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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.

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### 1. USB3.0 Tx Test Setup and Methodology

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)	

### 1.1 Equipment Used

#### **1.2 Setup Diagram**

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

**※** Sample equipment setup figure:





#### 1.3 Methodology





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#### 1.3.2 Test Procedure

 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.

		Ele View Tools Help					
auber D	SA71		DUT ID USB3.0_Tx test	app notes		PCIE-press	→ DUT/ID
work es	IE8-W	Select Acquire Analyze Report Version UISB 30 SuperSpeed	DUT Type	Crianner Dennir	non		► DUT Type
1	Í	Electrical Test Spec	Test Point Location	Channel Filter F	ile Type	States	
e bin	Sig i es	Test Method	Probing Location Host Connector	V USUS_CADE_D	EVICE_CITE.III		
ntation	a SigTes	Host - Compliance (TP1) with CTLE at Hos	t Connector, Software Channel				Simulation Window
1/2-	1	E LFPS Measurement	<b>•</b>	Test Description Select individual measurement	Configure	亨祥	
xpress ISB		ULFPS Fall Time		to view its description	Show MDI		
ek Liii Scope	Į SigTes	LFPS Rise Time			Select All	And the owner of	
ISA E	ľ	LFPS Vix-DIFF-PP			Deselect Al		
ktronix Ibar St			Ž		Tektronix	The second	
1		TekExpress launched successfully.		North Carlo	A CARLONIX		

- \* 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.

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Income and the second second			CTID [11] Touring compar	120301_1	and the second second	
Seeco Acquee 3	inalyze Report					
Host - Compliance (Th	1) with CTLE at H	lost Connector, S	oftware Channel			
Status		Acquisition	S DUT ON	Text	A	
			Turn on the DUT	FPS Duty Cycle		
<b>10</b>			4	FPS Rise Time	15	
10 Stated as musicon		EPC		FPS TBurst	S	
		LI I S	UN	FPS TPenod		
			a Sun Succident	LEPS TRepeat		
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tter a					and the local days in the local days	
Soled The Pre-Recorded	Waveform Files		cquire Step By Step	Show Acqu	ire Parameters	
onfige 3/1/2012 318 46 PM Wr	te: TRIGgerAIMODe	normal		Displa	y Statu:	Smile
3/1/2012 3:18:46 PM Wr 3/1/2012 3:18:46 PM Wr	te: TRIGger:ENHance te: TRIGger:A:HOLDo	ed off off:BY time		Auto S	croll	
3/1/2012 3 18 46 PM W/	te TRIGger A HOLDo te ACOLIIRE STOPAI	FTER SEQUENCE		Clear		Ram
3/1/2012 3.18.47 PM: Wi	te ACQUIRE STATE	1		<ul> <li>Save 51</li> </ul>	ature of	
Plote						



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.

	Automated Solution (Untitled)*		the Ast
			• A.A
	🔊 User Action Required	N ALLA CAL	
Select Acquire	Consective DUT BY Andre ADV		
Host - Compliance	panel Trigger light turns green, disconnect the AUX output of the scope.		- () () - (
Status	"In some cases, you may also need to wait until after seeing the green Trigger light then the white Arm light for the toggle to happen.		- And A
50	Please click Skip Pattern: Skip acquisition and all the tests that require this pattern OK (Acquire now): Reacquire and check the pattern now	illage swing	3S/s Jample
<b>50</b> Started acquisition			1, 2012
	Example CP1 signal	on rate	
H C	***************************************		
lec Use Pre-Record		cquire Parameters	
1001 3/1/2012 3:29 41 PM		play Status	SI
3/1/2012 3:29 42 PM 3/1/2012 3:29 42 PM		to Scroll	-
SUIT 3/1/2012 3/29/42 PM	a si na na mana	ear Ar	157

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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<sup>®</sup> Automation Framework USB 3.0 Test Report

DUT ID : Tx_test Device Type :Host 2/10/2012			CTS Version :0.9				
Date/Time	:11:52	Execution Time :15 Min	Overall Compliance Mode	:Yes			
			Overall Test Result :	Pass			
Scope Model	DSA71254	Scope Serial Number: B010358	Scope F/W Version : <b>5.3.4 BUILD 25</b> USB: 4.0.4.73, Frar	SPC Factory Calibration: <b>Pass</b>			

TekExpress Version :2.0.0.180 DPOJET Version:3.5.0 Build 17

	Measurement Details			Measured			Test	
Test Name	Sampling Rate	Record Length	Low Limit	Value	High Limit	Margin	Resul t	Comment
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





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