RF TEST REPORT

Test Equipment	:	Tri Band Module
Model Name	:	JSWAM83
FCC ID	:	XNKJSWAM83
Date of receipt	:	2019-02-28
Test duration	:	2019-03-22 ~ 2019-03-29
Date of issue	:	2019-03-29

Applicant : JUNSUNGTECH Co., Ltd.
448-2, Shinwol-dong, Yangchun-gu, Seoul, South Korea

Test Laboratory : Lab-T, Inc.
2182-42 Baegok-daero, Mohyeon-myeon, Cheoin-gu, Yongin-si
Gyeonggi-do, 17036, Korea

Test specification	:	FCC Part 15 Subpart E 15.407
RF Output Power	:	13.95 dBm
Test result	:	Pass

Tested by:

Engineer
SungSin Kim

Reviewed by:

Technical Manager
SangHoon Yu

CONTENTS

1. Applicant Information

Applicant	:	JUNSUNGTECH Co., Ltd.
Address	:	448-2, Shinwol-dong, Yangchun-gu, Seoul, South Korea
Telephone No.	:	+82-2-2697-2094
Fax No.	:	+82-2-2694-2093
Person in charge		Young Hoon Chung / ivanchung1@naver.com

Manufacturer	:	JUNSUNGTECH Co., Ltd.
Address	:	448-2, Shinwol-dong, Yangchun-gu, Seoul, South Korea

2. Laboratory Information

Test Laboratory	:	Lab-T, Inc.
Address	:	2182-42 Baegok-daero, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do, 17036, Korea
Telephone No.	:	+82 31-322-6767
Facsimile No.	:	+82 31-322-6768

<u>Certificate</u>

FCC Designation No.	:	KR0159
FCC Registration No.	:	133186
IC Site Registration No.	:	22000-1

3. Information About Test Equipment

3.1 Equipment Information

Equipment type	Tri Band Module
Equipment model name	JSWAM83
Equipment add model name	-
Frequency range	5 180 MHz ~ 5 240 MHz (3 channel) 5 736 MHz ~ 5 814 MHz (3 channel)
Modulation type	QPSK
Power supply	DC 3.3 V
H/W version	v1.0
S/W version	v1.0

Note:The above EUT information was declared by the manufacturer.

3.2 Antenna Information

Antenna 1	Frequency Band	5 150 ~ 5 250	5 725 ~ 5 850
	Type	PCB Antenna	PCB Antenna
	Gain	5.3 dBi	2.1 dBi
Antenna 2	Frequency Band	5 150 ~ 5 250	5 725 ~ 5 850
	Type	PCB Antenna	PCB Antenna
	Gain	5.2 dBi	2.3 dBi

*only one antenna is selected for use at any one time, through the on-board transmit-receive/diversity RF switch.

3.3 Test Frequency

Test mode	Test frequency (MHz)	
	5 150 ~ 5 250	5 725 ~ 5 850
Lowest Frequency	5 180	5 736
Middle Frequency	5 210	5 762
Highest Frequency	5 240	5 814

3.4 Worst-Case

Worst case	Antenna1

In case of antenna1 and antenna 2, the electric circuits are all the same.
The worst case is decided by the output power measurement. (Antenna1 or Antenna2)
Except for the output, the remaining test items were conducted in the worst case.

3.5 Tested Companion Device Information

Type	Manufacturer	Model	Note
-	-	-	-
	-	-	-

4. Test Report

4.1 Summary

FCC Part 15E 407			
Reference	Parameter	Clause	Status
Transmitter Requirements			
15.203 15.407(a)	Antenna Requirement	4.4.1	C
15.407(a)	Maximum Conducted Output Power	4.4.2	C
15.407(a)	Maximum Power Spectral Density	4.4.3	C
15.403(i) 15.407(e)	Emission Bandwidth	4.4.4	C
-	Occupied Bandwidth	4.4.4	C
15.407(g)	Frequency Stability	4.4.5	C
15.407(h)	Dynamic Frequency Selection	4.4.6	N/A
15.407(b) 15.205(a) 15.209(a)	Radiated Emission, Band Edge and Restricted bands	4.4.7	C
15.207(a)	Conducted Emissions	4.4.8	N/A[NOTE2]

NOTE 1 : C = Comply N/C = Not Comply N/T = Not Tested N/A = Not Applicable
NOTE 2 : EUT operates only in DC Power.

* The general test methods used to test this device is ANSI C63.10:2013

4.2 Measurement Uncertainty

Mesurement items	Expanded Uncertainty	
RF Output Power	1.13 dB	(The confidence level is about 95 %, *k*=2)
Power Spectral Density	1.42 dB	(The confidence level is about 95 %, *k*=2)
Occupied Channel Bandwidth	23.85 kHz	(The confidence level is about 95 %, *k*=2)
Conducted Spurious Emissions	0.39 dB	(The confidence level is about 95 %, *k*=2)
Radiated Spurious Emissions (1 GHz under)	4.88 dB	(The confidence level is about 95 %, *k*=2)
Radiated Spurious Emissions (Above 1 GHz)	6.14 dB	(The confidence level is about 95 %, *k*=2)
Conducted emission	2.34 dB	(The confidence level is about 95 %, *k*=2)

4.3 Test Report Version

Test Report No.	Date	Description
TRRFCC19-0019	19-03-29	Initial issue

4.4 Transmitter Requirements

4.4.1 Antenna Requirement

4.4.1.1 Regulation

Accoding 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.407(a)(1)(2)(3), If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.4.1.2 Result

Comply
(The transmitter has a Internal PCB Antenna.
The directional peak gain of the antenna1 is 5.3 dBi(5 150~5 250), 2.1 dBi(5 725 ~ 5 850)
and antenna2 is 5.2 dBi(5 150~5 250), 2.3 dBi(5 725 ~ 5 850).)

4.4.2 Maximum Conducted Output Power

4.4.2.1 Regulation

According to §15.407(a)(1)(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a)(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a)(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

4.4.2.2 Measurement Procedure

These test measurement settings are specified in section E of 789033 D02 General UNII Test Procedures.

4.4.2.2.1 Measurement using a Power Meter (PM)

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

The EUT is configured to transmit continuously or to transmit with a constant duty cycle.

At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.

The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.

(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

(iv) Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (1/0.25) if the duty cycle is 25%).

4.4.2.3 Result

Comply (measurement data : refer to the next page)

4.4.2.4 Measurement data

Test mode : QPSK Antenna1

Average Conducted Output Power				
Band (MHz)	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
5 150 ~ 5 250	5 180	6.84	23.98	17.14
	5 210	5.91	23.98	18.07
	5 240	5.56	23.98	18.42
5 725 ~ 5 850	5 736	4.46	30.00	25.54
	5 762	4.76	30.00	25.24
	5 814	5.31	30.00	24.69

NOTE1 : Since the directional gain of the PCB antenna declared by the manufacturer does not exceed 6.0 dBi ,there was no need to reduce the output power.
NOTE2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
NOTE3 : Result : Measured Value + Duty cycle Factor

Test mode : QPSK Antenna2

Average Conducted Output Power				
Band (MHz)	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
5 150 ~ 5 250	5 180	6.62	23.98	17.36
	5 210	5.74	23.98	18.24
	5 240	5.34	23.98	18.64
5 725 ~ 5 850	5 736	4.37	30.00	25.63
	5 762	4.66	30.00	25.34
	5 814	5.21	30.00	24.79

NOTE1 : Since the directional gain of the PCB antenna declared by the manufacturer does not exceed 6.0 dBi ,there was no need to reduce the output power.
NOTE2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
NOTE3 : Result : Measured Value + Duty cycle Factor

Test mode : QPSK Antenna1

Peak Conducted Output Power				
Band (MHz)	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
5 150 ~ 5 250	5 180	13.95	23.98	10.03
	5 210	12.98	23.98	11.00
	5 240	12.19	23.98	11.79
5 725 ~ 5 850	5 736	8.06	30.00	21.94
	5 762	8.37	30.00	21.63
	5 814	8.92	30.00	21.08

NOTE1 : Since the directional gain of the PCB antenna declared by the manufacturer does not exceed 6.0 dBi ,there was no need to reduce the output power.
NOTE2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
NOTE3 : Result : Measured Value + Duty cycle Factor

Test mode : QPSK Antenna2

Peak Conducted Output Power				
Band (MHz)	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
5 150 ~ 5 250	5 180	13.90	23.98	10.08
	5 210	12.87	23.98	11.11
	5 240	12.04	23.98	11.94
5 725 ~ 5 850	5 736	7.97	30.00	22.03
	5 762	8.19	30.00	21.81
	5 814	8.81	30.00	21.19

NOTE1 : Since the directional gain of the PCB antenna declared by the manufacturer does not exceed 6.0 dBi ,there was no need to reduce the output power.
NOTE2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
NOTE3 : Result : Measured Value + Duty cycle Factor

4.4.3 Maximum Power Spectral Density(PSD)

4.4.3.1 Regulation

According to §15.407(a)(1)(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a)(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a)(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

4.4.3.2 Measurement Procedure

These test measurement settings are specified in section F of 789033 D02 General UNII Test Procedures.

4.4.3.2.1 Maximum Power Spectral Density (PSD)

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power….” (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)

2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following adjustments to the peak value of the spectrum, if applicable:

a) If Method SA-2 or SA-2 Alternative was used, add 10 log (1/x), where x is the duty cycle, to the peak of the spectrum.
b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.

4. The result is the Maximum PSD over 1 MHz reference bandwidth.

5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.l.a).
b) Set VBW ≥ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

4.4.3.3 Result

Comply (measurement data : refer to the next page)

4.4.3.4 Measurement data

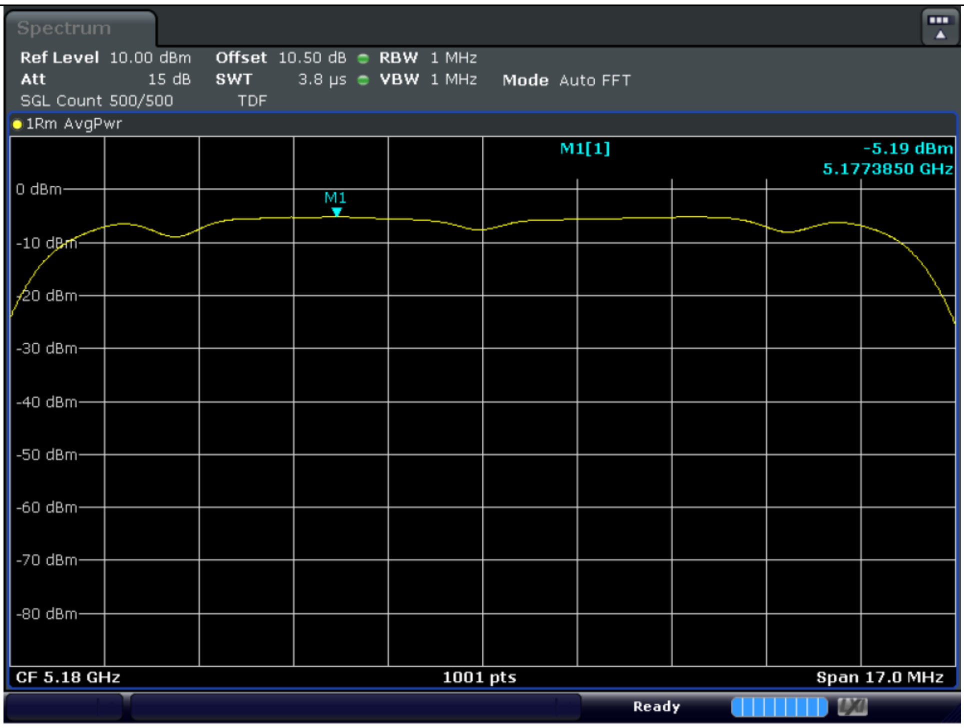
Test mode : QPSK Antenna1

Band(MHz)	Frequency(MHz)	Result(dBm/MHz)	Limit(dBm/MHz)	Margin(dB)
5 150 ~ 5 250	5 180	-5.19	11.00	16.19
	5 210	-5.89	11.00	16.89
	5 240	-6.09	11.00	17.09
Band(MHz)	Frequency(MHz)	Result(dBm/500kHz)	Limit(dBm/500kHz)	Margin(dB)
5 725 ~ 5 850	5 736	-6.54	30.00	36.54
	5 762	-6.42	30.00	36.42
	5 814	-6.26	30.00	36.26

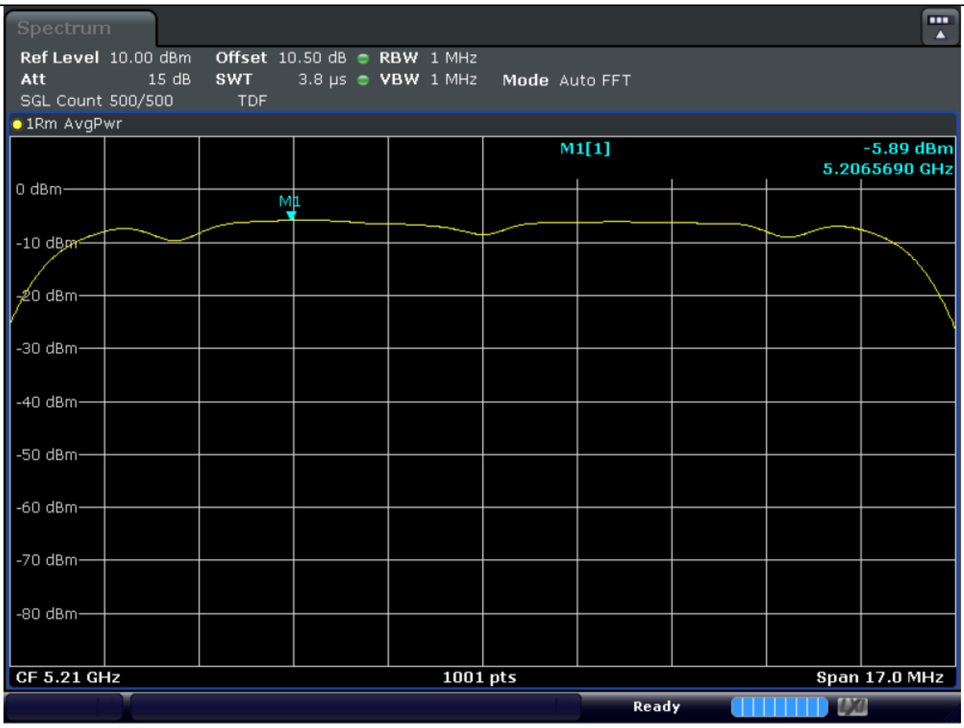
NOTE1 : Since the directional gain of the PCB antenna declared by the manufacturer does not exceed 6.0 dBi ,there was no need to reduce the output power.
NOTE2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
NOTE3 : Result : Measured Value + Duty cycle Factor
NOTE4 : Dutycycle Factor : 20log(Dutycycle) * Refer to 4.4.5.7

4.4.3.5 Test Plot

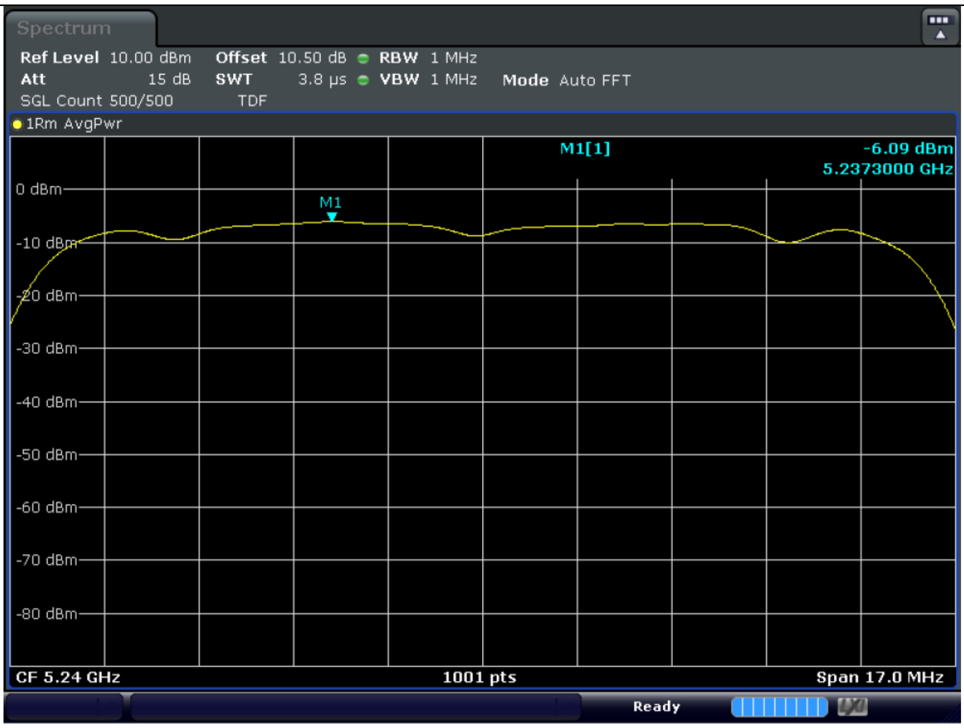
Test mode : 5 180 MHz



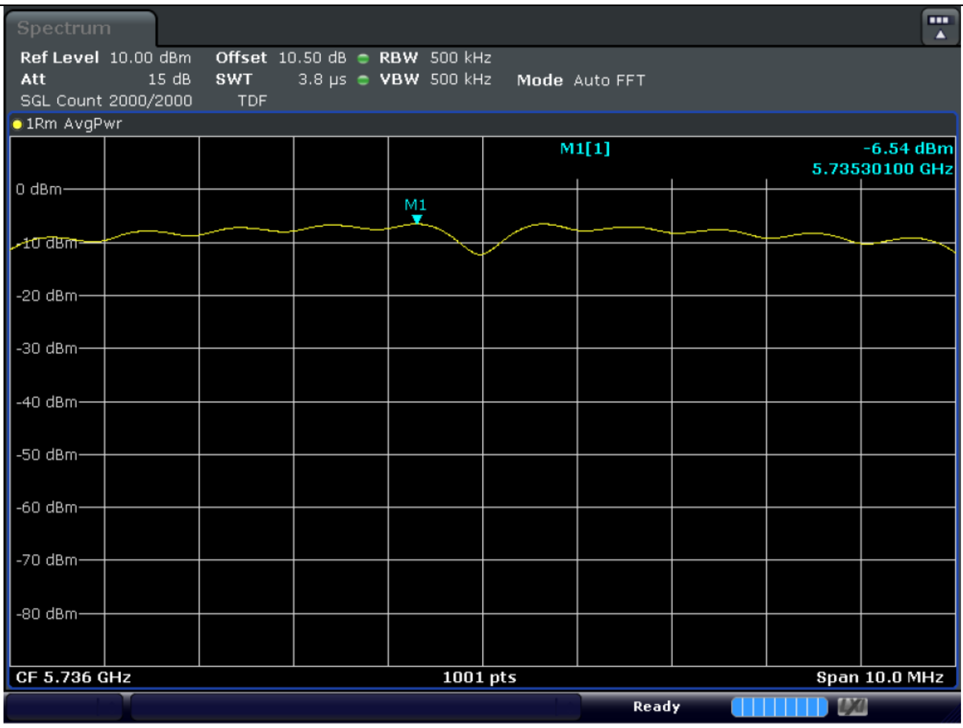
Test mode : 5 210 MHz



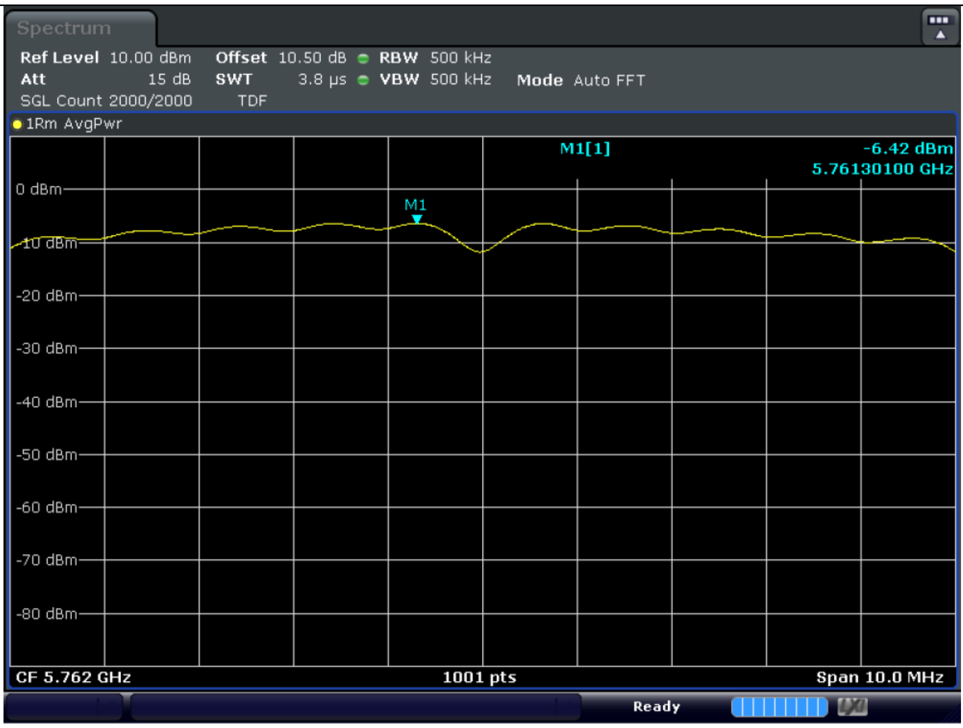
Test mode : 5 240 MHz



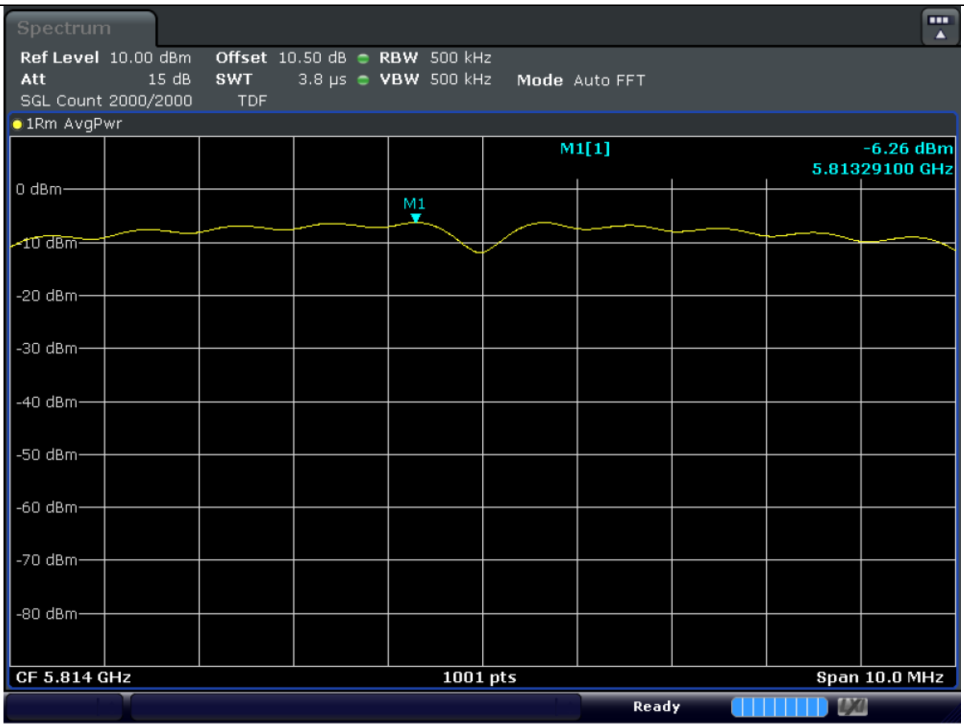
Test mode : 5 736 MHz



Test mode : 5 762 MHz



Test mode : 5 814 MHz



4.4.4 Emission Bandwidth

4.4.4.1 Regulation

According to §15.407(i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

According to §15.407(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

4.4.4.2 Measurement Procedure

These test measurement settings are specified in section C of 789033 D02 General UNII Test Procedures.

4.4.4.2.1 Emission Bandwidth (EBW)

a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

4.4.4.2.2 Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

4.4.4.3 Result

Comply (measurement data : refer to the next page)

4.4.4.4 Measurement data

Test mode : QPSK Antenna1

Emission Bandwidth(MHz)			
Band(MHz)	Lowest Frequency	Middle Frequency	Highest Frequency
5 150 ~ 5 250	16.19	16.17	16.17
5 725 ~ 5 850	9.83	9.83	9.83

NOTE1 : Limit : 5 725 ~ 5 825 Band : >500kHz

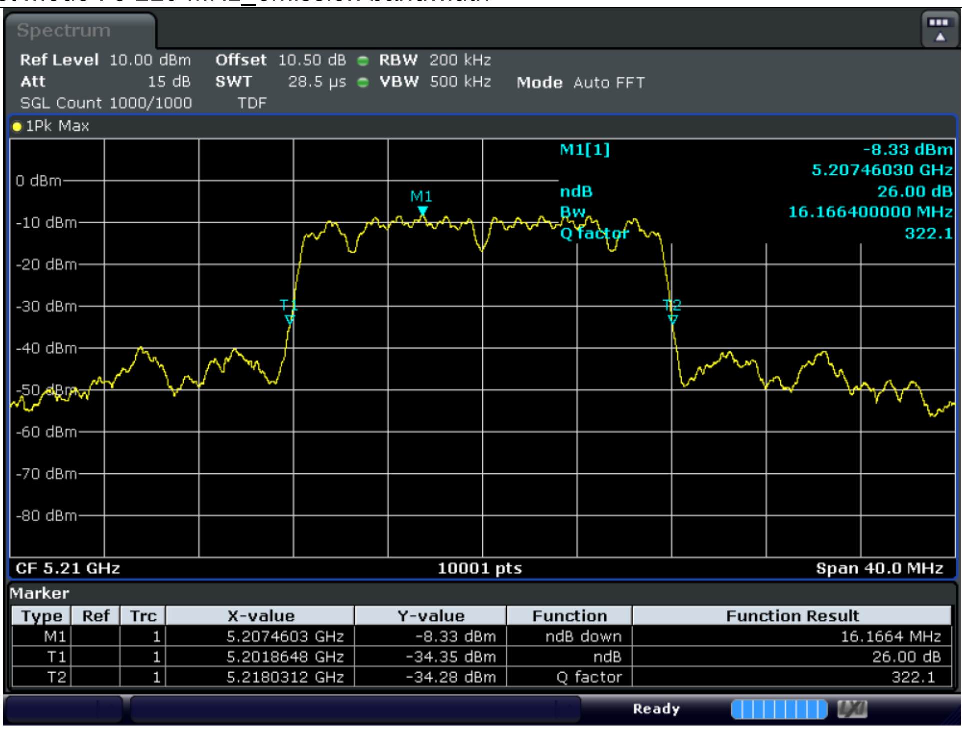
Test mode : QPSK Antenna1

Occupied Bandwidth(99 % Bandwith)(MHz)			
Band(MHz)	Lowest Frequency	Middle Frequency	Highest Frequency
5 150 ~ 5 250	15.07	15.03	15.03
5 725 ~ 5 850	13.92	13.93	13.94

4.4.4.5 Test Plot

Test mode : 5 180 MHz_emission bandwidth

Test mode : 5 210 MHz_emission bandwidth



Test mode : 5 240 MHz_emission bandwidth

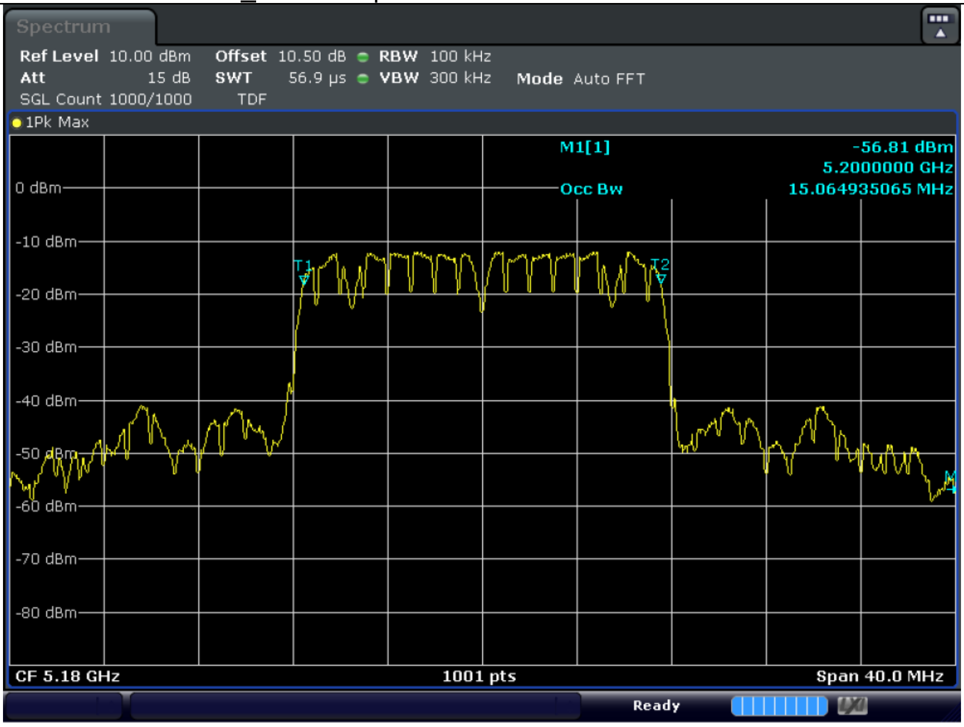
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.2374483 GHz	-8.72 dBm	ndB down	16.1744 MHz
T1		1	5.2318648 GHz	-34.70 dBm	ndB	26.00 dB
T2		1	5.2480392 GHz	-34.79 dBm	Q factor	323.8

Test mode : 5 736 MHz_emission bandwidth

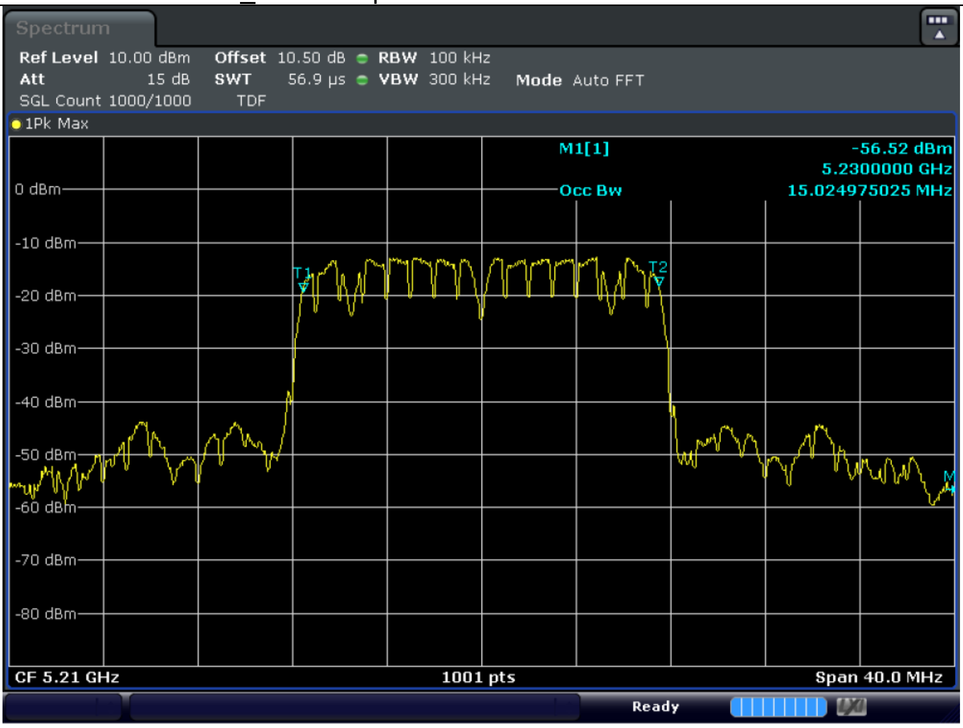
Test mode : 5 762 MHz_emission bandwidth

Test mode : 5 814 MHz_emission bandwidth

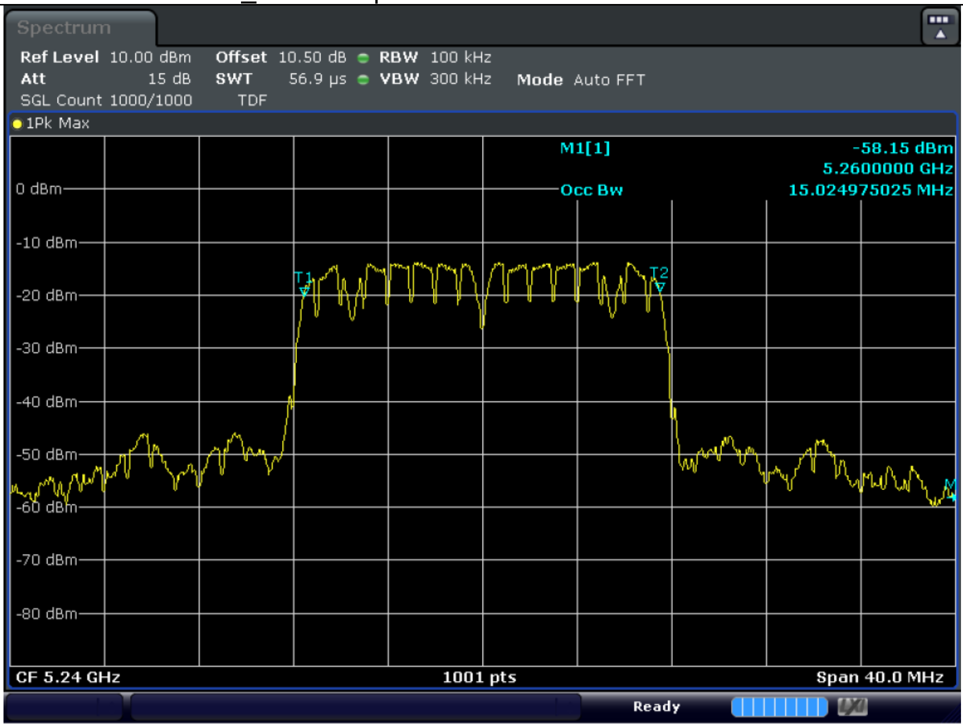
Test mode : 5 180 MHz_99% occupied bandwidth



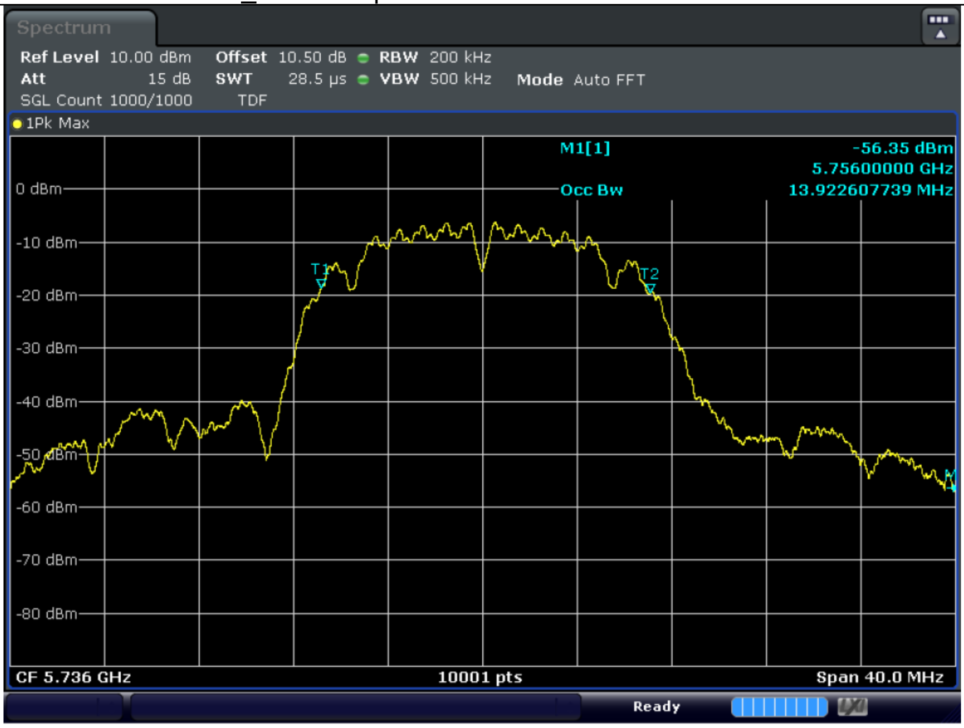
Test mode : 5 210 MHz_99% occupied bandwidth



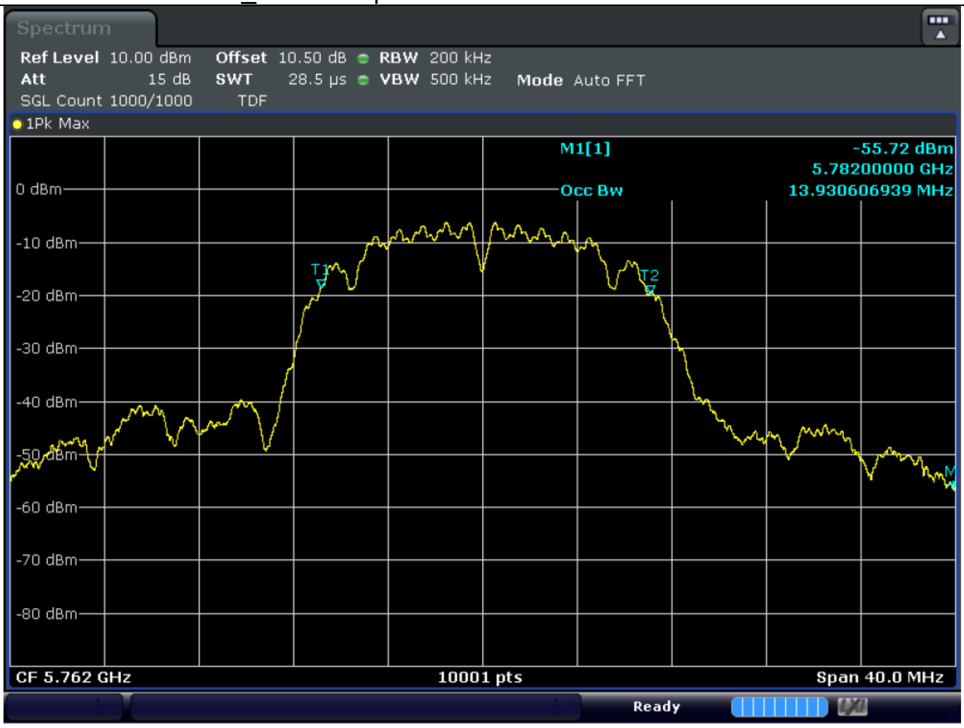
Test mode : 5 240 MHz_99% occupied bandwidth



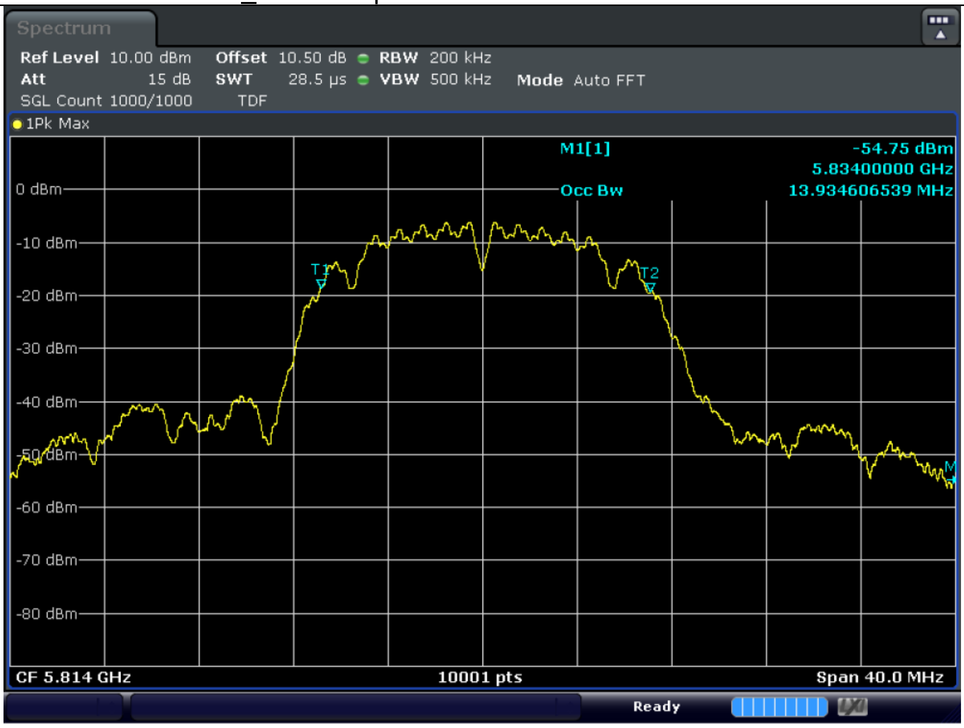
Test mode : 5 736 MHz_99% occupied bandwidth



Test mode : 5 762 MHz_99% occupied bandwidth



Test mode : 5 814 MHz_99% occupied bandwidth



4.4.5 Frequency Stability

4.4.5.1 Regulation

According to §15.407(i) (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users
manual.

4.4.5.2 Measurement Procedure

The frequency stability of the carrier frequency of the intentional radiator shall be maintained all conditions of normal operation as specified in the users manual. The frequency stability shall be maintained over a temperature variation of specified in the users manual at normal supply voltage, and over a variation in the primary supply voltage of specified in the users manual of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage

1. The EUT was placed inside the environmental test chamber.
2. The temperature was incremented by 10 °C intervals from lowest temperature.
3. Each increase step of temperature measured the frequency.
4. The test temperature was set 20°C and the supply voltage was then adjusted on the EUT from 85 % to 115% and the frequency record.

4.4.5.3 Result

Comply (measurement data : refer to the next page)

4.4.5.4 Measurement data

Test mode : QPSK Antenna1

Frequency (MHz)	Temp (℃)	Center Frequency (Hz)	Tolerance (%)
5 180 MHz	-20	5 179 992 794	-0.000 1
	-10	5 179 988 583	-0.000 2
	0	5 179 988 463	-0.000 2
	10	5 179 979 772	-0.000 4
	20	5 179 979 353	-0.000 4
	30	5 179 968 758	-0.000 6
	40	5 179 971 457	-0.000 6
	50	5 179 986 616	-0.000 3
	Voltage(%)		
	85	5 179 978 952	-0.000 4
	115	5 179 978 693	-0.000 4

Test mode : QPSK Antenna1

Frequency (MHz)	Temp (℃)	Center Frequency (Hz)	Tolerance (%)
5 210 MHz	-20	5 209 994 558	-0.000 1
	-10	5 209 988 388	-0.000 2
	0	5 209 988 333	-0.000 2
	10	5 209 979 554	-0.000 4
	20	5 209 978 975	-0.000 4
	30	5 209 966 908	-0.000 6
	40	5 209 971 238	-0.000 6
	50	5 209 986 283	-0.000 3
	Voltage(%)		
	85	5 209 978 645	-0.000 4
	115	5 209 978 597	-0.000 4

Test mode : QPSK Antenna1

Frequency (MHz)	Temp (℃)	Center Frequency (Hz)	Tolerance (%)
5 240 MHz	-20	5 239 995 111	-0.000 1
	-10	5 239 988 224	-0.000 2
	0	5 239 988 185	-0.000 2
	10	5 239 979 381	-0.000 4
	20	5 239 978 689	-0.000 4
	30	5 239 968 095	-0.000 6
	40	5 239 970 901	-0.000 6
	50	5 239 985 206	-0.000 3
	Voltage(%)		
	85	5 239 978 360	-0.000 4
	115	5 239 978 297	-0.000 4

Test mode : QPSK Antenna1

Frequency (MHz)	Temp (℃)	Center Frequency (Hz)	Tolerance (%)
5 736 MHz	-20	5 735 994 673	-0.000 1
	-10	5 735 993 723	-0.000 1
	0	5 735 987 046	-0.000 2
	10	5 735 977 387	-0.000 4
	20	5 735 975 457	-0.000 4
	30	5 735 964 947	-0.000 6
	40	5 735 968 235	-0.000 6
	50	5 735 981 315	-0.000 3
	Voltage(%)		
	85	5 735 978 844	-0.000 4
	115	5 735 984 242	-0.000 3

Test mode : QPSK Antenna1

Frequency (MHz)	Temp (℃)	Center Frequency (Hz)	Tolerance (%)
5 762 MHz	-20	5 761 994 447	-0.000 1
	-10	5 761 993 444	-0.000 1
	0	5 761 986 747	-0.000 2
	10	5 761 977 086	-0.000 4
	20	5 761 975 142	-0.000 4
	30	5 761 964 548	-0.000 6
	40	5 761 968 049	-0.000 6
	50	5 761 980 697	-0.000 3
	Voltage(%)		
	85	5 761 978 298	-0.000 4
	115	5 761 981 700	-0.000 3

Test mode : QPSK Antenna1

Frequency (MHz)	Temp (℃)	Center Frequency (Hz)	Tolerance (%)
5 814 MHz	-20	5 813 994 520	-0.000 1
	-10	5 813 993 452	-0.000 1
	0	5 813 986 611	-0.000 2
	10	5 813 976 962	-0.000 4
	20	5 813 974 932	-0.000 4
	30	5 813 964 283	-0.000 6
	40	5 813 967 802	-0.000 6
	50	5 813 981 017	-0.000 3
	Voltage(%)		
	85	5 813 978 014	-0.000 4
	115	5 813 980 894	-0.000 3

4.4.6 Spurious Emission, Band Edge, and Restricted bands

4.4.6.1 Regulation

According to §15.407(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

According to §15.209(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall notexceed the field strength levels specified in the following table:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shallnot be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permItted under other sections of this part, e.g., §§15.231 and 15.241.

According to §15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 – 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.386 75	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurement

4.4.6.2 Measurement Procedure

These test measurement settings are specified in section G of 789033 D02 General UNII Test Procedures
For all radiated emissions tests, measurements must correspond to the direction of maximum emission level for each measured emission (see ANSI C63.10 for guidance).

4.4.6.2.1 Unwanted Emissions in the Restricted Bands & Outside of the Restricted Bands

(1) For all measurements, follow the requirements in section II.G.3., “General Requirements for Unwanted Emissions Measurements”.
(2) At frequencies below 1000 MHz, use the procedure described in section II.G.4., “Procedure for Unwanted Emissions Measurements Below 1000 ㎒”.
(3) At frequencies above 1000 ㎒, measurements performed using the peak and average measurement procedures described in sections II.G.5. and II.G.6, respectively, must satisfy the respective peak and average limits. If all peak measurements satisfy the average limit, then average measurements are not required.

(4) Unwanted Emissions that fall Outside of the Restricted Bands

As specified in §15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a maximum emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in §15.407(b)(4)).

However, an out-of-band emission that complies with both the peak and average limits of §15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz maximum emission limit.

a) If radiated measurements are performed, field strength is then converted to EIRP as follows:

(i) EIRP = ((E*d)^2) / 30

where: • E is the field strength in V/m;

• d is the measurement distance in meters;

• EIRP is the equivalent isotropically radiated power in watts.

(ii) Working in dB units, the above equation is equivalent to:

EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77

(iii) or, if d is 3 meters:

EIRP[dBm] = E[dBμV/m] - 95.2

4.4.6.2.2 Radiated Spurious Emissions

1) The preliminary and final rdiated measurements were performed to determine the frequency producing the maximum emissions in at a 10m anechoic chamber. The EUT was tested at a distance 3 meters.

2) The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.

3) The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1 000 MHz using the TRILOG broadband antenna, and from 1 000 MHz to 40 000 MHz using the horn antenna.

4) Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

NOTE1 : The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1 GHz.

NOTE2 : The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz(1/T) for Average detection (AV) at frequency above 1 GHz. (where T = pulse width)

4.4.6.3 Result

Comply (measurement data : refer to the next page)

4.4.6.4 Measurement data

Test mode : Below 1 GHz (Worst case : 5 180 MHz)

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Ant Factor (dB)	Loss (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
68.80	QP	H	33.80	16.50	-29.00	21.30	40.00	18.70
75.47	QP	V	40.00	15.30	-29.00	26.30	40.00	13.70
171.98	QP	H	35.90	18.40	-28.10	26.20	43.50	17.30
188.71	QP	H	41.50	16.70	-27.90	30.30	43.50	13.20
245.70	QP	H	46.50	17.60	-27.60	36.50	46.00	9.50
258.07	QP	H	49.80	18.00	-27.50	40.30	46.00	5.70
282.56	QP	H	49.80	19.10	-27.30	41.60	46.00	4.40
360.64	QP	H	36.50	20.70	-27.20	30.00	46.00	16.00
860.26	QP	H	29.80	29.10	-25.50	33.40	46.00	12.60

Note 1 : Loss : Cable loss - Amp gain
Note 2 : Result : Reading + Ant Factor + Loss

Test mode : Above 1 GHz_5 180 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4 661.70	PK	H	42.90	-0.10	-	42.80	74.00	31.20
Above 5 GHz	Not Detected	-	-	-	-	-	-	-

Note 1 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
Note 2 : Peak Result : Reading + Factor
Note 3 : Dutycycle Factor : 10log(Dutycycle) * Refer to 4.4.5.7
Average Reasult : Reading + Factor + Dutycycle Factor
Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m
Above 1 GHz Distance Factor = 20log(1 / 3) = -9.54
Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.
Note 6 : Not Detected means that peak data does not exceed the average limit.

Test mode : Above 1 GHz_5 210 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Above 1 GHz	Not Detected	-	-	-	-	-	-	-

Note 1 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
Note 2 : Peak Result : Reading + Factor
Note 3 : Dutycycle Factor : 10log(Dutycycle) * Refer to 4.4.5.7
Average Reasult : Reading + Factor + Dutycycle Factor
Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m
Above 1 GHz Distance Factor = 20log(1 / 3) = -9.54
Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.
Note 6 : Not Detected means that peak data does not exceed the average limit.

Test mode : Above 1 GHz_5 180 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5 400.20	PK	V	41.40	1.50	-	42.90	74.00	31.10
Above 6 GHz	Not Detected	-	-	-	-	-	-	-

Note 1 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
Note 2 : Peak Result : Reading + Factor
Note 3 : Dutycycle Factor : 10log(Dutycycle) * Refer to 4.4.5.7
Average Reasult : Reading + Factor + Dutycycle Factor
Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m
Above 1 GHz Distance Factor = 20log(1 / 3) = -9.54
Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.
Note 6 : Not Detected means that peak data does not exceed the average limit.

Test mode : Above 1 GHz_5 736 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Above 1 GHz	Not Detected	-	-	-	-	-	-	-

Note 1 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
Note 2 : Peak Result : Reading + Factor
Note 3 : Dutycycle Factor : 10log(Dutycycle) * Refer to 4.4.5.7
Average Reasult : Reading + Factor + Dutycycle Factor
Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m
Above 1 GHz Distance Factor = 20log(1 / 3) = -9.54
Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.
Note 6 : Not Detected means that peak data does not exceed the average limit.

Test mode : Above 1 GHz_5 762 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Above 1 GHz	Not Detected	-	-	-	-	-	-	-

Note 1 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
Note 2 : Peak Result : Reading + Factor
Note 3 : Dutycycle Factor : 10log(Dutycycle) * Refer to 4.4.5.7
Average Reasult : Reading + Factor + Dutycycle Factor
Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m
Above 1 GHz Distance Factor = 20log(1 / 3) = -9.54
Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.
Note 6 : Not Detected means that peak data does not exceed the average limit.

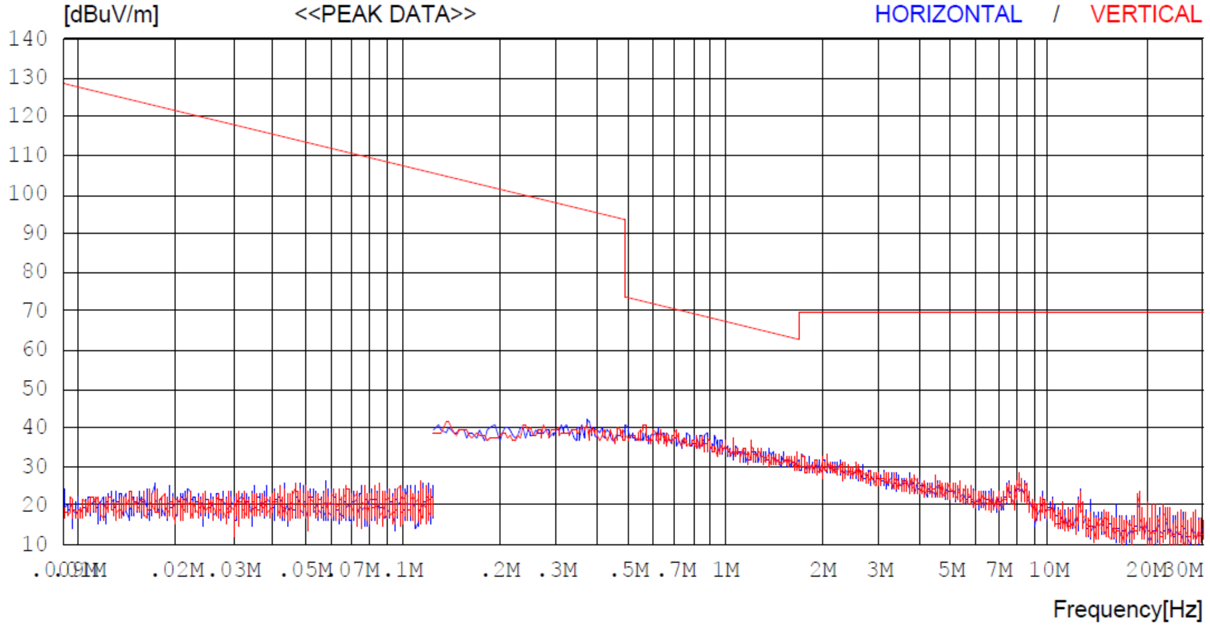
Test mode : Above 1 GHz_5 814 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Above 1 GHz	Not Detected	-	-	-	-	-	-	-

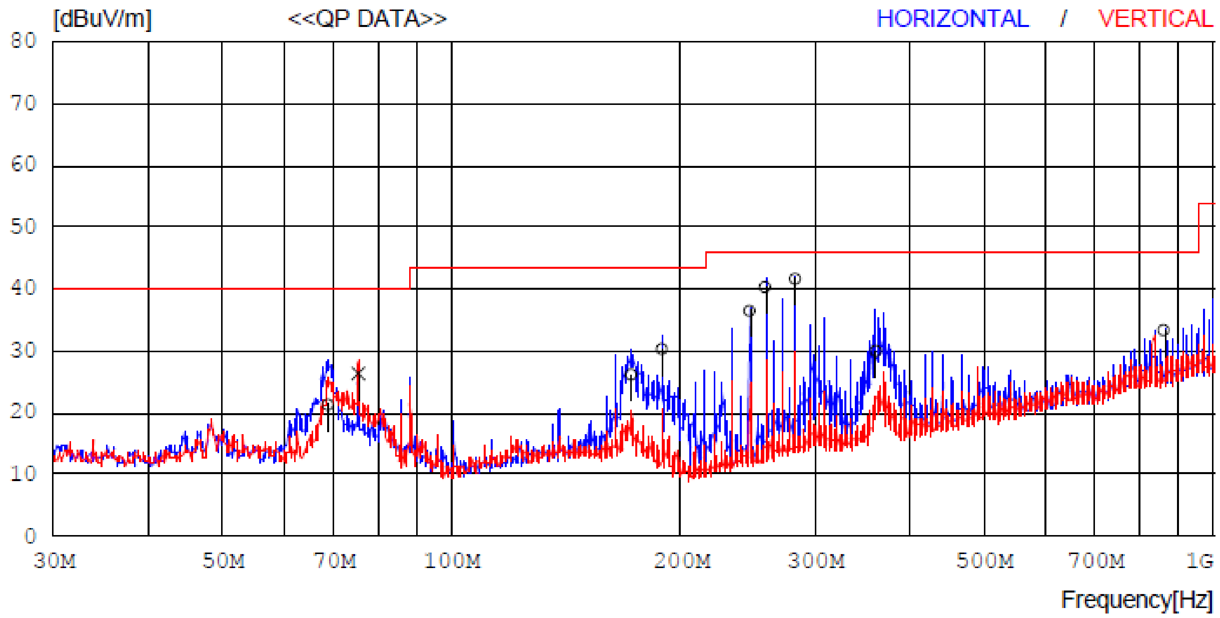
Note 1 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
Note 2 : Peak Result : Reading + Factor
Note 3 : Dutycycle Factor : 10log(Dutycycle) * Refer to 4.4.5.7
Average Reasult : Reading + Factor + Dutycycle Factor
Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m
Above 1 GHz Distance Factor = 20log(1 / 3) = -9.54
Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.
Note 6 : Not Detected means that peak data does not exceed the average limit.

4.4.6.5 Measurement Plot

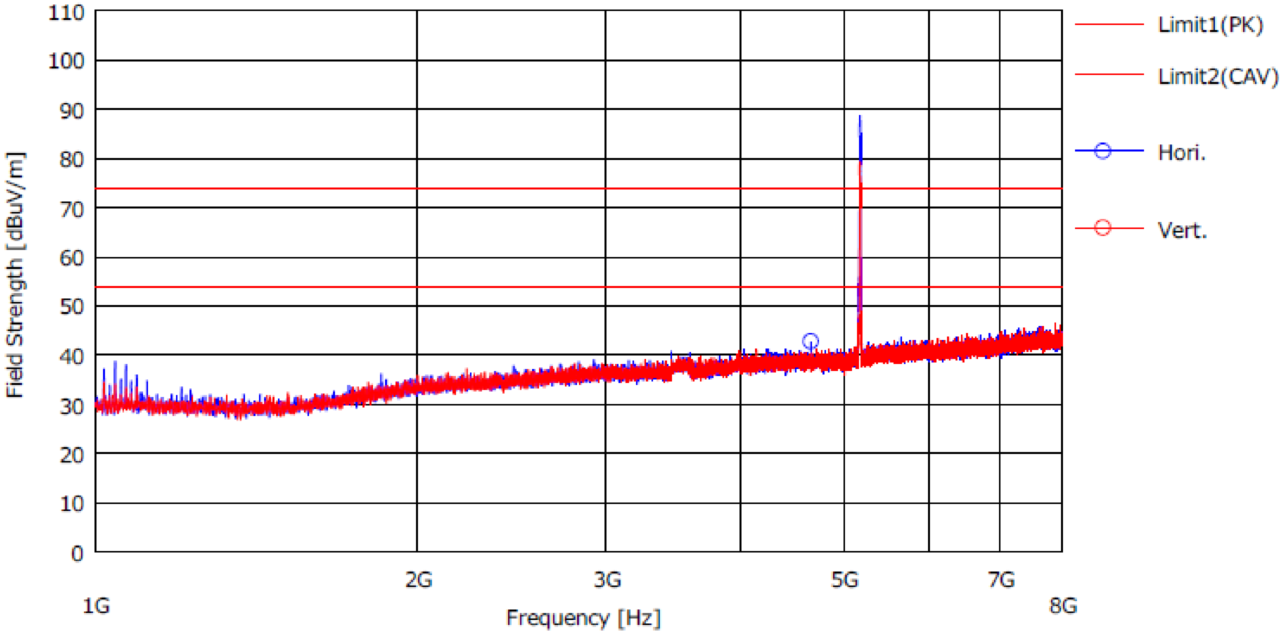
Test mode : 9 kHz ~ 30 MHz (Worst case : 5 180 MHz)



Test mode : 30 MHz ~ 1 GHz(Worst case : 5 180 MHz)

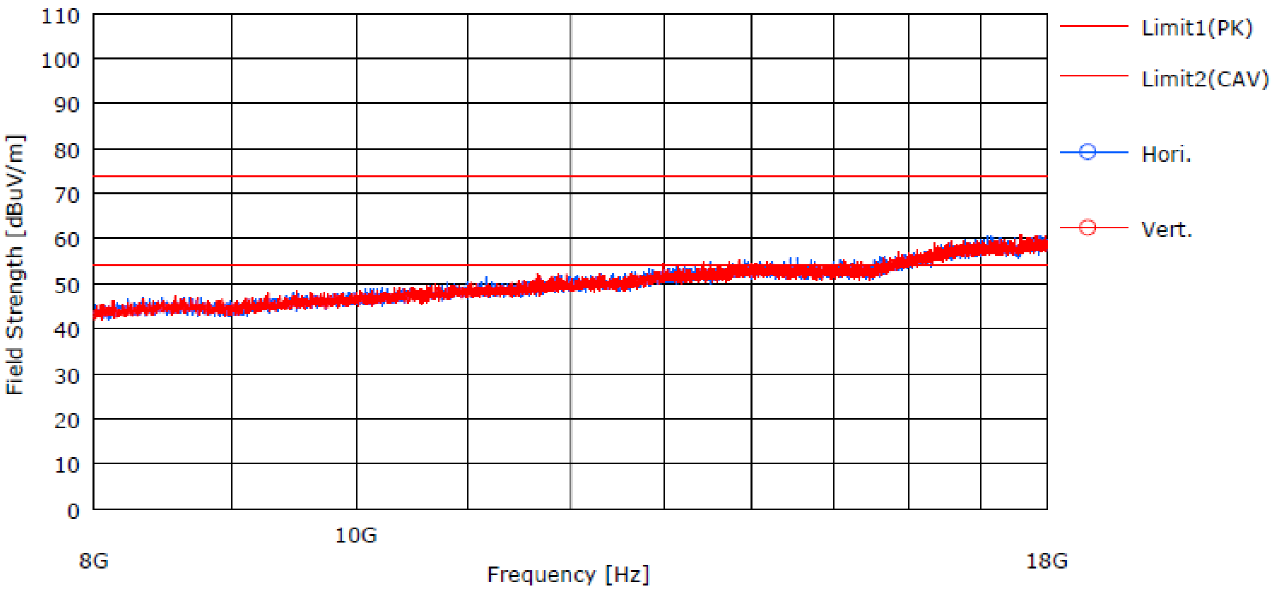


Test mode : 1 GHz ~ 8 GHz (Worst case : 5 180 MHz)



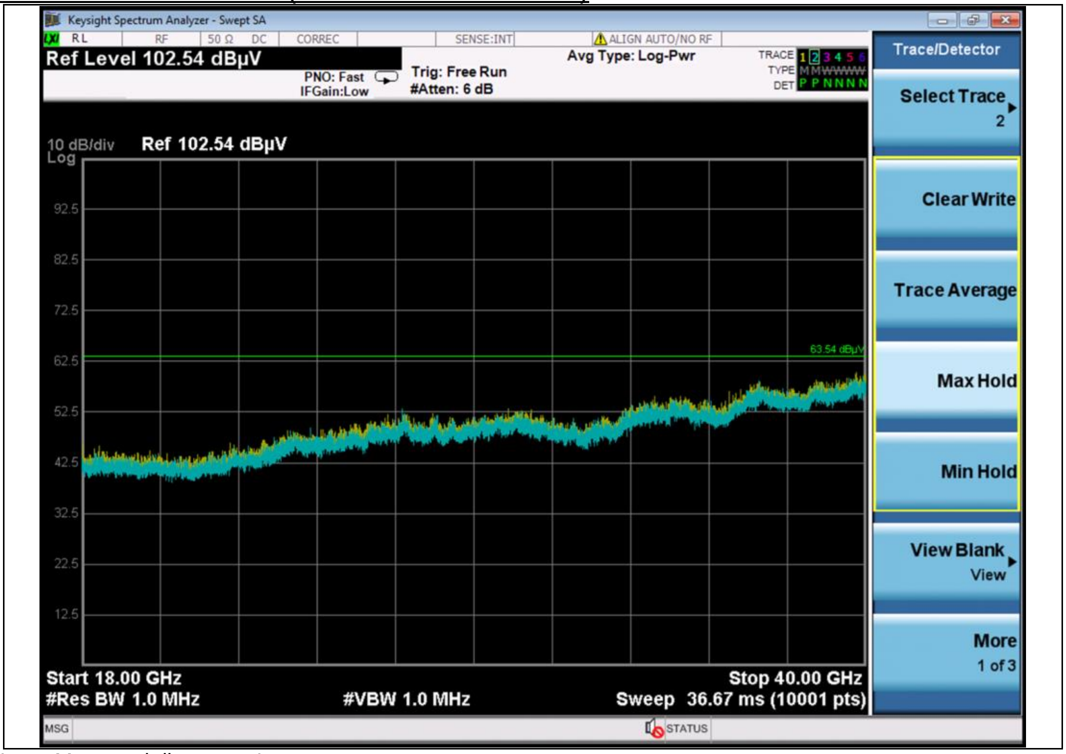
Note 1 : Measured distance : 1 m
Note 2 : Limit : Peak : 83.5 dBμV/m
Average : 63.5 dBμV/m

Test mode : 8 GHz ~ 18 GHz (Worst case : 5 180 MHz)



Note 1 : Measured distance : 1 m
Note 2 : Limit : Peak : 83.5 dBμV/m
Average : 63.5 dBμV/m

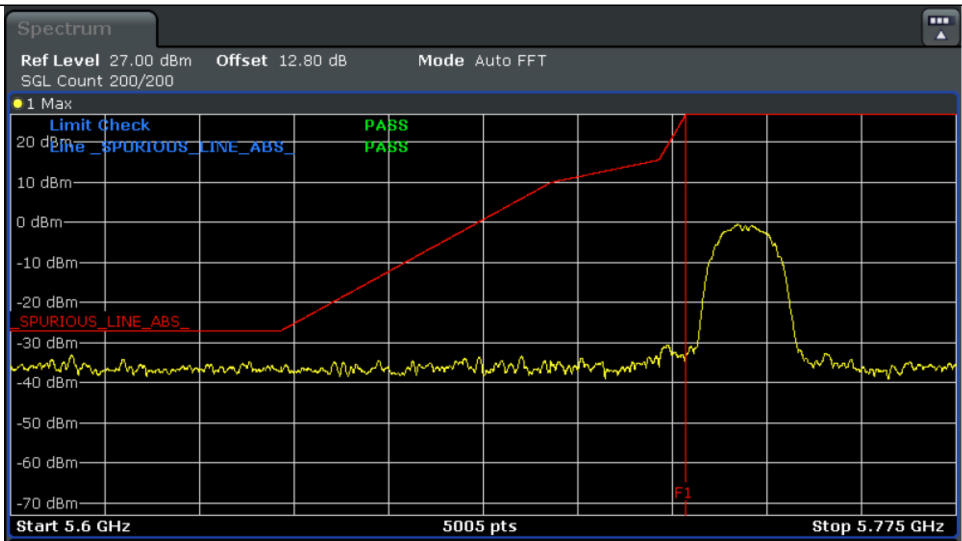
Test mode : 18 GHz ~ 40 GHz (Worst case : 5 180 MHz)



NOTE 1 : Measured distance : 1 m
NOTE 2 : Limit : Peak : 83.5 dBµV/m
Average : 63.5 dBµV/m
NOTE 3 : Yellow line : Horizontal
Blue line : Vertical

4.4.6.6 Measurement Plot_bandedge(5 725 MHz ~ 5 850 MHz)

Test mode : 5 736 MHz



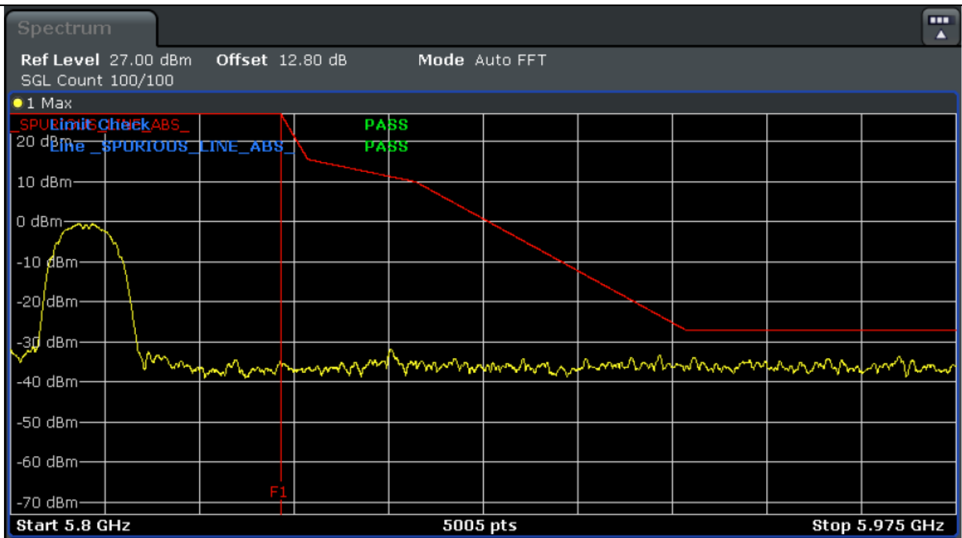
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.600 GHz	5.650 GHz	1.000 MHz	5.61136 GHz	-33.10 dBm	-6.10 dB
5.650 GHz	5.700 GHz	1.000 MHz	5.65002 GHz	-36.03 dBm	-9.05 dB
5.700 GHz	5.720 GHz	1.000 MHz	5.70001 GHz	-34.60 dBm	-44.60 dB
5.720 GHz	5.725 GHz	1.000 MHz	5.72067 GHz	-31.33 dBm	-48.45 dB
5.725 GHz	5.775 GHz	1.000 MHz	5.73462 GHz	-0.58 dBm	-27.58 dB

Ready

F1 : 5 725 MHz
Offset : Attenuator + Peak antenna gain + dutycycle factor

Test mode : 5 814 MHz



Spurious Emissions

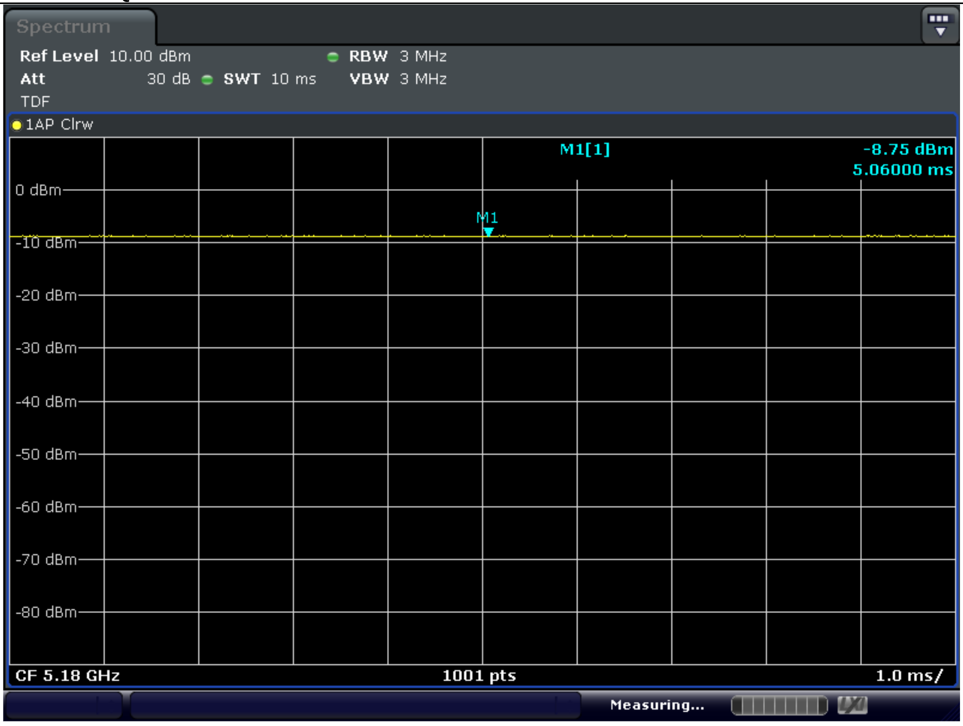
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.800 GHz	5.850 GHz	1.000 MHz	5.81276 GHz	-0.52 dBm	-27.52 dB
5.850 GHz	5.855 GHz	1.000 MHz	5.85500 GHz	-36.60 dBm	-52.21 dB
5.855 GHz	5.875 GHz	1.000 MHz	5.87041 GHz	-31.82 dBm	-43.10 dB
5.875 GHz	5.925 GHz	1.000 MHz	5.92498 GHz	-36.31 dBm	-9.33 dB
5.925 GHz	5.975 GHz	1.000 MHz	5.96444 GHz	-33.62 dBm	-6.62 dB

Ready

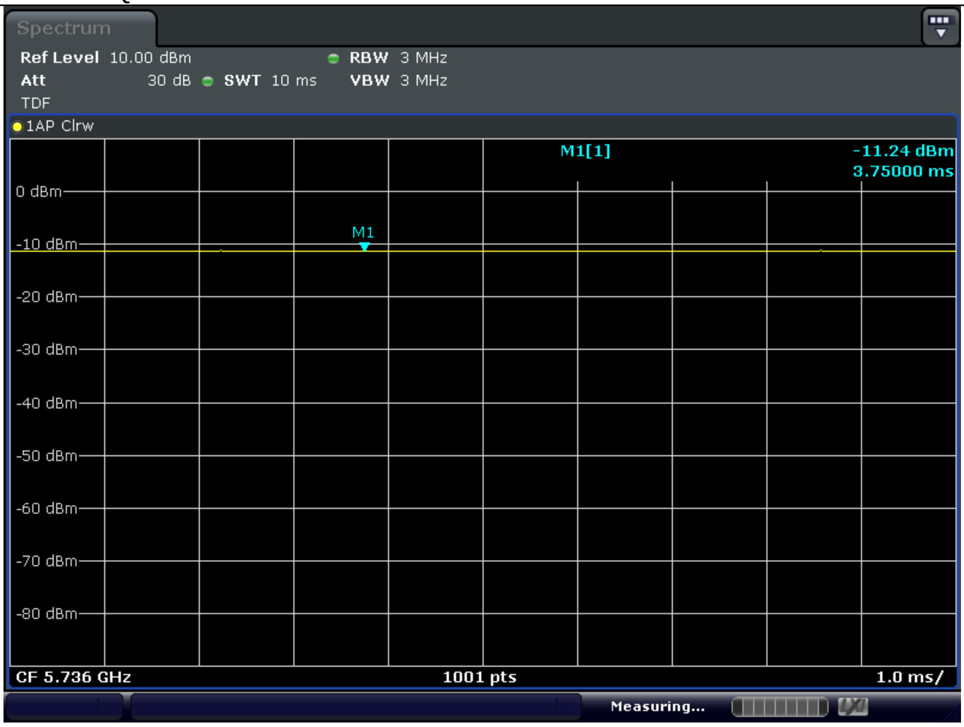
F1 : 5 850 MHz
Offset : Attenuator + Peak antenna gain + dutycycle factor

4.4.6.7 Measurement Plot_Dutycycle

Test mode : QPSK 5 180 MHz



Test mode : QPSK 5 736 MHz



4.4.7 Conducted Emission

4.4.7.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Ω line impedance stabilization network (LISN).
Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Qausi-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.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

4.4.7.2 Measurement Procedure

1) The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5 m away from the side wall of the shielded room.

2) Each current-carrying conductor of the EUT power cord was individually connected through a 50 Ω/50 μH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.

3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.

4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.

5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASIPEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

4.4.7.3 Result

N/A (EUT operates only in DC Power.)

APPENDIX I

TEST EQUIPMENT USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

Equipment	Manufacturer	Model	Serial No.	Cal. Date (yy.mm.dd)	Next Cal.Date (yy.mm.dd)
FSV Signal Analyzer	ROHDE&SCHWARZ	FSV30	103370	2018-10-15	2019-10-15
Power Sensor	KEYSIGHT	U2022XA	MY55320008	2018-08-17	2019-08-17
ATTENUATOR	INMET	26A-6	TR008	2018-10-12	2019-10-12
DC Power Supply	HP	66332A	US37471465	2019-01-10	2020-01-10
Digital MultiMeter	HP	34401A	US36025428	2019-01-10	2020-01-10
Signal Generator	ROHDE&SCHWARZ	SMB100A	178384	2018-10-15	2019-10-15
EMI Test Receiver	ROHDE&SCHWARZ	ESU40	100445	2018-12-14	2019-12-14
BiLog Antenna	Schwarzbeck	VULB9160	9160-3381	2017-06-15	2019-06-15
Preamplifier	TSJ	MLA-10k01-b01-27	1870369	2018-04-23	2019-04-23
Antenna Mast(10 m)	TOKIN	5977	-	-	-
Antenna Mast(10 m)	Innco	MA4640-XPET-0800	578	-	-
Controller(10 m)	TOKIN	5909L	141909L-1	-	-
Controller(10 m)	Innco	CO3000	40040217	-	-
Turn Table(10 m)	TOKIN	5983-1.5	-	-	-
10 m Semi-Anechoic Chamber	SY CORPORATION	-	-	-	-
Active Loop H-Field	ETS	6502	00150598	2017-06-01	2019-06-01
Double Ridege Horn Antenna	ETS	3117	00168719	2017-09-01	2019-09-01
Double Ridege Horn Antenna	A.H Systems, Inc	SAS-574	465	2017-04-25	2019-04-25
PREAMPLIFIER	Agilent	8449B	3008A02110	2019-01-14	2020-01-14
PREAMPLIFIER	A.H Systems, Inc	PAM-1840VH	166	2019-01-14	2020-01-14
EMI Test Receiver	ROHDE&SCHWARZ	ESR7	101440	2018-12-14	2019-12-14
LISN	ROHDE&SCHWARZ	ENV216	101883	2018-04-24	2019-04-24
Pulse Limiter	Schwarzbeck	VTSD 9561-F	9561-F189	2018-04-23	2019-04-23
PXA Signal Analyzer	KEYSIGHT	N9030A	MY54410264	2019-01-10	2020-01-10