Shenzhen CTA Testing Technology Co., Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15 C(15.249)

Report Reference No.....:	**CTA24092300201**
FCC ID..... :	**2AWJ8-ALPHA-EVO**
Compiled by (position+printed name+signature) .:	File administrators Jinghua Xiao
Supervised by (position+printed name+signature) .:	Test Engineer Lushan Kong
Approved by (position+printed name+signature) .:	Manager Eric Wang
Date of issue .....:	Sep. 23, 2024

Representative Laboratory Name.:	**Shenzhen CTA Testing Technology Co., Ltd.**
Address .....:	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name.....:	**Shen Zhen Simagic Technology Co., Limited**
Address .....:	302, Building 7, DCC Cultural and Creative Park, No. 98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, China
Test specification.....**:**	
Standard.....:	**FCC CFR 47 PART 15 C(15.249)** **ANSI C63.10-2020**
TRF Originator.....:	Shenzhen Global Test Service Co.,Ltd.
Master TRF .....:	Dated 2014-12

Test item description .....:	**Alpha EVO Wheelbase**
Trade Mark .....:	SIMAGIC
Manufacturer .....:	Shen Zhen Simagic Technology Co., Limited
Model/Type reference .....:	EVO I
Listed Models .....:	N/A
Modulation Type.....:	GFSK
Operation Frequency.....:	From 2402-2480MHz
Hardware Version .....:	N/A
Software Version.....:	N/A
Rating .....:	DC 48.0V/5.25A by Adapter
Result .....:	**PASS**

T E S T R E P O R T

Test Report No. :	**CTA24092300201**	Sep. 23, 2024 Date of issue

Equipment under Test	:	Alpha EVO Wheelbase
Model /Type	:	EVO I
Listed model	:	N/A
Applicant	:	**Shen Zhen Simagic Technology Co., Limited**
Address	:	302, Building 7, DCC Cultural and Creative Park, No. 98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, China
Manufacturer	:	**Shen Zhen Simagic Technology Co., Limited**
Address	:	302, Building 7, DCC Cultural and Creative Park, No. 98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, China

Test Result:	**PASS**

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.
ANSI C63.10-2020: American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Sep. 03, 2024
Testing commenced on	:	Sep. 03, 2024
Testing concluded on	:	Sep. 21, 2024

2.2. Product Description

Product Name	Alpha EVO Wheelbase
Trade Mark	SIMAGIC
Model/Type reference	EVO I
List Models	N/A
Model Declaration	N/A
Power supply:	DC 48.0V/5.25A by Adapter
Sample ID	CTA240923002 -S0001-1#, CTA240923002 -S0001-2#
SRD	
Frequency Range	2402-2480MHz
Channel Number	3Channels
Modulation Type	GFSK
Antenna Description	PCB Antenna 1, 1.80dBi(Max.)
Bluetooth	
Operation frequency	2402-2480MHz
Channel Number	40 channels for Bluetooth (DTS)
Channel Spacing	2MHz for Bluetooth (DTS)
Modulation Type	GFSK for Bluetooth (DTS)
Antenna Description	PCB Antenna 2, 0.60 dBi(Max)

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 48.0V

2.4. Short description of the Equipment under Test (EUT)

This is a Alpha EVO Wheelbase.
For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

Mode of Operations	Frequency Range (MHz)	Data Rate (Mbps)
SRD	2402	1
	2440	1
	2480	1
For Conducted Emission		
Test Mode	TX Mode	
For Radiated Emission		
Test Mode	TX Mode	

Channel	Frequency(MHz)
1	**2402**
2	**2440**
3	**2480**

The EUT has been tested under operating condition.

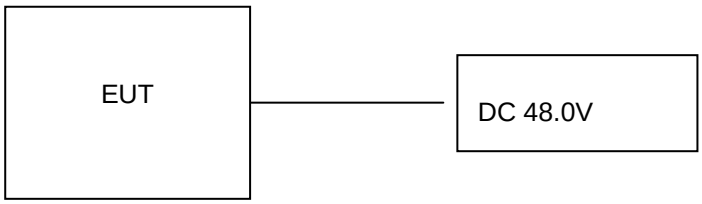
This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/50Hz modes, recorded worst case(AC 120V/60Hz).

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power, which was determined to be SRD mode.

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be SRD mode.

2.6. Block Diagram of Test Setup



2.7. EUT Exercise Software

The product continues to transmit signals after power on.

2.8. Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
Shen Zhen Simagic Technology Co., Limited	Adapter	N/A	N/A	SDOC

2.9. External I/O Cable

I/O Port Description	Quantity	Cable
USB Port	4	N/A
Type-C Port	1	N/A
DC IN Port	1	Non-Shielded, 1.0m
OUT PUT Port	8	N/A

2.10. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AWJ8-ALPHA-EVO** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.11. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:
FCC-Registration No.: 517856 Designation Number: CN1318
Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.
A2LA-Lab Cert. No.: 6534.01
Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.
The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. :

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5. Test Description

Applied Standard: FCC Part 15 Subpart C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.207(a)	Conduction Emissions	CTA240923002-S0001-1#	Compliant	Note 1
§15.205(a) §15.209(a) §15.249(a) §15.249(c)	Radiated Emissions Measurement	CTA240923002-S0001-1# CTA240923002-S0001-2#	Compliant	Note 1
§15.249	Band Edges Measurement	CTA240923002-S0001-1#	Compliant	Note 1
§15.249, §15.215	20 dB Bandwidth	CTA240923002-S0001-1#	Compliant	Note 1
§15.203	Antenna Requirements	/	Compliant	Note 1

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed
3. Note 1 – Test results inside test report;
4. Note 2 – Test results in other test report (MPE Report).
5. We tested all test mode and recorded worst case in report

3.6. Equipments Used during the Test

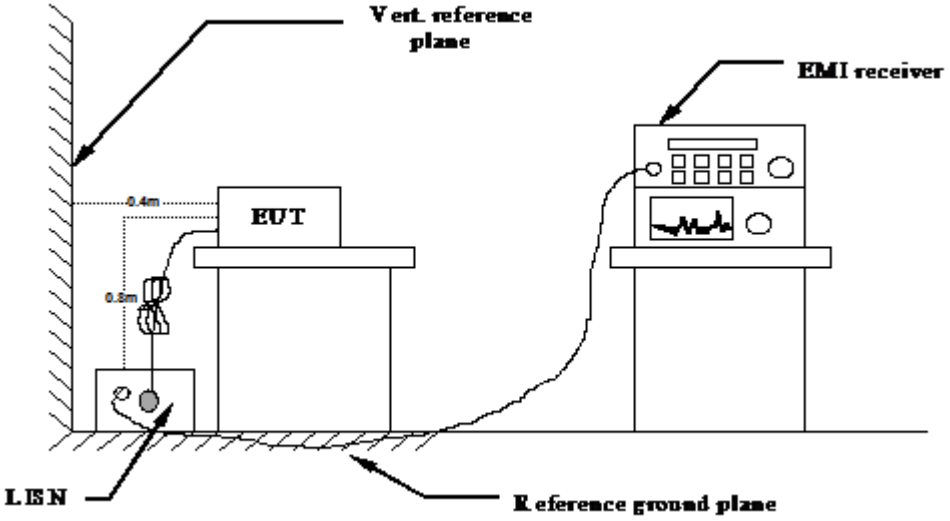
Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2024/08/01	2025/07/31
LISN	R&S	ENV216	CTA-314	2024/08/01	2025/07/31
EMI Test Receiver	R&S	ESPI	CTA-307	2024/08/01	2025/07/31
EMI Test Receiver	R&S	ESCI	CTA-306	2024/08/01	2025/07/31
Spectrum Analyzer	Agilent	N9020A	CTA-301	2024/08/01	2025/07/31
Spectrum Analyzer	R&S	FSP	CTA-337	2024/08/01	2025/07/31
Vector Signal generator	Agilent	N5182A	CTA-305	2024/08/01	2025/07/31
Analog Signal Generator	R&S	SML03	CTA-304	2024/08/01	2025/07/31
Universal Radio Communication	CMW500	R&S	CTA-302	2024/08/01	2025/07/31
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2024/08/01	2025/07/31
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2023/10/17	2024/10/16
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2023/10/13	2024/10/12
Loop Antenna	Zhinan	ZN30900C	CTA-311	2023/10/17	2024/10/16
Horn Antenna	Beijing Hangwei Dayang	OBH100400	CTA-336	2024/08/06	2027/08/05
Antenna Tower	Suzhou Keletuo electronic Technology Co., LTD	BK-*AT-BS	N/A	N/A	N/A
Amplifier	Schwarzbeck	BBV 9745	CTA-312	2024/08/01	2025/07/31
Amplifier	Taiwan chengyi	EMC051845B	CTA-313	2024/08/01	2025/07/31
Directional coupler	NARDA	4226-10	CTA-303	2024/08/01	2025/07/31
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2024/08/01	2025/07/31
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2024/08/01	2025/07/31
Automated filter bank	Tonscend	JS0806-F	CTA-404	2024/08/01	2025/07/31
Power Sensor	Agilent	U2021XA	CTA-405	2024/08/01	2025/07/31
Amplifier	Schwarzbeck	BBV9719	CTA-406	2024/08/01	2025/07/31

Note: 1. The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. 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 C63.10-2020.
2 Support equipment, if needed, was placed as per ANSI C63.10-2020
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2020
4 All support equipments received AC power from a second LISN, if any.
5 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.
6 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
7 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency range (MHz)	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.		

DISTURBANCE Calculation

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

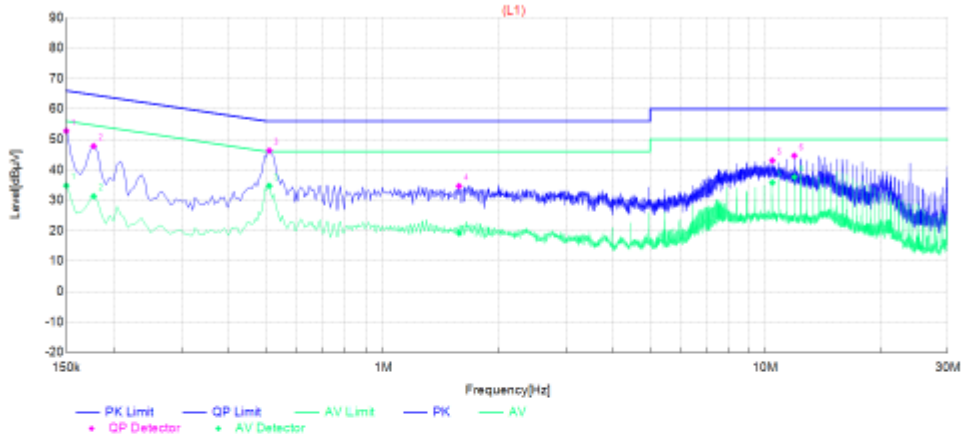
TEST RESULTS

Remark: We measured Conducted Emission at GFSK mode in AC 120V/60Hz and AC 240V/50Hz, the worst case was recorded(GFSK -MCH) .

Temperature	25℃	Humidity	60%
Test Engineer	Lushan Kong	Configurations	SRD

Power supply:	AC 120V/60Hz	Polarization	L

Test Graph



Final Data List

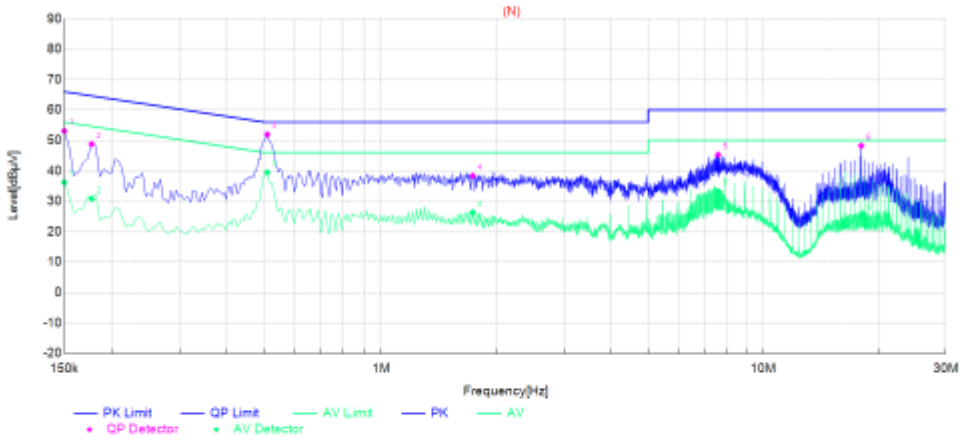
NO.	Frequency	QP Reading	AVG. Reading	Factor	QP Result	AVG. Result	QP Limit	AVG. Limit	QP Margin	AVG. Margin	Line	Remark
1	0.15	42.40	24.45	10.35	52.75	34.80	66.00	56.00	13.25	21.20	L1	PASS
2	0.177	37.57	21.08	10.22	47.79	31.30	64.63	54.63	16.84	23.33	L1	PASS
3	0.51	36.05	24.46	10.25	46.30	34.71	56.00	46.00	9.70	11.29	L1	PASS
4	1.581	24.39	8.93	10.24	34.63	19.17	56.00	46.00	21.37	26.83	L1	PASS
5	10.428	32.37	25.14	10.64	43.01	35.78	60.00	50.00	16.99	14.22	L1	PASS
6	11.913	33.83	26.82	10.80	44.63	37.62	60.00	50.00	15.37	12.38	L1	PASS

Note:1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

Power supply:	AC 120V/60Hz	Polarization	N

Test Graph



Final Data List

NO.	Frequency	QP Reading	AVG. Reading	Factor	QP Result	AVG. Result	QP Limit	AVG. Limit	QP Margin	AVG. Margin	Line	Remark
1	0.15	42.75	25.88	10.35	53.10	36.23	66.00	56.00	12.90	19.77	N	PASS
2	0.177	38.54	20.55	10.22	48.76	30.77	64.63	54.63	15.87	23.86	N	PASS
3	0.51	41.70	29.23	10.25	51.95	39.48	56.00	46.00	4.05	6.52	N	PASS
4	1.7385	28.12	16.13	10.25	38.37	26.38	56.00	46.00	17.63	19.62	N	PASS
5	7.602	34.72	22.73	10.55	45.27	33.28	60.00	50.00	14.73	16.72	N	PASS
6	18.006	36.98	14.04	11.26	48.24	25.30	60.00	50.00	11.76	24.70	N	PASS

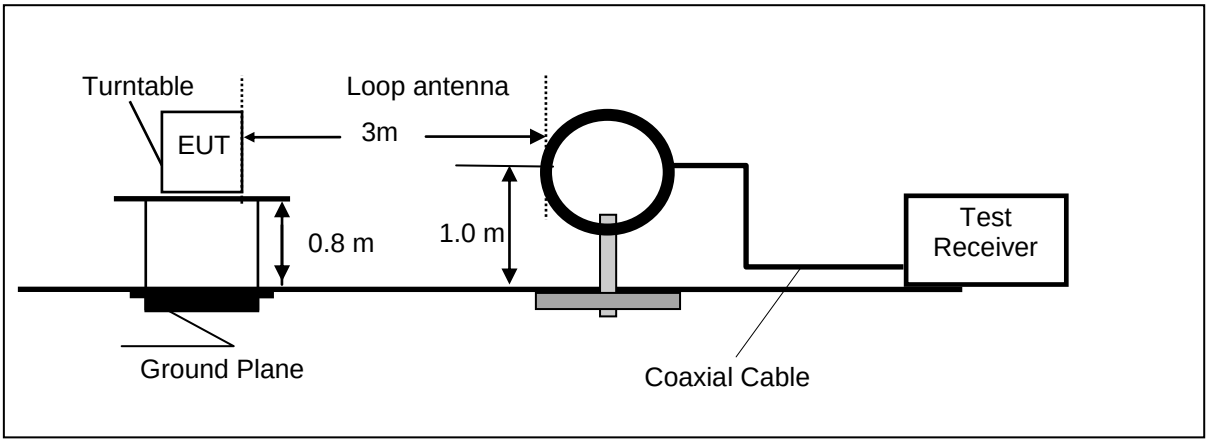
Note:1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

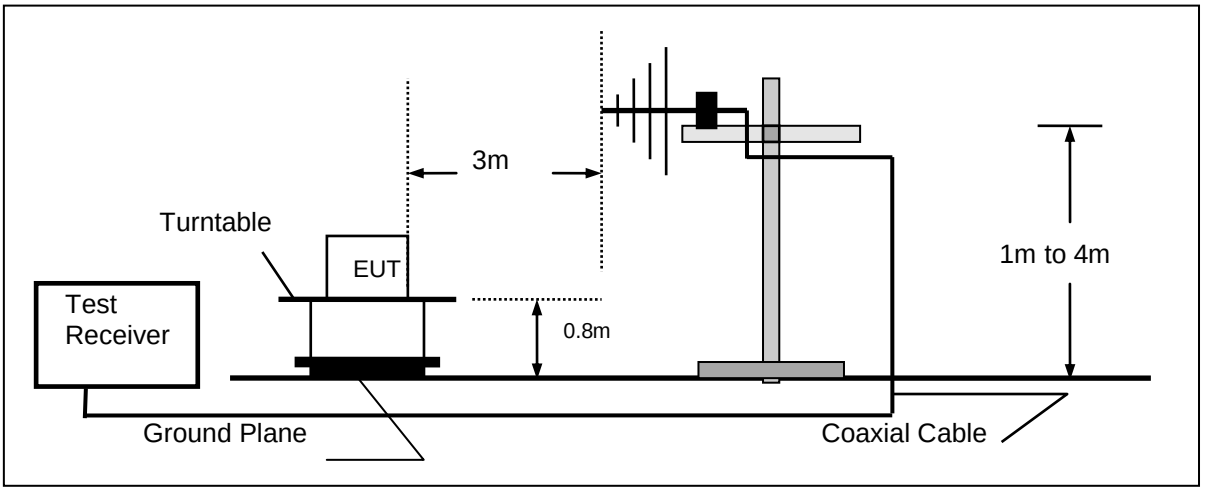
4.2. Radiated Emission

TEST CONFIGURATION

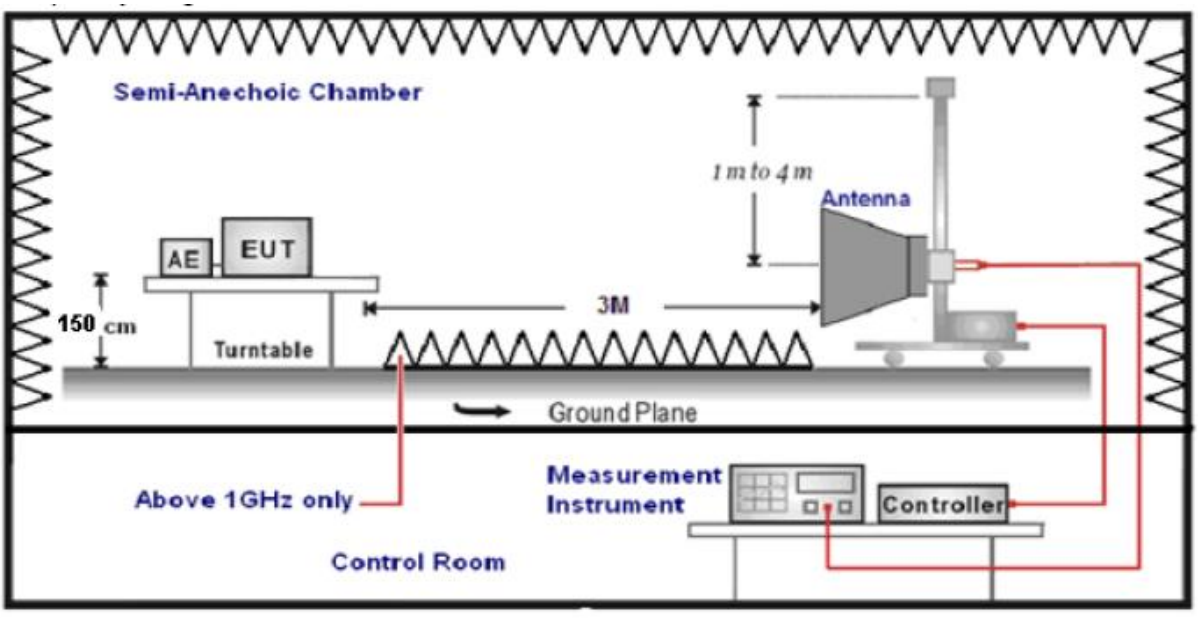
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 30MHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

1.The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

2.According to §15.249 (a) & RSS-210§B.10(a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	millivolts/meter	dBuV/m	microvolts/meter	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth
The field strength limits shall be measured using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using an International Special Committee on Radio Interference (CISPR) quasi-peak detector.

TEST RESULTS

Remark: We measured Radiated Emission at SRD mode from 9KHz to 10GHz in AC120V and the worst case was recorded.

Temperature	24℃	Humidity	48%
Test Engineer	Lushan Kong	Configurations	SRD

For 9 KHz~30MHz

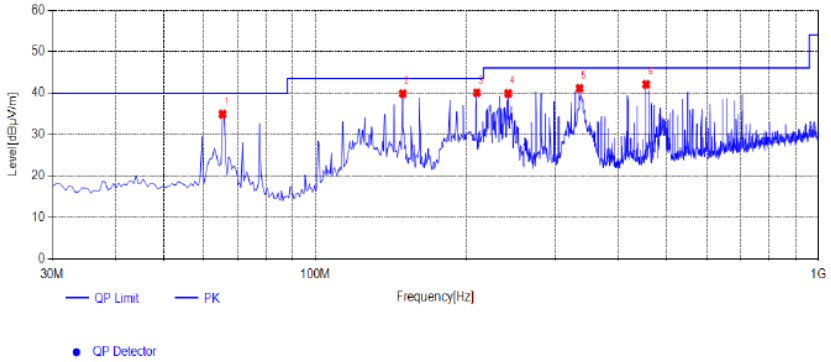
Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

For 30MHz-1GHz

Horizontal

Test Graph



Suspected List

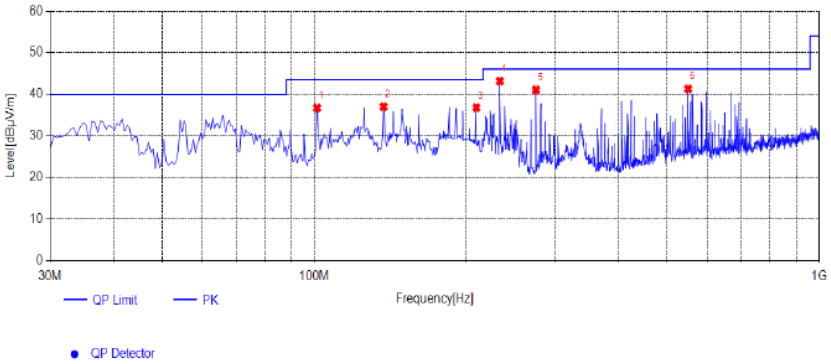
NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	65.405	47.70	-12.79	34.91	40.00	5.09	100	48	PK	Horizonta	PASS
2	149.31	54.13	-14.21	39.92	43.50	3.58	100	232	PK	Horizonta	PASS
3	209.45	50.06	-9.95	40.11	43.50	3.39	100	282	PK	Horizonta	PASS
4	241.945	48.97	-9.02	39.95	46.00	6.05	100	37	PK	Horizonta	PASS
5	335.065	47.72	-6.53	41.19	46.00	4.81	100	311	PK	Horizonta	PASS
6	454.86	45.83	-3.72	42.11	46.00	3.89	100	120	PK	Horizonta	PASS

Note: 1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

Vertical

Test Graph



Suspected List

NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	101.295	48.46	-11.77	36.69	43.50	6.81	100	29	PK	Vertical	PASS
2	137.185	51.20	-14.21	36.99	43.50	6.51	100	192	PK	Vertical	PASS
3	209.45	46.70	-9.95	36.75	43.50	6.75	100	192	PK	Vertical	PASS
4	233.215	52.41	-9.25	43.16	46.00	2.84	100	330	PK	Vertical	PASS
5	274.925	48.92	-7.84	41.08	46.00	4.92	100	334	PK	Vertical	PASS
6	550.405	42.79	-1.47	41.32	46.00	4.68	100	278	PK	Vertical	PASS

Note: 1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

Field strength of fundamental:

Frequency (MHz)	Pol.	Measure Result(PK, dBuV/m)	Measure Result(AV, dBuV/m)	Limit PK (dBuV/m)	Limit AV (dBuV/m)	Margin PK dB	Margin AV dB	Result
2402	H	82.75	79.33	114.00	94.00	31.25	14.67	Pass
2402	V	83.04	79.98	114.00	94.00	30.96	14.02	Pass
2440	H	81.58	78.12	114.00	94.00	32.42	15.88	Pass
2440	V	82.07	78.89	114.00	94.00	31.93	15.11	Pass
2480	H	81.69	78.56	114.00	94.00	32.31	15.44	Pass
2480	V	82.78	79.24	114.00	94.00	31.22	14.76	Pass

For 1GHz to 25GHz

Channel 1 / 2402 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4804.00	51.19	32.44	30.25	7.95	61.33	74.00	-12.67	Peak	Horizontal
4804.00	34.81	32.44	30.25	7.95	44.95	54.00	-9.05	Average	Horizontal
4804.00	54.85	32.44	30.25	7.95	64.99	74.00	-9.01	Peak	Vertical
4804.00	34.43	32.44	30.25	7.95	44.57	54.00	-9.43	Average	Vertical

Channel 2 / 2440 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4880.00	50.20	32.52	30.31	8.12	60.53	74.00	-13.47	Peak	Horizontal
4880.00	36.21	32.52	30.31	8.12	46.54	54.00	-7.46	Average	Horizontal
4880.00	52.37	32.52	30.31	8.12	62.70	74.00	-11.30	Peak	Vertical
4880.00	35.86	32.52	30.31	8.12	46.19	54.00	-7.81	Average	Vertical

Channel 3 / 2480 MHz

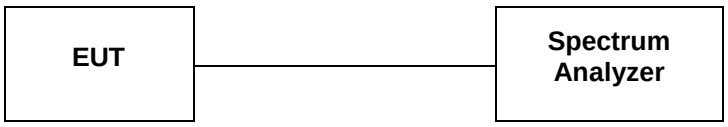
Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4960.00	50.60	32.68	30.27	7.88	60.89	74.00	-13.11	Peak	Horizontal
4960.00	35.53	32.68	30.27	7.88	45.82	54.00	-8.18	Average	Horizontal
4960.00	48.57	32.68	30.27	7.88	58.86	74.00	-15.14	Peak	Vertical
4960.00	30.87	32.68	30.27	7.88	41.16	54.00	-12.84	Average	Vertical

Notes:

1). Measuring frequencies from 9 KHz~10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.
2). Radiated emissions measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.
3). Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4). Measured= Reading- Pre. Fac.+ Ant. Fac.+ Cab. Loss
5). Margin = Measured- Limit

4.3. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

Use the following spectrum analyzer settings:
Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel
RBW = 1% to 5% of the 20 dB bandwidth
VBW =3 RBW
Sweep = auto
Detector function = peak
Trace = max hold
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

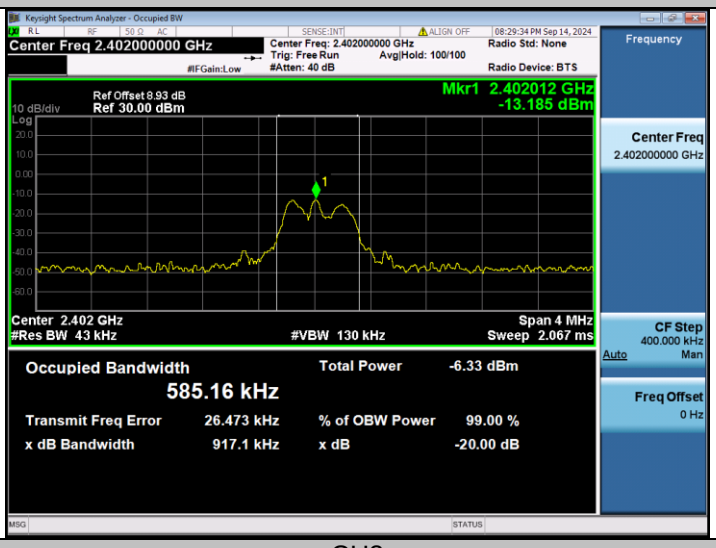
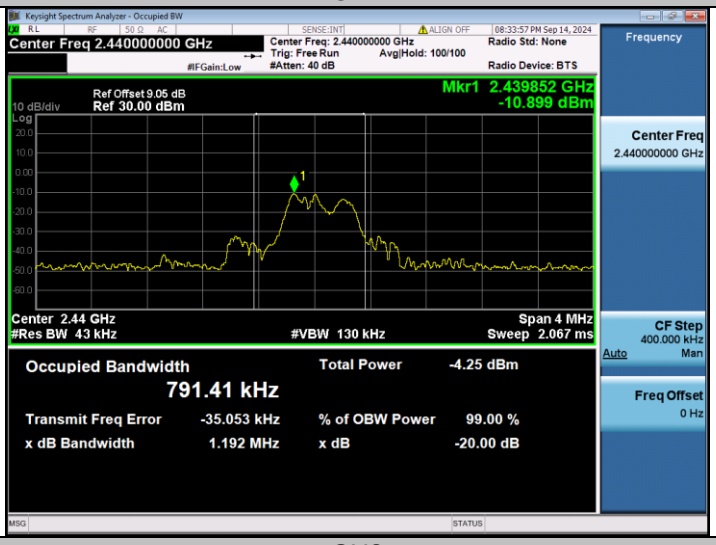
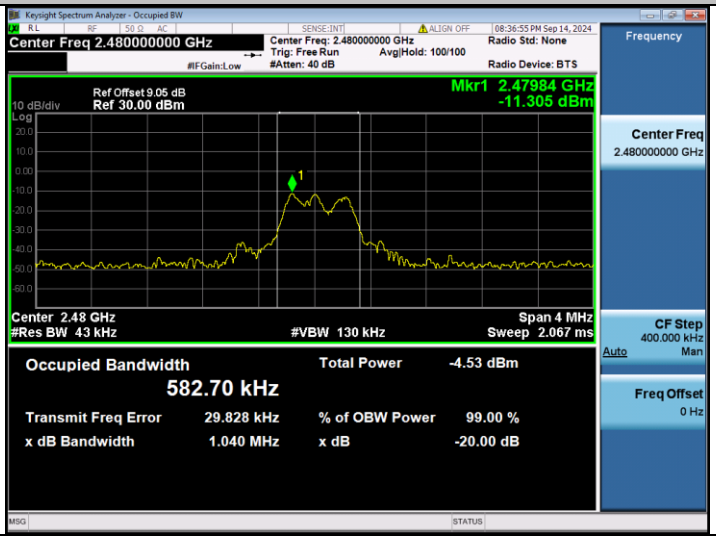
LIMIT

Non-Specified

TEST RESULTS

Temperature	24.2℃	Humidity	54.9%
Test Engineer	Lushan Kong	Configurations	SRD

Modulation	Channel	20dB Bandwidth (MHz)	Result
GFSK	1	0.58516	Pass
	2	0.79141	Pass
	3	0.58270	Pass

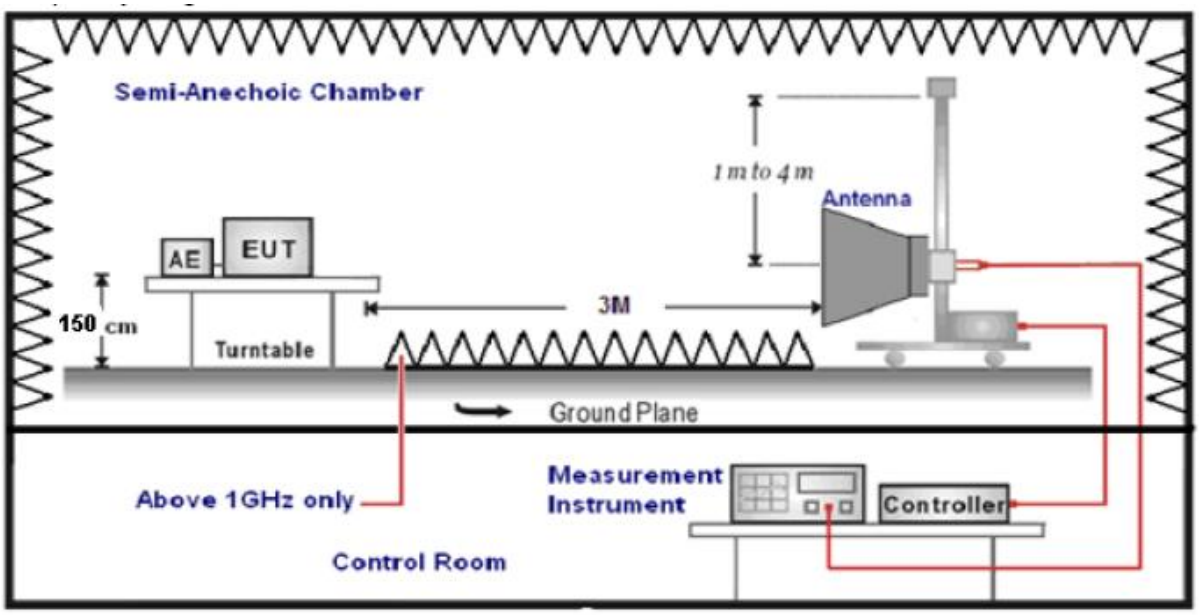
20dB Bandwidth
CH1

CH2

CH3


4.4. Band Edge Compliance of RF Emission

TEST REQUIREMENT

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

TEST CONFIGURATION



TEST PROCEDURE

The EUT is placed on a turntable, which is 0.8m above the ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
Peak: RBW=120MHz, RBW=300MHz / Sweep=AUTO
Repeat the procedures until the peak versus polarization are measured.

LIMIT

Below -20dB of the highest emission level in operating band.
Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

TEST RESULTS

4.4.1 For Radiated Bandedge Measurement

Temperature	23.8℃	Humidity	53.7%
Test Engineer	Lushan Kong	Configurations	SRD

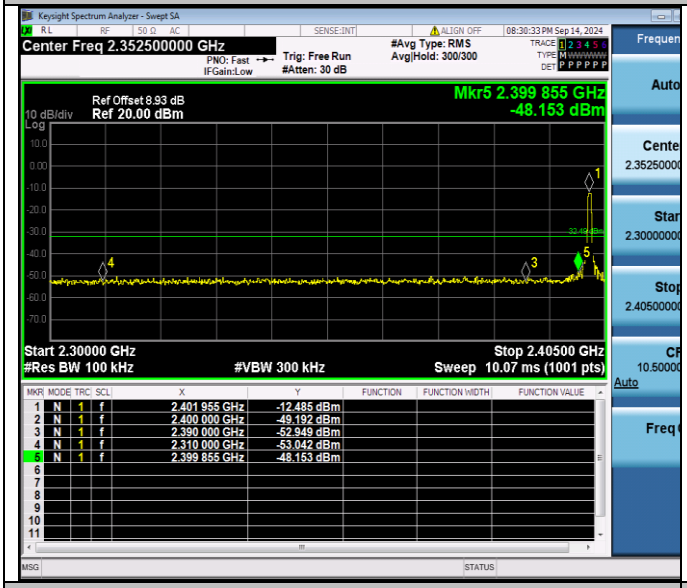
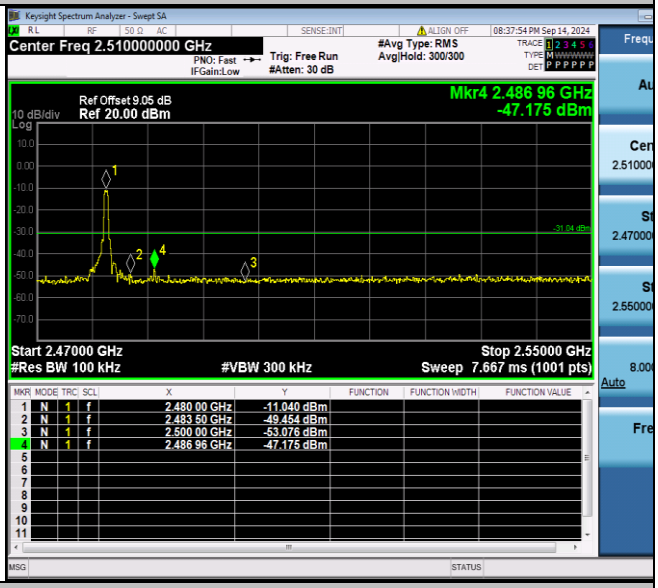
Frequency(MHz):			**2402**			**Polarity:**			**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390.00	45.72	PK	74.00	-28.28	1.50	85	51.03	27.49	3.32	36.12	-5.31
2390.00	33.65	AV	54.00	-20.35	1.50	85	38.96	27.49	3.32	36.12	-5.31
Frequency(MHz):			**2402**			**Polarity:**			**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390.00	50.47	PK	74.00	-23.53	1.50	267	55.78	27.49	3.32	36.12	-5.31
2390.00	31.02	AV	54.00	-22.98	1.50	267	36.33	27.49	3.32	36.12	-5.31
Frequency(MHz):			**2480**			**Polarity:**			**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.50	44.82	PK	74.00	-29.18	1.50	204	50.54	27.45	3.38	36.55	-5.72
2483.50	35.14	AV	54.00	-18.86	1.50	204	40.86	27.45	3.38	36.55	-5.72
Frequency(MHz):			**2480**			**Polarity:**			**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.50	49.74	PK	74.00	-24.26	1.50	134	55.46	27.45	3.38	36.55	-5.72
2483.50	30.01	AV	54.00	-23.99	1.50	134	35.73	27.45	3.38	36.55	-5.72

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

4.4.2 For Conducted Bandedge Measurement

Temperature	22.9℃	Humidity	53.2%
Test Engineer	Lushan Kong	Configurations	SRD

Band-edge for RF conducted emissions	
GFSK	
	
Channel 1 / 2402 MHz	Channel 3 / 2480 MHz

4.5. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The antenna used for this product is PCB Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1.80dBi.

Reference to the **Internal photos**.

5. TEST SETUP PHOTOS OF THE EUT

Photo of Radiated Emissions Measurement

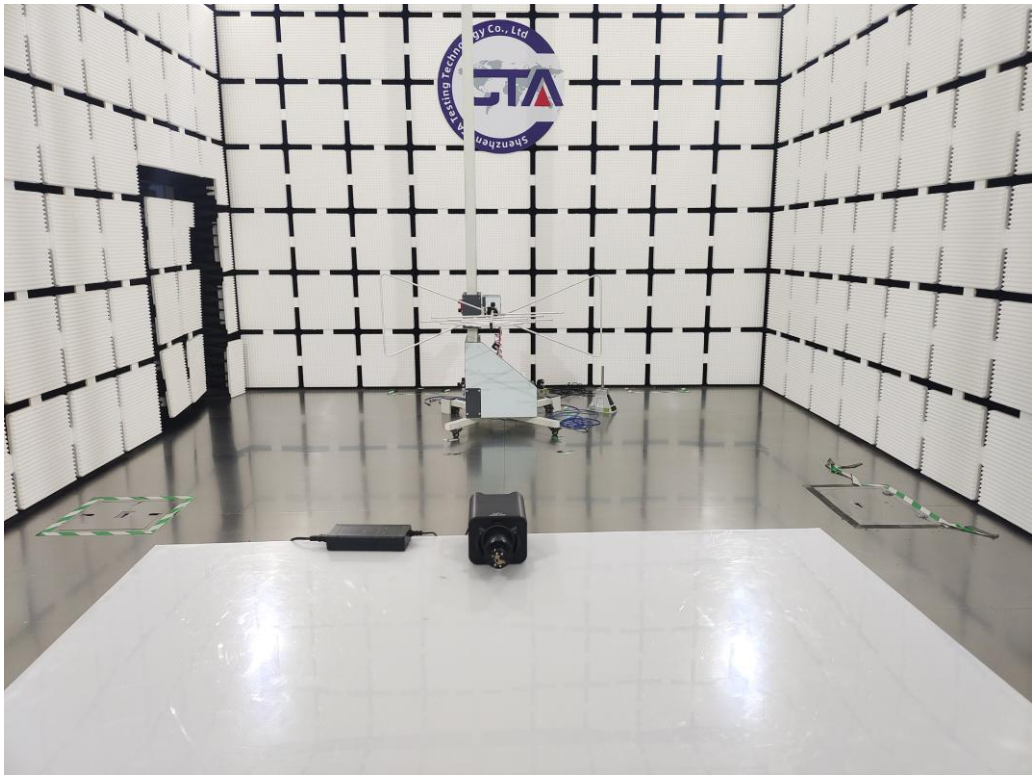


Fig. 1

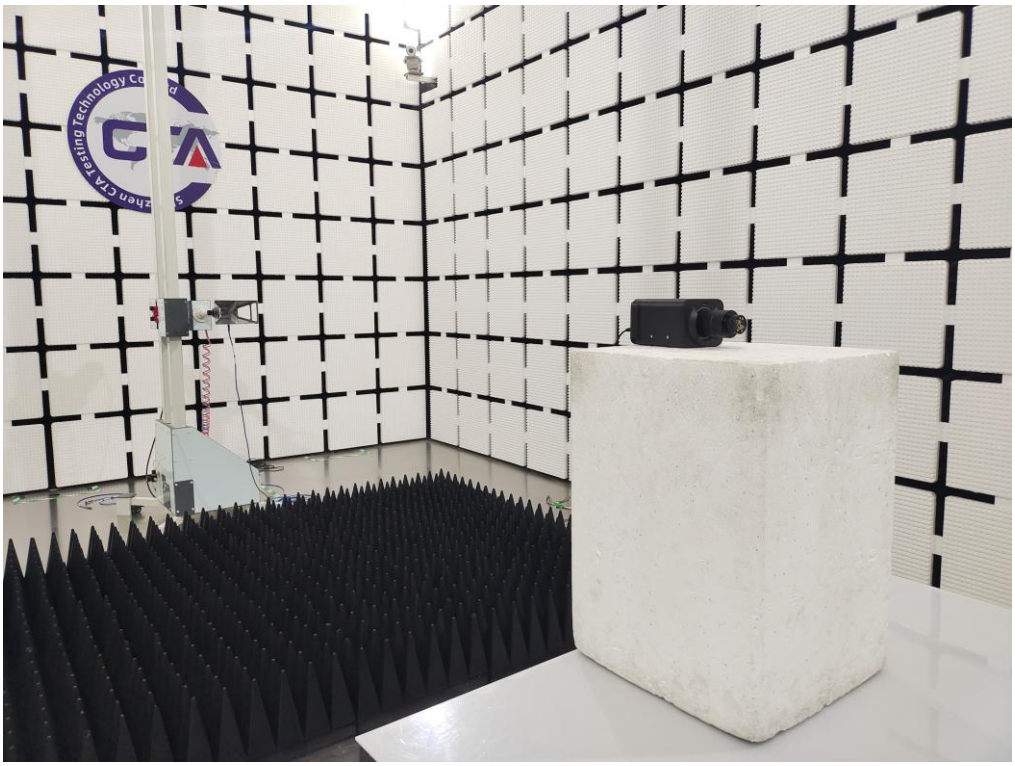


Fig. 2

Photo of Conducted Emission Measurement

Fig. 3

6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8


SIMAGIC

Fig. 9


MODEL: Alpha EVO Wheelbase
FCC ID:2AWJ8-ALPHA-EVO
INPUT: 46V⎓,5A max
MAX.TORQUE OUTPUT: 6Nm
SIMAGIC
DESIGNED BY SHENZHEN SIMAGIC TECH CO.,LTD
MADE IN CHINA

Fig. 10


SIMAGIC
AC/DC ADAPTER
DC Power Supply Unit
100-240V~50/60Hz 3.5A
48.0V ⎓ 5.25A 252.0W
IP20

Fig. 11

Fig. 12

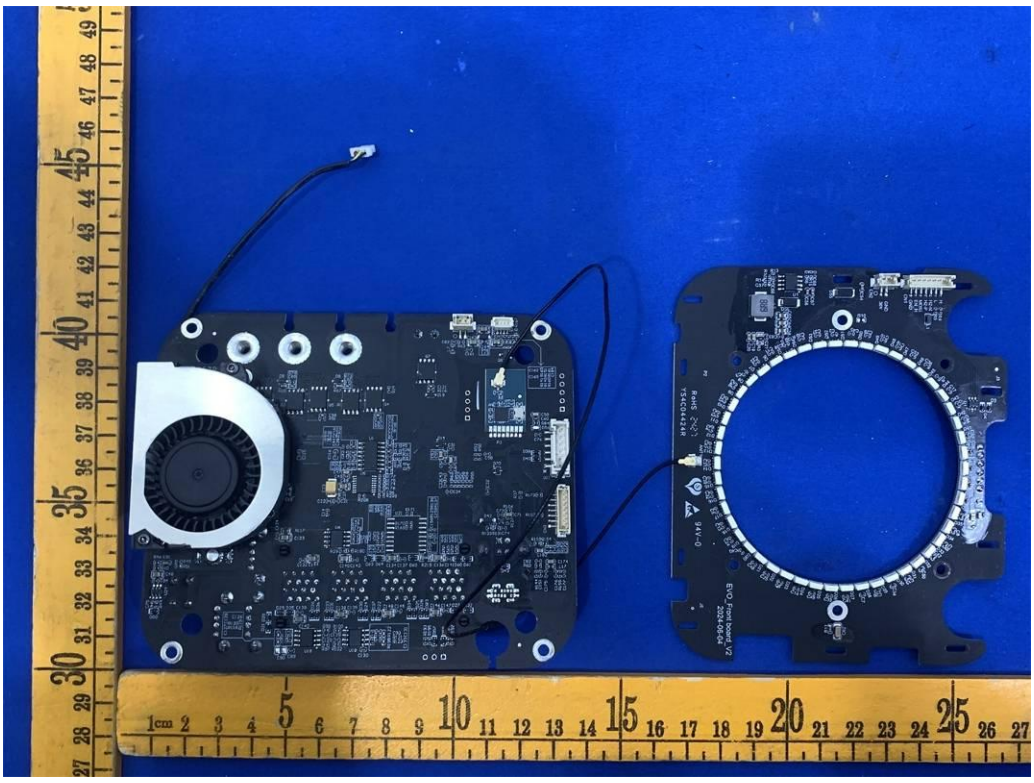


Fig. 13

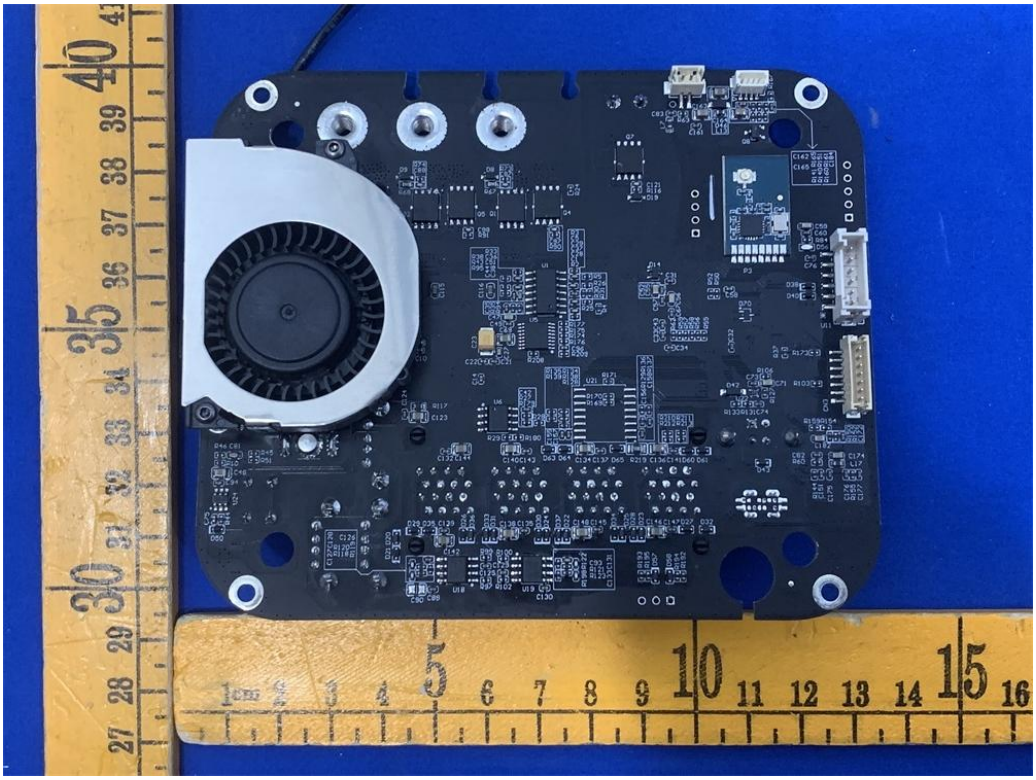


Fig. 14

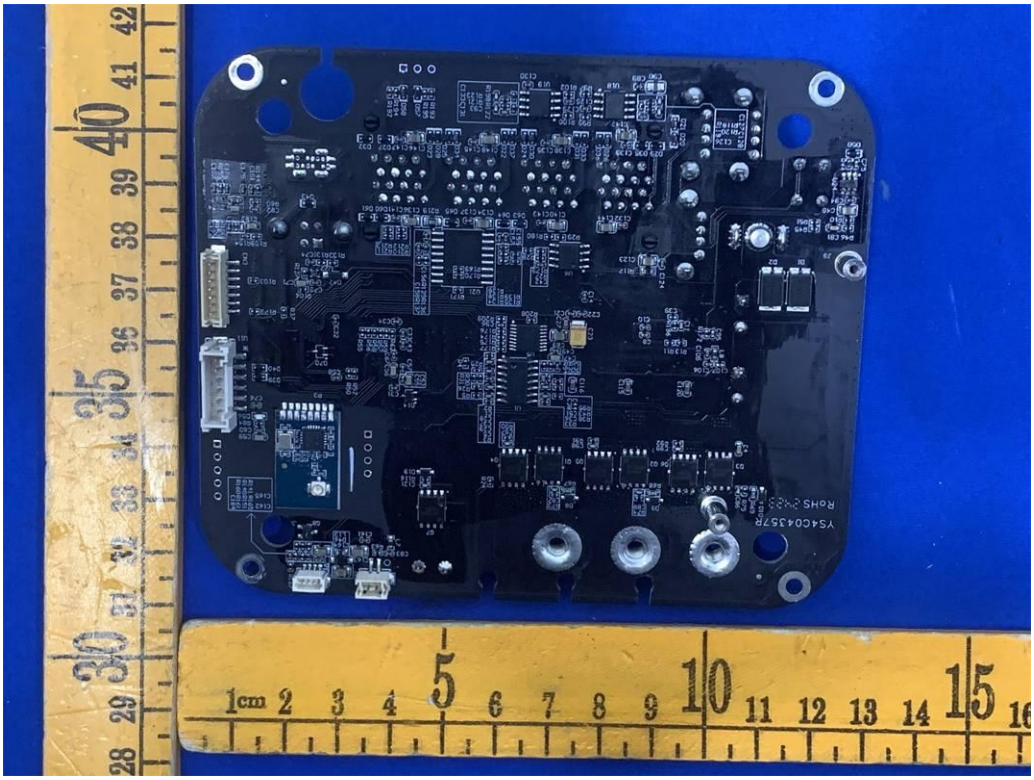


Fig. 15

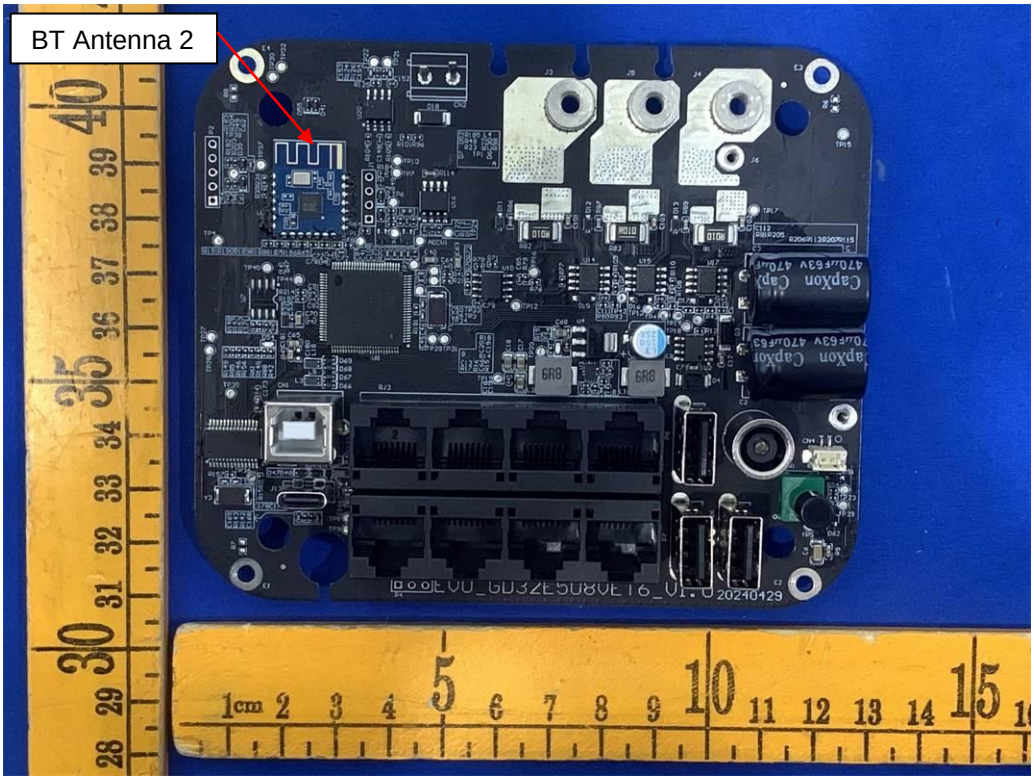


Fig. 16

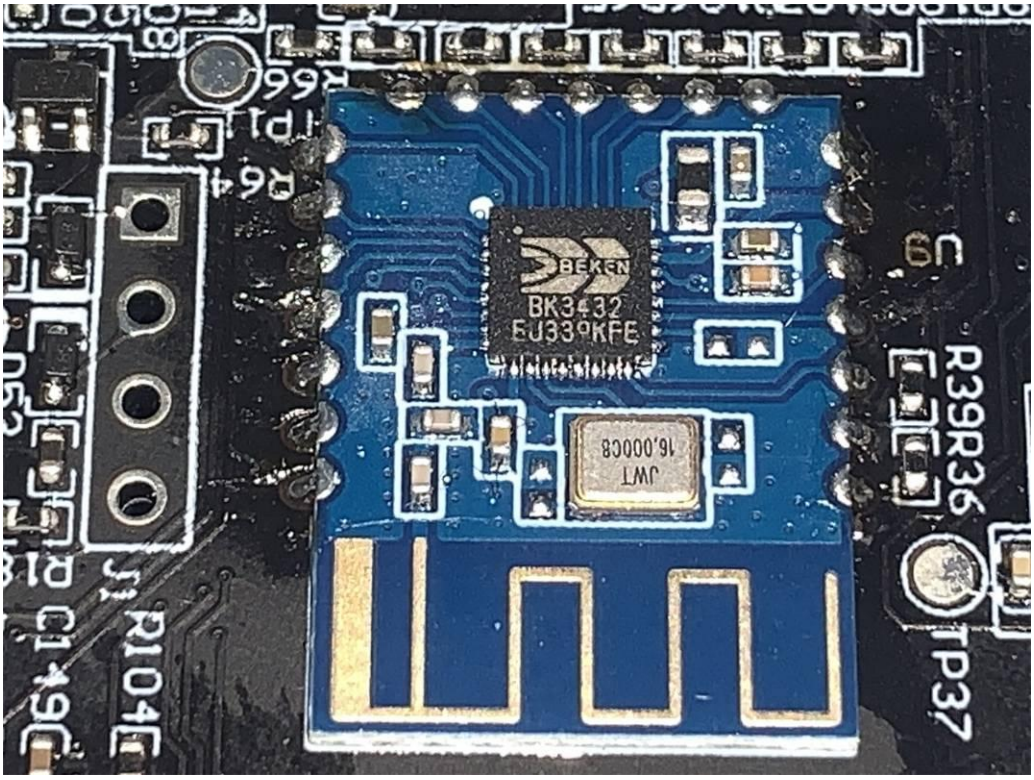

BEKEN
BK3432
EU33QKFE
JWT
16.000CB
R39R36
TP37
R104

Fig. 17

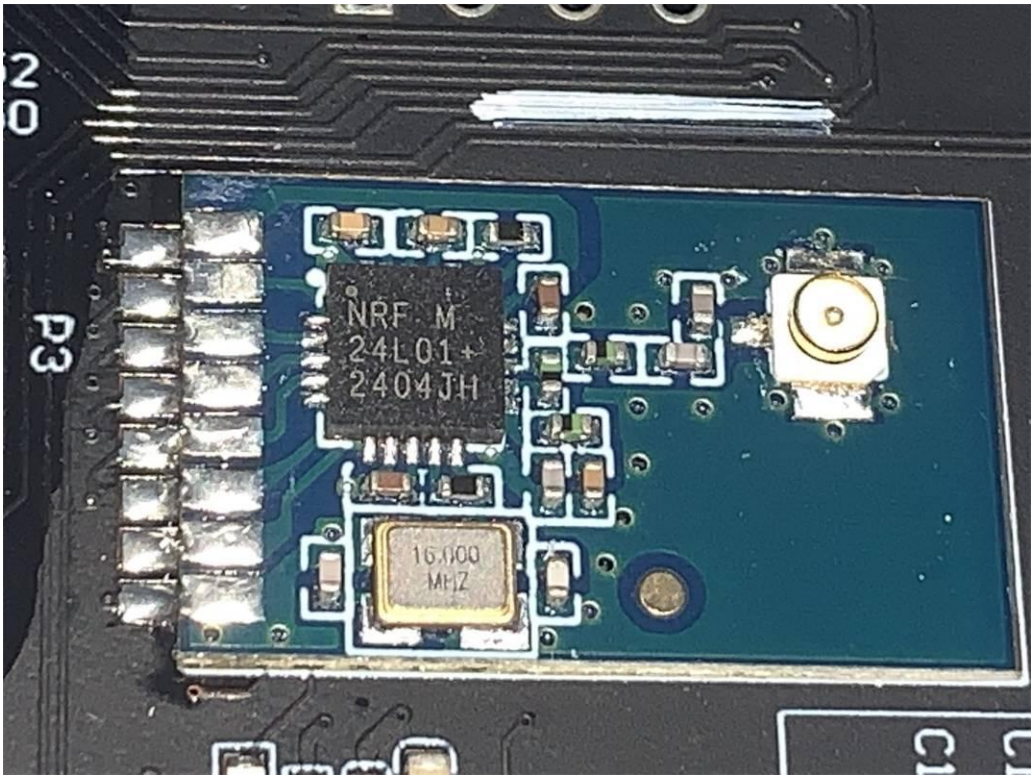

NRF M
24L01+
2404JH
16.000
MHZ
P3

Fig. 18

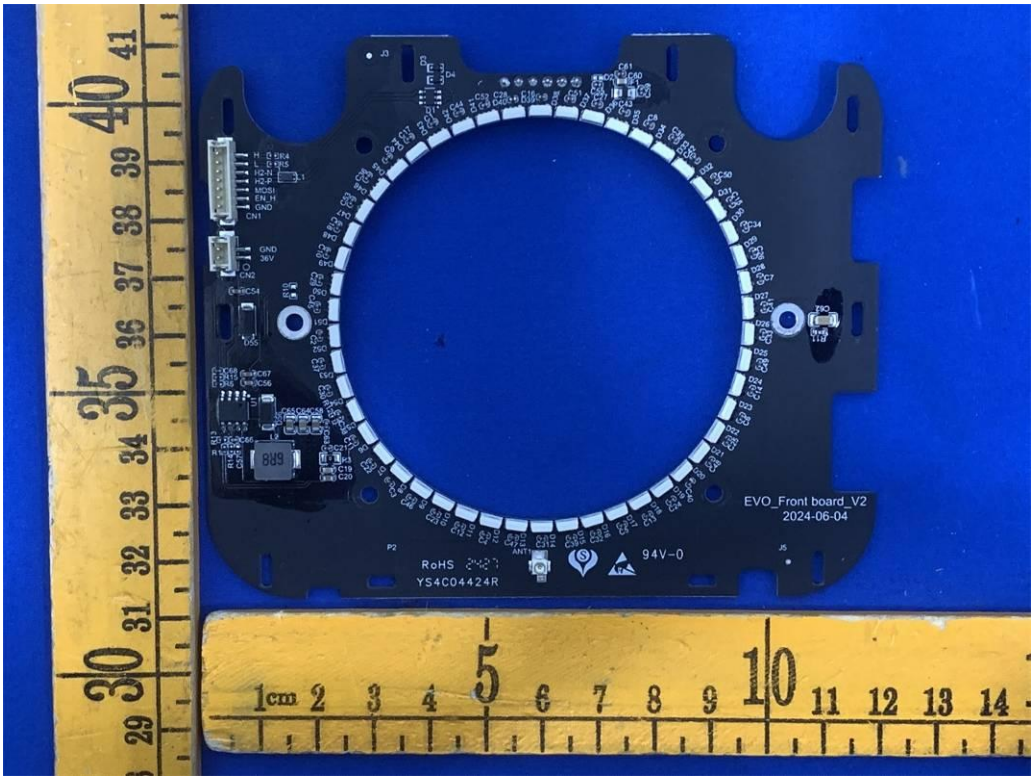


Fig. 19

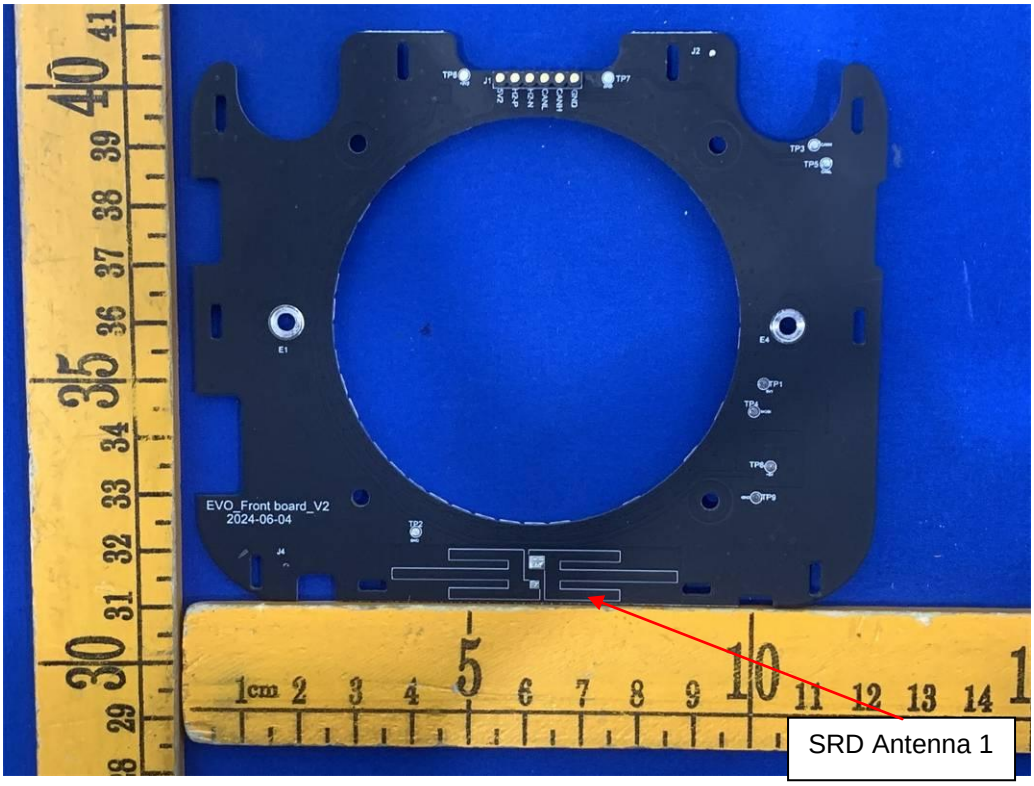


Fig. 20

.....End of Report.....