TEST REPORT

Reference No	:	WTS17S0990458E			
FCC ID	:	2AGE6-I3			
Applicant	:	Shenzhen Silver Star Intelligent Technology Co., Ltd.			
Address	:	Dafu Industrial Areas, Guanguang Road, Baoan District, Shenzhen, China			
Manufacturer	:	The same as above			
Address	:	The same as above			
Product	:	Robotic Vacuum Cleaner			
Model(s)	:	13			
Standards	:	FCC CFR47 Part 15 Section 15.249: 2016			
Date of Receipt sample	:	2017-09-18			
Date of Test	:	2017-09-19 to 2017-10-10			
Date of Issue	:	2017-10-11			
Test Result	:	Pass			
reproduced, except in full, wi	tho	port refer only to the sample(s) tested, this test report cannot be out prior written permission of the company. The report would be invalid titute and the signatures of compiler and approver. Prepared By:			
Address: 1/F., Fukangtai E		Waltek Services (Shenzhen) Co., Ltd. ding, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China Tel:+86-755-83551033 Fax:+86-755-83552400			
Compiled by:		Approved by:			
Jack	V	Ven WALTEK THE Zhou Zhoul			
Jack Wen / Test Engin	eer	Philo Zhong / Manager			

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2 Laboratories Introduction

Waltek Services Test Group Ltd. is one of the largest and the most comprehensive third party testing organizations in China, our headquarter located in Shenzhen (CNAS Registration No. L3110, A2LA Certificate Number: 4243.01) and have branches in Foshan (CNAS Registration No. L6478), Dongguan (CNAS Registration No. L9950), Zhongshan, Suzhou (CNAS Registration No. L7754), Ningbo and Hong Kong, Our test capability covered four large fields: safety test. Electronic Magnetic Compatibility(EMC), reliability and energy performance, Chemical test. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CPSC(Consumer Product Safety Commission), CEC(California energy efficiency), IC(Industry Canada) and ELI(Efficient Lighting Initiative). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as UL, Intertek(ETL-SEMKO), CSA, TÜV Rheinland, TÜV SÜD, etc. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

Waltek Services (Shenzhen) Co., Ltd.

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA		FCC ID \ DOC \ VOC	1
Canada	01140	IC ID \ VOC	2
Japan	CNAS (Begint retion No. 1 2440)	MIC-T \ MIC-R	-
Europe	─ (Registration No.: L3110) ─ A2LA	EMCD \ RED	-
Taiwan	(Certificate No.: 4243.01)	NCC	-
Hong Kong	(Certificate No.: 4243.01)	OFCA	-
Australia		RCM	-
India		WPC	-
Thailand	International Services	NTC	-
Singapore	7	IDA	-
Note:	•	•	•

- 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.
- 2. IC Canada Registration No.: 7760A

B. TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of	Notify body number
TUV Rheinland	
Intertek	Ontional
TUV SUD	Optional.
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS17S09904 58E	2017-09-18	2017-09-19 to 2017-10- 10	2017-10-11	original	-	Valid

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4 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
	15.249(a)	
Radiated Emission	15.209	PASS
	15.205(a)	
Periodic Operation	15.35(c)	PASS
	15.249	
Outside of Band Emission	15.205	PASS
	15.209	
20dB Bandwidth	15:215(c)	PASS
Antenna Requirement	15.203	PASS

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6 General Information

6.1 General Description of E.U.T.

Product :Robotic Vacuum Cleaner

Model(s) :13
Model Differences : N/A
Type of Modulation : GFSK

Frequency Range : 2404-2480MHz

The Lowest Oscillator : 32.768kHz

Antenna installation : PCB Printed Antenna

Antenna Gain : 0dBi

6.2 Details of E.U.T

Ratings : Input: DC 19V === 600mA

(Power by battery: DC 14.52V 2550mAh 37.03Wh, Adapter: Input: AC 100-240V, 50/60Hz, 0.4A Max

OUTPUT: 19V === 600mA)

Adapter : Manufacturer: SHENZHEN NALIN ELEC. TECH. CO., LTD

Model: NLB060190W1A4S58

6.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Lower channel	Middle channel	Upper channel
Transmitting	2404MHz	2442MHz	2480MHz

7 Equipment Used during Test

7.1 Equipment List

	7.1 Equipment List						
Cond	Conducted Emissions Test Site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date	
1.	EMI Test Receiver	R&S	ESCI	100947	2017-09-12	2018-09-11	
2.	LISN	R&S	ENV216	100115	2017-09-12	2018-09-11	
3.	Cable	Тор	TYPE16(3.5M)	-	2017-09-12	2018-09-11	
Cond	ucted Emissions Tes	t Site 2#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date	
1.	EMI Test Receiver	R&S	ESCI	101155	2017-09-12	2018-09-11	
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2017-09-12	2018-09-11	
3.	Limiter	York	MTS-IMP-136	261115-001 0024	2017-09-12	2018-09-11	
4.	Cable	LARGE	RF300	-	2017-09-12	2018-09-11	
3m S	emi-anechoic Chamb	er for Radiation Em	nissions Test sit	e 1#			
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date	
1	EMC Analyzer	Agilent	E7405A	MY4511494	3 2016-10-17	2017-10-16	
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2016-10-17	2017-10-16	
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2017-04-09	2018-04-08	
4	Coaxial Cable (below 1GHz)	Тор	TYPE16(13M)	-	2017-09-12	2018-09-11	
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2017-04-09	2018-04-08	
6	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2017-04-13	2018-04-12	
7	Coaxial Cable (above 1GHz)	Тор	1GHz-25GHz	EW02014-7	2017-04-13	2018-04-12	
3m S	3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date	
1	Test Receiver	R&S	ESCI	101296	2017-04-13	2018-04-12	
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2017-04-09	2018-04-08	
3	Amplifier	ANRITSU	MH648A	M43381	2017-04-13	2018-04-12	
4	Cable	HUBER+SUHNER	CBL2	525178	2017-04-13	2018-04-12	

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7.2 Description of Support Units

Equipment	Manufacturer	Model No.
/	/	/

7.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10 ⁻⁶
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
	± 5.03 dB
Radiated Spurious	(Bilog antenna 30M~1000MHz)
Emissions test	± 5.47 dB
	(Horn antenna 1000M~25000MHz)

7.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

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8 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Class/Severity: Class B

Limit: 66-56 dB_µV between 0.15MHz & 0.5MHz

56 dB_μV between 0.5MHz & 5MHz 60 dB_μV between 5MHz & 30MHz

Detector: Peak for pre-scan (9kHz Resolution Bandwidth)

8.1 E.U.T. Operation

Operating Environment:

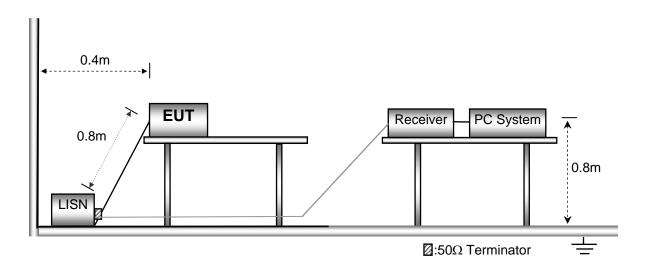
Temperature: 21.5 °C
Humidity: 51.9 % RH
Atmospheric Pressure: 101.2kPa

EUT Operation:

The test was performed in Transmitting mode, the test data were shown in the report.

8.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



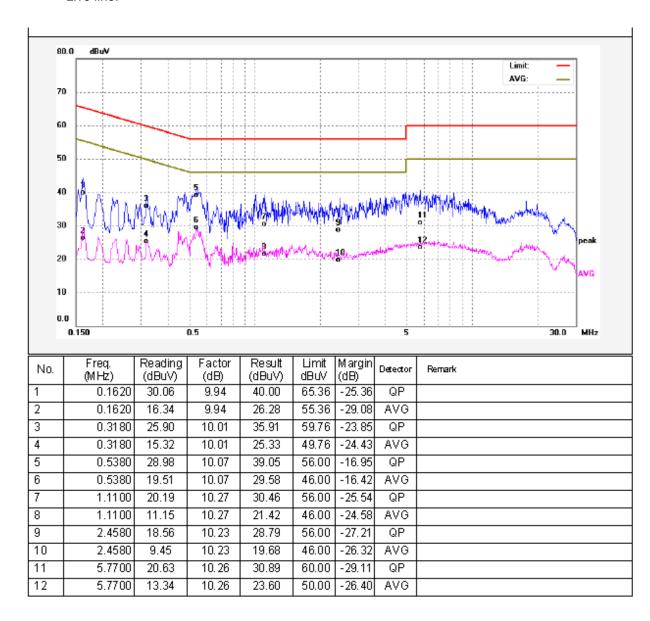
8.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

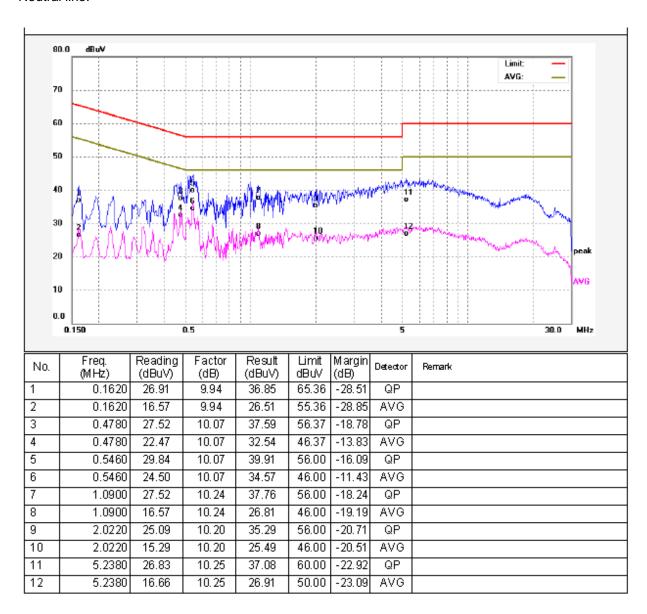
8.4 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

Live line:



Neutral line:



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9 Radiation Emission Test

Test Requirement: FCC Part15 Paragraph 15.249&15.209&15.205

Test Method: ANSI 63.10: 2013

Measurement Distance: 3m

Test Result: PASS

15.249(a)Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

15.209 Limit:

_	Field Stren	ngth	Field Strength Limit at 3m Measurement Dist		
Frequency (MHz)	uV/m	Distance (m)	uV/m	dBuV/m	
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	20log ^{(2400/F(kHz))} + 80	
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log ^{(24000/F(kHz))} + 40	
1.705 ~ 30	30	30	100 * 30	20log ⁽³⁰⁾ + 40	
30 ~ 88	100	3	100	20log ⁽¹⁰⁰⁾	
88 ~ 216	150	3	150	20log ⁽¹⁵⁰⁾	
216 ~ 960	200	3	200	20log ⁽²⁰⁰⁾	
Above 960	500	3	500	20log ⁽⁵⁰⁰⁾	

Note: RF Voltage(dBuV)=20 log₁₀ RF Voltage(uV)

9.1 EUT Operation

Operating Environment:

Temperature: 23.5 °C
Humidity: 51.1 % RH
Atmospheric Pressure: 101.2kPa

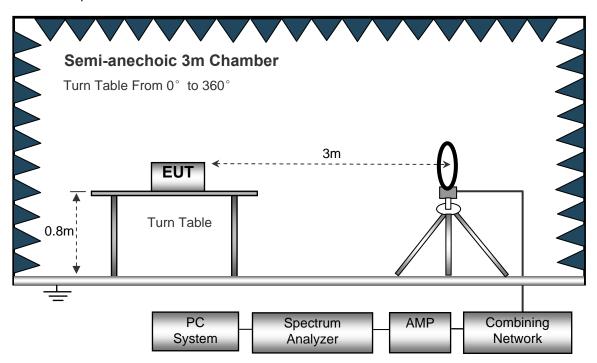
EUT Operation:

The test was performed in transmitting mode, the test data were shown in the report.

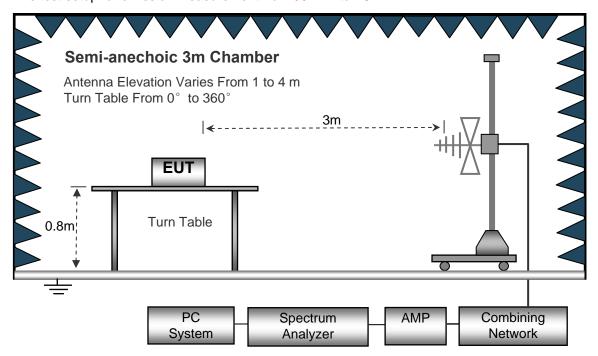
9.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

The test setup for emission measurement below 30MHz.



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



Anechoic 3m Chamber

Antenna Elevation Varies From 1 to 4 m
Turn Table From 0° to 360°

Turn Table

Absorbers

PC Spectrum AMP Combining

Analyzer

Network

The test setup for emission measurement above 1 GHz.

System

9.3 Spectrum Analyzer Setup

Below 30MHz		
	Sweep Speed	. Auto
	IF Bandwidth	.10kHz
	Video Bandwidth	.10kHz
	Resolution Bandwidth	.10kHz
30MHz ~ 1GH	z	
	Sweep Speed	. Auto
	Detector	.PK
	Resolution Bandwidth	.100kHz
	Video Bandwidth	.300kHz
Above 1GHz		
	Sweep Speed	. Auto
	Detector	.PK
	Resolution Bandwidth	.1MHz
	Video Bandwidth	.3MHz
	Detector	.Ave.
	Resolution Bandwidth	.1MHz
	Video Bandwidth	.10Hz

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9.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above1GHz, the EUT is 1.5m above ground plane.

- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Repeat above procedures until the measurements for all frequencies are complete.
- 7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
- 8. New battery is used during test.

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9.5 Test Result

Test Frequency: 32.768kHz ~ 30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 18GHz
Test Mode: Low channel Transmitting

Frequen	Receiver	Detect	Turn RX Antenna		Correct Correcte		FCC Part 15.231/209/205		
су	Reading	or	Angle	Heig ht	Pola r	Factor	Amplitud e	Limit	Margin
(MHz)	(dBµV)	(PK/QP /Ave)	Degre e	(m)	(H/V)	(dB/m)	(dBµV/m)	(dBµV /m)	(dB)
302.56	41.06	QP	329	1.7	V	-11.40	29.66	40.00	-10.34
2404.00	100.71	PK	5	1.7	Н	-13.07	87.64	114.00	-26.36
2404.00	91.48	PK	164	1.9	V	-13.07	78.41	114.00	-35.59
4808.00	48.26	PK	253	1.1	Н	-1.09	47.17	74.00	-26.83
4808.00	43.36	PK	237	1.1	V	-1.09	42.27	74.00	-31.73
7212.00	34.89	PK	84	1.7	Н	1.26	36.15	74.00	-37.85
7212.00	35.62	PK	16	1.2	V	1.26	36.88	74.00	-37.12
9616.00	39.69	PK	138	1.3	Н	3.29	42.98	74.00	-31.02
9616.00	35.66	PK	257	1.9	V	3.29	38.95	74.00	-35.05

AV = Peak +20Log10 (duty cycle) =Peak+ (0)[refer to section 10 for more detail]

Frequency	PK	Turn table	RX Ar	itenna	Duty cycle	AV	FCC Part 15.231/209/205	
rrequericy	FK	Angle	Height	Polar	Factor	AV	Limit	Margin
(MHz)	(dBµV/m)	Degree	(m)	(H/V)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2404.00	87.64	5	1.7	Н	0.00	87.64	94.00	-6.36
2404.00	78.41	164	1.9	V	0.00	78.41	94.00	-15.59
4808.00	47.17	253	1.1	Н	0.00	47.17	54.00	-6.83
4808.00	42.27	237	1.1	V	0.00	42.27	54.00	-11.73
7212.00	36.15	84	1.7	Н	0.00	36.15	54.00	-17.85
7212.00	36.88	16	1.2	V	0.00	36.88	54.00	-17.12
9616.00	42.98	138	1.3	Н	0.00	42.98	54.00	-11.02
9616.00	38.95	257	1.9	V	0.00	38.95	54.00	-15.05

Test Mode: Middle channel Transmitting

Eroguenov	Receiv er	Detect	Turn table		X enna	Correcte	Correct		C Part 1/209/205
Frequency	Readi ng	or	Angle	Hei ght	Pol ar	d Factor	ed Amplit ude	Limit	Margin
(MHz)	(dBµV)	(PK/QP /Ave)	Degre e	(m)	(H/ V)	(dB/m)	(dBµV/ m)	(dBµV/ m)	(dB)
302.56	39.92	QP	159	1.5	V	-11.40	28.52	40.00	-11.48
2442.00	97.62	PK	32	2.0	Н	-13.02	84.60	114.00	-29.40
2442.00	90.84	PK	118	1.2	V	-13.02	77.82	114.00	-36.18
4884.00	48.59	PK	154	1.4	Н	-1.01	47.57	74.00	-26.43
4884.00	43.83	PK	252	1.2	V	-1.01	42.82	74.00	-31.18
7326.00	35.08	PK	315	1.3	Н	1.35	36.43	74.00	-37.57
7326.00	36.05	PK	256	1.3	V	1.35	37.40	74.00	-36.60
9768.00	40.68	PK	348	1.3	Н	3.47	44.15	74.00	-29.85
9768.00	36.23	PK	352	1.8	V	3.47	39.70	74.00	-34.30

AV = Peak +20Log10 (duty cycle) =Peak+ (0)[refer to section 10 for more detail]

Eroguency	PK	Turn table	RX Ar	itenna	Duty cycle	AV	FCC 15.231/2	
Frequency	FK	Angle	Height	Polar	Factor	AV	Limit	Margin
(MHz)	(dBµV/m)	Degree	(m)	(H/V)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2442.00	84.60	32	2.0	Н	0.00	84.60	94.00	-9.40
2442.00	77.82	118	1.2	V	0.00	77.82	94.00	-16.18
4884.00	47.57	154	1.4	Н	0.00	47.57	54.00	-6.43
4884.00	42.82	252	1.2	V	0.00	42.82	54.00	-11.18
7326.00	36.43	315	1.3	Н	0.00	36.43	54.00	-17.57
7326.00	37.40	256	1.3	V	0.00	37.40	54.00	-16.60
9768.00	44.15	348	1.3	Н	0.00	44.15	54.00	-9.85
9768.00	39.70	352	1.8	V	0.00	39.70	54.00	-14.30

Test Mode: High channel Transmitting

Frequen	Receiv er	Detect	Turn table	R Ante	X enna	Correcte	Correct		Part 209/205
су	Readi ng	or	Angle	Hei ght	Pol ar	d Factor	ed Amplit ude	Limit	Margin
(MHz)	(dBµV)	(PK/QP /Ave)	Degre e	(m)	(H/ V)	(dB/m)	(dBµV/ m)	(dBµV/ m)	(dB)
302.56	40.34	QP	358	1.1	V	-11.40	28.94	40.00	-11.06
2480.00	100.38	PK	125	1.8	Н	-12.98	87.40	114.00	-26.60
2480.00	92.46	PK	220	1.3	V	-12.98	79.48	114.00	-34.52
4960.00	48.38	PK	7	1.8	Н	-0.86	47.52	74.00	-26.48
4960.00	43.72	PK	277	1.7	V	-0.86	42.86	74.00	-31.14
7440.00	35.17	PK	17	1.2	Н	1.58	36.75	74.00	-37.25
7440.00	35.82	PK	273	1.2	V	1.58	37.40	74.00	-36.60
9920.00	40.66	PK	355	1.4	Н	5.16	45.82	74.00	-28.18
9920.00	36.23	PK	82	1.9	V	5.16	41.39	74.00	-32.61

AV = Peak +20Log10(duty cycle)=Peak+(0) [refer to section 10 for more detail]

	PK PK	Turn RX Antenna Duty		AV	FCC Part 15.231/209/205			
Frequency	PK	table Angle	Height	Polar	cycle Factor	AV	Limit	Margin
(MHz)	(dBµV/m)	Degree	(m)	(H/V)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2480.00	87.40	125	1.8	Н	0.00	87.40	94.00	-6.60
2480.00	79.48	220	1.3	V	0.00	79.48	94.00	-14.52
4960.00	47.52	7	1.8	Н	0.00	47.52	54.00	-6.48
4960.00	42.86	277	1.7	V	0.00	42.86	54.00	-11.14
7440.00	36.75	17	1.2	Н	0.00	36.75	54.00	-17.25
7440.00	37.40	273	1.2	V	0.00	37.40	54.00	-16.60
9920.00	45.82	355	1.4	Н	0.00	45.82	54.00	-8.18
9920.00	41.39	82	1.9	V	0.00	41.39	54.00	-12.61

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10 Periodic Operation

The duty cycle was determined by the following equation:

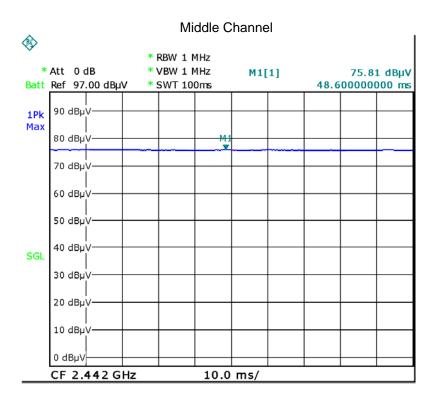
To calculate the actual field intensity, the duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

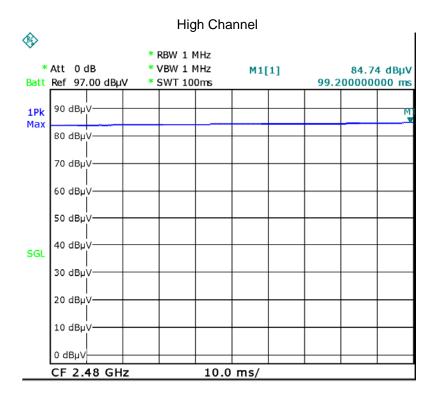
Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train * % Duty Cycle Correction Factor(dB)=20 * Log₁₀(Duty Cycle)

Test Channel	Low Channel	Middle Channel	High Channel
Total transmission time(ms)	100	100	100
Length of a complete transmission period(ms)	100	100	100
Duty Cycle(%)	1	1	1
Duty Cycle Correction Factor(dB)	0	0	0

Refer to the duty cycle plot (as below)

Test plots Low Channel ◈ * RBW 1 MHz * Att 0 dB * VBW 1 MHz 77.64 dBµV M1[1] 27.200000000 ms Batt Ref 97.00 dBµV * SWT 100ms 90 dBµV 1Pk Max M1 80 dBµV-70 dBµV 60 dBµV 50 dBµV 40 dBµV SGL 30 dBµV 20 dBµV 10 dBµV 0 dBµV CF 2.404 GHz 10.0 ms/





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11 Outside of Band Emission

Test Requirement: 15.249(d):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.

Test Method: ANSI C63.10:2013

Test Mode: Transmitting

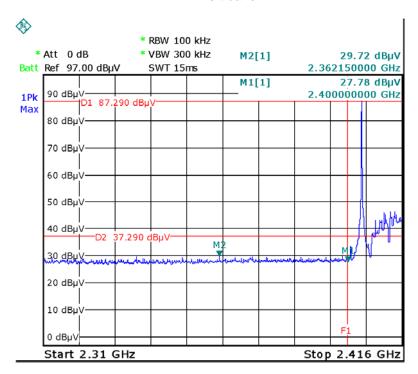
11.1 Test Procedure

Refer to section 7.4 of this test report.

11.2 Test Result

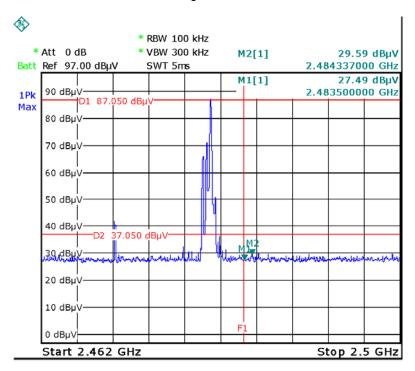
Test plots

Left band



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Right band



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12 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.215(c)

Test Method: ANSI C63.10:2013

Test Mode: Transmitting

12.1 Test Procedure

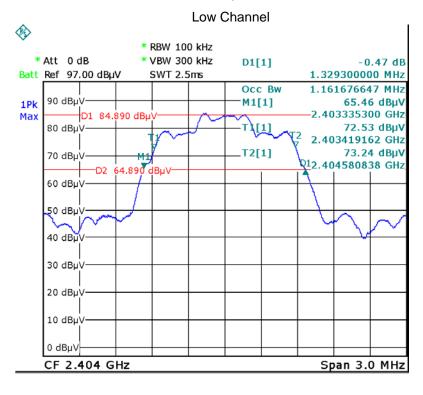
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

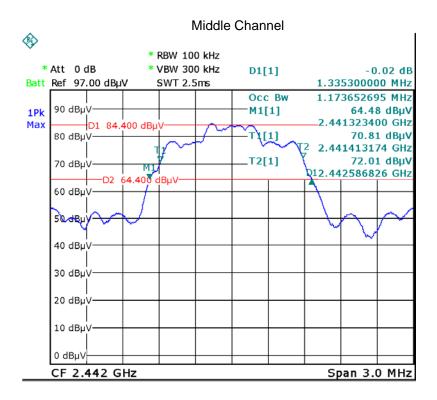
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

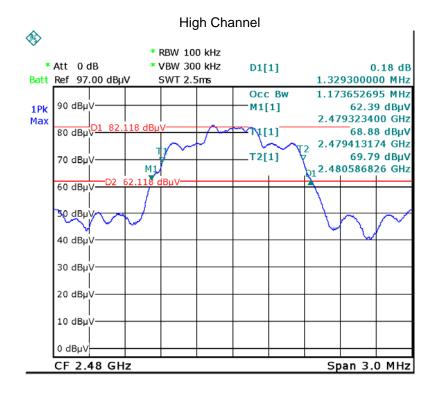
12.2 Test Result

Test Channel	20dB Bandwidth	99% Bandwidth		
low	1.329MHz	1.162MHz		
Middle	1.335MHz	1.174MHz		
high	1.329MHz	1.174MHz		

Test plots





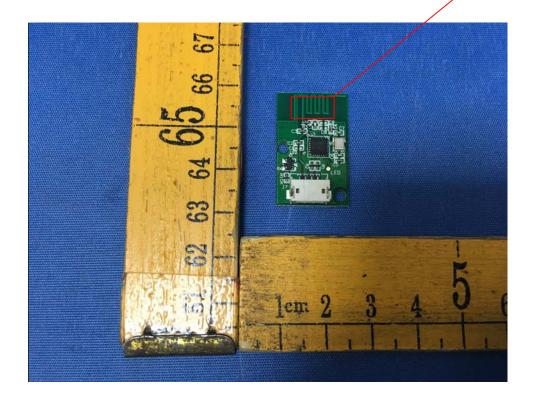


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13 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a PCB Printed Antenna, fulfil the requirement of this section.

ANT



14 Photographs Test Setup

14.1 Conducted Emission



14.2 Radiation Emission

Test frequency Below 30MHz



Test frequency from 30MHz to 1GHz



Test frequency above 1GHz~18GHz



15 Photographs - Constructional Details

15.1 Model I3- External Photos





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15.2 Model I3 - Internal Photos



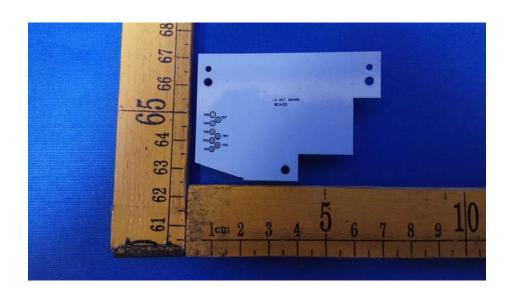


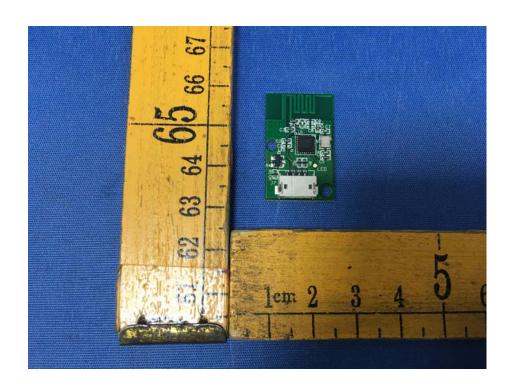
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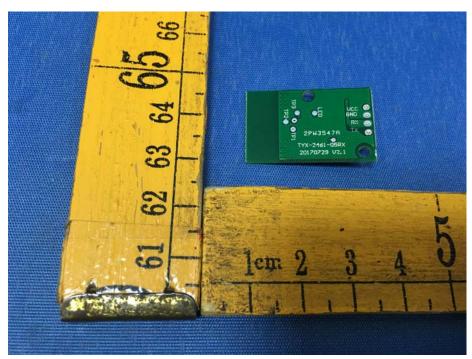


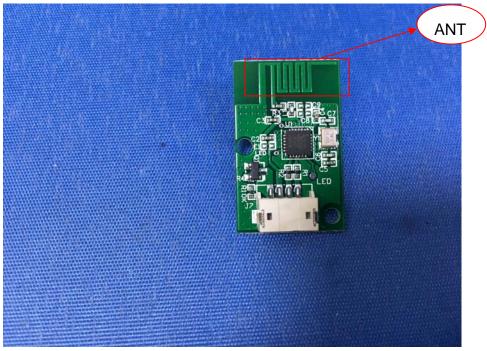
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====End of Report=====