FCC RADIO TEST REPORT
FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.231+ IC RSS-210 Issue 10**
Trade name	**Continental**
Product name	**Tire Pressure Monitor Sensor**
Model No.	**TIS-10DL**
Operation Freq.	**315 MHz**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of SGS Compliance Certification Services Inc. (Wugu Laboratory)

Approved by:

Kevin Tsai
Deputy Manager

Revision History

Rev.	Issue Date	Revisions	Effect page	Revised By
00	May 21, 2021	Initial Issue Note (01)	ALL	Doris Chu
01	August 17, 2021	See the following Note Rev. (01)	ALL	Doris Chu

Note (01)

1. Applicant change LF coil pad size, Battery hole enlargement, as per customer requested to verify radiated test data below 1GHz, above 1GHz.

Rev. (01)

1. SW change of data rate & change the averaging factor to -13.5dB, and only re-test duty cycle and radiation.
2. Other information, please refer to the T210406W05 and this test report.

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

FCC Applicant / Manufacturer	Continental Automotive GmbH Siemensstrasse 12 SV C TS RBG EMC-Laboratory Regensburg, 93055 Germany
IC Applicant / Manufacturer	Continental Automotive GmbH Siemensstrasse 12 Regensburg 93055 Germany (Federal Republic Of)
Equipment	Tire Pressure Monitor Sensor
Model Name	TIS-10DL
Model Discrepancy	N/A
Original EUT Receive Date	April 6, 2021
1st Update Received Date	July 12, 2021
Original Date of Test	April 20 ~ May 7, 2021
1st Update Date of Test	August 5, 2021
Periodic operation	☐ (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. ☐ (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation ☐ (3) Periodic transmissions at regular predetermined intervals are not permitted. ☒ (4) Periodic transmissions (lower field strength): each transmission is not greater than 1 sec and the silent period between transmissions is at least 30 times the duration of the transmission but in no case less than 10 sec.
Power Operation	DC 3V (Power by Battery)
Operation Frequency	315 MHz
S/W Version	N/A
H/W Version	N/A
EUT serial #	0001

Remark:

1. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

1.2 EUT CHANNEL INFORMATION

Frequency Range	315 MHz
Modulation Type	FSK & ASK
Number of Channels	1 channel

Remark:
Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	**Number of frequencies**	**Location in frequency range of operation**
☒ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☐ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Type	Integral antenna
Antenna Gain	-22 dBi
Antenna Connector	N/A

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87

Remark:
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)
CABID: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	-	Not applicable, because EUT doesn't connect to AC Main Source direct.
Radiation	Ray Li, Jerry Chang	-
RF Conducted	Jerry Chang	-

Remark: The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 INSTRUMENT CALIBRATION

Original:

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	07/24/2020	07/23/2021
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/25/2021	02/24/2022
Coaxial Cable	EMCI	EMC105	190914+327109/4	09/19/2020	09/18/2021
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/06/2021	01/05/2022
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	09/30/2020	09/29/2021
High Pass Filter	SOLVANG TECHNOLOGY INC.	STI15	9923	02/25/2021	02/24/2022
Loop Ant	COM-POWER	AL-130	121051	04/07/2021	04/06/2022
Pre-Amplifier	EMEC	EM330	060609	02/25/2021	02/24/2022
Pre-Amplifier	HP	8449B	3008A00965	02/25/2021	02/24/2022
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	07/24/2020	07/23/2021
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180413				

Remark: Each piece of equipment is scheduled for calibration once a year.

Update:

RF Conducted Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Signal Analyzer	R&S	FSV 40	101073	09/16/2020	09/15/2021
Software	N/A				

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	07/19/2021	07/18/2022
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/25/2021	02/24/2022
Coaxial Cable	EMCI	EMC105	190914+327109/4	09/19/2020	09/18/2021
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/06/2021	01/05/2022
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	09/30/2020	09/29/2021
High Pass Filter	SOLVANG TECHNOLOGY INC.	STI15	9923	02/25/2021	02/24/2022
Loop Ant	COM-POWER	AL-130	121051	04/07/2021	04/06/2022
Pre-Amplifier	EMEC	EM330	060609	02/25/2021	02/24/2022
Pre-Amplifier	HP	8449B	3008A00965	02/25/2021	02/24/2022
Signal Analyzer	R&S	FSV 40	101073	09/17/2020	09/16/2021
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180413				

Remark: Each piece of equipment is scheduled for calibration once a year.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

There are no accessories and support equipment be used during the test.

EUT Accessories Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

Support Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC 15.231, IC RSS-210, IC RSS-Gen Rules.

2. TEST SUMMARY

FCC Standard Sec.	IC Standard Sec.	Chapter	Test Item	Result
15.203	RSS-GEN Sec. 8.3	1.3	Antenna Requirement	Pass
15.207	RSS-GEN Sec. 8.8	4.1	AC Power-line Conducted Emission	Not applicable
15.231(c)	RSS-210 A.1.3	4.2	Emission Bandwidth	Not applicable
15.231(b)	RSS-210 A.1.4	4.3	Field Strength of Fundamental	Pass
15.209(b)	RSS-GEN Sec. 8.9	4.4	Transmitter Radiated Emission	Pass
15.231(a)(1)	RSS-210 A.1.2	4.5	Operation Restriction	Not applicable

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	315 MHz
RF Filed strength	**Original:** **FSK** Peak: 75.16 dBuv/m Average : 56.08 dBuv/m **Update:** **FSK** Peak: 75.39 dBuv/m Average : 62.12 dBuv/m **ASK** Peak: 75.34 dBuv/m Average : 62.07 dBuv/m

Remark: Field strength performed Average level at 3m.

3.2 THE WORST MODE OF MEASUREMENT

Original:

Radiated Emission Measurement Above 1G	
Test Condition	**Radiated Emission Above 1G**
Power supply Mode	**Mode 1: EUT power by Battery**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**
Worst Position	☐ **Placed in fixed position.** ☒ **Placed in fixed position at X-Plane (E2-Plane)** ☐ **Placed in fixed position at Y-Plane (E1-Plane)** ☐ **Placed in fixed position at Z-Plane (H-Plane)**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Battery**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

Update:

Radiated Emission Measurement Above 1G	
Test Condition	**Radiated Emission Above 1G**
Power supply Mode	**Mode 1: EUT power by Battery**
Worst Mode	**☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4**
Worst Position	**☐ Placed in fixed position.** **☒ Placed in fixed position at X-Plane (E2-Plane)** **☐ Placed in fixed position at Y-Plane (E1-Plane)** **☐ Placed in fixed position at Z-Plane (H-Plane)**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Battery**
Worst Mode	**☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

3.3 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

According to FCC 15.231(b), 15.231(e),

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500[1]	50 to 150[1]
174-260	1,500	150
260-470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

[1]Linear interpolations.

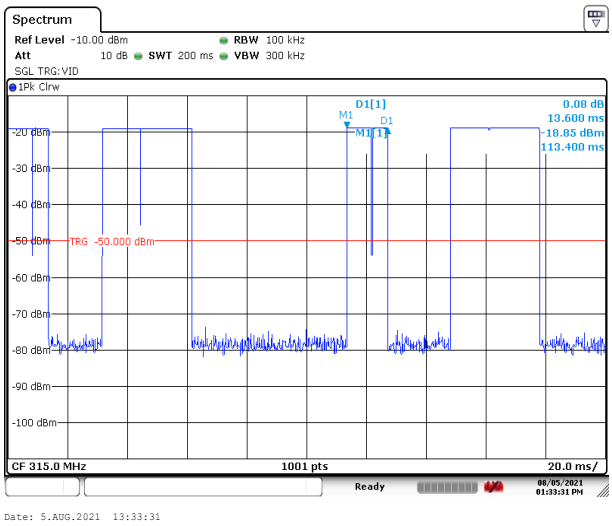
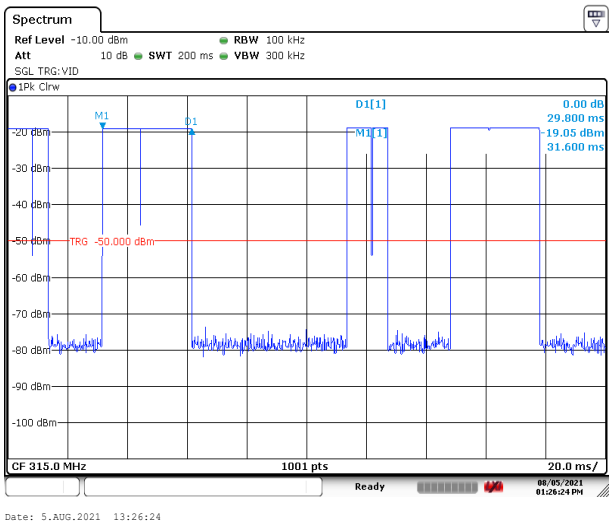
In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

3.4 EUT DUTY CYCLE

Update:

Temperature:	20.8 ~ 25.6℃	**Test date:**	August 5, 2021
Humidity:	43 ~ 56% RH	**Tested by:**	Jerry Chang

Duty Cycle			
TX ON (ms)	TX All(ms)	Duty Cycle	Duty Factor(dB)
21.70	100.00	21.70%	-13.27

1st	2st
	

Notes:

1. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by 20 log ($Time_{(on)}$ / [Period or 100 ms whichever is the lesser])
2. ASK duty cycle = 50%
   1st frame
   Frame duration(max) =13.6*0.5=6.8 ms

   2nd
   Frame duration(max) =29.8*0.5=14.9 ms

   Total frames duration in a 100ms window =6.8+14.9=21.7 ms
   Averaging Factor = 20*log(Frame duration/100ms)
   Averaging Factor =-13.27

4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a), RSS-Gen Sec.8.8,

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

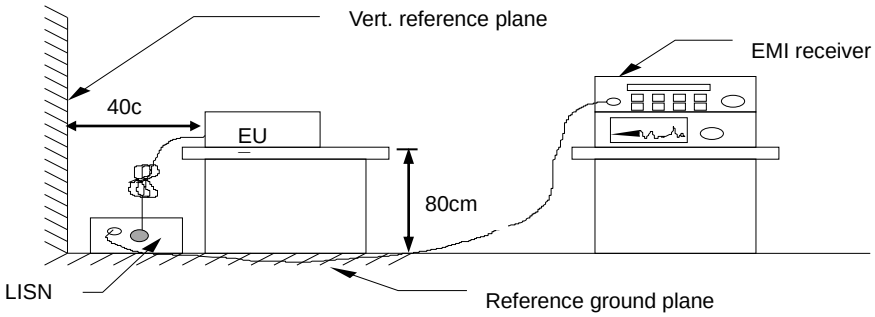
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete

4.1.3 Test Setup



4.1.4 Test Result

Not applicable, because EUT doesn't connect to AC Main Source direct.

4.2 EMISSION BANDWIDTH

4.2.1 Test Limit

According to §15.231(c), RSS-210 A.1.3 ,

Limit	☒ 70 MHz – 900 MHz : Fc * 0.25 % ☐ Above 900 MHz : Fc * 0. 5 %

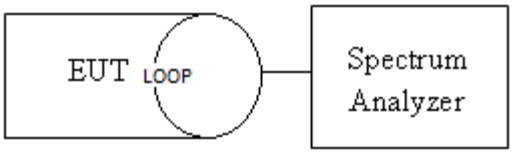
4.2.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.9.2,

The Loop antenna connected to the spectrum analyzer, was touching to the transmitter antenna. Set the RBW=20KHz, VBW=30KHz, Detector = Peak, Trace mode = Max hold, Sweep = Auto. Measure the maximum width of the emission that is constrained by the frequencies associated with the 20dB Bandwidth.

The Loop antenna connected to the spectrum analyzer, was touching to the transmitter antenna. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, Trace mode = Max hold, Sweep = Auto. Measure the maximum width of the emission that is constrained by the frequencies associated with the Occupied Bandwidth (99%).

4.2.3 Test Setup



4.2.4 Test Result

Not applicable. The EUT only verify radiation emission test data.

4.3 FIELD STRENGTH OF FUNDAMENTAL

4.3.1 Test Limit

According to §15.231(b)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

According to RSS-210 A.1.4

Table A2 — Reduced field strength limits for momentarily operated devices	
Fundamental Frequency (MHz), Excluding Restricted Frequency Bands Specified in RSS-Gen	**Field Strength of the Fundamental Emissions (µV/m at 3 m)**
70-130	500
130-174	500 to 1,500*
174-260**	1,500
260-470**	1,500 to 5,000*
Above 470	5,000

Note:
* Linear interpolation with frequency, f, in MHz:
For 130-174 MHz: Field Strength (µV/m) = (22.73 x f)-2454.55
For 260-470 MHz: Field Strength (µV/m) = (16.67 x f)-2833.33

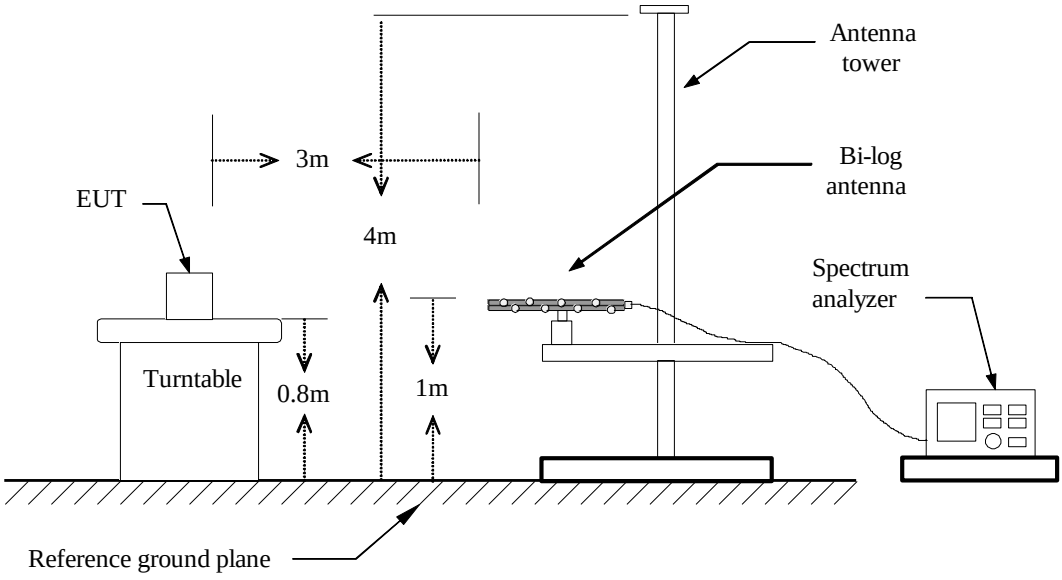
**: Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.

4.3.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 4.1.4 and clause 6.5

clause 4.1.4	☒ 4.1.4.2.2: Measurement Peak value. ☐ 4.1.4.2.3: Duty cycle ≥ 100%. ☒ 4.1.4.2.4: Measurement Average value.

4.3.3 Test Setup



4.3.4 Test Result

Original:

Temperature:	22.6℃	**Test date:**	May 7, 2021
Humidity:	59% RH	**Tested by:**	Ray Li

FSK

Field Strength					
Frequency (MHz)	**Fundamental (dBuV/m) at 3m**	**Limit (dBuV/m) at 3m**	**Margin (dB)**	**Axis/Pol.**	**Remark**
314.96	56.08	67.66	-11.58	X/V	AVG

Remark:

1. Fundamental measured method setting on spectrum, RBW=100 kHz, VBW=100kHz and Detector=Peak.
2. Average result = Peak result + Duty factor = 75.16 dBuV/m – 19.08= 56.08dBuV/m
3. 260MHz ~ 470MHz limit is 16.67 * (Frequency, MHz) – 2833.33
   Limit = 16.67 * (314.96 MHz) – 2833.33
   = 2417.0532 (uV/m)
   dBuv/m = 20 Log(uV/m) = 20 Log (2417.0532 uV/m)= 67.66dBuV/m

Update:

Temperature:	23.9℃	**Test date:**	August 5, 2021
Humidity:	66% RH	**Tested by:**	Jerry Chang

FSK

Field Strength					
Frequency (MHz)	**Fundamental (dBuV/m) at 3m**	**Limit (dBuV/m) at 3m**	**Margin (dB)**	**Axis/Pol.**	**Remark**
314.96	62.12	67.66	-5.54	X/V	AVG

Remark:

1. Fundamental measured method setting on spectrum, RBW=100 kHz, VBW=100kHz and Detector=Peak.
2. Average result = Peak result + Duty factor = 75.39 dBuV/m – 13.27= 62.12dBuV/m
3. 260MHz ~ 470MHz limit is 16.67 * (Frequency, MHz) – 2833.33
   Limit = 16.67 * (314.96 MHz) – 2833.33
   = 2417.0532 (uV/m)
   dBuv/m = 20 Log(uV/m) = 20 Log (2417.0532 uV/m)= 67.66dBuV/m

ASK

Field Strength					
Frequency (MHz)	**Fundamental (dBuV/m) at 3m**	**Limit (dBuV/m) at 3m**	**Margin (dB)**	**Axis/Pol.**	**Remark**
314.96	62.07	67.66	-5.59	X/V	AVG

Remark:

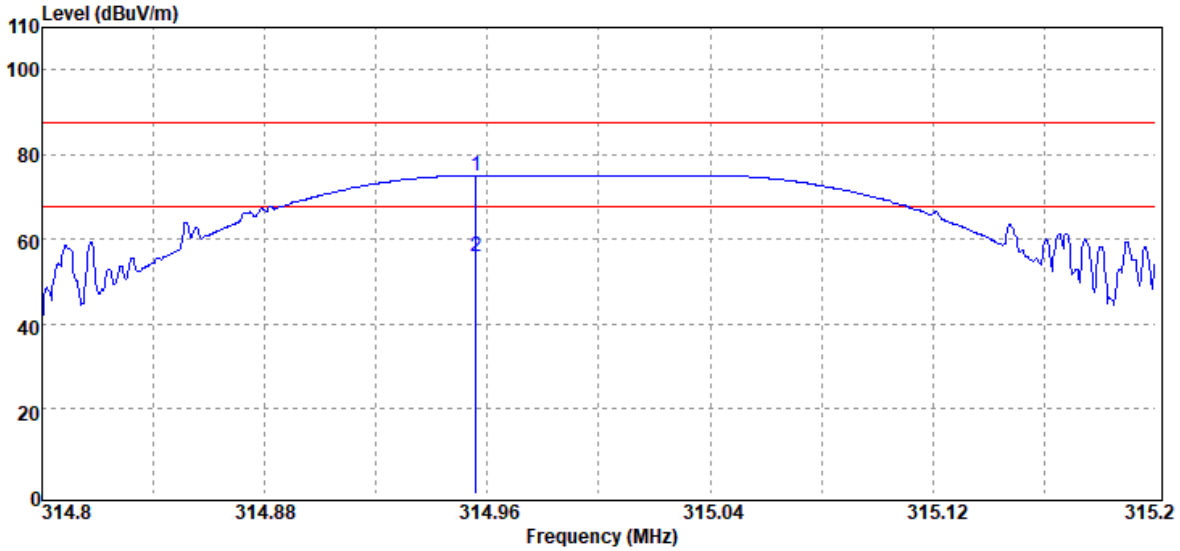
1. Fundamental measured method setting on spectrum, RBW=100 kHz, VBW=100kHz and Detector=Peak.
2. Average result = Peak result + Duty factor = 75.34 dBuV/m – 13.27= 62.07dBuV/m
3. 260MHz ~ 470MHz limit is 16.67 * (Frequency, MHz) – 2833.33
   Limit = 16.67 * (314.96 MHz) – 2833.33
   = 2417.0532 (uV/m)
   dBuv/m = 20 Log(uV/m) = 20 Log (2417.0532 uV/m)= 67.66dBuV/m

Test Data

Original:

FSK

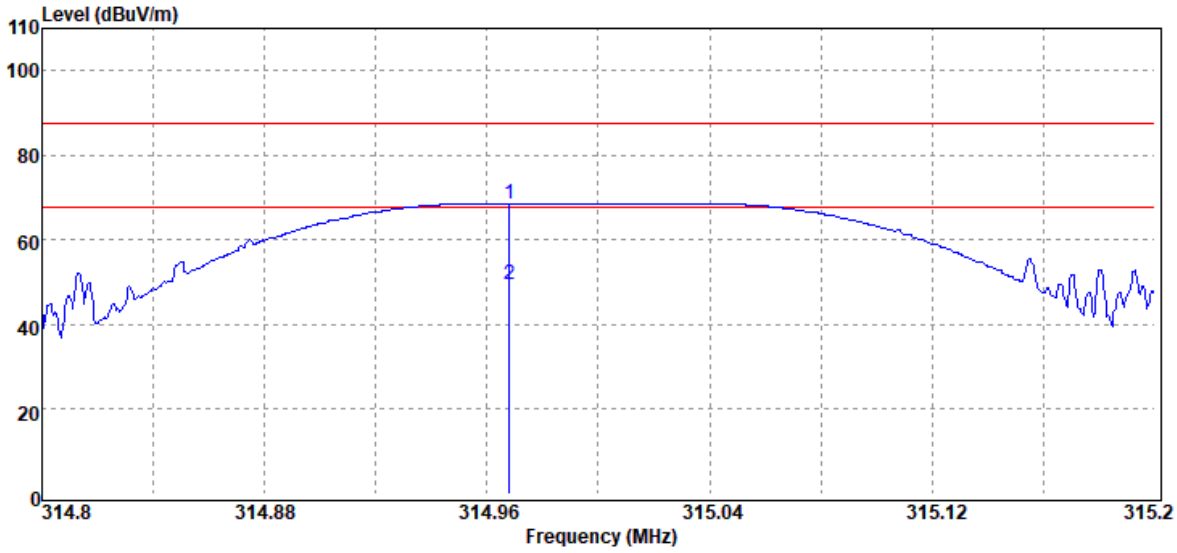
Test Mode:	315MHz	Temp/Hum	22.6(℃)/ 59%RH
Test Item	Fundamental	Test Date	May 7, 2021
Axis/Polarize	X-Plane/Ver.	Test Engineer	Ray Li
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1	314.96	Peak	82.75	-7.59	75.16	87.66	-12.50
2	314.96	Average	-	-19.08	56.08	67.66	-11.58

*Note:
No.2 Average result = Peak result + Duty factor = 75.16 dBuV/m –19.08= 56.08 dBuV/m

Test Mode:	315MHz	Temp/Hum	22.6(℃)/ 59%RH
Test Item	Fundamental	Test Date	May 7, 2021
Axis/Polarize	X-Plane/Hoz.	Test Engineer	Ray Li
Detector	Peak & AVG		

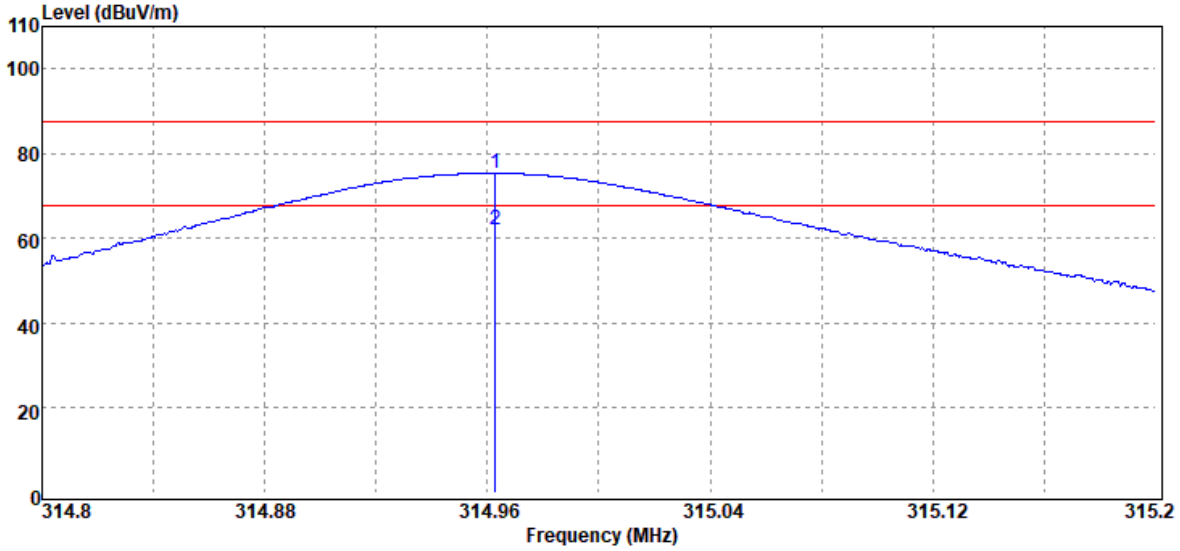


No	Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1	314.97	Peak	76.22	-7.59	68.63	87.66	-19.03
2	314.97	Average	-	-19.08	49.55	67.66	-18.11

*Note:
No.2 Average result = Peak result + Duty factor = 68.63 dBuV/m –19.08= 49.55 dBuV/m

Update:
FSK

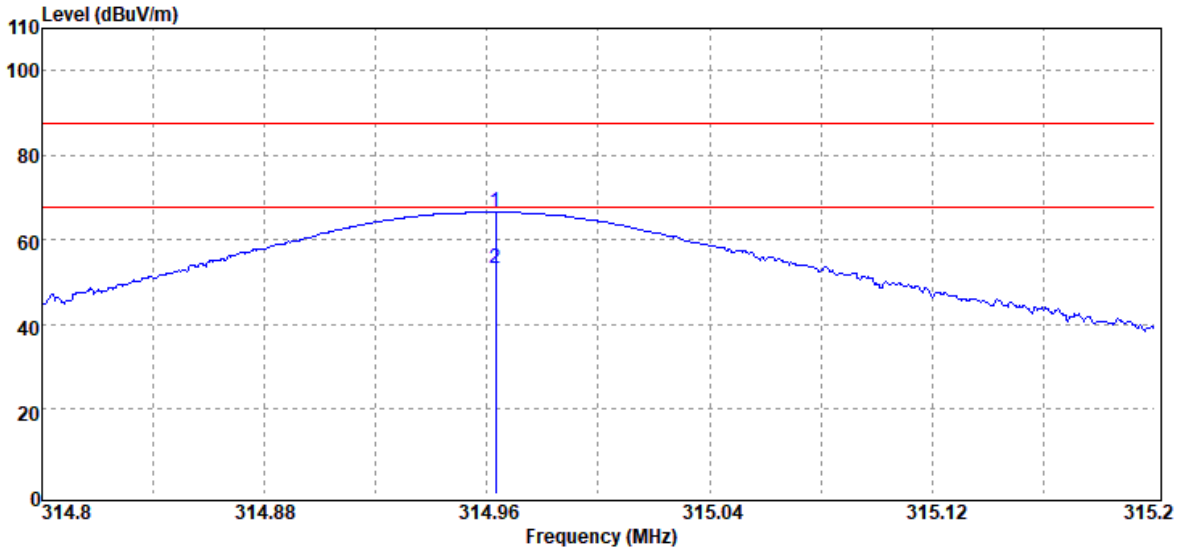
Test Mode:	315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Fundamental	Test Date	August 5, 2021
Axis/Polarize	X-Plane/Ver.	Test Engineer	Jerry Chang
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1	314.96	Peak	83.33	-7.94	75.39	87.66	-12.27
2	314.96	Average	-	-13.27	62.12	67.66	-5.54

*Note:
No.2 Average result = Peak result + Duty factor = 75.39 dBuV/m –13.27= 62.12 dBuV/m

Test Mode:	315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Fundamental	Test Date	August 5, 2021
Axis/Polarize	X-Plane/Hoz.	Test Engineer	Jerry Chang
Detector	Peak & AVG		

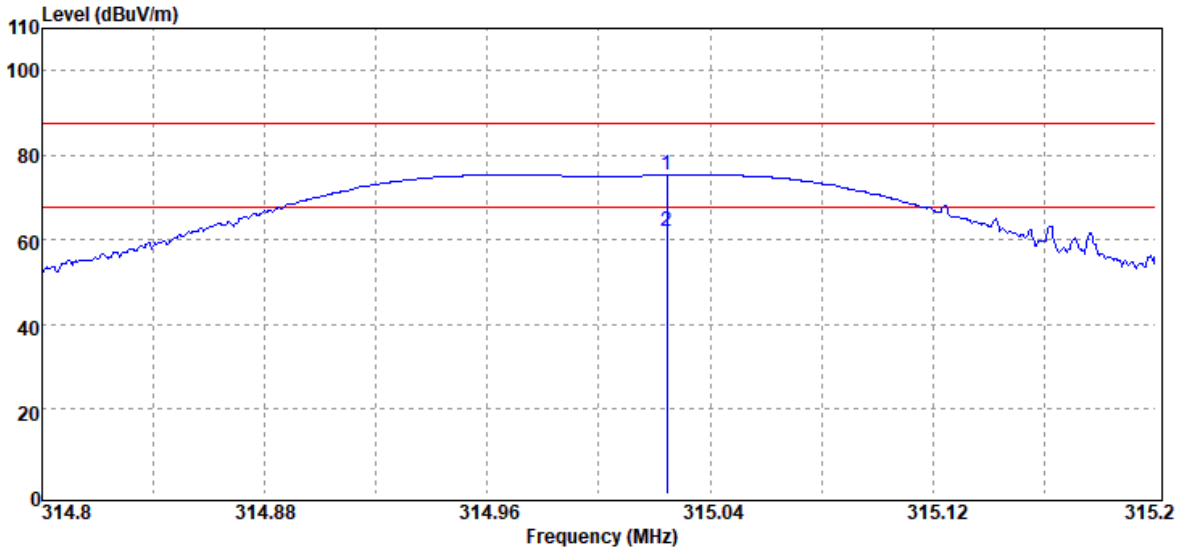


No	Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1	314.96	Peak	74.52	-7.94	66.58	87.66	-21.08
2	314.96	Average	-	-13.27	53.31	67.66	-14.35

*Note:
No.2 Average result = Peak result + Duty factor = 66.58 dBuV/m –13.27= 53.31 dBuV/m

ASK

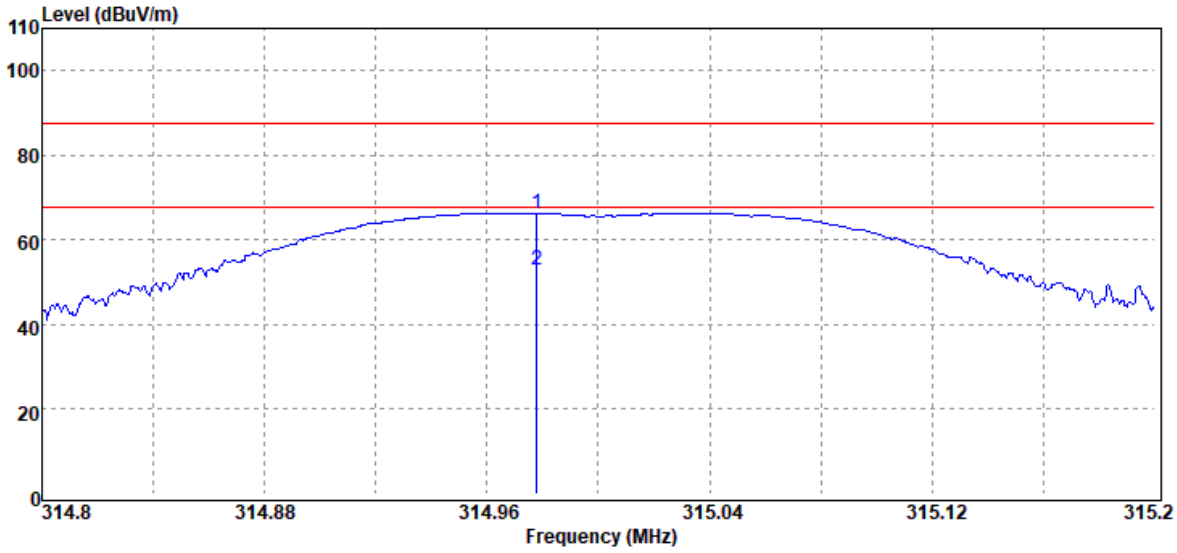
Test Mode:	315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Fundamental	Test Date	August 5, 2021
Axis/Polarize	X-Plane/Ver.	Test Engineer	Jerry Chang
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1	315.02	Peak	83.28	-7.94	75.34	87.66	-12.32
2	315.02	Average	-	-13.27	62.07	67.66	-5.59

*Note:
No.2 Average result = Peak result + Duty factor = 75.34 dBuV/m –13.27= 62.07dBuV/m

Test Mode:	315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Fundamental	Test Date	August 5, 2021
Axis/Polarize	X-Plane/Hoz.	Test Engineer	Jerry Chang
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1	314.98	Peak	74.25	-7.94	66.31	87.66	-21.35
2	314.98	Average	-	-13.27	53.04	67.66	-14.62

*Note:
No.2 Average result = Peak result + Duty factor = 66.31 dBuV/m –13.27= 53.04 dBuV/m

4.4 RADIATION UNWANTED EMISSION

4.4.1 Test Limit

According to §15.231(b) and §15.209, §15.205
Unwanted emissions limit follow the table or the FCC Part 15.209, whichever limit permits higher field strength.

According to RSS-210 A1.4 and RSS-GEN Sec. 8.9
Unwanted emissions shall comply with the general field strength limits specified in RSS-Gen or 10 times below the fundamental emissions field strength limit in table as below, whichever is less stringent.

According to §15.231(b)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

Below 30MHz

Frequency (MHz)	Field Strength				
	(μV/m)	(dBμV/m)	Measurement Distance (meter)	(dBμV/m)	Measurement Distance (meter)
0.009 - 0.490	2400/F(kHz)	48.52 – 13.80	300	128.52–104.84	3
0.490 - 1.705	24000/F(kHz)	33.80 – 22.97	30	73.80– 62.97	3
1.705 – 30.0	30	29.54	30	69.54	3

Above 30MHz

Frequency (MHz)	Field Strength		Measurement Distance (meter)
	(μV/m)	(dBμV/m)	
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

.

4.4.2 Test Procedure

Test method Refer as ANSI 63.10:2013

☒ Unwanted Emission	☒ clause 4.1.4.2.2: Measurement Peak value. ☐ clause 4.1.4.2.3: Duty cycle ≥ 100%. ☒ clause 4.1.4.2.4: Measurement Average value.

☒ Radiated Emission	☒ clause 6.4: below 30 MHz and test distance is 3m. ☒ clause 6.5: below 30 MHz -1 GHz and test distance is 3m. ☒ clause 6.6: Above 30 MHz and test distance is 3m.

1. The EUT is placed on a turntable, which is 0.8m for test below 1GHz and 1.5m for test above 1GHz, above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 1GHz:

   RBW=100kHz / VBW=300kHz / Sweep=AUTO

   Above 1GHz:

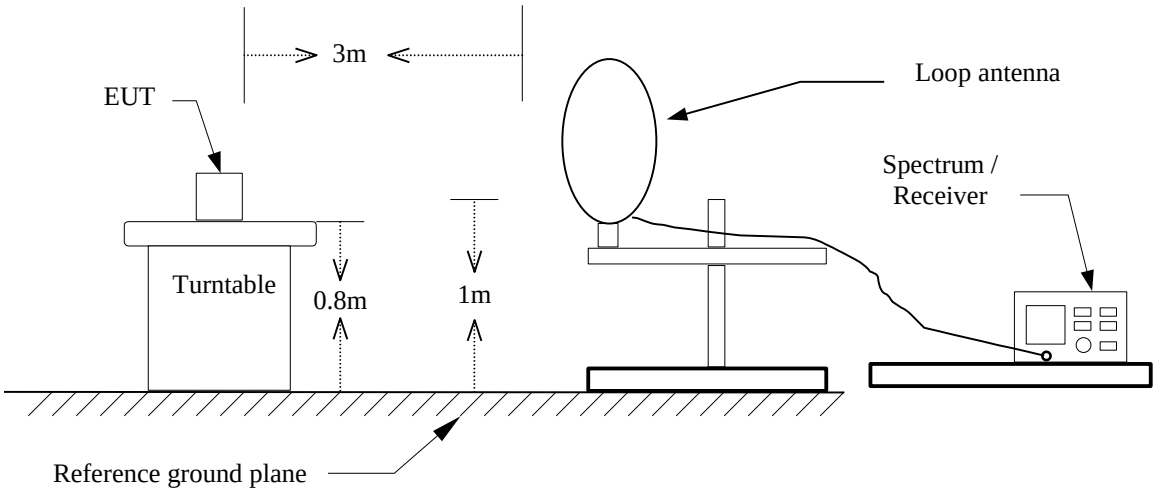
   (a)PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

   (b)AVERAGE: RBW=1MHz,
7. Repeat above procedures until the measurements for all frequencies are complete.

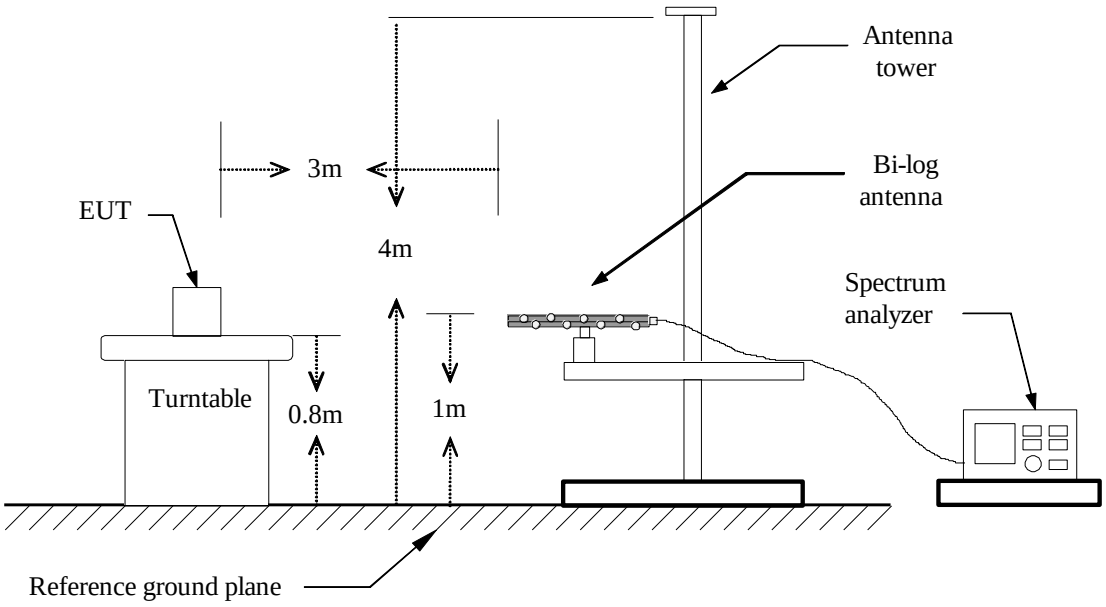
Remark.
1. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

4.4.3 Test Setup

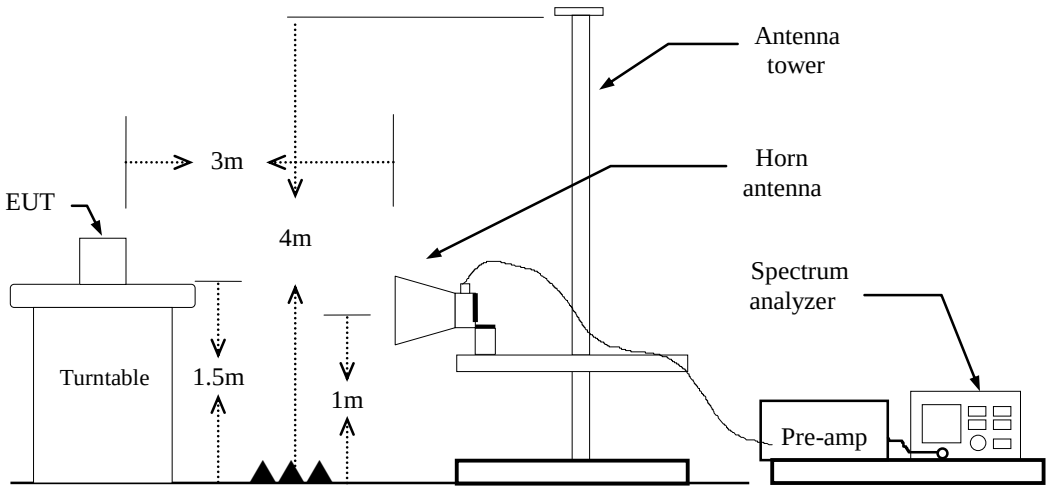
9kHz ~ 30MHz



30MHz ~ 1 GHz



Above 1 GHz



4.4.4 Test Result

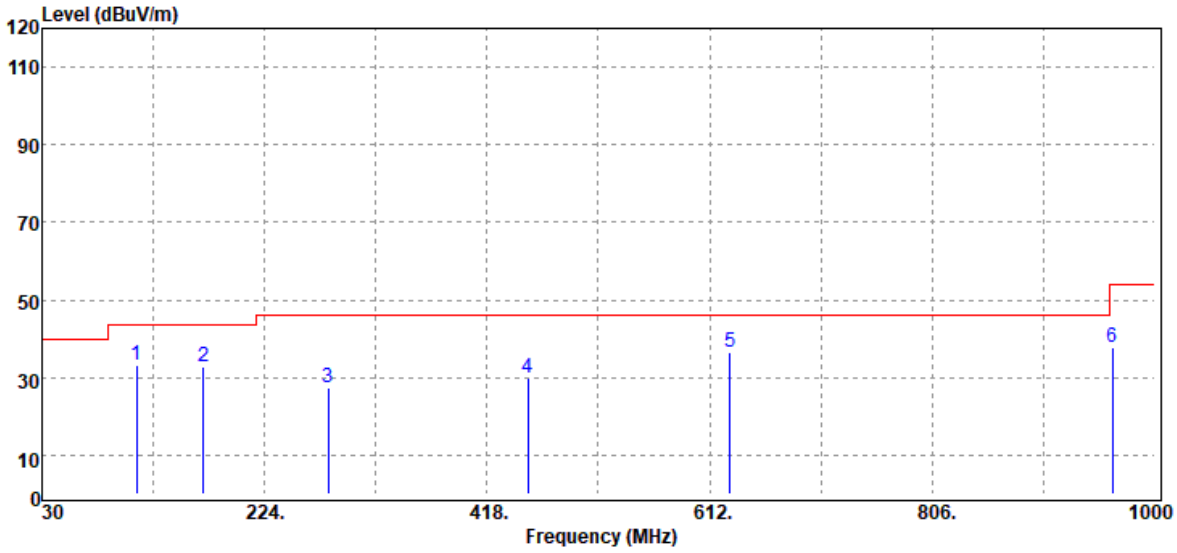
Pass.

Test Data

Original:

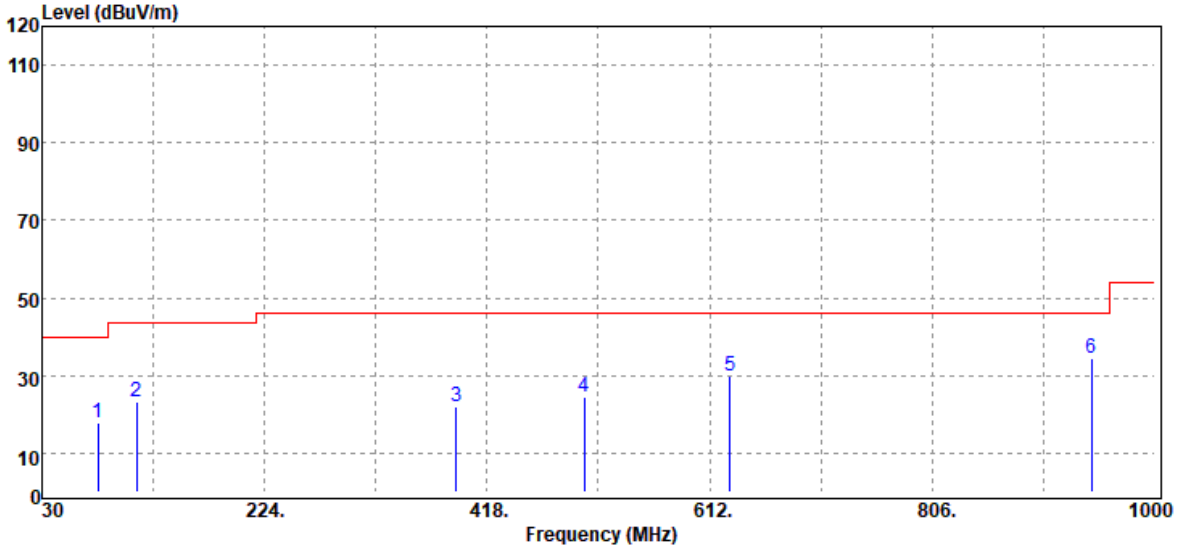
Below 1GHz

Test Mode:	FSK_315MHz	Temp/Hum	21.9(℃)/ 51%RH
Test Item	Below 1GHz	Test Date	April 20, 2021
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
112.45	Peak	43.34	-10.02	33.32	43.50	-10.18
170.65	Peak	43.67	-10.99	32.68	43.50	-10.82
279.29	Peak	36.12	-8.68	27.44	46.00	-18.56
453.89	Peak	33.94	-4.20	29.74	46.00	-16.26
629.46	Peak	36.36	0.20	36.56	46.00	-9.44
963.14	Peak	33.56	4.11	37.67	54.00	-16.33

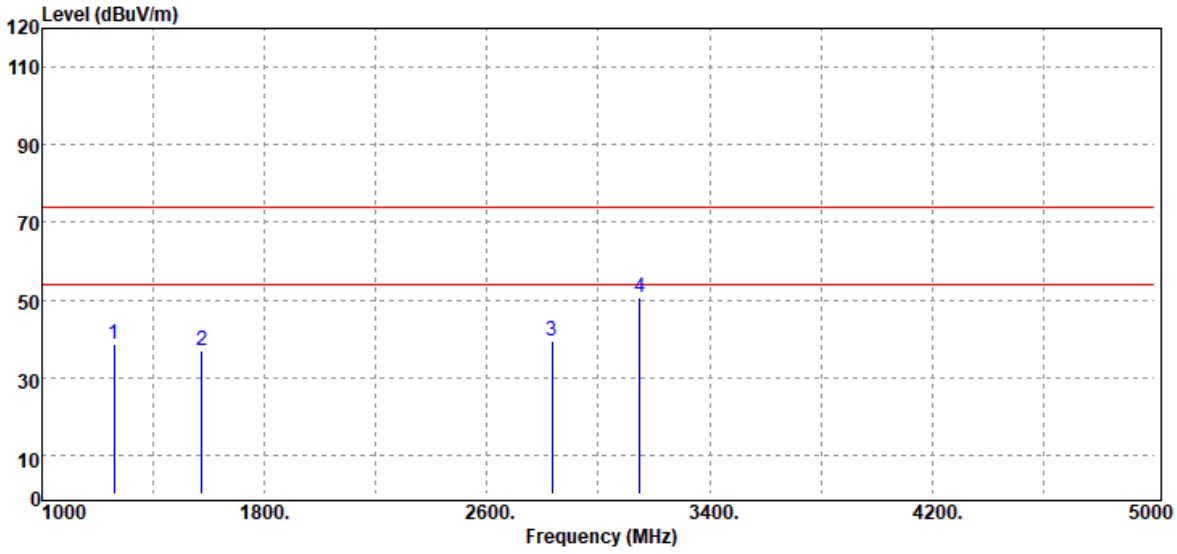
Test Mode:	FSK_315MHz	Temp/Hum	21.9(℃)/ 51%RH
Test Item	Below 1GHz	Test Date	April 20, 2021
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
78.50	Peak	33.37	-15.33	18.04	40.00	-21.96
112.45	Peak	33.34	-10.02	23.32	43.50	-20.18
390.84	Peak	28.25	-6.30	21.95	46.00	-24.05
502.39	Peak	27.87	-3.28	24.59	46.00	-21.41
629.46	Peak	29.56	0.20	29.76	46.00	-16.24
944.71	Peak	29.99	4.45	34.44	46.00	-11.56

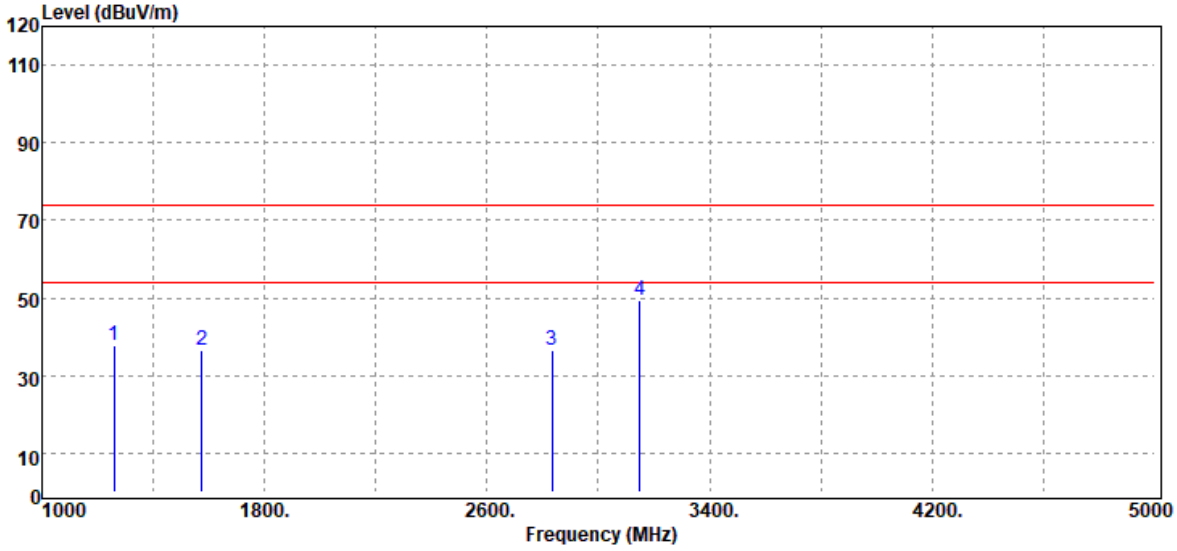
Above 1GHz

Test Mode:	FSK_315MHz	Temp/Hum	21.9(℃)/ 51%RH
Test Item	Above 1GHz	Test Date	April 21, 2021
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1260.00	Peak	44.45	-6.03	38.42	74.00	-35.58
1575.00	Peak	41.72	-4.83	36.89	74.00	-37.11
2835.00	Peak	38.86	0.59	39.45	74.00	-34.55
3150.00	Peak	49.06	1.58	50.64	74.00	-23.36
N/A						

Test Mode:	FSK_315MHz	Temp/Hum	21.9(℃)/ 51%RH
Test Item	Above 1GHz	Test Date	April 21, 2021
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		

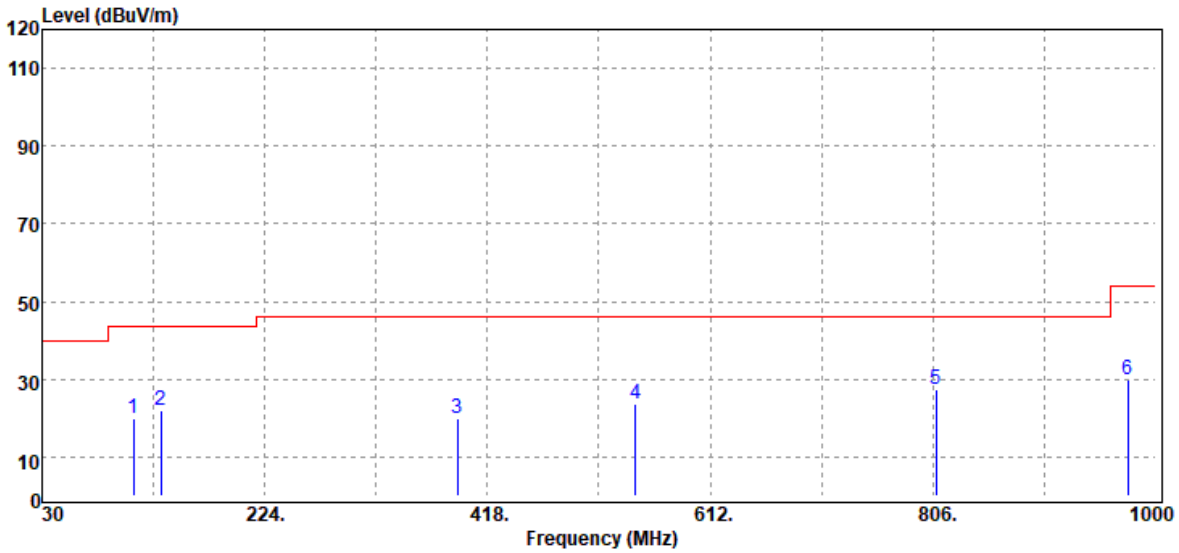


Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1260.00	Peak	43.89	-6.03	37.86	74.00	-36.14
1575.00	Peak	41.40	-4.83	36.57	74.00	-37.43
2835.00	Peak	36.14	0.59	36.73	74.00	-37.27
3150.00	Peak	47.85	1.58	49.43	74.00	-24.57
N/A						

Update:

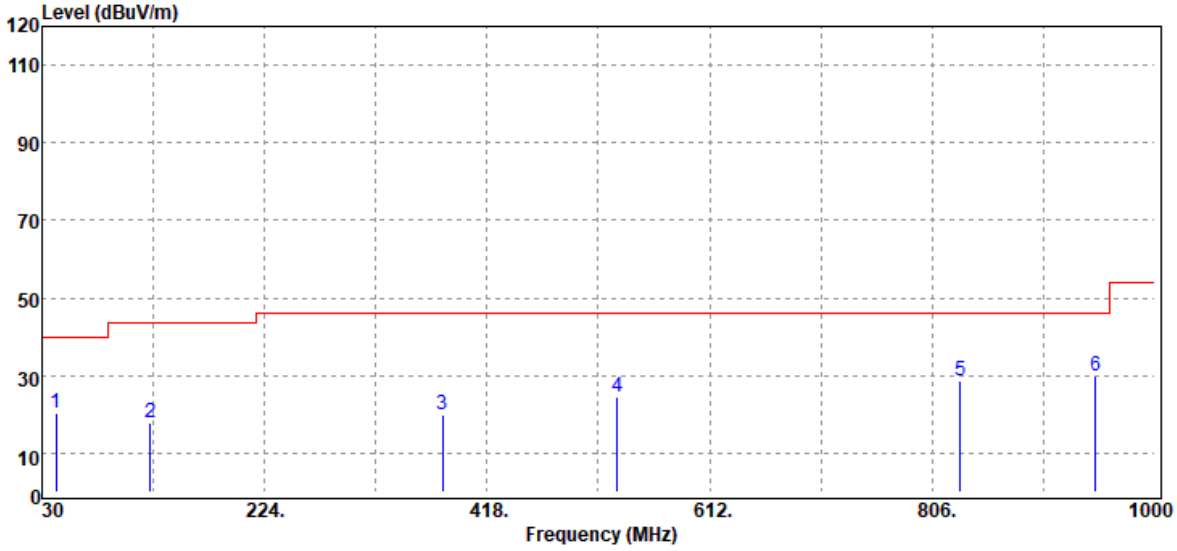
Below 1GHz

Test Mode:	FSK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Below 1GHz	Test Date	August 5, 2021
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
109.54	Peak	30.48	-10.52	19.96	43.50	-23.54
133.79	Peak	31.33	-9.36	21.97	43.50	-21.53
391.81	Peak	26.40	-6.27	20.13	46.00	-25.87
547.01	Peak	25.65	-1.87	23.78	46.00	-22.22
808.91	Peak	25.71	1.87	27.58	46.00	-18.42
975.75	Peak	25.18	4.61	29.79	54.00	-24.21

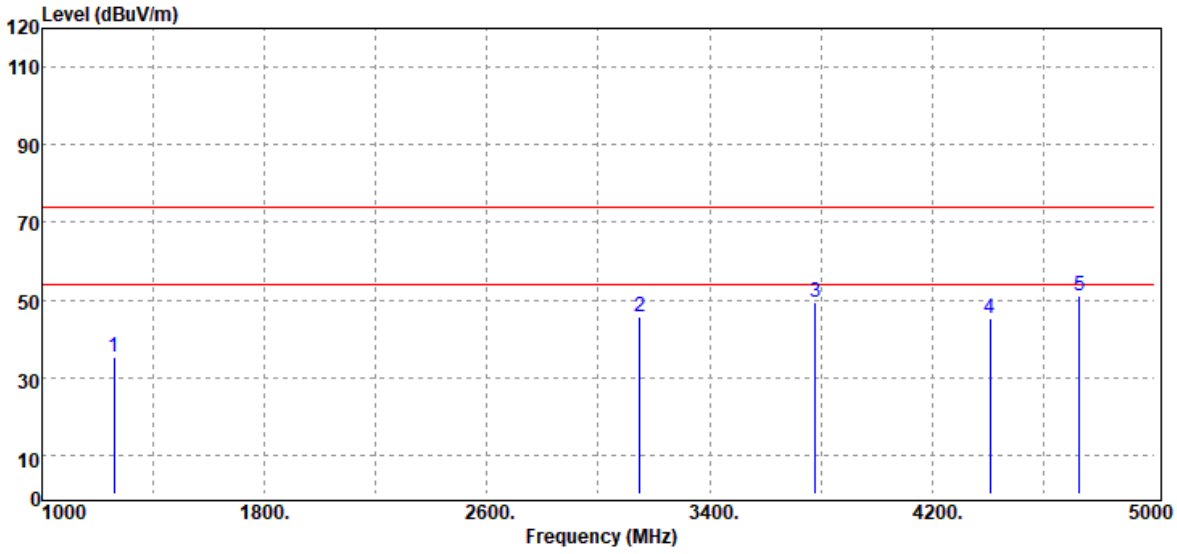
Test Mode:	FSK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Below 1GHz	Test Date	August 5, 2021
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
42.61	Peak	31.90	-11.59	20.31	40.00	-19.69
124.09	Peak	26.96	-9.06	17.90	43.50	-25.60
379.20	Peak	26.32	-6.55	19.77	46.00	-26.23
531.49	Peak	27.00	-2.37	24.63	46.00	-21.37
830.25	Peak	26.32	2.30	28.62	46.00	-17.38
948.59	Peak	25.27	4.83	30.10	46.00	-15.90

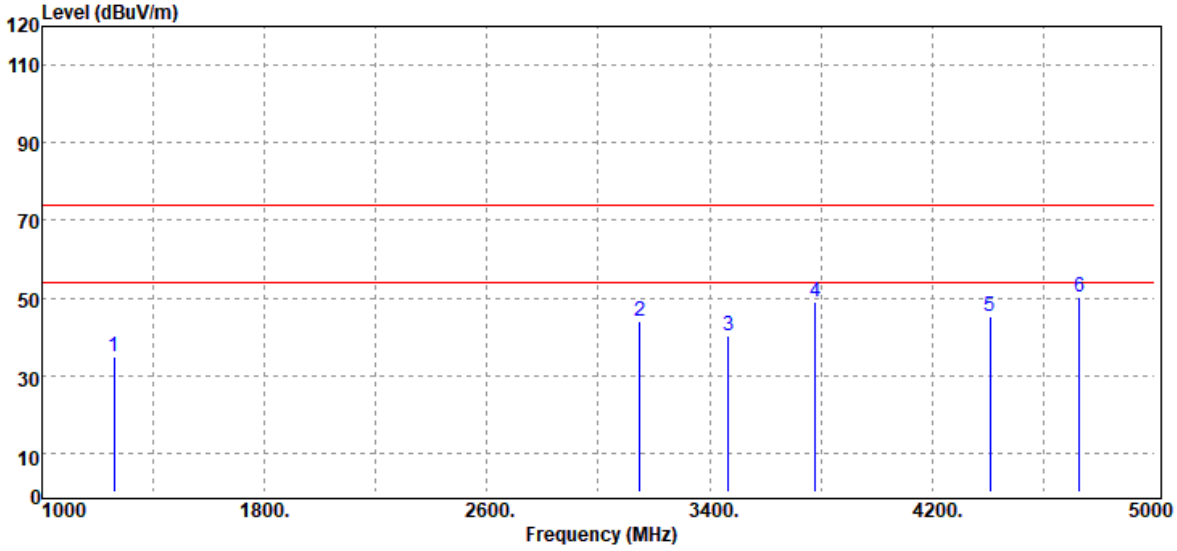
Above 1GHz

Test Mode:	FSK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Above 1GHz	Test Date	August 5, 2021
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1260.00	Peak	41.47	-6.03	35.44	74.00	-38.56
3148.00	Peak	43.92	1.57	45.49	74.00	-28.51
3780.00	Peak	40.45	8.81	49.26	74.00	-24.74
4408.00	Peak	39.69	5.41	45.10	74.00	-28.90
4728.00	Peak	44.66	6.33	50.99	74.00	-23.01
N/A						

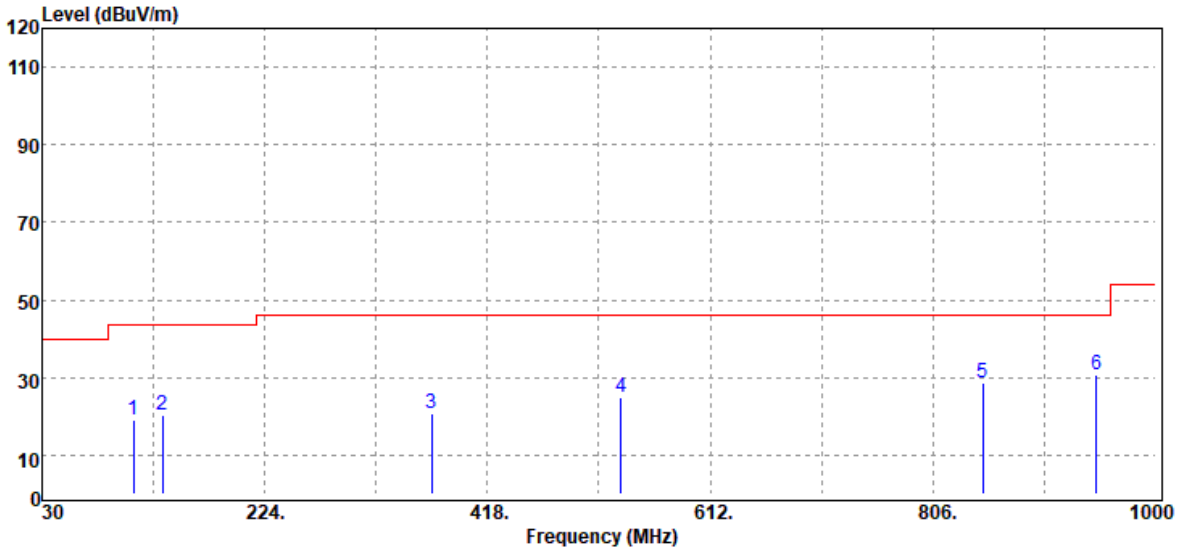
Test Mode:	FSK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Above 1GHz	Test Date	August 5, 2021
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1260.00	Peak	41.08	-6.03	35.05	74.00	-38.95
3148.00	Peak	42.53	1.57	44.10	74.00	-29.90
3468.00	Peak	37.72	2.68	40.40	74.00	-33.60
3780.00	Peak	40.09	8.81	48.90	74.00	-25.10
4408.00	Peak	39.93	5.41	45.34	74.00	-28.66
4728.00	Peak	44.11	6.33	50.44	74.00	-23.56

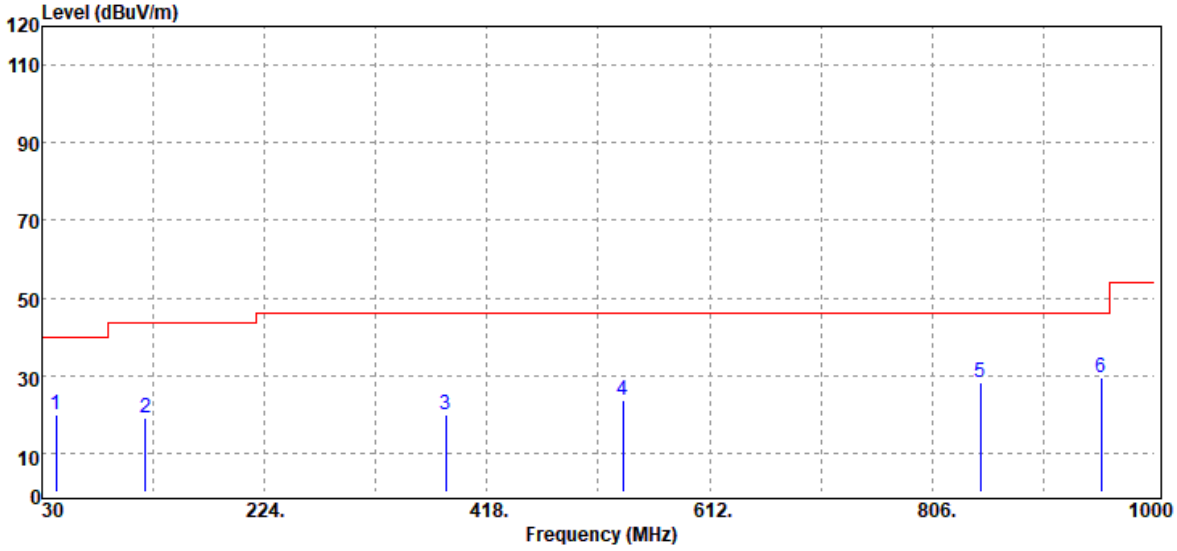
Below 1GHz

Test Mode:	ASK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Below 1GHz	Test Date	August 5, 2021
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
109.54	Peak	29.45	-10.52	18.93	43.50	-24.57
134.76	Peak	29.67	-9.36	20.31	43.50	-23.19
369.50	Peak	27.35	-6.61	20.74	46.00	-25.26
534.40	Peak	27.04	-2.20	24.84	46.00	-21.16
849.65	Peak	25.71	2.90	28.61	46.00	-17.39
948.59	Peak	25.84	4.83	30.67	46.00	-15.33

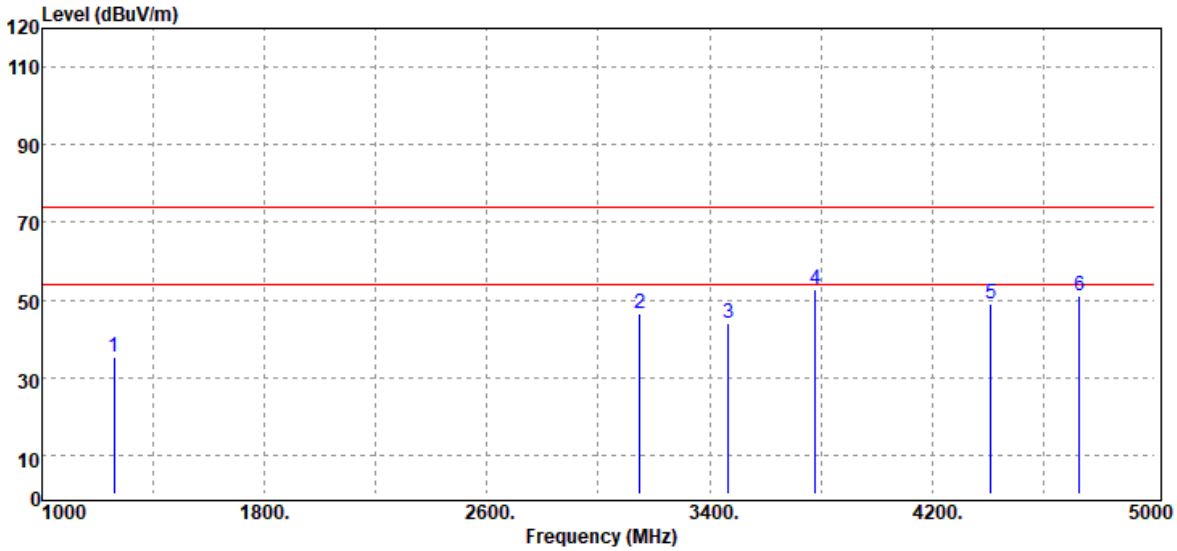
Test Mode:	ASK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Below 1GHz	Test Date	August 5, 2021
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
42.61	Peak	31.46	-11.59	19.87	40.00	-20.13
120.21	Peak	28.20	-9.11	19.09	43.50	-24.41
382.11	Peak	26.52	-6.48	20.04	46.00	-25.96
536.34	Peak	25.84	-2.11	23.73	46.00	-22.27
847.71	Peak	25.54	2.85	28.39	46.00	-17.61
953.44	Peak	24.92	4.57	29.49	46.00	-16.51

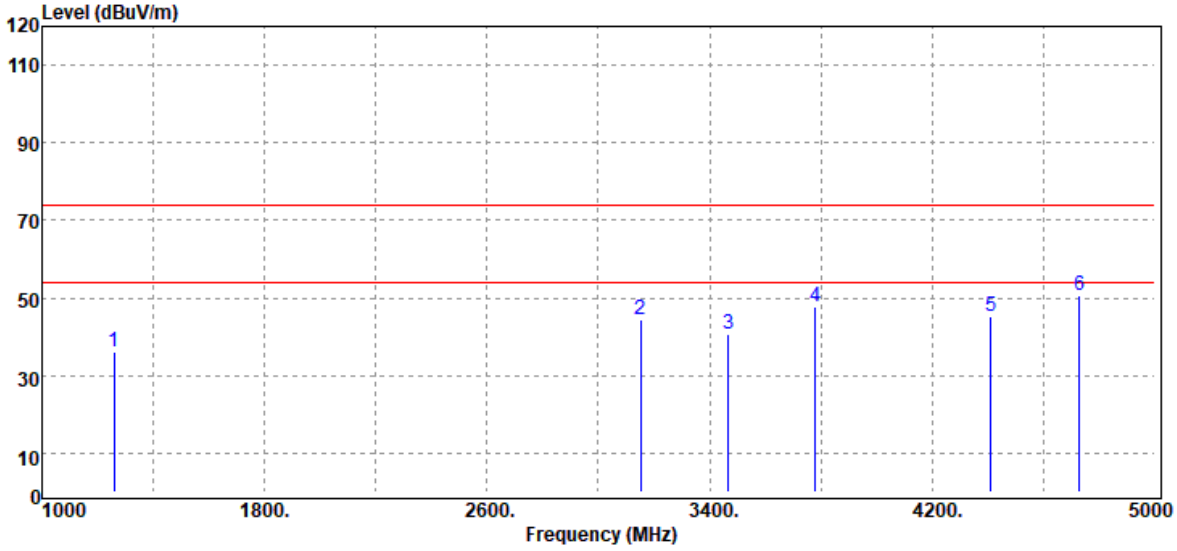
Above 1GHz

Test Mode:	ASK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Above 1GHz	Test Date	August 5, 2021
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1260.00	Peak	41.48	-6.03	35.45	74.00	-38.55
3148.00	Peak	44.76	1.57	46.33	74.00	-27.67
3468.00	Peak	41.36	2.68	44.04	74.00	-29.96
3780.00	Peak	43.88	8.81	52.69	74.00	-21.31
4412.00	Peak	43.59	5.43	49.02	74.00	-24.98
4728.00	Peak	44.86	6.33	51.19	74.00	-22.81

Test Mode:	ASK_315MHz	Temp/Hum	23.9(℃)/ 66%RH
Test Item	Above 1GHz	Test Date	August 5, 2021
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1260.00	Peak	42.07	-6.03	36.04	74.00	-37.96
3152.00	Peak	43.00	1.57	44.57	74.00	-29.43
3468.00	Peak	37.83	2.68	40.51	74.00	-33.49
3780.00	Peak	39.03	8.81	47.84	74.00	-26.16
4412.00	Peak	39.76	5.43	45.19	74.00	-28.81
4728.00	Peak	44.16	6.33	50.49	74.00	-23.51

4.5 OPERATION RESTRICTION

4.5.1 Test Limit

15.231(a)(1),

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

RSS-210 A1.2,

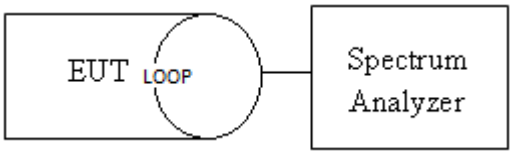
However, devices that are designed for limited use for thepurpose of initial programming, reprogramming or installing, and not forregular operations, may operate for up to 5 seconds, provided such devicesare used only occasionally in connection with each unit being programmed orinstalled.

4.5.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 7.4

The Loop antenna connected to the spectrum analyzer, was touching to the transmitter antenna. Set the RBW=1MHz, VBW=1MHz, Detector = Peak, Trace mode = Max hold, Sweep = 1s. Measure

4.5.3 Test Setup



4.5.4 Test Result

Not applicable. The EUT only verify radiation emission test data.

- End of Test Report -