Technical Feasibility of Power over 1000BT

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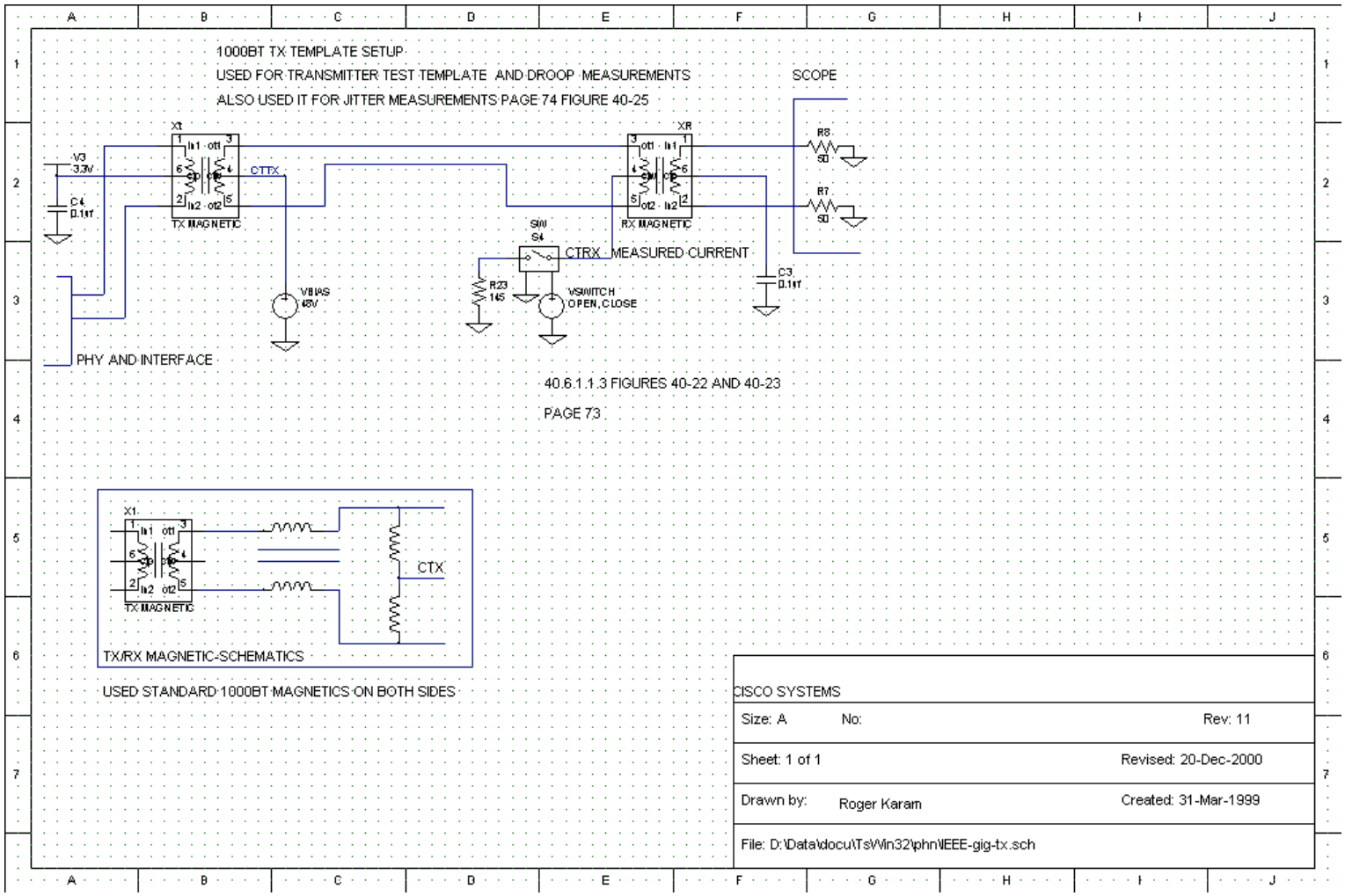
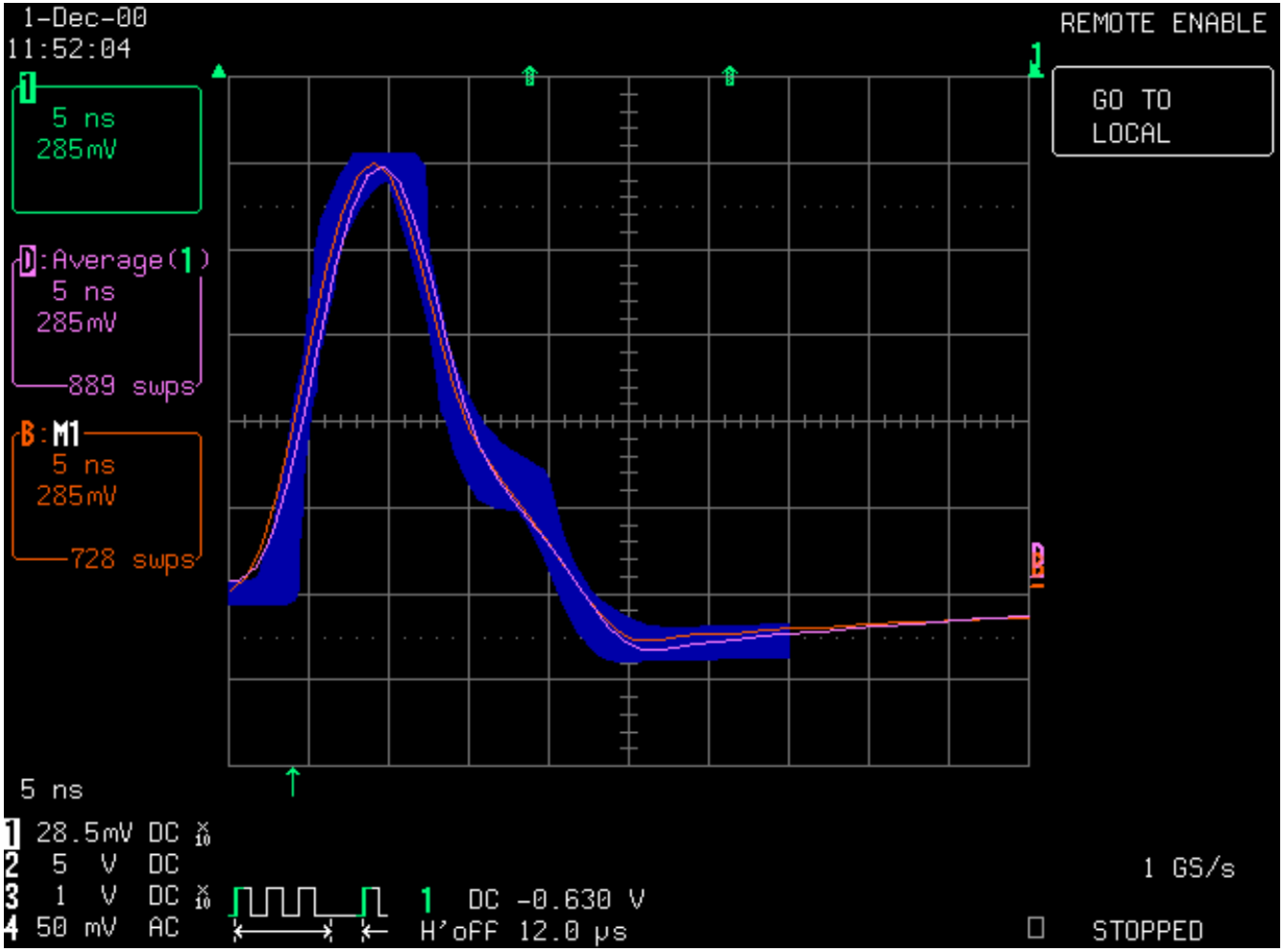
Transmit Template Measurements



Test Setup for I = 350 mA (red trace), I = 0 mA (pink trace)
[Following Slides]

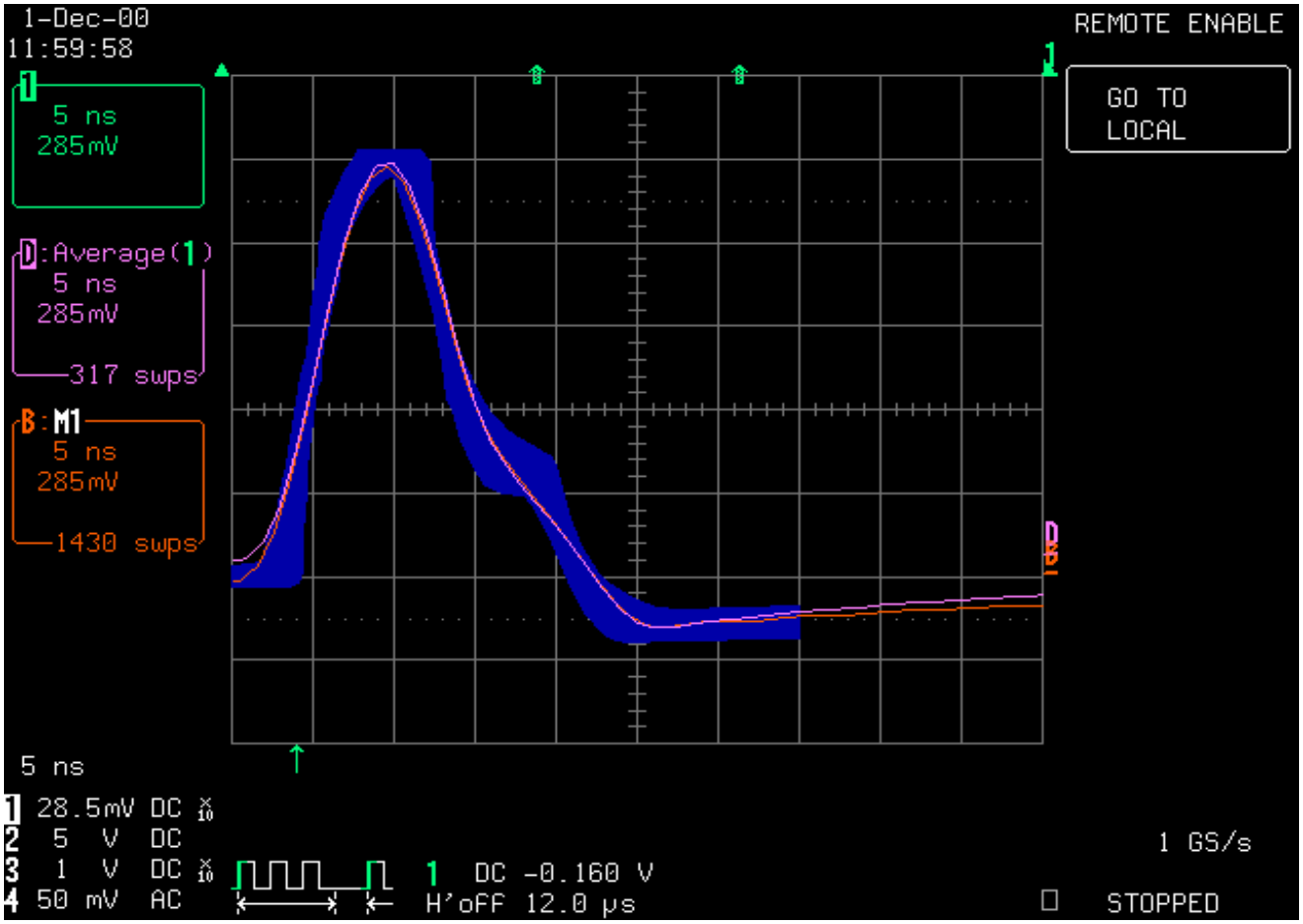
Transmit Template Measurements



40.6.1.2.1 Template 1 Channel A point A

I = 350 mA (red trace), I = 0 mA (pink trace)

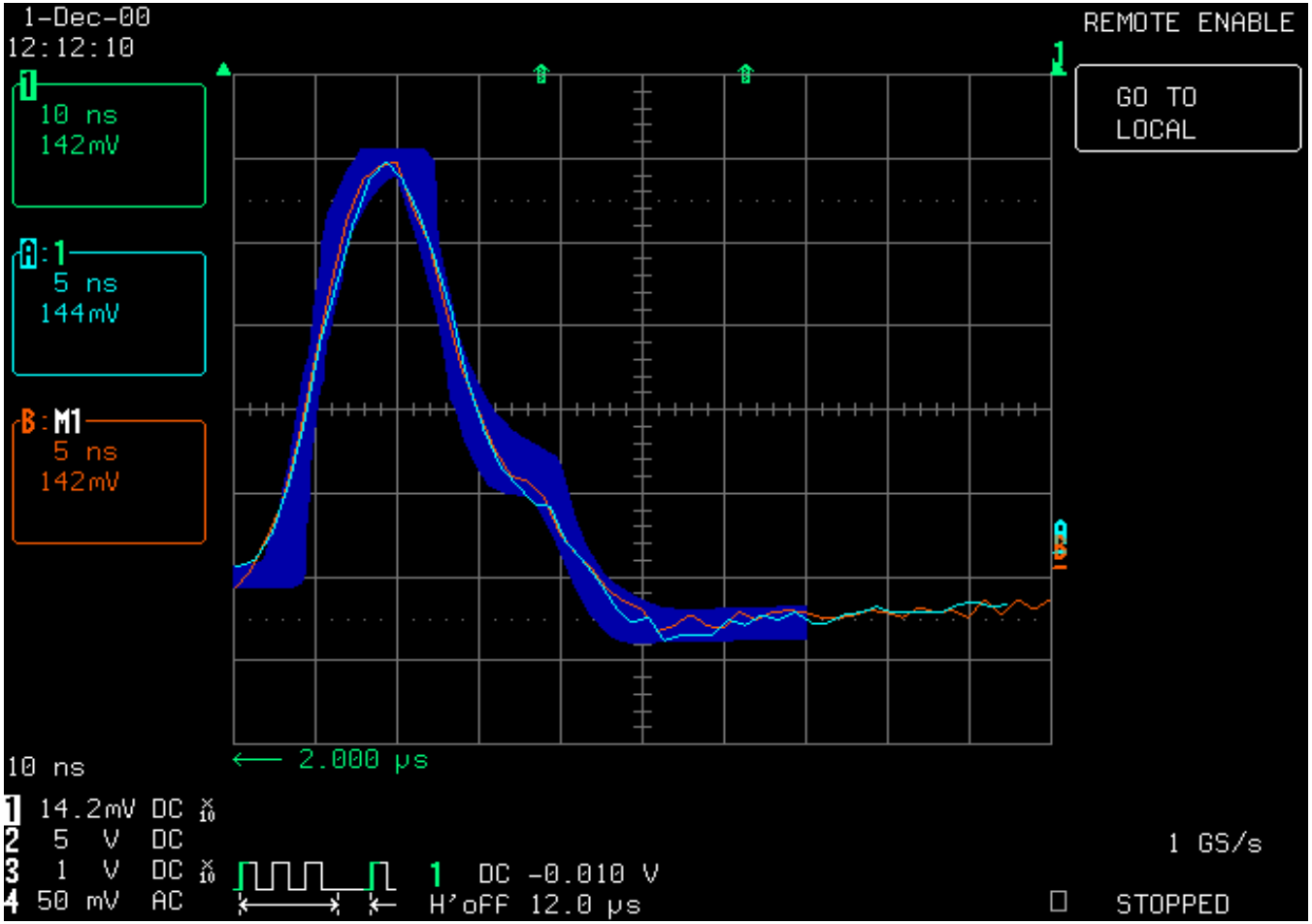
Transmit Template Measurements



40.6.1.2.1 Template 1 Channel A point B

I = 350 mA (red trace), I = 0 mA (pink trace)

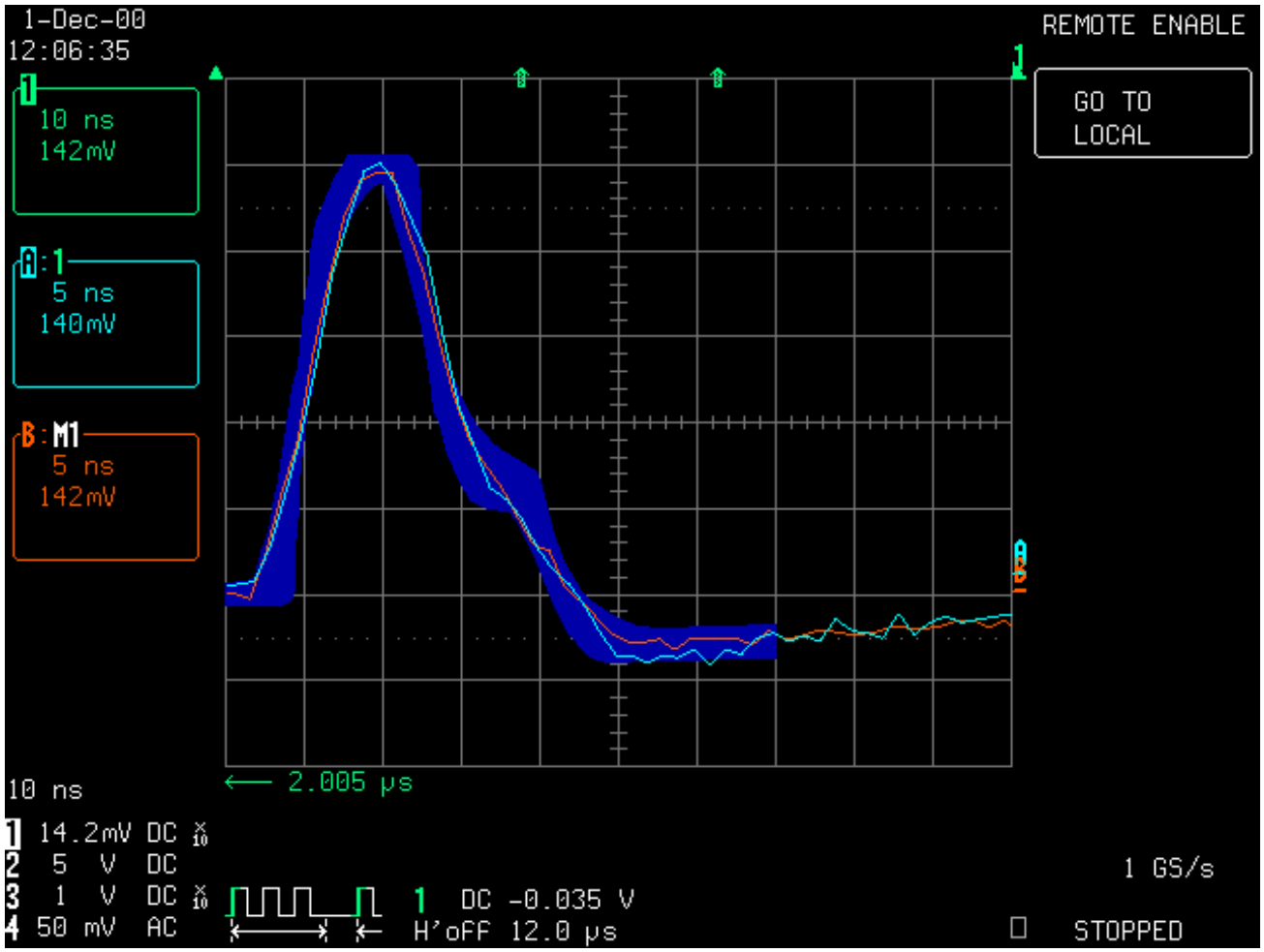
Transmit Template Measurements



40.6.1.2.1 Template 1 Channel A point C

I = 350 mA (red trace), I = 0 mA (pink trace)

Transmit Template Measurements



- **40.6.1.2.1 Template 1 Channel A point D**
- I = 350 mA (red trace), I = 0 mA (pink trace)

Transmit Template Measurements

D.U.T. :		Temp. (F):	25	Phase (Degrees) :	143
Date / Time :	12-05-2000:15:04:37	Vcc (V) :	3.3	DC Offset (mV):	-38.9
D.U.T. Configuration :					

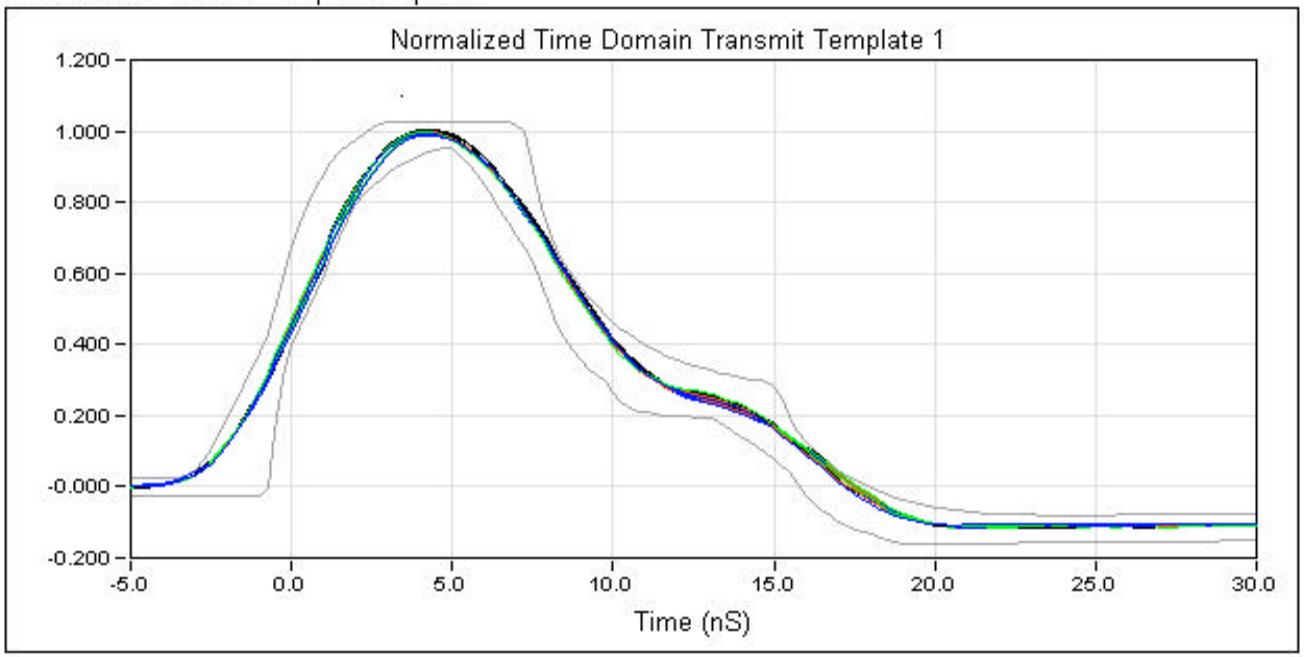
40.6.1.2.1 Peak Differential Output Voltage and Level Accuracy

Description	Rep.	Min.	Meas	Max.	Units
Point A	+-2mV	0.67	0.6649	0.82	V
Point B	+-2mV	-0.82	-0.6634	-0.67	V
Point C	+-2mV	-	0.3309	-	V
Point D	+-2mV	-	-0.3297	-	V
(1 + Point A/Point B) * 100%	+-0.25%	-1	-0.22	1	%
(1 - (0.5 * (PointA + PointB) / 2) / PointC) * 100%	+-0.5%	-2	-0.36	2	%
(1 - (0.5 * -(PointA + PoiintB) / 2) / PointD) * 100%	+-0.5%	-2	-0.72	2	%

Measurements from Template on Next Page

Transmit Template Measurements

40.6.1.2.3 Differential Output Template 1



Description	Horzontal Margin	Units	Vertical Margin	Units
Point A	0.375	nS	0.034	mV
Point B	0.425	nS	0.036	mV
Point C	0.450	nS	0.032	mV
Point D	0.350	nS	0.030	mV

Differential Output Template 1

Transmit Template Measurements

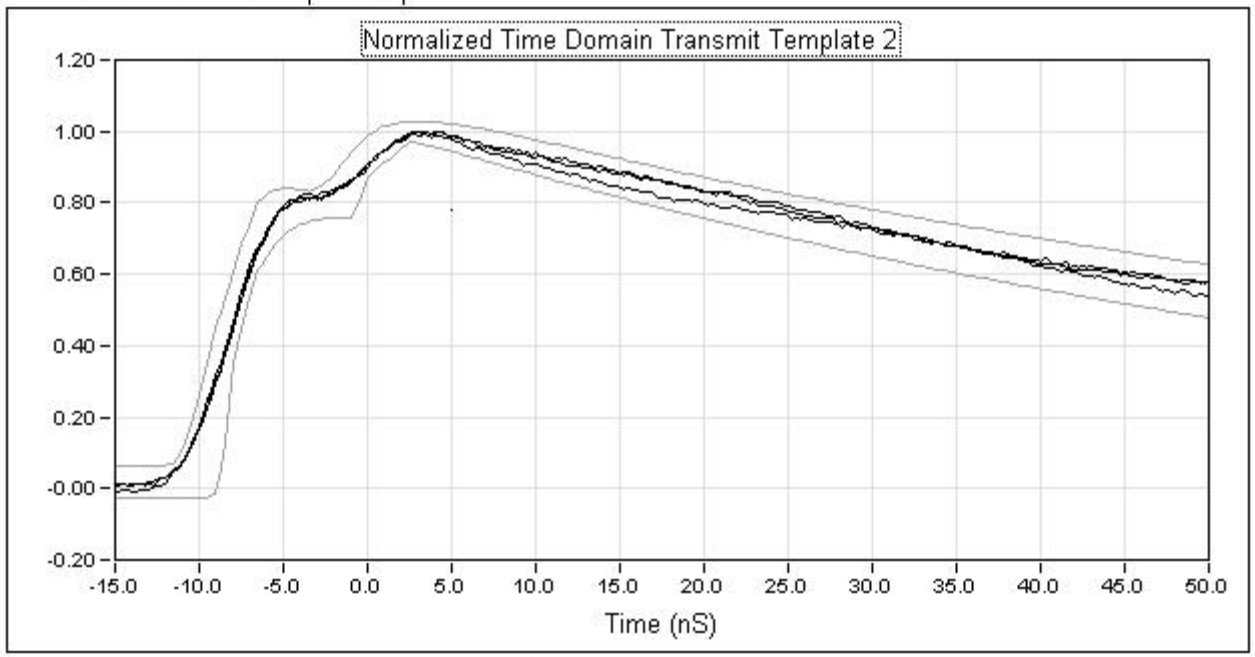
40.6.1.2.2 Maximum Output Droop

Description	Rep.	Min	Meas	Max	Units
Point F	+-2mV	-	-2.008	-	V
Point G	+-2mV	-	-1.852	-	V
Point H	+-2mV	-	2.020	-	V
Point J	+-2mV	-	1.873	-	V
(PointG / PointF) * 100%	+-0.5%	73.1	92.2	-	%
(PointH / PointJ) * 100%	+-0.5%	73.1	92.8	-	%

Measurements from Template on Next Page

Transmit Template Measurements

40.6.1.2.3 Differential Output Template 2



Description	Horzontal Margin	Units	Vertical Margin	Units
Point F	0.775	nS	0.029	mV
Point H	0.650	nS	0.030	mV

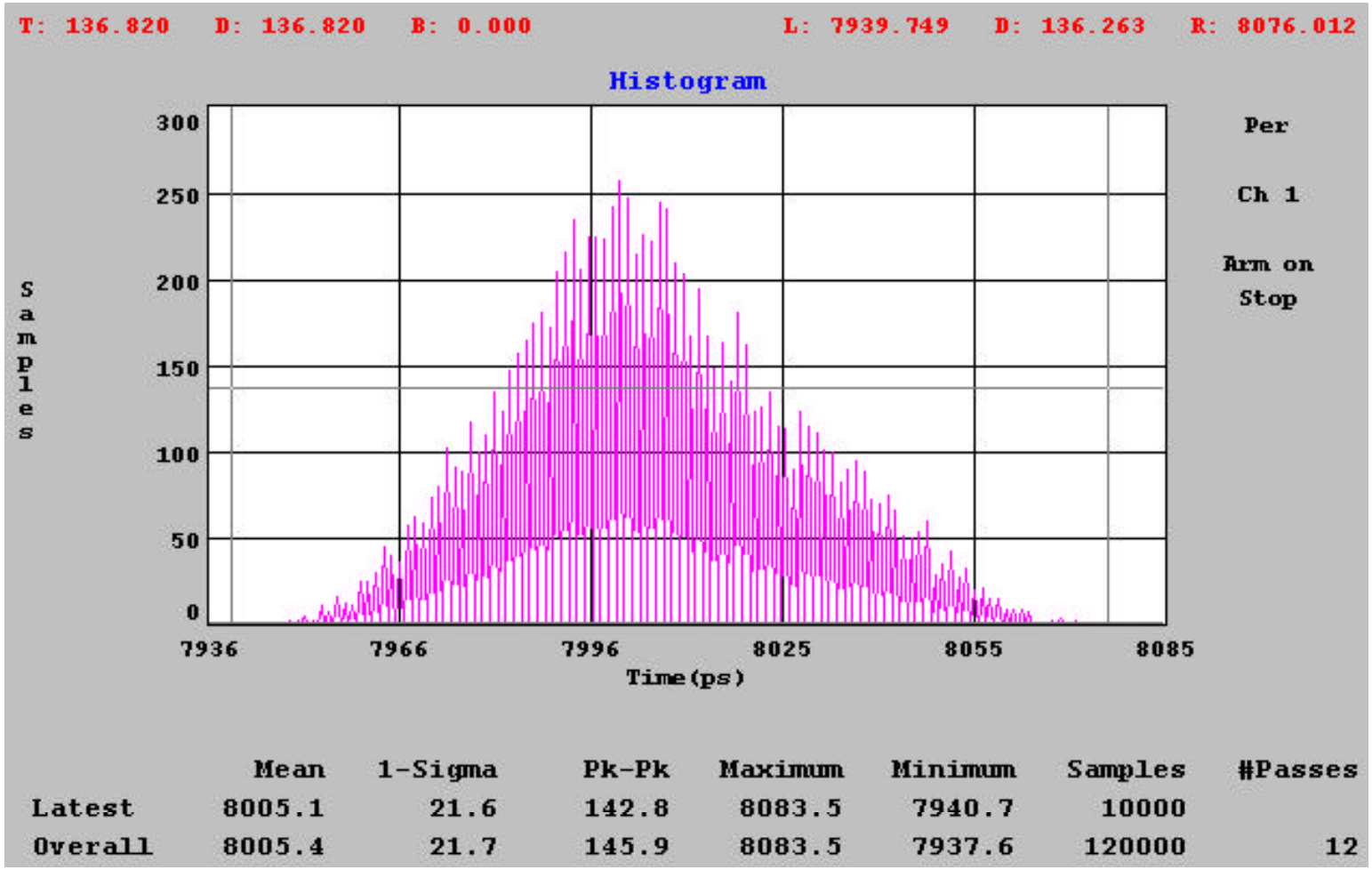
Differential Output Template 2

Transmit Template Measurements

40.6.1.2.4 Distortion

16.5 mV with and with out Power

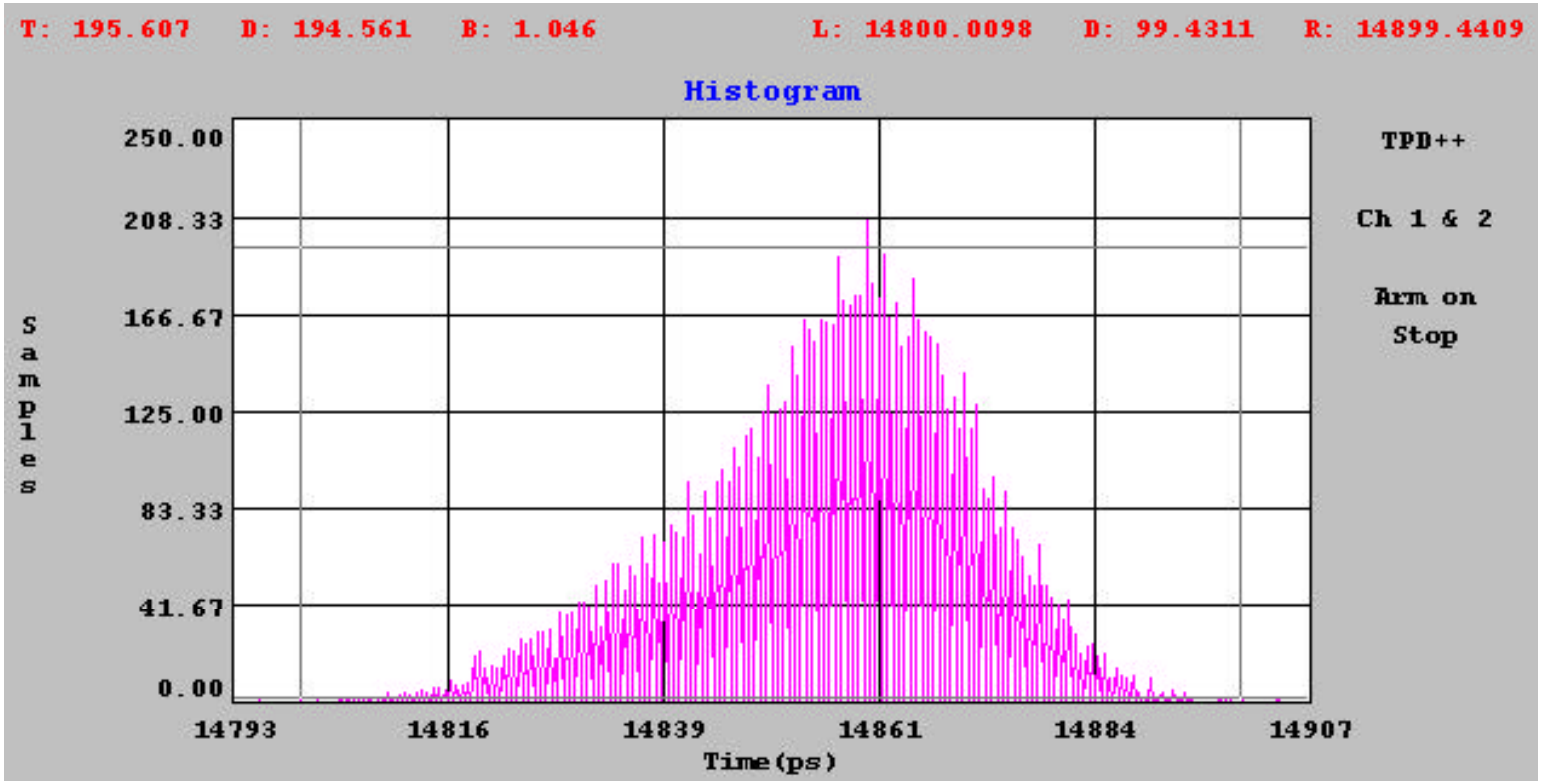
Transmit Template Measurements



	Mean	1-Sigma	Pk-Pk	Maximum	Minimum	Samples	#Passes
Latest	8005.1	21.6	142.8	8083.5	7940.7	10000	
Overall	8005.4	21.7	145.9	8083.5	7937.6	120000	12

40.6.1.2.5 Master Jitter TX_TCLK filtered 10^5 samples

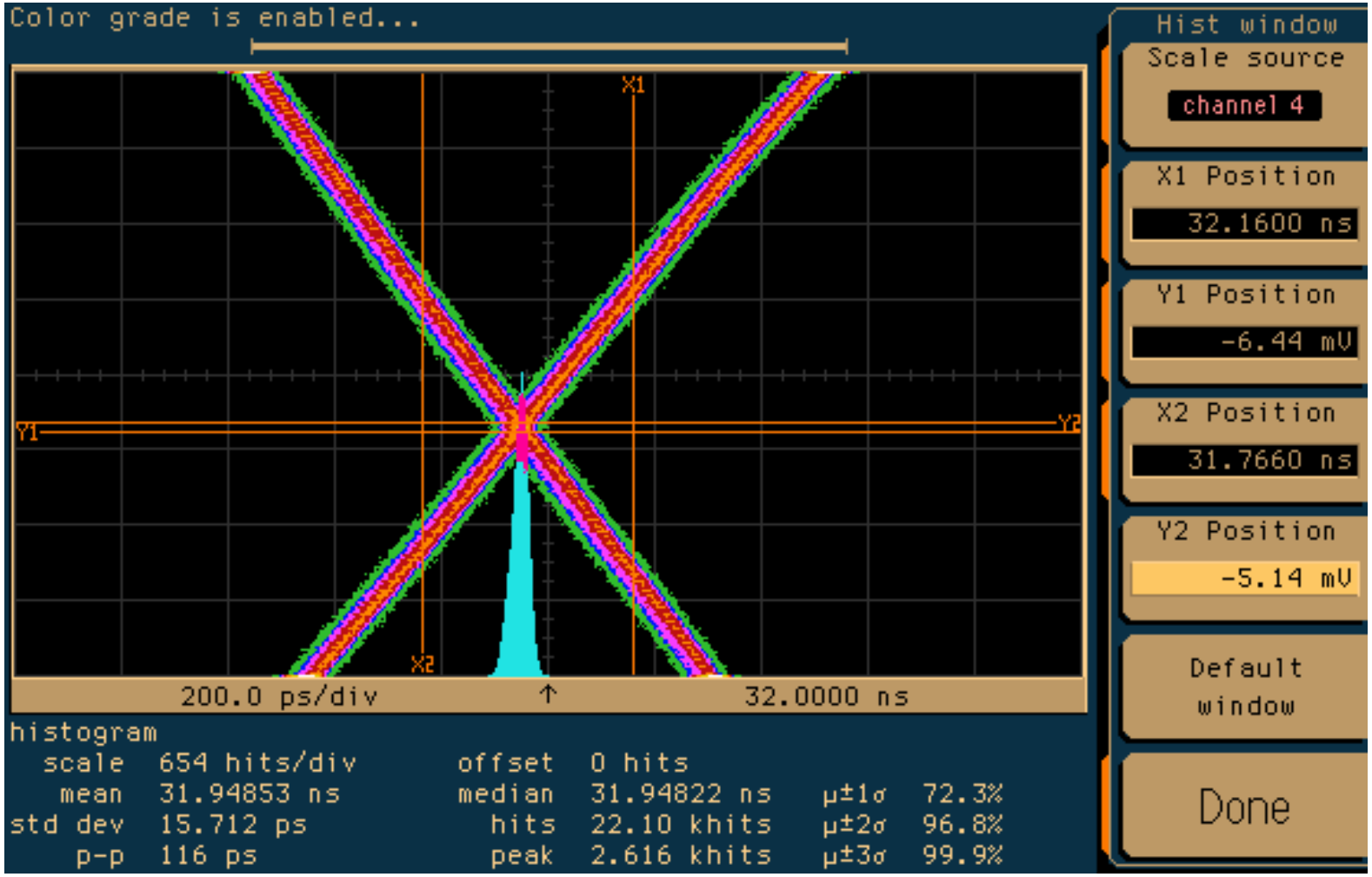
Transmit Template Measurements



	Mean	1-Sigma	Pk-Pk	Maximum	Minimum	Samples	#Passes
Latest	14855.5	14.8	107.4	14903.0	14795.5	10000	
Overall	14854.7	14.6	112.3	14906.0	14793.7	120000	12

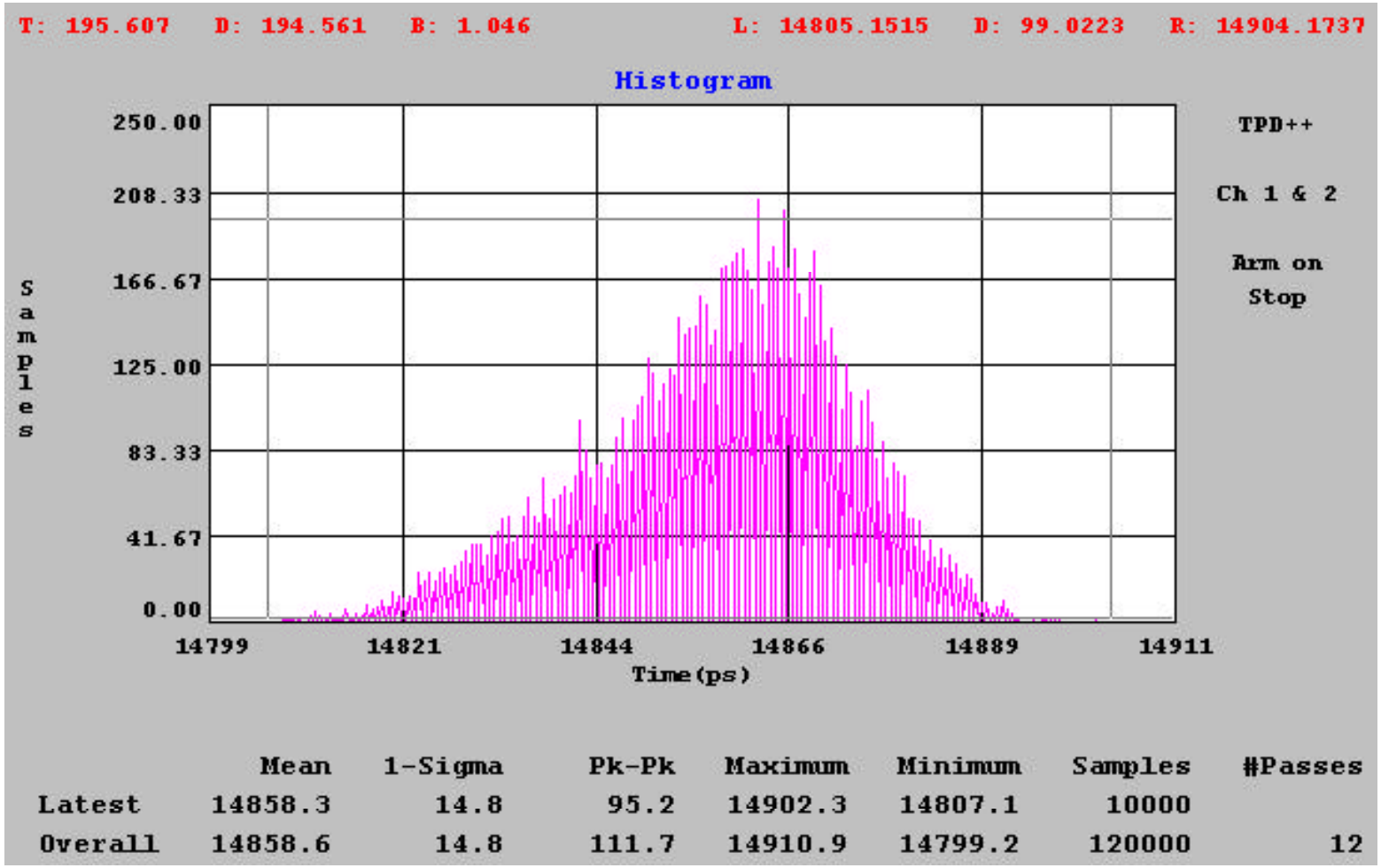
40.6.1.2.5 Jtxout Channel A with I = 0 mA

Transmit Template Measurements



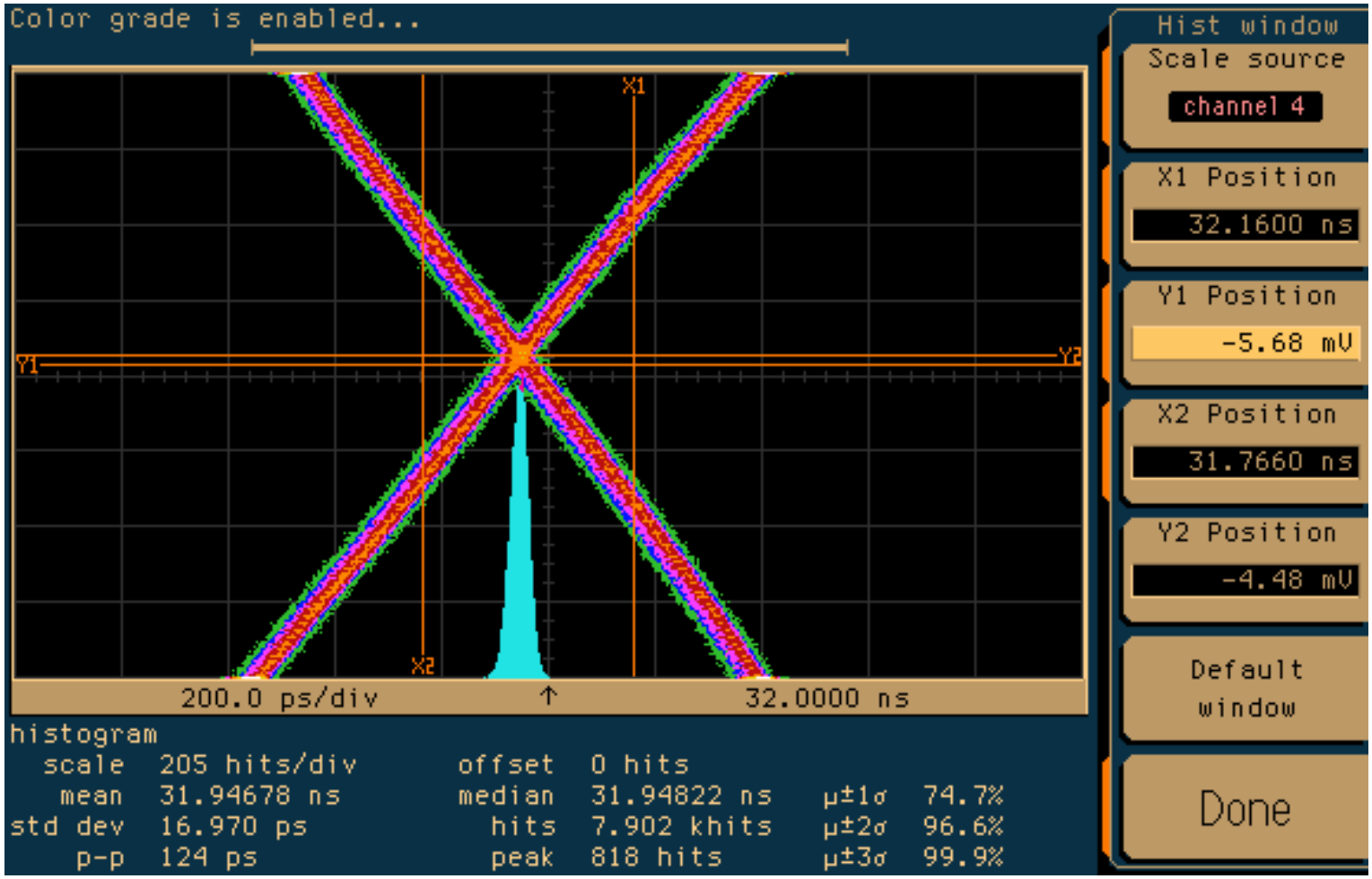
40.6.1.2.5 Jtxout Channel A with I = 0 mA

Transmit Template Measurements



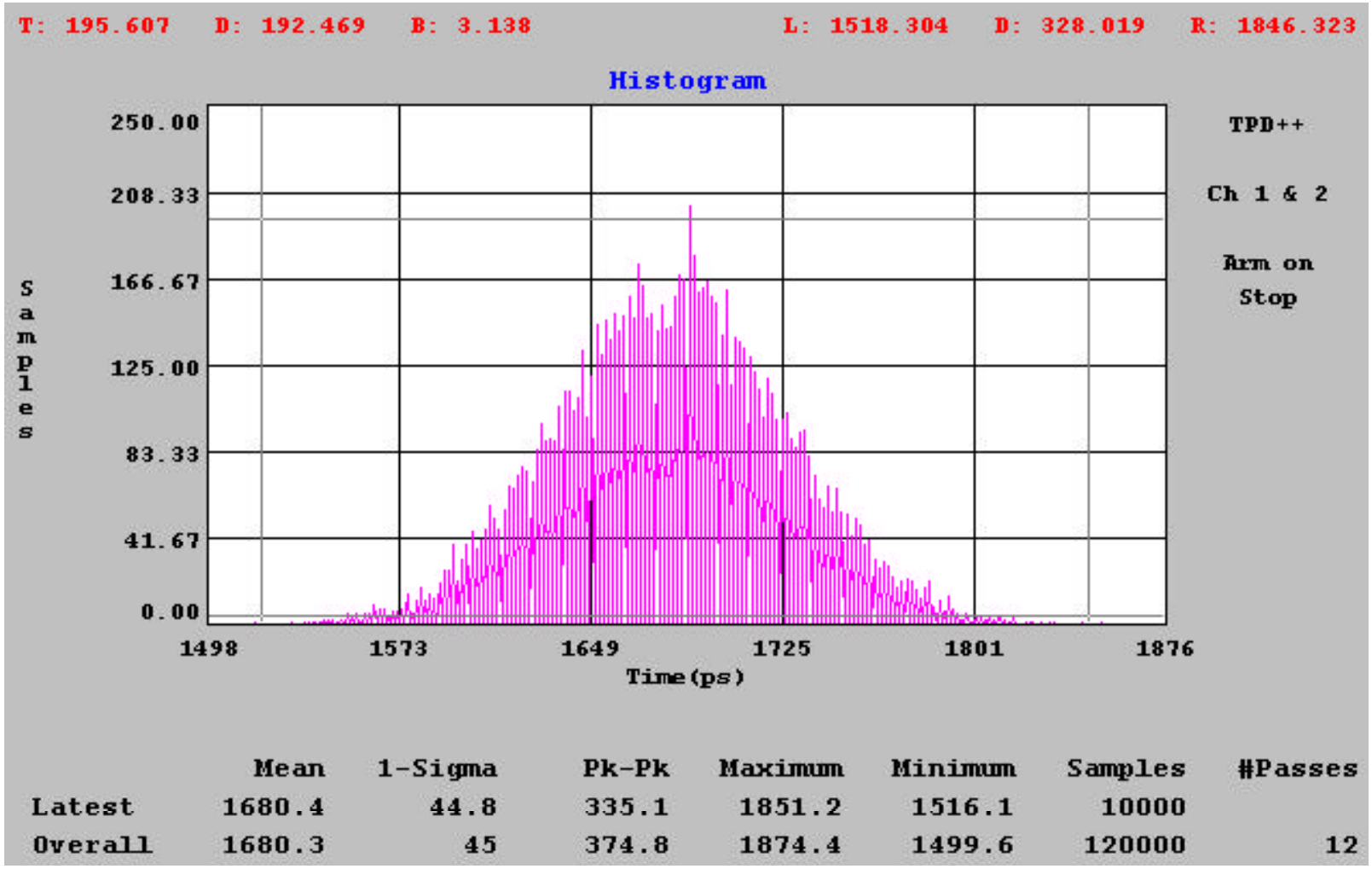
40.6.1.2.5 Jtxout Channel A with I = 350 mA

Transmit Template Measurements



40.6.1.2.5 Jtxout Channel A with I = 350 mA

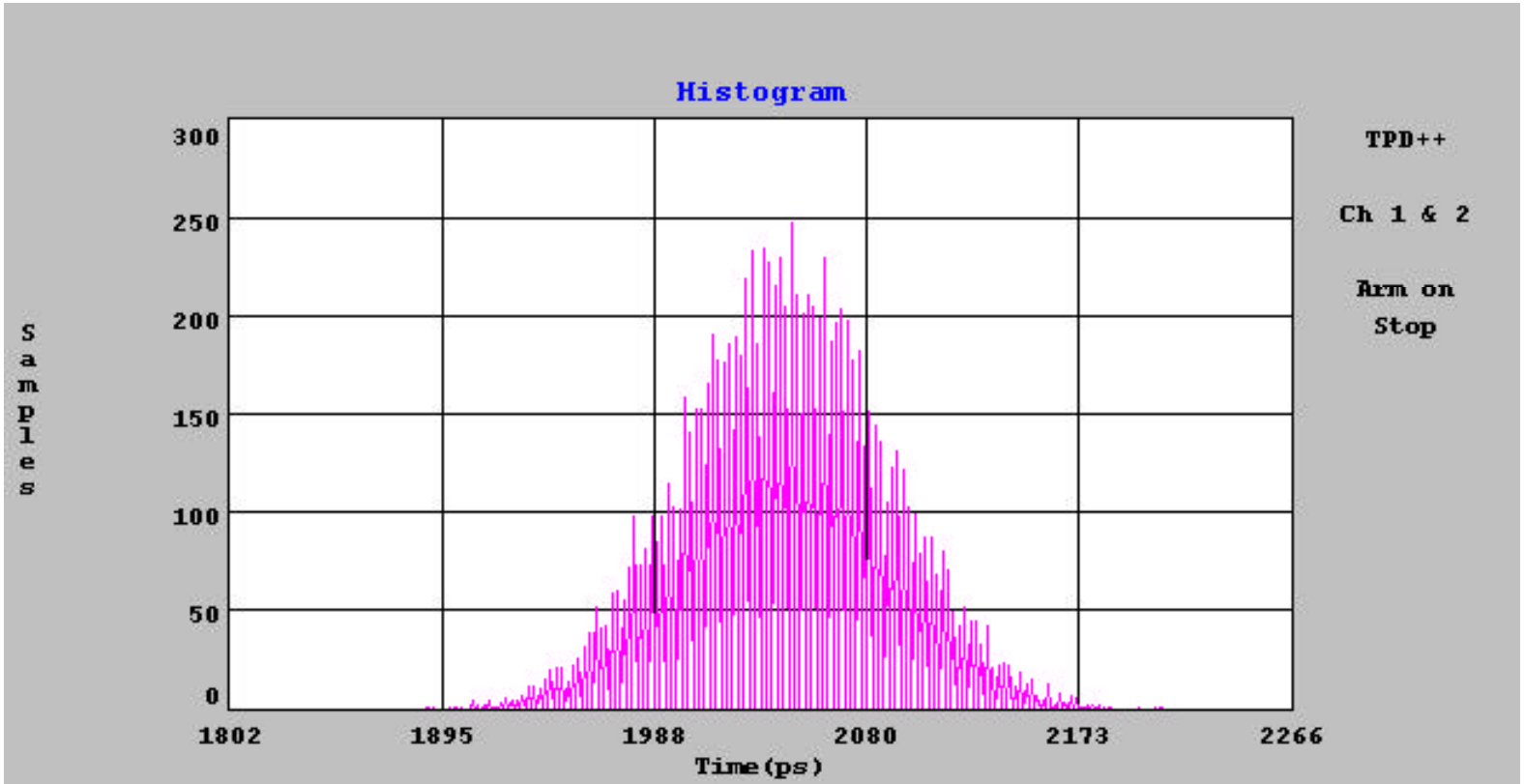
Transmit Template Measurements



	Mean	1-Sigma	Pk-Pk	Maximum	Minimum	Samples	#Passes
Latest	1680.4	44.8	335.1	1851.2	1516.1	10000	
Overall	1680.3	45	374.8	1874.4	1499.6	120000	12

40.6.1.2.5 Slave Jitter TX_TCLK filtered 10^5 samples

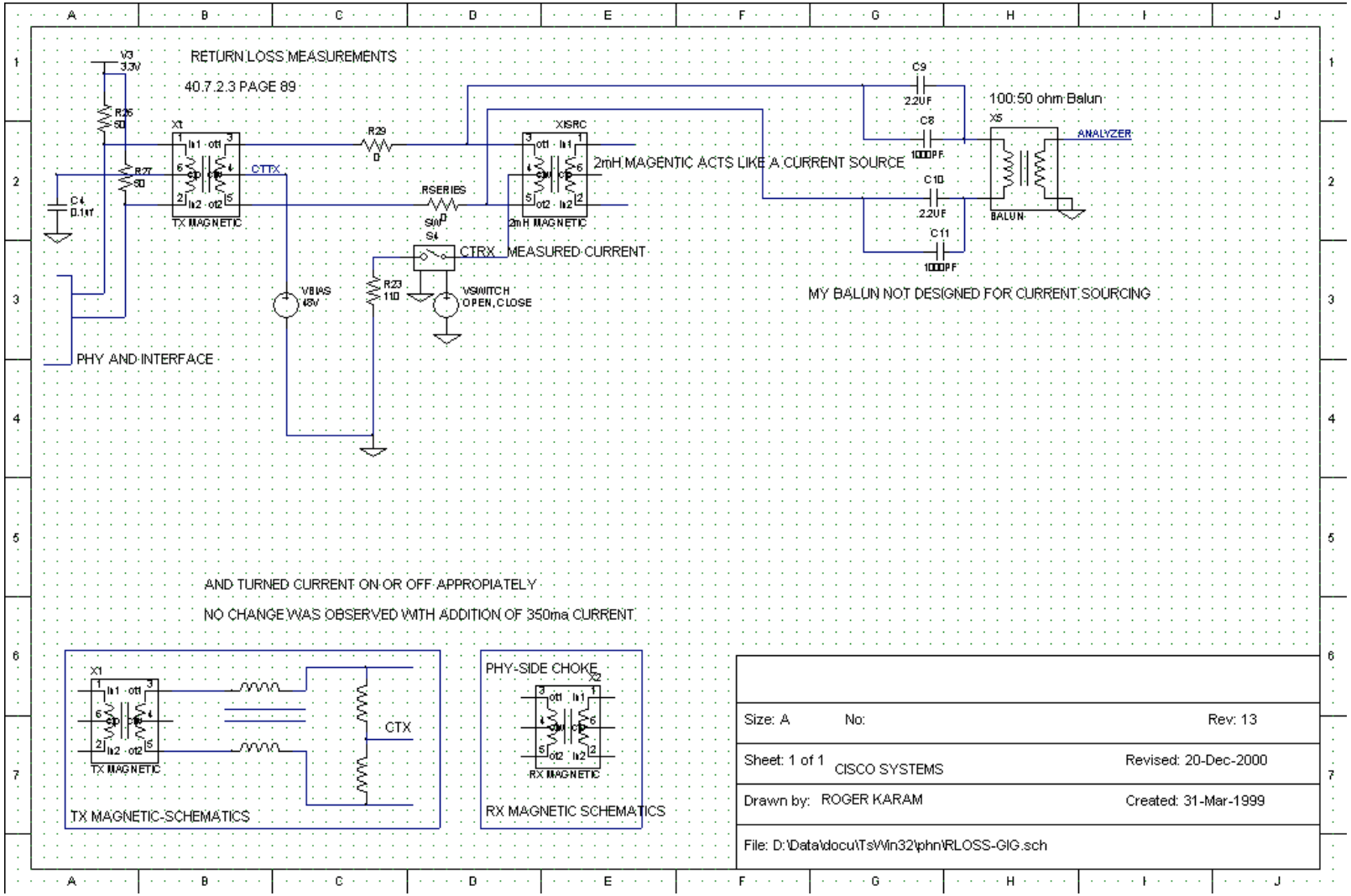
Transmit Template Measurements



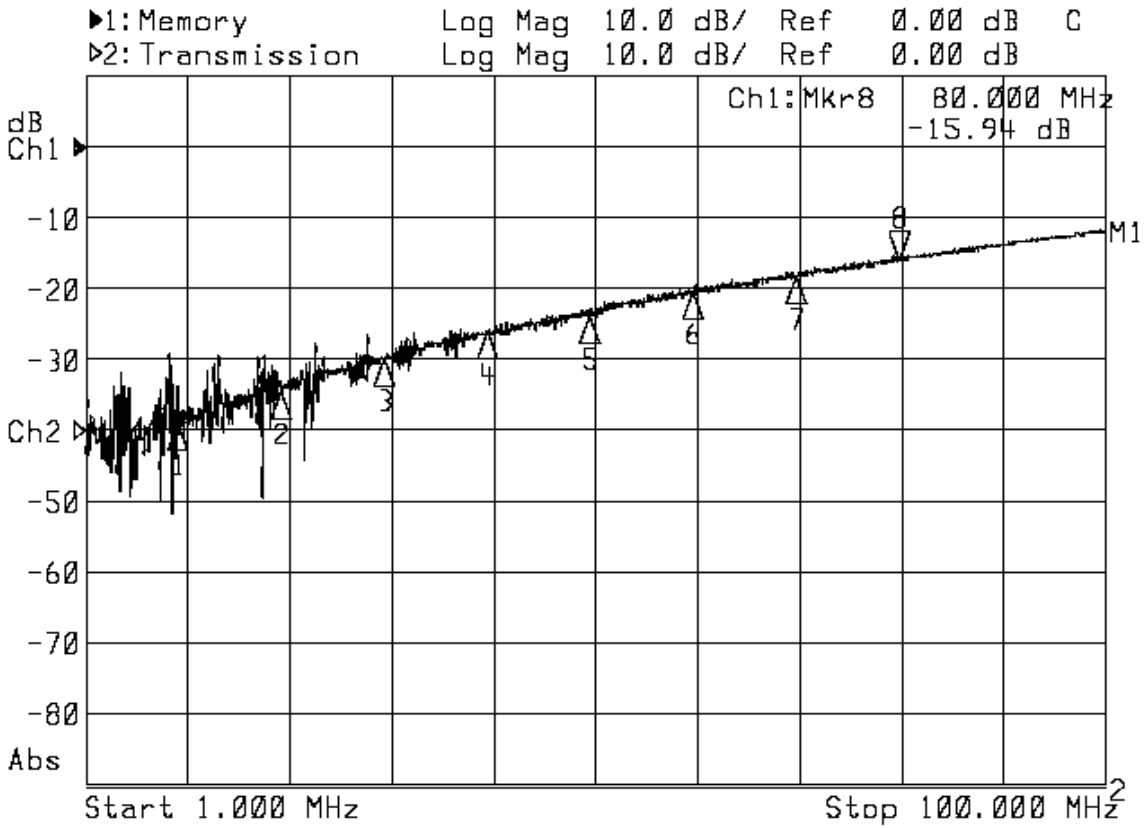
	Mean	1-Sigma	Pk-Pk	Maximum	Minimum	Samples	#Passes
Latest	2044.8	44.2	319.2	2208.9	1889.6	10000	
Overall	2034.6	43.8	458.4	2263.2	1804.8	14330000	1433

40.6.1.2.5 Slave Jitter TX_TCLK not filtered 100ms

Return Loss Schematic



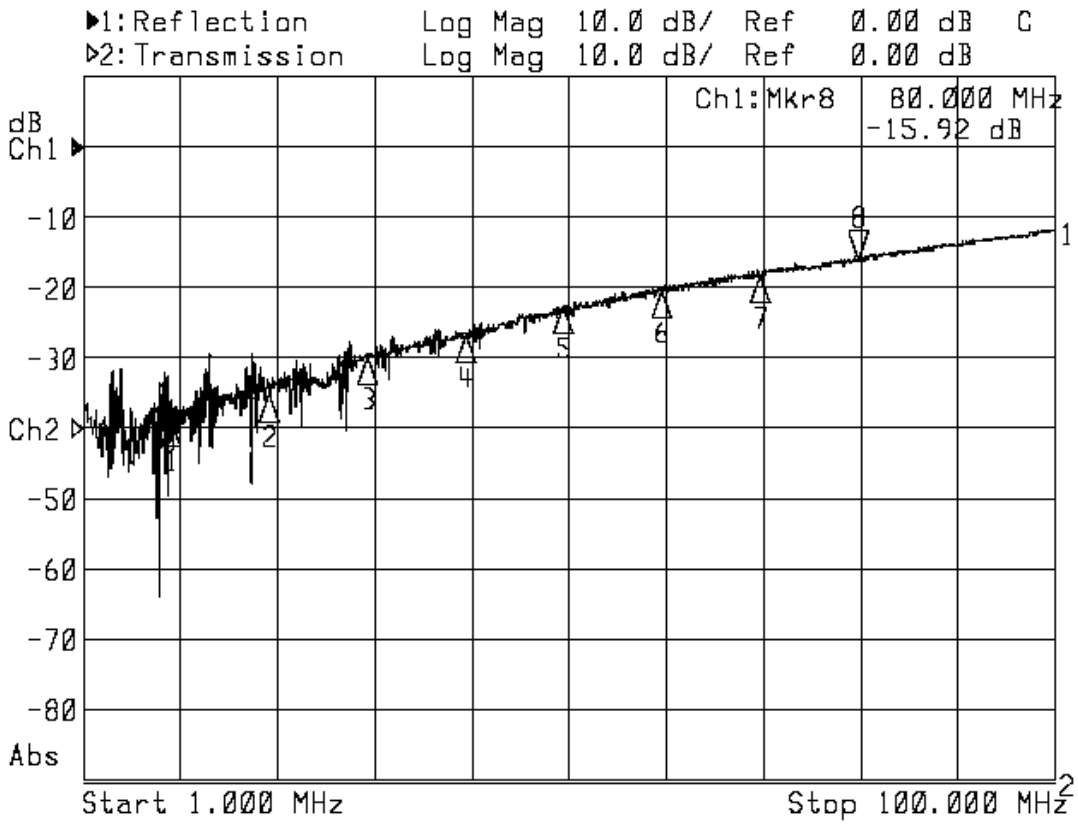
MDI



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 10.00	-38.84		
2: 20.00	-34.32		
3: 30.00	-29.71		
4: 40.00	-26.07		
5: 50.00	-23.79		
6: 60.00	-20.42		
7: 70.00	-18.00		
8> 80.00	-15.94		

40.8.3.1 Return Loss Channel A, I = 0 mA

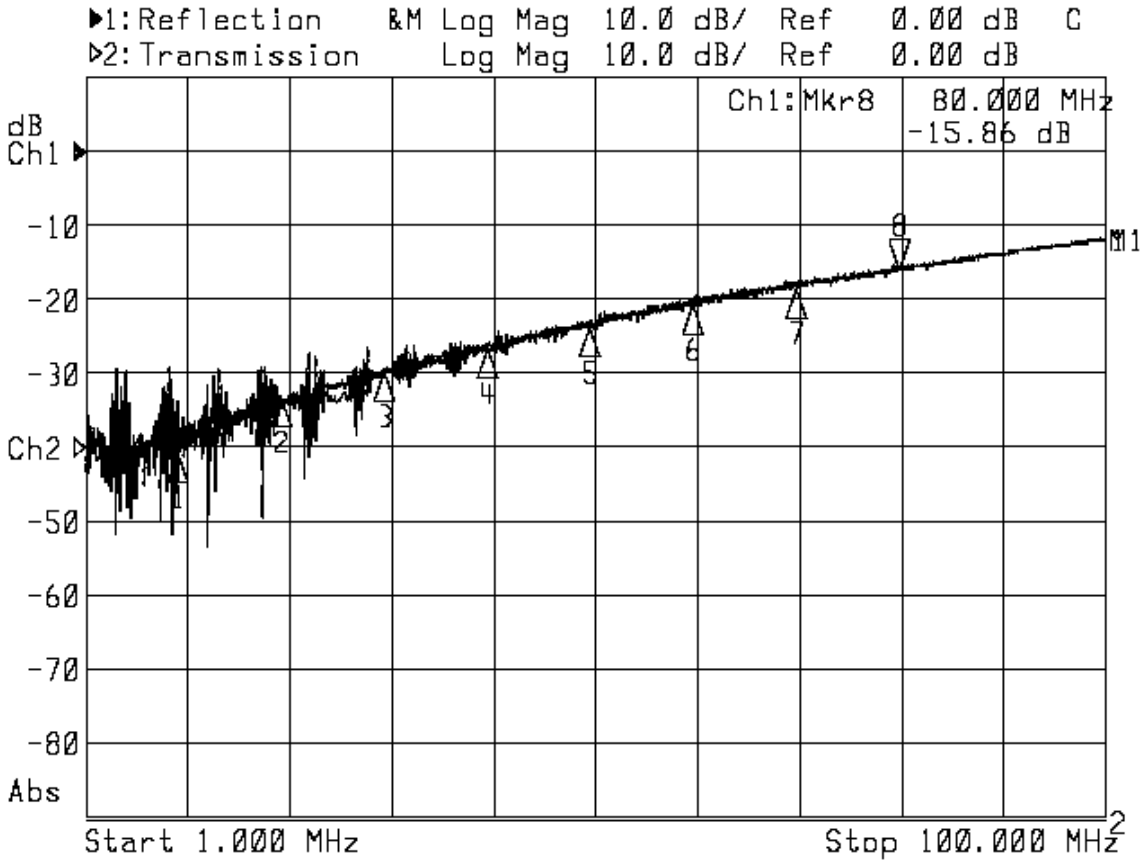
MDI



1:Mkr (MHz)	dB	2:Mkr (MHz)	dB
1: 10.00	-38.50		
2: 20.00	-35.16		
3: 30.00	-29.66		
4: 40.00	-26.63		
5: 50.00	-22.61		
6: 60.00	-20.46		
7: 70.00	-18.23		
8> 80.00	-15.92		

40.8.3.1 Return Loss Channel A, I = 350 mA

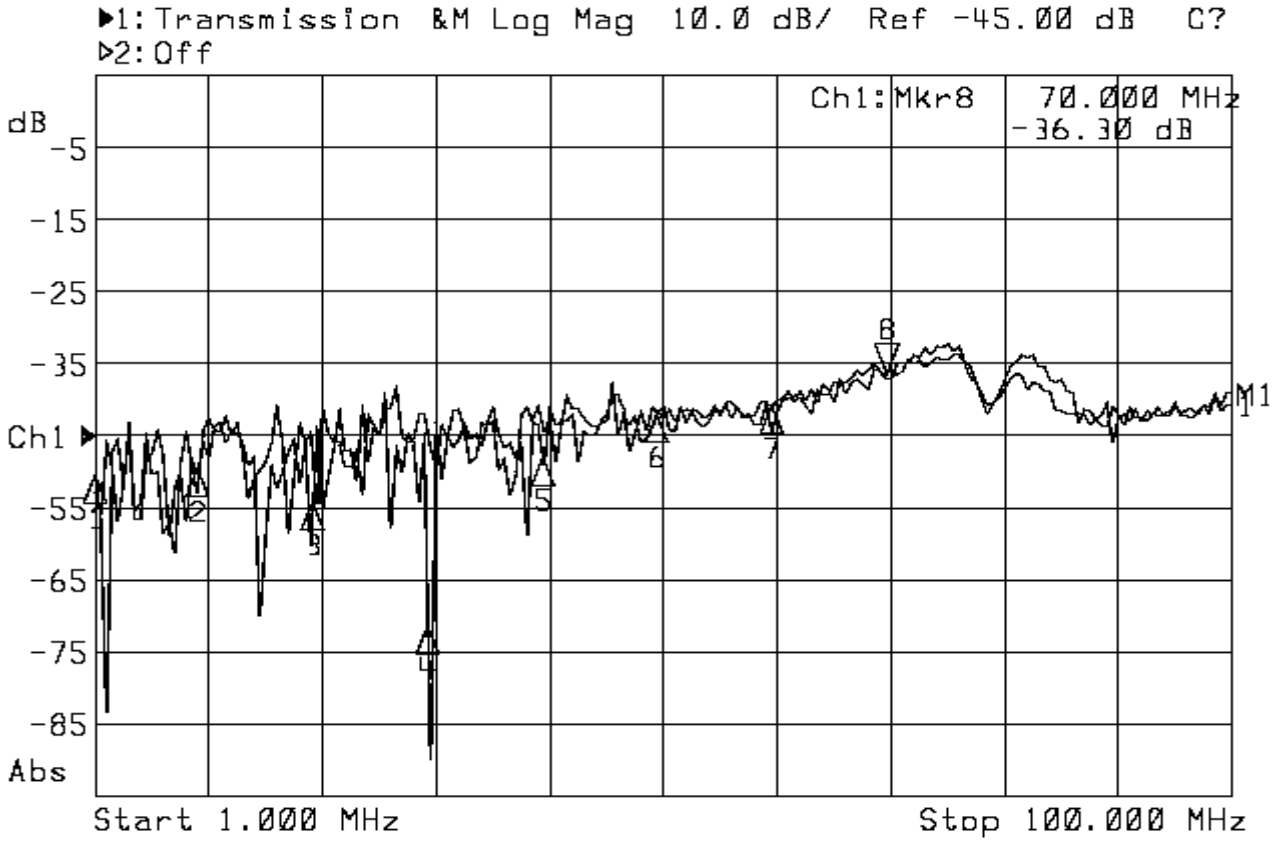
MDI



1:Mkr (MHz)	dB	2:Mkr (MHz)	dB
1: 10.00	-40.72		
2: 20.00	-33.24		
3: 30.00	-29.71		
4: 40.00	-26.50		
5: 50.00	-23.73		
6: 60.00	-20.57		
7: 70.00	-18.41		
8> 80.00	-15.86		

40.8.3.1 Return Loss Channel A, I = 0 and I = 350 mA

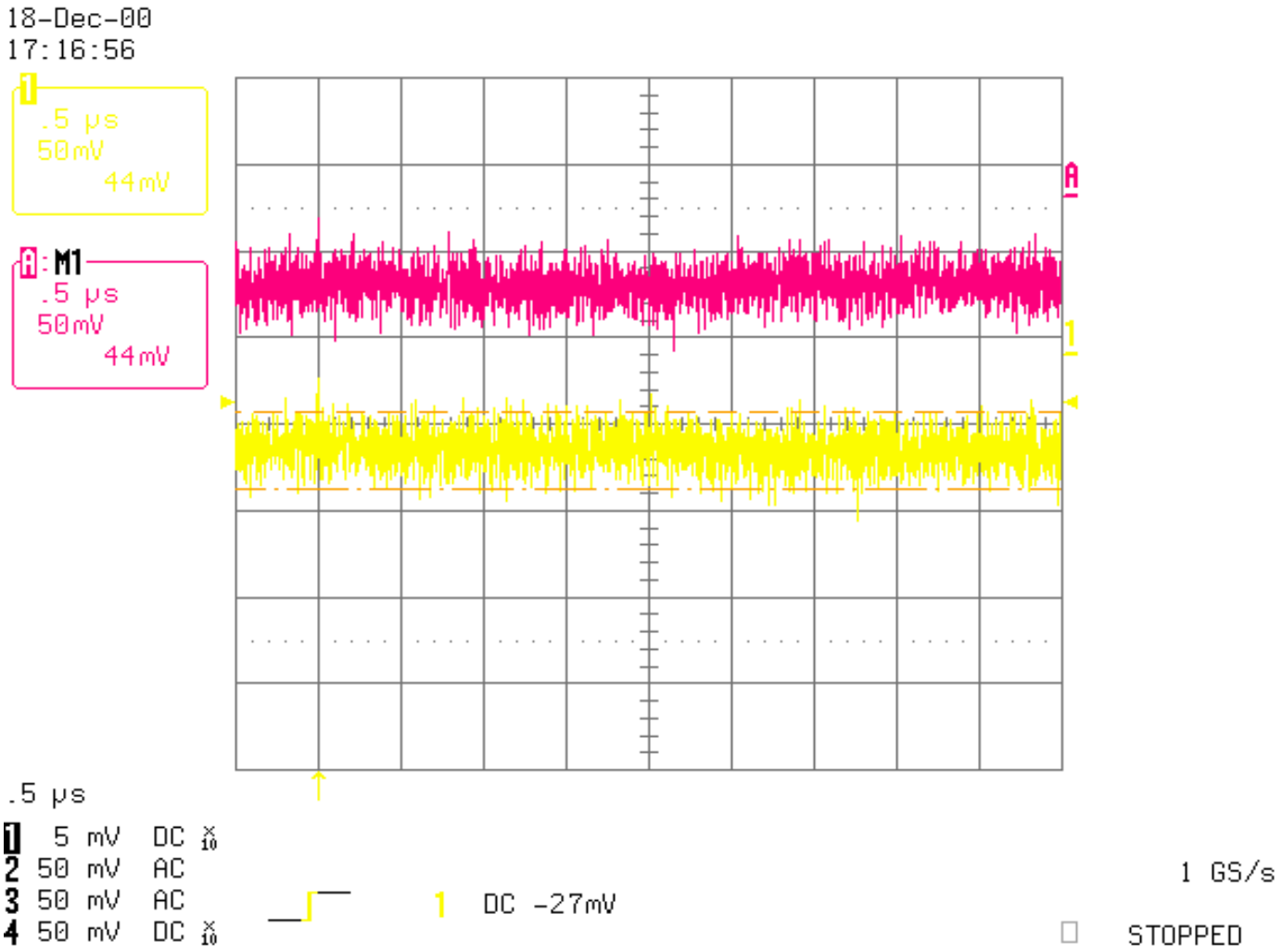
MDI



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1.00	-50.44		
2: 10.00	-49.51		
3: 20.00	-53.92		
4: 30.00	-71.21		
5: 40.00	-47.86		
6: 50.00	-41.80		
7: 60.00	-40.74		
8> 70.00	-36.30		

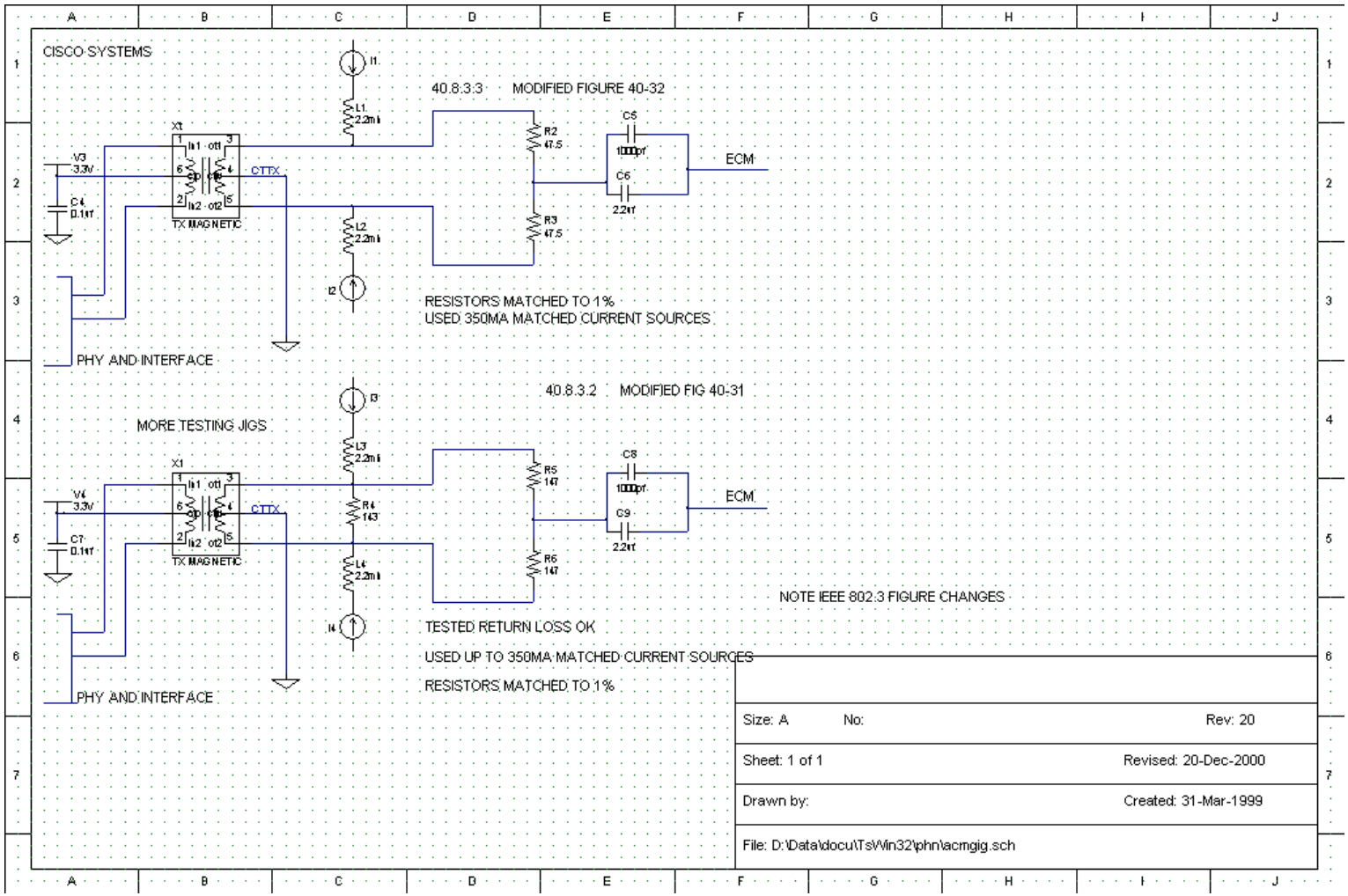
40.8.3.2 MDI impedance balance, I = 0, I = 350 mA

MDI



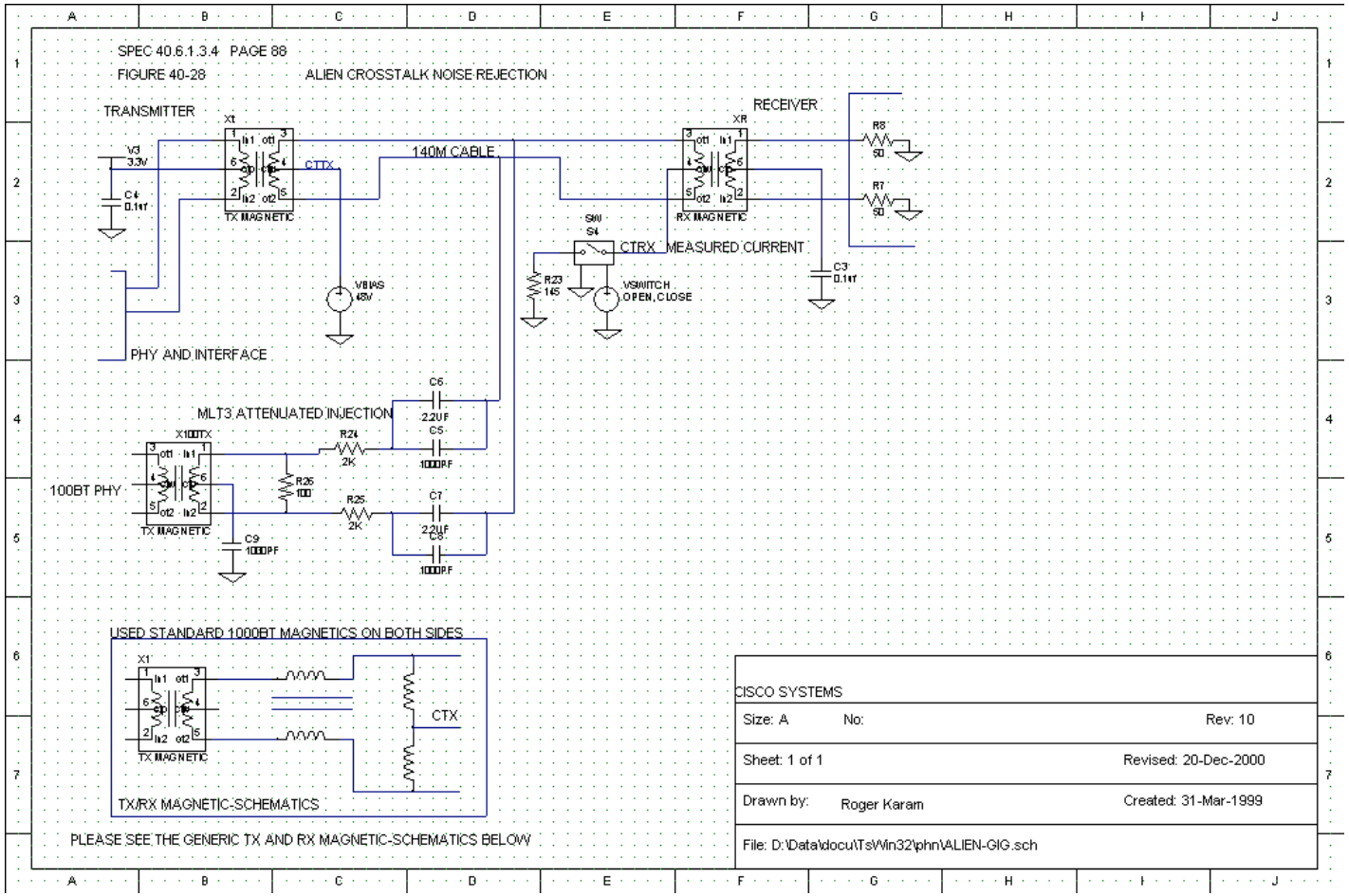
40.8.3.3 MDI common-mode output voltage, I = 0 mA (red); I = 350 mA (yellow)

MDI



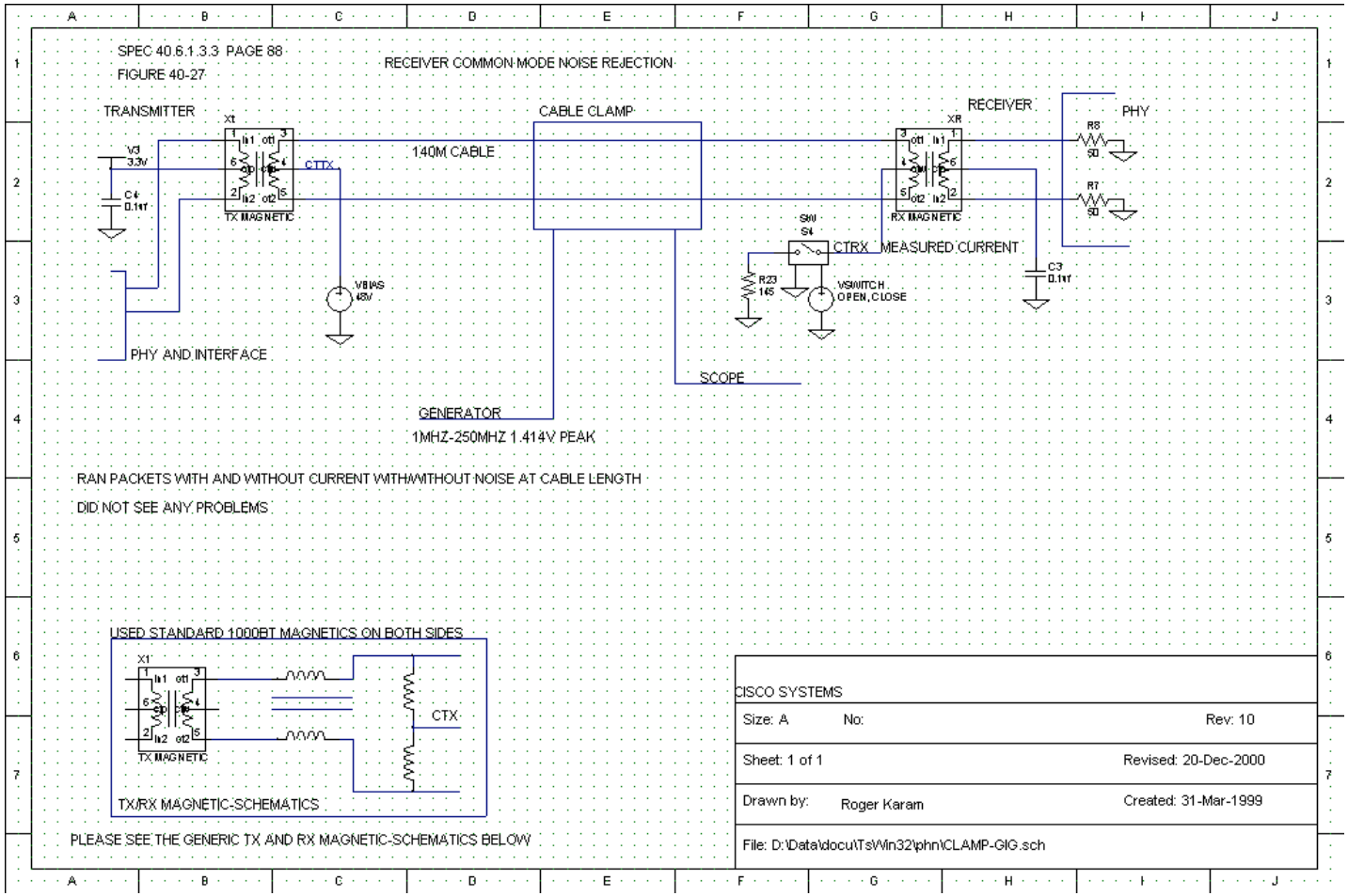
Modified 802.3 Schematics to measure
I = 0 mA (red); I = 350 mA (yellow) [previous slide]

40.6.1.3.4 RX Alien Crosstalk noise rejection



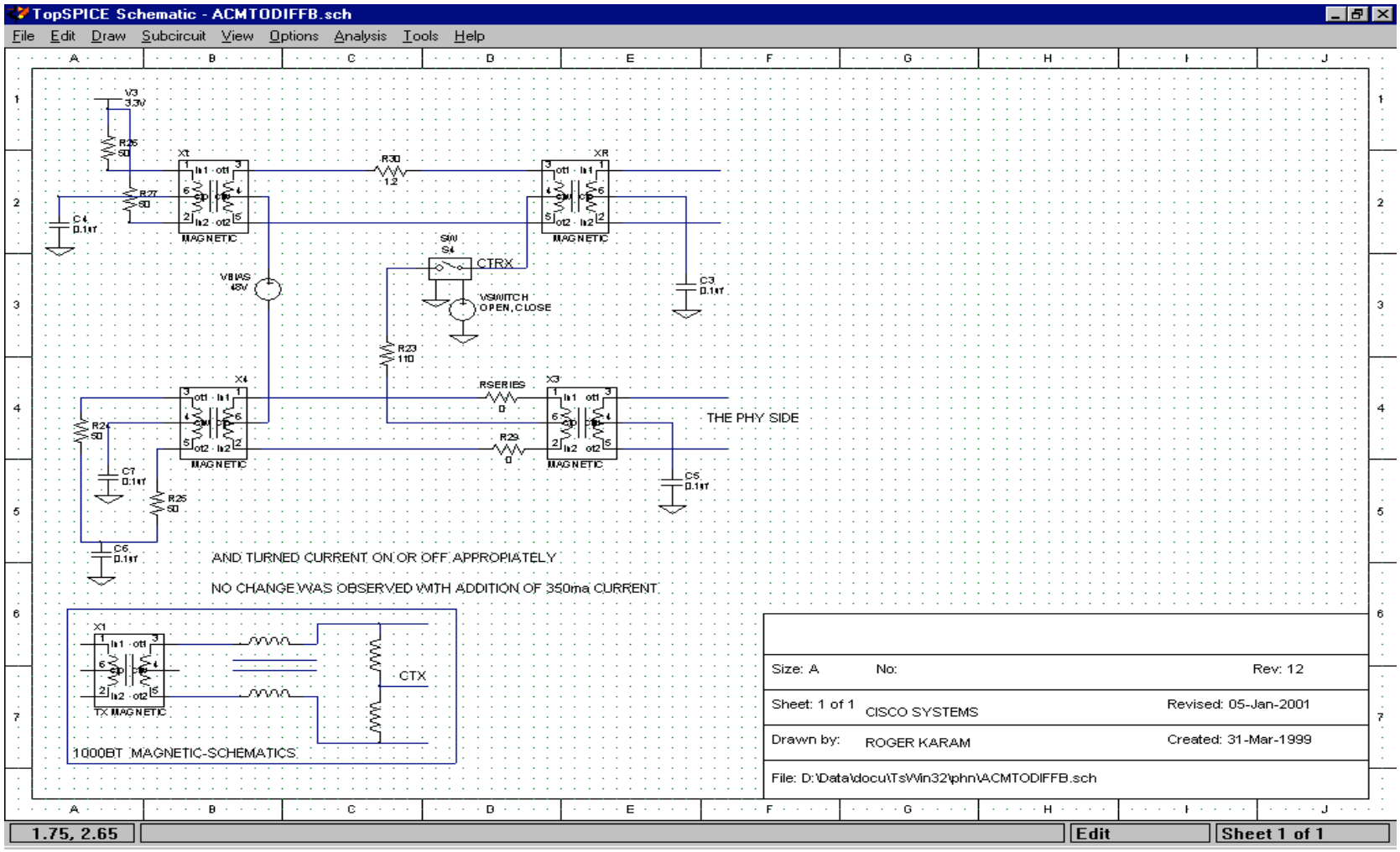
Pass I = 0 and 350 mA; able to receive 1000BaseT traffic with no errors for 10 minutes

Receiver Common Mode Noise Rejection Using a Clamp



Pass I = 0 and 350 mA; able to receive 1000BaseT traffic with no errors for 10 minutes at max cable

UNBALANCE TEST AT CABLE LENGTH



- **UNBALANCE TEST**

UNBALANCE TEST AT CABLE LENGTH

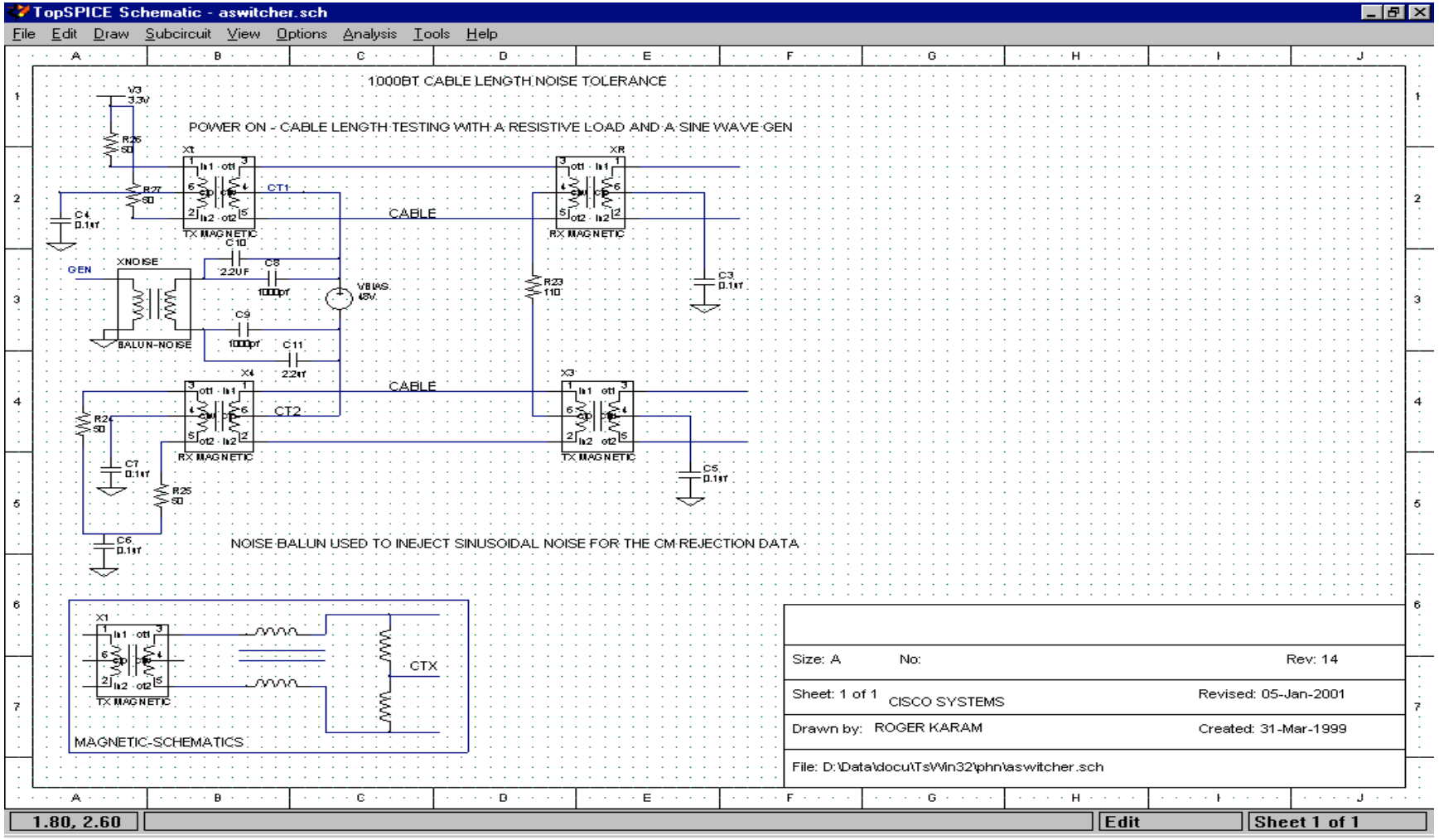
- **With a 1.2 ohms series- resistor we run error free at cables longer than 30m when 350ma is used, the DCR of a 30m cable=5.2ohms**
- **This is worse than the 10/100 case, but 1 out 5 ohms is a 20% error**

Effect Of Supply Noise On BER

Condition Applied, Used A Linear Supply And A Resistor	Cable Length	Source, Errors	Load, Errors
I=0 And I = 350ma	1-3m	0/0/0	0/0/0
I=0 And I=350ma	167M	0/0/0	0/0/0
I=0 Test1/Test2/Test3=	180M	7/10/10	2/3/2
100Million Packets I=350ma	180M	5/7/10	3/3/3

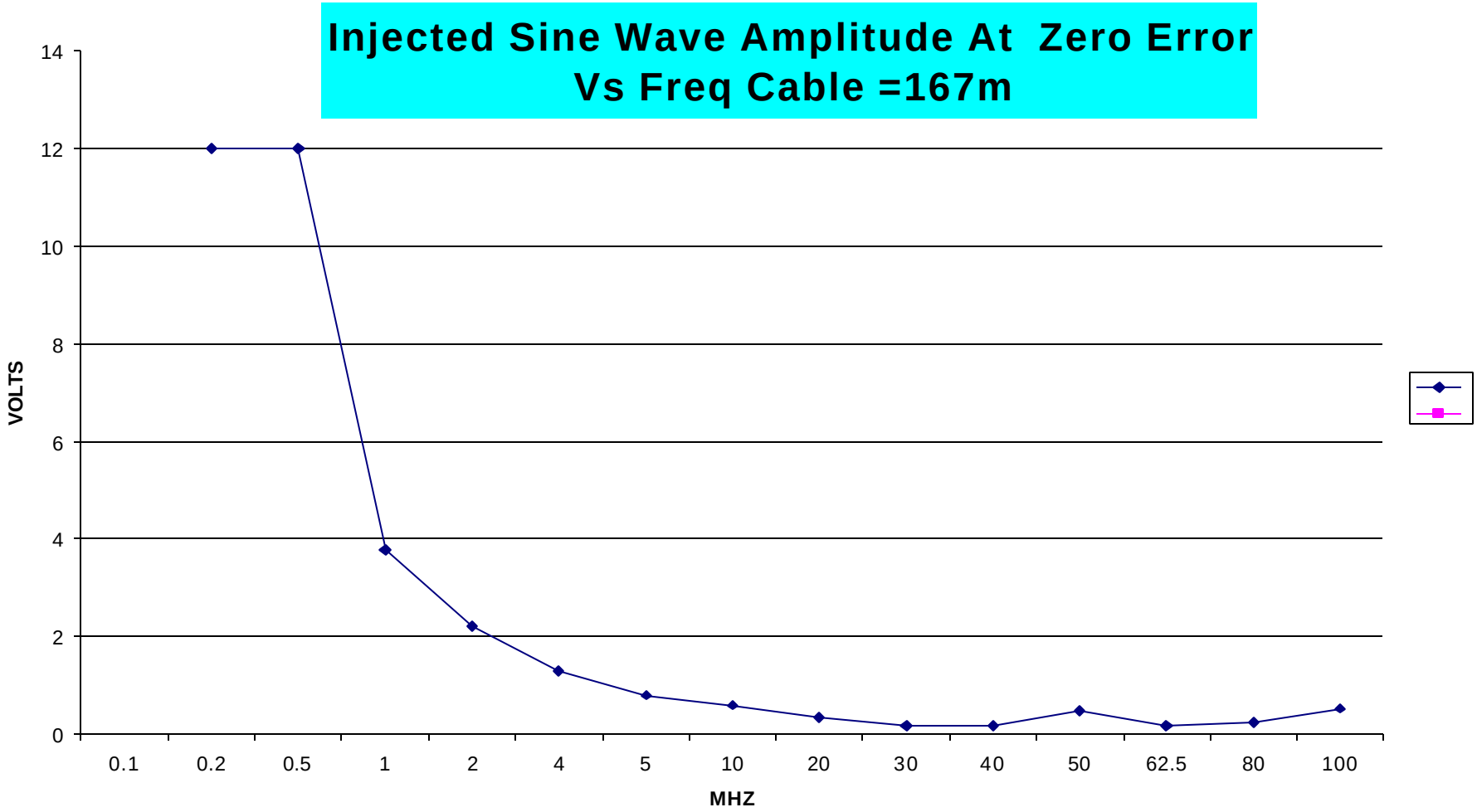
Basically No Change Is Visible When Power Was Added, Please Revisit The July 2000 Presentation For A Proof Of EMI Limitations That Would Impede The System Way A Head Of Any Cable Reach Issues.

Sine Wave Injection Test At Center Taps



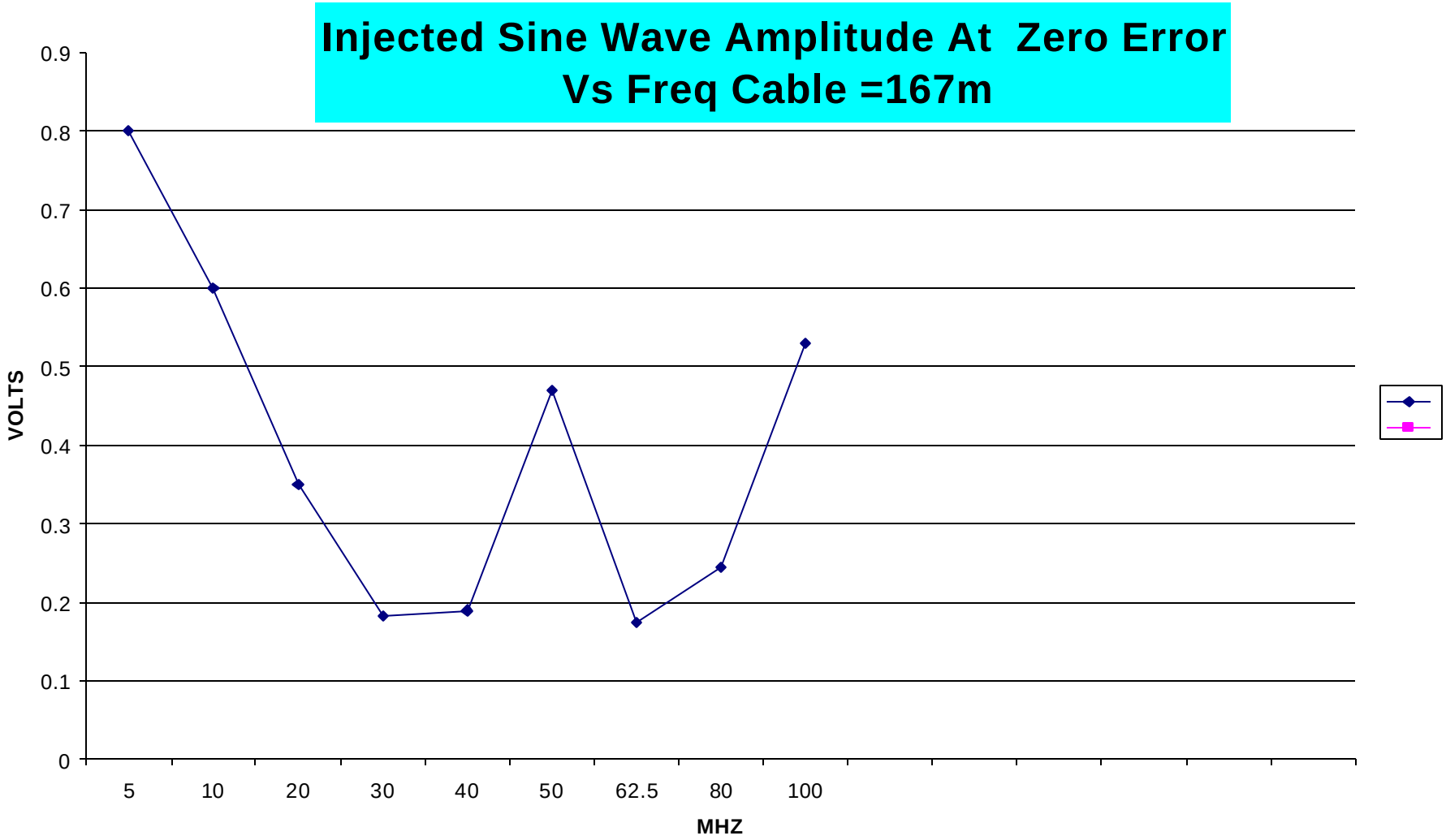
- **Noise across center taps**

Sine Wave Injection Test At Center Taps



- Noise across center taps

Sine Wave Injection Zoom To Freq > 4 Mhz



- Noise across center taps

CONCLUSION

- **POWER OVER 1000BT IS FEASIBLE**