

SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 1 of 41

TEST REPORT

Application No.: SZCR2306002099AT

Applicant: Mattel Asia Pacific Sourcing Ltd.

Address of Applicant: 11/F., South Tower, World Finance Centre, Harbour City, Tsimshatsui,

Kowloon, 852 Hong Kong

Manufacturer: Mattel Asia Pacific Sourcing Ltd.

Address of Manufacturer: 11/F., South Tower, World Finance Centre, Harbour City, Tsimshatsui,

Kowloon, 852 Hong Kong

Equipment Under Test (EUT):

EUT Name: HOT WHEELS® RODGER DODGER® RC Vehicle

Model No.: HTP54

FCC ID: PIYHTP54-23A5T

Standard(s): 47 CFR Part 15, Subpart C 15.249

Date of Receipt: 2023-06-30

Date of Test: 2023-07-01 to 2023-07-06

Date of Issue: 2023-07-13

Test Result: Pass*

Keny Xu



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^{*} In the configuration tested, the EUT complied with the standards specified above.



SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 2 of 41

	Revision Record						
Version	Chapter	Date	Modifier	Remark			
01		2023-07-13		Original			

Authorized for issue by:			
	Gebin Sun		
	Gebin Sun/Project Engineer	-	
	Exic Fu		
	Eric Fu/Reviewer	-	



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 3 of 41

Test Summary 2

Radio Spectrum Technical Requirement							
Item	Standard	Method	Requirement	Result			
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass			

Radio Spectrum Matter Part						
Item	Standard	Method	Requirement	Result		
20dB Bandwidth		ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass		
Field Strength of the Fundamental Signal (15.249(a))		ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass		
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass		
Radiated Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass		
Radiated Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass		



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 4 of 41

3 Contents

		Page
1	1 Cover Page	1
2	2 Test Summary	3
3	3 Contents	4
J	Contents	
4	4 General Information	6
	4.1 Details of E.U.T.	_
	4.2 Description of Support Units	
	4.3 Measurement Uncertainty	
	4.4 Test Location	
	4.5 Test Facility	
	4.6 Deviation from Standards	
	4.7 Abnormalities from Standard Conditions	
5	5 Equipment List	8
6	6 Radio Spectrum Technical Requirement	10
	6.1 Antenna Requirement	
	6.1.1 Test Requirement:	
	6.1.2 Conclusion	
7		
•		
	7.1 20dB Bandwidth	
	7.1.1 E.U.T. Operation	
	7.1.2 Test Mode Description	
	7.1.3 Test Setup Diagram	
	7.1.4 Neastrement Frocedure and Data	
	7.2.1 E.U.T. Operation	
	7.2.2 Test Mode Description	
	7.2.3 Test Setup Diagram	
	7.2.4 Measurement Procedure and Data	
	7.3 Restricted Band Around Fundamental Frequency	
	7.3.1 E.U.T. Operation	
	7.3.2 Test Mode Description	23
	7.3.3 Test Setup Diagram	24
	7.3.4 Measurement Procedure and Data	24
	7.4 Radiated Emissions Below 1GHz	
	7.4.1 E.U.T. Operation	
	7.4.2 Test Mode Description	
	7.4.3 Test Setup Diagram	
	7.4.4 Measurement Procedure and Data	
	7.5 Radiated Emissions Above 1GHz	
	7.5.1 E.U.T. Operation	33



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report	No .	S7C	R230	0600	209902
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Page. 5 of /11

		rage. 30141	
	7.5.2	Test Mode Description	33
		Test Setup Diagram	
		Measurement Procedure and Data	
8	Test S	Setup Photo	41
9	EUT C	Constructional Details (EUT Photos)	41



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 6 of 41

General Information

Details of E.U.T. 4.1

Power supply:	3V DC(1.5V x 2 "AA" Size Batteries)
Operation Frequency:	2420MHz to 2462MHz
Modulation Type:	GFSK
Number of Channels:	43
Channel spacing:	1MHz
Antenna Type:	Wire Antenna
Antenna Gain:	0.58dBi

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.			
		-				
The EUT has been tested as an independent unit.						

4.3 Measurement Uncertainty

· · · · · · · · · · · · · · · · · · ·	
Test Item	Measurement Uncertainty
20dB Bandwidth	± 3%
Field Strength of the Fundamental Signal (15.249(a))	± 4.5dB (Below 1GHz);± 4.8dB (Above 1GHz)
Restricted Band Around Fundamental Frequency	± 6.0dB (Below 1GHz);± 4.6dB (Above 1GHz)
Radiated Emissions Below 1GHz	± 6.0dB for 3m; ± 5.0dB for 10m
Radiated Emissions Above 1GHz	± 4.6dB (1GHz-18GHz);± 4.8dB (18MHz-40GHz)

Remark:

The Ulab (lab Uncertainty) is less than Ucispr/ETSI (CISPR/ETSI Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 7 of 41

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz. 10m Semi-anechoic chamber for below 1GHz. Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC -Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 8 of 41

5 **Equipment List**

20dB Bandwidth					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2022-10-20	2023-10-19
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2023-03-21	2024-03-20
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2022-07-08	2023-07-07
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	2023-03-31	2024-03-30

Field Strength of the Fundamental Signal (15.249(a))							
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date		
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01		
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2023-03-21	2024-03-20		
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23		
Microwave system amplifier	Agilent	83017A	SEM005-25	2022-09-21	2023-09-20		
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07		
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2022-08-10	2024-08-09		
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2023-03-21	2024-03-20		
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2023-03-21	2024-03-20		

Restricted Band Around Fundamental Frequency									
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date				
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01				
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2023-03-21	2024-03-20				
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23				
Microwave system amplifier	amplifier Agriefit 65017A SEN		SEM005-25	SEM005-25 2022-09-21					
Measurement Software			N/A	N/A	N/A				
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07				
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2022-08-10	2024-08-09				
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2023-03-21	2024-03-20				
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2023-03-21	2024-03-20				

Radiated Emissions Below 1GHz								
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date			
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2021-11-30	2023-11-29			
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18			



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 9 of 41

Chamber					
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2022-10-20	2023-10-19
BiConiLog Antenna	3142C	SEM003-01	2021-09-17	2023-09-16	
Pre-Amplifier	Agilent Technologies	echnologies 8447D SEM005-01 2		2023-03-20	2024-03-19
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2022-07-08	2023-07-07

Radiated Emissions Above 1GHz									
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date				
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01				
Signal Analyzer	Rohde & Schwarz	FSV40 SEM008		2023-03-21	2024-03-20				
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23				
Microwave system amplifier	Agilent	83017A	SEM005-25	2022-09-21	2023-09-20				
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A				
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07				
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2023-03-21	2024-03-20				

General used equipment								
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date			
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2022-09-04	2023-09-03			
Humidity/ Temperature Indicator Anymetre		TH101B	SEM002-09	2022-09-04	2023-09-03			
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2023-03-23	2024-03-22			



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 10 of 41

Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

15.203 requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0.58dBi.

Antenna location: Refer to internal photos



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 11 of 41

Radio Spectrum Matter Test Results 7

7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215 Test Method: ANSI C63.10 (2013) Section 6.9

7.1.1 E.U.T. Operation

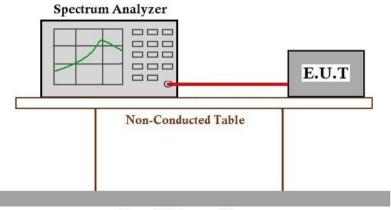
Operating Environment:

Temperature: 25.0 °C Humidity: 52.7 % RH Atmospheric Pressure: 1005 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description					
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.					

7.1.3 Test Setup Diagram



Ground Reference Plane

7.1.4 Measurement Procedure and Data

Test channel	20dB bandwidth (MHz)	Results
Lowest	9.294	Pass
Middle	8.646	Pass
Highest	7.642	Pass



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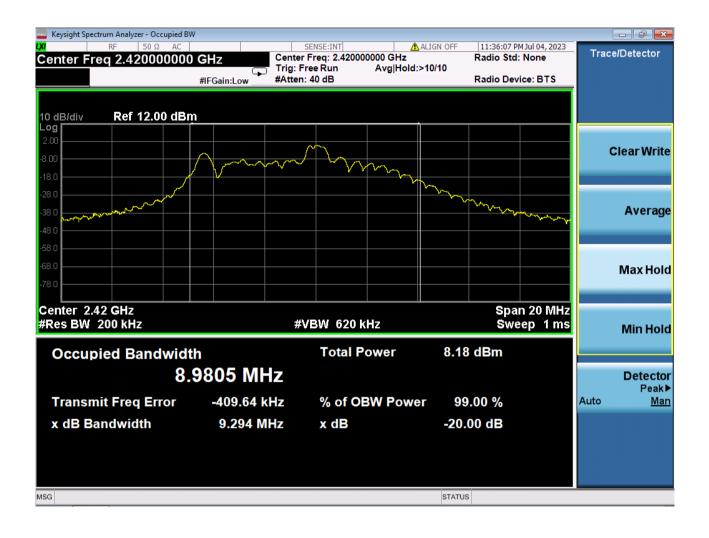
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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 12 of 41





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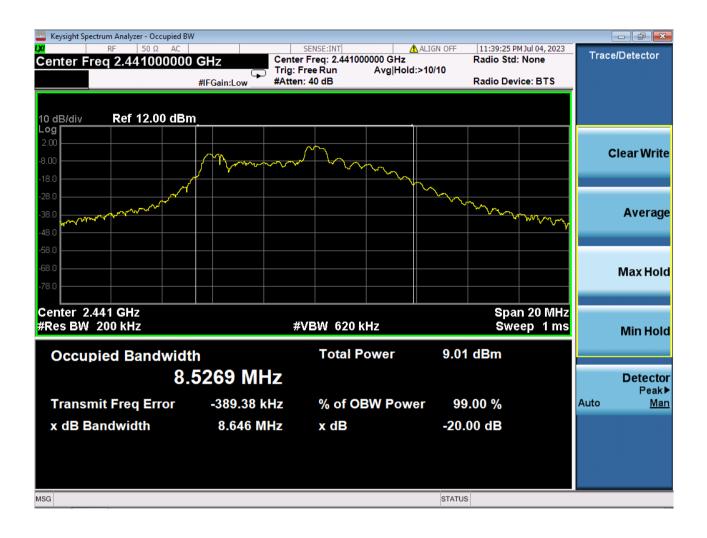
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Report No.: SZCR230600209902

Page: 13 of 41





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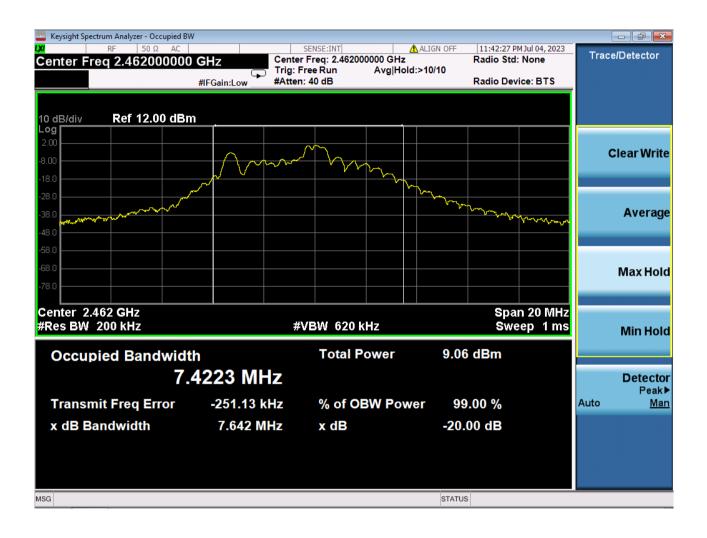
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Report No.: SZCR230600209902

Page: 14 of 41





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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 15 of 41

7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a) Test Method: ANSI C63.10 (2013) Section 6.5&6.6

Measurement Distance: 3m

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(millivolts/meter)	Field strength of harmonics(microvolts/meter)		
902-928	50	500		
2400-2483.5	50	500		
5725-5875	50	500		
24000-24250	250	2500		

Remark: The frequencies above 1000MHz 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 fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.

7.2.1 E.U.T. Operation

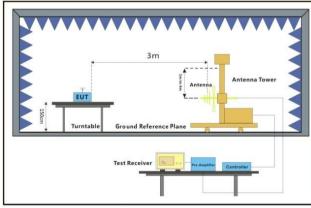
Operating Environment:

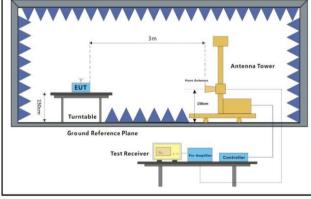
Temperature: 22.1 °C Humidity: 41.2 % RH Atmospheric Pressure: 1005 mbar

7.2.2 Test Mode Description

7.2.2 Test mode besomption							
Pre-scan / Final test	Mode Code	Description					
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.					

7.2.3 Test Setup Diagram





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Above 1GHz 30MHz-1GHz



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 16 of 41

7.2.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c.The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

q.lf the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h.Test the EUT in the lowest channel, the middle channel, the Highest channel.

i.The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j.Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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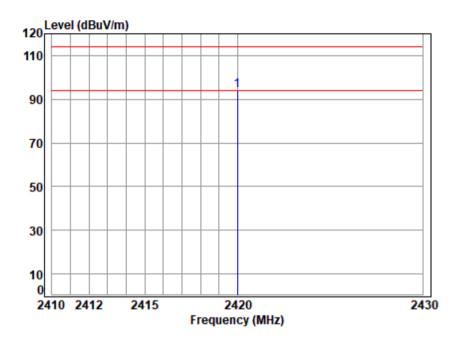


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 17 of 41

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT

Mode : 2420 Field strength

> Cable Ant Preamp Limit 0ver Read

Loss Factor Factor Level Level Frea Line Limit Remark

MHz dB dB/m dBuV dBuV/m dBuV/m

1 a 2420.000 4.20 28.94 35.63 96.40 93.91 114.00 -20.09 peak



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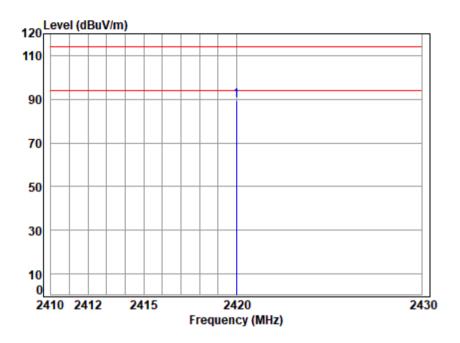


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 18 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL

: 02099AT/02100AT

Mode : 2420 Field strength

> Cable Ant Preamp Limit 0ver Read

Loss Factor Factor Frea Level Level Line Limit Remark

MHz dB dB/m dBuV dBuV/m dBuV/m

1 a 2420.000 4.20 28.94 35.63 91.91 89.42 114.00 -24.58 peak



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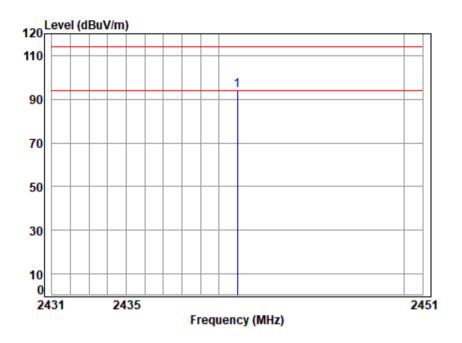


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 19 of 41

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: middle



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT

Mode : 2441 Field strength

> Cable Ant Preamp Limit 0ver Read

Loss Factor Factor Level Level Frea Line Limit Remark

MHz dB dB/m dBuV dBuV/m dBuV/m

1 a 2441.000 4.22 28.98 35.62 96.25 93.83 114.00 -20.17 peak



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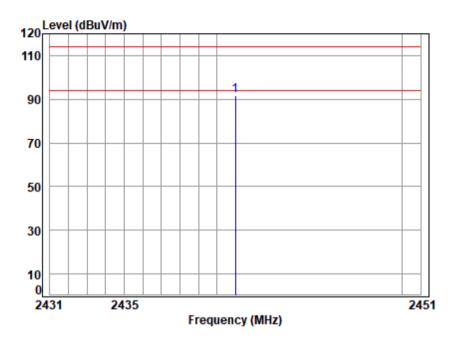


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Report No.: SZCR230600209902

Page: 20 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Site : chamber

Condition: 3m VERTICAL

: 02099AT/02100AT

Mode : 2441 Field strength

> Cable Ant Preamp Limit 0ver Read

Loss Factor Factor Level Level Frea Line Limit Remark

MHz dB dB/m dBuV dBuV/m dBuV/m

1 a 2441.000 4.22 28.98 35.62 93.92 91.50 114.00 -22.50 peak



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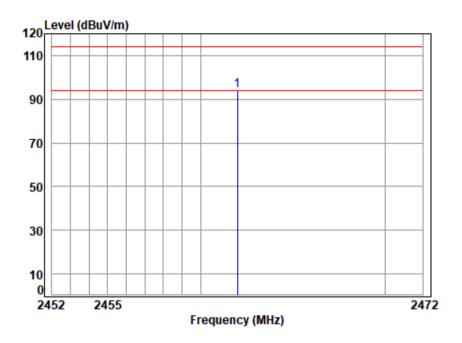


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Report No.: SZCR230600209902

Page: 21 of 41

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: High



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT

Mode : 2462 Field strength

> Cable Ant Preamp Limit 0ver Read

Loss Factor Factor Level Level Frea Line Limit Remark

MHz dB dB/m dBuV dBuV/m dBuV/m

1 a 2462.000 4.24 29.02 35.62 96.28 93.92 114.00 -20.08 peak



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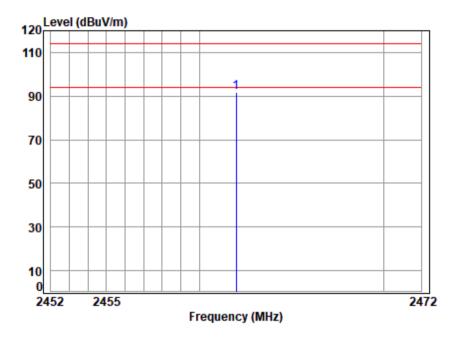


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

22 of 41 Page:

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m VERTICAL : 02099AT/02100AT

Mode : 2462 Field strength

> Cable Ant Preamp Limit 0ver Read

Loss Factor Factor Line Limit Remark Freq Level Level MHz dB dB/m dBuV dBuV/m dBuV/m dB

29.02 35.62 94.23 91.87 114.00 -22.13 peak 1 q 2462.000 4.24

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

2) 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. So, only the above measurement data were shown in the report



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Report No.: SZCR230600209902

Page: 23 of 41

7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

Frequency	Limit (dBuV/m @3m)	Remark	
30MHz-88MHz	40.0	Quasi-peak Value	
88MHz-216MHz	43.5	Quasi-peak Value	
216MHz-960MHz	46.0	Quasi-peak Value	
960MHz-1GHz	54.0	Quasi-peak Value	
Above 1GHz	54.0	Average Value	
Above 1GHz	74.0	Peak Value	

Emission 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.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.3 °C Humidity: 46.6 % RH Atmospheric Pressure: 1005 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.



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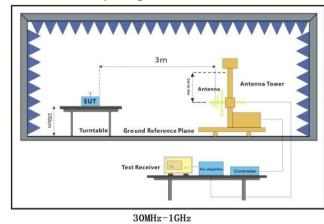


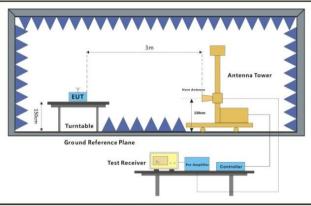
SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 24 of 41

7.3.3 Test Setup Diagram





Above 1GHz

7.3.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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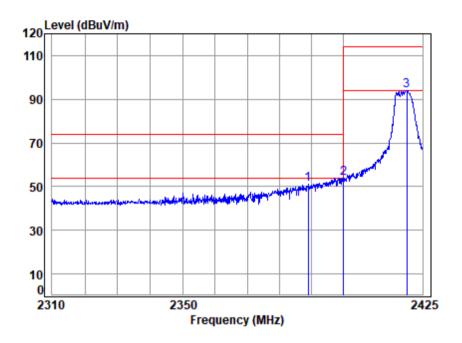


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 25 of 41

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT : 2420 Band edge Mode

	Freq			Preamp Factor					Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2388.983	4.16	28.88	35.64	53.50	50.90	74.00	-23.10	Peak
2 q	2400.000	4.18	28.90	35.64	56.50	53.94	74.00	-20.06	peak
3	2420.000	4.20	28.94	35.63	96.42	93.93	114.00	-20.07	peak



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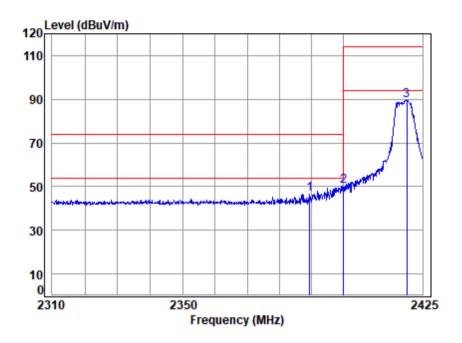


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 26 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL : 02099AT/02100AT : 2420 Band edge Mode

			8-							
		Cable	Ant	Preamp	Read		Limit	0ver		
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark	
_										
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2389.447	4.16	28.88	35.64	49.03	46.43	74.00	-27.57	Peak	
2 q	2400.000	4.18	28.90	35.64	52.74	50.18	74.00	-23.82	peak	
3	2420,000	4.20	28.94	35.63	92.09	89 60	114 00	-24 49	neak	



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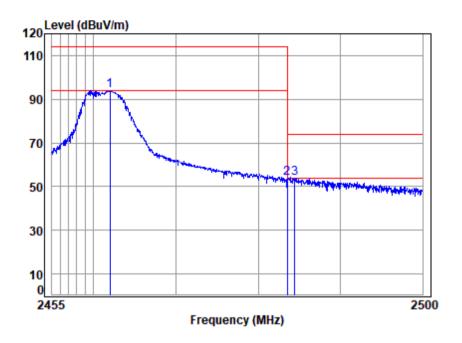


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 27 of 41

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: High



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT Mode : 2462 Band edge

	Freq			Preamp Factor					Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2462.000	4.24	29.02	35.62	96.29	93.93	114.00	-20.07	peak
2 q	2483.500	4.27	29.07	35.61	56.26	53.99	74.00	-20.01	peak
3	2484.383	4.27	29.07	35.61	55.98	53.71	74.00	-20.29	Peak



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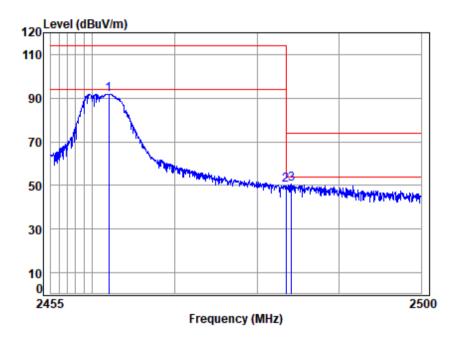


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 28 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber Condition: 3m VERTICAL

Job No : 02099AT/02100AT

Mode : 2462 Band edge

		Freq			Preamp Factor					Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	q	2462.000	4.24	29.02	35.62	94.22	91.86	114.00	-22.14	peak
2		2483.500	4.27	29.07	35.61	52.42	50.15	74.00	-23.85	peak
3		2484.157	4.27	29.07	35.61	52.96	50.69	74.00	-23.31	Peak

Remark

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
 - Final Test Level =Receiver Reading + Antenna Factor + Cable Factor Preamplifier Factor
- 2) 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. So, only the above measurement data were shown in the report



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 29 of 41

7.4 Radiated Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
960-1000	500	3

7.4.1 E.U.T. Operation

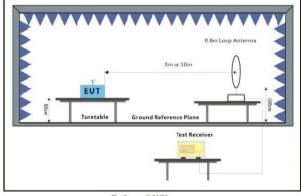
Operating Environment:

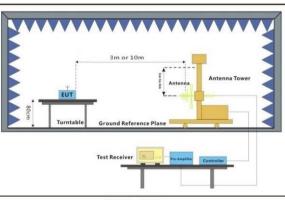
Temperature: 22.1 °C Humidity: 41.2 % RH Atmospheric Pressure: 1005 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.4.3 Test Setup Diagram





30MHz-1GHz Below 30MHz



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

30 of 41 Page:

7.4.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

3) Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.



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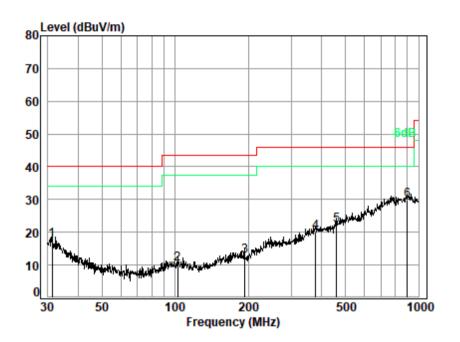


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 31 of 41

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

Job No. : 02099AT

Test Mode: 00

		Ant	Cable	Preamp	Read		Limit	0ver	
	Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	31.18	20.73	0.63	27.23	23.51	17.64	40.00	-22.36	QP
2	102.36	12.99	1.15	26.99	23.32	10.47	43.50	-33.03	QP
3	193.09	14.60	1.65	26.63	23.18	12.80	43.50	-30.70	QP
4	378.58	21.36	2.40	26.44	22.61	19.93	46.00	-26.07	QP
5	460.73	22.22	2.68	26.68	24.10	22.32	46.00	-23.68	QP
6 a	897.00	28.85	4.02	25.91	22.81	29.77	46.00	-16.23	OP



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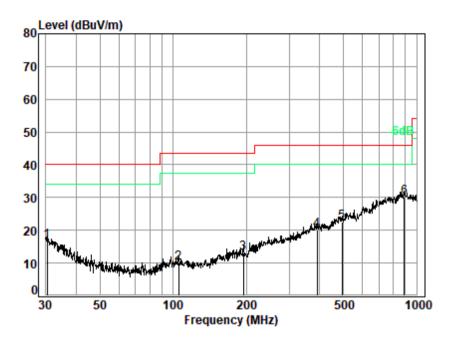


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 32 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Site : chamber

Condition: 3m VERTICAL Job No. : 02099AT

Test Mode: 00

		Ant	Cable	Preamp	Read		Limit	0ver	
	Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	30.32	21.27	0.63	27.23	22.00	16.67	40.00	-23.33	QP
2	105.27	12.91	1.17	26.98	22.98	10.08	43.50	-33.42	QP
3	194.45	14.53	1.66	26.62	23.58	13.15	43.50	-30.35	QP
4	390.72	21.46	2.45	26.47	22.74	20.18	46.00	-25.82	QP
5	494.20	22.95	2.79	26.78	23.40	22.36	46.00	-23.64	QP
6 g	890.73	28.95	4.00	25.94	22.99	30.00	46.00	-16.00	OP



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 33 of 41

7.5 Radiated Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.5.1 E.U.T. Operation

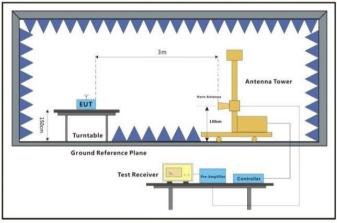
Operating Environment:

Temperature: 23.3 °C Humidity: 46.4 % RH Atmospheric Pressure: 1005 mbar

7.5.2 Test Mode Description

7.0.2 1000 10		5011011
Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.5.3 Test Setup Diagram



Above 1GHz



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 34 of 41

7.5.4 Measurement Procedure and Data

- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

- 2) Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) The field strength limits 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 the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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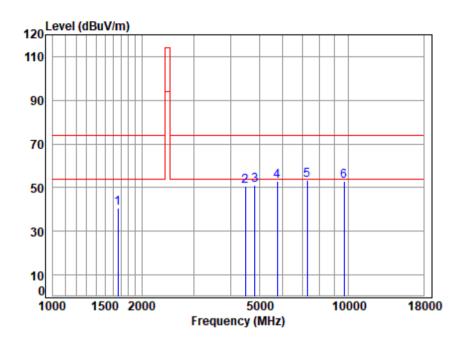


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 35 of 41

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT

Mode : 2420 TX RSE

		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1658.337	3.28	26.50	36.50	47.18	40.46	74.00	-33.54	peak
2	4482.150	6.75	32.99	34.66	45.41	50.49	74.00	-23.51	peak
3	4840.000	7.01	33.69	34.89	45.24	51.05	74.00	-22.95	peak
4	5746.982	7.92	34.40	35.03	45.74	53.03	74.00	-20.97	peak
5 q	7260.000	8.61	35.71	35.96	45.08	53.44	74.00	-20.56	peak
6	9680.000	10.49	37.37	35.56	40.83	53.13	74.00	-20.87	peak



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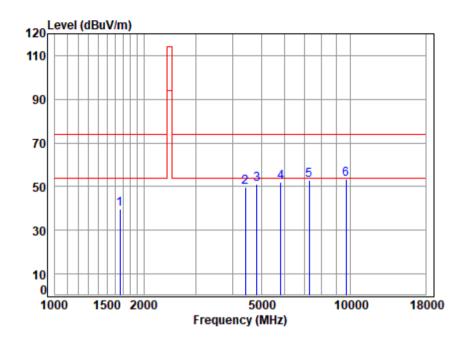


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 36 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL : 02099AT/02100AT

Mode : 2420 TX RSE

		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1663.137	3.29	26.53	36.48	46.54	39.88	74.00	-34.12	peak
2	4417.841	6.71	32.94	34.62	44.63	49.66	74.00	-24.34	peak
3	4840.000	7.01	33.69	34.89	45.50	51.31	74.00	-22.69	peak
4	5813.812	7.99	34.46	35.03	44.81	52.23	74.00	-21.77	peak
5	7260.000	8.61	35.71	35.96	44.52	52.88	74.00	-21.12	peak
6 q	9680.000	10.49	37.37	35.56	40.94	53.24	74.00	-20.76	peak



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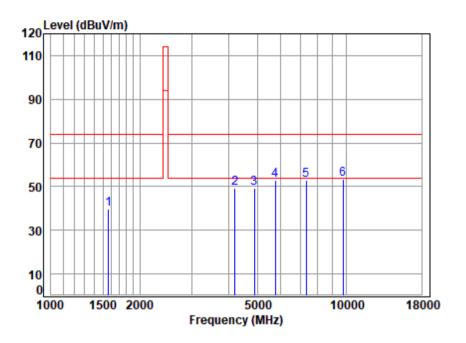


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 37 of 41

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: middle



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT

Mode : 2441 TX RSE

			Cable	Ant	Preamp	Read		Limit	0ver	
		Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	_									
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1		1569.721	3.16	26.06	36.70	46.95	39.47	74.00	-34.53	peak
2		4193.872	6.55	32.76	34.47	44.64	49.48	74.00	-24.52	peak
3		4882.000	7.04	33.77	34.91	43.18	49.08	74.00	-24.92	peak
4		5763.617	7.94	34.42	35.03	45.57	52.90	74.00	-21.10	peak
5		7323.000	8.67	35.76	35.97	44.66	53.12	74.00	-20.88	peak
6	q	9764.000	10.52	37.41	35.56	41.04	53.41	74.00	-20.59	peak



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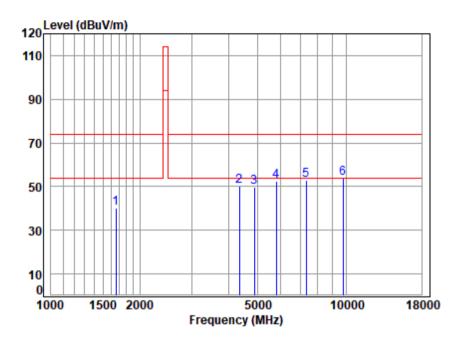


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 38 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Site : chamber Condition: 3m VERTICAL

: 02099AT/02100AT

Mode : 2441 TX RSE

		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
4	1662 127	2 20	26 52	36 40	47.00	40.24	74.00	22.66	
1	1663.137	3.29	26.53	36.48	47.00	40.34	74.00	-33.66	реак
2	4354.454	6.66	32.89	34.58	45.36	50.33	74.00	-23.67	peak
3	4882.000	7.04	33.77	34.91	43.79	49.69	74.00	-24.31	peak
4	5797.032	7.97	34.44	35.03	45.10	52.48	74.00	-21.52	peak
5	7323.000	8.67	35.76	35.97	44.51	52.97	74.00	-21.03	peak
6	q 9764.000	10.52	37.41	35.56	41.45	53.82	74.00	-20.18	peak



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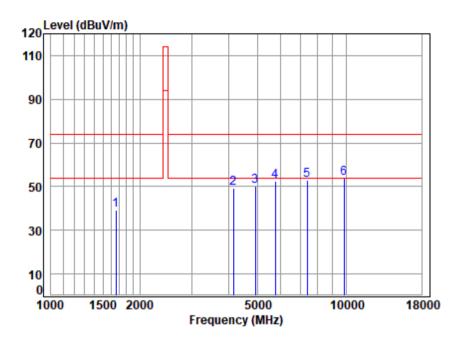


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 39 of 41

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: High



Site : chamber

Condition: 3m HORIZONTAL : 02099AT/02100AT

Mode : 2462 TX RSE

		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1658.337	3.28	26.50	36.50	46.01	39.29	74.00	-34.71	peak
2	4157.664								•
3	4924.000	7.07	33.85	34.94	43.98	49.96	74.00	-24.04	peak
4	5763.617	7.94	34.42	35.03	44.96	52.29	74.00	-21.71	peak
5	7386.000	8.73	35.81	35.98	44.15	52.71	74.00	-21.29	peak
6	q 9848.000	10.55	37.44	35.57	41.32	53.74	74.00	-20.26	peak



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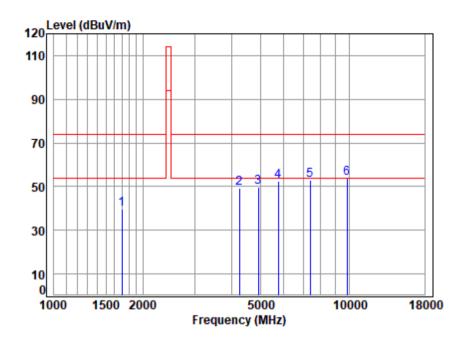


SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 40 of 41

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m VERTICAL : 02099AT/02100AT

Mode : 2462 TX RSE

	Cable	Ant	Preamp	Read		Limit	0ver	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1697.129	3.33	26.69	36.41	46.08	39.69	74.00	-34.31	peak
4242.641	6.58	32.80	34.50	44.34	49.22	74.00	-24.78	peak
4924.000	7.07	33.85	34.94	43.71	49.69	74.00	-24.31	peak
5763.617	7.94	34.42	35.03	45.31	52.64	74.00	-21.36	peak
7386.000	8.73	35.81	35.98	44.28	52.84	74.00	-21.16	peak
9848.000	10.55	37.44	35.57	41.23	53.65	74.00	-20.35	peak
	MHz 1697.129 4242.641 4924.000 5763.617 7386.000	Freq Loss MHz dB 1697.129 3.33 4242.641 6.58 4924.000 7.07 5763.617 7.94 7386.000 8.73	Freq Loss Factor MHz dB dB/m 1697.129 3.33 26.69 4242.641 6.58 32.80 4924.000 7.07 33.85 5763.617 7.94 34.42 7386.000 8.73 35.81	Freq Loss Factor Factor MHz dB dB/m dB 1697.129 3.33 26.69 36.41 4242.641 6.58 32.80 34.50 4924.000 7.07 33.85 34.94 5763.617 7.94 34.42 35.03 7386.000 8.73 35.81 35.98	Freq Loss Factor Factor Level MHz dB dB/m dB dBuV 1697.129 3.33 26.69 36.41 46.08 4242.641 6.58 32.80 34.50 44.34 4924.000 7.07 33.85 34.94 43.71 5763.617 7.94 34.42 35.03 45.31 7386.000 8.73 35.81 35.98 44.28	Freq Loss Factor Factor Level Level MHz dB dB/m dB dBuV dBuV/m 1697.129 3.33 26.69 36.41 46.08 39.69 4242.641 6.58 32.80 34.50 44.34 49.22 4924.000 7.07 33.85 34.94 43.71 49.69 5763.617 7.94 34.42 35.03 45.31 52.64 7386.000 8.73 35.81 35.98 44.28 52.84	Freq Loss Factor Factor Level Level Line MHz dB dB/m dB dBuV dBuV/m dBuV/m 1697.129 3.33 26.69 36.41 46.08 39.69 74.00 4242.641 6.58 32.80 34.50 44.34 49.22 74.00 4924.000 7.07 33.85 34.94 43.71 49.69 74.00 5763.617 7.94 34.42 35.03 45.31 52.64 74.00 7386.000 8.73 35.81 35.98 44.28 52.84 74.00	Cable Ant Preamp Freq Loss Factor Factor Read Level Level Limit Limit Over Limit MHz dB dB/m dB dBuV dBuV/m dBuV/m dBuV/m dB 1697.129 3.33 26.69 36.41 46.08 39.69 74.00 -34.31 4242.641 6.58 32.80 34.50 44.34 49.22 74.00 -24.78 4924.000 7.07 33.85 34.94 43.71 49.69 74.00 -24.31 5763.617 7.94 34.42 35.03 45.31 52.64 74.00 -21.36 7386.000 8.73 35.81 35.98 44.28 52.84 74.00 -21.16 9848.000 10.55 37.44 35.57 41.23 53.65 74.00 -20.35



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230600209902

Page: 41 of 41

Test Setup Photo 8

Refer to Appendix - Test Setup Photo for SZCR2306002099AT

EUT Constructional Details (EUT Photos) 9

Refer to External and Internal Photos for SZCR2306002099AT

- End of the Report -



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