Traceability Matrix

Id	Requirement / Use Case(s)	Design Element(s)	Tests
1	Device should turn on and off when power button is pressed. **UCID:** UC 09	**GUI:** - When power button is pressed, sends a signal to the slot changePowerState(). **CES Device:** - The device receives signal, it checks the current powerState, if powerState is ON, switch to OFF and disable device buttons (disableButtons(true)), if OFF switch to ON and enable device buttons (disableButtons(true)).	Press the power button to turn on/off. Buttons should be disabled when off.
2	When in therapy session, device should check if skin is in contact with electrodes. If contact is off for more than 5 seconds stop the session, if contact is connected within 5 seconds, resume session.	**GUI:** - When contact button is pressed, send a signal to slot toggleElectrode(). **CES Device:** - When system receives signal that electrodes are not in contact during a session. Start a 5 second timer and pause therapy timer. If contact is connected before timer reaches 0, resume session, else stop session (shutdownTherapy()).	Start a therapy session. Click on the contact button to apply electrodes to skin. Click again to take electrodes off skin, the session should pause. Wait 3 seconds and then click the contact button, the session should resume. Disconnect the electrodes and wait 5 seconds, the therapy session should end.
3	Device should allow for changing frequency amount. **UCID:** UC 03	**CES Device**: - Update the **GUI** to display the frequency menu with frequencies as QListWidget items (drawMenu(frequencyMenu)). - Once the user selects a frequency by pressing the OK button, a signal is sent to update the current frequency attribute (frequency = selectedRow). - The system updates the frequency for the next therapy (therapy->setFrequency(frequency)). - The system returns to the main menu (drawMenu(MainMenu)) - drawMenu function updates the frequency on the **GUI**	To update/Change the frequency of the device, turn the device on by pressing the power button, then navigate to the frequency menu with the up and down buttons. Then click the OK button to enter the frequency menu. Select one of the three frequency options. Once the option is selected, the device will return to the home menu, and the frequency will be updated and displayed at the bottom of the display.
4	Device should allow for changing waveform type.	**CES Device**: - Update the **GUI** to display the waveform menu with waveforms as QListWidget items (drawMenu(waveformMenu)).	To update/Change the waveform of the device, turn the device on by pressing the power button, then navigate to the waveform

	UCID: UC 04	- Once the user selects a waveform by pressing the OK button, a signal is sent to update the current waveform attribute (waveform = selectedRow). - The system updates the waveform for the next therapy (therapy->setWaveform(waveform)). - The system returns to the main menu (drawMenu(MainMenu)) - drawMenu function updates the waveform on the **GUI**	menu with the up and down buttons. Then click the OK button to enter the frequency menu. Navigate to one of the three waveform options with the up and down buttons. Press the OK button to select the highlighted option, the device will return to the home menu, and the waveform will be updated and displayed at the bottom of the display.
5	Device should allow for changing countdown cycle time. **UCID:** UC 02	**CES Device**: - Update the **GUI** to display the countdown cycle menu with countdown cycles as QListWidget items (drawMenu(countdownCycleMenu)). - Once the user selects a countdown cycle by pressing the OK button, a signal is sent to update the current countdown cycle attribute (countdownCycle = selectedRow). - The system updates the countdown cycle for the next therapy (therapy->setCountdownCycle (countdownCycle)). - The system returns to the main menu (drawMenu(MainMenu)) - drawMenu() function updates the countdown cycle on the **GUI**	To update/Change the Countdown Cycles of the device, turn the device on by pressing the power button, then navigate to the Countdown Cycles menu with the up and down buttons. Then click the OK button to enter the Countdown Cycles menu. Navigate to one of the three options with the up and down buttons. Press the OK button to select the highlighted option, the device will return to the home menu, and the countdown cycle time will be updated and displayed at the bottom of the display.
6	Device should allow for increasing charge. **UCID:** UC 01	**GUI:** - Plus button sends a signal to slot increaseCurrent() **CES Device:** - Increment current attribute by 1 if current level is less then 10. - Set current level of therapy (therapy->setCurrent()) - Update current level bar on the GUI by calling displayOptions()	To increase current charge. Press the plus button on the device, or set a desired current in the control panel input.
7	Device should allow for decreasing charge. **UCID:** UC 01	**GUI:** - Plus button sends a signal to slot decreaseCurrent() **CES Device:**	To increase current charge. Press the minus button on the device, or set a desired current in the control panel input.

		- Decrement current attribute by 2 if current level greater than 2, if less then 2, set current level to 1. - Set current level of therapy (therapy->setCurrent()) - Update current level bar on the GUI by calling displayOptions()	
8	Device should allow for starting a therapy session. **UCID:** UC 07	**CES Device:** - When start therapy menu is selected in the main menu. The device will update the **GUI** to display a timer set to the current countdown cycle. - When the electrodes are connected to the skin, the count down timer will start. - The home button will be disabled.	To start the therapy, navigate to the Start Therapy menu item in the Main Menu. Press the OK button to enter the therapy. To start the therapy, press the contact button, or the Toggle Electrodes button in the control panel. The therapy will start, and the timer will begin to count down.
9	Device should allow for stopping a therapy session. **UCID:** UC 06	**CES Device:** - During a therapy session, if the stop therapy option is selected, the timer will stop (timer->stop()) and the current therapy will be saved if saveTherapy is true, (shutdownTherapy()). - The system will enable the home button. - The system will update the menu back to the main menu (drawMneu(mainMenu)).	To stop a therapy session, navigate to the stop therapy option. Click the OK button to stop the therapy. The session should end, and timer stops.
10	Device should allow for saving a therapy session. **UCID:** UC 05	**CES Device:** - During the therapy session, if the save Therapy button is chosen. The system will update the saveTherapy Boolean to true. - Once the therapy is finished, the system will append the current therapy to a list of therapy history.	To save a therapy session, navigate to the save therapy option. Click the OK button to save the therapy. Then select the stop therapy option and press OK. Finally navigate to the History menu. Then therapy record will be displayed there.
11	Device should permanently shutdown and disable if device current exceeds 700uA. **UCID:** UC 08	**GUI:** - Plus button is pressed and sends a signal to slot increaseCurrent(). **CES Device:** - When increaseCurrent() is called, the system will check if the current level is less then 700uA. If so, increment the current level, else send shutdown signal to device, update the powerState (changePowerState()) and disable all buttons (disableButtons(true)).	To test the automatic shutdown and device disable when the current exceeds 700uA. Use the Current Box in the Control panel to manually adjust the Device Current. When the current exceeds 700uA, the device will shut down, and disable all buttons.
12	Device should shutdown when	**CES Device:**	To test, either wait 30 mins without using device, or click the

	inactive for 30 minutes.	- When device turns on start a 30 minute count down timer (updateIdleCountdown()). - If the device receives any button signals from the device reset the timer. - If a therapy session is active, reset the timer. - If the timer reaches 0, shutdown device (changePowerState())	"Auto shutdown 30 seconds" button to test the same feature.
13	When electrodes are in contact with skin display contact indicator icon.	**GUI:** - Send signal to slot toggleElectrode() when contact button is pressed. **CES Device:** - When system receives signal, update the skinContact state to true. - Set the contact indicator icon to visible on the GUI **GUI:** - Update the indicator to ON state.	To test the connected / disconnected indicator. Turn on the device and click the "contact" or "Toggle Electrodes" button. The electrode contact indicator will appear in the top left of the device display.
14	When device is in therapy session. Drain the battery. If battery is less than 5% display low battery message. If battery is less than 2% shutdown device.	**CES Device:** - When therapy session starts. Begin to drain battery. (updateBattery(-0.007)) - When battery is less that 5%, update GUI with low battery message. - When battery is less than 2%, display shutdown message, and then shutdown device (changePowerState()).	To test the battery drain, start a therapy session by navigating to the Start Therapy menu item, and connect the electrodes to skin. The battery level on the top right of the display, and the battery level in the control panel will start to decrease.