XAUI Compliance Channel Measurements

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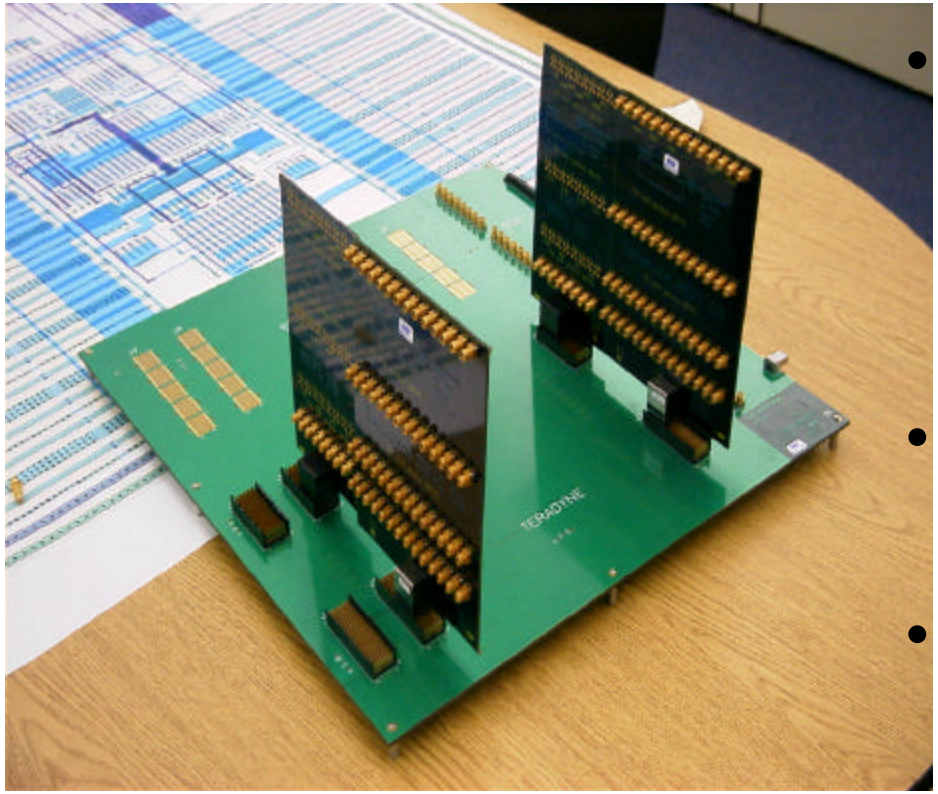
Texas Instruments

Jan 10, 2001 Irvine, CA(batteries required)

Channel Descriptions



- 2 channels over the same backplane, with different connectors (“CH21” and “CH22”)
- ~22 inches (18” bkpl, 2” each daughter card)
- Teradyne VHDM and AMP HS3 connectors

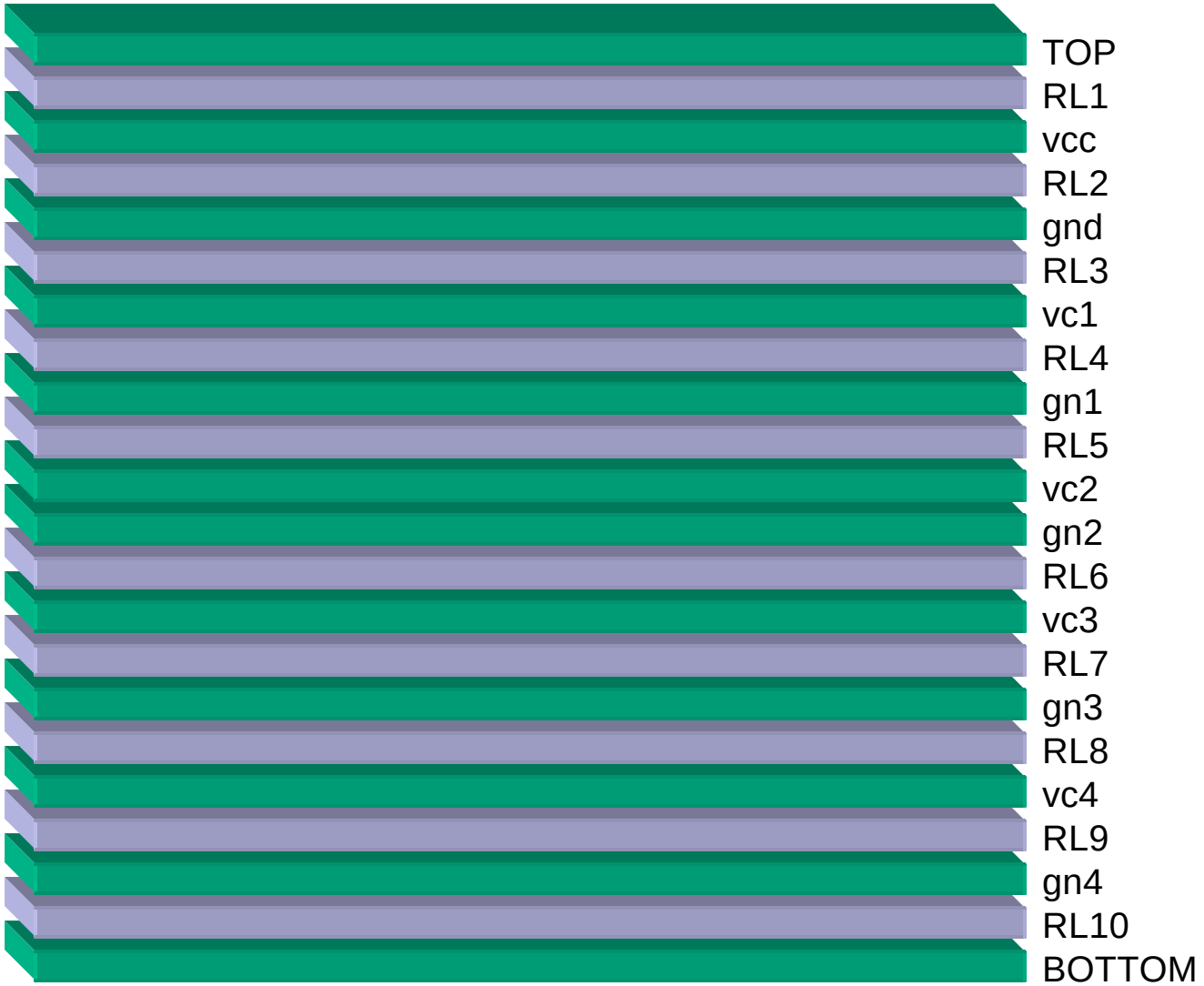
Board Stackup

Copper Weight and Layer Thickness			
1	1/2 oz	Overall	0.1250 +/- 0.0100
2	1/2 oz	Layer 1-2	0.0050 +/- 0.0010
3	1/2 oz	Layer 2-3	0.0030 +/- 0.0010
4	1/2 oz	Layer 3-4	0.0080 +/- 0.0010
5	1/2 oz	Layer 4-5	0.0085 +/- 0.0010
6	1/2 oz	Layer 5-6	0.0035 +/- 0.0010
7	1/2 oz	Layer 6-7	0.0030 +/- 0.0010
8	1/2 oz	Layer 7-8	0.0030 +/- 0.0010
9	1/2 oz	Layer 8-9	0.0085 +/- 0.0010
10	1/2 oz	Layer 9-10	0.0080 +/- 0.0010
11	1/2 oz	Layer 10-11	0.0030 +/- 0.0010
12	1/2 oz	Layer 11-12	0.0080 +/- 0.0010
13	1/2 oz	Layer 12-13	0.0085 +/- 0.0010
14	1/2 oz	Layer 13-14	
15	1/2 oz	Layer 14-15	0.0050 +/- 0.0010

Multi Layer - 15 layers	
.005 1/2-1/2	0.0068
2x106	0.0036
.008 1/2-1/2	0.0090
2x2116	0.0090
.0035 1/2-1/2 n4000-6	0.0000
2x106	0.0036
.0035 1/2-1/2 n4000-6	0.0000
2x2116	0.0090
.008 1/2-1/2	0.0090
2x106	0.0036
.008 1/2-1/2	0.0090
2x2116	0.0090
.008 1/2-0	0.0085
3x7628 1x106	0.0228
.005 1/2-1/2	0.0068
Calculated Thickness	0.1097
Pressed Thickness	0.1170

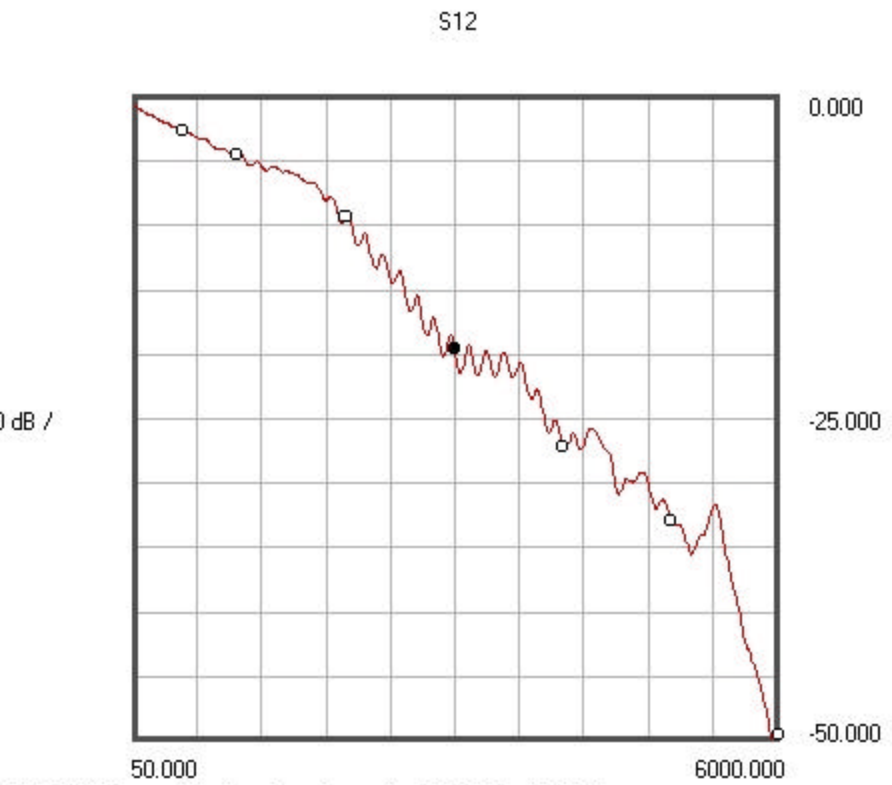
D_k = 3.9, Loss Tangent @ 1Ghz = 0.011

Layer Assignment



Frequency Domain Measurement

Channel 21 S21 Magnitude



MEASURED: Wednesday, December 06 2000, 11:02:13

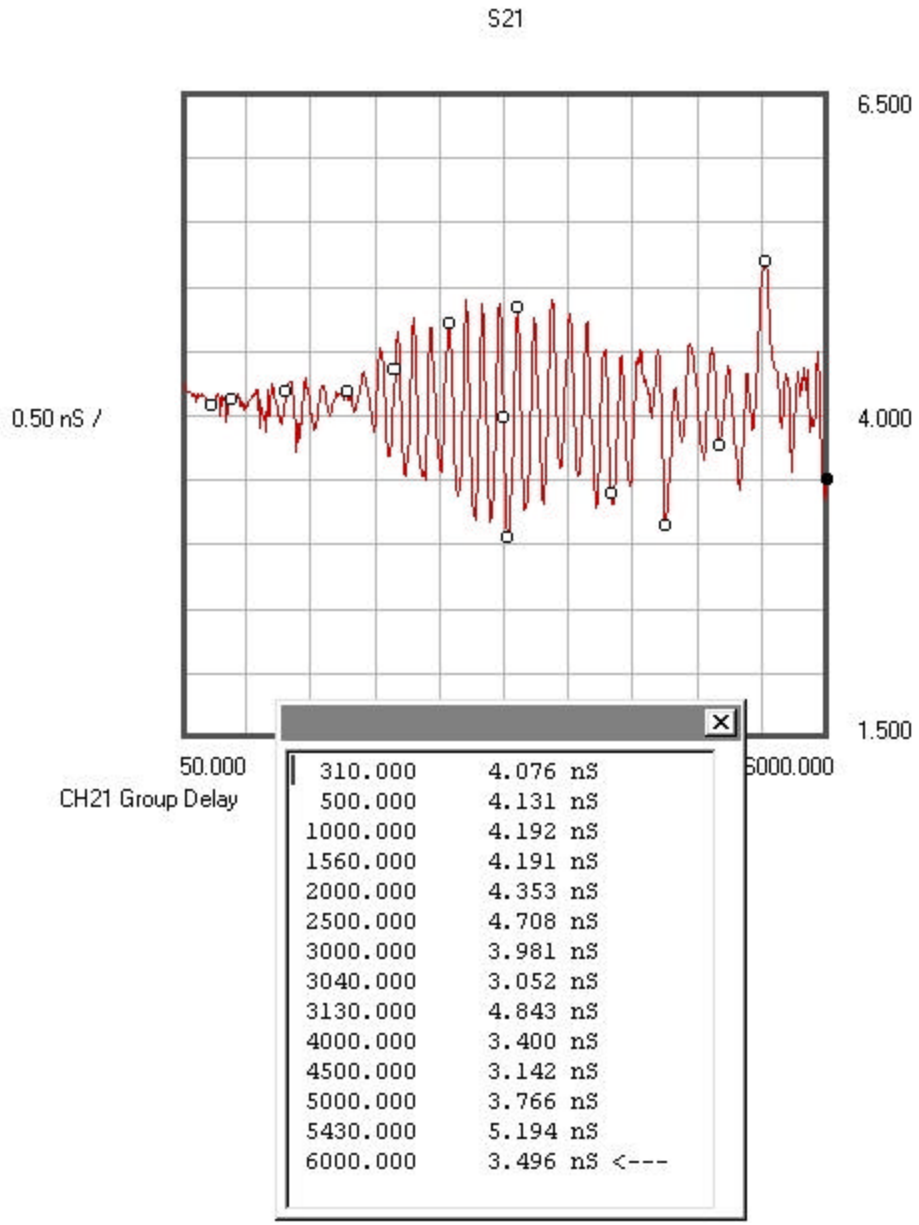
BACKPLANE BOARD MEASUREMENTS

Trace Information :
Differential Pair : CH_21
Backplane Net Name : A_CH_21_ : 18731.1mils
Daughtercard Connector : J5 ;
Position : P117 : 1334.0mils
Daughtercard Connector : J6 ;
Position : P114 : 1999.9mils

Total Trace Length :
18731.1 + 1334.0 + 1999.9 mils = 22065

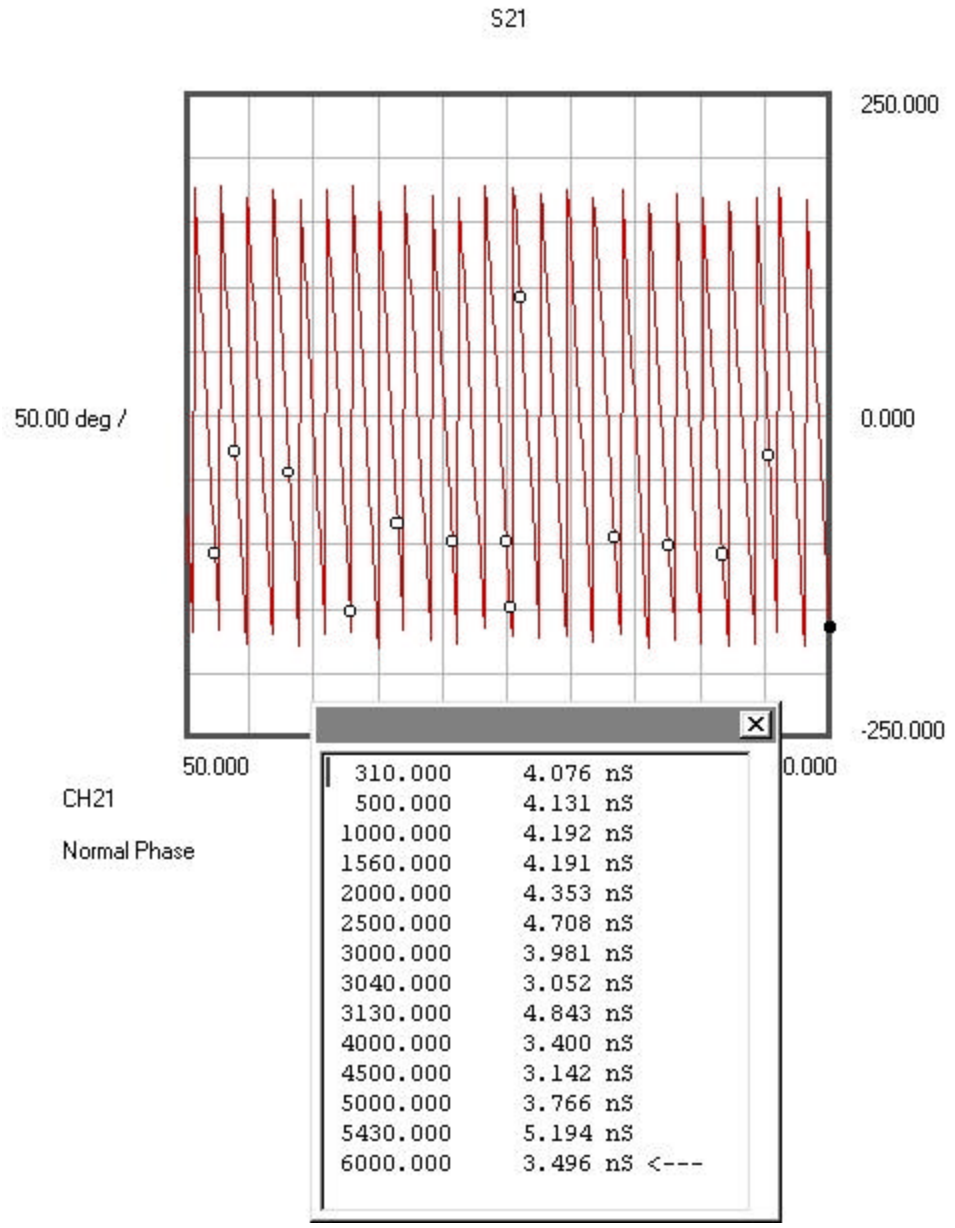
500.000	-2.631 dB	
1000.000	-4.394 dB	
2000.000	-9.755 dB	
3000.000	-18.207 dB	<---
4000.000	-22.397 dB	
5000.000	-41.126 dB	
6000.000	-51.442 dB	

Channel 21 Group Delay

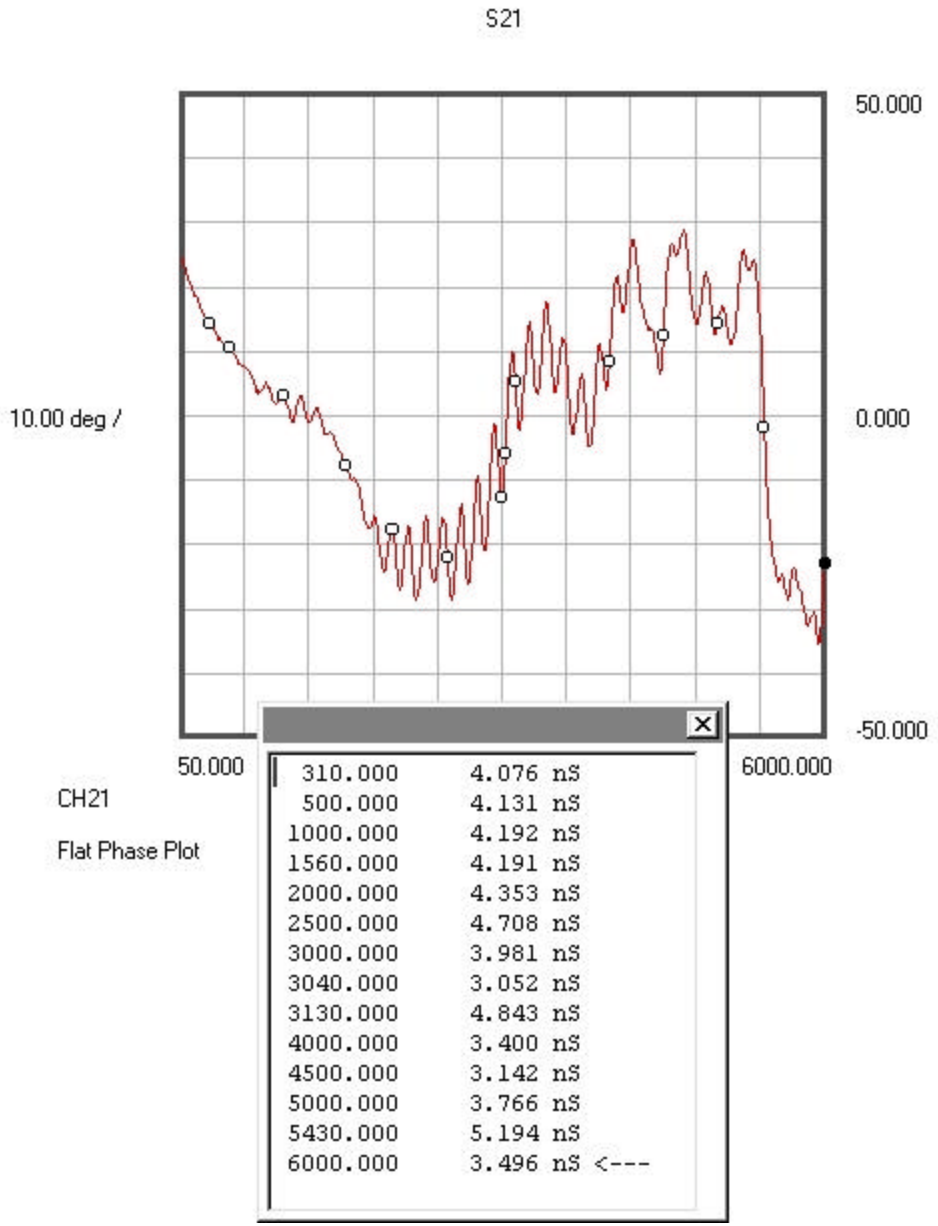


310.000	4.076 nS
500.000	4.131 nS
1000.000	4.192 nS
1560.000	4.191 nS
2000.000	4.353 nS
2500.000	4.708 nS
3000.000	3.981 nS
3040.000	3.052 nS
3130.000	4.843 nS
4000.000	3.400 nS
4500.000	3.142 nS
5000.000	3.766 nS
5430.000	5.194 nS
6000.000	3.496 nS <---

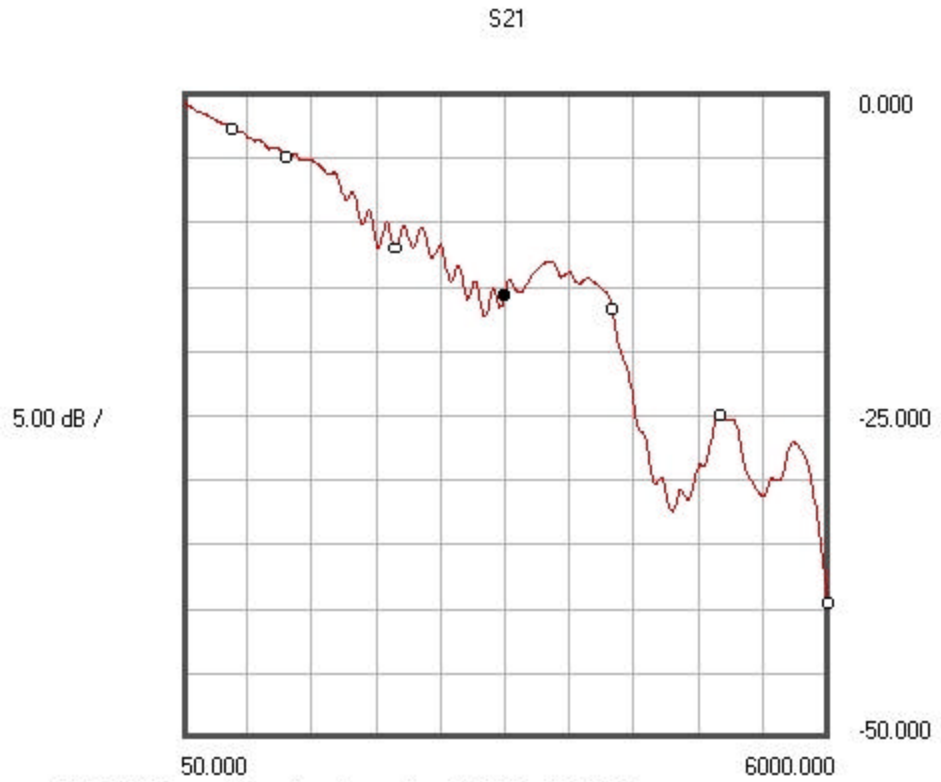
Channel 21 Normal Phase



Channel 21 Flat Phase



Channel 22
S21
Magnitude



MEASURED: Thursday, December 07 2000, 10:50:00

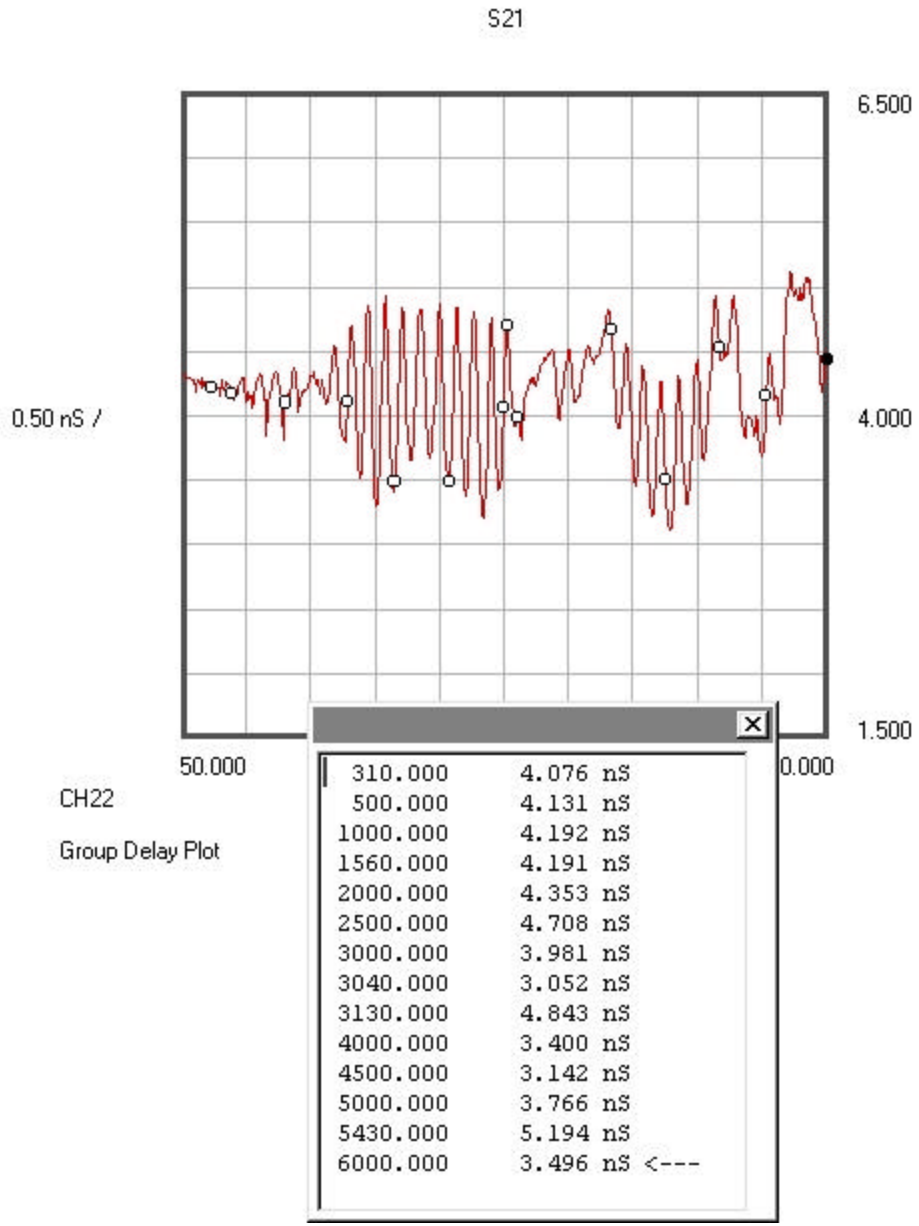
BACKPLANE BOARD MEASUREMENTS

Trace Information :
Differential Pair : CH_22
Backplane Net Name : A_CH_22

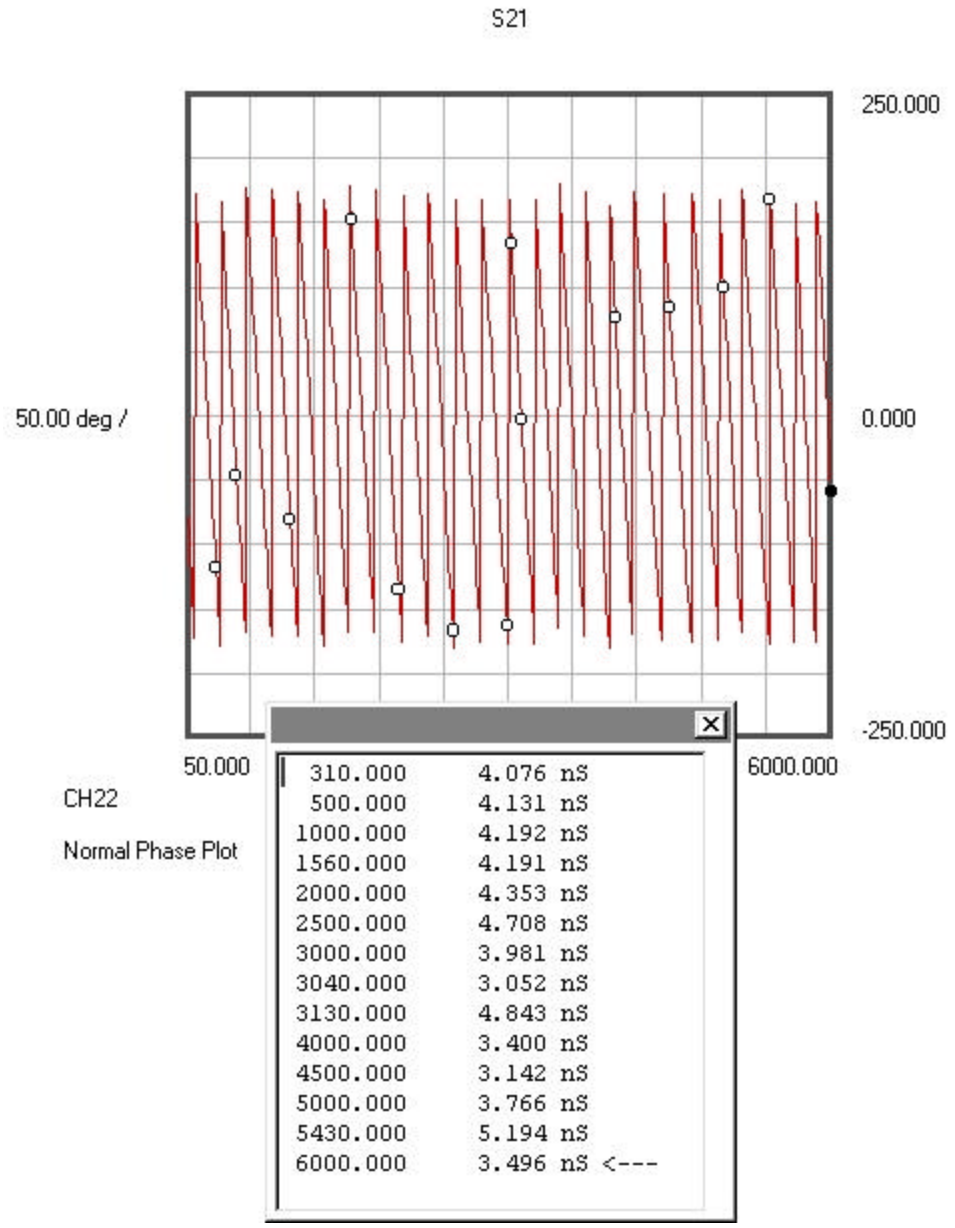
Total Trace Length (mils):
A_CH_22 : 1982.4 + 18009.3 + 1982.4 = 21974.1

500.000	-1.846	deg
1000.000	-5.021	deg
2000.000	1.984	deg
3000.000	35.668	deg <---
4000.000	-27.030	deg
5000.000	33.666	deg
6000.000	-55.338	deg

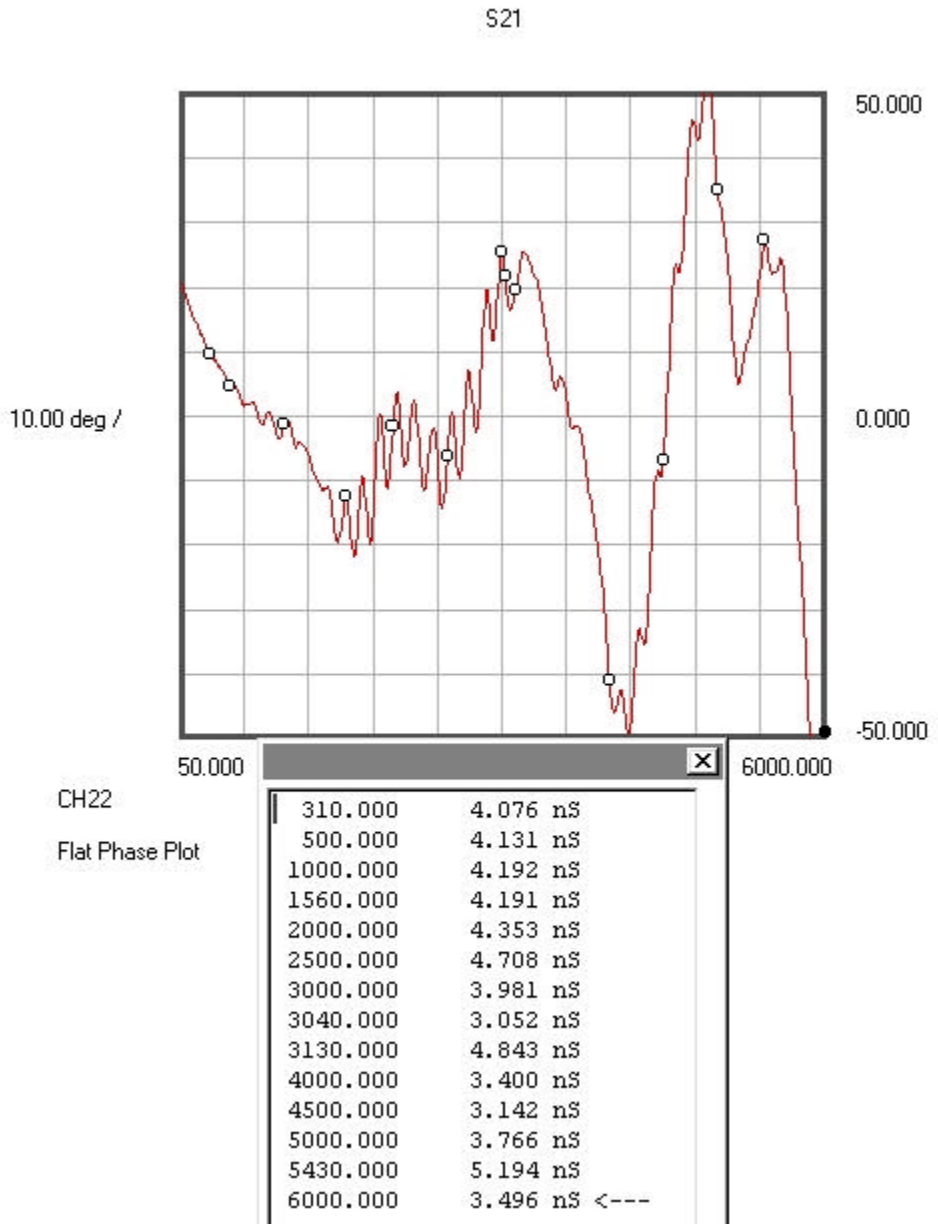
Channel 22 Group Delay



Channel 22 Normal Phase



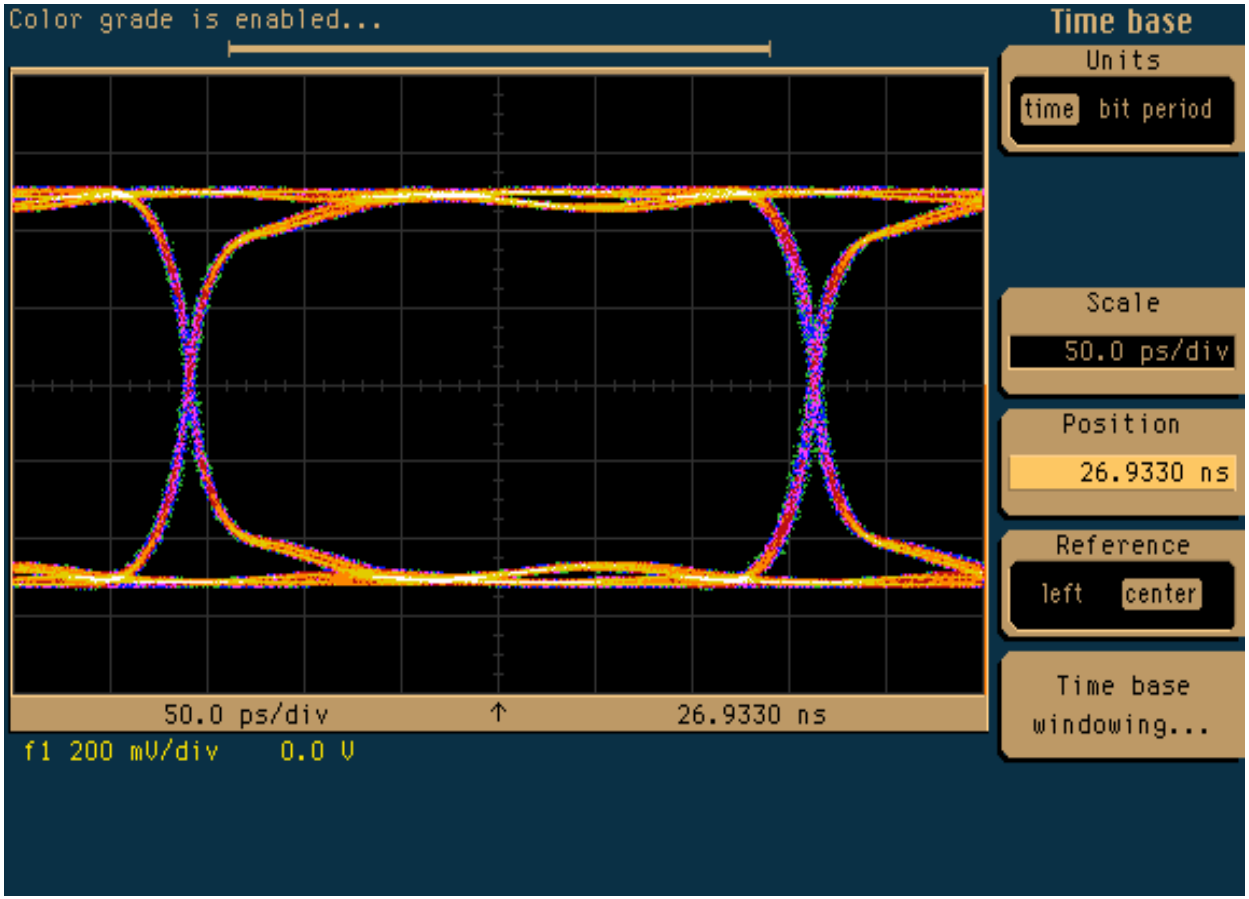
Channel 22 Flat Phase



Time Domain Measurements

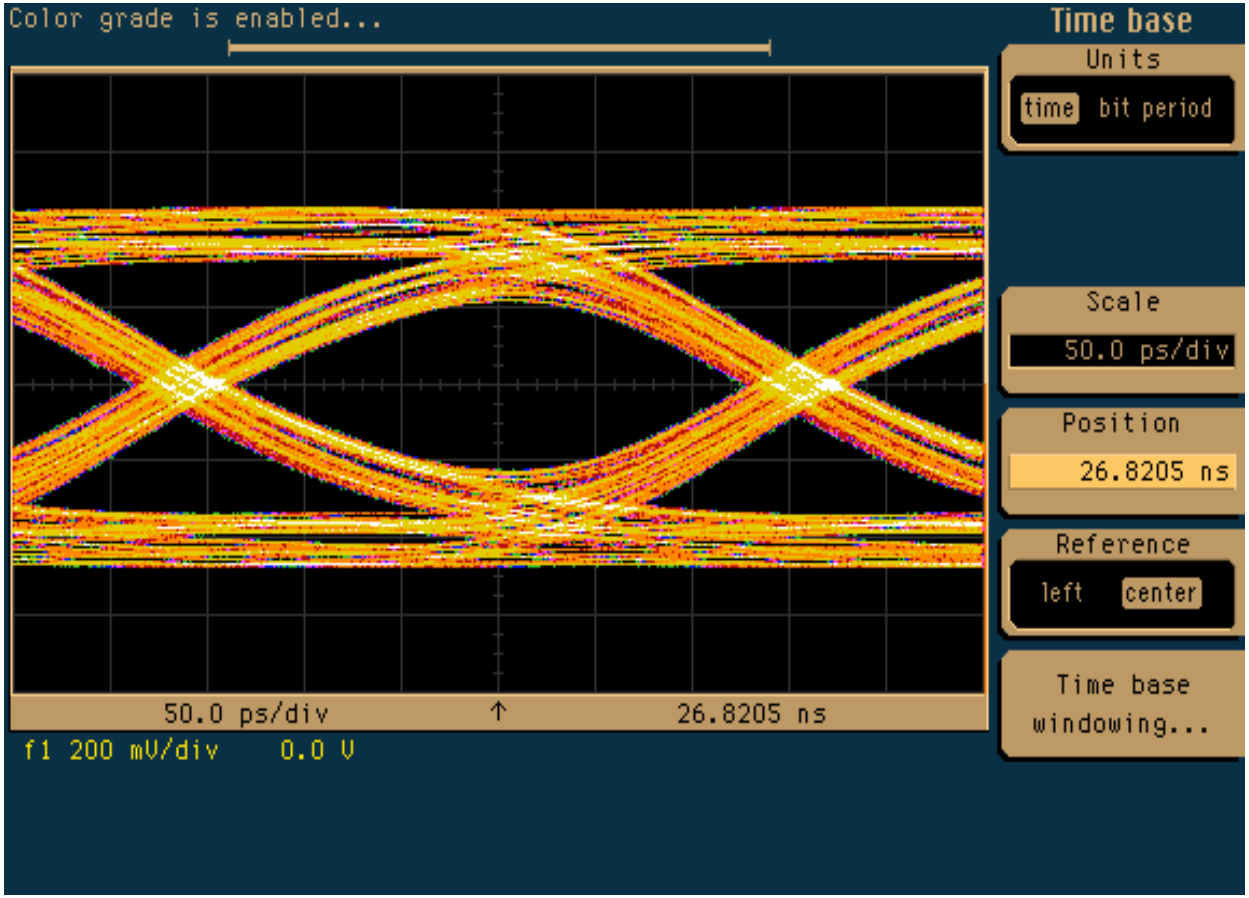
Transmit Eye

Two 1m cables with Barrel



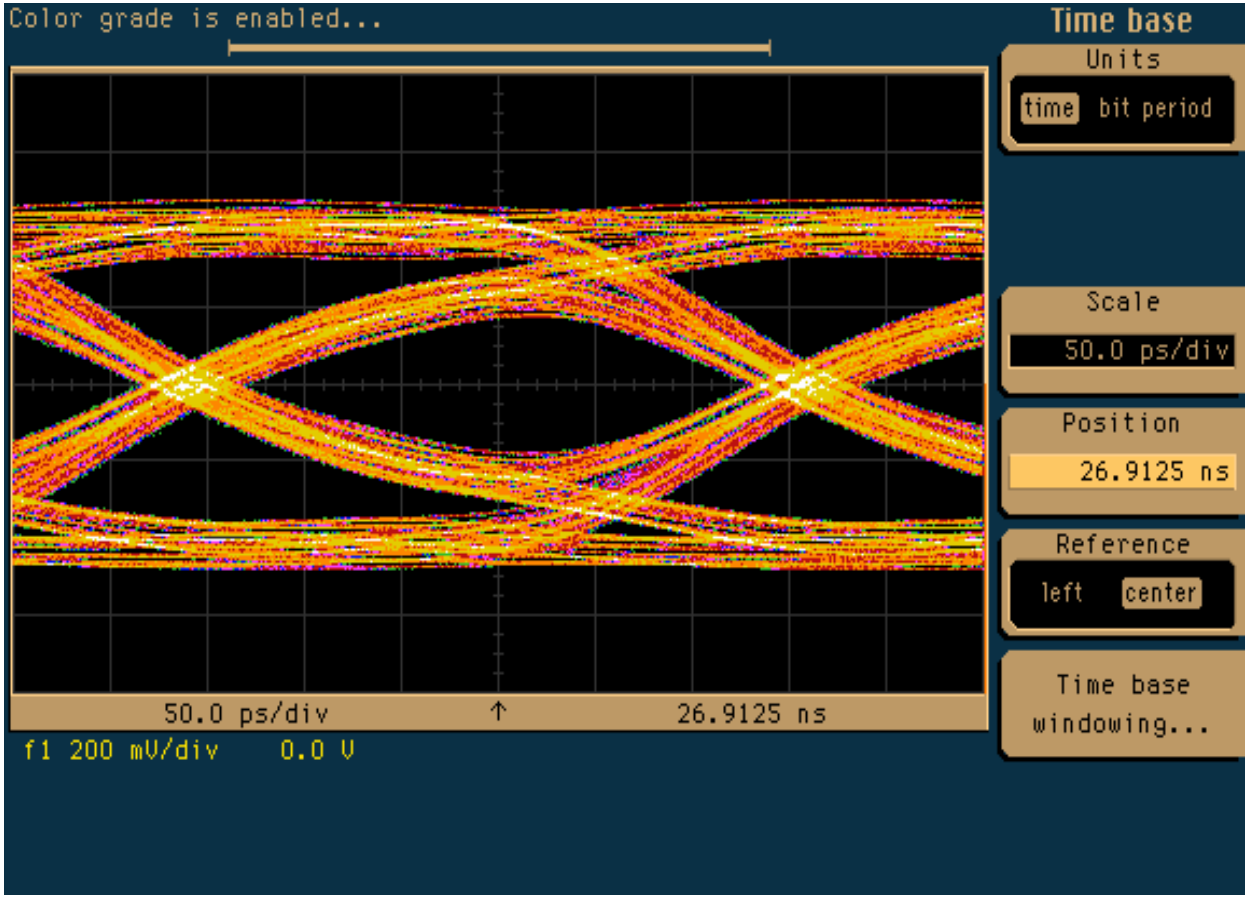
Receive Eye

~20 inches FR4 connector 21



Receive Eye

~20 inches FR4 Connector 22



Summary
Further Work Planned

- Connectors contribute small loss in the frequency range less than 1.5625Ghz.
- Connectors contribute significant loss in the frequency range from 1.5625Ghz to 6.0Ghz.
- Customer feedback: *A XAUI specification that at least comprehends the effects of connectors is needed.*
- Measurements of a possible "*Interoperability Platform*" is planned for Feb. '01.