TEST REPORT

1. Applicant		
Name		EDAM Information & Communications Co., Ltd.
Brand Name	:	N/A
Address	:	Geumjeong-dong, Hanlim Venture Town, 689-6), 301, 284, Gongdan-ro, Gunpo-si, Gyeonggi-do, Korea
FCC ID	:	S4KBTOP-F100
2. Products		
Name	:	ONBODYPLUS
Model No.	:	BTOP-F100
Variant Model No.	:	N/A
Manufacturer		EDAM Information & Communications Co., Ltd.
3. Test Standard	:	FCC CFR 47 Part 15.247 Subpart C
4. Test Method	:	ANSI C63.10-2009
5. Test Result	:	PASS
6. Dates of Test	:	September 10, 2015 to September 15, 2014
7. Date of Issue	:	September 16, 2014
8. Test Laboratory	:	Korea Standard Quality Laboratories FCC Designation Number : 100384

Tested by

HakHyeon, Yoon

Test Engineer:

Approved by

YeoungRyul, Jo

Compliance Engineer:

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Korea Standard Quality Laboratories
Testing Laboratories for EMC and Safety Compliance
www.ksqlab.com
#102, Jangduk-Dong, Hwasung-City, Kyunggi-Do, KOREA

1. Test Summary

Test	Test Requirement	Test method	Result
Power line conducted emission	FCC PART 15 C section 15.207	ANSI C63.10 Clause 6.2	PASS
Radiated emission	FCC PART 15 C section 15.205 & 15.209	ANSI C63.10 Clause 6.4	PASS
Minimum 6dB Bandwidth	FCC PART 15 C section 15.247(a)(2)	ANSI C63.10 Clause 6.9	PASS
Maximum peak output power	FCC PART 15 C section 15.247(b)	ANSI C63.10 Clause 6.10.2	PASS
Power spectrum density	FCC PART 15 C section 15.247(e)	ANSI C63.10 Clause 6.11	PASS
RF Conducted Spurious Emissions	FCC PART 15 C section 15.247(d)	ANSI C63.10 Clause 6.9	PASS
Radiated Emission BandEdge	FCC PART 15 C section 15.247(d)	ANSI C63.10 Clause 6.9	PASS
Emission outside the Frequency band	FCC PART 15 C section 15.247(d)	ANSI C63.10 Clause 6.12	PASS
RF Exposure	FCC PART 15 C section 15.247(i), 1.1307(b)(1)	-	PASS

Remark:

N/A: not applicable. Refer to the relative section for the details.

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.

ANSI C63.10: the detail version is ANSI C63.10:2009 in the whole report.

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3. General Information

3.1. Client Information

Applicant	:	EDAM Information & Communications Co., Ltd.
Address of Applicant	:	Geumjeong-dong, Hanlim Venture Town, 689-6), 301, 284, Gongdan-ro, Gunpo-si, Gyeonggi-do, Korea

3.2. General Description of E.U.T.

Product Name	:	ONBODYPLUS
Model No.	:	BTOP-F100

3.3. Details of E.U.T.

Operating Frequency	:	2402 MHz to 2480 MHz
Type of Modulation	:	BLE
Number of Channels	:	40 Channels
Channel Separation	:	2 MHz
Antenna Type	:	Integral
Antenna gain	:	1.99 dBi
Speciality	:	Bluetooth specification version 4.0
Power Supply	:	Working voltage
Normal Test Voltage	:	DC3.0V

3.4. Description of Support Units

The EUT has been tested with corresponding accessories as below:
Supplied by KSQ:

Description	Manufacturer	Model No.	Serial No.
NoteBook	Lenovo	80G0	-
Experimenter Board	Beacon	Beacon_UART	-

3.5. Abnormalities from Standard Conditions

None.

3.6. Other Information Requested by the Customer

None.

3.7. Test Location

#102, Jangduk Dong, Hwasung City, Kyunggi Do, South Korea
(FCC Designation Number : 100384)

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

4. Equipment Used during Test

No.	Test Equipment	Manufacturer	Model No.	Cal. Data	calibration interval	Used equipment
1	Spectrum Analyzer	Agilent	E4440A	14.11.12	1 year	■
2	Frequency Counter	HP	5350B	15.06.02	1 year	□
3	DC Power Supply	ALINCO	DM-340MV	15.06.02	1 year	■
4	Signal Generator	Leader Electronics	3220	15.06.02	1 year	■
5	Synthesized CW Generator	HP	83711B	15.06.02	1 year	□
6	SYNTHESIZED SWEEPER	HP	8340B	15.05.07	1 year	■
7	Function Generator	IWATSU	SG-4105	15.04.13	1 year	□
8	Modulation Analyzer	Agilent	8901B	15.06.03	1 year	□
9	Audio Analyaer	Agilent	8903B	15.06.02	1 year	□
10	Power Meter	Agilent	E4418B	15.06.02	1 year	□
11	Power Sensor	HP	8485A	15.06.04	1 year	□
12	Power Sensor	Agilent	8482B	15.06.03	1 year	□
13	Pre Amplifier	GTC	GA-1825A	15.06.02	1 year	□
14	Attenuator	Weinschel	53-30-33	15.04.10	1 year	□
15	Step Attenuator	Agilent	8494B	15.06.02	1 year	□
17	Step Attenuator	Agilent	8495B	15.06.02	1 year	□
18	Step Attenuator	Agilent	8496B	15.06.02	1 year	□
19	Attenuator	HP	8493C	15.06.03	1 year	□
20	Attenuator	HP	30dB	15.04.10	1 year	□
21	Attenuator	TAE SUNG	SMA-1	15.06.02	1 year	□
22	Attenuator	TAE SUNG	SMA-2	15.06.02	1 year	□
23	Termination	KWANG YEOK	KYTE-NJ-150 W	15.06.02	1 year	□
24	Bluetooth Tester	TESCOM	TC-3000A	15.06.05	1 year	□
25	Loop ANT.	Com-Power	AL-130	14.07.22	2 years	■
26	Horn ANT.	SCHWARZBECK	BBHA 9120D	15.06.03	2 years	■
27	Temp & Humidity Chamber	Seoksan Tech	SE-CT-02	15.06.11	1 year	□
28	Vibration Tester	Gana	GNV-400	15.06.10	1 year	□
29	Drop Tester	Self-made	DOC-800	N/A	N/A	□
30	Power Divider	Agilent	11636B	15.06.03	1 year	□
31	Power Divider	Agilent	11636B	15.06.03	1 year	□
32	RMS Multimeter	RMS Multimeter	FLUKE87	15.06.02	1 year	□
33	TEST RECEIVER	ROHDE&SCHWARZ	101014	15.06.03	1 year	■
34	Bi-log Antenna	SCHWARZBECK	VULB9160	15.05.11	2 years	■
35	Slidacs	HAN CHANG	5kV	N/A	N/A	□

5. Test Results

5.1. E.U.T. test conditions

Test Voltage:	DC 3.0V
Temperature:	20.0 -25.0 °C
Humidity:	38-50 % RH
Atmospheric Pressure:	1000 -1010 mbar
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)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	27	2456
1	2404	15	2432	28	2458
2	2406	16	2434	29	2460
3	2408	17	2436	30	2462
4	2410	18	2438	31	2464
5	2412	19	2440	32	2466
6	2414	20	2442	33	2468
7	2416	21	2444	34	2470
8	2418	22	2446	35	2472
9	2420	23	2448	36	2474
10	2422	24	2450	37	2476
11	2424	25	2452	38	2478
12	2426	26	2454	39	2480
13	2428				

Remark:

Test frequencies are the lowest channel: 0 channel(2402 MHz), middle channel: 20 channel(2442 MHz) and highest channel: 39 channel(2480 MHz)

5.2. Antenna Requirement

Standard requirement

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 **PASS**

The transmitter has an Integrated Chip antenna. The directional gain of the antenna is 1.99 dBi. please refer to the EUT internal photos.

5.3. 6dB Occupied Bandwidth

Test Requirement: FCC Part 15 C Section 15.247 (a)(2)

Test Method: ANSI C63.10 2009 Section 6.2
Test Result: Pass
Final Test Mode: Engineering mode
Limit: 500 kHz
Test Procedure:

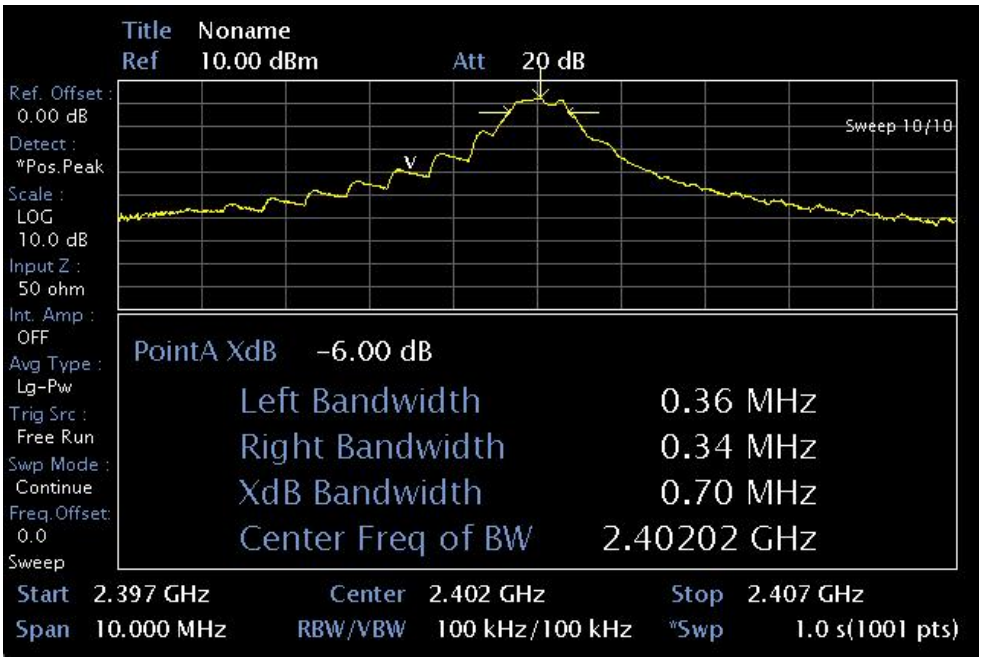
1. Place the EUT on the table and set it in Engineering mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=100KHz, VBW =3* RBW, Span=10MHz, Sweep=auto
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured was complete.

Test date:

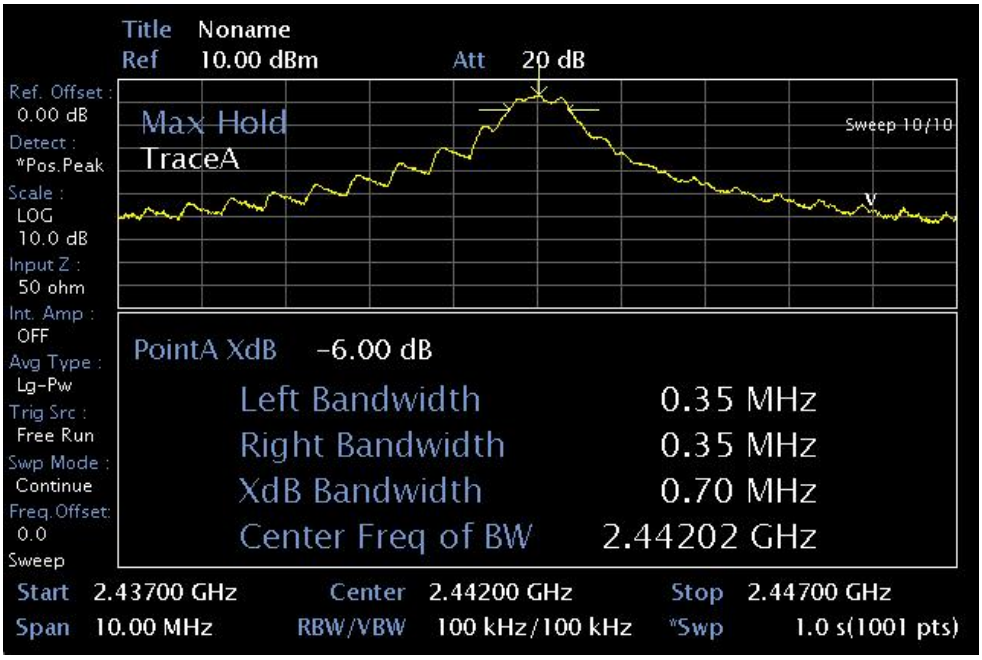
Measured values of the 6dB Occupied Bandwidth			
Frequency (MHz)	Result (kHz)	Limit (kHz)	Verdict
2402	700	500	Pass
2442	700	500	Pass
2480	690	500	Pass

Result plot as follows:

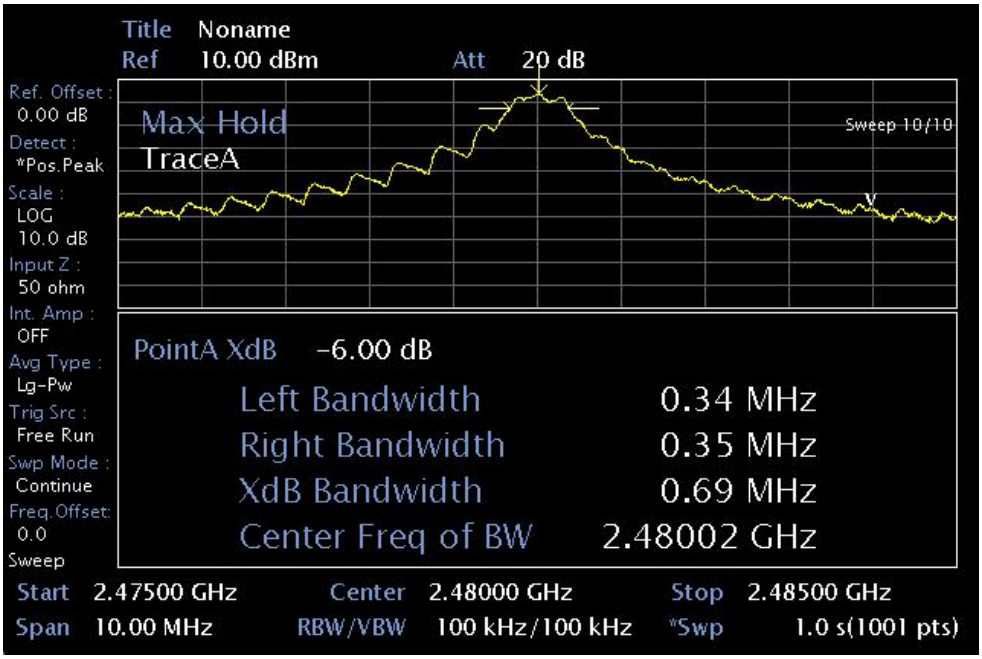
Lowest Channel(2402 MHz):



Middle Channel(2442 MHz):



Highest Channel(2480 MHz):



5.4. Conducted Peak Output Power

Test Requirement: FCC Part 15.247 Section 15.247(b)(3)

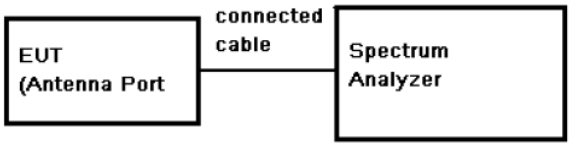
Test Method: ANSI C63.10 2009 Section 6.10

Test Result: Pass

Test Limit: 30dBm

Final Test Mode: Engineering mode

Test Configuration:



Test Procedure:

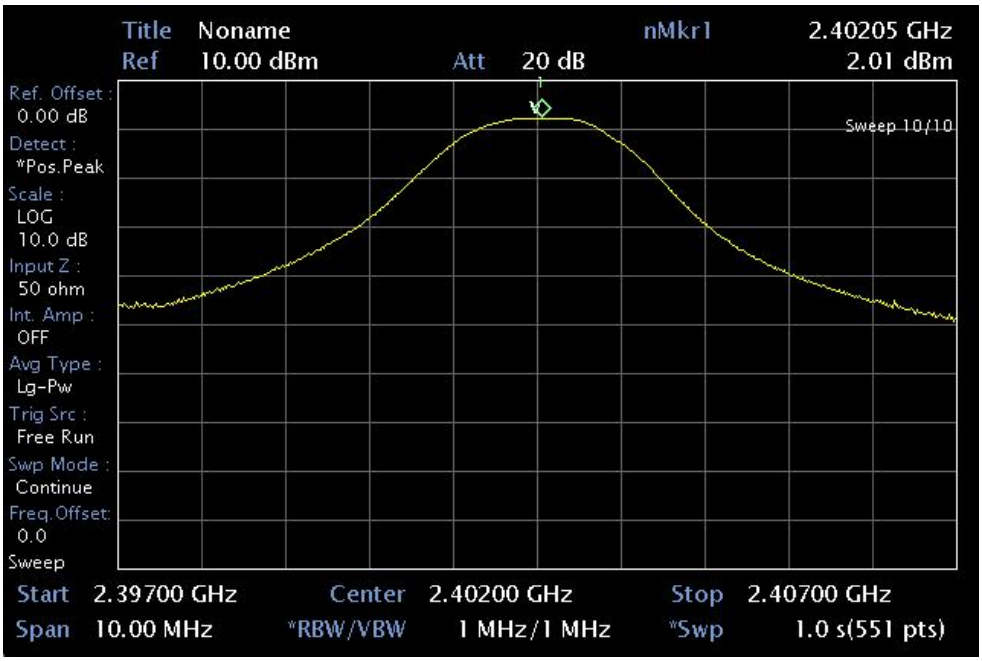
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 1 MHz. Span= fully encompass the bandwidth, Sweep = auto; Detector Function = Peak Trace mode=max hold
3. Use the spectrum analyzer' channel power measurement function with the band limits set equal to the bandwidth edges.
4. Keep the EUT in transmitting at lowest, middle and highest channel individually. Record the max value.

Test Results record:

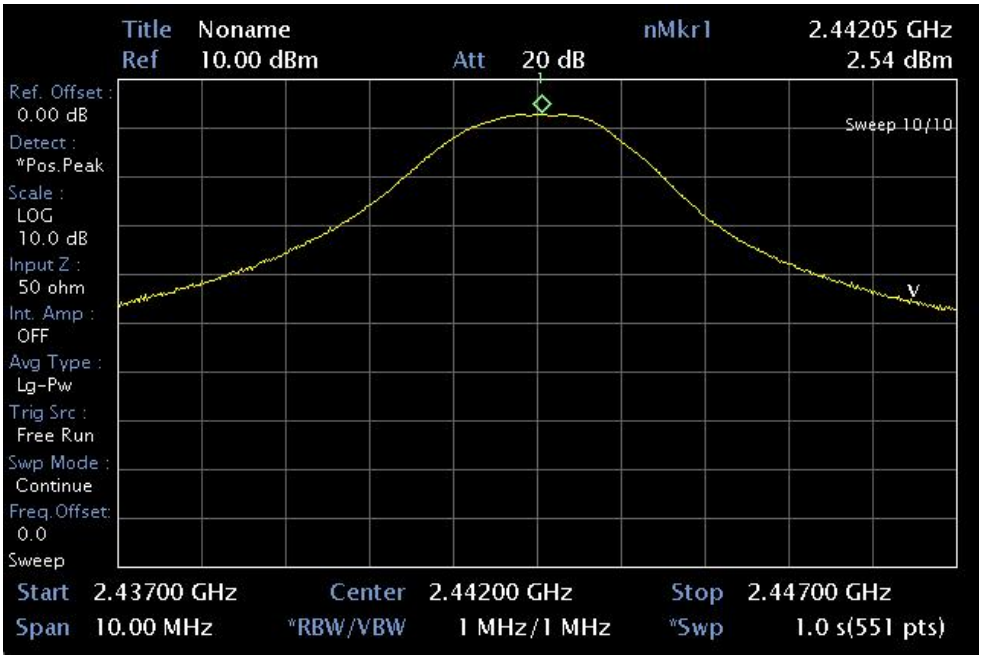
Measured values of the Conducted Peak Output Power(Conducted)				
Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)	Verdict
2402	2.01	0.0016	1	Pass
2442	2.54	0.0018	1	Pass
2480	2.98	0.0020	1	Pass

Result plot as follows:

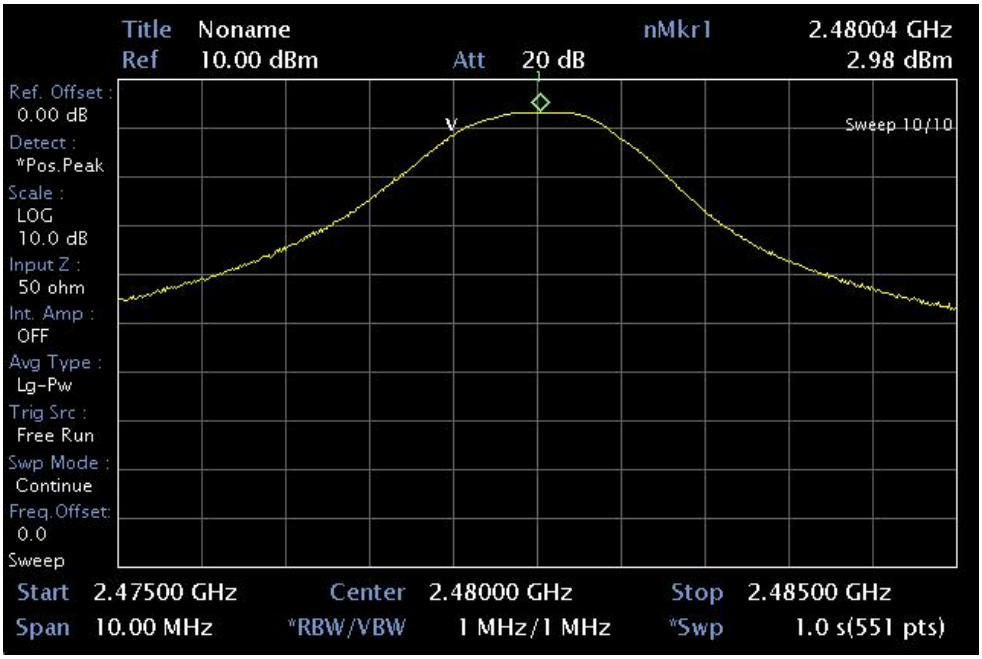
Lowest Channels



Middle Channels



Highest Channels



5.5. Peak Power Spectral Density

Test Requirement: FCC Part 15, Subpart C Section 15.247 (e)

Test Method: ANSI C63.10,2009 Section 6.11.2

Test Result: Pass

Test Limit: 8dBm/3kHz

Final Test Mode: Engineering mode

Measurement Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: Center Frequency= Channel Frequency, RBW = 3 kHz VBW = 10 kHz. Span= fully encompass the bandwidth, Sweep = auto; Detector Function = Peak Trace mode=max hold,
3. Set MKR=Center Frequency, Trace=Clear Write.
4. Adjust the Span = 1 MHz, Sweep Time=auto, Trace=Max hold, MKR=Peak Search.
5. Record the marker level for the particular mode.
6. Repeat these steps for other channel and device modes.

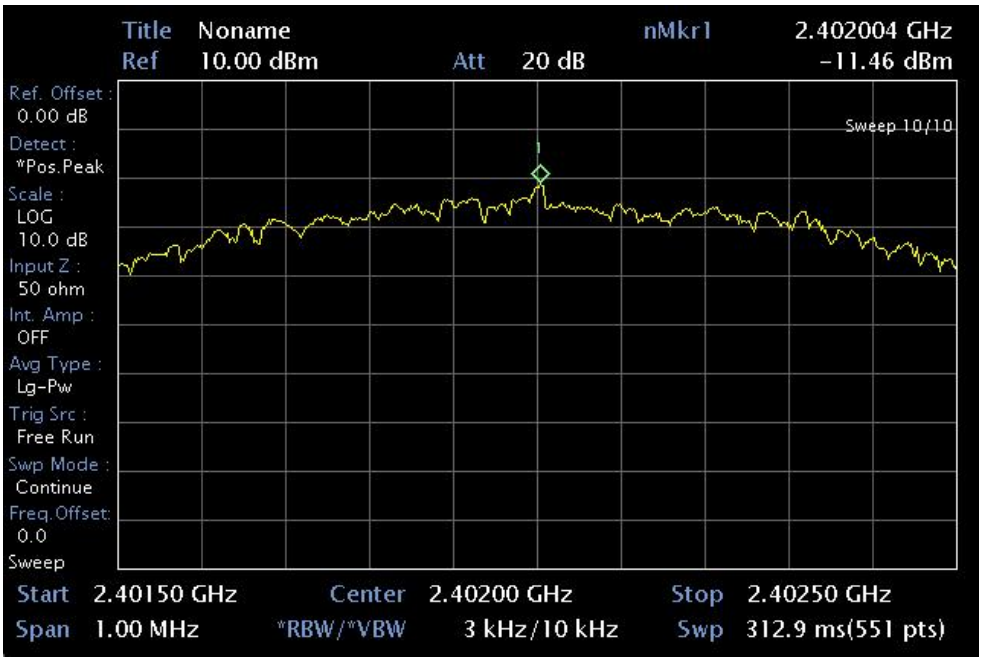
:

Test Results record:

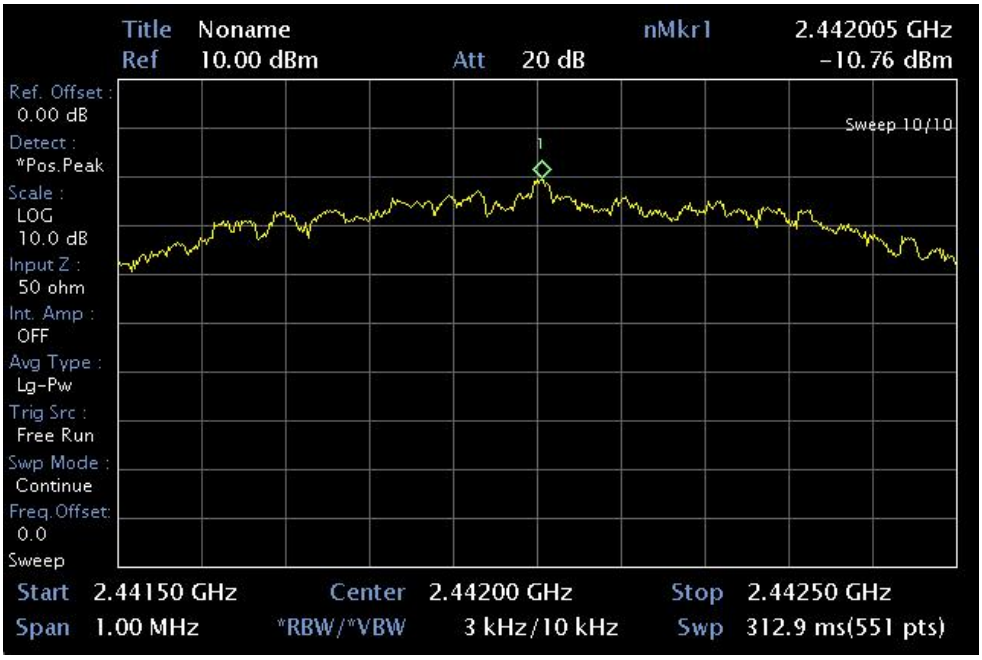
Measured values of the Peak Power Spectral Density				
Center frequency (MHz)	Peak frequency (MHz)	Peak power Spectral Density (dBm)	Limit (dBm)	Verdict
2405	2402.004	-11.46	8	Pass
2442	2442.005	-10.76	8	Pass
2480	2480.009	-10.38	8	Pass

Result plot as follows:

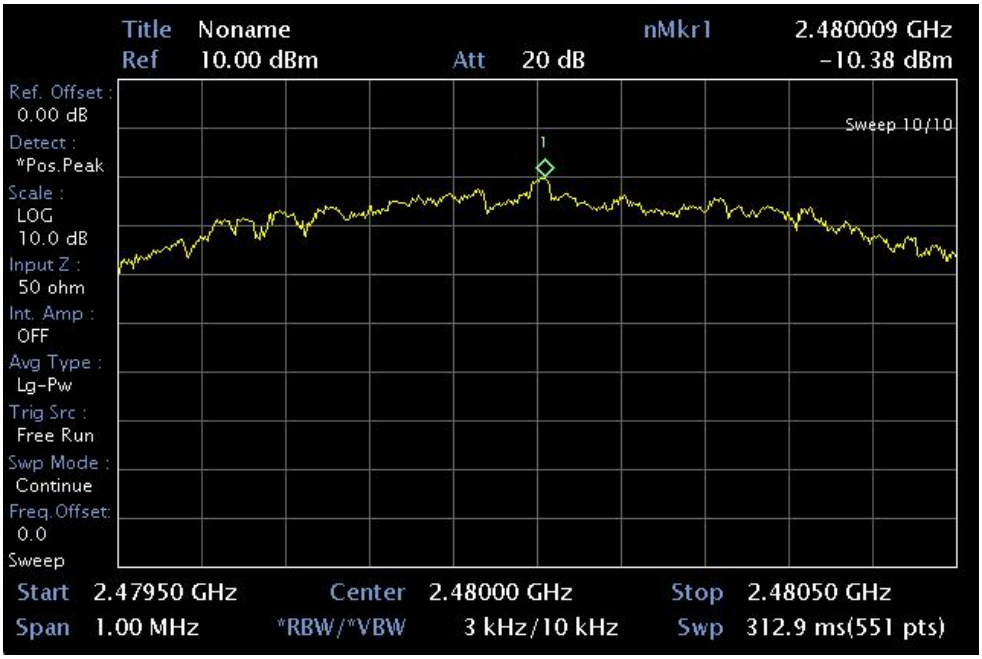
Lowest Channels



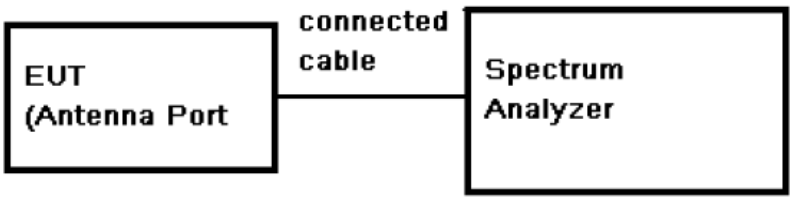
Middle Channels



Highest Channels

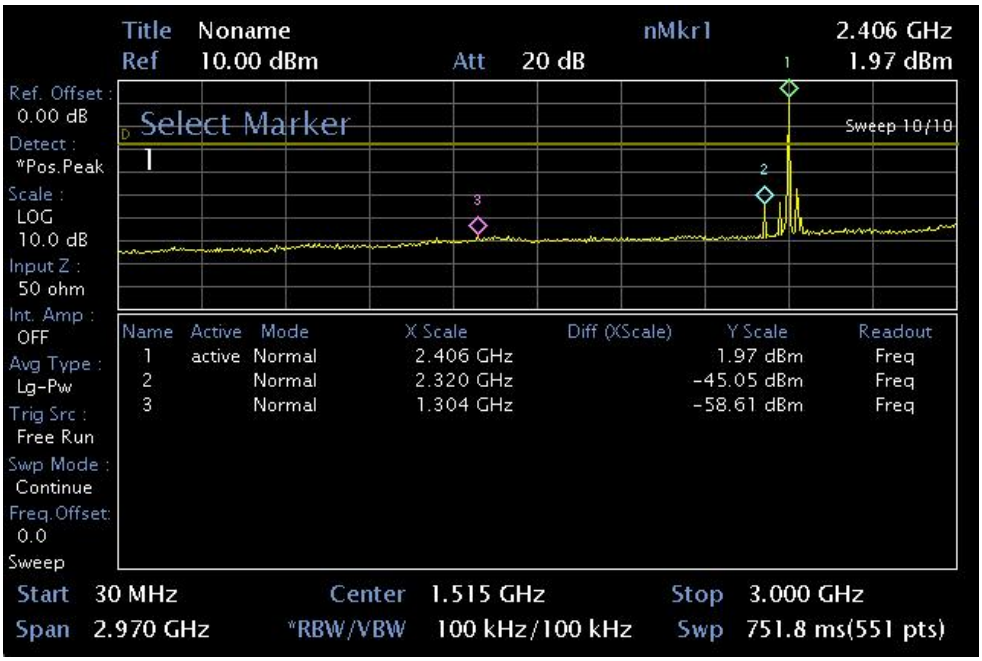


5.6. Conducted Spurious Emissions

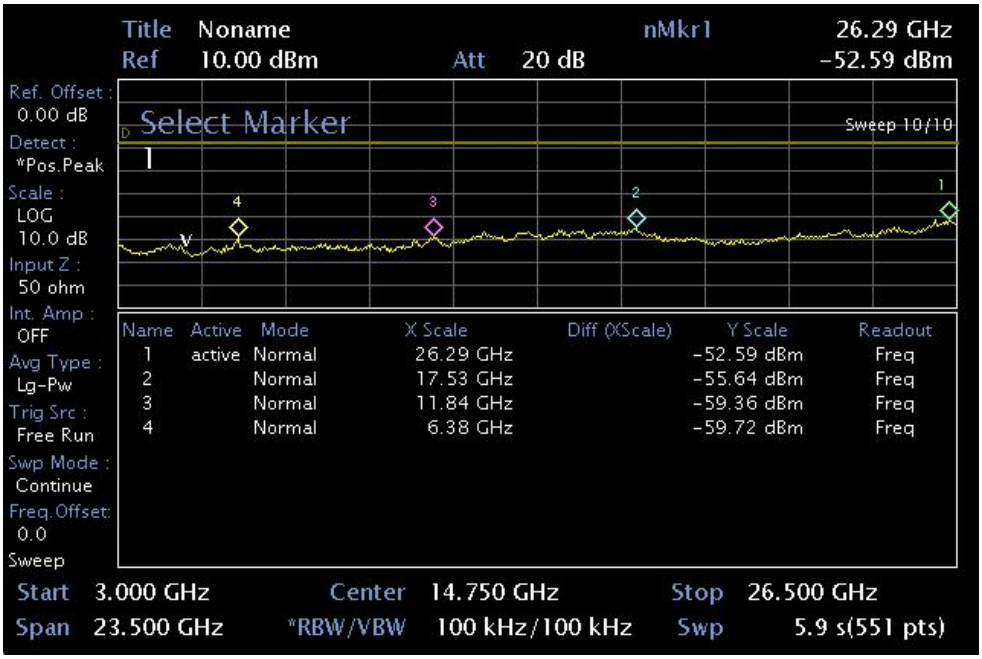
Test Requirement:	FCC Part 15 Section 15.247(d)
Test Method:	ANSI C63.10:2009 Clause 7.7.10
Test Result:	Pass
Limit:	(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced 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.
Final Test Mode:	Engineering mode
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. 2. Set the spectrum analyzer: RBW = 100KHz. VBW >= RBW. Sweep = auto; Detector Function = Peak (Max. hold).

Result plot as follows:

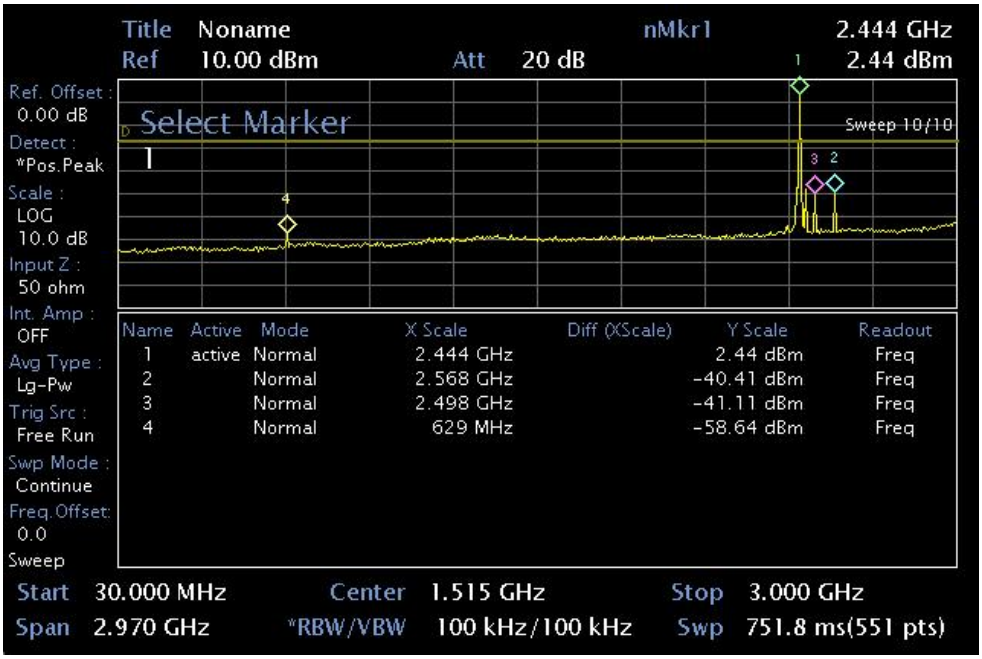
Lowest channel (2402 MHz): 30MHz ~ 3GHz



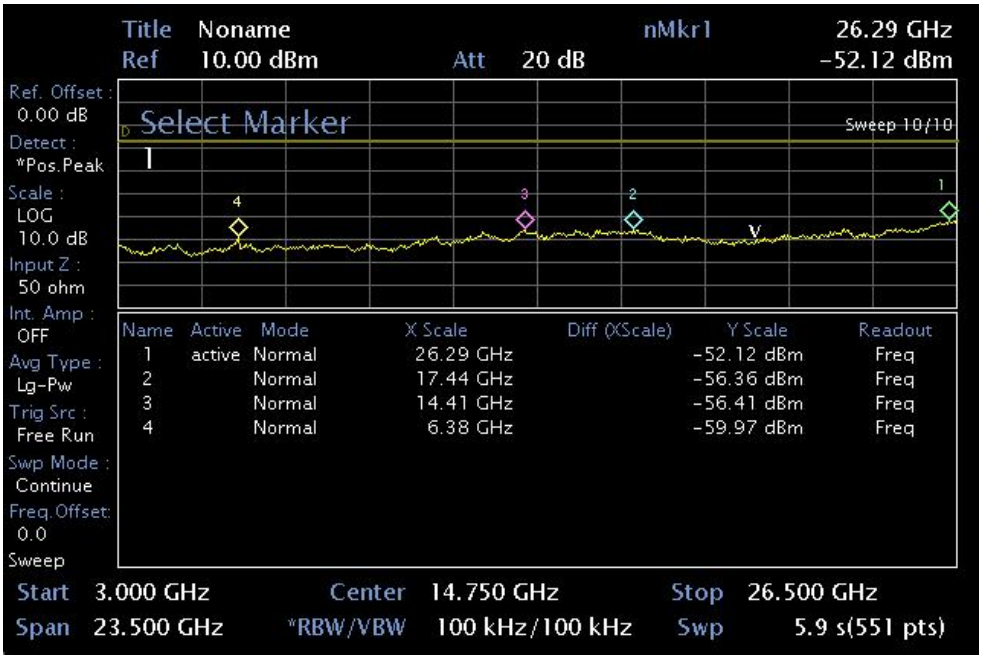
Lowest channel (2402 MHz): 3GHz ~ 26GHz



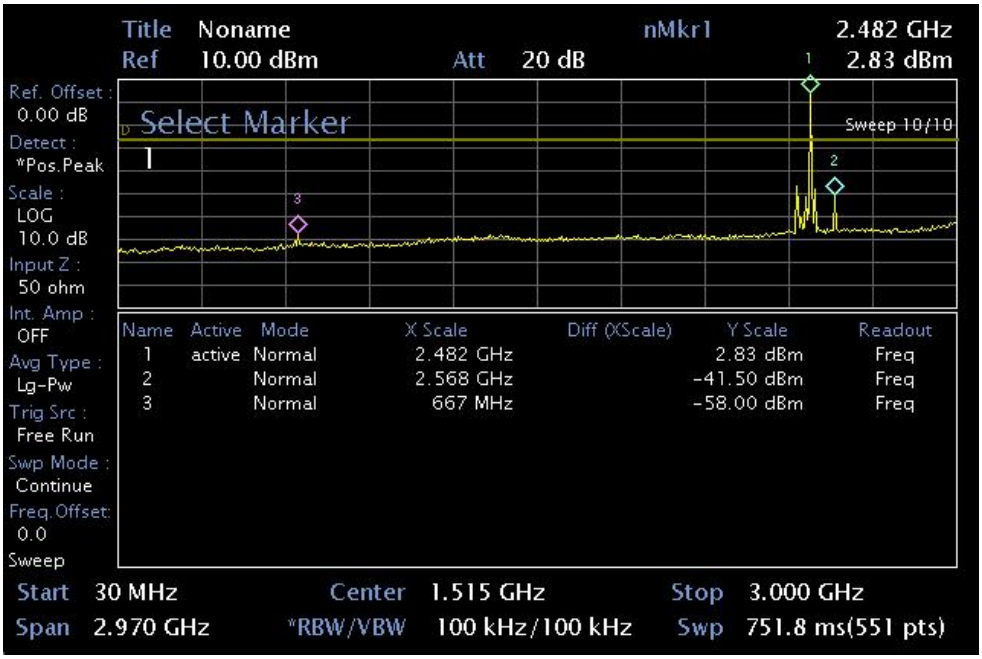
Middle Channel (2442 MHz): 30MHz ~ 3GHz



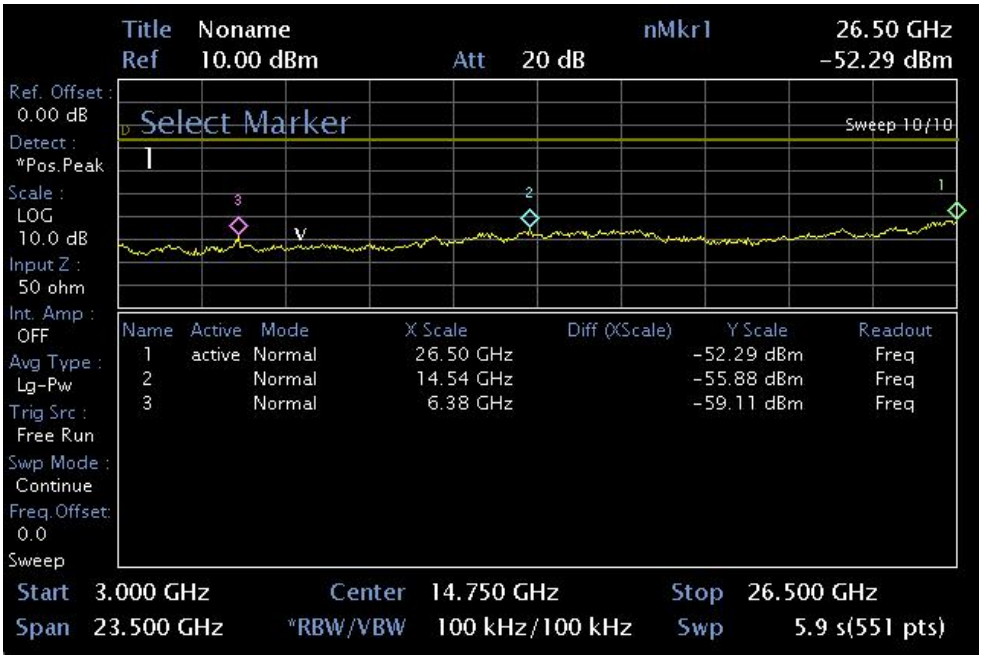
Middle Channel (2442 MHz): 3GHz ~ 26GHz



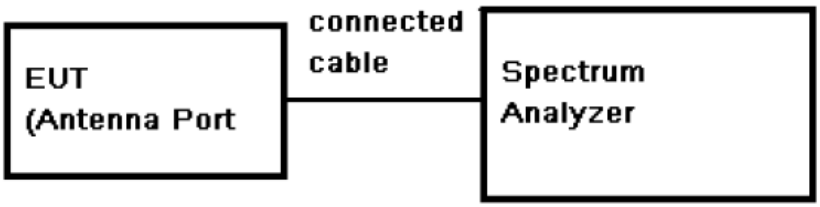
Highest Channel (2480 MHz) : 30MHz ~ 3GHz



Highest Channel (2480 MHz) : 3GHz ~ 26GHz

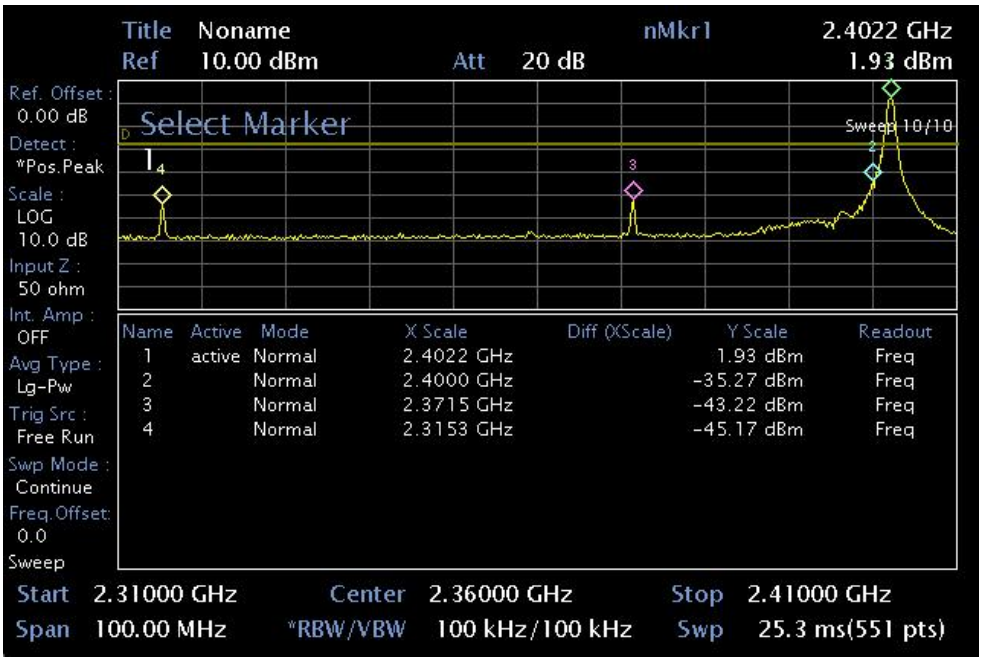


5.7. Conducted Band-edge

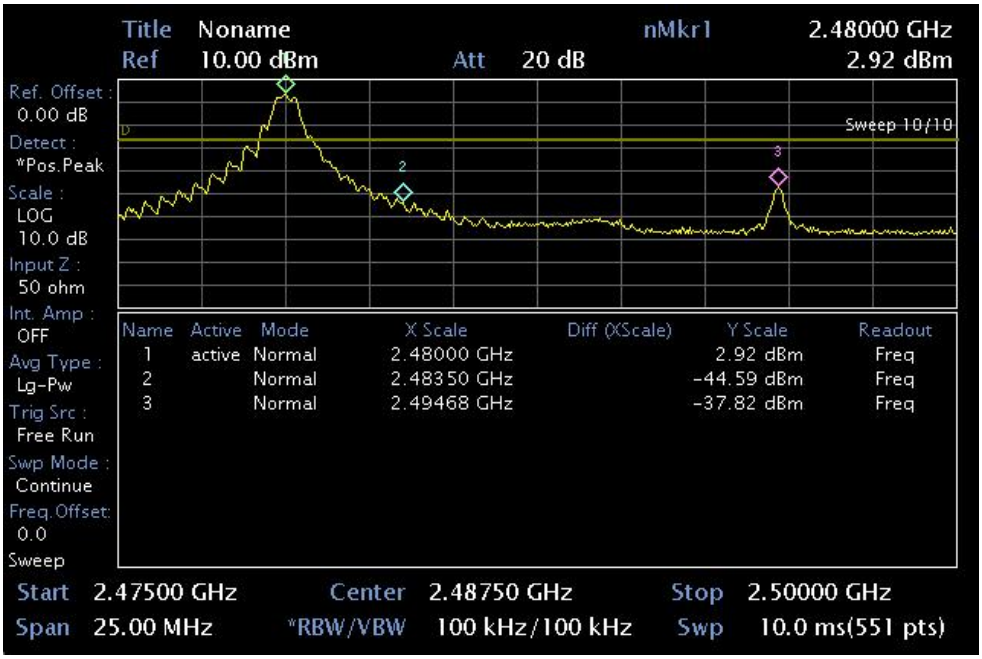
Test Requirement:	FCC Part 15 Section 15.247(d)
Test Method:	ANSI C63.10:2009 Clause 7.7.10
Test Result:	Pass
Limit:	(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. the radio frequency power that is produced 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.
Final Test Mode:	Engineering mode
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. 2. Set the spectrum analyzer: RBW = 100KHz. VBW >= RBW. Sweep = auto; Detector Function = Peak (Max. hold).

Result plot as follows:

Lowest Channels



Highest Channels

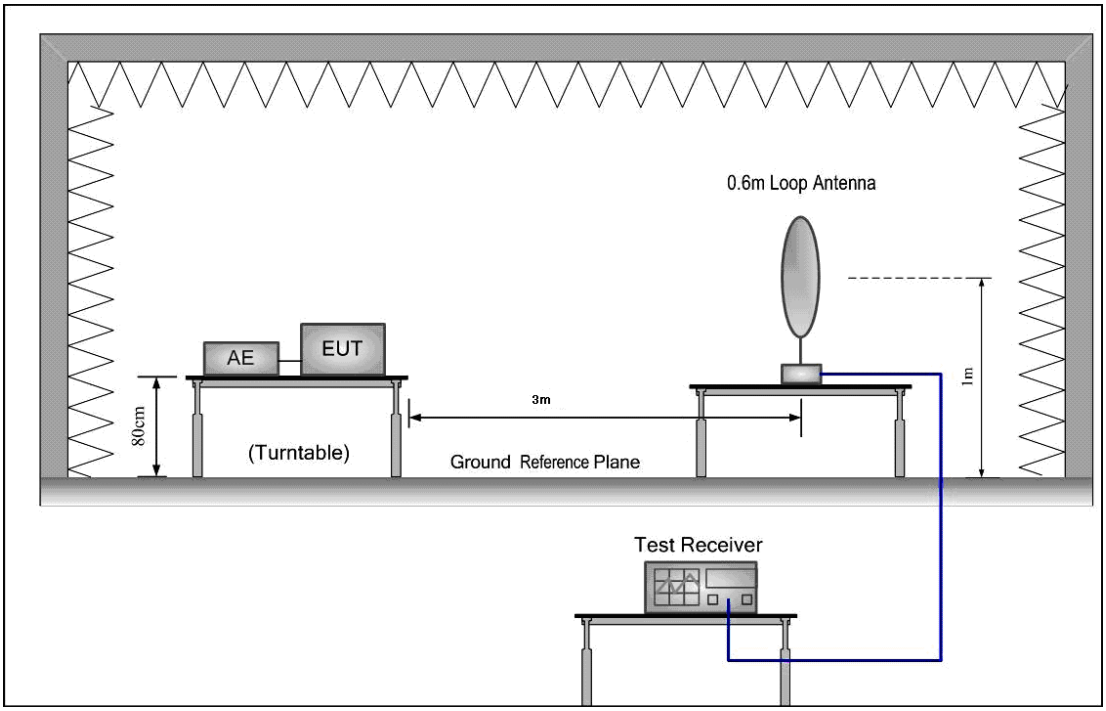


5.8. Radiated Spurious Emissions

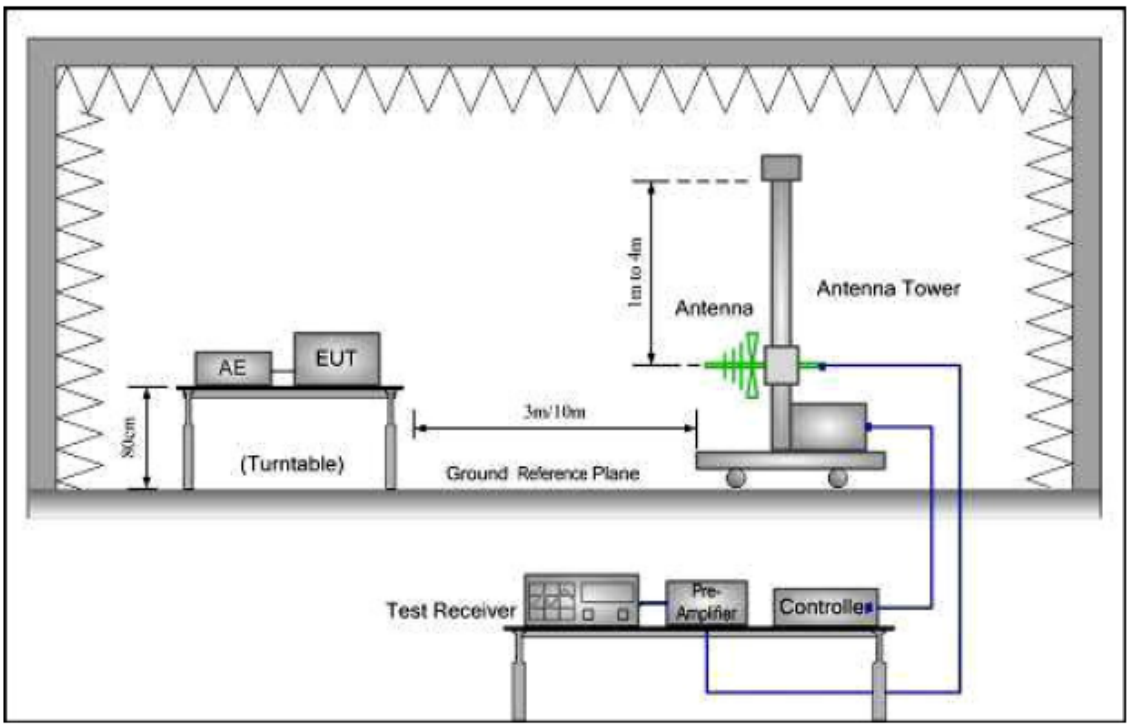
Test Requirement:	FCC Part 15 Section 15.209 and Section 15.205
Test Method:	ANSI C63.10:2009 Clause 6.12
Test Result:	Pass
Final Test Mode:	Engineering mode
Test site/setup:	Measurement Distance: 3m (Semi-Anechoic Chamber) Test instrumentation resolution bandwidth 200 Hz and Quasi-Peak detector applies (9 KHz −150 KHz). Test instrumentation resolution bandwidth 9 KHz and Quasi-Peak detector applies (150 KHz - 30 MHz). Test instrumentation resolution bandwidth 120 kHz and Quasi-Peak detector applies (30 MHz - 1000 MHz). For PK value: RBW = 1 MHz for f ³ 1 GHz; VBW ³ RBW; Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for f ³ 1 GHz VBW =10Hz; Sweep = auto Detector function = peak Trace = max hold Receive antenna scan height 1 m - 4 m. polarization Vertical / Horizontal
15.209 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

Test Configuration:

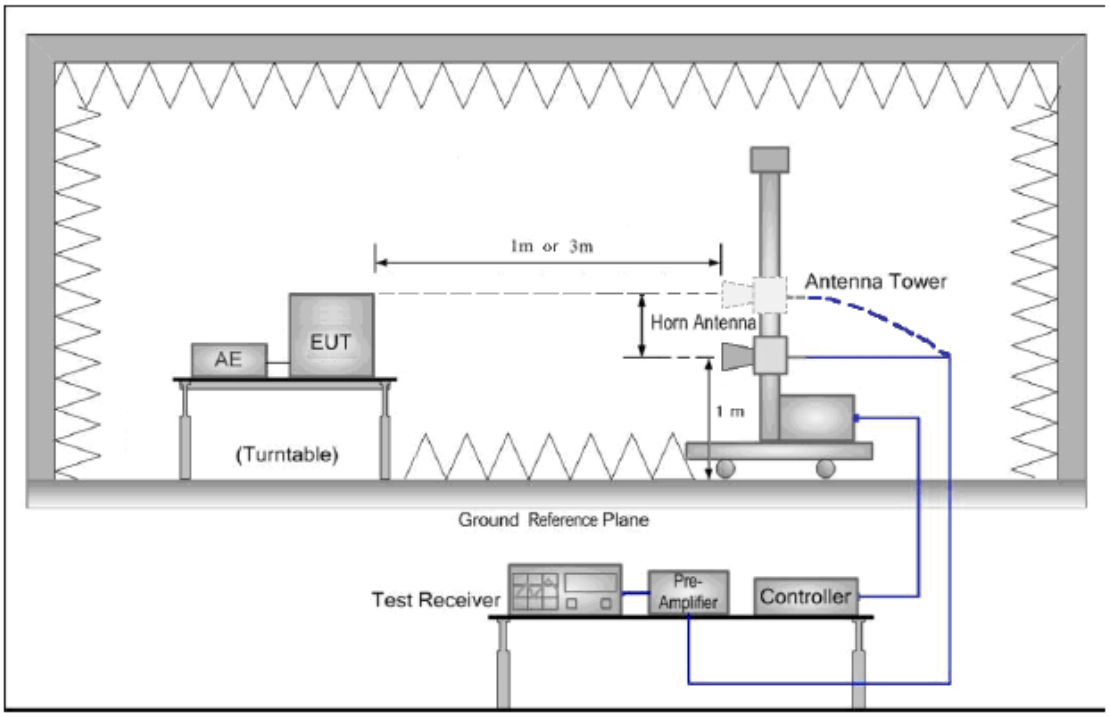
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 40 GHz emissions:



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.

For hand-held or body-worn devices rotated through three orthogonal axes(X,Y,Z) to determine which attitude (orientation) and equipment arrangement produces the highest emission relative to the limit; the attitude and equipment arrangement that produces the highest emission relative to the limit was used in making final radiated emission measurements.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.

Submit this data.

5.8.1. Harmonic and other spurious emissions

5.8.1.1. Test at low Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions. Quasi-Peak Measurement

Vertical:

Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
47.65	QP	V	17.24	13.86	31.10	40.00	8.90
71.80	QP	V	25.99	9.38	35.37	40.00	4.63
168.67	QP	V	19.64	9.53	29.17	43.50	14.33
257.14	QP	V	11.94	13.74	25.68	46.00	20.32
400.31	QP	V	19.43	17.22	36.65	46.00	9.35
900.53	QP	V	8.02	24.74	32.76	46.00	13.24

Horizontal:

Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
96.08	QP	H	25.23	11.27	36.50	40.00	7.00
192.12	QP	H	20.77	11.39	32.16	40.00	11.34
336.60	QP	H	14.92	15.64	30.56	43.50	15.44
400.31	QP	H	13.67	17.22	30.89	46.00	15.11
648.40	QP	H	9.91	21.71	31.62	46.00	14.38
900.53	QP	H	9.02	24.74	33.76	46.00	12.24

1~26.5 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
1726.00	V	40.38	30.1	27.30	43.18	74.00
1769.00	H	41.15	30.1	27.30	43.95	74.00
2666.50	V	47.31	33.26	26.36	54.21	74.00
2732.00	H	44.44	33.64	26.50	51.58	74.00
4361.50	H	32.82	37.92	23.72	47.02	74.00
5763.50	V	34.6	41.21	25.26	50.55	74.00

Average Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
1726.00	V	33.38	30.1	27.30	36.18	54.00
1769.00	H	33.27	30.1	27.30	36.07	54.00
2666.50	V	34.97	33.26	26.36	41.87	54.00
2732.00	H	38.12	33.64	26.50	45.26	54.00
4361.50	H	25.5	37.92	23.72	39.70	54.00
5763.50	V	27.67	41.21	25.26	43.62	54.00

5.8.1.2. Test at middle Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions. Quasi-Peak Measurement

Vertical:

Quasi-Peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
47.65	QP	V	16.59	13.86	30.45	40.00	9.55
71.80	QP	V	26.54	9.38	35.92	40.00	4.08
168.67	QP	V	20.13	9.53	29.66	43.50	13.84
400.31	QP	V	19.08	17.22	36.30	46.00	9.70
660.72	QP	V	7.33	21.82	29.15	46.00	16.85
900.53	QP	V	6.88	24.74	31.62	46.00	14.38

Horizontal:

Quasi-Peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
47.65	QP	H	2.51	13.86	16.37	40.00	23.63
96.08	QP	H	24.91	11.27	36.18	43.50	7.32
192.12	QP	H	21.31	11.39	32.70	43.50	10.80
384.08	QP	H	14.24	16.82	31.06	46.00	14.94
672.44	QP	H	8.29	21.92	30.21	46.00	15.79
900.53	QP	H	8.35	24.74	33.09	46.00	12.91

1~26.5 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
1333.50	V	41.15	28.78	27.56	42.37	74
1746.50	H	40.57	30.1	27.30	43.37	74
2666.50	V	46.44	33.26	26.36	53.34	74
2672.50	H	43.84	33.26	26.36	50.74	74
5771.50	V	37.57	41.21	25.26	53.52	74
5787.50	H	33.65	41.21	25.26	49.60	74

Average Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
1333.50	V	37.97	28.78	27.56	39.19	54
1746.50	H	33.32	30.1	27.30	36.12	54
2666.50	V	42.78	33.26	26.36	49.68	54
2672.50	H	37.63	33.26	26.36	44.53	54
5771.50	V	28.75	41.21	25.26	44.70	54
5787.50	H	26.66	41.21	25.26	42.61	54

5.8.1.3. Test at high Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions. Quasi-Peak Measurement

Vertical:

Quasi-Peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
47.65	QP	V	16.66	13.86	30.52	40.00	9.48
71.80	QP	V	25.83	9.38	35.21	40.00	4.79
175.19	QP	V	20.6	9.90	30.50	43.50	13.00
400.31	QP	V	19.08	17.22	36.30	46.00	9.70
672.44	QP	V	6.94	21.92	28.86	46.00	17.14
900.53	QP	V	7.42	24.74	32.16	46.00	13.84

Horizontal:

Quasi-Peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
47.65	QP	H	2.76	13.86	16.62	40.00	23.38
96.08	QP	H	25.18	11.27	36.45	43.50	7.05
192.12	QP	H	20.9	11.39	32.29	43.50	11.21
400.31	QP	H	13.72	17.22	30.94	46.00	15.06
660.13	QP	H	8.86	21.81	30.67	46.00	15.33
900.53	QP	H	6.37	24.74	31.11	46.00	14.89

1~26.5 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
1782.50	V	41.02	30.1	27.30	43.82	74
1814.00	H	40.48	30.39	27.23	43.64	74
2666.50	V	46.53	33.26	26.36	53.43	74
2695.00	H	44.35	33.26	26.36	51.25	74
4126.00	V	33.68	37.46	23.92	47.22	74
4450.00	H	32.18	38.14	23.62	46.70	74

Average Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
1782.50	V	33.29	30.1	27.30	36.09	54
1814.00	H	32.8	30.39	27.23	35.96	54
2666.50	V	42.84	33.26	26.36	49.74	54
4126.00	V	26.17	37.46	23.92	39.71	54
4450.00	H	25.22	38.14	23.62	39.74	54

Remark:

1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Measured Value + Antenna Factor + Cable Loss −Amplifier Gain.

2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

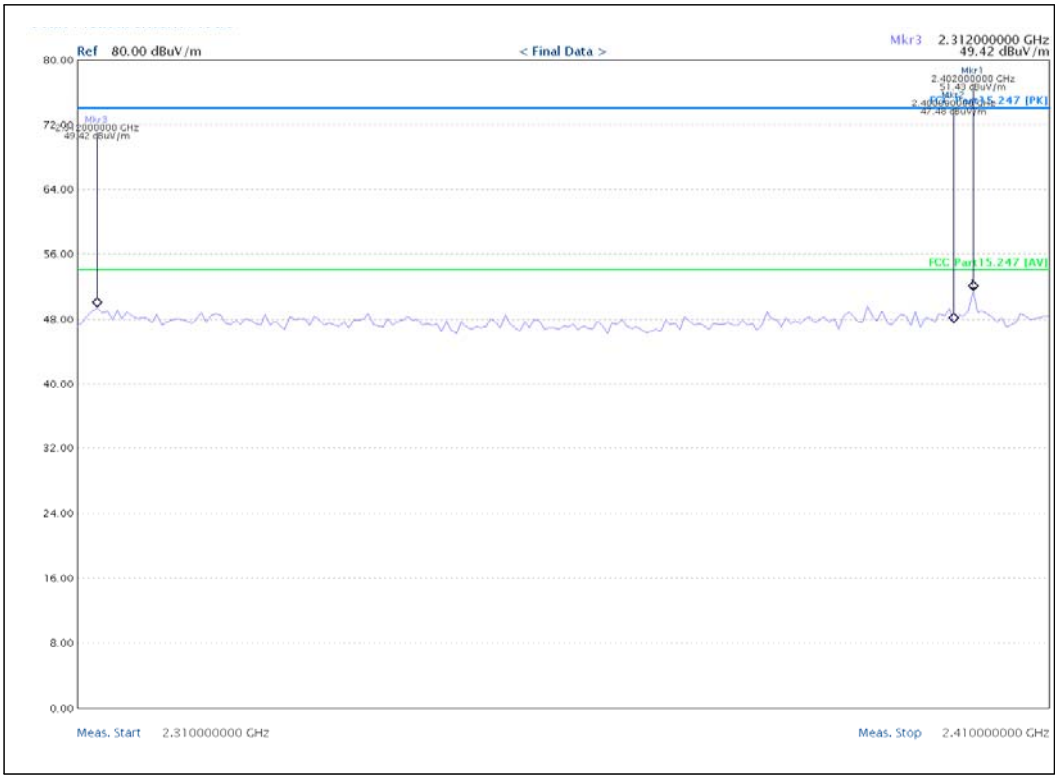
5.9. Band edge (Radiated Emission)

Test Requirement:	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 63.10:2009 Clause 6.12
Test Result:	Pass
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 ³ 1 GHz VBW ³ RBW; Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for f ³ 1 GHz VBW =10Hz; Sweep = auto Detector function = peak Trace = max hold

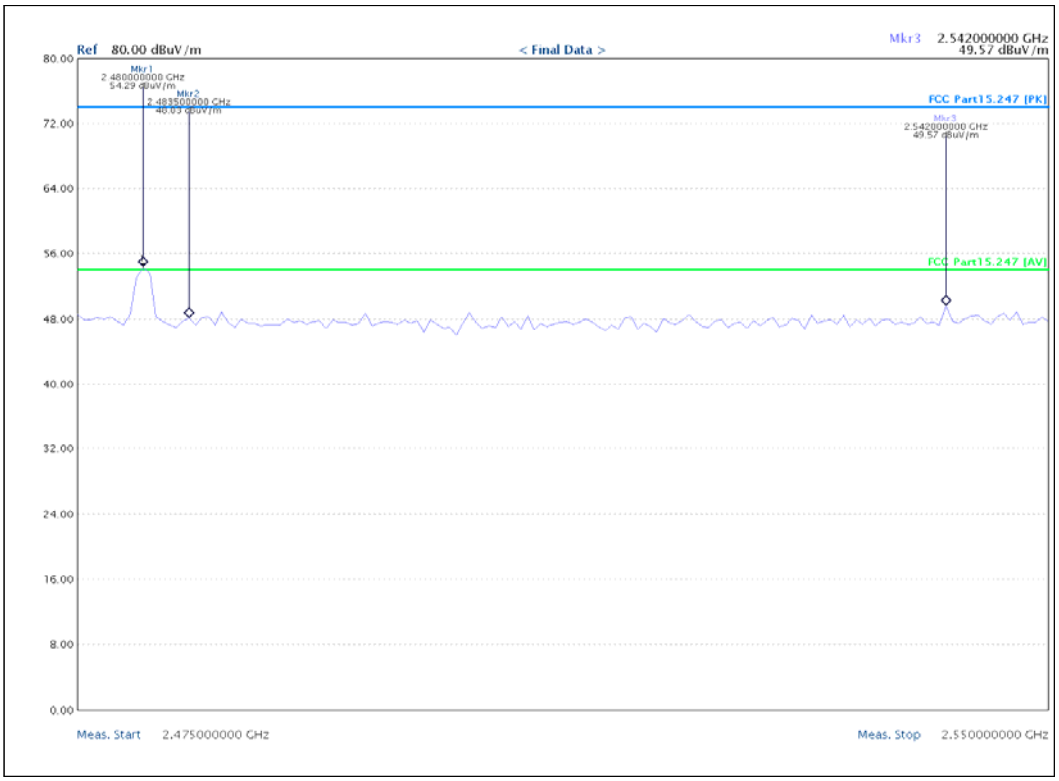
According to section 15.35(b) for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Result plot as follows:

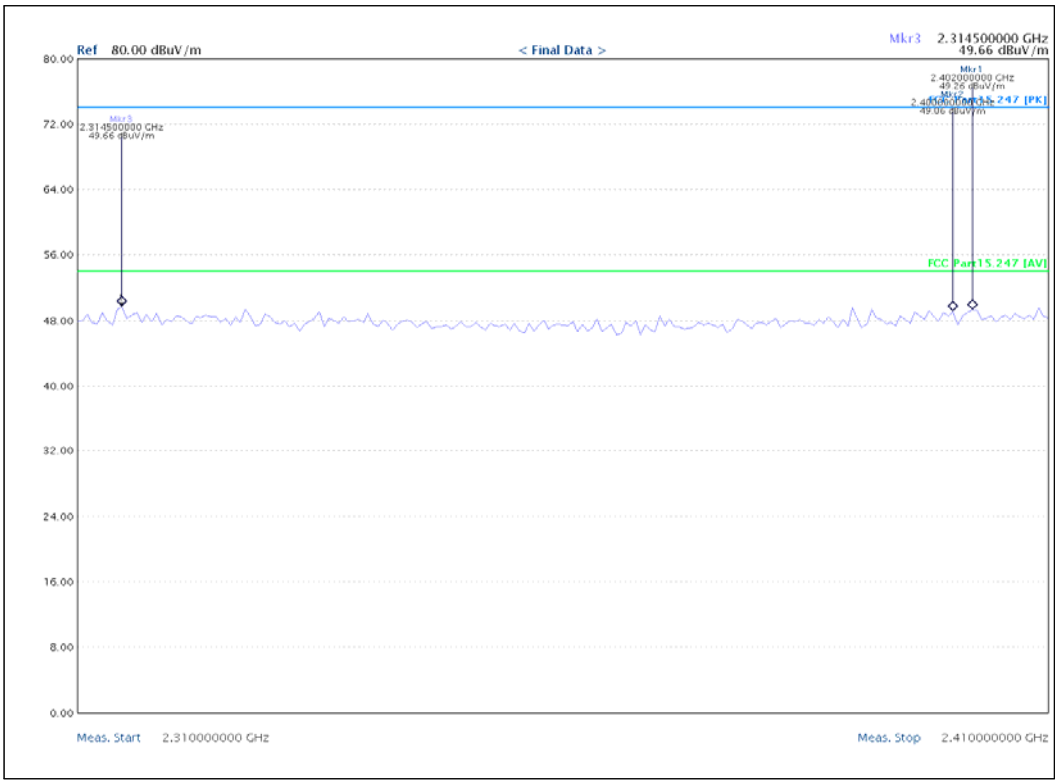
Low Channel (2402 MHz) , Horizontal , Peak Detector



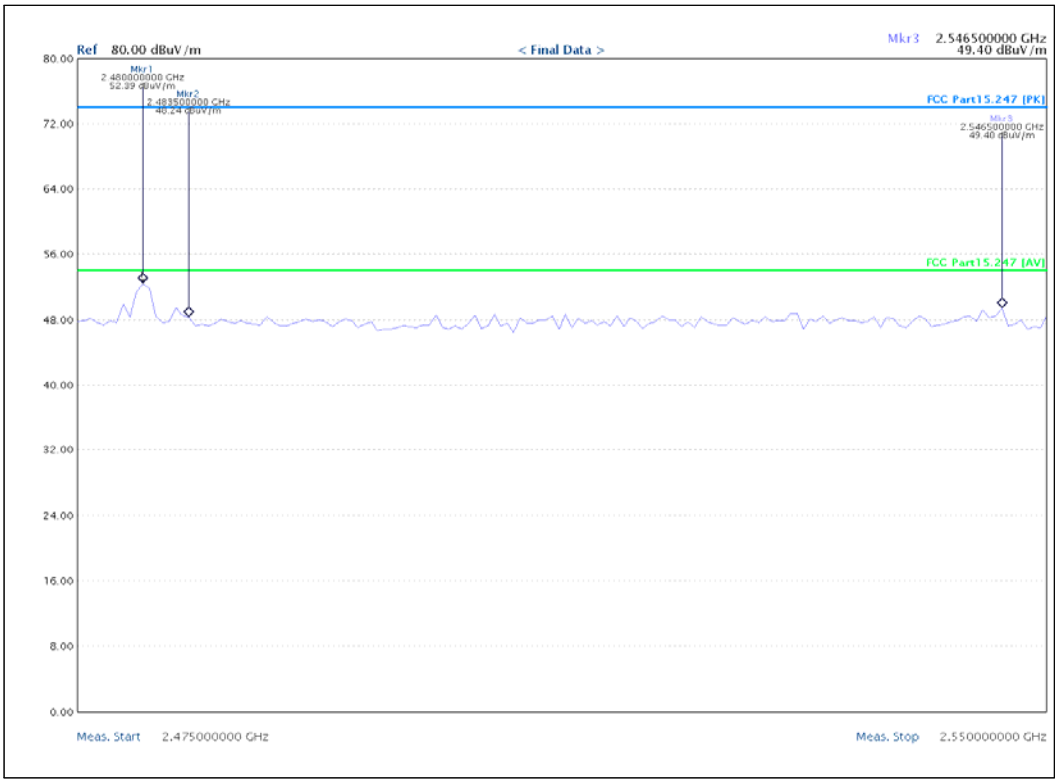
High Channel (2480MHz) , Horizontal , Peak Detector



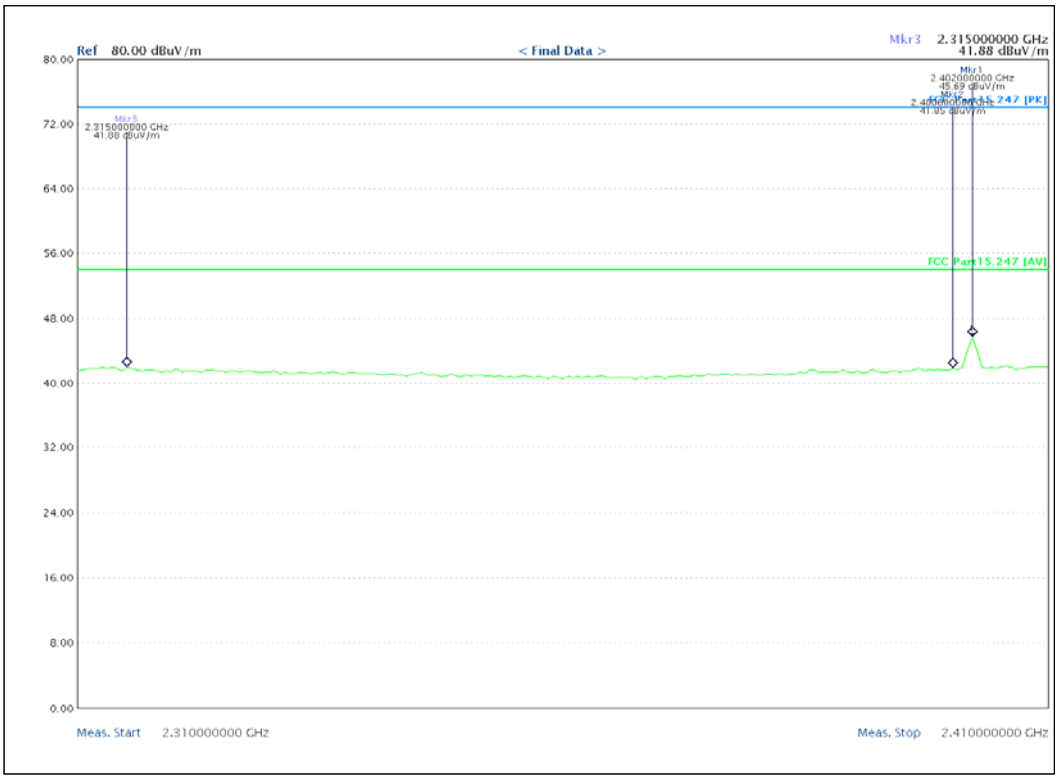
Low Channel (2402 MHz) , Vertical , Peak Detector



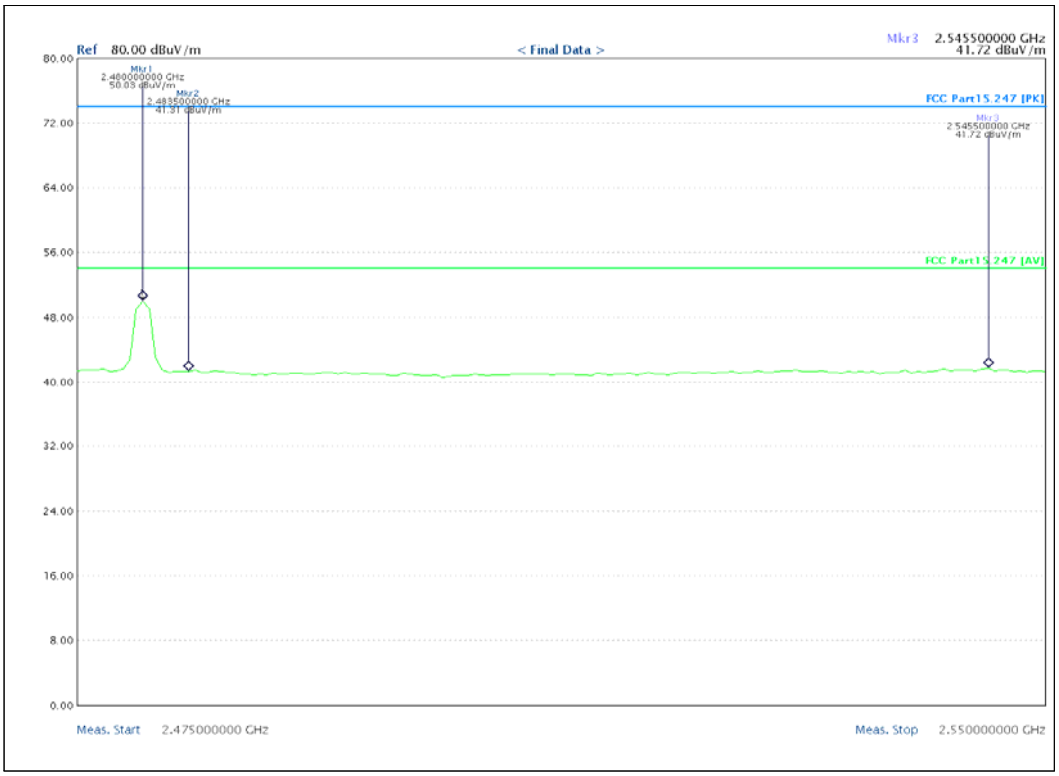
High Channel (2480MHz) , Vertical , Peak Detector



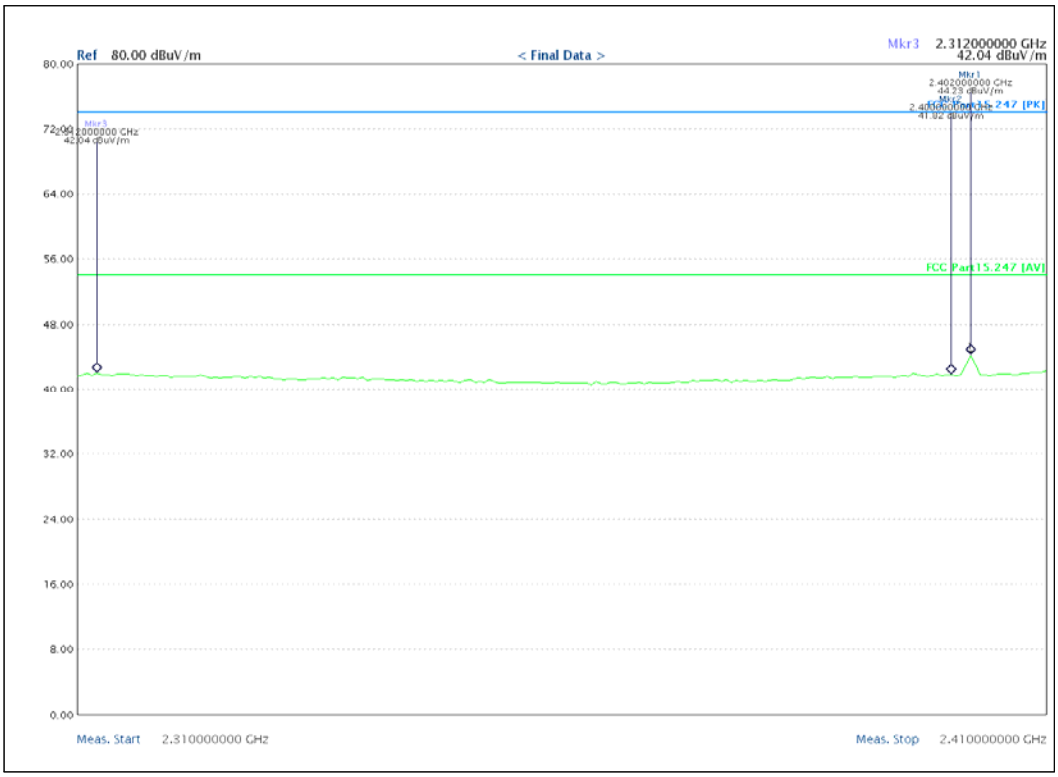
Low Channel (2402 MHz) , Horizontal , Average Detector



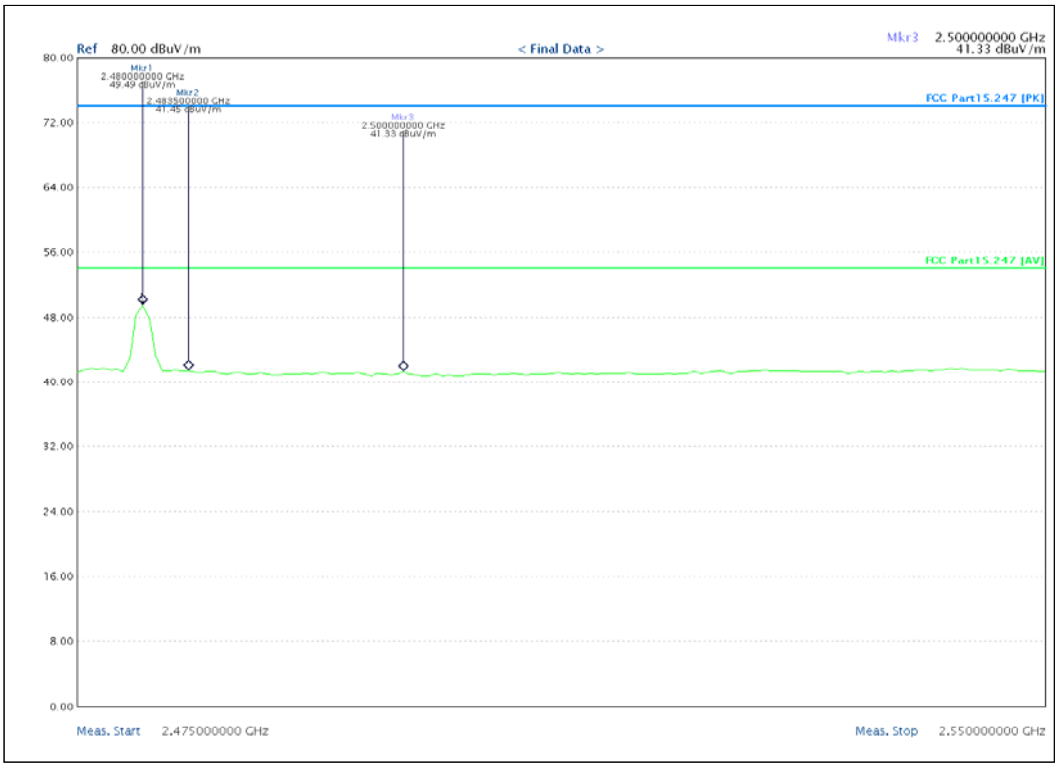
High Channel (2480MHz) , Horizontal , Average Detector



Low Channel (2402 MHz) , Vertical , Average Detector



High Channel (2480MHz) , Vertical , Average Detector



5.10. Radio Frequency Exposure Procedures

Regulation

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

KDB 447498 D01: Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table:

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Maximum Measured Transmitter Power:

Channel Frequency (MHz)	Maximum Peak Conducted Output Power		Max Antenna Gain (dBi)	Numeric antenna gain (mW)
	(dBm)	(mW)		
2480	2.98	1.99	1.99	1.58

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]
· [√f(GHz)] = 2.23/5*√2.480 = 0.702 ≤ 3.0
Threshold at which no SAR required is 10mW and ≤ 3.0 for 1-g SAR, Separation distance is 5mm.
Conclusion : The SAR measurement is exempt.

APPENDIX

1. EUT photo