



Report No.:

TW2306621-01E

File reference No.:

2023-07-21

Applicant:

Autel Robotics Co., Ltd.

601, 701, 801, 901, Block B1, Nanshan iPark, No. 1001 Xueyuan Avenue,
Nanshan District, Shenzhen, Guangdong, 518055, China

Product:

Nest

Model No.:

Nest

Trademark:

Autel Robotics

Test Standards:

FCC Part 15.247 & ANSI C63.10-2013

RSS-247, Issue 2, Feb. 2017

RSS-Gen, Issue 5, Amendment 2, Feb. 2021

Test result:

It is herewith confirmed and found to comply with the
requirements set up by ANSI C63.10, FCC Part 15.247 and
RSS-247 for the evaluation of electromagnetic compatibility

Approved By:

Terry Tang

Terry Tang

Manager



Dated:

July 21, 2023

Results appearing herein relate only to the sample tested

**The technical reports is issued errors and omissions exempt and is subject to
withdrawal at**

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le
Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com



Special Statement:

The testing quality ability of our laboratory meet with “Quality Law of People’s Republic of China” Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAL. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAL-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAL/AC01:2002 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

CAB identifier: CN0033

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1.0 General Details

1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TESTING LABORATORIES.
Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China
Telephone: (755) 83448688
Fax: (755) 83442996
Site Listed with Federal Communications commission (FCC)
Registration Number: 744189
For 3m Anechoic Chamber
Site Listed with Industry Canada of Ottawa, Canada
Registration Number: IC: 5205A
CAB identifier: CN0033
For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: Autel Robotics Co., Ltd.
Address: 601, 701, 801, 901, Block B1, Nanshan iPark, No. 1001 Xueyuan Avenue, Nanshan District, Shenzhen, Guangdong, 518055, China
Telephone: --
Fax: --

1.3 Description of EUT

Product: Nest
Manufacturer: Autel Robotics Co., Ltd.
Address: 601, 701, 801, 901, Block B1, Nanshan iPark, No. 1001 Xueyuan Avenue, Nanshan District, Shenzhen, Guangdong, 518055, China
Trademark: Autel Robotics
Model Number: Nest
Additional Model Number: N/A
Hardware Version: N/A
Software Version: N/A
Serial No.: N/A
Rating: DC 12V
Type of Modulation: IEEE 802.11b: DSSS (CCK, QPSK, DBPSK)
IEEE 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
900M/2.4G transfer image: QPSK, 16QAM

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Frequency range 2400-2483.5MHz; 902-928MHz
Air Data Rate IEEE 802.11b: 11, 5.5, 2, 1 Mbps
IEEE 802.11g: 54, 48,36, 24, 18, 12, 9, 6 Mbps
IEEE 802.11n: mcs0-mcs7
Antenna: 2.4G wifi
FPC antenna gain: 6.7dBi
900M transfer image
External antenna gain: 5dBi;
PCB antenna gain: 3.1dBi
2.4G transfer image
External antenna gain: 5dBi;
PCB antenna gain: 3.3dBi

1.4 Sample No.: 2306621-1

1.5 Test Duration

2023-06-22 to 2023-07-13

1.6 Channel List

802.11b/g/n20: 11channel

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400MHz ~ 2483.5MHz	01	2412MHz	08	2447MHz
	02	2417MHz	09	2452MHz
	03	2422MHz	10	2457MHz
	04	2427MHz	11	2462MHz
	05	2432MHz	/	/
	06	2437MHz	/	/
	07	2442MHz	/	/

900M 1.4MHz: 23channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	904	12	916
2	905		
.....			
.....		22	925
11	915	23	926

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900M 10MHz: 13channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	909	8	916
2	910		
.....			
.....		12	920
7	915	13	921

900M 20MHz: 3channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	914	/	/
2	915	/	/
3	916	/	/

2.4G 1.4MHz: 73channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2403.5	36	2439.5
2	2404.5		
.....			
.....		72	2474.5
35	2438.5	73	2475.5

2.4G 10MHz: 65channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2407.5	33	2439.5
2	2408.5		
.....			
.....		64	2470.5
32	2438.5	65	2471.5

2.4G 20MHz: 51channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412.5	33	2437.5
2	2413.5		
.....			
.....		50	2461.5
25	2436.5	51	2462.5

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For Power Setting value

For 900M transfer image and 2.4G transfer image

Test Mode	Power Level Setting defined by Manufacturer		
Test software	RRTL6.0.0_VCOM		
Frequency (MHz)	904	915	926
QPSK 1.4MHz	Default	Default	Default
16QAM 1.4MHz	Default	Default	Default
Frequency (MHz)	909	915	921
QPSK 10MHz	Default	Default	Default
16QAM 10MHz	Default	Default	Default
Frequency (MHz)	914	915	916
QPSK 20MHz	Default	Default	Default
16QAM 20MHz	Default	Default	Default
Frequency (MHz)	2403.5	2438.5	2475.5
QPSK 1.4MHz	Default	Default	Default
16QAM 1.4MHz	Default	Default	Default
Frequency (MHz)	2407.5	2438.5	2471.5
QPSK 10MHz	Default	Default	Default
16QAM 10MHz	Default	Default	Default
Frequency (MHz)	2412.5	2436.5	2462.5
QPSK 20MHz	Default	Default	Default
16QAM 20MHz	Default	Default	Default

For 2.4G Wifi

Test Mode	Power Level Setting defined by Manufacturer		
Test software	SecureCRT		
Frequency (MHz)	2412	2442	2462
802.11b	Default	Default	Default
802.11g	Default	Default	Default
802.11n20	Default	Default	Default

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1.7 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions below 1GHz Uncertainty =4.7dB

Radiated Emissions above 1GHz Uncertainty =6.0dB

Conducted Power Uncertainty =6.0dB

Power Spectral Density=0.61dB

RF Conducted Spurious Emission=1.2dB

Occupied Channel Bandwidth Uncertainty =5%

Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.8 Test Engineer

The sample tested by

— Andy

Print Name: Andy Xing



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2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2022-07-15	2023-07-14
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2022-07-18	2023-07-17
Loop Antenna	EMCO	6507	00078608	2022-07-18	2025-07-17
Spectrum	R&S	FSIQ26	100292	2022-07-15	2023-07-14
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2022-07-18	2025-07-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2022-07-18	2024-07-17
Power meter	Anritsu	ML2487A	6K00003613	2022-07-18	2023-07-17
Power sensor	Anritsu	MA2491A	32263	2022-07-18	2023-07-17
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2022-07-18	2025-07-17
9*6*6 Anechoic	--	--	N/A	2022-07-26	2025-07-25
EMI Test Receiver	RS	ESVB	826156/011	2022-07-15	2023-07-14
EMI Test Receiver	RS	ESCS 30	834115/006	2022-07-15	2023-07-14
Spectrum	HP/Agilent	E4407B	MY50441392	2022-07-15	2023-07-14
Spectrum	RS	FSP	1164.4391.38	2022-07-15	2023-07-14
RF Cable	Zhengdi	ZT26-NJ-NJ-8 M/FA	--	2022-07-15	2023-07-14
RF Cable	Zhengdi	7m	--	2022-07-15	2023-07-14
Pre-Amplifier	Schwarebeck	BBV9743	#218	2022-07-15	2023-07-14
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2022-07-15	2023-07-14
LISN	SCHAFFNER	NNB42	00012	2022-08-18	2023-07-17
ESPI Test Receiver	R&S	ESPI 3	100379	2022-07-15	2023-07-14
LISN	R&S	EZH3-Z5	100294	2022-07-18	2023-07-17
LISN	R&S	EZH3-Z5	100253	2022-07-18	2023-07-17
2.4G band-pass filter	Micro-Tronics	BRM50701	SN-041	2022-07-18	2023-07-17

2.2 Automation Test Software

For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

For Radiated Emissions

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

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3. DESCRIPTION OF TEST MODES

IEEE 802.11b, 802.11g, 802.11n (HT20) mode

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode: 1Mbps data rate (worst case) was chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) was chosen for full testing. IEEE 802.11n mode: mcs0 (worst case) were chosen for full testing;

900M 1.4MHz

Channel	Frequency (MHz)
Low	904
Middle	916
High	926

900M 10MHz

Channel	Frequency (MHz)
Low	909
Middle	915
High	921

900M 20MHz

Channel	Frequency (MHz)
Low	914
Middle	915
High	916

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2.4G 1.4MHz

Channel	Frequency (MHz)
Low	2403.5
Middle	2439.5
High	2475.5

2.4G 10MHz

Channel	Frequency (MHz)
Low	2407.5
Middle	2439.5
High	2471.5

2.4G 20MHz

Channel	Frequency (MHz)
Low	2412.5
Middle	2439.5
High	2462.5

There are two modulation type provided to the EUT: QPSK and 16QAM. For radiated emission test and restricted band test, only the worst case was recorded in the test report. And QPSK modulation was the worst case.

Note: During the test, the duty cycle was set up to 100%

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3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:			
Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.203 RSS-Gen 6.8	Antenna Requirement	Pass	Complies
FCC Part 15, Paragraph 15.207 RSS-Gen 8.8	Conducted Emission Test	N/A	N/A
FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit RSS-247 Section 5.2 a)	Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth > 500kHz	Pass	Complies
FCC Part 15, Paragraph 15.247(b) RSS-247 Section 5.4 d)	Maximum peak output power Limit: max. 30dBm	Pass	Complies
FCC Part 15, Paragraph 15.109, 15.205 & 15.209 RSS-Gen Clause 8.9	Transmitter Radiated Emission Limit: Table 15.209	Pass	Complies
FCC Part 15, Paragraph 15.247(e) RSS-247 Section 5.2 b)	Power Spectral Density Limit: max. 8dBm/3kHz	Pass	Complies
FCC Part 15, Paragraph 15.247(d) RSS-247 Section 5.5) and RSS-Gen Clause 8.10	Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209	Pass	Complies

3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247 & ANSI C63.10-2013
RSS-247, Issue 2, Feb. 2017 & RSS-Gen, Issue 5, Amendment 2, Feb. 2021
KDB 662911 D01 Multiple Transmitter Output v02r01

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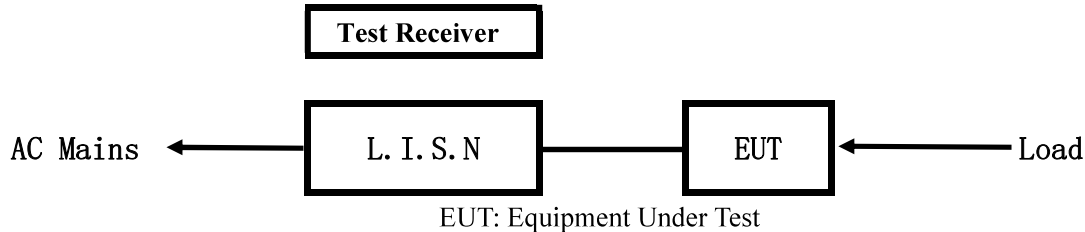


4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

5.0 Power Line Conducted Emission Test

5.1 Schematics of the test

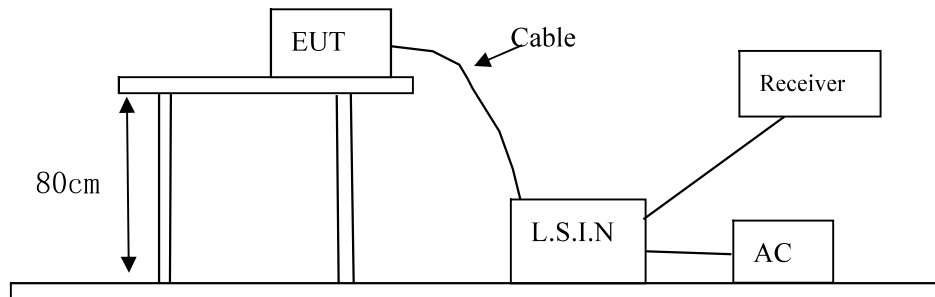


5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10 –2013.

Test Voltage: DC12V

Block diagram of Test setup



5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
N/A			

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	Rating
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N/A			
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5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

- A Setup the EUT and simulators as shown on follow
- B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

- Notes:
- 1. *Decreasing linearly with logarithm of frequency.
 - 2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

N/A

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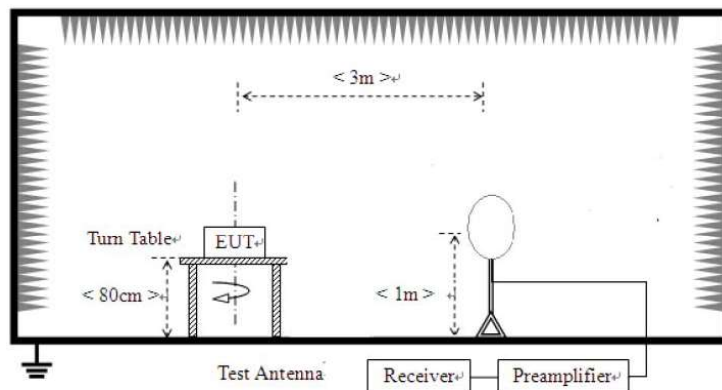
6.0 Radiated Emission Test

6.1 Test Method and test Procedure:

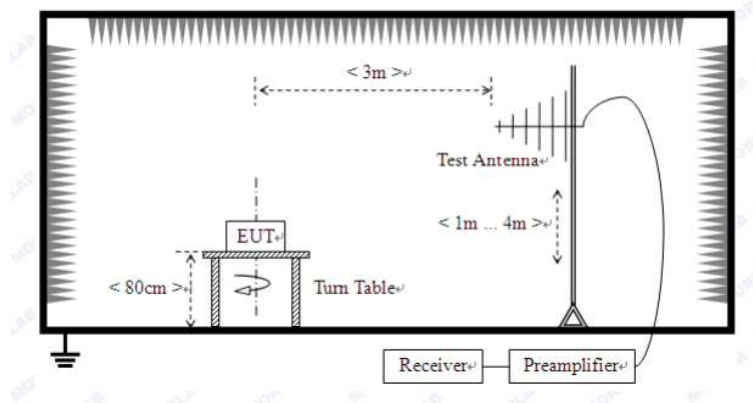
- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.
- (3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=1MHz VBW=3MHz and PK detector. AV value with RBW=1MHz, VBW=3MHz and RMS detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.

Block diagram of Test setup

For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to 1GHz



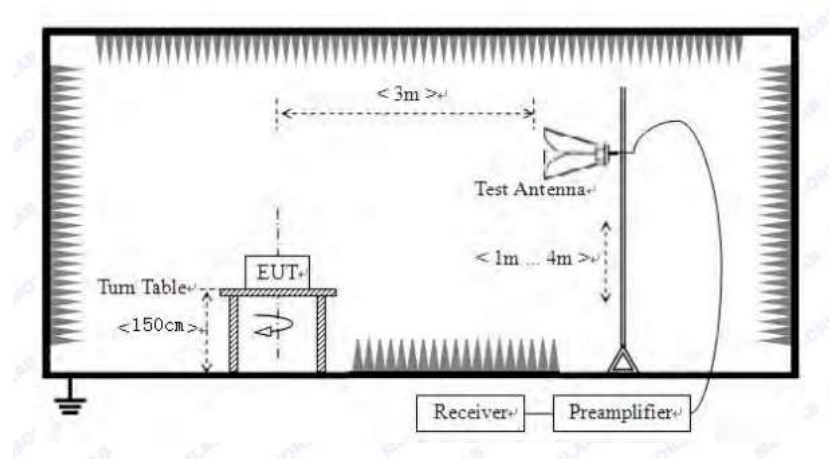
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For radiated emissions above 1GHz



6.2 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
0.009-0.049	3	$20\log(2400/F(\text{kHz})) + 40\log(300/3)$
0.490-1.705	3	$20\log(24000/F(\text{kHz})) + 40\log(30/3)$
1.705-30	3	69.5
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
1. RF Voltage (dBuV) = $20 \log$ RF Voltage (μ V)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
 4. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz.As to 1G-25G, the final emission level got using PK. For fundamental measurement, PK detector used.
 5. For radiated emissions from 9kHz to 30MHz, the emission level is much less than the limit for more than 20dB. No necessary to take down the record.
 6. For radiated emissions from 30MHz to 1000MHz, Worst case were recorded in the test report.
 7. For transfer image mode, worst case for mimo mode was recorded for PCB ant and External ant.

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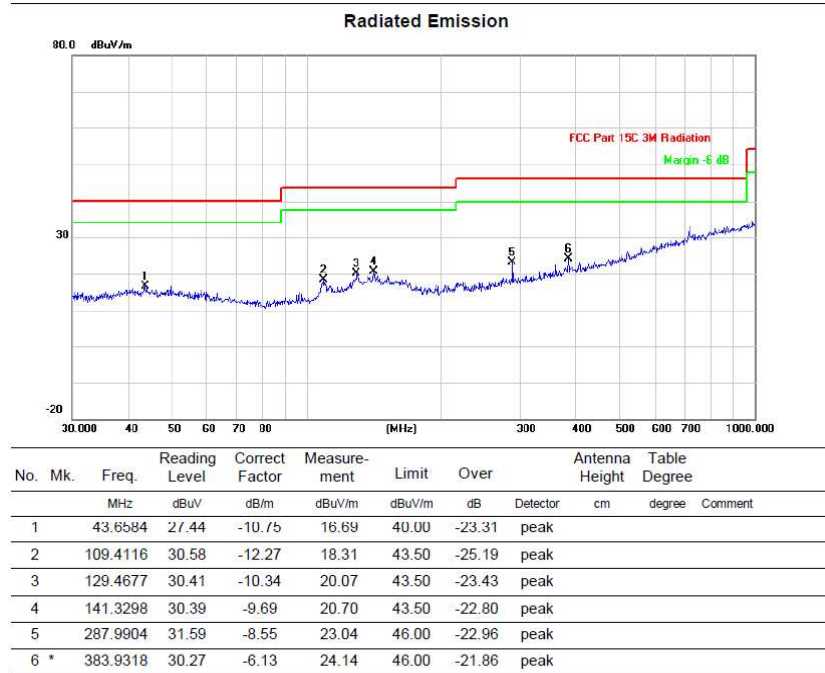


Test result

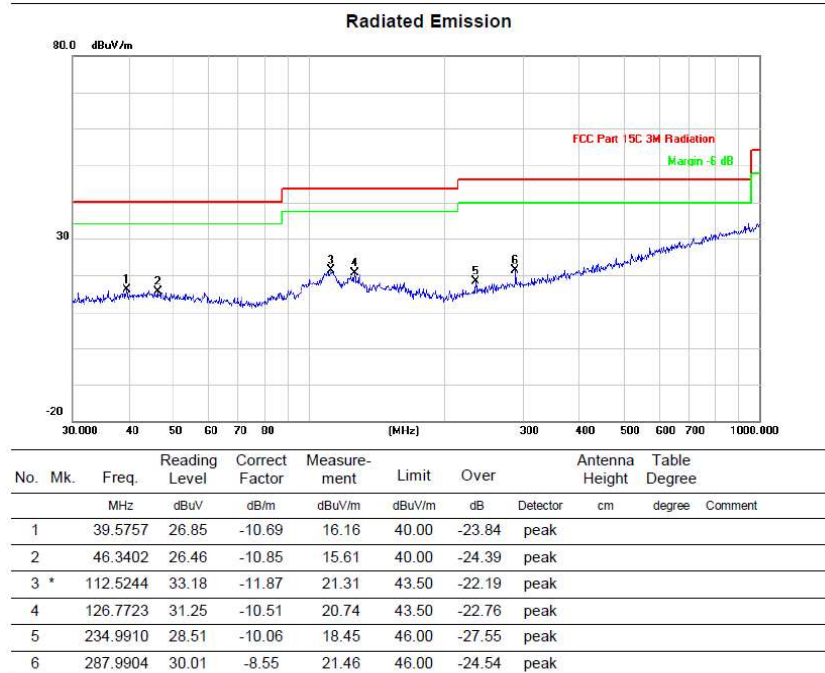
30MHz-1000MHz

For 2.4G wifi: worst case for 802.11b channel 1

Horizontal



Vertical



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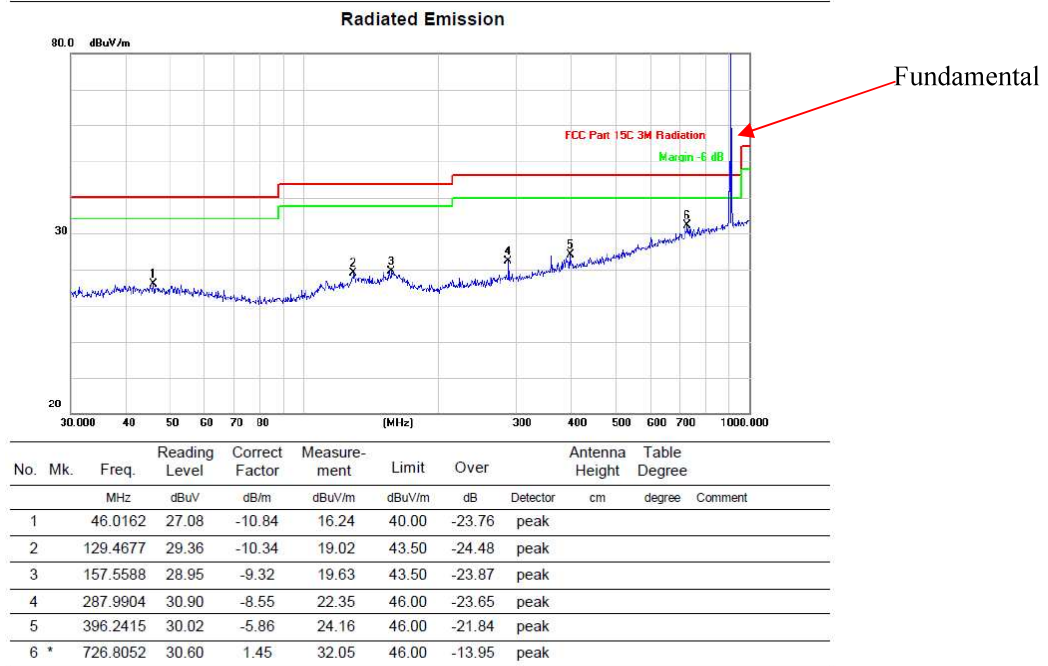
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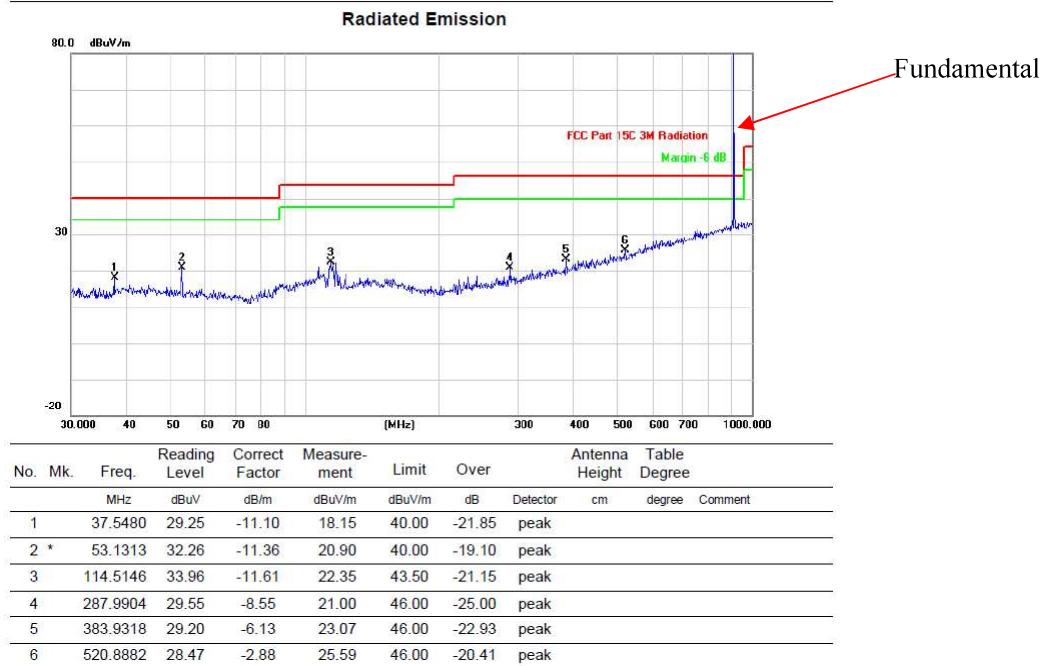


For 900M transfer image: worst case for 900M 1.4MHz channel 1
For external antenna

Horizontal



Vertical



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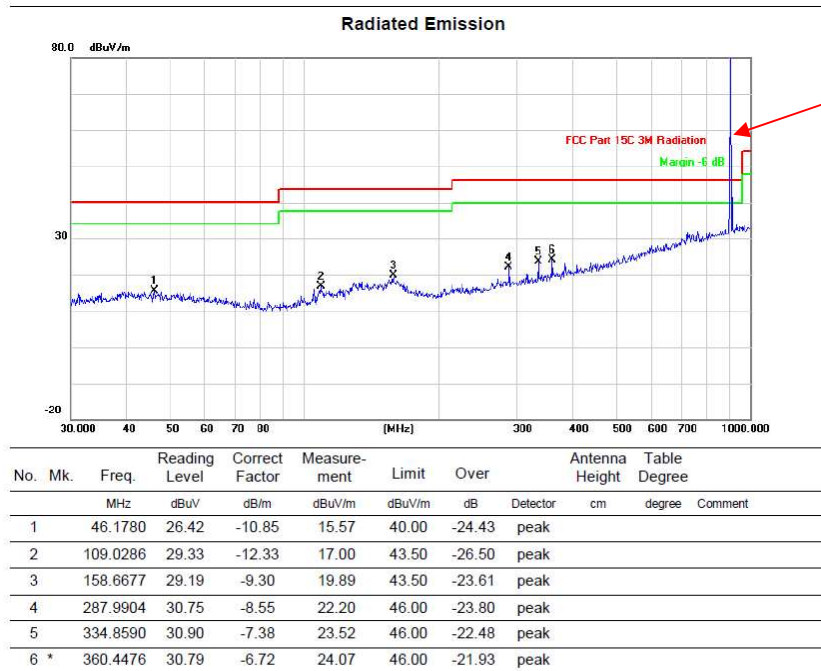
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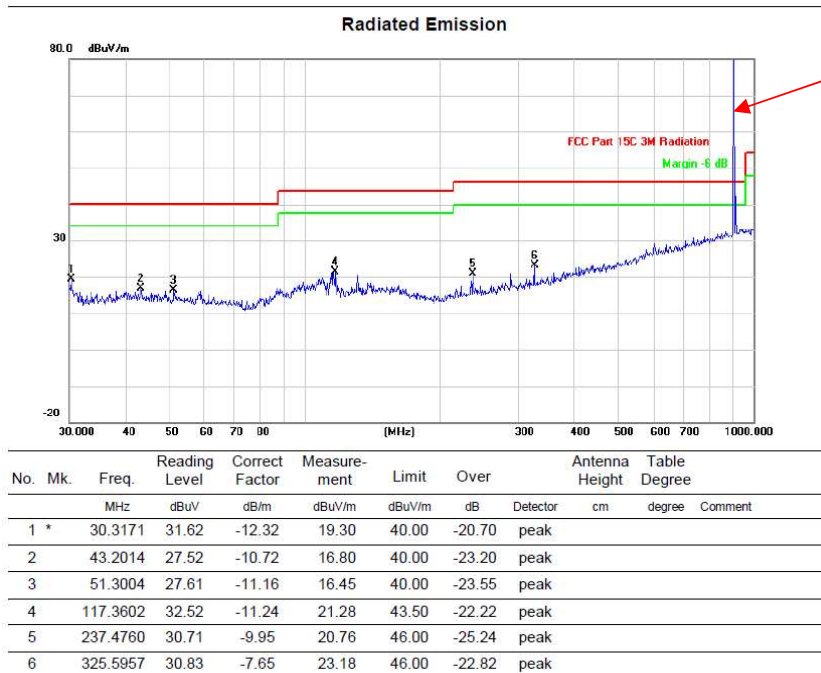


For PCB antenna

Horizontal



Vertical



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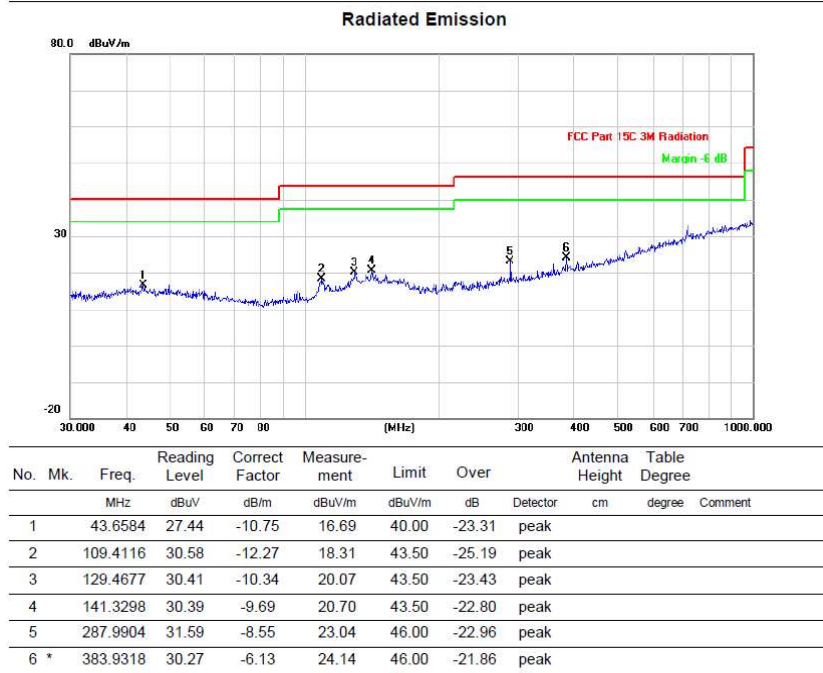
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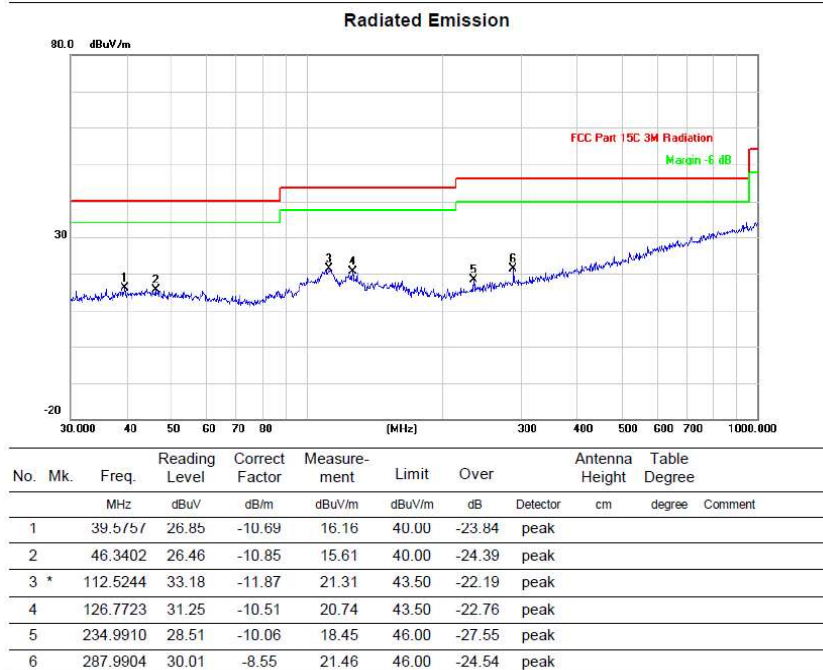


For 2.4G transfer image: worst case for 2.4G 1.4MHz channel 1
For external antenna

Horizontal



Vertical



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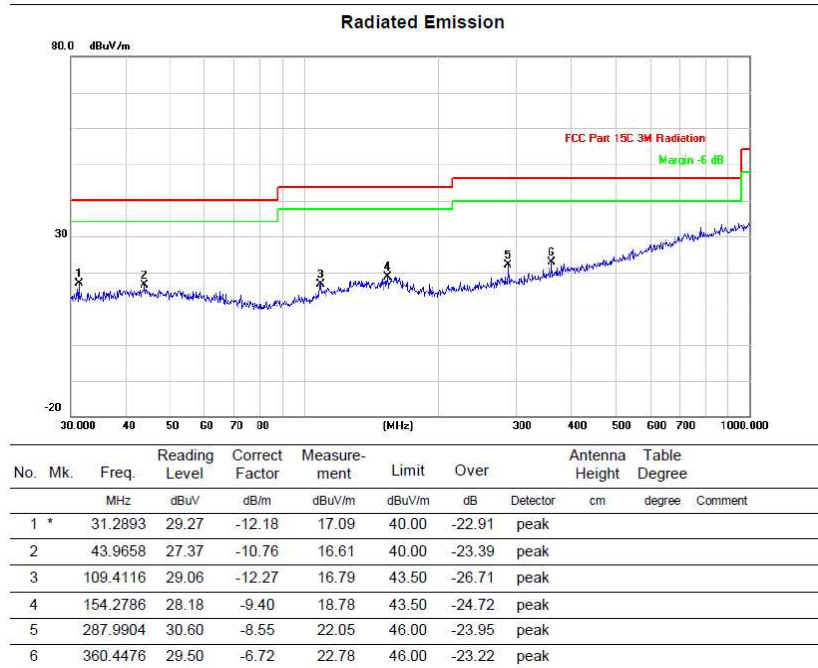
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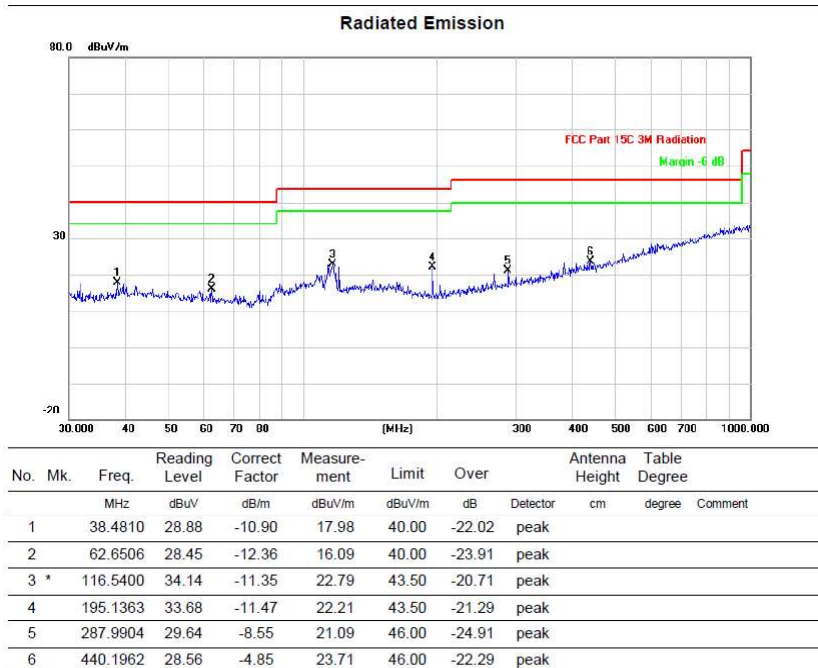


For PCB antenna

Horizontal



Vertical



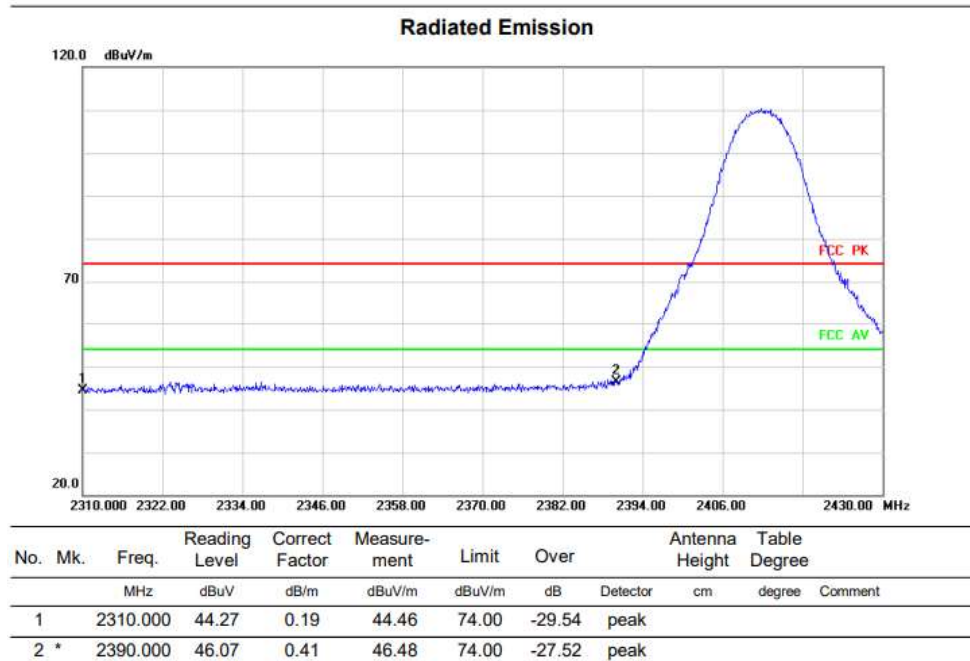
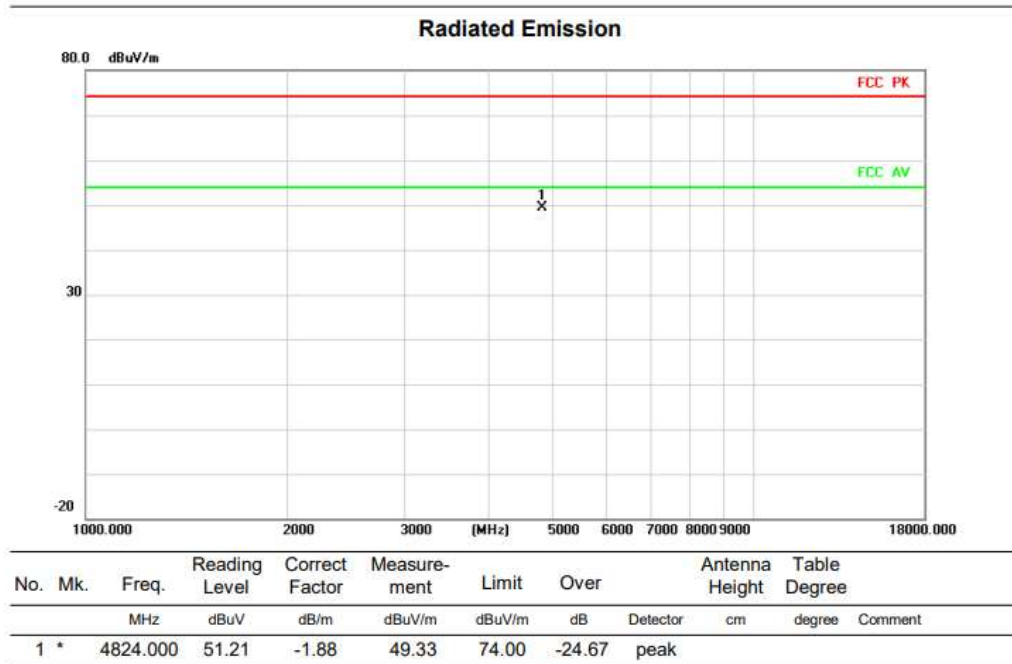
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Above 1GHz
For 2.4G WIFI
11B channel 1: Horizontal



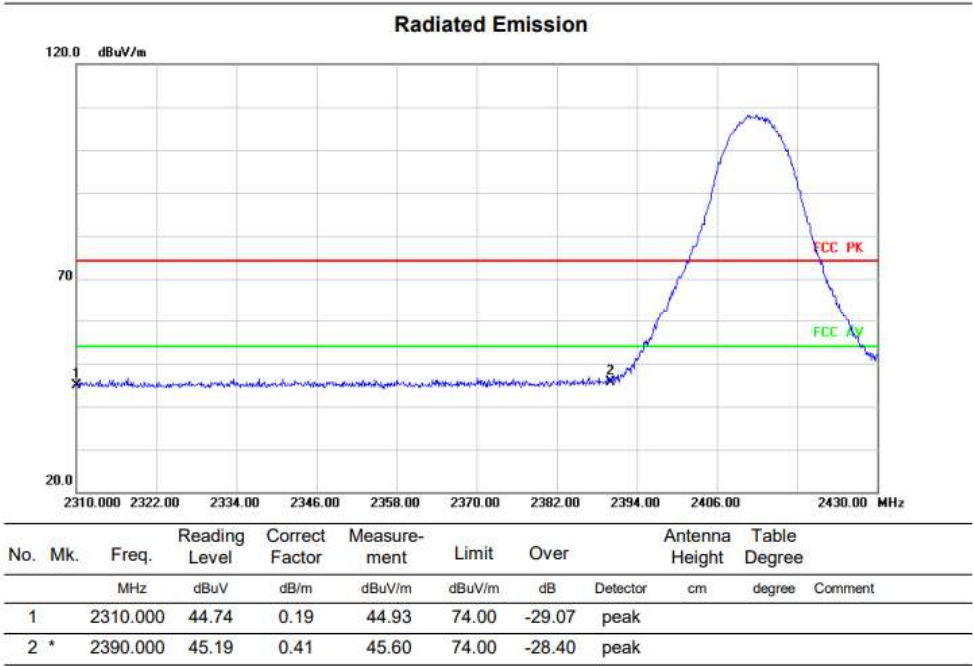
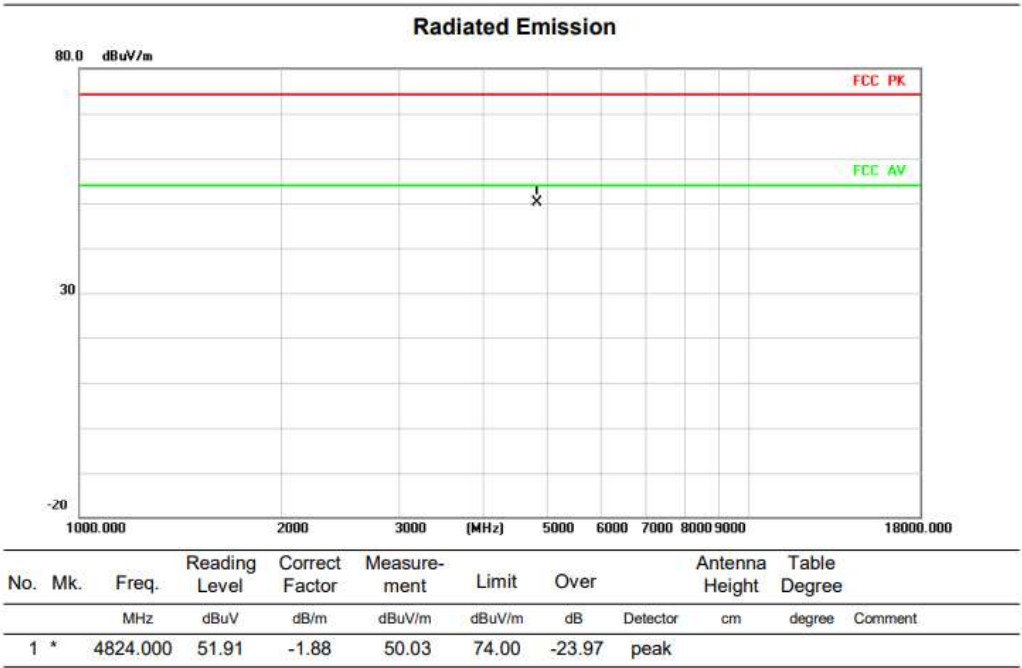
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11B channel 1: Vertical



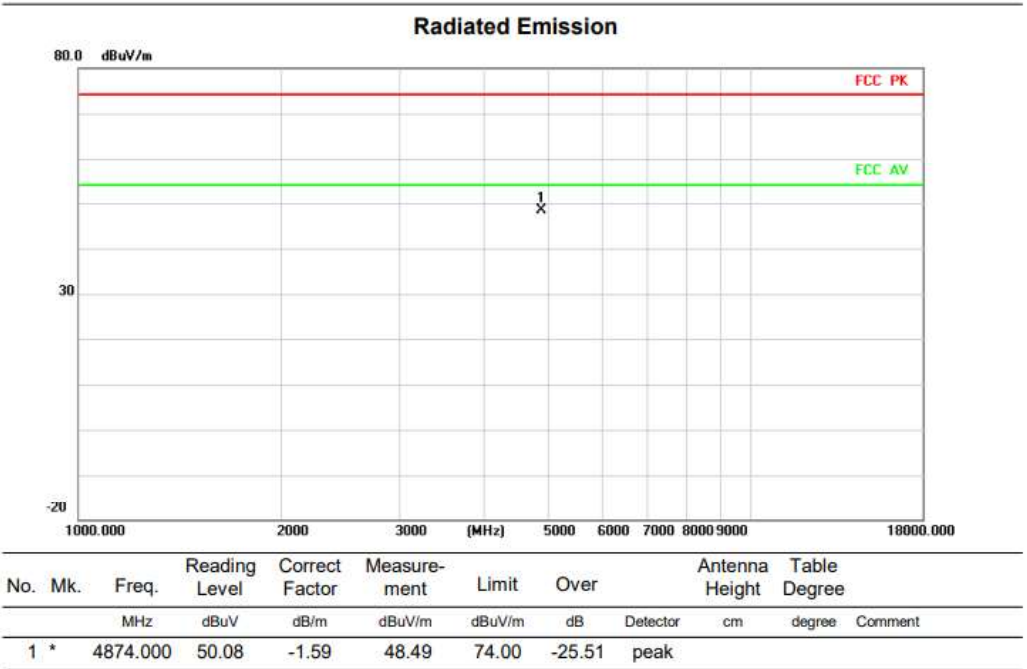
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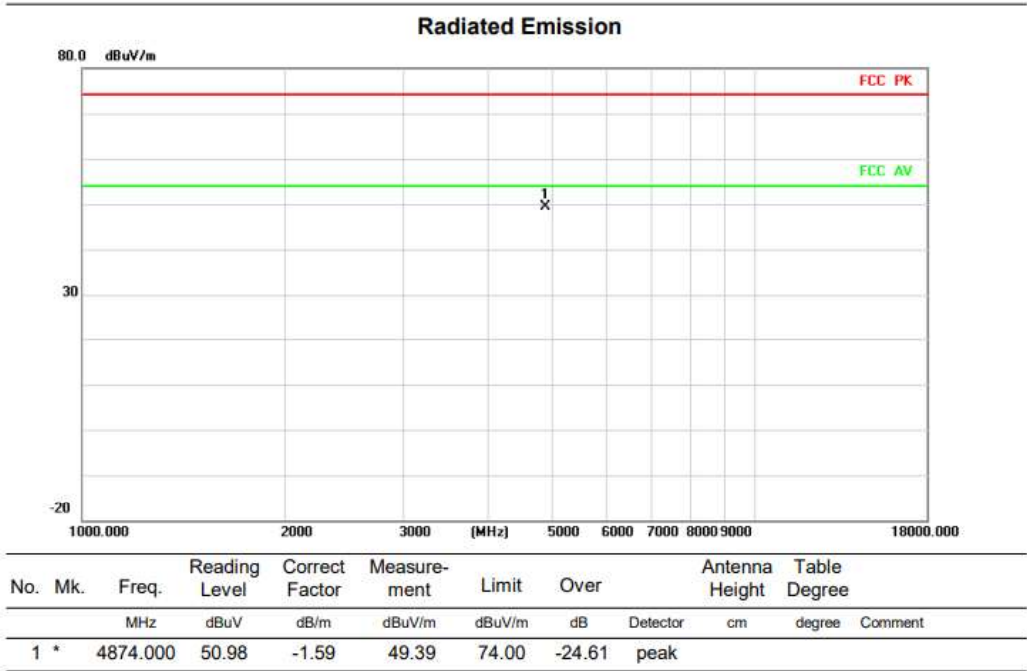
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11B channel 6: Horizontal



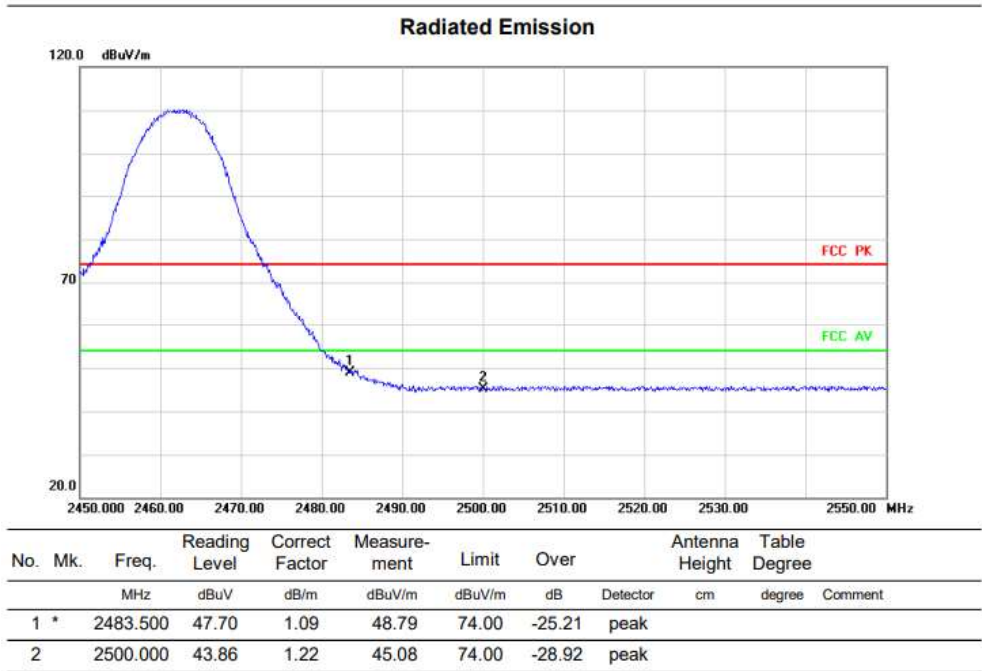
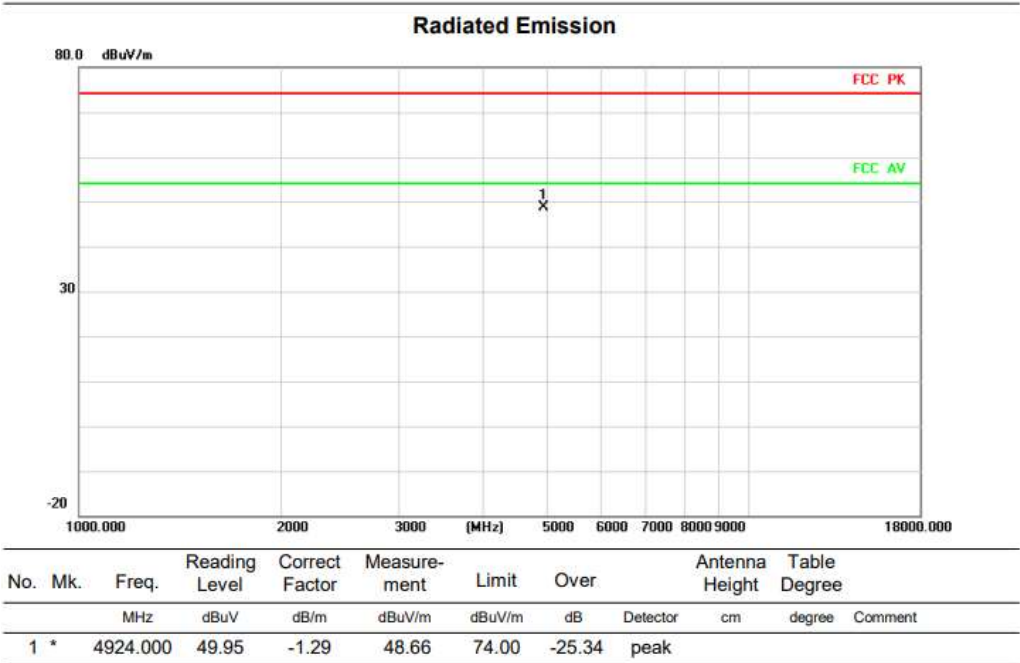
11B channel 6: Vertical



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11B channel 11: Horizontal



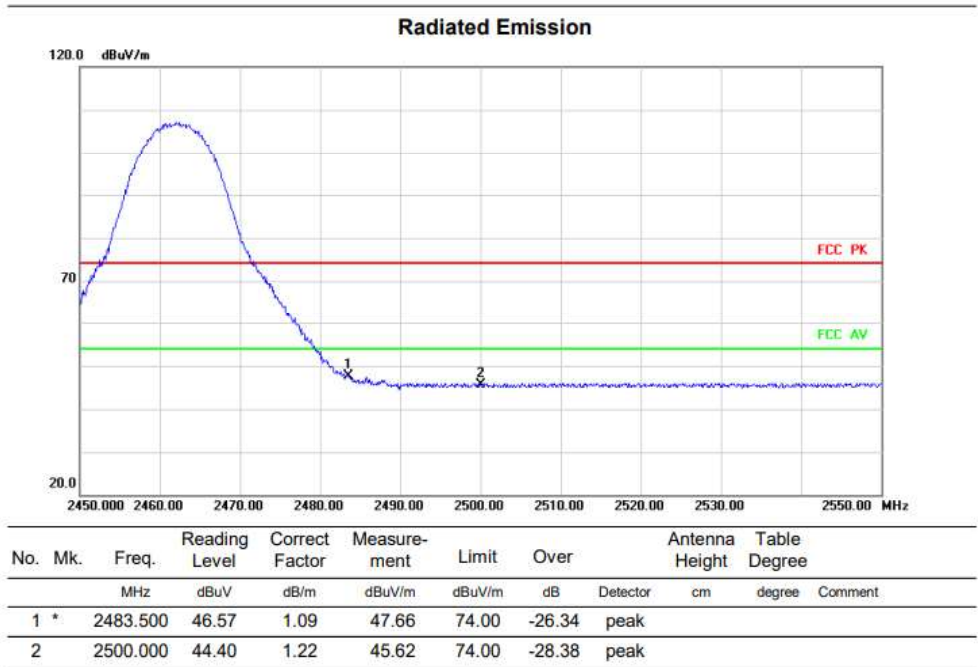
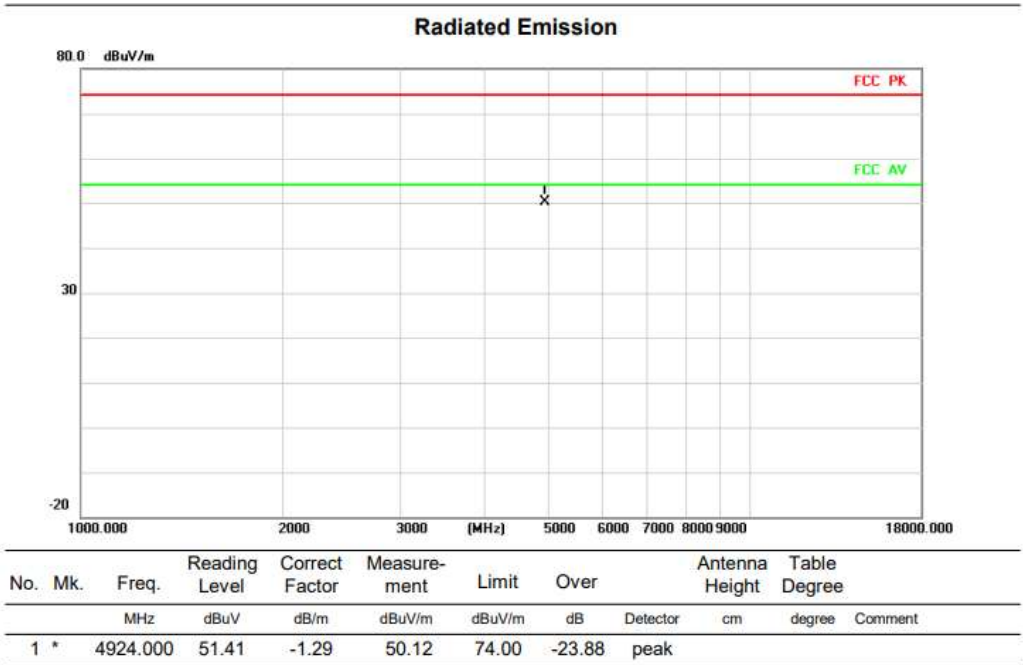
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11B channel 11: Vertical



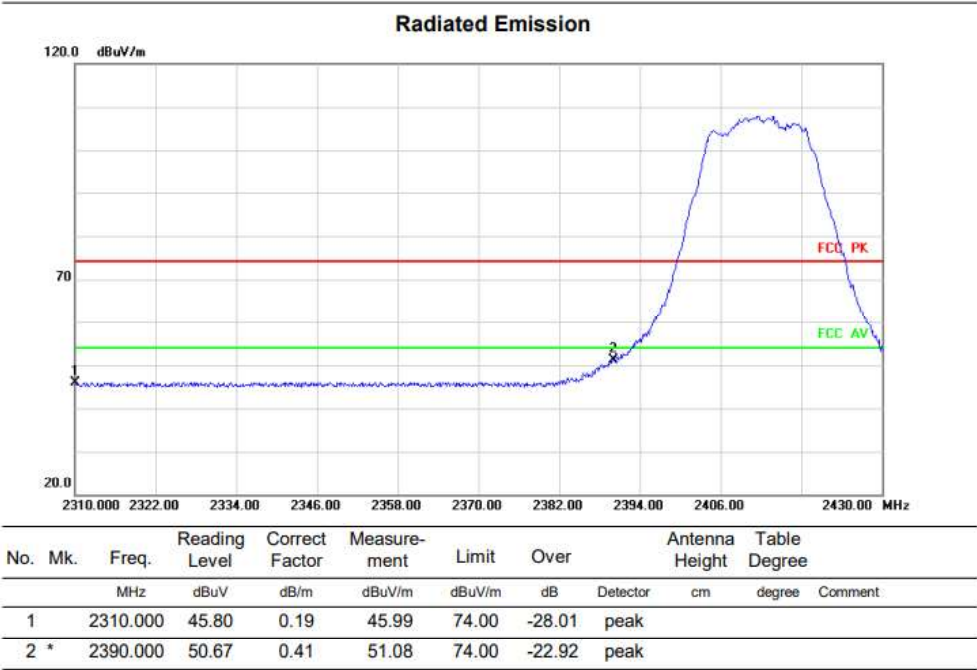
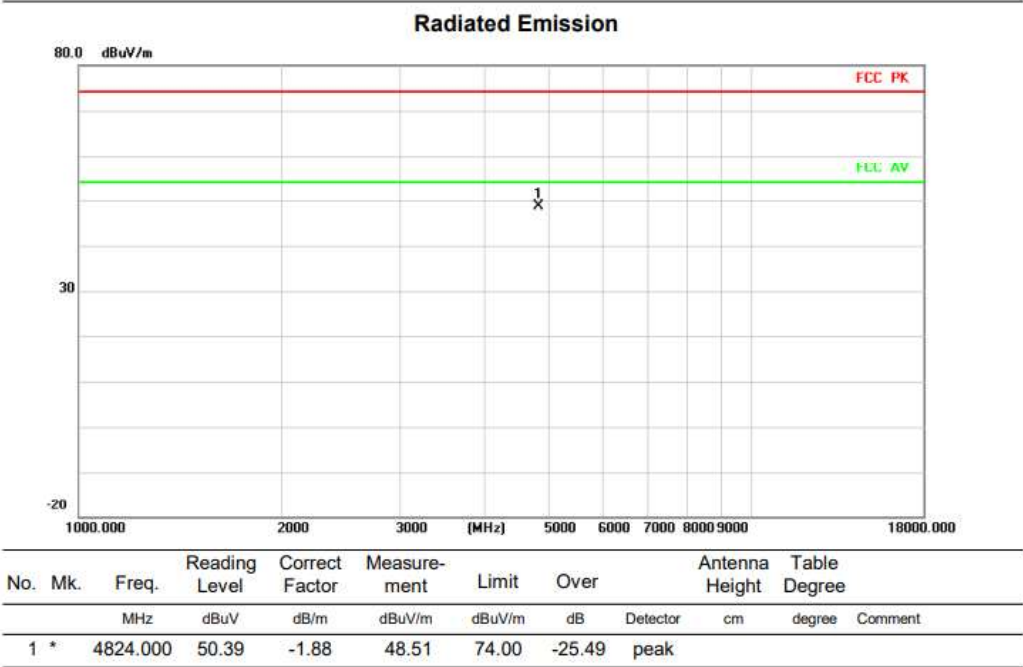
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11G channel 1: Horizontal



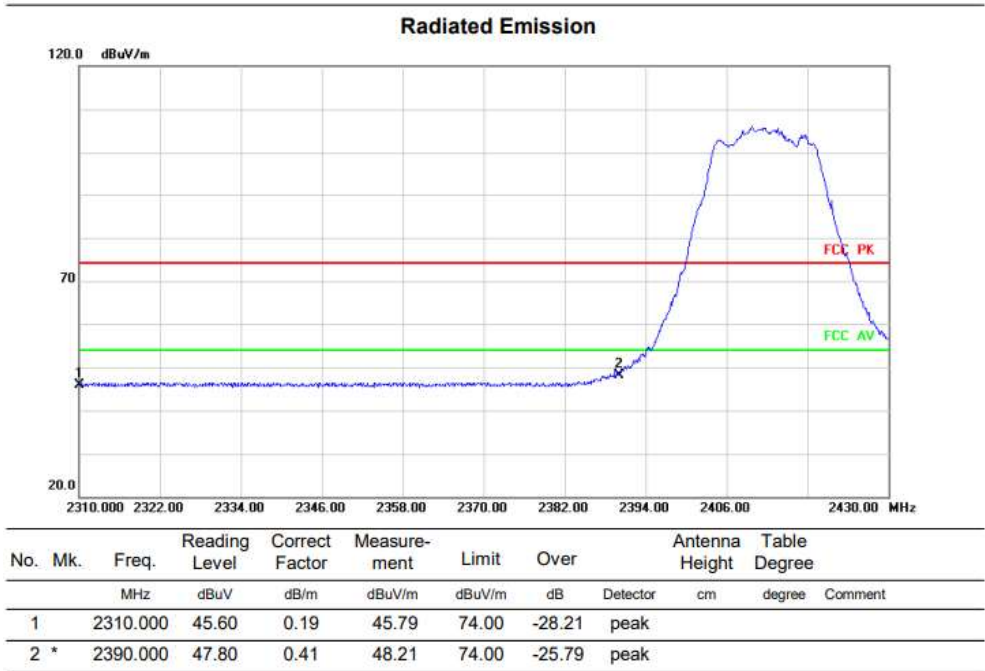
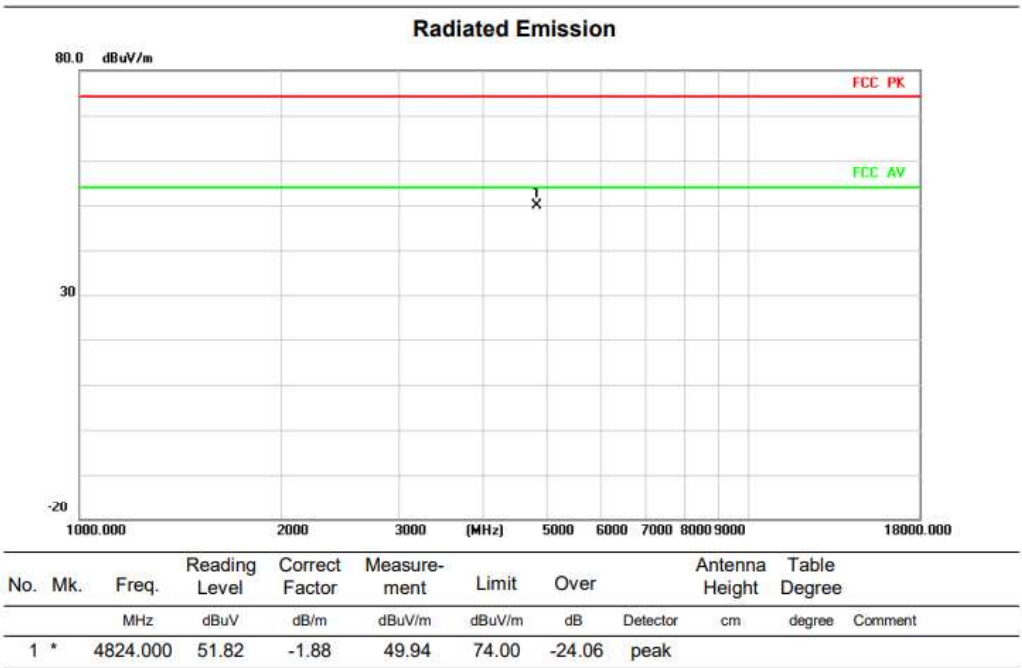
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11G channel 1: Vertical



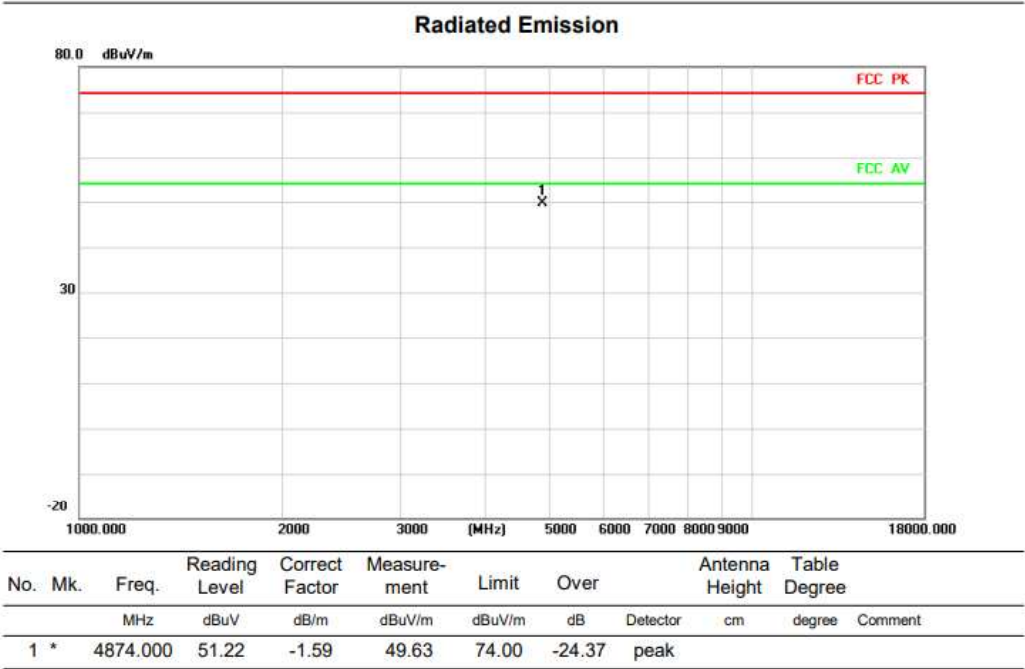
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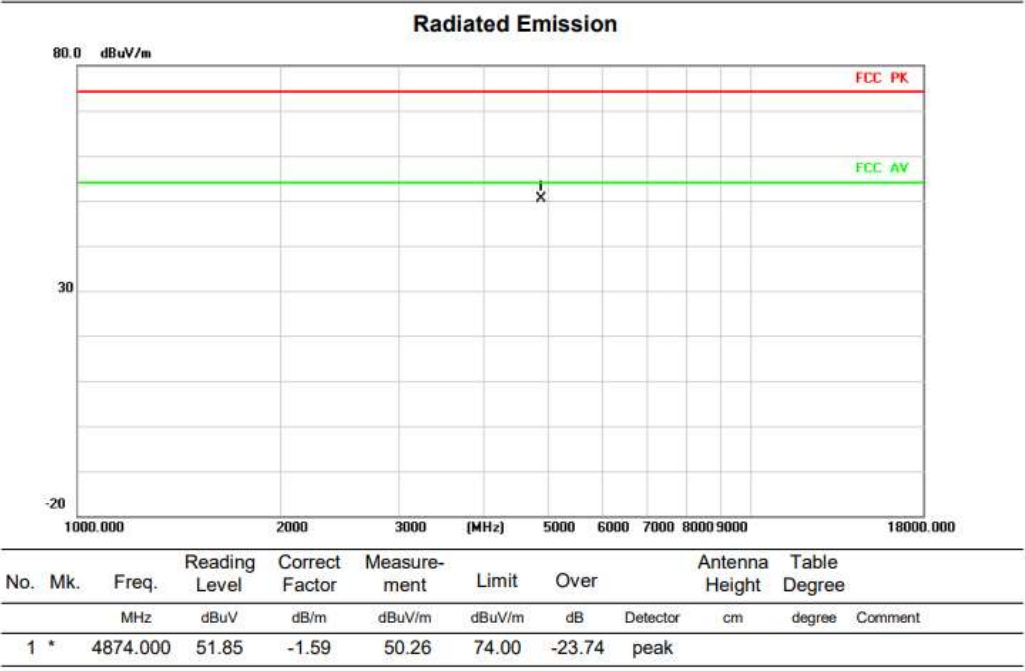
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11G channel 6: Horizontal



11G channel 6: Vertical



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