



FCC PART 15, SUBPART C

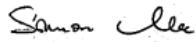
TEST AND MEASUREMENT REPORT

For

Geoforce, Inc.

750 Canyon Drive, Suite 140,
Coppell, TX 75019, USA

FCC ID: OWA00GTX

Report Type: Original Report	Product Type: Globalstar Simplex Tracking Device
Prepared By: Bo Li 	
Report Number: R1504201-247	
Report Date: 2015-07-20	
Reviewed By: RF Lead  Simon Ma	
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164	

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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*” (b)(2)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1504201-247	Original Report	2015-07-20

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *Geoforce Inc.*, and their product, *FCC ID: OWA00GTX*, model number: *GT0K, GT1K*, which henceforth is referred to as the EUT (Equipment under Test). The EUT is a Globalstar Simplex Tracking Device contains BLE chip on board.

1.2 Mechanical Description of EUT

The EUT measures approximately 68 mm (L) x 68 mm (W) x 29mm (H) and weighs approximately 1.2 kg.

The data gathered are from a typical production sample provided by the manufacturer with serial number: A30615D0601 provided by customer.

1.3 Objective

This report is prepared on behalf of *Geoforce, Inc.*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules

The objective is to determine compliance with FCC Part 15.247 for Output Power, Antenna Requirements, AC Line Conducted Emissions, 6 dB Bandwidth, power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2009, American National Standard for Testing Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:

- 1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.
- 2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminaires and Computers.
- 3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.
- 4- A Product Certification Body accredited to **ISO Guide 65: 1996** by **A2LA** to certify:
 2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
 3. Radio Communication Equipment for Singapore.
 4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
 5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
 6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

<http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b>

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2009 and FCC KDB 558074 D01 DTS Meas Guidance v03r02.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The test utility used was *SmartRF Flash Programmer*, provided by *Geoforce, Inc.*, and was verified by Bo Li to comply with the standard requirements being tested against.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
Toshiba	Laptop	Satellite A665-S6093	XA491776K
Texas Instrument	CC Debugger	-	-

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model
Texas Instrument	BLE Chip	CC2540
Origin	GPS Module	-
Geoforce	Globalstar Transmitter	Myte
Omni-ID	RFID chip	Fit 200

2.6 Power Supply and Line Filters

N/A

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
RF Cable	<1M	PSA	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
§15.247(i), §2.1091	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	N/A ¹
§15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.209, §15.247(d)	Restricted Bands, Radiated Spurious Emissions	Compliant
§15.247(a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Peak Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

¹This device was powered by three AA batteries.

4 FCC §15.247(i) & §2.1091 - RF Exposure

4.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* (180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

4.3 MPE Results

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>-1.72</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>0.672</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2402</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>3</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>1.995</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.000267</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.000267 mW/cm² Limit is 1.0 mW/cm²

5 FCC §15.203 - Antenna Requirements

5.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna Description

Antenna Type	Antenna Gain (dBi) @ 2.4 GHz
Internal PCB	3

6 FCC §15.205, §15.209 & §15.247(d) – Spurious Radiated Emissions

6.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

6.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2009. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

6.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

Above 1000 MHz:

- (1) Peak: $\text{RBW} = 1\text{MHz} / \text{VBW} = 1\text{MHz} / \text{Sweep} = \text{Auto}$
- (2) Average: $\text{RBW} = 1\text{MHz} / \text{VBW} = 10\text{Hz} / \text{Sweep} = \text{Auto}$

6.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + Atten - Ga$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

6.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-09-28	1 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2014-10-16	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2014-09-18	1 year
EMCO	Horn Antenna	3115	9511-4627	2014-10-17	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A10187	2014-08-08	1 year
-	SMA cable	-	C0002	Each time ¹	N/A
IW Microwave	High Frequency Cable	DC-1438	SPS-2303-3840-SPS	2014-09-23	1 year
Hewlett-Packard	5 ft N-type RF cable	-	1268	2014-07-24	1 year
Agilent	Pre-amplifier	8449B	3008A01978	2015-03-11	1 year

Note¹: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: **BACL** attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.

6.6 Test Environmental Conditions

Temperature:	22° C
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Bo Li on 2015-04-29 in 5m chamber3.

6.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15C standard's radiated emissions limits, and had the worst margin of:

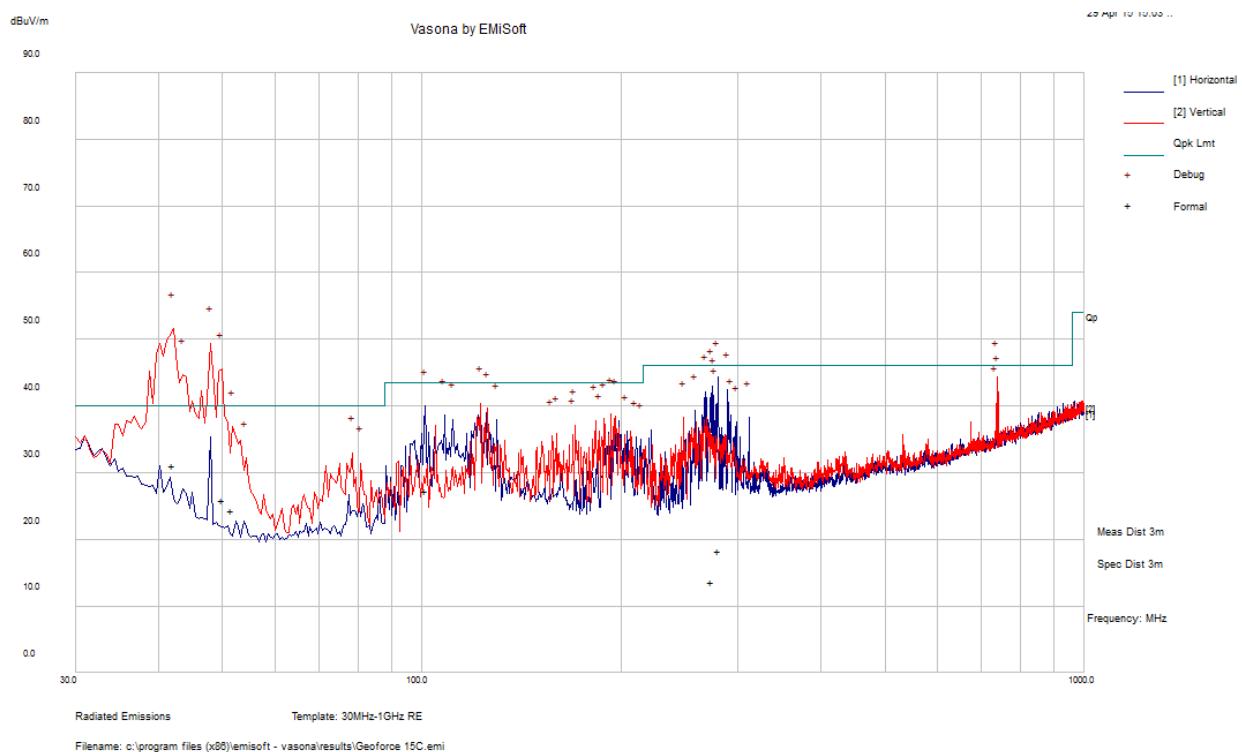
30MHz – 25 GHz:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Mode, Channel
-8.413	2483.5	Horizontal	BLE, High CH

Please refer to the following table and plots for specific test result details

6.8 Radiated Emissions Test Data and Plots

1) 30 MHz – 1 GHz



Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dB μ V/m)	Margin (dB)	Comments
42.133	31.14	213	V	152	40	-8.86	QP
49.91475	25.94	297	V	5	40	-14.06	QP
279.935	18.35	283	H	64	46	-27.65	QP
274.181	13.64	212	H	350	46	-32.36	QP
51.6265	24.41	242	V	179	40	-15.59	QP
101.28025	27.26	141	H	109	43.5	-16.24	QP

2) Above 1 GHz

Frequency (MHz)	S.A. Reading (dB μ V)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dB μ V/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dB μ V/m)	Margin (dB)	
Low Channel 2402 MHz											
2402	58.37	296	100	V	28.197	2.86	0	89.427	-	-	Peak
2402	57.85	43	129	H	28.197	2.86	0	88.907	-	-	Peak
2402	57.29	296	100	V	28.197	2.86	0	88.347	-	-	Ave
2402	56.71	43	129	H	28.197	2.86	0	87.767	-	-	Ave
2390	27.16	296	100	V	28.197	2.86	0	58.217	74	-15.783	Peak
2390	26.87	43	129	H	28.197	2.86	0	57.927	74	-16.073	Peak
2390	13.43	296	100	V	28.197	2.86	0	44.487	54	-9.513	Ave
2390	13.11	43	129	H	28.197	2.86	0	44.167	54	-9.833	Ave
4804	46.25	127	100	V	33.182	4.29	34.76	48.962	74	-25.038	Peak
4804	43.18	328	100	H	33.182	4.29	34.76	45.892	74	-28.108	Peak
4804	36.57	127	100	V	33.182	4.29	34.76	39.282	54	-14.718	Ave
4804	34.12	328	100	H	33.182	4.29	34.76	36.832	54	-17.168	Ave
7206	44.33	220	100	V	37.442	5.67	35.06	52.382	69.427	-17.045	Peak
7206	43.98	75	100	H	37.442	5.67	35.06	52.032	68.907	-16.875	Peak
7206	30.89	220	100	V	37.442	5.67	35.06	38.942	68.347	-29.405	Ave
7206	30.97	75	100	H	37.442	5.67	35.06	39.022	67.767	-28.745	Ave
9608	45.09	0	100	V	38.834	8.7	35.57	57.054	69.427	-12.373	Peak
9608	43.12	0	100	H	38.834	8.7	35.57	55.084	68.907	-13.823	Peak
9608	30.59	0	100	V	38.834	8.7	35.57	42.554	68.347	-25.793	Ave
9608	30.38	0	100	H	38.834	8.7	35.57	42.344	67.767	-25.423	Ave
Middle Channel 2440 MHz											
2440	60.43	210	103	V	28.197	2.86	0	91.487	-	-	Peak
2440	63.37	21	130	H	28.197	2.86	0	94.427	-	-	Peak
2440	59.74	210	103	V	28.197	2.86	0	90.797	-	-	Ave
2440	62.74	21	130	H	28.197	2.86	0	93.797	-	-	Ave
4880	46.57	104	100	V	33.182	4.29	34.76	49.282	74	-24.718	Peak
4880	47.1	315	100	H	33.182	4.29	34.76	49.812	74	-24.188	Peak
4880	36.21	104	100	V	33.182	4.29	34.76	38.922	54	-15.078	Ave
4880	36.59	315	100	H	33.182	4.29	34.76	39.302	54	-14.698	Ave
7320	46.51	225	100	V	37.442	5.67	35.06	54.562	74	-19.438	Peak
7320	44.29	64	100	H	37.442	5.67	35.06	52.342	74	-21.658	Peak
7320	36.82	225	100	V	37.442	5.67	35.06	44.872	54	-9.128	Ave
7320	29.87	64	100	H	37.442	5.67	35.06	37.922	54	-16.078	Ave
9760	43.89	0	100	V	38.834	8.7	35.57	55.854	71.487	-15.633	Peak
9760	43.95	0	100	H	38.834	8.7	35.57	55.914	74.427	-18.513	Peak
9760	29.83	0	100	V	38.834	8.7	35.57	41.794	70.797	-29.003	Ave
9760	29.79	0	100	H	38.834	8.7	35.57	41.754	73.797	-32.043	Ave

Frequency (MHz)	S.A. Reading (dB μ V)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dB μ V/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dB μ V/m)	Margin (dB)	
High Channel 2480 MHz											
2480	59.74	230	107	V	28.197	2.86	0	90.797	-	-	Peak
2480	60.97	13	125	H	28.197	2.86	0	92.027	-	-	Peak
2480	58.48	230	107	V	28.197	2.86	0	89.537	-	-	Ave
2480	60.18	13	125	H	28.197	2.86	0	91.237	-	-	Ave
2483.5	27.58	230	107	V	28.197	2.86	0	58.637	74	-15.363	Peak
2483.5	27.89	13	125	H	28.197	2.86	0	58.947	74	-15.053	Peak
2483.5	14.48	230	107	V	28.197	2.86	0	45.537	54	-8.463	Ave
2483.5	14.53	13	125	H	28.197	2.86	0	45.587	54	-8.413	Ave
4960	46.58	330	100	V	33.182	4.29	34.76	48.962	74	-25.038	Peak
4960	45.71	318	100	H	33.182	4.29	34.76	45.892	74	-28.108	Peak
4960	36.43	330	100	V	33.182	4.29	34.76	39.282	54	-14.718	Ave
4960	35.18	318	100	H	33.182	4.29	34.76	36.832	54	-17.168	Ave
7440	46.05	225	100	V	37.442	5.67	35.06	54.102	74	-19.898	Peak
7440	44.59	0	100	H	37.442	5.67	35.06	52.642	74	-21.358	Peak
7440	33.72	225	100	V	37.442	5.67	35.06	41.772	54	-12.228	Ave
7440	29.83	0	100	H	37.442	5.67	35.06	37.882	54	-16.118	Ave
9920	43.86	0	100	V	38.834	8.7	35.57	55.824	70.797	-14.973	Peak
9920	43.58	0	100	H	38.834	8.7	35.57	55.544	72.027	-16.483	Peak
9920	29.47	0	100	V	38.834	8.7	35.57	41.434	69.537	-28.103	Ave
9920	29.37	0	100	H	38.834	8.7	35.57	41.334	71.237	-29.903	Ave

7 FCC §15.247(a)(2) - 6 dB & 99% Emission Bandwidth

7.1 Applicable Standards

According to FCC §15.247(a)(2) systems using digital modulation techniques may operate in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

7.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-09-29	1 year

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

7.4 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

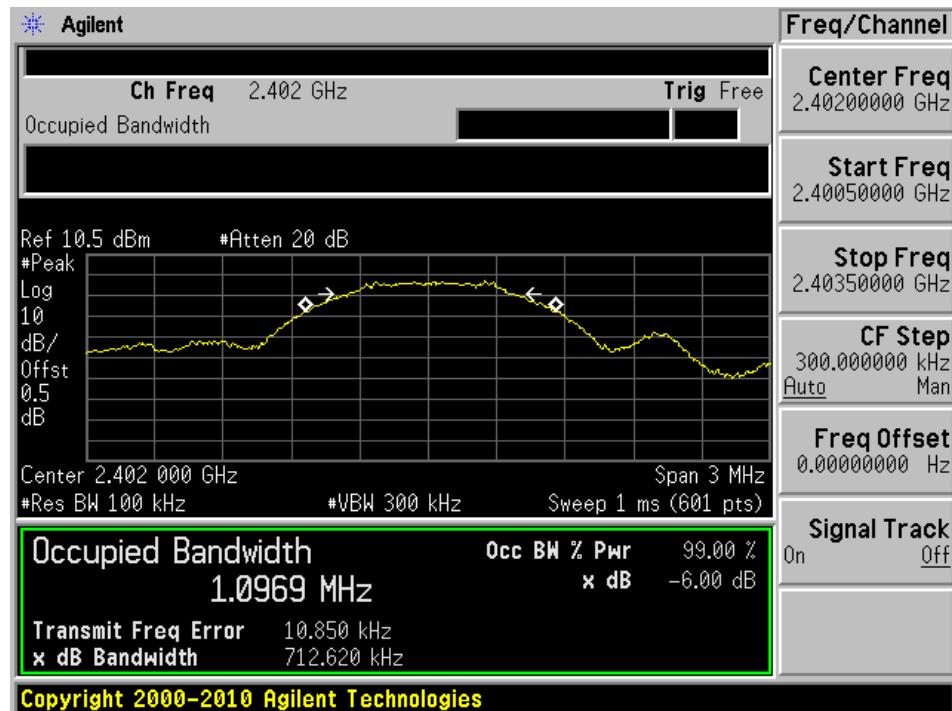
The testing was performed by Bo Li on 2015-04-29 in RF site.

7.5 Test Results

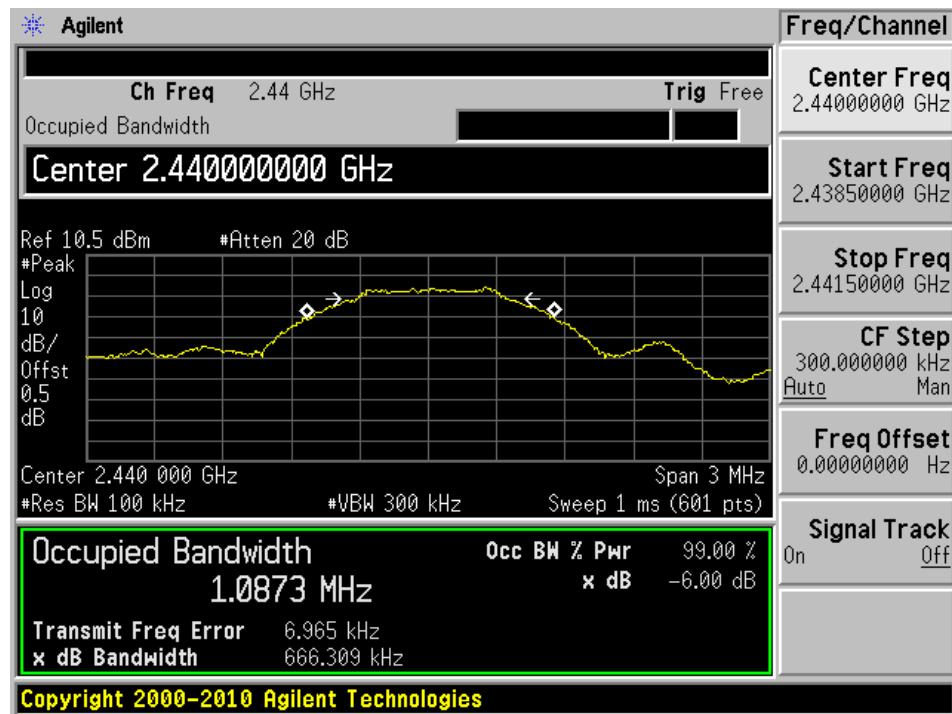
Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	Limit (kHz)	Results
Low	2402	712.62	1096.9	> 500	Compliant
Middle	2440	666.309	1087.3	> 500	Compliant
High	2480	684.02	1080	> 500	Compliant

Please refer to the following plots for detailed test results

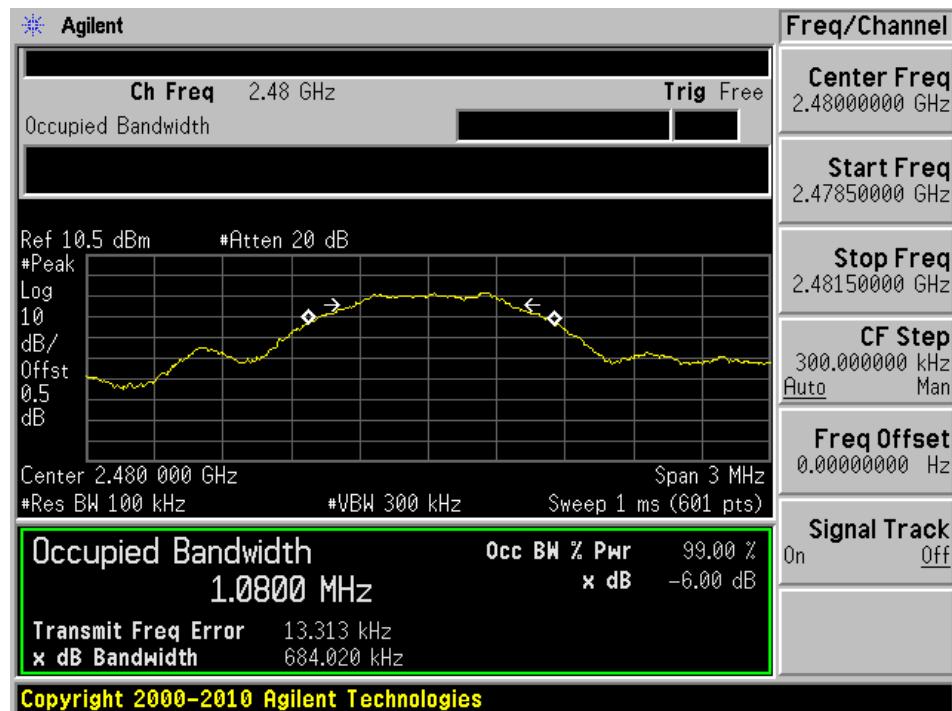
Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz



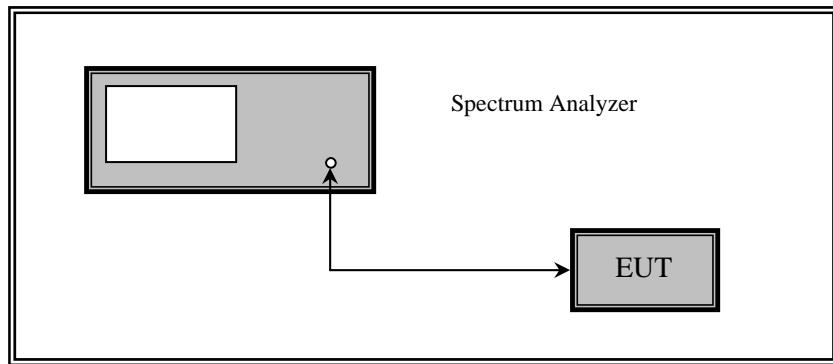
8 FCC §15.247(b) - Output Power Measurement

8.1 Applicable Standards

According to FCC §15.247(b) for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

8.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power



8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-09-29	1 year

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

8.4 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

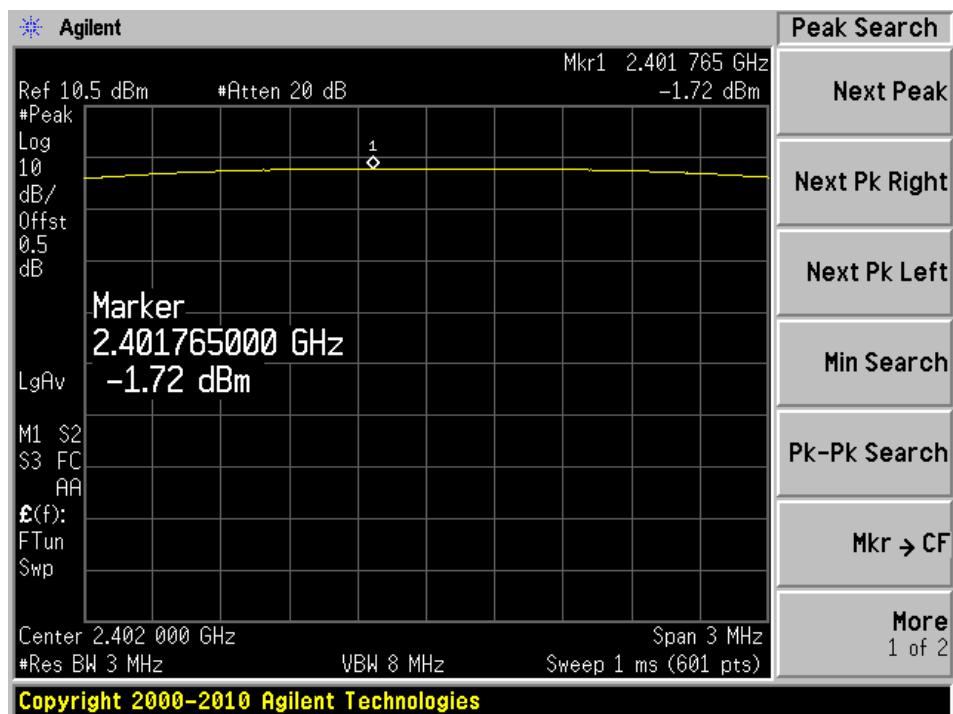
The testing was performed by Bo Li on 2015-04-29 in RF site.

8.5 Test Results

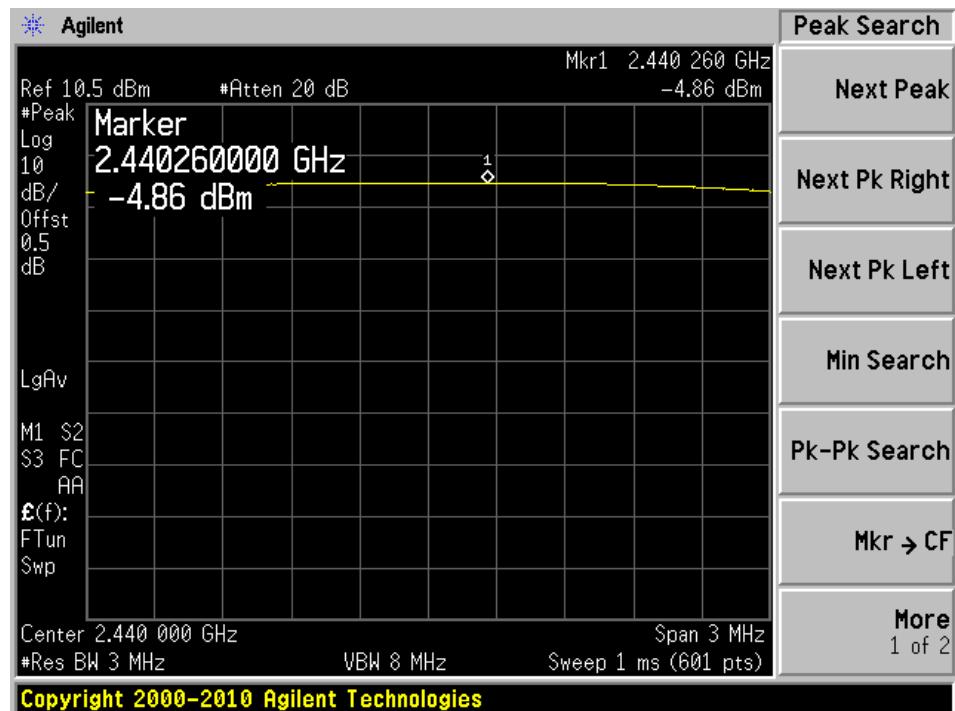
Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Limit (dBm)
Low	2402	-1.72	30
Middle	2440	-4.86	30
High	2480	-7.28	30

Please refer to following plots.

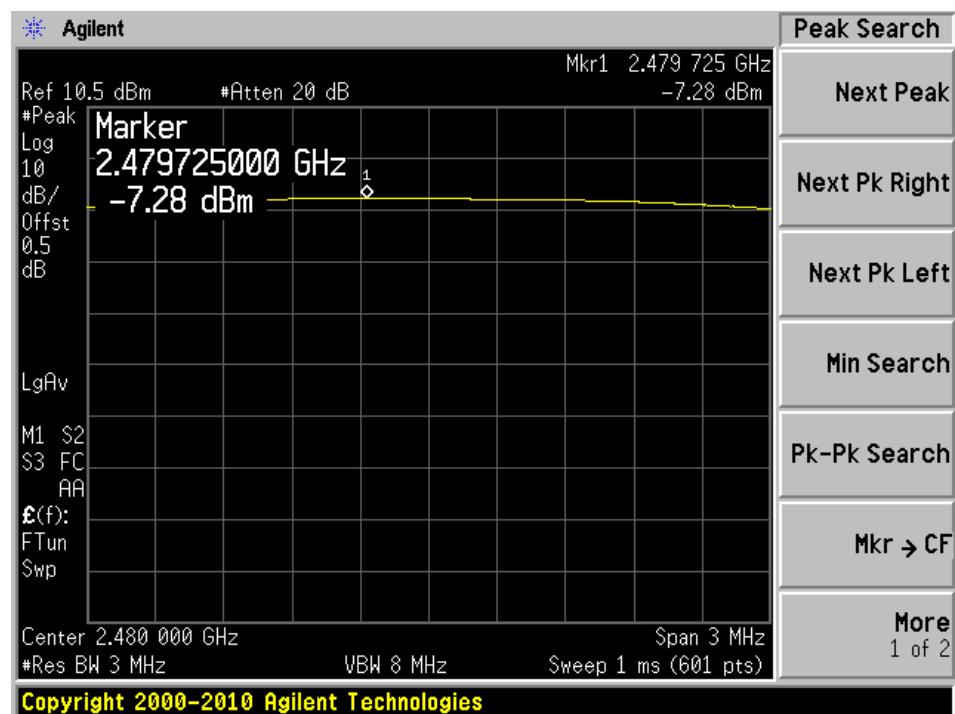
Low Channel: 2402 MHz



Middle Channel: 2440 MHz



High Channel: 2480 MHz



9 FCC §15.247(d) – Spurious Emissions at Antenna Port

9.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-09-29	1 year

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

9.4 Test Environmental Conditions

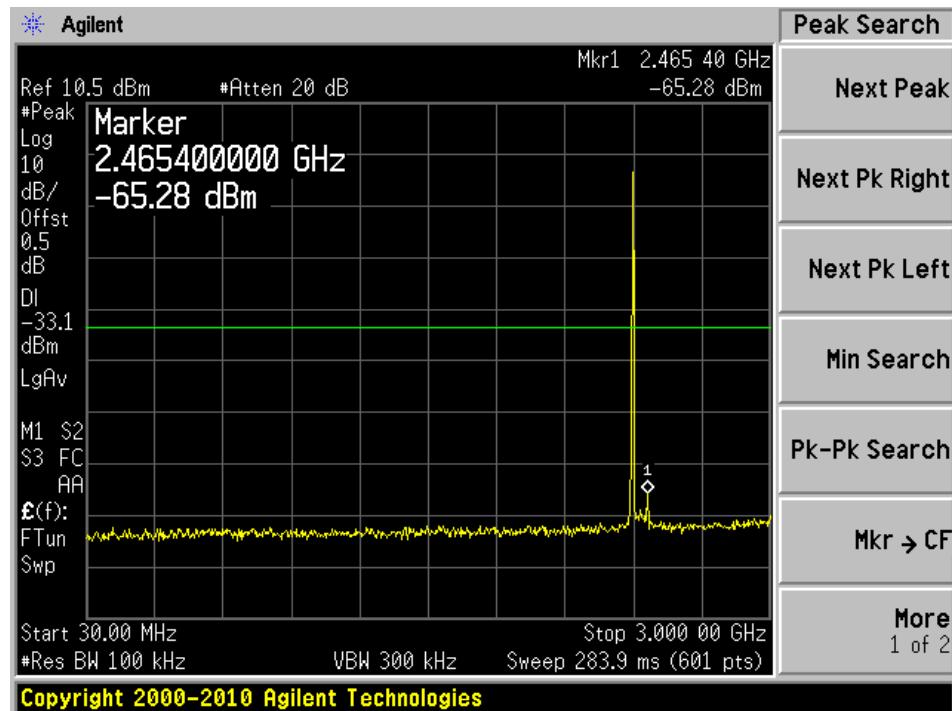
Temperature:	22 °C
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Bo Li on 2015-04-29 in RF site.

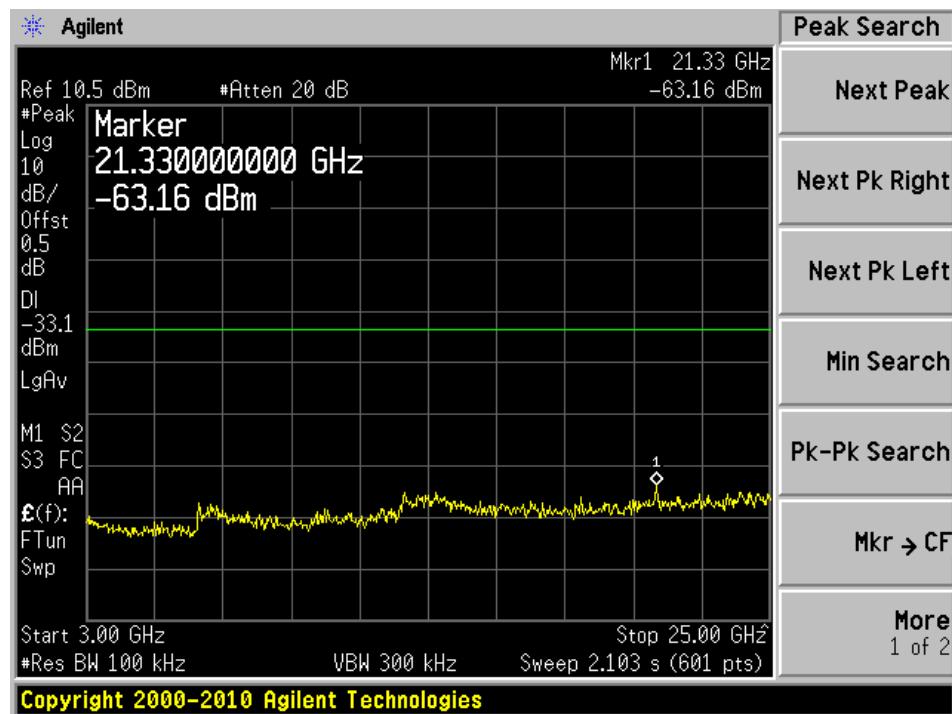
9.5 Test Results

Please refer to following plots.

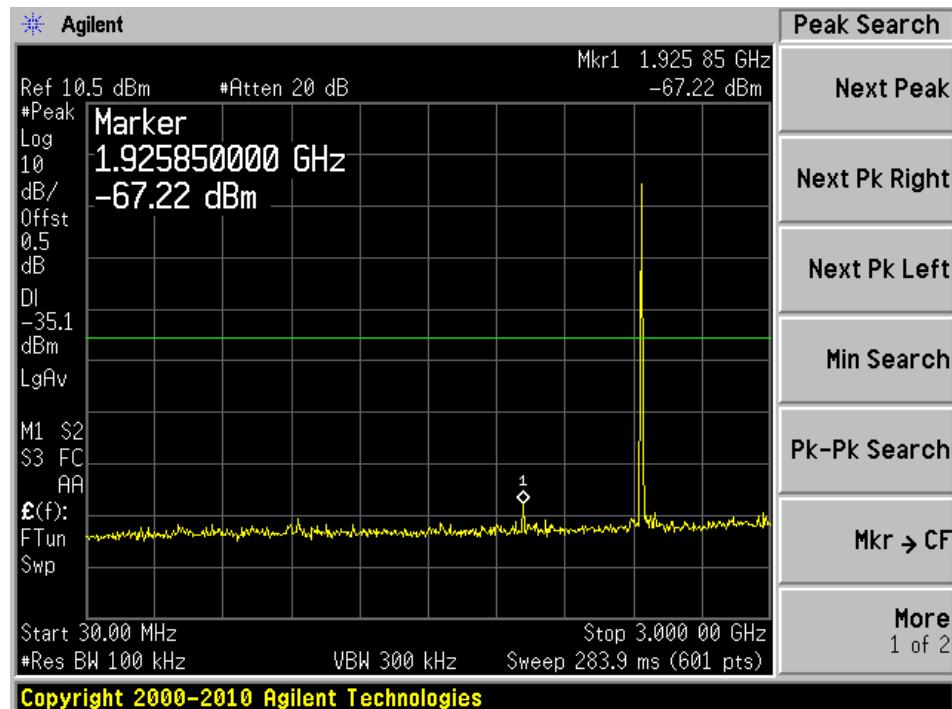
Low Channel, 30 MHz -3 GHz



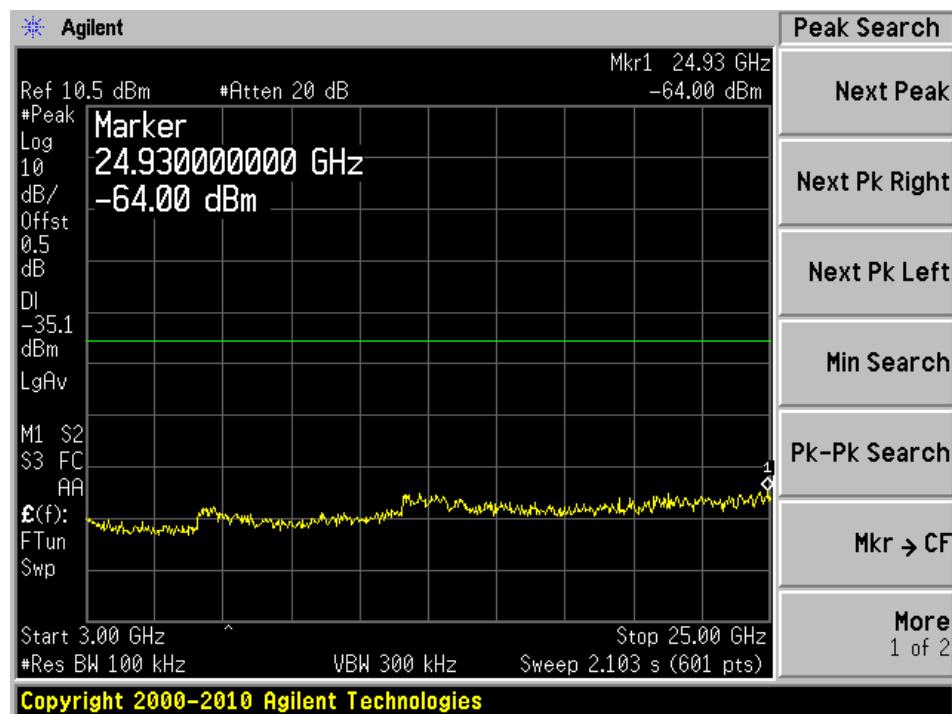
Low Channel, 3 GHz – 25 GHz



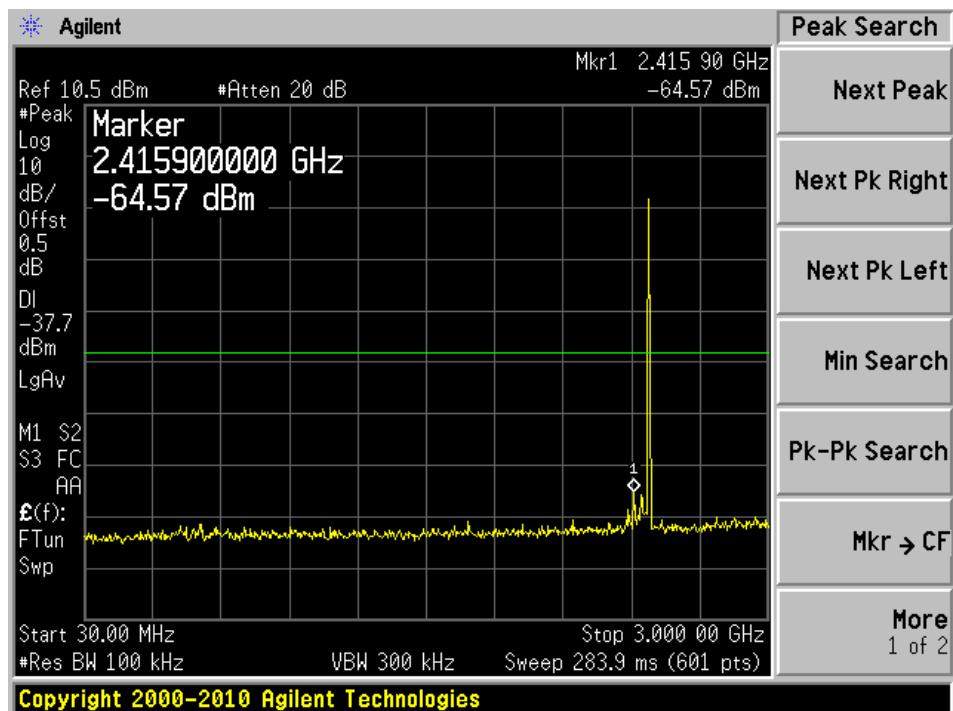
Middle Channel, 30 MHz -3 GHz



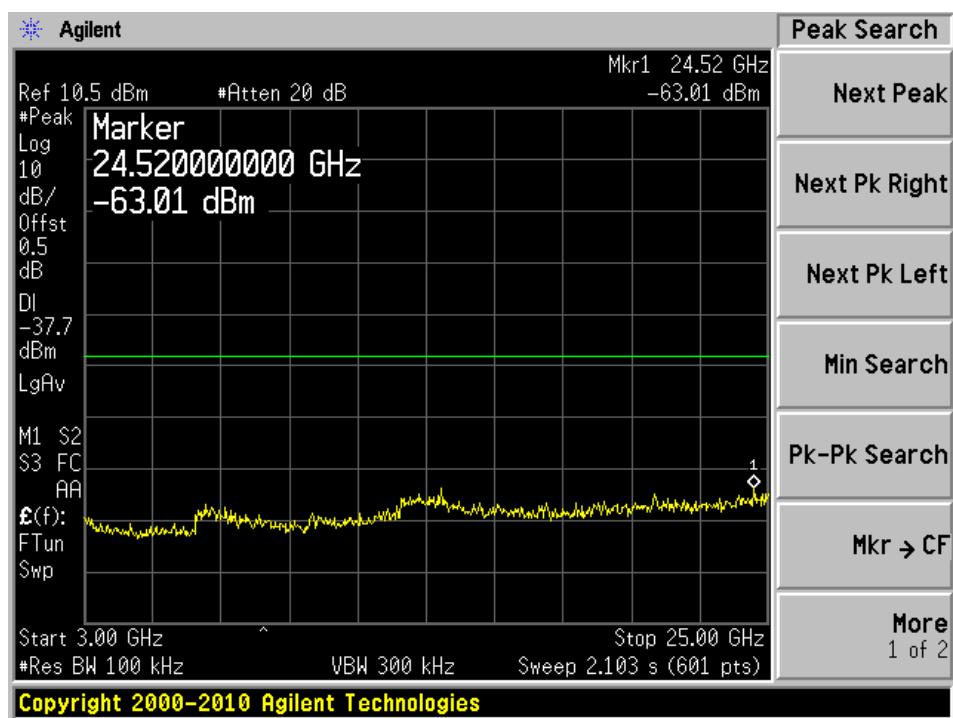
Middle Channel, 3 GHz – 25 GHz



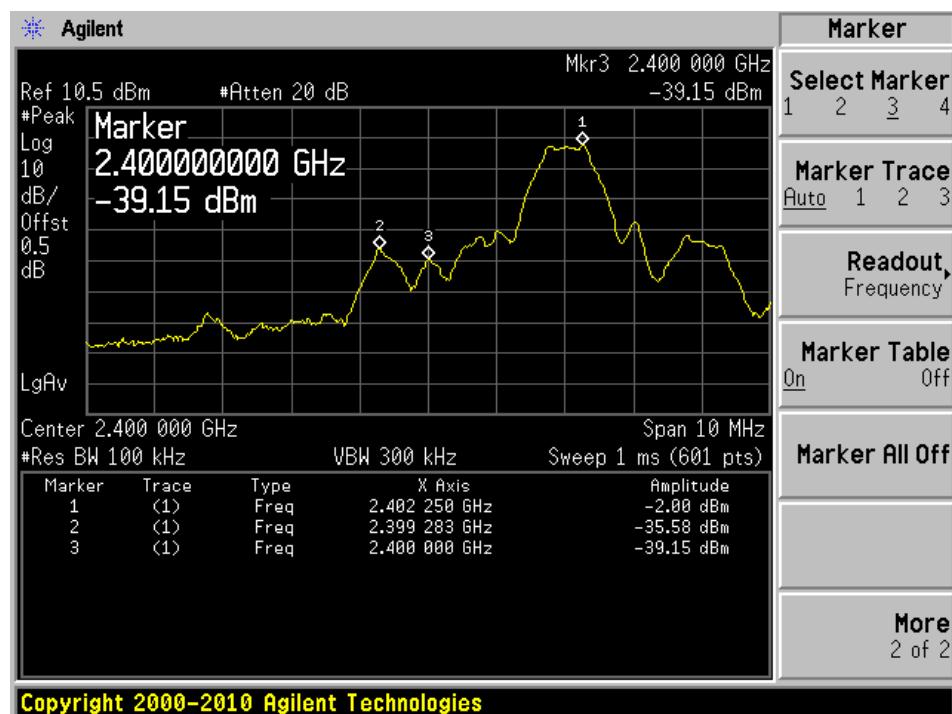
High Channel, 30 MHz -3 GHz



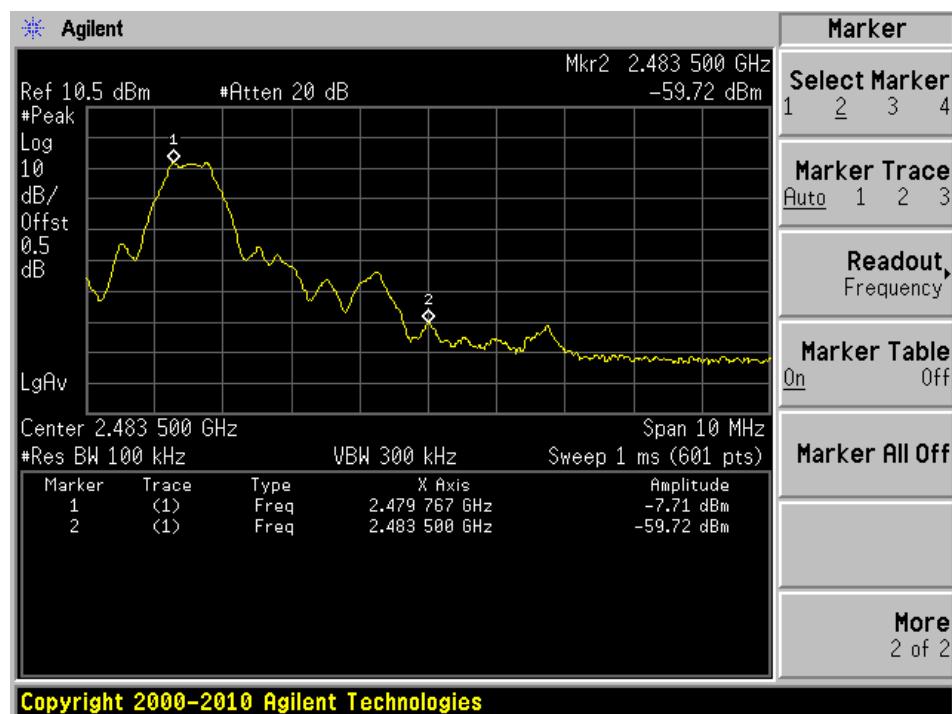
High Channel, 3 GHz – 25 GHz



Low Band Edge



High Band Edge



10 FCC §15.247(e) – Power Spectral Density

10.1 Applicable Standards

According to FCC §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-09-29	1 year

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

10.4 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

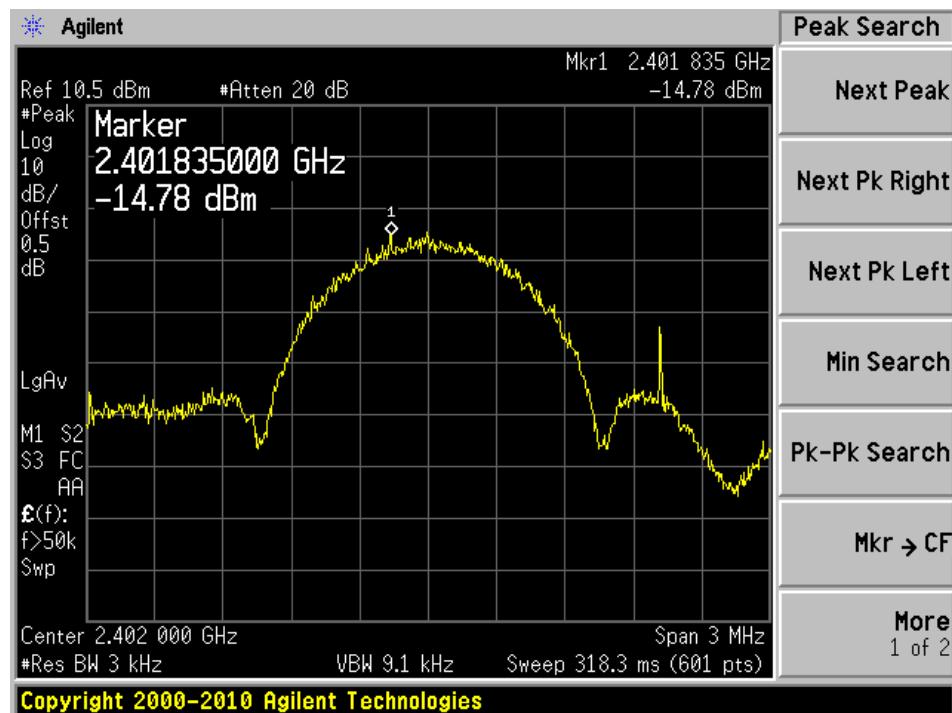
The testing was performed by Bo Li on 2015-04-29 in RF site.

10.5 Test Results

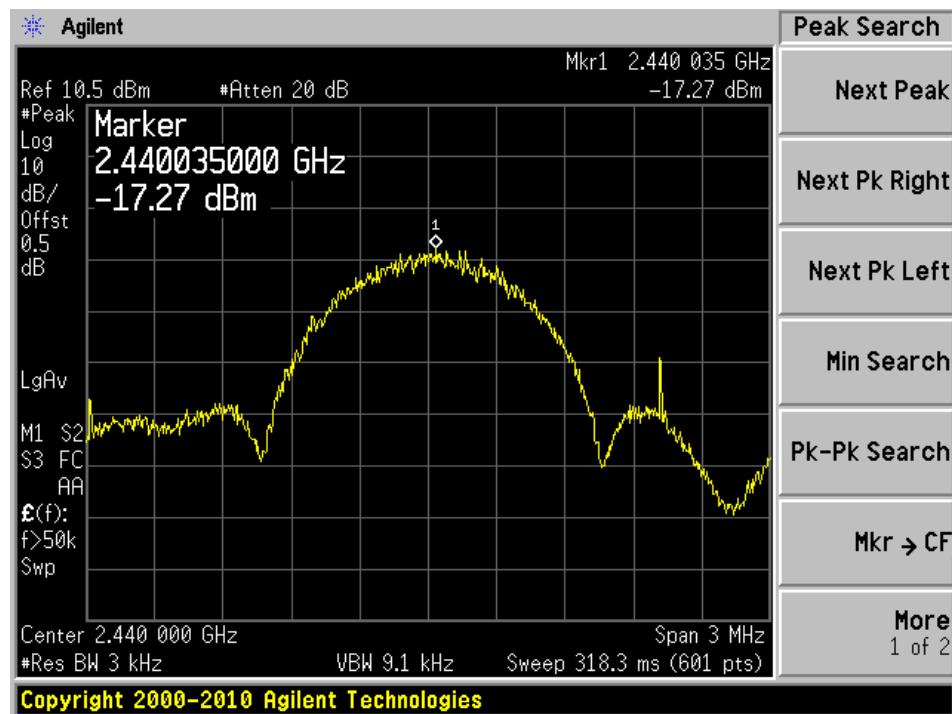
Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-14.78	8
Middle	2440	-17.27	8
High	2480	-19.92	8

Please refer to the following plots for detailed test results:

Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz

