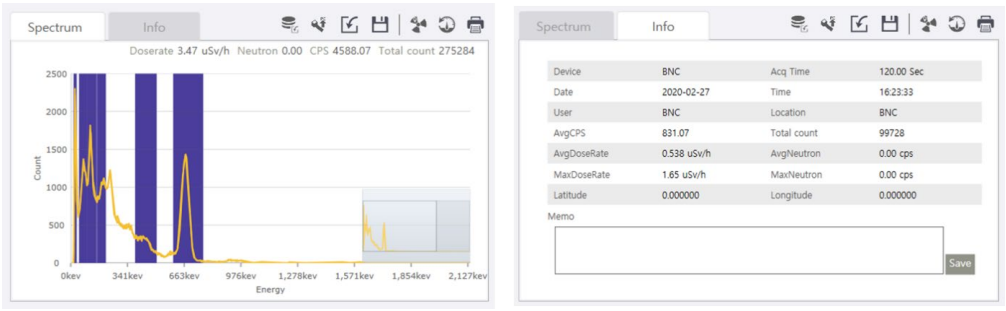


Figure 7.8.2. Spectrum vs. Info Window Example

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1	Event List	Displays Events in numerical order. Includes date and user.
2	Download buttons	Allows the user to load event data to PeakID by clicking either Load from PDA or Load from DB (a database previously saved on PC)
3	Event spectrum/Info	Displays spectrum and general information for the selected Event
4	Display option	X and Y-axis display option and Dynamic range setup
5	Photos	Displays photos and video if any were attached
6	Identification	Displays nuclides identified in the selected Event
7	Real-time activity	Displays activity as a function of time for the selected date
8	Map	Displays GPS location and activity information

7.8.2. Managing Event Log

PeakID IV manages Event log in various ways. The Event Log DB can be directly downloaded from the SAM 940+, a PC database, or XLM file format. The following sections describe methods for downloading event log to the PeakID IV.

7.8.2.1. Download Event Data from the SAM 940+ to a PC

1. Ensure that the SAM 940+ is properly connected to the PC (refer to **Section 5.4: Connecting the SAM 940+ to a PC**).
2. On the PC, open PeakID IV.
3. Click **Load from SAM 940+ icon**  . Download confirm message window will pop up as shown in figure 7.8.3 ①.
4. Select an Event from the list to analyze.

PeakID automatically downloads event data to the PC database and deletes it from the SAM 940+. Downloaded Events are displayed in the Event List area ②.

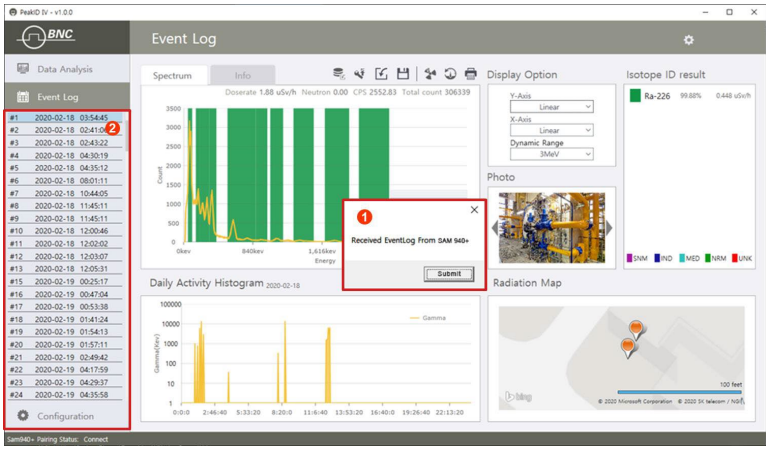

Figure 7.8.3. Download from the SAM 940+ Example

7.8.2.2. Load Event Data from a PC Database

All the Events collected from multiple SAM 940+ units (as well as SAM 945 and SAM 950 units) may be stored in a single database and managed using PeakID IV. It is not necessary to connect the unit to a PC in order to manage or analyze Events loaded from a PC database.

1. Click **Load from DB**  (Figure 7.8.4). The database browsing window pops up ①.
2. Click on the desired folder to select it. Folders are labeled with the date of collection of the event data.
3. When a folder is selected, the Event(s) from that folder will appear in the Event List area ②. Select an Event from the Event List to display the spectrum and other information.

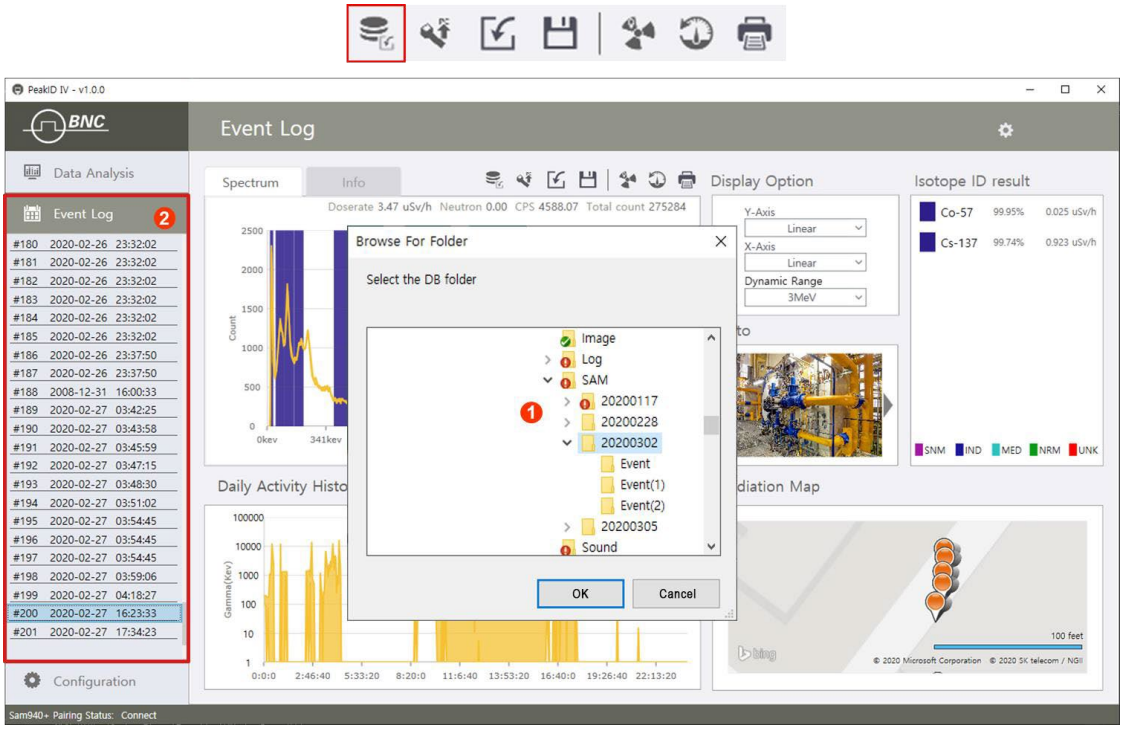

Figure 7.8.4. Load Data from a PC Database Example

7.8.2.3. Importing XML File Format

PeakID IV allows users to import XML file formats specified in the ANSI 42.42 standard.

1. Click the disk icon  . The directory screen will appear (figure 7.8.5).
2. Browse to the desired destination directory, select it, and click **Open**.

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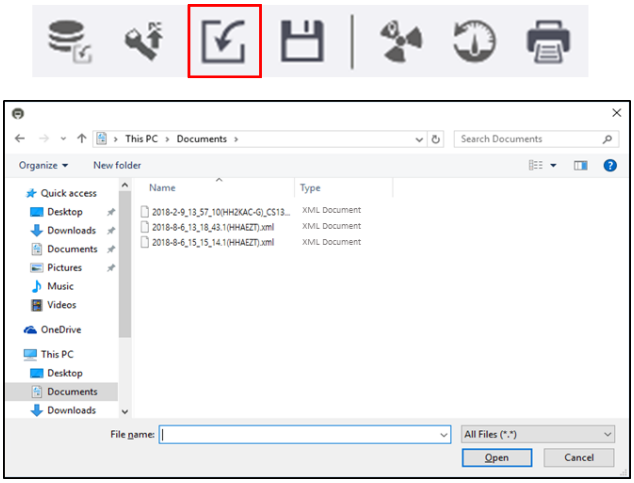

Figure 7.8.5. Importing XML File Format

7.8.2.4. Save As XML File

The spectrum and relevant data from an Event can be saved in the XML file format specified in the ANSI 42.42 standard.

1. Select the Event from the Event List
2. Click the disk icon  in the lower left corner of the screen. The directory screen will appear. (figure 7.8.6)
3. Browse to the desired destination directory, select it, and click **Save**.

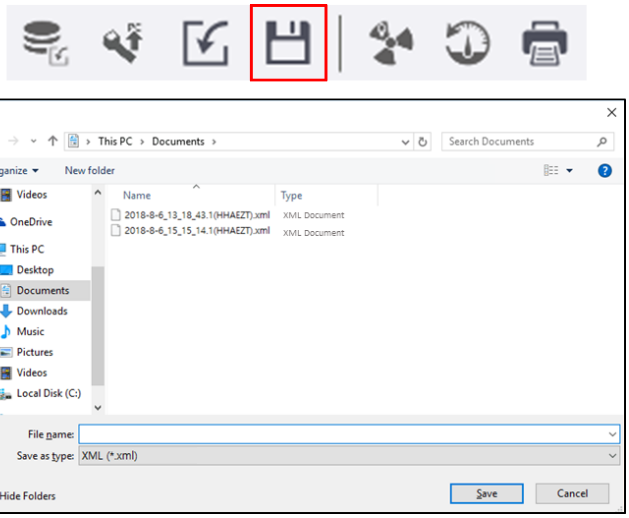

Figure 7.8.6. Save as XML File Example

7.8.2.5. Send Event to RadResponder

The spectrum and relevant data from an Event can be sent to RadResponder cloud (Refer to RadResponder section).

1. Select the Event from the Event List
2. Click the disk icon  in the lower left corner of the screen (Figure 7.8.7.) The RadResponder screen will appear.
3. Select either single event or multiple event.
4. Select event to be sent.
5. Click Grant button to send the selected event to RadResponder cloud.

The default setting for Event ID is Testing Training (refer to section 7.9.4.12. RadResponder account setup).

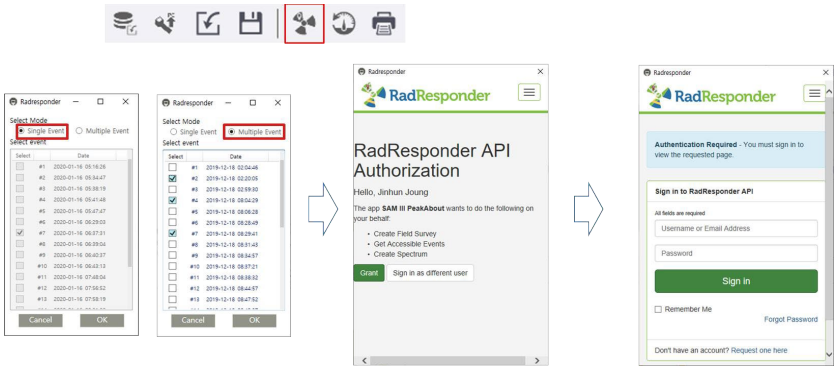

Figure 7.8.7. Send Event to RadResponder Example

7.8.2.6. Recalibration

PeakAbout and Peak ID use the 2nd order polynomial fit to convert measured channel value to corresponding energy. To achieve 2nd order polynomial fit minimum of 3 data points are required and they are 32 keV and 662 keV from Cs-137 and 1,461 keV from K-40.

However, recalibration allows users to replay spectrum analysis with customized energy calibration coefficients and library settings.

1. Select  icon.
2. Recalibration window pops up as shown in figure xx.
3. Check select box to assign channel to energy line.
4. Select OK.

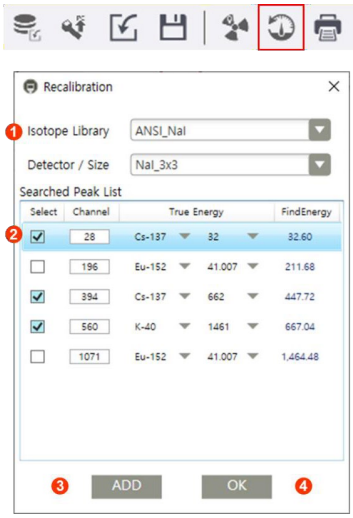

Figure 7.8.8. Recalibration Setup Window Example

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7.8.2.7. Print

The spectrum and relevant data from an Event can be printed.

1. Select the Event from the Event List.
2. Click the printer icon. Refer to the section xx for printing format and instructions.

7.9. CONFIGURATION MENU GUI

7.9.1. Navigating the Event Log GUI

The PeakID IV Configuration menu allows users to configure the SAM 940+ settings. Some parameters that need frequent changes can be set by using the PeakAbout IV configuration menu. On the other hand, the PeakID Configuration menu provides full access and management of all configurable parameters in operating the SAM 940+.

The configuration GUI consists of User setting, Administrator Setting, and Library setting. Administrator login is required to use advanced features.

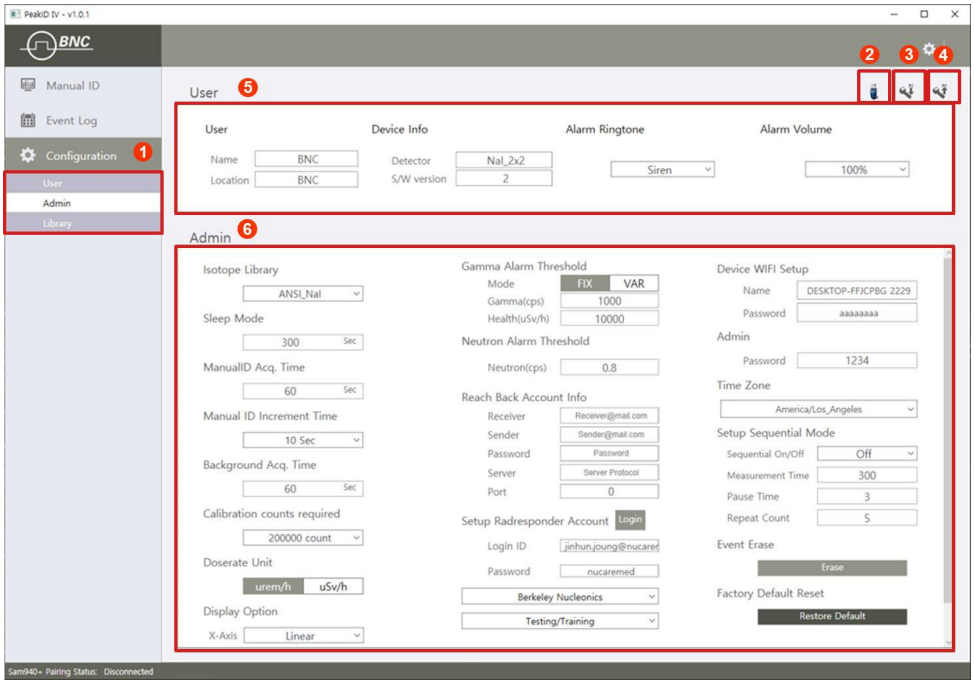

Figure 7.9.1. Configuration Menu GUI Example.

1	Configuration sub menus	Configuration has User, Administrator, and Library sub menus
2	Copy to an USB	Copy configuration to an USB device
3	Upload to SAM 940+	Upload configuration to SAM 940+ via Wi-Fi network
4	Download from SAM 940+	Download configuration from SAM 940+ via Wi-Fi network
5	User setup	User name and location, Language, and alarm ringtone setup
6	Administrator setup	Password protected configuration items

7.9.2. Copy Configuration to a USB Device

Configuration parameters can be copied to an external USB device for backup and/or downloading the parameters to the SAM 940+ device.

1. Insert an USB device to a PC.
2. Select USB device icon ①.
3. Confirmation message will be appeared as shown in figure 7.9.2. Click OK.
4. Select the USB device.
5. Select folder to save the configuration parameters.

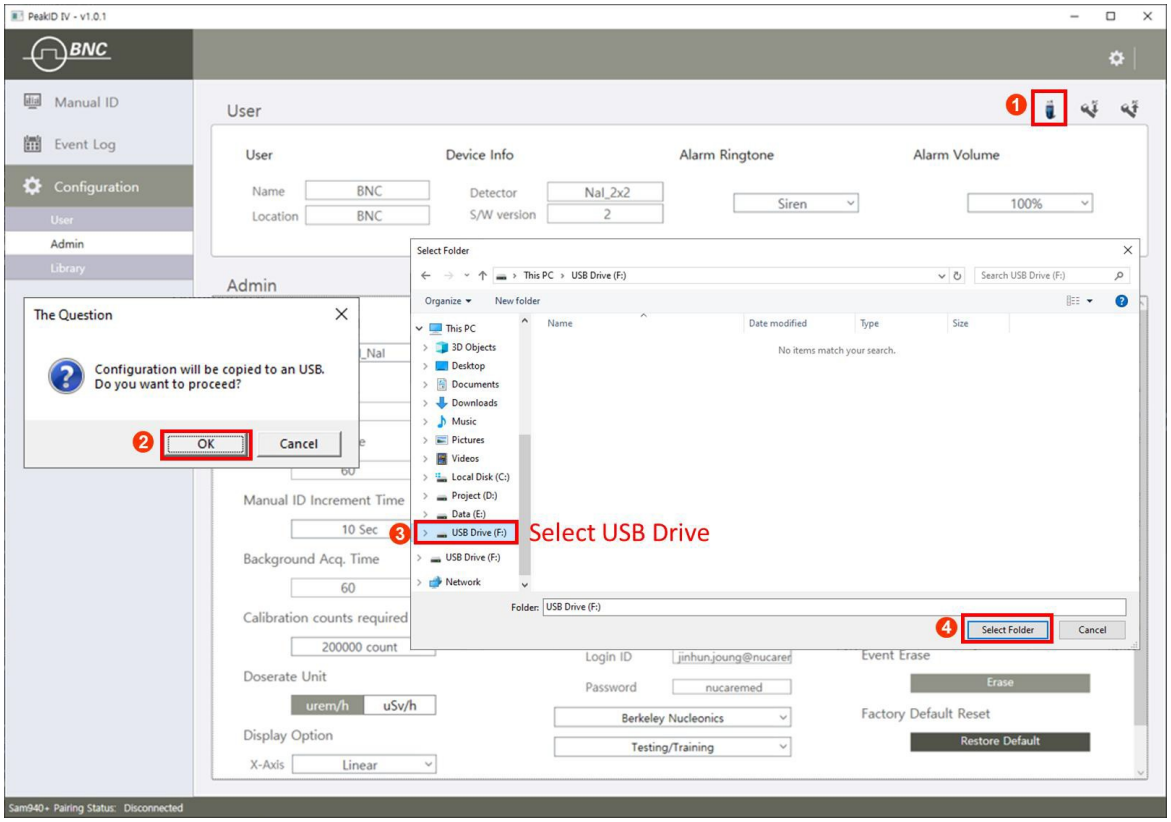

Figure 7.9.2. Copy Configuration to a USB Device

Refer to the section on downloading a SAM 940+ configuration from a USB.

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7.9.3. Upload/Download Configuration Via Wi-Fi Network

All setup parameters configured and saved by PeakID IV can be transferred to SAM 940+ or vice versa using a Wi-Fi network.

7..3.1. Download Configuration Parameters from the SAM 940+

1. Click  icon.
2. The saved parameters of SAM 940+ are downloaded/ overwritten to PeakID IV.

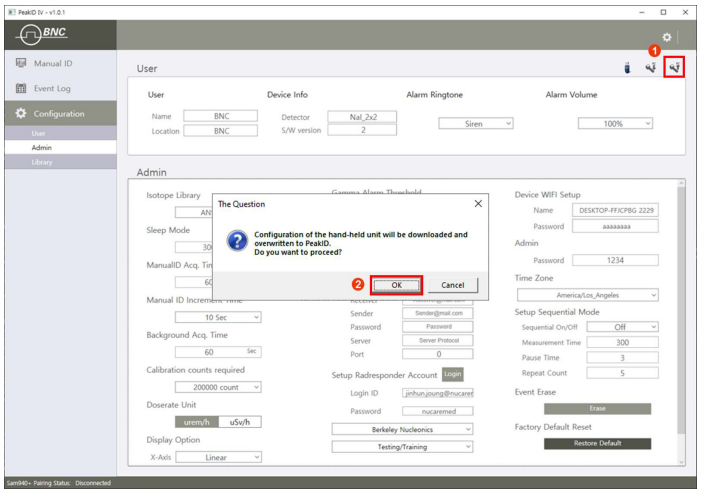

Figure 7.9.3. Download Configuration from the SAM 940+.

7..3.2. Upload Configuration Parameters to the SAM 940+

1. Click  icon.
2. The edited/saved parameters in PeakID IV are uploaded/ overwritten to the SAM 940+.

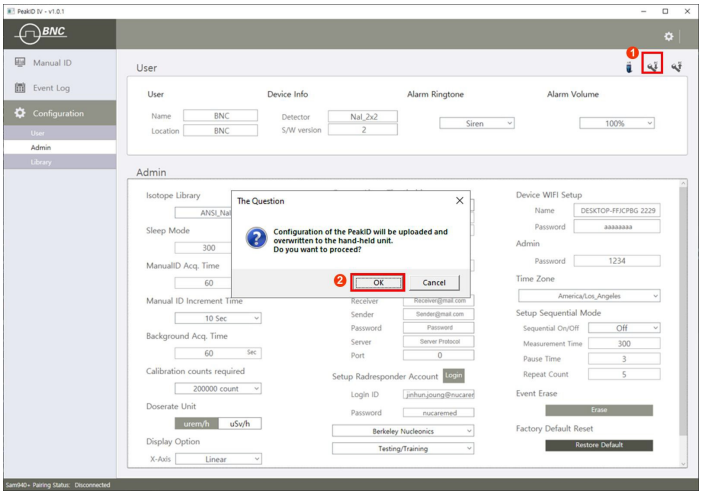

Figure 7.9.4. Upload Configuration to the SAM 940+.

The SAM 940+ and a PC should be paired to use this feature. Refer to the section xx for pairing SAM 940+.

7.9.4. User Setup

User settings allow the user to set User name, Location, Language, and Alarm Ringtone.

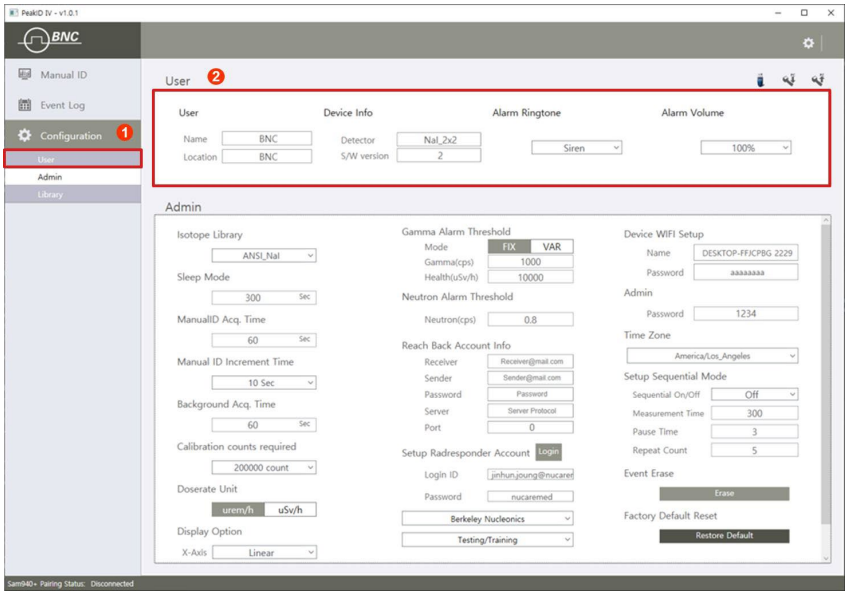

Figure 7.9.5. User Setup Example

7.9.3.1. Enter User Name and Search Location

Entering these settings will save the operator's name and the search location with the Event data.

7.9.3.2. Device Info.

Display device information and software version of PeakAbout IV.

Only English language is supported currently. Consult with BNC for other language support if needed.

7.9.3.3. Alarm Ringtone Setup

There are six alarm ringtones to choose from: Siren, Morning Call, Bell, Trumpet, Telephone call, and Beep.

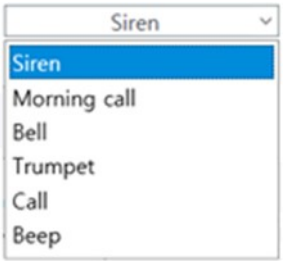

Figure 7.9.6. Ringtone Types

The default alarm ringtone is Siren.

The "Beep" ringtone is different from the other choices in that the rate of the "beep" increases as detected energy increases in count rate.

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7.9.4.3. Alarm Volume Setup

User can define alarm volume. 0 volume represents vibration mode.

7.9.5. Administrator Setup

You must enter the Administrator password before you can open the Administrator setup management tool.

1. Click the **Admin** menu (Figure 7.9.4) ①.

2. Enter the Administrator password ②. The default password is **1234**. The Admin configurable List is shown in figure 7.9.5. ③.

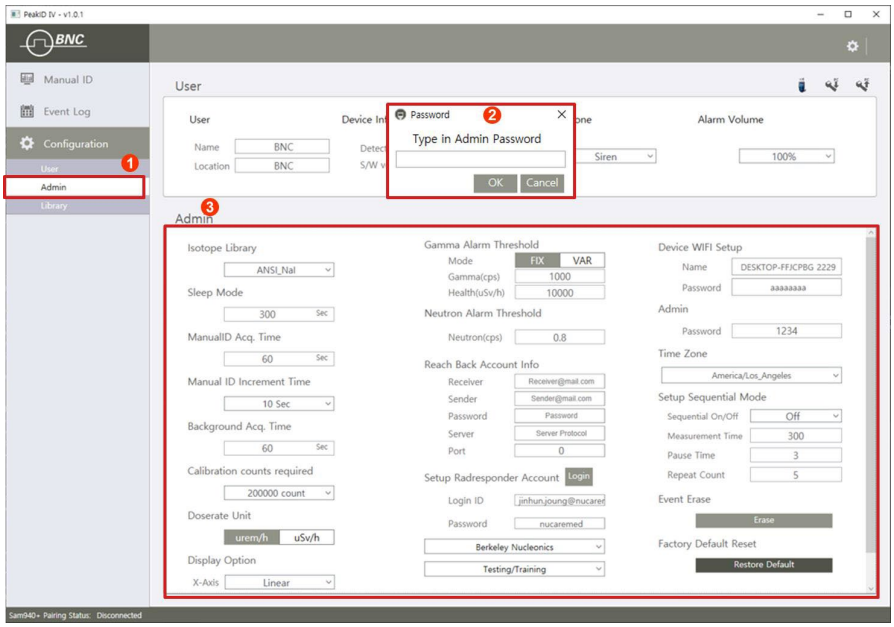

Figure 7.9.7. Admin Menu GUI Example

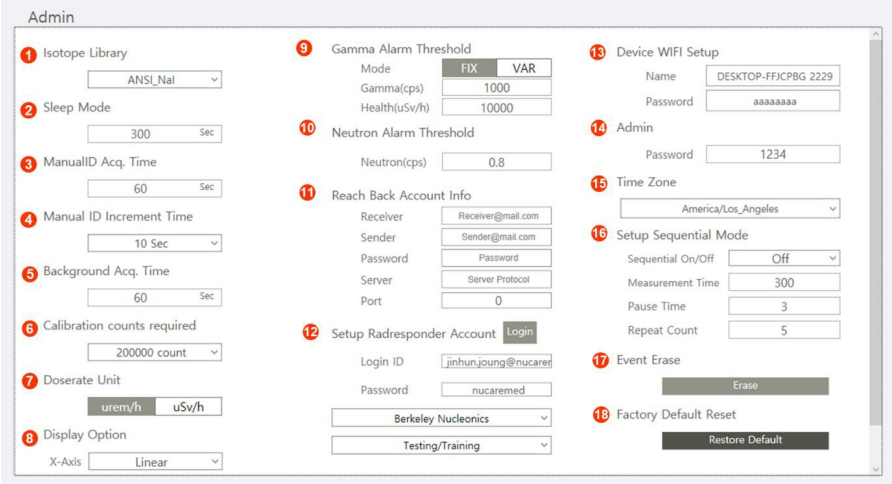

Figure 7.9.8. List of Configuration by Admin.

7.9.4.1. Isotope Library List

The Library List in PeakAbout IV for SAM 940+ contains eight libraries. Four libraries are optimized for sodium iodide (NaI) detectors. Four libraries are optimized for high-resolution detectors like cerium bromide (CeBr).

1. Open and select the Library from the list.

The default library is ANSI_NaI (ANSI_CeBr if your SAM 940+ has a high-resolution detector).

- **ANSI_NaI and ANSI_CeBr are compliant with ANSI N42.34-2006**

^{241}Am, ^{133}Ba, ^{57}Co, ^{60}Co, ^{137}Cs, ^{152}Eu (not ANSI required), ^{18}F, ^{67}Ga, ^{123}I, ^{125}I, ^{131}I, ^{111}In, ^{192}Ir, ^{40}K, ^{237}Np, ^{237}Np HE, ^{239}Pu, ^{226}Ra, ^{99m}Tc, ^{232}Th, ^{201}Tl, ^{233}U, ^{233}U HE, ^{235}U, ^{235}U HE, ^{238}U

- **IND_NaI and IND_CeBr are specialized with additional Industrial classified isotopes**

^{241}Am, ^{109}Cd, ^{57}Co, ^{60}Co, ^{134}Cs, ^{137}Cs, ^{152}Eu, ^{111}In, ^{192}Ir, ^{40}K, ^{85}Kr, ^{54}Mn, ^{22}Na, ^{204}Tl

- **MED_NaI and MED_CeBr are specialized with additional Medical classified isotopes**

^{77}Br, ^{58}Co, ^{60}Co, ^{67}Co, ^{51}Cr, ^{137}Cs, ^{18}F, ^{67}Ga, ^{124}I, ^{131}I, ^{192}Ir, ^{40}K, ^{99}Mo, ^{24}Na, ^{81}Rb, ^{82}Rb, ^{83}Rb, ^{124}Sb, ^{46}Sc, ^{75}Se, ^{153}Sm, ^{85}Sr, ^{89}Sr, ^{99m}Tc, ^{201}Tl, ^{133}Xe, ^{88}Y, ^{90}Y, ^{88}Zr, ^{89}Zr

- **ANSI15_NaI and ANSI15_CeBr are compliant with ANSI N42.34-2015**

^{241}Am, ^{133}Ba, ^{57}Co, ^{60}Co, ^{137}Cs, ^{67}Ga, ^{131}I, ^{192}Ir, ^{40}K, ^{239}Pu, ^{226}Ra, ^{99m}Tc, ^{232}Th, ^{201}Tl, ^{235}U, ^{238}U, DU, HEU, RGPu, WGPu

7.9.4.2. Sleep Mode

To save power consumption and maximize operation time, the SAM 940+ falls in sleep mode when it is not used for a certain time.

The default sleep mode time is 120 seconds.

7.9.4.3. Manual Identification Acquisition Time

To measure and record an event, Manual Isotope Identification must be performed. Manual ID can be performed whether the SAM 940+ is in an alarm condition or not.

1. Open the **MANUAL ID ACQ. Time** menu:

The default Manual ID Measurement Time is 120 seconds.

7.9.4.4. Manual Identification Adjustment Time

When Manual ID is initiated, an event spectrum begins. While the Manual ID is running, you may decide that you will need to record a longer measurement. Without interrupting or restarting your Manual ID, you can extend or reduce the measurement time.

The Manual Identification Adjustment Time is defined in the Administrator Settings menu.

1. Open the Manual ID Adj. Time menu:

The default Manual ID Adjustment Time is 10 seconds.

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7.9.4.5. Background Measurement Time

Reliable background information is critical to good nuclide identification and alarm performance. PeakAbout IV uses an advanced NORM rejection algorithm to minimize false alarms due to fluctuations of Naturally Occurring Radioactive Material in the background.

1. Open the **BACKGROUND MEASUREMENT** menu:

The default Background Measurement Time is 120 seconds.

It is good practice to select a Background Measurement Time value that is equal to your Manual Identification Measurement Time value. Refer to **Section 4.4.6.7: Manual Identification Measurement Time**.

7.9.4.6. Calibration Measurement Count

Although Auto Calibration and Auto Stabilization features adjust the calibration parameters of the SAM 940+ to correct for drift caused by environmental changes in ambient temperature, if drift of more than ±20% between the stabilized peak and the original peak (Cs-137 calibration peak) occurs, then you must perform manual calibration using a Cs-137 source. Refer to **Section 4.4.6.16: Perform Energy Calibration**.

1. Open the **CALIBRATION** menu:

The default Calibration Count value is 200,000 counts (200 x 1000).

7.9.4.7. Dose Rate Measurement Unit

The dose rate unit will apply automatically to dose rate values that are displayed in the Gauge screen, the Manual ID, and the Event files. The value of the Health Safety Threshold will also be automatically adjusted.

The default Dose Rate Unit is rem/h.

7.9.4.8. Display Option

The display option allows user to select x-axis option for QCC (Quadratic) spectrum analysis. Refer to the section xx for QCC display.

The default X-axis display option is Linear.

7.9.4.9. Select Alarm Mode and Alarm Threshold

In the Administrator Settings menu, PeakAbout IV provides two modes for alarm triggering:

Fixed Alarm Mode is a basic method that assumes the background environment exhibits a very small amount of fluctuation. The alarm is triggered when the count rate exceeds the operator-determined threshold value. This method can cause false alarms if there is substantial background fluctuation due to Naturally Occurring Radioactive Material (NORM), as is often the case when the system is moving across a large area while actively monitoring.

Variable Alarm Mode is a more advanced method that continuously samples the previous 10 seconds worth of background fluctuation and calculates the standard deviation above background (σ, or sigma) of the fluctuation. Using this method prevents alarms due to changing background (and eliminates the need to perform new background measurements). Instead, alarms are triggered when real gamma peaks exceed the standard deviation of the dynamic threshold value. We recommend using Variable Alarm Mode when moving across a large area that may be subject to changes in background.

1. Select Alarm mode
2. Set Gamma alarm threshold
3. Set Health alarm threshold

The default threshold value for the Fixed Alarm Mode is 1000 counts per second (cps), which is optimal for many applications. A typical background environment produces around 200 cps for a 3 x 3-inch NaI detector, or lower if a high-resolution detector option was chosen. A threshold value lower than 1000 is usually unnecessary and is more likely to generate false alarms. In situations where the background environment is known to be above normal, it may be necessary to select a higher value such as 2000 or 3000 cps to minimize false alarms.

The default threshold value for Variable Alarm Mode is 4 (Sigma) which is optimal for many applications. The typical range is 1 to 6 (Sigma). Selection of a lower value creates slack in the threshold criteria and increases the likelihood of false alarms. Selecting a higher value can narrow the threshold criteria and cause significant gamma activity to be overlooked if it passes very quickly.

For the user's safety, PeakAbout IV features a separate Health Safety Alarm with a different ringtones and visual signal. When the safety threshold is exceeded, the distinctive Health Safety ringtone sounds, and the Operating Message displays "DANGER" (Figure 4.46). The Health Safety Alarm takes precedence over all other alarm conditions. The Health Safety Alarm threshold is defined in the Administrator Settings menu.

For your protection, PeakAbout IV also features a separate and unique alarm which is triggered when the Health Safety Threshold is exceeded. Refer to **Section 4.4.6.3: Select Health Safety Threshold**.
The default value for Health Safety Threshold is 10,000 μrem/h (100 μSv/h).

7.9.4.10. Select Neutron Threshold

If your SAM 940+ includes the neutron detection option, then it contains either a solid-state sensor arrays on a ^{6}Li substrate (Domino), a tube filled with ^{3}He gas and integrated with moderator, or a doped Gamma Detector designed to catch neutron activity as well. PeakAbout IV will display neutron activity on the Gauge screen in counts per second (cps) (Figure 4.44).

The default value for Neutron Threshold is 0.8 CPS which is optimal for most applications.

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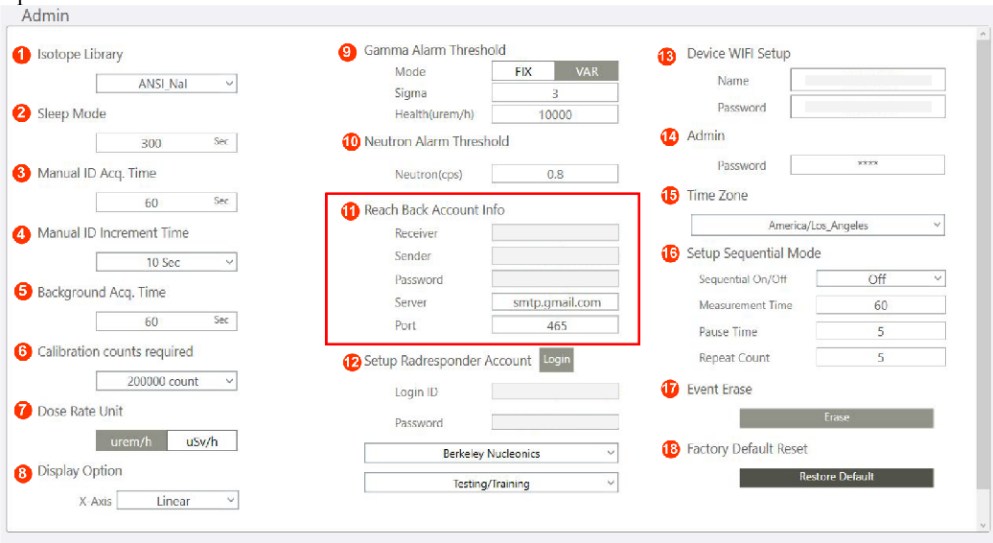
7.9.4.11. Reach-Back Email Account

When operating within range of a Wi-Fi network, the SAM 940+ allows you to transmit spectrum and event data directly to a prearranged location such as a U.S. DOE reach-back facility, group leader, command center, etc. Data from an Event that you select is emailed in N42-compatible XML format to the specified recipient. The system is optimized for Gmail (the email service developed by Google). Before you can transmit spectrum and event data, you must setup email information.



7.9.4.12. RadResponder Account

In the United States, we have partnered with FEMA to implement RadResponder, a free network for the rapid collection and management of radiological data during an emergency. When the SAM 940+ is operating within range of Wi-Fi, spectrum and event data can be uploaded to the RadResponder cloud in the appropriate format. RadResponder can be accessed on PDAs, smartphones, tablets, or any computer connected to the web, allowing it to be seamlessly employed at all levels of government during a radiological or nuclear emergency.

You must already have established a RadResponder account at **www.RadResponder.net** before you can use this feature.

1. Click the Login button.
2. Sign in with RadResponder ID/Password.
3. Click Grant button.
4. Select Sponsor and type or event.

Once the login information (user ID/password, Sponsor, and event type) are saved, you don't need to repeat this procedure when sending event to RadResponder server unless Sponsor and/or event type need to be changed.

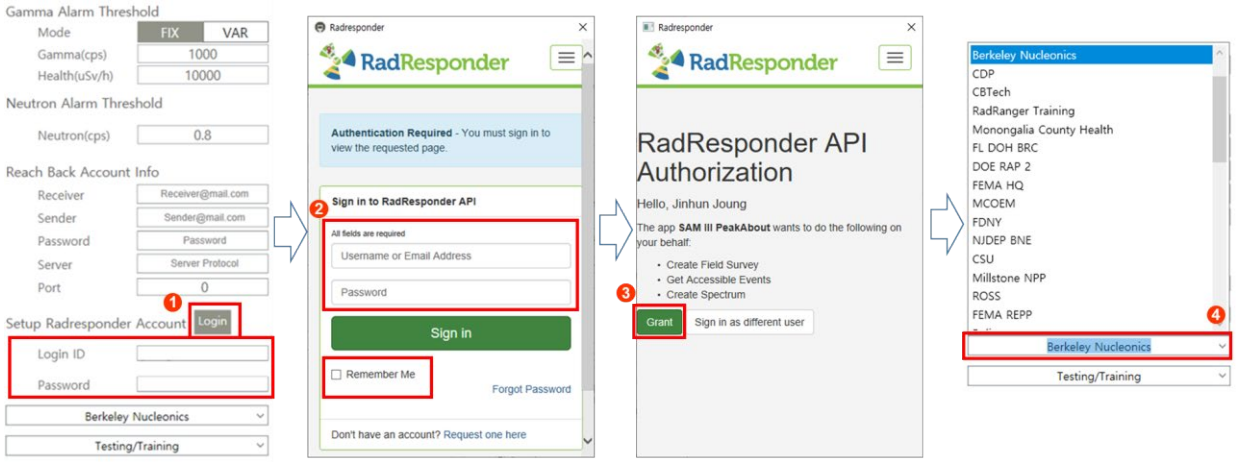


Figure 7.9.10. List of Configuration by Admin.

7.9.4.13. Wi-Fi Setup

Select the available Wi-Fi network and login. The SAM 940+ and a PC should be the same Wi-Fi network to exchange data between.

7.9.4.14. Change Admin. Password

Change administrator's password.

Note: Factory setup is 1234. It is recommended to change it to more secured combination.

7.9.4.15. Time Zone

Event data has a date/time stamp and proper date/time zone has to be setup.

7.9.4.16. Setup Sequential Mode

The purpose of Sequential Mode is to generate a series of measurements separated by short pauses, one right after the other. The sequence of measurements is generated by a single keypress, instead of requiring the operator to manually begin each individual Event. All Events in the sequence have the same Measurement Time, and the Pause Time between Events is the same. The sequence continues for a specified Number of Measurements or until the user interrupts and cancels the sequence. Sequential Mode is useful for plotting a series of events while the SAM 940+ moves along a continuous path.

For each Event in the sequence, the SAM 940+ collects the date, time, GPS position, overall count rate, overall dose rate, count rate, and dose rate for each identified isotope, and other typical event data (including the identified neutron rate if the neutron detection option is installed). After the survey, all the spectral data from the entire sequence may be batch processed (to a spreadsheet, for example) with a single command.

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7.9.4.17. Erase Event

Erase the event data saved in the SAM 940+.

7.9.4.18. Restore Factory Hardware Configuration

The Restore Factory HW Configuration setting is used to reset parameters like calibration and high voltage bias for the installed detector. Situations in which this operation is useful are extremely rare, and the procedure should only be performed by a factory technician. Contact BNC before performing this operation.

7.9.5. Library Setup

You must enter the Administrator password before you can open the Isotope Library management tool and upload an Isotope Library to the SAM 940+.

7.9.5.1. Navigating Library Menu GUI

The Library Menu GUI consists of Library Name ②, Isotope List ③, Isotope Info ④, Photopeak and BR info ⑤, and icons ⑥ for transferring the Library to the SAM 940+. Refer to the following sections for details of each.

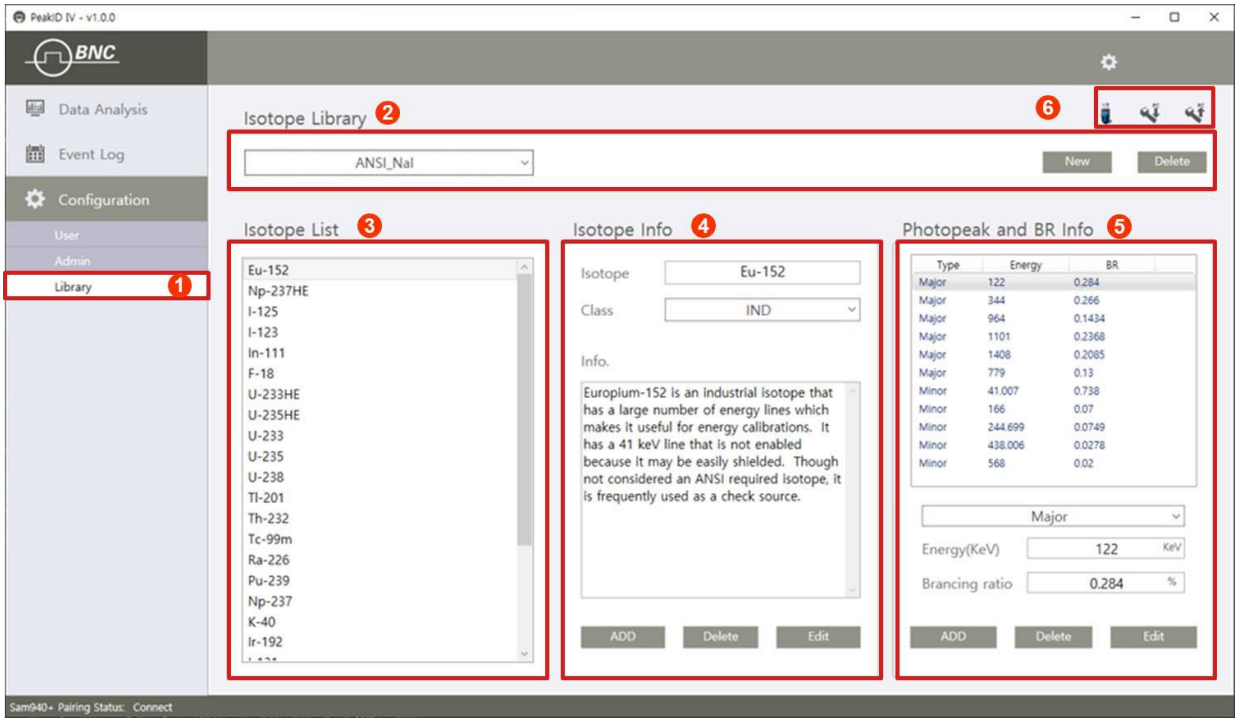

Figure 7.9.11. Library Menu GUI.

7.9.5.2. Isotope Name

The SAM 940+ provides total of 6 libraries. Edit existing library, Adding a new library and deleting a library from the list are all managed here.

7.9.5.3 Isotope List

Isotope List displays the isotopes in the selected library.

7.9.5.4. Isotope Info

Isotope Info displays the information for the selected isotope in the

isotope list. Admin can Add, Delete, or Edit the isotope.

7.9.5.5. Photopeak and BR info

Photopeak and BR info displays the photopeak(s) and its BR (Branching Ratio) of the selected isotope in the selected library.

Admin can Add, Delete, or Edit the isotope information.

7.9.5.6. Upload to SAM 940+

Uploading the library information to the SAM 940+ (or vice versa) can be done by clicking the icon.

CHAPTER 8. REMINDERS AND USEFUL TIPS

- ✓ Make sure there are no radiation sources in the vicinity of the SAM 940+ before turning the power on.
- ✓ Make sure there are no radiation sources in the vicinity of the SAM 940+ during Auto Calibration.
- ✓ Make sure there are no radiation sources in the vicinity of the SAM 940+ before performing a Background Measurement.
- ✓ Wearing polarized lenses such as sunglasses can make the LCD display appear blank. We recommend that you do not wear polarized lenses while using the SAM 940+.
- ✓ Do not open the unit. Opening the unit may void your warranty. Any repairs or alterations should only be performed by technicians who are authorized by BNC.

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APPENDIX: SPECIFICATIONS

Detectors	
Gamma	2x2 inch NaI(Tl), CeBr3, LaBr3. 2x1 inch CeBr3 or LaBr3
Neutron	Solid State Domino, CLLBC and CLYC
External Probe	External gamma or neutron detector, GPS, 4G LTE SIM card (optional)

Performance	
Energy Range	20 keV - 10 MeV (Gamma)
Linearization	Real-time linearization by firmware
Dose rate range (ID mode)	0-10 mR/h
Dose rate range (GM Count mode)	10 mR/h - 100 R/h
stabilization	"K-40 Finder": sourceless automatic real-time stabilization
Identification	ANSI N42.34 compatible
MCA channel	16 bit 2048 ch.
Library categories	SNM, IND, MED, NORM
Typical resolution	NaI(Tl) < 7%, CeBr3 <5%, LaBr3 <4% @ 662 keV

BATTERY	
Type	replaceable Li-ion (2 ea.)
Operation time	>5h in dose rate mode with display back light off, maximum run time: > 5x2 h
Backup battery adapter	4 AA alkaline batteries (> 2h. backup)

PHYSICAL			
Dimensions (W x D x H)	102 x 243 x 97 (mm)	Weight	1.2 kg

ENVIRONMENTAL			
Operating Temperature	-20℃(-4℉)~50℃(122℉)	Protection Rating	IP65
Relative Humidity	10 to 80%, non condensing	Testing Condition	IEC 62706, EN 61326

DISPLAY	
Type	LCD
Size	3.5inch
Resolution	480 x 320, configurable up to 1920x1080

INPUT/OUTPUT	
USB	micro USB 2.0
Bluetooth	Class 4.0
WLAN	802.11n Wireless LAN

MISCELLANEOUS	
GPS	22tracking, 66channels, 1-10Hz
CCD Camera	CMOS 8MP (optional)
GYRO sensor	Linearity 0.1 ±% FS (optional)

SOFTWARE	
Reach-back	ANSI N42.42 or CSV event data
Application SW	Android based application SW and Windows based SW for command center

ACCESSORIES			
Case	Pelican style carrying case	Charger	USB charger
Holster	Belt holster	Connection cable	mini USB cable