



Part 15C

TEST REPORT

Product Name	Neptune pine
Model Name	P312
FCC ID	2ABWUP312
Client	NEPTUNE COMPUTER INC.
Manufacturer	NEPTUNE COMPUTER INC.
Date of issue	June 10, 2014

TA Technology (Shanghai) Co., Ltd.

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GENERAL SUMMARY

Reference Standard(s)	FCC CFR47 Part 15C (2012) Radio Frequency Devices 15.205 Restricted bands of operation; 15.207 Conducted limits; 15.209 Radiated emission limits; general requirements; 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz. ANSI C63.4 Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40GHz. (2009) KDB 558074 D01 DTS Meas Guidance v03r01 Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
Conclusion	This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 2 of this test report are below limits specified in the relevant standards. General Judgment: Pass
Comment	The test result only responds to the measured sample.

Approved by Weizhong Yang

Weizhong Yang
Director

Revised by Lingling Kang

Lingling Kang
RF Manager

Performed by Yu Wang

Yu Wang
RF Engineer

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1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L2264.

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 428261.

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 8510A.

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

This report alone does not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

If the electronic report is inconsistent with the printed one, it should be subject to the latter.

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1.2. Testing laboratory

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: Yang Weizhong
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: yangweizhong@ta-shanghai.com

1.3. Applicant Information

Company: NEPTUNE COMPUTER INC.
666 SHERBROOKE ST. W., SUITE 1000
Address: MONTREAL
H3A 1E7
CANADA

1.4. Manufacturer Information

Company: NEPTUNE COMPUTER INC.
666 SHERBROOKE ST. W., SUITE 1000
Address: MONTREAL
H3A 1E7
CANADA

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1.5. Information of EUT

General information

Product IMEI:	354727049900673
Hardware Version:	P1
Software Version:	JB_V0.29
Antenna Type:	Internal Antenna
Device Operating Configurations:	
Test Mode	Bluetooth(Low Energy)
Modulation Type:	GFSK
Packet Type:(Maximum Payload)	1Mbps
Max. Conducted Power	-0.91dBm
Power Supply:	Battery or Charger (AC adaptor)
Operating Frequency Range(s)	2400 ~ 2483.5 MHz

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Auxiliary equipment details

AE1: Battery

Model: Mini Phone
Manufacturer: Tian Yu Communication Technology (Kun Shan) CO.,Ltd
S/N: /

AE2: Adapter

Model: DSA-5PFK-05 FUS 050100a
Manufacturer: DEE VAN ENTERPRISE CO., LTD.
S/N: /

1.6. Test Date

The test is performed from March 11, 2014 to March 19, 2014.

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2. Test Information

2.1. Test Mode

During the process of the testing, The EUT is max power transmission with proper modulation.

EUT is stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) with Adapter 1 and the worst case was recorded.

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

Note: All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.

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2.2. Summary of test results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Peak Power Output -Conducted	15.247(b)(1)	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

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2.3. Peak Power Output –Conducted

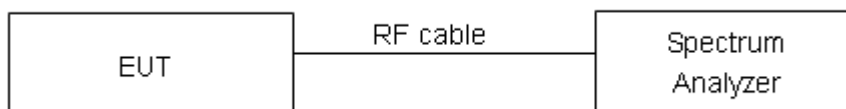
Ambient condition

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) (1) specifies that " For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts."

Peak Output Power	$\leq 0.125\text{W}$ (21dBm)
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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.

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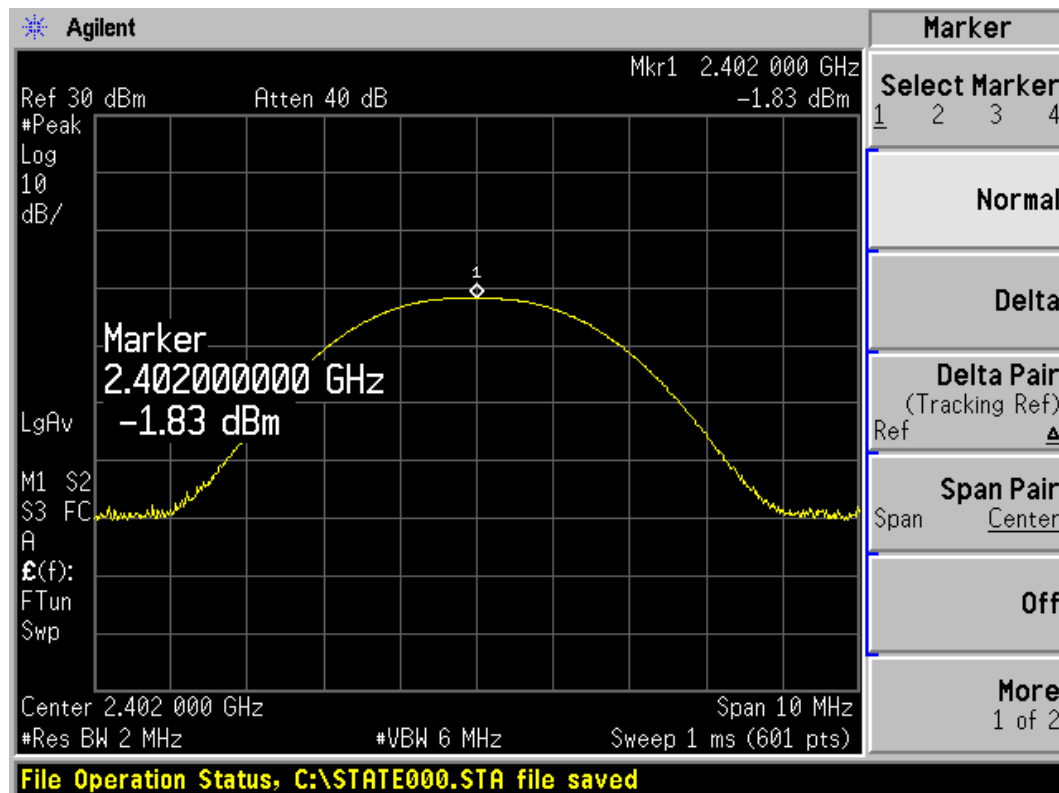
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Test Results

Bluetooth (Low Energy)

Channel	Frequency (MHz)	Peak Output Power (dBm)	Conclusion
		1Mbps	
0	2402	-1.83	PASS
19	2440	-0.91	PASS
39	2480	-0.93	PASS

Note: The measured power density (dBm) has the offset with cable loss already.



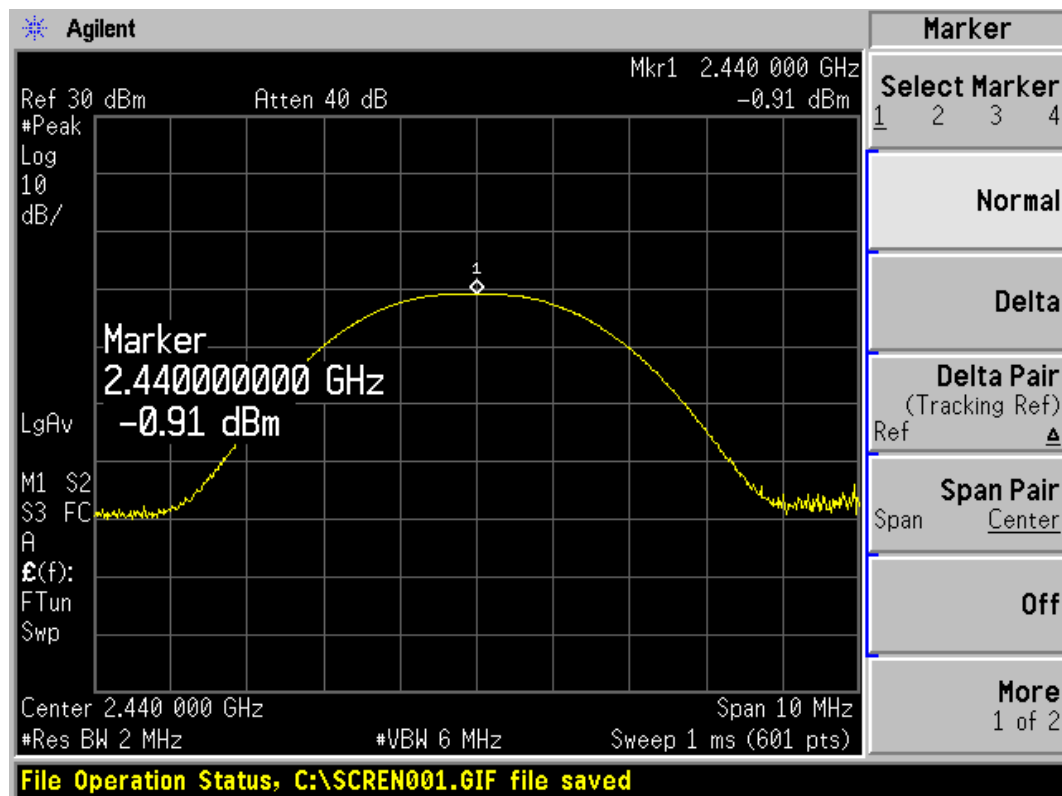
Carrier frequency (MHz): 2402

Channel No.:0

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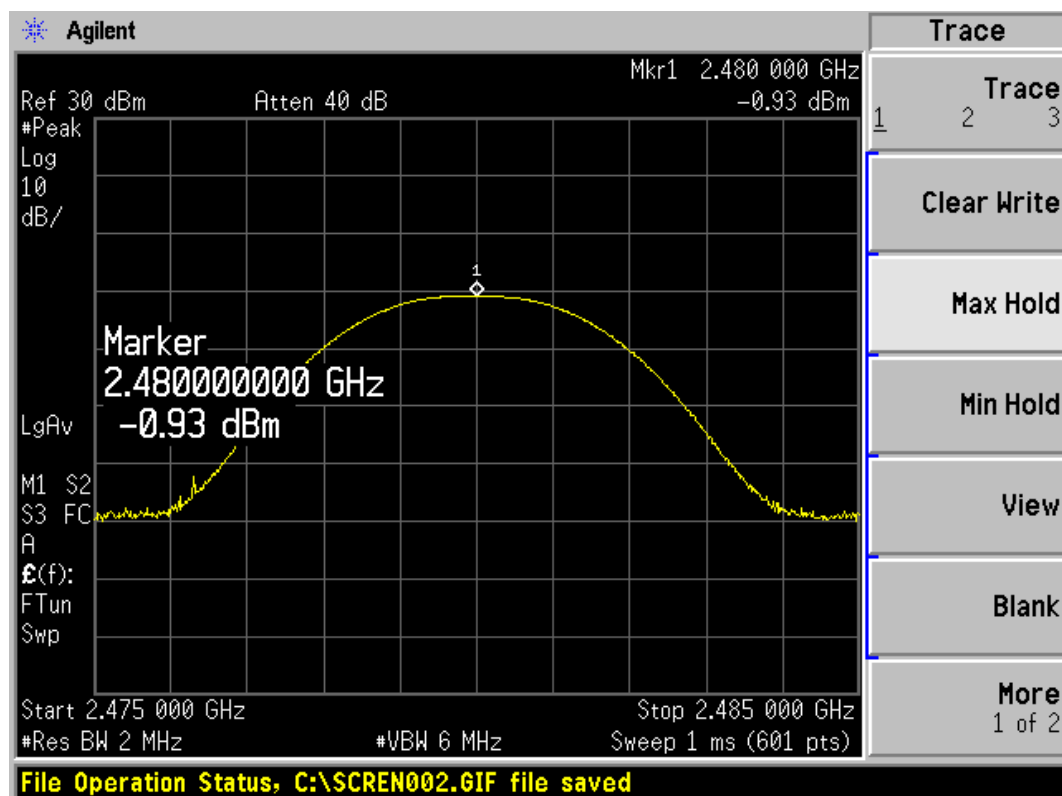
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Carrier frequency (MHz): 2440

Channel No.:19



Carrier frequency (MHz): 2480

Channel No.:39

2.4. 6dB Occupied Bandwidth

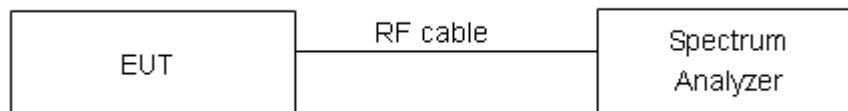
Ambient condition

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, and 5725–5850 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.

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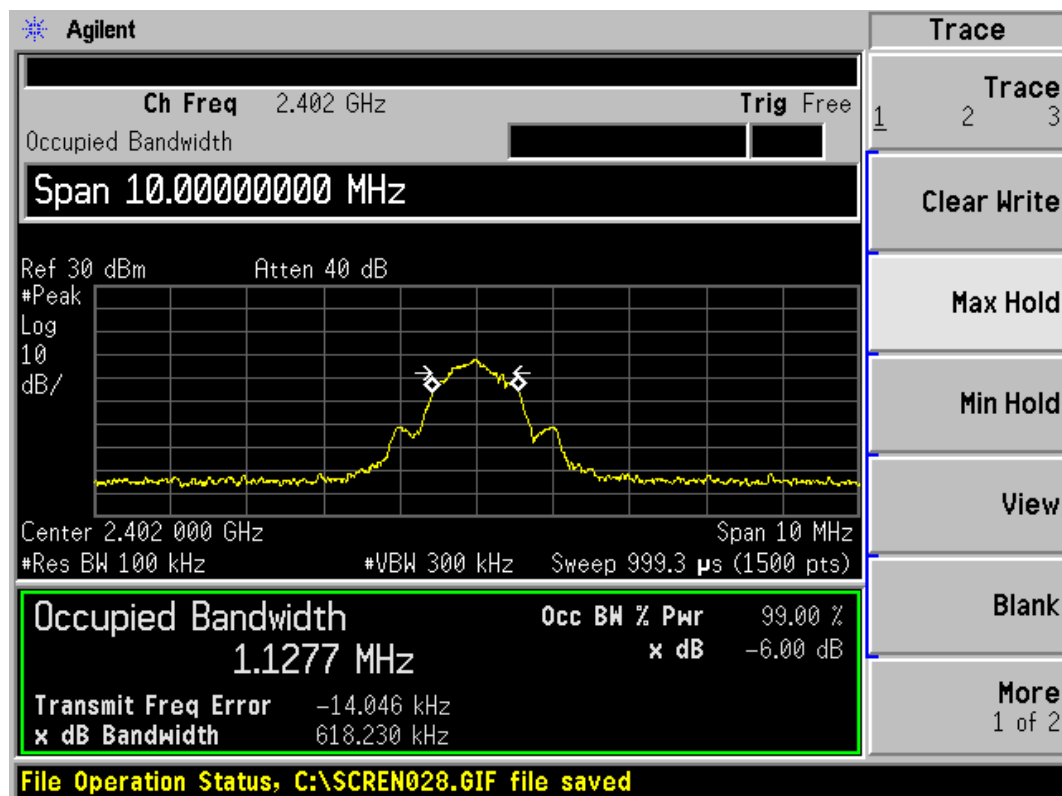
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Test Results:

Bluetooth (Low Energy)

Channel	Frequency (MHz)	6dB Bandwidth (kHz)
0	2402	618.230
19	2440	568.804
39	2480	568.161



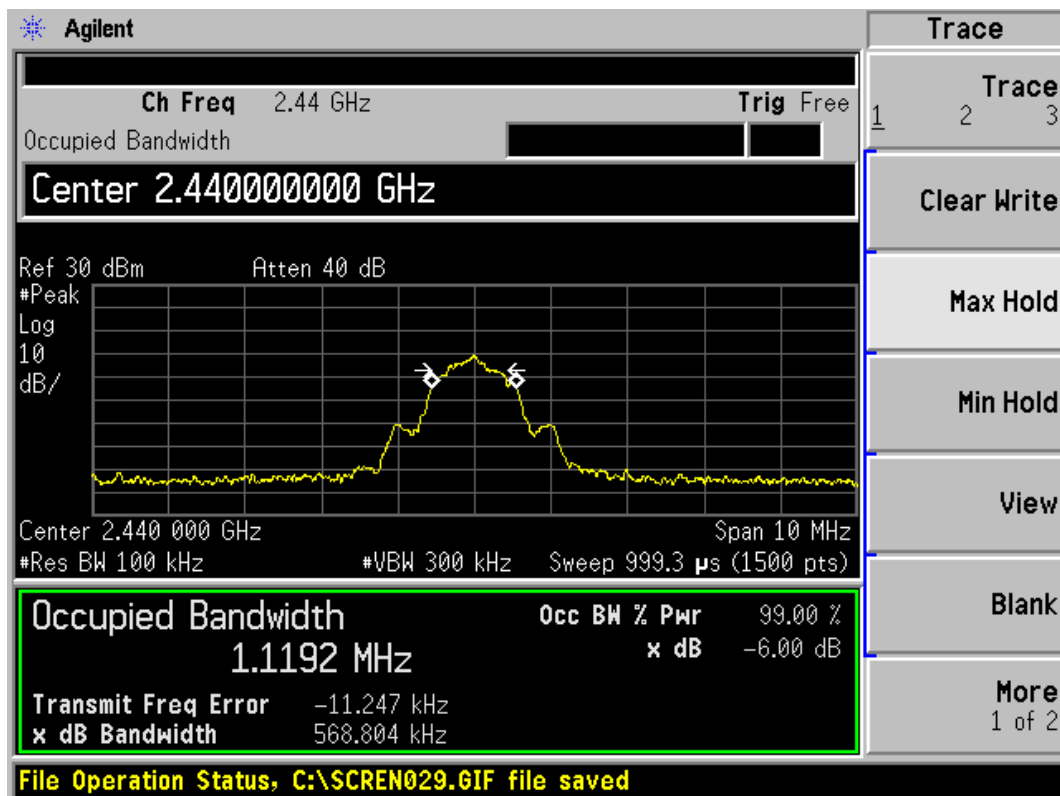
Carrier frequency (MHz): 2402

Channel No.:0

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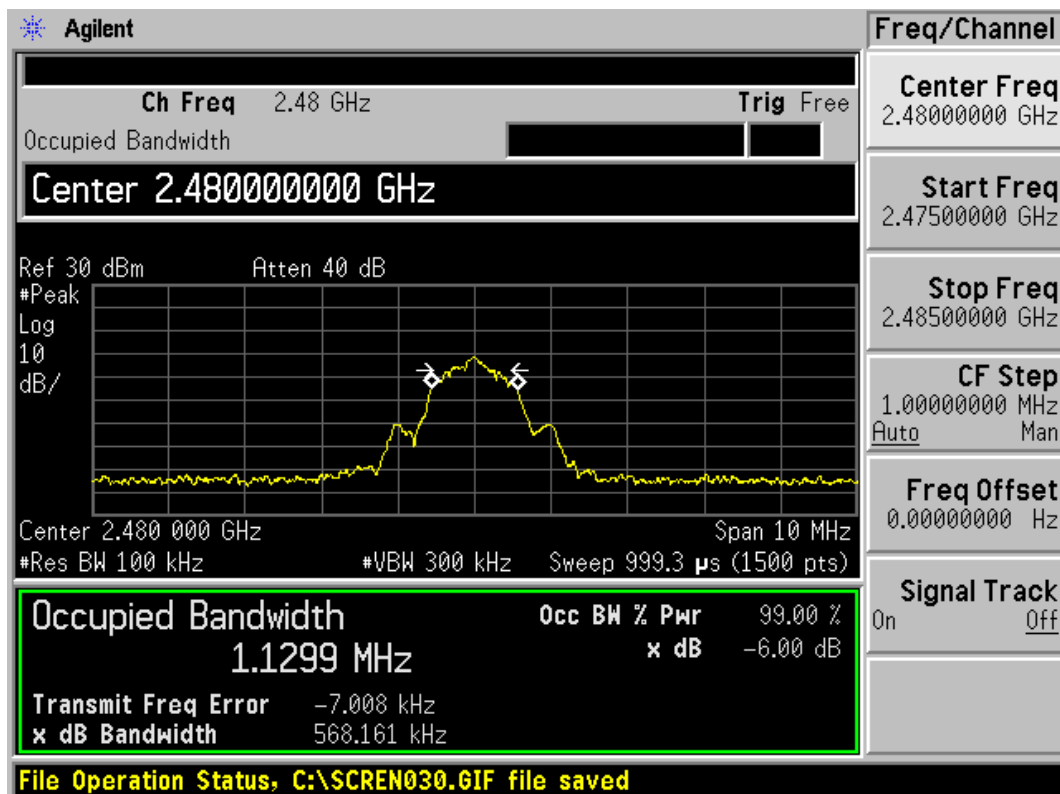
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Carrier frequency (MHz): 2440

Channel No.:19



Carrier frequency (MHz): 2480

Channel No.:39

2.5. Band Edge Compliance

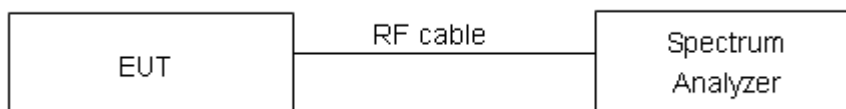
Ambient condition

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 $k = 1.96$.

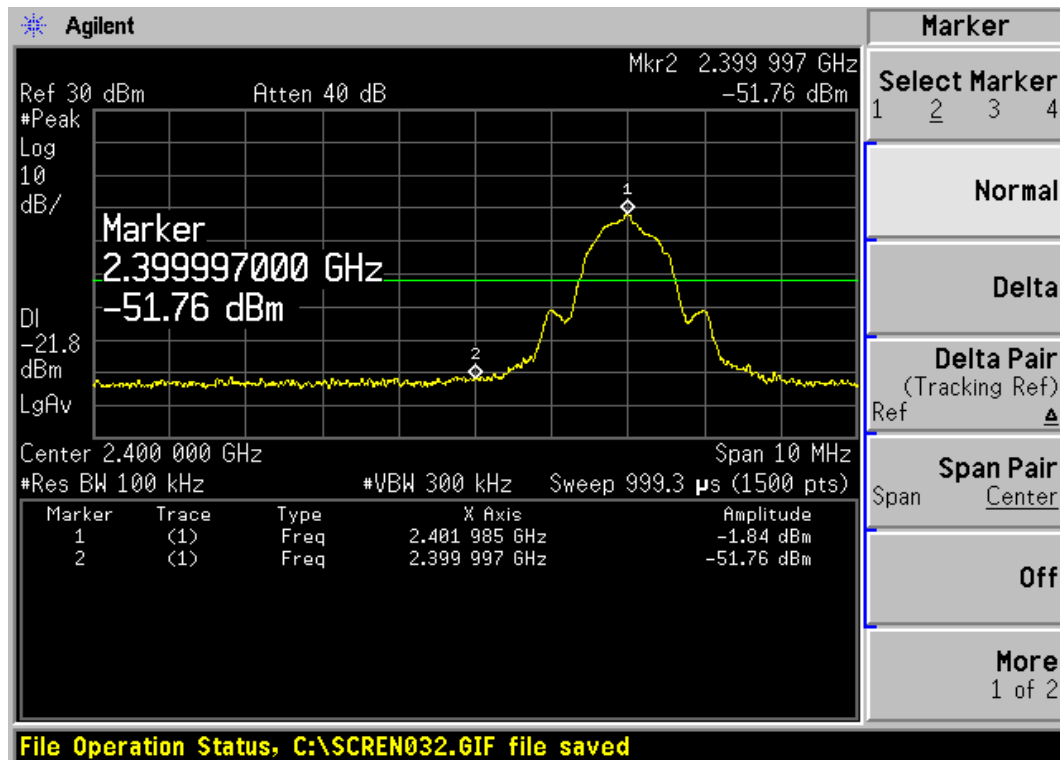
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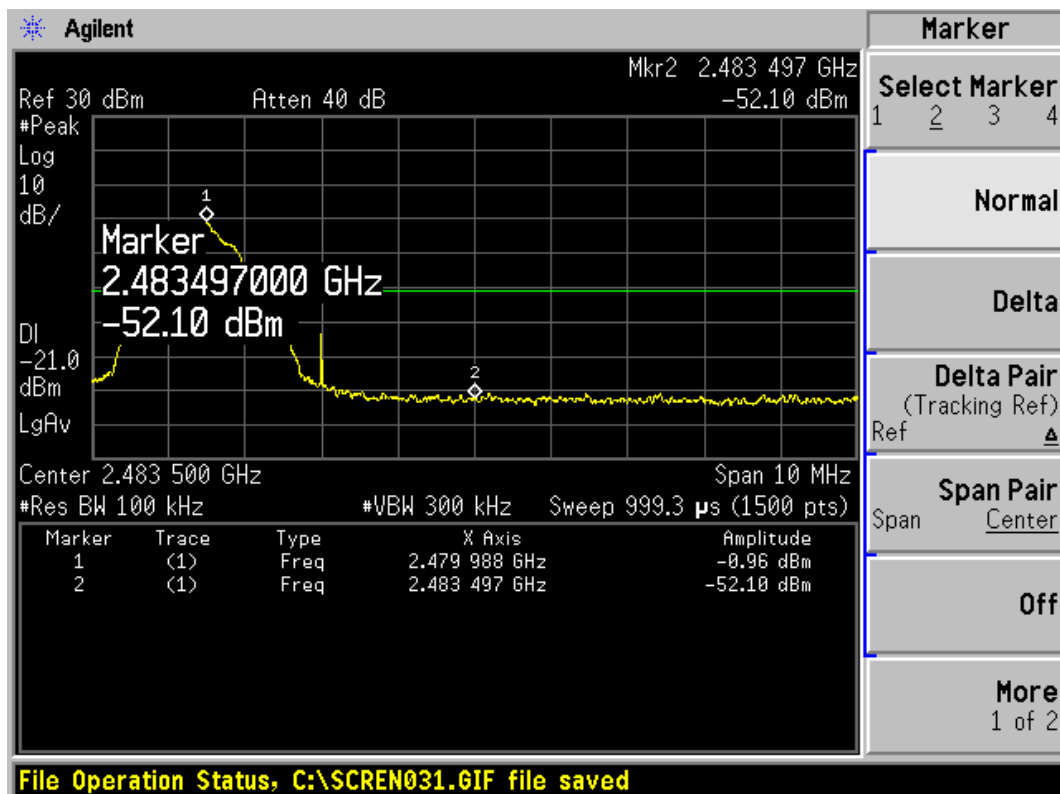
Test Results: PASS

Low Energy



Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2480

Channel No.:39

2.6. Power Spectral Density

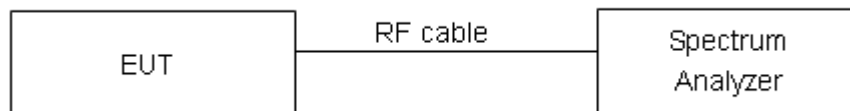
Ambient condition

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 at least 1.5 times the Low Energy channel bandwidth. The peak power spectral density is recorded. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(3\text{ kHz}/100\text{kHz}) = -15.2\text{ dB}$.

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 $k = 2$, $U = 0.75\text{dB}$.

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Test Results:

Bluetooth (Low Energy)

Channel Number	Power Spectral Density dBm / 3kHz	Conclusion
0	-3.08	PASS
19	-2.34	PASS
39	-2.38	PASS

Note: The measured power density (dBm) has the offset with cable loss already.



Low energy, Channel No.: 0

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Low energy, Channel No.: 19



Low energy, Channel No.: 39

2.7. 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:

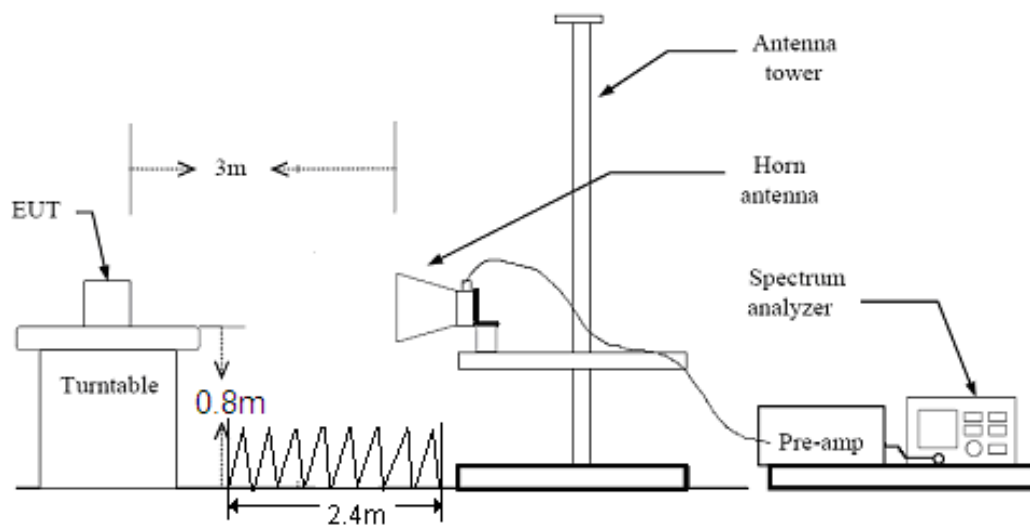
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) 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 $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit.

If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak- average correction factor, derived from the appropriate duty cycle calculation.

This setting method can refer to KDB 558074.

Test setup



Note: Area side: 2.4mX3.6m

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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)
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.

Peak Limit=74 dBuV/m

Average Limit=54 dBuV/m

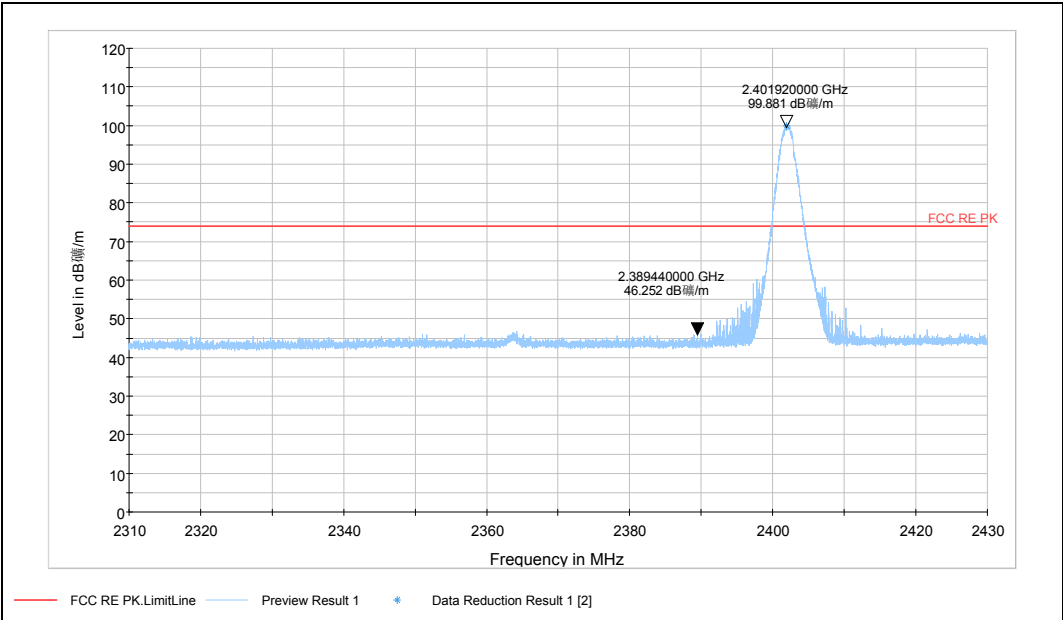
Measurement Uncertainty

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

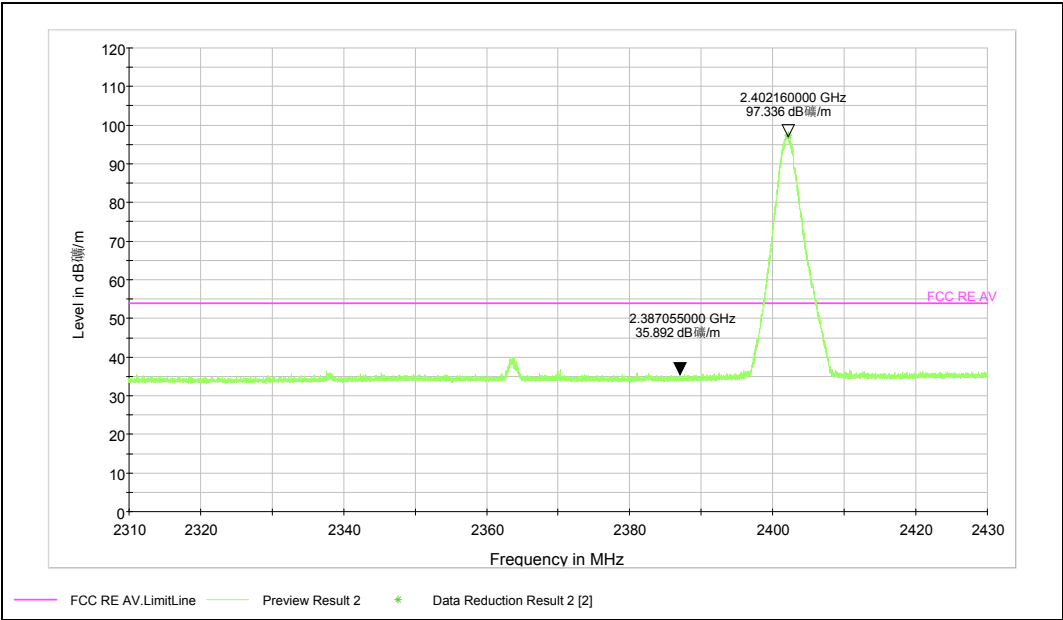
Channel 0

Peak



Note: The signal beyond the limit is carrier, a font (Level in dB μ V/m) in the test plot =(level in dBuV/m)

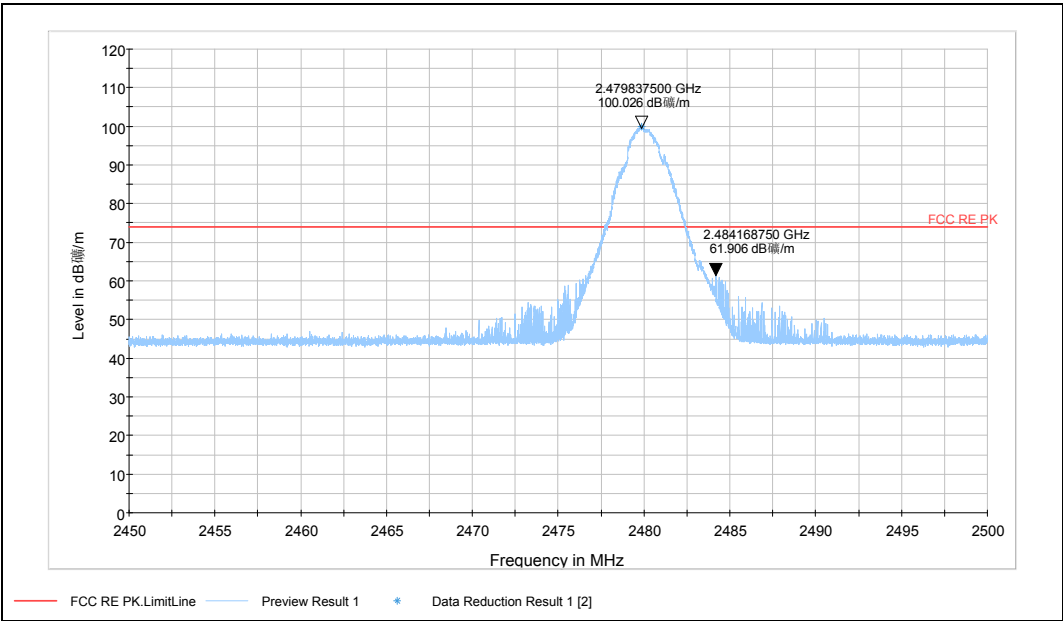
Average



Note: The signal beyond the limit is carrier, a font (Level in dB μ V/m) in the test plot =(level in dBuV/m)

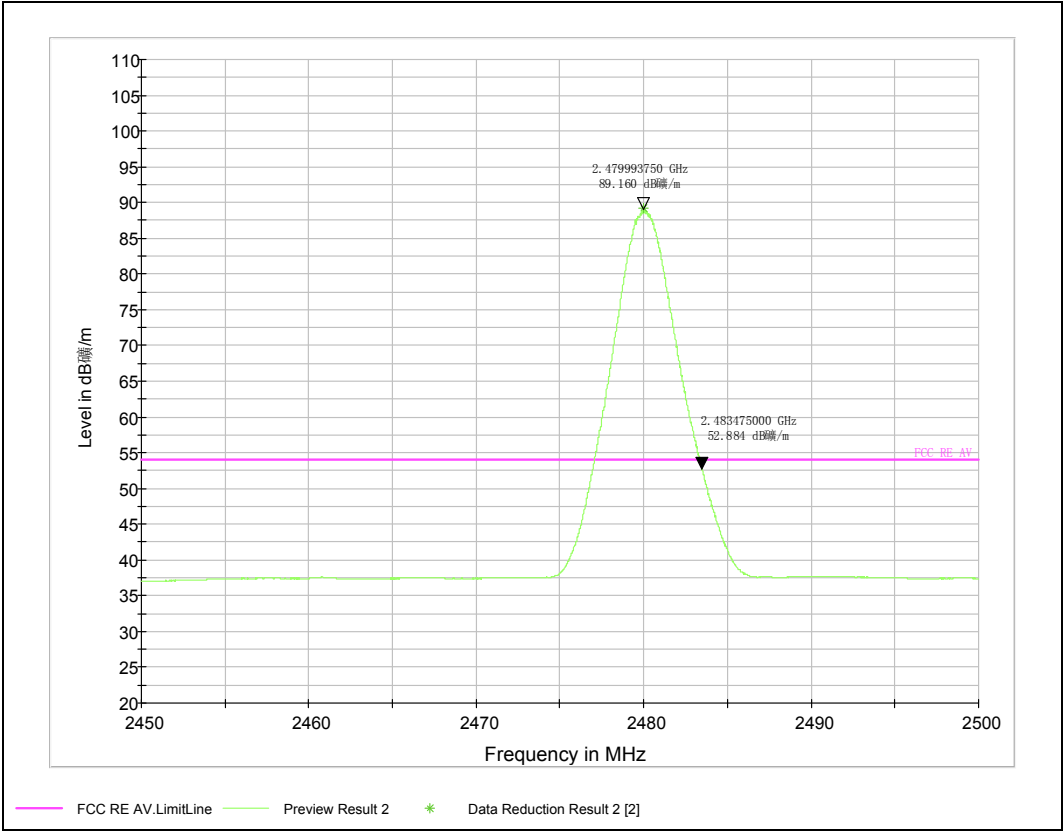
Channel 39

Peak



Note: The signal beyond the limit is carrier, a font (Level in dBm/m) in the test plot =(level in dBuV/m)

Average



Note: The signal beyond the limit is carrier, a font (Level in dBm/m) in the test plot =(level in dBuV/m)

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2.8. Spurious RF Conducted Emissions

Ambient condition

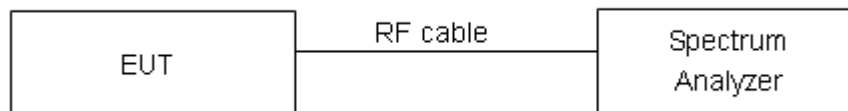
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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	2.08	≤ -17.92
	2440	-5.622	≤ -25.622
	2480	-5.176	≤ -25.176

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

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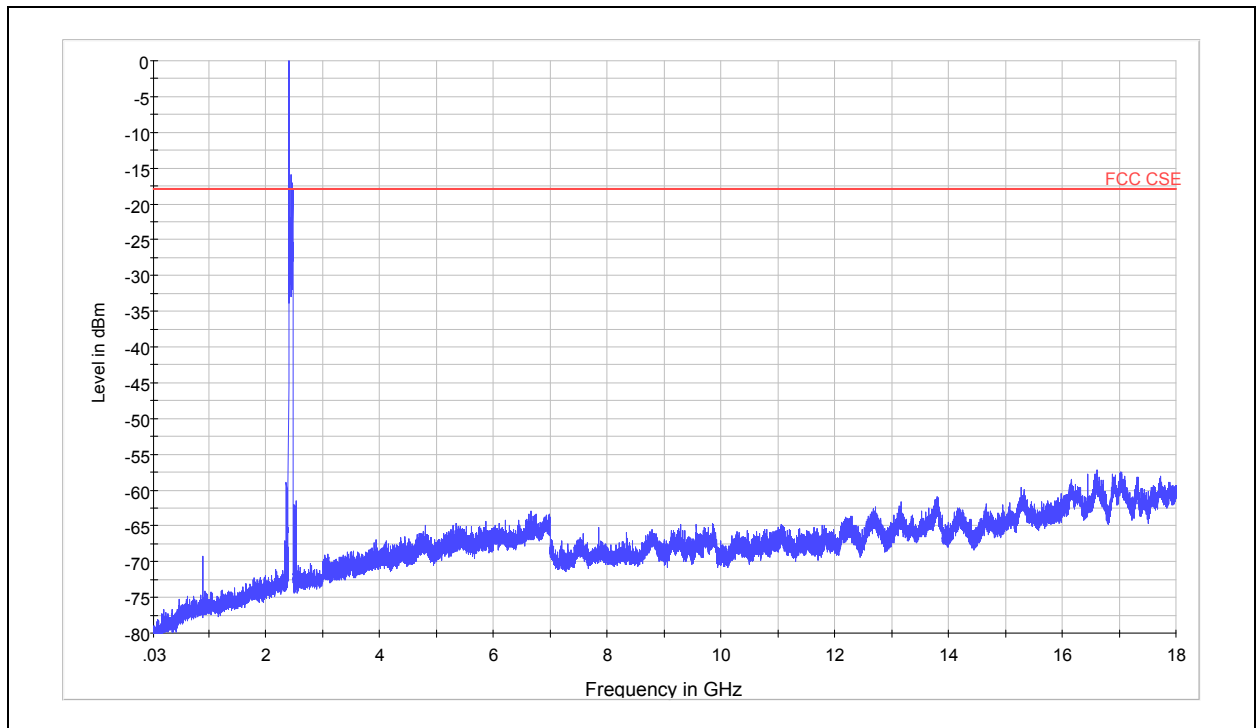
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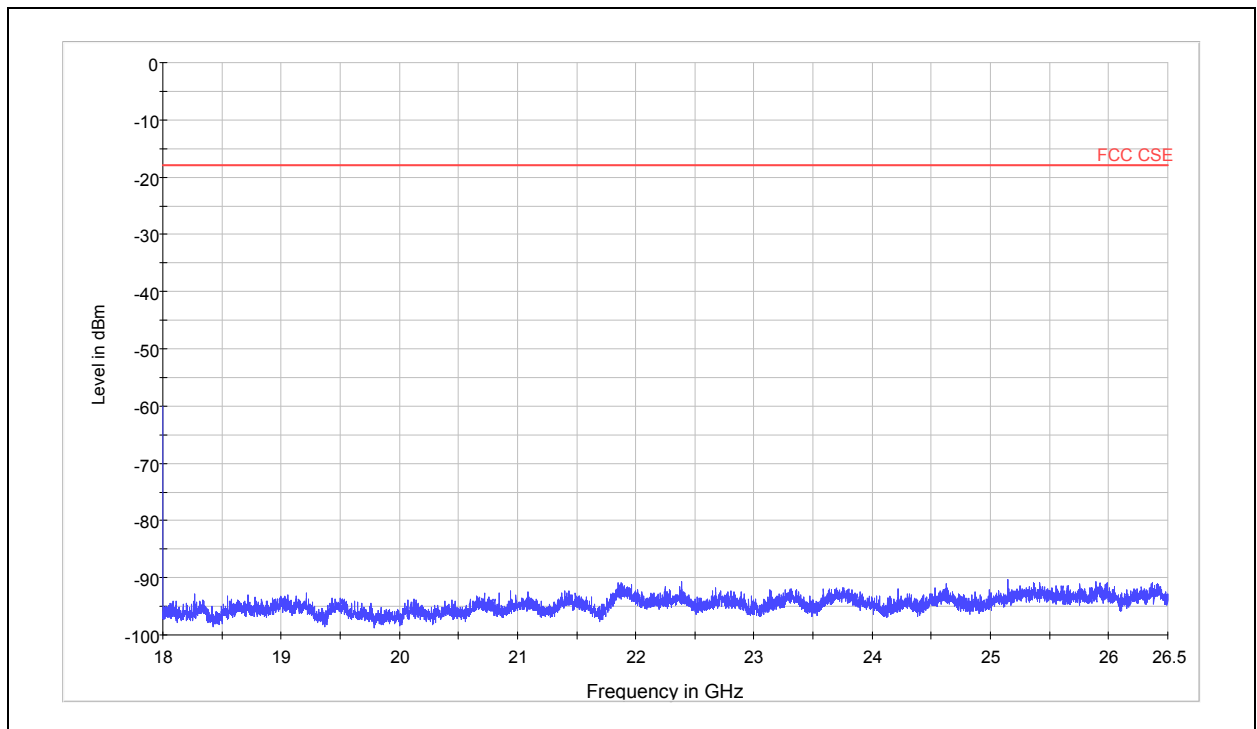
Test Results:

Bluetooth (Low Energy)

CH0:

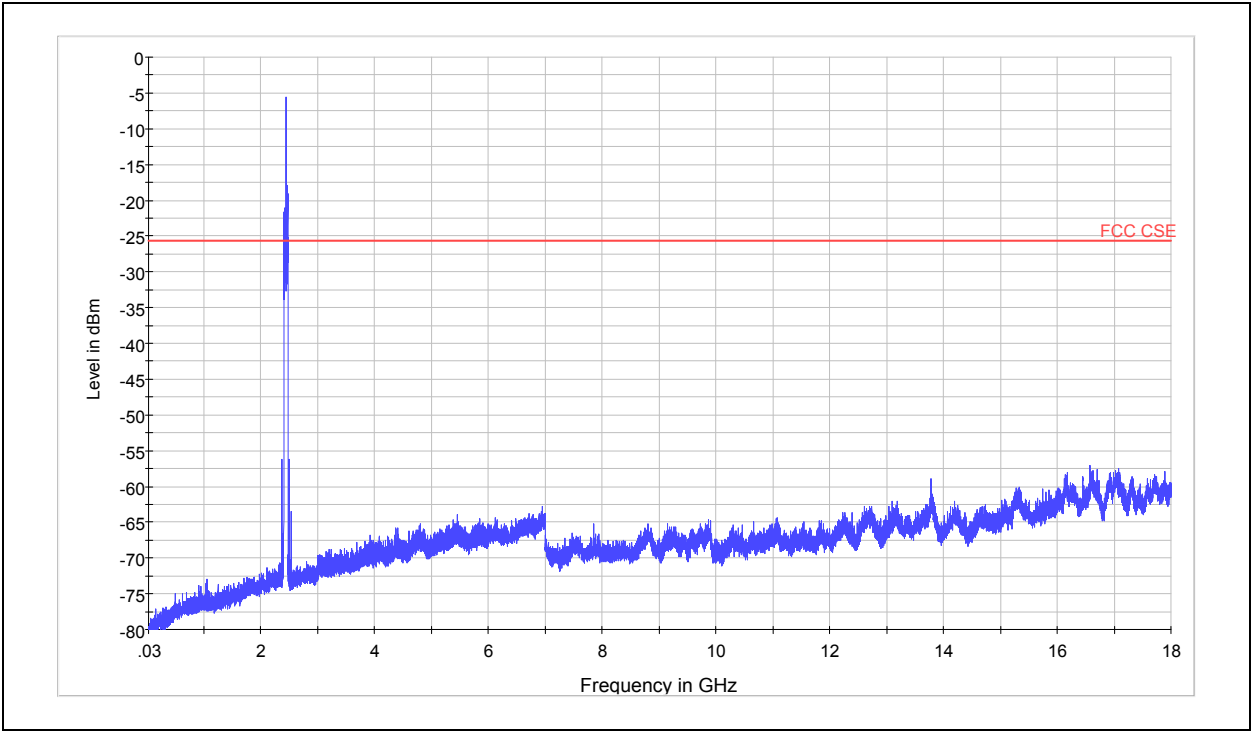


Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2402
Spurious RF conducted emissions from 30MHz to 18GHz

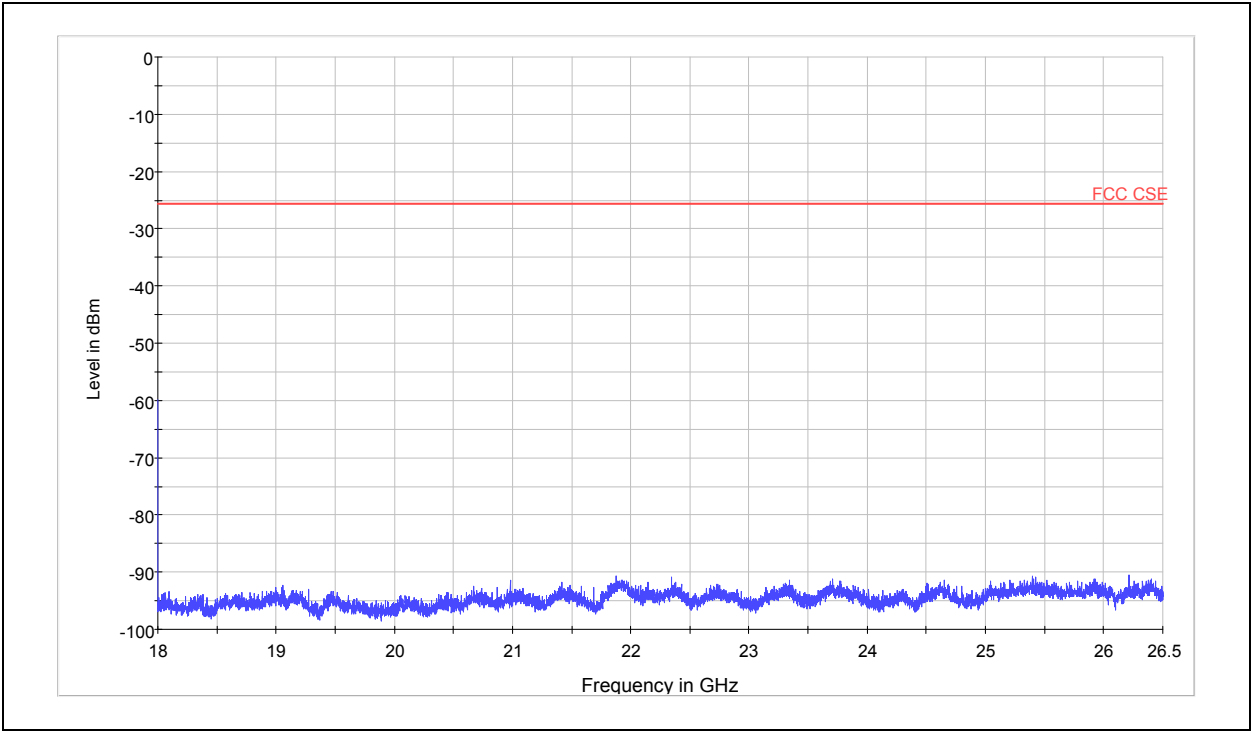


Spurious RF conducted emissions from 18GHz to 26.5GHz

CH19:

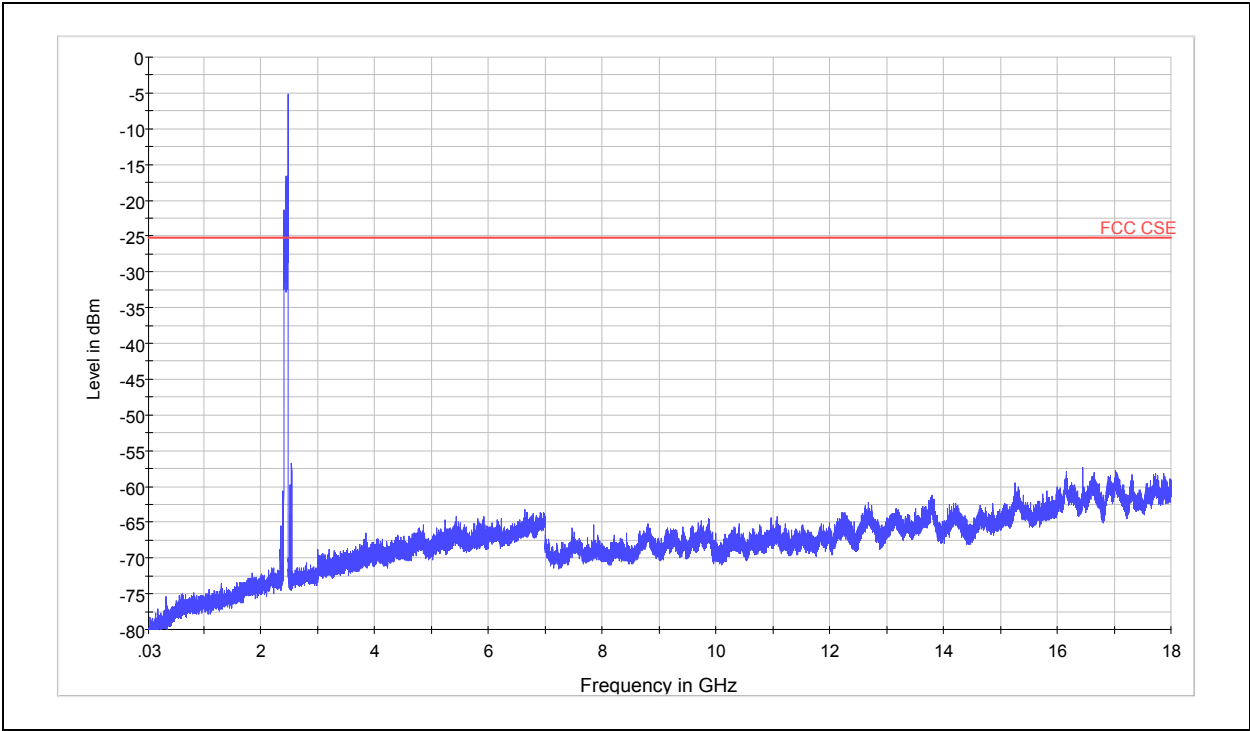


Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2440
Spurious RF conducted emissions from 30MHz to 18GHz

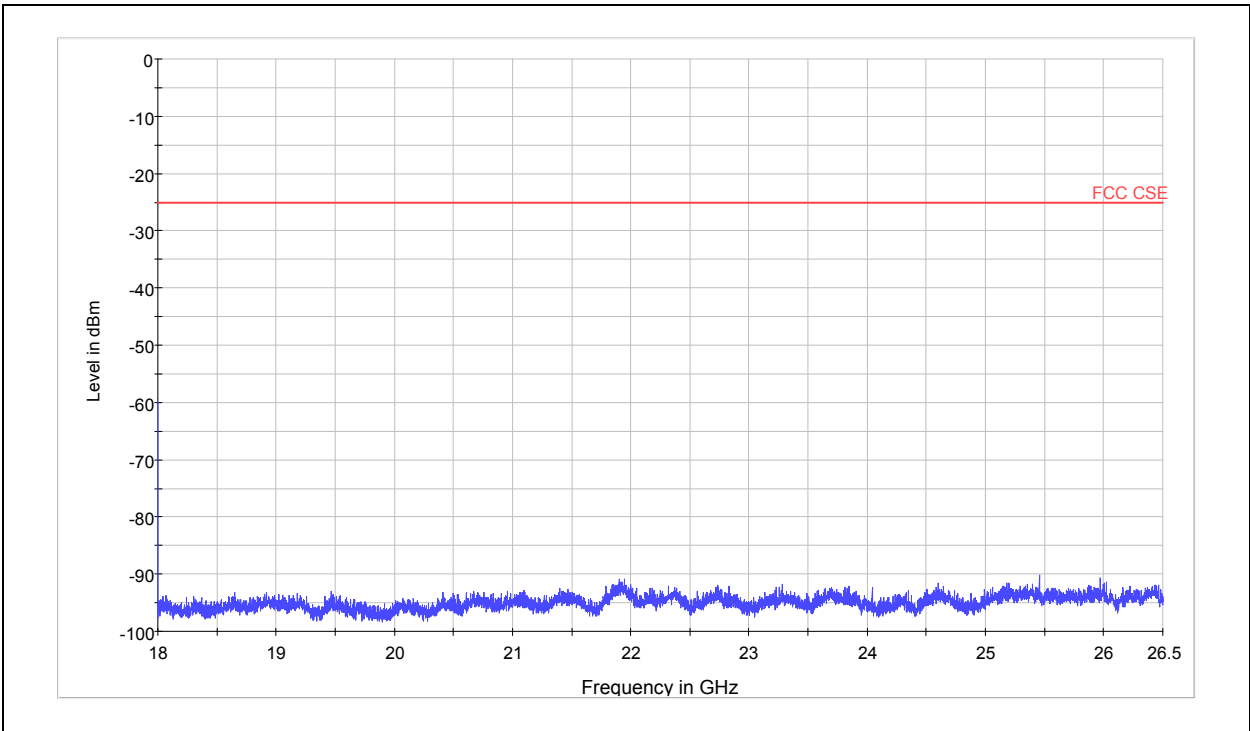


Spurious RF conducted emissions from 18GHz to 26.5GHz

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

2.9. 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 C63.4-2009. 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 range from 9kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

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=10Hz / Sweep=AUTO

The test is in transmitting mode.

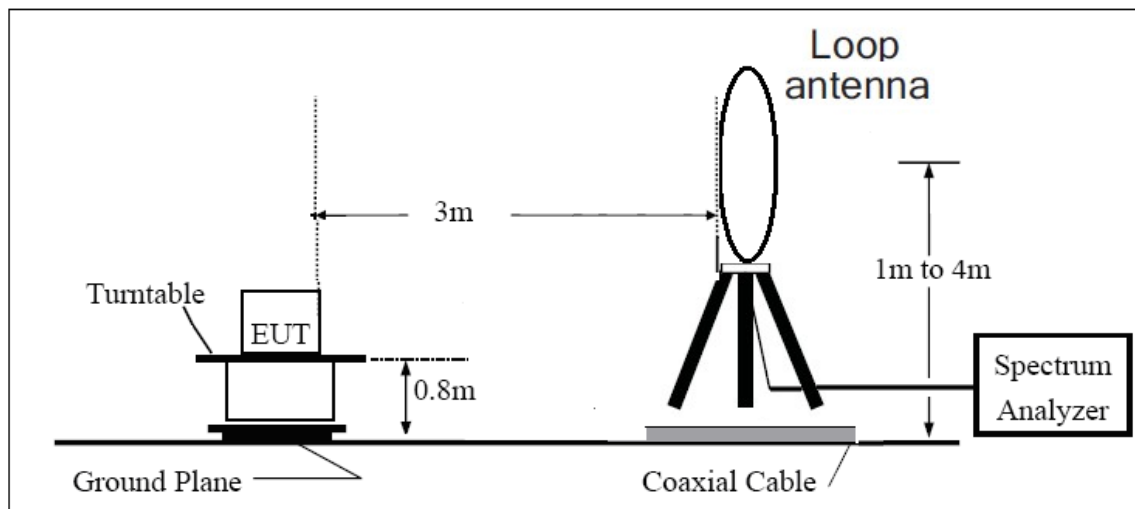
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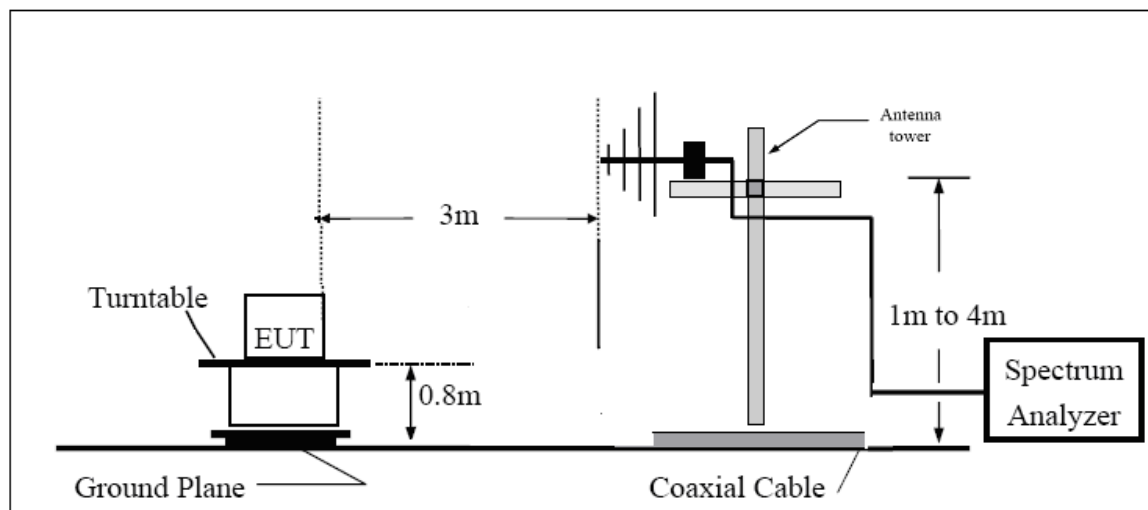
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Test setup

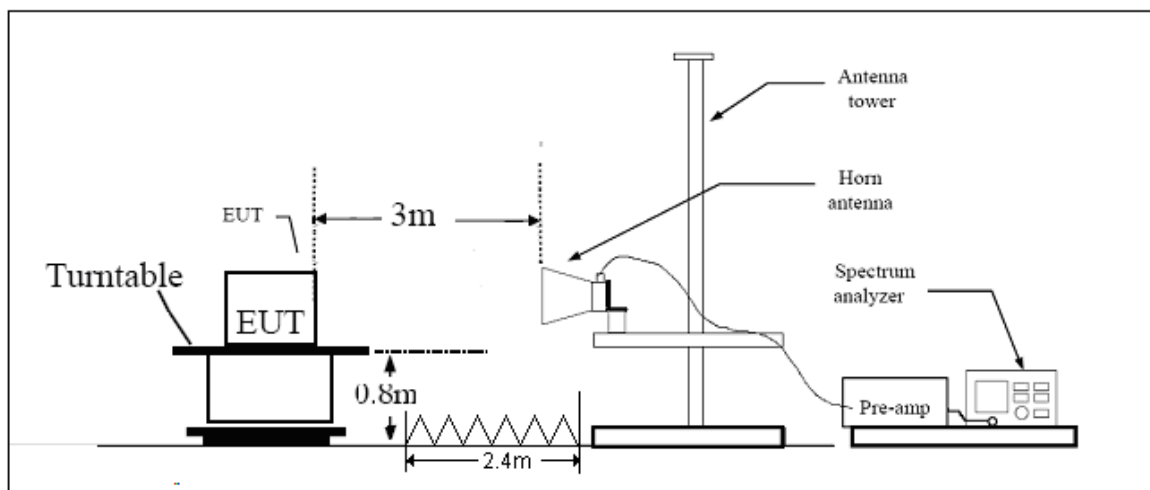
9KHz~~~ 30MHz



30MHz~~~ 1GHz



Above 1GHz



Note: Area size: 2.4mX3.6m

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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

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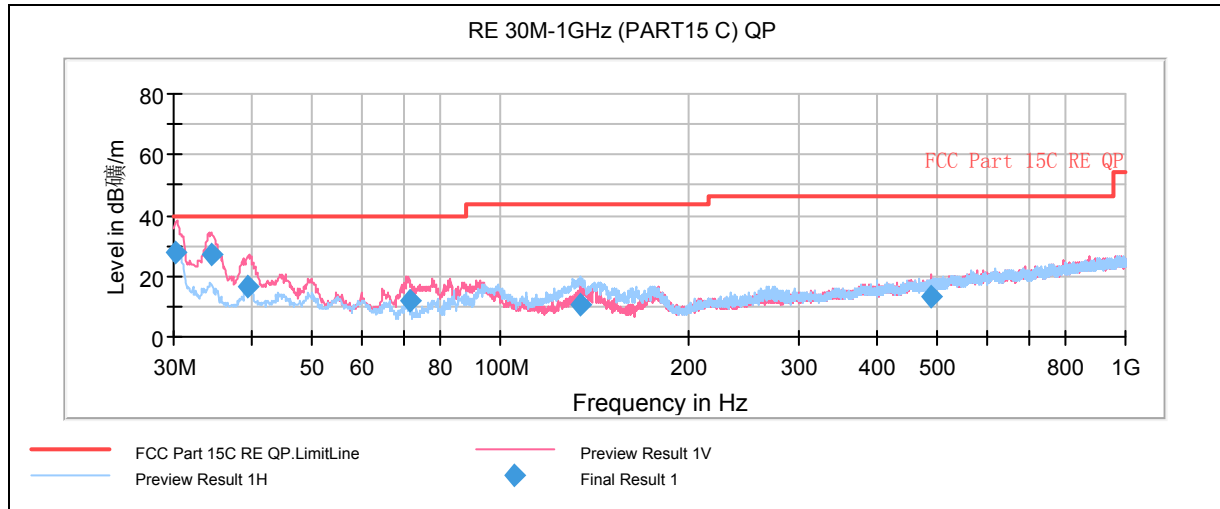
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Test result

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Note: a font (Level in dBμV/m) in the test plot =(level in dBμV/m)
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)
30.300000	27.5	100.0	V	45.0	44.7	-17.2	12.5	40.0
34.423750	27.1	100.0	V	321.0	46.1	-19.0	12.9	40.0
39.478750	16.6	100.0	V	16.0	35.9	-19.3	23.4	40.0
71.606250	12.0	100.0	V	342.0	39.8	-27.8	28.0	40.0
134.413750	10.8	201.0	H	127.0	39.7	-28.9	32.7	43.5
487.936250	13.3	400.0	V	324.0	31.7	-18.4	32.7	46.0

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

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

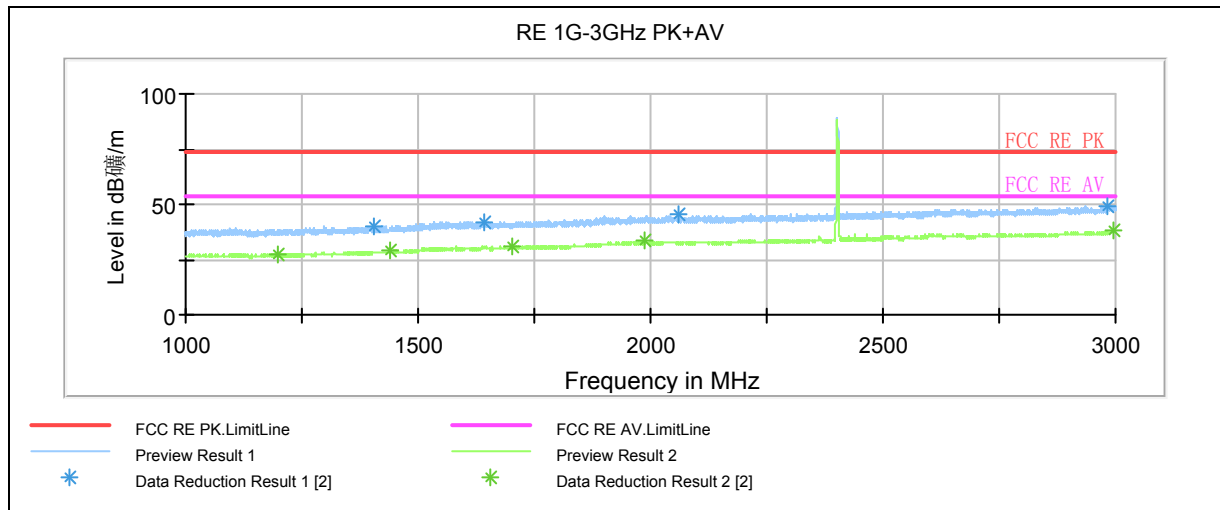
3. Margin = Limit – Quasi-Peak

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Note: a font (Level in dB μ V/m) in the test plot =(level in dB μ V/m)

Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	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)
1406.500000	40.1	100.0	V	290.0	48.5	-8.4	33.9	74
1642.750000	42.1	100.0	V	327.0	47.3	-5.2	31.9	74
2061.250000	45.8	100.0	V	248.0	48.8	-3	28.2	74
2981.750000	49.2	100.0	V	356.0	47.9	1.3	24.8	74

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

Frequency (MHz)	Average (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)
1197.000000	27.2	100.0	H	31.0	36.9	-9.7	26.8	54
1441.000000	28.7	100.0	V	248.0	36.7	-8	25.3	54
1704.000000	30.9	100.0	V	327.0	36.4	-5.5	23.1	54
1988.500000	33.3	100.0	H	38.0	36.5	-3.2	20.7	54
2994.250000	37.9	100.0	V	263.0	36.5	1.4	16.1	54

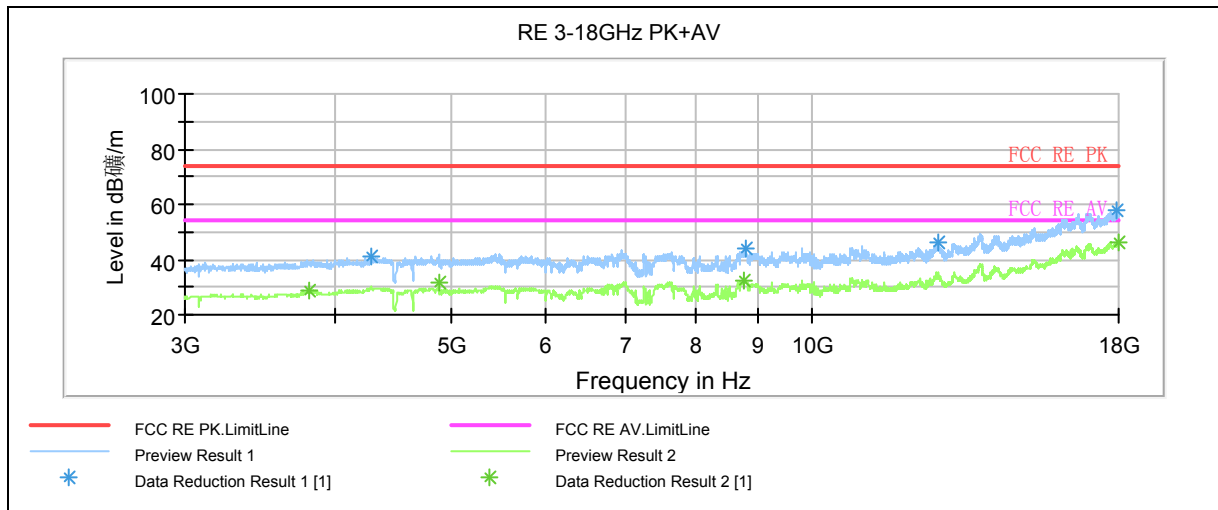
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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Note: a font (Level in dBμV/m) in the test plot =(level in dBuV/m)
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)
4297.500000	41.0	100.0	V	251.0	39.5	1.5	33.0	74
8788.125000	44.2	100.0	H	0.0	36.1	8.1	29.8	74
12718.125000	46.4	100.0	V	339.0	33.9	12.5	27.6	74
17938.125000	57.6	100.0	H	186.0	34.2	23.4	16.4	74

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

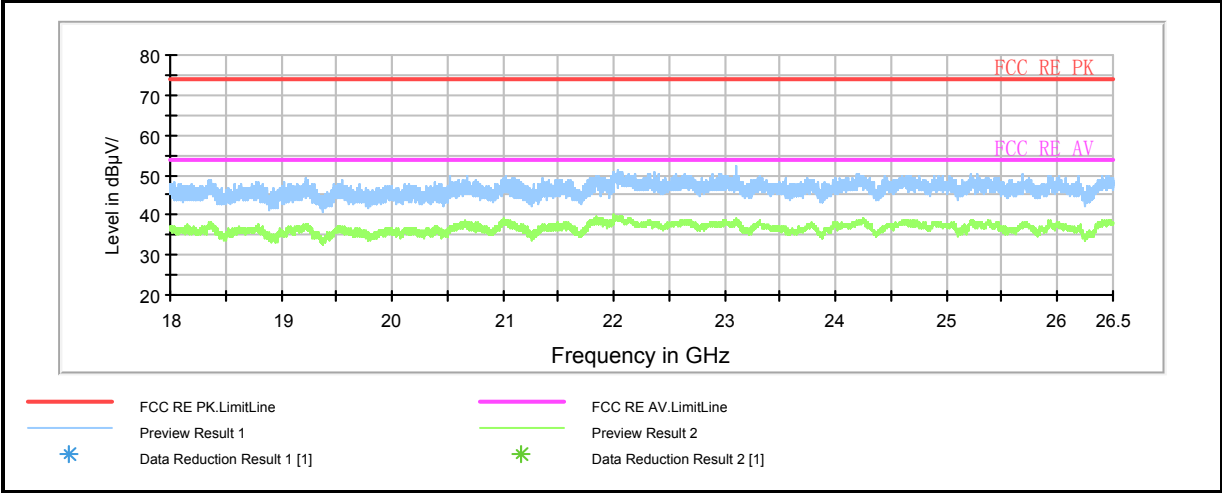
Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3808.125000	28.9	100.0	V	179.0	29.2	-0.3	25.1	54
4880.625000	31.7	100.0	V	347.0	29.8	1.9	22.3	54
8780.625000	32.4	100.0	H	52.0	24.3	8.1	21.6	54
18000.000000	46.3	100.0	V	269.0	22.8	23.5	7.7	54

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

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Radiates Emission from 18GHz to 26.5GHz

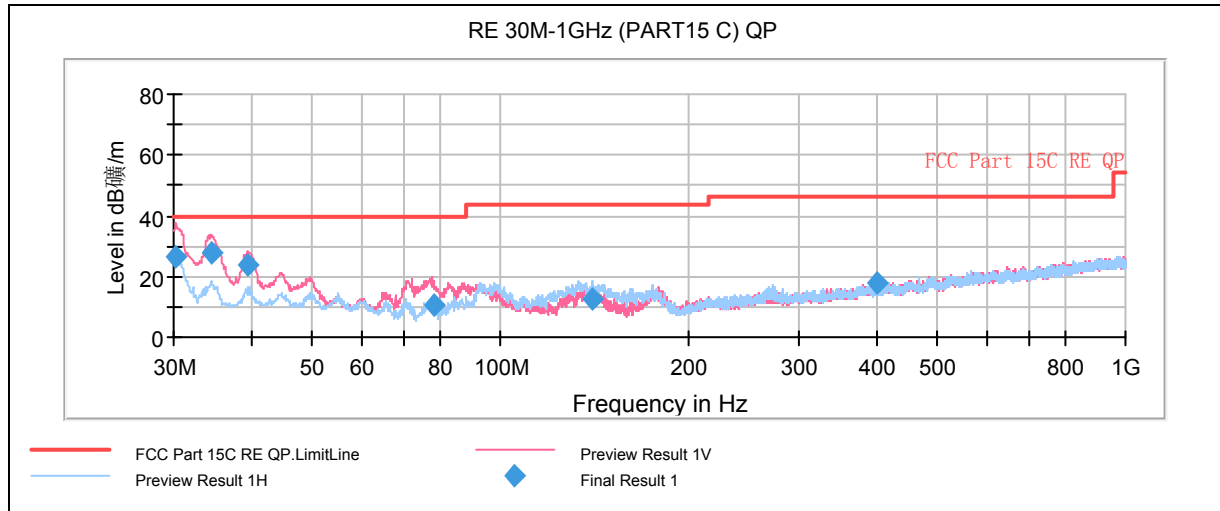
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Note: a font (Level in dB μ V/m) in the test plot =(level in dB μ V/m)
Radiates Emission from 30MHz to 1GHz

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)
30.140000	26.6	100.0	V	16.0	43.7	-17.1	13.4	40.0
34.503750	27.6	100.0	V	152.0	46.6	-19.0	12.4	40.0
39.516250	23.9	100.0	V	271.0	43.2	-19.3	16.1	40.0
78.191250	10.3	125.0	V	193.0	38.5	-28.2	29.7	40.0
140.761250	12.4	221.0	H	117.0	41.6	-29.2	31.1	43.5
399.995000	18.0	100.0	H	155.0	38.2	-20.2	28.0	46.0

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

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

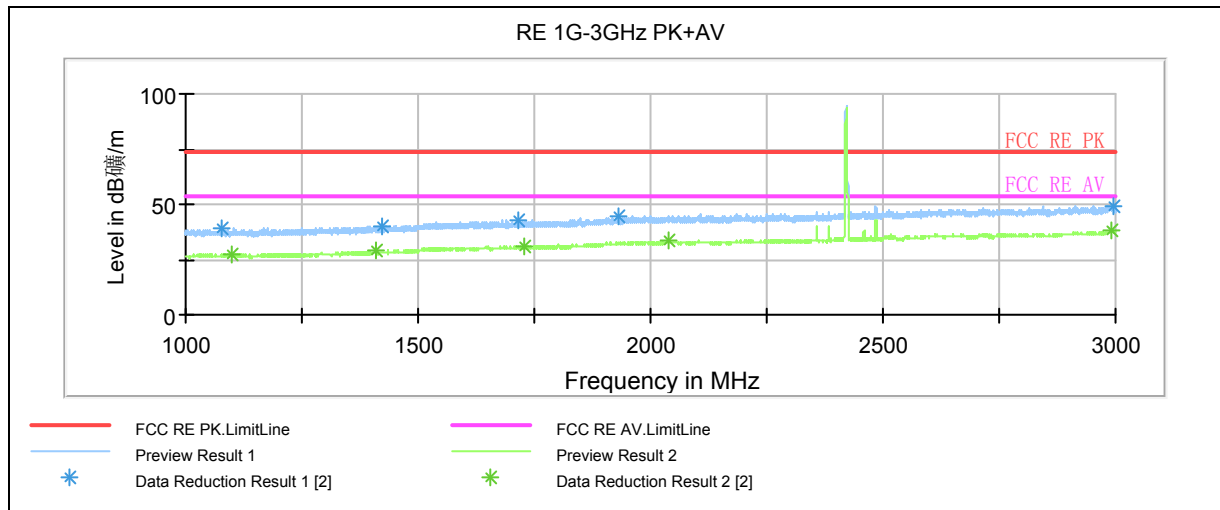
3. Margin = Limit – Quasi-Peak

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Note: a font (Level in dBμV/m) in the test plot =(level in dBuV/m)

Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1077.750000	39.2	100.0	V	182.0	49.1	-9.9	34.8	74
1421.750000	40.0	100.0	V	346.0	48.1	-8.1	34.0	74
1714.000000	43.0	100.0	V	28.0	48.5	-5.5	31.0	74
1932.500000	44.6	100.0	V	182.0	48.5	-3.9	29.4	74
2997.500000	49.2	100.0	V	234.0	47.8	1.4	24.8	74

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

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1097.000000	27.4	100.0	H	0.0	37.4	-10	26.6	54
1409.000000	28.9	100.0	H	68.0	37.3	-8.4	25.1	54
1728.500000	31.0	100.0	V	212.0	36.7	-5.7	23.0	54
2038.500000	33.3	100.0	H	145.0	36.3	-3	20.7	54
2991.500000	38.2	100.0	V	340.0	36.8	1.4	15.8	54

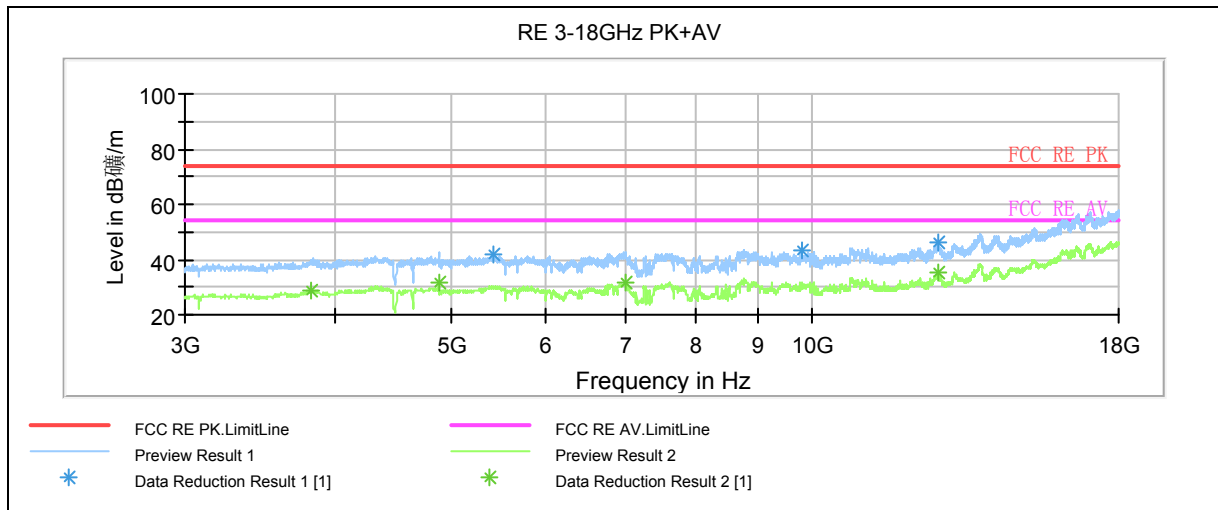
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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Note: a font (Level in dBμV/m) in the test plot =(level in dBμV/m)
Radiates Emission from 3GHz to 18GHz

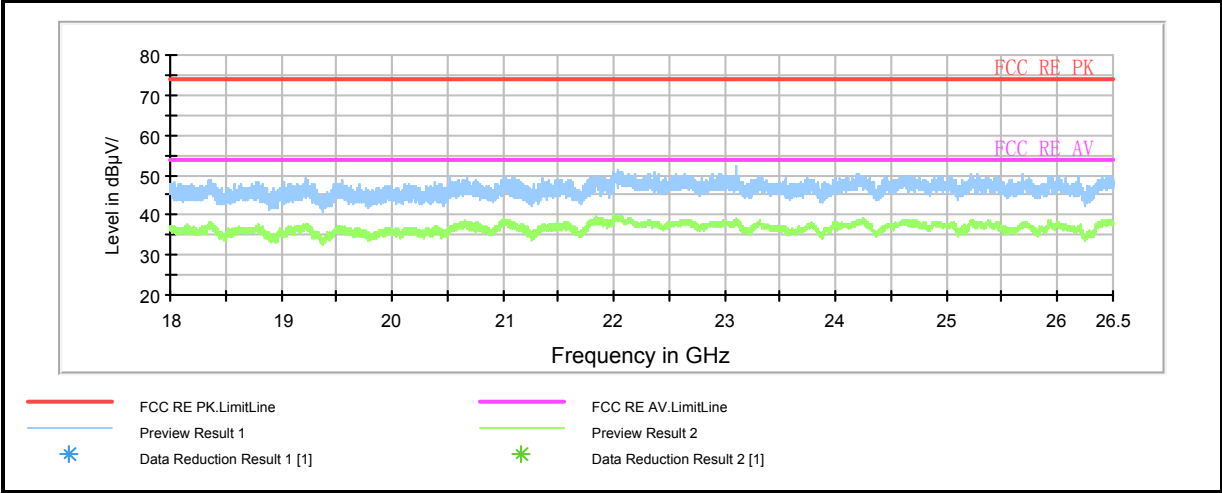
Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
5413.125000	42.1	100.0	H	274.0	39.5	2.6	31.9	74
9802.500000	43.6	100.0	H	230.0	34.1	9.5	30.4	74
12735.000000	45.9	100.0	H	87.0	33.3	12.6	28.1	74

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

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3823.125000	29.0	100.0	H	140.0	29.1	-0.1	25.0	54
4880.625000	31.8	100.0	V	350.0	29.9	1.9	22.2	54
6991.875000	31.9	100.0	V	0.0	26.9	5	22.1	54
12742.500000	35.4	100.0	V	236.0	22.8	12.6	18.6	54

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

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Radiates Emission from 18GHz to 26.5GHz

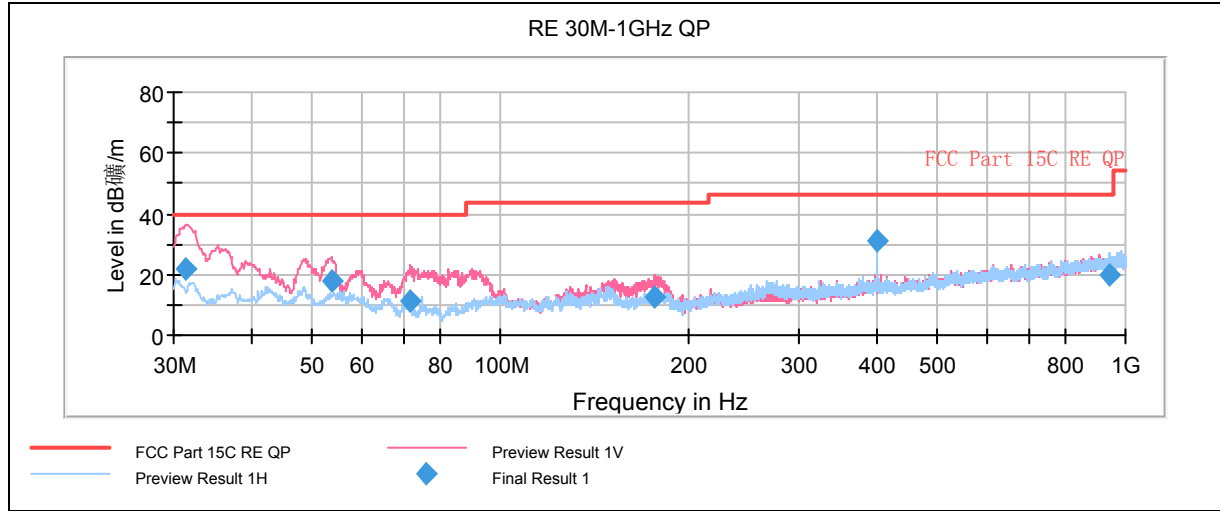
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Note: a font (Level in dB μ V/m) in the test plot =(level in dB μ V/m)
Radiates Emission from 30MHz to 1GHz

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)
31.376362	21.9	120.0	V	299.0	39.8	-17.9	18.1	40.0
53.831534	18.0	100.0	V	115.0	40.3	-22.3	22.0	40.0
71.729778	11.5	100.0	V	273.0	39.6	-28.1	28.5	40.0
176.629772	12.6	100.0	V	278.0	40.5	-27.9	30.9	43.5
399.975000	31.2	125.0	V	229.0	52.0	-20.8	14.8	46.0
944.984500	19.9	100.0	H	24.0	32.2	-12.3	26.1	46.0

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

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

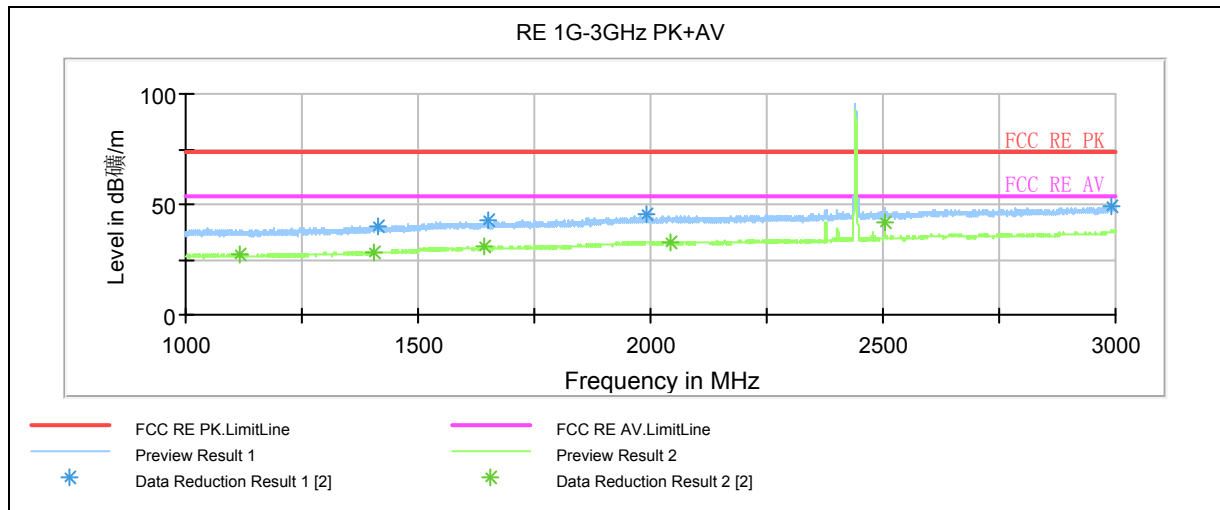
3. Margin = Limit – Quasi-Peak

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Note: a font (Level in dB μ V/m) in the test plot =(level in dB μ V/m)

Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	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)
1415.000000	40.0	100.0	H	7.0	48.2	-8.2	34.0	74
1652.000000	42.7	100.0	H	207.0	48.3	-5.6	31.3	74
1990.250000	45.2	100.0	V	0.0	48.3	-3.1	28.8	74
2991.750000	48.8	100.0	H	271.0	47.4	1.4	25.2	74

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

Frequency (MHz)	Average (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)
1117.500000	27.4	100.0	H	100.0	37.1	-9.7	26.6	54
1403.500000	28.6	100.0	H	305.0	37.0	-8.4	25.4	54
1643.500000	31.0	100.0	V	0.0	36.2	-5.2	23.0	54
2043.750000	33.2	100.0	V	134.0	36.2	-3	20.8	54
2504.750000	41.9	100.0	H	0.0	42.8	-0.9	12.1	54

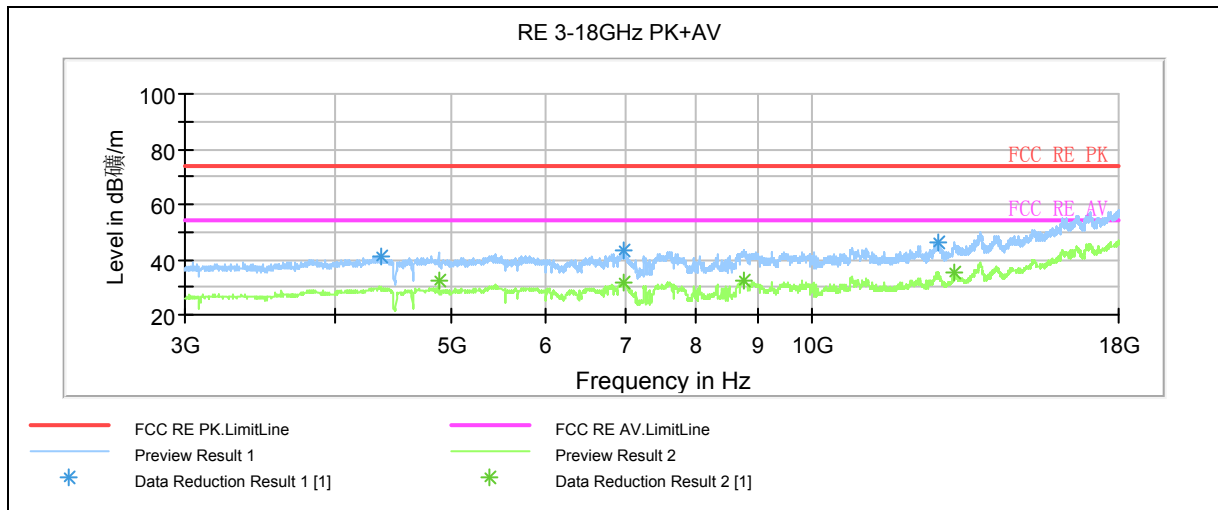
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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Note: a font (Level in dBμV/m) in the test plot =(level in dBuV/m)
Radiates Emission from 3GHz to 18GHz

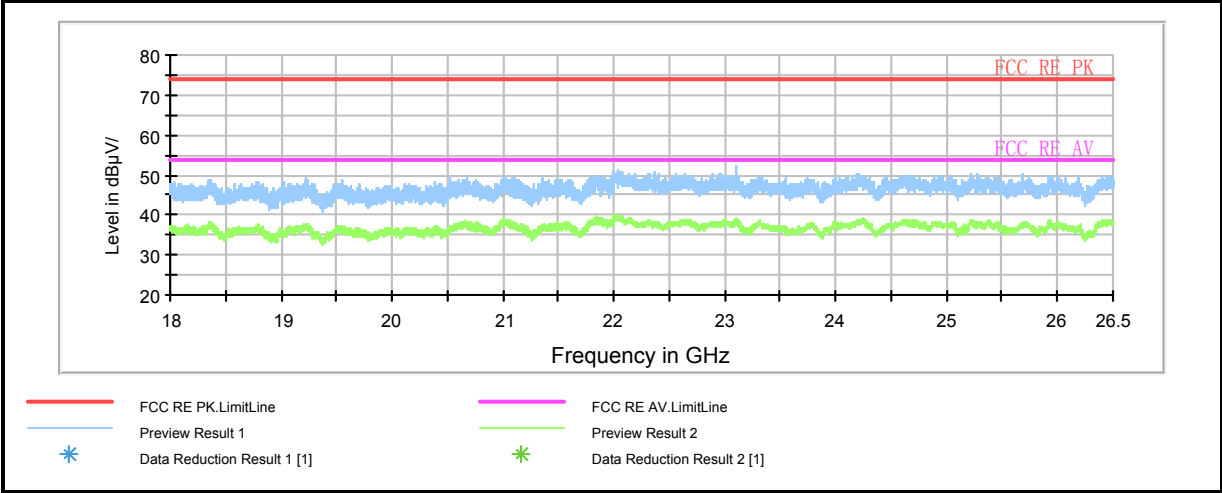
Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
12744.375000	46.1	100.0	V	39.0	33.5	12.6	27.9	74
6952.500000	43.5	100.0	H	77.0	38.8	4.7	30.5	74
4365.000000	41.3	100.0	H	147.0	39.9	1.4	32.7	74

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

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
4882.500000	32.3	100.0	V	18.0	30.5	1.8	21.7	54
6956.250000	31.5	100.0	H	0.0	26.8	4.7	22.5	54
8786.250000	32.5	100.0	H	0.0	24.4	8.1	21.5	54
13138.125000	35.2	100.0	V	343.0	22.4	12.8	18.8	54

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

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Radiates Emission from 18GHz to 26.5GHz

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2.10. Conducted Emission

Ambient condition

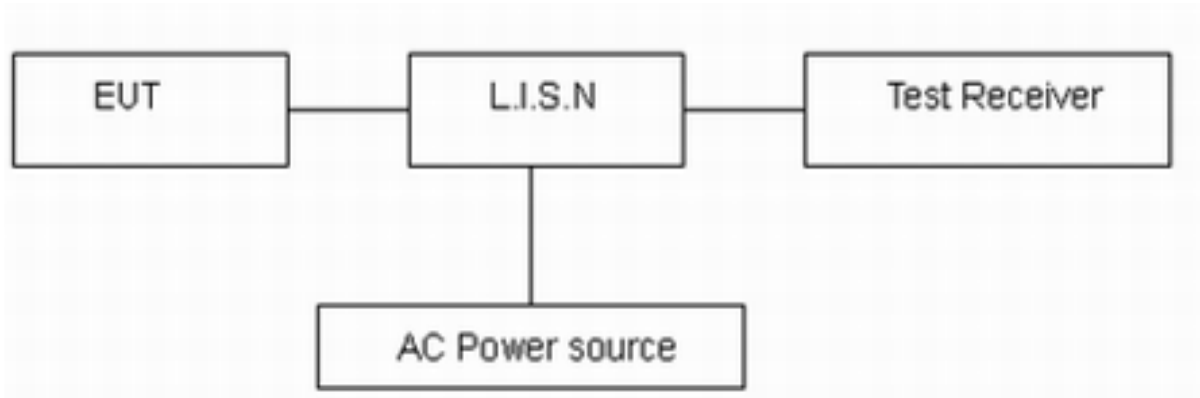
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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 C63.4-2009. 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.

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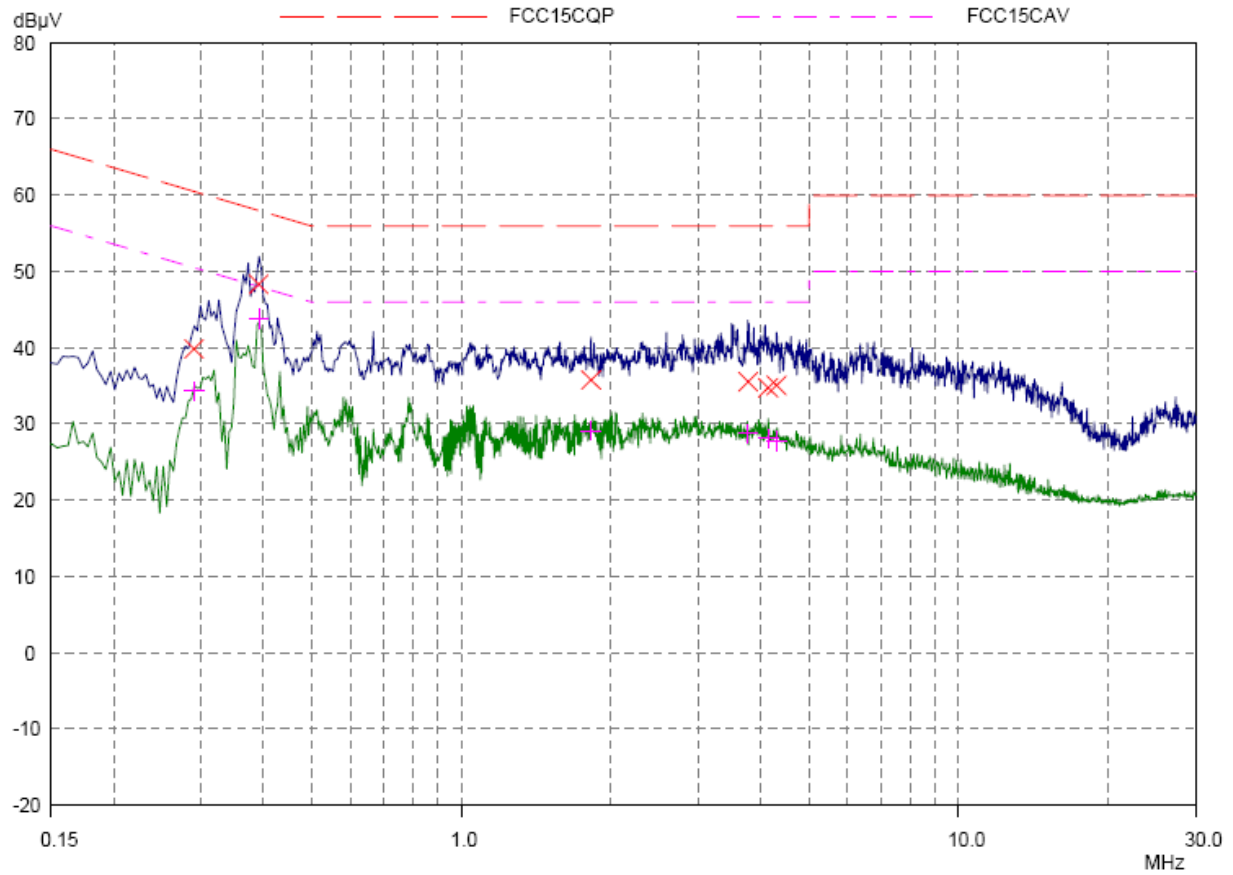
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Test Results:

Low Energy



Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.29062	39.83	60.51	20.68	L1	gnd
0.39218	48.34	58.02	9.68	L1	gnd
1.82187	35.75	56.00	20.25	L1	gnd
3.77109	35.56	56.00	20.44	L1	gnd
4.13828	34.72	56.00	21.28	L1	gnd
4.30625	35.07	56.00	20.93	L1	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.29062	34.30	50.51	16.21	L1	gnd
0.39218	43.80	48.02	4.22	L1	gnd
1.82187	29.17	46.00	16.83	L1	gnd
3.77109	28.71	46.00	17.29	L1	gnd
4.13828	28.09	46.00	17.91	L1	gnd
4.30625	27.80	46.00	18.20	L1	gnd

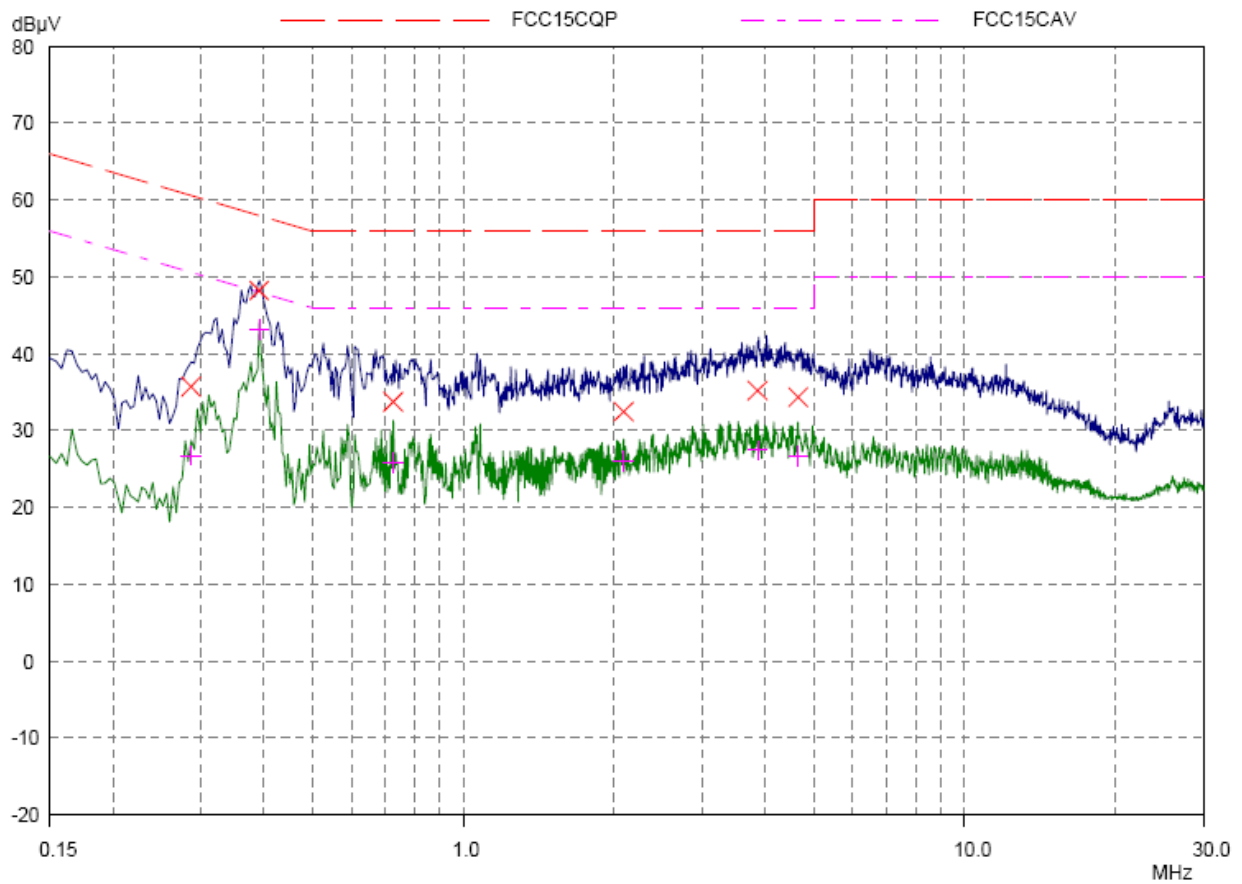
L Line

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Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.28671	35.73	60.62	24.89	N	gnd
0.39218	48.22	58.02	9.80	N	gnd
0.72421	33.77	56.00	22.23	N	gnd
2.0914	32.48	56.00	23.52	N	gnd
3.86484	35.24	56.00	20.76	N	gnd
4.6539	34.37	56.00	21.63	N	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.28671	26.80	50.62	23.82	N	gnd
0.39218	43.16	48.02	4.86	N	gnd
0.72421	25.79	46.00	20.21	N	gnd
2.0914	26.06	46.00	19.94	N	gnd
3.86484	27.46	46.00	18.54	N	gnd
4.6539	26.72	46.00	19.28	N	gnd

N Line

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3. Main Test Instruments

No.	Name	Type	Manufacturer	Serial Number	Calibration Date	Valid Period
01	EMI Test Receiver	ESCS30	R&S	100138	2014-01-14	One year
02	Loop Antenna	FMZB1516	SCHWARZBECK	237	2012-06-30	Two years
03	LISN	ENV216	R&S	101171	2014-04-12	One year
04	EMI Test Receiver	ESCI	R&S	100948	2013-06-29	One year
05	TRILOG Broadband Antenna	VULB 9163	Schwarzbeck	9163-201	2013-06-19	Three years
06	Signal Analyzer	FSV30	R&S	100815	2013-06-29	One year
07	Double Ridged Waveguide Horn Antenna	HF907	R&S	100126	2012-07-02	Three years
08	Standard Gain Horn	3160-09	ETS-Lindgren	00102644	2012-05-20	Three years
09	PSG Analog Signal Generator	E8257D	Agilent	MY49281101	2013-06-29	One year
10	ESG Vector Signal Generator	E4438C	Agilent	MY49070900	2013-06-29	One year
11	Spectrum Analyzer	E4445A	Agilent	MY46181146	2013-06-29	One year
12	Power Splitter	SHX-GF2-2-13	Hua Xiang	10120101	NA	NA
13	MOB COMMS DC SUPPLY	66319D	Agilent	MY43004105	2013-06-29	One year
14	Power Sensor	E9304A	Agilent	MY50220022	2013-06-29	One year
15	Power Meter	E4418B	Agilent	MY50000623	2013-06-29	One year
16	Vibration table	ESS-050-120	dongling	D1007126	2013-08-22	Three years

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

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance



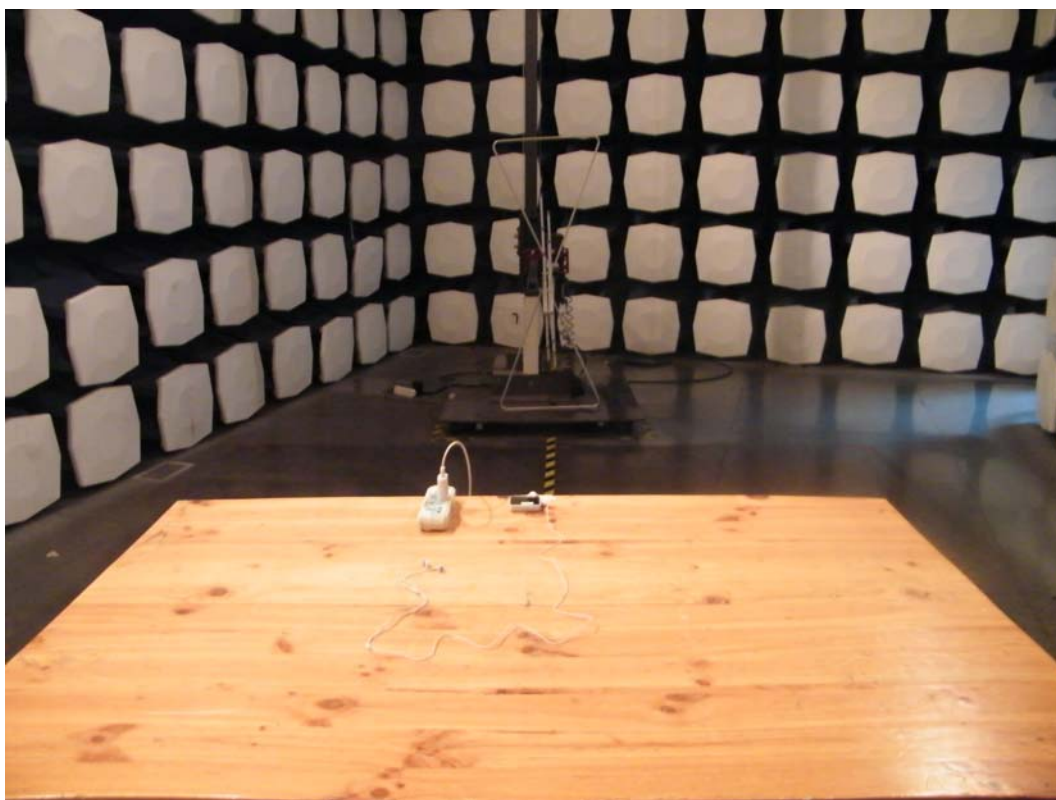
a: EUT



b: Adapter

Picture 1 Constituents of EUT

A.2 Test Setup



Picture 2 Radiated Emission Test Setup