



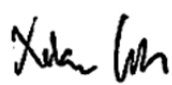
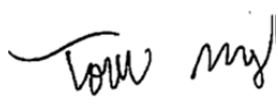
FCC PART 15, SUBPART C TEST AND MEASUREMENT REPORT

For

Perceptimed, Inc.

365 San Antonio Road,
Mountain View, CA 94048, USA

FCC ID: 2AJ8D-HNGBAG-G1

Report Type: Original Report	Product Type: ScripClip Hanging Bag Pharmacy Prescription Tracker
Xiao Lin 	
Prepared By: Test Engineer	
Report Number: R1610134-247	
Report Date: 2016-11-14	
Todd Moy 	
Reviewed By: RF Lead	
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by A2LA*, NIST, or any agency of the Federal Government.

* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" Rev-10

TABLE OF CONTENTS

1 General Description.....	5
1.1 Product Description for Equipment Under Test (EUT)	5
1.2 Mechanical Description of EUT	5
1.3 Objective.....	5
1.4 Related Submittal(s)/Grant(s)	5
1.5 Test Methodology	5
1.6 Measurement Uncertainty	6
1.7 Test Facility Registrations	6
1.8 Test Facility Accreditations	7
2 System Test Configuration.....	9
2.1 Justification.....	9
2.2 EUT Exercise Software.....	9
2.3 Duty Cycle Correction Factor	9
2.4 Local Support Equipment	10
2.5 EUT Internal Configuration Details.....	10
2.6 Support Equipment	10
2.7 Interface Ports and Cabling.....	10
3 Summary of Test Results	11
4 FCC §15.203 - Antenna Requirements	12
4.1 Applicable Standards	12
4.2 Antenna Description	12
5 FCC §15.247(i) - RF Exposure	13
5.1 Applicable Standards	13
5.2 MPE Prediction.....	13
5.3 MPE Results	13
6 FCC §15.247(d) - Spurious Radiated Emissions	14
6.1 Applicable Standards	14
6.2 Test Setup	15
6.3 Test Procedure	15
6.4 Corrected Amplitude & Margin Calculation.....	16
6.5 Test Equipment List and Details.....	16
6.6 Test Environmental Conditions	17
6.7 Summary of Test Results	17
6.8 Radiated Emissions Test Results	18
7 FCC §15.247(a) (2) -Emission Bandwidth	20
7.1 Applicable Standards	20
7.2 Measurement Procedure.....	20
7.3 Test Equipment List and Details.....	20
7.4 Test Environmental Conditions	20
7.5 Test Results.....	21
8 FCC §15.247(b) (3) - Output Power Measurement.....	22
8.1 Applicable Standards	22
8.2 Measurement Procedure.....	22
8.3 Test Equipment List and Details.....	22
8.4 Test Environmental Conditions	22
8.5 Test Results.....	23
9 FCC §15.247(d) - 100 kHz Bandwidth of Band Edges.....	24
9.1 Applicable Standards	24
9.2 Measurement Procedure.....	24

9.3	Test Equipment List and Details	24
9.4	Test Environmental Conditions	24
9.5	Test Results	25
10	FCC §15.247(e) - Power Spectral Density	26
10.1	Applicable Standards	26
10.2	Measurement Procedure	26
10.3	Test Equipment List and Details	26
10.4	Test Environmental Conditions	26
10.5	Test Results	26
11	FCC §15.247(d) - Spurious Emissions at Antenna Terminals	28
11.1	Applicable Standards	28
11.2	Test Procedure	28
11.3	Test Equipment List and Details	28
11.4	Test Environmental Conditions	28
11.5	Test Results	28
12	Annex A (Normative) - FCC Equipment Labeling Requirements	32
12.1	FCC ID Label Requirements	32
12.2	FCC ID Label Contents and Location	33
13	Annex B (Normative) - Test Setup Photographs	34
13.1	Radiated Emission below 1 GHz Front View	34
13.2	Radiated Emission below 1 GHz Rear View	34
13.3	Radiated Emission above 1 GHz Front View	35
13.4	Radiated Emission above 1 GHz Rear View	35
14	Annex C (Normative) - EUT Photographs	36
14.1	EUT – Top View	36
14.2	EUT – Bottom View	36
14.3	EUT – Left View	37
14.4	EUT – Right View	37
14.5	EUT – Open Case View	38
14.6	EUT – Main Board Top View	38
14.7	EUT – Main Board Bottom View	39
15	Annex D (Informative) - Declaration of Similarity	40

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1610134-247	Original Report	2016-11-14

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Perceptimed Inc.*, and their product model: *SCLP-HNGBAG-G1V1* & *SCLP-HNGBAG-G1V2*, FCC ID: 2AJ8D-HNGBAG-G1 or the “EUT” as referred to in this report. It is a scripClip Hanging Bag pharmacy prescription tracker for pharmacy prescription tracking.

1.2 Mechanical Description of EUT

The EUT measures approximately 205 mm (L) x 100 mm (W) x 15 mm (H) and weight 0.1 kg.

The test data gathered are from typical production sample, serial number: 1H7CQ2H and 1H7CQ2K assigned by Perceptimed Inc

1.3 Objective

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

The objective was to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, 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 C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v03r05: 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.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 0.57 \text{ dB}$
Power Spectral Density, conducted	$\pm 1.48 \text{ dB}$
Unwanted Emissions, conducted	$\pm 1.57 \text{ dB}$
All emissions, radiated	$\pm 4.0 \text{ dB}$
AC power line Conducted Emission	$\pm 2.0 \text{ dB}$
Temperature	$\pm 2 \text{ }^{\circ} \text{C}$
Humidity	$\pm 5 \%$
DC and low frequency voltages	$\pm 1.0 \%$
Time	$\pm 2 \%$
Duty Cycle	$\pm 3 \%$

1.7 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02), in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.03) to certify

- For the USA (Federal Communications Commission):

- 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
- 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
- 3- All Telephone Terminal Equipment within FCC Scope C.

- For the Canada (Industry Canada):

- 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
- 2 All Scope 2-Licensed Personal Mobile Radio Services;
- 3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
- 4 All Scope 4-Licensed Maritime & Aviation Radio Services;
- 5 All Scope 5-Licensed Fixed Microwave Radio Services
- 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.

- For Singapore (Info-Communications Development Authority (IDA)):

- 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2

- For the Hong Kong Special Administrative Region:

- 1 All Radio Equipment, per KHCA 10XX-series Specifications;
- 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
- 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.

- For Japan:

- 1 MIC Telecommunication Business Law (Terminal Equipment):
 - All Scope A1 - Terminal Equipment for the Purpose of Calls;
 - All Scope A2 - Other Terminal Equipment
- 2 Radio Law (Radio Equipment):
 - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
 - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
 - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.01) to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

- 1 Electronics and Office Equipment:
 - for Telephony (ver. 3.0)
 - for Audio/Video (ver. 3.0)
 - for Battery Charging Systems (ver. 1.1)
 - for Set-top Boxes & Cable Boxes (ver. 4.1)
 - for Televisions (ver. 6.1)
 - for Computers (ver. 6.0)
 - for Displays (ver. 6.0)
 - for Imaging Equipment (ver. 2.0)
 - for Computer Servers (ver. 2.0)
- 2 Commercial Food Service Equipment
 - for Commercial Dishwashers (ver. 2.0)
 - for Commercial Ice Machines (ver. 2.0)
 - for Commercial Ovens (ver. 2.1)
 - for Commercial Refrigerators and Freezers
- 3 Lighting Products
 - For Decorative Light Strings (ver. 1.5)
 - For Luminaires (including sub-components) and Lamps (ver. 1.2)
 - For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
 - For Integral LED Lamps (ver. 1.4)
- 4 Heating, Ventilation, and AC Products
 - for Residential Ceiling Fans (ver. 3.0)
 - for Residential Ventilating Fans (ver. 3.2)
- 5 Other
 - For Water Coolers (ver. 3.0)

D. A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Industry Canada - IC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
 - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
 - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
 - o EMC Directive 2014/30/EC US-EU EMC & Telecom MRA CAB
 - o Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC
US -EU EMC & Telecom MRA CAB
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA)
APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
 - o ENERGY STAR Recognized Test Laboratory – US EPA
 - o Telecommunications Certification Body (TCB) – US FCC;
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

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

The worst-case data rates was determined 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 software used was V316ScripClip provided by *Perceptimed Inc* the software complied with the standard requirements being tested against.

2.3 Duty Cycle Correction Factor

According to KDB 558074 D01 DTS Meas Guidance v03r05 section 6.0:

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data is being acquired (i.e., no transmitter off-time is to be considered).

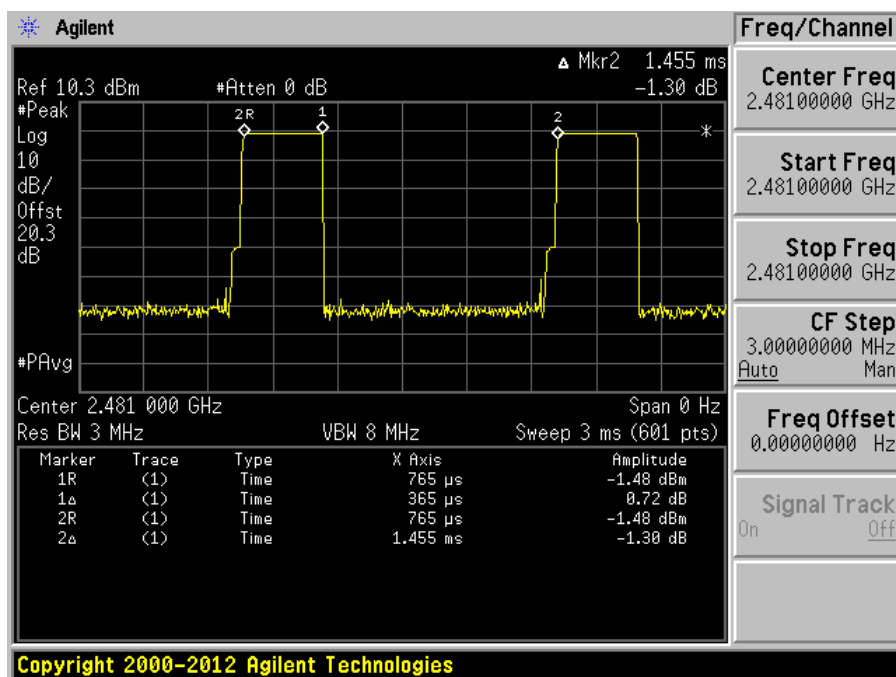
On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
0.365	1.455	25.09	6.005

Duty Cycle = On Time (ms)/ Period (ms)

Duty Cycle Correction Factor (dB) = $10 \cdot \log(1/\text{Duty Cycle})$

Please refer to the following plots.

Duty Cycle



2.4 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude D630

2.5 EUT Internal Configuration Details

Manufacturer	Model	Serial Number
Nordic Semiconductor	nRF51822	-

2.6 Support Equipment

There was no support equipment included, or intended for use with EUT during these tests.

2.7 Interface Ports and Cabling

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

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliant
§2.1091, §15.247(i)	RF Exposure	Compliant
§15.247 (d)	Spurious Emissions at Antenna Port	Compliant
§15.205, §15.209, §15.247(d)	Radiated Spurious Emissions	Compliant
§15.247(a)(2)	6 dB & 99% 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

Note: EUT is battery operating, AC Line Conducted Emissions not required.

4 FCC §15.203 - Antenna Requirements

4.1 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.

4.2 Antenna Description

The antennas used by the EUT are permanent attached antennas.

Antenna Type	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Omnidirectional	2400-2483.5	3.6

5 FCC §15.247(i) - RF Exposure

5.1 Applicable Standards

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

5.2 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

5.3 MPE Results

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>1.84</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>1.528</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>3.6</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>2.291</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.000696</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 0.000696 mW/cm². Limit is 1.0 mW/cm².

6 FCC §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 §15.205(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 §15.209(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 §15.247 (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 C63.10-2013. 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 were 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 was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was 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:

$$CA = A_i + AF + CL + \text{Atten} - G_a$$

For example, a corrected amplitude of 40.3 dB μ V/m = Indicated Reading (32.5 dB μ V) + 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	Receiver, EMI Test	ESCI 1166.5950K03	100338	2016-02-04	2 year
Agilent	Analyzer, Spectrum	E4440A	US45303156	2016-01-19	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Sciences	Antenna, Biconi-Log	JB3	A020106-2	2015-07-11	2 years
EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	2 years
HP	Amplifier, Pre	8449B	3147A00400	2016-03-30	1 year
IW	Armored High Frequency Cable	DC 1531	KPS-1501A3960KPS	2016-08-05	1 Year
-	SMA cable	-	C0002	Each time ¹	N/A
-	N-Type Cable	-	C00013	2016-04-28	1 year
-	N-Type Cable	-	C00014	2016-05-28	1 year
HP	Pre-Amplifier	8447D	2443A04374	2016-06-28	1year
Wisewave	Antenna, Horn	ARH-4223-02	10555-01	2015-10-22	2 years
Wisewave	Amplifier, Low Noise	ALN-22093530-01	12263-01	2016-05-16	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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

Statement of Traceability: BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) “A2LA Policy on Metrological Traceability”.

6.6 Test Environmental Conditions

Temperature:	20-22° C
Relative Humidity:	42-45 %
ATM Pressure:	102 kPa

The testing was performed by Xiao Lin from 2016-10-25 to 2016-10-28 in 5m chamber 3.

6.7 Summary of Test Results

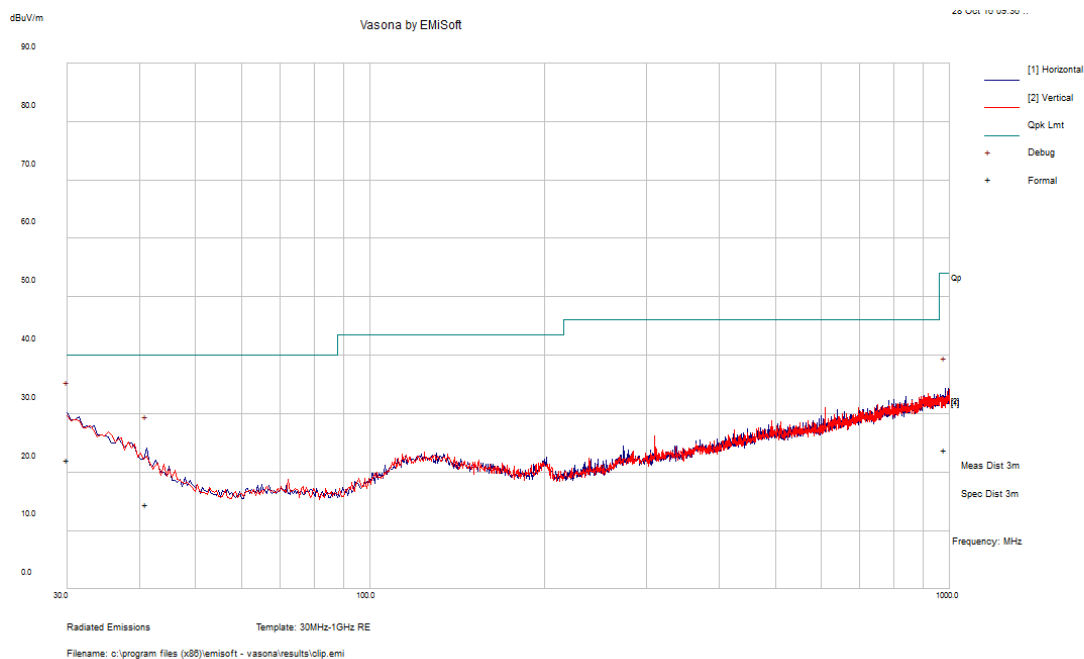
According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C standard's radiated emissions limits, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	channel
-4.11	2483.5	Horizontal	High channel

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

6.8 Radiated Emissions Test Results

1) 30 MHz – 1 GHz Worst Case, Measured at 3 meters



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)	Comment
30.0034	22.06	141	H	273	40	-17.94	QP
41.0145	14.45	100	H	127	40	-25.55	QP
981.4105	23.82	233	H	341	54	-30.18	QP

Note: Only 3 emissions were present because the other emissions were under the noise floor.

2) 1–25 GHz Measured at 3 meters

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
Low Channel 2402 MHz											
2402	52.43	292	198	H	29.04	5.19	0.00	86.66	-	-	PK
2402	40.49	292	198	H	29.04	5.19	0.00	74.72	-	-	AV
2402	49.81	182	220	V	29.04	5.19	0.00	84.04	-	-	PK
2402	37.87	182	220	V	29.04	5.19	0.00	72.10	-	-	AV
2390	27.16	292	198	H	29.04	5.19	0.00	61.39	74.00	-12.61	PK
2390	15.22	292	198	H	29.04	5.19	0.00	49.45	54.00	-4.55	AV
2390	27.28	182	220	V	29.04	5.19	0.00	61.51	74.00	-12.49	PK
2390	15.34	182	220	V	29.04	5.19	0.00	49.57	54.00	-4.43	AV
4804	48.71	326	206	H	32.47	10.51	38.56	53.13	74.00	-20.87	PK
4804	36.77	326	206	H	32.47	10.51	38.56	41.19	54.00	-12.81	AV
7206	46.86	0	100	H	36.69	12.85	37.9	58.50	74.00	-15.51	PK
7206	34.92	0	100	H	36.39	12.85	37.9	46.25	54.00	-7.75	AV
9608	45.14	0	100	H	37.77	15.26	38.29	59.88	74.00	-14.12	PK
9608	33.20	0	100	H	37.77	15.26	38.29	47.93	54.00	-6.07	AV
Middle Channel 2440 MHz											
2440	52.97	304	213	H	29.04	5.19	0.00	87.20	-	-	PK
2440	41.03	304	213	H	29.04	5.19	0.00	75.26	-	-	AV
2440	51.43	263	279	V	29.04	5.19	0.00	85.66	-	-	PK
2440	39.49	263	279	V	29.04	5.19	0.00	73.72	-	-	AV
4880	47.12	0	100	H	32.64	8.83	38.54	50.05	74.00	-23.95	PK
4880	35.18	0	100	H	32.64	8.83	38.54	38.11	54.00	-15.89	AV
7320	46.91	0	100	H	37.15	12.01	37.90	58.17	74.00	-15.83	PK
7320	34.97	0	100	H	37.15	12.01	37.90	46.23	54.00	-7.77	AV
9760	47.49	0	100	H	37.92	13.70	38.29	60.82	74.00	-13.18	PK
9760	35.55	0	100	H	37.92	13.70	38.29	48.88	54.00	-5.12	AV
High Channel 2481 MHz											
2481	51.47	298	180	H	29.41	5.19	0.00	86.07	-	-	PK
2481	39.53	298	180	H	29.41	5.19	0.00	74.13	-	-	AV
2481	48.62	177	269	V	29.41	5.19	0.00	83.22	-	-	PK
2481	36.68	177	269	V	29.41	5.19	0.00	71.28	-	-	AV
2483.5	27.23	298	180	H	29.41	5.19	0.00	61.83	74.00	-12.17	PK
2483.5	15.29	298	180	H	29.41	5.19	0.00	49.89	54.00	-4.11	AV
2483.5	27.11	177	269	V	29.41	5.19	0.00	61.71	74.00	-12.29	PK
2483.5	15.17	177	269	V	29.41	5.19	0.00	49.77	54.00	-4.23	AV
4962	47.57	0	100	H	32.64	10.51	38.54	52.18	74.00	-21.82	PK
4962	35.63	0	100	H	32.64	10.51	38.54	40.24	54.00	-13.76	AV
7443	47.04	0	100	H	37.14	13.36	37.89	59.65	74.00	-14.35	PK
7443	35.10	0	100	H	37.14	13.36	37.89	47.71	54.00	-6.29	AV
9924	46.22	0	100	H	37.99	15.60	38.33	61.48	74.00	-12.53	PK
9924	34.28	0	100	H	37.99	15.60	38.33	49.53	54.00	-4.47	AV

7 FCC §15.247(a) (2) -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 v03r05: 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	Analyzer, Spectrum	E4440A	US45303156	2016-01-19	1 year
-	SMA cable	-	-	Each time ¹	N/A
-	20 dB attenuator	-	-	Each time ¹	N/A

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

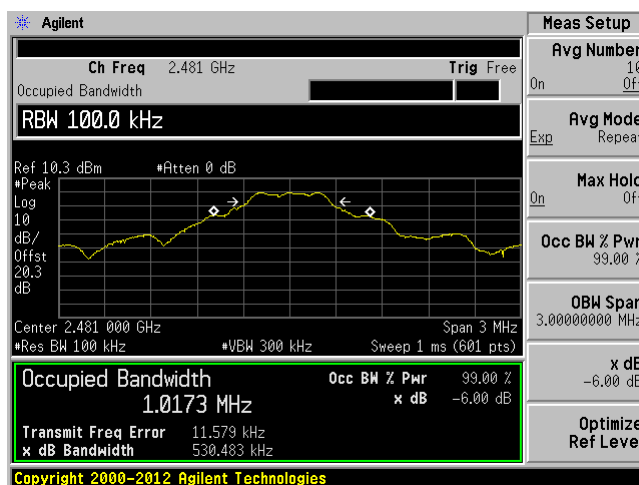
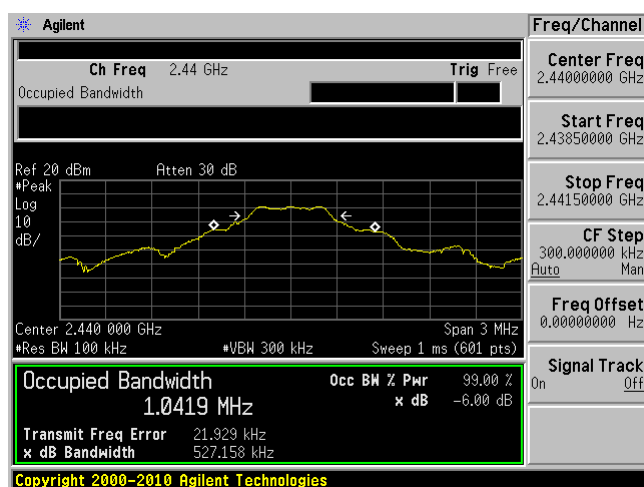
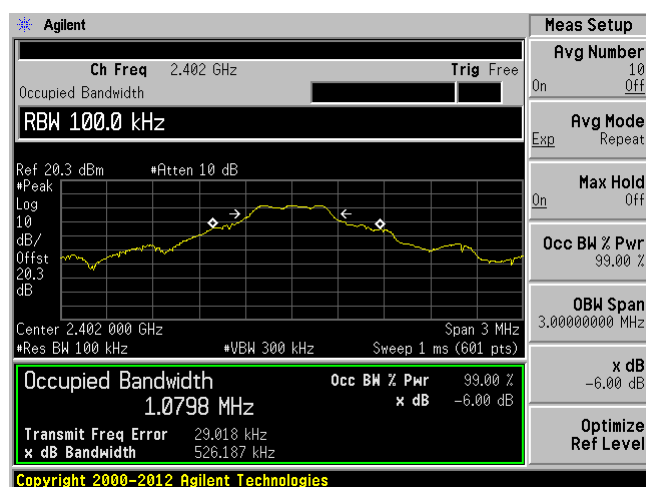
Statement of Traceability: BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) “A2LA Policy on Metrological Traceability”.

7.4 Test Environmental Conditions

Temperature:	20-22° C
Relative Humidity:	42-45 %
ATM Pressure:	102 KPa

The testing was performed by Xiao Lin and Jose Martinez from 2016-10-24 to 2016-10-27 in RF site.

Channel	Frequency (MHz)	99% OBW (kHz)	6 dB OBW (kHz)	6 dB OBW Limit (kHz)
Low	2402	1079.8	526.187	500
Middle	2440	1041.9	527.158	500
High	2481	1017.3	530.483	500



8 FCC §15.247(b) (3) - Output Power Measurement

8.1 Applicable Standards

According to FCC §15.247(b) (3), 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 v03r05: 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	Analyzer, Spectrum	E4440A	US45303156	2016-01-19	1 year
-	RF Cable	-	-	Each time ¹	N/A
-	20 dB attenuator	-	-	Each time ¹	N/A

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

Statement of Traceability: BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

8.4 Test Environmental Conditions

Temperature:	20-22° C
Relative Humidity:	42-45 %
ATM Pressure:	102 KPa

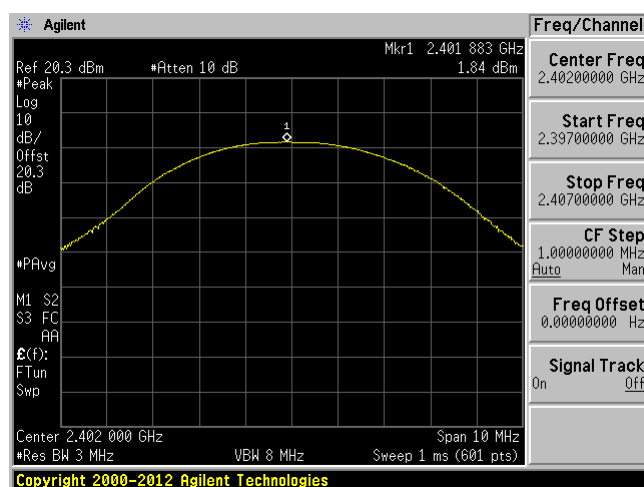
The testing was performed by Xiao Lin and Jose Martinez from 2016-10-24 to 2016-10-27 in RF site.

8.5 Test Results

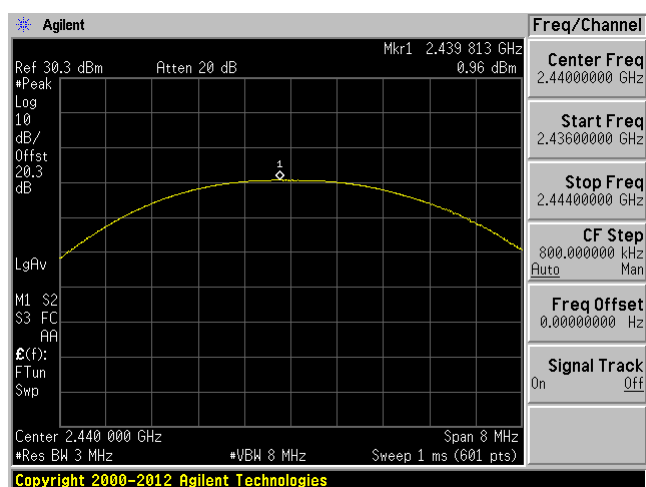
Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Limit (dBm)
Low	2402	1.84	30
Middle	2440	0.96	30
High	2481	-0.59	30

Please refer to the following plots for detailed test results.

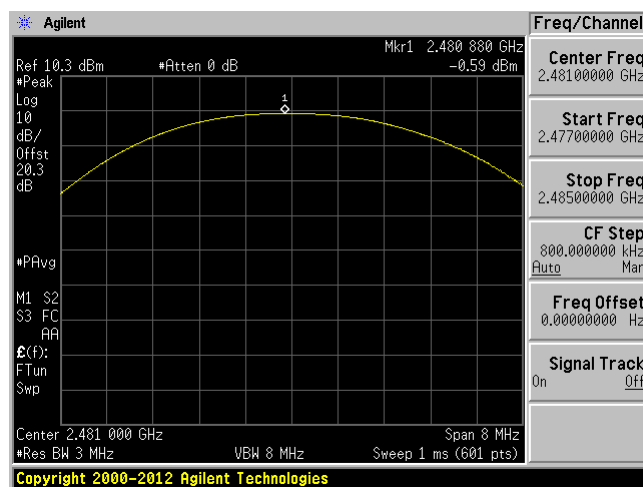
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2481 MHz



9 FCC §15.247(d) - 100 kHz Bandwidth of Band Edges

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 v03r05: 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	Analyzer, Spectrum	E4440A	US45303156	2016-01-19	1 year
-	RF Cable	-	-	Each time ¹	N/A
-	20 dB attenuator	-	-	Each time ¹	N/A

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

Statement of Traceability: BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) “A2LA Policy on Metrological Traceability”.

9.4 Test Environmental Conditions

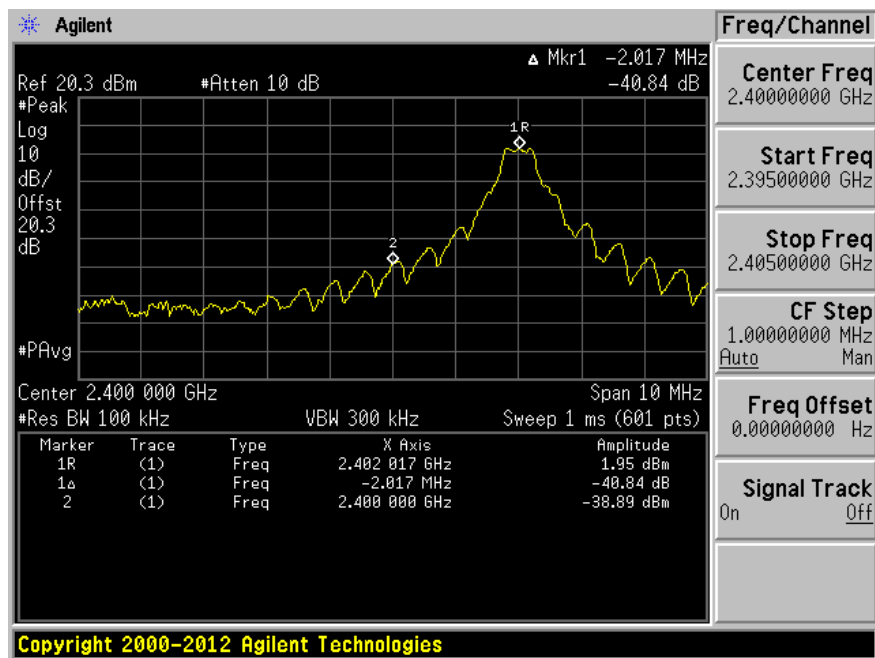
Temperature:	20-22° C
Relative Humidity:	42-45 %
ATM Pressure:	102 KPa

The testing was performed by Xiao Lin from 2016-10-25 to 2016-10-27 in RF site.

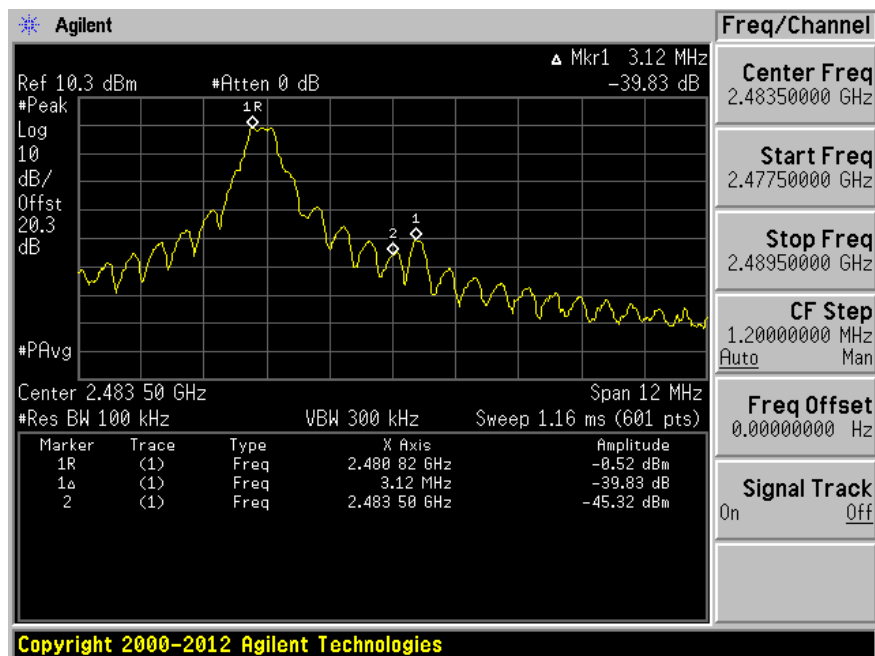
9.5 Test Results

Please refer to the following plots.

Low Channel 2402 MHz



High Channel 2481 MHz



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 v03r05: 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	Analyzer, Spectrum	E4440A	US45303156	2016-01-19	1 year
-	RF Cable	-	-	Each time ¹	N/A
-	20dB attenuator	-	-	Each time ¹	N/A

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

Statement of Traceability: BAEL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

10.4 Test Environmental Conditions

Temperature:	20-22° C
Relative Humidity:	42-45 %
ATM Pressure:	102 kPa

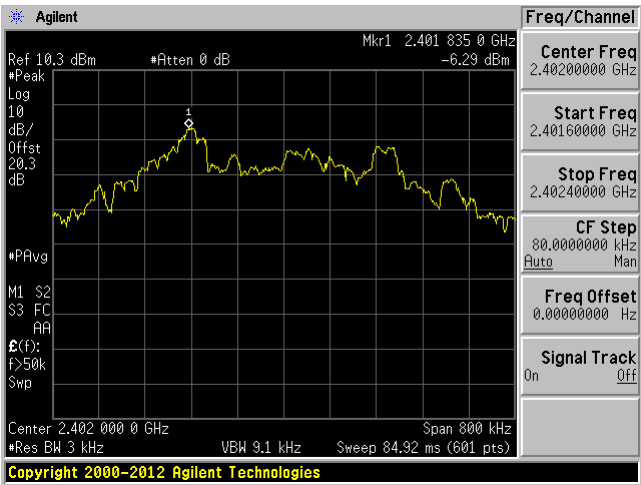
The testing was performed by Xiao Lin and Jose Martinez from 2016-10-24 to 2016-10-27 in RF site.

10.5 Test Results

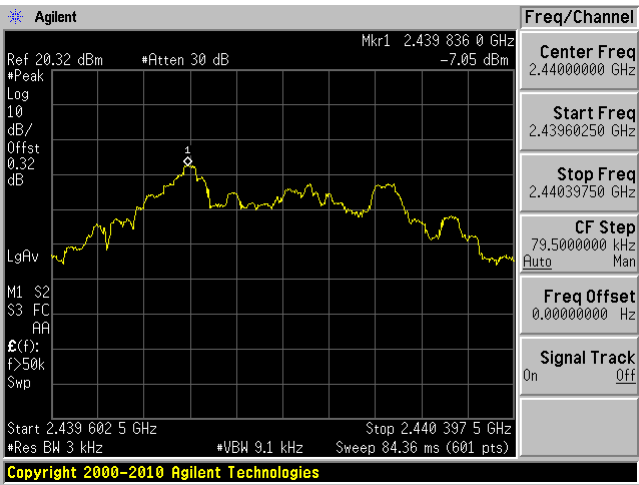
Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)
Low	2402	-6.29	8
Middle	2440	-7.05	8
High	2481	-8.74	8

Please refer to the following plots for detailed test results

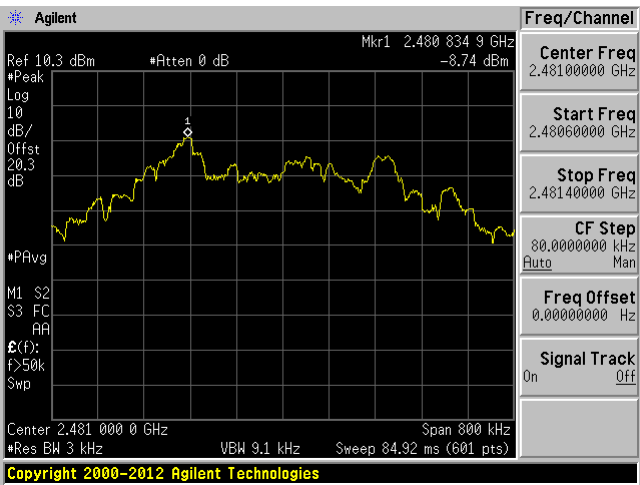
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2481 MHz



11 FCC §15.247(d) - Spurious Emissions at Antenna Terminals

11.1 Applicable Standards

For 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)).

11.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US45303156	2016-01-19	1 year
-	RF Cable	-	-	Each time ¹	N/A
-	20dB attenuator	-	-	Each time ¹	N/A

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

Statement of Traceability: BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

11.4 Test Environmental Conditions

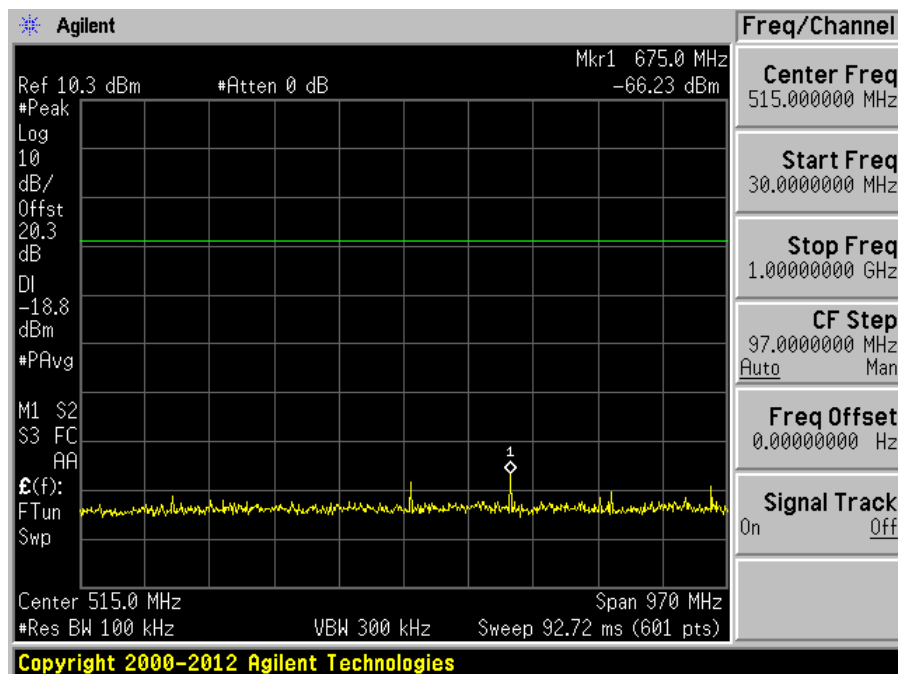
Temperature:	20-22° C
Relative Humidity:	42-45 %
ATM Pressure:	102 KPa

The testing was performed by Xiao Lin and Jose Martinez from 2016-10-24 to 2016-10-27 in RF site.

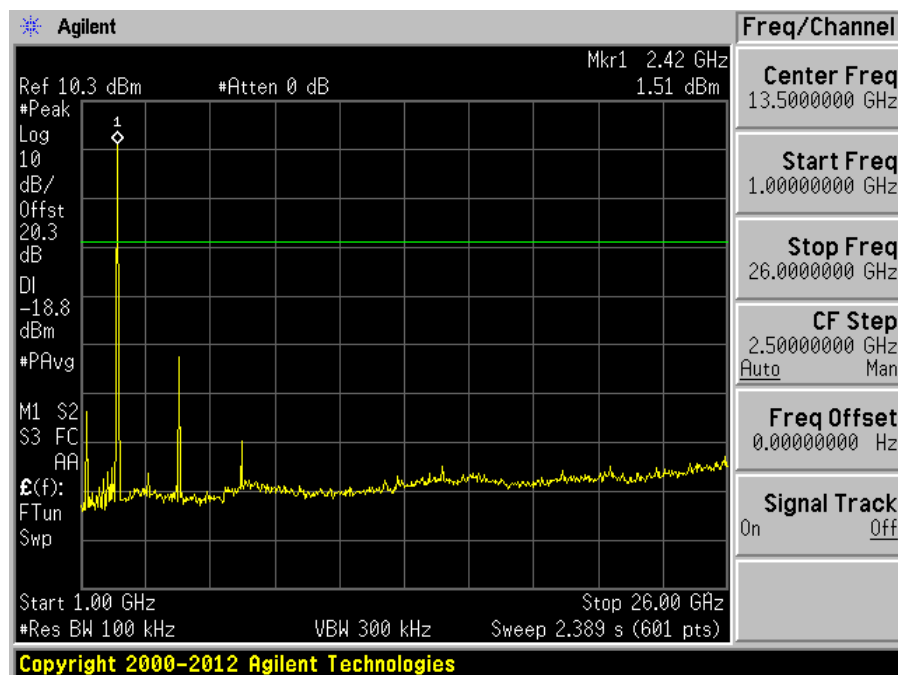
11.5 Test Results

Please refer to following plots.

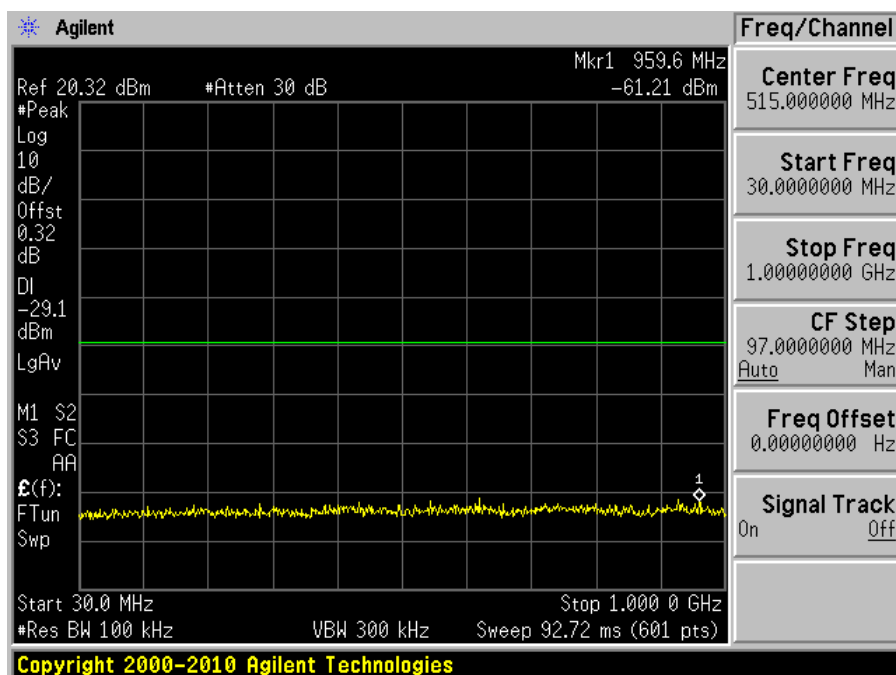
Low Channel 30 MHz – 1 GHz



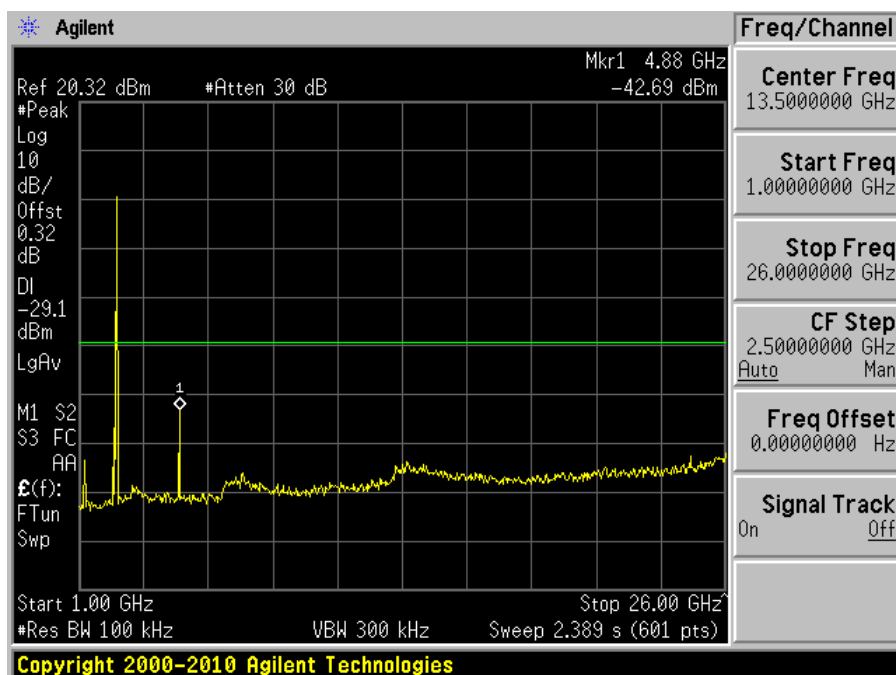
Low Channel 1 GHz – 26 GHz



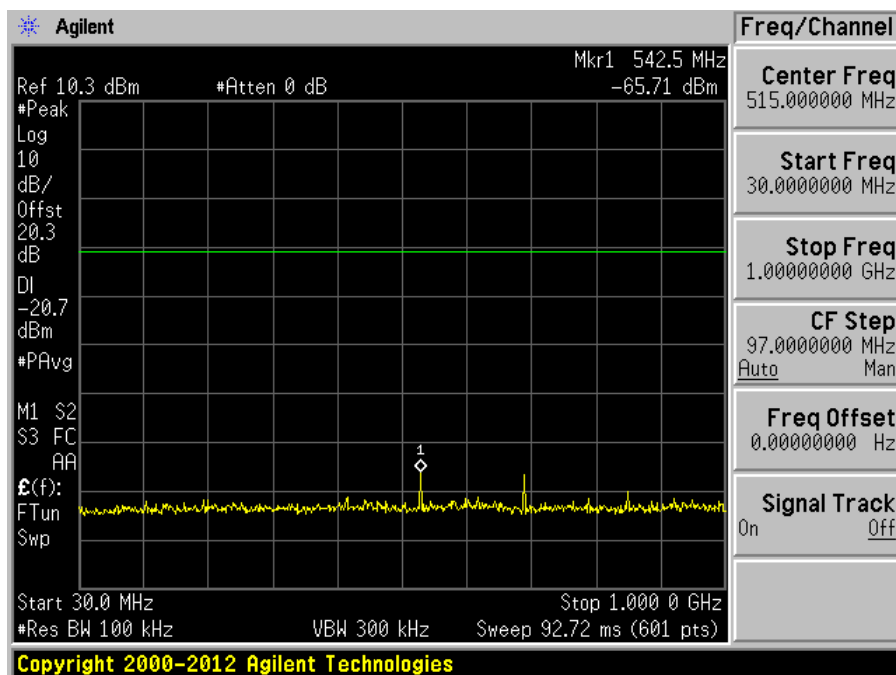
Middle Channel 30 MHz – 1 GHz



Middle Channel 1 GHz – 26 GHz



High Channel 30 MHz – 1 GHz



High Channel 1 GHz – 26 GHz

