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From: YT, Anne and Jessy
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Subject: The Application Notes of USB3.0 Tx Test for FAE Training

Introduction

This document is application notes of USB3.0 Tx test for FAE training. It provides the test setup, the procedure and the outcome report (by TekExpress) for FAE. The whole document is based on the 'Universal Serial Bus 3.0 Specification (including errata and ECNs through May1, 2011)'.

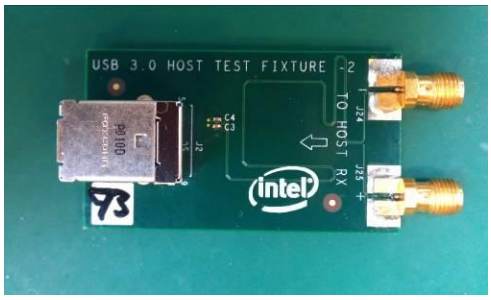
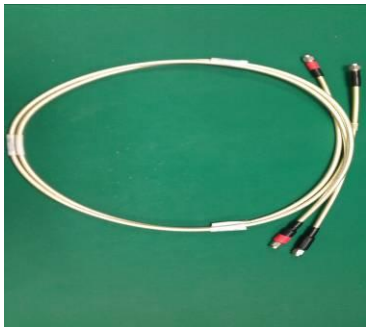
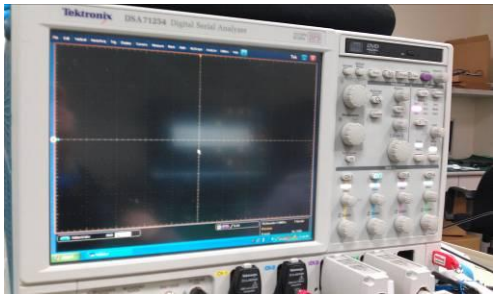
References

[1] 'Universal Serial Bus 3.0 Specification (including errata and ECNs through May1, 2011)'.
[2] 'Universal Serial Bus 3.0 Specification (including errata and ECNs through May1, 2011)', Chapter 7.5.4, page7-51, Fig.7-17; Chapter 6.4.4, page 6-12, Table 6-7.

Contents

1. USB3.0 Tx Test Setup and Methodology

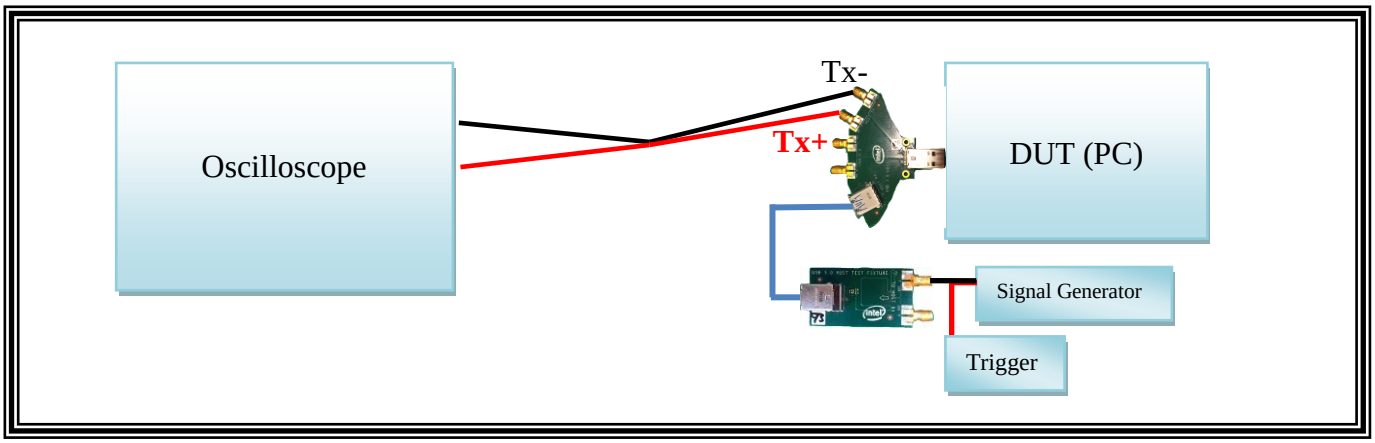
1.1 Equipment Used

1) USB3.0 Host Test fixture-1 	2) USB3.0 Host Test fixture-2 
3) SMA cable 	4) Oscilloscope 
5) Signal Generator (30MHz 12Bit, 5M sample IEEE402.2) 	

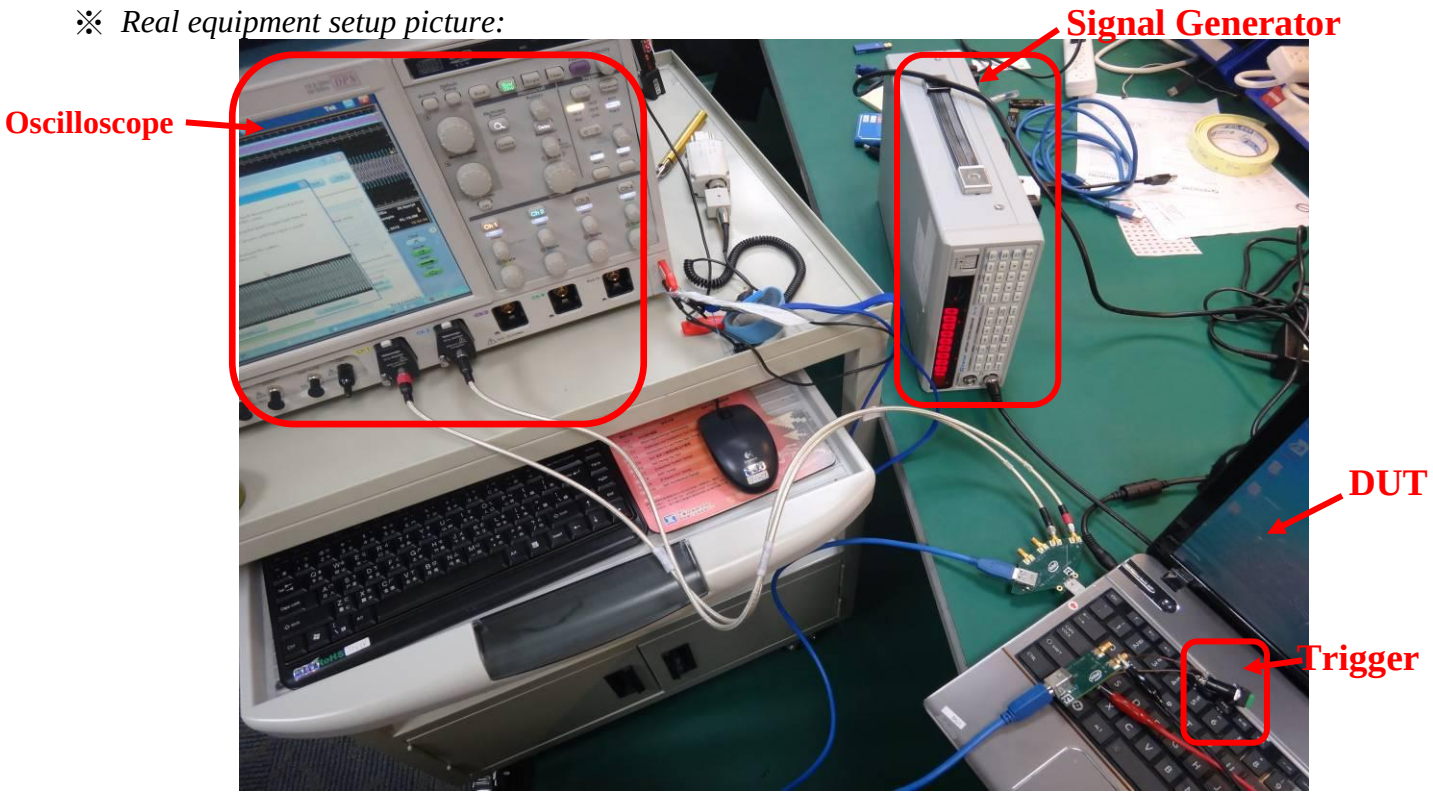
1.2 Setup Diagram

The following figures are the configuration of the sample and real equipment setup.

※ *Sample equipment setup figure:*

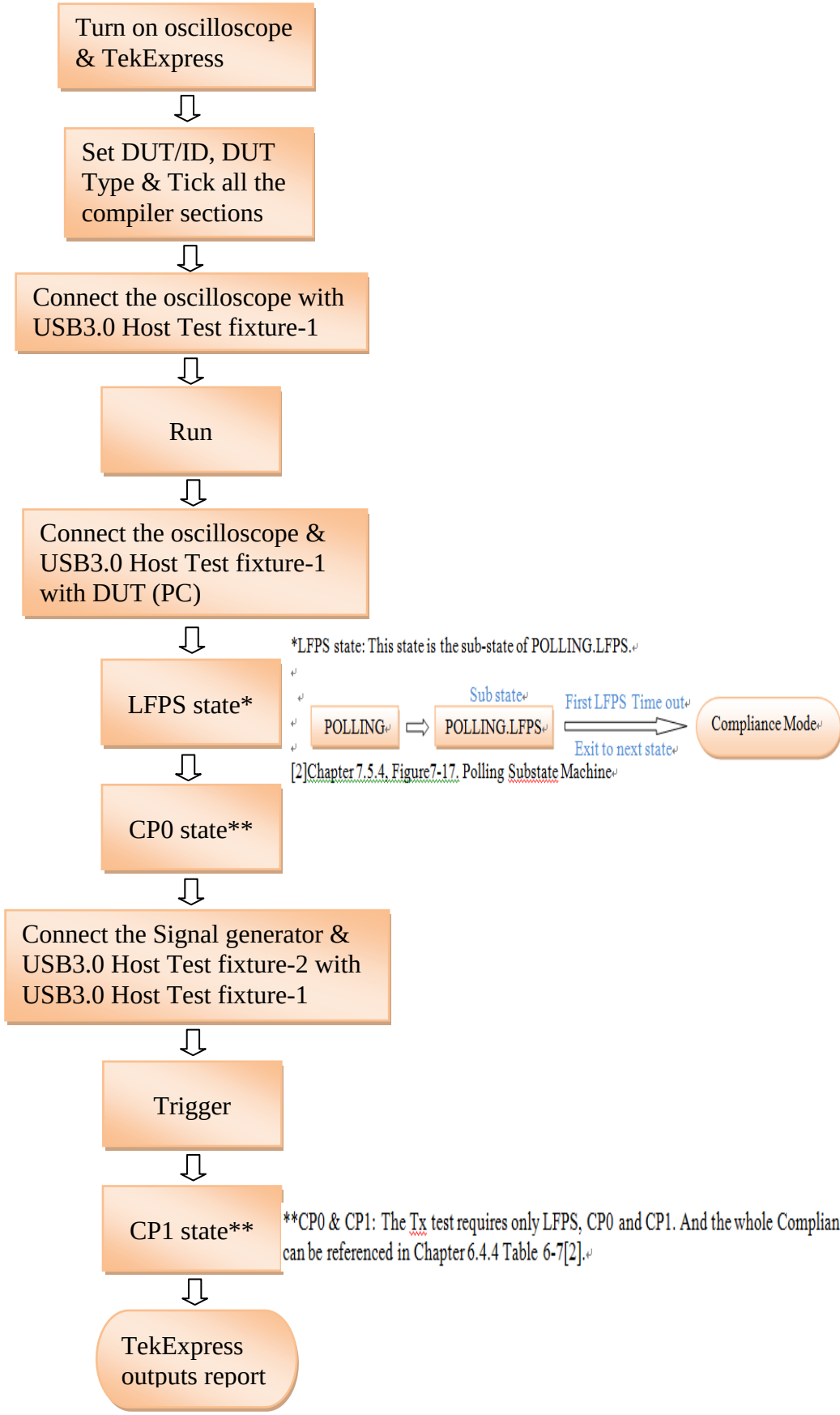


※ *Real equipment setup picture:*



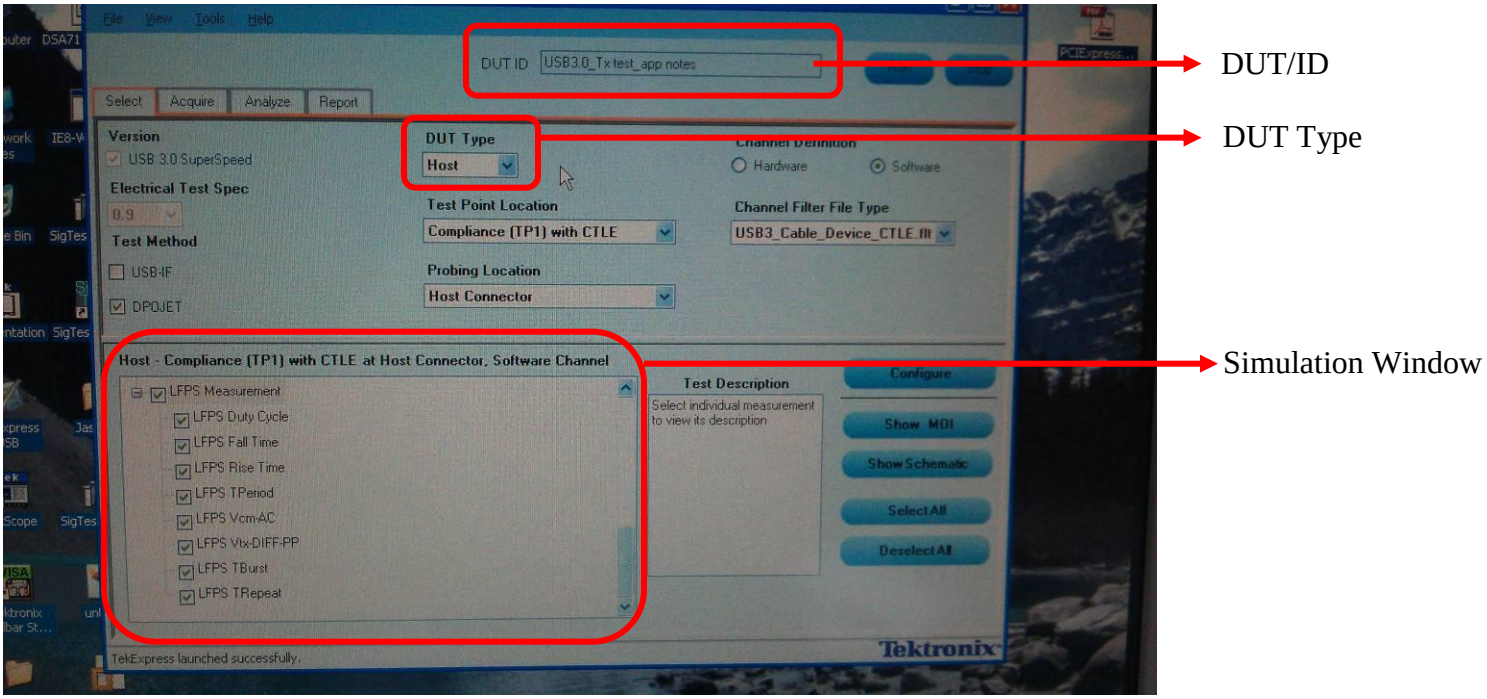
1.3 Methodology

1.3.1 Flow Chart



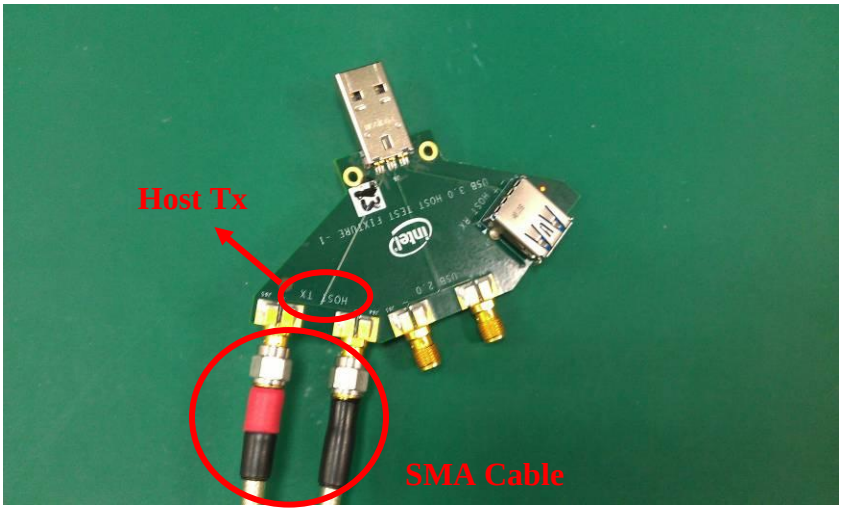
1.3.2 Test Procedure

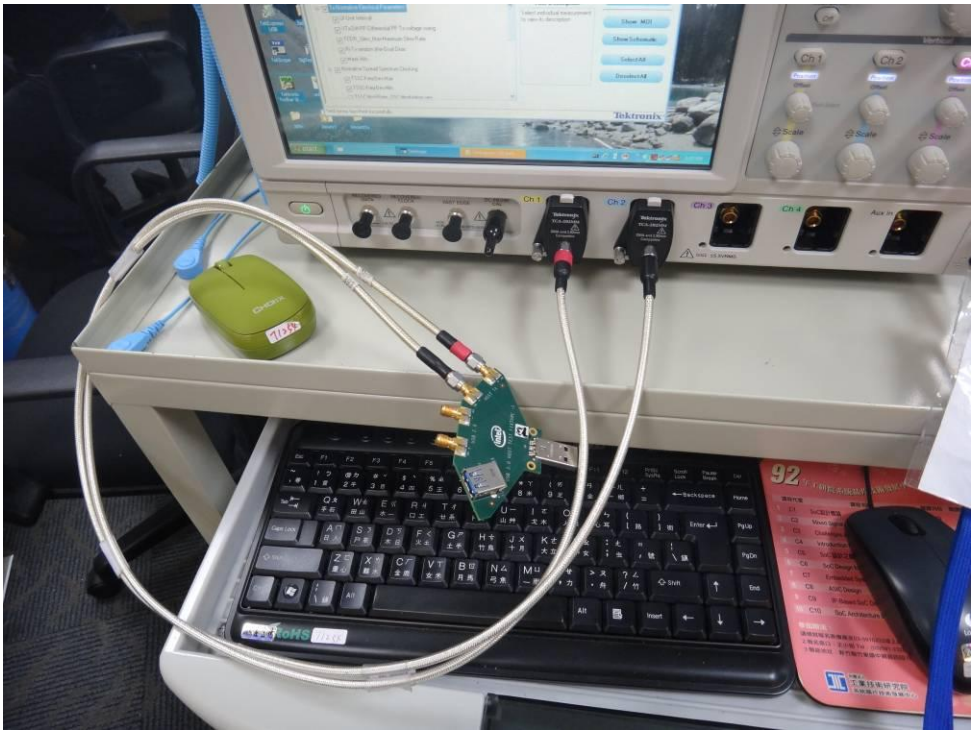
1) Open the oscilloscope (Tektronic) and TekExpress. The Following picture displays the screenshot of the TekExpress. Firstly, typing a name on DUT/ID column to create a file name. In this Tx test, selecting 'Host' on the DUT Type and ticking all the simulated sections on the lower left window. Then connect the SMA Cable with Tektronic.



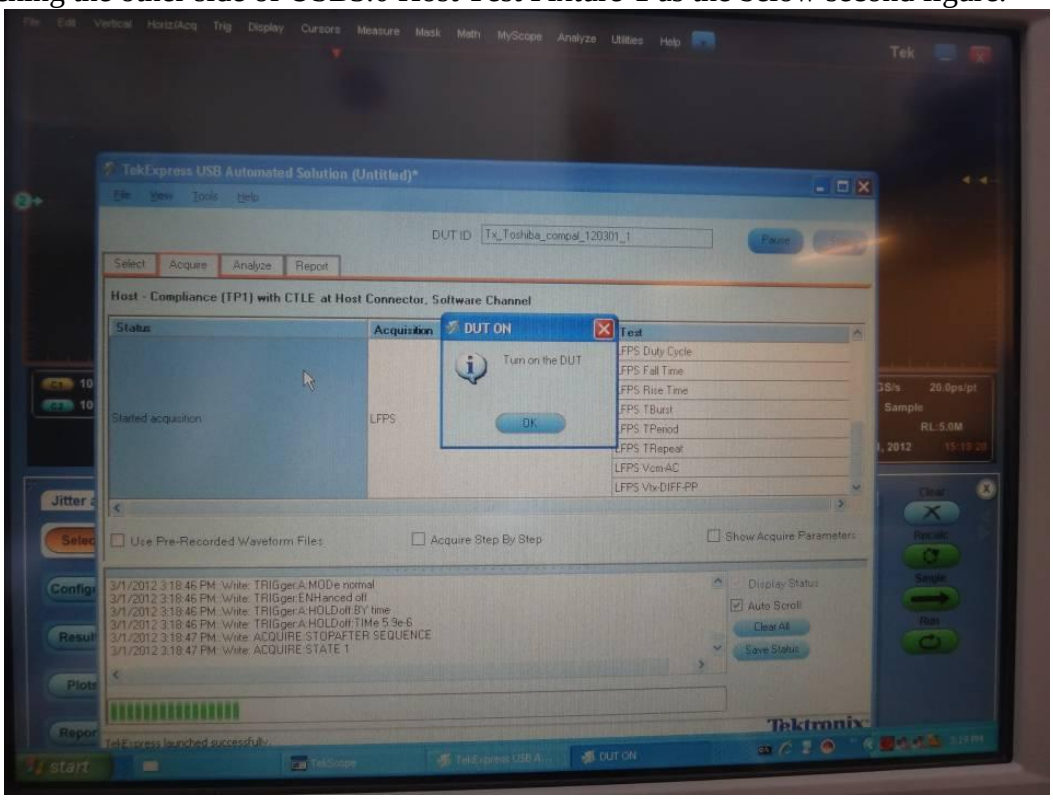
※ Three main simulated sections: LFPS, CP0 and CP1.

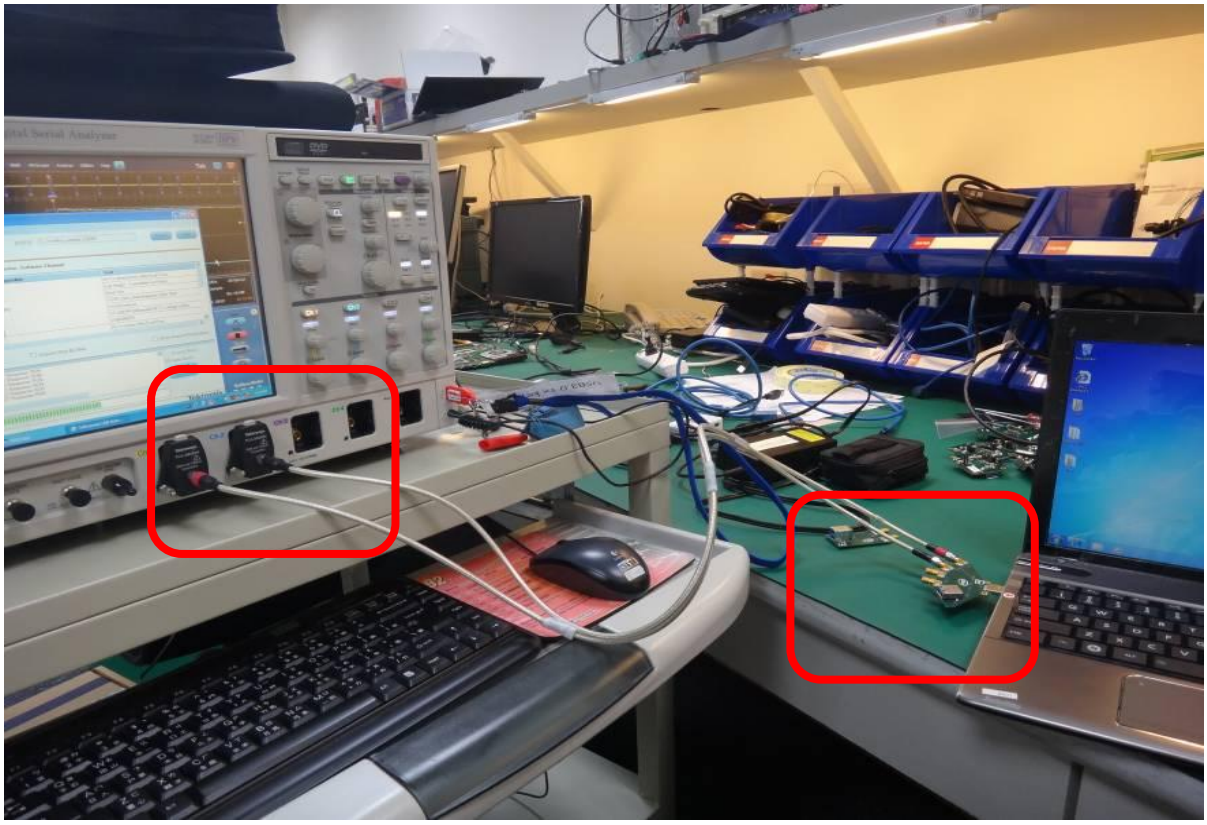
2) Connect the other side of SMA Cable with the Host Tx port of USB3.0 Host Test Fixture-1 and then go run.



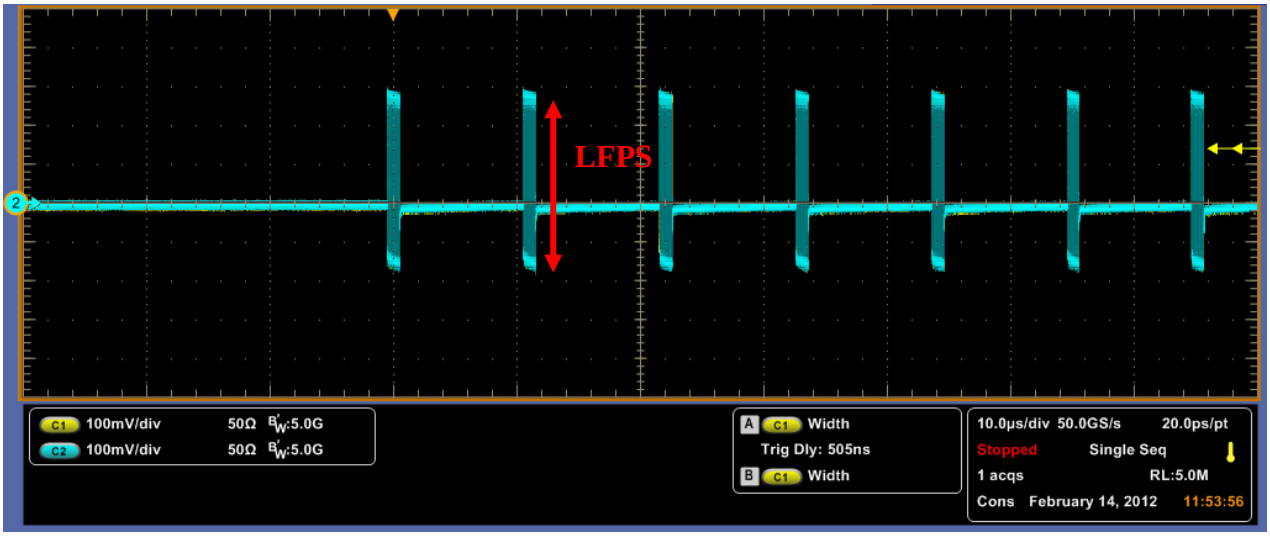


3) After running a short period, the monitor shows the ‘Turn on DUT’ as below figure. When showing that button, attaching the other side of USB3.0 Host Test Fixture-1 as the below second figure.

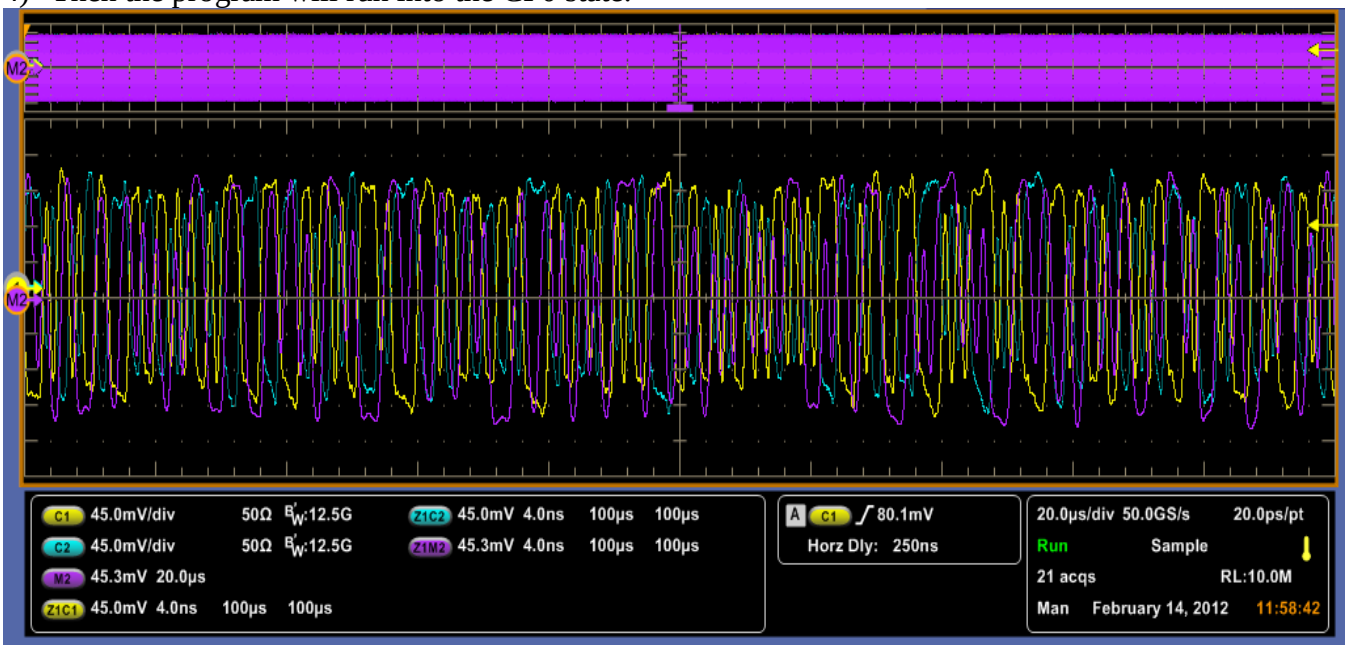




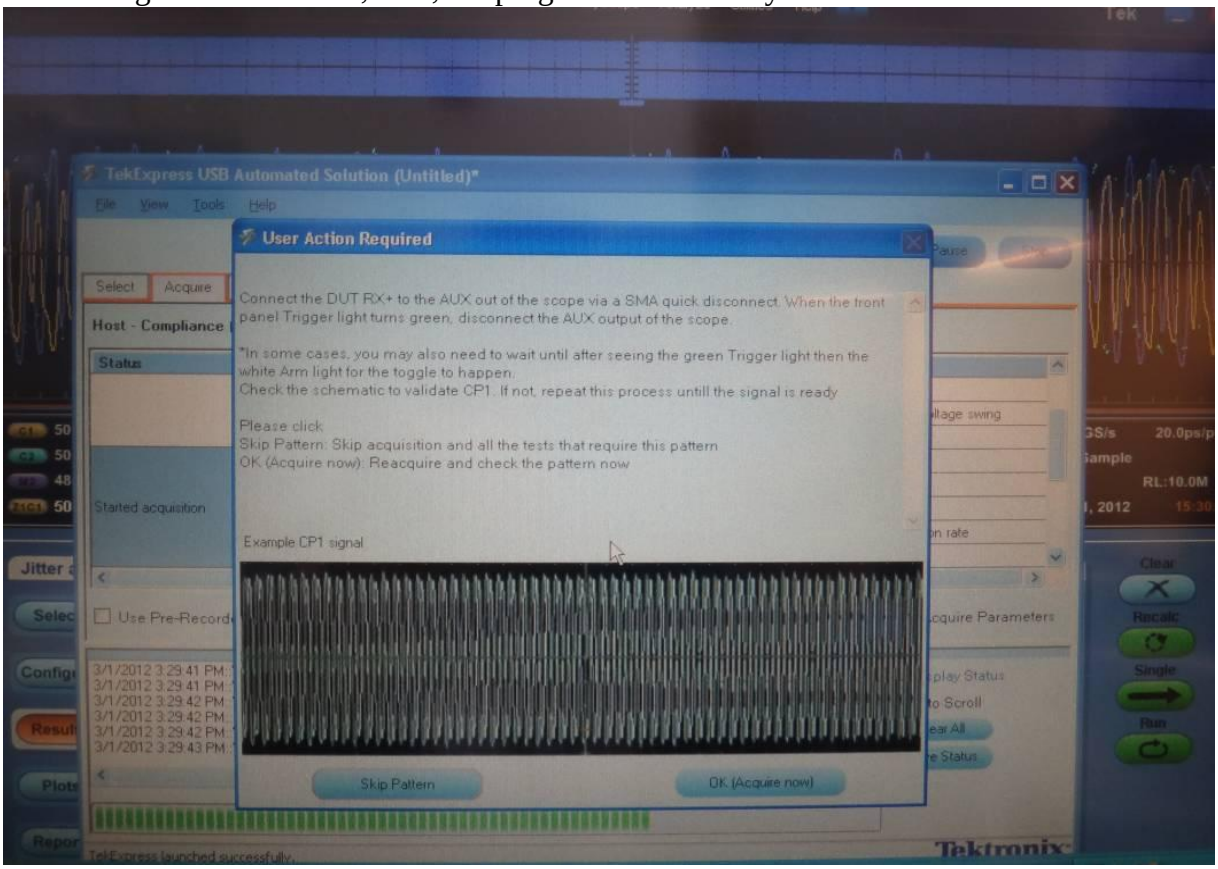
Once connecting the DUT, the monitor shall appear the waveform as the below figure. This kind of waveform is LFPS. After that, it can run the next step by pressing OK of ‘Turn on the DUT’.



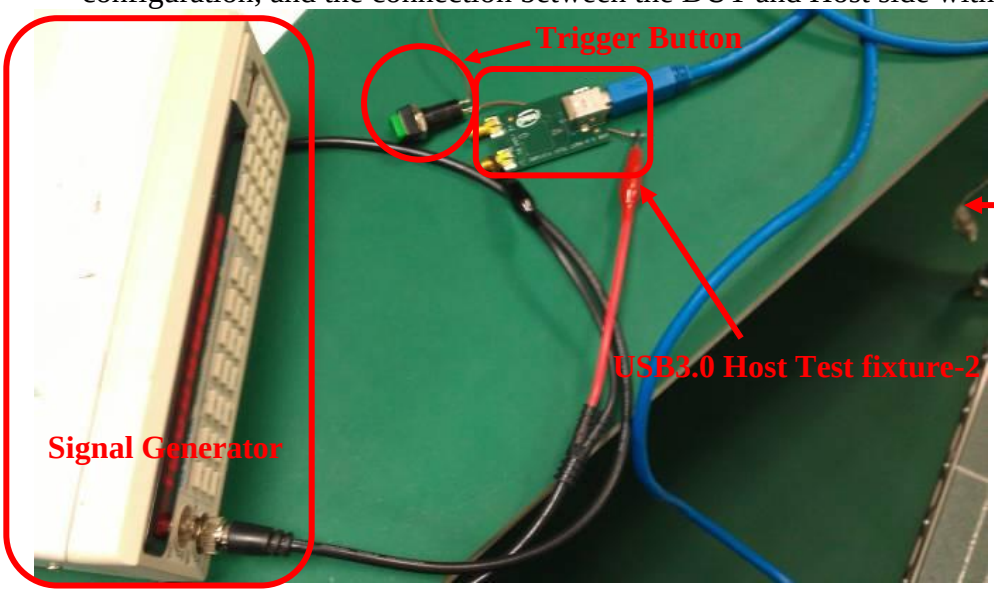
4) Then the program will run into the CP0 state.

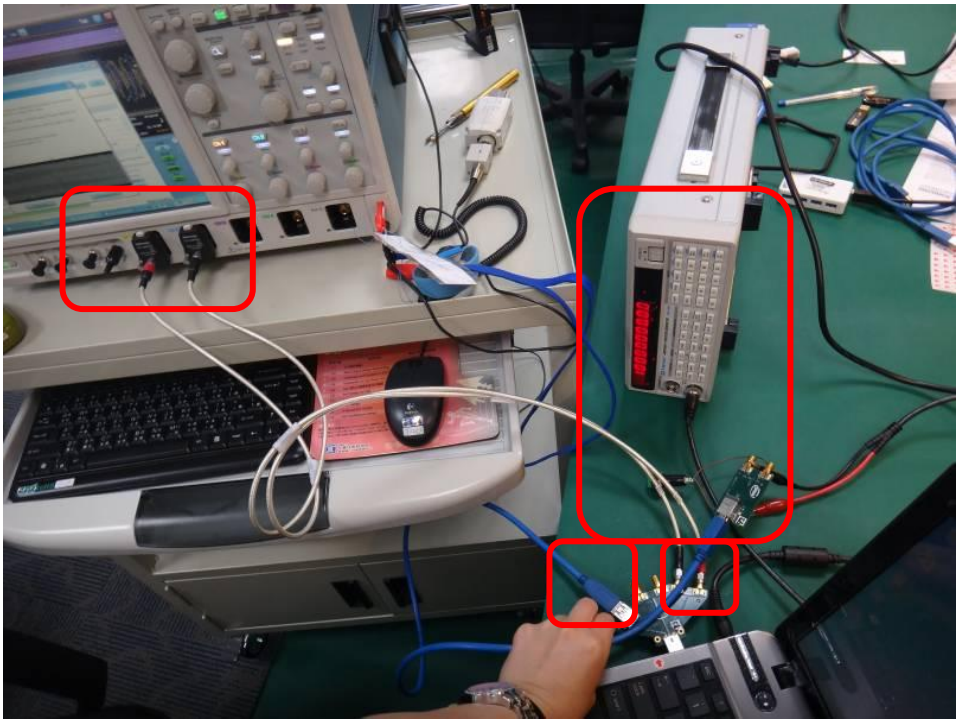


5) Before running to the next state, CP1, the program will inform you what the CP1's waveform is.



6) In order to go to CP1, it requires triggering the DUT. The following figures demonstrate the triggered configuration, and the connection between the DUT and Host side with the triggered configuration.





7) When triggering the signal generator which tuned in 1M Hz/1V, the frequency of waveform becomes 2.5GHz, and its period becomes around 400ps or the pattern changed. Those phenomena can tell the state CP0 is changed into the state CP1. The CP1 state waveform is as the below figure.

8) The final result on the monitor byTekExpress, which putting in the next section.

2. Results

The results of theUSB3.0 Tx test are showing as following report by TekExpress program.

TekExpress Automation Framework

TekExpress® Automation Framework

USB 3.0 Test Report

DUT ID : **Tx_test**
Date/Time : **2/10/2012 11:52**

Device Type :Host

Execution Time :15 Min

CTS Version :0.9

Overall Compliance Mode :Yes

Overall Test Result : **Pass**

Scope Model :**DSA71254**

Scope Serial Number:**B010358**

Scope F/W Version :**5.3.4 BUILD 25**

SPC Factory Calibration:**Pass**

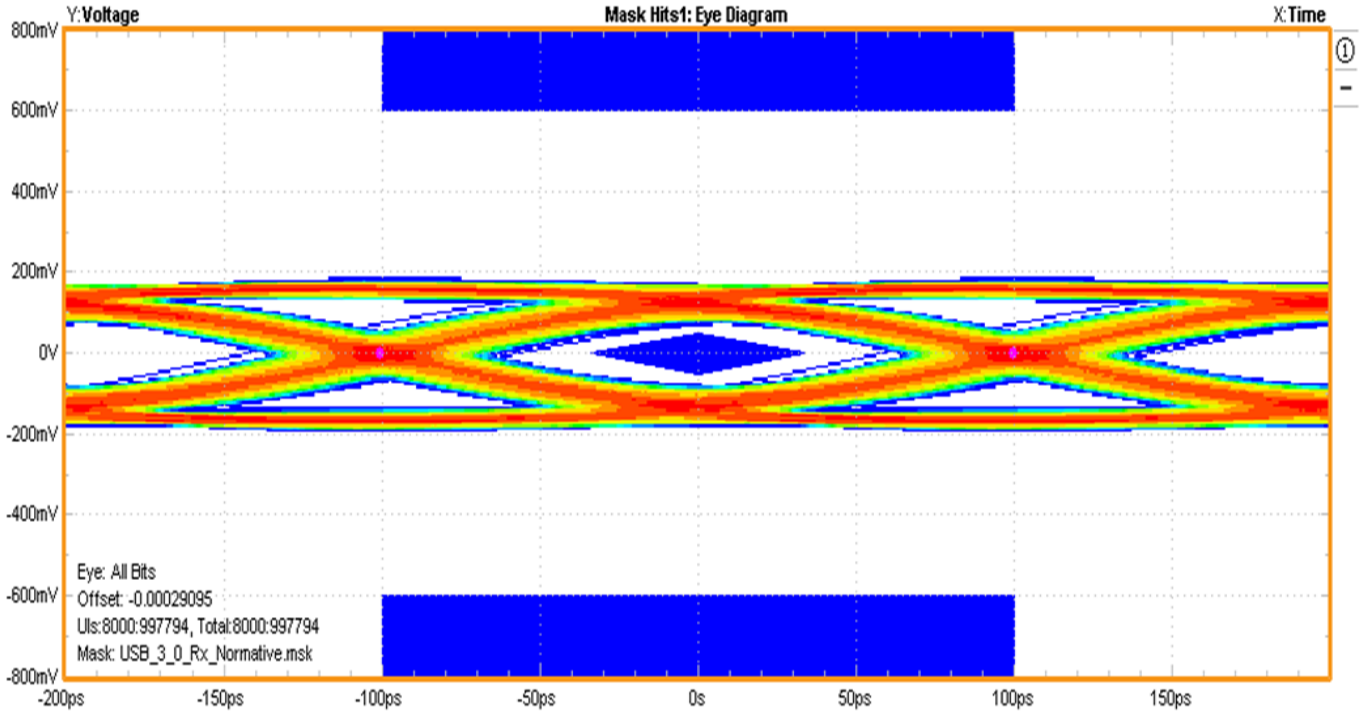
TekExpress Version :**USB: 4.0.4.73, Framework: 2.0.0.180**

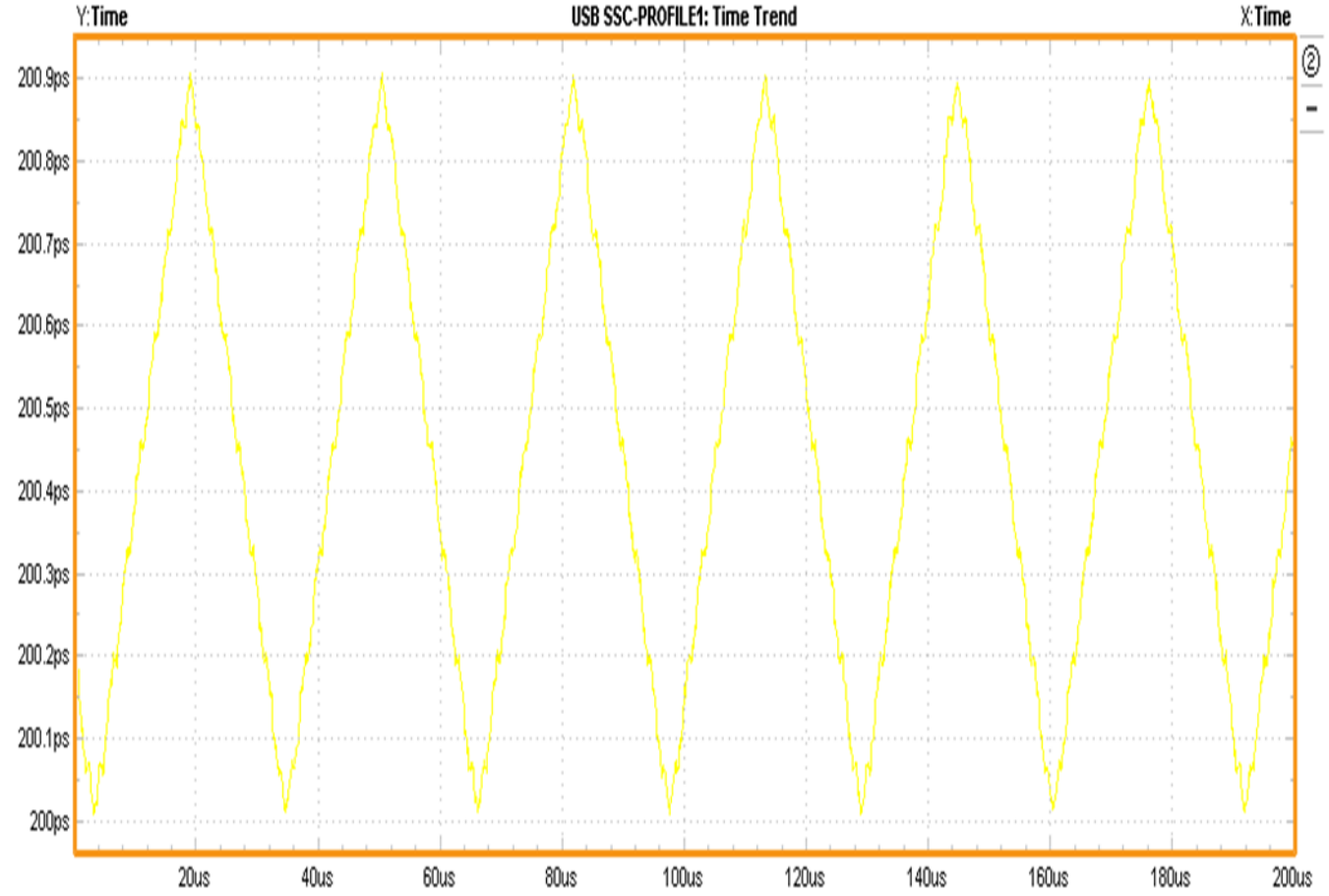
DPOJET Version:**3.5.0 Build 17**

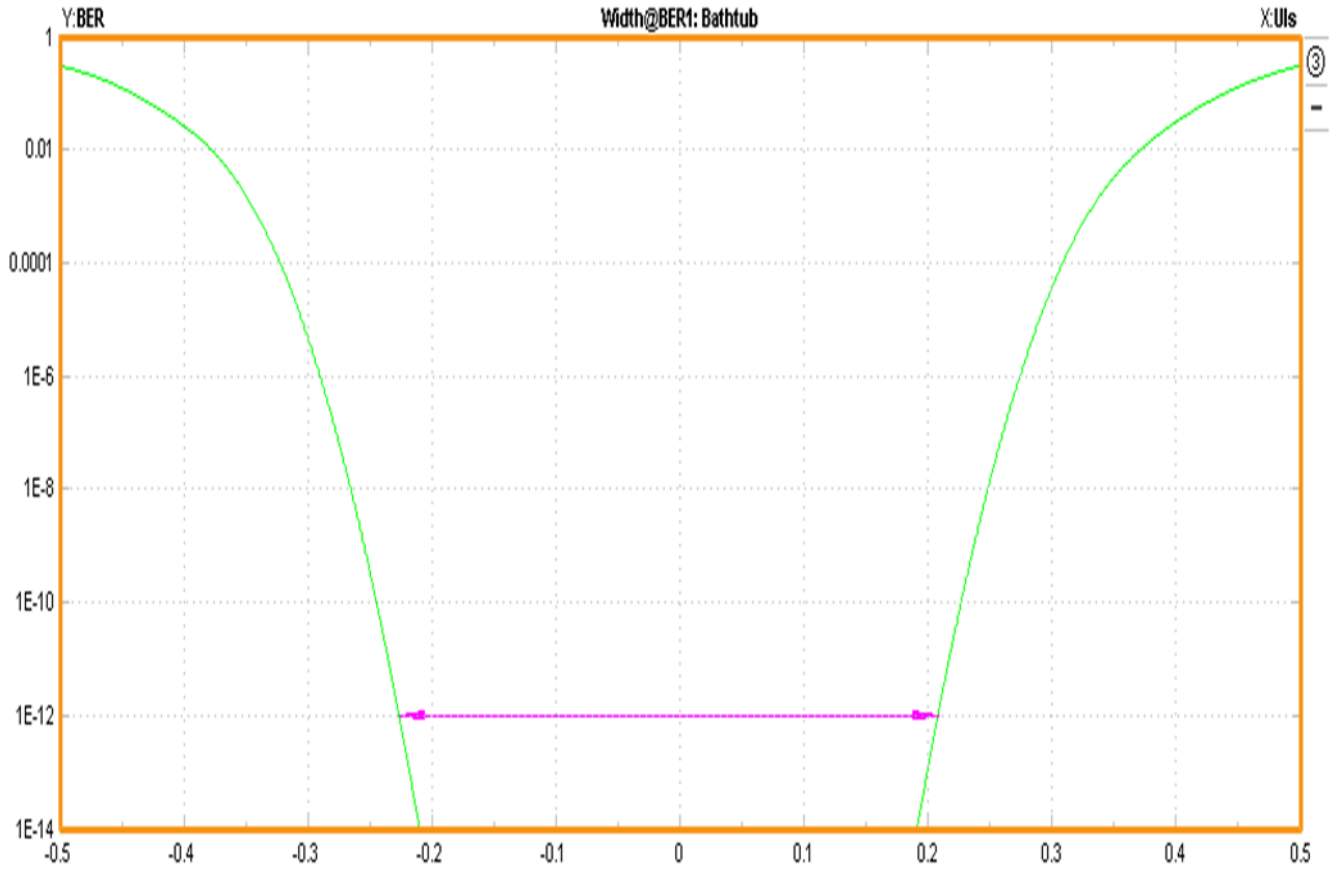
Test Name	Measurement Details		Low Limit	Measured Value	High Limit	Margin	Test Result	Comment
	Sampling Rate	Record Length						
DJ-Tx deterministic Jitter-Dual Dirac	50.000G(S/s)	10.000M	NA	46.730ps	86.000ps	39.270ps,NA	Pass	
Eye Height - Transmitter Eye Mask	50.000G(S/s)	10.000M	100.000mV	137.630mV	1.200V	1.062V,37.630mV	Pass	
Mask Hits	50.000G(S/s)	10.000M	NA	0	NA	NA,NA	Pass	
Rj-Tx random jitter-Dual Dirac	50.000G(S/s)	10.000M	NA	1.484ps	3.290ps	1.806ps,NA	Pass	
TCDR_Slew_Max -Maximum Slew Rate	50.000G(S/s)	10.000M	NA	4.502ms/s	10.000ms/s	5.498ms/s,NA	Pass	

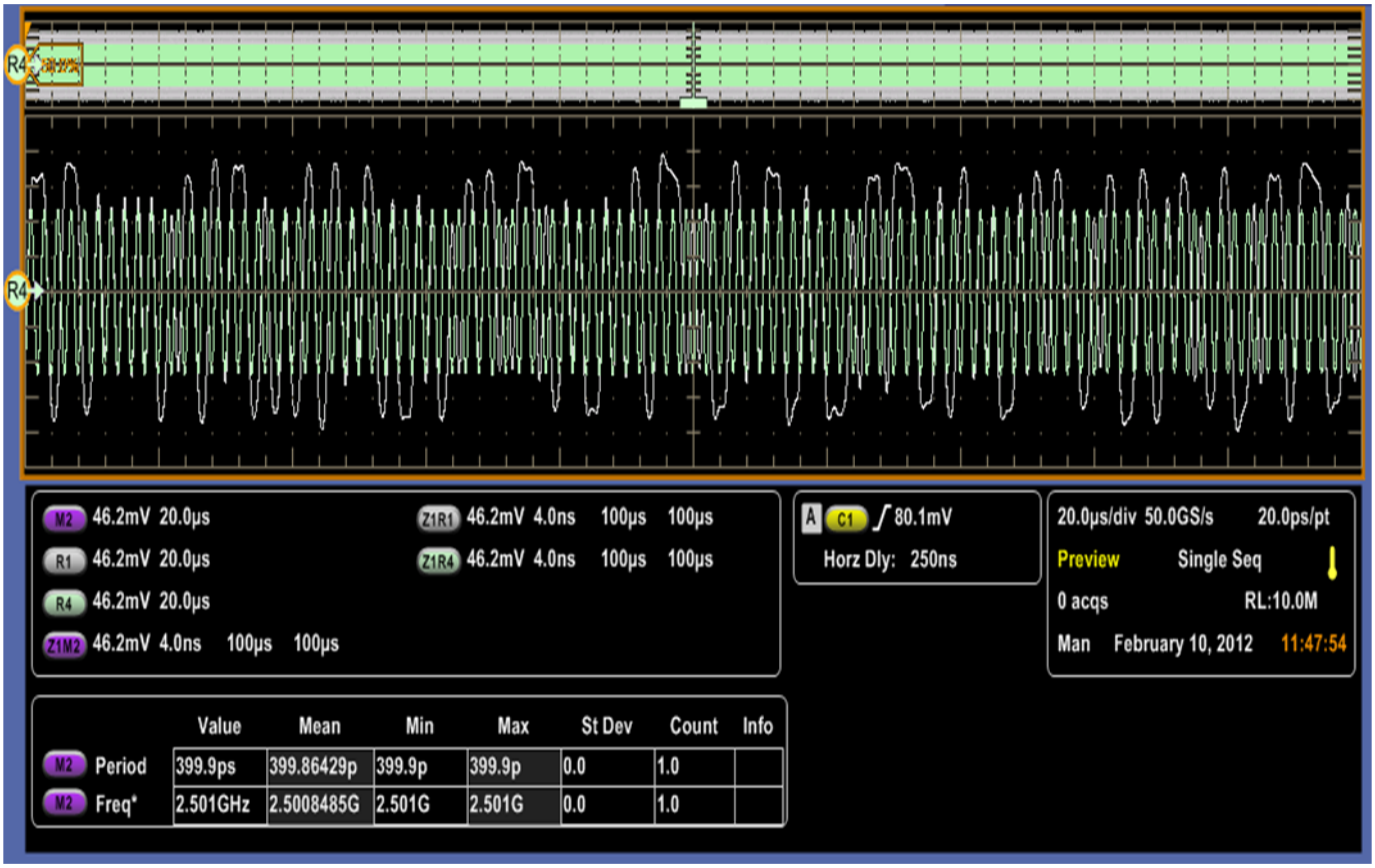
Note:
RJ CP0 and TJ CP0 are provided as reference measurements

Measurement Plots:






Y:BER
Width@BER1: Bathtub
X:UIs
1
0.01
0.0001
1E-6
1E-8
1E-10
1E-12
1E-14
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5


M2 46.2mV 20.0µs
R1 46.2mV 20.0µs
R4 46.2mV 20.0µs
Z1M2 46.2mV 4.0ns 100µs 100µs
Z1R1 46.2mV 4.0ns 100µs 100µs
Z1R4 46.2mV 4.0ns 100µs 100µs
A C1 80.1mV
Horz Dly: 250ns
20.0µs/div 50.0GS/s 20.0ps/pt
Preview Single Seq
0 acqs RL:10.0M
Man February 10, 2012 11:47:54
Value Mean Min Max St Dev Count Info
M2 Period 399.9ps 399.86429p 399.9p 399.9p 0.0 1.0
M2 Freq* 2.501GHz 2.5008485G 2.501G 2.501G 0.0 1.0