Experiment HN-14: Senses – The Eye and Ear

Equipment Required

PC or Mac Computer

IXTA, USB cable, IXTA power supply

NMD-Eye - ** This lab uses the Eye only **

NMD-Ear

Spike Sorting Analysis Module in LabScribe

Equipment Setup

1. Find the NMD-Eye model.
2. Plug the connector of the models into the DIN inputs of the IX-TA. Plug the Eye model into channel A5.

Carefully remove the stickers from the colored lens.

Figure HN-14-S1: The NMD-Eye model.

The eye will be connected to channel A5.

Figure HN-14-S2: The IXTA with the NMD-Eye connected.

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Experiment HN-14: Senses – The Eye and Ear

NOTE – This lab uses the Eye Model only

Exercise 1: Eye Model using Different Color Discs

Aim: To measure the action potentials of the "eye" when using different colored discs.

Approximate Time: 15 minutes

Procedure

1. Place the eye model on the table.
2. Type **White** in the Mark box. Click Record and using the flashlight and shine the light onto the "lens" of the eye model for 10 seconds. Click the Mark button to mark the recording.
3. Wait 3 seconds after shutting off the flashlight and then click Stop when done.

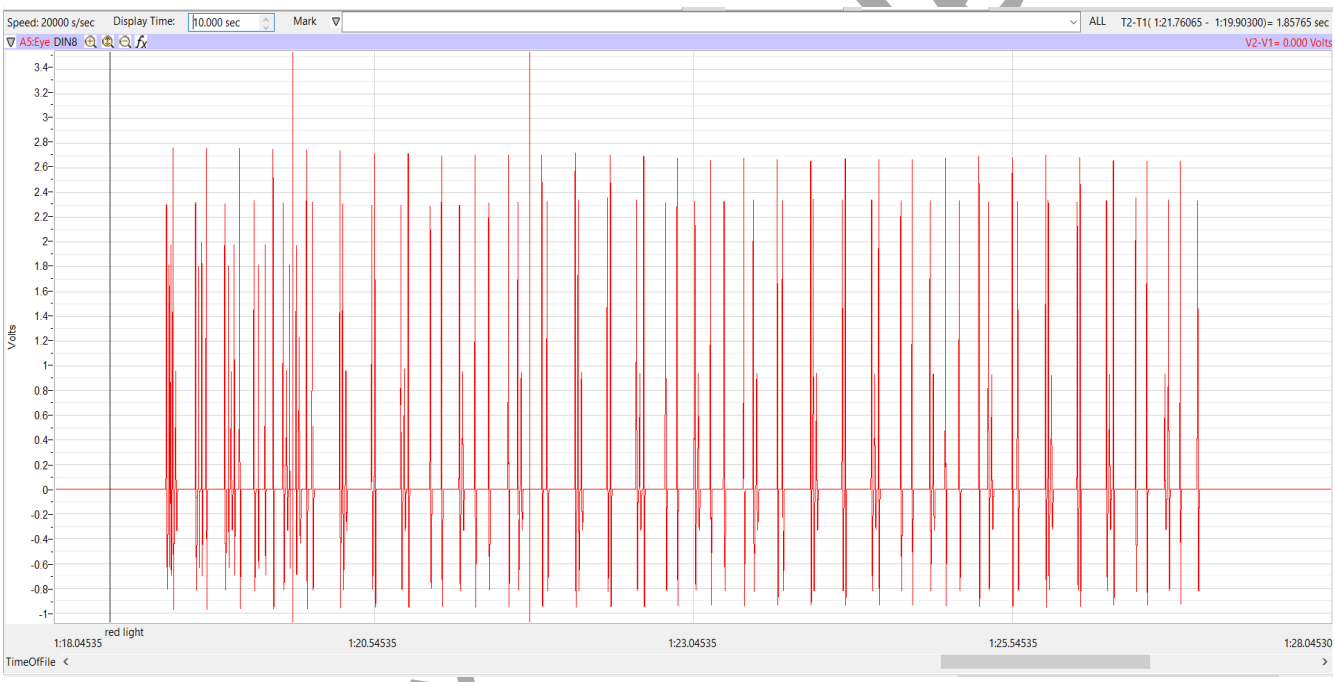

Figure HN-14-L1: Recording of the Eye with the flashlight for 10 seconds.

3. Place the red disc over the "lens" of the eye model. Type **Red** in the Mark box. Click Record and then press the mark button to mark the recording. Shine the flashlight onto the red disc and record for 10 seconds. Wait 3 seconds after recording and then click Stop.
4. Repeat step 3 using the green and blue discs.
5. Click Stop and the end of recording.
6. Select Save As in the File menu, name the file and save the data file.

Work Text Lab

Data Analysis

1. Go to Edit → Preferences → Options and change the Data Display points in the lower right to at least 1,000,000.
2. Use the Double Display Time icons to adjust the display time of the Main window to show all the data on the screen. You will need to click this button a couple of times.

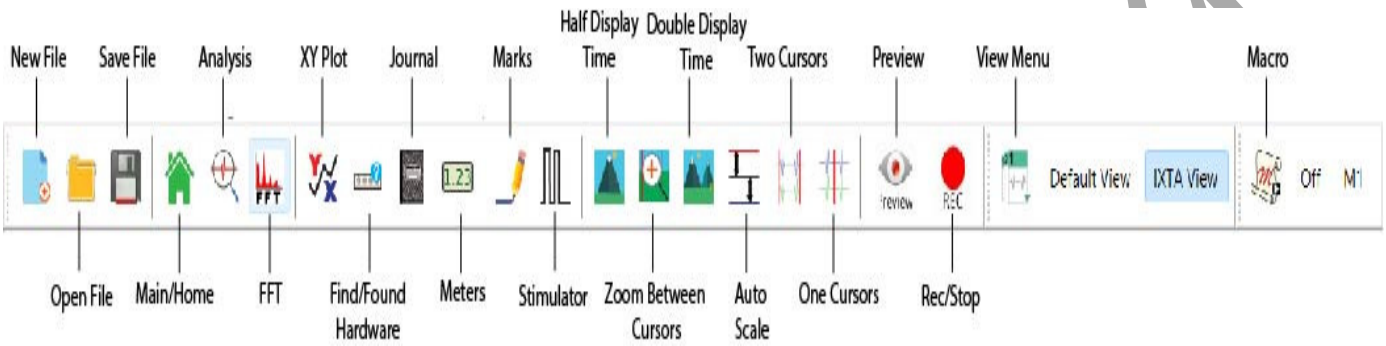

Figure HN-14-L2: The LabScribe toolbar.

3. From the menu options, click Advanced → Spike Sorting
4. This will open the Spike Sorting Analysis module.

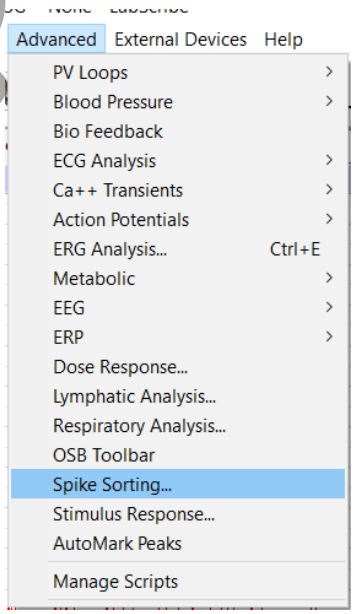

Figure HN-14-L3: Advanced → Spike Sorting

5. Make sure:
   - Spike Channel → Eye
   - Date Range → Complete File
   - **Do not change other parameters**

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6. Click Find Spikes.

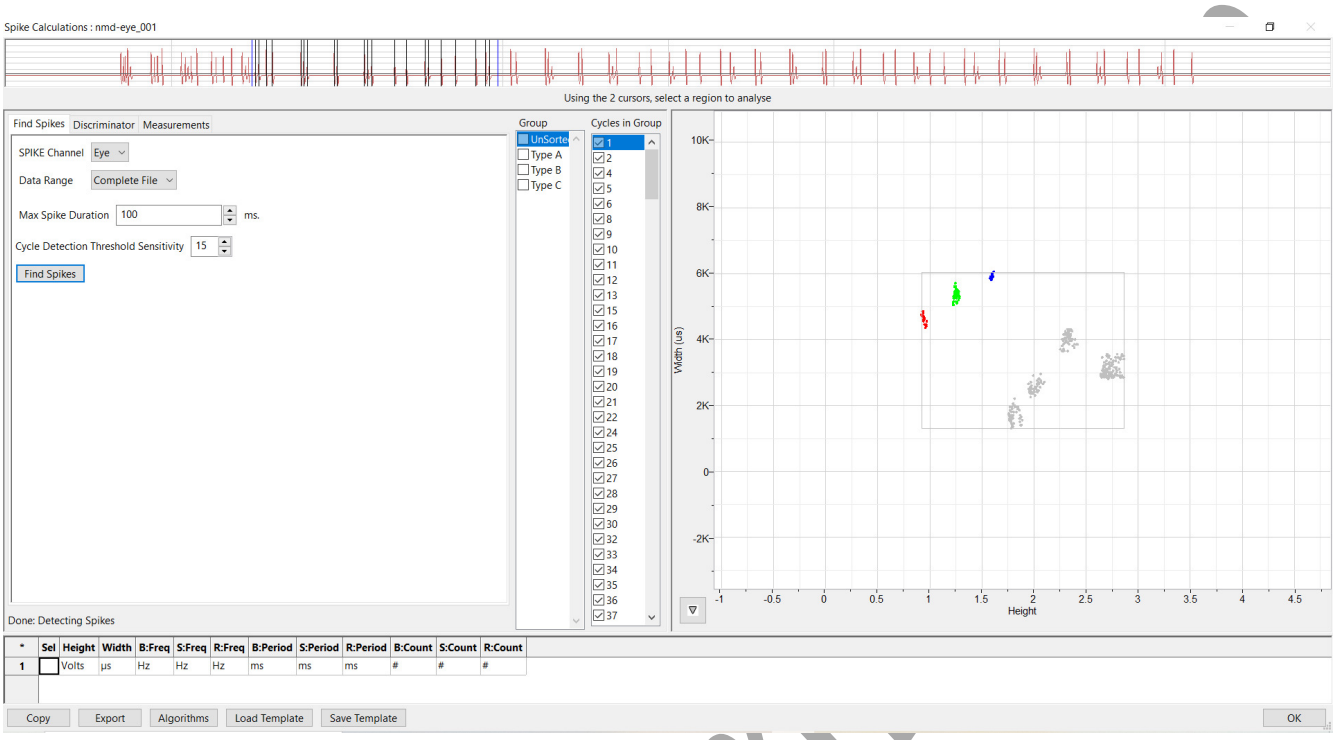


Figure HN-14-L4: Spike Sorting "Find Spikes" window.

7. Once the spikes have been sorted, you should see a graph with red, green, blue and gray spikes.
8. Click the Discriminator tab. Click "Current Spike Type".
   - Type A – will show the spikes for red light
   - Type B – will show the spikes for green light
   - Type C – will show the spikes for blue light

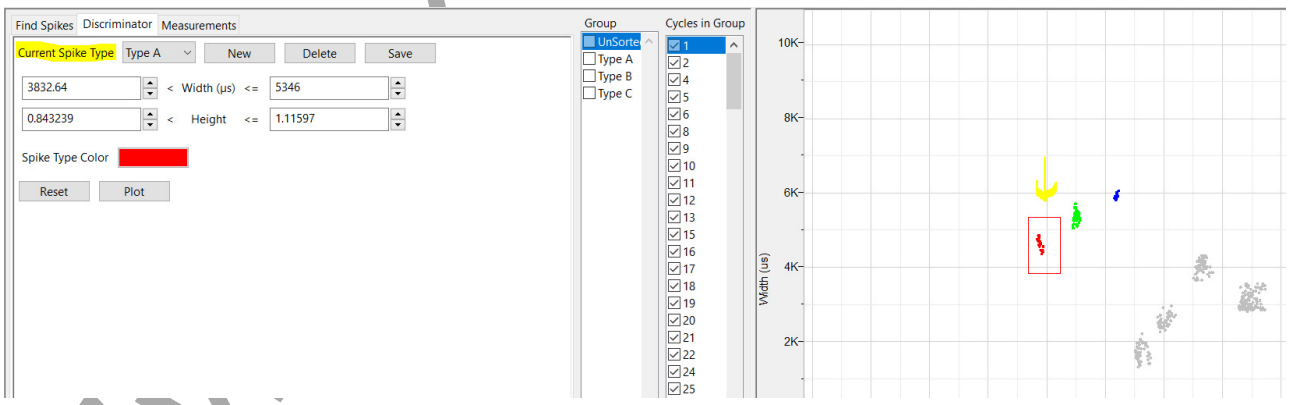
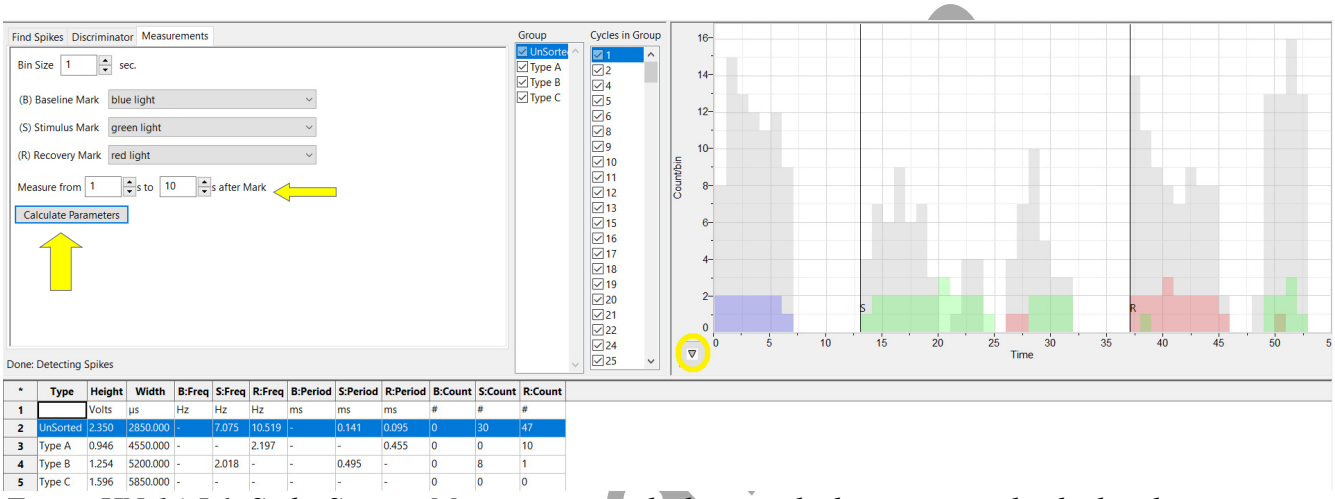


Figure HN-14-L5: Current spike type shown is for the red light.

Not for Sale

9. Click the Measurements tab.
    - Measure From is 0 → 10 seconds.
    - Click the down arrow just to the left of the graph – click View Histogram
        - B = blue light
        - S = green light
        - R = red light
    - Click Calculate Parameters
        - Parameters shown include: the frequency of the spikes, the period, and number of spikes for each type of light.

These may need to be selected from the drop-down menus.



*	Type	Height	Width	B:Freq	S:Freq	R:Freq	B:Period	S:Period	R:Period	B:Count	S:Count	R:Count
1		Volts	µs	Hz	Hz	Hz	ms	ms	ms	#	#	#
2	UnSorted	2.350	2850.000	-	7.075	10.519	-	0.141	0.095	0	30	47
3	Type A	0.946	4550.000	-	-	2.197	-	-	0.455	0	0	10
4	Type B	1.254	5200.000	-	2.018	-	-	0.495	-	0	8	1
5	Type C	1.596	5850.000	-	-	-	-	-	-	0	0	0

Figure HN-14-L6: Spike Sorting Measurements tab showing the histogram and calculated parameters.

Questions

1. Which type of photoreceptor is best able to process bright light and color?
2. Which photoreceptor is primarily used in dim light?
3. The tri-chromatic theory of color vision describes the types of cones. Which of these is NOT a type of cone in humans ~ Red, Yellow, Blue or Green?
4. What is the term for the process of creating electrical energy in response to light?
5. What are the key steps in the phototransduction process?
6. What is the role of photoreceptor adaptation?

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Exercise 2: Eye Model using a Combination of Colored Discs

Aim: To measure the action potentials of the "eye" when using different colored discs in combination.

Approximate Time: 15 minutes

Procedure:

1. Click File → New to open a new file to record a combination of colored discs.
2. Repeat Exercise 1, this time using 2 colored discs at the same time.
3. Use red and blue; blue and green; red and green combinations.
4. Repeat the same data analysis and see if you notice any differences in the spike types and how they are represented.

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