COMP 3004

Final Project

Team 29:

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Contents:

<u>Use Cases</u>

Use Case 1: Normal use

<u>Primary Actor</u>: The user
<u>Stakeholders and Interests</u>:
User: wants to receive CES therapy.
<u>Pre-Condition</u>: None
<u>Success Guarantees</u>: The user successfully completes their desired session.
<u>Main Success Scenario</u>:
1. Plug the CES cable into the CES output jack on the Oasis pro.
2. Dampen earlobe with a small amount of water, saliva, saline solution, or gel.
3. Attach the black ear clip on the CES cable to your left earlobe and the red ear clip to the right earlobe.
4. To turn on, push and hold the power button until the green light above the power button lights up.
5. Lights on the bar graph light up, indicating the amount of battery power
6. Select the length of time for the session (20, 45, or user defined), press the power button again.
7. Choose a session by selecting the up or down INT arrows to highlight the session you want
8. Press the checkmark button to start the session.
9. Check connection, must be at least okay.
10. The number will blink to confirm your selection.
11. Adjust the intensity by pressing or holding the up or down INT arrows. Increase the intensity until the stimulation can just barely be felt.
12. Oasis pro will automatically turn off after the session has completed.

<u>Extensions</u>:
6. a) No session is selected within 2 minutes:
   i. The Oasis Pro turns off.
6-7 a) The user presses the replay button:
   i. Use Case 2: Replay Session
4-12. a) Battery level is critically low:
   i. Use Case 3: Low Battery
6-11 a) The user presses the record button:
   i. The Main Success Scenario continues as normal with one extra step. Before automatically turning off, the Oasis Pro will save the session information (duration, type, and intensity level at end of session) to the user's saved sessions.
7-12 a) The user presses the power button:
   i. The session will end early and the Soft Off process will begin.
   ii. The graph will scroll from 8 to 1 to confirm that Soft Off is in progress.
7-12 b) The eat clips are disconnected during a session:
   i. The session will pause and wait for the ear clips to be reconnected.
   ii. No connection (7 and 8 blinking) will display for a couple of seconds, then the graph may scroll up and down indicating that the unit is returning the voltage to a safe testing level. This may take up to 20 seconds.
   iii. After reconnecting, the Main Success Scenario will resume.

Use Case 2: Replay Session

<u>Primary Actor</u>: The user
<u>Pre-Condition</u>: The Oasis Pro is on.
<u>Success Guarantees</u>: The user successfully completes their saved session.
<u>Main Success Scenario</u>:
1. The user enters the session number they would like to replay in the Oasis Pro Extension.
2. The user presses the replay button.
3. Check connection, must be at least okay.
4. The number will blink to confirm your selection.
5. Adjust the intensity by pressing or holding the up or down INT arrows. Increase the intensity until the stimulation can just barely be felt.
6. Oasis pro will automatically turn off after the session has completed
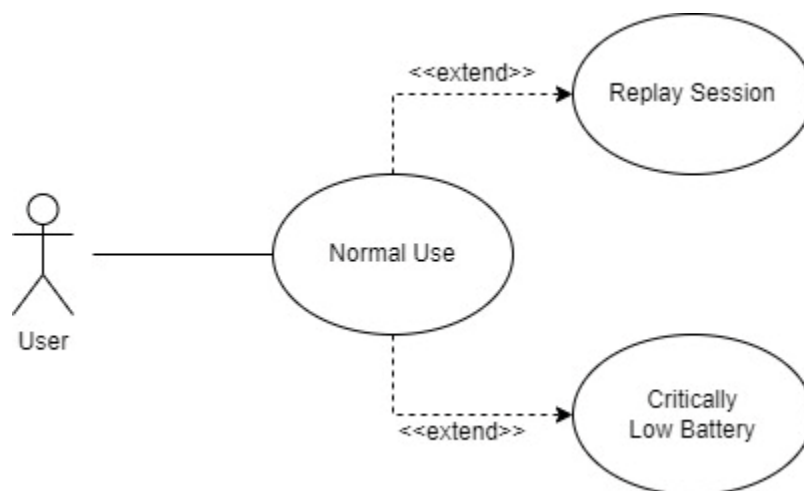
Use Case 3: Critically Low Battery

<u>Primary Actor</u>: The user
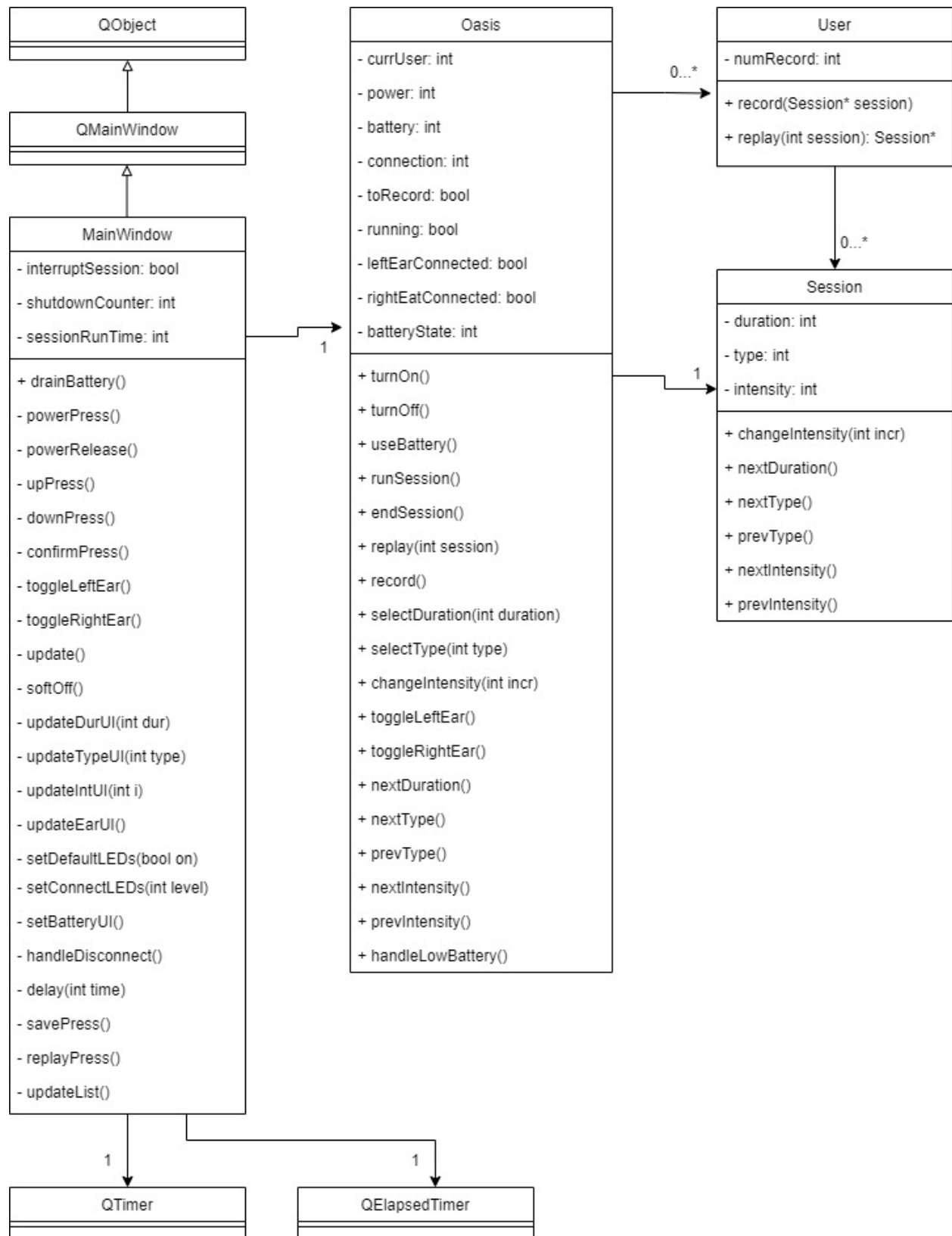<u>Pre-Condition</u>: The Oasis Pro is on, and the battery level is critically low.
<u>Success Guarantees</u>: The Oasis Pro completes a Soft Off process.
<u>Main Success Scenario</u>:
1. The graph displays a single blinking bar indicating the low battery level.
2. The current session will end early, and the Oasis Pro will turn off.
3. The battery indicator will continue to blink for a short period of time.
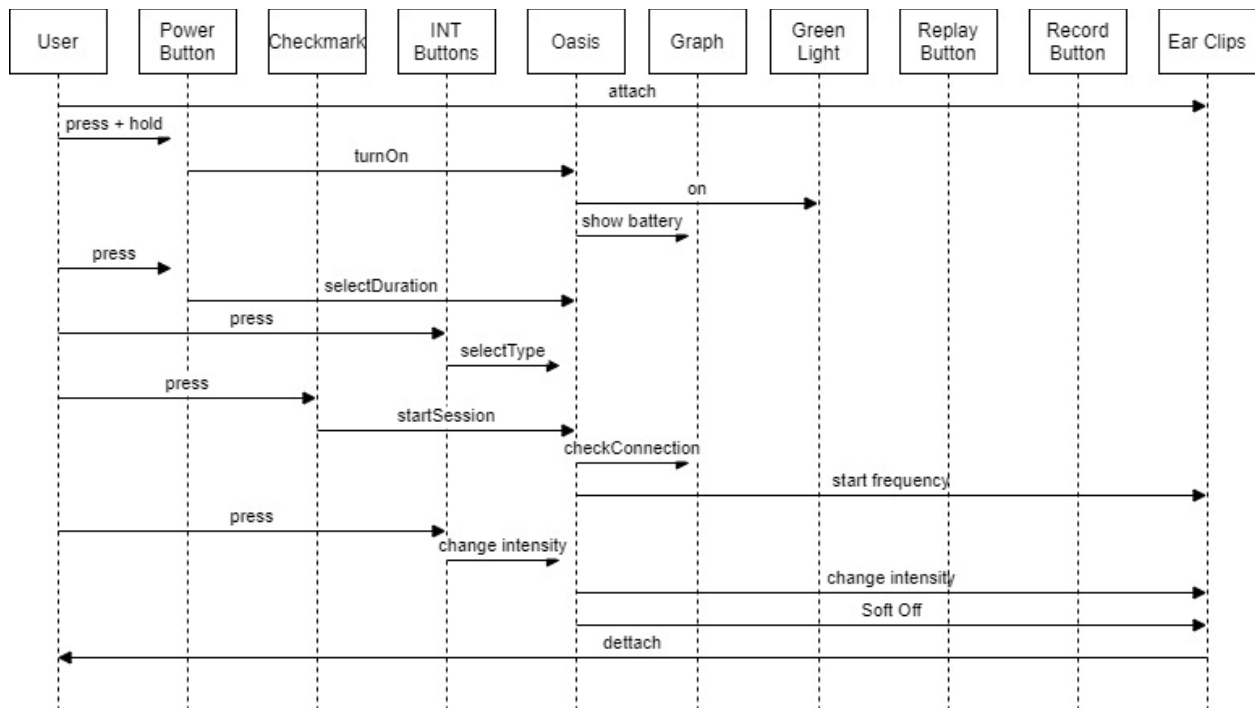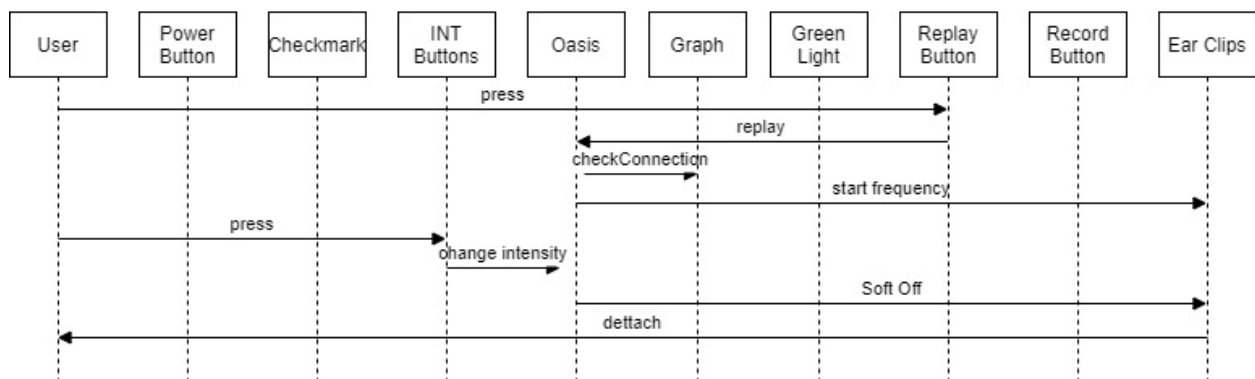4. The battery must be replaced before the unit can be used again.

UML:

QObject

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QMainWindow

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MainWindow

- interruptSession: bool
- shutdownCounter: int
- sessionRunTime: int

+ drainBattery()
- powerPress()
- powerRelease()
- upPress()
- downPress()
- confirmPress()
- toggleLeftEar()
- toggleRightEar()
- update()
- softOff()
- updateDurUI(int dur)
- updateTypeUI(int type)
- updateIntUI(int i)
- updateEarUI()
- setDefaultLEDs(bool on)
- setConnectLEDs(int level)
- setBatteryUI()
- handleDisconnect()
- delay(int time)
- savePress()
- replayPress()
- updateList()

1

Oasis

- currUser: int
- power: int
- battery: int
- connection: int
- toRecord: bool
- running: bool
- leftEarConnected: bool
- rightEatConnected: bool
- batteryState: int

+ turnOn()
+ turnOff()
+ useBattery()
+ runSession()
+ endSession()
+ replay(int session)
+ record()
+ selectDuration(int duration)
+ selectType(int type)
+ changeIntensity(int incr)
+ toggleLeftEar()
+ toggleRightEar()
+ nextDuration()
+ nextType()
+ prevType()
+ nextIntensity()
+ prevIntensity()
+ handleLowBattery()

0...*

User

- numRecord: int

+ record(Session* session)
+ replay(int session): Session*

0...*

Session

- duration: int
- type: int
- intensity: int

+ changeIntensity(int incr)
+ nextDuration()
+ nextType()
+ prevType()
+ nextIntensity()
+ prevIntensity()

1

1

QTimer

1

QElapsedTimer

Sequence Diagrams:
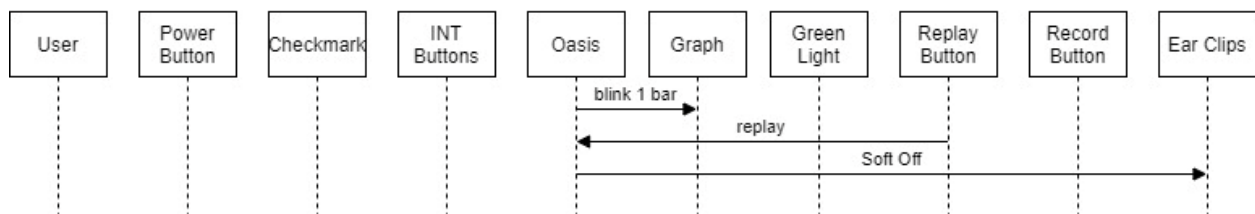
Sequence 1 – Normal Use

Note: The user can change duration, type, and intensity as many times as desired by pressing the respective button. In the above sequence diagram, each is only changed once.

Sequence 2 – Replay Session

Sequence 3 – Critically Low Battery

Traceability Matrix:

ID	Requirement	Related Use Case	Fulfilled By	Tested By	Description
1	Press and hold the power button until the power LED turns on.	UC1	MainWindow, Oasis	Tests 1-9: Press and hold the *powerButton* while the Oasis Pro is off and observe the *powerLED* turn green.	The *Oasis* class contains an int variable *power* which represents the power state of the Oasis Pro. The functions *turnOn* and *turnOff* are called when the *MainWindow* p*owerButton* is pressed and held to turn the power on and off respectively.
2	The graph will display the battery level for a couple of seconds when you first turn on the unit	UC1	MainWindow, Oasis	Tests 1-9: After turning on the Oasis Pro, observe the three lights to the right of the *powerButton* indicating the relative battery level.	The *Oasis* class contains an int variable *battery* which stores the current battery level of the Oasis Pro. The *MainWindow* calls the *getBattery* function to get and display the battery level on the *Graph*. The battery level is always displayed by the three lights to the right of the power button.
3	If no session is selected within two (2) minutes, the Oasis Pro will turn off.	UC1	MainWindow, Oasis	Turn on the Oasis Pro using the power button, then do not select any session for 2 minutes. Observe the Oasis Pro will turn off.	If two minutes elapses, the *MainWindow* will call the *Oasis turnOff* function.
4	To turn off the Oasis Pro at any time, press and hold the power button until the unit shuts off.	n/a	MainWindow, Oasis	While the Oasis Pro is on, press and hold the *powerButton* and observe the *powerLED* turn off.	The *MainWindow powerButton* if pressed and held will call the *Oasis turnoff* function and turn off the Oasis Pro.
5	All sessions end with Soft Off™: a gradual reduction of the CES stimulus. After Soft Off™ the unit will power of.	UC1, UC2	MainWindow, Oasis, Session	Tests 1, 2, 6: When the session ends, observe the graph as the intensity decreases, indicating the Soft Off.	The *MainWindow softOff* function will continuously decrease the *Session Intensity* and then call the *Oasis turnOff* function.
6	To end a session early, press and release the power button. The graph will scroll from 8 to 1 to confirm that Soft Off™ is in progress	UC1	MainWindow, Oasis	Tests 1, 2, 6: Press the power button during a session, observe the graph as it scrolls to 1, indicating the Soft Off.	The *Oasis running* bool variable indicates if there is a session currently running. When the p*owerButton* is pressed during a session, in the *MainWindow*, the *Graph* will indicate the softOff and call the *Oasis turnOff* function.

7	The battery level is also monitored and displayed periodically while the session is running	n/a	MainWindow, Oasis	Tests 1, 2, 6: During a session, observe the three lights to the right of the *powerButton* indicating the relative battery level.	The *Oasis* stores the battery level in the int variable *battery*. The *MainWindow* will periodically display the battery level while the *Oasis running* is true.
8	When the battery level is getting low, the graph will display two (2) bars and blink	n/a	MainWindow, Oasis	Test 7: When the battery level is less than 25, observe the three lights beside the *powerButton*.	When the *Oasis battery* is less than 25, the *MainWIndow Graph* will display two blinking bars.
9	When the battery level is critically low, the graph will display a single (1) blinking bar. If this warning occurs during a session, the session will end early and the battery indicator will continue to blink for a short period of time. The battery must be replaced before the unit can be used again	UC3	MainWindow, Oasis	Test 8: When the battery level is less than 10, observe the three lights beside the *powerButton*.	When the *Oasis battery* is less than 10, the *MainWindow Graph* will display one blinking bar. If the *Oasis running* variable is true, the current session will end with the *softOff*.
10	Simulation should handle battery depletion as a function of length of therapy, intensity, and connection to skin	n/a	MainWindow, Oasis, Session	Tests 1-9: Observe the console output while the Oasis Pro is on to see the battery drain.	The *Oasis* class contains the *useBattery* function which decreases the *battery* variable. The *MainWindow* will call the *useBattery* function to decrease the Oasis Pro battery level appropriately based on the *Session duration, Session intensity*, and *Oasis connection*.
11	The Oasis Pro has three (3) standard session groups (20 minutes, 45 minutes, and user designed)	n/a	Session	The session groups can be seen along the top left of the Oasis Pro.	The *Session* class contains an int variable *duration* which represents the selected duration.
12	Each group offers four (4) sessions	n/a	Session	The session types can be seen along the top of the Oasis Pro.	The *Session* class contains an int variable *type* which represents the selected session type.

13	The session number is indicated by the lit number between the intensity and select controls. If no number is lit, then the group has no sessions programmed into it	UC1	MainWindow, Oasis, Session	Tests 1-3: The session type selected is shown by which session type is lit along the top of the Oasis Pro. Press the INT arrows and observe the type change.	The *MainWindow Graph* has the current session number selected lit. The *Session* class contains a *type* variable corresponding to the current session. The *MainWindow* call the *Oasis* function *selectType* to change the *Session type*.
14	Press and release the power button to switch between groups. The lit group icon will change	UC1	MainWindow, Oasis, Session	Test 1-3: The current session duration is indicated by the lit group in the top left corner. Press the *powerButton* and observe the duration change.	When the *MainWindow powerButton* is pressed, the *Oasis selectDuration* function is called which calls the *Session setDuration* function to update the *duration* variable.
15	Press the INT up or down to highlight a session number. If no sessions are available in a group, no numbers will be lit. The frequency and mode icons associated with the session light up to indicate what frequency range and CES pulse type will be used	UC1	MainWindow, Oasis, Session	Tests 1-3: The session type selected is shown by which session type is lit along the top of the Oasis Pro. Press the INT arrows and observe the type change.	When the *MainWindow intUp* or *intDown* button is pressed, the *Oasis selectType* function is called which calls the *Session setType* function to update the *type* variable.
16	Press the select button to start the highlighted session. The session number will flash and the session will begin after a five (5) second delay	UC1	MainWindow, Oasis	Tests 1, 2: Press the *selectButton* and observe the graph as the session starts after the connectivity test.	When the *MainWindow selectButton* is pressed, the *Oasis runSession* function is called which starts the *Session currSession*.
17	At the start of each session, the Oasis Pro checks for an electrical connection by entering a test mode.	UC1, UC2	MainWindow, Oasis	Tests 1, 2, 3, 6: Press the *selectButton* and observe the graph. The connection will be displayed.	The *Oasis* class contains an in variable *connection* which represents the connection level of the Oasis Pro. At the start of a session, the *Oasis getConnection* function is called which returns the *connection.* The *MainWindow* then displays the result on the *Graph*

18	The graph will display the status of the connection. The Oasis Pro will run with either an Okay or Excellent connection. No connection: 7 and 8 blink red; okay connection: 4, 5, and 6 solid yellow; excellent connection: 1, 2, and 3 solid green	UC1, UC2	MainWindow, Oasis	Tests 1, 2, 3, 6: Press the *selectButton* and observe the graph. The connection will be displayed.	The *Oasis* class stores the Oasis Pro *connection* and depending on the value, the *MainWIndow* will display the appropriate indication of the connection level. If *connection* has a value of 0, the session will not run.
19	The intensity may be adjusted as soon as the connection test ends	UC1, UC2	MainWindow, Oasis, Session	Tests 1, 2, 6: After the connection test has completed, press the INT arrows and observe the graph update with the intensity.	After the connection test, the *Oasis running* variable will be set to true which indicates to the *MainWindow* that the *intUp* and *intDown* buttons should adjust the *Session intensity* by calling *Oasis increaseIntensity.*
20	If the ear clips are disconnected, the Oasis Pro will pause the session and wait for the ear clips to be reconnected. No Connection (7 and 8 blinking) will display for a couple of seconds, then the graph may scroll up and down indicating that the unit is returning the voltage to a safe testing level; this may take up to 20 seconds (the and lights may turn on as well)	UC1	MainWindow, Oasis	Test 4: During a session, uncheck the L and R boxes and observe as the session pauses and No Connection is indicated on the graph. Re-check the boxes and the session will resume.	In the *Oasis* class, the *leftEarConnected* and *rightEarConnected* attributes indicate the connection. If while a session is *running* the variables change to false, then the *currSession* will pause and the *connectivity* will change to no connection.
21	To increase the intensity of the stimulus, press the INT up button. To decrease the intensity, press the INT down button	UC1, UC2	MainWindow, Oasis, Session	Tests 1, 2, 6: While a session is running, press the INT buttons and observe the graph.	When the *MainWindow intUp* or *intDown* button is pressed, if the *Oasis running* variable is true, then the *increaseIntensity* function is called which increases the *Session intensity* by the passed value. The increase value is determined based on which button is pressed and for how long.
22	The graph lights 1 to 8 only show an approximate intensity level	n/a	MainWindow	Tests 1, 2, 6: While a session is running, observe the graph, it displays the approximate intensity level.	The *MainWIndow Graph* will light up with the approximate intensity level

23	When adjusting intensity, the topmost lit number will blink	n/a	MainWindow	Tests 1, 2, 6: While a session is running, press the INT buttons and observe the graph.	When adjusting the intensity, the approximate intensity level displayed on the *MainWindow Graph* will blink.
24	Users can choose to record a therapy and add to treatment history. Therapy session information to be recorded: session type, duration and intensity level (if changed during therapy choose last selected intensity level)	UC1	MainWindow, Oasis, Session, User	Test 5: Before a session ends, press the record button and when the session completes, it will be added to the users list on the right side of the Oasis Pro interface.	The *MainWindow* contains a *record* button which can be pressed anytime before a session has completed. When pressed, the *Oasis record* function is called which indicates that the *Session currSession* should be added to the current *User's* array of recorded session. The session gets recorded during *endSession*.
25	Users can replay selected treatments from history of treatments	UC2	MainWindow, Oasis, Session, User	Test 6: Enter a valid user and recorded session number, then press the replay button and observe the graph to see the session begin.	The *MainWindow* contains *replay* button. The *Oasis* class contains an array of *Users*. Each *User* contains an array of *recorded Sessions*. Specify a user and recorded session number, then press the *replay* button to replay the specified session.
26	Support multiple users	n/a	Oasis, Users	Enter a valid user number then press *updateList* to see the recorded sessions for that user.	The *Oasis* class contains an array of multiple *Users.*

<u>Tests</u>

Test 1: Regular use (Excellent ear connection)

Turn on Oasis Pro, set your duration and type of session, check both checkboxes (left and right ear) for an excellent connection then proceed to start the session

Test 2: Regular use (Good ear connection)

Turn on Oasis Pro, set your duration and type of session, check a single checkbox (either left or right ear) for a good connection then proceed to start the session

Test 3: Regular use (Bad ear connection)

Turn on Oasis Pro, set your duration and type of session, try to start a session. The session won't start since none of the ears are connected (bad connection)

Test 4: Ear disconnected

Turn on Oasis Pro, set your duration and type of session, check a single checkbox (either left or right ear), start the session, while the session is running uncheck the checkbox, the Oasis pro will pause the session until an ear is reconnected

Test 5: Session recording

Turn on Oasis Pro, set your duration and type of session, check one or both checkboxes, start the session, enter the user number inside the user textbox, press the record button, the session will be recorded to the specified user's history

Test 6: Replay recorded session

Turn on Oasis Pro, check one or both checkboxes, enter the user number and update the list to display the user's saved history information, enter the saved session number, press the replay button, a session will start with same settings as the recorded session

Test 7: Low battery

Turn on Oasis Pro, set the battery level to 25

Test 8: Critically low battery

Turn on Oasis Pro, set the battery level to 10

Test 9: Turn off while the session is running

Turn on Oasis Pro, set your duration and type of session, check one or both checkboxes, start the session, hold the power button for 2 seconds, the Oasis pro will turn off