

# 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-2022-00135  
Page (1) / (73) Pages

## 1. Client

- Name : SEONG JI INDUSTRIAL CO., LTD
- Address : 54-33, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, South Korea
- Date of Receipt : 2021-11-17

## 2. Manufacturer

- Name : SEONG JI INDUSTRIAL CO., LTD
- Address : 54-33, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, South Korea

**3. Use of Report** : For FCC / ISED Certification

**4. Test Sample / Model:** AUDIO TRANSCEIVER / ATM510 and ATM511


**5. Date of Test** : 2021-11-24 to 2022-01-05

**6. Test Standard(method) used** : FCC 47 CFR part 15 subpart E 15.407  
RSS-247 & RSS-Gen

**7. Testing Environment:** Temp.: (24 ± 1) °C, Humidity: (50 ± 1) % 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  Ji-Hye Kim: (Signature)	Technical Manager  Won-Jae, Hwang: (Signature)
-------------	---	---

2022-01-12

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-2022-00135  
Page (2) / (73) Pages

## REPORT REVISION HISTORY

Date	Revision	Page No
2022-01-12	Issued (CTK-2022-00135)	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.*



**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-2022-00135  
Page (3) / (73) Pages

## CONTENTS

1. General Product Description .....	4
1.1 Client Information .....	4
1.2 Product Information.....	4
1.3 Peripheral Devices .....	5
1.4 Model Differences.....	5
2. Facility and Accreditations.....	6
2.1 Test Facility .....	6
2.2 Laboratory Accreditations and Listings.....	6
2.3 Calibration Details of Equipment Used for Measurement.....	6
3. Test Specifications .....	7
3.1 Standards .....	7
3.2 Mode of operation during the test .....	9
3.3 Maximum Measurement Uncertainty .....	10
3.4 Test Software .....	10
4. Technical Characteristic Test.....	11
4.1 6dB Bandwidth .....	11
4.2 99% Bandwidth .....	17
4.3 OUTPUT POWER.....	23
4.4 Power Spectral Density .....	25
4.5 Frequency Stability.....	31
4.6 Unwanted Emissions .....	33
4.7 AC Conducted Emissions .....	68
APPENDIX A – Test Equipment Used For Tests .....	73



**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-2022-00135  
Page (4) / (73) Pages

## 1. General Product Description

### 1.1 Client Information

<b>Company</b>	SEONG JI INDUSTRIAL CO., LTD
<b>Contact Point</b>	54-33, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, South Korea
<b>Contact Person</b>	Name : Lee Sang Young E-mail : sylee@seongji.co.kr Tel : +82-31-239-8194 Fax : +82-31-233-7048

### 1.2 Product Information

<b>FCC ID</b>	2AS8LATM510
<b>Certification Number ISED</b>	25119-ATM510
<b>Product Description</b>	AUDIO TRANSCEIVER
<b>Model name</b>	ATM510
<b>Variant Model name</b>	ATM511
<b>Operating Frequency</b>	UNII 1 : 5 157.35 MHz – 5 247.35 MHz (2 MHz_BW) 5 158.35 MHz – 5 248.35 MHz (4 MHz_BW)  UNII 3 : 5 728.35 MHz – 5 846.35 MHz (2 MHz_BW) 5 729.35 MHz – 5 847.35 MHz (4 MHz_BW)
<b>RF Output Power</b>	UNII 1 5 157.35 MHz – 5 247.35 MHz (2 MHz_BW) : 8.11 dBm (6.47 mW) 5 158.35 MHz – 5 248.35 MHz (4 MHz_BW) : 7.32 dBm (5.40 mW)  UNII 3 5 728.35 MHz – 5 846.35 MHz (2 MHz_BW) : 8.07 dBm (6.41 mW) 5 729.35 MHz – 5 847.35 MHz (4 MHz_BW) : 7.29 dBm (5.36 mW)
<b>Antenna Specification</b>	ANT1, ANT2 type : PCB Antenna ANT1 Gain : 1.2 dBi ANT2 Gain : 1.7 dBi
<b>Type of Modulation</b>	Pi/4 DQPSK
<b>Power Source</b>	ATM510 : DC 5 V ATM511 : DC 3.3 V
<b>Hardware Rev</b>	REV1.0
<b>Software Rev</b>	<2 MHz_BW> TX : 2.0.15 RX : 2.0.1  <4 MHz_BW> TX : 3.0.15 RX : 3.0.1



**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-2022-00135  
Page (5) / (73) Pages

### 1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	15-bs563TU	CND7253QPR
AC/DC Adapter	HP	HSTNN-LA40	-

### 1.4 Model Differences

The ATM511 model only changes the power source circuit from the Basic model.

The transmitter schematic and circuits including the antenna are electrically identical

ATM510 : DC 5.0 V

ATM511 : DC 3.3 V



**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-2022-00135  
Page (6) / (73) Pages

## 2. Facility and Accreditations

### 2.1 Test Facility

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

The conducted measurement facility is located at 5, Dongbu-ro 221beon-gil, 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.



**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-2022-00135  
 Page (7) / (73) Pages

### 3. Test Specifications

#### 3.1 Standards

FCC Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
15.407(e)	6 dB Bandwidth	C	Conducted
15.407(a)	99% Bandwidth	C	
15.407(a)(1)	Conducted Output Power	C	
15.407(a)(1)	Power Spectral Density	C	
15.407(g)	Frequency Stability	C	
15.407 (b)	Undesirable emission	C	Radiated
15.205, 15.407 (b)(5),(6)	Radiated Spurious Emission	C	
15.207	AC Conducted Emissions	C	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.789033.			



**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-2022-00135  
 Page (8) / (73) Pages

ISED Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
<b>RSS-Gen 6.7</b>	6 dB Bandwidth	C	Conducted
<b>RSS-Gen 6.7</b>	99% Bandwidth	C	
<b>RSS-247</b> <b>6.2.1.1,</b> <b>6.2.4.1</b>	Conducted Output Power	C	
<b>RSS-247</b> <b>6.2.1.1,</b> <b>6.2.4.1</b>	Power Spectral Density	C	
<b>RSS-Gen</b> <b>6.11</b>	Frequency Stability	C	
<b>RSS-247</b> <b>6.2.1.2,</b> <b>6.2.4.2</b>	Undesirable emission	C	Radiated
<b>RSS-Gen</b> <b>6.13</b>	Radiated Spurious Emission	C	
<b>RSS-Gen 7.3</b>	Receiver Spurious Emissions	C	
<b>RSS-Gen 8.8</b>	AC Conducted Emissions	C	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, RSS-247 Issue 2, RSS-Gen Issue 5			
<i>Note 4:</i> The tests were performed according to the method of measurements prescribed in KDB No.789033.			





**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-2022-00135  
Page (9) / (73) Pages

### 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.  
The engineering test program was provided and enabled to make EUT continuous transmit.

#### Test Frequency

- Digital Modulation\_2MHz\_BW

	Lowest channel	Middle channel	Highest channel
<b>UNII 1</b>	5 157.35 MHz	5 201.35 MHz	5 247.35 MHz
<b>UNII 3</b>	5 728.35 MHz	5 786.35 MHz	5 846.35 MHz

- Digital Modulation\_4MHz\_BW

	Lowest channel	Middle channel	Highest channel
<b>UNII 1</b>	5 158.35 MHz	5 202.35 MHz	5 248.35 MHz
<b>UNII 3</b>	5 729.35 MHz	5 787.35 MHz	5 847.35 MHz

Test mode	Duty Cycle
2MHz_BW	100%
4MHz_BW	100%



**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-2022-00135  
Page (10) / (73) Pages

### 3.3 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
Conducted RF Output Power	1.5 dB (C.L.: Approx. 95 %, $k = 2$ )
Power Spectral Density	1.5 dB (C.L.: Approx. 95 %, $k = 2$ )
Occupied Bandwidth	0.1 MHz (C.L.: Approx. 95 %, $k = 2$ )
Unwanted Emission(conducted)	3.0 dB (C.L.: Approx. 95 %, $k = 2$ )
Radiated Emissions ( $f \leq 1$ GHz)	4.66 dB (C.L.: Approx. 95 %, $k = 2$ )
Radiated Emissions ( $f > 1$ GHz)	4.76 dB (C.L.: Approx. 95 %, $k = 2$ )
Line Conducted Emission	1.96 dB (C.L.: Approx. 95 %, $k = 2$ )

### 3.4 Test Software

Conducted Test	Ics Pro Ver. 6.0.3
Radiated Test	TOYO EMI software EP5RE Ver. 6.0.1.0
Line Conducted Test	ESCI7, ESCI3 : EMC32 Ver. 8.50.0 ESR7 : EMC32 Ver. 8.53.0



**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-2022-00135  
Page (11) / (73) Pages

## 4. Technical Characteristic Test

### 4.1 6dB Bandwidth

#### Test Procedures

KDB 789033 – Section C.2  
ANSI C63.10-2013 - Section 6.9.2  
RSS-GES Issue 5 – Section 6.7

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.

#### Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- b) VBW  $\geq 3 \times$  RBW
- c) Detector = peak
- d) Trace mode = Max hold
- e) Sweep = auto couple
- f) Allow trace to fully 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.

#### Minimum Standard:

---

6 dB Bandwidth > 500 kHz

---



**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-2022-00135  
 Page (12) / (73) Pages

**Test Data:**

Mode	6 dB Bandwidth (MHz)	
	Digital Modulation_2MHz_BW	
ANT	ANT1	ANT2
Frequency		
5 157.35 MHz	1.585	1.629
5 201.35 MHz	1.755	1.558
5 247.35 MHz	1.666	1.639
5 728.35 MHz	1.616	1.578
5 786.35 MHz	1.573	1.544
5 846.35 MHz	1.677	1.481
Measurement uncertainty	± 0.1 MHz	

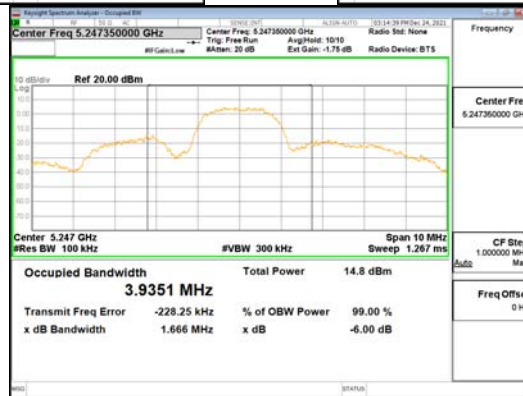
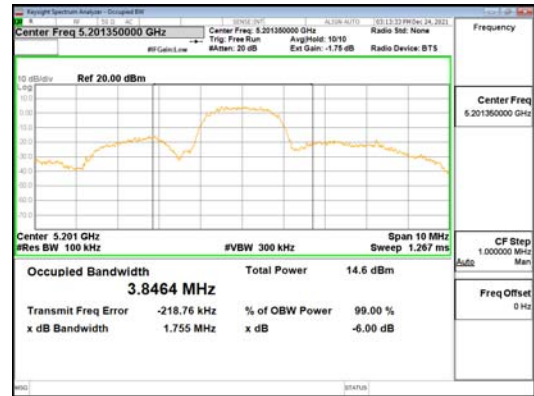
Mode	6 dB Bandwidth (MHz)	
	Digital Modulation_4MHz_BW	
ANT	ANT1	ANT2
Frequency		
5 158.35 MHz	3.642	3.532
5 202.35 MHz	3.579	3.541
5 248.35 MHz	3.371	3.546
5 729.35 MHz	3.560	3.588
5 787.35 MHz	3.581	3.501
5 847.35 MHz	3.575	3.487
Measurement uncertainty	± 0.1 MHz	

See next pages for actual measured spectrum plots.



**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-2022-00135  
 Page (13) / (73) Pages



**ANT1\_Digital Modulation\_2MHz\_BW-UNII 1**

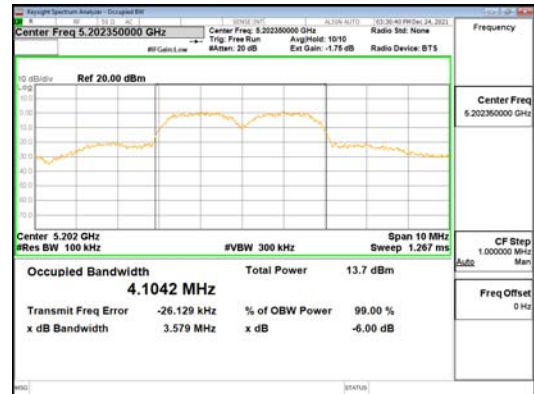
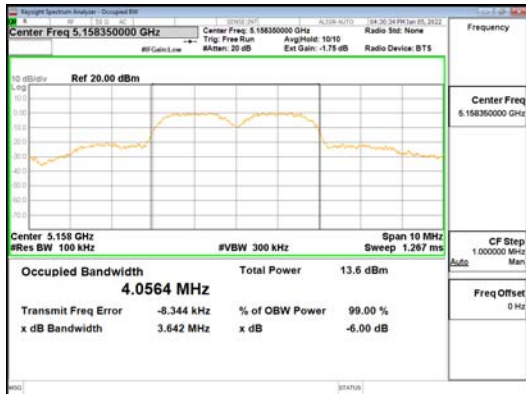


**ANT1\_Digital Modulation\_2MHz\_BW-UNII 3**

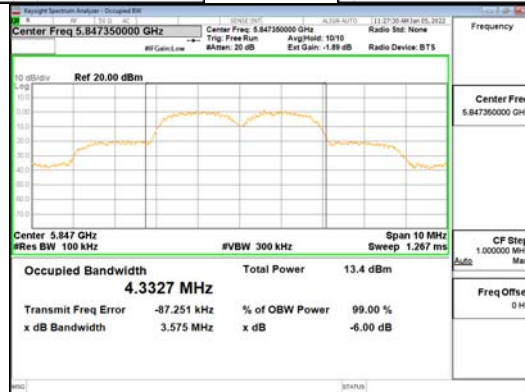
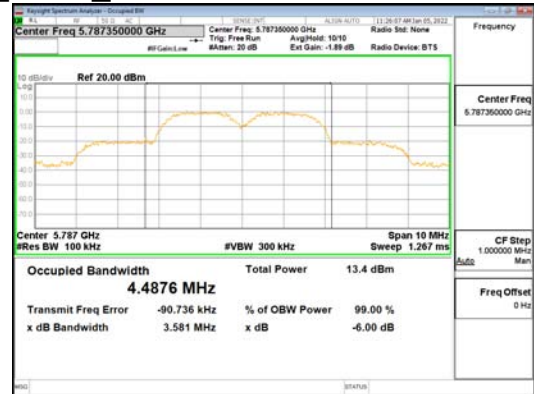
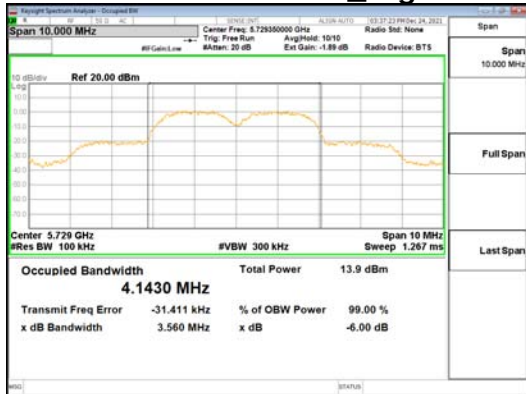


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (14) / (73) Pages



**ANT1\_Digital Modulation\_4MHz\_BW-UNII 1**

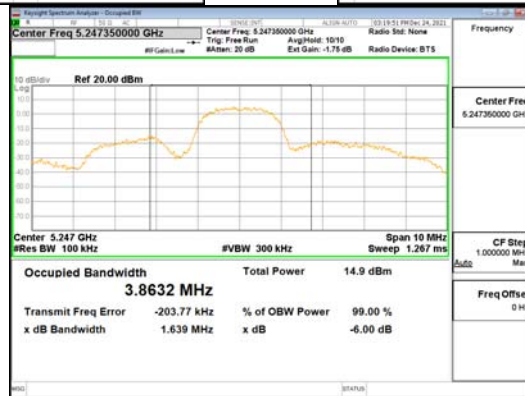
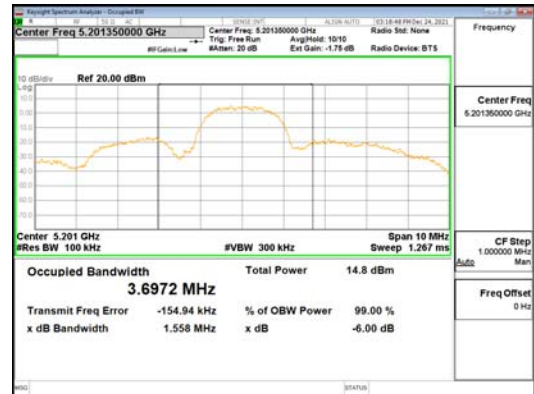
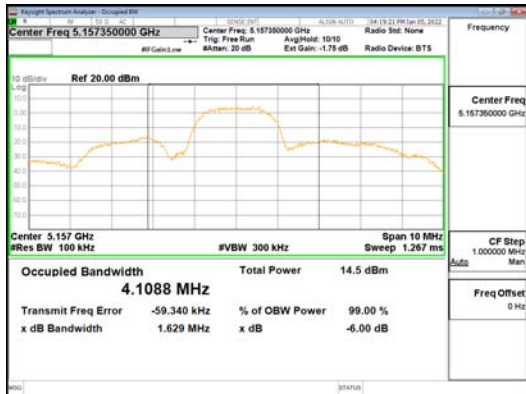


**ANT1\_Digital Modulation\_4MHz\_BW-UNII 3**

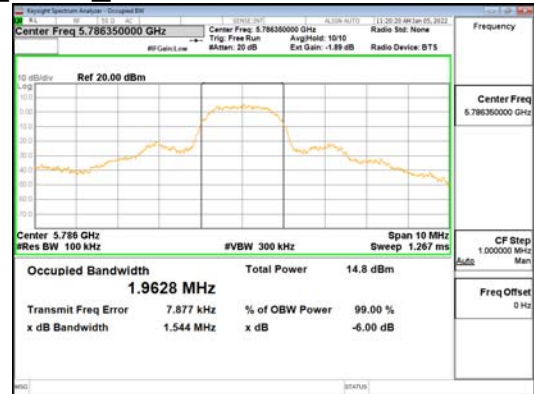


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (15) / (73) Pages



**ANT2\_Digital Modulation\_2MHz\_BW-UNII 1**

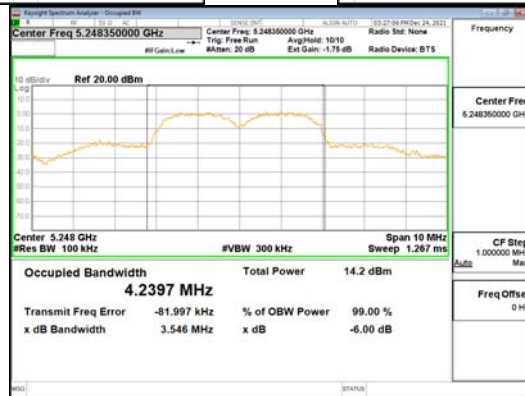
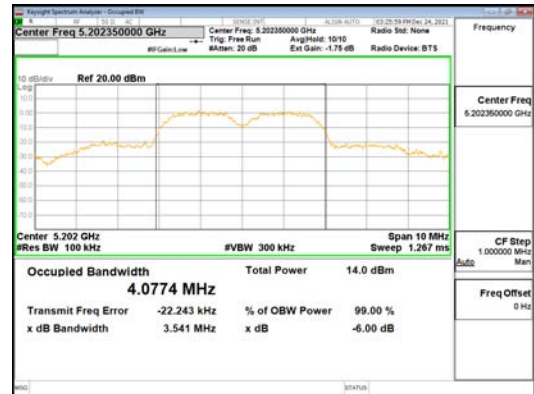
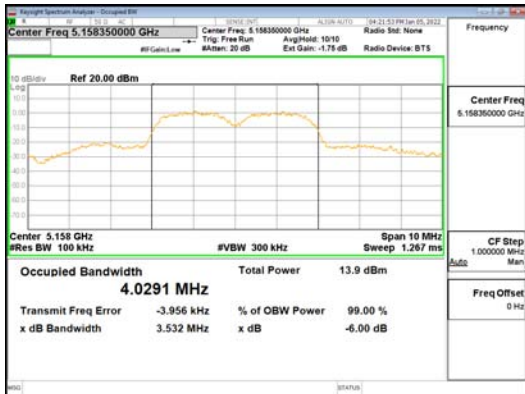


**ANT2\_Digital Modulation\_2MHz\_BW-UNII 3**

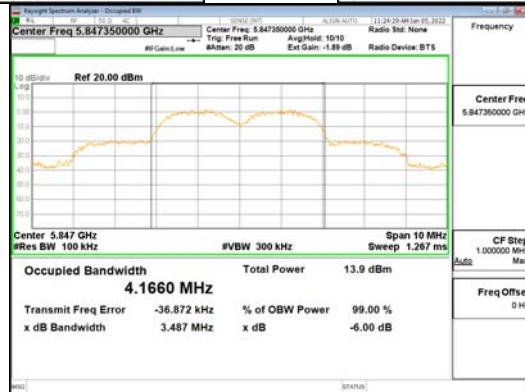
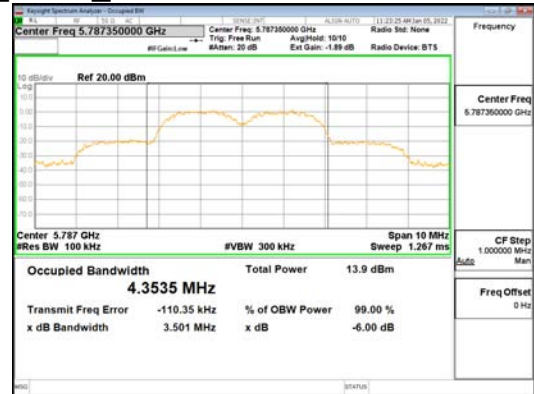
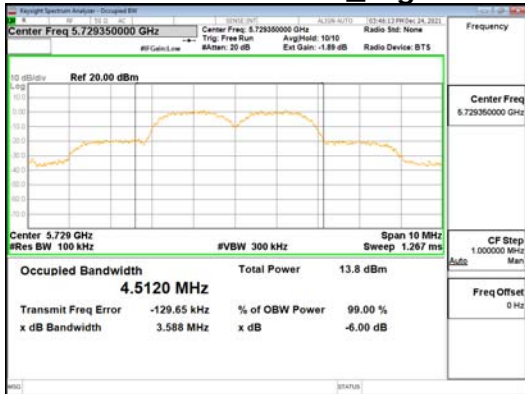


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (16) / (73) Pages



**ANT2\_Digital Modulation\_4MHz\_BW-UNII 1**



**ANT2\_Digital Modulation\_4MHz\_BW-UNII 3**





**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-2022-00135  
Page (17) / (73) Pages

## 4.2 99% Bandwidth

### Test Procedures

KDB 789033 – Section C.1  
ANSI C63.10-2013 - Section 6.9.3  
RSS-GEN Issue 5 – Section 6.7

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

### Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = approximately 1 % of the emission bandwidth
- b) VBW  $\geq$  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%.

### **Minimum Standard:**

---

NA

---

### **Test Data:**



**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-2022-00135  
 Page (18) / (73) Pages

Mode	99% Bandwidth (MHz)	
	Digital Modulation_2MHz_BW	
ANT	ANT1	ANT2
Frequency		
5 157.35 MHz	3.675	4.109
5 201.35 MHz	3.846	3.697
5 247.35 MHz	3.935	3.863
5 728.35 MHz	1.996	2.006
5 786.35 MHz	2.011	1.963
5 846.35 MHz	1.960	1.958
Measurement uncertainty	± 0.1 MHz	

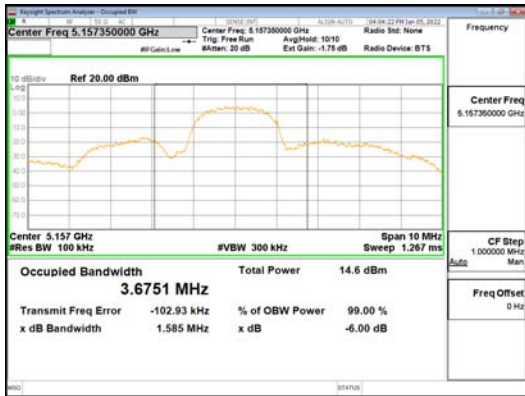
Mode	99% Bandwidth (MHz)	
	Digital Modulation_4MHz_BW	
ANT	ANT1	ANT2
Frequency		
5 158.35 MHz	4.056	4.029
5 202.35 MHz	4.104	4.077
5 248.35 MHz	4.294	4.240
5 729.35 MHz	4.143	4.512
5 787.35 MHz	4.488	4.354
5 847.35 MHz	4.333	4.166
Measurement uncertainty	± 0.1 MHz	

See next pages for actual measured spectrum plots.



**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-2022-00135  
 Page (19) / (73) Pages



**ANT1\_Digital Modulation\_2MHz\_BW-UNII 1**

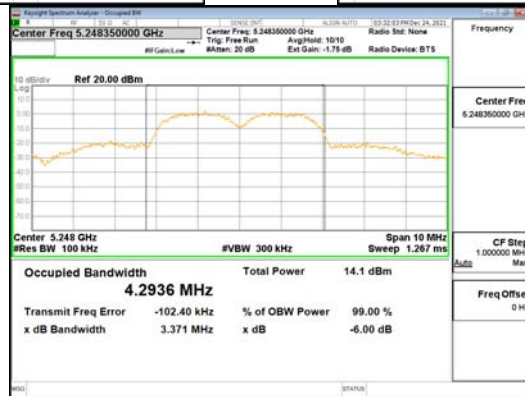
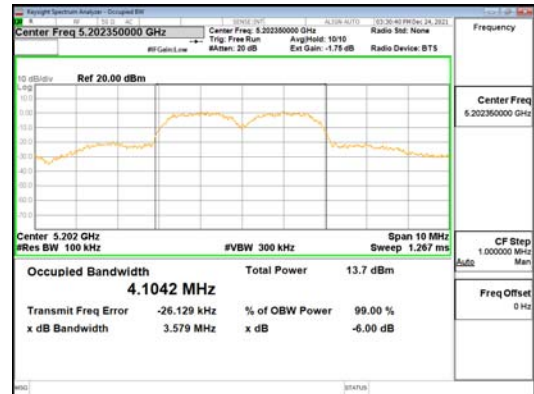
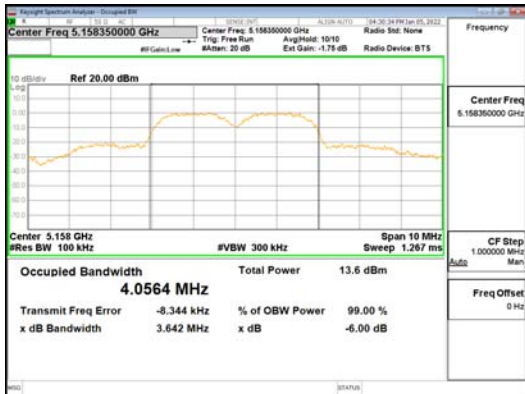


**ANT1\_Digital Modulation\_2MHz\_BW-UNII 3**

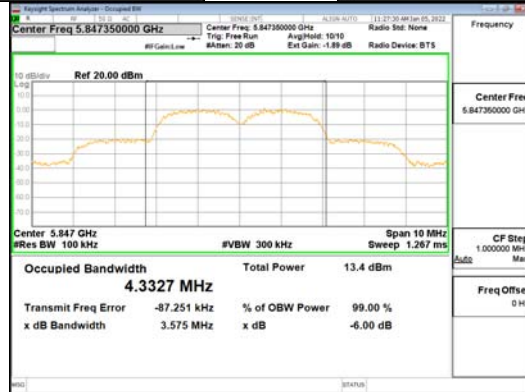
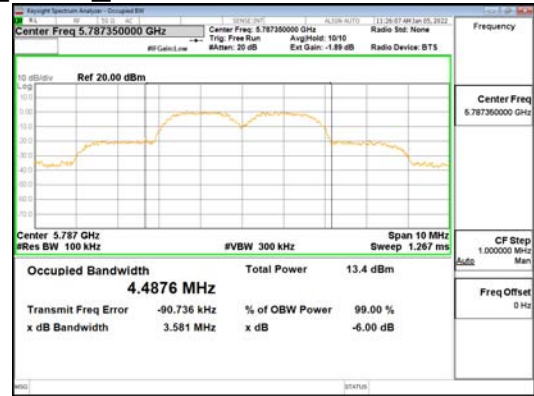
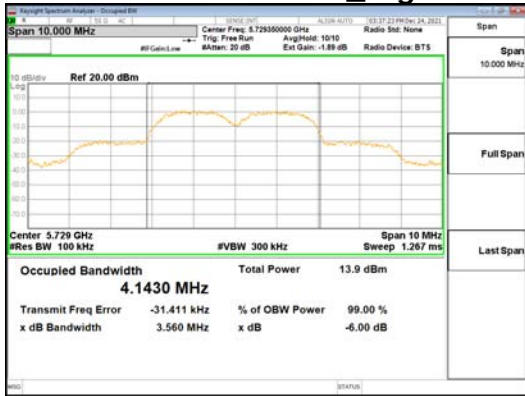


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (20) / (73) Pages



**ANT1\_Digital Modulation\_4MHz\_BW-UNII 1**

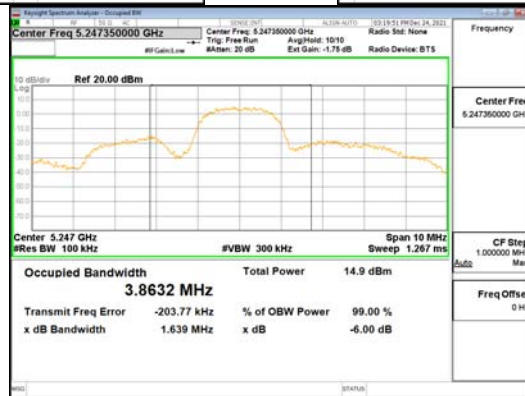
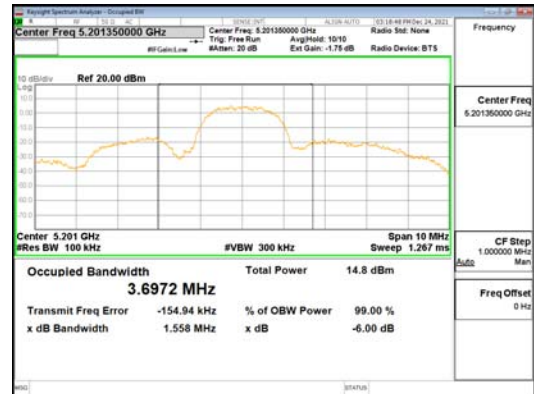
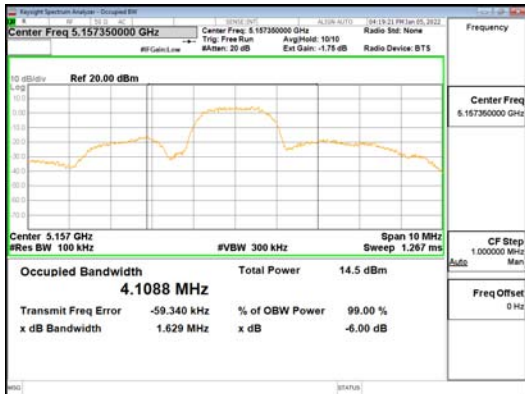


**ANT1\_Digital Modulation\_4MHz\_BW-UNII 3**



**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-2022-00135  
 Page (21) / (73) Pages



**ANT2\_Digital Modulation\_2MHz\_BW-UNII 1**

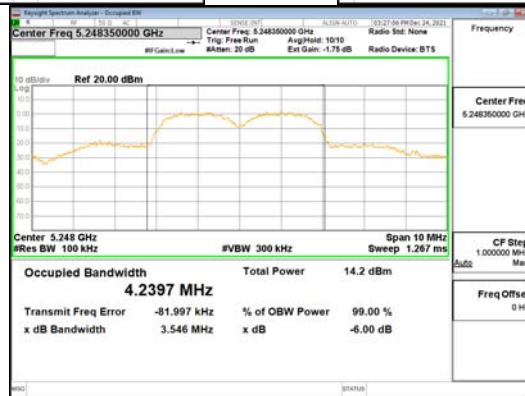
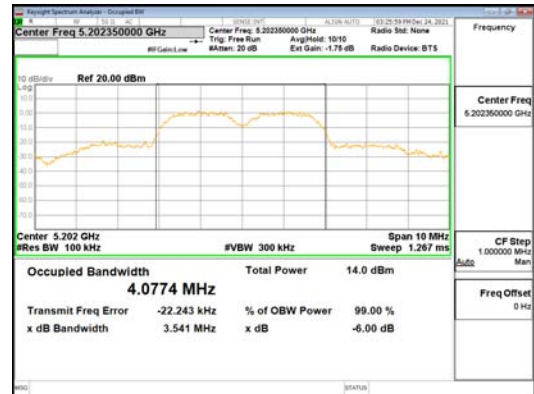
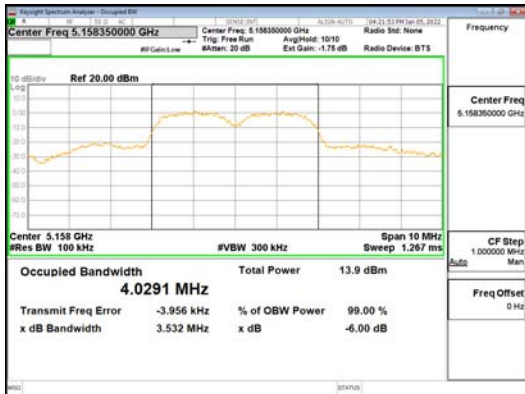


**ANT2\_Digital Modulation\_2MHz\_BW-UNII 3**

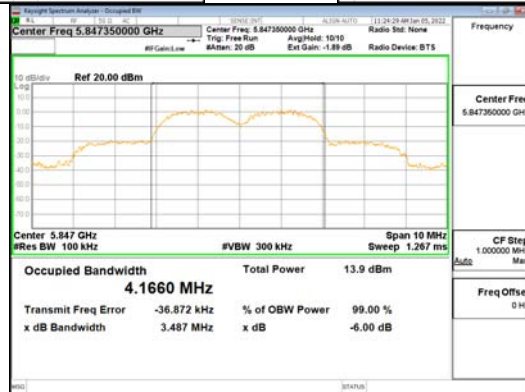
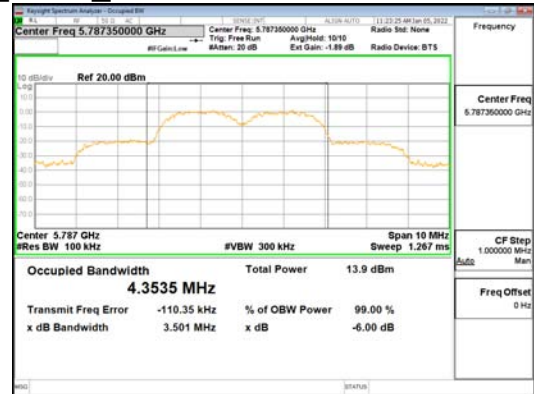
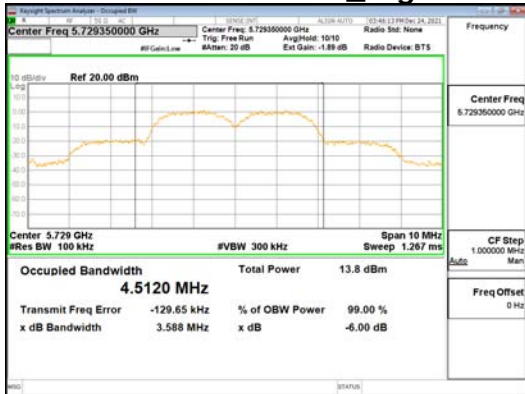


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (22) / (73) Pages



**ANT2\_Digital Modulation\_4MHz\_BW-UNII 1**



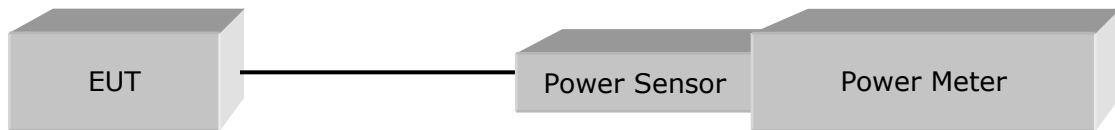
**ANT2\_Digital Modulation\_4MHz\_BW-UNII 3**

## 4.3 OUTPUT POWER

### Test Procedures

KDB 789033 – Section E.3.a (Method PM, Measurement using an RF average power meter)  
RSS-GEN Issue 5 – Section 6.12

The transmitter output is connected to a average power meter.



### Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) Measure the average power of the transmitter.
- b) Duty cycle factor =  $10\log(1/x)$

### **Limit**

Band	Mode	Limit (dBm)
UNII 1	Digital Modulation	24.00
UNII 3		30.00



**Test Data**

**<ANT1>**

Test Mode	Frequency (MHz)	Measured Output Power (dBm)	Limit (dBm)	Margin (dB)
Digital Modulation_2MHz_BW	5 157.35	6.87	24.00	17.13
	5 201.35	7.29	24.00	16.71
	5 247.35	7.56	24.00	16.44
	5 728.35	7.67	30.00	22.33
	5 786.35	7.50	30.00	22.50
	5 846.35	7.29	30.00	22.71
Digital Modulation_4MHz_BW	5 158.35	6.00	24.00	18.00
	5 202.35	6.34	24.00	17.66
	5 248.35	6.73	24.00	17.27
	5 729.35	6.77	30.00	23.23
	5 787.35	6.50	30.00	23.50
	5 847.35	6.26	30.00	23.74
Measurement uncertainty	± 1.5 dB			

**<ANT2>**

Test Mode	Frequency (MHz)	Measured Output Power (dBm)	Limit (dBm)	Margin (dB)
Digital Modulation_2MHz_BW	5 157.35	7.67	24.00	16.33
	5 201.35	7.93	24.00	16.07
	5 247.35	8.11	24.00	15.89
	5 728.35	8.07	30.00	21.93
	5 786.35	7.93	30.00	22.07
	5 846.35	7.76	30.00	22.24
Digital Modulation_4MHz_BW	5 158.35	6.96	24.00	17.04
	5 202.35	7.11	24.00	16.89
	5 248.35	7.32	24.00	16.68
	5 729.35	7.29	30.00	22.71
	5 787.35	6.90	30.00	23.10
	5 847.35	6.84	30.00	23.16
Measurement uncertainty	± 1.5 dB			





## 4.4 Power Spectral Density

### Test Procedures

KDB 789033 – Section F (Method SA-1, Maximum Power Spectral Density)  
RSS-247 Issue 2 – Section 5.2(b)

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

### Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 1 MHz, 500 KHz (UNII 3)
- b) VBW = 3 MHz, 1.5 MHz (UNII 3)
- c) Sweep time = auto
- d) Detector = power averaging (rms)
- e) Trace mode = Average at least 100

### Limit

Band	Mode	Limit (dBm)
UNII 1	Digital Modulation	11.00
UNII 3		30.00



**Test Data**

**<ANT1>**

Test Mode	Frequency (MHz)	Measured Power Density (dBm)	Limit (dBm)	Margin (dB)
Digital Modulation_2MHz_BW	5 157.35	5.269	11.000	5.731
	5 201.35	5.516	11.000	5.484
	5 247.35	5.977	11.000	5.023
	5 728.35	3.383	30.000	26.617
	5 786.35	3.685	30.000	26.315
	5 846.35	3.408	30.000	26.592
Digital Modulation_4MHz_BW	5 158.35	1.532	11.000	9.468
	5 202.35	1.781	11.000	9.219
	5 248.35	2.235	11.000	8.765
	5 729.35	-0.117	30.000	30.117
	5 787.35	-0.692	30.000	30.692
	5 847.35	-0.824	30.000	30.824
Measurement uncertainty	± 1.5 dB			

**<ANT2>**

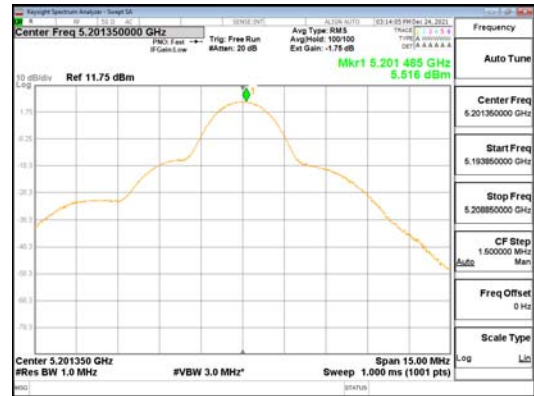
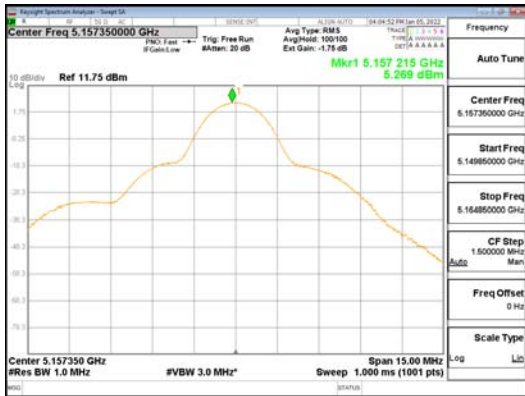
Test Mode	Frequency (MHz)	Measured Power Density (dBm)	Limit (dBm)	Margin (dB)
Digital Modulation_2MHz_BW	5 157.35	5.262	11.000	5.738
	5 201.35	5.646	11.000	5.354
	5 247.35	6.034	11.000	4.966
	5 728.35	3.514	30.000	26.486
	5 786.35	3.452	30.000	26.548
	5 846.35	3.564	30.000	26.436
Digital Modulation_4MHz_BW	5 158.35	1.669	11.000	9.331
	5 202.35	2.010	11.000	8.990
	5 248.35	2.381	11.000	8.619
	5 729.35	-0.101	30.000	30.101
	5 787.35	-0.146	30.000	30.146
	5 847.35	-0.127	30.000	30.127
Measurement uncertainty	± 1.5 dB			

See next pages for actual measured spectrum plots.

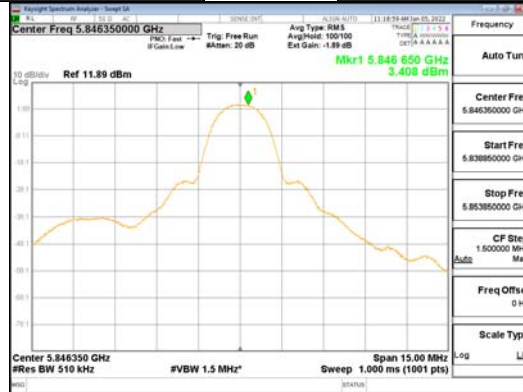


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (27) / (73) Pages



**ANT1\_Digital Modulation\_2MHz\_BW-UNII 1**

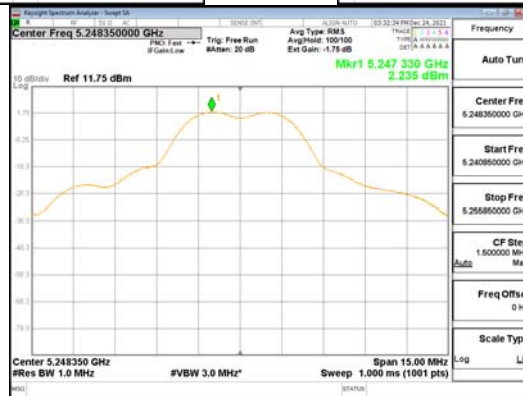


**ANT1\_Digital Modulation\_2MHz\_BW-UNII 3**



**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-2022-00135  
 Page (28) / (73) Pages



**ANT1\_Digital Modulation\_4MHz\_BW-UNII 1**

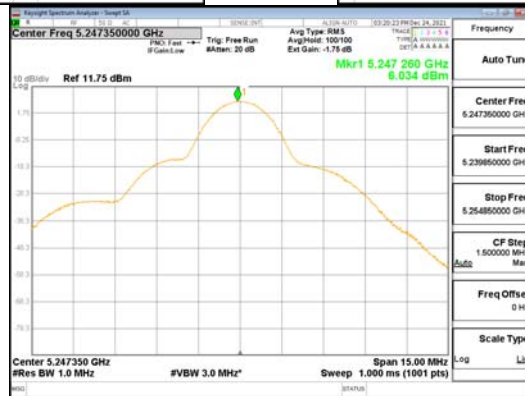
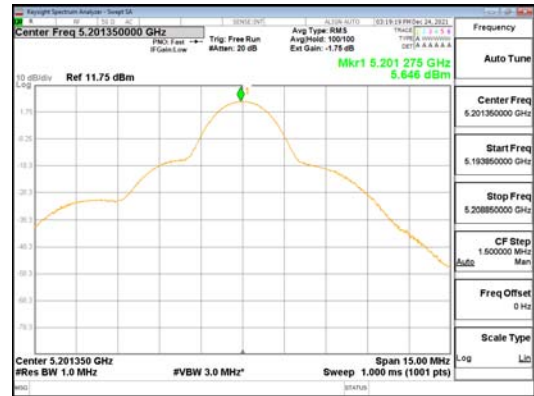
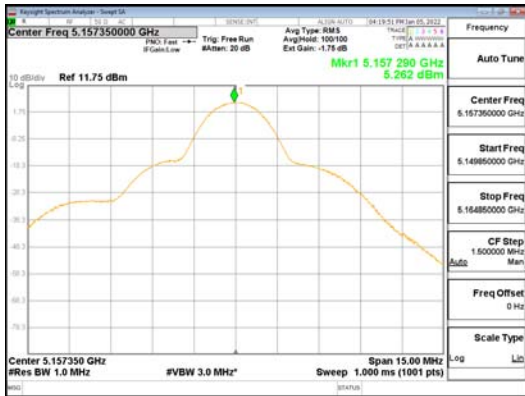


**ANT1\_Digital Modulation\_4MHz\_BW-UNII 3**

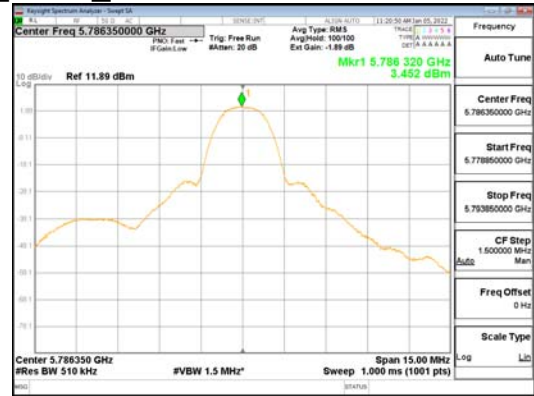


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (29) / (73) Pages



**ANT2\_Digital Modulation\_2MHz\_BW-UNII 1**

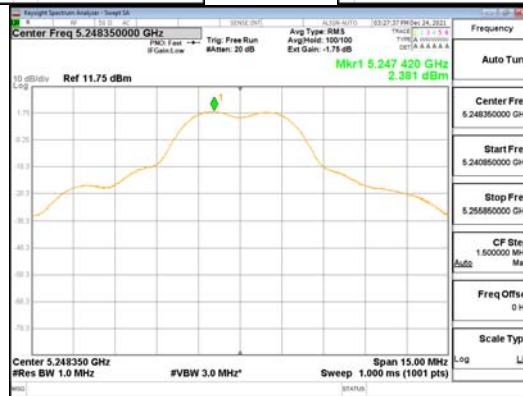
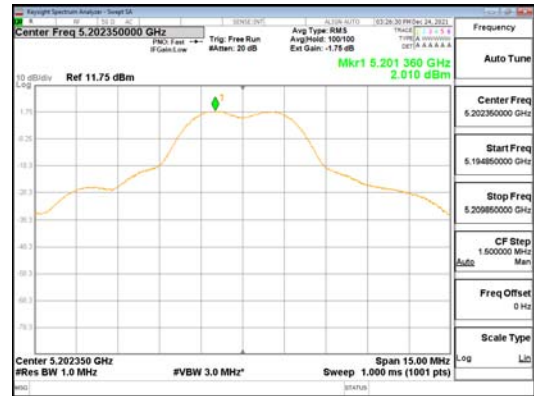


**ANT2\_Digital Modulation\_2MHz\_BW-UNII 3**



**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-2022-00135  
 Page (30) / (73) Pages



**ANT2\_Digital Modulation\_4MHz\_BW-UNII 1**



**ANT2\_Digital Modulation\_4MHz\_BW-UNII 3**



## 4.5 Frequency Stability

### Test Procedures

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between 0 °C to +70 °C (Declaration by the Manufacturer) and 85 to 115 percent of the nominal voltage. The temperature was incremented by 10 °C intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

### Test Data

<ATM510>

Measured Frequency Error (kHz)								
Test Frequency : 5 157.35 MHz, 2MHz_BW (UNII 1)								
Temperature (°C)	0	10	20	30	40	50	60	70
V <sub>nom</sub>	-173.76	-111.88	-77.093	79.45	-109.19	-93.67	-26.62	-0.57
V <sub>min</sub>	-132.91							
V <sub>max</sub>	-162.85							

V<sub>nom</sub> : DC 5 V, V<sub>min</sub> : DC 4.25 V, V<sub>nom</sub> : DC 5.75 V

Measured Frequency Error (kHz)								
Test Frequency : 5 728.35 MHz, 2MHz_BW (UNII 3)								
Temperature (°C)	0	10	20	30	40	50	60	70
V <sub>nom</sub>	15.96	21.39	13.30	4.80	-4.38	-11.47	-12.11	3.44
V <sub>min</sub>	24.18							
V <sub>max</sub>	15.23							

V<sub>nom</sub> : DC 5 V, V<sub>min</sub> : DC 4.25 V, V<sub>nom</sub> : DC 5.75 V



**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-2022-00135  
Page (32) / (73) Pages

<ATM511>

Measured Frequency Error (kHz)	
Test Frequency : 5 157.35 MHz, 2MHz_BW (UNII 1)	
V <sub>min</sub>	-189.32
V <sub>max</sub>	-149.57

V<sub>nom</sub> : DC 3.3 V, V<sub>min</sub> : DC 2.805 V, V<sub>nom</sub> : DC 3.795 V

Measured Frequency Error (kHz)	
Test Frequency : 5 728.35 MHz, 2MHz_BW (UNII 3)	
V <sub>min</sub>	5.24
V <sub>max</sub>	3.95

V<sub>nom</sub> : DC 3.3 V, V<sub>min</sub> : DC 2.805 V, V<sub>nom</sub> : DC 3.795 V

Note :

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature range as tested.





## 4.6 Unwanted Emissions

### Test Location

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

### Test Procedures

KDB 789033 - Section G

- 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

- Peak

Frequency Range = 1 GHz ~ 40 GHz

- a) RBW = 1 MHz  
b) VBW  $\geq 3 \times$  RBW  
c) Detector = Peak  
d) Sweep time = auto  
e) Trace mode = max hold

- Average (duty cycle  $\geq 98\%$ )

Frequency Range = 1 GHz ~ 40 GHz

- a) RBW = 1 MHz  
b) VBW  $\geq 3 \times$  RBW  
c) Detector = RMS  
d) Sweep time = auto  
e) Averaging type = power (i.e., RMS)  
f) Trace mode = average (at least 100 traces)



**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-2022-00135  
 Page (34) / (73) Pages

- Average (duty cycle < 98%)

Frequency Range = 1 GHz ~ 40 GHz

a) RBW = 1 MHz

b) VBW ≥ 3 x RBW

c) Detector = RMS

d) Sweep time = auto

e) Averaging type = power (i.e., RMS)

f) Trace mode = average (at least 100 traces)

If power averaging (RMS) mode, then the applicable correction factor is  $10 \log(1/x)$ , where x is the duty cycle.

**Limit**

**- 15.209(a)**

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.

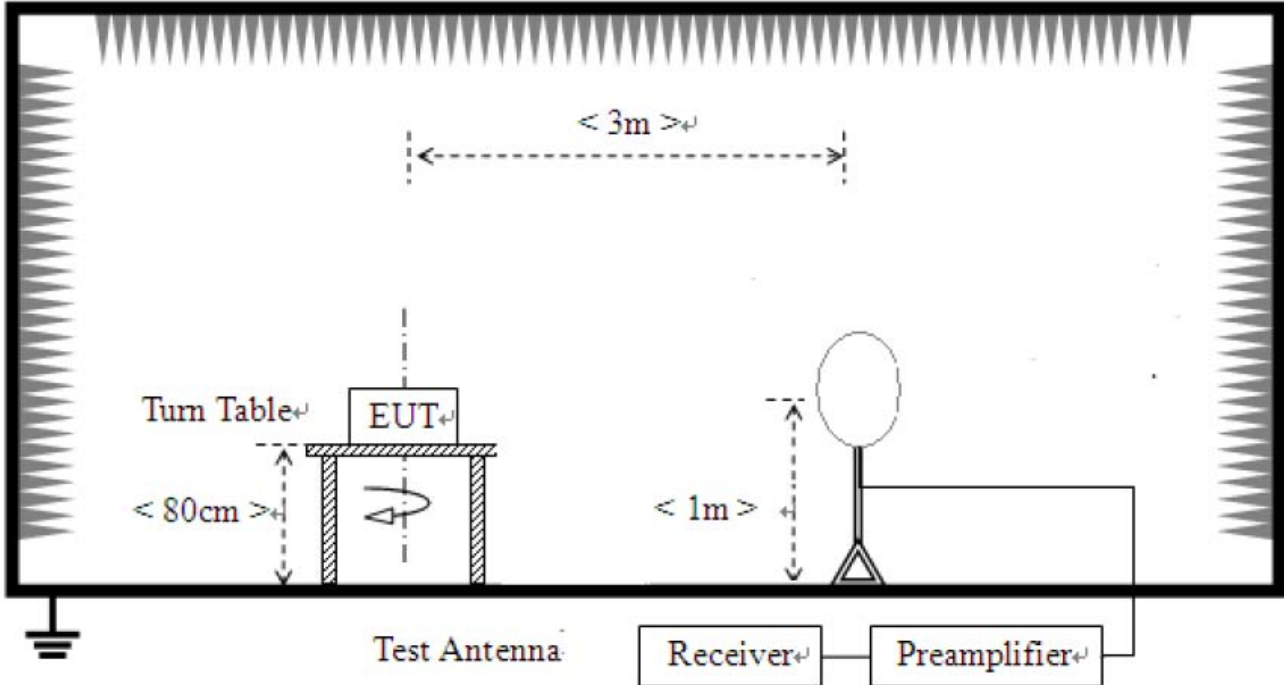
**- 15.407, KDB 789033**

E.I.R.P -27 dBm/MHz

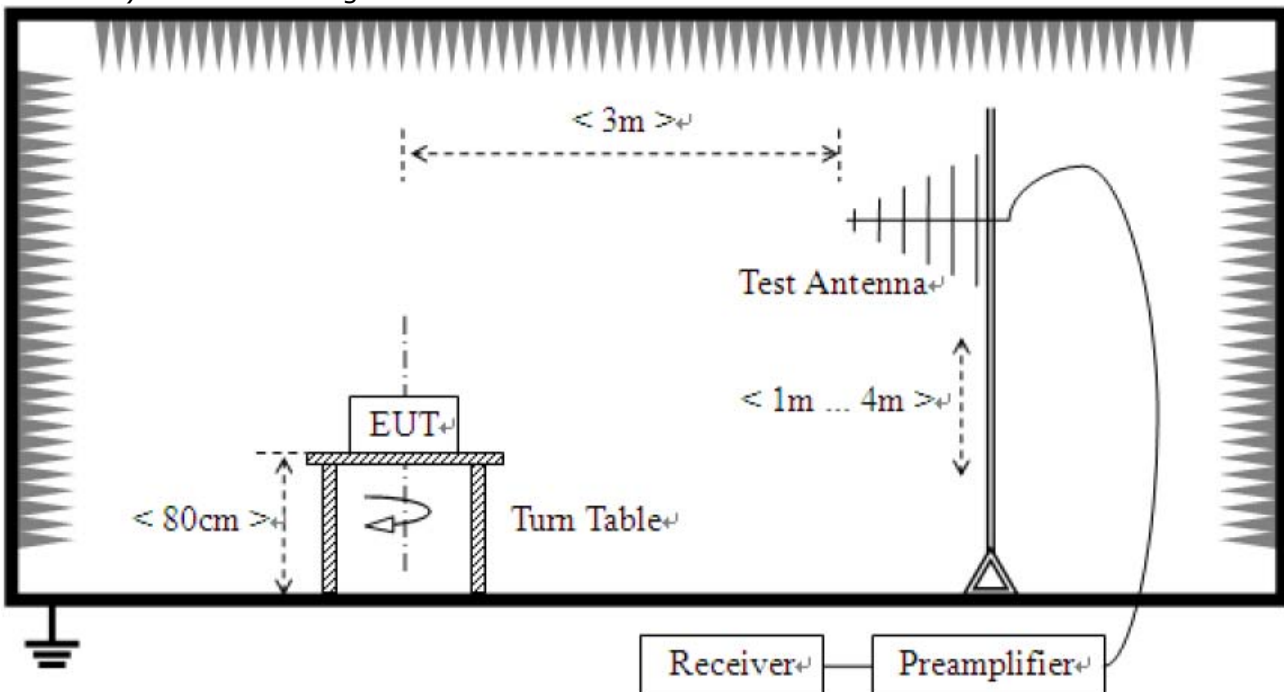
$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2$ , for  $d = 3\text{m}$

**Test Setup:**

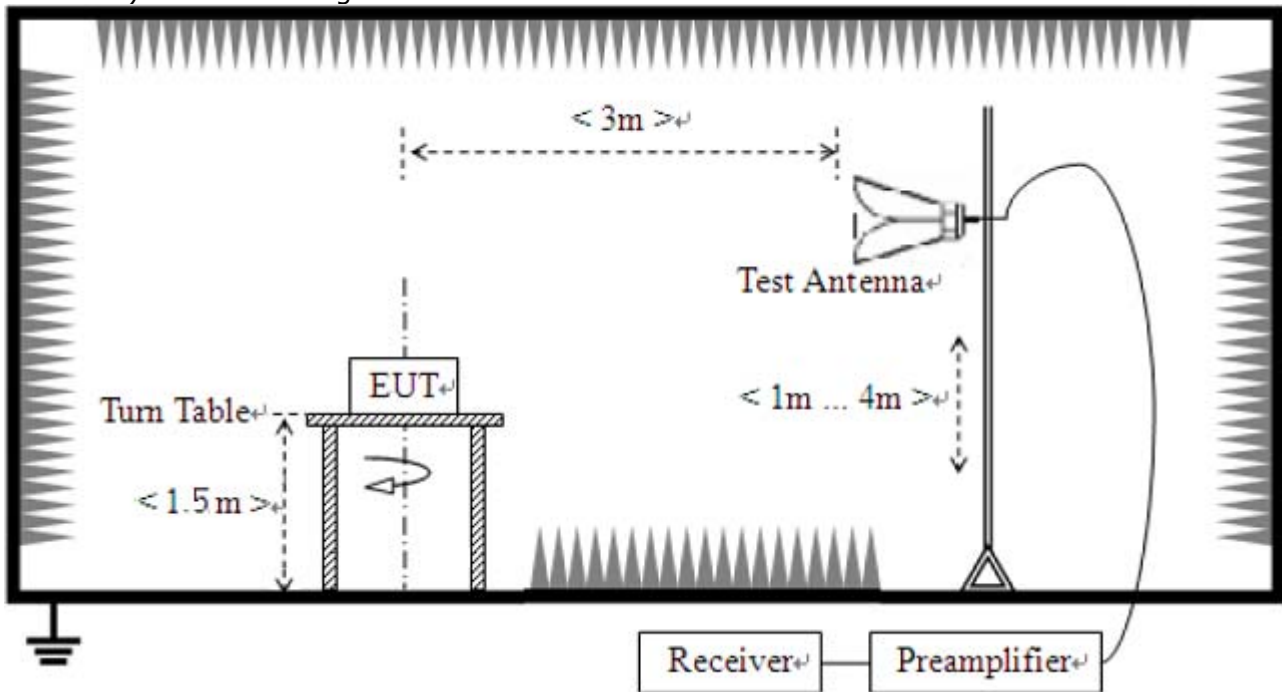
- 1) For field strength of emissions from 9 kHz to 30 MHz



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



3) For field strength of emissions above 1 GHz



## Test Results

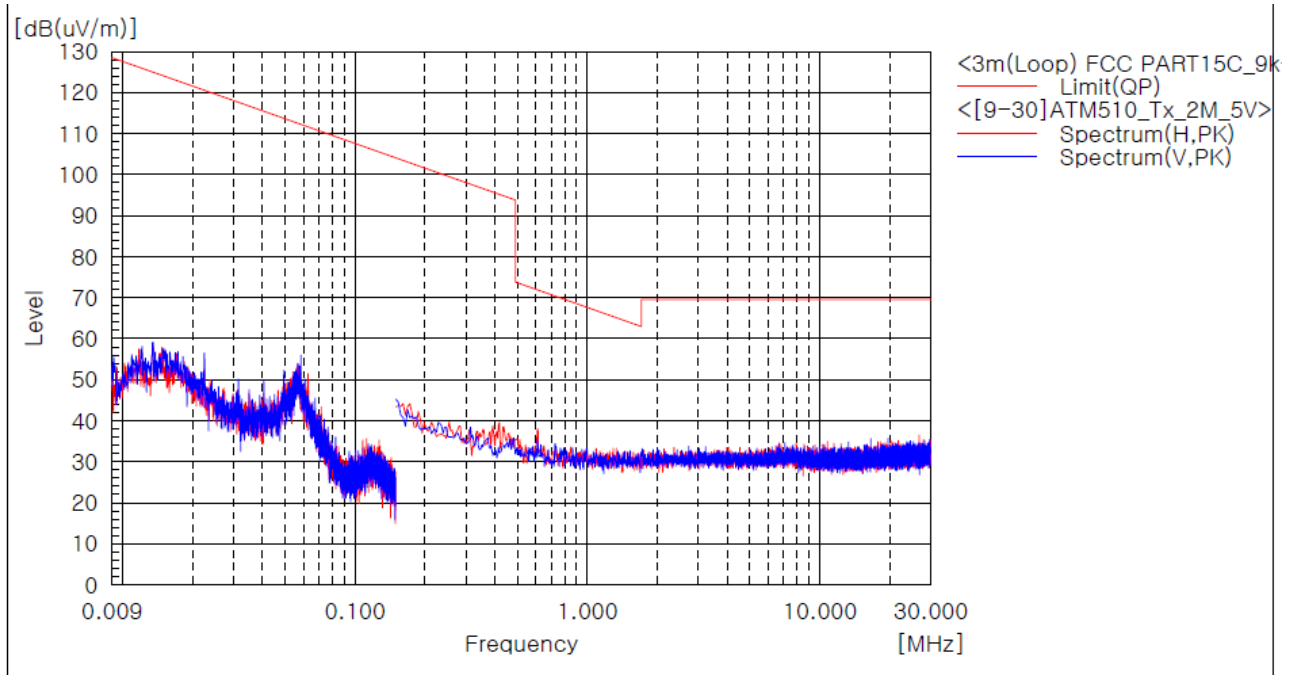
### 1) 9 kHz to 30 MHz

Test mode : Transmitter (ATM510, Worst Case)

The requirements are:

Complies

### Test Data



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
-----------------	-----	----------------	---------------	------------------	------------------	-------------

The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.

### Remark :

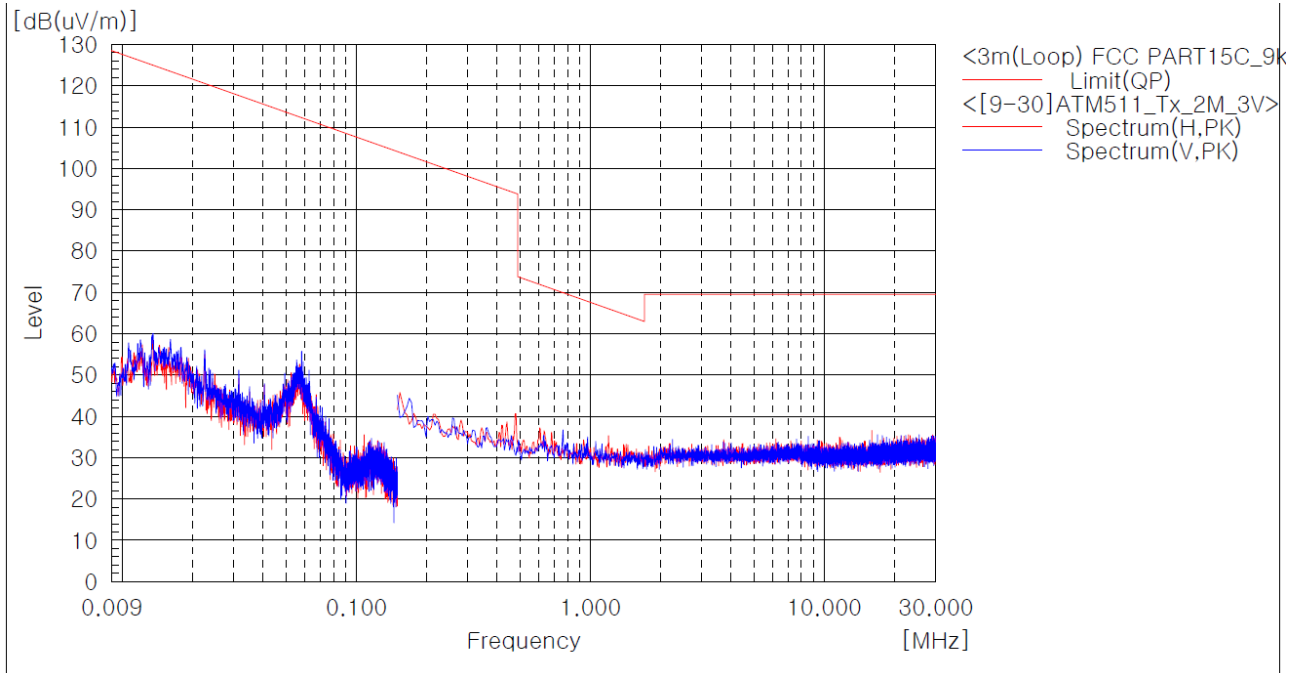
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor +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

**Test mode : Transmitter (ATM511, Worst Case)**

The requirements are:

Complies

**Test Data**



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
-----------------	-----	----------------	---------------	------------------	------------------	-------------

The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.

**Remark :**

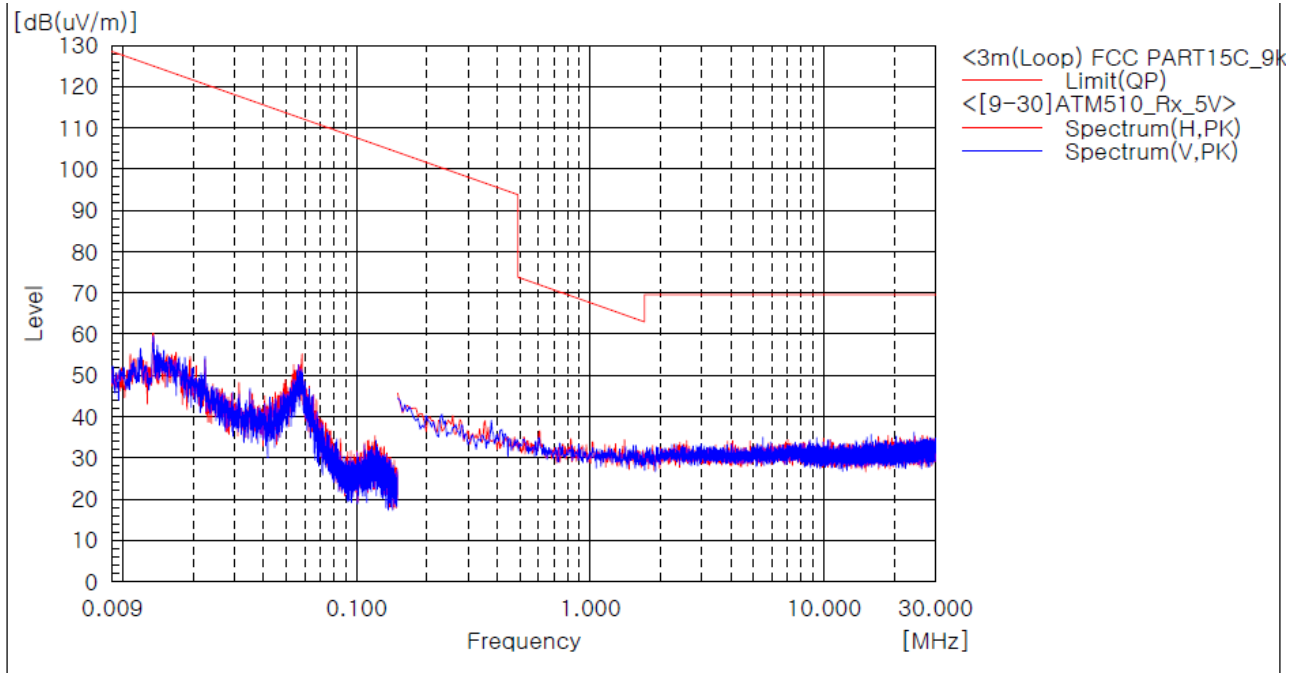
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor +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

**Test mode : Receiver (ATM510, Worst Case)**

The requirements are:

Complies

**Test Data**



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
-----------------	-----	----------------	---------------	------------------	------------------	-------------

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
4. This data is the Peak(PK) value.



**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

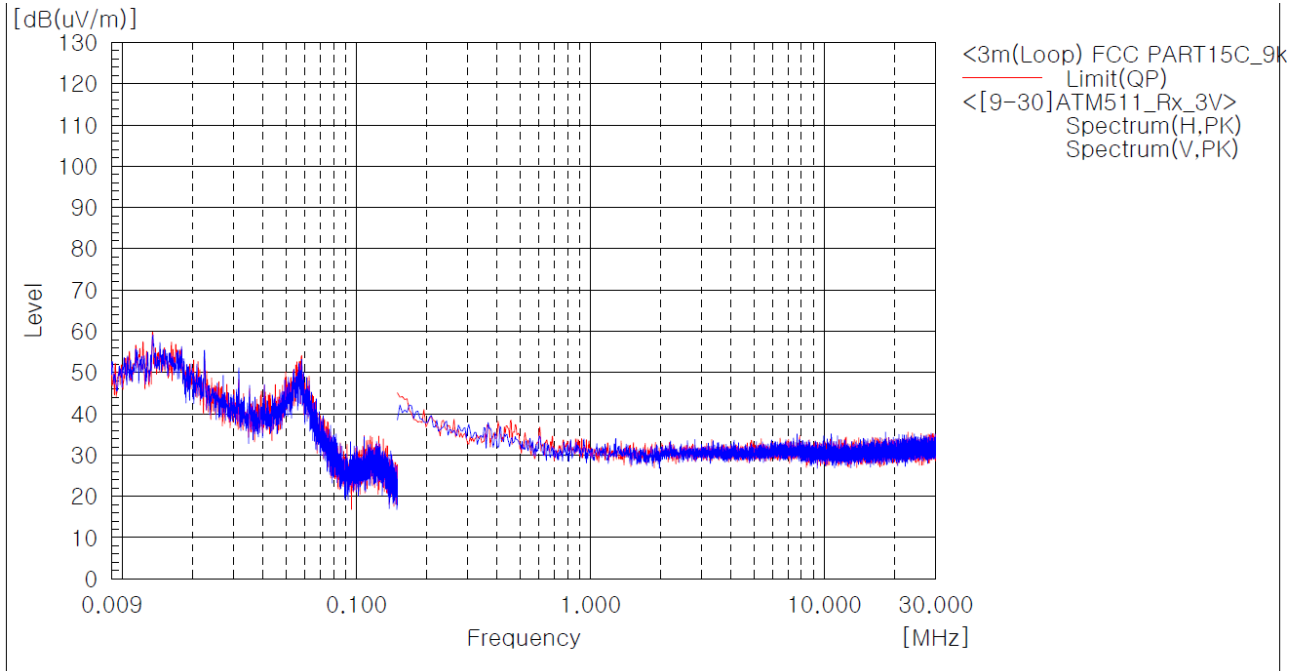
Report No.:  
 CTK-2022-00135  
 Page (40) / (73) Pages

**Test mode : Receiver (ATM511, Worst Case)**

The requirements are:

Complies

**Test Data**



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
-----------------	-----	----------------	---------------	------------------	------------------	-------------

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
4. This data is the Peak(PK) value.



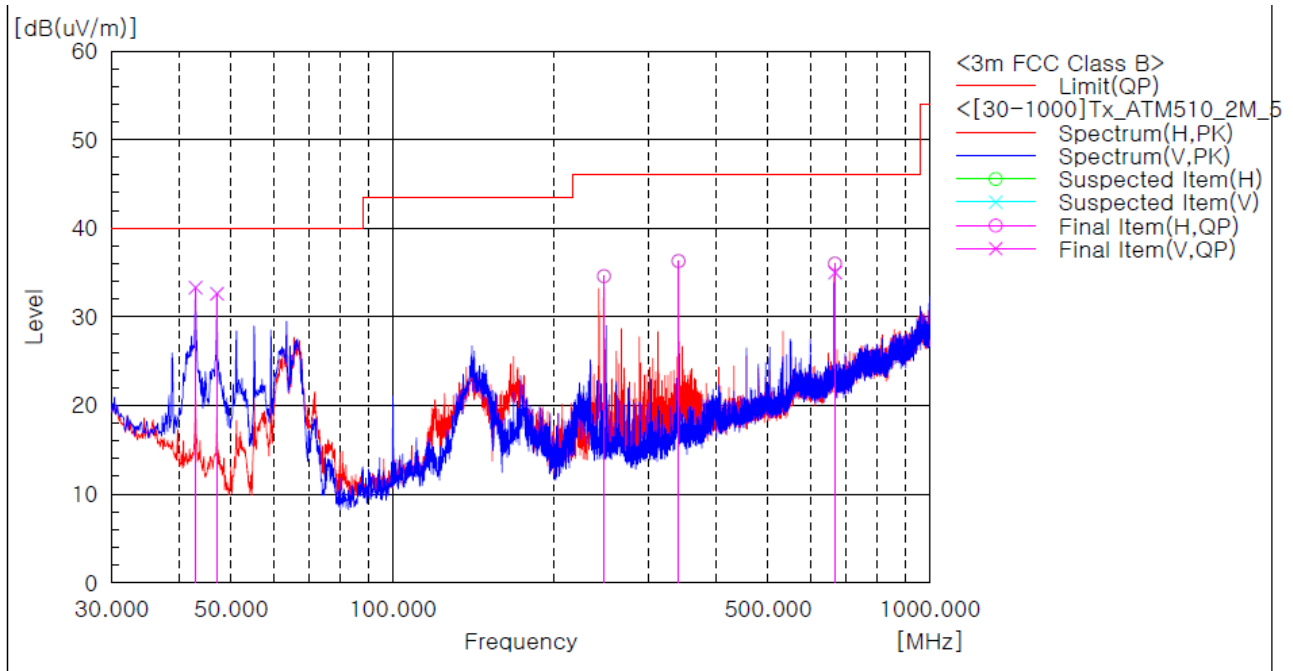
## 2) 30 MHz to 1 GHz

### Test mode : Transmitter (ATM510, 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	42.974	V	45.9	-12.6	33.3	40.0	6.7	100.0	291.0
2	47.096	V	47.4	-14.8	32.6	40.0	7.4	100.0	311.0
3	247.523	H	44.4	-9.8	34.6	46.0	11.4	101.0	101.0
4	340.643	H	43.8	-7.5	36.3	46.0	9.7	101.0	292.0
5	666.078	H	35.0	1.0	36.0	46.0	10.0	101.0	225.0
6	666.563	V	34.0	1.0	35.0	46.0	11.0	100.0	68.0

#### Remark :

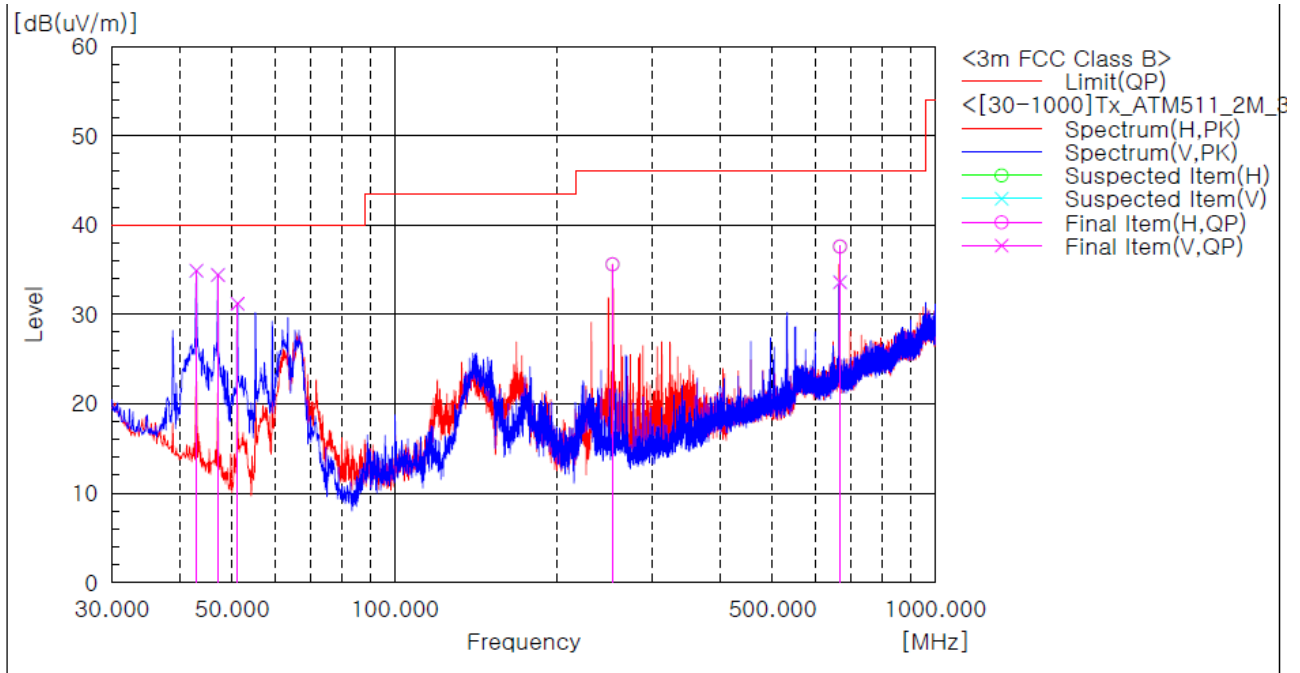
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.
5. We have done all test mode. The results are only attached worst cases.

**Test mode : Transmitter (ATM511, 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	42.974	V	47.5	-12.6	34.9	40.0	5.1	100.0	245.0
2	47.096	V	49.2	-14.8	34.4	40.0	5.6	100.0	285.0
3	51.219	V	48.1	-16.9	31.2	40.0	8.8	100.0	325.0
4	252.979	H	44.9	-9.3	35.6	46.0	10.4	101.0	102.0
5	666.441	H	36.6	1.0	37.6	46.0	8.4	205.0	238.0
6	666.441	V	32.6	1.0	33.6	46.0	12.4	100.0	68.0

**Remark :**

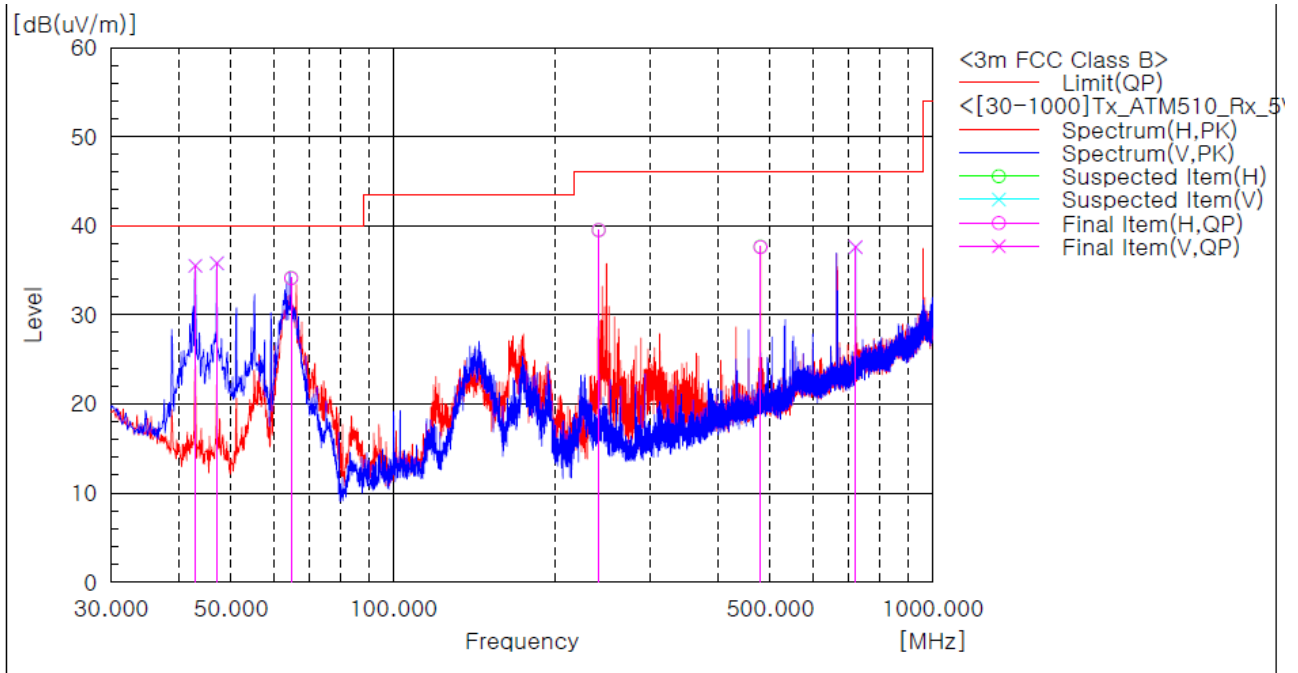
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.
5. We have done all test mode. The results are only attached worst cases.

**Test mode : Receiver (ATM510, 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	42.974	V	48.1	-12.6	35.5	40.0	4.5	101.0	232.0
2	47.096	V	50.6	-14.8	35.8	40.0	4.2	101.0	268.0
3	64.678	H	52.3	-18.2	34.1	40.0	5.9	307.0	16.0
4	240.369	H	50.5	-11.0	39.5	46.0	6.5	205.0	1.0
5	479.595	H	40.5	-2.9	37.6	46.0	8.4	101.0	180.0
6	719.913	V	35.7	1.9	37.6	46.0	8.4	101.0	25.0

**Remark :**

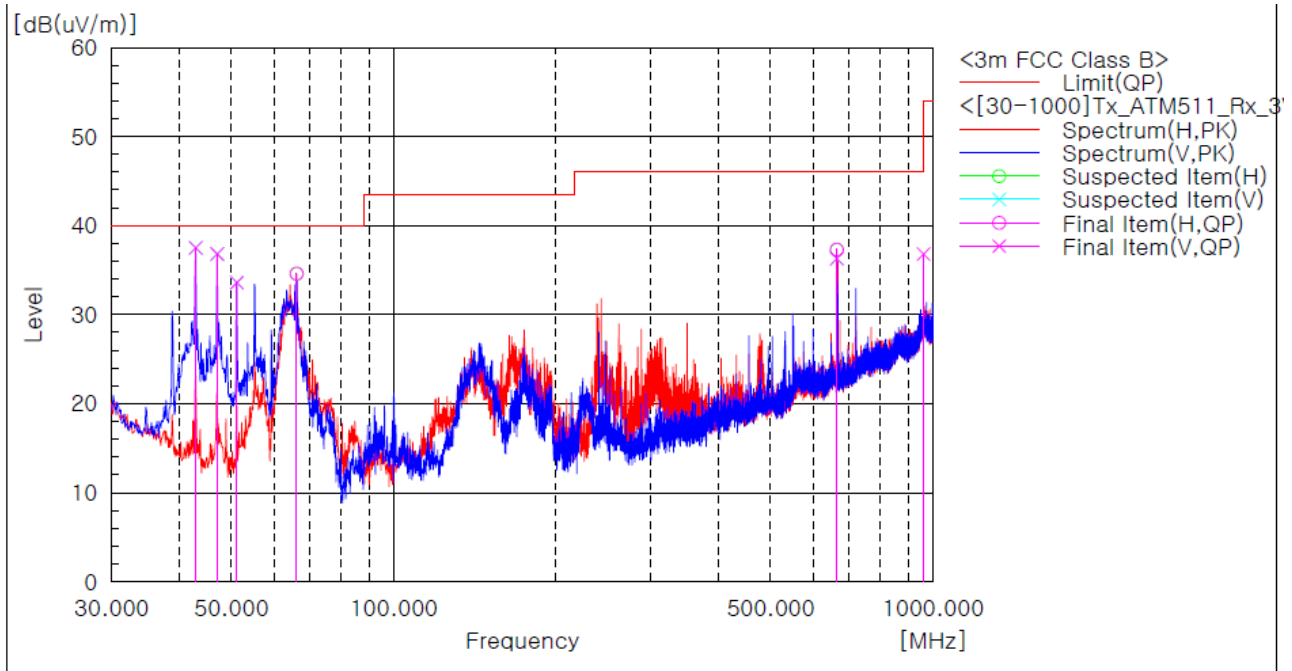
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.
5. We have done all test mode. The results are only attached worst cases.

**Test mode : Receiver (ATM511, 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	42.974	V	50.1	-12.6	37.5	40.0	2.5	101.0	318.0
2	47.096	V	51.6	-14.8	36.8	40.0	3.2	101.0	331.0
3	51.219	V	50.5	-16.9	33.6	40.0	6.4	101.0	308.0
4	66.133	H	52.6	-18.0	34.6	40.0	5.4	307.0	6.0
5	663.774	H	36.2	1.1	37.3	46.0	8.7	205.0	248.0
6	663.774	V	35.2	1.1	36.3	46.0	9.7	101.0	61.0
7	960.594	V	28.5	8.3	36.8	54.0	17.2	101.0	131.0

**Remark :**

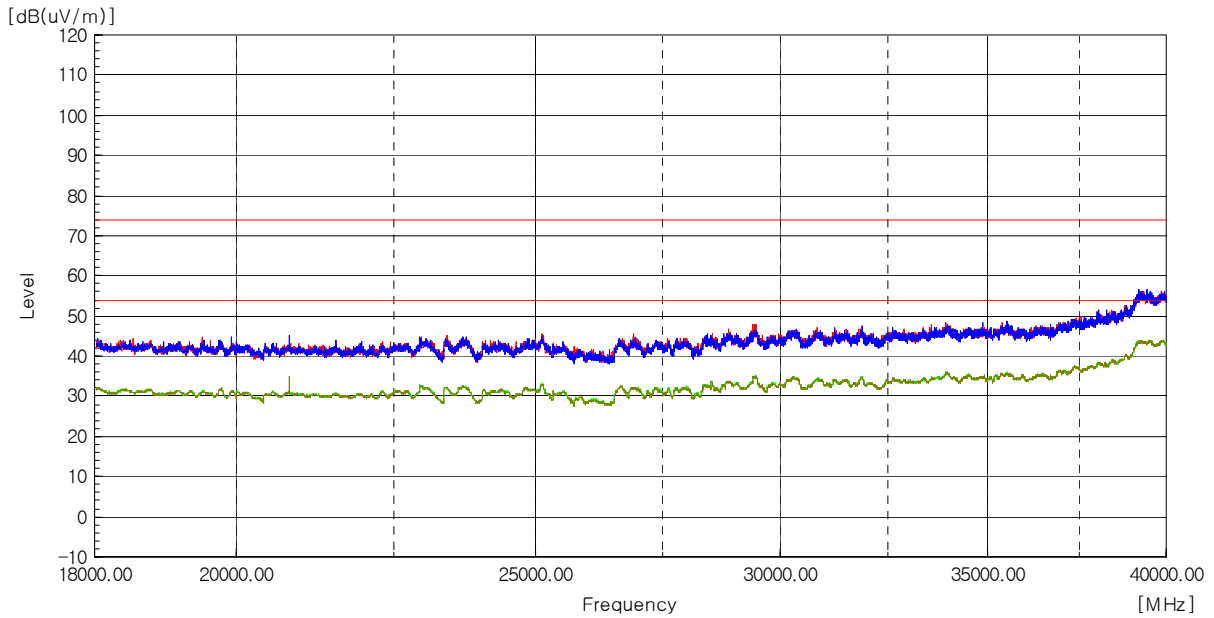
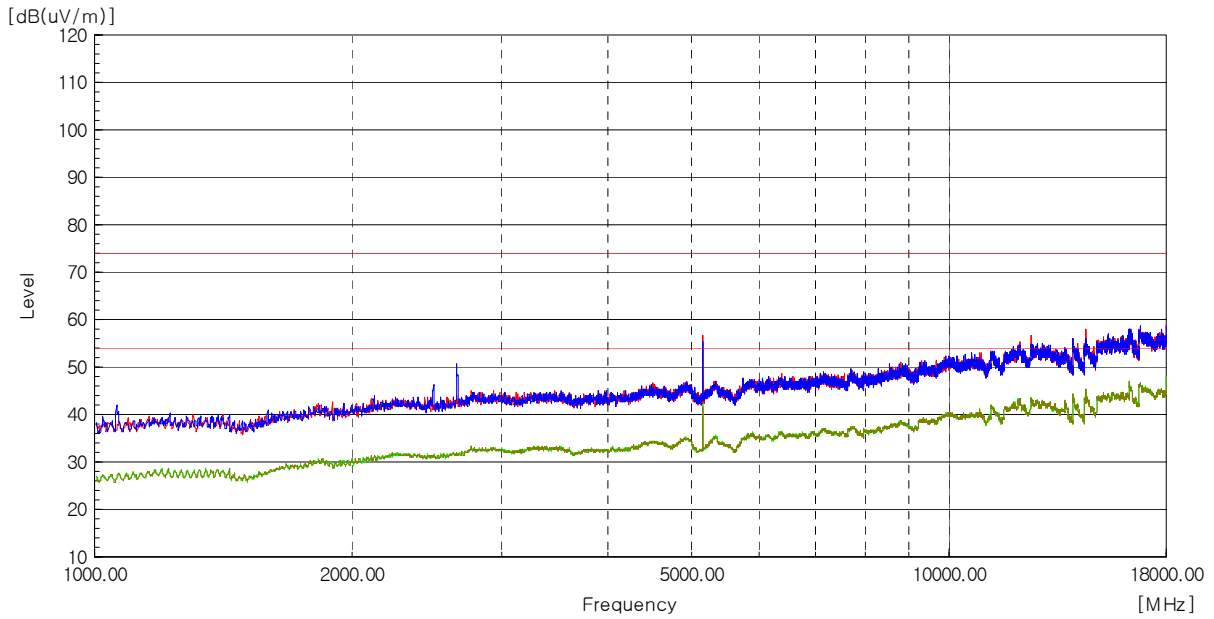
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.
5. We have done all test mode. The results are only attached worst cases.

### 3) above 1 GHz

The requirements are:

Complies

#### Test Data





**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-2022-00135  
 Page (46) / (73) Pages

**Test mode : Digital Modulation\_2MHz\_BW, ANT1**

The requirements are:

Complies

**Test Data**

**Lowest\_UNII 1 (5 157.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 1 (5 201.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 1 (5 247.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Lowest\_UNII 3 (5 728.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 3 (5 786.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 3 (5 846.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**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-2022-00135  
Page (47) / (73) Pages

**Remarks**

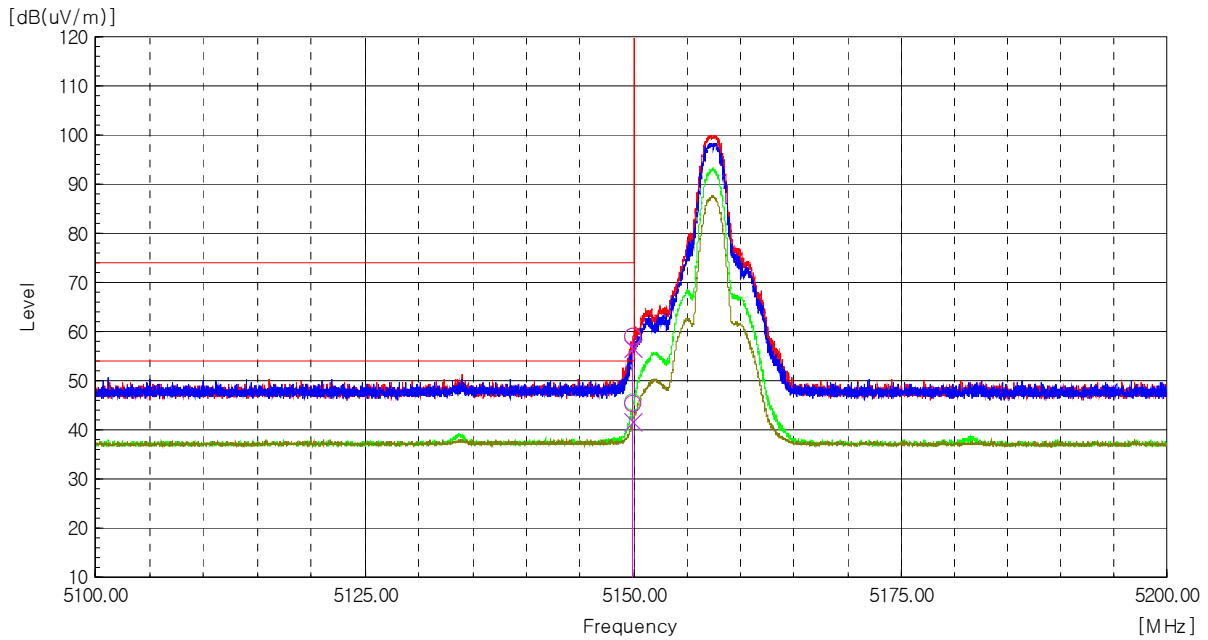
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)  
Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - 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-2022-00135  
 Page (48) / (73) Pages

Worst Case Mode :	Digital Modulation_2MHz BW
Antenna	ANT1
Distance of Measurements :	3 Meters
Operating Frequency :	5 157.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
5 149.93	H	56.9	-----	2.0	58.9	-----	-----	74.0	-----	15.1	-----
5 149.98	H	-----	43.5	2.0	-----	45.5	0.0	-----	54.0	-----	8.5
5 149.88	V	54.6	-----	2.0	56.6	-----	-----	74.0	-----	17.4	-----
5 149.98	V	-----	39.8	2.0	-----	41.8	0.0	-----	54.0	-----	12.2

Radiated Restricted Band Edge Plot

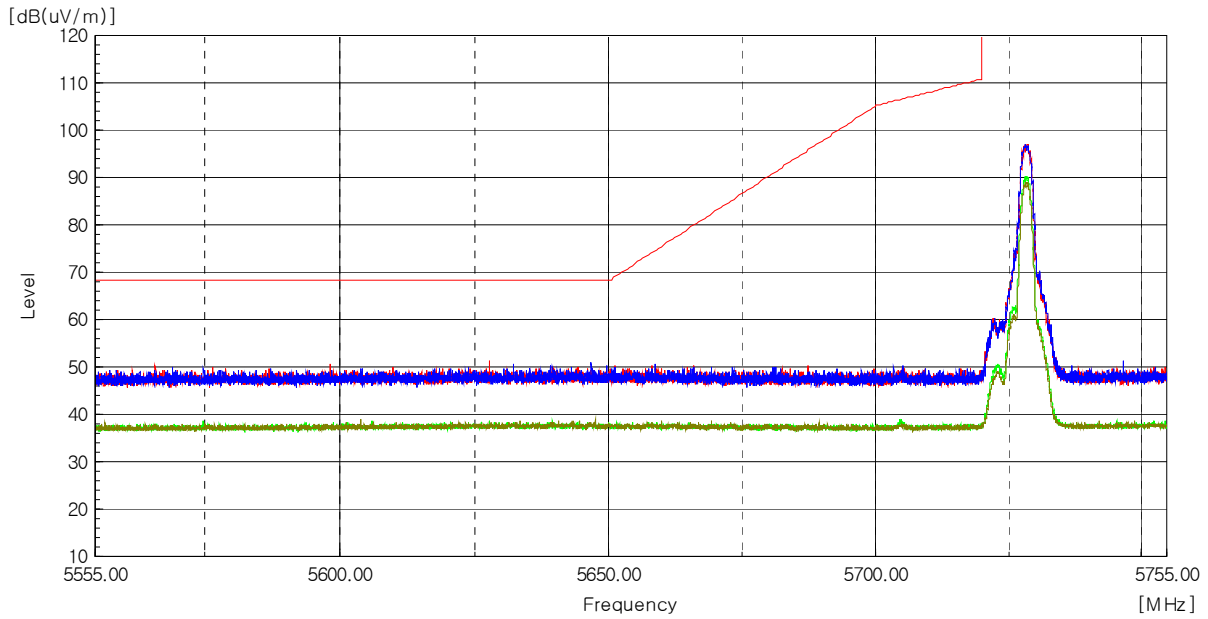




**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (49) / (73) Pages

Worst Case Mode :	Digital Modulation_2MHz BW
Antenna	ANT1
Distance of Measurements :	3 Meters
Operating Frequency :	5 728.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

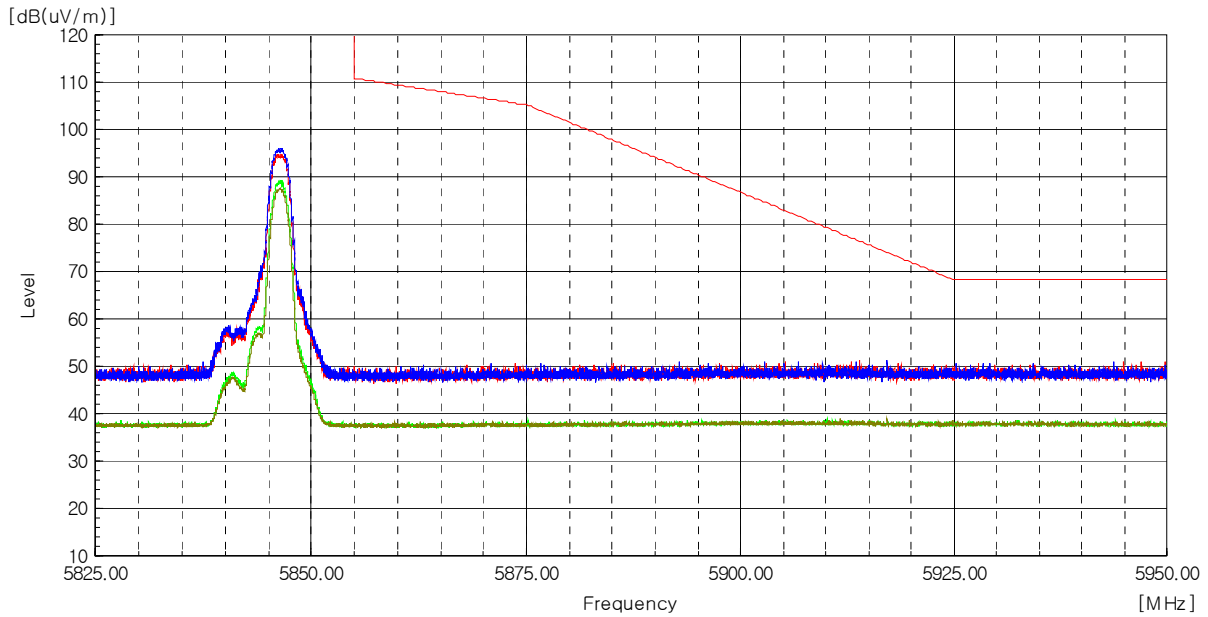
### Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (50) / (73) Pages

Worst Case Mode :	Digital Modulation_2MHz BW
Antenna	ANT1
Distance of Measurements :	3 Meters
Operating Frequency :	5 846.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

### Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (51) / (73) Pages

**Test mode : Digital Modulation\_4MHz\_BW, ANT1**

The requirements are:

Complies

**Test Data**

**Lowest\_UNII 1 (5 158.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 1 (5 202.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 1 (5 248.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Lowest\_UNII 3 (5 729.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 3 (5 787.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 3 (5 847.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**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-2022-00135  
Page (52) / (73) Pages

**Remarks**

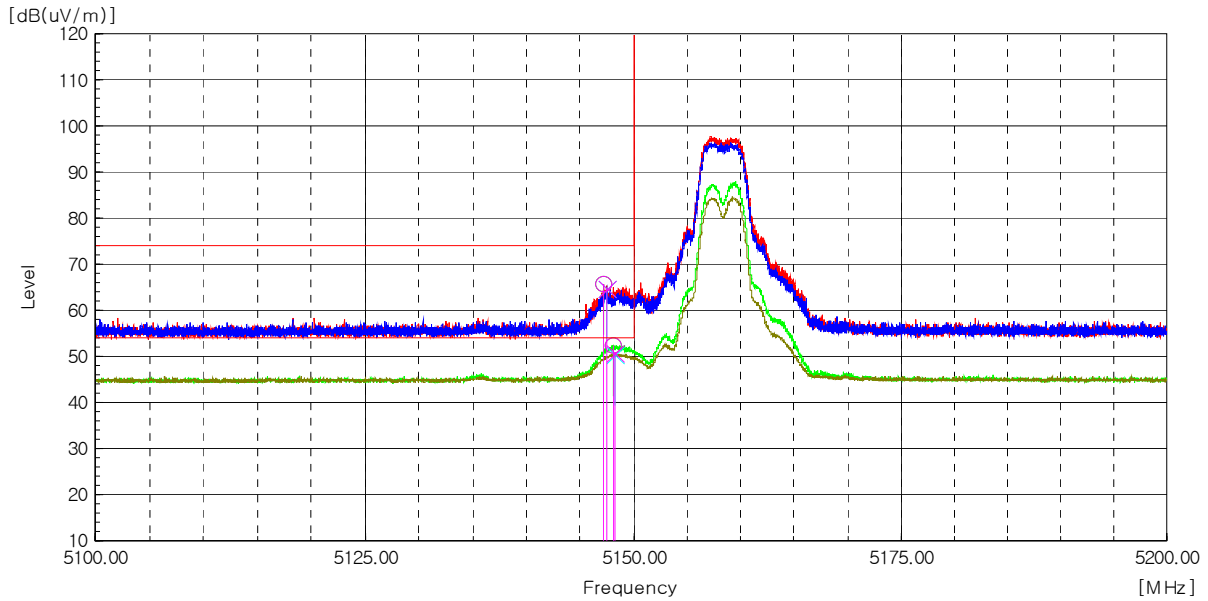
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)  
Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - 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-2022-00135  
 Page (53) / (73) Pages

Worst Case Mode :	Digital Modulation_4MHz BW
Antenna	ANT1
Distance of Measurements :	3 Meters
Operating Frequency :	5 158.35 MHz



Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
5 147.25	H	63.6	-----	2.0	65.6	-----	-----	74.0	-----	8.4	-----
5 148.14	H	-----	50.4	2.0	-----	52.4	0.0	-----	54.0	-----	1.6
5 147.44	V	62.6	-----	2.0	64.6	-----	-----	74.0	-----	9.4	-----
5 148.23	V	-----	48.5	2.0	-----	50.5	0.0	-----	54.0	-----	3.5

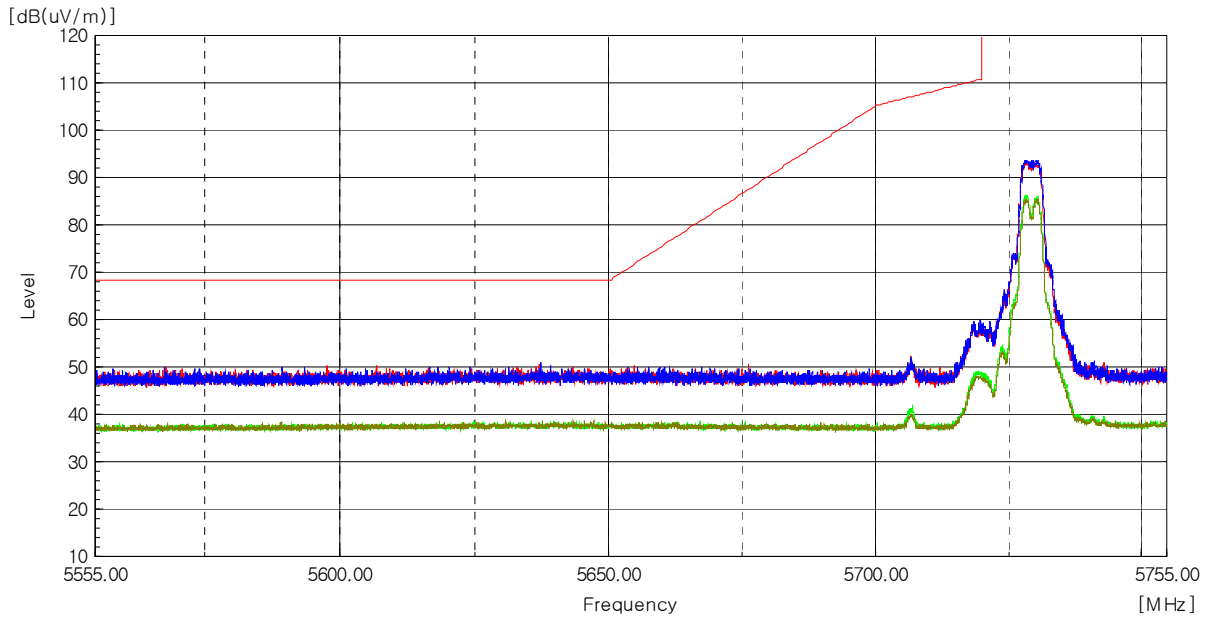
Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (54) / (73) Pages

Worst Case Mode :	Digital Modulation_4MHz BW
Antenna	ANT1
Distance of Measurements :	3 Meters
Operating Frequency :	5 729.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

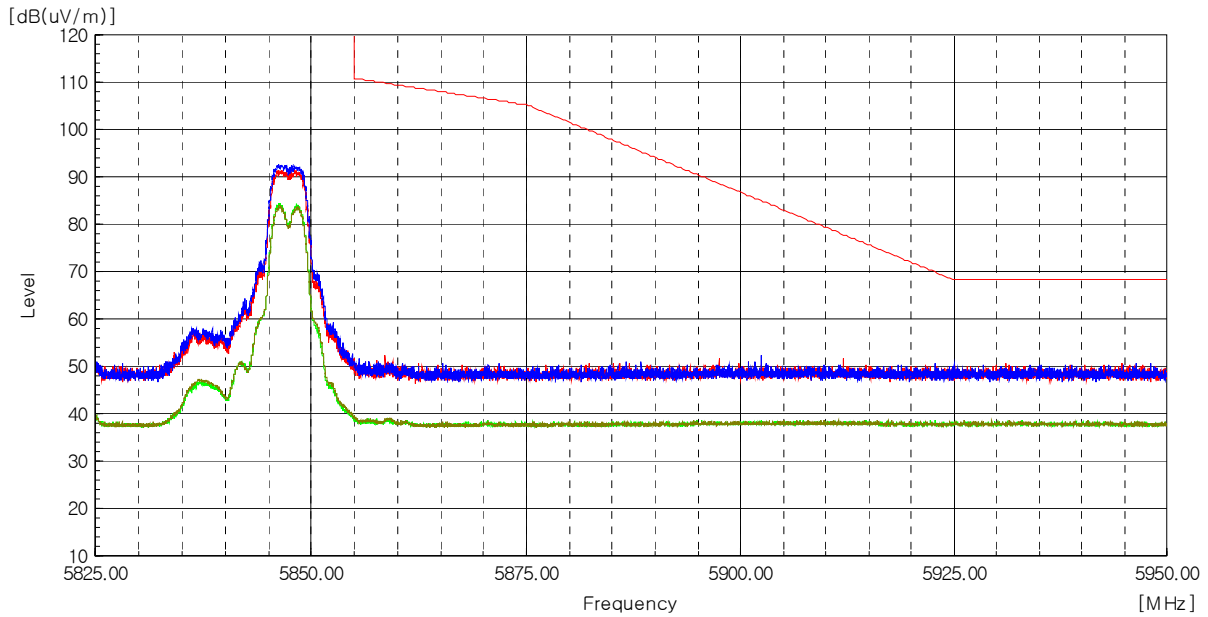
### Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (55) / (73) Pages

Worst Case Mode :	Digital Modulation_4MHz BW
Antenna	ANT1
Distance of Measurements :	3 Meters
Operating Frequency :	5 847.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

### Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (56) / (73) Pages

**Test mode : Digital Modulation\_2MHz\_BW, ANT2**

The requirements are:

Complies

**Test Data**

**Lowest\_UNII 1 (5 157.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 1 (5 201.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 1 (5 247.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Lowest\_UNII 3 (5 728.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 3 (5 786.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 3 (5 846.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.



**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-2022-00135  
Page (57) / (73) Pages

**Remarks**

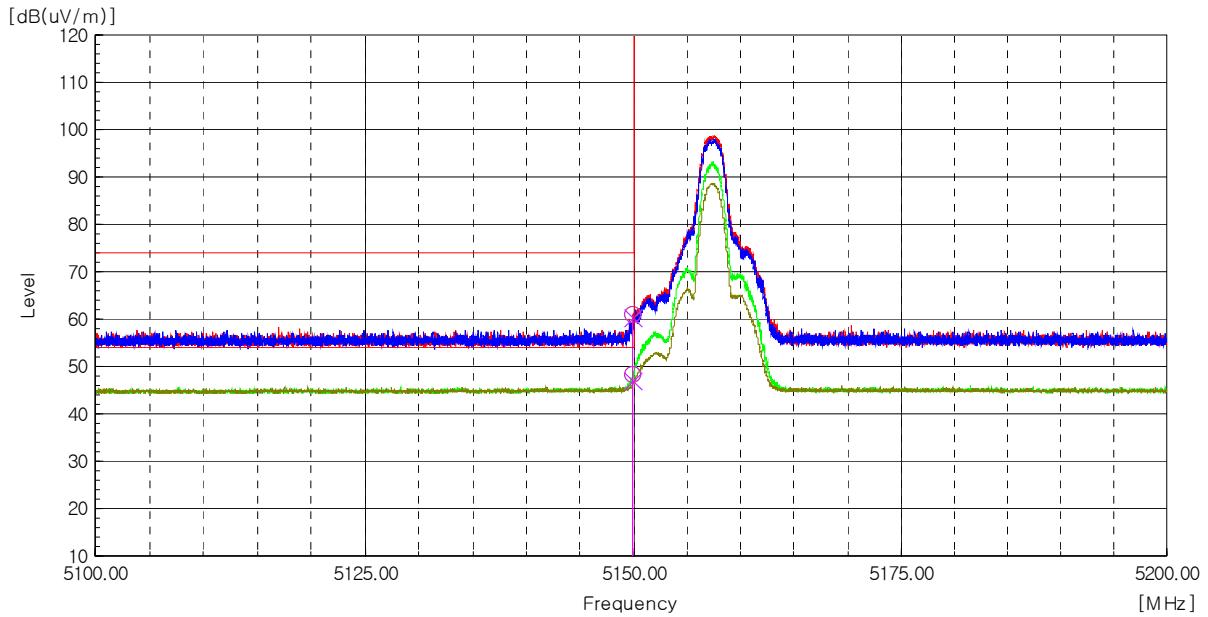
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)  
Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - 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-2022-00135  
 Page (58) / (73) Pages

Worst Case Mode :	Digital Modulation_2MHz BW
Antenna	ANT2
Distance of Measurements :	3 Meters
Operating Frequency :	5 157.35 MHz



Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
5 149.90	H	59.1	-----	2.0	61.1	-----	-----	74.0	-----	12.9	-----
5 149.85	H	-----	46.4	2.0	-----	48.4	0.0	-----	54.0	-----	5.6
5 149.98	V	58.4	-----	2.0	60.4	-----	-----	74.0	-----	13.6	-----
5 149.98	V	-----	44.9	2.0	-----	46.9	0.0	-----	54.0	-----	7.1

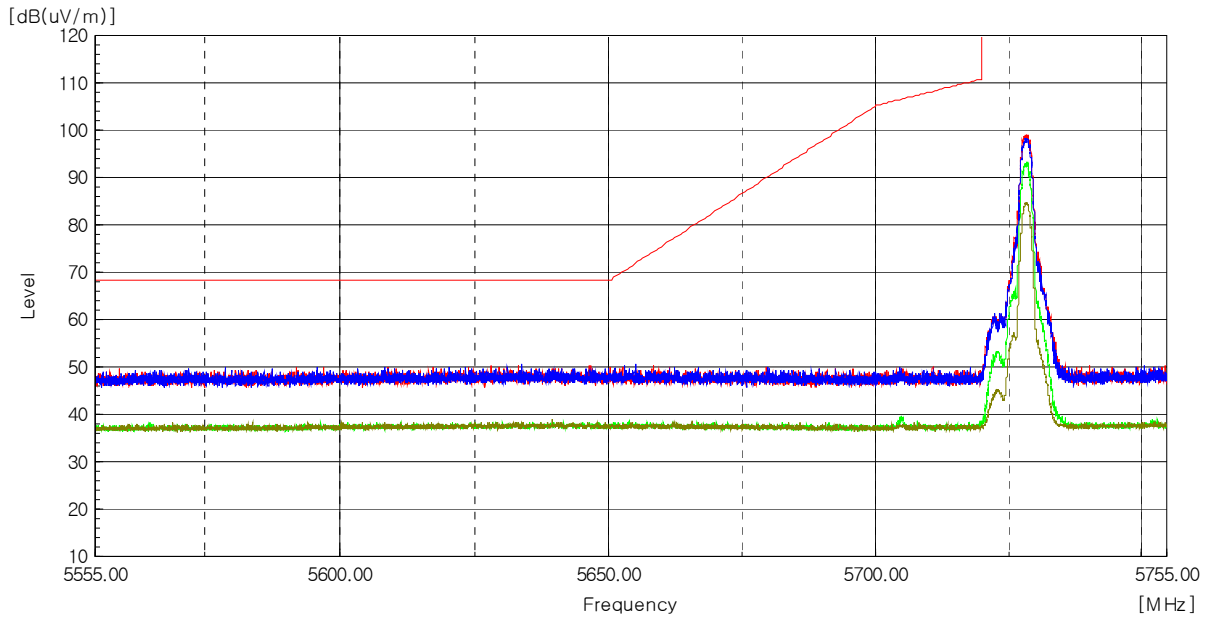
Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (59) / (73) Pages

Worst Case Mode :	Digital Modulation_2MHz BW
Antenna	ANT2
Distance of Measurements :	3 Meters
Operating Frequency :	5 728.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

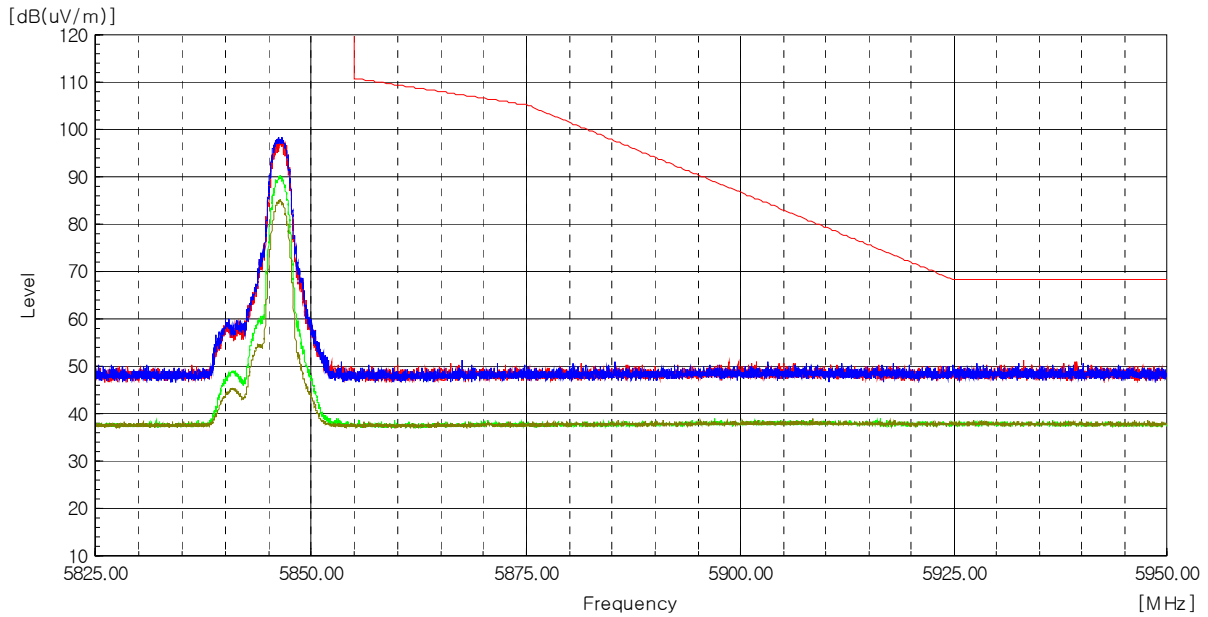
### Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (60) / (73) Pages

Worst Case Mode :	Digital Modulation_2MHz BW
Antenna	ANT2
Distance of Measurements :	3 Meters
Operating Frequency :	5 846.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

### Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (61) / (73) Pages

**Test mode : Digital Modulation\_4MHz\_BW, ANT2**

The requirements are:

Complies

**Test Data**

**Lowest\_UNII 1 (5 158.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 1 (5 202.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 1 (5 248.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Lowest\_UNII 3 (5 729.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Middle\_UNII 3 (5 787.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**Highest\_UNII 3 (5 847.35 MHz)**

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-----	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

No emissions were detected at a level greater than 20dB below limit.

**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-2022-00135  
Page (62) / (73) Pages

**Remarks**

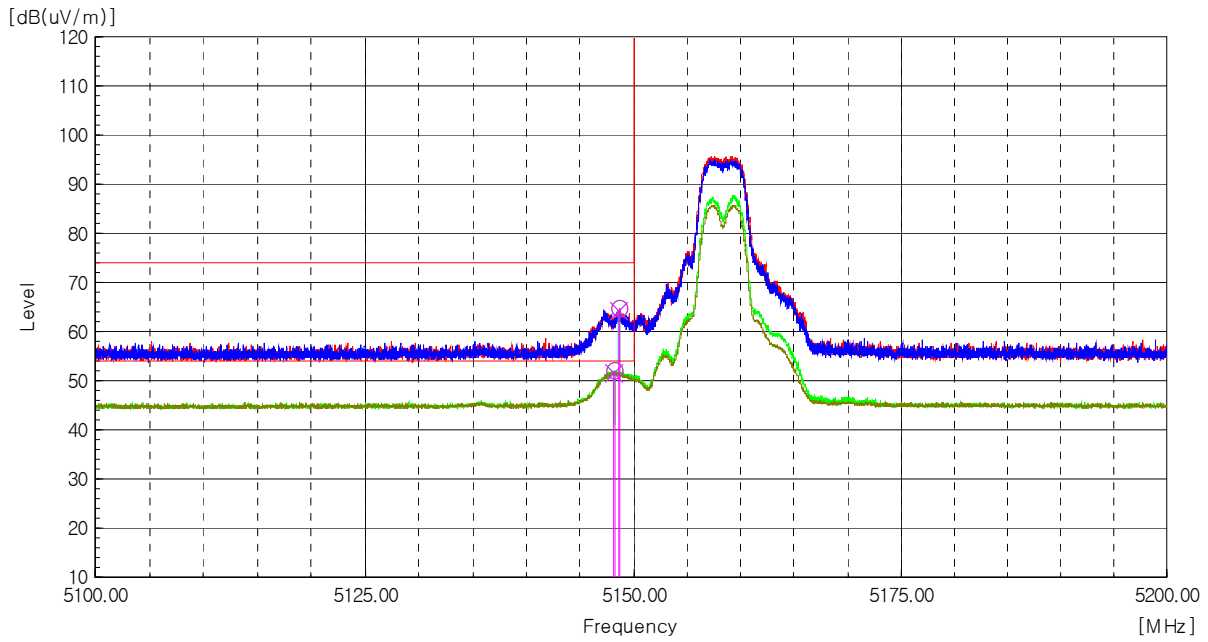
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)  
Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - 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-2022-00135  
 Page (63) / (73) Pages

Worst Case Mode :	Digital Modulation_4MHz BW
Antenna	ANT2
Distance of Measurements :	3 Meters
Operating Frequency :	5 158.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
5 148.78	H	62.8	-----	2.0	64.8	-----	-----	74.0	-----	9.2	-----
5 148.23	H	-----	50.1	2.0	-----	52.1	0.0	-----	54.0	-----	1.9
5 148.59	V	62.3	-----	2.0	64.3	-----	-----	74.0	-----	9.7	-----
5 148.08	V	-----	49.8	2.0	-----	51.8	0.0	-----	54.0	-----	2.2

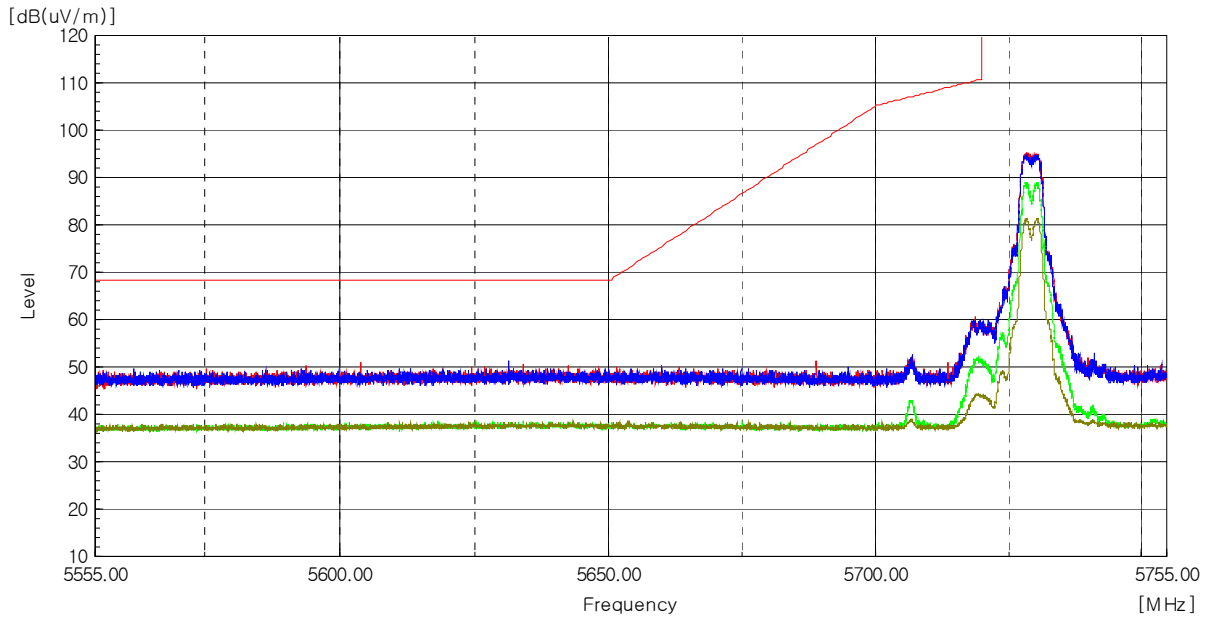
Radiated Restricted Band Edge Plot



**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-2022-00135  
 Page (64) / (73) Pages

Worst Case Mode :	Digital Modulation_4MHz BW
Antenna	ANT2
Distance of Measurements :	3 Meters
Operating Frequency :	5 729.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

### Radiated Restricted Band Edge Plot

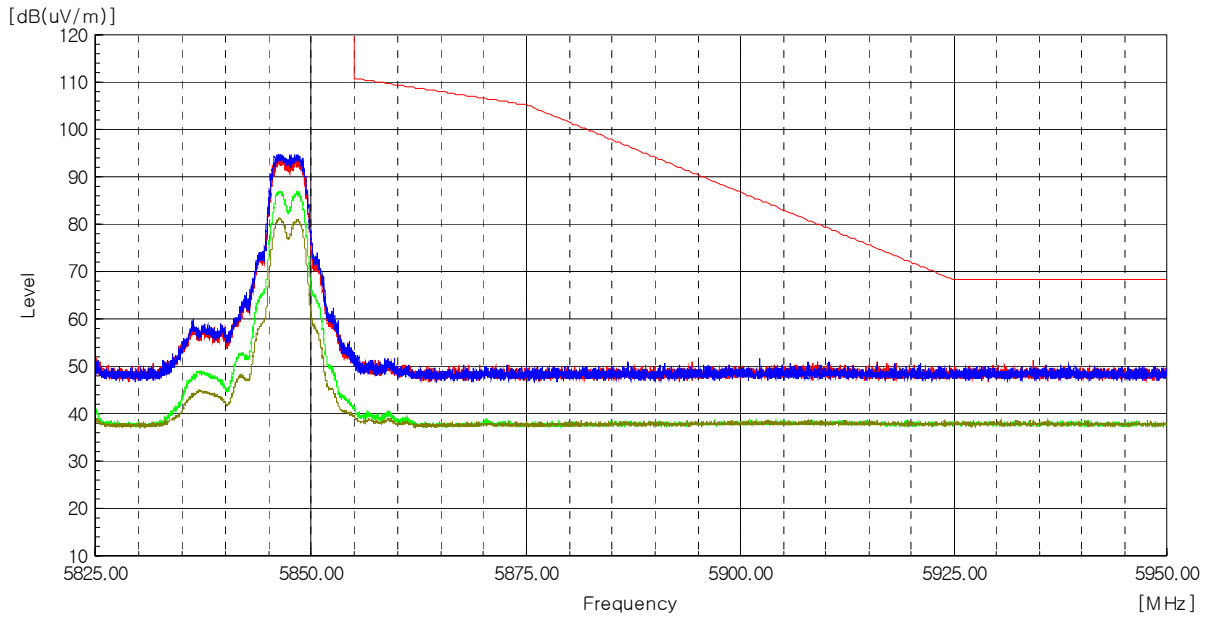




**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2022-00135  
 Page (65) / (73) Pages

Worst Case Mode :	Digital Modulation_4MHz BW
Antenna	ANT2
Distance of Measurements :	3 Meters
Operating Frequency :	5 847.35 MHz



Frequency [MHz]	Reading (P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
-----------------	-------------	-------------------	-------------------	---------------	---------------------	---------------------	------------------------	---------------------	---------------------	----------------	----------------

The emissions above 1 GHz were 20 dB lower than the limit.

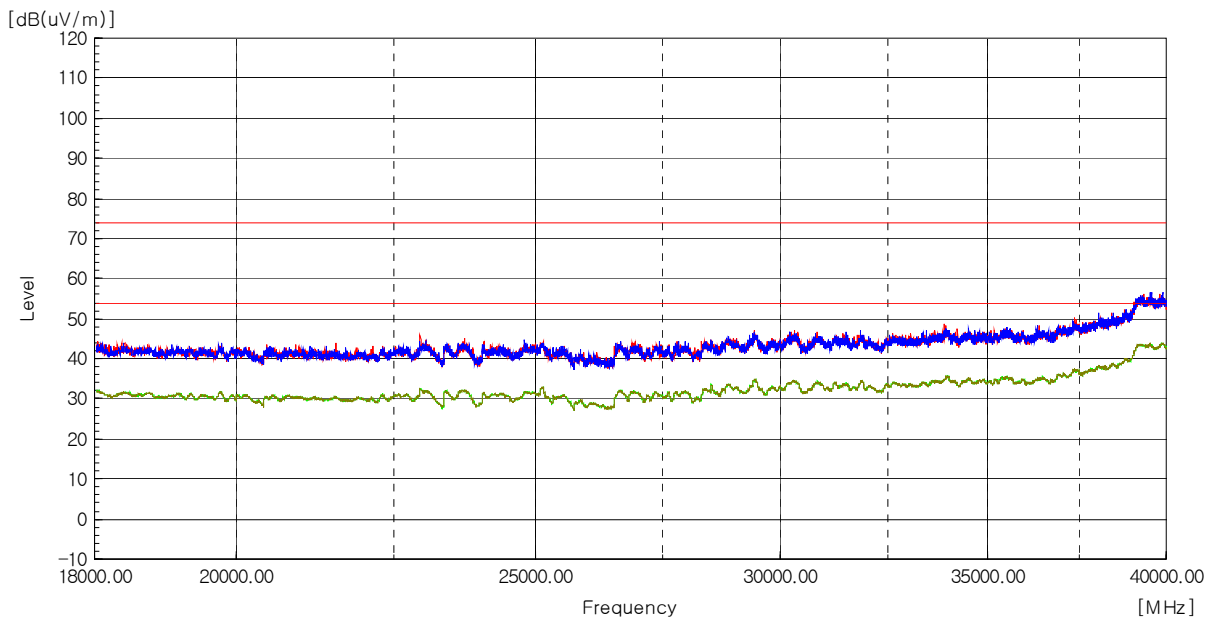
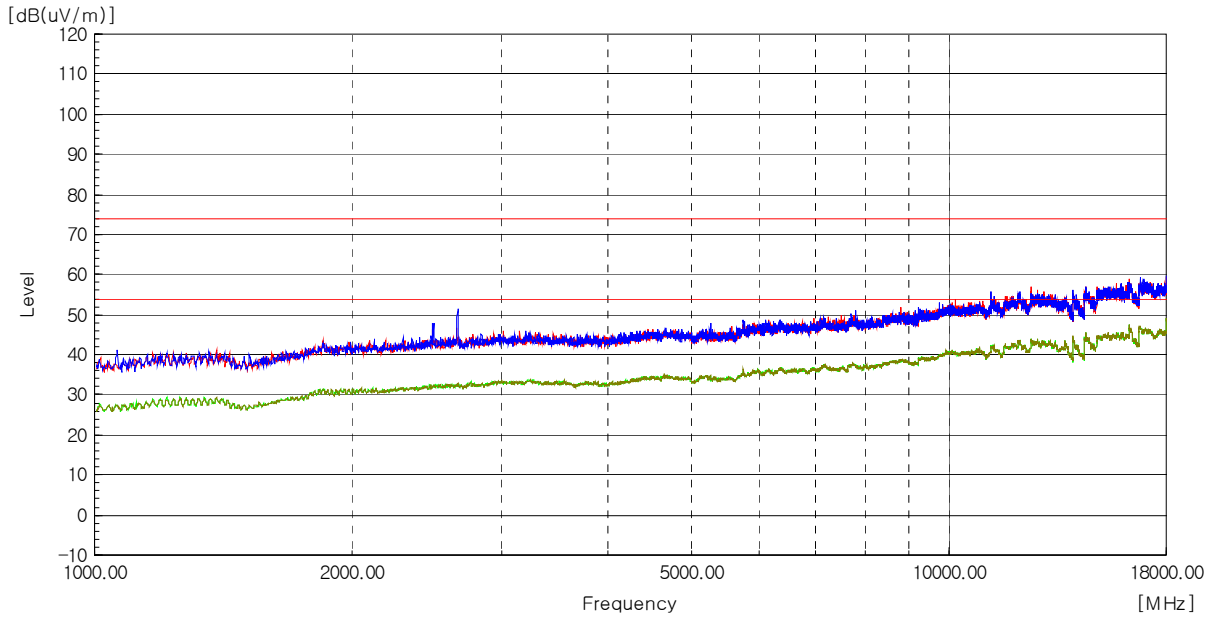
### Radiated Restricted Band Edge Plot



**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-2022-00135  
Page (66) / (73) Pages

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





**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-2022-00135  
Page (67) / (73) Pages

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
--------------------	-----	-------------------------	-------------------------	------------------	------------------------	------------------------	---------------------------------	------------------------	------------------------	----------------------	----------------------

The emissions above 1 GHz were 20 dB lower than the limit.

### Remarks

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 stand-up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)  
Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - 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-2022-00135  
Page (68) / (73) Pages

## 4.7 AC Conducted Emissions

### Test Location

Shielded Room

### Frequency Range of Measurement

150 kHz to 30 MHz

### Instrument Settings

IF Band Width: 9 kHz

### Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

### Limit

#### - 15.207(a)

Frequency (MHz)	Conducted Limit (dBuV)	
	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.

### Test Results

The requirements are:

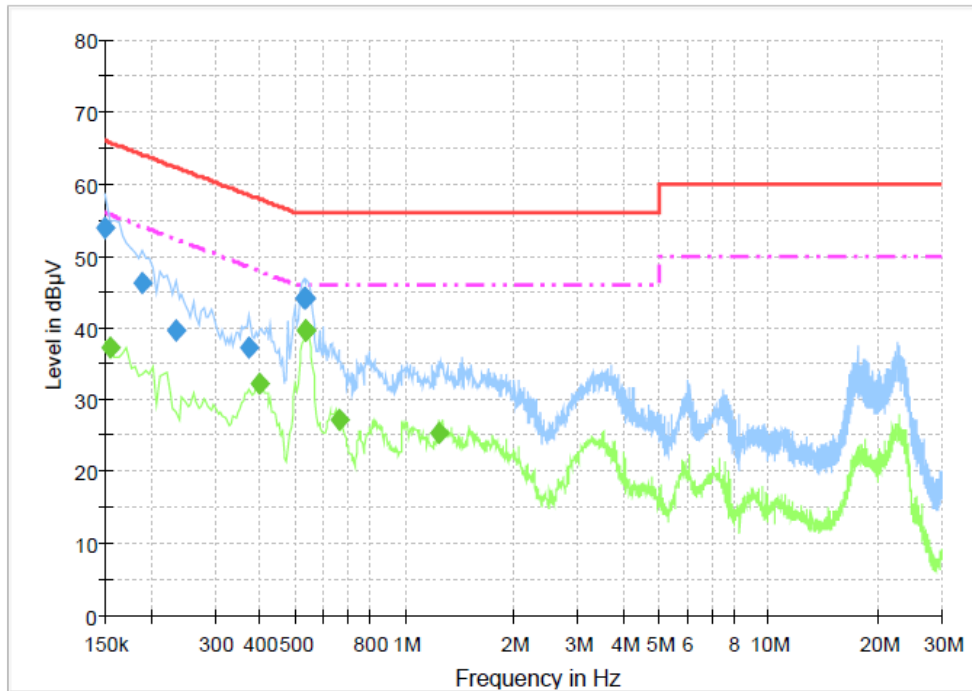
Complies

**Test Data**

- ATM510

[LINE]

3CE\_Class B\_L1



**Final Result 1**

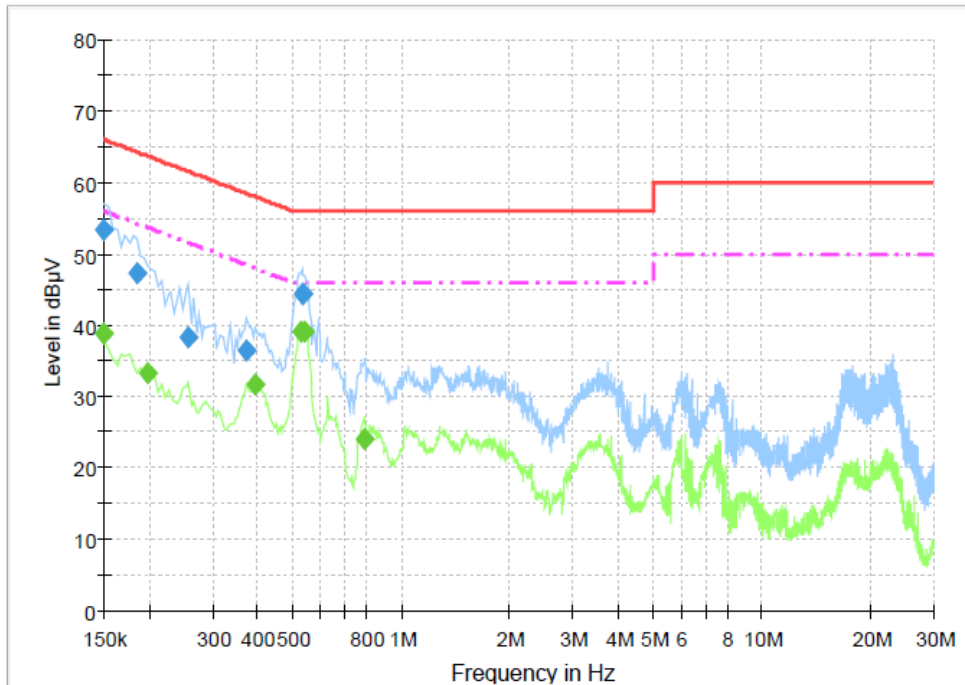
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	53.8	1000.0	9.000	On	L1	9.7	12.2	66.0
0.190500	46.2	1000.0	9.000	On	L1	9.9	17.8	64.0
0.235500	39.7	1000.0	9.000	On	L1	9.7	22.5	62.3
0.375000	37.1	1000.0	9.000	On	L1	9.9	21.3	58.4
0.528000	44.1	1000.0	9.000	On	L1	9.9	11.9	56.0
0.537000	44.2	1000.0	9.000	On	L1	9.9	11.8	56.0

**Final Result 2**

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	37.2	1000.0	9.000	On	L1	9.8	18.5	55.8
0.397500	32.1	1000.0	9.000	On	L1	9.9	15.8	47.9
0.532500	39.5	1000.0	9.000	On	L1	9.9	6.5	46.0
0.537000	39.6	1000.0	9.000	On	L1	9.9	6.4	46.0
0.663000	27.3	1000.0	9.000	On	L1	9.9	18.7	46.0
1.243500	25.4	1000.0	9.000	On	L1	9.8	20.6	46.0

[NEUTRAL]

3CE\_Class B\_N



### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	53.4	1000.0	9.000	On	N	9.8	12.6	66.0
0.186000	47.3	1000.0	9.000	On	N	9.9	16.9	64.2
0.258000	38.2	1000.0	9.000	On	N	9.7	23.3	61.5
0.375000	36.4	1000.0	9.000	On	N	9.9	22.0	58.4
0.532500	44.4	1000.0	9.000	On	N	9.9	11.6	56.0
0.537000	44.3	1000.0	9.000	On	N	9.9	11.7	56.0

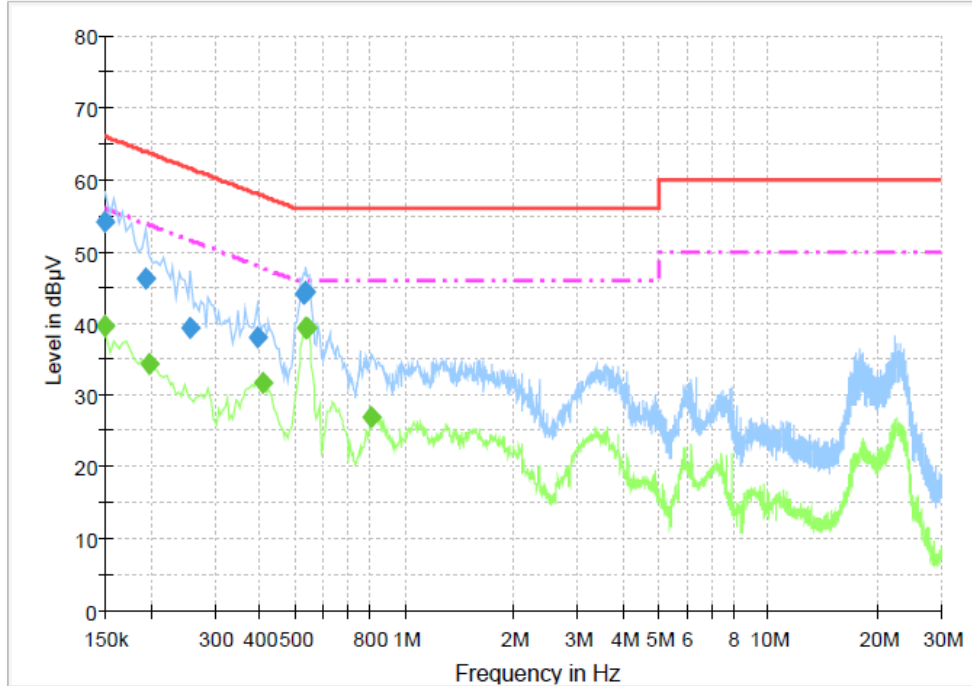
### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	38.9	1000.0	9.000	On	N	9.8	17.1	56.0
0.199500	33.4	1000.0	9.000	On	N	9.8	20.3	53.6
0.393000	31.7	1000.0	9.000	On	N	9.9	16.3	48.0
0.528000	39.2	1000.0	9.000	On	N	9.9	6.8	46.0
0.541500	39.1	1000.0	9.000	On	N	9.9	6.9	46.0
0.789000	24.0	1000.0	9.000	On	N	9.9	22.0	46.0

- ATM511

[LINE]

3CE\_Class B\_L1



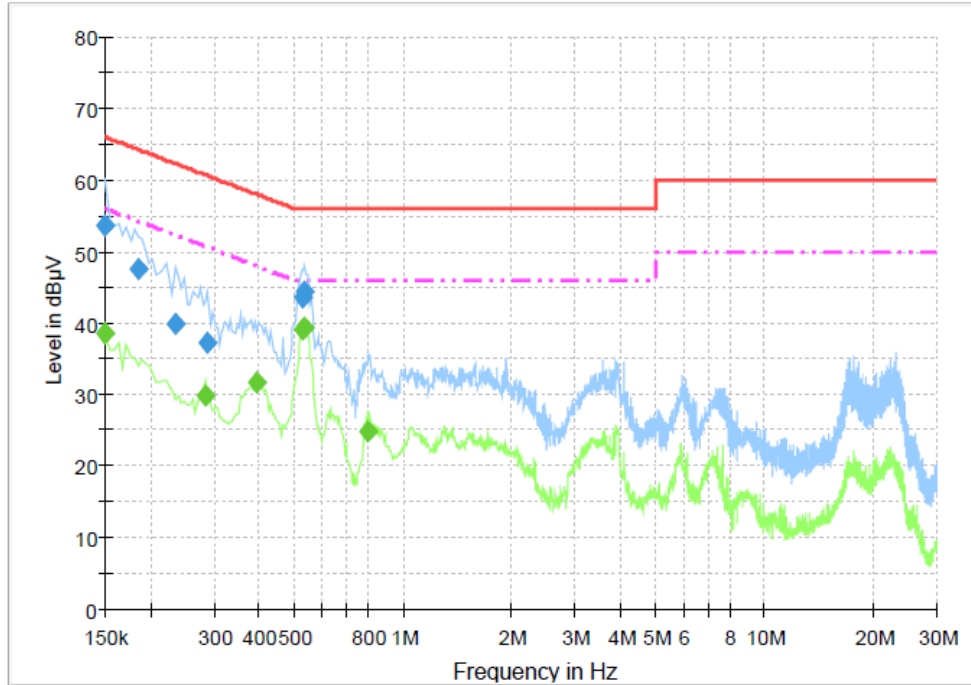
### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	54.2	1000.0	9.000	On	L1	9.7	11.8	66.0
0.195000	46.2	1000.0	9.000	On	L1	9.9	17.7	63.8
0.258000	39.3	1000.0	9.000	On	L1	9.6	22.2	61.5
0.393000	37.9	1000.0	9.000	On	L1	9.9	20.1	58.0
0.528000	44.0	1000.0	9.000	On	L1	9.9	12.0	56.0
0.537000	44.3	1000.0	9.000	On	L1	9.9	11.7	56.0

### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	39.5	1000.0	9.000	On	L1	9.7	16.5	56.0
0.199500	34.2	1000.0	9.000	On	L1	9.8	19.4	53.6
0.406500	31.8	1000.0	9.000	On	L1	9.9	15.9	47.7
0.532500	39.4	1000.0	9.000	On	L1	9.9	6.6	46.0
0.541500	39.2	1000.0	9.000	On	L1	9.9	6.8	46.0
0.811500	26.8	1000.0	9.000	On	L1	9.8	19.2	46.0

[NEUTRAL]  
3CE\_Class B\_N



**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	53.5	1000.0	9.000	On	N	9.8	12.5	66.0
0.186000	47.4	1000.0	9.000	On	N	9.9	16.8	64.2
0.235500	39.8	1000.0	9.000	On	N	9.7	22.5	62.3
0.289500	37.3	1000.0	9.000	On	N	9.8	23.3	60.5
0.528000	43.7	1000.0	9.000	On	N	9.9	12.3	56.0
0.537000	44.3	1000.0	9.000	On	N	9.9	11.7	56.0

**Final Result 2**

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	38.4	1000.0	9.000	On	N	9.8	17.6	56.0
0.285000	29.8	1000.0	9.000	On	N	9.8	20.8	50.7
0.393000	31.8	1000.0	9.000	On	N	9.9	16.2	48.0
0.528000	39.0	1000.0	9.000	On	N	9.9	7.0	46.0
0.537000	39.5	1000.0	9.000	On	N	9.9	6.5	46.0
0.802500	24.9	1000.0	9.000	On	N	9.8	21.1	46.0





**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-2022-00135  
 Page (73) / (73) Pages

## APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	Signal Analyzer	Agilent	N9020A	MY52090670	2021-10-21	2022-10-21
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2021-04-12	2022-04-12
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2021-10-20	2022-10-20
4	BILOG ANTENNA	TESEQ	CBL6111D	58490	2021-03-03	2023-03-03
5	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2020-05-20	2022-05-20
6	Attenuator	PASTERNAK	PE7047-6	NONE	2021-02-26	2022-02-26
7	6dB Attenuator	BIRD	5W 6dB	1744	2021-12-17	2022-12-17
8	AMPLIFIER	SONOMA	310	291721	2021-01-22	2022-01-22
9	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2022-01-11	2023-01-11
10	Horn Antenna	ETS-Lindgren	3117	00154525	2021-10-21	2022-10-21
11	Preamplifier	Agilent	8449B	3008A00464	2021-10-19	2022-10-19
12	Horn Antenna	SCHWARZBECK	BBHA9170	00967	2021-05-25	2022-05-25
13	Low Noise Amplifier	TESTEK	TK-PA1840H	200115-L	2021-05-21	2022-05-21
14	Band Reject Filter	Micro Tronics	BRM50716	G315	2021-10-08	2022-10-08
15	LISN	Rohde & Schwarz	ENV216	101236	2021-10-20	2022-10-20
16	EMI Test Receiver	Rohde & Schwarz	ESCI3	100032	2022-01-11	2023-01-11
17	Temp&Humi Chamber	ESPEC CORP.	SH-242	93008423	2022-05-03	2023-05-03
18	Power Meter	Anritsu	ML2488B	0924006	2022-10-12	2023-10-12
19	Wide Bandwidth Sensor	Anritsu	MA2491A	0845498	2022-10-13	2023-10-13

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (Conducted)	Junkosha Inc.	MWX221	1512S127	2021-11-25
2	RF Cable (Line Conducted)	Canare Corporation	L-5D2W	N/A	2021-10-20
3	RF Cable (9kHz-30MHz Radiated)	HUBER+SUHNER	NA	NA	2021-02-20
4	RF Cable (9kHz-1GHz Below Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2021-02-20
5	RF Cable (30MHz-1GHz Below Radiated)	HUBER+SUHNER	SUCOFLEX 104	N/A	2021-02-20
6	RF Cable (1GHz-18GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY2374/2	2021-02-20
7	RF Cable (1GHz-40GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY4728/2	2021-02-20
8	RF Cable (18GHz-40GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	803010/2	2021-10-27