

# TEST REPORT

**Application No.:** SZCR2303000777AT  
**Applicant:** Tiiwee B.V.  
**Address of Applicant:** Olof Palmeborg 190 Schiedam 3124TS Netherlands  
**Manufacturer:** Tiiwee B.V.  
**Address of Manufacturer:** Olof Palmeborg 190 Schiedam 3124TS Netherlands  
**Equipment Under Test (EUT):**  
**EUT Name:** tiiwee PIR sensor 02  
**Model No.:** TWPIR02  
**Trade Mark:** tiiwee  
**FCC ID:** 2BAP8TWPIR02  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.231  
**Date of Receipt:** 2023-03-22  
**Date of Test:** 2023-04-01 to 2023-06-13  
**Date of Issue:** 2023-06-14

<b>Test Result:</b>	<b>Pass*</b>
---------------------	--------------

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

*Keny Xu*

Keny Xu  
EMC Laboratory Manager



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

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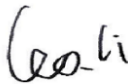
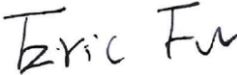
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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300077701

Page: 2 of 34

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023-06-14		Original

Authorized for issue by:				
				
		Leo Li/Project Engineer		
				
		Eric Fu/Reviewer		



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## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.231	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.231(c)	Pass
Dwell Time (15.231(e))		ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.231(e)	Pass
Field Strength of the Fundamental Signal (15.231(e))		ANSI C63.10 (2013) Section 6.5	Field Strength of the Fundamental Signal (15.231(e))	Pass
Radiated Emissions below 1GHz		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15C Section 15.231(b) and 15.209	Pass
Radiated Emissions above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15C Section 15.231(b) and 15.209	Pass

### 3 Contents

	Page
1 Cover Page .....	1
2 Test Summary .....	3
3 Contents .....	4
4 General Information.....	6
4.1 Details of E.U.T. ....	6
4.2 Description of Support Units .....	6
4.3 Measurement Uncertainty .....	6
4.4 Test Location .....	7
4.5 Test Facility.....	7
4.6 Deviation from Standards .....	7
4.7 Abnormalities from Standard Conditions .....	7
5 Equipment List .....	8
6 Radio Spectrum Technical Requirement.....	11
6.1 Antenna Requirement .....	11
6.1.1 Test Requirement: .....	11
6.1.2 Conclusion .....	11
7 Radio Spectrum Matter Test Results .....	12
7.1 Conducted Emissions at AC Power Line (150kHz-30MHz) .....	12
7.1.1 E.U.T. Operation .....	12
7.1.2 Test Mode Description .....	12
7.1.2 Test Setup Diagram .....	13
7.1.3 Measurement Procedure and Data.....	13
7.2 20dB Bandwidth .....	16
7.2.1 E.U.T. Operation .....	16
7.2.2 Test Mode Description .....	16
7.2.3 Test Setup Diagram .....	16
7.2.4 Measurement Procedure and Data.....	17
7.3 Dwell Time (15.231(e)) .....	18
7.3.1 E.U.T. Operation .....	18
7.3.2 Test Mode Description .....	18
7.3.3 Test Setup Diagram .....	18
7.3.4 Measurement Procedure and Data.....	19
7.4 Field Strength of the Fundamental Signal (15.231(e)) .....	20
7.4.1 E.U.T. Operation .....	20
7.4.2 Test Mode Description .....	20
7.4.3 Test Setup Diagram .....	21
7.4.4 Measurement Procedure and Data.....	21
7.5 Radiated Emissions below 1GHz.....	26
7.5.1 E.U.T. Operation .....	26



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

Report No.: SZCR230300077701

Page: 5 of 34

7.5.2	Test Mode Description .....	26
7.5.3	Test Setup Diagram .....	27
7.5.4	Measurement Procedure and Data .....	27
7.6	Radiated Emissions above 1GHz .....	30
7.6.1	E.U.T. Operation .....	30
7.6.2	Test Mode Description .....	30
7.6.3	Test Setup Diagram .....	30
7.6.4	Measurement Procedure and Data .....	31
8	Test Setup Photo .....	34
9	EUT Constructional Details (EUT Photos) .....	34



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## 4 General Information

### 4.1 Details of E.U.T.

Power supply:	4.5V DC (1.5Vx3"AAA" Size Batteries) DC 5V from adapter input AC 120V/60Hz
Modulation Type:	ASK
Operation Frequency	433.92MHz
Channel Numbers:	1
Antenna Type:	Integral Antenna

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.
Adapter	Apple	A1443	REF. No.SEA05D11D
Micro USB Cable	PHILIPS	SWR2101	REF. No.SEA07A00

### 4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
20dB Bandwidth	3%
Dwell Time (15.231(e))	3%
Field Strength of the Fundamental Signal (15.231(e))	$\pm 6.0\text{dB}$
Radiated Emissions below 1GHz	$\pm 6.0\text{dB}$
Radiated Emissions above 1GHz	$\pm 4.6\text{dB}$ (1-18GHz); $\pm 4.8\text{dB}$ (18-40GHz)

Remark:

The  $U_{\text{lab}}$  (lab Uncertainty) is less than  $U_{\text{CISPR/ETSI}}$  (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.: SZCR230300077701

Page: 7 of 34

## 4.4 Test Location

All tests were performed at:

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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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## 5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2022-05-14	2025-05-13
EMI Test Receiver	Rohde&Schwarz	ESCI	SEM004-02	2023-03-20	2024-03-19
Measurement Software	AUDIX	e3 V8.2014-6-27a	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2022-07-08	2023-07-07
LISN	Rohde&Schwarz	ENV216	SEM007-01	2022-09-20	2023-09-19
LISN	ETS-LINDGREN	3816/2	SEM007-02	2023-03-20	2024-03-19

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
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2023-03-21	2024-03-20

Dwell Time (15.231(e))					
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
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2023-03-21	2024-03-20



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

Report No.: SZCR230300077701

Page: 9 of 34

Field Strength of the Fundamental Signal (15.231(e))					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2022-10-20	2023-10-19
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2021-09-17	2023-09-16
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	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 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 Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2022-10-20	2023-10-19
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2021-09-17	2023-09-16
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	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

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

Report No.: SZCR230300077701

Page: 10 of 34

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	SEM008-04	2023-03-20	2024-03-19
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

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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## 6 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.

Antenna location: Refer to Internal photos



## 7 Radio Spectrum Matter Test Results

### 7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C

Humidity: 50.5 % RH

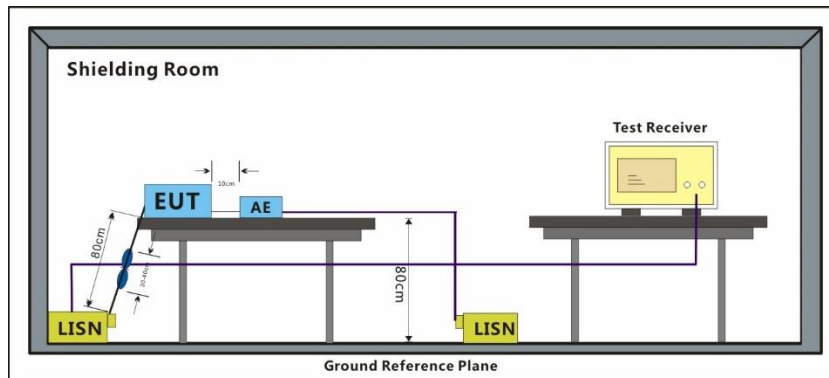
Atmospheric Pressure: 1010 mbar

#### 7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge+TX mode_Keep the EUT in continuously transmitting mode.



### 7.1.2 Test Setup Diagram



### 7.1.3 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark 1: Level=Read Level+ Cable Loss+ LISN Factor

Remark 2: all models have been tested and only the worst case of MT1001 was recorded in this report.

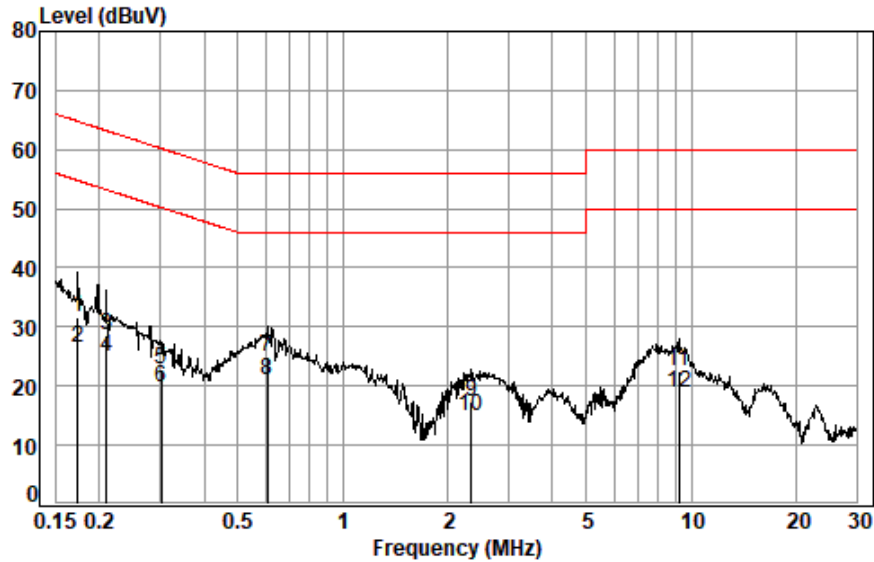
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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300077701

Page: 14 of 34

Test Mode: 00; Line: Live line



Site : Shielding Room

Condition: Line

Job No. : 00777AT

Test mode: 02

	Freq	Cable	LISN	Read	Limit	Over	
	MHz	Loss	Factor	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB
1	0.1740	0.03	9.76	21.83	31.62	64.77	-33.15 QP
2	0.1740	0.03	9.76	16.56	26.35	54.77	-28.42 Average
3	0.2094	0.04	9.76	18.75	28.55	63.23	-34.68 QP
4	0.2094	0.04	9.76	15.13	24.93	53.23	-28.30 Average
5	0.3019	0.04	9.76	13.06	22.86	60.19	-37.33 QP
6	0.3019	0.04	9.76	9.99	19.79	50.19	-30.40 Average
7 *	0.6075	0.06	9.77	15.18	25.01	56.00	-30.99 QP
8 *	0.6075	0.06	9.77	11.01	20.84	46.00	-25.16 Average
9	2.3460	0.11	9.83	7.44	17.38	56.00	-38.62 QP
10	2.3460	0.11	9.83	5.00	14.94	46.00	-31.06 Average
11	9.2043	0.20	10.21	12.19	22.60	60.00	-37.40 QP
12	9.2043	0.20	10.21	8.38	18.79	50.00	-31.21 Average



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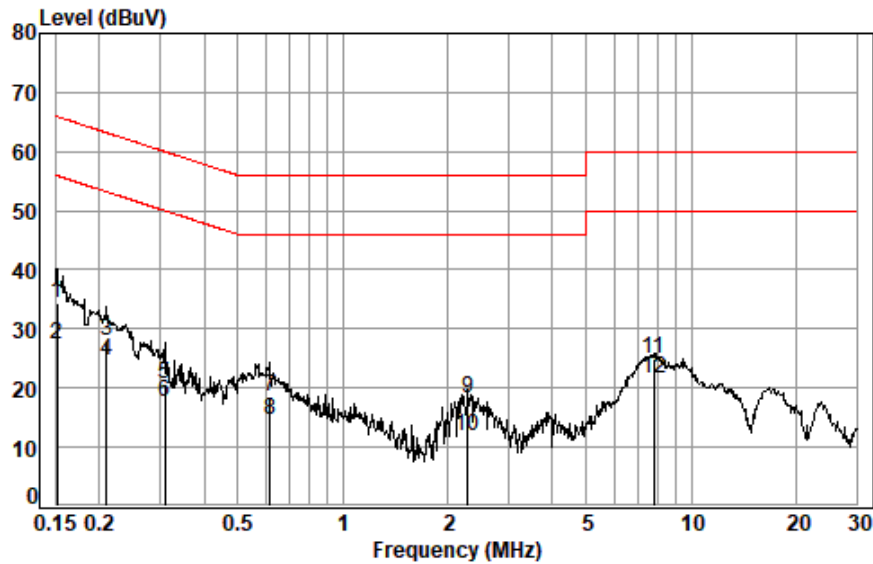
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Test Mode: 00; Line: Neutral Line



Site : Shielding Room

Condition: Neutral

Job No. : 00777AT

Test mode: 02

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 *	0.1516	0.03	9.74	24.75	34.52	65.91	-31.39	QP
2	0.1516	0.03	9.74	17.63	27.40	55.91	-28.51	Average
3	0.2106	0.04	9.73	18.18	27.95	63.18	-35.23	QP
4	0.2106	0.04	9.73	14.81	24.58	53.18	-28.60	Average
5	0.3083	0.04	9.73	10.83	20.60	60.02	-39.42	QP
6	0.3083	0.04	9.73	7.75	17.52	50.02	-32.50	Average
7	0.6173	0.06	9.74	8.77	18.57	56.00	-37.43	QP
8	0.6173	0.06	9.74	4.87	14.67	46.00	-31.33	Average
9	2.2847	0.11	9.80	8.48	18.39	56.00	-37.61	QP
10	2.2847	0.11	9.80	1.98	11.89	46.00	-34.11	Average
11	7.8102	0.19	10.13	14.53	24.85	60.00	-35.15	QP
12 *	7.8102	0.19	10.13	11.41	21.73	50.00	-28.27	Average



### 7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.231(c)

Test Method: ANSI C63.10 (2013) Section 6.9

Limit:

Frequency range(MHz)	Limit
70-900	No wider than 0.25% of the center frequency
Above 900	No wider than 0.5% of the center frequency

Remark: For this device, the limit is  $433.92\text{MHz} \times 0.25\% = 1.0848\text{MHz}$

#### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24.5 °C

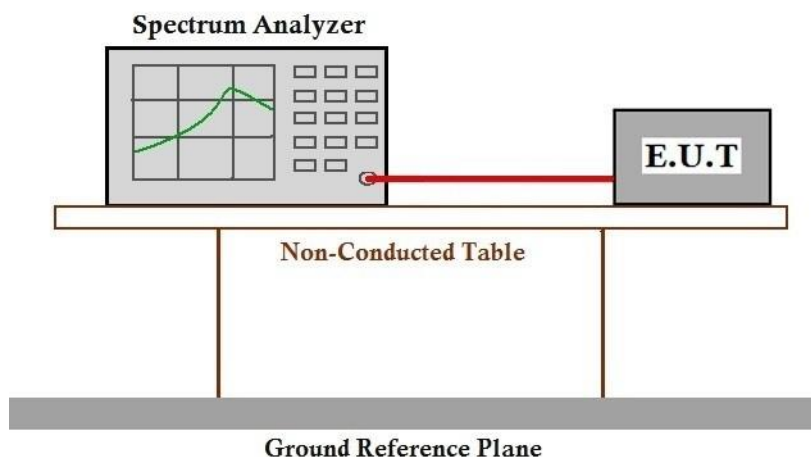
Humidity: 41.0 % RH

Atmospheric Pressure: 1015 mbar

#### 7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge+TX mode_Keep the EUT in continuously transmitting mode.
Pre-scan	03	TX mode_Keep the EUT in continuously transmitting mode.

#### 7.2.3 Test Setup Diagram





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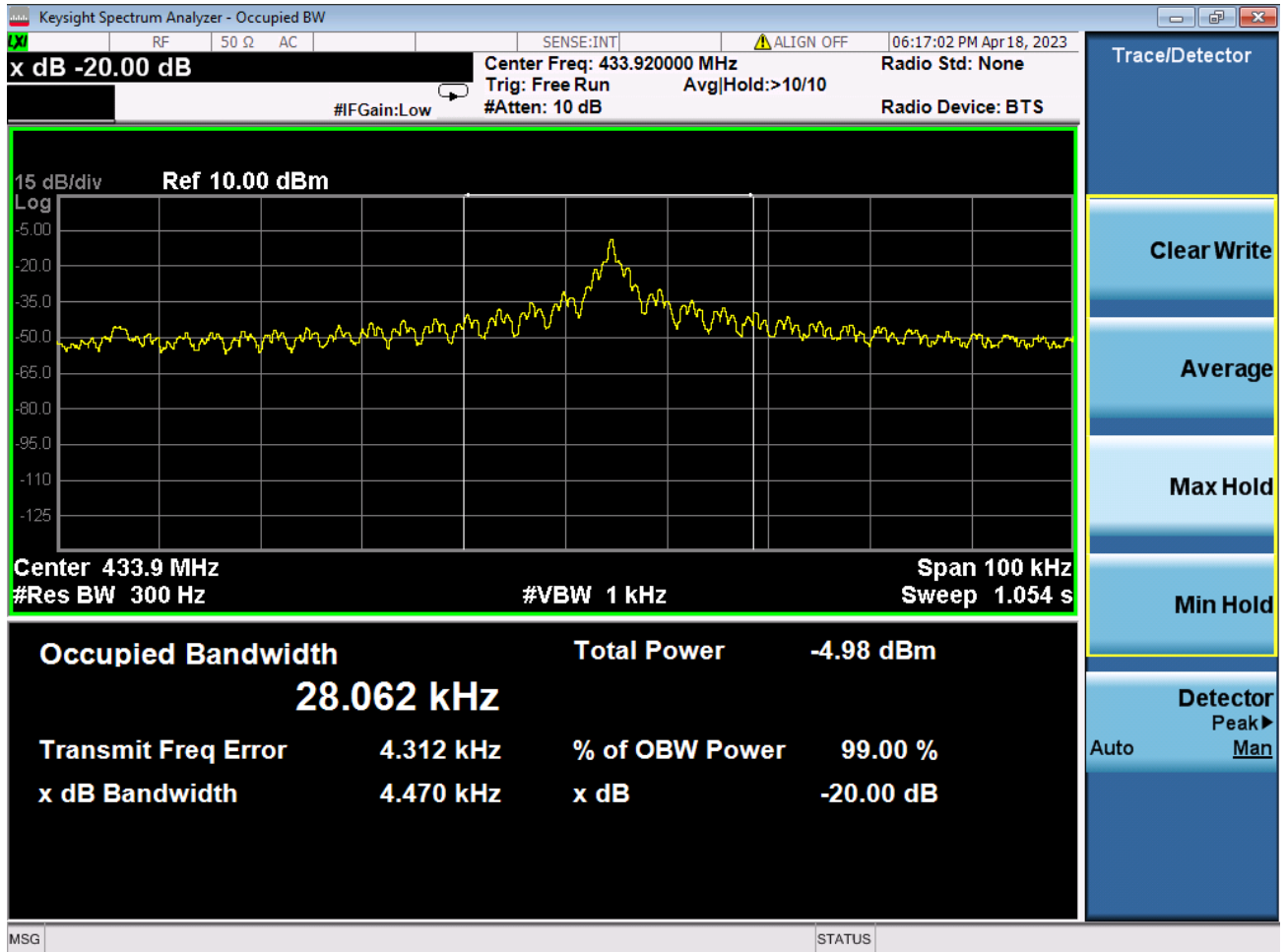
SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300077701

Page: 17 of 34

### 7.2.4 Measurement Procedure and Data

Test Channel	Bandwidth	Limit	Verdict
433.92MHz	28.062kHz	1.0848MHz	PASS



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### 7.3 Dwell Time (15.231(e))

Test Requirement 47 CFR Part 15, Subpart C 15.231(e)

Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

Device type	Limit
Manually operated transmitter	The switch automatically deactivate the transmitter within not more than 5 seconds of being released
Automatically active transmitter	Cease transmission within 5 seconds after activation
Periodic transmissions to determine system integrity of transmitters used in security or safety applications	The total transmission time does not exceed 2 seconds per hour

**Remark: this device is an Automatically active transmitter.**

#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24.5 °C

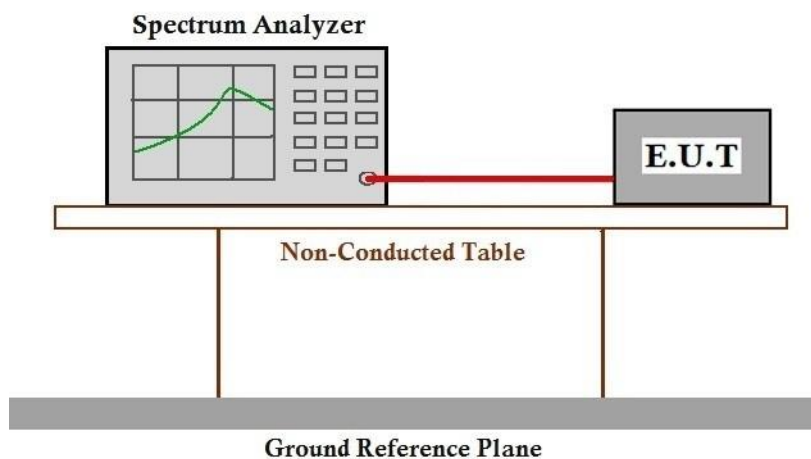
Humidity: 41.0 % RH

Atmospheric Pressure: 1015 mbar

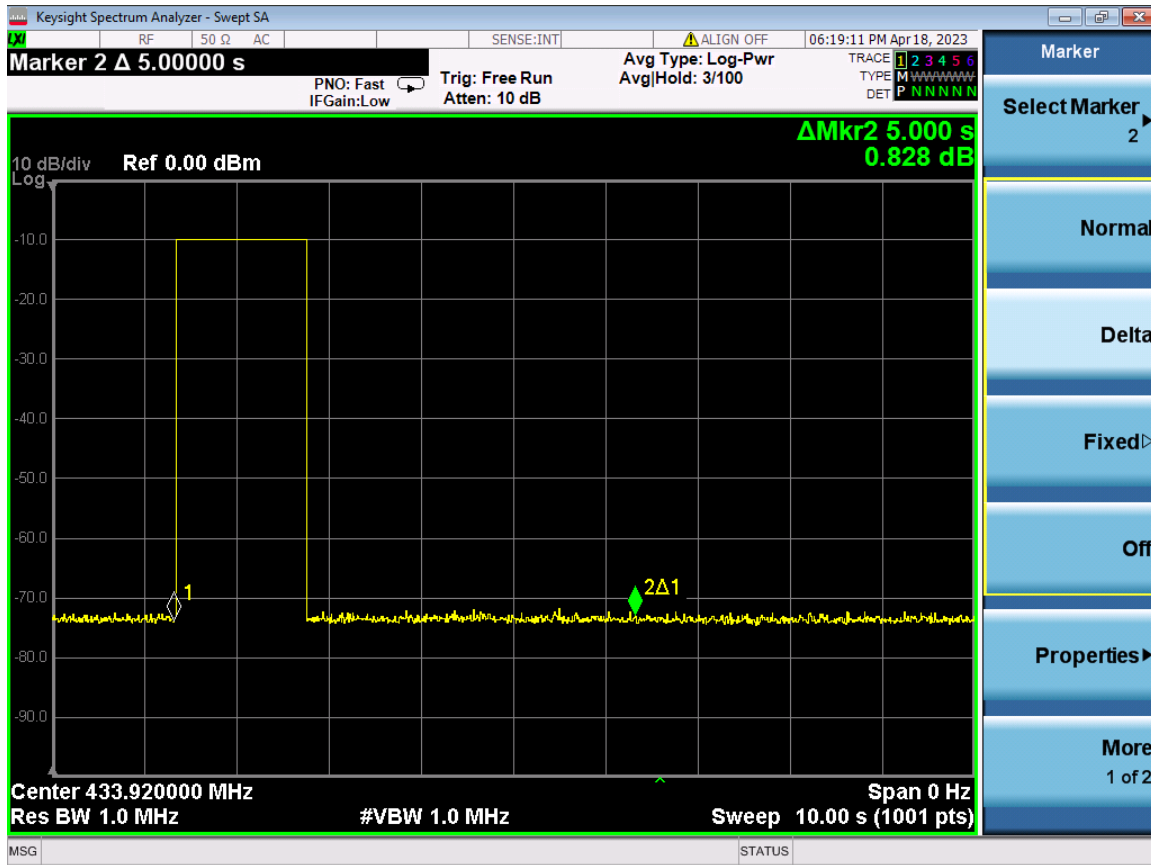
#### 7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge+TX mode_Keep the EUT in continuously transmitting mode.
Pre-scan	03	TX mode_Keep the EUT in continuously transmitting mode.

#### 7.3.3 Test Setup Diagram



### 7.3.4 Measurement Procedure and Data



## 7.4 Field Strength of the Fundamental Signal (15.231(e))

Test Requirement Field Strength of the Fundamental Signal (15.231(e))

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

Measurement Distance: 3m

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of spurious emissions(microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

Remark: the emission limit is based on measurement instrumentation employing an average detector at a distance of 3 meters. 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.

### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

Humidity: 47.6 % RH

Atmospheric Pressure: 1015 mbar

### 7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge+TX mode_Keep the EUT in continuously transmitting mode.
Pre-scan	03	TX mode_Keep the EUT in continuously transmitting mode.



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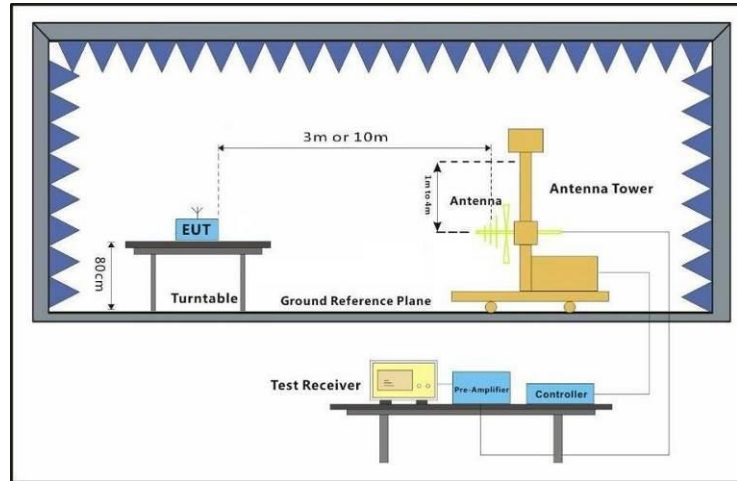
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### 7.4.3 Test Setup Diagram



### 7.4.4 Measurement Procedure and Data

- 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.
- 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.
- 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.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.
- The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

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

The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle), where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log(12.7043/35.08) = -8.82 \text{ dB}$$

Here:

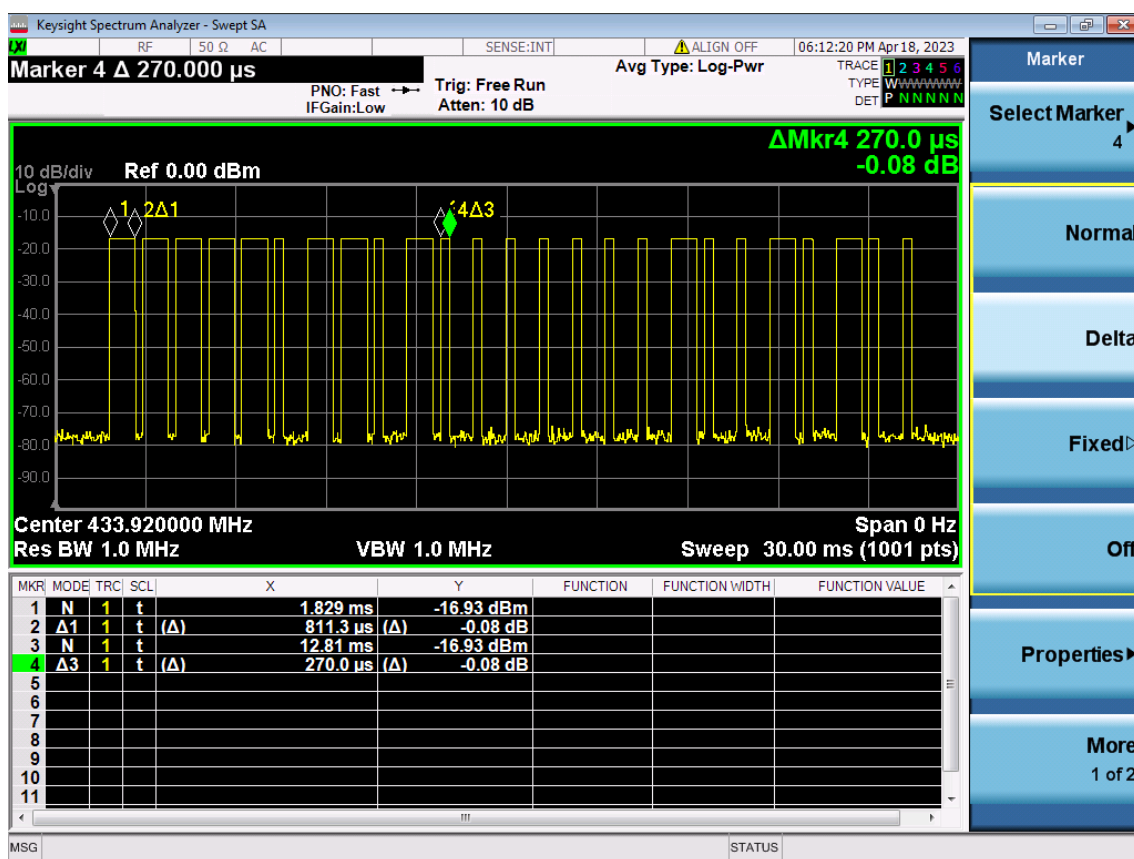
$$\text{Duty cycle} = \text{Ton\_cum} / \text{Ton+off}$$

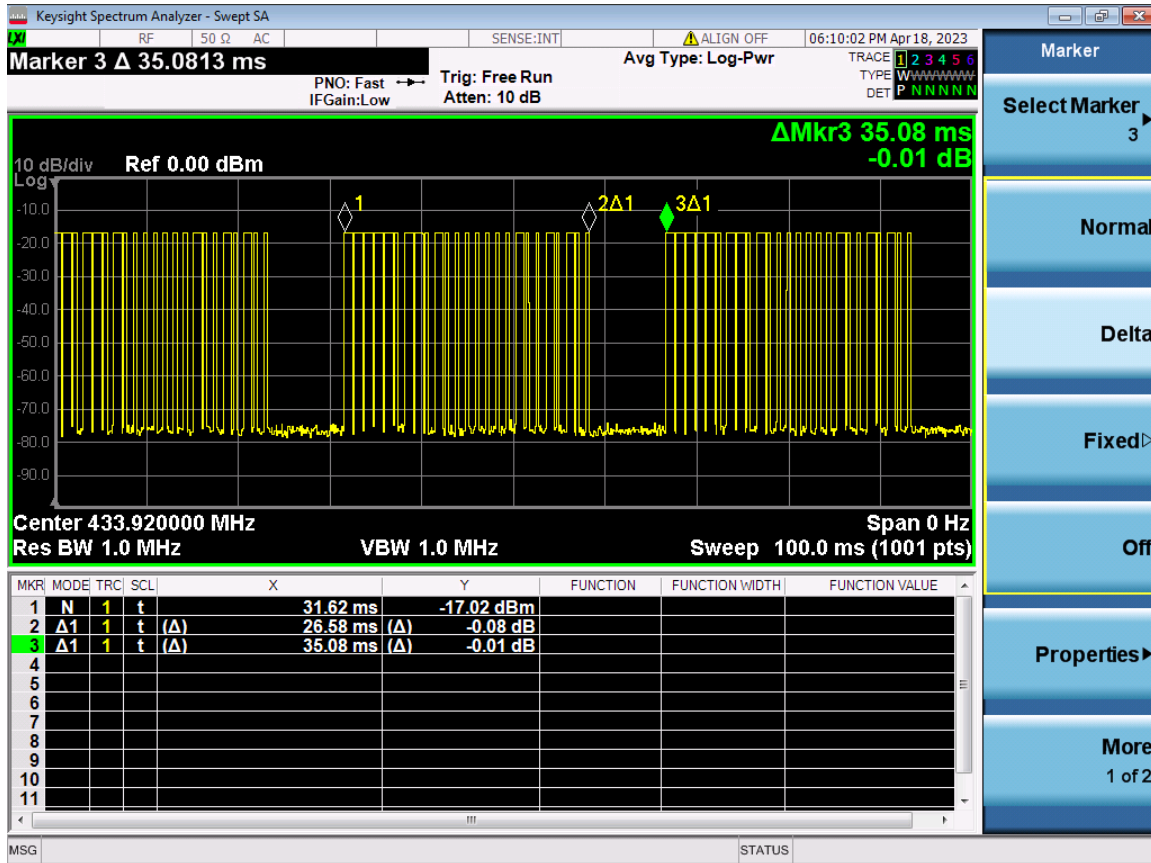
$$\text{Ton\_cum} = 0.8113 \times 11 + 0.27 \times 14 = 12.7043 \text{ ms}$$

$$\text{Ton+off} = 35.08 \text{ ms}$$

$$\text{duty cycle} = 12.7043/35.08 = 36.22\%$$

Please refer to below plot for more details.





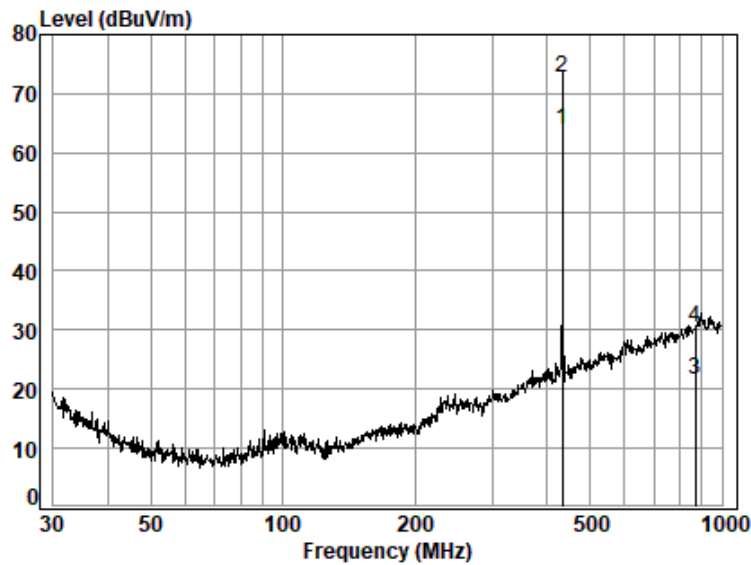
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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300077701

Page: 24 of 34

Test Mode: 02; Polarity: Horizontal



Site : chamber  
Condition: 3m HORIZONTAL  
Job No. : 00777AT  
Test Mode: 02

	Ant Freq	Cable Factor	Preamp Loss	Read Factor	Level Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dB	
1	434.07	21.29	2.59	26.60	66.47	63.75	72.87	-9.12 Average
2 p	434.07	21.29	2.59	26.60	75.29	72.57	92.87	-20.30 Peak
3	869.13	27.97	3.92	26.02	15.85	21.72	52.87	-31.15 Average
4	869.13	27.97	3.92	26.02	24.67	30.54	72.87	-42.33 Peak



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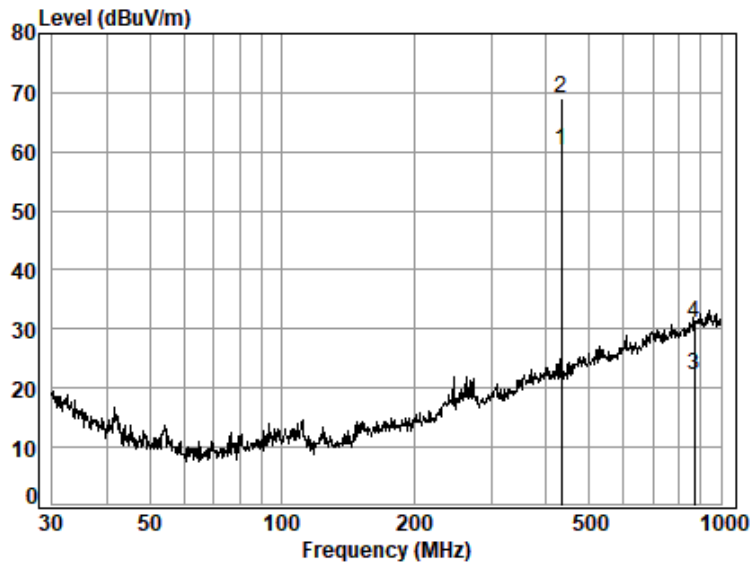
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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300077701

Page: 25 of 34

Test Mode: 02; Polarity: Vertical



Site : chamber

Condition: 3m VERTICAL

Job No. : 00777AT

Test Mode: 02

		Ant	Cable	Preamp	Read	Limit	Over	
	Freq	Factor	Loss	Factor	Level	Level	Line	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	434.07	21.29	2.59	26.60	63.07	60.35	72.87	-12.52 Average
2 p	434.07	21.29	2.59	26.60	71.89	69.17	92.87	-23.70 Peak
3	869.13	27.97	3.92	26.02	16.28	22.15	52.87	-30.72 Average
4	869.13	27.97	3.92	26.02	25.10	30.97	72.87	-41.90 Peak



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

Report No.: SZCR230300077701

Page: 26 of 34

## 7.5 Radiated Emissions below 1GHz

Test Requirement 47 CFR Part 15C Section 15.231(b) and 15.209

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
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C

Humidity: 53.5 % RH

Atmospheric Pressure: 1010 mbar

### 7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge+TX mode_Keep the EUT in continuously transmitting mode.
Pre-scan	03	TX mode_Keep the EUT in continuously transmitting mode.



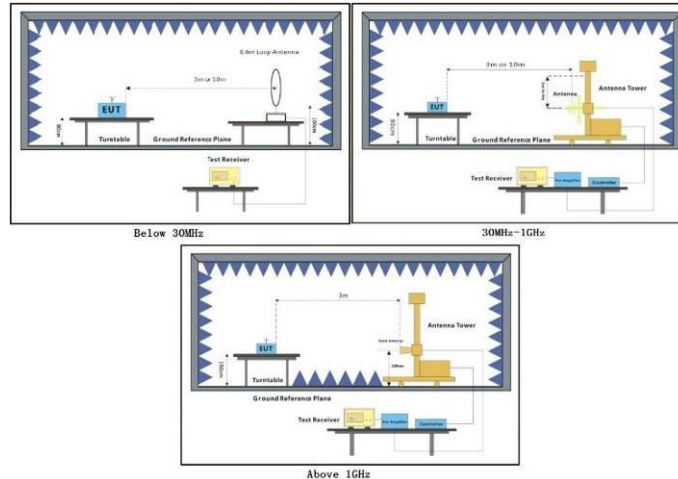
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### 7.5.3 Test Setup Diagram



### 7.5.4 Measurement Procedure and Data

- 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.
- 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.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.
- The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Remark:

- 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
- Scan from 9kHz to 1GHz, 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.

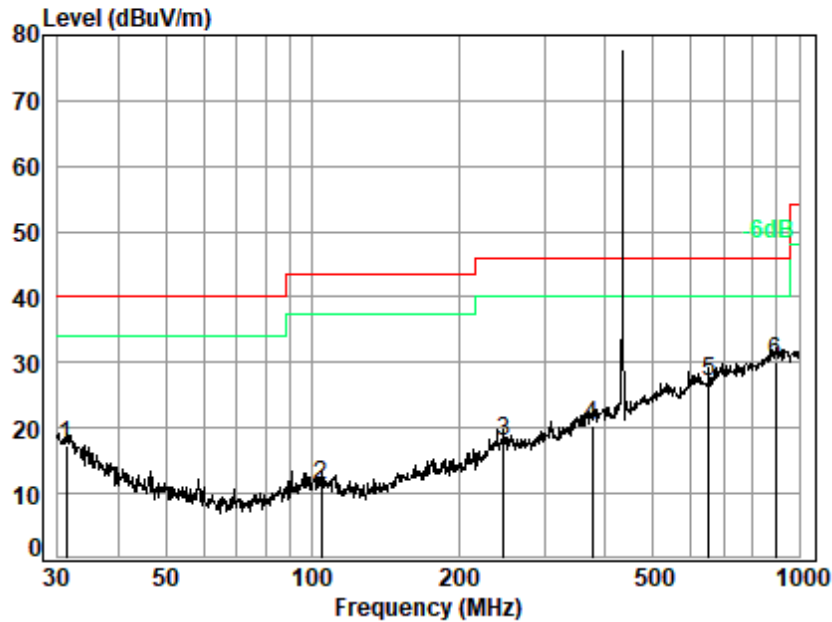
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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300077701

Page: 28 of 34

Test Mode: 02; Polarity: Horizontal



Site : chamber  
Condition: 3m HORIZONTAL  
Job No. : 00777AT  
Test Mode: 02

	Ant Freq	Cable Factor	Preamp Loss	Read Factor	Level	Limit	Over	
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	31.18	20.73	0.63	27.23	23.18	17.31	40.00	-22.69 QP
2	104.17	12.96	1.16	26.98	24.21	11.35	43.50	-32.15 QP
3	247.68	17.93	1.90	26.41	24.45	17.87	46.00	-28.13 QP
4	375.94	21.38	2.39	26.43	23.18	20.52	46.00	-25.48 QP
5	651.94	24.97	3.28	26.89	25.85	27.21	46.00	-18.79 QP
6 q	893.86	28.94	4.01	25.92	23.09	30.12	46.00	-15.88 QP



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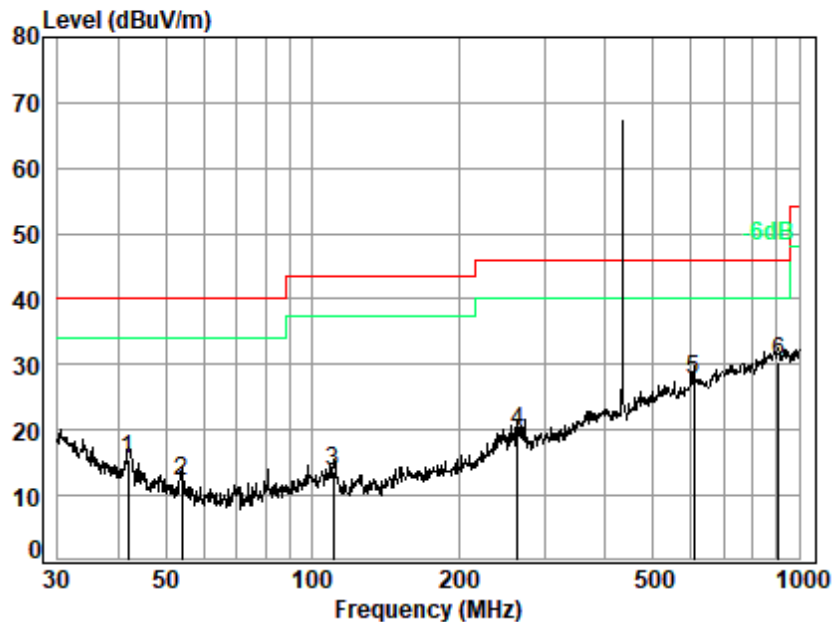
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Test Mode: 02; Polarity: Vertical



Site : chamber  
Condition: 3m VERTICAL  
Job No. : 00777AT  
Test Mode: 02

	Ant	Cable	Preamp	Read		Limit	Over	
	Freq	Factor	Loss	Factor	Level	Level	Line	Limit Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	41.86	14.66	0.69	27.19	27.33	15.49	40.00	-24.51 QP
2	54.07	12.01	0.81	27.15	26.49	12.16	40.00	-27.84 QP
3	110.57	12.47	1.20	26.96	26.94	13.65	43.50	-29.85 QP
4	263.82	17.85	1.96	26.34	26.19	19.66	46.00	-26.34 QP
5	607.79	25.62	3.14	27.07	26.05	27.74	46.00	-18.26 QP
6 q	906.48	28.50	4.04	25.87	23.77	30.44	46.00	-15.56 QP



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### 7.6 Radiated Emissions above 1GHz

Test Requirement 47 CFR Part 15C Section 15.231(b) and 15.209

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

Measurement Distance: 3m

#### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.4 °C

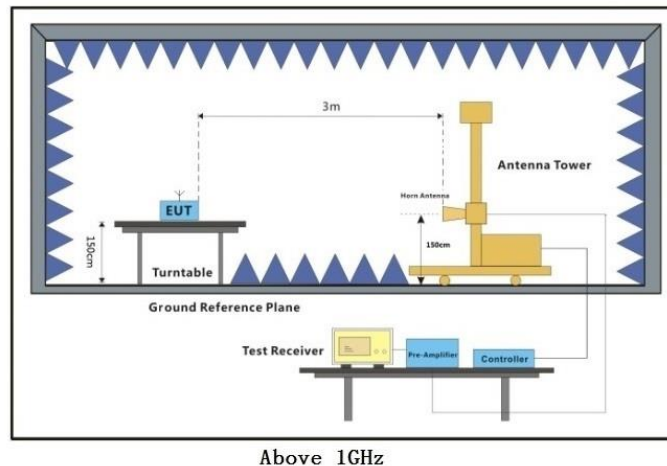
Humidity: 52.1 % RH

Atmospheric Pressure: 1010 mbar

#### 7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge+TX mode_Keep the EUT in continuously transmitting mode.
Pre-scan	03	TX mode_Keep the EUT in continuously transmitting mode.

#### 7.6.3 Test Setup Diagram



## 7.6.4 Measurement Procedure and Data

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.
- The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Remark:

- 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
- For frequencies above 1GHz, 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.



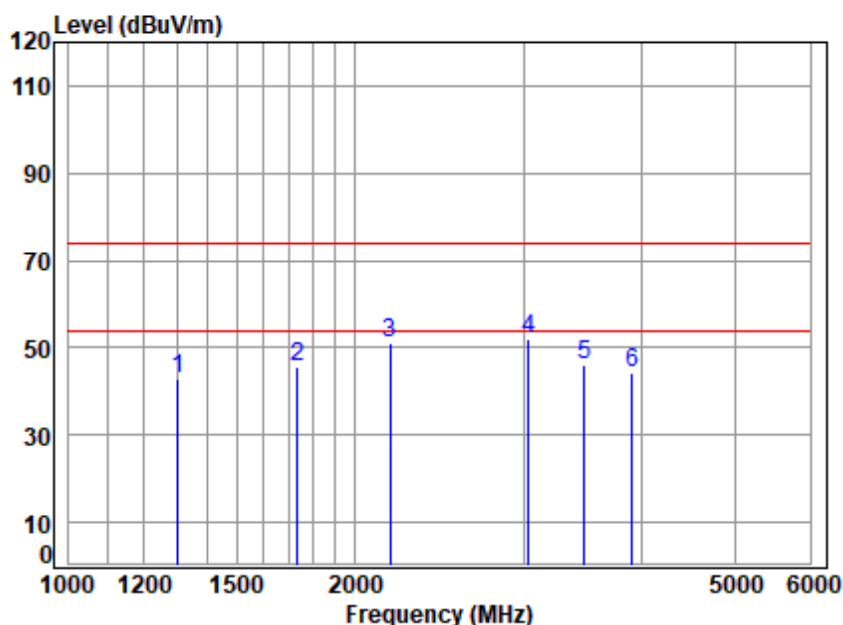
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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300077701

Page: 32 of 34

Test Mode: 02; Polarity: Horizontal



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00777AT  
Mode : 433 TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1301.760	2.96	24.71	38.63	53.79	42.83	74.00	-31.17	Peak
2	1736.483	3.53	26.80	38.88	53.99	45.44	74.00	-28.56	Peak
3	2172.398	4.01	28.25	39.10	57.97	51.13	74.00	-22.87	Peak
4	3037.063	4.87	31.17	39.53	55.61	52.12	74.00	-21.88	Peak
5	3473.883	5.56	31.75	39.91	48.52	45.92	74.00	-28.08	Peak
6	3902.968	6.15	32.60	40.23	45.91	44.43	74.00	-29.57	Peak



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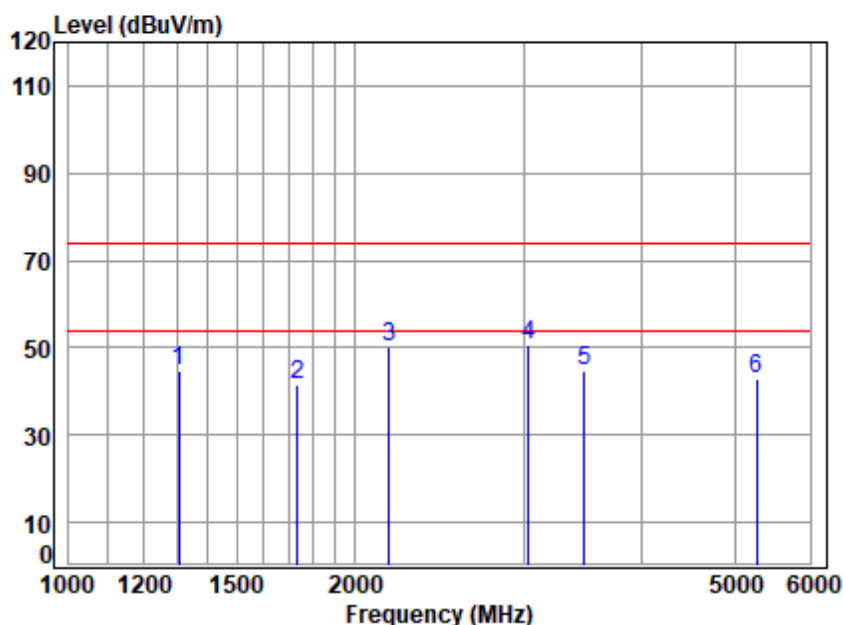
## SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

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

Report No.: SZCR230300077701

Page: 33 of 34

Test Mode: 02; Polarity: Vertical



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00777AT  
Mode : 433 TX RSE

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1303.666	2.96	24.71	38.63	55.79	44.83	74.00	-29.17 Peak
2	1736.483	3.53	26.80	38.88	50.28	41.73	74.00	-32.27 Peak
3	2168.510	4.01	28.26	39.10	56.96	50.13	74.00	-23.87 Peak
4	3037.063	4.87	31.17	39.53	54.23	50.74	74.00	-23.26 Peak
5	3473.883	5.56	31.75	39.91	47.30	44.70	74.00	-29.30 Peak
6	5273.809	7.49	34.10	41.12	42.40	42.87	74.00	-31.13 Peak



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## 8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZCR2303000777AT

## 9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for SZCR2303000777AT

- End of the Report -



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