

TEST REPORT

Reference No...... : WTX23X10232632W001
FCC ID : 2ASIVPGD228FNC
Applicant : PIN GENIE, INC. DBA LOCKLY
Address : 676 Transfer Rd., St. Paul, MN 55114
Manufacturer : Smart Electronic Industrial (Dong Guan) Co., Ltd.
Address : Qing Long Road, Long Jian Tian Village, Huang Jiang Town, Dong Guan,
Guang Dong, China
Product Name : Electronic lock with BLE & fingerprint & RFID
Model No...... : PGD228FC
Standards : FCC Part 15.247
Date of Receipt sample : 2023-10-31
Date of Test..... : 2023-10-31 to 2023-11-09
Date of Issue : 2023-11-09
Test Report Form No. : WTX_Part 15_247W
Test Result..... : **Pass**

Remarks:

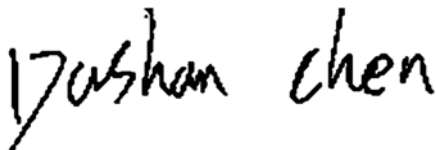
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

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TABLE OF CONTENTS

1. GENERAL INFORMATION4
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)4
1.2 TEST STANDARDS.....5
1.3 TEST METHODOLOGY5
1.4 TEST FACILITY5
1.5 EUT SETUP AND TEST MODE6
1.6 MEASUREMENT UNCERTAINTY7
1.7 TEST EQUIPMENT LIST AND DETAILS8

2. SUMMARY OF TEST RESULTS.....11

3. ANTENNA REQUIREMENT12
3.1 STANDARD APPLICABLE12
3.2 EVALUATION INFORMATION12

4. FIELD STRENGTH OF SPURIOUS EMISSIONS.....13
4.1 STANDARD APPLICABLE13
4.2 TEST PROCEDURE13
4.3 CORRECTED AMPLITUDE & MARGIN CALCULATION.....15
4.4 SUMMARY OF TEST RESULTS/PLOTS.....15

APPENDIX PHOTOGRAPHS.....19

Report version

Version No.	Date of issue	Description
Rev.00	2023-11-09	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	Electronic lock with BLE & fingerprint & RFID
Trade Name	LOCKLY
Model No.:	PGD228FC
Adding Model(s):	/
Rated Voltage:	DC1.5"AA"*4
Power Adapter:	/
Software Version:	V1.00
Hardware Version:	REV:A0
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Bluetooth Version:	V5.0 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	0.75dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	FPC Antenna
Antenna Gain:	-0.1dBi

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

558074 D01 15.247 Meas Guidance v05r02: Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under section 15.247 of the Fcc rules.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A and the CAB identifier is CN0057.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low	2402MHz
TM2	Middle	2440MHz
TM3	High	2480MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	45~55 %
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-26GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

Fixed asset Number	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
WTXE1041A 1001	Communication Tester	Rohde & Schwarz	CMW500	148650	2023-02-25	2024-02-24
WTXE1005A 1005	Spectrum Analyzer	Agilent	N9020A	US471401 02	2023-02-25	2024-02-24
WTXE1084A 1001	Spectrum Analyzer	Agilent	N9020A	MY543205 48	2023-02-25	2024-02-24
WTXE1004A 1-001	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2023-02-25	2024-02-24
<input type="checkbox"/> Chamber A: Below 1GHz						
WTXE1005A 1003	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/03 5	2023-02-25	2024-02-24
WTXE1007A 1001	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/00 5	2023-02-25	2024-02-24
WTXE1007A 1001	Amplifier	HP	8447F	2805A034 75	2023-02-25	2024-02-24
WTXE1010A 1007	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-20	2024-03-19
WTXE1010A 1006	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2023-03-20	2026-03-19
<input type="checkbox"/> Chamber A: Above 1GHz						
WTXE1005A 1003	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/03 5	2023-02-25	2024-02-24
WTXE1007A 1001	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/00 5	2023-02-25	2024-02-24
WTXE1065A 1001	Amplifier	C&D	PAP-1G18	14918	2023-02-25	2024-02-24
WTXE1010A 1005	Horn Antenna	ETS	3117	00086197	2021-03-19	2024-03-18
WTXE1010A 1010	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2021-03-19	2024-03-18
WTXE1003A 1001	Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2023-02-25	2024-02-24
<input type="checkbox"/> Chamber B: Below 1GHz						
WTXE1010A 1006	Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2021-04-09	2024-04-08
WTXE1038A 1001	Amplifier	Agilent	8447D	2944A104 57	2023-02-25	2024-02-24

WTXE1001A 1002	EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2023-02-25	2024-02-24
<input checked="" type="checkbox"/> Chamber C:Below 1GHz						
WTXE1093A 1001	EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2023-02-25	2024-02-24
WTXE1010A 1013-1	Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2021-05-28	2024-05-27
WTXE1010A 1007	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-20	2024-03-19
WTXE1007A 1002	Amplifier	HP	8447F	2944A038 69	2023-02-25	2024-02-24
<input checked="" type="checkbox"/> Chamber C: Above 1GHz						
WTXE1093A 1001	EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2023-02-25	2024-02-24
WTXE1103A 1005	Horn Antenna	POAM	RTF-118A	1820	2023-03-10	2026-03-09
WTXE1103A 1006	Amplifier	Tonscend	TAP01018050	AP22E806 235	2023-02-25	2024-02-24
WTXE1010A 1010	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2021-03-19	2024-03-18
WTXE1003A 1001	Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2023-02-25	2024-02-24
<input checked="" type="checkbox"/> Conducted Room 1#						
WTXE1001A 1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2023-02-25	2024-02-24
WTXE1002A 1001	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2023-02-25	2024-02-24
WTXE1003A 1001	AC LISN	Schwarz beck	NSLK8126	8126-279	2023-02-25	2024-02-24
<input type="checkbox"/> Conducted Room 2#						
WTXE1001A 1004	EMI Test Receiver	Rohde & Schwarz	ESPI	101259	2023-02-25	2024-02-24
WTXE1003A 1003	LISN	Rohde & Schwarz	ENV 216	100097	2023-02-25	2024-02-24

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission Room 1#)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission Room 2#)*	SKET	EMC-I	V2.0

*Remark: indicates software version used in the compliance certification testing.

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§15.203; §15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	N/A
§15.207(a)	Conducted Emission	N/A
§15.247(e)	Power Spectral Density	N/A
§15.247(a)(2)	DTS Bandwidth	N/A
§15.247(b)(3)	RF Output Power	N/A
§15.209(a)	Radiated Emission	Compliant
§15.247(d)	Band Edge (Out of Band Emissions)	N/A

Class II Permissive Change: The BAT board has changed its power supply from a socket to a soldered plug and moved its position; Added 1 TVS tube and 2 resistors.

Note: Report is for Class II Permissive Change only. Updated test data include Antenna Requirement and Radiated Emission. Other test data refer to the original report WTX22X08157683W001, The original FCC ID issue date: 09/16/2022.

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 15.203, 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 shall be considered sufficient to comply with the provisions of this section.

3.2 Evaluation Information

This product has a FPC antenna, fulfill the requirement of this section.

4. Field Strength of Spurious Emissions

4.1 Standard Applicable

According to §15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

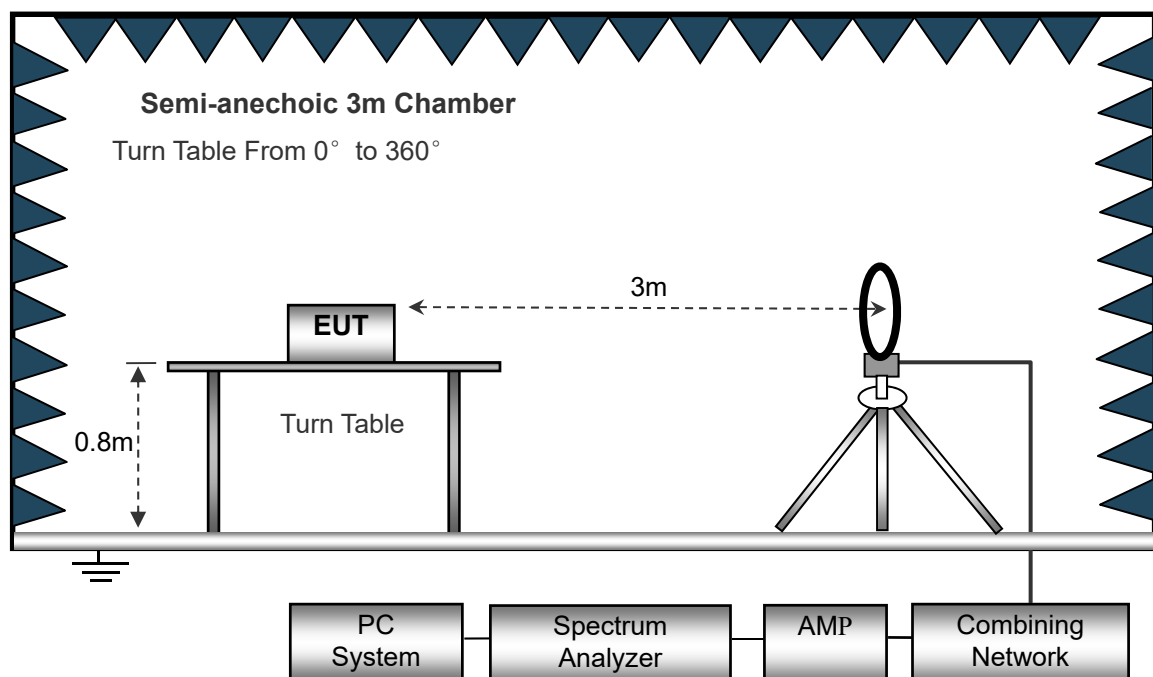
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.2 Test Procedure

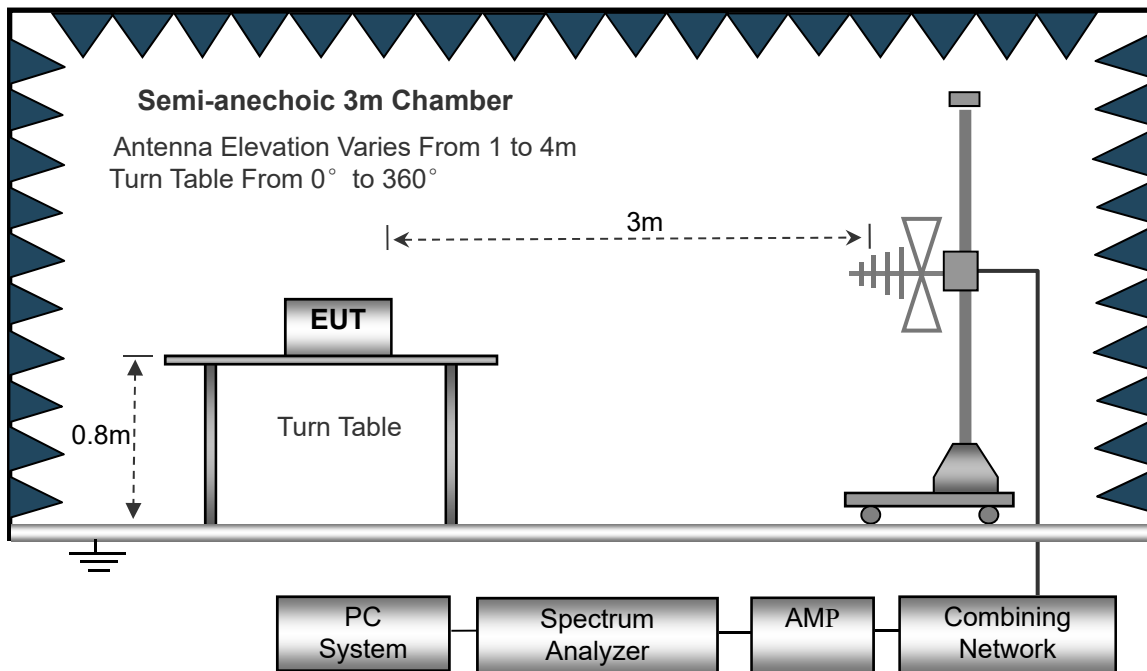
The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle. The spacing between the peripherals was 10cm.

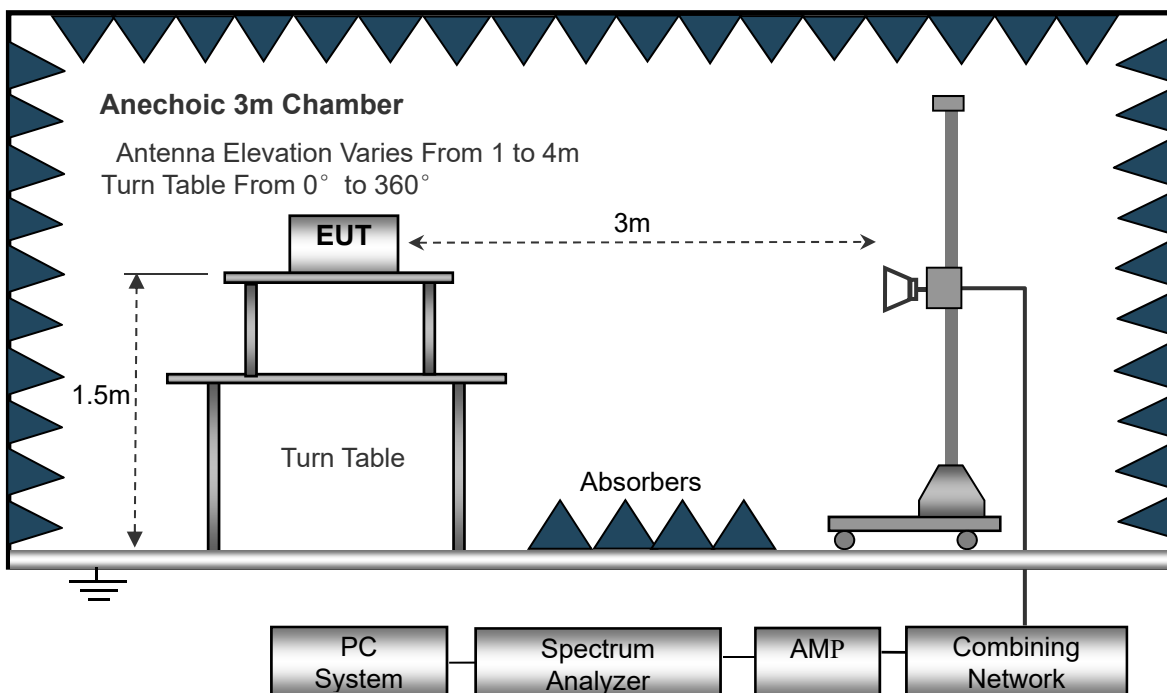
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30MHz to 1GHz.



The test setup for emission measurement above 1GHz.



Frequency :9kHz-30MHz
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 Sweep time= Auto
 Trace = max hold

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold

Reference No.: WTX23X10232632W001

Detector function = peak

Detector function = peak, QP

Detector function = peak, AV

4.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

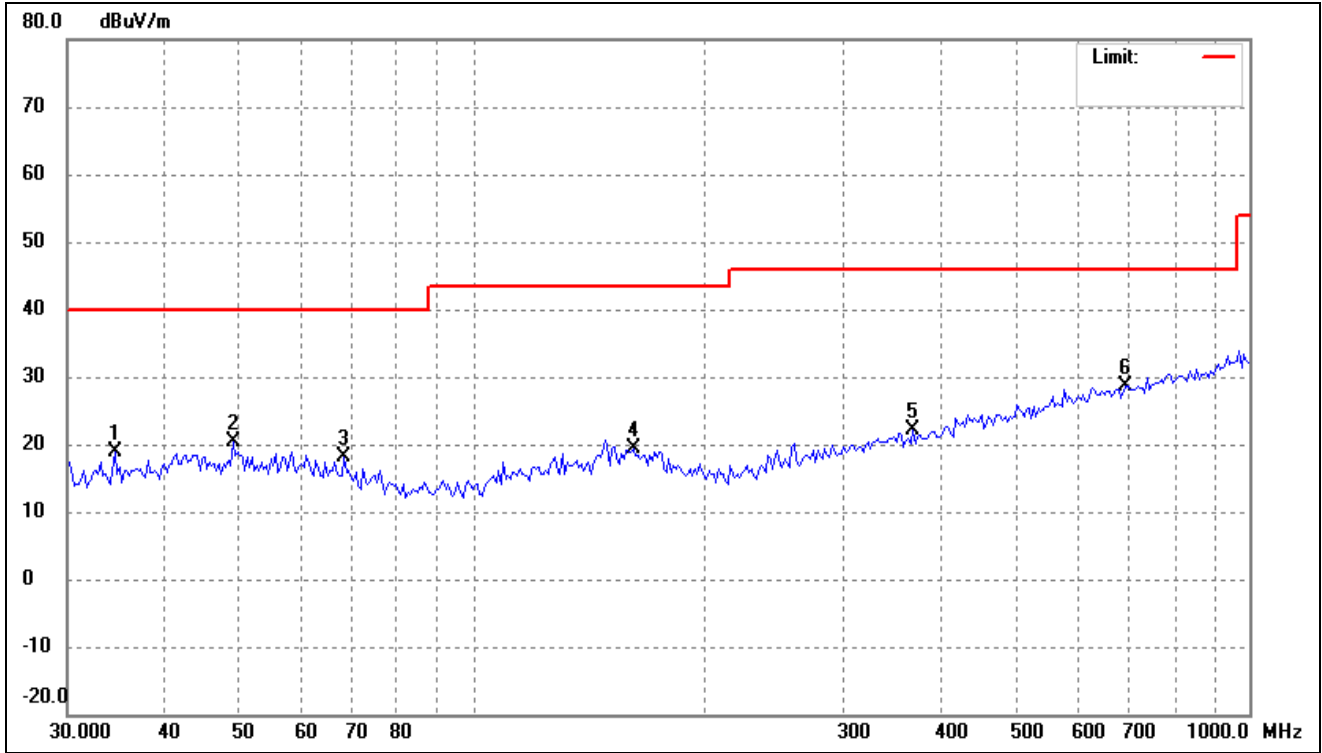
$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

4.4 Summary of Test Results/Plots

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

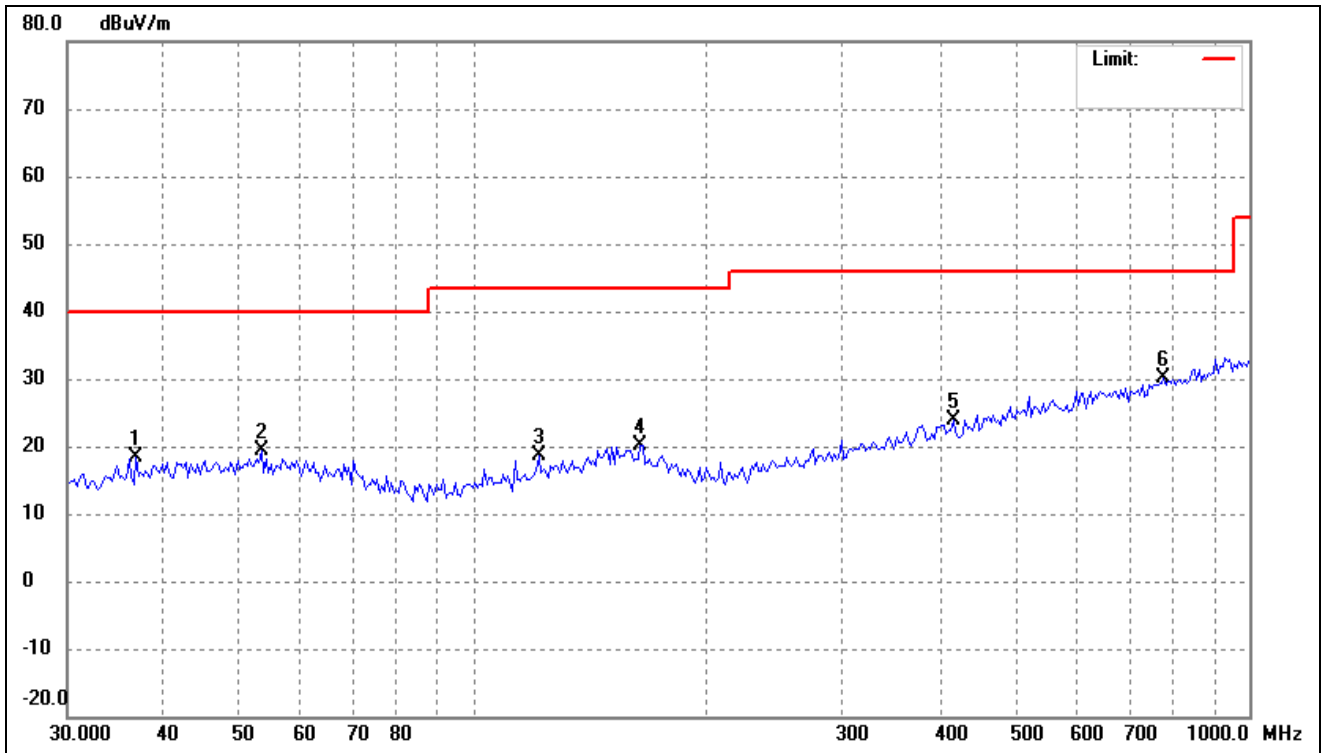
➤ Spurious Emissions Below 1GHz

Test Channel	Low(worst case)	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	34.5269	28.43	-9.61	18.82	40.00	-21.18	-	-	peak
2	49.0627	28.43	-8.16	20.27	40.00	-19.73	-	-	peak
3	68.2635	28.61	-10.45	18.16	40.00	-21.84	-	-	peak
4	160.8851	27.94	-8.64	19.30	43.50	-24.20	-	-	peak
5	368.6682	28.70	-6.63	22.07	46.00	-23.93	-	-	peak
6	693.9101	29.73	-1.14	28.59	46.00	-17.41	-	-	peak

Test Channel	Low(worst case)	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	36.7811	27.54	-9.17	18.37	40.00	-21.63	-	-	peak
2	53.3794	27.84	-8.45	19.39	40.00	-20.61	-	-	peak
3	121.4623	29.09	-10.43	18.66	43.50	-24.84	-	-	peak
4	164.3129	28.87	-8.72	20.15	43.50	-23.35	-	-	peak
5	415.4486	29.33	-5.54	23.79	46.00	-22.21	-	-	peak
6	776.4848	29.93	0.08	30.01	46.00	-15.99	-	-	peak

Remark: '- Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

➤ Spurious Emissions Above 1GHz

Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2402MHz							
4804	59.68	-3.59	56.09	74	-17.91	H	PK
4804	41.55	-3.59	37.96	54	-16.04	H	AV
7206	52.01	-0.52	51.49	74	-22.51	H	PK
7206	40.9	-0.52	40.38	54	-13.62	H	AV
4804	59.42	-3.59	55.83	74	-18.17	V	PK
4804	43.67	-3.59	40.08	54	-13.92	V	AV
7206	53.46	-0.52	52.94	74	-21.06	V	PK
7206	40.85	-0.52	40.33	54	-13.67	V	AV
Middle Channel-2440MHz							
4880	59.42	-3.49	55.93	74	-18.07	H	PK
4880	42.92	-3.49	39.43	54	-14.57	H	AV
7320	55.72	-0.47	55.25	74	-18.75	H	PK
7320	38.32	-0.47	37.85	54	-16.15	H	AV
4880	60.38	-3.49	56.89	74	-17.11	V	PK
4880	42.43	-3.49	38.94	54	-15.06	V	AV
7320	54.75	-0.47	54.28	74	-19.72	V	PK
7320	40.66	-0.47	40.19	54	-13.81	V	AV
High Channel-2480MHz							
4960	58.97	-3.41	55.56	74	-18.44	H	PK
4960	42.12	-3.41	38.71	54	-15.29	H	AV
7440	54.98	-0.42	54.56	74	-19.44	H	PK
7440	38.09	-0.42	37.67	54	-16.33	H	AV
4960	60.3	-3.41	56.89	74	-17.11	V	PK
4960	41.44	-3.41	38.03	54	-15.97	V	AV
7440	55.87	-0.42	55.45	74	-18.55	V	PK
7440	39.46	-0.42	39.04	54	-14.96	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

******* END OF REPORT *******