Neurobit Optima+™ 4 / 2 BT / USB
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Portable equipment for neurofeedback, biofeedback & physiological data acquisition

Highlights

Neurobit Optima is a family of highly integrated, **multimodal**, portable devices enabling measurements of physiological signals for psychological training, scientific research, education and similar applications.

They are equipped with 2-4 **versatile**, accurate, low noise measurement channels with **individually configurable** functions, sampling rates, frequency characteristics and other parameters.

High sampling rates up to 2000 sps (with 4 times faster input oversampling) allow wideband biosignals to also be captured.

The devices are available in a wireless, battery powered, **wearable version** and in a **USB powered version**, with medical grade galvanic isolation from the computer for safety and low interference.

Neurobit Optima+ models include an **extension port** for extra modality sensors: BVP, nIR HEG and pIR HEG. It also allows new digital sensors to be added in the future.

Neurobit Optima+ 4 models are also equipped with an **EEG cap interface**, with configurable connections between measurement channels and 10-20 system cap. It facilitates quick QEEG assessments and multi-site EEG training.

All Neurobit Optima devices have built-in **tests of electrode-skin impedances** and circuit continuity.

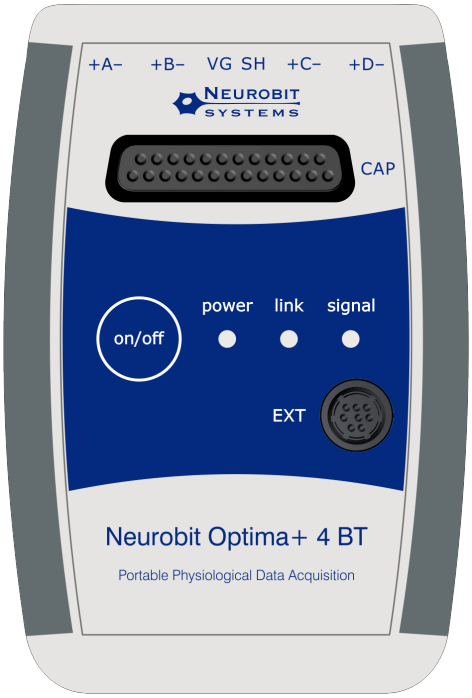
All channels have individual reference inputs, with connections to **references configured in software**.

High amplifier parameters and configurable filters of mains power noise (50 Hz | 60 Hz | off) increase **immunity to external interference**.

The equipment works with many software applications (including some freeware) for flexible, **real-time signal processing**, visualization, and storage. The **Neurobit API** allows new software to be integrated with any Neurobit device.

Our products are made in the European Union.

REMARK: Neurobit Optima devices are not medical products.



Product features

	model	NO-2 BT	NO-2 USB	NO+2 BT	NO+2 USB	NO+4 BT	NO+4 USB
	product code	101011	101012	101013	101014	101021	101022
	data link	Bluetooth	isolated	Bluetooth	isolated	Bluetooth	isolated
	power	batteries	USB	batteries	USB	batteries	USB
	number of versatile channels	2	2	2	2	4	4
	built-in impedance tests	√	√	√	√	√	√
	software setup of reference inputs	√	√	√	√	√	√
	selectable frequency characteristics	√	√	√	√	√	√
	selectable time constants, incl. DC[1]	√	√	√	√	√	√
	configurable filter of mains power noise	√	√	√	√	√	√
	active shielding option	√	√	√	√	√	√
main supported modalities	EEG	√	√	√	√	√	√
	sEMG	√	√	√	√	√	√
	ECG	√	√	√	√	√	√
	EOG	√	√	√	√	√	√
	GSR	√	√	√	√	√	√
	HRV	√	√	√	√	√	√
	SCP	√	√	√	√	√	√
	RESP[2]	√	√	√	√	√	√
	breath air flow	√	√	√	√	√	√
	skin temperature	√	√	√	√	√	√
	nIR HEG[3]			√	√	√	√
	pIR HEG[3]			√	√	√	√
	BVP (PPG)[3]			√	√	√	√
	extension port			√	√	√	√
	additional channel for digital sensors[4]			√	√	√	√
	EEG cap interface[5]					√	√
	belt clip	√		√		√	
	power, link and signal state lights	√	√	√	√	√	√
	interoperation with many computer applications[6]	√	√	√	√	√	√
	remote firmware upgrade	√	√	√	√	√	√
	application program-ming interface (API)	√	√	√	√	√	√
	CE mark	√	√	√	√	√	√

Notes:

[1] *DC coupling available for the highest voltage range*

[2] *measurement of respiratory effort with a belt*

[3] *in channel A, via EXT port*

[4] *3rd or 5th channel; currently it enables events to be marked with a button*

[5] *with software setup of connections between 4 channels and the cap electrodes*

[6] *BioExplorer, BioEra, BrainBay, Mind-Body Training Tools, Neurobit Recorder and more*

Technical data

Number of versatile measurement channels

- NO* 4 models 4
- NO* 2 models 2

Number of extra digital channels (NO+* models) 1

Resolution of ADC conversion 16 bits

Measurement capabilities:

Measured quantity	Application (modalities)	Measurement ranges	Accuracy	Output sample rate (independent for ea. chan.)
Voltage	EEG, sEMG, HRV, EOG etc.	800 µV 6 mV 24 mV	1 %[1]	2000 | 1000 | 500 | 250 | 125 | 62.5 sps
Resistance	resistive sensors of non-electrical quantities	31.25 kΩ 125 kΩ 1 MΩ	1 %[2]	15.625 sps
Conductance	GSR (EDA) etc.	1..20 µS (µmho) 8..160 µS (µmho) 32..640 µS (µmho)		15.625 sps
Temperature	skin temperature, breath airflow	-18..120 °C	0.2 °C (from 0 to 70°C)	15.625 sps
Current (NO+, chan. A)	BVP (PPG) etc.	100 nA AC 2 µA AC 25 µA DC		62.5 sps
nIR HEG (NO+, chan. A)	nIR HEG	0..200 %		62.5 sps
pIR HEG (NO+, chan. A)	pIR HEG	0..50 °C		62.5 sps

Maximum total sample stream >4000 sps

Oversampling factor 4 (up to 8000 sps input sample rate)

Passband[3]

- lower corner frequency (-3dB) 0 (DC)[4] | 0.01 | 0.5 Hz
- upper corner frequency (-3dB)
  - linear phase sharp frequency char. 40 % of output sample rate (up to 800 Hz)
  - linear phase mild frequency char. 30 % of output sample rate (up to 600 Hz)

Notch width of mains power noise filter[3] (-3dB) 20 % of the mains power frequency

Common mode rejection ratio (CMRR)[3, 8] >130 dB (60 Hz)

Differential input impedance[3] >10 GΩ (DC)

Differential input capacitance[3] 340 pF

Equivalent input noise[3] 1 µVpp (0.15 µVrms)[5]

Maximum differential DC component[3, 6]	±240 mV
Frequency used for measurement of impedance, resistance and conductance	31.25 Hz
Wireless data transmission (BT models)	Bluetooth 2.0 (2.4 GHz), class 2
Wireless link range (BT models)	up to 10 m
Power supply	
• BT models	2 x AA alkaline or rechargeable NiMH batteries
• USB models	USB port
Battery life[7] (BT models)	24 h typ. (alkaline batteries)
USB galvanic isolation barrier (USB models)	
• Rated dielectric insulation voltage	2500 Vrms min. (1 minute)
• Input to output resistance	1 TΩ min.
• Input to output capacitance	13 pF typ.
Measurement sockets	Touch-Proof 1.5mm (DIN 42802-1)
EEG cap connector (NO+4 models)	DB-25, compatible with Electro-Cap products
USB port connector (USB models)	micro B 2.0
Dimensions (L x W x D)	
• BT models (w. clip)	117 x 79 x 32 mm
• USB models	117 x 79 x 27 mm
Weight (w. batteries)	
• NO*4 BT models	190 g
• NO*2 BT models	170 g
Working ambient temperature	0..40 °C

Notes:

[1] sine test signal of 8 Hz and amplitude equal to 90 % of the measurement range

[2] test resistance equal to 90 % of the measurement range

[3] for voltage measurements

[4] DC coupling available for 24 mV range

[5] EEG profile, 800 µV range, 125 sps, lower corner freq. 0.5 Hz, short-circuited inputs

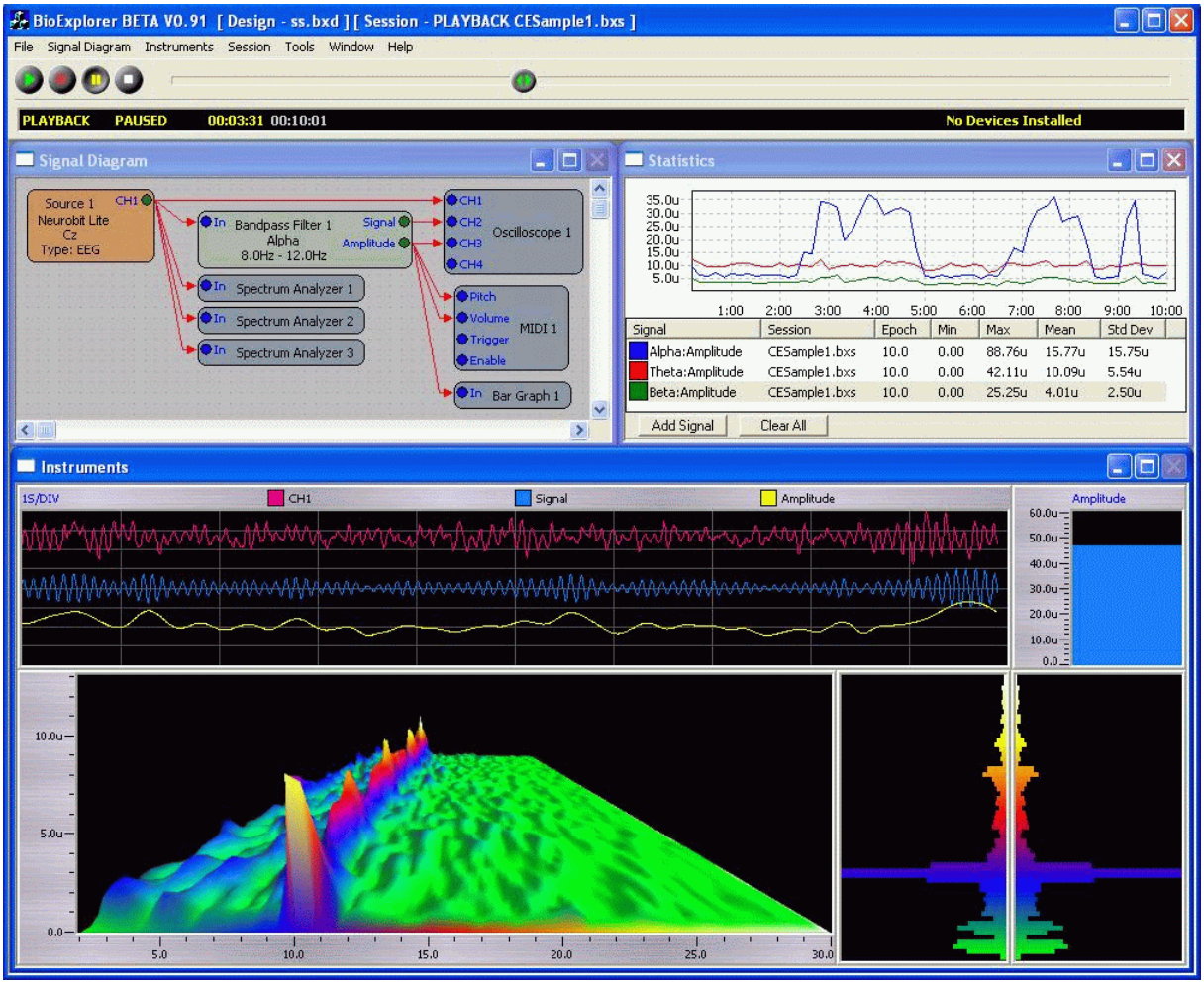
[6] for AC measurements

[7] NO+4 BT device turned on and transmitting

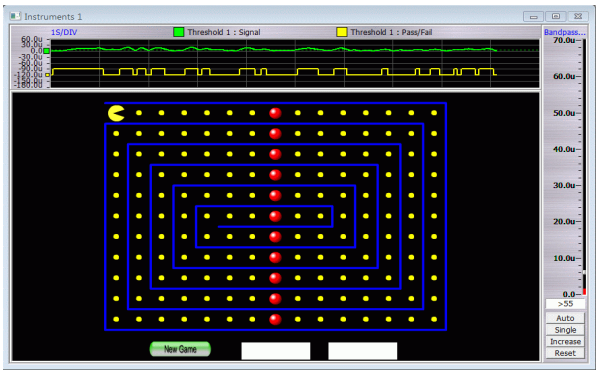
[8] bipolar measurements, zero source impedance

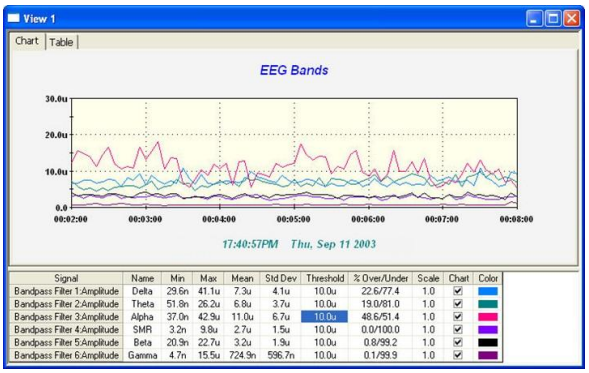
Software

BioExplorer is one of the applications working with Neurobit Optima. This popular biofeedback software enables flexible design of signal processing and presentation.

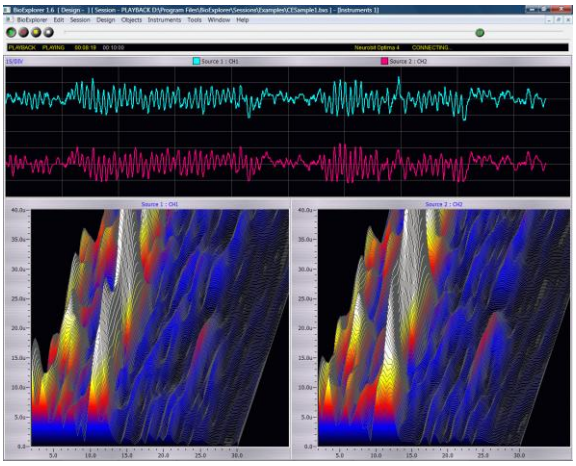


Multimedia feedback in many forms is available: diagrams, bar gauges, animations, DVD movies, games, as well as CD and MIDI audio. User can create his/her own training protocols or apply ready to use designs from established neurotherapists. Additional biofeedback games and other resources for BioExplorer can be bought in the net. Separate monitors for a trainer and a trainee are supported. The software also enables to create a session report and export data to a spreadsheet.

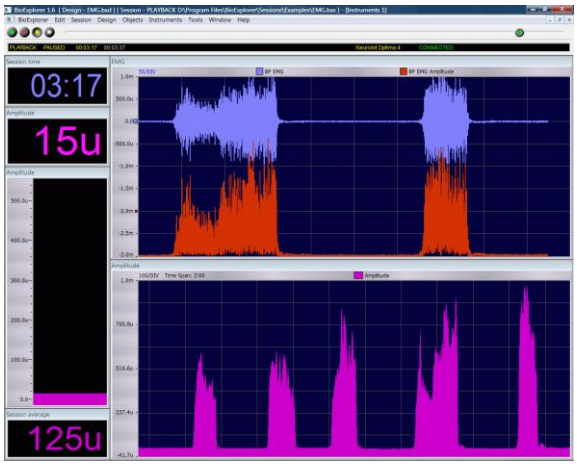




Example BioExplorer screenshots for selected modalities supported by Neurobit Optima*:

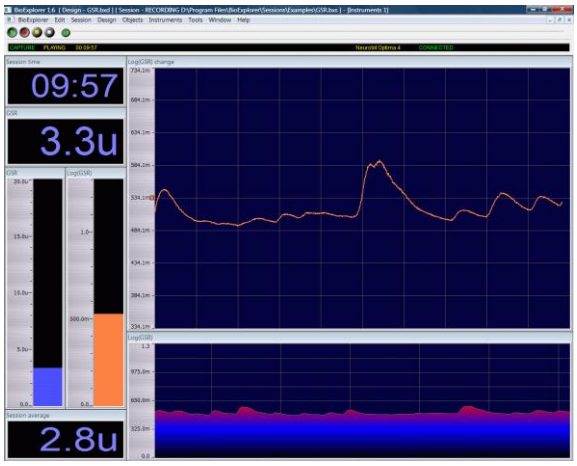


EEG

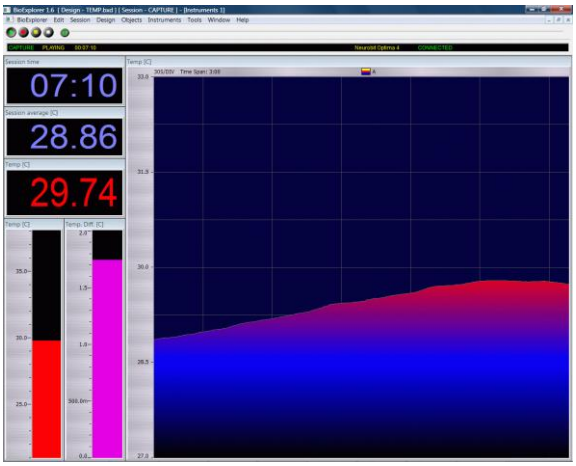


EMG

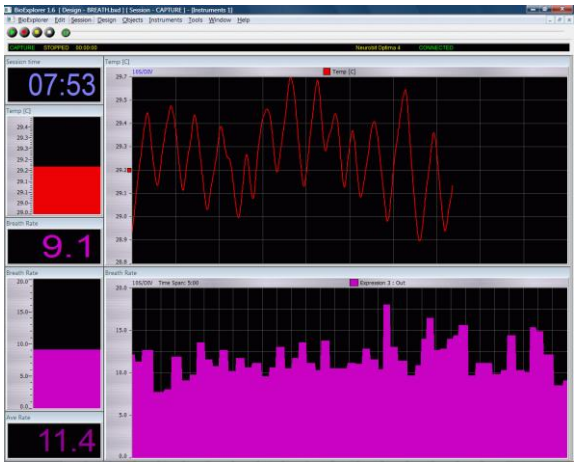
HRV



GSR



TEMP



BREATH

