TEST REPORT

Reference No	WTX21X09095991W-1
FCC ID	2ASIVPGD628F
Applicant	PIN GENIE, INC. DBA LOCKLY
Address	676 Transfer Rd., St. Paul, MN 55114
Product Name	Electronic lock with BLE & fingerprint
Test Model	PGD628F
Standards	FCC Part 15.247
Date of Receipt sample :	Sept. 10, 2021
Date of Test	Sept. 10, 2021 to Oct. 08, 2021
Date of Issue	Oct. 08, 2021
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 compiler and approver.

Prepared By:

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

Tel.: +86-755-33663308 Fax.: +86-755-33663309

Tested by:

Mike Shi / Project Engineer

Reviewed By:

Jason Su / RF Manager

Approved & Authorized By:

in Chen

Silin Chen / Manager

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Report version

Version No.	Date of issue	Description	
Rev.00	Oct. 08, 2021	Original	
/	/	/	

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information Applicant: Address of applicant:	PIN GENIE, INC. DBA LOCKLY 676 Transfer Rd., St. Paul, MN 55114
Manufacturer: Address of manufacturer:	Smart Electronic Industrial (Dong Guan) Co., Ltd. Qing Long Road, Long Jian Tian Village, Huang Jiang Town, Dong Guan, Guang Dong, China

General Description of EUT	
Product Name:	Electronic lock with BLE & fingerprint
Trade Name	LOCKLY
Model No.:	PGD628F
Adding Model(s):	/
Rated Voltage:	DC1.5V*4
Power Adapter:	/
	•

Note: The test data is gathered from a production sample, provided by the manufacturer.

Technical Characteristics of EUT		
Bluetooth Version:	V5.0 (BLE mode)	
Frequency Range:	2402-2480MHz	
RF Output Power:	-2.90dBm (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.

<u>558074 D01 15.247 Meas Guidance v05r02</u>: 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 maintain ed 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.

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	± 0.42 dB	
Occupied Bandwidth	Conducted	$\pm 1.5\%$	
Power Spectral Density	Conducted	±1.8dB	
Conducted Spurious Emission	Conducted	±2.17dB	
Conducted Emissions	Conducted	9-150kHz ±3.74dB	
		0.15-30MHz ±3.34dB	
	Radiated	30-200MHz ±4.52dB	
Transmitter Spurious Emissions		0.2-1GHz ±5.56dB	
	Kaulateu	1-6GHz ±3.84dB	
		6-26GHz ±3.92dB	

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No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date	
SEMT-1075	Communication	Rohde &	CMW500	148650	2021-03-27	2022-03-26	
SENIT-1075	Tester	Schwarz	CM W 500	148030	2021-05-27	2022-05-20	
SEMT-1063	GSM Tester	Rohde &	CMU200	114403	2021-03-27	2022-03-26	
SLW1-1005	OSIM Tester	Schwarz	CMI0200	114403	2021-05-27	2022-03-20	
SEMT-1072	Spectrum	Agilent	E4407B	MY41440400	2021-03-27	2022-03-26	
	Analyzer		2				
SEMT-1079	Spectrum	Agilent	N9020A	US47140102	2021-03-27	2022-03-26	
	Analyzer						
SEMT-1080	Signal	Agilent	83752A	3610A01453	2021-03-27	2022-03-26	
	Generator						
SEMT-1081	Vector Signal	Agilent	N5182A	MY47070202	2021-03-27	2022-03-26	
GEN (TE 1020	Generator	XX7 · 1 1	15064	D (204	2021 02 27	2022.02.26	
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2021-03-27	2022-03-26	
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2021-03-27	2022-03-26	
SEMT-1031	Spectrum	Rohde & Schwarz	FSP30	836079/035	2021-03-27	2022-03-26	
	Analyzer EMI Test	Rohde &					
SEMT-1007	Receiver	Schwarz	ESVB	825471/005	2021-03-27	2022-03-26	
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2021-04-12	2022-04-11	
SEMT-1003	Amplifier	C&D	PAP-1G18	2002	2021-04-12	2022-04-11	
SEMT-1049	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-04-12	2022-04-11	
SENT 1005	Broadband	Senwarz beek		5115	2021 03 17	2023 03 10	
SEMT-1068	Antenna	Schwarz beck	VULB9163	9163-333	2021-03-19	2023-03-18	
SEMT-1042	Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18	
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2021-04-27	2023-04-26	
SEMT-1169	Pre-amplifier	Direction	PAP-2640	14145-14153	2021-04-27	2022-04-26	
		Systems Inc.	2010		2021 01 27	2022 01 20	
SEMT-1163	Spectrum	Rohde &	FSP40	100612	2021-03-27	2022-03-26	
	Analyzer	Schwarz					
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2021-03-27	2022-03-26	
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2021-03-19	2023-03-18	
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	/	/	
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	/	/	
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	/	/	
SEMT-C004	Cable	Zheng DI	2M0RFC	/	/	/	
SEMT-C005	Cable	Zheng DI	1M0RFC	/	/	/	
SEMT-C006	Cable	Zheng DI	1M0RFC	/	/	/	

1.7 Test Equipment List and Details

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Software List										
Description	Manufacturer	Version								
EMI Test Software	Farad	EZ-EMC	RA-03A1							
(Radiated Emission)*	Farau	EZ-EIVIC	KA-05A1							
EMI Test Software	Earrad	EZ EMC	DA 02A1							
(Conducted Emission)*	Farad	EZ-EMC	RA-03A1							

*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	Compliant
§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)	Compliant

N/A: Data refer to the original report WTX20X03009763W-1.

Note: Report is for C2PC only. The test data includes Radiated Emission and Out of Band Emissions. Those not tested mark with N/A (not effected by the C2PC).

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 §15.209(a), must also comply with the radiated emission limits specified in §15.209(a).

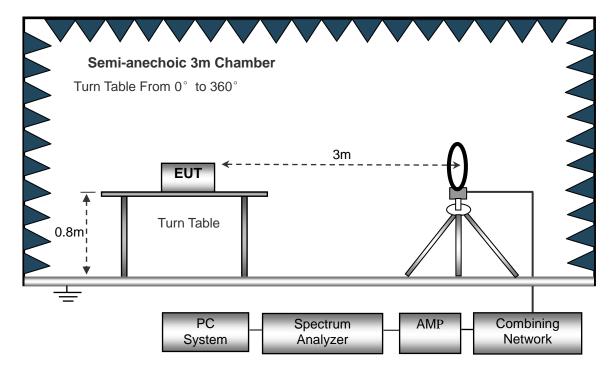
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.2 Test Procedure

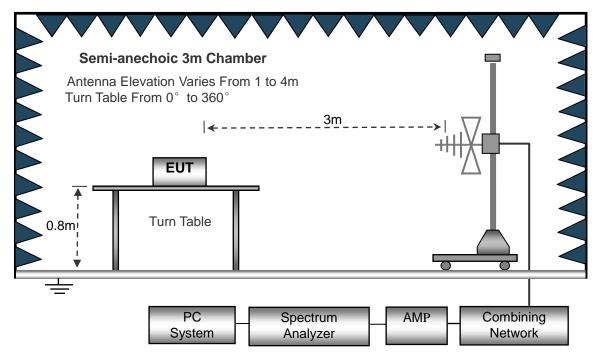
The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

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.

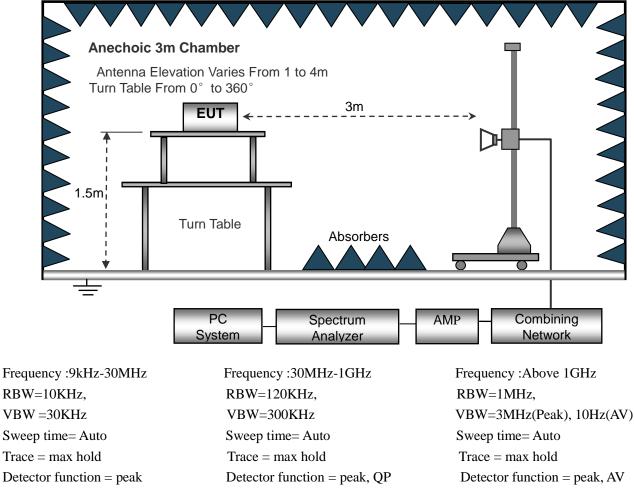
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1GHz.



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:

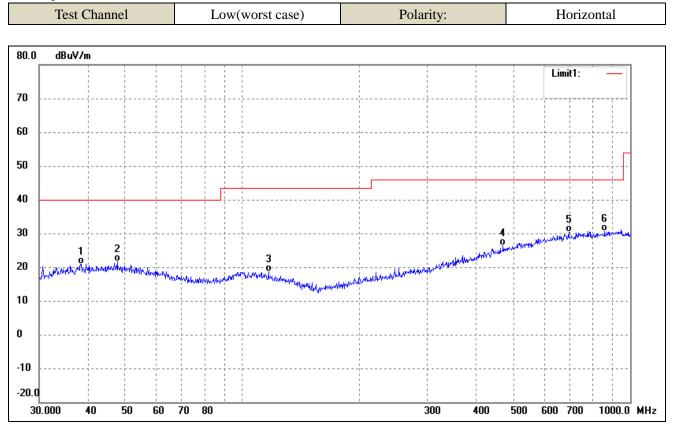
Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss - Ampl. Gain

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

Margin = Corr. Ampl. – FCC Part 15 Limit

4.4 Summary of Test Results/Plots

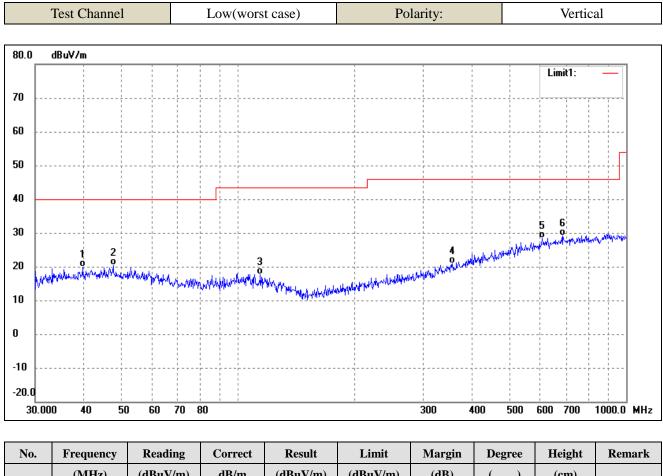
Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.



Spurious Emissions Below 1GHz

No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	38.4809	28.19	-7.37	20.82	40.00	-19.18	-	-	QP
2	47.6586	28.55	-6.97	21.58	40.00	-18.42	-	-	QP
3	116.9495	27.92	-9.38	18.54	43.50	-24.96	-	-	QP
4	470.5232	28.40	-2.04	26.36	46.00	-19.64	-	-	QP
5	694.4174	28.91	1.37	30.28	46.00	-15.72	-	-	QP
6	860.0352	28.27	2.45	30.72	46.00	-15.28	-	-	QP

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INO.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Kemark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	39.7147	26.83	-7.07	19.76	40.00	-20.24	-	-	QP
2	47.6586	27.31	-6.97	20.34	40.00	-19.66	-	-	QP
3	114.1138	26.73	-9.17	17.56	43.50	-25.94	-	-	QP
4	356.6758	26.02	-5.20	20.82	46.00	-25.18	-	-	QP
5	607.7867	27.97	0.46	28.43	46.00	-17.57	-	-	QP
6	687.1507	27.86	1.30	29.16	46.00	-16.84	-	-	QP

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

Reference No.: WTX21X09095991W-1

Spurious Emissions Above 1GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
			Low Channe	el-2402MHz			
4804	53.40	-3.59	49.81	74	-24.19	Н	РК
4804	50.17	-3.59	46.58	54	-7.42	Н	AV
7206	57.14	-0.52	56.62	74	-17.38	Н	РК
7206	36.71	-0.52	36.19	54	-17.81	Н	AV
4804	54.14	-3.59	50.55	74	-23.45	V	РК
4804	47.77	-3.59	44.18	54	-9.82	V	AV
7206	60.16	-0.52	59.64	74	-14.36	V	РК
7206	43.55	-0.52	43.03	54	-10.97	V	AV
	•		Middle Chan	nel-2440MHz			
4880	54.83	-3.49	51.34	74	-22.66	Н	РК
4880	49.58	-3.49	46.09	54	-7.91	Н	AV
7320	59.50	-0.47	59.03	74	-14.97	Н	РК
7320	37.37	-0.47	36.90	54	-17.10	Н	AV
4880	54.00	-3.49	50.51	74	-23.49	V	РК
4880	48.79	-3.49	45.30	54	-8.70	V	AV
7320	60.04	-0.47	59.57	74	-14.43	V	РК
7320	43.93	-0.47	43.46	54	-10.54	V	AV
			High Chann	el-2480MHz			
4960	53.15	-3.41	49.74	74	-24.26	Н	РК
4960	49.06	-3.41	45.65	54	-8.35	Н	AV
7440	57.57	-0.42	57.15	74	-16.85	Н	РК
7440	35.90	-0.42	35.48	54	-18.52	Н	AV
4960	52.14	-3.41	48.73	74	-25.27	V	РК
4960	46.80	-3.41	43.39	54	-10.61	V	AV
7440	58.60	-0.42	58.18	74	-15.82	V	РК
7440	44.31	-0.42	43.89	54	-10.11	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.

5. Out of Band Emissions

5.1 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).

5.2 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.11, the Emissions in nonrestricted frequency bands test method as follows:

a) Set the center frequency and span to encompass frequency range to be measured.

- b) Set the RBW = 100kHz.
- c) Set the VBW \geq [3 \times RBW].
- d) Detector = peak.
- e) Sweep time = auto couple.

f) Trace mode = max hold.

- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

According to the KDB 558074 D01 v05r02 Subclause 8.5 and ANSI C63.10-2013 Subclause 11.12, the Emissions in restricted frequency bands test method as follows:

A. Radiated emission measurements:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement

KDB publication number: 913591 may be used for the radiated bandedge measurements.

B. Antenna-port conducted measurements

Peak emission levels are measured by setting the instrument as follows:

a) RBW = as specified in Table 9.

b) VBW \geq [3 \times RBW].

c) Detector = peak.

d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

RBW as a function of frequency

Frequency	RBW
9kHz to 150kHz	200Hz to 300Hz
0.15MHz to 30MHz	9kHz to 10kHz
30MHz to 1000MHz	100kHz to 120kHz
>1000MHz	1MHz

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

5.3 Summary of Test Results/Plots

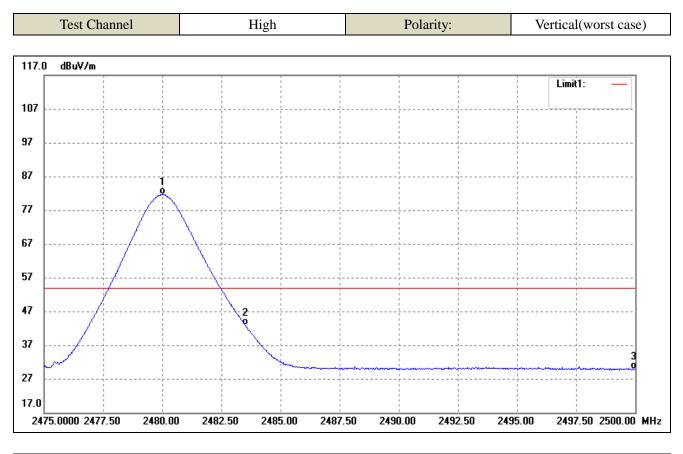
Radiated test

Test Channel			Low		Pola	Vertical(worst case				
117.0	dBu∀/m									
									Limit1:	
107			·							
97			·	· · · · · · · · · · · · · · · · · · ·						
87										
									9	
77										
67										
57										
47										
37										<u>A</u> .
	L							2 0		ΝV
27	 		· · · · · · · · · · · · · · · · · · ·							
17.0										
231	0.0000 2320.00	2330.00	2340.00	2350.00	2360.00	2370.00	2380.00	2390.00	2400.0	0 2410.00

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	41.40	-10.82	30.58	54.00	-23.42	Average Detector
	2310.000	52.50	-10.82	41.68	74.00	-32.32	Peak Detector
2	2390.000	41.31	-10.70	30.61	54.00	-23.39	Average Detector
	2390.000	52.38	-10.70	41.68	74.00	-32.32	Peak Detector
3	2402.100	93.26	-10.69	82.57	/	/	Average Detector
	2402.300	97.73	-10.69	87.04	/	/	Peak Detector

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No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2480.000	92.20	-10.58	81.62	/	/	Average Detector
	2480.200	96.38	-10.58	85.80	/	/	Peak Detector
2	2483.500	53.53	-10.58	42.95	54.00	-11.05	Average Detector
	2483.500	63.58	-10.58	53.00	74.00	-21.00	Peak Detector
3	2500.000	40.33	-10.55	29.78	54.00	-24.22	Average Detector
	2500.000	52.44	-10.55	41.89	74.00	-32.11	Peak Detector

APPENDIXPHOTOGRAPHS

Please refer to "ANNEX"

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