

# TEST REPORT



## CTK Co., Ltd.

(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2020-04333  
Page (1) / (21) Pages

### 1. Client

- Name : Haier US Appliance Solutions, Inc.
- Address : Appliance Park AP2-226, Louisville, KY 40225, United States
- Date of Receipt : 2020-10-08

### 2. Manufacturer

- Name : Haier US Appliance Solutions, Inc.
- Address : Appliance Park AP2-226, Louisville, KY 40225, United States

### 3. Use of Report : For FCC Report

### 4. Test Sample / Model: Wi-Fi Module / WCATA006

### 5. Date of Test : 2020-10-19 to 2020-10-19

### 6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247 RSS-247 & RSS-Gen

### 7. Testing Environment: Temp.: (24 ± 5) °C, Humidity: (50 ± 3) % R.H.

### 8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by	Technical Manager
	Ji-Hye, Kim: (Signature)	Won-Jae, Hwang: (Signature)

2020-11-04

Republic of KOREA **CTK Co., Ltd.**



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2020-04333  
Page (2) / (21)Pages

## REPORT REVISION HISTORY

Date	Revision	Page No
2020-11-04	Issued (CTK-2020-04333)	all

*This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.*

## **CONTENTS**

1. General Product Description .....	4
1.1 Client Information .....	4
1.2 Product Information.....	4
1.3 Peripheral Devices .....	4
2. Facility and Accreditations.....	5
2.1 Test Facility .....	5
2.2 Laboratory Accreditations and Listings.....	5
2.3 Calibration Details of Equipment Used for Measurement.....	5
3. Test Specifications .....	6
3.1 Standards .....	6
3.2 Mode of operation during the test .....	7
3.3 Introduction .....	7
3.4 Differences.....	8
3.5 Maximum Measurement Uncertainty .....	8
3.6 Test Software .....	8
4. Technical Characteristic Test.....	9
4.1 Radiated Emission .....	9
APPENDIX A – Test Equipment Used For Tests .....	21

## 1. General Product Description

### 1.1 Client Information

<b>Company</b>	Haier US Appliance Solutions, Inc.
<b>Contact Point</b>	Appliance Park AP2-226, Louisville, KY 40225, United States
<b>Contact Person</b>	Name : Park, Hansung E-mail : hansung.park@geappliances.com Tel : +82-31-8094-6732

### 1.2 Product Information

<b>FCC ID</b>	ZKJ-WCATA006
<b>ISED</b>	10229A-WCATA006
<b>Product Description</b>	Wi-Fi Module
<b>Model name</b>	WCATA006
<b>Variant Model name</b>	-
<b>Operating Frequency</b>	2 412 MHz – 2 462 MHz
<b>RF Output Power</b>	802.11b : 16.10 dBm (40.74 mW) 802.11g : 11.48 dBm (14.06 mW) 802.11n : 11.28 dBm (13.43 mW)
<b>Antenna Specification</b>	Antenna type : Chip Antenna Peak Gain : 1.47 dBi
<b>Number of channels</b>	11
<b>Type of Modulation</b>	802.11b : DSSS 802.11g/n : OFDM
<b>Data Rate</b>	802.11b : 11 / 5.5 / 2 / 1 Mbps 802.11g : 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps 802.11n: MCS0-7, up to 72.2 Mbps
<b>Power Source</b>	DC 5 V
<b>Hardware Rev</b>	Rev 2
<b>Software Rev</b>	V3.5b-117987

### 1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	15-bs563TU	CND7253R6N
AC/DC Adapter	HP	HSTNN-CA40	-

## 2. Facility and Accreditations

### 2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yong-in-si, Gyeonggi-do, Korea.

### 2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A-2
KOREA	NRRA	KR0025

### 2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

### 3. Test Specifications

#### 3.1 Standards

FCC Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	6 dB Bandwidth	C (Note 5)	Conducted
15.247(b)	Maximum Output Power	C (Note 5)	
15.247(d)	Conducted Spurious emission	C (Note 5)	
15.247(d)	Unwanted Emission(Conducted)	C (Note 5)	
15.247(e)	Power Spectral Density	C (Note 5)	
15.209	Radiated Emissions (9 kHz ~ 1 GHz)	C	Radiated
15.209	Radiated Emissions (above 1 GHz)	C (Note 5)	
15.207	AC Conducted Emission	C (Note 5)	Line Conducted
<i>Note 1:</i> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
<i>Note 2:</i> The data in this test report are traceable to the national or international standards.			
<i>Note 3:</i> The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013			
<i>Note 4:</i> The tests were performed according to the method of measurements prescribed in KDB No.558074.			
<i>Note 5:</i> etc. : The conformity assessment of except for this item was confirmed by the other report. (Test Report No. CTK-2018-02896 issued on 2018-09-14 by CTK Co., Ltd..)			

ISED Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
RSS-Gen 6.6	6 dB Bandwidth	C (Note 5)	Conducted
RSS-247 5.4(d)	Maximum Output Power	C (Note 5)	
RSS-Gen 6.13	Conducted Spurious emission	C (Note 5)	
RSS-Gen 6.13	Unwanted Emission(Conducted)	C (Note 5)	
RSS-247 5.2(b)	Power Spectral Density	C (Note 5)	
RSS-Gen 6.13	Radiated Emissions (9 kHz ~ 1 GHz)	C	Radiated
RSS-Gen 6.13	Radiated Emissions (above 1 GHz)	C (Note 5)	
RSS-Gen 5	Receiver Spurious Emissions (9 kHz ~ 1 GHz)	C	
RSS-Gen 5	Receiver Spurious Emissions (above 1 GHz)	C (Note 5)	
RSS-Gen 8.8	AC Conducted Emission	C (Note 5)	Line Conducted
<i>Note 1:</i> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
<i>Note 2:</i> The data in this test report are traceable to the national or international standards.			
<i>Note 3:</i> The sample was tested according to the following specification: ISED RSS-247 Issue 2, RSS-GEN Issue 4, ANSI C63.10-2013			
<i>Note 4:</i> The tests were performed according to the method of measurements prescribed in KDB No.558074.			
<i>Note 5:</i> etc. : The conformity assessment of except for this item was confirmed by the other report. (Test Report No. CTK-2018-02896 issued on 2018-09-14 by CTK Co., Ltd..)			

### 3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.  
During at testing, system components were manipulated within the confines of typical usage to maximize each emission.  
For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit.  
All modulation modes were tests. The results are only attached worst cases.

#### Test Frequency

Lowest channel	Middle channel	Highest channel
-	-	2 462 MHz

#### Test mode

Test mode	Modulation	Data rate	Duty Cycle	Duty Cycle Factor
802.11b	DSSS	1 Mbps	99.0%	-
802.11g	OFDM	6 Mbps	94.2%	0.26 dB
802.11n	OFDM	MCS 0	93.9%	0.27 dB

### 3.3 Introduction

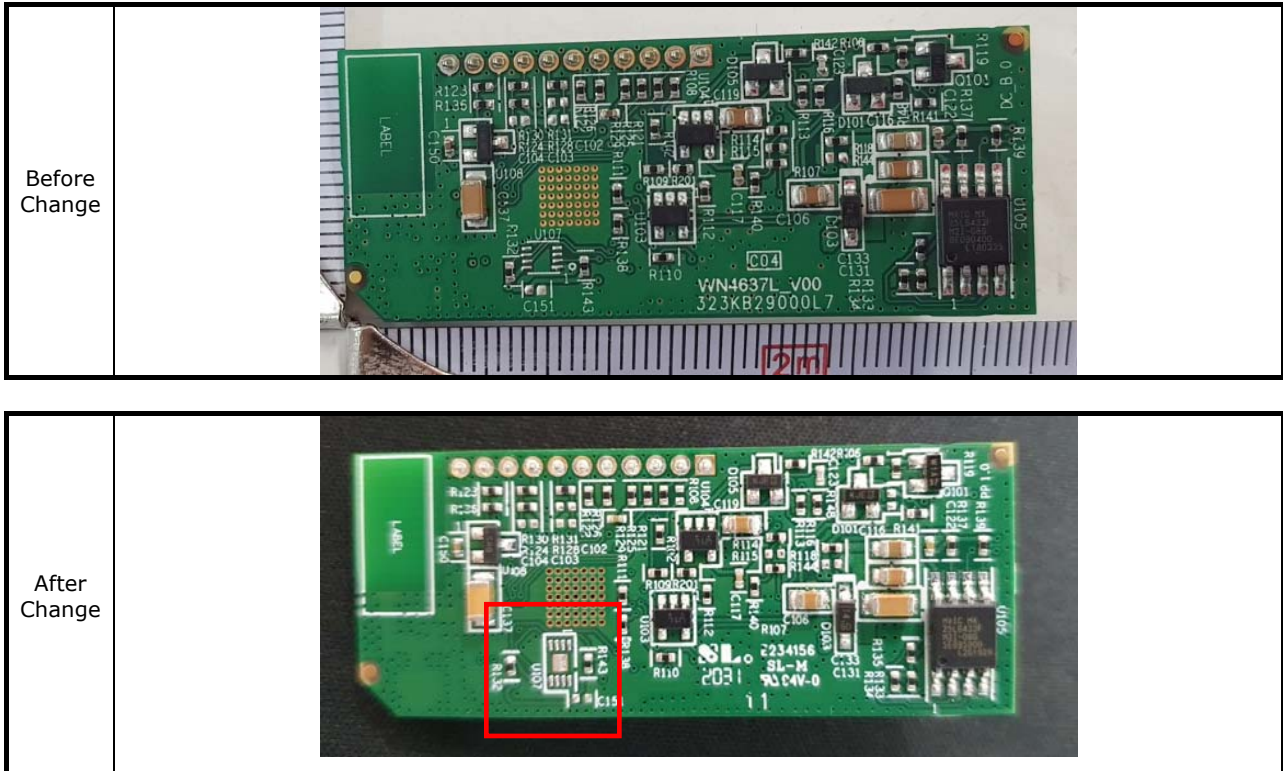
The before change(Different MFi IC circuit) and the after changing PCB (MFi IC circuit) has identical PCB layout, antenna, SW implementation for Wi-Fi. Based on their similarity, the FCC Part 15C (equipment class: DTS) test data issued data of WCATA006 references the test data of existing report. (Test Report No. CTK-2018-02896 issued on 2018-09-14 by Haier US Appliance Solutions, Inc..)

※ MFi : "Made for iPhone/iPod/iPad", a licensing program for developers of hardware and software for Apple products

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID (FCC ID: ZKJ-WCATA006) and IC Cert.No(IC : 10229A-WCATA006).

### 3.4 Differences

The before change(Different MFi IC circuit) and the after changing PCB (MFi IC circuit) has identical PCB layout, antenna, SW implementation for Wi-Fi.



### 3.5 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.  
Coverage factor  $k = 2$ , Confidence levels of 95 %

Description	Uncertainty
Radiated Emissions ( $f \leq 1$ GHz)	$\pm 4.0$ dB

### 3.6 Test Software

Radiated Test	TOYO EMI software EP5RE Ver. 6.0.1.0
---------------	--------------------------------------



## 4. Technical Characteristic Test

### 4.1 Radiated Emission

#### Test Location

- ☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)  
☐ 3 m SAC (test distance : 3 m)

#### Test Procedures

KDB 558074 - Section 8.5, 8.6  
ANSI C63.10-2013 - Section 11.11, 11.12  
RSS-Gen - Section 6.13

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

#### Test Settings:

Frequency Range = 9 kHz ~ 1 GHz

- a) RBW = 100 kHz for  $f < 1$  GHz, 9 kHz for  $f < 30$  MHz  
b) VBW  $\geq$  RBW  
c) Detector = CISPR Quasi-peak  
d) Sweep time = auto couple

## Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
<sup>1</sup> 0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	<sup>2</sup> Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector.

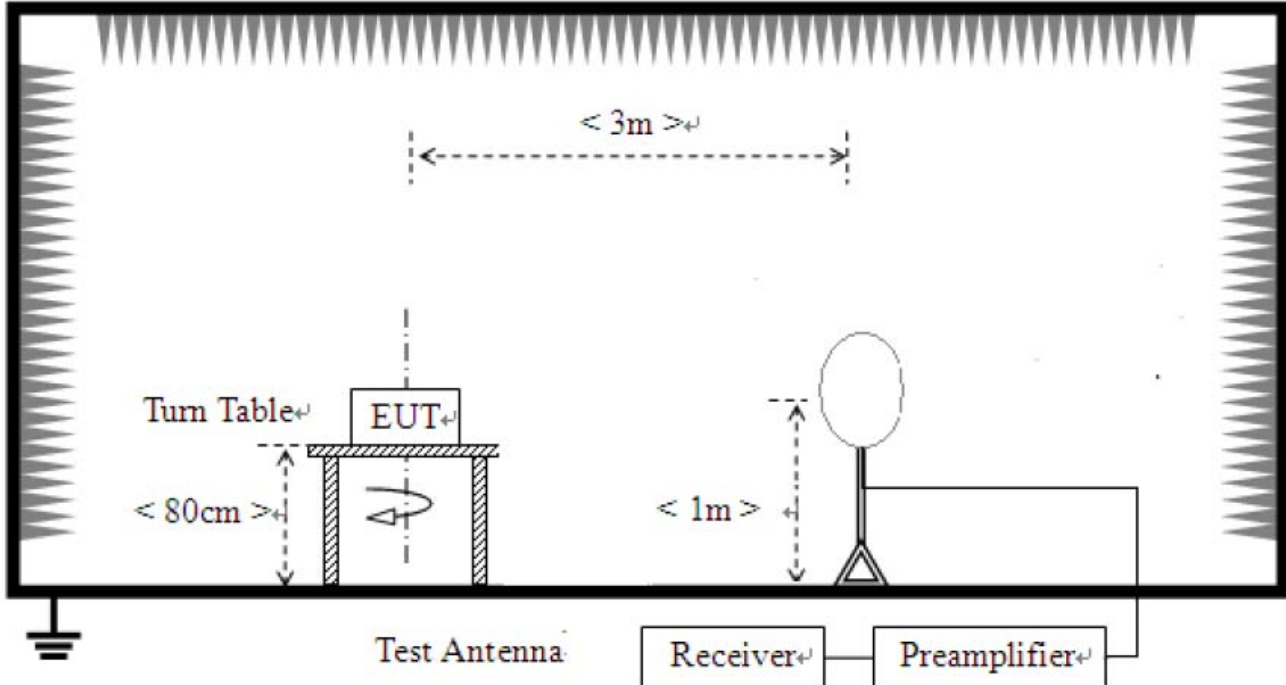
FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

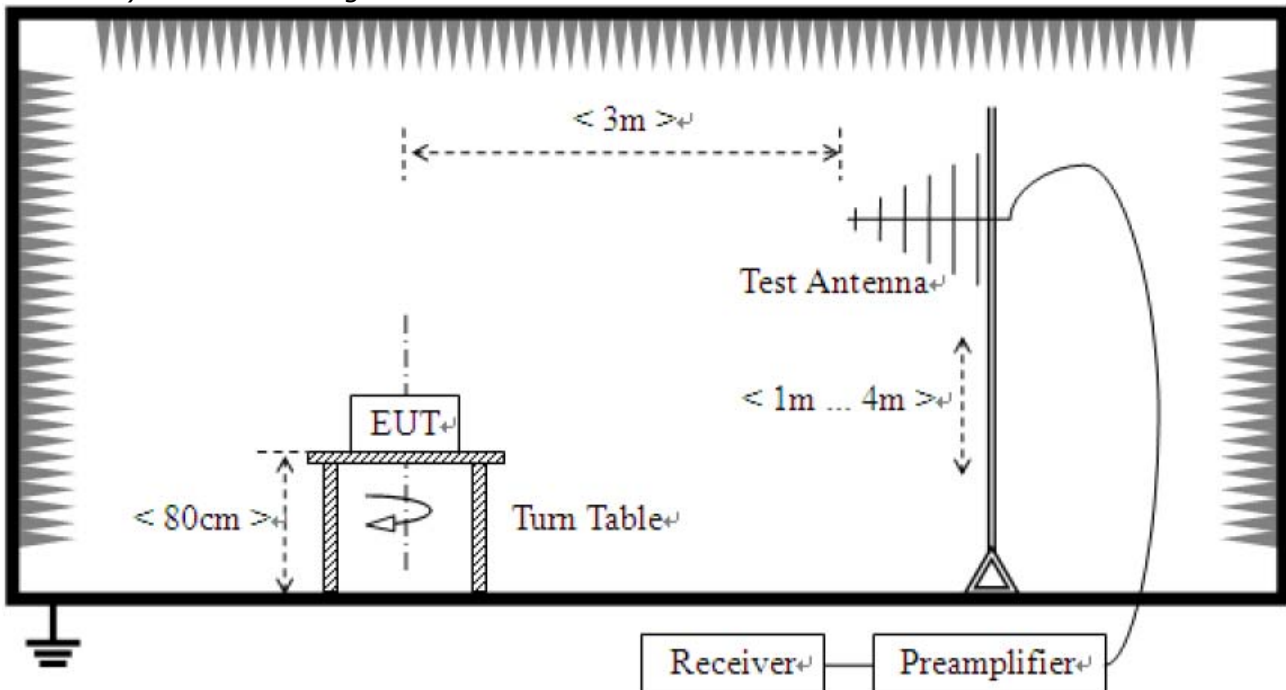
\*\* Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

### Test Setup:

- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz



## Test results

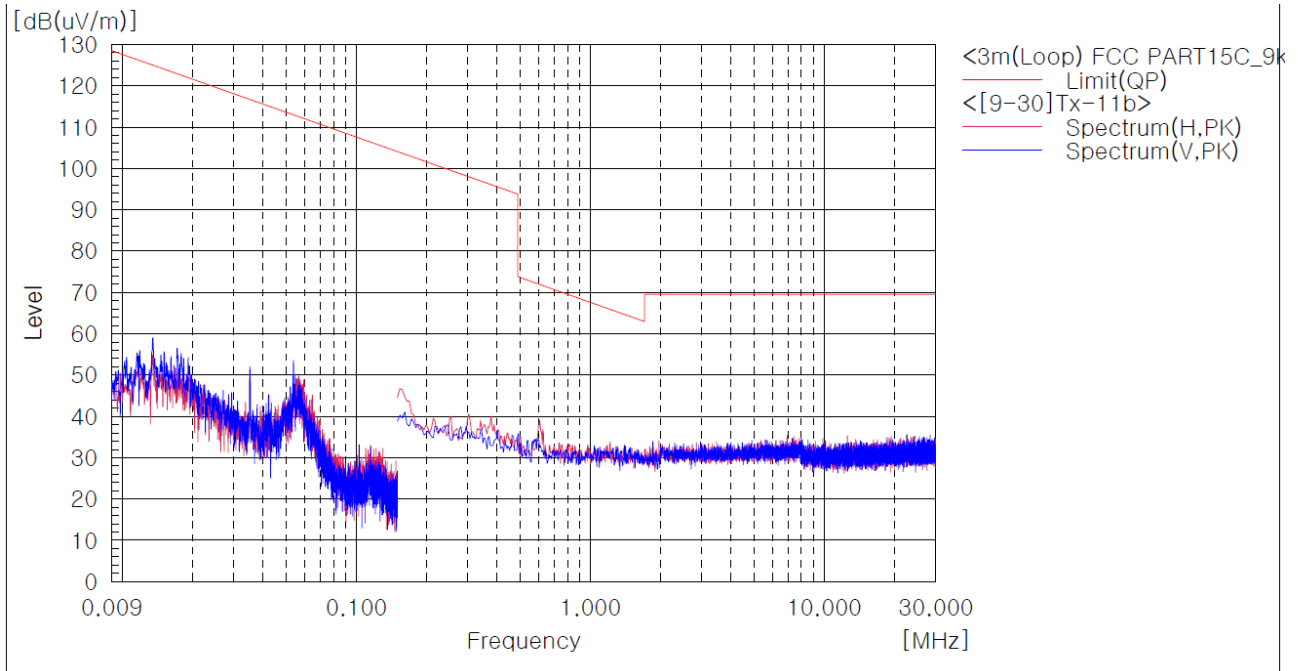
### 1) 9 kHz to 30 MHz

Test mode : Transmitter, 802.11b, High Channel(Worst Case)

The requirements are:

☒ Complies

#### Test Data



Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.			

#### Remark :

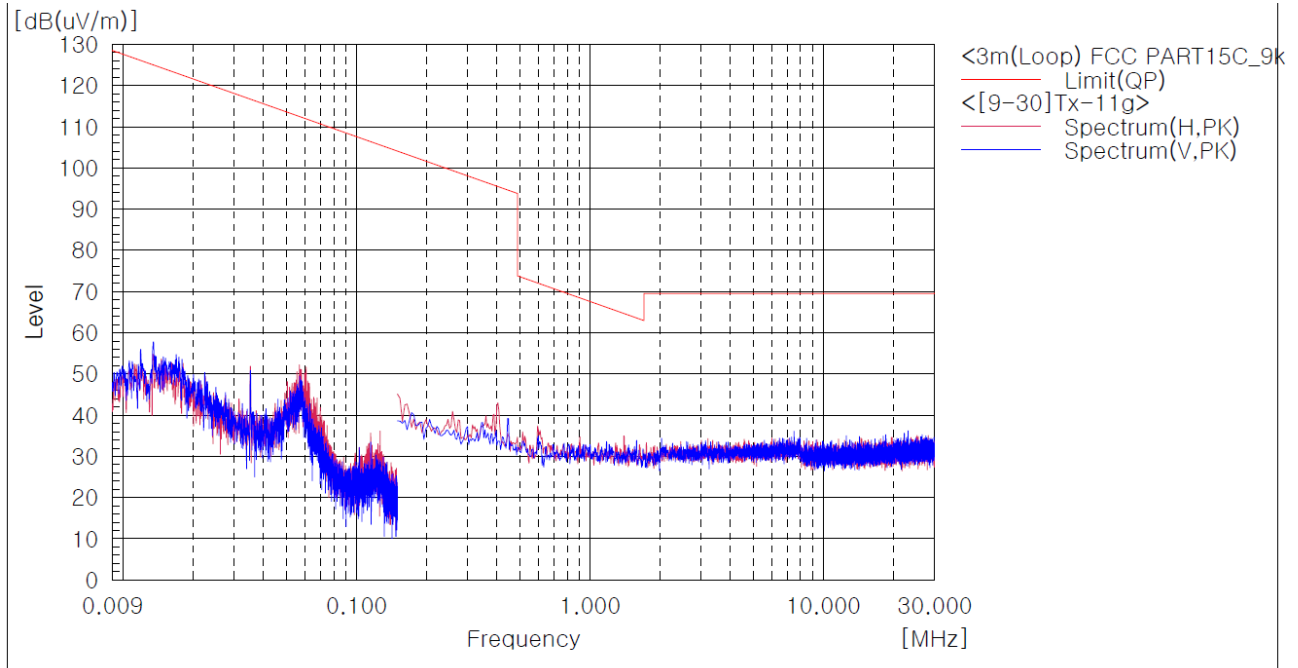
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

**Test mode : Transmitter, 802.11g, High Channel(Worst Case)**

The requirements are:

☒ Complies

**Test Data**



Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.			

**Remark :**

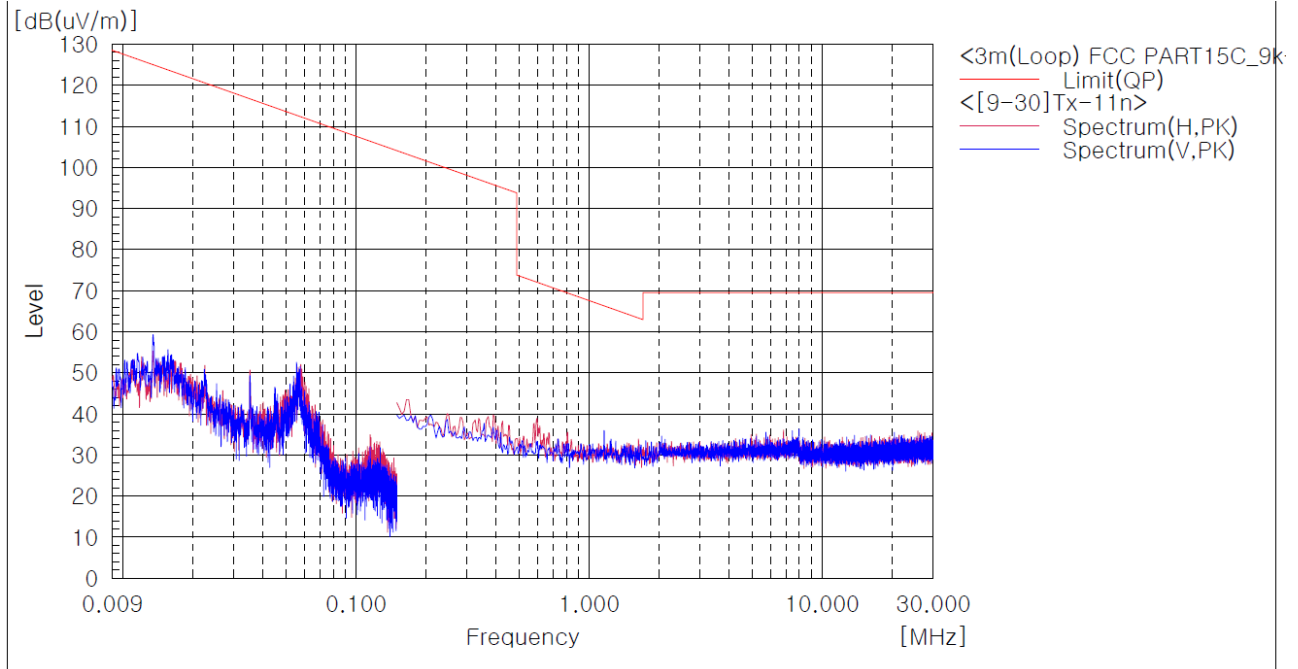
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

**Test mode : Transmitter, 802.11n, High Channel(Worst Case)**

The requirements are:

☒ Complies

**Test Data**



Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.			

**Remark :**

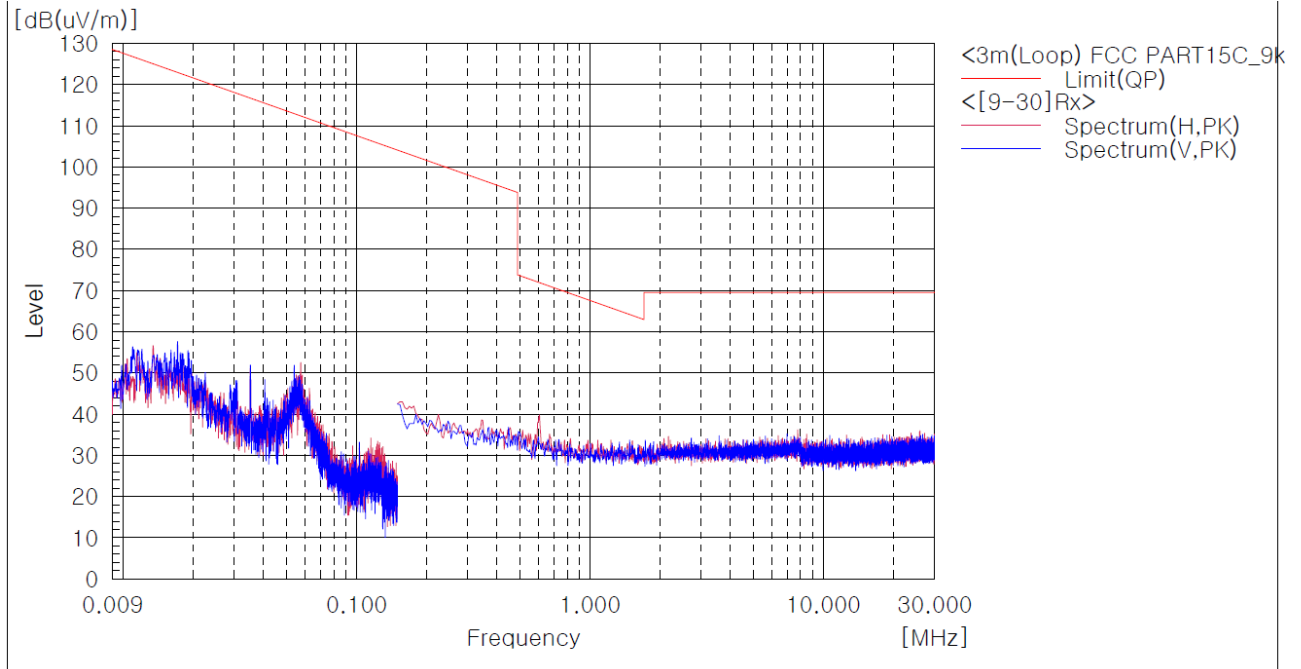
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

**Test mode : Receiver (Worst Case)**

The requirements are:

☒ Complies

**Test Data**



Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.			

**Remark :**

1. The unwanted 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.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.



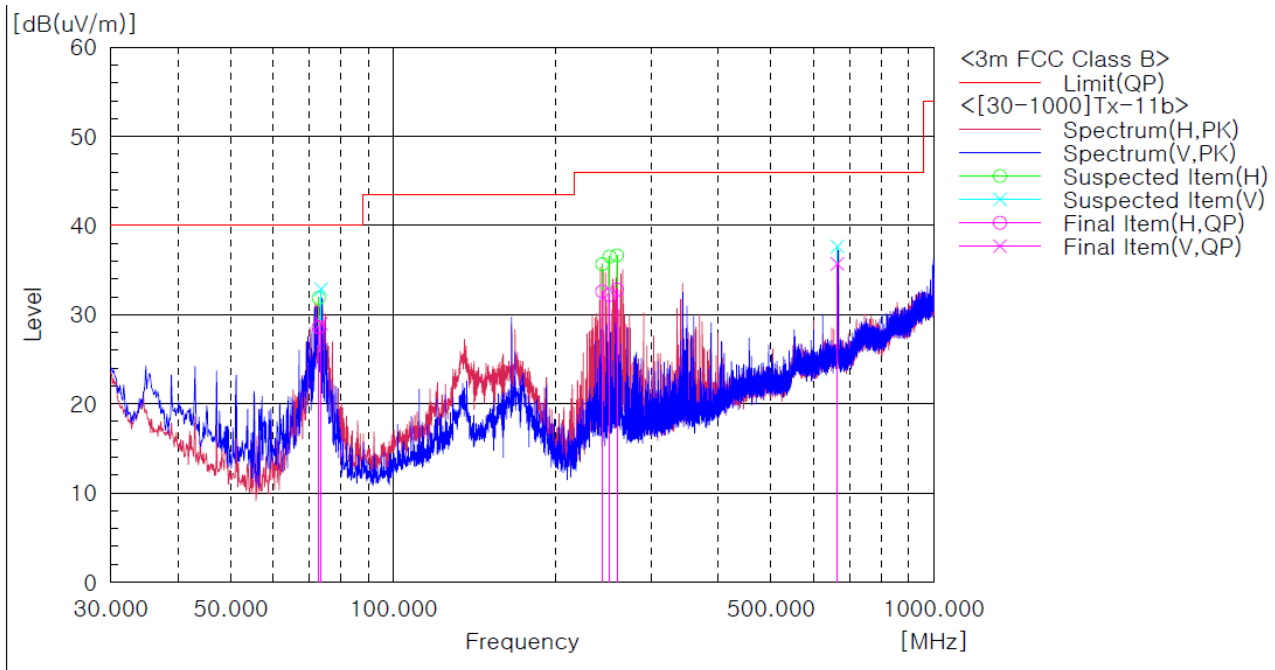
## 2) 30 MHz to 1 GHz

Test mode : Transmitter, 802.11b, High Channel(Worst Case)

The requirements are:

☒ Complies

### Test Data



### Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	72.801	H	46.2	-17.6	28.6	40.0	11.4	308.0	190.0
2	73.529	V	46.6	-17.6	29.0	40.0	11.0	101.0	96.0
3	243.643	H	42.9	-10.3	32.6	46.0	13.4	101.0	337.0
4	251.403	H	41.5	-9.3	32.2	46.0	13.8	101.0	247.0
5	259.526	H	41.0	-8.2	32.8	46.0	13.2	101.0	353.0
6	663.774	V	34.7	1.0	35.7	46.0	10.3	192.0	203.0

### Remark :

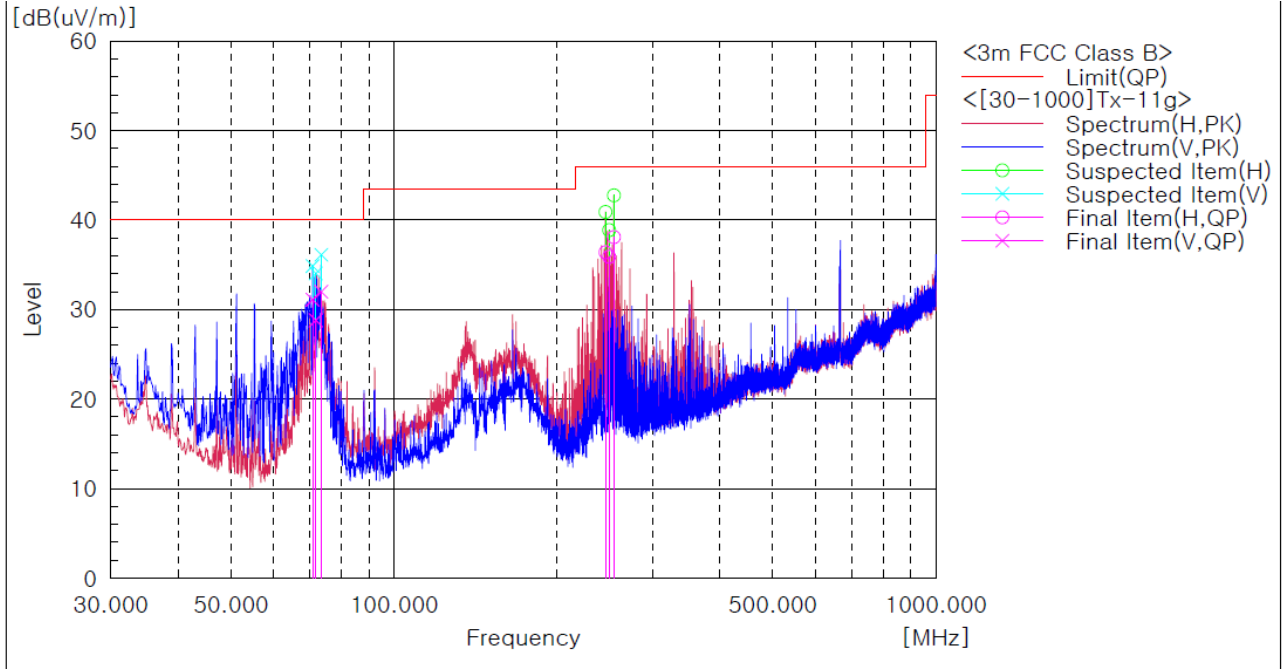
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

**Test mode : Transmitter, 802.11g, High Channel(Worst Case)**

The requirements are:

☒ Complies

**Test Data**



**Final Result**

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	70.740	V	48.9	-17.8	31.1	40.0	8.9	101.0	9.0
2	71.710	V	46.5	-17.7	28.8	40.0	11.2	192.0	101.0
3	73.408	V	49.6	-17.6	32.0	40.0	8.0	192.0	156.0
4	245.704	H	46.4	-10.0	36.4	46.0	9.6	101.0	237.0
5	249.463	H	45.4	-9.5	35.9	46.0	10.1	101.0	247.0
6	254.676	H	47.1	-9.0	38.1	46.0	7.9	101.0	345.0

**Remark :**

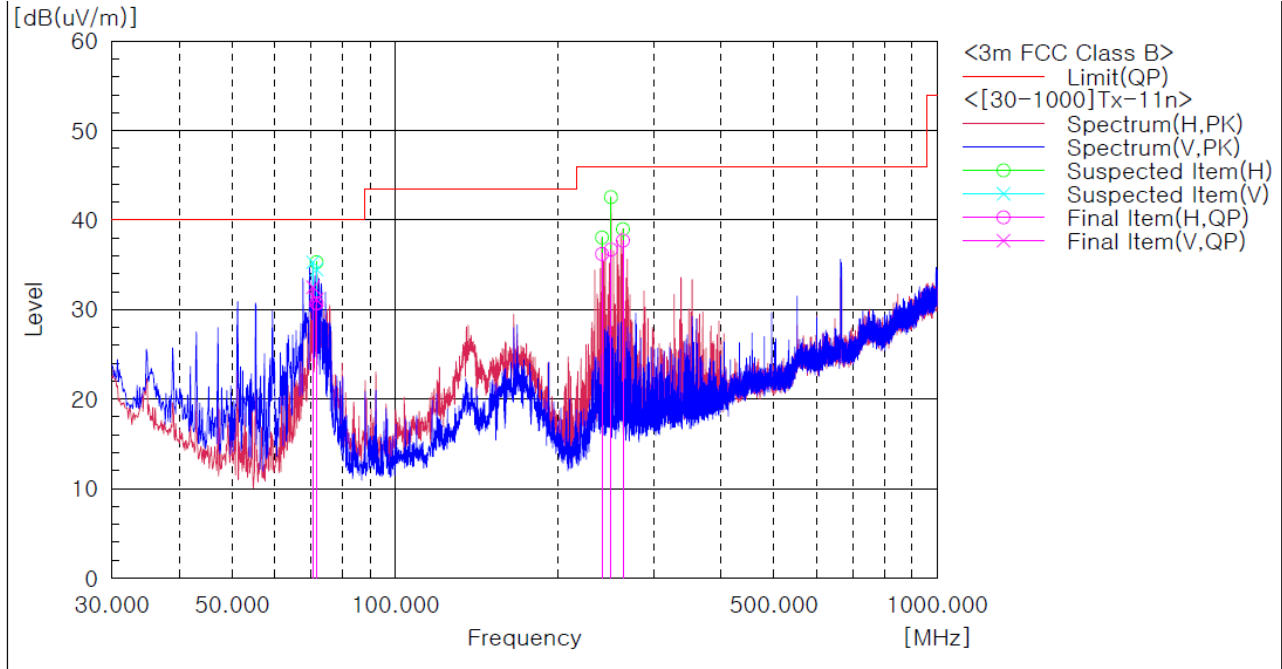
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

**Test mode : Transmitter, 802.11n, High Channel(Worst Case)**

The requirements are:

☒ Complies

**Test Data**



**Final Result**

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	70.498	V	50.3	-17.8	32.5	40.0	7.5	194.0	165.0
2	71.589	H	48.4	-17.7	30.7	40.0	9.3	209.0	228.0
3	71.589	V	48.8	-17.7	31.1	40.0	8.9	194.0	101.0
4	240.854	H	46.9	-10.7	36.2	46.0	9.8	209.0	248.0
5	250.190	H	46.2	-9.5	36.7	46.0	9.3	101.0	357.0
6	263.285	H	46.0	-8.3	37.7	46.0	8.3	101.0	226.0

**Remark :**

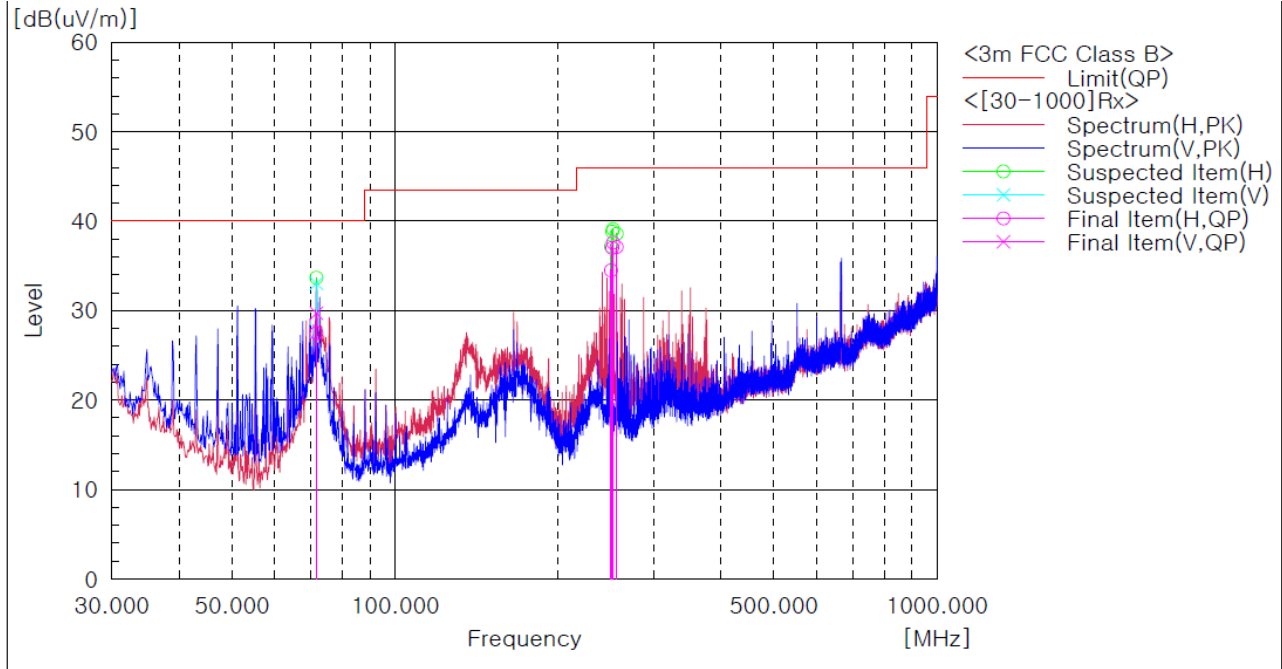
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

### Test mode : Receiver (Worst Case)

The requirements are:

☒ Complies

### Test Data



### Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	71.589	H	45.2	-17.7	27.5	40.0	12.5	205.0	214.0
2	71.589	V	47.4	-17.7	29.7	40.0	10.3	101.0	7.0
3	250.433	H	43.9	-9.4	34.5	46.0	11.5	101.0	210.0
4	251.645	H	46.3	-9.3	37.0	46.0	9.0	101.0	357.0
5	252.494	H	46.8	-9.2	37.6	46.0	8.4	101.0	247.0
6	256.374	H	45.7	-8.6	37.1	46.0	8.9	205.0	228.0

### Remark :

1. The unwanted 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(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2020-04333  
 Page (21) / (21)Pages

## APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2020-10-20	2021-10-20
2	Bilog Antenna	Schaffner	CBL6111C	2551	2020-05-26	2022-05-26
3	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2020-05-20	2022-05-20
4	6dB Attenuator	R&S	DNF	272.4110.50-2	2020-10-23	2021-10-23
5	AMPLIFIER	SONOMA	310	291721	2020-01-22	2021-01-22

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2020-05-29
2	RF Cable	HUBER+SUHNER	SUCOFLEX 104	N/A	2020-05-29
3	RF Cable	HUBER+SUHNER	SUCOFLEX 104	MY27573/4	2020-05-29
4	RF Cable	HUBER+SUHNER	SUCOFLEX 106	N/A	2020-05-29