



FCC ID TEST REPORT

for

Wireless Control Pad Switch(Transmitter)

Model: TZ980-WH

FCC ID: 2ABOC-TZ980

Prepared for: Titan USA LLC
11770 Haynes Bridge Rd., STE. 205-336, Alpharetta, GA 30009 U.S.A.

Prepared by: Shenzhen TCT Testing Technology Co.,Ltd
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Report Number: TCT131231017F2-1
Date of Test: Jan. 03~Jan. 13, 2014
Date of Report: Jan. 03~Jan. 13, 2014

The results detailed in this test report relate only to the specific sample(s) tested. It is the Application's responsibility to ensure that all production units are manufactured with equivalent EMC characteristics. This report is not to be reproduced except in full, without written approval from TCT Testing Technology.

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1.0 General Details

1.1 Test Lab Details

Name :	Shenzhen Tongce Testing Lab
Address:	1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China
Telephone:	13410377511
Fax:	--

The test facility is recognized, certified, or accredited by the following organizations:

FCC Registration Number: 572331

Shenzhen TCT Testing Technology Co., Ltd., Shenzhen EMC Laboratory: Shenzhen Tongce Testing Lab
The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.
Registration Number: 572331

Industry Canada (IC)

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing
Registration Number IC: 10668A-1

1.2 Applicant Details

Applicant:	Titan USA LLC
Address:	11770 Haynes Bridge Rd., STE. 205-336, Alpharetta, GA 30009 U.S.A.
Telephone:	678 845 8899
Fax:	678 691 1246

Manufacturer:	Chang Year Enterprise Co. Ltd.
Address:	No. 56-12, Lane 376, Sec. 1, Zhongshan Rd., Changhua City, Taiwan
Telephone:	--
Fax:	--

1.3 Description of EUT

Product:	Wireless Control Pad Switch(Transmitter)
Model No.:	TZ980-WH
Additional Model No.:	TZ980-IR, TZ980-GR
Brand Name:	Aimshot
Additional Trade Name:	N.A.
Operation Frequency:	2406MHz, 2441MHz, 2476MHz
Modulation Type:	GFSK
Channel number:	3
Antenna Designation:	A internal antenna, and the maximum antenna gain is 0dBi.
Rating:	DC 3V Via a lithium battery Model: CR1632, DC 3V, 120MAH

1.4 Statement:

All models above are identical in interior structure, electrical circuits and components are different for the marketing requirement.

1.5 Test Engineer

The sample tested by



Printed name: Jack Kang

2.0 Test equipments and Associated Equipment used during the test.

2.1 Test Equipments

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	July 07, 2013	July 06, 2014
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	July 07, 2013	July 06, 2014
Pre-amplifier	Teseq	LNA6900	--	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8447D	83153007374	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8449B	3008A01738	July 08, 2013	July 07, 2014
Loop antenna	A.R.A.	PLA-1030/B	1029	July 08, 2013	July 07, 2014
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	July 08, 2013	July 07, 2014
Horn Antenna	ETS LINDGREN	3117	--	July 08, 2013	July 07, 2014

2.2 AE used during the test

Equipment type	Manufacturer	Model
N.A.		
N.A.		
N.A.		

2.3. Block Diagram of EUT Configuration



Note: A new battery are used for E.U.T during the test

Low channel: 2406MHz, Middle channel: 2441MHz, High channel: 2476MHz

The EUT is a portable device, and measurements were conducted in all three axis (X, Y, Z), and the worst case (X axis) was submitted only.

3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications

Requirement	CFR 47 Section	Result	Notes
Conduction Emission, 0.15MHz to 30M Hz	N.A.	N.A.	N.A.
Radiated Emission Test	Section 15.209, 15.35 Section 15.249(a)(d)	PASS	Complies
Band Edge Test	15.249(d)	PASS	Complies
Occupied Bandwidth	Section 15.249, Section 15.215(c)	PASS	Complies
Antenna Requirement	Section 15.203	PASS	Complies

Note: This EUT is power by battery only, the conducted emission is not applicable

3.2 Test Standards

FCC Rules and Regulations Part 15 Subpart C 15.249: 2012

4.0 EUT Modification

No modification by Shenzhen TCT Testing Technology Co., Ltd

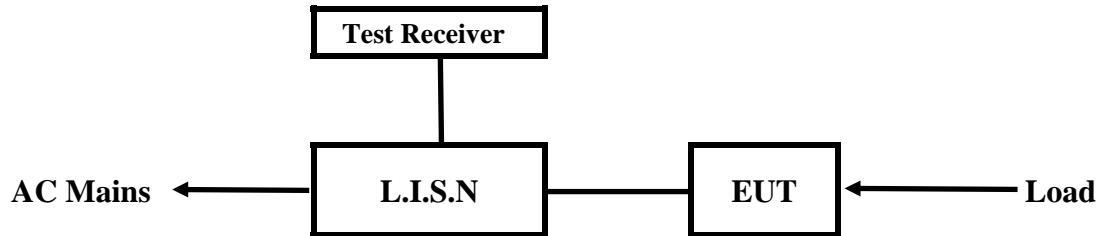
5.0 Measurement Uncertainty

(95% confidence levels, k=2)

No.	Item	MU
1.	Radio Frequency	$\pm 1 \times 10^{-9}$
2.	Temperature	$\pm 0.1^\circ\text{C}$
3.	Humidity	$\pm 1.0\%$
4.	RF power, conducted	$\pm 0.34\text{dB}$
5.	RF power density, conducted	$\pm 1.45\text{dB}$
6.	Spurious emissions, conducted	$\pm 3.70\text{dB}$
7.	All emissions, radiated	$\pm 4.50\text{dB}$

6.0 Power Line Conducted Emission Test

6.1 Schematics of the test



EUT: Equipment Under Test

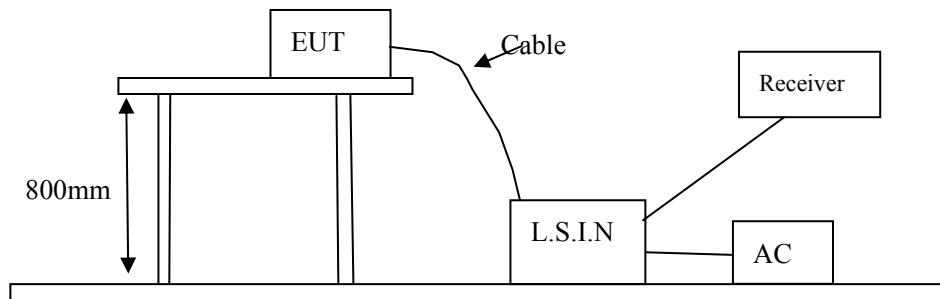
6.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2009 and ANSI C63.4-2003

The Frequency spectrum From 0.15MHz to 30MHz was investigated.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



6.3 EUT Operating Condition

Operating condition is according to ANSI C63.10-2009 and ANSI C63.4-2003

- 1) Setup the EUT and simulators as shown on the following
- 2) Enable AF signal and confirm EUT active to normal condition

6.4 Test Equipment

N.A.

6.5 Conducted Emission Limit

Frequency(MHz)	Class A Limits (dB μ V)		Class B Limits (dB μ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

Notes: 1) *Decreasing linearly with logarithm of frequency.
2) The tighter limit shall apply at the transition frequencies

6.6 Test specification:

Environmental conditions: Temperature: 22° C Humidity: 52% Atmospheric pressure: 103kPa

Frequency range: 0.15 MHz – 30 MHz

The test was carried out in the following operation mode(s):

- --

6.7 Test result

--

The requirements are FULFILLED

Remarks: The EUT is powered by battery supply product, so this test is not applicable.

A Conducted Emission on Line Terminal of the power line (150kHz to 30MHz)

EUT Description: --

Operation Mode: --

Tested By: --

Test date: --

Start Frequency 0.15MHz	Stop Frequency 30MHz	Step 4.5KHz	IF BW 10KHz	Detector QP+AV	Final M-Time 1s
----------------------------	-------------------------	----------------	----------------	-------------------	--------------------

Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Live		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
			--	--		
			--	--		
			--	--		

B Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)

EUT Description: --

Operation Mode: --

Tested By: --

Test Data: --

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s

Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Live		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--

7.0 Radiated Emission Test

7.1 Test Method and test Procedure:

- 1) The EUT was tested according to ANSI C63.10-2009 and ANSI C63.4-2003
- 2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2009 and ANSI C63.4-2003
- 3) The frequency spectrum from 9kHz to 5GHz was investigated. All readings from 9kHz to 30MHz are quasi-peak values with a resolution bandwidth of 10 kHz, measured with loop antenna.

All readings from 30MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz, measured with Bi-log antenna.

All readings are above 1 GHz are peak values with a resolution bandwidth of 1 MHz, measured with horn antenna.

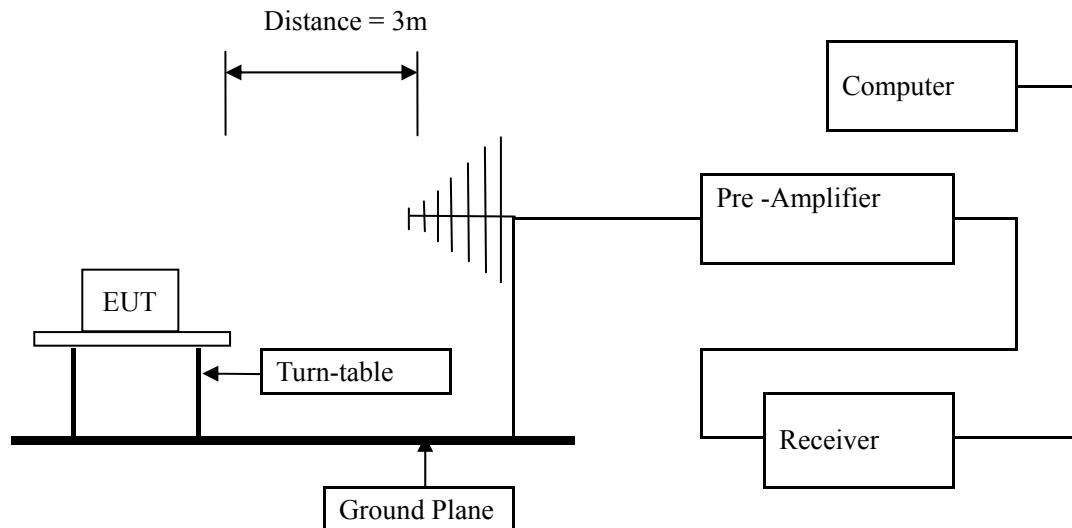
- 4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for above 30MHz each frequency .

The antenna high is 1 m to find the maximum emission for each frequency below 30MHz

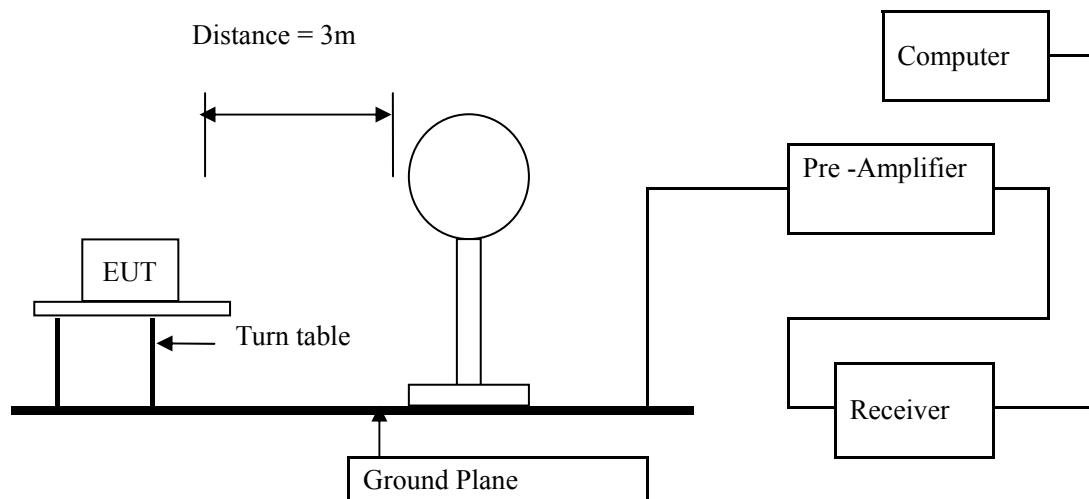
- 5) Tested distance: 3 meters
- 6) The antenna polarization: Vertical polarization and Horizontal polarization.
- 7) Each azimuth of E.U.T will be tested.

7.2 Block diagram of Test setup

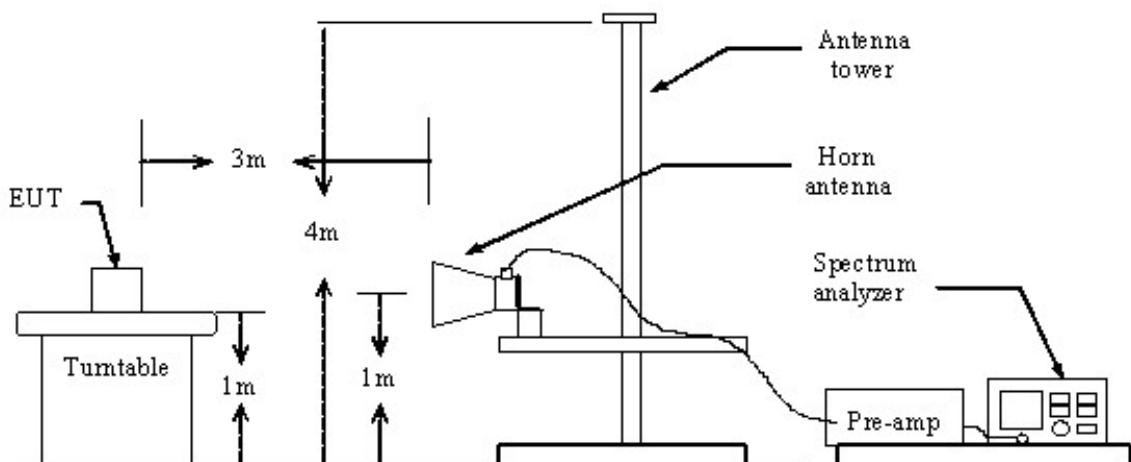
Block diagram of Test setup for frequency 30-1000MHz



Block diagram of Test setup for frequency below 30MHz



Block diagram of Test setup for frequency above 1GHz



7.3 Limit

According to 15.249(a) requirements:

Fundamental Frequency (MHz)	Filed Strength of(millivolts/meter)	
	Fundamental	Harmonics
902-928	50	0.5
2400-2483.5	50	0.5
5725-5875	50	0.5
24000-24250	250	2.5

For this E.U.T

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)			Field Strength of Harmonics (3m)		
	mV/m	dBuV/m		mV/m	dBuV/m	
2400-2483.5	50	94 (Average)	114 (Peak)	0.5	54 (Average)	74 (Peak)

Note:

- 1) RF Field Strength (dBuV) = $20 \log_{10} \text{RF Voltage (uV)}$
- 2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- 3) The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

According to 15.249(d) requirements: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequencies in restricted band are complied to limit

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
0.009-0.490	3	$20 \log_{10} 2400/F \text{ (kHz)} + 80$
0.490-1.705	3	$20 \log_{10} 24000/F \text{ (kHz)} + 40$
1.705-30	3	$20 \log_{10} 30 + 40$
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note:

- 1) RF Voltage (dBuV) = $20 \log_{10} \text{RF Voltage (uV)}$
- 2) In the Above Table, the tighter limit applies at the band edges.
- 3) Distance refers to the distance in meters between the measuring instrument antenna and the EUT
- 4) The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
- 5) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula $Ld1 = Ld2 * (d2/d1)$

7.4 Test Equipment

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	July 07, 2013	July 06, 2014
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	July 07, 2013	July 06, 2014
Pre-amplifier	Teseq	LNA6900	--	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8447D	83153007374	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8449B	3008A01738	July 08, 2013	July 07, 2014
Loop antenna	A.R.A.	PLA-1030/B	1029	July 8, 2013	July 7, 2014
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	July 08, 2013	July 07, 2014
Horn Antenna	ETS LINDGREN	3117	--	July 08, 2013	July 07, 2014
Horn Antenna	ETS LINDGREN	3160	--	July 08, 2013	July 07, 2014

7.5 Test specification:

Environmental conditions: Temperature 23° C Humidity: 50% Atmospheric pressure: 103kPa

7.6 Test result

Result: Pass

A Radiated Emission (9 kHz----30 MHz)

Note: 1) Emission Level=Reading+ Cable loss-Antenna factor-Amp factor
2) The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Result: Pass

Frequency (MHz)	Level@3m (dB μ V/m)	Limit@3m (dB μ V/m)
--	--	--
--	--	--
--	--	--
--	--	--

B General Radiated Emissions Data

Radiated Emission (30MHz----1000MHz)

In Horizontal

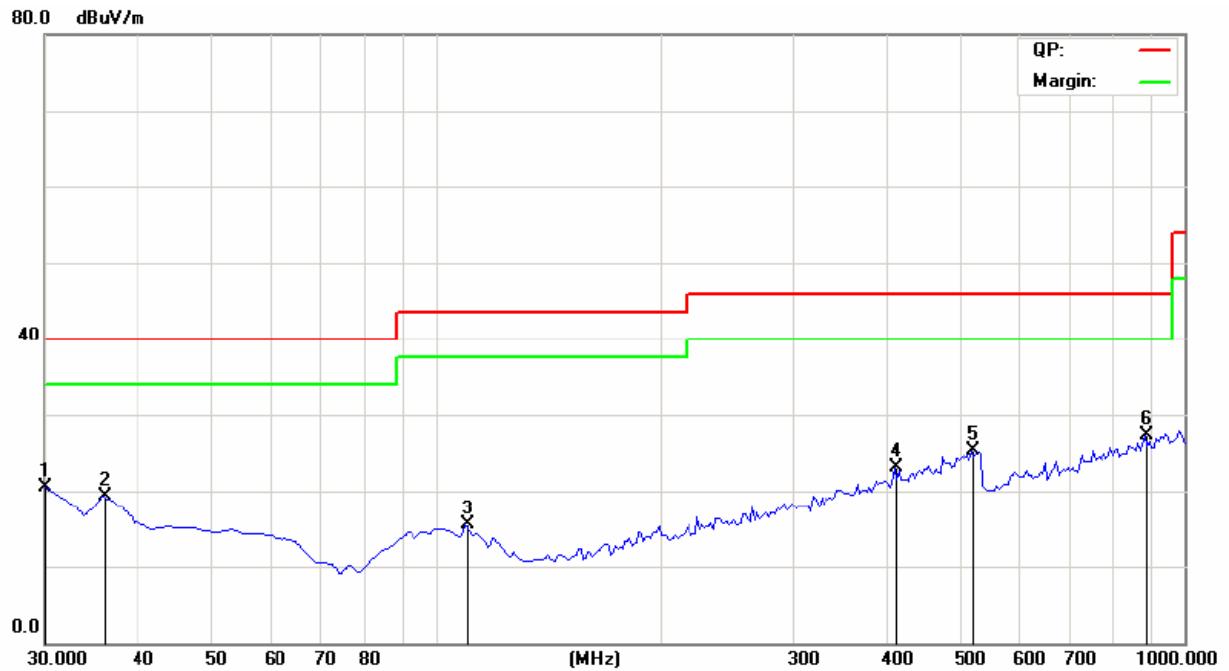
Please refer to following diagram for individual



Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
31.9440	16.06	H	40.00
55.2705	16.66	H	40.00
103.8677	15.76	H	43.50
245.7715	17.11	H	46.00
420.7214	23.29	H	46.00
531.5230	25.47	H	46.00

In Vertical

Please refer to following diagram for individual



Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
30.0000	20.43	V	40.00
35.8316	19.24	V	40.00
109.6994	15.47	V	43.50
411.0020	23.02	V	46.00
523.7475	25.27	V	46.00
889.1984	27.32	V	46.00

Note: Measurements were conducted in all channels (high, middle, low), and the worst case (low channel) was submitted only.

C Fundamental & Harmonics and Spurious Radiated Emission Data (1000MHz-25000MHz)

Low channel: 2406 MHz				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2406	77.51(PK)	H	114/94	-16.49
2406	77.24(PK)	V	114/94	-16.76
4812	43.83 (PK)	H	74/54	-10.17
4812	42.89(PK)	V	74/54	-11.11
7541	45.59(PK)	H	74/54	-8.41
7541	42.54(PK)	V	74/54	-11.46

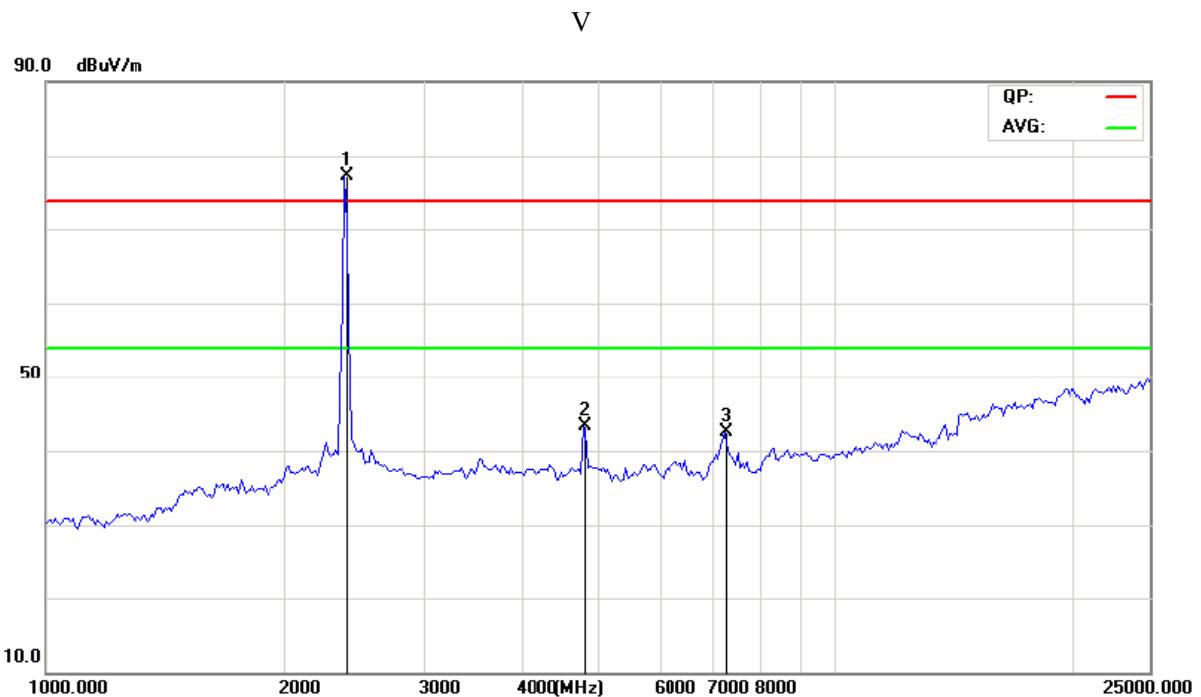
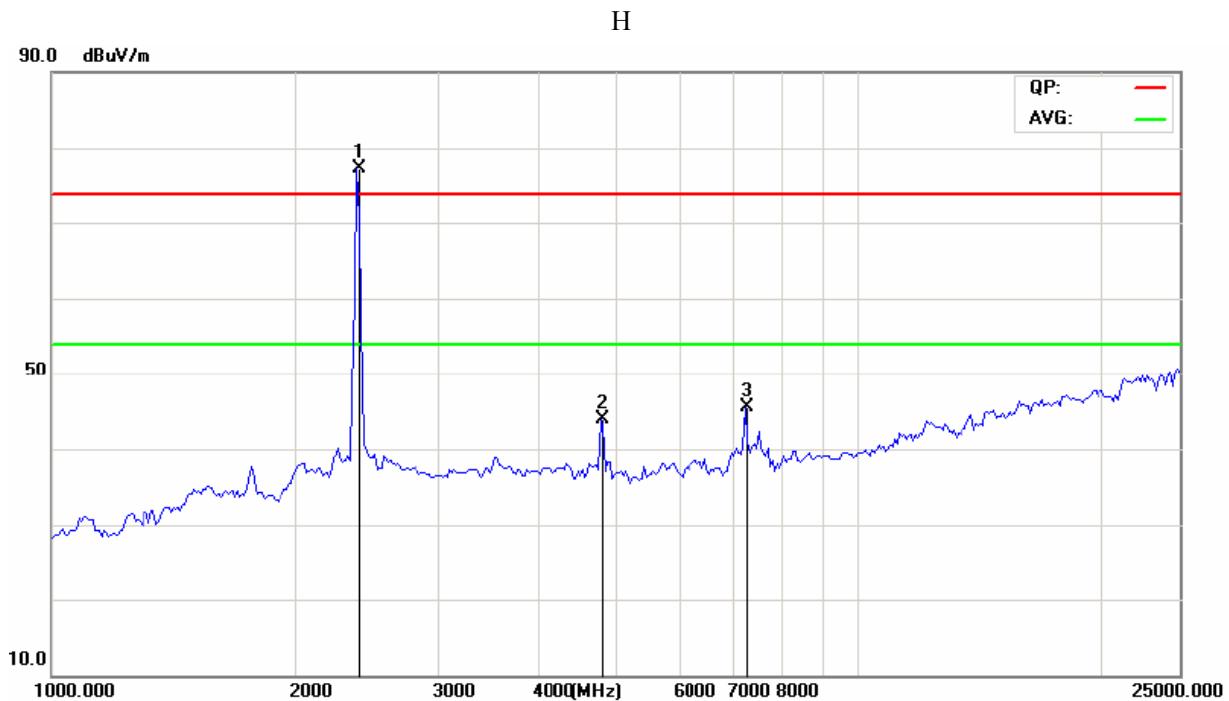
Middle channel: 2441 MHz				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2441	77.82 (PK)	H	114/94	-16.18
2441	76.82 (PK)	V	114/94	-17.18
4882	44.45 (PK)	H	74/54	-9.55
4882	44.45 (PK)	V	74/54	-9.55
7323	45.02 (PK)	H	74/54	-8.98
7323	44.52 (PK)	V	74/54	-9.48

High channel: 2476 MHz				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal/ Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2476	79.08 (PK)	H	114/94	-14.92
2476	79.36 (PK)	V	114/94	-14.64
4952	43.71 (PK)	H	74/54	-10.29
4952	42.53 (PK)	V	74/54	-11.47
7428	47.14 (PK)	H	74/54	-6.86
7428	49.64 (PK)	V	74/54	-4.36

Note:

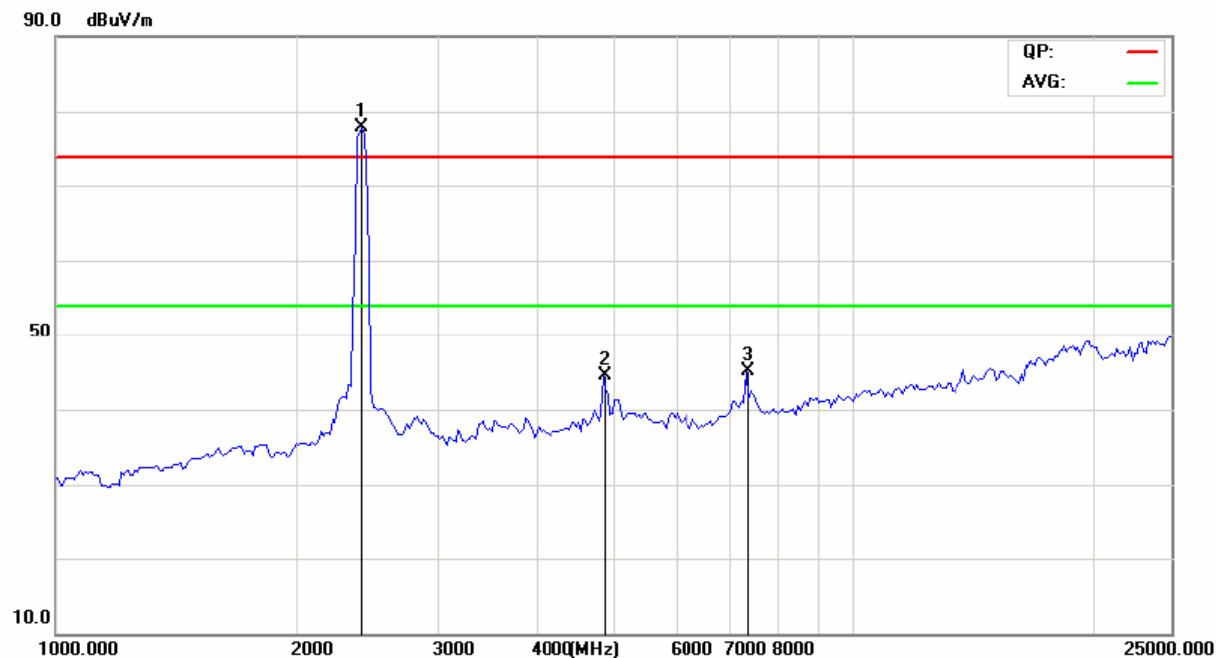
- 1) PK= Peak, AV= Average
- 2) Emission Level = Reading Level + Antenna Factor + Cable Loss.
- 3) Margin= Limit(AV) – Emission Level
- 4) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 5) The other emission levels are too small, which are not reported. It is deemed to comply with the requirement of the rule.

Please refer to the following diagram for individual
Low Channel: 2406 MHz

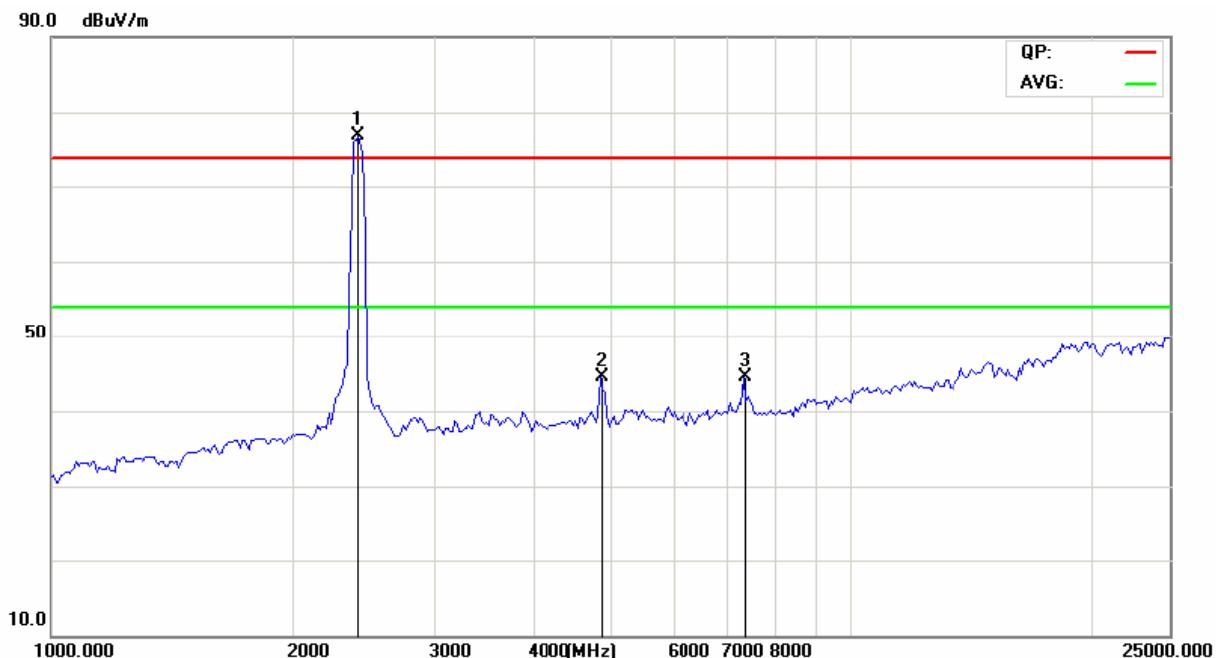


Please refer to following diagram for individual
Middle Channel: 2441 MHz

H

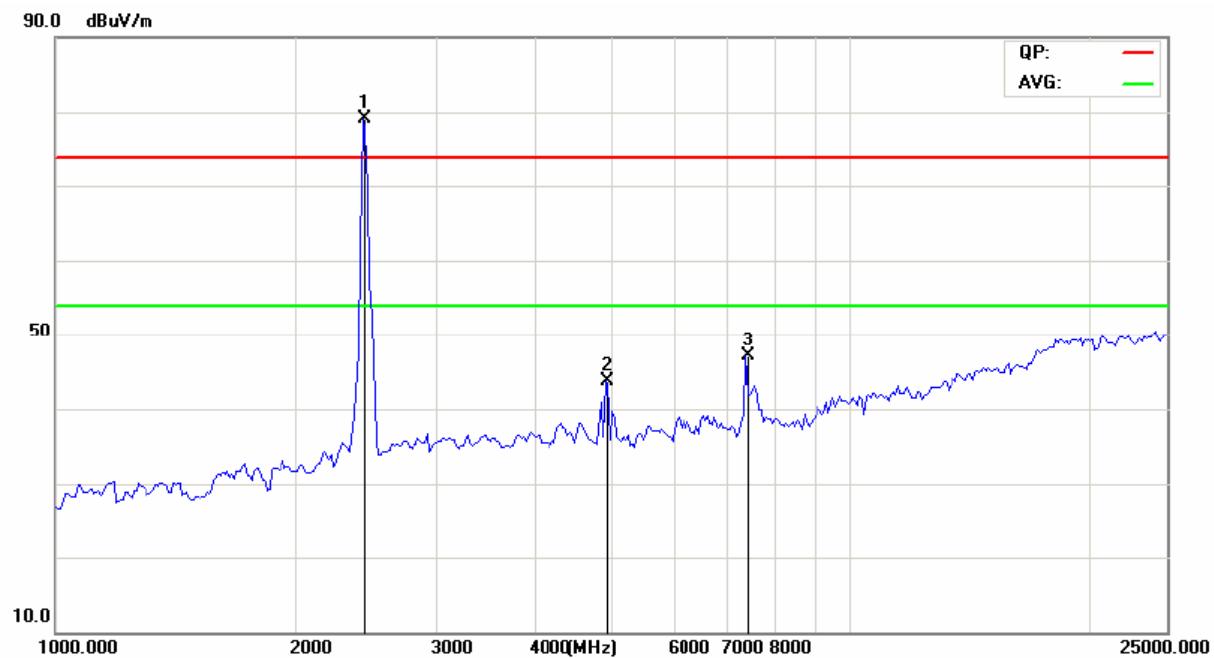


V

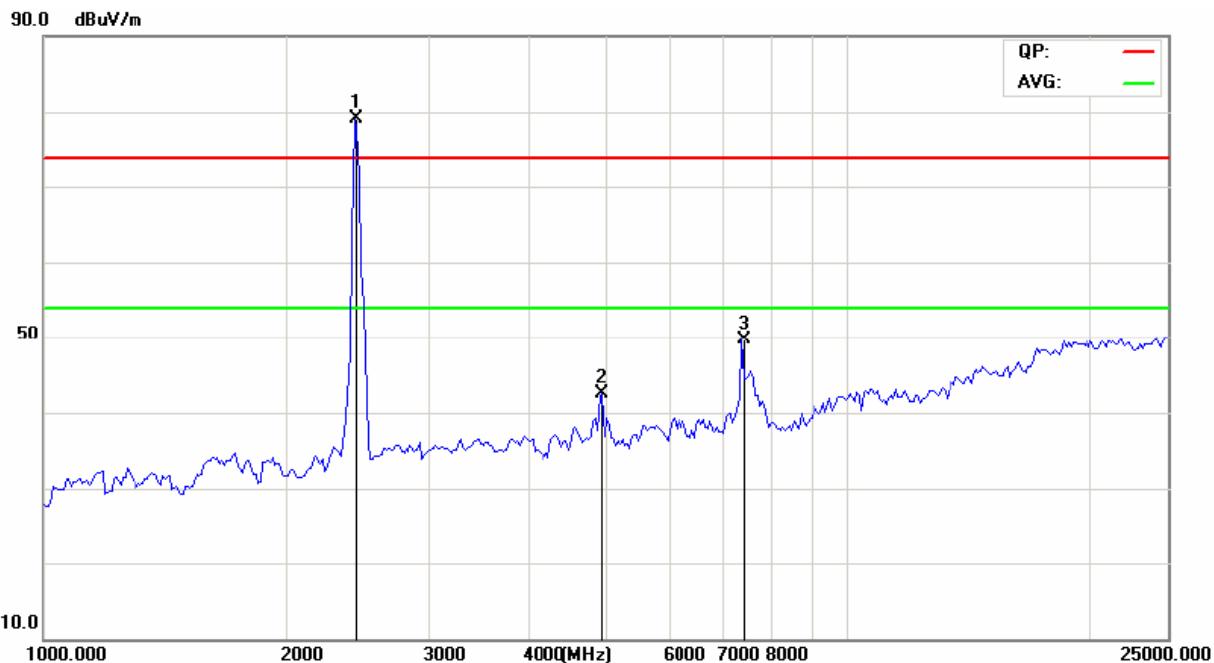


Please refer to following diagram for individual
High Channel: 2476 MHz

H



V



8. Band Edge

8.1 Band Edge Limit

1) According to 15.249(d) requirements: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

2) For Emissions in Restricted band, the limit is below the general radiated emission limits in 15.209

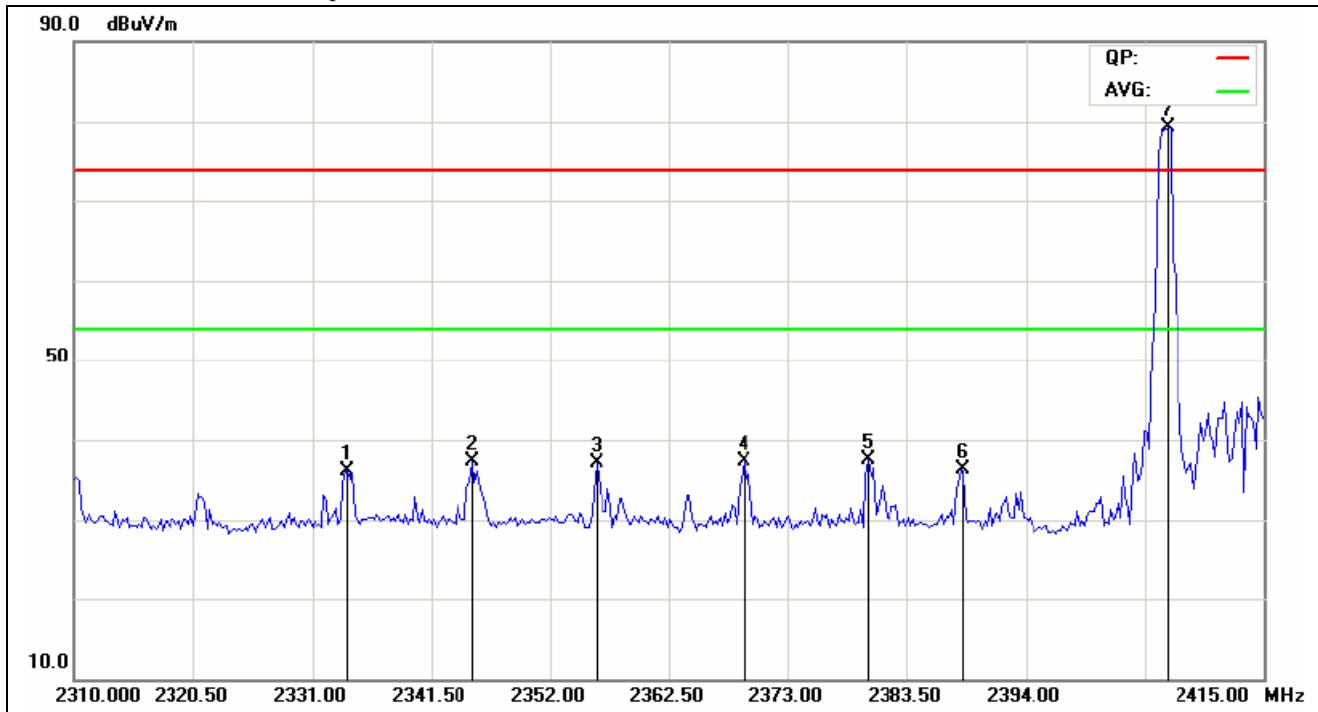
8.2 Test Equipment

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	July 07, 2013	July 06, 2014
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	July 07, 2013	July 06, 2014
Pre-amplifier	Teseq	LNA6900	--	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8447D	83153007374	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8449B	3008A01738	July 08, 2013	July 07, 2014
Loop antenna	A.R.A.	PLA-1030/B	1029	July 8, 2013	July 07, 2014
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	July 08, 2013	July 07, 2014
Horn Antenna	ETS LINDGREN	3117	--	July 08, 2013	July 07, 2014
Horn Antenna	ETS LINDGREN	3160	--	July 08, 2013	July 07, 2014

8.3 Test Result

Pass

Low channel in Horizontal polarization

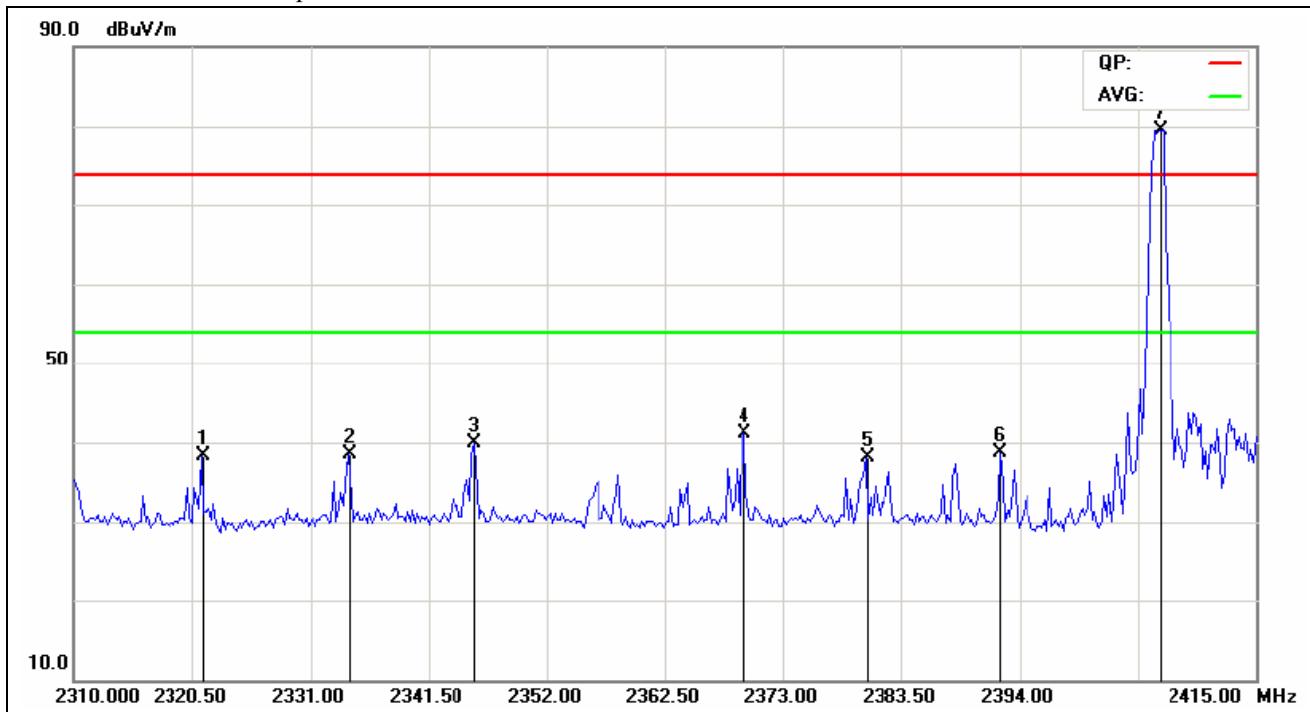


Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2334.2	36.16	Peak	74.00
2345.1	37.30	Peak	74.00
2356.1	37.14	Peak	74.00
2369.1	37.33	Peak	74.00
2380.0	37.42	Peak	74.00
2388.7	36.40	Peak	74.00
2406.6	78.65	Peak	114.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 37.42 dB μ V/m at 2380.0MHz, which meets the average limit in 15.209.. It is deemed to comply with the requirements.

Low channel in Vertical polarization

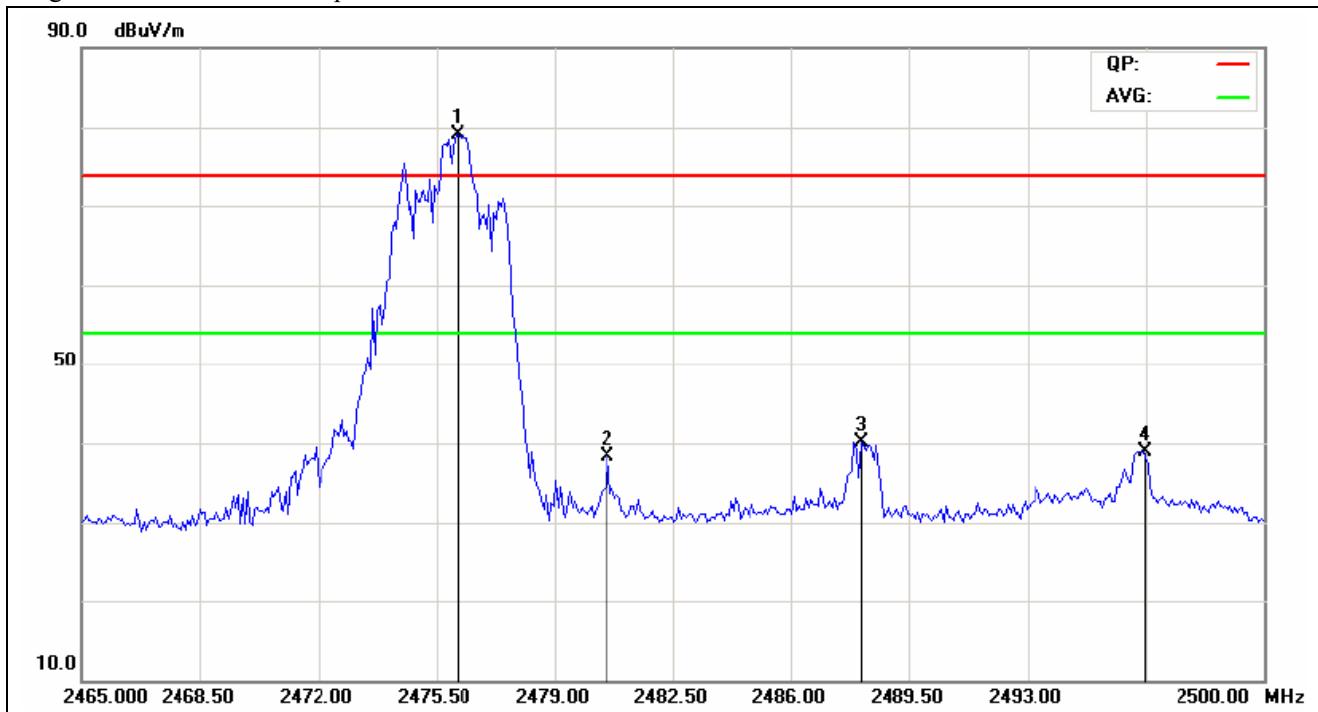


Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2321.4	38.35	Peak	74.00
2334.4	38.46	Peak	74.00
2345.6	39.87	Peak	74.00
2369.5	41.09	Peak	74.00
2380.3	38.16	Peak	74.00
2392.3	38.76	Peak	74.00
2406.6	79.14	Peak	114.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209.

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 41.09dB μ V/m at 2369.5 MHz, which meets the average limit in 15.209. It is deemed to comply with the requirements.

High channel in Horizontal polarization

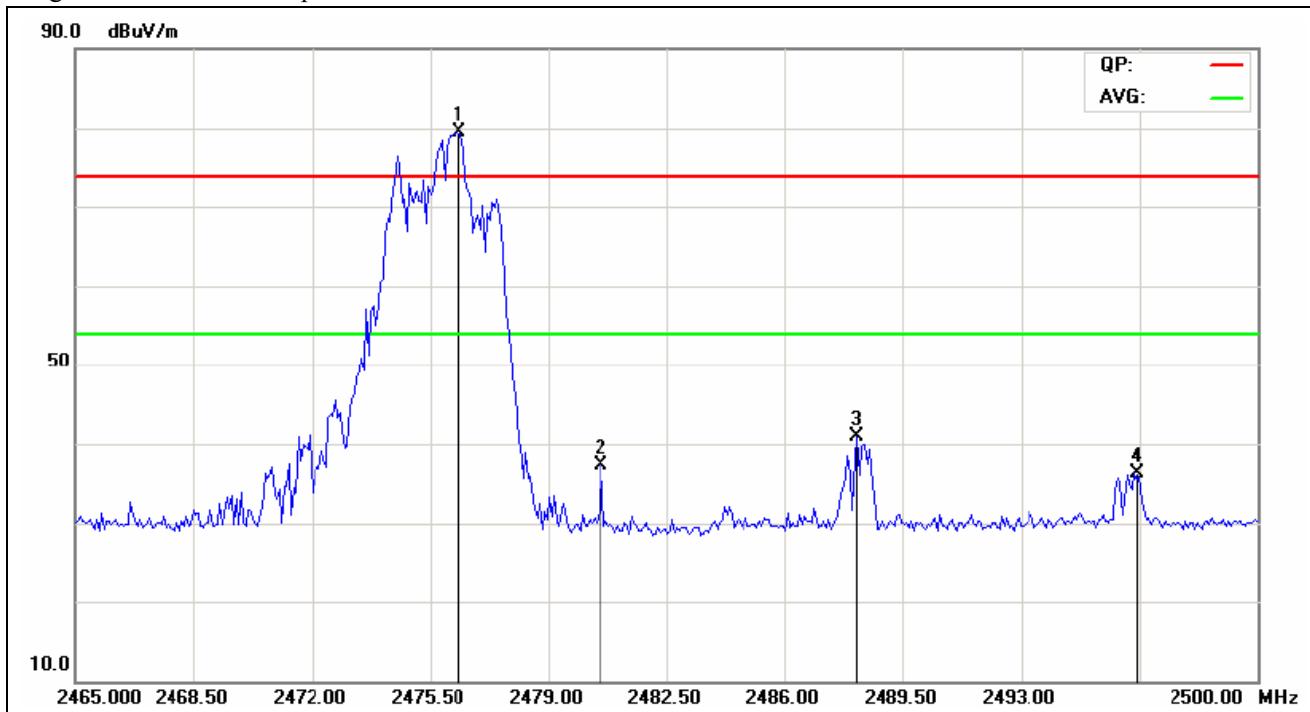


Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2476.2	79.01	Peak	114.00
2480.6	38.33	Peak	74.00
2488.1	40.19	Peak	74.00
2496.4	38.99	Peak	74.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 40.19 dB μ V/m at 2488.1 MHz, which meets the average limit in 15.209. It is deemed to comply with the requirements.

High channel in Vertical polarization



Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2476.3	79.53	Peak	114.00
2480.1	37.33	Peak	74.00
2488.2	40.89	Peak	74.00
2496.4	36.30	Peak	74.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209.

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 40.89dB μ V/m at 2488.2MHz, which meets the average limit in 15.209. It is deemed to comply with the requirements.

9.0 Occupied Bandwidth

9.1 Test Equipment

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	July 07, 2013	July 06, 2014

9.2 Test Specification:

Environmental conditions: Temperature 22° C Humidity: 50% Atmospheric pressure: 103kPa

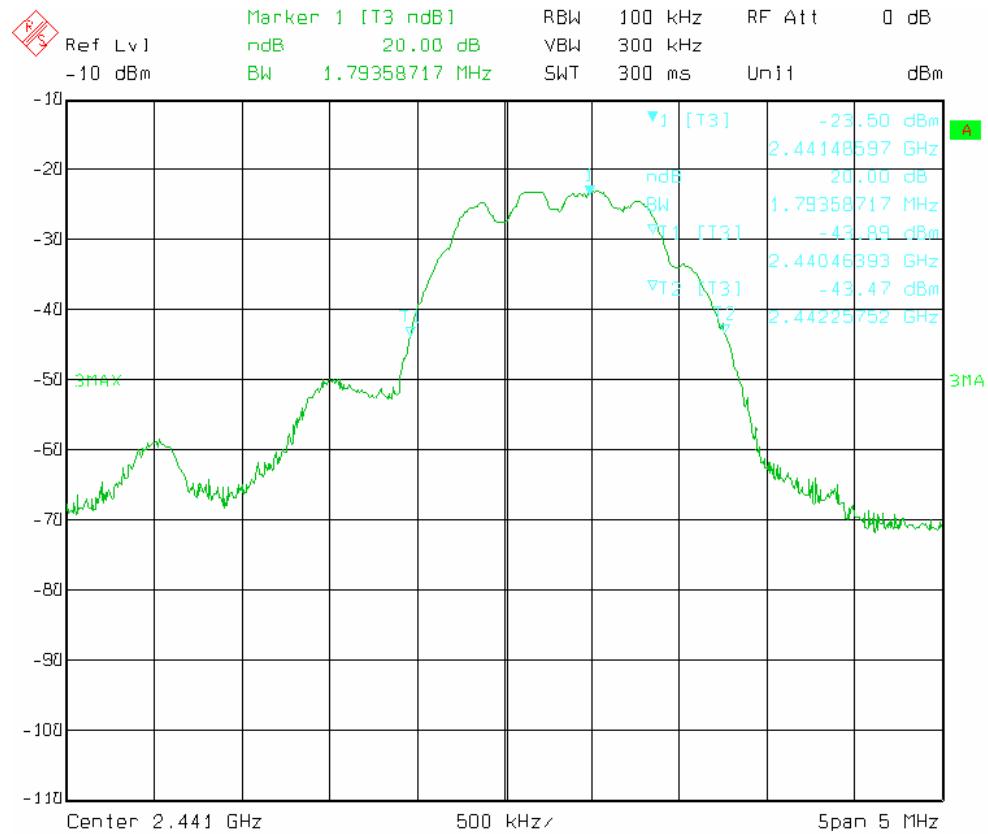
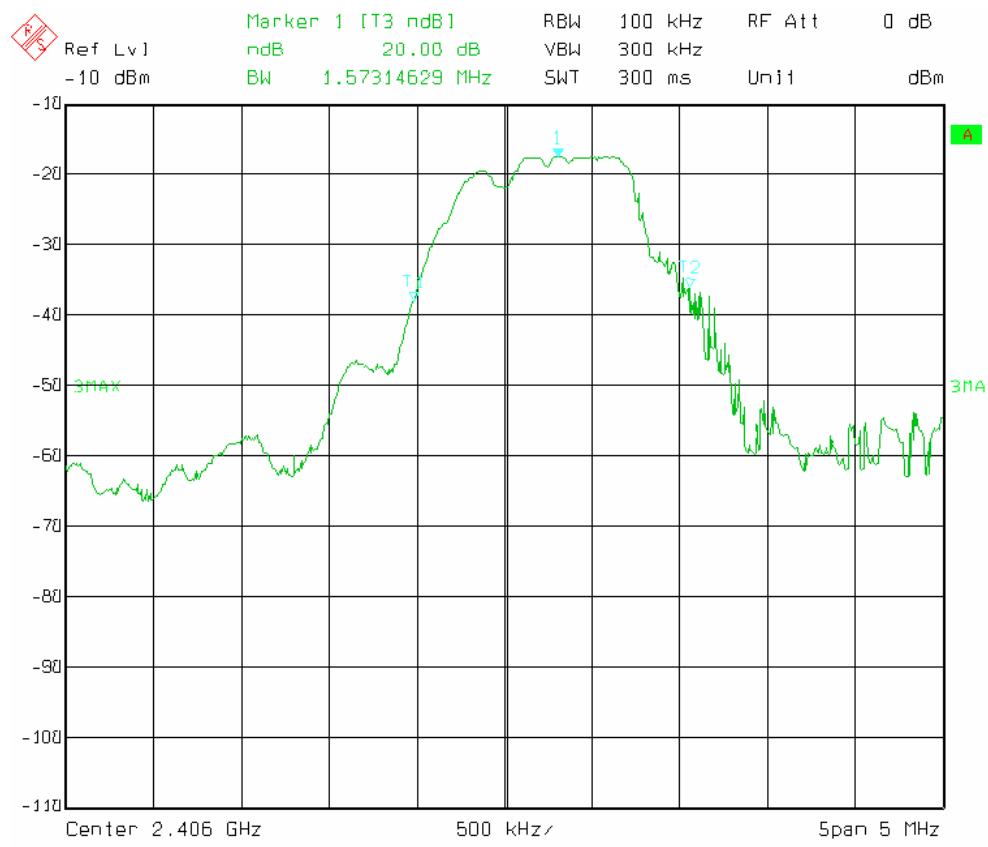
9.3 Limit

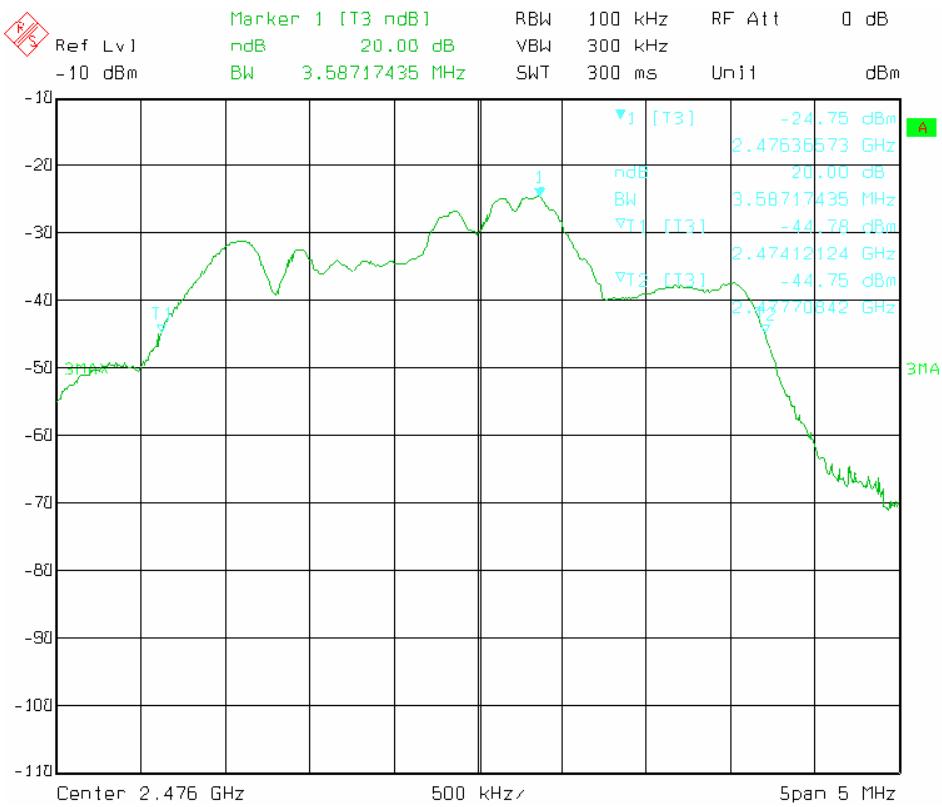
According to 15.215(c), 20dB Bandwidth should be tested.

9.4 Test Result:

Channel	20dB Bandwidth (kHz)	Limit (kHz)	Conclusion
Low	1573.1	--	PASS
Middle	1793.6	--	PASS
High	3587.2	--	PASS

Test Data as follows:





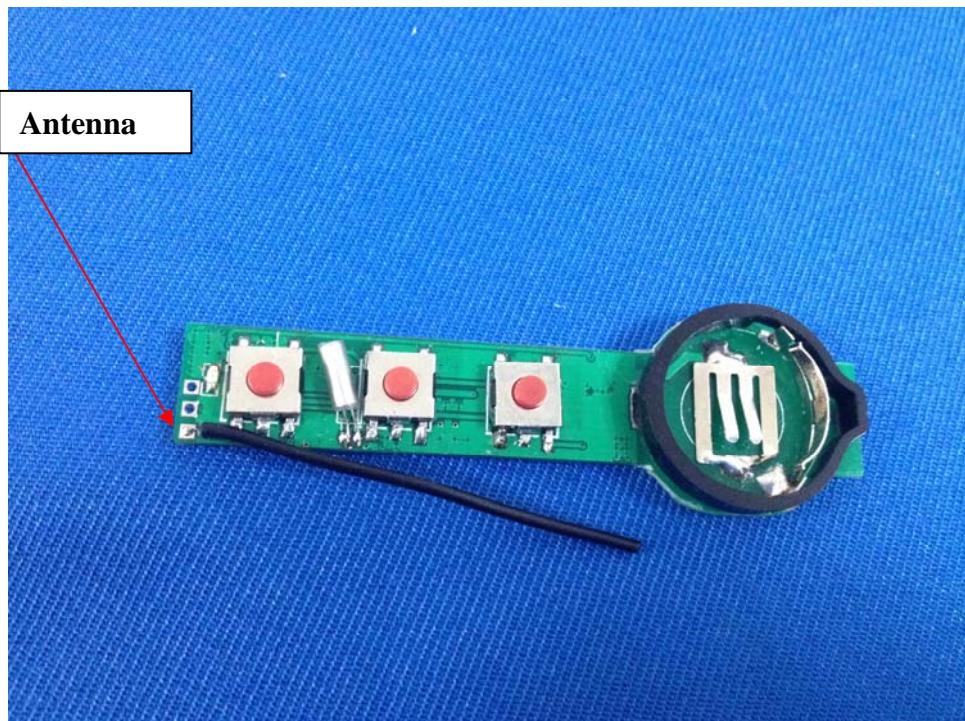
10.0 Antenna Requirement

10.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

10.2 Antenna Specification

According to the manufacturer declared, PIFA antennas; the maximum gain of antennas is 0 dBi. and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.



--End of the report--