4321823.53 V4.0

FCC Test report for Hue Dimmer Switch, NAM, Hue Dimmer Switch, EU

Models 324131092621 for Hue Dimmer Switch, NAM 324131137411 for Hue Dimmer Switch, EU

Guangzhou, date of issue: 2015-05-27

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By order of Philips Lighting Company at New Jersey, US

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1 CONCLUSION

The device under test (DUT) as mentioned in this report complies with the stated requirements of the FCC Part 15, Subpart C.

FCC ID: CIW-9290011736X

The test results in this report belong to model 324131092621, and the results are also representative for model 324131137411.

The conclusion and results stated in this test report are based on a non-recurrent examination of sample(s) provided by the applicant.

The tests described in this report do not result in the right to use any approval mark as conferred by DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch As far as the tests were based on certain specifications; these are mentioned in the report.

2 SUMMARY

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

2.1 Applied standards

Standard	Year	Title
FCC part 15, Subpart C	2014	Federal Communications Commission (FCC) – Radio Frequency Devices

2.2 Reference standards

Standard	Year	Title
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
FCC/KDB-558074 D01 v03r02	2014	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247

2.3 Overview of results

Test Item	Standard	Result
Antenna requirement	FCC PART 15 C section 15.247 (c) and Section 15.203	PASS
6 dB Bandwidth	FCC PART 15 C section 15.247 (a)(2)	PASS
Maximum Peak Output Power	FCC PART 15 C section 15.247(b)(3)	PASS
Peak Power Spectral Density	FCC PART 15 C section 15.247(e)	PASS
Conducted Spurious Emission (30MHz to 25GHz)	FCC PART 15 C section 15.209 &15.247(d)	PASS
Radiated Spurious Emission 30 MHz to 25 GHz)	FCC PART 15 C section 15.209 &15.247(d)	PASS
Band Edges Measurement	FCC PART 15 C section 15.247 (d) &15.205	PASS

Remark:
EUT: In this whole report EUT means Equipment Under Test.
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radio Frequency.

3 GENERAL INFORMATION

3.1 Model description

The apparatus as supplied for the test is Hue Dimmer Switch, NAM, Hue Dimmer Switch, EU model 324131092621 intended for residential use, the product contains electronic control circuitry and powered by 3Vdc (CR2450 Button cell Battery).

According to customer's declaration,

1) Model 324131092621 is identical to model 324131137411 except for the model designation and silkscreen of the button.

2) The characteristics of device are:

Operating Frequency	2405 MHz – 2480 MHz	
Operating Temperature Range	-5 – 45 ℃	
Antenna Assembly	Type	Internal, PCB antenna
	Gain	Maximum 2,99 dBi
Modulation Type	O-QPSK	
Adaptivity	Adaptive	

Hence, model 324131092621 was chosen for full testing, and the corresponding data is representative of the model 324131137411.

Figure 1 Model 324131092621

The operating modes as stated in the user manual are On and OFF mode.

3.2 Product Information

Equipment under test	Hue Dimmer Switch, NAM, Hue Dimmer Switch, EU
Trade mark	PHILIPS
Tested Type	324131092621
Represented type(s)	324131137411
Rating	3Vdc (CR2450 Button cell Battery)

3.3 Customer Information

Applicant	Philips Lighting Company
Contact person	James R Cyre
Telephone	785 8221511
Telefax	785 8221510
Address	A Div of North American Philips Lighting, 200 Franklin Square Drive, Somerset, New Jersey

Manufacturer	AZ e-lite Pte Ltd.
Contact person	Jason Saw
Telephone	+65 6594 2277
Telefax	+65 6749 1198
Address	31 Ubi Road 1 Aztech Building

Factory	Aztech Communication Device (DG) Ltd.
Contact person	Sam Jiang
Telephone	+86 769 83936688
Telefax	+86 769 8393 1138
Address	Jiu Jiang Shui Village, Chang Ping Town

3.4 Product labeling

According to section 15.19, the DUT shall have the following statement labeled to its housing on a conspicuous location:

“This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation”.

3.5 User information

The user- or instruction manual shall:

Caution the user that changes or modifications not expressly approved by the responsible party for compliance could void the user’s authority to operate the equipment.

Inform the user about special RF emission protection measures, which are delivered with the product, for example shielded cables.

4 TEST INFORMATION

4.1 Test configuration

Requirements:	15.31(e): For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery. 15.32: Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested as follows: Testing shall be in accordance with the procedures specified in Section 15.31 of this part.
Test frequencies and frequency range:	According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table: According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

Frequency range of radiated emission measurements

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

EUT channels and frequencies list:

Channel	**Frequency (MHz)**
0	2405
1	2410
2	2415
3	2420
4	2425
5	2430
6	2435
7	2440
8	2445
9	2450
10	2455
11	2460
12	2465
13	2470
14	2475
15	2480

The device was modified, which can select the channel and transmitting continuously. Test frequencies are lowest channel: 2405 MHz, middle channel: 2440MHz and highest channel: 2480 MHz

4.2 Special accessories of the EUT

None.

4.3 Assistant equipment used on the test

None.

4.4 Test laboratory

Location	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch
Registration Number	245651
Address	Building A3, No.3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P.R. China
Date	2015-03-20 to 2015-03-31
Supervised by	Daniel He

4.5 Test facility

The semi-anechoic chamber test site and corresponding measurement facility are located at the premises of DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch.

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSV	SN101012	2014/09/11	1 Year
3	RF Cable	/	/	/	2014/09/11	1 Year
4	Temp & Humi Programmable Chamber	ESPEC	EL-10KA	08107561	2014/06/16	1 Year
5	DC Power Source	APC	ADL-100V-50A	D31102J076	2014/06/24	1 Year

4.6 Environmental conditions

Tests have been performed in a controlled laboratory environment, where the environmental conditions are maintained within the applicable ranges.

Ambient temperature	15 °C – 25 °C
Relative Humidity air	30% - 60%

4.7 Measurement Uncertainty

Test Item	Uncertainty
Occupied Channel Bandwidth	±0,7%
RF Output power, conducted	±0,6dB
Power Spectral Density, Conducted	±0,6dB
Unwanted Emissions, Conducted	±0,7dB
DC and Low frequency voltage	±0,5%
Uncertainty for Radiation Emission test	±3,32dB

Remark：

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5 ANTENNA REQUIREMENT

5.1 Standard equipment

15.203 requirement:

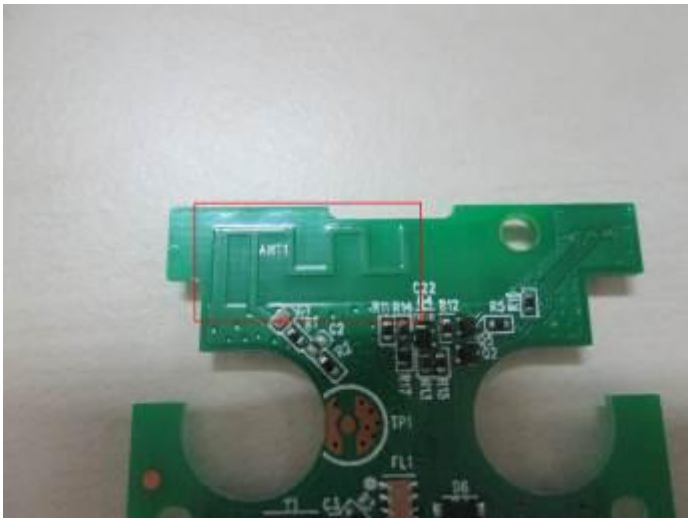
For intentional device. According to 15.203. an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna

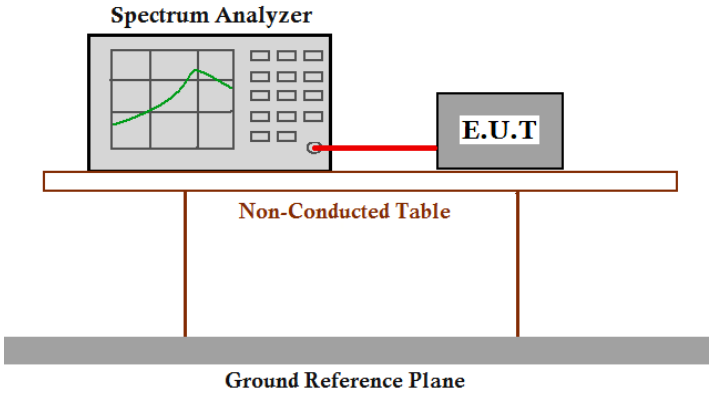
The antenna is PCB Layout antenna and no consideration of replacement. The best case gain of the antenna is 2,99dBi



Test result: The unit does meet the FCC requirements.

6 OCCUPIED BANDWIDTH

Test Requirement:	FCC Part 15 C section 15.247 (a)(2)Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	FCC/KDB-558074 D01 v03r02 Clause 8.1
Test Status:	Enter test mode for the product. Test in Channel lowest (2405MHz), middle (2440MHz) and highest (2480MHz), keep in continuously transmitting status.
Test Configuration:	



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable
   (cable loss =1.5dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW=100KHz. VBW = 300KHz. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Set span to encompass the entire emission bandwidth of the signal.
3. Mark the peak power frequency and -6dB (upper and lower) power frequency.
4. Repeat until all the test status is investigated.

Results

99% bandwidth (MHz)

Channel No.	Frequency (MHz)	Mode	**99% bandwidth(MHz)** Limit
0	2405	O-QPSK	2,401
7	2440		2,317
15	2480		2,304

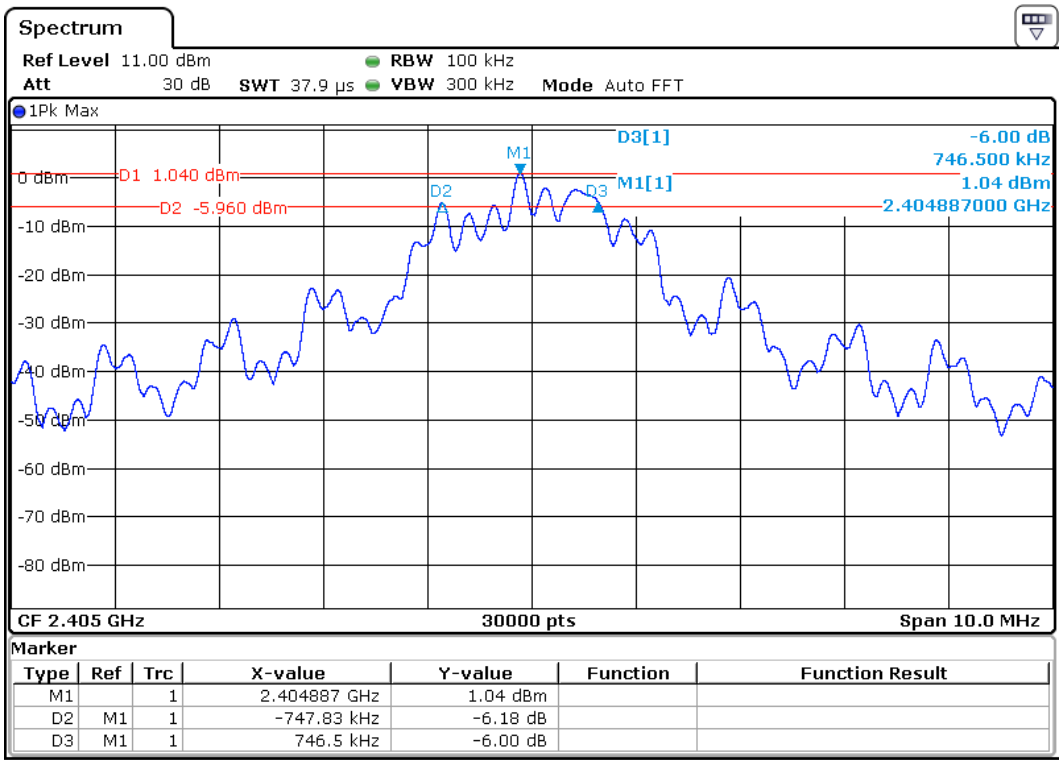
-6dB down points bandwidth (MHz)

Channel No.	Frequency (MHz)	Mode	Measured 6dB bandwidth (kHz)	Limit (KHz)	Conclusion
0	2405	O-QPSK	1494,33	≥500KHz	PASS
7	2440		1549,84		PASS
15	2480		1488,00		PASS

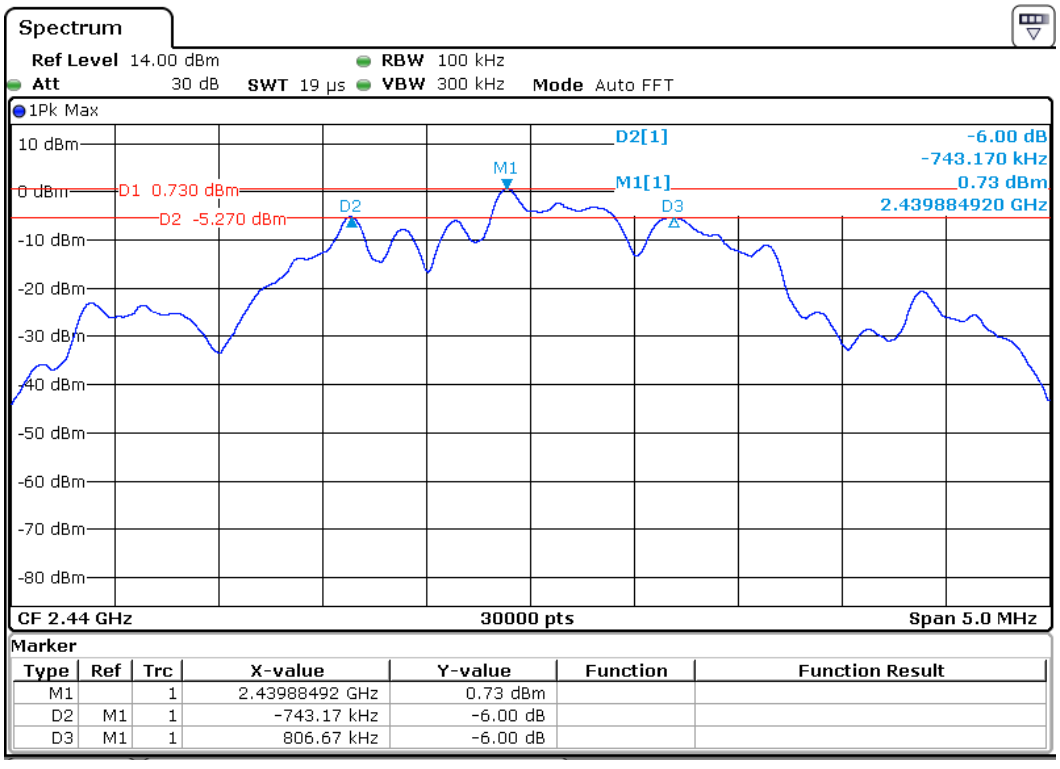
Test result: The unit does meet the FCC requirements.

-6dB down points bandwidth (MHz)

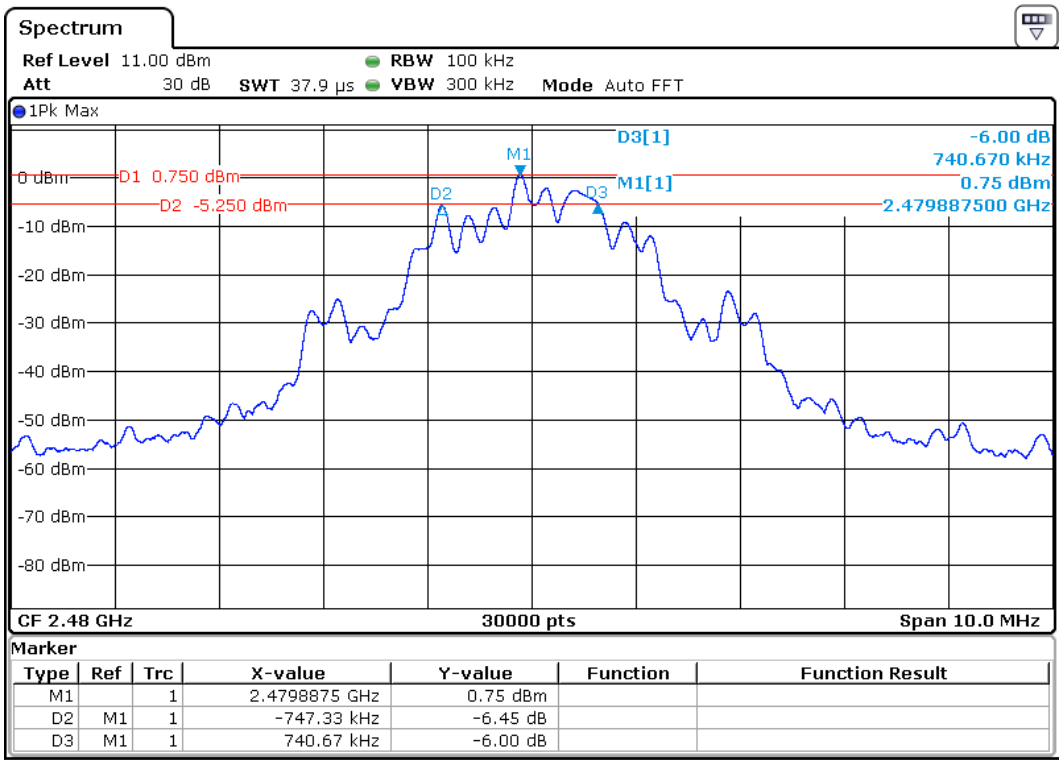
Lowest Channel (2.405 GHz):



Middle Channel (2.440 GHz):



Highest Channel (2.480 GHz):

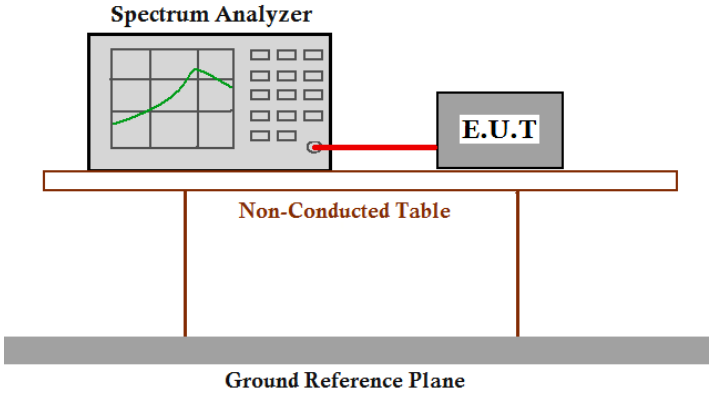


Conclusion:

PASS

7 MAXIMUM PEAK OUTPUT POWER

Test Requirement:	FCC Part 15 C section 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. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1), (b) (2), and (b) (3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
Test Method:	FCC/KDB-558074 D01 v03r02 Clause 9.1.1
Test Status:	Enter test mode for the product. Test in Channel lowest (2405MHz), middle (2440MHz) and highest (2480MHz), keep in continuously transmitting status.
Test Configuration:	



Test Procedure:	

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable

(Cable loss =1.5dB) from the antenna port to the spectrum.

2. Set the RBW≥DTS bandwidth
3. Set the VBW ≥ 3 x RBW
4. Set the span ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Use peak marker function to determine the peak amplitude level.
9. Report the worst case.

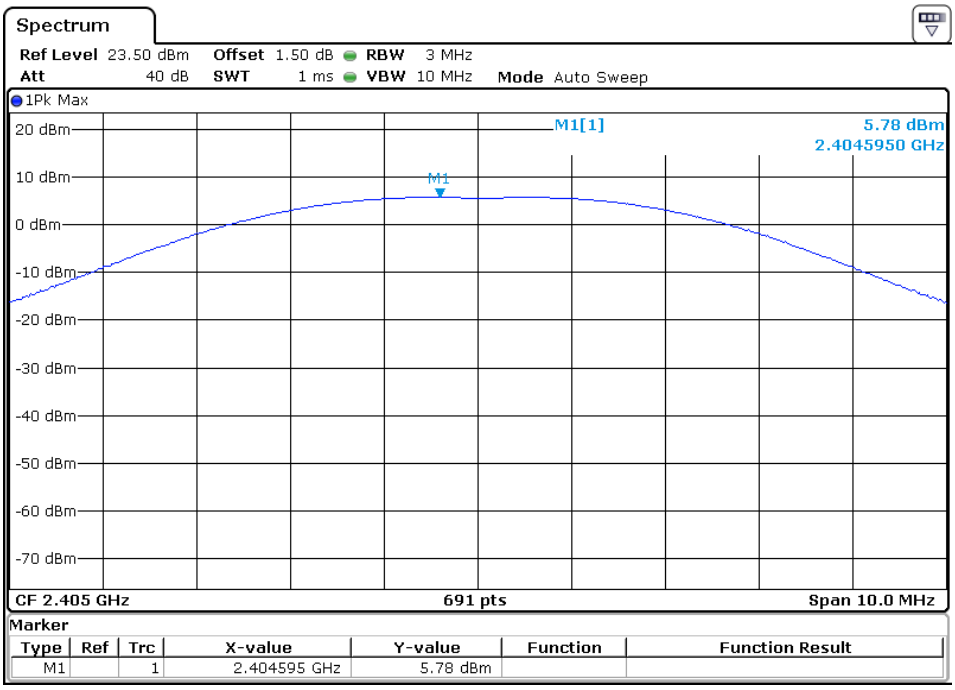
Results

Mode	Frequency (MHz)	Results (dBm)	Limit (dBm)	Margin (dB)	Conclusion
O-QPSK	2405	5,78	1W (30dBm)	-24,22	PASS
	2440	5,63		-24,37	PASS
	2480	5,37		-24,63	PASS

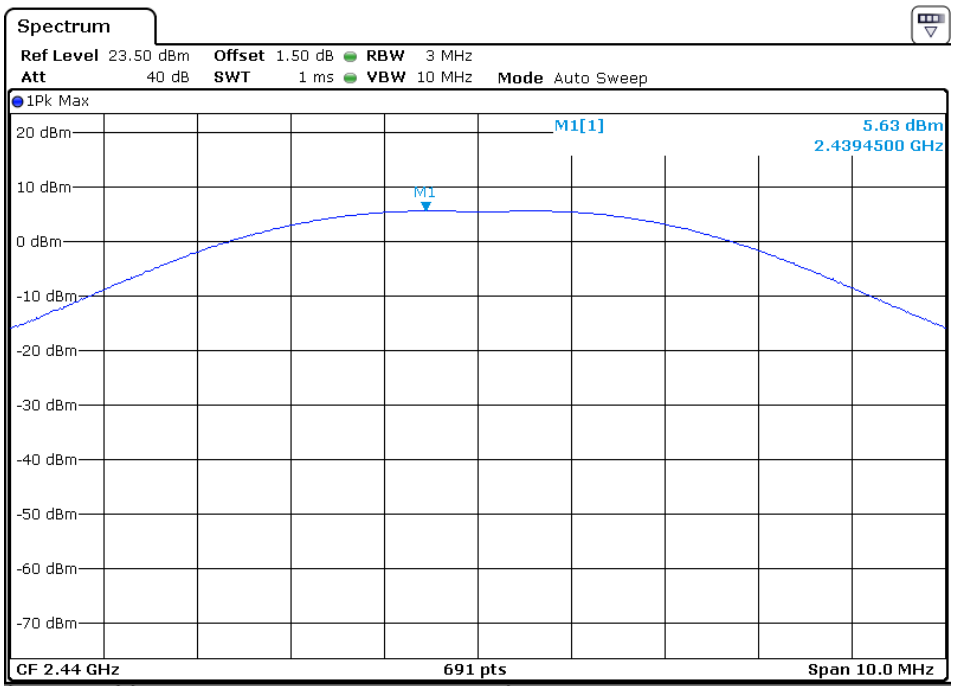
The unit does meet the FCC requirements.

Result plot as follows:

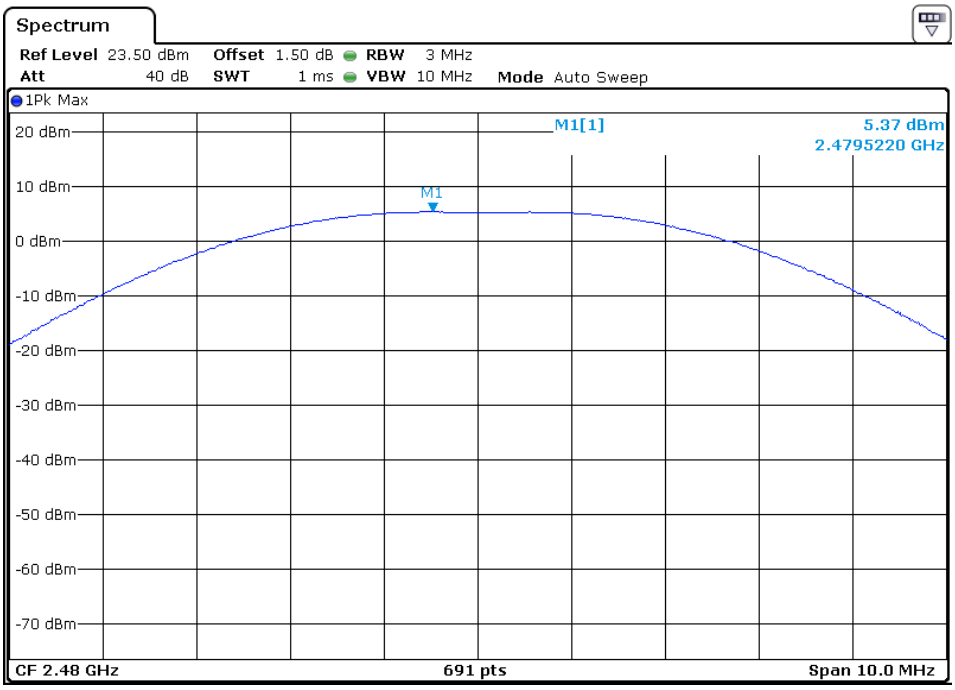
Channel 0:2.405GHz:



Channel 7:2.440GHz:



Channel 15:2.480GHz:

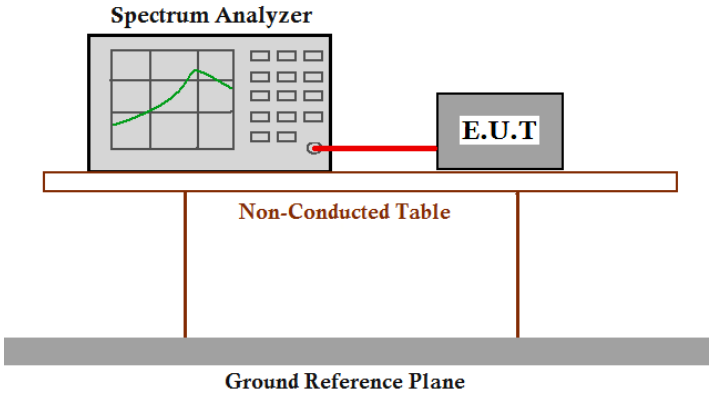


Conclusion:

PASS

8 PEAK POWER SPECTRAL DENSITY

Test Requirement:	FCC Part 15 C section 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.
	This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	ANSI C63.10: Clause 6.11.2.3
Test Status:	Enter test mode for the product. Test in Channel lowest (2405MHz), middle (2440MHz) and highest (2480MHz), keep in continuously transmitting status.
Test Configuration:	



Test Procedure:	

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (cable loss =1.5dB) from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyser:
   a) Set CENTER FREQUENCY = Frequency from Power Spectral Density Test Matrix (see 6.10.2)
   b) Set SPAN = 20 MHz (For devices with a nominal 40 MHz BW, 50 MHz span will be needed)
   c) Set REFERENCE LEVEL = 20 dBm
   d) Set ATTENUATION = 0 dB (add internal attenuation, if necessary)
   e) Set SWEEP TIME = Coupled
   f) Set RBW = 3 kHz
   g) Set VBW = 10 kHz

h) Set DETECTOR = Peak
i) Set MKR = Center Frequency
j) Set TRACE = CLEAR WRITE
Place the radio in continuous transmit mode. Set the TRACE to MAX HOLD, and after the trace stabilizes, the TRACE to VIEW. Set the marker on the peak of the signal and then adjust the center frequency of the spectrum analyzer to the marker frequency.
After viewing the EUT waveform on the spectrum analyzer, perform the following spectrum analyzer
functions to capture the trace:
Set SPAN = 300 kHz
Set SWEEP TIME = 100 s
Set TRACE = MAX HOLD
Set MKR = PEAK SEARCH

3. Measure the Power Spectral Density of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worst case.

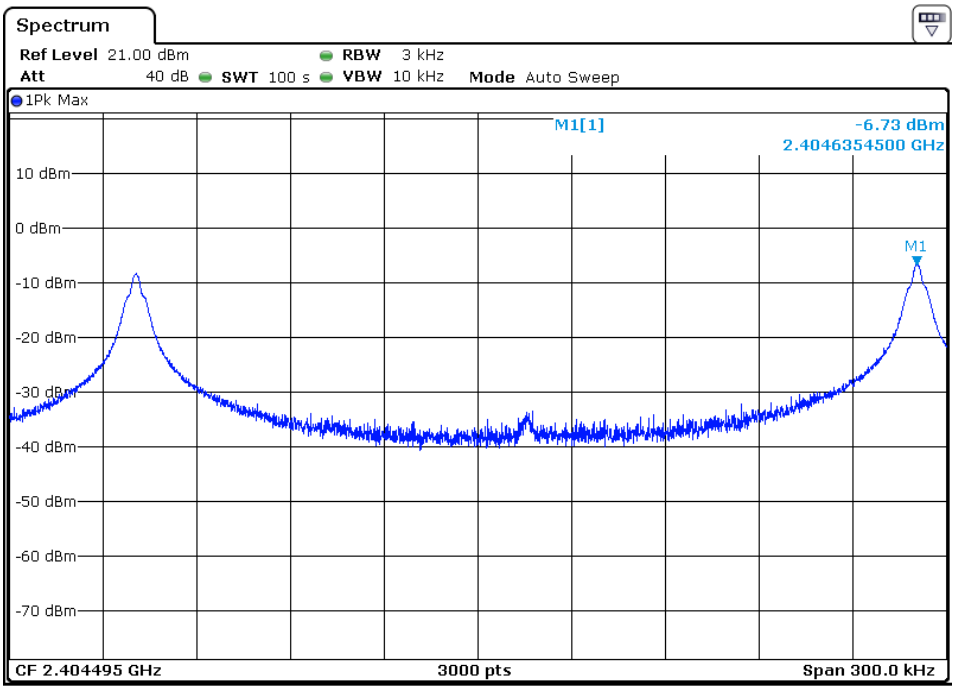
Results

Mode	Frequency (MHz)	Measured Peak Power Spectral Density (dBm/3KHz)	Limit (MHz)	Margin (dB)	Conclusion
O-QPSK	2405	-6,73	8dBm/3KHz	-14,73	PASS
	2440	-6,63		-14,63	PASS
	2480	-5,21		-13,21	PASS

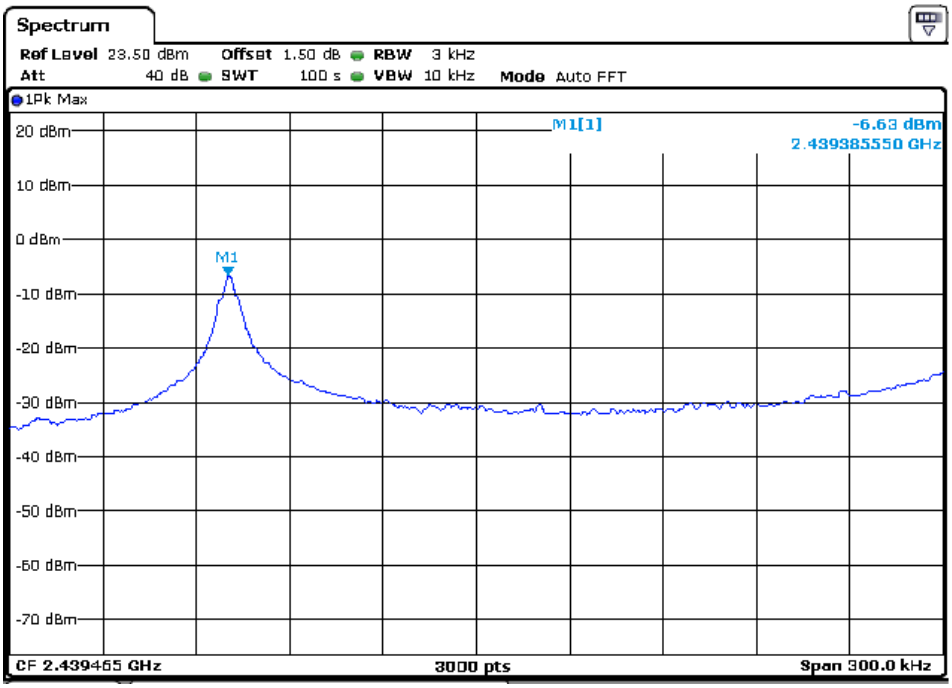
The unit does meet the FCC requirements.

Result plot as follows:

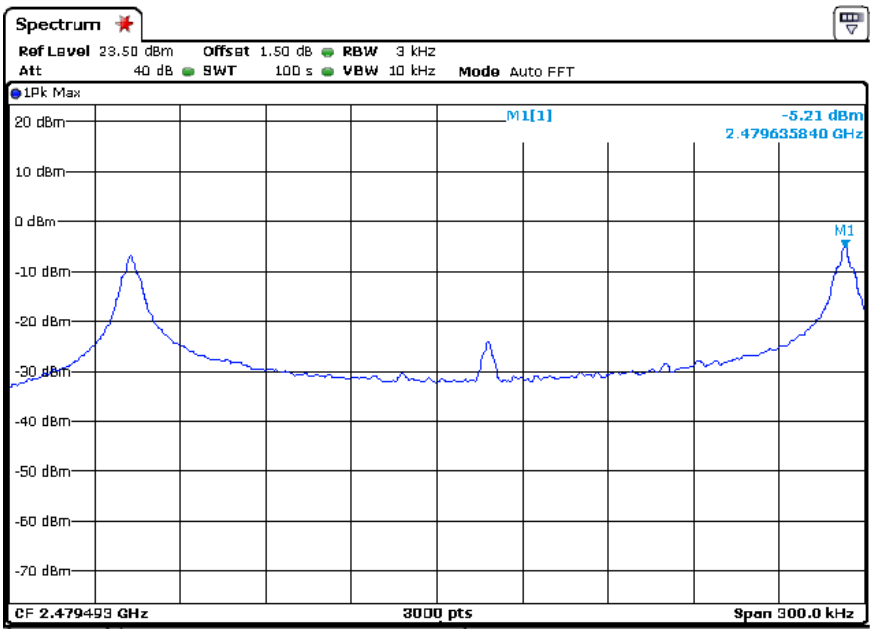
Channel 0:2.405GHz:



Channel 7:2.440GHz:



Channel 15:2.480GHz:

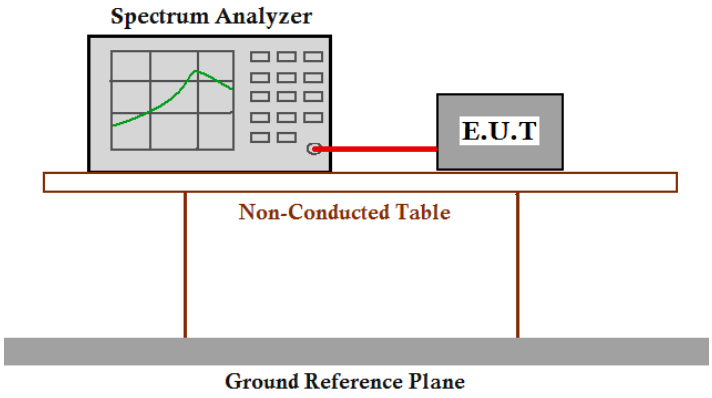


Conclusion:

PASS

9 CONDUCTED SPURIOUS EMISSIONS

Test Requirement:	FCC Part 15 C section 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.
Test Method:	ANSI C63.10: Clause 6.7
Test Status:	Enter test mode for the product. Test in Channel lowest (2405MHz), middle (2440MHz) and highest (2480MHz), keep in continuously transmitting status.
Test Configuration:	

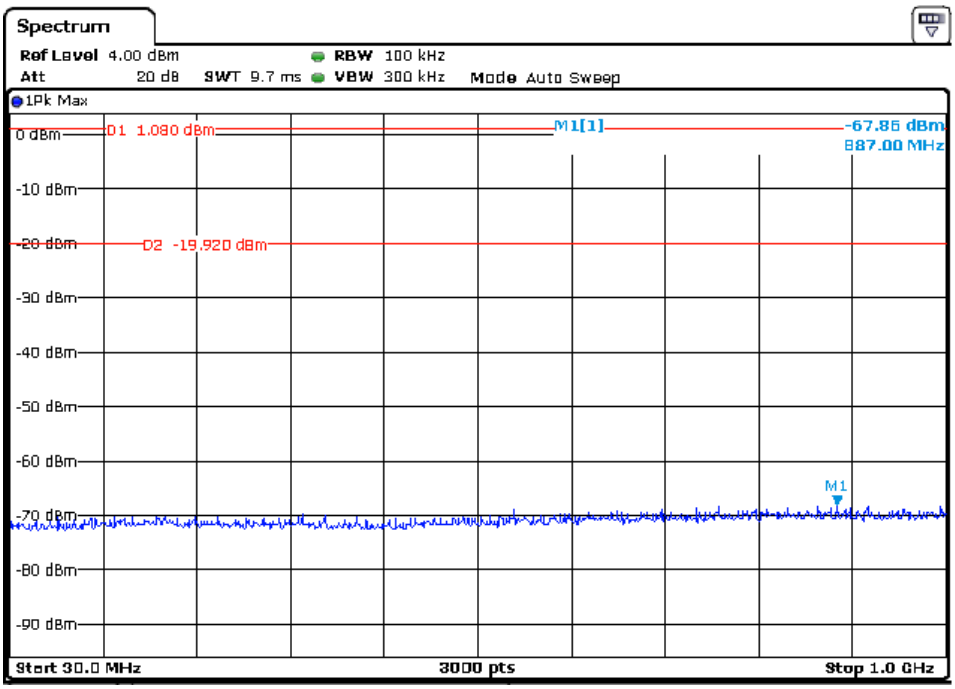


Test Procedure:	

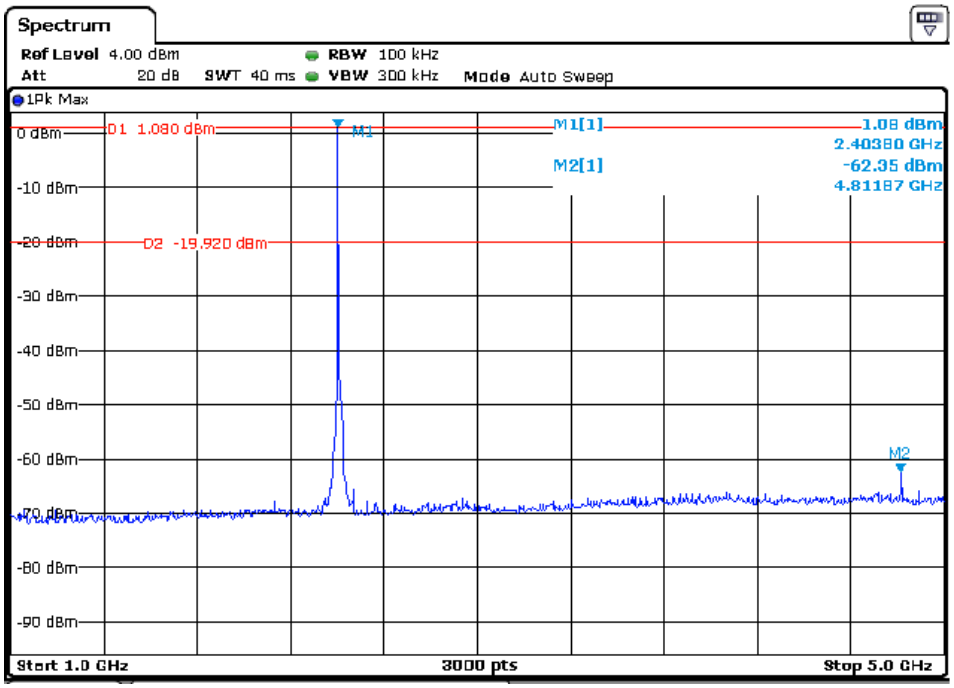
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyser or power meter.
2. Set the spectrum analyser: RBW=100 KHz, VBW = 300KHz. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Scan up through 10th harmonic.
3. Measure the Conducted Spurious Emissions of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worst case.

Result plot as follows:

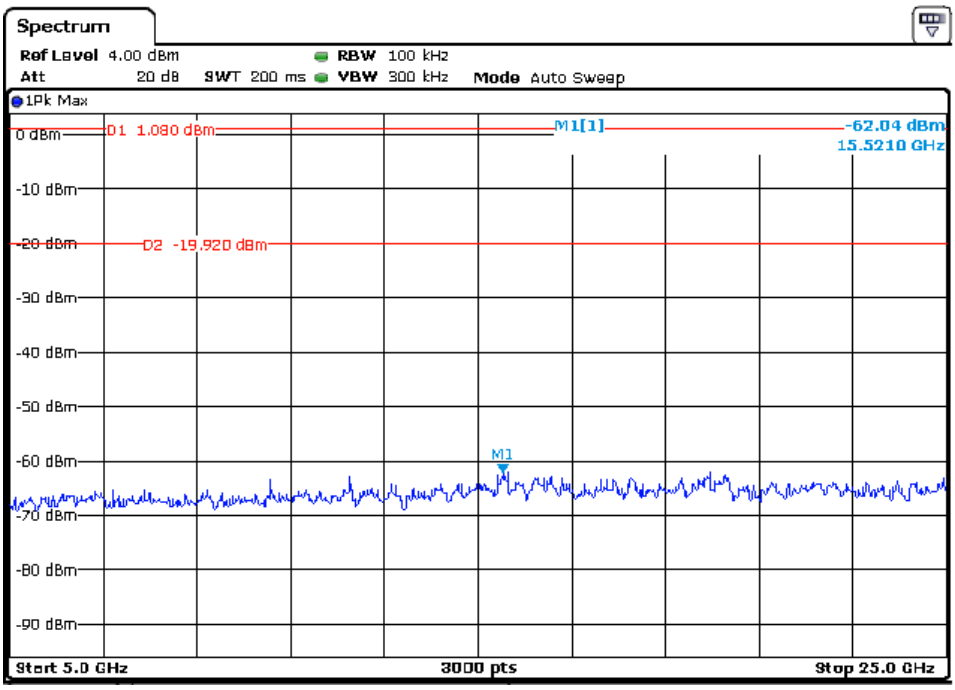
Channel 0:2.405GHz:
30MHz to 1GHz:



1GHz to 5GHz:

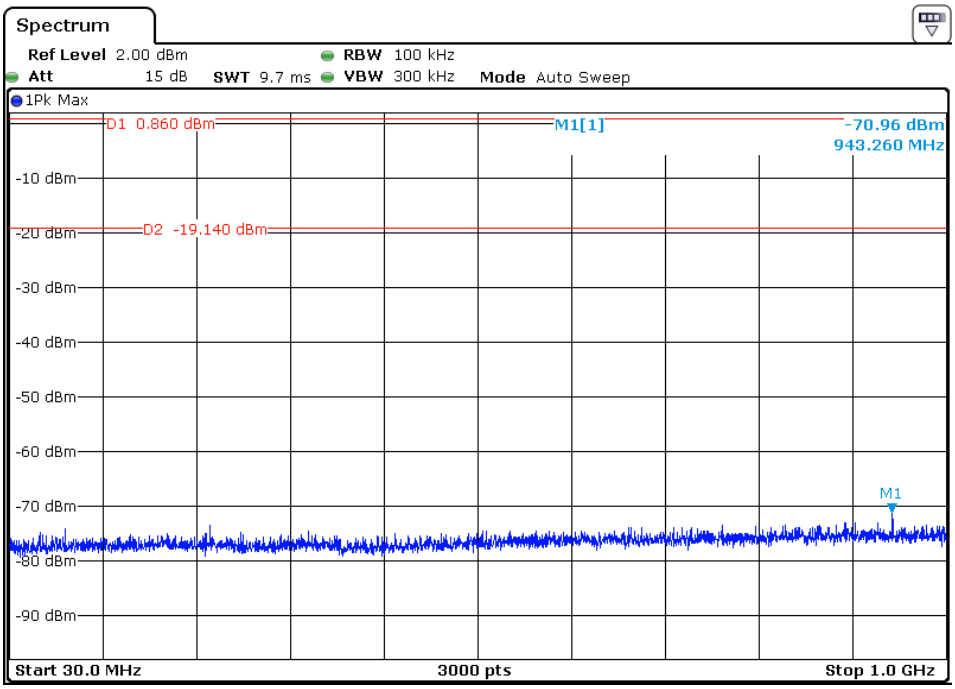


5GHz to 25GHz:

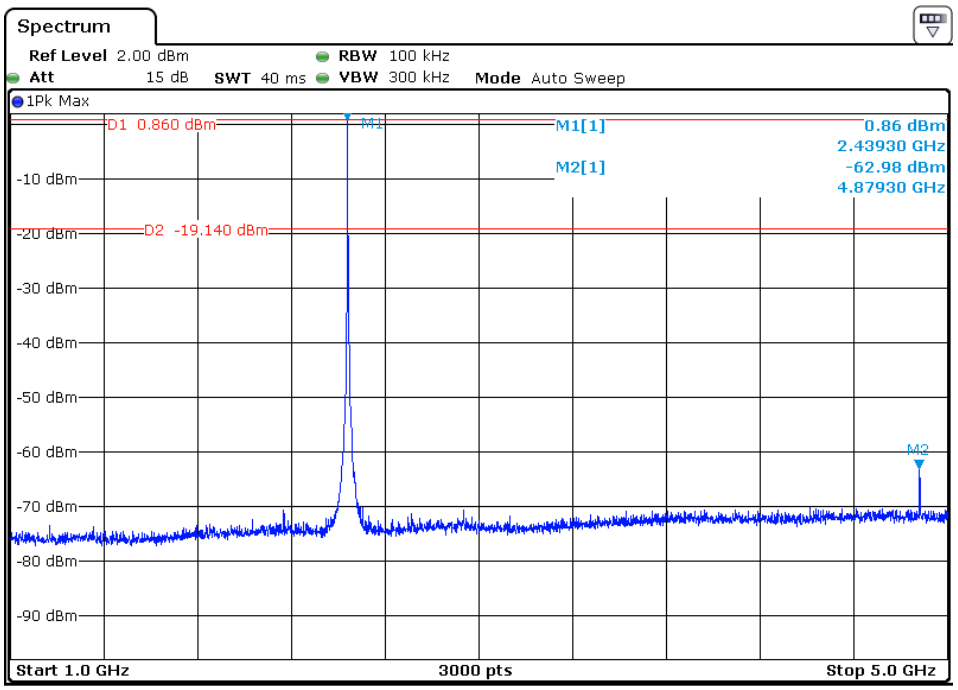


Channel 7:2.440GHz:

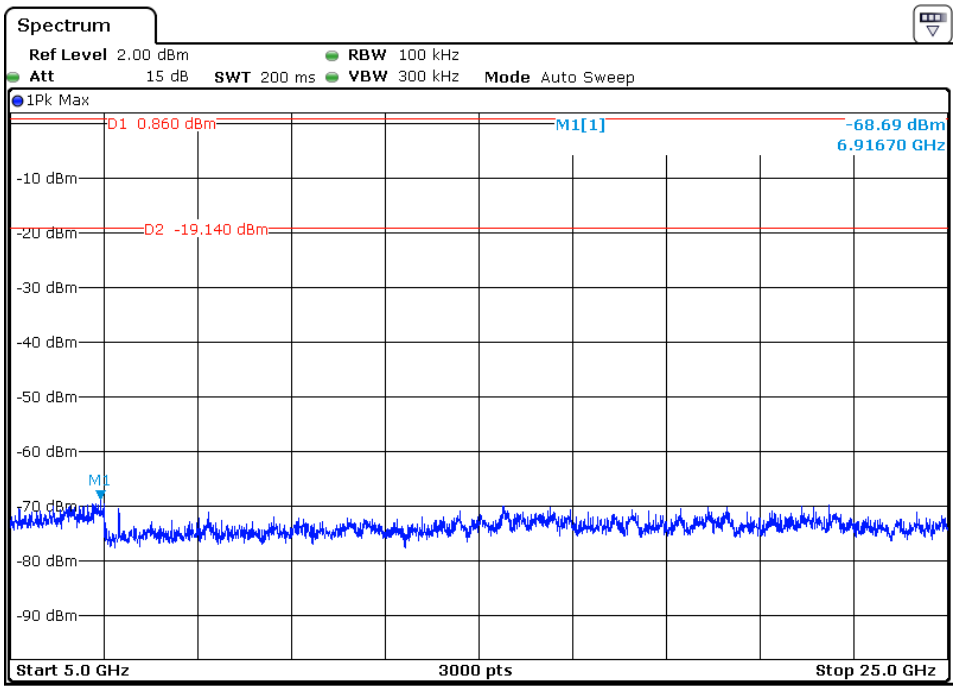
30MHz to 1GHz:



1GHz to 5GHz:

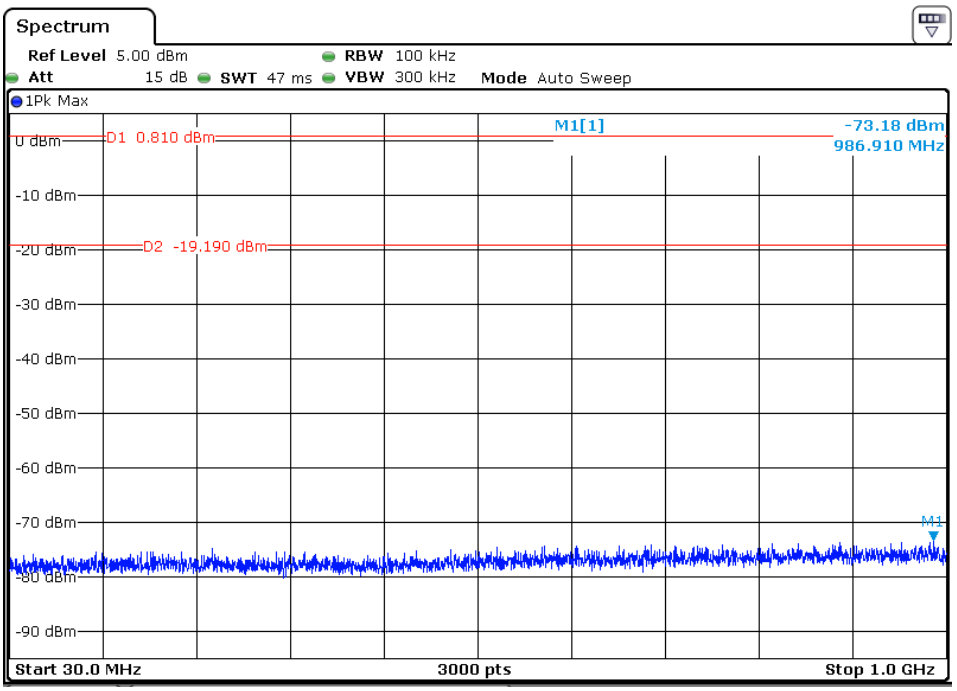


5GHz to 25GHz:

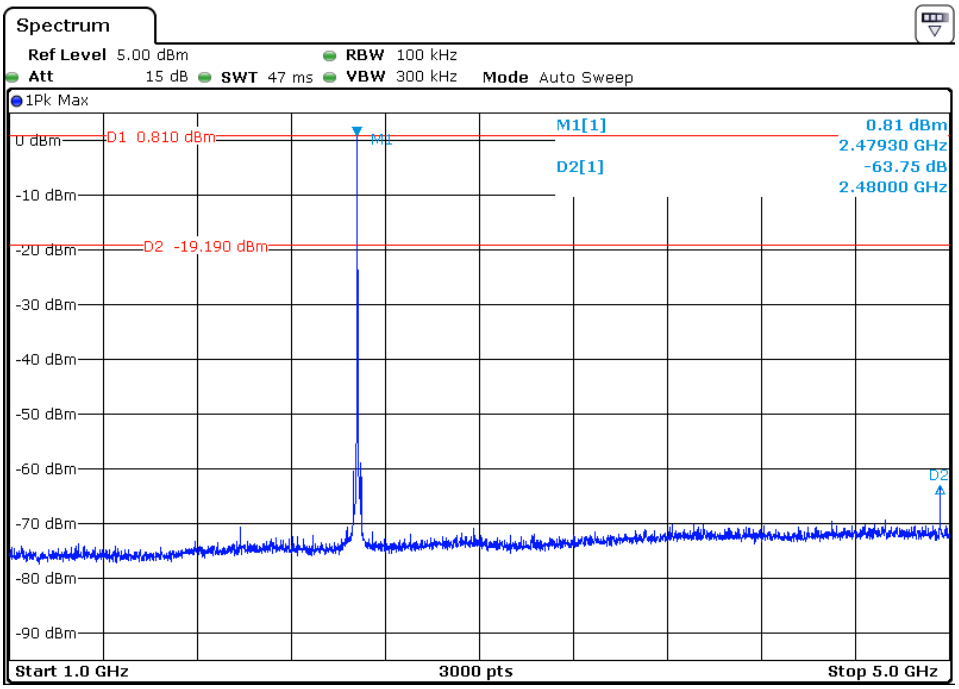


Channel 15:2.480GHz:

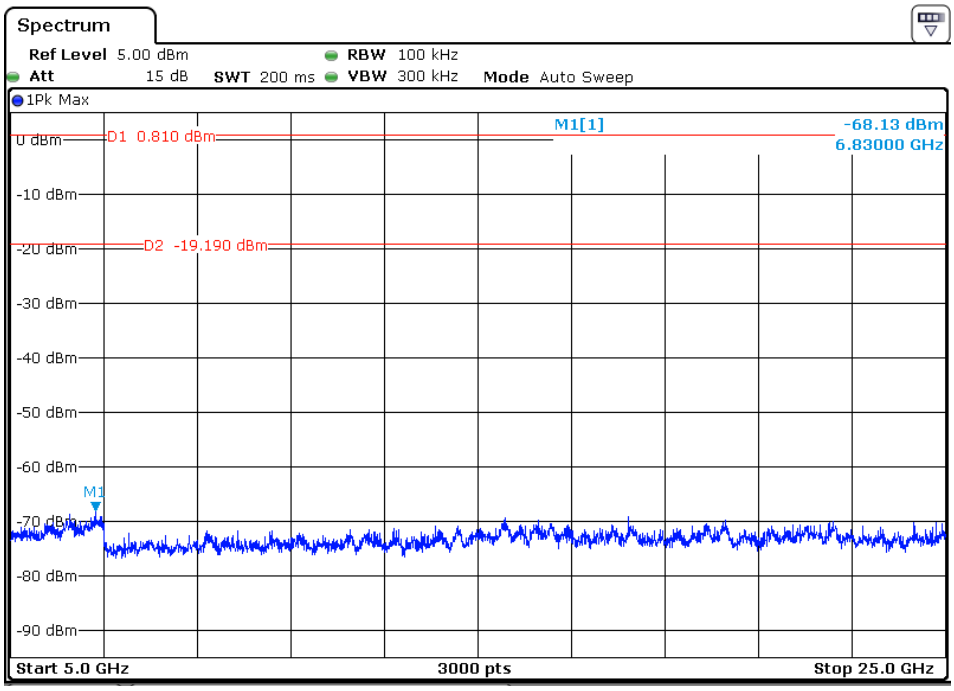
30MHz to 1GHz:



1GHz to 5GHz:



5GHz to 25GHz:



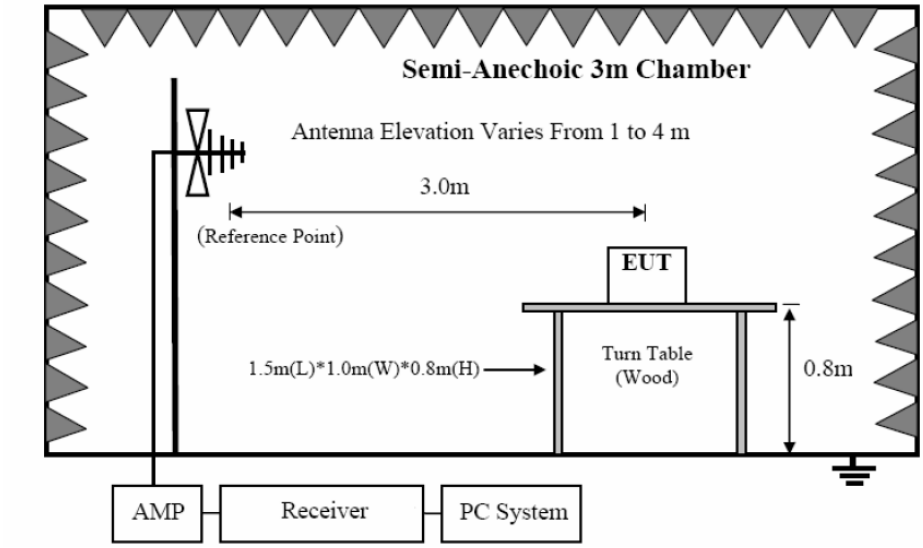
Conclusion:

PASS

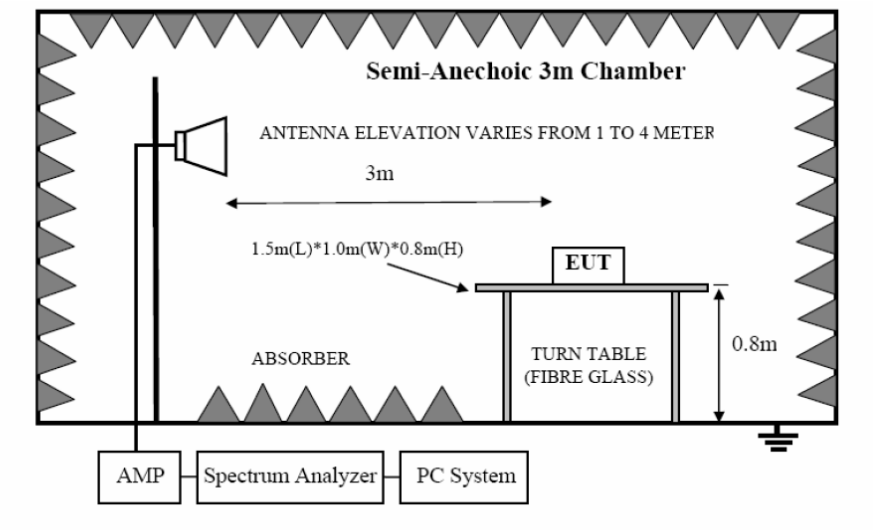
10 RADIATED SPURIOUS EMISSIONS

Test Requirement:	FCC Part 15 C section 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.
Test Method:	ANSI C63.10: Clause 6.4, 6.5 and 6.6
Test Status:	Enter test mode for the product. Test in Channel lowest (2405MHz), middle (2440MHz) and highest (2480MHz), keep in continuously transmitting status.
Test Configuration:	

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

Test Procedure:	

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

The receiver scanned from the lowest frequency generated within the EUT to 25GHz.When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

From 30MHz to 1GHz, read the Quasi-Peak field strength of the emissions with receiver QP detector RBW=120KHz.

Above 1GHz, read the Peak field strength

Read the Peak field strength through RBW=1MHz,VBW=3MHz in spectrum analyzer setting;

For Average field strength according 15.35(a)

15.35(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission

limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

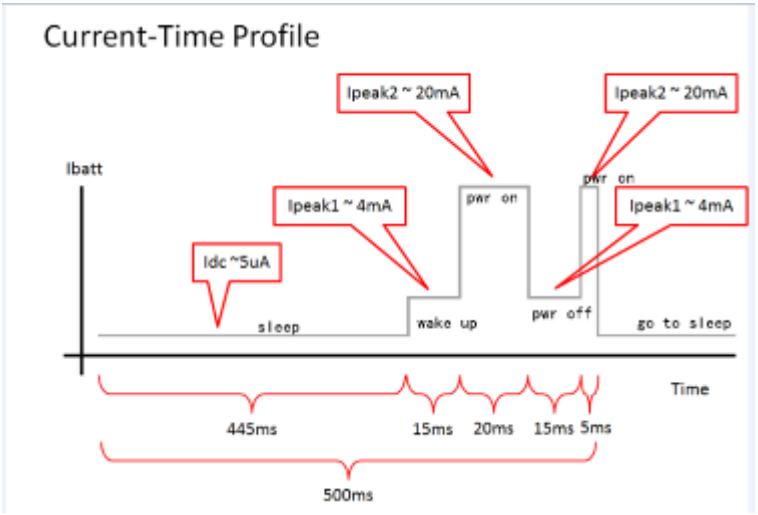
According to 15.35 (b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz, When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.255, and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: **Average = Peak value + 20log (Duty cycle)**, where the duty factor is calculated from following formula:

20log (Duty cycle) = 20log(T_{pulse} (25/100)) = 20log (0.25)= -12.041dB

In an effort to demonstrate compliance with the 15.209 limit.

Duty cycle:

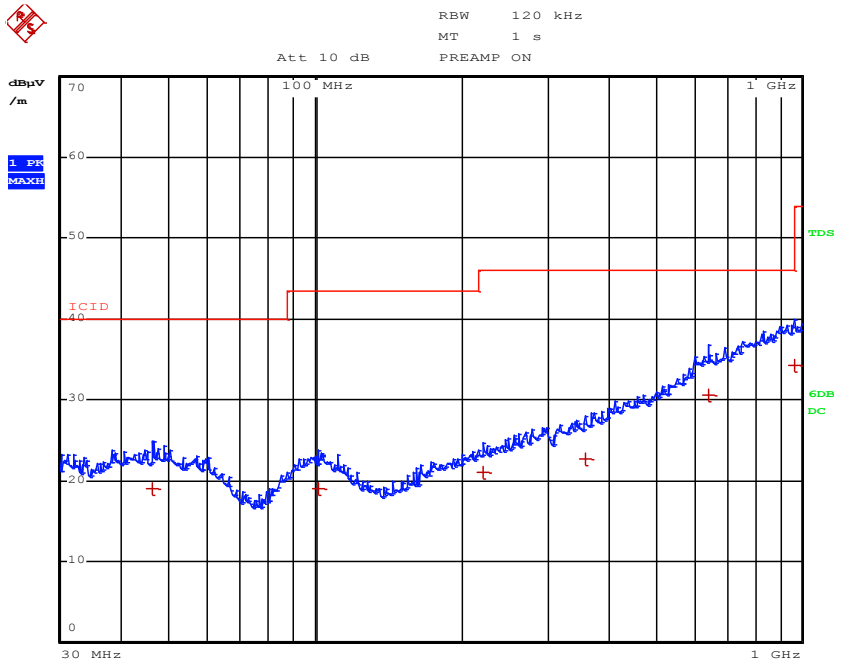


Remark: During test, the device is transmitting continuously, but in the actual use, it has duty cycle.

Results:
Channel 0: 2,405GHz:

30MHz to 1GHz:

Horizontal



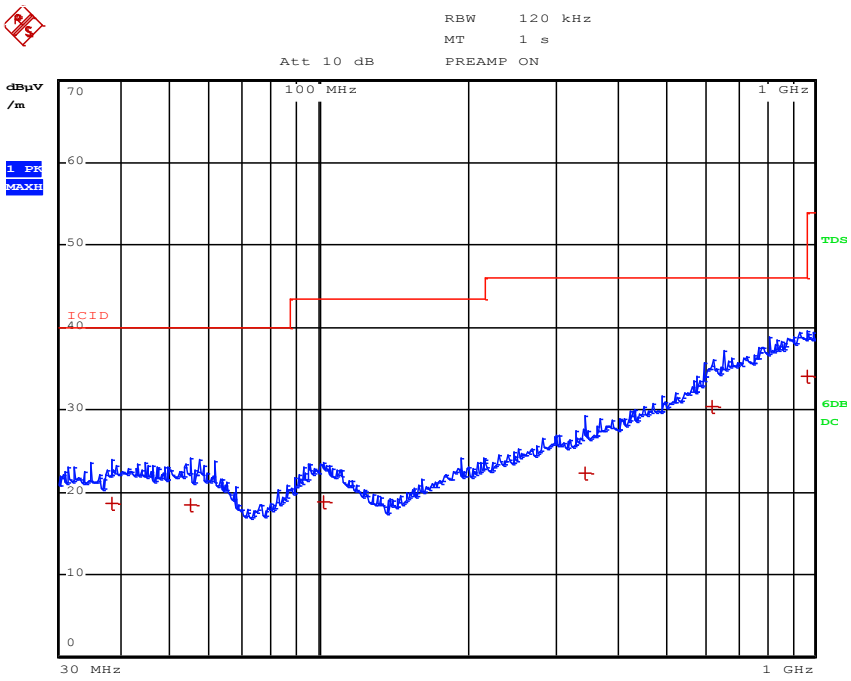
EDIT PEAK LIST (Final Measurement Results)

Trace1:	ICID
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	645.04 MHz	30.50	-15.49
1 Quasi Peak	967.8 MHz	34.22	-19.77
1 Quasi Peak	46.24 MHz	18.95	-21.04
1 Quasi Peak	359.24 MHz	22.75	-23.25
1 Quasi Peak	101.48 MHz	18.99	-24.50
1 Quasi Peak	220.92 MHz	21.04	-24.96

No other significant emissions were measured at the frequency range of interest employing the QP detector.

Vertical



EDIT PEAK LIST (Final Measurement Results)

Trace1:	ICID
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	620.68 MHz	30.36	-15.63
1 Quasi Peak	964.36 MHz	34.15	-19.84
1 Quasi Peak	38.36 MHz	18.69	-21.30
1 Quasi Peak	55.32 MHz	18.53	-21.46
1 Quasi Peak	345.36 MHz	22.36	-23.63
1 Quasi Peak	102.64 MHz	18.83	-24.67

No other significant emissions were measured at the frequency range of interest employing the QP detector.

1GHz to 25GHz:

antenna polarization	Test frequency (MHz)	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	4810,00	62,90	74,00	-11,1	Peak
	7215,00	56,79		-17,21	
	9620,00	52,84		-21,16	
	12025,00	48,62		-25,38	
	14430,00	46,79		-27,21	
	16835,00	45,84		-28,16	
Vertical	4810,00	61,78	74,00	-12,22	Peak
	7215,00	55,89		-18,11	
	9620,00	51,44		-22,56	
	12025,00	48,31		-25,69	
	14430,00	45,86		-28,14	
	16835,00	44,14		-29,86	

antenna polarization	Test frequency	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	4810,00	50,86	54,00	-3,14	Average
	7215,00	44,75		-9,25	
	9620,00	40,80		-13,20	
	12025,00	36,58		-17,42	
	14430,00	34,75		-19,25	
	16835,00	33,80		-20,20	
Vertical	4810,00	49,74	54,00	-4,26	Average
	7215,00	43,85		-10,15	
	9620,00	39,40		-14,60	
	12025,00	36,27		-17,73	
	14430,00	33,20		-20,18	
	16835,00	32,10		-21,90	

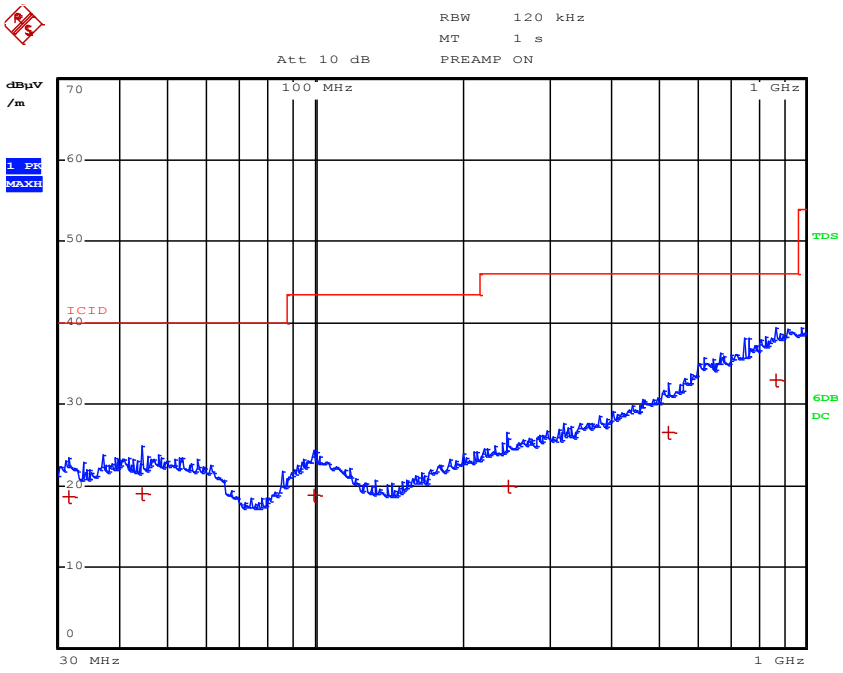
No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Remark: average value for the result above 1GHz is by average factor rather than average detector

Channel 7: 2,440GHz:

30MHz to 1GHz:

Horizontal



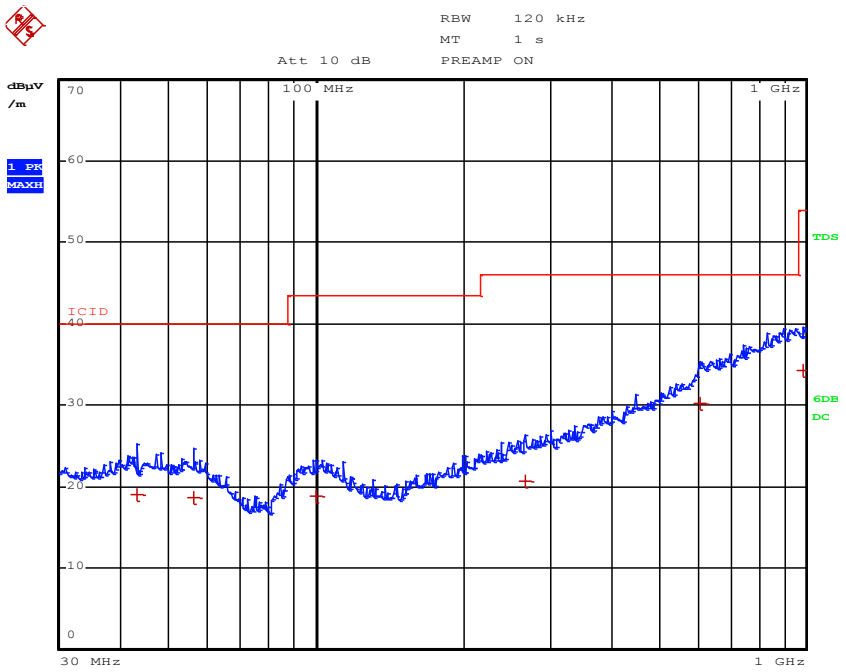
EDIT PEAK LIST (Final Measurement Results)

Trace1:	ICID
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	868.56 MHz	33.01	-12.98
1 Quasi Peak	522.92 MHz	26.49	-19.50
1 Quasi Peak	44.48 MHz	18.93	-21.06
1 Quasi Peak	31.48 MHz	18.65	-21.34
1 Quasi Peak	99.32 MHz	18.86	-24.63
1 Quasi Peak	248.28 MHz	20.02	-25.98

No other significant emissions were measured at the frequency range of interest employing the QP detector.

Vertical



EDIT PEAK LIST (Final Measurement Results)

Trace1:	ICID
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	606.52 MHz	30.18	-15.81
1 Quasi Peak	984.32 MHz	34.24	-19.75
1 Quasi Peak	43.04 MHz	19.02	-20.97
1 Quasi Peak	56.52 MHz	18.59	-21.40
1 Quasi Peak	100.4 MHz	18.91	-24.58
1 Quasi Peak	266.76 MHz	20.65	-25.35

No other significant emissions were measured at the frequency range of interest employing the QP detector.

1GHz to 25GHz:

antenna polarization	Test frequency (MHz)	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	4880,00	62,45	74,00	-11,55	Peak
	7320,00	55,18		-18,82	
	9760,00	51,96		-22,04	
	12200,00	47,53		-26,47	
	14640,00	46,89		-27,11	
	17080,00	44,98		-29,02	
Vertical	4880,00	62,32	74,00	-11,68	Peak
	7320,00	54,96		-19,04	
	9760,00	50,67		-23,33	
	12200,00	47,43		-26,57	
	14640,00	46,25		-27,75	
	17080,00	44,72		-29,28	

antenna polarization	Test frequency	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	4880,00	50,41	54,00	-3,59	Average
	7320,00	43,14		-10,86	
	9760,00	39,92		-14,08	
	12200,00	35,49		-18,51	
	14640,00	34,85		-19,15	
	17080,00	32,94		-21,06	
Vertical	4880,00	50,28	54,00	-3,72	Average
	7320,00	42,92		-11,08	
	9760,00	38,63		-15,37	
	12200,00	35,39		-18,61	
	14640,00	34,21		-19,79	
	17080,00	32,68		-21,32	

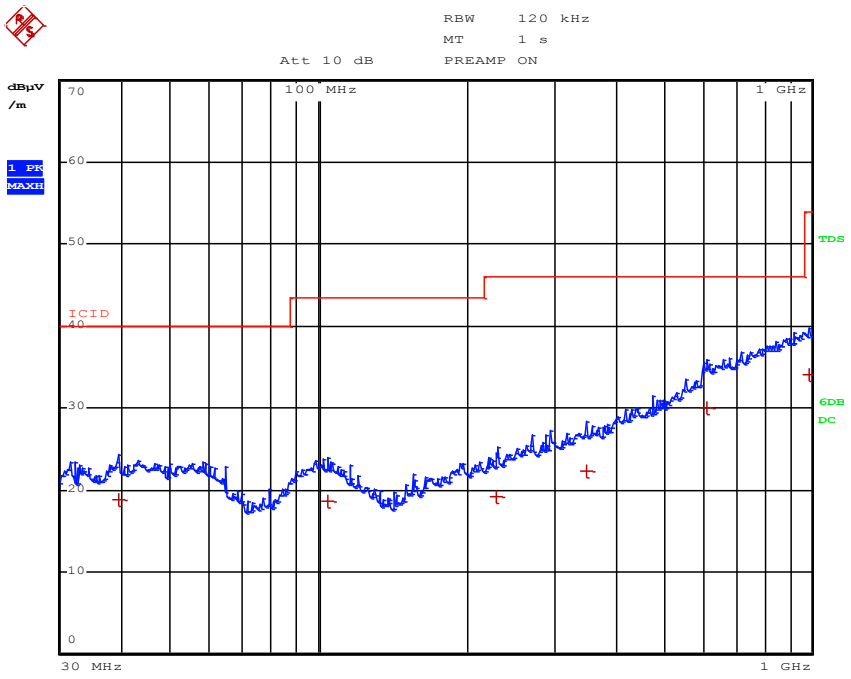
No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Remark: average value for the result above 1GHz is by average factor rather than average detector

Channel 15: 2,480GHz:

30MHz to 1GHz:

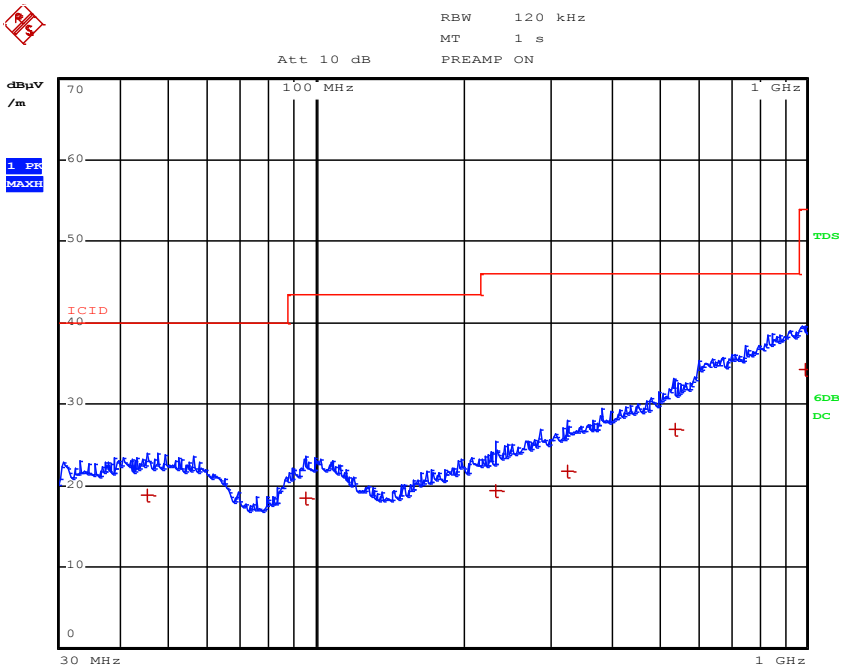
Horizontal



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	ICID		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	612.48 MHz	30.13	-15.86
1 Quasi Peak	985.56 MHz	34.15	-19.84
1 Quasi Peak	39.28 MHz	18.79	-21.20
1 Quasi Peak	348.08 MHz	22.31	-23.68
1 Quasi Peak	104.32 MHz	18.61	-24.88
1 Quasi Peak	229.24 MHz	19.22	-26.77

No other significant emissions were measured at the frequency range of interest employing the QP detector.

Vertical



EDIT PEAK LIST (Final Measurement Results)

Trace1:	ICID
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	539.72 MHz	26.95	-19.04
1 Quasi Peak	995.04 MHz	34.29	-19.70
1 Quasi Peak	45.2 MHz	18.89	-21.10
1 Quasi Peak	325.68 MHz	21.73	-24.26
1 Quasi Peak	95.28 MHz	18.44	-25.05
1 Quasi Peak	233.04 MHz	19.46	-26.53

No other significant emissions were measured at the frequency range of interest employing the QP detector.

1GHz to 25GHz:

antenna polarization	Test frequency (MHz)	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	4960,00	62,20	74,00	-11,8	Peak
	7440,00	54,95		-19,05	
	9920,00	51,82		-22,18	
	12400,00	46,47		-27,53	
	14880,00	45,82		-28,18	
	17360,00	44,35		-29,65	
Vertical	4960,00	62,74	74,00	-11,26	Peak
	7440,00	54,52		-19,48	
	9920,00	51,83		-22,17	
	12400,00	46,11		-27,89	
	14880,00	44,72		-29,28	
	17360,00	43,74		-30,26	

antenna polarization	Test frequency	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	4960,00	50,16	54,00	-3,84	Average
	7440,00	42,91		-11,09	
	9920,00	39,78		-14,22	
	12400,00	34,43		-19,57	
	14880,00	33,78		-20,22	
	17360,00	32,31		-21,69	
Vertical	4960,00	50,70	54,00	-3,30	Average
	7440,00	42,48		-11,52	
	9920,00	39,79		-14,21	
	12400,00	34,07		-19,93	
	14880,00	32,68		-21,32	
	17360,00	31,70		-22,30	

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors

Remark: average value for the result above 1GHz is by average factor rather than average detector

Conclusion:

PASS

11 RADIATED EMISSION MEASUREMENT ON BAND EDGE

Test Requirement:	FCC Part 15 C section 15.247
	(d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10: Clause 6.4, 6.5 and 6.6
Test Status:	Enter test mode for the product. Test in Channel lowest (2405MHz) and highest (2480MHz), keep in continuously transmitting status.
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	40.0 dBμV/m between 30MHz & 88MHz;
	43.5 dBμV/m between 88MHz & 216MHz;
	46.0 dBμV/m between 216MHz & 960MHz;
	54.0 dBμV/m above 960MHz.
Detector:	For PK value: RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz VBW =10Hz Sweep = auto Detector function = peak Trace = max hold

Section 15.205 Restricted bands of operation.
(a) Except as shown 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	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

Results:
Channel 0: 2,405GHz:

antenna polarization	Test frequency (MHz)	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	2310,00	51,74	74,00	-22,26	Peak
	2390,00	50,25		-23,75	
	2483,50	50,12		-23,88	
	2500,00	49,16		-24,84	
Vertical	2310,00	50,56	74,00	-23,44	Peak
	2390,00	49,21		-24,79	
	2483,50	49,94		-24,06	
	2500,00	48,52		-25,48	

antenna polarization	Test frequency (MHz)	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	2310,00	41,24	54,00	-12,76	Average
	2390,00	40,15		-13,85	
	2483,50	40,09		-13,91	
	2500,00	38,96		-15,04	
Vertical	2310,00	40,12	54,00	-13,88	Average
	2390,00	39,18		-14,82	
	2483,50	39,74		-14,26	
	2500,00	39,05		-14,95	

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Channel 15: 2,480GHz:

antenna polarization	Test frequency (MHz)	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	2310,00	50,89	74,00	-23,11	Peak
	2390,00	49,21		-24,79	
	2483,50	49,77		-24,23	
	2500,00	48,65		-25,35	
Vertical	2310,00	50,74	74,00	-23,26	Peak
	2390,00	49,89		-24,11	
	2483,50	48,65		-25,35	
	2500,00	48,41		-25,59	

antenna polarization	Test frequency (MHz)	Measured field strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	2310,00	39,94	54,00	-14,06	Average
	2390,00	38,93		-15,07	
	2483,50	39,12		-14,88	
	2500,00	38,27		-15,73	
Vertical	2310,00	39,47	54,00	-14,53	Average
	2390,00	38,25		-15,75	
	2483,50	39,14		-14,86	
	2500,00	38,25		-15,75	

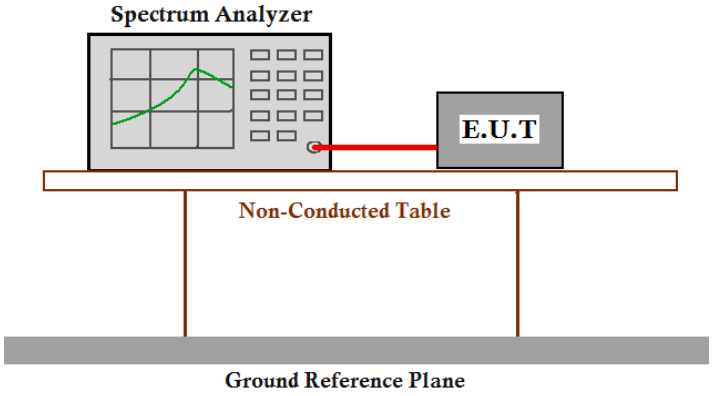
No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Conclusion:

PASS

12 BAND EDGES REQUIREMENT

Test Requirement:	FCC Part 15 C section 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.
Test Method:	ANSI C63.10: Clause 6.9.2
Test Status:	Enter test mode for the product. Test in Channel lowest (2405MHz) and highest (2480MHz), keep in continuously transmitting status.
Test Configuration:	

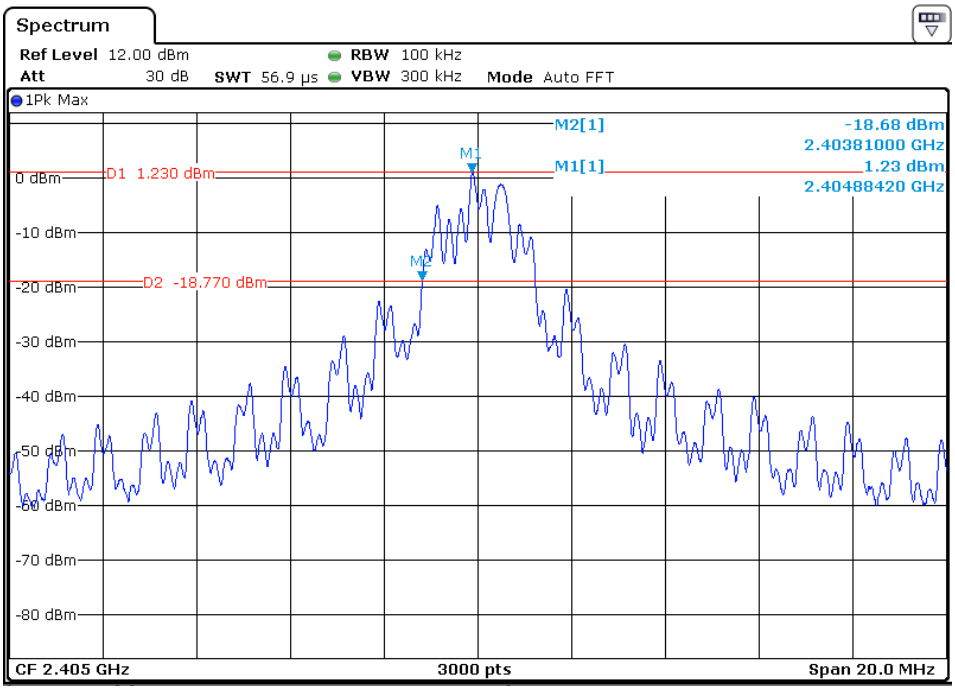


Test Procedure:

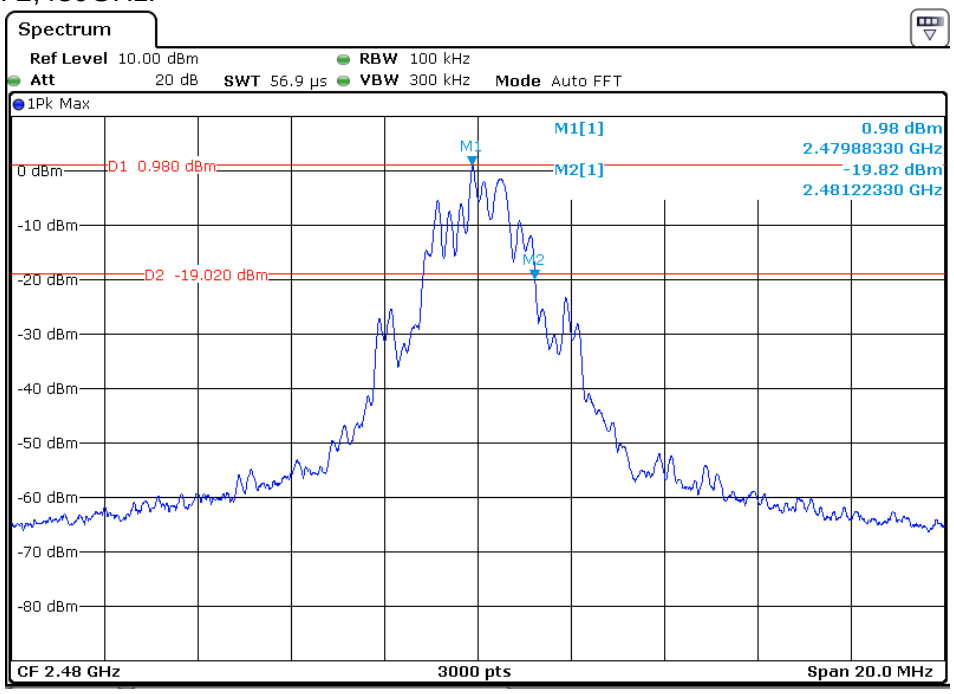
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set span to encompass the entire emission bandwidth (EBW) of the signal.
3. RBW≥1% of spectrum analyzer display span; VBW≥RBW.
4. Sweep=auto; Detector function=Peak; Trace=Max hold.
5. Measure the Conducted Spurious Emissions and Radiated Emissions of the test frequency with special test status.
6. Repeat until all the test status is investigated.
7. Report the worse.

Results with plots as follows:

Channel 0: 2,405GHz:



Channel 0: 2,480GHz:



Conclusion:

PASS

13 TEST SETUP AND ARRANGEMENT

The photograph shows the tested device.

Figure 2 Conducted measurement Test setup

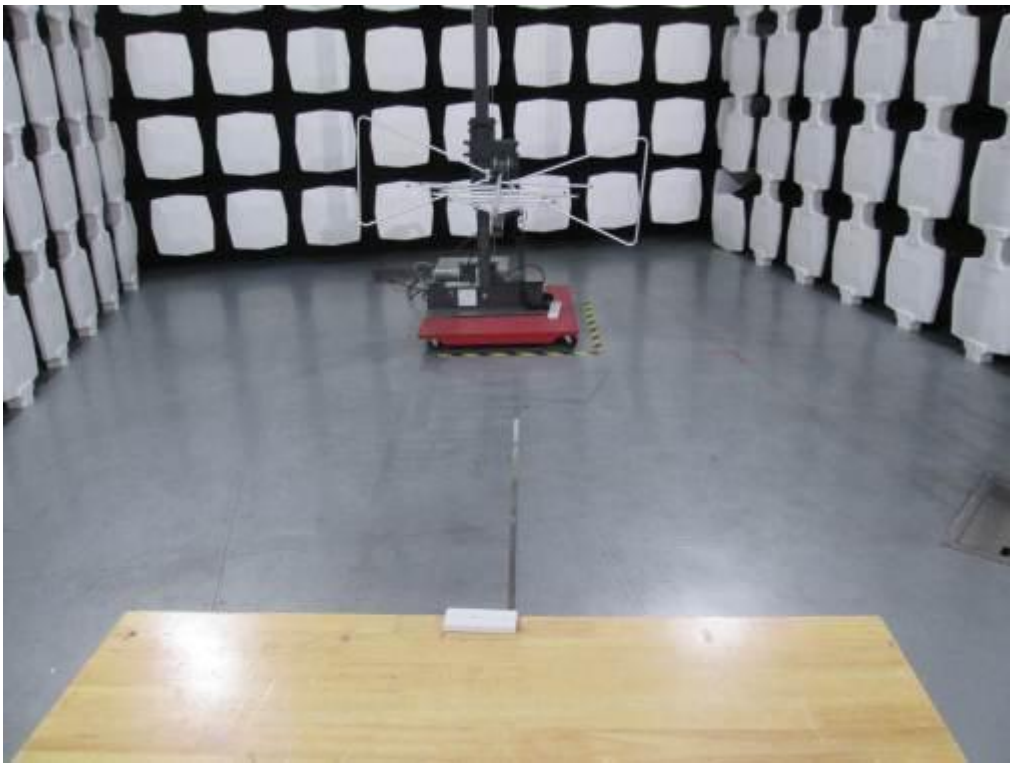


Figure 3 Radiated emission test setup (below 1 GHz)

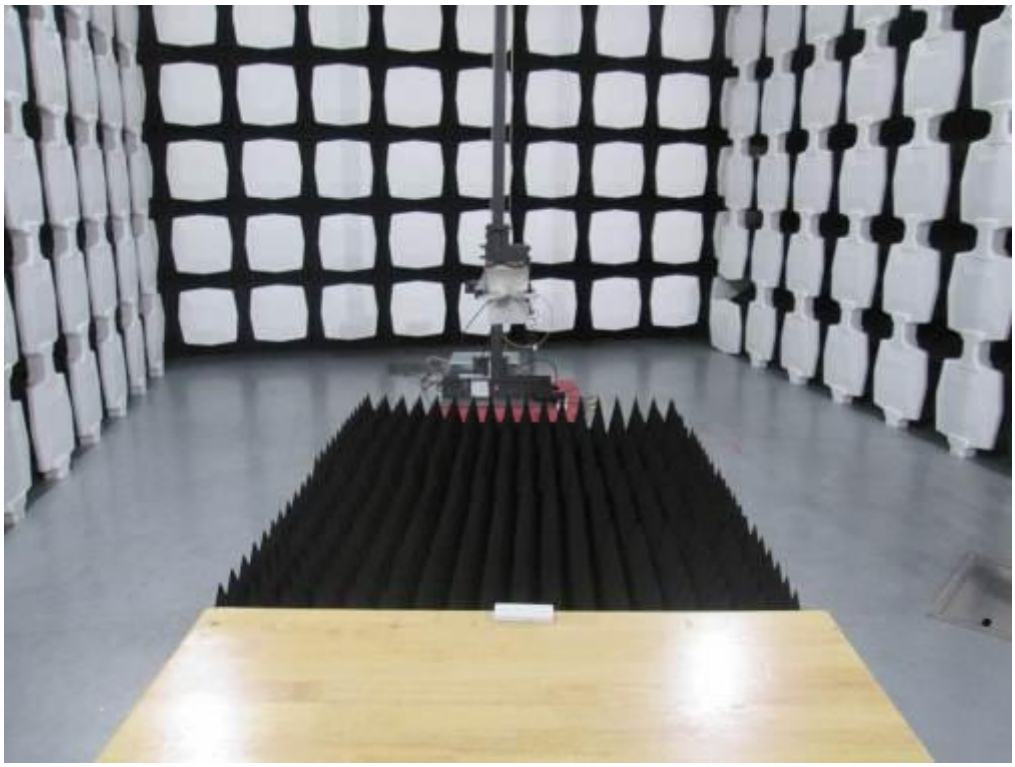
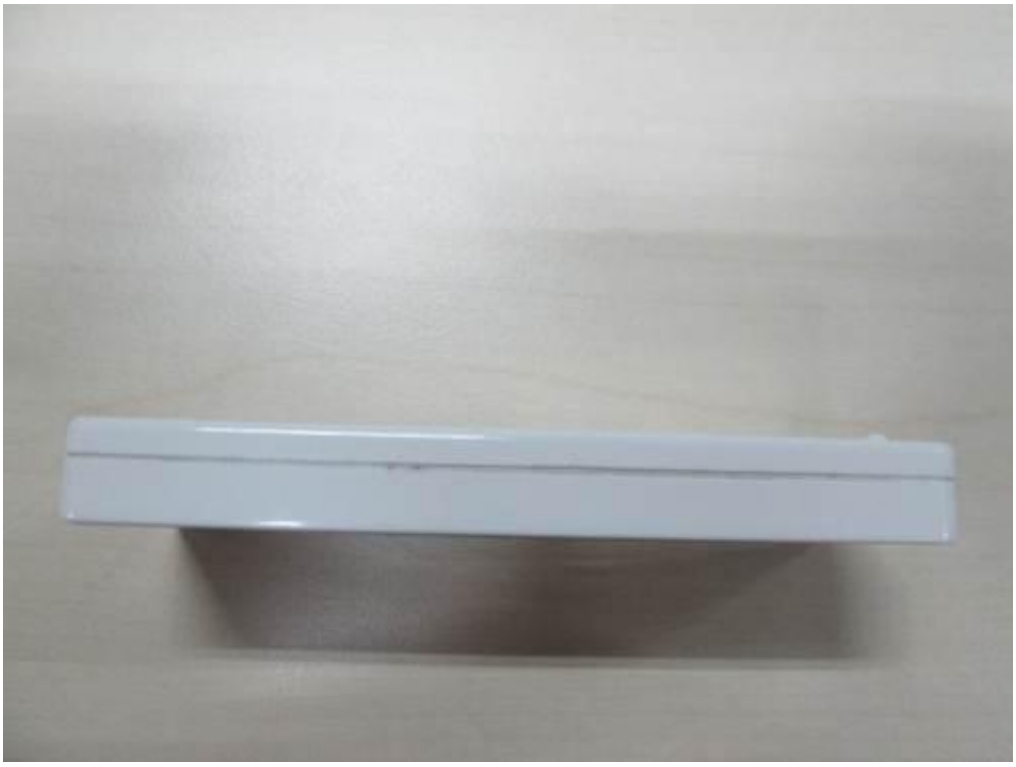


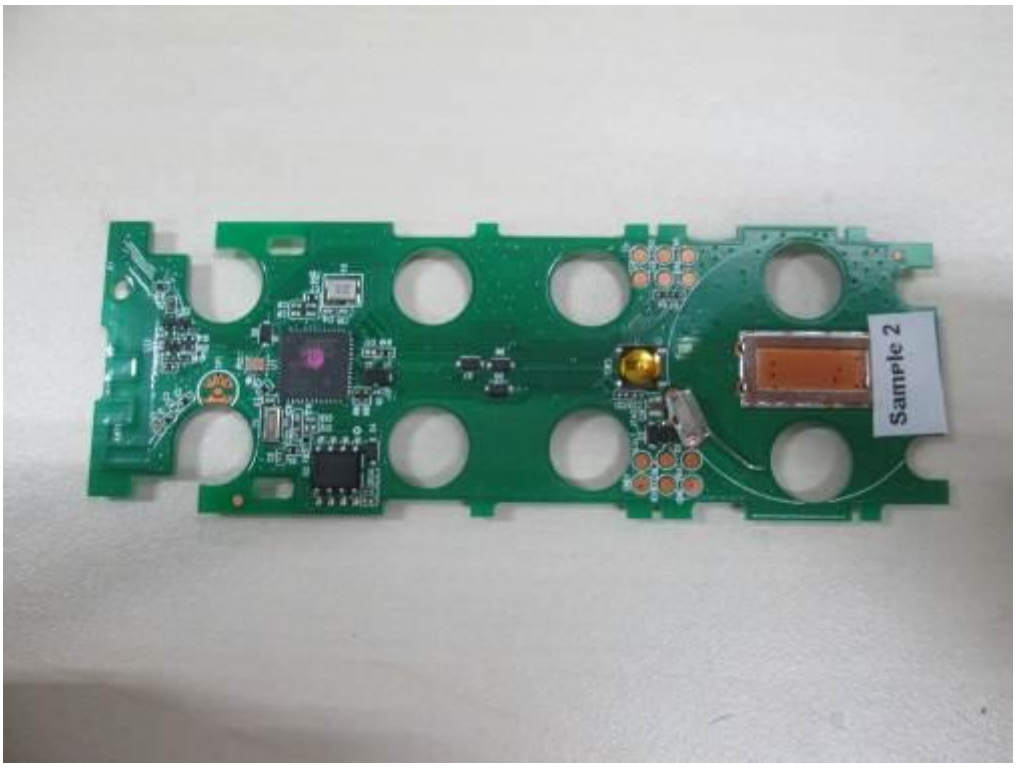
Figure 4 Radiated emission test setup (above 1 GHz)

14 PHOTOS OF EUT




PHILIPS
Sensie 2


Sensie 2


Sample 2