



RF TEST REPORT

Applicant	TP-LINK TECHNOLOGIES CO.,LTD
FCC ID	TE7C5LV1
Brand	TP-LINK
Product	C5L FDD-LTE Smartphone
Model	TP601C
Report No.	RXA1511-0187RF05R2
Issue Date	January 22, 2016

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C(2014)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Handwritten signature of Lingling Kang in blue ink.

Reviewed by: Lingling Kang/ Manager

Handwritten signature of Kai Xu in blue ink.

Approved by: Kai Xu/ Director



TA Technology (Shanghai) Co., Ltd.

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Summary of measurement results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Peak Power Output -Conducted	15.247(b)(3)	PASS
2	Occupied Bandwidth (6dB)	15.247(a)(2)	PASS
3	Band Edge Compliance	15.247(d)	PASS
4	Power Spectral Density	15.247(e)	PASS
5	Spurious Radiated Emissions in the restricted band	15.247(d),15.205,15.209	PASS
6	Spurious RF Conducted Emissions	15.247(d)	PASS
7	Radiates Emission	15.247(d),15.205,15.209	PASS
8	AC Power Line Conducted Emission	15.207	PASS
Date of Testing: November 14, 2015~ November 23, 2015			

1. Test Laboratory

1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of TA technology (shanghai) co., Ltd).The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above. This report must not be used by the client to claim product certification, approval, or endorsement by CNAS or any government agencies.

1.2. Test facility

CNAS (accreditation number:L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (recognition number is 428261)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA(Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
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Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com

2. General Description of Equipment under Test

Client Information

Applicant	TP-LINK TECHNOLOGIES CO., LTD.
Applicant address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China
Manufacturer	TP-LINK TECHNOLOGIES CO., LTD.
Manufacturer address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China

Accessory Equipment Details

Name	Model	Manufacturer	Capacity	S/N
Battery	NBL-45A2000	TP-LINK TECHNOLOGIES CO., LTD.	2000mAh	B1151006100980

General information

Model:	TP601C
IMEI:	SIM 1: 868788020000031 SIM 2: 868788020001047
Hardware Version:	P1
Software Version:	H10S100D03B20151015R1003
Power Supply:	Battery/AC adapter
Antenna Type:	Internal Antenna
Test Mode:	Bluetooth(Low Energy)
Modulation Type:	GFSK
Packet Type:(Maximum Payload)	1Mbps
Max. Conducted Power	1.163dBm
Operating Frequency Range(s)	2400 ~ 2483.5 MHz



3. Test Information

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC CFR47 Part 15C (2014) Radio Frequency Devices

ANSI C63.4 (2014)

KDB 558074 D01 DTS Meas Guidance v03r03

4. Test Configuration

Test Mode

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

Test Modes		
Band	Radiated Test Cases	Conducted Test Cases
Bluetooth(Low Energy)	Channel 0/19/39	Channel 0/19/39

5. Test Case Results

5.1. Peak Power Output –Conducted

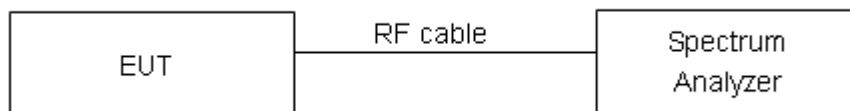
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the spectrum analyzer with a known loss. The EUT is max power transmission with proper modulation. The peak detector is used. RBW is set to 2 MHz; VBW is set to 6 MHz. These measurements have been tested at following channels: 0, 19 and 39 of Bluetooth (Low Energy).

Test Setup



Limits

Rule Part 15.247 (b) (3) specifies that " For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt."

Peak Output Power	$\leq 1W$ (30dBm)
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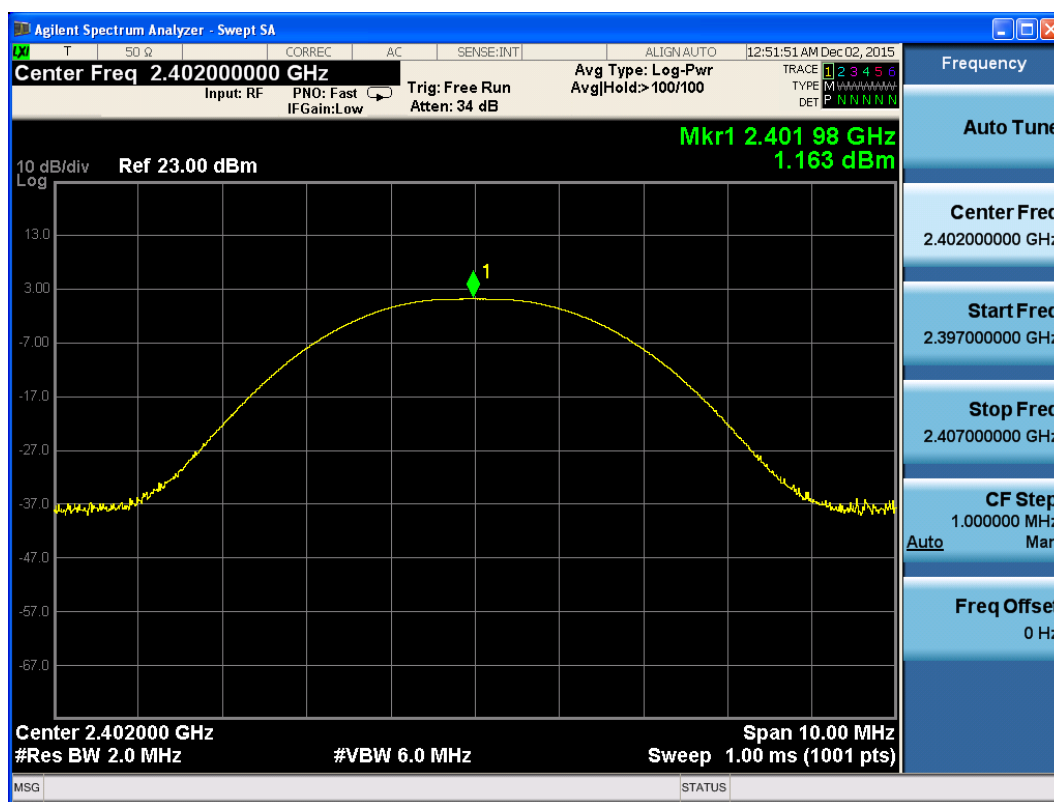
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.44$ dB.

Test Results

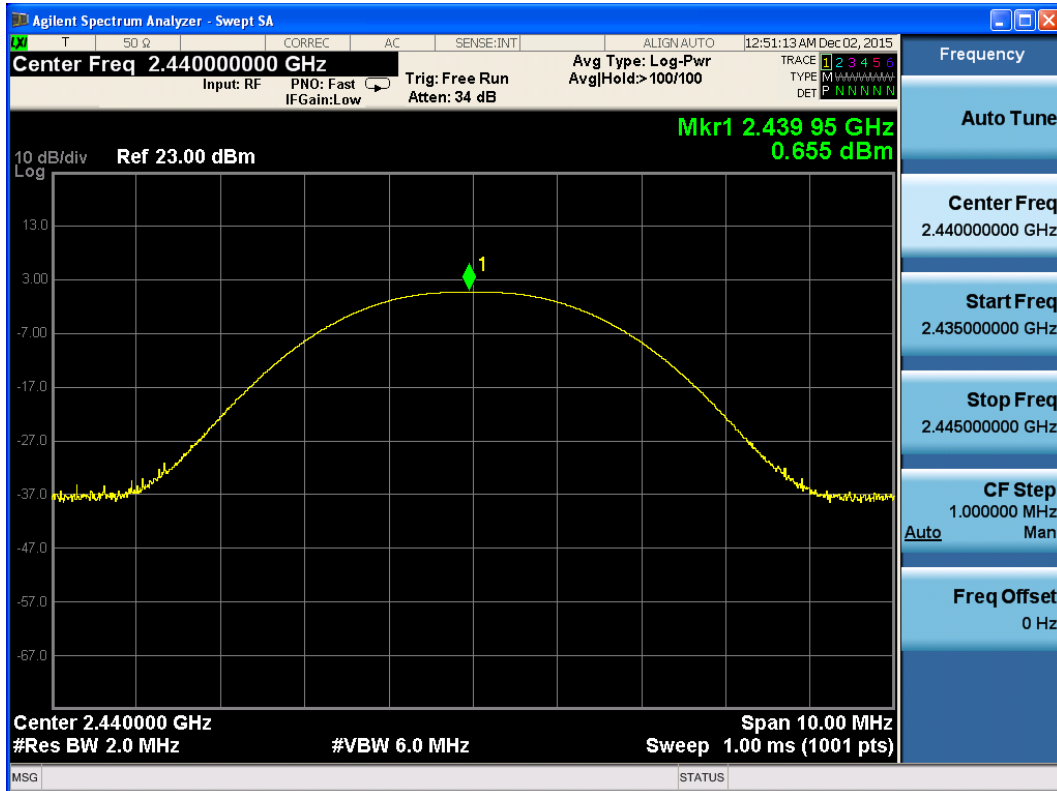
Bluetooth (Low Energy)

Channel	Frequency (MHz)	Peak Output Power (dBm)	Conclusion
		1Mbps	
0	2402	1.163	PASS
19	2440	0.655	PASS
39	2480	1.026	PASS



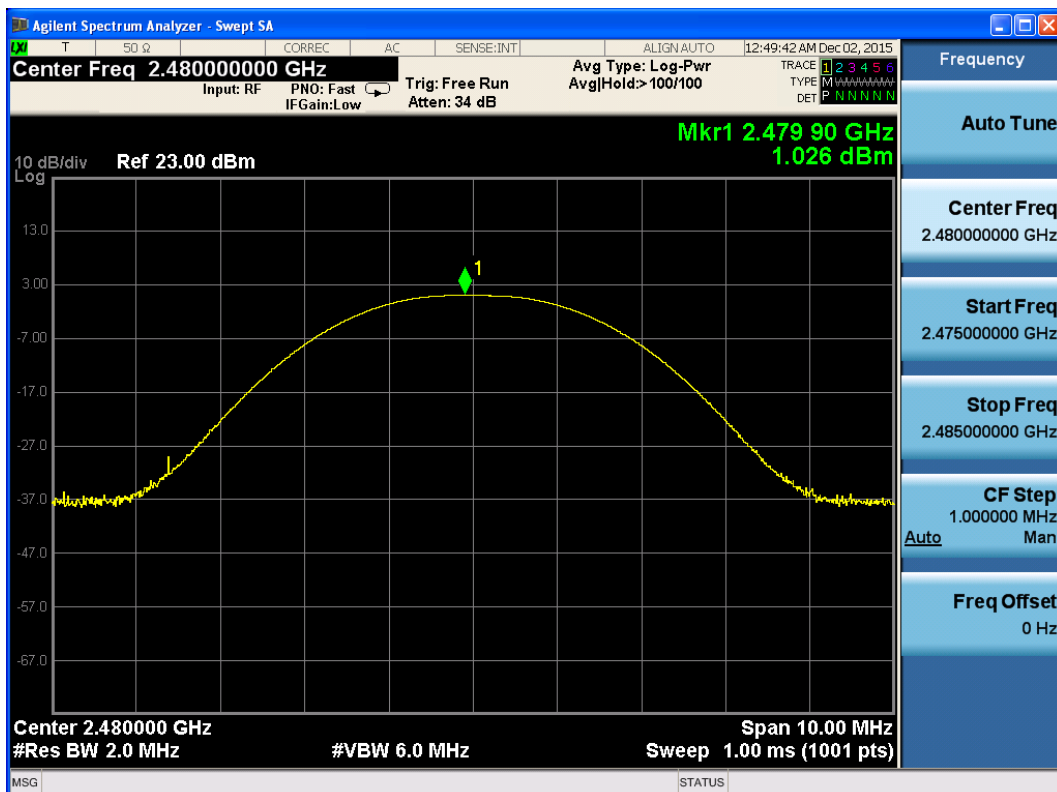
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2440

Channel No.:19



Carrier frequency (MHz): 2480

Channel No.:39

5.2. 6dB Occupied Bandwidth

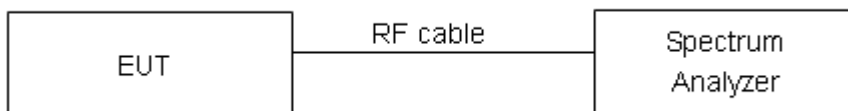
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer with a known loss. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 100 kHz, VBW is set to 300 kHz on spectrum analyzer.

Test Setup



Limits

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

minimum 6 dB bandwidth	≥ 500 kHz
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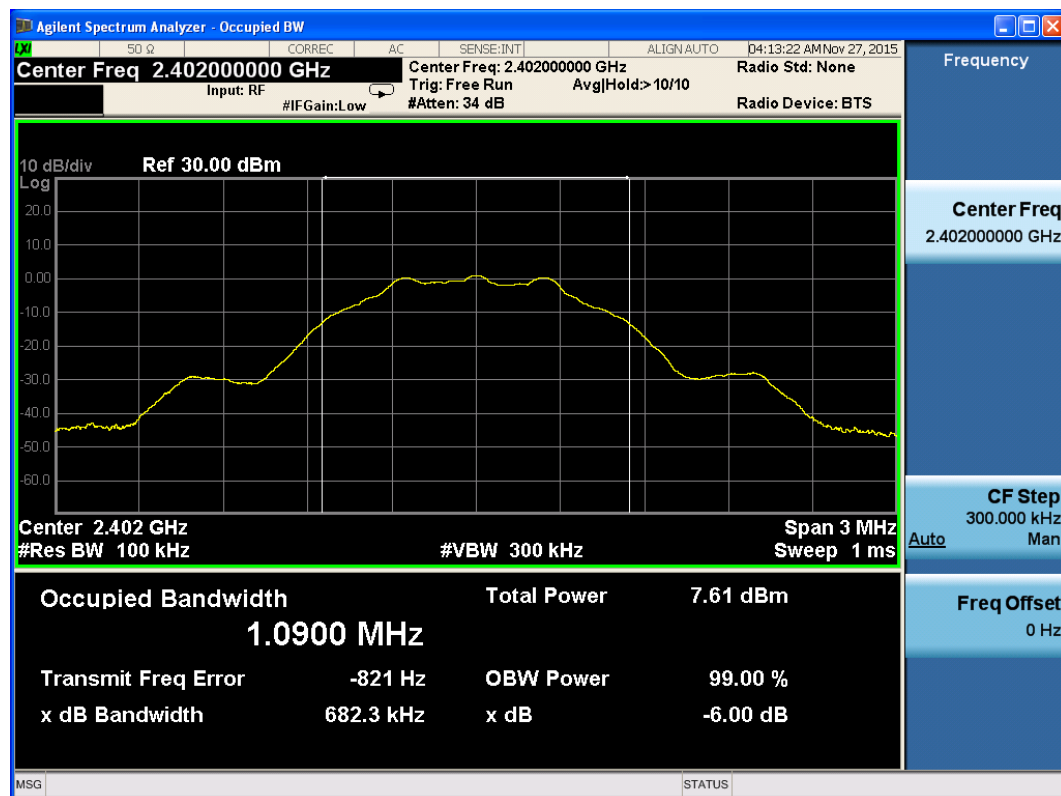
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results:

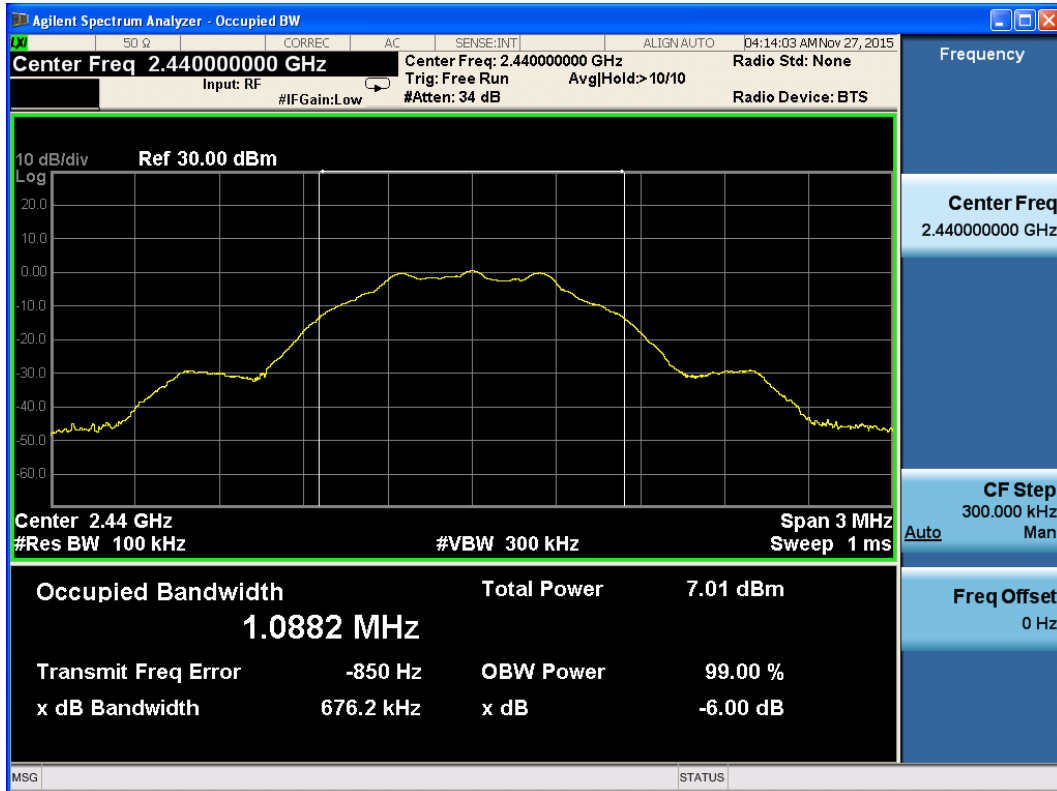
Bluetooth (Low Energy)

Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Conclusion
0	2402	682.3	PASS
19	2440	676.2	PASS
39	2480	678.7	PASS



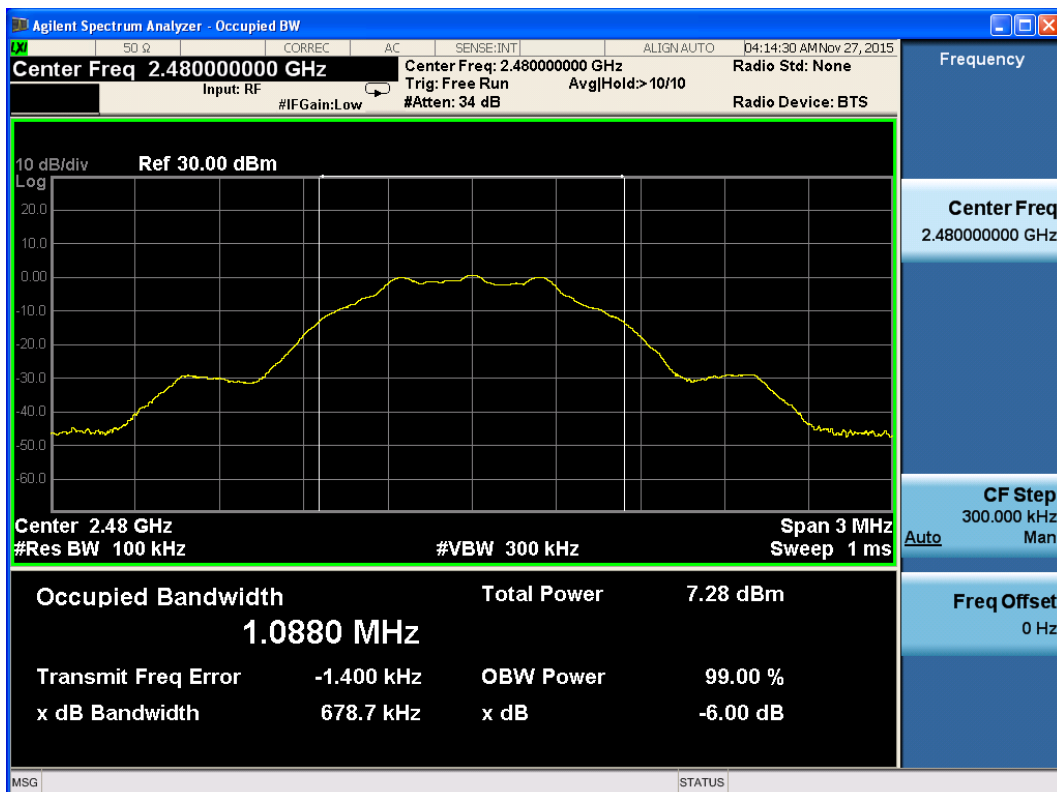
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2440

Channel No.:19



Carrier frequency (MHz): 2480

Channel No.:39

5.3. Band Edge Compliance

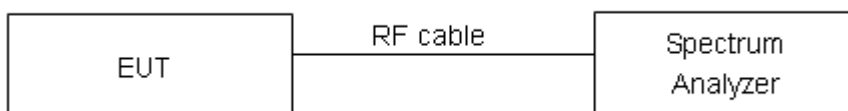
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer with a known loss. The lowest and highest channels were measured. The peak detector is used. RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer.

Test Setup



Limits

Rule Part 15.247(d) specifies that “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.”

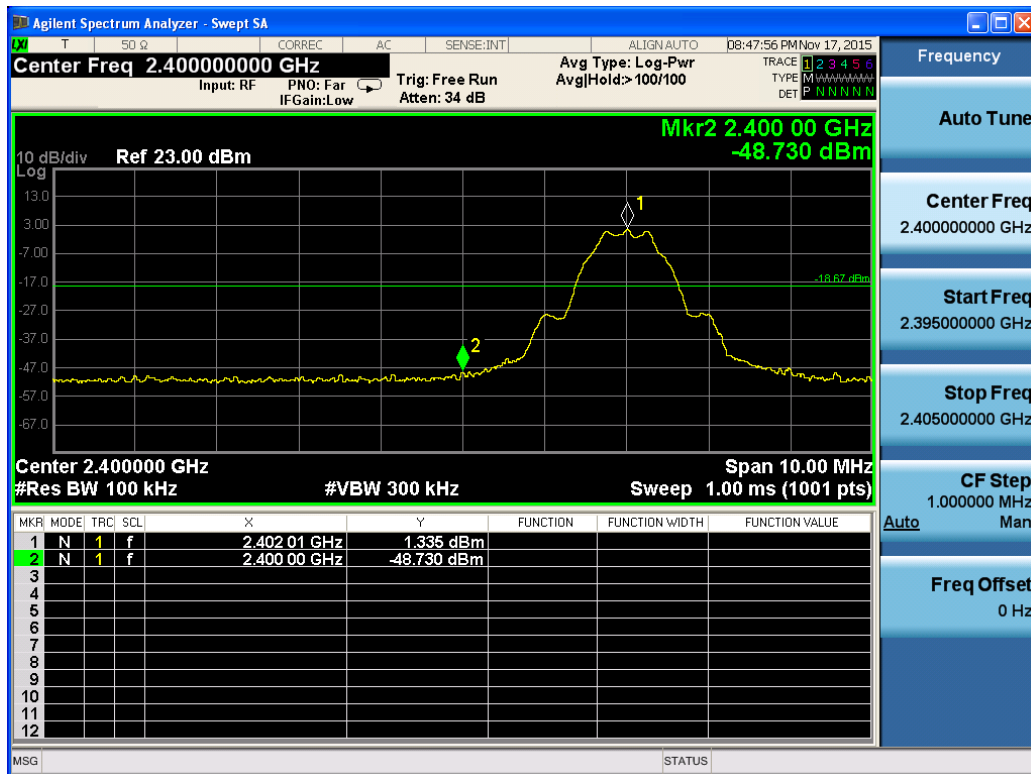
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.



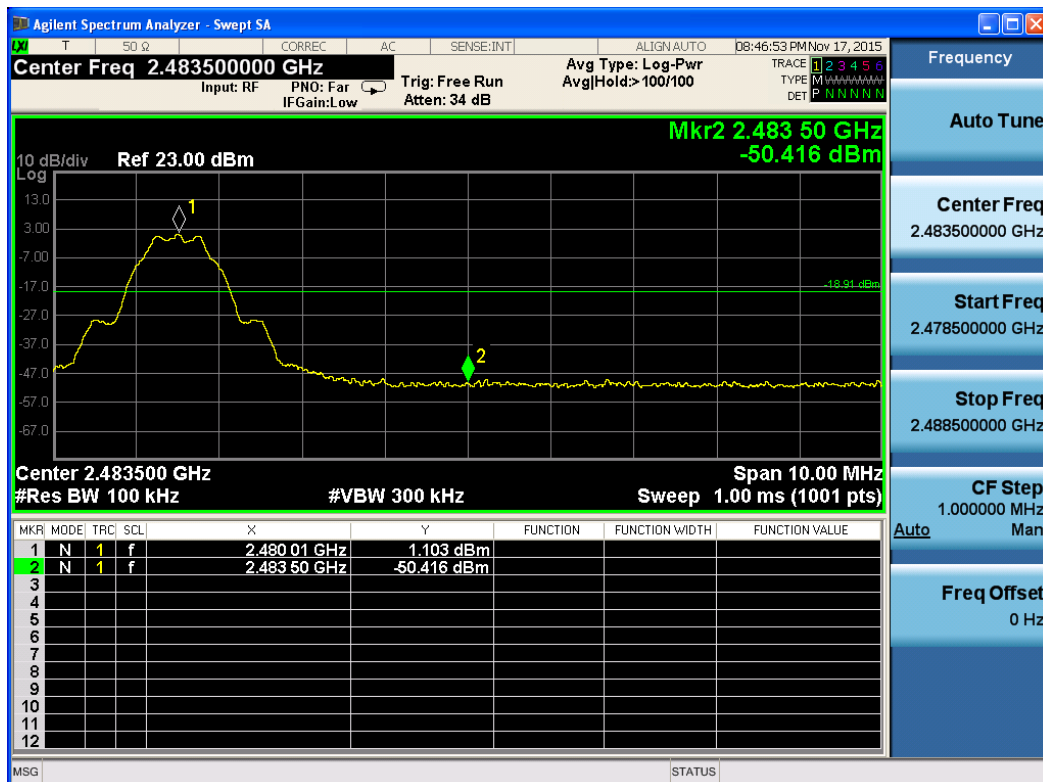
Test Results: PASS

Low Energy



Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2480

Channel No.:39

5.4. Power Spectral Density

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

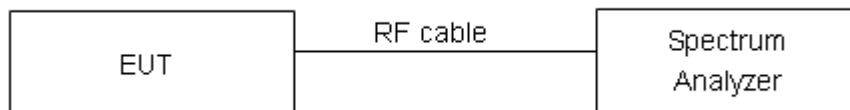
Method of Measurement

The EUT was connected to the spectrum analyzer with a known loss.

RBW is set to 3 kHz and VBW is set to 10 kHz on spectrum analyzer. Set the span to 1.5 times the DTS channel bandwidth. Sweep time = auto couple. Trace mode = max hold.

The peak power spectral density is recorded.

Test setup



Limits

Rule Part 15.247(e) specifies that” 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. ”

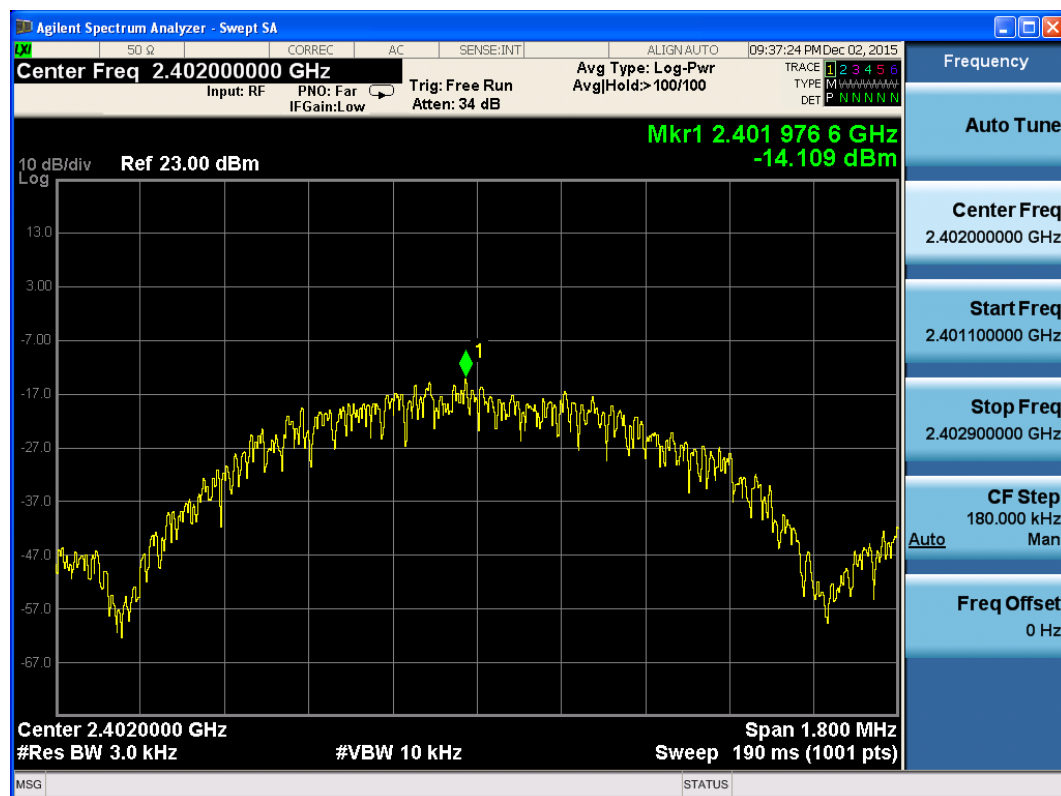
Limits	$\leq 8 \text{ dBm} / 3\text{kHz}$
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Measurement Uncertainty

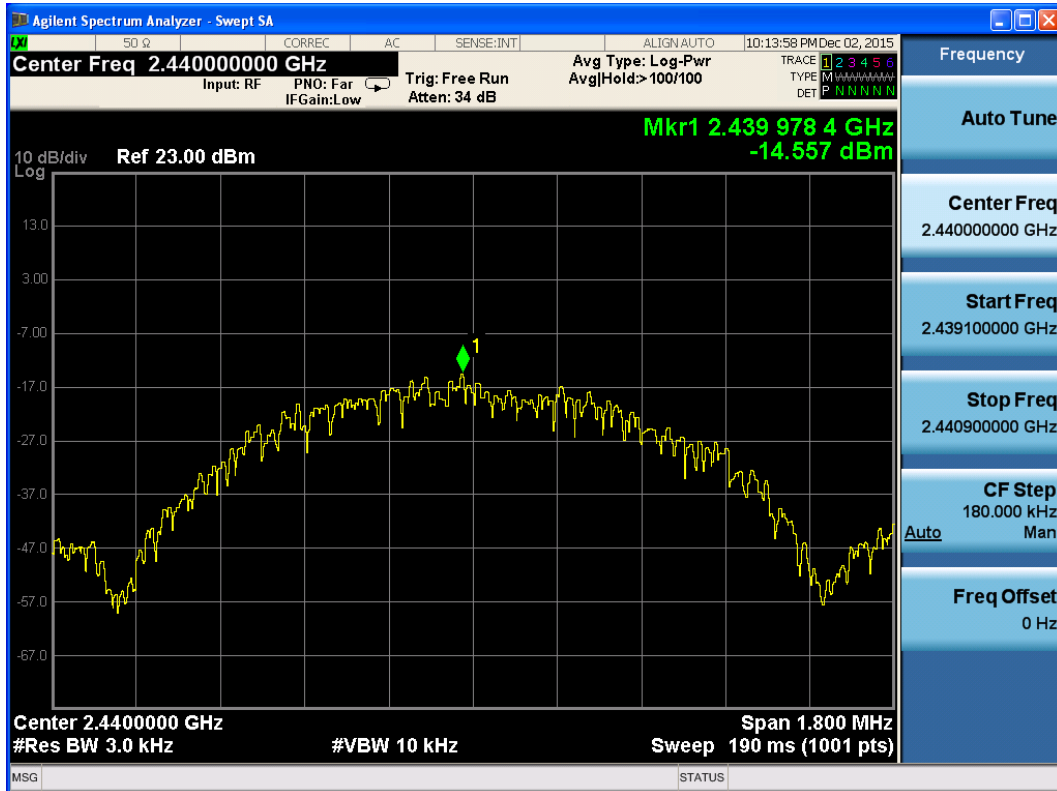
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.75\text{dB}$.

**Test Results:****Bluetooth (Low Energy)**

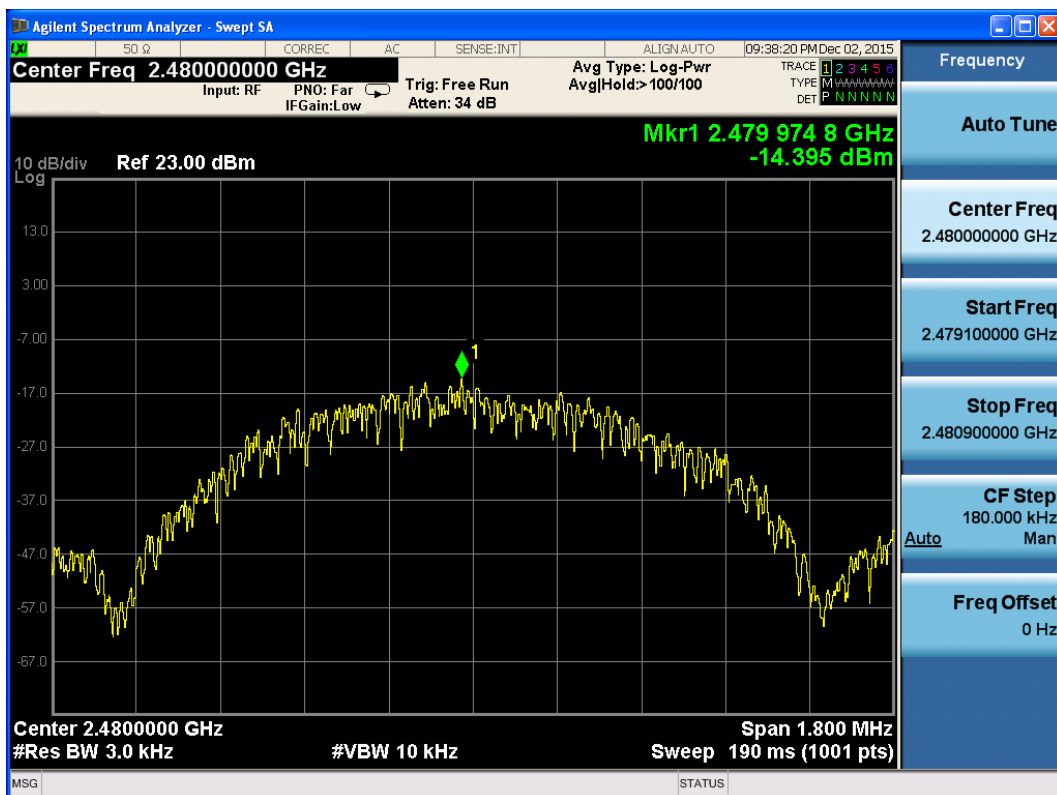
Channel Number	Power Spectral Density dBm / 3kHz	Conclusion
0	-14.109	PASS
19	-14.557	PASS
39	-14.395	PASS



Low energy, Channel No.: 0



Low energy, Channel No.: 19



Low energy, Channel No.: 39

5.5. Spurious Radiated Emissions in the Restricted Band

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. RBW is set to 100kHz. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

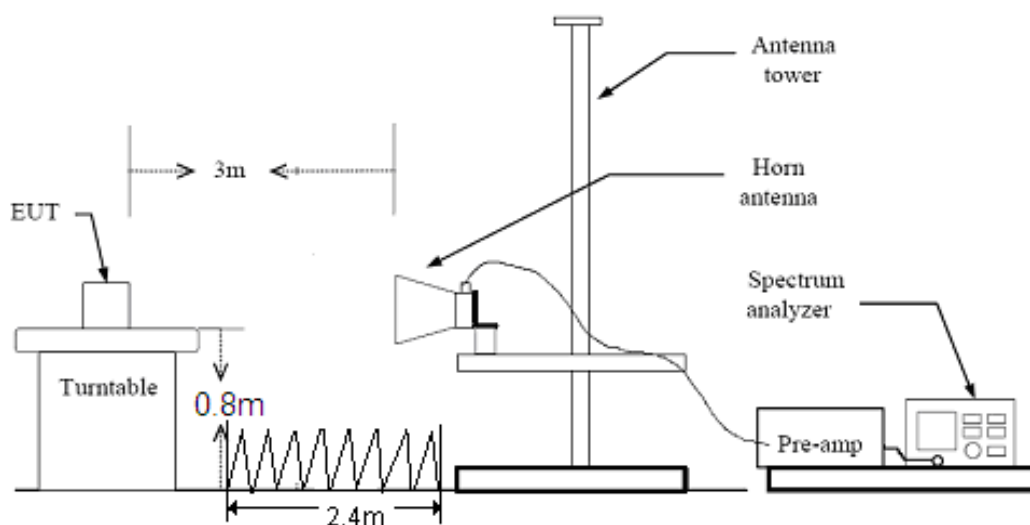
Set the spectrum analyzer in the following:

- (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
- (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

This setting method can refer to **KDB 558074**.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Y axis) and the antenna is vertical.

Test setup



Note: Area side: 2.4mX3.6m

Limits

Spurious Radiated 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Peak Limit=74 dBuV/m

Average Limit=54 dBuV/m

Measurement Uncertainty

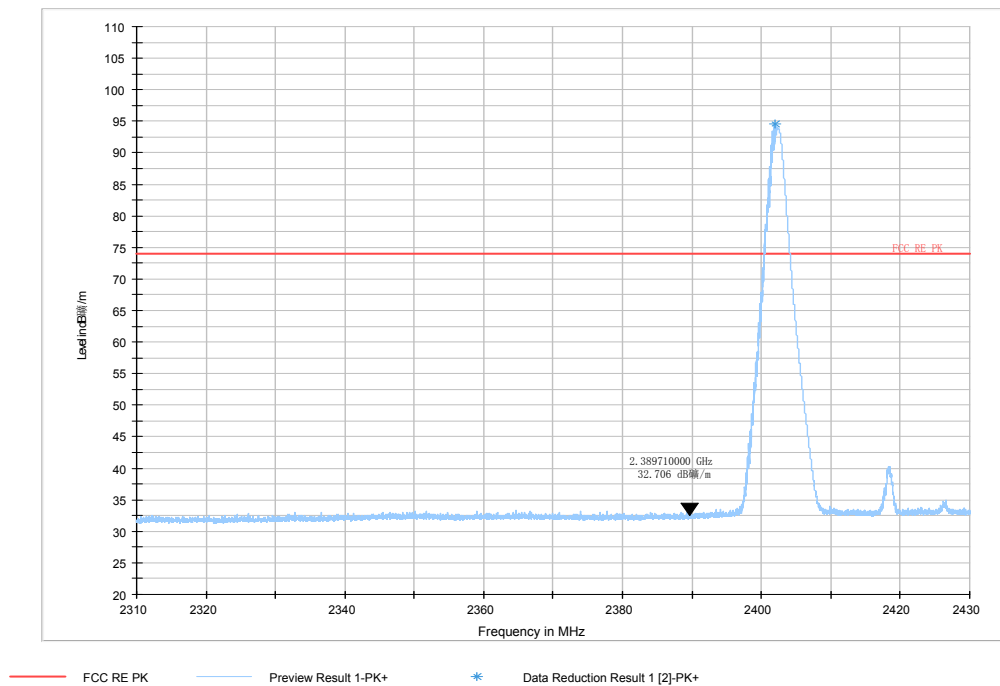
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 3.55$ dB.

Test Results: PASS

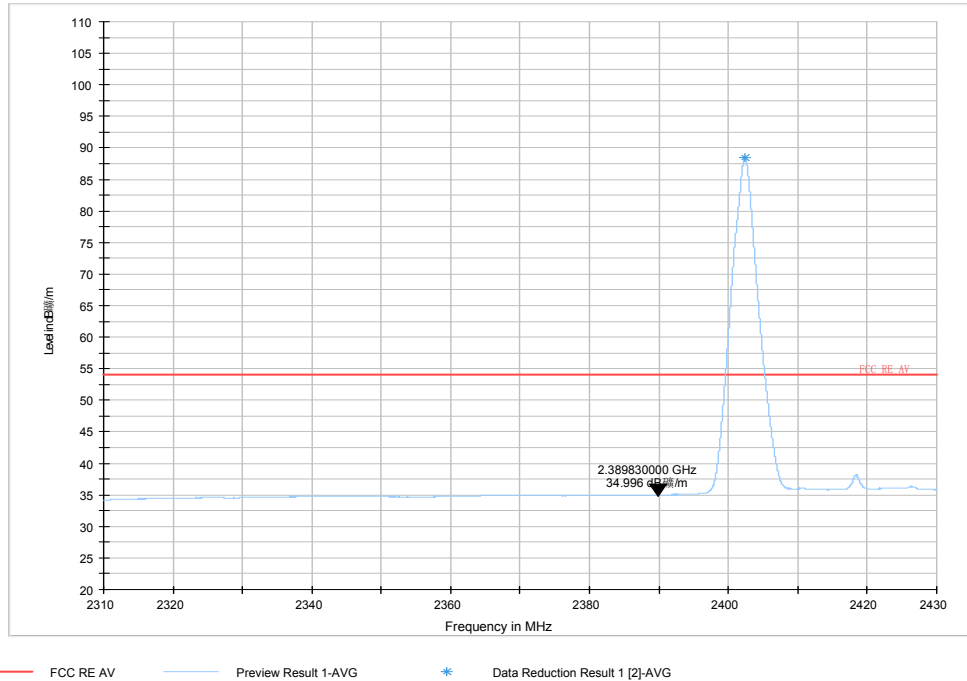
The messy code (dBuV/m) including in the following plots mean dBuV/m.

Channel 0

Peak

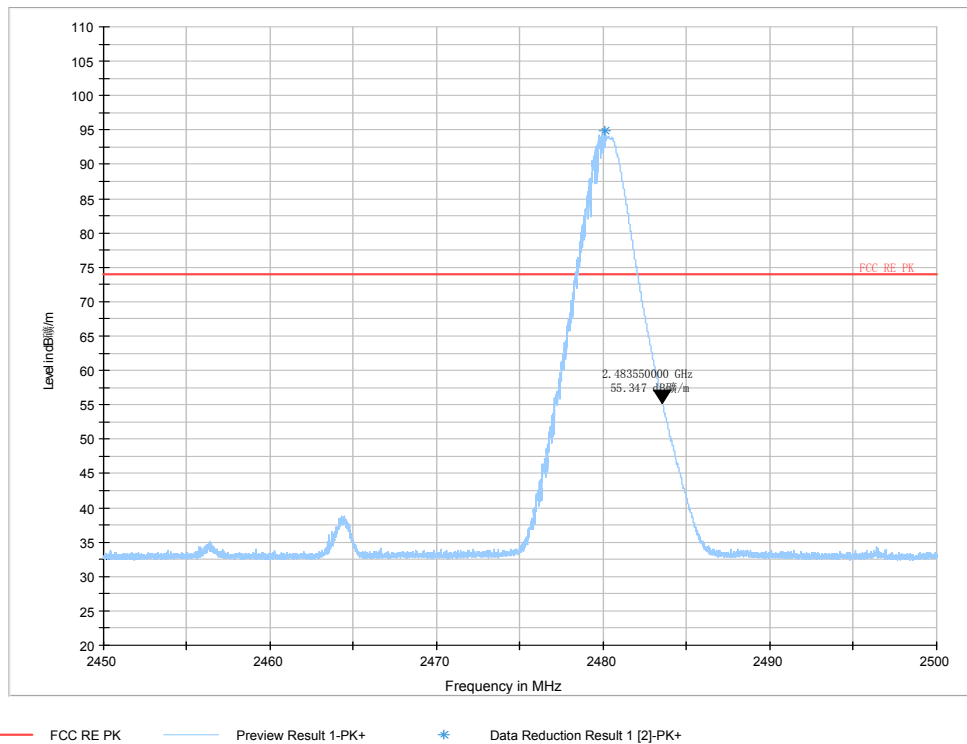


Average

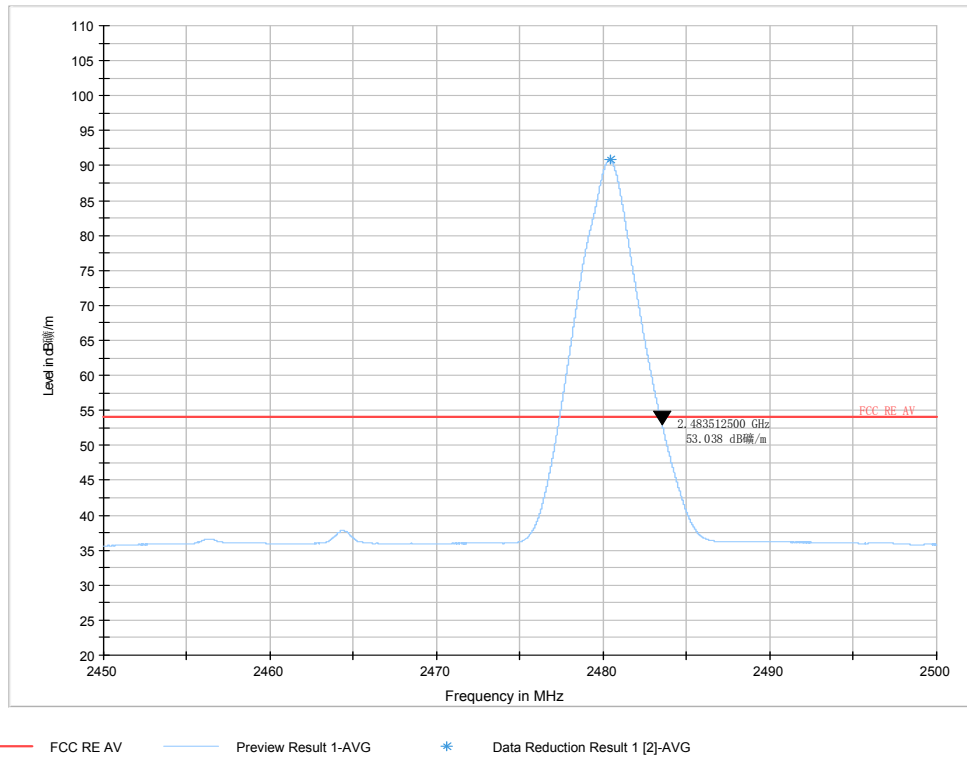


Channel 39

Peak



Average



5.6. Spurious RF Conducted Emissions

Ambient condition

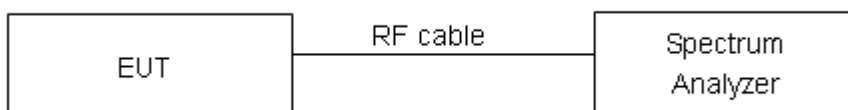
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. RBW and VBW are set to 100 kHz, Sweep is set to ATUO.

The test is in transmitting mode.

Test setup



Limits

Rule Part 15.247(d) pacifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.”

Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
Bluetooth (Low Energy)	2402	3.136	-16.864
	2440	1.808	-18.192
	2480	7.192	-12.808

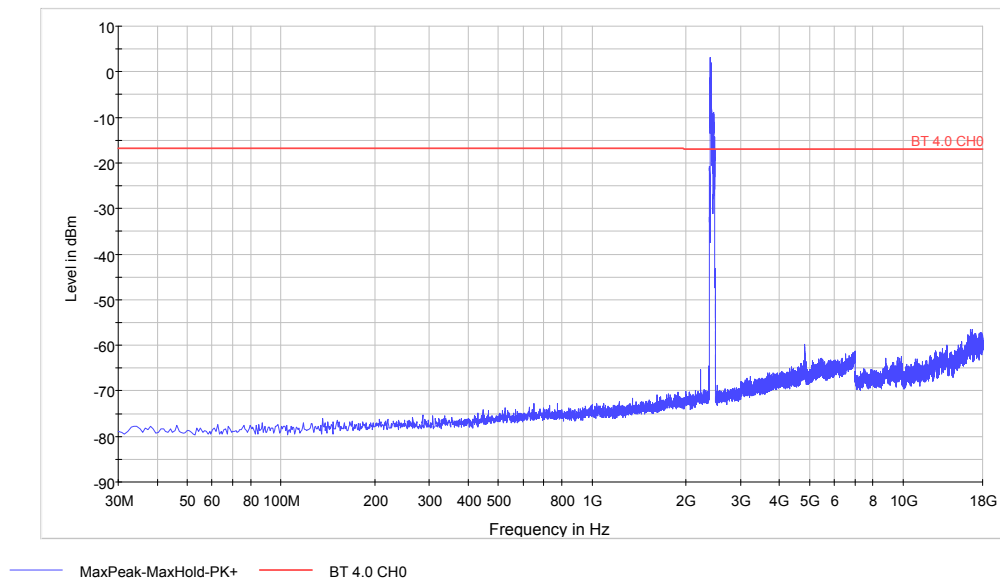
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

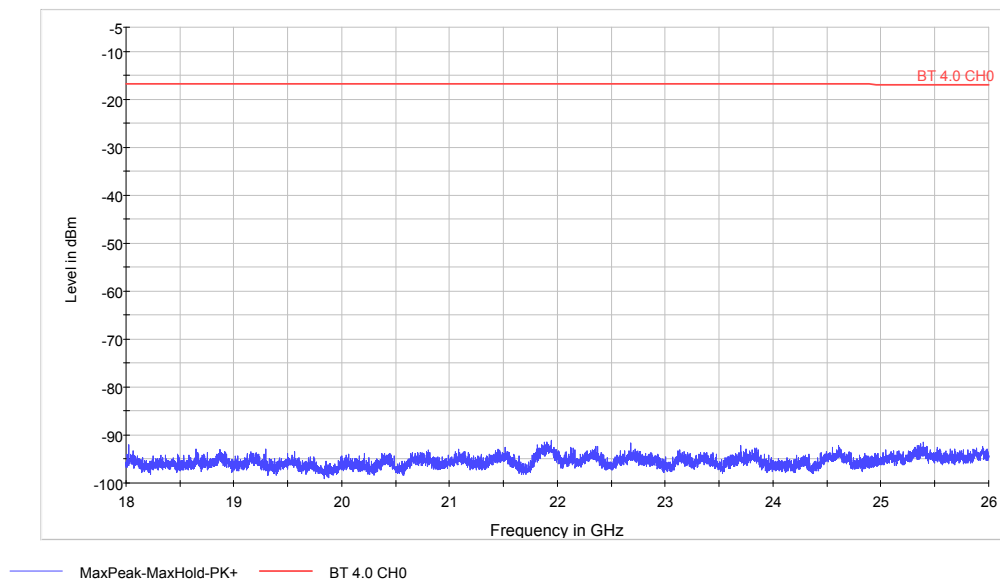
Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

**Test Results:**

Bluetooth (Low Energy)

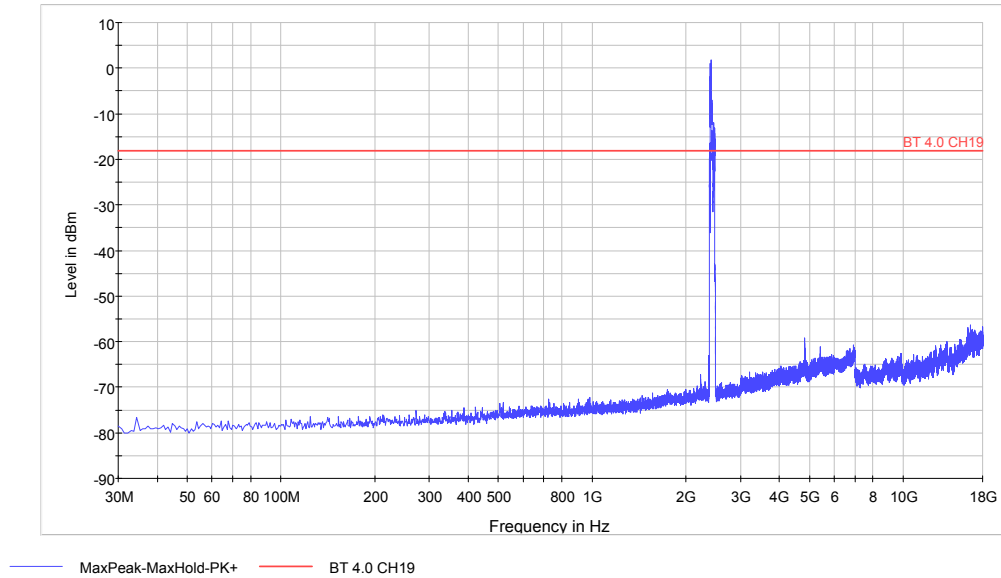
CH0:

Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2402
Spurious RF conducted emissions from 30MHz to 18GHz

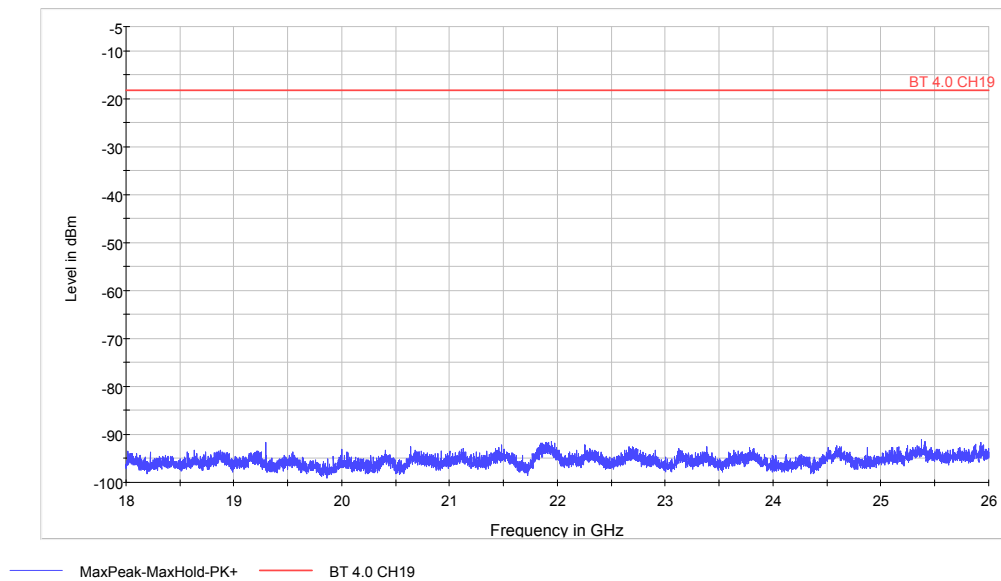


Spurious RF conducted emissions from 18GHz to 26.5GHz

CH19:

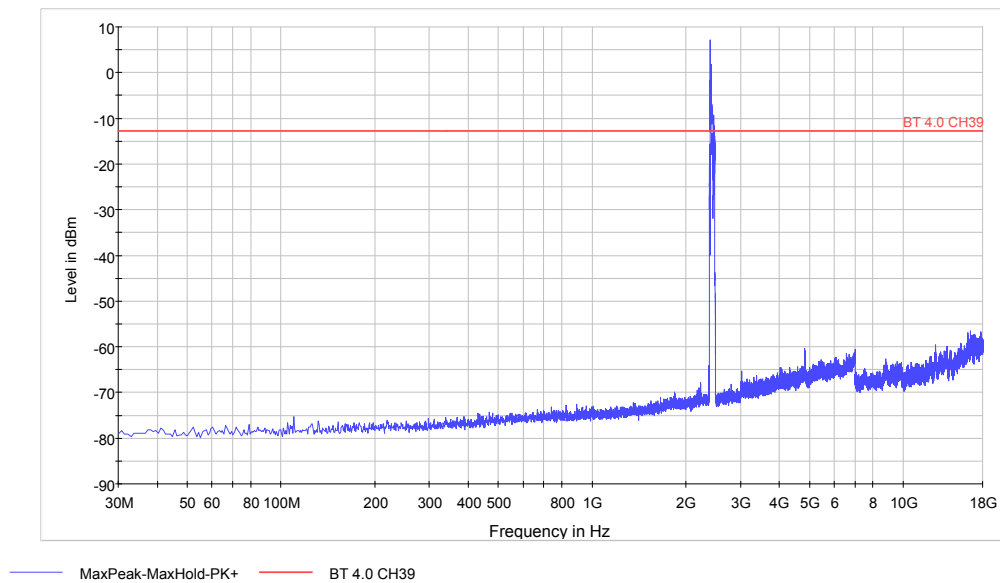


Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2440
Spurious RF conducted emissions from 30MHz to 18GHz

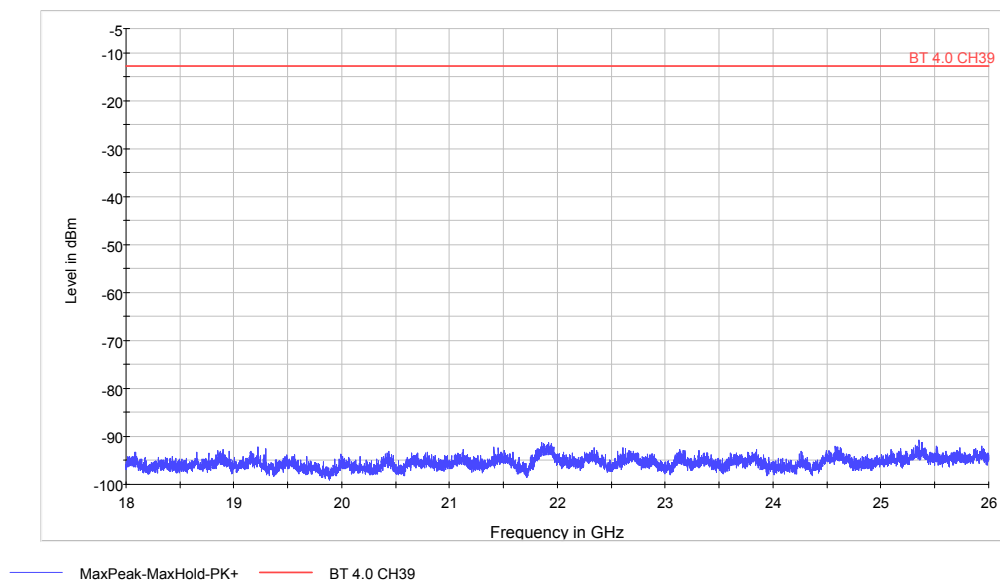


Spurious RF conducted emissions from 18GHz to 26.5GHz

CH39:



Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2480
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

5.7. Radiates Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz (detector: Peak and Quasi-Peak)

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

Above 1GHz (detector: Peak):

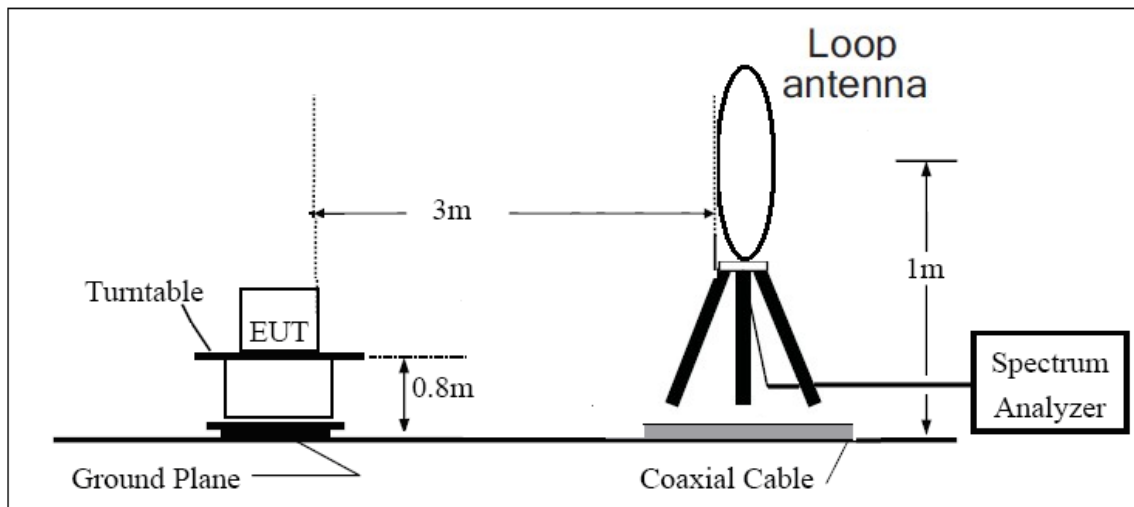
(a) PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

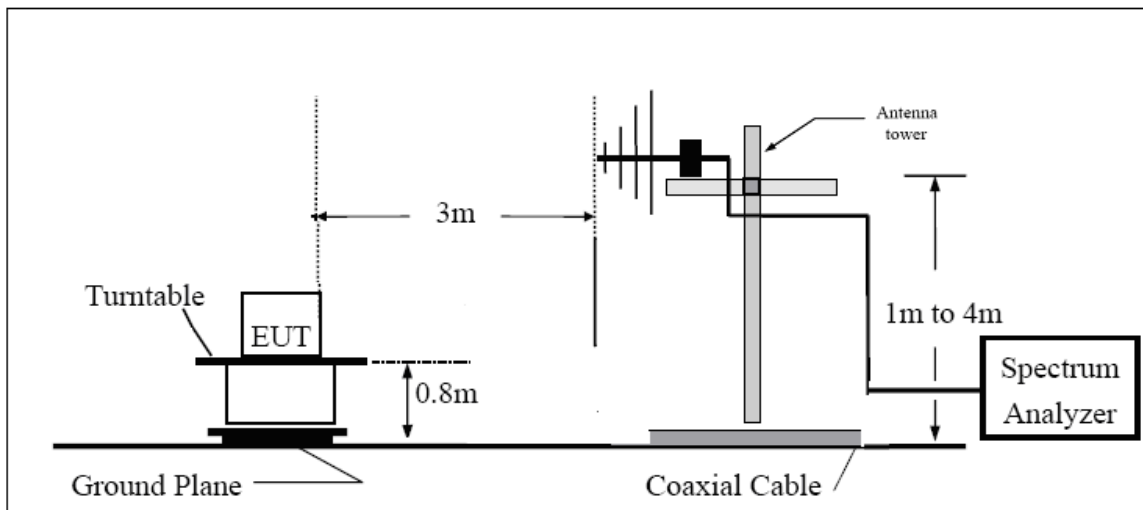
The test is in transmitting mode.

Test setup

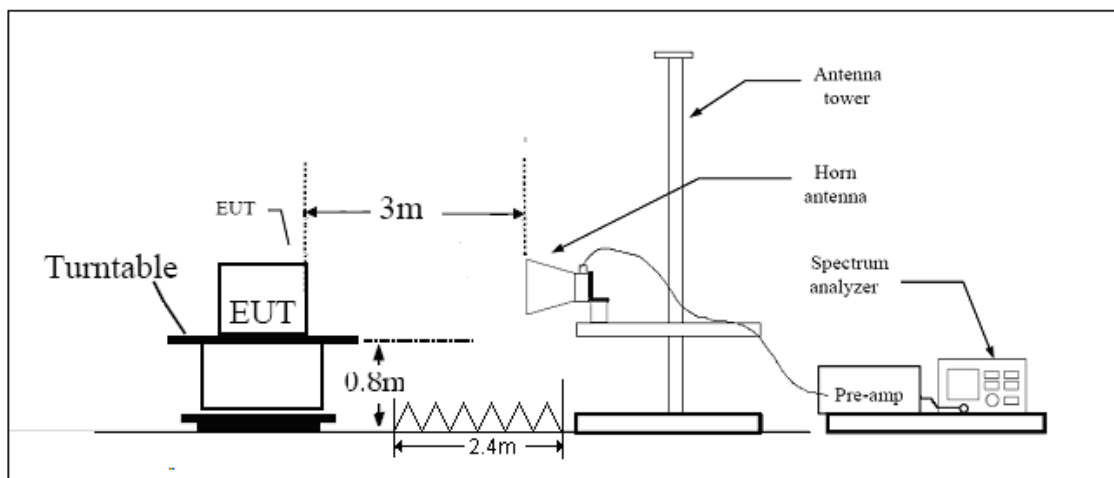
9KHz~~~ 30MHz



30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Rule Part 15.247(d) specifies that “In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).”

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009–0.490	2400/F(kHz)	/
0.490–1.705	24000/F(kHz)	/
1.705–30.0	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test result

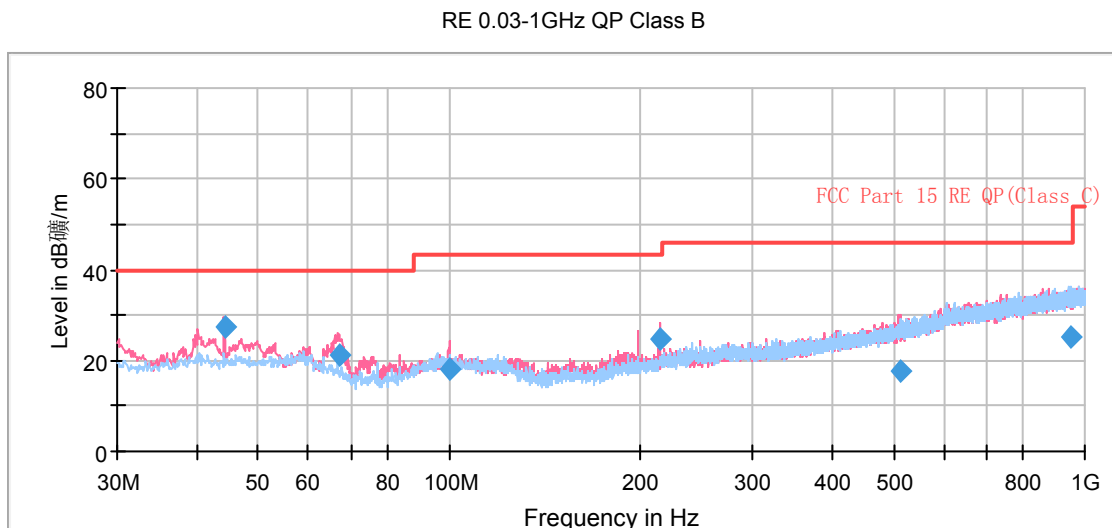
Sweep from 9 kHz to 30MHz, and the emissions more than 20 dB below the permissible value are not reported.

The messy code (dB μ V/m) including in the following graphs mean dBuV/m.

The following graphs display the maximum values of horizontal and vertical by software.

For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

Low Energy-Channel 0



Radiates Emission from 30MHz to 1GHz

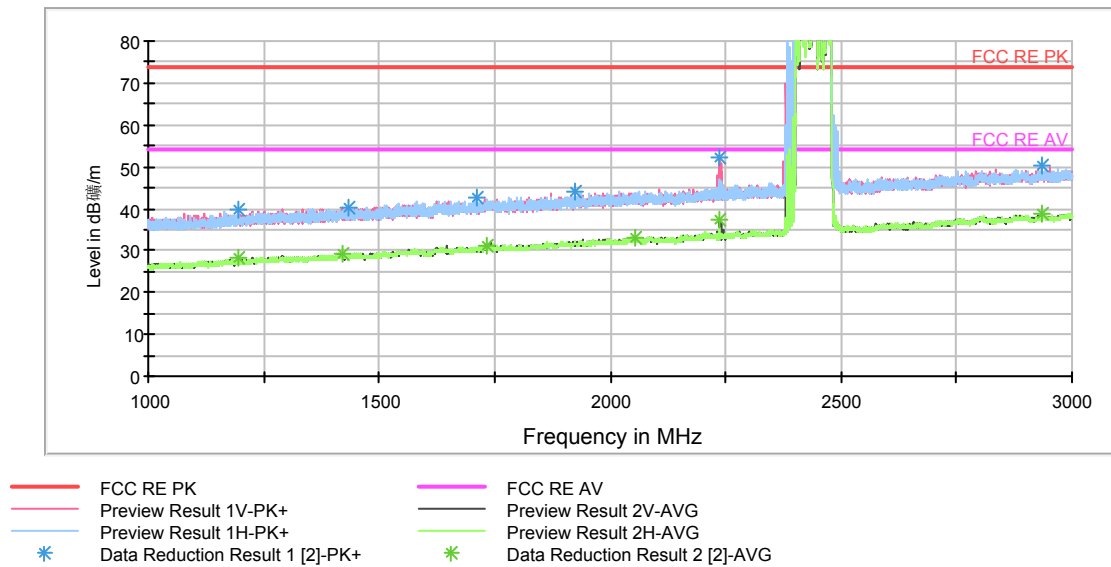
Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
44.266250	27.3	100.0	V	346.0	40.4	-13.1	12.7	40.0
67.380000	21.1	100.0	V	332.0	30.7	-9.6	18.9	40.0
99.843750	18.1	100.0	V	86.0	31.3	-13.2	25.4	43.5
214.502500	24.6	100.0	V	0.0	37.2	-12.6	18.9	43.5
512.248750	17.6	125.0	V	352.0	37.8	-20.2	28.4	46.0
952.221250	25.2	125.0	H	286.0	51.2	-26.0	20.8	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

RE Bluetooth PK+AV



Radiates Emission from 1GHz to 3GHz
 Note: The signal beyond the limit is carrier.

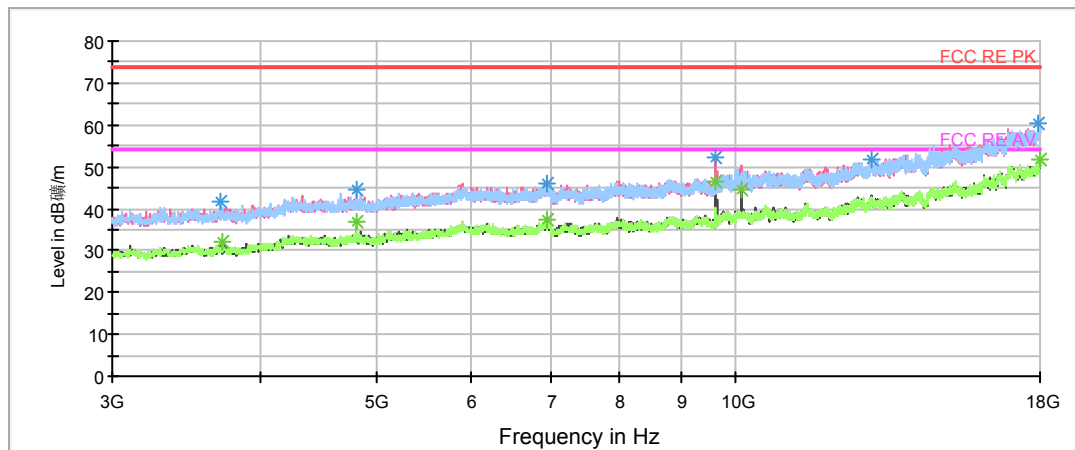
Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1195.250000	37.0	100.0	H	0.0	44.5	-7.5	37.0	74
1419.750000	38.8	100.0	H	283.0	44.6	-5.8	35.2	74
1731.750000	40.6	100.0	V	348.0	43.5	-2.9	33.4	74
2054.000000	42.4	100.0	H	15.0	44.2	-1.8	31.6	74
2238.250000	52.0	100.0	V	22.0	53.0	-1.0	22.0	74
2936.500000	47.3	100.0	V	358.0	50.6	-3.3	26.7	74

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1195.250000	28.1	100.0	H	0.0	35.6	-7.5	25.9	54
1419.750000	29.2	100.0	H	283.0	35.0	-5.8	24.8	54
1731.750000	31.2	100.0	V	348.0	34.1	-2.9	22.8	54
2054.000000	33.2	100.0	H	15.0	35.0	-1.8	20.8	54
2238.250000	37.6	100.0	V	22.0	38.6	-1.0	16.4	54
2936.500000	39.0	100.0	V	358.0	42.3	-3.3	15.0	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



RE 3-18GHz PK+AV



— FCC RE PK
— Preview Result 1V-PK+
— Preview Result 1H-PK+
* Data Reduction Result 1 [1]-PK+

— FCC RE AV
— Preview Result 2V-AVG
— Preview Result 2H-AVG
* Data Reduction Result 2 [1]-AVG

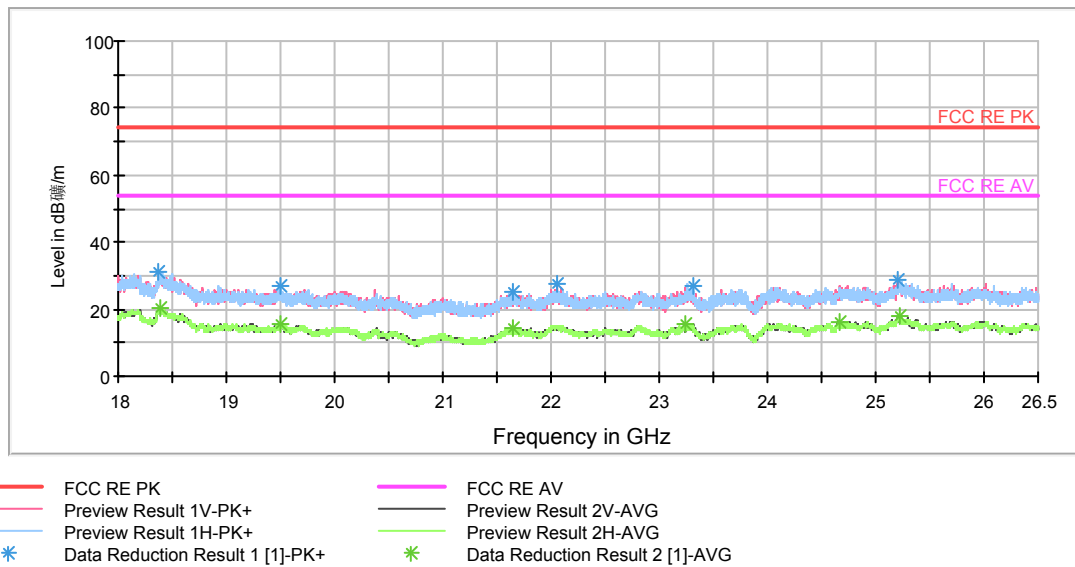
Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3706.875000	40.0	100.0	H	94.0	40.3	-0.3	34.0	74
4803.750000	44.7	100.0	H	0.0	47.4	-2.7	29.3	74
6952.500000	43.5	100.0	V	247.0	50.2	-6.7	30.5	74
9607.500000	52.0	100.0	V	11.0	62.0	-10.0	22.0	74
10123.125000	50.5	100.0	V	2.0	64.3	-13.8	23.5	74
17990.625000	58.3	100.0	V	2.0	83.6	-25.3	15.7	74

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3706.875000	31.9	100.0	H	94.0	32.2	-0.3	22.1	54
4803.750000	36.7	100.0	H	0.0	39.4	-2.7	17.3	54
6952.500000	37.4	100.0	V	247.0	44.1	-6.7	16.6	54
9607.500000	46.4	100.0	V	11.0	56.4	-10.0	7.6	54
10123.125000	44.6	100.0	V	2.0	58.4	-13.8	9.4	54
17990.625000	51.6	100.0	V	2.0	76.9	-25.3	2.4	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

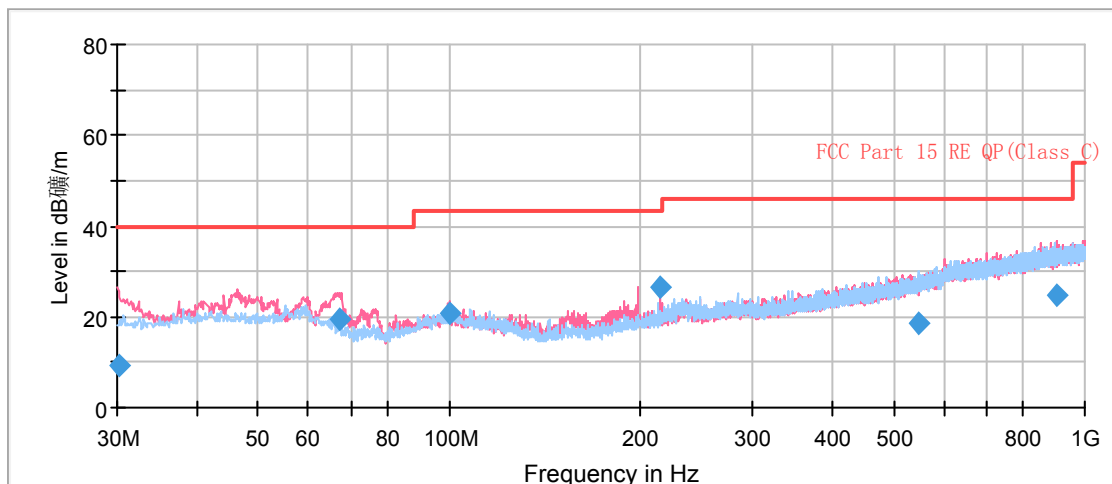
Frequency (MHz)	Peak (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18395.250000	29.4	V	0.0	34.3	-4.9	44.6	74
19491.750000	25.2	V	0.0	32.8	-7.6	48.8	74
21651.812500	25.1	H	0.0	34.3	-9.2	48.9	74
23248.750000	26.1	V	0.0	33.6	-7.5	47.9	74
24664.000000	24.1	H	0.0	31.2	-7.1	49.9	74
25222.875000	27.2	H	0.0	33.1	-5.9	46.8	74

Frequency (MHz)	Average (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18395.250000	20.5	V	0.0	25.4	-4.9	33.5	54
19491.750000	15.8	V	0.0	23.4	-7.6	38.2	54
21651.812500	14.3	H	0.0	23.5	-9.2	39.7	54
23248.750000	15.5	V	0.0	23.0	-7.5	38.5	54
24664.000000	16.4	H	0.0	23.5	-7.1	37.6	54
25222.875000	17.9	H	0.0	23.8	-5.9	36.1	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Middle Energy-Channel 19

RE 0.03-1GHz QP Class B



Radiates Emission from 30MHz to 1GHz

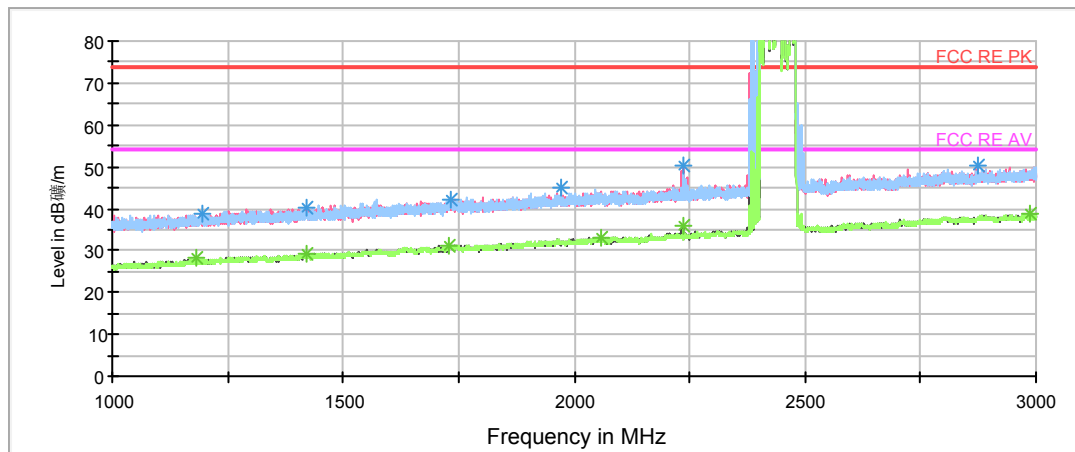
Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
30.120000	9.4	100.0	V	324.0	21.3	-11.9	30.6	40.0
67.183750	19.5	125.0	V	313.0	29.2	-9.7	20.5	40.0
100.163750	20.6	114.0	V	68.0	33.8	-13.2	22.9	43.5
214.502500	26.6	100.0	V	334.0	39.2	-12.6	16.9	43.5
547.496250	18.4	100.0	H	124.0	39.3	-20.9	27.6	46.0
902.392500	24.7	125.0	V	334.0	50.4	-25.7	21.3	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

RE Bluetooth PK+AV



— FCC RE PK
— FCC RE AV
— Preview Result 1V-PK+
— Preview Result 2V-AVG
— Preview Result 1H-PK+
— Preview Result 2H-AVG
* Data Reduction Result 1 [2]-PK+
* Data Reduction Result 2 [2]-AVG

Radiates Emission from 1GHz to 3GHz

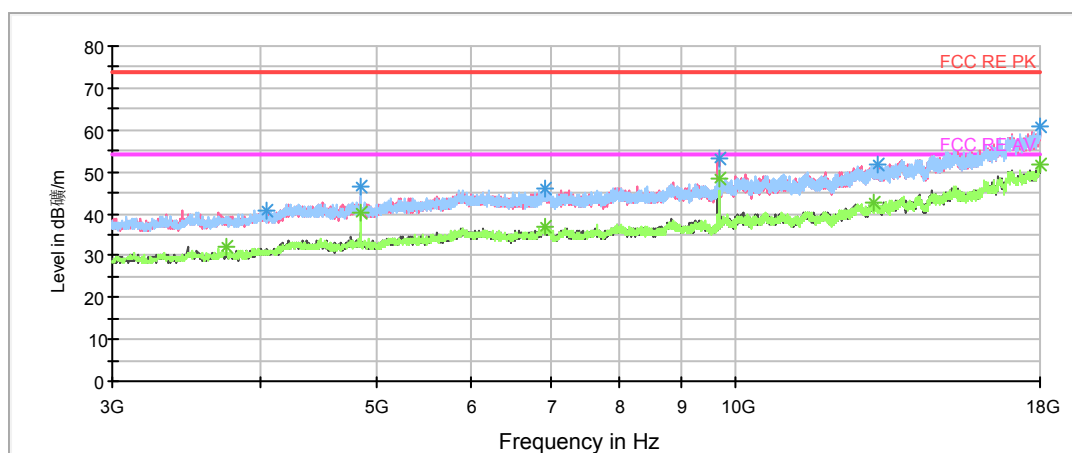
Note: The signal beyond the limit is carrier.

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1181.000000	37.6	100.0	H	87.0	44.7	-7.1	36.4	74
1420.000000	38.6	100.0	V	251.0	44.4	-5.8	35.4	74
1729.750000	40.5	100.0	H	87.0	43.6	-3.1	33.5	74
2059.750000	42.9	100.0	H	63.0	44.4	-1.5	31.1	74
2236.750000	50.5	100.0	V	0.0	51.5	-1.0	23.5	74
2989.000000	46.9	100.0	V	335.0	50.7	-3.8	27.1	74

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1181.000000	28.1	100.0	H	87.0	35.2	-7.1	25.9	54
1420.000000	29.4	100.0	V	251.0	35.2	-5.8	24.6	54
1729.750000	31.3	100.0	H	87.0	34.4	-3.1	22.7	54
2059.750000	33.0	100.0	H	63.0	34.5	-1.5	21.0	54
2236.750000	35.8	100.0	V	0.0	36.8	-1.0	18.2	54
2989.000000	38.6	100.0	V	335.0	42.4	-3.8	15.4	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

RE 3-18GHz PK+AV



— FCC RE PK
— FCC RE AV
— Preview Result 1V-PK+
— Preview Result 2V-AVG
— Preview Result 1H-PK+
— Preview Result 2H-AVG
* Data Reduction Result 1 [1]-PK+
* Data Reduction Result 2 [1]-AVG

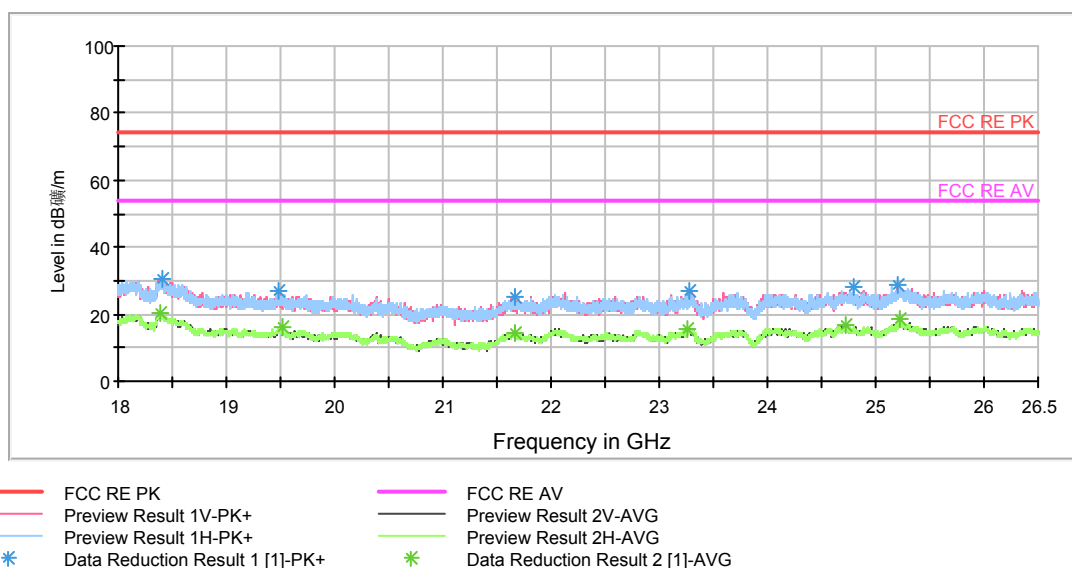
Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3736.875000	38.6	100.0	H	72.0	38.9	-0.3	38.9	74
4841.250000	46.4	100.0	H	0.0	49.2	-2.8	49.2	74
6918.750000	45.0	100.0	V	327.0	51.9	-6.9	51.9	74
9684.375000	53.3	100.0	V	0.0	64.2	-10.9	64.2	74
13053.750000	48.6	100.0	H	150.0	64.8	-16.2	64.8	74
17992.500000	58.8	100.0	H	323.0	84.1	-25.3	84.1	74

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3736.875000	32.1	100.0	H	72.0	32.4	-0.3	21.9	54
4841.250000	40.1	100.0	H	0.0	42.9	-2.8	13.9	54
6918.750000	37.1	100.0	V	327.0	44.0	-6.9	16.9	54
9684.375000	48.3	100.0	V	0.0	59.2	-10.9	5.7	54
13053.750000	42.9	100.0	H	150.0	59.1	-16.2	11.1	54
17992.500000	51.6	100.0	H	323.0	76.9	-25.3	2.4	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18380.375000	28.2	V	0.0	33.0	-4.8	45.8	74
19510.875000	23.9	V	0.0	31.4	-7.5	50.1	74
21658.187500	23.1	V	0.0	32.3	-9.2	50.9	74
23251.937500	25.3	H	0.0	32.8	-7.5	48.7	74
24727.750000	24.8	H	0.0	31.0	-6.2	49.2	74
25231.375000	27.1	V	0.0	33.0	-5.9	46.9	74

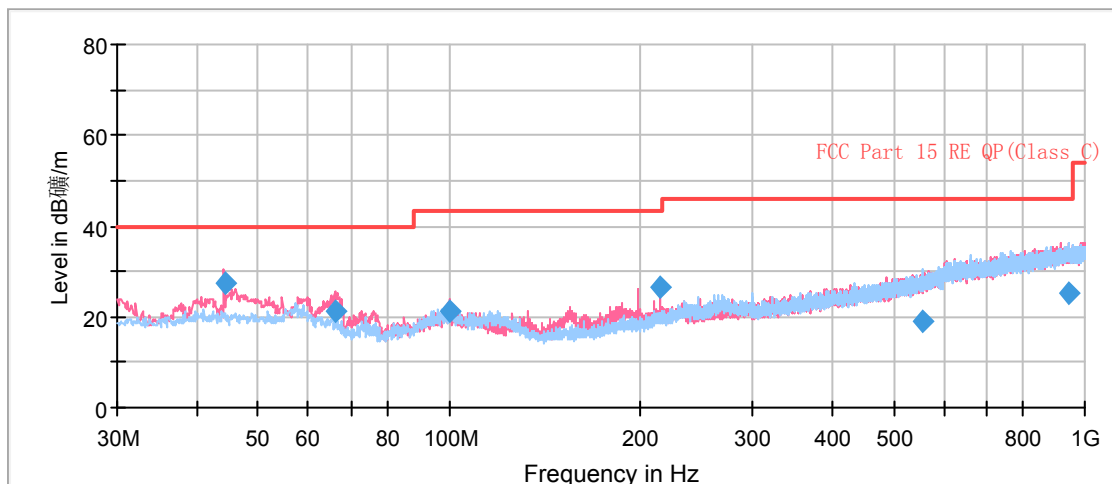
Frequency (MHz)	Average (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18380.375000	20.2	V	0.0	25.0	-4.8	33.8	54
19510.875000	15.9	V	0.0	23.4	-7.5	38.1	54
21658.187500	14.5	V	0.0	23.7	-9.2	39.5	54
23251.937500	15.7	H	0.0	23.2	-7.5	38.3	54
24727.750000	16.5	H	0.0	22.7	-6.2	37.5	54
25231.375000	18.5	V	0.0	24.4	-5.9	35.5	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



High Energy-Channel 39

RE 0.03-1GHz QP Class B



Radiates Emission from 30MHz to 1GHz

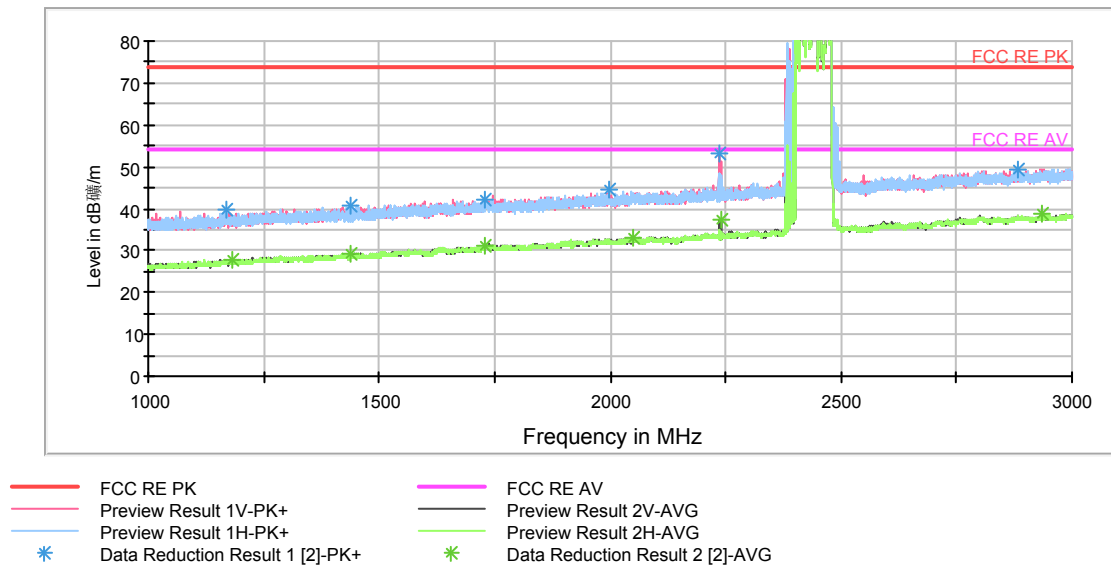
Frequency (MHz)	Quasi-Peak (dB μ V/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dB μ V/m)	Correct Factor (dB)	Margin (dB)	Limit (dB μ V/m)
44.266250	27.2	100.0	V	24.0	40.3	13.1	12.8	40.0
66.411250	21.3	100.0	V	329.0	31.3	10.0	18.7	40.0
100.163750	21.1	114.0	V	34.0	34.3	13.2	22.4	43.5
214.502500	26.7	100.0	V	336.0	39.3	12.6	16.8	43.5
556.062500	18.8	100.0	H	15.0	40.0	21.2	27.2	46.0
942.036250	25.3	100.0	V	353.0	51.3	26.0	20.7	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

RE Bluetooth PK+AV



Radiates Emission from 1GHz to 3GHz

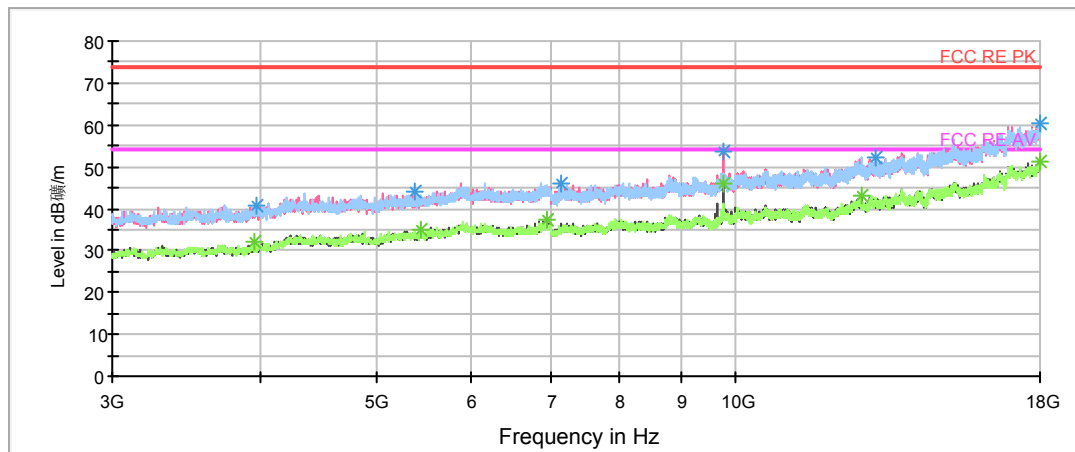
Note: The signal beyond the limit is carrier.

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1184.000000	37.3	100.0	H	0.0	44.5	-7.2	36.7	74
1437.000000	38.4	100.0	H	37.0	44.5	-6.1	35.6	74
1729.750000	39.6	100.0	H	0.0	42.7	-3.1	34.4	74
2048.250000	42.4	100.0	H	242.0	44.4	-2.0	31.6	74
2239.750000	51.4	100.0	V	0.0	52.4	-1.0	22.6	74
2936.750000	48.1	100.0	V	0.0	51.4	-3.3	25.9	74

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1184.000000	27.8	100.0	H	0.0	35.0	-7.2	26.2	54
1437.000000	29.1	100.0	H	37.0	35.2	-6.1	24.9	54
1729.750000	31.4	100.0	H	0.0	34.5	-3.1	22.6	54
2048.250000	33.1	100.0	H	242.0	35.1	-2.0	20.9	54
2239.750000	37.6	100.0	V	0.0	38.6	-1.0	16.4	54
2936.750000	38.8	100.0	V	0.0	42.1	-3.3	15.2	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

RE 3-18GHz PK+AV



— FCC RE PK
— Preview Result 1V-PK+
— Preview Result 1H-PK+
* Data Reduction Result 1 [1]-PK+
— FCC RE AV
— Preview Result 2V-AVG
— Preview Result 2H-AVG
* Data Reduction Result 2 [1]-AVG

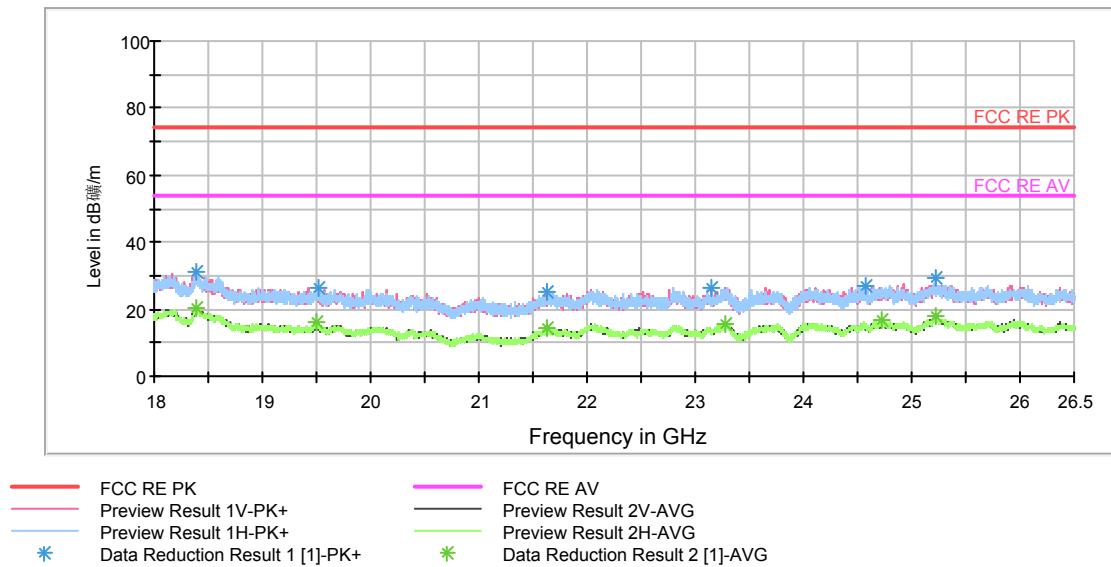
Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3945.000000	39.9	100.0	H	173.0	40.0	0.1	34.1	74
5448.750000	41.9	100.0	H	84.0	45.7	3.8	32.1	74
6945.000000	43.6	100.0	V	147.0	50.3	6.7	30.4	74
9763.125000	53.7	100.0	V	10.0	65.5	11.8	20.3	74
12738.750000	49.7	100.0	V	191.0	64.8	15.1	24.3	74
17973.750000	58.0	100.0	H	51.0	83.1	25.1	16.0	74

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3945.000000	32.2	100.0	H	173.0	32.3	0.1	21.8	54
5448.750000	35.2	100.0	H	84.0	39.0	3.8	18.8	54
6945.000000	37.2	100.0	V	147.0	43.9	6.7	16.8	54
9763.125000	46.1	100.0	V	10.0	57.9	11.8	7.9	54
12738.750000	43.0	100.0	V	191.0	58.1	15.1	11.0	54
17973.750000	51.4	100.0	H	51.0	76.5	25.1	2.6	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18385.687500	29.8	H	0.0	34.6	-4.8	44.2	74
19500.250000	25.2	V	0.0	32.7	-7.5	48.8	74
21634.812500	24.0	H	0.0	33.1	-9.1	50.0	74
23274.250000	25.6	V	0.0	32.8	-7.2	48.4	74
24728.812500	26.6	H	0.0	32.8	-6.2	47.4	74
25220.750000	26.0	V	0.0	32.0	-6.0	48.0	74

Frequency (MHz)	Average (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18385.687500	20.5	H	0.0	25.3	-4.8	33.5	54
19500.250000	16.1	V	0.0	23.6	-7.5	37.9	54
21634.812500	14.4	H	0.0	23.5	-9.1	39.6	54
23274.250000	15.5	V	0.0	22.7	-7.2	38.5	54
24728.812500	16.7	H	0.0	22.9	-6.2	37.3	54
25220.750000	18.2	V	0.0	24.2	-6.0	35.8	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

5.8. Conducted Emission

Ambient condition

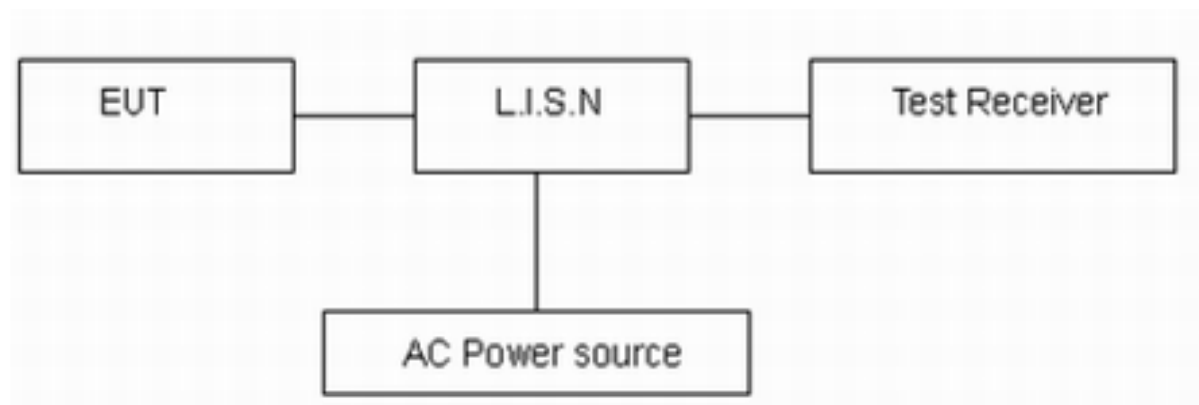
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10-2013. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

The test is in transmitting mode.

Test Setup



Note: AC Power source is used to change the voltage from 220V/50Hz to 110V/60Hz.

Limits

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50

*: Decreases with the logarithm of the frequency.

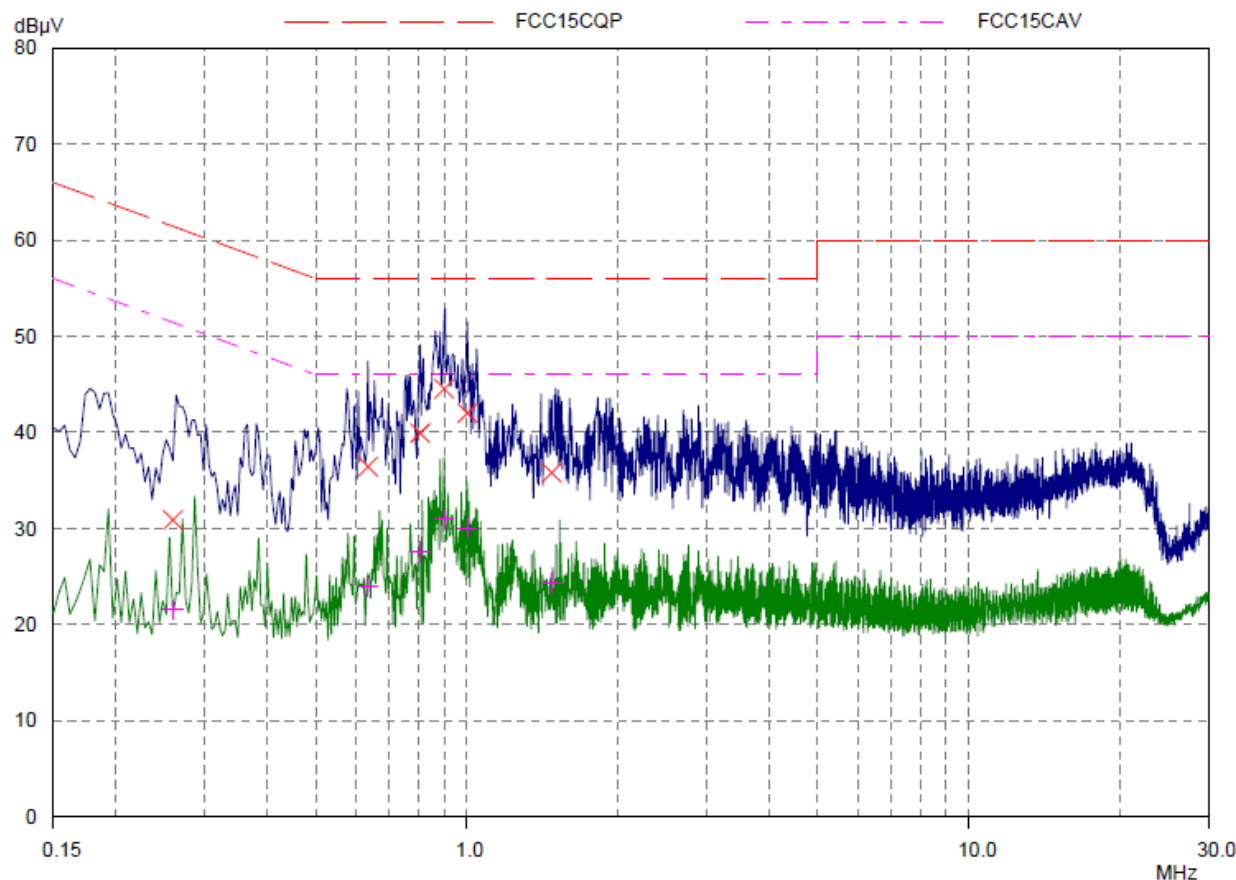
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 2.69$ dB.

**Test Results:**

Following plots, Blue trace uses the peak detection, Green trace uses the average detection.

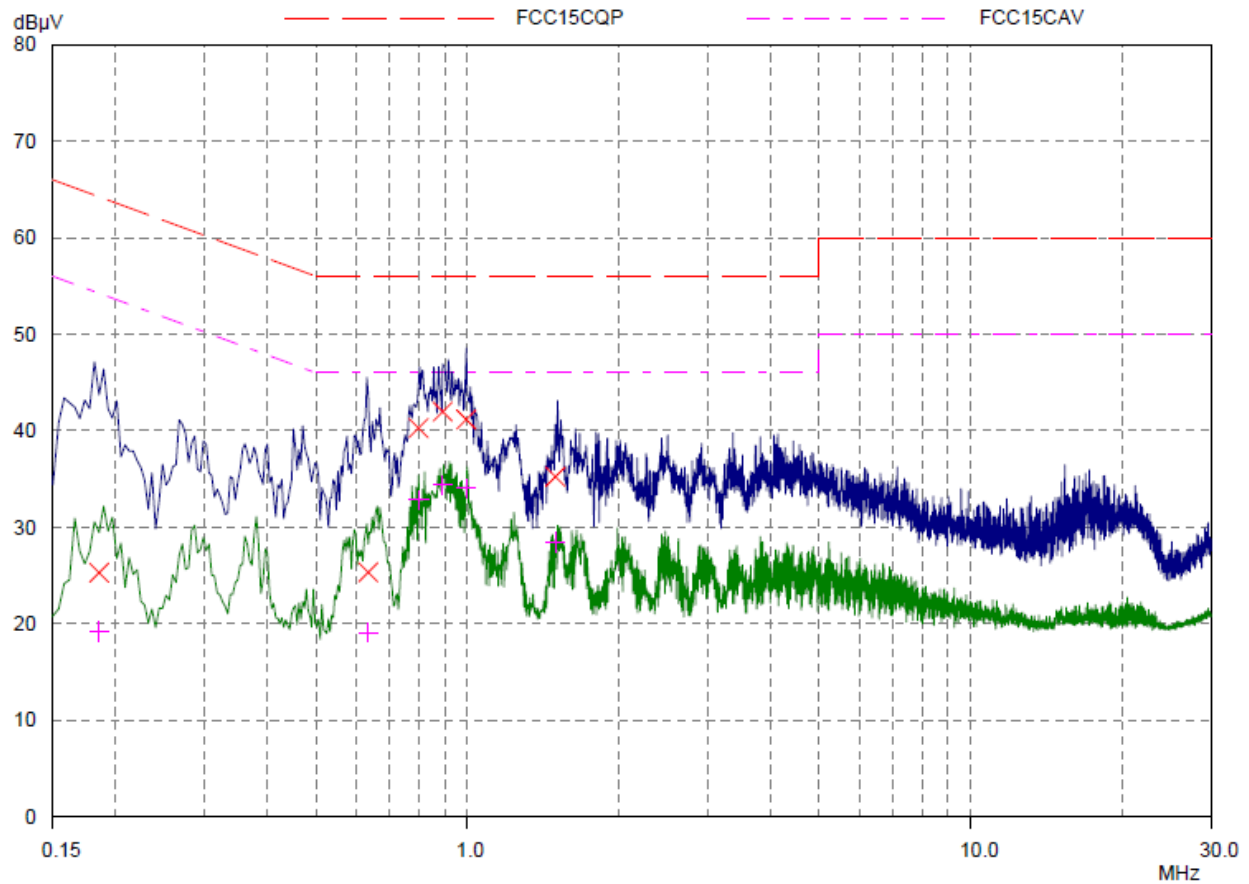
Low Energy –CH0

**Final Measurement Results**

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.25937	30.90	61.45	30.55	L1	gnd
0.63437	36.44	56.00	19.56	L1	gnd
0.80625	39.94	56.00	16.06	L1	gnd
0.9	44.52	56.00	11.48	L1	gnd
1.00156	42.00	56.00	14.00	L1	gnd
1.47421	35.80	56.00	20.20	L1	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.25937	21.57	51.45	29.88	L1	gnd
0.63437	23.95	46.00	22.05	L1	gnd
0.80625	27.59	46.00	18.41	L1	gnd
0.9	30.94	46.00	15.06	L1	gnd
1.00156	30.06	46.00	15.94	L1	gnd
1.47421	24.37	46.00	21.63	L1	gnd

L Line



Final Measurement Results

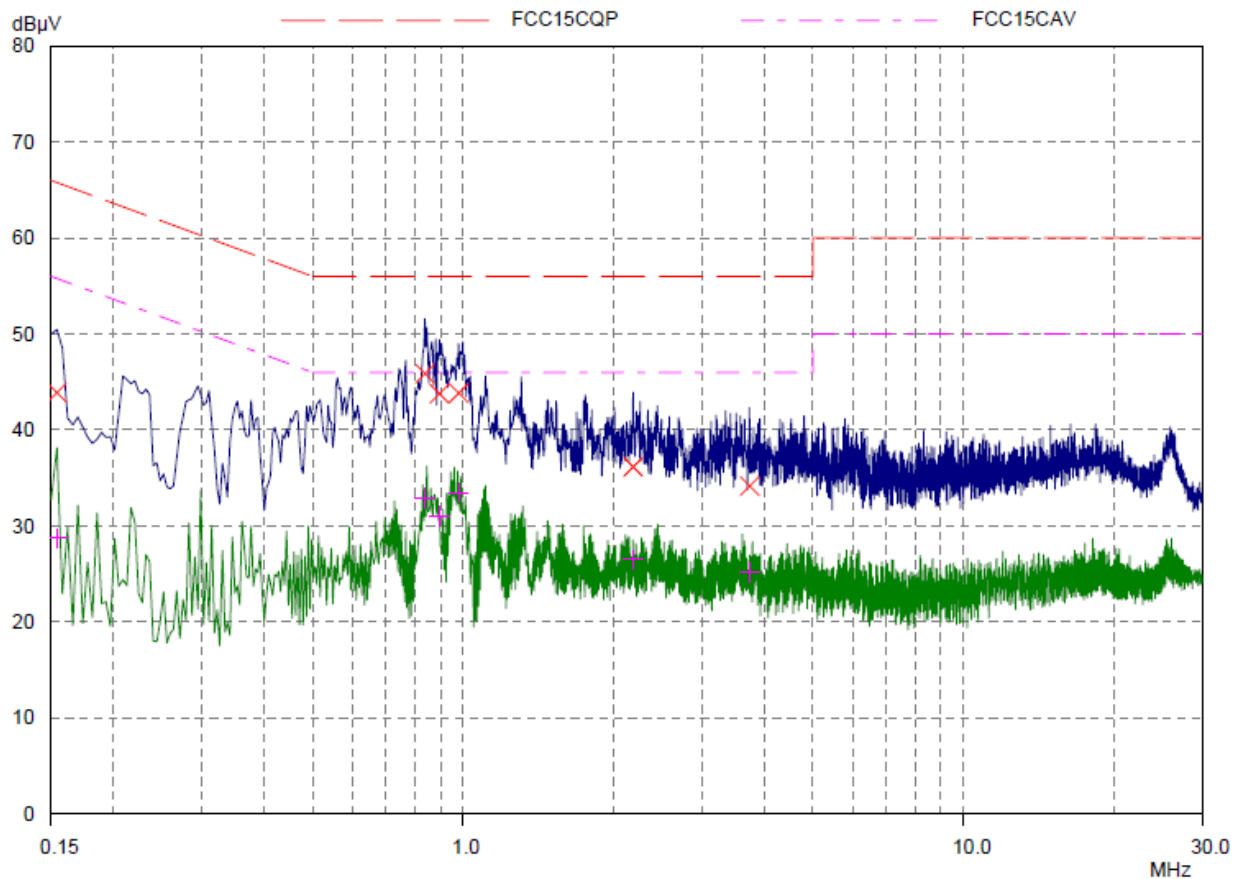
Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.18515	25.30	64.25	38.95	N	gnd
0.63437	25.34	56.00	30.66	N	gnd
0.79843	40.28	56.00	15.72	N	gnd
0.89218	41.98	56.00	14.02	N	gnd
0.99375	41.18	56.00	14.82	N	gnd
1.49375	35.24	56.00	20.76	N	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.18515	19.20	54.25	35.05	N	gnd
0.63437	19.12	46.00	26.88	N	gnd
0.79843	32.85	46.00	13.15	N	gnd
0.89218	34.36	46.00	11.64	N	gnd
0.99375	34.04	46.00	11.96	N	gnd
1.49375	28.44	46.00	17.56	N	gnd

N Line



Low Energy -CH19

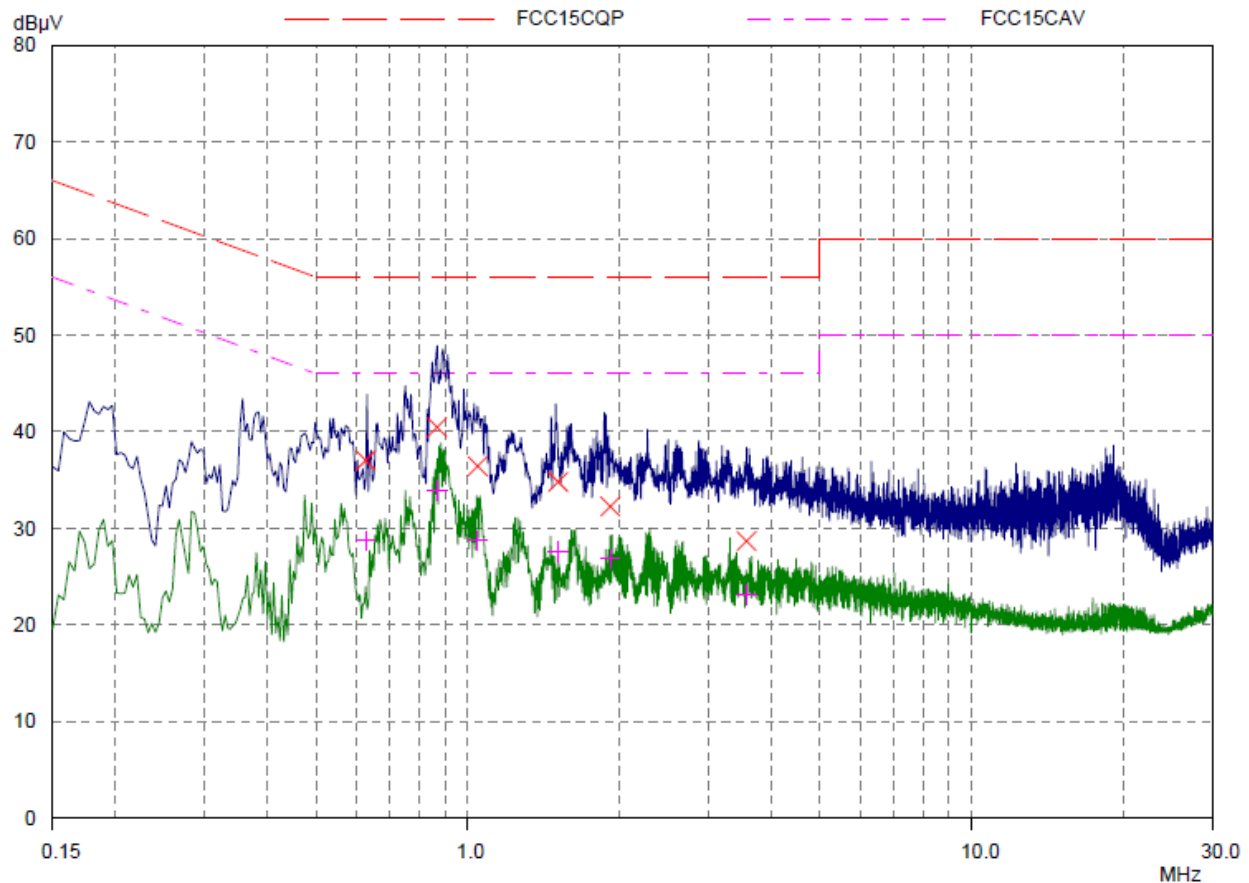


Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.1539	43.88	65.79	21.91	L1	gnd
0.8375	45.88	56.00	10.12	L1	gnd
0.89609	43.78	56.00	12.22	L1	gnd
0.97812	43.84	56.00	12.16	L1	gnd
2.18515	36.16	56.00	19.84	L1	gnd
3.73593	34.16	56.00	21.84	L1	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.1539	28.74	55.79	27.05	L1	gnd
0.8375	32.91	46.00	13.09	L1	gnd
0.89609	31.01	46.00	14.99	L1	gnd
0.97812	33.49	46.00	12.51	L1	gnd
2.18515	26.51	46.00	19.49	L1	gnd
3.73593	25.22	46.00	20.78	L1	gnd

L Line



Final Measurement Results

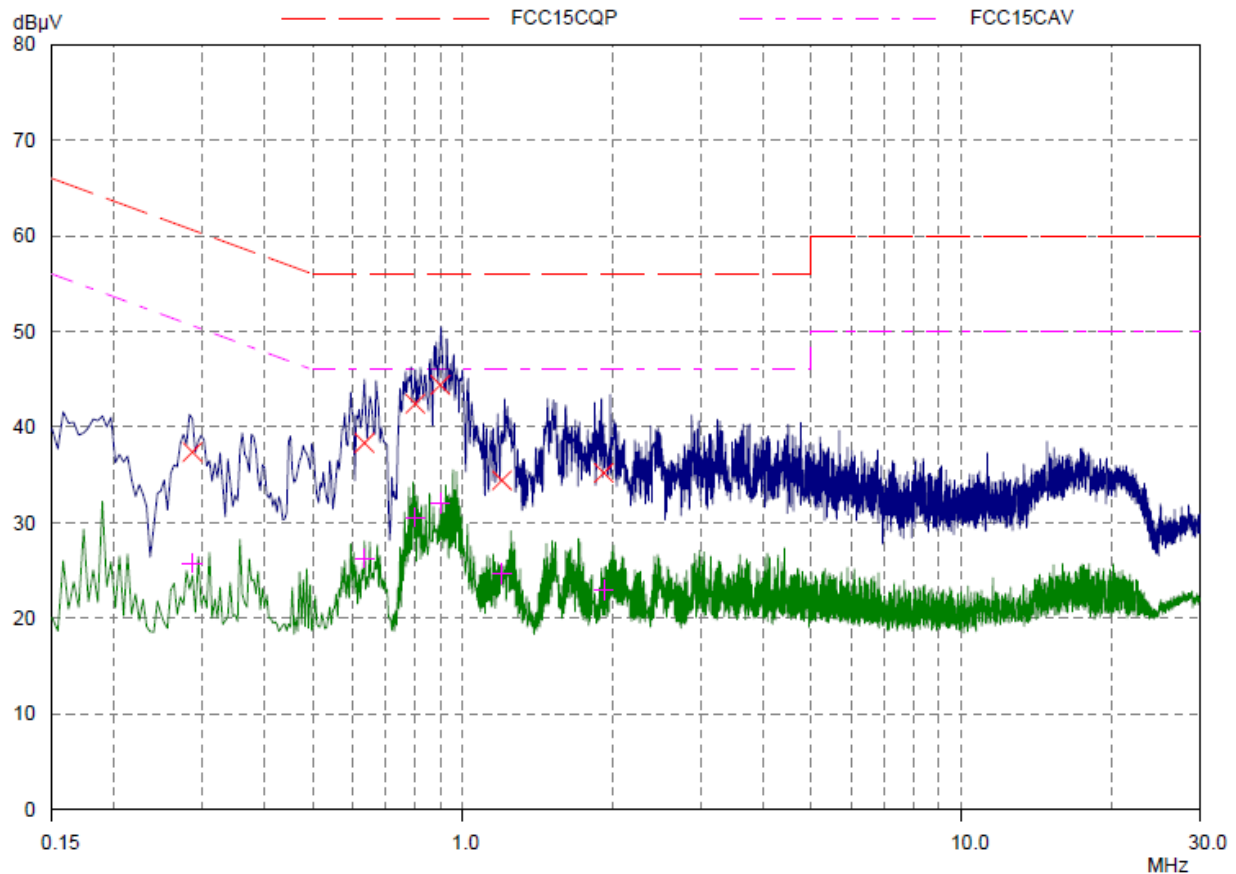
Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.62656	37.04	56.00	18.96	N	gnd
0.86875	40.46	56.00	15.54	N	gnd
1.04453	36.44	56.00	19.56	N	gnd
1.50937	34.82	56.00	21.18	N	gnd
1.91562	32.26	56.00	23.74	N	gnd
3.57187	28.68	56.00	27.32	N	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.62656	28.74	46.00	17.26	N	gnd
0.86875	33.94	46.00	12.06	N	gnd
1.04453	28.74	46.00	17.26	N	gnd
1.50937	27.59	46.00	18.41	N	gnd
1.91562	26.83	46.00	19.17	N	gnd
3.57187	23.15	46.00	22.85	N	gnd

N Line



Low Energy –CH39

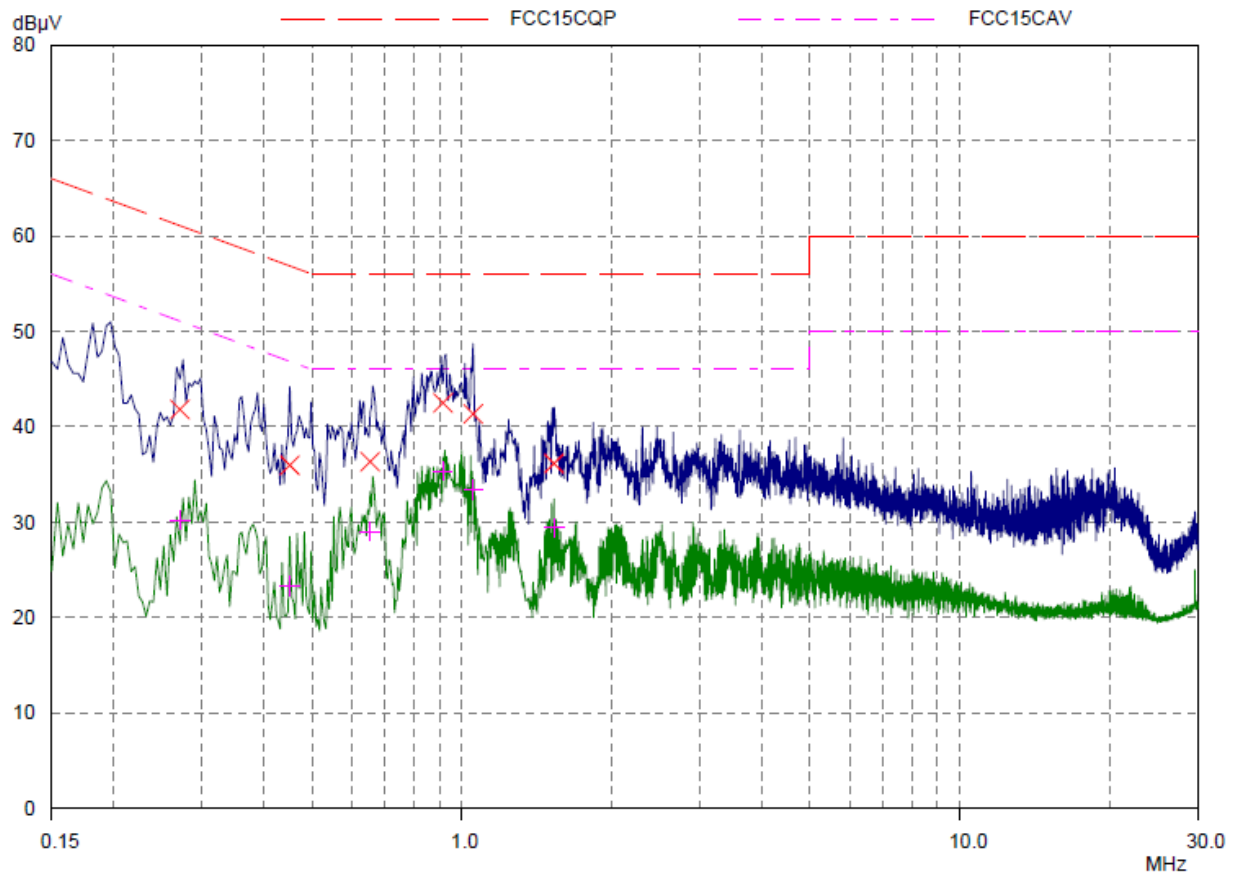


Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.28671	37.38	60.62	23.24	L1	gnd
0.63437	38.34	56.00	17.66	L1	gnd
0.80234	42.44	56.00	13.56	L1	gnd
0.9	44.40	56.00	11.60	L1	gnd
1.19687	34.42	56.00	21.58	L1	gnd
1.91562	35.20	56.00	20.80	L1	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.28671	25.79	50.62	24.83	L1	gnd
0.63437	26.26	46.00	19.74	L1	gnd
0.80234	30.55	46.00	15.45	L1	gnd
0.9	32.08	46.00	13.92	L1	gnd
1.19687	24.69	46.00	21.31	L1	gnd
1.91562	22.96	46.00	23.04	L1	gnd

L Line



Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.27109	41.82	61.08	19.26	N	gnd
0.45078	35.96	56.86	20.90	N	gnd
0.6539	36.34	56.00	19.66	N	gnd
0.91562	42.50	56.00	13.50	N	gnd
1.05234	41.36	56.00	14.64	N	gnd
1.5289	36.16	56.00	19.84	N	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.27109	30.22	51.08	20.86	N	gnd
0.45078	23.34	46.86	23.52	N	gnd
0.6539	29.03	46.00	16.97	N	gnd
0.91562	35.33	46.00	10.67	N	gnd
1.05234	33.38	46.00	12.62	N	gnd
1.5289	29.40	46.00	16.60	N	gnd

N Line

6. Main Test Instruments

Name	Type	Manufacturer	Serial Number	Calibration Date	Expiration Time
Loop Antenna	FMZB1519	SCHWARZBECK	1519-047	2014-02-29	2017-02-28
EMI Test Receiver	ESCI	R&S	100948	2015-05-22	2016-05-21
TRILOG Broadband Antenna	VULB 9163	Schwarzbeck	9163-201	2014-12-06	2017-12-05
Double Ridged Waveguide Horn Antenna	HF907	R&S	100126	2014-12-06	2017-12-05
Spectrum Analyzer	N9010A	Agilent	MY47191109	2015-05-22	2016-05-21
Spectrum Analyzer	FSV30	R&S	100815	2014-12-17	2015-12-16
Standard Gain Horn	3160-09	ETS-Lindgren	00102644	2015-01-30	2018-01-29
RF Cable	SMA 15cm	Agilent	0001	2015-11-09	2016-01-08

*****END OF REPORT *****

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance



Front Side



Back Side

a: EUT



b: Battery

Picture 1 EUT

A.2 Test Setup



30M Hz-1GHz



Above 1GHz

Picture 2 Radiated Emission Test Setup



Picture 3 Conducted Emission Test Setup