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TEST REPORT

Report No. : CQASZ20191201316E-07
Applicant: SHENZHEN HUBSAN TECHNOLOGY CO., LTD
Address of Applicant: 13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China 518054
Equipment Under Test (EUT):
EUT Name: HUBSAN ZINO 2
Model No.: ZINO 2
Brand Name: HUBSAN
Standards: ETSI EN 303 413 V1.1.1 (2017-06)
Date of Receipt: 2019-12-16
Date of Test: 2019-12-16 to 2020-01-03
Date of Issue: 2020-01-03
Test Result : **PASS***

*In the configuration tested, the EUT complied with the standards specified above

Tested By: Tom Chen.
(Tom chen)

Reviewed By: Aaron Ma
(Aaron Ma)

Approved By: Jack Ai
(Jack Ai)



1 Version

Revision History of Report

Report No.	Version	Description	Issue Date
CQASZ20191201316E-07	Rev.01	Initial report	2020-01-03

2 Test Summary

Radio Spectrum Matter (RSM) Part				
Test	Test Requirement	Test Method	Limit	Result
GUE adjacent frequency band selectivity performance	EN 303 413 V1.1.1 (2017-06) Clause 4.2.1	EN 303 413 V1.1.1 (2017-06) Clause 5.4	Clause 4.2.1.2	PASS
Spurious emissions	EN 303 413 V1.1.1 (2017-06) Clause 4.2.2	EN 303 413 V1.1.1 (2017-06) Clause 5.5	Clause 4.2.2.2	PASS

Remark:

The tested sample(s) and the sample information are provided by the client.

Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radiated Frequency.
CH: In this whole report CH means channel.
Volt: In this whole report Volt means Voltage.
Temp: In this whole report Temp means Temperature.
Humid: In this whole report Humid means humidity.
Press: In this whole report Press means Pressure.
N/A: In this whole report not application.

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4 General Information

4.1 Client Information

Applicant:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD
Address of Applicant:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China 518054
Manufacturer:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD
Address of Manufacturer:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China 518054

4.2 General Description of EUT

Product Name:	HUBSAN ZINO 2	
Model No.:	ZINO 2	
Trade Mark:	HUBSAN	
EUT Supports Radios application:	5G WIFI: 5150MHz~5250 MHz, 5725MHz~5850 MHz	
Power Supply:	remote-control unit	Battery: 3.6V 3350 mAh Li-Po
	plane unit	Battery: 15.2 V 3800 mAh Li-Po Power Supply: MODEL: P173D3000 INPUT: 100-240V~50/60Hz 1.2A OUTPUT: 17.3V 3000mA

4.3 Product Specification subjective to this standard

Nominal Frequency:	1559 MHz to 1610 MHz
Global Navigation Satellite System (GNSS)	Global Positioning System (GPS)
Sample Type:	Portable production
Antenna Type:	Integral antenna

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

1) support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
/	/	/	/	/

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.5 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

4.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	5.5Hz
2	RF power, conducted	0.75dB
		5.12dB (30MHz-1GHz)
3	Radiated Spurious emission test	4.60dB (1GHz-25GHz)
		1°C
4	Temperature test	2%
5	Humidity test	0.5%
6	DC power voltages	5.5Hz

5 Equipment List

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
Horn Antenna	R&S	HF906	CQA-012	2019/9/26	2020/9/25
Bilog Antenna	R&S	HL562	CQA-011	2019/9/26	2020/9/25
EMI Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSU26	CQA-038	2019/10/25	2020/10/24
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	4012339	2019/10/25	2020/10/24
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2019/10/25	2020/10/24
Radio Communication Analyzer	Anritsu	MT8820C	CQA-090	2019/4/4	2020/4/3
RF Control Unit	Tonsced	JS0806-2	CQA-57	2018/9/26	2019/9/25
Vector signal generator	R&S	SMBV100A	CQA-039	2019/9/26	2020/9/25

6 Radio Technical Requirements Specification in EN 303 413

6.1 Receiver Requirements

6.1.1 Adjacent signal selectivity

Test Requirement: EN 303 413 Clause 4.2.1

Test Method: EN 303 413 Clause 5.4

EUT Operation:

Ambient: Temp.: 26°C Humid.: 56% Press.: 1015 mbar

Test Status: Keep the Rx operating with receiver mode under normal test conditions.

1) All GNSS and GNSS signals declared as supported in the test report shall be simulated during the conformance testing. The relevant GNSS and GNSS signals and the relative signal levels between signal types per GNSS are detailed in table B-1.

Table B-1: GNSS, GNSS signals and relative signal levels

	Galileo		GPS/Modernized GPS		GLONASS		SBAS		BDS (see note 2)		
Signal levels relative to reference power levels (see note 1)	E1	0 dB	L1 C/A	0 dB	G1	0 dB	L1	0 dB	B1I	D1	0 dB
										D2	+5 dB
	E6	+2 dB	L1C	+1,5 dB	G2	-6 dB					
	E5	+2 dB	L2C	-1,5 dB							
			L5	+3,6 dB							

NOTE 1: The signal levels represent the total signal power of the satellite per channel, not for example pilot and data channels separately.
NOTE 2: For BDS, D1 represents MEO/IGSO satellites B1I signal type and D2 represents GEO satellites B1I signal type.

Where more than one GNSS is supported then the relative signal levels between GNSS to be used during conformance testing are detailed in table B-2.

Table B-2: Relative signal levels for each GNSS supported

GNSS signal details

GNSS	Relative signal level for all satellites (see note)
GPS	0 dB
Galileo	+1,5 dB
GLONASS	-2,5 dB
SBAS	-2,5 dB
BDS	-4,5 dB

NOTE: GPS is used as the reference GNSS. If GPS is not supported then values shall be adjusted and referenced to another supported GNSS.

The signal level(s) for each GNSS shall be as detailed in table B-3 which also gives the maximum signal level that shall be used for each GNSS when the effects of table B-1 and table B-2 are taken into account.

Table B-3: (Maximum) signal levels for each GNSS supported

GNSS	Parameters	Value
GPS	(Maximum) signal level	-128,5 dBm
Galileo	(Maximum) signal level	-127 dBm
GLONASS	(Maximum) signal level	-131 dBm
SBAS	(Maximum) signal level	-131 dBm
BDS	(Maximum) signal level	-133 dBm

For GUE utilizing the 1559 MHz to 1610 MHz RNSS band

Measurement procedure

- 1) Configure the GNSS signal generator to simulate those GNSS and GNSS signals from EN 303 413 table 4-1 declared as supported by the GUE, with power levels.
- 2) With the adjacent frequency signal switched off, the EUT shall be given sufficient time to acquire all simulated satellites from the declared GNSS system(s).

- 3) Record the baseline C/N_0 value(s) reported by the EUT. Sufficient filtering shall be used to obtain a stable value. C/N_0 may be averaged across all the satellites in view for each GNSS constellation. However, C/N_0 shall not be averaged across satellite signals in different GNSS constellations. For a multi-GNSS EUT, there shall be a separate C/N_0 value recorded for each GNSS constellation and each GNSS signal supported.
- 4) The adjacent frequency signal generator shall be configured to generate the signal defined in EN 303 413 table 4-4, at the first test point centre frequency and signal power level as specified in EN 303 413 table 4-2.
- 5) The adjacent frequency signal shall be switched on, and the EUT's C/N_0 value(s) recorded as in step 3) to measure the degradation with respect to the baseline value(s) recorded in step 3).
- 6) Test point Pass/Fail Criteria: If the C/N_0 degradation from step 5) does not exceed the value in equations 4-1, then this test point is set to "pass". If the C/N_0 degradation exceeds the value in equation 4-1, then this test point is set to "fail." For a multi-GNSS and multi-signal EUT, there shall be a separate pass/fail determination for each GNSS and for each GNSS signal supported. If the C/N_0 degradation exceeds the value in equation 4-1 for any supported GNSS or supported GNSS signal, then this test point is set to "fail".
- 7) Step 1) through step 6) shall be repeated for all test point centre frequencies (and associated signal power level) specified in EN 303 413 table 4-2.

If the EUT passes the C/N_0 degradation test for all test points for all GNSS constellations and all GNSS signals declared as supported from EN 303 413 table 4-1, the EUT shall be deemed to "pass". If the C/N_0 degradation test fails for any GNSS constellation or GNSS signal at any of the test points, the EUT shall be deemed to "fail".

For GUE utilizing the 1164 MHz to 1300 MHz RNSS bands

For a GUE also utilizing the RNSS bands in the 1164 MHz to 1300 MHz range, the test method in EN 303 413 clause 5.4.3 (step 1) through step 7), inclusive), shall be repeated using the adjacent frequency test point centre frequencies and associated signal power levels specified in EN 303 413 table 4-3.

If the EUT passes the C/N_0 degradation tests as defined in both EN 303 413 clause 5.4.3 and clause 5.4.4, the EUT shall be deemed to "pass". If the C/N_0 degradation test fails tests as defined in either or both of EN 303 413 clause 5.4.3 or clause 5.4.4, the EUT shall be deemed to "fail".

Table 4-1: GNSS, GNSS signals and RNSS frequency bands

GNSS	GNSS Signal Designations	RNSS Frequency Band (MHz)
BDS	B1	1 559 to 1 610
Galileo	E1	1 559 to 1 610
	E5a	1 164 to 1 215
	E5b	1 164 to 1 215
	E6	1 215 to 1 300
GLONASS	G1	1 559 to 1 610
	G2	1 215 to 1 300

GPS	L1	1 559 to 1 610
	L2	1 215 to 1 300
	L5	1 164 to 1 215
SBAS	L1	1 559 to 1 610
	L5	1 164 to 1 215

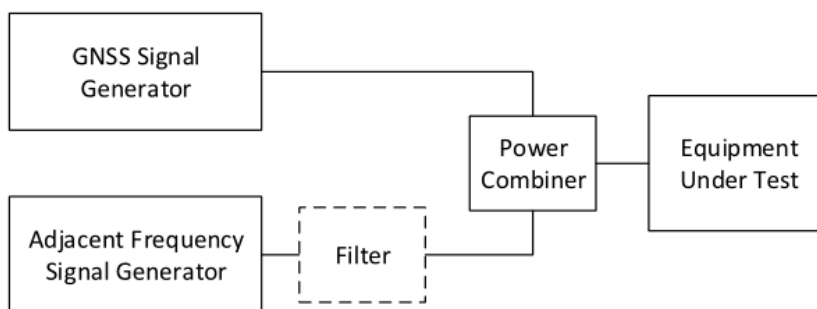
Table 4-2:Frequency bands, adjacent frequency signal test point centre frequencies and power levels for the 1 559 MHz to 1 610 MHz RNSS band

Frequency band (MHz)	Test point centre frequency (MHz)	Adjacent frequency signal power level (dBm)
1518 to 1525	1524	-65
1525 to 1549	1548	-95
1549 to 1559	1554	-105
1559 to 1610	GUE RNSS band under test	
1610 to 1626	1615	-105
1626 to 1640	1627	-85

Table 4-3:Frequency bands, adjacent frequency signal test point centre frequencies and power levels for the 1 164 MHz to 1 300 MHz RNSS band

Frequency band (MHz)	Test point centre frequency (MHz)	Adjacent frequency signal power level (dBm)
960 to 1164	1154	-75
1164 to 1215	GUE RNSS band under test	
1215 to 1260	GUE RNSS band under test	
1260 to 1300	GUE RNSS band under test	
1300 to 1350	1310	-85

Test Setup:



Conducted measurement setup for EUT adjacent frequency band selectivity

Equipment Used: Refer to section 6 for details.

Limit: $\Delta C/N_0 \leq 1$ dB

Test result: PASS

Test data:

For the 1 559 MHz to 1 610 MHz RNSS band

Frequency band (MHz)	Test point centre frequenc	Adjacent frequency signal power level (dBm)	Measured C/N0 (dB-Hz)			
	From table 4-2	From table 4-2	No interfering signal	With interfering signal	Decrease of C/N0	Decrease ≤ 1 dB
1518 to 1525	1524(MHz)	-65(dBm)	/	/	$\Delta C/N0 \leq 1dB$	BDSD1 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		BDSD2 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		Galileo <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		GLONASS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			40.7	40.58		GPS <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
			/	/		SBAS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
1525 to 1549	1548(MHz)	-95(dBm)	/	/		BDSD1 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		BDSD2 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		Galileo <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		GLONASS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			40.72	40.59		GPS <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
			/	/		SBAS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
1549 to 1559	1554(MHz)	-105(dBm)	/	/		BDSD1 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		BDSD2 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		Galileo <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		GLONASS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			40.72	40.7		GPS <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
			/	/		SBAS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
1610 to 1626	1615(MHz)	-105(dBm)	/	/		BDSD1 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		BDSD2 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		Galileo <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		GLONASS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			40.73	40.67		GPS <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
			/	/		SBAS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
1626 to 1640	1627(MHz)	-85(dBm)	/	/		BDSD1 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A

			/	/		BDSD2 <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		Galileo <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			/	/		GLONASS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
			40.7	40.67		GPS <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
			/	/		SBAS <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A

6.1.2 Spurious Radiations

Test Requirement: EN 303 413 Clause 4.2.2

Test Method: EN 303 413 Clause 5.5

EUT Operation:

Ambient: Temp.: 25°C Humid.: 57% Press.: 1010mbar

Test Status: Keep the EUT in receive-only operating mode

- 1) The emissions over the range 30 MHz to 1 000 MHz shall be identified. Spectrum analyser settings:
 - Resolution bandwidth: 100 kHz
 - Video bandwidth: 300 kHz
 - Filter type: 3 dB (Gaussian)
 - Detector mode: RMS
 - Trace Mode: Max Hold
 - Sweep Points: $\geq 19\,400$
 - Sweep time: Auto

Receiver Setup:

- 2) The emissions over the range 1 GHz to 8.3 GHz shall be identified. Spectrum analyser settings:
 - Resolution bandwidth: 1 MHz
 - Video bandwidth: 3 MHz
 - Filter type: 3 dB (Gaussian)
 - Detector mode: RMS
 - Trace Mode: Max Hold
 - Sweep Points: $\geq 14\,600$
 - Sweep time: Auto

Equipment Used: Refer to section 6 for details.

Test Setup:

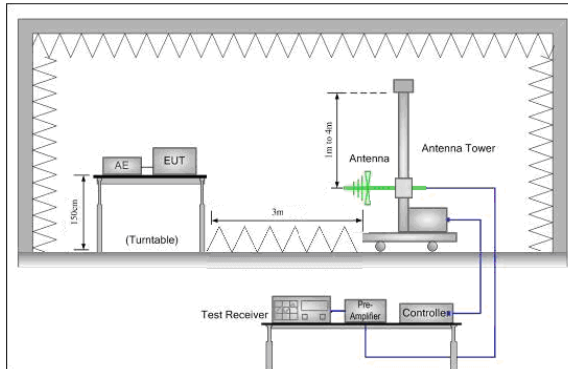


Figure 1. 25MHz to 1GHz

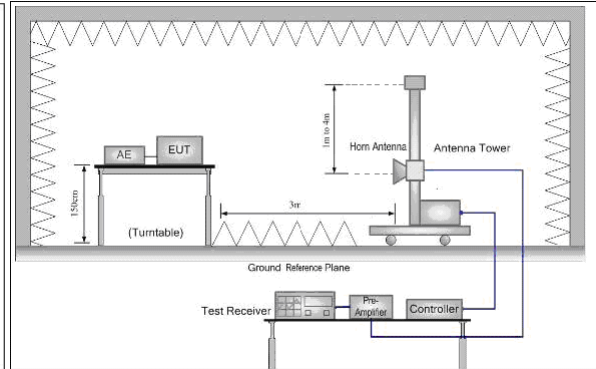


Figure 2. Above 1GHz

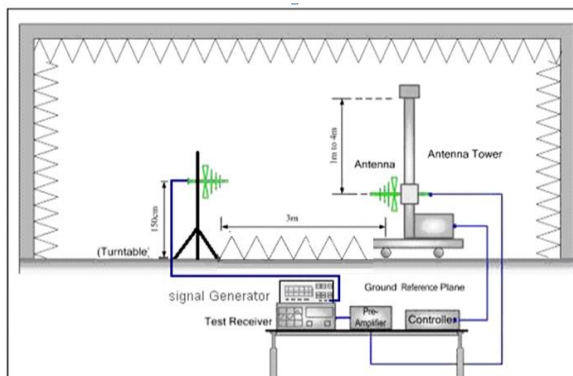


Figure 1. 25MHz to 1GHz

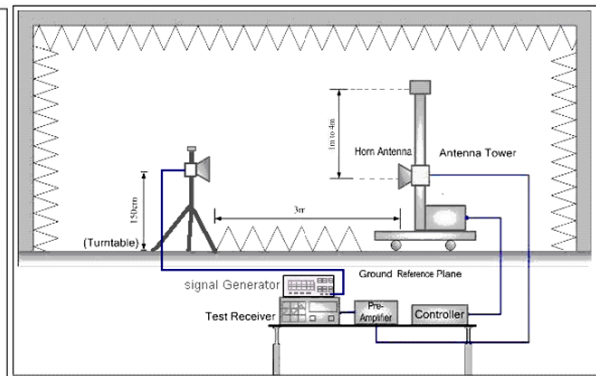


Figure 2. Above 1GHz

1. Scan from 30MHz to 8.3GHz; find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Test procedure as below:

- 1) The EUT was powered ON and placed on a 1.5m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
- 7) The output power into the substitution antenna was then measured.
- 8) Steps 6) and 7) were repeated with both antennas polarized.
- 9) Calculate power in dBm by the following formula:

$$\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

Test Procedure:

$$\text{EIRP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP} = \text{ERP} + 2.15\text{dB}$$

where: Pg is the generator output power into the substitution antenna.

10) Repeat above procedures until all frequencies measured was complete.

Limit:

Frequency range	Limit
30MHz-1000MHz	-57dBm
1GHz-8.3GHz	-47dBm

Test result:

PASS

Test Data:

Below 1GHz

GNSS Frequency Band 1559 to 1610 MHz							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
51.325	150	269	-65.22	-57	-8.22	Pass	H
69.850	150	102	-66.20	-57	-9.20	Pass	V
287.825	150	17	-66.10	-57	-9.10	Pass	H
350.650	150	280	-65.84	-57	-8.84	Pass	V
831.025	150	102	-67.65	-57	-10.65	Pass	H
801.525	150	63	-66.77	-57	-9.77	Pass	V

Above 1GHz

GNSS Frequency Band 1559 to 1610 MHz							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
4967.23	150	23	-57.17	-47	-10.17	Pass	H
4967.74	150	201	-56.66	-47	-9.66	Pass	V
7446.68	150	134	-55.96	-47	-8.96	Pass	H
7430.33	150	83	-55.89	-47	-8.89	Pass	V
9911.89	150	299	-56.84	-47	-9.84	Pass	H
9936.64	150	151	-57.47	-47	-10.47	Pass	V

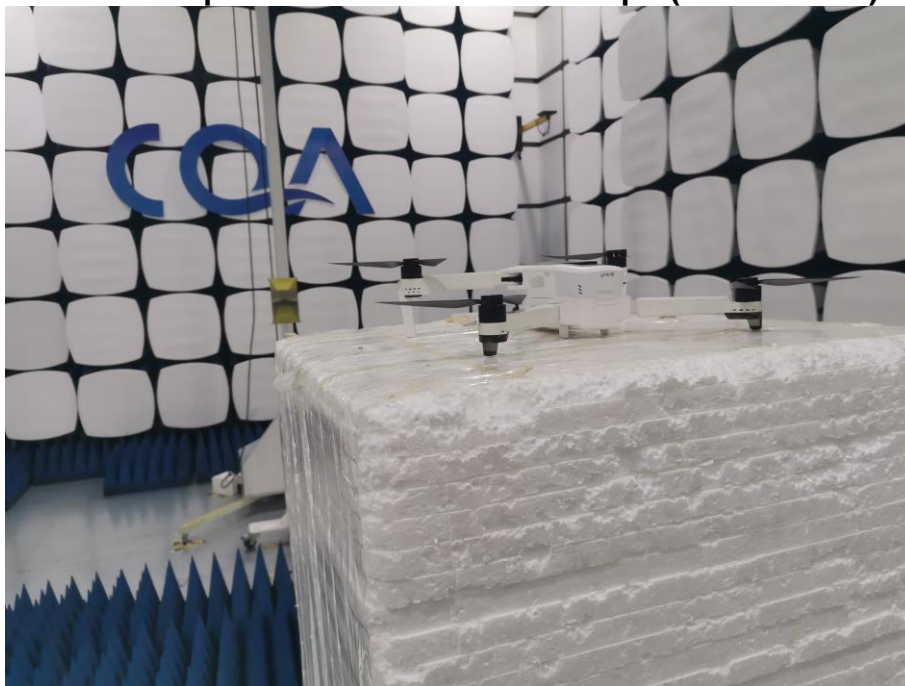
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Test Model No.: ZINO 2

Radiated spurious emission Test Setup-1 (Below 1GHz)



Radiated spurious emission Test Setup-2(Above 1GHz)



PHOTOGRAPHS OF EUT Constructional Details

Refer to APPENDIX 2 PHOTOGRAPHS OF EUT for CQASZ20191201316E-01.

*** End of Report ***