



TEST REPORT

ETSI EN 300 440 V2.2.1 (2018-07)

Report Reference No. : TZ210902557-SRD2

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Date of issue : 2021/11/3

Testing Laboratory Name : Shenzhen Tongzhou Testing Co.,Ltd

Address : 1th Floor, Building 1, Haomai High-tech Park, Huating Road 387,
Dalang Street, Longhua, Shenzhen, China

Applicant's name : Dongguan YINYAN Electric Tech.LTD

Address : EMAX Industrial Park, Gao-long Industrial Zone, Huanzhuli Village,
Changping Town, Dongguan City, Guangdong Province, China

Test specification..... :

Standard..... : ETSI EN 300 440 V2.2.1 (2018-07)

TRF Originator : Shenzhen Tongzhou Testing Co.,Ltd

Master TRF : Dated 2018-09

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Test item description..... : Tinyhawk 3

Trade Mark..... : EMAX

Model/Type reference : Tinyhawk 3

List Model..... : N/A

Hardware Version : V1.0

Software Version..... : V1.0

Operation Frequency : 2404MHz to 2476MHz

Modulation Type : OFDM

Ratings..... : 1,DC 5V in
2,DC 3.8V by battery

Result..... : PASS

Anna Hu



Andy Zhang



TEST REPORT

Test Report No. : TZ210902557-SRD2	2021/11/3 Date of issue
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Equipment under Test : Tinyhawk 3

Model /Type : Tinyhawk 3

Listed Models : N/A

Applicant : Dongguan YINYAN Electric Tech.LTD

Address : EMAX Industrial Park, Gao-long Industrial Zone, Huanzhuli Village, Changping Town, Dongguan City, Guangdong Province, China

Manufacturer : Dongguan YINYAN Electric Tech.LTD

Address : EMAX Industrial Park, Gao-long Industrial Zone, Huanzhuli Village, Changping Town, Dongguan City, Guangdong Province, China

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

**** Modified History ****

Revision	Description	Issued Data	Remark
Revision 00	Initial Test Report Release	2021/11/3	Andy Zhang



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1 TEST STANDARDS

The tests were performed according to following standards:

[ETSI EN 300 440 V2.2.1 \(2018-07\)](#)



Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range;
Harmonised Standard covering the essential requirements of article 3.2 of Directive 2016/53/EU

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	2021/9/20
Testing commenced on	:	2021/9/20
Testing concluded on	:	2021/11/1



2.2 Product Description

The **Dongguan YINYAN Electric Tech.LTD**'s Model: Tinyhawk 3 or the “EUT” as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Tinyhawk 3
Model(s) Number	Tinyhawk 3
List Model	N/A
Difference description	N/A
Hardware version	V1.0
Software version	V1.0
Antenna Type	Integral

Wireless Type	Working Frequency	Modulation Type	Version
SRD-RX	2404MHz to 2476MHz	GFSK,2-FSK	/
SRD-TX	5733MHz to 5866MHz	FM	/



2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/>	120V / 60 Hz	<input type="radio"/>	230V / 50Hz
		<input type="radio"/>	12 V DC	<input type="radio"/>	24 V DC
		<input checked="" type="radio"/>	Other (specified in blank below)		

Refer to section 3.2 of this report

2.4 Short description of the Equipment under Test (EUT)

Tinyhawk 3(M/N: Tinyhawk 3)

For more details, refer to the user's manual of the EUT.

2.5 EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continuous transmitting and receiving mode for testing.

2.6 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

2.7 Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt	Type of Test
TZ210902557-1#	N/A	V1.0	V1.0	2021/9/20	Radio
TZ210902557-2#	N/A	V1.0	V1.0	2021/9/20	EMF
TZ210902557-3#	N/A	V1.0	V1.0	2021/9/20	EMC

2.8 Modifications

No modifications were implemented to meet testing criteria.



2.9 NOTE

Function	Test Standards	Reference Report
EMC	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1 (2019-03) EN55032:2015+A11:2020/EN55035:2017+A11:2020 EN IEC 61000-3-2:2019/EN61000-3-3:2013+A1:2019	TZ210902557-RE
SRD	ETSI EN 300 440 V2.2.1 (2018-07)	TZ210902557-SRD1
		TZ210902557-SRD2
EMF	EN 62479:2010 EN 50663:2017	TZ210902557-EMF



3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen Tongzhou Testing Co.,Ltd
1th Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen,
China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2014) and CISPR Publication 22.

3.2 Environmental conditions

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

Normal Temperature/NT: 25°C

High Temperature/HT: 35°C

Low Temperature/LT: -10°C

Normal Voltage: DC 3.8V

High Voltage/HV: DC 4.35V

Low Voltage/LV: DC 3.5V

Relative Humidity: 55 %

Air Pressure: 989 hPa



3.3 Test Description

ETSI EN 300 440 requirements		
Test Items	standard	Verdict
Transmitter requirements		
Equivalent isotropically radiated power (e.i.r.p.)	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.2.2	N/A
Permitted range of operating frequencies	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.2.3	N/A
Unwanted emissions in the spurious domain	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.2.4	N/A
Duty cycle	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.2.5	N/A
Additional requirements for FHSS equipment	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.2.6	N/A
Receiver requirements		
Adjacent channel selectivity	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.3.3	PASS
Blocking or desensitization	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.3.4	PASS
Spurious emissions	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.3.5	PASS
Spectrum access techniques		
Listen Before Talk (LBT)	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.4.2	N/A
Detect And Avoid techniques (DAA)	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.4.3	N/A
Adaptive Frequency Agility (AFA)	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.4.4	N/A
2,45 GHz RFID systems		
Effective radiated power	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.5	N/A
GBSAR systems		
Effective radiated power	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.6.1	N/A
Permitted range of operating frequencies	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.6.2	N/A
DAA threshold	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.6.3	N/A
Antenna pattern	ETSI EN 300 440 V2.2.1 (2018-07)) Sub-clause 4.6.4	N/A

Remark: The measurement uncertainty is not included in the test result.



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 Tongzhou Testing 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 Tongzhou Testing Co.,Ltd is reported:

Test Items	Measurement Uncertainty	Notes
Frequency error	25 Hz	(1)
Frequency range	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Adjacent and alternate channel power Conducted	1.20 dB	(1)
Conducted spurious emission	1.60 dB	(1)
Radiated spurious emission	2.20 dB	(1)
Intermodulation attenuation	1.00 dB	(1)
Maximum useable receiver sensitivity	2.80 dB	(1)
Co-channel rejection	2.80 dB	(1)
Adjacent channel selectivity	2.80 dB	(1)
Spurious response rejection	2.80 dB	(1)
Intermodulation response rejection	2.80 dB	(1)
Blocking or desensitization	2.80 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.



3.5 Equipments Used during the Test

Conducted Method						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2021/1/4	2022/1/3
2	Signal Generator	Keysight	N5182A	MY4620709	2021/1/4	2022/1/3
3	Signal Generator	R&S	SML03	102924/0013	2021/1/4	2022/1/3
4	Power Sensor	Agilent	U2021XA	MY5365004	2021/1/4	2022/1/3
5	Power Meter	Agilent	U2531A	TW53323507	2021/1/4	2022/1/3
6	Climate Chamber	KRUOMR	KRM-1000	KRM16072901	2021/1/4	2022/1/3
7	Wideband Radio Communication Tester	R&S	CMW500	101855	2021/1/4	2022/1/3
8	Test Software	Tonscend	JS1120-3	V2.5.77.0418	--	--

Radiated Method						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	Wideband Antenna	schwarzbeck	VULB 9163	958	2019/11/16	2022/11/15
2	Horn Antenna	schwarzbeck	9120D-1141	1574	2019/11/16	2022/11/15
3	EMI Test Receiver	R&S	ESCI	100849/003	2021/1/4	2022/1/3
4	Controller	MF	MF7802	N/A	N/A	N/A
5	Amplifier	schwarzbeck	BBV 9743	209	2021/1/4	2022/1/3
6	Amplifier	Tonscend	TSAMP-0518SE	--	2021/1/4	2022/1/3
7	RF Cable	HUBER+SUHNER	RG214	N/A	2021/1/4	2022/1/3
8	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2021/1/4	2022/1/3
9	Horn Antenna	ETS	3117	00218874	2019/11/16	2022/11/15
10	Wideband Antenna	Sunol	JB3	A020115	2019/1/16	2022/1/15
11	Test Software	Tonscend	JS36-RSE	V1.0.2.0	--	--

4 TEST CONDITIONS AND RESULTS

4.1 Receiver Requirements

4.1.1 Adjacent channel selectivity

APPLICABILITY

This requirement applies to Equipment Category 1 receivers, when invoked, as defined in clause 4.3.1.

LIMIT

The adjacent channel selectivity of the equipment under specified conditions shall not be less than the levels of the unwanted signal as stated in table 6.

Table 6: Limit for adjacent channel selectivity

Receiver category	Limit
1	-30 dBm + k
2	No limit
3	No limit

The correction factor, k, is as follows:

$$k = -20\log f - 10\log BW$$

Where:

- f is the frequency in GHz;

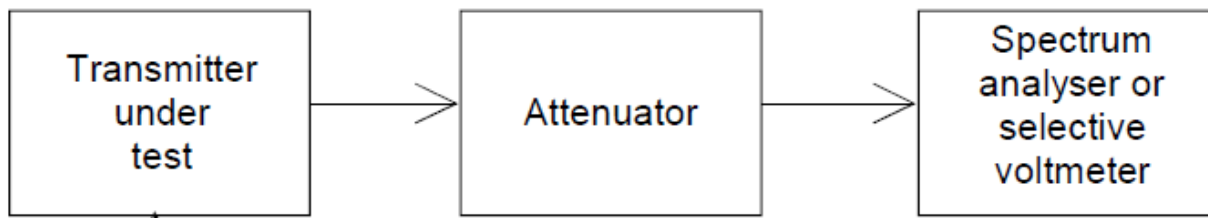
- BW is the channel bandwidth in MHz.

The factor k is limited within the following:

- $0 < k < 40$ dB.

The measured adjacent channel selectivity shall be stated in the test report.

TEST CONFIGURATION



Conformance

This measurement shall be conducted under normal conditions.

Two signal generators A and B shall be connected to the receiver via a combining network to the receiver, either:

- via a test fixture or a test antenna to the receiver integrated, dedicated or test antenna; or
- directly to the receiver permanent or temporary antenna connector.

The method of coupling to the receiver shall be stated in the test report.

Signal generator A shall be at the nominal frequency of the receiver, with normal modulation of the wanted signal.

Signal generator B shall be unmodulated and shall be adjusted to the adjacent channel centre frequency immediately above that of the wanted signal.

Initially signal generator B shall be switched off and using signal generator A the level that still gives sufficient response shall be established. The output level of generator A shall then be increased by 3 dB.

Signal generator B is then switched on and adjusted until the wanted criteria are met. This level shall be



recorded.

The measurements shall be repeated with signal generator B unmodulated and adjusted to the adjacent channel centre immediately below the wanted signal.

The adjacent channel selectivity shall be recorded for the upper and lower adjacent channels as the level in dBm of the unwanted signal.

For tagging systems (e.g. RF identification, anti-theft, access control, location and similar systems) signal generator A may be replaced by a physical tag positioned at 70 % of the measured system range in metres. In this case, the adjacent selectivity shall be recorded as the level in dBm of lowest level of the unwanted signal (generator B) resulting in a non-read of the tag.

TEST RESULTS

N/A, EUT is a category 2 receiver



4.1.2 Blocking or desensitization

APPLICABILITY

This requirement applies to all Category 1, 2, and 3 SRD communication media receivers.

LIMIT

The blocking level, for any frequency within the specified ranges, shall not be less than the values given in table 7, except at frequencies on which spurious responses are found.

Table 6: Limits for blocking or desensitization

Receiver category	Limit
1	-30 dBm + k
2	-45 dBm + k
3	-60 dBm + k

The correction factor, k, is as follows:

$$k = -20\log f - 10\log BW$$

Where:

- f is the frequency in GHz;

- BW is the channel bandwidth in MHz.

The factor k is limited within the following:

- $0 < k < 40$ dB.

The measured adjacent channel selectivity shall be stated in the test report.

Limits at different bandwidths and frequencies:

D8 Mode:

BW(MHz)	CH	Frequency (GHz)	k(dB)	Limits (dBm)
0.15	0	2.404	0.62	≥ -44.38
	36	2.44	0.49	≥ -44.51
	71	2.475	0.37	≥ -44.63

Note: 2.44GHz is the worst case for this test.

D8 Mode:

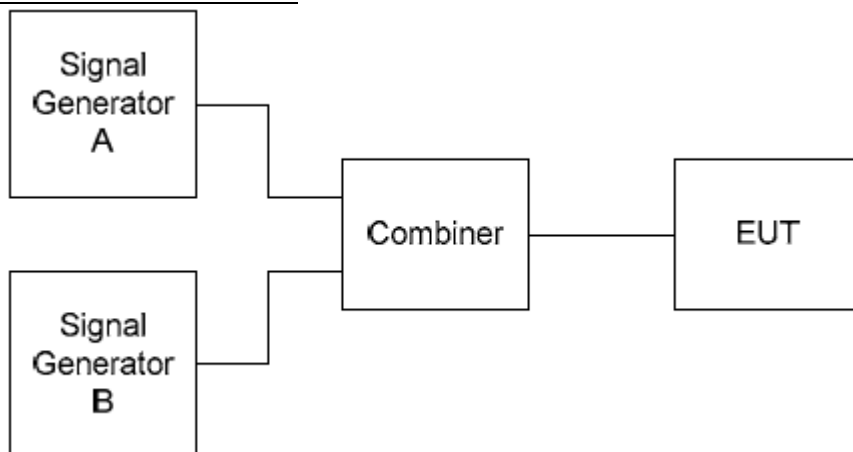
BW(MHz)	CH	Frequency (GHz)	k(dB)	Limits (dBm)
0.2	0	2.404	-0.63	≥ -45.63
	36	2.44	-0.76	≥ -45.76
	71	2.475	-0.88	≥ -45.88

Note: 2.44GHz is the worst case for this test.

LBT Mode:

BW(MHz)	CH	Frequency (GHz)	k(dB)	Limits (dBm)
0.65	1	2.405	-5.75	≥ -50.75
	36	2.44	-5.88	≥ -50.88
	72	2.476	-6.00	≥ -51

Note: 2.44GHz is the worst case for this test.

TEST CONFIGURATION**Conformance**

This measurement shall be conducted under normal conditions.

Two signal generators A and B shall be connected to the receiver via a combining network to the receiver, either:

- a) via a test fixture or a test antenna to the receiver integrated, dedicated or test antenna; or
- b) directly to the receiver permanent or temporary antenna connector.

The method of coupling to the receiver shall be stated in the test report.

Signal generator A shall be at the nominal frequency of the receiver, with normal modulation of the wanted signal.

Signal generator B shall be unmodulated and shall be adjusted to a test frequency at approximately 10 times, 20 times and 50 times of the receive channel bandwidth above upper band edge of the receive channel.

Initially signal generator B shall be switched off and using signal generator A the level which still gives sufficient response shall be established. The output level of generator A shall then be increased by 3 dB.

Signal generator B is then switched on and adjusted until the wanted criteria are met. This level shall be recorded.

The measurement shall be repeated with the test frequency for signal generator B at approximately 10 times, 20 times and 50 times of the receive channel bandwidth below the lower band edge of the receive channel.

The blocking or desensitization shall be recorded as the level in dBm of lowest level of the unwanted signal (generator B).

For tagging systems (e.g. RF identification, anti-theft, access control, location and similar systems) signal generator A may be replaced by a physical tag positioned at 70 % of the measured system range in metres. In this case, the blocking or desensitization shall be recorded as the ratio in dB of lowest level of the unwanted signal (generator B) resulting in a non-read of the tag. to the declared sensitivity of the receiver +3 dB.

TEST RESULTS

Below is the worst case situation test data.

D8:

Test Channel		Blocking Signal(signal generator B)					
		Lower or Upper	Spacing	Frequency (MHz)	Test Value (dBm)	Limit (dBm)	Verdict
/	2440MHz	Lower	10*BW	2438.5	-3	≥-44.51	PASS
			20*BW	2437	2	≥-44.51	PASS
			50*BW	2432.5	5	≥-44.51	PASS
		Upper	10*BW	2441.5	-4	≥-44.51	PASS
			20*BW	2443	2	≥-44.51	PASS
			50*BW	2447.5	5	≥-44.51	PASS
Note: k=-23.40dB, BW=6.5MHz							

D16:

Test Channel		Blocking Signal(signal generator B)					
		Lower or Upper	Spacing	Frequency (MHz)	Test Value (dBm)	Limit (dBm)	Verdict
/	24400MHz	Lower	10*BW	2438	-2	≥-45.76	PASS
			20*BW	2436	2	≥-45.76	PASS
			50*BW	2430	6	≥-45.76	PASS
		Upper	10*BW	2442	-2	≥-45.76	PASS
			20*BW	2444	2	≥-45.76	PASS
			50*BW	2450	6	≥-45.76	PASS
Note: k=-23.40dB, BW=6.5MHz							

LBT:

Test Channel		Blocking Signal(signal generator B)					
		Lower or Upper	Spacing	Frequency (MHz)	Test Value (dBm)	Limit (dBm)	Verdict
/	2440MHz	Lower	10*BW	2433.5	1	≥-50.88	PASS
			20*BW	2427	2	≥-50.88	PASS
			50*BW	2407.5	4	≥-50.88	PASS
		Upper	10*BW	2446.5	0	≥-50.88	PASS
			20*BW	2453	2	≥-50.88	PASS
			50*BW	2472.5	5	≥-50.88	PASS
Note: k=-23.40dB, BW=6.5MHz							

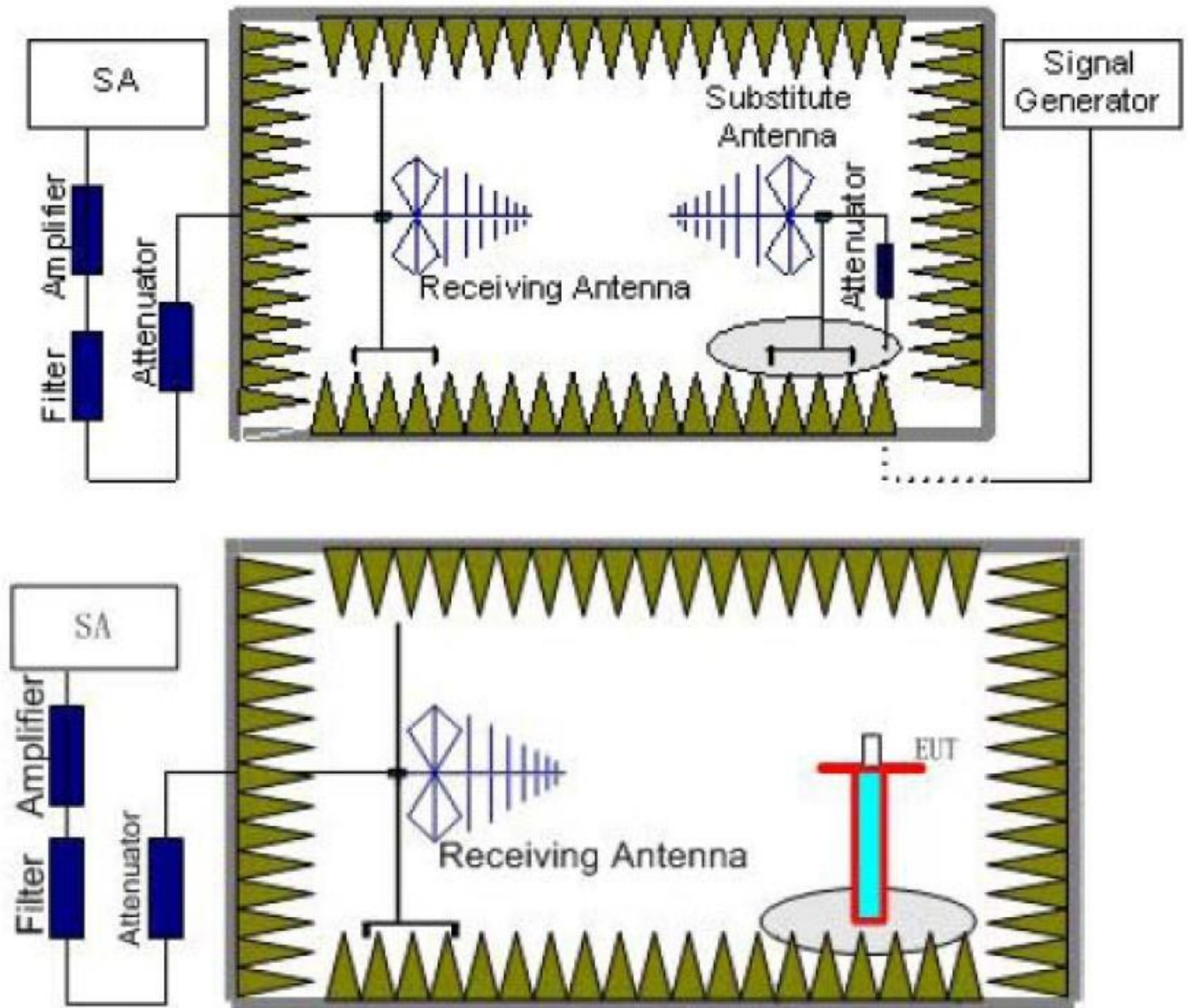
4.1.3 Receiver Spurious emissions

LIMIT

Final Draft ETSI EN 300 440 V2.2.1 (2018-07) Sub-clause 4.2.4.4

The power of any spurious emission shall not exceed 2 nW in the range 25 MHz to 1 GHz and shall not exceed 20 nW on frequencies above 1 GHz.

TEST CONFIGURATION



TEST PROCEDURE

Step 1:

The measurement is carried out in the fully anechoic chamber. EUT was placed on a 1.50 meter high non-conductive table at a 3 meter test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is 1.50 m and varies in certain range to find the maximum power value. Connect the EUT to the BTS simulator via the air interface. The measurement is carried out using a spectrum analyzer or receiver. Then the antenna height and turn table rotation is adjusted till the maximum power value is founded on spectrum analyzer or receiver. A filter is necessary in the band near to the carrier frequency. A filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

**Step 2:**

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

Calculation procedure:

The data of cable loss, antenna gain and air loss has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss, antenna gain and air loss. The basic equation with a sample calculation is as followed:

$$P = P_R + L_C + L_A - G$$

Where

P: Power of the Radiated Spurious Emissions (dBm)

P_R : reading of the receiver (dBm)

L_C : Cable Lose and power amilifer gain and filter cable loss (dB)

L_A : Air loss (dB)

G: Antenna Gain (dBi)

Assumed the reading of the receiver is -60dBm. A cable lose of 10dB, an air lose of 30dB and an antenna gain of 11dBi are added.

$$P = P_R + L_C + L_A - G = -60 + 10 + 30 - 11 = -31 \text{ dBm}$$

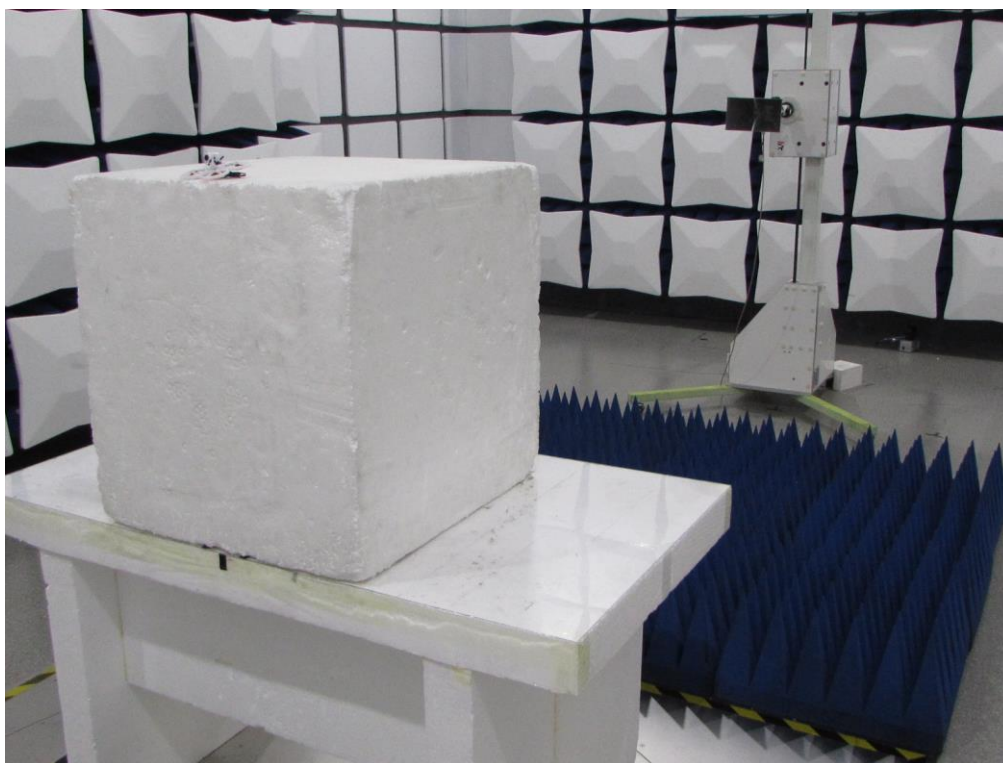
TEST RESULTS

Note: All modes has been tested, list the worst case in this item.(D8 Mode)

Temperature:	22.8° C
Humidity:	56%
Test Engineer:	Tony Luo

Fre. (MHz)	ANT. Pol.	Result (dBm)	Limit (dBm)	Margin (dB)	Conclusion
Below 1GHz:					
50.02	V	-67.62	-57	10.62	PASS
560.35	H	-66.29	-57	9.29	PASS
Above 1GHz:					
Test Mode: Lowest frequency					
5250.35	H	-55.09	-47	8.09	PASS
5250.35	V	-56.44	-47	9.44	PASS
14470.21	H	-56.92	-47	9.92	PASS
14470.21	V	-57.93	-47	10.93	PASS
Test Mode: Highest frequency					
5205.52	H	-56.31	-47	9.31	PASS
5205.52	V	-58.06	-47	11.06	PASS
6822.10	H	-58.16	-47	11.16	PASS
6822.10	V	-59.95	-47	12.95	PASS
Note: 1. no record for margin above 20dB. 2. Cable loss and antenna gain was combined in the calculated result.					

5 Test Setup Photos of the EUT





6 External and Internal Photos of the EUT

Reference to the test report No. TZ210902557-RE

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