

FCC Certification Test Report

NZN Labs, Inc.

LITPro

Model: LP003

FCC ID: 2AEQD-LP003

REPORT# 15WB0304003F Rev 0
May.22, 2015

Prepared for:

NZN Labs, Inc.

43200 Business Park Dr STE 101, Temecula, CA USA 92590

Prepared by:

WASHINGTON TECHNOLOGY INTERNATIONAL LIMITED

This report applies only to the sample evaluated prior to the preparation date stated above.

This report must be copied in its entirety, including all technical documents.

FCC Certification Test Report

**For the
NZN Labs, Inc.
LITPro
Model: LP003**

FCC ID: 2AEQD-LP003

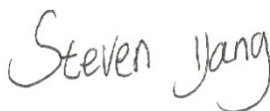
**WLL REPORT# 15WB0304003F Rev 0
May.22, 2015**

Prepared by:



Henry guo

Reviewed by:



Steven yang

Abstract

This report has been prepared on behalf of NZN Labs, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Spread Spectrum Transceiver under Part 15.247 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for NZN Labs, Inc

The above equipment was tested by A Test Lab Techno Corp. Taiwan Accreditation Foundation accreditation number: 1330

And the tested by Shenzhen Academy of Metrology and Quality Inspection. The FCC Registration Number is 806614

The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2009 and KDB 558074, and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247 .The test results of this report relate only to the tested sample identified in this report.

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LITPro is a Bluetooth V4.0 compliant device and complies with the limits for a Direct Sequence Spread Spectrum Transmitter device under Part 15.247 of the FCC Rules and Regulations.

Revision History	Reason	Date
Rev 0	Initial Release	June 11, 2015

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1 Introduction

1.1 Compliance Statement

After the modifications listed in Section 2.7 were installed:

NZN Labs, Inc. LITPro complies with the limits for a Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

1.2 Test Scope Summary

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 2009 version of ANSI C63.10

Test Specification	Specific Description	Result	Modifications (Y/N)	Test Location
CFR47 Part 15.207	Conducted Emissions – AC Power Ports	Complied	No	Shenzhen Academy of Metrology and Quality Inspection
CFR47 Part 15.209	Radiated Emissions	Complied	No	Shenzhen Academy of Metrology and Quality Inspection
CFR47 Part 15.247	RF Power Output	Complied	No	A Test Lab Techno Corp.
CFR47 Part 15.247(b)	Spurious Emissions at Antenna Terminals	Complied	No	A Test Lab Techno Corp.
CFR47 Part 15.247(c)	Radiated Spurious Emissions	Complied	No	Shenzhen Academy of Metrology and Quality Inspection
CFR47 Part 15.247	RF Power Spectral Density	Complied	No	A Test Lab Techno Corp.
CFR47 Part 15.247	Occupied Bandwidth	Complied	No	A Test Lab Techno Corp..
CFR47 Part 15.247	Band Edge Measurement (Conducted)	Complied	No	A Test Lab Techno Corp.
CFR47 Part 15.247	Band Edge Measurement (Radiated)	Complied	No	Shenzhen Academy of Metrology and Quality Inspection

NOTE: The EUT is also considered as a kind of other class B digital device it has been verified to comply with the requirements of FCC Part 15B Class B (Verification) the test report has been issued by WTIL.

1.3 Contract Information

Customer: NZN Labs, Inc
43200 Business Park Dr STE 101, Temecula,
CA USA 92590

1.4 Test and Support Personnel

Murphy Wang A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade City,
Taoyuan County 334, Taiwan R.O.C.

Peter Lin Shenzhen Academy of Metrology and Quality Inspection
No.4 TongFa Road, Xili Town Nanshan
District, Shenzhen, China

1.5 Abbreviations

A	A mpere
ac	a lternating c urrent
AM	A mplitude M odulation
Amps	A mp e res
b/s	b its per second
BW	B and W idth
CE	C onducted E mission
cm	c ent m eter
CW	C ontinuous W ave
dB	d eci B el
dc	d irect c urrent
EMI	E lectro m agnetic I nterference
EUT	E quipment U nder T est
FM	F requency M odulation
G	g iga - prefix for 10^9 multiplier
Hz	H ertz
IF	I ntermediate F requency
k	k ilo - prefix for 10^3 multiplier
LISN	L ine I mpedance S tabilization N etwork
M	M ega - prefix for 10^6 multiplier
m	m eter
μ	m icro - prefix for 10^{-6} multiplier
NB	N arrow b and
QP	Q uasi- P eak
RE	R adiated E missions
RF	R adio F requency
rms	r oot- m ean- s quare
SN	S erial N umber
S/A	S pectrum A nalyzer
V	V olt

2 Equipment Under Test

2.1 EUT Identification

The results obtained relate only to the item(s) tested.

Table 1: Overview of LITPro, Equipment Under Test

ITEM	DESCRIPTION
FCC ID Number	2AEQD-LP003
EUT Name:	LITPro
Test Model:	LP003
FCC Rule Parts:	§15.247
Frequency Range:	2402MHz – 2480MHz
Maximum Output Power:	0.597dBm
Modulation Technology :	GFSK
Necessary Bandwidth:	N/A
Keying:	Automatic
Type of Information:	Bluetooth V4.0: GFSK
Number of Channels:	40
Antenna Type	CHIP ANTENNA MONOPOLE
Antenna Gain	1.7dBi
Frequency Tolerance:	N/A
Emission Type(s):	N/A
Interface Cables:	USB Power cable
Power Source & Voltage:	3 V DC from button battery/5V DC via adapter
Adapter:	M/N:A8+-501000 Input: A C 100V-240V Max:0.2A Output: DC 5V /1000mA

Mark: EUT used two RF chips(U3&U5), the same modulation technology with U3&U5,so we show both U3&U5 test results in this report.

2.2 EUT Description

Product Name: LITPro

Model No. : LP003

EUT Rated Voltage: DC 3V button battery/DC 5V from adapter

Equipment Configuration

The EUT were set up as outlined in Figure 1. The EUT was comprised of the following equipment. (All Modules, PCBs, etc. listed were considered as part of the EUT, as tested.)

2.3 Test Configuration

NZN Labs, Inc. LITPro, Equipment Under Test (EUT), was operated from 5V DC from adapter.

The EUT firmware/software was set up to control power, bit rate, and channel selection.

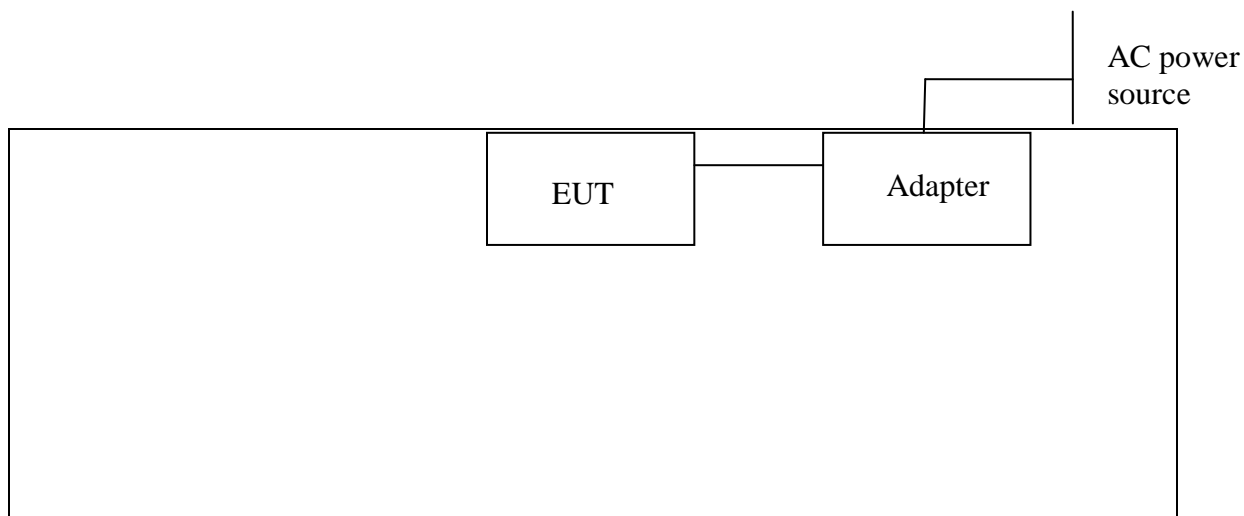


Figure 1: Test Configuration

2.4 Equipment Configuration

The EUT was set up as outlined in Figure 1. The EUT was comprised of the following equipment. (All Modules, PCBs, etc. listed were considered as part of the EUT, as tested.)

Table 2: Equipment Configuration

Name / Description	Model Number	Part Number	Serial Number	Revision
LITPro	LP003	/	/	/

2.5 Interface Cables

Table 3: Interface Cables

Slot #	Port Identification	Connector Type	Cable Length	Shielded (Y/N)	Termination Point
1	USB Cable	Unshielded, Detachable	<1m	N	Dedicated Charging Port

2.6 Support Equipment

The following support equipment was used during testing:

No.	Description	Manufacturer	Model	Serial Number	Approved type
1.	--	--	--	--	<input type="checkbox"/> FCC ID <input type="checkbox"/> BSMI ID

2.7 EUT Modifications

N/A

2.8 Testing Algorithm

LITPro was operated continuously by normal operating conditions. During the testing, the EUT connected with Notebook by a USB-TTL Board and controlled by Notebook software to continuously transmit Bluetooth signal at frequency band 2402MHz, 2440MHz and 2480MHz.

2.9 Test Location

Site 1:

A Test Lab Techno Corp.

No. 140-1, Changan Street, Bade City,

Taoyuan County 334, Taiwan R.O.C.

Tel: +886-3-2710188 / Fax: +886-3-2710190

Taiwan Accreditation Foundation accreditation number: 1330

<http://www.atl-lab.com.tw/e-index.htm>

Site 2:

Shenzhen Academy of Metrology and Quality Inspection

No.4 TongFa Road, Xili Town Nanshan District, Shenzhen, China

2.10 Measurements

2.10.1 Measurement Method

All measurements were performed according to the 2009 version of ANSI C63.10 for testing compliance of a wide variety of unlicensed wireless devices

2.10.2 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm \sqrt{\frac{a^2}{div_a^2} + \frac{b^2}{div_b^2} + \frac{c^2}{div_c^2} + \dots}$$

where u_c = standard uncertainty
 a, b, c, \dots = individual uncertainty elements
 $\text{div}_{a, b, c}$ = the individual uncertainty element
divisor based on the probability
distribution
divisor = 1.732 for rectangular distribution
divisor = 2 for normal distribution
divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = k u_c$$

where U = expanded uncertainty
 k = coverage factor
 $k \leq 2$ for 95% coverage (ANSI/NCSL Z540-2
Annex G)
 u_c = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 4 below.

Table 4: Expanded Uncertainty List

Test Item	Frequency Range		Uncertainty (dB)
Conducted Emission	9kHz ~ 30MHz		± 2.02
Radiated Emission	9kHz ~ 30MHz		± 3.14
	30MHz ~ 1000MHz	Horizontal	± 3.98
		Vertical	± 3.62
	1000MHz ~ 18000MHz	Horizontal	± 3.11
		Vertical	± 3.07
	18000MHz ~ 40000MHz	Horizontal	± 3.66
		Vertical	± 3.54

3 Test Equipment

Table 5 shows a list of the test equipment used for measurements along with the calibration information.

Table 5: Test Equipment List

Conducted Emission

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
SB3319	EMI Test Receiver	Rohde & Schwarz	ESCS30	Jan.20,2015	1 Year
SB4357	AMN	Rohde & Schwarz	ENV216	Jan.20,2015	1 Year

Radiated Emission

3 Meter Chamber					
Model No.	Equipment	Manufacturer	Serial Number	Cal. Date	Remark
ESU40	EMI Test Receiver	R&S	SB8501/09	May.16, 2015	1 Year
VULB9163	Bilog Antenna	Schwarzbeck	SB8501/04	Jan.20, 2015	1 Year
HF906	Horn Antenna	R&S	SB3435	Jan.20, 2015	1 Year
--	Amplifier(1-18GHz)	R&S	SB3435/01	Jan.20, 2015	1 Year
--	Amplifier(18-40GHz)	R&S	SB3435/02	May.16, 2015	1 Year
AT4560	Horn Antenna	Amplifier Research	SB5392/02	May.16, 2015	1 Year
9X6X6	3m Semi-anechoic chamber	Albatross Projects	SB3450/01	Oct.12, 2013	2 Years
ESI26	EMI Test Receiver	Rohde & Schwarz	SB3436	Jan.20,2015	1 Year
VULB9163	Broadband antenna	SCHWARZBECK	SB3955	Jan.20,2015	1 Year
HF907	Horn Antenna	R&S	SB8501/01	Aug.15,2014	1 Year

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request

4 Test Results

4.1 RF Power Output:

To measure the output power the unit was set to transmit on a low, high and middle channel. The output from the transmitter was connected to an attenuator and then to the input of a detector diode. The output of the detector diode was displayed on an oscilloscope. The trace deflection was recorded and the transmitter was replaced with a signal generator at the same frequency. The output of the signal generator was increased until the trace deflection was the same as it was with the transmitter. The signal from the generator was then connected to a power meter and the level was taken.

4.1.1 Limit (FCC Part 15.247b(3))

For frequency hopping systems operating in the 2400-2483.5 MHz band, employing at least 75 non-overlapping hopping channels, For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

4.1.2 Test Procedure

Connected the EUT's antenna port to Power Sensor, and use power meter to test peak output power.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

4.1.3 Test Data

The EUT LITPro complied with the FCC Part 15.247 RF Power Output requirements.

Table 6 provides the test results for RF Power Output.

4.1.4 Areas of Concern

None.

Table 6: RF Power Output

EUT: LITPro			
Model: LP003(U3)			
Test date:2015-05-18		Pressure: $101.3 \pm 1.0\text{kpa}$	Humidity: $51.4 \pm 3.0\%$
Tested by: Eric Ou Yang		Test site: RF site	Temperature: $23.1 \pm 0.6^{\circ}\text{C}$
Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	Frequency (MHz)	Peak output Power (dBm)	Limit (dBm)
GFSK	2402	-3.446	30
	2440	-3.640	30
	2480	-5.887	30
Conclusion: PASS			

EUT: LITPro			
Model: LP003(U5)			
Test date: 2015-05-18		Pressure: $101.3 \pm 1.0\text{kpa}$	Humidity: $51.4 \pm 3.0\%$
Tested by: Eric Ou Yang		Test site: RF site	Temperature: $23.1 \pm 0.6^{\circ}\text{C}$
Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	Frequency (MHz)	Peak output Power (dBm)	Limit (dBm)
GFSK	2402	-1.580	30
	2440	-1.516	30
	2480	-3.245	30
Conclusion: PASS			

EUT: LITPro			
Model: LP003(U3 & U5)			
Test date: 2015-05-18		Pressure: 101.3 ± 1.0 kpa	Humidity: $51.4 \pm 3.0\%$
Tested by: Eric Ou Yang		Test site: RF site	Temperature: $23.1 \pm 0.6^{\circ}\text{C}$
Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	Frequency (MHz)	Peak output Power (dBm)	Limit (dBm)
GFSK	2402	0.597	30
	2440	0.561	30
	2480	-1.358	30
Conclusion: PASS			

4.2 RF Power Spectral Density

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

4.2.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

4.2.2 Test Procedure

1. Connected the EUT's antenna port to spectrum analyzer device by 20dB attenuator.
2. Set the test frequency as center frequency, Set RBW=3KHz,VBW=10KHz,Span large enough capture the entire frequency, Read out maximum peak level frequency
3. Set the span to 1.5 times of the DTS Bandwidth Detector= Peak; Sweep time= Auto Couple; Trace Mode= Max hold.
4. Allow trace to fully stabilize use the peak marker function to determine the maximum amplitude level within the RBW.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude.

4.2.3 Test Data

The EUT LITPro complied with the FCC Part 15.247 RF Power Spectral Density requirements.

Table 7, 8 provides the test results for RF Power Spectral Density.

4.2.4 Areas of Concern

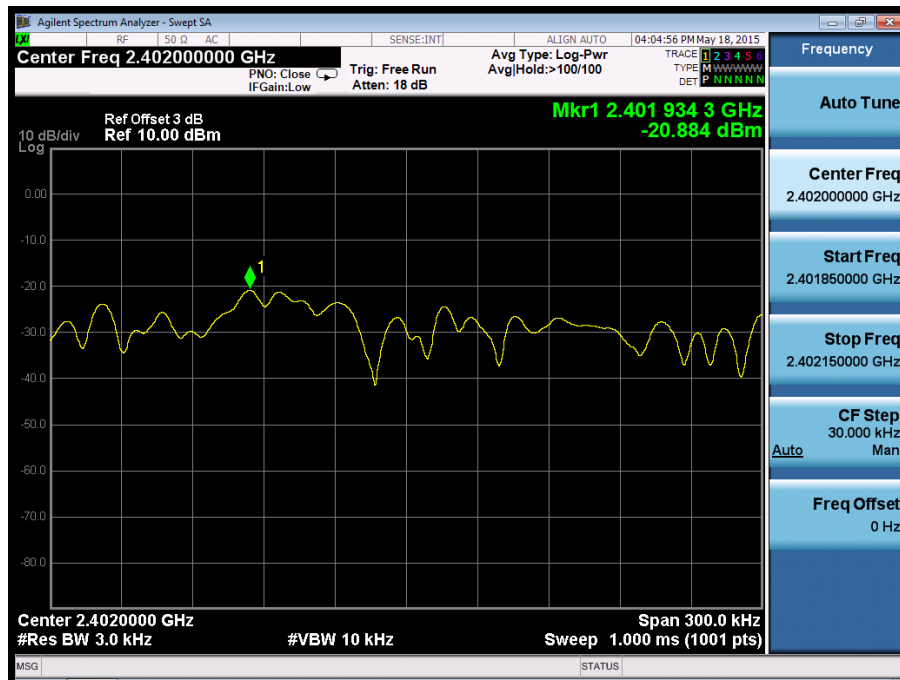
None.

Table 7: RF Power Spectral Density

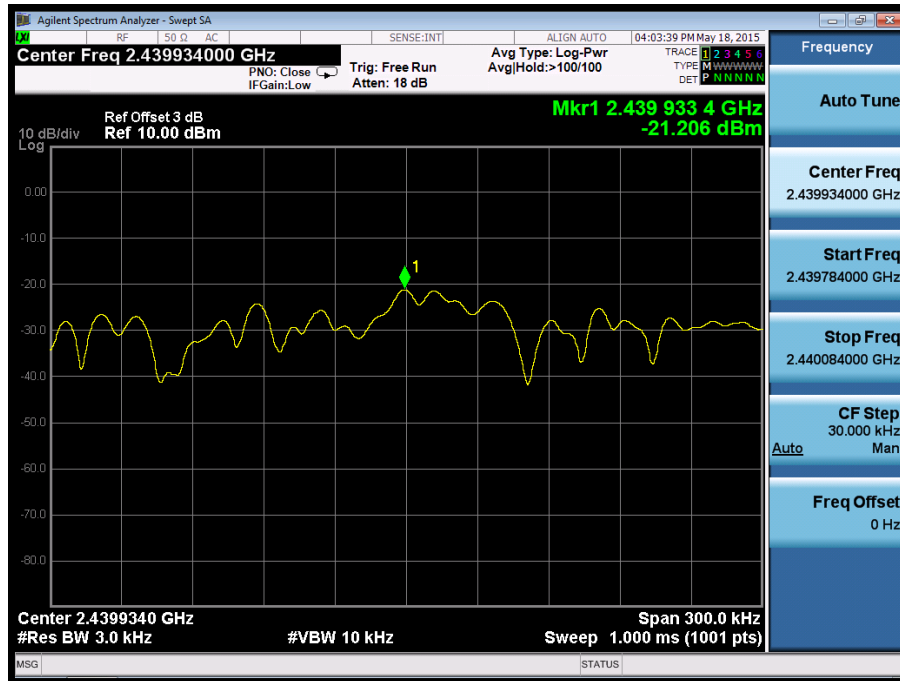
EUT: LITPro			
Model: LP003(U3)			
Test date: 2015-05-19		Pressure: 101.5 ± 1.0 kpa	Humidity: $52.3 \pm 3.0\%$
Tested by: Eric Ou Yang		Test site: RF site	Temperature: $23.1 \pm 0.6^{\circ}\text{C}$

Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	CH (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-20.884	8
	2440	-21.206	8
	2480	-23.098	8
Conclusion: PASS			

Test Mode: CH0: 2402MH



Test Mode: CH19: 2440MHz



Test Mode: CH39: 2480MHz

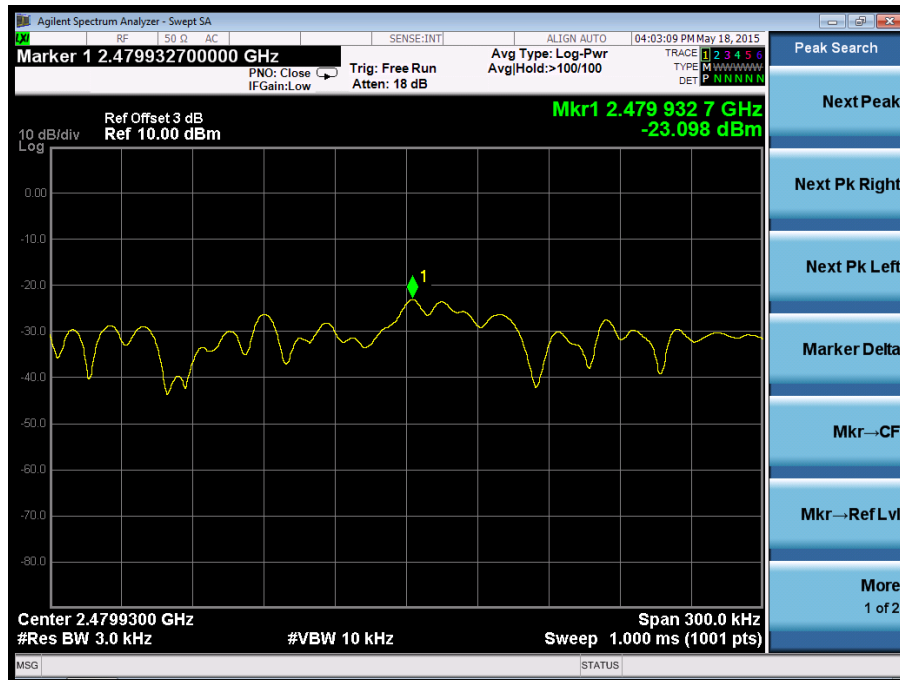
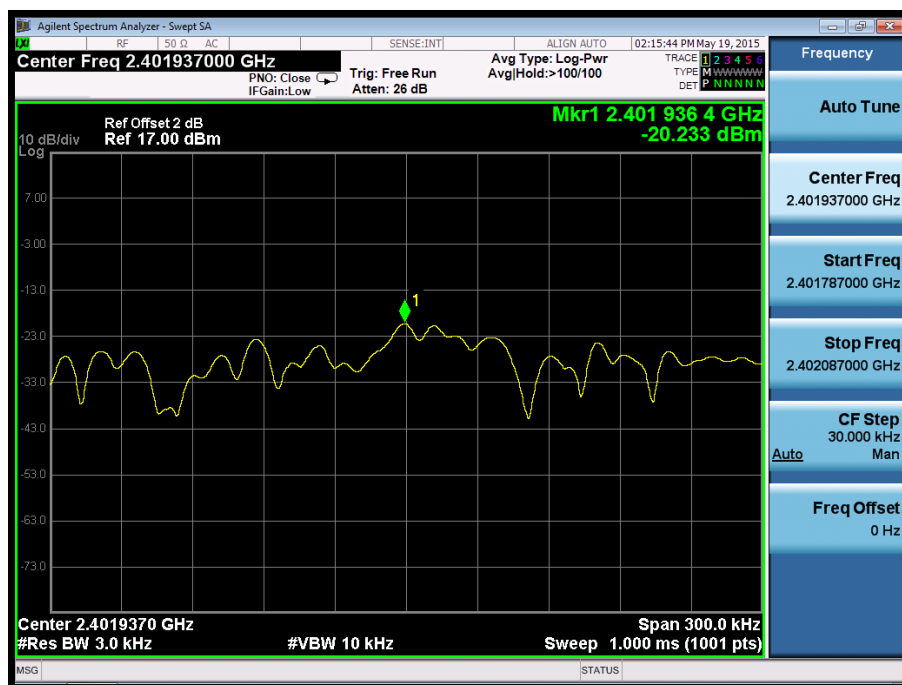


Table 8: RF Power Spectral Density

EUT: LITPro			
Model: LP003(U5)			
Test date: 2015-05-19	Pressure: 101.5 ± 1.0 kpa		Humidity: $52.3 \pm 3.0\%$
Tested by: Eric Ou Yang	Test site: RF site		Temperature: $23.1 \pm 0.6^{\circ}\text{C}$
Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	CH (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-20.233	8
	2440	-21.520	8
	2480	-21.847	8
Conclusion: PASS			

Test Mode: CH0: 2402MH



Test Mode: CH19: 2440MHz



Test Mode: CH39: 2480MHz

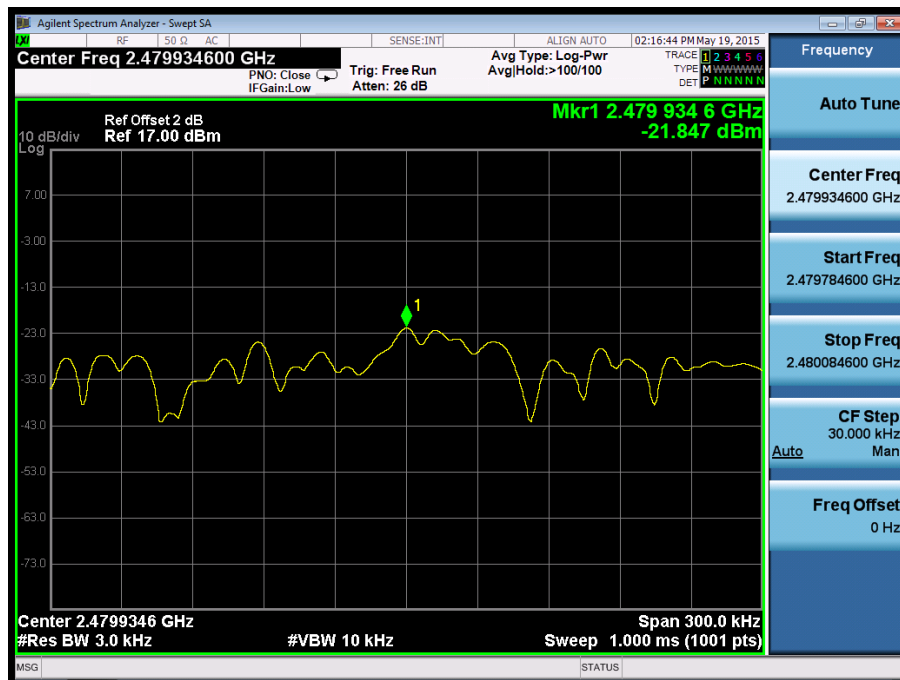


Table 9: RF Power Spectral Density

EUT: LITPro			
Model: LP003(U3&U5)			
Test date: 2015-05-19	Pressure: 101.5 ± 1.0 kpa		Humidity: $52.3 \pm 3.0\%$
Tested by: Eric Ou Yang	Test site: RF site		Temperature: $23.1 \pm 0.6^{\circ}\text{C}$
Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	CH (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-17.536	8
	2440	-18.350	8
	2480	-19.417	8
Conclusion: PASS			

4.3 Occupied Bandwidth

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

4.3.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

4.3.2 Test Procedure

The transmitter output was connected to a spectrum analyzer, The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

4.3.3 Test Data

The EUT LITPro complied with the FCC Part 15.247 Occupied bandwidth requirements.

Table 10 and Table 11 provides the test results for Occupied bandwidth.

4.3.4 Areas of Concern

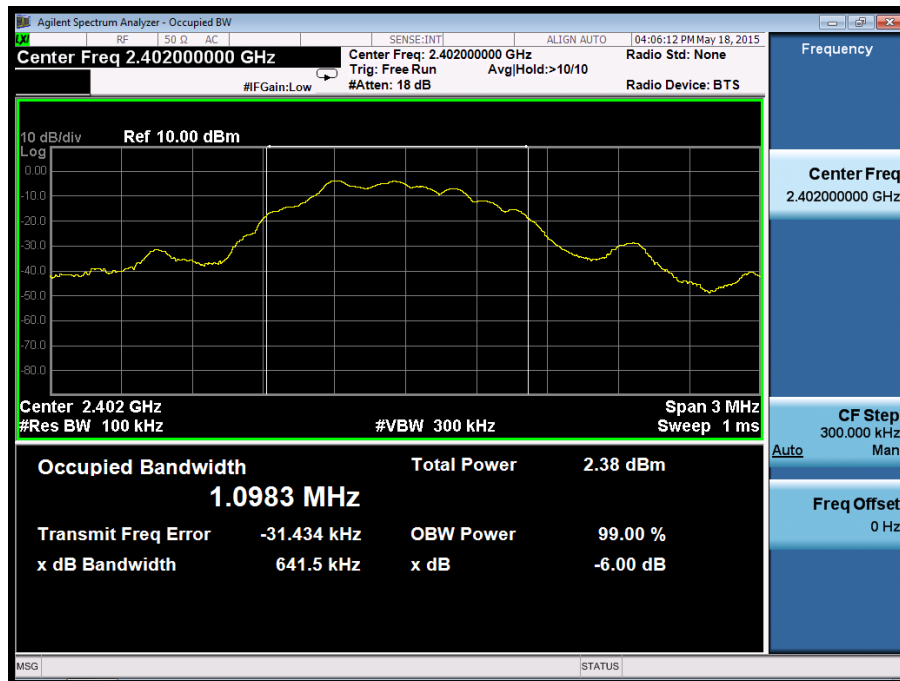
None.

**Table 10: Occupied Bandwidth
Results**

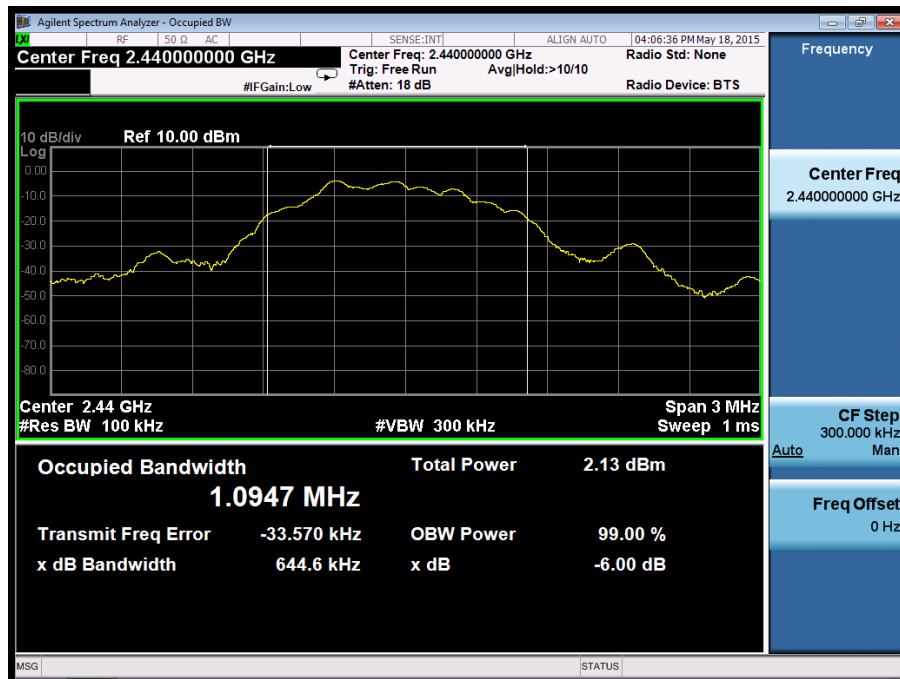
EUT: LITPro		
Model: LP003(U3)		
Test date:2015-05-18	Pressure: $101.5 \pm 1.0\text{kPa}$	Humidity: $52.3 \pm 3.0\%$
Tested by: Eric Ou Yang	Test site: RF site	Temperature: $22.6 \pm 0.6^{\circ}\text{C}$

Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	CH (MHz)	6 dB bandwidth (kHz)	Limit (kHz)
GFSK	2402	641.5	>500
	2440	644.6	>500
	2480	638.8	>500
Conclusion: PASS			

Test Mode: CH0: 2402MHz



Test Mode: CH19: 2440MHz



Test Mode: CH39: 2480MHz

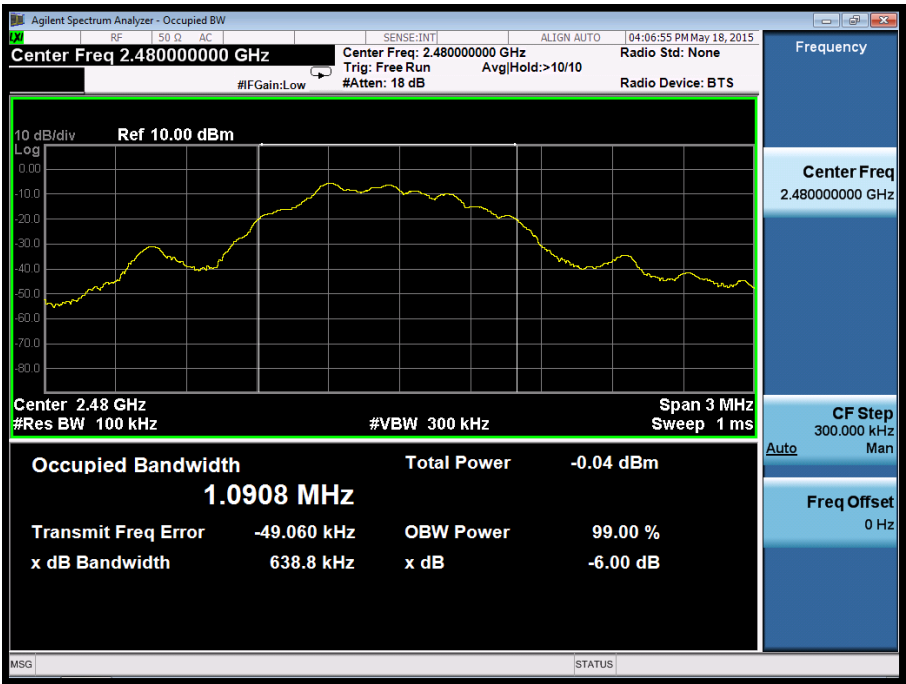
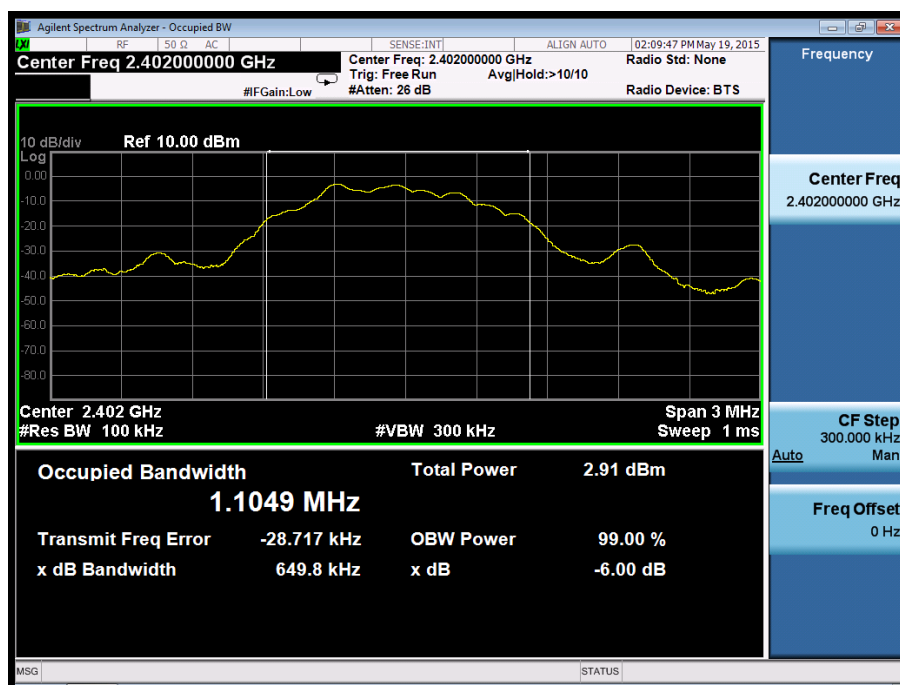


Table 11: Occupied Bandwidth Results

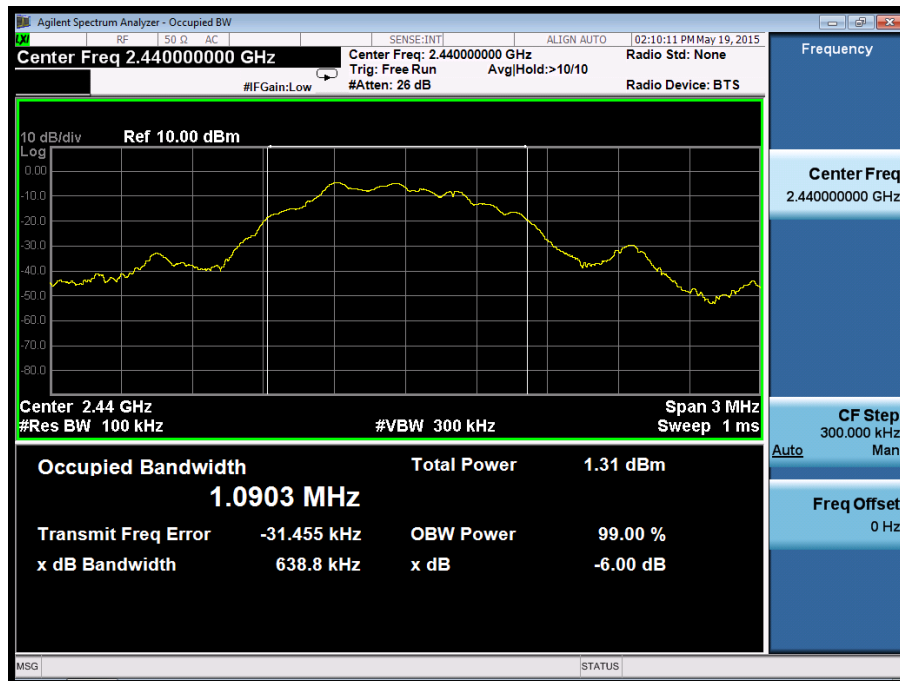
EUT: LITPro		
Model: LP003(U5)		
Test date:2015-05-19	Pressure: 101.5 ± 1.0 kPa	Humidity: 52.3 ± 3.0 %
Tested by: Eric Ou Yang	Test site: RF site	Temperature: 22.6 ± 0.6 °C

Cable loss: 11 dB		Attenuator loss: 20 dB	
Test Mode	CH (MHz)	6 dB bandwidth (kHz)	Limit (kHz)
GFSK	2402	649.8	>500
	2440	638.8	>500
	2480	626.9	>500
Conclusion: PASS			

Test Mode: CH0: 2402MHz



Test Mode: CH19: 2440MHz



Test Mode: CH39: 2480MHz



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

4.4.1 Limit

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

4.4.2 Test Procedure

The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions detected.

4.4.3 Test Data

The EUT LITPro complied with the FCC Part 15.247 Spurious Emissions at Antenna Terminals requirements.

Table 12 provides the test results for Spurious Emissions at Antenna Terminals.

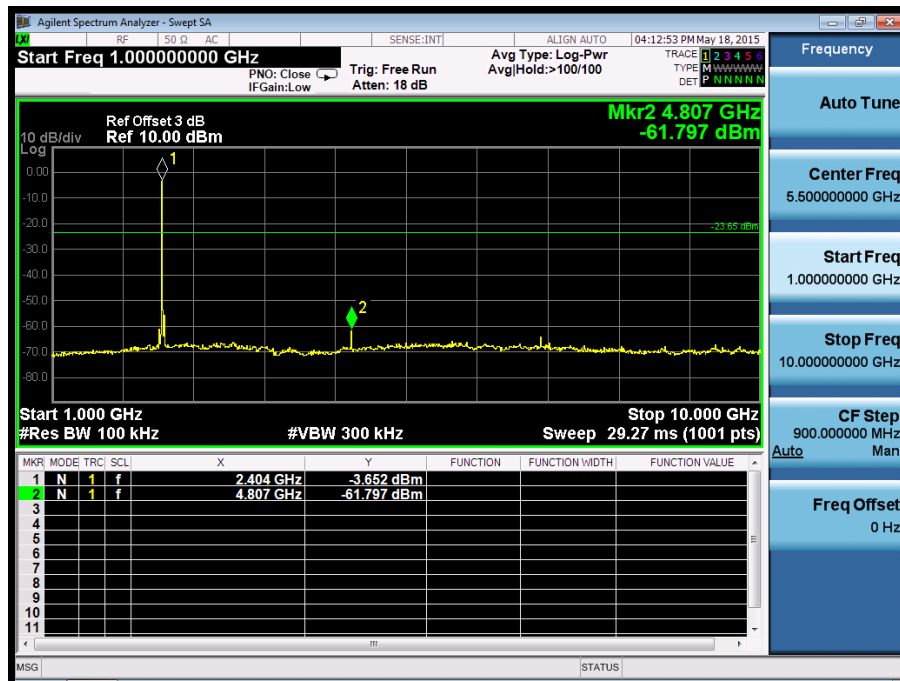
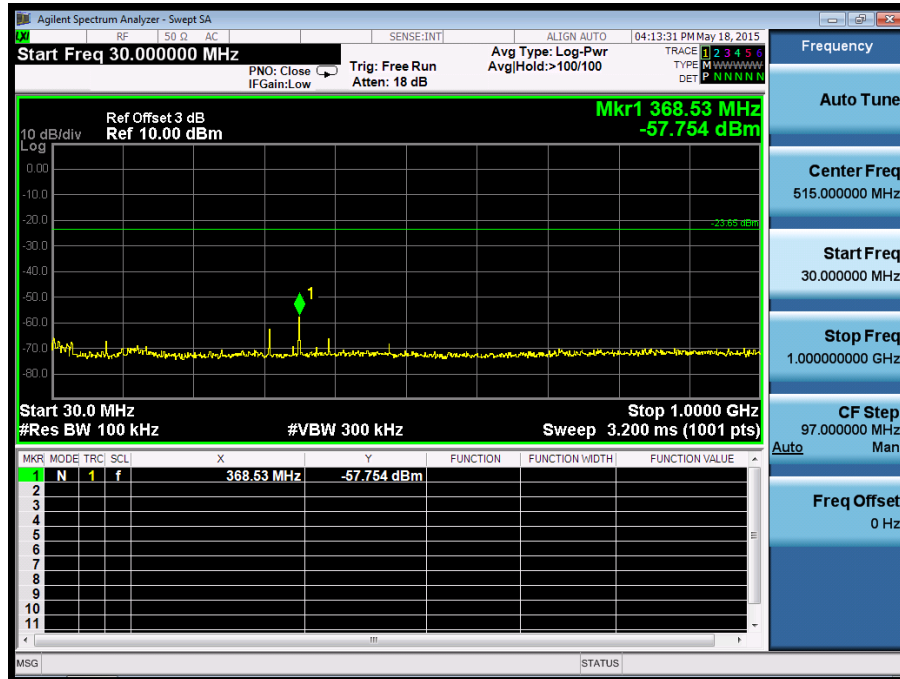
4.4.4 Areas of Concern

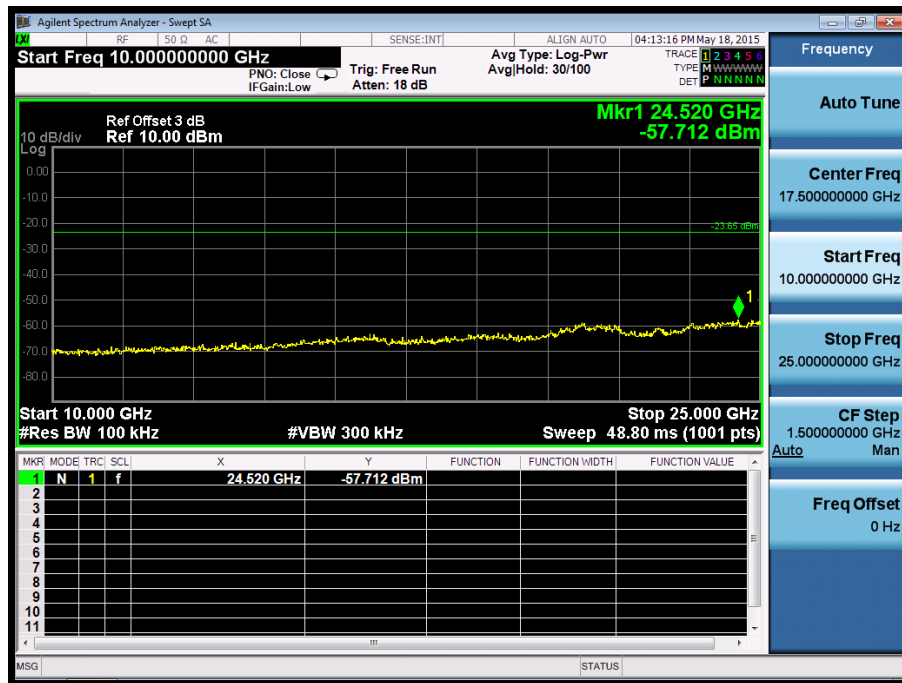
None.

Table 12: Spurious Emissions at Antenna Terminals Results

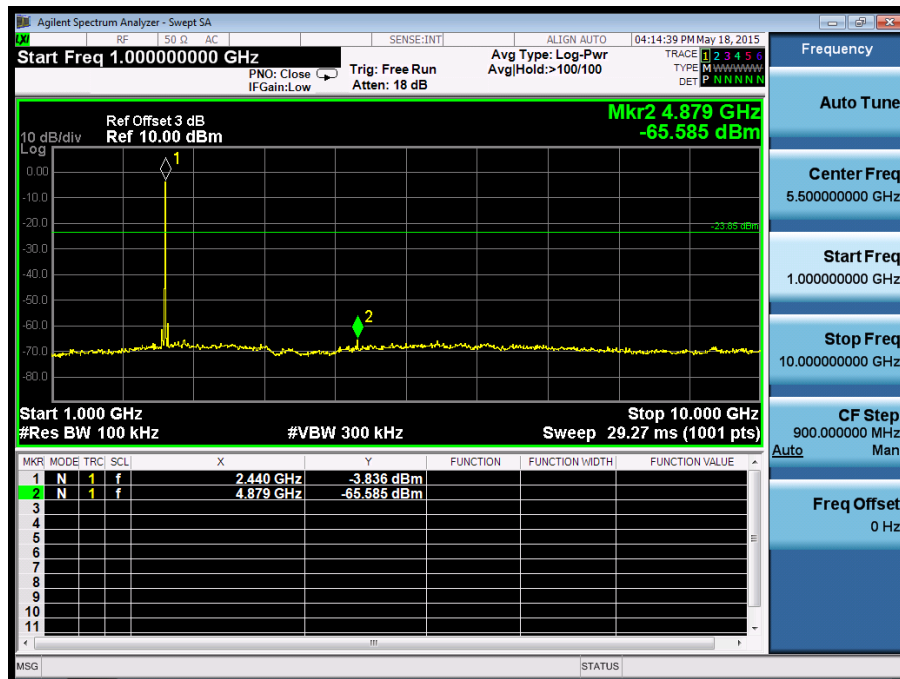
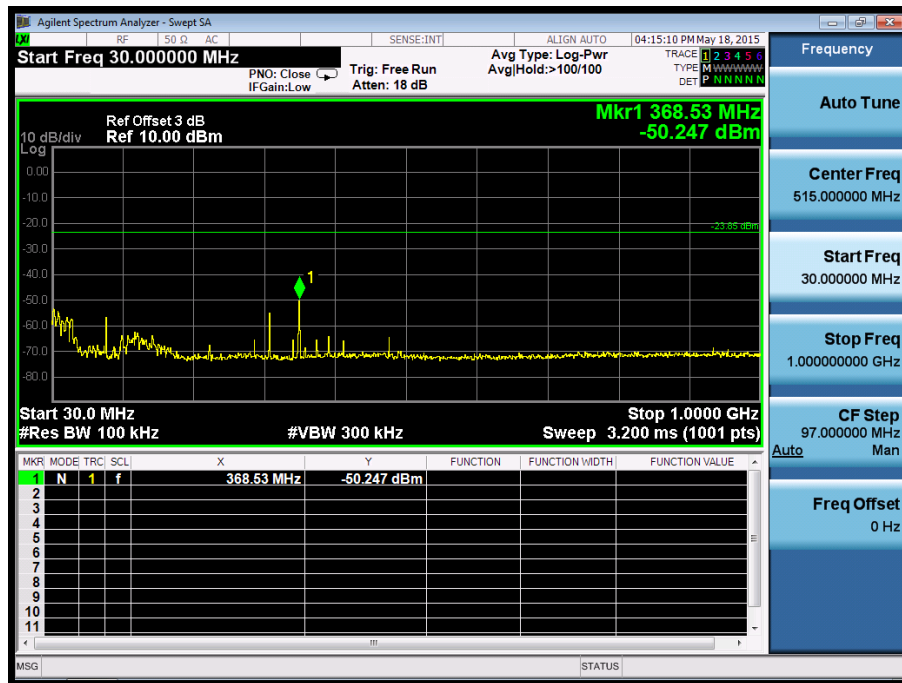
U3

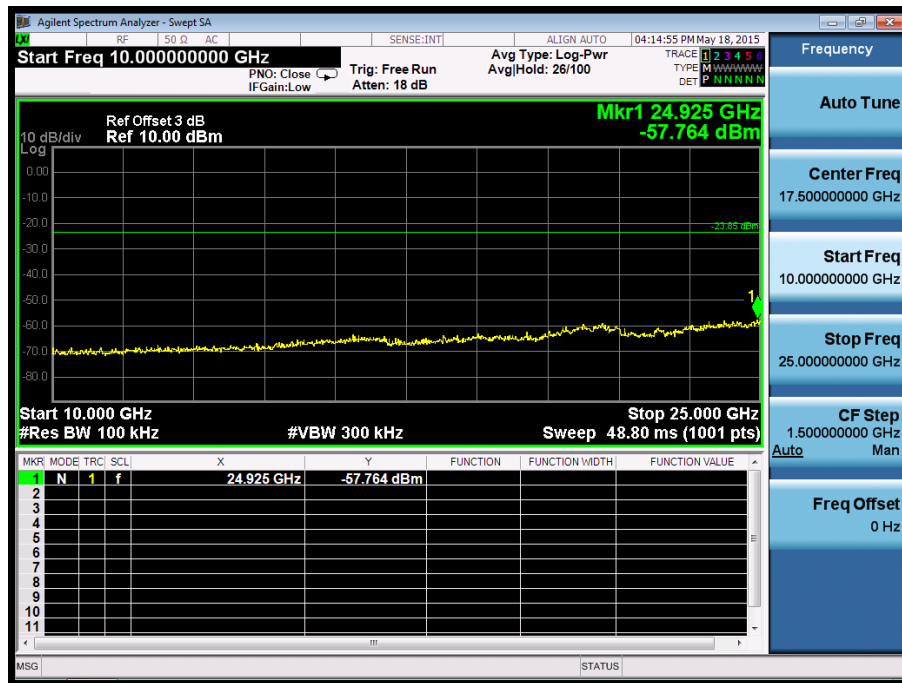
Test Mode: CH0: 2402MHz



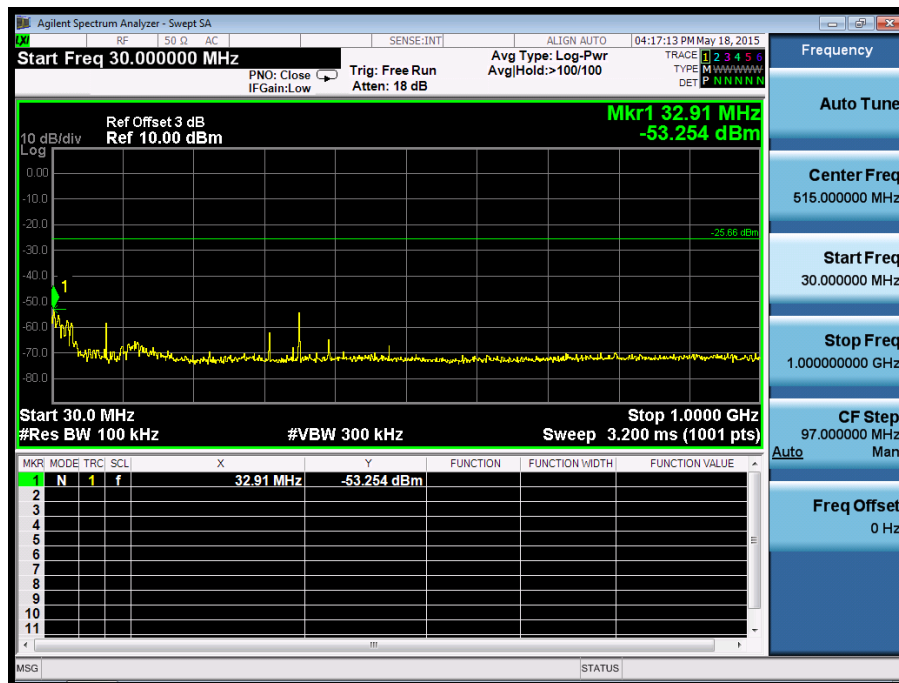


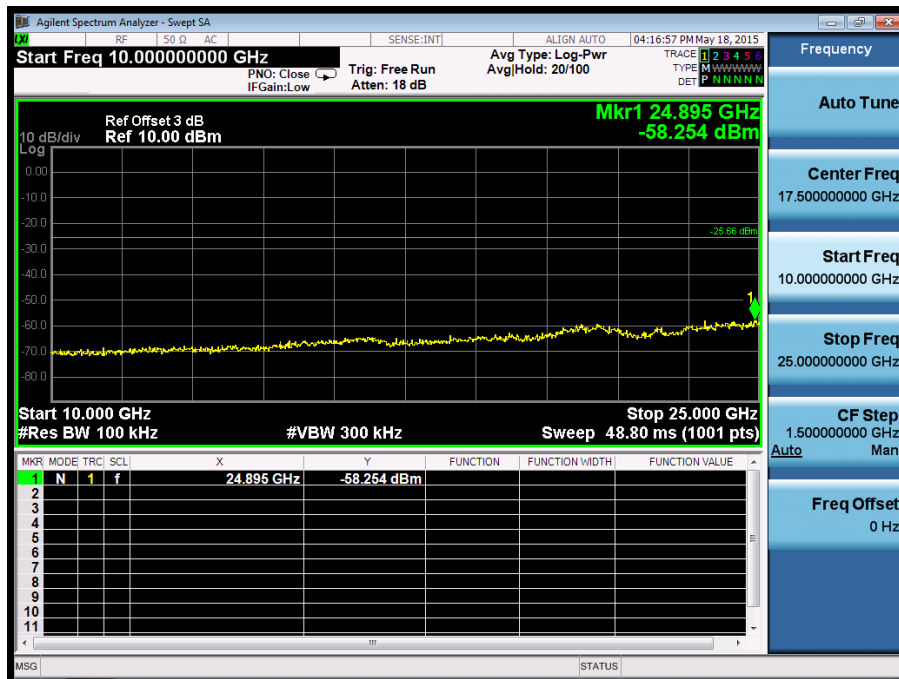
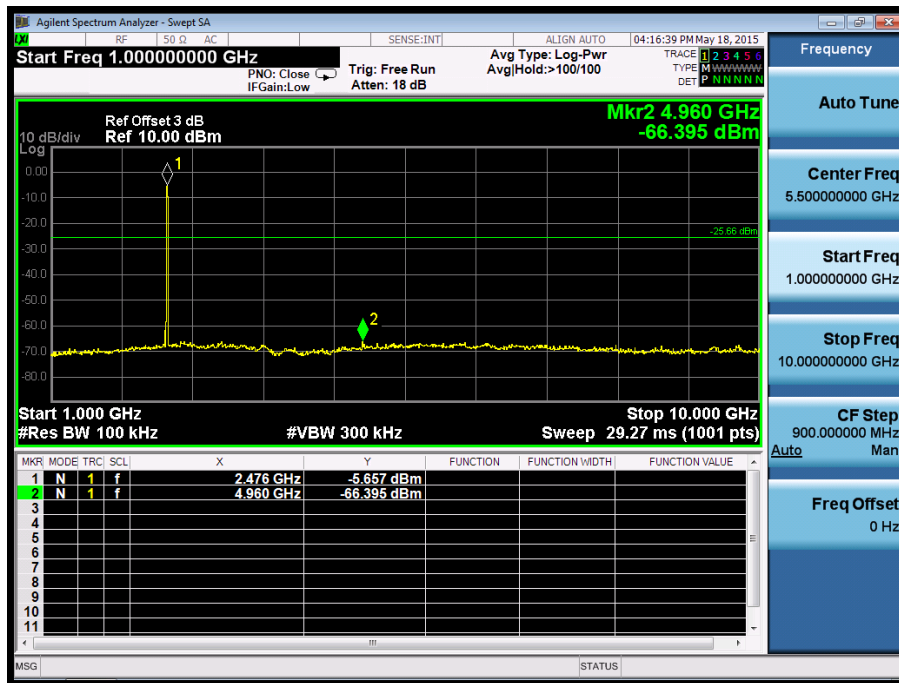
Test Mode: CH19: 2440MHz





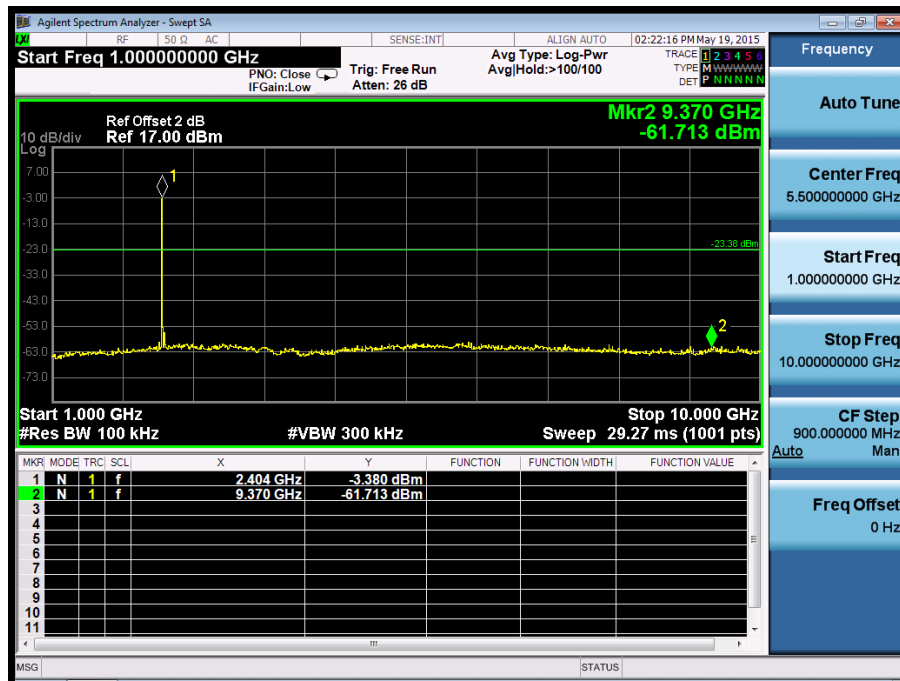
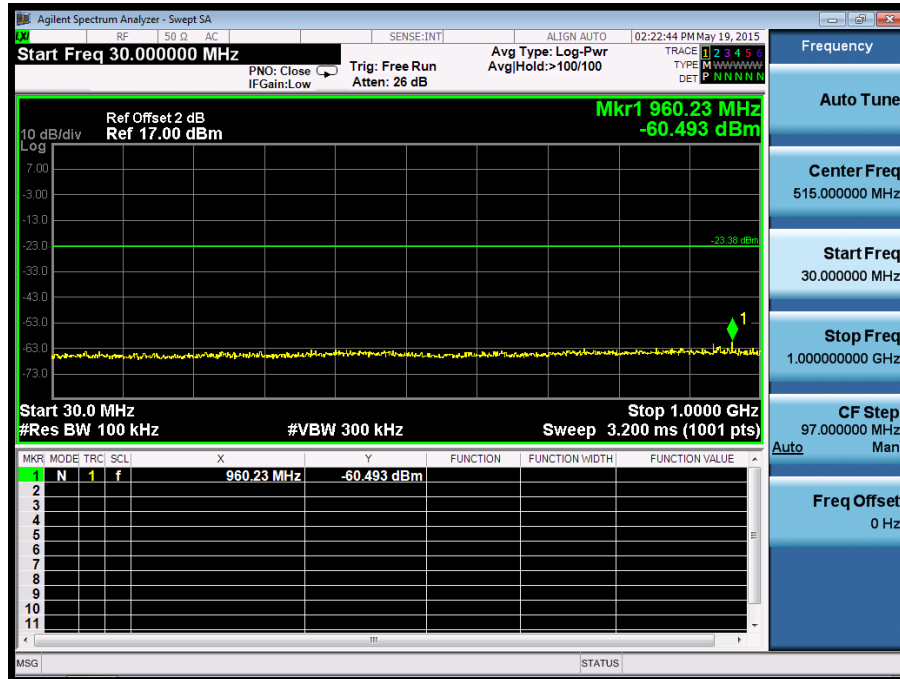
Test Mode: CH39: 2480MHz

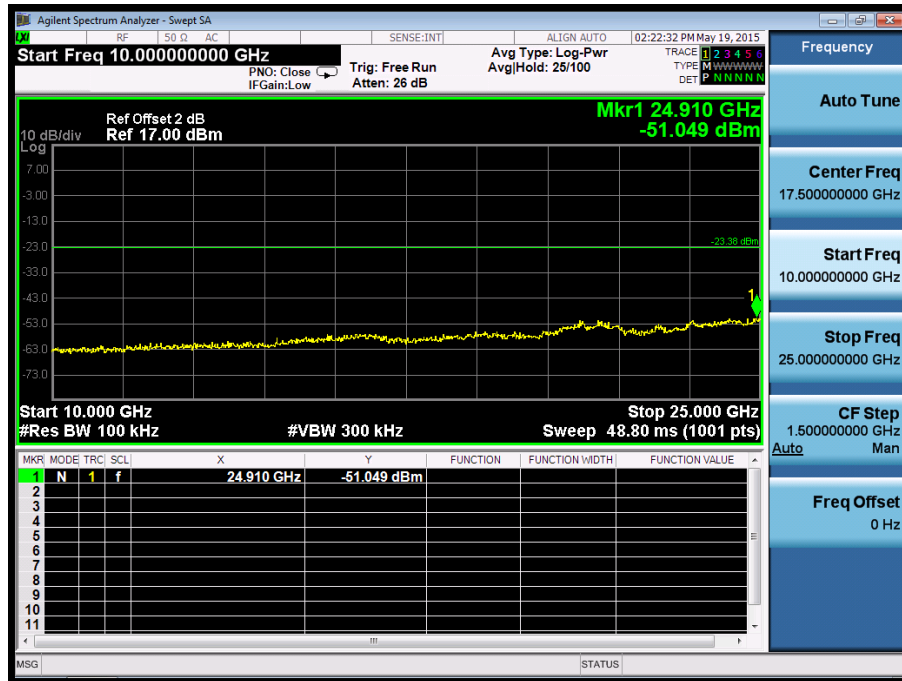




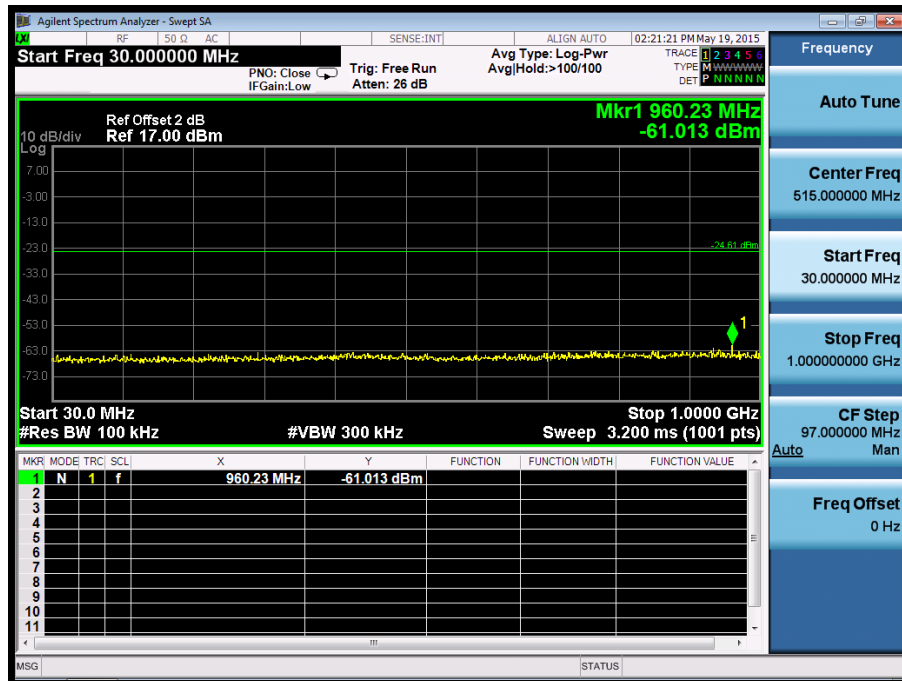
U5

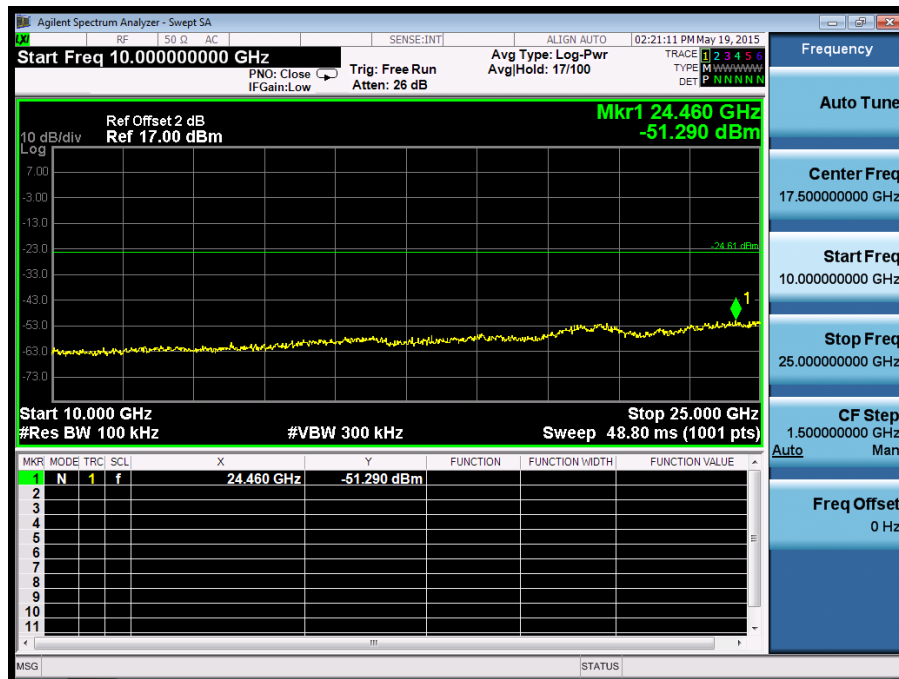
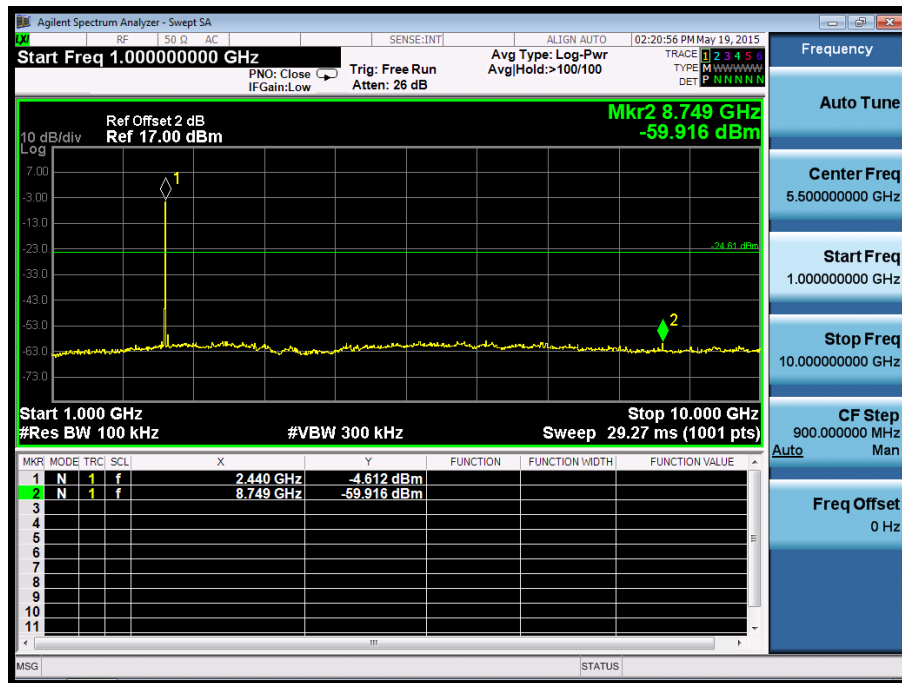
Test Mode: CH0: 2402MHz



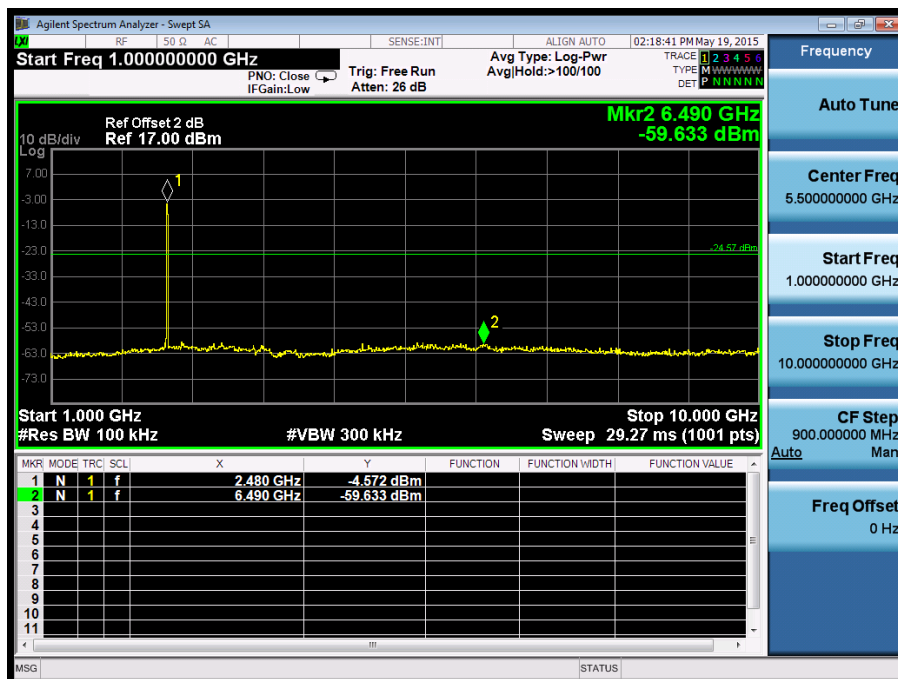
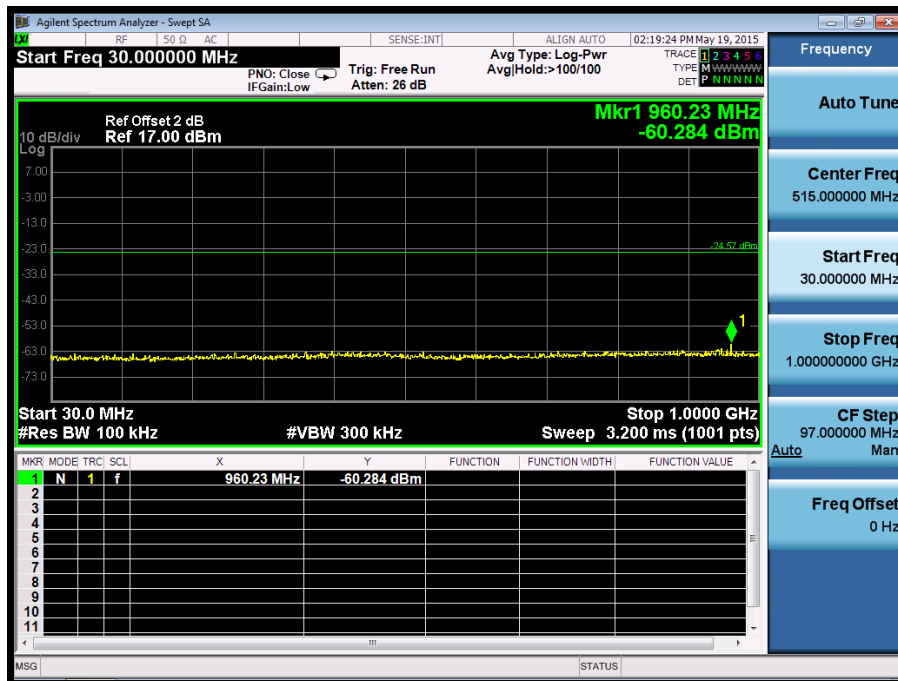


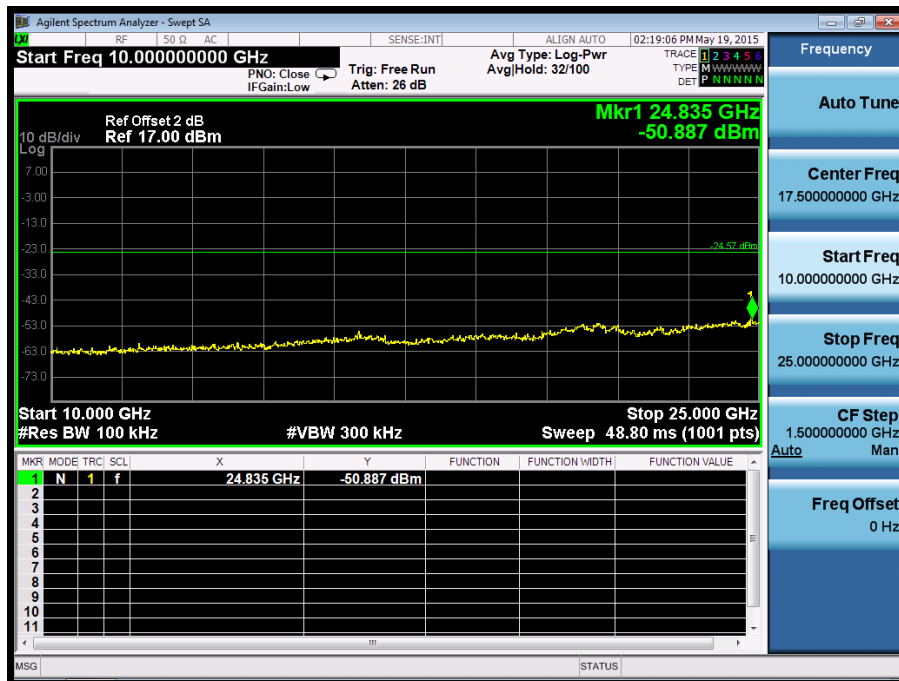
Test Mode: CH19: 2440MHz





Test Mode: CH39: 2480MHz





4.5 AC Conducted Emission (FCC Part §15.207)

4.5.1 Limit

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

4.5.2 Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
SB3319	EMI Test Receiver	Rohde & Schwarz	ESCS30	Jan.20,2015	1 Year
SB4357	AMN	Rohde & Schwarz	ENV216	Jan.20,2015	1 Year

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

4.5.3 Test Procedure

The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

4.5.4 Test Data

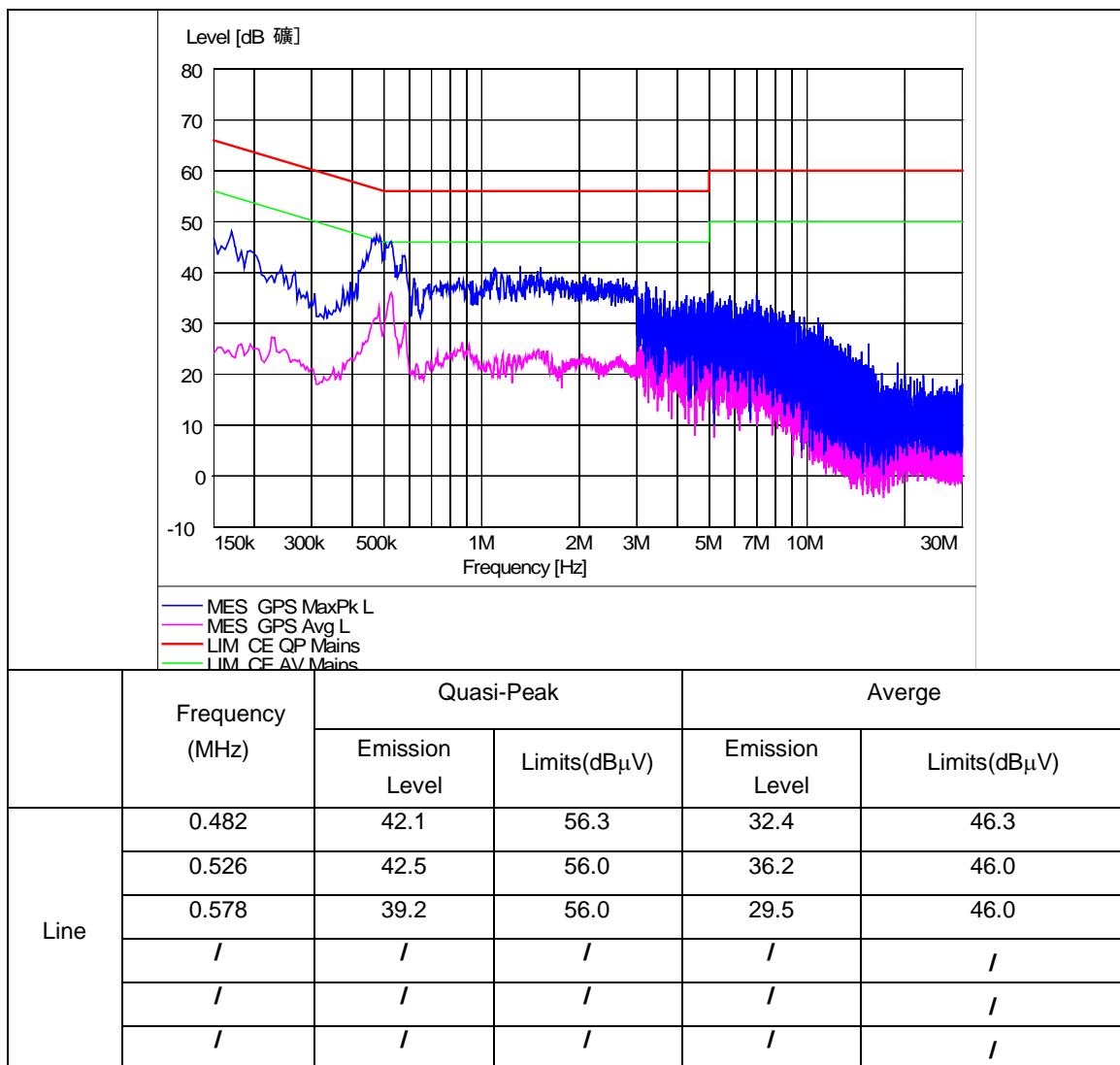
The EUT LITPro complied with the FCC Part 15.207 AC Conducted Emission requirements.

Table 13 provides the test results for AC Conducted Emission.

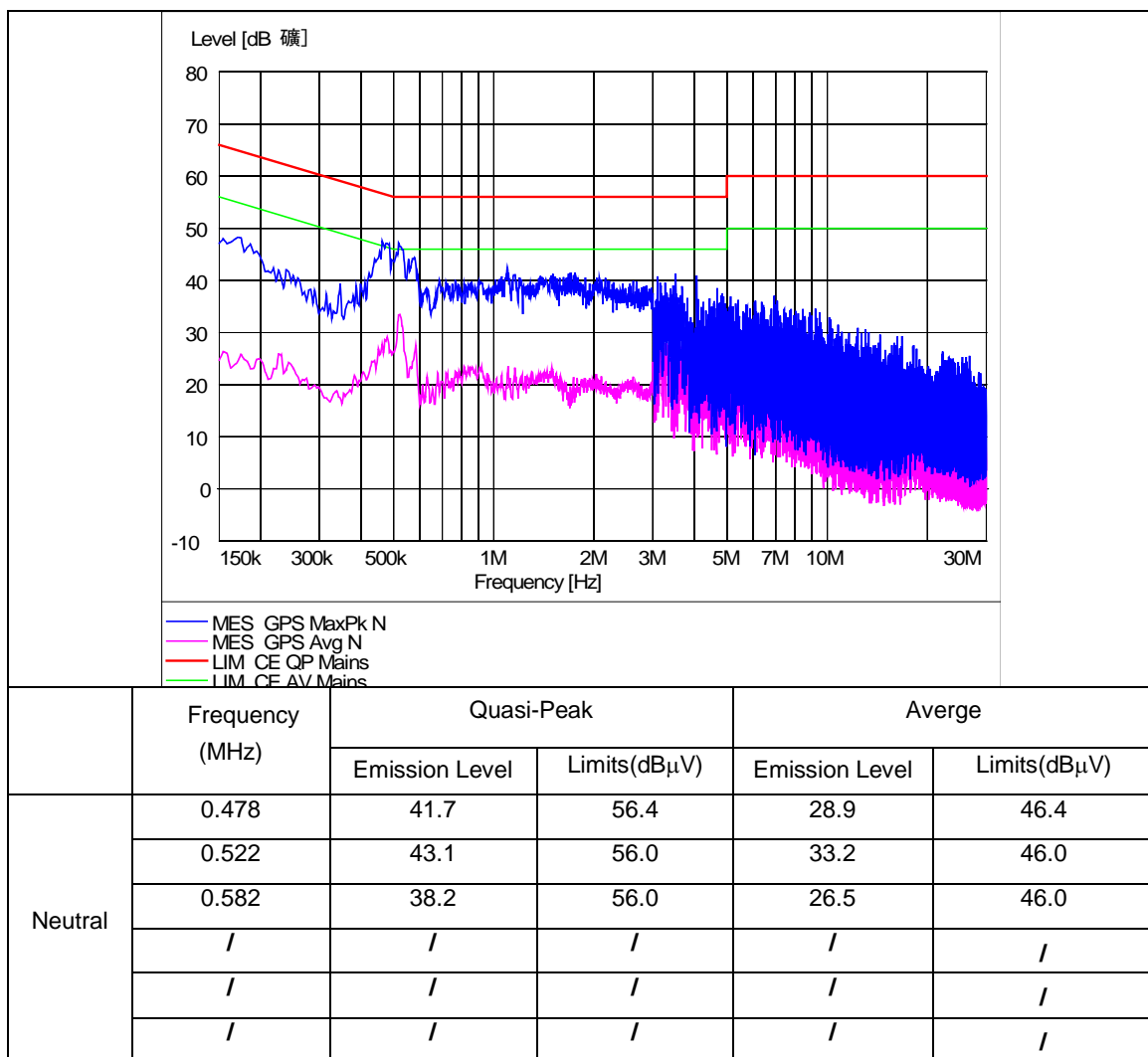
4.5.5 Areas of Concern

Table 13: AC Conducted Emission Test Data

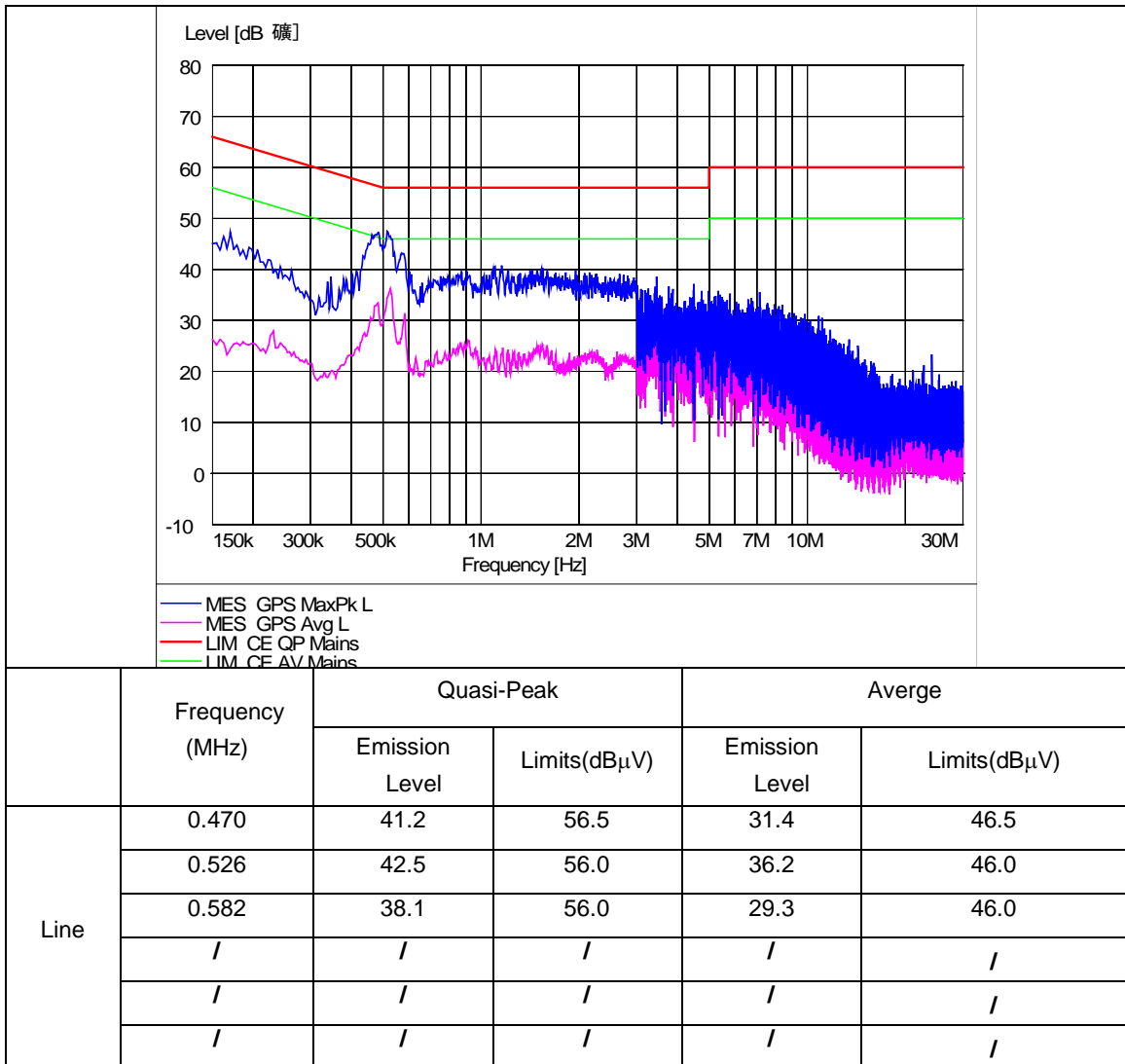
Standard:	FCC Part 15C	Line:	L1
Test item:	Conducted Emission	Power:	DC 5.0V
Model Number:	LP003(U3)	Temp.(°C)/Hum.(%RH):	20(°C)/39%RH
Mode:	Tx Mode	Date:	21/05/2015
		Test By:	Eric Ou Yang
Description:			



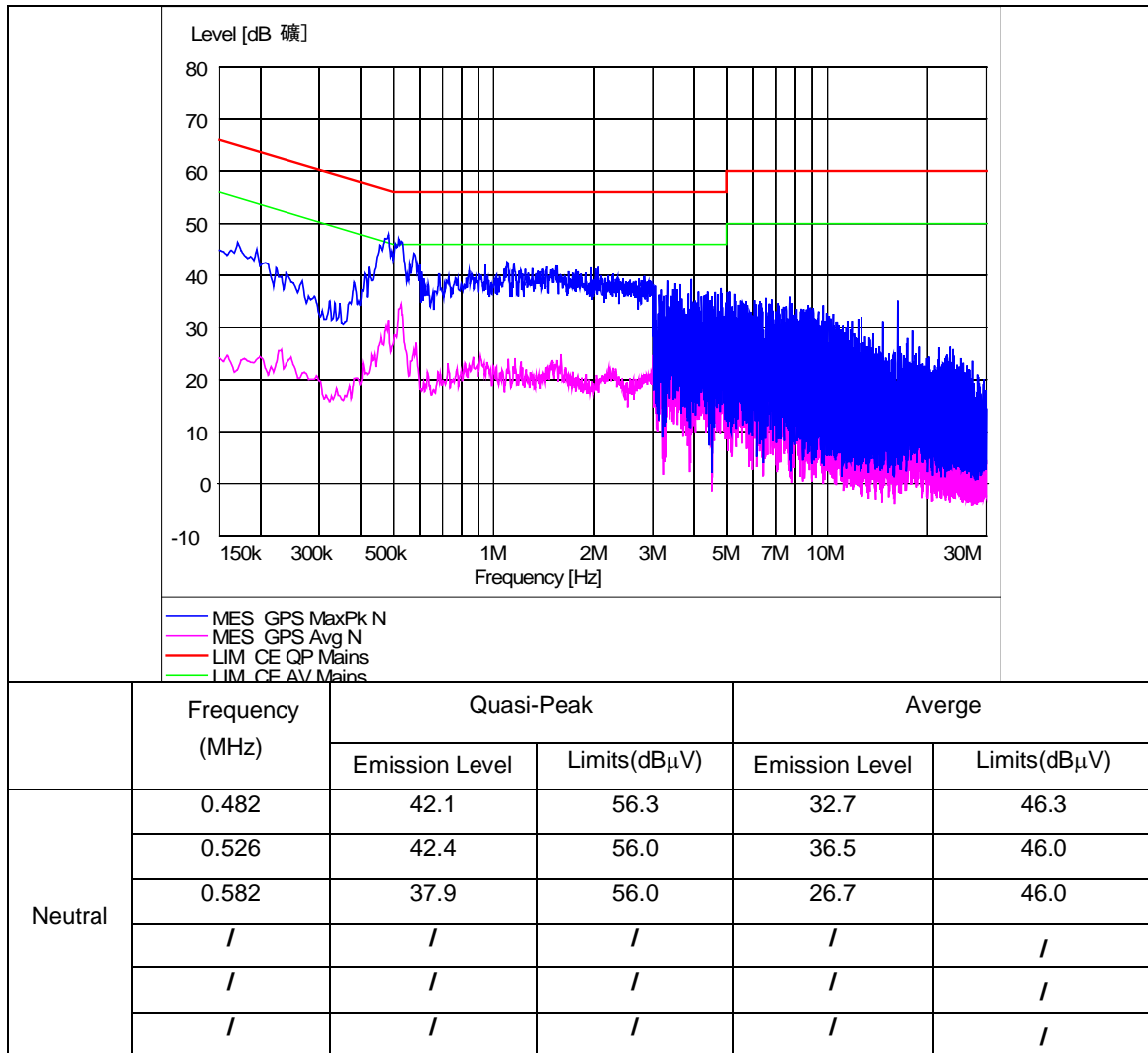
Standard:	FCC Part 15C	Line:	N
Test item:	Conducted Emission	Power:	DC 5.0V
Model Number:	LP003(U3)	Temp.(°C)/Hum.(%RH):	20(°C)/39%RH
Mode:	Tx Mode	Date:	21/05/2015
		Test By:	Eric Ou Yang
Description:			



Standard:	FCC Part 15C	Line:	L1
Test item:	Conducted Emission	Power:	DC 5.0V
Model Number:	LP003(U5)	Temp.(°C)/Hum.(%RH):	20(°C)/39%RH
Mode:	Tx Mode	Date:	21/05/2015
		Test By:	Eric Ou Yang
Description:			



Standard:	FCC Part 15C	Line:	N
Test item:	Conducted Emission	Power:	DC 5.0V
Model Number:	LP003(U5)	Temp.(°C)/Hum.(%RH):	20(°C)/39%RH
Mode:	Tx Mode	Date:	21/05/2015
		Test By:	Eric Ou Yang
Description:			



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

Radiated emissions that fall in the restricted bands must comply with the general emissions limits in 15.209(a).

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>30 kHz
>1000 MHz	1 MHz	<30 Hz

Harmonic and Spurious emissions that were identified as coming from the EUT were checked in Peak and in Average Mode. The high frequency, which started from 18 to 26.5GHz, was pre-scan and the test result which was 20dB lower than the limit was not reported.

Peak measurements and average measurements are made. All emissions were determined to have a peak-to-average ratio of less than 20 dB.

4.6.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.10-2009. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

4.6.2 Test Data

The EUT LITPro complied with the FCC Part 15.247 Radiated Spurious Emissions requirements.

Table 14, 15 provide the test results for Radiated Spurious Emissions.

4.6.3 Areas of Concern

None.

Note: The duty cycle factor for calculate average level is 13.65 dB, and average limit is 20 dB blowe peak limit, so if peak measured level comply with average limit, the average level was deemed to comply with average limit.

$$\text{Duty cycle(ms)} = \text{Ton/T} = (0.872 - 0.742) / (1.368 - 0.742) * 100\% = 20.77\%$$

$$\text{Duty cycle factor} = 20 \log (1/\text{duty cycle}) = 13.65$$

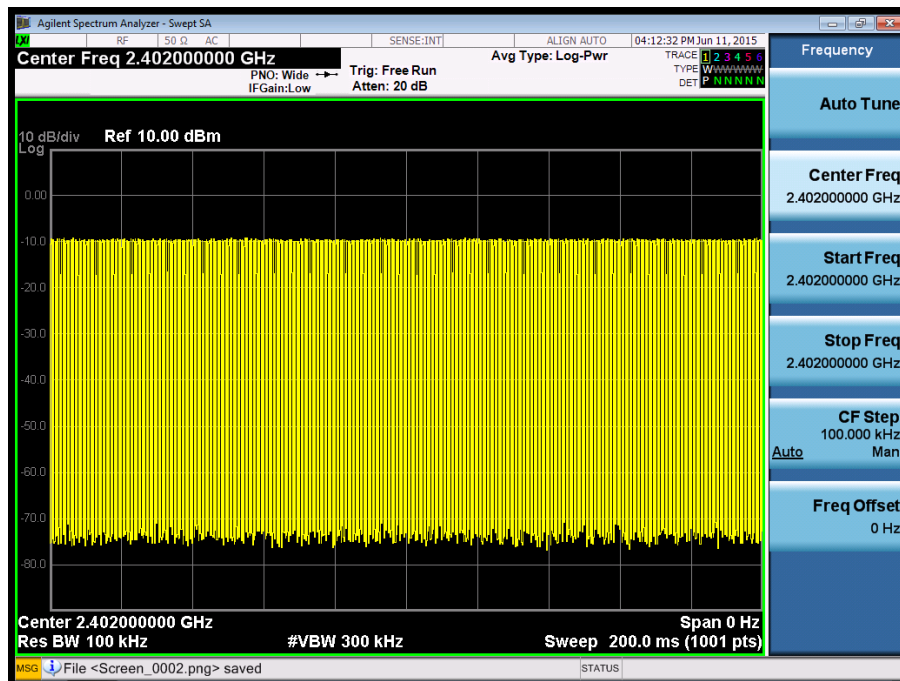
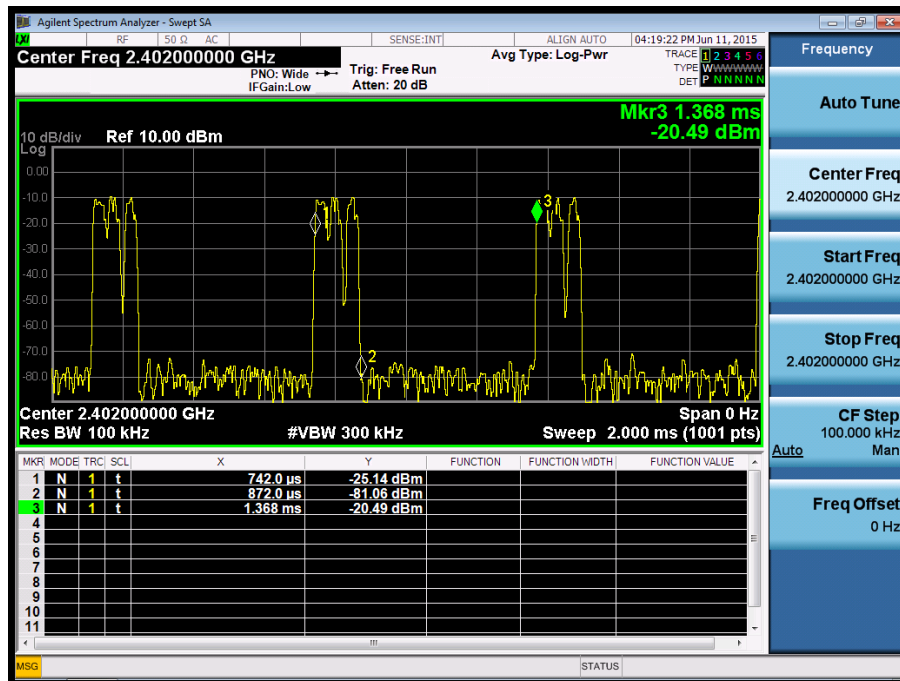


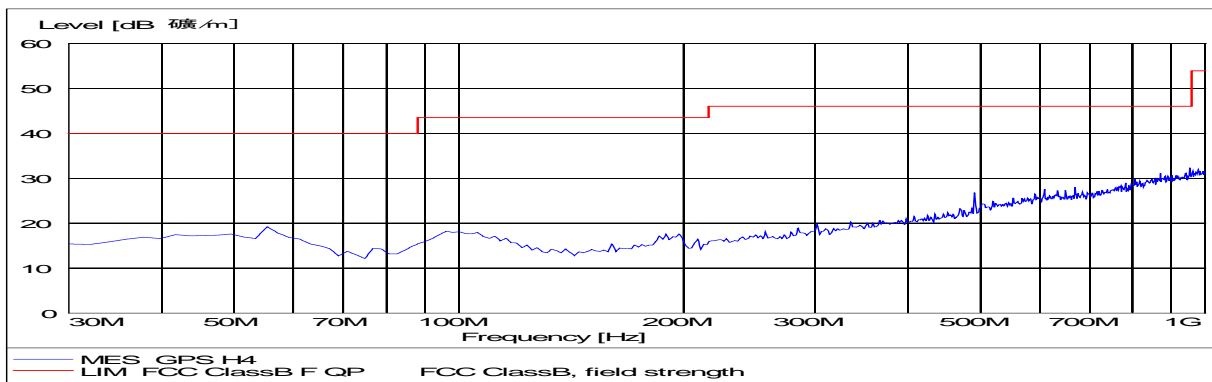
Table 14: Radiated Emission Test Data (Below 1GHz)

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	LP003(U3)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
		Test By:	Eric Ou Yang

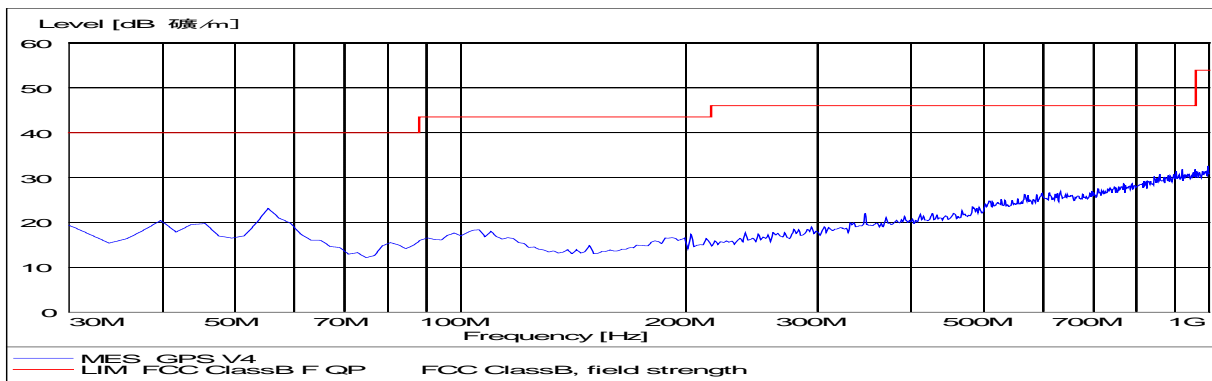
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz).

Horizontal(30MHz-1GHz)



Vertical(30MHz-1GHz)

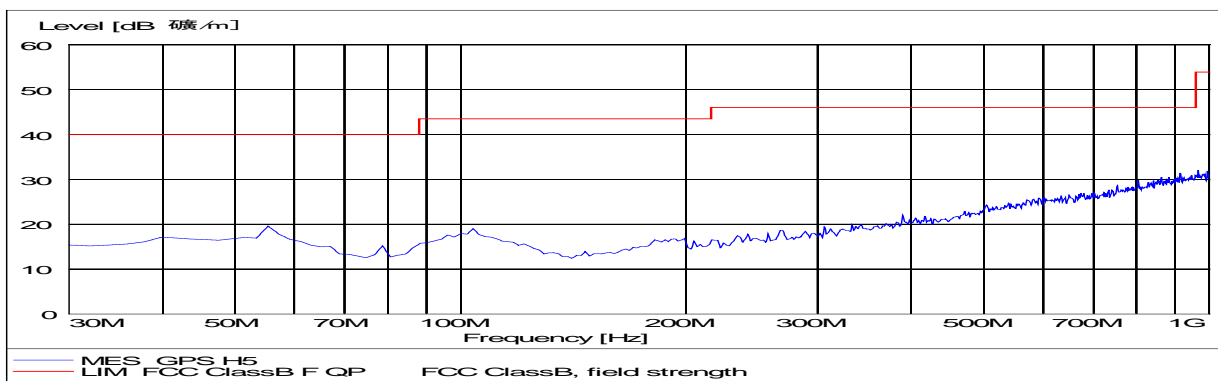


Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	LP003(U5)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
		Test By:	Eric Ou Yang

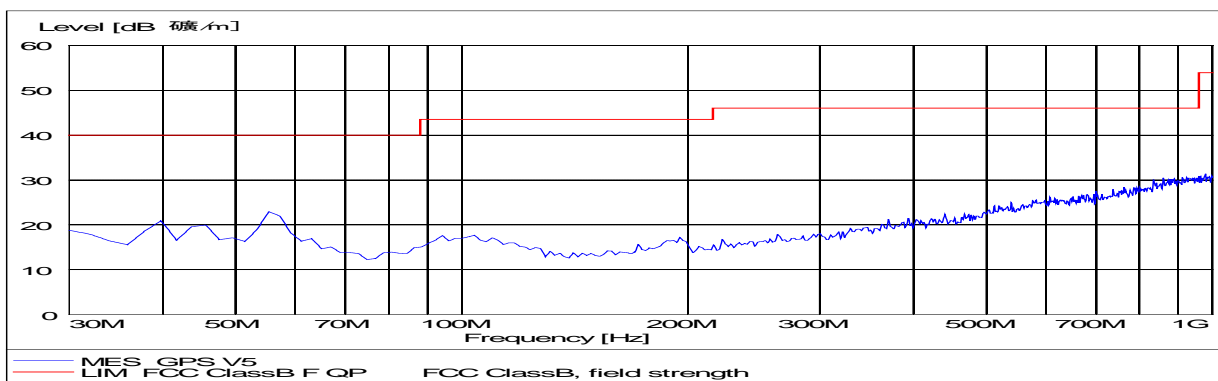
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~1GHz).

Horizontal(30MHz-1GHz)



Vertical(30MHz-1GHz)

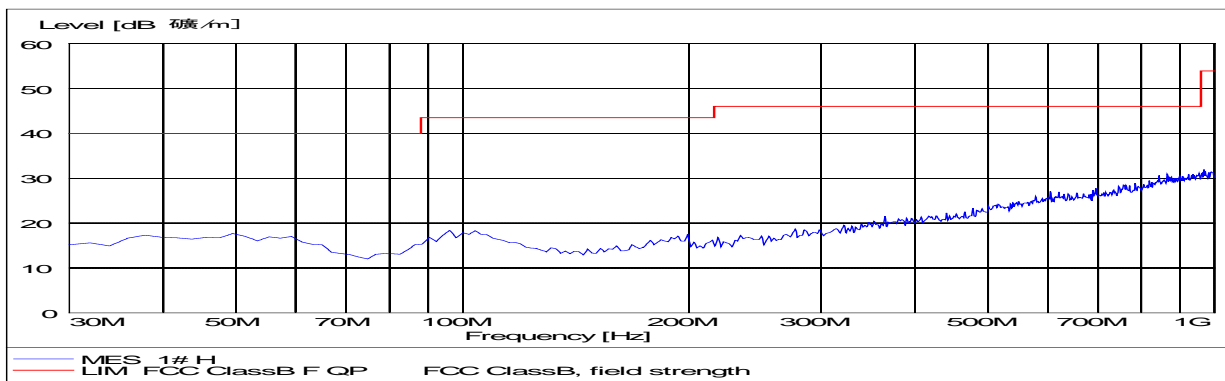


Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	LP003(U3&U5)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
		Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~1GHz).

Horizontal(30MHz-1GHz)



Vertical(30MHz-1GHz)

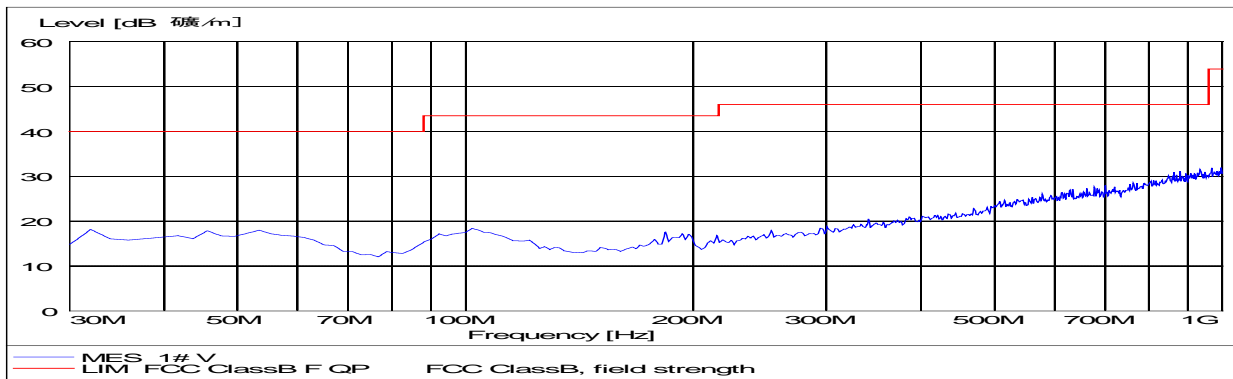
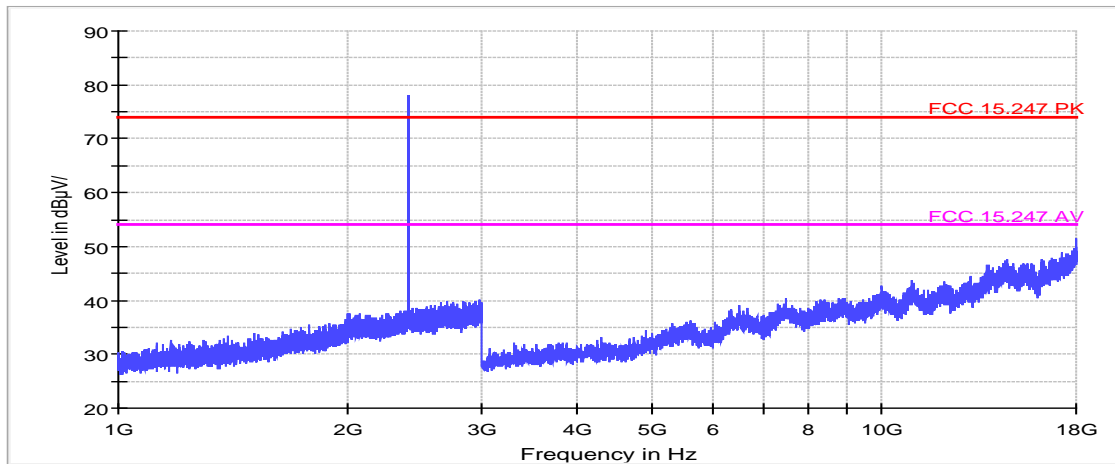


Table 15: Radiated Emission Test Data (Above 1GHz)

Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Radiated Emission		Power:		DC 5.0V	
Model Number:		LP003(U3)		Temp.(℃)/Hum.(%RH):		26(℃)/60%RH	
Mode:		Tx Mode		Date:		21/05/2015	
Frequency:		2402MHz		Test By:		Eric Ou Yang	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4804.00	40.09	0.20	40.29	74.00	33.71	peak	H
--	--	--	--	--	--	Average	H
4804.00	36.78	6.15	42.93	74.00	31.07	peak	V
--	--	--	--	--	--	Average	V
7206.00	39.92	2.51	42.43	74.00	31.57	peak	H
--	--	--	--	--	--	Average	H
7206.00	36.05	7.01	43.06	74.00	30.94	peak	V
--	--	--	--	--	--	Average	V
9608.00	43.05	4.05	47.10	74.00	26.90	peak	H
--	--	--	--	--	--	Average	H
9608.00	40.44	7.71	48.15	74.00	25.85	peak	V
--	--	--	--	--	--	Average	V
2402.00	78.91	0.17	79.08	--	--	peak	H
2402.00	76.05	2.94	78.99	--	--	peak	V

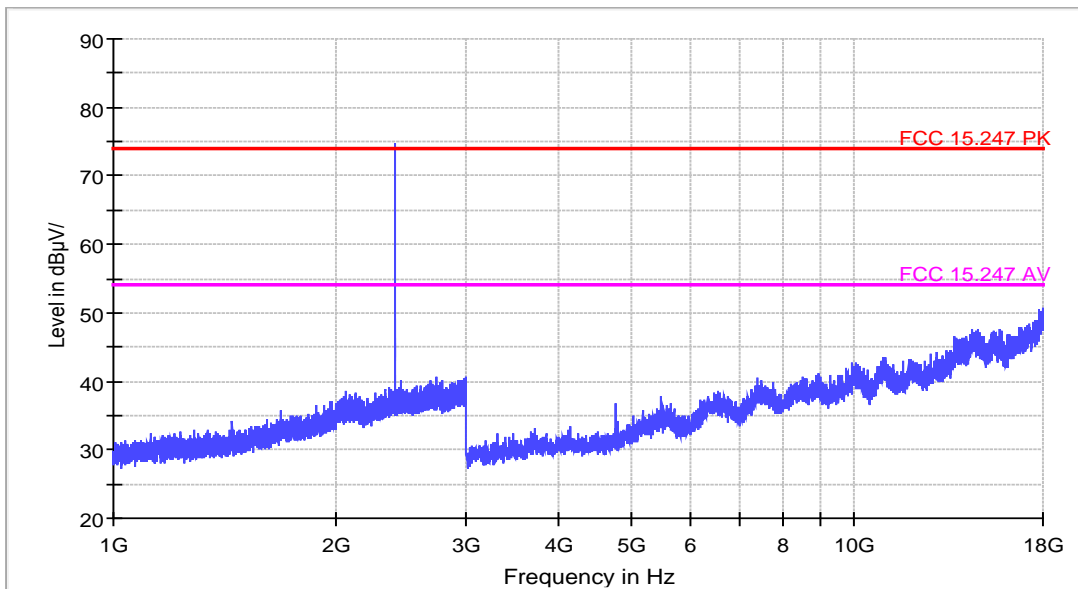
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

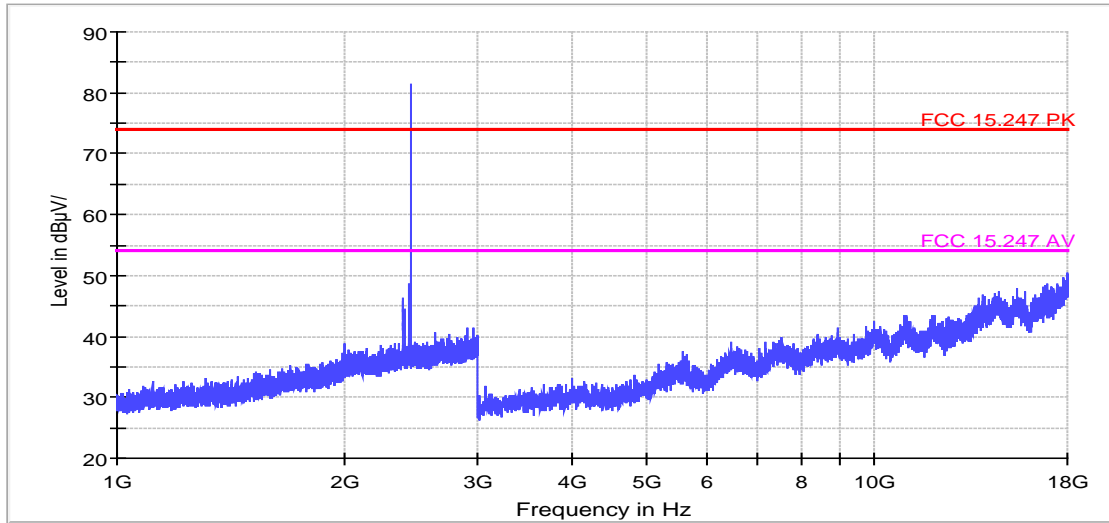
FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Radiated Emission		Power:		DC 5.0V	
Model Number:		LP003(U3)		Temp.(°C)/Hum.(%RH):		26(°C)/60%RH	
Mode:		Tx Mode		Date:		21/05/2015	
Frequency:		2440MHz		Test By:		Eric Ou Yang	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4880	39.45	0.41	39.86	74.00	34.14	peak	H
--	--	--	--	--	--	Average	H
4880	35.46	8.21	43.67	74.00	30.33	peak	V
--	--	--	--	--	--	Average	V
7320	40.19	2.69	42.88	74.00	31.12	peak	H
--	--	--	--	--	--	Average	H
7320	38.16	7.21	45.37	74.00	28.63	peak	V
--	--	--	--	--	--	Average	V
9760	41.22	4.25	45.47	74.00	28.53	peak	H
--	--	--	--	--	--	Average	H
9760	38.95	7.82	46.77	74.00	27.23	peak	V
--	--	--	--	--	--	Average	V
2440	83.04	1.92	84.96	--	--	peak	H
2440	75.06	3.01	78.07	--	--	peak	V

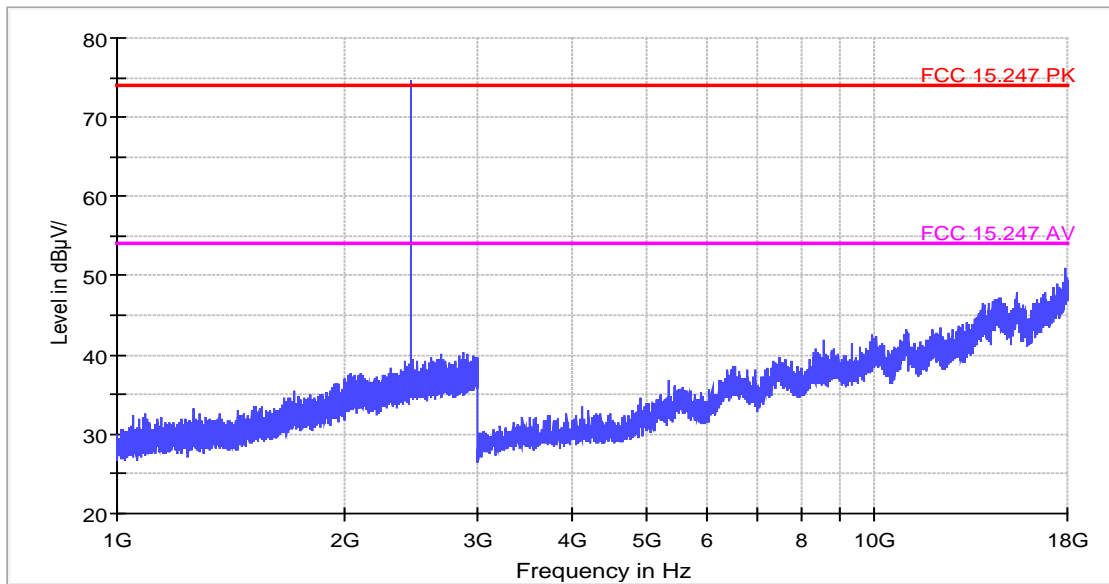
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

FCC Electric Field Strength 1-18GHz operate on 2.4GHz

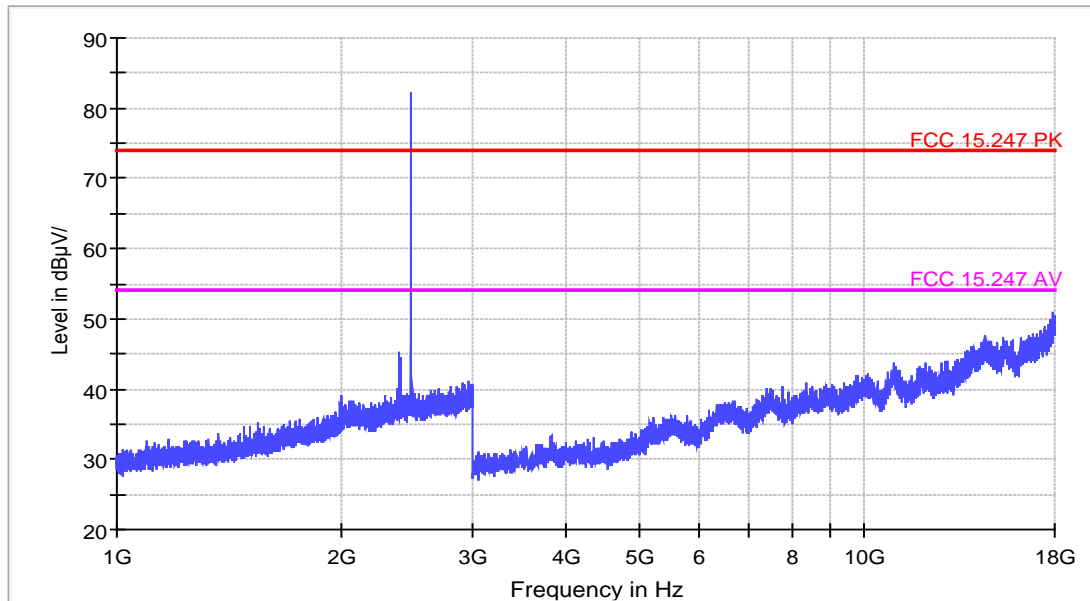


Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5.0V
Model Number:	LP003(U3)	Temp.(°C)/Hum. (%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
Frequency:	2480MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4960	39.15	0.81	39.96	74.00	34.04	peak	H
--	--	--	--	--	--	Average	H
4960	34.59	8.91	43.50	74.00	30.50	peak	V
--	--	--	--	--	--	Average	V
7440	40.16	2.85	43.01	74.00	30.99	peak	H
--	--	--	--	--	--	Average	H
7440	38.22	7.39	45.61	74.00	28.39	peak	V
--	--	--	--	--	--	Average	V
9920	42.35	4.48	46.83	74.00	27.17	peak	H
--	--	--	--	--	--	Average	H
9920	39.77	7.95	47.72	74.00	26.28	peak	V
--	--	--	--	--	--	Average	V
2480	85.69	2.03	87.72	--	--	peak	H
2480	78.67	3.09	81.76	--	--	peak	V

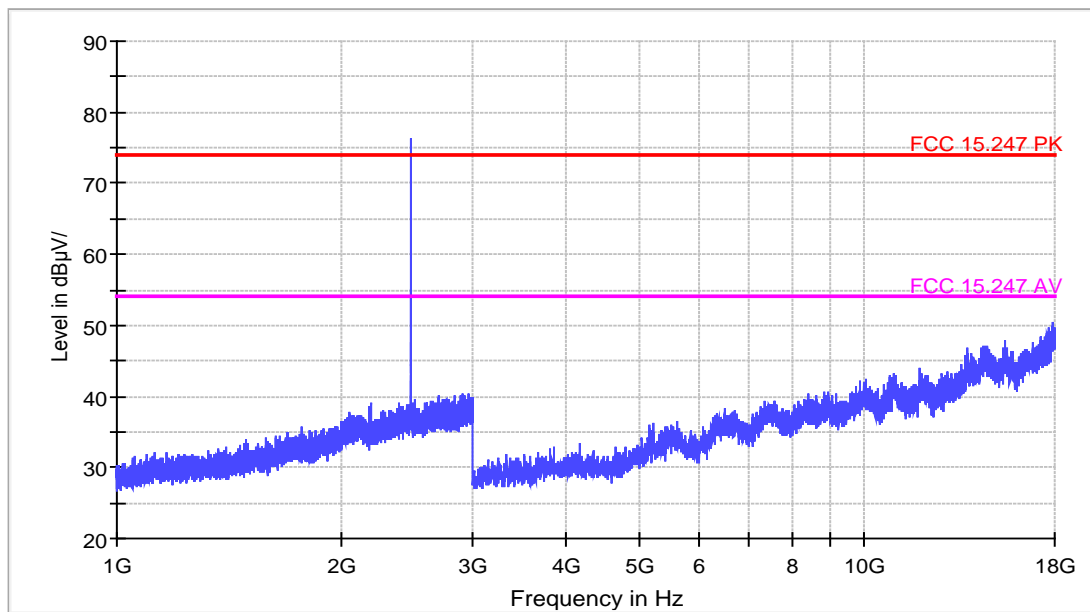
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

FCC Electric Field Strength 1-18GHz operate on 2.4GHz

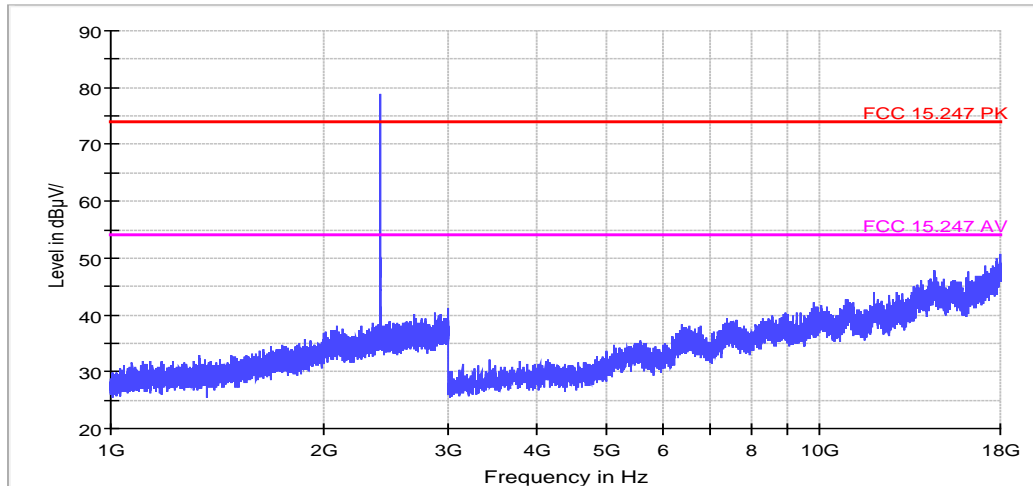


Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5.0V
Model Number:	LP003(U5)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
Frequency:	2402MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBUV)	Correct Factor (dB/m)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4804.00	40.01	0.20	40.21	74.00	33.79	peak	H
--	--	--	--	--	--	Average	H
4804.00	35.15	6.15	41.30	74.00	32.70	peak	V
--	--	--	--	--	--	Average	V
7206.00	41.06	2.51	43.57	74.00	30.43	peak	H
--	--	--	--	--	--	Average	H
7206.00	36.68	7.01	43.69	74.00	30.31	peak	V
--	--	--	--	--	--	Average	V
9608.00	42.55	4.05	46.60	74.00	27.40	peak	H
--	--	--	--	--	--	Average	H
9608.00	36.73	7.71	43.74	74.00	30.26	peak	V
--	--	--	--	--	--	Average	V
2402.00	79.89	0.17	80.06	--	--	peak	H
2402.00	83.46	2.94	86.40	--	--	peak	V

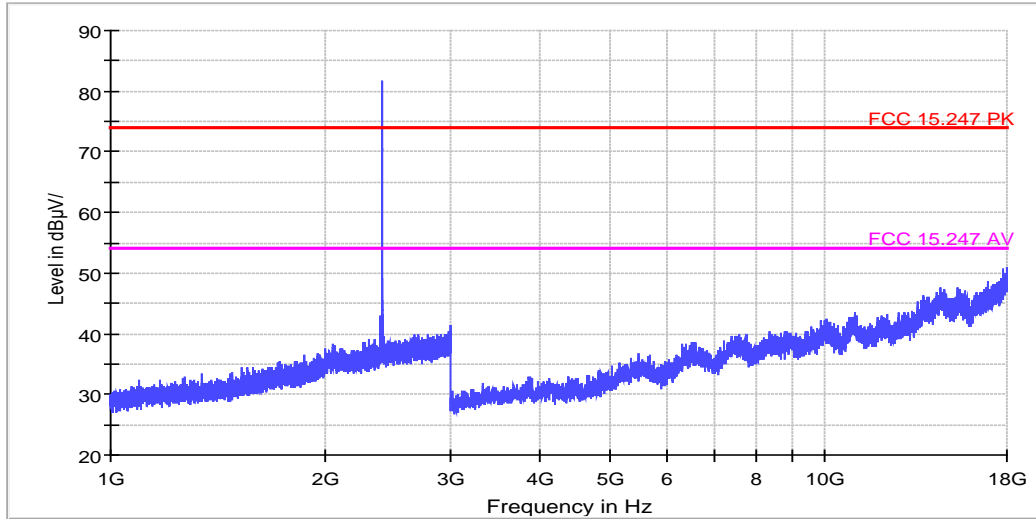
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

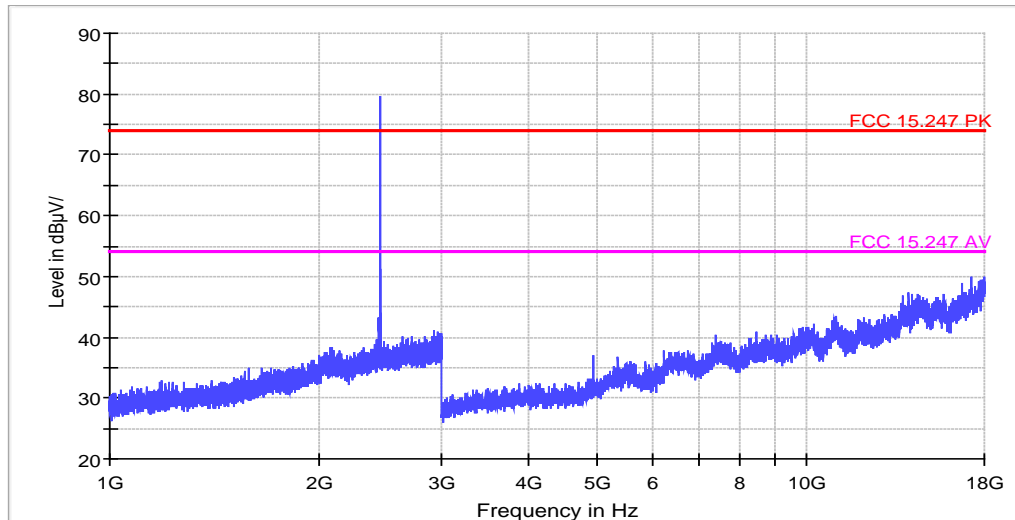
FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Radiated Emission		Power:		DC 5.0V	
Model Number:		LP003(U5)		Temp.(°C)/Hum.(%RH):		26(°C)/60%RH	
Mode:		Tx Mode		Date:		21/05/2015	
Frequency:		2440MHz		Test By:		Eric Ou Yang	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4880	42.05	0.41	42.46	74.00	31.54	peak	H
--	--	--	--	--	--	Average	H
4880	38.61	8.21	46.82	74.00	27.18	peak	V
--	--	--	--	--	--	Average	V
7320	41.56	2.69	44.25	74.00	29.75	peak	H
--	--	--	--	--	--	Average	H
7320	39.01	7.21	46.22	74.00	27.78	peak	V
--	--	--	--	--	--	Average	V
9760	43.29	4.25	47.54	74.00	26.46	peak	H
--	--	--	--	--	--	Average	H
9760	40.18	7.82	48.00	74.00	26.00	peak	V
--	--	--	--	--	--	Average	V
2440	79.99	1.92	81.91	--	--	peak	H
2440	76.43	3.01	79.44	--	--	peak	V

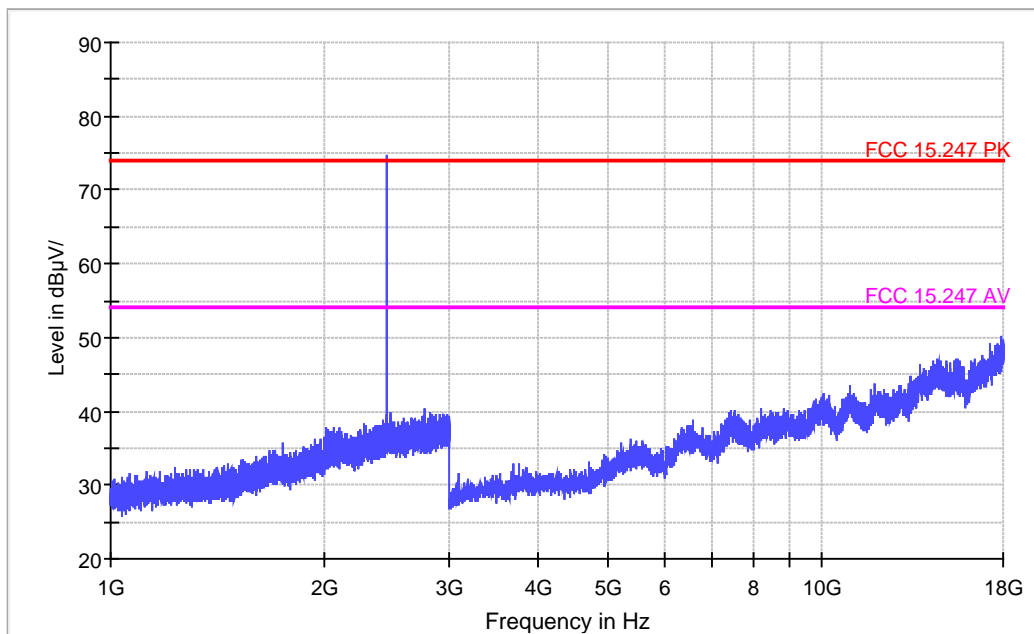
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

FCC Electric Field Strength 1-18GHz operate on 2.4GHz

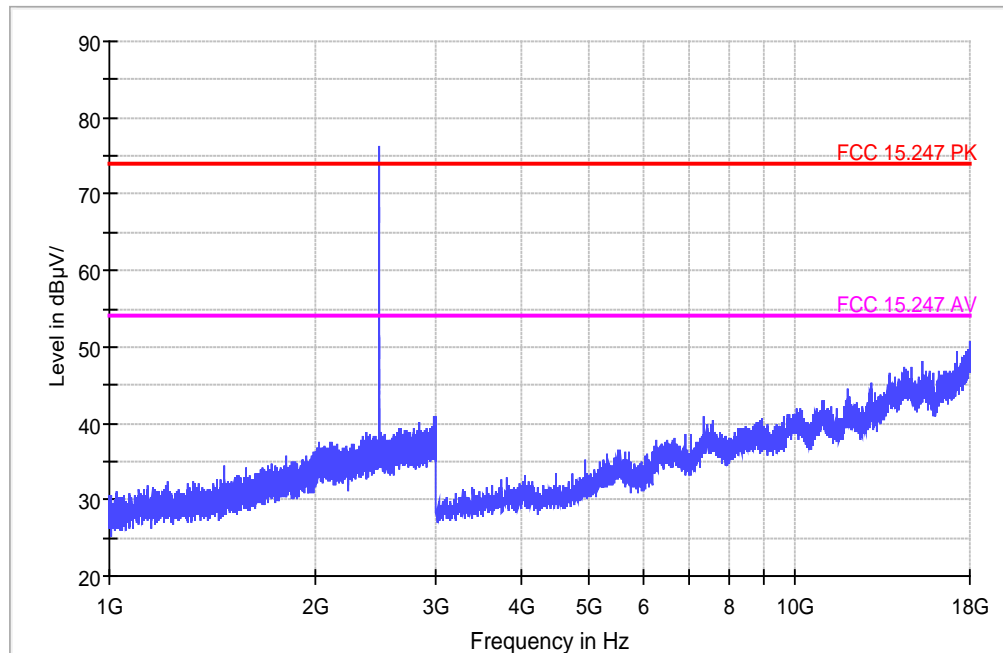


Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5.0V
Model Number:	LP003(U5)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
Frequency:	2480MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4960	39.66	0.81	40.07	74.00	33.93	peak	H
--	--	--	--	--	--	--	H
4960	36.67	8.91	44.88	74.00	29.12	peak	V
--	--	--	--	--	--	--	V
7440	40.16	2.85	43.01	74.00	30.99	peak	H
--	--	--	--	--	--	--	H
7440	34.25	7.39	41.64	74.00	32.36	peak	V
--	--	--	--	--	--	--	V
9920	40.95	4.48	45.43	74.00	28.57	peak	H
--	--	--	--	--	--	--	H
9920	35.87	7.95	43.82	74.00	30.18	peak	V
--	--	--	--	--	--	--	V
2480	79.93	2.03	81.95	--	--	peak	H
2480	76.05	3.09	79.14	--	--	peak	V

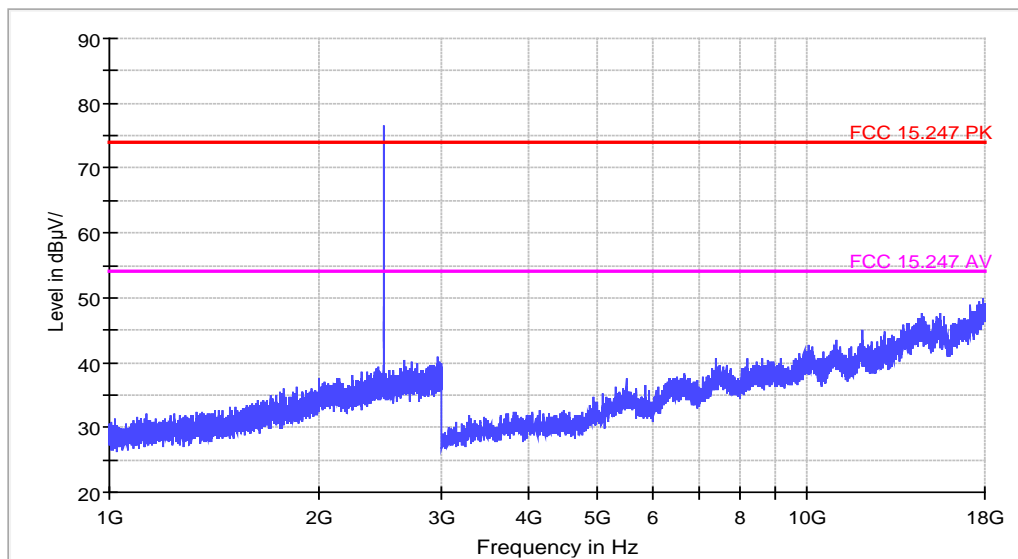
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

FCC Electric Field Strength 1-18GHz operate on 2.4GHz

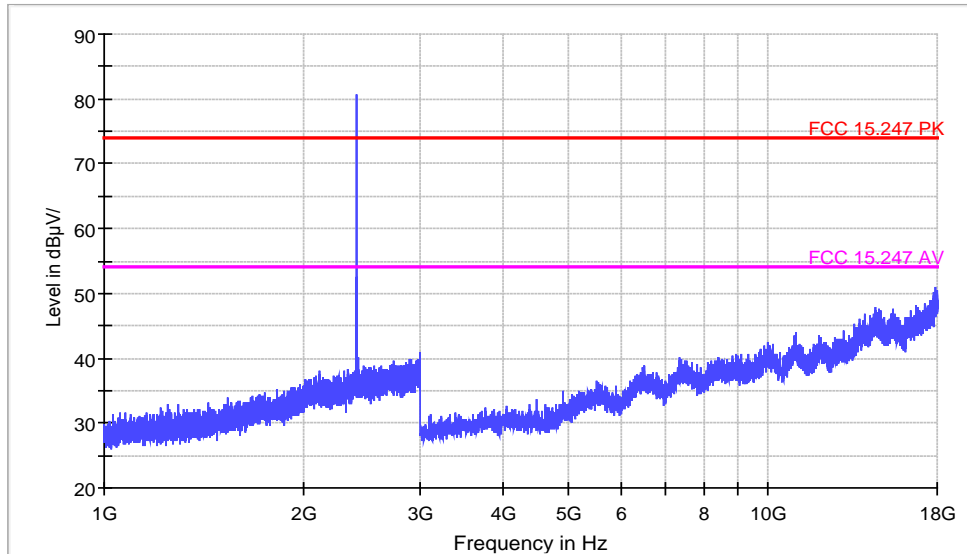


Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5.0V
Model Number:	LP003(U3&U5)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
Frequency:	2402MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4804.00	41.23	0.20	41.43	74.00	33.79	peak	H
--	--	--	--	--	--	--	H
4804.00	36.77	6.15	42.92	74.00	32.70	peak	V
--	--	--	--	--	--	--	V
7206.00	36.83	2.51	39.34	74.00	34.66	peak	H
--	--	--	--	--	--	--	H
7206.00	33.19	7.01	40.20	74.00	33.80	peak	V
--	--	--	--	--	--	--	V
9608.00	41.55	4.05	45.60	74.00	28.40	peak	H
--	--	--	--	--	--	--	H
9608.00	37.77	7.71	45.48	74.00	28.52	peak	V
--	--	--	--	--	--	--	V
2402.00	84.11	0.17	84.28	--	--	peak	H
2402.00	77.29	2.94	80.23	--	--	peak	V

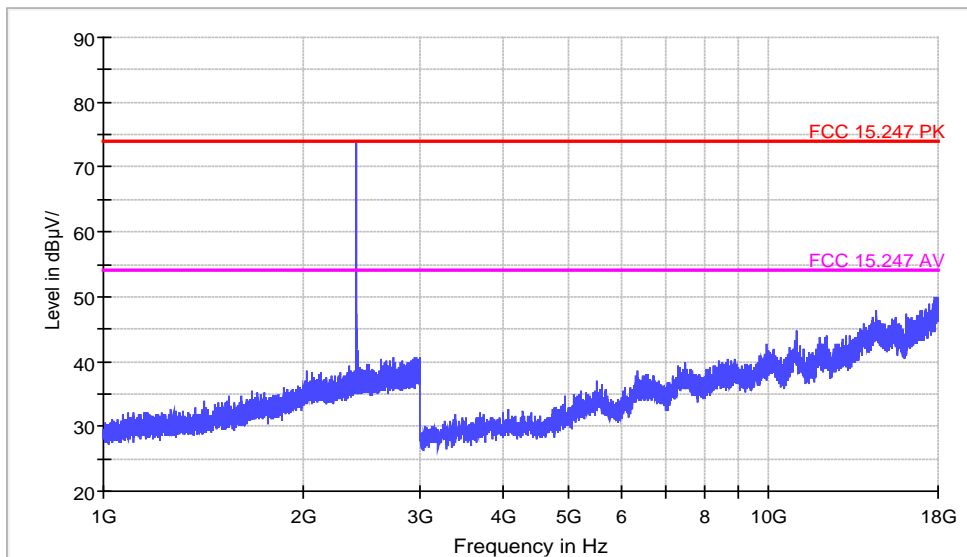
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

FCC Electric Field Strength 1-18GHz operate on 2.4GHz

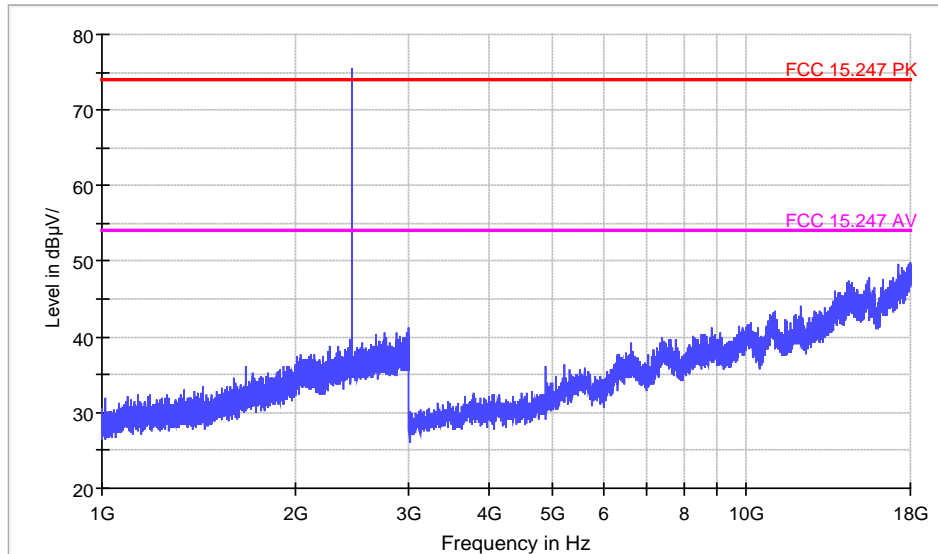


Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5.0V
Model Number:	LP003(U3&U5)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	Tx Mode	Date:	21/05/2015
Frequency:	2440MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4880	41.33	0.41	41.74	74.00	32.26	peak	H
--	--	--	--	--	--	--	H
4880	39.25	8.21	47.46	74.00	26.54	peak	V
--	--	--	--	--	--	--	V
7320	39.92	2.69	42.61	74.00	31.39	peak	H
--	--	--	--	--	--	--	H
7320	36.03	7.21	43.24	74.00	30.76	peak	V
--	--	--	--	--	--	--	V
9760	40.15	4.25	44.4	74.00	29.60	peak	H
--	--	--	--	--	--	--	H
9760	37.72	7.82	45.54	74.00	28.46	peak	V
--	--	--	--	--	--	--	V
2440	78.15	1.92	80.07	--	--	peak	H
2440	74.91	3.01	77.92	--	--	peak	V

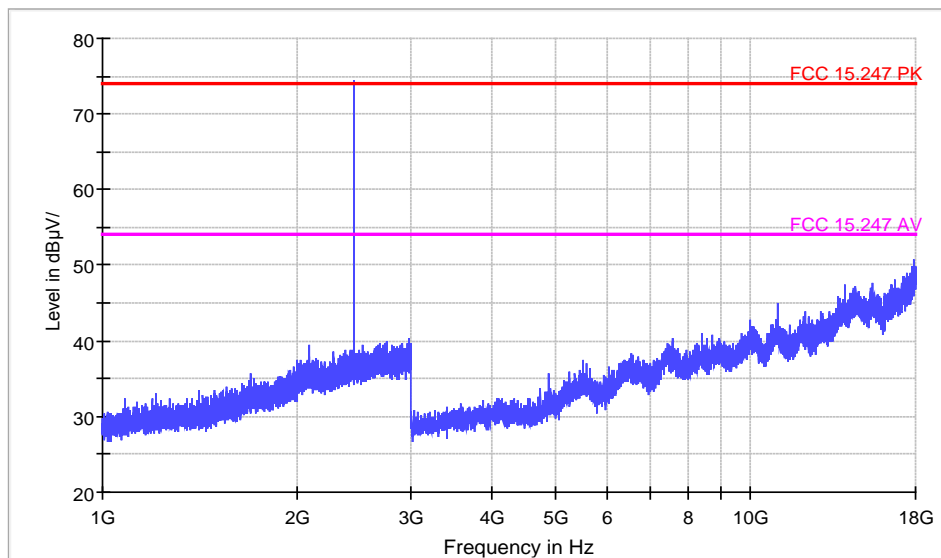
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

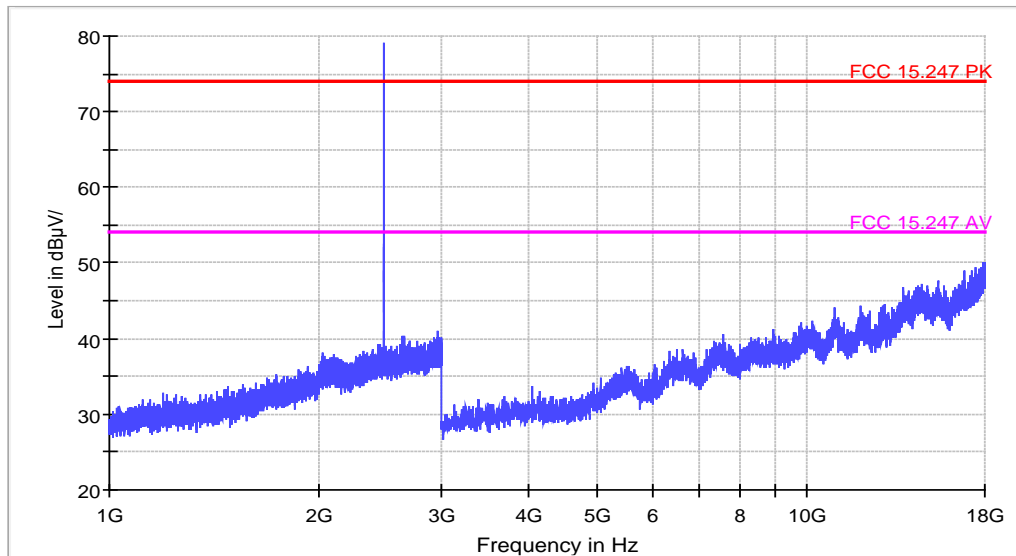
FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Radiated Emission		Power:		DC 5.0V	
Model Number:		LP003(U3&U5)		Temp.(°C)/Hum.(%RH):		26(°C)/60%RH	
Mode:		Tx Mode		Date:		21/05/2015	
Frequency:		2480MHz		Test By:		Eric Ou Yang	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4960	38.15	0.81	38.96	74.00	35.04	peak	H
--	--	--	--	--	--	--	H
4960	36.22	8.91	45.13	74.00	28.87	peak	V
--	--	--	--	--	--	--	V
7440	38.15	2.85	41.00	74.00	33.00	peak	H
--	--	--	--	--	--	--	H
7440	35.11	7.39	42.50	74.00	31.50	peak	V
--	--	--	--	--	--	--	V
9920	41.62	4.48	46.10	74.00	27.90	peak	H
--	--	--	--	--	--	--	H
9920	37.79	7.95	45.74	74.00	28.26	peak	V
--	--	--	--	--	--	--	V
2480	79.51	2.03	81.54	--	--	peak	H
2480	75.38	3.09	78.47	--	--	peak	V

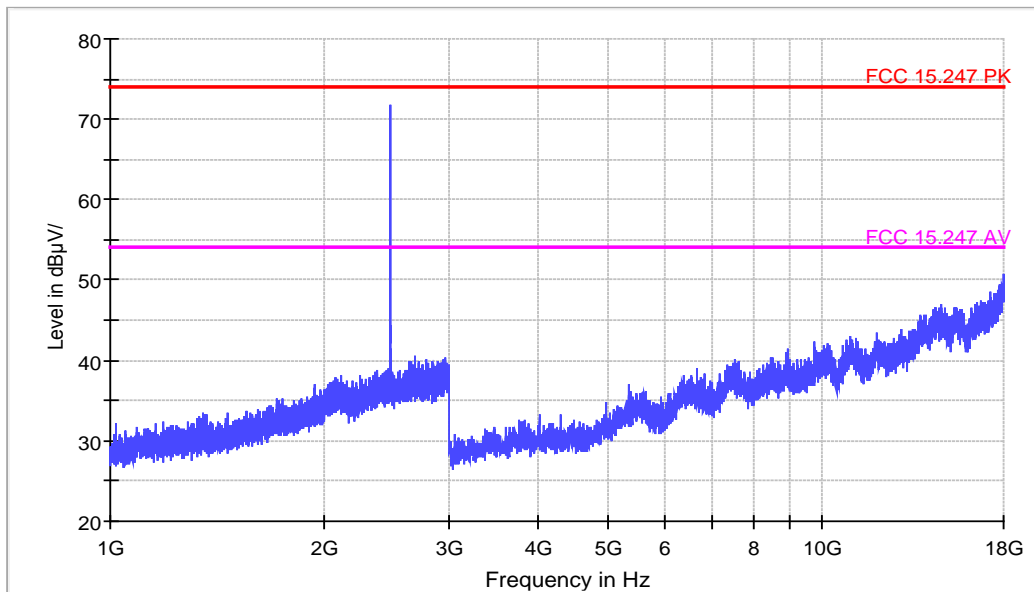
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



4.7 Band Edge Measurements (Conducted)

Conducted band edge measurements at 2390MHz and 2483MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the shielding room and the table lists the corrected levels of the emissions at the band edge for comparison to the limit.

4.7.1 Test Data

The EUT LITPro complied with the FCC Part 15.247 Conducted band edge emissions requirements.

Table 16 and 17 provides the test results for Conducted band edge emissions.

4.7.2 Areas of Concern

None.

Table 16: Band Edge Measurements for U3 (Conducted)

Test Mode:CH0: 2402MHz

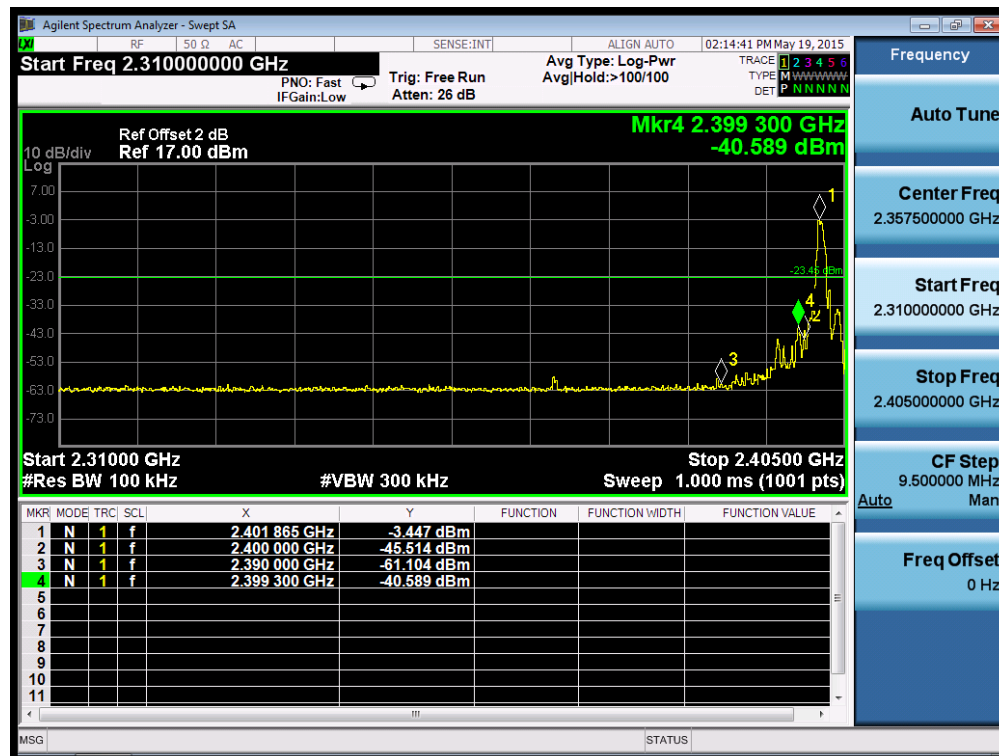


Test Mode:CH39: 2480MHz

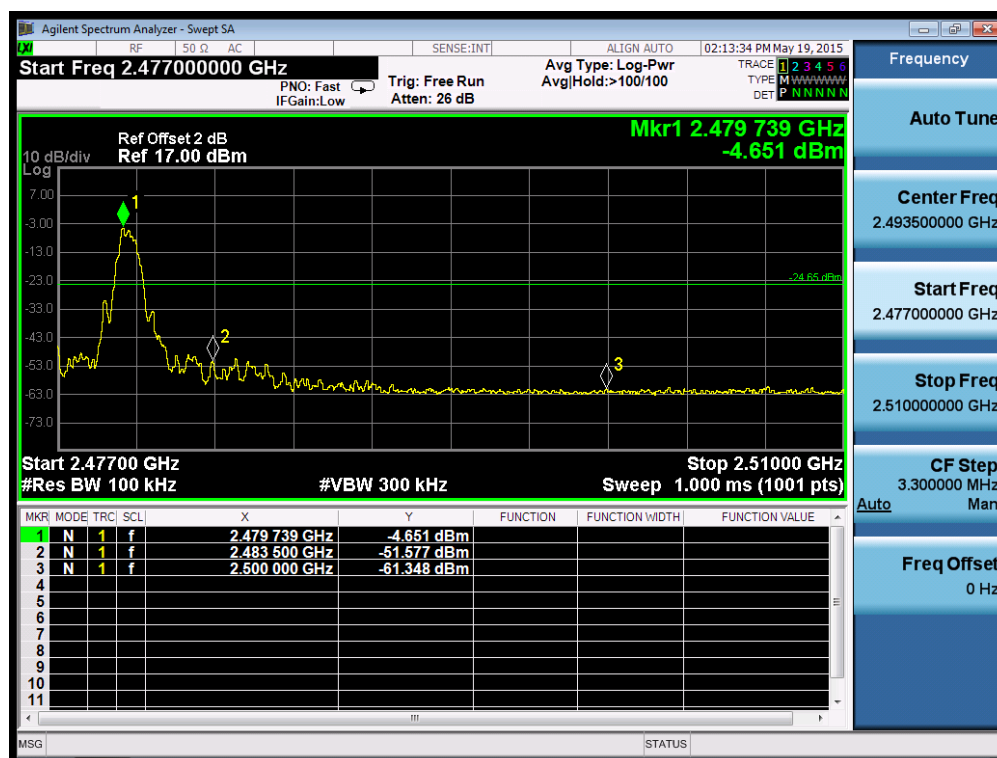


Table 17: Band Edge Measurements for U5 (Conducted)

Test Mode:CH0: 2402MHz



Test Mode:CH39: 2480MHz



4.8 Band Edge Measurements (Radiated)

Radiated band edge measurements at 2390MHz and 2483MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 1 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz for average levels).

4.8.1 Test Data

The EUT LITPro complied with the FCC Part 15.247 Radiated band edge emissions requirements.

Table 18 19 and 20 provides the test results for Radiated band edge emissions.

4.8.2 Areas of Concern

None.

Table 18: Band Edge Measurements for U3 (Radiated)

2402/H	<p>FCC Electric Field Strength 2.4GHz Bandedge-PK</p> <p>2.402311500 GHz 85.687 dBµV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p>																														
2402/V	<p>FCC Electric Field Strength 2.4GHz Bandedge-PK</p> <p>2.402197500 GHz 79.744 dBµV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p>																														
	<table><tr><th>Frequency (MHz)</th><th>Result (dBuV/m)</th><th>Limit (dBuV/m)</th><th>Margin (dB)</th><th>Antenna</th><th>Remark</th></tr><tr><td>2399.2</td><td>45.33</td><td>74</td><td>28.67</td><td>H</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>H</td><td>Average</td></tr><tr><td>2390.1</td><td>44.03</td><td>74</td><td>29.97</td><td>V</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>V</td><td>Average</td></tr></table>	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark	2399.2	45.33	74	28.67	H	Peak	--	--	--	--	H	Average	2390.1	44.03	74	29.97	V	Peak	--	--	--	--	V	Average
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark																										
2399.2	45.33	74	28.67	H	Peak																										
--	--	--	--	H	Average																										
2390.1	44.03	74	29.97	V	Peak																										
--	--	--	--	V	Average																										

2480/H

FCC Electric Field Strength 2.4GHz Bandedge-PK

The plot shows the electric field strength in dBμV/ versus frequency in MHz. The y-axis ranges from 30 to 100 dBμV/ in increments of 10. The x-axis ranges from 2478 to 2510 MHz in increments of 5. A blue line represents the measured signal, which peaks at 2.479660800 GHz with a level of 84.937 dBμV/. A vertical purple line is positioned at approximately 2483.5 MHz. Two horizontal reference lines are shown: a red line at 74 dBμV/ labeled 'FCC 15.247 PK' and a magenta line at 54 dBμV/ labeled 'FCC 15.247 AV'.

2480/V

FCC Electric Field Strength 2.4GHz Bandedge-PK

The plot shows the electric field strength in dBμV/ versus frequency in MHz. The y-axis ranges from 30 to 100 dBμV/ in increments of 10. The x-axis ranges from 2478 to 2510 MHz in increments of 5. A blue line represents the measured signal, which peaks at 2.479718400 GHz with a level of 81.713 dBμV/. A vertical purple line is positioned at approximately 2483.5 MHz. Two horizontal reference lines are shown: a red line at 74 dBμV/ labeled 'FCC 15.247 PK' and a magenta line at 54 dBμV/ labeled 'FCC 15.247 AV'.

Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark
2483.5	44.06	74	29.94	H	Peak
--	--	--	--	H	Average
2483.5	43.01	74	30.99	V	Peak
--	--	--	--	V	Average

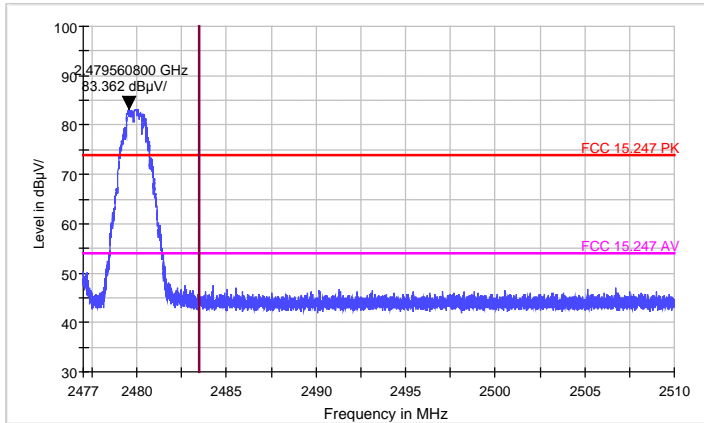
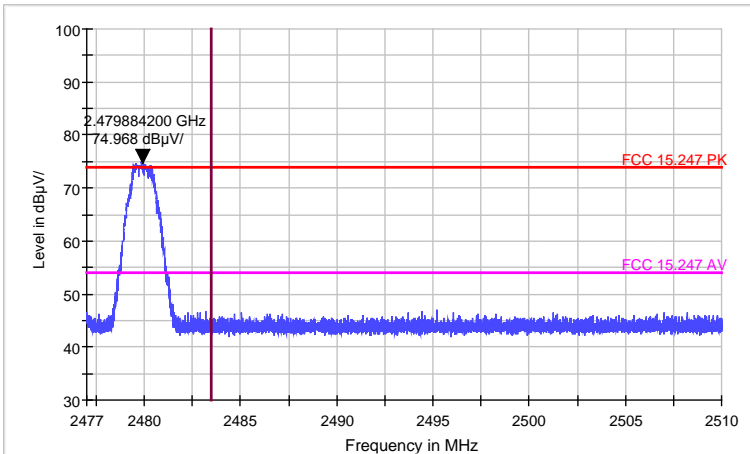
Table 19:Band Edge Measurements for U5 (Radiated)

2402/H	<p>FCC Electric Field Strength 2.4GHz Bandedge-PK</p> <p>2.402007500 GHz 82.125 dBuV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p> <p>Level in dBuV/</p> <p>Frequency in MHz</p>																														
2402/V	<p>FCC Electric Field Strength 2.4GHz Bandedge-PK</p> <p>2.402007500 GHz 82.574 dBuV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p> <p>Level in dBuV/</p> <p>Frequency in MHz</p>																														
	<table><tr><th>Frequency (MHz)</th><th>Result (dBuV/m)</th><th>Limit (dBuV/m)</th><th>Margin (dB)</th><th>Antenna</th><th>Remark</th></tr><tr><td>2399.2</td><td>55.02</td><td>74</td><td>18.98</td><td>H</td><td>Peak</td></tr><tr><td>2390.2</td><td>41.37</td><td>54</td><td>12.63</td><td>H</td><td>Average</td></tr><tr><td>2390.1</td><td>53.12</td><td>74</td><td>20.88</td><td>V</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>V</td><td>Average</td></tr></table>	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark	2399.2	55.02	74	18.98	H	Peak	2390.2	41.37	54	12.63	H	Average	2390.1	53.12	74	20.88	V	Peak	--	--	--	--	V	Average
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark																										
2399.2	55.02	74	18.98	H	Peak																										
2390.2	41.37	54	12.63	H	Average																										
2390.1	53.12	74	20.88	V	Peak																										
--	--	--	--	V	Average																										

2480/H	<div>FCC Electric Field Strength 2.4GHz Bandedge-PK</div> <p>Level in dBuV/</p> <p>Frequency in MHz</p> <p>2483.54400 GHz 86.261 dBuV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p>																														
2480/V	<div>FCC Electric Field Strength 2.4GHz Bandedge-PK</div> <p>Level in dBuV/</p> <p>Frequency in MHz</p> <p>2483.580800 GHz 83.297 dBuV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p>																														
	<table><tr><th>Frequency (MHz)</th><th>Result (dBuV/m)</th><th>Limit (dBuV/m)</th><th>Margin (dB)</th><th>Antenna</th><th>Remark</th></tr><tr><td>2483.5</td><td>46.02</td><td>74</td><td>27.98</td><td>H</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>H</td><td>Average</td></tr><tr><td>2483.5</td><td>41.25</td><td>74</td><td>32.75</td><td>V</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>V</td><td>Average</td></tr></table>	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark	2483.5	46.02	74	27.98	H	Peak	--	--	--	--	H	Average	2483.5	41.25	74	32.75	V	Peak	--	--	--	--	V	Average
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark																										
2483.5	46.02	74	27.98	H	Peak																										
--	--	--	--	H	Average																										
2483.5	41.25	74	32.75	V	Peak																										
--	--	--	--	V	Average																										

Table 20:Band Edge Measurements for U3&U5 (Radiated)

2402/H	<div>FCC Electric Field Strength 2.4GHz Bandedge-PK</div> <p>Level in dBuV/</p> <p>Frequency in MHz</p> <p>2.404221000 GHz 84.249 dBuV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p>																														
2402/V	<div>FCC Electric Field Strength 2.4GHz Bandedge-PK</div> <p>Level in dBuV/</p> <p>Frequency in MHz</p> <p>2.403793500 GHz 77.907 dBuV/</p> <p>FCC 15.247 PK</p> <p>FCC 15.247 AV</p>																														
	<table><tr><th>Frequency (MHz)</th><th>Result (dBuV/m)</th><th>Limit (dBuV/m)</th><th>Margin (dB)</th><th>Antenna</th><th>Remark</th></tr><tr><td>2399.2</td><td>46.78</td><td>74</td><td>27.22</td><td>H</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>H</td><td>Average</td></tr><tr><td>2390.1</td><td>43.15</td><td>74</td><td>30.85</td><td>V</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>V</td><td>Average</td></tr></table>	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark	2399.2	46.78	74	27.22	H	Peak	--	--	--	--	H	Average	2390.1	43.15	74	30.85	V	Peak	--	--	--	--	V	Average
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark																										
2399.2	46.78	74	27.22	H	Peak																										
--	--	--	--	H	Average																										
2390.1	43.15	74	30.85	V	Peak																										
--	--	--	--	V	Average																										

2480/H	<div>FCC Electric Field Strength 2.4GHz Bandedge-PK</div> 																														
2480/V	<div>FCC Electric Field Strength 2.4GHz Bandedge-PK</div> 																														
	<table><tr><th>Frequency (MHz)</th><th>Result (dBuV/m)</th><th>Limit (dBuV/m)</th><th>Margin (dB)</th><th>Antenna</th><th>Remark</th></tr><tr><td>2483.5</td><td>47.16</td><td>74</td><td>26.84</td><td>H</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>H</td><td>Average</td></tr><tr><td>2483.5</td><td>44.49</td><td>74</td><td>29.51</td><td>V</td><td>Peak</td></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>V</td><td>Average</td></tr></table>	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark	2483.5	47.16	74	26.84	H	Peak	--	--	--	--	H	Average	2483.5	44.49	74	29.51	V	Peak	--	--	--	--	V	Average
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark																										
2483.5	47.16	74	26.84	H	Peak																										
--	--	--	--	H	Average																										
2483.5	44.49	74	29.51	V	Peak																										
--	--	--	--	V	Average																										

4.9 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The Bluetooth antenna is an PIFA antenna and the maximum antenna gain of BT used was -4.5 dBi.

-----The End-----