



Test Report No.:
FCC2023-0047-EMC

EMC Test Report

FCC ID : 2A24I-V08G08J17
EUT : Smart Sense Tag
MODEL : ST300 Air
BRAND NAME : Tag-N-Trac
APPLICANT : Tag-N-Trac Inc.
CLASSIFICATION OF TEST : N/A

CVC Testing Technology Co., Ltd.



CVC Testing Technology Co., Ltd.

Test Report No.: FCC2023-0047-EMC

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Applicant		Name: Tag-N-Trac Inc. Address: 4250 Executive Sq, #675, La Jolla, CA 92037, US	
Manufacturer		Name: AOVX WIRELESS SOLUTIONS CO., LTD Address: Room 501, BlockA1, ZhongAn Valley, 900 Wangjiang West Road, High-tech Zone, HeFei, China 230088	
Equipment Under Test		Product Name: Smart Sense Tag Model/Type: ST300 Air Brand Name: Tag-N-Trac Serial NO.: N/A Sample NO.:4-1	
Date of Receipt.	2023.07.21	Date of Testing	2023.07.21 ~ 2023.08.22
Test Specification		Test Result	
FCC Part 15, Subpart B, Class B (SDOC)		PASS	
Evaluation of Test Result	The equipment under test was found to comply with the requirements of the standards applied. Seal of CVC Issue Date: 2023.08.22		
Tested by:  Lu Wei Ji Name Signature	Reviewed by:  Xu Zhen Fei Name Signature	Approved by:  Chen Hua Wen Name Signature	
Other Aspects: NONE.			
Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested			

This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC.



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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FCC2023-0047-EMC	Original release	2023.08.22



1. SUMMARY OF TEST RESULTS

EMISSION			
Standard	Test Item	Result	Remarks
FCC Part 15, Subpart B, Class B (SDOC)	Conducted test (AC port)	PASS	Minimum passing margin is 17.7dB at 0.805MHz
	Radiated Test (30MHz~ 1GHz)	PASS	Minimum passing margin is 7.33dB at 945.6MHz
	Radiated Test (Above 1GHz)	PASS	Minimum passing margin is 6.66dB at 4884.1884MHz



1.1 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. interval	Cal. Due
Radiation emission						
EMI Test Receiver (3M)	N9038A-508	MY532290079	EM-000397	Agilent	1 year	2024-02-22
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	1 year	2024-02-22
Radio Communication Test	CMW500	156686	EM-000623	R&S	1 year	2023-12-06
Broadband Antenna(3m)	VULB 9163	9163-530	EM-000342	SCHWARZBECK	1 year	2024-06-25
Loop Antenna	HLA 6121	540046	EM-000546	TESEQ	1 year	2024-06-05
Loop Antenna	FMZB1513	1513-170	EM-000384	SCHWARZBECK	1 year	2024-02-24
H-field antenna	FESP 5133-7/41	00458	EM-000674-4	SCHWARZBECK	1 year	2024-06-05
Monopole antenna	HFH2-Z6E	101317	EM-000613	R&S	1 year	2024-03-02
Waveguide Horn Antenna	BBHA9120B	602	EM-000383	SCHWARZBECK	1 year	2024-01-11
Waveguide Horn Antenna	HF906	360306/008	WKNA-0024-8	R&S	1 year	2024-02-24
Semi-Anechoic Chamber(3m)	FACT-4	ST08035	WKNA-0024	ETS	3 year	2024-12-11
Vector Signal Generator	N5172B	MY53051933	EM-000487-1	KEYSIGHT	1 year	2023-12-06
Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. interval	Cal. Due
Radiation emission						
EMI Test Receiver	ESR3	102394	VG DY-0705	R&S	1 year	2024-02-22
LISN	NSLK 8127	8127644	VG DY-0150	SCHWARZBECK	1 year	2023-09-03
LISN	NSLK 8128	8128-316	VG DY-0149	SCHWARZBECK	1 year	2023-09-03
DC LISN	PVDC8301-017	PVDC8301#17	VG DY-0692	SCHWARZBECK	1 year	2023-10-07
LISN	NSLK 8129	8129-268	EM-000388	SCHWARZBECK	1 year	2024-02-22
Plus Limiter (#1)	VTSD 9561 F-N	00515	VG DY-0808	SCHWARZBECK	1 year	2024-03-03
Impedance Stabilization Network	ISN T800	27095	WKNE-0195	TESEQ	1 year	2023-09-03
Impedance Stabilization Network	NTFM8131	#184	EM-000498	SCHWARZBECK	1 year	2024-05-29
Voltage Probe	TK9420	9420-499	VG DY-0128	SCHWARZBECK	1 year	2024-02-22
Power Divider	4901.17.B	22643830	DB-0016	HUBER+SUHNER	1 year	2023-08-31
Video Signal Generator	GV-798+	151064920001	VGDS-0215	PROMAX	1 year	2024-05-29
Audio Signal Generator	GAG-810	EK871591	EM-000309	GW	1 year	2023-12-06



1.2 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:

No.	ITEM	FREQUENCY	UNCERTAINTY
1	Conducted emissions	9kHz~30MHz	±2.66dB
2	Radiated emissions	9KHz ~ 30MHz	±0.769dB
		30MHz ~ 1GMHz	±0.877dB
		1GHz ~ 18GHz	±0.777dB
		18GHz ~ 40GHz	±1.315dB

1.3 TEST LOCATION

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology Co., Ltd.

Address: No.3, TiantaiyiRoad, KaitaiAvenue, ScienceCity, Guangzhou, China
Post Code: 510663 Tel: 020-32293888
FAX: 020-32293889 E-mail: office@cvc.org.cn
Test Firm Registration Number: 937273



2. GENERAL INFORMATION

2.1 GENERAL PRODUCT INFORMATION

PRODUCT	Smart Sense Tag
BRAND	Tag-N-Trac
TEST MODEL	ST300 Air
ADDITIONAL MODEL	N/A
FCC ID	2A24I-V08G08J17
POWER SUPPLY	DC 3.6V from battery or DC 5V from USB host unit
LTE CATEGORY	CAT 1
OPERATING FREQUENCY	See section 2.3
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A
Remark: 1. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report. 3. EUT photo refer to the report (Report NO.: FCC2023-0047-EUT).	

2.2 DESCRIPTION OF ACCESSORIES

N/A



2.3 OPERATING FREQUENCY

Mode	Band	TX(MHz)	RX(MHz)
GSM	GSM 850	824 ~ 849	869 ~ 894
	GSM 1900	1850 ~ 1910	1930 ~ 1990
LTE Band	LTE B2	1850 ~ 1910	1930 ~ 1990
	LTE B4	1930 ~ 1990	1930 ~ 1990
	LTE B5	1930 ~ 1990	1930 ~ 1990
	LTE B7	2500 ~ 2570	2620 ~ 2690
	LTE B12	699 ~ 716	729 ~ 746
	LTE B13	777 ~ 787	746 ~ 756
	LTE B25	1850 ~ 1915	1930 ~ 1995
	LTE B26	814~ 824	859 ~ 869
		824~ 849	869 ~ 894
LTE B66	1710 ~ 1780	2110 ~ 2180	



2.4 INDEPENDENT OPERATION MODES

The EUT were tested under the following modes, the final worst mode was marked in boldface and recorded in this report.

EMISSION Test Modes		
For Conducted Emission Tests		
	Test Mode	Test Voltage
1	Normal Working + GSM/LTE Link + GNSS IDLE + Sensor	DC 3.6V from battery
Remark: The above test modes in boldface were the worst cases, only the test data of these modes were reported.		
For Radiated Emission Tests		
	Test Mode	Test Voltage
1	Normal Working + GSM/LTE Link + GNSS IDLE + Sensor	DC 3.6V from battery
2	Normal Working + GSM/LTE Link + GNSS IDLE + Sensor	DC 5V from USB host unit
Remark: The above test modes in boldface were the worst cases, only the test data of these modes were reported.		



2.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturers, the EUT must comply with the requirements of the following standards:

FCC PART 15, SUBPART B, CLASS B (SDOC)
ANSI C63.4:2014

All test items have been performed and recorded as per the above standards.

2.6 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Support Equipment					
NO	Description	Brand	Model No.	Serial Number	Supplied by
1	Sensor	N/A	N/A	N/A	Client

3. EMISSION

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 Limit

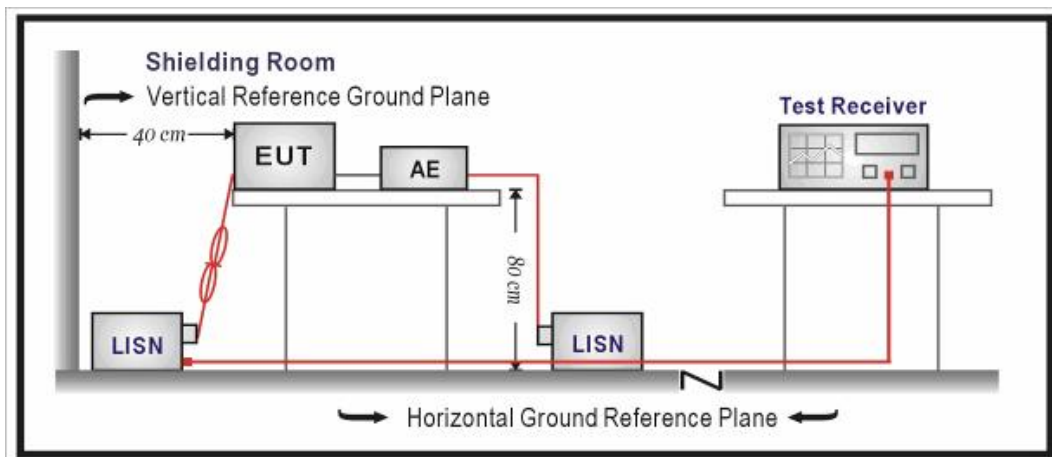
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.
NOTE: 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.1.2 Measurement procedure

- The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the Test photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source. The equipment under test shall be placed on a support of non-metallic material, the height of which shall be 1.5m above the ground,
- The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

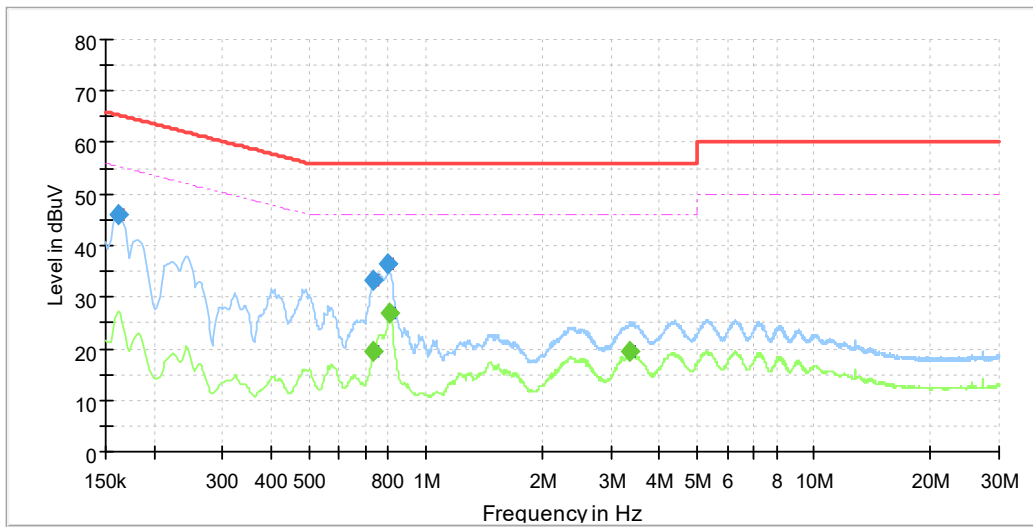
3.1.3 Test setup





3.1.4 Test results

Test Mode	See section 2.4	Frequency Range	150KHz ~ 30MHz
PHASE	Line (L)		

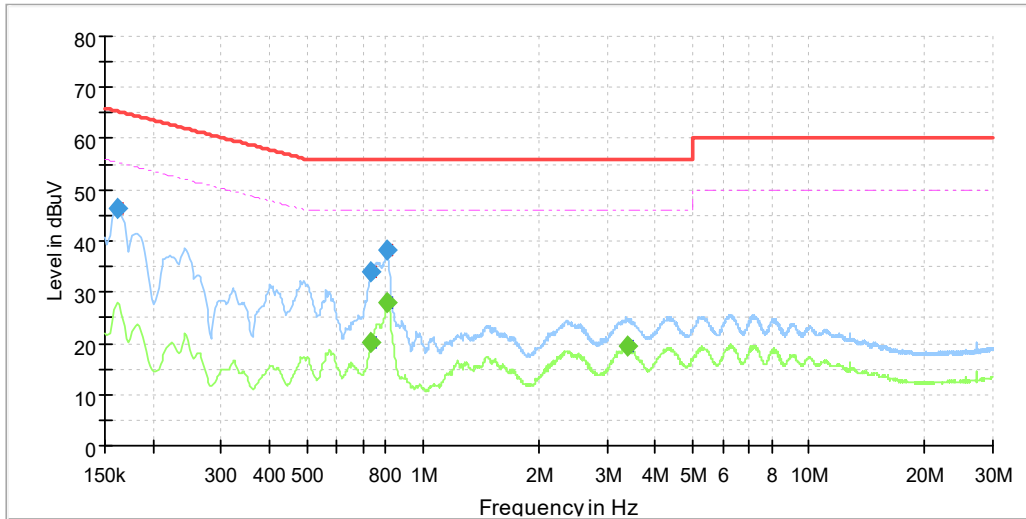


NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.161	46.0	---	65.4	19.4	L1	20.4
2	0.735	---	19.6	46.0	26.4	L1	20.7
3	0.735	33.3	---	56.0	22.7	L1	20.7
4	0.803	36.4	---	56.0	19.6	L1	20.7
5	0.805	---	26.9	46.0	19.1	L1	20.7
6	3.372	---	19.4	46.0	26.6	L1	20.7

Remark: The emission levels of other frequencies were very low against the limit.



Test Mode	See section 2.4	Frequency Range	150KHz ~ 30MHz
PHASE	Line (N)		



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.161	46.3	---	65.4	19.1	N	20.5
2	0.735	---	20.2	46.0	25.8	N	20.6
3	0.735	33.9	---	56.0	22.1	N	20.6
4	0.805	---	28.0	46.0	18.0	N	20.6
5	0.805	38.3	---	56.0	17.7	N	20.6
6	3.374	---	19.3	46.0	26.7	N	20.7

Remark: The emission levels of other frequencies were very low against the limit.



3.2 RADIATED EMISSION

3.2.1 Limits Of Radiated Emission

TEST STANDARD:

FCC Part 15, Subpart B (Section: 15.109), for above 1GHz(section 3.2.2 Table 4)

FCC Part 15, Subpart B

Frequency (MHz)	Distance (m)	Class A (dBuV)	Class B (dBuV)
30 - 88	3	QP: 49.5	QP: 40
88 - 216	3	QP: 54	QP: 43.5
216 - 960	3	QP: 56.9	QP: 46
960-1000	3	QP: 60	QP: 54
Above 1000	3	Avg: 60 Peak: 80	Avg: 54 Peak: 74

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

NOTE: 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

NOTE: 3. All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.2.2 Test Procedures

The basic test procedure was in accordance with ANSI C63.4:2014 (section 12).

1. From 30 MHz to 1GHz test procedure as below:

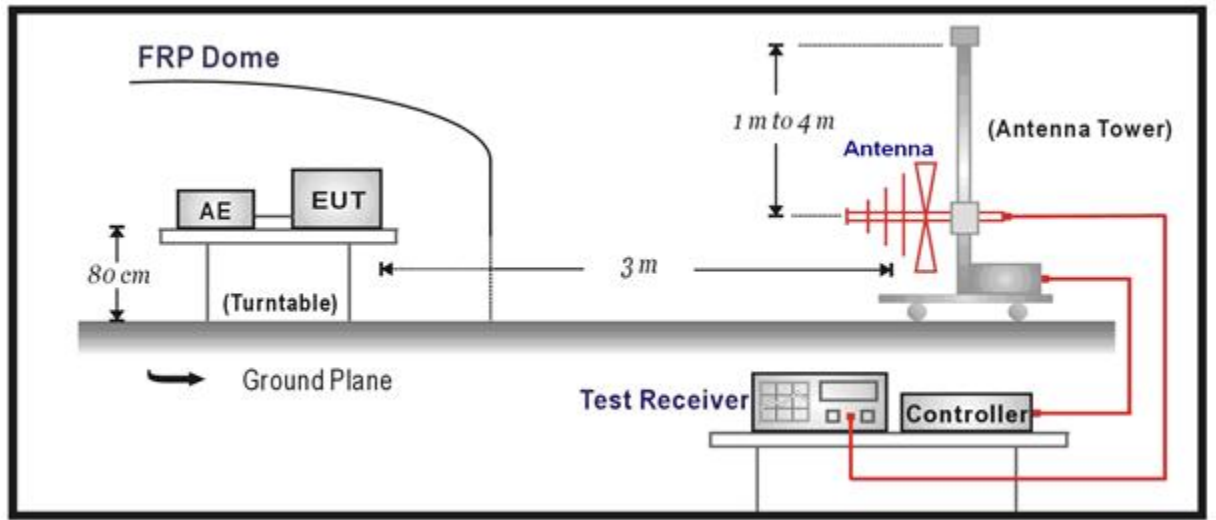
- 1) The radiated emissions were tested in a semi-anechoic chamber.
- 2) The Product was placed on the non-conductive turntable 0.1 m above the ground at a chamber.
- 3) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- 4) For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

2. Above 1GHz test procedure as below:

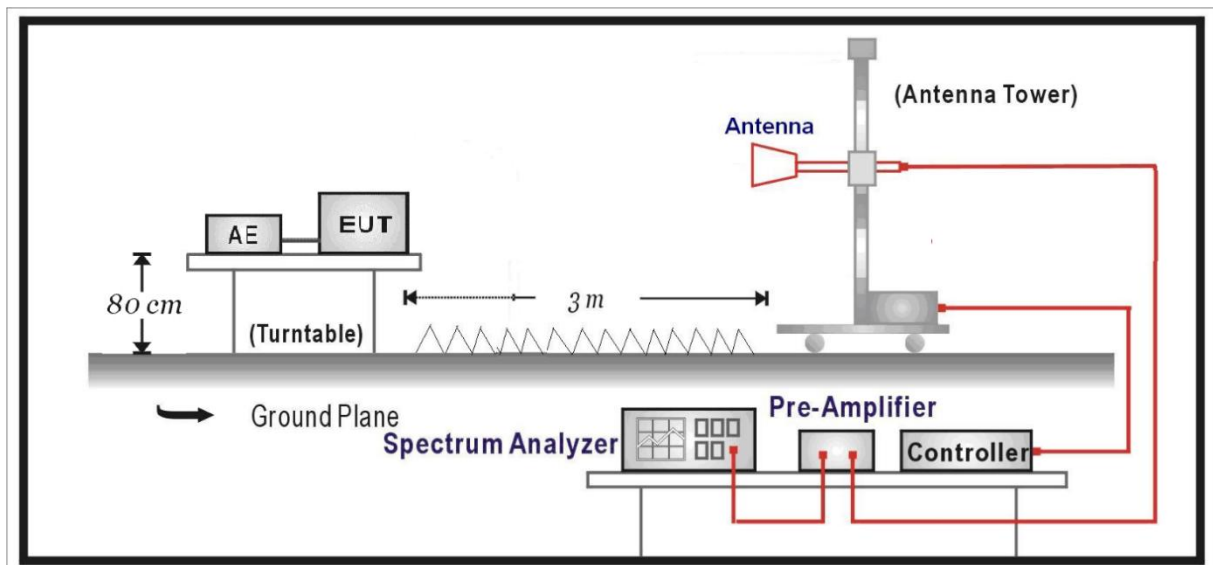
- 1) The radiated emissions were tested in a fully Anechoic Chamber.
- 2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- 3) For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

3.2.3 Test Setup

Below 1GHz Test Setup:



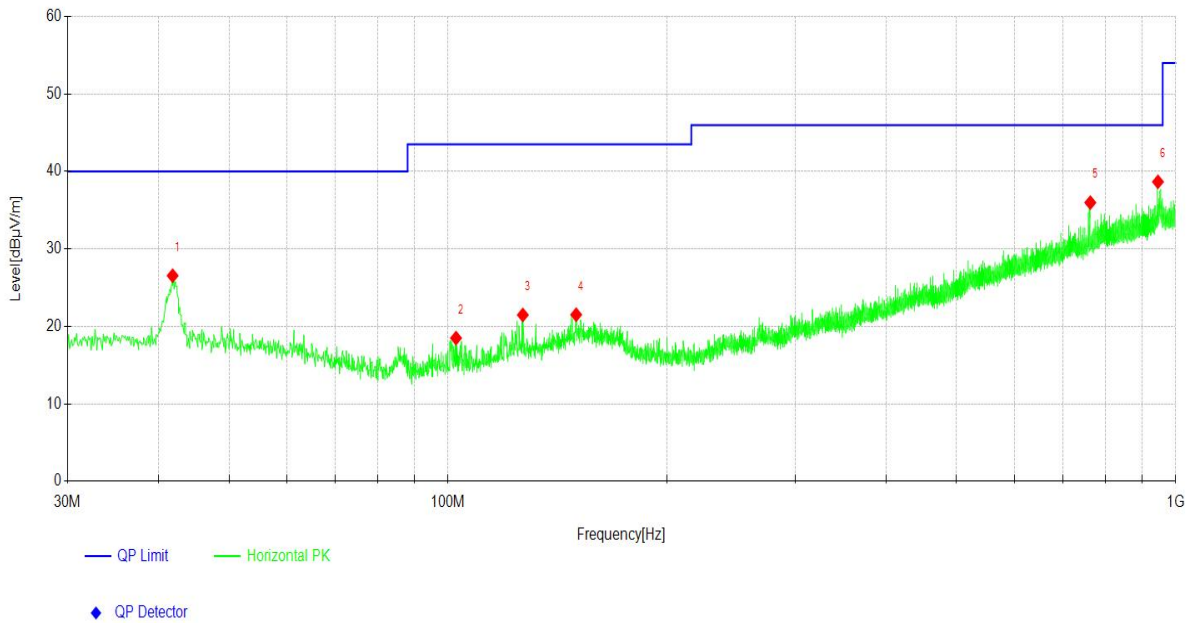
Above 1GHz Test Setup:





3.2.4 Test Results (Below 1GHz)

Test Mode	See section 2.4	Frequency Range	30-1000MHz
Test Voltage	See section 2.4	Detector Function	Quasi-Peak(QP)
Environmental Conditions	25.5deg. C,55% RH	Tested By	Li Yueao

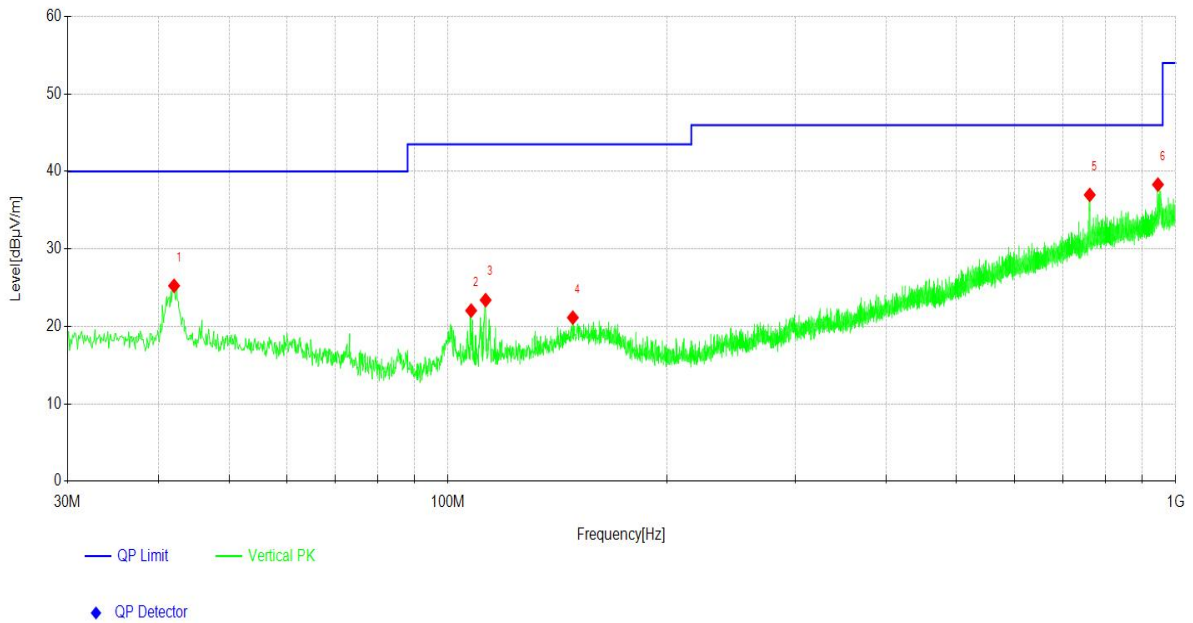


Suspected Data List										
NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	41.83	7.77	18.78	26.55	40.00	13.45	200	36	PK	Horizontal
2	102.5	3.30	15.19	18.49	43.50	25.01	100	51	PK	Horizontal
3	126.7	4.32	17.16	21.48	43.50	22.02	200	318	PK	Horizontal
4	150.0	2.10	19.41	21.51	43.50	21.99	200	65	PK	Horizontal
5	763.3	6.51	29.47	35.98	46.00	10.02	100	114	PK	Horizontal
6	945.6	6.42	32.25	38.67	46.00	7.33	200	279	PK	Horizontal

- Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
 2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 4. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]



Test Mode	See section 2.4	Frequency Range	30-1000MHz
Test Voltage	See section 2.4	Detector Function	Quasi-Peak(QP)
Environmental Conditions	25.5deg. C,55% RH	Tested By	Li Yueao



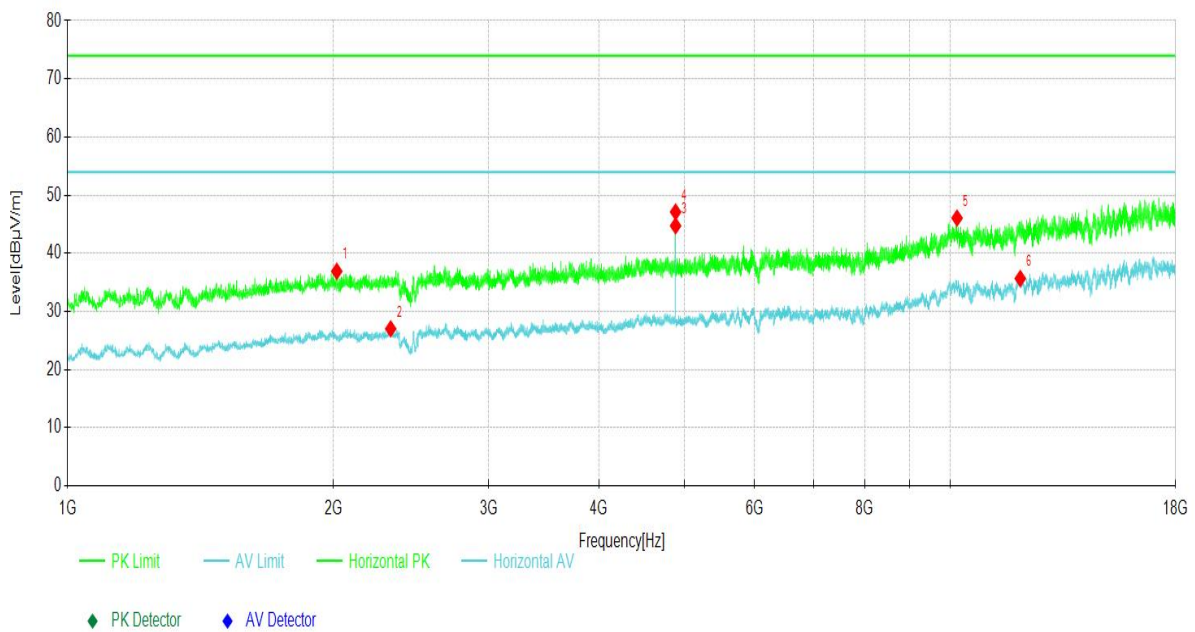
Suspected Data List										
NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	42.02	6.44	18.80	25.24	40.00	14.76	100	290	PK	Vertical
2	107.6	6.43	15.61	22.04	43.50	21.46	200	125	PK	Vertical
3	112.6	7.31	16.09	23.40	43.50	20.10	200	96	PK	Vertical
4	148.4	1.96	19.17	21.13	43.50	22.37	100	25	PK	Vertical
5	762.0	7.56	29.42	36.98	46.00	9.02	100	0	PK	Vertical
6	945.6	6.06	32.25	38.31	46.00	7.69	100	333	PK	Vertical

- Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
 2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 4. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]



3.2.5 Test Results (Above 1GHz)

Test Mode	See section 2.4	Frequency Range	Above 1GHz
Test Voltage	See section 2.4	Detector Function	PK/AV
Environmental Conditions	25.5deg. C,55% RH	Tested By	Li Yueao

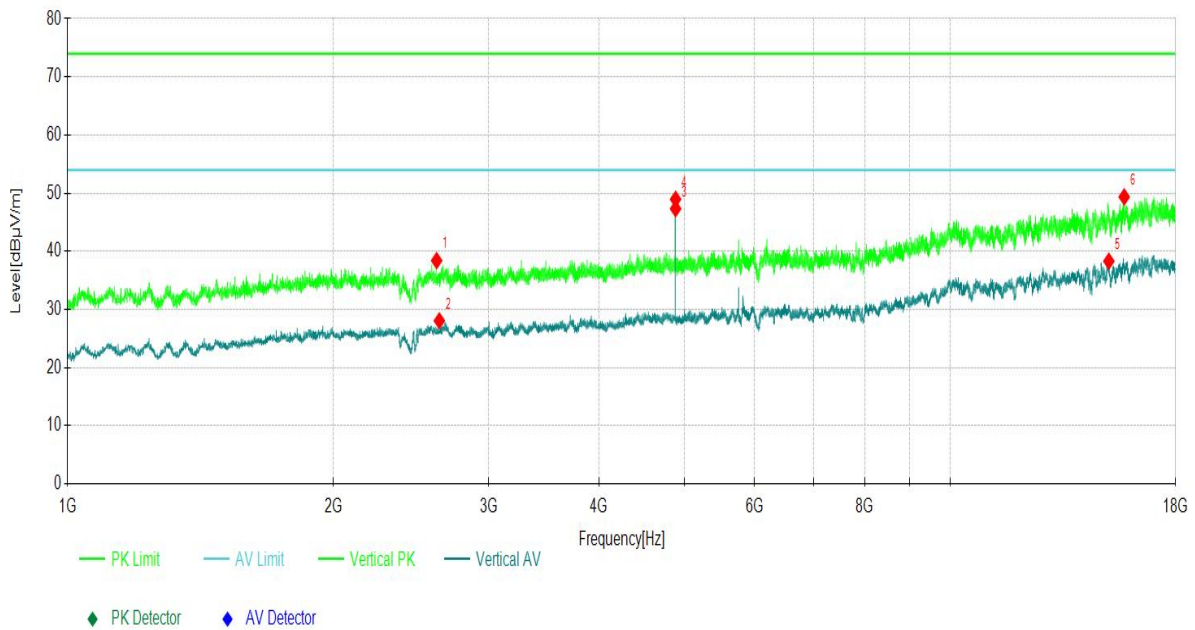


Suspected Data List									
Frequency [MHz]	Polarity	Factor [dB/m]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg
2018.3018	Horizont	-13.63	50.56	36.93	74.00	37.07	PK	100	243
2323.1323	Horizont	-14.49	41.52	27.03	54.00	26.97	AV	100	243
4884.1884	Horizont	-9.83	54.57	44.74	54.00	9.26	AV	100	28
4884.1884	Horizont	-9.83	56.95	47.12	74.00	26.88	PK	100	28
10178.217	Horizont	0.09	45.99	46.08	74.00	27.92	PK	100	270
12004.400	Horizont	0.94	34.74	35.68	54.00	18.32	AV	100	106

- Remark: 1. Above 18GHz have been test and test data more than 20dB margin.
 2. Level (dBµV/m) = Reading (dBµV) + Factor (dB/m).
 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 4. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]



Test Mode	See section 2.4	Frequency Range	Above 1GHz
Test Voltage	See section 2.4	Detector Function	PK/AV
Environmental Conditions	25.5deg. C,55% RH	Tested By	Li Yueao



Suspected Data List									
Frequency [MHz]	Polarity	Factor [dB/m]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg
2618.9619	Vertical	-14.15	52.57	38.42	74.00	35.58	PK	100	163
2637.5638	Vertical	-14.13	42.20	28.07	54.00	25.93	AV	100	229
4884.1884	Vertical	-9.83	57.17	47.34	54.00	6.66	AV	100	81
4884.1884	Vertical	-9.83	58.80	48.97	74.00	25.03	PK	100	81
15122.112	Vertical	4.33	33.99	38.32	54.00	15.68	AV	100	45
15738.173	Vertical	5.41	43.96	49.37	74.00	24.63	PK	100	36

- Remark: 1. Above 18GHz have been test and test data more than 20dB margin.
 2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 4. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]



4. PHOTOGRAPHS OF TEST SETUP

Please refer to the attached file (TEST SETUP)



5. PHOTOGRAPHS OF THE EUT

Please refer to the attached file (External Photos and Internal Photos).

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



Important

- (1) The test report is valid without the official stamp of CVC;
- (2) Any part photocopies of the test report are forbidden without the written permission from CVC;
- (3) The test report is invalid without the signatures of Approval and Reviewer;
- (4) The test report is invalid if altered;
- (5) Objections to the test report must be submitted to CVC within 15 days.
- (6) Generally, commission test is responsible for the tested samples only.
- (7) As for the test result “-” or “N” means “not applicable”, “/” means “not test”, “P” means “pass” and “F” means “fail”

The test data and test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA symbol is not presented.

Laboratory: CVC Testing Technology Co., Ltd.

Address: No.3, TiantaiyiRoad, KaitaiAvenue, ScienceCity, Guangzhou, China

Post Code: 510663

Tel: 020-32293888

FAX: 020-32293889

E-mail: office@cvc.org.cn