WB JOHNSON Instruments

User and Maintenance Manual

Spartan Pack

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Table of Contents

Figures

Tables

1 Introduction of Spartan Pack

1.1 Introduction

Spartan Pack is a mobile radiation detection, identification and data collection unit. The Spartan Pack system consists of a tablet computer, a gamma detector and a neutron detector with associated electronics. A mobile phone can be used as an additional remote control unit to monitor the system. It is designed to be unnoticeable and it utilizes tablet computer and a smart phone as easy user interfaces.

The Spartan Pack system continuously collects and analyzes radiation information acquired by its detectors. All the collected data is also stored into a database for later review or more detailed analysis.

The Spartan Pack system is driven by the Spartan Pack software which has been specifically designed to enable high quality field spectrometry, real time monitoring and data communication.

The unit is designed to have full connectivity / compliance to EnviScreen system and it is scalable from one measurement unit to full radiation surveillance solution. Spartan Pack is using modern portable computer to integrate the data from GPS positioning, data acquisition software, online calibration and radionuclide analysis algorithms together with data management tools.

Although system is designed to be very easy to use it contains expert mode including analyzing tools for advanced user. WI-FI connection between computer and smart phone with graphical interface forms communication link to the operational center or experts through the Ethernet, WI-FI or optional 4G LTE.

Fig. 1-1 Spartan Pack introduction

1.2 For Your Safety

Tab. 1-1 Declarations, warnings and cautions

DECLARATIONS
Strictly follow the Instructions for Use
Any use of the instrument requires full understanding and strict observation of these instructions. The Instrument is only to be used for purposes specified here. WB Johnson Instruments accepts no liability for any consequential loss, injury or damage resulting from the use or misuse of the supplied information, or from any errors or omissions to this manual.
It shall be the sole responsibility of the purchaser to ensure the suitability of the product for a particular application. It is also the purchaser's responsibility to use and maintain the product in accordance with the procedures and recommendations described in this User and Maintenance Manual.
Liability for proper function or damage
The liability for the proper function of the instrument is irrevocably transferred to the owner or operator to the extent that the instrument is serviced or repaired by personnel not employed or authorized by Environics Service or if the instrument is used in a manner not conforming to its intended use.
WB Johnson Instruments cannot be held responsible for damage caused by noncompliance with the recommendations given above.
The warranty and liability provisions of the terms of sale and delivery of WB Johnson Instruments are likewise not modified by the recommendation given above.
WARNING A WARNING calls attention to a condition or possible situation that could cause injury to the operator.
Disposal of the detector
Return the Spartan Pack to the manufacturer, WB Johnson Instruments, for disposal. WB Johnson Instruments will take care of dispatching the source to a proper end-storage.
WARNING A WARNING calls attention to a condition or possible situation that could cause injury to the operator.
Lithium Rechargeable Battery
Spartan Pack uses a rechargeable lithium battery
The battery should never be opened or disassembled
Lithium batteries must be disposed properly and in accordance with local regulations

CAUTION
A CAUTION calls attention to a condition or possible situation that could damage or destroy the product or the operator's work.

Maintenance

Maintenance performed without training by WB Johnson Instruments will avoid warranty.

DO NOT attempt to open or modify the Spartan Pack. Spartan Pack can only be repaired by personnel trained and authorized to do so.

Handling precautions

In order to ensure the detector continues to operate at maximum performance it is suggested that you:

- Read all instructions carefully before operating Spartan Pack system
- Do not remove module covers unless instructed by the manufacturer
- Do not perform maintenance, while power is supplied to the device
- Always wear personal protective equipment when handling potentially hazardous material
- Operation temperature range is -20… +50 °C (-4… +122°F)

Storage precautions

- Storage temperature range is -20… +50°C (-4… +122°F)
- Recommended storage temperature range is from +10… +30°C (+50… 86°F)
- Recommended relative humidity range is from 30%... 90% (Without condensation)
- In case of long storage period (more than 3 months), charge the battery to 25 – 50% of its capacity before storage

Operation in rain

- When Spartan Pack is used in rain, make sure that you use the rain hood on the backpack. Rain hood is located in the pocket of the backpack

The warranty and liability provisions of the terms of sale and delivery of WB Johnson Instruments are likewise not modified by the recommendations given above.

1.3 Definition of Terms

Tab. 1-2 Abbreviations

Abbreviation	Description
LED	Light Emitting Diode
GPS	Global Positioning System
USB	Universal Serial Bus

1.4 Technical Description

Spartan Pack is a mobile radiation detection, identification and data collection unit. The system is based on proven scintillator detector technology:

Radiation source energy-photons are absorbed in crystal's a scintillator, triggering the release of UV-photons.

UV-photons are converted into photoelectrons and multiplied in the photomultiplier.

The Multichannel analyzer analyses the signals and the information is shown on Spartan Pack software user interface.

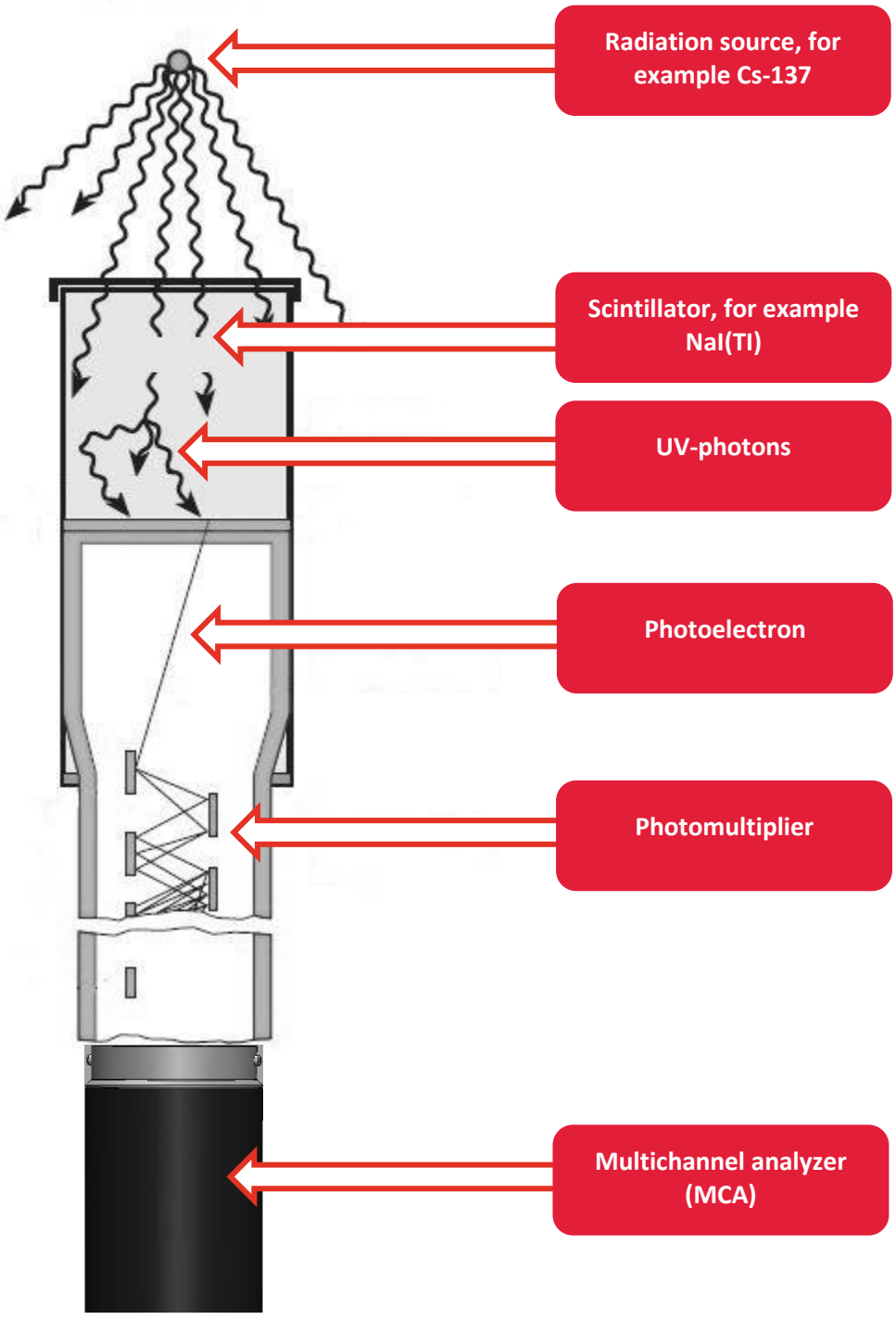

Fig. 1-2 Scintillator operational principle

1.5 Technical Data

1.5.1 Spartan Pack

- **Name:** Spartan Pack
- **Size** (H x W x L)**:** 530 mm x 380 mm x 220 mm (20.9” x 15.0” x 8.7”)
- **Weight:** Approx.
  - 4.5 kg (10 lbs) with gamma detector
  - 6.3 kg (14 lbs) with gamma and neutron detector
- **Color:** Black
- **Operational Temperature:** -20°C…+50°C
- **Storage Temperature:** -20°C…+50°C
- **Battery Life:** >6 hours with battery unit
- **Energy Range:** 30KeV to 3MeV (Gamma)
- **Dose Rate Range:** 0,01 to 100µSv/h
- **Dose Rate Accuracy:** ±5%
- **Spectrum:** 2048 channel MCA

1.5.2 Tablet Computer

- **Name:** Panasonic Toughpad FZ-M1
- **Size** (H x W x L)**:** 280 mm x 203 mm x 132 mm (11.0” x 8.0” x 5.2”)
- **Weight:** 0.7 kg (1.54 lbs)
- **Operational Temperature:** -20...+50°C
- **Storage Temperature:** -20...+60°C
- **Power:** Li-Ion rechargeable hot swappable battery
- **Input Power:** 100 – 240VAC with External Power Adaptor
- **Connections:** USB, Ethernet, Wi-Fi and optional 4G LTE via separate modem
- **GPS:** Integrated GPS
- **Operating System:** Windows 10

1.5.3 Gamma Detectors

The Spartan Pack can be equipped with $LaBr_3$ scintillation detector.

Tab. 1-3 Technical data of $LaBr_3$ scintillation detectors

Gamma Detector	$LaBR_3$ Scintillation 1.5” x 1.5”	$LaBR_3$ Scintillation 2” x 2”
Name	Gamma Detector	Gamma Detector
Length	330 mm (13.0”)	360 mm (14.2”)
Diameter	80 mm (3.1”)	100 mm (3.9”)
Weight	1.6 kg (3.5 lbs)	Approx. 2 kg (4.4 lbs)
Operational Temperature	-20°C…+50°C	-20°C…+50°C
Storage Temperature	-20°C…+50°C	-20°C…+50°C
Power	USB (+5VDC) or POE	USB (+5VDC) or POE
Connections	USB and Ethernet	USB and Ethernet
Detector Type	$LaBR_3$ Scintillation 1.5” x 1.5”	LaBR3 Scintillation 2” x 2”
Energy Resolution	<3% FWHM @ 662KeV	<3% FWHM @ 662KeV

Spartan Pack can also be equipped with NaI(Tl) scintillation detector.

Tab. 1-4 Technical data of NaI(Tl) Scintillation detectors

Gamma Detector	NaI(Tl) Scintillation 2”x2”	NaI(Tl) Scintillation 3”x3”
Name	Gamma Detector	Gamma Detector
Length	370 mm (14.6”)	410 mm (16.1”)
Diameter	80 mm (3.1”)	100 mm (3.9”)
Weight	1.7 kg (3.8 lbs)	2.8 kg (6.2 lbs)
Operational Temperature	-20°C…+50°C	-20°C…+50°C
Storage Temperature	-20°C…+50°C	-20°C…+50°C
Power	USB (+5VDC) or POE	USB (+5VDC) or POE
Connections	USB and Ethernet	USB and Ethernet
Detector Type	NaI(Tl) Scintillation 2”x2”	NaI(Tl) Scintillation 3”x3”
Energy Resolution	<7.5% FWHM @ 662KeV	<7.5% FWHM @ 662KeV

1.5.4 Remote Control Unit

- **Name:** Mobile Phone
- **Size:** (H x W x L)**:** See the User Manual of the Mobile Phone
- **Weight:** See the User Manual of the Mobile Phone
- **Operational Temperature:** -20°C…+50°C
- **Storage Temperature:** -20°C…+60°C
- **Power:** See the User Manual of the Mobile Phone
- **Battery Life:** >8 hours
- **Input Power:** 100 – 250VAC with External Power Adaptor or USB (+5VDC)

Note: Type of the delivered Mobile Phone may vary depending on availability

1.6 Equipment Description

The Spartan Pack is delivered with the basic accessories that are meant to help with installation and verifying the normal operation of Spartan Pack. There are also several optional items that can be used with the Spartan Pack Mobile Radiation Detector.

Tab. 1-5 Spartan Pack equipment

Equipment	Item No.
Spartan Pack, Mobile Radiation Detector, 2” x 2” NaI(Tl)	E12510000
Spartan Pack, Mobile Radiation Detector, 1.5”x 1.5” $LaBr_3$	E12509000
Spartan Pack, Mobile Radiation Detector, 3” x 3” NaI(Tl)	E13453000
Spartan Pack, Mobile Radiation Detector, 2” x 2” $LaBr_3$	E13452000
Basic accessories	**Item No.**
Panasonic Toughpad FZ-M1, Tablet Computer	E09407000
Remote Control Unit	E12404000
Spartan Pack User and Maintenance Manual	ED19576
Optional accessories	**Item No.**
H^3 free ^6Li: ZnS (Ag) Neutron Detector	E11827000
Spartan Pack Solo Radiation Source Locator Device	E12970000
USB Hub	E10565000
Modem 4G	E13533000

1.7 Key Elements

1.7.1 Key Elements of the Spartan Pack

The standard Spartan Pack assembly consists of a Tablet Computer with Windows 10 operating system and gamma detector with associated electronics. Computer and detector tube are packed to the backpack. A mobile phone can be used as an additional Remote Control Unit to monitor the system. Spartan Pack can be equipped with optional neutron detector and also radiation source locator device.

The computer pocket is attached to the backpack by using Velcro and zipper and it is removable. This allows the user to take the computer for portable use during the operation.

The main parts of the Spartan Pack are shown below:

Tab. 1-6 Key elements of Spartan Pack

Key elements of Spartan Pack
1. Tablet Computer
2. Gamma Radiation Detector
3. AC Adaptor
4. Remote Control Unit
5. Ac Adaptor for Remote Control Unit
6. Backpack with Rain Hood
7. AC In Power Connector

Fig. 1-3 Key elements of Spartan Pack

1.7.2 Key Elements of the Tablet Computer

The Spartan Pack includes Panasonic Tough pad FZ-M1 rugged tablet computer with Spartan Pack-software. Computer offers USB connections to the Gamma and Neutron Detectors 4G modem and wireless Ethernet Connections and optional mobile 4G LTE modem connections for the system integration and GPS. The computer's internal battery also enables hot swapping the rechargeable battery; The computer will stay powered on for approximately one minute without the battery. See Chapter 9.2:Replacement of Battery of the Tablet Computer for more detailed instructions.

Tab. 1-7 Key elements of the tablet computer

Key elements of Tablet Computer
1. Mains Power Connector
2. Front Camera
3. Touch Screen
4. Headphone Jack
5. USB Connector for Detectors / USB Hub
6. Power Switch
7. Rechargeable Battery
8. Ethernet Port
9. Slot for SD Memory Card

Fig. 1-4 Key elements of Tablet Computer

1.7.3 Key Elements of the Gamma Detector

Essential for the system is the Saint-Gobain Brilliance 38s38 (1.5”x1.5”) Lanthanum bromide ($LaBr_3$) or 2”x2” NaI(Tl) gamma detector. Detector is connected to Canberra Osprey multi-channel analyser (MCAs) which is in turn connected to the Spartan Pack computer via universal serial bus (USB) cables. The detector is enclosed in waterproof plastic containers for protection. The detector offers also the option for Ethernet connection. Also Saint-Gobain Brilliance 51s51 (2”x2”) Lanthanum bromide ($LaBr_3$) and 3”x3” NaI(Tl) gamma detectors are available.

Tab. 1-8 Key elements of the gamma detector

Key elements of Gamma Detector
1. USB connector
2. Hardwired Ethernet Connector
3. Carrying Handle

Fig. 1-5 Key elements of Gamma Detector

1.7.4 Key Elements of the Remote Control Unit

Modern Mobile Phone can be used as a Remote Control Unit of the Spartan Pack. It can be used to monitor the radiation measurements by using Spartan Pack web-service software. It is also possible to use any modern smart phone which offers the web-browser and WI-FI.

Note: Type of the delivered Mobile Phone may vary depending on availability. The Mobile Phone shown in this document is an example. See the detailed information from Mobile Phone's own User Manual.

Tab. 1-9 Key elements of the remote control unit

Key elements of Remote Control Unit
1. Power Switch
2. Mains Power Connector / USB
3. Display
4. Mains Power Adaptor and cable

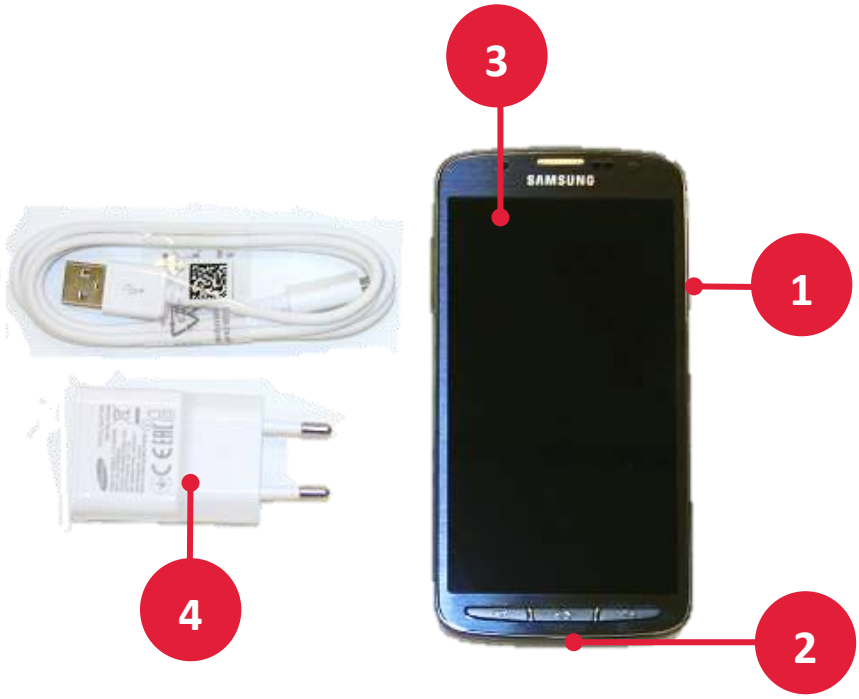

Fig. 1-6 Key elements of Remote Control Unit

1.8 Operation

Spartan Pack system is designed to operate automatically. Once switched on via tablet power switch, it will begin collecting data and storing them into a database. The data acquisition is done in four modes simultaneously:

- The search mode (SRCH) provides a short integration time, typically 4 seconds. This mode reacts quickly to changes in radiation field measured by the spectrometers and is ideal for finding radio nuclides in the vicinity while moving.
- The short monitor mode (MON1) uses a moderate acquisition time, typically ten times that of the SRCH mode. The MON1 mode provides better statistics for analysis and gives more accurate dose rate readings when the radiation field is not changing. The MON1 mode may uncover radio nuclides that cause a very weak signal.
- The long monitor mode (MON2) uses a long acquisition time, typically hundred times that of the SRCH mode. The MON2 mode has the same weaknesses and strengths as the MON1 mode.
- The user mode (USER) uses a changeable acquisition time, typically 1 - 64 seconds. For neutron detectors the USER mode choices are 2, 4, 8, 32 and 64 seconds.

The data collected in each of the modes are processed by a pipeline of data analysis and processing software attached to each detector and finally stored into a database.

1.8.1 About In-situ Gamma Measurement

When making in-situ gamma measurements, it is important to ensure the quality of the collected data. The detectors will be exposed to changing environmental conditions, which means the energy calibration will tend to drift. If the energy calibration is not correct, nuclide identification will become impossible. Spartan Pack-software addresses this problem automatically by adjusting the energy calibration based on analysis of the collected spectrum.

Spartan Pack is able to use various methods of data communication to enable reach back functionality. The field operator employing the unit may seek expert assistance immediately by transferring measurements to headquarters by e-mail. The unit may also be remotely monitored in real-time via the instrument sharing functionality.

1.8.2 About the Database

LINSSI is a MySQL based database system designed for storing spectral data. LINSSI v.2.3 and included documentation is provided free of charge at:

http://linssi.hut.fi/

The required MySQL database and its documentation are freely available at:

http://dev.mysql.com/downloads/

The Spartan Pack-software installation provides a LINSSI & MySQL database system, which can be installed if the user chooses so. Usually a computer is a dedicated part of a Spartan Pack system, and a typical software installation contains everything needed to get the system up and running.

It is recommended that you familiarize yourself with the structure of the LINSSI database to make it easier to understand the operation of the Spartan Pack-software.

1.8.3 GPS Location

The Spartan Pack includes built in GPS Module that uses the Global Positioning System to determine the precise location of the unit. GPS coordinates can be seen from the Spartan Pack-software. If the Spartan Pack is connected to the Control Center the location coordinates are automatically sent to EnviScreen Operix monitoring and warning software and the unit's location can be seen on the map.

1.8.4 Mobile Data Transferring option

The Spartan Pack Tablet Computer includes a capability for 4G LTE Mobile Broadband via separate, optional 4G modem. This feature allows mobile communication from the device to the remote database or surveillance systems. The measuring data, alarms, spectral data and positioning (GPS) information can be transmitted using the cell phone network. The concept must be specified in co-operation with the customer and requires special setup work.

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2 Normal Operation

2.1 Setting Up the Unit

The unit is set for use at the factory, and may be taken into use immediately. It is however recommended that an expert user goes through the settings before the unit is taken to the field. The unique identifiers of the unit should be set up as described in section 6.2.1: Changing the Preferences.

2.2 Charging the Battery

The Tablet Computer of the Spartan Pack includes Li-Ion rechargeable battery. Battery can be charged by connecting the Mains Power Cable to the AC Power In connector of the Spartan Pack. The battery charging starts automatically when the Mains Power Cable is connected.

The Mains Power Supply requires between 100 – 250VAC 50 – 60 Hz input.

Fig. 2-1 Charging the battery of the Tablet Computer

The battery of the Remote Control Unit can be charged by connecting the Mains Power Adapter Cable to the Mains Power Connector of the device.

The Mains Power Adapter requires between 100 – 250VAC 50 – 60 Hz input.

Fig. 2-2 Charging the battery of the Remote Control Unit

2.3 Setting up the 4G Modem for use

Using the modem for wireless network requires an optional USB hub. Possible configurations for the SIM card have to be done on a separate computer with internet connection. When connecting the modem to PC via USB connection cable, a web page for configuration opens automatically.

Tab. 2-1 Disassembling the 4G Modem

Setting up the 4G Modem for use		
Action	**Description**	**Picture**
1	Remove the screws of the Modem case cover **(4 pcs)** Lift the cover off	
2	Slide off the modem's SIM card cover	
3	Insert the SIM card	

Setting up the 4G Modem for use		
Action	**Description**	**Picture**
4	Plug the USB connection cable to the USB port of the Modem case	
5	Connect the other end of the USB connection cable to the USB port of the USB hub	
6	Slide the modem's SIM card cover back in place	
7	Tighten the screws of the modem case cover **(4 pcs)**	

2.4 Turning On the Device

The Spartan Pack system can be turned on by pressing the power button on the top side of the computer. The Spartan Pack software and data collection will start automatically as soon as the computer has booted up.

Tab. 2-2 Turning on the device

Turning On the Unit		
Action	**Description**	**Picture**
1	Open the cover of the computer	
2	Press the power button until the power indicator lights and computer starts up	

2.4.1 The Start Up Sequence

When the unit is turned on the computer will first boot up the Windows10 operating system. Once the operating system is loaded, the background programs: "**Spartan Pack web-service**", "**GPSLocationService**" and "**WI-FI creator**" will be launched automatically. After that the **Spartan Pack-software** will be started automatically.

Fig. 2-3 Spartan Pack splash screen

A splash screen with the Spartan Pack-logo is displayed until the main view is loaded. The main view will initially display the Graph view.

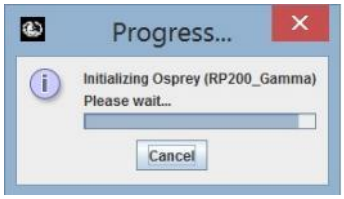


Fig. 2-4 Initialization progress

When the main view appears, the software will initialize the detectors. For the gamma detector the initialization involves adjusting the energy calibration of the detector. A progress bar is displayed while the adjustment information is gathered.

The adjustment of the energy calibration is a two-step process: first the initial energy calibration is determined and displayed on the screen; it is then adjusted and presented for the user to verify.

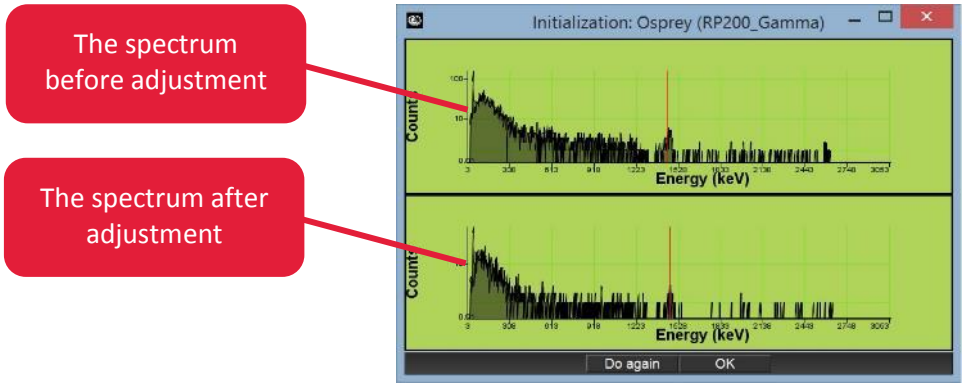


Fig. 2-5 Energy calibration adjustment

The correctness of the energy calibration can be verified visually, by making sure that the red line is placed on the lanthanium-138 contribution on the displayed spectra. The energy of the lanthanium-138 peak may not be correct on the upper spectrum depicting the energy calibration before adjustment, but should be correct on the lower spectrum depicting the energy calibration after the adjustment.

If the maximum of the counts of the lanthanum lump is not at 1468 keV energy (red line) the process will have to be repeated. Do this by using the **Do again** button. Prior to pressing the button you may narrow down the peak search region by painting an area containing the lanthanum peak in the lower spectrum (press down and drag to paint).

NOTE: For the $LaBr_3$ detector the internal La contamination peaks are used as reference (a multiplet of peaks around 1468 keV). For the NaI(Tl) detector the potassium peak (1460.8 keV) is used as reference.

Usually it is enough to visually check that the red line is on the centric of the lanthanum peak on both displayed spectra. If the energy calibration is satisfactory, press the '**OK**' button to dismiss the initialization dialog. Use the '**cancel**' button to stop the initialization at any time. If you cancel the initialization, the energy calibration is not adjusted.

The data collection will begin automatically after the detector initialization.

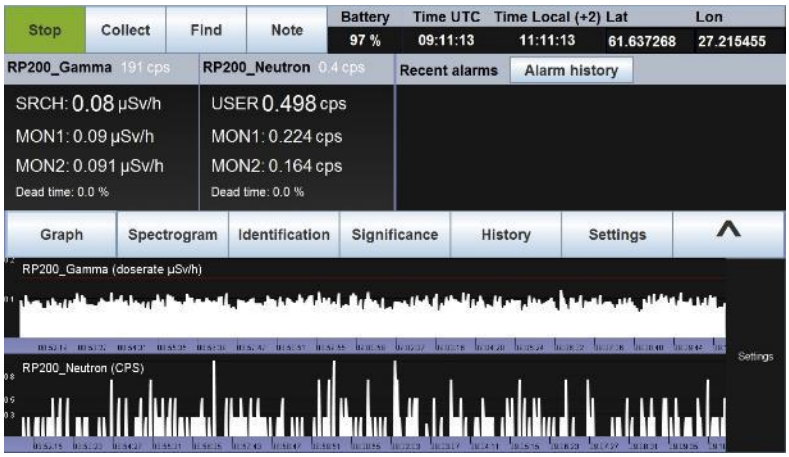


Fig. 2-6 Data collection

2.5 Connecting the Remote Control Unit

Remote Control Unit and Spartan Pack use WI-FI connection. During the start-up sequence the Spartan Pack creates WI-FI network for the remote control use. Spartan Pack must be turned on and the Spartan Pack-software must be running before the Remote Control Unit can be connected. Spartan Pack offers the web-client which can be used over the WI-FI connection with web-browser.

All settings are pre-configured in the factory and the system is ready to use. If the WI-FI network need to be re-configured the default settings are:

Tab. 2-3 Default network settings

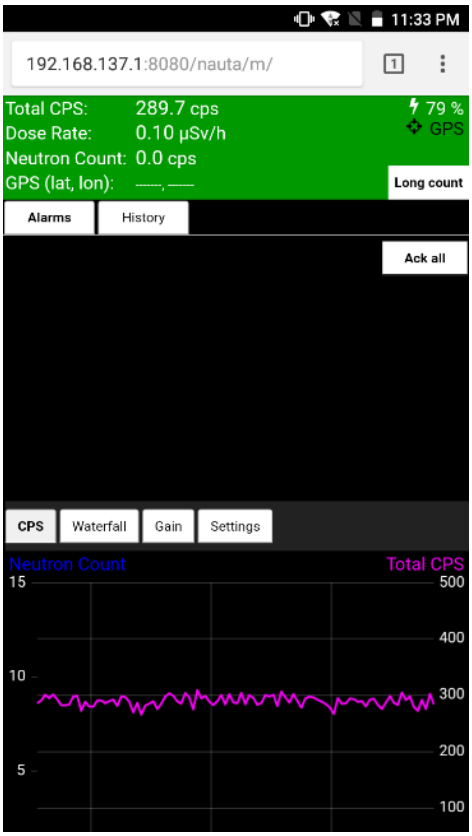
Default Settings	Values
Wi-Fi Name	Spartan Pack_xxx (xxx = serial number last three numbers)
Wi-Fi Password	12345678
IP Address of the Remote Control Unit	192.168.137.10
Gateway	192.168.137.10

DNS	192.168.137.10
Subnet mask	255.255.255.0

Note: Make sure that the WI-FI is enabled from the Spartan Pack Computer and Remote Control Unit. The status of the WI-FI can be checked from the network settings of the devices.

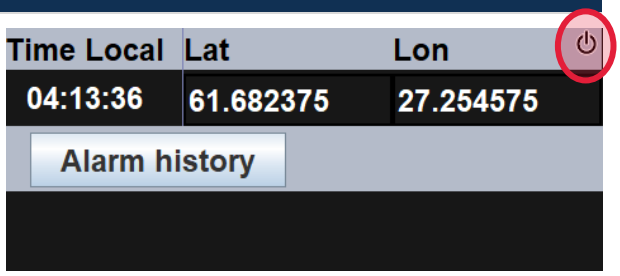
Tab. 2-4 Connecting the Remote Control Unit

Connecting the Remote Control Unit		
Action	**Description**	**Picture**
Note: The Mobile Phone shown in this manual is an example. See the detailed information from Mobile Phone's own User Manual		
1	Turn on the Remote Control Unit by pressing the "Power" button	
2	In the Main Screen of the Remote Control Unit, press the "Web Client" icon	

Connecting the Remote Control Unit		
Action	**Description**	**Picture**
3	Web browser opens and automatically connects to Spartan Pack web client **Note:** If the connection cannot be established, check that the WI-FI is enabled from the Spartan Pack Computer and Remote Control Unit. The status of the WI-FI can be checked from the network settings of the devices. Also make sure that the address of the Spartan Pack web-client is correct The default address of the Spartan Pack web-client is: **http://192.168.137.1:8080/nauta/m/**	

2.6 Shutting Down the Spartan Pack and Remote Control Unit

Tab. 2-5 Shutting down the Spartan Pack and Remote Control Unit

Shutting down the Spartan Pack and Remote Control Unit		
Action	**Description**	**Picture**
1	Shut down the Spartan Pack by clicking the “Power” button in the upper right-hand corner of the Spartan Pack-software and confirm quitting by clicking the “Yes” button	
2	Shutdown the Remote Control Unit by pressing the “Power” button	

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3 Using the Spartan Pack with Spartan Pack Software

The operation of the Spartan Pack system is controlled through the graphical user interface contained in the Spartan Pack-software. The computer includes a touch screen therefore the buttons and other widgets can be interacted with by using the stylus or fingers.

Fig. 3-1 Operating the Spartan Pack software

3.1 Restarting and Closing the Spartan Pack software

Spartan Pack-software is closed by using the Power button in the upper right-hand corner of the Spartan Pack-software. The Spartan Pack is turned on by pressing the Power button at the top side of the computer. When the Spartan Pack is turned on it automatically starts the Spartan Pack-software. The Spartan Pack-software will launch, and the detector initialization phase will proceed as normal.

Fig. 3-2 Spartan Pack software start-up

3.2 Saving and Clearing the Database

Before the unit is taken into the field, it is recommended to save the existing database and then clear the database. This way it is easy to identify different missions.

Accessing and performing actions like clearing the database and saving the database to USB storage device are described in chapter 6.3: Clearing and Saving the Database.

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4 Operator Level User

This chapter describes the basic use features that enables functions such as:

- Changing settings
- Checking the state of the measurement system
- Verifying the state of the energy calibration peak
- The measurement's stop and restart
- Making the long measurement
- Adding notes to the measurement
- Viewing the measurement's data to the real time
- Viewing the alarms and the alarm history during the last 60 minutes

4.1 Using the Main Window

The main window provides the user with some common controls in the upper toolbar and access to data visualization views through the tabs below the detector monitor panel.

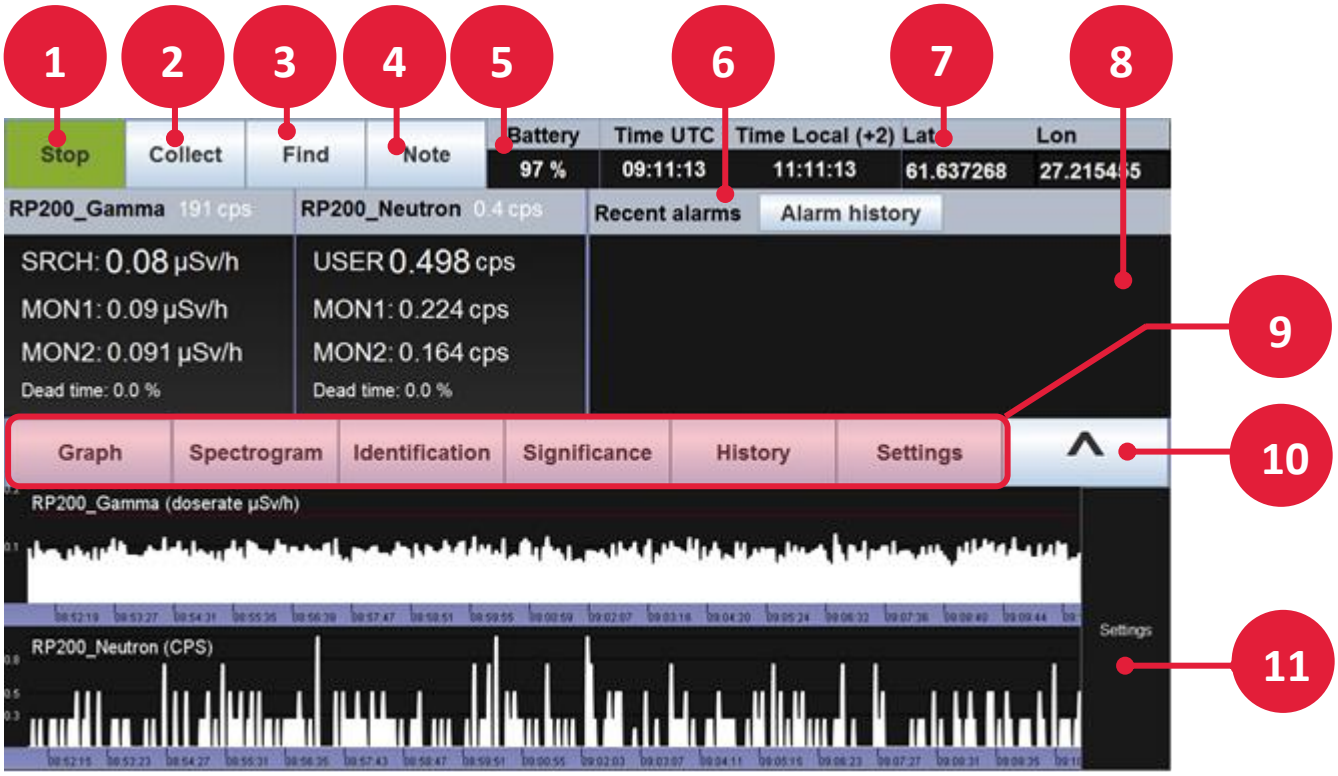


Fig. 4-1 Main window

1. Start / Stop button
2. Collection Button
3. Finder button
4. Note button
5. Battery status
6. Alarm monitor panel
7. GPS position display
8. Alarms area
9. View tabs
10. Maximize / minimize graph view
11. Graph view settings

Fig. 4-2 Find button

Find button opens up the finder dialog. The finder dialog is used to recall spectra that have either been marked by the user or have caused an alarm. For full details on the finder dialog see chapter 5: Advanced Level User.

Battery panel displays the charge left on the computer's battery. The charge is represented by a percentage value, i.e. a full battery charge is represented by text 100%, and a half by the text 50%.

Fig. 4-3 Battery status indicator

Fig. 4-4 GPS position displays

GPS position displays indicate the longitude and latitude readings from an attached GPS. If no position info is available, the displays show zero value.

Fig. 4-5 View tabs

View tabs are used to change the data visualization view displayed in the main window. Whichever data visualization view you choose, the tabs toolbar will always remain visible.

The tabs toolbar enable you to switch between three different data visualization views for monitoring the collection of spectral data. In addition to these views there are the Identification, History and Settings views.

4.2 Changing Settings

The **Settings view** displays information on the system state. The status of the virtual devices is displayed in the **Setup panel** and the **Device panel**. The status of gain stabilizer is displayed in **Stability panel**.

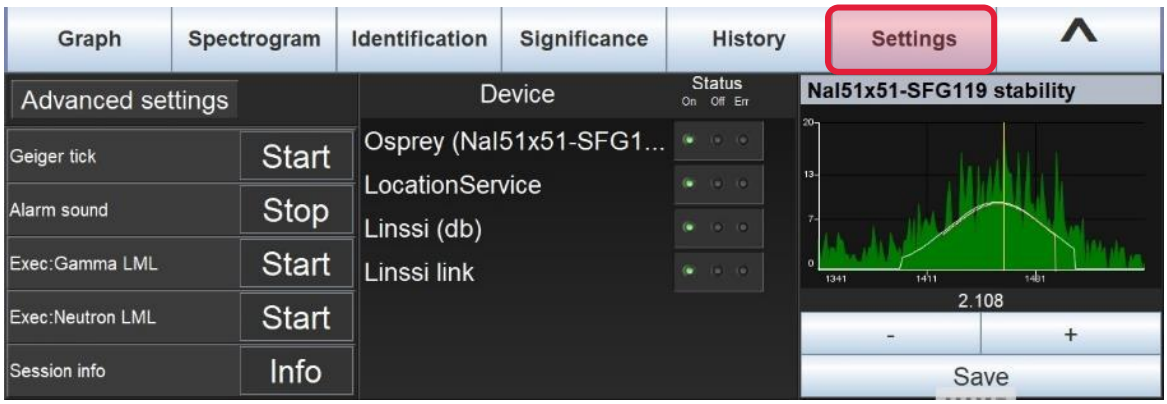
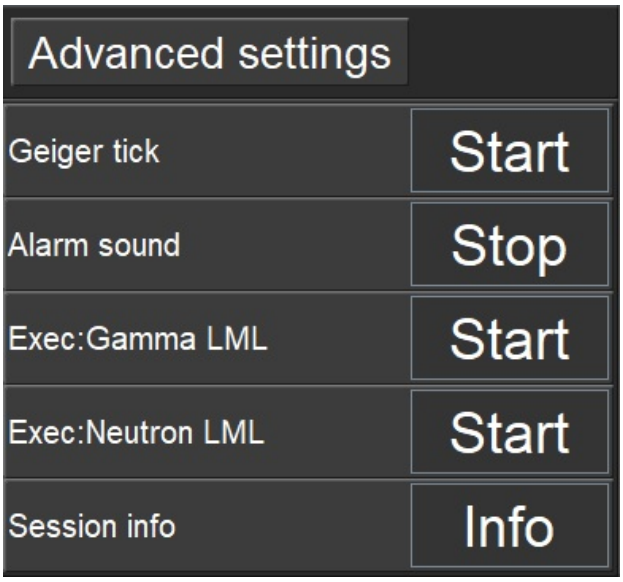


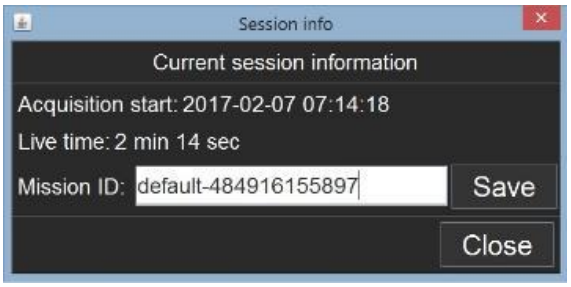
Fig. 4-6 Selecting settings view via main window

Tab. 4-1 Changing settings via settings tab

Changing settings	
Actions in Settings view	
Setup panel enables access to the advanced settings of individual processors. **Advanced settings** are behind password protected expert mode. For full details on all the virtual devices and their settings see chapter 6: Expert Level User	
Geiger Tick button can be used to start or stop to generate voice of Geiger ticking. **Alarm sound** button can be used to turn off / turn on the alarm sound from the tablet computer **Dose rate limit adjuster** button can be used to start or stop the dose rate limit adjusting. **Exec: Gamma LML** button can be used to write Gamma measurements into tablet computer's hard drive in LML format **Exec: Neutron LML** button can be used to write Neutron measurements into tablet computer's hard drive in LML format	

Changing settings

The **Session info** button may be used to give a mission ID for current mission. The **Mission ID** box can be used to type a mission ID. The **Save** button can be used to store a mission ID into the database.



4.3 Checking the State of the Measurement System

The **Device panel** displays the virtual devices comprising the Spartan Pack system.

Beside each device are three LEDs. The LEDs indicate the state of the device. If the device is activated the first LED will be lit green. If the device is deactivated the second LED will be lit yellow. If the device is malfunctioning, the last LED will be lit red. When Spartan Pack-software has started up, no device should display a red LED, otherwise there is something wrong with the system and it might not work correctly.

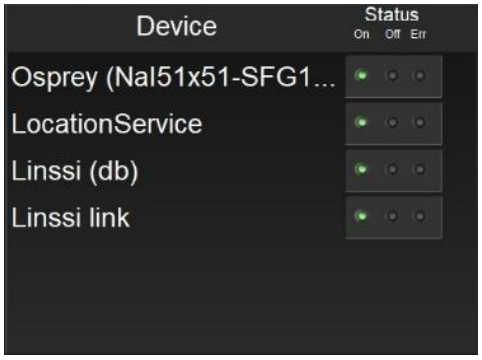


Fig. 4-7 Device panel

The devices shown in the **Device panel** may vary depending on what kind of application the Spartan Pack-software has been configured for. There are, however, some common devices you may expect to see in (almost) any kind of setup. These are:

- **Osprey (RP200_Gamma**) **-** The MCA devices represent the connections to the physical multi-channel analyzers connected to the computer. On Expert mode, some of the device settings such as high voltage and threshold can be changed in the advanced settings.
- **LocationService -** The Spartan Pack software communicates with the GPS using the LocationService socket.
- **Linssi (db) –** Indicates the connection to the Linssi database.
- **Linssi link -** The Linssi database is used to store the measurement data.

4.4 Verifying the State of the Energy Calibration Peak

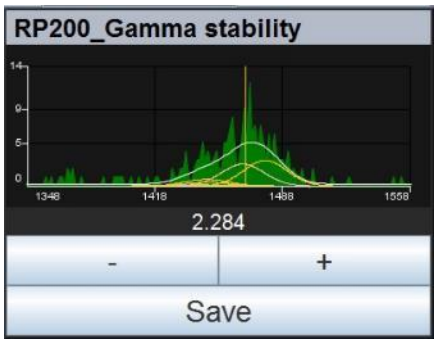


Fig. 4-8 Stability panel

The **Stability panel** displays the state of the energy calibration for the $LaBr_3$ detector. A portion of the spectrum around the lanthanum-138 energy peak is plotted in this panel. The peak itself is plotted in green and should always be present in this plot. The yellow curves show analysis results of the individual components that make up the peak. The white curve shows the overall analysis of the peak. When the white curve matches the shape of the green peak the energy calibration is good. Ideally the yellow vertical line should hit the highest point of the white curve. If the green peak does not exist or the white curve doesn't match its shape, the energy calibration is bad. The absence of the green peak in this plot is an indication of serious deviation from correct energy calibration, and the automatic adjustment continuously done by Spartan Pack won't be enough to correct the situation. In this case Use the Stability panel to set the gain to a correct value.

1. The energy calibration peak can be adjusted by changing the value of the gain. Gain value can be decreased and increased by pressing the "**-**"- and "**+**" -buttons. Gain value can be saved by pressing '**Save'**-button.
2. If the energy calibration peak must be moved to the right the gain value must be decreased. If the peak must be moved to the left the gain value must be increased.

The energy calibration is correct when the software has locked on onto the lanthanum peak at around **1468 keV** for the **$LaBr_3$ detector**. For the **NaI(Tl) detector** the potassium peak at **1460.8 keV** is used as reference.

4.5 The Measurement's Stop and Restart

Fig. 4-9 Start / stop button

The **Start / stop button** in upper toolbar can be used to start or stop the data collection. When the Spartan Pack system is started, the data collection is also started automatically. This button can be used to temporarily stop it and to subsequently start it again. When the system is started, the Start / stop button background colour is green. Additionally the start / stop button display text "**Stop**".

4.6 Making a Long Measurement

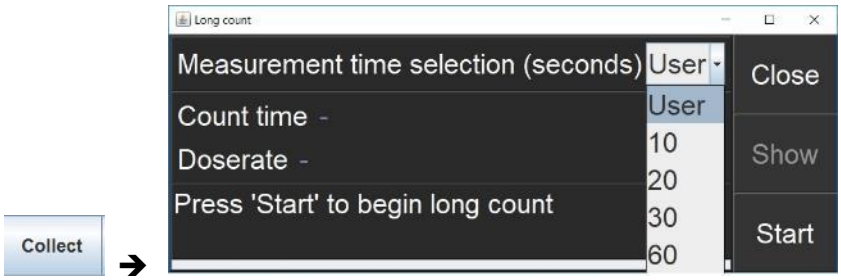


Fig. 4-10 Collect button

The **Collect button** may be used to make a long measurement. Pressing the **'collect'** button opens a dialog where the user can determine the measurement time in seconds. The measurement is started when the **'start'** button is pressed. While a long count is being made, the measurement time and dose rate can be viewed in the dialog and the measurement is updated in the background. Pressing the stop button will finish the long count and display the collected spectrum in the spectrum viewer. For full details on the spectrum viewer see chapter 5: Advanced Level User.

Fig. 4-11 Long measurement in progress

4.7 Adding notes to the Measurement

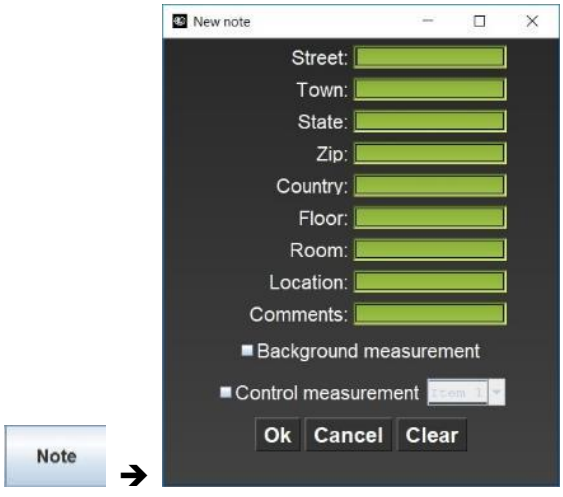


Fig. 4-12 Adding a note

The **Note button** may be used to drop a note on the next measurement produced by the detectors. Notes are stored into the database, and may be used to keep track of places or events during the data collection. When the note button is pressed, a dialog will appear allowing you to specify a variety of information to be stored on the note. The note button will display the state of the note. When the note is waiting for a

measurement to arrive the note button will be gray. In a case where note has been dropped but the measurement has been stopped, the note button will be gray until measurement is done.

4.8 Viewing the Measurement's Data to the Real Time

Fig. 4-13 Detector monitor panel

The **Detector monitor panel** displays the counts per second (CPS), dead time for each detector. For gamma detectors dose rates are displayed for SRCH, MON1 and MON2 modes in addition to the counts per second from the SRCH mode. The dose rate will always be displayed in the unit of micro-Sieverts per hour (µSv/h). For neutron detectors the counts per second are displayed for all modes. The dead time percentage is displayed based on SRCH mode.

4.9 Viewing the Alarms and the Alarm History During the Last 60 Minutes

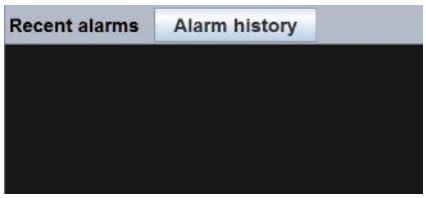


Fig. 4-14 Alarm monitor panel

The **Alarm monitor panel.** The Alarm panel contains the Alarm LED and the Alarms area. When a nuclide or heightened count rate is detected, the Alarm LED will be turned on and the Alarms area display the alarms the user has not acknowledged. In the absence of such alarms the Alarm LED and the alarm display will be turned off. When a dose rate level has been detected, the Alarm LED will be lit and pulsate with a yellow colour. When a dangerous dose rate level has been detected, the Alarm LED will be lit and pulsate with red colour.

Fig. 4-15 Alarms in alarm monitor panel

Alarms will be displayed in the alarms area. The Alarm LED will pulsate lightly to attract user's attention. When an alarm is displayed in the Alarm monitor panel it must be acknowledged by the user before further alarms of the same type (same radionuclide / region of interest caused an alarm in the same mode) are displayed. Use the **Acknowledge** button to acknowledge an alarm.

Fig. 4-16 Acknowledging alarms / alarm history

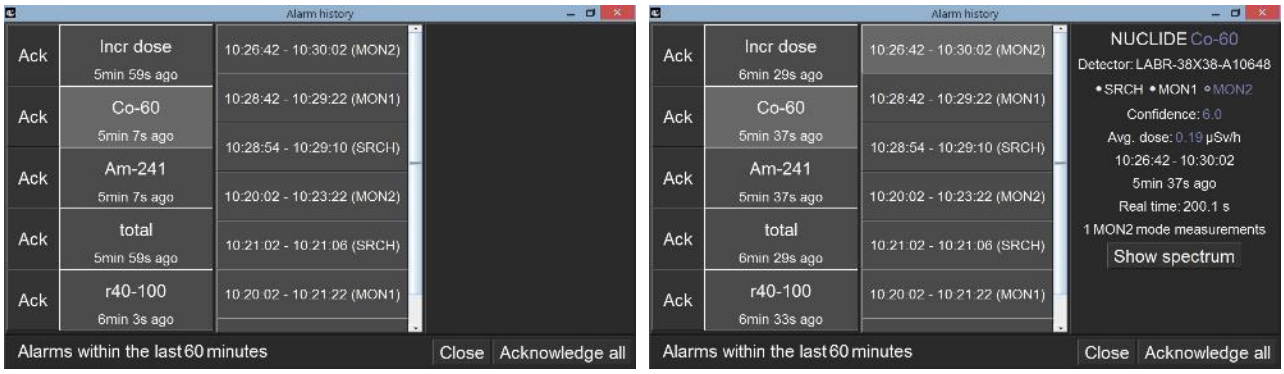


Fig. 4-17 Alarm history window

The **Alarm history** displays alarms during the last 60 minutes. Each time a radionuclide is detected and identified with sufficient confidence (i.e. it causes an alarm), an entry is added into the Alarm history. The nuclide name is shown along with the time elapsed from latest observation of the nuclide.

By clicking on the nuclide name, an overview of the observations is shown on a timeline. Each entry in the alarm history may be opened to reveal more detailed information about the observations of the given nuclide. Once opened, the time interval and the mode in which the observation was made are shown. Each of these entries can also be opened to reveal the individual measurements on the intervals.

The measurements may be chosen and show in the spectrum viewer using the **Show spectrum** button. For full details on the spectrum viewer see chapter 5: Advanced Level User.

5 Advanced Level User

The following chapter of advanced level user describes operations such as:

- Researching measurement data using of the spectrogram view
- Researching measurement data with significance view tab
- Researching of the history of the measurement's data by the database
- Exploring of measurements spectrum using the spectrum viewer
- Finding marked measurements or the alarms with the finder action

5.1 Researching Measurement Data Using the Spectrogram View

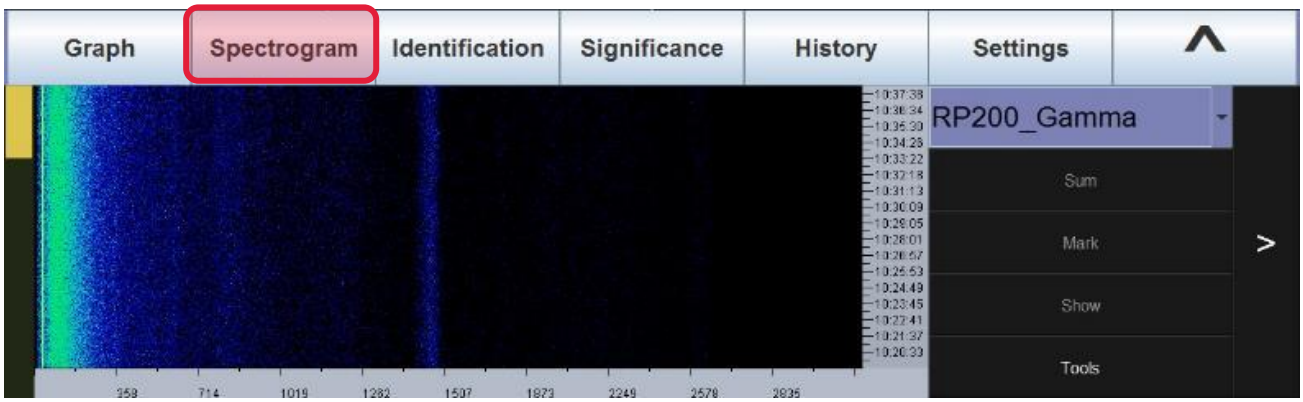


Fig. 5-1 Spectrogram view

The **Spectrogram view** displays a "waterfall plot" i.e. time series of spectra, for each gamma detector. The spectra are displayed so that each spectrum corresponds to a horizontal line, with the latest spectrum being the top line and the preceding spectra being plotted on lower lines in order, the most distant in time being on the bottom.

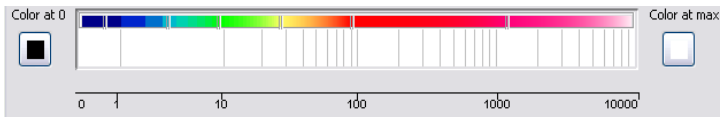


Fig. 5-2 Spectrum color encoding

The counts per channel for each spectrum are encoded as colours according to a colour mapping.

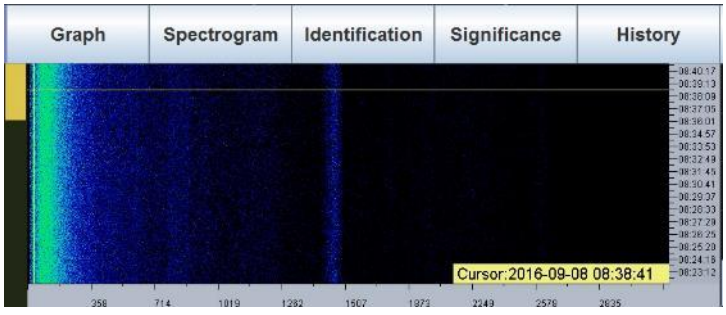


Fig. 5-3 Selecting a spectra of interest

The spectrogram view also displays a cursor that can be used to select spectra of interest from the spectrogram. By pressing the pen down on the screen, the cursor is moved to the spectrum on the horizontal line under the pen. The acquisition start time of the spectrum under the cursor will be displayed in the lower left corner of each spectrogram. Further actions may be performed on the spectrum under the cursor.

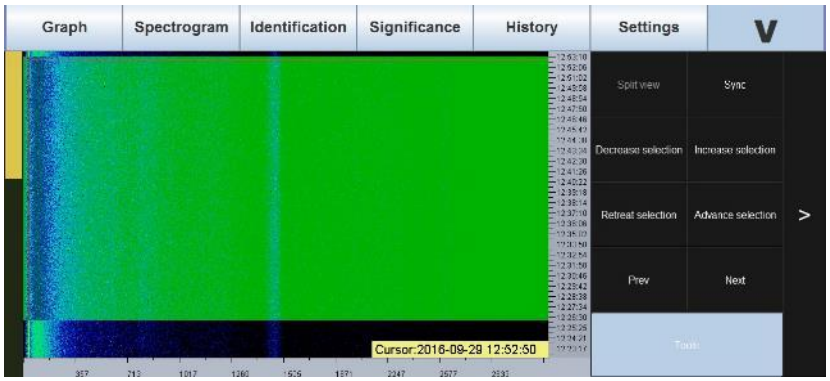
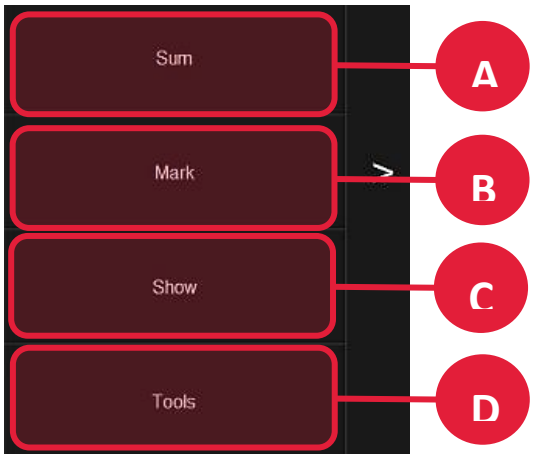
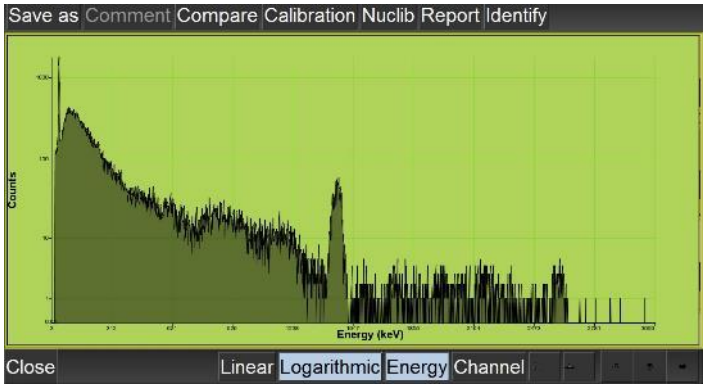
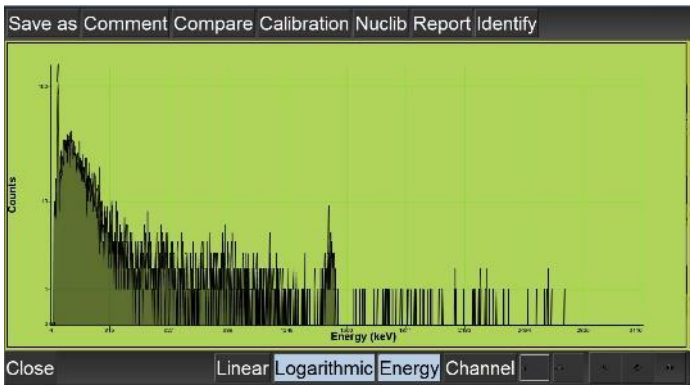


Fig. 5-4 Selecting a range of spectra

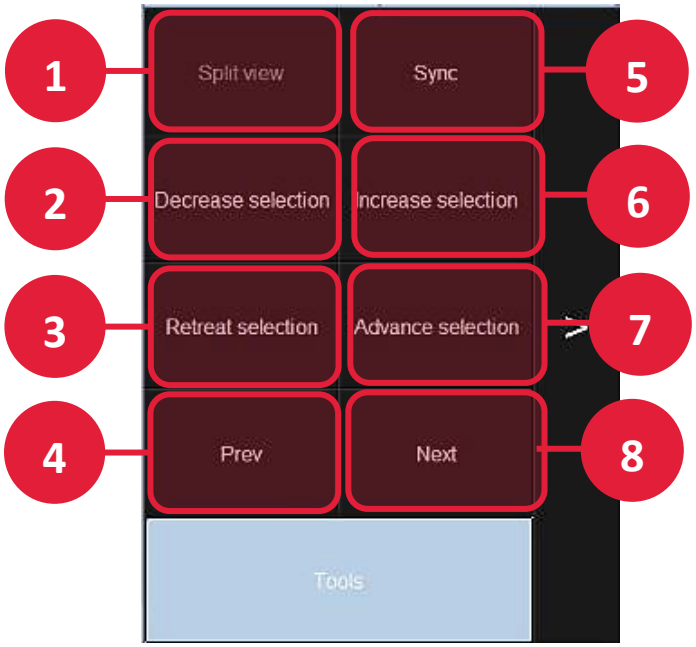
A range of spectra can also be selected in the spectrogram view. This is done by pressing the pen down and the dragging across the range of spectra desired. Once a range is selected, further actions become possible The Tools tab contains various different actions. The different actions are described in the tables below:

Tab. 5-1 Actions in Spectrogram View

Functions in Spectrogram View		
Function	**Description**	**Picture**
		
A	The **Sum** button may be used to sum the spectra that produced the time series data in the selected range together and show the result in the spectrum viewer	

Functions in Spectrogram View		
B	The **Mark** button may be used to place a note on the spectrum that produced the time series data point under the cursor. The note will be stored into the database and attached to the measurement corresponding to the spectrum	
C	The **Show** button may be used to show the selected spectrum in the spectrum view	

Tab. 5-2 Buttons in Tools tab

Functions in Spectrogram View	
Function	**Description**
D	 By pressing the **Tools** button, a dialog above with different actions opens
D1	The **Split view** button resizes the graphs to identical sizes based on available screen-estate
D2	The **Decrease selection** button decreases the size of the range selection by one spectrum
D3	The **Retreat selection** button moves the range selection one spectrum backwards in time
D4	The **Prev** button moves the cursor to previous spectrum
D5	The **Sync** button synchronizes different the graphs at the same time
D6	The **Increase selection** button increases the size of the range selection by one spectrum
D7	The **Advance selection** button moves the range selection one spectrum forward in time
D8	The **Next** button moves the cursor to next spectrum

For each spectrogram visible, there are additional spectrogram specific actions:

The time series data in the selected range together and show the result in the spectrum viewer.

5.2 The Identification View

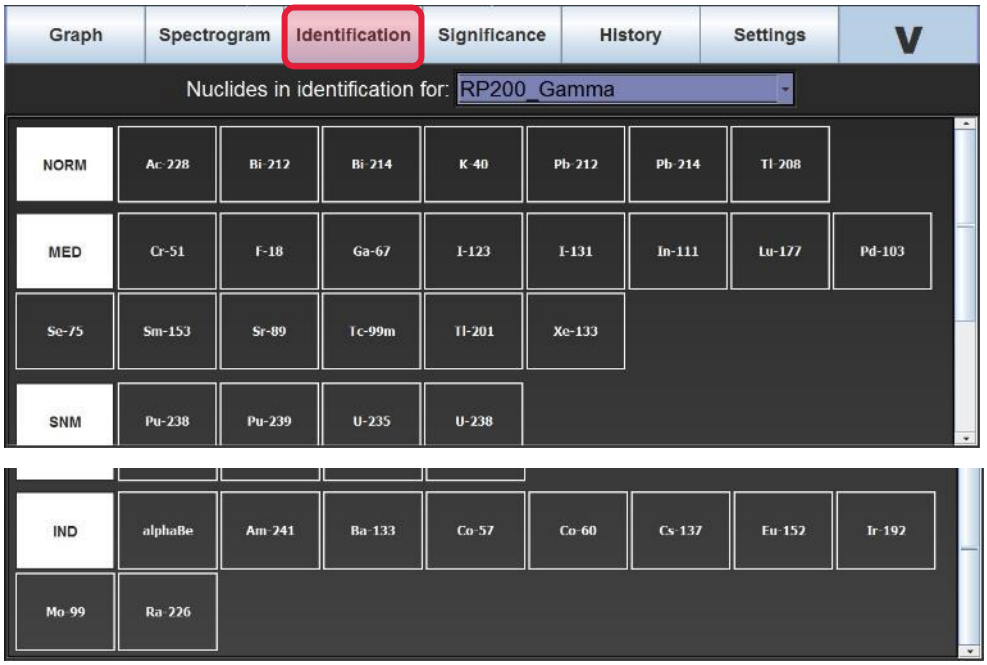


Fig. 5-5 Identification view

The **Identification view** displays the nuclides selected for identification and the respective categories the nuclides belong to. The identification view may be used to quickly enable or disable identification for a given nuclide or entire category. When identification is disabled for a nuclide, it will not cause alarms and cannot be identified by the identifier algorithm. The detector which identification nuclides are displayed is chosen using the choice box above.

5.3 Researching Measurement Data with Significance View Tab

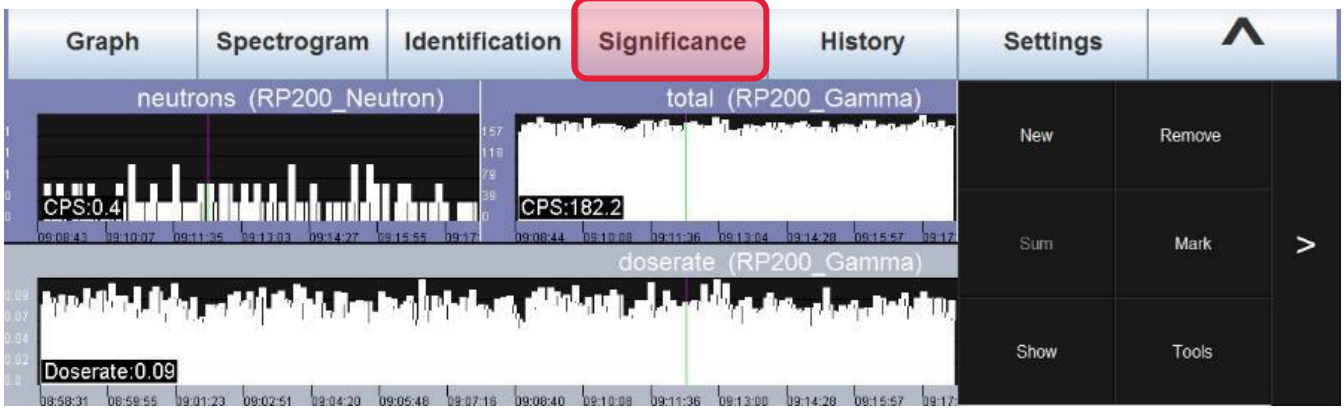


Fig. 5-6 Significance view

The **Significance view** displays a time series plot of nuclide significances resulting from the hypothesis testing done by Spartan Pack-software. Counts per second time series may also be plotted for desired regions of interest. The significance view can also be used to set the cursor position and to select a range, exactly like the spectrogram. Note that the cursor position is synchronized between the spectrogram and the significance views, but the range selection is not.

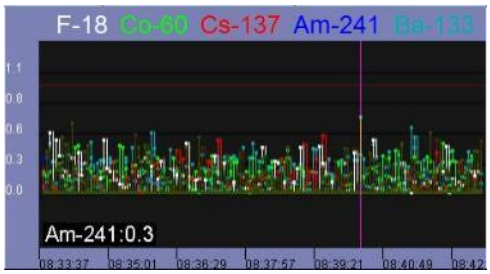


Fig. 5-7 Peak significance

The significance is an indicator of existence of a peak in an analysed spectrum. The significances for the peaks of a given nuclide are plotted as dots connected by a stem. Each dot corresponds to the peak significance. The stem connects the peaks together, making it easier to visualize nuclides instead of isolated peaks.

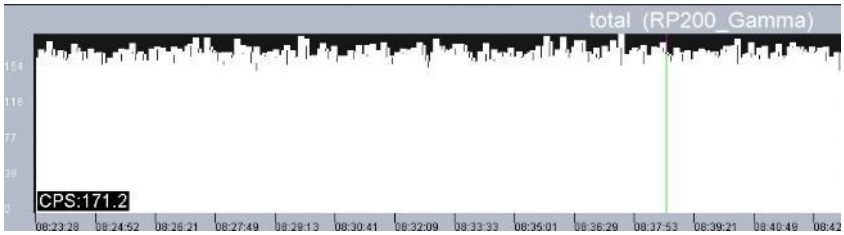
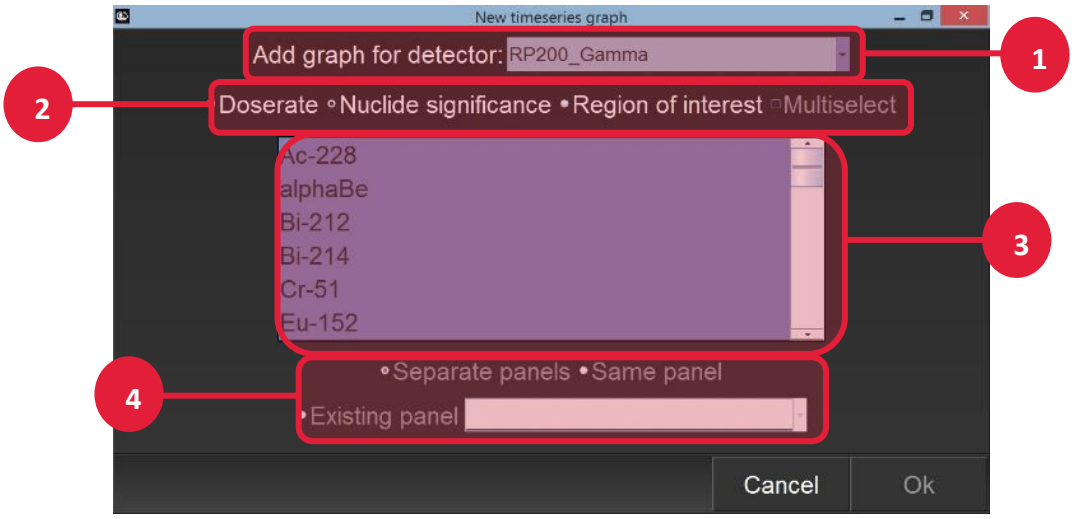
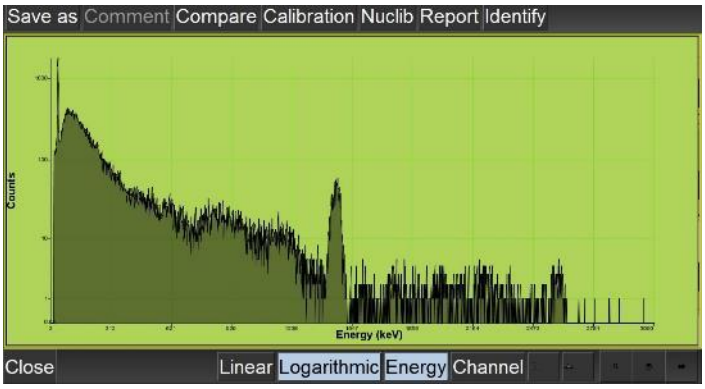
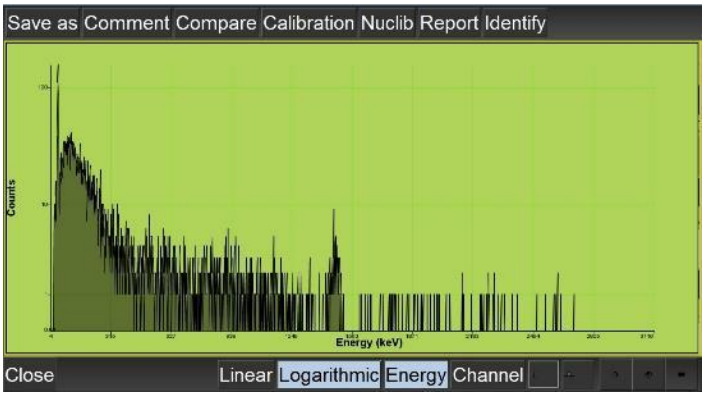
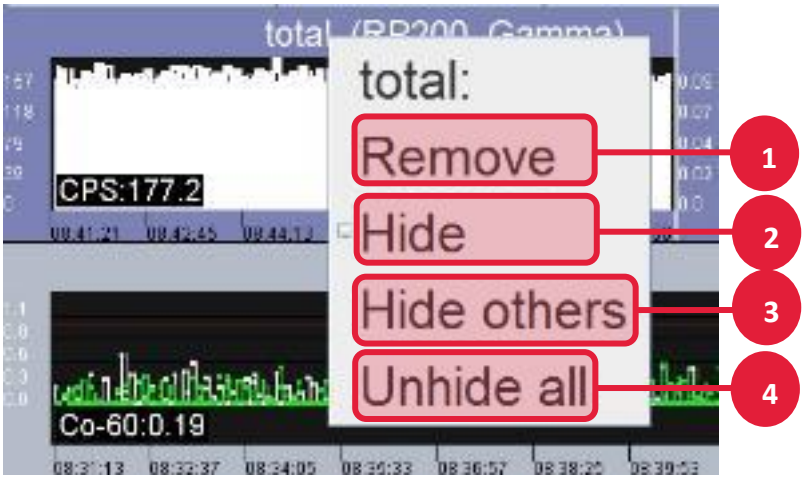


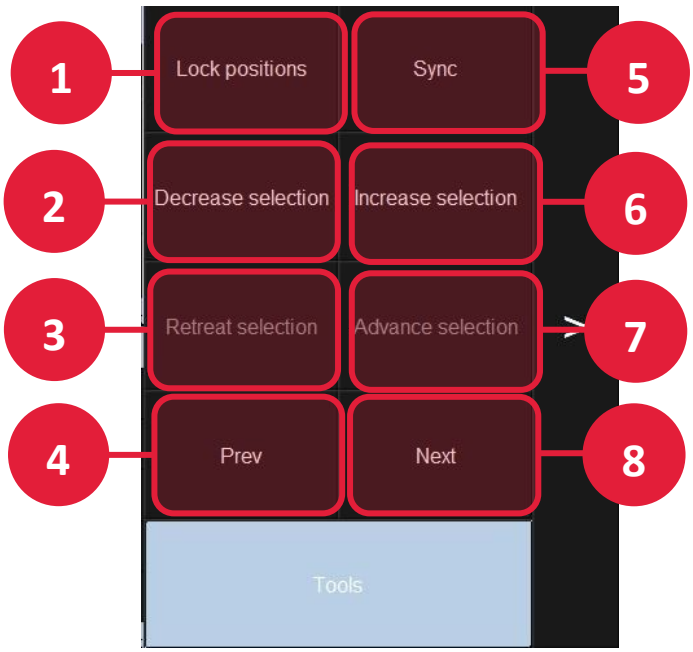
Fig. 5-8 Region of interest time series

The region of interest time series displays the counts per second in the given region.

Researching Measurement Data with Significance View Tab		
Function	**Description**	**Picture**
		

Researching Measurement Data with Significance View Tab	
A	 The **New** button may be used to open up the Significance graph addition dialog
A1	First use "**Add graph for detector**" menu to select the detector.
A2	Once the detector is selected, use the **graph selection buttons** to select wanted graph of presentation
A3	After then the available graphs will be shown in the available **graph display**. Select the graph or graphs will be to add from the list
A4	Also specify which panel the graphs will be added to. • To add each graph to their individual panel, select **'Separate panels'** option. • To add all the graphs to a new panel, select the **'Same panel'** option. • To add the graphs to an existing panel, select the **'Existing panel'** option. If the 'Existing panel' option is selected, use the **panel list** to choose the panel to add the graphs to. The panel list will display the panels already in the significance view. The panel name is derived by appending the significance nuclides names together for each detector. Use the **Ok** button to add the graphs. Use the **Cancel** button to quit without adding. Note that for ROIs only the 'Separate panels' option is available. Not can add significance graphs resulting from different detector data to same panel

B	The **Sum** button may be used to sum the spectra that produced the time series data in the selected range together and show the result in the spectrum viewer	
C	The **Show** button may be used to show the spectrum that produced the time series data point under the cursor	
D	 The **Remove** button may be used to remove the graph from the view Each significance panel has a header in which the nuclides or ROIs displayed in the panel are enumerated. The detector which produces the data for the time series is given in parenthesis. By pressing the pen on the nuclide or ROI name, you can access further graph specific actions	
D1	Select the **Remove** option to remove the given graph from the panel	
D2	Select the **Hide** option to hide the selected graph	

Researching Measurement Data with Significance View Tab	
D3	Select the **Hide others** to hide other graphs in the panel
D4	Select the **Unhide all** to make all graphs in the panel visible
E	The **Mark** button may be used to place a note on the spectrum that produced the time series data point under the cursor. The note will be stored into the database and attached to the measurement corresponding to the spectrum 
F	 By pressing the **Tools** button, a dialog above with different actions opens
F1	The **Lock positions** button may be used stop the measurement draw on the time series graph, and Unlock positions button may be used to continue drawing on the graphs
F2	The **Decrease selection** button decreases the size of the range selection by one spectrum
F3	The **Retreat selection** button moves the range selection one spectrum backwards in time
F4	The **Prev** button moves the cursor to previous spectrum
F5	The **Sync** button synchronizes different the graphs at the same time

Researching Measurement Data with Significance View Tab	
F6	The **Increase selection** button increases the size of the range selection by one spectrum
F7	The **Advance selection** button moves the range selection one spectrum forward in time
F8	The **Next** button moves the cursor to next spectrum

5.4 Researching the History of the Measurement Data from the Database

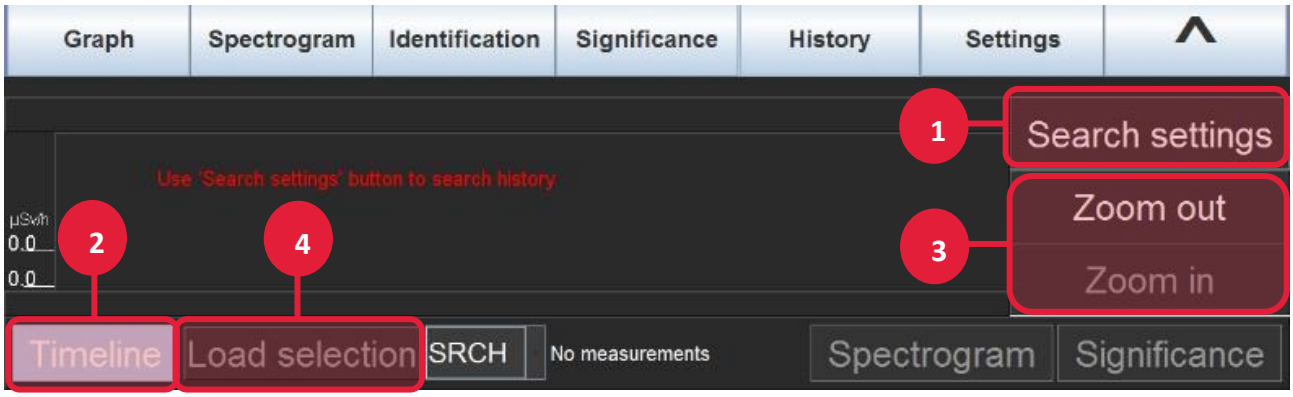
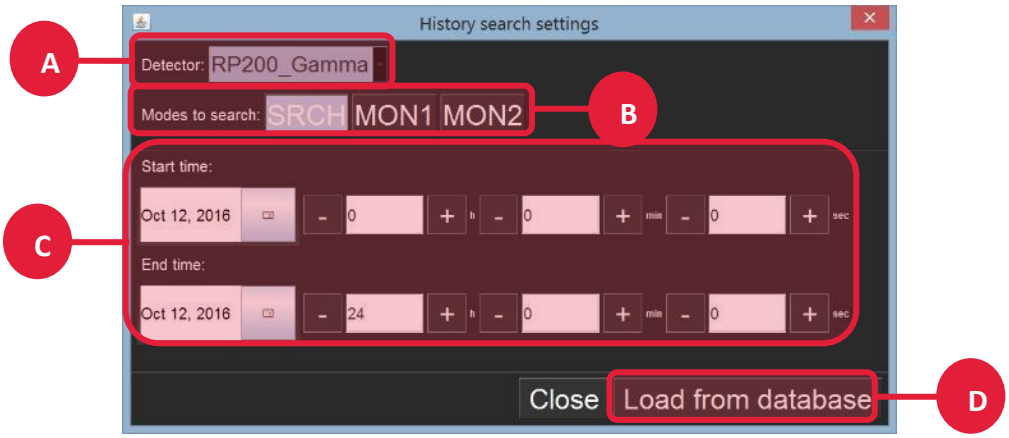
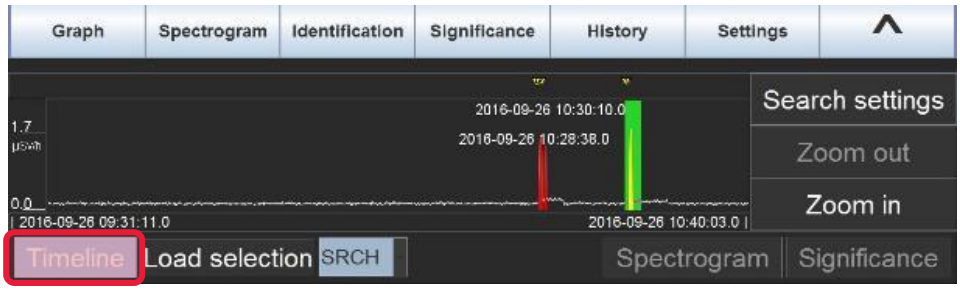
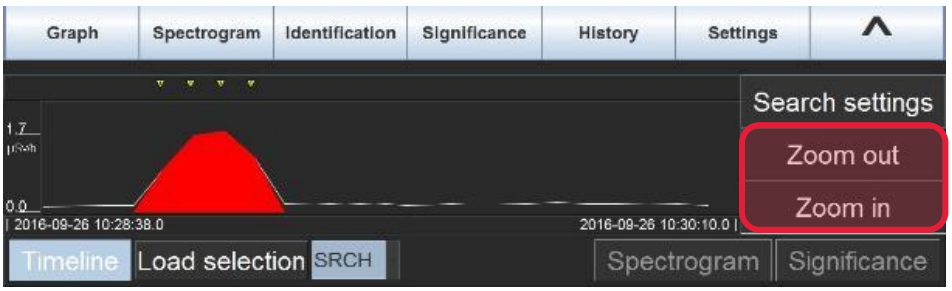
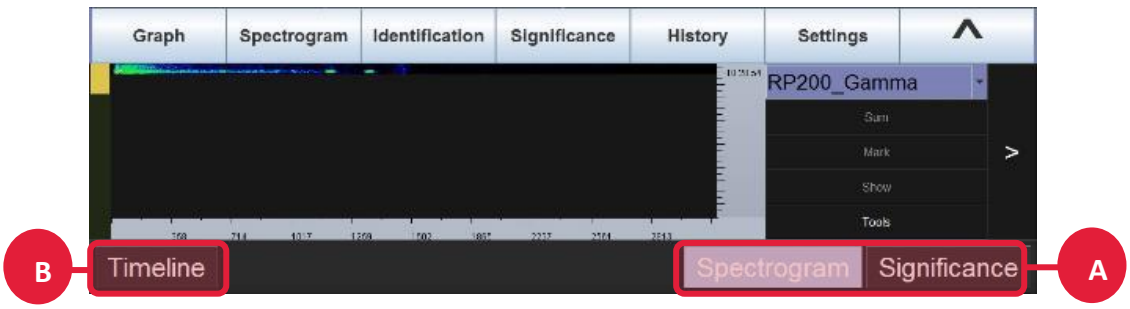


Fig. 5-9 History view

The **History view** contains controls that allow browsing the data stored into the database included with Spartan Pack. The history view contains controls that may hinder the performance of the unit if used without discretion. It is recommended that measurements are stopped while history is being browsed. Browsing the database can place much stress on the computer's CPU.

Tab. 5-3 Functions in History view

Researching the history of Measurement Data from the Database	
Function	**Description**
1	 The **Search settings** button opens up the History search settings dialog. The History search settings dialog is used to load measurements for database to the History view

Researching the history of Measurement Data from the Database	
1A	Use the **Detector** selection box to select which detectors history data should be browsed
1B	Use the **Modes to search** buttons: **SRCH**, **MON1** and **MON2** to select which measurements to should be searched
1C	Use the **Start time** and **End time** selectors to select the start and end time of a region to fetch
1D	Use the **Load from database** button to fetch the region defined by start time and end time selectors
2	 Use the **Timeline panel** to select a range of history data to be browsed. This is done by pressing the pen down and the dragging across the range of history data desired. Once a range is selected, further actions become possible
3	 Use the **Zoom in** and the **Zoom out** buttons to zoom view of history data
4	 Use the **Load selection** button to load the region selected in the Timeline panel. Loading will cause a spectrogram view open up inside the history view.

Researching the history of Measurement Data from the Database	
4A	Use the **Spectrogram** and **Significance** buttons to choose between a spectrogram or significance view
4B	Use the **Timeline** button to open the timeline view in the History view

5.5 Exploring Measurements Spectrum Using the Spectrum Viewer

The **Spectrum viewer** is used to view spectra in a more conventional energy vs. counts graph plot. The spectrum viewer can also be used to perform additional actions on the spectrum displayed in it.

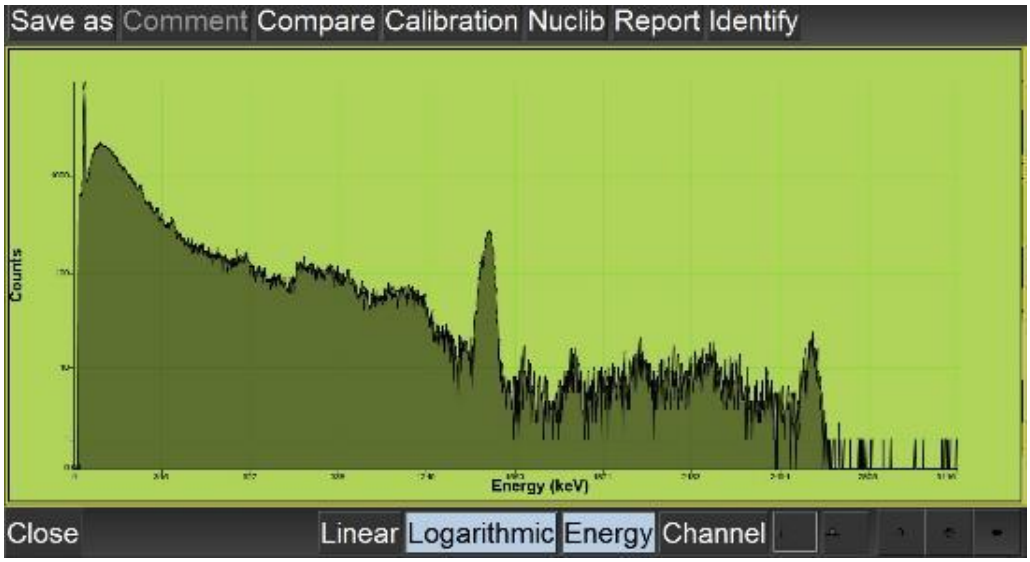


Fig. 5-10 Spectrum viewer

The spectrum viewer can be accessed by a variety of means, it is usually opened up after a long count has been finished, or spectra under the cursor have been selected for viewing. To open up the spectrum viewer, click the **Show** button in the **Spectrogram toolbar**.

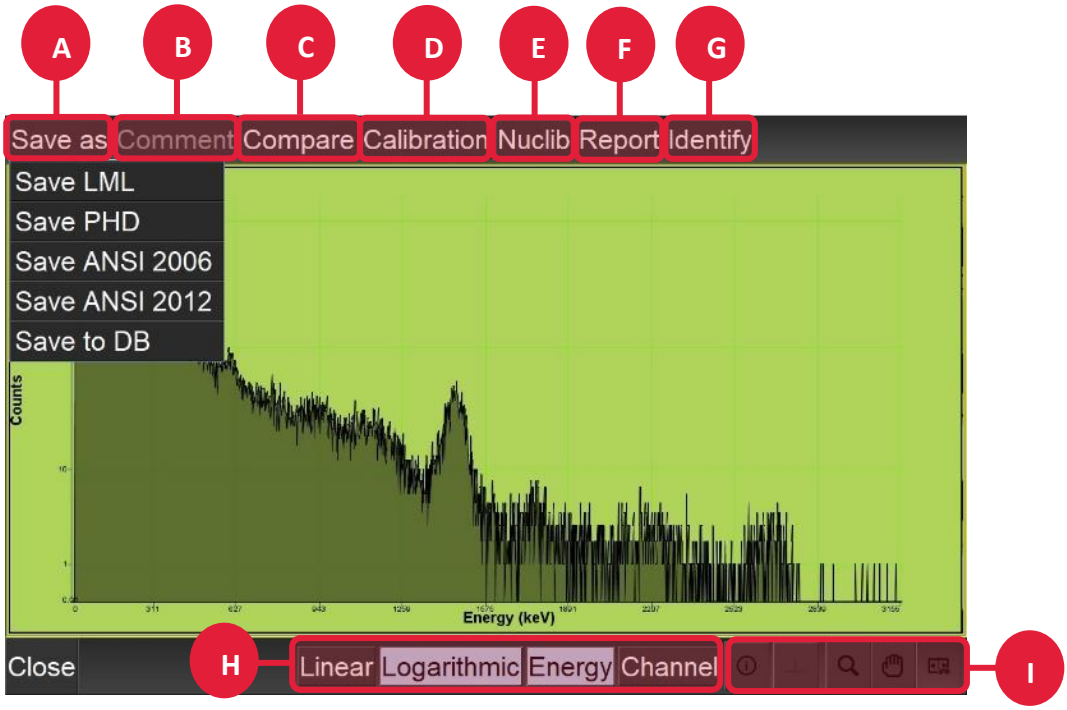
The spectrum viewer also contains further actions:

- Open a PHD or LML file by dragging it onto the spectrum viewer from windows explorer.
- Copy the measurement to clipboard by pressing keyboard buttons: **ctrl + c**
- Paste a measurement from clipboard to the spectrum viewer by pressing keyboard buttons: **ctrl + v**

Tab. 5-4 Functions in Spectrum Viewer

Exploring Measurements Spectrum Using the Spectrum Viewer

Overview



To open up the **Save as** menu, click the Save as button in the Spectrum toolbar

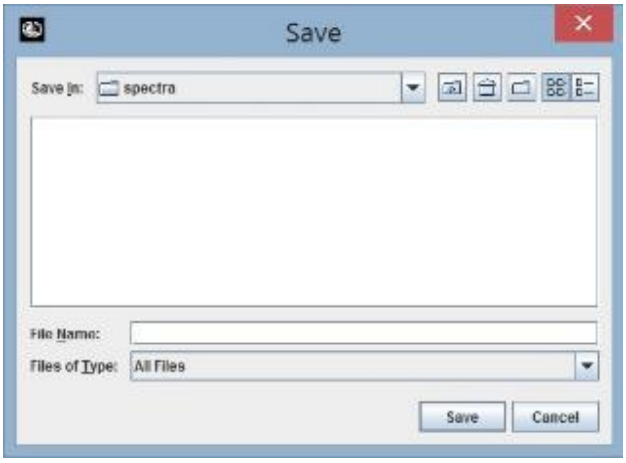
Function A - Saving spectrum

The **Save LML** button opens up a save dialog that lets you save the currently displayed spectrum as a Linssi Mark-up Language (LML) format file

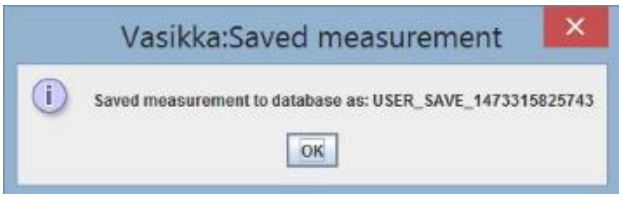
The **Save PHD** button opens up a save dialog that lets you save the currently displayed spectrum as an IMS2.0 format file

The **Save ANSI 2006** button lets you save the currently displayed spectrum as ANSI 2006 format

The **Save ANSI 2012** button lets you save the currently displayed spectrum as ANSI 2012 format

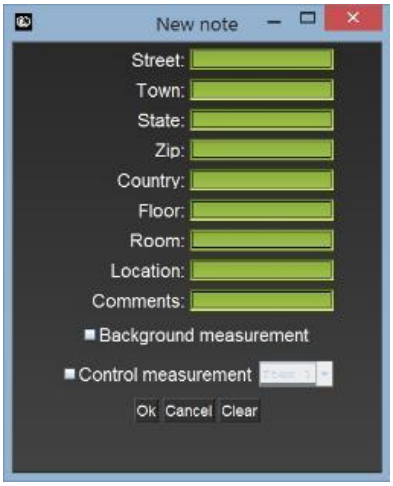


The **Save to DB** button saves the currently shown measurement to database



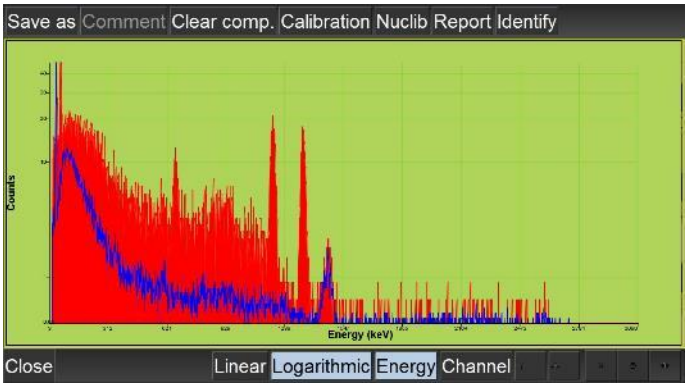
Function B - Comment

The **Comment** button opens up the note dialog and it allows specifying a note which will then be attached to the currently shown measurement. The note will then be saved to the database if the measurement already exists in the database. If the measurement doesn't exist in the database, the note will be saved along with the measurement when the measurement is saved. If the measurement will not be saved the note too will be lost. The comment dialog allows specifying the measurement to be a background measurement or a control measurement related to a background. If control measurement is selected, use the background selection box to select which background it will be related to.



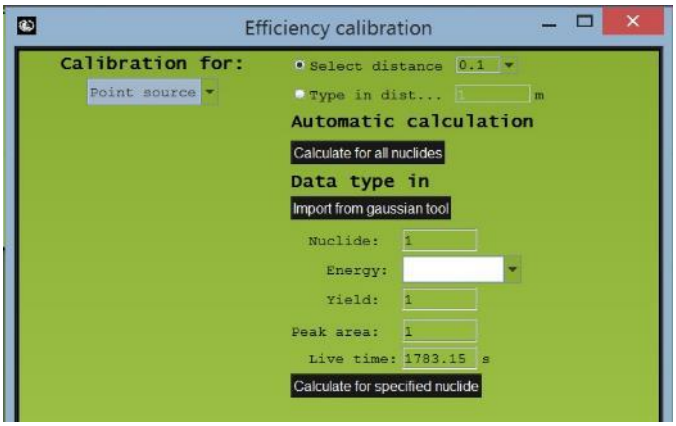
Function C - Compare

The **Compare** button allows comparing the currently displayed spectrum with another one. When comparing, the spectra will be plot differently. Both spectra are normalized to represent counts per second in each channel. The **Compare** button will open up the comparison selection dialog. This dialog allows selecting the measurement to compare with by either opening a file, selecting a measurement with a note attached to it or selecting a measurement with an alarm attached to it. Use the alarms or notes tabs to select the note or alarm and press the **Compare** button to open the comparison



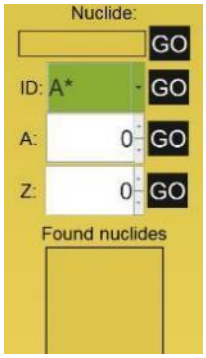
Function D - Calibration

The **Calibration** button allows applying an efficiency calibration to the measurement. This will calculate the activity of radio nuclides observed in the spectrum. The efficiency calibration dialog will open up. Select the type of efficiency calibration to apply and the distance at which the measurement was made. Press the **Calculate for all nuclides** button to calculate the activities for radio nuclides in identification. The calculation displays the activity for radio nuclides identified from the measurement



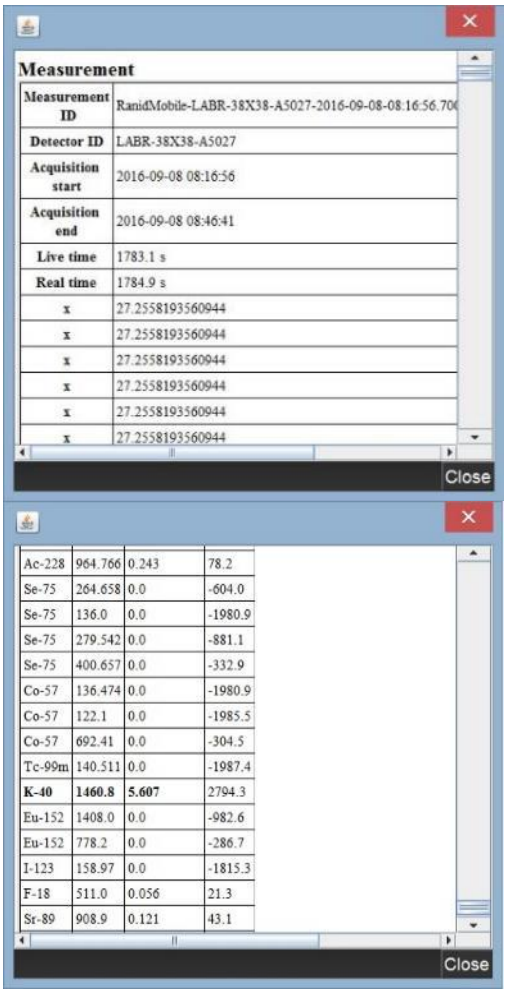
Function E - Nuclib

The **Nuclib** button allows browsing the nuclide library. Press the **Nuclib** button to open up the Nuclide sidebar. The nuclide data is based on ENSDF data. Either type in the name of the nuclide to browse, or select it from the list. The **Show lines** button will plot the nuclides gamma line energies. The **Show details** button will open up a display of the nuclide data



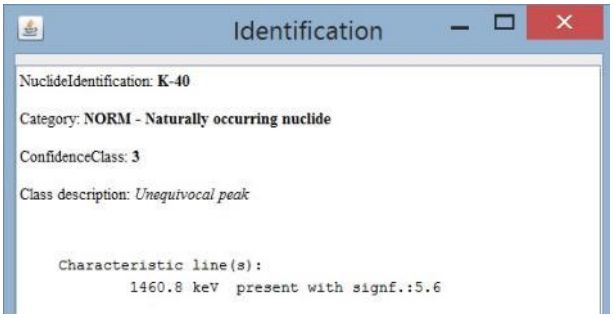
Function F - Report

The **Report** button will show a report of the currently shown measurement. The report will contain detailed information about the measurement, such as measurement identifier, acquisition start and end times, dead time and dose rate. The report window will also show the analysis results for the measurement. The **Report** button will also plot the nuclides gamma line energies



Function G - Identify

The **Identify** button will run the identification algorithm on the currently visible measurement. The identification detail window will open up to show the results



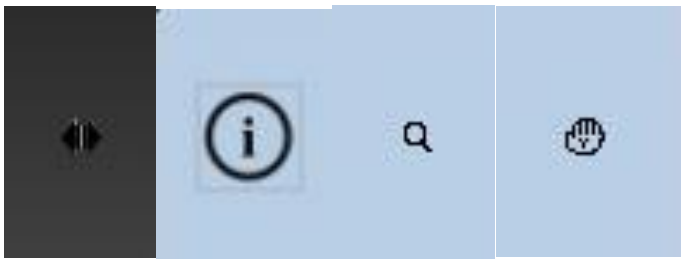
Exploring Measurements Spectrum Using the Spectrum Viewer

Function H – Spectrum Examination Tools

To examine the spectrum in the Spectrum viewer, use the following buttons in the lower toolbar

Use the **Linear** button or the **Logarithmic** button to change format spectrum for graph

Use the **Energy** button or the **Channel** button to choose either energy values or channel values for graph



The **Reset Zoom** button can be used to return the original spectra view

Click the **Info tool** button to use info tool. Press and drag on the display area to view info

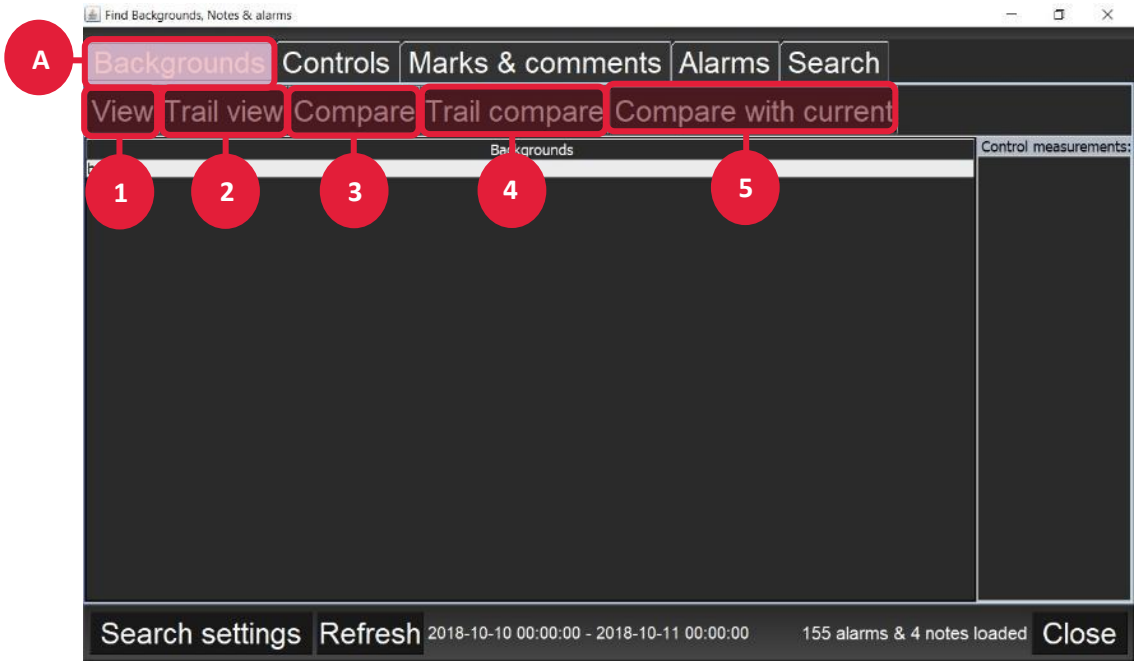
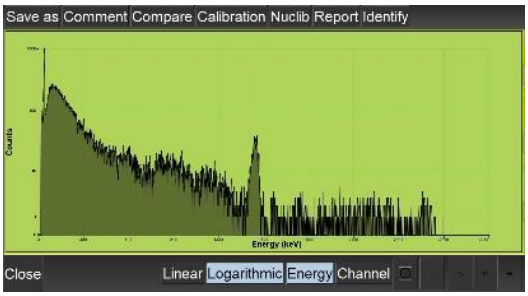
Click the **Zoom tool** button to use zooming. Press and drag on the display area to zoom in. Right click to zoom out

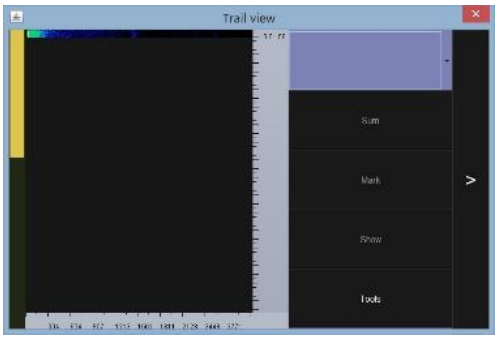
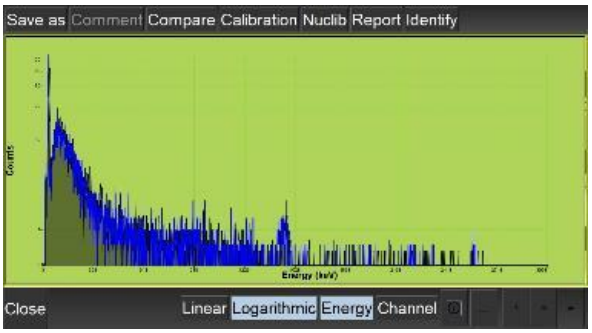
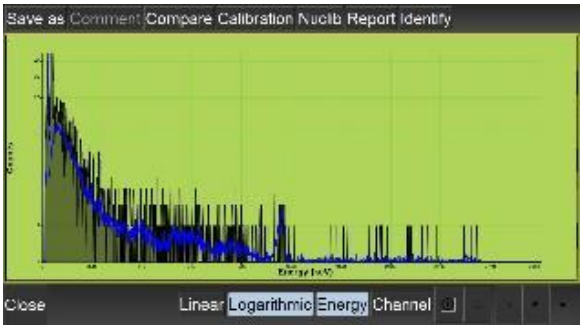
Click the **Pan tool** button to use pan tool. Press and drag on the display area to pan

5.6 Finding Marked Measurements or the Alarms with the Finder Action

The **Finder** is used to recall spectra from the database. A spectrum that has been commented can be found in one of the first three views. The first view displays measurements commented and specified to be 'background' measurements. The control measurements corresponding to the background measurements are also found in this view.

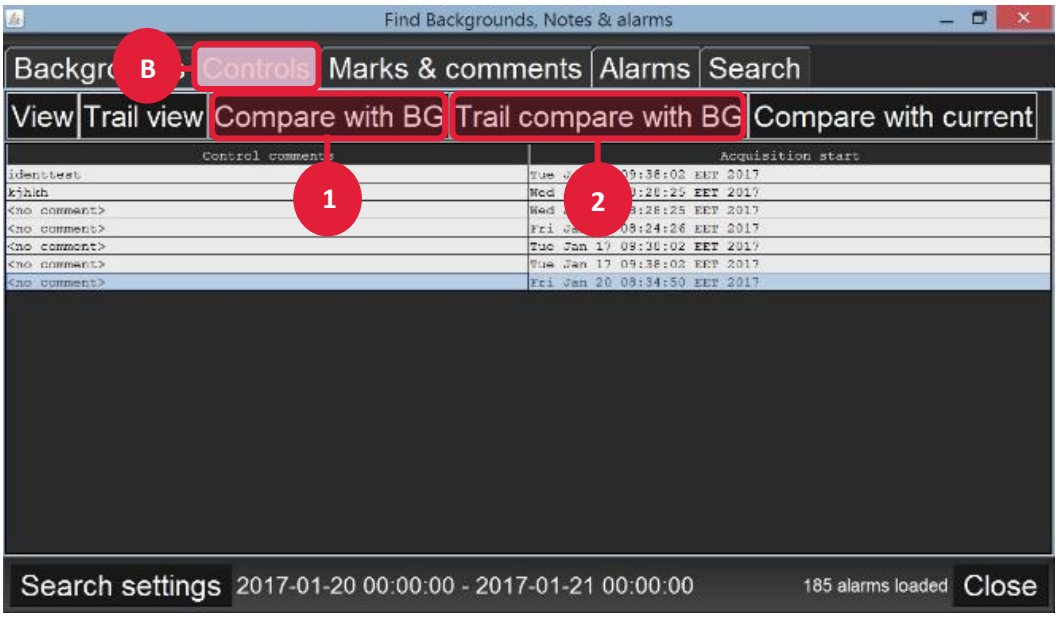
Tab. 5-5 Functions in Finder dialog

Functions in Finder Dialog		
Tab A - Backgrounds		
		
Background measurements are measurements with a special meaning to provide a reference for future measurements		
A1	Use the **View** button to display the selected background in the spectrum viewer	

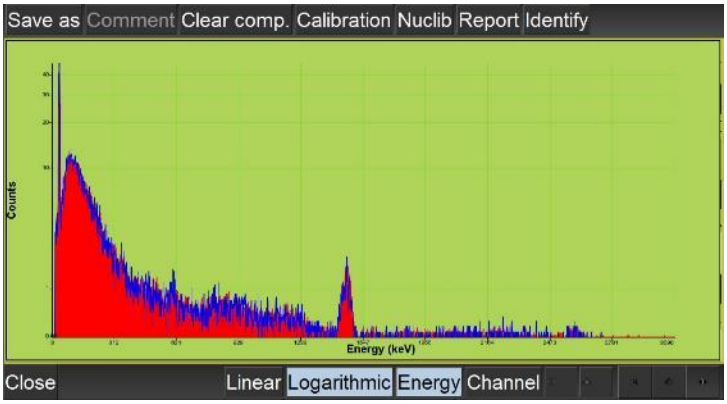
Functions in Finder Dialog		
A2	Use the **Trail view** button to display a spectrogram of measurements made during the duration of the background measurement	
A3	Use the **Compare** button to display the selected background and control together in the spectrum viewer	
A4	Use the **Trail compare** button to display spectrograms of measurements during the background and control	
A5	Use the **Compare with current** button to display the selected background together with the measurement that is showing in the spectrum viewer	

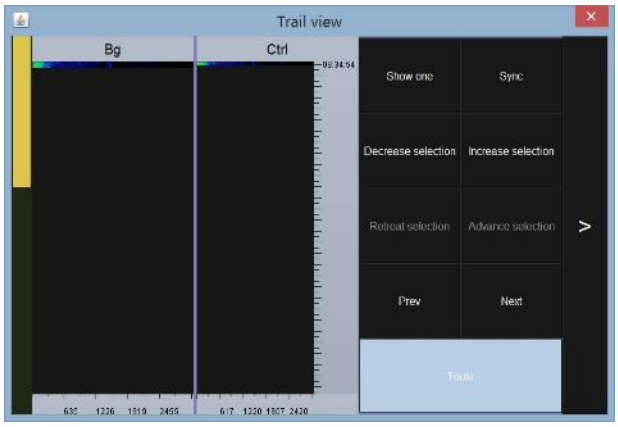
Functions in Finder Dialog

Tab B - Controls



The second view displays control measurements. Control measurements are attached to background measurements. It may be easier to locate a specific control in this view, as it does not involve first finding the correct background. Background and control measurements can be visually compared using the comparison function

B1	Use the **Compare with background** button to display the selected control and its associated background together in the spectrum viewer	

Functions in Finder Dialog		
B2	Use the **Trail compare with background** button and **Split view** button to display spectrograms of measurements during the background and control side by side	

The third view displays measurements that have comments as a result of using the comment function of Spectrum Viewer or the mark function of spectrogram or significance views.

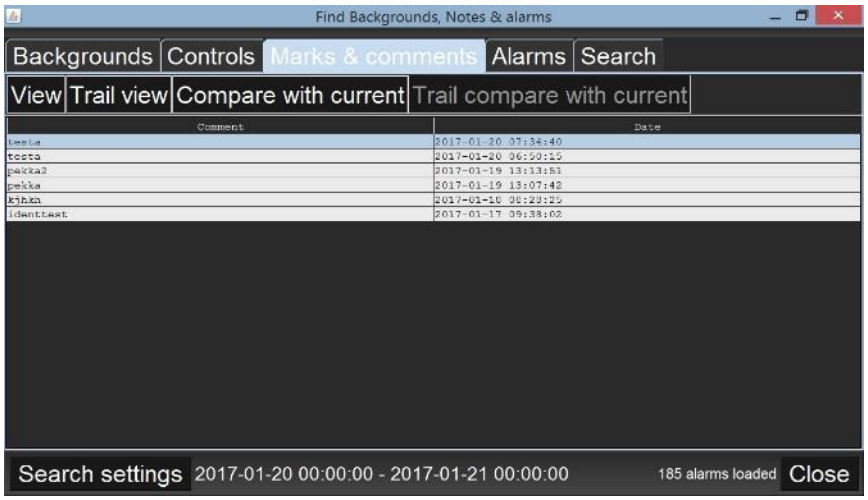


Fig. 5-11 Marks & Comments tab

The fourth view displays measurements that have caused alarms. If the Alarms view is empty, use the **Search settings** button to load alarms from database into view.

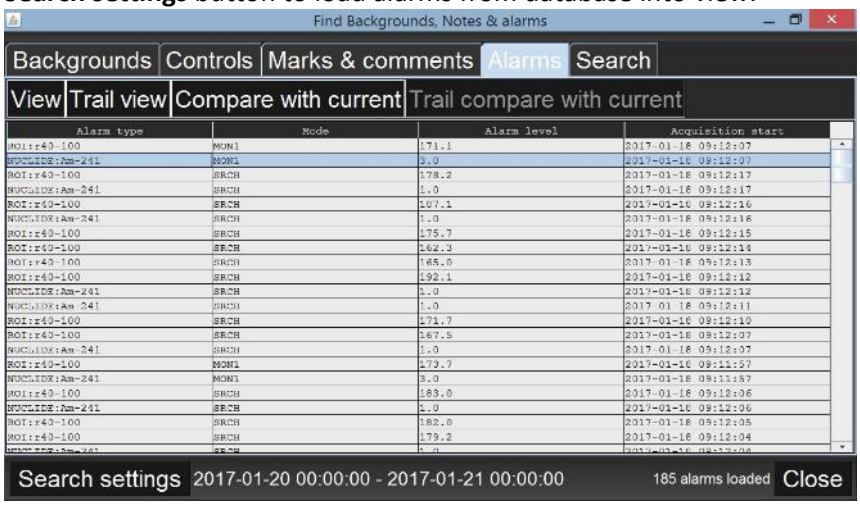


Fig. 5-12 Alarms tab

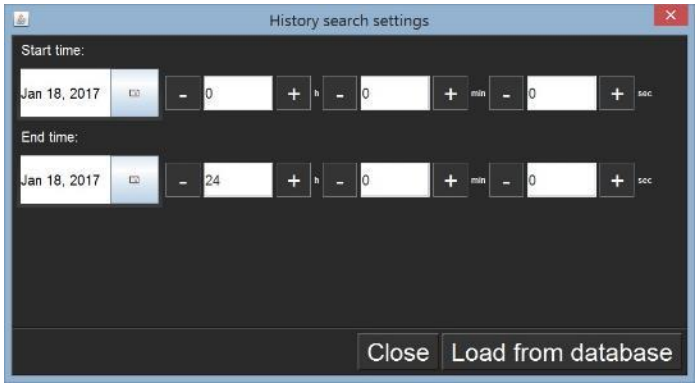


Fig. 5-13 History search settings

Use the **Start time** and **End time** selectors to select the start and end time of a region to fetch.

Use **Load from database** button to load alarms from database to the Alarms view.

Note: to view measurements with notes or alarms, database loading must be stopped or user has to wait for it to complete before being able to view the measurements.

6 Expert Level User

The expert mode contains the advanced settings of Spartan Pack. The password protection feature is provided so that the expert controls are not accessed and modified accidentally.

The default password to the expert mode is : eoy

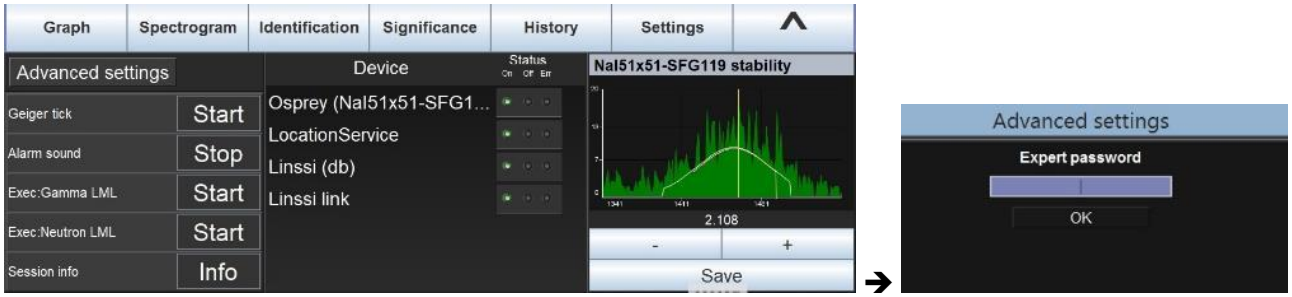


Fig. 6-1 Accessing advanced settings

To access the **Advanced settings**, input the password into the "**Expert password**" box and click the **OK** button. By giving the expert password, the unit is switched into expert mode.

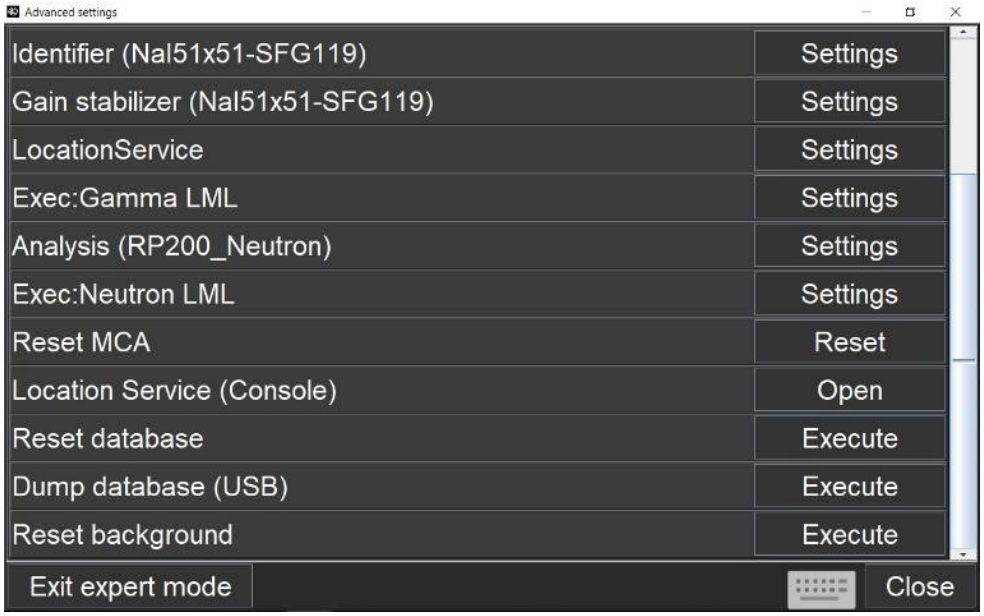


Fig. 6-2 Advanced settings

In expert mode user will be able to access the various settings of the unit and the nuclide database from the spectrum viewer.

6.1 Spartan Pack Software Devices

The Spartan Pack-software is a collection of software devices each performing their specific actions on the measurements made using the detectors. Some devices, such as the MCA devices correspond to the actual hardware connected to the machine and the software that controls it. Even though there is usually little need to touch the settings of the software devices, it is useful to familiarize oneself with their functions in order to fully take advantage of the capabilities of the unit.

6.2 Spartan Pack and Spartan Pack software

The Vasikka device represents the Spartan Pack unit and software. This device cannot be stopped, but the settings button can be used to access the software preferences. It is important to edit the preferences the first time the unit is started in order to specify certain unit identifiers.

6.2.1 Changing the Preferences

Fig. 6-3 Accessing Vasikka settings

Use the **Vasikka settings** button in the **Advanced settings** to open up the Spartan Pack preferences dialog. The dialog has the following items:

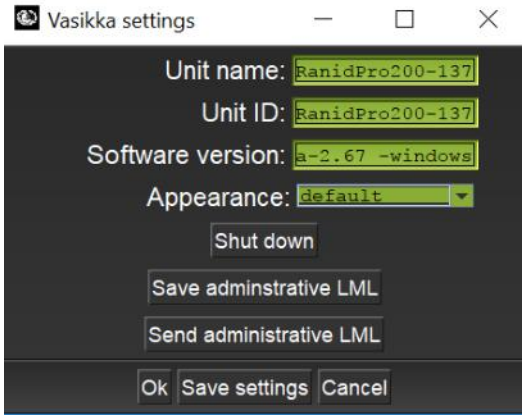


Fig. 6-4 Vasikka settings dialog

The **Unit name** field. Use this to specify a name for the unit. When reach back functionality is used, it is important to identify the different units. Type a unique name for the unit in the name field. If a LINSSI database is used in the headquarters, the unit name must be unique (i.e. no two units should share the same name).

The **Unit ID** field. Use this to specify an identifier for the unit. The identifier is used to identify the unit in the database. Type in a unique identifier for the unit in the unit ID field. If the LINSSI database from this unit is transferred to a different location, it is important that the identifiers are unique (i.e. no two units should have the same identifier).

The software version display, this field displays the software version in use. This field is not editable.

The **Appearance list**. Use this list to change the appearance of the Spartan Pack-software. The default appearance has white text on dark background. The inverted appearance is similar to the default, but has black text on bright background.

Use the **Ok** button to apply the changes. Use the **Save settings** button to apply and save the changes to disk. When you save the settings they will be automatically applied next time the unit is started. Use the **Cancel** button to abandon the changes.

When taking the unit into use for the first time, should be check the preferences and save the settings.

6.3 Clearing and Saving the Database

To access actions like clearing the databases and saving the database to USB storage device move in the **Advanced settings** and execute wanted action**.**

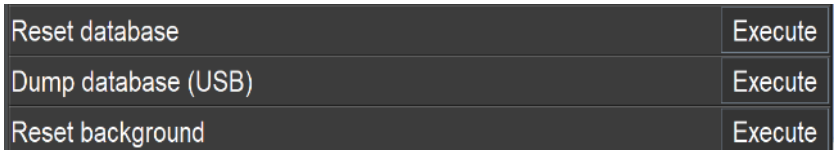


Fig. 6-5 Advanced database settings

Use the "**Execute"** button of the "**Reset database"** action to clear the database. After clearing the database the Spartan Pack will shut down and must then be turned on again by pressing the power button on the top side of the computer.

Use the "**Execute"** button of the "**Reset background"** action to clear the background database. After clearing the database the Spartan Pack will shut down and must then be turned on again by pressing the power button on the top side of the computer.

Before starting to save the database, stop the measurement of the Spartan Pack by clicking "**Start/Stop**" button in the upper left-hand corner of the Spartan Pack-software and insert the USB storage device to the USB-port of the USB-hub or the computer.

Use the "**Execute"** button of the "**Dump database"** action to save the database to USB storage device.

Note: After saving the database, a restart must be done. Shut down the Spartan Pack by clicking the "Power" button in the upper right-hand corner of the Spartan Pack-software and then turn the device on by pressing the power button on the top side of the computer.

6.4 Data Manager

The data manager manages the data produced by the detectors. The data manager is responsible for reading the data in from the connected detectors, integrating it together into measurements and passing it to the processing pipelines and visualization. The data manager settings allow the user to access use the MCA connections and the processing pipelines for the different detectors.

Fig. 6-6 Accessing data manager settings

To view or change the data manager settings, use the **Data manager settings** button in the **Advanced settings** to open up the data manager settings dialog.

6.4.1 Instrument Connections

From the data manager settings dialog use the **Instrument connections** button to open up the instrument connections dialog.

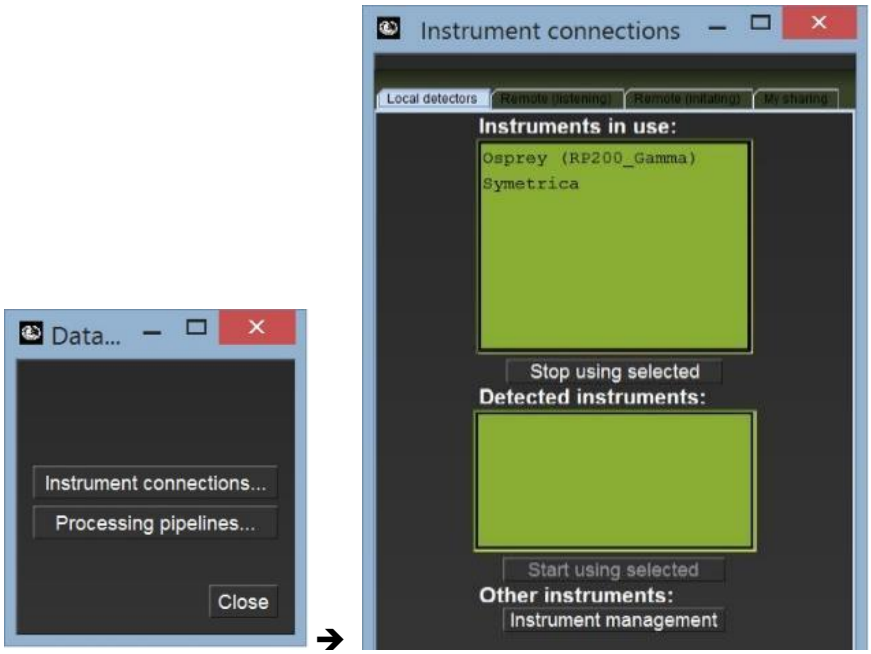


Fig. 6-7 Instruments connections dialog

The instrument connections dialog contains four tabs. The **Local detectors** tab displays the instruments connected to the local machine. The **Remote (listening)** tab allows using the instruments of another unit which is listening for connections. **The Remote (initiating)** allows using the instruments of another unit which is attempting to initiate connections. The **My Sharing** tab allows sharing instruments with remote units.

6.4.2 About MCA and Detector Settings

Before making measurements using a detector, settings must be defined to be applied to the MCA the detector is attached to. Spartan Pack treats the combination of a detector and MCA as instruments, and all settings of the instruments are accessed through the detector. This is because a detector does not need to be aware of which MCA it is connected to whereas the MCA must in order to be able to apply correct high voltage, gain and conversion gain settings based on the detector attached.

6.4.3 Connecting a Local MCA or Changing the Detector Connected to the MCA

When a supported USB connectable MCA is connected, a dialog will pop up to notify that MCA is detected. If the MCA and detector settings are already known, the instrument can be taken into use immediately. If the Instrument settings are not known, they must be defined before the instrument can be taken into use.

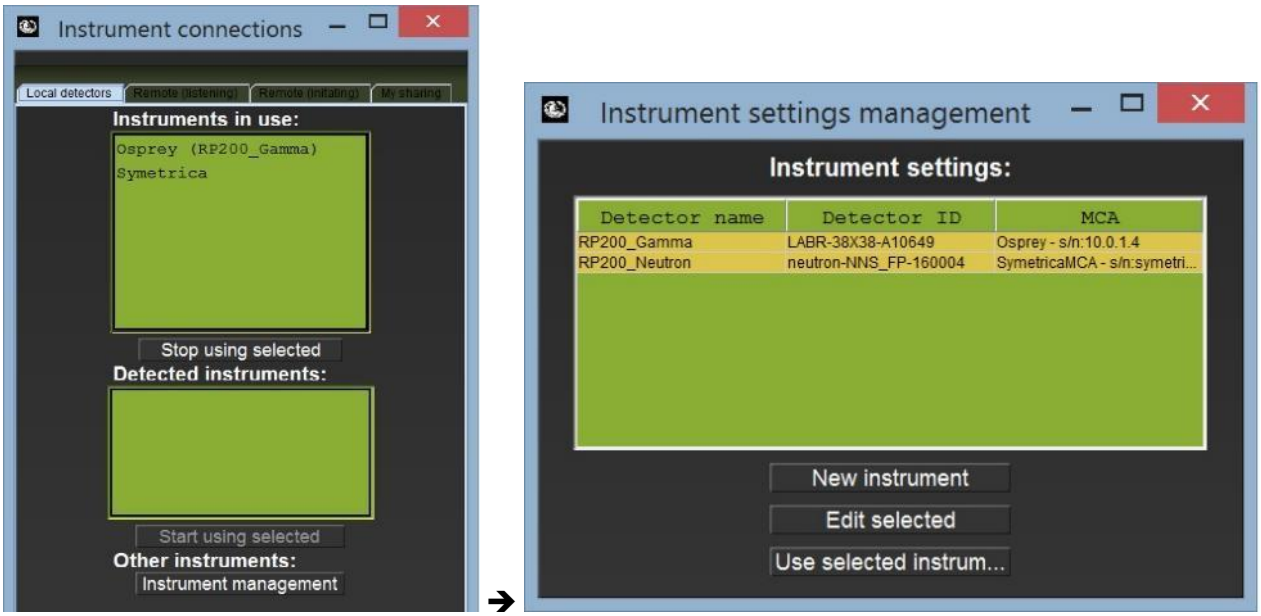


Fig. 6-8 Instrument settings management dialog

The Instrument connections dialog displays the instruments connected to the machine in the instruments connected list on its first page. If you want to attach a new MCA that has not been used before, click the **Instrument management** button. The **Instrument management window** will appear, allowing to creating settings for the new detector or MCA.

Fig. 6-9 New instrument settings dialog

Use the **New Instrument button** to open up the **Instrument settings editor**. For information on this editor, see Chapter 6.5.1 Editing Detector and MCA Settings.

If you have attached a MCA that you have used previously select it from the detected instruments list and click the **'Start using selected'** button. If the instrument is not present in the detected instruments list (not USB connectable) click the '**Instrument management' button** and select the appropriate instrument. Press the '**Use this instrument' button** to take the instrument to use. If you have changed the detector while the MCA was disconnected, carry out the procedure below.

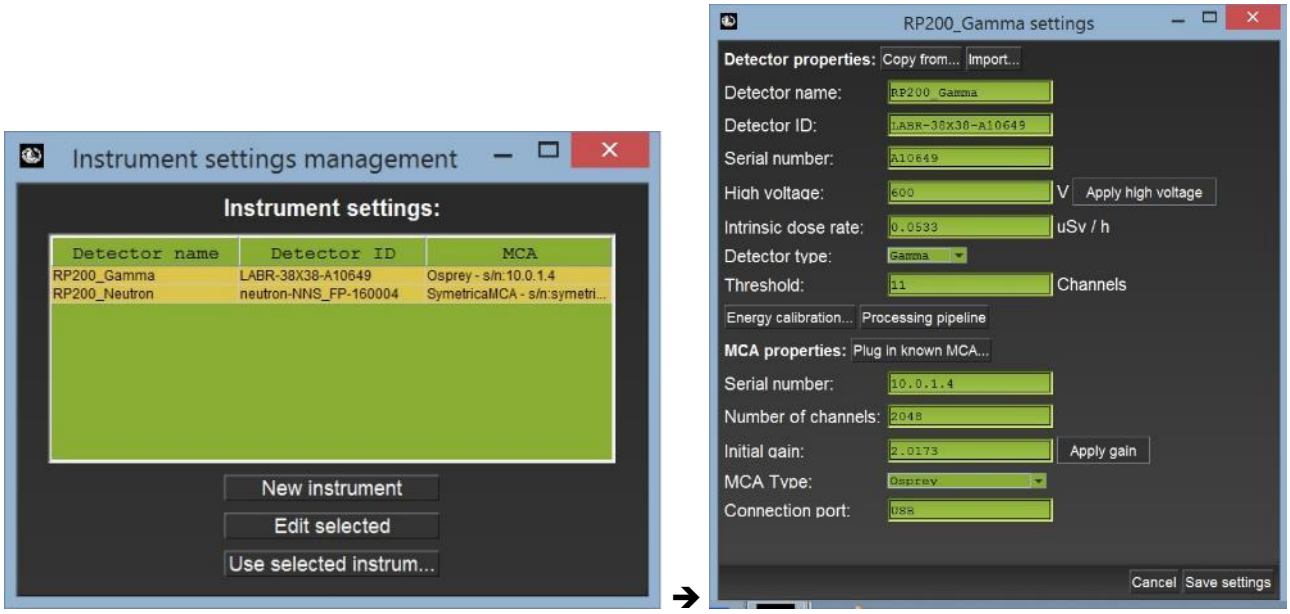


Fig. 6-10 Spartan Pack gamma settings

If you have changed the detector on an attached MCA, select the instrument in the list and click the '**Edit selected' button**. The **Instrument settings editor window** will appear. Select an existing detector or create a new one as detailed above. Press '**Save settings'** to approve the settings.

Once the instrument is taken into use, you should see the new devices related to that instrument appear in the **Device panel** of the **Settings view**.

6.4.4 About Instrument Sharing

A Spartan Pack unit may share its instruments (detectors, GPS and clock) with remote units. The remote units will then obtain data from the instruments as if they were connected to the local machine. The instrument sharing is done via WISP (Wide-area Instrument Sharing Protocol). WISP can be carried by any kind of connection and Spartan Pack supports the use of TCP/IP, Bluetooth serial port profile and RS232 protocols as carriers. This means that units connected by wired Ethernet or wireless LAN as well as units equipped with Bluetooth devices or connected by serial port cables, can share instruments. USB and various other ports can be configured as virtual serial ports or block devices for WISP use. WISP is also used to connect the remote control PDA to Spartan Pack unit, it is just another unit to share instruments with.

6.4.5 Connecting a Remote Instrument Shared by Another Unit

To connect to a remote instrument shared by another unit, use the **Remote (listening)** or **Remote (initiating)** tabs in the **Instrument connections dialog**.

Fig. 6-11 Remote (listening) tab

The **Remote (listening**) tab is used to connect to a unit listening for incoming connections. Give the IP address of the remote unit into the **Vasikka remote adapter address list**. Give the port to connect to into the **WISP info port list**. Press the **Query instruments** to query for instruments shared by the remote unit. The Unit ID, Unit Name and instruments list should update when the query is complete. Use the **Instrument list** to select which instruments to share and press the **Add selected instruments** button to start using them.

Fig. 6-12 Remote (initiating) tab

The **Remote (initiating)** tab is used to connect to a unit attempting to initiate connection with computer. Select the port to listen to in the **WISP receive port list**. Press the **Listen for instruments** button to accept the connection from the remote unit. The Unit ID, Unit Name and instruments list should update when the connection is established. Use the **Instrument list** to select which instruments to share and press the **Add selected instruments** button to start using them.

6.4.6 Sharing Your Instruments with Another Unit

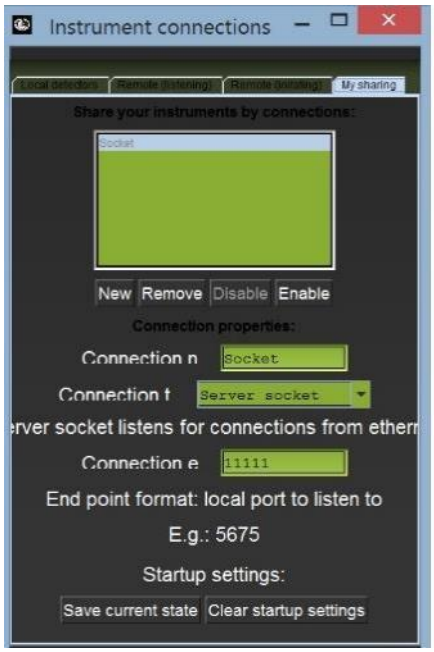


Fig. 6-13 My Sharing tab in instrument connections dialog

To share your instruments with another unit: use the **My Sharing tab** in the **Instrument connections dialog**. The tab allows you to create an interface for instrument sharing. The currently enabled interfaces are displayed in the Sharing interfaces list.

Fig. 6-14 Creating a new sharing interface

To create a new sharing interface, use the '**New'** button. A new entry will be added into the list. The entry will initially be displayed in grey colour to indicate its disabled status. You may now edit its properties by selecting the interface.

Use the **Connection name** field to specify a name for the sharing interface. Name 'WISP info' carries a special meaning. Rather than being an interface to exchange instrument data through, a 'WISP info' interface is used to exchange information about the sharing itself. The 'WISP info' interface disconnects its connection as soon as the needed information is exchanged with the remote unit, so there usually needs to be only one of these. WISP info is used only by TCP / IP connections, i.e. socket and server socket type. Other names for sharing interfaces are only used to identify the interface in question and carry no special meaning.

Use the **Connection type list** to choose the connection type. The type can be:

- **Block device**. A UNIX style device represented by a file.
- **Serial port**. A RS232 serial port, either real or emulated.
- **Server socket**. A TCP / IP connection that accepts incoming connections.
- **Socket**. A TCP / IP initiating connection.
- **Bluetooth server**. A Bluetooth serial profile server.

Use the **Connection end point** to give the port or address as applicable. The endpoint has different meaning for different types of interfaces:

- For a Block device the endpoint is the filename of the file representing the device.
- For a Serial port it is the serial port name (e.g. COM1 in windows)
- For a Server socket it is the TCP / IP port to listen to.
- For a Socket it is the internet address to connect to (e.g. 124.12.232.12:3434)
- For a Bluetooth server it is not needed.

Once sharing interface is defined, use the '**Enable'** button to activate it and enable sharing.

To disable sharing, use the '**Disable'** button.

To remove the selected interface, use the '**Remove'** button.

To save the state of sharing interfaces press '**Save current state'** button. The sharing interfaces will then be enabled automatically when the unit or software is started the next time.

To clear sharing settings use the '**Clear start-up settings'** button. This will cause any sharing interface information to be wiped away.

6.5 MCA

A MCA device represents the multichannel analyser a detector is connected to. The MCA device cannot be stopped, as it is controlled by the data manager rather than being controlled directly.

Fig. 6-15 Accessing MCA settings

To view or change the MCA settings, use the '**Osprey settings'** button in the **Advanced settings** to open up the **MCA settings dialog**.

6.5.1 Editing Detector and MCA Settings

The detector and MCA settings can be accessed by using the '**Instrument settings...' button** next to the corresponding MCA device in the **Advanced settings**. This will open up the **RP200_Gamma settings.**

Fig. 6-16 Editing detector and MCA settings

Fill in all the required information about the detector and either choose an existing MCA, or fill in the information for a new MCA. Be careful about filling in the serial numbers and the Detector ID field. These must contain globally unique values i.e. no two MCAs or detectors should have identical values in these fields. If the serial numbers of two MCAs happen to be the same, you must define a new serial number for the MCA, possibly by appending the real one with a '*' or any other symbol.

Press the **'Save settings' button** to approve the settings. Creating the settings does not take the instrument to use therefore you must use the **Instrument management window** to do that.

6.5.2 Energy Calibration

The Energy calibration dialog, accessed from the instrument settings editor using the **'Energy calibration…**' button is used to make an energy calibration for the detector.

Fig. 6-17 Accessing energy calibration settings

The Energy calibration window can be opened up by pressing the Energy calibration button in the RP200_Gamma settings. The Energy calibration dialog will appear.

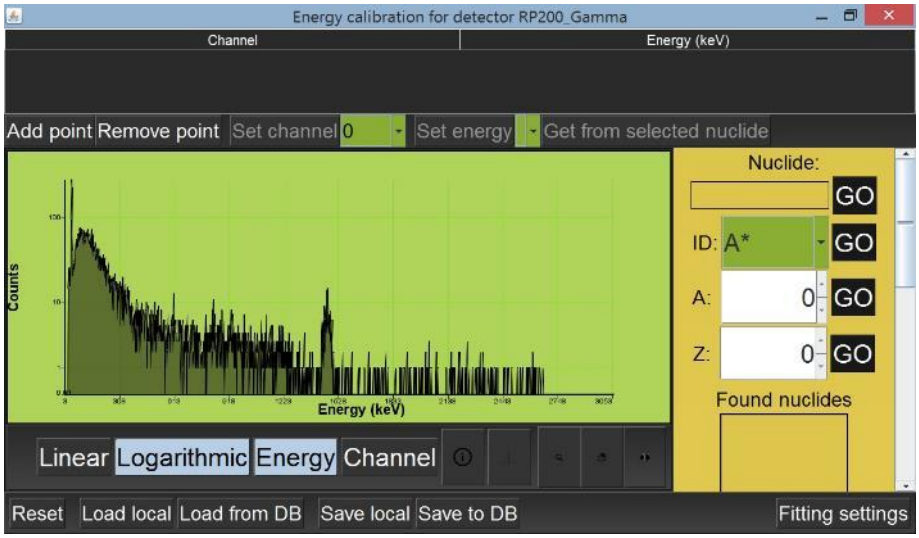


Fig. 6-18 Energy calibration dialog

The Energy calibration window contains a snapshot of the spectrum currently being acquired. The spectrum is displayed in the Spectrum display panel.

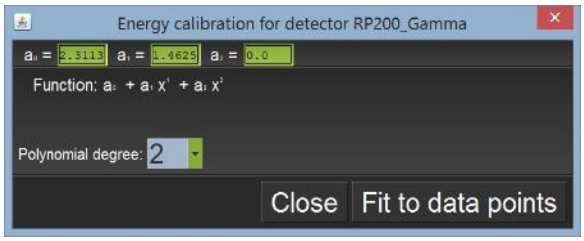


Fig. 6-19 Energy calibration function toolbar

The Energy calibration function toolbar can be opened up by pressing the '**Fit**' button in the Energy calibration window. The current energy calibration function is displayed in the Energy calibration function toolbar. The function is always a polynomial. The degree of the polynomial can be chosen from the Polynomial degree list. Depending on the degree, the polynomial is characterised by a number of coefficients. These are displayed in the Polynomial coefficient fields.

To make an energy calibration by specifying the polynomial coefficients you can edit the coefficients directly. Pressing enter after editing in any of the coefficient fields will then cause the new energy calibration to be applied to the spectrum display panel.

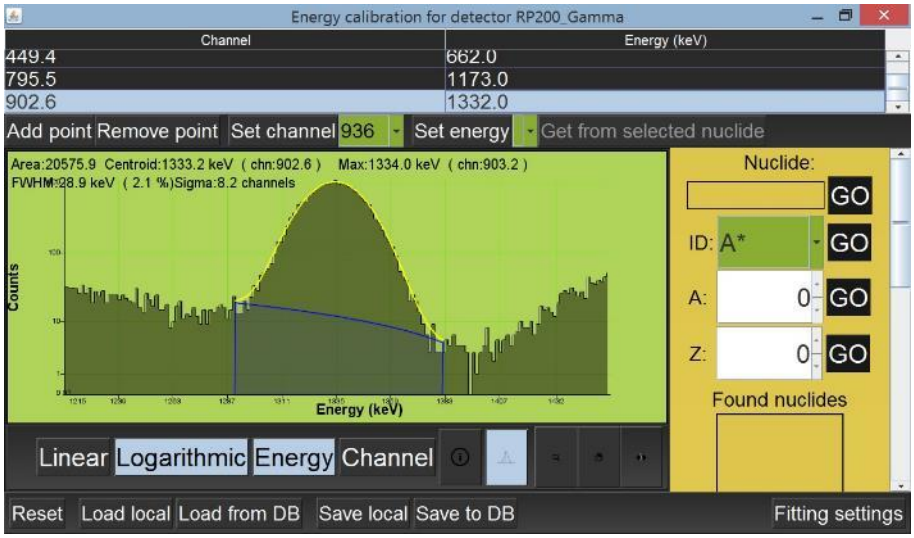


Fig. 6-20 Adding a new data point

To make an energy calibration by fitting a polynomial to a set of data points, use the Data points table. Add a new data point into the table by pressing Add data point button. The first column in the table is used to give the channel value for the data point. Use the second column to give the energy corresponding to the channel on that data point row. Once you have specified enough data points (at least polynomial degree + 1) you may perform the fit.

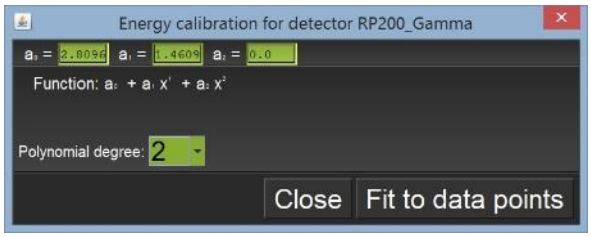


Fig. 6-21 Fitting a polynomial to a set of data points

Do this by pressing the '**Fit to data points'** button. A polynomial of the degree selected in the Polynomial degree list will be fitted and the new energy calibration will be displayed in the spectrum display panel.

Closing the energy calibration window will cause the new energy calibration to be taken into use in the Acquisition drawers Spectrum display panel.

Use the Reset button to revert to the situation when the energy calibration window was opened.

You may save the energy calibration for the given detector using the '**Save local'** button. This will save the energy calibration to the file describing the detector. You can also save the energy calibration into the database by using the '**Save to DB**' button. You will be asked for a calibration ID for the calibration. Saving to database will make the energy calibration available to other software using the LINSSI database. It is always recommended to save the energy calibration at least locally, even if you use the database saving feature.

6.6 Identifier

An identifier device is usually found for each MCA. The identifier device runs a peak detection algorithm on the incoming spectra. The peak detection data is then used to confirm or deny the hypothesis that a given nuclide is present based on an identification rule for the nuclide. If the hypothesis is confirmed, the observation of the nuclide is classified according to criteria given in table below:

Tab. 6-1 The confidence level criteria

Identifier			
Condifence level	**Number of peaks**	**Rule**	**Comment**
1	1	$1 \leq S \leq 1.5$	Small peak (H0)
2	1	$1.5 < S \leq 2$	Small but clear peak (H0)
3	1	$S > 2$	Unequivocal peak (H0) - no other information on nuclide ID. Typically 137Cs @ 661 keV
4	2	$1 \leq S1,2 \leq 1.5$	Two small peaks (H0)

Identifier			
Condifence level	**Number of peaks**	**Rule**	**Comment**
5	2	1.5 < S1 ≤ 2 1 ≤ S2 ≤ 2	Two small peaks, at least one of them clear (H0)
6	2	S1 > 2 S2 ≥ 1	Two peaks, at least one of them unequivocal (H0)
7	≥ 3	S1 > 2 S2 > 2 S3 ≥ 1	Three or more peaks, two of them unequivocal (H0)
8	2	S1 > 2 S2 > 2 0.7 < A1/A2 < 1.3	The ratio of the measured peak areas is within 30 % as predicted by the decay data and the efficiency curve. No low energy line is considered.
9	≥ 3	S1 > 2 S2 > 2 S3 > 2 0.7 < Ai/Aj < 1.3	The ratios of the measured peak areas of three most significant peaks are within 30 % as predicted by the decay data and the efficiency curve. No low energy line is considered.
10		Human review	

An identification rule for a nuclide defines the key lines that must be present as peaks in the spectrum for the nuclide to be considered present. Secondary lines can also be specified, these are not required to be present, but may bolster the confidence of the identification. Identification rules for nuclides that may cause interference in the identification may be specified for a given rule. These exclusion rules are then evaluated together with the rule under consideration to mitigate the effects of interference.

6.6.1 Hypothesis Testing

For each nuclide specified to be among those searched for the identifier device performs a hypothesis test. The test involves checking the peak significance for each peak corresponding to the selected lines of the nuclide. The significance is obtained by estimating the peak area and variance near the nominal energy of the line.

The peak significance *S* is defined as the ratio of peak area to Currie's critical level L_c

$$S = A / Lc(\alpha)$$

The Curries critical level L_c is given by

$$Lc(\alpha) = k\alpha * \sigma(A)$$

Where σ(*A*) is the standard deviation of peak area and k_α is the value of the normal distributed H_0 statistic corresponding to the desired tail probability of false positives.

A region of interest (ROI) is defined around the nominal peak energy based on the resolution calibration of the detector. Additional ROIs are defined around the peak ROI to estimate the baseline. The presence of key lines and secondary lines of the nuclide are then considered according to the identification rule for the nuclide.

6.6.2 Changing the Identifier Settings

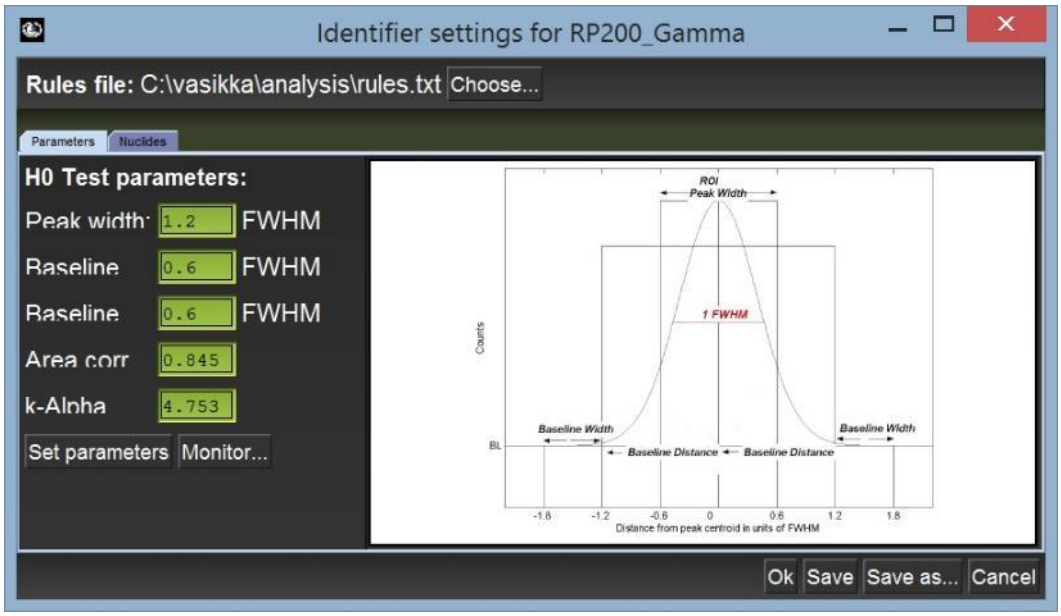


Fig. 6-22 Identifier settings dialog

To access the identifier settings for a given detector, click the corresponding '**Identifier settings'** button. A identifier settings dialog will appear. This dialog allows you to change the peak detection parameters (peak ROI size, baseline ROI sizes, baseline ROI distance and kAlpha), as well as the radio nuclides and their gamma lines searched for.

6.6.3 Changing the Peak Detection Parameters

Use the **Parameters tab** to change the hypothesis test parameters. The meaning of the parameters is illustrated in the figure next to the parameter fields.

Use the **peak width** field to give the peak ROI width in full width half maximum. The Gaussian the FWHM refers to is obtained from the resolution calibration.

Use the **Baseline width** to give the upper and lower baseline ROI width in full width half maximum.

Use the **Baseline distance** field to give the distance of the upper and lower baseline ROI from the peak ROI in full width half maximum.

Use the **k-Alpha** field to give the k_α value.

The peak detection parameters in this tab can be overridden by peak-specific parameters.

6.6.4 Changing the Nuclides in the Hypothesis Test

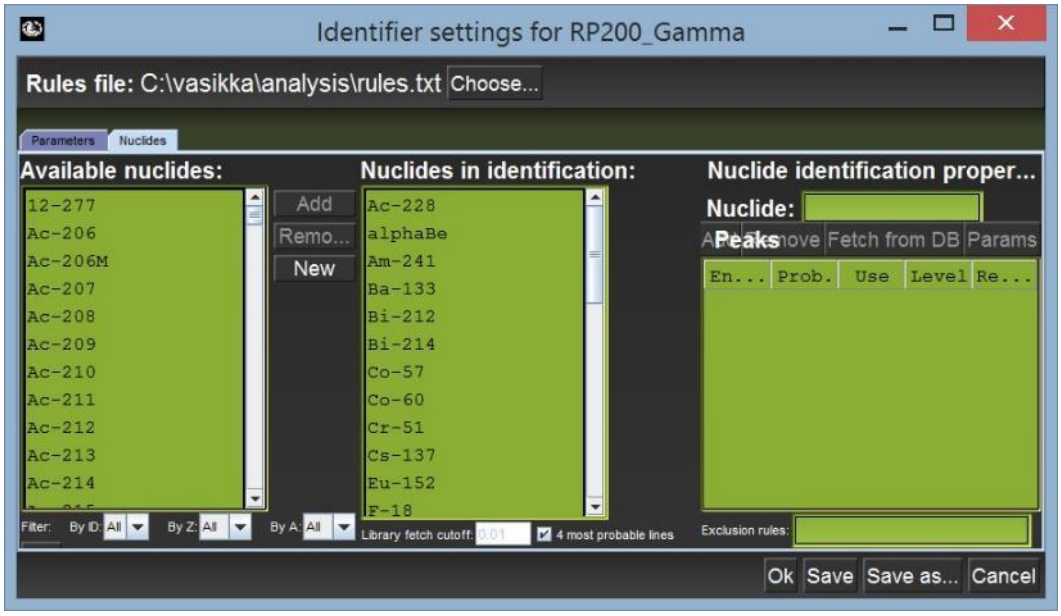


Fig. 6-23 Adding nuclides into the hypothesis test

To add or remove nuclides in the hypothesis test, use the **Nuclides tab**. The **Nuclides tab** has a list of nuclides in the library and a list of nuclides in analysis. The list of nuclides in analysis shows the nuclides for which the hypothesis test is performed on.

To add a nuclide from the library into the hypothesis test, select a nuclide from the Available nuclides list and press the **Add** button.

To remove a nuclide from the hypothesis test, select the nuclide from the Nuclides in analysis list and press the **Remove** button.

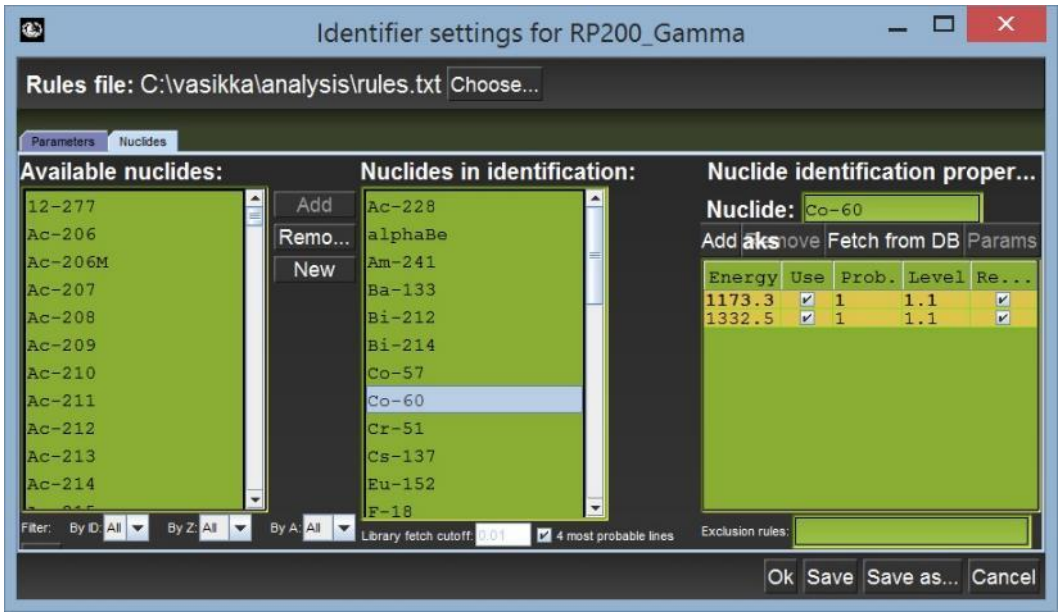


Fig. 6-24 Removing nuclides from the hypothesis test

To edit the properties of a nuclide in the hypothesis test, select the nuclide in the Nuclides in analysis list. The properties of the nuclide will then be displayed in the Nuclide analysis properties panel.

Use the Nuclide field to edit the name of the nuclide. The name will be displayed in various views, including the significance view and the report view. The name is also the identifier of the nuclide, so there should not be two nuclides sharing the same name in the analysis.

Use the **peaks table** to edit the peak properties of the nuclide in the hypothesis test. The peaks table enumerates the peaks looked for by the analysis. Each peak has the following properties:

- **Energy**, the nominal energy of the peak
- **Use**. When the Use property is selected, the peak will be included in the analysis.
- **Emission probability**. This property is not used in analysis, but can guide in deciding whether the peak should be even included.
- **Level**. The peak significance level that must be exceeded for the peak to be present.
- **Required**. Use this to specify that the line is a key line i.e. it must be found for the rule to be satisfied.

Add to a custom peak into a nuclide by pressing the '**add'** button. Use the '**remove'** button to remove the peak selected in the peaks table. The '**fetch from DB'** button will fetch the peaks from the database. You may give desired peak custom peak detection parameters by selecting the line and pressing the '**custom parameters'** button. The custom parameters can be useful when the peak is a multiple or originates from x-rays. When giving custom parameters, you may also specify a comment that will be shown in the identification details.

6.7 Analysis

The analysis device performs ROI summation and uses this information to determine heightened count rate levels in different regions of the spectrum. The analysis device also calculates the dose rate from the spectrum by summing together the selected ROIs multiplied by their contribution coefficients.

6.7.1 Changing the Regions of Interest Monitored

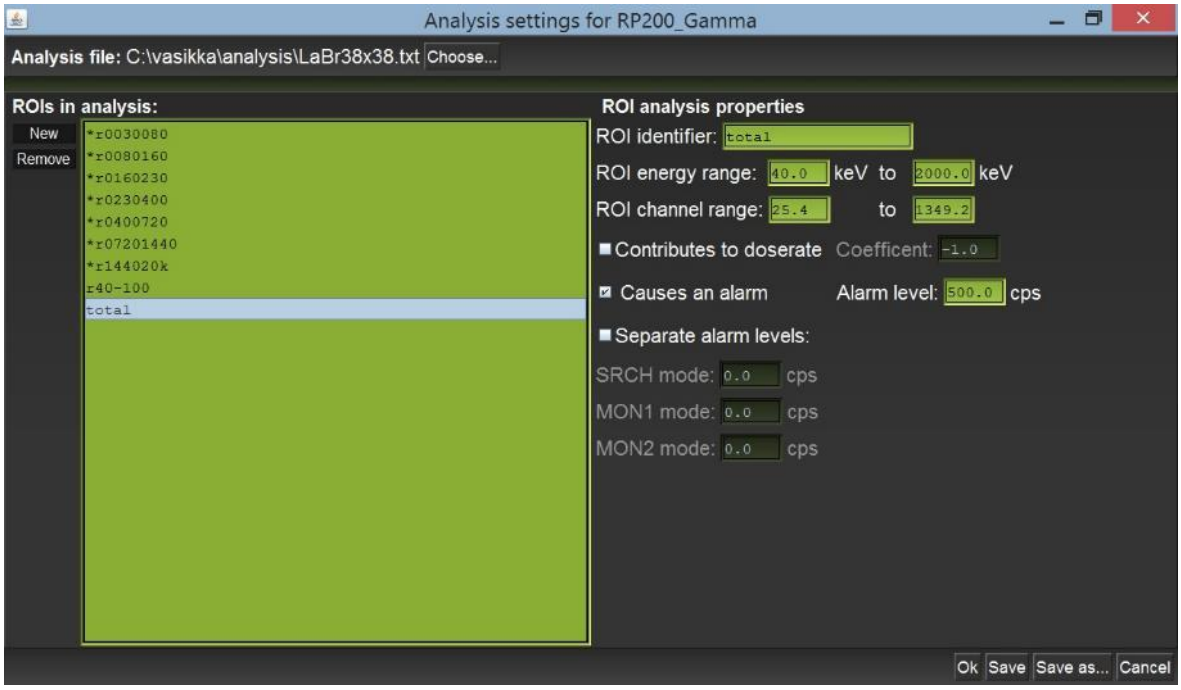


Fig. 6-25 Analysis settings dialog

Regions of interest (ROIs) are monitored by the analysis. Use the regions of interest tab to select which energy intervals will be monitored.

The ROIs included in analysis are given in the ROI list.

Use the '**New'** button to create a new ROI.

Use the '**Remove button'** to remove the selected ROI from analysis.

To edit the properties of a ROI in analysis, select it from the ROI list. The properties of the ROI will then be displayed in the ROI analysis properties panel.

Use the **ROI identifier field** to specify a name for the ROI. The name will be displayed in various views, including the significance view and the report view. The name is also the identifier of the ROI, so there should not be two nuclides sharing the same name in the analysis.

Specify the energy range the ROI is comprised of using the **Start energy** and **End energy field**s.

If the ROI contributes to the dose rate calculation, check the **contributes to the doserate** checkbox, and use the **Coefficient field** to give the contribution coefficient.

If the ROI can cause an alarm, check the **Causes an alarm** checkbox and use the **Alarm level** field to give the alarm level in counts per second.

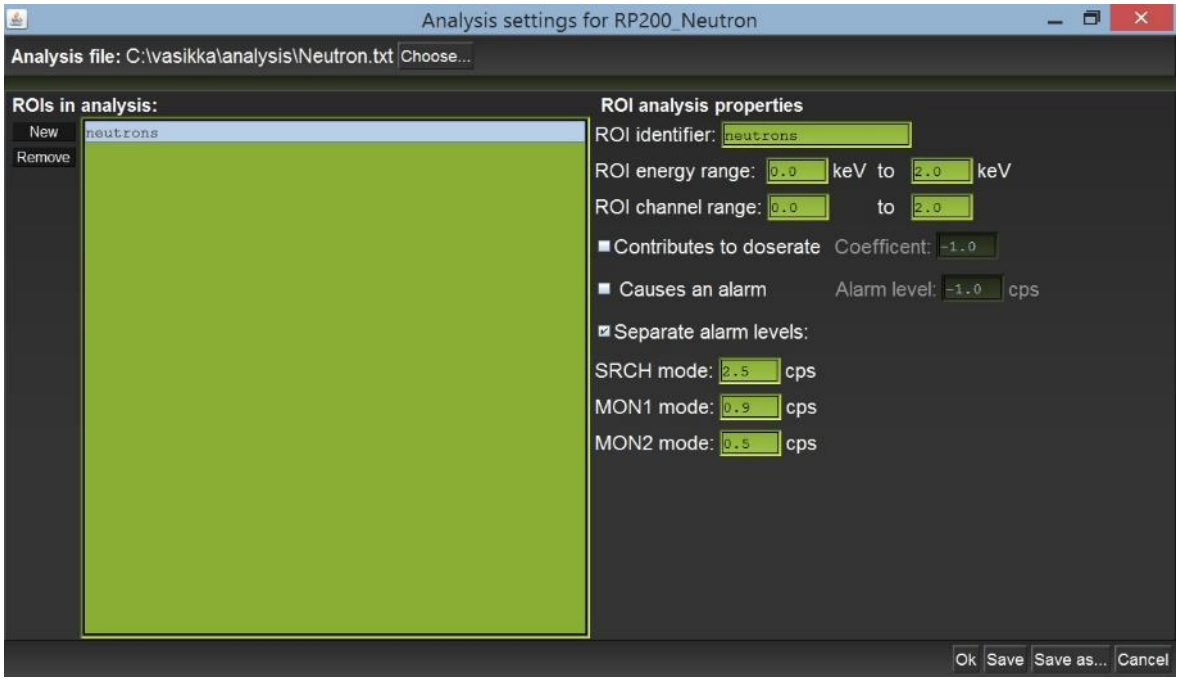


Fig. 6-26 Setting different alarm levels for each of the integration modes

If you want to give different alarm levels for each of the integration modes, use the **Separate alarm levels** checkbox. Then give the alarm levels in the text boxes below.

6.8 GPS

The GPS device allows the inclusion of positional data into measurements. The positional data will be saved to the database with the rest of the measurement data. The GPS device connects to a hardware GPS device and reads the position and quality information obtained.

6.8.1 Changing GPS Settings

Fig. 6-27 GPS settings dialog

To view or change GPS settings, use the '**LocationService Settings'** button in the **Advanced settings** to open up the **GPS settings** dialog. The **GPS Settings** dialog can be used to view GPS position and quality information, disconnect and reconnect the GPS, as well as search for Bluetooth GPS devices in the vicinity.

Use the **GPS port** field to select which port the GPS is connected to. The port should refer to a serial port.

Use the **Baud rate** field to set the speed at which the GPS is configured to connect at (consult your GPS hardware manual).

Use the **Protocol selection** to select the protocol your GPS uses to communicate (again, consult your GPS hardware manual). Usually the GPS hardware use NMEA protocol.

By pressing the '**Location Service (Console)'** button, a following dialog opens:

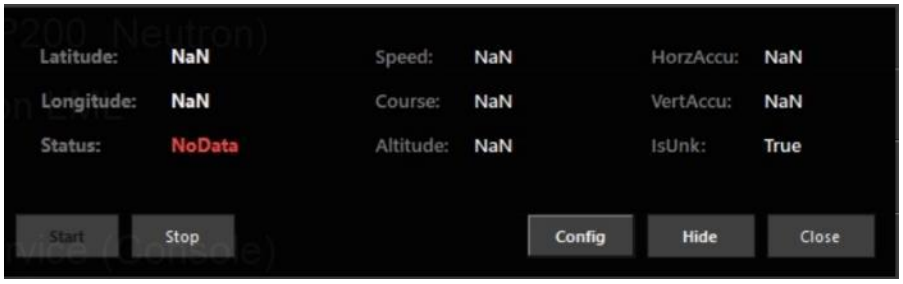


Fig. 6-28 Location service console dialog

Pressing **'Config'** button allows user to change the GPS threshold radius in meters.

Fig. 6-29 Changing GPS threshold radius

Fig. 6-30 Tools tab in GPS settings dialog

Use the **Tools tab** to search for Bluetooth connectable GPS. Press the '**Search for Bluetooth devices'** button to begin the Bluetooth search. Once the search is complete, the found Bluetooth devices will be displayed in the device table. Press the **'Use selected device'** button to take the selected device into use.

Use the **'Save settings '**button to save the GPS settings. They will then be applied automatically next time the unit is started.

7 Using the Spartan Pack With Remote Control Unit

The Spartan Pack offers the web-service software for the Remote Control Unit. Web-service software can be operated via web-browser. Communication is created by using WI-FI.

The Remote control unit includes touch screen and all operation can be carried out by finger.

With the Remote Control Unit user can monitor the values of the radiation measurements, view the nuclide identifications and alarms, view the spectrum data, do the long count measurements and display and adjust the energy calibration state.

7.1 Main Screen of the Spartan Pack Web Service Software

The main window provides some common measuring views with numeric, graphic and spectrogram format. Also the battery status, long count and gain adjustment functions are available in main screen.

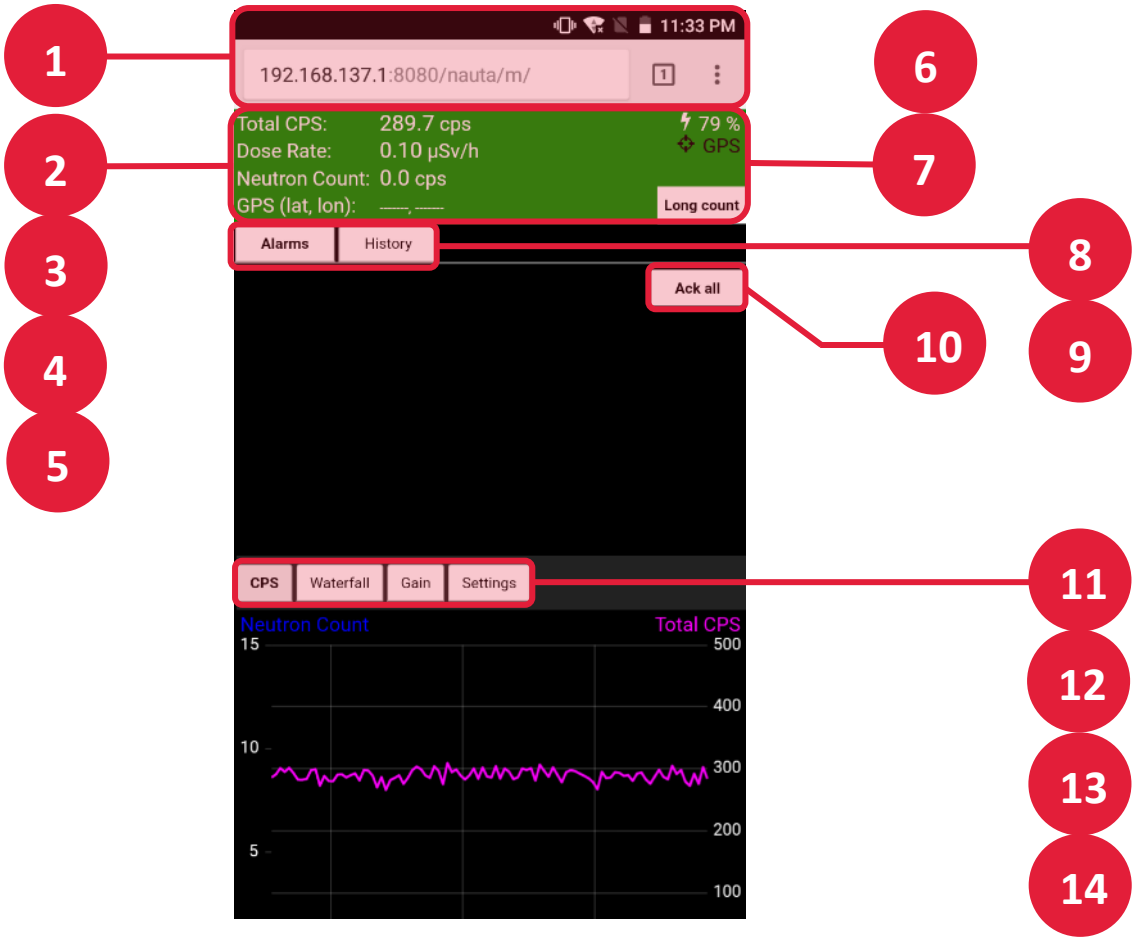


Fig. 7-1 Main Screen of the Spartan Pack Web Service Software

1. Address of the Spartan Pack Web Service
2. Total CPS Value
3. Dose Rate Value
4. Neutron Detector CPS Value
5. GPS Latitude and Longitude
6. Battery Status
7. GPS Status
8. Alarms Tab
9. Alarm History Tab
10. Acknowledge All Alarms Button
11. Total CPS View
12. Waterfall View
13. Gain View
14. Settings tab

Address of the Spartan Pack web-service:

- Default Web-service address is: http://192.168.137.1:8080/nauta/m/

Total CPS View:

- The graph display's the Counts per Second values from gamma and neutron detectors.

Alarms View:

- The alarms view displays the alarms and nuclides detected within the last 80 minutes.

Ack all button:

- Acknowledges all active alarms.

History View:

- The history view displays all the acknowledged alarms

Battery Status:

- Battery status indicates the Spartan Pack computer battery charge level in percent (0 – 100%)

Long Count View:

- The long count view is used to make a long measurement and save the measurement to the database.

Settings Tab:

- The Settings tab is used to turn on/off alarm sound and vibration alarm. The audio of the Geiger Click can also be turned on / off. Settings tab also includes buttons for full screen mode and for shutting down the user interface and tablet computer.

Waterfall View:

- The Waterfall view displays a "waterfall plot" i.e. time series of spectra, for gamma detector.

Gain View:

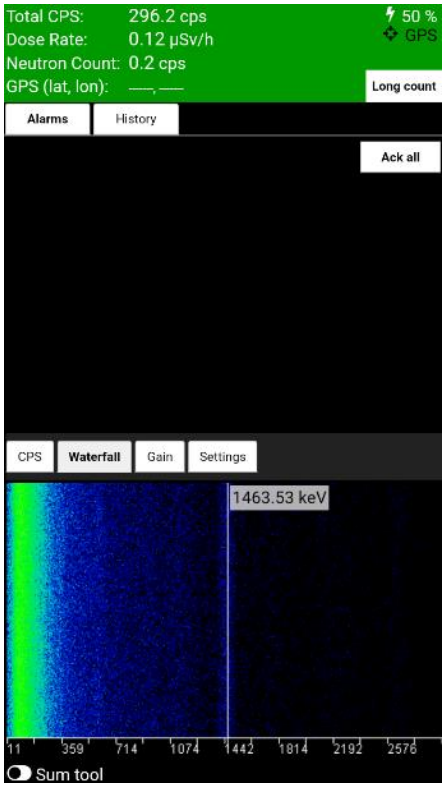
- The gain view display's the state of the energy calibration for the gamma detector. It is also possible to adjust the energy calibration peak if needed.

7.2 Waterfall View

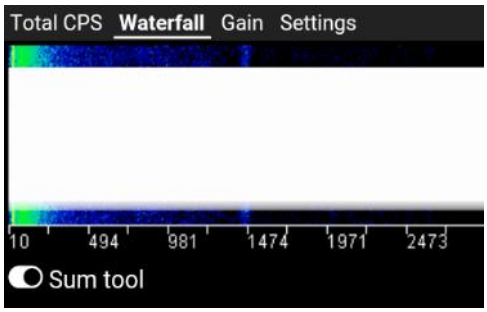
The Waterfall view displays a so-called "waterfall" plot of spectra. The latest spectrum is represented by the topmost line, with previous spectra on the following lines. The energy axis runs from left to right i.e. the leftmost edge corresponds to the lowest energy on the spectra and the rightmost edge of the line corresponds to the highest energy. The intensity of radiation is represented as colour.

It is possible to plot the sum of the spectra from interest area. Also it is possible to view the energy values by pushing the waterfall.

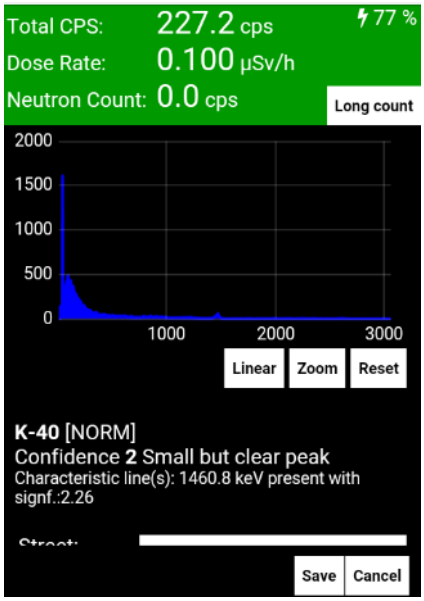
Tab. 7-1 Viewing the energy values of the waterfall

Viewing the Energy Values of the Waterfall		
Action	**Description**	**Picture**
1	Touch the waterfall with finger to display the energy value and view different area energy values by moving the finger	

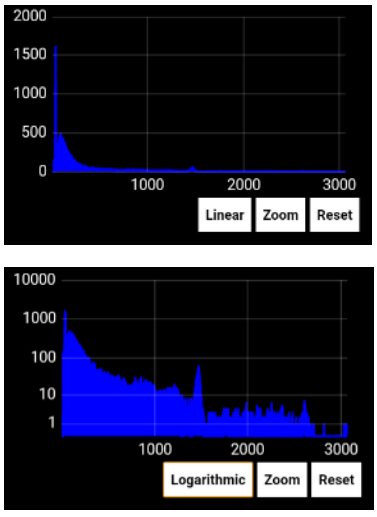
Tab. 7-2 Drawing the sum of the spectra

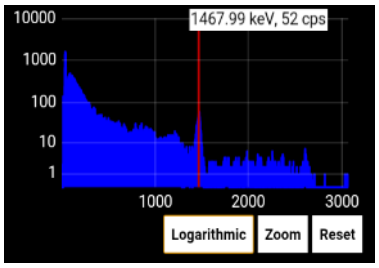
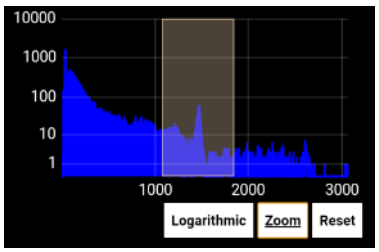
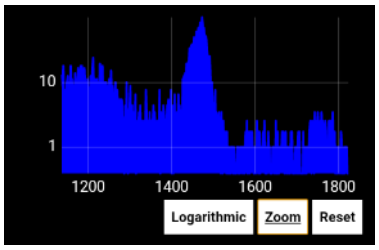
Drawing the Sum of the Spectra		
Action	**Description**	**Picture**
1	Push the **SUM-tool** button	
2	Select the area of interest for dragging	
3	When the area of interest is selected, the spectra and the results of the identification of nuclides are opened into a new window	

Tab. 7-3 Viewing identification details

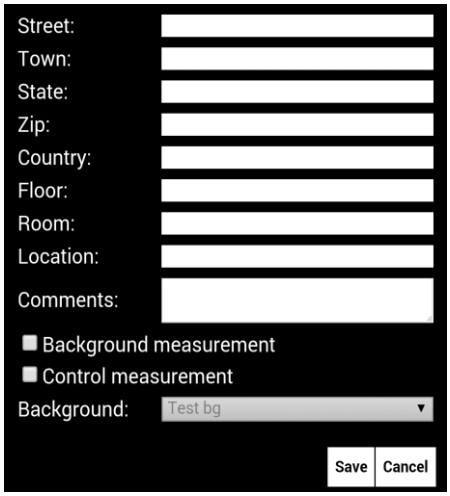
Viewing Identification Details		
Action	**Description**	**Picture**
1	Results of the identification of nuclides are shown below the spectra. The nuclide name and the nuclide category are shown on the title line. In the second line are shown the confidence level of nuclide identification with the explanation. The following lines contain information about the peak used for identification.	

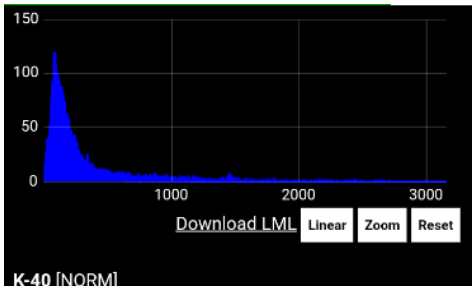
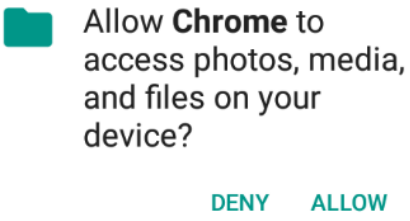
Tab. 7-4 Functions for viewing the spectra

Functions for Viewing the Spectra		
Action	**Description**	**Picture**
1	The view of spectra can be changed from linear presentation to logarithmic presentation by pushing the **Linear** button.	

Functions for Viewing the Spectra		
Action	**Description**	**Picture**
2	The energy values of the spectra can also be viewed by touching the spectrum with finger	
3	Spectra can be zoomed by pushing the **Zoom** button and dragging the area of interest **Note:** After zooming, the original spectra view can be restored by pressing the **Reset** button	 

Tab. 7-5 Saving the spectra to the database

Saving the Spectra to the Database		
Action	**Description**	**Picture**
1	Spectra can be saved to the Spartan Pack's database by pressing the **Save** button In order to save the operation, all available information has to be filled into the fields.	

Saving the Spectra to the Database		
Action	**Description**	**Picture**
2	Spectra can also be downloaded into a LML file. **Note:** The operating system of the Remote Control Unit may require permission from the user to save files into its memory	 

7.3 Gain Adjustment

The Gain-tab displays the state of the energy calibration for the gamma detector. The gain adjustment enables the adjustment of the energy calibration peak if needed. The peak itself is plotted in this view and should always be present in this plot. The correct place of the energy peak is marked by red line.

The energy peak is correct if the highest point of the peak hits to the red line. If the peak is not shown in this view or peak of highest point does not hit to the red line, the gain adjustment must be done.

Note: The Spartan Pack do the automatic energy calibration adjustment online in MON1 mode. Measuring time is 40 seconds. If the energy calibration peak differs too much to the set point, the automatic adjustment cannot be done.

The energy calibration peak can be adjusted by changing the value of the gain. Gain value can be increased and decreased by pushing the arrow buttons. Gain value can saved by pushing **Save** button. If the energy calibration peak must be moved to the right the gain value has to be decreased. If the peak must be moved to the left the gain value has to be increased.

Note: Energy calibration peak measurement time is 40 seconds. After the gain adjustment wait for approximately 40 seconds that the new measurement appears to the gain measurement display.

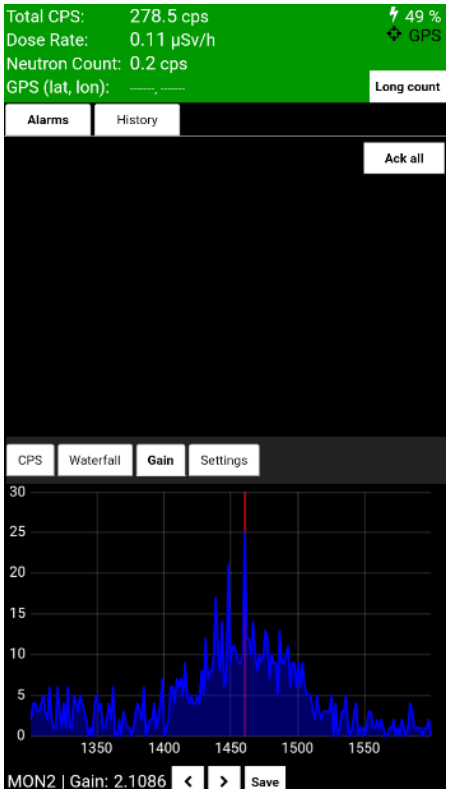
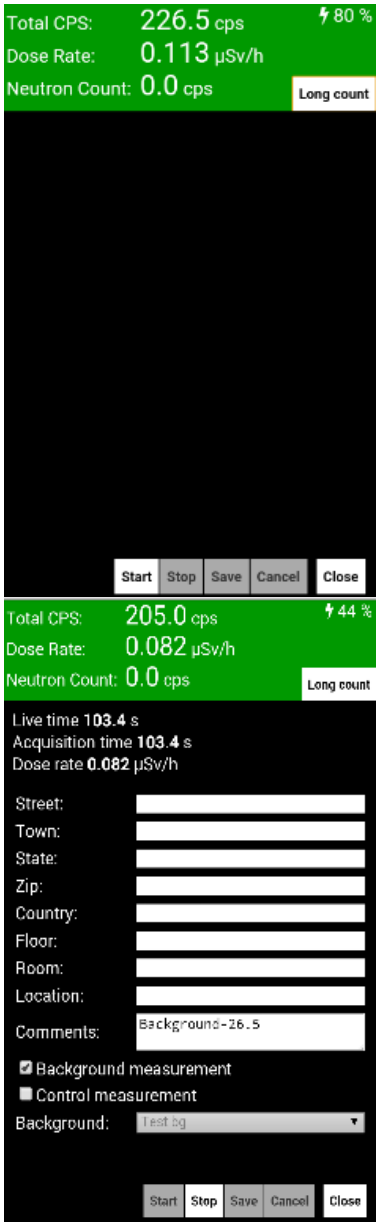


Fig. 7-2 Gain adjustment

7.4 Long Count View

The long count view is used to make a long measurement and save the measurement to the database.

Tab. 7-6 Making a long count measurement

Making a Long Count Measurement		
Action	**Description**	**Picture**
1	Start the measurement by pushing the **Long Count** button from the main view and then push the Start-button	
2	The spectrum will be collected as well as the live time and acquisition time	
3	It is possible to fill to the information fields while the long count is working	
4	Long count can be stopped by pushing **Stop** button	
5	When the long count is finished the spectra and the results of the identification of nuclides will be displayed	

Results of the identification of nuclides will be shown below the spectra. The nuclide name and the nuclide category are shown on the title line. The confidence level of nuclide identification with the explanation is shown in the second line**.** The following lines contain information about the peak used for identification**.**

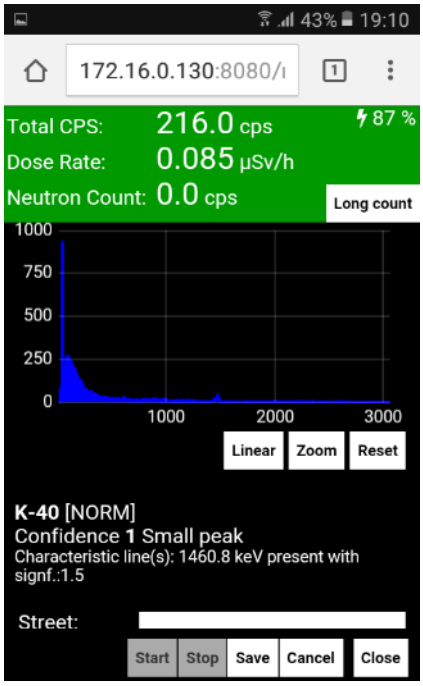
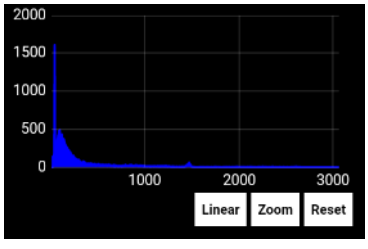
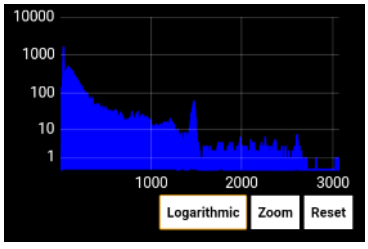
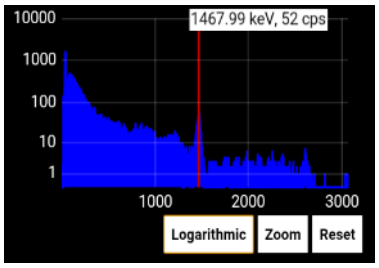
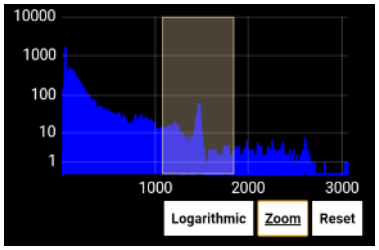
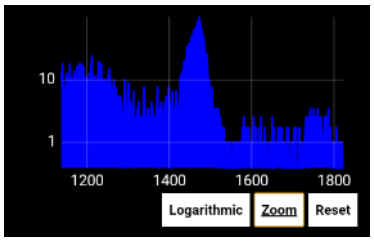


Fig. 7-3 Viewing Identification Details

The view of spectra can be changed from linear presentation to logarithmic presentation by pushing the **Linear** button.

Tab. 7-7 Functions for viewing the spectra

Functions for Viewing the Specta		
Action	**Description**	**Picture**
1	The view of spectra can be changed from linear presentation to logarithmic presentation by pushing the **Linear** button	 

Functions for Viewing the Specta		
Action	**Description**	**Picture**
2	The energy values of the spectra can also be viewed by touching the spectrum with finger	
3	Spectra can be zoomed by pushing the **Zoom** button and dragging the area of interest **Note:** After zooming, the original spectra view can be restored by pressing the **Reset** button	 

Spectra can be saved to the Spartan Pack's database by pressing the **Save** button. In order to save the operation, all available information has to filled into the fields.

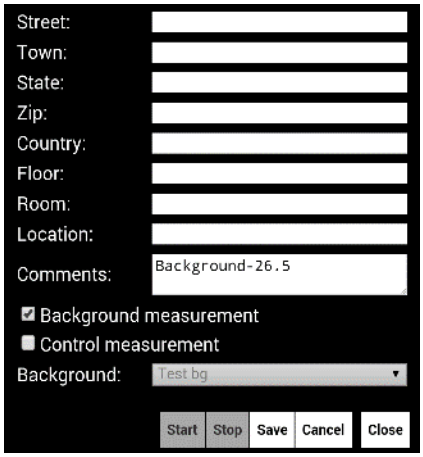
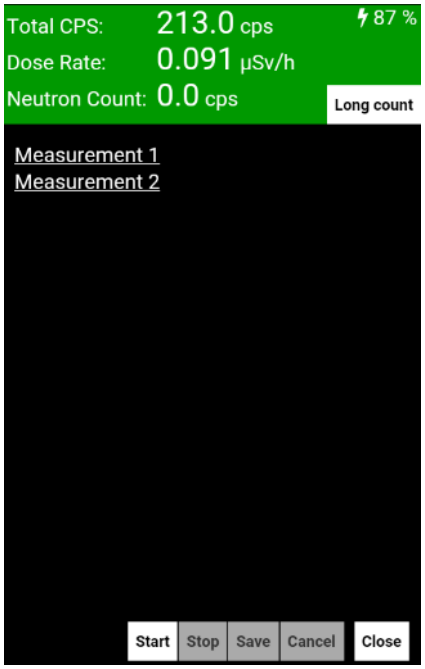
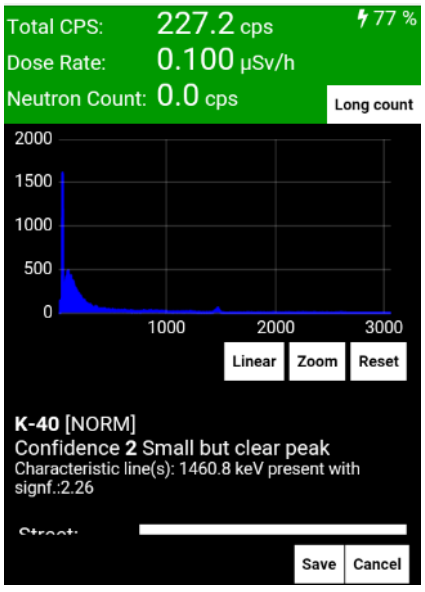


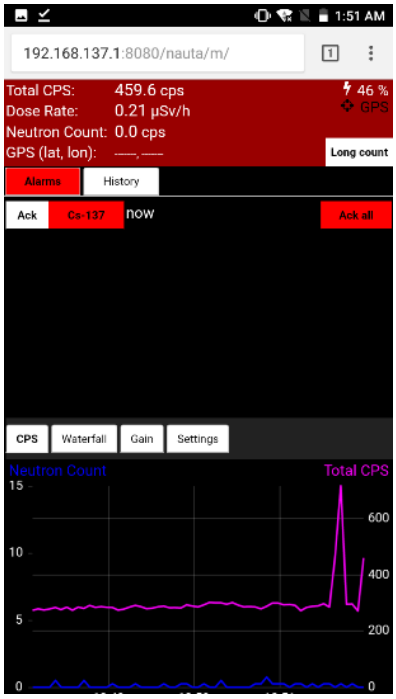
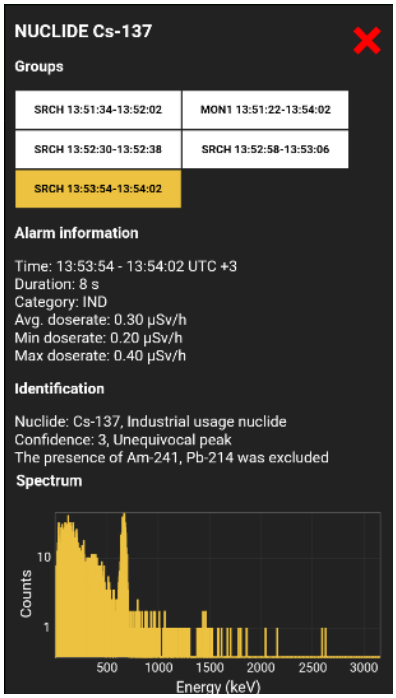
Fig. 7-4 Saving the spectra to the database

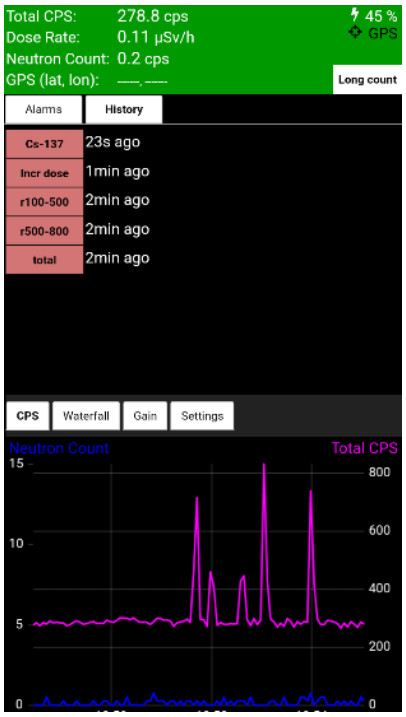
Tab. 7-8 Re-viewing the long count via link

Re-viewing the Long Count via Link		
Action	**Description**	**Picture**
1	When the long count is stopped the long count measurement link “Measurement” appears to the Long Count view.	
2	The measurement spectra can be viewed and saved by pressing the Measurement-link.	
3	The spectra will open into a new window. It is possible to zoom in the spectra, view the energy values and save the spectra to the database.	

7.5 Viewing the Alarms and the Alarm History on Remote Control Unit

Tab. 7-9 Viewing the Alarms and the Alarm history on Remote Control Unit

Viewing the Alarms and the Alarm History		
Action	**Description**	**Picture**
1	When an alarm is triggered the bar in the main screen of the Remote Control Unit will turn red and alarm (nuclide) type will be displayed in the Alarms view	
2	By clicking the alarm name, a dialog with more detailed information will open	

Viewing the Alarms and the Alarm History		
Action	**Description**	**Picture**
3	All acknowledged alarms are displayed in the history view and their information can be viewed here	

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8 Using the Spartan Pack Solo

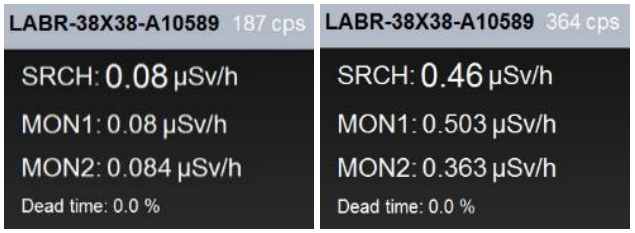
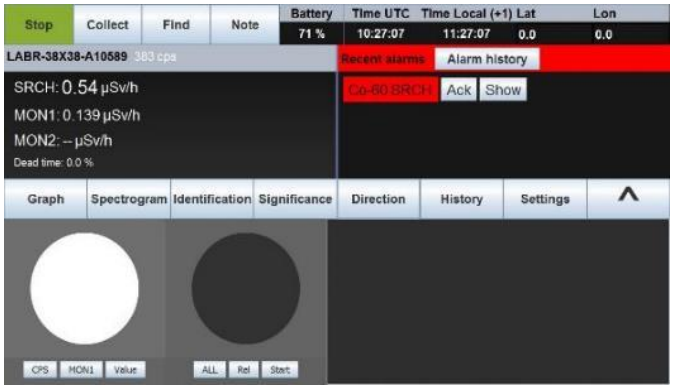
The Spartan Pack Solo is an add-on device that offers spectrometric radiation source locating for Spartan Pack.

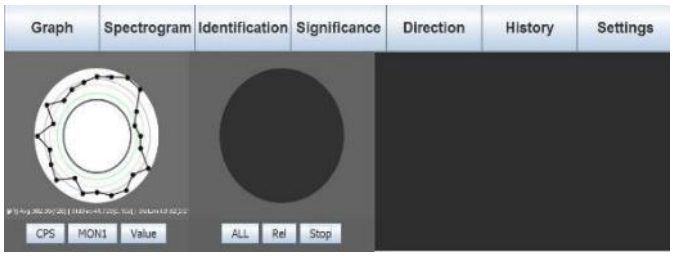
The Spartan Pack Solo can be fully operated via the Spartan Pack Software; from the tablet computer and the mobile phone.

Note: Make sure the Spartan Pack backpack is in upright position before operating with the Spartan Pack Solo.

8.1 Direction Tab of the Spartan Pack Software

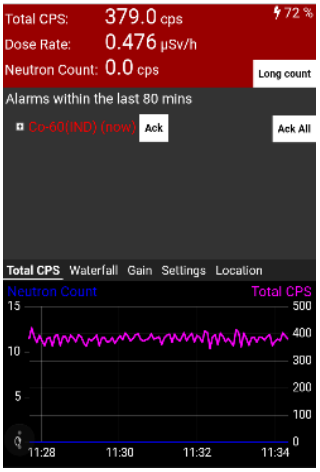
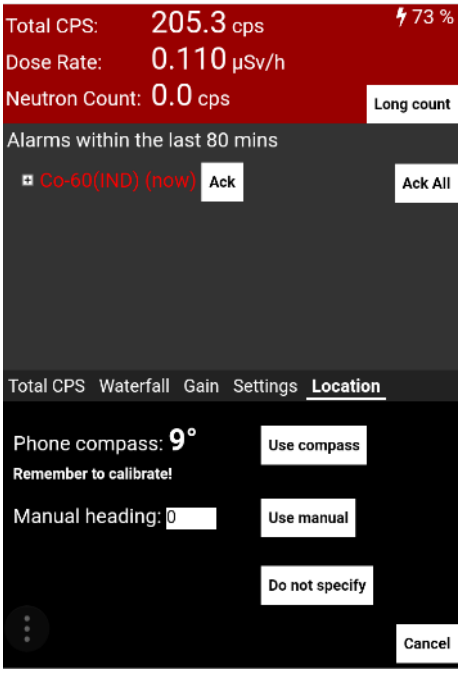
Tab. 8-1 Direction tab of the Spartan Pack software

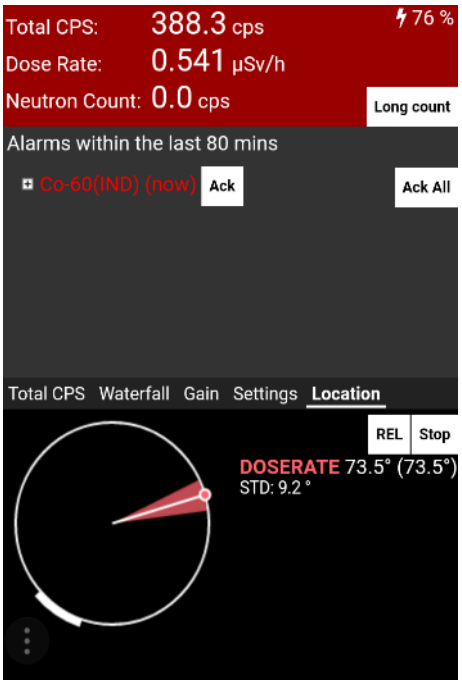
Direction Tab of the Spartan Pack Software		
Action	**Description**	**Picture**
	Note: Before starting the radiation source locating make sure that the radiation level has grown high enough. Radiation level has to be at least two times the background radiation's CPS or dose rate value	
1	Click on '**Direction**' tab	
2	Start-up the Spartan Pack Solo device by '**Start**' button in '**Location**' tab	
3	The spectrum collection and calculation of the radiation source direction begins	
4	The measurement algorithm process is shown in a white circle	

Direction Tab of the Spartan Pack Software		
Action	**Description**	**Picture**
5	It is possible to view different algorithm modes (USER, SRCH, MON1, MON2) during the measurement algorithm process by clicking the middle button under the white circle It is also possible to change the algorithm ROI area view from 'CPS' to ROI areas or dose rate by clicking the left button under the white circle	
6	The Spartan Pack software presents the compass direction and the cone, for pointing the direction of the source	
7	Relative view of direction information can be changed to compass representation by pushing the **'REL'**-button	
8	When multiple radiation sources are detected, they are shown in different colours	
9	Stop the radiation source locator device by pressing the '**Stop**' button **Note:** The settings of the compass can only be specified in the **'Location'** on a mobile phone	

8.2 Location Tab of the Spartan Pack Web Service Software

Tab. 8-2 Location tab of the Spartan Pack Web Service Software

Location Tab of the Spartan Pack Web Service Software		
Action	**Description**	**Picture**
Note: Before starting the radiation source locating make sure that the radiation level has grown high enough. Radiation level has to be at least two times the background radiation's CPS or dose rate value		
1	Press the **'Location'** tab	
2	Start-up the Spartan Pack Solo device by pressing the '**Start**' button in the '**Location**' tab.	
3	Specify compass for use: • Press **'Use Compass'** button to use phone's compass • In order to use an external compass, specify the compass value in the **'Manual heading'** field and press **'Use manual'** • Press **'Do not specify'** button to use the device without compass. **Note**: If '**Use compass**' will be selected make sure the cell phone's compass is calibrated. To do this, rotate the phone in the air in figure eight pattern.	
4	The Spartan Pack software presents the compass direction and the cone pointing to the direction of the source	
5	Relative view of direction information can be changed to compass representation by pushing the **'REL'**-button	

Location Tab of the Spartan Pack Web Service Software		
Action	**Description**	**Picture**
6	Stop the radiation source locator device by pressing the '**Stop**' button **Note**: If the Spartan Pack is a part of the Enviscreen Operix system, '**Stop**' button also stops sending the radiation source locator information for the Operix software.	

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9 Maintenance

Spartan Pack has been designed to be rugged and reliable, and has only a small number of maintenance actions that can be performed at the Operator level.

Normal Operator maintenance actions are:

- Inserting/Removing the SIM Card or the microSD Memory Card of the Tablet Computer
- Replacement of the Battery of the Tablet Computer
- Calibration Check
- Cleaning the device

CAUTION
The device must be turned off during maintenance work unless otherwise indicated.
Maintenance may ONLY be performed by the technicians trained by WB Johnson Instruments. Maintenance performed without training by WB Johnson Instruments will void the warranty. Detailed instructions to perform maintenance are provided in training. Supplies to perform maintenance are available from WB Johnson Instruments. Supplies to perform maintenance are available from WB Johnson Instruments.

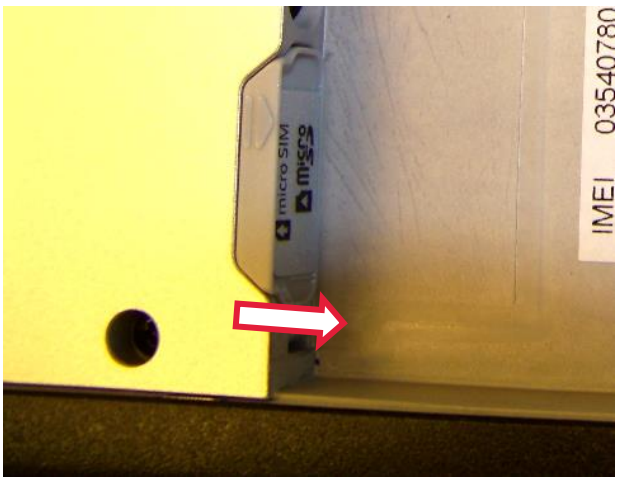
9.1 Inserting / Removing the SIM card or the microSD Memory Card of the Tablet Computer

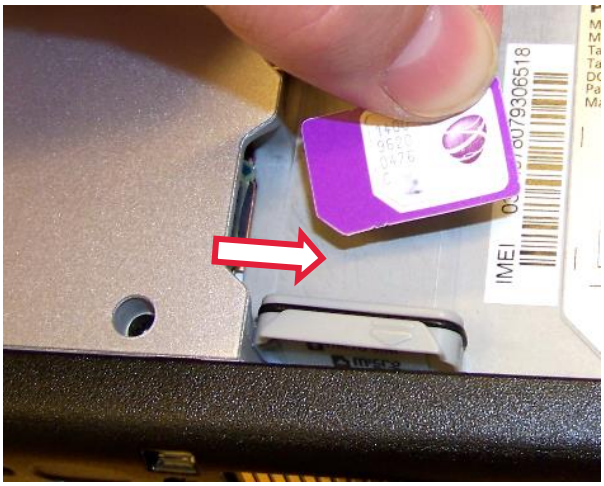
Tab. 9-1 Preliminary information for replacing the SIM card / microSD memory card

PRELIMINARY INFORMATION
Required Spare Parts: None
Required Tools: None
Preliminary Tasks: Disconnect the device from its power source Decontaminate the device if it has been exposed to hazardous material. See chapter 9.5: Decontamination for decontamination instructions
Final Tasks: Connect the device back to its power source Dispose properly of all waste
Warnings and Precautions: Perform the task in an ESD-protected environment 

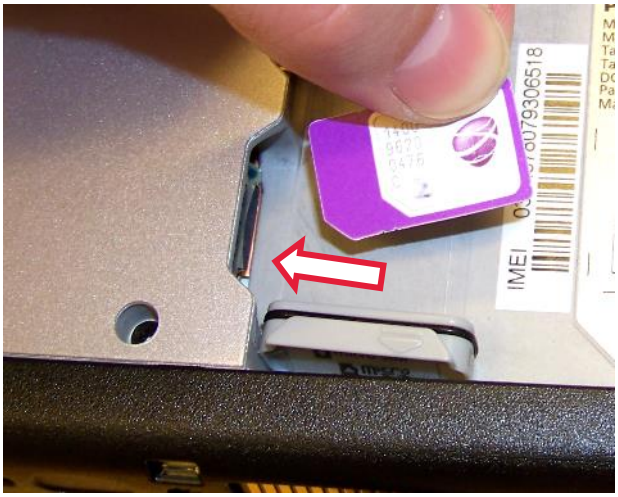
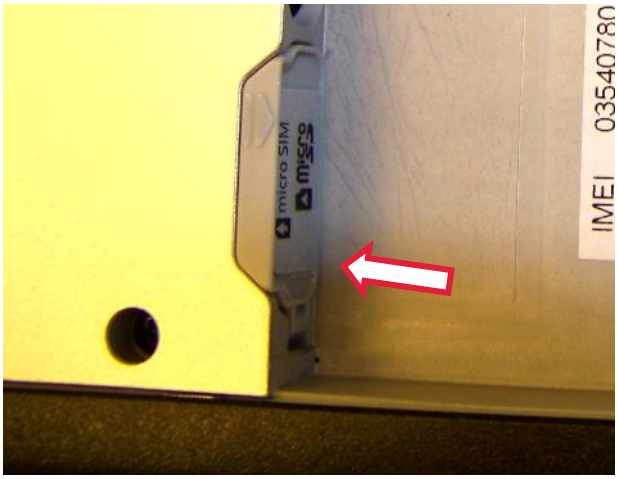
Tab. 9-2 Removing the SIM card / microSD memory card

DISASSEMBLY		
Action	**Description**	**Picture**
1	Shutdown the Spartan Pack	
2	Open the fastening straps of the computer pocket	
3	Take the computer out from the pocket	

DISASSEMBLY		
Action	**Description**	**Picture**
4	Disconnect the power cable of the USB hub (?)	
5	Slide the battery latch down and remove the battery pack	
6	Open the cover of the SIM and microSD card slot	

DISASSEMBLY		
Action	**Description**	**Picture**
7	Remove the SIM card or the microSD memory card	

Tab. 9-3 Inserting the SIM card / microSD memory card

ASSEMBLY		
Action	**Description**	**Picture**
1	Insert the SIM card or the microSD memory card	
2	Close the cover of the SIM card and microSD card slot	
3	Insert the battery pack until it securely fits the connector and lift the battery latch up	

ASSEMBLY		
Action	**Description**	**Picture**
4	Connect the USB hub power cable (?)	
5	Put the computer back to the pocket	
6	Close the fastening straps of the computer pocket	

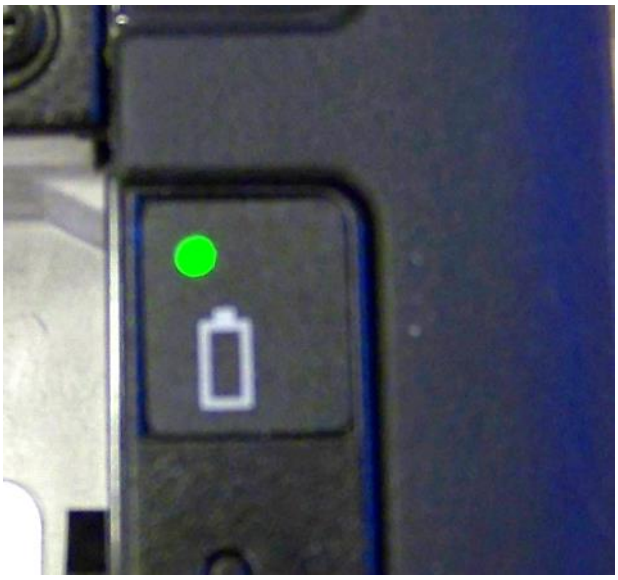
ASSEMBLY		
Action	**Description**	**Picture**
7	Turn on the Spartan Pack	

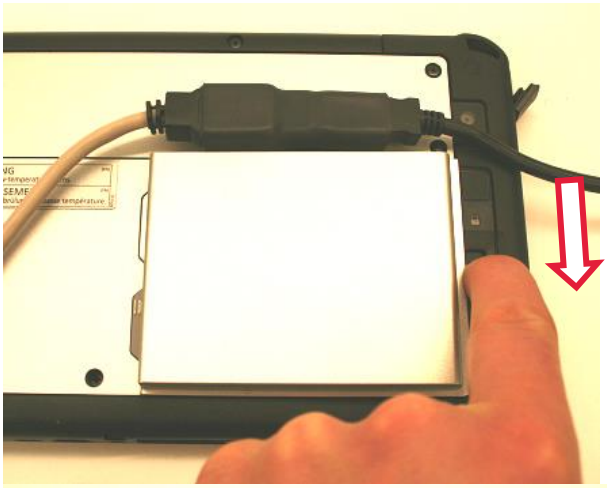
9.2 Replacement of Battery of the Tablet Computer

Tab. 9-4 Preliminary information for replacing the battery of the tablet computer

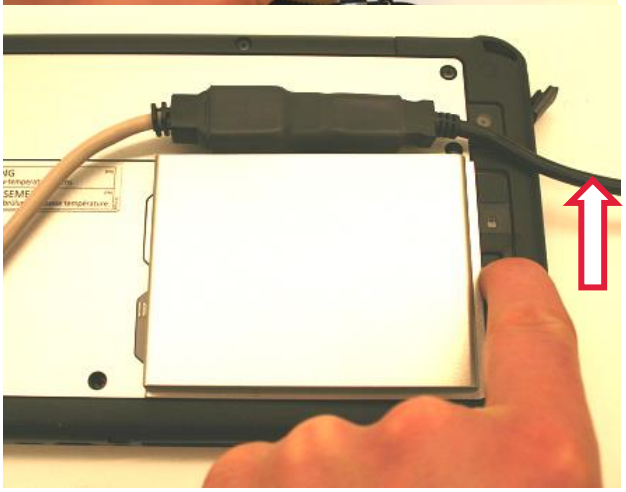
PRELIMINARY INFORMATION
Required Spare Parts: E10284 Battery Pack for Toughpad Computer
Required Tools: None
Preliminary Tasks: Disconnect the device from its power source Remove the Tablet Computer from the backpack Decontaminate the device if it has been exposed to hazardous material. See chapter 9.5: Decontamination for decontamination instructions
Final Tasks: Insert the Tablet Computer to the backpack Connect the device back to its power source Turn the device on Dispose properly of all waste
Warnings and Precautions: Perform the task in an ESD-protected environment 

Tab. 9-5 Removing the battery of the tablet computer

DISASSEMBLY		
Action	**Description**	**Picture**
1	Open the fastening straps of the computer pocket	
2	Take the computer out from the pocket	
3	The battery is hot swappable, meaning the internal battery of the computer will keep the device powered on for approximately one minute even without the removable battery. Check that the battery indicator on the rear of the computer doesn't light red. If the battery indicator lights red then shut down the computer before replacing the battery pack	

DISASSEMBLY		
Action	**Description**	**Picture**
4	Slide the battery latch down and remove the battery pack	 

Tab. 9-6 Assembling the battery of the tablet computer

ASSEMBLY		
Action	**Description**	**Picture**
1	Insert the new battery pack until it securely fits the connector and slide the battery latch up	 
2	Put the computer back to the pocket	

ASSEMBLY		
Action	**Description**	**Picture**
3	Close the fastening straps of the computer pocket	

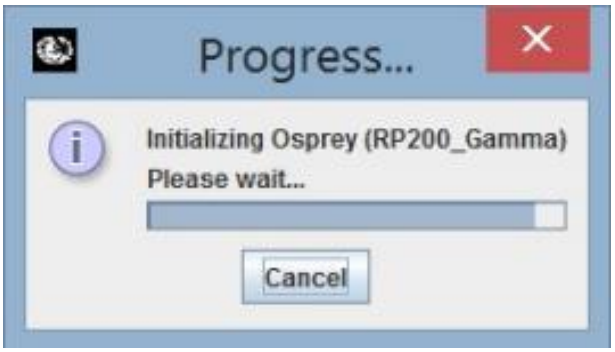
9.3 Calibration Check

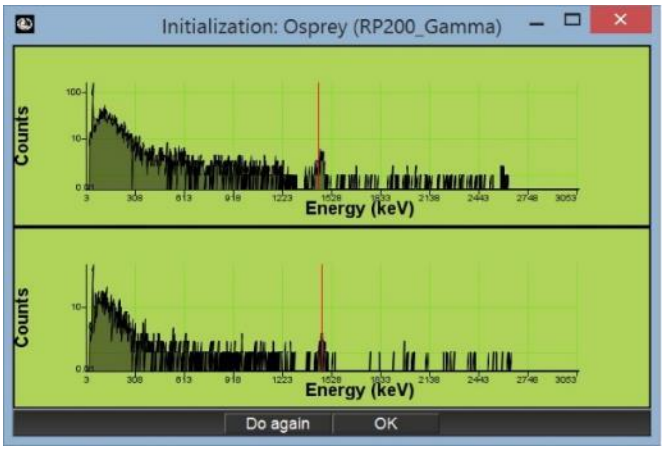
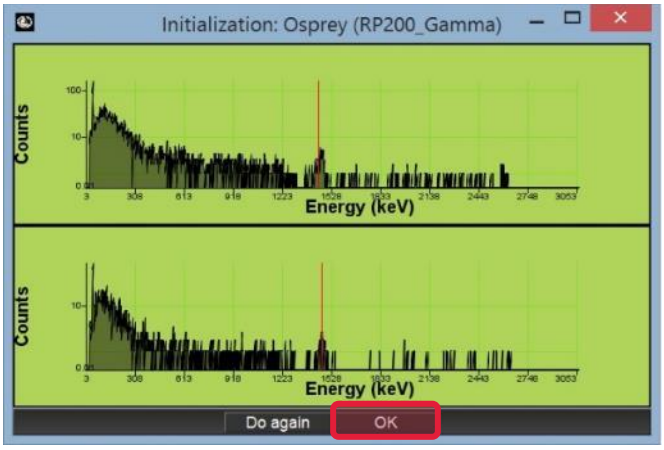
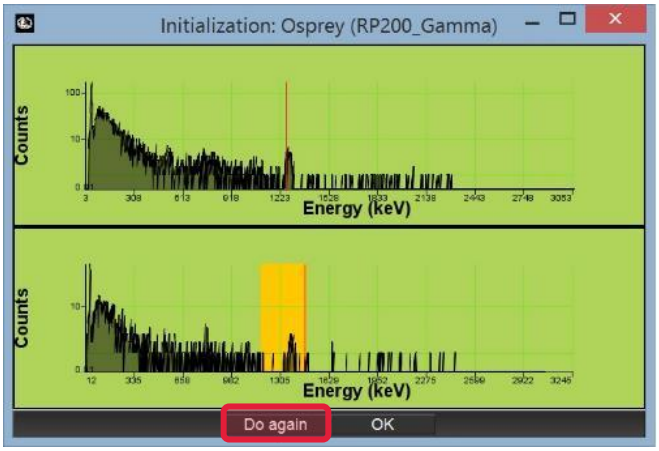
With the calibration check state of the energy calibration and the crystal condition of the gamma detectors will be verified. Spartan Pack measurements data is reliable only when the calibration check is completed successfully. If the calibration check does not pass, then the energy calibration must be done. If the crystal condition check is pointing that the crystal has poor resolution, the performance of the crystal has reduced and replacing it is recommended.

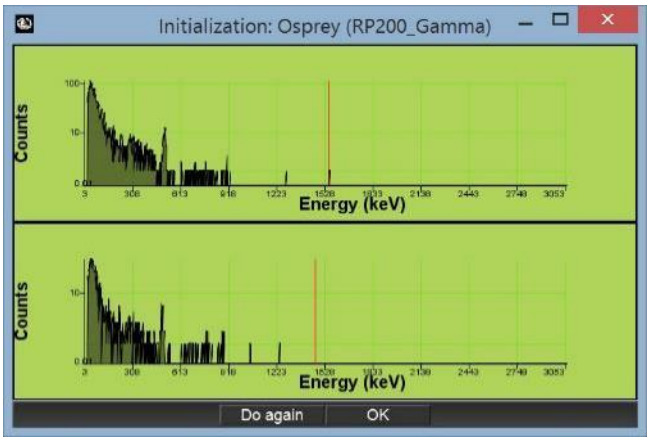
The calibration check is divided into three steps: In the first step energy calibration is initialized, in the second step the gain adjustment of energy calibration is carried out and in the third step the energy calibration will be checked and the condition of the gamma detector's crystal will be verified. The calibration check only applies for the gamma detectors.

9.3.1 Step 1 – The Initialization of Energy Calibration

Tab. 9-7 Step 1 – The initialization of energy calibration

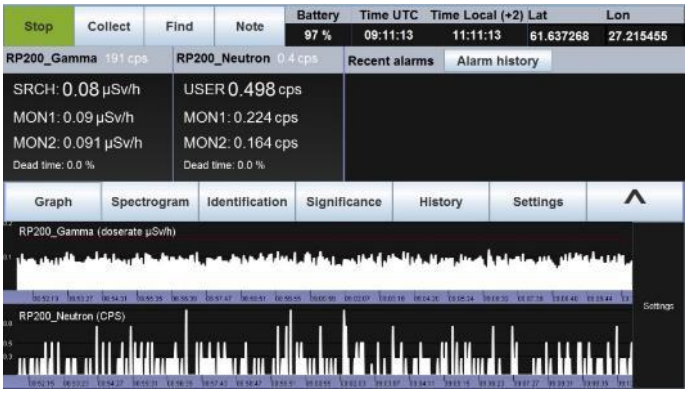
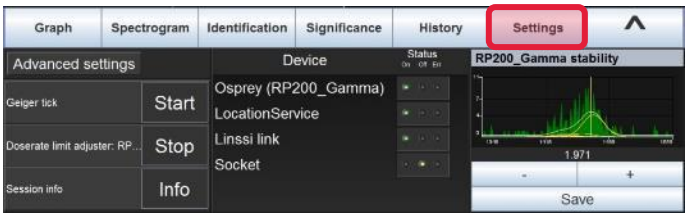
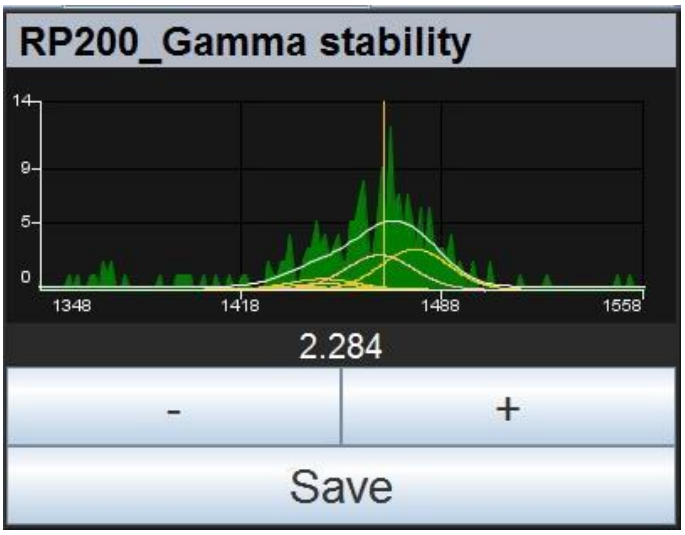
CALIBRATION CHECK – Step 1		
Action	**Description**	**Picture**
1	Start up the Spartan Pack	
2	Adjusting the energy calibration of the gamma detector is displayed on the initialization window	

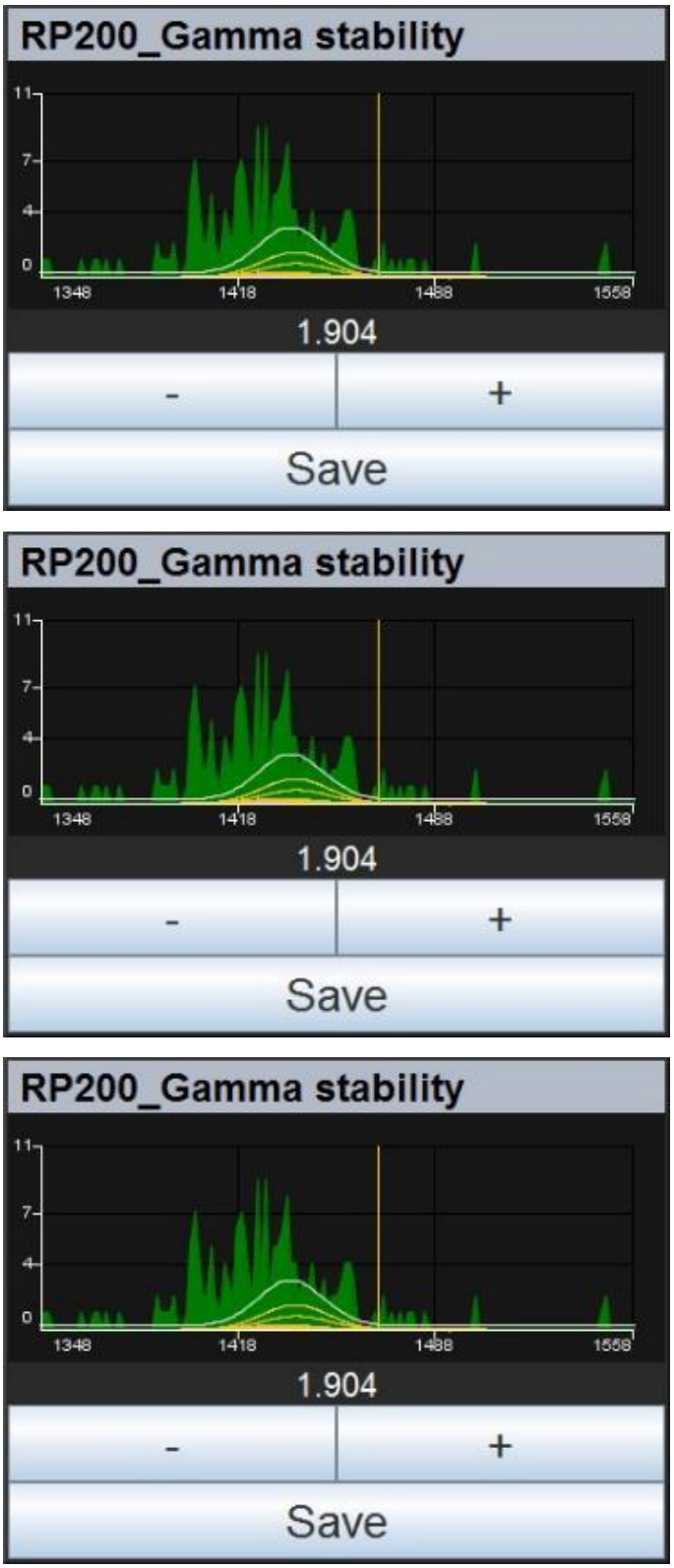
CALIBRATION CHECK – Step 1		
Action	**Description**	**Picture**
3	Visually check that the red line is on correct energy on both displayed spectra. Correct energy for NaI(Tl) scintillation detector is 1460.8keV and 1468keV for $LaBr_3$ scintillation detector	
4	If the energy calibration is satisfactory, press the '**OK**' button to dismiss the initialization dialog and **move onto the step 2 in the calibration check**	
5	If the red line is on different energy the lower spectrum then the process will have to be repeated. Do this by painting an area containing the correct energy in the lower spectrum and press the '**Do again**' button If necessary, the **'Do again'** procedure can be repeated	

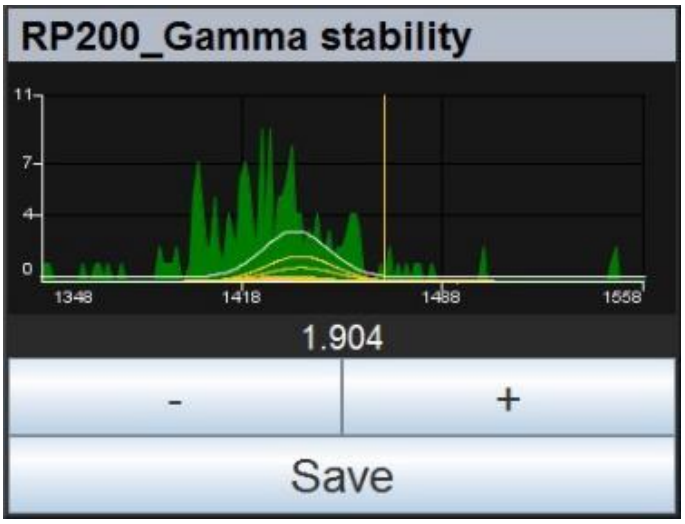
CALIBRATION CHECK – Step 1		
Action	**Description**	**Picture**
6	Note: If on the upper spectrum the energy calibration peak differs too much to the set point, the gain adjustment won't be enough to correct the situation and there is no reason to continue forward. Restart the device and start from the beginning If this does not resolve the issue, then likely the gamma detector settings are false **and the setting file must be replaced** If the issue still persists after replacing the setting file, **calibration check is rejected and the detector must be calibrated**	

9.3.2 Step 2 - Gain Adjustment of the Energy Calibration

Tab. 9-8 Step 2 – Gain adjustment of the energy calibration

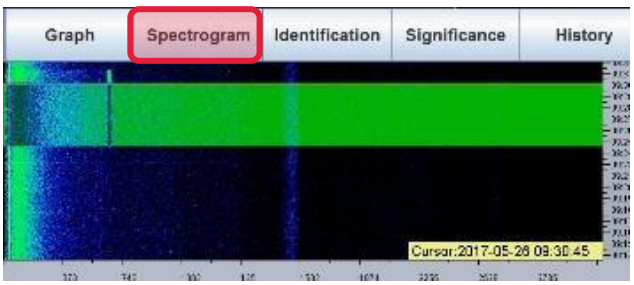
CALIBRATION CHECK – Step 2		
Action	**Description**	**Picture**
1	The data collection will begin automatically after the detector initialization and the main window will switch the current view to the main view	
2	Click on **'Settings'** tab	
3	In the '**Settings**' tab, check the state of the energy peak in the stability view The correct place of the energy peak is marked by yellow line in the stability view The energy peak is correct if the highest point of the peak hits to the yellow line with energy value **1468 keV** for the **$LaBr_3$ detector** and the **NaI(Tl) detector** at **1460.8 keV**	
4		

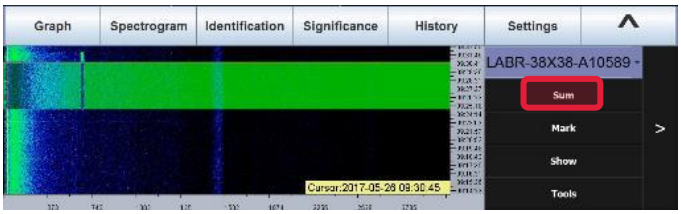
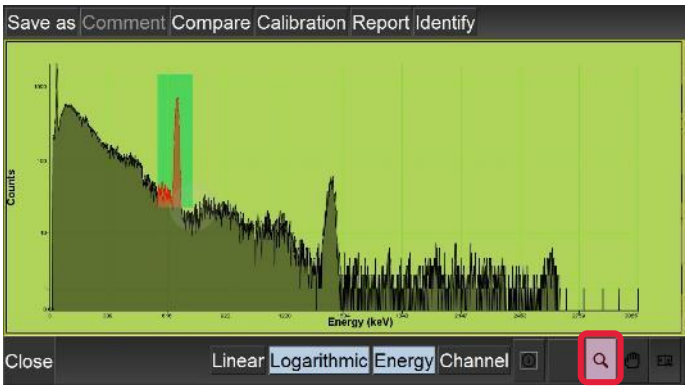
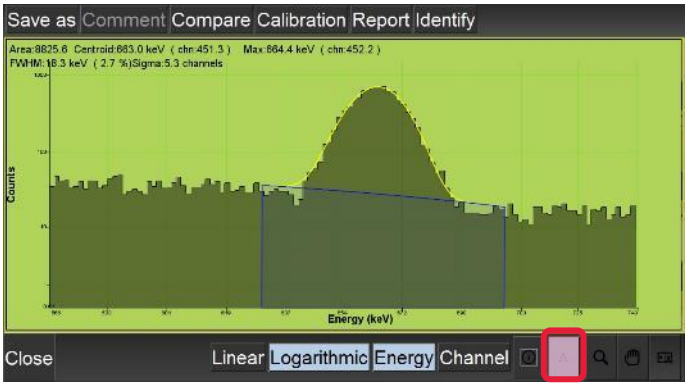
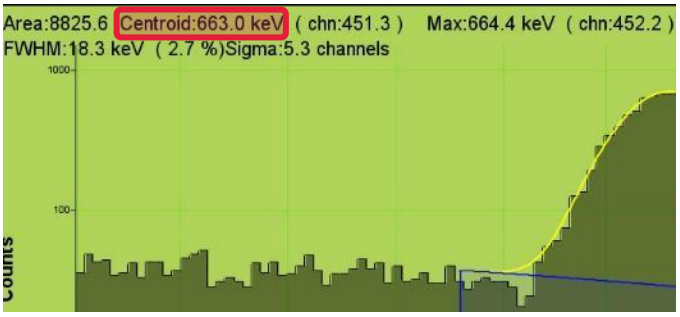
CALIBRATION CHECK – Step 2		
Action	**Description**	**Picture**
5	**Note:** If the peak's highest point does not hit the yellow line, **the gain adjustment must be done** **The gain adjustment:** The energy calibration peak can be adjusted by changing the value of the gain. Gain value can be decreased and increased by pushing the **"-"**- and **"+"** -buttons. If the energy calibration peak must be moved to the right the gain value must be decreased. If the peak must be moved to the left the gain value must be increased. Gain value can be saved by pushing **'Save'** button	

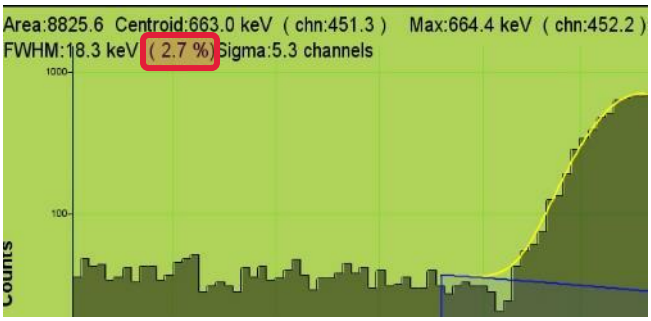
CALIBRATION CHECK – Step 2		
Action	**Description**	**Picture**
6	**Note:** If the energy calibration peak does not show in the stability view then there is no reason to continue to next step. **The process must be restarted from the beginning, from step 1** If the issue will not be resolved, then the energy calibration is bad and the detector must be calibrated	

9.3.3 Step 3 – Check of the Energy Calibration and the Gamma Detector's Condition

Tab. 9-9 Step 3 – Check of the energy calibration and the gamma detector's condition

CALIBRATION CHECK – Step 3		
Action	**Description**	**Picture**
1	Energy calibration and condition of the gamma detector is tested with Cs-137 source	
2	Insert Cs-137 source approximately 10 cm away from the gamma detector	
3	Click on **'Spectrogram'** tab and wait five minutes. During this time the test measurement will be generate sufficient measurement data	

CALIBRATION CHECK – Step 3		
Action	**Description**	**Picture**
4	Press and drag on the display area and click **'Sum'** button to view the spectrum of the test measurement	
5	Use the **Zoom tool** (symbol of magnifying glass) to zoom in the peak of the **Cs 137** nuclide in the spectrum viewer Click on the '**Zoom'** button to use zooming. Press and drag on the area of the peak to zoom into the peak of the **Cs-137** nuclide	
6	Use the '**Gaussian-tool'** (symbol of wave) to get the energy value and the energy resolution value of the **Cs 137** nuclide With the '**Gaussian tool'** selected, click next to the peak and drag along the baseline to the other side of the peak	
7	Compare the energy value of the peak to acceptance limit values Acceptance limit is: **Cs-137, 662 keV ± 3 keV** When the energy value of the peak is inside acceptance limit values, then **the calibration check is approved** **Note:** If the acceptance limit is not reached, **then the calibration check is rejected.** **In this case the energy calibration must be done**	

CALIBRATION CHECK – Step 3		
Action	**Description**	**Picture**
8	Crystal condition can also be verified with the '**Gaussian tool'** Compare the energy resolution value made by the '**Gaussian tool'** to acceptance limit values	
9	The $LaBr_3$ gamma detector's acceptance limit is: **3,6% FWHM @ 662 keV , Cs137** The NaI(Tl) gamma detector's acceptance limit is: **9% FWHM @ 662 keV , Cs137** Energy resolution is good for the gamma detector when the energy resolution is less than acceptance limit values.	Specification: < 3% FWHM @ 662keV ($LaBr_3$) — Actual: 2.7% FWHM @ 662keV Specification: < 7.5% FWHM @ 662keV (NaI) — Actual: 6.7% FWHM @ 662keV

9.4 Cleaning

The collection of dirt or other organic materials (Waxes, solvents, etc.) on the surface of the device can degrade its detection capabilities. Ensure that the device is kept clean.

Cleaning lightly stained surfaces:

1. Wipe the external surfaces of the device using a towel dampened with solution containing water and soap or unscented dish washing liquid
    - After drying, the device is ready to be operated again

NOTE

Ensure that during cleaning the Spartan Pack is powered off

WARNING

Do not submerge the device in solution. Do not use other solvents or cleaning agents other than a mild soap water solution or other odorless cleaning agents.

WARNING

Do not spray liquid to the inlets, outlets or connectors.

9.5 Decontamination

Decontamination is generally a combination of mechanical, physical and chemical cleaning methods. The collection of dirt or other organic materials (Waxes, solvents, etc.) on the surface of the device can degrade its detection capabilities. Ensure that the device is kept clean.

Needed materials and tools for general decontamination:

- Hand-operated sprayer
- Several disposable gloves
- Cleaning tissues/towels

Decontaminating lightly contaminated surfaces:

1. Wipe the external surfaces of the device using a towel dampened with solution containing water and soap or unscented dish washing liquid
    - After drying, the device is ready to be operated again

More specialized cleaning methods are described in following chapters.

WARNING
Do not spray liquid to the inlets, outlets or connectors.
Do not use high-pressure cleaning equipment, only hand-operated sprayers.
The towels and water should be treated as hazardous waste and handled according to all national laws and regulations.

NOTE
Ensure that the Spartan Pack is powered off during cleaning.
Decontamination procedures should be performed outdoors or in well-ventilated rooms.
Decontamination procedures should be performed while wearing an adequate level of protection.

9.5.1 Radiological Decontamination

Perform a systematic decontamination to thoroughly clean all of the contaminated parts. Pay attention to places where radioactive dust may stick. If it is not possible to clean a contaminated part, it will need to be changed. The disposal of contaminated parts should be handled according to local regulations.

Follow the instructions given by your own organization. Basically, all radiation exceeding the normal background radiation should be taken into account and be decontaminated according to instructions below.

Note: Remember that radiological decontamination does not destroy the radiation but only removes it from the surface.

Decontaminating surfaces:

1. Remove radiological contamination from surface by either using brush, wetted towel or vacuum cleaner
    - Change the disposable gloves and towels to avoid cross-contamination
    - Do not use pressurized air for cleaning to avoid dust dispersion
2. Wipe the external surfaces of the device using a towel dampened with solution containing water and soap or unscented dish washing liquid
    - Change the disposable gloves and towels to avoid cross-contamination
3. Monitor the decontamination result using an appropriate monitoring tool
4. Repeat the decontamination steps 1… 3 as required

It's recommended to use identifying radiation detector for deeper inspection due to differences in the harmfulness of different isotopes.

WARNING
Do not spray liquid to the inlets, outlets or connectors.
Do not use high-pressure cleaning equipment, only hand-operated sprayers.
The towels and water should be treated as hazardous waste and handled according to all national laws and regulations.

NOTE
Decontamination procedures should be performed outdoors or in well-ventilated rooms.
Decontamination procedures should be performed while wearing an adequate level of protection.

10 Troubleshooting

If the Spartan Pack senses a hardware of software failure it will stop and will not enter the normal operating mode.

Due to system's integrated design the user can perform only very limited maintenance. If the following solutions do not resolve the problem, it is recommended to contact authorized service or manufacturer.

In case of any doubt, return the instrument back to the authorized service or manufacturer unopened.

Tab. 10-1 Troubleshooting

Troubleshooting
Spartan Pack or Remote Control Unit will not start
Possible causes but are not limited to: ▪ Lack of Power
1. Check the power connections and power availability 2. Connect the AC adaptor 3. Insert a fully charged battery
If this does not resolve the issue, contact authorized maintenance or manufacturer for further instructions
Spartan Pack will not shut down
Possible causes include but are not limited to: ▪ Operating system of the tablet computer is in error mode
1. Remove the USB device and Express Card 2. Wait for a few minutes. Normally this is not a malfunction
If this does not resolve the issue, contact authorized maintenance or manufacturer for further instructions

The power is turned on, but the “Warming up the system" text appears

Possible causes include but are not restricted to:

- The computer is warming up before start up

1. Wait for the computer to start up (the maximum waiting time will be displayed on the screen)
2. If, “Cannot warm up the system” is displayed, the computer failed to warm up and does not start. In this case, turn off the computer, leave it in an environment of 5 °C or higher temperature for about an hour, and then turn on the power again

If this does not resolve the issue, contact authorized maintenance or manufacturer for further instructions

Spartan Pack will not communicate via Ethernet

Possible causes include but are not restricted to:

- Wrong IP address or wrong IP address space in network settings
- Ethernet card of the tablet computer is broken

1. Check the network settings

If this does not resolve the issue, contact authorized maintenance or manufacturer for further instructions

Spartan Pack will not communicate via 4G LTE network

Possible causes include but are not restricted to:

- The signal level of the 4G LTE network is weak
- SIM card is not assembled
- PIN code is incorrect or not entered
- 4G LTE modem configurations are not correct
- Wireless Ethernet switch of the tablet computer is off

1. Check the signal level of the 4G LTE network
2. Check the SIM card and PIN code
3. Check the 4G LTE settings

If this does not resolve the issue, contact authorized maintenance or manufacturer for further

Spartan Pack-software does not detect the Gamma or Neutron Detectors during the start-up process
Possible causes but are not restricted to: ▪ USB connector is disconnected
1. Shut down the Spartan Pack-software 2. Plug in the USB connectors 3. Start up the Spartan Pack-software
If this does not resolve the issue, contact manufacturer for further instructions
Tablet computer does not recognize the connected detector
Possible causes include but are not restricted to: ▪ USB drivers of the tablet computer are in the error state
1. Restart Spartan Pack
If this does not resolve the issue, contact manufacturer for further instructions
Spartan Pack gives wrong nuclide alarms and alarming even if the ambient radiation level is low
Possible causes but are not limited to: ▪ The automatic startup calibration is adjusted wrong or calibration is not correct
1. Restart the device
If this does not resolve the issue, calibration check must be done. See the chapter 9.3: Calibration Check for instructions. Otherwise contact authorized maintenance or manufacturer for further instructions

Automatic start up calibration sequence does not find the correct position

- La-138 / K-40 peak @1468keV or
- NaI(Tl) / K-40 peak @ 1460,8kev

Possible causes include but are not limited to:

- Spartan Pack has been started in higher or lower temperature that normally
- Spartan Pack has been started in elevated radiation field and it has detected another nuclide peak
- Scintillation detector has encountered severe shock or vibration
- Detector has been damaged

1. If the detector is LaBr3: Select the correct La-138 / K-40 peak @1468keV peak and repeat the startup calibration
2. If the detector is NaI(Tl): Select the correct K-40 peak @1460,8keV peak and repeat the startup calibration
3. If this does not resolve the issue then calibration check must be done. See Chapter 9.3: Calibration Check for instructions

If this does not resolve the issue, contact authorized maintenance or manufacturer for further instructions

GPS does not start in Spartan Pack software

Possible causes include but are not restricted to:

- GPS receiver does not get the signal from GPS satellites or the signal strength is not adequate
- GPS receiver does not start in startup process of the operating system

1. Move the Spartan Pack to the better position to maximize the GPS signal
2. Restart the Spartan Pack

If this does not resolve the issue, contact authorized maintenance or manufacturer for further instructions

Remote Control Unit does not connect to the Spartan Pack

Possible causes include but are not restricted to:

- WI-FI “AdHoc” network in disabled Ethernet card of the tablet computer is broken
- Remote Control Unit is out of range of the WI-FI
- IP-address and port setup is wrong in the Remote Control Unit

1. Check the WI-FI settings from the Tablet Computer and Remote Control Unit
2. Put the Remote Control Unit closer to the Spartan Pack
3. Restart the Spartan Pack and Remote Control Unit

If this does not resolve the issue, contact authorized maintenance or manufacturer for further instructions

11 Optional Accessories

Table below shows the optional accessories.

Tab. 11-1 Optional accessories

Optional accessories	Item No.
H^3 free ^6Li: ZnS (Ag) Neutron Detector	E11827000
USB Hub	E10565000
Spartan Pack Solo Radiation Source Locator Device	E12970000
Modem 4G	E13533000

11.1 Neutron Detector

The Spartan Pack can be equipped with optional H^3 free ^6Li:ZnS(Ag) flat panel neutron detector. The detector can be connected to Spartan Pack computer via universal serial bus (USB) cable. Detector is packed to the IP65 classified aluminium case.

11.1.1 Technical Information

- **Name:** Neutron Detector
- **Size:** (H x W x L)**:** 25 mm x 220mm x 235mm (1.0” x 8.7” x 9.3”)
- **Weight:** 1,2 kg (2.65 lbs)
- **Operational Temperature:** -20°C…+55°C
- **Storage Temperature:** -20°C…+55°C
- **Power:** USB (+5VDC)
- **Connections:** USB
- **Detector Type:** H^3 free ^6Li: ZnS (Ag) Detector

11.1.2 Key Elements

Tab. 11-2 Key elements of Neutron Detector

Key elements of Neutron Detector
1. Detector Case
2. USB Connection Cable

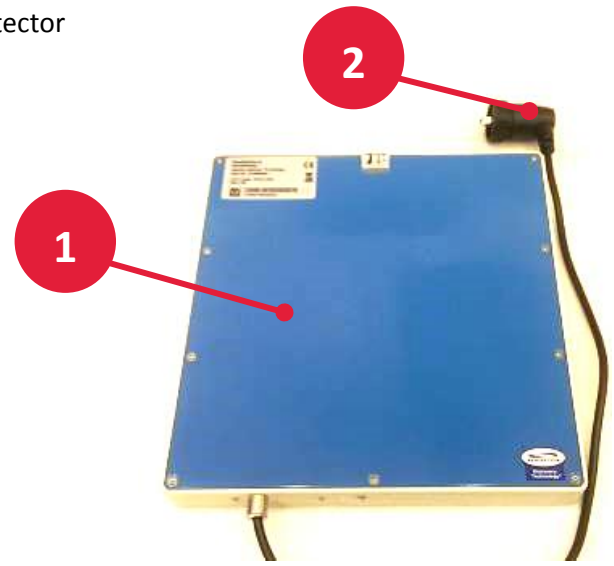


Fig. 11-1 Neutron detector

11.2 USB Hub

Spartan Pack must be equipped with optional USB Hub, if device includes neutron detector or the Spartan Pack Solo. USB Hub offers three standard USB 2.0 ports. One port is reserved for neutron detector, one port is reserved for gamma detector and one port is reserved for the Spartan Pack Solo. USB Hub is powered by the tablet computer USB when the connection cable is installed.

11.2.1 Technical Information

- **Name:** Spartan Pack USB Hub 3 ports
- **Size** (H x W x L): 42mm x 80mm x 125mm (1.7” x 3.1” x 4.9”)
- **Weight:** 0,5 kg (1.1 lbs)
- **Operational Temperature:** -20°C…+50°C
- **Storage Temperature:** -20°C…+60°C
- **Input Power:** USB power from computer

11.2.2 Key Elements

Tab. 11-3 Key elements of USB Hub

Key elements of USB Hub
1. Connector for Tablet Computer
2. Connector for the Spartan Pack Solo
3. Connector for Gamma Detector
4. Connector for Neutron Detector

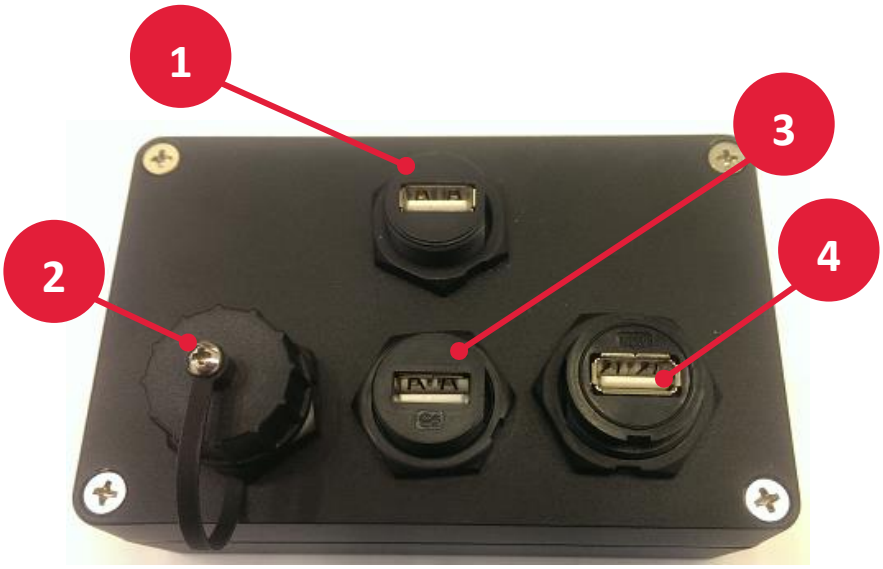


Fig. 11-2 USB hub

11.3 Key Elements of the 4G Modem

11.3.1 Technical Information

In order to access wireless network for data transferring, a modem has to be used.

11.3.2 Key Elements

Tab. 11-4 Key elements of 4G Modem

Key elements of 4G Modem
1. Cover of the Modem Case
2. 4G Modem
3. USB Port
4. USB connection cable

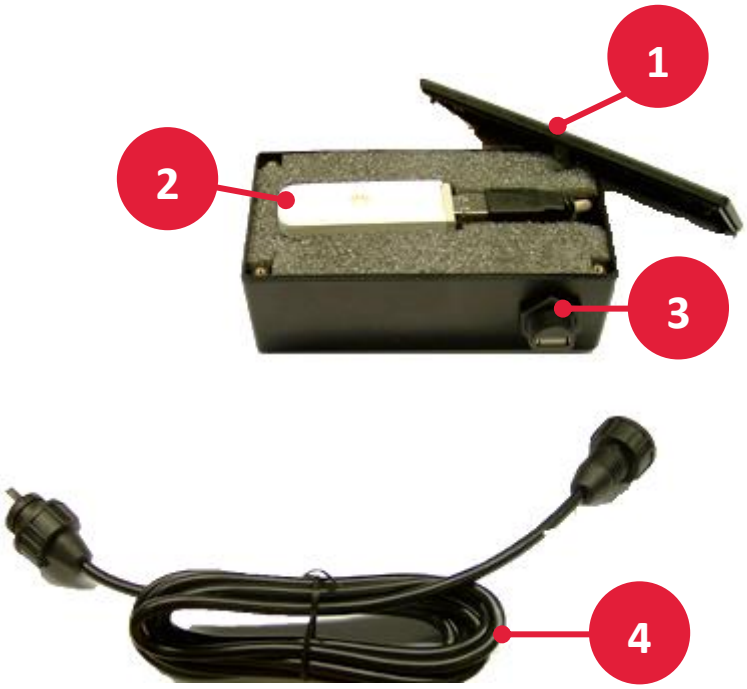


Fig. 11-3 Key Elements of the 4G Modem

11.4 Spartan Pack Solo

The Spartan Pack can be equipped with optional radiation source locator device. The Spartan Pack Solo device detects sources of gamma radiation and calculates the radiation source direction. The Spartan Pack Solo can be connected to Spartan Pack computer via universal serial bus (USB) cable.

11.4.1 Technical Information

- **Name:** Spartan Pack Solo
- **Size** (H x W x L): 130 mm x 135 mm x 270 mm (5.1” x 5.3” x 10.6”)
- **Weight:** 1,2 kg (2.64 lbs)
- **Operational Temperature:** -20°C…+50°C
- **Storage Temperature:** -20°C…+60°C
- **Input Power:** USB (+5VDC)
- **Connection:** USB

11.4.2 Key Elements

Tab. 11-5 Key elements of Spartan Pack Solo

Key elements of Spartan Pack Solo
1. Gamma Detector
2. USB Connection cable
3. USB Connector
4. Place for Gamma Detector

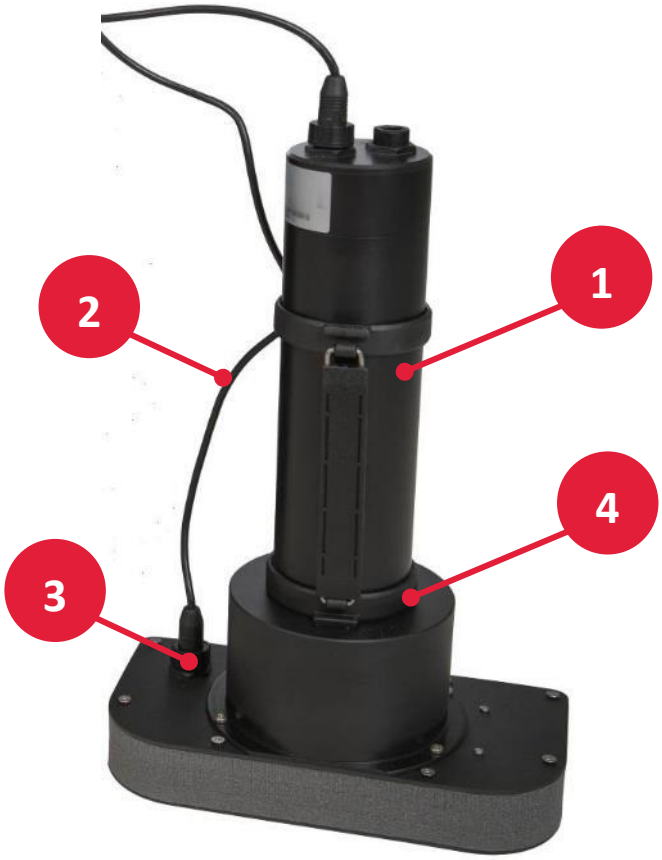


Fig. 11-4 Spartan Pack Solo source locator device

12 Products Pre-Service Declaration Form

You can request the products pre-service declaration form from customer.services@environics.fi and fill it according to the instructions provided within. Alternatively, you can fill it at http://www.environics.fi/pre-service-declaration-form/.

Before sending products to WB Johnson Instruments for service, you must inform the company of the hazardous substances you have used or measured with our product. This information is fundamental for the safety of our service employees and will determine the procedures employed to service your equipment.

The pre-service declaration has to be completed and a copy must be sent via email, fax or post. You can declare multiple equipment's with one form, if they have been in contact with the same substances.

After reception of the completed form, WB Johnson Instruments will contact you and give you an **RMA** number (Return Material Authorization) and instructions on delivering the device(s) to service. Attach one copy of the filled form including the **RMA** number with the device(s) to be sent to WB Johnson Instruments.
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