



FCC Certification Test Report
for
Demarc Technologies Group, LLC
QGK-DT200

June 30, 2003

Prepared for:

Demarc Technologies Group, LLC
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Frenchtown, NJ 08825

Prepared By:

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**FCC Certification Test Report
for the
Demarc Technologies Group, LLC
DT-ZM-200mW-WC 2.4 GHz DSSS
QGK-DT200**

WLL JOB# 7384

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Abstract

This report has been prepared on behalf of Demarc Technologies Group, LLC to support the attached Application for Equipment Authorization. The test report and application are submitted for a Spread Spectrum Transceiver under Part 15.247 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a Demarc Technologies Group, LLC DT-ZM-200mW-WC 2.4 GHz DSSS.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The Demarc Technologies Group, LLC DT-ZM-200mW-WC 2.4 GHz DSSS complies with the limits for a Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The Demarc Technologies Group, LLC DT-ZM-200mW-WC Spread Spectrum System complies with the limits for a Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer: Demarc Technologies Group, LLC
40 Fairview Road
Frenchtown, NJ 08825

Quotation Number: 60022

1.4 Test Dates

Testing was performed from April 17, 2003 to May 20, 2003.

1.5 Test and Support Personnel

Washington Laboratories, LTD G. Snyder, C. Beattie, K. Gemmell, J. Ritter
Client Representative Tony Morella

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
cm	centimeter
CW	Continuous Wave
dB	decibel
dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
k	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
m	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

EUT: Demarc Technologies Group, LLC DT-ZM-200mW-WC 2.4 GHz DSSS Card
Omnidirectional Antenna – DTG17E-450 17.8dbi
Plate Antenna – DTFPG18 18dbi

The Demarc Technologies Group, LLC DT-ZM-200mW-WC 2.4 GHz DSSS Card is a wireless LAN card used in conjunction with a PC and an antenna.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Demarc Technologies Group, LLC
FCC ID Number	QGK-DT200
EUT Name:	Reliawave 100
Model:	DT-ZM-200mW-WC
FCC Rule Parts:	§15.247
Frequency Range:	2412.67 MHz - 2462.5 MHz
Maximum Output Power:	20.3dBm (107mW) @2412 MHz
Modulation:	Direct Sequence Spread Spectrum
Occupied Bandwidth:	6.47MHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	11
Antenna Type	Two types: Omnidirectional Antenna – DTG17E-450 17.8dbi Plate Antenna – DTFPG18 18dbi
Frequency Tolerance:	N/A
Emission Type(s):	N/A
Interface Cables:	See Section 2.2
Power Source & Voltage:	120VAC via support PC

2.2 Test Configuration

The DT-ZM-200mW-WC was configured with a notebook computer (HP Pavilion Model 6645Cv and HP Power Supply F1454A), and antennas. The EUT was operated from 120Vac/60Hz power.

An extender card was used for the interface to the PC during testing. The extender card was used so that the EUT was fully exposed during the test thus allowing use in different devices.

The following antennas were used during testing:

Omnidirectional Antenna – DTG17E-450 17.8dbi

Plate Antenna – DTFPG18 18dbi

These antennas represent the highest gain for each type of antenna used. The Omnidirectional antennas listed in the manual are the panel antennas with no deflection plate attached.

The following cables were used on the DT-ZM-200mW-WC during testing:

Port/Cable Description	Shielding	Length	Connected (from/to)
P/N: DTRPMMCX-NM-PIG	Yes	0.3 meters	PCMIA RCV Port to 50 Ω terminator
P/N: DTRPMMCX-NM-PIG	Yes	0.3 meters	PCMIA RCV Port to Antenna

2.3 Testing Algorithm

The DT-ZM-200mW-WC 2.4 GHz DSSS was operated continuously via the notebook PC, which used client-supplied software (Radio Testing Program Version 1.0) to set control channels (1, 6, 11). Worst-case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

FCC97114 Report & Order, Appendix C: Guidance on Measurements for Direct Sequence Spread Spectrum Systems

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-93)

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ± 2.3 dB.

This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, total uncertainty = $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2. Test Equipment List

Manufacturer & Model	Description	Serial Number	Property Number	Calibration Due Date
Agilent Technologies 8474B	Detector	2905A04196	00416	N/A
A.H. Systems SAS-200/518	Log Periodic Antenna	117	00001	3/1/03
Antenna Research Associates DRG-118/A	Horn Antenna (new)	1236	00425	8/29/03
Antenna Research Associates LPB-2520	Biconilog Antenna Site 2	1044	00007	6/19/03
Hewlett Packard 8449B	Pre-Amplifier	3008A00729	00066	2/11/04
Hewlett Packard 8564E	Spectrum Analyzer	3643A00657	00067	4/18/03
Hewlett Packard 85650A	Q.P. Adapter (Site 1)	2811A01283	00068	7/2/03
Hewlett Packard 85685A	RF Preselector (Site 2)	3221A01395	00071	5/17/03
Hewlett Packard 8568B	Spectrum Analyzer (Site 2)	2634A02888	00073	7/3/03
Solar Electronics 8012-50-R-24-BNC	LISN	8379493	00124	6/20/03

4 Test Results

4.1 RF Power Output

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer (HP8564E). The method of measurement chosen was one that has been an acceptable test procedure per the FCC. The following describes the test procedure used.

Using the spectrum analyzers Band Power Measurement Function over the appropriate emission bandwidth (6dB bandwidth + 2MHz) gives the peak output reading. The following table lists the conducted power measurements.

Table 3. RF Power Output

Frequency	Level	Limit	Pass/Fail
Channel 1 2412.53 MHz	23.05 dBm	30dBm	Pass
Channel 6 2437.35 MHz	23.04 dBm	30dBm	Pass
Channel 11 2462.79 MHz	23.12 dBm	30dBm	Pass

4.2 Power Spectral Density

For DSSS devices, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band.

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

The carrier was modulated internally via firmware that provided loop-back data to the rear-panel T1 connectors.

Table 4. Power Spectral Density

Frequency	Level	Limit	Pass/Fail
Channel 1 2411 MHz	-5.2 dBm	8 dBm	Pass
Channel 6 2437 MHz	-4.94 dBm	8 dBm	Pass
Channel 11 2463 MHz	-5.69 dBm	8 dBm	Pass

4.3 Occupied Bandwidth

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

For Direct Sequence Spread Spectrum Systems, FCC Part 15.247 requires that the minimum 6 dB bandwidth be at least 500 kHz.

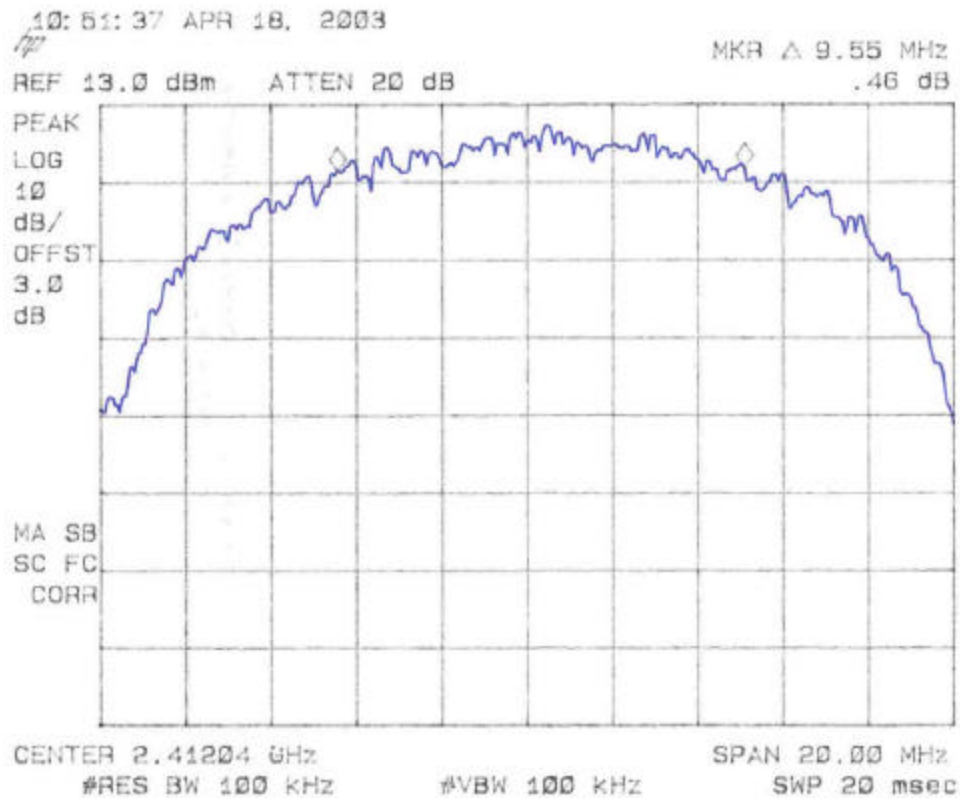


Figure 1. Occupied Bandwidth Channel 1

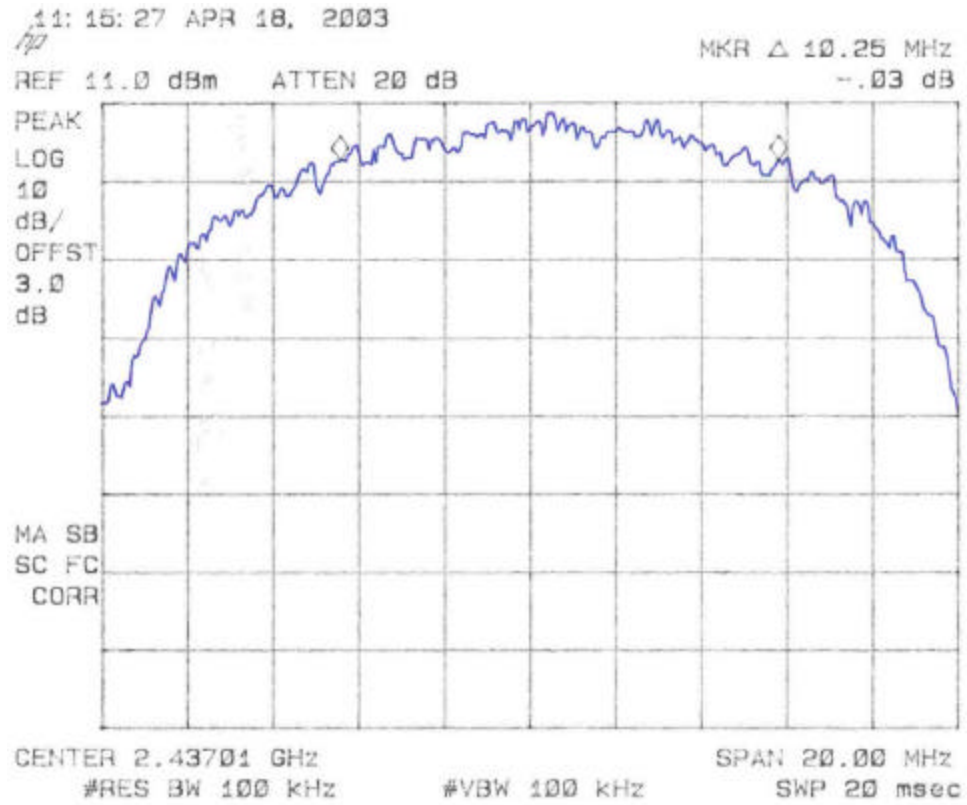


Figure 2. Occupied Bandwidth Channel 6

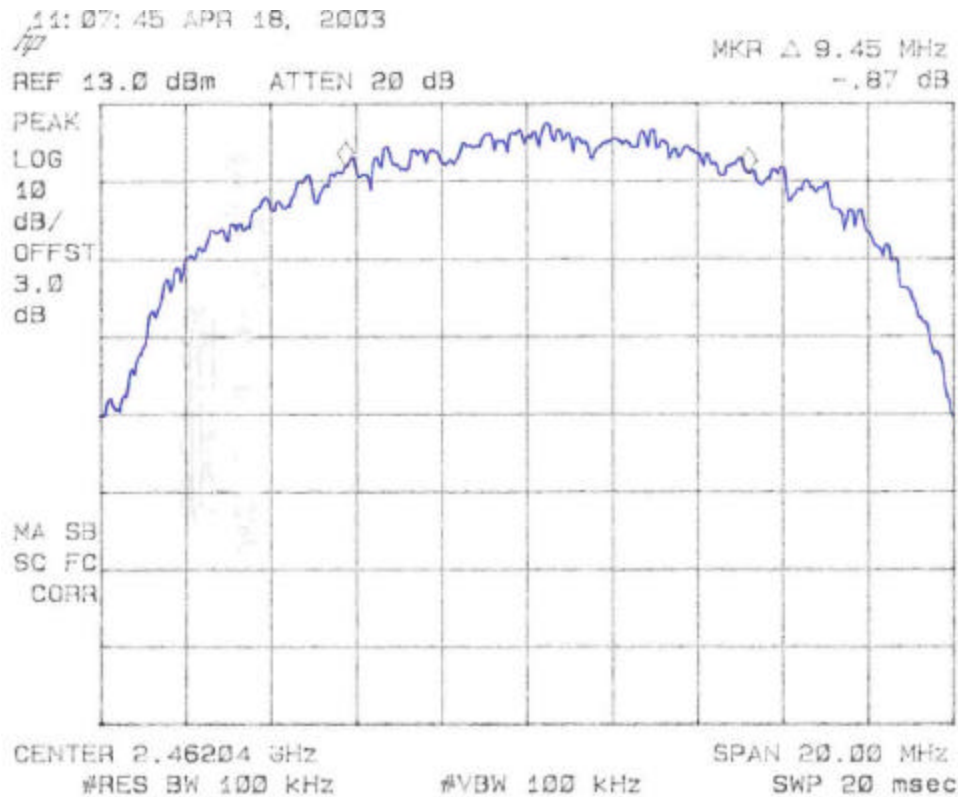


Figure 3. Occupied Bandwidth Channel 11

Table 5 provides a summary of the Occupied Bandwidth Results.

Table 5. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Channel 1 2412 MHz	9.55 MHz	> 500 kHz	Pass
Channel 6 2437.5 MHz	10.25 MHz	> 500 kHz	Pass
Channel 11 2462.5 MHz	9.45 MHz	> 500 kHz	Pass

4.4 Spurious Emissions at Antenna Terminals (FCC Part §15.247(b))

In any 100 kHz band outside the frequency band in which the system is operating, the RF power shall be at least 20dB below that in the 100 kHz bandwidth that contain the highest level of the desired power.

See the plots of conducted emissions plots below.

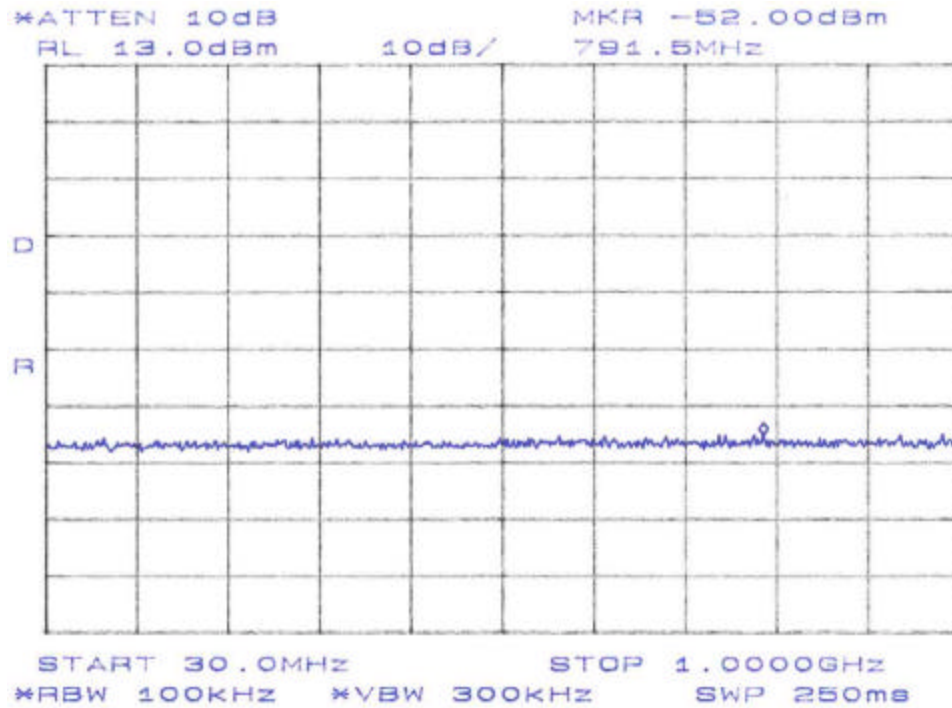


Figure 4. Spurious Emissions Data- Channel 1, 30MHz - 1GHz

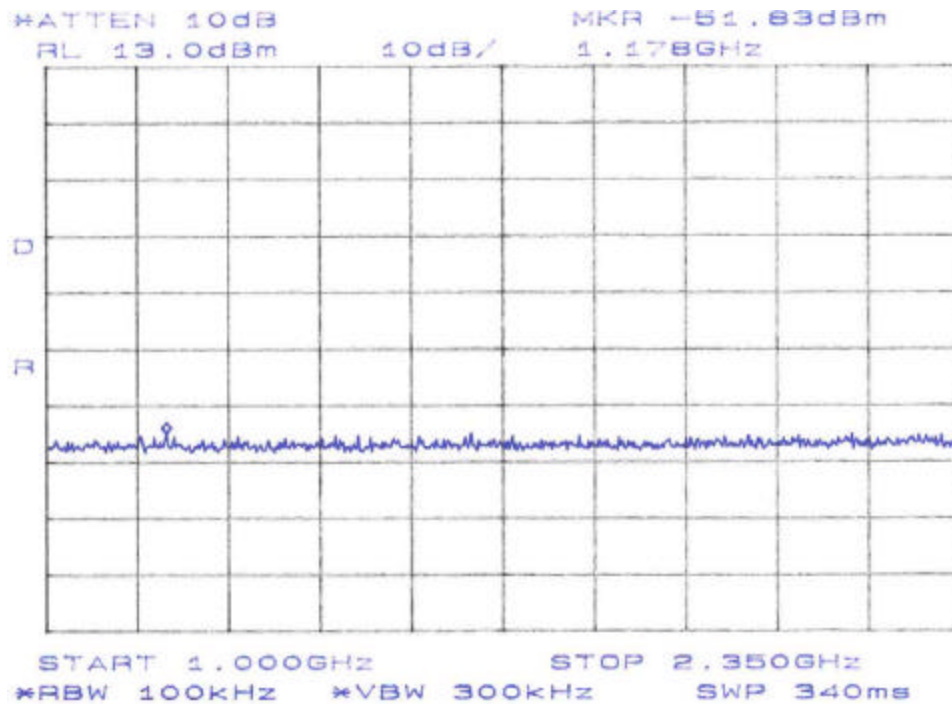


Figure 5. Spurious Emissions Data- Channel 1, 1GHz – 2.35 GHz

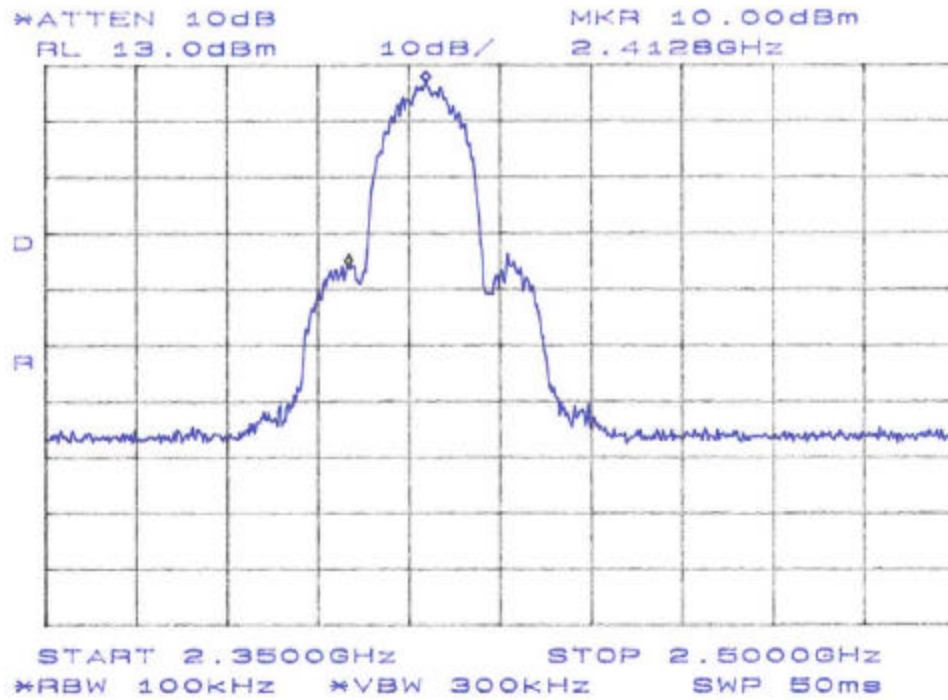


Figure 6. Spurious Emissions Data- Channel 1, 2.35GHz – 2.5GHz

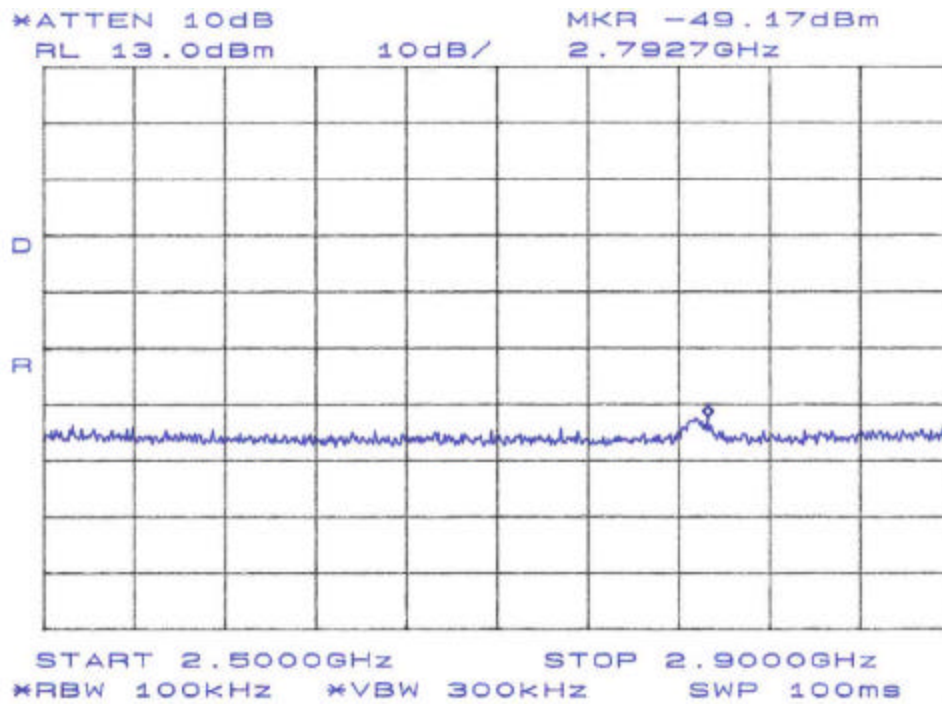


Figure 7. Spurious Emissions Data- Channel 1, 2.5GHz – 2.9GHz

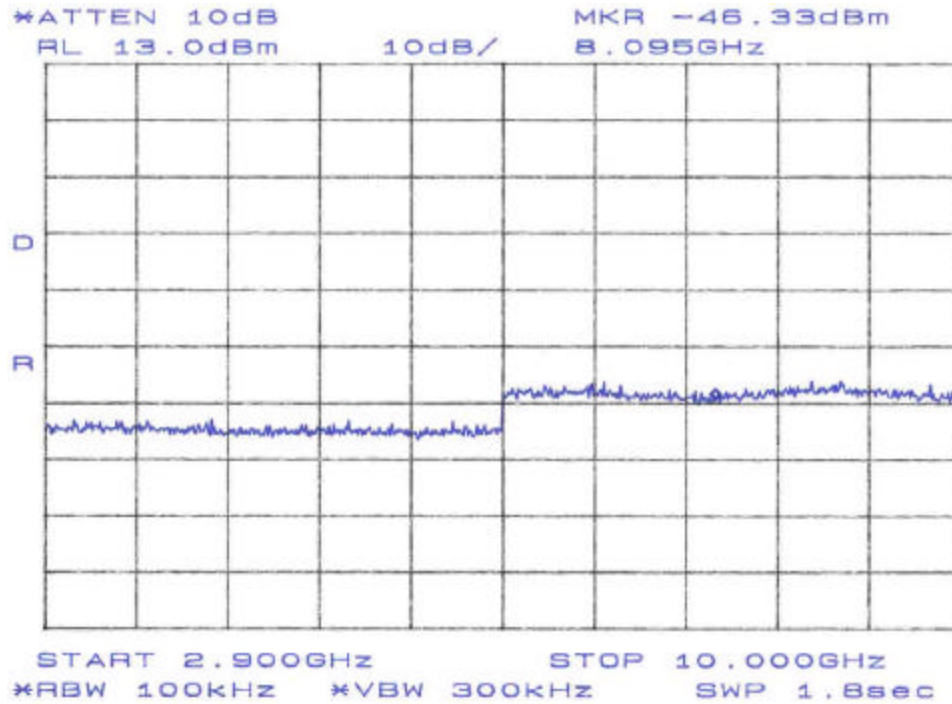


Figure 8. Spurious Emissions Data- Channel 1, 2.9GHz – 10GHz

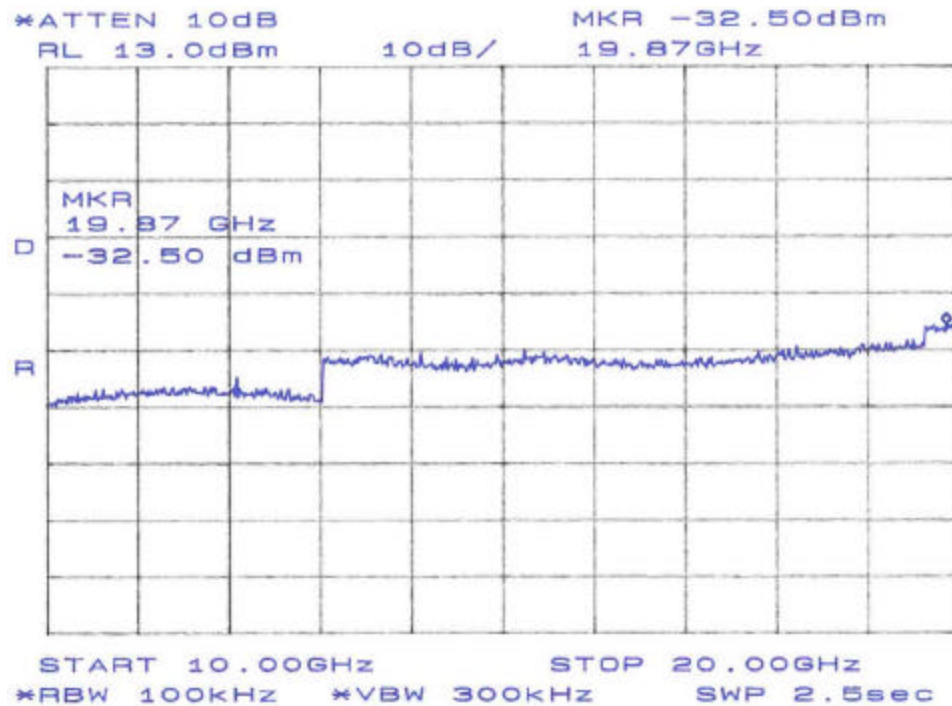


Figure 9. Spurious Emissions Data- Channel 1, 10GHz – 20GHz

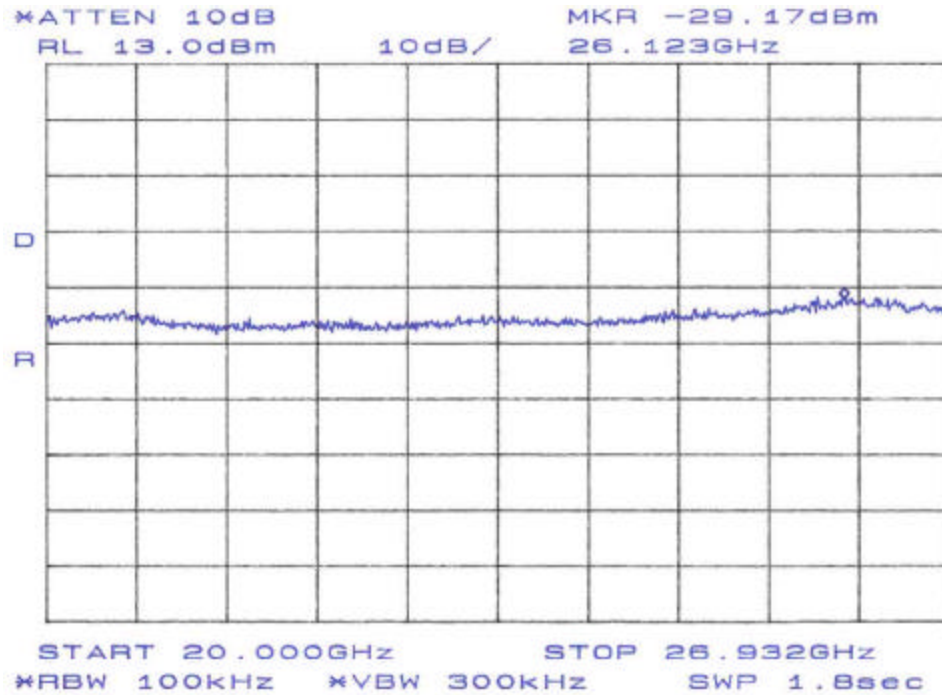


Figure 10. Spurious Emissions Data- Channel 1, 20GHz – 26GHz

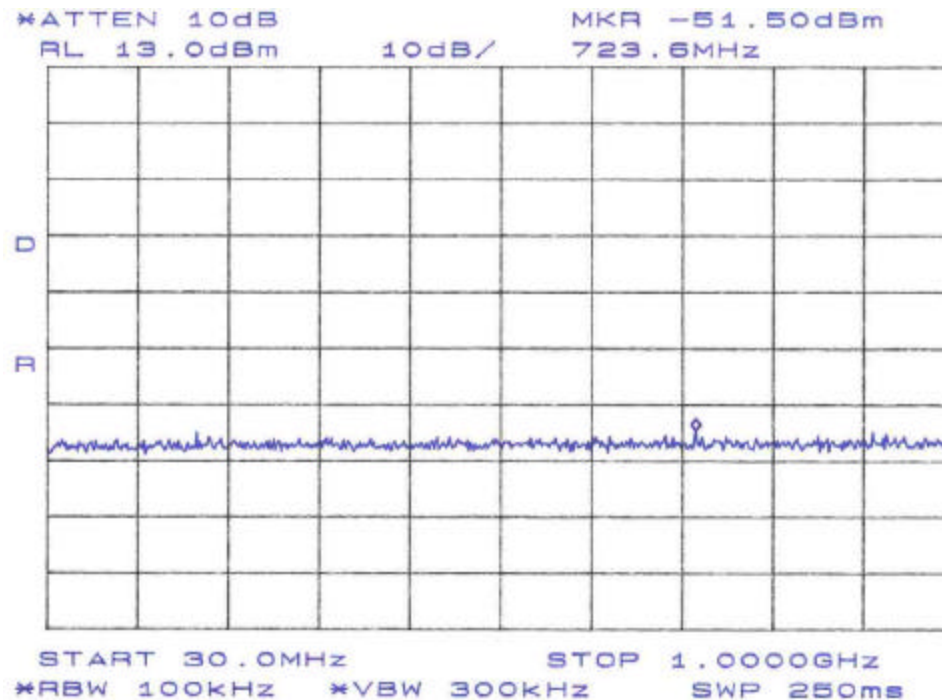


Figure 11. Spurious Emissions Data- Channel 6, 30MHz - 1GHz

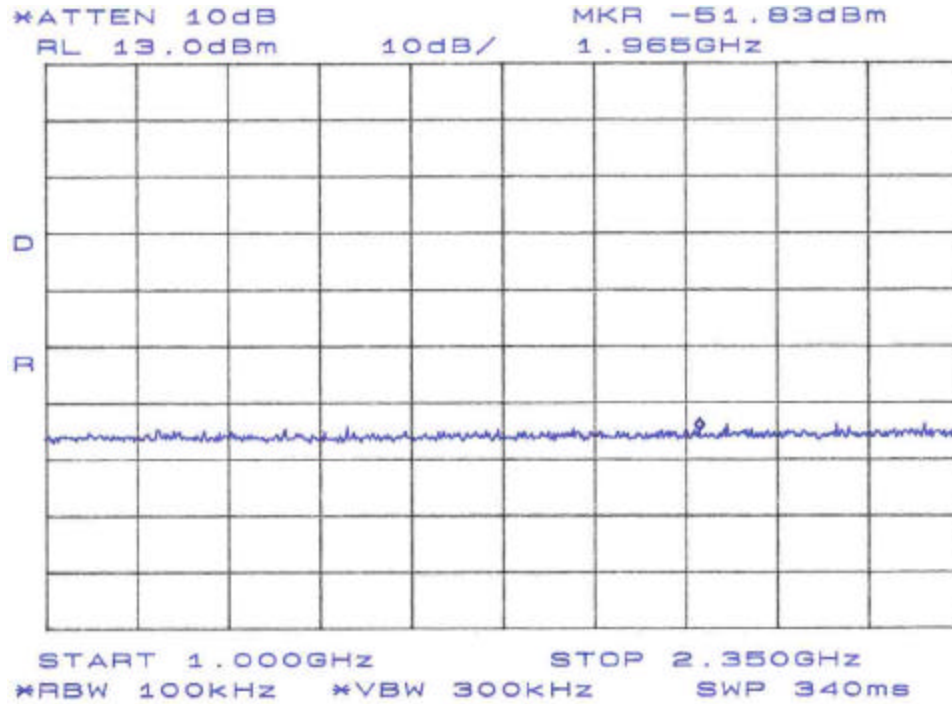


Figure 12. Spurious Emissions Data- Channel 6, 1GHz – 2.35 GHz

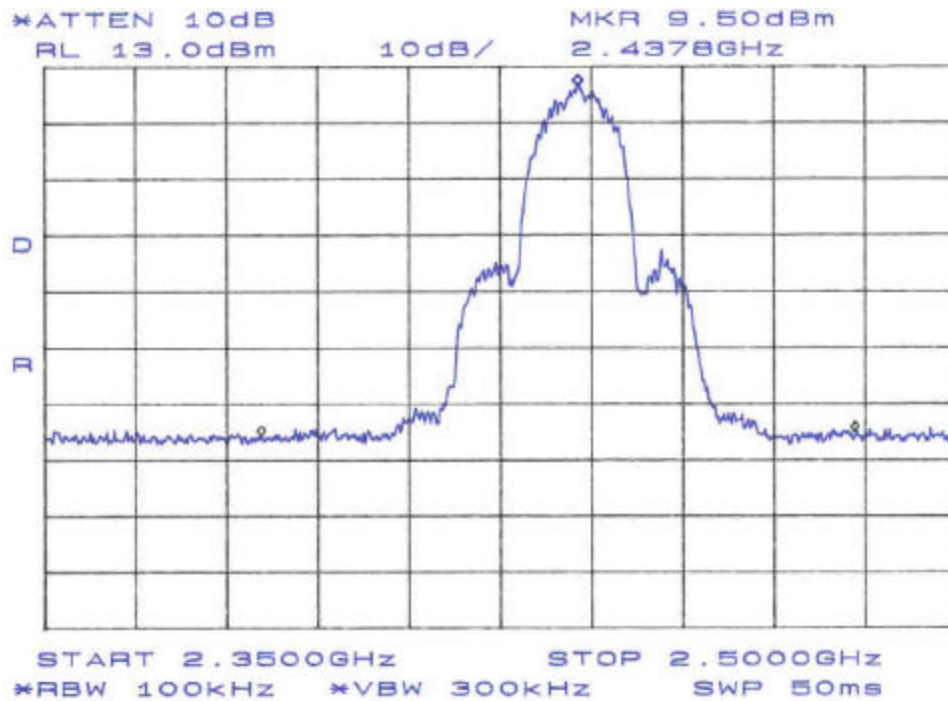


Figure 13. Spurious Emissions Data- Channel 6, 2.35GHz – 2.5GHz

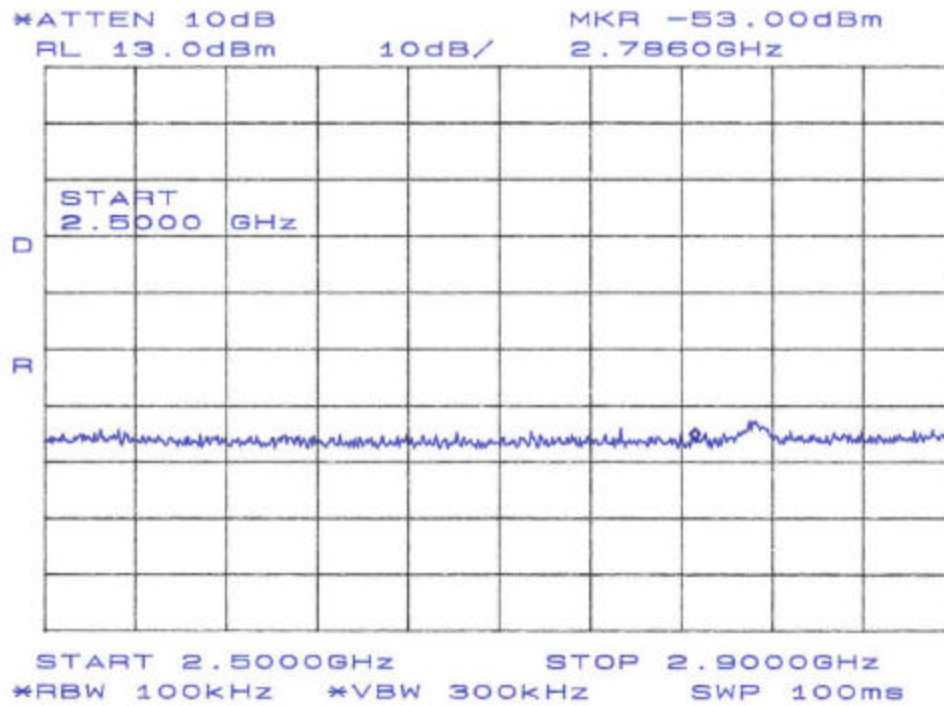


Figure 14. Spurious Emissions Data- Channel 6, 2.5GHz – 2.9GHz

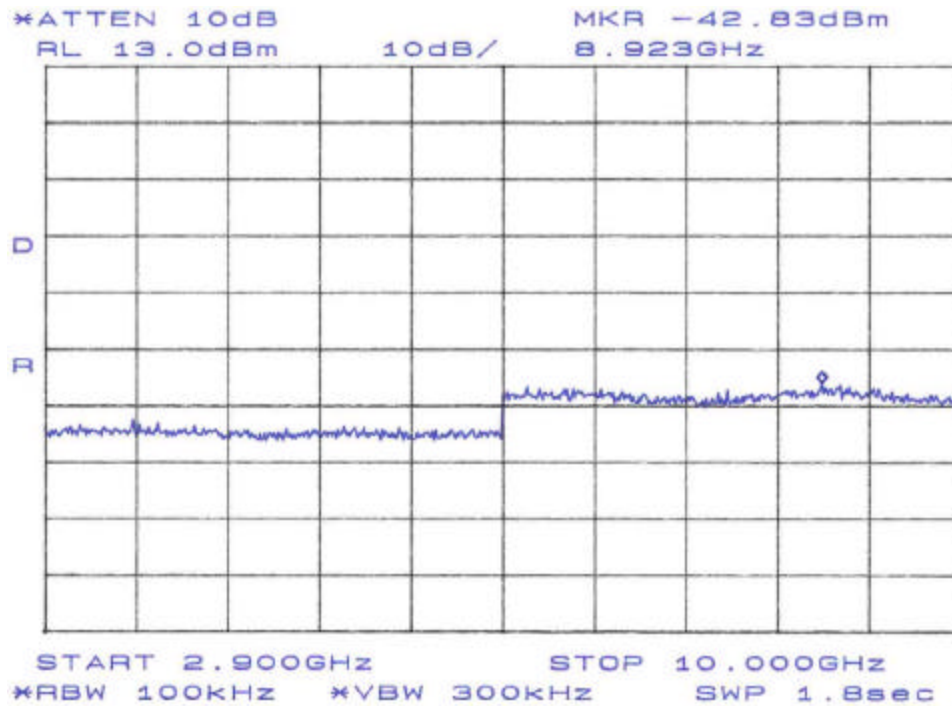


Figure 15. Spurious Emissions Data- Channel 6, 2.9GHz – 10GHz

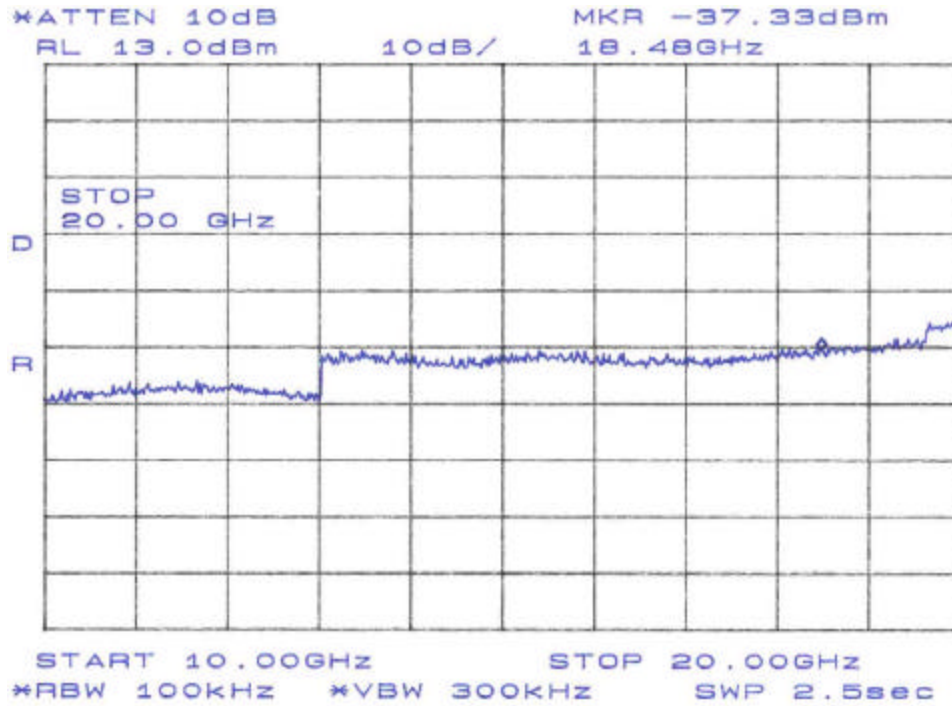


Figure 16. Spurious Emissions Data- Channel 6, 10GHz – 20GHz

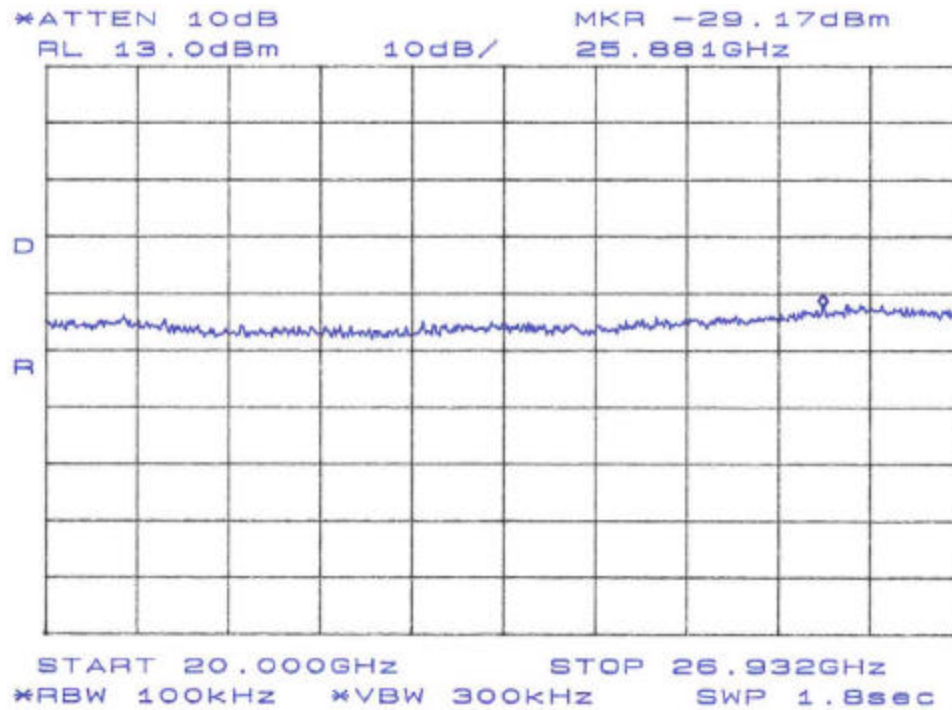


Figure 17. Spurious Emissions Data- Channel 6, 20GHz – 26GHz

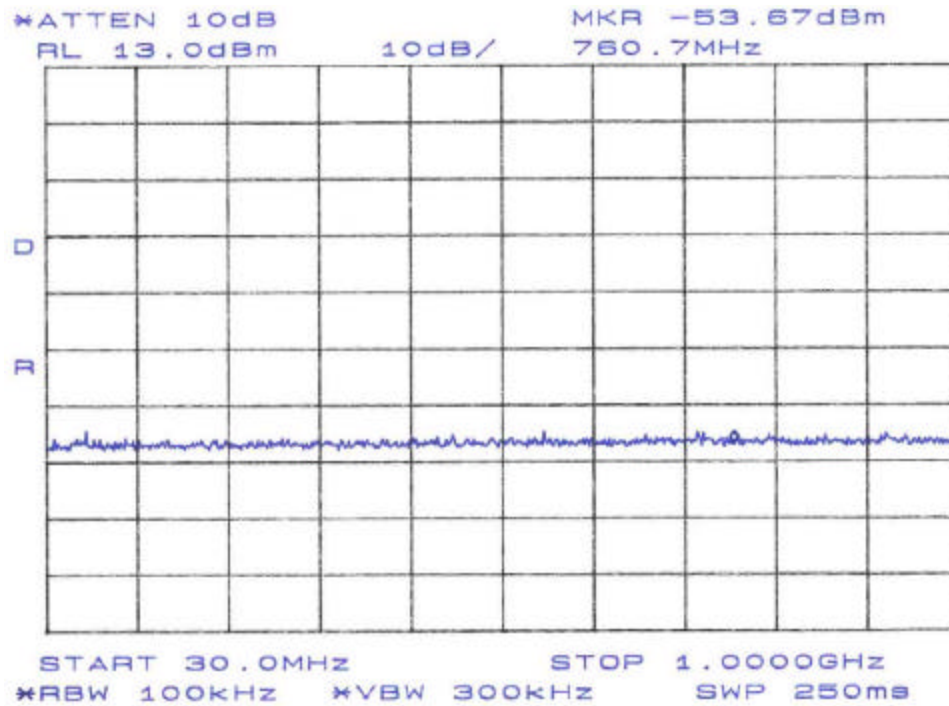


Figure 18. Spurious Emissions Data- Channel 11, 30MHz - 1GHz

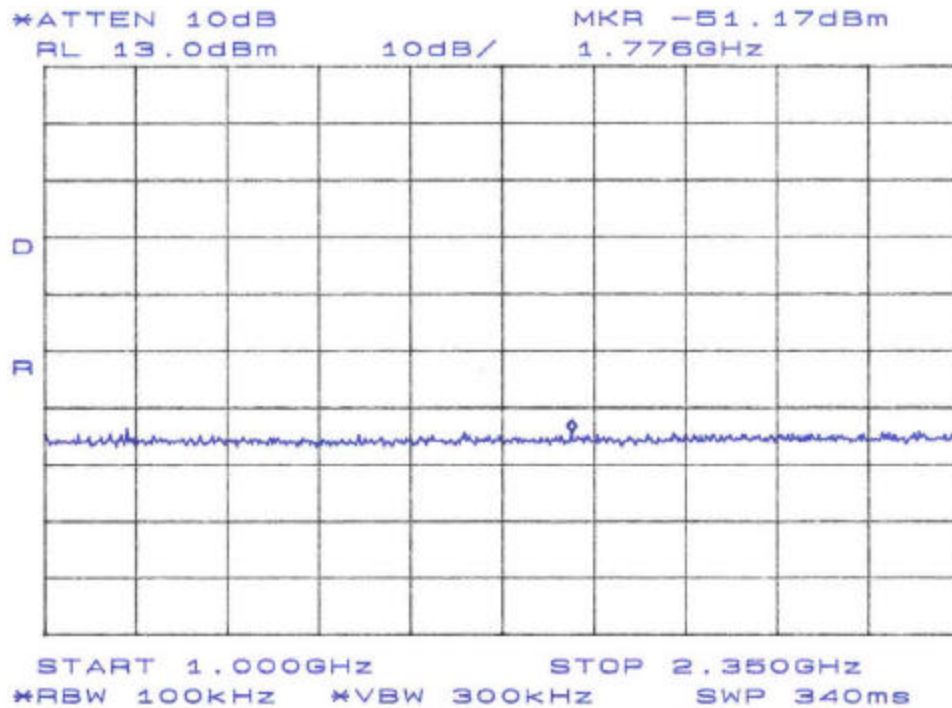


Figure 19. Spurious Emissions Data- Channel 11, 1GHz – 2.35 GHz

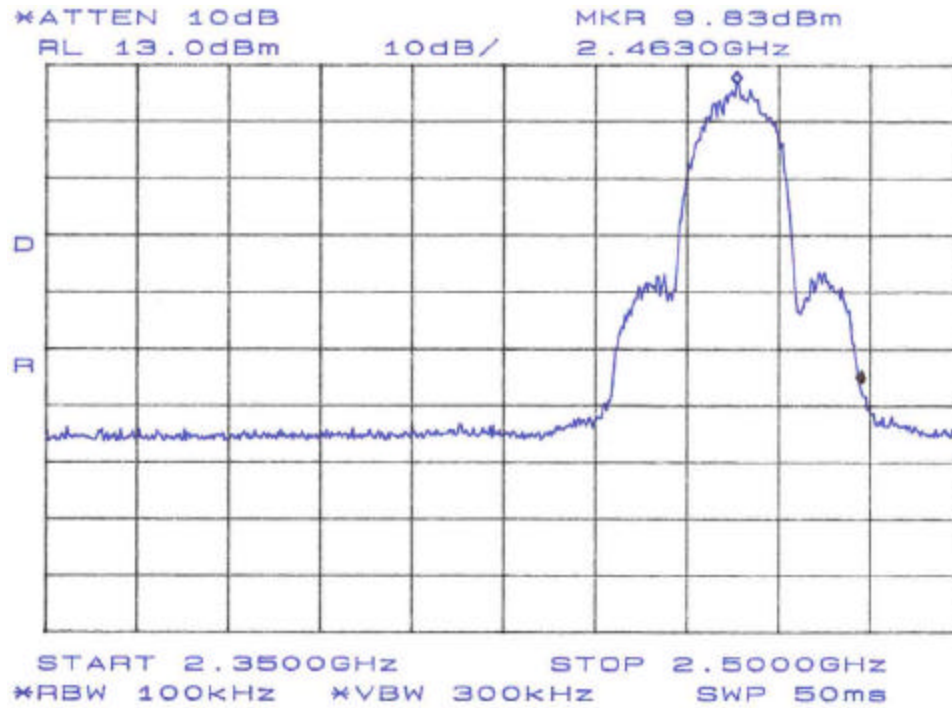


Figure 20. Spurious Emissions Data- Channel 11, 2.35GHz – 2.5GHz

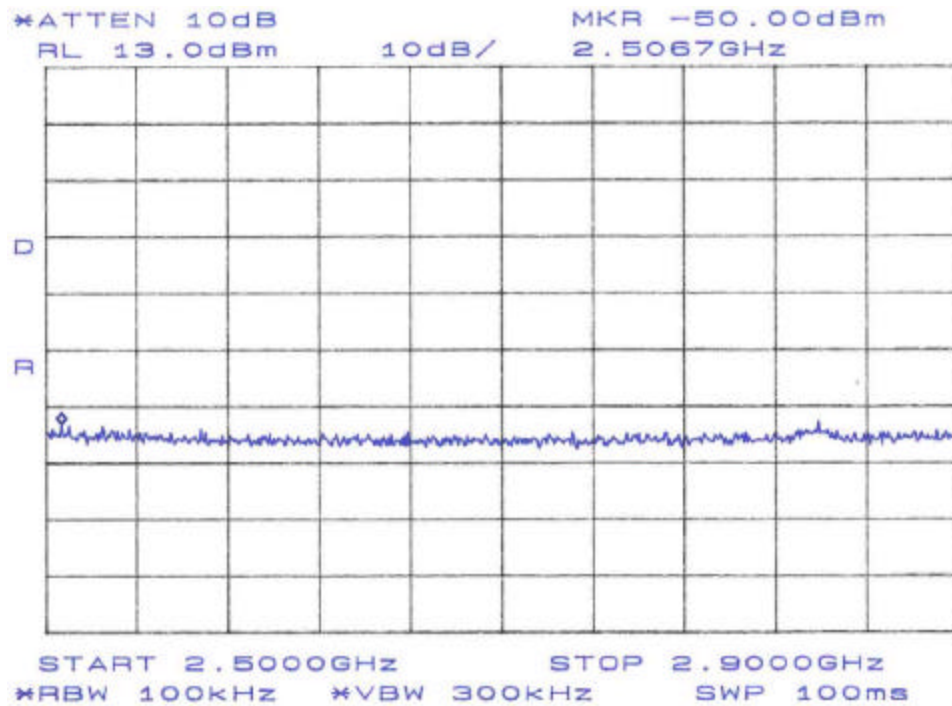


Figure 21. Spurious Emissions Data- Channel 11, 2.5GHz – 2.9GHz

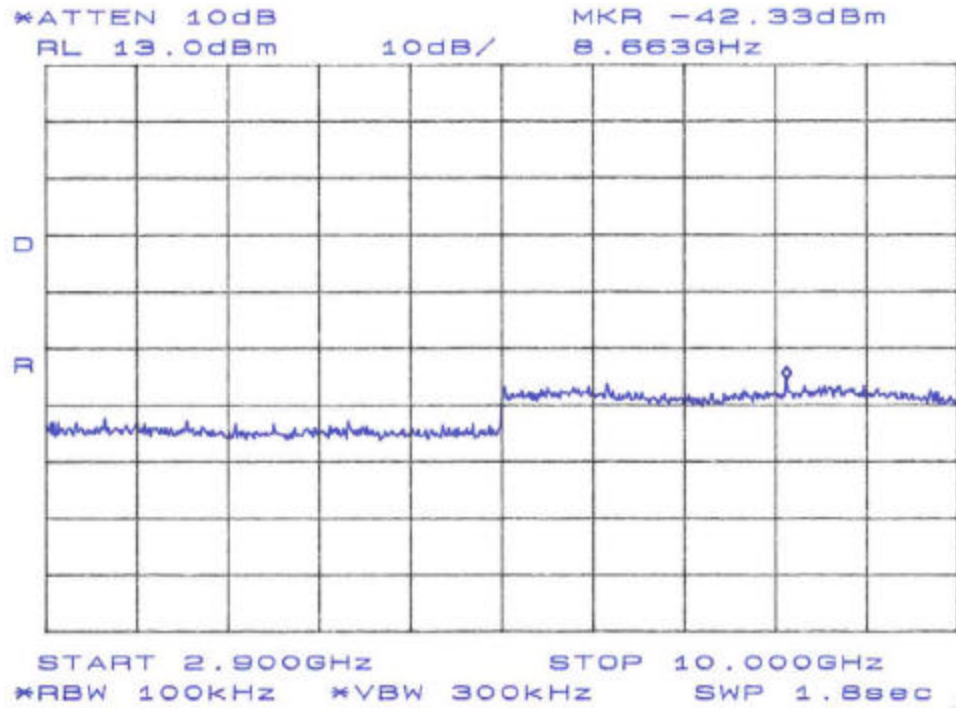


Figure 22. Spurious Emissions Data- Channel 11, 2.9GHz – 10GHz

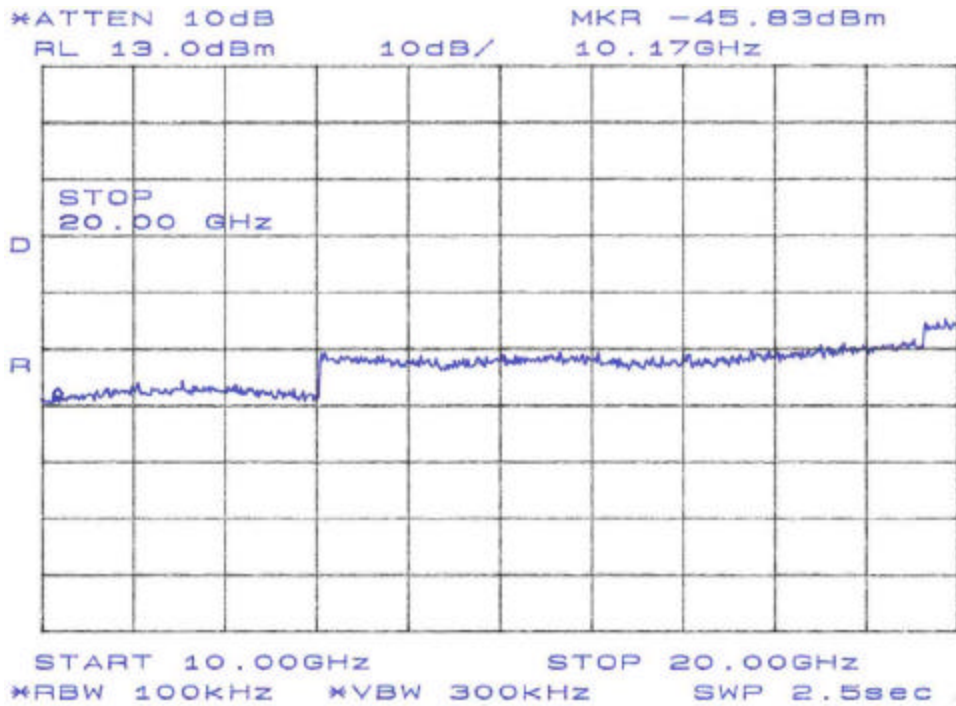


Figure 23. Spurious Emissions Data- Channel 11, 10GHz – 20GHz

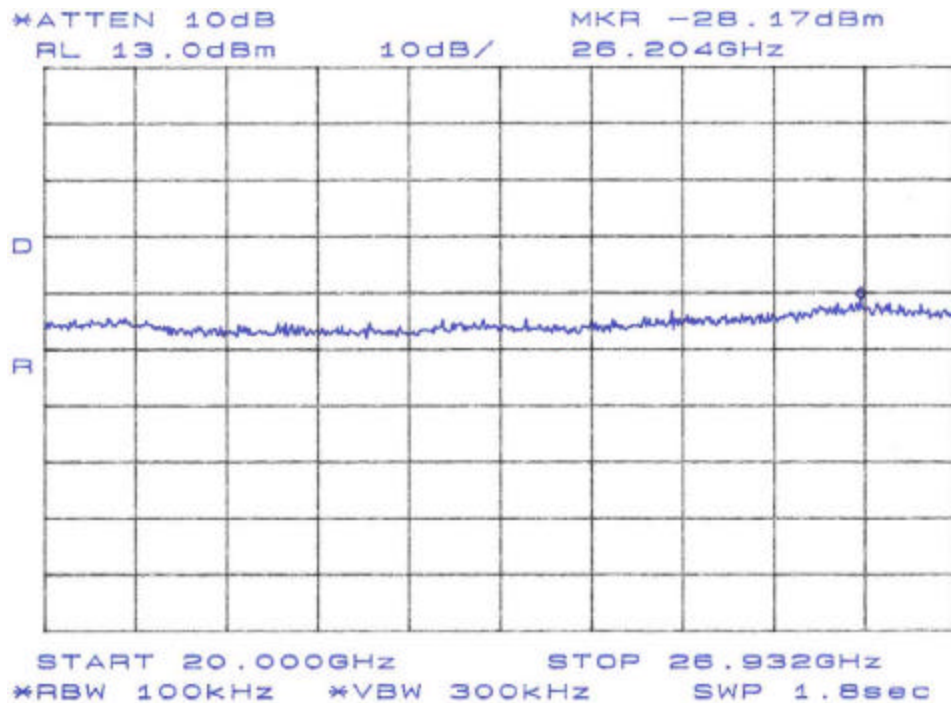


Figure 24. Spurious Emissions Data- Channel 11, 20GHz – 26GHz

4.5 Radiated Spurious Emissions: (FCC Part §15.247(c))

The EUT must comply with the radiated spurious emission limits of 15.209(a) for emissions that fall in the restricted bands as defined in Section 15.205(a).

4.5.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-1992. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The EUT was tested in the following configurations and modes:

Antenna	Channel
Plate	1, 6 & 11
Omnidirectional	1, 6 & 11

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	100kHz	>100kHz
>1000 MHz	1 MHz	10Hz (avg), 1MHz (peak)

Harmonic and spurious emissions that were identified as coming from the EUT were checked in Peak and in Average Mode. It was verified that the peak-to-average ratio did not exceed 20dB for the restricted bands.

Emissions were measured to the 10th harmonic of the transmit frequency.

The following is a sample calculation used in the data tables for calculating the final field strength of spurious emissions and comparing these levels to the specified limits.

Sample Calculation:

Spectrum Analyzer Voltage (SA Level): V dBμV

Antenna Factor (Ant Corr): AFdB/m

Cable Loss Correction (Cable Corr): CCdB

Amplifier Gain: GdB

Electric Field (Corr Level): EdBμV/m = VdBμV + AFdB/m + CCdB - GdB

To convert to linear units: EμV/m = antilog (EdBμV/m/20)

These data are supplied in the following tables.

Table 6. Radiated Emission Test Data (§15.205 Restricted Bands)

Channel 1 DTG17E-450 Antenna

CLIENT:	Demarc	DATE:	5/20/03
TESTER:	Ken Gemmell	JOB #:	7384
<u>EUT Information:</u>		<u>Test Requirements:</u>	
EUT:	200 mW	TEST STD:	FCC Part 15
CONFIGURATION:	Channel 1, G17 Panel	DISTANCE:	3m
CLOCKS:		CLASS:	B
<u>Test Equipment/Limit:</u>			
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	None

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
114.44	V	225.0	1.0	11.2	10.6	2.4	0.0	24.2	16.2	150.0	-19.3
245.74	V	45.0	1.0	9.6	12.4	3.5	0.0	25.5	18.8	200.0	-20.5
333.73	V	180.0	1.0	6.5	14.2	4.1	0.0	24.9	17.5	200.0	-21.2
114.44	H	180.0	4.0	10.6	10.6	2.4	0.0	23.6	15.1	150.0	-19.9
245.74	H	90.0	3.6	8.5	12.4	3.5	0.0	24.4	16.6	200.0	-21.6
333.73	H	180.0	3.8	7.3	14.2	4.1	0.0	25.7	19.2	200.0	-20.4
1206.27	H	22.0	1.0	56.7	25.8	1.7	34.3	50.0	315.3	5000.0	-24.0
1206.27	H	0.0	1.0	34.1	25.8	1.7	34.3	27.4	23.4	500.0	-26.6
4828.00	H	0.0	1.0	46.9	32.8	4.2	34.5	49.4	294.7	5000.0	-24.6
4828.00	H	0.0	1.0	34.8	32.8	4.2	34.5	37.3	73.2	500.0	-16.7
12070.00	H	0.0	1.0	44.4	41.1	5.2	32.2	58.5	840.6	5000.0	-15.5 a
12070.00	H	0.0	1.0	32.7	41.1	5.2	32.2	46.8	219.3	500.0	-7.2 a
14484.00	H	0.0	1.0	46.0	40.6	7.6	32.5	61.8	1223.4	5000.0	-12.2 a
14484.00	H	0.0	1.0	31.8	40.6	7.6	32.5	47.6	238.5	500.0	-6.4 a
19312.00	H	0.0	1.0	48.3	39.7	7.8	35.4	60.4	1049.5	5000.0	-13.6 a
19312.00	H	0.0	1.0	37.0	39.7	7.8	35.4	49.1	285.8	500.0	-4.9 a
1206.27	V	22.0	1.0	57.1	25.8	1.7	34.3	50.4	330.2	5000.0	-23.6
1206.27	V	0.0	1.0	33.9	25.8	1.7	34.3	27.2	22.8	500.0	-26.8
4828.00	V	0.0	1.0	45.6	32.8	4.2	34.5	48.1	253.7	5000.0	-25.9
4828.00	V	0.0	1.0	31.1	32.8	4.2	34.5	33.6	47.8	500.0	-20.4
12070.00	V	0.0	1.0	44.2	41.1	5.2	32.2	58.3	821.5	5000.0	-15.7 a
12070.00	V	0.0	1.0	32.4	41.1	5.2	32.2	46.5	211.2	500.0	-7.5 a
14484.00	V	0.0	1.0	45.9	40.6	7.6	32.5	61.7	1209.4	5000.0	-12.3 a
14484.00	V	0.0	1.0	31.9	40.6	7.6	32.5	47.7	241.3	500.0	-6.3 a
19312.00	V	0.0	1.0	46.2	39.7	7.8	35.4	58.3	824.1	5000.0	-15.7 a
19312.00	V	0.0	1.0	35.3	39.7	7.8	35.4	47.4	234.1	500.0	-6.6 a

Table 7. Radiated Emission Test Data (§15.205 Restricted Bands)

Channel 6 DTG17E-450 Antenna

CLIENT:	Demarc	DATE:	5/20/03
TESTER:	Ken Gemmell	JOB #:	7384
<u>EUT Information:</u>		<u>Test Requirements:</u>	
EUT:	200 mW	TEST STD:	FCC Part 15
CONFIGURATION:	Channel 6, G17 Panel	DISTANCE:	3m
CLOCKS:		CLASS:	B
<u>Test Equipment/Limit:</u>			
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	None

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
285.00	V	90.0	1.0	6.4	12.6	3.8	0.0	22.8	13.8	200.0	-23.2
331.77	V	180.0	1.0	8.4	14.1	4.1	0.0	26.6	21.4	200.0	-19.4
285.00	H	90.0	4.0	7.3	12.6	3.8	0.0	23.7	15.3	200.0	-22.3
331.77	H	180.0	3.4	7.7	14.1	4.1	0.0	25.9	19.8	200.0	-20.1
1222.90	V	0.0	1.0	57.1	25.9	1.8	34.3	50.5	336.6	5000.0	-23.4
1222.90	V	0.0	1.0	34.0	25.9	1.8	34.3	27.4	23.4	500.0	-26.6
4874.70	V	0.0	1.0	44.8	32.9	4.3	34.5	47.4	235.0	5000.0	-26.6
4874.70	V	0.0	1.0	30.7	32.9	4.3	34.5	33.3	46.3	500.0	-20.7
7312.05	V	0.0	1.0	44.1	37.9	4.6	34.8	51.7	385.1	5000.0	-22.3 a
7312.05	V	0.0	1.0	32.6	37.9	4.6	34.8	40.2	102.5	500.0	-13.8 a
12186.75	V	0.0	1.0	44.9	40.7	5.4	32.2	58.9	877.4	5000.0	-15.1 a
12186.75	V	0.0	1.0	32.3	40.7	5.4	32.2	46.3	206.4	500.0	-7.7 a
19498.80	V	0.0	1.0	47.6	39.7	7.8	35.3	59.8	976.2	5000.0	-14.2 a
19498.80	V	0.0	1.0	37.2	39.7	7.8	35.3	49.4	293.8	500.0	-4.6 a
1222.90	H	0.0	1.0	56.6	25.9	1.8	34.3	50.0	316.7	5000.0	-24.0
1222.90	H	0.0	1.0	32.8	25.9	1.8	34.3	26.2	20.4	500.0	-27.8
4874.70	H	45.0	1.0	45.8	32.9	4.3	34.5	48.4	263.6	5000.0	-25.6
4874.70	H	0.0	1.0	31.3	32.9	4.3	34.5	33.9	49.7	500.0	-20.1
7312.05	H	0.0	1.0	43.1	37.9	4.6	34.8	50.7	344.5	5000.0	-23.2 a
7312.05	H	0.0	1.0	32.3	37.9	4.6	34.8	39.9	99.3	500.0	-14.0 a
12186.75	H	0.0	1.0	44.6	40.7	5.4	32.2	58.6	847.6	5000.0	-15.4 a
12186.75	H	0.0	1.0	33.0	40.7	5.4	32.2	47.0	222.9	500.0	-7.0 a
19498.80	H	0.0	1.0	46.4	39.7	7.8	35.3	58.6	847.3	5000.0	-15.4 a
19498.80	H	0.0	1.0	37.4	39.7	7.8	35.3	49.6	301.7	500.0	-4.4 a

a = ambient

Table 8. Radiated Emission Test Data (§15.205 Restricted Bands)

Channel 11 DTG17E-450 Antenna

CLIENT:	Demarc	DATE:	5/20/03
TESTER:	Ken Gemmell	JOB #:	7384
<u>EUT Information:</u>		<u>Test Requirements:</u>	
EUT:	200 mW	TEST STD:	FCC Part 15
CONFIGURATION:	Channel 11, G17 Panel	DISTANCE:	3m
CLOCKS:		CLASS:	B
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	None

a = ambient

Frequency	Polarity	Azimuth	Ant. Hght	SA Level (QP)	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Degree	(m)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
112.50	V	90.0	1.0	14.9	10.4	2.4	0.0	27.7	24.2	150.0	-15.9
133.73	V	180.0	1.0	13.6	10.2	2.5	0.0	26.3	20.6	150.0	-17.2
245.78	V	225.0	1.0	10.6	12.4	3.5	0.0	26.5	21.1	200.0	-19.5
112.50	H	90.0	4.0	12.7	10.4	2.4	0.0	25.5	18.8	150.0	-18.1
133.73	H	180.0	4.0	13.1	10.2	2.5	0.0	25.8	19.5	150.0	-17.7
245.78	H	270.0	4.0	11.6	12.4	3.5	0.0	27.5	23.7	200.0	-18.5
1067.75	H	180.0	1.0	51.8	25.1	1.3	34.4	43.9	156.4	5000.0	-30.1
1067.75	H	180.0	1.0	38.3	25.1	1.3	34.4	30.4	33.1	500.0	-23.6
4925.00	H	0.0	1.0	46.7	32.9	4.4	34.5	49.5	297.2	5000.0	-24.5
4925.00	H	0.0	1.0	32.5	32.9	4.4	34.5	35.3	58.0	500.0	-18.7
7388.00	H	0.0	1.0	41.7	37.9	4.6	34.8	49.4	296.4	5000.0	-24.5 a
7388.00	H	0.0	1.0	32.2	37.9	4.6	34.8	39.9	99.3	500.0	-14.0 a
12313.00	H	0.0	1.0	42.7	40.3	5.7	32.1	56.5	668.0	5000.0	-17.5 a
12313.00	H	0.0	1.0	32.7	40.3	5.7	32.1	46.5	211.2	500.0	-7.5 a
19712.00	H	0.0	1.0	50.9	39.7	7.8	35.3	63.1	1435.1	5000.0	-10.8 a
19712.00	H	0.0	1.0	36.9	39.7	7.8	35.3	49.1	285.4	500.0	-4.9 a
22176.00	H	0.0	1.0	50.3	40.5	8.4	35.0	64.2	1619.1	5000.0	-9.8 a
22176.00	H	0.0	1.0	37.5	40.5	8.4	35.0	51.4	372.2	500.0	-2.6 a
1067.75	V	90.0	1.0	49.9	25.1	1.3	34.4	42.0	125.2	5000.0	-32.0
1067.75	V	135.0	1.0	37.5	25.1	1.3	34.4	29.6	30.0	500.0	-24.4
4925.00	V	0.0	1.0	47.1	32.9	4.4	34.5	49.8	310.1	5000.0	-24.1
4925.00	V	0.0	1.0	35.1	32.9	4.4	34.5	37.8	77.9	500.0	-16.1
7388.00	V	0.0	1.0	43.1	37.9	4.6	34.8	50.8	348.2	5000.0	-23.1 a
7388.00	V	0.0	1.0	32.1	37.9	4.6	34.8	39.8	98.1	500.0	-14.1 a
12313.00	V	0.0	1.0	44.4	40.3	5.7	32.1	58.2	815.2	5000.0	-15.8 a
12313.00	V	0.0	1.0	32.6	40.3	5.7	32.1	46.4	208.8	500.0	-7.6 a
19712.00	V	0.0	1.0	49.8	39.7	7.8	35.3	62.0	1260.1	5000.0	-12.0 a
19712.00	V	0.0	1.0	37.5	39.7	7.8	35.3	49.7	305.8	500.0	-4.3 a
22176.00	V	0.0	1.0	49.9	40.5	8.4	35.0	63.8	1556.9	5000.0	-10.1 a
22176.00	V	0.0	1.0	37.3	40.5	8.4	35.0	51.2	365.0	500.0	-2.7 a

Table 9. Radiated Emission Test Data (§15.205 Restricted Bands)

Channel 1 DTFPG18 Antenna

CLIENT:	Demarc	DATE:	5/20/03
TESTER:	Ken Gemmell	JOB #:	7384
<u>EUT Information:</u>		<u>Test Requirements:</u>	
EUT:	200 mW	TEST STD:	FCC Part 15
CONFIGURATION:	Channel 1, G18 Flat Panel	DISTANCE:	3m
CLOCKS:		CLASS:	B
<u>Test Equipment/Limit:</u>			
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	None

Frequency	Polarity	Azimuth	Ant. Hght	SA Level (QP)	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Degree	(m)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
114.43	V	270.0	1.0	12.1	10.6	2.4	0.0	25.1	18.0	150.0	-18.4
240.00	V	180.0	1.0	17.5	12.4	3.3	0.0	33.2	45.6	200.0	-12.8
114.43	H	270.0	3.8	13.2	10.6	2.4	0.0	26.2	20.4	150.0	-17.3
240.00	H	180.0	4.0	14.5	12.4	3.3	0.0	30.2	32.3	200.0	-15.8
1206.27	H	340.0	1.0	57.5	25.8	1.7	34.3	50.8	345.7	5000.0	-23.2
1206.27	H	0.0	1.0	33.5	25.8	1.7	34.3	26.8	21.8	500.0	-27.2
4828.00	H	0.0	1.0	47.4	32.8	4.2	34.5	49.9	312.1	5000.0	-24.1
4828.00	H	0.0	1.0	33.9	32.8	4.2	34.5	36.4	66.0	500.0	-17.6
12070.00	H	0.0	1.0	44.1	41.1	5.2	32.2	58.2	812.1	5000.0	-15.8 a
12070.00	H	0.0	1.0	32.6	41.1	5.2	32.2	46.7	216.8	500.0	-7.3 a
14484.00	H	0.0	1.0	45.5	40.6	7.6	32.5	61.3	1155.0	5000.0	-12.7 a
14484.00	H	0.0	1.0	31.6	40.6	7.6	32.5	47.4	233.1	500.0	-6.6 a
19312.00	H	0.0	1.0	47.5	39.7	7.8	35.4	59.6	957.2	5000.0	-14.4 a
19312.00	H	0.0	1.0	36.5	39.7	7.8	35.4	48.6	269.8	500.0	-5.4 a
1206.27	V	0.0	1.0	57.9	25.8	1.7	34.3	51.2	362.0	5000.0	-22.8
1206.27	V	0.0	1.0	33.9	25.8	1.7	34.3	27.2	22.8	500.0	-26.8
4828.00	V	0.0	1.0	46.4	32.8	4.2	34.5	48.9	278.2	5000.0	-25.1
4828.00	V	0.0	1.0	31.8	32.8	4.2	34.5	34.3	51.8	500.0	-19.7
12070.00	V	0.0	1.0	44.3	41.1	5.2	32.2	58.4	831.0	5000.0	-15.6 a
12070.00	V	0.0	1.0	33.1	41.1	5.2	32.2	47.2	228.9	500.0	-6.8 a
14484.00	V	0.0	1.0	46.2	40.6	7.6	32.5	62.0	1251.9	5000.0	-12.0 a
14484.00	V	0.0	1.0	32.3	40.6	7.6	32.5	48.1	252.7	500.0	-5.9 a
19312.00	V	0.0	1.0	47.0	39.7	7.8	35.4	59.1	903.6	5000.0	-14.9 a
19312.00	V	0.0	1.0	36.2	39.7	7.8	35.4	48.3	259.7	500.0	-5.7 a

a = ambient

Table 10. Radiated Emission Test Data (§15.205 Restricted Bands)

Channel 6 DTFPG18 Antenna

CLIENT:	Demarc	DATE:	5/20/03
TESTER:	Ken Gemmell	JOB #:	7384
<u>EUT Information:</u>		<u>Test Requirements:</u>	
EUT:	200 mW	TEST STD:	FCC Part 15
CONFIGURATION:	Channel 6, G18 Flat Panel	DISTANCE:	3m
CLOCKS:		CLASS:	B
<u>Test Equipment/Limit:</u>			
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	None

Frequency	Polarity	Azimuth	Ant. Hght	SA Level (QP)	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Degree	(m)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
240.00	V	45.0	1.0	9.3	12.4	3.3	0.0	25.0	17.7	200.0	-21.0
960.00	V	0.0	1.0	7.4	22.5	7.9	0.0	37.8	77.6	500.0	-16.2
240.00	H	90.0	3.8	7.9	12.4	3.3	0.0	23.6	15.1	200.0	-22.4
960.00	H	0.0	1.0	8.9	22.5	7.9	0.0	39.3	92.2	500.0	-14.7
1222.90	V	22.0	1.0	56.3	25.9	1.8	34.3	49.7	307.0	5000.0	-24.2
1222.90	V	0.0	1.0	34.2	25.9	1.8	34.3	27.6	23.9	500.0	-26.4
4874.70	V	0.0	1.0	44.0	32.9	4.3	34.5	46.6	214.3	5000.0	-27.4
4874.70	V	45.0	1.0	31.5	32.9	4.3	34.5	34.1	50.8	500.0	-19.9
7312.05	V	0.0	1.0	44.7	37.9	4.6	34.8	52.3	412.7	5000.0	-21.7 a
7312.05	V	0.0	1.0	32.7	37.9	4.6	34.8	40.3	103.7	500.0	-13.7 a
12186.75	V	0.0	1.0	44.0	40.7	5.4	32.2	58.0	791.0	5000.0	-16.0 a
12186.75	V	0.0	1.0	32.8	40.7	5.4	32.2	46.8	218.6	500.0	-7.2 a
19498.80	V	0.0	1.0	46.8	39.7	7.8	35.3	59.0	890.3	5000.0	-15.0 a
19498.80	V	0.0	1.0	37.5	39.7	7.8	35.3	49.7	304.1	500.0	-4.3 a
1222.90	H	0.0	1.0	57.6	25.9	1.8	34.3	51.0	355.3	5000.0	-23.0
1222.90	H	0.0	1.0	33.4	25.9	1.8	34.3	26.8	21.9	500.0	-27.2
4874.70	H	0.0	1.0	45.4	32.9	4.3	34.5	48.0	251.8	5000.0	-26.0
4874.70	H	0.0	1.0	32.3	32.9	4.3	34.5	34.9	55.7	500.0	-19.1
7312.05	H	0.0	1.0	43.8	37.9	4.6	34.8	51.4	373.4	5000.0	-22.5 a
7312.05	H	0.0	1.0	32.5	37.9	4.6	34.8	40.1	101.7	500.0	-13.8 a
12186.75	H	0.0	1.0	43.7	40.7	5.4	32.2	57.7	764.1	5000.0	-16.3 a
12186.75	H	0.0	1.0	32.7	40.7	5.4	32.2	46.7	215.4	500.0	-7.3 a
19498.80	H	0.0	1.0	46.7	39.7	7.8	35.3	58.9	877.1	5000.0	-15.1 a
19498.80	H	0.0	1.0	37.3	39.7	7.8	35.3	49.5	298.2	500.0	-4.5 a

a = ambient

Table 11. Radiated Emission Test Data (§15.205 Restricted Bands)

Channel 11 DTFPG18 Antenna

CLIENT:	Demarc	DATE:	5/20/03
TESTER:	Ken Gemmell	JOB #:	7384
EUT:	200 mW	TEST STD:	FCC Part 15
CONFIGURATION:	Channel 11, G18 Flat Panel	DISTANCE:	3m
CLOCKS:		CLASS:	B
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	None

a = ambient

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
114.43	V	180.0	1.0	9.7	10.6	2.4	0.0	22.7	13.6	150.0	-20.8
331.75	V	135.0	1.0	12.6	14.1	4.1	0.0	30.8	34.8	200.0	-15.2
114.43	H	180.0	4.0	10.9	10.6	2.4	0.0	23.9	15.7	150.0	-19.6
331.75	H	90.0	3.6	11.7	14.1	4.1	0.0	29.9	31.3	200.0	-16.1
1067.75	H	180.0	1.0	52.8	25.1	1.3	34.4	44.9	175.5	5000.0	-29.1
1067.75	H	180.0	1.0	38.5	25.1	1.3	34.4	30.6	33.8	500.0	-23.4
4925.00	H	0.0	1.0	45.7	32.9	4.4	34.5	48.5	264.9	5000.0	-25.5
4925.00	H	0.0	1.0	32.3	32.9	4.4	34.5	35.1	56.6	500.0	-18.9
7388.00	H	0.0	1.0	41.6	37.9	4.6	34.8	49.3	293.0	5000.0	-24.6 a
7388.00	H	0.0	1.0	32.9	37.9	4.6	34.8	40.6	107.6	500.0	-13.3 a
12313.00	H	0.0	1.0	42.0	40.3	5.7	32.1	55.8	616.3	5000.0	-18.2 a
12313.00	H	0.0	1.0	32.4	40.3	5.7	32.1	46.2	204.1	500.0	-7.8 a
19712.00	H	0.0	1.0	50.3	39.7	7.8	35.3	62.5	1339.3	5000.0	-11.4 a
19712.00	H	0.0	1.0	37.8	39.7	7.8	35.3	50.0	316.5	500.0	-4.0 a
22176.00	H	0.0	1.0	49.7	40.5	8.4	35.0	63.6	1511.0	5000.0	-10.4 a
22176.00	H	0.0	1.0	37.3	40.5	8.4	35.0	51.2	363.7	500.0	-2.8 a
1067.75	V	135.0	1.0	50.5	25.1	1.3	34.4	42.6	134.2	5000.0	-31.4
1067.75	V	180.0	1.0	38.2	25.1	1.3	34.4	30.3	32.6	500.0	-23.7
4925.00	V	0.0	1.0	47.1	32.9	4.4	34.5	49.8	310.1	5000.0	-24.1
4925.00	V	0.0	1.0	35.1	32.9	4.4	34.5	37.8	77.9	500.0	-16.1
7388.00	V	0.0	1.0	42.5	37.9	4.6	34.8	50.2	325.0	5000.0	-23.7 a
7388.00	V	0.0	1.0	31.6	37.9	4.6	34.8	39.3	92.6	500.0	-14.6 a
12313.00	V	0.0	1.0	44.7	40.3	5.7	32.1	58.5	843.9	5000.0	-15.5 a
12313.00	V	0.0	1.0	33.5	40.3	5.7	32.1	47.3	231.6	500.0	-6.7 a
19712.00	V	0.0	1.0	49.7	39.7	7.8	35.3	61.9	1245.6	5000.0	-12.1 a
19712.00	V	0.0	1.0	37.7	39.7	7.8	35.3	49.9	312.9	500.0	-4.1 a
22176.00	V	0.0	1.0	49.3	40.5	8.4	35.0	63.2	1453.0	5000.0	-10.7 a
22176.00	V	0.0	1.0	37.0	40.5	8.4	35.0	50.9	351.4	500.0	-3.1 a

4.6 AC Powerline Conducted Emissions: (FCC Part §15.207)

The EUT was placed on an 80 cm high 1 x 1.5 m non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω /50 μ H Line Impedance Stabilization Network bonded to a 3 x 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 450 kHz to 30 MHz was measured. The detector function was set to quasi-peak or peak, as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. Data are recorded in Table 12.

Table 12. Conducted Emissions Test Data; 15.207

CLIENT:	Demarc	DATE:	5/21/03
MODEL:	200 mW	TEST STD:	FCC Part 15
JOB #:	7384	CLASS:	FCC_B
TESTER:	Ken Gemmell	TEST SITE:	CSITE2_CE
TEST VOLTAGE:	120 VAC		

LINE 1 - NEUTRAL

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
0.20	41.6	10.7	63.8	-11.5	33.1	10.7	53.8	-10.0
0.39	28.7	10.7	58.1	-18.7	23.6	10.7	48.1	-13.8
0.65	23.4	10.8	56.0	-21.8	20.7	10.8	46.0	-14.5
4.82	22.7	11.5	56.0	-21.8	22.7	11.5	46.0	-11.8
8.79	25.0	11.9	60.0	-23.1	25.0	11.9	50.0	-13.1
20.00	15.5	12.6	60.0	-31.9	15.5	12.6	50.0	-21.9

LINE 2 - PHASE

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
0.20	39.4	10.7	63.8	-13.7	32.5	10.7	53.8	-10.6
0.39	34.3	10.7	58.1	-13.1	32.7	10.7	48.1	-4.7
0.65	26.4	10.8	56.0	-18.8	24.6	10.8	46.0	-10.6
4.82	0.0	11.5	56.0	-44.5	0.0	11.5	46.0	-34.5
8.79	0.0	11.9	60.0	-48.1	0.0	11.9	50.0	-38.1
20.00	0.0	12.6	60.0	-47.4	0.0	12.6	50.0	-37.4