DreamMachine Userguide

Content

The companion app is functional but certainly not ready for industrial deployment.Please be forgiving of hiccups, bugs and glitches and report them to dguen@uos.de

DreamMachine

The Device

The DreamMachine is a low-cost EEG device developed by researchers at the University of Osnabrück. It features 24 channels and transmits data via Bluetooth with a transmission rate of up to 250Hz. The DreamMachine works in a range of ± 2.5 V . Usage of the DreamMachine requires an android device with the current version of the DreamMachine Companion app installed on it.

DreamMachine Companion App

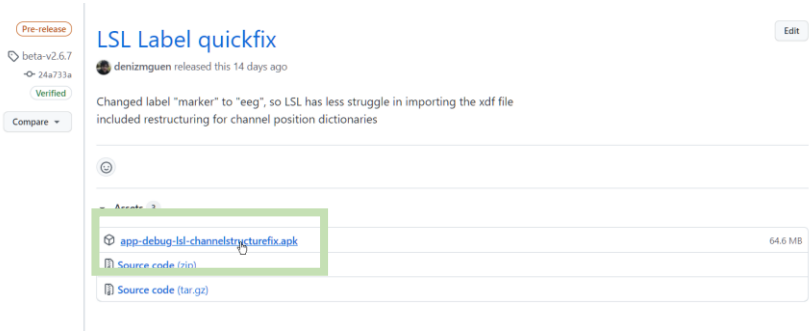
Android Device Requirements

- Android 8+
- Support for Bluetooth Low Energy

Installing the App

1. Visit https://github.com/denizmguen/EEG-Droid/releases

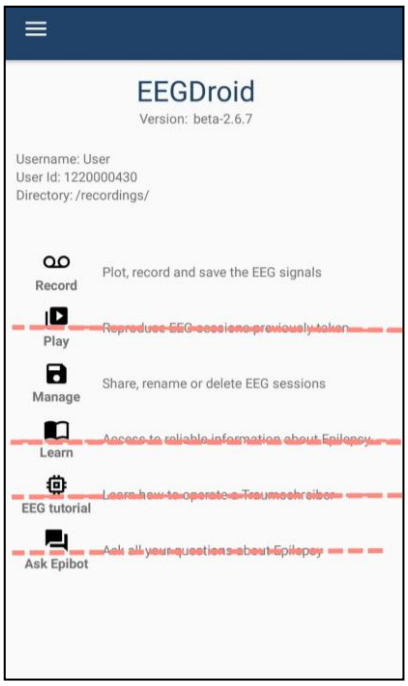
2. Click on “Assets”

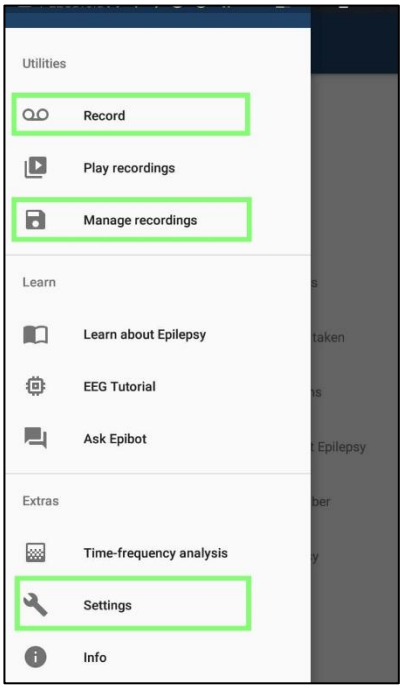


3. Download the .apk file by clicking on the filename
4. Move the .apk file to your device.
5. Open the .apk file from your device.
6. (Allow installation from unknown sources.)

App Overview

Record, Share and **Settings** are currently the only functional app activities

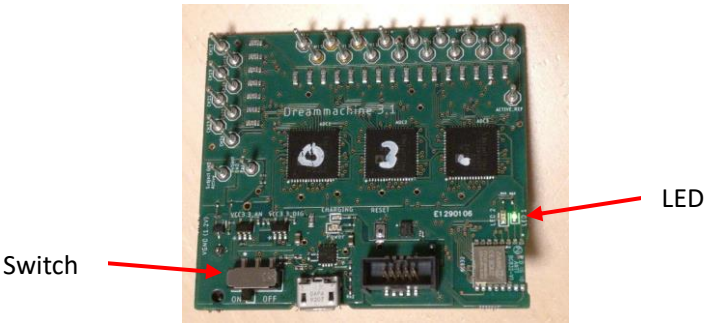




“Record” - Connect to the DreamMachine via Bluetooth

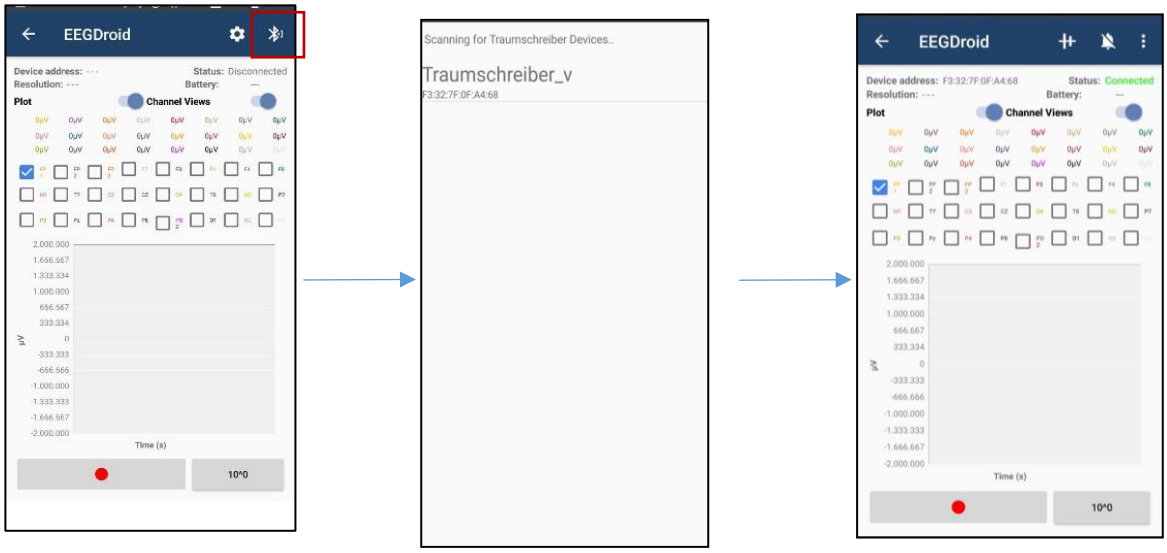
Turn on the DreamMachine

First, make sure the DreamMachine is turned on, by checking whether the switch at the bottom left is set to “on” and LED 1 on the bottom right is lighting up in green. If the LED does not light up in green, recharge via micro USB. You can use the device while charging.



Search for devices

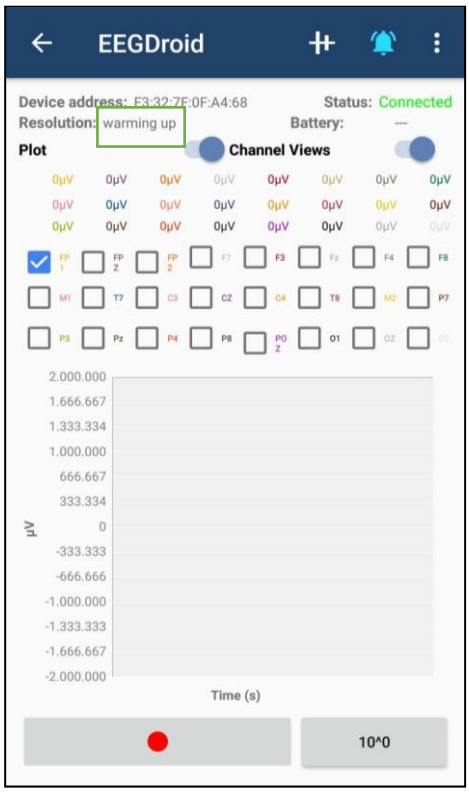
Afterward, open the “Record” activity and tap on the Bluetooth symbol in the top right corner of the screen. Turn on Bluetooth and locational services and give the app access to both of them when asked.



Tap on the name of the device and then wait until it says “Connected” on the top right corner of the display to continue.

“Record” - Stream EEG Data via Bluetooth

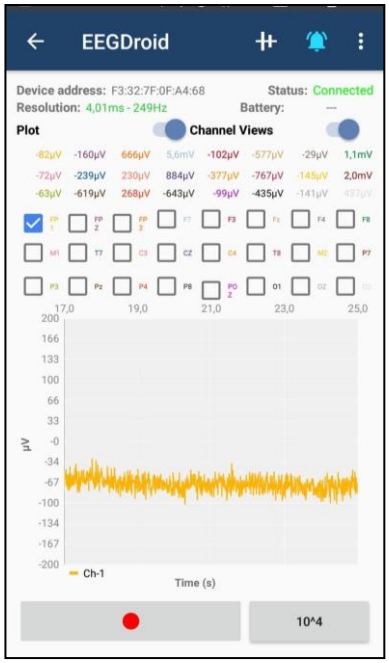
Warm Up



Tap the notification bell on the top right corner to start receiving data. First, it should say “warming up” next to the Resolution text.

If it stays at “warming up” for more than two seconds, tap the arrow on the top left and repeat the steps above from “Connect the DreamMachine”.

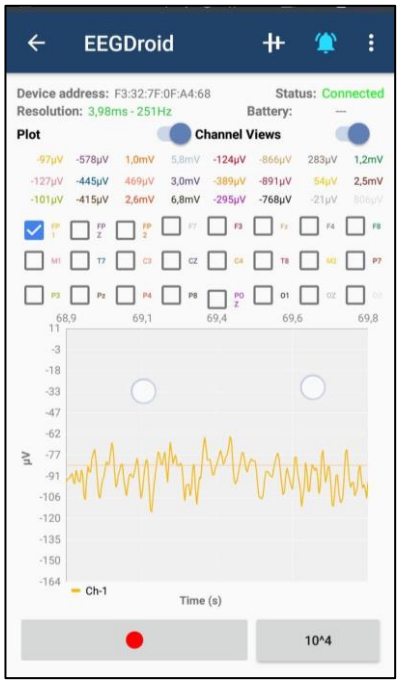
Tap Zoom

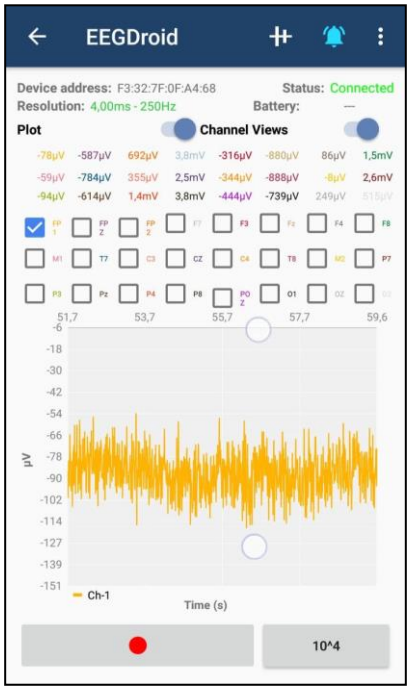


If you record low amplitude signals, initially the signal will appear as a flat line. The button on the bottom right indicates the order of magnitude of the zoom level. Tap it until the desired zoom level is reached.

In this case, 10^4 is appropriate.

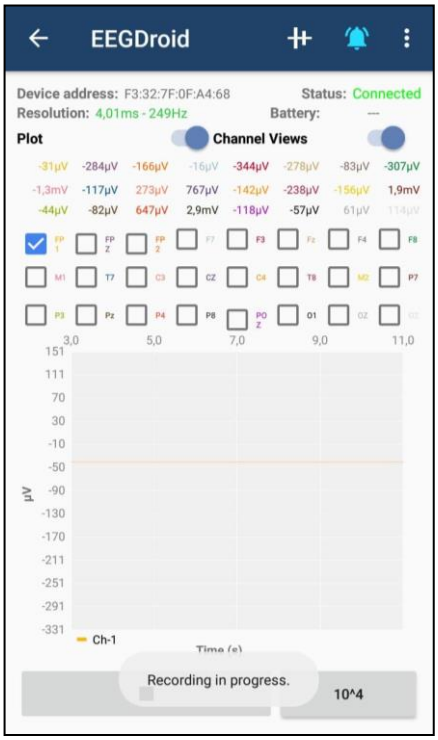
Pinch Zoom

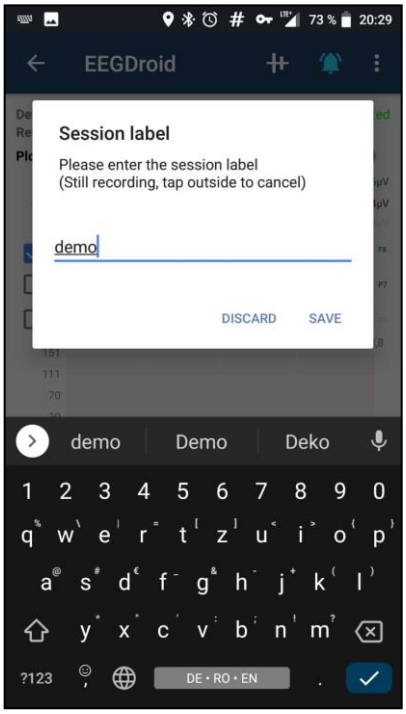




You can use two fingers to pinch zoom horizontally and vertically.

Make Recordings

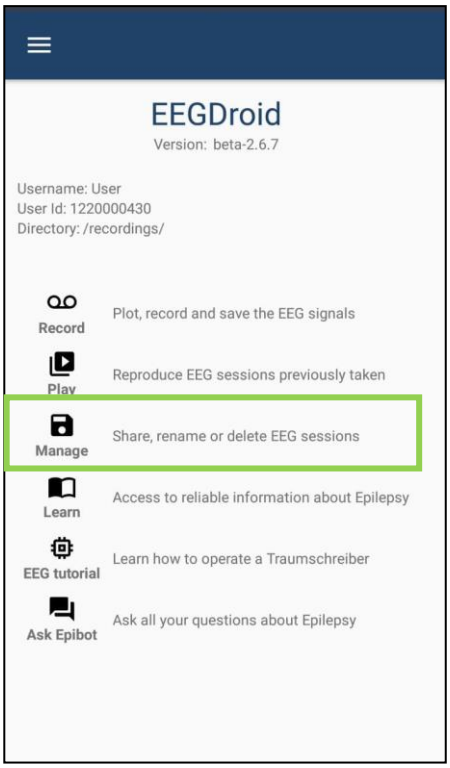




While the Traumschreiber transmits data, press the record button at the bottom left. Due to an unresolved glitch, you will not see a signal on the graph for about 8 seconds but don't worry; All data is being recorded from the moment you press the record button.

Press the record button again and name your recording.

Manage Recordings



Go back to the main menu and tap the "Manage" option.

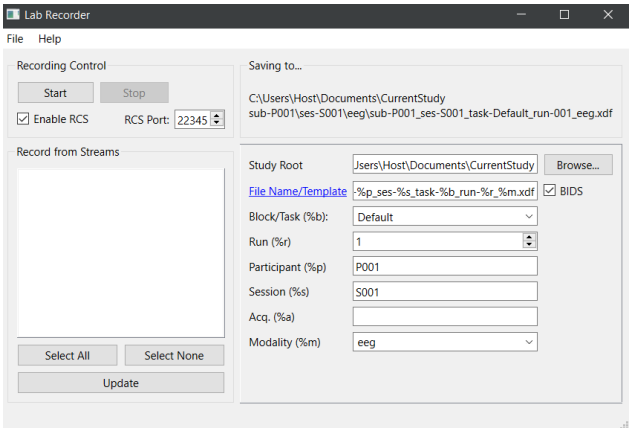
From here you can use select multiple recordings and share them.

Stream via Lab-Streaming-Layer (LSL)

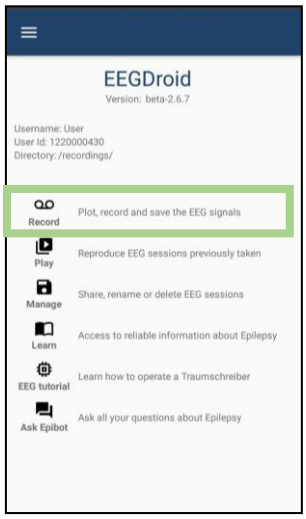
- Download the LSL App for your operating system from

  https://github.com/labstreaminglayer/App-LabRecorder/releases

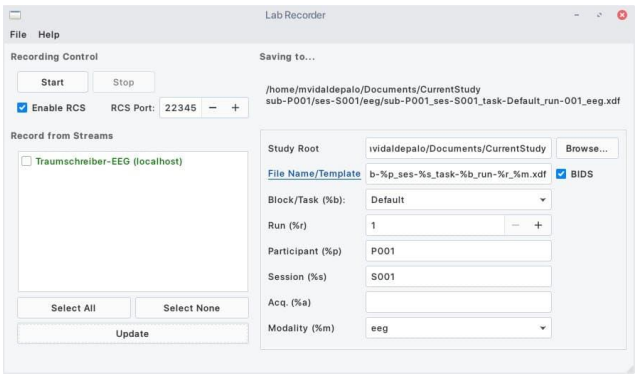
- Deactivate Wi-Fi on your android device.
- Activate “Hotspot” on your android device.
- Connect your computer to the android device hotspot via USB-Tethering or Wi-Fi.
- Launch the LSL App on your computer (Labrecorder.exe for Windows)



- Launch the Record activity on your android device

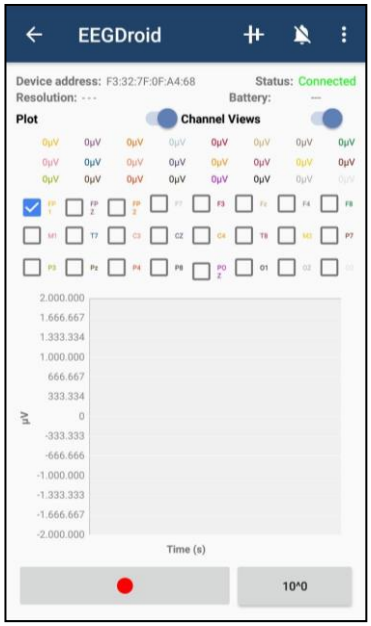


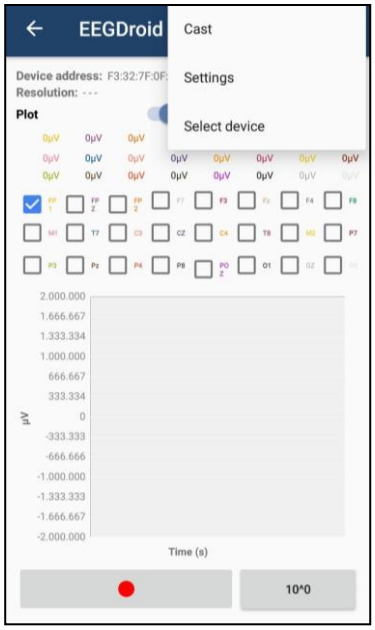
- Click “Update” on the Lab Recorder software and you should see a stream pop up.



Change the DreamMachine Configuration (Advanced)

Access the DreamMachine configuration from the “Record” section. If your screen is narrow, you’ll see 3 dots. Tap on the 3 dots and then on “Settings” to open a pop-up window where you can configure the Traumschreiber. All of the settings and their meaning are explained in the table below. For wide screens, just directly tap on the “settings” symbol, which is a cog.





Setting	Description
Gain	Amplification of the original signal
Bits per channel	This determines the quality of the signal. High-end devices should always use 16bits unless too much data is lost during transmission (which the app will tell you).
Running Average Filter	A simple filter based on running average
Transmission Rate	Low-end devices that struggle with a lot of data loss can use a transmission rate of 167Hz instead of 250Hz
First Order High Pass	Cut-off frequency of first-order high pass filter
IIR High Pass	Cut-off frequency and order of IIR high pass filter
Low Pass Filter	Cut-off frequency and order of low pass filter
Band Stop Filter	Notch Filter that aggressively attenuates the amplitudes around 50Hz. These correspond to the noise emitted by standard power lines.
Bitshift Min	0 for EEG, higher values (e.g. 2) for EOG or ECG
Bitshift Max	0 for EEG, higher values (e.g. 6) for EOG or ECG
Encoding Safety Factor	Only change for development and testing