

## Advanced Electrophysiology

### Data analysis 26 February - 12 March 2026

#### 1) Download Clampfit 10.7 at:

<https://support.moleculardevices.com/s/article/Axon-pCLAMP-10-Electrophysiology-Data-Acquisition-Analysis-Software-Download-Page>

google: Clampfit 10.7 download

(Windows only; for mac users you need parallels, available at

<https://www.parallels.com/>

14-day free trial available

#### 2) Transfer of set of data for analysis

In the Electrophysiological data folder, you will find 5 folders named WT Cell1-5. They contain electrophysiological recordings from 5 WT layer V pyramidal neurons from medial prefrontal cortex acute slice of mice. Each folder contains 3 files that you can open with Clampfit. They are sequential recordings of excitatory synaptic currents from the same layer V pyramidal neuron:

- 1) Baseline: Baseline recordings (12 traces recorded every 20 s)
- 2) Drug: 36 traces (every 20 s) during application of MPEP (20  $\mu$ M; 2-Methyl-6-(phenylethynyl)pyridine hydrochloride), a non-competitive antagonist of the metabotropic glutamate receptor mGluR5
- 3) NBQX: 20 traces (every 20 s) during application of NBQX (10  $\mu$ M; 2,3-Dioxo-6-nitro-1,2,3,4-tetrahydrobenzo[*f*]quinoxaline-7-sulfonamide) a competitive AMPA and kainate receptor antagonist.

#### 3) Opening and visualization of the traces with Clampfit

- a. Select sweeps
- b. Adjustment visualization window
- c. Brief overview of the analysis possibilities
- d. Sampling interval (20  $\mu$ s; 50 kHz)

#### 4) What do the traces show:

- a. Voltage command: holding potential: -70 mV, passive properties, voltage-gated currents, mEPSCs
- b. Stimulus artefact, AMPAR synaptic currents (recordings done in the presence of Bicuculline (10  $\mu$ M) a competitive GABA<sub>A</sub> antagonist and D-APV (50  $\mu$ M; D-2-amino-5-phosphonovalerate), a competitive NMDA receptor antagonist.
- c. How to isolate currents in native systems (voltage command, pharmacology) as opposed to heterologous expression systems.
- d. 50 Hz noise

#### 5) How and why the experiment was done

- a. AMPAR excitatory synaptic currents (amplitude, rise time, decay time)
  - i. Does mGluR5 regulates AMPAR synaptic currents
- b. Paired pulse ratio as a proxy of synaptic vesicle release probability ( $P_r$ )
  - i. Does mGluR5 affects  $P_r$
- c. Even traces: holding potential: +40 mV
  - i. Does mGluR5 affects the AMPAR rectification index

#### 6) How to analyze the data

- a. How to average traces
- b. How to offset traces
- c. How to calculate current amplitude
- d. How to calculate current rise time
- e. How to calculate current decay time constant: the weighted decay time constant
- f. How to calculate AMPAR PPR
- g. How to calculate AMPAR rectification index
- h. How to calculate the effect of MPEP
- i. NBQX: how and why to digitally subtract traces

#### 7) Install Igor Pro and GraphPad Prism 5 on your system

#### 8) Using a computer routine to automate data analysis In Igor PRO

- Passive properties:  $R_s$   $R_{in}$  and  $C_m$

#### 9) Using the right statistical test in GraphPad