



FCC/IC - TEST REPORT

Report Number : **68.912.19.0018.01** Date of Issue: August 16, 2019

Model : **LZW31**

Product Type : Dimmer Switch

Applicant : LEEDARSON LIGHTING CO., LTD

Address : Xingda Road, Xingtai Industrial Zone, Changtai County,
Zhangzhou, Fujian, China

Production Facility : LEEDARSON LIGHTING CO., LTD

Address : Xingda Road, Xingtai Industrial Zone, Changtai County,
Zhangzhou, Fujian, China

Test Result : Positive Negative

Total pages including
Appendices : 38

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval



1 Table of Contents

1 Table of Contents.....	2
2 Details about the Test Laboratory.....	3
3 Description of the Equipment Under Test.....	4
4 Summary of Test Standards.....	5
5 Summary of Test Results.....	6
6 General Remarks.....	7
7 Test setups.....	8
8 Systems test configuration.....	9
9 Technical Requirement.....	10
9.1 Conducted Emission.....	10
9.2 Field strength of emissions and Restricted bands.....	19
9.3 Out of Band Emissions.....	24
9.4 20dB Bandwidth & 99% Occupied Bandwidth.....	33
10 Test equipment lists.....	37
11 System Measurement Uncertainty.....	38

2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration
Number: 514049

ISED#: 10320A

CAB identifier: CN0077

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

Test Site 2

Company name: Dongguan Dongdian Testing Service Co., Ltd.
No.17,Zong bu Road 2, Songshan Lake Sci&Tech, Industry Park,
Dongguan City,Guangdong Province, China, 523808

Telephone: +86-0769-38826678
Fax: +86-0769-38826678

IC Registration
No.: 10288A

CAB identifier: CN0048

3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product/PMN:	Dimmer Switch
Model no./HVIN:	LZW31
FCC ID:	2AB2QLZW31
IC:	10256A-LZW31
Options and accessories:	NIL
Rated Voltage:	AC 120V/60Hz;
Rated Power:	400W for Incandescent Lamp; 300W for LED Lamp; 150W for CFL
RF Transmission Frequency:	908.4MHz, 908.42MHz, 916MHz
Modulation:	908.4MHz, 908.42MHz for FSK 916MHz for GFSK
Antenna Type:	PCB
Antenna Gain:	-5.5dBi
Description of the EUT:	The product is a Dimmer Switch that operated at the 908.4MHz, 908.42MHz, 916MHz;

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	RATINGS	MODEL NO.(SHIELD)
---	---	---	---

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5, Amendment 1, March 2019	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 9 August 2016	RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

All the test methods were according to ANSI C63.10-2013.

5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C 15.249, RSS-Gen, RSS-210					
Test Condition	Pages	Test Site	Test Result		
			Pass	Fail	N/A
15.207 & RSS-Gen A8.8 Conducted emission AC power port	10	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.205(a), §15.209(a), §15.249(a), §15.249(c) & RSS-210 B.10, RSS-GEN 6.13/8.9/8.10 Field strength of emissions and Restricted bands	13	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.249(d), RSS-210 B.10 Out of band emissions	18	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC §15.215(c) 20dB bandwidth & RSS-Gen 6.7 99% Occupied Bandwidth	23	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203, RSS-GEN 6.8 Antenna requirement	See note 2		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark 1: N/A- Not Applicable;

Note 1: The EUT used an integral PCB antenna, which gain is -5.5dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID:2AB2QLZW31 and IC:10256A-LZW31 complies with Section 15.207, 15.205, 15.209, 15.249 of the FCC Part 15, Subpart C Rules; RSS-Gen Issue 5 and RSS-210 issue 9.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed

- **Not** Performed

The Equipment Under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

Sample Received Date: August 12, 2019

Testing Start Date: August 12, 2019

Testing End Date: August 13, 2019

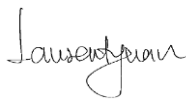
- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:

Tested by:







Laurent Yuan
EMC Project
Manager

Henry Chen
EMC Project
Engineer

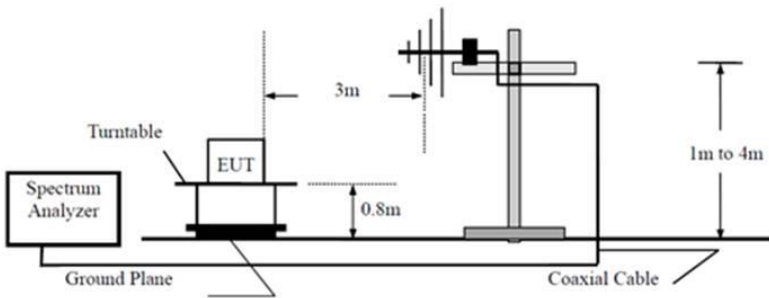
Louise Liu
EMC Test Engineer
Test Site 1

Sunny Zhang
EMC Test Engineer
Test Site 2

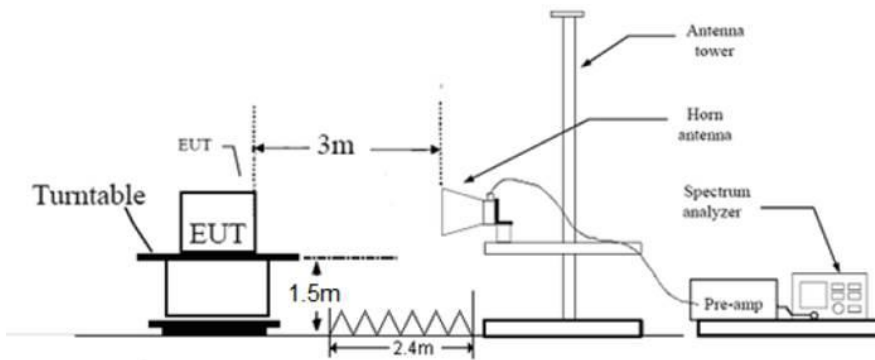
7 Test setups

7.1 Radiated test setups

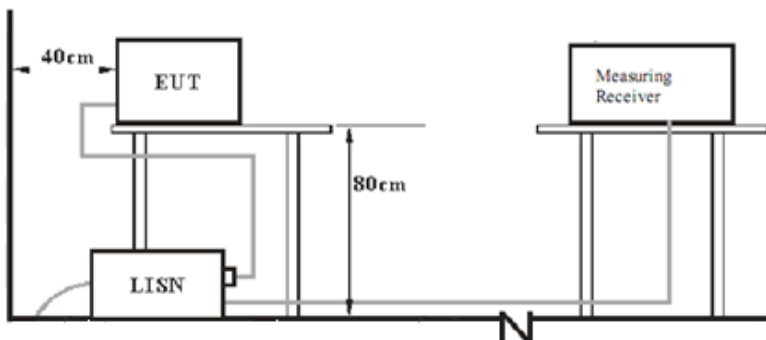
Below 1GHz



Above 1GHz



7.2 AC Power Line Conducted Emission test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
---	---	---	---

Test software information:

TEST SOFTWARE VERSION	SSCOM	
FREQUENCY	MODULATION	SETTING TX POWER
908.4 MHZ	FSK	23
908.42 MHZ	FSK	23
916 MHZ	GFSK	23

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

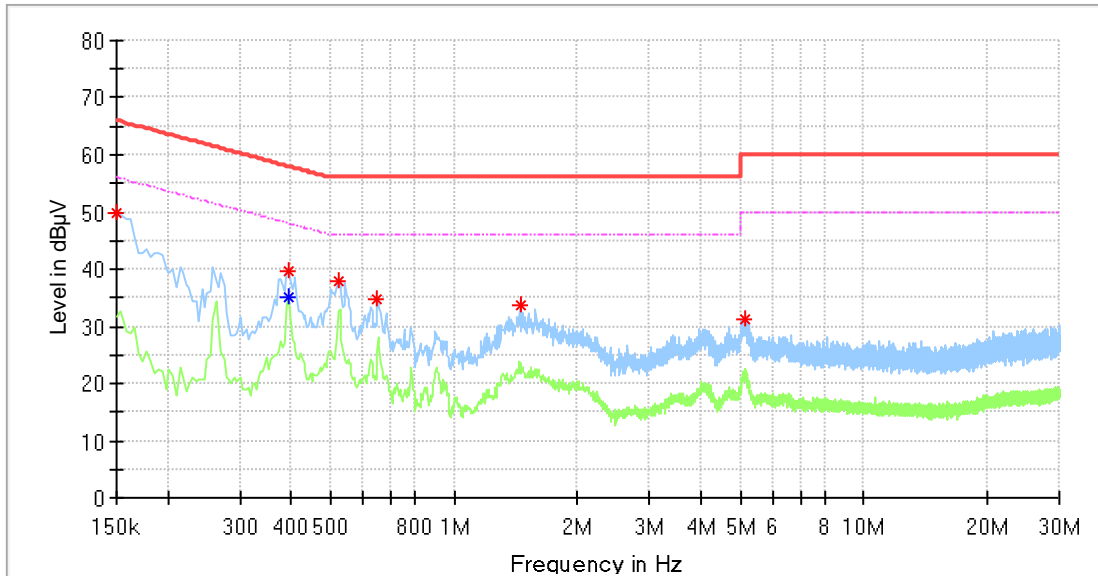
Limit

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency.

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Max) + Normal working with transmitting
 Test specification : Positive
 Comment : AC 120V/60Hz
 Remark : Single Live Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	49.88	---	66.00	16.12	L1	10.5
0.394000	39.64	---	57.98	18.34	L1	10.3
0.394000	---	35.12	47.98	12.86	L1	10.3
0.522000	37.96	---	56.00	18.04	L1	10.3
0.650000	34.58	---	56.00	21.42	L1	10.3
1.450000	33.83	---	56.00	22.17	L1	10.3
5.114000	31.30	---	60.00	28.70	L1	10.5

Remark :

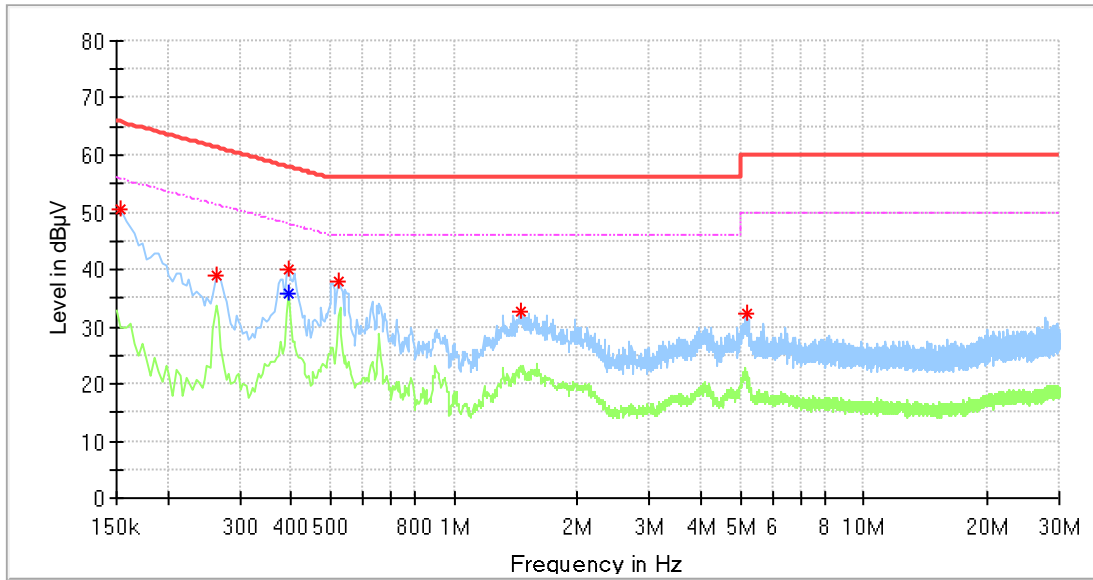
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Max) + Normal working with transmitting
 Test specification : Negative
 Comment : AC 120V/60Hz
 Remark : Single Live Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.154000	50.56	---	65.78	15.22	N	10.2
0.262000	38.99	---	61.37	22.37	N	10.2
0.394000	39.94	---	57.98	18.04	N	10.3
0.394000	---	35.84	47.98	12.14	N	10.3
0.522000	37.76	---	56.00	18.24	N	10.3
1.450000	32.64	---	56.00	23.36	N	10.3
5.186000	32.38	---	60.00	27.62	N	10.5

Remark :

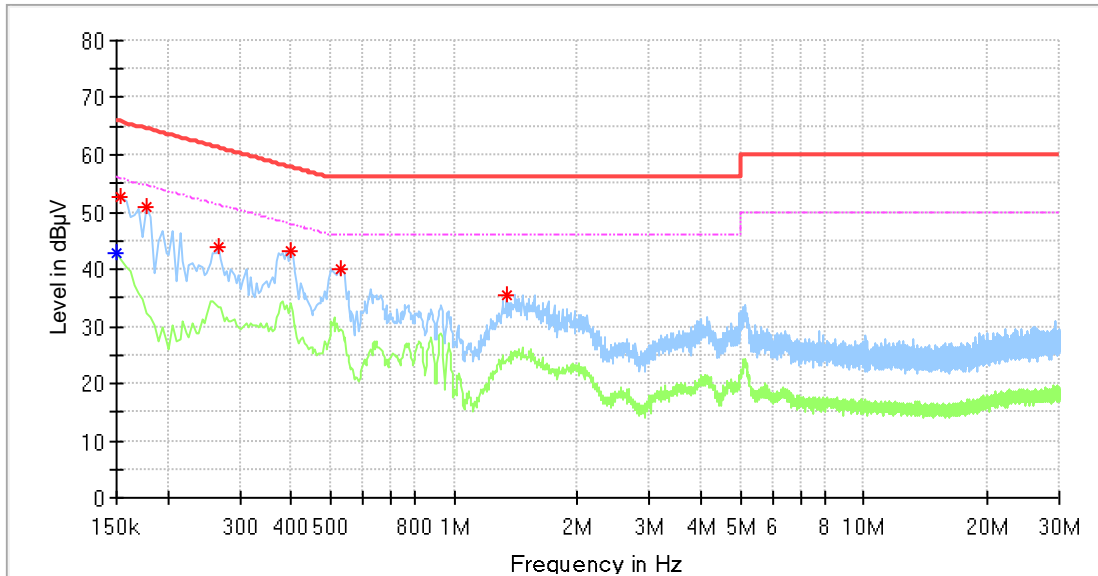
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Min) + Normal working with transmitting
 Test specification : Positive
 Comment : AC 120V/60Hz
 Remark : Single Live Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	---	42.74	56.00	13.26	L1	10.5
0.154000	52.81	---	65.78	12.97	L1	10.2
0.178000	50.94	---	64.58	13.64	L1	10.2
0.266000	43.97	---	61.24	17.27	L1	10.2
0.398000	43.15	---	57.90	14.74	L1	10.3
0.530000	40.09	---	56.00	15.91	L1	10.3
1.338000	35.61	---	56.00	20.39	L1	10.3

Remark :

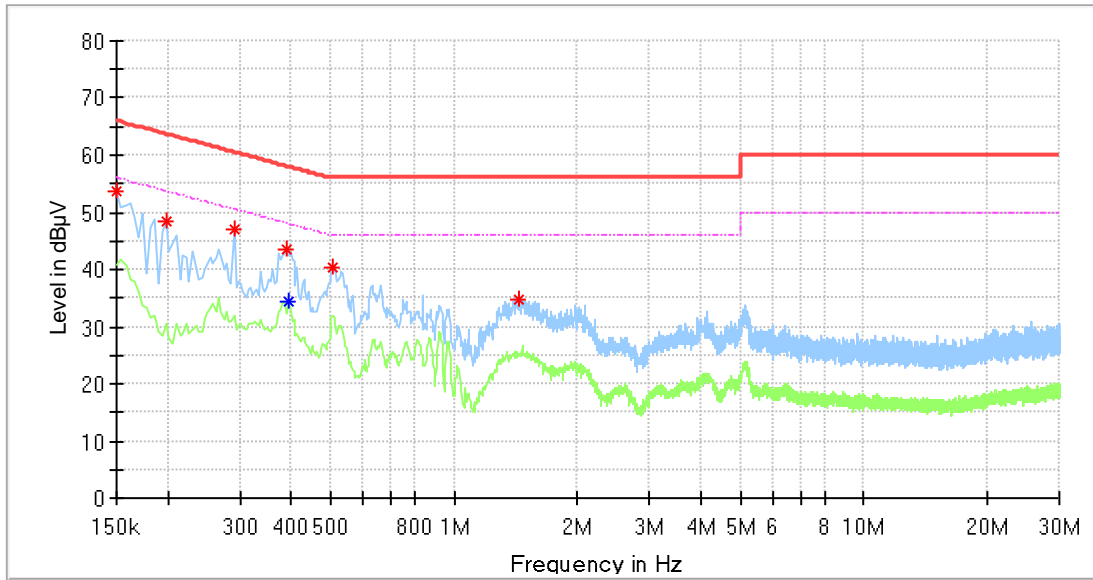
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Min) + Normal working with transmitting
 Test specification : Negative
 Comment : AC 120V/60Hz
 Remark : Single Live Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	53.69	---	66.00	12.31	N	10.5
0.198000	48.33	---	63.69	15.36	N	10.2
0.290000	46.93	---	60.52	13.59	N	10.2
0.390000	43.67	---	58.06	14.39	N	10.3
0.394000	---	34.53	47.98	13.45	N	10.3
0.506000	40.48	---	56.00	15.52	N	10.3
1.438000	34.89	---	56.00	21.11	N	10.3

Remark :

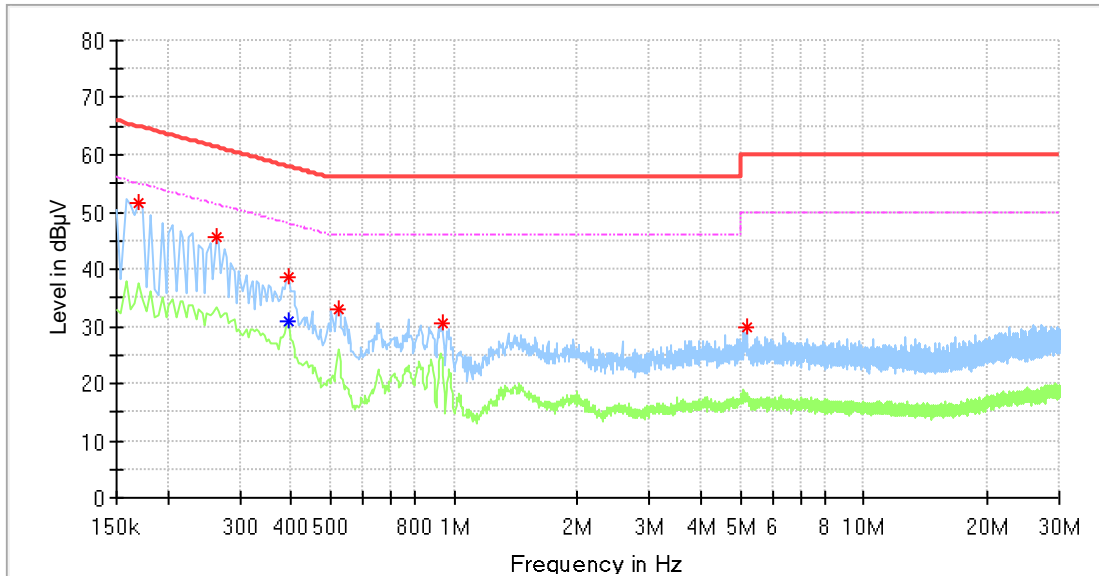
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Max) + Normal working with transmitting
 Test specification : Positive
 Comment : AC 120V/60Hz
 Remark : Live& Neutral Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.170000	51.64	---	64.96	13.32	L1	10.2
0.262000	45.44	---	61.37	15.93	L1	10.2
0.394000	---	30.87	47.98	17.11	L1	10.3
0.394000	38.75	---	57.98	19.23	L1	10.3
0.522000	33.08	---	56.00	22.92	L1	10.3
0.934000	30.56	---	56.00	25.44	L1	10.3
5.198000	29.77	---	60.00	30.23	L1	10.5

Remark :

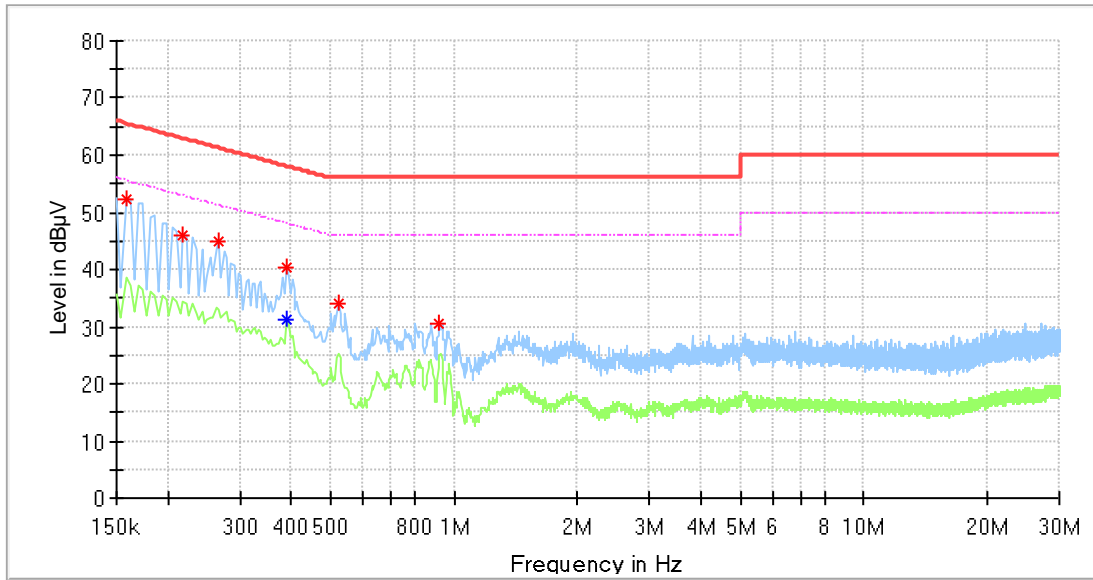
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Max) + Normal working with transmitting
 Test specification : Negative
 Comment : AC 120V/60Hz
 Remark : Live& Neutral Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.158000	52.44	---	65.57	13.13	N	10.2
0.218000	46.09	---	62.89	16.80	N	10.2
0.266000	44.80	---	61.24	16.44	N	10.2
0.390000	---	31.33	48.06	16.74	N	10.3
0.390000	40.51	---	58.06	17.55	N	10.3
0.522000	33.92	---	56.00	22.08	N	10.3
0.922000	30.57	---	56.00	25.43	N	10.3

Remark :

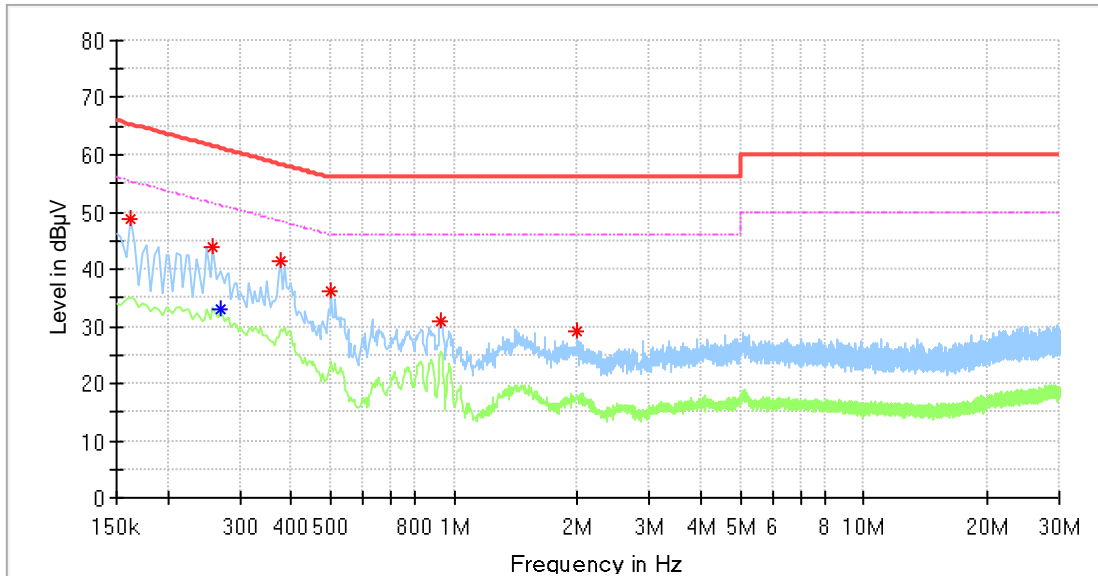
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Min) + Normal working with transmitting
 Test specification : Positive
 Comment : AC 120V/60Hz
 Remark : Live& Neutral Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.162000	48.63	---	65.36	16.73	L1	10.2
0.258000	43.79	---	61.50	17.70	L1	10.2
0.270000	---	33.08	51.12	18.03	L1	10.2
0.378000	41.47	---	58.32	16.86	L1	10.3
0.502000	36.02	---	56.00	19.98	L1	10.3
0.926000	31.01	---	56.00	24.99	L1	10.3
1.990000	28.98	---	56.00	27.02	L1	10.3

Remark :

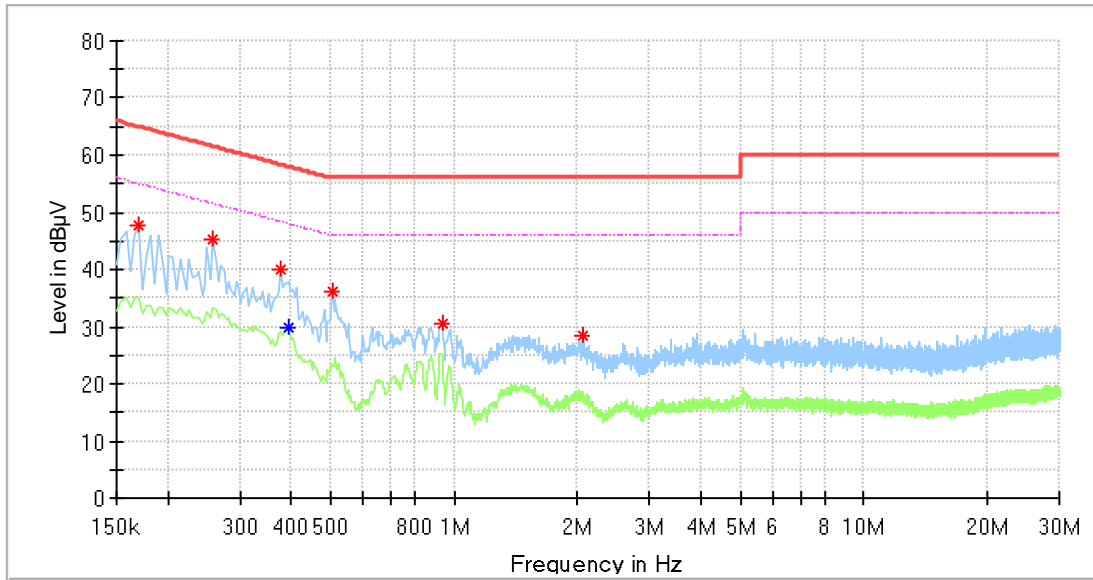
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Dimmer Switch
 M/N : LZW31
 Operating Condition : Light on(Min) + Normal working with transmitting
 Test specification : Negative
 Comment : AC 120V/60Hz
 Remark : Live& Neutral Line working



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.170000	47.81	---	64.96	17.15	N	10.2
0.258000	45.18	---	61.50	16.31	N	10.2
0.378000	40.06	---	58.32	18.27	N	10.3
0.394000	---	29.76	47.98	18.22	N	10.3
0.506000	36.13	---	56.00	19.87	N	10.3
0.934000	30.49	---	56.00	25.51	N	10.3
2.074000	28.45	---	56.00	27.55	N	10.3

Remark :

Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

9.2 Field strength of emissions and Restricted bands

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW \geq RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW \geq RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (duty cycle \geq 98%) for peak detection at frequency above 1GHz
- 4: If the emission is pulsed (duty cycle <98%), modify the unit for continuous operation: use the settings shown above, then correct the reading by subtracting the peak to average duty cycle correction factor $20\log(\text{duty cycle})$, derived from the appropriate duty cycle calculation.

Field strength of emissions and Restricted bands

Limits

According to §15.249 (a) & RSS-210 A2.9(a) , the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

According to §15.249 (c)& RSS-210 B.10, Field strength limits are specified at a distance of 3 meters.

According to §15.249 (d)& RSS-210 B.10, 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& RSS-Gen, whichever is the lesser attenuation.

According to §15.205 and RSS-GEN 8.10 Unwanted emissions falling into restricted bands in §15.205 (a) and RSS-GEN 8.10 Table 7 shall comply with the limits specified in §15.209 and RSS-Gen.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Field strength of emissions and Restricted bands

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

EUT: Dimmer Switch
 M/N: LZW31
 Operating Condition: Tx; 908.4MHz

For Peak& QP Value

Radiated Emission										
Value	Emissions Frequency MHz	E-Field Polarity	Reading Level dBµV/m	Amplifier Gain dB	Antenna Factor dB/m	Cable Loss dB	Emission dBµV/m	Limit dBµV/m	Margin dBm	Emission Type
QP	279.04	H	12.70	/	13.54	5.11	31.35	46.00	14.65	Spurious
QP	38.21	V	8.47	/	13.03	3.75	25.25	40.00	14.75	Spurious
PK	908.40	H	62.52	/	21.80	6.96	91.28	114.00	22.72	Fundamental
PK	908.40	V	59.98	/	21.80	6.96	88.74	114.00	25.26	Fundamental
PK	9534.00	H	48.21	43.89	37.13	7.59	49.04	74.00	24.96	Spurious
PK	7069.00	V	49.51	43.49	35.64	6.30	47.96	74.00	26.04	Spurious

For AV Value

Radiated Emission												
Value	Emissions Frequency MHz	E-Field Polarity	Reading Level dBµV/m	Amplifier Gain dB	Antenna Factor dB/m	Cable Loss dB	AV Reading Level dBµV/m	Peak to average correction Factor dB	AV Emission dBµV/m	Limit dBµV/m	Margin dBm	Emission Type
AV	/	H	/	/	/	/	/	0	/	/	/	Spurious
AV	/	V	/	/	/	/	/	0	/	/	/	Spurious

Peak to average duty cycle correction factor =20log(dutycycle), dutycycle=100%

Remark:

- 1: Data of measurement within this frequency range shown “/” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
 - 2: “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
 - 3: AV Emission Level= Peak emission Level+20log(dutycycle) (for duty cycle<98%)
 - 4: PK Emission = Reading Level + Correction Factor
- AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)
 Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
 Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
 (The Reading Level is recorded by software which is not shown in the sheet)

Field strength of emissions and Restricted bands

EUT: Dimmer Switch

M/N: LZW31

Operating Condition: Tx; 908.42MHz

For Peak& QP Value

Radiated Emission										
Value	Emissions Frequency MHz	E-Field Polarity	Reading Level dB μ V/m	Amplifier Gain dB	Antenna Factor dB/m	Cable Loss dB	Emission dB μ V/m	Limit dB μ V/m	Margin dBm	Emission Type
QP	616.37	H	3.15	/	18.78	6.14	28.07	46.00	17.93	Spurious
QP	813.11	V	3.33	/	20.84	6.63	30.80	46.00	15.20	Spurious
PK	908.42	H	61.01	/	21.80	6.96	89.77	114.00	24.23	Fundamental
PK	908.42	V	59.65	/	21.80	6.96	88.41	114.00	25.59	Fundamental
PK	7970.00	H	47.63	43.11	36.28	6.59	47.39	74.00	26.61	Spurious
PK	7851.00	V	47.45	43.16	36.18	6.55	47.02	74.00	26.98	Spurious

For AV Value

Radiated Emission												
Value	Emissions Frequency MHz	E-Field Polarity	Reading Level dB μ V/m	Amplifier Gain dB	Antenna Factor dB/m	Cable Loss dB	AV Reading Level dB μ V/m	Average Factor dB	AV Emission dB μ V/m	Limit dB μ V/m	Margin dBm	Emission Type
AV	/	H	/	/	/	/	/	0	/	/	/	Spurious
AV	/	V	/	/	/	/	/	0	/	/	/	Spurious

Peak to average duty cycle correction factor = $20\log(\text{duty cycle})$, duty cycle = 100%

Remark:

- 1: Data of measurement within this frequency range shown "/" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 2: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- 3: AV Emission Level= Peak emission Level+20log(duty cycle) (for duty cycle<98%)
- 4: PK Emission = Reading Level + Correction Factor
 AV Emission = Average Reading Level + Correction Factor (for duty cycle \geq 98%)
 Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
 Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
 (The Reading Level is recorded by software which is not shown in the sheet)

Field strength of emissions and Restricted bands

EUT: Dimmer Switch
 M/N: LZW31
 Operating Condition: Tx; 916MHz

For Peak& QP Value

Radiated Emission										
Value	Emissions Frequency MHz	E-Field Polarity	Reading Level dBµV/m	Amplifier Gain dB	Antenna Factor dB/m	Cable Loss dB	Emission dBµV/m	Limit dBµV/m	Margin dBm	Emission Type
QP	285.98	H	9.97	/	13.69	5.13	28.79	46.00	17.21	Spurious
QP	77.87	V	15.43	/	9.02	4.07	28.52	40.00	11.48	Spurious
PK	916.00	H	61.63	/	21.88	6.99	90.50	114.00	23.50	Fundamental
PK	916.00	V	59.08	/	21.88	6.99	87.95	114.00	26.05	Fundamental
PK	9670.00	H	47.27	43.95	37.21	7.67	48.20	74.00	25.80	Spurious
PK	8650.00	V	48.30	43.45	36.80	7.05	48.70	74.00	25.30	Spurious

For AV Value

Radiated Emission												
Value	Emissions Frequency MHz	E-Field Polarity	Reading Level dBµV/m	Amplifier Gain dB	Antenna Factor dB/m	Cable Loss dB	AV Reading Level dBµV/m	Average Factor dB	AV Emission dBµV/m	Limit dBµV/m	Margin dBm	Emission Type
AV	/	H	/	/	/	/	/	0	/	/	/	Spurious
AV	/	V	/	/	/	/	/	0	/	/	/	Spurious

Peak to average duty cycle correction factor =20log(dutycycle), dutycycle=100%

Remark:

- 1: Data of measurement within this frequency range shown “/” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 2: “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- 3: AV Emission Level= Peak emission Level+20log(dutycycle) (for duty cycle<98%)
- 4: PK Emission = Reading Level + Correction Factor
 AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)
 Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
 Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
 (The Reading Level is recorded by software which is not shown in the sheet)

9.3 Out of Band Emissions

Test Method

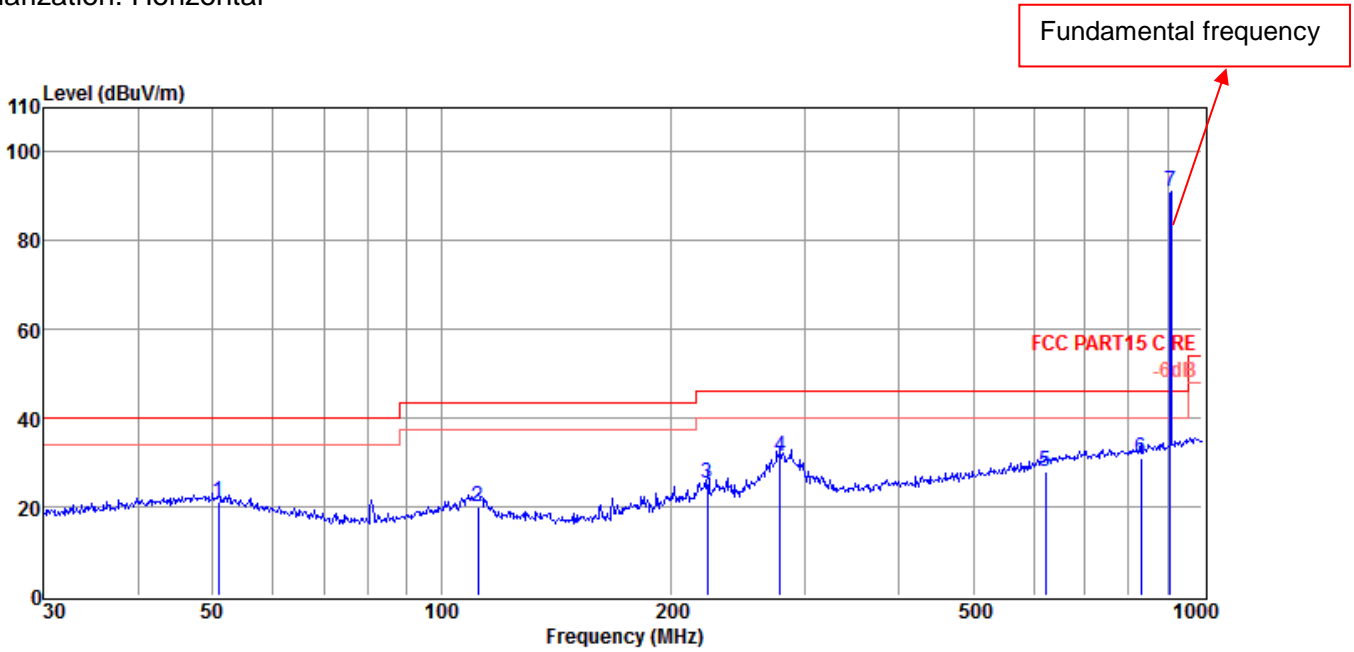
- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

Limits

According to §15.249(d) & RSS-210 B.10 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 and RSS-Gen, whichever is the lesser attenuation.

Out of Band Emissions

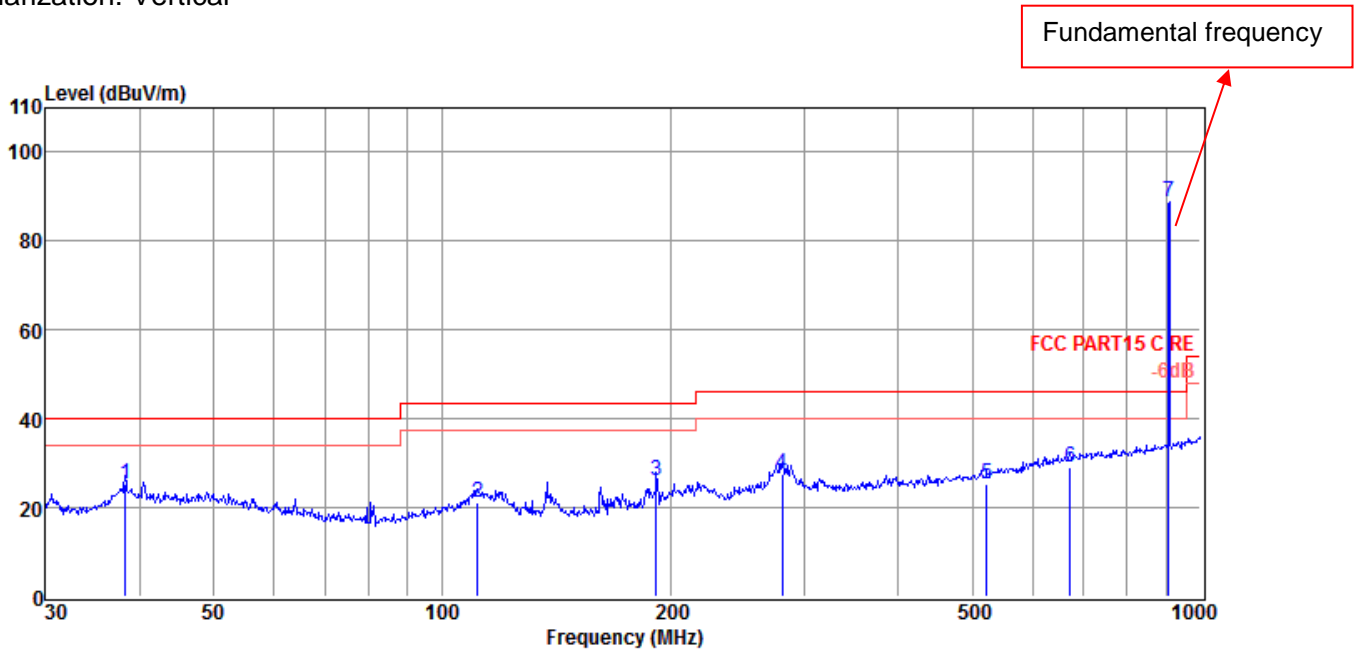
EUT: Dimmer Switch
M/N: LZW31
Operating Condition: Tx; 908.4MHz
Polarization: Horizontal



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	50.94	2.91	14.27	3.88	21.06	40.00	-18.94	QP	HORIZONTAL
2	111.74	4.37	11.42	4.27	20.06	43.50	-23.44	QP	HORIZONTAL
3	223.73	8.38	12.12	4.90	25.40	46.00	-20.60	QP	HORIZONTAL
4	279.04	12.70	13.54	5.11	31.35	46.00	-14.65	QP	HORIZONTAL
5	622.89	2.90	18.89	6.16	27.95	46.00	-18.05	QP	HORIZONTAL
6	830.40	3.48	21.02	6.67	31.17	46.00	-14.83	QP	HORIZONTAL
7	908.40	62.52	21.80	6.96	91.28	114.00	-22.72	Peak	HORIZONTAL

Out of Band Emissions

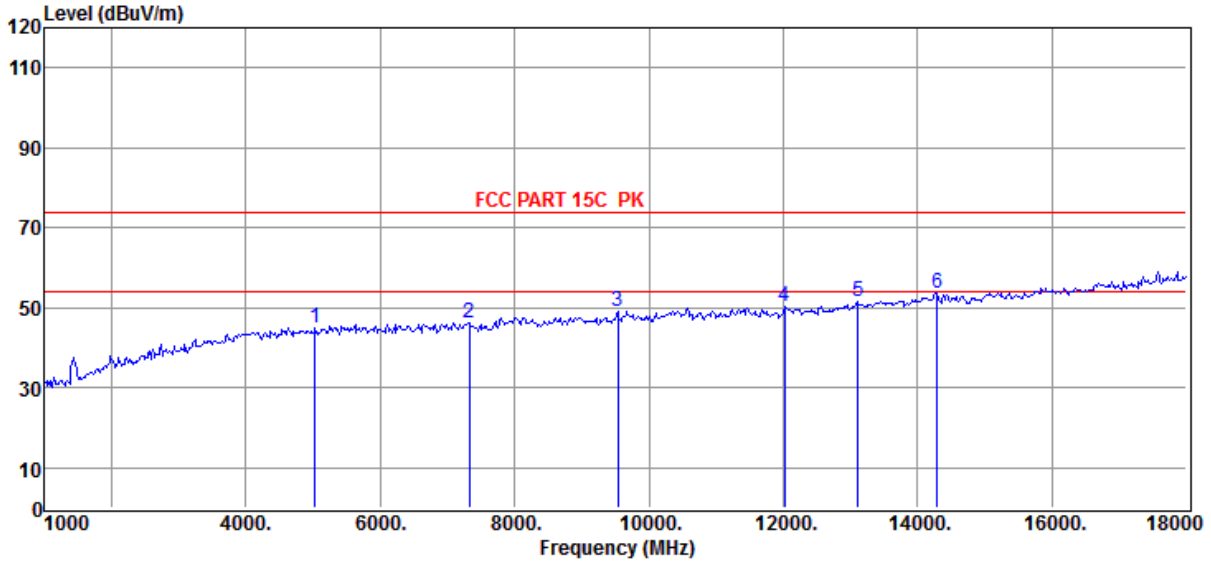
EUT: Dimmer Switch
M/N: LZW31
Operating Condition: Tx; 908.4MHz
Polarization: Vertical



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	38.21	8.47	13.03	3.75	25.25	40.00	-14.75	QP	VERTICAL
2	111.35	5.48	11.51	4.26	21.25	43.50	-22.25	QP	VERTICAL
3	191.75	10.89	10.25	4.78	25.92	43.50	-17.58	QP	VERTICAL
4	281.01	8.72	13.58	5.11	27.41	46.00	-18.59	QP	VERTICAL
5	522.72	1.89	17.44	5.89	25.22	46.00	-20.78	QP	VERTICAL
6	672.84	3.13	19.69	6.30	29.12	46.00	-16.88	QP	VERTICAL
7	908.40	59.98	21.80	6.96	88.74	114.00	-25.26	Peak	VERTICAL

Out of Band Emissions

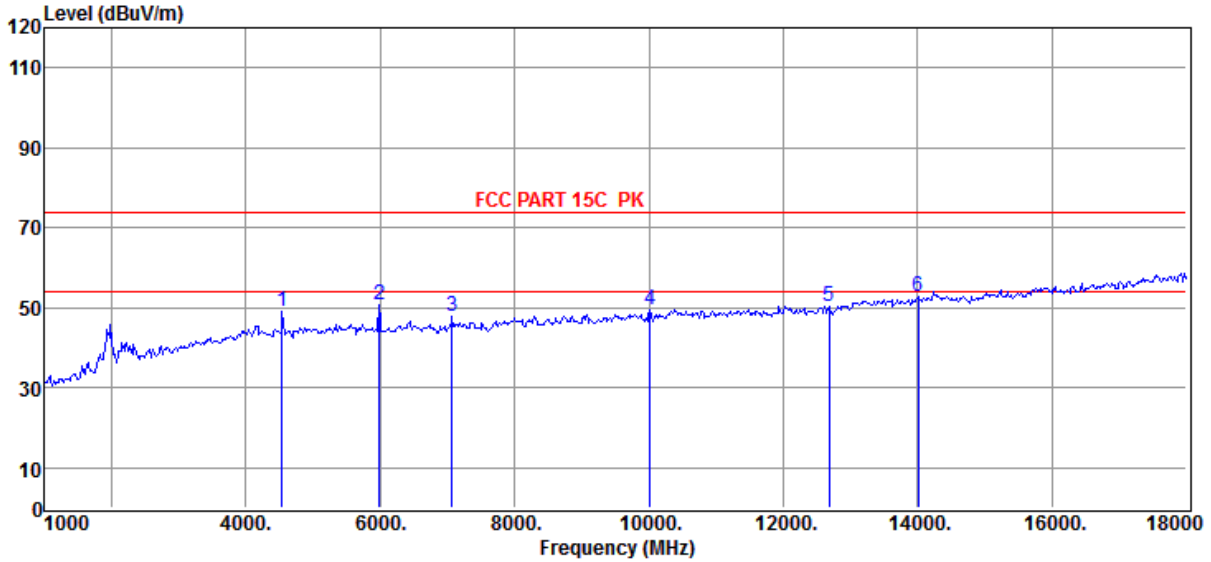
EUT: Dimmer Switch
 M/N: LZW31
 Operating Condition: Tx; 908.4MHz
 Polarization: Horizontal



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	5029.00	49.18	33.92	44.19	5.88	44.79	74.00	-29.21	Peak	HORIZONTAL
2	7324.00	47.40	35.80	43.38	6.38	46.20	74.00	-27.80	Peak	HORIZONTAL
3	9534.00	48.21	37.13	43.89	7.59	49.04	74.00	-24.96	Peak	HORIZONTAL
4	12016.00	46.95	38.00	43.56	8.79	50.18	74.00	-23.82	Peak	HORIZONTAL
5	13104.00	47.11	38.45	43.30	9.25	51.51	74.00	-22.49	Peak	HORIZONTAL
6	14294.00	46.66	40.26	43.04	9.73	53.61	74.00	-20.39	Peak	HORIZONTAL

Out of Band Emissions

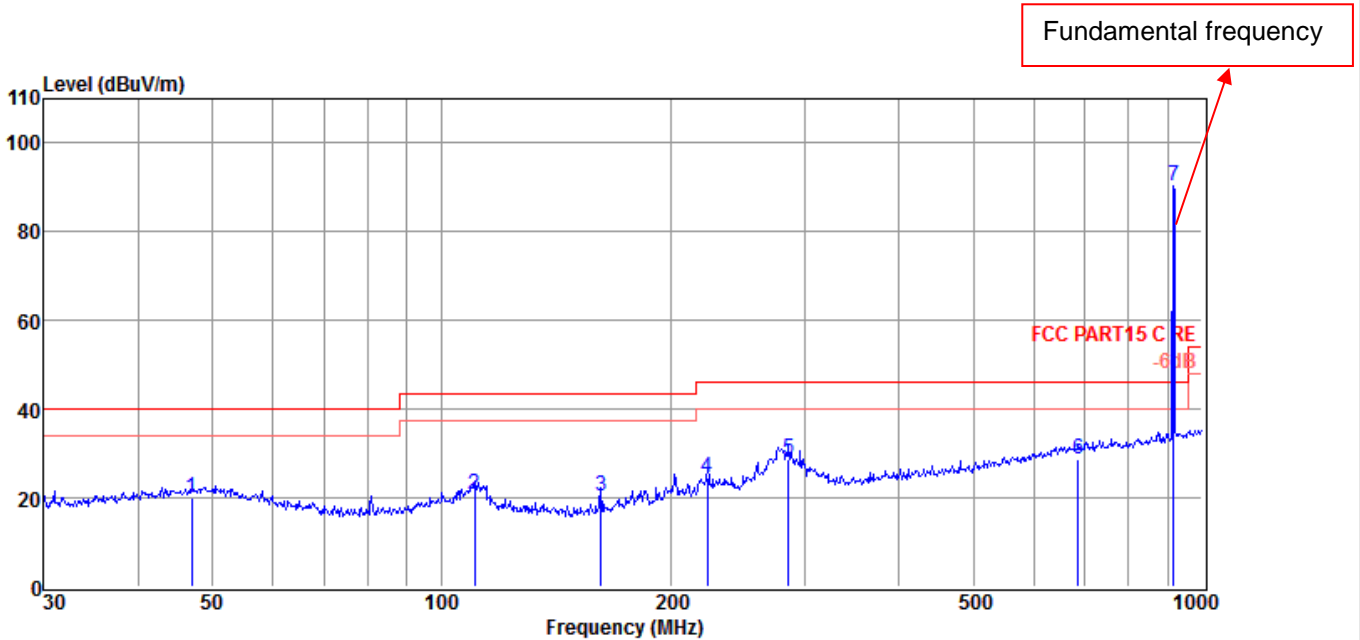
EUT: Dimmer Switch
 M/N: LZW31
 Operating Condition: Tx; 908.4MHz
 Polarization: Vertical



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4536.00	53.97	33.62	44.29	5.78	49.08	74.00	-24.92	Peak	VERTICAL
2	5981.00	54.05	34.69	44.00	6.00	50.74	74.00	-23.26	Peak	VERTICAL
3	7069.00	49.51	35.64	43.49	6.30	47.96	74.00	-26.04	Peak	VERTICAL
4	10010.00	48.31	37.41	44.10	7.85	49.47	74.00	-24.53	Peak	VERTICAL
5	12679.00	46.64	38.17	43.40	9.07	50.48	74.00	-23.52	Peak	VERTICAL
6	14005.00	46.16	40.20	43.10	9.57	52.83	74.00	-21.17	Peak	VERTICAL

Out of Band Emissions

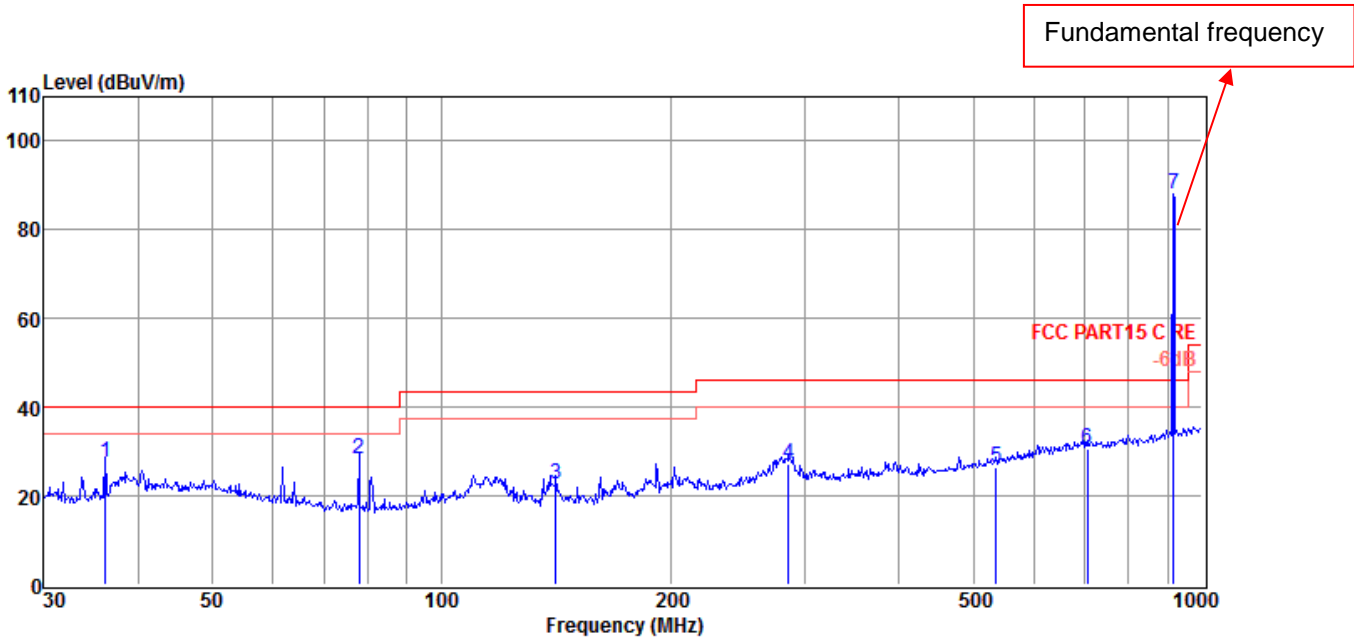
EUT: Dimmer Switch
 M/N: LZW31
 Operating Condition: Tx; 916MHz
 Polarization: Horizontal



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	47.00	2.01	14.27	3.84	20.12	40.00	-19.88	QP	HORIZONTAL
2	110.57	5.00	11.68	4.26	20.94	43.50	-22.56	QP	HORIZONTAL
3	162.04	7.05	8.82	4.61	20.48	43.50	-23.02	QP	HORIZONTAL
4	223.73	7.63	12.12	4.90	24.65	46.00	-21.35	QP	HORIZONTAL
5	285.98	9.97	13.69	5.13	28.79	46.00	-17.21	QP	HORIZONTAL
6	687.15	2.34	19.91	6.34	28.59	46.00	-17.41	QP	HORIZONTAL
7	916.07	61.63	21.88	6.99	90.50	114.00	-23.50	Peak	HORIZONTAL

Out of Band Emissions

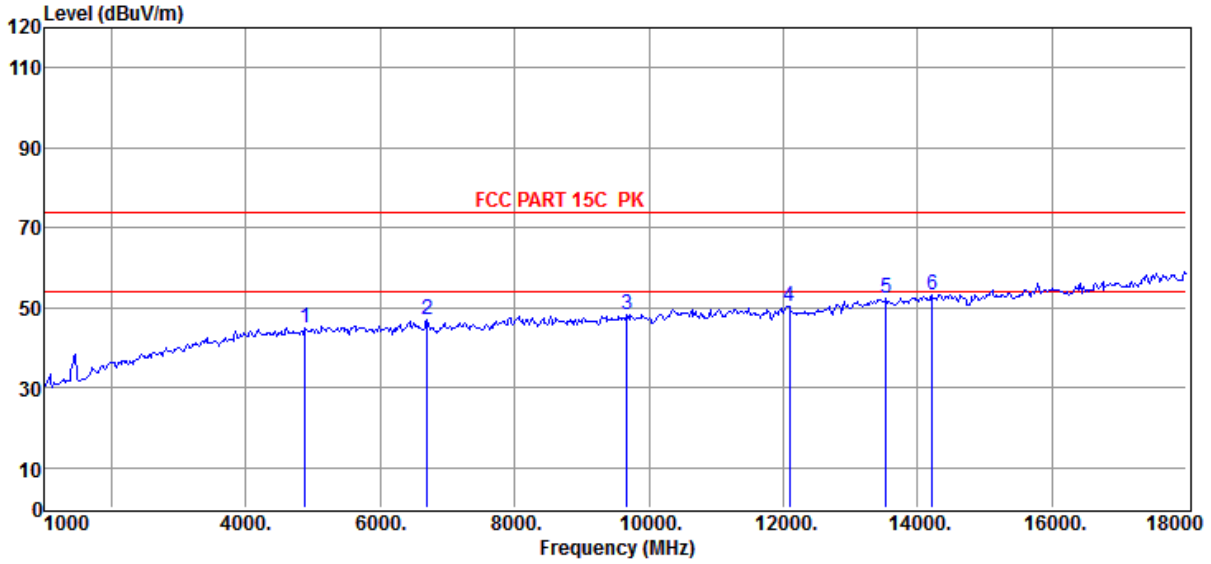
EUT: Dimmer Switch
M/N: LZW31
Operating Condition: Tx; 916MHz
Polarization: Vertical



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	36.13	11.26	12.59	3.72	27.57	40.00	-12.43	QP	VERTICAL
2	77.87	15.43	9.02	4.07	28.52	40.00	-11.48	QP	VERTICAL
3	141.33	9.53	8.66	4.45	22.64	43.50	-20.86	QP	VERTICAL
4	285.98	8.47	13.69	5.13	27.29	46.00	-18.71	QP	VERTICAL
5	535.71	3.04	17.63	5.92	26.59	46.00	-19.41	QP	VERTICAL
6	706.70	4.10	20.14	6.40	30.64	46.00	-15.36	QP	VERTICAL
7	916.07	59.08	21.88	6.99	87.95	114.00	-26.05	Peak	VERTICAL

Out of Band Emissions

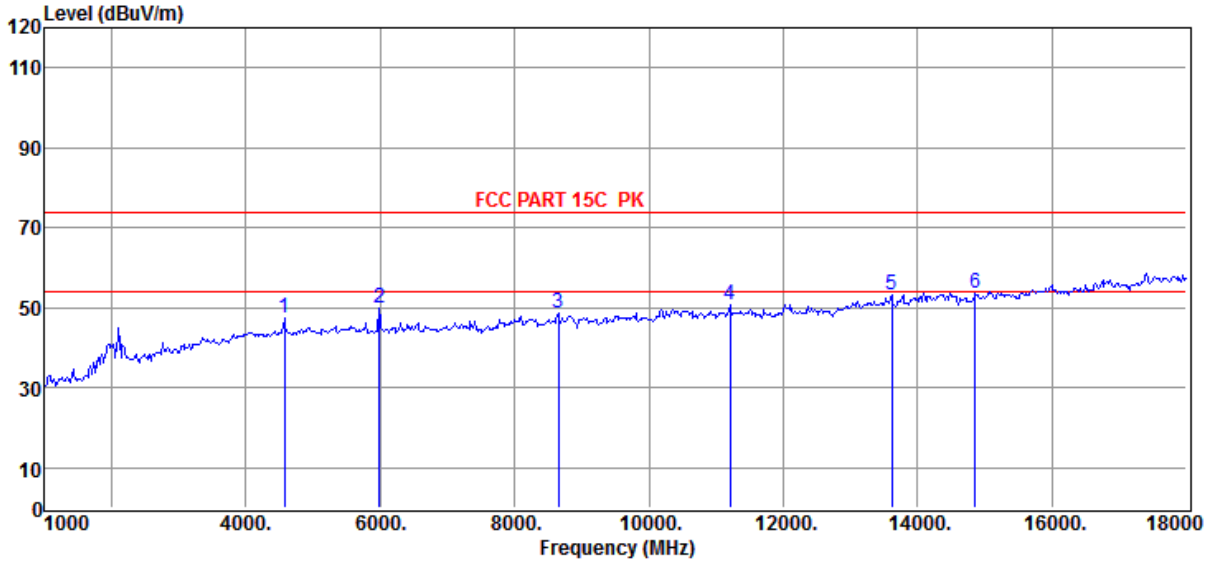
EUT: Dimmer Switch
 M/N: LZW31
 Operating Condition: Tx; 916MHz
 Polarization: Horizontal



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4876.00	49.36	33.83	44.22	5.85	44.82	74.00	-29.18	Peak	HORIZONTAL
2	6695.00	49.18	35.42	43.66	6.19	47.13	74.00	-26.87	Peak	HORIZONTAL
3	9670.00	47.27	37.21	43.95	7.67	48.20	74.00	-25.80	Peak	HORIZONTAL
4	12084.00	47.09	38.02	43.54	8.82	50.39	74.00	-23.61	Peak	HORIZONTAL
5	13529.00	46.93	39.07	43.21	9.40	52.19	74.00	-21.81	Peak	HORIZONTAL
6	14209.00	46.42	40.24	43.06	9.69	53.29	74.00	-20.71	Peak	HORIZONTAL

Out of Band Emissions

EUT: Dimmer Switch
 M/N: LZW31
 Operating Condition: Tx; 916MHz
 Polarization: Vertical



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4570.00	52.11	33.64	44.28	5.79	47.26	74.00	-26.74	Peak	VERTICAL
2	5981.00	53.19	34.69	44.00	6.00	49.88	74.00	-24.12	Peak	VERTICAL
3	8650.00	48.30	36.80	43.45	7.05	48.70	74.00	-25.30	Peak	VERTICAL
4	11200.00	48.28	37.95	43.76	8.32	50.79	74.00	-23.21	Peak	VERTICAL
5	13614.00	47.62	39.28	43.19	9.43	53.14	74.00	-20.86	Peak	VERTICAL
6	14855.00	45.75	40.59	42.93	10.05	53.46	74.00	-20.54	Peak	VERTICAL

9.4 20dB Bandwidth & 99% Occupied Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

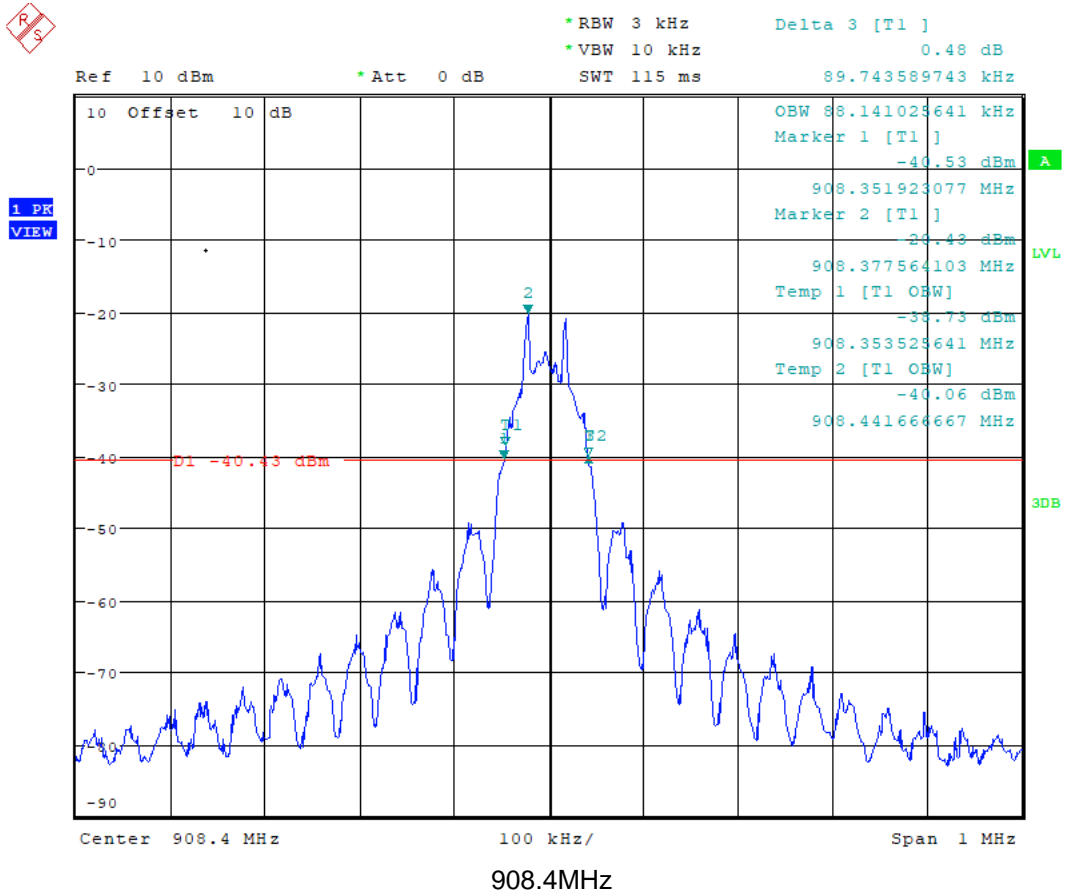
Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

According to RSS-Gen 6.7 when an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

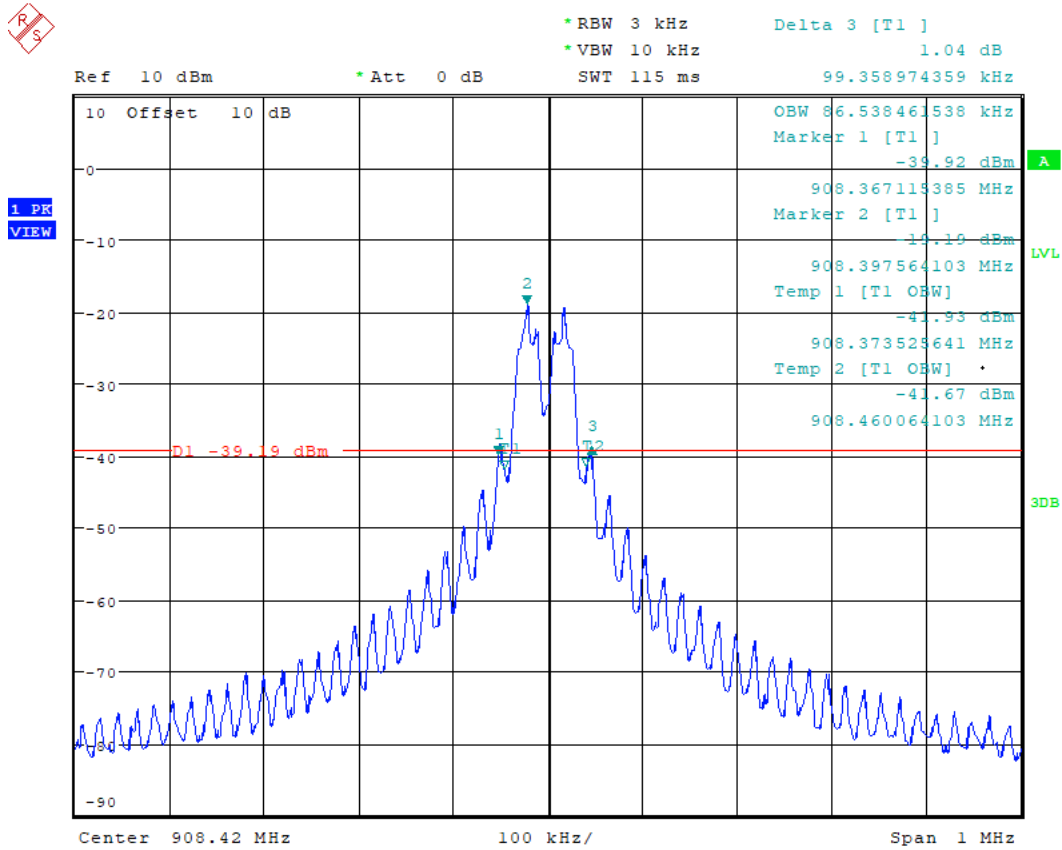
20dB Bandwidth & 99% Occupied Bandwidth

Frequency	20dB Bandwidth	99% Bandwidth	Limit
MHz	KHz	kHz	kHz
908.4	89.743	88.141	--



20dB Bandwidth & 99% Occupied Bandwidth

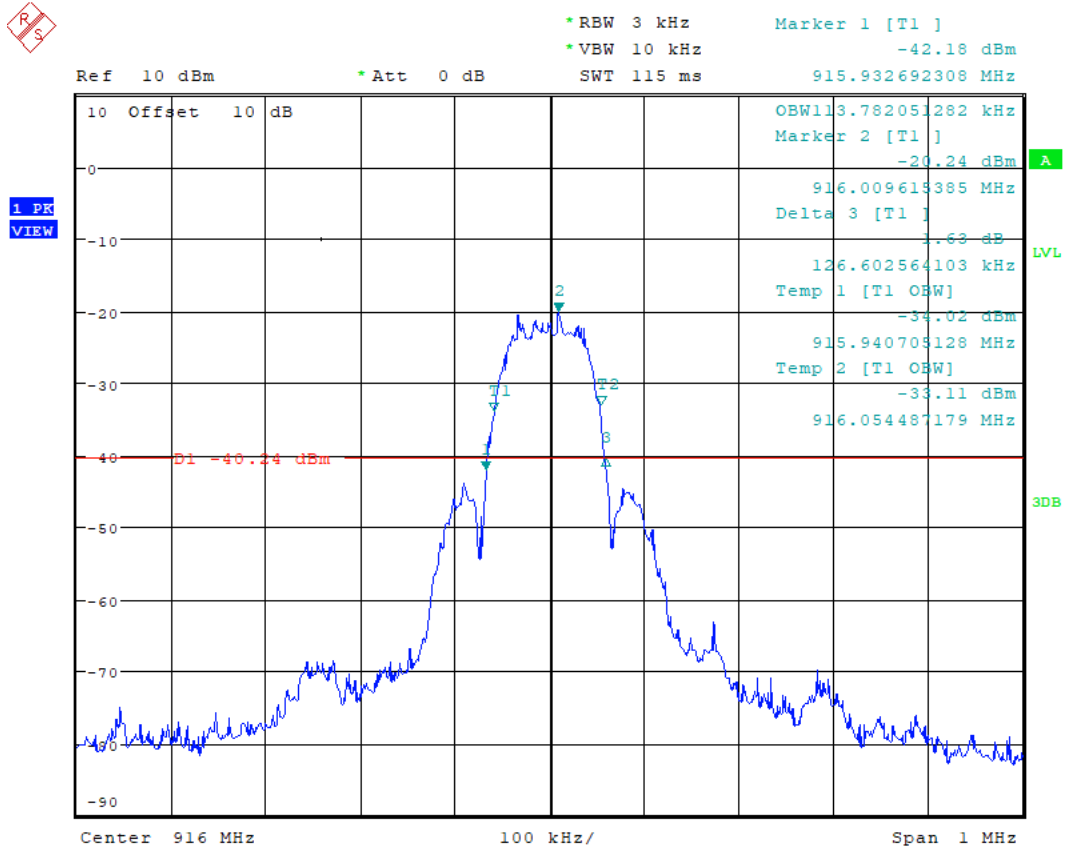
Frequency MHz	20dB Bandwidth KHz	99% Bandwidth kHz	Limit kHz
908.42	99.358	86.538	--



908.42MHz

20dB Bandwidth & 99% Occupied Bandwidth

Frequency	20dB Bandwidth	99% Bandwidth	Limit
MHz	KHz	kHz	kHz
916	126.602	113.782	--



916MHz

10 Test equipment lists

List of Test Instruments

Site 1

Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-14-001	101782	2020-6-28
LISN	Rohde & Schwarz	ENV4200	8-4-87-14-001	100249	2020-6-28
LISN	Rohde & Schwarz	ENV432	68-4-87-16-001	101318	2020-7-19
LISN	Rohde & Schwarz	ENV216	68-4-87-14-002	100326	2020-6-28
ISN	Rohde & Schwarz	ENY81	68-4-87-14-003	100177	2020-6-28
ISN	Rohde & Schwarz	ENY81-CA6	68-4-87-14-004	101664	2020-6-28
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	68-4-27-14-001	9420-584	2020-6-24
RF Current Probe	Rohde & Schwarz	EZ-17	68-4-27-14-002	100816	2020-7-2
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	2020-6-28
Test software	Rohde & Schwarz	EMC32	68-4-90-14-003-A10	Version9.15.00	N/A

Site 2

Radiated Emission Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	R&S	ESU8	100316	Oct. 12, 2018	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 25, 2019	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	Nov. 09, 2018	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Oct. 20, 2018	1 Year
Double Ridged Horn Antenna	R&S	HF907	100276	Nov. 16, 2018	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	Oct. 25, 2018	1 Year
Pre-amplifier	A.H.	PAM-0118	360	Oct. 12, 2018	1 Year
Pre-amplifier	TERA-MW	TRLA-0040G35	101303	Oct. 12, 2018	1 Year
RF Cable	HUBSER	CP-X2+ CP-X1	W11.03+ W12.02	Oct. 21, 2018	1 Year
RF Cable	N/A	SMAJ-SMAJ-1M+ 11M	17070133+17070131	Nov. 08, 2018	1 Year
MI Cable	HUBSER	C10-01-01-1M	1091629	Oct. 21, 2018	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Site 1:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.21dB

Site 2:

Test Item	Uncertainty
Bandwidth	1.1%
Temperature	0.4 °C
Humidity	2 %
Uncertainty for Radiation Emission test (30 MHz-1 GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz-40 GHz)	4.10 dB (1-6 GHz)
	4.40 dB (6 GHz-18 GHz)
	3.54dB (18GHz-26 GHz)
	4.30 dB (26 GHz-40 GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	