RF TEST REPORT

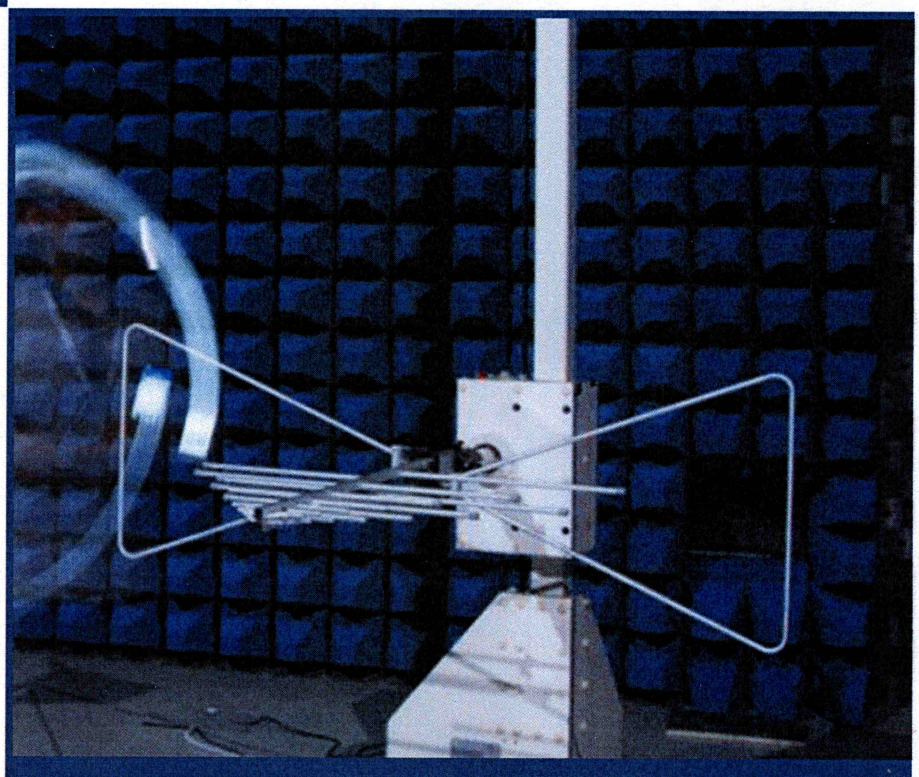
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Wireless data capture terminal

ISSUED TO
Huizhou Techzen I.O.T Science and Technology Co., Ltd.

No.10, Lane 1, Huifeng Road(East), Zhongkai High-Tech Zone, Huizhou City, China



Tested by: Xiong Chong
Xiong Chong
Date Jul.28,2021

Approved by:
Liao Jianming
(Technical Director)
Date Jul.28,2021

Report No.:	BL-SZ2140248-402
EUT Name:	Wireless data capture terminal
Model Name:	TZ2GDDZF
Brand Name:	Techzen ® 天泽图丰
Test Standard:	47 CFR Part 15 Subpart C
	RSS-310 Issue 5
	RSS-Gen Issue 5
FCC ID:	2A2F8TZ2GDDZF
ISED Number:	27491-TZ2GDDZF
Test Conclusion:	Pass
Test Date:	Apr. 04, 2021 ~ Jun. 30, 2021
Date of Issue:	Jul. 28, 2021

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Revision History

Version	Issue Date	Revisions
Rev. 01	Jul. 28, 2021	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20℃ to 25℃
Ambient Relative Humidity	30% to 60%
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

(1) The test report reference to the report template version v1.0.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

(7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Huizhou Techzen I.O.T Science and Technology Co., Ltd.
Address	No.10, Lane 1, Huifeng Road(East), Zhongkai High-Tech Zone, Huizhou City, China

2.2 Manufacturer Information

Manufacturer	Huizhou Techzen I.O.T Science and Technology Co., Ltd.
Address	No.10, Lane 1, Huifeng Road(East), Zhongkai High-Tech Zone, Huizhou City, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Wireless data capture terminal
Model Name Under Test	TZ2GDDZF
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	DC Line	
	Model No.	N/A
	Length (Approx.)	1.0 m
Ancillary Equipment 2	RFID Card	

2.6 Technical Information

Network and Wireless connectivity	ZigBee, RFID

The requirement for the following technical information of the EUT was tested in this report:

Modulation Type	ASK
Product Type	☐ Mobile ☐ Portable ☒ Fix Location
Frequency Range	120kHz-130kHz
Receiver Categorization	3
Number of channel	1
Tested Channel	1
Antenna Type	Dipole Antenna

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-19 Edition)	Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
3	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
4	RSS-310 Issue 5	Licence-Exempt Radio Apparatus: Category II Equipment

3.2 Verdict

No.	Description	FCC Part No.	ISED Part No.	Test Result	Verdict
1	Radiated Emission	15.209,15.215 (b)	RSS-310 10.6 RSS-Gen 8.9	Annex A.1	Pass
2	Conducted Emission, AC Ports	15.207	RSS-Gen 8.8	Annex A.2	Pass
3	Emissions Bandwidth	15.215(c)	RSS-Gen 6.7	Annex A.3	Pass
4	Frequency Stability	15.215(c)	RSS-Gen 6.11	Annex A.4	Pass

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	2.96 dB
Radiated emissions (30 MHz-1 GHz)	3.67 dB
Radiated emissions (1 GHz-18 GHz)	3.57 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

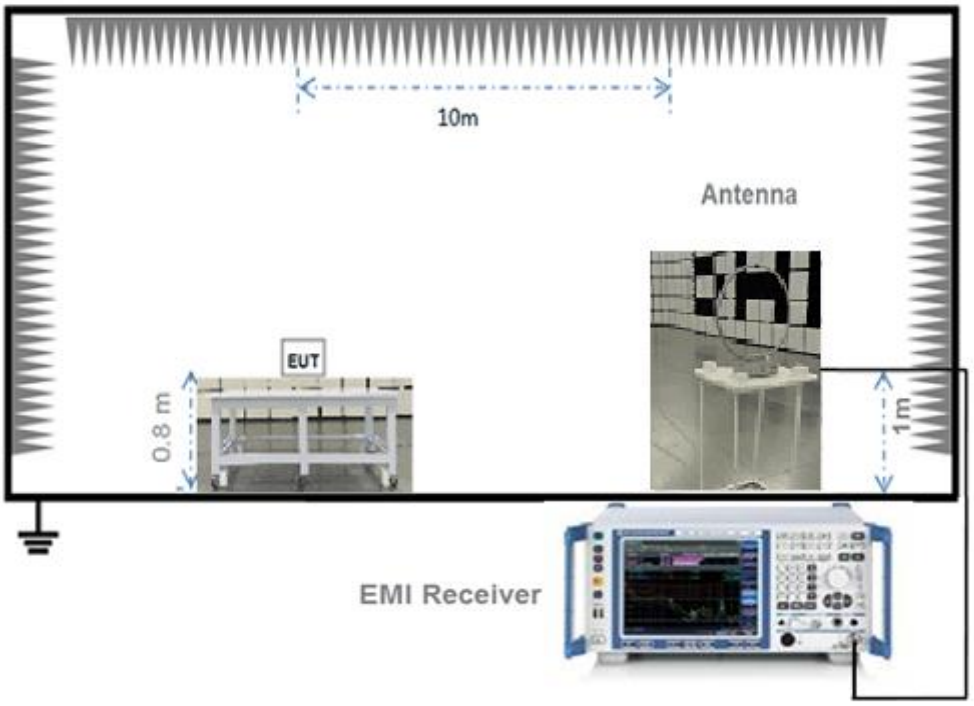
Relative Humidity	30% to 60%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
Working Voltage of the EUT	NV (Normal Voltage)	9V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2020.06.09	2021.06.08
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.06.01	2022.05.31
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2019.10.29	2021.10.28
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2019.07.02	2022.07.01
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2018.08.08	2021.08.07
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2020.06.09	2021.06.08
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2021.06.01	2022.05.31
LISN	SCHWARZBECK	NSLK 8127	8127-687	2021.06.08	2022.06.07
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.4m*3.1m*2.8m	N/A	2018.08.16	2021.08.15
Test Software	BALUN	BL410_E	V19.918	--	--

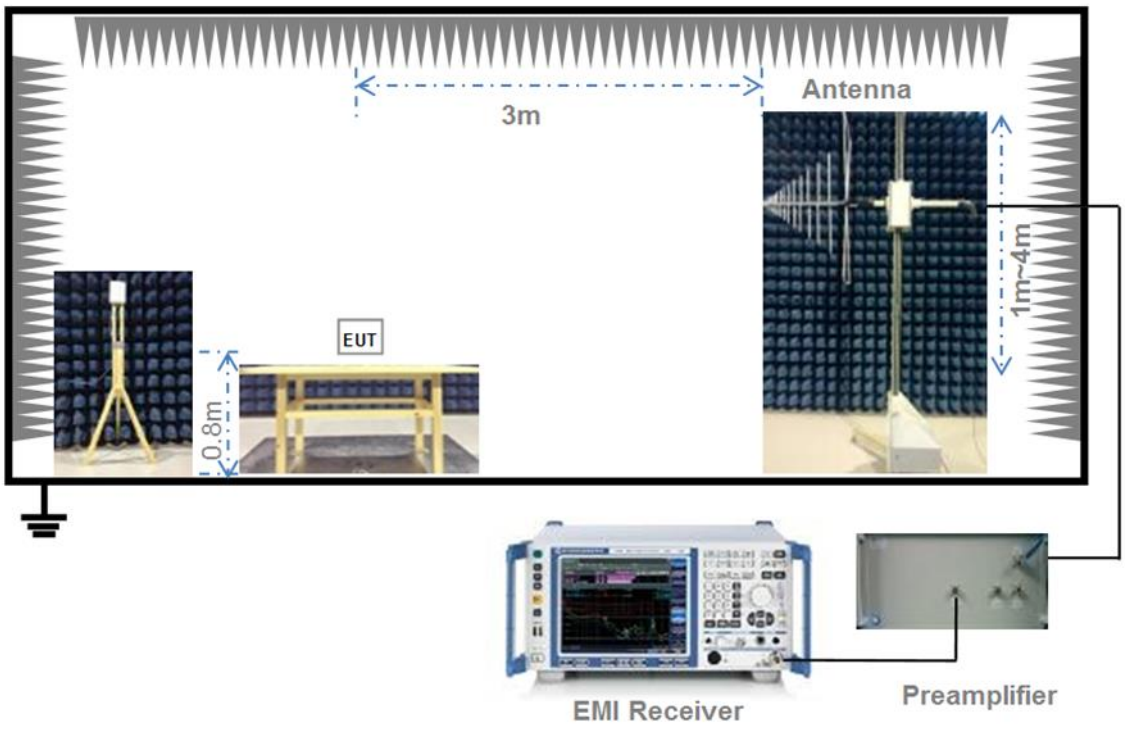
4.3 Test Setups

Test Setup 1



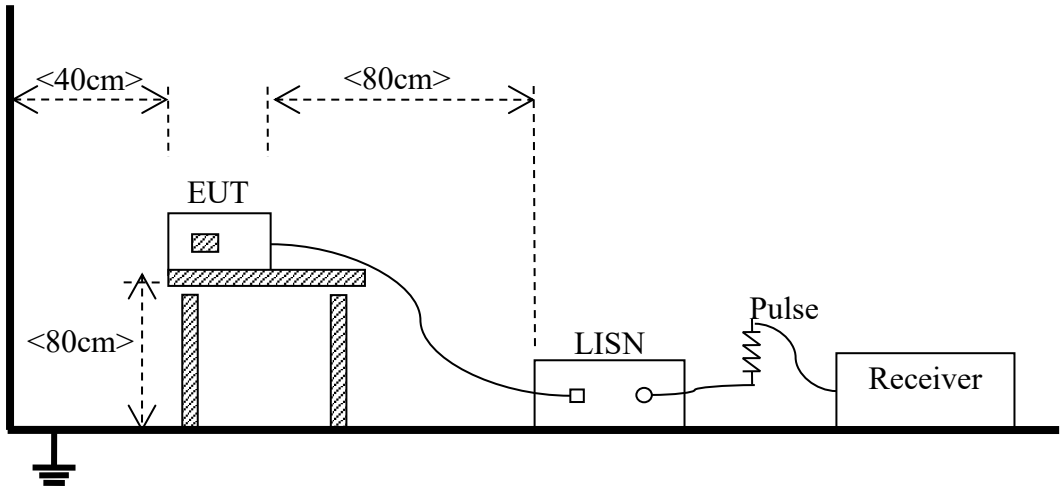
For Radiated Emission Test (Below 30 MHz))

Test Setup 2



(For Radiated Emission Test (30 MHz-1 GHz))

Test Setup 3



(For Conducted Emission, AC Ports Test)

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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

NOTE:

1) Field Strength (dBμV/m) = 20*log [Field Strength (μV/m)].

2) In the emission tables above, the tighter limit applies at the band edges.

3) For above 1000 MHz, limit field strength of harmonics: 54 dBuV/m@3 m (AV) and 74 dBuV/m@3 m (PK)

4) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). For example, at the frequency 9 kHz, limit @10m = 20*log (2400/f) + 40log (dlimit/dmeasure) where limit = 300m, dmeasure=10m. limit @10m = 20*log (2400/9) + 40log (300/10) = 107.5 (dBμV/m).

5) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided, When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements). For example, at the frequency 30 MHz, limit @10m = 20*log (100) + 20log (dlimit/dmeasure) where limit = 3m, dmeasure=10m. limit @10m = 20*log (100) + 20log (3/10) = 29.5 (dBμV/m).

5.1.1.2 Test Setup

Refer to 4.3 section (test setup 1 to test setup 2) for radiated emission test, the photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain (dB)

3. Over limit = Results – Limit.

5.1.2 Conducted Emission

5.1.2.1 Test Limit

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

1) The limit is applicable to Class B ITE.
2) The lower limit shall apply at the band edges.
3) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Refer to 4.3 section test (test setup 3) for conducted emission, the photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor = Insertion loss + Cable loss

3. Over limit = Results – Limit.

5.1.3 Emission bandwidth

5.1.3.1 Limit

FCC §15.215(c)

The 20 dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth (10*log1%=20 dB) taking the total RF output power.

5.1.3.2 Test Setup

Refer to 4.3 section test (test setup 1) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Frequency stability

5.1.4.1 Limit

Frequency stability is a measure of frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage.

When the measurement method of transmitter frequency stability is not stated in the applicable RSS or

reference standards, the f ollowing conditions apply:

(a)The reference temperature for radio transmitters is +20°C (+68°F).

(b)A hand-held device that is only capable of operating using internal batteries shall be tested at the battery's nominal voltage, and again at the battery's operating end-point voltage, which shall be specified by the equipment manufacturer. For this test, either a battery or an external power supply can be used.

(c)The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency-determining

circuit element shall be made subsequent to this initial set-up.

With the transmitter installed in an environmental test chamber, the unmodulated carrier frequency and

frequency stability shall be measured under the conditions specified below for licensed and licence-exempt devices, unless specified otherwise in the applicable RSS. A suf f icient stabilization period at each temperature shall be used prior to each frequency measurement.

For licensed devices, the following measurement conditions apply:

(a)at the temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supplyvoltage

(b)at the temperature of+20°C (+68°F)and at ±15% of the manufacturer's rated supply voltage

If the f requency stability limits are only met within a temperaturerange that is smaller than the range

specif ied in (a) for licensed or licence-exempt devices, the f requency stability requirement will be deemed to be met if the transmitter is automatically prevented from operating outside this smaller temperature range and if the published operating characteristics f or the equipment are revised to reflect this restricted temperature range.

If the device contains both licence and licence-exempt transmitter modules, the device's frequency stability shall be measured under the most stringent condition specified in the applicable RSS of the transmitter module.

In addition, if an unmodulated carrier is not available, the method used to measure frequency stability shall be described in the test report.

5.1.4.2 Test Setup

Refer to 4.3 section test (test setup 1) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

1. The test is performed in a Temperature Chamber.
2. The EUT is configured as MS + DC Power Supply.

5.1.4.4 Test Result

Please refer to ANNEX A.4.

ANNEX A TEST RESULTS

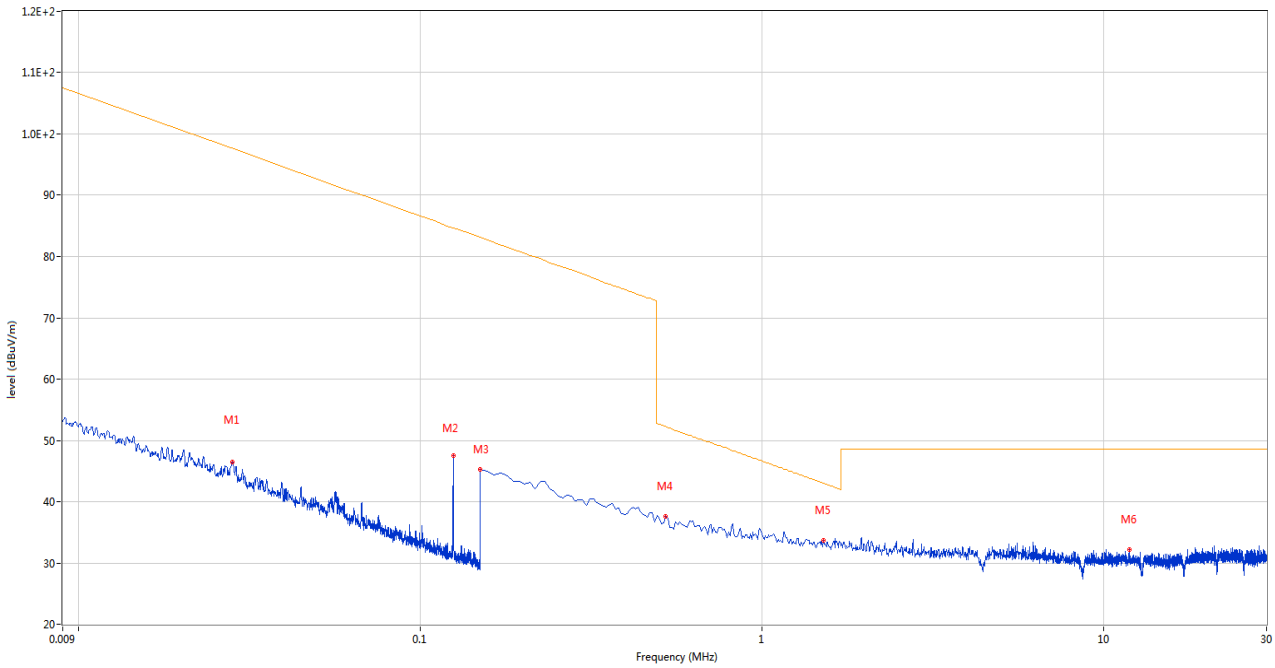
A.1 Radiated Emission

Note [1]: The symbol of "--" in the table which means not application.

Note [2]: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

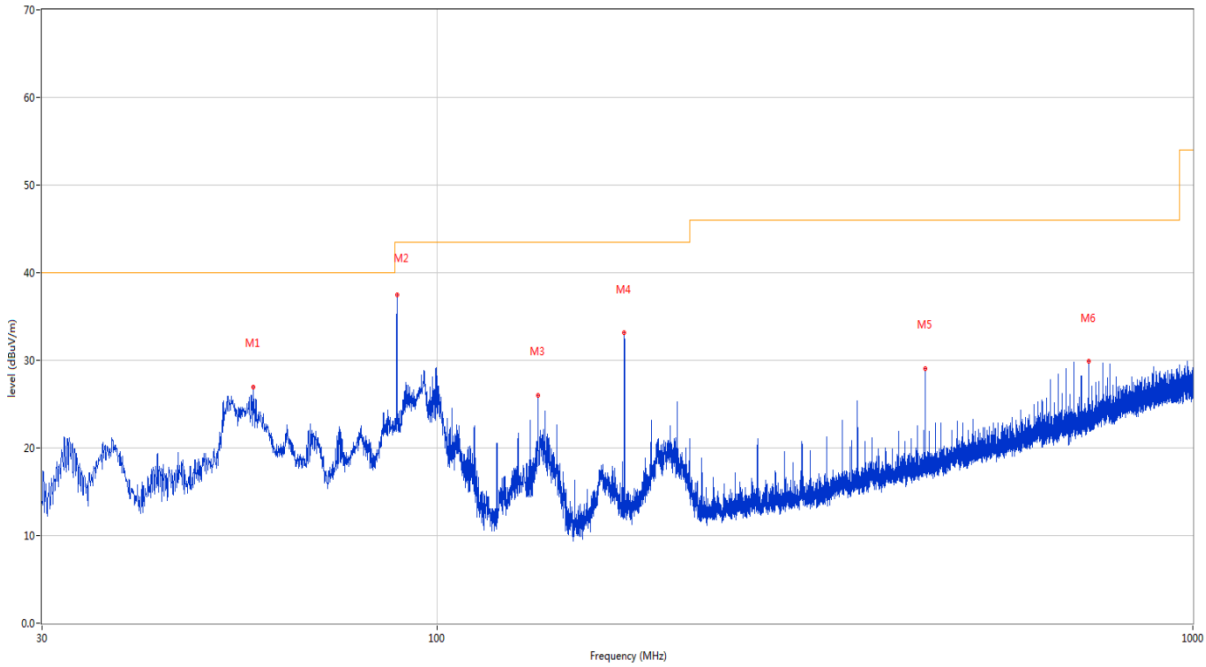
Test Data and Plots

A.1.1 Test Antenna Vertical, 9 kHz –30 MHz



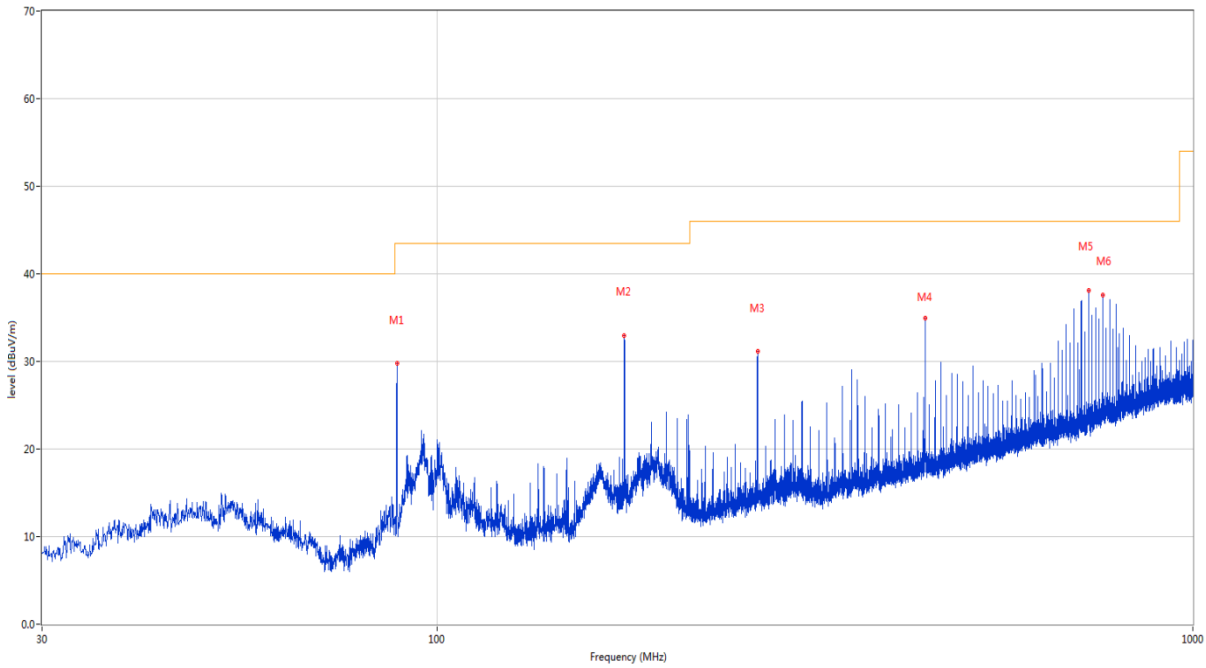
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.028	46.39	20.15	97.6	-51.21	Peak	88.00	100	Vertical	Pass
2	0.125	47.51	20.16	84.6	-37.09	Peak	185.00	100	Vertical	N/A
3	0.150	45.21	20.15	83.1	-37.89	Peak	318.00	100	Vertical	Pass
4	0.523	37.52	20.28	52.2	-14.68	Peak	140.00	100	Vertical	Pass
5	1.516	33.70	20.51	43.0	-9.30	Peak	52.00	100	Vertical	Pass
6	11.903	32.16	20.85	48.5	-16.34	Peak	228.00	100	Vertical	Pass

A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	57.111	26.97	-23.90	40.0	-13.03	Peak	35.70	100	Vertical	Pass
2	88.491	37.45	-26.41	43.5	-6.05	Peak	91.60	100	Vertical	Pass
3	136.021	25.97	-27.52	43.5	-17.53	Peak	301.00	100	Vertical	Pass
4	176.955	33.12	-26.25	43.5	-10.38	Peak	151.30	100	Vertical	Pass
5	442.396	29.06	-17.83	46.0	-16.94	Peak	151.30	100	Vertical	Pass
6	728.012	29.85	-12.55	46.0	-16.15	Peak	177.50	100	Vertical	Pass

A.1.3 Test Antenna Horizontal, 30 MHz – 1 GHz



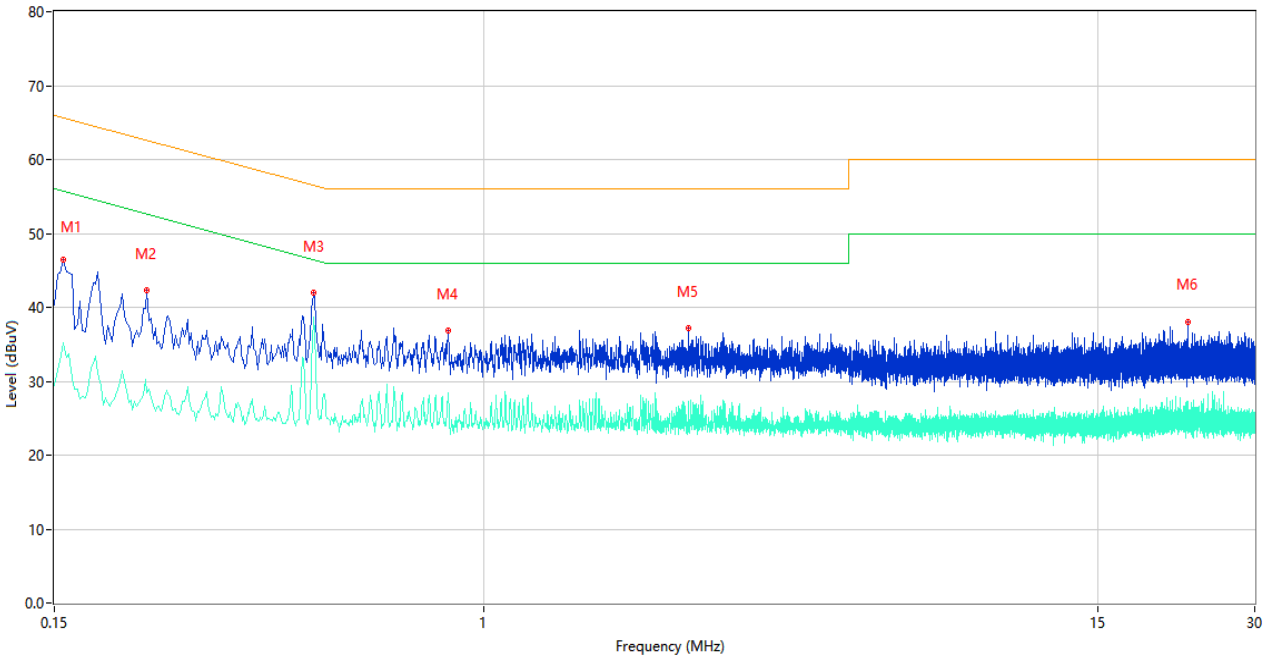
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	88.491	29.74	-26.41	43.5	-13.76	Peak	189.80	200	Horizontal	Pass
2	176.955	32.98	-26.25	43.5	-10.52	Peak	305.20	200	Horizontal	Pass
3	265.419	31.15	-22.17	46.0	-14.85	Peak	64.90	100	Horizontal	Pass
4	442.396	34.93	-17.83	46.0	-11.07	Peak	3.60	100	Horizontal	Pass
5	727.964	38.06	-12.54	46.0	-7.94	Peak	107.40	100	Horizontal	Pass
6	759.974	37.55	-11.80	46.0	-8.45	Peak	94.70	100	Horizontal	Pass

A.2 Conducted Emission

Note: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

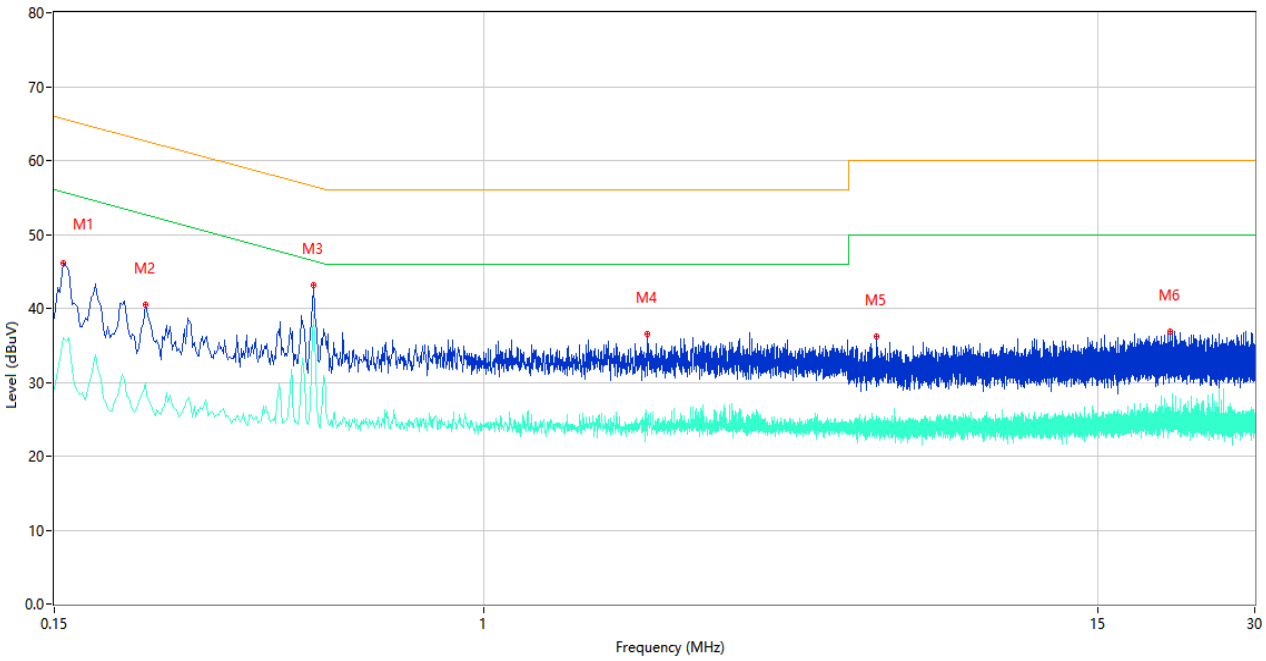
Test Data and Plots

A.2.1 L Phase



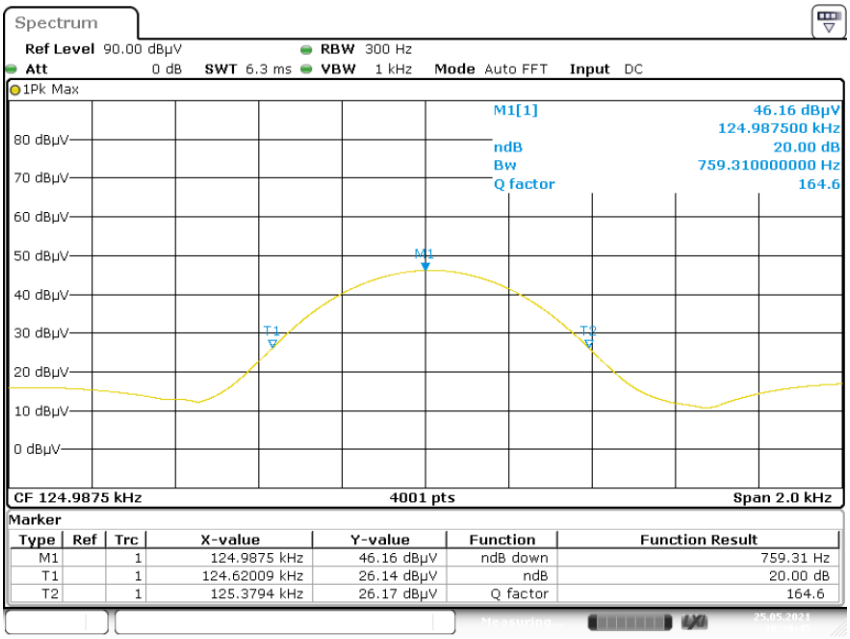
No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.156	46.36	10.41	65.67	-19.31	Peak	L	Pass
1**	0.156	35.19	10.41	55.67	-20.48	AV	L	Pass
2	0.226	42.33	10.36	62.60	-20.27	Peak	L	Pass
2**	0.226	28.40	10.36	52.60	-24.20	AV	L	Pass
3	0.472	41.99	10.30	56.48	-14.49	Peak	L	Pass
3**	0.472	38.70	10.30	46.48	-7.78	AV	L	Pass
4	0.852	36.83	10.24	56.00	-19.17	Peak	L	Pass
4**	0.852	28.40	10.24	46.00	-17.60	AV	L	Pass
5	2.466	37.15	10.28	56.00	-18.85	Peak	L	Pass
5**	2.466	26.63	10.28	46.00	-19.37	AV	L	Pass
6	22.396	37.94	10.60	60.00	-22.06	Peak	L	Pass
6**	22.396	25.06	10.60	50.00	-24.94	AV	L	Pass

A.2.2 N Phase

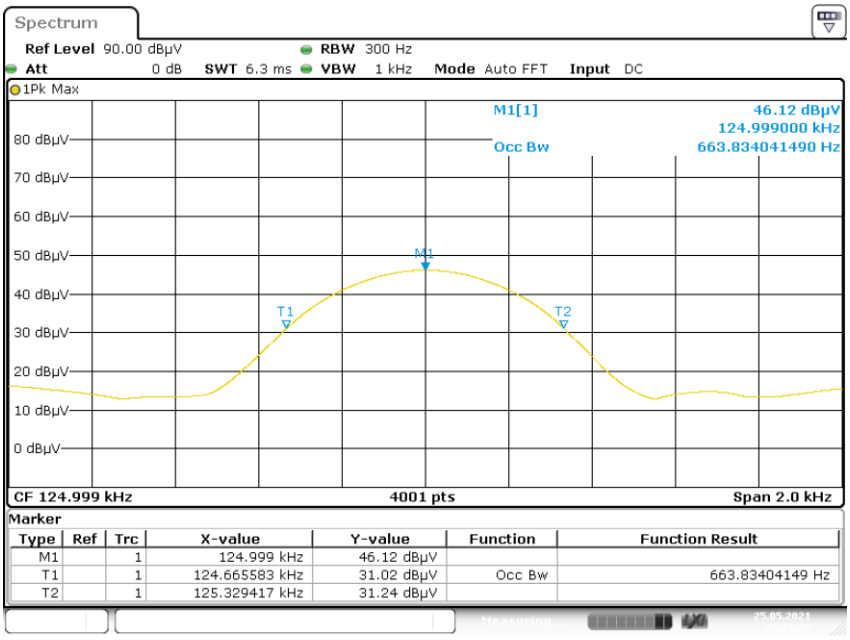


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.156	46.08	10.41	65.67	-19.59	Peak	N	Pass
1**	0.156	36.03	10.41	55.67	-19.64	AV	N	Pass
2	0.224	40.44	10.37	62.67	-22.23	Peak	N	Pass
2**	0.224	29.92	10.37	52.67	-22.75	AV	N	Pass
3	0.472	43.17	10.30	56.48	-13.31	Peak	N	Pass
3**	0.472	39.21	10.30	46.48	-7.27	AV	N	Pass
4	2.058	36.46	10.27	56.00	-19.54	Peak	N	Pass
4**	2.058	24.61	10.27	46.00	-21.39	AV	N	Pass
5	5.656	36.19	10.31	60.00	-23.81	Peak	N	Pass
5**	5.656	25.45	10.31	50.00	-24.55	AV	N	Pass
6	20.706	36.78	10.57	60.00	-23.22	Peak	N	Pass
6**	20.706	24.65	10.57	50.00	-25.35	AV	N	Pass

A.3 Emissions Bandwidth



99% Occupied Bandwidth



A.4 Frequency Stability

Note 1: Because the 85%(7.65V) of the rated supply voltage value exceeds the cut-off voltage lower(8V) limit of the manufacturer, the cut-off voltage of EUT is test here.

Note 2: The operating temperature range of the EUT is -10°C to 85°C.

OPERATING FREQUENCY:	125 000Hz
REFERENCE VOLTAGE:	9 V
DEVIATION LIMIT:	±40%

VOLTAGE (%)	Test Conditions		Frequency(MHz)	Deviation	Verdict
	Power (VDC)	Temperature (°C)			
100	9	+20°C(Ref)	124.987500	-0.0001	Pass
100		-20	N/A	N/A	
100		+50	124.978500	-0.0002	
MIN(Battery End Point, 85)	8	+20	124.981600	-0.0001	
MAX(Battery End Point, 115)	10.35	+20	124.979400	-0.0002	

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2140248-AE-2.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2140248-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2140248-AI.PDF”.

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