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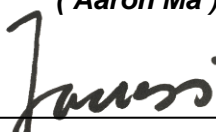
TEST REPORT

Report No. : CQASZ20191201316E-03
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 300 440 V2.1.1 (2017-03)
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)

Reviewed By: 
(Aaron Ma)

Approved By: 
(Jack Ai)



1 Version

Revision History of Report

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

2 Test Summary

Radio Spectrum Matter (RSM) Part			
Test item	Test Requirement	Limit	Result
Equivalent Isotropically Radiated Power	EN 300 440 V2.1.1 Clause 4.2.2	Clause 4.2.2.4	PASS
Permitted Range of Operating Frequencies	EN 300 440 V2.1.1 Clause 4.2.3	Clause 4.2.3.5	PASS
Spurious Emission from Tx	EN 300 440 V2.1.1 Clause 4.2.4	Clause 4.2.4.4	PASS
Duty Cycle	EN 300 440 V2.1.1 Clause 4.2.5	Clause 4.2.5.4	PASS
Additional requirements for FHSS equipment	EN 300 440 V2.1.1 Clause 4.2.6	Clause 4.2.6.4	N/A
Adjacent channel selectivity	EN 300 440 V2.1.1 Clause 4.3.3	Clause 4.3.3.4	N/A
Blocking or desensitization	EN 300 440 V2.1.1 Clause 4.3.4	Clause 4.3.4.4	PASS
Spurious Emission from Rx	EN 300 440 V2.1.1 Clause 4.3.5	Clause 4.3.5.4	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: The EUT is spread spectrum equipment and it belongs to receiver category 3.

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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

Frequency Range:	5725MHz~5850MHz
Producte Category:	Non specific radio equipment (provider declaration)
Receiver category	Receiver category 3 (provider declaration)
Modulation Technique:	Spread spectrum
Modulation Type:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)
Transmitter Operating channel width(OCW)	≤20MHz (provider declaration)
Number of Channels:	5 (declared by the client)
Hardware version:	EA04058034-04
Software version:	V0.1.1
Sample Type:	Portable production
Test Software of EUT:	Atheros Radio test 2(manufacturer declare)
Antenna Type:	Integral antenna
Antenna Gain:	ANT1: 3.0dBi
	ANT2: 3.0dBi
Test voltage:	DC3.6V

Operation Frequency Each of Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
For IEEE 802.11a/n-HT20 operation in the 5725 MHz to 5850 MHz band							
149	5745 MHz	153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	--	--	--	--	--	--

Using test software was control EUT work in continuous transmitter and receiver mode.and select test channel as below:

Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a	5725 MHz to 5850 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz

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	Radiated Emission (Below 1GHz)	5.12dB
2	Radiated Emission (Above 1GHz)	4.60dB
3	Conducted Disturbance (0.15~30MHz)	3.34dB
4	Radio Frequency	3×10^{-8}
5	Duty cycle	0.6 %.
6	Occupied Bandwidth	1.1%
7	RF conducted power	0.86dB
8	RF power density	0.74
9	Conducted Spurious emissions	0.86dB
10	Temperature test	0.8℃
11	Humidity test	2.0%
12	Supply voltages	0.5 %.
13	Frequency Error	5.5 Hz

5 Equipment List

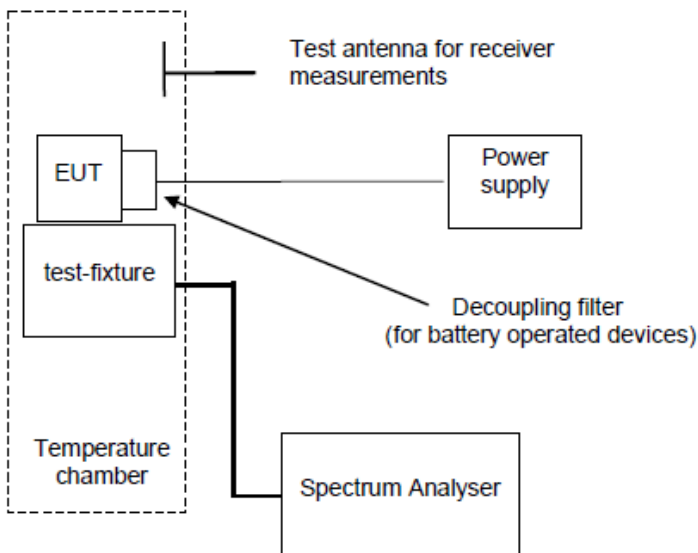
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Horn Antenna	R&S	HF906	CQA-012	2019/9/26	2020/9/25
Bilog Antenna	R&S	HL562	CQA-011	2019/9/26	2020/9/25
EMI Test Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSU26	CQA-038	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSV40	CQA-075	2019/6/11	2020/6/10
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
Preamplifier	EMCI	EMC184055SE	CQA-089	2019/9/25	2020/9/24
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2019/9/25	2020/9/24
high-low temperature chamber	Auchno	OJN-9606	CQA-S003	2019/9/25	2020/9/24
Signal generator	R&S	SME06	CQA-024	2019/9/26	2020/9/25
Vector signal generator	R&S	SMBV100A	CQA-039	2019/9/25	2020/9/24
DC power	KEYSIGHT	E3631A	CQA-028	2019/9/26	2020/9/25
RF Control Unit	Tonsced	JS0806-2	CQA-057	2019/9/26	2020/9/25
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2019/9/26	2020/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2019/9/26	2020/9/25
RF Cable (9KHz~40GHz)	CQA	N/A	C005	2019/9/26	2020/9/25

6 Radio Technical Requirements Specification in EN 300 440

6.1 Transmitter Requirements

6.1.1 Equivalent Isotropically Radiated Power

6.1.1.1 -6dB Bandwidth

Test Requirement:	EN 300 440 Clause 4.2.2.3.2		
Ambient:	Temp.: 24.5°C	Humid.: 56%	Press.: 1015 mbar
Test Status:	Test the unmodulated carrier at the highest, middle and the lowest channels under normal and extreme conditions.		
Equipment Used:	Refer to section 5 for details.		
Test Setup:			

Bandwidth Requirement:	≥1MHz channel bandwidth
Test Result:	N/A

Test Data:

ANT1:

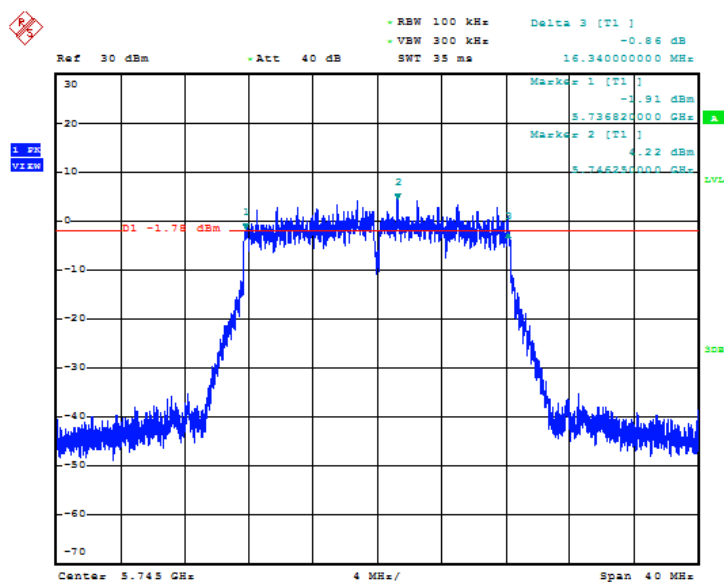
Channel (Frequency)	-6dB Bandwidth(MHz)	Requirement (MHz)	Conclusion
CH149 (5745MHz)	16.340	≥1MHz	N/A
CH157 (5785MHz)	16.370	≥1MHz	N/A
CH165 (5825MHz)	16.410	≥1MHz	N/A

ANT2:

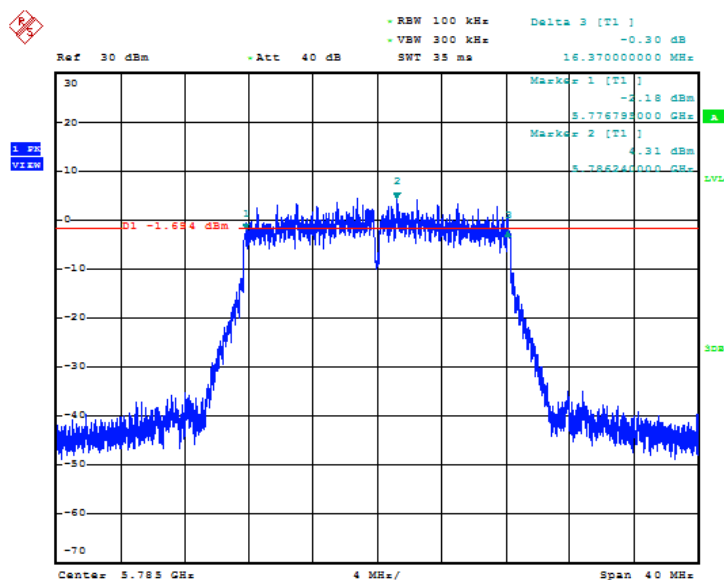
Channel (Frequency)	-6dB Bandwidth(MHz)	Requirement (MHz)	Conclusion
CH149 (5745MHz)	16.435	≥1MHz	N/A
CH157 (5785MHz)	16.400	≥1MHz	N/A
CH165 (5825MHz)	16.345	≥1MHz	N/A

Test plot as follows:

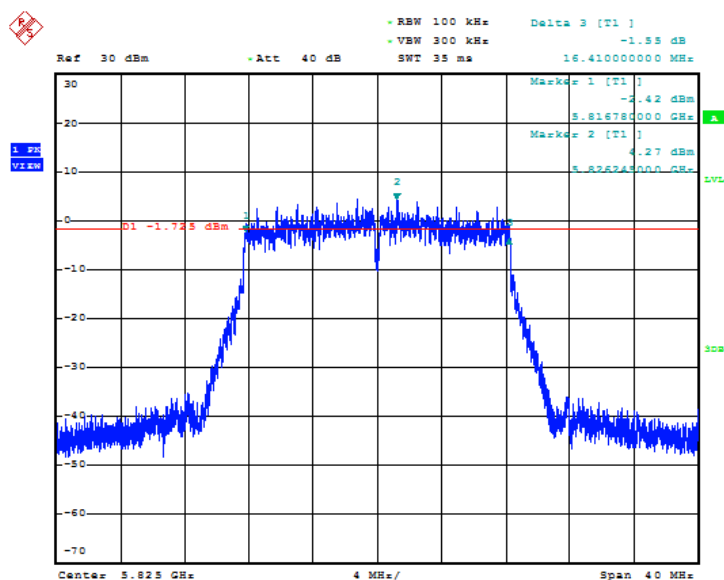
ANT1:



Date: 3.JAN.2020 16:59:45

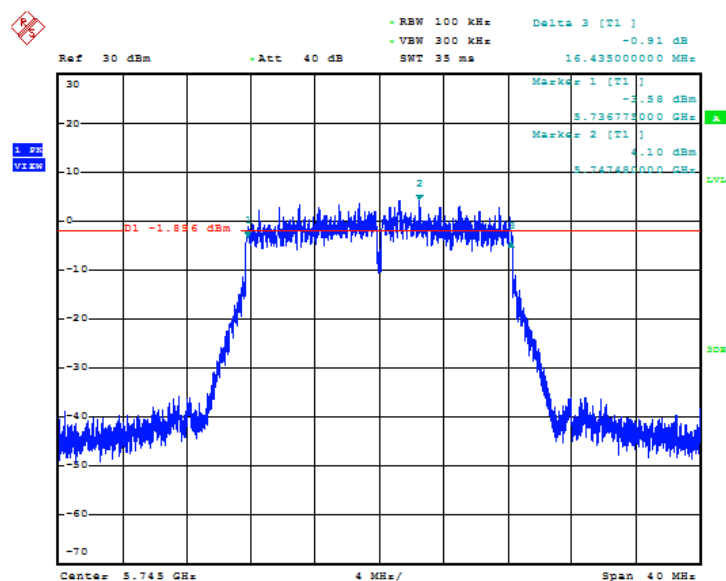


Date: 3.JAN.2020 17:06:24

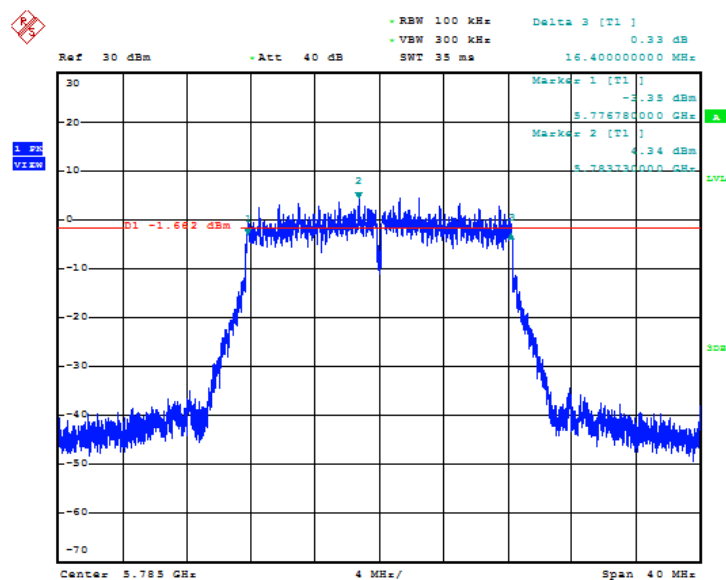


Date: 3.JAN.2020 17:10:46

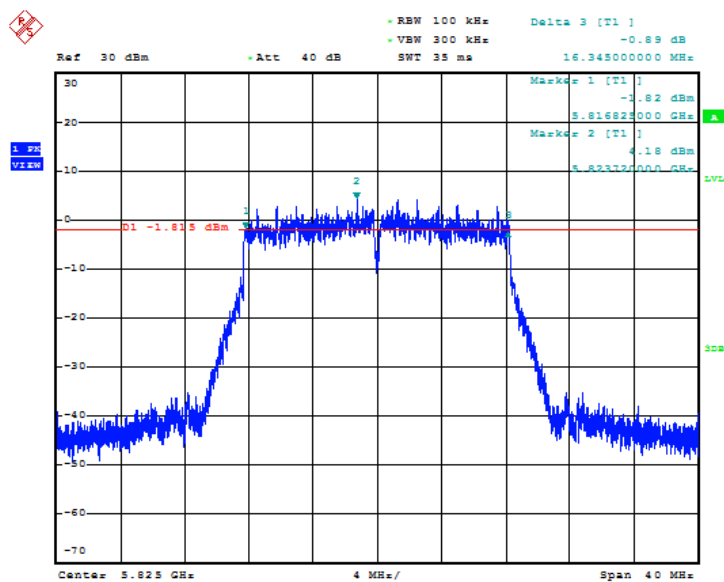
ANT2:



Date: 3.JAN.2020 17:16:17



Date: 3.JAN.2020 17:21:42



Date: 8.JAN.2020 17:29:17

6.1.1.2 Duty Cycle

Test Requirement:

EN 300 440 Clause 4.2.2.3.2

Ambient:

Temp.: 24.5°C

Humid.: 56°C

Press.: 1015mbar

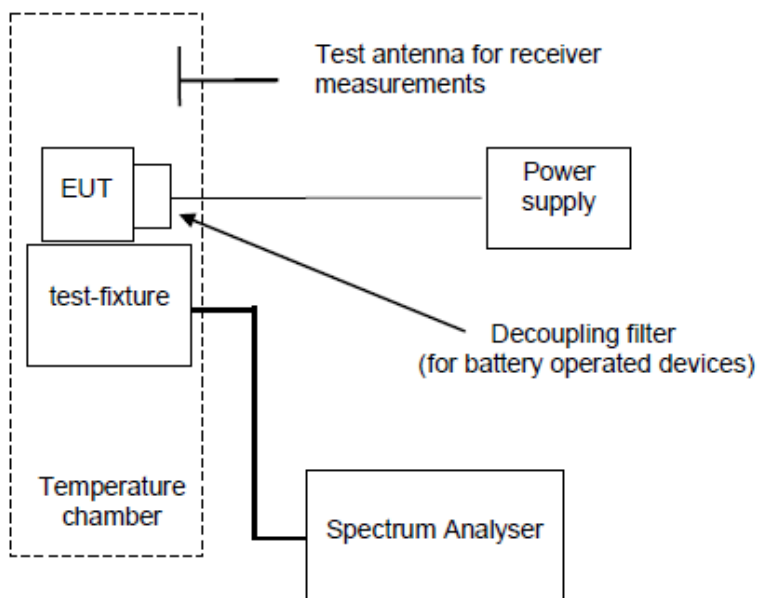
Test Status:

Test the unmodulated carrier at the highest, middle and the lowest channels under normal and extreme conditions.

Equipment Used:

Refer to section 5 for details.

Test Setup:



Duty Cycle Requirement:

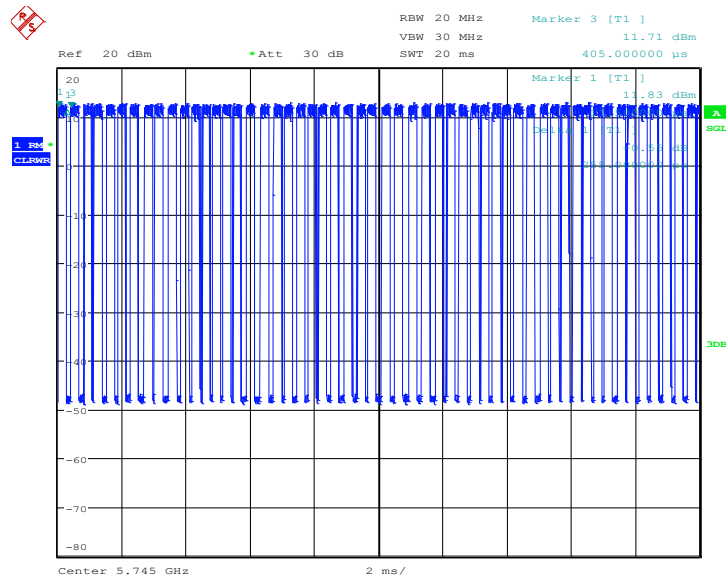
N/A

Test Result:

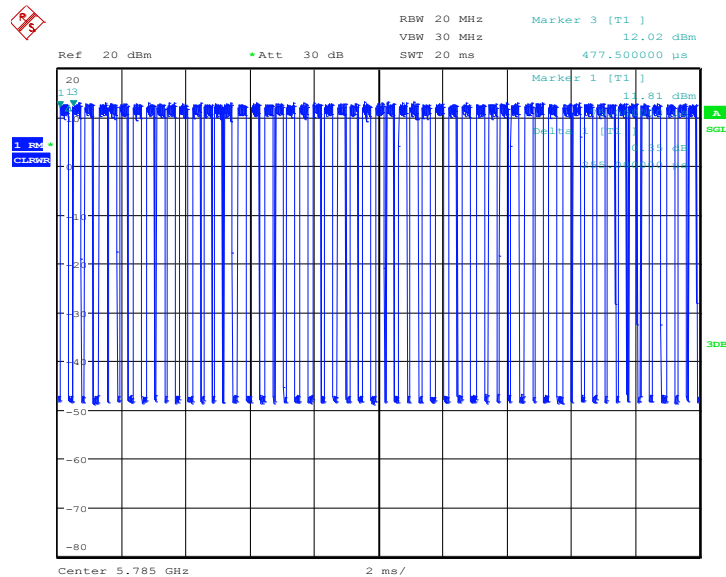
N/A

Test plot as follows:

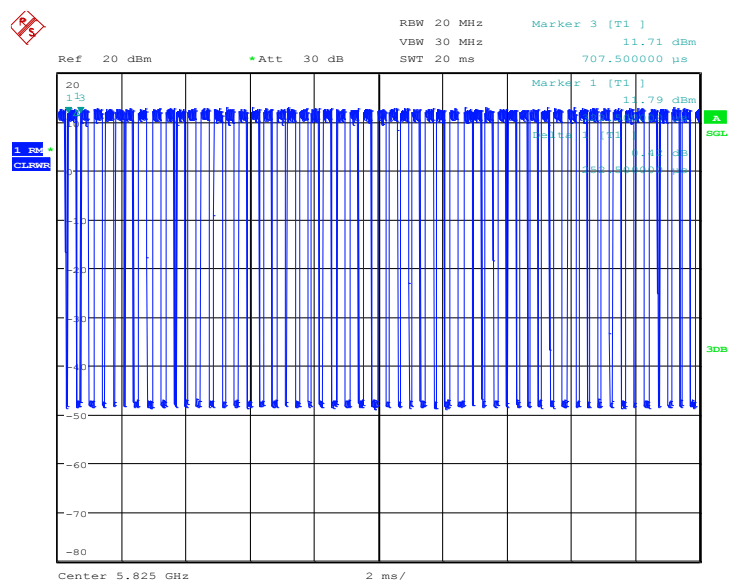
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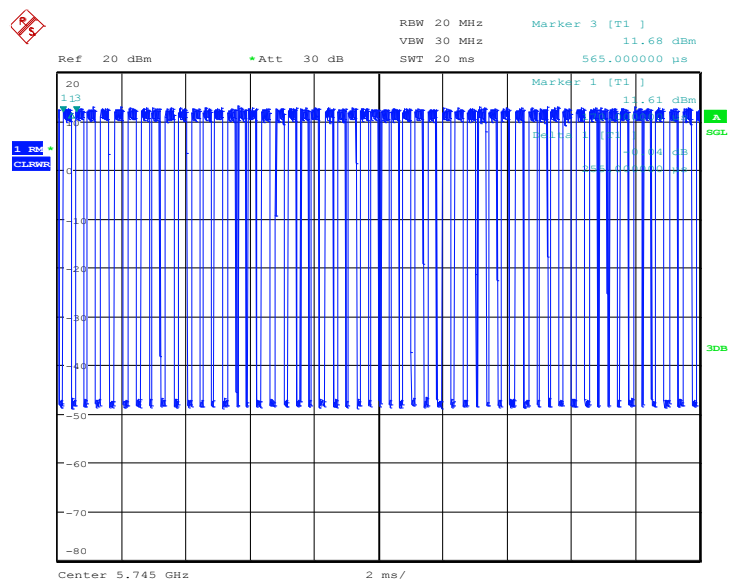


Date: 3.JAN.2020 17:04:03

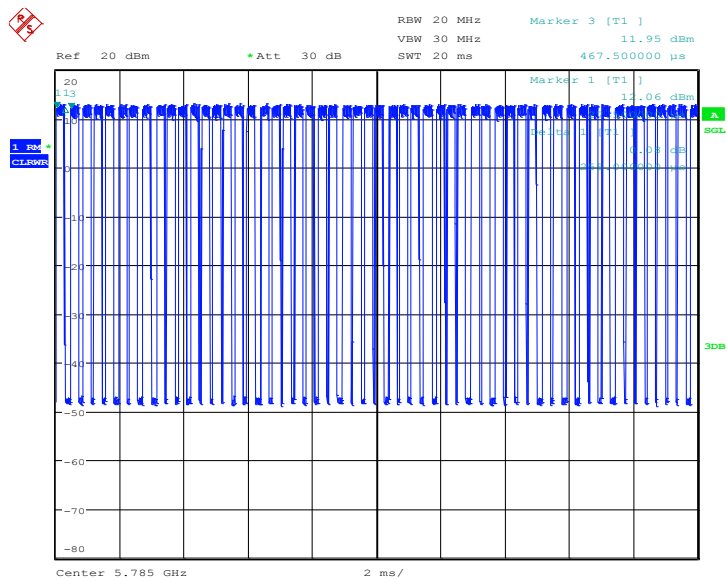


Date: 3.JAN.2020 17:08:25

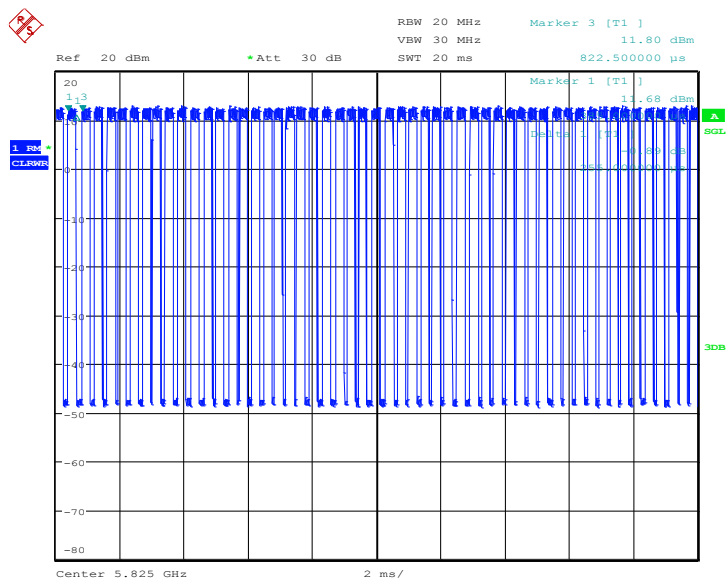
ANT2:



Date: 3.JAN.2020 17:14:39



Date: 3.JAN.2020 17:19:23



Date: 3.JAN.2020 17:24:58

6.1.1.3 Equivalent Isotropically Radiated Power

Test Requirement: EN 300 440 Clause 4.2.2

Ambient: Temp.: 22.5°C Humid.: 57% Press.: 1015 mbar

Test Status: Test the unmodulated carrier at the highest, middle and the lowest channels under normal and extreme conditions.

Equipment Used: Refer to section 5 for details.

Test Setup:

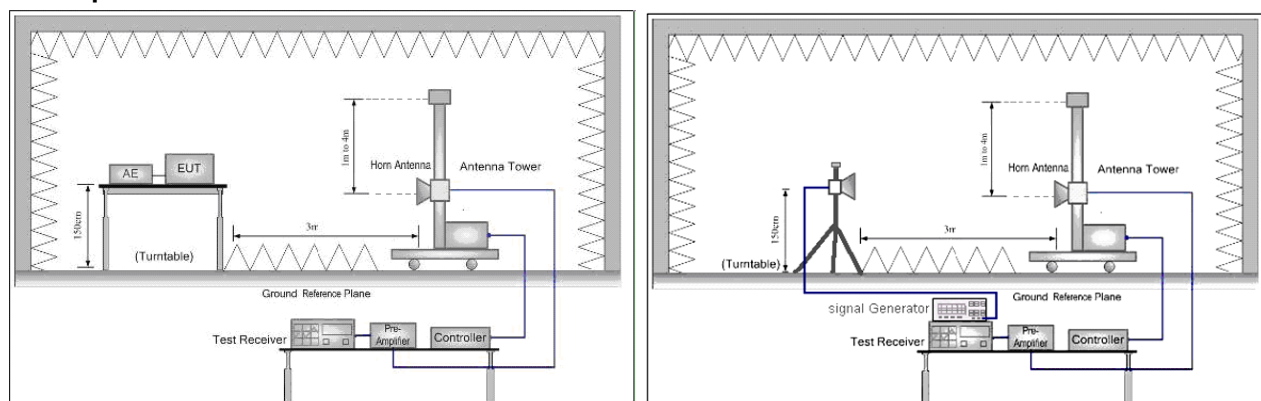
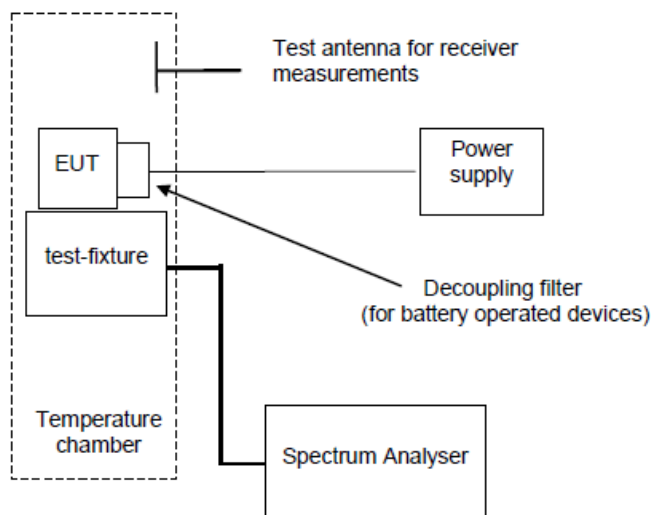


Figure 1. Above 1GHz(Normal Condition)

Test Setup:

(Extreme Condition)



Test Procedure:

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 (above 18GHz the distance is 1 meter) 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:

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

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

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

- 10) Test the EUT in the lowest channel ,middle channel, the Highest channel
- 11) Repeat above procedures until all frequencies measured was complete.

Limit:

14dBm

Test result:

PASS

Test Data:

ANT1:

Test Conditions		Mode	Channel (Frequency)	EIRP Value (dBm)	Limit (dBm)	Result
Temp (°C)	Volt (V DC)					
Normal (22.5)	V _{norm} : 3.6	OFDM	CH149(5745MHz)	9.64	14	PASS
			CH157(5785MHz)	9.60	14	PASS
			CH165(5825MHz)	9.58	14	PASS
-20	V _{min} : 3.4	OFDM	CH149(5745MHz)	9.61	14	PASS
			CH157(5785MHz)	9.62	14	PASS
			CH165(5825MHz)	9.59	14	PASS
-20	V _{max} : 4.2	OFDM	CH149(5745MHz)	9.60	14	PASS
			CH157(5785MHz)	9.62	14	PASS
			CH165(5825MHz)	9.58	14	PASS
55	V _{min} : 3.4	OFDM	CH149(5745MHz)	9.59	14	PASS
			CH157(5785MHz)	9.58	14	PASS
			CH165(5825MHz)	9.61	14	PASS
55	V _{max} : 4.2	OFDM	CH149(5745MHz)	9.63	14	PASS
			CH157(5785MHz)	9.61	14	PASS
			CH165(5825MHz)	9.60	14	PASS
Remark: EIRP= Read EIRP value (dBm) + 10 log (1/x) X=duty cycle						

ANT2:

Test Conditions		Mode	Channel (Frequency)	EIRP Value (dBm)	Limit (dBm)	Result
Temp (°C)	Volt (V DC)					
Normal (22.5)	V _{norm} : 3.6	OFDM	CH149(5745MHz)	9.53	14	PASS
			CH157(5785MHz)	9.48	14	PASS
			CH165(5825MHz)	9.46	14	PASS
-20	V _{min} : 3.4	OFDM	CH149(5745MHz)	9.51	14	PASS
			CH157(5785MHz)	9.54	14	PASS
			CH165(5825MHz)	9.49	14	PASS
-20	V _{max} : 4.2	OFDM	CH149(5745MHz)	9.53	14	PASS
			CH157(5785MHz)	9.50	14	PASS
			CH165(5825MHz)	9.52	14	PASS
55	V _{min} : 3.4	OFDM	CH149(5745MHz)	9.52	14	PASS
			CH157(5785MHz)	9.54	14	PASS
			CH165(5825MHz)	9.49	14	PASS
55	V _{max} : 4.2	OFDM	CH149(5745MHz)	9.57	14	PASS
			CH157(5785MHz)	9.55	14	PASS
			CH165(5825MHz)	9.52	14	PASS
Remark: EIRP= Read EIRP value (dBm) + 10 log (1/x) X=duty cycle						

6.1.2 Permitted Range of Operating Frequencies

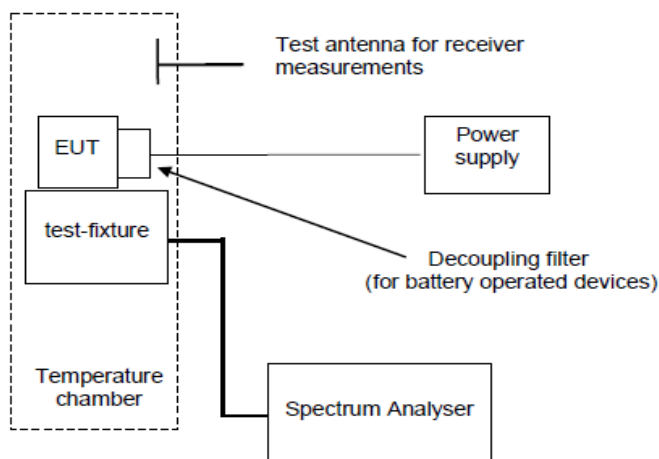
Test Requirement: EN 300 440 Clause 4.2.3

Ambient: Temp.: 24.5°C Humid.: 56% Press.: 1015 mbar

Test Status: Test the unmodulated carrier at the highest, middle and the lowest channels under normal and extreme conditions.

Equipment Used: Refer to section 5 for details.

Test Setup:



Limit: $F_L > 5.725\text{GHz}$ and $F_H < 5.875\text{GHz}$ (-30dBm)

Test result: PASS

Test Data:

ANT1:

Test Conditions		Mode	CH(Frequency)	Result(MHz)	Limit (MHz)	Conclusion
Temp (°C)	Volt (V DC)					
Normal (24.5)	V _{norm} : 3.6	OFDM	CH149(5745MHz)	5734.56	>5725	PASS
			CH165(5825MHz)	5834.85	<5875	PASS
-20	V _{min} : 3.4	OFDM	CH149(5745MHz)	5735.11	>5725	PASS
			CH165(5825MHz)	5833.89	<5875	PASS
-20	V _{max} : 4.2	OFDM	CH149(5745MHz)	5734.88	>5725	PASS
			CH165(5825MHz)	5835.14	<5875	PASS
55	V _{min} : 3.4	OFDM	CH149(5745MHz)	5734.35	>5725	PASS
			CH165(5825MHz)	5836.01	<5875	PASS
55	V _{max} : 4.2	OFDM	CH149(5745MHz)	5735.25	>5725	PASS
			CH165(5825MHz)	5834.34	<5875	PASS
Remark: Actual Test Line=-30dBm-10 log (1/x) X=duty cycle						

ANT2:

Test Conditions		Mode	CH(Frequency)	Result(MHz)	Limit (MHz)	Conclusion
Temp (°C)	Volt (V DC)					
Normal (24.5)	V _{norm} : 3.6	OFDM	CH149(5745MHz)	5735.24	>5725	PASS
			CH165(5825MHz)	5835.41	<5875	PASS
-20	V _{min} : 3.4	OFDM	CH149(5745MHz)	5734.26	>5725	PASS
			CH165(5825MHz)	5836.54	<5875	PASS
-20	V _{max} : 4.2	OFDM	CH149(5745MHz)	5735.98	>5725	PASS
			CH165(5825MHz)	5834.45	<5875	PASS
55	V _{min} : 3.4	OFDM	CH149(5745MHz)	5735.42	>5725	PASS
			CH165(5825MHz)	5834.65	<5875	PASS
55	V _{max} : 4.2	OFDM	CH149(5745MHz)	5734.26	>5725	PASS
			CH165(5825MHz)	5835.86	<5875	PASS
Remark: Actual Test Line=-30dBm-10 log (1/x) X=duty cycle						

6.1.3 Spurious Emissions

Test Requirement: EN 300 440 Clause 4.2.4

Ambient: Temp.: 25.9°C Humid.: 44% Press.: 1005 mbar
Test Status: Test the unmodulated carrier at the highest, middle and the lowest channels under normal and extreme conditions.

Receiver Setup:

Frequency range	Measuring receiver bandwidth	Detector mode
25MHz-1000MHz	120kHz	QP
1GHz-40GHz	1MHz	Peak

Equipment Used: Refer to section 5 for details.

Test Setup:

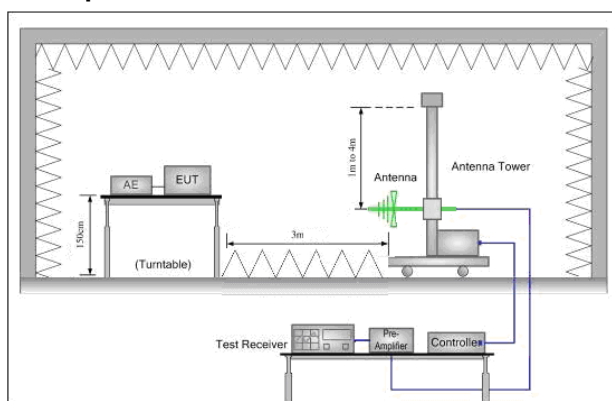


Figure 1. 25MHz to 1GHz

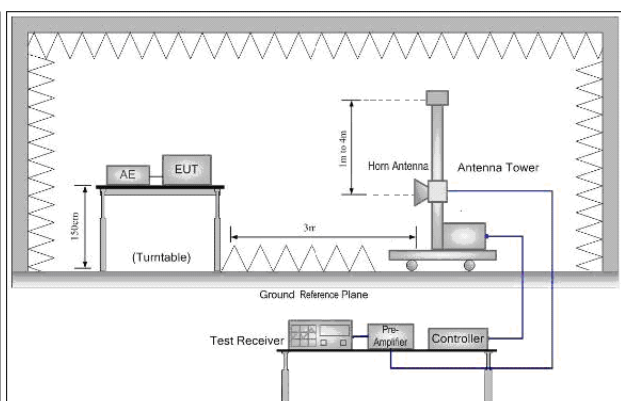


Figure 2. Above 1GHz

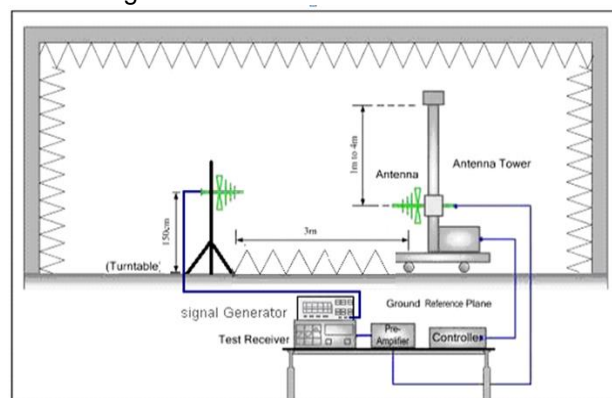


Figure 1. 25MHz to 1GHz

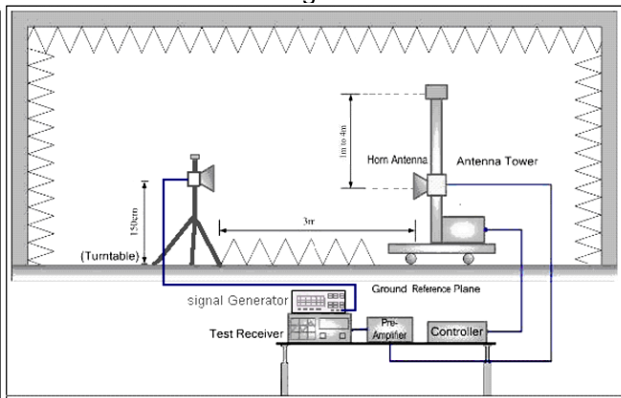


Figure 2. Above 1GHz

Test Procedure:

- 1 Scan from 25MHz to 40GHz; 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 (above 18GHz the distance is 1 meter) 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:

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

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

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

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

Repeat above procedures until all frequencies measured was complete.

Limit:

Frequency ranges	47 MHz to 74 MHz 87.5 MHz to 108 MHz	Other Frequencies ≤ 1000 MHz	Frequencies > 1000 MHz
state	174 MHz to 230 MHz 470 MHz to 862 MHz		
Operating	4 nW	250 nW	1 μW
Standby	2 nW	2 nW	20 nW

Test result:

PASS

Test Data:

ANT1:

Lowest channel (5745MHz)							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
11490	150	266	-44.55	-30	-14.55	Pass	H
11490	150	23	-44.44	-30	-14.44	Pass	V
17235	150	329	-42.25	-30	-12.25	Pass	H
17235	150	180	-43.69	-30	-13.69	Pass	V

Highest channel (5825MHz)							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
11650	150	25	-42.77	-30	-12.77	Pass	H
11650	150	21	-42.22	-30	-12.22	Pass	V
17475	150	167	-42.23	-30	-12.23	Pass	H
17475	150	320	-43.74	-30	-13.74	Pass	V

Standby mode							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
433.54	150	89	-65.38	-57	-8.38	Pass	H
433.54	150	56	-65.83	-57	-8.83	Pass	V
623.61	150	318	-65.77	-57	-8.77	Pass	H
623.61	150	276	-65.92	-57	-8.92	Pass	V
1045.08	150	149	-57.81	-47	-10.81	Pass	H
1045.08	150	215	-57.50	-47	-10.50	Pass	V
1210.64	150	169	-57.77	-47	-10.77	Pass	H
1210.64	150	209	-56.21	-47	-9.21	Pass	V

ANT2:

Lowest channel (5745MHz)							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
11490	150	264	-44.37	-30	-14.37	Pass	H
11490	150	323	-44.64	-30	-14.64	Pass	V
17235	150	146	-42.44	-30	-12.44	Pass	H
17235	150	39	-44.86	-30	-14.86	Pass	V

Highest channel (5825MHz)							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
11650	150	247	-42.27	-30	-12.27	Pass	H
11650	150	112	-43.62	-30	-13.62	Pass	V
17475	150	152	-44.42	-30	-14.42	Pass	H
17475	150	345	-44.85	-30	-14.85	Pass	V

Standby mode							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
432.40	150	124	-64.28	-57	-7.28	Pass	H
432.40	150	108	-65.32	-57	-8.32	Pass	V
632.90	150	325	-64.66	-57	-7.66	Pass	H
632.90	150	240	-65.27	-57	-8.27	Pass	V
1082.28	150	143	-55.09	-47	-8.09	Pass	H
1082.28	150	20	-57.44	-47	-10.44	Pass	V
1276.62	150	319	-55.44	-47	-8.44	Pass	H
1276.62	150	3	-55.30	-47	-8.30	Pass	V

Remark:

The disturbance above 1GHz /below 1GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

6.2 Receiver Requirements

Receiver Classification, Table 5 of EN 300 440.		
Receiver category	Relevant receiver clauses	Risk assessment of receiver performance
1	4.3.3, 4.3.4 and 4.3.5	Highly reliable SRD communication media; e.g. serving human life inherent systems (may result in a physical risk to a person).
2	4.3.4 and 4.3.5	Medium reliable SRD communication media e.g. causing Inconvenience to persons, which cannot simply be overcome by other means.
3	4.3.4 and 4.3.5	Standard reliable SRD communication media e.g. Inconvenience to persons, which can simply be overcome by other means (e.g. manual).

The EUT (Receiver part) belong to Class 3.

6.2.1 Blocking or Desensitization

Test Requirement: EN 300 440 Clause 4.3.4

Test Results: Not applicable, since the test applied to class 1 or class 2 receivers only. Please refer to clause 4.3.1 of EN 300 440.

Test Requirement: EN 300 440 Clause 4.3.4

EUT Operation:

Ambient: Temp.: 25.5°C

Humid.: 59%

Press.: 1005 mbar

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

Far Field Calculation Formula

Test Setup:

$$E = \frac{\sqrt{30PG(\theta, \phi)}}{r}$$

G = antenna gain relative to an isotropic antenna
 θ, ϕ = elevation and azimuth angles to point of investigation
 r = distance from observation point to the antenna

Equipment Used: Refer to section 6 for details.

Limits for blocking or desensitization

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

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:

$$0 < k < 40 \text{ dB.}$$

Test result: PASS

Test data:

Receiver category	Bandwidth	Channel	Blocking test frequency	Test Value	Limit	Result
3	1MHz	5745MHz	50 times upper band edge of the receive channel	-52.25	-87.34	PASS
			20 times upper band edge of the receive channel	-54.84		PASS
			10 times upper band edge of the receive channel	-52.58		PASS
			10 times lower band edge of the receive channel	-55.54		PASS
			20 times lower band edge of the receive channel	-54.45		PASS
			50 times lower band edge of the receive channel	-52.86		PASS
		5785MHz	50 times upper band edge of the receive channel	-52.04	-87.45	PASS
			20 times upper band edge of the receive channel	-52.65		PASS
			10 times upper band edge of the receive channel	-53.84		PASS
			10 times lower band edge of the receive channel	-50.15		PASS
			20 times lower band edge of the receive channel	-50.68		PASS
			50 times lower band edge of the receive channel	-54.56		PASS
		5825MHz	50 times upper band edge of the receive channel	-56.74	-87.48	PASS
			20 times upper band edge of the receive channel	-53.84		PASS
			10 times upper band edge of the receive channel	-52.85		PASS
			10 times lower band edge of the receive channel	-53.55		PASS
			20 times lower band edge of the receive channel	-52.15		PASS
			50 times lower band edge of the receive channel	-54.67		PASS

6.2.2 Spurious Radiations

Test Requirement: EN 300 440 Clause 4.3.5

Ambient: Temp.: 25.9°C Humid.: 44% Press.: 1005mbar

Test Status: 1) Keep the EUT in continuously receiver with test single.
2) Keep the EUT searching and receiving the useful test signal.
3) Test EUT in normal conditions.

Receiver Setup:

Frequency range	Measuring receiver bandwidth	Detector mode
25MHz-1000MHz	120kHz	QP
1GHz-40GHz	1MHz	Peak

Equipment Used: Refer to section 5 for details.

Test Setup:

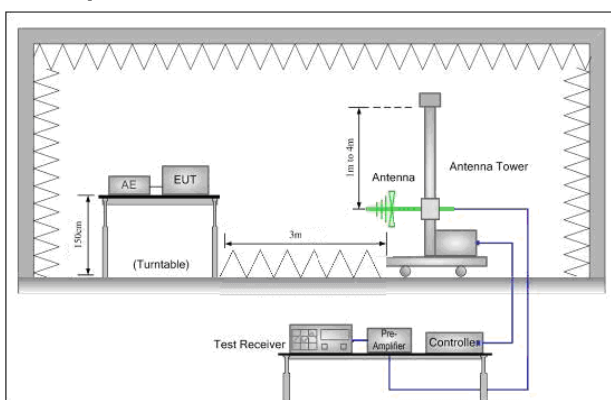


Figure 1. 25MHz to 1GHz

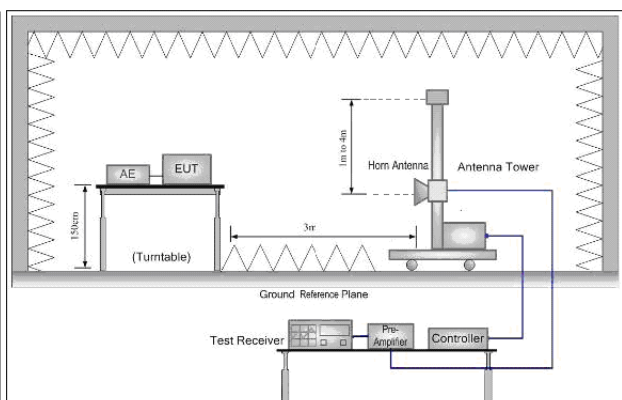


Figure 2. Above 1GHz

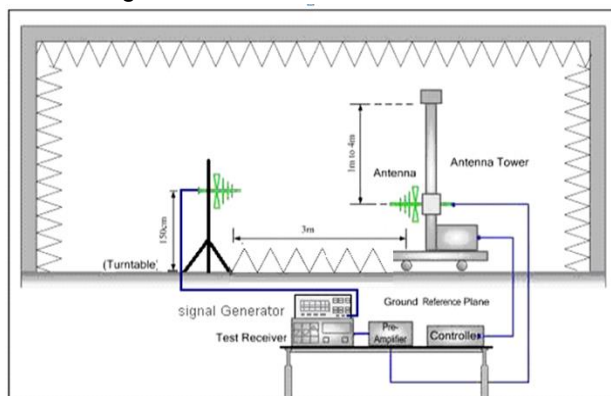


Figure 1. 25MHz to 1GHz

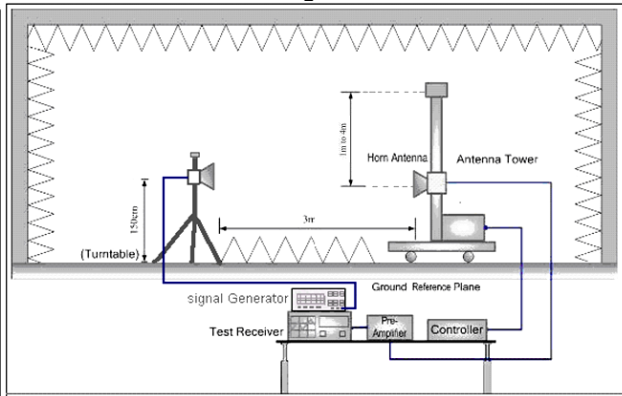


Figure 2. Above 1GHz

1. Scan from 25MHz to 40GHz; 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:

Test Procedure:

- 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 (above 18GHz the distance is 1 meter) 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:

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

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

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

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
25MHz-1000MHz	2nW
1GHz-40GHz	20nW

Test result:

PASS

Test Data:

Lowest channel (5745MHz)							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
338.87	133	119	-65.89	-57	-8.89	Pass	H
338.87	179	288	-65.23	-57	-8.23	Pass	V
576.38	167	157	-64.45	-57	-7.45	Pass	H
576.38	129	349	-65.65	-57	-8.65	Pass	V
4093.98	147	158	-57.82	-47	-10.82	Pass	H
4093.98	119	63	-55.13	-47	-8.13	Pass	V
5205.79	113	239	-55.42	-47	-8.42	Pass	H
5205.79	110	55	-55.26	-47	-8.26	Pass	V

Highest channel (5825MHz)							
Frequency (MHz)	Height (cm)	Azimuth (deg)	Spurious Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	Antenna Polaxis.
132.38	200	98	-65.84	-57	-8.84	Pass	H
132.38	146	59	-65.18	-57	-8.18	Pass	V
734.32	184	264	-64.23	-57	-7.23	Pass	H
734.32	144	39	-64.32	-57	-7.32	Pass	V
3051.76	175	199	-55.49	-47	-8.49	Pass	H
3051.76	117	155	-55.59	-47	-8.59	Pass	V
6205.37	173	113	-57.53	-47	-10.53	Pass	H
6205.37	135	62	-55.82	-47	-8.82	Pass	V

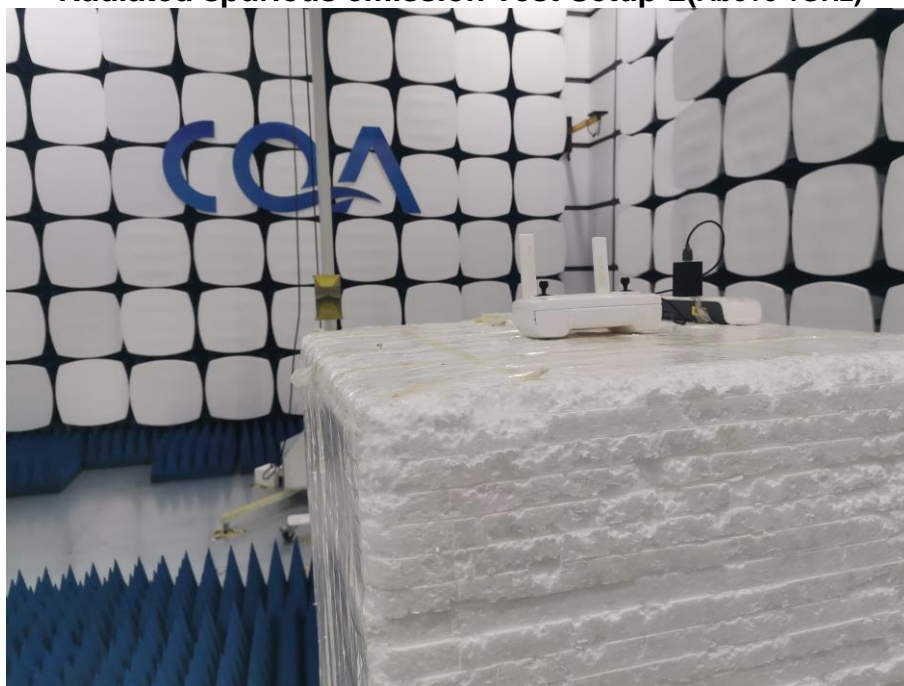
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

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 ***