

Test Report

Verified code: 430754

Report No.: E202112291004-14

Customer: Autel Intelligent Tech. Corp., Ltd.

Address: 7th-8th, 10th Floor, Bldg. B1, Zhiyuan, Xueyuan Rd. Xili, Nanshan, Shenzhen, 518055
China

Sample Name: Professional Key Tool

Sample Model: MaxiIM KM100

Receive Sample
Date: Jan.06,2022

Test Date: Jan.10,2022 ~ Apr.14,2022

Reference
Document: CFR 47 FCC Part 15 Subpart C
ANSI C63.10:2013

Test Result: Pass

Prepared by: Yang Zhaoyun

Reviewed by:

Jiang Tao

Approved by: Xiao Liang

GUANGZHOU GRG METROLOGY & TEST CO., LTD

Issued Date: 2022-04-18

GUANGZHOU GRG METROLOGY & TEST CO., LTD.

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E202112291004-14	Original Issue	2022/04/16

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1. TEST RESULT SUMMARY

Standard	Item	Limit / Severity	Result
Part 15,Subpart C (15.231)	Conducted Emissions	§15.207	PASS
	Antenna Requirement	§15.203	PASS
	Transmission Time	§15.231(a) (2)	PASS
	20DB Bandwidth	§15.231 (c)	PASS
	Radiated Spurious Emission	§15.231(b)	PASS

The EUT antenna is loop antenna. Max antenna gain is -10dBi .which accordance 15.203.is considered sufficient to comply with the provisions of this section.

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2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name: Autel Intelligent Tech. Corp., Ltd.
Address: 7th-8th, 10th Floor, Bldg. B1, Zhiyuan, Xueyuan Rd. Xili, Nanshan, Shenzhen, 518055 China

2.2 MANUFACTURER

Name: Autel Intelligent Tech. Corp., Ltd.
Address: 7th-8th, 10th Floor, Bldg. B1, Zhiyuan, Xueyuan Rd. Xili, Nanshan, Shenzhen, 518055 China

2.3 FACTORY

Name: Autel Intelligent Technology Corp., Ltd. Guangming Branch
Address: 7F&6F, East Wing, Building 2, and 6F of Electronical Building, Yanxiang Industrial Zone, Gaoxin Rd, Dongzhou Community of Guangming New District, Shenzhen

2.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Professional Key Tool
Model No.: MaxiIM KM100
Adding Model: /
Model Differences: /
Trade Name: AUTEL
Sample No: E202112291004-0001
FCC ID: WQ8IMKM100
Power Supply: 5Vdc power supplied by adapter
3.85Vdc power supplied by Rechargeable Li-ion battery
Adapter Specification: Model: GME10C-050200FUu
Input: 100-240V~50-60Hz 0.28A
Output: 5.0V --- 2A 10W
Model: IBQ088GA
Battery Specification: Rated voltage: 3.85Vdc
Limited charge voltage: 4.4Vdc
Rated capacity: 4950mAh, 19.06Wh
Frequency Range: 315MHz, 433.92MHz
Max Antenna gain: Loop antenna, -10dBi(Max)
Sample submitting way: ☒ Provided by customer ☐ Sampling
Type of Modulation: FSK, ASK
Temperature Range: 0°C~55°C
Hardware Version: SM2031_MAIN_V5
Software Version: V1.20.24
Note: /

2.5 TEST MODE

Mode No.	Description of the modes
Mode 1	Transmitting

2.6 LOCAL SUPPORTIVE

Name of Equipment	Manufacturer	Model	Serial Number	Note
/	/	/	/	/

2.7 CONFIGURATION OF SYSTEM UNDER TEST

EUT

2.8 TEST SOFTWARE:

Software version	Test level
NA	Default

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3. LABORATORY AND ACCREDITATIONS

3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

Add.: No.1301 Guangguang Road Xinlan Community, Guanlan Street, Longhua District
Shenzhen, 518110, People's Republic of China.
P.C.: 518000
Tel : 0755-61180008
Fax: 0755-61180008

3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA A2LA(Certificate#:2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada ISED (Company Number: 24897, CAB identifier:CN0069)

USA FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site,
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3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Conduction Emission		9kHz ~ 150kHz	2.8dB
		150kHz ~ 10MHz	2.8dB
		10MHz ~ 30MHz	2.2dB
Radiated Emission	Horizontal	9kHz ~ 30MHz	4.46dB
		30MHz ~ 1000MHz	4.3dB
		1GHz ~ 18GHz	5.6dB
	Vertical	9kHz ~ 30MHz	4.46dB
		30MHz ~ 1000MHz	4.3dB
		1GHz ~ 18GHz	5.6dB

Measurement	Uncertainty
RF frequency	6.0×10^{-6}
RF power conducted	0.78 dB
Occupied channel bandwidth	0.4 dB
Unwanted emission, conducted	0.68 dB
Humidity	6 %
Temperature	2 °C

This uncertainty represents an expanded uncertainty factor of $k=2$.

4. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Conducted Emissions				
EMI TEST RECEIVER	R&S	ESCI	100783	2022-09-13
LISN(EUT)	R&S	ENV216	101543	2022-09-14
EZ-EMC	EZ	CCS-3A1-CE	/	/
Radiated Spurious Emission&Restricted bands of operation				
Test S/W	EZ	CCS-2ANT		
Loop Antenna	TESEQ	HLA6121	52599	2022-04-21
Test Receiver	R&S	ESR7	102444	2022-09-22
Amplifier	EMEC	EM330	/	2023-03-05
Bi-log Antenna	TESEQ	CBL6143A	32399	2022-11-25
Spectrum Analyzer	Agilent	N9020B	MY59050667	2022-12-10
Bilog Antenna	Schwarzbeck	VULB 9163	01279	2023-03-15
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	02143	2022-10-22
Amplifier	Tonscend	TAP9E6343	AP20E806065	2022-06-03
Amplifier	Tonscend	TAP01018048	AP20E8060075	2022-06-07
Test S/W	Tonscend	JS32-RE/2.5.2.4		
20DB Bandwidth& Duty cycle &Transmission Time				
Spectrum Analyzer	Keysight	N9020B	MY59050813	2022-12-13

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5. CONDUCTED EMISSIONS

5.1. LIMITS

Frequency range	Limits (dB μ V)	
	Quasi-peak	Average
150kHz~0.5MHz	66~56	56~46
0.5MHz~5MHz	56	46
5MHz~30MHz	60	50

NOTE: (1) The lower limit shall apply at the transition frequencies.

(2) The limit decreases in line with the logarithm of the frequency in the range of 150 kHz to 0.5MHz.

5.2. TEST PROCEDURES

Procedure of Preliminary Test

Test procedures follow ANSI C63.10:2013.

For measurement of the disturbance voltage the equipment under test (EUT) is connected to the power supply mains and any other extended network via one or more artificial network(s). An EUT, whether intended to be grounded or not, and which is to be used on a table is configured as follows:

- Either the bottom or the rear of the EUT shall be at a controlled distance of 40 cm from a reference ground plane. This ground plane is normally the wall or floor of a shielded room. It may also be a grounded metal plane of at least 2 m by 2 m. This is physically accomplished as follows:

- 1) place the EUT on a table of non-conducting material which is at least 80 cm high. Place the EUT so that it is 40 cm from the wall of the shielded room, or place the EUT on a table of non-conducting material which is 40 cm high so that the bottom of the EUT is 40 cm above the ground plane;

- All other conductive surfaces of the EUT shall be at least 80 cm from the reference ground plane;

- The EUT are placed on the floor that one side of the housings is 40 cm from the vertical reference ground plane and other metallic parts;

- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between the ground plane and the table.

- I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

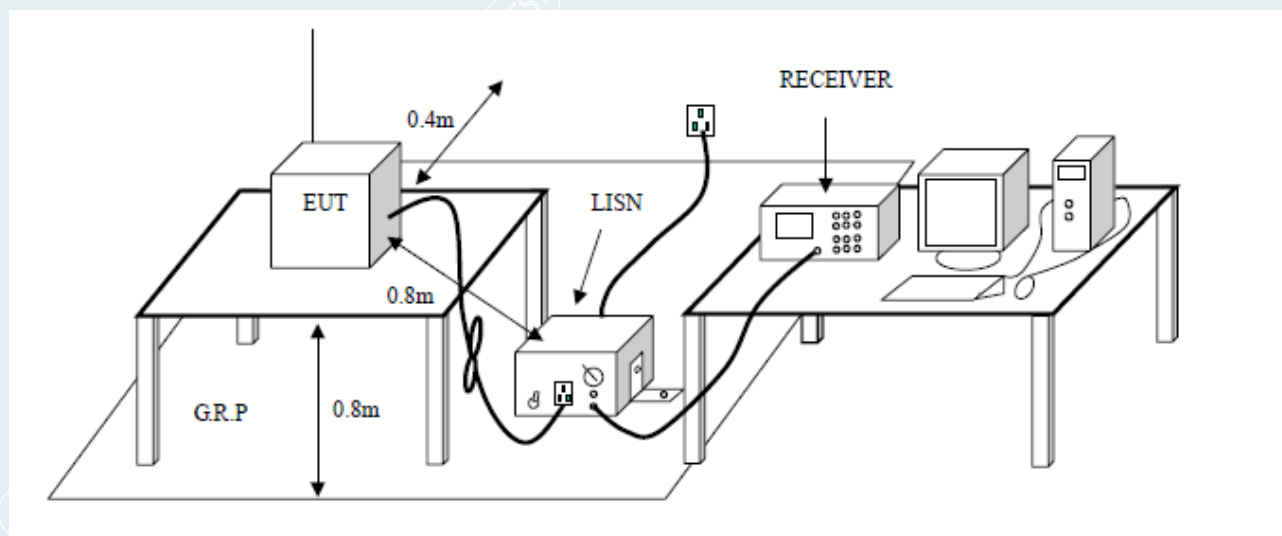
The test mode(s) described in Item 2.5 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.5 producing the highest emission level. The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

5.3. TEST SETUP



5.4. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

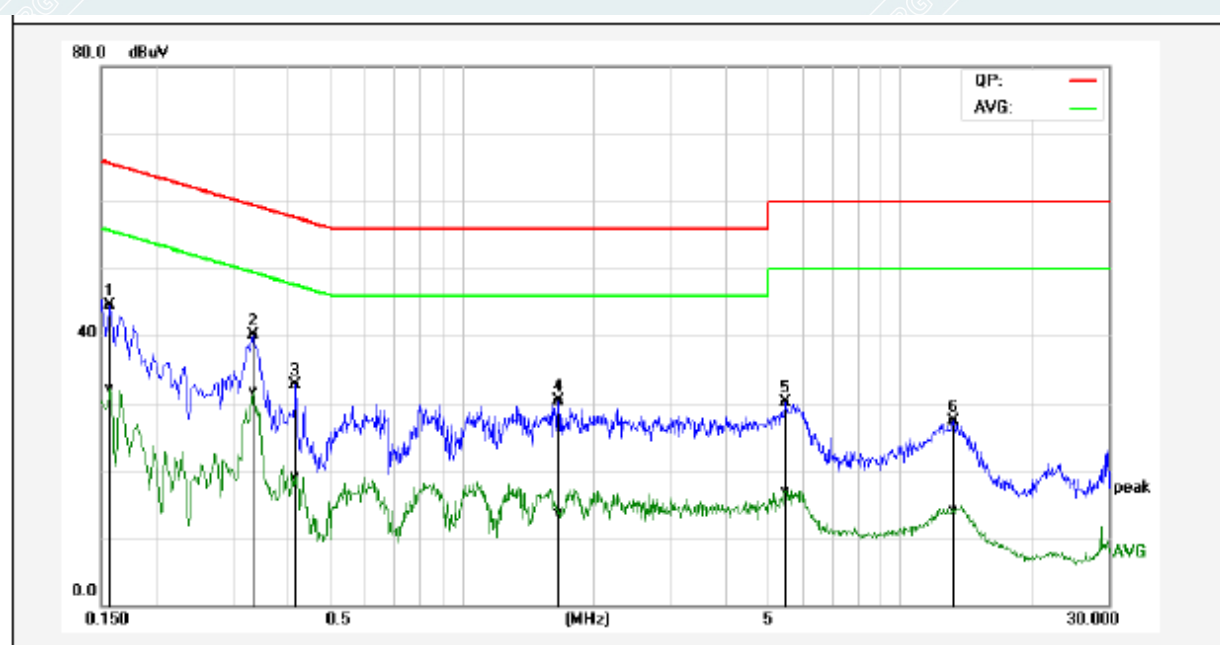
Factor = Insertion loss of LISN + Cable Loss
 Result = Quasi-peak Reading/ Average Reading + Factor
 Limit = Limit stated in standard
 Margin = Result (dBuV) – Limit (dBuV)

5.5. TEST RESULTS

All models were pretested and only the worst modes were recorded in this report. (315MHz)

EUT Name	Professional Key Tool	Model	MaxiIM KM100
Environmental Conditions	23.4°C/48%RH/101kPa	Test Mode	Mode 1
Power supply	AC120V/60Hz	Tested By	Tang Shenghui
Test Date	2022-04-14	Sample No.	E202112291004-0001

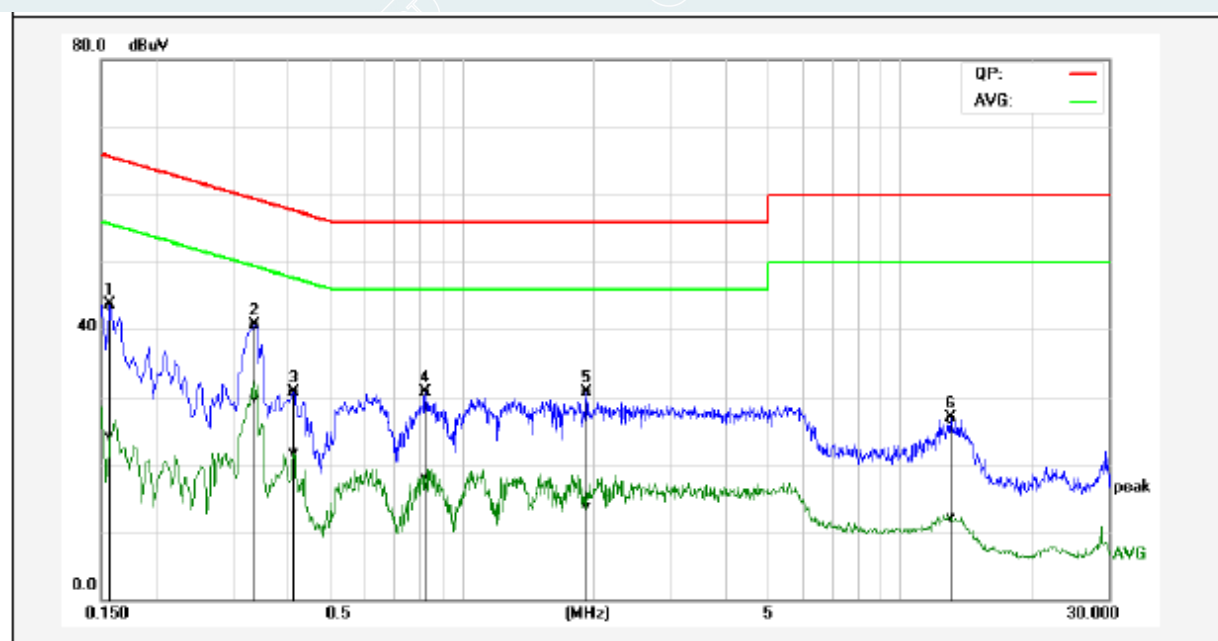
Line: L1



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1580	35.03	22.60	9.53	44.56	32.13	65.56	55.57	-21.00	-23.44	Pass
2*	0.3339	30.57	22.10	9.56	40.13	31.66	59.35	49.35	-19.22	-17.69	Pass
3	0.4180	23.05	9.53	9.57	32.62	19.10	57.49	47.49	-24.87	-28.39	Pass
4	1.6660	20.73	4.10	9.60	30.33	13.70	56.00	46.00	-25.67	-32.30	Pass
5	5.4940	20.50	7.21	9.68	30.18	16.89	60.00	50.00	-29.82	-33.11	Pass
6	13.2860	17.47	4.34	9.82	27.29	14.16	60.00	50.00	-32.71	-35.84	Pass

EUT Name	Professional Key Tool	Model	MaxiIM KM100
Environmental Conditions	23.4°C/48%RH/101kPa	Test Mode	Mode 1
Power supply	AC120V/60Hz	Tested By	Tang Shenghui
Test Date	2022-04-14	Sample No.	E202112291004-0001

Line: N



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1580	34.09	14.58	9.51	43.60	24.09	65.56	55.57	-21.96	-31.48	Pass
2*	0.3379	30.99	20.02	9.63	40.62	29.65	59.25	49.25	-18.63	-19.60	Pass
3	0.4140	20.95	12.03	9.66	30.61	21.69	57.57	47.57	-26.96	-25.88	Pass
4	0.8300	21.08	8.22	9.64	30.72	17.86	56.00	46.00	-25.28	-28.14	Pass
5	1.9340	21.04	4.20	9.60	30.64	13.80	56.00	46.00	-25.36	-32.20	Pass
6	13.1260	16.95	2.18	9.85	26.80	12.03	60.00	50.00	-33.20	-37.97	Pass

6. RADIATED SPURIOUS EMISSIONS

6.1 LIMITS

§15.231(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 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

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667*F - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

§15.231(b)(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.

Frequency (MHz)	Quasi-peak(μV/m)	Measurement distance(m)	Quasi-peak(dBμV/m)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

NOTE: (1) The lower limit shall apply at the transition frequencies.

6.2 TEST PROCEDURES

- 1) The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6) If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported.
Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- 7) The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the Z position. So the data shown was the Z position only.

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6.3 TEST SETUP

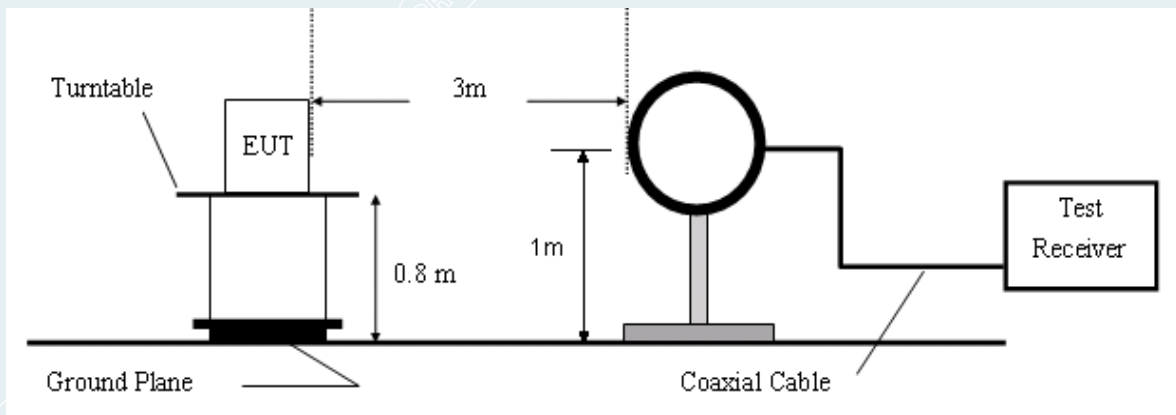


Figure 1. 9kHz to 30MHz radiated emissions test configuration

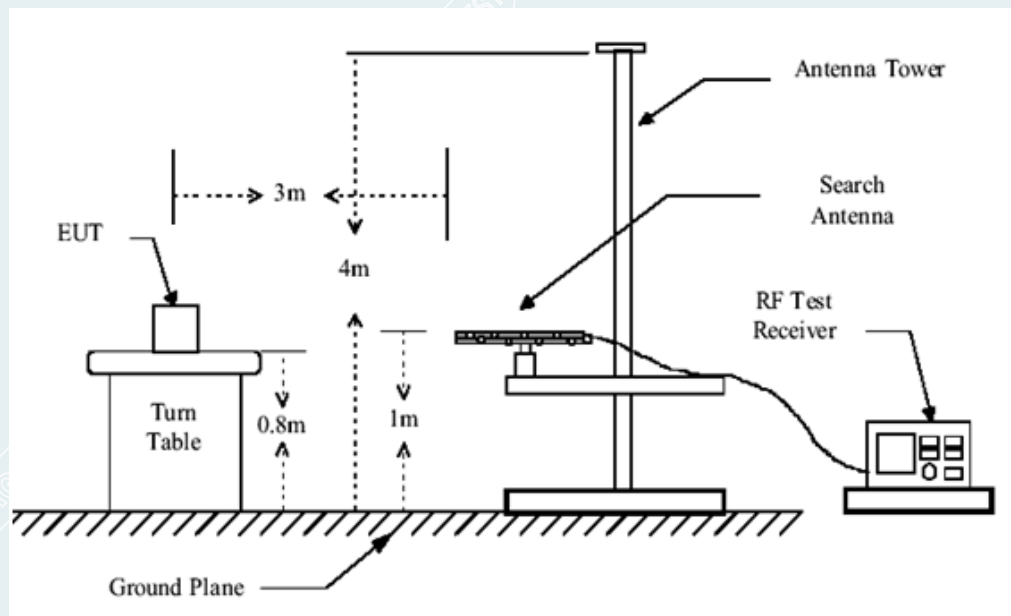


Figure 2. 30MHz to 1GHz radiated emissions test configuration

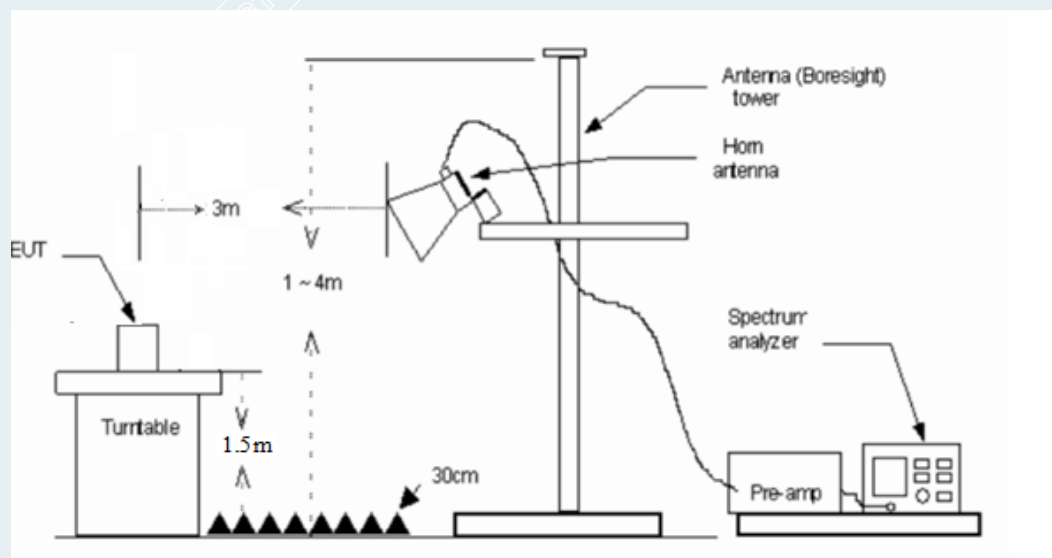


Figure 3. Above 1GHz radiated emissions test configuration

6.4 DATA SAMPLE**Below 1GHz**

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXX.XXXX	37.47	-16.41	21.06	40.00	-18.94	V	QP

Above 1GHz

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXXX.XXX	55.54	4.56	60.10	74.00	-13.90	V	Peak
XXXX.XXX	29.66	4.56	34.22	54.00	-19.78	V	AVG

Frequency (MHz)

= Emission frequency in MHz

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m)

= Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m)

= Reading (dBuV) + Corr. Factor (dB/m)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Result (dBuV/m) – Limit(dBuV/m)

Q.P.

= Quasi-peak Reading

Peak

= Peak Reading

AVG

= Average Reading

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6.5 TEST RESULTS

Environment:

23.4°C/48%RH/101kPa

Power Source:

DC 3.85V

Test Date:

2022-04-07

Test By :

Lu Wei

The field strength of fundamental:

TX / 315MHz

FSK

Frequency	Reading	Result	Correct	Limit	Margin	Height	Degree	Antenna Pole	Remark
(MHz)	(dBuV/m)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dB)	(cm)	(deg)	(V/H)	
315	102.52	77.36	-25.16	95.62	18.26	200	62	H	peak
315	108.86	83.70	-25.16	95.62	11.92	200	286	V	peak

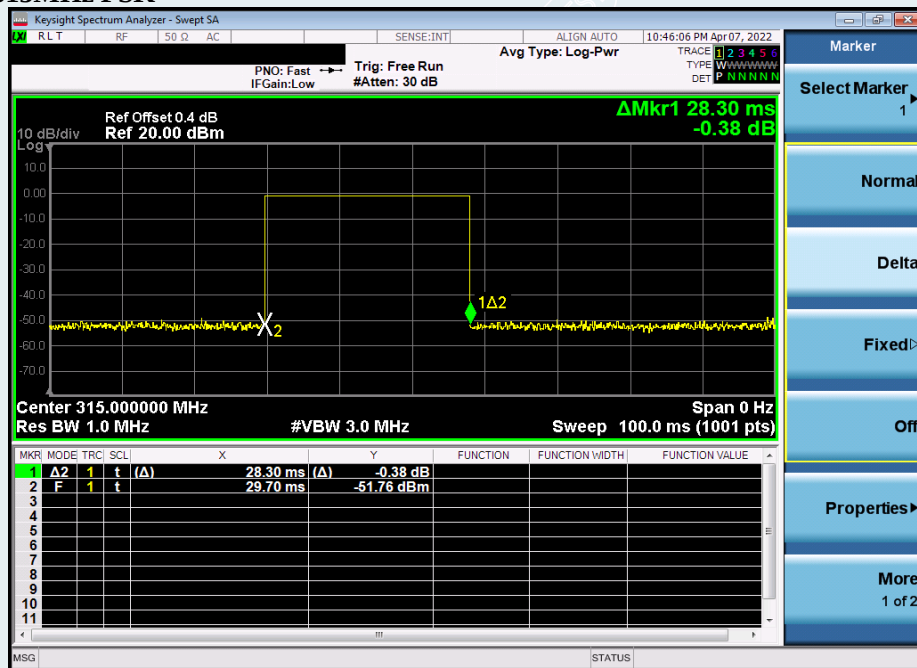
Frequency	PK Result	Duty Cycle Correction	Result	Limit	Margin	Antenna Pole(V/H)	Remark
(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)		
315	77.36	-10.96	66.40	75.62	9.22	H	AVG
315	83.70	-10.96	72.74	75.62	2.88	V	AVG

Remark:

1. $AVG = Peak + 20\log(Duty\ Cycle)$
2. Duty Cycle = On time/Total time = 28.3ms/100.0ms = 28.3%
3. Duty Cycle Correction Factor: $20\log(0.283) = -10.96$

Transmitting conditions:

Duty Cycle: 315MHz FSK



TX / 315MHz

ASK

Frequency	Reading	Result	Correct	Limit	Margin	Height	Degree	Antenna Pole	Remark
(MHz)	(dBuV)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dB)	(cm)	(deg)	(V/H)	
315	102.11	76.95	-25.16	95.62	18.67	200	67	H	peak
315	108.82	83.66	-25.16	95.62	11.96	200	289	V	peak

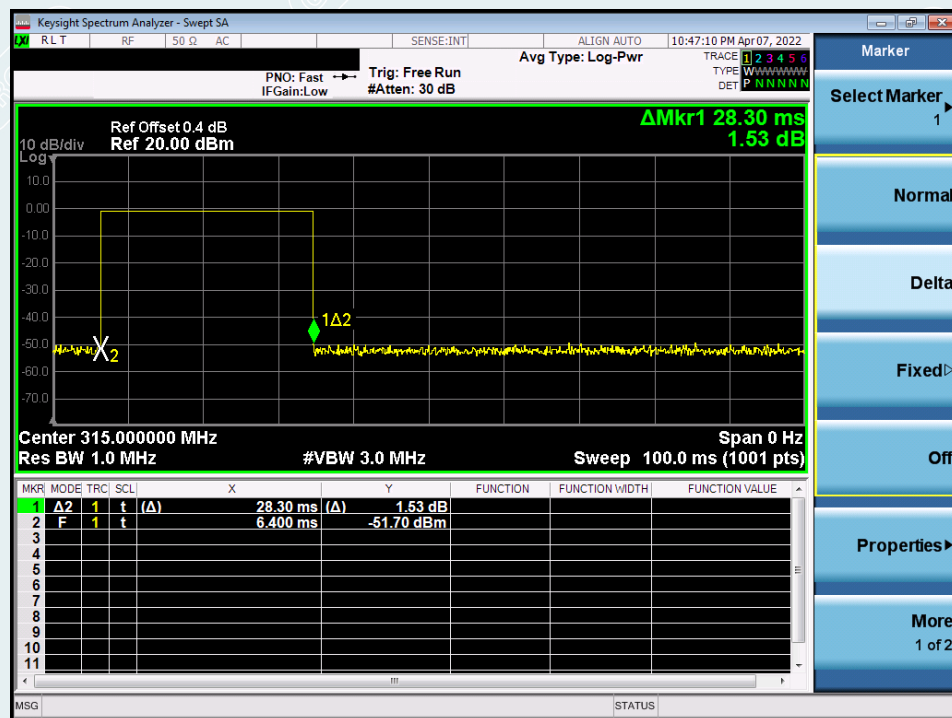
Frequency	PK Result	Duty Cycle Correction	Result	Limit	Margin	Antenna Pole(V/H)	Remark
(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)		
315	76.95	-10.96	65.99	75.62	9.63	H	AVG
315	83.66	-10.96	72.70	75.62	2.92	V	AVG

Remark:

1. $AVG = \text{Peak} + 20\log(\text{Duty Cycle})$
2. Duty Cycle = On time/Total time = $28.3\text{ms}/100.0\text{ms} = 28.3\%$
3. Duty Cycle Correction Factor: $20\log(0.283) = -10.96$

Transmitting conditions:

Duty Cycle: 315MHz ASK



FSK

Frequency	PK Result	Duty Cycle Correction	Result	Limit	Margin	Antenna Pole(V/H)	Remark
(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)		
433.92	71.58	-10.96	60.62	80.83	20.21	H	AVG
433.92	73.98	-10.96	63.02	80.83	17.81	V	AVG

1. $AVG = Peak + 20 \log(Duty\ Cycle)$
2. $Duty\ Cycle = \frac{On\ time}{Total\ time} = \frac{28.3ms}{100.0ms} = 28.3\%$
3. Duty Cycle Correction Factor: $20 \log(0.283) = -10.96$

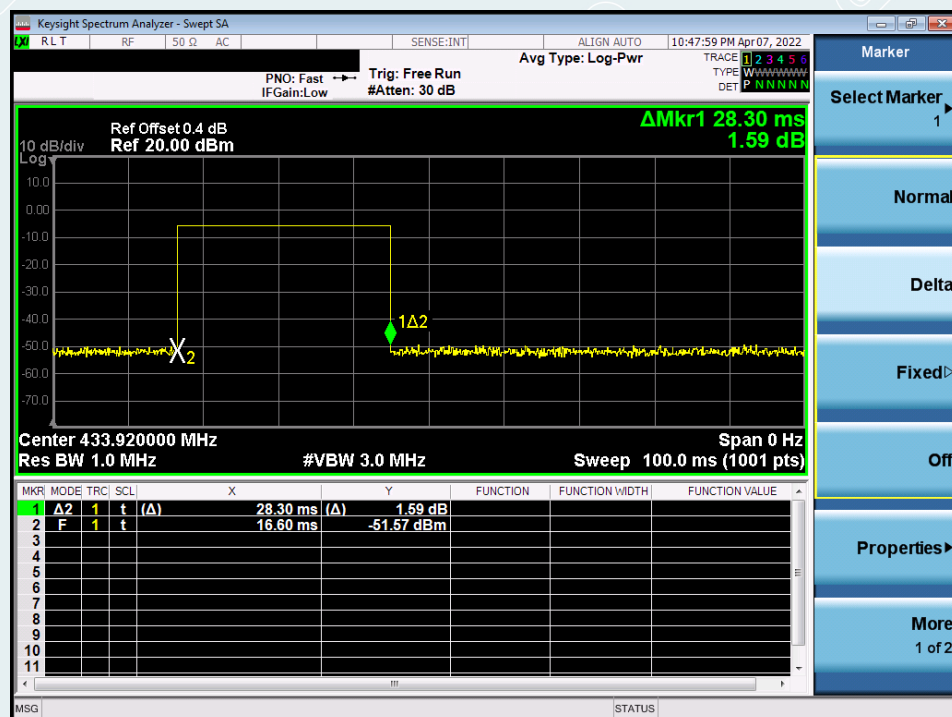
24.6 (C) / 52 %RH

DC 3.85V

2022-04-07

Lu Wei

Duty Cycle:433.92MHz FSK



ASK

Frequency	Reading	Result	Correct	Limit	Margin	Height	Degree	Antenna Pole	Remark
(MHz)	(dBuV/m)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dB)	(cm)	(deg)	(V/H)	
433.92	93.86	71.88	-21.98	100.83	28.95	100	52	H	peak
433.92	95.67	73.69	-21.98	100.83	27.14	200	283	V	peak

Frequency	PK Result	Duty Cycle Correction	Result	Limit	Margin	Antenna Pole(V/H)	Remark
(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)		
433.92	71.88	-11.00	60.88	80.83	19.95	H	AVG
433.92	73.69	-11.00	62.69	80.83	18.14	V	AVG

Remark:

1. $AVG = Peak + 20 \log(Duty\ Cycle)$
2. $Duty\ Cycle = On\ time / Total\ time = 28.2ms / 100.0ms = 28.2\%$
3. Duty Cycle Correction Factor: $20 \log(0.282) = -11.00$

Transmitting conditions:

Environment:

24.6 (C) / 52 %RH

Power Source:

DC 3.85V

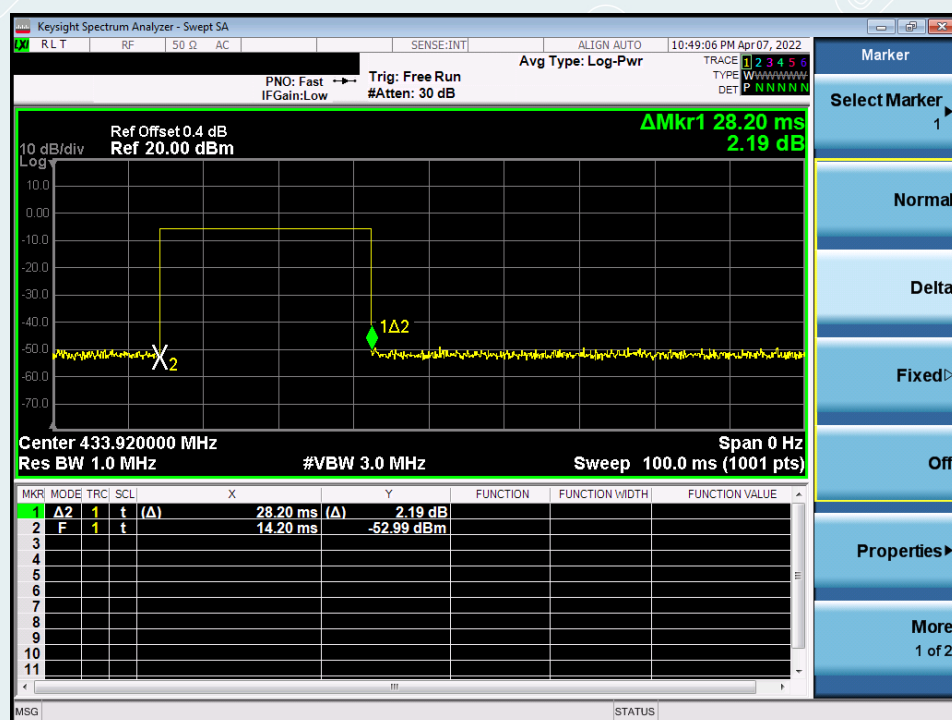
Test Date:

2022-04-07

Test By :

Lu Wei

Duty Cycle: 433.92MHz ASK



315MHz FSK

Environment:

25.0 (C) / 60 %RH

Power Source:

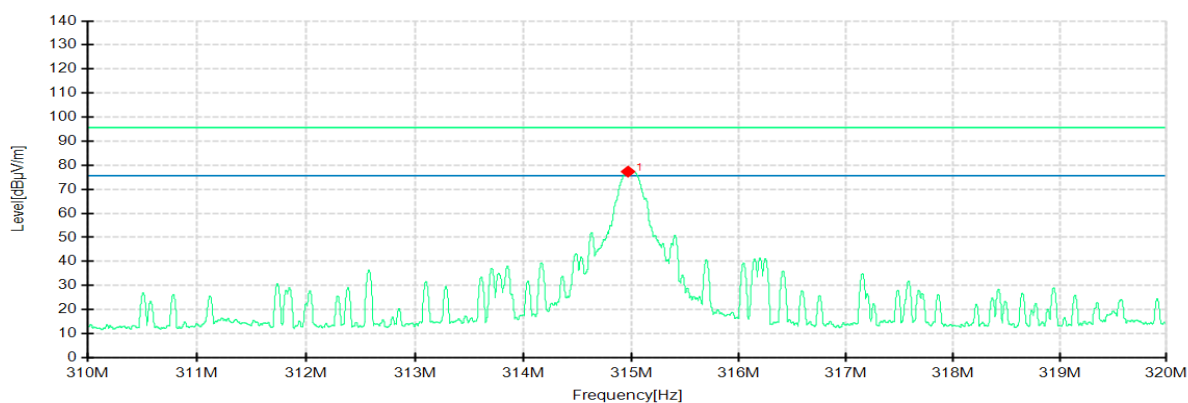
DC 3.85V

Test Date:

2022-04-12

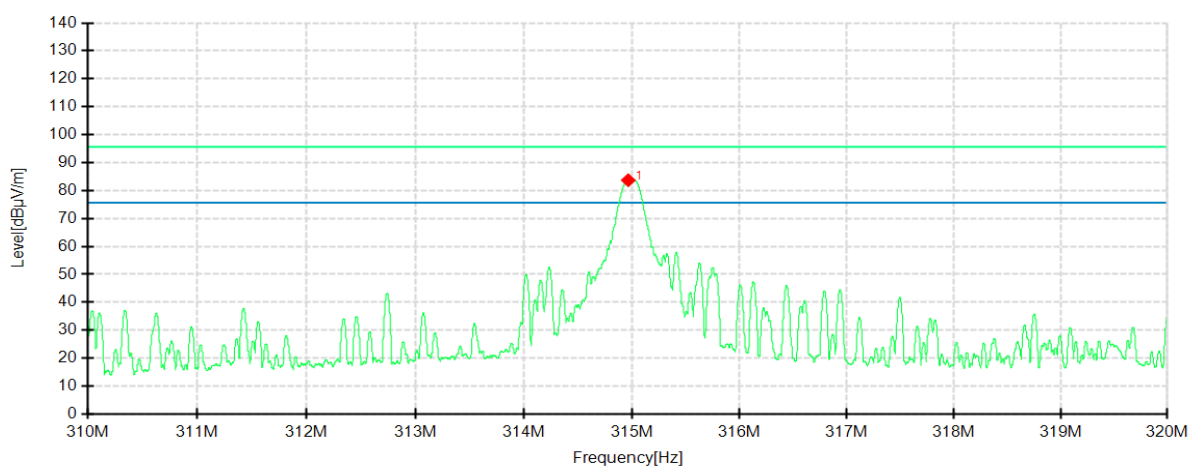
Test By :

Lu Qiang



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	314.9700	102.52	77.36	-25.16	95.62	18.26	200	62	Horizontal



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	314.9675	108.86	83.70	-25.16	95.62	11.92	200	286	Vertical

315MHz ASK

Environment:

25.0 (C) / 60 %RH

Power Source:

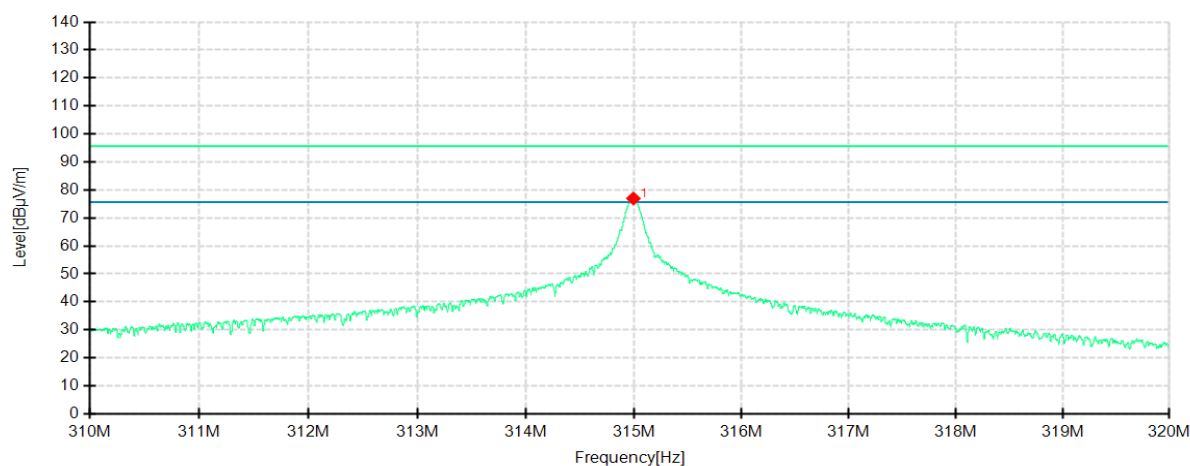
DC 3.85V

Test Date:

2022-04-12

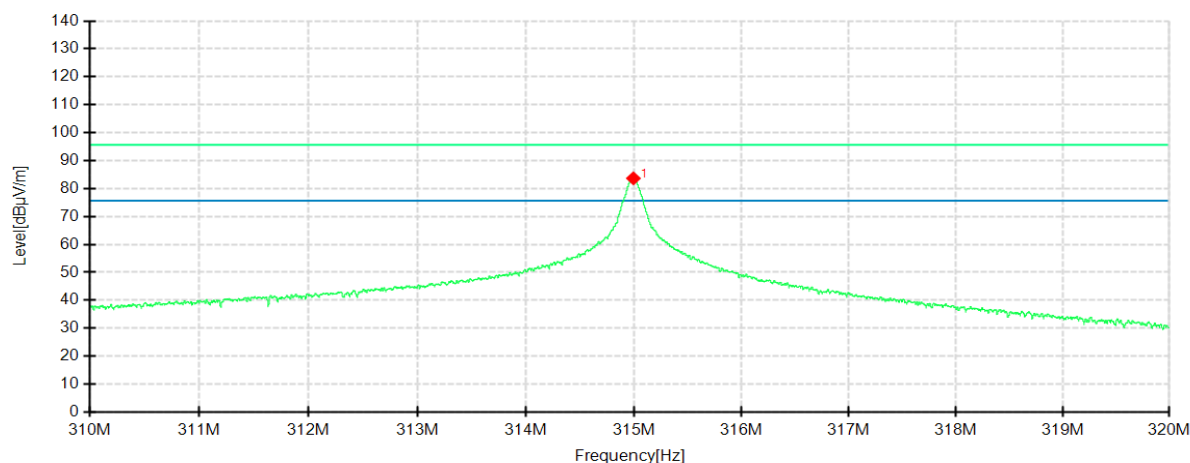
Test By :

Lu Qiang



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	314.9963	102.11	76.95	-25.16	95.62	18.67	200	67	Horizontal



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	314.9963	108.82	83.66	-25.16	95.62	11.96	200	289	Vertical

433.92MHz FSK

Environment:

25.0 (C) / 60 %RH

Power Source:

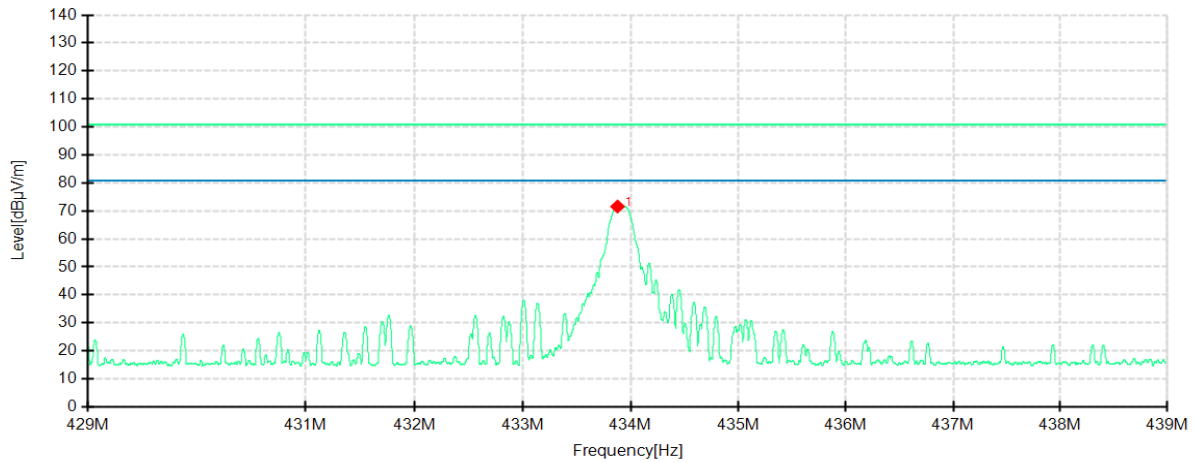
DC 3.85V

Test Date:

2022-04-12

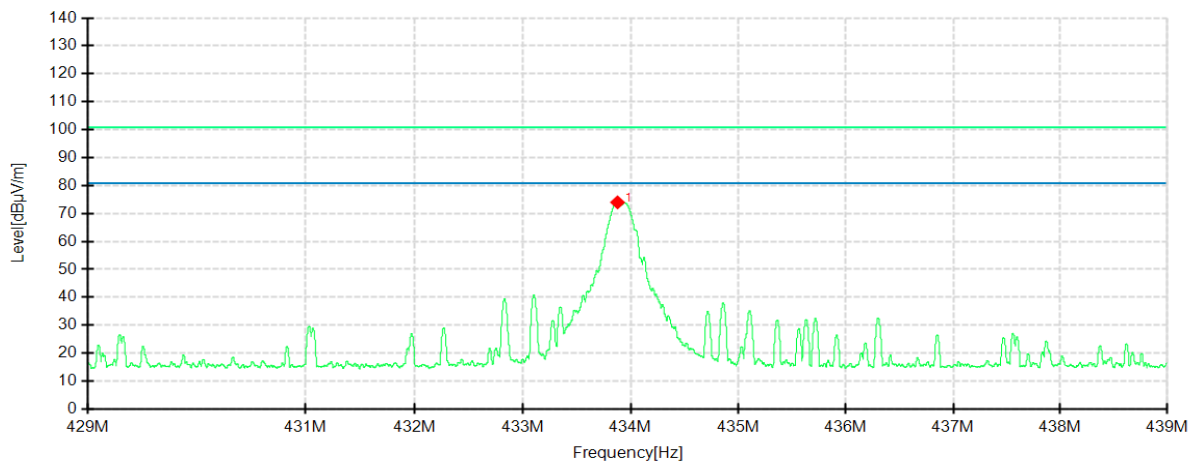
Test By :

Lu Qiang



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	433.8788	93.56	71.58	-21.98	100.83	29.25	100	48	Horizontal



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	433.8788	95.96	73.98	-21.98	100.83	26.85	200	277	Vertical

433.92MHz ASK

Environment:

25.0 (C) / 60 %RH

Power Source:

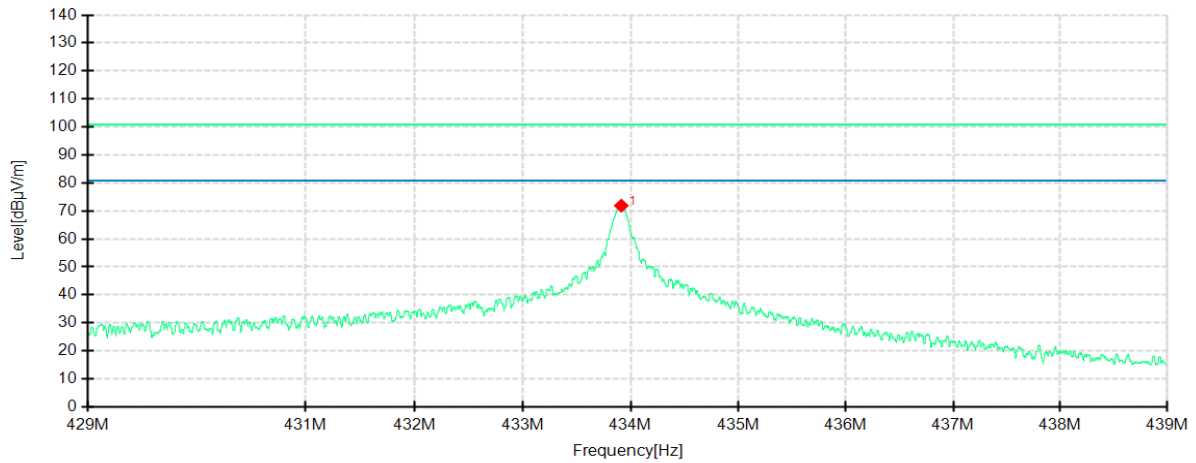
DC 3.85V

Test Date:

2022-04-12

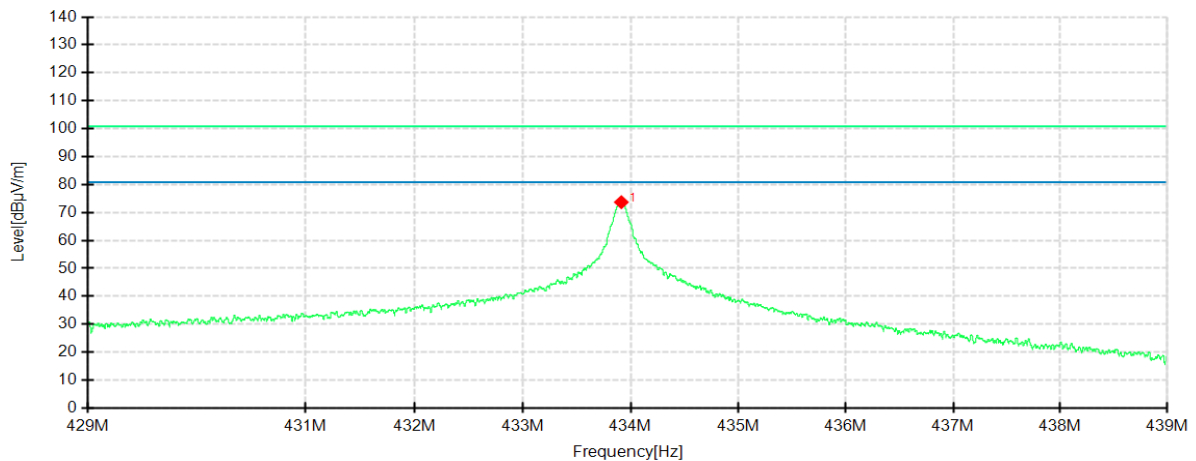
Test By :

Lu Qiang



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	433.9138	93.86	71.88	-21.98	100.83	28.95	100	52	Horizontal



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	433.9138	95.67	73.69	-21.98	100.83	27.14	200	283	Vertical

Radiated Spurious Emission**For 9kHz to 30MHz**

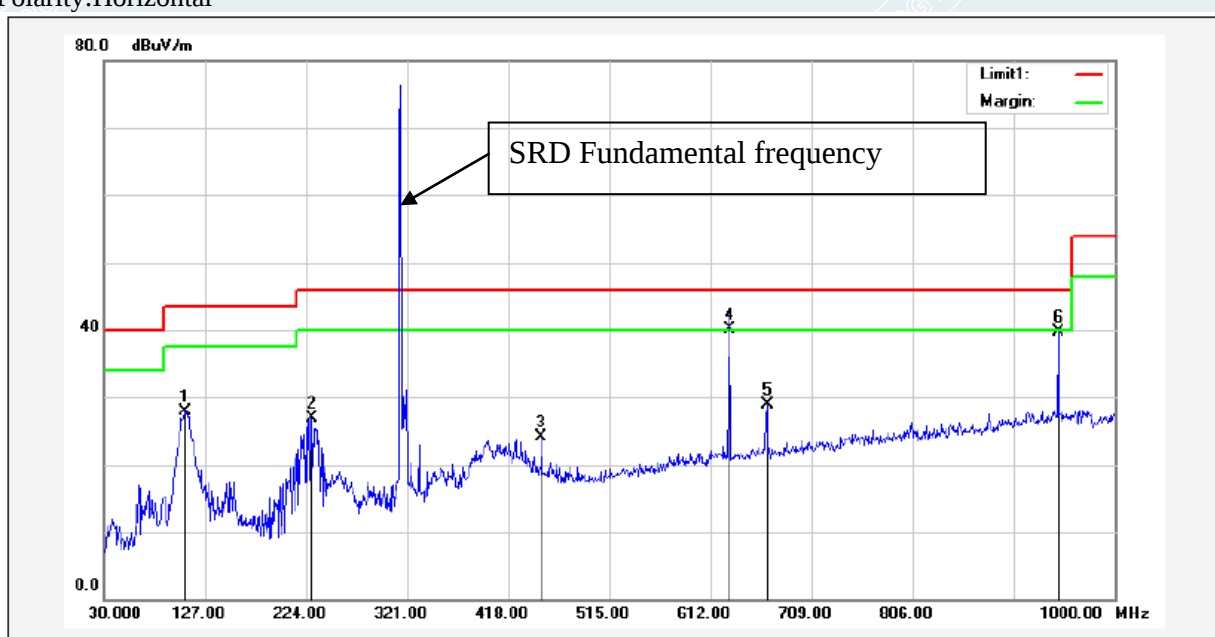
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For 30MHz – 1GHz

Test Voltage:	3.85V dc	Test Mode:	TX
Ambient temperature:	24.0℃	Test By :	Zeng Xianglong
Relative humidity:	46%	TestDate:	2022-04-04

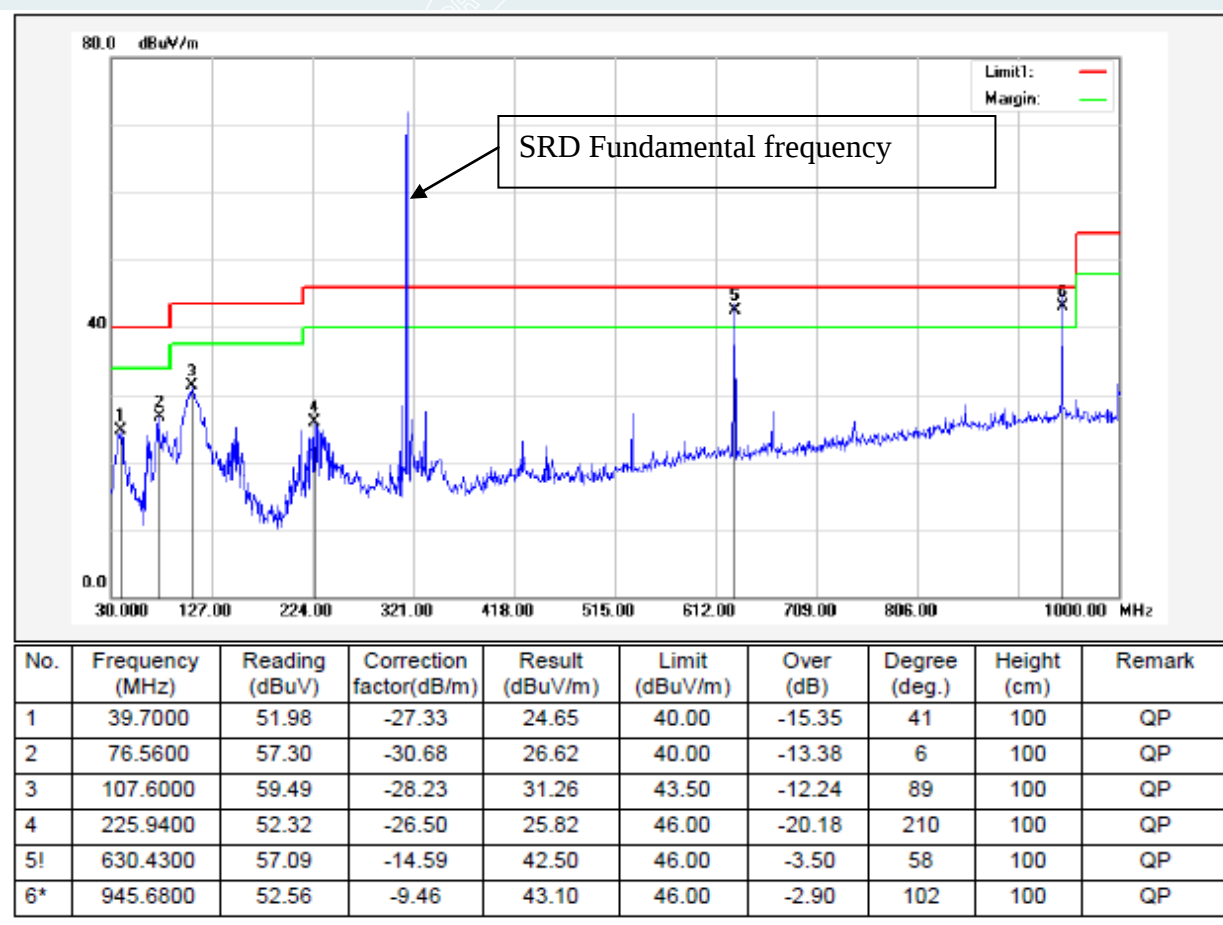
315MHz FSK

Polarity:Horizontal



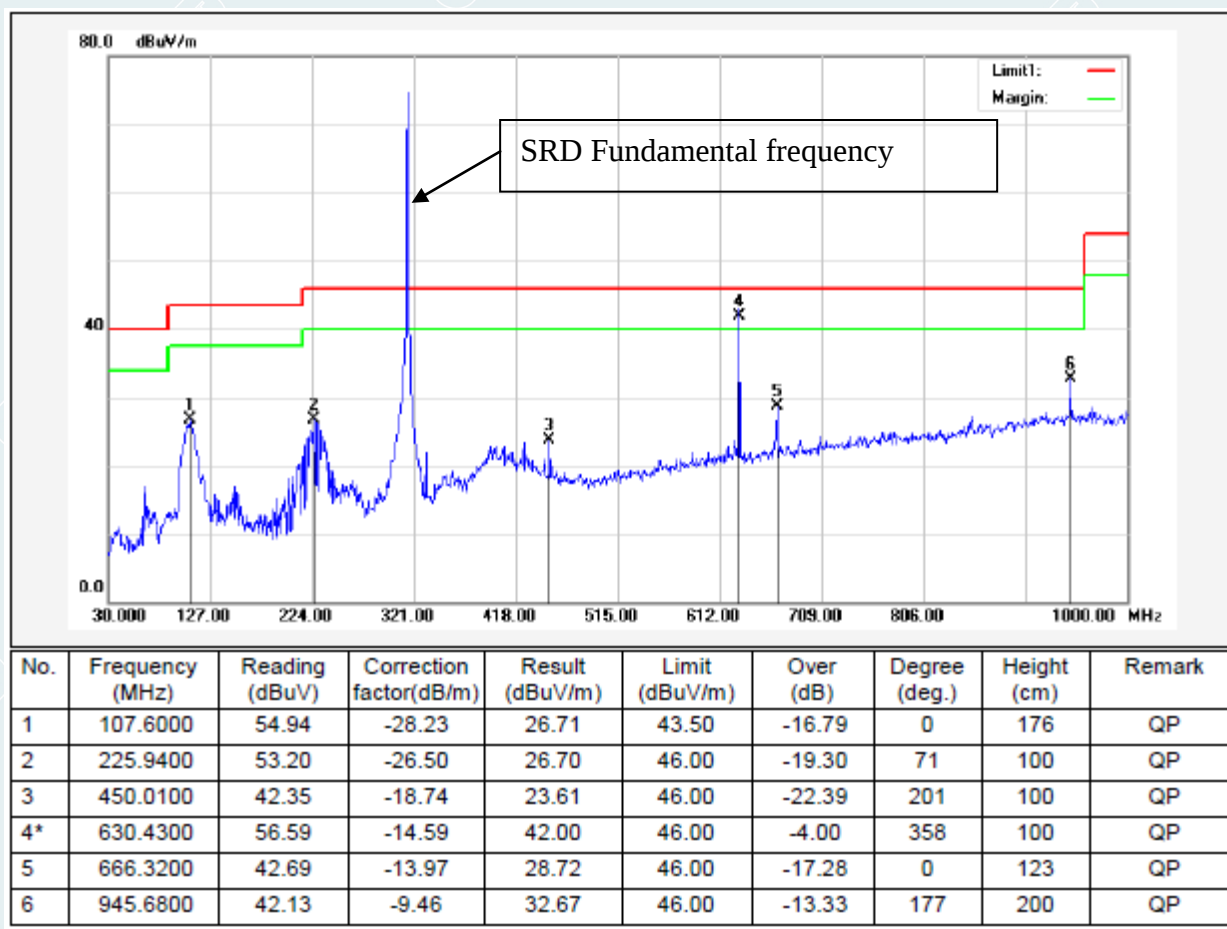
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over (dB)	Degree (deg.)	Height (cm)	Remark
1	108.5700	56.04	-28.10	27.94	43.50	-15.56	359	302	QP
2	229.8200	53.28	-26.33	26.95	46.00	-19.05	81	100	QP
3	450.0100	42.75	-18.74	24.01	46.00	-21.99	211	100	QP
4*	630.4300	54.79	-14.59	40.20	46.00	-5.80	359	102	QP
5	666.3200	42.90	-13.97	28.93	46.00	-17.07	359	100	QP
6	945.6800	49.20	-9.46	39.74	46.00	-6.26	81	100	QP

Polarity:Vertical

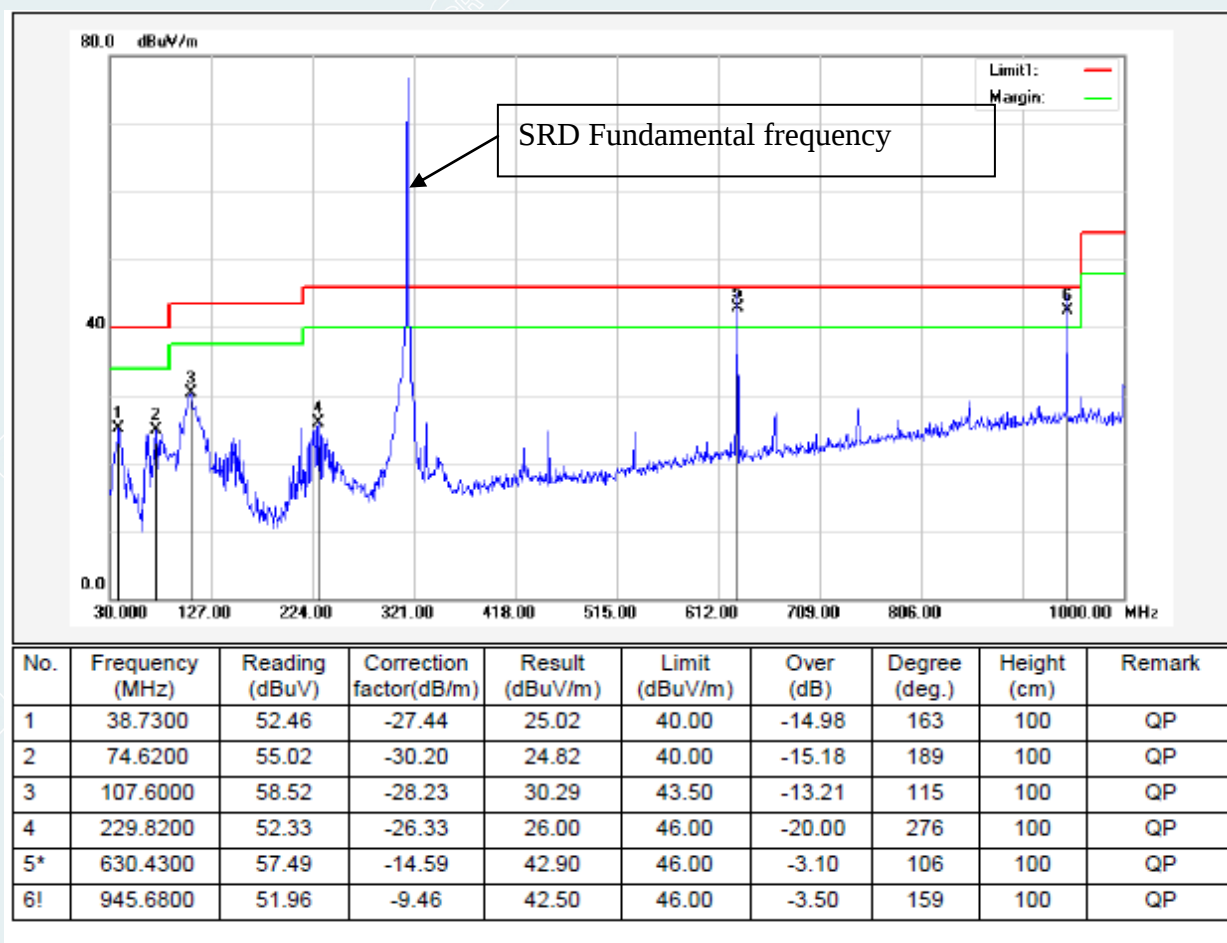


315MHz ASK

Polarity:Horizontal

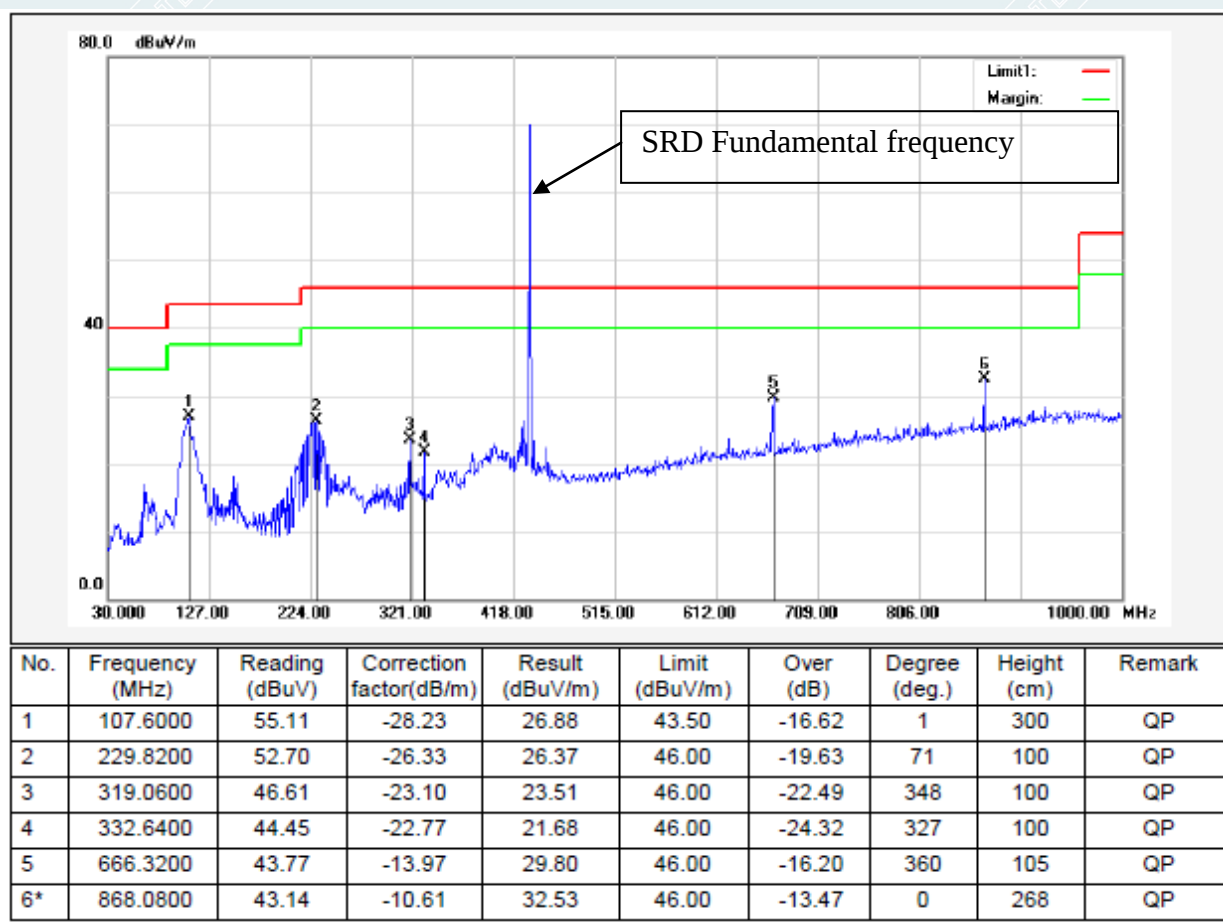


Polarity:Vertical

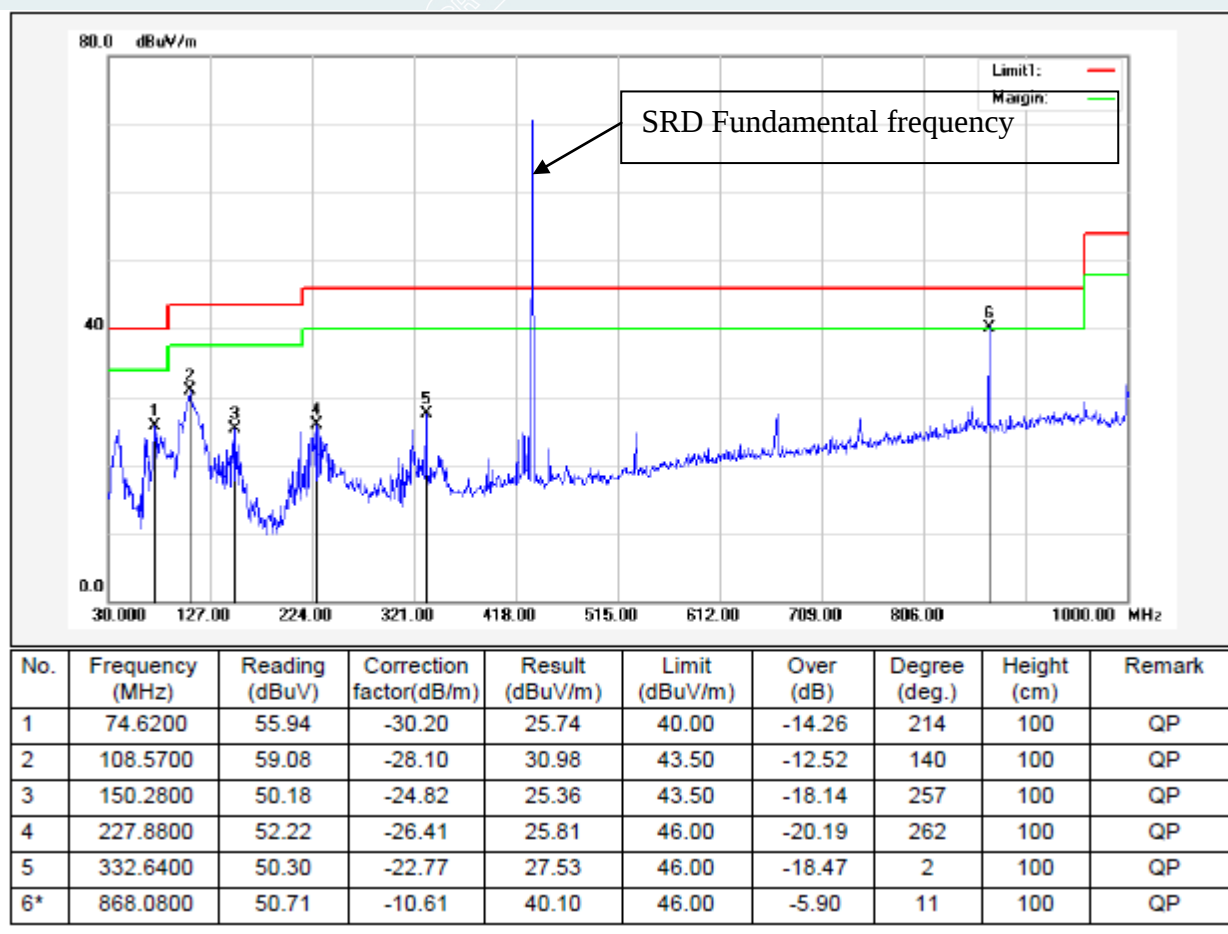


433.92MHz FSK

Polarity:Horizontal

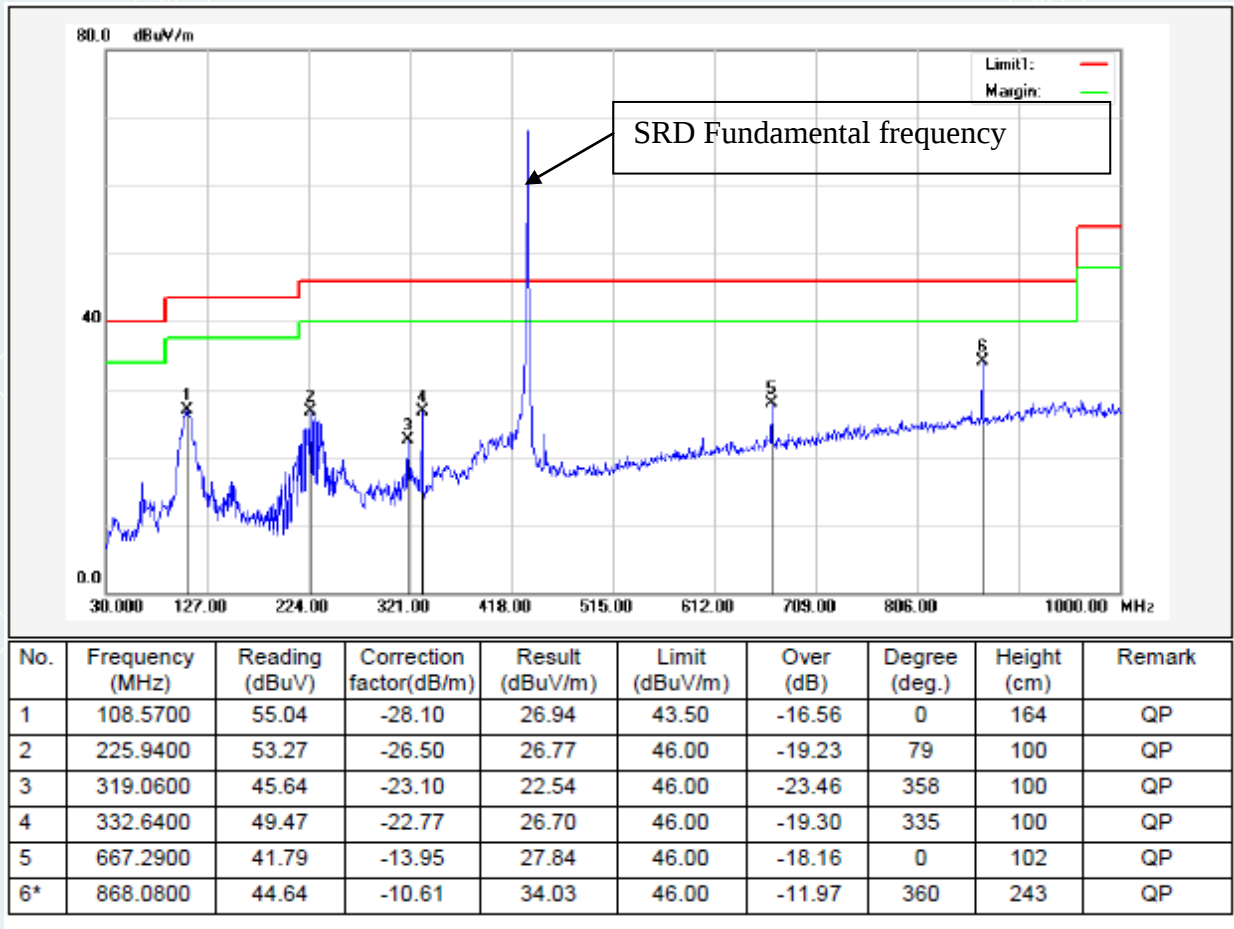


Polarity:Vertical

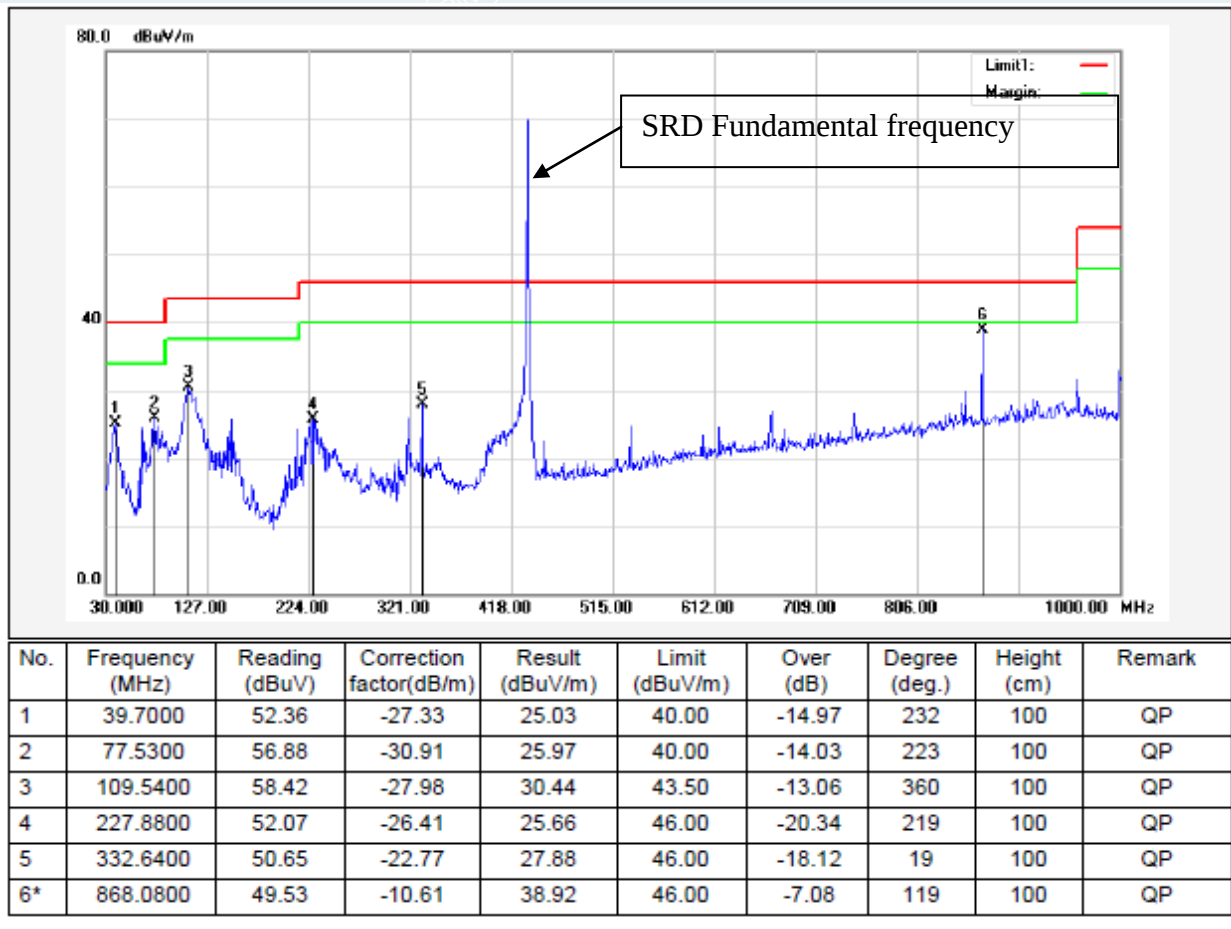


433.92MHz ASK

Polarity:Horizontal



Polarity:Vertical

**Remark:**

- 1 No emission found between lowest internal used/generated frequency to 30MHz.
- 2 Radiated emissions measured in frequency range from 30MHz to 1GHz were made with an instrument using Quasi-peak detector mode.
- 3 The IF bandwidth of Receiver between 30MHz to 1GHz was 120kHz.
- 4 Below 1GHz: factor = Antenna Factor + Cable Loss.

For Emission above 1GHz:

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Test Voltage:	3.85V dc	Test Mode:	TX
Ambient temperature:	25℃	Test By :	Zhang Zishan
Relative humidity:	60%	TestDate:	2022-04-04

315MHz FSK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1278.0000	56.72	33.10	-23.62	74.00	40.90	100	34	Horizontal
2	1729.0000	53.71	33.44	-20.27	74.00	40.56	200	86	Horizontal
3	1998.0000	57.08	35.97	-21.11	74.00	38.03	100	216	Horizontal
4	2862.0000	53.76	35.79	-17.97	74.00	38.21	100	32	Horizontal
5	3330.0000	55.31	38.27	-17.04	74.00	35.73	200	228	Horizontal
6	4662.0000	53.10	40.30	-12.80	74.00	33.70	200	243	Horizontal
1	1133.0000	56.31	31.92	-24.39	74.00	42.08	200	272	Vertical
2	1332.0000	56.46	33.15	-23.31	74.00	40.85	200	126	Vertical
3	2000.0000	55.66	34.55	-21.11	74.00	39.45	200	44	Vertical
4	2847.0000	54.05	36.07	-17.98	74.00	37.93	200	44	Vertical
5	3706.0000	53.60	37.39	-16.21	74.00	36.61	200	237	Vertical
6	4662.0000	52.81	40.01	-12.80	74.00	33.99	100	316	Vertical

315MHz ASK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1188.0000	56.26	32.12	-24.14	74.00	41.88	200	99	Horizontal
2	1550.0000	54.99	33.23	-21.76	74.00	40.77	200	206	Horizontal
3	2594.0000	54.80	36.10	-18.70	74.00	37.90	100	75	Horizontal
4	3330.0000	58.13	41.09	-17.04	74.00	32.91	200	222	Horizontal
5	4338.0000	52.78	38.73	-14.05	74.00	35.27	100	309	Horizontal
6	5604.0000	48.38	39.01	-9.37	74.00	34.99	100	306	Horizontal
1	1332.0000	58.13	34.82	-23.31	74.00	39.18	200	159	Vertical
2	2024.0000	56.30	35.20	-21.10	74.00	38.80	200	185	Vertical
3	2331.0000	56.57	36.54	-20.03	74.00	37.46	200	169	Vertical
4	2664.0000	57.80	39.11	-18.69	74.00	34.89	200	180	Vertical
5	3330.0000	56.14	39.10	-17.04	74.00	34.90	200	206	Vertical
6	4944.0000	83.57	72.52	-11.05	74.00	1.48	100	65	Vertical

433.92MHz FSK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1278.0000	56.98	33.36	-23.62	74.00	40.64	100	45	Horizontal
2	1738.0000	54.26	33.95	-20.31	74.00	40.05	100	186	Horizontal
3	2501.0000	54.67	35.18	-19.49	74.00	38.82	200	144	Horizontal
4	3330.0000	59.77	42.73	-17.04	74.00	31.27	200	223	Horizontal
5	4662.0000	55.04	42.24	-12.80	74.00	31.76	200	257	Horizontal
6	5686.0000	48.67	39.54	-9.13	74.00	34.46	100	155	Horizontal
1	1192.0000	56.52	32.39	-24.13	74.00	41.61	100	222	Vertical
2	1472.0000	56.17	33.68	-22.49	74.00	40.32	200	200	Vertical
3	2294.0000	55.40	35.08	-20.32	74.00	38.92	100	82	Vertical
4	3164.0000	54.68	37.31	-17.37	74.00	36.69	100	92	Vertical
5	4420.0000	52.05	38.55	-13.50	74.00	35.45	100	92	Vertical
6	5606.0000	48.71	39.35	-9.36	74.00	34.65	100	56	Vertical

433.92MHz ASK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1278.0000	56.05	32.43	-23.62	74.00	41.57	100	26	Horizontal
2	1687.0000	53.37	33.09	-20.28	74.00	40.91	200	332	Horizontal
3	2024.0000	56.00	34.90	-21.10	74.00	39.10	200	153	Horizontal
4	2664.0000	55.34	36.65	-18.69	74.00	37.35	100	226	Horizontal
5	3330.0000	57.00	39.96	-17.04	74.00	34.04	200	223	Horizontal
6	4662.0000	52.00	39.20	-12.80	74.00	34.80	200	242	Horizontal
1	1332.0000	57.26	33.95	-23.31	74.00	40.05	200	173	Vertical
2	2331.0000	61.67	41.64	-20.03	74.00	32.36	200	217	Vertical
3	2664.0000	58.85	40.16	-18.69	74.00	33.84	200	204	Vertical
4	3330.0000	56.03	38.99	-17.04	74.00	35.01	200	162	Vertical
5	4171.0000	52.29	37.79	-14.50	74.00	36.21	100	46	Vertical
6	4846.0000	50.88	39.26	-11.62	74.00	34.74	200	258	Vertical

Note:

- 1 Radiated emissions measured in frequency range from 1GHz – 10GHz were made with an instrument using Peak/AV detector mode.
- 2 According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it's unnecessary to perform an average measurement.
- 3 The IF bandwidth of Receiver between above was 1MHz
- 4 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain.

7. 20DB BANDWIDTH

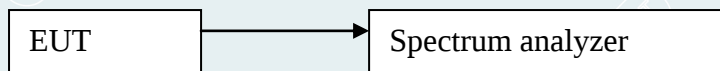
7.1 LIMITS

§15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

7.2 TEST PROCEDURES

- 1) Set resolution bandwidth (RBW) = 2kHz. Set the video bandwidth (VBW) $\geq 3 \times$ RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize, record 20dB bandwidth value.
- 2) Repeat above procedures until all frequencies measured were complete.

7.3 TEST SETUP



7.4 TEST RESULTS

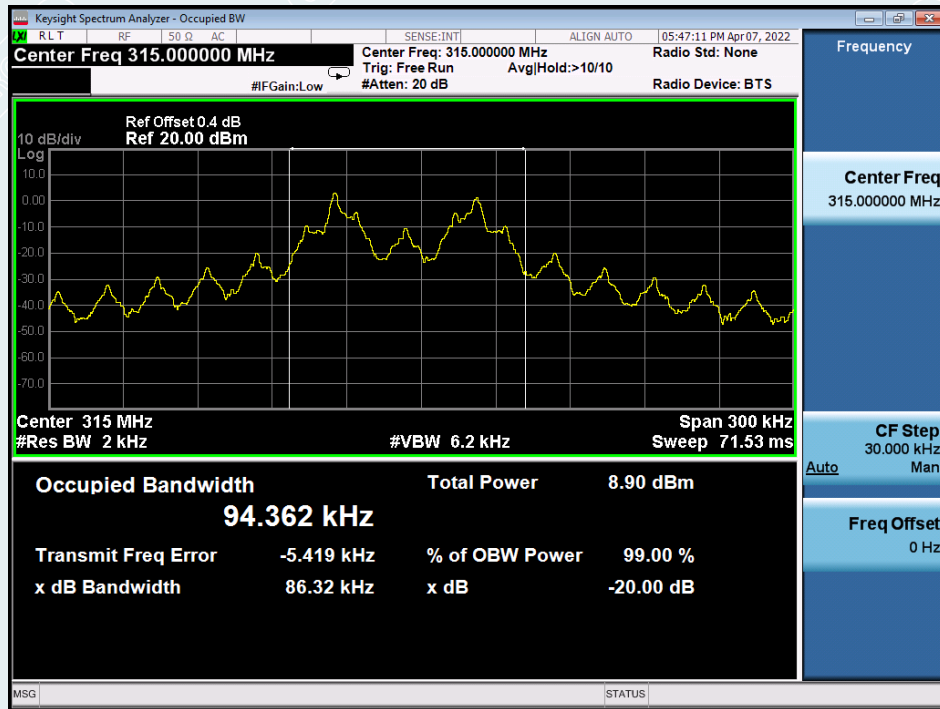
Environment:	23.4°C/48%RH/101kPa
Power Source:	DC 3.85V
Test Date:	2022-04-07
Test By :	Lu Wei

Test mode: 315MHz FSK

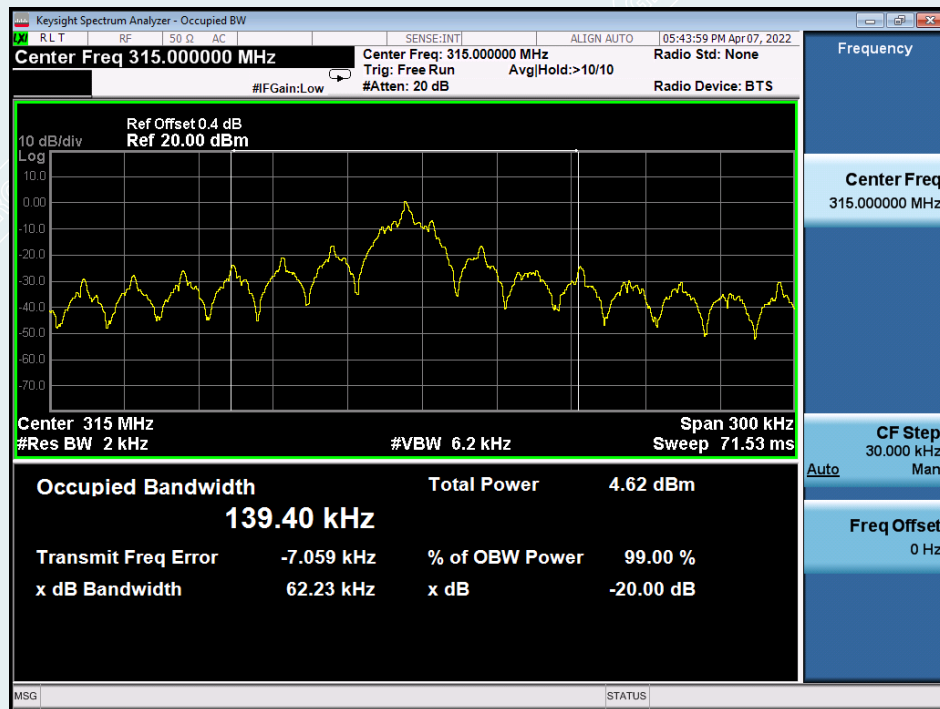
Frequency(MHz)	Bandwidth(kHz)	Limit(kHz)	Test Result
315	86.32	787.5	PASS

Test mode: 315MHz ASK

Frequency(MHz)	Bandwidth(kHz)	Limit(kHz)	Test Result
315	62.23	787.5	PASS

Test Plot

315MHz FSK



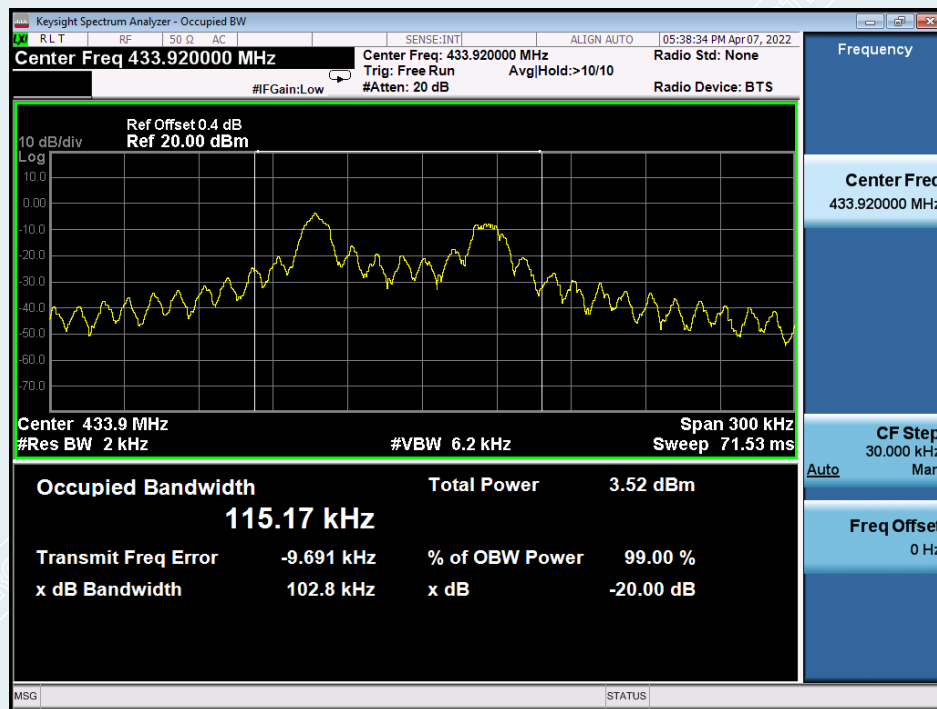
315MHz ASK

Test mode: 433.92MHz FSK

Frequency(MHz)	Bandwidth(kHz)	Limit(kHz)	Test Result
433.92	102.8	1084.8	PASS

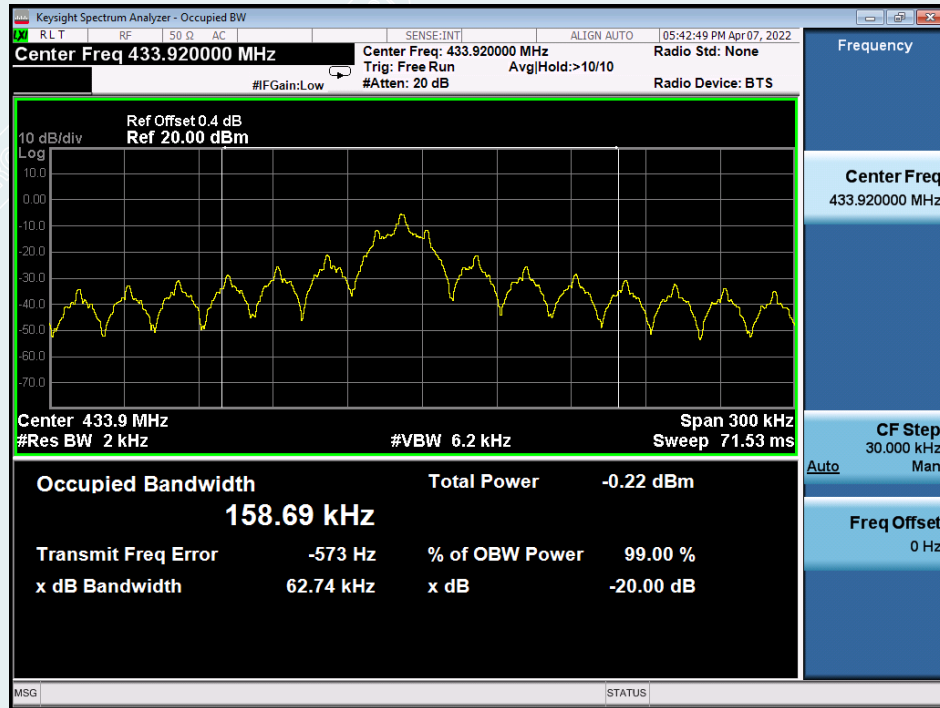
Test mode: 433.92MHz ASK

Frequency(MHz)	Bandwidth(kHz)	Limit(kHz)	Test Result
433.92	62.74	1084.8	PASS

Test Plot

433.92MHz FSK

----- The following blanks -----



433.92MHz ASK

----- The following blanks -----

8. TRANSMISSION TIME

8.1 LIMITS

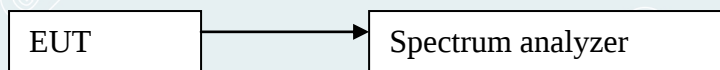
§15.231(a) for this periodic operation:

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

8.2 TEST PROCEDURES

- 1) The spectrum analyzer resolution bandwidth that is $\leq$ EBW. So we test the Maximum Conducted Output Power ——Integrated band power method.
- 2) Set Set the analyzer span = 0Hz. RBW = 1MHz.Set VBW =3MHz. Detector = Peak. Sweep = Adjust according to actual conditions.
- 3) Allow the trace to stabilize, record value.

8.3 TEST SETUP



8.4 TEST RESULTS

Environment:

23.4°C/48%RH/101kPa

Power Source:

DC 3.85V

Test Date:

2022-04-11 to 2022-04-12

Test By :

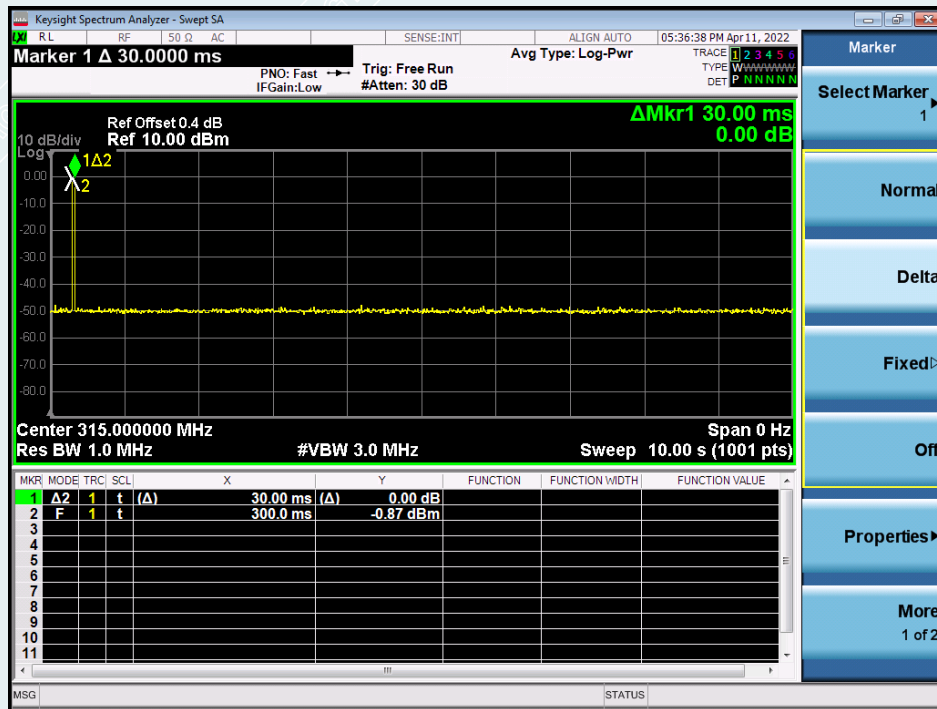
Lu Wei

315MHz FSK

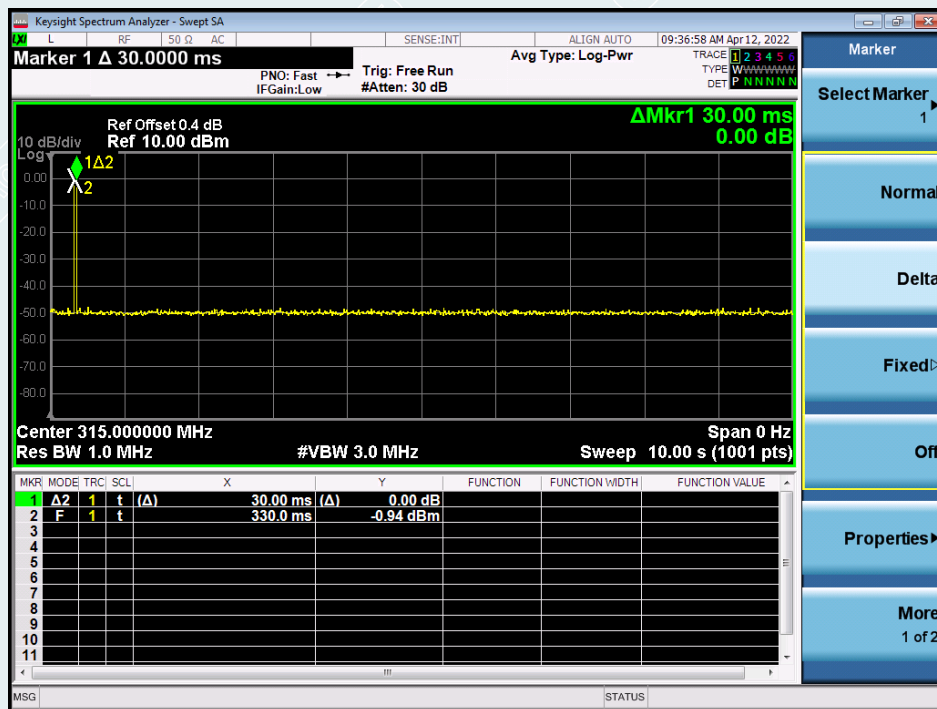
Frequency (MHz)	Transmission Time (s)	Limit (s)	Result
315	0.03	≤ 5	Pass

315MHz ASK

Frequency (MHz)	Transmission Time (s)	Limit (s)	Result
315	0.03	≤ 5	Pass

Test Plot

315MHz FSK



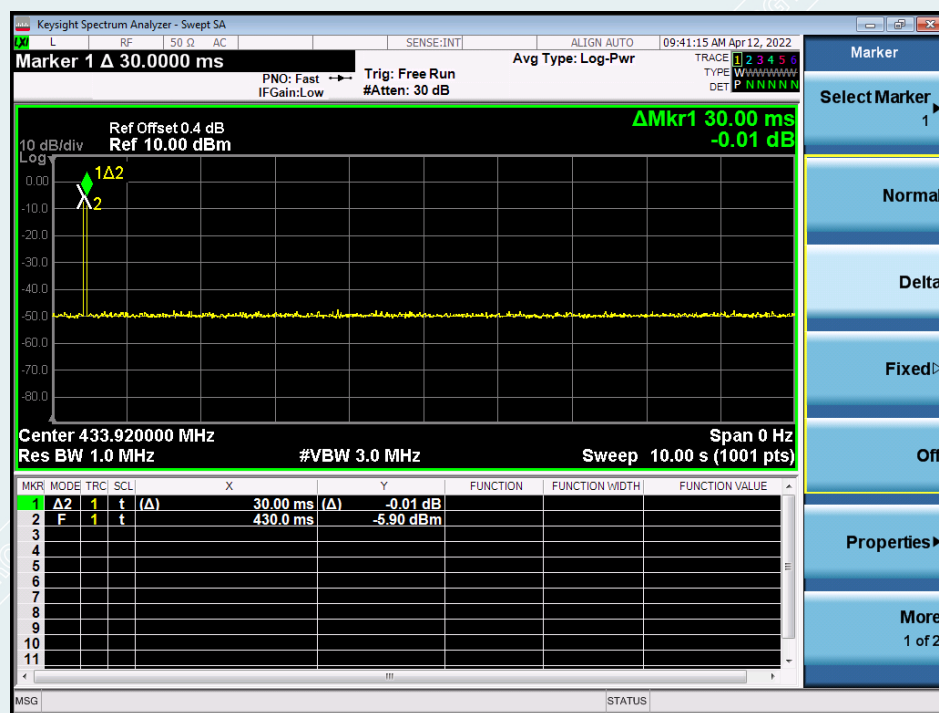
315MHz ASK

433.92MHz FSK

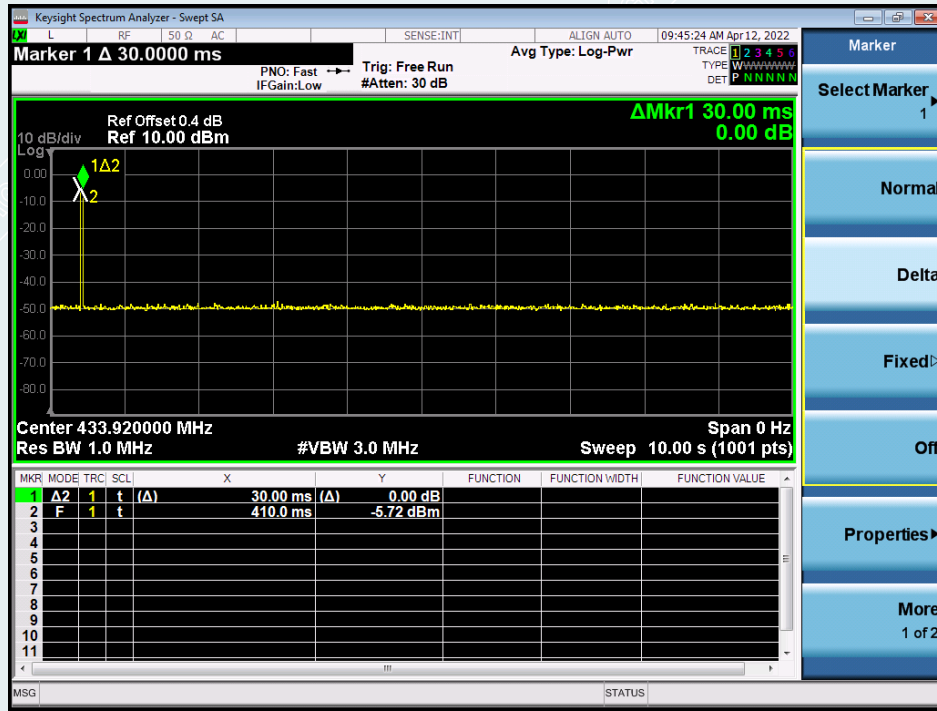
Frequency (MHz)	Transmission Time (s)	Limit (s)	Result
433.92	0.03	≤ 5	Pass

433.92MHz ASK

Frequency (MHz)	Transmission Time (s)	Limit (s)	Result
433.92	0.03	≤ 5	Pass

Test Plot

433.92MHz FSK



433.92MHz ASK

----- The following blanks -----

APPENDIX A. PHOTOGRAPHS OF EUT TEST SETUP

Please refer to the attached document E202112291004-26-Test setup photo.

APPENDIX B. PHOTOGRAPHS OF EUT

Please refer to the attached document E202112291004-27-EUT Photo.

----- End of Report -----