TEST REPORT

Report No.	CISRR24080100502
Project No.	CISR240801005
FCC ID	2AIT9-PG-500
Applicant	SZ PGST Co., Ltd
Address	No.9 Building, Huafu Industrial Park, Huachang Road, Longhua District, Shenzhen, Guangdong, China
Manufacturer	SZ PGST Co., Ltd
Address	No.9 Building, Huafu Industrial Park, Huachang Road, Longhua District, Shenzhen, Guangdong, China
Product Name	Alarm Host
Trade Mark	--
Model/Type reference	PG-500
Listed Model(s)	--
Standard	Part 15 Subpart C Section 15.231
Test date	August 2, 2024 ~ August 8, 2024
Issue date	August 9, 2024
Test result	**Complied**

Prepared by: Rory Huang **Approved by: Genry Long**

The test results relate only to the tested samples.

The test report should not be reproduced except in full without the written approval of Shenzhen Bangce Testing Technology Co., Ltd.

Contents

1. REPORT VERSION

Version No.	Issue date	Description
00	August 9, 2024	Original

2. SUMMARY OF TEST RESULT

Report clause	Test Item	Standard Requirement	Result
5.1	Antenna Requirement	15.203	PASS
5.2	AC Conducted Emission	15.207	PASS
5.3	20 dB Bandwidth	15.231(c)	PASS
5.4	Radiated Spurious Emission	15.231 (e)/15.205/15.209	PASS
5.5	Transmitter Deactivation Time	15.231	PASS
5.6	Duty cycle Factor	15.231	PASS

Note:

– The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Product Description

Main unit information:	
Product Name:	Alarm Host
Trade Mark:	--
Model No.:	PG-500
Listed Model(s):	--
Power supply:	DC 3.7V from Battery
Hardware version:	V2.8
Software version:	V1.2

3.2. Radio Specification Description

Technology:	SRD
Modulation:	ASK
Operation frequency:	433.92MHz
Channel Number:	1
Antenna type:	Spring Antenna
Antenna gain:	-2.9dBi

3.3. Modification of EUT

No modifications are made to the EUT during all test items.

3.4. Testing Site

Laboratory Name	Shenzhen Bangce Testing Technology Co., Ltd.
Laboratory Location	101, building 10, Yunli Intelligent Park, Shutianpu community, Matian Street, Guangming District, Shenzhen, Guangdong, China
FCC registration number	736346

3.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS (dBuV/m) = RA (dBuV) + AF (dB/m) + CL (dB) – AG (dB)

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

3.6. DISTURBANCE Calculation

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

4. TEST CONFIGURATION

4.1. Test frequency list

Channel	Frequency (MHz)
CH1	433.92

4.2. Test mode

For RF test items:		
The engineering prototype is provided with key switching channel to realize EUT continuous transmission..Power setting Default.		
Test Item	Test Mode	Modulation
Conducted test item	TX mode	ASK
Radiated test item	TX mode	ASK
Remark: – The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.		

4.3. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

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

Item	Equipment name	Trade Name	Model No.
1	Adapter	Huawei	HW-05002000C

4.4. Test sample information

Type	sample no.
Engineer sample	CISR240801005-S01
Normal sample	CISR240801005-S02

4.5. Testing environmental condition

Type	Requirement	Actual
Temperature:	15~35°C	25°C
Relative Humidity:	25~75%	50%
Air Pressure:	860~1060mbar	1000mbar

4.6. Statement of the measurement uncertainty

No.	Test Items	Measurement Uncertainty
1	AC Conducted Emission	1.63dB
2	Power Spectral Density	1.34dB
3	20dB Bandwidth	0.002%
4	Duty cycle	-
5	Conducted Band Edge and Spurious Emission	1.93dB
6	Radiated Band Edge Emission	3.76dB for 30MHz-1GHz 3.80dB for above 1GHz
7	Radiated Spurious Emission	3.76dB for 30MHz-1GHz 3.80dB for above 1GHz

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

4.7. Equipment Used during the Test

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	SKET	9.3*6.3*6	N/A	2021.10.15	3Year
Spectrum analyzer	Agilent	N9020A	MY50530263	2024.01.08	1Year
Receiver	ROHDE&SCHWARZ	ESCI	100853	2024.01.08	1Year
Spectrum analyzer	R&S	FSV-40N	/	2024.01.08	1Year
Bilog Antenna	Schwarzbeck	VULB 9163	1463	2023.01.09	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2487	2023.01.09	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	2023.01.09	2Year
RF Cable	Tonscend	Cable 1	/	2024.01.08	1Year
RF Cable	Tonscend	Cable 2	/	2024.01.08	1Year
RF Cable	SKET	Cable 3	/	2024.01.08	1Year
Pre-amplifier	Tonscend	TAP9K3G32	AP21G806153	2024.01.08	1Year
Pre-amplifier	Tonscend	TAP01018050	AP22E806229	2024.01.08	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8127	/	2024.01.08	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	2024.01.08	1Year
Horn Antenna	SCHWARZBECK	BBHA9170	1130	2023.01.09	2 Year
Preamplifier	Tonscend	TAP18040048	AP21C806126	2024.01.08	1Year
variable-frequency power source	Pinhong	PH1110	/	2024.01.08	1Year
6dB Attenuator	SKET	DC-6G	/	N/A	N/A
Artificial power network	Schwarzbeck	NSLK8127	8127-01096	2024.01.08	1Year
EMI Test Receiver	Rohde&schwarz	ESCI7	100853	2024.01.08	1Year
8-wire Impedance Stabilization Network	Schwarzbeck	NTFM 8158	8158-00337	2024.01.08	1Year
Artificial power network	Schwarzbeck	ENV216	/	2024.01.08	1Year
Antenna tower	SKET	Bk-4AT-BS	AT2021040101-V1	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Antenna Requirement

Standard Applicable	**FCC CFR Title 47 Part 15 Subpart C Section 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the response-ble 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.
Description	The antenna type is a PCB antenna, Refer to the below antenna photo.

Remark: The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen Bangce Testing Technology Co., Ltd. does not assume any responsibility.

5.2. AC Conducted Emission

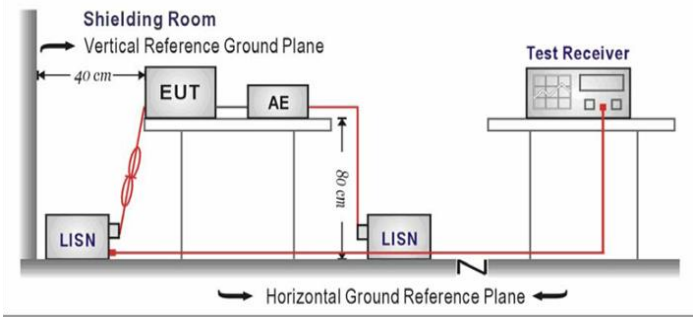
Limit:

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	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.

Test configuration:



Test procedure:

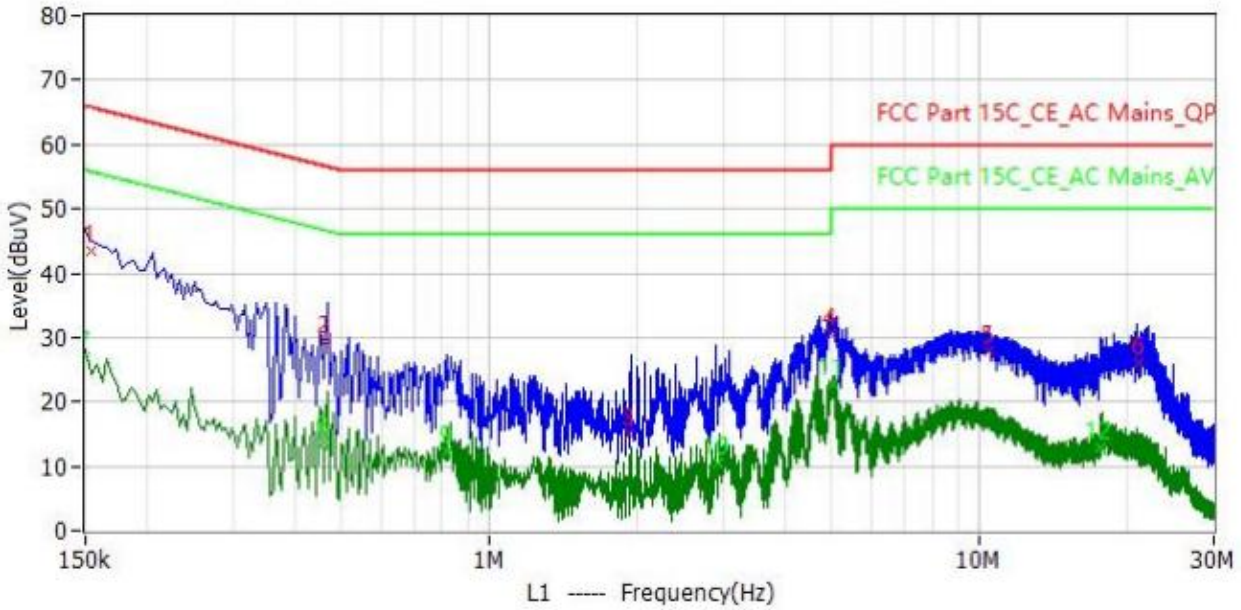
1. The EUT was setup according to ANSI C63.10 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

Test mode: Refer to the clause 4.3

Result: **Passed**

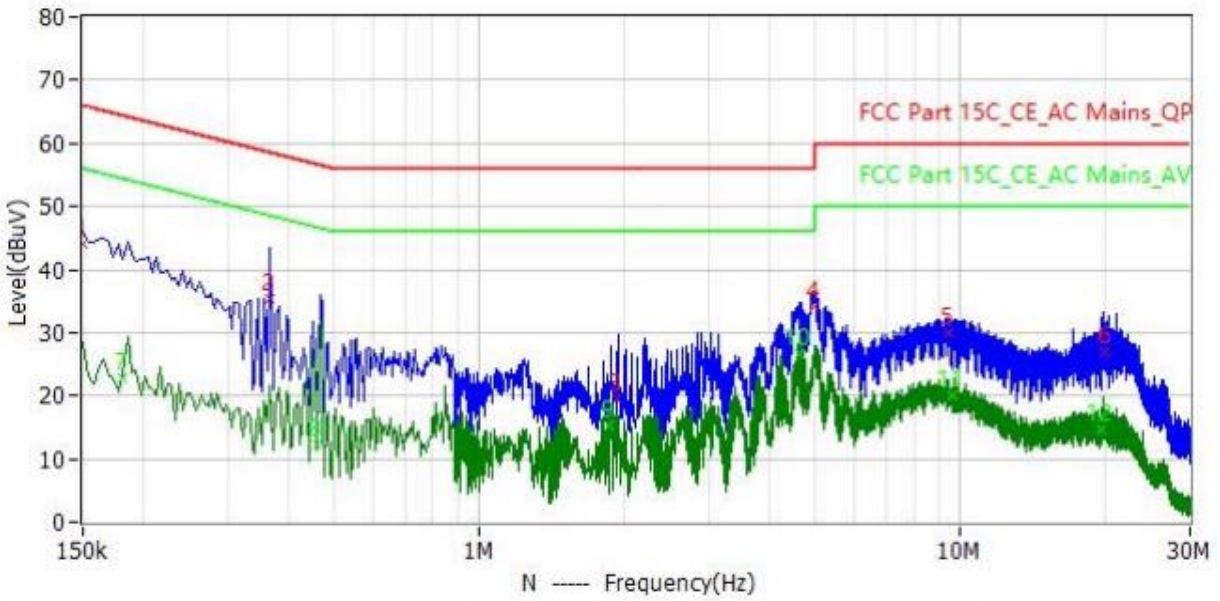
Test Data

TM1 / Line: Line



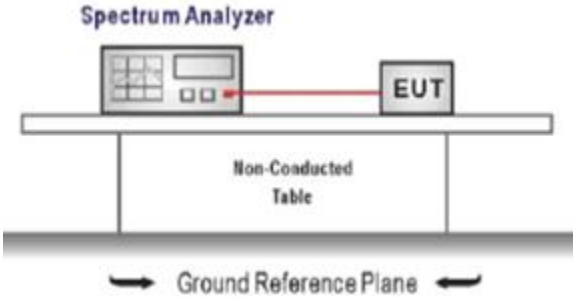
No.	Frequency	Limit dBuV	Level dBuV	Margin dB	Reading dBuV	Factor dB	Detector	Polar
1	154.000kHz	65.8	43.5	-22.3	43.5	0.0	QP	L1
2	462.000kHz	56.7	29.4	-27.3	29.3	0.1	QP	L1
3	1.934MHz	56.0	14.9	-41.1	14.8	0.1	QP	L1
4	4.974MHz	56.0	30.5	-25.5	30.3	0.2	QP	L1
5	10.390MHz	60.0	28.0	-32.0	27.7	0.3	QP	L1
6	21.106MHz	60.0	26.1	-33.9	25.6	0.5	QP	L1
7	150.000kHz	56.0	26.9	-29.1	26.9	0.0	CAV	L1
8	458.000kHz	46.7	13.9	-32.8	13.8	0.1	CAV	L1
9	822.000kHz	46.0	12.2	-33.8	12.1	0.1	CAV	L1
10	2.930MHz	46.0	10.4	-35.6	10.3	0.1	CAV	L1
11	5.010MHz	50.0	22.8	-27.2	22.6	0.2	CAV	L1
12	17.554MHz	50.0	12.9	-37.1	12.5	0.4	CAV	L1

TM1 / Line: Neutral



No.	Frequency	Limit dBuV	Level dBuV	Margin dB	Reading dBuV	Factor dB	Detector	Polar
1	150.000kHz	66.0	44.0	-22.0	44.0	0.0	QP	N
2	366.000kHz	58.6	35.5	-23.1	35.4	0.1	QP	N
3	1.938MHz	56.0	19.4	-36.6	19.3	0.1	QP	N
4	4.982MHz	56.0	34.3	-21.7	34.1	0.2	QP	N
5	9.414MHz	60.0	30.1	-29.9	29.8	0.3	QP	N
6	19.898MHz	60.0	27.0	-33.0	26.5	0.5	QP	N
7	182.000kHz	54.4	22.7	-31.7	22.7	0.0	CAV	N
8	458.000kHz	46.7	12.2	-34.5	12.1	0.1	CAV	N
9	1.866MHz	46.0	15.2	-30.8	15.1	0.1	CAV	N
10	4.626MHz	46.0	26.6	-19.4	26.4	0.2	CAV	N
11	9.646MHz	50.0	20.2	-29.8	19.9	0.3	CAV	N
12	19.558MHz	50.0	14.8	-35.2	14.3	0.5	CAV	N

5.3. 20 dB Bandwidth

Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test configuration:	
Test procedure:	1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously 3. Use the following spectrum analyzer settings: Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a Test channel RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW Sweep = auto, Detector function = peak, Trace = max hold 4. Measure and record the results in the test report.
Test mode:	Refer to the clause 4.3
Result:	**Passed**

Center Frequency of operation(MHz)	Maximum allowed bandwidth(kHz)	Measured 20dB Bandwidth(kHz)	Result
433.9164	1084.8	263.8	PASS


Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN OFF
03:14:48 PM Aug 09, 2024
x dB -20.00 dB
Center Freq: 433.920000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Peak Search
Mkr1 433.9164 MHz
2.3189 dBm
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 433.9 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 300 kHz
Sweep 1 ms
Occupied Bandwidth
253.39 kHz
Total Power 3.79 dBm
Transmit Freq Error -11.618 kHz
OBW Power 99.00 %
x dB Bandwidth 263.8 kHz
x dB -20.00 dB
start
Agilent Spectrum Ana...
3:14 PM

5.4. Radiated Spurious Emission

Limit:

FCC CFR Title 47 Part 15 Subpart C Section 15.209

Frequency	Limit (dBuV/m)	Value
0.009 MHz ~0.49 MHz	2400/F(kHz) @300m	Quasi-peak
0.49 MHz ~ 1.705 MHz	24000/F(kHz) @30m	Quasi-peak
1.705 MHz ~30 MHz	30 @30m	Quasi-peak

Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3

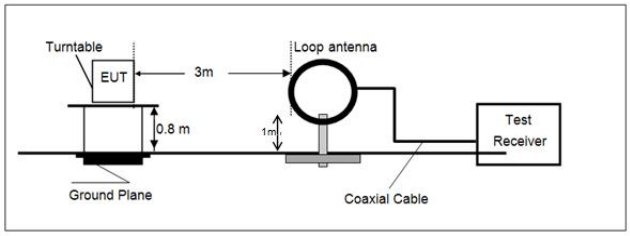
Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)

Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

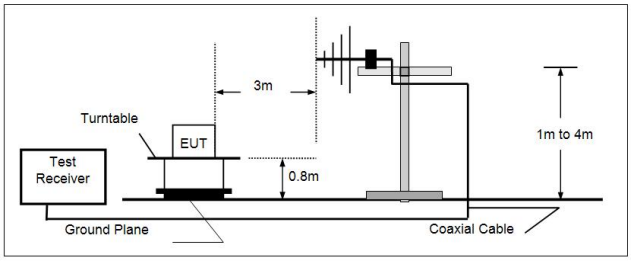
Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1] 1,250 to 3,750	[1] 125 to 375
174-260	3,750	375
260-470	[1] 3,750 to 12,500	[1] 375 to 1,250
Above 470	12,500	1,250

Test configuration:

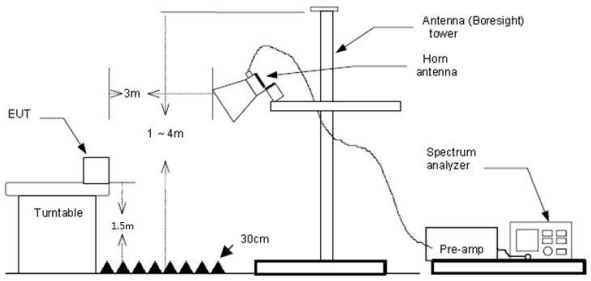
9kHz~30MHz



30 MHz ~ 1 GHz



Above 1 GHz



Test procedure:

1. The EUT was setup and tested according to ANSI C63.10.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
   a) Span shall wide enough to fully capture the emission being measured;
   b) Below 1 GHz:
      RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
      If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
   c) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement
   d) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=Average, Trace=RMS for Average measurement

Test mode: Refer to the clause 4.3

Result: **Passed**

Note:

1) Level= Reading + Factor/Transd; Factor/Transd =Antenna Factor+ Cable Loss- Preamp Factor
2) Over Limit = Level– Limit
3) Average measurement was not performed if peak level is lower than average limit(54 dBuV/m) for above 1GHz.

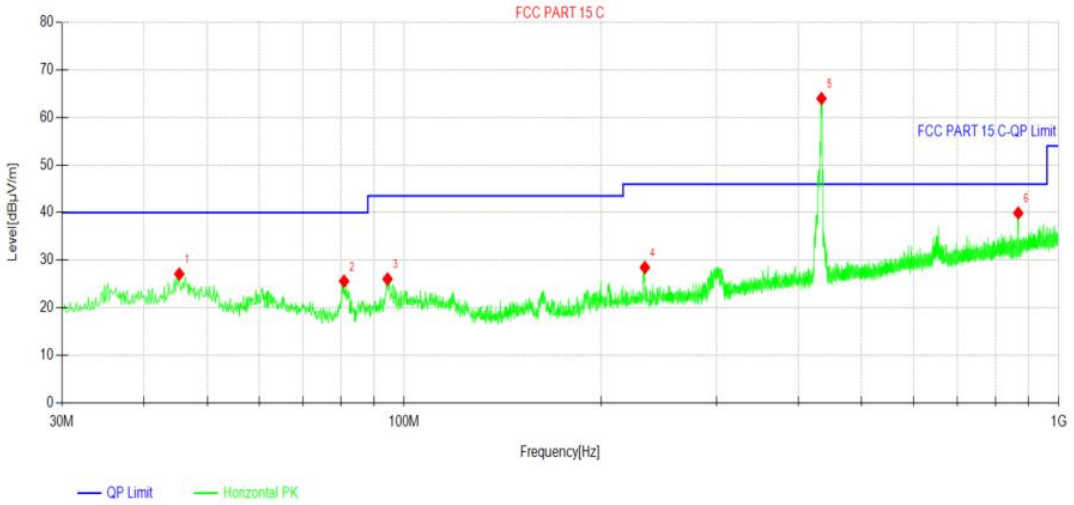
For 9 kHz ~ 30 MHz

The EUT was pre-scanned this frequency band, found the radiated level 20dB lower than the limit, so don't show data on this report.

For 30 MHz ~ 1000 MHz

Have pre-scan all test channel, found CH1 which it was worst case, so only show the worst case's data on this report.

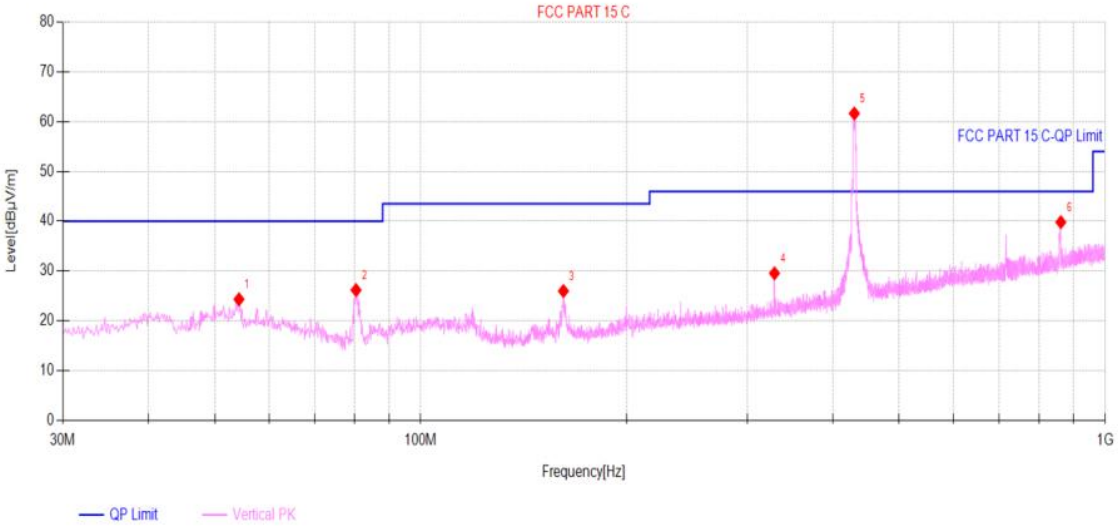
Polarization:	Horizontal



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	45.326	11.56	27.09	15.53	40.00	12.91	100	270	Horizont
2	80.925	15.67	25.58	9.91	40.00	14.42	100	130	Horizont
3	94.311	13.25	26.04	12.79	43.50	17.46	100	310	Horizont
4	233.215	14.22	28.47	14.25	46.00	17.53	100	360	Horizont
5	434.102	45.60	63.99	18.39	46.00	-17.99	100	10	Horizont
6	867.401	14.94	39.92	24.98	46.00	6.08	100	100	Horizont

Fundamental and Harmonics Result						
Frequency (MHz)	Peak Level (dBµV/m)	AV Factor(dBµV/m) (see Section 5.4)	Average Level (dBµV/m)	Limit(dBµV/m) (average)	Limit(dBµV/m) (Peak)	Conclusion
434.102	63.99	-10.12	53.87	60.81	80.81	PASS
867.410	39.92	-10.12	29.87	40.81	60.81	PASS

Polarization:	Vertical



Suspected Data List

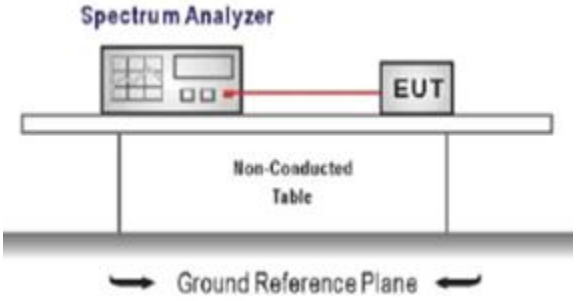
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	54.25	9.43	24.32	14.89	40.00	15.68	100	40	Vertical
2	80.44	16.39	26.18	9.79	40.00	13.82	100	280	Vertical
3	161.629	15.21	25.99	10.78	43.50	17.51	100	350	Vertical
4	328.76	12.93	29.55	16.62	46.00	16.45	100	30	Vertical
5	430.028	43.28	61.64	18.36	46.00	-15.64	100	270	Vertical
6	861.581	14.81	39.82	25.01	46.00	6.18	100	310	Vertical

Fundamental and Harmonics Result						
Frequency (MHz)	Peak Level (dBµV/m)	AV Factor(dBµV/m) (see Section 5.4)	Average Level (dBµV/m)	Limit(dBµV/m) (average)	Limit(dBµV/m) (Peak)	Conclusion
430.02	61.64	-10.12	51.52	60.70	80.70	PASS
861.58	39.82	-10.12	29.70	40.70	60.70	PASS

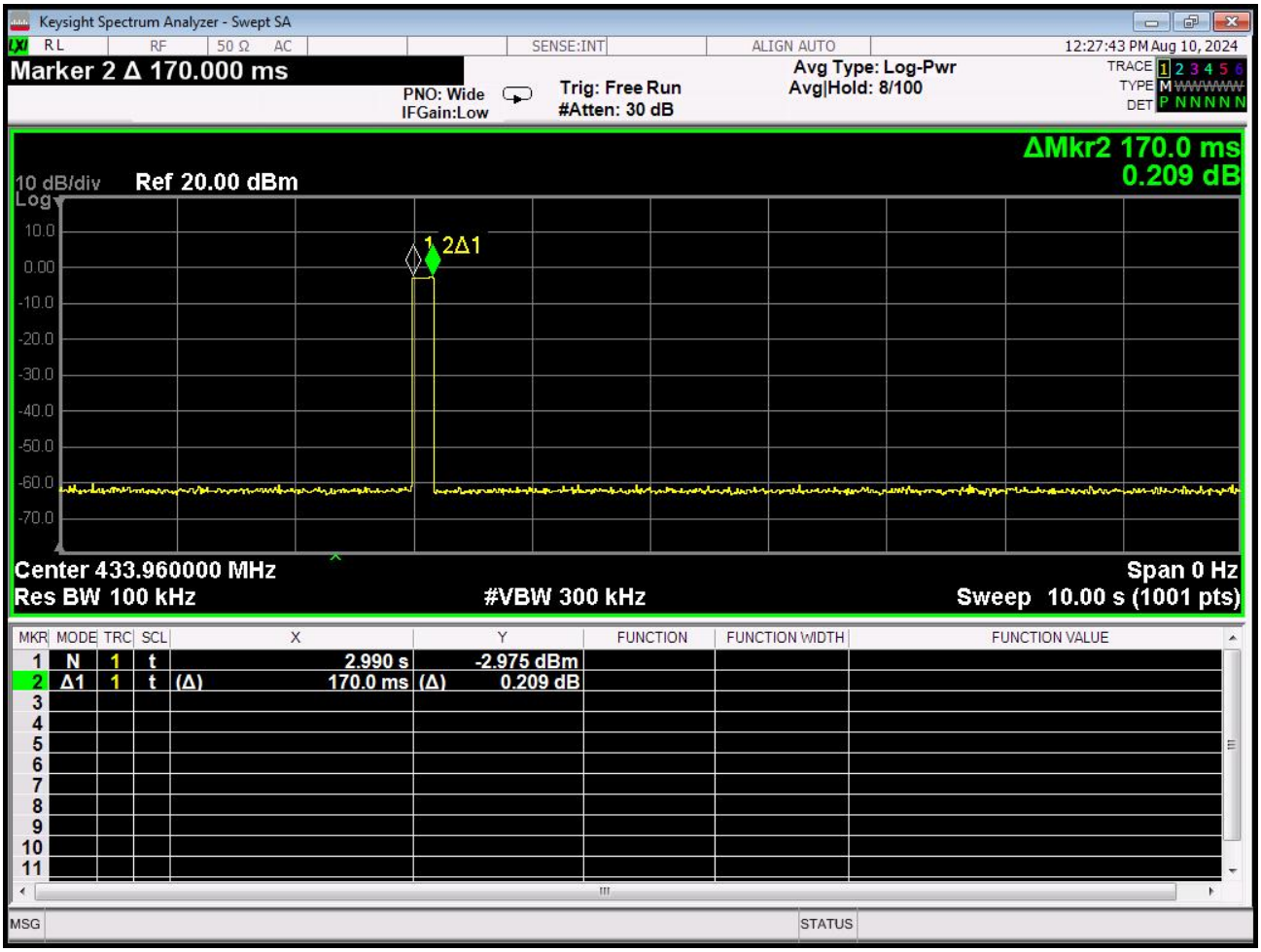
For 1 GHz ~ 5 GHz

Test channel:433.92MHz									
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity
1204.00	68.58	30.26	4.09	38.29	-3.94	74	9.36	Peak	Horizontal
1204.00	49.20	30.26	4.09	38.29	-3.94	54	8.74	Average	Horizontal
1204.00	65.97	30.26	4.09	38.29	-3.94	74	11.97	Peak	Vertical
1204.00	51.23	30.26	4.09	38.29	-3.94	54	6.71	Average	Vertical

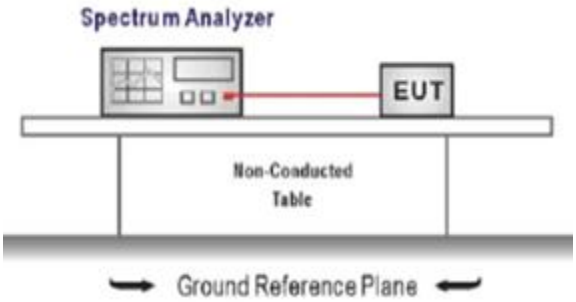
5.5. Transmitter Deactivation Time

Limit:	Devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.
Test configuration:	
Test procedure:	Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.
Test mode:	Refer to the clause 4.3
Result:	**Passed**

Test Results			
Frequency (MHz)	Activation Time(s)	Limit: not more than 5 seconds of being released (s)	Conclusion
433.96	0.17	5	PASS


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
12:27:43 PM Aug 10, 2024
Marker 2 Δ 170.000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 8/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
ΔMkr2 170.0 ms
0.209 dB
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1 2Δ1
Center 433.960000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 10.00 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 t 2.990 s -2.975 dBm
2 Δ1 1 t (Δ) 170.0 ms (Δ) 0.209 dB
3
4
5
6
7
8
9
10
11
MSG
STATUS

5.6. Duty cycle Factor

Limit:	No dedicated limit specified in the Rules.
Test configuration:	
Test procedure:	1. Place the EUT on the table and set it in transmitting mode. 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. 3. Set centre frequency of spectrum analyzer=operating frequency. 4. Set the spectrum analyzer as RBW=100kHz, VBW=300kHz, Span=0Hz, Adjust Sweep=Auto. 5. Repeat above procedures until all frequency measured was complete.
Test mode:	Refer to the clause 4.3
Result:	**Passed**

Test Data

Ton = 1.14*9+0.36*16=16.02(ms)

Tp = 51.29(ms)

The duty cycle=16.02/51.29=0.312

Average Correction Factory = 20log (Ton/Tp) =20log (0.312) = -10.12dB

Test plot of Duty cycle	

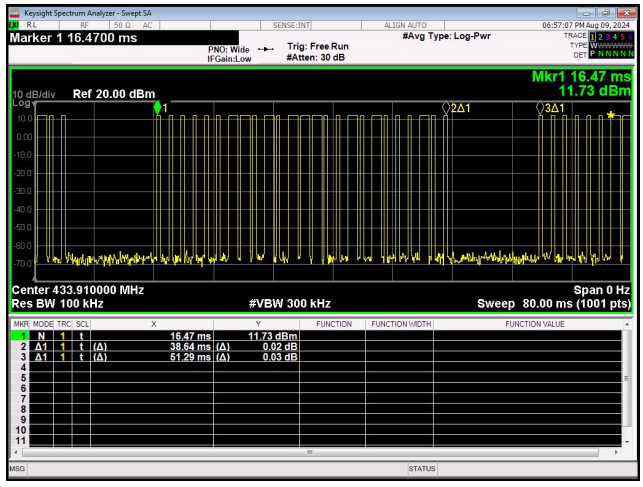
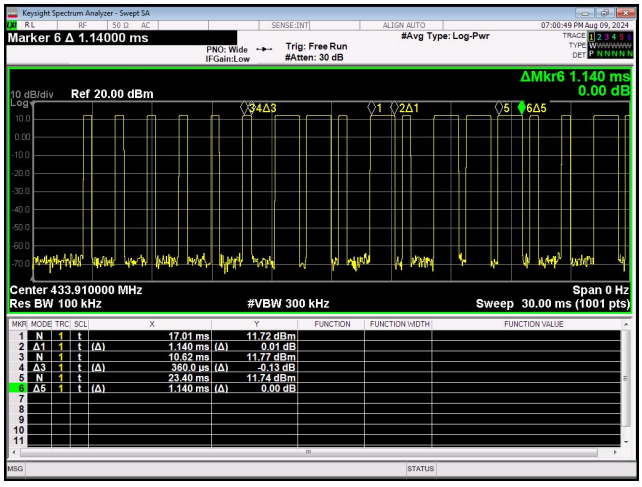

	

Fig.1	Fig.2

6. TEST SETUP PHOTOS

Please refer to separated files for Test Setup Photos of the EUT.

7. EXTERNAL AND INTERNAL PHOTOS

7.1. External Photos

Please refer to separated files for External Photos of the EUT.

7.2. Internal photos

Please refer to separated files for Internal Photos of the EUT.

------End of the report------