SHIMADZU

Excellence in Science

functional Near-Infrared Spectroscopy System

LIGHTNIRS

Expanding the Possibilities for the Future

Shimadzu Portable functional Near-Infrared Spectroscopy (fNIRS) System for Research*

LIGHTNIRS ™

Optical Imaging of Living Organisms

functional Near-Infrared Spectroscopy (fNIRS) is drawing attention as

a new method to support next generation neuroscience,

reducing restrictions to enable measurements of cerebral function

under close to everyday conditions.

Shimadzu is using cutting-edge science and technology to contribute

to the continuously advancing field of neuroscience.

* LIGHTNIRS is a portable functional near-infrared spectroscopy system for research purposes.
  For research use only. This product has not been approved or certified as a medical equipment under
  the Japanese Pharmaceutical and Medical Device Act, and so is not for use for treatment or diagnostic
  purposes. Not for use in diagnostic procedures.

Portability Expands Range of Research Applications

▮ Neuromarketing research

▮ Communication research

▮ Brain-machine interface (BMI) research

▮ Rehabilitation research

This portable functional near-infrared spectroscopy system for research irradiates the head with near-infrared light, which easily penetrates living tissue. While the light is scattered and absorbed within the living tissue, a portion of the reflected light is detected, and used to measure the activity at the surface of the brain in real time.

The portability of LIGHTNIRS allows visualizing brain function activity in real time in a more natural state than other methods. Consequently, it is being used in a wide range of applications including medical research, developmental psychology, education, cognitive science and engineering.

Two Extension Holders to Suit the Research Objective

Adopting the whole head type of holder, which is fitted to the head, enables the optimal site to be
Though portable, they can accommodate various types of research.

Measurements of Cognitive Functions Focusing on the Frontal Region : Holder Type A

Examples of Applicable Fields
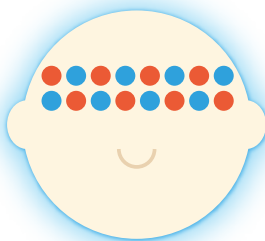

Neuromarketing
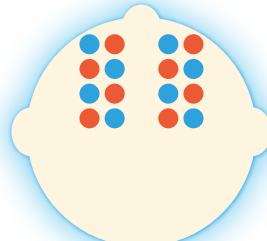
Communications

Educational Psychology

Measurement channels can be configured focusing on the frontal lobe. This can be utilized in a wide range of fields focusing on various cognitive function measurements, including neuromarketing and communications, education, and psychology.

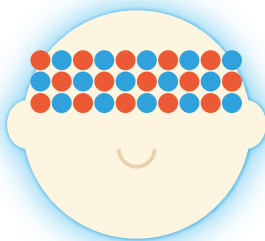### Examples of Measurement Region Selection

When use one unit

● Transmitter fiber
● Receiver fiber

Forehead
2×8(22ch)

Dorsolateral prefrontal area
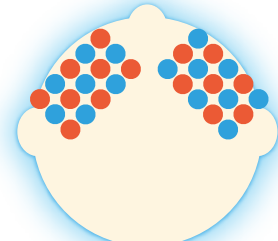2×4(10ch)×2

Language area
2×4(10ch)×2

When use two-unit connecting system

Dorsolateral prefrontal cortex + Prefrontal area
3×10(47ch)
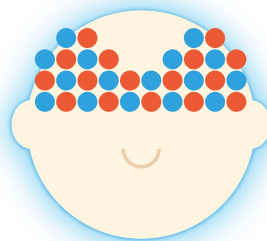
Dorsolateral prefrontal cortex +
Supplementary motor area
3×10(48ch)

Temporal region
3×5(24ch)×2(Both)

＊Other sites can also be configured.

## Improved Light-Blocking Characteristics

This blocks the ambient light, which would have an impact on fNIRS measurements through contamination by sunlight and indoor illumination. The material used is easy to wear, lightweight, and is excellent at blocking light.
This can be used for outdoor measurements, and for simultaneous measurements with eye gaze and motion analysis systems using near-infrared light.

selected to suit the measurement conditions. Two types are available to suit the research objective.

Multipurpose Measurements of Multiple Regions ： Holder Type B

Examples of Applicable Fields
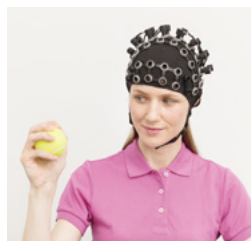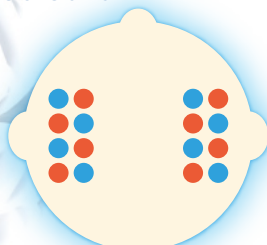

Exercise Physiology

Bioengineering

Various Industrial Applications

In addition to the frontal pole region, measurement channels can be configured for multiple measurement regions including the motor areas, somatosensory areas, and visual areas. This can be utilized for multipurpose applications on-site for exercise physiology, bioengineering, and a variety of industrial applications.
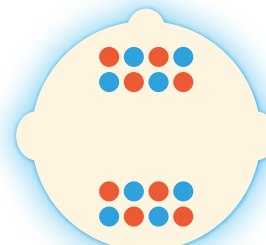
Examples of Measurement Region Selection

● Transmitter fiber
● Receiver fiber

When use one unit

Temporal area(bilateral)
2×4（10ch）×2
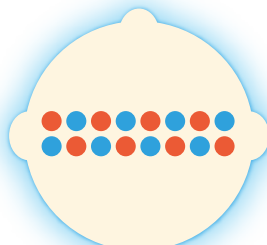
Primary motor area
2×8（22ch）
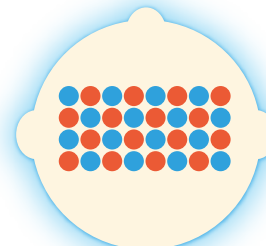
Visual area and Frontal pole
2×4（10ch）×2

When use two-unit connecting system
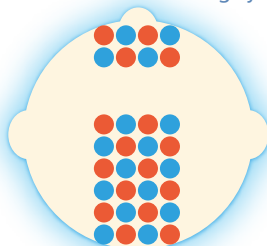
Frontal pole + Visual cortex + Somatesthetic area
2×4+4×6（48ch）
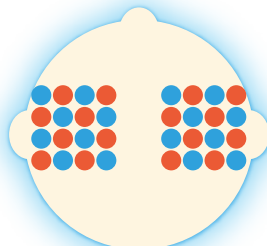
Motor area + Temporal gyrus
4×4（24ch）×2（Both）

Motor area
4×8（52ch）

＊Other sites can also be configured.

Selectable opticalfiber (8 pairs)

This is a removable 8-unit optical fiber for transmitting and receiving light.Fiber length is selectable from 1m and 2m.Thanks to the structure of the fiber tips, which easily part the subject's hair, and adhere well to the scalp, not only the forehead but also the parts of the head with hair can be measured.
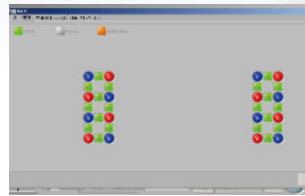
Fiber Tip

High Function Measurements with Simple Operations

Easy to Wear

The holder fits the head well, so it is easy to wear. Even the parts of the head with hair can be easily adjusted in the intuitive sensitivity adjustment window.
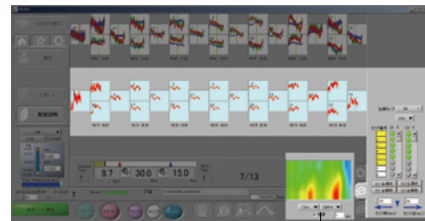

Sensitivity Adjustment Window

Easy Operability Via a Graphical User Interface

An intuitive user interface allows setting advanced measurement and analysis parameters.

[Measurement Mode]

■ Real Time Monitoring Process Functions

Trend graphs are added for each task or channel, and mapping information is simultaneously integrated during measurements.

Real time task addition   Real time map integration

[Analysis Mode]

■ Comprehensive Data Processing Functions

The software provides various data analysis and data processing tools, including independent component analysis (ICA), frequency ltering, adding tasks, adding channels, as well as centroid and integral values.

■ Batch Processing Functions

Permits batch processing with predetermined analysis procedures.
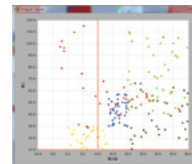
Channel addition   Centroid and integral analysis functions   Batch processing functions

Triple Wavelength Semiconductor Laser Ensures Stable Measurements

Three wavelengths are used to measure variations in the concentration of Oxygenated, deoxygenated and total hemoglobin, which are used as indicators for brain activity. LIGHTNIRS uses three wavelengths. The aim is to provide more stable, highly reliable data.
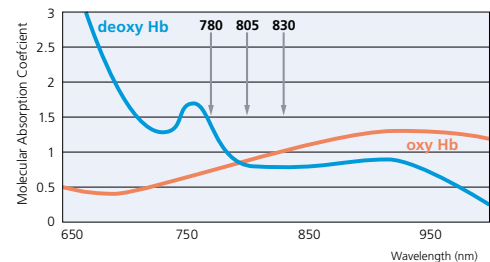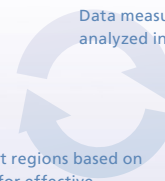

Data Compatibility Supports Ongoing Research

Data acquired using a Shimadzu FOIRE-3000 or LABNIRS™ functional near-infrared spectroscopy system can be loaded directly by the data analysis software included with the LIGHTNIRS system for comparison. Consequently, it can take advantage of existing data sets.

Data measured in the field is analyzed in details.

Limiting measurement regions based on basic research allows for effective measurements in the field.

FOIRE-3000   LABNIRS

Easy to Customize to Suit the Research Application

Higher Measurement Freedom

▶ Portability

A specialized carrying bag (included standard) provides two ways to carry the unit.

Backpack Type   Shoulder Bag Type

▶ Communication Between Computers

The multiple computers for measurement can be networked. Multiple people (up to four) can be measured simultaneously, in communications research for example.

▶ Exchangeable Probe Length

To suit the measurement environment, 1 m or 2 m optical fibers can be selected.

▶ Two-Unit Connecting System

Measurement regions can be extended with a two-unit connecting system.

A Wealth of Options

Video Recording Software

Records synchronized video images of a subject's body movements during measurements by USB camera. Movement artifacts can be identied and easily linked to the data.
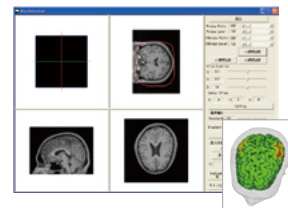
3D Position Measurement System*3

This system equipped with fibers measures 3D position information. This item is essential to provide highly reproducible measurements.
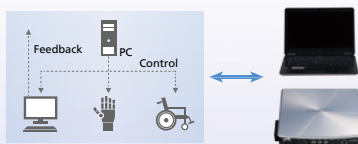
MRI Image Overlay Software*3

This software projects a mapping image onto an individual's MRI image based on 3D information.

Real-Time Data Transfer Software

This supports biofeedback with the subject and brain-machine interface (BMI) to control external devices by transferring measured data to another PC in real time.

Feedback   PC
              Control

Stimulus Presentation System*3

Experiments can be implemented in which the timing of the presentation of sensory and auditory stimuli is strictly controlled.

Digital/Analog Signal Input Cable

This special cable enables the input of signals from external equipment. Use this when synchronizing signals with sensory presentation systems and other physiological measurement equipment.

Additional Analysis License

Analysis can be performed in an environment other than the computer provided. This is convenient when multiple individuals are using the system. Data measured with the LABNIRS, OMM-3000, and FOIRE-3000 series can also be loaded.

*3: Option common to LABNIRS series

Key Specifications

Measurement method	3-wavelength absorbance calculation
Measured item	Variations in Oxy-Hb, Deoxy-Hb, and Total-Hb
Light source	3-wavelength near-infrared semiconductor lasers,Class 1 [IEC-60825-1 (2007)]
Detector	Avalanche photodiode
Power supply	15 V input from AC adapter or lithium-ion battery
External inputs	3 digital channels and 10 analog channels
Dimensions	W253 × D222 × H68 mm (not including protrusions)
Weight	About 1600 g (not including computer, batteries, and probes)
Operating temperature	15 to 30 °C, providing temperature changes are within 5 °C/h during measurements
Operating humidity	45 to 85 % (with no condensation)

253

222

68
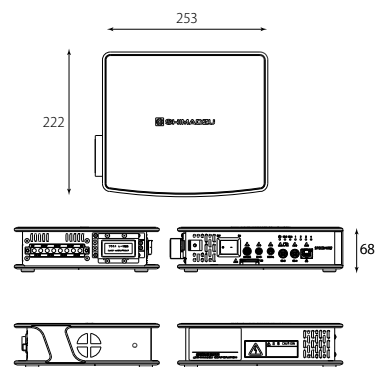
functional Near-Infrared Spectroscopy System for Research

LABNIRS

LABNIRS has quickly become the most powerful and comprehensive fNIRS system for brain imaging research available.Measurements can be obtained using up to 40 bersets, equaling 142 channels that can be distributed over a wide area of the brain or concentrated to use high-density mode. High quality signal can be obtained for the whole head in as little as 27 msec.

By using safe near-infrared light to measure the oxygen status in the brain surface, the system can be used to view, in real time, the active areas of the brain or their activity level during higher-order brain functions, such as seeing, hearing, or moving.

■ Measured item: Variations in Oxy-Hb, Deoxy-Hb, and Total-Hb
■ Number of measurement channels: LABNIRS from 4 pairs
 (10 channels) to 40 pairs (142 channels)
 Temporal resolution:6 msec / fiber or 27 msec for whole head
 measurement.

Product brochure: C297-E097A

Laser Safety

This product uses semiconductor lasers categorized as Class 1 under IEC-60825-1 (2007).Read the Instruction Manual carefully before using the product.

CLASS 1 LASER PRODUCT

• All values in this brochure are standard values. Actual values may differ slightly.
• Photographs in this brochure may include items and options not included with the system.

LIGTHNIRS and LABNIRS are trademarks of Shimadzu Corporation or its affiliated companies in Japan and/or other countries.

SHIMADZU

Shimadzu Corporation

www.shimadzu.com/an/