

OBELAB



NIRSIT LITE

**User
Manual**

Before Using Our Product

Thank you for purchasing NIRSIT-Lite. NIRSIT-Lite is functional Near-Infrared spectroscopy device made by OBELAB Inc. It is a device designed to measure variations in cerebral blood oxygen saturation by radiating a near-infrared light beam, at two wavelengths of 780 nm and 850 nm, into the cerebral cortex. The device radiates a LED light with a output of 1 mW or less which is harmless to the human body. The device comes with PC software you can use to monitor the distribution of cerebral oxygen saturation via multiple channels. This product comes in two versions: NIRSIT Lite for adults and NIRSIT Lite for children.

This user manual contains important information regarding the use of the device. Please read this manual carefully before using the device. Keep this manual within easy reach for future reference.

Please contact us if you have questions about this manual or the product purchased.

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- Email: contact@obelab.com
- Website: <http://www.obelab.com>
- Version: v1.0

Warranty and Liability

Warranty

OBELAB Inc. warrants the quality of this product as specified below

Warranty Service

Free repair service is provided within warranty period (1 year from the date of purchase) to the damaged device due to component failure during proper operation.

Charged Service

Service is charged when the following cases apply:

- 1 Out of warranty period
- 2 Within warranty period
 - a. Repairs resulting from natural disasters (lightning, fire, earthquake, storm, flood, etc.)
 - b. Repairs resulting from a device failure or damage caused by user mishandling (impact, dropping)
 - c. repairs resulting from old or worn out consumables (battery, cable, etc.) that need replacement
 - d. repairs resulting from a device failure due to unauthorized repair or modification
 - e. repairs resulting from the use of unauthorized components
 - f. repairs resulting from services performed by an unauthorized person or entity

Notice

For matters that are not specified in this document, the Act on Consumer Protection of Korea and relevant regulations on compensation for consumers shall apply. For other repairs and questions, please contact your dealer or the OBELAB Customer Support Center.

Request for service on a functioning device will result in service charges. Please read the User Manual.

This warranty is only valid in the Republic of Korea, and not to be re-issued. Please store the warranty in a safe place or send a scanned copy to OBELAB (contact@obelab.com).

For other repairs and any service-related questions, please contact your dealer or the OBELAB Customer Support Center.

Copyrights

This manual is the property of OBELAB Inc. and protected by copyright law. Unauthorized use or reproduction, in whole or part, is strictly forbidden.

Contents of this user manual are subject to change without notice, regarding changes to the performance or specifications of the device. For information on the device and user manual, please contact the OBELAB Customer Support Center.

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Table of Contents

Before Using Our Product	i
Warranty and Liability	ii
Copyrights	iii
History of Revision	iv
Table of Contents	v
1. Overview	1
1.1 Safety Instructions	1
1.1.1 User Qualification	1
1.1.2 Electrical Safety Instructions	1
1.1.3 General Safety Instructions	2
1.1.4 When cleaning the device	2
1.2 Symbols Used	3
1.3 Guideline for equipment disposal	4
1.4 Notation	5
2. Using NIRSIT-Lite	6
2.1 Names and Locations of Components	6
2.2 Basic Components	7
2.3 Battery	7
2.3.1 Charging the Battery	8
2.3.2 Checking Battery Level	9
2.4 Sensor Module Position	10
3. Before Using NIRSIT-Lite Software	11
3.1 Preparing to wear	11
3.1.1 Installing the Strap	11
3.1.2 Checking Operation Status	12
3.2 Turning on the device	12

3.3	Putting on the device	13
3.4	Installing the Software	14
3.5	Running the Software.....	14
3.6	Connecting to the device	15
4.	Using NIRSIT-Lite Software	17
4.1	PC Software Structure	17
4.2	Setting Serial Port	18
4.2.1	Connecting to Serial Port	18
4.3	Gain Calibration	20
4.4	MONITORING	21
4.4.1	MONITORING Mode Screen Overview.....	22
4.5	REPLAY	24
4.5.1	REPLAY Screen Overview	24
5.	Maintenance	25
5.1	Replacing Accessories and Components.....	25
5.1.1	Replacing Straps	25
5.2	Cleaning	25
5.2.1	Cleaning Silicone padded sensors	25
5.2.2	Cleaning NIRSIT-Lite	25
6.	Troubleshooting.....	26
7.	7. Product Specifications	27
7.1	Mechanical Characteristics	27
7.2	Technical Characteristics	27
7.3	Electrical Characteristics	28
7.4	PC Requirements.....	28
7.5	Environmental Requirements	28
8.	Appendix.....	29
8.1	Guidance and Manufacturer’s Declaration	29
8.1.1	Guidance and Manufacturer’s Declaration – Electromagnetic Emissions.....	29
8.1.2	Guidance and Manufacturer’s Declaration – Electronmagnetic Immunity	30

8.1.3	Guidance and Manufacturer's Declaration – Electromagnetic Immunity – Equipment & Systems that are NOT life supporting.....	31
8.1.4	Recommended separation distances between portable and mobile RF communications equipment and the system.....	32

1. Overview

1.1 Safety Instructions

Safety instructions are provided to ensure user safety and prevent property damage. Please read the following safety instructions and warnings before using the device.

- WARNING Symbol



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Failure to comply with a warning could result in severe damage to the device.

- CAUTION Symbol



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Failure to comply with a caution may result in damage to the device.

- IMPORTANT Symbol



Indicates instructions that users must observe or refer to. All users must check and follow the instructions.

1.1.1 User Qualification



To use the device, the user must

- Read and understand this user manual.
 - Understand the basic structure and features of the device.
 - Be able to detect abnormal operation and take appropriate measures.
 - Be at least 15 years old and have reading experience for at least five years.
 - Be capable of understanding numbers and languages without difficulty, have knowledge of oxygen saturation measurement principles, and have experience using the device or previous training.
-

1.1.2 Electrical Safety Instructions



- Always check the condition of the power supply, computer, tablet, and cable connections before using the device.
 - Ensure that the battery is not replaced by an unauthorized user. There is risk of overheating, fire, and explosion.
 - Do not disassemble the device for maintenance or repair when it is connected to a power supply.
-

⚠ CAUTION Make sure to turn off the device when it is not in use.

1.1.3 General Safety Instructions

⚠ WARNING

- Do not use the device in a place where there is a risk of explosion.
- Keep the device away from inflammables.
- Do not stare directly into the sensor unit or LED.
- Do not operate the device with wet hands.
- Do not arbitrarily disassemble, repair, or modify the device. Inspection and repair must only be performed by certified professionals. For technical support, please contact the nearest Customer Support Center.

⚠ CAUTION

- Do not use the device on a patient who has a stab wound on the forehead or who is undergoing surgery.
- Keep the device away from water, humidity, and/or contaminants.
- To ensure safety, follow the instructions described in this user manual when using the device.
- Never let the device drop. Do not expose the device to excessive shock.
- Always keep the device in the storage case when not in use.

IMPORTANT

This device is intended for research purposes only and must be used by researchers or personnel that have been sufficiently trained in its use.

- Use the device with the dedicated software.
- Use the device under indoor lighting condition.
- Ensure that a fire extinguisher is within reach.
- Use the device at optimal temperature (15-35°C) to ensure safe operation.
- Store the device away from direct sunlight.

1.1.4 When cleaning the device



⚠ WARNING Do not spray disinfectant on the device. Sprayed disinfectant can cause ignition.

⚠ CAUTION Do not use wet or damp clothes or spray cleaners. There is risk of electric shock and damage to the device.

1.2 Symbols Used

A list of symbols found in this manual and on the label on the device is shown below. It is important to understand these indications, and to follow the safety instructions.

Table 1-1 Symbols Used

Symbol	Name	Description
 WARNING	WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Failure to comply with a warning could result in severe damage to the device.
 CAUTION	CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Failure to comply with a caution may result in damage to the device.
IMPORTANT	IMPORTANT	Indicates instructions that users must observe or refer to. All users must check and follow the instructions.
NOTE	NOTE	Additional information that aids in device operation.

1.3 Guideline for equipment disposal



Figure 1-1 WEEE label (Directive 2002/96/EC)

Please dispose of the device according to your local regulations. The product contains components that can be recycled. Please recycle products to protect the environment. All of the product components, except for the battery, can be recycled. Plastic parts may be recycled, or burned in a controlled environment, depending on local laws.

NOTE

Please consult OBELAB, its resellers, or other disposal agencies for more information regarding disposal.

1.4 Notation

Notation is a series of special symbols or conventions used in this manual to denote different items.

This manual uses the following notation for users' better understanding of the device:

Table 1-2 Notation Used in the Manual

Notation	Decryption
“ ”	Used to denote a reference. Example: See "Chapter 1. Overview."
Bold	Used to denote GUI elements such as menus and buttons. Example: Click the STOP button.
>	Used to list several menus or buttons in sequence. Example: Click the STOP > OPEN buttons.
<ul style="list-style-type: none"> ▪ ABC ▪ ABC ▪ ABC 	Used to divide or list items of the same level in an organized way.
<ol style="list-style-type: none"> 1 ABC 2 ABC 3 ABC 	Used to describe a work procedure in order.
<ol style="list-style-type: none"> ① ② ③ 	Used to name or describe components of an image.

2. Using NIRSIIT-Lite

2.1 Names and Locations of Components

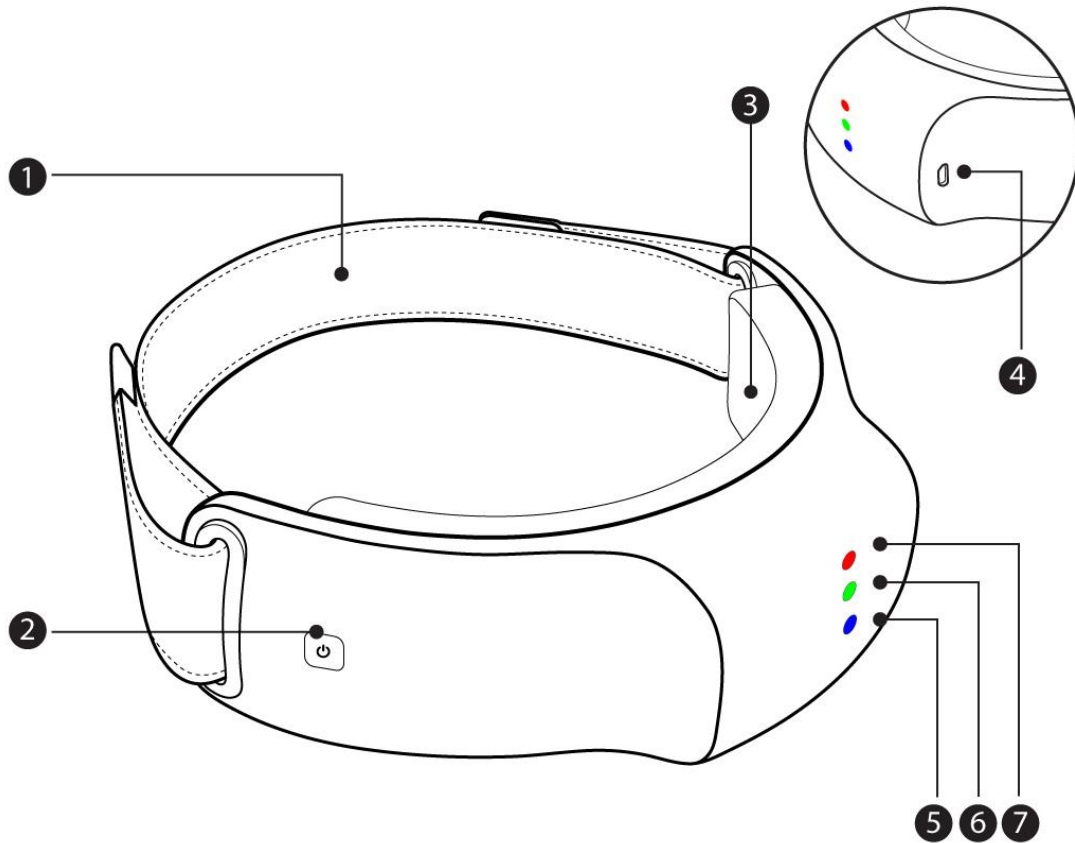


Figure 2-1 Components of the System
Table 2-1 Components and Their Functions

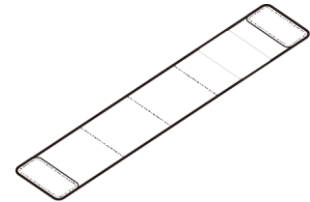
No.	설명
1	Strap
2	Power button
3	Silicone padded Sensors
4	5-pin micro connector
5	Status Indicator (Bluetooth)
6	Status Indicator (Power)
7	Status Indicator (Charging)

2.2 Basic Components

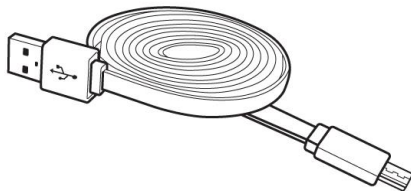
When opening the package, please make sure to check the components and inform the OBELAB Customer Support Center if there are any issues with the package.



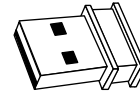
NIRSIT-Lite



Strap



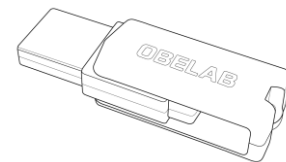
USB 2.0 Cable



BLE dongle (BLED112)



Storage and carry-on box for NIRSIT LITE



USB Memory stick with
PC software and Manual

NOTE

To purchase accessories, please contact OBELAB or an authorized dealer.
BLE Dongle specifications: Sinicon Labs, BLED112, BLE v4.0 CE, FCC, IC, KC certified

Tx: +0dBm to -27dBm, Rx: -91dBm

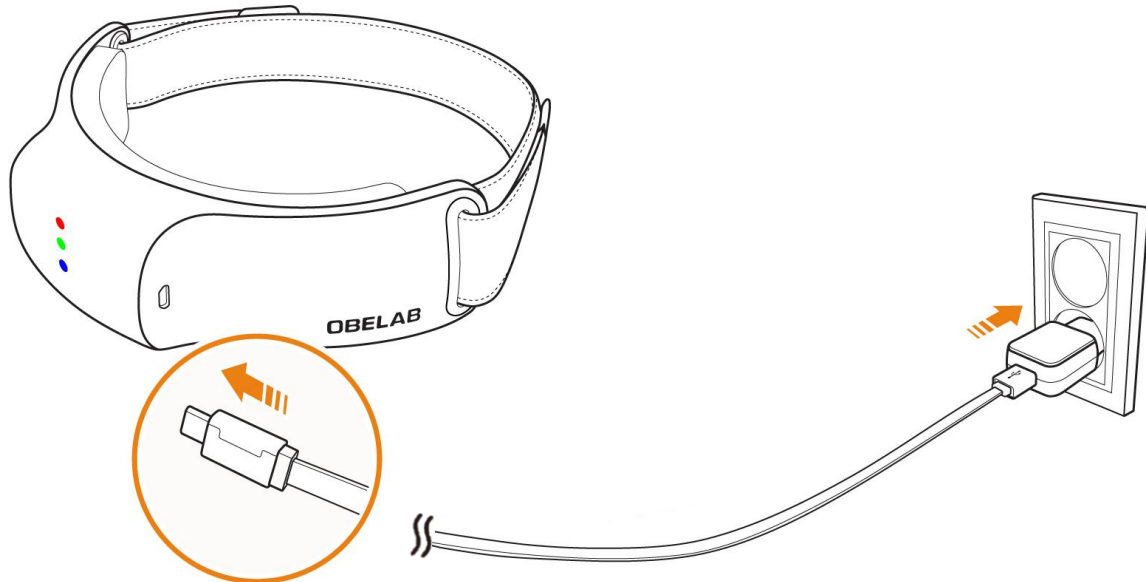
Interface: USB (virtual COM port emulation)

2.3 Battery

NIRSIT is powered by a lithium-ion polymer battery. For prolonged use, charge the battery at least 1 hour and 30 minutes before operating the device. Regularly check the remaining battery level to ensure availability.

2.3.1 Charging the Battery

Charge the battery by connecting the NIRSIT-Lite via a USB cable to a power adaptor.

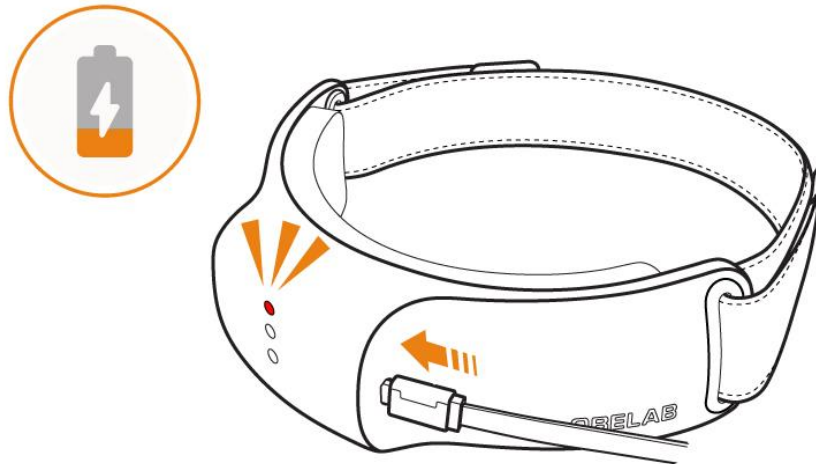


NOTE

- For the power adapter, must use an IEC60950-1 certified adapter for the charging adapter.
Input: AC 100-240V, 50/60Hz 0.4A, Maximum output: DC 5V, 2.1A
-

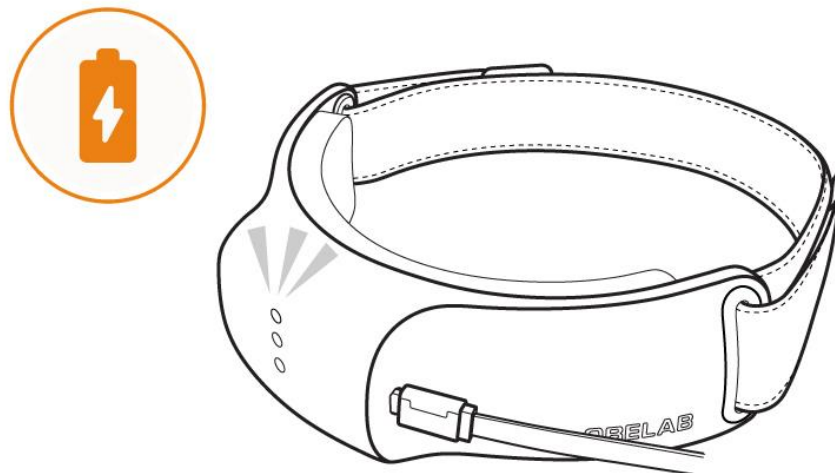
2.3.2 Checking Battery Level

Charging in Progress



Red LED On

Fully Charged



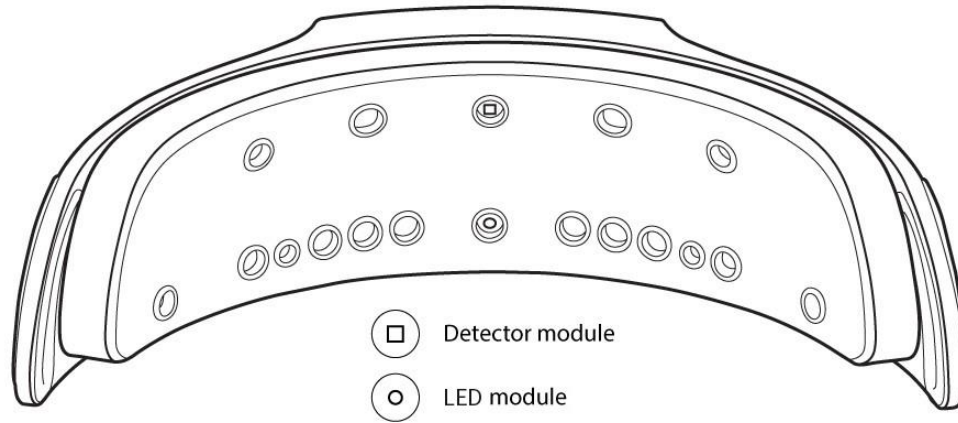
Red LED Off

Charging Mode

Make sure that the device is off before you charge.
Measurement cannot be performed while charging

2.4 Sensor Module Position

The below picture shows the difference between LED modules and detector modules in terms of external appearance.



Optical Safety

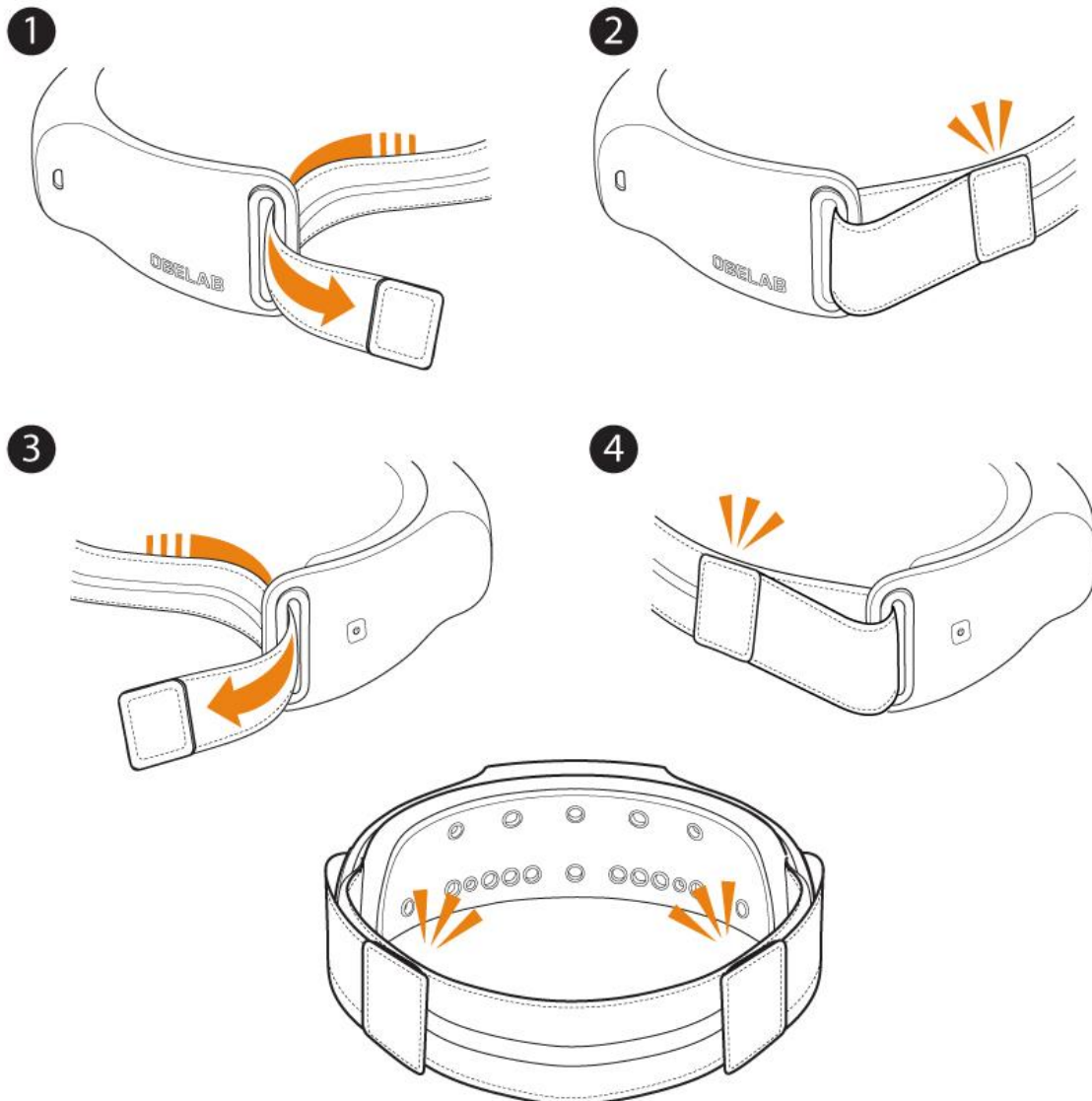
The device uses LED Light Sources which is harmless to human body.

3. Before Using NIRSIT-Lite Software

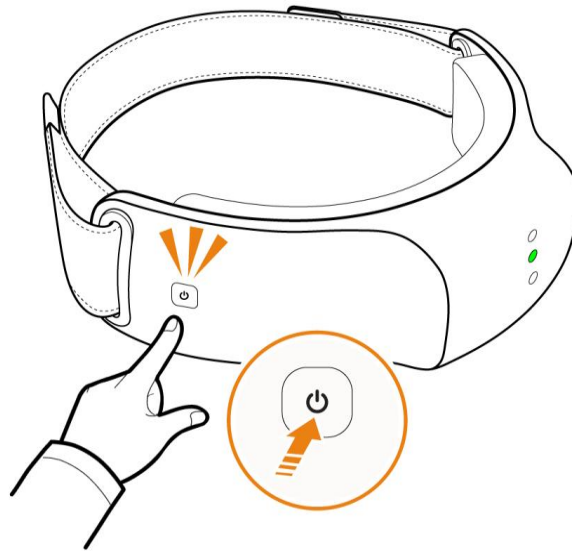
3.1 Preparing to wear

3.1.1 Installing the Strap

Adjust the strap to fit the subject's head.

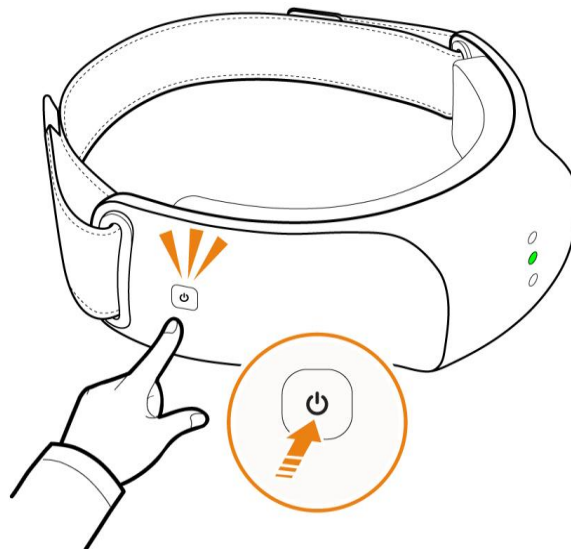


3.1.2 Checking Operation Status



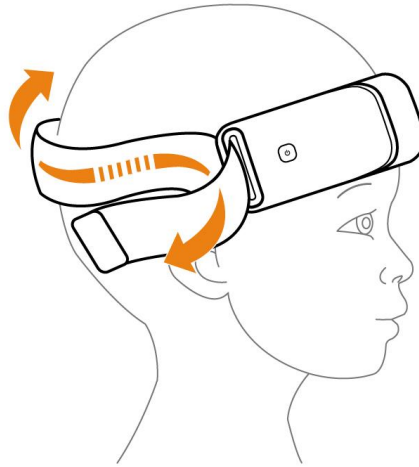
- 1 Press and hold the Power button for 3 seconds to turn on the device. Once powered on, the status indicator will illuminate in green, and a beep will be heard.
- 2 Press and hold the Power button for 3 seconds again to turn off the device. Once powered off, the status indicator will be off as well

3.2 Turning on the device

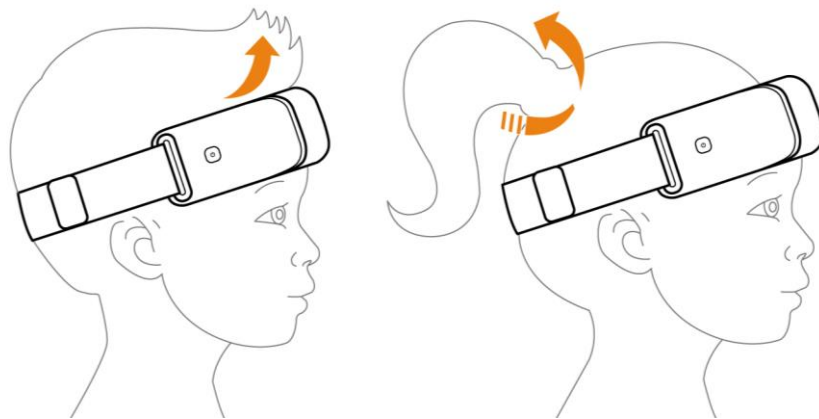


- 1 Turn on the NIRSIT device by pressing and holding the Power button for 3 seconds.
- 2 Check the green LED light from the status indicator in the middle of the device.
- 3 Run NIRSIT-Lite software in PC.

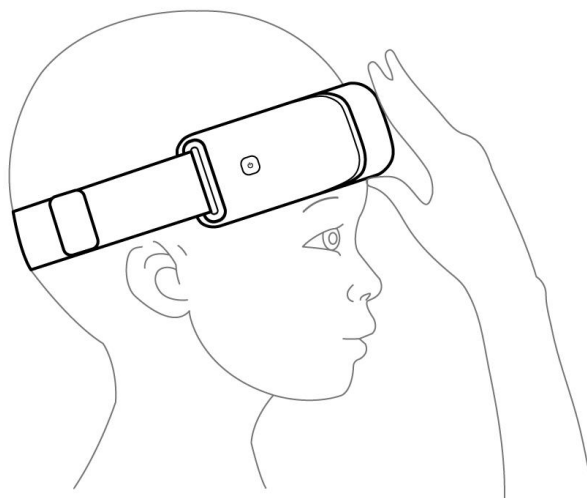
3.3 Putting on the device



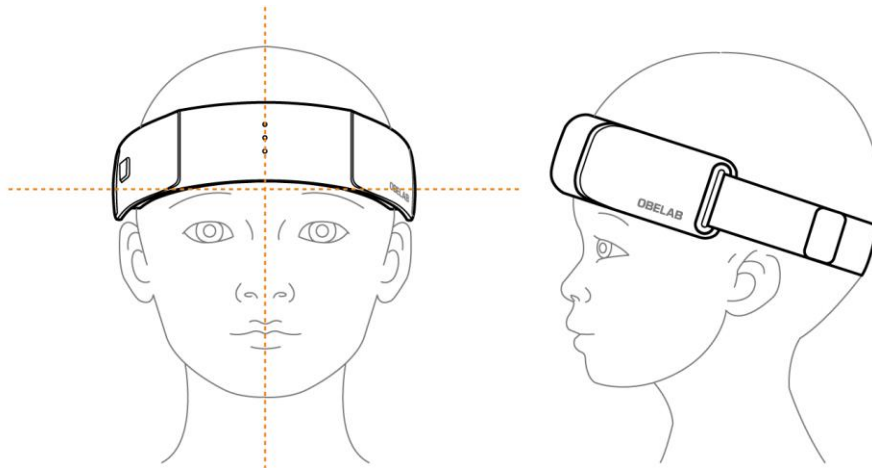
- 1 For the comfortable fitting, make enough space between subject's forehead and the device by loosening the strap before putting on the device.



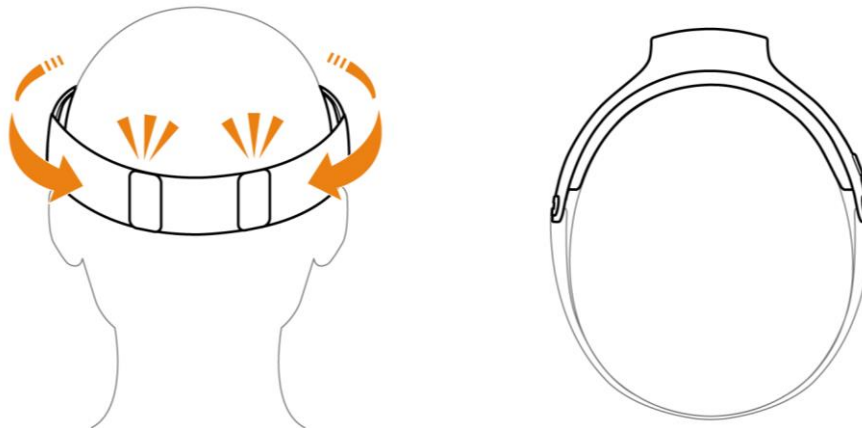
- 2 As shown below, remove all hair from the forehead region and put the device on. Subject might need to hold a front side of the device with one hand for accurate fitting.



- 3 Take extra care to align the green LED light with the subject's eyes, nose and eyebrows, so that the device is placed adequately on the middle of subject's forehead.



- 4 Attach the strap to the Velcro to ensure the device adequately comes into contact with the forehead of the subject. The closer the device is to the forehead, the better, but you can adjust the strength of the adhesion with a strap if necessary (e.g. the subject feels too much pressure around forehead)



3.4 Installing the Software

Please install the PC software which is included inside the USB memory stick. Follow the instructions inside. If reinstallation or additional installation is needed, download the software from the OBELAB website after registering the device under www.obelab.com>JOIN US.

OBELAB website: www.obelab.com>SUPPORT>DOWNLOAD

3.5 Running the Software

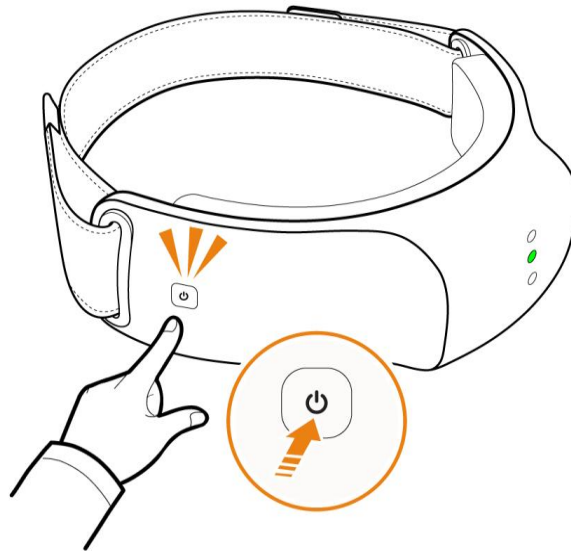
On the WINDOW PC screen, select **NIRSIT –Lite PC** () icon.

Software will run automatically.

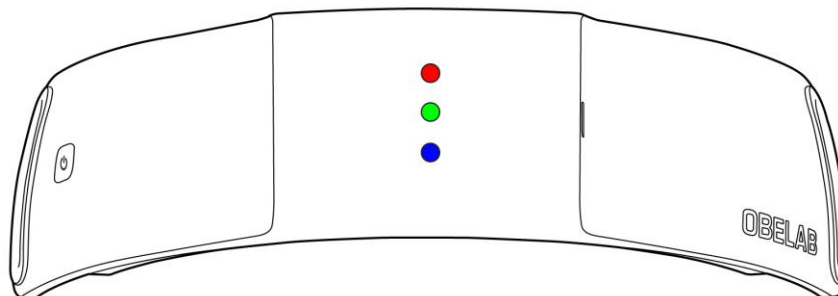
3.6 Connecting to the device

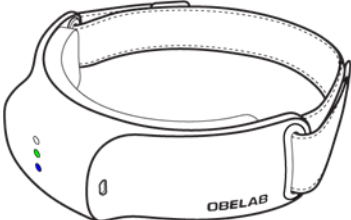
When you turn on the device, the device is connected to NIRSIT-Lite PC software via BLE.

Power LED (Green Color) will be on after you turn on the NIRSIT LITE device initially,



BLE LED (Blue Color) will be on after connected to PC as shown figure below.





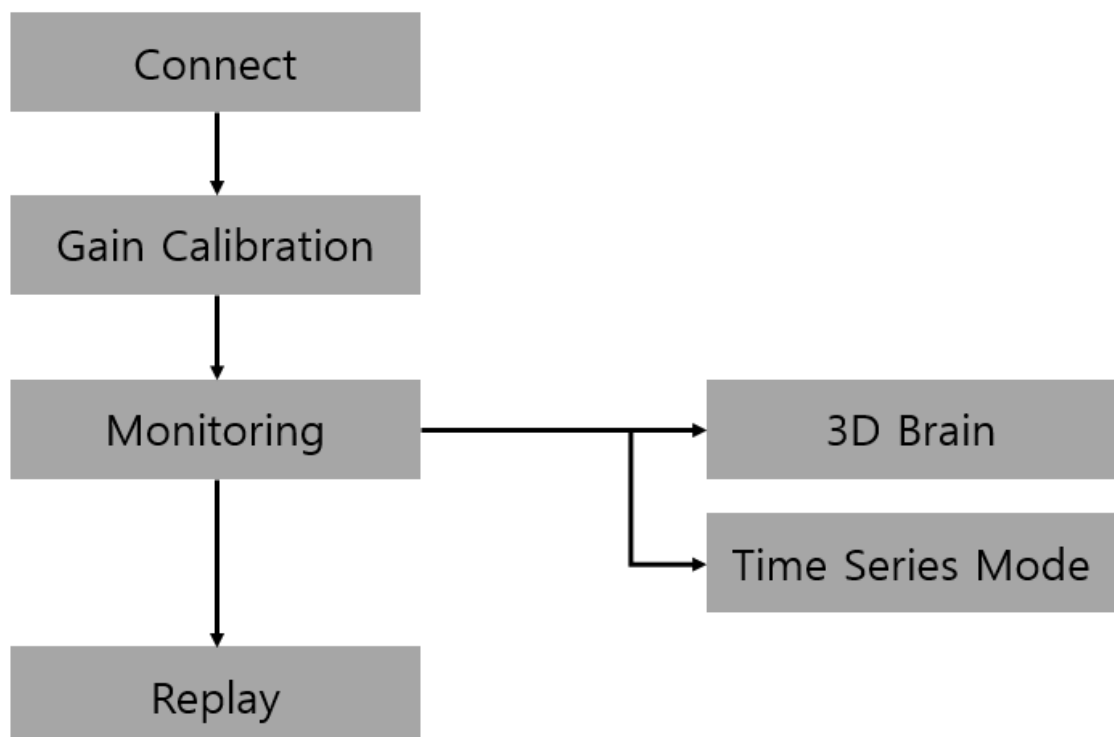
4. Using NIRSIT-Lite Software

NIRSIT-Lite PC software is designed to view real-time variations in cerebral oxygen saturation according to the subject's cognitive status, measured via the NIRSIT-Lite device. This PC Software contains all functions for subjects and observers.

- Subject
 - Wears the NIRSIT LITE device and performs tasks provided in the NIRSIT-Lite software.
- Observer
 - Uses the NIRSIT LITE software to monitor the blood oxygen level of the subject's brain in **3D** mode or **TIME SERIES** mode in real-time.

4.1 PC Software Structure

Below chart briefly outlines the NIRSIT LITE software structure for Window OS. NIRSIT LITE software runs in Connect Mode by default to set serial port and connect to PC before the measurement.



4.2 Setting Serial Port

4.2.1 Connecting to Serial Port

1 [Default] BLED112 Dongle

Default mode to use BLED112.

- i. Click "default", then restart the program.
- ii. Select comport "COM#" for the BLED112 (connected to PC) and press "Open"
- iii. Click "N-Lite scan" to find the device (power should be turned on)
- iv. Select a device MAC address to use.
- v. Click "Connect" to connect to the device.

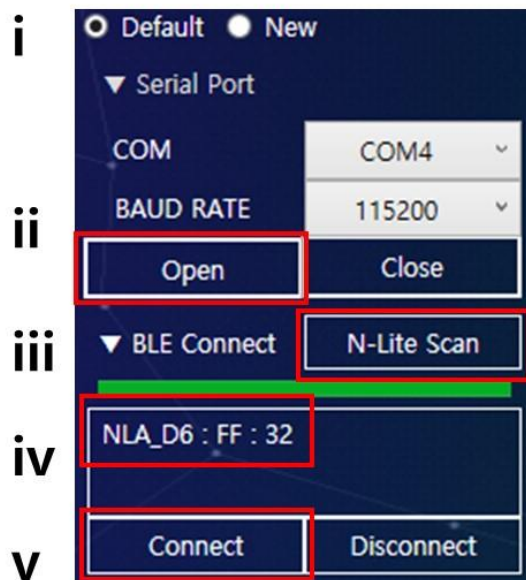
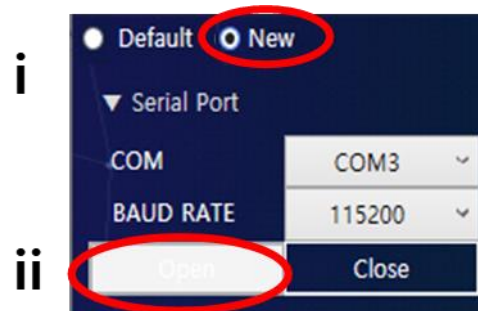


Figure 1: BLED112 Bluetooth Smart USB dongle

2 [New] OBELAB BLE dongle

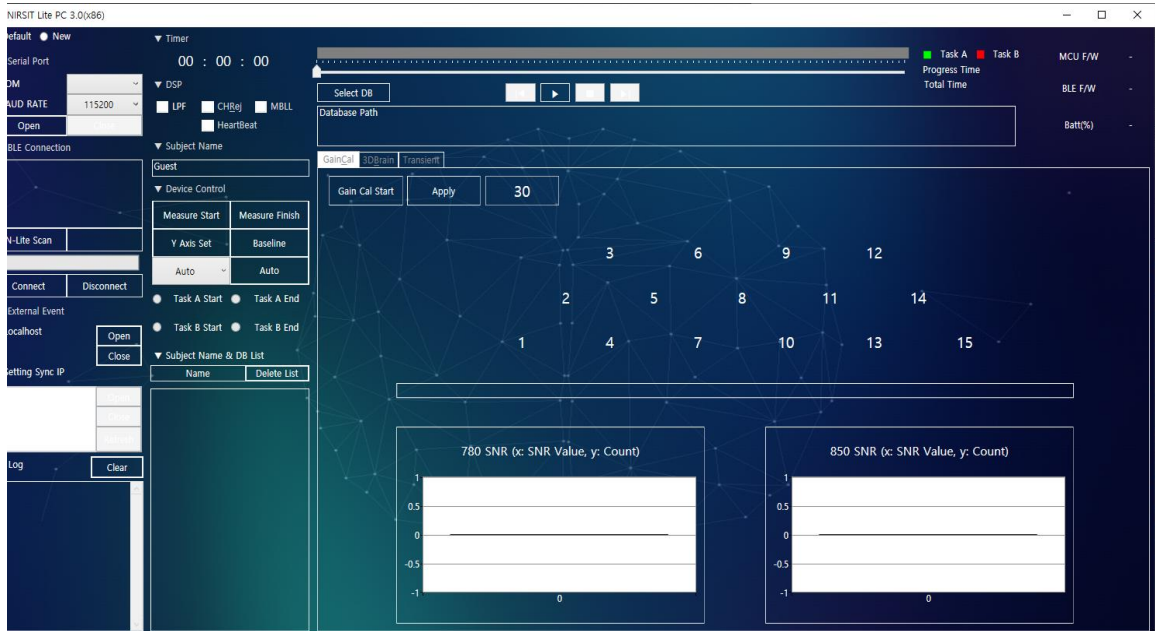
New mode to use OBELAB BLE dongle.

- i. Click "New", then restart the program.
- ii. Select comport "COM#" for the OBELAB BLE dongle (connected to PC) and press "Open"
- iii. OBELAB dongle will be automatically connected to the nearest NIRSIT-Lite (power should be turned on)



4.3 Gain Calibration

- 1 Select **Gain Cal Start**. Sensor Gain calibration of NIRSIT-Lite LED and detectors allows the device to measure optimal signals from the subject. The subject will need to stay calm with minimal physical movement during the **CALIBRATION** process to avoid possible artifacts.



- 2 Once calibration is complete and the time bar at the bottom turns blue, active channels will be shown with yellow circles. In addition, signal to SNR (Signal Noise Ratio) will be shown as a graph.



Real-time Monitoring (MONITORING Mode)

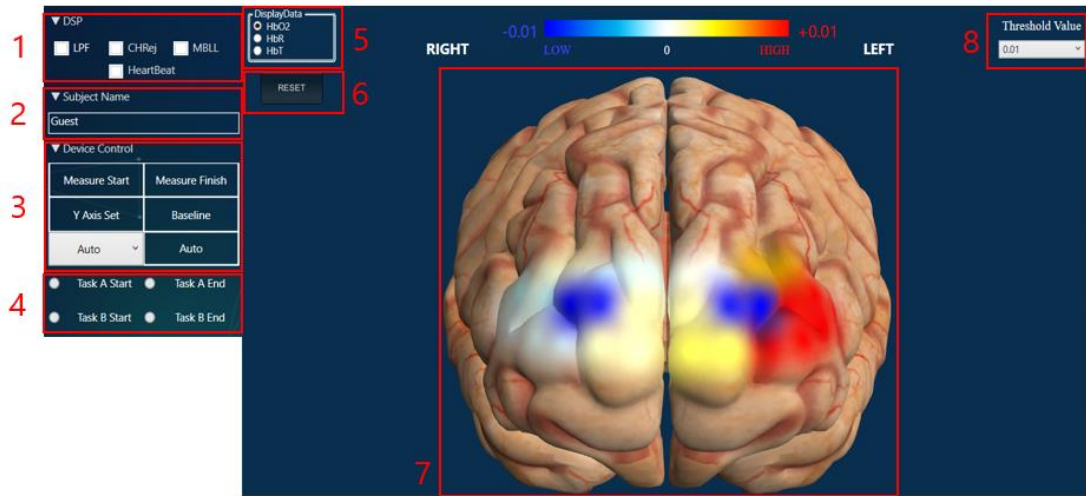
4.4 MONITORING

In MONITORING mode, two different modes are available for real time monitoring, both of which display the change in the cerebral oxygen saturation level of the subject.

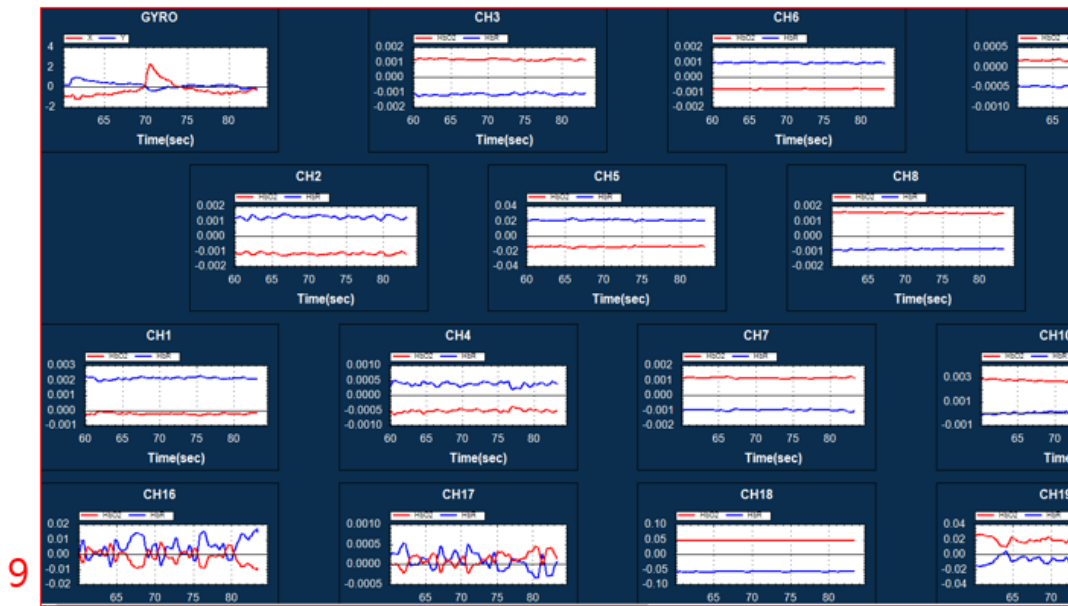
MONITORING comes with two sub-modes.

MONITORING Mode	설명
3D Mode	3D mode visualizes the changes in the hemoglobin level in real-time on a 3D brain model. Depending on the intended use, the user can choose to monitor among HbO ₂ , HbR, or HbT changes.
Time Series Mode	Time Series mode shows HbO ₂ and HbR changes in a graph format in real-time on a channel by channel basis.

4.4.1 MONITORING Mode Screen Overview



3D Mode



TIME SERIES Mode

No.	Description
1	Display on-screen filtering menu items as follows: <ul style="list-style-type: none"> ▪ LPF: Use a low-pass filter to remove high frequency noise. ▪ CHANNEL REJECTION: that do not meet the default/set SNR value. ▪ MBLL: View changes in HbO2 and HbR levels calculated with the Modified Beer-Lambert Law. HEART BEAT: Remove heartbeat effect.
2	Subject Name: Display subject's name.
3	Display on-screen function menu items as follows:

No.	Description	
	<ul style="list-style-type: none"> ▪ Measure Start: Start measurement of HbO2 Or HbR Or HbT ▪ Measure Finish: Finish the measurement and save data ▪ Y Axis Set: Set Y axis of Time Series graph ▪ Baseline: Set the baseline of initial MBLL value to the current value. 	
4	Save the task start point by selecting the TASK A START button. Save the task end point by selecting the TASK A END button. The same applies to the Task B START and END button.	
	NOTE	You can manually save the task start point and end point in the NIRSIT database. It is possible to record two tasks (tasks A and B) simultaneously.
5	<ul style="list-style-type: none"> • HbO2: Color-map changes in HbO2 level • HbR: Color-map changes in HbR level • HbT: Color-map changes in the sum of HbO2 and HbR levels 	
6	Reset the position of the 3D brain image.	
7	3D brain image <ul style="list-style-type: none"> ▪ RIGHT denotes Right Hemisphere. ▪ LEFT denotes Left Hemisphere. ▪ Measured signal is shown in mM, ranging from -0.010mM to 0.010mM. 	
	NOTE	Measured signals are represented in multiple colors on 3D brain image, and each color indicates different states: <ul style="list-style-type: none"> ▪ White: Initial state of the brain (Baseline) ▪ White < Yellow < Red: Increase in HbO2 level ▪ White > Light Blue > Blue: Decrease in HbO2
8	<ul style="list-style-type: none"> ▪ Threshold value: Update HbO2, HbR, HbT Display Color Map with changed value 	
9	Time series image Time Series Mode shows HbO2 and HbR changes in a graph format in real-time on a channel by channel basis.	

4.5 REPLAY

REPLAY MODE plays measured data using saved database.

4.5.1 REPLAY Screen Overview



REPLAY Mode

No.	설명
1	Select DB : Select database to play
2	Shows the path of database
3	Display on-screen function menu items as follows: <ul style="list-style-type: none"> ▪ PLAY: Play saved data. ▪ PAUSE: Pause playing. ▪ STOP: Stop Playing. ▪ BACKWARD: Move 5 seconds backward. ▪ FORWARD: Move 5 seconds forward.
4	Display total time and progress time.
5	Reset the position of the 3D brain image.
6	Display the playlist of data in database.

5. Maintenance

5.1 Replacing Accessories and Components

5.1.1 Replacing Straps

Replace with a new strap if the current strap is dirty, damaged or feels loose.

A strap can be removed by following the installation instructions in reverse order.

5.2 Cleaning

Make sure to turn off the NIRSIT device before cleaning. The device must be cleaned and stored after use. If not properly cleaned, or if exposed to direct sunlight, the device may become discolored.

5.2.1 Cleaning Silicone padded sensors

Wipe with an alcohol-moistened soft cloth.

Silicon caps are frequently in contact with subjects. Take extra care to maintain hygiene.

Use cotton buds to remove foreign substance in sensor holes.

5.2.2 Cleaning NIRSIT-Lite

3 Wipe with a soft cloth moistened with a non-abrasive cleaning solution mixed with water.

**WARNING**

- Make sure that liquid does not enter the device. This can cause device failure.
 - Do not spray directly on the device.
 - Do not use abrasive agents e.g. acetone as they can damage the surface.
-

1 Use a dry cloth to wipe off the moisture.

2 To remove foreign objects from the sensor, use a cotton ball soaked with alcohol.

NOTE

NIRSIT-Lite can be sterilized with ultraviolet rays.

6. Troubleshooting

Symptoms	Possible cause	Solution
The device will not turn on.	The battery is discharged.	Charge the battery
The battery will not charge.	The battery has expired.	Contact OBELAB or an authorized dealer.
	The cable is damaged or severed.	If you have a spare, replace the cable. If you do not have a spare, purchase a new cable.
	This environment is not suitable to store or operate the product.	Meet environmental requirements.
Cannot connect with the PC.	The BLE feature is turned off.	Turn on the PC BLE.
	Sometimes a wireless connection cannot be established due to environmental factors (e.g. congested area such as a big event venue).	Use a USB cable for a wired connection.

NOTE

Information related to after-sales services and other technical information on the device can be found in the service manual provided by OBELAB.

7. 7. Product Specifications

7.1 Mechanical Characteristics

Item	Description
Size (Width x Depth x Height)	Kids : 185.2 x 101.6 x 50 (mm)
	Adult : 186.5 x 104.8 x 52.6 (mm)
Weight (including battery)	Kids : 163 (g)
	Adult : 172 (g)

7.2 Technical Characteristics

Item	Description	
Source	Source Type	Dual wavelength LED
	Number of Sources	5
	Output	Under 5 mW for each wavelength
	Wavelength	780 nm, 850 nm
	Operation Mode	Continuous-Wave
Detector	Detector Type	Active detection sensor
	Number of Detectors	13
	Number of channels	Up to 21 channels
Measurement	Source-Detector distance	3 cm , 0.8 cm , 1.9cm, 3.3 cm (2.5 cm, 0.8 cm, 1.6 cm 3.3 cm Kids)
	System Scan Rate	Up to 8.138 Hz
	Operation Mode	Continuous-Wave

7.3 Electrical Characteristics

Item		Description
Input Voltage (via USB port)		5 V
Maximum Voltage (via USB port)		2.1 A
Battery	Type	Lithium ion polymer battery
	Usage Time	Up to 5 hours(when fully charged)
	Voltage	3.7 V
	Capacity	1000 mAh
Data Storage		Built-in memory in PC storage
Communication	Wireless	BLE 5.0 (2.4 GHz)
	Wired	Serial Communication

7.4 PC Requirements

Item	Description
Operating System	Windows 10 or higher (64bit recommended)
CPU	i5 core or higher
RAM	8 GB or more (16 GB recommended)
Internal Memory	SSD (HDD not supported) 128 GB or higher

7.5 Environmental Requirements

Item		Description
Operating Environment	Temperature	15°C~35°C
	Humidity	20%~80%
Storage Environment	Temperature	-10°C~45°C
	Humidity	Max ≤80%

8. Appendix

8.1 Guidance and Manufacturer's Declaration

8.1.1 Guidance and Manufacturer's Declaration – Electromagnetic Emissions

This system is intended for use in the electromagnetic environment specified below. The customer or user of the system should ensure that it is used in such an environment.

Emissions test	Compliance	Electromagnetic environment - guidance
RF emission CISPR 11	Group 1	This system uses RF energy only for its internal functions. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emission CISPR 11	Class A	
Harmonic emissions IEC 61000-3-2	N/A	This system is suitable for use in all establishments other than domestic establishments and those directly connected to the public low-voltage power supply network.
Voltage fluctuations / Flicker emissions	N/A	
IEC 61000-3-3		

NOTE

The use of cables and components other than those specified for this system is not recommended. Using cables or components that do not meet the system specifications may affect emission quality.

8.1.2 Guidance and Manufacturer's Declaration – Electromagnetic Immunity


This system is intended for use in the electromagnetic environment specified below. The customer or user of the system should ensure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	The floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.

- NOTE**
1. UT is the AC mains voltage prior to application of the test level.
 2. The use of cables and components other than those specified for the current system is not recommended. Using cables or components other than those specified for the current system may affect the immunity

8.1.3 Guidance and Manufacturer's Declaration – Electromagnetic Immunity – Equipment & Systems that are NOT life supporting

This system is intended for use in the electromagnetic environment specified below. The customer or user of the system should ensure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Radiated RF IEC 61000-4-3	3V/m 80MHz~2.5GHz	3V/m	<p>80 MHz~800 MHz:d=1.2</p> <p>800 MHz - 2.5 GHz: $d = 2.3$ where P is the maximum output power rating of the transmitter in watts (W) and d is the recommended separation distance in meters (m), based on the transmitter manufacturer's standard.</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
NOTE			<ol style="list-style-type: none"> 3. At 80 MHz and 800 MHz, the higher frequency range applies. 4. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people. 5. The use of cables and components other than those specified for the system is not recommended. This may result in decreased electromagnetic immunity of the system.
a			<p>Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast, cannot be predicted theoretically with any degree of accuracy.</p> <p>To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered.</p> <p>If the measured field strength in the location in which the system is used exceeds the applicable RF compliance level above, the system should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the system.</p>
b			<p>Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p>

8.1.4 Recommended separation distances between portable and mobile RF communications equipment and the system

For systems that are not NOT life supporting

This system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or user of the system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the system as recommended below, according to the maximum output power of the communications equipment.

Rated max. output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz - 80 MHz $d = 1.2 \sqrt{P}$	80MHz~800MHz $d=1.2\sqrt{P}$	150 kHz - 80 MHz $d = 1.2 \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer's standard.

Warranty

Serial Number			
Period	1 year from the date of purchase		
Date of Purchase			
Place of Purchase	Sold at		
	Name		
Customer Registration	Address		
	TEL	TEL	Mobile

Coverage

■ **Warranty Service**

Free warranty service applies to repair services required for this device occurring as a result of failure during proper operation in the warranty period (1 year from the date of purchase).

■ **Charged Service**

A service fee will be applied in the following cases.

1. Out of warranty period
2. Within warranty period
 - I. repairs resulting from natural disasters (lightning, fire, earthquake, storm, flood, etc.)
 - II. repairs resulting from a device failure or damage caused by the user's mishandling (Impact, dropping)
 - III. repairs resulting from old consumables (battery, cable, etc.) that need replacement
 - IV. repairs resulting from a device failure due to unauthorized repair and modification
 - V. repairs resulting from the use of unauthorized components
 - VI. repairs resulting from services performed by an unauthorized person

■ **Notice**

For matters that are not specified in this document, the Act on Consumer Protection of Korea and relevant regulations on compensation for consumers shall apply.

For other repairs and questions, please contact your dealer or the OBELAB Customer Support Center.

Request for service on a functioning device will result in service charge. Please read the User Guide.

This warranty is only effective in the Republic of Korea, and not to be re-issued. Please store the warranty in a safe place or send a scanned copy to OBELAB (contact@obelab.com).

For any inconveniences related to service, please contact an authorized dealer or the OBELAB Customer Service Center.

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