

FCC PART 15.231
EMI MEASUREMENT AND TEST REPORT

For

Shenzhen Sunricher Technology Co.,Ltd
310,Longtaili building No.30,Avenue 4th,High Tech Sience Park,Shenzhen

FCC ID:2ACUQ2836

(M/N): SR-2836RGB(US),SR-2836R(US),SR-2836CCT(US)

This Report Concerns: Original Report	Equipment Type: LED Controller
Test Engineer:	Lisa Chen <i>Lisa Chen</i>
Report No.:	BSL150907-1
Receive EUT Date/Test Date:	September 1, 2015/ September 1- September 23, 2015
Reviewed By:	Mike moo <i>Mike moo</i>
Prepared By:	BSL Testing Co.,LTD. NO. 24, ZH Park, Nantou, Shenzhen, 518000 China Tel: 86- 755-26508703 Fax: 86- 755-26508703

TABLE OF CONTENTS

1.	GENERAL INFORMATION	3
1.1.	Report information	3
1.2.	Measurement Uncertainty	3
2.	PRODUCT DESCRIPTION	4
2.1.	EUT Description	4
2.2.	Block Diagram of EUT Configuration.....	5
2.3.	Support Equipment List	5
2.4.	Test Conditions	5
3.	TEST RESULTS SUMMARY	6
	Modifications	6
4.	TEST EQUIPMENT USED	7
5.	ANTENNA REQUIREMENT	8
5.1.	Standard Applicable.....	8
5.2.	Antenna Connected Construction	8
5.3.	Result	8
6.	CONDUCTED POWER LINE TEST	9
6.1.	Test Equipment	9
6.2.	Test Procedure	9
6.3.	Test Setup.....	9
6.4.	Conducted Power line Emission Limits.....	9
6.5.	Conducted Power Line Test Result.....	10
7.	RADIATED EMISSION TEST	11
7.1.	Test Equipment	11
7.2.	Test Procedure	11
7.3.	Radiated Test Setup	11
7.4.	Radiated Emission Limit.....	13
7.5.	Radiated Emission Test Result	14
8.	20DB OCCUPIED BANDWIDTH	22
8.1.	Test Equipment	22
8.2.	Test Procedure	22
8.3.	FCC 15.231(c) 20dB Bandwidth Limit.....	22
8.4.	Test Result	23
9.	DEACTIVATION TESTING.....	25
9.1.	Test Equipment	25
9.2.	Test Procedure	25
9.3.	Deactivation Testing Requirement	25
9.4.	Test Result	26

1. GENERAL INFORMATION

1.1. Report information

- 1.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BSL approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BSL in any way guarantees the later performance of the product/equipment.
- 1.1.2. The sample/s mentioned in this report is/are supplied by Applicant, BSL therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
- 1.1.3. Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BSL, unless the applicant has authorized BSL in writing to do so.

Test Facility -

The test site used to collect the radiated data is located on the address of BSL Testing Co.,LTD.

(FCC Registered Test Site Number: 191509) on

NO. 24, ZH Park, Nantou, Shenzhen, 518000 China

The Test Site is constructed and calibrated to meet the FCC requirements.

1.2. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	+/-1.25dB
2	RF Power, Conducted	+/-0.20dB
3	Spurious emissions, conducted	+/-0.33dB
4	All emissions, radiated (<1G)	+/-3.47dB
5	All emissions, radiated (>1G)	+/-3.82dB
6	Temperature	+/-0.5°CdB
7	Humidity	+/-2%

2. PRODUCT DESCRIPTION

2.1. EUT Description

Description	: LED Controller
Applicant	: Shenzhen Sunricher Technology Co.,Ltd 310,Longtaili building No.30,Avenue 4th,High Tech Sience Park,Shenzhen,China
Manufacturer	: Shenzhen Sunricher Technology Co.,Ltd 310,Longtaili building No.30,Avenue 4th,High Tech Sience Park,Shenzhen,China
Model Number	: SR-2836RGB(US),SR-2836R(US),SR-2836CCT(US)
Frequency	: 868MHz
Number of Channels	: 1 Channel
Power Supply	: DC 3V battery (The new battery is used during the measurement)
Trade:	: N/A
HW version	: 94V-0
SW version	: V1
antenna type	: PCB
antenna gain	: 0dBi

The series products, model name: SR-2836RGB(US),SR-2836R(US),SR-2836CCT(US) have the same circuit diagram,PCB layout, software, RF Module, Features and functionality. The differences are the model name, so, we select SR-2836RGB(US) Series to test.

2.2. Block Diagram of EUT Configuration



2.3. Support Equipment List

Name	Model No	S/N	Manufacturer	Used (Y/N)

2.4. Test Conditions

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-25
Humidity (%RH)	25-75	50-63
Barometric pressure (mbar)	860-1060	950-1000

3. TEST RESULTS SUMMARY

Standard Section	Test Item	Judgment
15.207	Conducted Emission	N/A
15.203	Antenna Requirement	Pass
15.231b	Radiated Spurious Emission	Pass
15.231c	Occupied Bandwidth	Pass
15.231a	Deactivation Testing	Pass

Remark: "N/A" means "Not applicable".

Statement 1: All testing was performed using the test procedures found in ANSI C63.4-2003.

Statement 2: The relevant Buttons of this EUT are already performed, and only the worst evaluated results are recorded in this report.

Statement 3:

Test operating mode (1): Switch ON/OFF

Test operating mode (2): dimmer(**dimmer Worst case:Button from the left rotary right to the end**)

The relevant Test operating mode of this EUT are already performed, and only the worst evaluated results are recorded in this report.

Switch on/off and dimmer These two operation modes is not the same code scheme,transmission time, long-pulse, short-pulse,duration time of period,duty cycle and average correction factor.

Modifications

No modification was made.

4. TEST EQUIPMENT USED

EQUIPMENT/FACILITIES	MANUFACTURER	MODEL	SERIAL NO.	DATE OF CAL.	CAL. INTERVAL
3m Semi-Anechoic Chamber	Chengyu Electron	9 (L)*6 (W)* 6 (H)	BSL086	Aug. 23 2015	1 Year
EMI Test Receiver	Rohde & Schwarz	ESCI3	BSL001	Sep. 28 2014	1 Year
BiConiLog Antenna	Rohde & Schwarz	HL562 (30MHz – 3GHz)	BSL009	Sep. 28 2014	1 Year
Double -ridged waveguide horn	Rohde & Schwarz	BBHA9120D (1 – 18GHz)	BSL008	Aug. 27 2015	1 Year
Cable	PUTIANLE	BSL045 (9 kHz-40GHz)	BSL045	Aug. 27 2015	1 Year
Cable	PUTIANLE	BSL046 (9 kHz-40GHz)	BSL046	Aug. 27 2015	1 Year
Cable	PUTIANLE	BSL047 (9 kHz-40GHz)	BSL047	Aug. 27 2015	1 Year
Amplifier(100kHz-40G Hz)	R&S	SMR40	BSL007	Sep. 28 2014	1 Year
Band filter	Amindeon	82346	BSL049	Aug. 27 2015	1 Year
Active Loop Antenna	Schwarzbeck	FMZB1519 (9 kHz - 30 MHz)	BSL011	Sep. 28 2014	1 Year
Coaxial Switch	YUANFANG	TA218B	BSL004	Aug. 27 2015	1 Year
Spectrum analyzer	Rohde & Schwarz	FSP40	BSL049	Sep. 28 2014	1 Year

Note:
all measurements are typically performed radiated.

5. ANTENNA REQUIREMENT

5.1. 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.

5.2. Antenna Connected Construction

According to § 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The antenna used in this product is the PCB antenna. The antenna is permanently attached. Refer to the product photo.

5.3. Result

Compliance

6. CONDUCTED POWER LINE TEST

6.1. Test Equipment

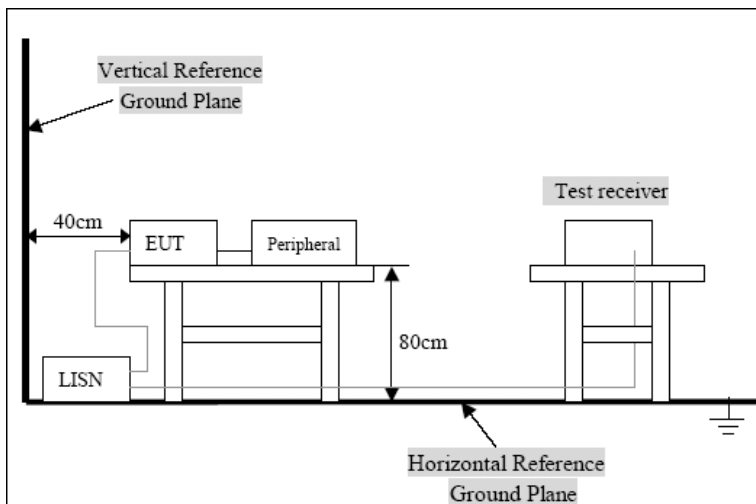
Please refer to section 4 this report.

6.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uh coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling impedance with 50ohm termination.

Both sides of A.C. Line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement. Conducted emissions were measured over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

6.3. Test Setup



For the actual test configuration, please refer to the related items-Photos of testing

6.4. Conducted Power line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHZ)	Class A QP/AV	Class B QP/AV
0.15-0.5	79/66	65-56/56-46
0.5-5.0	73/60	56-46
5.0-3.0	73/60	60-50

Note: In the above table, the tighter limit applies at the band edges.

6.5. Conducted Power Line Test Result

Note: It is powered by the battery, conduction emission test is not applicable.

7. RADIATED EMISSION TEST

7.1. Test Equipment

Please refer to section 4 this report.

7.2. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level.

Calibrated Loop antenna is used as receiving antenna for frequencies below 30MHz, Calibrated Bilog antenna is used as receiving antenna for frequencies between 30 MHz and 1 GHz, Calibrated Horn antenna is used as receiving antenna for frequencies above 1000MHz. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

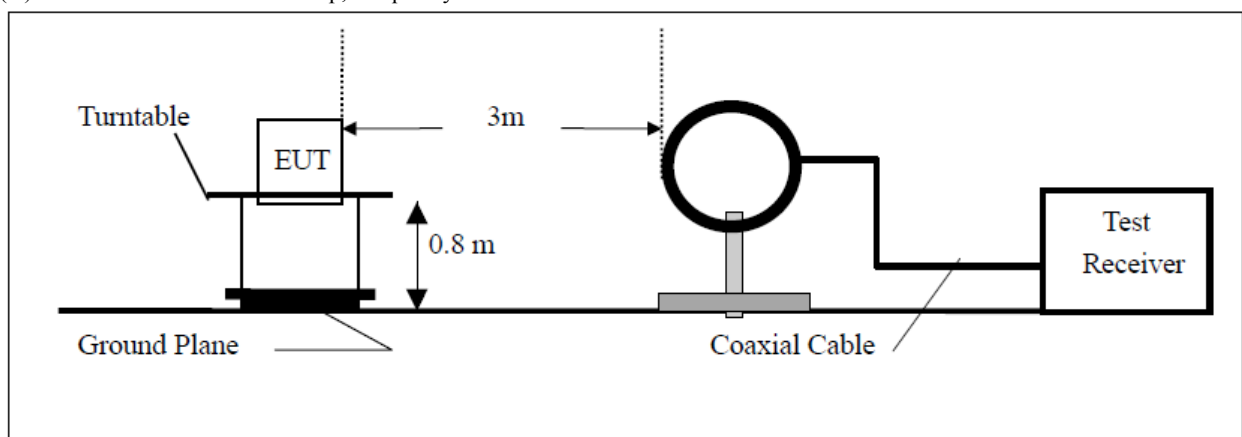
The frequency range from 9kHz to 5GHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Peak detector and Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

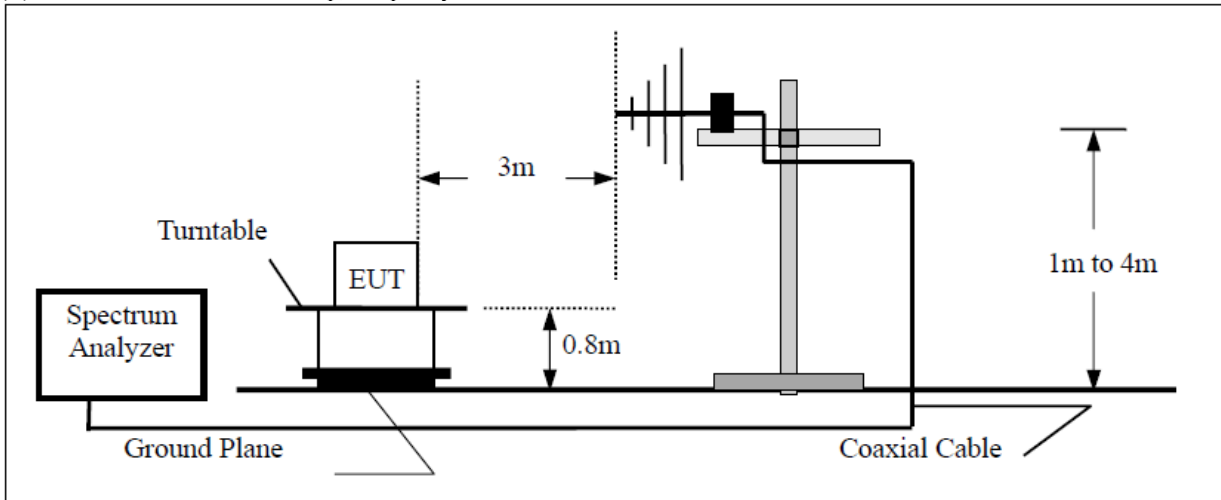
Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit. And X direction is worst mode.

7.3. Radiated Test Setup

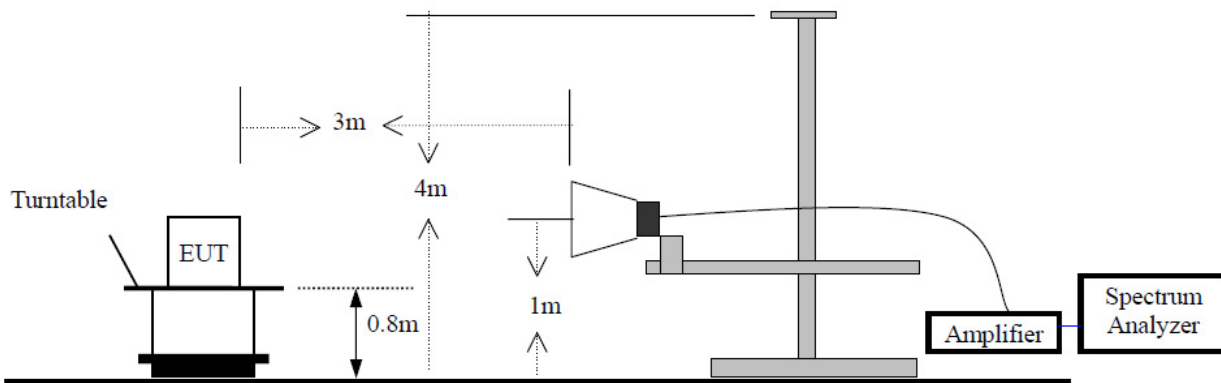
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



7.4. Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below :

A. Fundamental and Harmonics Radiated Emissions FCC 15.231 Limit

Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)	Field Strength of Unwanted Emissions (microvolts/meter)
40.66 - 40.70	2250.00	225.00
70 - 130	1250.00	125.00
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3750.00	375.00
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12500.00	1250.00

Note:

- (1) RF Voltage (dBuV) = 20 log 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. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

B. Spurious Radiated Emissions.

Frequency (MHz)	Limit			The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
	Field Strength of Quasi-peak Value (microvolts/m)	Field Strength of Quasi-peak Value (dBµV/m)	Measurement distance (m)	
0.009 - 0.490	2400/F(kHz)	/	300	
0.490 - 1.705	24000/F(kHz)	/	30	
1.705-30	30	29.5	30	
30 - 88	100	40	3	
88 - 216	150	43.5	3	
216 - 960	200	46	3	
Above 960	500	54	3	

Note: (1) RF Voltage (dBuV) = 20 log Voltage (uV)

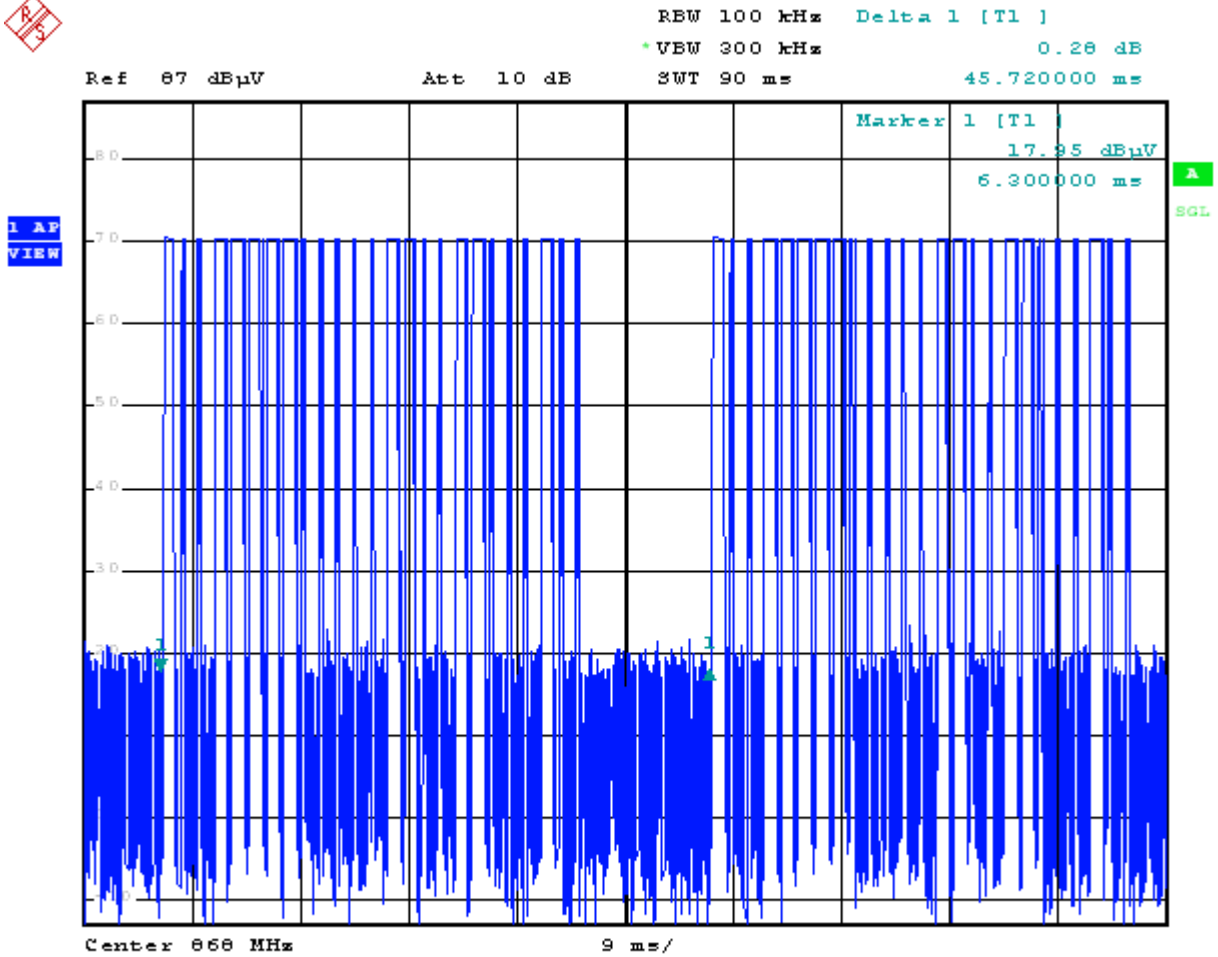
- (2) In the Above Table, the tighter limit applies at the band edges.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

7.5. Radiated Emission Test Result

Pass

Test operating mode (1):Switch ON/OFF

The period time



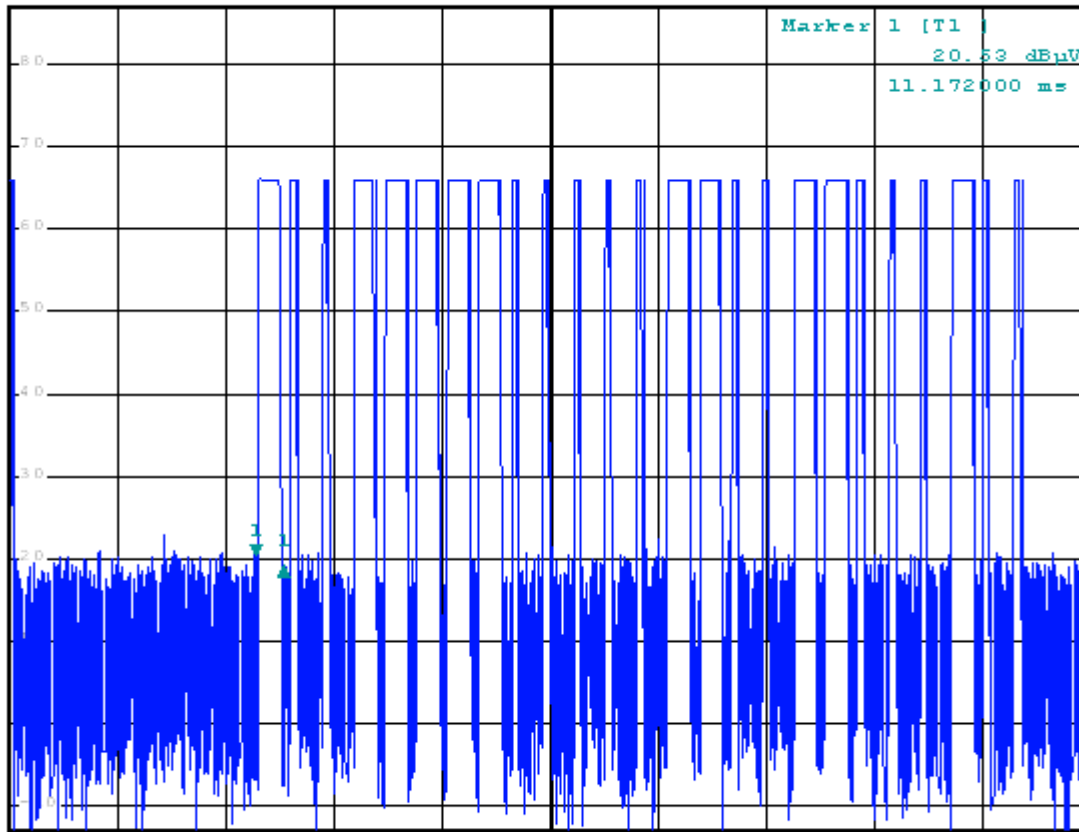
Date: 1.SEP.2015 11:07:36

long signal and short signal time



Ref 67 dB μ V Att 10 dB RBW 100 kHz Delta 1 [T1]
SWT 49 ms -1.45 dB
*VBW 300 kHz 1.274000 ms

1 AP
VIEW



A
SGL

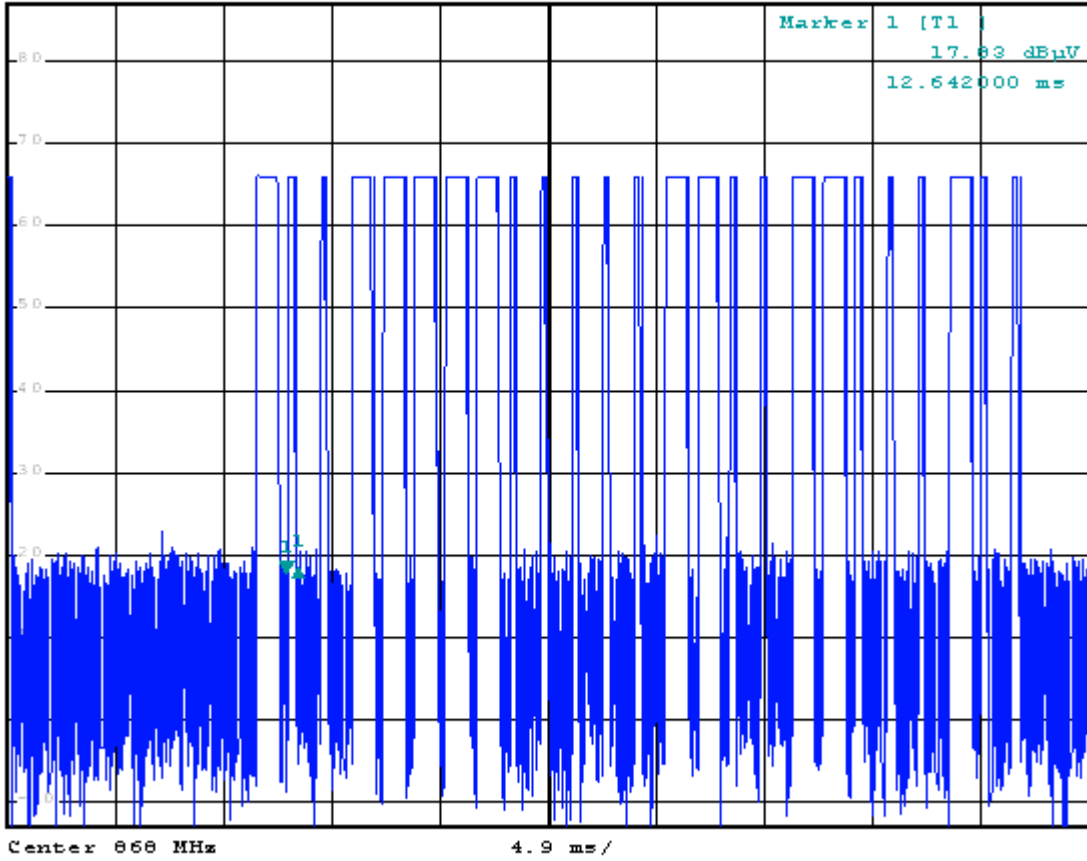
Center 668 MHz 4.9 ms/

Date: 1.SEP.2015 11:13:15



REW 100 kHz Delta 1 [T1]
*VBW 300 kHz 0.78 dB
Ref 67 dBμV Att 10 dB SWT 49 ms 490.000000 μs

1 AP
VIEW



A
SGL

Date: 1.SEP.2015 11:14:36

The period time = 45.72 ms

Ton1=1.274ms

Ton2=0.490ms

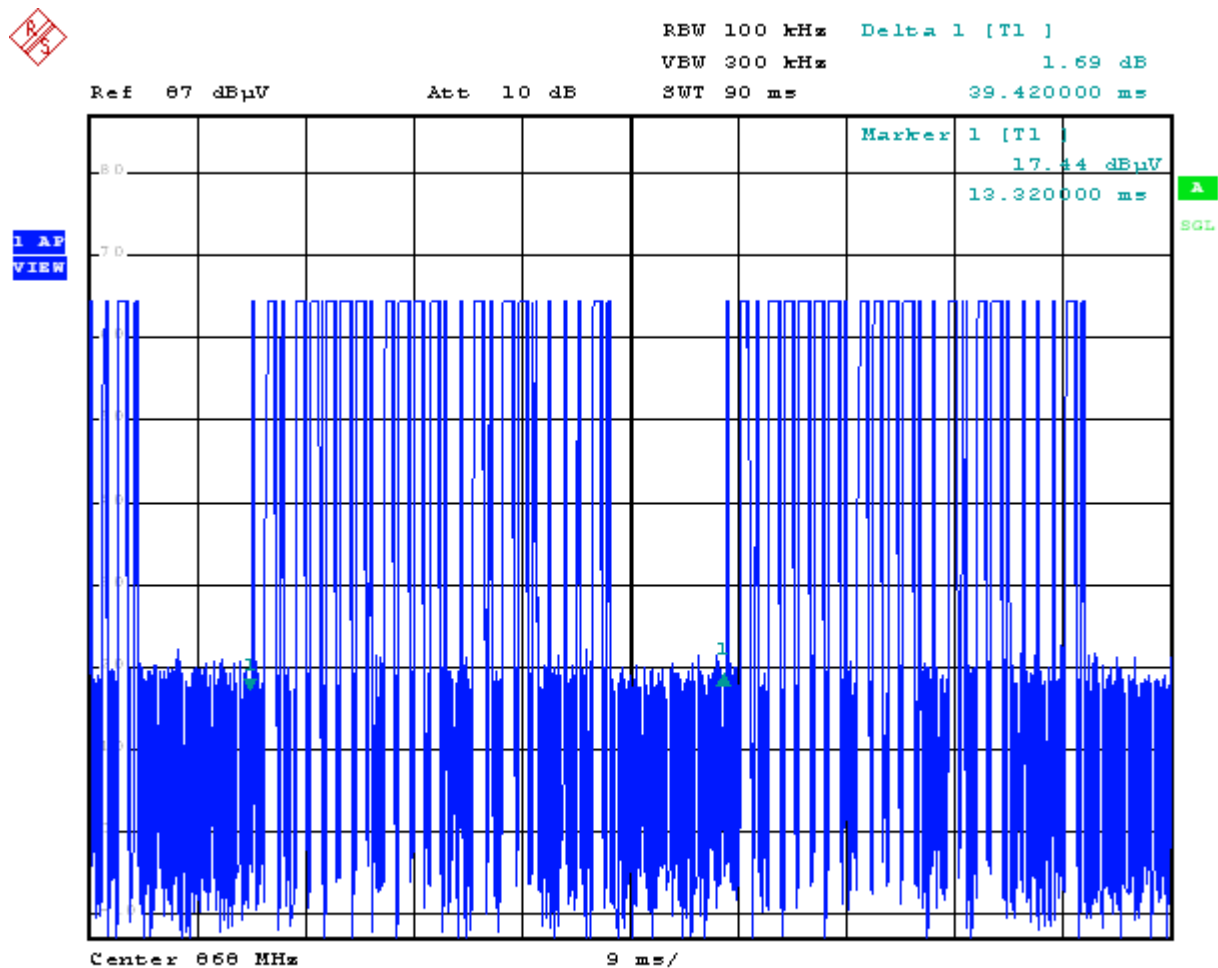
Ton of The period time = (1.274×11) + (0.49×14) ms=20.874ms

The duty cycle = Ton / The period time =20.874ms / 45.72ms= 0.457 ms

Therefore, the average factor is found by $20\log(\text{The duty cycle}) = 20\log(0.457) = -6.802\text{dB}$

Test operating mode (2): dimmer

The period time



Date: 16.SEP.2015 01:58:04

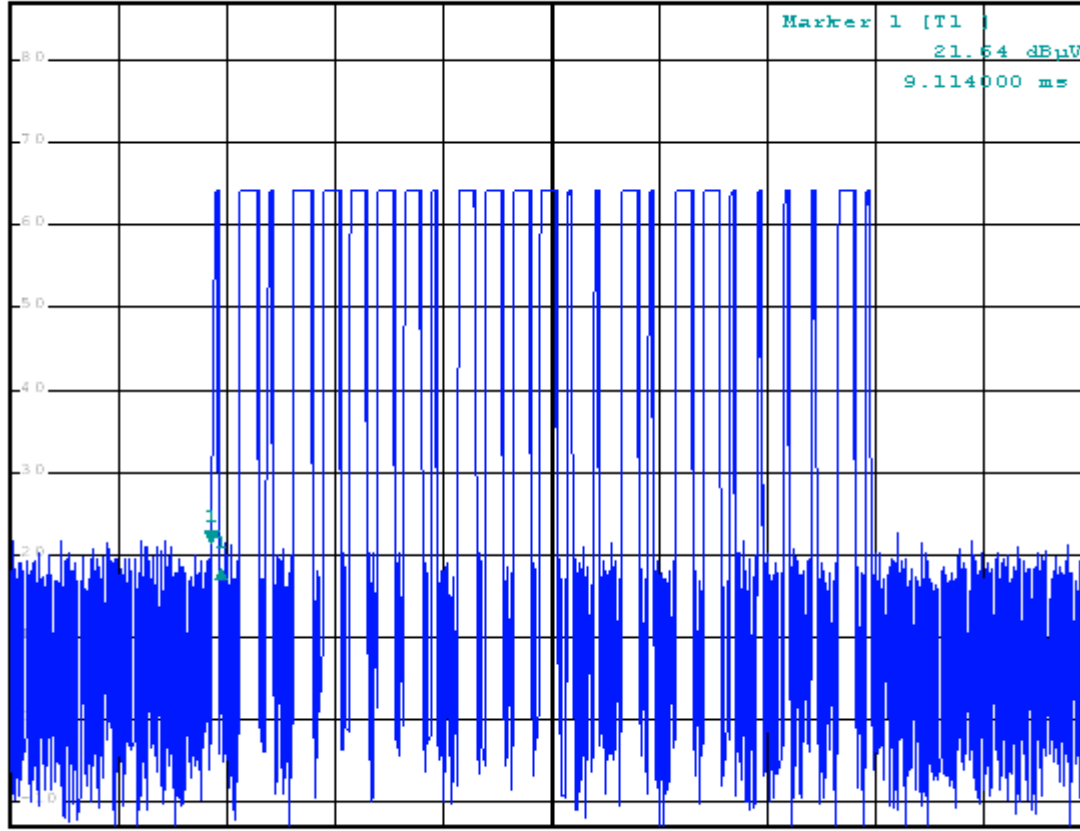
long signal and short signal time



REW 100 kHz Delta 1 [T1]
VEW 300 kHz -3.39 dB
SWT 49 ms 392.000000 μs

Ref 67 dBμV Att 10 dB

1 AP
VIEW



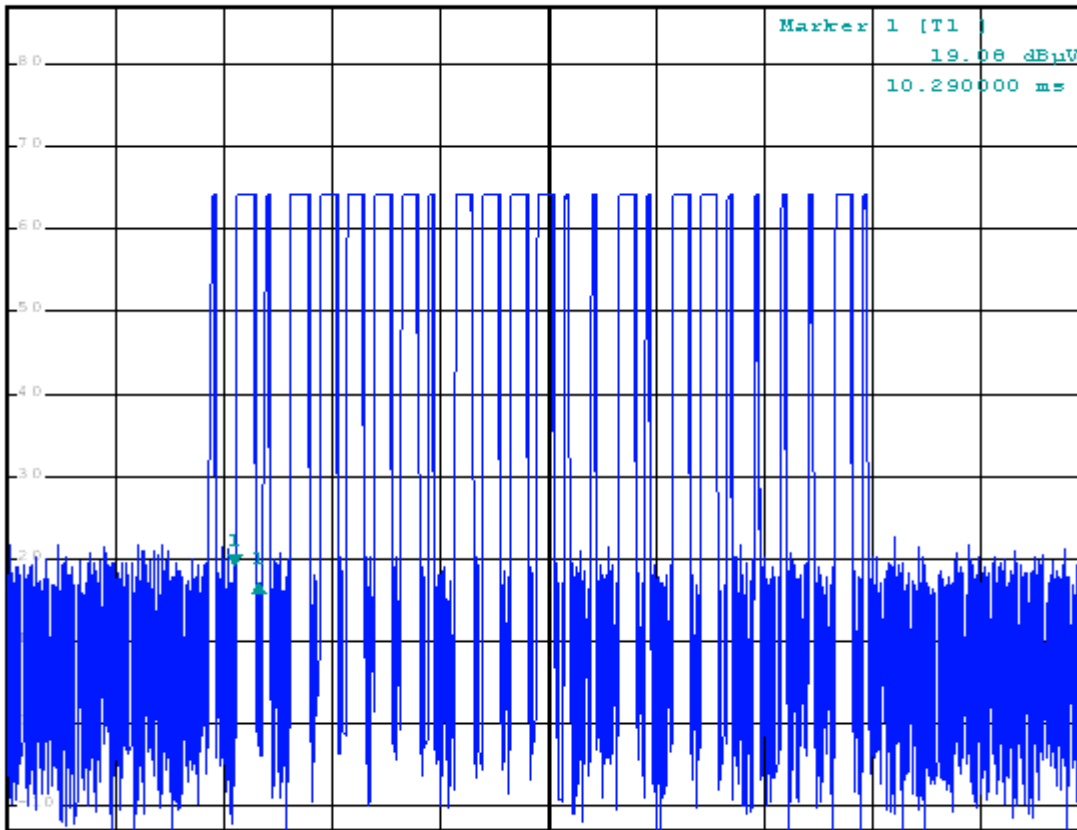
Center 868 MHz 4.9 ms/

Date: 16.SEP.2015 01:59:42



Ref 87 dB μ V Att 10 dB RBW 100 kHz Delta 1 [T1]
VEW 300 kHz -1.91 dB
SWT 49 ms 1.078000 ms

1 AP
VIEW



A
SGL

Date: 16.SEP.2015 02:00:32

The period time = 39.42 ms

Ton1=0.392ms

Ton2=1.078ms

Ton of The period time = (0.392 \times 11) + (1.078 \times 14) ms=19.404ms

The duty cycle = Ton / The period time =19.404ms /39.42ms=0.49

Therefore, the average factor is found by 20log (The duty cycle) =20log (0.49) =-6.196dB

Radiated Emissions Data

Test mode:continuous & constant TX

Test Result:PASS

Test operating mode (1):Switch ON/OFF

For below 9kHz-30MHz Spurious

Freq. (MHz)	Emission(dBuV/m) PK / AV	Limits(dBuV/m) PK / AV	Margin (dB)
-	-	-	-
-	-	-	-

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.

For 30M-10GHz Spurious

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

HORIZONTAL

Frequency	Average Factor	Field Strength	Field Strength	Limit (PK)	Limit(AV)	State
MHz	dB	dBuV/m (PK)	dBuV/m (AV)	dBuV/m	dBuV/m	
868	-6.802	82.24	75.438	101.94	81.94	pass
1736	-6.802	59.29	52.488	81.94	61.94	pass
2604	-6.802	52.7	45.898	81.94	61.94	pass
3472	-6.802	55.51	48.708	81.94	61.94	pass
4340	-6.802	54.97	48.168	81.94	61.94	pass
434	--	36.49(QP)	--	46(QP)	--	pass

VERTICAL

Frequency	Average Factor	Field Strength	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dB	dBuV/m (PK)	dBuV/m (AV)	dBuV/m	dBuV/m	
868	-6.802	77.6	70.798	101.94	81.94	pass
1736	-6.802	54.56	47.758	81.94	61.94	pass
2604	-6.802	50.52	43.718	81.94	61.94	pass
3472	-6.802	50.09	43.288	81.94	61.94	pass
4340	-6.802	50.66	43.858	81.94	61.94	pass
434	--	37.98 (QP)	--	46(QP)	--	pass

NOTE:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. Field Strength(AV) = Field Strength(PK)+Average Factor.
3. *: Denotes restricted band of operation.

Test operating mode (2): dimmer

For below 9kHz-30MHz Spurious

Freq. (MHz)	Emission(dBuV/m) PK / AV	Limits(dBuV/m) PK / AV	Margin (dB)
-	-	-	-
-	-	-	-

Note:

- Emissions attenuated more than 20 dB below the permissible value are not reported.

For 30M-10GHz Spurious

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

HORIZONTAL

Frequency	Average Factor	Field Strength	Field Strength	Limit (PK)	Limit(AV)	State
MHz	dB	dBuV/m (PK)	dBuV/m (AV)	dBuV/m	dBuV/m	
868	-6.196	81.26	75.064	101.94	81.94	pass
1736	-6.196	58.31	52.114	81.94	61.94	pass
2604	-6.196	51.72	45.524	81.94	61.94	pass
3472	-6.196	54.53	48.334	81.94	61.94	pass
4340	-6.196	53.99	47.794	81.94	61.94	pass
434	--	36.27(QP)	--	46(QP)	--	pass

VERTICAL

Frequency	Average Factor	Field Strength	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dB	dBuV/m (PK)	dBuV/m (AV)	dBuV/m	dBuV/m	
868	-6.196	76.62	70.424	101.94	81.94	pass
1736	-6.196	53.58	47.384	81.94	61.94	pass
2604	-6.196	49.54	43.344	81.94	61.94	pass
3472	-6.196	49.11	42.914	81.94	61.94	pass
4340	-6.196	49.68	43.484	81.94	61.94	pass
434	--	37.76 (QP)	--	46(QP)	--	pass

NOTE:

- Emissions attenuated more than 20 dB below the permissible value are not reported.
- Field Strength(AV) = Field Strength(PK)+Average Factor.
- *: Denotes restricted band of operation.

8. 20DB OCCUPIED BANDWIDTH

8.1. Test Equipment

Please refer to Section 5 this report.

8.2. Test Procedure

1. The EUT was tested according C63.4-2003. The radiated test was performed at FCC Registration laboratory.
2. 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.

8.3. FCC 15.231(c) 20dB Bandwidth Limit

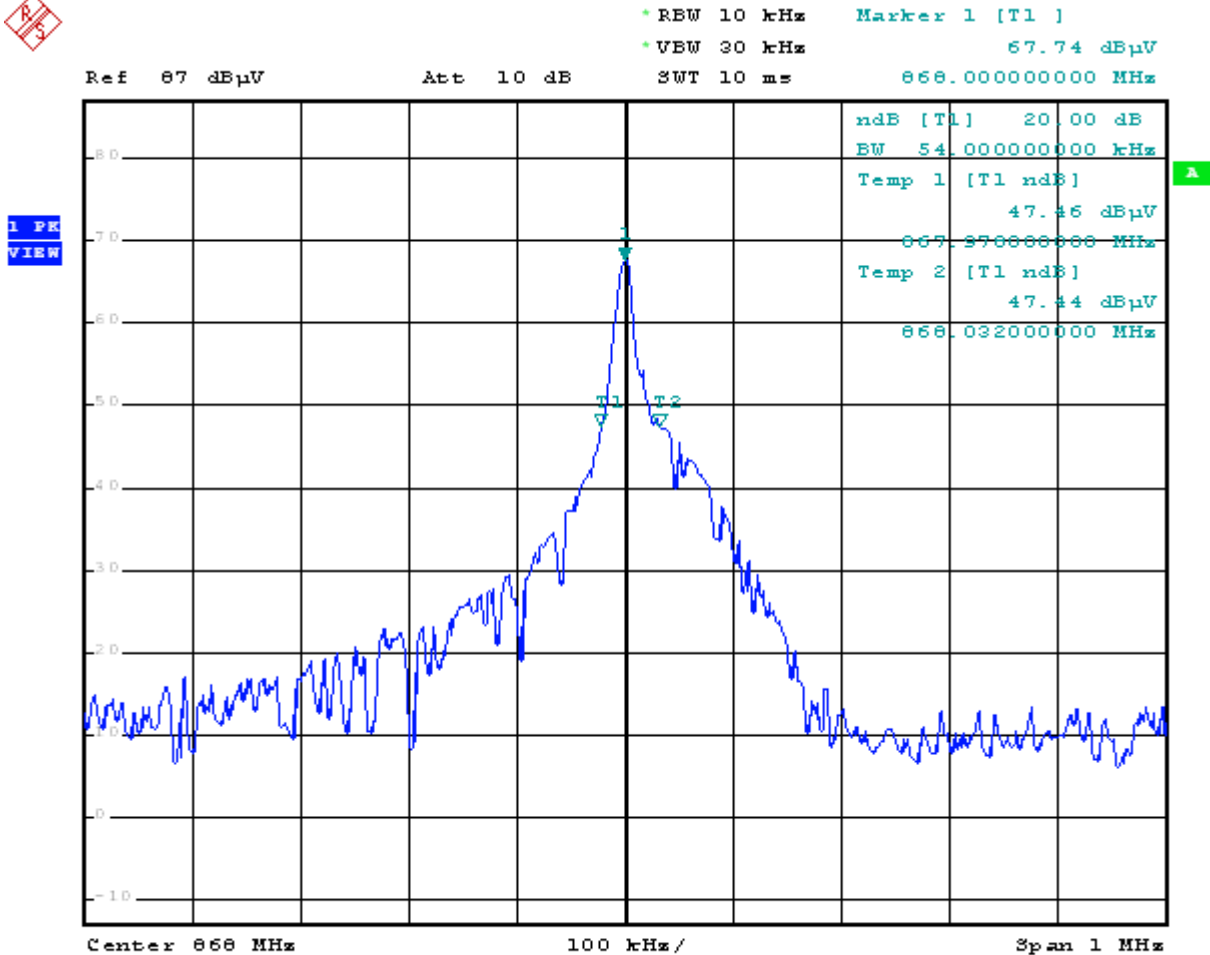
Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Therefore, the bandwidth of the emission limit is $868\text{MHz} \times 0.25\% = 2.17\text{MHz}$. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.4. Test Result

Temperature 25°C Humidity: 55%RH
 :
 Limit =868MHz*0.25% = 2.17MHz
 Test data: 54KHz Test Result: PASS
 Test operating mode (1):Switch ON/OFF

Temperature 25°C Humidity: 55%RH
 :
 Limit =868MHz*0.25% = 2.17MHz
 Test data: 60KHz Test Result: PASS
 Test operating mode (2): dimmer

Test mode:unmodified for timing
Test operating mode (1):Switch ON/OFF

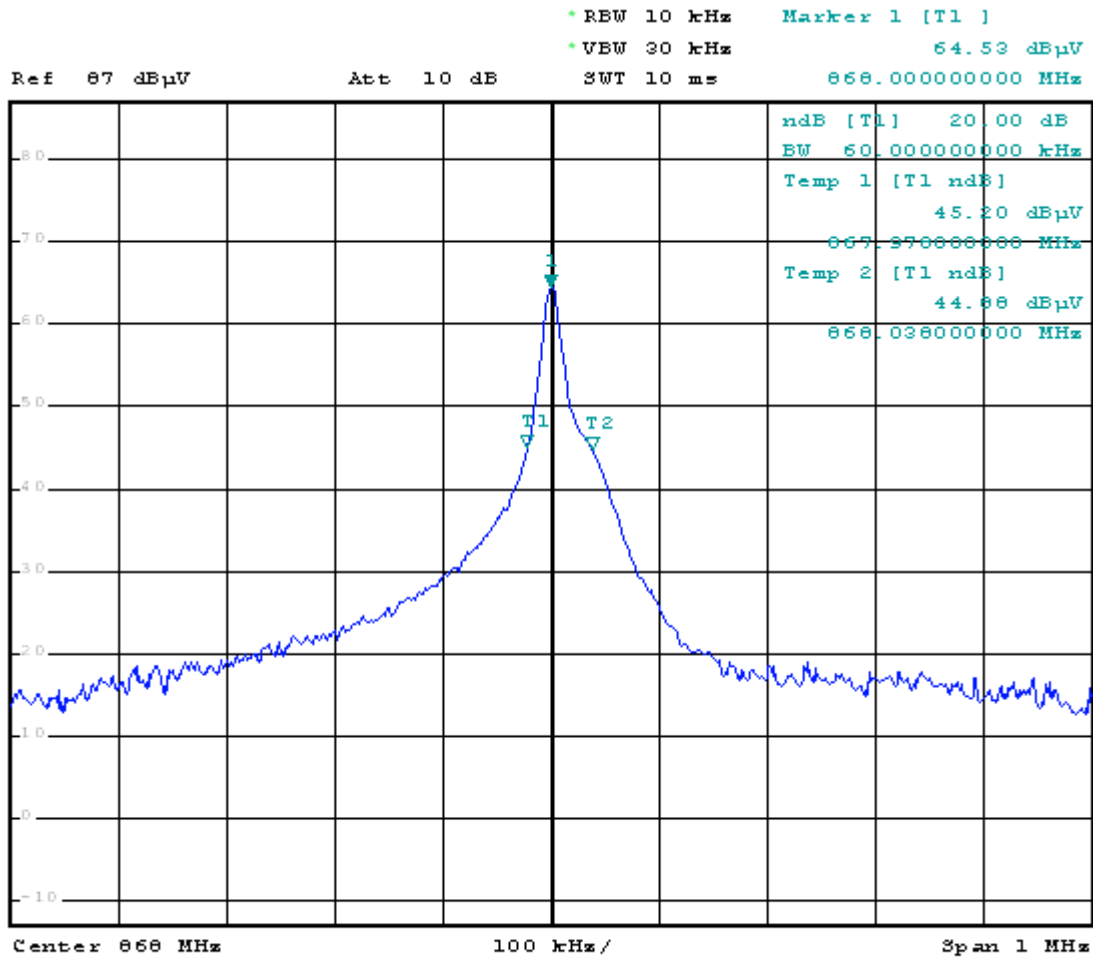


Date: 1.SEP.2015 11:22:01

Test operating mode (2): dimmer



1 PK
VIEW



Date: 16.SEP.2015 02:05:22

9. DEACTIVATION TESTING

9.1. Test Equipment

Please refer to Section 5 this report.

9.2. Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Set center frequency=868MHz

Set SPAN=0Hz

Set RBW=100kHz

Set VBW=300kHz

Set SWEET TIME>5s

9.3. Deactivation Testing Requirement

Per 15.231(a) (1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

9.4. Test Result

Temperature: 25°C Humidity: 55%RH
 this manually activated transmission stops automatically within 5 seconds after the last Switch ON/OFF.
 0.400 s

Test time: (the pressing times of the Key will not be Change activate time.) Test Result: PASS

Test operating mode (1): Switch ON/OFF

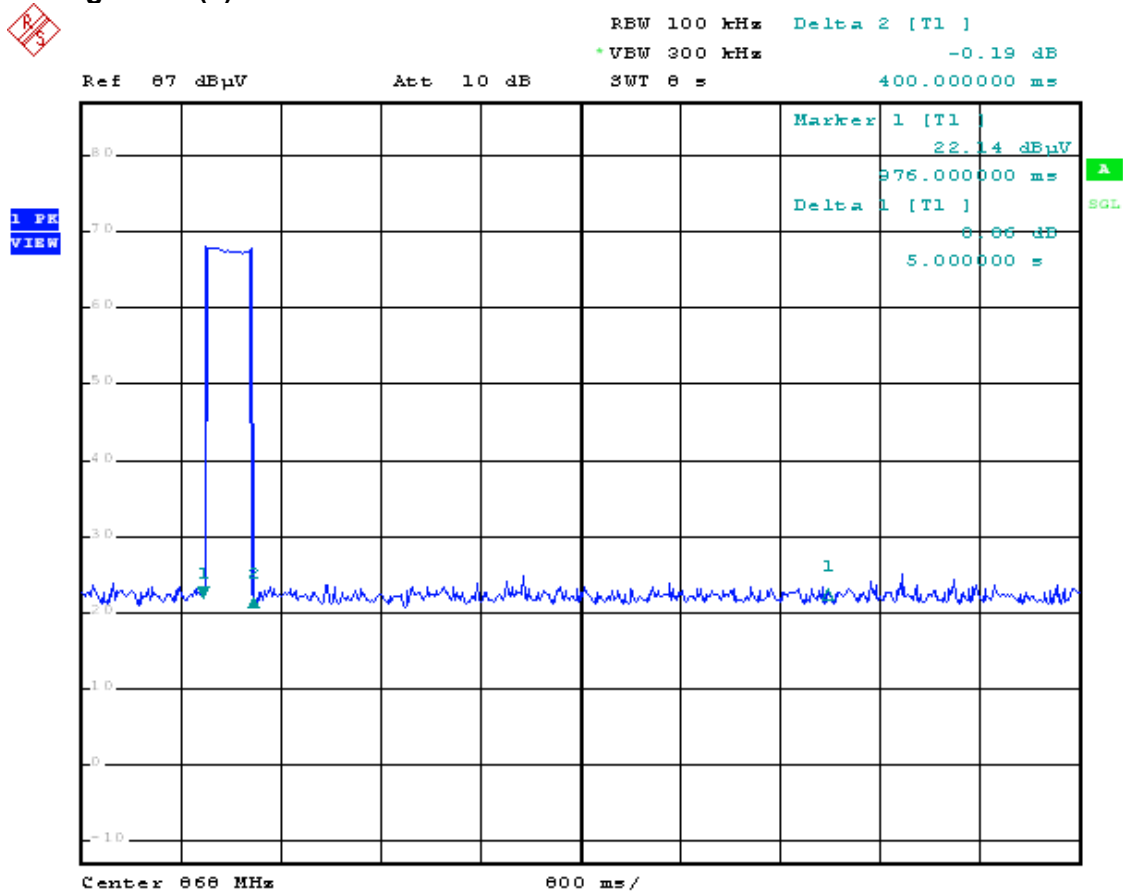
Temperature: 25°C Humidity: 55%RH
 this manually activated transmission stops automatically within 5 seconds after the last rotation.
 PASS
 (this manually activated transmission stops automatically within 5 seconds after the last rotation.)

Test time: RF Transmission as long the dimmer is rotated in any direction. Test Result: PASS
 3.28S

Test operating mode (2): dimmer

Test mode: unmodified for timing

Test operating mode (1): Switch ON/OFF



Date: 1.SEP.2015 11:29:48

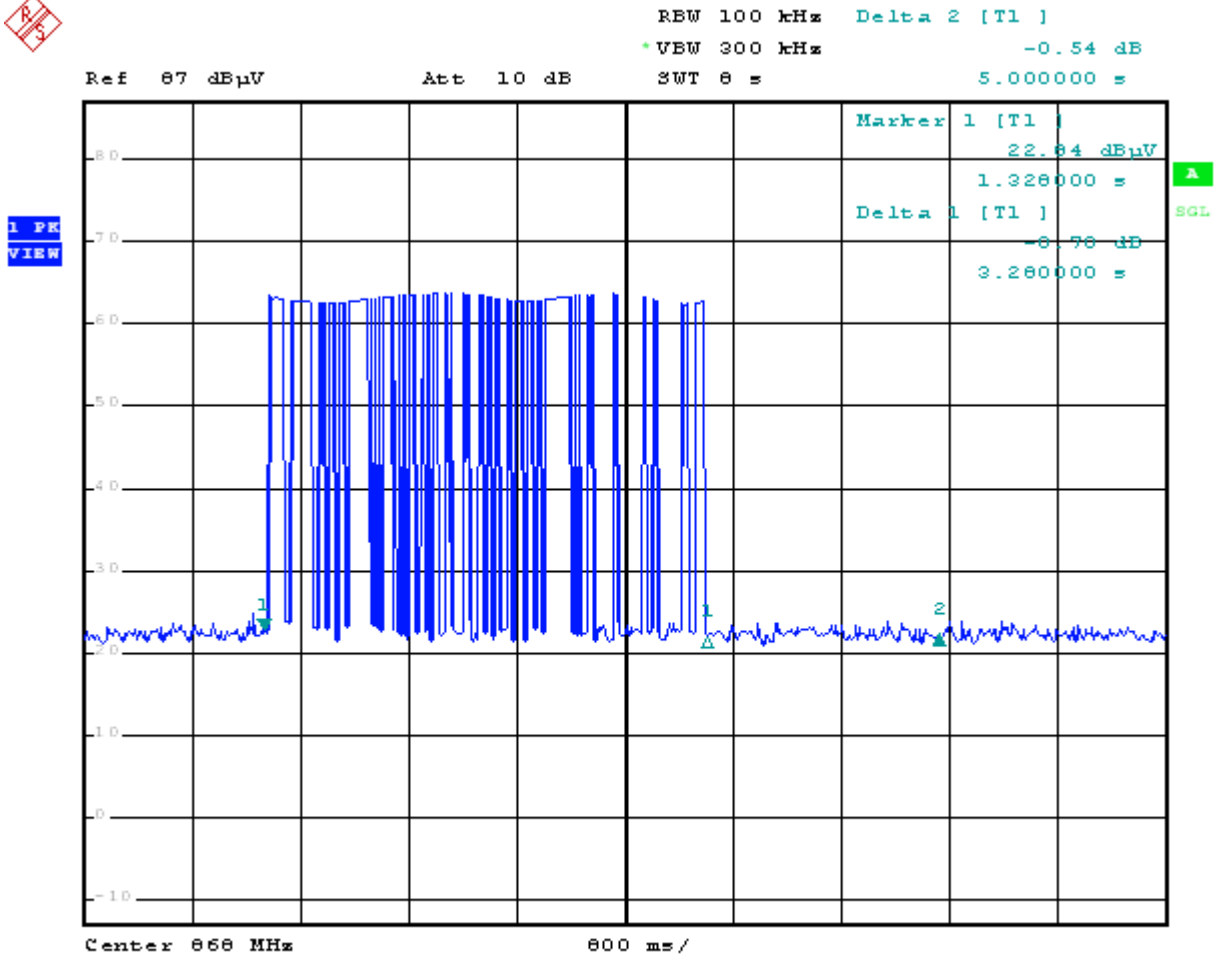
Test operating mode (2): dimmer

Test Result: PASS

Under the mode of dimmer,

(1) RF Transmission as long the dimmer is rotated in any direction. 3.28S

(2) this manually activated transmission stops automatically within 5 seconds after the last rotation.



Date: 23.SEP.2015 19:16:50

End Of The Report