

# USB4 SigTest User Manual rev 0.75

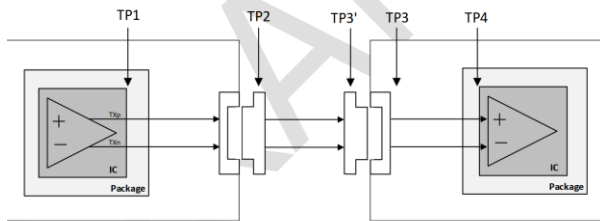
SigTest is the USB4 post analysis software tool. The data captured with the Oscilloscope is imported into this software for post processing. SigTest is capable of rendering the signal quality measurements captured with the Oscilloscope. The post processed parameters are checked against the specified pass/fail criteria.

## **USB4 SigTest running template:**

```
USB4_SigTest.exe technology test_mode test_point cts_test_name wdir file1 file2  
report_name de_embedding
```

## **Input arguments:**

1. technology = **gen2\_rounded/gen2\_legacy/gen3\_rounded/gen3\_legacy**  
SigTest supports all USB4 bitrates.  
**gen2\_rounded** = 10Gb/s  
**gen3\_rounded** = 20Gb/s  
**gen2\_legacy** = 10.3125Gb/s  
**gen3\_legacy** = 20.625Gb/s
2. test\_mode = **tx/rx**  
**tx** – SigTest supports the transmitter Router Assembly compliance tests.  
**rx** – SigTest supports the receiver Router Assembly stressed eye calibration.
3. test\_point = **tp2/tp3\_prime/tp3**  
SigTest supports the Router Assembly compliance tests at following test points.



**tp2** - transmitter Router Assembly compliance test point, which requires the de-embedding of 1 m coax cable.

**tp3** - transmitter Router Assembly compliance test point, which requires the de-embedding of 1 m coax cable and embedding of 2m/0.8m passive cable for Gen2/Gen3 respectively.

**tp3\_prime** (TP3' in the screenshot above) - receiver Router Assembly stressed eye calibration test point. No de-embedding / embedding is required.

**tp3** - receiver Router Assembly stressed eye calibration test point, which requires the de-embedding of 1 m coax cable.

4. cts\_test\_name = **ui\_ssc\_eye/rise\_fall\_time/jitter/ac\_common\_mode/transmitter\_equalization/electrical\_idle\_voltage/tx\_frequency\_variation\_training/tp3**

**ui\_ssc\_eye** – the test done using PRBS31 pattern and includes the following transmitter compliance tests: Minimum Unit Interval, SSC\_Down\_Spread\_Range,

SSC\_Down\_Spread\_Rate, SSC\_Phase\_Deviation, SSC\_Slew\_Rate, Eye Diagram Measurement ( including eye height and eye width measurements ).

Test Methods in the CTS section Gen2: 3.3.2.4, 3.3.3.4, 3.3.4.4, 3.3.5.4, 3.3.6.4, 3.3.17.4 Gen3: 3.4.2.4, 3.4.3.4, 3.4.4.4, 3.4.5.4, 3.4.6.4, 3.4.17.4

**rise\_fall\_time** – the test done using SQ128 pattern and includes the following transmitter compliance tests: Rise Time, Fall Time.

Test Method in the CTS section Gen2: 3.3.8.4 Gen3: 3.4.8.4

**jitter** - the test done using PRBS15 pattern and includes the following transmitter compliance tests: Total Jitter, UJ, UDJ, DDJ, UDJ\_LF, DCD.

Test Methods in the CTS section Gen2: 3.3.10.4, 3.3.11.4, 3.3.12.4, 3.3.13.4, 3.3.14.4, 3.3.15.4 Gen3: 3.4.10.4, 3.4.11.4, 3.4.12.4, 3.4.13.4, 3.4.14.4, 3.4.15.4

**ac\_common\_mode** – the test done using PRBS31 pattern and includes the following transmitter compliance test: AC\_CM.

Test Method in the CTS section Gen2: 3.3.16.4 Gen3: 3.4.16.4

**transmitter\_equalization** - the test done using SQ128 pattern and includes the following transmitter compliance test: Pre-shoot and De-emphasis for all USB4 presets.

Test Method in the CTS section Gen2: 3.3.1.4 Gen3: 3.4.1.4

**electrical\_idle\_voltage** - the test done when the DUT is in electrical idle mode and includes the following transmitter compliance test: V\_ELEC\_IDLE.

Test Method in the CTS section Gen2: 3.3.9.4 Gen3: 3.4.9.4

**frequency\_variation\_training** - the test done using several patterns PRBS31, SQ128, SQ4 as described in the CTS section 3.3.7.4 and includes the following transmitter compliance test: INIT\_FREQ\_VARIATION, DELTA\_FREQ\_200ns, DELTA\_FREQ\_1000ns.

Test Method in the CTS section Gen2: 3.3.7.4 Gen3: 3.4.7.4

**tp3** - the test done using several patterns PRBS31, PRBS15 as described in the CTS section Gen2: 3.3.18.4, 3.3.19.4, 3.3.20.4, 3.3.21.4 Gen3: 3.4.18.4, 3.4.19.4, 3.4.20.4, 3.4.21.4

5. wdir = waveform\_directory

**wdir** – the full path to the waveform location

6. file1 = waveform\_name.bin/ waveform\_name.trc/ waveform\_name.wfm

waveform\_name – the waveform full name, including the waveform format that represent the scope vendor:

**waveform\_name.bin** – KS Scope

**waveform\_name.trc** – Lecroy Scope

**waveform\_name.wfm** – TEK Scope

7. file2 = **none**

**none** – this input parameter shall be “none” in this SigTest revision.

8. report\_name = **report\_name**

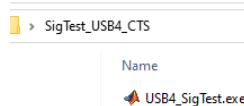
**report\_name** – any relevant report name chosen by operator.

9. de\_embedding = **none**

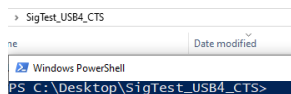
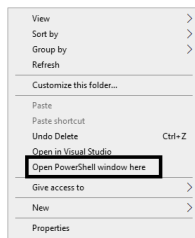
**none** – this input parameter shall be “none” in this SigTest revision.

## **USB4 SigTest installation and running:**

1. System requirements:  
Minimum memory: 16GB RAM  
Recommended memory: 32GB RAM and higher.
2. Install Matlab Runtime Compiler MCR R2019b (9.7).
3. Run the executable .exe file:
  - a) Create folder, for example "SigTest\_USB4\_CTS"
  - b) Place the USB4\_SigTest.exe into the folder "SigTest\_USB4\_CTS"



- c) Open PowerShell window from the folder created in #1 by pressing SHIFT + Right mouse button and then press on "Open PowerShell window here"



## **Scope definitions for saving waveforms:**

1. Sampling Rate  $\geq 80\text{GSa/s}$ .
2. The evaluated record length shall be  $500\mu\text{s}$  per channel.
3. No CDR, no average, no interpolation and no equalization shall be applied.
4. The scope BW shall be 16GHz for Gen2 and 21GHz for Gen3.
5. Adjust vertical scale to fit signal into scope screen.
6. The saved waveforms for all Router Assembly compliance transmitter and receiver tests shall be differential (for example: CH1 - CH3), except of the waveform for **ac\_common\_mode** test that shall be common (for example: (CH1 + CH3)/2).
7. The waveforms shall include the De-embedding and Embedding depend on the Router Assembly compliance test point and the test mode as following:  
Test mode: Tx, Test point: TP2
  - De-embedding of the cable from the plug test fixture to the scope.Test mode: Tx, Test point: TP3
  - De-embedding of the cable from the plug test fixture to the scope and the embedding of Type-C cable 2m for Gen2, 0.8m for Gen3 speeds.Test mode: Rx, Test point: TP3 Prime
  - No de-embedding and no embedding shall be applied.Test mode: Rx, Test point: TP3
  - De-embedding of the cable connecting from the last receptacle to the scope.
8. The waveforms shall include the correct test pattern type per test according to the CTS and the tests pattern length, otherwise the test will interrupt and exit.

# Router Assembly Transmitter Testing

## Note

- a) All setups and test procedures shall be the same as described in the USB4 Electrical - Router Assembly Compliance Test Specification paragraph 3.
- b) The SigTest post processed results shall replace the scope application calculations.

## TP2:

1.      cts\_test\_name - **ui\_ssc\_eye**

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded tx tp2 ui_ssc_eye
```





```
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\ tp2_prbs31.bin none ui_ssc_eye none
```

```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : TX, TestPoint : TP2
The following tests are in progress ...
Minimum Unit Interval Measurement
SSC Down Spread Range Measurement
SSC Down Spread Rate Measurement
SSC Phase Deviation Measurement
SSC Slew Rate Measurement
Eye Diagram Measurement
Loading File tp2_prbs31.bin ....
Writing tie_period_frequency_gen2_rounded_tp2_ui_ssc_eye.jpg
Writing eye_diagram_gen2_rounded_tp2_ui_ssc_eye.jpg
Writing result to .\ui_ssc_eye_result_21-Oct-2020.csv
The tests are completed
```

Report files location:

SigTest\_USB4\_CTS

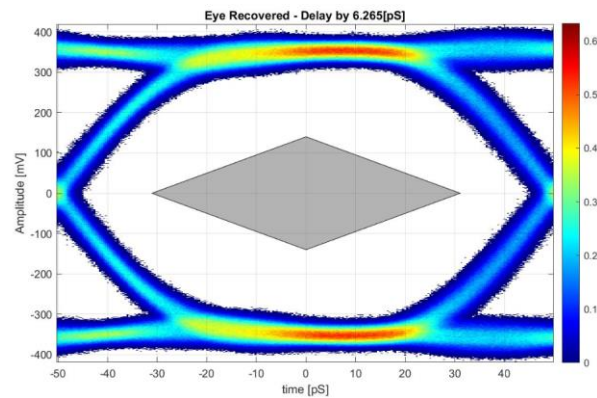
Name

-  ui\_ssc\_eye\_result\_21-Oct-2020.csv
-  eye\_diagram\_gen2\_rounded\_tp2\_ui\_ssc\_eye.jpg
-  tie\_period\_frequency\_gen2\_rounded\_tp2\_ui\_ssc\_eye.jpg
-  USB4\_SigTest.exe

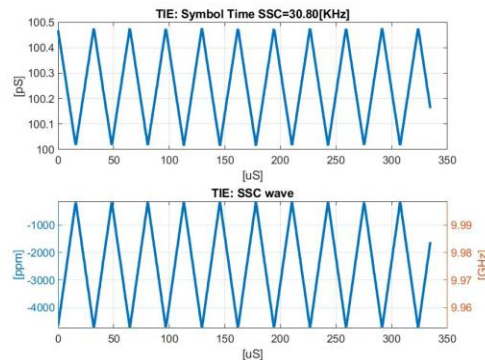
### 1.1. The .CSV file ui\_ssc\_eye\_result\_21-Oct-2020.csv

|   |           |                           |                      |                              |                          |                                |            |                                |        |
|---|-----------|---------------------------|----------------------|------------------------------|--------------------------|--------------------------------|------------|--------------------------------|--------|
| Electrical Compliance Test Specification for gen2_rounded |           |                           |                      |                              |                          |                                |            |                                |        |
| Date:   | 21-Oct-20 |                           |                      |                              |                          |                                |            |                                |        |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\            |           |                           |                      |                              |                          |                                |            |                                |        |
| File: tp2_prbs31.bin                                      |           |                           |                      |                              |                          |                                |            |                                |        |
| Minimum Unit Interval Measurement [pS]:                   | PASS      | UI Min Min                | 100.016081           | UI Min Max                   | 100.019604               | CTS: UI Min Min                | 99.97      | CTS: UI Min Max                | 100.03 |
| SSC Down Spread Range Measurement[%]:                     | PASS      | Min SSC_Down_Spread_Range | 0.451389             | Max SSC_Down_Spread_Range    | 0.458343                 | CTS: Min SSC_Down_Spread_Range | 0.4        | CTS: Max SSC_Down_Spread_Range | 0.5    |
| SSC Down Spread Rate Measurement[KHz]:                    | PASS      | Min SSC Down Spread Rate  | 30.716886            | Max SSC Down Spread Rate     | 30.887801                | CTS: Min SSC Down Spread Rate  | 30         | CTS: Max SSC Down Spread Rate  | 33     |
| SSC Phase Deviation Measurement [ns p-p]:                 | PASS      | SSC Phase Deviation       | 18.959192            | CTS: Min SSC Phase Deviation | 2.5                      | CTS: Max SSC Phase Deviation   | 22         |                                |        |
| SSC Slew Rate Measurement [ppm/us]:                       | PASS      | SSC Slew Rate             | 550.560944           | CTS: SSC Slew Rate           | 1250                     |                                |            |                                |        |
| Eye Diagram Measurement:                                  | PASS      | Eye: Count of Violation   | 0 EyeWidth [pS]      |                              | 89.281492: EyeHeight[mV] |                                | 593.984185 |                                |        |
| Informative: Symbol Rate [GHz]:                           | NONE      | Symbol Rate               | 9.975472 Drift [PPM] |                              | -2452.82                 |                                |            |                                |        |

### 1.2. The .jpg file eye\_diagram\_gen2\_rounded\_tp2\_ui\_ssc\_eye.jpg



### 1.3. The .jpg file tie\_period\_frequency\_gen2\_rounded\_tp2\_ui\_ssc\_eye.jpg



## 2. cts\_test\_name - **rise\_fall\_time**



Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded tx tp2 rise_fall_time
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\ tp2_sq128.bin none
gen2_rounded_rise_fall_time none
```

```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : TX, TestPoint : TP2
The following tests are in progress ...
Rise/Fall Time Measurement
Loading File tp2_sq128.bin ....
Writing result to .\rise_fall_time_result_21-Oct-2020.csv
The tests are completed
```

Report files location:

SigTest\_USB4\_CTS

| Name  |
|---|
|  rise_fall_time_result_21-Oct-2020.csv |
|  USB4_SigTest.exe                      |

2.1. The .CSV file gen2\_rounded\_rise\_fall\_time\_result\_21-Oct-2020.csv

|   |           |           |           |                    |    |
|---|-----------|-----------|-----------|--------------------|----|
| Electrical Compliance Test Specification for gen2_rounded |           |           |           |                    |    |
| Date:   | 21-Oct-20 |           |           |                    |    |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\            |           |           |           |                    |    |
| File: tp2_sq128.bin                                       |           |           |           |                    |    |
| Rise-Time Measurement[pS]:                                | PASS      | Rise Time | 33.009421 | CTS: Min Rise Time | 10 |
| Fall-Time Measurement[pS]:                                | PASS      | Fall Time | 32.982458 | CTS: Min Fall Time | 10 |

3. cts\_test\_name – **jitter**

Run the following command from the PowerShell window:





```
.\USB4_SigTest.exe gen2_rounded tx tp2 jitter
```

```
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\ tp2_prbs15.bin none jitter none
```

```
Running SIGTEST : Technology : GEN2_ROUND, TestMode : TX, TestPoint : TP2
The following tests are in progress ...
Total Jitter Measurement
UJ Measurement
UDJ Measurement
DDJ Measurement
Low Frequency UDJ Measurement
DCD Measurement
Loading File tp2_prbs15.bin ....
Writing tj_bathtub_gen2_rounded_tp2_jitter.jpg
Writing histogram_pj_rj_ddj_gen2_rounded_tp2_jitter.jpg
Writing result to .\jitter_result_21-Oct-2020.csv
The tests are completed
```

Report files location:

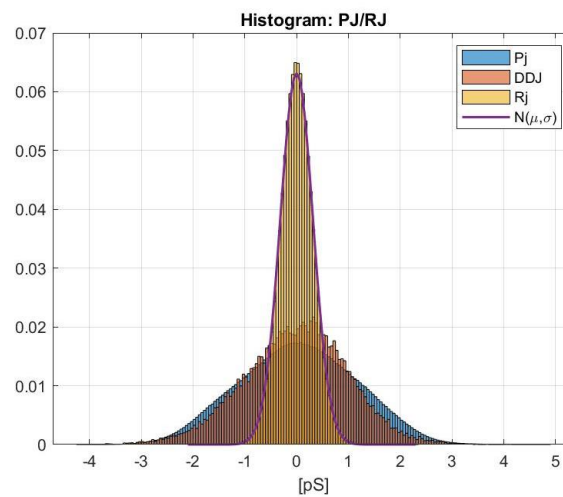
SigTest\_USB4\_CTS

| Name  |
|---|
|  jitter_result_21-Oct-2020.csv                   |
|  histogram_pj_rj_ddj_gen2_rounded_tp2_jitter.jpg |
|  tj_bathtub_gen2_rounded_tp2_jitter.jpg          |
|  USB4_SigTest.exe                                |

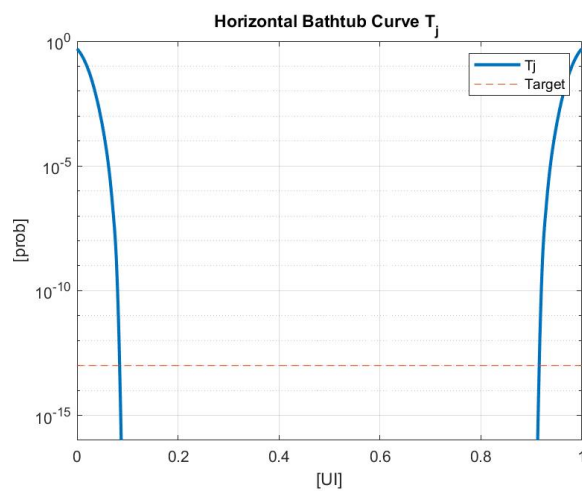
### 3.1. The .CSV file jitter\_result\_21-Oct-2020.csv

|   |           |                     |          |                 |          |
|---|-----------|---------------------|----------|-----------------|----------|
| Electrical Compliance Test Specification for gen2_rounded |           |                     |          |                 |          |
| Date:   | 21-Oct-20 |                     |          |                 |          |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\            |           |                     |          |                 |          |
| File: tp2_prbs15.bin                                      |           |                     |          |                 |          |
| Total Jitter (BER=1e-13) Measurement Ulp-p:               | PASS      | TJ                  | 0.168537 | CTS: Max TJ     | 0.38     |
| UJ Measurement Ulp-p:                                     | PASS      | UJ Jitter Ulp-p     | 0.090646 | CTS: Max UJ     | 0.31     |
| UDJ Measurement Ulp-p:                                    | PASS      | UDJ jitter Ulp-p    | 0.031796 | CTS: Max UDJ    | 0.17     |
| UDJ LF Measurement Ulp-p:                                 | PASS      | UDJ LF jitter Ulp-p | 0.018213 | CTS: Max UDJ LF | 0.04     |
| DDJ Measurement Ulp-p:                                    | PASS      | DDJ jitter Ulp-p    | 0.077891 | CTS: Max DDJ    | 0.15     |
| DCD Measurement Ulp-p:                                    | PASS      | DCD jitter Ulp-p    | 0.015579 | CTS: Max DCD    | 0.03     |
| Informative: Symbol Rate [GHz]:                           | NONE      | Symbol Rate         | 9.975472 | Drift [PPM]     | -2452.85 |

### 3.2. The .jpg file histogram\_pj\_rj\_ddj\_gen2\_rounded\_tp2\_jitter.jpg



### 3.3. The .jpg file tj\_bathtub\_gen2\_rounded\_tp2\_jitter.jpg



#### 4.      cts\_test\_name - **ac\_common\_mode**

Run the following command from the PowerShell window:



```
.\USB4_SigTest.exe gen2_rounded tx tp2 ac_common_mode  
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\ tp2_prbs31_common.bin none  
ac_common_mode none
```

```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : TX, TestPoint : TP2  
The following tests are in progress ...  
AC Common Mode Measurement  
Loading File tp2_prbs31_common.bin ....  
Writing result to .\ac_common_mode_result_21-Oct-2020.csv  
The tests are completed
```

Report files location:

SigTest\_USB4\_CTS

Name

 ac\_common\_mode\_result\_21-Oct-2020.csv  
 USB4\_SigTest.exe

##### 4.1.      The .CSV file ac\_common\_mode\_result\_21-Oct-2020.csv

|   |           |                    |      |                        |     |
|---|-----------|--------------------|------|------------------------|-----|
| Electrical Compliance Test Specification for gen2_rounded |           |                    |      |                        |     |
| Date:   | 21-Oct-20 |                    |      |                        |     |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\            |           |                    |      |                        |     |
| File: tp2_prbs31_common.bin                               |           |                    |      |                        |     |
| AC CM Measurement:  | PASS      | AC CM: Vac [mVp2p] | 81.2 | CTS: Max AC CM [mVp2p] | 100 |

#### 5.      cts\_test\_name - **electrical\_idle\_voltage**

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded tx tp2 electrical_idle_voltage  
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\ tp2_eidle.bin none electrical_idle_voltage  
none
```



```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : TX, TestPoint : TP2  
The following tests are in progress ...  
Electrical Idle Voltage Measurement  
Loading File tp2_eidle.bin ....  
Writing result to .\electrical_idle_voltage_result_21-Oct-2020.csv  
The tests are completed
```



Report files location:

SigTest\_USB4\_CTS

Name

 electrical\_idle\_voltage\_result\_21-Oct-2020.csv  
 USB4\_SigTest.exe

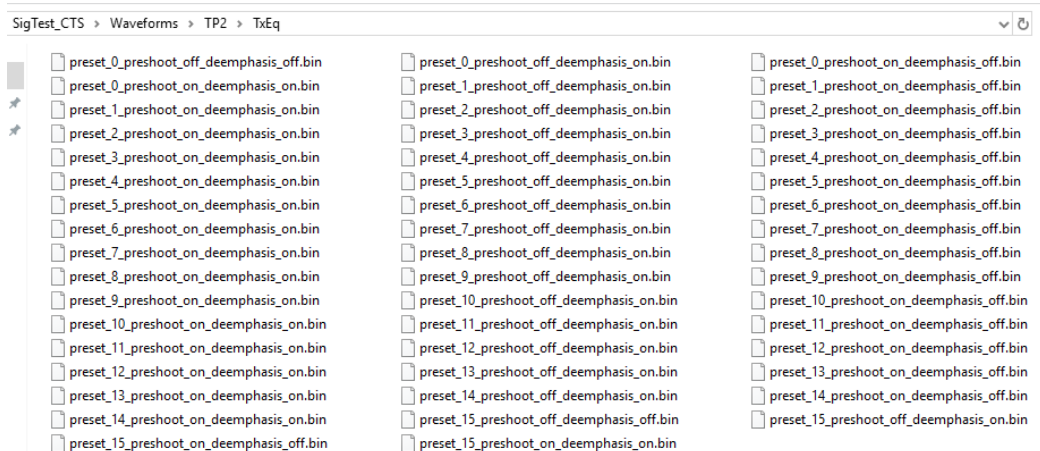
#### 5.1. The .CSV file electrical\_idle\_voltage\_result\_21-Oct-2020.csv

|   |           |             |          |                      |    |
|---|-----------|-------------|----------|----------------------|----|
| Electrical Compliance Test Specification for gen2_rounded |           |             |          |                      |    |
| Date:   | 21-Oct-20 |             |          |                      |    |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\            |           |             |          |                      |    |
| File: tp2_idle.bin  |           |             |          |                      |    |
| Electrical Idle Voltage Measurement[mV]:                  | PASS      | V_ELEC_IDLE | 1.663508 | CTS: Max V_ELEC_IDLE | 20 |

#### 6. cts\_test\_name - **transmitter\_equalization**

Notes:

- The saved waveforms for each preset shall be located in the same folder.
- The waveforms names shall be the same as in the screenshot below.



Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen3_rounded tx tp2 transmitter_equalization  
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\TxEq\ " " none transmitter_equalization  
none
```

```
Running SIGTEST : Technology : GEN3_ROUNDED, TestMode : TX, TestPoint : TP2  
The following tests are in progress ...  
Transmitter Equalization  
Loading File preset_0_preshoot_on_deemphasis_on.bin ....  
Loading File preset_0_preshoot_off_deemphasis_on.bin ....  
Loading File preset_0_preshoot_on_deemphasis_off.bin ....  
Loading File preset_1_preshoot_on_deemphasis_on.bin ....  
Loading File preset_1_preshoot_off_deemphasis_on.bin ....  
Loading File preset_1_preshoot_on_deemphasis_off.bin ....  
Loading File preset_2_preshoot_on_deemphasis_on.bin ....  
Loading File preset_2_preshoot_off_deemphasis_on.bin ....  
Loading File preset_2_preshoot_on_deemphasis_off.bin ....  
Loading File preset_3_preshoot_on_deemphasis_on.bin ....  
Loading File preset_3_preshoot_off_deemphasis_on.bin ....  
Loading File preset_3_preshoot_on_deemphasis_off.bin ....  
Loading File preset_4_preshoot_on_deemphasis_on.bin ....  
Loading File preset_4_preshoot_off_deemphasis_on.bin ....  
Loading File preset_4_preshoot_on_deemphasis_off.bin ....  
Loading File preset_5_preshoot_on_deemphasis_on.bin ....  
Loading File preset_5_preshoot_off_deemphasis_on.bin ....  
Loading File preset_5_preshoot_on_deemphasis_off.bin ....  
Loading File preset_6_preshoot_on_deemphasis_on.bin ....  
Loading File preset_6_preshoot_off_deemphasis_on.bin ....  
Loading File preset_6_preshoot_on_deemphasis_off.bin ....  
Loading File preset_7_preshoot_on_deemphasis_on.bin ....  
Loading File preset_7_preshoot_off_deemphasis_on.bin ....  
Loading File preset_7_preshoot_on_deemphasis_off.bin ....  
Loading File preset_8_preshoot_on_deemphasis_on.bin ....  
Loading File preset_8_preshoot_off_deemphasis_on.bin ....  
Loading File preset_8_preshoot_on_deemphasis_off.bin ....  
Loading File preset_9_preshoot_on_deemphasis_on.bin ....  
Loading File preset_9_preshoot_off_deemphasis_on.bin ....  
Loading File preset_9_preshoot_on_deemphasis_off.bin ....  
Loading File preset_10_preshoot_on_deemphasis_on.bin ....  
Loading File preset_10_preshoot_off_deemphasis_on.bin ....  
Loading File preset_10_preshoot_on_deemphasis_off.bin ....  
Loading File preset_11_preshoot_on_deemphasis_on.bin ....  
Loading File preset_11_preshoot_off_deemphasis_on.bin ....  
Loading File preset_11_preshoot_on_deemphasis_off.bin ....  
Loading File preset_12_preshoot_on_deemphasis_on.bin ....  
Loading File preset_12_preshoot_off_deemphasis_on.bin ....  
Loading File preset_12_preshoot_on_deemphasis_off.bin ....  
Loading File preset_13_preshoot_on_deemphasis_on.bin ....  
Loading File preset_13_preshoot_off_deemphasis_on.bin ....  
Loading File preset_13_preshoot_on_deemphasis_off.bin ....  
Loading File preset_14_preshoot_on_deemphasis_on.bin ....  
Loading File preset_14_preshoot_off_deemphasis_on.bin ....  
Loading File preset_14_preshoot_on_deemphasis_off.bin ....  
Loading File preset_15_preshoot_on_deemphasis_on.bin ....  
Loading File preset_15_preshoot_off_deemphasis_on.bin ....  
Loading File preset_15_preshoot_on_deemphasis_off.bin ....  
Loading File preset_0_preshoot_off_deemphasis_off.bin ....  
Loading File preset_15_preshoot_off_deemphasis_off.bin ....  
Writing result to .\transmitter_equalization_result_21-Oct-2020.csv  
The tests are completed
```

Report files location:

SigTest\_USB4\_CTS

Name



transmitter\_equalization\_result\_21-Oct-2020.csv



USB4\_SigTest.exe

### 6.1. The .CSV file transmitter\_equalization\_result\_21-Oct-2020.csv

|   |           |             |                    |                 |                    |                      |
|---|-----------|-------------|--------------------|-----------------|--------------------|----------------------|
| Electrical Compliance Test Specification for gen3_rounded |           |             |                    |                 |                    |                      |
| Date:   | 21-Oct-20 |             |                    |                 |                    |                      |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP2\TxEq\       |           |             |                    |                 |                    |                      |
| File:   |           |             |                    |                 |                    |                      |
| Transmitter Equalization Test:                            |           |             |                    |                 |                    |                      |
| Preset#   | Pre-shoot | De-emphasis | Pre-shoot[dB]      | De-emphasis[dB] | CTS: Pre-shoot[dB] | CTS: De-emphasis[dB] |
| 0   | PASS      | PASS        | 0                  | 0               | 0                  | 0                    |
| 1   | PASS      | PASS        | 0                  | -1.4            | 0                  | -1.9                 |
| 2   | PASS      | PASS        | 0                  | -3.3            | 0                  | -3.6                 |
| 3   | PASS      | PASS        | 0                  | -4.4            | 0                  | -5                   |
| 4   | PASS      | PASS        | 0                  | -7.7            | 0                  | -8.4                 |
| 5   | PASS      | PASS        | 0.7                | 0               | 0.9                | 0                    |
| 6   | PASS      | PASS        | 0.8                | -1.6            | 1.1                | -1.9                 |
| 7   | PASS      | PASS        | 1.2                | -3.8            | 1.4                | -3.8                 |
| 8   | PASS      | PASS        | 1.4                | -5.2            | 1.7                | -5.8                 |
| 9   | PASS      | PASS        | 2.4                | -7.8            | 2.1                | -8                   |
| 10  | PASS      | PASS        | 1.4                | 0               | 1.7                | 0                    |
| 11  | PASS      | PASS        | 1.8                | -1.9            | 2.2                | -2.2                 |
| 12  | PASS      | PASS        | 2.2                | -3              | 2.5                | -3.6                 |
| 13  | PASS      | PASS        | 3.2                | -6.3            | 3.4                | -6.7                 |
| 14  | PASS      | PASS        | 4.2                | 0.2             | 3.6                | 0                    |
| 15  | PASS      | PASS        | 1.4                | -1.4            | 1.7                | -1.7                 |
| Swing   | Swing[dB] |             | CTS: Min Swing[dB] |                 | CTS: Max Swing[dB] |                      |
| PASS  | 3.3       |             | 2.5                |                 | 4.5                |                      |

## 7. cts\_test\_name – frequency\_variation\_training

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen3_rounded tx tp2 frequency_variation_training
C:\Desktop\SigTest_USB4_CTS\Waveforms\ tx_frequency_variation_training.bin none
tx_clk_switch none
```

```
***** SIGTEST Version: 0.6 *****
Running SIGTEST : Technology : GEN3_ROUNDED, TestMode : TX, TestPoint : TP2
The following tests are in progress ...
TX Frequency Variation Training Measurement
Loading File tx_frequency_variation_training.bin ...
Writing tx_clock_switch_analysis_gen3_rounded_tp2_tx_clk_switch.jpg
Writing result to .\tx_clk_switch_result_21-Jul-2021.csv
The tests are completed
PS C:\Users\lab\ss\01\Desktop\SigTest>
```

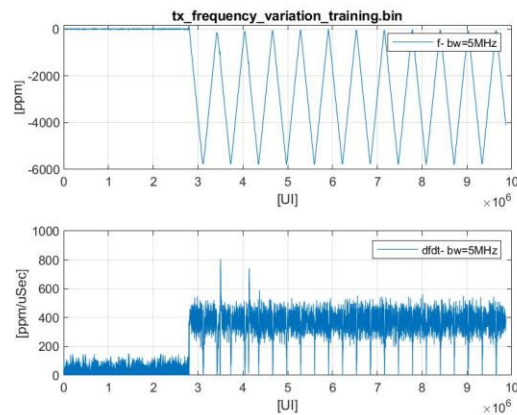
Report files location:

|   |                   |
|---|-------------------|
| tx_clk_switch_result_21-Jul-2021.csv                        | 7/21/2021 1:30 PM |
| tx_clock_switch_analysis_gen3_rounded_tp2_tx_clk_switch.jpg | 7/21/2021 1:30 PM |
| USB4_SigTest.exe  | 7/21/2021 1:15 PM |

### 7.1. The .csv file tx\_clk\_switch\_result\_21-Jul-2021.csv

|   |      |                             |                                      |                                       |
|---|------|-----------------------------|--------------------------------------|---------------------------------------|
| Electrical Compliance Test Specification for gen3_rounded |      |                             |                                      |                                       |
| Date:21-Jul-2021  |      |                             |                                      |                                       |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\                |      |                             |                                      |                                       |
| File: tx_frequency_variation_training.bin                 |      |                             |                                      |                                       |
| TX Frequency Variation Training Measurement:              |      |                             |                                      |                                       |
| INIT_FREQ_VARIATION:                                      | PASS | INIT_FREQ_VARIATION result: | 60.5711 CTS: Min INIT_FREQ_VARIATION | -300 CTS: Max INIT_FREQ_VARIATION 300 |
| DELTA_FREQ_200nS:   | PASS | DELTA_FREQ_200nS result:    | 190.233 CTS: Max DELTA_FREQ_200nS    | 1400                                  |
| DELTA_FREQ_1000nS:  | PASS | DELTA_FREQ_1000nS result:   | 672.266 CTS: Max DELTA_FREQ_1000nS   | 2200                                  |
| FREQ_OVERSHOOT:   | PASS | FREQ_OVERSHOOT result:      | 178.8158 CTS: Max FREQ_OVERSHOOT     | 1400                                  |
| Informative: Symbol Rate [GHz]                            | NONE | Symbol Rate                 | 19.94935 Drift [PPM]                 | -2532.28                              |

7.2. The .jpg file tx\_clock\_switch\_analysis\_gen3\_rounded\_tp2\_tx\_clk\_switch.jpg



8. cts\_test\_name – **tp3**

Notes:

- Save 5 waveforms with PRBS31 pattern using the scope configuration above.
- Save 1 waveform with PRBS15 pattern using the scope configuration above.
- The saved waveforms for each trial shall be in the same folder.  
1 trial – prbs15 and 5 trials – prbs31.
- The waveforms names shall be the same as in the screenshot below.

SigTest\_USB4\_CTS > Waveforms > TP3

Name

- tp3\_prbs15.bin
- tp3\_prbs31\_trial\_1.bin
- tp3\_prbs31\_trial\_2.bin
- tp3\_prbs31\_trial\_3.bin
- tp3\_prbs31\_trial\_4.bin
- tp3\_prbs31\_trial\_5.bin

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded tx tp3 tp3
```






```
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3\ tp3.bin none eye_jitter none
```

```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : TX, TestPoint : TP3
The following tests are in progress ...
Total Jitter TP3 Measurement
UJ TP3 Measurement
UDJ TP3 Measurement
Eye Diagram TP3 Measurement
Loading File tp3_prbs31_trial_1.bin ...
Loading File tp3_prbs31_trial_2.bin ...
Loading File tp3_prbs31_trial_3.bin ...
Loading File tp3_prbs31_trial_4.bin ...
Loading File tp3_prbs31_trial_5.bin ...
Loading File tp3_prbs31_trial_2.bin ...
Writing eye_diagram_gen2_rounded_tp3_eye_jitter.jpg
Loading File tp3_prbs15.bin ...
Writing tj_bathtub_gen2_rounded_tp3_eye_jitter.jpg
Writing histogram_pj_rj_ddj_gen2_rounded_tp3_eye_jitter.jpg
Writing result to .\eye_jitter_result_25-Oct-2020.csv
The tests are completed
```

Report files location:

SigTest\_USB4\_CTS

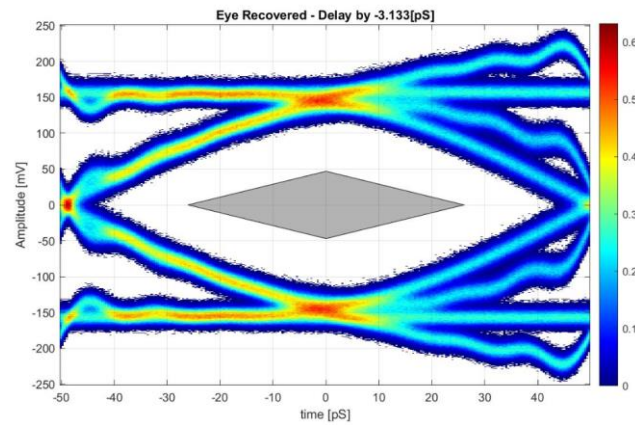
Name

 eye\_jitter\_result\_21-Oct-2020.csv  
 histogram\_pj\_rj\_ddj\_gen2\_rounded\_tp3\_eye\_jitter.jpg  
 tj\_bathtub\_gen2\_rounded\_tp3\_eye\_jitter.jpg  
 eye\_diagram\_gen2\_rounded\_tp3\_eye\_jitter.jpg  
 USB4\_SigTest.exe

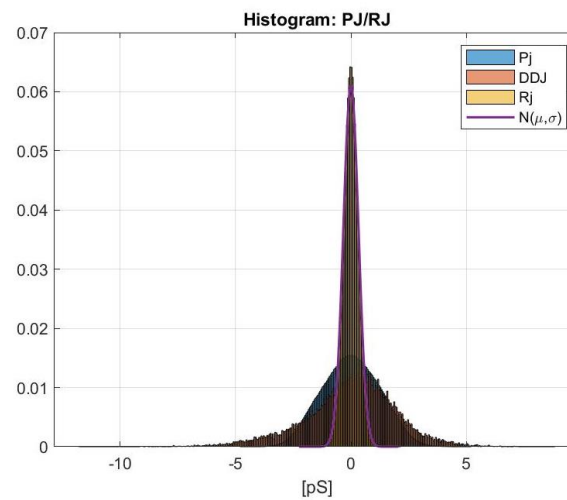
8.1. The .CSV file eye\_jitter\_result\_21-Oct-2020.csv

|   |           |                        |                      |               |                         |               |                |               |                |               |                |               |                |               |             |
|---|-----------|------------------------|----------------------|---------------|-------------------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|-------------|
| Electrical Compliance Test Specification for gen2_rounded |           |                        |                      |               |                         |               |                |               |                |               |                |               |                |               |             |
| Date:   | 21-Oct-20 |                        |                      |               |                         |               |                |               |                |               |                |               |                |               |             |
| DIR C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3\            |           |                        |                      |               |                         |               |                |               |                |               |                |               |                |               |             |
| File: tp3.bin   |           |                        |                      |               |                         |               |                |               |                |               |                |               |                |               |             |
| Total Jitter (BER=1e-13) Measurement Up-p:                | PASS      | TJ                     | 0.299601 CTS: Max TJ |               | 0.6                     |               |                |               |                |               |                |               |                |               |             |
| UI Measurement Up-p:                                      | PASS      | UI Jitter Up-p         | 0.093693 CTS: Max UI |               | 0.31                    |               |                |               |                |               |                |               |                |               |             |
| UI Measurement Up-p:                                      | PASS      | UI Jitter Up-p         | 0.094914 CTS: Max UI |               | 0.17                    |               |                |               |                |               |                |               |                |               |             |
| Eye Diagram Measurements:                                 | PASS      | Eye Count of Violation | 0 EyeWidth[ps]       |               | 81.841387 EyeHeight[mV] |               | 207.027864     |               |                |               |                |               |                |               |             |
| Informative: Symbol Rate [Gns]                            | NONE      | Symbol Rate            | 9.975465 Drift [PPM] |               | -2453.53                |               |                |               |                |               |                |               |                |               |             |
| CTLE-Adc[dB]  | 0         | DfE[mV]                | Eye Height[mV]       | Eye Width[ps] | Eye Height[mV]          | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Area[mV*ps] |
| 1   | 0         | 50                     | 1.409                | 0.785         | 0.285                   | 1.175         | 0.318          | 1.175         | 1.457          | 0.783         | 0.315          | 0.783         | 0.76           | 0.94          | 0.64        |
| 0.891   | 1         | 48.2                   | 142.647              | 62.262        | 129.546                 | 59.129        | 140.216        | 63.437        | 141.373        | 61.479        | 136.547        | 61.479        | 138.07         | 61.557        | 8504.51     |
| 0.794   | 2         | 42                     | 170.9                | 71.269        | 162.341                 | 70.877        | 172.953        | 70.485        | 172.992        | 70.485        | 168.59         | 70.485        | 169.56         | 70.72         | 11990.66    |
| 0.708   | 3         | 36.7                   | 197.61               | 78.317        | 191.643                 | 77.925        | 199.418        | 79.883        | 198.652        | 80.275        | 194.414        | 79.1          | 196.35         | 79.1          | 15533.05    |
| 0.631   | 4         | 32                     | 208.352              | 82.233        | 205.568                 | 80.667        | 206.991        | 81.058        | 208.858        | 82.235        | 205.37         | 83.016        | 207.65         | 81.841        | 16949.65    |
| 0.562   | 5         | 27.8                   | 196.69               | 80.275        | 195.141                 | 82.235        | 197.331        | 83.016        | 199.43         | 82.625        | 194.596        | 81.45         | 196.64         | 81.92         | 16109.95    |
| 0.501   | 6         | 24                     | 185.353              | 76.751        | 182.983                 | 76.359        | 185.388        | 79.883        | 185.091        | 79.492        | 181.683        | 74.01         | 184.1          | 77.299        | 14235.46    |
| 0.447   | 7         | 20.7                   | 170.463              | 70.877        | 168.146                 | 72.443        | 172.005        | 72.443        | 171.527        | 71.269        | 168.334        | 72.052        | 170.09         | 71.817        | 12215.35    |
| 0.398   | 8         | 17.8                   | 154.847              | 66.57         | 153.365                 | 67.744        | 156.741        | 67.744        | 156.386        | 67.744        | 154.618        | 67.744        | 155.19         | 67.509        | 10476.95    |
| 0.355   | 9         | 15.2                   | 138.71               | 62.262        | 139.772                 | 61.87         | 142.913        | 63.045        | 140.059        | 63.828        | 140.079        | 63.045        | 140.31         | 62.81         | 8815.04     |
| Optimal CTLE: 4   |           |                        |                      |               |                         |               |                |               |                |               |                |               |                |               |             |

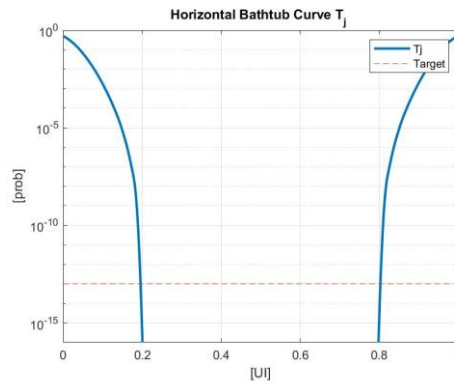
8.2. The .jpg file eye\_diagram\_gen2\_rounded\_tp3\_eye\_jitters.jpg



8.3. The .jpg file histogram\_pj\_rj\_ddj\_gen2\_rounded\_tp3\_eye\_jitters.jpg



8.4. The .jpg file tj\_bathtub\_gen2\_rounded\_tp3\_eye\_jitters.jpg



## Router Assembly Receiver stressed eye calibration.

### Note

- The receiver stressed eye calibration procedure shall be the same as described in the USB4 Electrical - Router Assembly Compliance Test Specification paragraph 4.
- The SigTest post processed results shall replace the scope application calculations.

### TP3'(Case1):

- cts\_test\_name – **jitter**

The test below shall be used for the following calibrations:





- 4.2.1.1 Data Dependent Jitter - DDJ calibration
- 4.2.1.3 Random Jitter - RJ calibration
- 4.2.1.4 Periodic Jitter - PJ calibration
- 4.2.1.5 Total Jitter - TJ calibration

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded rx tp3_prime jitter
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_Prime\
TP3_Prime_Gen2_Rounded_prbs15.bin none jitters none
```

```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : RX, TestPoint : TP3_PRIME
The following tests are in progress ...
Data Dependent Jitter - DDJ Calibration
Random Jitter - RJ Calibration
Periodic Jitter - PJ Calibration
Total Jitter - TJ Calibration
Loading File TP3_Prime_Gen2_Rounded_prbs15.bin ....
Writing tj_bathtub_gen2_rounded_tp3_prime_jitters.jpg
Writing histogram_pj_rj_ddj_gen2_rounded_tp3_prime_jitters.jpg
Writing result to .\jitters_result_21-Oct-2020.csv
The tests are completed
```

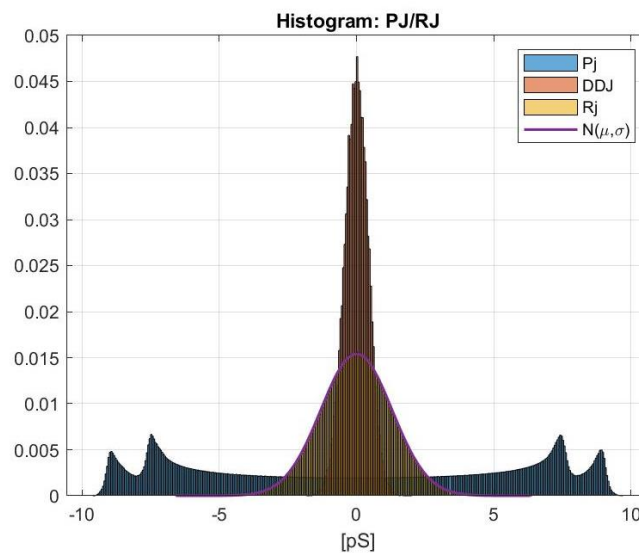
Report files location:

| SigTest_USB4_CTS  |  |
|---|--|
| <input type="checkbox"/>  | Name   |
|  | jitters_result_21-Oct-2020.csv                         |
|  | histogram_pj_rj_ddj_gen2_rounded_tp3_prime_jitters.jpg |
|  | tj_bathtub_gen2_rounded_tp3_prime_jitters.jpg          |
|  | USB4_SigTest.exe                                       |

1.1. The csv. File jitters\_result\_21-Oct-2020.csv

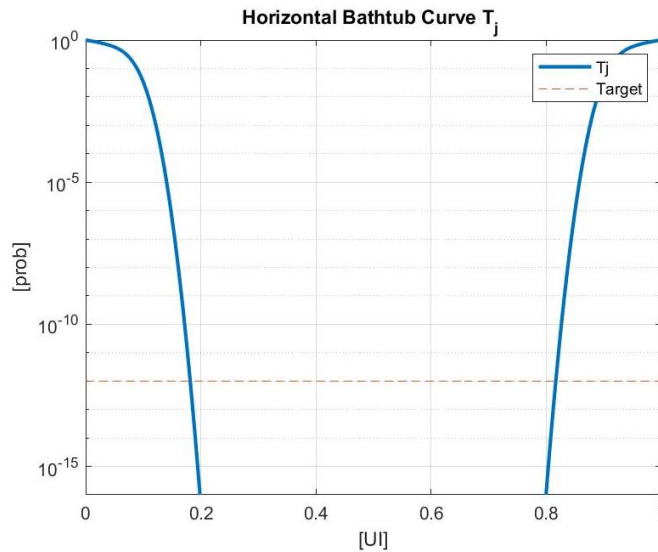
|   |  |             |          |             |          |
|---|--|-------------|----------|-------------|----------|
| Electrical Compliance Test Specification for gen2_rounded |  |             |          |             |          |
| Date:   | 21-Oct-20  |             |          |             |          |
| DIR:  | C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_Prime\ |             |          |             |          |
| File:   | TP3_Prime_Gen2_Rounded.bin                       |             |          |             |          |
| Total Jitter (BER=1e-12) Measurement Ulp-p:               | Tj   | 0.363443    |          |             |          |
| PJ Jitter Measurement mUI:                                | PJ-rms   | 58.981258   |          |             |          |
| RJ Jitter Measurement mUI:                                | RJ-rms   | 12.812331   |          |             |          |
| DDJ Measurement Ulp-p:                                    | DDJ jitter Ulp-p                                 | 0.038398    |          |             |          |
| Informative: Symbol Rate [GHz]:                           | NONE   | Symbol Rate | 9.974974 | Drift [PPM] | -2502.56 |

1.2. The .jpg file histogram\_pj\_rj\_ddj\_gen2\_rounded\_tp3\_prime\_jitters.jpg



1.3. The .jpg file tj\_bathtub\_gen2\_rounded\_tp3\_prime\_jitters.jpg





## 2. cts\_test\_name – **ac\_common\_mode**

The test below shall be used for the following calibration:

### a) 4.2.1.2 AC Common Mode Measurements

Run the following command from the PowerShell window:


```
.\USB4_SigTest.exe gen2_rounded rx tp3_prime ac_common_mode
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_Prime\
TP3_Prime_Gen2_Rounded_prbs31_common.bin none ac_common_mode none
```


```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : RX, TestPoint : TP3_PRIME
The following tests are in progress ...
AC Common Mode - Calibration
Loading File TP3_Prime_Gen2_Rounded_prbs31_common.bin ....
Writing result to .\ac_common_mode_result_21-Oct-2020.csv
The tests are completed
```

Report files location:

SigTest\_USB4\_CTS

☐ Name

 ac\_common\_mode\_result\_21-Oct-2020.csv

 USB4\_SigTest.exe

2.1. The .csv file ac\_common\_mode\_result\_21-Oct-2020.csv

|   |                    |      |
|---|--------------------|------|
| Electrical Compliance Test Specification for gen2_rounded |                    |      |
| Date:   | 21-Oct-20          |      |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_Prime\      |                    |      |
| File: TP3_Prime_Gen2_Rounded_prbs31_common.bin            |                    |      |
| AC CM Measurement:  | AC CM: Vac [mVp2p] | 81.2 |

### 3. cts\_test\_name – **ui\_ssc\_eye**

The test above shall be used for the following calibration:

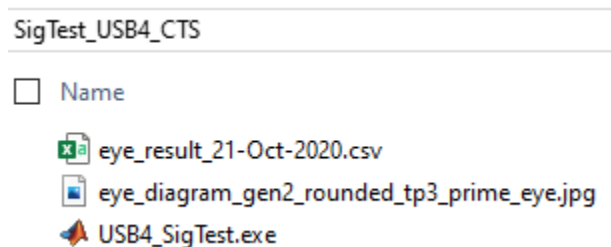
#### a) 4.2.1.6 Input Eye Diagram

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded rx tp3_prime ui_ssc_eye
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_Prime\
TP3_Prime_Gen2_Rounded_prbs31.bin none eye none
```

```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : RX, TestPoint : TP3_PRIME
The following tests are in progress ...
Input Eye Diagram - Calibration
Loading File TP3_Prime_Gen2_Rounded_prbs31.bin ....
Writing eye_diagram_gen2_rounded_tp3_prime_eye.jpg
Writing result to .\eye_result_21-Oct-2020.csv
The tests are completed
```

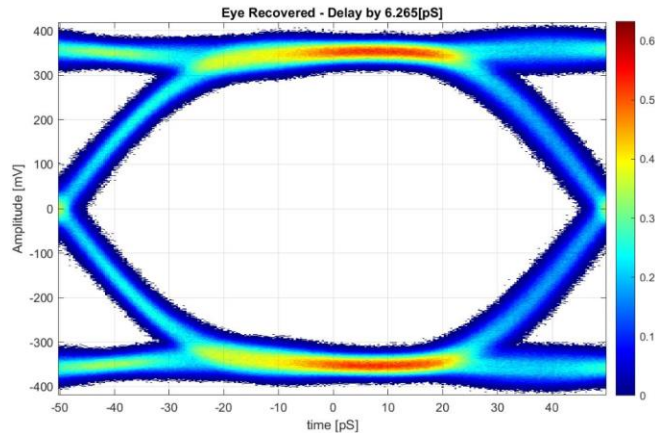
Report files location:



#### 3.1. The .csv file eye\_result\_21-Oct-2020.csv

|   |               |             |               |             |          |
|---|---------------|-------------|---------------|-------------|----------|
| Electrical Compliance Test Specification for gen2_rounded |               |             |               |             |          |
| Date:   | 21-Oct-20     |             |               |             |          |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_Prime\      |               |             |               |             |          |
| File: TP3_Prime_Gen2_Rounded_prbs31.bin                   |               |             |               |             |          |
| Eye Diagram Measurement:                                  | EyeWidth [pS] | 89.281492   | EyeHeight[mV] | 593.984184  |          |
| Informative: Symbol Rate [GHz]:                           | NONE          | Symbol Rate | 9.975472      | Drift [PPM] | -2452.82 |

#### 3.2. The .jpg file eye\_diagram\_gen2\_rounded\_tp3\_prime\_eye.jpg



#### 4. cts\_test\_name – **frequency\_variation\_training**

there is a need to calibrate the RX SSC profile to meet CTS requirement.

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded rx tp3_prime frequency_variation_training
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_prime\ rx_frequency_variation_training.bin
none rx_clk_switch_cal none
```

```
***** SIGTEST Version: 0.6 *****
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : RX, TestPoint : TP3_PRIME
The following tests are in progress ...
TX Frequency Variation Training Measurement
Loading File rx_frequency_variation_training.bin ...
Writing rx_clock_switch_analysis_gen2_rounded_tp3_prime_rx_clk_switch_cal.jpg
Writing result to .\rx_clk_switch_cal_result_21-Jul-2021.csv
The tests are completed
```

Report files location:

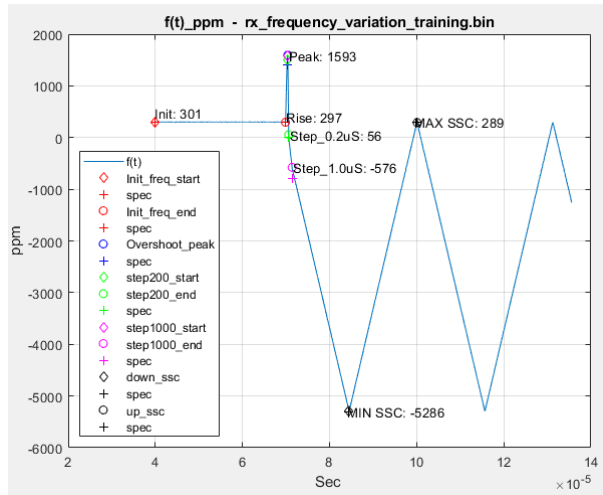
| Name  | Date modified     | Type                 | Size  |
|---|-------------------|----------------------|-------|
| rx_clk_switch_cal_result_21-Jul-2021.csv                              | 7/21/2021 3:40 PM | Microsoft Excel C... | 2 KB  |
| rx_clock_switch_analysis_gen2_rounded_tp3_prime_rx_clk_switch_cal.jpg | 7/21/2021 3:40 PM | JPG File             | 75 KB |

##### 4.1. The .csv file rx\_clk\_switch\_cal\_result\_21-Jul-2021.csv

|   |      |                                |             |                                    |  |
|---|------|--------------------------------|-------------|------------------------------------|--|
| Electrical Compliance Test Specification for gen2_rounded |      |                                |             |                                    |  |
| Date:21-Jul-2021  |      |                                |             |                                    |  |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3_prime\      |      |                                |             |                                    |  |
| File: rx_frequency_variation_training.bin                 |      |                                |             |                                    |  |
| RX Frequency Variation Training Measurement:              |      |                                |             |                                    |  |
| INIT_FREQ_VARIATION:                                      | PASS | RX_INIT_FREQ_VARIATION result: | 298.659135  | CTS: Min RX_INIT_FREQ_VARIATION    | -300 CTS: Target INIT_FREQ_VARIATION 300 |
| DELTA_FREQ_200nS:   | PASS | RX_DELTA_FREQ_200nS result:    | -1389.83096 | CTS: Abs target RX_DELTA_FREQ_200  | 1400                                     |
| DELTA_FREQ_1000nS:  | PASS | RX_DELTA_FREQ_1000nS result:   | -2189.70318 | CTS: Abs target RX_DELTA_FREQ_1000 | 2200                                     |
| FREQ_OVERSHOOT:   | PASS | RX_FREQ_OVERSHOOT result:      | 1593.431124 | CTS: Target RX_FREQ_OVERSHOOT      | 1600                                     |
| Informative: Symbol Rate [GHz]:                           | NONE | Symbol Rate                    | 9.981822    | Drift [PPM]                        | -1817.76                                 |

##### 4.2. The .jpg file

rx\_clock\_switch\_analysis\_gen2\_rounded\_tp3\_prime\_rx\_clk\_switch\_cal.jpg



Note – there is a need to calibrate RX SSC profile for RX frequency variation training test over TP3, the usage is the same except the test point

.\USB4\_SigTest.exe gen3\_legacy rx **tp3** frequency\_variation\_training  
 C:\Desktop\SigTest\_USB4\_CTS\Waveforms\TP3\ rx\_frequency\_variation\_training.bin none  
 rx\_clk\_switch\_cal\_tp3 none

All same but over results the overshoot limit is 1400ppm

|    | A  | B    | C                              | D        | E                                    | F        | G                               | H   |
|----|--|------|--------------------------------|----------|--------------------------------------|----------|---------------------------------|-----|
| 1  | Electrical Compliance Test Specification for gen3_legacy |      |                                |          |                                      |          |                                 |     |
| 2  | Date:21-Jul-2021   |      |                                |          |                                      |          |                                 |     |
| 3  | DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3\           |      |                                |          |                                      |          |                                 |     |
| 4  | File: rx_frequency_variation_training.bin                |      |                                |          |                                      |          |                                 |     |
| 5  | RX Frequency Variation Training Measurement:             |      |                                |          |                                      |          |                                 |     |
| 6  | INIT_FREQ_VARIATION:                                     | PASS | RX_INIT_FREQ_VARIATION result: | 299.818  | CTS: Min RX_INIT_FREQ_VARIATION      | -300     | CTS: Target INIT_FREQ_VARIATION | 300 |
| 7  | DELTA_FREQ_200nS:  | PASS | RX_DELTA_FREQ_200nS result:    | -1386.11 | CTS: Abs target RX_DELTA_FREQ_200nS  | 1400     |                                 |     |
| 8  | DELTA_FREQ_1000nS:                                       | PASS | RX_DELTA_FREQ_1000nS result:   | -2184.71 | CTS: Abs target RX_DELTA_FREQ_1000nS | 2200     |                                 |     |
| 9  | FREQ_OVERSHOOT:  | PASS | RX_FREQ_OVERSHOOT result:      | 1389.743 | CTS: Target RX_FREQ_OVERSHOOT        | 1400     |                                 |     |
| 10 | Informative: Symbol Rate [GHz]:                          | NONE | Symbol Rate                    | 20.58823 | Drift [PPM]                          | -1782.83 |                                 |     |
| 11 |  |      |                                |          |                                      |          |                                 |     |
| 12 |  |      |                                |          |                                      |          |                                 |     |

## 5. cts\_test\_name – tp3

The test below shall be used for the following calibration:

### a) 4.2.2.1 Input Eye Diagram

Notes:

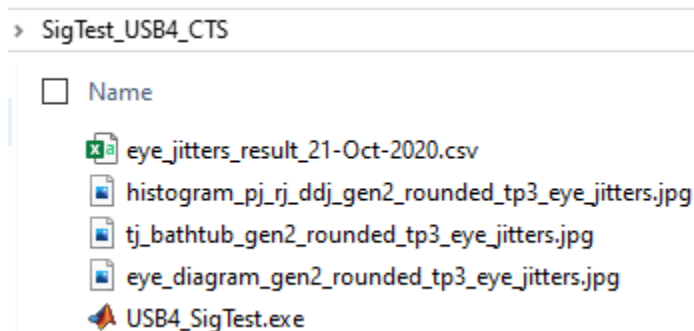
- Save 5 waveforms with PRBS31 pattern using the scope configuration above.
- Save 1 waveform with PRBS15 pattern using the scope configuration above.
- The saved waveforms for each trial shall be in the same folder.  
1 trial – prbs15 and 5 trials – prbs31.
- The waveforms names shall be the same as in the screenshot below.

Run the following command from the PowerShell window:

```
.\USB4_SigTest.exe gen2_rounded rx tp3 tp3  
C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3\Rx\ tp3.bin none eye_jitters none
```

```
Running SIGTEST : Technology : GEN2_ROUNDED, TestMode : RX, TestPoint : TP3  
The following tests are in progress ...  
Receiver TP3 Input Eye Diagram Calibration  
Loading File tp3_prbs31_trial_1.bin ...  
Loading File tp3_prbs31_trial_2.bin ...  
Loading File tp3_prbs31_trial_3.bin ...  
Loading File tp3_prbs31_trial_4.bin ...  
Loading File tp3_prbs31_trial_5.bin ...  
Loading File tp3_prbs31_trial_2.bin ...  
Writing eye_diagram_gen2_rounded_tp3_eye_jitters.jpg  
Loading File tp3_prbs15.bin ...  
Writing tj_bathtub_gen2_rounded_tp3_eye_jitters.jpg  
Writing histogram_pj_rj_ddj_gen2_rounded_tp3_eye_jitters.jpg  
Writing result to .\eye_jitters_result_25-Oct-2020.csv  
The tests are completed
```

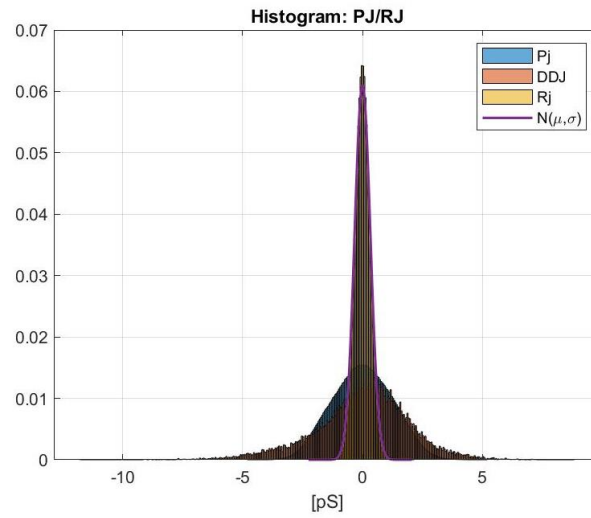
Report files location:



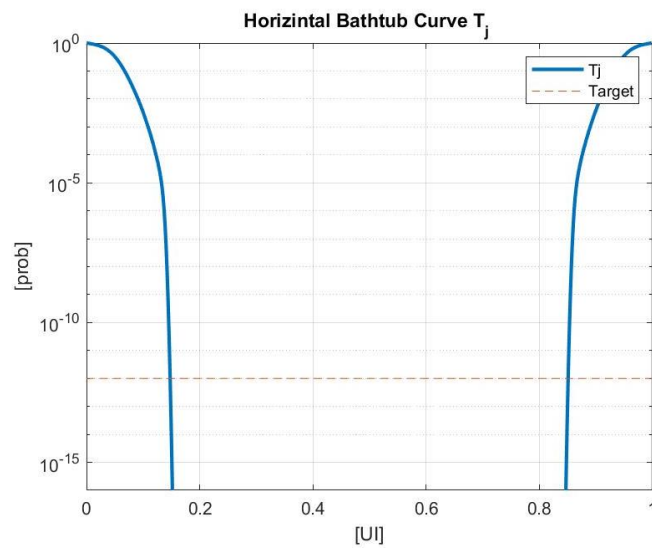
### 5.1. The .csv file eye\_jitters\_result\_21-Oct-2020.csv

|   |                  |             |                |               |                |               |                |               |                |               |                |               |                 |                |             |  |
|---|------------------|-------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|-----------------|----------------|-------------|--|
| Electrical Compliance Test Specification for gen2_rounded |                  |             |                |               |                |               |                |               |                |               |                |               |                 |                |             |  |
| Date:   | 25-Oct-20        |             |                |               |                |               |                |               |                |               |                |               |                 |                |             |  |
| DIR:C:\Desktop\SigTest_USB4_CTS\Waveforms\TP3\Rx\         |                  |             |                |               |                |               |                |               |                |               |                |               |                 |                |             |  |
| File: tp3.bin   |                  |             |                |               |                |               |                |               |                |               |                |               |                 |                |             |  |
| Eye Diagram Measurement:                                  | EyeWidth [ps]    | 81.841387   | EyeHeight[mV]  | 207.027864    |                |               |                |               |                |               |                |               |                 |                |             |  |
| Informative: Symbol Rate [GHz]:                           | NONE             | Symbol Rate | 9.975465       | Drift [PPM]   | -2453.53       |               |                |               |                |               |                |               |                 |                |             |  |
| CTLE-Adc[dB]  | CTLE-OC Gain[dB] | DfE[mV]     | Eye Height[mV] | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Eye Height[mV] | Eye Width[ps] | Avg. Height[mV] | Avg. Width[ps] | Area[mV*ps] |  |
|   | 1                | 0           | 50             | 1.409         | 0.783          | 0.285         | 1.175          | 0.318         | 1.175          | 1.457         | 0.783          | 0.313         | 0.76            | 0.94           | 0.64        |  |
| 0.891   | 1                | 48.2        | 142.647        | 62.262        | 129.546        | 59.129        | 140.216        | 63.437        | 141.373        | 61.479        | 136.547        | 61.479        | 138.07          | 61.557         | 8504.51     |  |
| 0.794   | 2                | 42          | 170.9          | 71.269        | 162.341        | 70.877        | 172.953        | 70.485        | 172.992        | 70.485        | 168.59         | 70.485        | 169.56          | 70.72          | 11990.66    |  |
| 0.708   | 3                | 36.7        | 197.61         | 78.317        | 191.643        | 77.925        | 199.418        | 79.883        | 198.652        | 80.275        | 194.414        | 79.1          | 196.35          | 79.1           | 15533.05    |  |
| 0.631   | 4                | 32          | 208.352        | 82.233        | 205.568        | 80.667        | 206.991        | 81.058        | 208.658        | 82.233        | 205.37         | 83.016        | 207.03          | 81.841         | 16943.65    |  |
| 0.562   | 5                | 27.8        | 196.69         | 80.275        | 195.141        | 82.233        | 197.331        | 83.016        | 199.43         | 82.625        | 194.586        | 81.45         | 196.64          | 81.92          | 16108.95    |  |
| 0.501   | 6                | 24          | 185.353        | 76.751        | 182.983        | 76.359        | 185.388        | 79.883        | 185.091        | 79.492        | 181.683        | 74.01         | 184.1           | 77.299         | 14233.46    |  |
| 0.447   | 7                | 20.7        | 170.463        | 70.877        | 168.146        | 72.443        | 172.005        | 72.443        | 171.527        | 71.269        | 168.334        | 72.052        | 170.09          | 71.817         | 12215.35    |  |
| 0.398   | 8                | 17.8        | 154.847        | 66.57         | 153.365        | 67.744        | 156.741        | 67.744        | 156.386        | 67.744        | 154.618        | 67.744        | 155.19          | 67.509         | 10476.95    |  |
| 0.355   | 9                | 15.2        | 138.71         | 62.262        | 139.772        | 61.87         | 142.913        | 63.045        | 140.059        | 63.828        | 140.079        | 63.045        | 140.31          | 62.81          | 8813.04     |  |
| Optimal CTLE: 4   |                  |             |                |               |                |               |                |               |                |               |                |               |                 |                |             |  |

### 5.2. The .jpg file histogram\_pj\_rj\_ddj\_gen2\_rounded\_tp3\_eye\_jitters.jpg



5.3. The .jpg file `tj_bathtub_gen2_rounded_tp3_eye_jitters.jpg`



5.4. The .jpg file `eye_diagram_gen2_rounded_tp3_eye_jitters.jpg`

