FCC Test Report

Report No.: AGC06326201001FE08

FCC ID	:	2ARTCRR-5
PRODUCT DESIGNATION	:	Two-way radio
BRAND NAME	:	Arcshell
MODEL NAME	:	AR-5, AR-6
APPLICANT	:	Henan Aofeng Industrial Co., Ltd.
DATE OF ISSUE	:	Oct. 19, 2020
STANDARD(S)	:	FCC Part 15 Rules
REPORT VERSION	:	V 1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Oct. 19, 2020	Valid	Initial release

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1. VERIFICATION OF COMPLIANCE

Applicant	Henan Aofeng Industrial Co., Ltd.
Address	Zhongyuanqu Jianshexilu 92 Hao 1 Haolou 2 Danyuan 5 Ceng 44 Hao, Zhengzhou, Henan, China 450007
Manufacturer	Henan Aofeng Industrial Co., Ltd.
Address	Zhongyuanqu Jianshexilu 92 Hao 1 Haolou 2 Danyuan 5 Ceng 44 Hao, Zhengzhou, Henan, China 450007
Factory	Henan Aofeng Industrial Co., Ltd.
Address	Zhongyuanqu Jianshexilu 92 Hao 1 Haolou 2 Danyuan 5 Ceng 44 Hao, Zhengzhou, Henan, China 450007
Product Designation	Two-way radio
Brand Name	Arcshell
Test Model	AR-5
Serial Model	AR-6
Difference Description	1.AR-5 and AR-6 have different face shell styles, different battery shells, different charger shells and different models. 2. AR-5 & AR-6 PCB boards & specifications are the same. 3. AR-6 has different colors.
Measurement Procedure	ANSI C63.4: 2014
Date of test	Oct. 13, 2020~Oct.19, 2020
Deviation	No any deviation from the test method.
Condition of Test Sample	Normal
Report Template	AGCRT-US-PTT/EMC

The above equipment was tested by Attestation Of Global Compliance (Shenzhen) Co., Ltd. for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, the measurement procedure according to ANSI C63.4:2014. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements. The test results of this report relate only to the tested sample identified in this report.

Prepared By

Donjon Huang

(Project Engineer)

Oct. 19, 2020

Reviewed By

Max Zhang

(Reviewer)

Oct. 19, 2020

Approved By

Forrest Lei

Authorized Officer

Oct. 19, 2020

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2. PRODUCT INFORMATION

The EUT is a **Two-way radio** designed for voice communication. It is designed by way of utilizing the F3E modulation achieves the system operating.
A major technical description of EUT is described as following:

Communication Type	Voice / Tone only
Modulation	FM
RX Frequency Range	RX: 400MHz -470MHz
Emission Type	F3E
Antenna Designation	Detachable
Antenna Gain	2.15dBi
Hardware Version	V2.4
Software Version	200/2W【1】【K】
Power Supply	DC 3.7V,1500mAh by battery, charging for DC4.2V

I/O Port Information (☐Applicable ☐Not Applicable)

I/O Port of EUT			
I/O Port Type	**Q'TY**	**Cable**	**Tested with**
Antenna Port	1	0	1

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3. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong,China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

List of Test Equipment:

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	May 15, 2020	May 14, 2021
LISN	R&S	ESH2-Z5	100086	Jul. 03, 2020	Jul. 02, 2021

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	May 15, 2020	May 14, 2021
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 09, 2019	Jan. 08, 2021
ANTENNA	SCHWARZBECK	VULB9168	D69250	Oct. 13, 2020	Sep. 17, 2021
POSITIONING CONTROLLER	MF	MF-7802	MF780208285	--	--
HORN ANTENNA	ETS LINDGREN	3117	00034609	May. 16, 2019	May. 15, 2021
RF Communication Test Set	HP	8920B	--	Jul. 10, 2020	Jul. 09, 2021
EXA Signal Analyzer	Agilent	N9020A	MY53300860	July 15, 2020	July 14, 2021
Attenuator	Schaffner	58-30-33	ML030	Oct. 28, 2019	Oct. 27, 2020

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4. SUPPORT EQUIPMENT LIST

Device Type	Manufacturer	Model Name	Serial No.	Data Cable	Power Cable
Charger	-	N/A	-	-	1.0m Unshielded
Battery	-	BL-1	-	-	-
Back clip	-	N/A	-		

5. SYSTEM DESCRIPTION

EUT test procedure:

1. Connect EUT and peripheral devices.
2. Power on the EUT, the EUT begins to work.
3. Make sure the EUT normal working.

EMC TEST MODES

No.	TEST MODES
1	Scanning mode
2	Scanning stopped/Receiving at low channel of 400 MHz -470 MHz
3	Scanning stopped/Receiving at middle channel of 400 MHz -470 MHz
4	Scanning stopped/Receiving at high channel of 400 MHz -470 MHz

Note: Only the result of the worst case was recorded in the report.

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6. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in measurement" (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission, Uc = ±3.1 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±4.0 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 Db

7. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.107	Conduction Emission	Compliant
§15.109	Radiated Emission	Compliant
§15.111	Antenna Conducted Power for receivers	Compliant
§15.121(b)	Scanning receivers and frequency converters used with scanning receivers	Compliant

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8. FCC RADIATED EMISSION TEST

8.1. TEST EQUIPMENT OF RADIATED EMISSION

8.2. LIMITS OF RADIATED EMISSION TEST

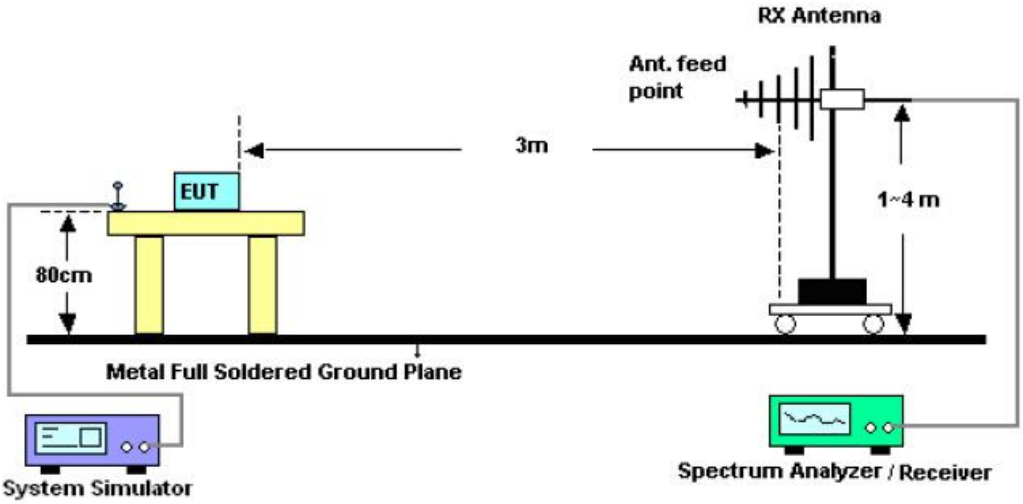
Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m/ Q.P.)
30~88	3	40.0
88~216	3	43.5
216~960	3	46.0
ABOVE 960	3	54.0

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m/ P.K.)	Maximum Field Strength Limit (dBuV/m/ A.V.)
ABOVE 1G	3	74	54

**Note: The lower limit shall apply at the transition frequency. Because the EUT RX frequency range up to 470 MHz, so the upper the frequency range up to 2 GHz.

8.3 BLOCK DIAGRAM OF RADIATED EMISSION TEST

RADIATED EMISSION TEST SETUP 30MHz-1000MHz



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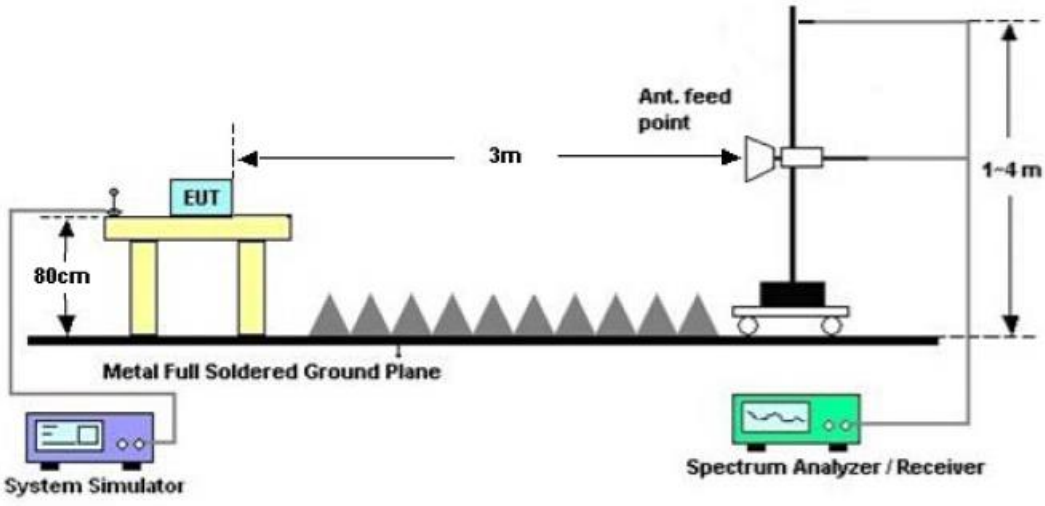
RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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8.4 PROCEDURE OF RADIATED EMISSION TEST

1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2) Support equipment, if needed, was placed as per ANSI C63.4.
3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
4) The EUT received power by AC 120V/60Hz.
5) The antenna was placed at 3 meter away from the EUT as stated in FCC Part 15. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.
6) The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
7) The test mode(s) were scanned during the test:
8) Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P./Peak reading is presented. For emissions below 1GHz, use 120KHz RBW and VBW>=3RBW for QP reading.
9) For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
10) When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
11) If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
12) For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
13) In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.
14) The test data of the worst case condition (mode 1) was reported on the following Data page

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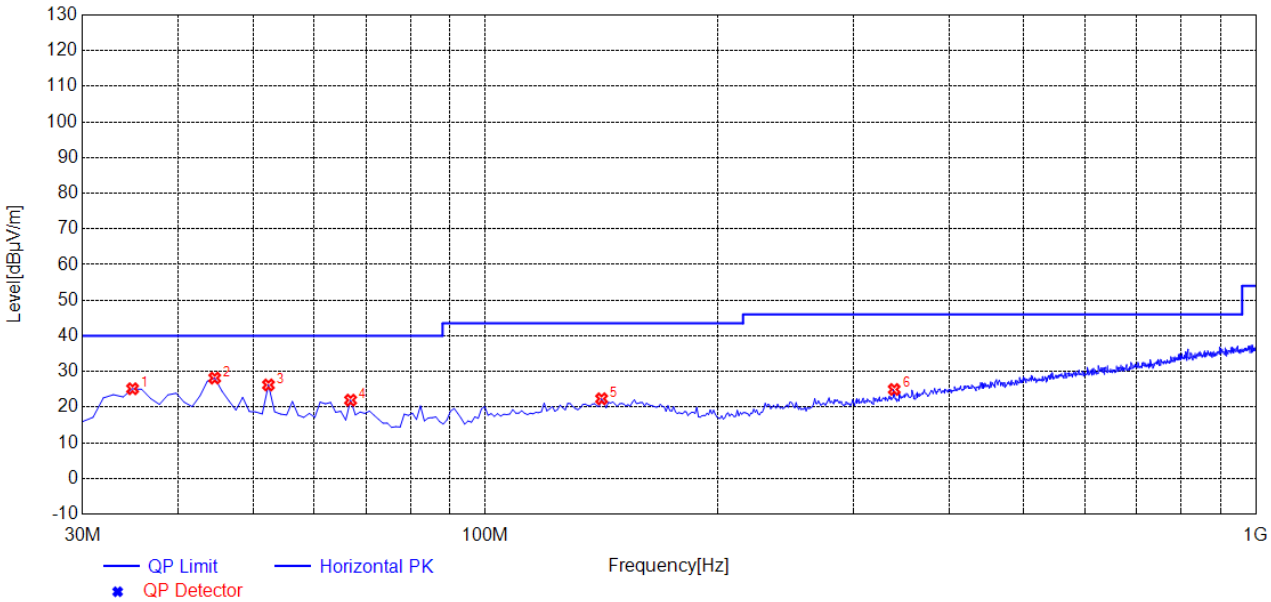
8.5 TEST RESULT OF RADIATED EMISSION TEST

Radiated Emission Test –Horizontal -3m Below 1G



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	34.8500	25.16	10.70	40.00	14.84	100	1	Horizontal
2	44.5500	28.15	11.82	40.00	11.85	100	42	Horizontal
3	52.3100	26.22	11.49	40.00	13.78	100	201	Horizontal
4	66.8600	21.96	9.76	40.00	18.04	200	170	Horizontal
5	141.5500	22.34	14.88	43.50	21.16	100	267	Horizontal
6	339.4300	24.96	17.44	46.00	21.04	200	96	Horizontal

RESULT: PASS

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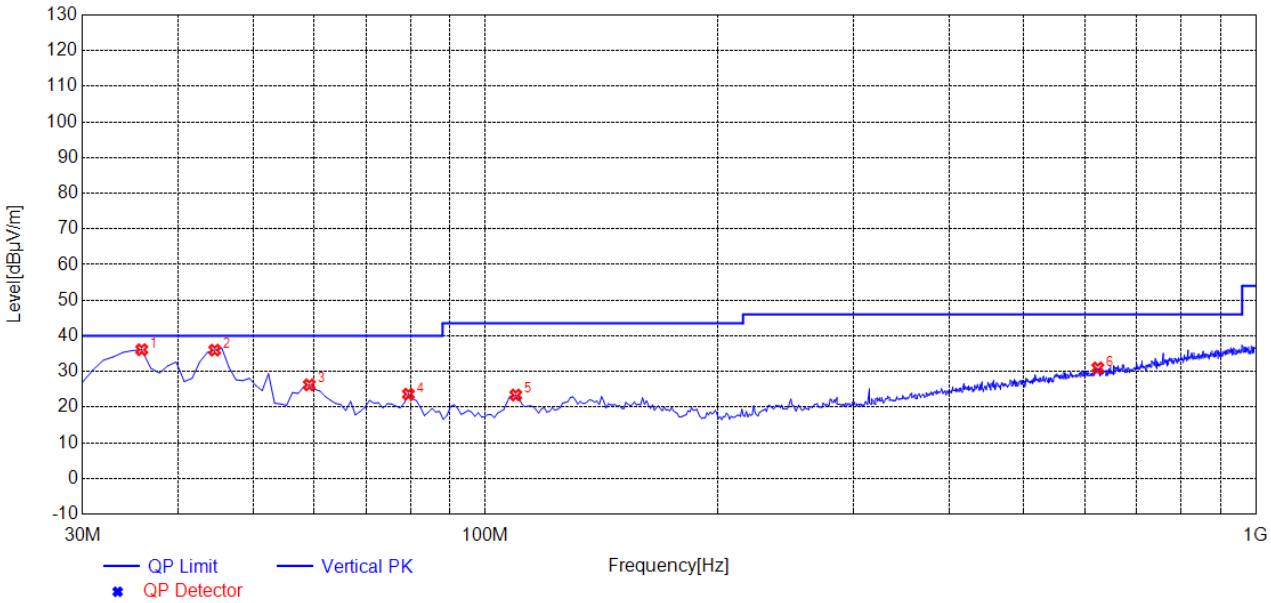
Radiated Emission Test –Vertical -3m Below 1G



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.8200	36.11	10.93	40.00	3.89	100	0	Vertical
2	44.5500	35.99	11.82	40.00	4.01	100	346	Vertical
3	59.1000	26.25	10.98	40.00	13.75	100	31	Vertical
4	79.4700	23.63	7.26	40.00	16.37	100	73	Vertical
5	109.5400	23.39	12.37	43.50	20.11	100	12	Vertical
6	623.6400	30.99	24.74	46.00	15.01	100	230	Vertical

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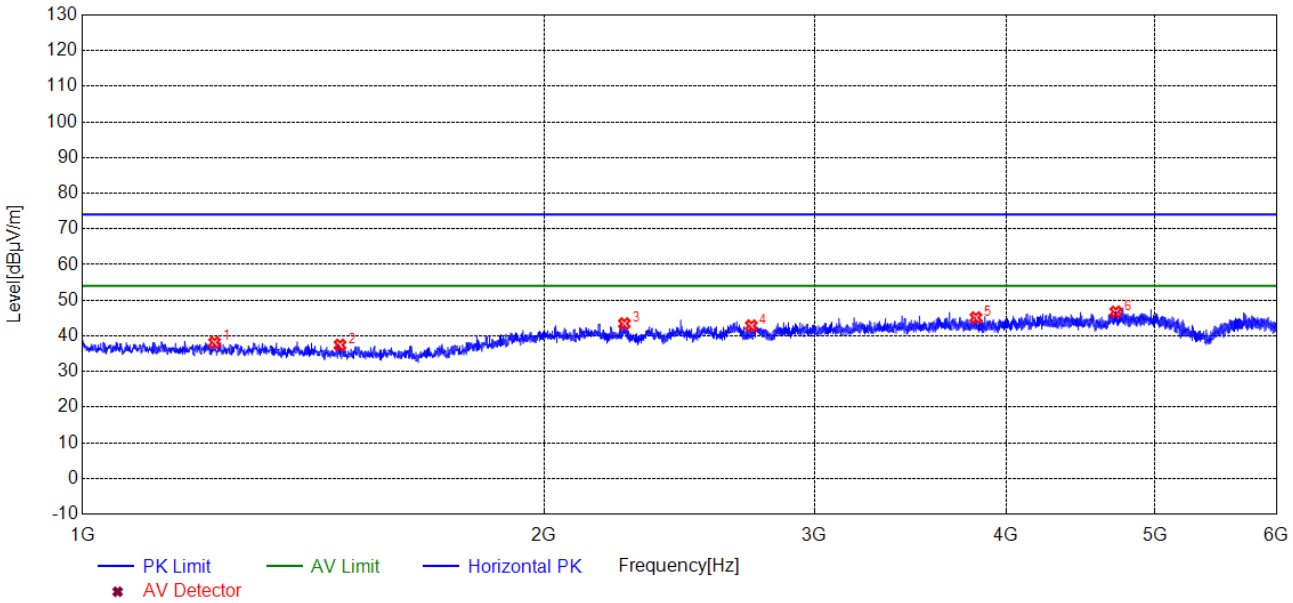
Radiated Emission Test –Horizontal -3m Above 1G



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1219.5220	38.12	-16.86	74.00	35.88	100	250	Horizontal
2	1472.0472	37.42	-17.10	74.00	36.58	100	20	Horizontal
3	2255.6256	43.43	-10.75	74.00	30.57	100	60	Horizontal
4	2729.1729	42.82	-9.54	74.00	31.18	100	150	Horizontal
5	3823.2823	45.12	-6.89	74.00	28.88	100	330	Horizontal
6	4716.3716	46.73	-4.99	74.00	27.27	100	50	Horizontal

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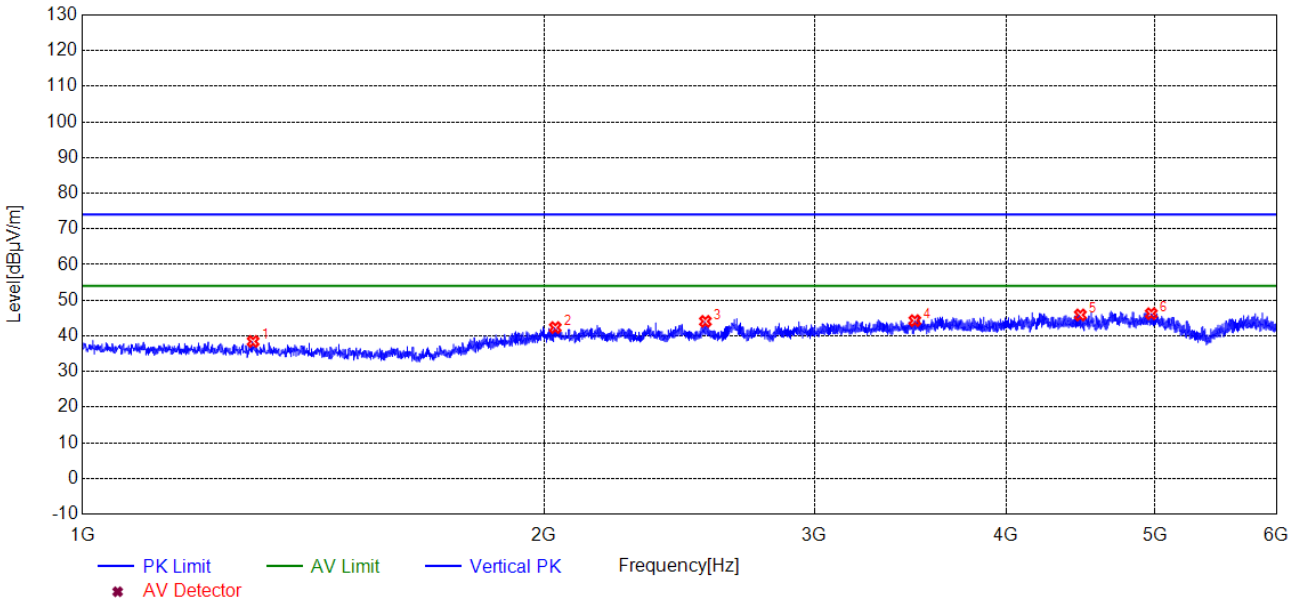
Radiated Emission Test –Vertical -3m Above 1G



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1292.0292	38.43	-16.93	74.00	35.57	100	30	Vertical
2	2033.6034	42.31	-11.68	74.00	31.69	100	80	Vertical
3	2547.1547	44.05	-9.68	74.00	29.95	100	100	Vertical
4	3488.2488	44.26	-7.64	74.00	29.74	100	30	Vertical
5	4471.8472	45.87	-5.27	74.00	28.13	100	280	Vertical
6	4973.8974	46.22	-4.75	74.00	27.78	100	10	Vertical

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss - Amplifier gain, Margin= Limit-Measurement.
2. The “Factor” value can be calculated automatically by software of measurement system.

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9. CONDUCTED EMISSION TEST

9.1 PROVISIONS APPLICABLE

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the, the radio frequency voltage that is conducted back onto the AC power line on any frequencies within the band 150 KHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50uH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit(dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

9.2 MEASUREMENT PROCEDURE

(1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

(2) Support equipment, if needed, was placed as per ANSI C63.4.

(3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

(4) The EUT received AC 120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

(5) All support equipments received AC power from a second LISN, if any.

(6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.

(7) Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes. During the above scans, the emissions were maximized by cable manipulation.

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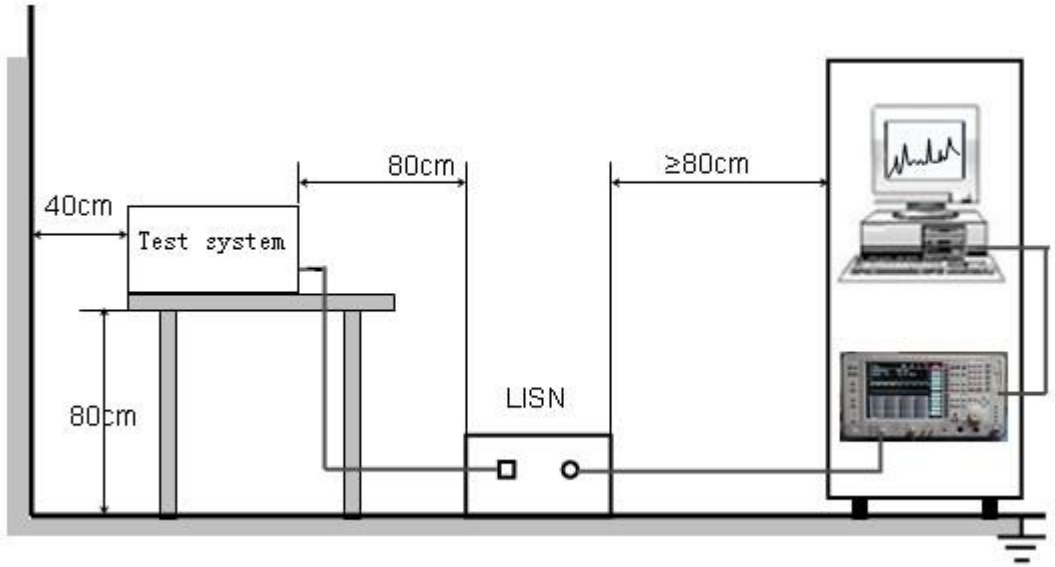
9.3 TEST SETUP BLOCK DIAGRAM



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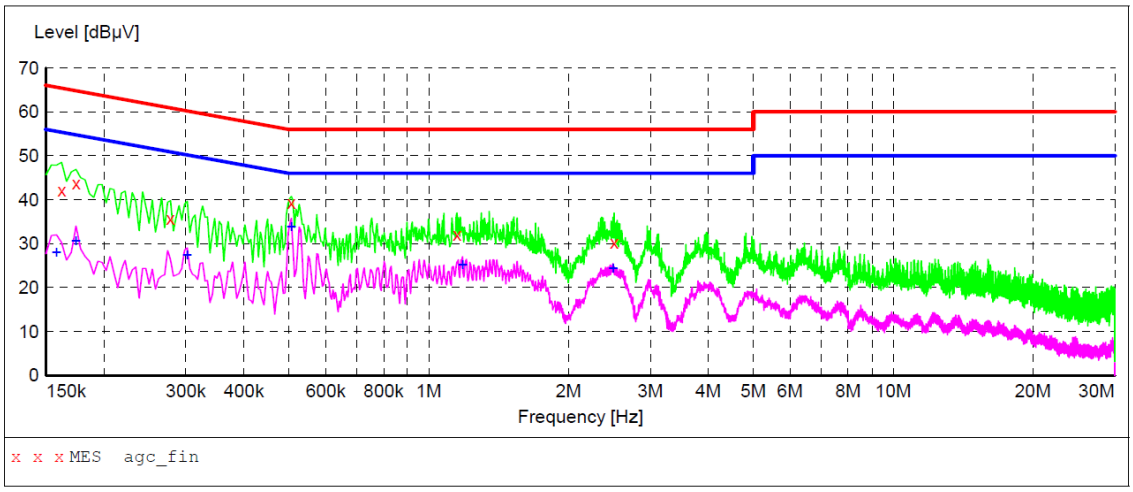
9.4 TEST RESULT

LONG ANTENNA

CONDUCTED EMISSION TEST–L



MEASUREMENT RESULT: "agc_fin"

2020/10/16 16:14

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.162000	42.10	11.3	65	23.3	QP	L1
0.174000	43.80	11.3	65	21.0	QP	L1
0.278000	35.70	11.3	61	25.2	QP	L1
0.506000	39.30	11.3	56	16.7	QP	L1
1.150000	32.00	11.3	56	24.0	QP	L1
2.506000	30.20	11.4	56	25.8	QP	L1

MEASUREMENT RESULT: "agc_fin2"

2020/10/16 16:14

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.158000	28.10	11.3	56	27.5	AV	L1
0.174000	30.60	11.3	55	24.2	AV	L1
0.302000	27.50	11.3	50	22.7	AV	L1
0.506000	33.90	11.3	46	12.1	AV	L1
1.182000	25.20	11.3	46	20.8	AV	L1
2.494000	24.40	11.4	46	21.6	AV	L1

RESULT: PASS

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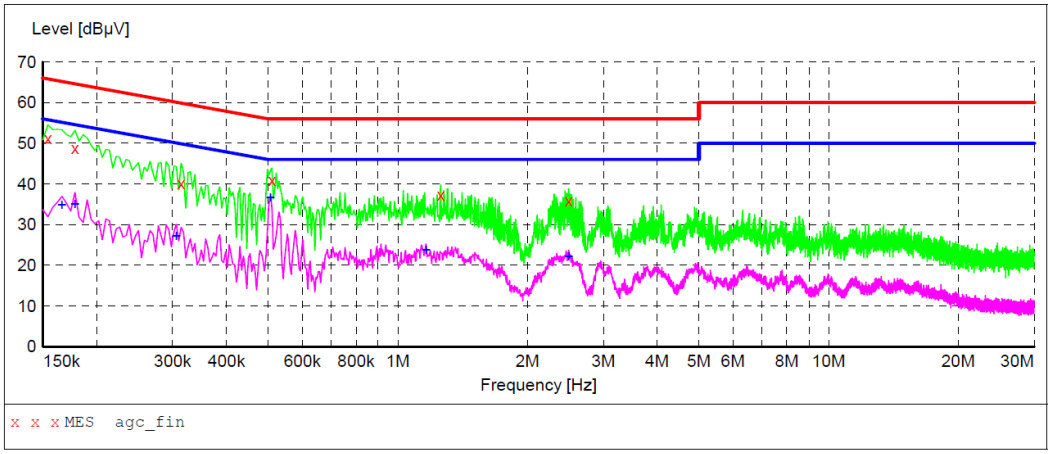
CONDUCTED EMISSION TEST–N



MEASUREMENT RESULT: "agc_fin"

2020/10/16 16:10

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.154000	51.20	11.3	66	14.6	QP	N
0.178000	48.80	11.3	65	15.8	QP	N
0.314000	40.20	11.3	60	19.7	QP	N
0.510000	41.00	11.3	56	15.0	QP	N
1.258000	37.20	11.3	56	18.8	QP	N
2.490000	35.80	11.4	56	20.2	QP	N

MEASUREMENT RESULT: "agc_fin2"

2020/10/16 16:09

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.166000	34.80	11.3	55	20.4	AV	N
0.178000	35.10	11.3	55	19.5	AV	N
0.306000	27.20	11.3	50	22.9	AV	N
0.506000	36.60	11.3	46	9.4	AV	N
1.162000	23.90	11.3	46	22.1	AV	N
2.494000	22.30	11.4	46	23.7	AV	N

RESULT: PASS

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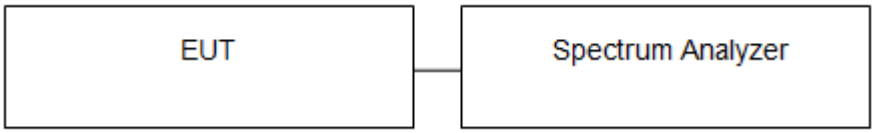
10. ANTENNA CONDUCTED POWER FOR RECEIVERS

LIMIT

The antenna conducted power of the receiver as defined in §15.111 shall not exceed the values given in the following tables

Frequency Range	9 KHz to 2GHz
Limit	2.0 nW (-57 dBm)

TEST CONFIGURATION



TEST PROCEDURE

1. The receiver antenna terminal connected to a spectrum analyzer.
2. The test data of the worst case condition (mode 1) was reported on the following Data page.

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc@agc-cert.com.

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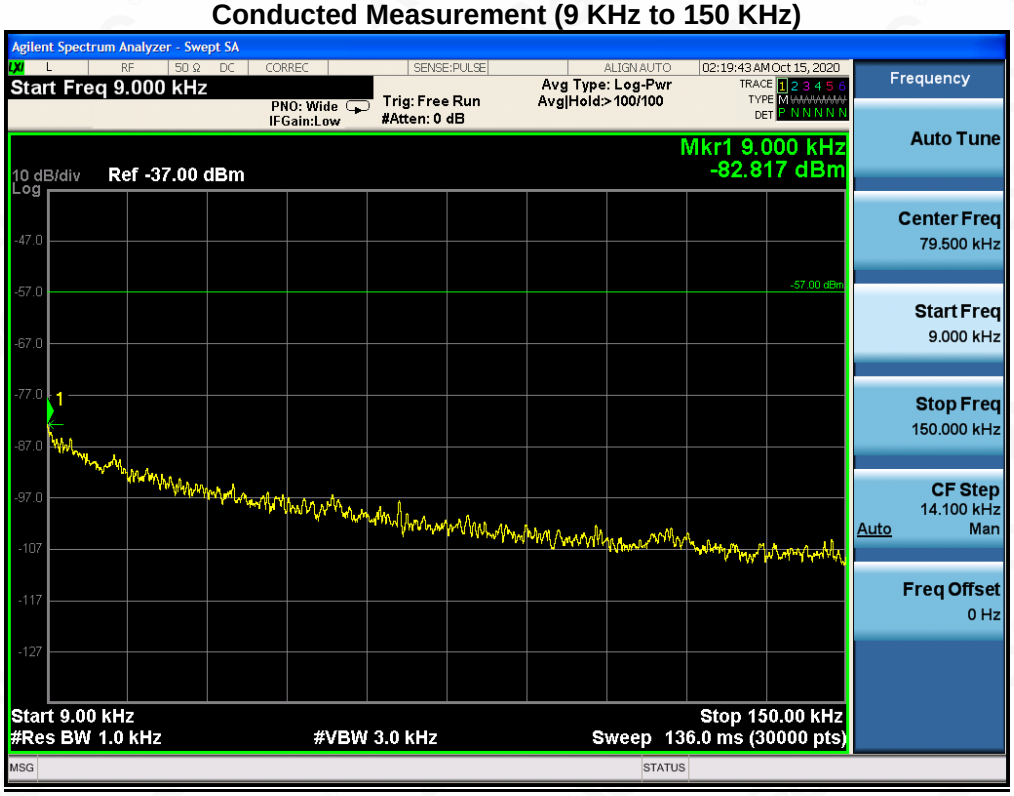
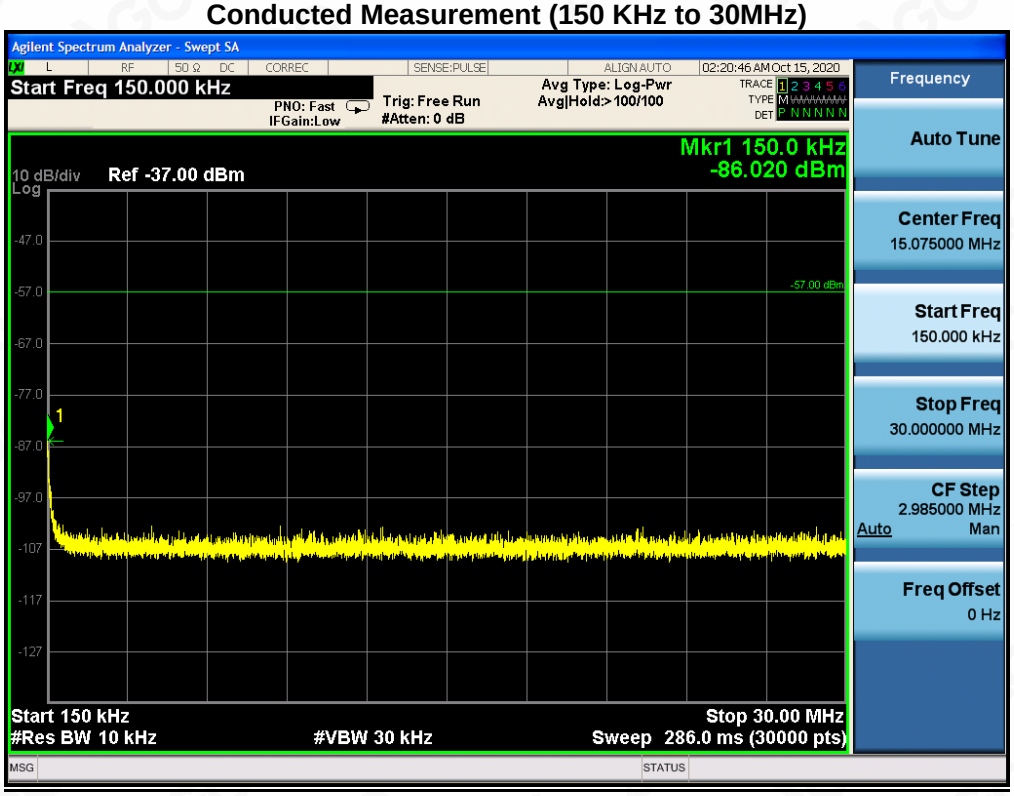
TEST RESULTS

Conducted Measurement (9 KHz to 150 KHz)



Conducted Measurement (150 KHz to 30MHz)



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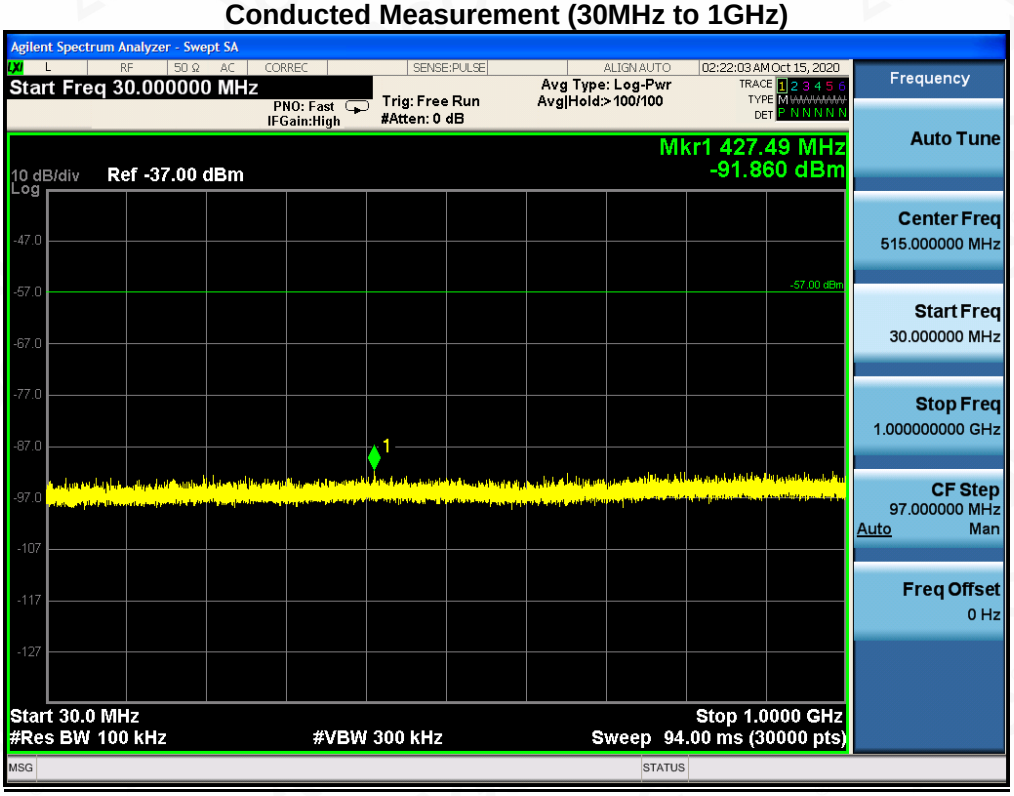
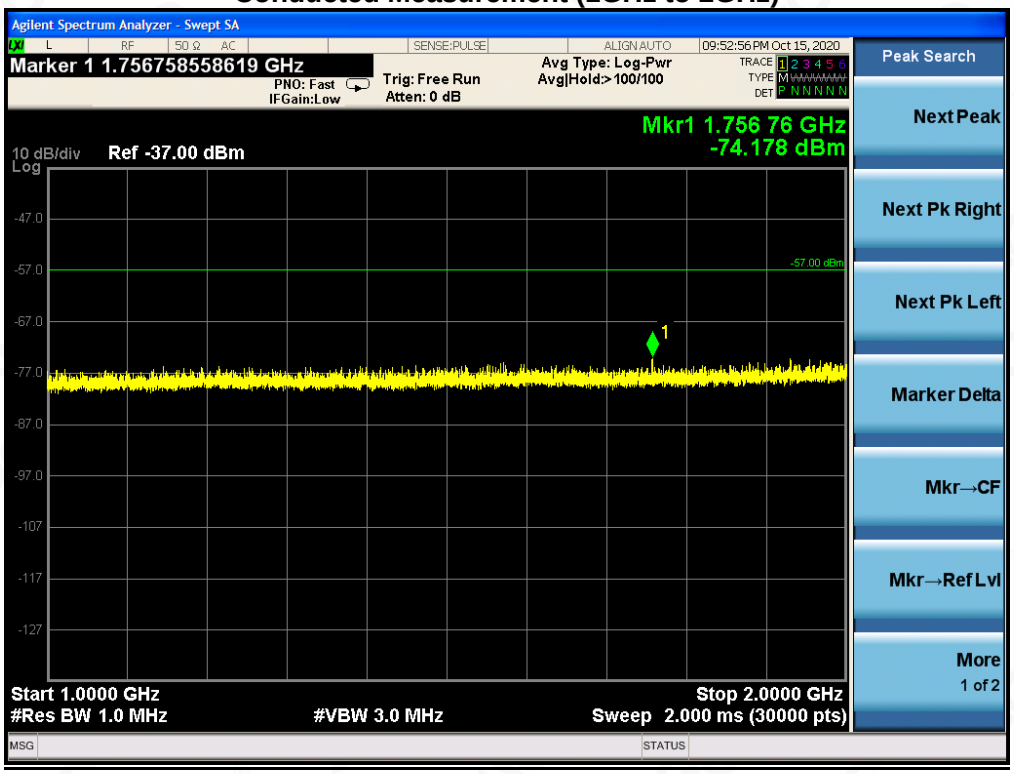
Conducted Measurement (30MHz to 1GHz)



Conducted Measurement (1GHz to 2GHz)



PASS

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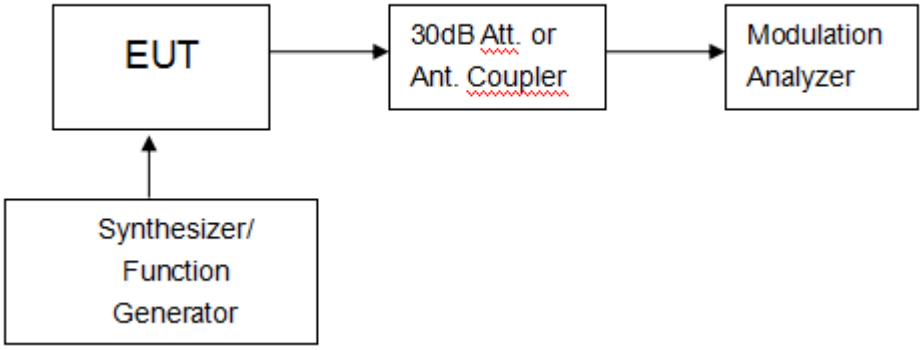
11. SANNING RECEIVERS AND FREQUENCY CONVERTERS USED WITH SANNING RECEIVERS.

LIMIT

Except as provided in paragraph (c) of this section, scanning receivers shall reject any signals from the Cellular Radiotelephone Service frequency bands that are 38 dB or lower based upon a 12 dB SINAD measurement, which is considered the threshold where a signal can be clearly discerned from any interference that may be present.

TEST CONFIGURATION



TEST PROCEDURE

Please review the FCC Part 15.121 b section requirements to meet the testing process

TEST RESULTS

UHF:

Frequency Range(MHz)	Channel	Measurement Result (dB)	Limit(dB)	Result
400-470	Bottom	46	＞38	Pass
400-470	Middle	42	＞38	Pass
400-470	Top	45	＞38	Pass

Note:1.This device meets the requirements of FCC PART 15.121.b

2.The test report only shows the worst test results

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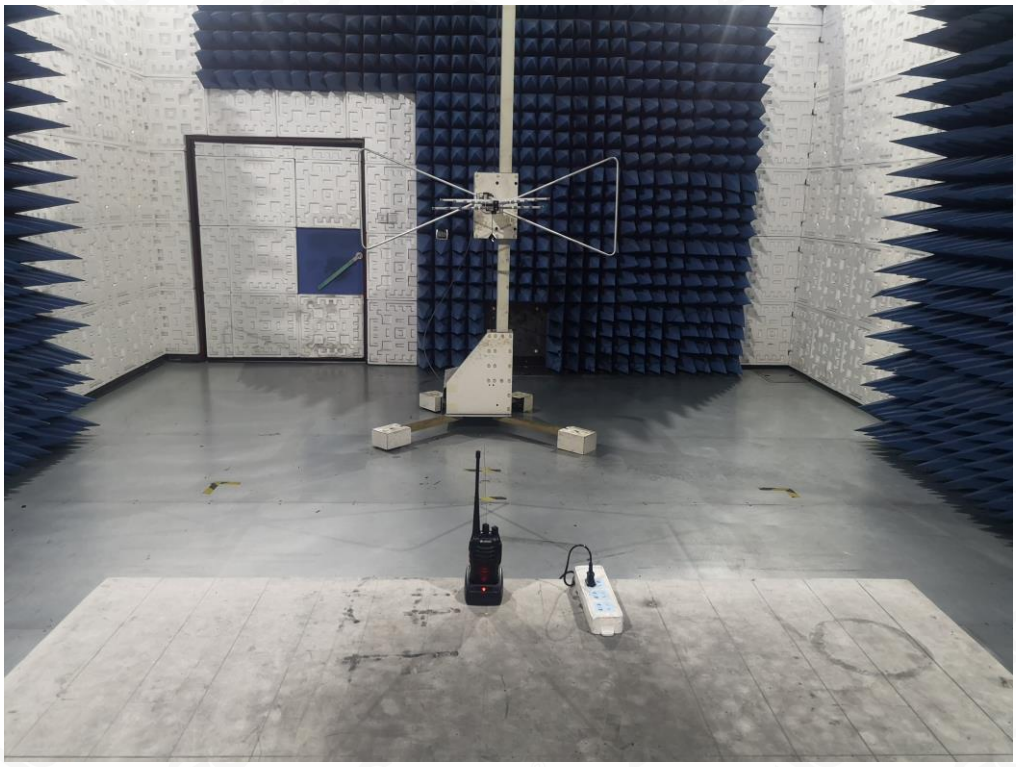
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

CONDUCTED EMISSION TEST SETUP-LONG ANTENNA

RADIATED EMISSION TEST SETUP-BELOW 1GHZ



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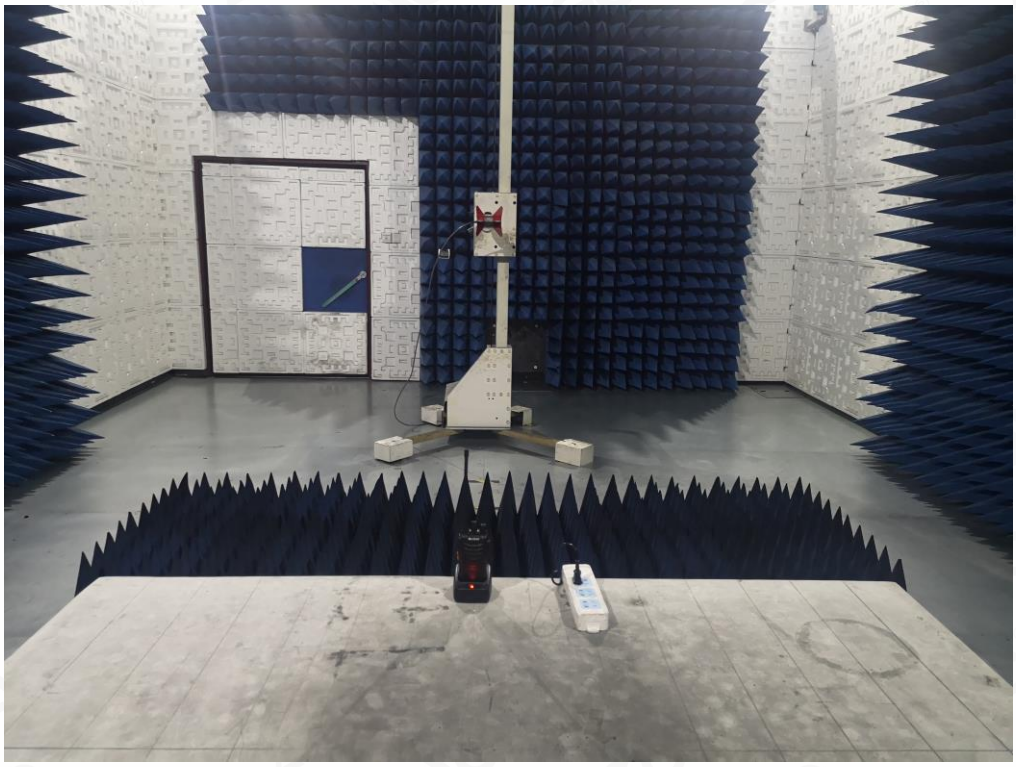
RADIATED EMISSION TEST SETUP-ABOVE 1GHZ



----END OF REPORT----

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Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3.The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. The non-CMA report issued by AGC is only permitted to be used by the client as internal reference use and shall not be used for public demonstration purpose.

5. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

6. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

7. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

8.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

9. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.

10. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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