



TEST REPORT

APPLICANT : Nanjing Juplink Intelligent Technologies Co., Ltd.
PRODUCT NAME : Dual-band Gigabit Router
MODEL NAME : RX4-1500
BRAND NAME : JupLink
FCC ID : 2AT9Z-RX4-1500
STANDARD(S) : 47 CFR Part 15 Subpart B
RECEIPT DATE : 2019-08-06
TEST DATE : 2019-08-06 to 2019-08-21
ISSUE DATE : 2019-08-22

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Change History		
Version	Date	Reason for change
1.0	2019-08-22	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Nanjing Juplink Intelligent Technologies Co., Ltd.
Applicant Address:	No. 757, Dixiu Road, Binjiang Economic Development Zone, Jiangning District, Nanjing, China
Manufacturer:	Sichuan Tianyi Comheart Telecom Co., Ltd.
Manufacturer Address:	No. 198, Section 1, Xueshan Avenue, Dayi County, Chengdu, Sichuan, China

1.2. Equipment Under Test (EUT) Description

EUT Type:	Dual-band Gigabit Router	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	V1.0.0	
Software Version:	V1.0.1	
Accessory Information:	AC Adapter	
	Brand Name:	Transin
	Model No:	TS-A012-120010Aq
	Serial No:	(N/A, marked #1 by test site)
	Rated Output:	12V=1A
	Rated Input:	200-240V~50/60Hz

Note:

1. For a more detailed description, please refer to specification or user's manual supplied by the applicant and/or manufacturer



2. Test Results

2.1. Applied Reference Documents

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result
1	15.107	Conducted Emission	2019.08.14	Bowers Zeng	PASS
2	15.109	Radiated Emission	2019.08.14	Bowers Zeng	PASS

NOTE: The tests were performed according to the method of measurements prescribed in ANSI C63.4-2014.



2.2. EUT Setup and Operating Conditions

Frequency range was investigated: Conducted emission test: from 150 KHz to 30 MHz; Radiated emission test: from 30MHz to 25000MHz.

Test Item	
Mode 1	: EUT + Data Link with PC

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106

3. 47 CFR Part 15B Requirements

3.1. Conducted Emission

3.1.1. Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

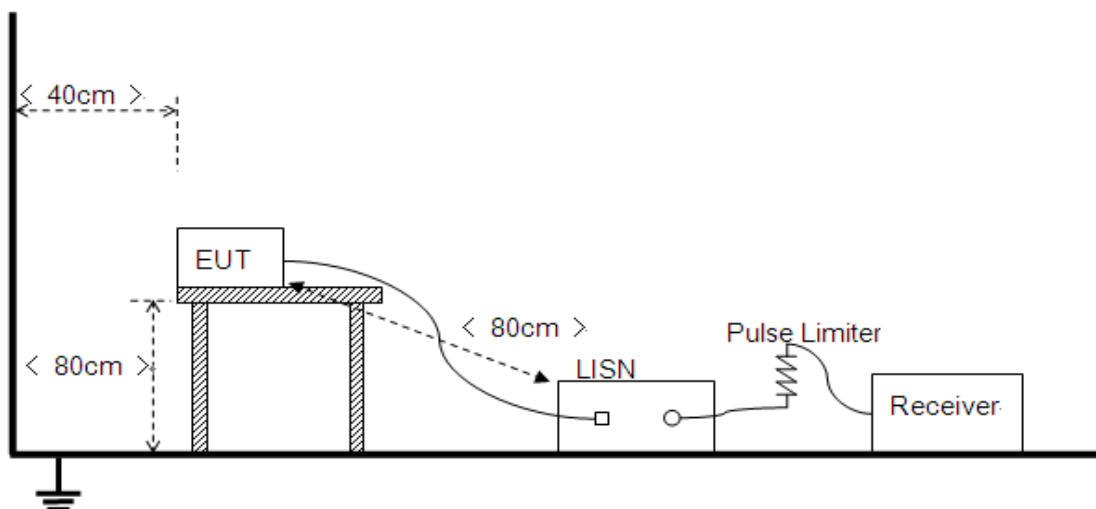
Frequency range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- a) The limit subjects to the Class B digital device.
- b) The lower limit shall apply at the band edges.
- c) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.1.2. Test Setup

Please refer to Annex A for the photographs of the Test Configuration.





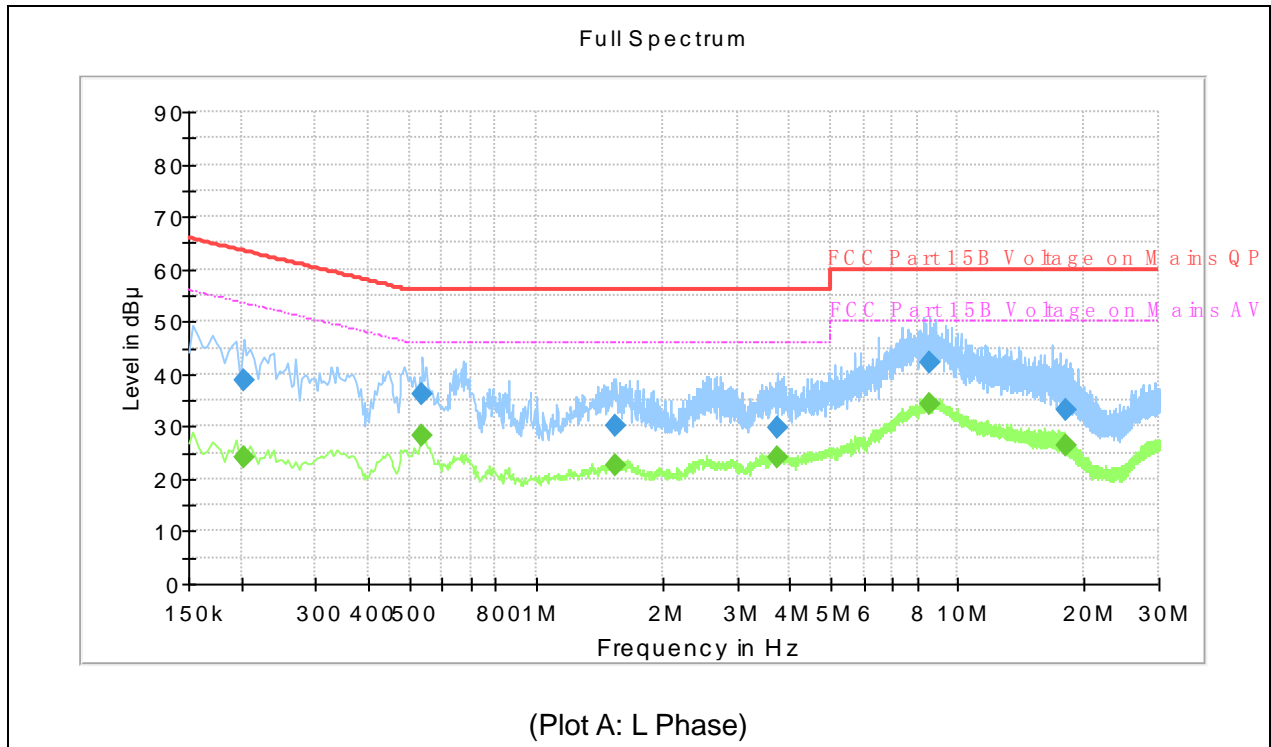
The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

The power strip or extension cord has been investigated to make sure that the LISN integrity is maintained with respect to the impedance characteristics as prescribed in ANSI C63.4-2014 at Clause 4.3.

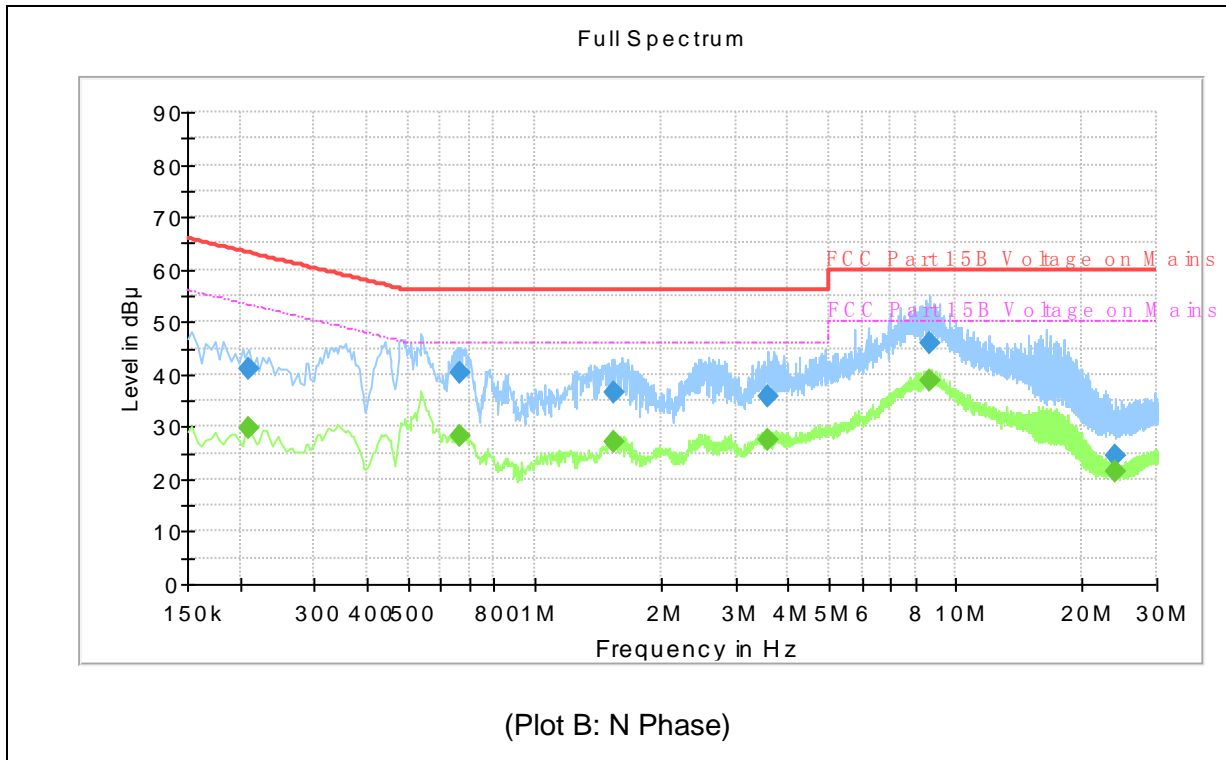
3.1.3. Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

A. Test Plot and Suspicious Points:



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Verdict
0.202000	---	24.16	53.53	29.37	L1	10.2	PASS
0.202000	38.75	---	63.53	24.78	L1	10.2	PASS
0.538000	---	28.33	46.00	17.67	L1	10.2	PASS
0.538000	36.18	---	56.00	19.82	L1	10.2	PASS
1.550000	---	22.69	46.00	23.31	L1	10.3	PASS
1.550000	30.22	---	56.00	25.78	L1	10.3	PASS
3.718000	29.92	---	56.00	26.08	L1	10.4	PASS
3.718000	---	23.97	46.00	22.03	L1	10.4	PASS
8.622000	42.01	---	60.00	17.99	L1	10.6	PASS
8.622000	---	34.25	50.00	15.75	L1	10.6	PASS
17.970000	---	26.23	50.00	23.77	L1	10.7	PASS
17.970000	33.27	---	60.00	26.73	L1	10.7	PASS



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)	Verdict
0.210000	---	29.72	53.21	23.49	N	10.2	PASS
0.210000	41.04	---	63.21	22.17	N	10.2	PASS
0.666000	---	28.24	46.00	17.76	N	10.2	PASS
0.666000	40.35	---	56.00	15.65	N	10.2	PASS
1.546000	---	26.97	46.00	19.03	N	10.3	PASS
1.546000	36.40	---	56.00	19.60	N	10.3	PASS
3.594000	35.77	---	56.00	20.23	N	10.4	PASS
3.594000	---	27.37	46.00	18.63	N	10.4	PASS
8.650000	45.85	---	60.00	14.15	N	10.5	PASS
8.650000	---	38.97	50.00	11.03	N	10.5	PASS
23.918000	---	21.56	50.00	28.44	N	10.6	PASS
23.918000	24.48	---	60.00	35.52	N	10.6	PASS



3.2. Radiated Disturbance

3.2.1. Requirement

According to FCC section 15.109 (a), the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength Limitation at 3m Measurement Distance	
	(μ V/m)	(dB μ V/m)
30.0 - 88.0	100	20log 100
88.0 - 216.0	150	20log 150
216.0 - 960.0	200	20log 200
Above 960.0	500	20log 500

As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in dB μ V/m is calculated by 20log Emission Level(μ V/m).

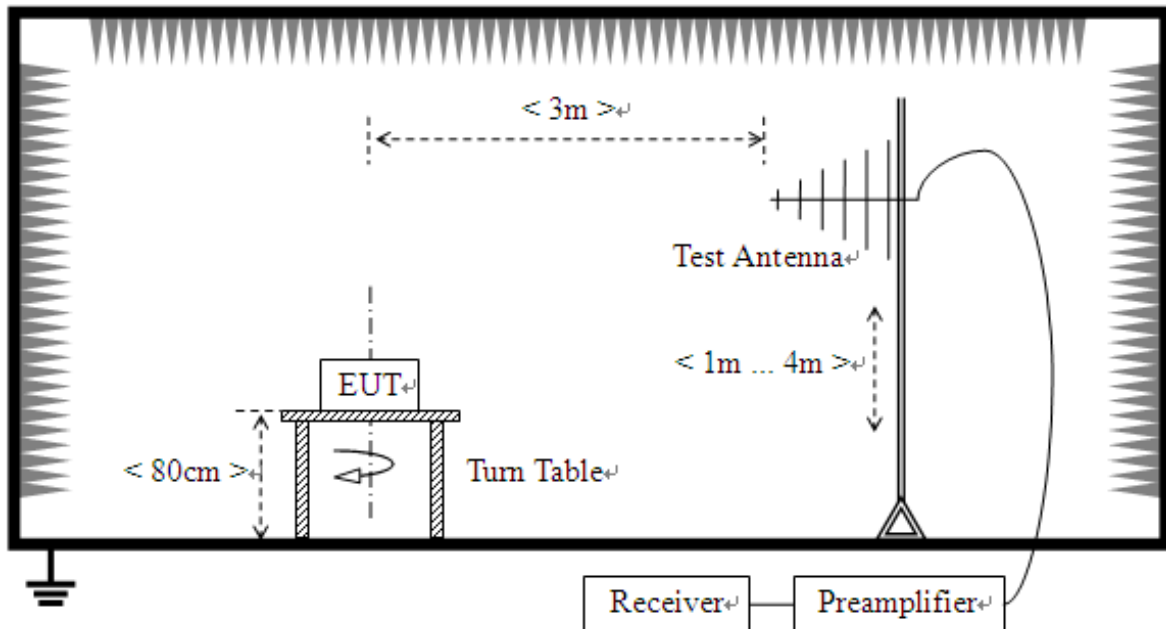
3.2.2. Frequency range of measurement

According to 15.33(b)(1), the frequency range of radiated measurement for the EUT is listed in the following table:

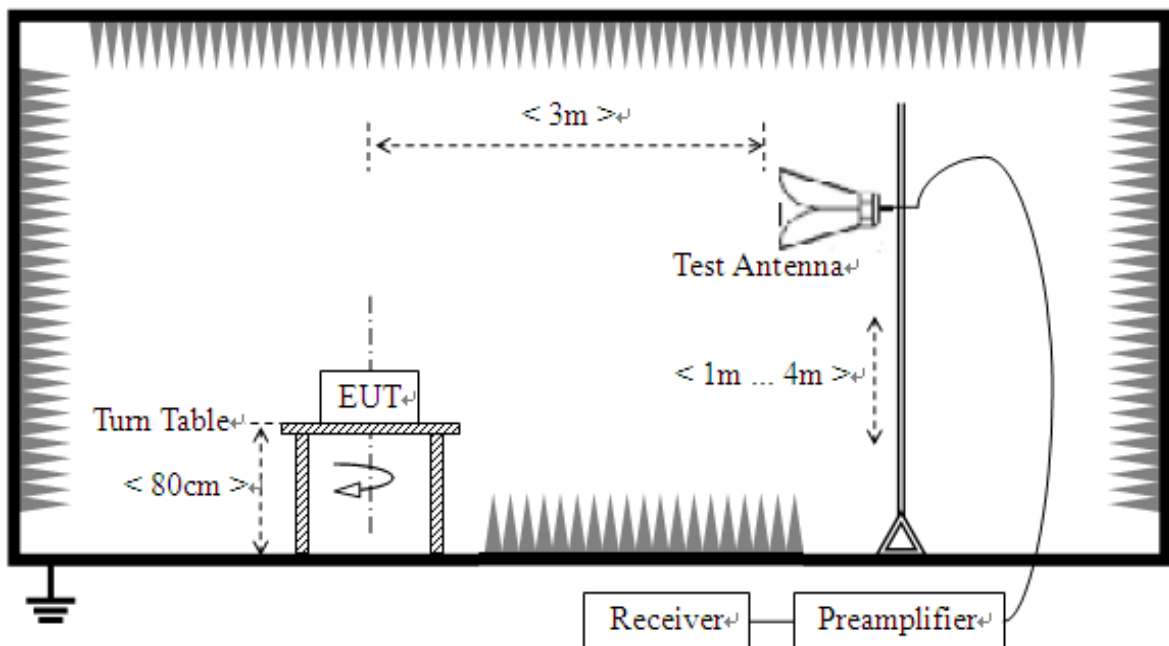
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

3.2.3. Test Setup

- 1) For radiated emissions from 30MHz to 1GHz



- 2) For radiated emissions above 1GHz





The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.



c. The height of 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.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

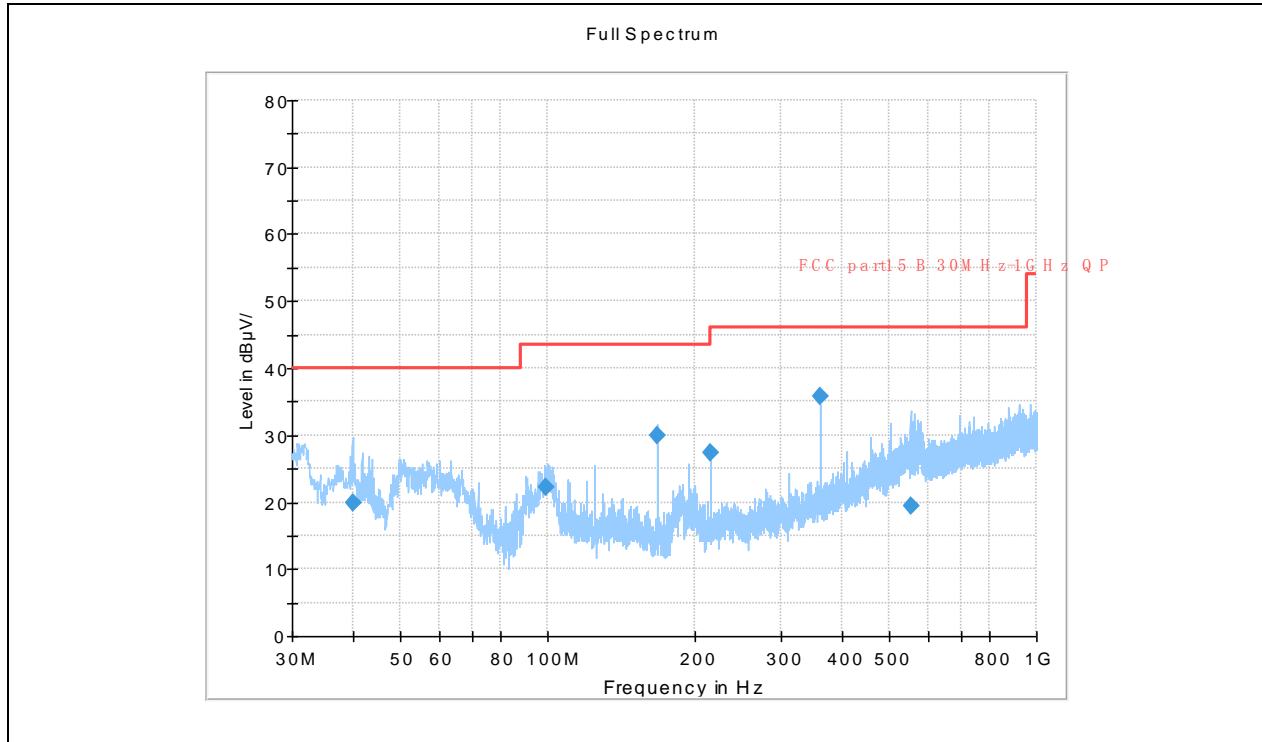
f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasipeak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

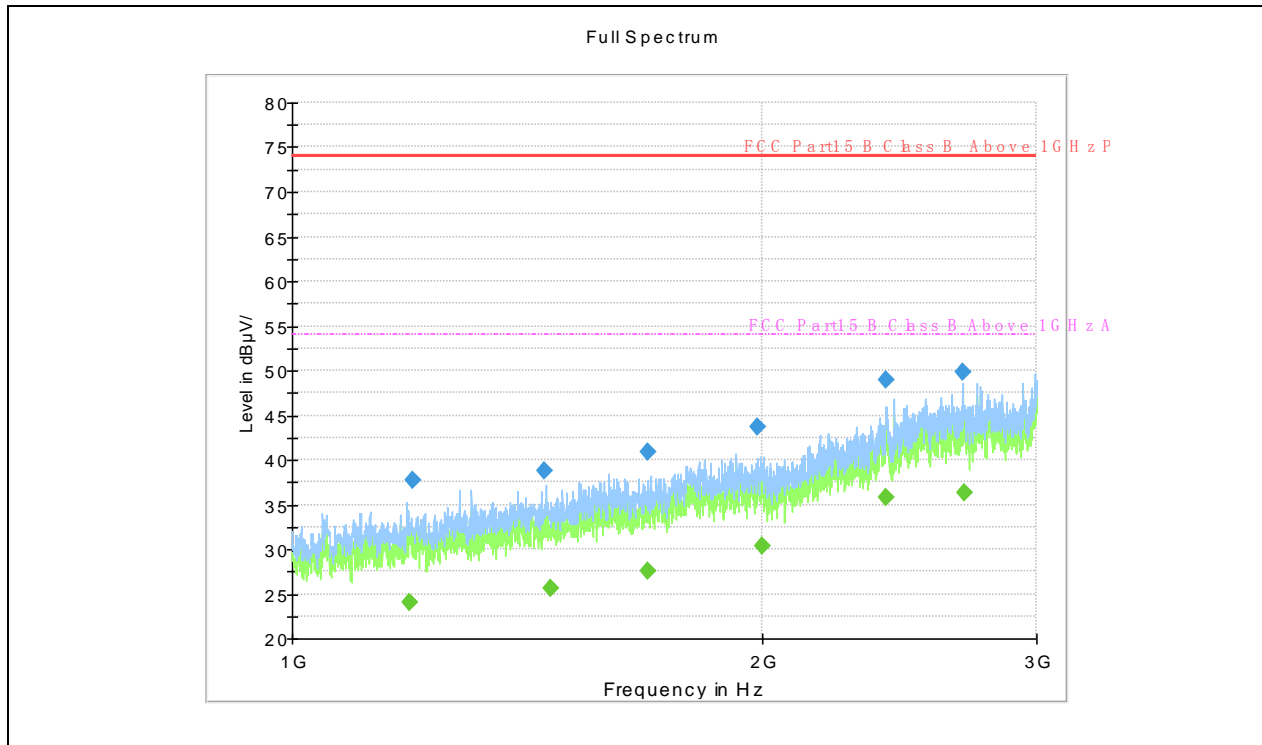
3.2.4. Test Result

Note1: For the frequency, which started from 6GHz to 25GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.



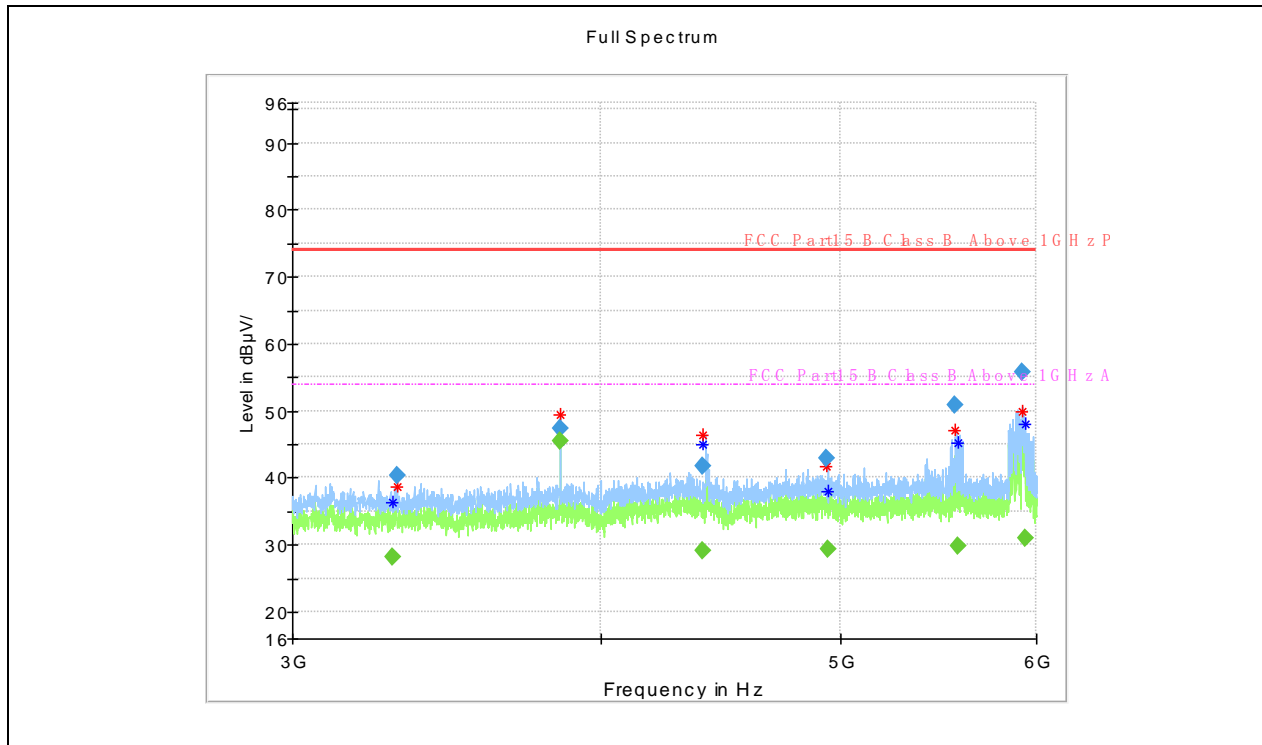
(Plot A: ANT-Vertical, 30MHz - 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
40.142083	19.84	40.00	20.16	V	15.6	PASS
99.197917	22.32	43.50	21.18	V	14.5	PASS
167.982500	29.86	43.50	13.64	V	11.9	PASS
215.997500	27.46	43.50	16.04	V	13.8	PASS
360.002083	35.76	46.00	10.24	V	18.6	PASS
551.981250	19.47	46.00	26.53	V	22.6	PASS



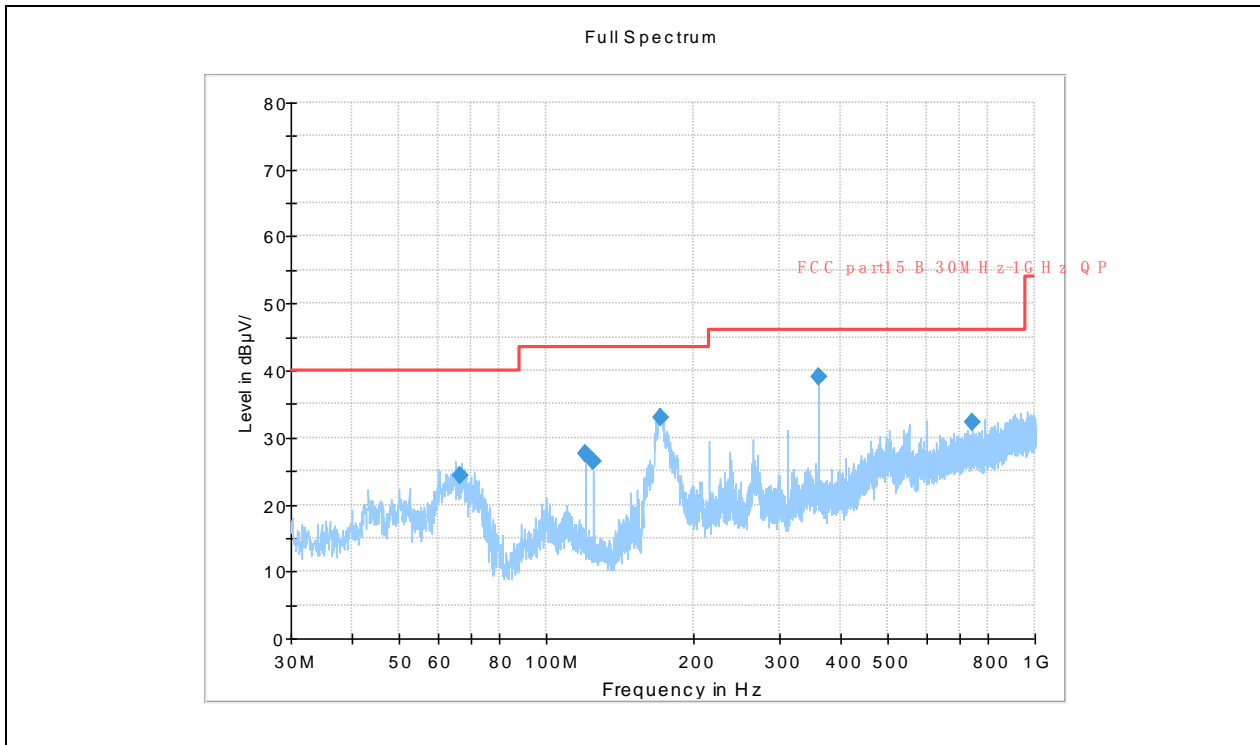
(Plot C: ANT- Vertical, 1GHz - 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1190.600000	---	23.97	54.00	30.03	V	-0.8	PASS
1194.600000	37.73	---	74.00	36.27	V	-0.6	PASS
1452.400000	38.72	---	74.00	35.28	V	1.3	PASS
1466.000000	---	25.66	54.00	28.34	V	1.6	PASS
1688.900000	---	27.54	54.00	26.46	V	3.7	PASS
1689.100000	40.79	---	74.00	33.21	V	3.7	PASS
1987.700000	43.74	---	74.00	30.26	V	7.2	PASS
2000.100000	---	30.28	54.00	23.72	V	7.5	PASS
2402.600000	---	35.75	54.00	18.25	V	13.3	PASS
2405.000000	49.02	---	74.00	24.98	V	13.2	PASS
2688.700000	49.87	---	74.00	24.13	V	14.8	PASS
2696.700000	---	36.34	54.00	17.66	V	14.7	PASS



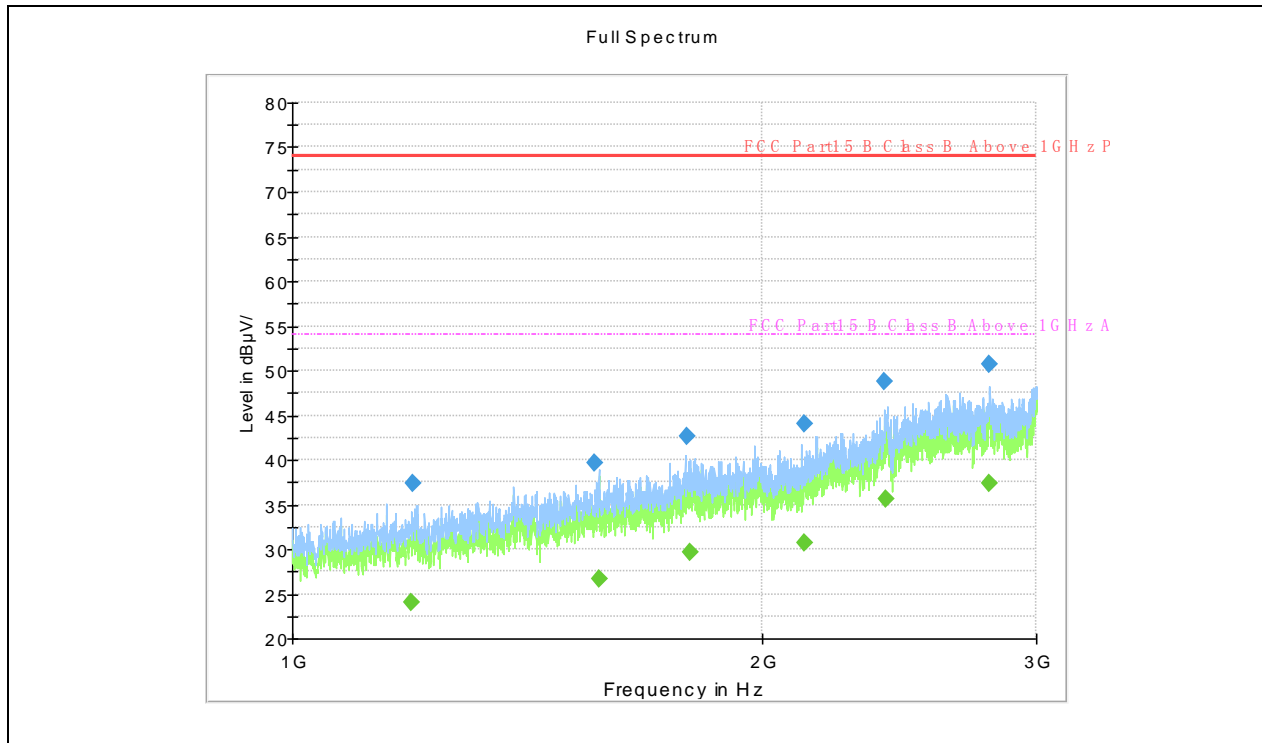
(Plot C: ANT- Vertical, 1GHz - 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3295.237500	---	28.21	54.00	25.79	V	-6.1	PASS
3306.727500	40.29	---	74.00	33.71	V	-6.3	PASS
3849.952500	---	45.36	54.00	8.64	V	-4.7	PASS
3849.990000	47.42	---	74.00	26.58	V	-4.7	PASS
4395.690000	41.80	---	74.00	32.20	V	-3.6	PASS
4397.970000	---	29.16	54.00	24.84	V	-3.6	PASS
4936.807500	42.81	---	74.00	31.19	V	-2.9	PASS
4943.317500	---	29.37	54.00	24.63	V	-2.9	PASS
5561.835000	50.90	---	74.00	23.10	V	-2.5	PASS
5573.977500	---	29.85	54.00	24.15	V	-2.6	PASS
5923.342500	55.78	---	74.00	18.22	V	-2.0	PASS
5937.247500	---	31.01	54.00	22.99	V	-1.9	PASS



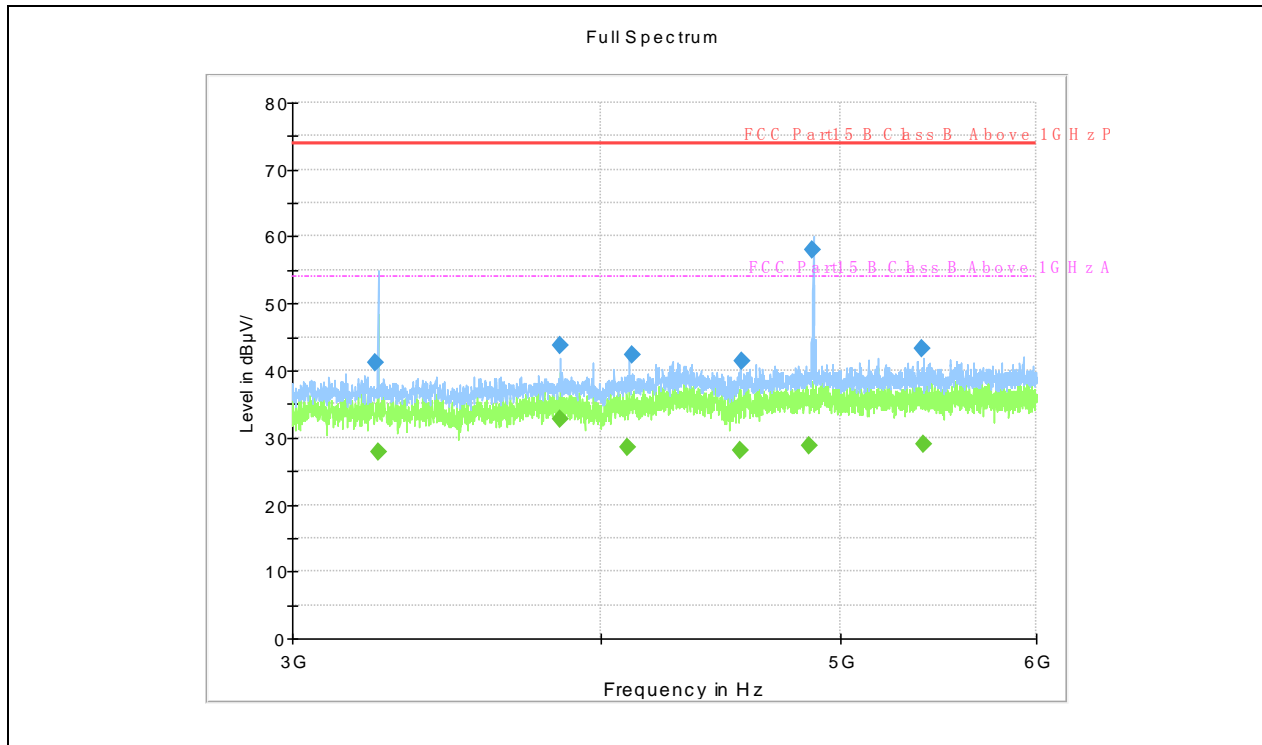
(Plot B: ANT- Horizontal, 30MHz - 1GHz)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
66.420000	24.31	40.00	15.69	H	13.0	PASS
120.007500	27.62	43.50	15.88	H	13.1	PASS
124.979167	26.32	43.50	17.18	H	11.1	PASS
170.725417	33.05	43.50	10.45	H	12.3	PASS
360.002083	39.15	46.00	6.85	H	18.6	PASS
744.000833	32.35	46.00	13.65	H	25.9	PASS



(Plot D: ANT- Horizontal, 1GHz - 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1190.800000	---	23.98	54.00	30.02	H	-0.8	PASS
1195.600000	37.39	---	74.00	36.61	H	-0.6	PASS
1562.600000	39.67	---	74.00	34.33	H	2.9	PASS
1573.800000	---	26.75	54.00	27.25	H	3.1	PASS
1791.700000	42.65	---	74.00	31.35	H	6.1	PASS
1800.100000	---	29.70	54.00	24.30	H	6.7	PASS
2128.700000	44.06	---	74.00	29.94	H	8.2	PASS
2129.500000	---	30.67	54.00	23.33	H	8.2	PASS
2398.600000	48.81	---	74.00	25.19	H	13.4	PASS
2403.700000	---	35.67	54.00	18.33	H	13.3	PASS
2798.600000	---	37.35	54.00	16.65	H	16.4	PASS
2799.200000	50.67	---	74.00	23.33	H	16.5	PASS



(Plot D: ANT- Horizontal, 3GHz - 6GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3241.920000	41.08	---	74.00	32.92	H	-6.2	PASS
3250.110000	---	27.82	54.00	26.18	H	-6.1	PASS
3850.005000	---	32.69	54.00	21.31	H	-4.7	PASS
3850.102500	43.63	---	74.00	30.37	H	-4.7	PASS
4099.965000	---	28.65	54.00	25.35	H	-4.4	PASS
4117.522500	42.27	---	74.00	31.73	H	-4.3	PASS
4550.812500	---	28.14	54.00	25.86	H	-3.9	PASS
4557.285000	41.35	---	74.00	32.65	H	-3.9	PASS
4858.117500	---	28.87	54.00	25.13	H	-3.0	PASS
4870.957500	58.12	---	74.00	15.88	H	-2.9	PASS
5390.557500	43.38	---	74.00	30.62	H	-2.4	PASS
5398.747500	---	29.07	54.00	24.93	H	-2.5	PASS



Annex A Test Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2Uc(y))	9kHz-150kHz	3.10 dB
	150kHz-30MHz	2.61dB

Uncertainty of Radiated Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2Uc(y))	30MHz-200MHz	3.87dB
	200MHz-1000MHz	4.07dB
	1GHz-6GHz	4.25dB
	6GHz-18GHz	5.00dB



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	XIAMEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. Kehu-Morlab Test Laboratory
Laboratory Address:	Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian) China
Telephone:	+86-0592-5612050
Facsimile:	+86-0592-5612095

2. Identification of the Responsible Testing Location

Name:	XIAMEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. Kehu-Morlab Test Laboratory
Address:	Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian) China

3. Accreditation Certificate

Accredited Testing Laboratory:	The FCC designation number is CN1249. (Kehu-Morlab Test Laboratory)
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4. Test Software Utilized

No.	Model	Version Number	Producer	Test Item
1	EMC32	V10.00.00	Rode&Schwarz	RE
2	EMC32	V10.20.01	Rode&Schwarz	CE

5. Conducted Emission Test Equipments

No.	Equipment Name	Serial No.	Model No.	Manufacturer	Cal.Date	Cal.Due Date
1	EMI Receiver	102174	ESR3	ESR3	2019.01.08	2020.01.07
2	LISN	101338	ENV432	ENV432	2019.01.14	2020.01.13
3	Pulse Limiter (10dB)	317	VTSD 9561 F	VTSD 9561 F	2019.01.14	2020.01.13
4	Coaxial cable(BNC) (30MHz-3GHz)	EMC01	N/A	Morlab	2019.01.14	2020.01.13

**6. Radiated Test Equipments**

No.	Equipment Name	Serial No.	Model No.	Manufacturer	Cal. Date	Cal.Due Date
1	Anechoic Chamber	N/A	9m*6m*6m	ETS-Lindgren	2018.11.27	2019.11.26
2	Signal Analyzer	101294	FSV40	R&S	2019.01.04	2020.01.03
3	Active Ring Antenna	FMZB 1513 #269	FMZB 1513	Schwarzbeck	2019.01.02	2020.01.01
4	Linear Log Periodic Broad Band Antenna	949	VULB 9163	Schwarzbeck	2018.09.25	2019.09.24
5	Ultra-Wideband Horn Antenna	102615	HF907	R&S	2019.01.19	2020.01.18
6	Coaxial cable (N male) (9kHz -3GHz)	EMC02	N/A	Morlab	2019.01.04	2020.01.03
7	Coaxial cable (N male) (9kHz -3GHz)	EMC03	N/A	Morlab	2019.01.04	2020.01.03
8	Coaxial cable (N male) (1GHz-26.5GHz)	EMC04	N/A	Morlab	2019.01.04	2020.01.03
9	Coaxial cable (N male) (1GHz-26.5GHz)	EMC05	N/A	Morlab	2019.01.04	2020.01.03
10	Pre-amplifier (1GHz-18GHz)	8810011	PAP-1G18	CDSI	2019.01.04	2020.01.03

————— END OF REPORT —————