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## PATCH-CLAMP MICROCHIP TESTING CIRCUIT INTERFACE

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Team # 10

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## Introduction

This project is about building up a patch-clamp microchip testing circuit interface using available equipments and collected data. The function of the interface should be being able to make the circuits work well and output expected, useful and correct data.

By working with graduated students assigned by our advisor/client, we need to achieve following to make the project success:

- 1) Setup the patch-clamp testing circuit interface using the commercial amplifier and probes.
- 2) Measure the ion channel potential of cells using the patch-clamp microchip.
- 3) Measure the action potential of cells under external stimulations using the patch-clamp microchip.

## Deliverables

Complete the electrical testing setup in Fall semester; and carry out the measurement and submit a comprehensive final report by April 2018.

## Design

Capacitance compensation  
Electrode resistance test  
Junction potentials-search mode  
Patch sealing resistance  
Recording during voltage clamping  
Current clamping  
Series resistance compensation  
Leakage resistance compensation

## Project Requirements

Circuit design and implementation  
Electrical measurement and real-time data acquisition  
Some knowledge of MEMS

## Challenges

Usage of specific tools in Electronic Engineering field  
The application of Amplifiers  
Biologic background knowledge  
Tests based on various environments

## Timeline

Task	Start time	End time	Task description
Project begin	Week 1	Week 3	Held the first group meeting and give task to every group member
Website setup	Week 2	Week 3	Set up the website, upload member's information. Start to upload weekly report.
Gather information and research	Week 3	Week 5	Read documents and corresponding background knowledge about patch-clamp. Read the manual of the commercial amplifier and probes.
Setup and operation	Week 6	Week 13	Capacitance compensation Electrode resistance test Junction potentials-search mode Patch sealing resistance Recording during voltage clamping Current clamping Series resistance compensation Leakage resistance compensation

Complete the electrical testing setup	Week 14	Week 16	Finish setting up the patch-clamp testing circuit interface
First semester Presentation	Week 15	Week 16	Present the component of setup and the testing plan for next semester
Testing circuit	Week 17	Week 22	Testing the PC-one voltage clamp mode Using speed to simulate patch currents Testing the PC-one in current clamp mode
Measure the data under different simulations	Week 23	Week 30	Measure the ion channel potential of cells. Measure the action potential of cells under external simulations. Gather the results of the measurements by microscope and summarize the information get from the experiments.
Comprehensive final report	Week 31	Week 32	Present the whole project and the achievements in this project..

## Conclusion

The patch clamp technique is a laboratory technique in electrophysiology that allows the study of single or multiple ion channels in cells. We are going to build the circuit with the microchip to achieve our measurements goals. The patch clamp technique can be applied to a wide variety of cells, but is especially useful in the study of excitable cells such as neurons, cardiomyocytes, muscle fibers, and pancreatic beta cells.

## References

## Appendices