

Muse: The Brain Sensing Headband Tech Spec Sheet

Muse Headband:

- Flexible, adjustable, lightweight headband with 7 EEG sensors capable of reading 4 channels of data - two on the forehead and two at the top of the ears
 - Produces bipolar readings using Fpz(center of forehead) as the reference for TP9(left ear), Fp1(left forehead), Fp2(right forehead), TP10(right ear).
 - 1 reference sensor at Fpz and 2 DRL sensors on the forehead.
 - The 7-sensor montage enables estimation of hemispheric asymmetries (with an emphasis on the pre-frontal lobe) and thus facilitates brain-state discrimination that depends on asymmetry, such as emotional valence (positive vs. negative emotions).
 - EEG signals are oversampled and then downsampled to yield an output sampling rate of 220 Hz with 2uV (RMS) noise.
 - Active noise suppression is achieved with a DRL - REF feedback configuration using centrally positioned frontal sensors.
 - Input range of AC coupled signal (low cutoff at 1 Hz) is 2 mV p-p.
- An on-board 3-axis accelerometer enables motion input for games and for quantifying head movements.
- Communicates over bluetooth and is compatible with iOS 6.1+ (iPhone 4S+, iPad 3+, iPad Mini 2+, iTouch 6+), Android OS 4.0.3+, Mac OS (OSX 10.8+), Windows 7 & 8 and Ubuntu Linux LTS releases.
- Rechargeable lithium-ion battery (charge via micro-USB jack, just like most cell phones). Lasts up to 5 hours of use per charge. Typical lithium-ion batteries last a minimum of 500 charge cycles. Thus if you use Muse for 15 minutes a day, the battery should last at least 27 years.
- Battery fuel gauge which measures the amount of remaining battery.
- 5 LEDs which display various states of operation.

INTERFACE SOFTWARE AND API

In addition to the apps that will be included with Muse, we will supply processing software to use in apps you create yourself. We will provide both higher-level processing (which does sophisticated analysis; details below) and lower-level processing (which simply reads raw data from the device and does some basic analysis) so you can take whichever approach fits your needs.

In developing this system, we opted to offload all real-time analysis to the host system, apart from some basic filtering and compression algorithms. This decision was made in order to conserve battery life on the headband, allow for a sleeker design, and access much more processing power to achieve better brainwave analysis.

Below are a list of features available in the SDK.

Available Now

- MuseIO: the desktop driver for Windows, MacOS, and Linux, provides:
 - An OSC and LSL message interface to allow easy integration with programs such as Max/MSP, Puredata, Quartz composer and Processing.
 - Matlab compatible using MusePlayer to convert recorded sessions to Matlab format.
 - Basic set of algorithms included:
 - Absolute power for alpha, beta, theta, gamma, delta for each channel
 - FFT for each channel
 - Proper fit indicator for each channel
 - Data quality indicator for each channel
 - Blink event
 - Jaw Clench event
- MuseLab: the Brainwave visualizer tool: view data in real time, annotate data, record to disk, apply DSP algorithms, rebroadcast data.
- MusePlayer: a tool to record, convert, and playback brainwave sessions.
 - Supported inputs: OSC network stream, OSC-replay file format, Muse file format
 - Supported outputs: MATLAB, CSV, OSC network stream, OSC-replay file format, Muse file format, Print to screen