The equipment consists of a fully automated patch clamp system for recording from up to 8 cells simultaneously with giga-Ohm seals. The system must be capable of single channel recordings in the on-cell mode and voltage and current clamp recordings in the whole cell configuration. The system must also include high quality amplifiers, a pipetting robot and a PC and be capable of 48 unattended recordings as well as user intervention at any time during the experiment.

The system should be available within 4-6 weeks.

1.1 Complete System

- Must include benchtop pipetting robot with width no more than 60 cm
- Must be standalone (no external air supply required)
- Must have external PC (no tablet or touchscreen)
- Must have external amplifiers compatible with manual patch clamp experiments
- Must have integrated temperature control with heating up to 60°C possible
- Must be capable of running unattended to perform 48 recordings without user intervention
- Must be able to record 8 cells simultaneously
- Must have a robotic reusable Teflon coated pipette with fully adjustable pipette speed in the range of at least 1 – 400 µl/s
- Must have flexible deck space on the robot for storage of compounds, including space for glass bottles, Eppendorf tubes, glass vials etc
- Must have full automation but modifications to protocols during the experiment must also be possible
- Must have continuous waste removal system to add large volumes of external solution to each well and an unlimited number of additions

1.2 Amplifiers

- HEKA EPC10 Quattro amplifiers
- Must be compatible with Patchmaster software for data acquisition
- Voltage clamp and current clamp/Low Frequency Voltage Clamp (LFVC) modes
- Gentle Switch option from voltage clamp to current clamp (injection current is equal to the current monitor in voltage clamp mode)
- Must have at least 16 Digital-In and 16 Digital-Out connections
- Bandwidth must be: 100 kHz (low and medium gain range), > 60 kHz (high gain range)
- Series resistance compensation must have fast time constants of down to 2µs
- Sampling rates up to 200 kHz must be possible
- RMS noise of 350 femtoamps (fA) must be achievable by the amplifier
- Broad RS compensation range: up to 1 nanofarad (nF)
- Must be able to detect currents +-50 pA upto +-2 µA
- Output voltage range of ±1V

1.3 Computer

- Must be provided with a PC with specifications:
- Core: at least Intel i5
- Ram minimum 8GB
- HDD minimum 512 GB
- At least 8 USB Ports
- Windows 11

- Dimensions: Height: 290 mm (11,42")
  Width: 92,6 mm (3,65")
  Depth: 292,8 mm (11,53")
- Monitor must be provided (not touchscreen)

1.4 Software

- Must have software controlling pipetting robot
- Must have electrophysiology data acquisition software compatible with HEKA Patchmaster
- Must have further analysis software Igor Pro from Wavemetrics

1.5 Consumable

- Must have borosilicate glass bottom
- Must have 16 microfluidic chambers per chip
- Must be available in a variety of resistances
- Must have single hole and multi-hole options
- Electrodes must be external, not integrated in the chip
- Must be possible to use part of the chip for the experiment and the rest of the chip at a later date
- Diameter of microfluidic external chamber should be in millimeter range to ensure good surface to volume ratio

1.6 Temperature control

- Must be able to heat solution inside the pipette to rapidly and transiently activate heat-activated TRP channels (set temperature up to 60°C must be possible)
- Must be possible to set temperature of measure head, chip wagon and pipette individually up to 60°C

1.7 Extra requirements

- Must be possible to exchange the internal solution
- Must be upgradeable to include an add-on for automated Dynamic clamp
- Must be proven that mechanically activated channels can be activated using shear stress
- Single channel recordings in on-cell mode must be possible and be demonstratable with examples
- It must be possible to pipette large volumes of up to 200 µl per well in a single addition
- Addition of sticky compounds must be possible with a single addition

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13.12.2023
09:30:43
GMT+01:00

Francesco
Leonetti
13.12.2023
09:55:10
GMT+00:00