COMPLIANCE WORLDWIDE INC.
TEST REPORT 120-08R1

In Accordance with the Requirements of

FCC PART 90
Subpart I—General Technical Standards
Sections 205, 209, 210, 213 and 214

Issued to

Ultra Electronics SML Technologies
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for

G-Max GAS6146 UHF Transceiver 400-470 MHz

FCC ID: VZ7001

Report Issued on March 13, 2008

Tested by

Brian F. Breault

Reviewed by

Larry K. Stillings

Table of Contents

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1. Scope

This test report certifies that the Ultra Electronics SML Technologies G-Max UHF Transceiver, as tested, meets the FCC Part 90, Subparts 205, 209, 210, 213 and 214 requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

2. Product Details

2.1. Manufacturer: Ultra Electronics SML Technologies

2.2. Model Number: G-Max UHF Transceiver

2.3. Serial Number: 1990

2.4. Description: The Integrated Modem Ships Identification Unit (SID) is an intelligent transponder which can be fitted to any fixed or moving object and will transmit its position, identity and call sign. It has been designed to incorporate the customer requirements of the offshore oil and gas industry.

2.5. Power Source: +12 VDC to +36 VDC (Tested at +13.8 VDC)

2.6. EMC Modifications: None

3. Product Configuration

3.1. Support Equipment

Device	Manufacturer	Model	Serial No.	Comment
Notebook PC	Compaq	Presario 1600	1V02DCJ7L3K0	For setup only
Power Supply	Sorensen	DCS33-33E	N0026B1064	12 Amps @24 VDC
Antenna (1st Choice)	Procom	CXL 70-3/h	N/A	Rod type UHF antenna, +5 dBi
Antenna (2nd Choice)	Procom	CXL 70-1/h	N/A	Rod type UHF antenna, +2 dBi

3.2. Cables

Cable Type	Length	Shield	From	To
RF, 50 Ω, BNC male - N male[1]	4m	Yes	DUT	Antenna
Serial/Power[2]	115 cm	No	DUT	Notebook PC

[1] Customer supplied cable - Manufacturer: NEXANS, Part Number: 5600-AZZD
[2] Notebook PC is connected only during setup

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3. Product Configuration (continued)

3.3. Operational Characteristics & Software

(1) By pressing "1" on key-board, the radio will turn ON its transmitter (unmodulated carrier only) at the frequency shown on (a|z) "Channel....n". ON & OFF can be toggled by pressing this key.

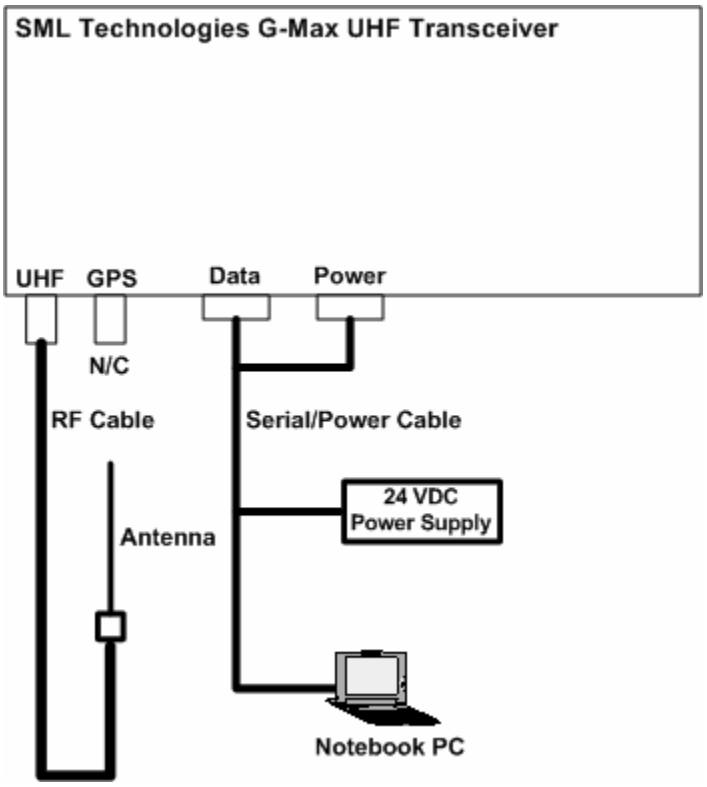
(2) By pressing "2" on key-board, the radio will turn ON its transmitter modulating a 1KHz tone test pattern at the frequency shown on (a|z) "Channel....n". ON & OFF can be toggled by pressing this key.

(3) By pressing "3" on Key-board, the radio will send a short "burst" test message at the frequency shown on (a|z) "Channel....n". A burst message is sent each time the key is pressed.

(4) By pressing "4" on key-board, the radio will send short messages at different intervals selected using the (s|x) "Cyclic Interval" selection at the frequency shown on (a|z) "Channel....n".

(c) Pressing "c" on the key-board enables RF power calibration for each of the RF power selections configured using SIDYNT. This function should not be used, without consulting manufacture.

3.4. Block Diagram



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4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
EMI Receiver	Hewlett Packard	8546A	3650A00360	3/14/2008
Spectrum Analyzer	Hewlett Packard	8593E	3829A03887	3/8/2008
Bilog Antenna	Com-Power	AC220	25509	8/2/2008
High Pass Filter	Mini-Circuits	VHF-740	3 0629	10/24/2009
Signal Generator	Hewlett Packard	8648C	3623A03429	2/19/2009
Multimeter	Fluke	187	79690058	2/19/2009
Temperature Chamber	Assoc. Test Labs	SLHU-1-CRLC	N/A	N/A
Attenuator Set 50Ω, 2W	Mini-Circuits	BW-SXW2	N/A	N/A
3-Way Power Splitter	Mini-Circuits	ZFSC-3-1	15542	01/25/2009
Oscilloscope	Tektronix	2230	B031344	7/11/2008
RF Detector	Hewlett Packard	HMS2865	N/A	N/A
Modulation Analyzer	Hewlett Packard	8901A	2239A02235	01/25/2009

4.2. Measurement & Equipment Setup

Test Date: 1/10/2008

Test Engineer: Brian Breault

Normal Site Temperature (15 - 35°C): 21.6

Relative Humidity (20 -75%RH): 25

4.3. Test Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 90, Sections 205, 209, 210, 213 and 214.

The test methods used to generate the data is this test report are in accordance with ANSI C63.4: 2003, 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.

Measurements were made in accordance with TIA-603-C: Land Mobile FM or PM Communications Equipment Measurement. and Performance Standard.

For all radiated measurements, the UHF antenna connected to the device under test was mounted vertically on an 80cm table in order to simulate a typical installation.

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5. Measurement Summary

Section Description or Test Requirement	FCC Part 90 Reference	Test Report Section	Result	Comment
Power and Antenna Height Limits	Section 205	6.1	Compliant	
Bandwidth Limitations	Section 209	6.2	Compliant	
Emission Masks	Section 210	6.3	Compliant	Includes spurious and harmonic emissions.
Frequency Stability	Section 213	6.4	Compliant	
Transient Frequency Behavior	Section 214	6.5	Compliant	
Conducted Spurious Emissions	Section 2.1051	6.6	Compliant	
Radiated Spurious Emissions	Section 2.1053	6.7	Compliant	

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6. Measurement Data

6.1. Power and Antenna Height Limits (450 MHz to 470 MHz)

Requirement: The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT (Antenna Height Above Average Terrain) and required service area and will be authorized in accordance with the following table (Reference FCC CFR 90, Section 90.205, Table 2) and FCC Part 2.1046(a),(c).

	Service area radius (km)									
	3	8	13	16	24	32	40[4]	48[4]	64[4]	80[4]
Maximum ERP (w)[1]	2	100	2500	2500	2500	2500	2500	2500	2500	2500
Up to reference HAAT (m)[3]	15	15	15	27	63	125	250	410	950	2700

[1] Maximum ERP indicated provides for a 39 dBu signal strength at the edge of the service area per FCC Report R–6602, Fig. 29 (See § 73.699, Fig. 10 b).

[2] Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 39 dBu.

[3] When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation: $ERP_{allow} = ERP_{max} \times (HAAT_{ref}\, HAAT_{actual})^2$.

[4] Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 39 dBu

The output power of the device under test is limited by the firmware to 500 mW (+26.99 dBm) at a firmware setting of 628. The measurements to support this claim are supplied below. A +13.8 volt fixed DC supply was used to power the DUT for the power measurements.

6.1.1. Peak Transmitter Output Power, Transmitter Only (Unmodulated carrier)

Channel	Frequency	Output Power	
	(MHz)	(mW)	(dBm)
0	458.50	498.66	26.98
10	458.75	498.75	26.98
20	459.00	498.80	26.98

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6. Measurement Data

6.1. Power and Antenna Height Limits (450 MHz to 470 MHz) (continued)

6.1.2. Maximum ERP

ERP is defined in FCC Title 47, Chapter I, Part 2, Subpart A, Section 2.1 as "Effective Radiated Power. The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction."

ERP = Transmitter Power (dBm) - Cable Loss (dB) + Antenna Gain (dBi)

The manufacturer of the device under test recommends 2 antennas for use with their product. The following table provides the worst case effective radiated power based on the measured transmitter output power and the antenna gain:

Channel	Frequency	Transmitter Power[1]	Cable Insertion Loss[2]	Antenna Gain[3]	Total Output Power	
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(Watts)
0	458.50	26.98	1.17	+5	30.81	1.21
10	458.75	26.98	1.17	+5	30.81	1.21
20	459.00	26.98	1.17	+5	30.81	1.21

[1] Measured. See section 6.1.1.
[2] Customer supplied cable for use with Procom CXL 70-3/h. Insertion Loss was measured.
[3] Customer supplied Procom CXL 70-3/h. A second customer supplied antenna, Procom CXL 70-1/h had a gain of +2 dBi. Gain data was supplied by the antenna manufacturer.

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6. Measurement Data (continued)

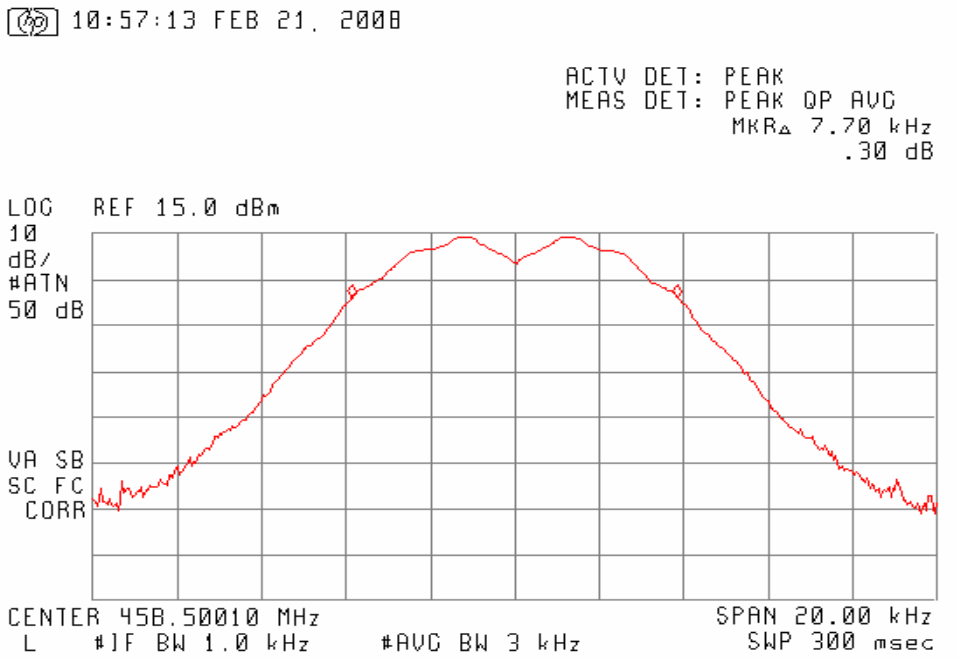
6.2. Bandwidth Limitations (FCC Part 2.1049, 90.210(i) and (j))

Requirement: Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. The device uses Modulation schemes of GSMK and 4LFSK therefore the Emissions designator for this device is **7K8F1D**

6.2.1. Occupied (99% Power) Bandwidth

Channel	Frequency	Occupied Bandwidth	Result
	(MHz)	(kHz)	
0	458.50	7.70	Compliant
10	458.75	7.75	Compliant
20	459.00	7.80	Compliant

6.2.1.1. Occupied (99% Power) Bandwidth Measurement, Channel 0



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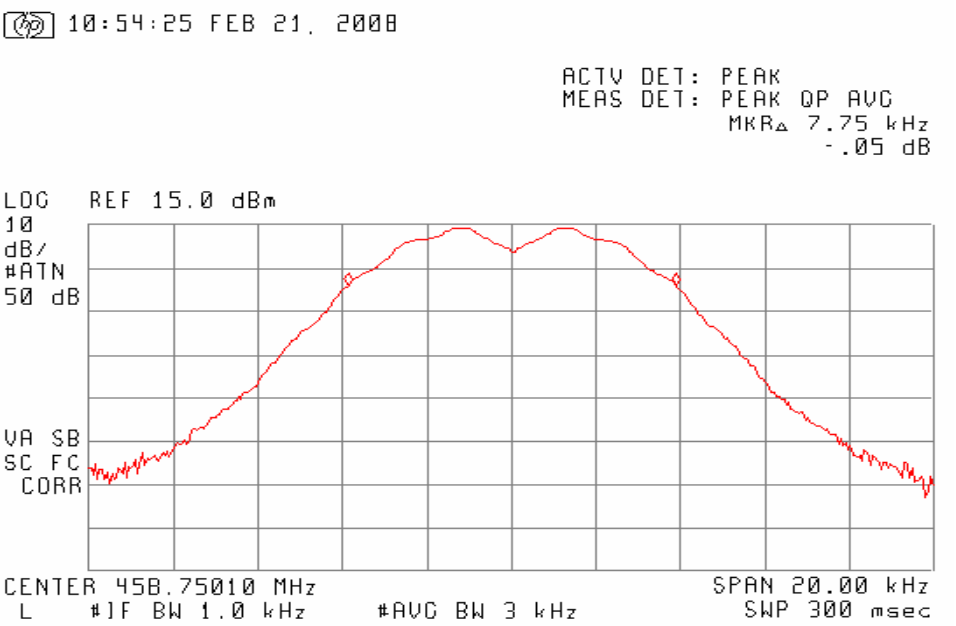
6. Measurement Data (continued)

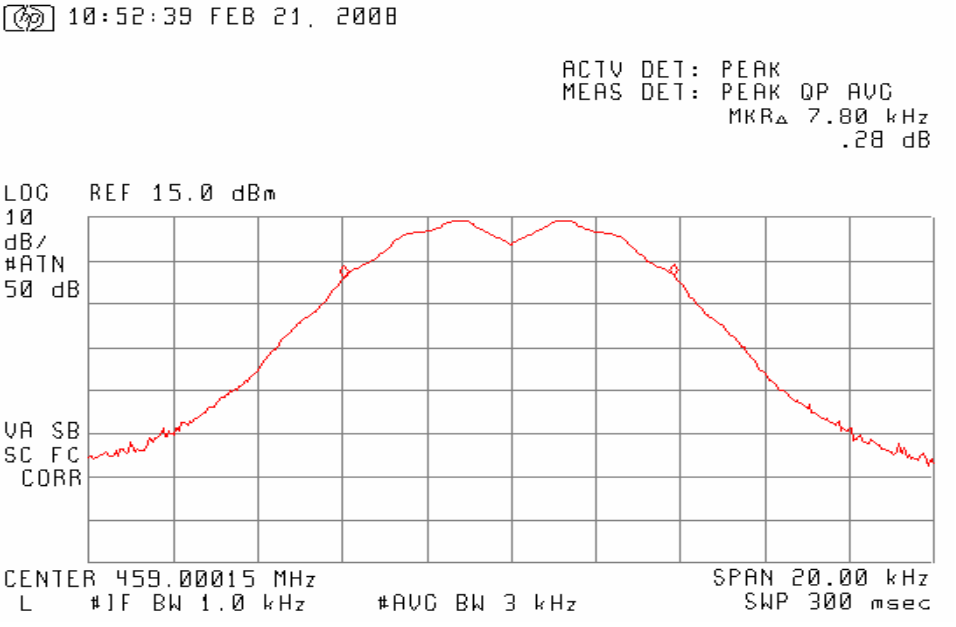
6.2. Bandwidth Limitations (FCC Part 2.1049, 90.210(i) and (j)) (continued)

6.2.1. Occupied (99% Power) Bandwidth (continued)

6.2.1.2. Occupied (99% Power) Bandwidth Measurement, Channel 10



6.2.1.3. Occupied (99% Power) Bandwidth Measurement, Channel 20



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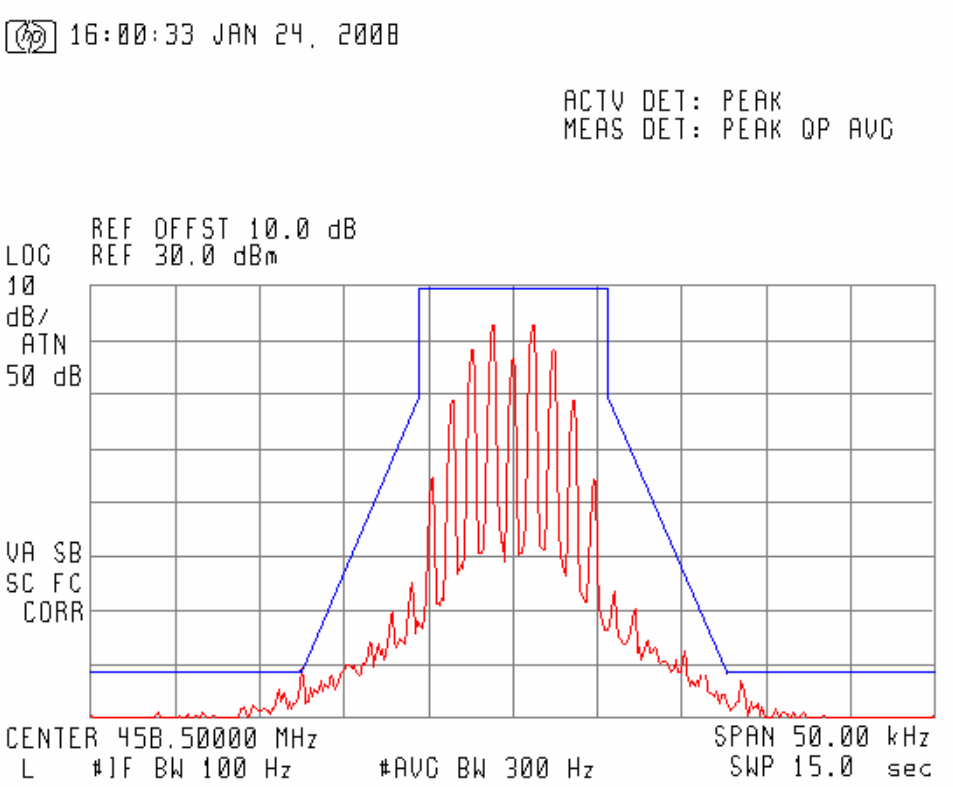
6. Measurement Data (continued)

6.3. Emissions Masks (90.210)

Requirement: Emission Mask D: 12.5 kHz channel bandwidth equipment.

1. On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0: Zero dB.
2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd - 2.88 kHz) dB.
3. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

6.3.1. Channel 0 - 458.50 MHz



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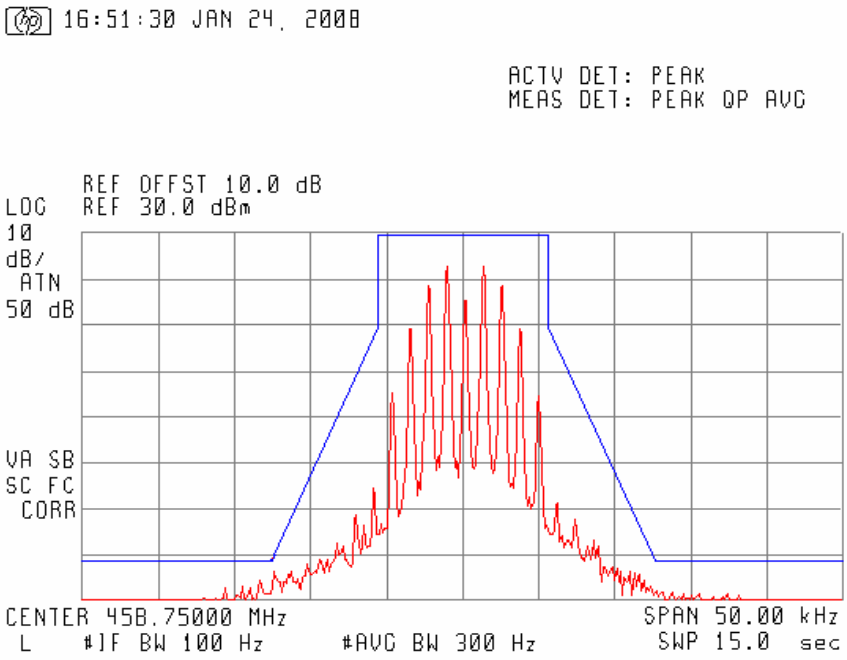
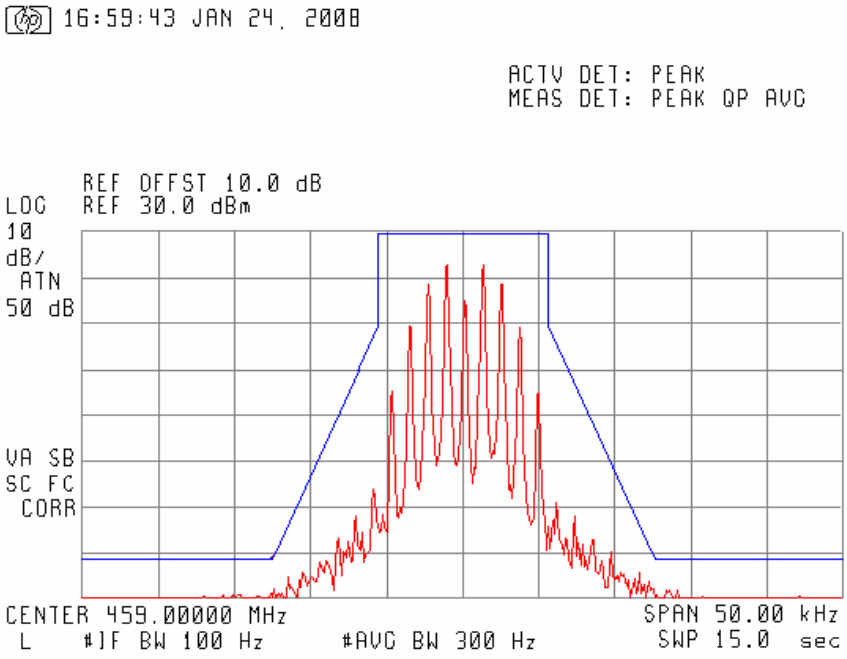
6. Measurement Data (continued)

6.3. Emissions Masks (continued)

6.3.2. Channel 10 - 458.75 MHz



6.3.3. Channel 20 - 459.00 MHz



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6. Measurement Data (continued)

6.3. Emissions Masks (continued)

6.3.4. Spurious and Harmonic Emissions (FCC Part 2.1053, 90.210)

Note: Refer to section 6.1.1, Peak Transmitter Output Power, for the reference values used in the following table.

Harmonic	Channel 0: 468.50 MHz		Channel 10: 468.75 MHz		Channel 20: 469.00 MHz	
	Frequency (MHz)	Relative Output (dBc)	Frequency (MHz)	Relative Output (dBc)	Frequency (MHz)	Relative Output (dBc)
2	917.00	-98.18	917.50	-99.69	918.00	-97.87
3	1375.50	-102.47	1376.25	-100.86	1377.00	-100.45
4	1834.00	-116.47	1835.00	-116.38	1836.00	-116.79
5	2292.50	-116.60	2293.75	-117.25	2295.00	-117.98
6	2751.00	-113.67	2752.50	-113.09	2754.00	-113.34
7	3209.50	-113.71	3211.25	-115.00	3213.00	-112.15
8	3668.00	-115.10	3670.00	-113.91	3672.00	-113.07
9	4126.50	-114.65	4128.75	-114.23	4131.00	-115.30
10	4585.00	-114.73	4587.50	-114.01	4590.00	-115.06
11	5043.50	-116.16	5046.25	-114.15	5049.00	-116.19
12	5502.00	-114.34	5505.00	-114.01	5508.00	-115.52
13	5960.50	-115.08	5963.75	-107.96	5967.00	-115.07
14	6419.00	-116.42	6422.50	-109.79	6426.00	-114.80
15	6877.50	-108.65	6881.25	-108.49	6885.00	-107.72
16	7336.00	-107.46	7340.00	-106.89	7344.00	-109.24
17	7794.50	-108.44	7798.75	-106.42	7803.00	-106.73
18	8253.00	-105.57	8257.50	-106.08	8262.00	-106.56
19	8711.50	-107.70	8716.25	-107.07	8721.00	-106.69
20	9170.00	-107.16	9175.00	-106.29	9180.00	-108.21

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6. Measurement Data (continued)

6.4. Frequency Stability (FCC Part 2.1055(d)(1), 90.213(a))

Requirement: A transmitter operating in the 421 MHz to 512 MHz frequency range must have a minimum frequency stability of 2.5 ppm at the specified maximum rated output power. This requirement will be verified using the following manufacturer's specifications:

- Operating voltage range : +8 VDC to +30 VDC
- Operating temperature range : -10°C to +50°C.

6.4.1. Frequency Stability with Variation in Supply Voltage

Note: The selected voltages are based on the voltage range detailed in the manufacturer's specifications.

6.4.1.1. Channel 0 - 458.50 MHz

Supplied Voltage	Measured Frequency	Frequency Error	
(VDC)	(MHz)	(MHz)	(PPM)
8	458.499645	0.000355	0.77
19	458.499707	0.000293	0.64
30	458.499707	0.000293	0.64

6.4.1.2. Channel 10 - 458.75 MHz

Supplied Voltage	Measured Frequency	Frequency Error	
(VDC)	(MHz)	(MHz)	(PPM)
8	458.749588	0.000412	0.90
19	458.749588	0.000412	0.90
30	458.749576	0.000424	0.92

6.4.1.3. Channel 20 - 459.00 MHz

Supplied Voltage	Measured Frequency	Frequency Error	
(VDC)	(MHz)	(MHz)	(PPM)
8	458.999563	0.000437	0.95
19	458.999563	0.000437	0.95
30	458.999563	0.000437	0.95

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6. Measurement Data (continued)

6.4. Frequency Stability (continued)

6.4.2. Frequency Stability with Variation in Temperature

6.4.2.1. Channel 0 - 458.50 MHz

Temperature	Measured Frequency	Frequency Error	
°C	(MHz)	(MHz)	(PPM)
+23 (Ambient)	458.499650	0.000350	0.76
-30	458.499887	0.000113	0.25
+50	458.499362	0.000638	1.39

6.4.2.2. Channel 10 - 458.75 MHz

Temperature	Measured Frequency	Frequency Error	
°C	(MHz)	(MHz)	(PPM)
+23	458.749595	0.000405	0.88
-30	458.749865	0.000135	0.29
+50	458.749345	0.000655	1.43

6.4.2.3. Channel 20 - 459.00 MHz

Temperature	Measured Frequency	Frequency Error	
°C	(MHz)	(MHz)	(PPM)
+23	458.999573	0.000427	0.93
-30	458.999872	0.000128	0.28
+50	458.999386	0.000614	1.34

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6. Measurement Data (continued)

6.5. Transient Frequency Behavior (FCC Part 90.214)

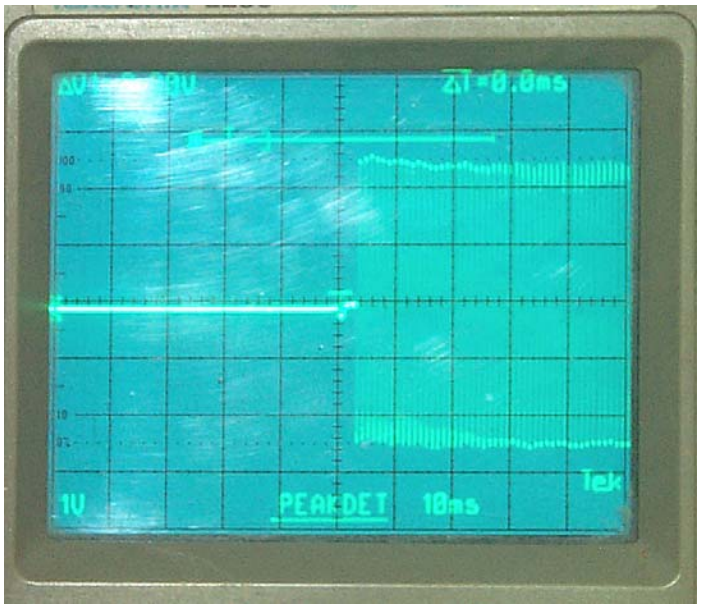
Requirement: Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

T_1	±25.0 kHz	10 ms	See note
T_1	±12.5 kHz	25 ms	
T_1	±25.0 kHz	10 ms	See note

Note: If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

6.5.1. Transient Frequency Behavior Measurements

6.5.1.1. Channel 0 - 458.50 MHz, Transmitter Off



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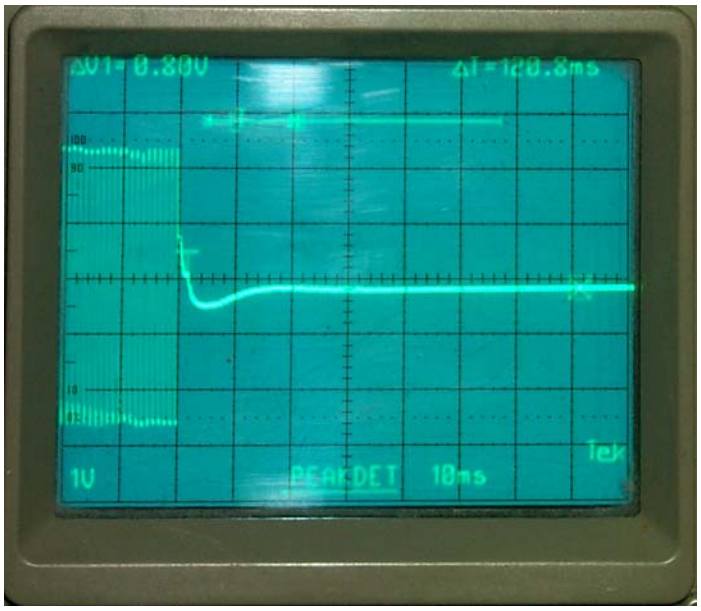
6. Measurement Data (continued)

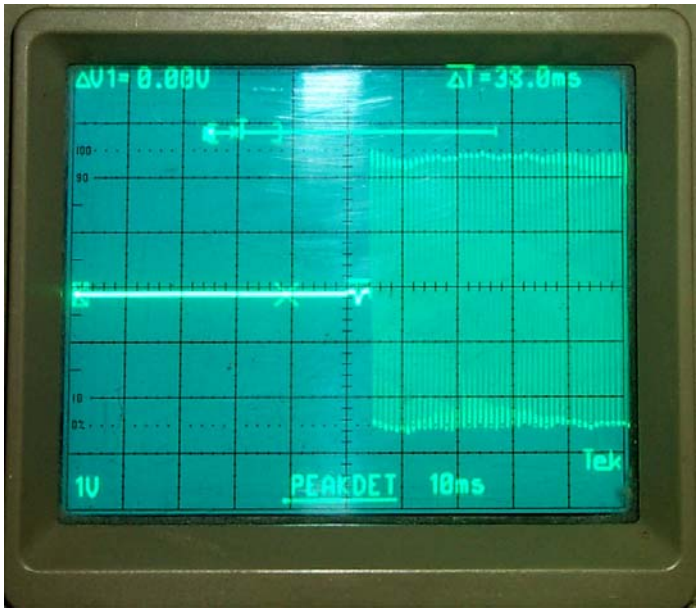
6.5. Transient Frequency Behavior (continued)

6.5.1. Transient Frequency Behavior Measurements

6.5.1.2. Channel 0 - 458.50 MHz, Transmitter On



6.5.1.3. Channel 10 - 458.75 MHz, Transmitter Off



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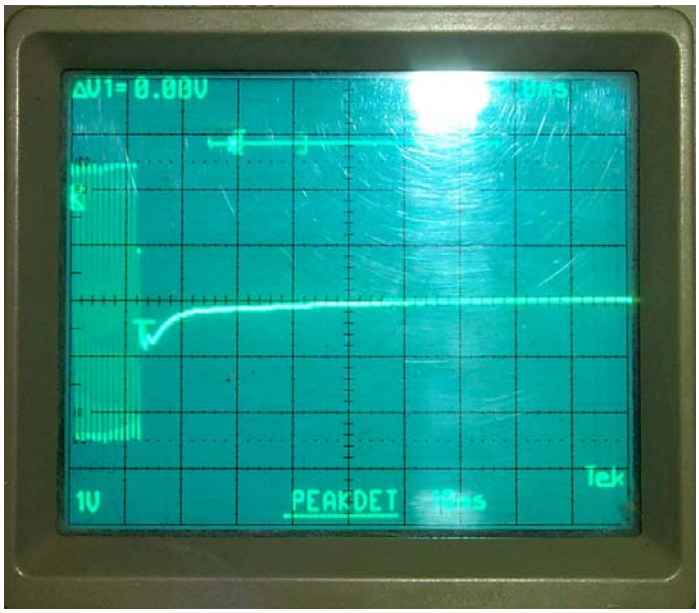
6. Measurement Data (continued)

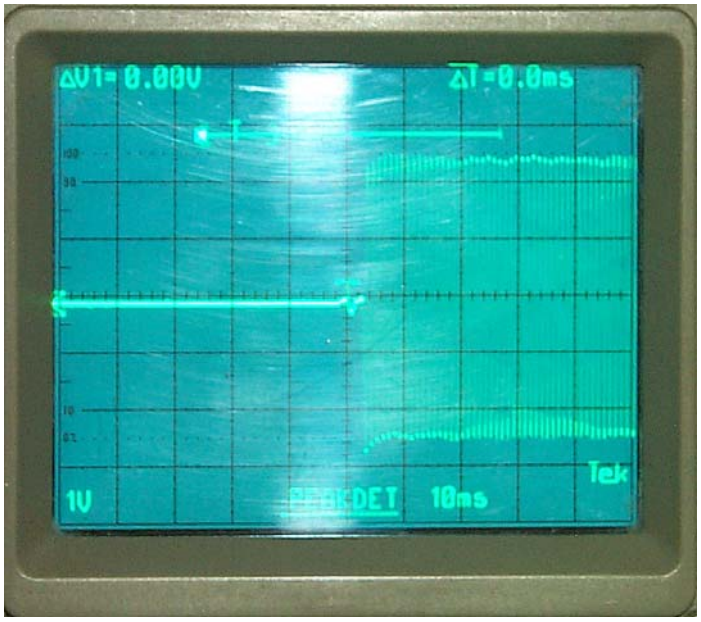
6.5. Transient Frequency Behavior (continued)

6.5.1. Transient Frequency Behavior Measurements

6.5.1.4. Channel 10 - 458.75 MHz, Transmitter On



6.5.1.5. Channel 20 - 459.00 MHz, Transmitter Off



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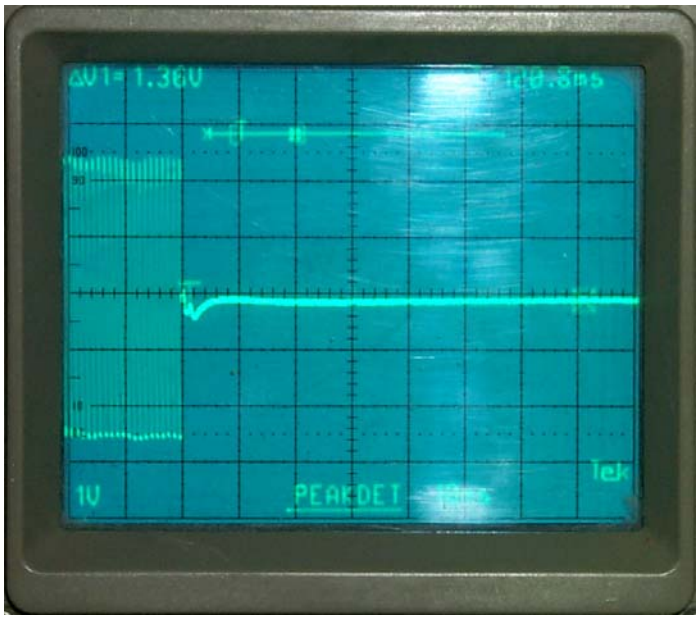
6. Measurement Data (continued)

6.5. Transient Frequency Behavior (continued)

6.5.1. Transient Frequency Behavior Measurements

6.5.1.6. Channel 20 - 450.00 MHz, Transmitter On



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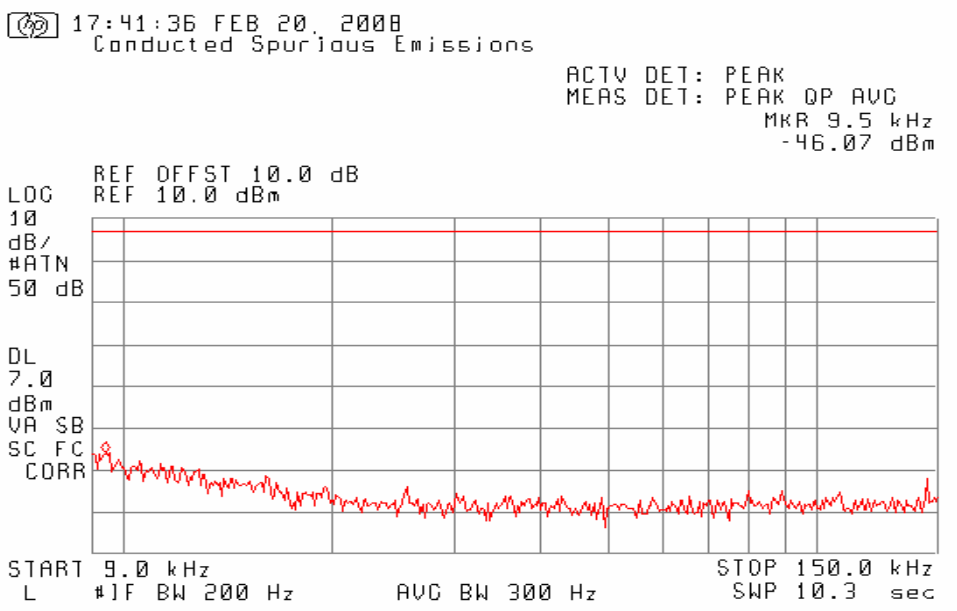
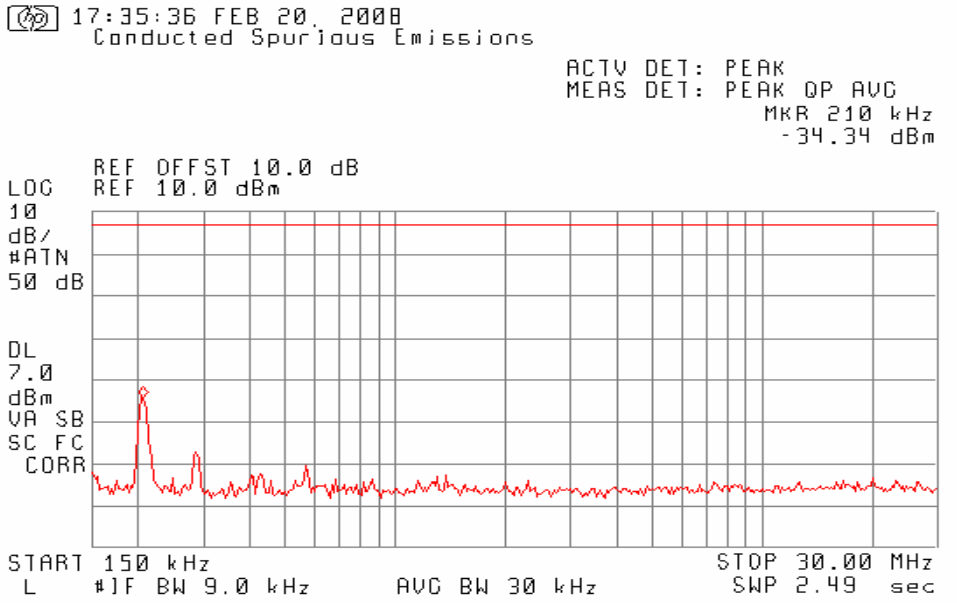
6. Measurement Data (continued)

6.6. Conducted Spurious Emissions

6.6.1. 9 kHz to 150 kHz



6.6.2. 150 kHz to 30 MHz



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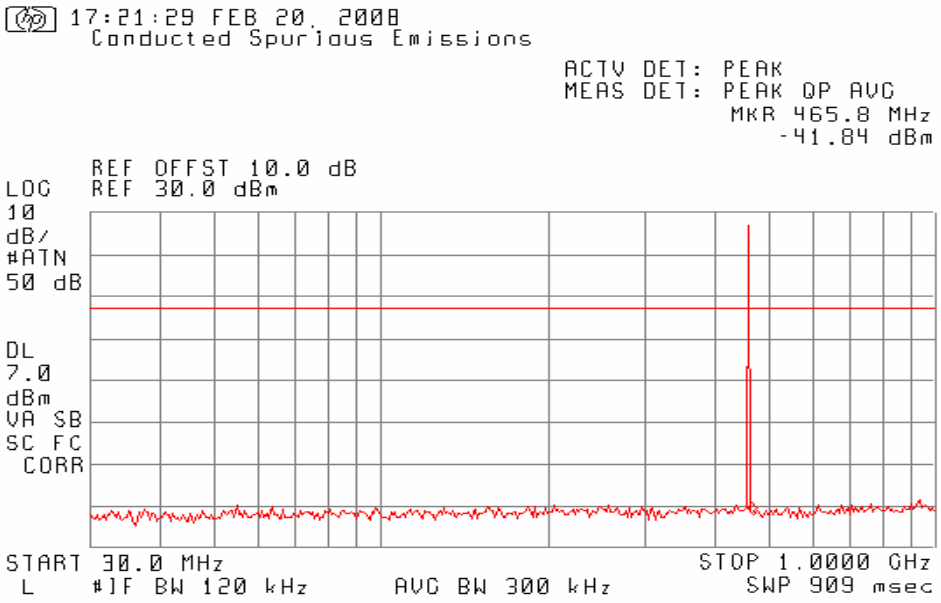
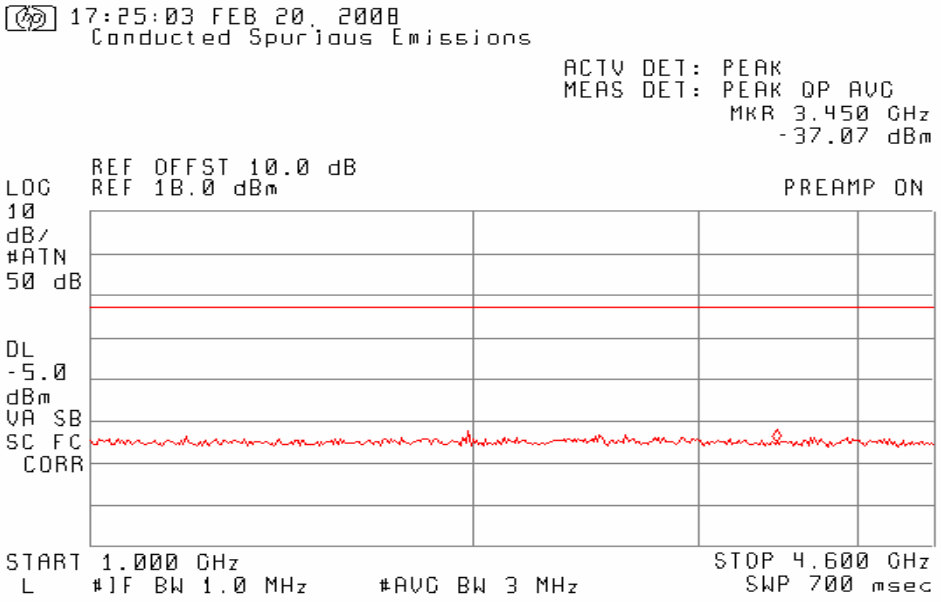
6. Measurement Data (continued)

6.6. Conducted Spurious Emissions (continued)

6.6.3. 30 MHz to 1 GHz



6.6.4. 1 GHz to 4.6 GHz



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6. Measurement Data (continued)

6.7. Radiated Spurious Emissions

There were no measurable emissions other than the harmonic emissions detailed in section 6.3.

7. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023A-1)**.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.

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Appendix A

G-Max GAS6146 Transmitter Frequency List

Channel	Frequency
0	458.500
1	458.525
2	458.550
3	458.575
4	458.600
5	458.625
6	458.650
7	458.675
8	458.700
9	458.725
10	458.750
11	458.775
12	458.800
13	458.825
14	458.850
15	458.875
16	458.900
17	458.925
18	458.950
19	458.975
20	459.000

The highlighted cells represent the transmitter frequencies used for this evaluation.

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