TEST REPORT

ON

0.5 TO 18.0 GHz

50nS TO CW RF PULSE WIDTH RANGE

SMALL SIZE

LEVEL, SCAN AND PULSE MODULATION MODULE

PMI MODEL No:

LSP-0518-SK

Serial No: M2P3

DESIGNED AND DEVELOPED UNDER PMI IR&D PROGRAM
BY
S. Kuhn

REPORTED
BY
P. WOOD

JULY 25, 2003

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ISO9001 : 1994 CERTIFIED

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PMI MODEL No: LSP-0518-SK

LEVEL, SCAN AND PULSE MODULATION MODULE

KEY FEATURES:

- RF PULSE WIDTH RANGE 50nS TO CW
- BROAD BANDWIDTHS AVAILABLE
- SMALL SIZE 4.0" X 3.3" X 0.70"

SPECIFICATIONS:

• FREQUENCY RANGE	: 0.5 TO 18.0 GHz, Other Frequencies Available
• RF INPUT POWER	: +12 dBm Operational, +14 dBm Max.
• OUTPUT P1 dB	: +12 dBm Min. @ +12dBm Input
• IP3	: +22 dB Min.
• HARMONICS @ P1 dB	: -20.0 dBc Min.
• SPURIOUS OUTPUTS	: -60 dBc Min.
• VSWR (RF INPUT)	: 2.2:1 Max.
• VSWR (RF OUTPUT)	: 2.2:1 Max.
• LEVEL SET (POWER ATTENUATION)	: 70 dB Range
• SCAN MODULATION (ATTENUATION)	: 70 dB Range
• COMBINED ATTENUATION (LEVEL & SCAN)	: 100 dB Min.
• SCAN & LEVEL BANDWIDTH	: 10 kHz
• SCAN PULSE RESPONSE-SETTLING	: 50 µSec Max.
• SCAN PULSE RESPONSE-RISE & FALL	: 15 µSec Max.
• DIGITAL PROCESSING JITTER	: 10 µSec Max.
• SYSTEM FREQUENCY FLATNESS	: ±2.0 dB
• ATTENUATION FREQUENCY FLATNESS	: ±2.0 dB From 0 to 40 dB Attenuation ±3.0 dB From 40 to 60 dB Attenuation
• ATTENUATION LINEARITY	: ±1.5 dB
• PULSE MODULATION DEPTH	: 60 dB Min.
• RF PULSE WIDTH RANGE	: 50 nS to CW
• RF PULSE RISE & FALL	: 9 nS Max.
• RF PULSE REPETITION RATE	: 10 MHz Max.
• RF PULSE DISTORTION	: 0.3dB Max.
• PULSE CW / DIFFERENTIAL	: 0.4dB Max.
• PULSE WIDTH FIDELITY	: ±10 nS Max.
• SENSITIVITY	: 6 dB / Volt
• BIAS VOLTAGES / CURRENTS	: ±15 VDC @ +1.5 Amps & -1.0 Amps Max.
• SIZE	: 4.0" X 3.3" X 0.70"

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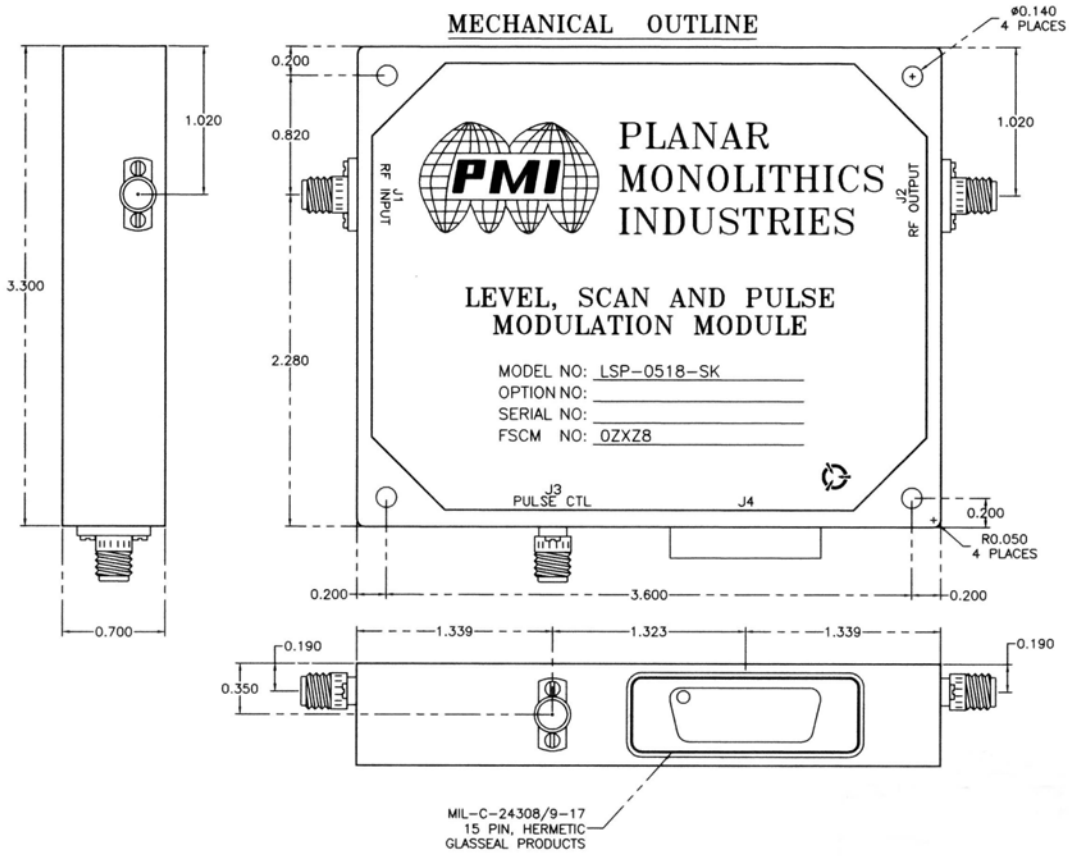
MECHANICAL OUTLINE

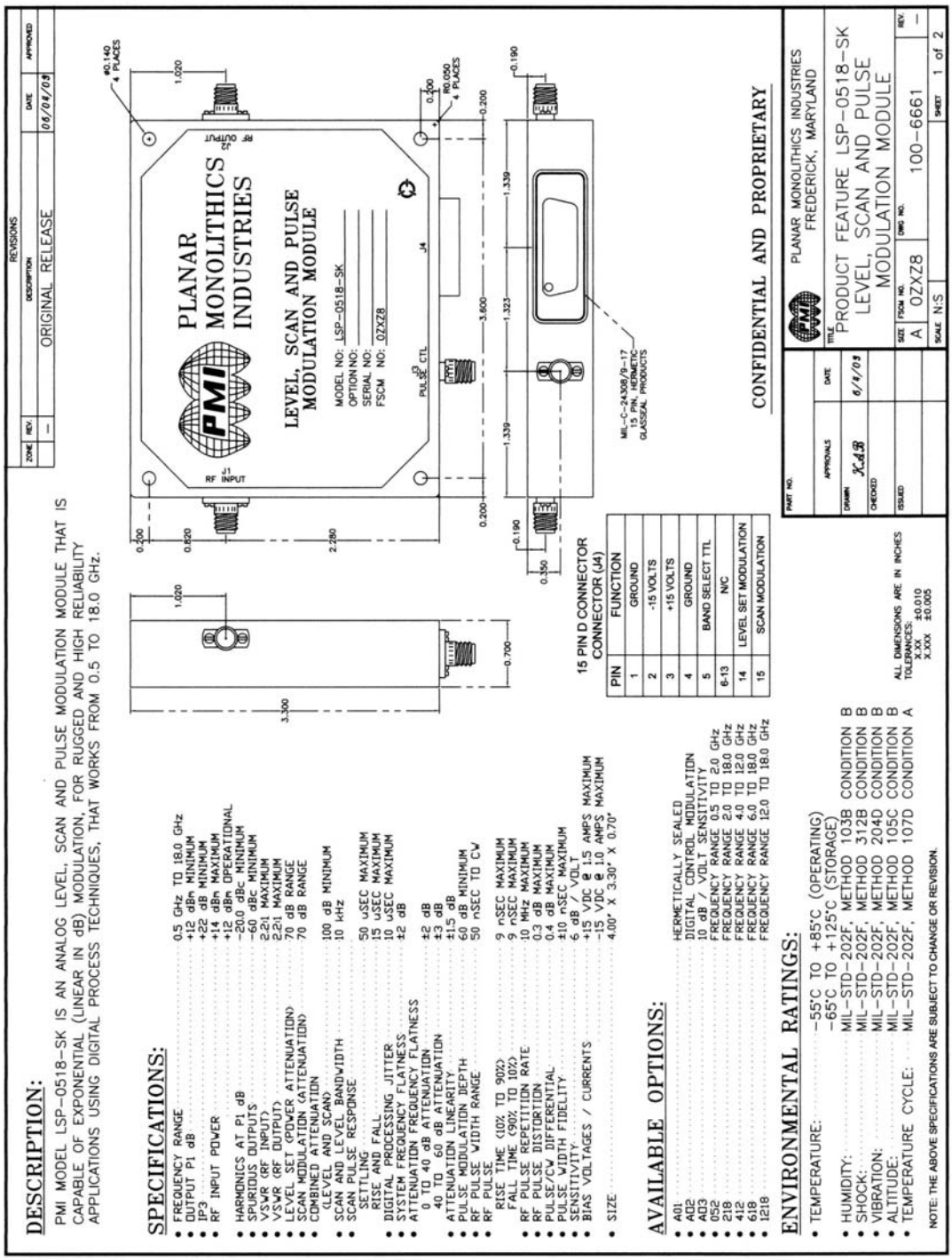


15 Pin "D" Connector (J4)	
PIN	**FUNCTION**
1	GROUND
2	-15 VDC
3	+15 VDC
4	GROUND
5	BAND SELECT TTL
6-13	NO CONNECTION
14	LEVEL SET MODULATION
15	SCAN MODULATION

ENVIRONMENTAL RATINGS

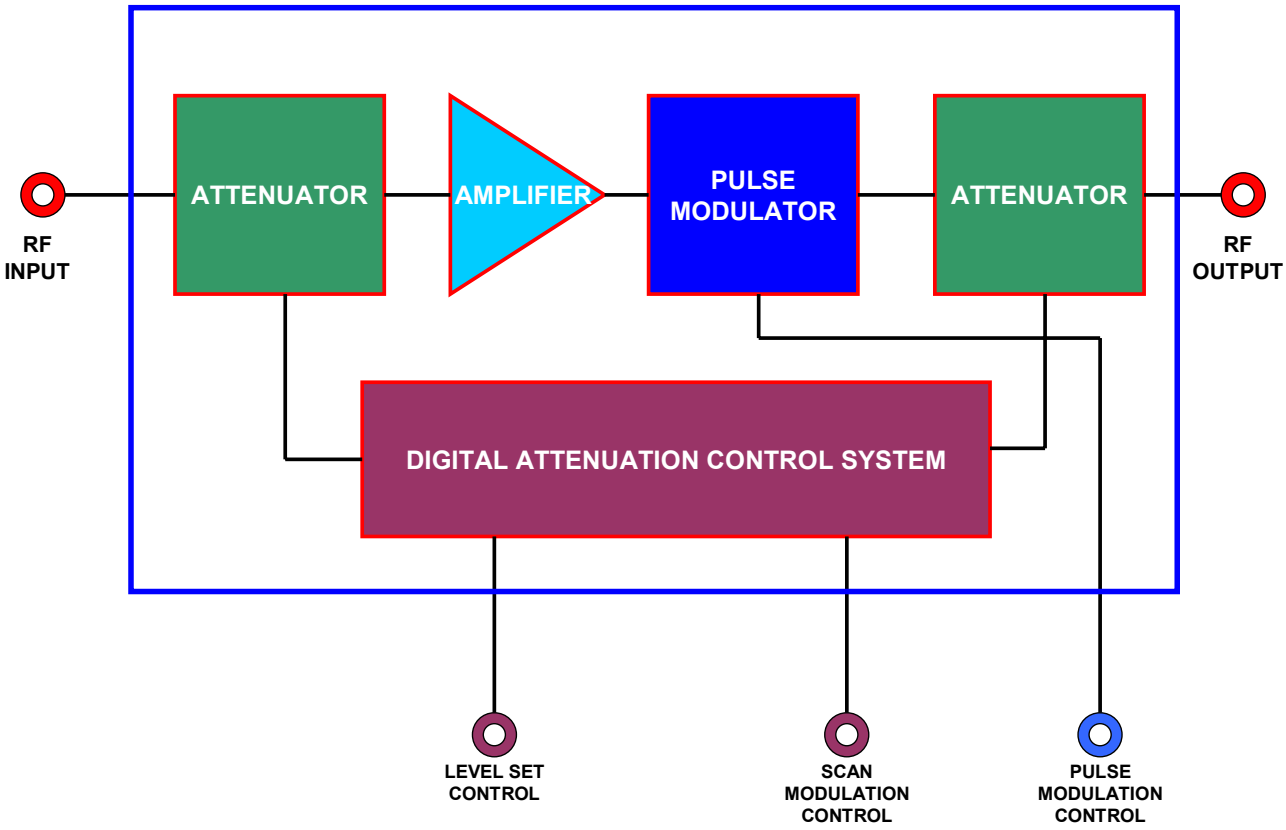
●	TEMPERATURE	-55°C TO +85°C (Operating) -65°C TO +125°C (Storage)
●	HUMIDITY	MIL-STD-202F, METHOD 103D, CONDITION B
●	SHOCK	MIL-STD-202F, METHOD 213B, CONDITION B
●	VIBRATION	MIL-STD-202F, METHOD 204D, CONDITION B
●	ALTITUDE	MIL-STD-202F, METHOD 105C, CONDITION B
●	TEMPERATURE CYCLE	MIL-STD-202F, METHOD 107D, CONDITION A

PRODUCT FEATURE



FUNCTIONAL BLOCK DIAGRAM

LEVEL, SCAN AND PULSE MODULATION MODULE



INTRODUCTION

LEVEL, SCAN AND PULSE MODULATOR SUBSYSTEM MODULE

The unit described in this report is summarized as follows:

- **An input band selection switch giving two RF Input channels.**
- **Having a Single RF Output.**
- **Both RF Input channels are capable of operating over 0.5 to 18.0 GHz.**
- **Two analog attenuation control inputs.**
- **Internal digital processing of all attenuation controls at >100 ksps.**
- **Individually, each attenuation control can set attenuation to more than 70dB.**
- **Analog control bandwidth is usable to 10 kHz.**
- **Combined each analog input has a specified control range of 60dB giving a total control range beyond 100 dB.**
- **A Pulse Modulator giving <10nS switch times and 60dB modulation depth.**
- **An amplifier to make up system loss.**
- **Output P_{1dB} of 13 dBm.**
- **Compact Size of 3.30" X 4.00" X 0.70"**

Notes:

- **Due to a temperature dependence on the speed of the internal attenuation MMICs the UUT (Unit Under Test) must run at >50°C in order to get a response time of <1mS.**
- **Tested with UUT (Unit Under Test) mounted using spacers separating the mounting plate and UUT. This allows the UUT to rise to a temperature above that of the mounting plate.**
- **The mounting plate with the UUT installed was clamped onto a temperature variable "Hot" plate preset for each test.**

INTRODUCTION CONTINUED

LEVEL, SCAN AND PULSE MODULATOR SUBSYSTEM MODULE

DEFINITIONS:

AMPLITUDE MODULATION:

A linear tranfer function from control voltage to output voltage.
This is the normal modulation used for AM radio.
(*The LSP module does not do this*.)

SCAN MODULATION:

Linear transfer function for control voltage of attenuation as expressed in dB's.
This is in reality an exponential transfer function.

$V_{out} = A \times 10 \wedge (V_{control} / B)$ A and B are constants.

A Typical Transfer Function Specification would be: 10dB per Volt.

LEVEL SETTING:

In the LSP module the level setting function is similar to the scan modulation in that a control voltage sets the dB's of attenuation to vary the output level.

PULSE MODULATION:

This is an on and off function, switching the RF on and off to generate waveforms of a desired shape or characteristic.

ATTENUATION:

Attenuation is the incremental reduction of signal strength through controlled adjustments of ever increasing resistance within the RF circuit. These controls can be either through digital or analog inputs. Attenuation is expressed in dB's. The Level set and Scan modulation functions are in reality attenuation controls.

POWER GAIN vs. FREQUENCY AND TEMPERATURE

UUT TESTED AT 0.5, 1.25, 2.0, 10.0 AND 18.0 GHz FREQUENCY
UUT TESTED AT +65°C, +25°C AND -20°C TEMPERATURE

PMI MODLE No: LSP-0518-SK Serial No: M2P3 Power Gain Compression			
Frequency	Temperature	Power Out	Measured Compression
GHz	deg C	dBm	dB
18.0	65	13.13	0.66
	25	13.11	0.29
	-20	13.25	0.83
10.0	65	13.32	0.35
	25	13.22	-0.35
	-20	13.7	0.46
2.0	65	13.48	0.45
	25	13.29	0.31
	-20	13.26	0.44
1.25	65	13.72	0.48
	25	13.5	0.4
	-20	13.89	0.37
0.5	65	13.57	0.33
	25	13.38	0.29
	-20	13.66	0.31

TABLE 1

RF OUTPUT POWER vs. TEMPERATURE AND FREQUENCY

UUT TESTED AT 0.5, 1.25, 2.0, 10.0 AND 18.0 GHz FREQUENCY
UUT TEST AT +65°C, +25°C AND -20°C TEMPERATURE
UUT TEST WITH +12 dBm INPUT POWER

PMI MODEL No: LSP-0518-SK Serial No: M2P3 Power Output vs. Temperature and Frequency					
Frequency GHz	Power In dBm	Analog Attenuation Control Volts	Power Out +25C	Power Out -20C	Power Out +65C
0.5	12	0.8333	6.68	6.91	5.86
1.25	12	0.8333	5.46	5.76	4.66
2	12	0.8333	5.29	5.72	4.47
10	12	0.8333	4.67	5.48	3.87
18	12	0.8333	4.49	5.48	3.52

TABLE 2

ATTENUATION LINEARITY

INSERTION LOSS AS MEASURED @ +25°C

UUT TESTED FROM 0.5 TO 18.0 GHz FREQUENCY

THIS IS THE ABSOLUTE VALUE OF INSERTION LOSS AND ALL OTHER MEASUREMENTS WERE TAKEN RELATIVE TO THIS MEASUREMENT

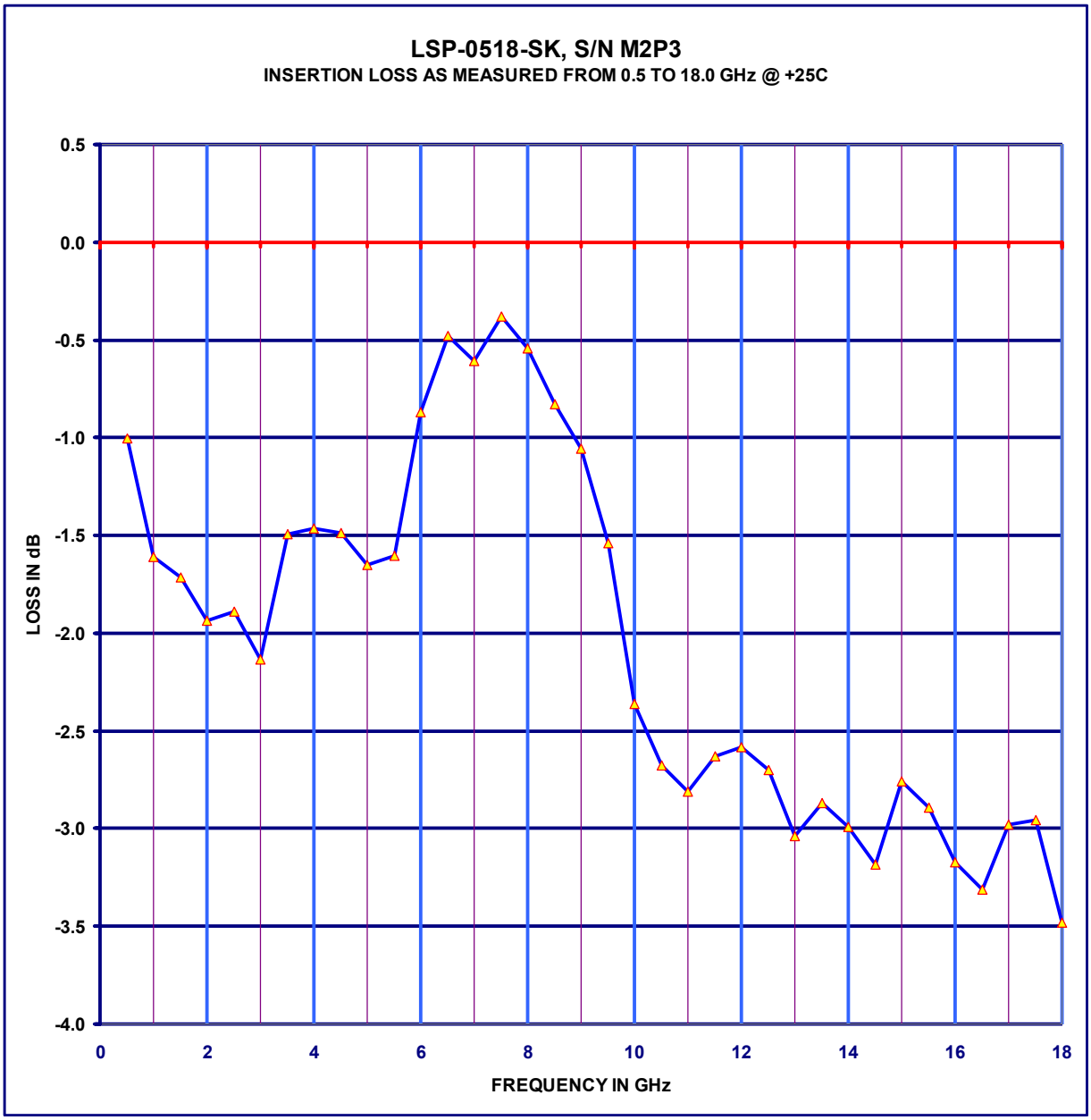


CHART 1

ATTENUATION LINEARITY OVER FREQUENCY

As Measured from 0.5 to 18.0 GHz @ +25°C

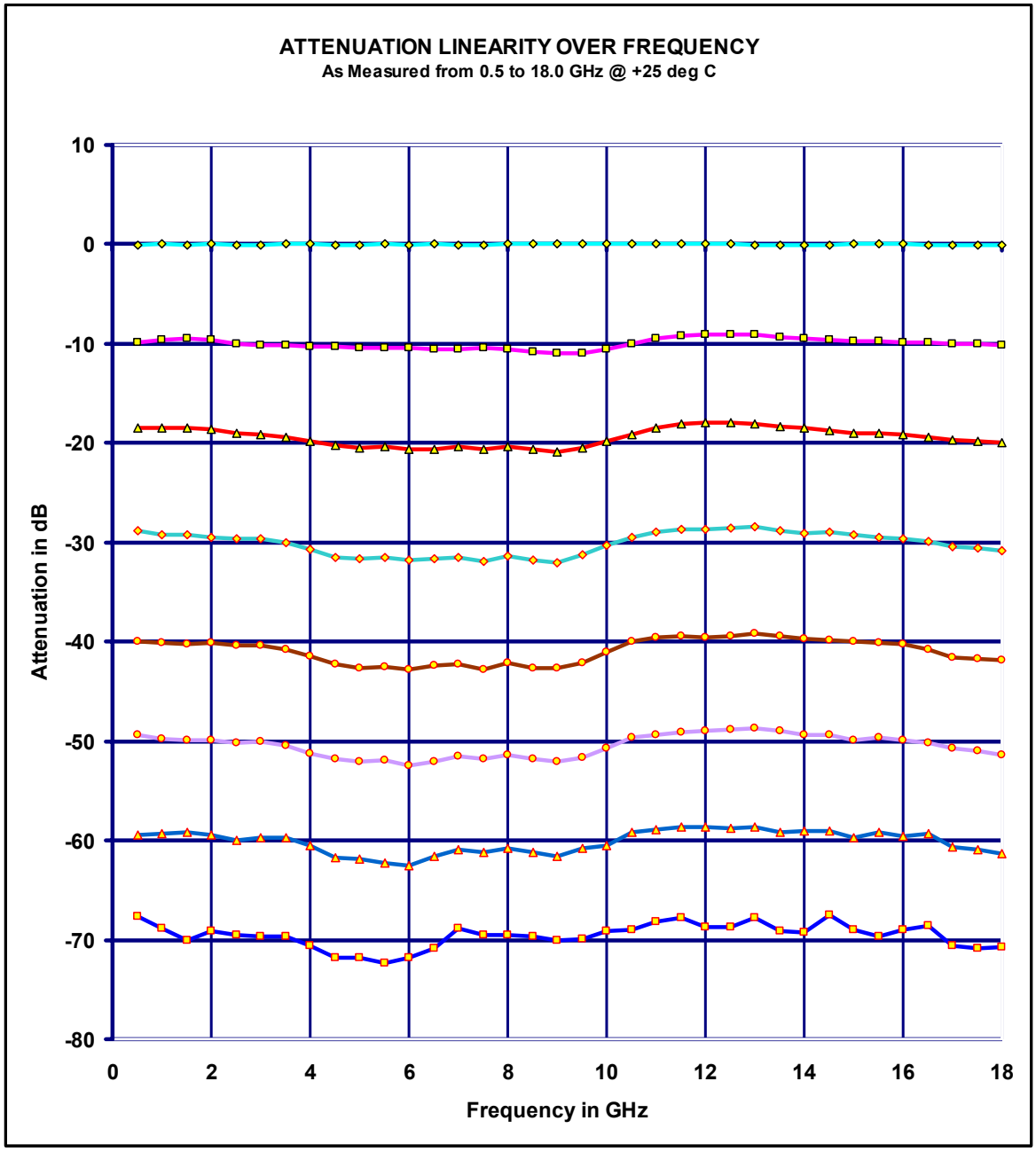


CHART 2

ATTENUATION LINEARITY OVER FREQUENCY

As Measured from 0.5 to 18.0 GHz @ +25°C

Frequency In GHz	Insertion Loss	0dB	10dB	20dB	30dB	40dB	50dB	60dB	70dB
0.5	-1.001	-0.027137	-9.8209	-18.428	-28.863	-39.941	-49.339	-59.398	-67.651
1.0	-1.6105	0.0009721	-9.6361	-18.424	-29.248	-40.175	-49.782	-59.368	-68.874
1.5	-1.7168	-0.027218	-9.5386	-18.453	-29.271	-40.203	-49.92	-59.245	-70.003
2.0	-1.9367	0.025532	-9.6715	-18.618	-29.437	-40.166	-49.911	-59.488	-69.104
2.5	-1.8917	-0.028636	-9.9833	-19.084	-29.593	-40.422	-50.148	-60.04	-69.516
3.0	-2.1364	-0.056545	-10.1	-19.139	-29.663	-40.429	-50.034	-59.689	-69.687
3.5	-1.4957	0.021101	-10.108	-19.407	-30.03	-40.739	-50.471	-59.731	-69.6
4.0	-1.4669	-0.0034647	-10.239	-19.847	-30.736	-41.421	-51.209	-60.564	-70.617
4.5	-1.4848	-0.069852	-10.269	-20.185	-31.462	-42.3	-51.854	-61.716	-71.867
5.0	-1.6503	-0.017712	-10.398	-20.526	-31.696	-42.665	-52.059	-61.832	-71.815
5.5	-1.606	0.010234	-10.37	-20.405	-31.541	-42.508	-51.859	-62.289	-72.357
6.0	-0.86803	-0.0081893	-10.385	-20.583	-31.757	-42.727	-52.437	-62.578	-71.772
6.5	-0.48144	0.0066594	-10.582	-20.589	-31.643	-42.43	-52.058	-61.629	-70.912
7.0	-0.60812	-0.012324	-10.487	-20.413	-31.514	-42.312	-51.518	-60.88	-68.807
7.5	-0.37835	-0.012312	-10.466	-20.566	-31.964	-42.789	-51.834	-61.163	-69.567
8.0	-0.54453	-0.0038519	-10.579	-20.364	-31.409	-42.131	-51.369	-60.777	-69.48
8.5	-0.8287	0.021376	-10.76	-20.683	-31.717	-42.597	-51.736	-61.155	-69.609
9.0	-1.0542	0.010231	-11.018	-20.919	-31.997	-42.655	-52.052	-61.539	-70.119
9.5	-1.5404	0.058441	-10.974	-20.541	-31.277	-42.098	-51.652	-60.744	-69.924
10.0	-2.3633	0.062664	-10.507	-19.803	-30.336	-41.064	-50.711	-60.539	-69.112
10.5	-2.6759	0.0091633	-9.968	-19.101	-29.439	-40.023	-49.62	-59.213	-68.923
11.0	-2.8137	0.019556	-9.4806	-18.462	-28.945	-39.581	-49.395	-58.953	-68.126
11.5	-2.6298	0.016751	-9.1784	-18.123	-28.697	-39.427	-49.09	-58.689	-67.754
12.0	-2.5836	0.016282	-9.0994	-17.979	-28.626	-39.557	-48.943	-58.671	-68.712
12.5	-2.7005	0.001992	-9.0538	-17.951	-28.485	-39.435	-48.87	-58.746	-68.77
13.0	-3.0401	-0.051026	-9.1059	-18.035	-28.417	-39.185	-48.713	-58.623	-67.808
13.5	-2.8687	-0.03073	-9.2915	-18.34	-28.806	-39.488	-49.015	-59.142	-69.078
14.0	-2.9921	-0.029221	-9.4318	-18.535	-29.04	-39.75	-49.308	-59.012	-69.22
14.5	-3.1847	-0.023544	-9.664	-18.7	-28.926	-39.784	-49.413	-59.053	-67.493
15.0	-2.7566	0.014627	-9.7978	-18.954	-29.165	-39.988	-49.923	-59.726	-69.027
15.5	-2.8949	0.018944	-9.8145	-19.03	-29.474	-40.053	-49.643	-59.129	-69.606
16.0	-3.1734	0.0061054	-9.8278	-19.199	-29.583	-40.193	-49.887	-59.625	-68.931
16.5	-3.3117	-0.025099	-9.8498	-19.366	-29.956	-40.713	-50.175	-59.361	-68.615
17.0	-2.9808	-0.005228	-10.044	-19.669	-30.455	-41.545	-50.724	-60.603	-70.556
17.5	-2.9549	-0.05049	-10.073	-19.77	-30.625	-41.738	-51.047	-60.965	-70.798
18.0	-3.4804	-0.039594	-10.112	-19.892	-30.792	-41.86	-51.428	-61.282	-70.668

TABLE 3

ATTENUATION LINEARITY vs. CONTROL VOLTAGE

As Measured from 0.5 to 18.0 GHz @ +25°C with Error Plots

- Blue line = Best Fit Straight Line
- Red line = Measured Attenuation 0 to 70 dB
- Green line = Error in dB

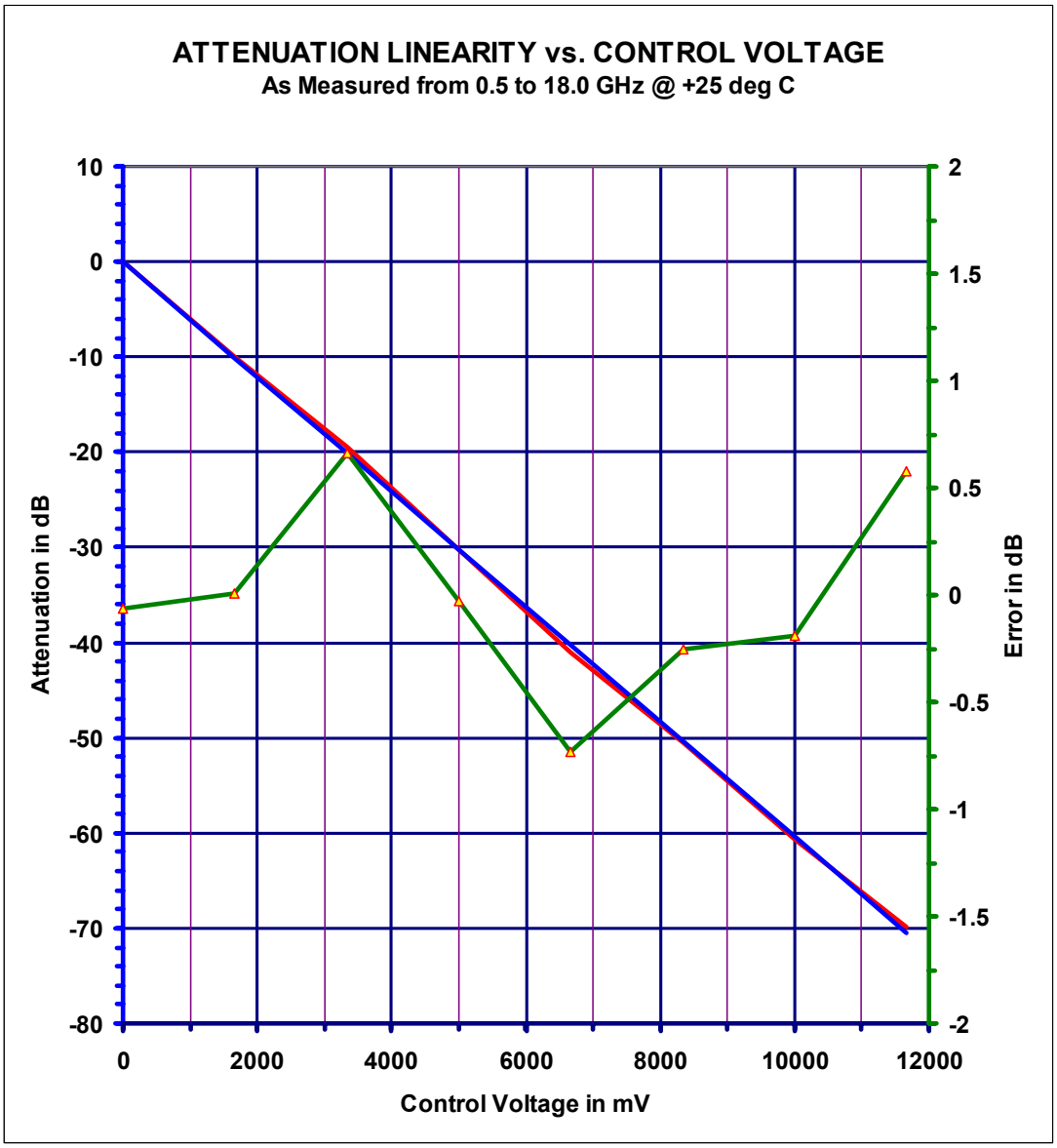


CHART 4

ATTENUATION LINEARITY vs. CONTROL VOLTAGE

As Measured from 0.5 to 18.0 GHz @ +25°C with Error

	FREQUENCY	0dB	10dB	20dB	30dB	40dB	50dB	60dB	70dB
Max	0.5 to 2.0 GHz	0.03	-9.54	-18.42	-28.86	-39.94	-49.34	-59.24	-67.65
Min		-0.03	-9.82	-18.62	-29.44	-40.20	-49.92	-59.49	-70.00
Center		0.00	-9.68	-18.52	-29.15	-40.07	-49.63	-59.37	-68.83
Deviation		0.03	0.14	0.10	0.29	0.13	0.29	0.12	1.18
Average		-0.01	-9.67	-18.48	-29.20	-40.12	-49.74	-59.37	-68.91
Cent Fit		0.37	-9.59	-19.50	-29.43	-39.37	-49.30	-59.24	-69.19
Cent Dev		-0.37	-0.09	0.98	0.28	-0.70	-0.33	-0.13	0.36
Ave Fit		0.38	-9.59	-19.51	-29.46	-39.41	-49.35	-59.30	-69.27
Ave Dev		-0.39	-0.08	1.03	0.26	-0.71	-0.39	-0.08	0.36
Max	2.0 to 18.0 GHz	0.06	-9.05	-17.95	-28.42	-39.19	-48.71	-58.62	-67.49
Min		-0.07	-11.02	-20.92	-32.00	-42.79	-52.44	-62.58	-72.36
Center		0.00	-10.04	-19.44	-30.21	-40.99	-50.58	-60.60	-69.93
Deviation		0.07	0.98	1.48	1.79	1.80	1.86	1.98	2.43
Average		0.00	-10.02	-19.48	-30.22	-41.02	-50.55	-60.22	-69.63
Cent Fit		0.05	-10.05	-20.10	-30.18	-40.26	-50.33	-60.41	-70.50
Cent Dev		-0.06	0.01	0.66	-0.03	-0.73	-0.25	-0.19	0.58
Ave Fit		-0.04	-10.09	-20.09	-30.12	-40.15	-50.18	-60.21	-70.26
Ave Dev		0.04	0.07	0.62	-0.09	-0.87	-0.37	-0.01	0.62
Max	0.5 to 18.0 GHz	0.06	-9.05	-17.95	-28.42	-39.19	-48.71	-58.62	-67.49
Min		-0.07	-11.02	-20.92	-32.00	-42.79	-52.44	-62.58	-72.36
Center		0.00	-10.04	-19.44	-30.21	-40.99	-50.58	-60.60	-69.93
Deviation		0.07	0.98	1.48	1.79	1.80	1.86	1.98	2.43
Average		-0.01	-9.99	-19.39	-30.13	-40.95	-50.48	-60.14	-69.57
Cent Fit		0.05	-10.05	-20.10	-30.18	-40.26	-50.33	-60.41	-70.50
Cent Dev		-0.06	0.01	0.66	-0.03	-0.73	-0.25	-0.19	0.58
Ave Fit		0.00	-10.05	-20.04	-30.07	-40.09	-50.11	-60.13	-70.17
Ave Dev		0.00	0.05	0.65	-0.06	-0.86	-0.37	-0.02	0.60

TABLE 4

ATTENUATION ACCURACY vs. CONTROL VOLTAGE

As Measured from 0.5 to 18.0 GHz @ +65°C with Error Plots

- Blue line = Best Fit Straight Line
- Red line = Measured Attenuation 0 to 70 dB
- Green line = Error in dB

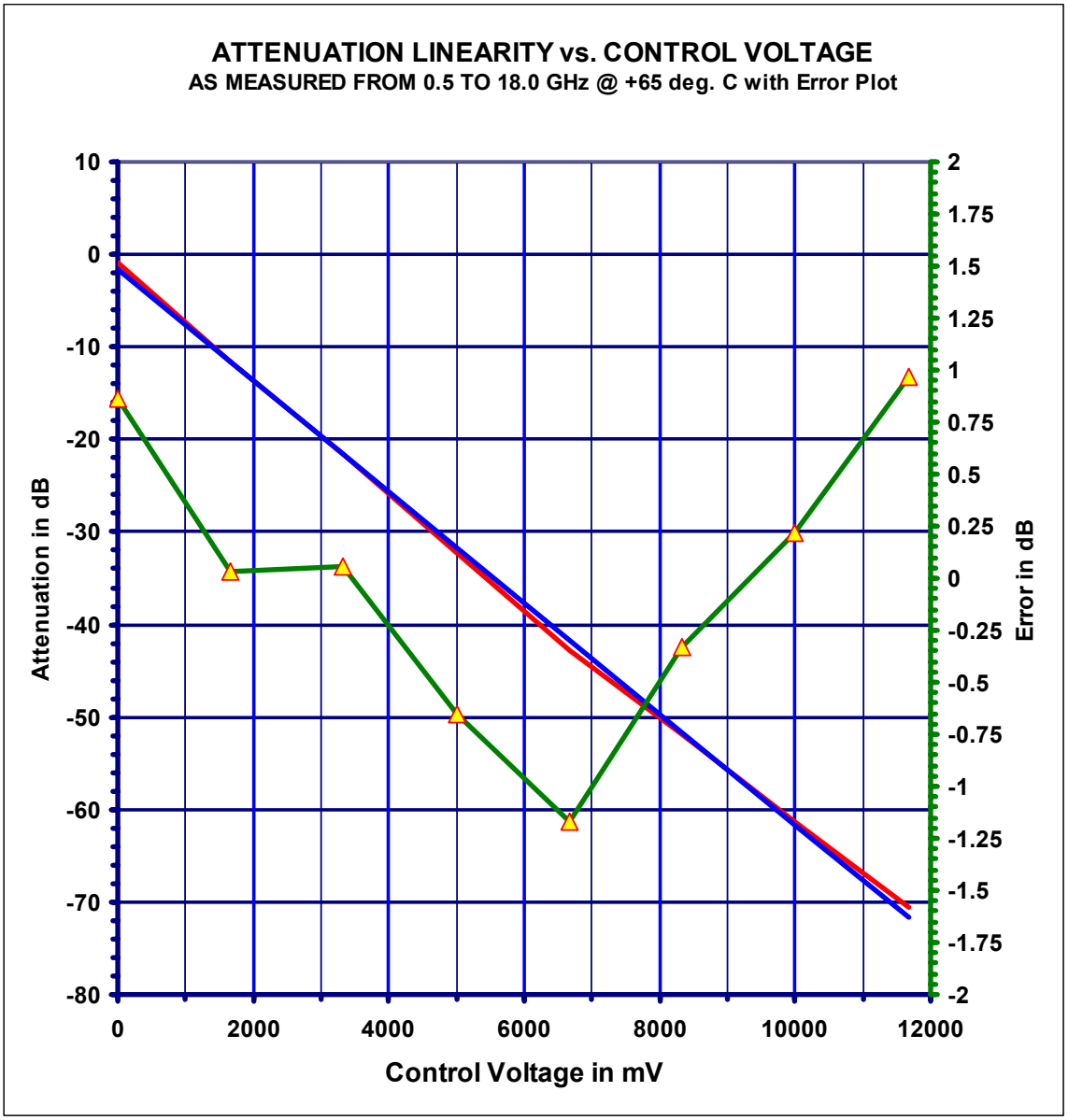


CHART 5

ATTENUATION ACCURACY vs CONTROL VOLTAGE @ +65°C

TABULAR DATA FOR CHART ABOVE

	FREQUENCY	0dB	10dB	20dB	30dB	40dB	50dB	60dB	70dB
Max	0.5 to 2.0 GHz	-0.47	-11.06	-20.26	-30.58	-41.02	-50.45	-59.77	-68.38
Min		-0.57	-11.32	-20.56	-30.88	-41.69	-50.65	-60.21	-70.03
Center		-0.52	-11.19	-20.41	-30.73	-41.36	-50.55	-59.99	-69.21
Deviation		0.05	0.13	0.15	0.15	0.34	0.10	0.22	0.82
Average		-0.53	-11.18	-20.35	-30.74	-41.48	-50.54	-59.94	-68.89
Cent Fit		-1.08	-10.92	-20.74	-30.58	-40.41	-50.24	-60.07	-69.90
Cent Dev		0.56	-0.27	0.34	-0.15	-0.94	-0.31	0.08	0.70
Ave Fit		-1.14	-10.94	-20.75	-30.55	-40.36	-50.16	-59.97	-69.78
Ave Dev		0.61	-0.23	0.40	-0.19	-1.12	-0.38	0.03	0.88
Max	2.0 to 18.0 GHz	-0.44	-10.57	-20.03	-30.49	-41.16	-50.35	-59.70	-68.59
Min		-1.21	-12.71	-23.17	-34.10	-44.60	-53.56	-63.10	-72.91
Center		-0.82	-11.64	-21.60	-32.30	-42.88	-51.96	-61.40	-70.75
Deviation		0.39	1.07	1.57	1.80	1.72	1.60	1.70	2.16
Average		-0.66	-11.72	-21.70	-32.28	-42.92	-51.93	-61.21	-70.45
Cent Fit		-1.67	-11.67	-21.67	-31.67	-41.67	-51.66	-61.67	-71.67
Cent Dev		0.85	0.03	0.07	-0.63	-1.21	-0.29	0.26	0.92
Ave Fit		-1.72	-11.69	-21.65	-31.62	-41.59	-51.56	-61.53	-71.50
Ave Dev		1.06	-0.03	-0.04	-0.65	-1.33	-0.37	0.32	1.05
Max	0.5 to 18.0 GHz	-0.44	-10.57	-20.03	-30.49	-41.02	-50.35	-59.70	-68.38
Min		-1.21	-12.71	-23.17	-34.10	-44.60	-53.56	-63.10	-72.91
Center		-0.82	-11.64	-21.60	-32.30	-42.81	-51.96	-61.40	-70.65
Deviation		0.39	1.07	1.57	1.80	1.79	1.60	1.70	2.26
Average		-0.65	-11.67	-21.58	-32.14	-42.80	-51.82	-61.10	-70.33
Cent Fit		-1.68	-11.67	-21.66	-31.65	-41.64	-51.63	-61.62	-71.61
Cent Dev		0.86	0.03	0.06	-0.65	-1.17	-0.33	0.22	0.97
Ave Fit		-1.67	-11.62	-21.58	-31.53	-41.49	-51.44	-61.40	-71.36
Ave Dev		1.01	-0.05	0.00	-0.61	-1.30	-0.38	0.30	1.03

TABLE 5

ATTENUATION LINEARITY OVER FREQUENCY

As Measured from 0.5 to 18.0 GHz @ +65°C

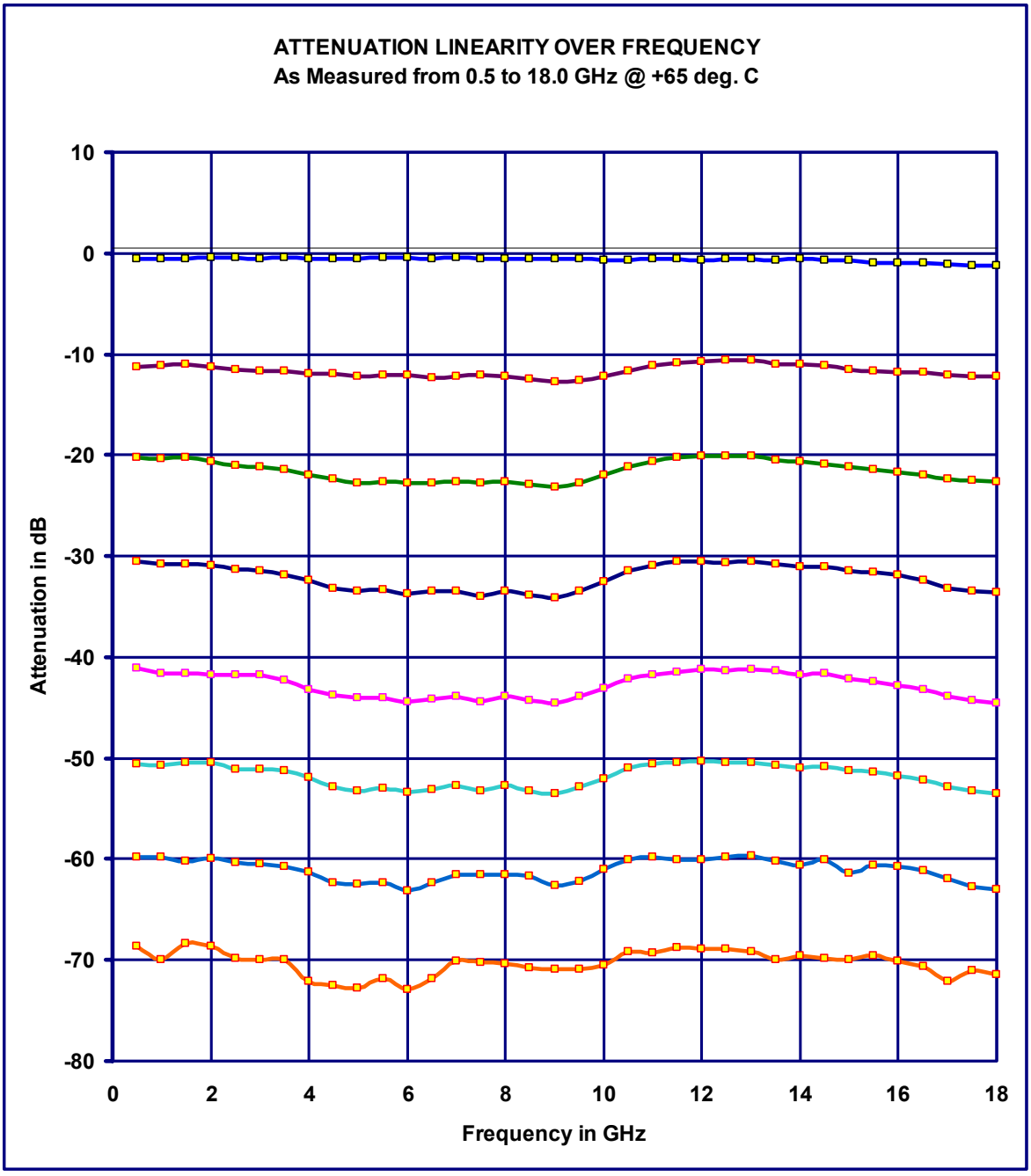


Chart 6

ATTENUATION LINEARITY OVER FREQUENCY

As Measured from 0.5 to 18.0 GHz @ +65°C

Attenuation in dB	0 dB	10 dB	20 dB	30 dB	40 dB	50 dB	60 dB	70 dB
Frequency in GHz								
0.5	-0.57	-11.32	-20.26	-30.58	-41.02	-50.56	-59.77	-68.58
1.0	-0.56	-11.13	-20.30	-30.76	-41.63	-50.65	-59.85	-70.03
1.5	-0.50	-11.06	-20.28	-30.75	-41.58	-50.50	-60.21	-68.38
2.0	-0.47	-11.20	-20.56	-30.88	-41.69	-50.45	-59.94	-68.59
2.5	-0.47	-11.51	-21.00	-31.31	-41.78	-51.07	-60.39	-69.86
3.0	-0.50	-11.61	-21.10	-31.46	-41.73	-51.11	-60.50	-69.99
3.5	-0.44	-11.66	-21.46	-31.87	-42.23	-51.24	-60.69	-69.96
4.0	-0.51	-11.92	-21.93	-32.40	-43.18	-51.92	-61.33	-72.12
4.5	-0.54	-11.94	-22.35	-33.17	-43.78	-52.86	-62.34	-72.48
5.0	-0.52	-12.15	-22.72	-33.51	-44.04	-53.20	-62.43	-72.82
5.5	-0.46	-12.03	-22.58	-33.31	-44.09	-53.00	-62.41	-71.83
6.0	-0.48	-12.07	-22.79	-33.68	-44.42	-53.35	-63.10	-72.91
6.5	-0.52	-12.29	-22.79	-33.48	-44.14	-53.09	-62.33	-71.79
7.0	-0.48	-12.15	-22.58	-33.44	-43.88	-52.74	-61.57	-70.15
7.5	-0.55	-12.09	-22.77	-34.00	-44.45	-53.26	-61.54	-70.25
8.0	-0.51	-12.26	-22.60	-33.49	-43.85	-52.78	-61.58	-70.43
8.5	-0.51	-12.47	-22.93	-33.88	-44.33	-53.26	-61.73	-70.76
9.0	-0.56	-12.71	-23.17	-34.10	-44.60	-53.56	-62.61	-70.90
9.5	-0.60	-12.66	-22.77	-33.45	-43.86	-52.88	-62.25	-70.85
10.0	-0.64	-12.19	-22.02	-32.55	-43.08	-52.00	-61.04	-70.47
10.5	-0.66	-11.65	-21.17	-31.46	-42.09	-51.02	-60.06	-69.20
11.0	-0.62	-11.12	-20.60	-30.86	-41.78	-50.60	-59.80	-69.31
11.5	-0.63	-10.80	-20.19	-30.52	-41.43	-50.42	-60.09	-68.80
12.0	-0.70	-10.69	-20.09	-30.57	-41.24	-50.35	-60.10	-68.94
12.5	-0.62	-10.57	-20.03	-30.64	-41.31	-50.39	-59.75	-68.96
13.0	-0.63	-10.66	-20.12	-30.49	-41.16	-50.48	-59.70	-69.18
13.5	-0.73	-10.98	-20.44	-30.83	-41.39	-50.66	-60.16	-70.03
14.0	-0.57	-10.97	-20.66	-31.11	-41.76	-51.04	-60.57	-69.60
14.5	-0.70	-11.19	-20.84	-31.09	-41.67	-50.85	-60.11	-69.86
15.0	-0.75	-11.49	-21.19	-31.39	-42.12	-51.27	-61.38	-69.96
15.5	-0.95	-11.61	-21.43	-31.63	-42.44	-51.38	-60.58	-69.60
16.0	-1.00	-11.74	-21.68	-31.90	-42.88	-51.80	-60.79	-70.14
16.5	-0.99	-11.85	-21.94	-32.43	-43.28	-52.13	-61.19	-70.60
17.0	-1.15	-12.02	-22.35	-33.15	-43.91	-52.82	-62.00	-72.09
17.5	-1.21	-12.15	-22.54	-33.45	-44.30	-53.26	-62.74	-71.00
18.0	-1.21	-12.18	-22.60	-33.63	-44.53	-53.54	-63.07	-71.49

TABLE 6

ATTENUATION ACCURACY vs. CONTROL VOLTAGE

As Measured from 0.5 to 18.0 GHz @-20°C with Error Plots

- Blue line = Best Fit Straight Line
- Red line = Measured Attenuation 0 to 70 dB
- Green line = Error in dB

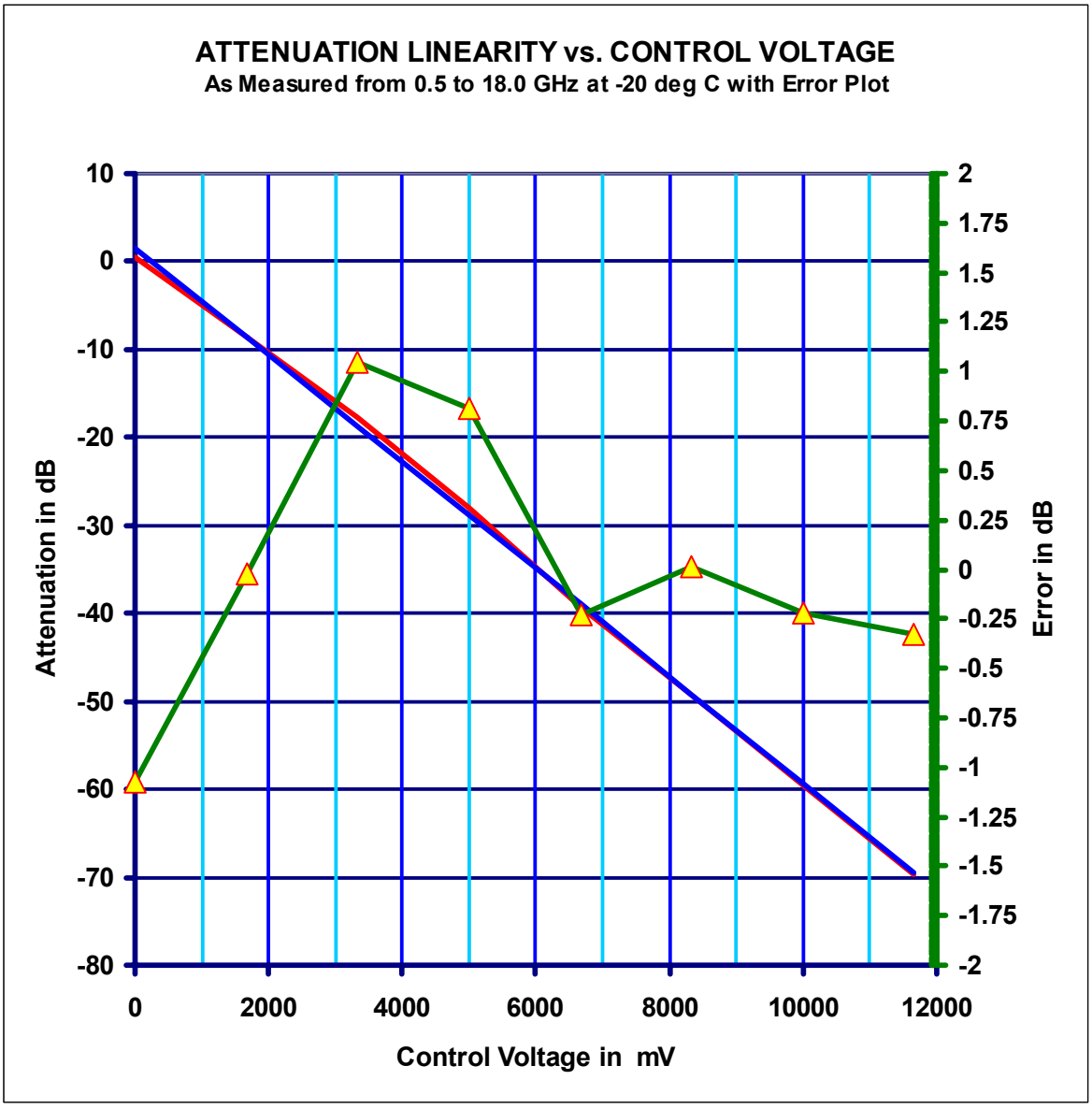


CHART 7

ATTENUATION ACCURACY vs. CONTROL VOLTAGE

As Measured from 0.5 to 18.0 GHz @-20°C with Error

	FREQUENCY	0dB	10dB	20dB	30dB	40dB	50dB	60dB	70dB
Max	0.5 to 2.0 GHz	0.43	-8.40	-16.83	-27.17	-38.21	-48.78	-58.93	-67.89
Min		0.20	-8.58	-17.13	-27.64	-38.95	-49.13	-59.38	-69.39
Center		0.31	-8.49	-16.98	-27.41	-38.58	-48.96	-59.15	-68.64
Deviation		0.12	0.09	0.15	0.23	0.37	0.17	0.22	0.75
Average		0.33	-8.50	-16.98	-27.43	-38.71	-48.95	-59.13	-68.43
Cent Fit		1.64	-8.40	-18.43	-28.47	-38.51	-48.54	-58.58	-68.62
Cent Dev		-1.33	-0.09	1.45	1.06	-0.08	-0.42	-0.57	-0.02
Ave Fit		1.59	-8.43	-18.44	-28.47	-38.49	-48.50	-58.52	-68.55
Ave Dev		-1.26	-0.07	1.46	1.03	-0.22	-0.45	-0.61	0.12
Max	2.0 to 18.0 GHz	0.68	-7.73	-16.23	-26.18	-37.30	-47.16	-57.27	-66.99
Min		0.22	-9.56	-19.18	-30.00	-41.23	-51.16	-61.78	-72.54
Center		0.45	-8.64	-17.70	-28.09	-39.26	-49.16	-59.53	-69.77
Deviation		0.23	0.92	1.48	1.91	1.97	2.00	2.25	2.78
Average		0.44	-8.67	-17.71	-28.05	-39.22	-49.03	-59.09	-68.88
Cent Fit		1.51	-8.62	-18.76	-28.89	-39.03	-49.17	-59.30	-69.44
Cent Dev		-1.06	-0.02	1.05	0.80	-0.23	0.01	-0.22	-0.32
Ave Fit		1.33	-8.70	-18.73	-28.76	-38.79	-48.82	-58.85	-68.88
Ave Dev		-0.88	0.03	1.01	0.71	-0.42	-0.21	-0.24	0.00
Max	0.5 to 18.0 GHz	0.68	-7.73	-16.23	-26.18	-37.30	-47.16	-57.27	-66.99
Min		0.20	-9.56	-19.18	-30.00	-41.23	-51.16	-61.78	-72.54
Center		0.44	-8.64	-17.70	-28.09	-39.26	-49.16	-59.53	-69.77
Deviation		0.24	0.92	1.48	1.91	1.97	2.00	2.25	2.78
Average		0.44	-8.66	-17.65	-28.00	-39.17	-49.03	-59.09	-68.85
Cent Fit		1.51	-8.63	-18.76	-28.90	-39.03	-49.17	-59.30	-69.44
Cent Dev		-1.07	-0.02	1.05	0.81	-0.23	0.01	-0.22	-0.33
Ave Fit		1.35	-8.68	-18.70	-28.74	-38.77	-48.79	-58.83	-68.86
Ave Dev		-0.92	0.02	1.05	0.74	-0.40	-0.23	-0.27	0.00

TABLE 7

ATTENUATION LINEARITY OVER FREQUENCY

As Measured from 0.5 to 18.0 GHz @ -20°C

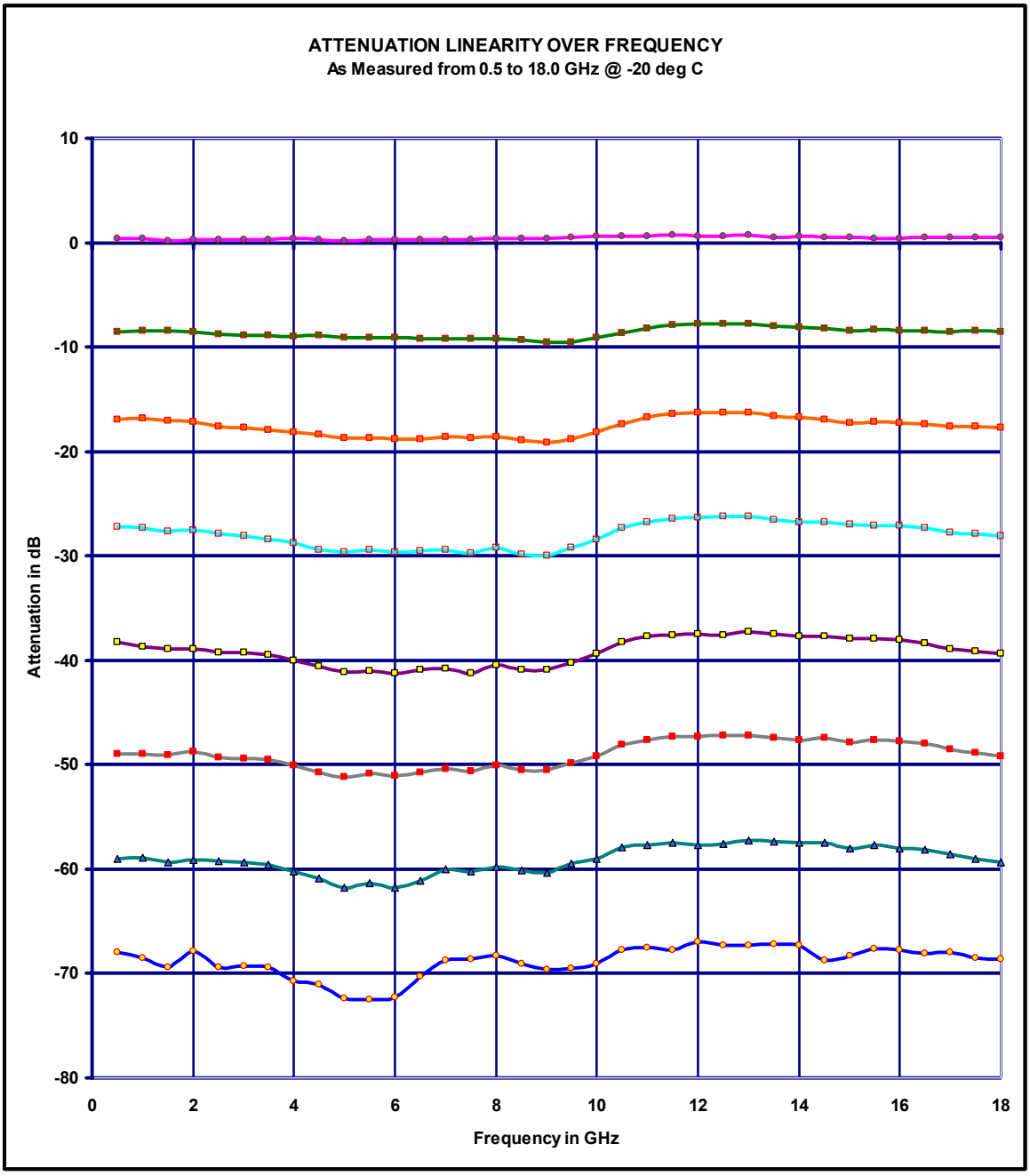


CHART 8

ATTENUATION LINEARITY OVER FREQUENCY

As Measured from 0.5 to 18.0 GHz @ -20°C

Attenuation in dB	0 dB	10 dB	20 dB	30 dB	40 dB	50 dB	60 dB	70 dB
Frequency in GHz								
0.5	0.43	-8.58	-16.91	-27.17	-38.21	-48.95	-59.07	-67.94
1.0	0.40	-8.40	-16.83	-27.38	-38.74	-48.93	-58.93	-68.49
1.5	0.20	-8.48	-17.06	-27.64	-38.95	-49.13	-59.38	-69.39
2.0	0.30	-8.54	-17.13	-27.54	-38.92	-48.78	-59.16	-67.89
2.5	0.33	-8.81	-17.59	-27.91	-39.21	-49.31	-59.19	-69.40
3.0	0.32	-8.84	-17.77	-28.07	-39.26	-49.36	-59.33	-69.26
3.5	0.32	-8.88	-17.89	-28.38	-39.46	-49.55	-59.56	-69.42
4.0	0.34	-8.97	-18.17	-28.77	-40.05	-50.09	-60.24	-70.71
4.5	0.26	-8.93	-18.38	-29.37	-40.59	-50.74	-60.88	-71.08
5.0	0.22	-9.09	-18.71	-29.61	-41.11	-51.16	-61.78	-72.35
5.5	0.28	-9.06	-18.67	-29.42	-41.02	-50.84	-61.33	-72.54
6.0	0.30	-9.09	-18.79	-29.61	-41.21	-51.07	-61.76	-72.32
6.5	0.28	-9.23	-18.81	-29.48	-40.89	-50.74	-61.09	-70.26
7.0	0.32	-9.18	-18.62	-29.39	-40.81	-50.36	-60.00	-68.69
7.5	0.33	-9.16	-18.74	-29.72	-41.23	-50.65	-60.25	-68.68
8.0	0.37	-9.24	-18.60	-29.21	-40.45	-50.06	-59.78	-68.31
8.5	0.39	-9.38	-18.90	-29.85	-40.88	-50.56	-60.10	-69.11
9.0	0.43	-9.56	-19.18	-30.00	-40.91	-50.57	-60.38	-69.63
9.5	0.54	-9.53	-18.85	-29.21	-40.28	-49.88	-59.44	-69.49
10.0	0.57	-9.12	-18.16	-28.40	-39.31	-49.16	-59.07	-69.04
10.5	0.58	-8.64	-17.35	-27.38	-38.30	-48.09	-57.91	-67.69
11.0	0.65	-8.19	-16.75	-26.82	-37.74	-47.68	-57.64	-67.56
11.5	0.68	-7.93	-16.42	-26.43	-37.55	-47.35	-57.51	-67.69
12.0	0.59	-7.80	-16.29	-26.36	-37.51	-47.35	-57.65	-66.99
12.5	0.63	-7.73	-16.23	-26.19	-37.55	-47.16	-57.59	-67.34
13.0	0.67	-7.75	-16.23	-26.18	-37.30	-47.17	-57.27	-67.28
13.5	0.54	-8.01	-16.60	-26.53	-37.49	-47.40	-57.37	-67.24
14.0	0.62	-8.06	-16.71	-26.80	-37.72	-47.61	-57.45	-67.28
14.5	0.48	-8.23	-16.91	-26.74	-37.76	-47.45	-57.43	-68.70
15.0	0.50	-8.44	-17.28	-27.03	-37.96	-47.81	-58.06	-68.33
15.5	0.42	-8.37	-17.22	-27.05	-37.97	-47.68	-57.73	-67.64
16.0	0.42	-8.41	-17.28	-27.12	-38.01	-47.76	-58.02	-67.72
16.5	0.47	-8.43	-17.35	-27.37	-38.34	-47.94	-58.12	-68.11
17.0	0.49	-8.50	-17.61	-27.75	-38.88	-48.58	-58.56	-67.99
17.5	0.52	-8.48	-17.63	-27.86	-39.09	-48.88	-59.03	-68.50
18.0	0.49	-8.54	-17.71	-28.07	-39.37	-49.15	-59.33	-68.64

TABLE 8

SCAN MODULATION
SINE WAVE RESPONSE

SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 1dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

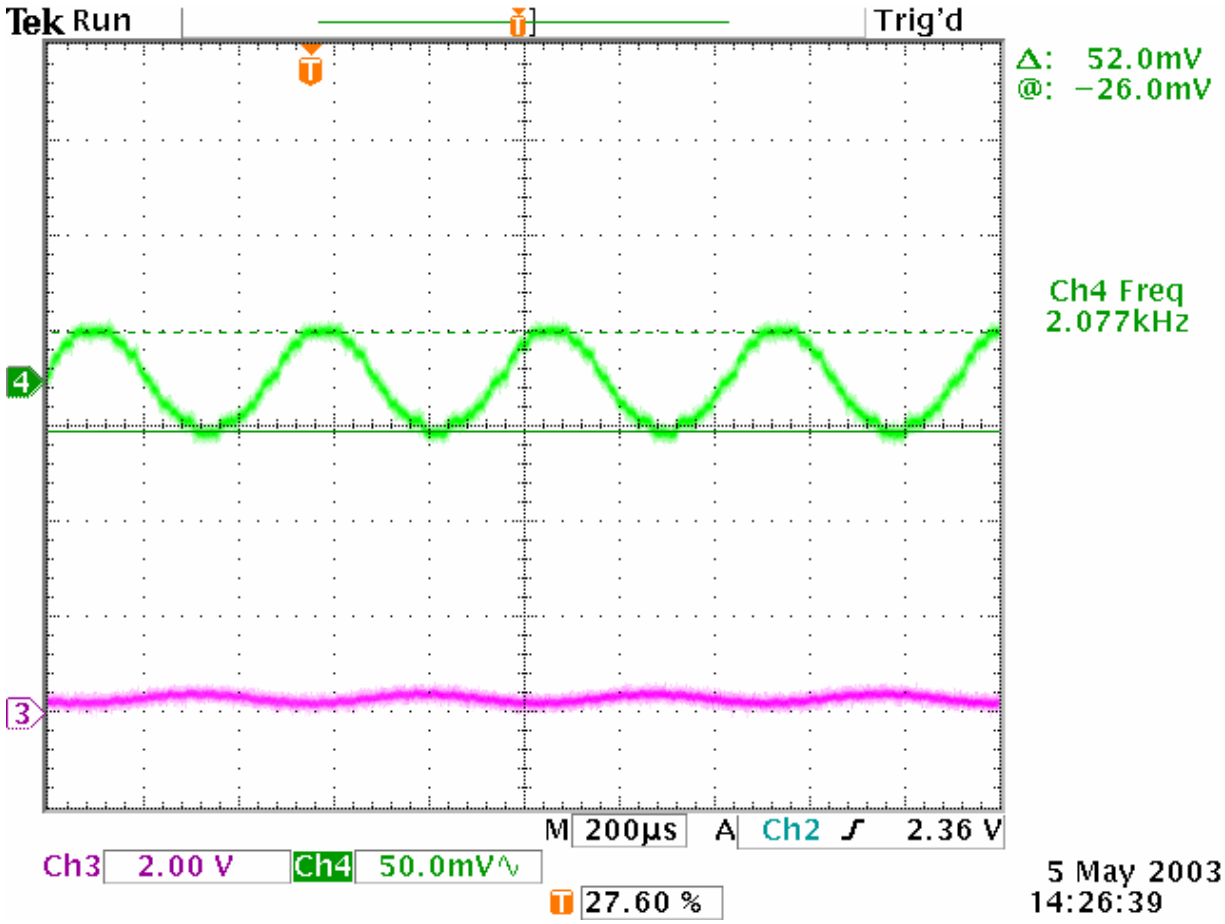
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 1dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 1dB Depth Level Set at 2V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

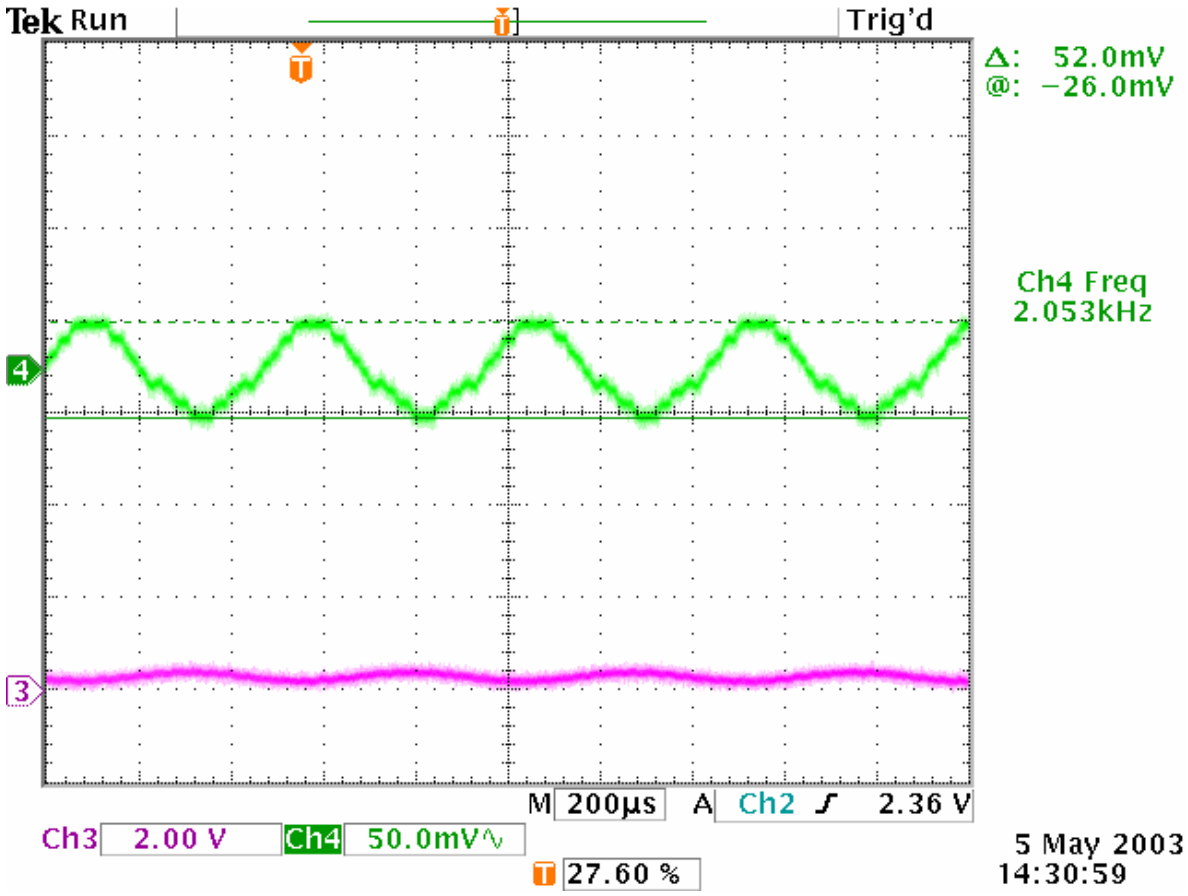
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 2 Volt

LSP MODULE AMPLITUDE MODULATION is set for 1dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 1dB Depth Level Set at 3V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

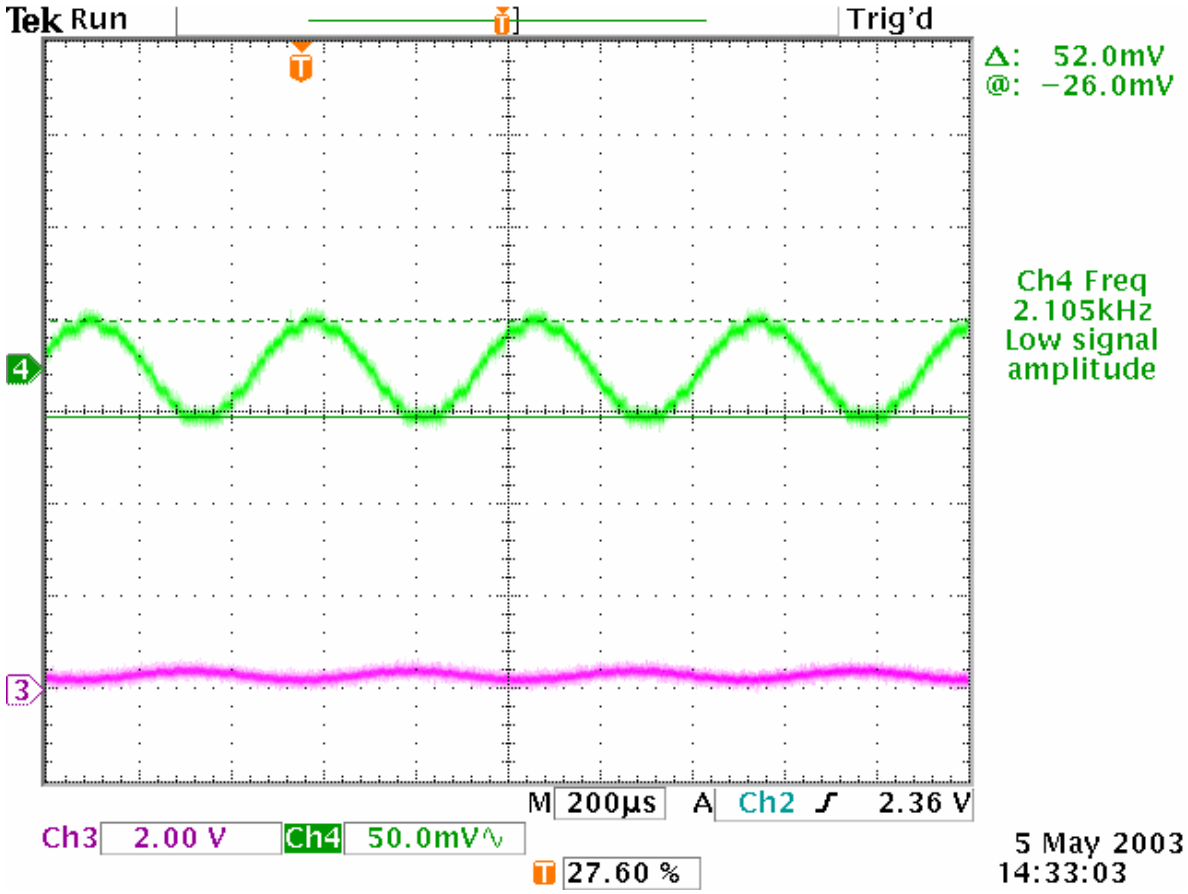
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 3 Volt

LSP MODULE AMPLITUDE MODULATION is set for 1dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 1dB Depth Level Set at 4V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

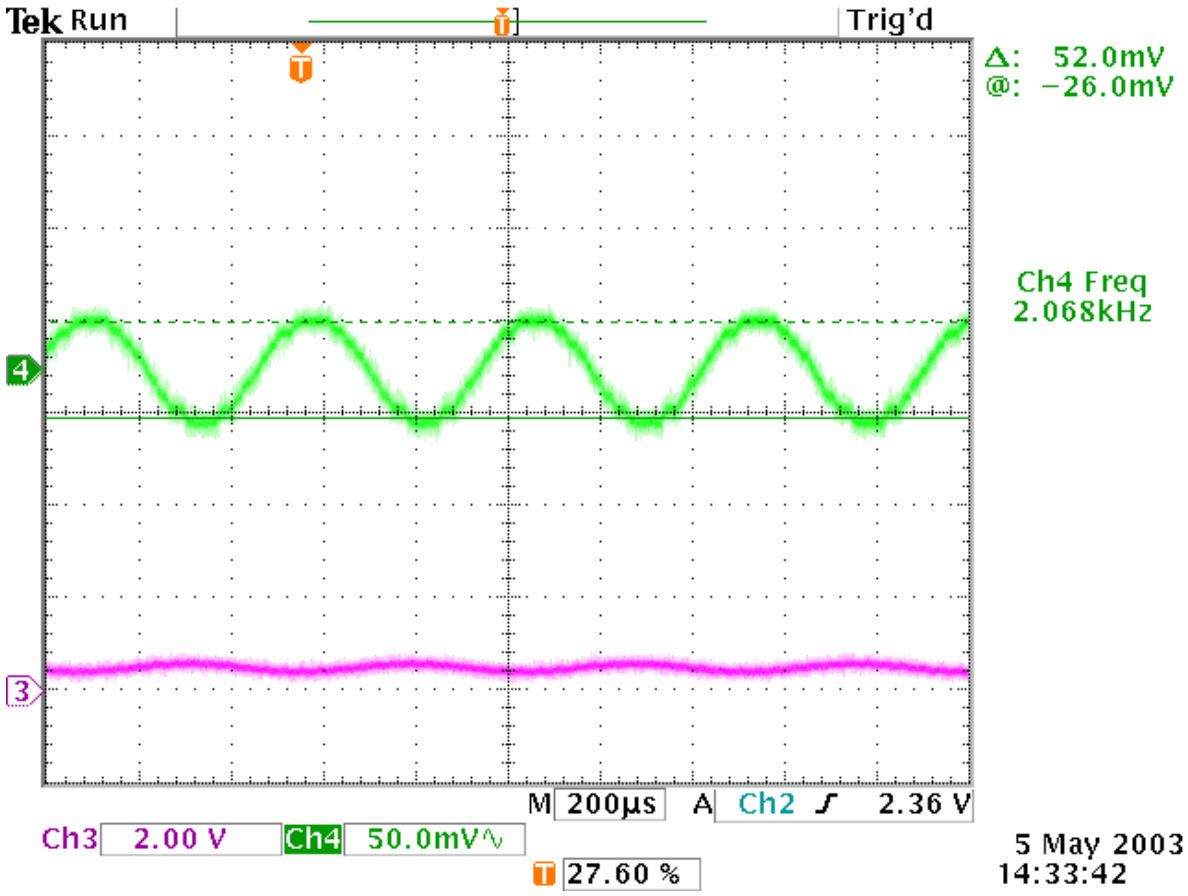
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 4 Volt

LSP MODULE AMPLITUDE MODULATION is set for 1dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 1dB Depth Level Set at 5V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

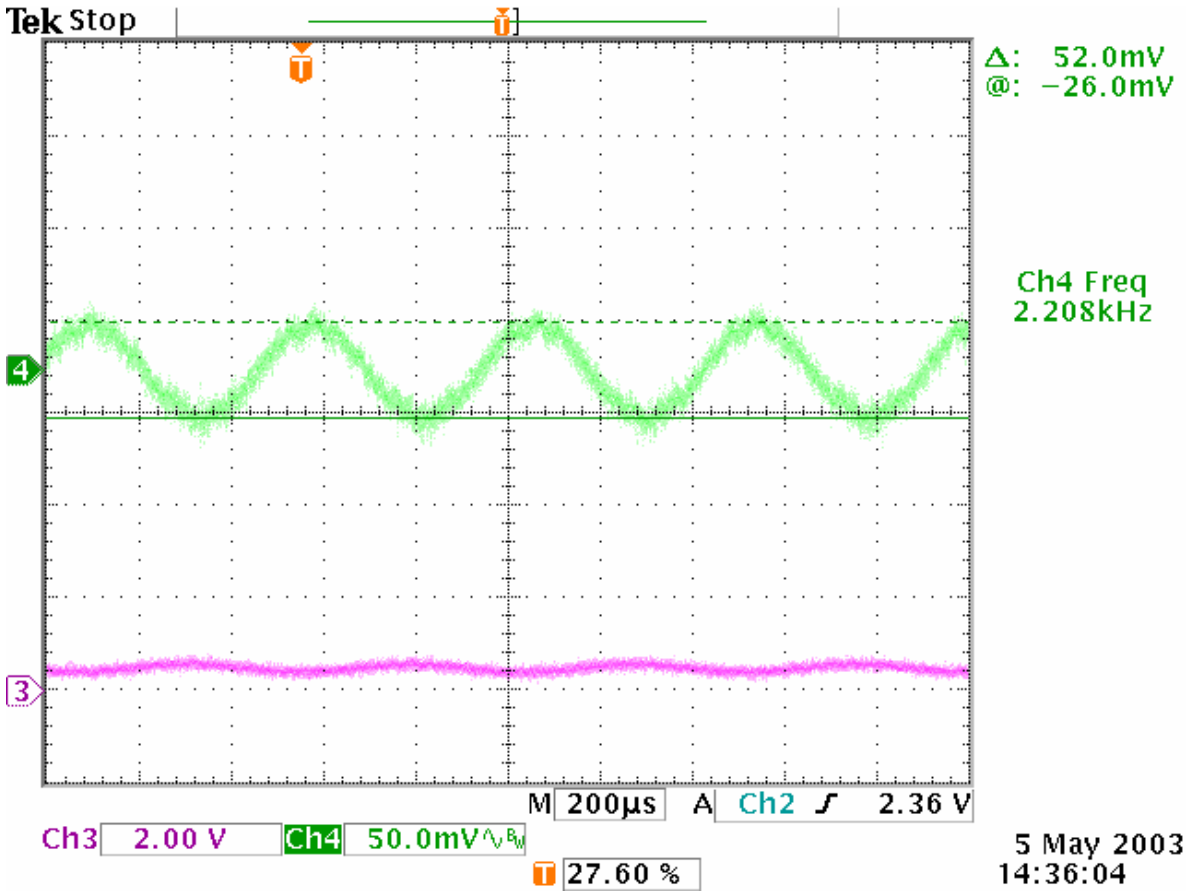
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 5 Volt

LSP MODULE AMPLITUDE MODULATION is set for 1dB depth

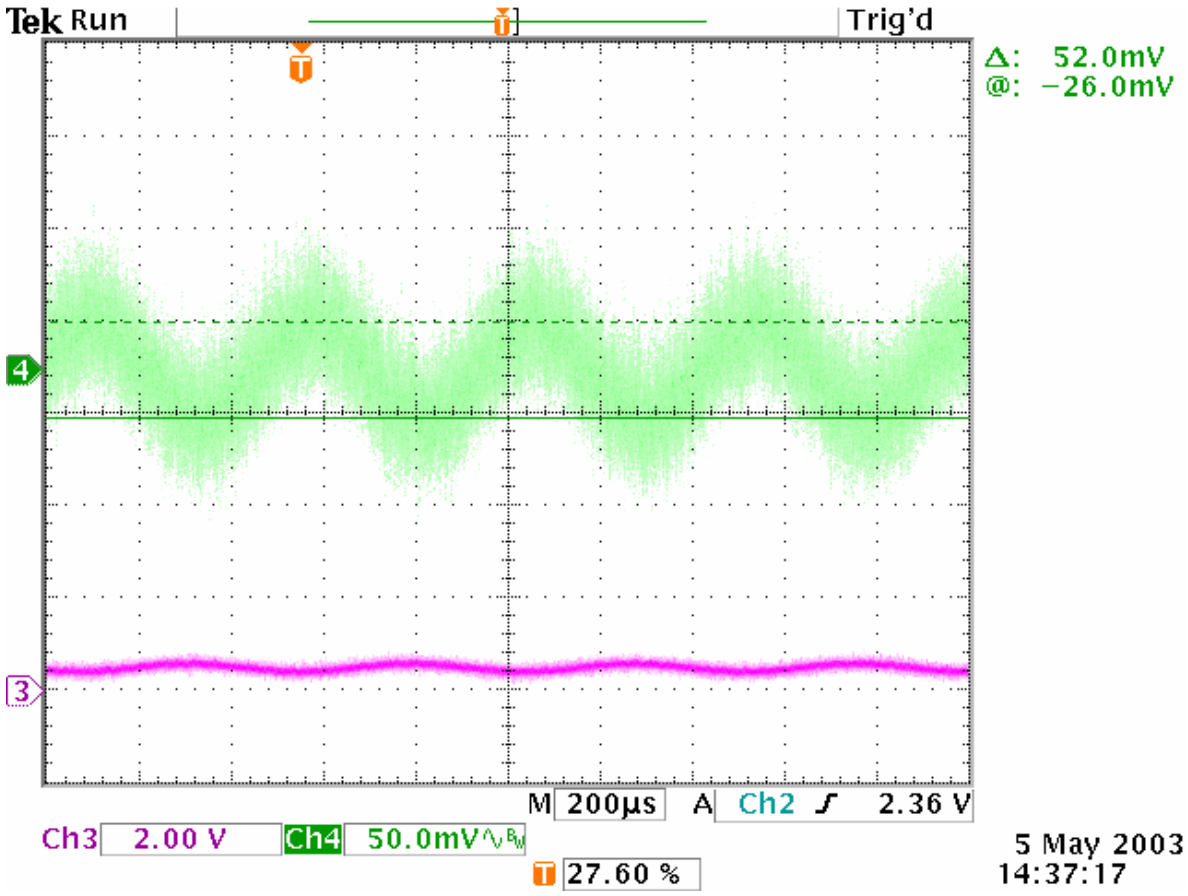
2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 1dB Depth Level Set at 10V

12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 10 Volt
LSP MODULE AMPLITUDE MODULATION is set for 1dB depth
2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 5dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

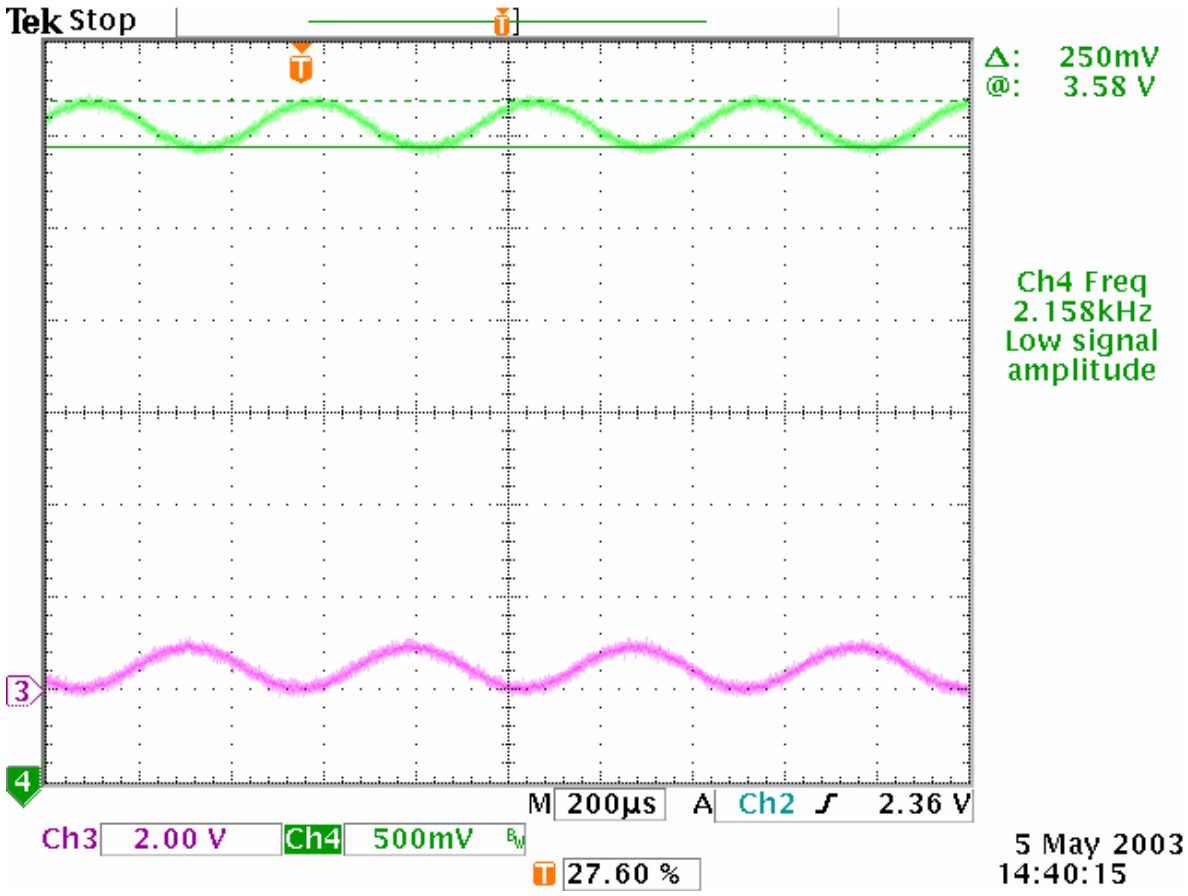
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 5 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 10dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

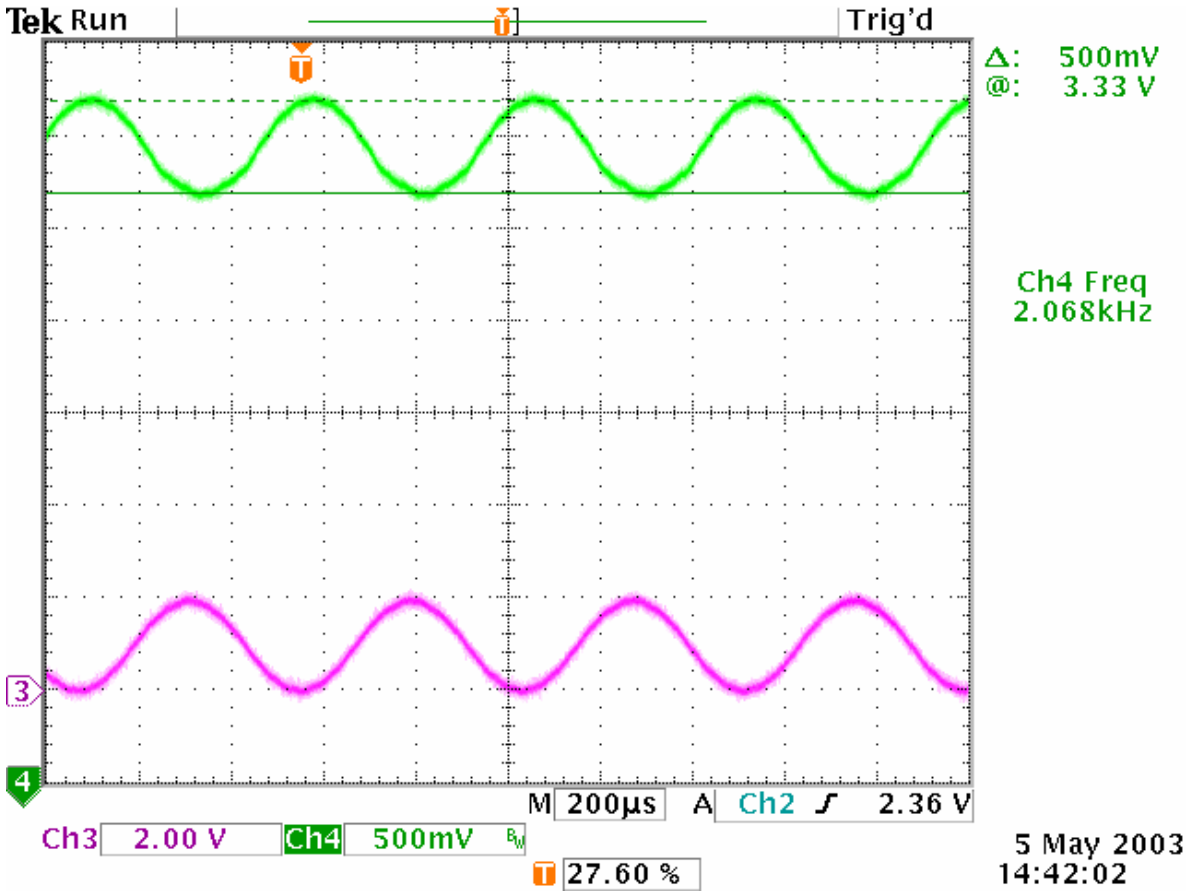
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 10 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 15dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

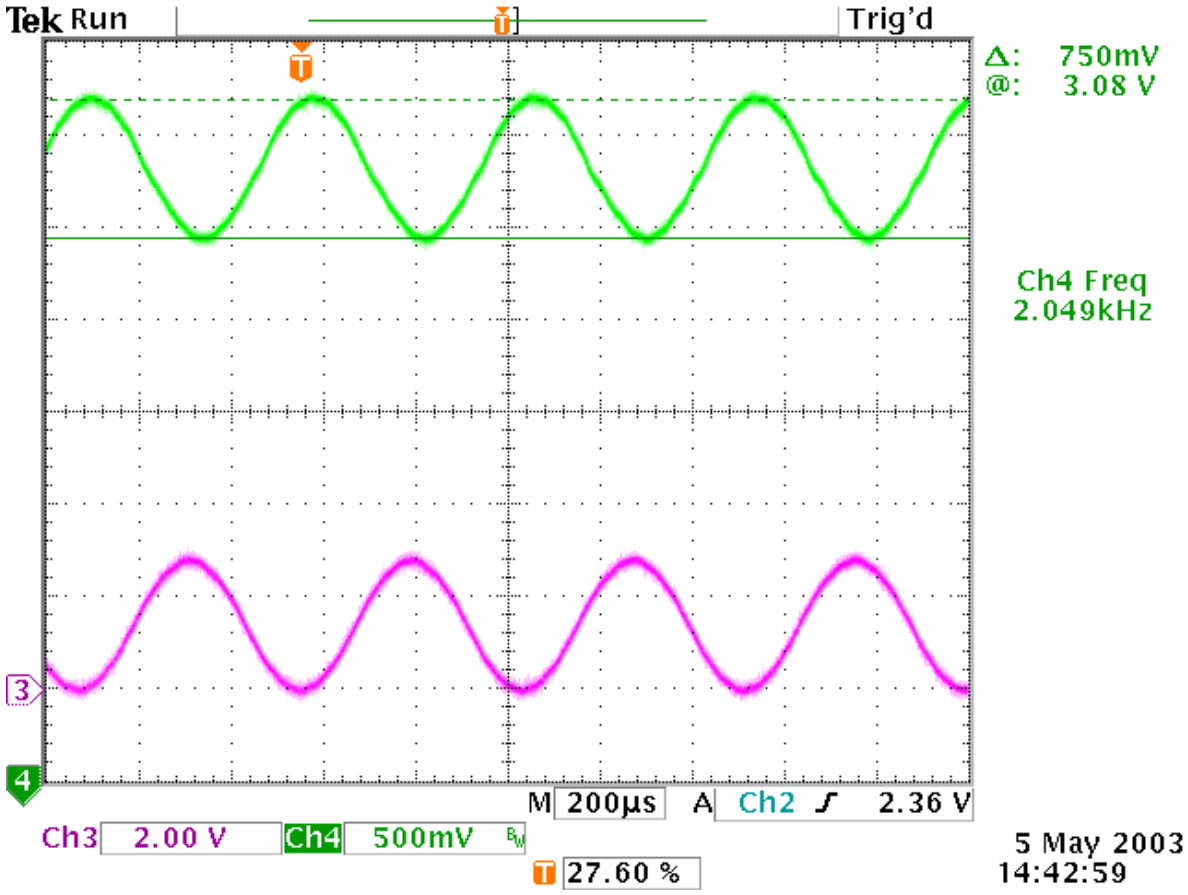
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 15 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 20dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

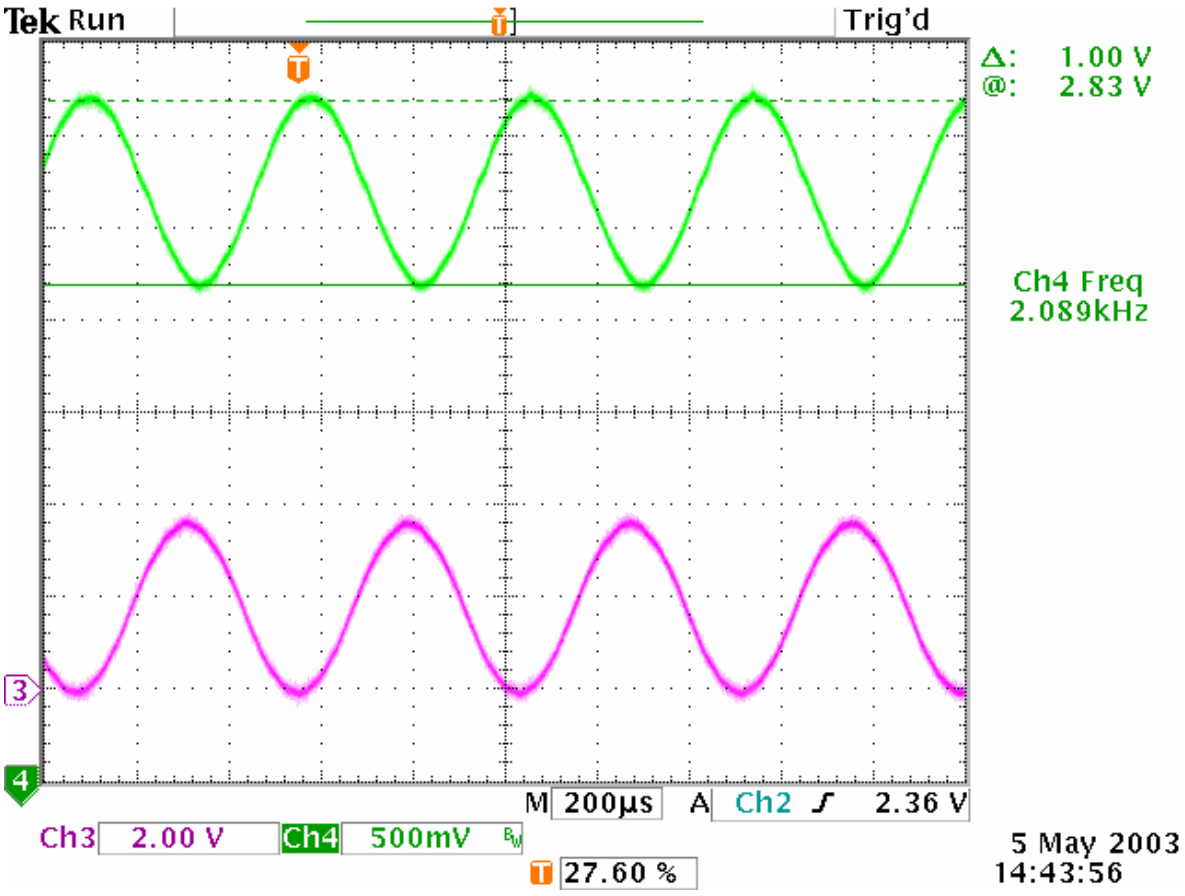
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 20 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 25dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

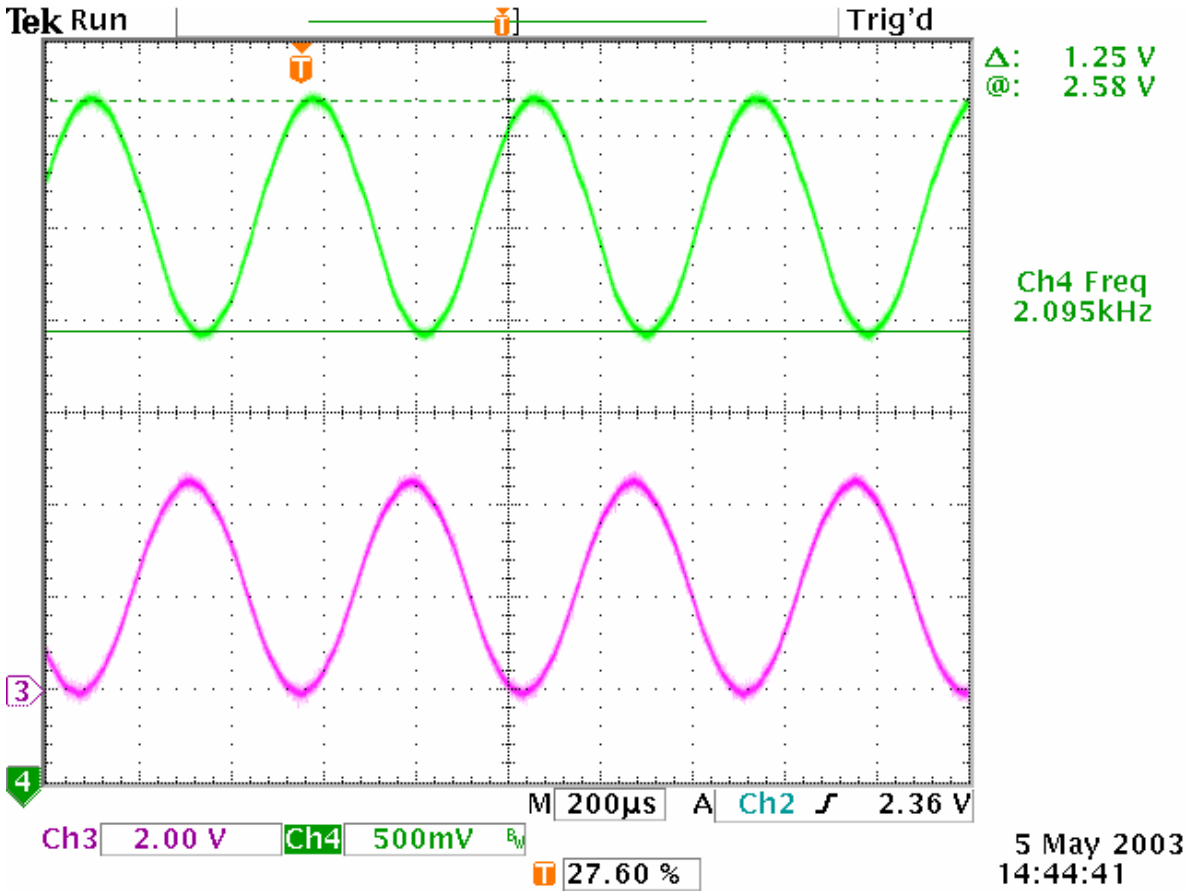
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 25 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 30dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

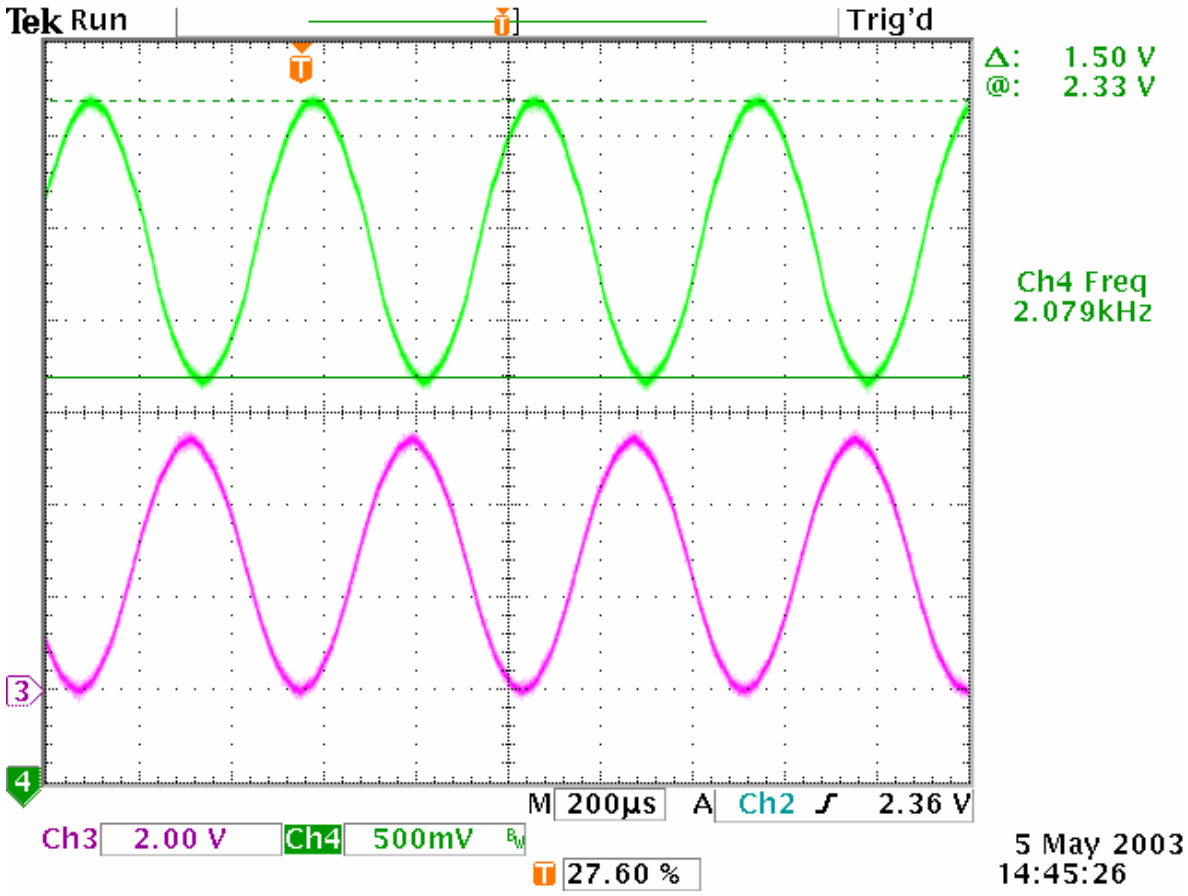
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 30 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 35dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

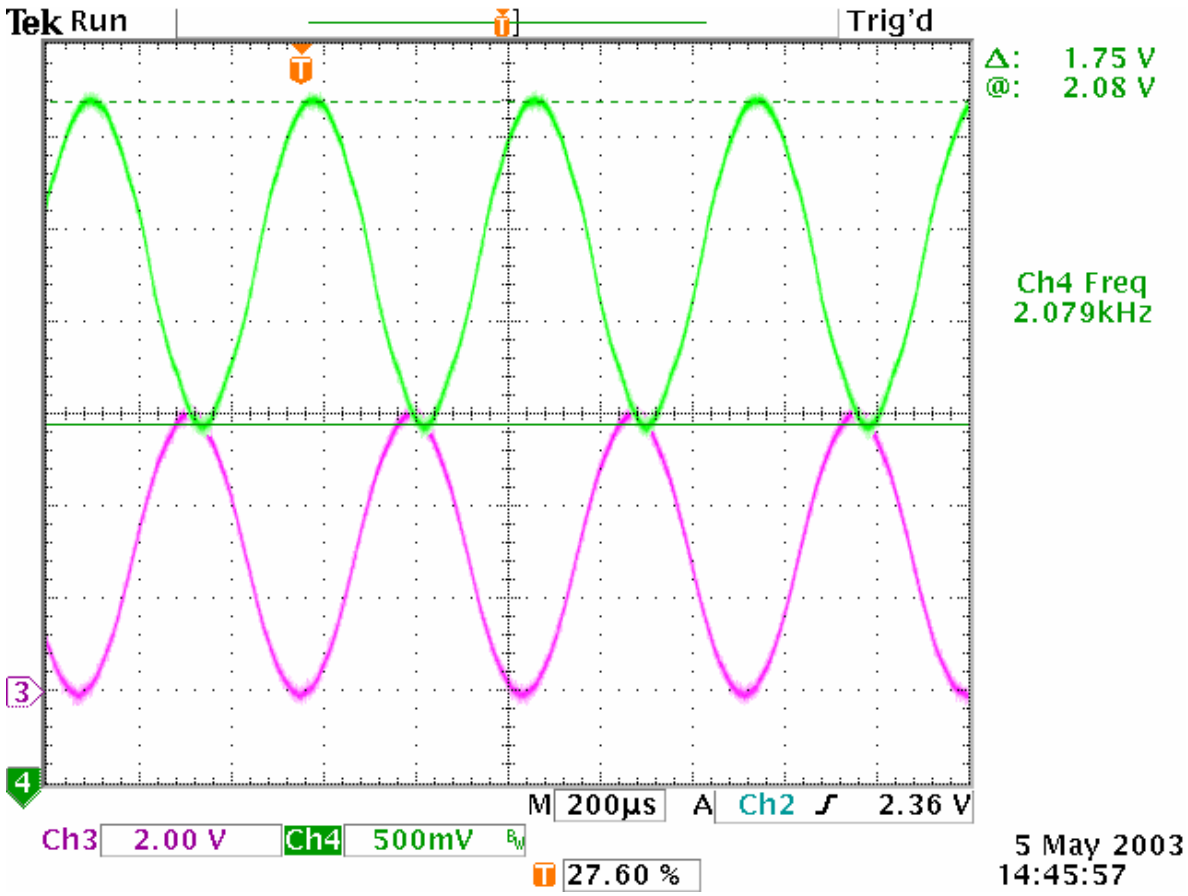
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 35 dB depth

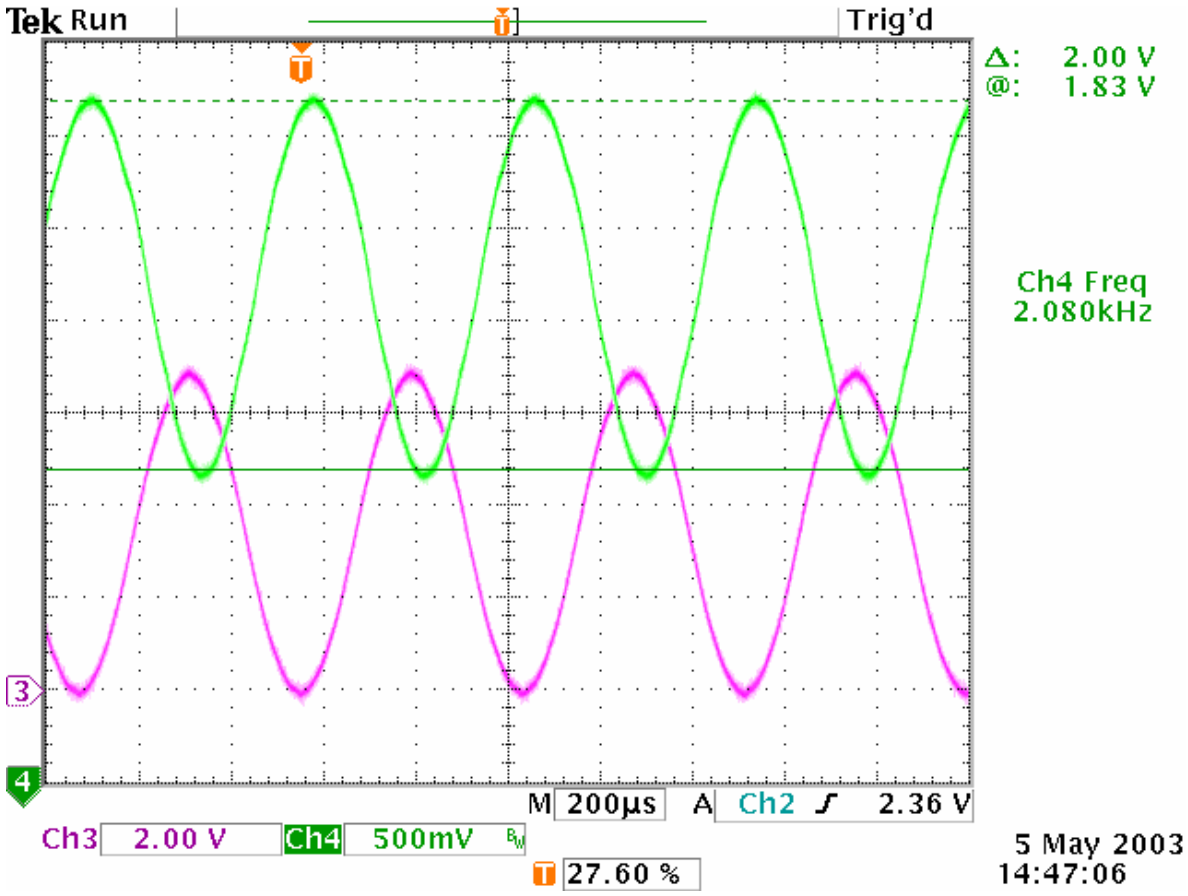
2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 40dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 1 Volt
LSP MODULE AMPLITUDE MODULATION is set for 40 dB depth
2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 45dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

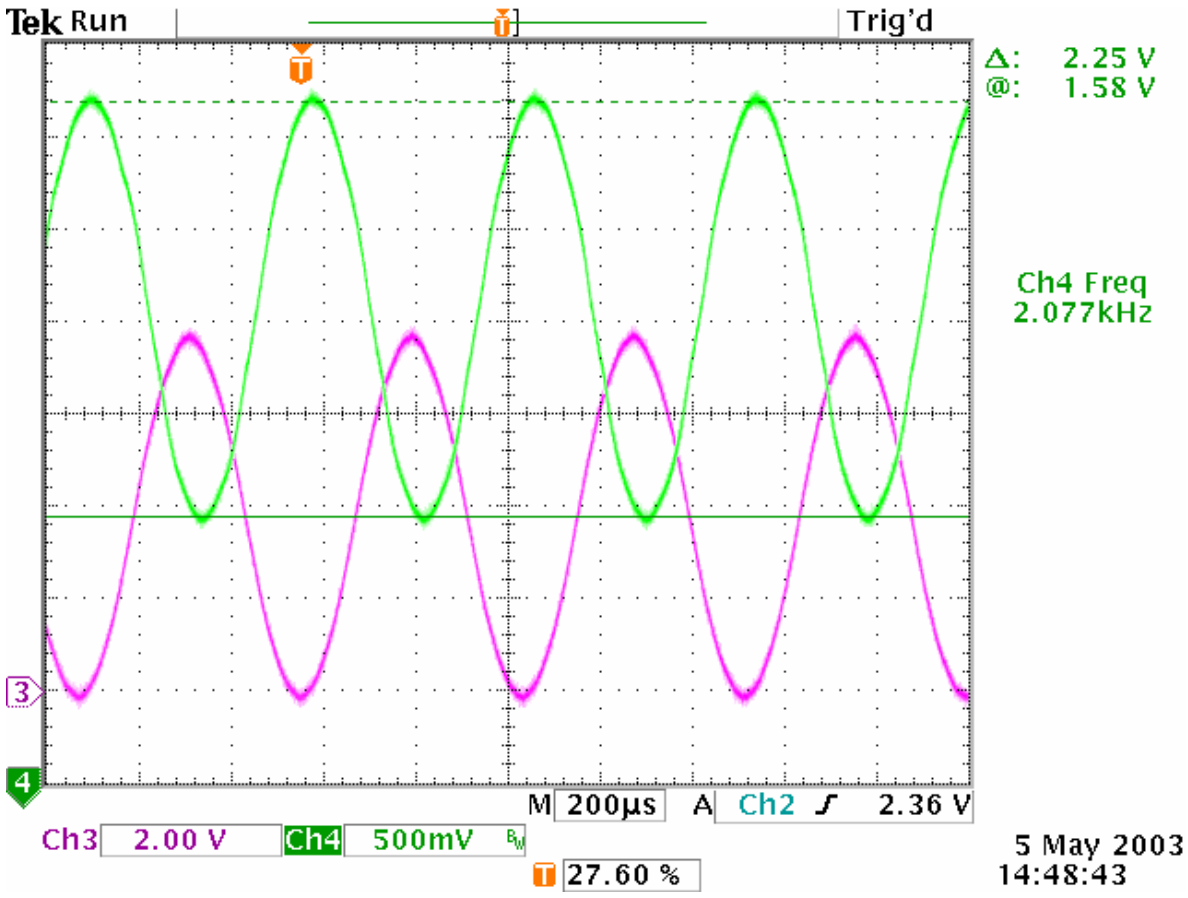
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 45 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 50dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

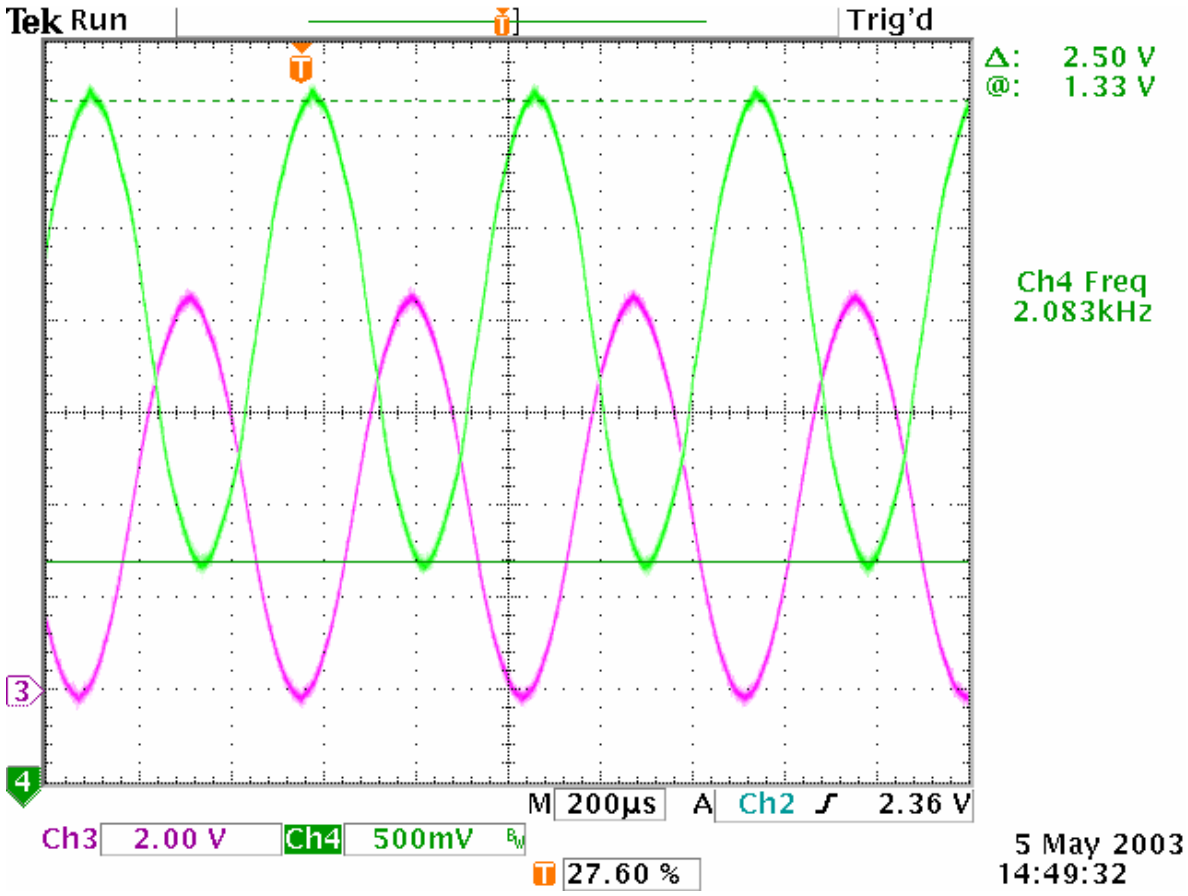
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 50 dB depth

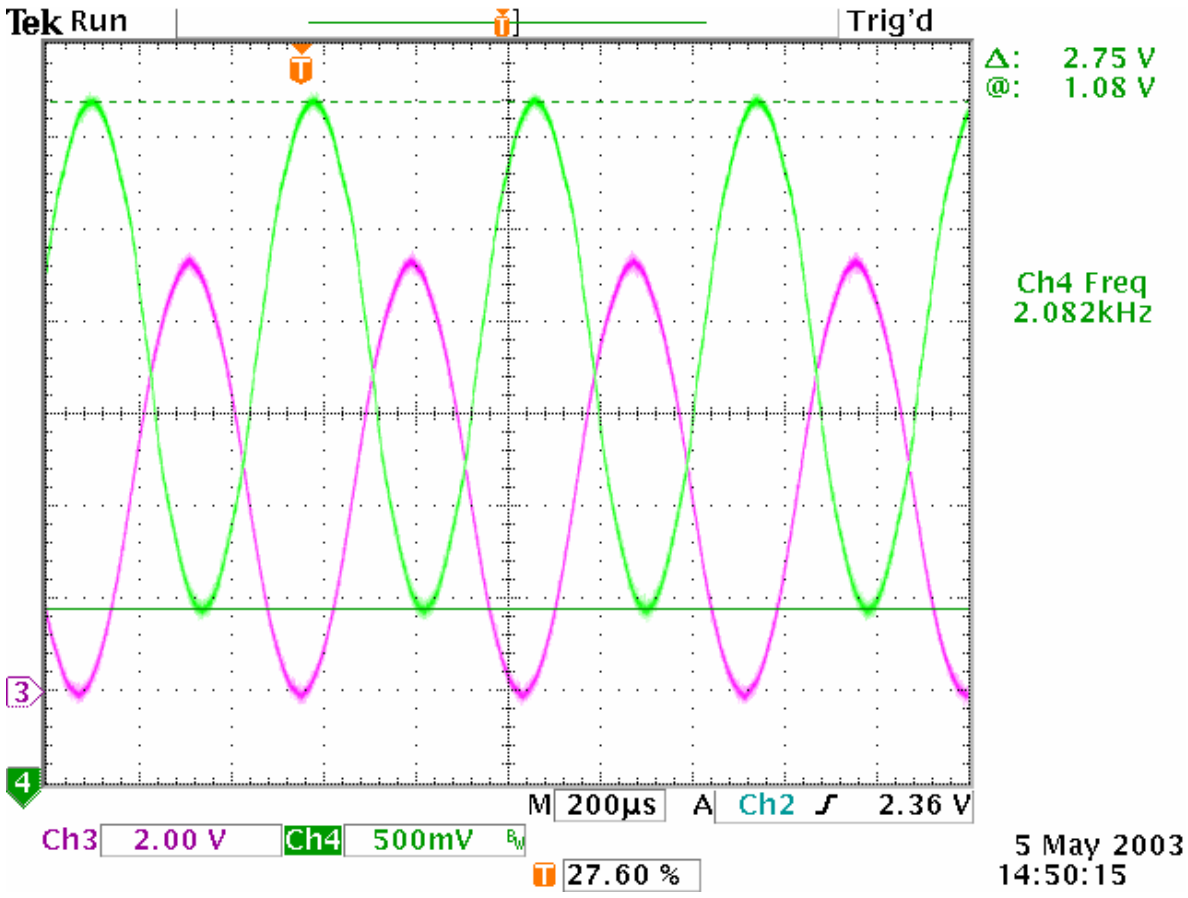
2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 55dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 1 Volt
LSP MODULE AMPLITUDE MODULATION is set for 55 dB depth
2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 60dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

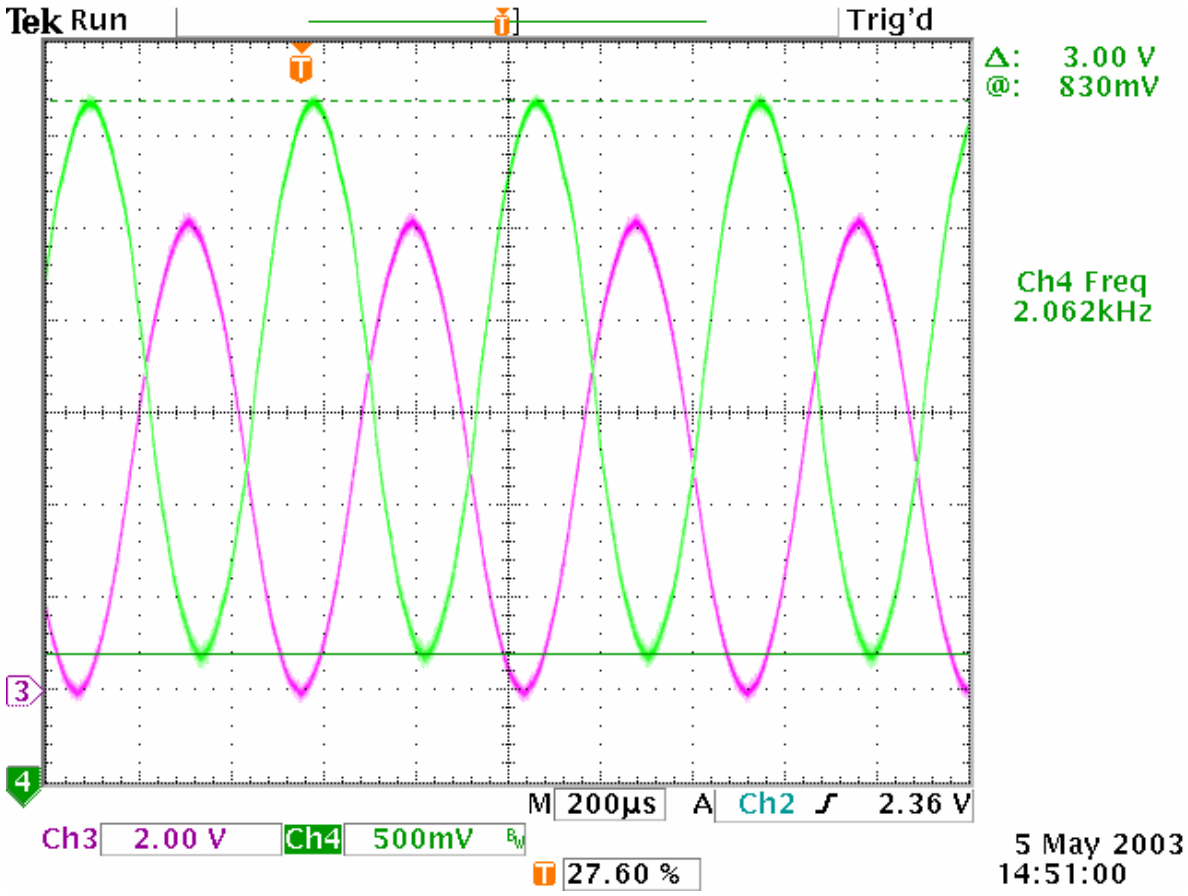
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 60 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 65dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

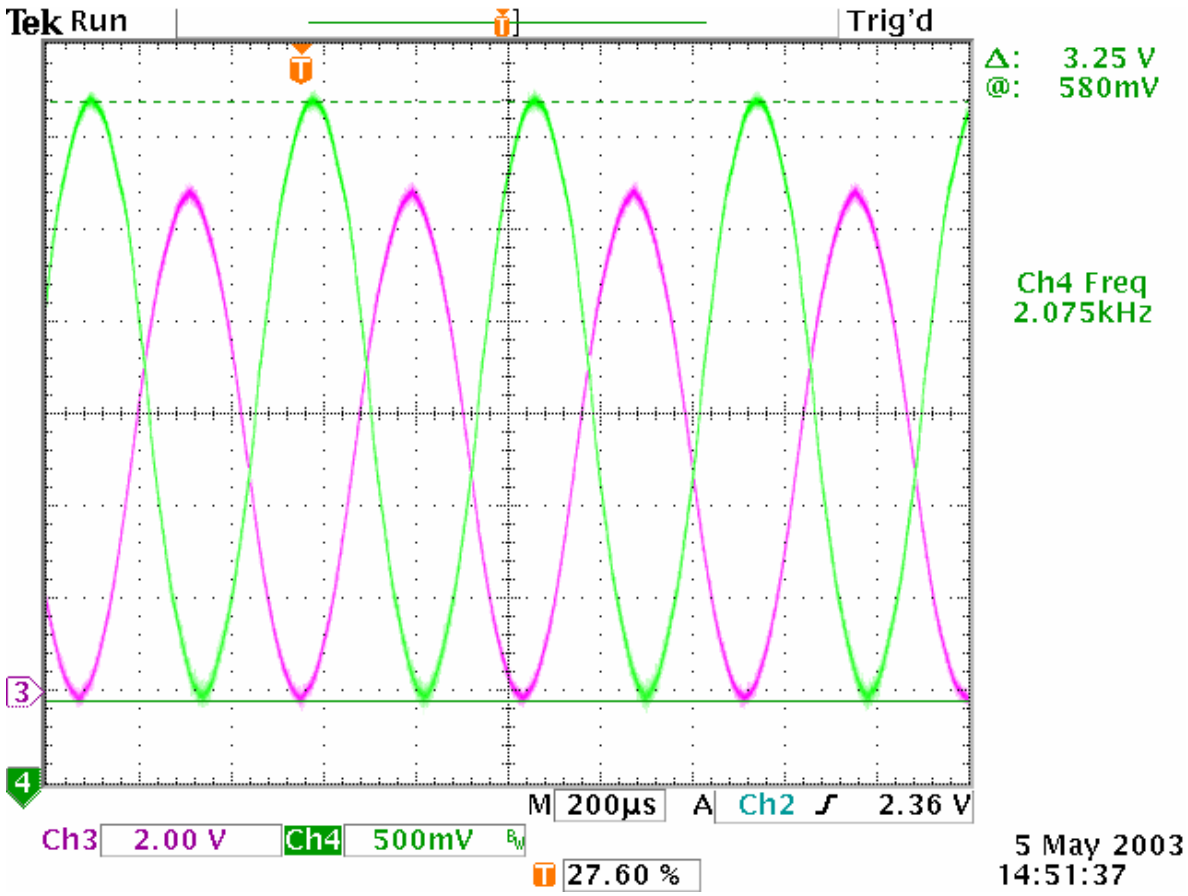
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 65 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

2kHz Sine Wave 70dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

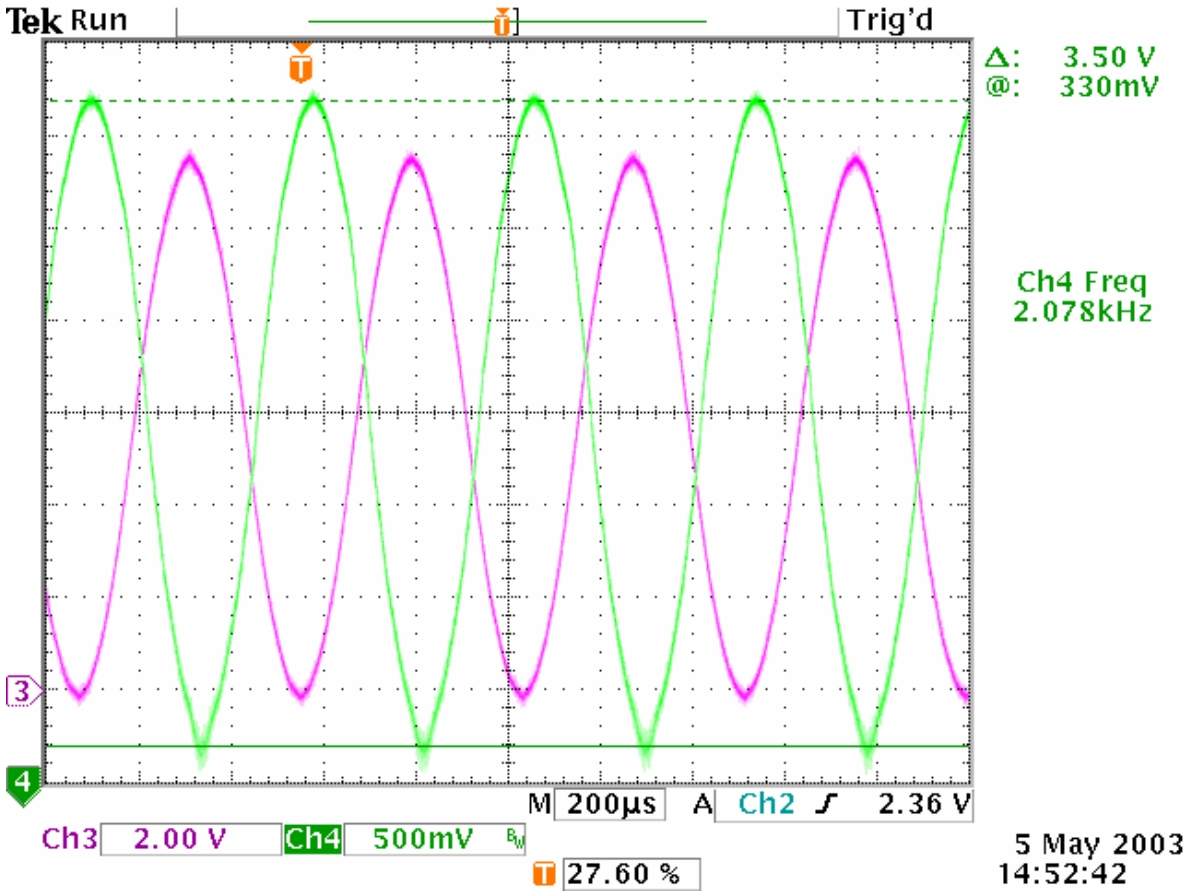
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 70 dB depth

2 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

1 Hz Sine Wave 60dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

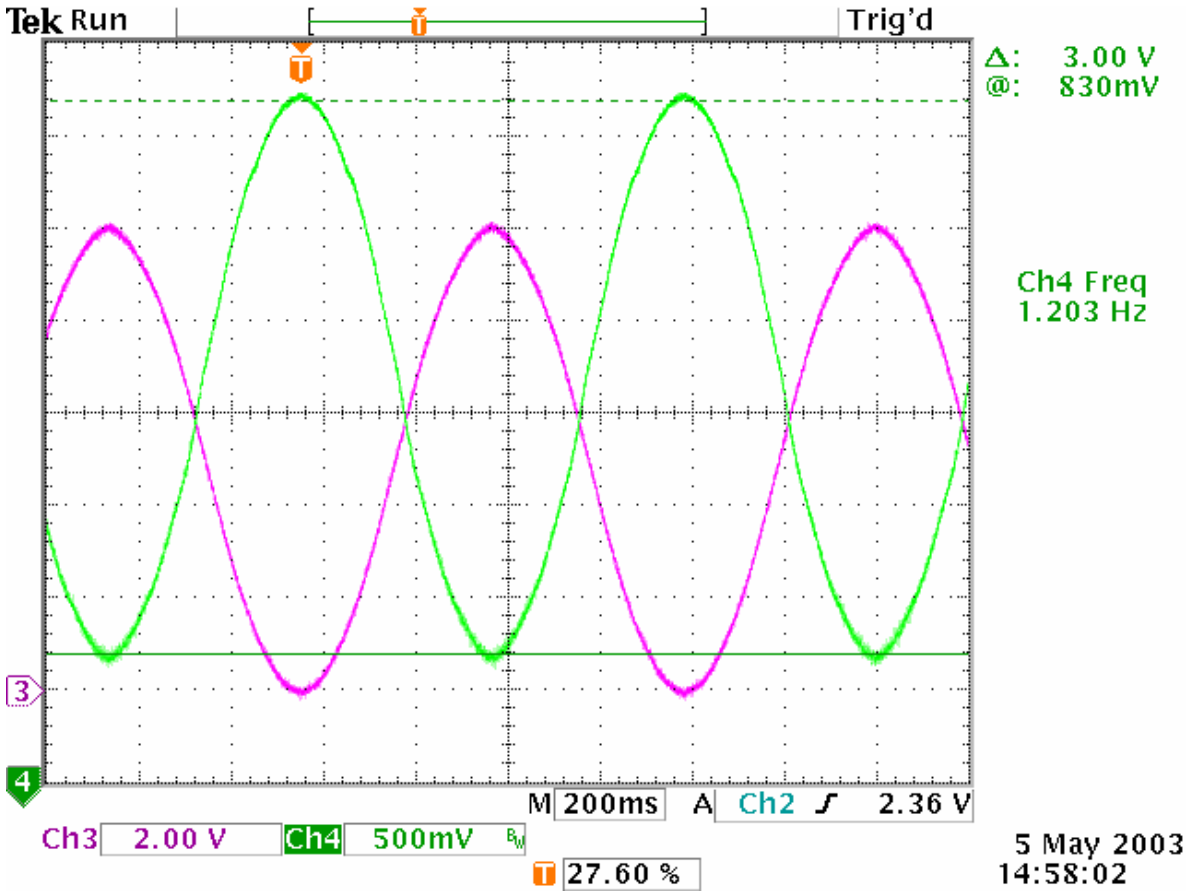
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 60 dB depth

1 Hz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 5dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

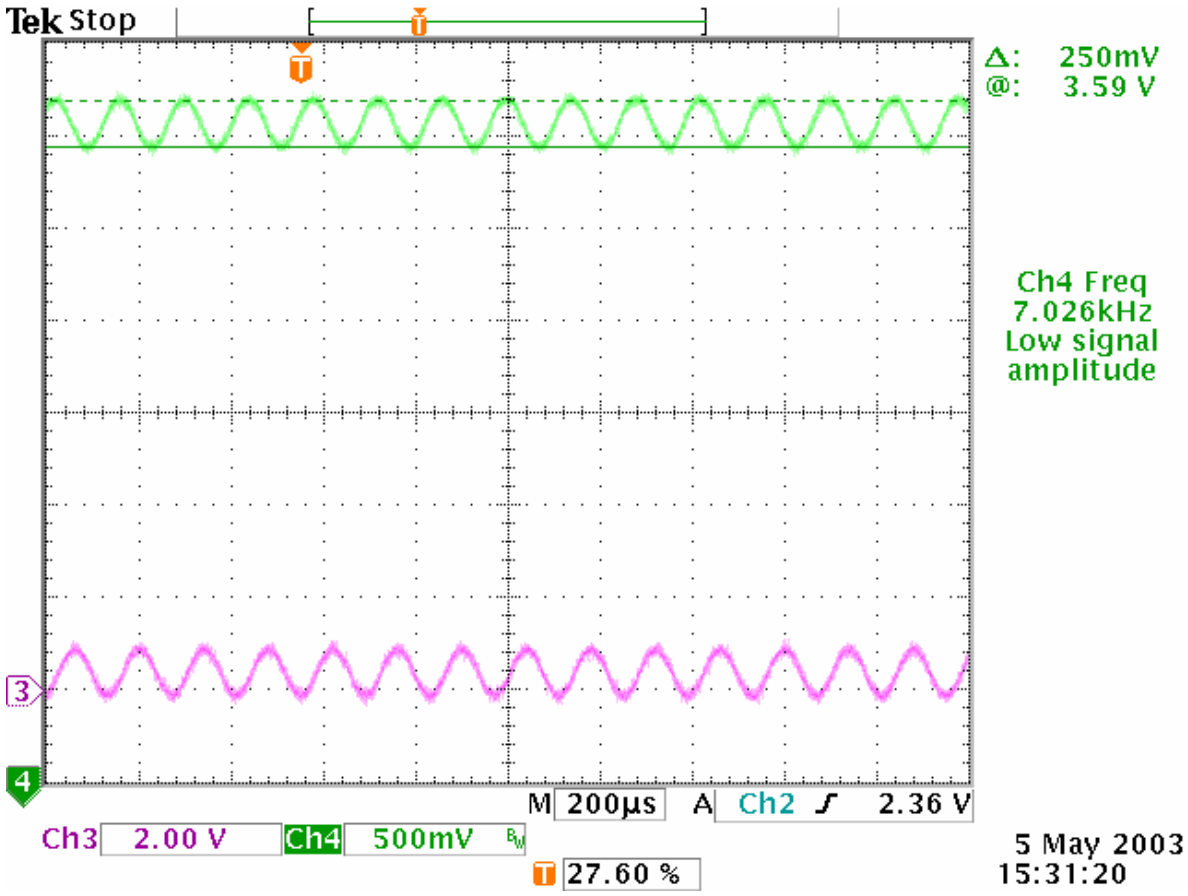
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 5 dB depth

7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 10dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

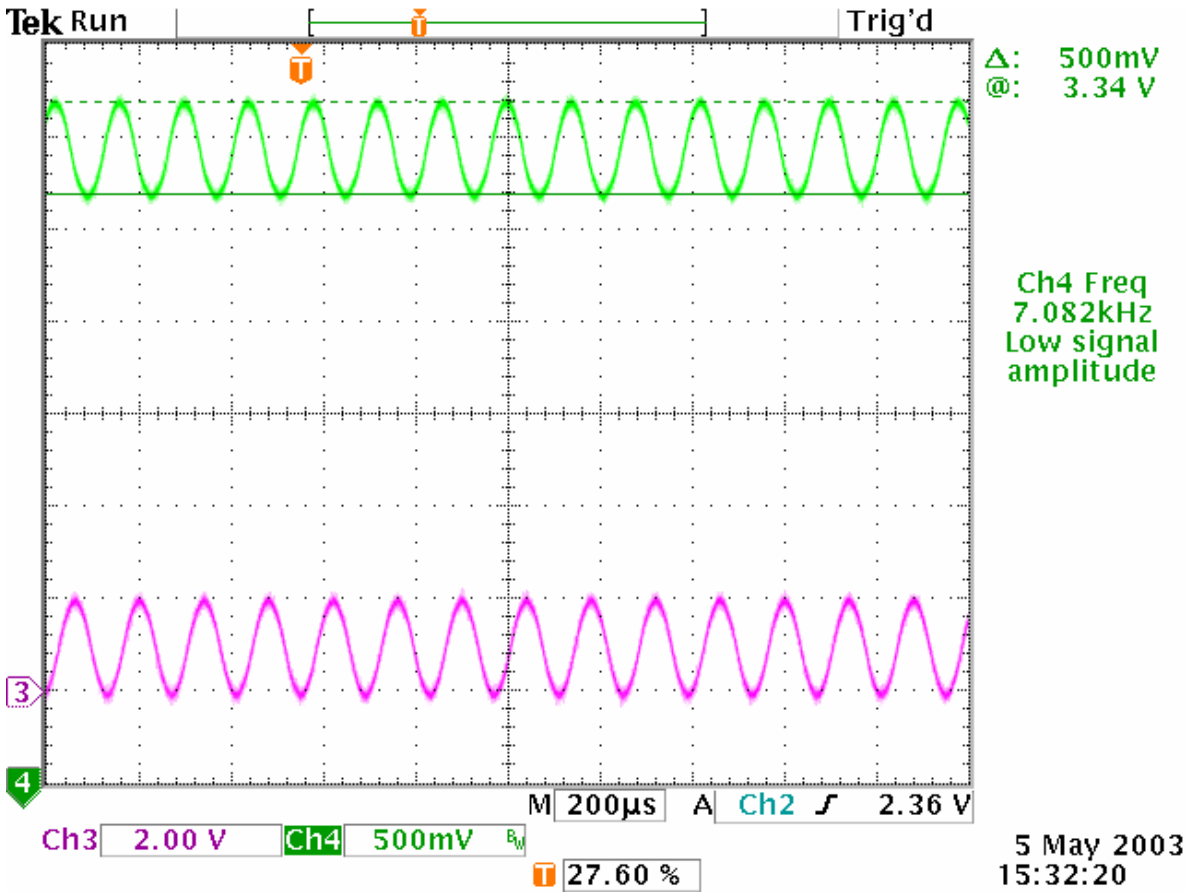
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 10 dB depth

7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 15dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

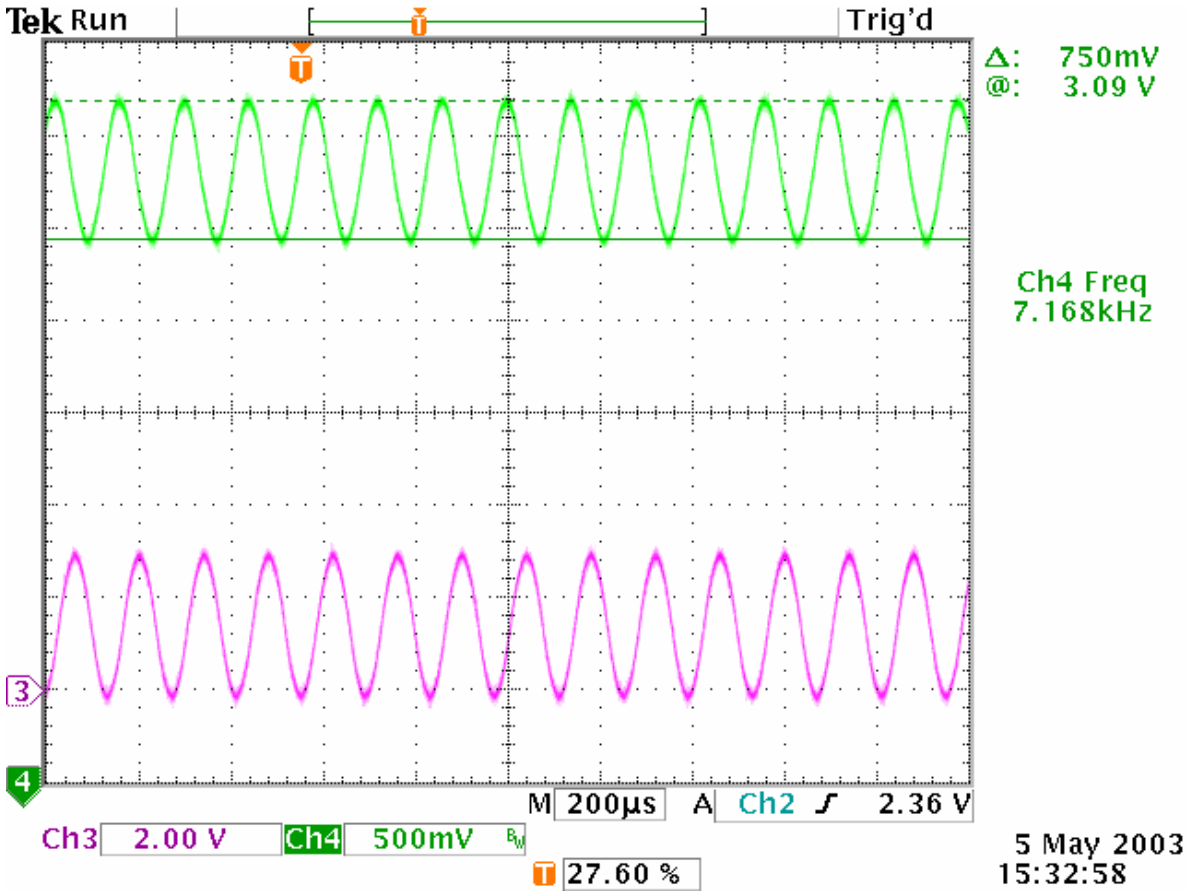
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 15 dB depth

7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 20dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

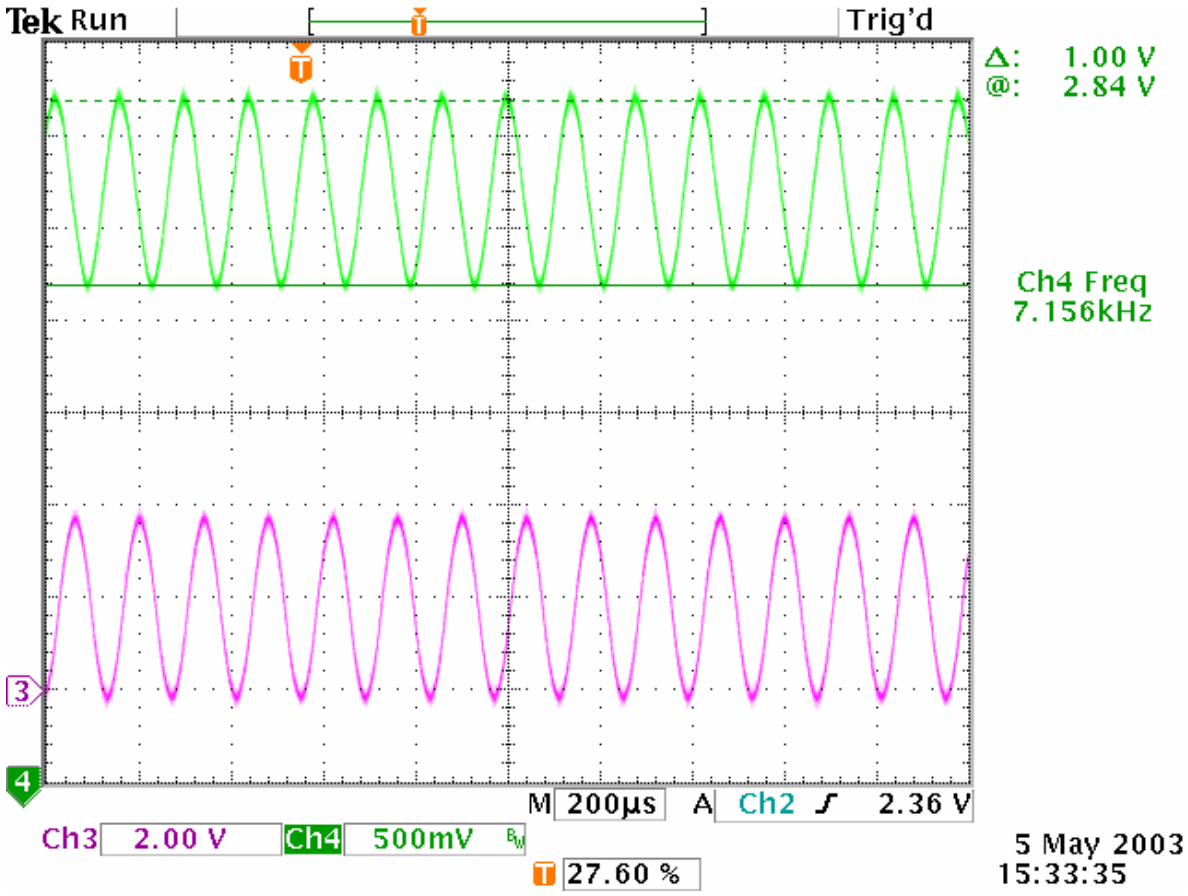
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 20 dB depth

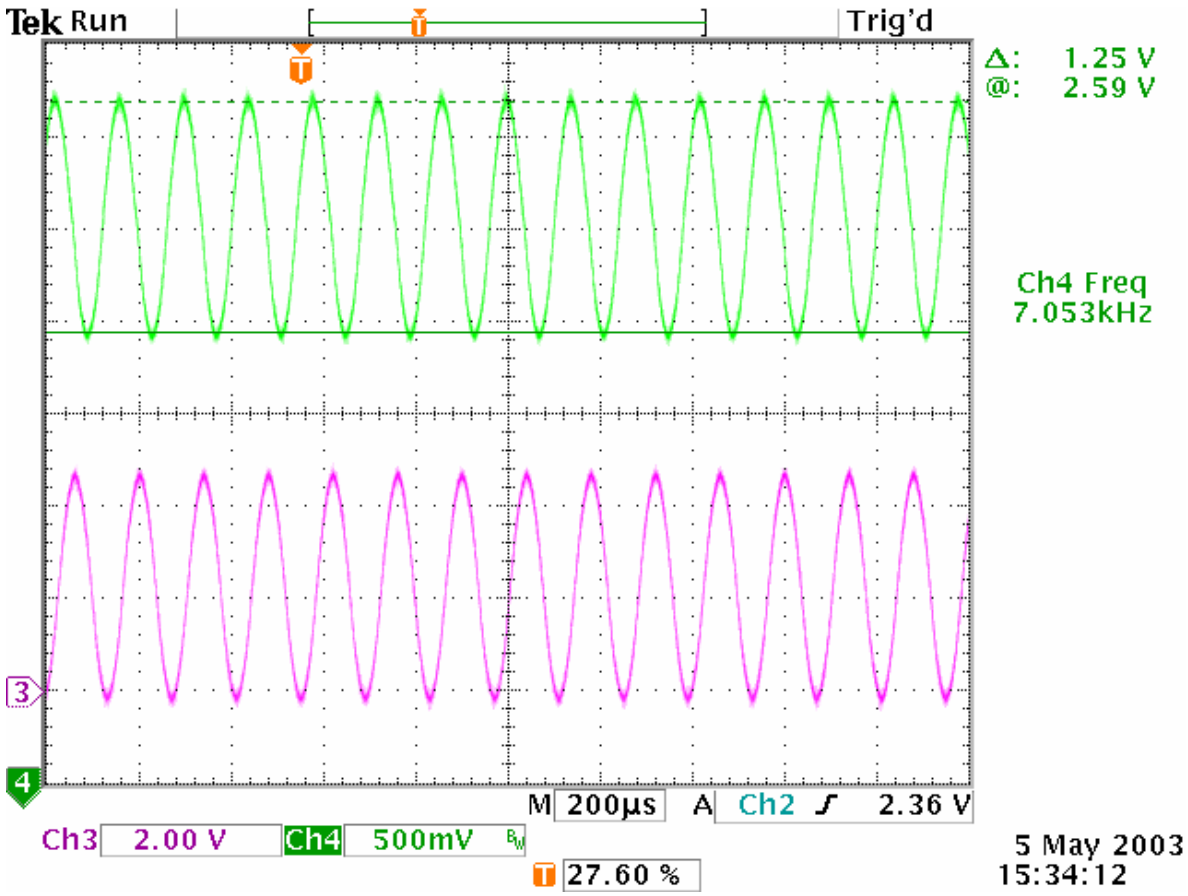
7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 25dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 1 Volt
LSP MODULE AMPLITUDE MODULATION is set for 25 dB depth
7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 30dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

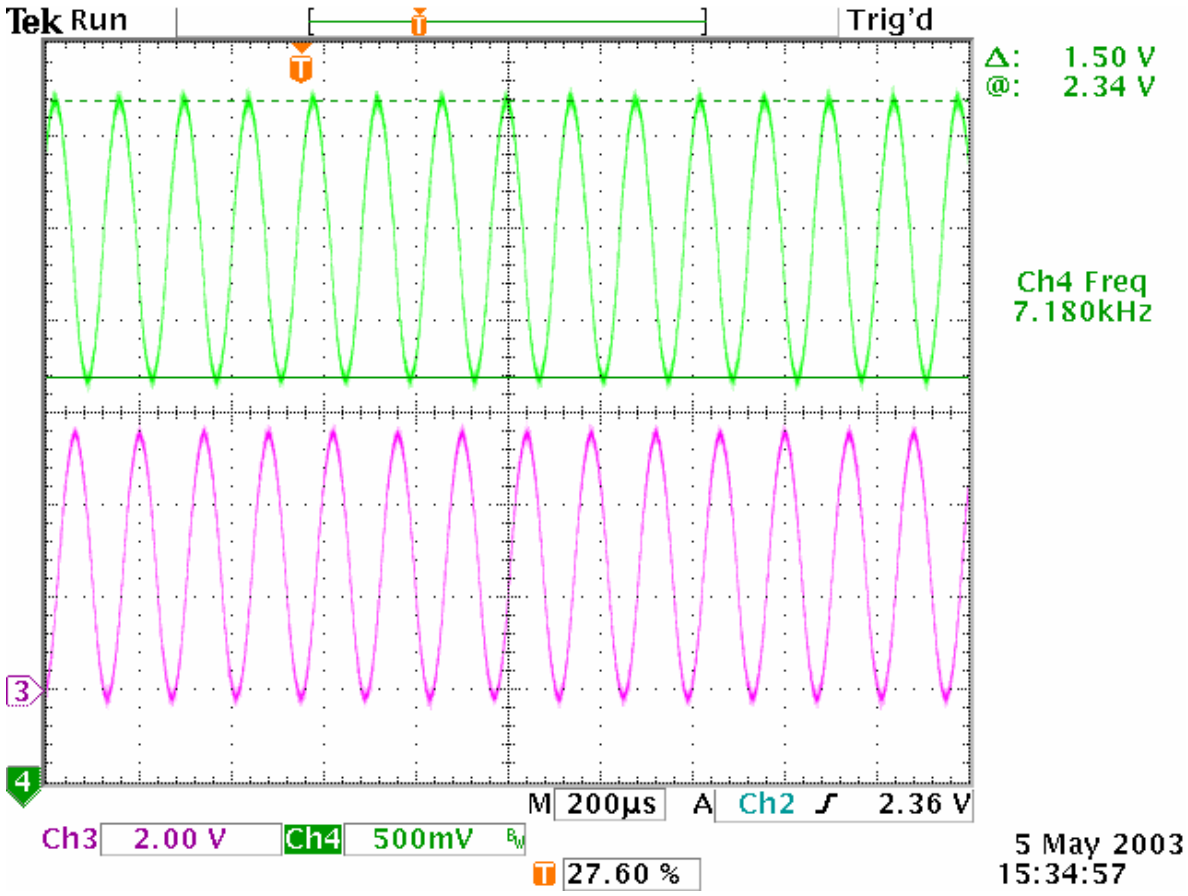
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 30 dB depth

7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 35dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

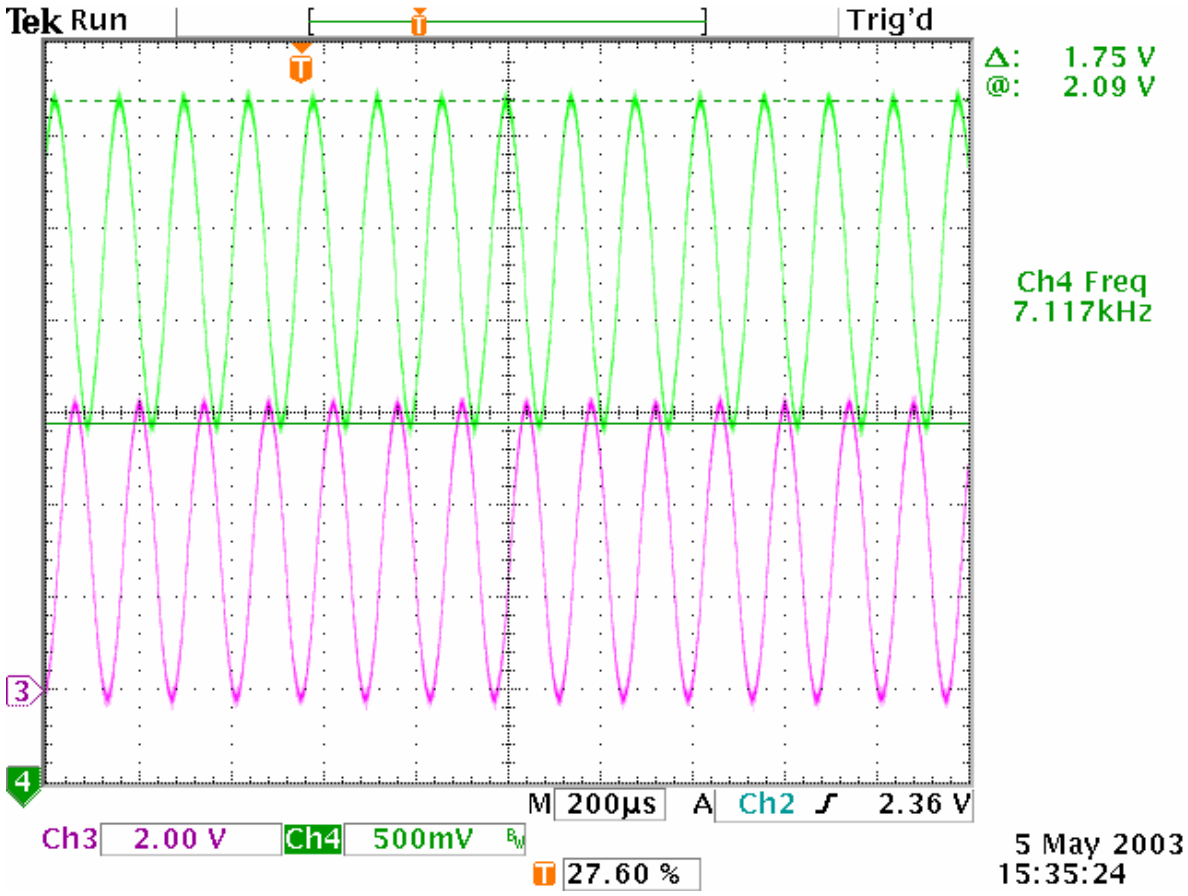
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 35 dB depth

7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 40dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

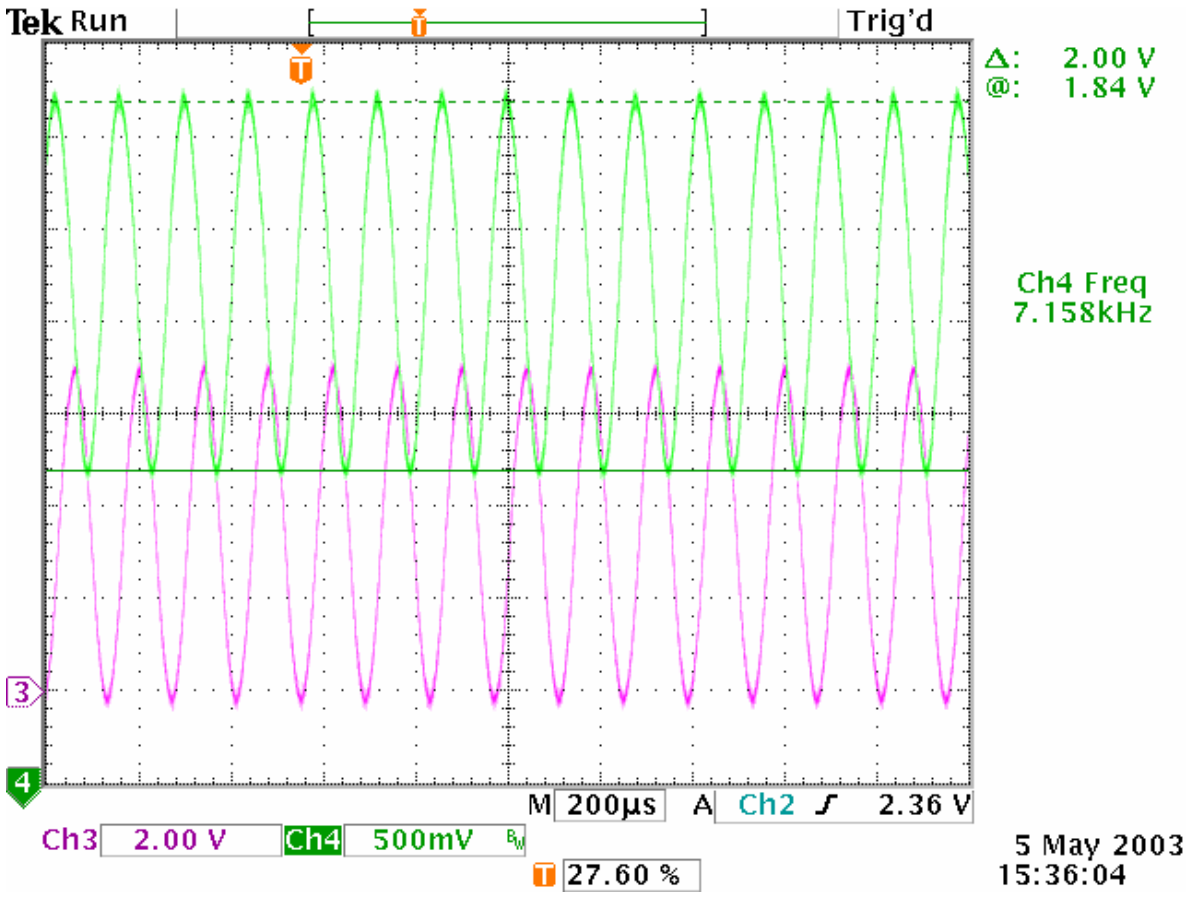
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 40 dB depth

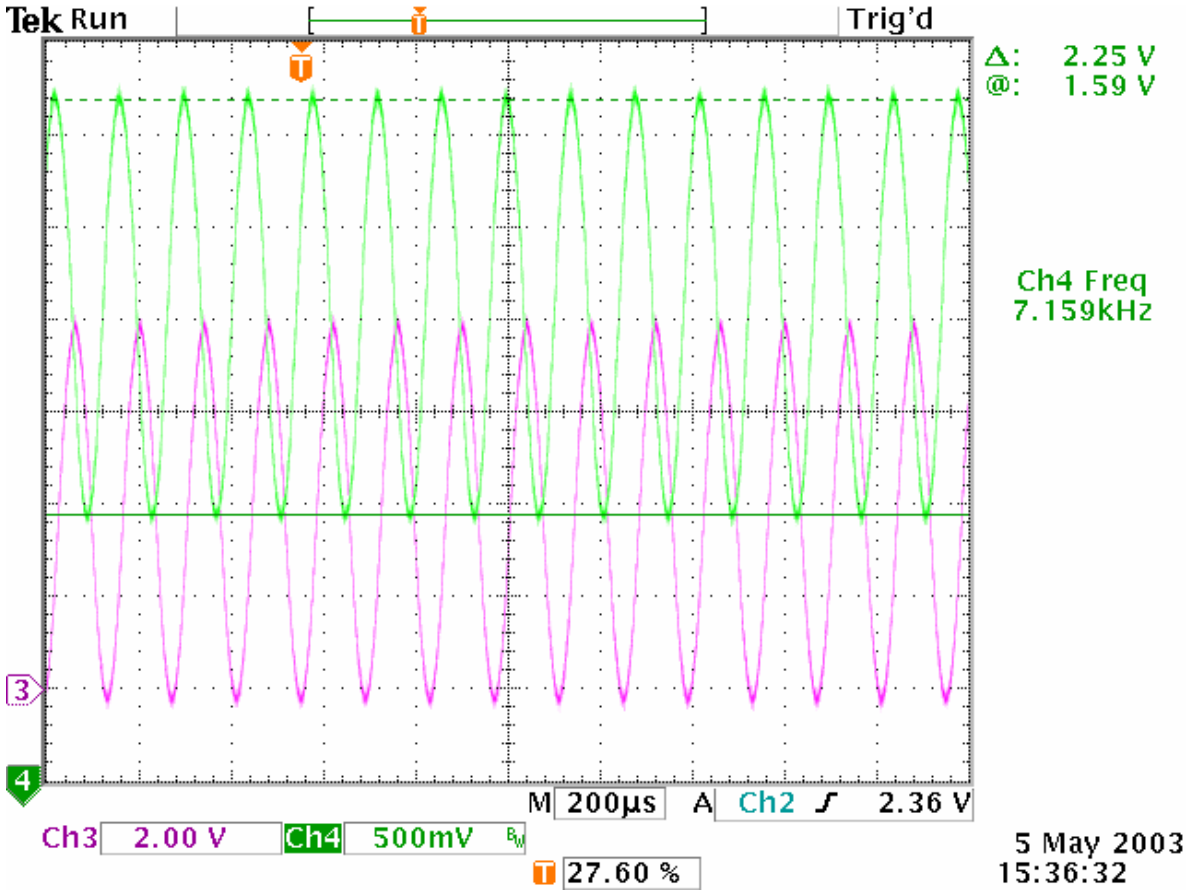
7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 45dB Depth Level Set at 1V

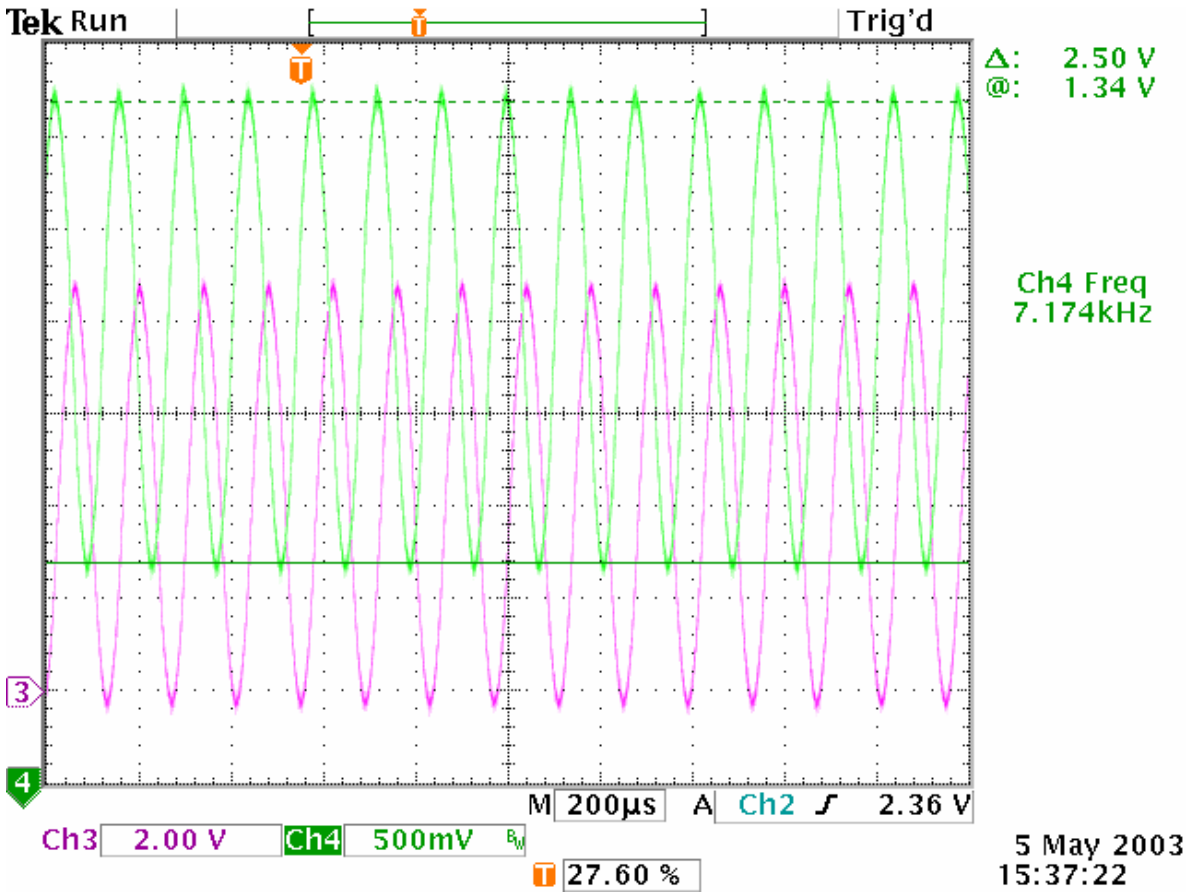
12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 1 Volt
LSP MODULE AMPLITUDE MODULATION is set for 45 dB depth
7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 50dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 1 Volt
LSP MODULE AMPLITUDE MODULATION is set for 50 dB depth
7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 55dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

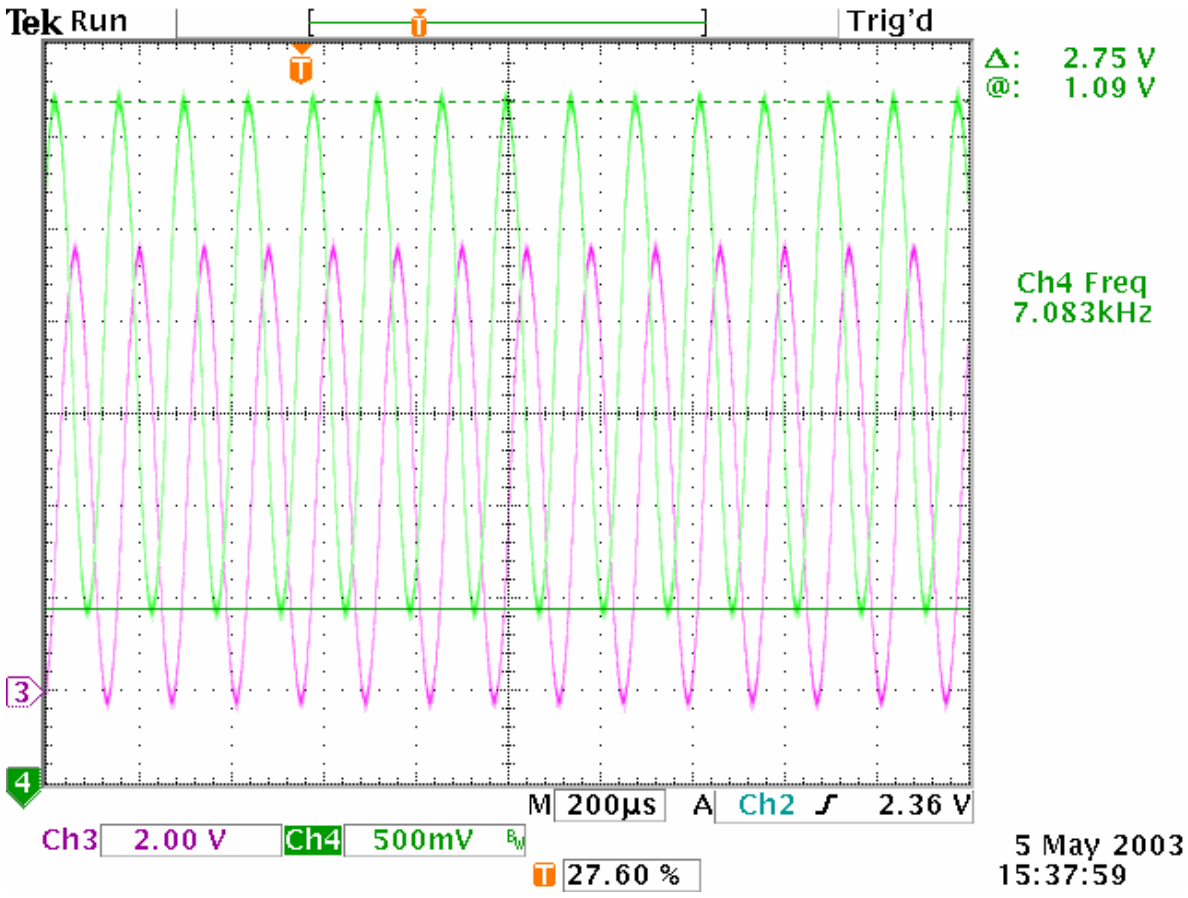
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 55 dB depth

7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 60 dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

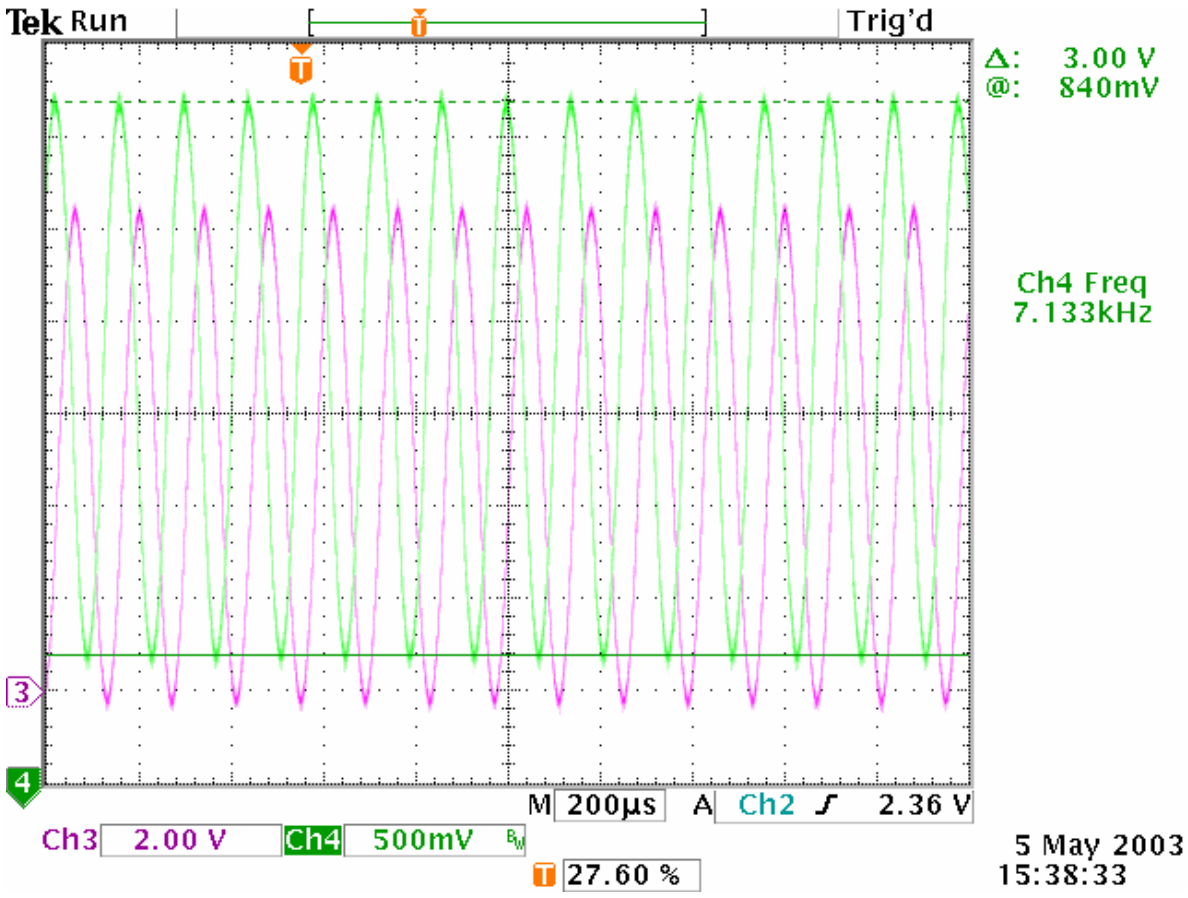
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

LSP MODULE LEVEL SET @ 1 Volt

LSP MODULE AMPLITUDE MODULATION is set for 60 dB depth

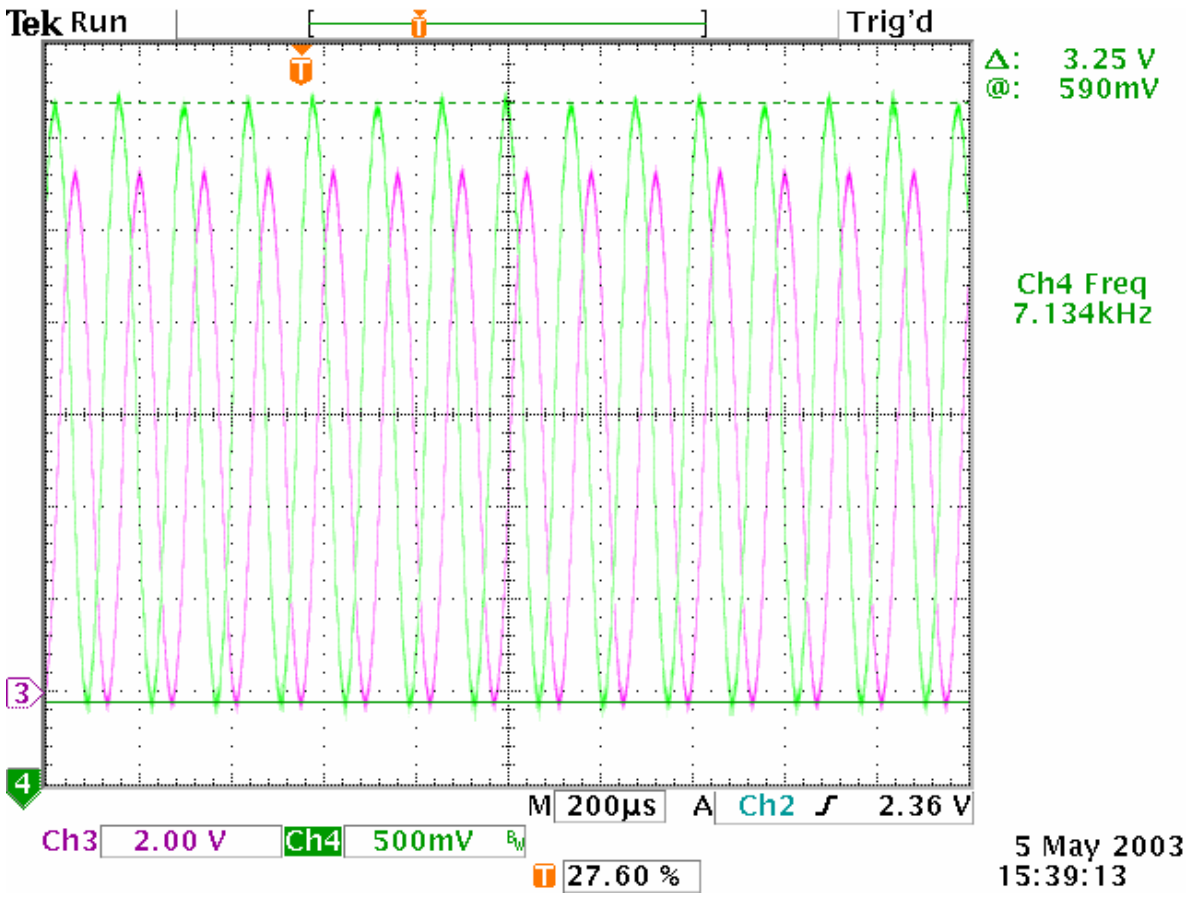
7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 65dB Depth Level Set at 1V

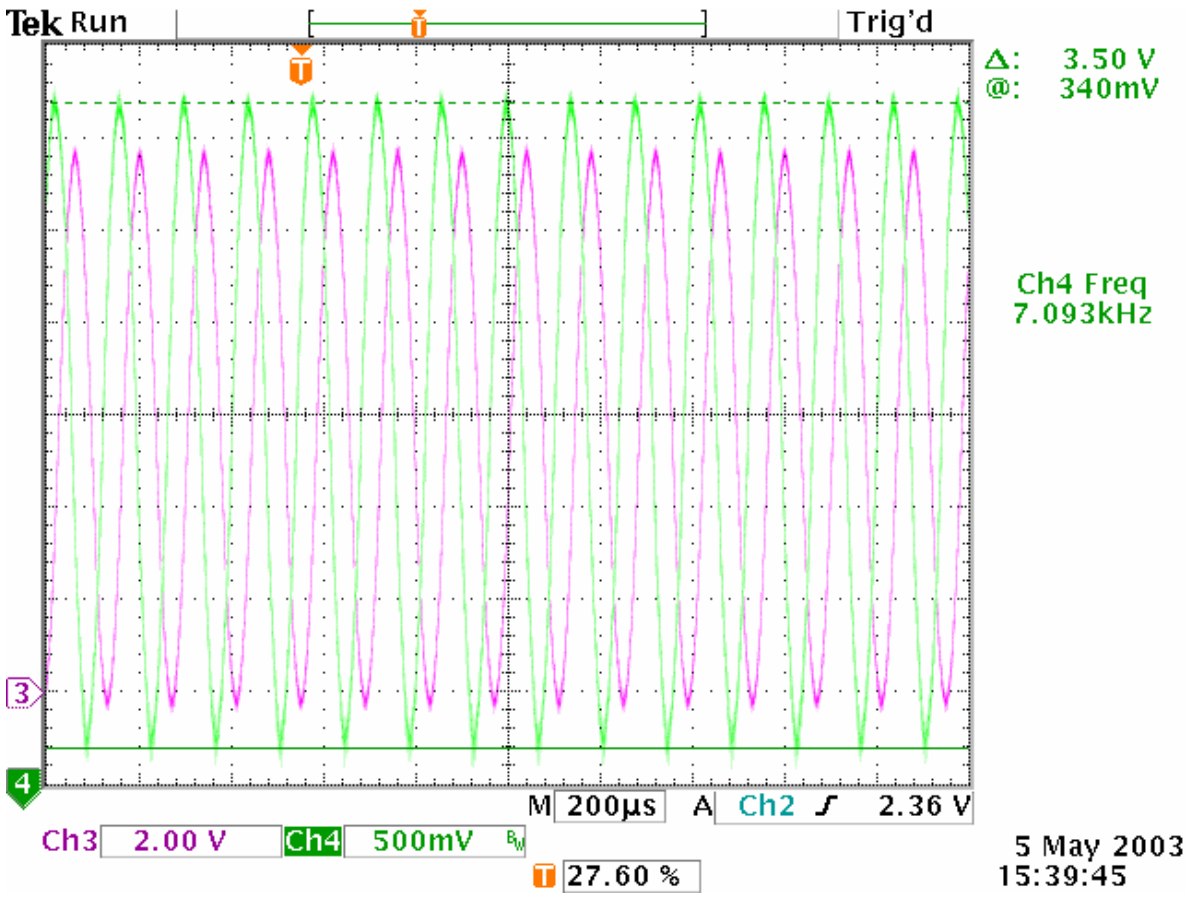
12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 1 Volt
LSP MODULE AMPLITUDE MODULATION is set for 65 dB depth
7 kHz Sine Wave



SCAN MODULATION SINE WAVE RESPONSE

7kHz Sine Wave 70 dB Depth Level Set at 1V

12 dBm Input Power @ 4 GHz
DLVA @ 50mV / dB -or- 500mV / 10dB
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace
CONTROL SIGNAL : Purple Trace
LSP MODULE LEVEL SET @ 1 Volt
LSP MODULE AMPLITUDE MODULATION is set for 70 dB depth
7 kHz Sine Wave



SCAN MODULATION PULSE REPONSE

SCAN MODULATION PULSE RESPONSE
"FALL TIME"

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

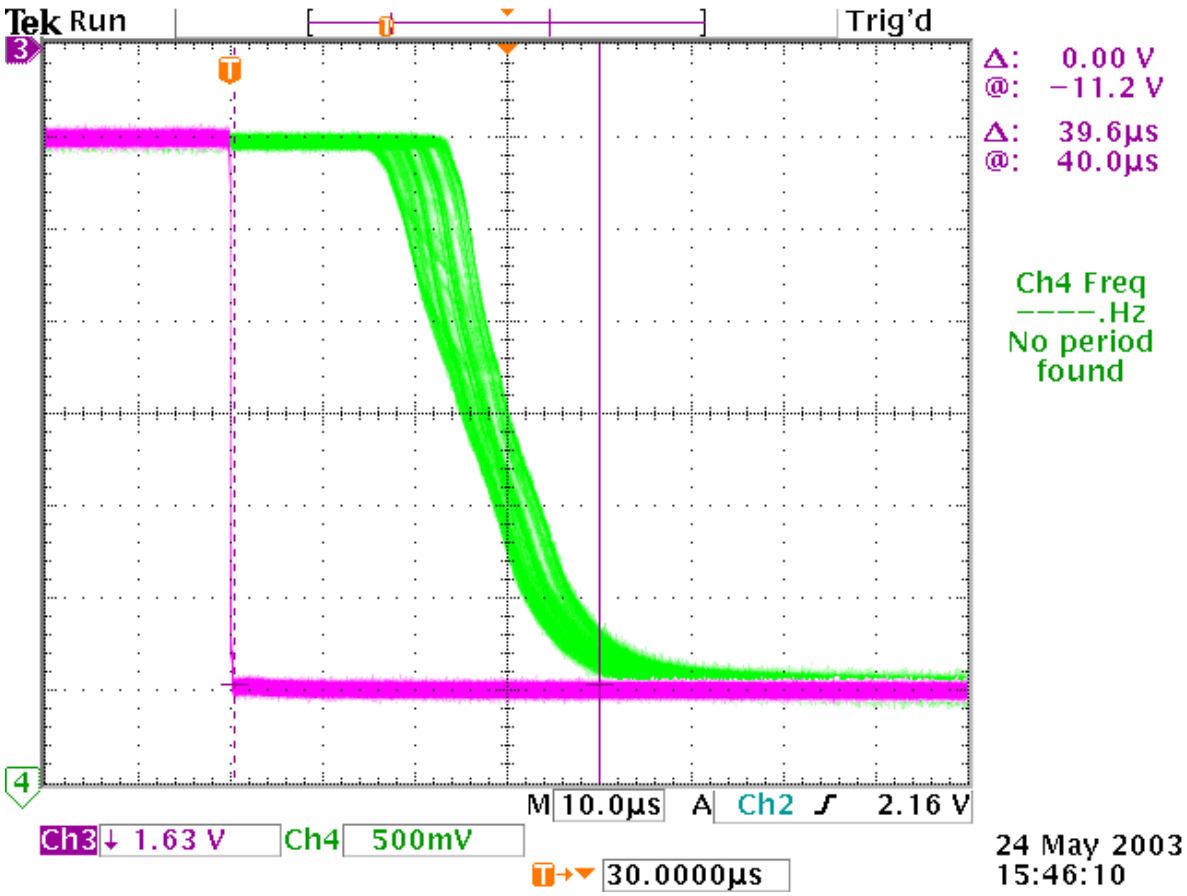
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C

FALL TIME= 39.6 µS (Spec is 50µS)



SCAN MODULATION PULSE RESPONSE

"RISE TIME"

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

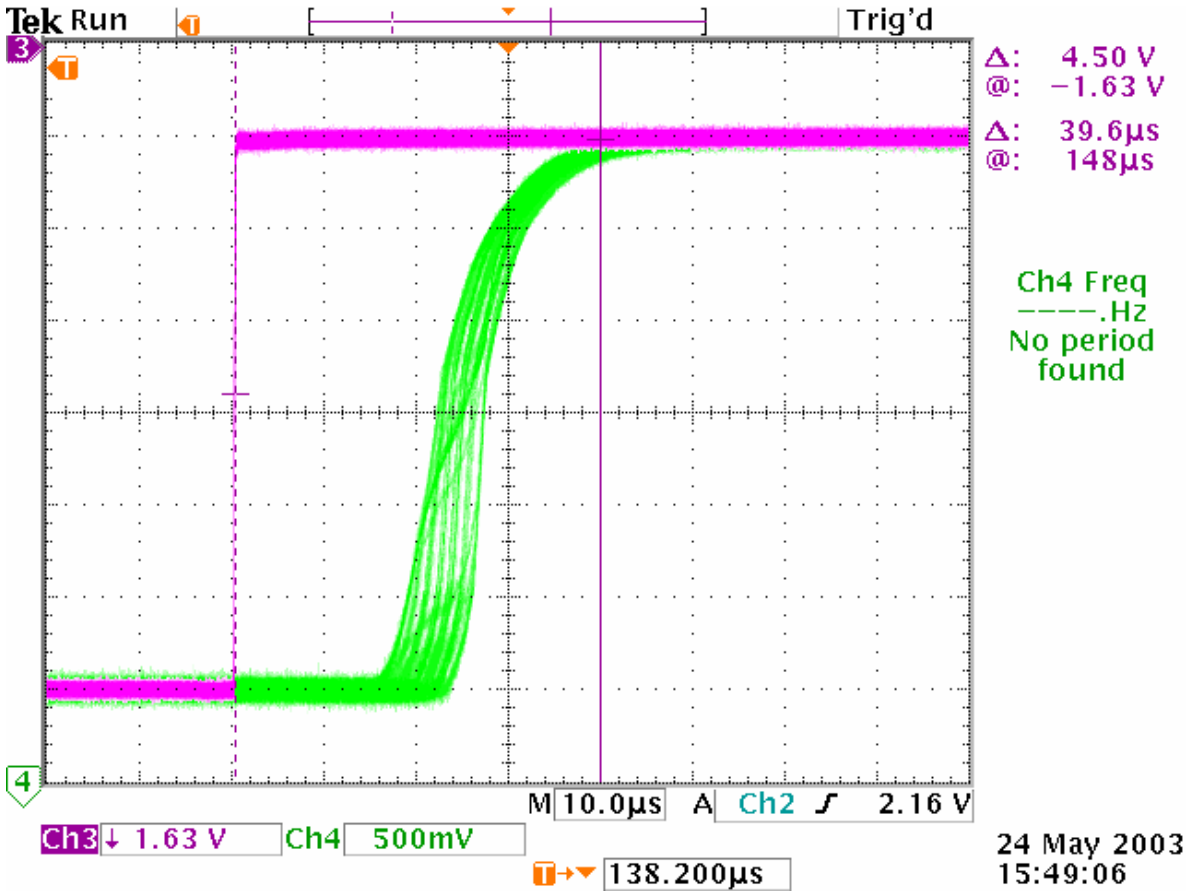
DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C

RISE TIME= 39.6 µS (Spec is 50µS)



SCAN MODULATION PULSE RESPONSE

2.14 kHz Pulse

12 dBm Input Power @ 4 GHz

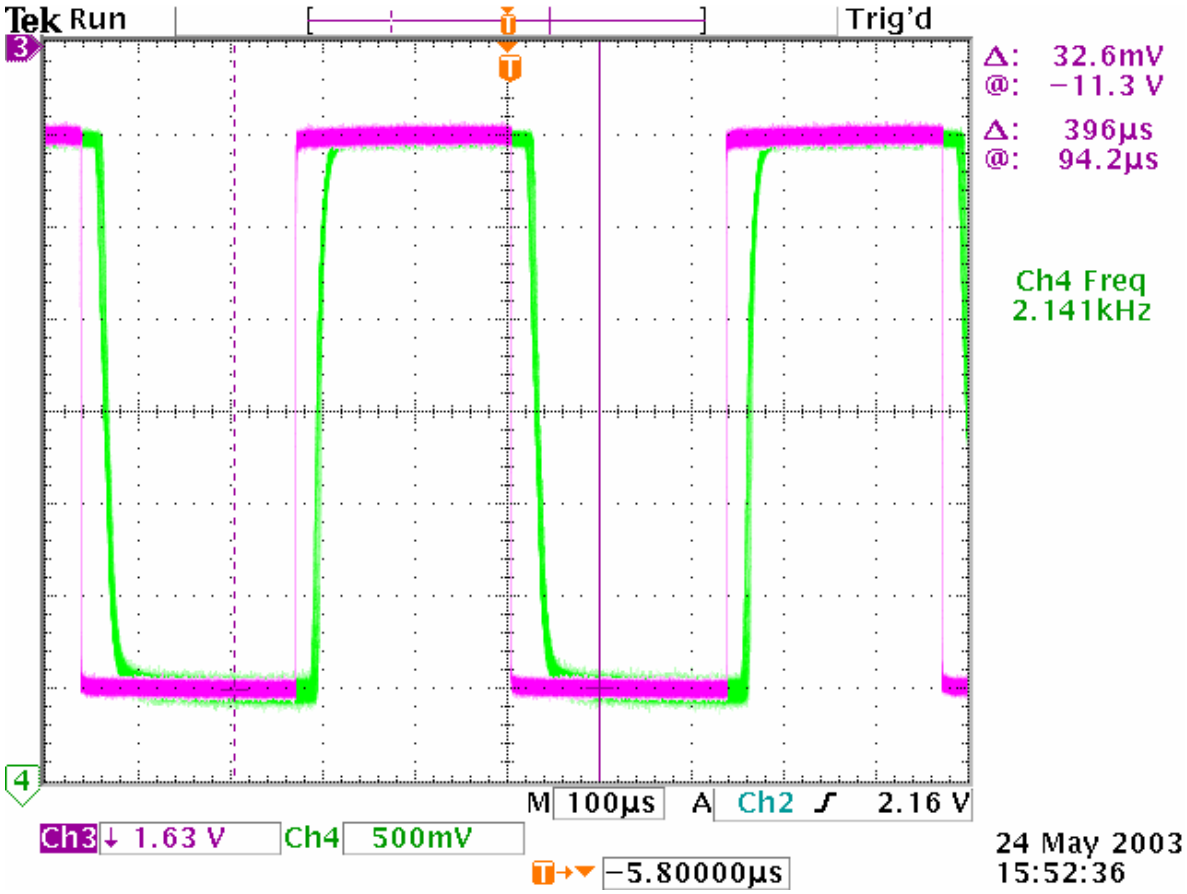
DLVA @ 50mV / dB -or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



SCAN MODULATION PULSE RESPONSE

7.3 kHz Pulse

12 dBm Input Power @ 4 GHz

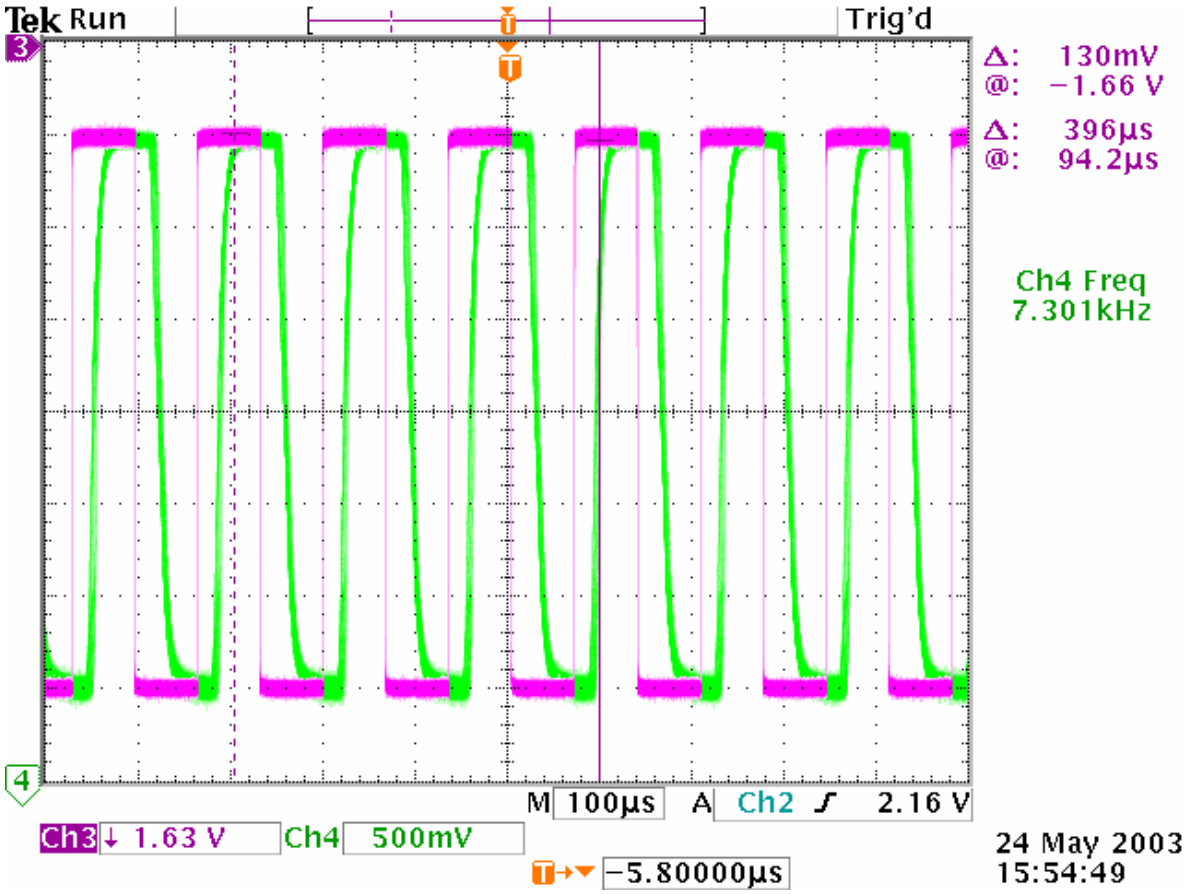
DLVA @ 50mV / dB -or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



SCAN MODULATION PULSE RESPONSE

9.18µS Rise, 16.4µS Fall

12 dBm Input Power @ 4 GHz

DLVA @ 50mV / dB -or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C

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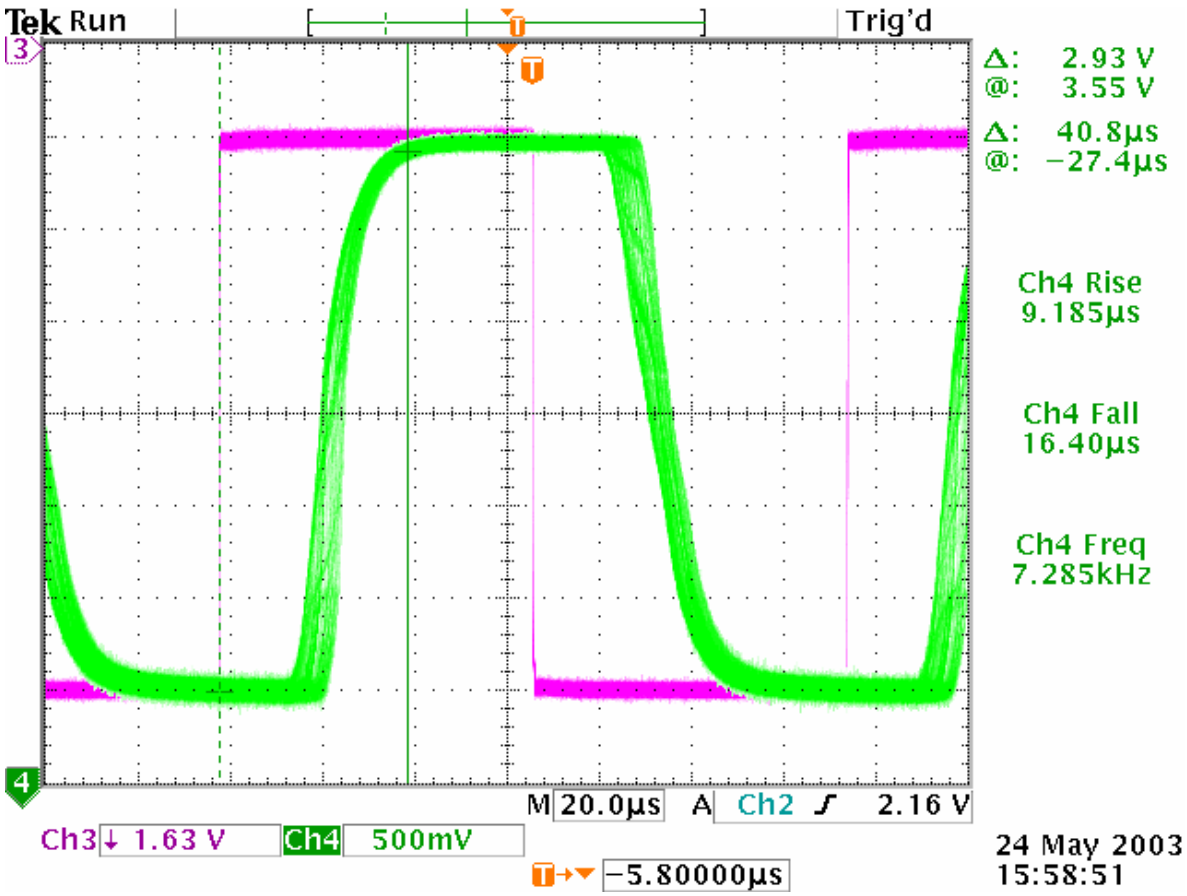


SCAN MODULATION PULSE RESPONSE

11.45µS Rise, 13.68µS Fall

12 dBm Input Power @ 4 GHz

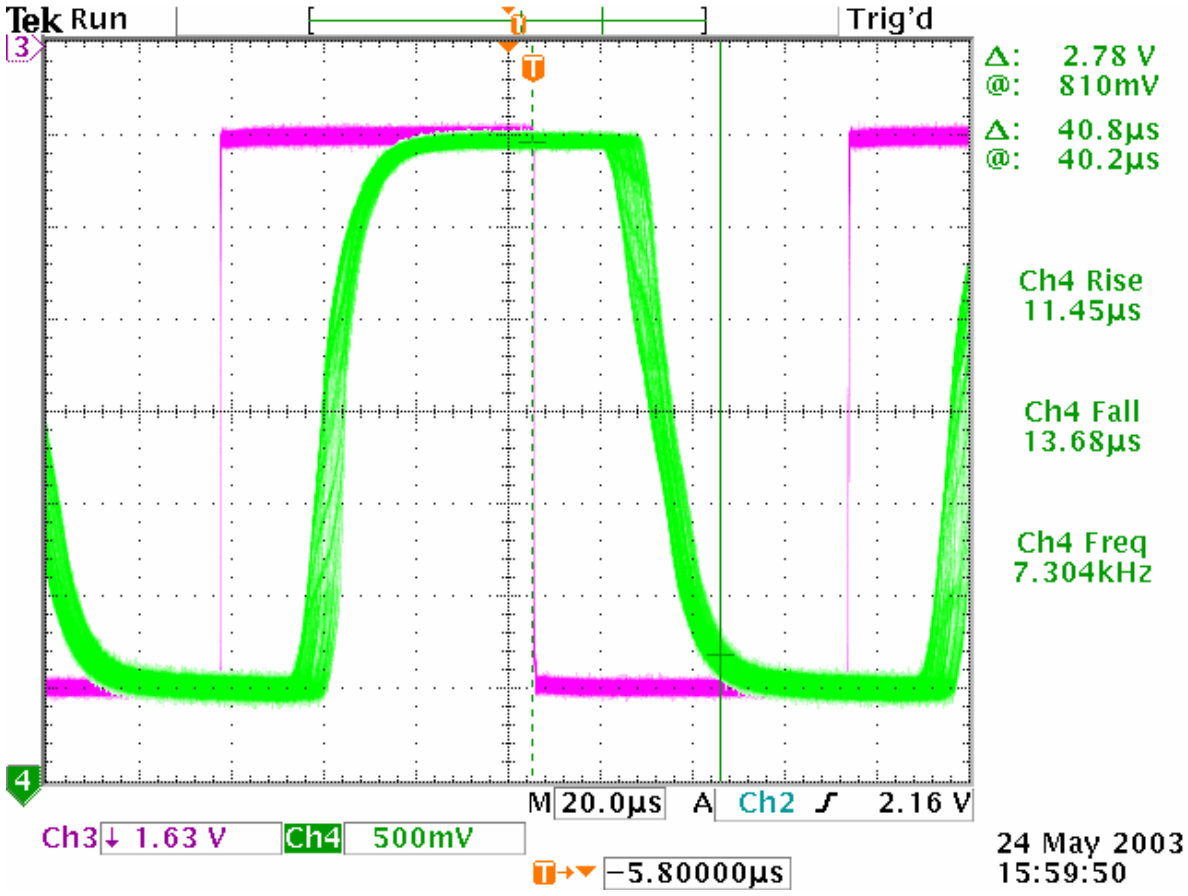
DLVA @ 50mV / dB -or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



SCAN MODULATION PULSE RESPONSE

10.92µS Rise, 13.69µS Fall

12 dBm Input Power @ 4 GHz

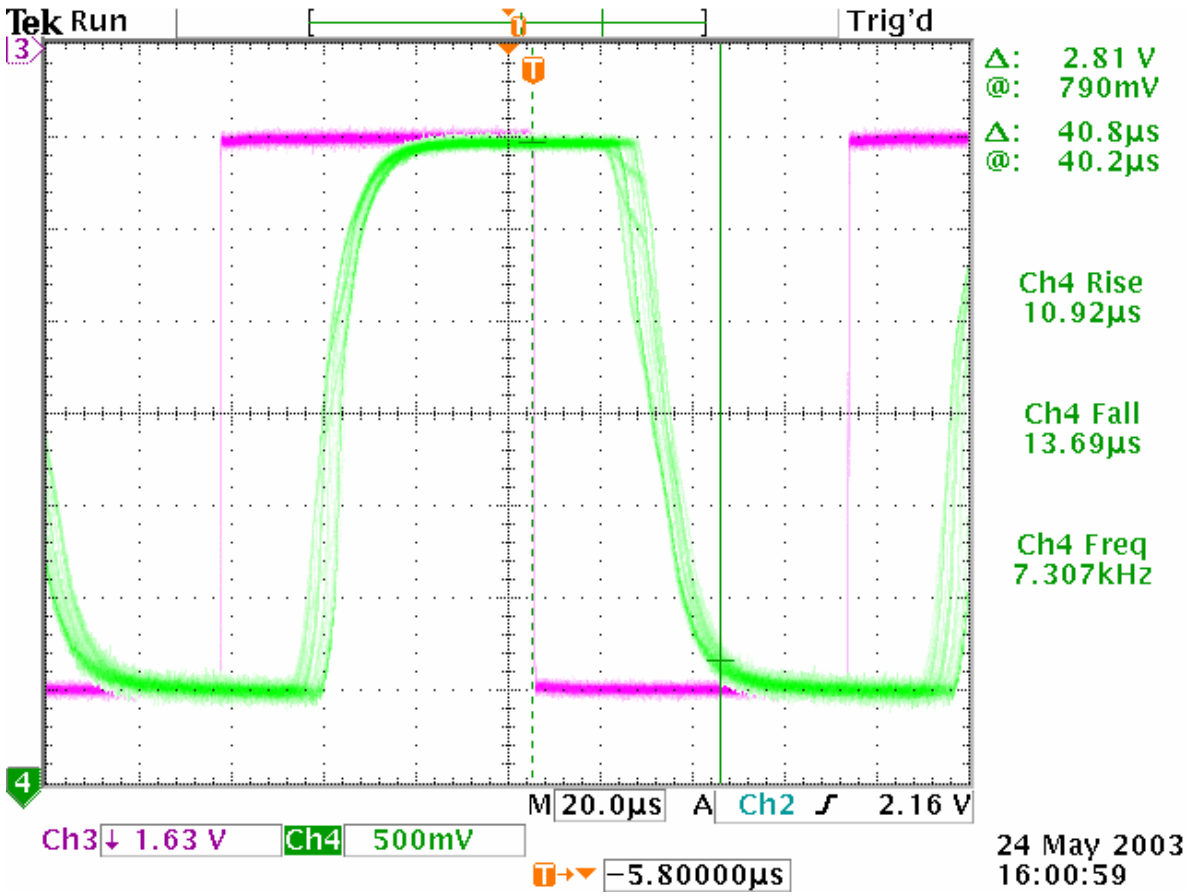
DLVA @ 50mV / dB -or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



SCAN MODULATION PULSE RESPONSE

8.05µS Rise, 16.88µS Fall

12 dBm Input Power @ 4 GHz

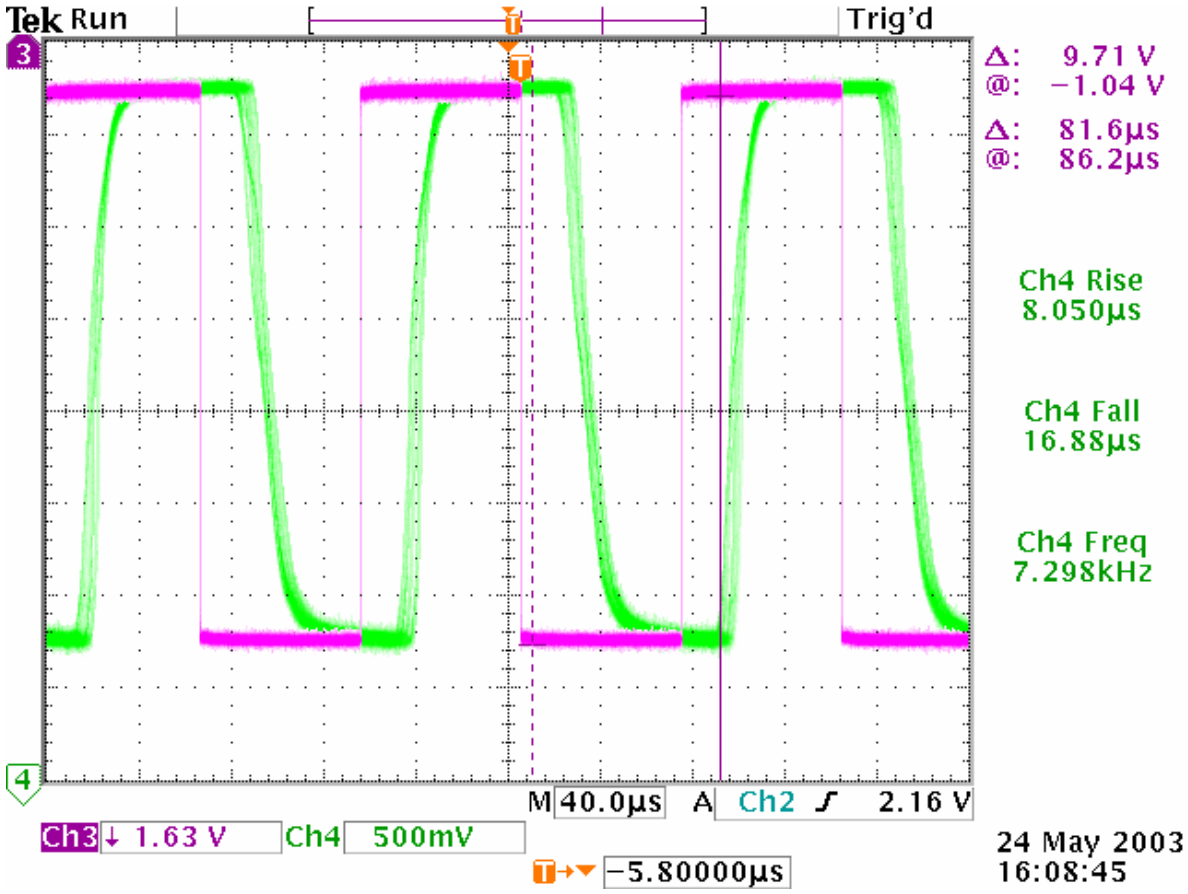
DLVA @ 50mV / dB –or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



SCAN MODULATION PULSE RESPONSE

12.7µS Rise, 15.59µS Fall

12 dBm Input Power @ 4 GHz

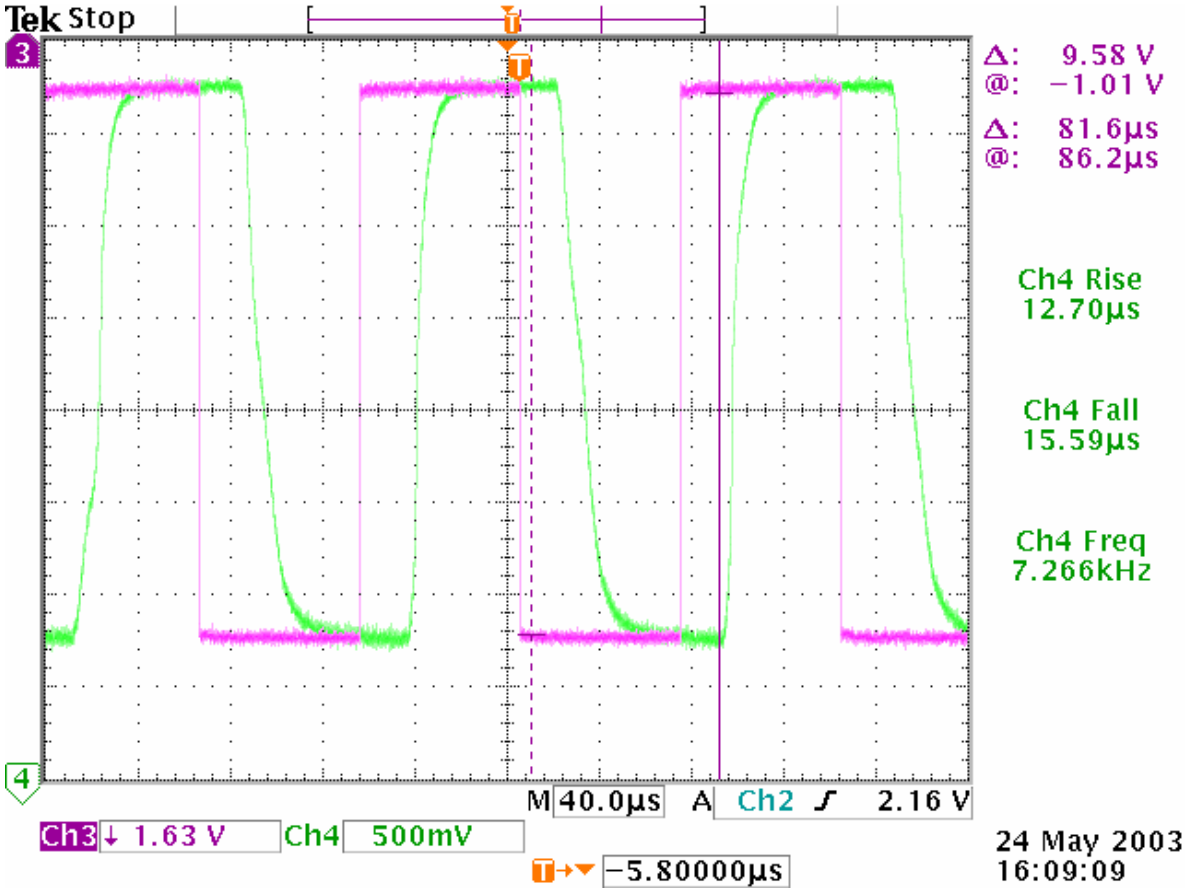
DLVA @ 50mV / dB –or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



SCAN MODULATION PULSE RESPONSE

11.9µS Rise, 15.40µS Fall

12 dBm Input Power @ 4 GHz

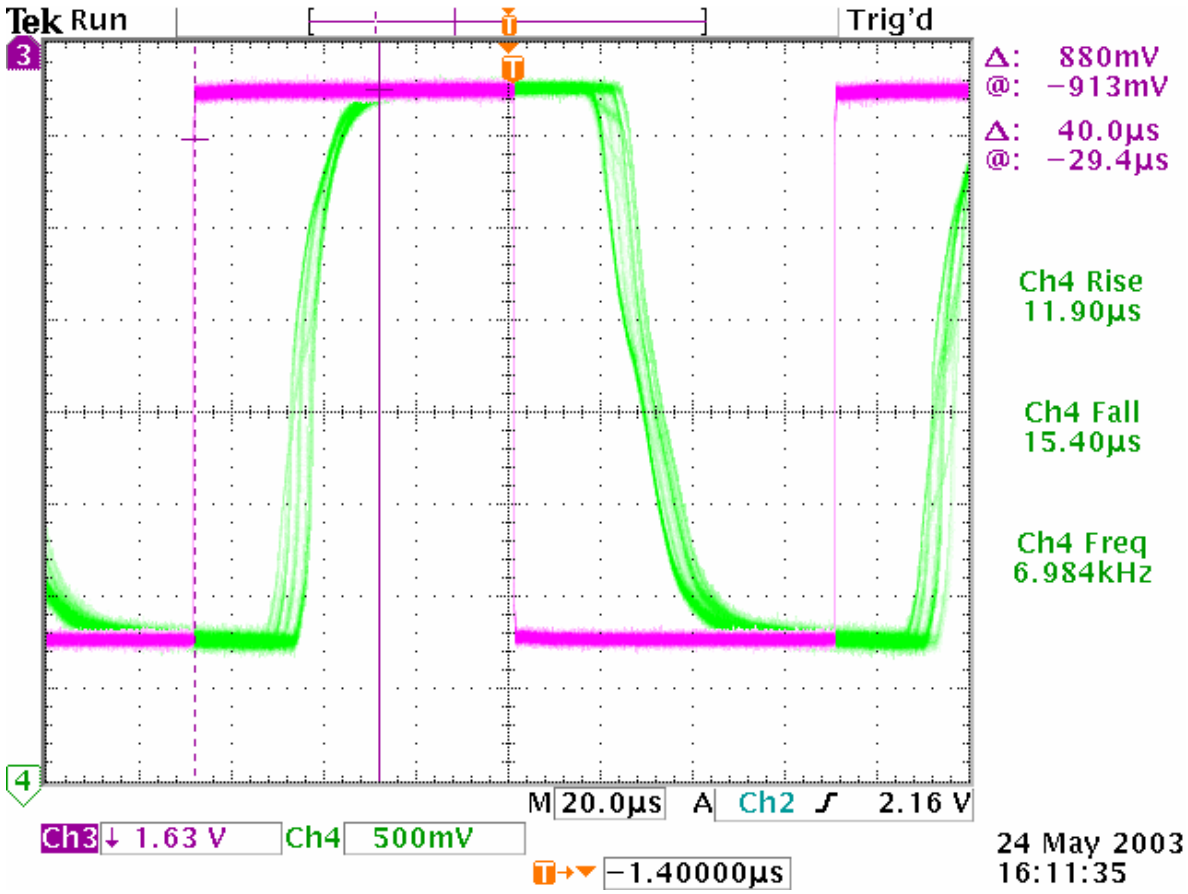
DLVA @ 50mV / dB –or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



SCAN MODULATION PULSE RESPONSE

12.44µS Rise and 15.51µS Fall

12 dBm Input Power @ 4 GHz

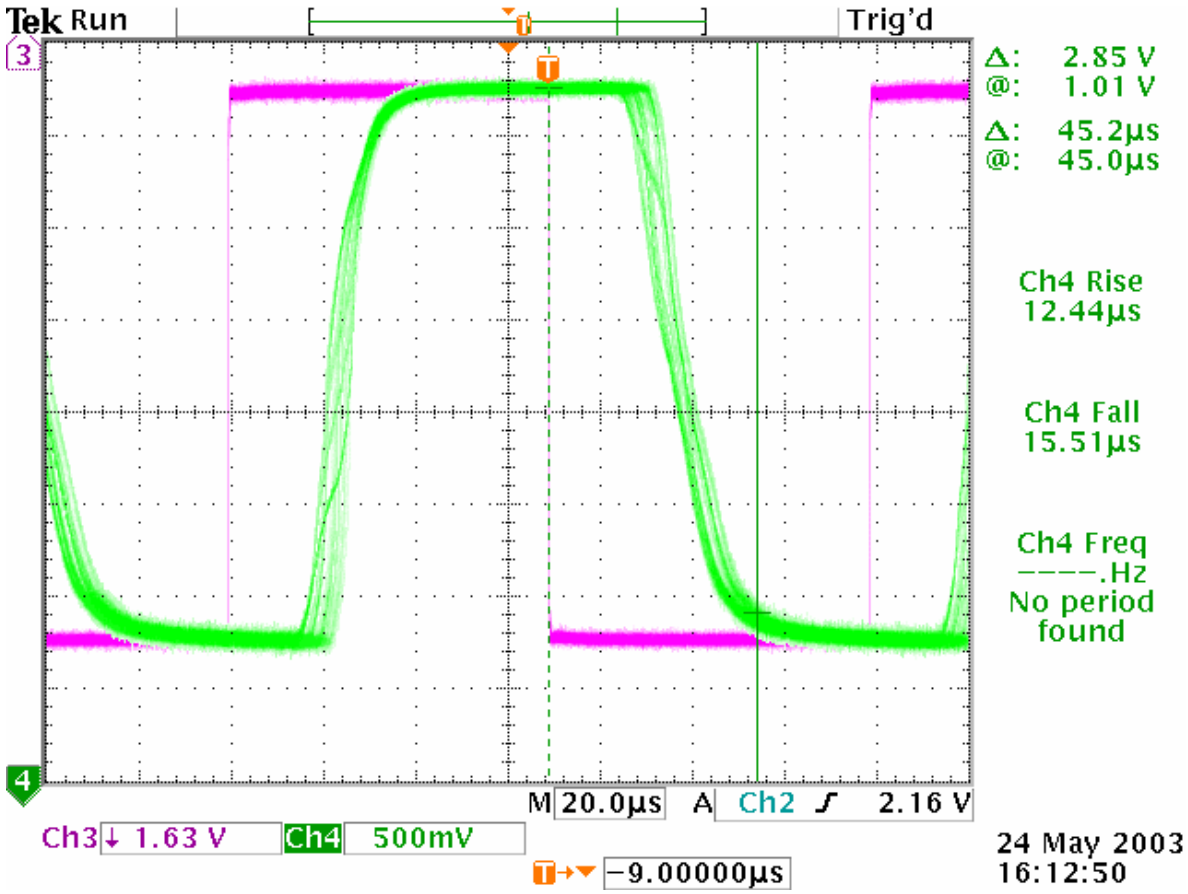
DLVA @ 50mV / dB –or- 500mV / 10dB

DLVA Output @ 1dB / Division (AC Coupled) : CH4 Green Trace

CONTROL SIGNAL : Purple Trace

NOTE: Purple Trace has been Inverted and the Scale Adjusted to match the DLVA Output

NOTE: UUT is Free Standing on table, self heated to a case temperature of ≈70°C



PULSE MODULATION DEPTH

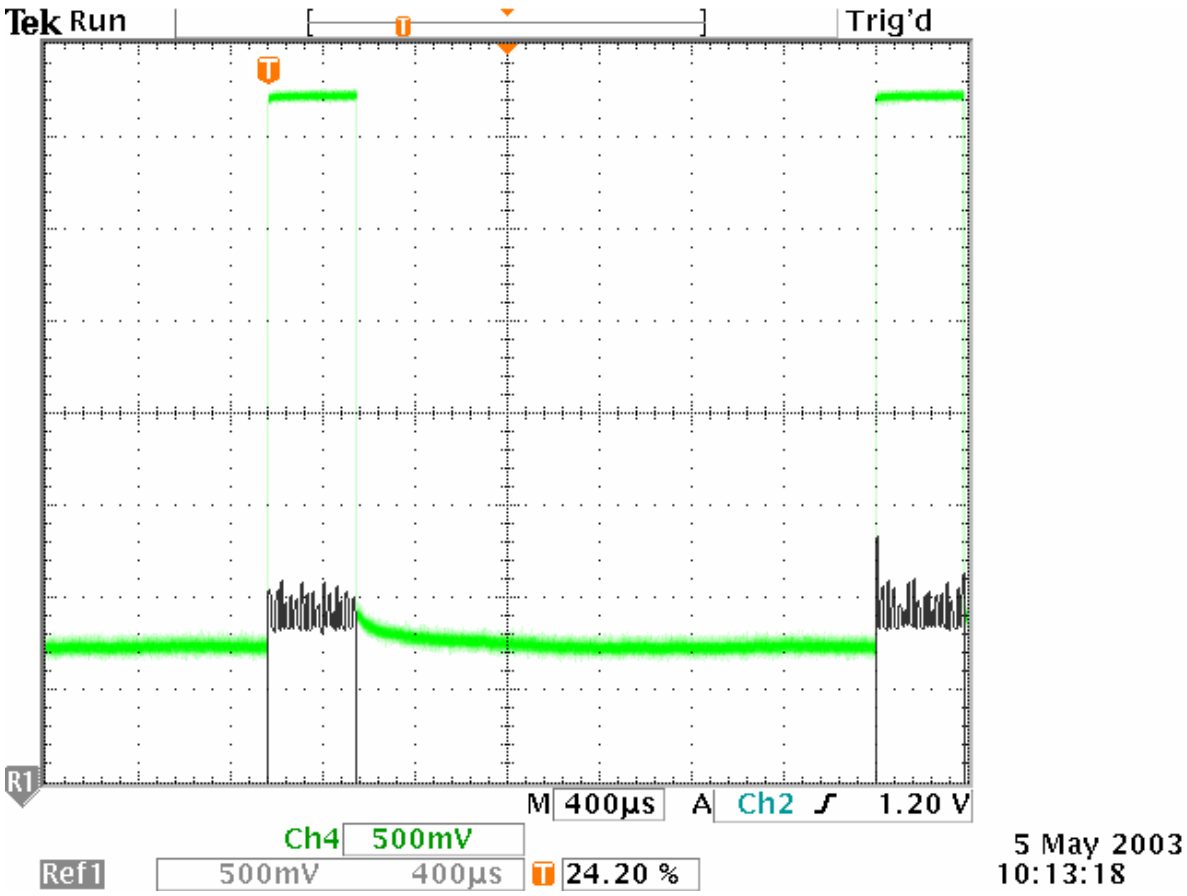
PULSE DEPTH >60dB
As Measured at 500 MHz

Green trace is : XDLVA output when input signal is + 10dBm

Black trace is : XDLVA output when input signal is - 50dBm

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Modulation Depth : >60dB at 500 MHz



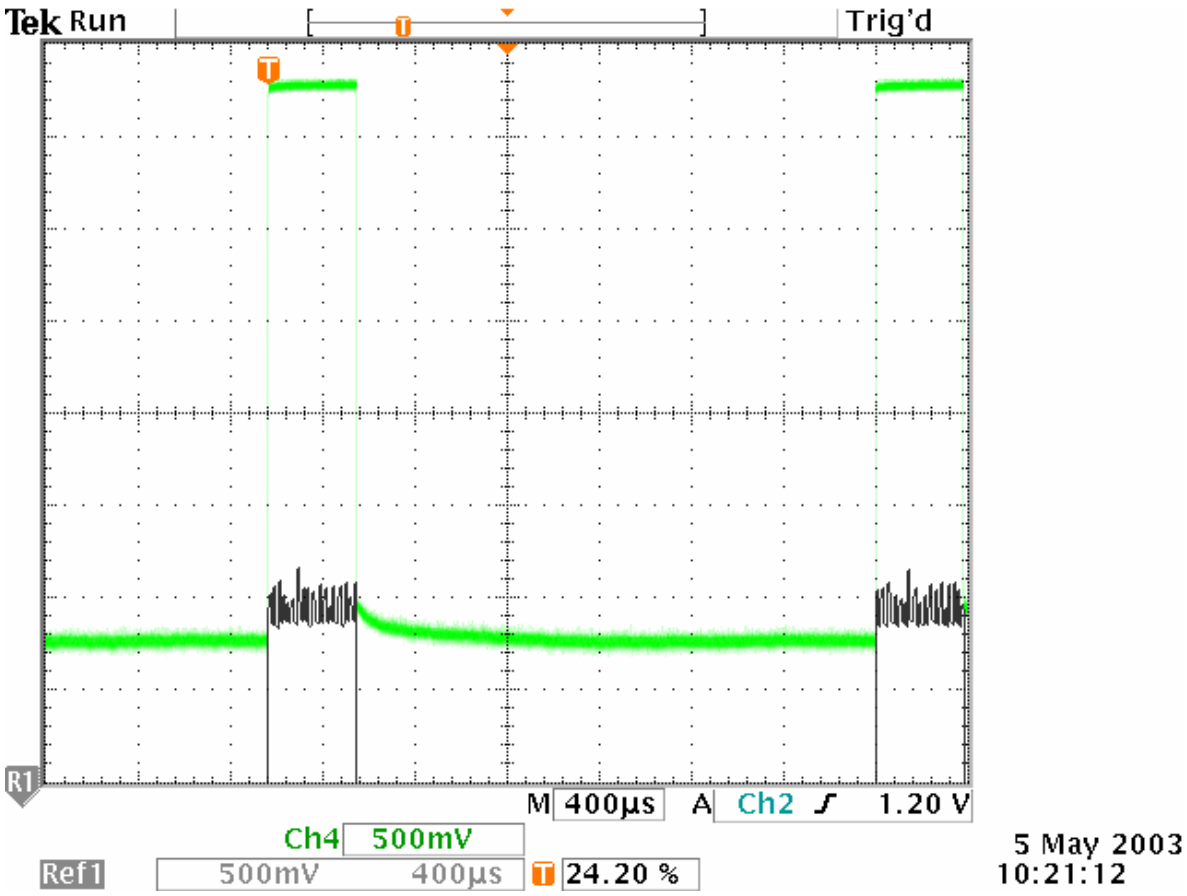
PULSE DEPTH >60dB
As Measured at 1.25 GHz

Green trace is : XDLVA output when input signal is + 10dBm

Black trace is : XDLVA output when input signal is - 50dBm

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Modulation Depth >60dB at 1.25 GHz



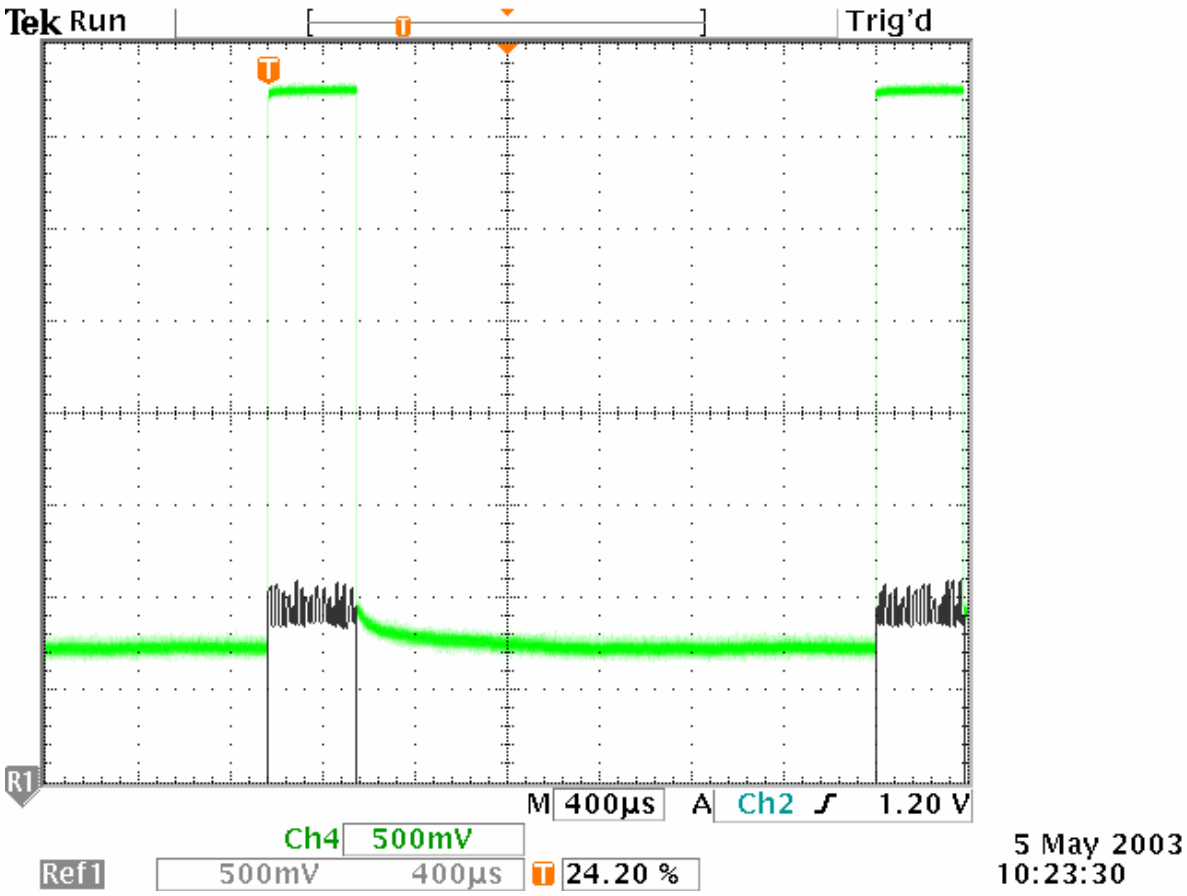
PULSE DEPTH >60dB
As Measured at 2.0 GHz

Green trace is : XDLVA output when input signal is + 10dBm

Black trace is : XDLVA output when input signal is - 50dBm

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Modulation Depth : > 60dB at 2GHz



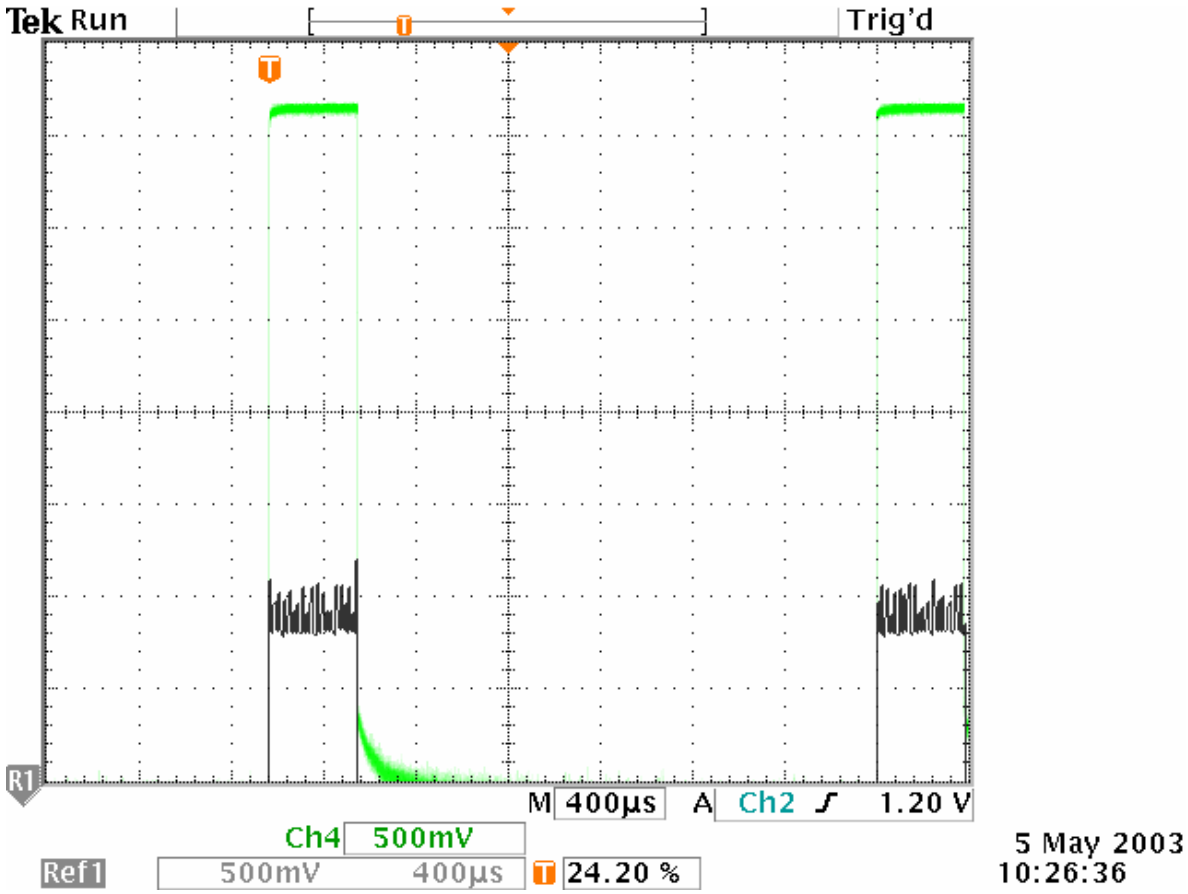
PULSE DEPTH >60dB
As Measured at 10.0 GHz

Green trace is : XDLVA output when input signal is + 10dBm

Black trace is : XDLVA output when input signal is - 50dBm

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Modulation Depth : > 60dB at 10 GHz



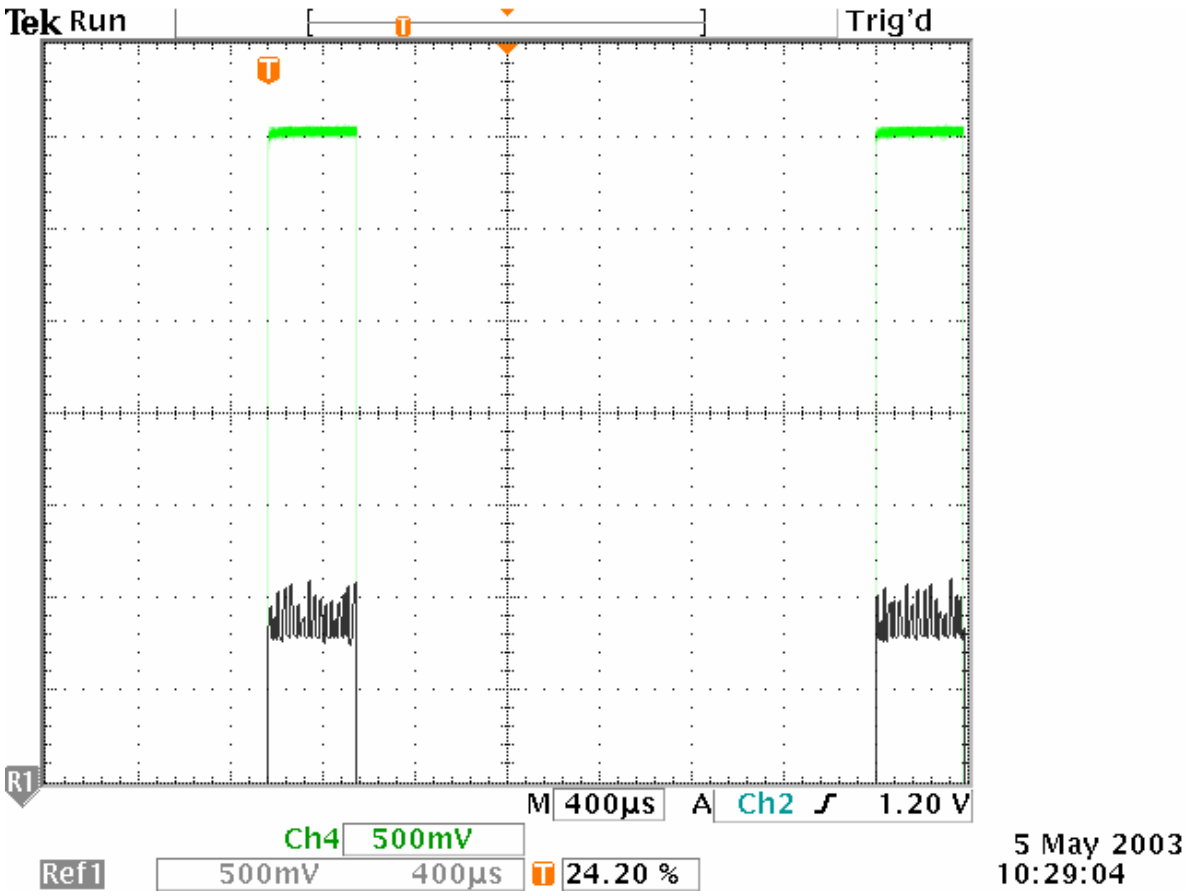
PULSE DEPTH >60dB
As Measured at 18.0 GHz

Green trace is : XDLVA output when input signal is + 10dBm

Black trace is : XDLVA output when input signal is - 50dBm

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Modulation Depth : > 60dB at 18 GHz



PULSE PARAMETERS

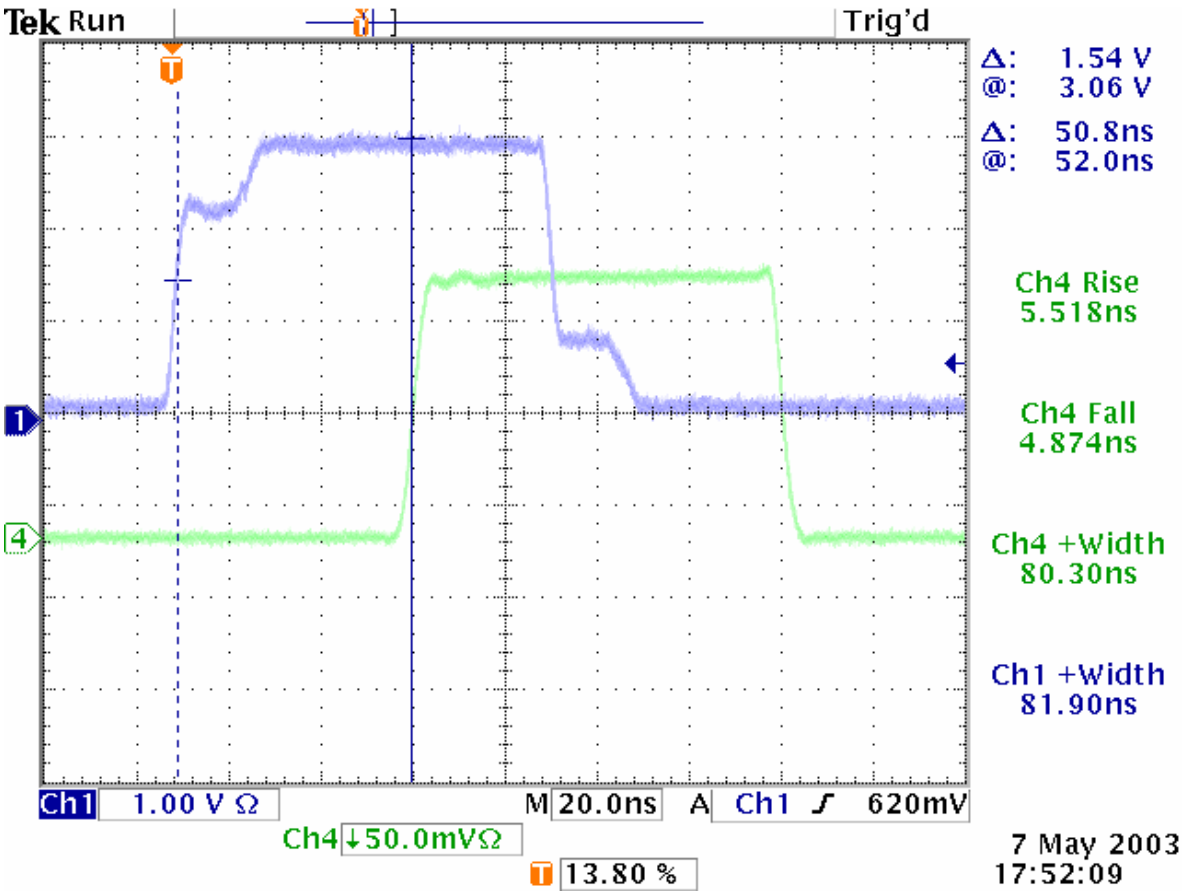
PULSE PARAMETERS

Rise, Fall, Fidelity, Minimum Pulse Width As Measured @ 4 GHz & +25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.



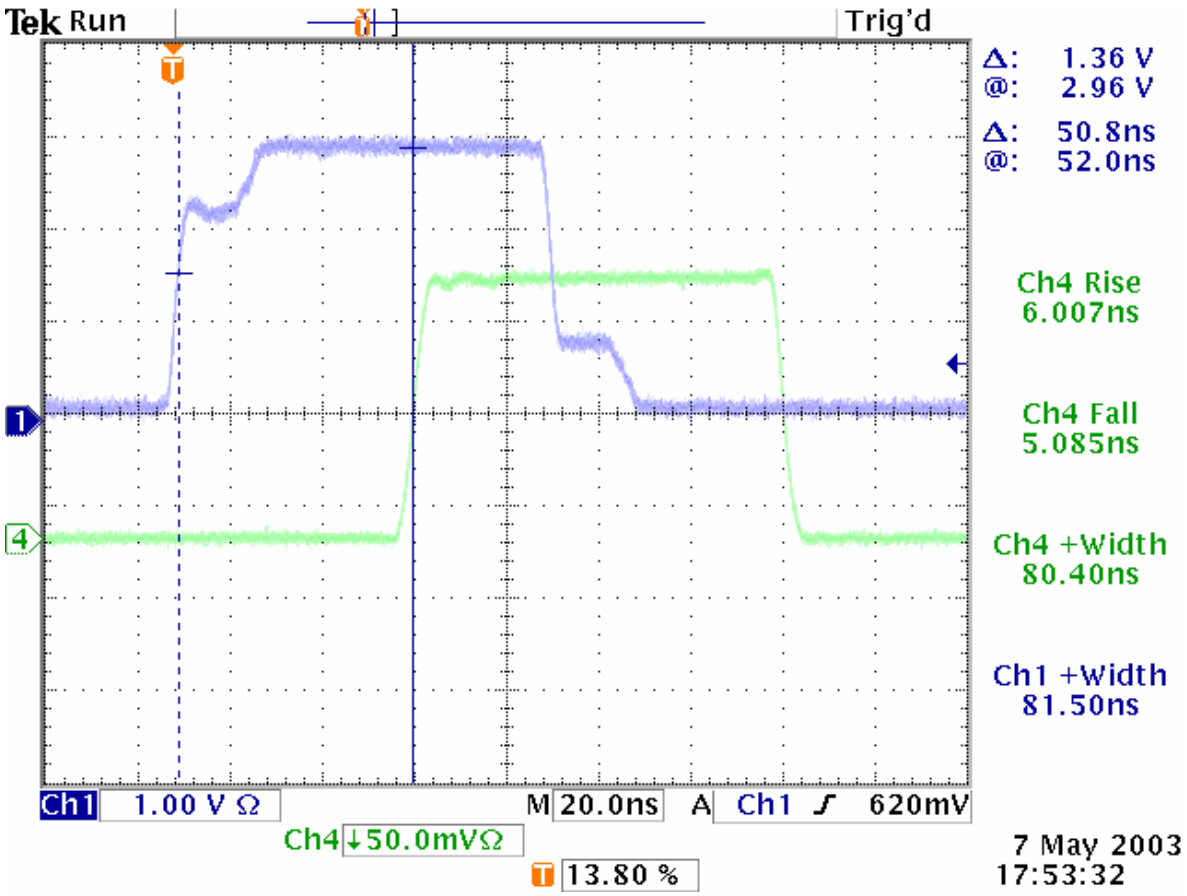
PULSE PARAMETERS

Rise, Fall, Fidelity, Minimum Pulse Width As Measured @ 1.25 GHz & +25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.



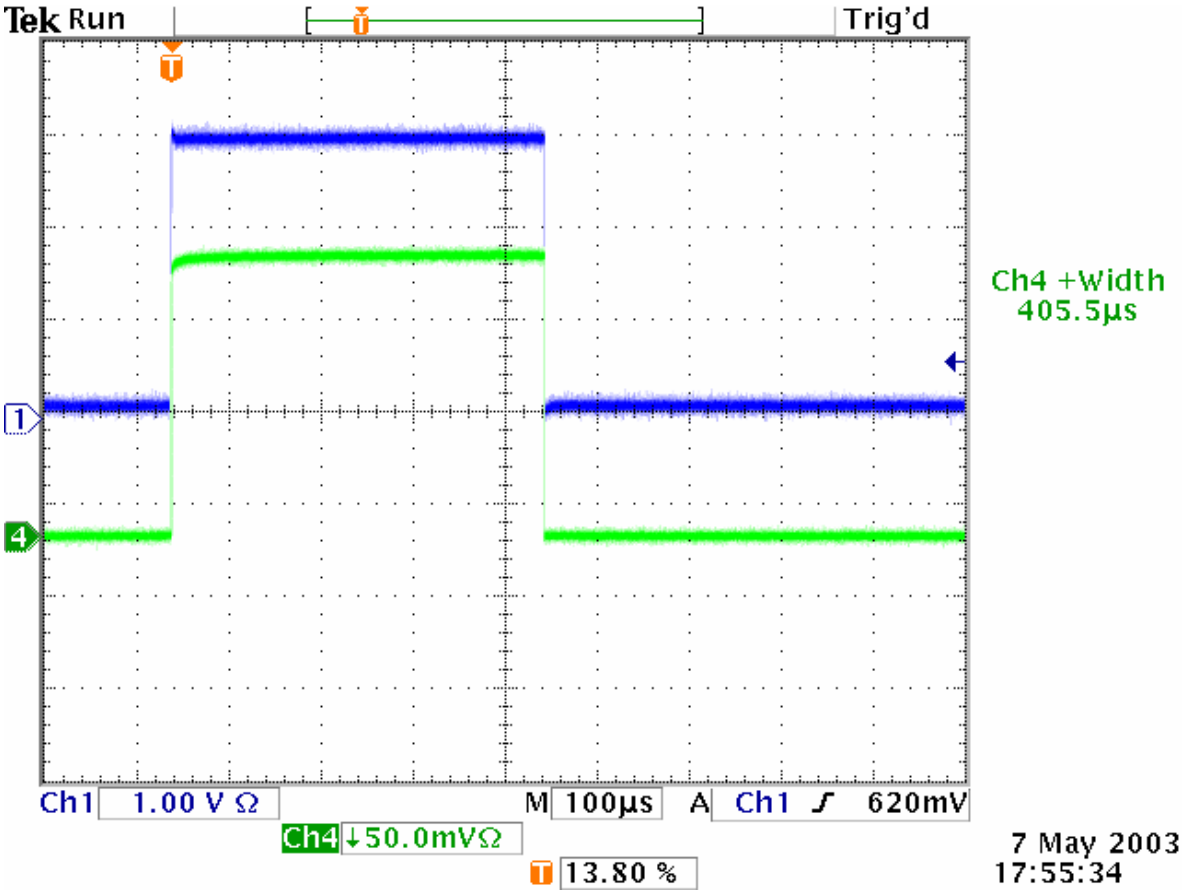
PULSE PARAMETERS

Maximum Pulse Width As Measured @ 4 GHz & +25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.



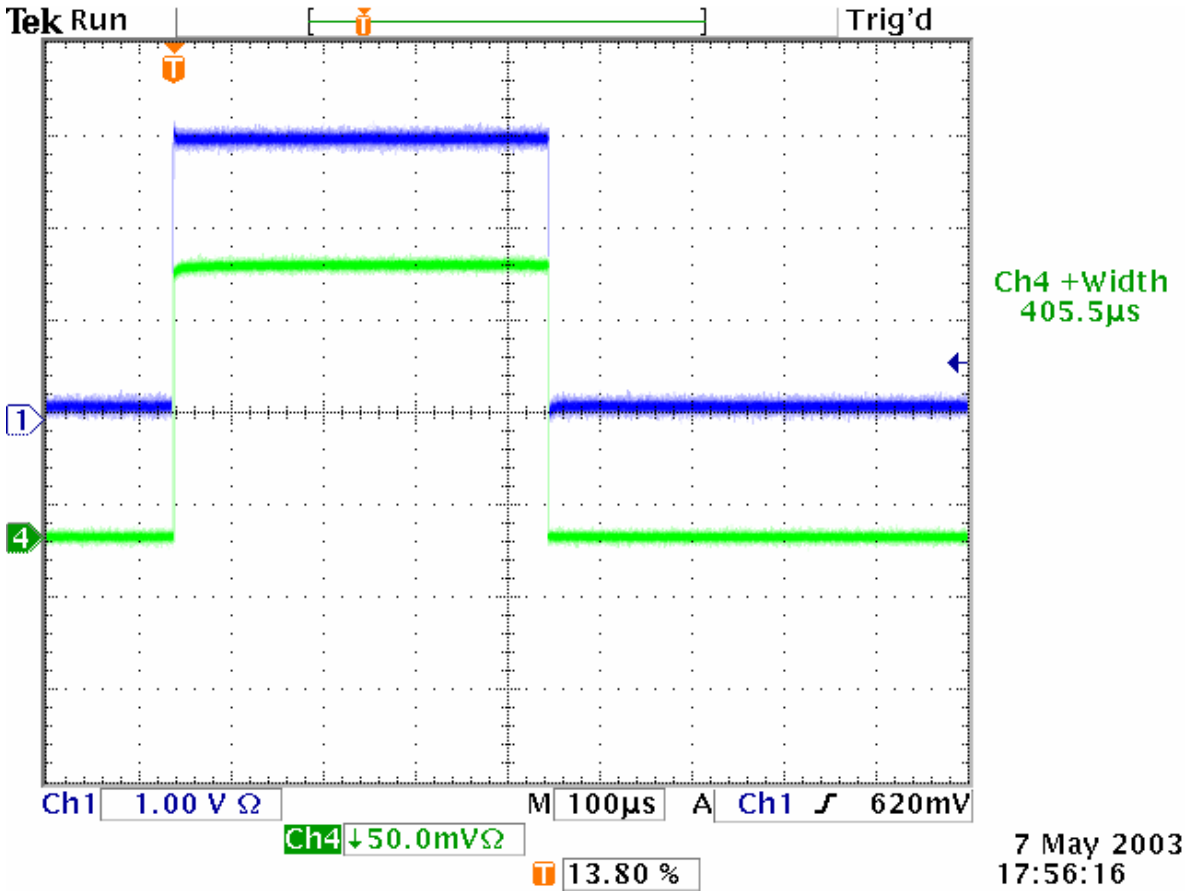
PULSE PARAMETERS

Maximum Pulse Width As Measured @ 1.25 GHz & +25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.



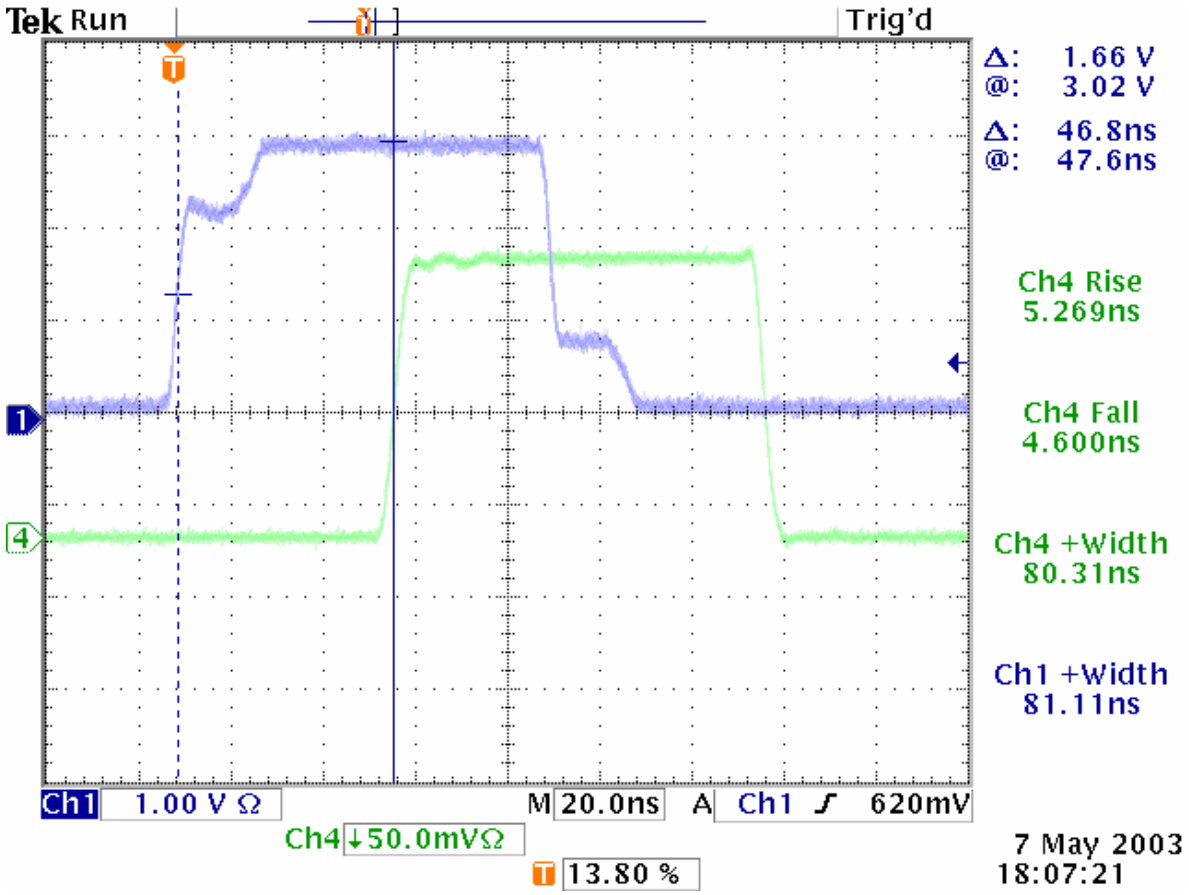
PULSE PARAMETERS

Rise, Fall, Fidelity, Minimum Pulse Width As Measured @ 4 GHz & -20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.



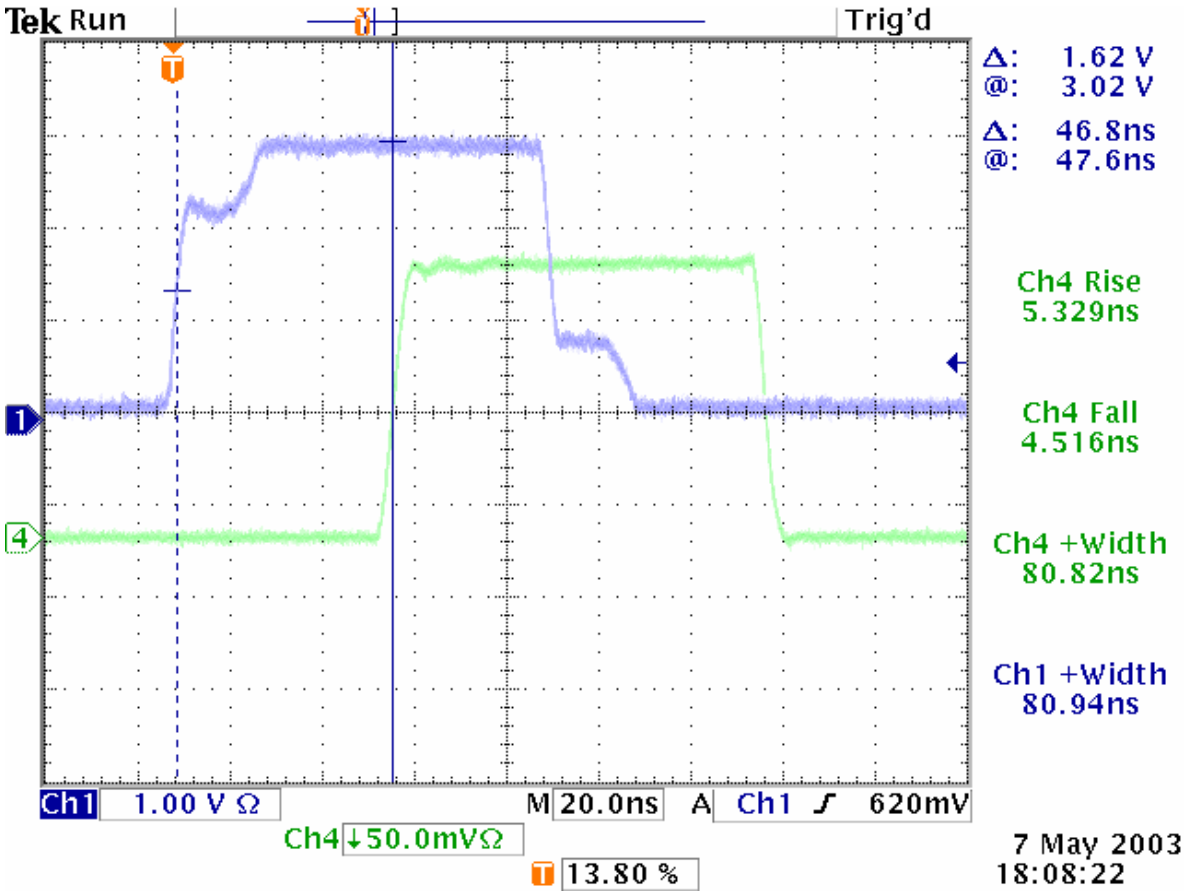
PULSE PARAMETERS

Rise, Fall, Fidelity, Minimum Pulse Width As Measured @ 1.25 GHz & -20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.



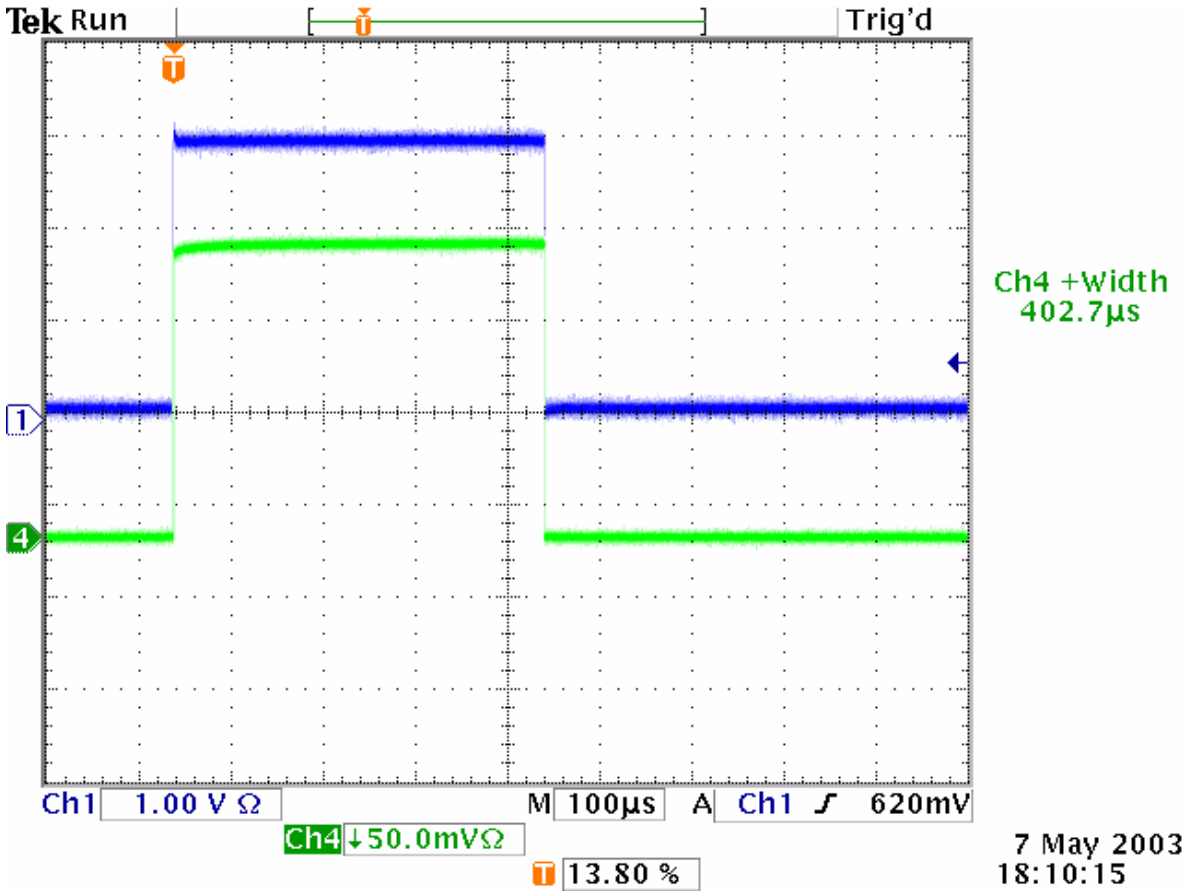
PULSE PARAMETERS

Maximum Pulse Width As Measured @ 4 GHz & -20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.



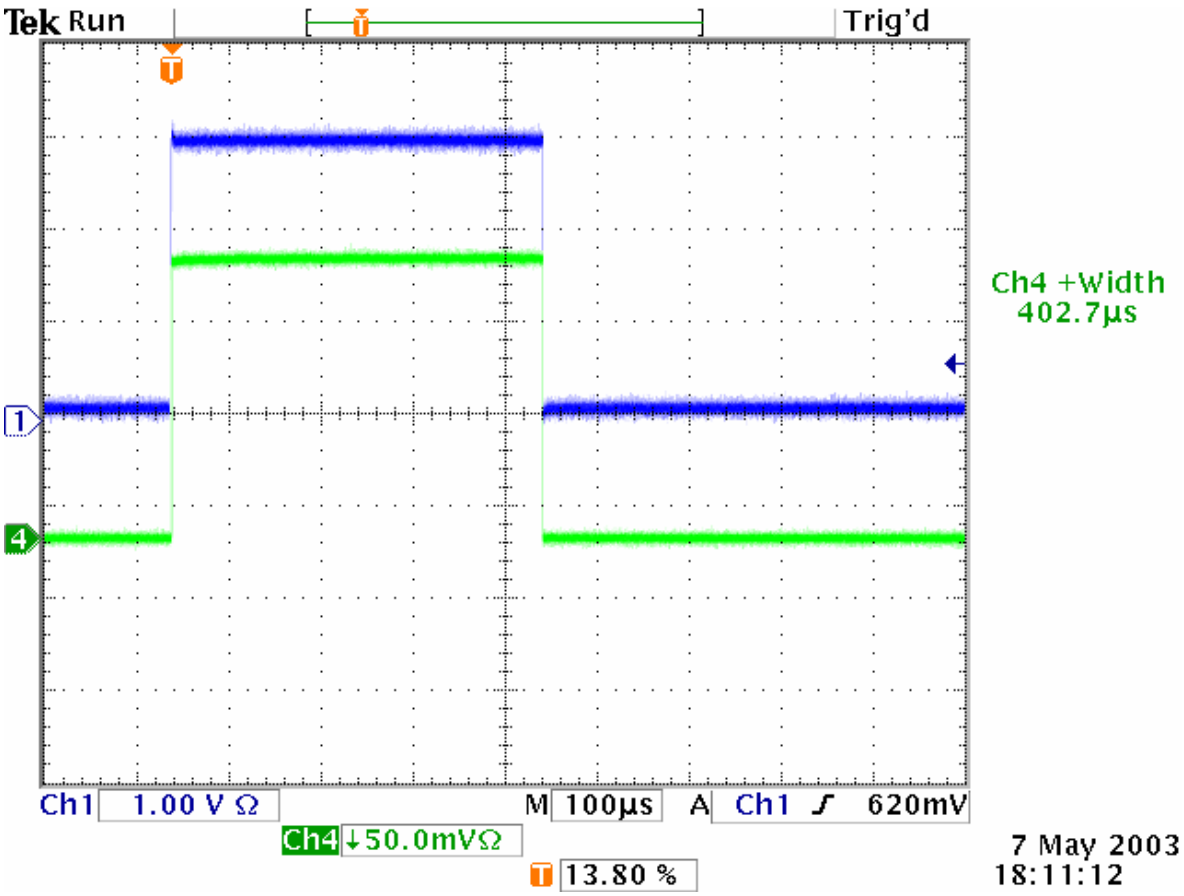
PULSE PARAMETERS

Maximum Pulse Width Pulse Width As Measured @ 4 GHz & -20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.



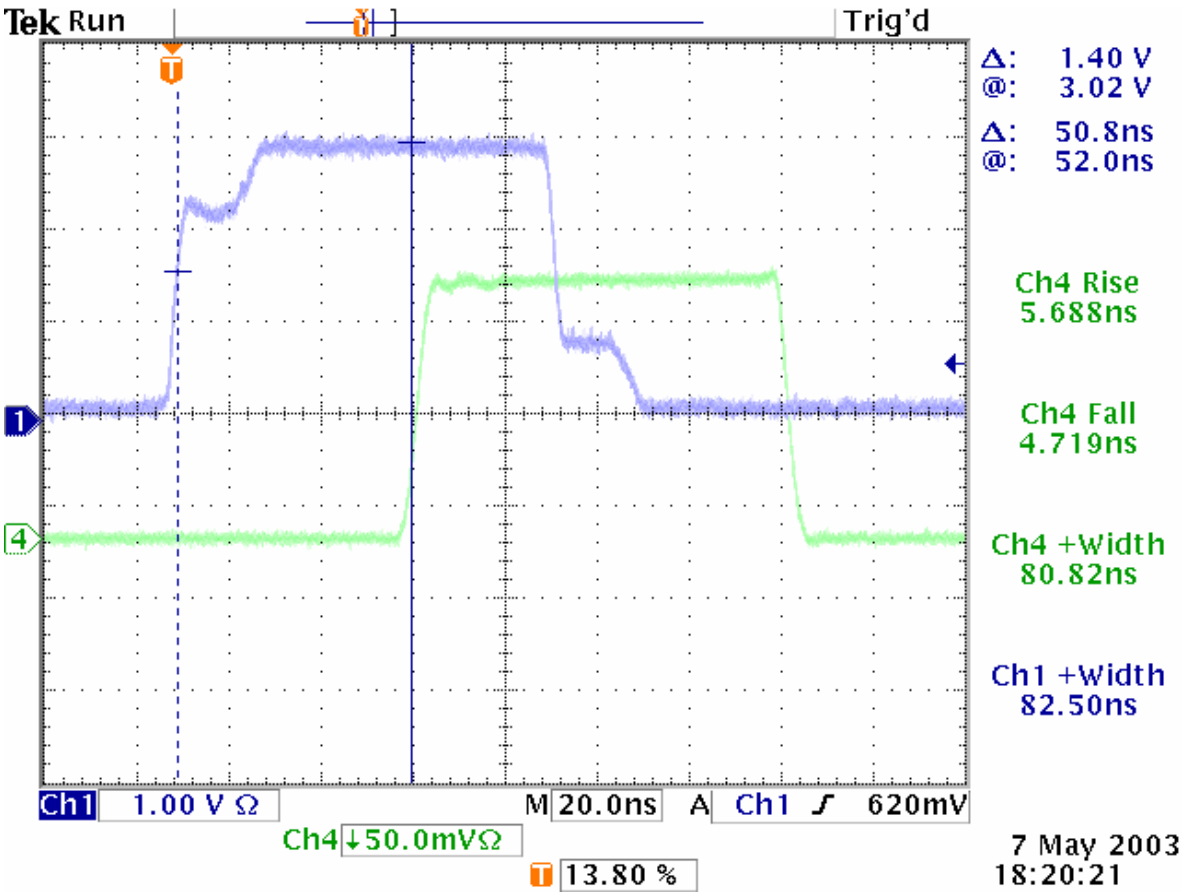
PULSE PARAMETERS

Rise, Fall, Fidelity, Minimum Pulse Width As Measured @ 4 GHz & +65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.



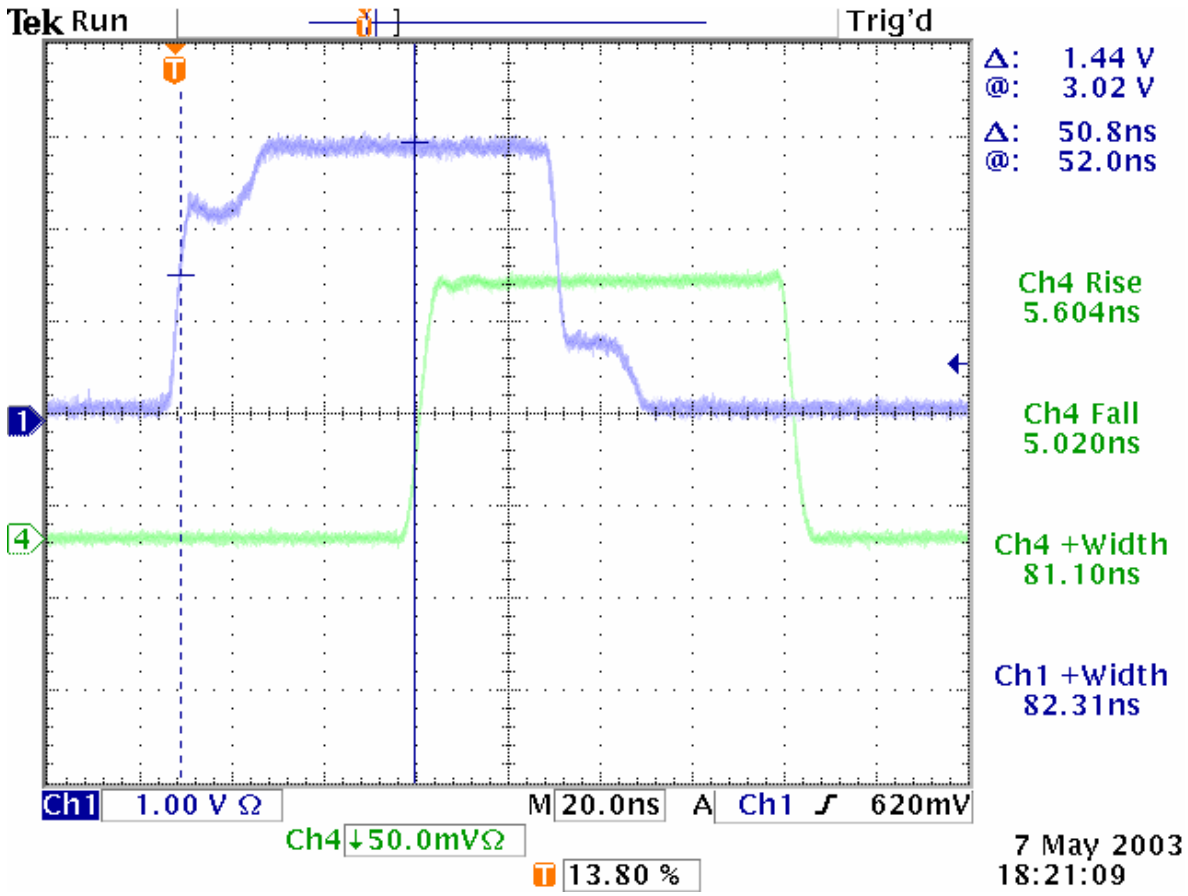
PULSE PARAMETERS

Rise, Fall, Fidelity, Minimum Pulse Width As Measured @ 1.25 GHz & +65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.



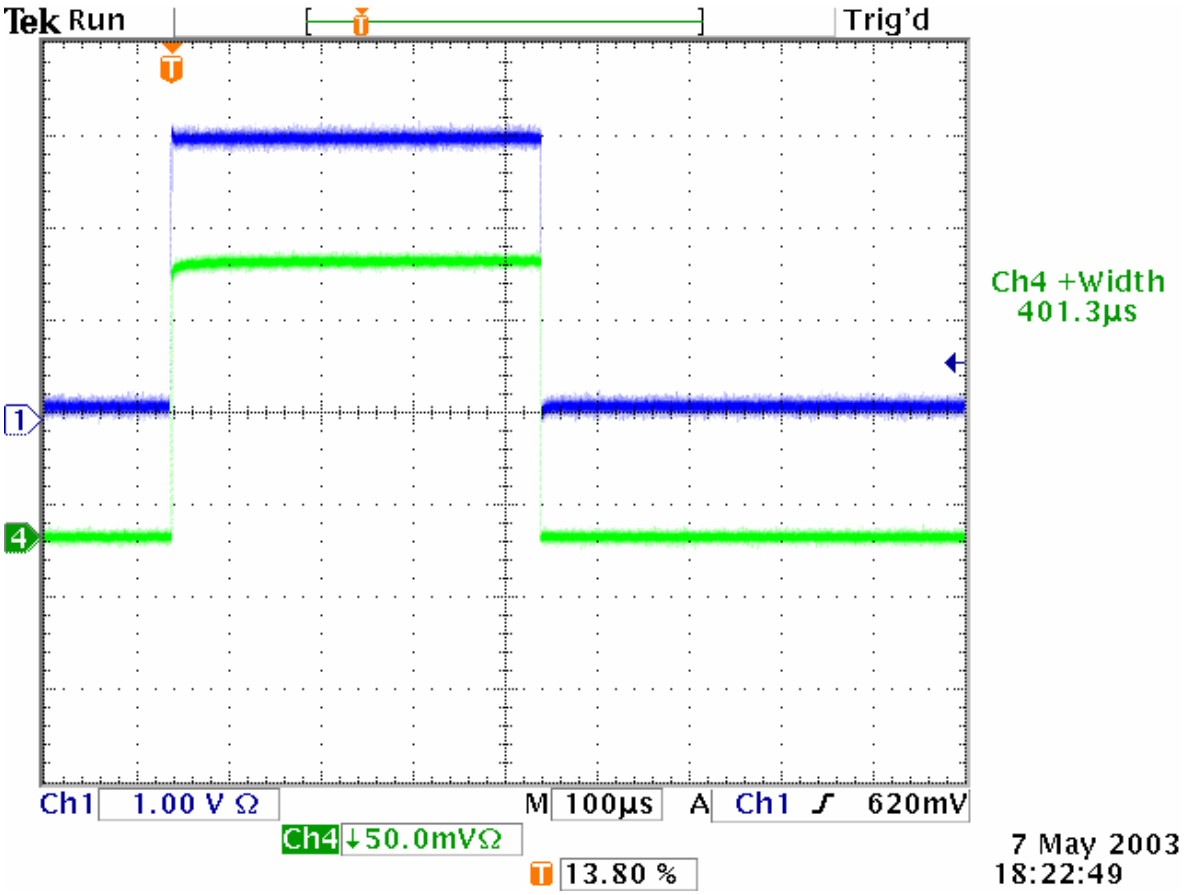
PULSE PARAMETERS

Maximum Pulse Width As Measured @ 4 GHz & +65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.



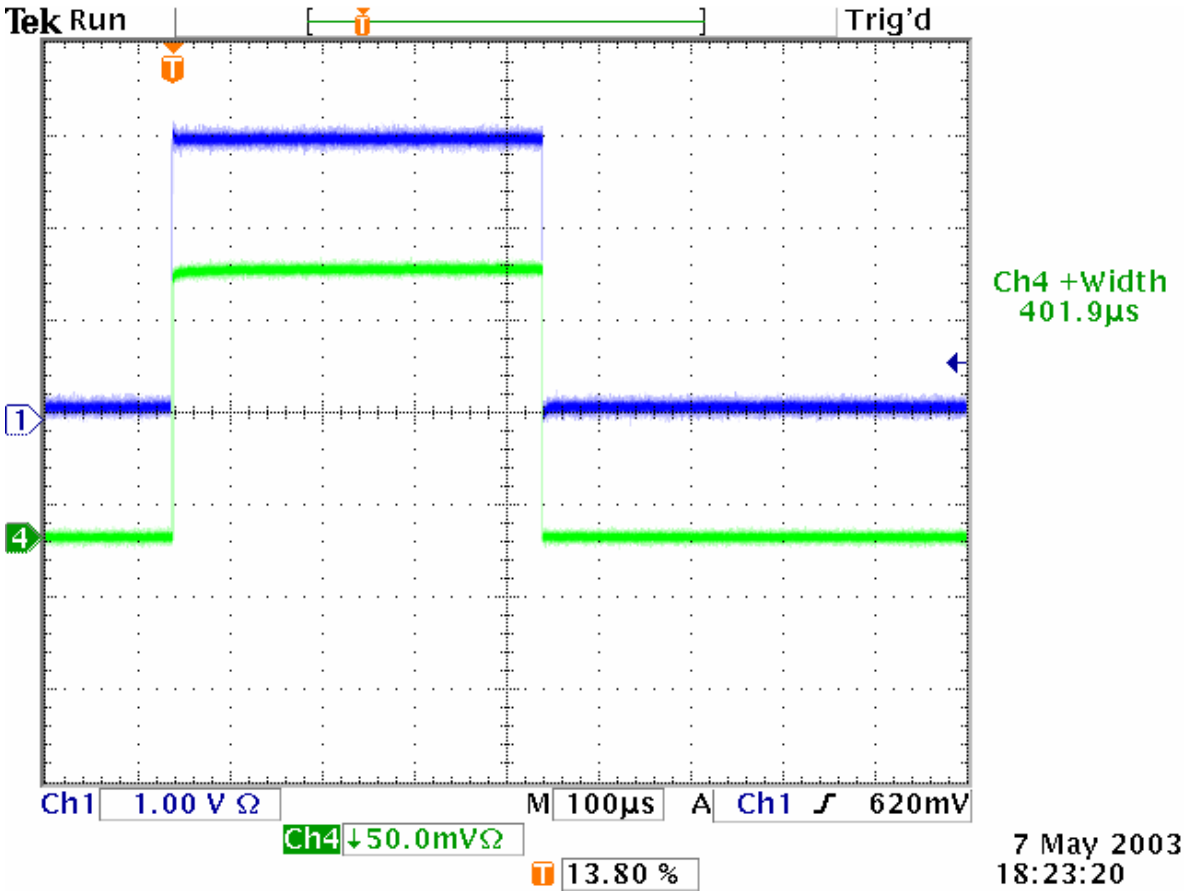
PULSE PARAMETERS

Maximum Pulse Width As Measured @ 1.25 GHz & +65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.



PULSE REPETITION

PULSE REPETITION

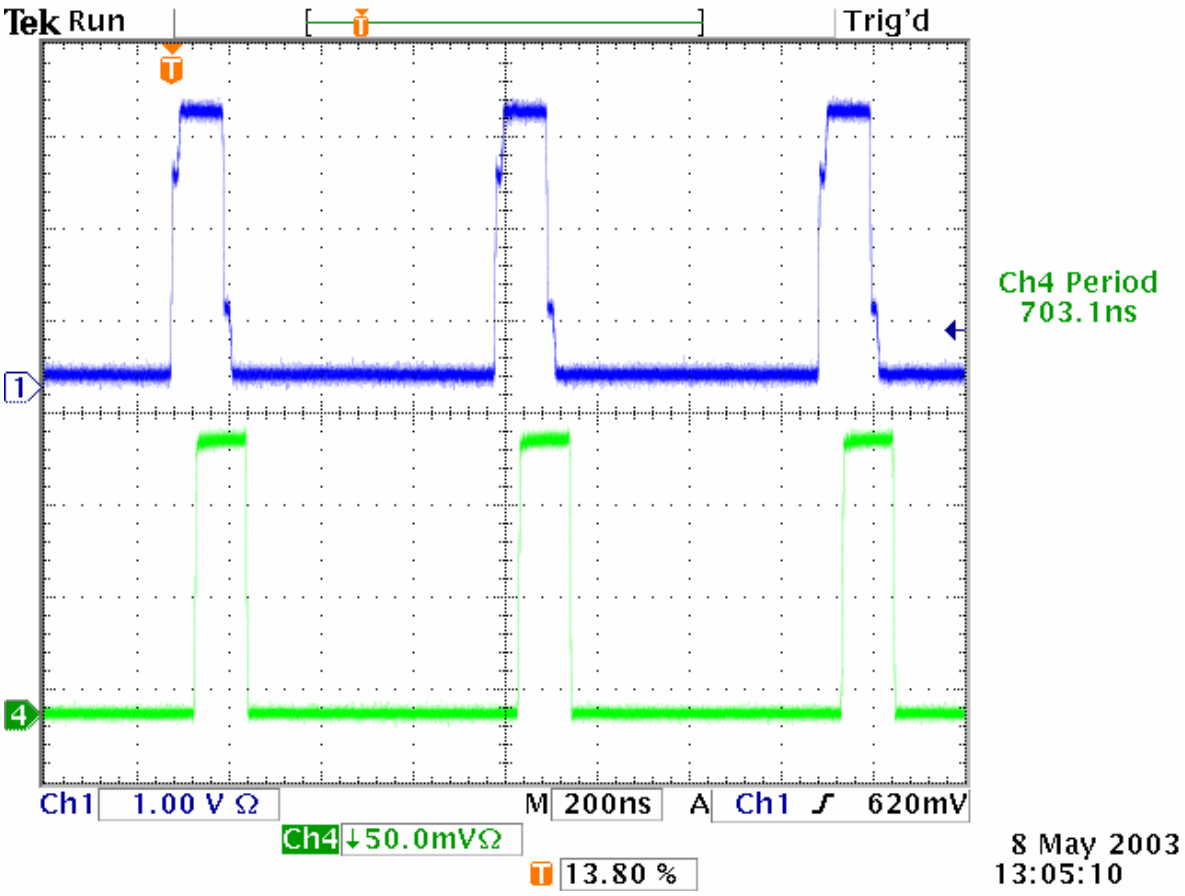
Interval < 1 microsecond at 4.0 GHz + 25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval less than 1 microsecond



PULSE REPETITION

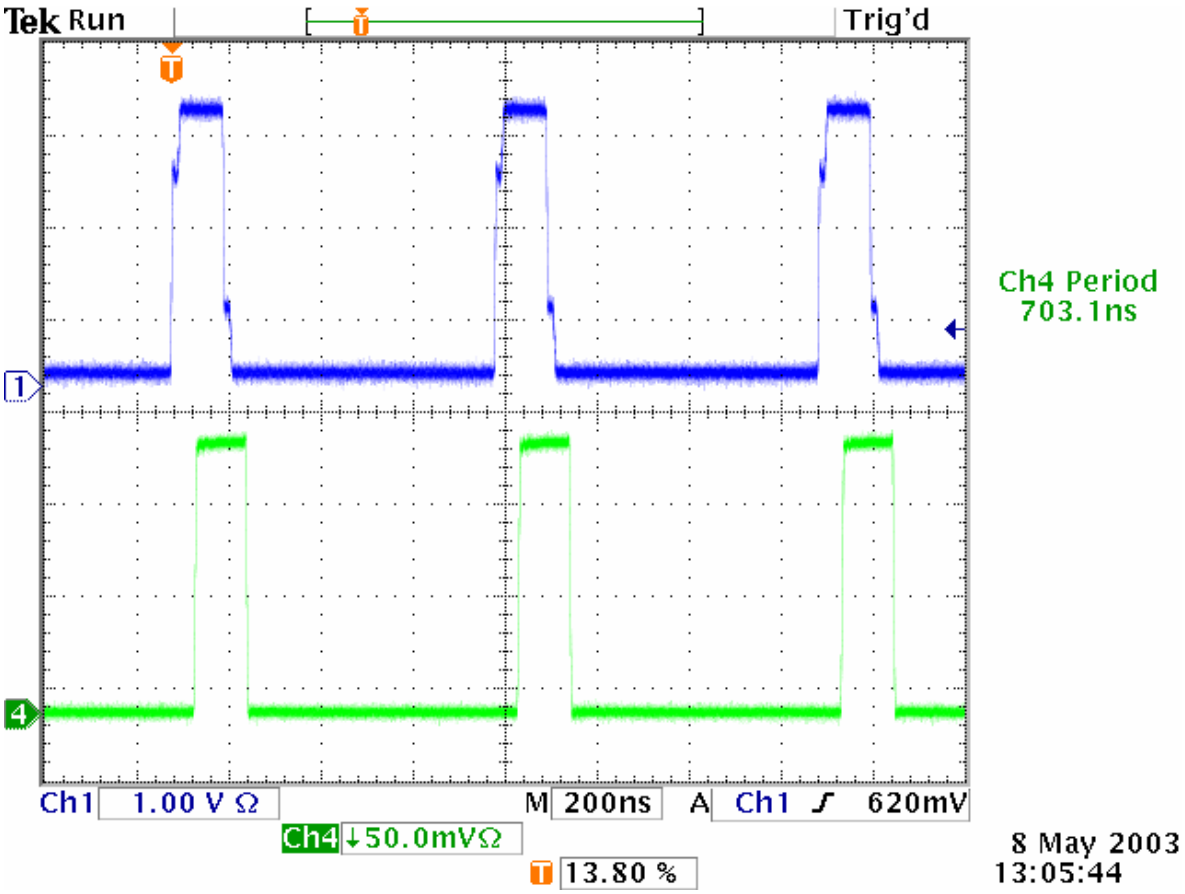
Interval < 1 microsecond at 1.25 GHz + 25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval less than 1 microsecond



PULSE REPETITION

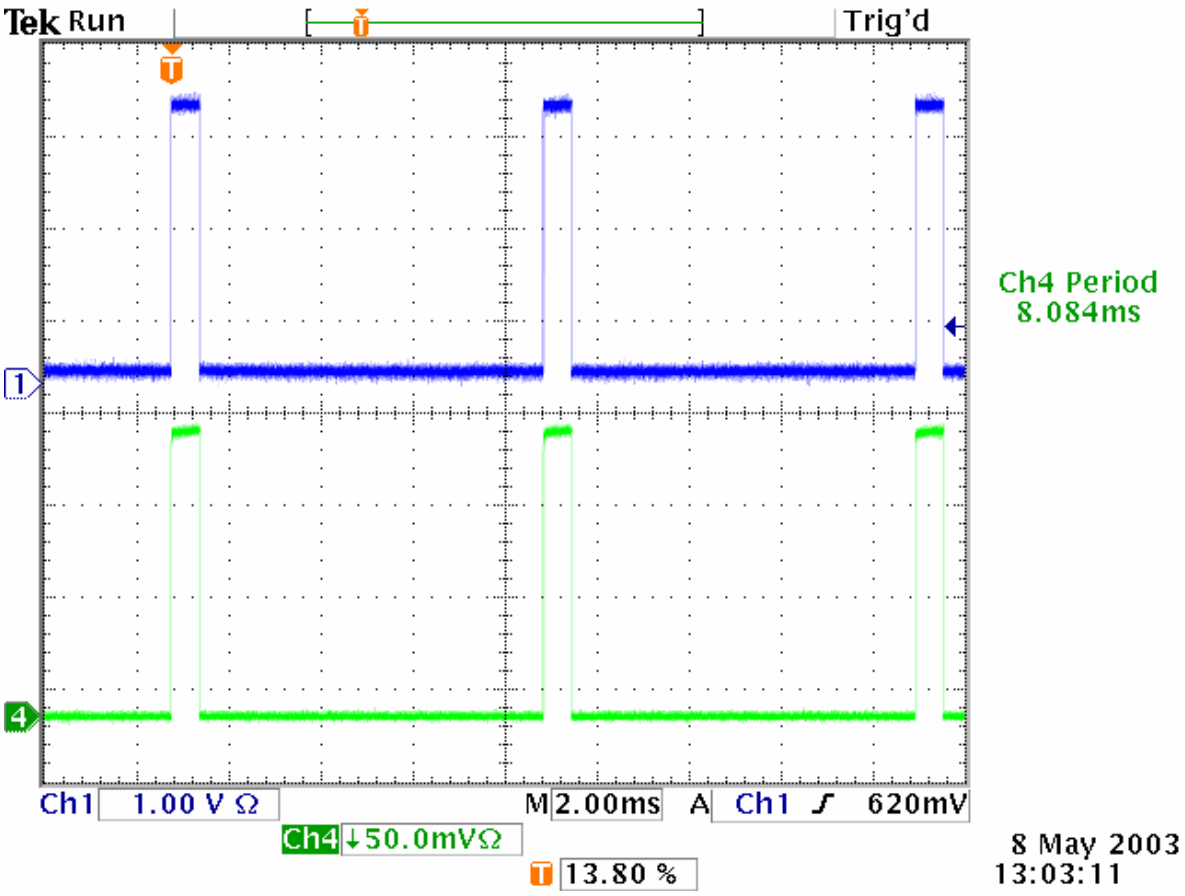
Interval > 6 milliseconds at 4.0 GHz + 25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval greater than 6 milliseconds



PULSE REPETITION

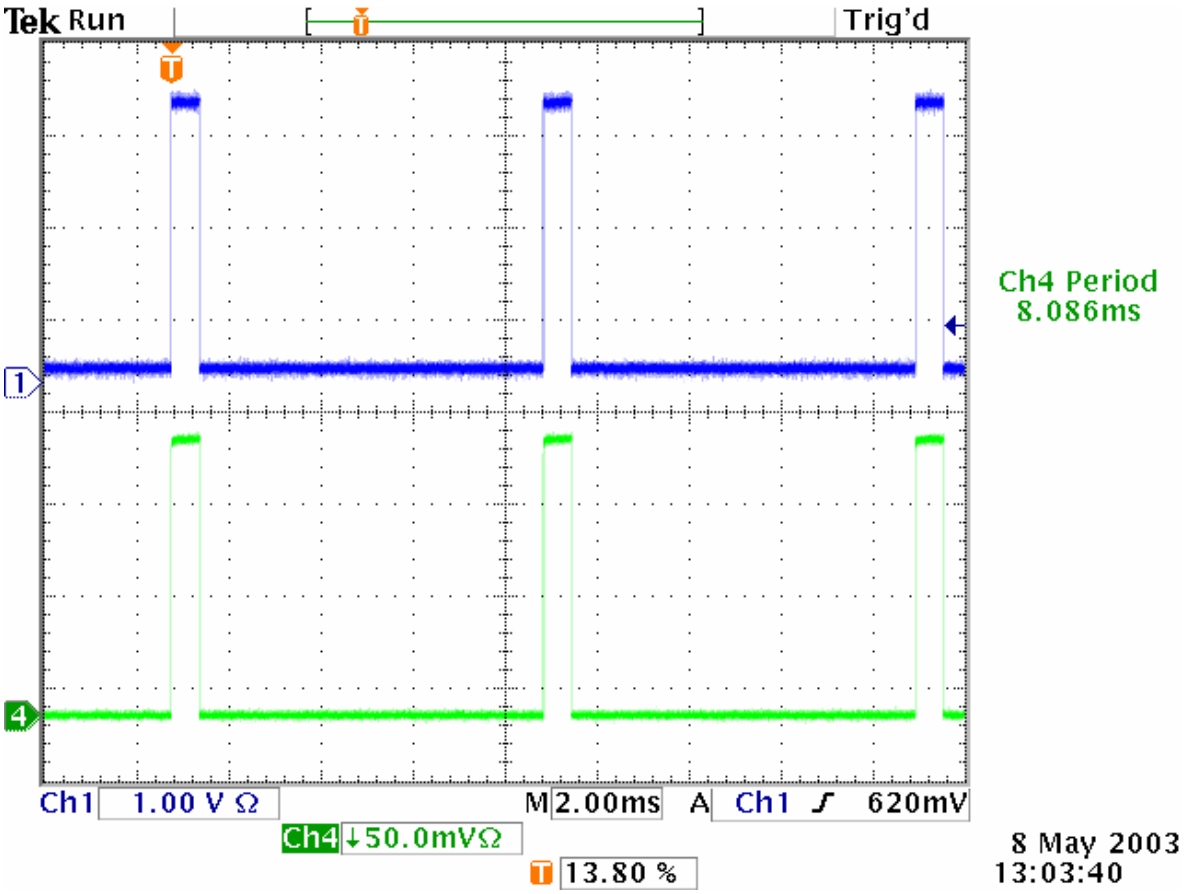
Interval > 6 milliseconds at 1.25 GHz + 25 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval greater than 6 milliseconds



PULSE REPETITION

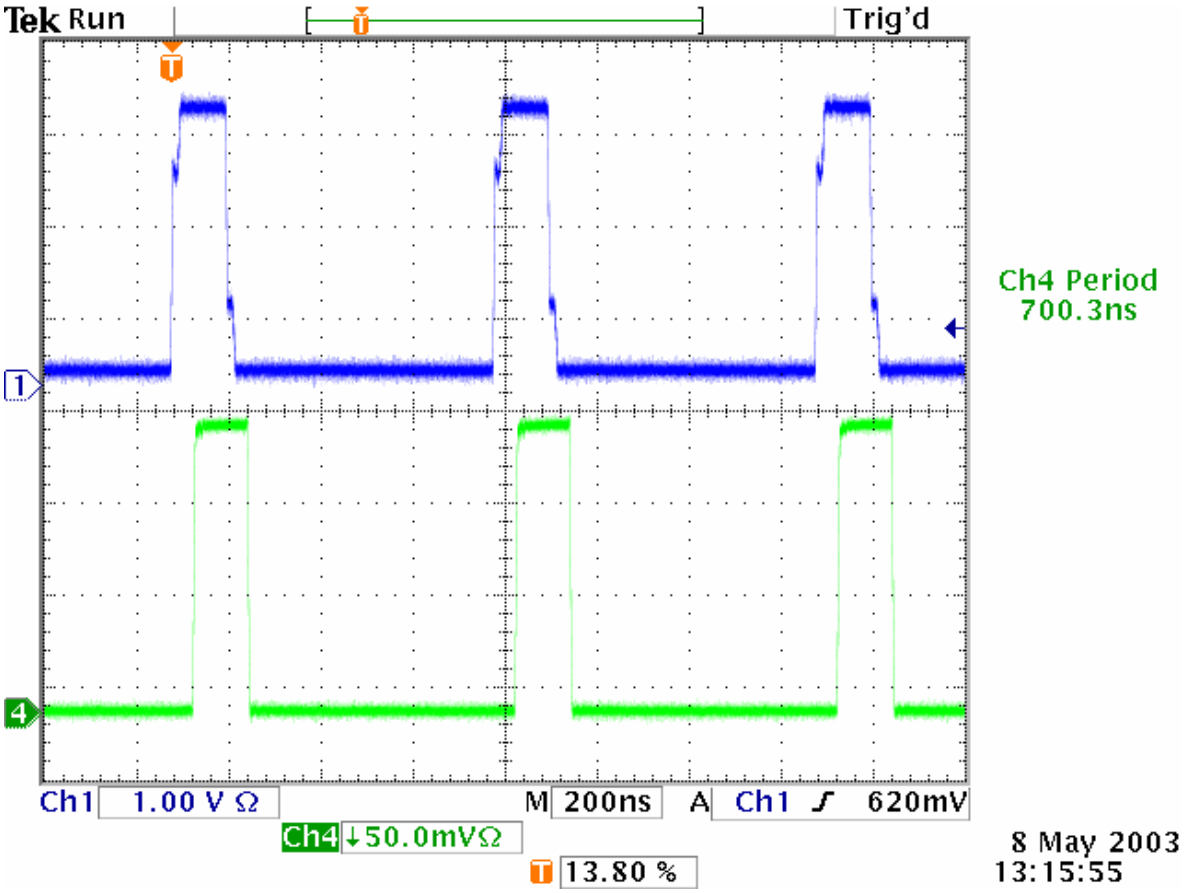
Interval < 1 microsecond at 4.0 GHz - 20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval less than 1 microsecond



PULSE REPETITION

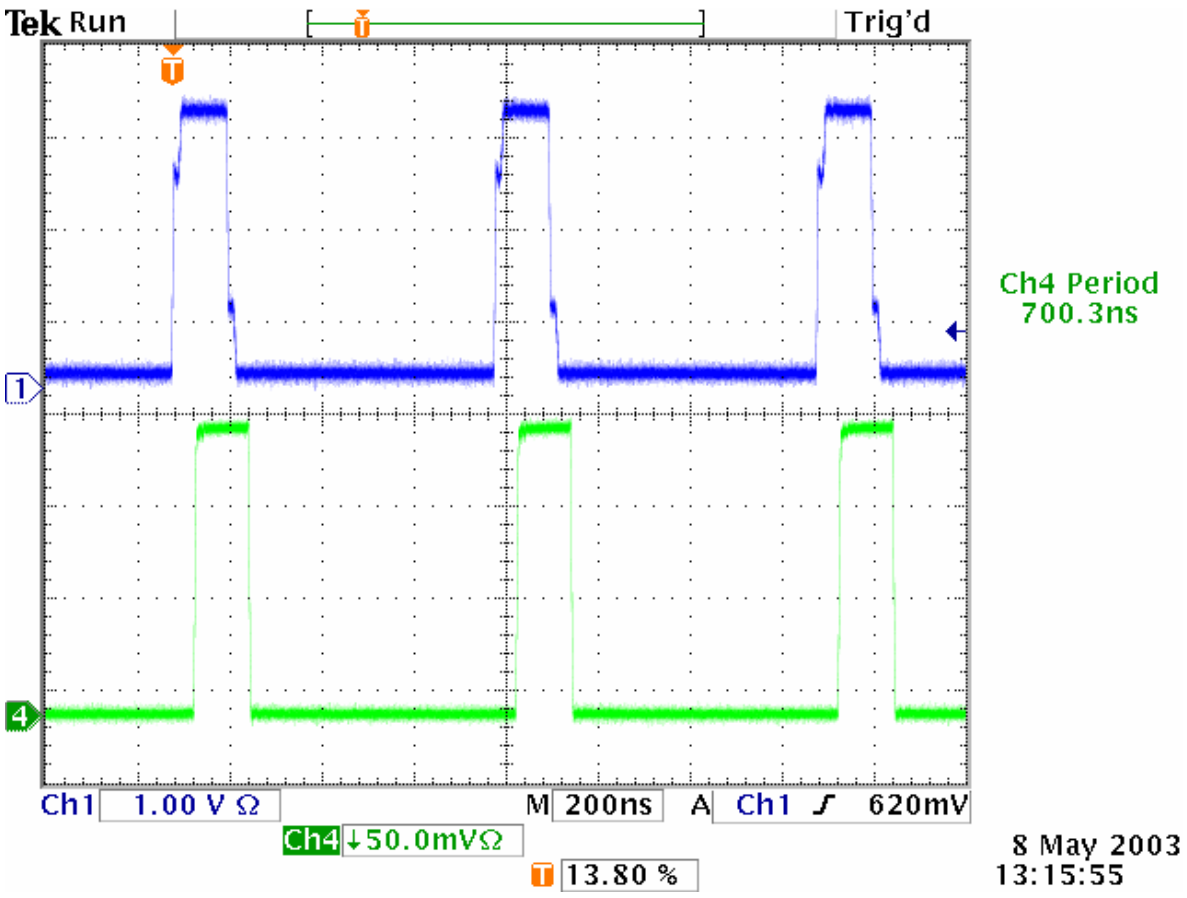
Interval < 1 microsecond at 1.25 GHz - 20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval less than 1 microsecond



PULSE REPETITION

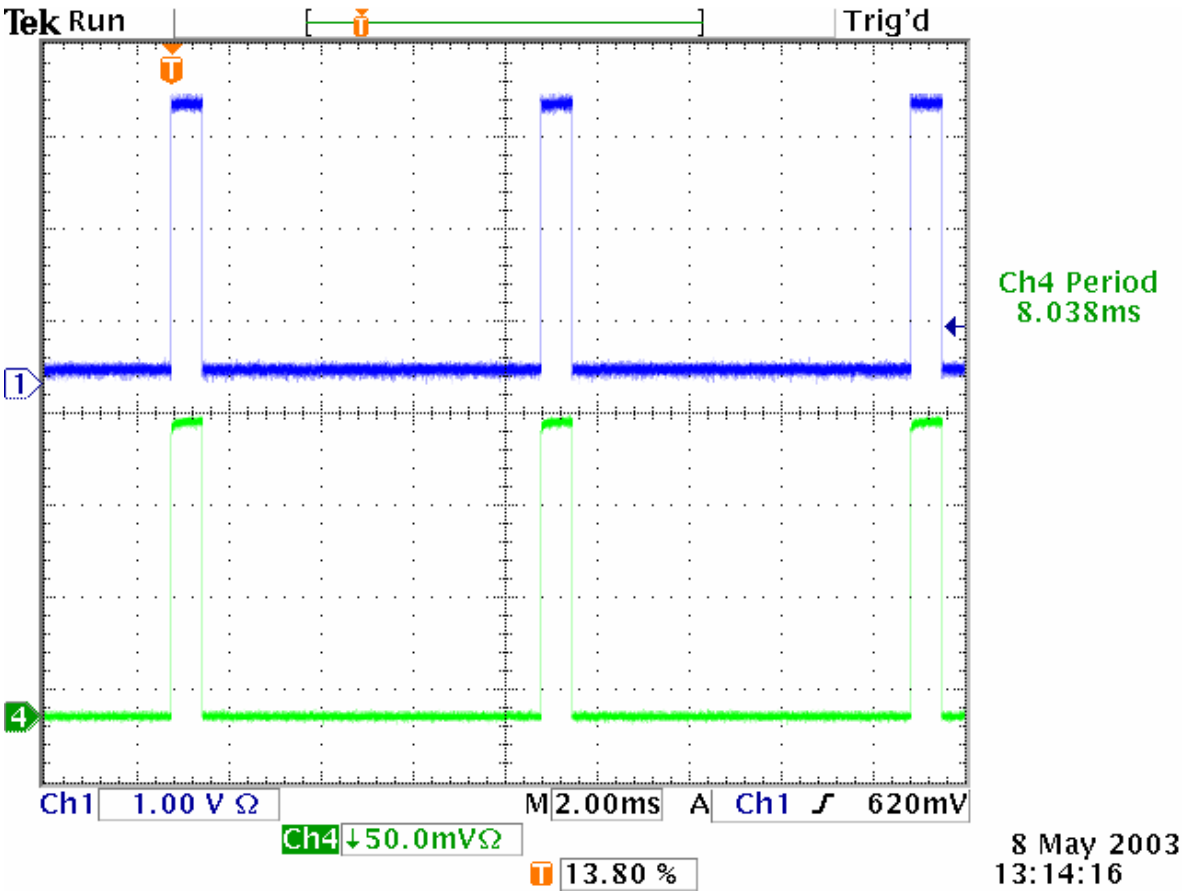
Interval > 6 milliseconds at 4.0 GHz - 20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval greater than 6 milliseconds



PULSE REPETITION

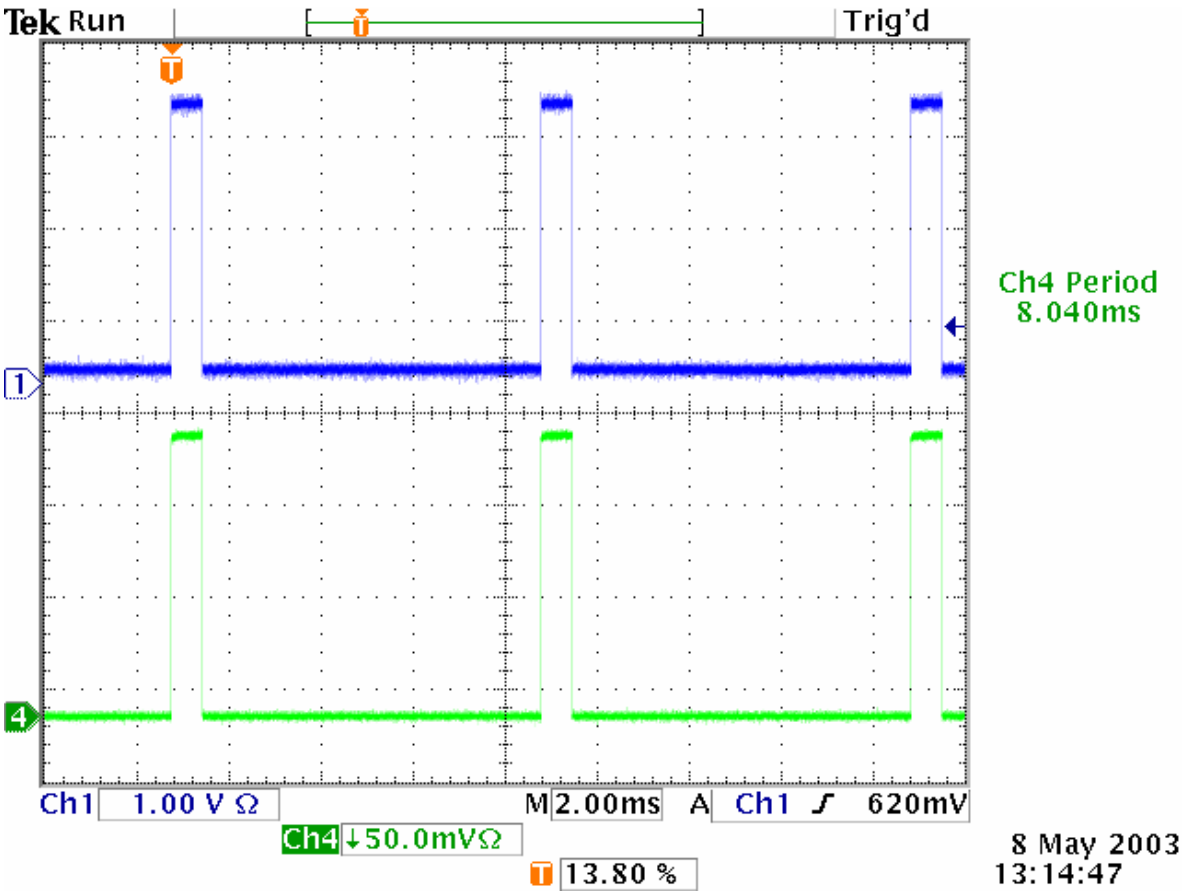
Interval > 6 milliseconds at 1.25 GHz - 20 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval greater than 6 milliseconds



PULSE REPETITION

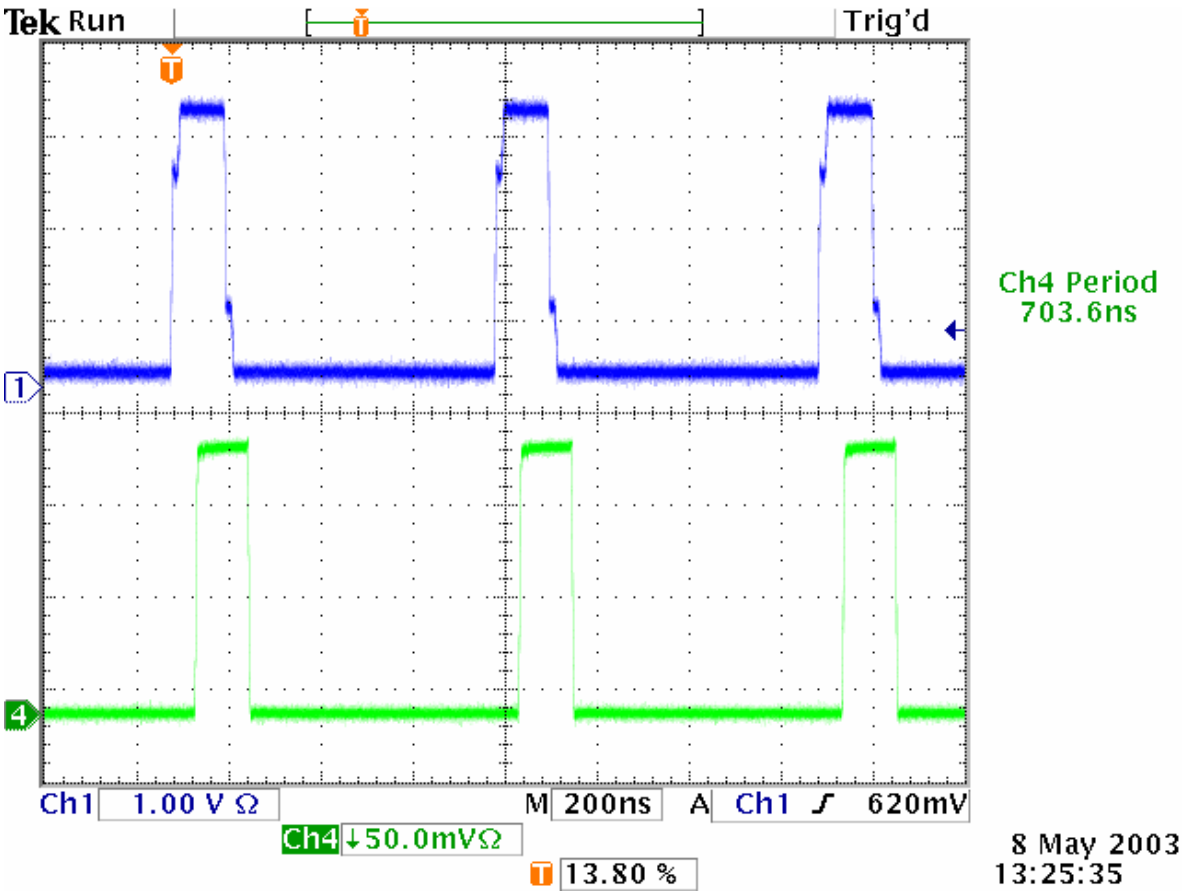
Interval < 1 microsecond at 4.0 GHz + 65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval less than 1 microsecond



PULSE REPETITION

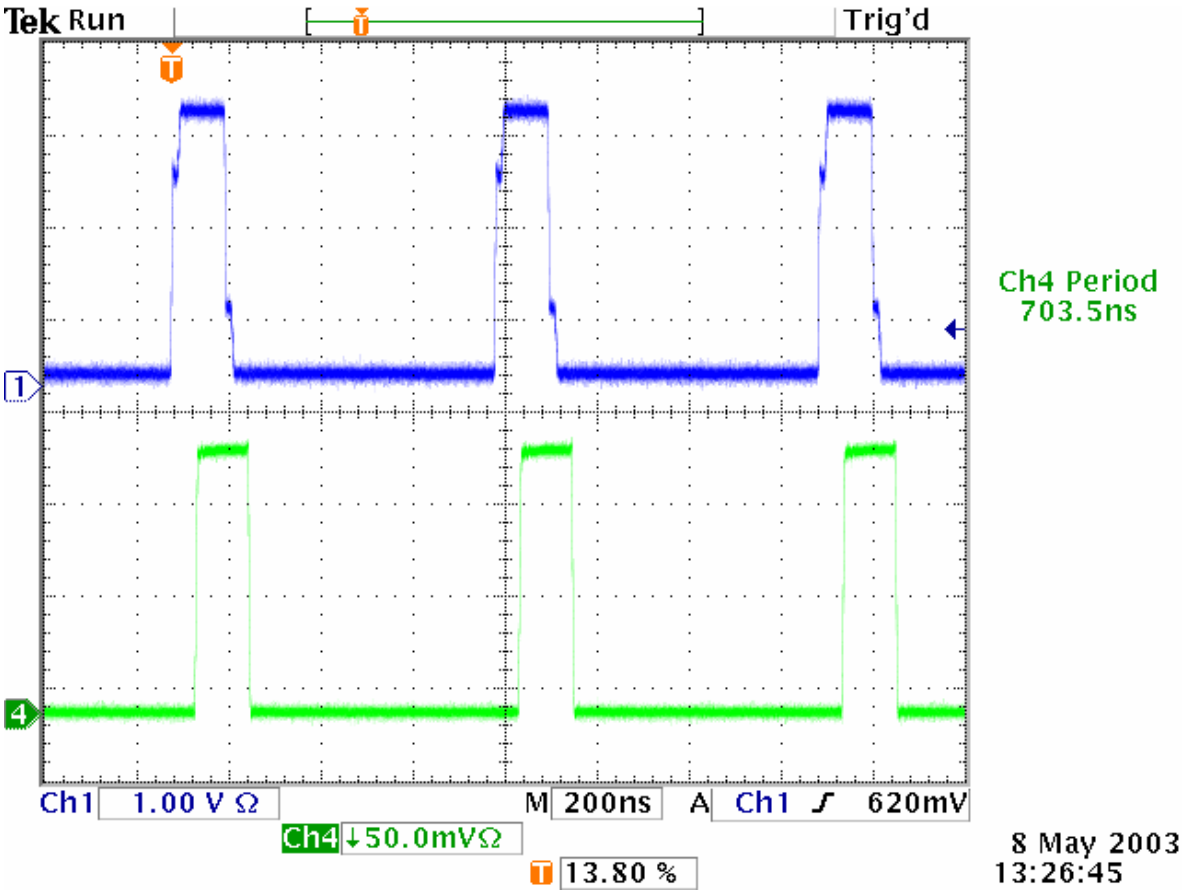
Interval < 1 microsecond at 1.25 GHz + 65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval less than 1 microsecond



PULSE REPETITION

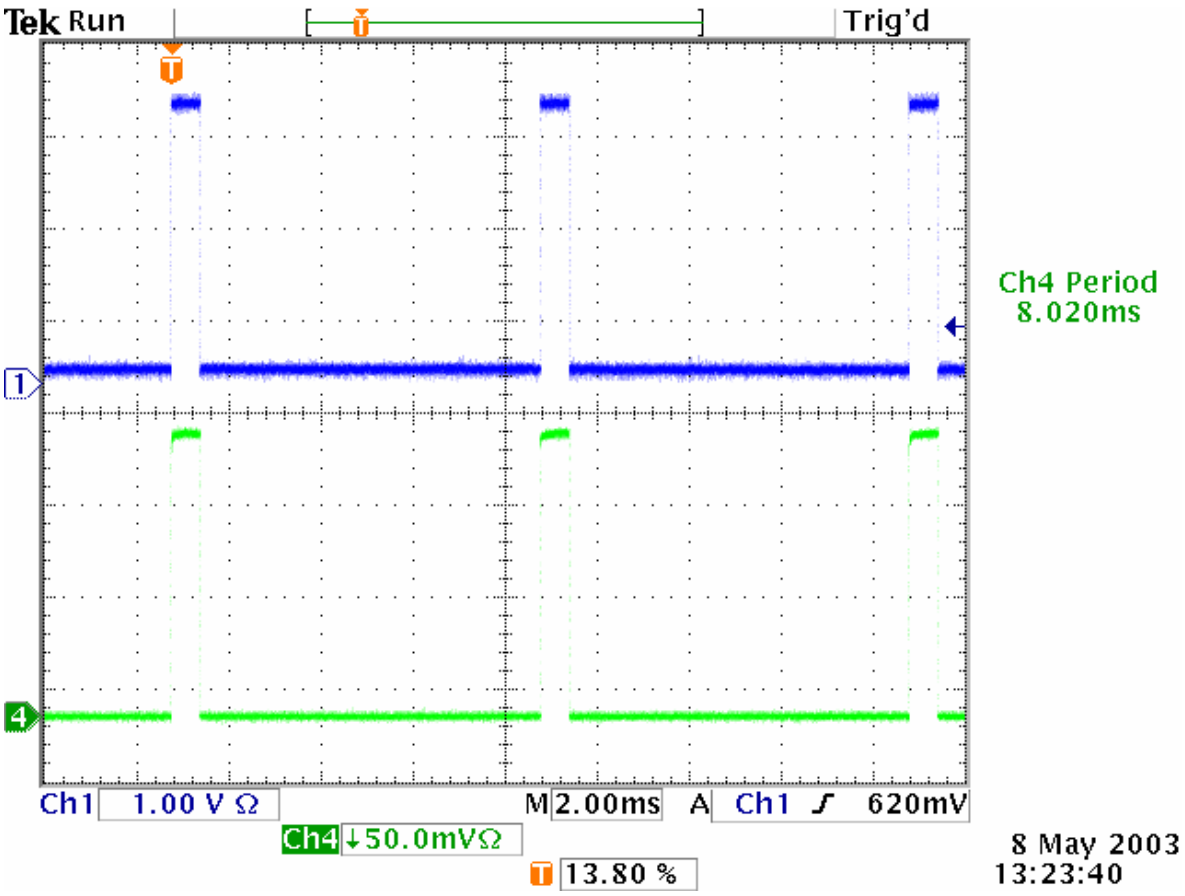
Interval > 6 milliseconds at 4.0 GHz + 65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 4 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval greater than 6 milliseconds



PULSE REPETITION

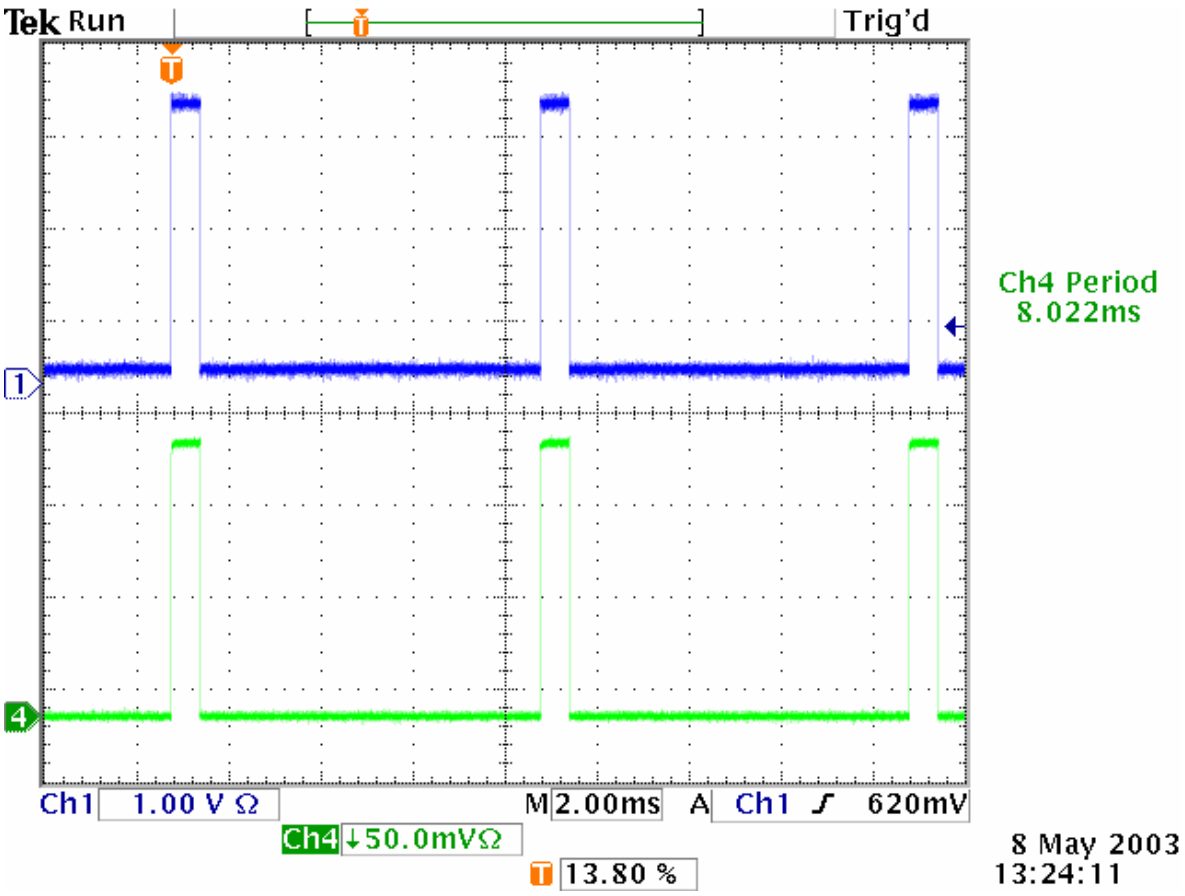
Interval > 6 milliseconds at 1.25 GHz + 65 deg C

Blue trace is : TTL control signal

Green trace is : Detector Output with 12 dBm input 1.25 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.

Pulse Repetition Interval greater than 6 milliseconds



PULSE DISTORTION

PULSE DISTORTION

As Measured at 4.0 GHz and +25°C

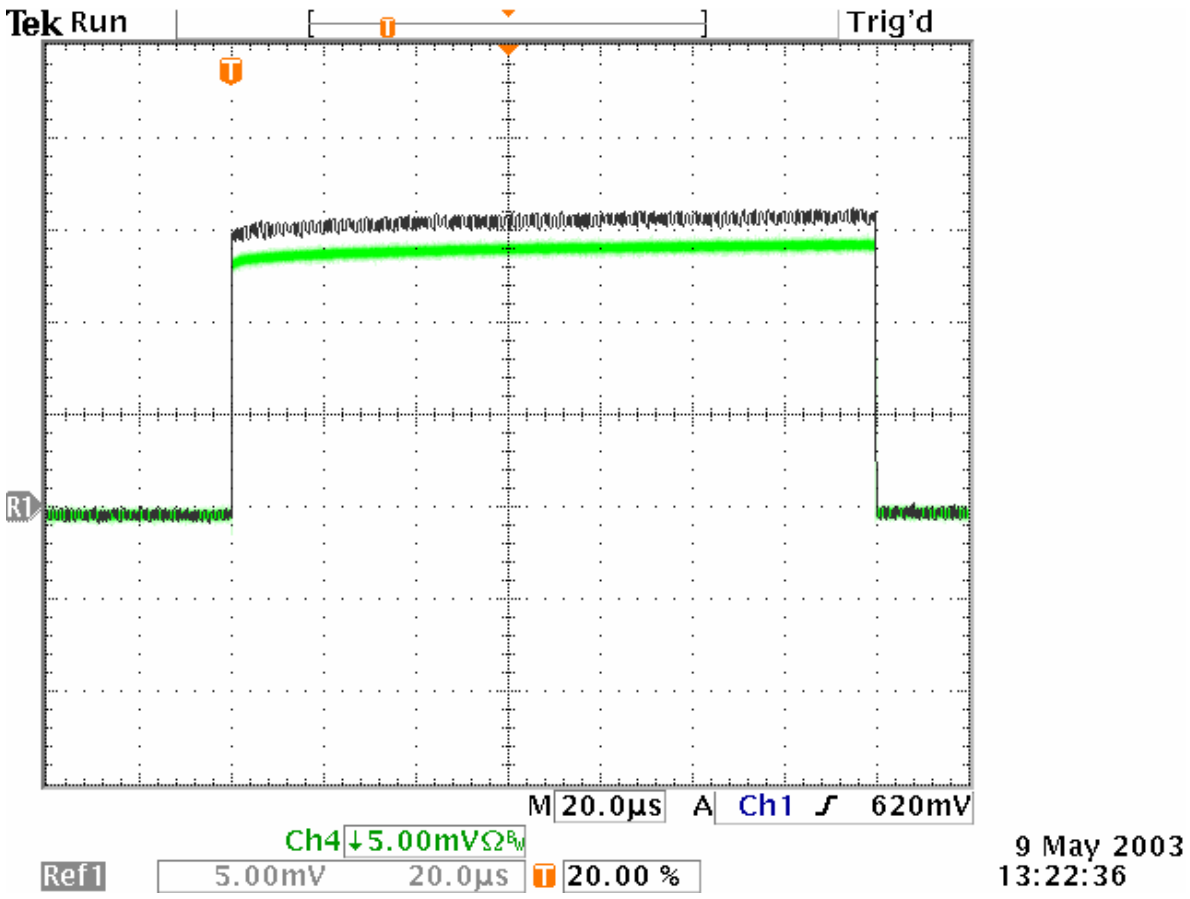
Black trace is : Detector Output with -10.5 dBm input

Green trace is : Detector Output with -11 dBm input

Freq = 4 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.

The separation is 0.5 dB on the RF showing the pulse distortion is less than 0.2 dB.



PULSE DISTORTION

As Measured at 1.25 GHz and +25°C

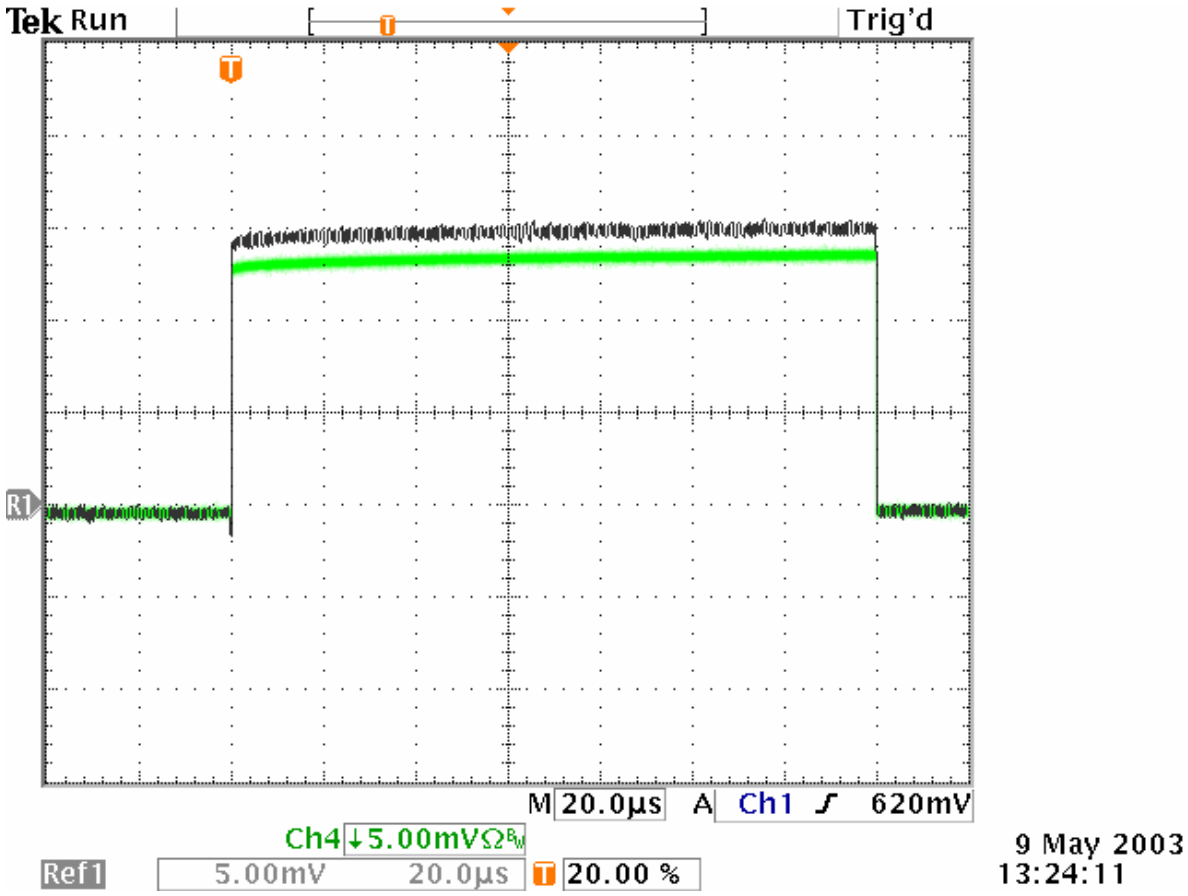
Black trace is : Detector Output with -10.5 dBm input

Green trace is : Detector Output with -11 dBm input

Freq = 1.25 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.

The separation is 0.5 dB on the RF showing the pulse distortion is less than 0.2 dB.



PULSE DISTORTION

As Measured at 4.0 GHz and -20°C

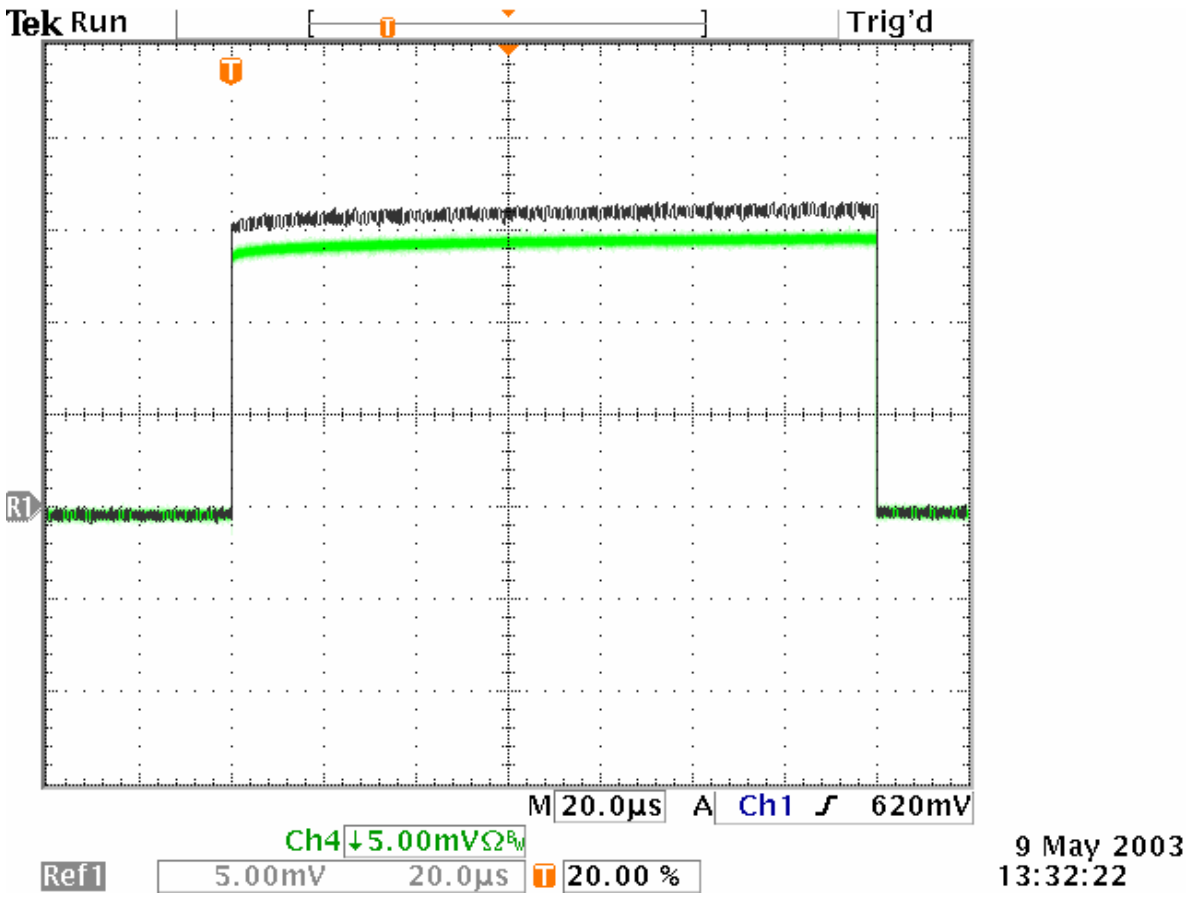
Black trace is : Detector Output with -10.5 dBm input

Green trace is : Detector Output with -11 dBm input

Freq = 4 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.

The separation is 0.5 dB on the RF showing the pulse distortion is less than 0.2 dB.



PULSE DISTORTION

As Measured at 1.25 GHz and -20°C

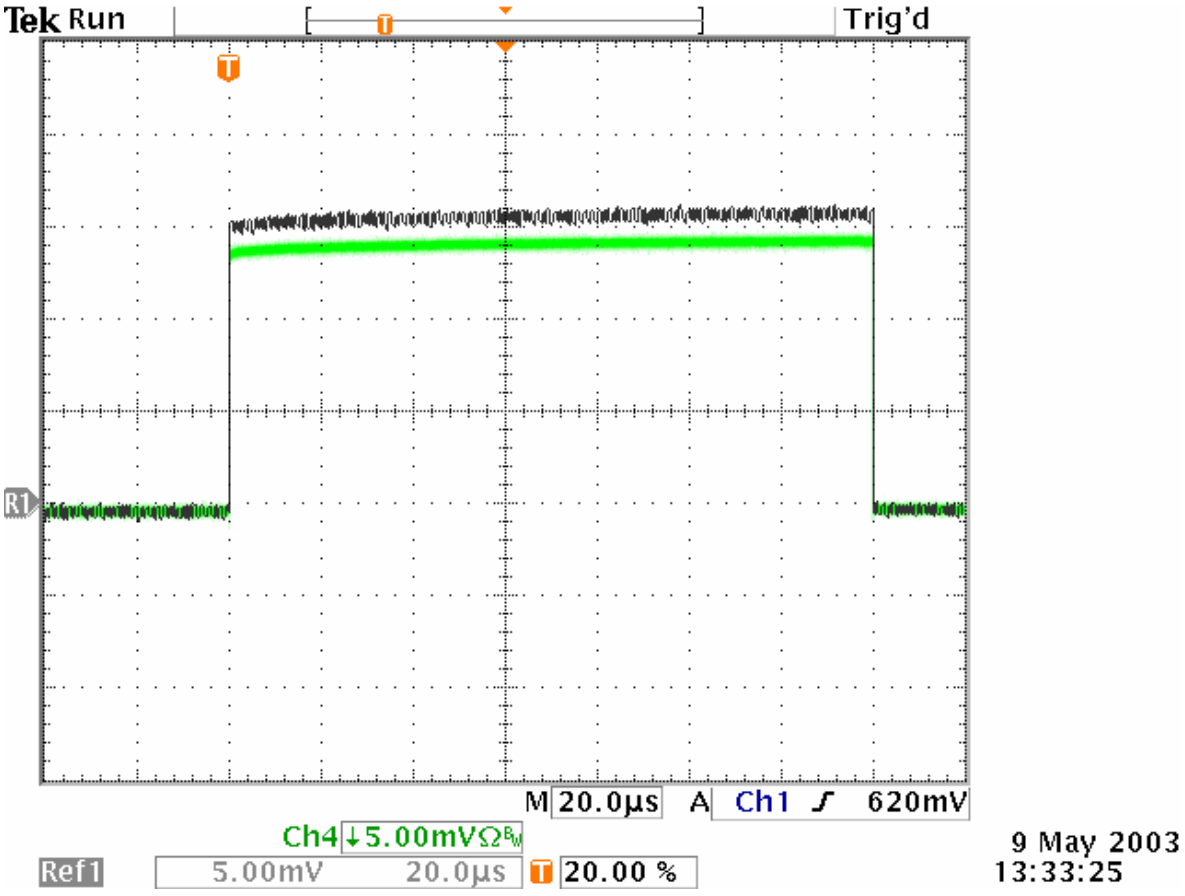
Black trace is : Detector Output with -10.5 dBm input

Green trace is : Detector Output with -11 dBm input

Freq = 1.25 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.

The separation is 0.5 dB on the RF showing the pulse distortion is less than 0.2 dB.



PULSE DISTORTION

As Measured at 4.0 GHz and +65°C

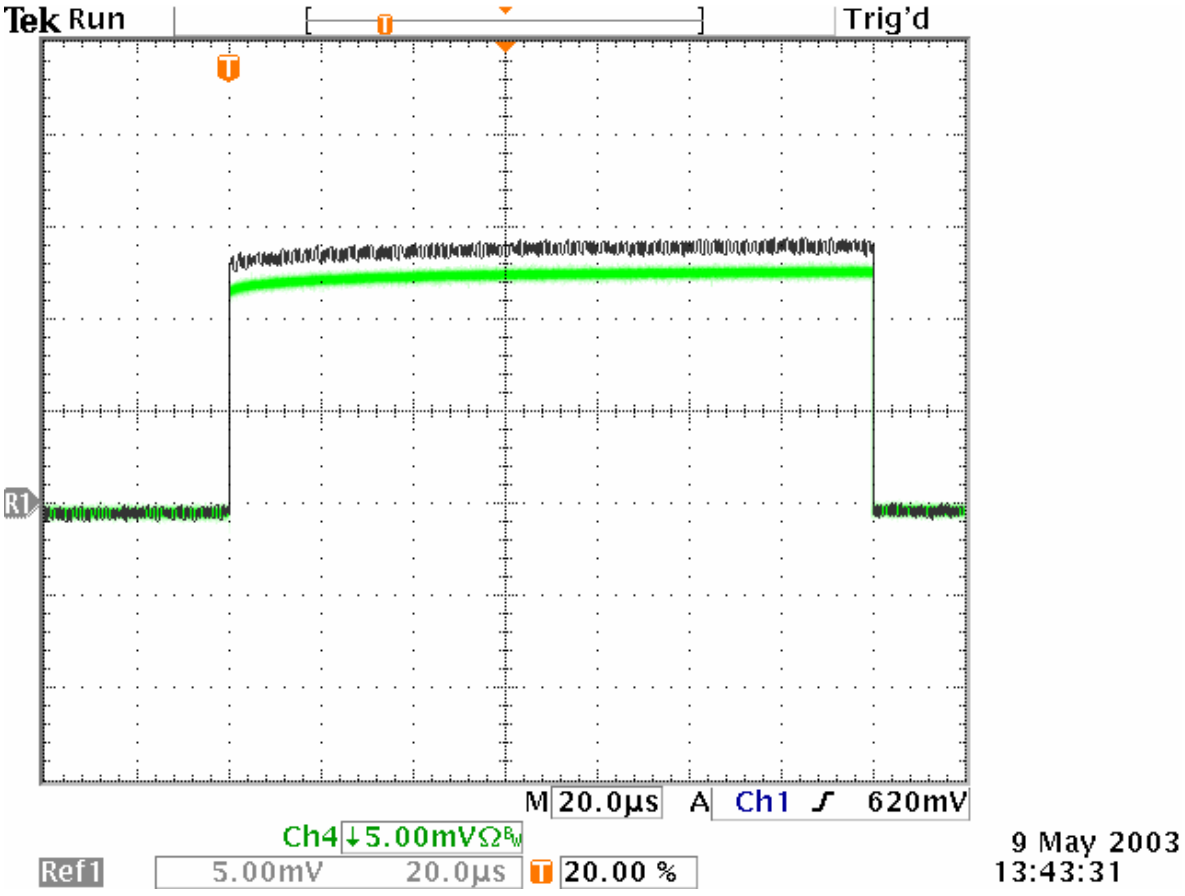
Black trace is : Detector Output with -10.5 dBm input

Green trace is : Detector Output with -11 dBm input

Freq = 4 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.

The separation is 0.5 dB on the RF showing the pulse distortion is less than 0.2 dB.



PULSE DISTORTION

As Measured at 1.25 GHz and +65°C

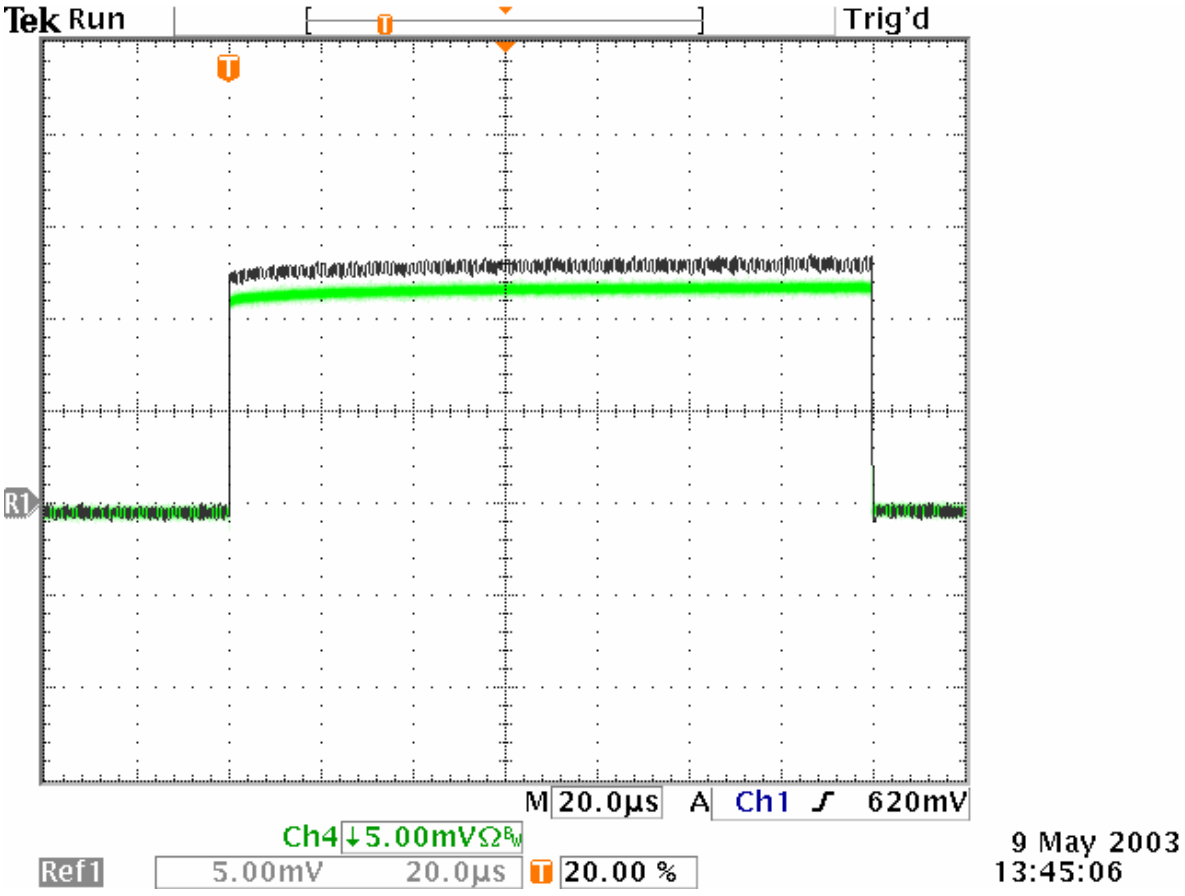
Black trace is : Detector Output with -10.5 dBm input

Green trace is : Detector Output with -11 dBm input

Freq = 1.25 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.

The separation is 0.5 dB on the RF showing the pulse distortion is less than 0.2 dB.



PULSE / CW DIFFERENTIAL

PULSE / CW DIFFERENTIAL

Pulse and CW Differential as Measured at 4.0 GHz and +25°C

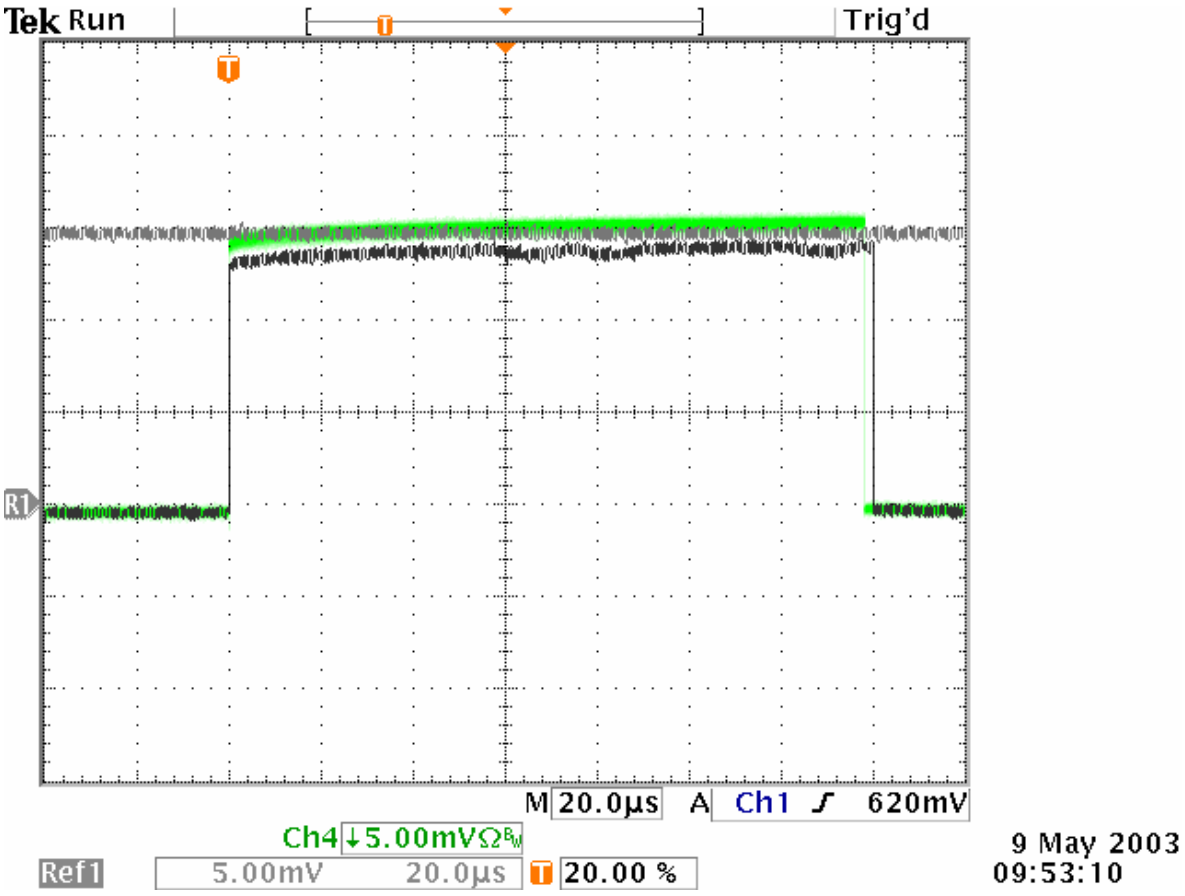
Black Trace1 is : Detector Output with -11 dBm input CW

Black trace2 is : Detector Output with -11 dBm input Pulse

Green trace is : Detector Output with -10.5 dBm input Pules

Freq = 4 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.



PULSE / CW DIFFERENTIAL

Pulse and CW Differential as Measured at 1.25 GHz and +25°C

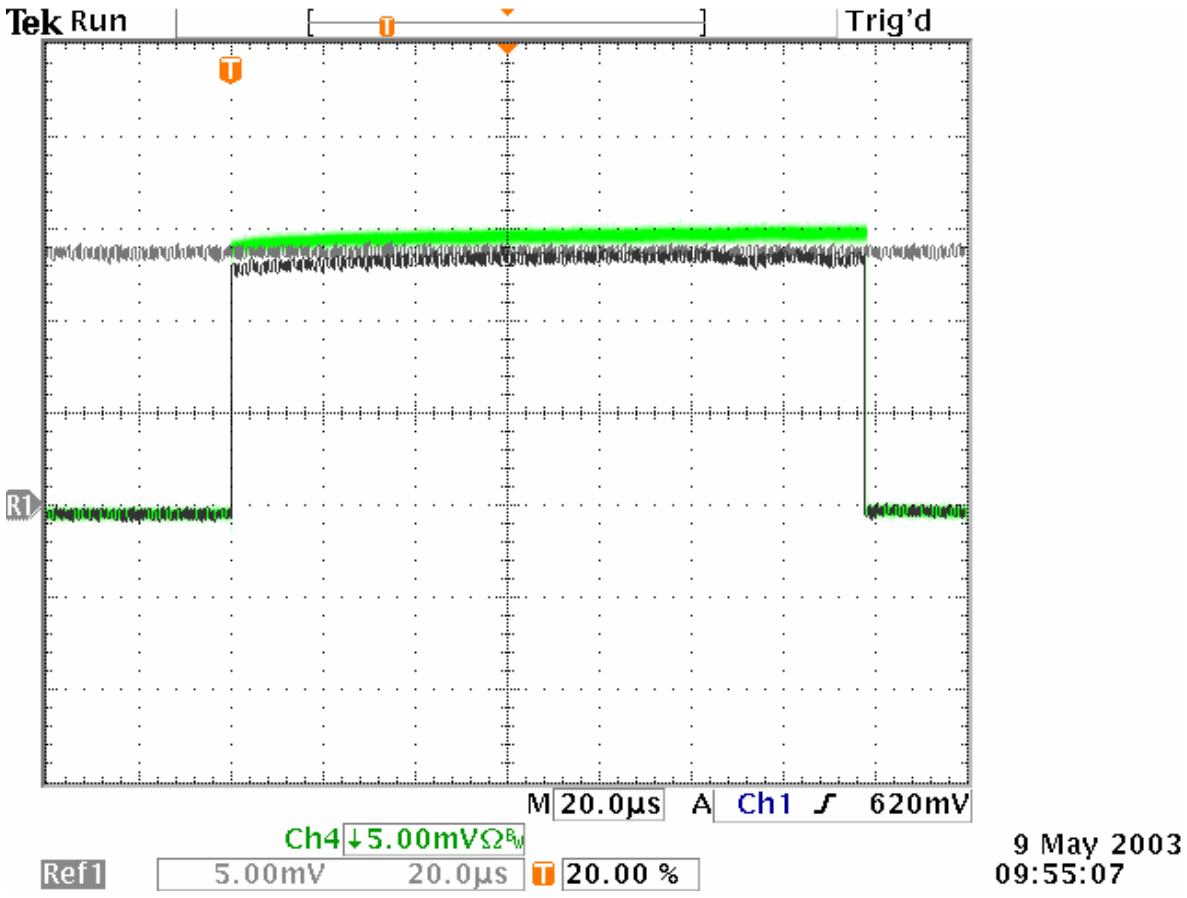
Black Trace1 is : Detector Output with -11 dBm input CW

Black trace2 is : Detector Output with -11 dBm input Pulse

Green trace is : Detector Output with -10.5 dBm input Pules

Freq = 1.25 GHz

25 deg C Base temperature, UUT mounted on mounting spacers.



PULSE / CW DIFFERENTIAL

Pulse and CW Differential as Measured at 4.0 GHz and -20°C

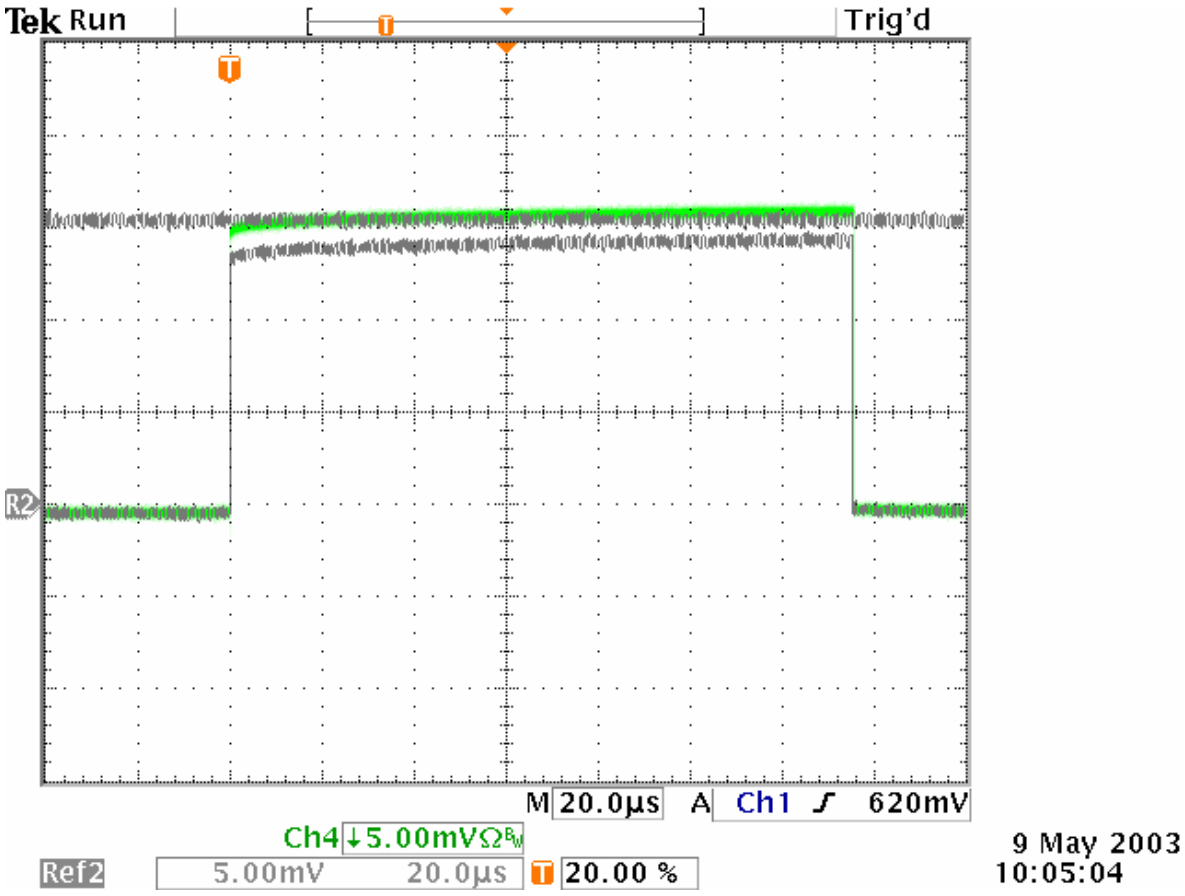
Black Trace1 is : Detector Output with -11 dBm input CW

Black trace2 is : Detector Output with -11 dBm input Pulse

Green trace is : Detector Output with -10.5 dBm input Pules

Freq = 4 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.



PULSE / CW DIFFERENTIAL

Pulse and CW Differential as Measured at 1.25 GHz and -20°C

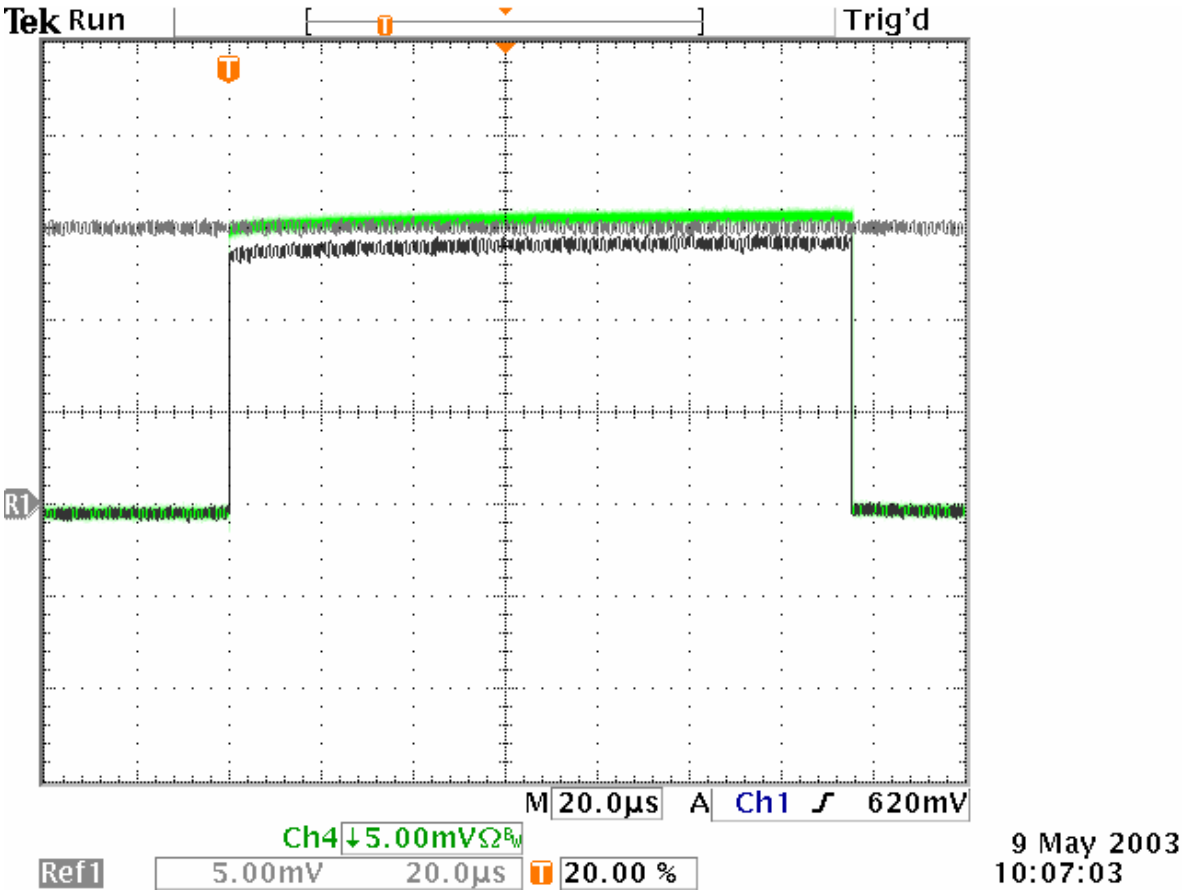
Black Trace1 is : Detector Output with -11 dBm input CW

Black trace2 is : Detector Output with -11 dBm input Pulse

Green trace is : Detector Output with -10.5 dBm input Pules

Freq = 1.25 GHz

-20 deg C Base temperature, UUT mounted on mounting spacers.



PULSE / CW DIFFERENTIAL

Pulse and CW Differential as Measured at 4.0 GHz and +65°C

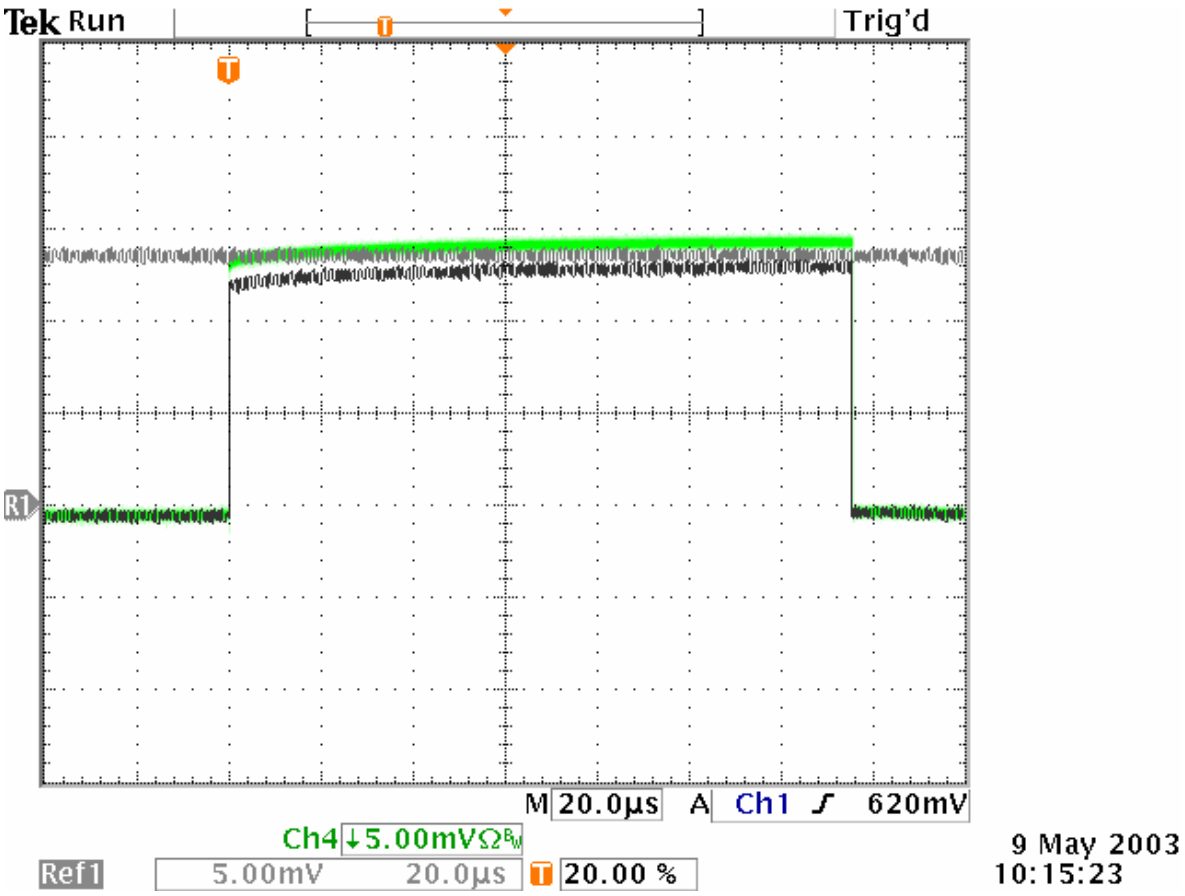
Black Trace1 is : Detector Output with -11 dBm input CW

Black trace2 is : Detector Output with -11 dBm input Pulse

Green trace is : Detector Output with -10.5 dBm input Pules

Freq = 4 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.



PULSE / CW DIFFERENTIAL

Pulse and CW Differential as Measured at 1.25 GHz and +65°C

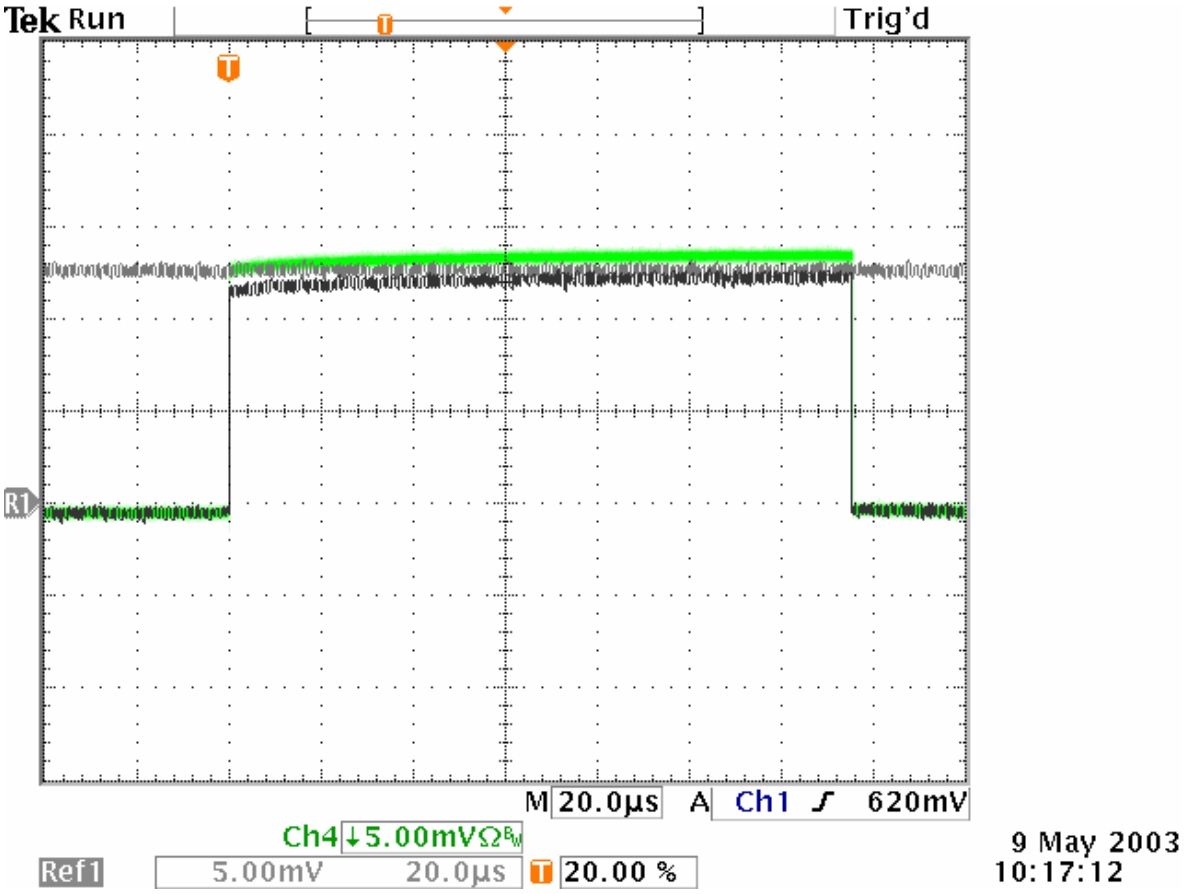
Black Trace1 is : Detector Output with -11 dBm input CW

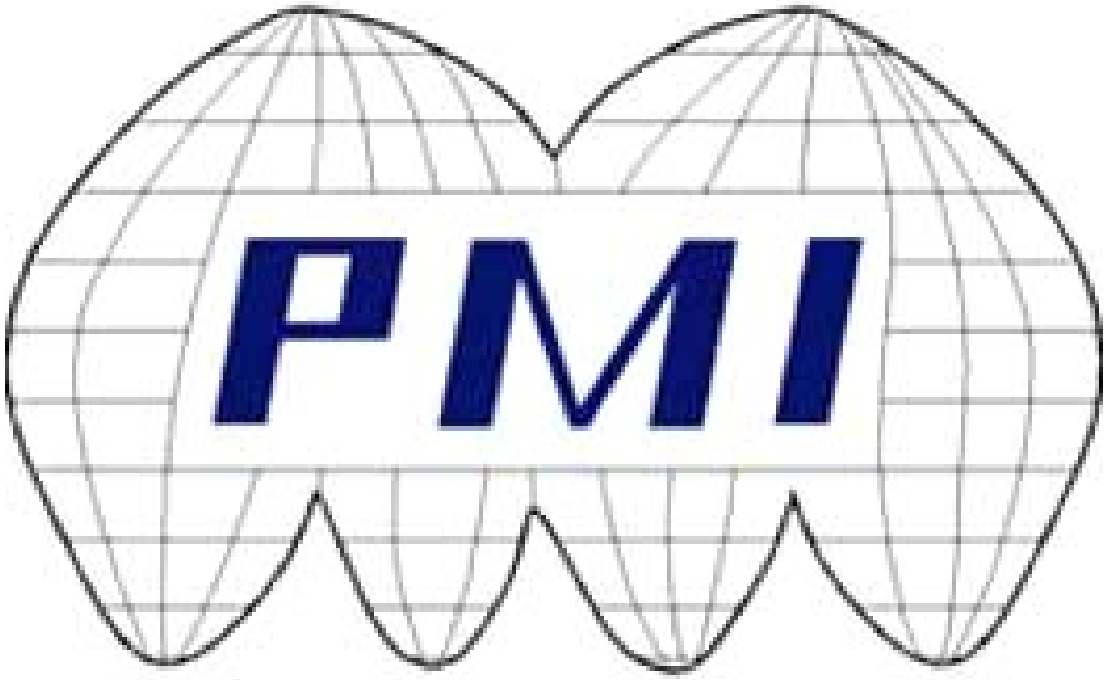
Black trace2 is : Detector Output with -11 dBm input Pulse

Green trace is : Detector Output with -10.5 dBm input Pulse

Freq = 1.25 GHz

65 deg C Base temperature, UUT mounted on mounting spacers.





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