

## Requirements

Operating System: Windows 64 bit.

The software is operable with [NeuroSky's Mindwave headset](#).

## Installation

### Bluetooth Pairing

Establish Bluetooth connection between the MindWave headset and your PC by adding a device to your PC: Control Panel→Devices and Printers→Add a device.

Switch the MindWave Mobile headset ON and wait until Windows finds the MindWave device. It should appear in the box.

Switch the MindWave Mobile headset into "**Pairing Mode**" by holding the On/Off switch past the "On" position (**over 3 seconds**) until the device appears as "ready to pair". Pair the device.

If you do not have built in Bluetooth connection in your PC, you will need to add [USB Bluetooth connector](#).

2 Extract **BrainMARC monitor\_XX.rar** to a folder.

3 Run the file **setup.bat (not the setup.exe)**

4 Follow the instructions of the setup process.

5 Note that the BrainMARC install will be followed automatically by the MATLAB Runtime installation.

6 The first time you run the application you will be prompted to enter the application activation code that was forwarded to you via email. Example of the code format: **abcd-efgh-ijkl-mnop-qrst-uvwxy-z12**

7 From the desktop icon or from the Windows Start menu open the BrainMARC BrainMARC Monitor application.



8 Connect with NeuroSky's MindWave device

## Troubleshooting: No EEG connection

If you cannot establish any connection at all with NeuroSky's MindWave mobile device, refer to the [manufacturer's user guide](#) and [support services](#).

## BrainMARC Monitor Operation

### Initial screen

The screenshot shows the BrainMARC monitor interface. At the top, there are input fields for 'Activator number' and 'Subject number'. Below these are three diamond-shaped buttons: 'Single Focus Events', 'Brain Engagement', and 'Comfort'. The 'Comfort' button has a sub-menu with 'Comfort marker' and 'Comfort tendency'. A large green 'Start' button is at the bottom center. A status bar at the bottom shows 'Open file' and 'Media file: Activation time(sec): 0'. Callouts on the right side point to specific features:

- EEG connection quality (see below)**: Points to a shield icon in the top right corner.
- Choose biomarker(s) (see below)**: Points to the 'Comfort' button.
- Start EEG analysis and marker generation**: Points to the 'Start' button.
- Open data from past session**: Points to the 'Open file' button.
- Activate media and timing**: Points to the 'Media file: Activation time(sec): 0' button.

### EEG connection quality icons

	<p><b>Good</b> The number in the circle is indicative for the quality of the BEI measure and ranges from 1-6, where 6 indicates the highest quality)</p>		<p>Medium</p>		<p>No connection (refer to <i>Troubleshooting: No EEG connection</i>)</p>
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### Biomarker options

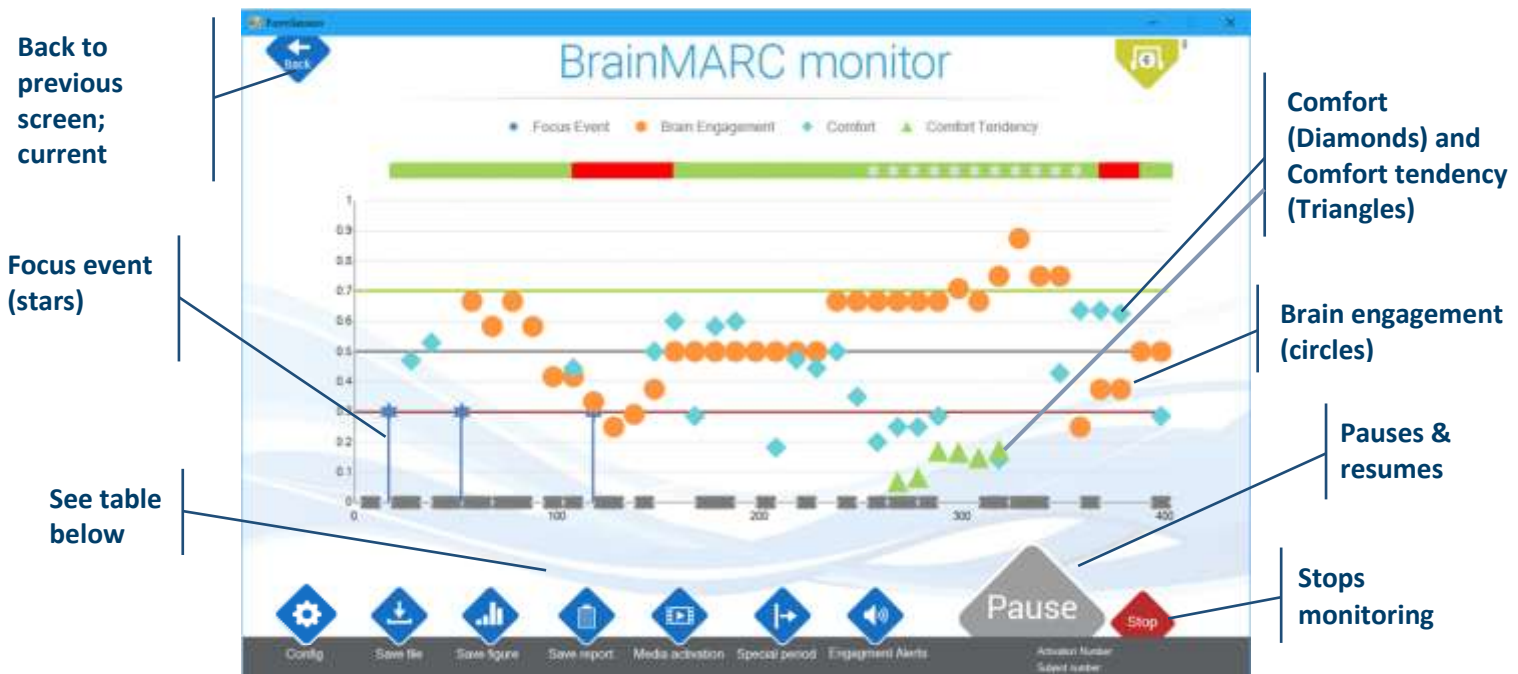
**BrainMARC's Brain Engagement Monitor allows you to choose one or more of the following biomarkers:**

- **Brain Engagement Index (BEI):** Indicates the level of ongoing mental focus.
- **Focus Events Index (FEI):** level of response to specific attention evoking triggers (without *a priori* knowledge of their timing) at 1-second intervals.
- **Comfort Index (CI):** a basic index of affect level.
- **Comfort Tendency Index (CTI):** an index of consistent tendencies in the affect level (increase or decrease).

BrainMARC Monitor dashboard displays the Brain Engagement, Focus Events, Comfort and Comfort Tendency indices online. The data can be stored for later analysis. The tool supports the uploading of media clips and marking periods of interest, thus facilitating analysis of the index data in relation to specific content segments.

The effectiveness of the underlying technology for monitoring attention level and memory effects was proven by a unique study that shows that a known medical intervention, which affects attention and memory, has an immediate effect on the EEG biomarkers tracked by BrainMARC (Baron-Shahaf et al, 2015).

## Working screen



### Save file

Save data generated by the software. Data presented in numerical values. In each line, The first 5 values are the Index values over 0.3 of the focus events (per 5 seconds) and following the first comma the BEI value generated based on the preceding 60 seconds.



### Save figure

Save figure generated by the software



### Save report

Save parameters chosen for the activation (e.g., markers chosen, timing of special periods, timing and name of media activation)



### Media activation:

Allows activation of media clips while the software is running.



### Special period

Allows marking of areas of interest while the software is running. Special areas are marked by darker background and their timing is indicated in the report.



### Colored bar Alerts:

Produces three different sounds in correspondence to the threshold bar colors.



### Config:

Special settings:

#### a. high or low sensitivity

**b. Thresholds colored bar:** The monitor provides feedback among the different levels of attention.

1 - A lowpass threshold, 2 - A highpass threshold, 3 – bandpass (see below explanation).

1

A lowpass threshold is defined when attention drops below 0.3, or from the previous average, in a consistent manner for about 1 minute. This threshold aims at identifying reduced attention.

2

A highpass threshold is defined when attentions surpasses 0.7 in a consistent manner for about 1 minute. This threshold aims at identifying conditions such as anxiety, severe pain and/or disinhibition.

3

Bandpass uses both thresholds.

### Thresholds colored bar:

Whenever the BEI is within the desired thresholds, the sampling is marked in green. When the BEI is outside the desired thresholds, the sampling is marked in red. If the BEI is below the lowpass threshold, yet the comfort index is low (indicating nevertheless some degree of attention effort) the sampling is marked in yellow. Whenever above average attention is noted, the sampling is marked with an asterisk.

## Disclaimer

The BrainMARC Monitor is not intended for medical use.

## BrainMARC Ltd

P.O.B. 128 Yoneam Illit 20692, Israel  
 contact@brainmarc.com  
 www.brainmarc.com  
 +972-4-666-7760

## BEI marker evaluation test

In order to experiment the software with a validated well established test, we suggest to perform a backward digit span test as a fast test for evaluation of the BEI marker.

## Digit span

Digit span is an attention test used to see how many numbers a person is able to remember. There is a forward and backward assessment. Forward measures immediate memory and backward measures working memory.

## Instructions to the Experimenter

You should have in front of you a sheet headed Lists for Digit Span Determination. You will see that lists are arranged in **sets**, those in each set being of **the same length**, the lists becoming progressively longer as you work down the page. **Prior to the test, wait until the subject has at least three sequential BEI values (orange circles) below 0.5. You may ask him to relax to reduce his BEI level.**

Explain to the subject that you are going to read him lists of digits, and that he should try to repeat the digits **in the reverse order (backwards) in which they were read out**. If the subject seems unclear about what is required, go through an example, say, the list: 4, 7, 1, and he should reply 1, 7, 4. Read the digits in an even tone, at approximately the rate of **one digit per second**.

Start this procedure from the two digits set (three numbers in each set) and continue to three digits set up until the subject gets two lists from the set wrong, or abort efforts.

<b>2 digit set →</b>	83	54	27
<b>3 digit set →</b>	829	687	871
<b>4 digit set →</b>	6241	1372	5316
<b>5 digit set →</b>	84132	85293	79514
<b>6 digit set →</b>	587261	492617	148239
<b>7 digit set →</b>	2941378	6297865	1897562
<b>8 digit set →</b>	65148279	28653197	85729136
<b>9 digit set →</b>	679174382	239874615	539748216
<b>10 digit set →</b>	4982176453	2853967624	2914984357