HELP
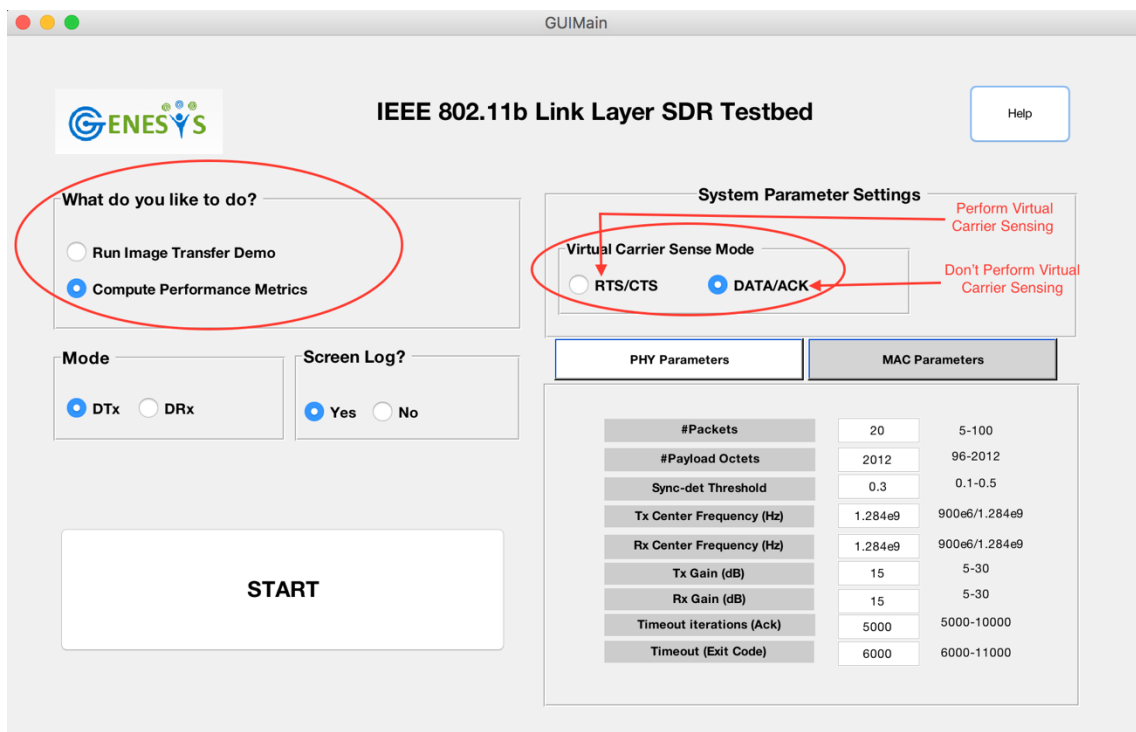
Please visit our project page for downloading our code base with instructions for initial configuration [Click here]

Getting started with GUI

(a) At first, you can select the radio button to either run the image transfer demo or measure the system performance. Next, you can optionally select the radio button for Virtual Carrier Sensing - i.e. RTS-CTS-DATA-ACK or DATA-ACK exchanges.

(b) At first, you can select the mode you want your USRP to function i.e. Receiver (DRx) or Transmitter (DTx), by pressing radio button for DRx or DTx.
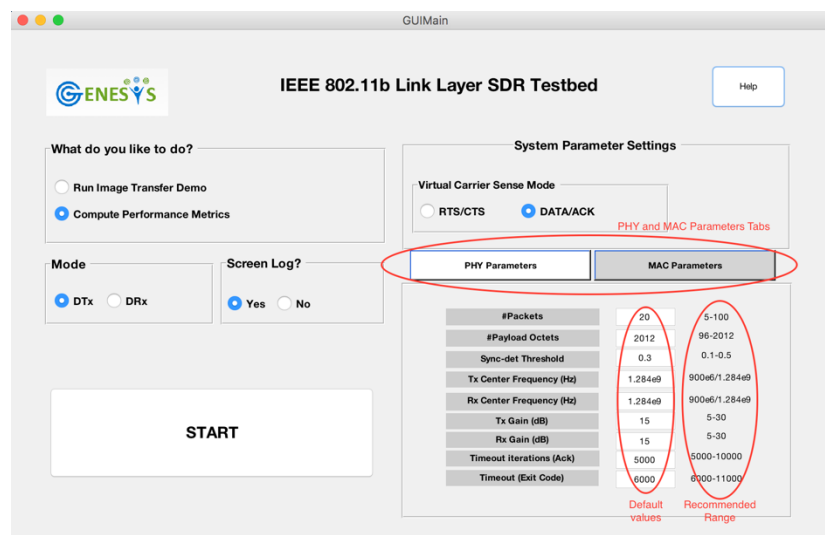
(c) Adjacent to the mode radio button, we have the screen log option for printing diagnostic text to command window. Select Yes to display and No to not display.

(d) There are two tabs for system parameters, one for PHY parameters and the other for MAC parameters. The default settings are shown in the text boxes next to the respective parameters. The values can be set by entering in the text box next to them. On the right of the text boxes you can see the recommended ranges of the respective parameters.
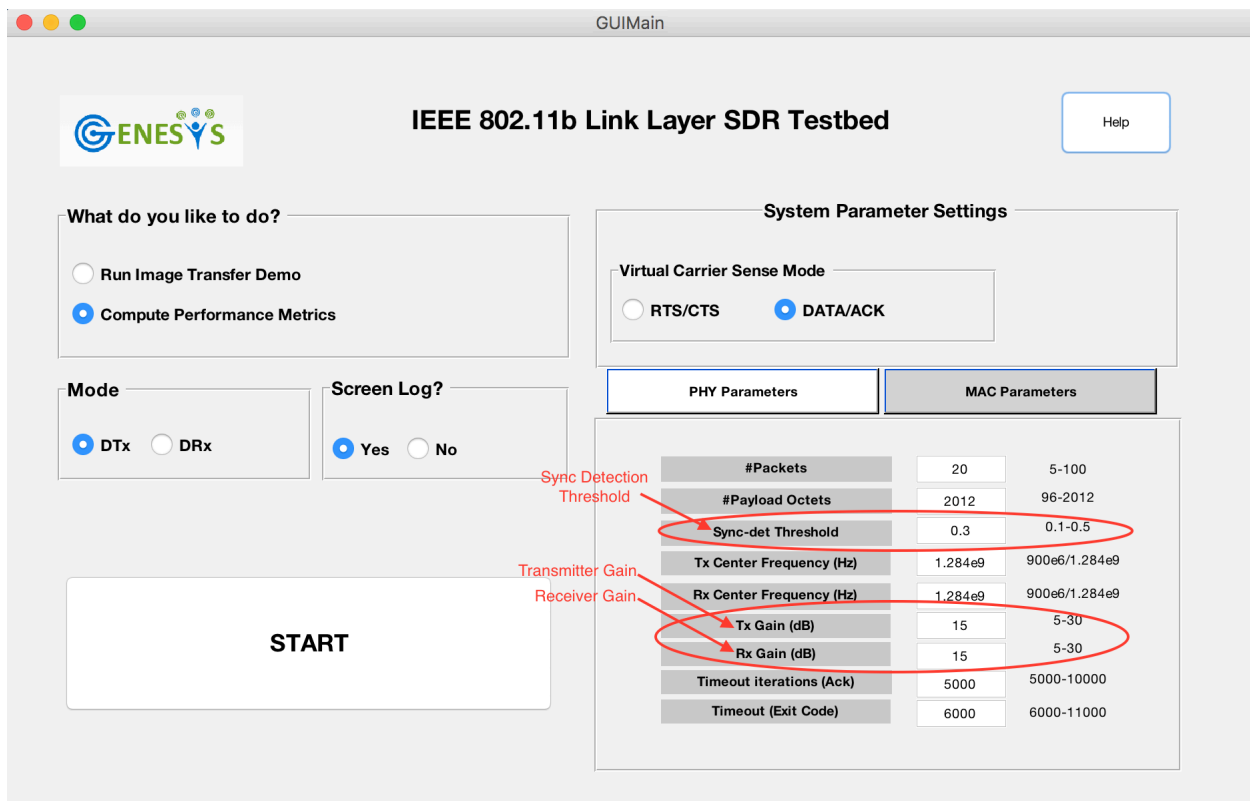
(e) Next, you can change the parameters in PHY and MAC tabs for experimentation. Start the experiment with default values of the parameters by pressing the start button and measure the systems performance metrics - Packet Error Rate (PER) and Bi-directional link latency. Based upon this PER result, you can vary the Gain values, and subsequently the Sync-Det Threshold. If the PER values are higher, the gain values can be increased to a higher value. Gain values should be increased on increasing the distance between the DTx and DRx.

(f) After tuning the gain values you can further modify the value of Sync-Det Threshold. The threshold can be decreased to a lower value than default. A very low (< 0.2) threshold value can lead to noise interference during preamble detection and a high (> 0.5) value can lead to no-detections.
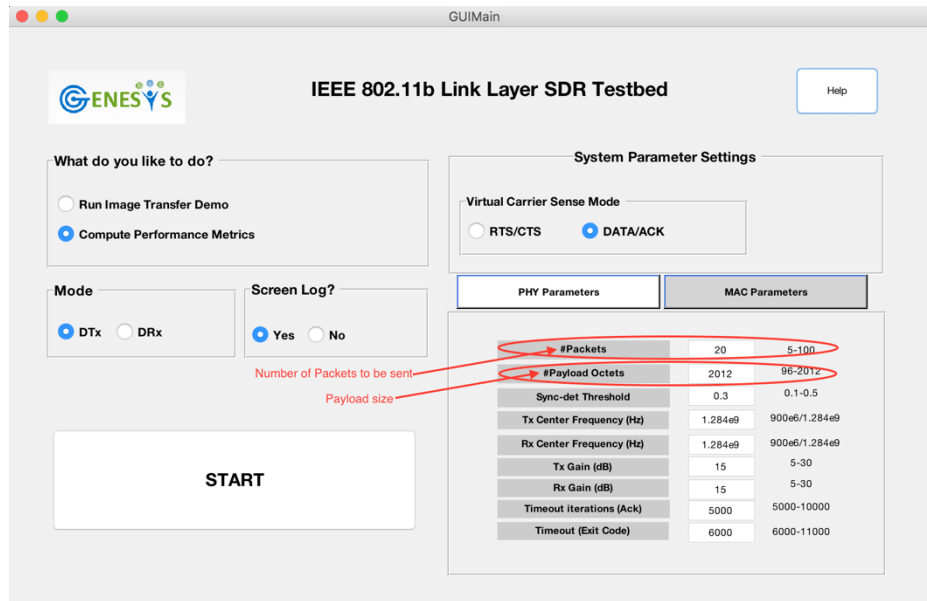
(g) Next, choose the number of DATA packets which are to be transmitted in #Packets edit box. Further the size of the payload in the DATA packet can be changed in #Payload Octets.
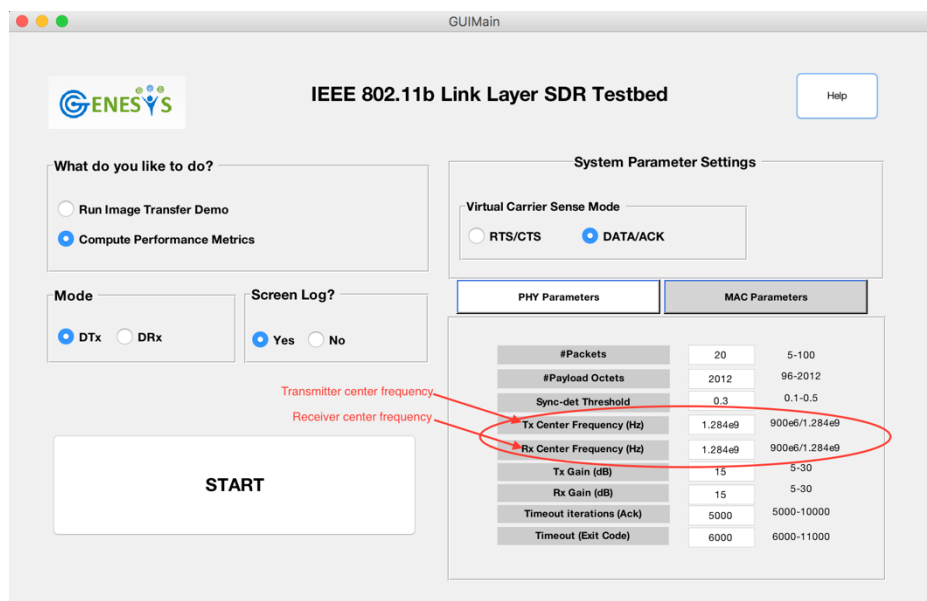
(h) The transmitter center frequency and receiver center frequency can be changed. The default value is set at 1.284 GHz. You should be careful to not use the frequency in the licensed spectrum, which can interfere with licensed users.
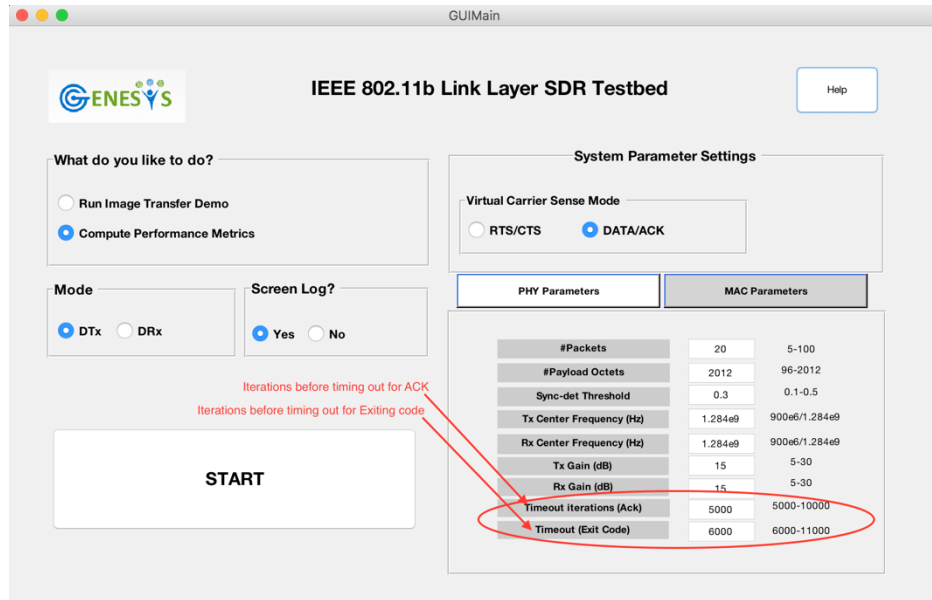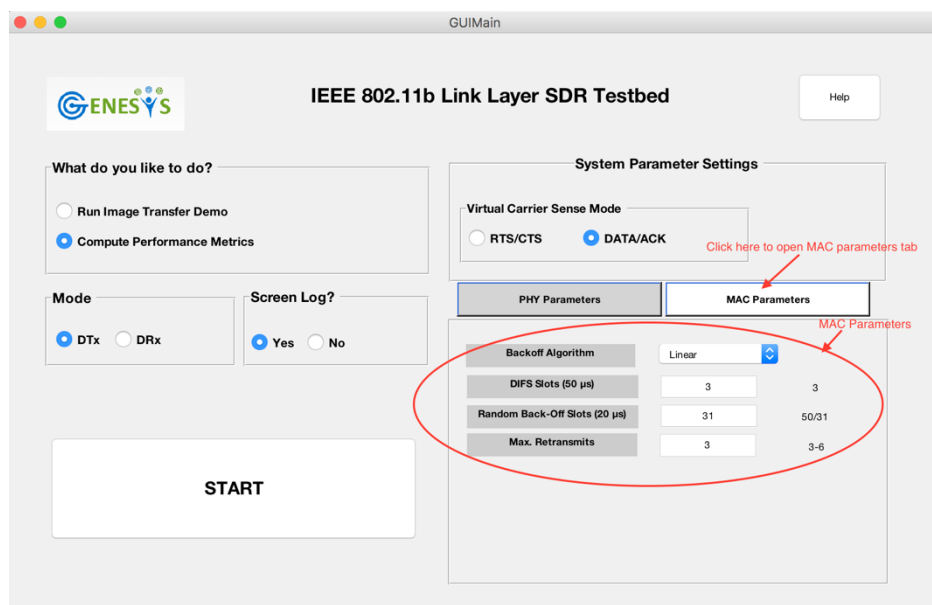
(i) The number of iterations for which the code runs before timing out for an ACK pabcket and making a hard exit from the code can be set using the Timeout iterations (Ack) and Timeout (Exit Code) respectively. EXIT code iterations is higher than the ACK iterations.

(j) Now you can select the MAC parameters tab and modify the parameter settings - choice of the Backoff Algorithm, DIFS Slots, Random-Back Slots, Max. Retransmits.

(k) Once you have set all the parameters, push the start button and start the experiment with the desired parameter setting.
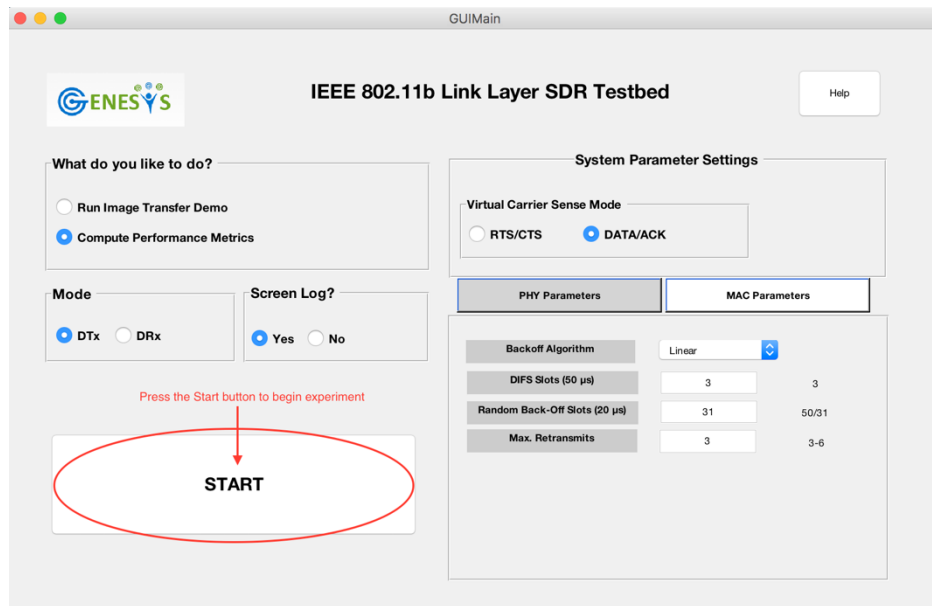
System parameters setting:

PHY Parameters:

1) #Packets:

- Number of DATA packets to be transmitted for the operationTo test the system to measure performance, we generally suggest to a larger number of DATA packets > 100.
- To see how the system works and for general experiments, we recommend values < 30.

2) #Payload Octets:

- Number of Payload Octets (size)Payload Size is variable in accordance with the standard.
- The value is a non-negative integer with a maximum of 2012.

3) Sync-Det Threshold/Preamble Detection Threshold:

- We use a threshold based cross-correlation detector for preamble detection.
- We can attain an appropriate threshold value based on the Packet error rate for different runs by varying the Cross-Correlation threshold.
- The lower the packet error rate means the better it detects the preamble.
- If we keep the threshold too low, we may have high false positives due to the noise floor. On the other hand, very high threshold values will fail to detect preamble and result in high packet misses.
- Therefore, we have to select an optimal value for good results. Through extensive experiments, we have set the threshold value to 0.3.

4) Tx Center Frequency: Transmit Center Frequency

- We have used the frequency bands - 900 MHz / 1.284 GHz for our experimentation.
- The user can check for other frequency bands in her area which can be utilized for the application without interfering with existing technologies that use those bands.

5) Rx Center Frequency: Receive Center Frequency Same as (4)

6) Tx Gain: Transmitter Gain

- Gains are selected based upon the distance between the Transmitter (DTx) and the Receiver (DRx).
- If the packet error rate is higher in a particular distance setting, the gains can be increased and tested again for packet error rate.
- By observation, gain value of 15 for both DTx & DRx is sufficient for a distance of 3 meters.

7) Rx Gain: Receiver Gain Same as (6)

- Tx Gain and Rx Gain values may defer with each other.

8) Timeout Iterations (ACK): Number of iterations the code will run idly for DTx to wait for ACK and CTS packet

- The user can pick an integer indicating how many times the loop is to be run to check for the expected ACK and CTS packet.

9) Timeout (Exit Code): Number of iterations the code will run idly before exiting main loop

- The node determines that the system is idle if it waits the maximum number of iterations specified by the Timeout variable before it terminates the execution of the main loop.
- It is usually kept higher than Timeout Iterations (ACK).

MAC Parameters:

1) Backoff Algorithm: Linear OR Exponential

- The choice determines how the minimum contention window is scaled to adapt the medium access to the channel conditions.
- The default algorithm is Exponential backoff
- With few contending DTxs, the exponential algorithm is wasteful as it introduces large link latencies.

2) DIFS Slots: Number for DIFS wait slots

- The standard specifies it be fixed at 3.
- The user can pick a different value to vary the behavior of the MAC layer.

3) Random Back-off Slots: Random number of slot durations the DTx spends in Random Back-off State

- The standard specifies it be fixed at 31.
- You can pick a different value to vary the behavior of the MAC layer.

4) Max. Retransmits: Maximum number of times the DTx retransmits a DATA packet

- Many retransmits allowed for the same packet will decrease the channel utilization as the link latency will be high.
- With no retransmits allowed, the system will not be robust to packet errors.
- We recommend a maximum of 3 retransmits.

Appearance of the GUI:

Please note that the GUI has been designed for resolutions in recent computers but if your current system's resolution is lower/higher it may lead to unusual appearance of GUI. In this case, resize the GUI by taking the mouse pointer on the sides or corners of the GUI for better appearance.