Traceability Matrix - Team 11

Requirement	Fulfilled By Design Element(s)	Running a Test Case	High Level Implementation Description
USE CASE 1: TURN THE POWER ON	MainWindow, UI, QPushButton	Pressing and holding the power button for a few seconds while the device is currently powered off allows one to be able to see the device turn on. All features become enabled at this point forward.	Even when the device is turned off, the device is constantly listening for input on the power button. Once the power button on the UI is pressed and held for a few seconds, then the device proceeds to power on. Powering on the device allows for all of the device's battery QLabels and session history to be displayed, changing the device state to be in "selection state". In addition, all relevant interactive portions of the UI that pertain to the selection state become enabled, allowing the user to interact with them. Note that everything will be in their "default state", such as the intensity defaulting to 0, the connection defaulting to "excellent connection", and the QPushButton's text defaulting to display "OFF".
USE CASE 2: TURN THE POWER OFF	MainWindow, UI, QPushButton	Pressing and holding the power button for a few seconds while the device is currently powered on allows the tester to see the device power off and all features become disabled. If the device is left idle for around 45 seconds, it turns off.	Once the power button on the UI is pressed and held for at least a few seconds while the device is currently powered on, then the device proceeds to power off and go into a "soft off" state. While in the process of turning off, all labels and buttons are reverted back to the device's default state (etc. by hiding text and disabling interactivity) and ends a session early if one is currently in progress.
USE CASE 3: END A SESSION	MainWindow, UI, Session, Record, QTimer, QProgressBar	By starting a session and waiting until the session naturally ends. The CES device's progress bar scrolls from 8 to 1 to confirm that a Soft Off is in progress.	The device goes through a "soft off", consisting of having the QProgressbar (that was used for displaying intensity prior) to slowly scroll from 8 to 1. The device is now in its "ending" phase, which lasts roughly 8 seconds before reverting back to its selection phase again. The "record session" QPushButton is now enabled and begins listening to see whether the patient wants the therapy session to be recorded. This QPushButton will continue to prompt the user into having their session recording even after the "ending" phase is over so long as another session hasn't begun.
USE CASE 4: DETECT BATTERY LEVEL	MainWindow, UI, QTimer, QAbstractSlider, QProgressBar	To test, all one has to do is begin a session and they would be able to see the battery slowly drain while a session is running. In changing the intensity level while the session is running (using the UP or DOWN button), one is able to test to see the different depletion rates. Changing the connection to 'No Connection' using the QAbstractSlider pauses the session and battery	A QTimer is used to constantly update the battery level QProgressbar based on the total time elapsed since the session began. The battery's depletion rate is a function of a session's current intensity multiplied by a flat scalar value. Notably, the higher the intensity, then the higher the battery depletion rate. As such, the battery percent remaining is constantly being deducted by this calculated value each second *only* while a session is running, meaning that longer sessions will reduce the overall battery more (given everything else is constant). It must be noted

		stops draining until session is resumed. If the battery is critically low, the user needs to close and restart the program which is equivalent to replacing the battery in an actual device.	that immediately after reaching low battery level (30%), the battery display turns yellow, and upon reaching critically low (10%), the battery display blinks red and turns the device off momentarily after a “soft off”. If one were to turn on the device when the battery is critical, the device’s battery blinks red, does a soft off and then proceeds to turn off. Also note that the battery does not deplete during a session if connection was lost.
USE CASE 5: SELECT SESSION GROUP AND TYPE	MainWindow, UI, Session, Record, QPushButton, QTimer, QListWidget	With the device currently powered on with sufficient battery level and in the selection state, one can run tests on selecting a session by using the power button to switch between the session groups (do NOT have to hold the power button for a few seconds) and then using the UP and DOWN arrows to select session type. Once done in this order and clicking ‘Select’, the session group and type can be confirmed. To test the user defined functionality, the user must toggle to that group, which only then makes a spinbox visible for users to input a time (either with the arrows to increase/decrease time or just using the textbox itself).	As the user presses the power button while the device is in the selection state, the device toggles between the 3 session groups, stored using a QList. The selection state also activates the INT UP and DOWN QPushbuttons to be used for session type selection rather than for intensity, also using a QList to toggle through the types. The “Select” QPushButton also begins listening for input during the selection state, and once pressed will create the session and record, also changing the device state to be in its “running” state. In addition, when the “user defined” group is toggled, a spinbox appears and it listens to see what the desired session duration should be using text input and increase/decrease arrows.
USE CASE 6: PERFORM CONNECTION TEST	MainWindow, UI, QTimer, QAbstractSlider, QProgressBar	To test the connectivity of the device, one can adjust the QAbstractSlider to their choice of connection level during the selection state. Once the “Select” button is pressed, the device goes through a connection test and the will run depending on the connection level as explained in the implementation column. Another way to test this is to change the connection level during a running session, causing a connection test to occur and pauses the session accordingly, also explained in the implementation column. The ways to confirm these findings are through whether the timer still counts down or not, and the color of the L R lights.	The connection test occurs while a device is in its “connection state”, which just checks the current connectivity level and determines whether a device session can be run depending on that connection. This test lasts for roughly 5 seconds. At any time while the device is powered on, the QAbstractSlider may be toggled that corresponds to changing connectivity. If the connection type toggled is “No Connection” while a session is in progress, then it will be paused until the connection becomes “Okay” or “Excellent” again. Normally a connection test is automatically triggered once a session is selected, however changing the connection type to “No Connection” during a session triggers a test as well. In addition to inhibiting a session’s ability to run, the connection level is also determinant of the color of the L R icons: green for “Excellent Connection”, yellow for “Okay Connection”, and red for “No Connection”.
USE CASE 7: ADJUST	MainWindow, UI, Record, Session,	While a session is running, one is able to adjust the	If the device’s state is “running”, then the “UP” and “DOWN” QPushButtons listen for input

INTENSITY	QPushButton, QProgressBar	intensity using the UP and DOWN buttons (up to increase and down to decrease intensity). As previously mentioned, the changes in intensity reflect upon the battery's depletion rate, a way to confirm that changes were registered.	that adjusts the intensity level (not the session type anymore). If a user presses the "UP" QPushbutton, they increase the intensity level and vice versa for the "DOWN" QPushbutton. The updated intensity will change the intensity value previously stored inside the record object. Note that the device has a maximum and minimum values for intensity, ranging from levels 0 - 7 (corresponding to 1-8 on the QProgressBar), meaning that intensities cannot be adjusted to exceed these values.
USE CASE 8: RECORD THERAPY AND ADD TO TREATMENT HISTORY	MainWindow, UI, Record, Session, QList, QPushButton	Upon a session's natural completion, press the "record session" button beside the session history log to add the previous session to it. The user has until the next session begins or the device turns off to test this feature.	Once the "record session" button is pressed, the record object that was created for the session is added to the list of all previously recorded records since the application began. With the addition of a new record object inside the list, the history log on the GUI is now updated to reflect the newly included record. If the user does not press the button before a new session begins or the device turns off, then the record will be discarded.