

FCC Part 15C

Measurement and Test Report

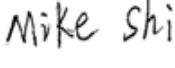
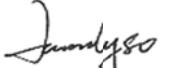
For

SIMPLELINK TECHNOLOGY CO.,LIMITED

2/F, Bldg.A2, Xin'an 2nd Industrial Park, Xixiang, Bao'an District,

Shenzhen, China

FCC ID: 2AOPASIM1010-LK4

FCC Rule(s):	<u>FCC Part 15.231e</u>
Product Description:	<u>Wireless Dimmer Light Kit</u>
Tested Model:	<u>SIM1010-LK4</u>
Report No.:	<u>STR17128315I</u>
Sample Receipt Date:	<u>2017-12-27</u>
Tested Date:	<u>2017-12-28 to 2018-01-08</u>
Issued Date:	<u>2018-01-08</u>
Tested By:	<u>Mike Shi / Engineer</u> 
Reviewed By:	<u>Silin Chen / EMC Manager</u> 
Approved & Authorized By:	<u>Jandy So / PSQ Manager</u> 
Prepared By:	<p>Shenzhen SEM Test Technology Co., Ltd. 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C. (518101) Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn</p>

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permission by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: SIMPLELINK TECHNOLOGY CO.,LIMITED
Address of applicant: 2/F, Bldg.A2, Xin'an 2nd Industrial Park, Xixiang, Bao'an District, Shenzhen, China

Manufacturer: SIMPLELINK TECHNOLOGY CO.,LIMITED
Address of manufacturer: 2/F, Bldg.A2, Xin'an 2nd Industrial Park, Xixiang, Bao'an District, Shenzhen, China

General Description of EUT	
Product Name:	Wireless Dimmer Light Kit
Trade Name:	/
Model No.:	SIM1010-LK4
Adding Model(s):	SIM1000,SIM2000,SIM3000,SIM4000,SIM5000, SIM6000,SIM7000,SIM8000,SIM9000
Rated Voltage:	DC 3.3V
Power Adapter Model:	/
Software Version:	SIM1010-LK4-SW
Hardware Version:	SIM1010-LK4-HW
<i>Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model SIM1010-LK4, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	433.75 MHz
Max. Field Strength:	64.74dBuV/m(3m)
Data Rate:	/
Modulation:	GFSK
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
Lowest Internal Frequency of EUT:	26MHz

1.2 Test Standards

The following report is prepared on behalf of the SIMPLELINK TECHNOLOGY CO.,LIMITED in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, 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, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology 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 at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Transmitting	With modulation(433.75MHz)

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
Occupied Bandwidth	Conducted	±1.5%
Conducted Spurious Emission	Conducted	±2.17dB
Transmission Time	Conducted	±5%
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2018-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-12	2018-06-11
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-12	2018-06-11
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-12	2018-06-11

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	N/A
§ 15.209	Radiated Spurious Emissions	Compliant
§15.231(e)	Deactivation Testing	Compliant
§15.231(e)	Radiated Emissions	Compliant
§15.231(c)	20dB Bandwidth Testing	Compliant

N/A: not applicable

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 Test Result

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

4. Radiated Emissions

4.1 Standard Applicable

According to §15.231(e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emission (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500 **	50 to 150 **
174 - 260	1,500	150
260 - 470	1,500 to 5,000 **	150 to 500 **
Above 470	5,000	500

** linear interpolations

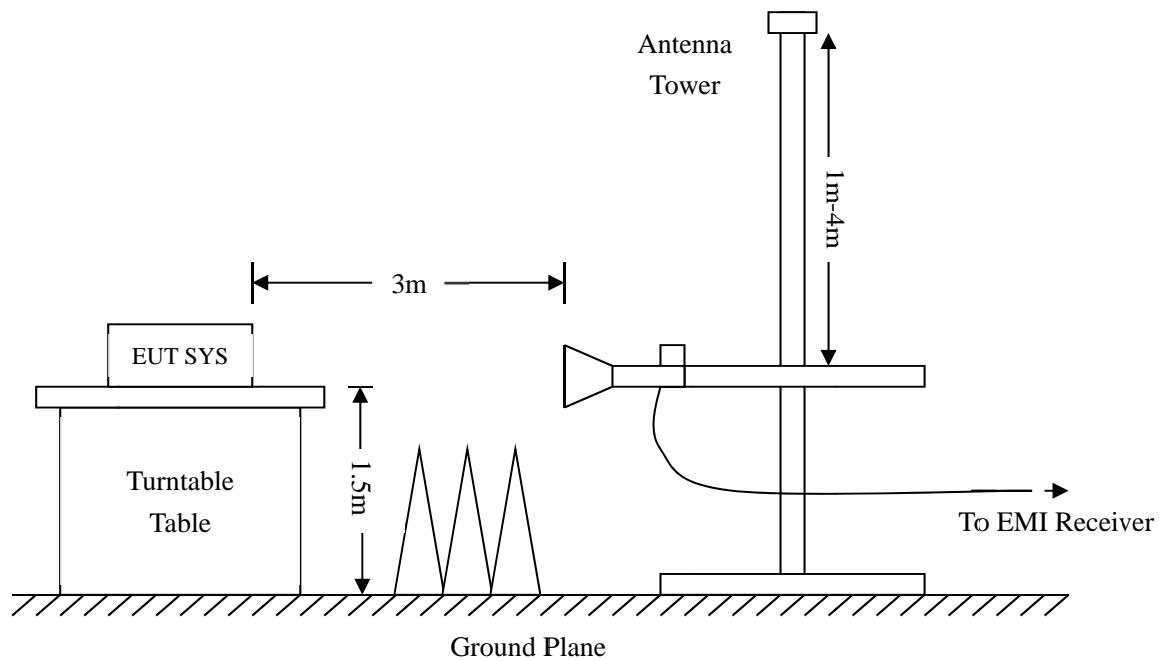
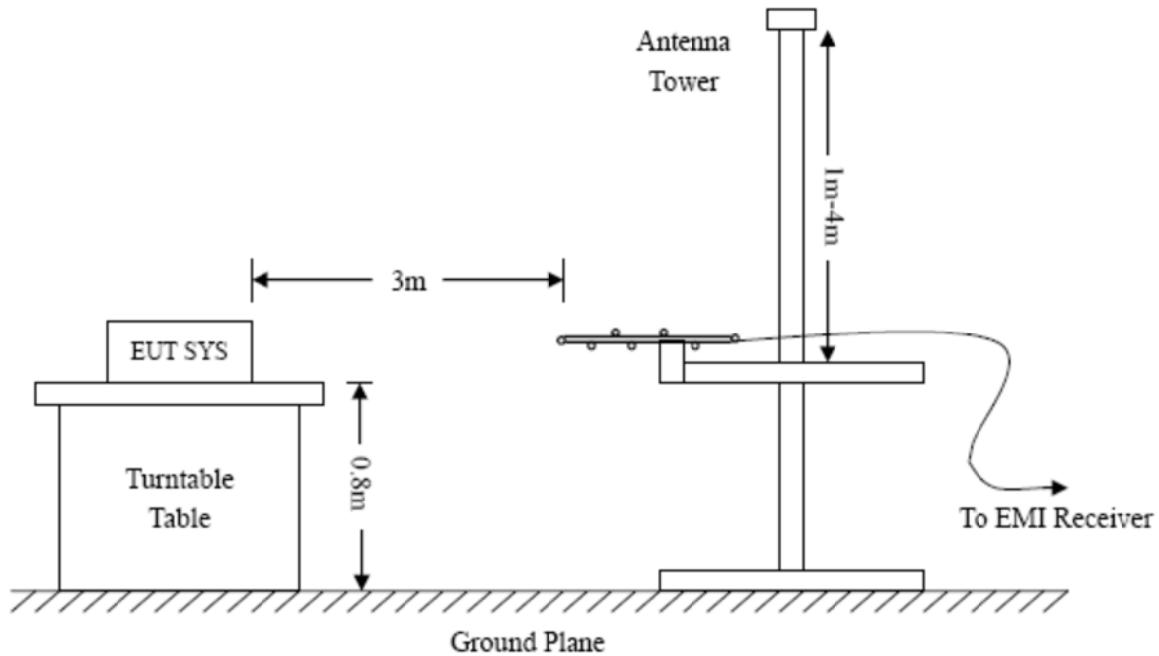
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

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.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

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 15.231(e) and FCC Part 15.209 Limit.



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:

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

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:

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

4.4 Environmental Conditions

Temperature:	21° C
Relative Humidity:	50%
ATM Pressure:	1011 mbar

4.5 Summary of Test Results/Plots

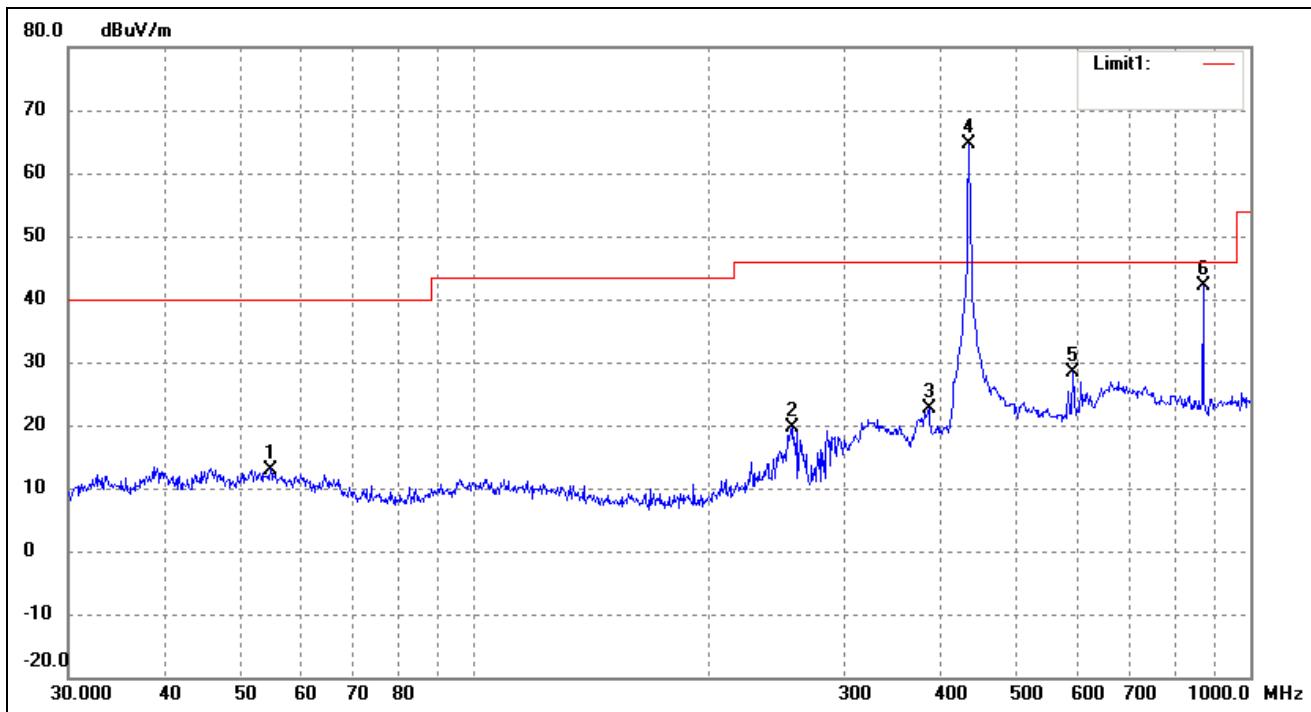
According to the data below, the FCC Part 15.205, 15.209 and 15.231 standards, and had the worst margin of:

-3.83 dB at 869.1301MHz in the **Horizontal** polarization, **Peak Detector, 9 kHz to 6 GHz, 3 Meters**

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

Plot of Radiated Emissions Test Data

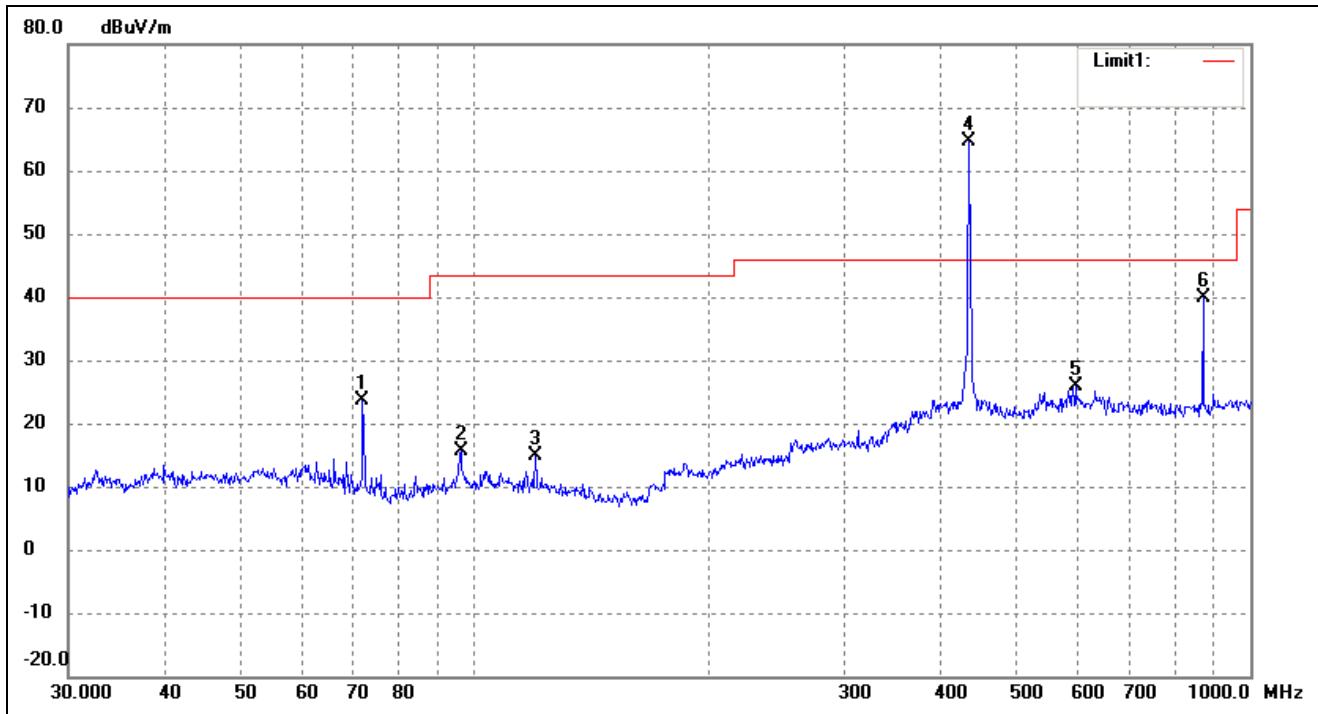
EUT: Wireless Dimmer Light Kit
 Tested Model: SIM1010-LK4
 Operating Condition: TM1
 Comment: DC 3.3V
 Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	54.6428	29.5	-16.5	13	40	-27	342	100	peak
2	256.521	31.58	-11.9	19.68	46	-26.32	99	100	peak
3	385.2805	31.24	-8.58	22.66	46	-23.34	157	100	peak
4	434.065	72.31	-7.74	64.57	92.86	-28.29	100	100	peak
4*	434.065	58.55	-7.74	50.81	72.86	-22.05	100	100	QP
5	590.9737	30.31	-1.94	28.37	46	-17.63	344	100	peak
6	869.1301	44.59	-2.42	42.17	72.86	-30.69	203	100	peak
6*	869.1301	30.83	-2.42	28.41	52.86	-24.45	203	100	peak

Above 1GHz

No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	1301.250	36.97	-8.44	28.53	54	-25.47	324	150	AVG
2	1301.250	50.73	-8.44	42.29	74	-31.71	92	150	peak
3	1735.000	37.45	-9.92	27.53	54	-26.47	304	150	AVG
4	1735.000	51.21	-9.92	41.29	74	-32.71	93	150	peak

Test Specification: *Vertical*


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree	Height (cm)	Remark
1	71.8319	42.45	-18.94	23.51	40	-16.49	231	100	peak
2	96.0986	32.71	-17.14	15.57	43.5	-27.93	317	100	peak
3	119.8555	31.52	-16.67	14.85	43.5	-28.65	60	100	peak
4	434.065	72.48	-7.74	64.74	92.86	-28.12	265	100	peak
	434.065	58.72	-7.74	50.98	72.86	-21.88	265	100	
5	595.1328	27.03	-1.16	25.87	46	-20.13	167	100	peak
6	869.1301	42.32	-2.42	39.9	72.86	-32.96	281	100	peak
	869.1301	28.56	-2.42	26.14	52.86	-26.72	281	100	

Above 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree	Height (cm)	Remark
1	1301.250	51.45	-8.44	43.01	74.00	-30.99	243	150	peak
2	1301.250	41.22	-8.44	32.78	54.00	-21.22	92	150	AVG
3	1735.000	52.39	-9.92	42.47	74.00	-31.53	336	150	peak
4	1735.000	40.90	-9.92	30.98	54.00	-23.02	81	150	AVG

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz..

The fundamental frequency is 433.75MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 433.75MHz..

5. 20dB Bandwidth

5.1 Standard Applicable

According to FCC Part 15.231(c), 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.

5.2 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

5.3 Environmental Conditions

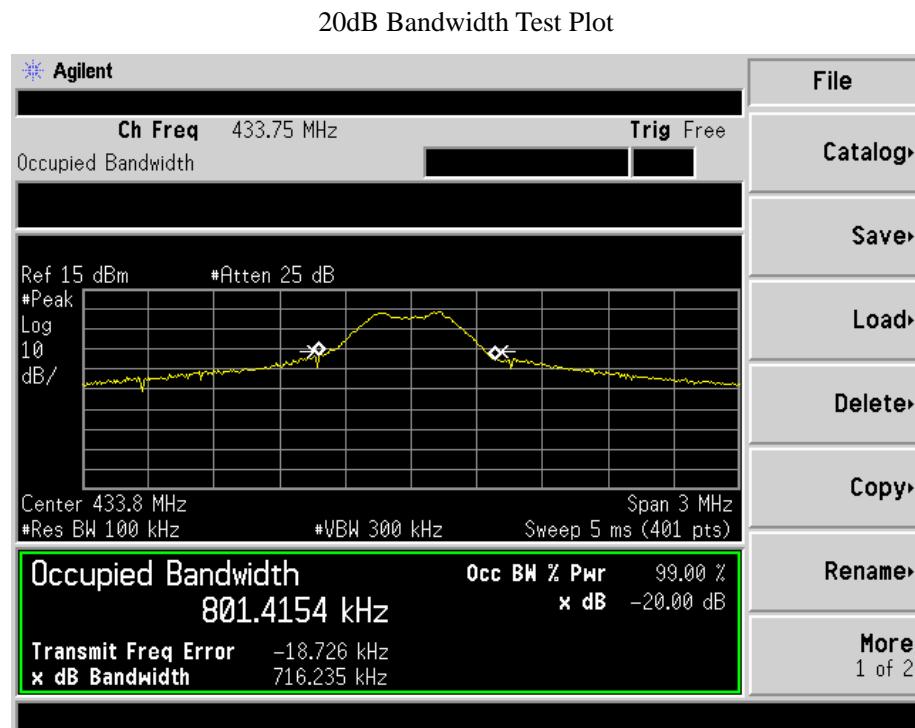
Temperature:	21° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

Test Frequency MHz	20dB Bandwidth kHz	Limit kHz	Result
433.75	716.235	1084	Pass

Limit = Fundamental Frequency X 0.25% = 433.75 MHz X 0.25% = 1084 kHz

Please refer to the attached plots.



6. Transmission Time

6.1 Standard Applicable

According to FCC 15.231(e), 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.

6.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.75MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

6.3 Environmental Conditions

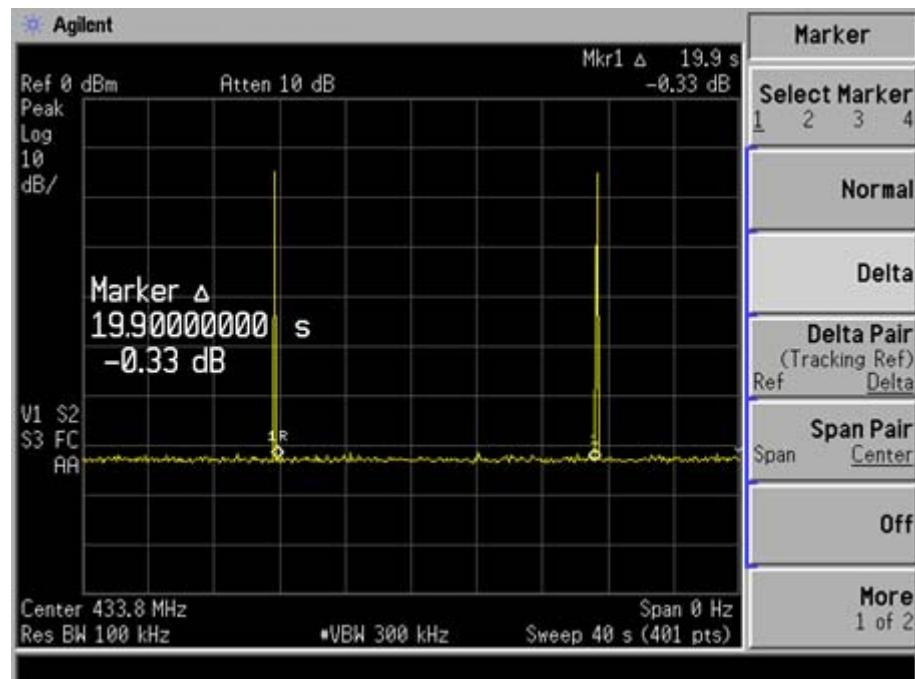
Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

6.4 Summary of Test Results/Plots

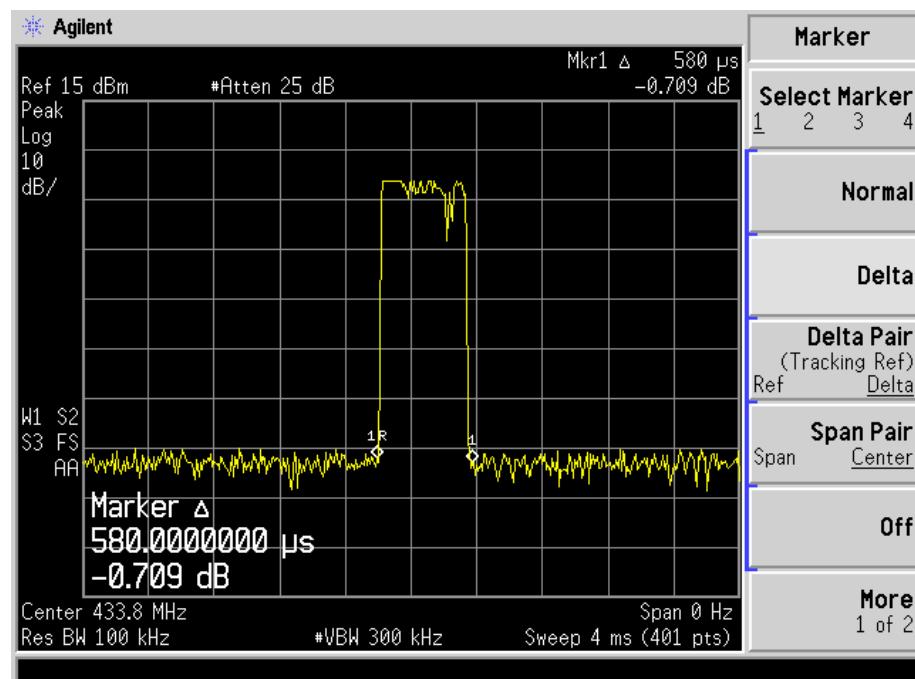
Item	Measured Value	Limit	Result
Transmission Time	0.00058 s	1 s	Pass
Silent Time	19.90 s	10 s	Pass
Transmission Time /Silent Time	34310	30	Pass

Please refer to the attached plots.

Silent Time



Transmission Time



7. Duty Cycle

7.1 Standard Applicable

According to FCC Part 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

7.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.75MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

7.3 Environmental Conditions

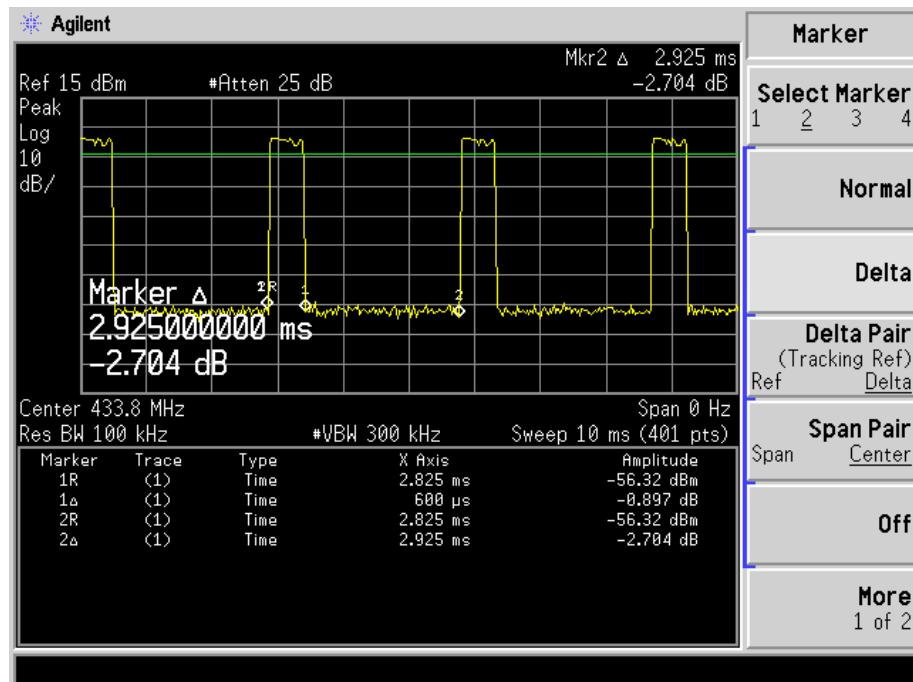
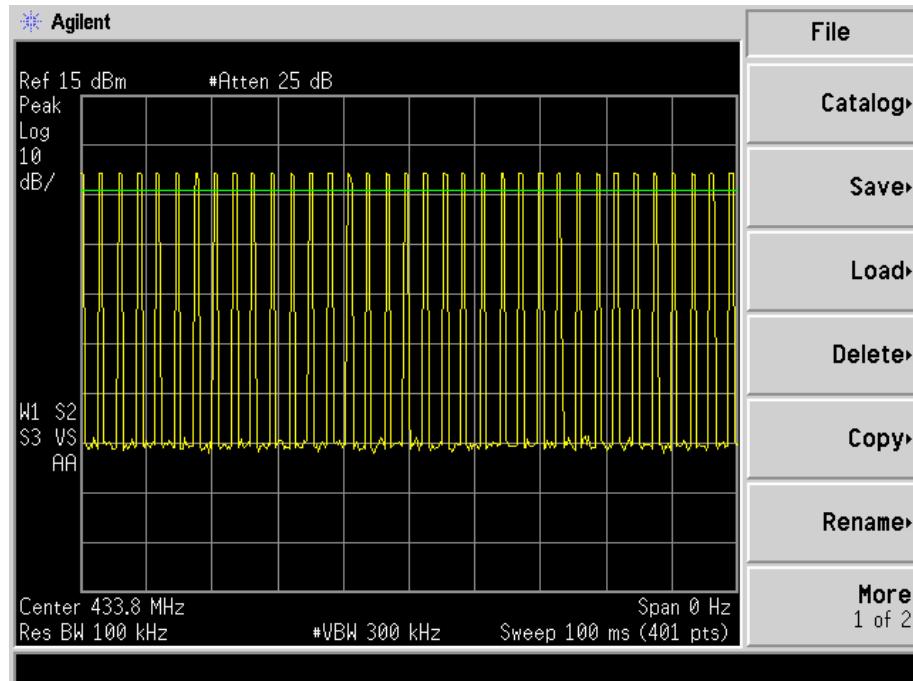
Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

Test Period (T _p) ms	Total Time (T _{on}) ms	Duty Cycle %	Duty Cycle Factor dB
2.925	0.60	20.51	-13.76

Please refer to the attached test plots

Width of Pulse



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