



FCC PART 15.231

TEST REPORT

For

Xeleum Lighting LLC

225 W 36th St Suite 706 New York United States

FCC ID: 2APEA-XCM-001

Report Type: Original Report	Product Type: XCM (Xi-Fi Communication Module)
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Xeleum Lighting LLC*'s product, model number: *XCM-001 (FCC ID: 2APEA-XCM-001)* (or the "EUT") in this report was a *XCM (Xi-Fi Communication Module)*, which was measured approximately: 60 mm (L) * 42 mm (W) * 25 mm (H), rated with input voltage: DC 12 V.

** All measurement and test data in this report was gathered from production sample serial number: 1710079 (Assigned by BAACL, Shenzhen). The EUT supplied by the applicant was received on 2017-11-20.*

Objective

This test report is prepared on behalf of *Xeleum Lighting LLC*. All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

FCC PART 15.249 DXX submissions with FCC ID: 2APEA-XCM-001.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
Radiated emission	30MHz~1 GHz	±5.91 dB
	Above 1 GHz	±4.92 dB
AC Power Lines Conducted Emissions		±1.95dB
Occupied Bandwidth		±0.5 kHz
Temperature		±1.0 °C
Humidity		±6 %

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing by manufacturer.

16 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	433.107	8	434.028
1	433.222	9	434.143
2	433.337	A	434.258
3	433.452	B	434.373
4	433.568	C	434.488
5	433.683	D	434.603
6	433.798	E	434.718
7	433.913	F	434.833

Channel 0 and Channel F were tested.

Special Accessories

No special accessories was used

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

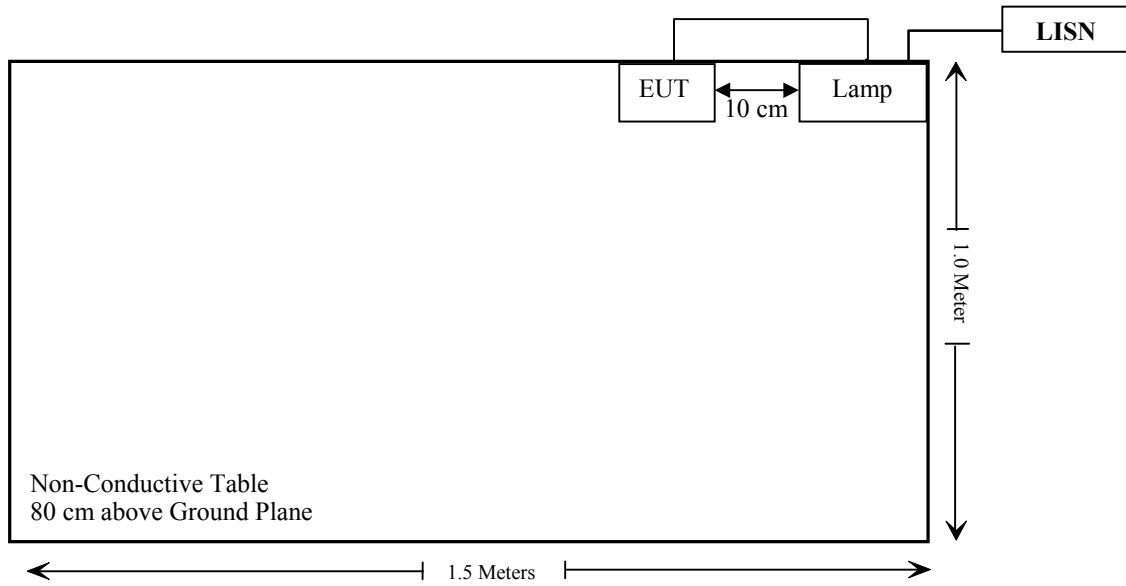
Manufacturer	Description	Model	Serial Number
Xeleum	Lamp	N/A	N/A

External I/O Cable

Cable Description	Length (m)	From / Port	To
Un-shielding Un-Detachable AC Power Cable	1.2	Lamp	LISN

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliance
§15.231 (c)	20dB Emission Bandwidth	Compliance
§15.231 (a) (2)	Deactivation	Compliance

TEST EQUIPMENT LIST AND DETAILS

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2017-08-04	2018-08-04
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2017-12-21	2018-12-21
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2017-11-19	2018-05-17
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Unknown	Conducted Emission Cable	78652	UF A210B-1-0720-504504	2017-11-12	2018-05-12
Radiated Emission Test					
A.H.System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2017-04-24	2018-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-05-21	2018-05-21
HP	Amplifier	HP8447E	1937A01046	2017-11-19	2018-05-17
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369223410-001	2017-11-19	2018-05-17
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-17
Ducommun technologies	RF Cable	RG-214	1	2017-11-19	2018-05-17
Ducommun technologies	RF Cable	RG-214	2	2017-11-22	2018-05-22
RF Conducted Test					
WEINSCHL	10dB Attenuator	5324	AU 3842	Each Time	
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-24	2018-12-24
Ducommun technologies	RF Cable	RG-214	3	Each Time	

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Antenna Connector Construction

The EUT has one external antenna arrangement, which used a unique coupling to this product. And the antenna is 2.0 dBi, fulfill the requirement of this section. Please refer to EUT photos.

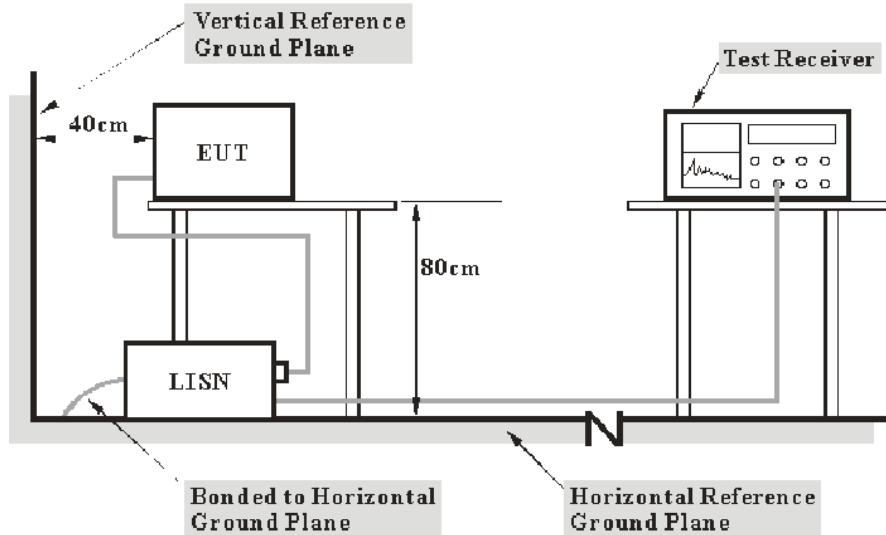
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BAEL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

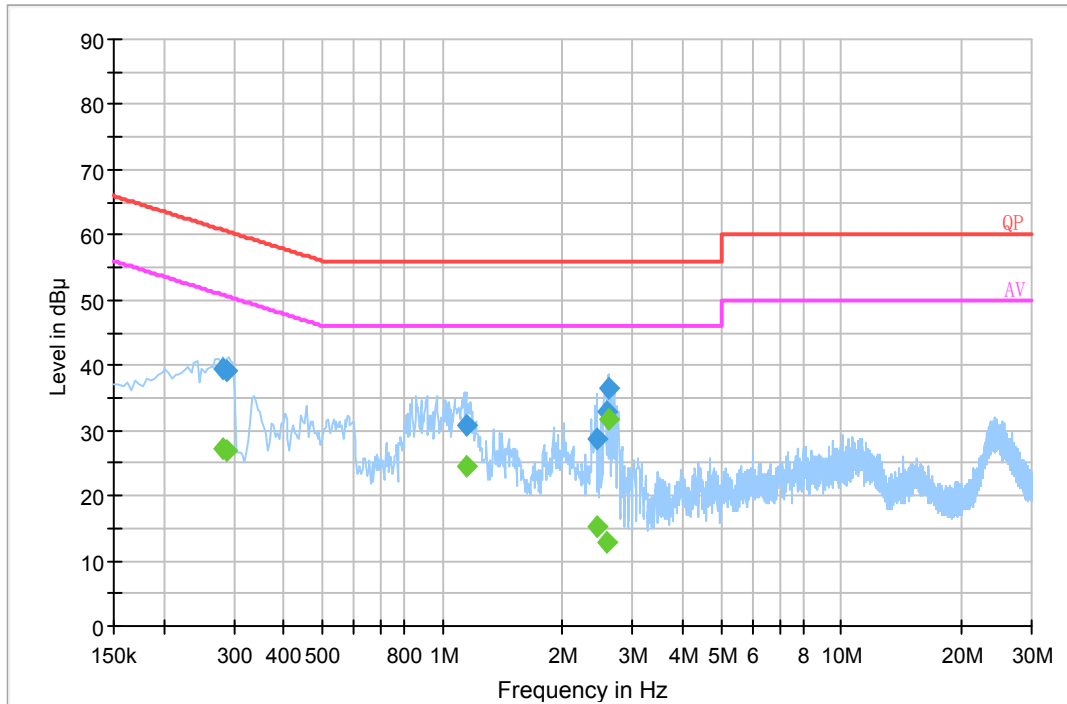
Temperature:	24.2°C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Hill He on 2018-03-23.

EUT operation mode: Lighting and transmitting

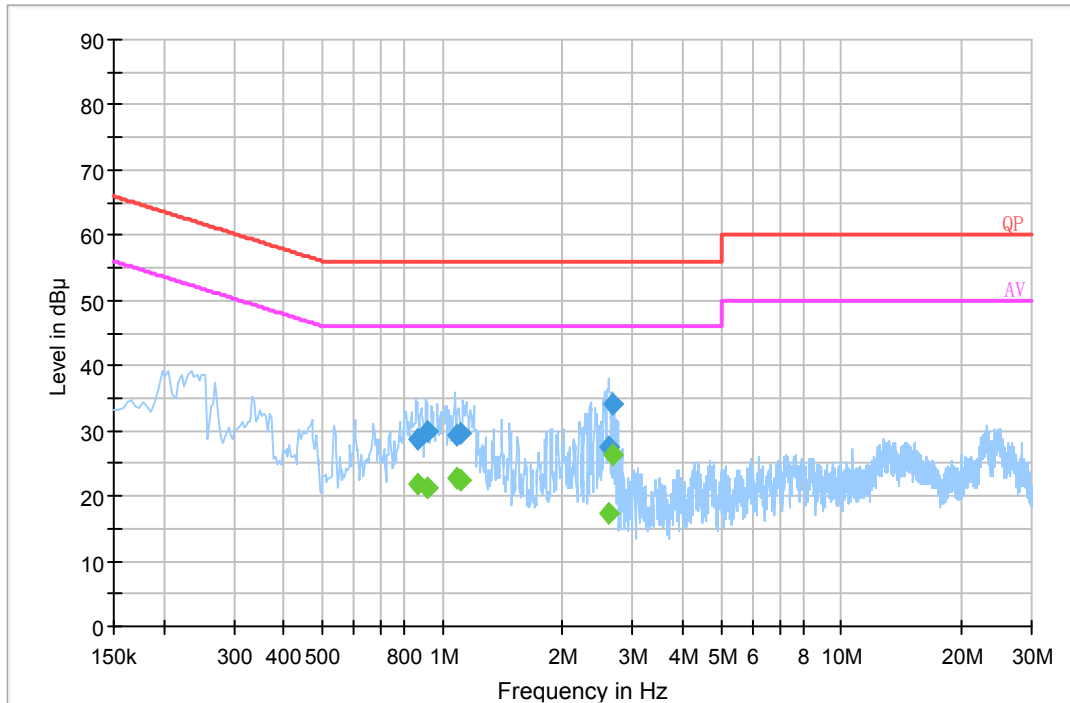
For 433.107 MHz:

AC 120V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.281500	39.6	20.2	60.8	21.2	QP
0.289500	39.2	20.2	60.5	21.3	QP
1.146950	30.8	20.1	56.0	25.2	QP
2.453490	28.7	20.1	56.0	27.3	QP
2.575030	32.8	20.1	56.0	23.2	QP
2.614610	36.6	20.1	56.0	19.4	QP
0.281500	27.2	20.2	50.8	23.6	Ave.
0.289500	27.0	20.2	50.5	23.5	Ave.
1.146950	24.5	20.1	46.0	21.5	Ave.
2.453490	15.2	20.1	46.0	30.8	Ave.
2.575030	13.0	20.1	46.0	33.0	Ave.
2.614610	31.7	20.1	46.0	14.3	Ave.

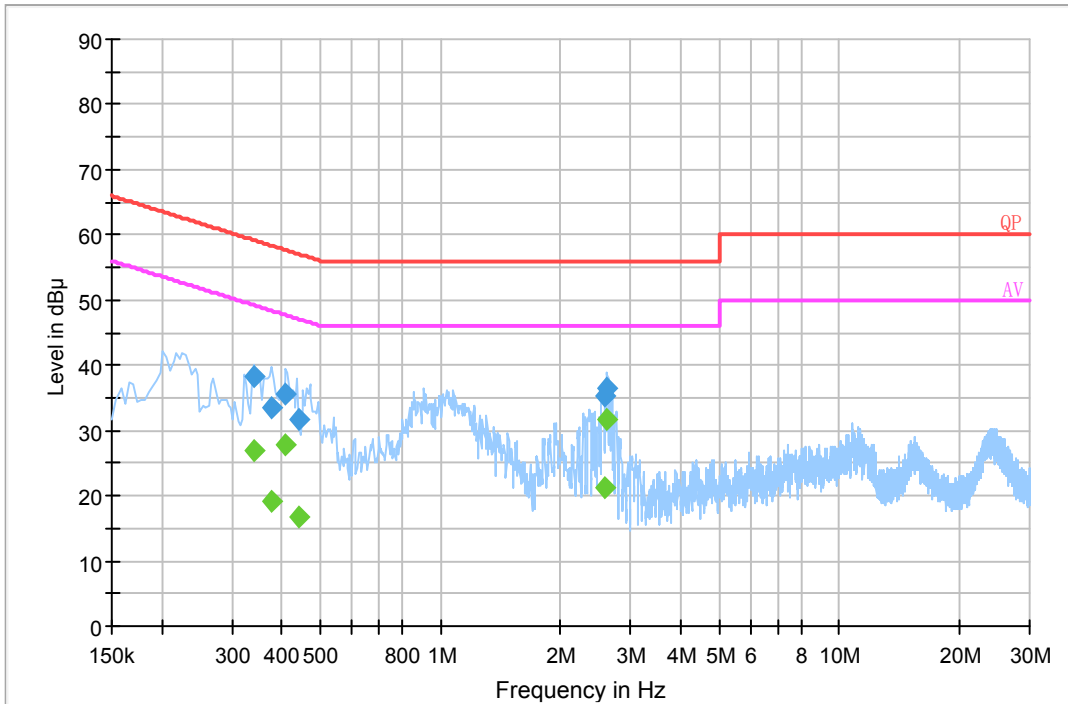
AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.870870	28.8	20.1	56.0	27.2	QP
0.916350	29.9	20.1	56.0	26.1	QP
1.089830	29.3	20.1	56.0	26.7	QP
1.113110	29.7	20.1	56.0	26.3	QP
2.610850	27.4	20.1	56.0	28.6	QP
2.673950	34.1	20.1	56.0	21.9	QP
0.870870	21.8	20.1	46.0	24.2	Ave.
0.916350	21.2	20.1	46.0	24.8	Ave.
1.089830	22.7	20.1	46.0	23.3	Ave.
1.113110	22.4	20.1	46.0	23.6	Ave.
2.610850	17.4	20.1	46.0	28.6	Ave.
2.673950	26.5	20.1	46.0	19.5	Ave.

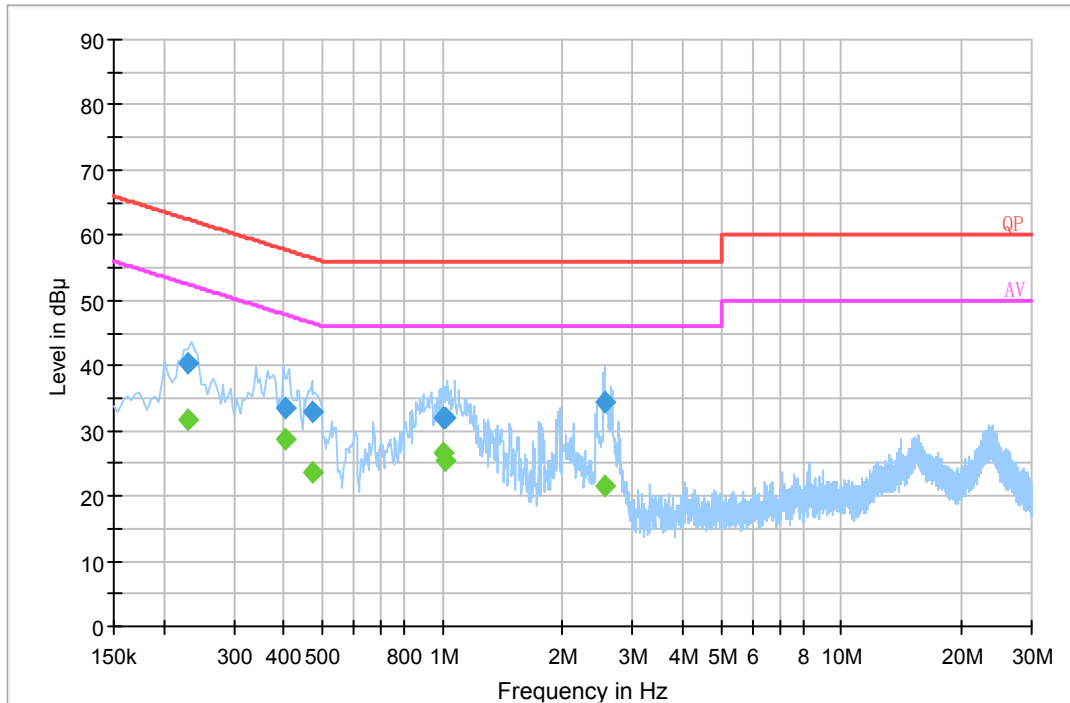
For 434.833 MHz:

AC 120V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.340870	38.1	20.2	59.2	21.1	QP
0.376330	33.5	20.2	58.4	24.9	QP
0.407850	35.7	20.2	57.7	22.0	QP
0.439430	31.6	20.2	57.1	25.5	QP
2.582730	35.3	20.1	56.0	20.7	QP
2.618610	36.6	20.1	56.0	19.4	QP
0.340870	27.0	20.2	49.2	22.2	Ave.
0.376330	19.2	20.2	48.4	29.2	Ave.
0.407850	27.7	20.2	47.7	20.0	Ave.
0.439430	16.7	20.2	47.1	30.4	Ave.
2.582730	21.3	20.1	46.0	24.7	Ave.
2.618610	31.8	20.1	46.0	14.2	Ave.

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.229500	40.3	20.2	62.5	22.2	QP
0.403970	33.5	20.2	57.8	24.3	QP
0.470950	32.9	20.2	56.5	23.6	QP
1.006970	32.1	20.1	56.0	23.9	QP
1.018550	31.9	20.1	56.0	24.1	QP
2.547810	34.4	20.1	56.0	21.6	QP
0.229500	31.6	20.2	52.5	20.8	Ave.
0.403970	28.6	20.2	47.8	19.1	Ave.
0.470950	23.7	20.2	46.5	22.8	Ave.
1.006970	26.7	20.1	46.0	19.4	Ave.
1.018550	25.5	20.1	46.0	20.5	Ave.
2.547810	21.5	20.1	46.0	24.5	Ave.

Note:

- 1) Corrected Amplitude = Reading + Correction Factor
- 2) Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation
- 3) Margin = Limit – Corrected Amplitude

FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

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

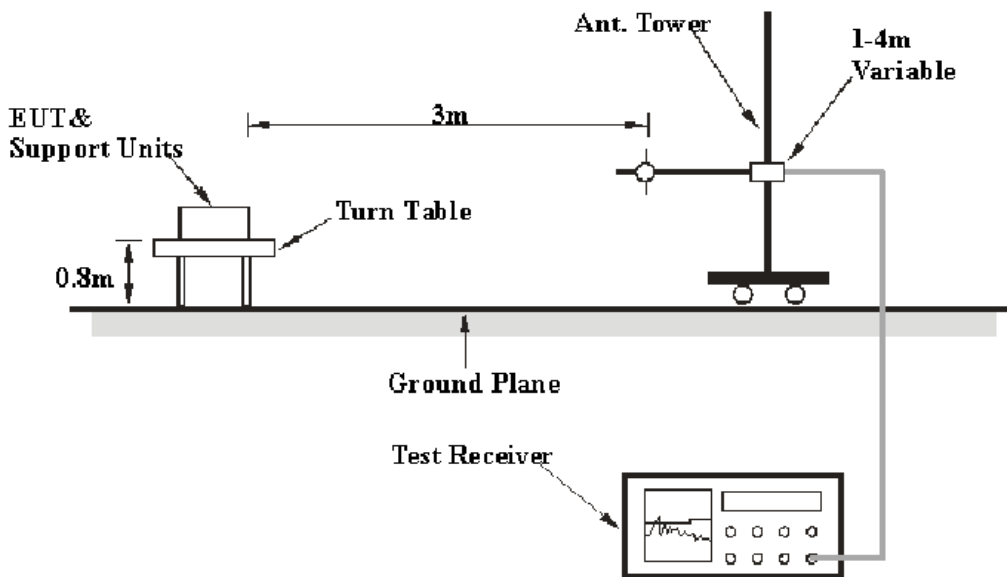
Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

*Linear interpolations.

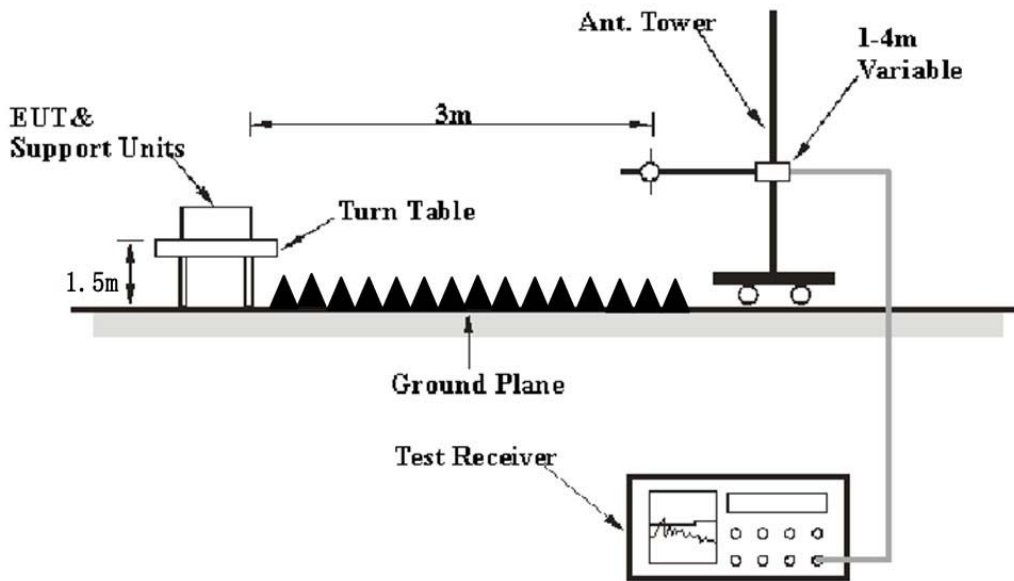
The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK

Test Procedure

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

All final data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 5.8 dB means the emission is 5.8 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b)

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL, $U_{(L_m)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

Temperature:	25~26 °C
Relative Humidity:	52~55 %
ATM Pressure:	100.5~101.1 kPa

The testing was performed by Hill He from 2018-03-05 to 2018-03-31.

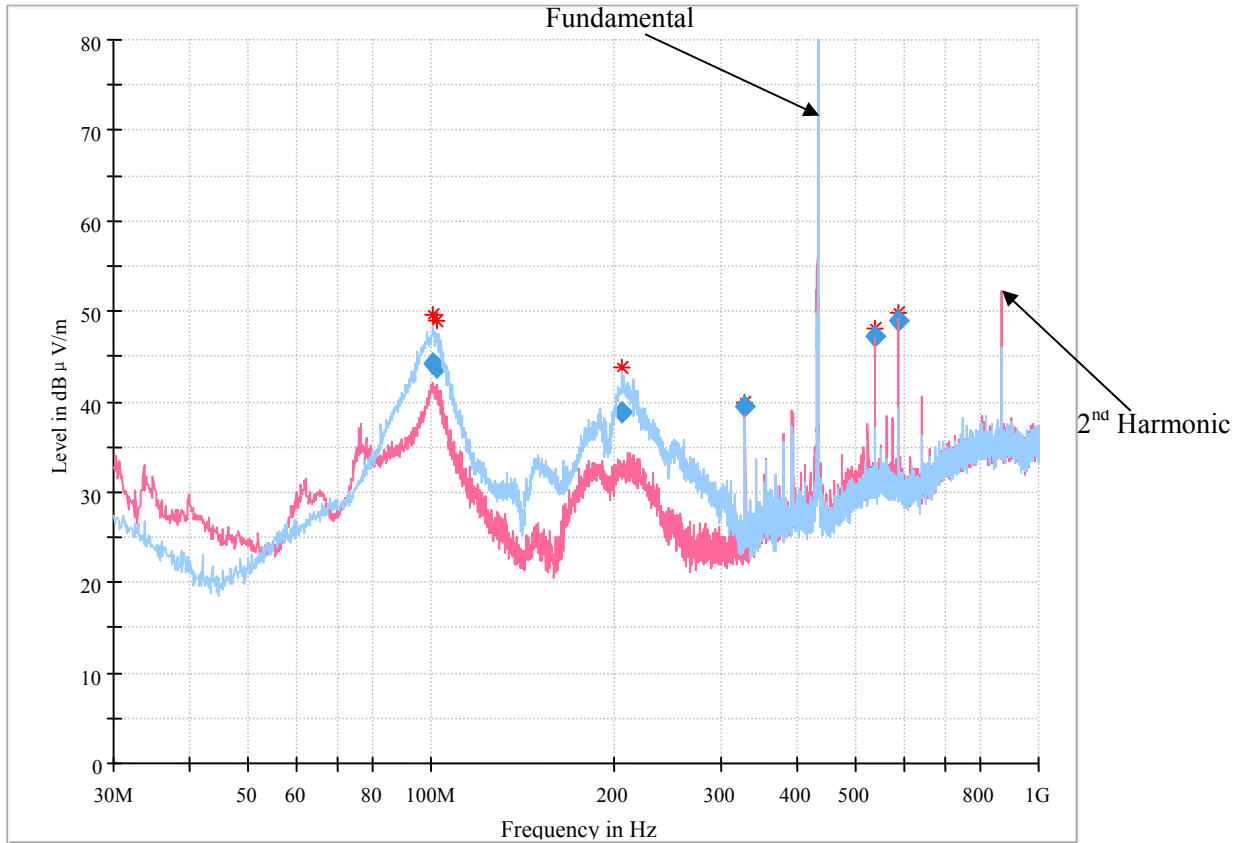
Test mode: Transmitting

30 MHz - 1GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.231(b)		
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)	Comment
433.107 MHz										
433.107	94.93	PK	334	105	H	0.2	95.13	100.80	5.67	Fundamental
433.107	99.88	PK	194	103	V	0.2	100.08	100.80	0.72	Fundamental
866.214	44.23	PK	159	207	H	9.9	54.13	80.80	26.67	Spurious
866.214	45.49	PK	168	201	V	9.9	55.39	80.80	25.41	Spurious
434.833 MHz										
434.833	93.07	PK	155	202	H	0.2	93.27	100.86	7.59	Fundamental
434.833	93.69	PK	107	235	V	0.2	93.89	100.86	6.97	Fundamental
869.666	43.92	PK	206	177	H	9.6	53.52	80.86	27.34	Spurious
869.666	44.54	PK	256	186	V	9.6	54.14	80.86	26.72	Spurious

Field Strength of Average							
Frequency (MHz)	Peak Measurement @3m (dBµV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.231(b)		
					Limit (dBµV/m)	Margin (dB)	Comment
433.107 MHz							
433.107	95.13	H	-24.58	70.55	80.80	10.25	Fundamental
433.107	100.08	V	-24.58	75.50	80.80	5.30	Fundamental
866.214	54.13	H	-24.58	29.55	60.80	31.25	Spurious
866.214	55.39	V	-24.58	30.81	60.80	29.99	Spurious
434.833 MHz							
434.833	93.27	H	-24.58	68.69	80.86	12.17	Fundamental
434.833	93.89	V	-24.58	69.31	80.86	11.55	Fundamental
869.666	53.52	H	-24.58	28.94	60.86	31.92	Spurious
869.666	54.14	V	-24.58	29.56	60.86	31.30	Spurious

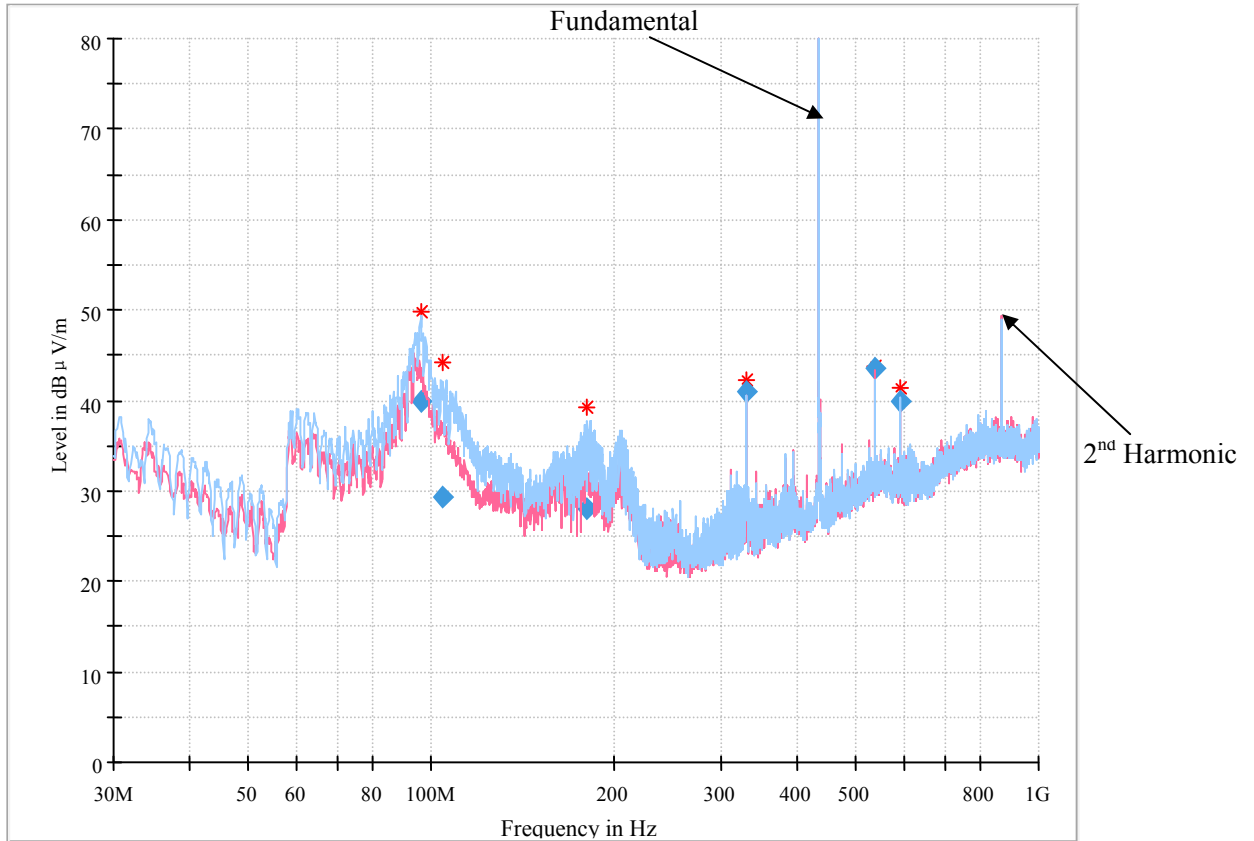
For 433.107 MHz:



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Detector (PK/QP/Ave.)	Antenna Height (cm)	Antenna Polarity	Turntable Position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
100.516500	44.23	QP	281.0	H	21.0	-9.2	60.80	16.57
102.013375	43.83	QP	252.0	H	25.0	-9.0	60.80	16.97
206.338875	38.92	QP	164.0	H	20.0	-5.6	60.80	21.88
329.085125	39.40	QP	181.0	V	295.0	-2.7	46.00*	6.60
537.066750	47.28	QP	106.0	V	240.0	4.4	60.80	13.52
589.063625	48.90	QP	107.0	V	233.0	3.8	60.80	11.90

Note*: Within Restricted Bands.

For 434.833 MHz:



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Detector (PK/QP/Ave.)	Antenna Height (cm)	Antenna Polarity	Turntable Position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
96.000250	39.87	QP	129.0	H	63.0	-9.8	60.86	20.99
104.432875	29.40	QP	105.0	H	0.0	-8.6	60.86	31.46
180.905125	28.14	QP	104.0	H	16.0	-5.5	60.86	32.72
330.802875	40.99	QP	203.0	H	108.0	-2.7	46.00*	5.01
538.785875	43.48	QP	105.0	V	125.0	4.5	60.86	17.38
590.782125	39.94	QP	105.0	H	352.0	3.8	60.86	20.92

Note*: Within Restricted Bands.

1 GHz - 5 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.231(b)		
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)	Comment
433.107 MHz										
1299.32	63.77	PK	86	1.8	H	-8.04	55.73	80.80	25.07	Spurious
1299.32	60.30	PK	16	1.4	V	-8.04	52.26	80.80	28.54	Spurious
2165.54	71.35	PK	47	2	H	-0.97	70.38	80.80	10.42	Spurious
2165.54	72.94	PK	112	2.3	V	-0.97	71.97	80.80	8.83	Spurious
3031.75	62.74	PK	58	1.7	H	1.21	63.95	80.80	16.85	Spurious
3031.75	65.29	PK	104	1.4	V	1.21	66.50	80.80	14.30	Spurious
3897.96	62.08	PK	220	1.5	H	2.72	64.80	80.80	16.00	Spurious
3897.96	61.15	PK	8	2.1	V	2.72	63.87	80.80	16.93	Spurious
434.833 MHz										
1304.50	69.04	PK	40	2.2	H	-8.04	61.00	80.86	19.86	Spurious
1304.50	70.71	PK	207	1.5	V	-8.04	62.67	80.86	18.19	Spurious
2174.17	75.89	PK	278	1.9	H	-0.97	74.92	80.86	5.94	Spurious
2174.17	76.08	PK	297	1.7	V	-0.97	75.11	80.86	5.75	Spurious
2609.00	68.40	PK	353	2.3	H	-0.72	67.68	80.86	13.18	Spurious
2609.00	65.89	PK	138	1.0	V	-0.72	65.17	80.86	15.69	Spurious
3043.83	64.99	PK	2	2.0	H	1.21	66.20	80.86	14.66	Spurious
3043.83	60.91	PK	322	2.5	V	1.21	62.12	80.86	18.74	Spurious
3478.66	63.75	PK	264	2.0	H	1.32	65.07	80.86	15.79	Spurious
3478.66	61.51	PK	350	1.9	V	1.32	62.83	80.86	18.03	Spurious
3913.50	61.15	PK	116	1.8	H	2.72	63.87	80.86	16.99	Spurious
3913.50	66.43	PK	43	1.4	V	2.72	69.15	80.86	11.71	Spurious

Field Strength of Average Emission							
Frequency (MHz)	Peak Measurement @3m (dB μ V/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Amplitude (dB μ V/m)	FCC Part 15.231(b)		
					Limit (dB μ V/m)	Margin (dB)	Comment
433.107 MHz							
1299.32	55.73	H	-24.58	31.15	60.80	29.65	Spurious
1299.32	52.26	V	-24.58	27.68	60.80	33.12	Spurious
2165.54	70.38	H	-24.58	45.80	60.80	15.00	Spurious
2165.54	71.97	V	-24.58	47.39	60.80	13.41	Spurious
3031.75	63.95	H	-24.58	39.37	60.80	21.43	Spurious
3031.75	66.50	V	-24.58	41.92	60.80	18.88	Spurious
3897.96	64.80	H	-24.58	40.22	60.80	20.58	Spurious
3897.96	63.87	V	-24.58	39.29	60.80	21.51	Spurious
434.833 MHz							
1304.50	61.00	H	-24.58	36.42	60.86	24.44	Spurious
1304.50	62.67	V	-24.58	38.09	60.86	22.77	Spurious
2174.17	74.92	H	-24.58	50.34	60.86	10.52	Spurious
2174.17	75.11	V	-24.58	50.53	60.86	10.33	Spurious
2609.00	67.68	H	-24.58	43.10	60.86	17.76	Spurious
2609.00	65.17	V	-24.58	40.59	60.86	20.27	Spurious
3043.83	66.20	H	-24.58	41.62	60.86	19.24	Spurious
3043.83	62.12	V	-24.58	37.54	60.86	23.32	Spurious
3478.66	65.07	H	-24.58	40.49	60.86	20.37	Spurious
3478.66	62.83	V	-24.58	38.25	60.86	22.61	Spurious
3913.50	63.87	H	-24.58	39.29	60.86	21.57	Spurious
3913.50	69.15	V	-24.58	44.57	60.86	16.29	Spurious

Note:

Corrected Amplitude = Corrected Factor + Reading

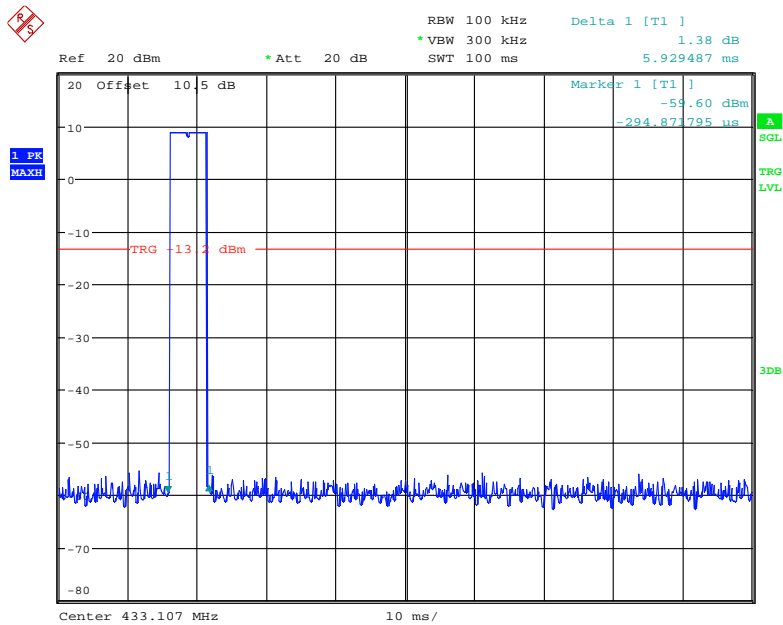
Corrected Factor = Antenna factor (Rx) + cable loss – amplifier factor

Margin = Limit - Corr. Amplitude

Ave. = PK + 20*log(Duty Cycle)

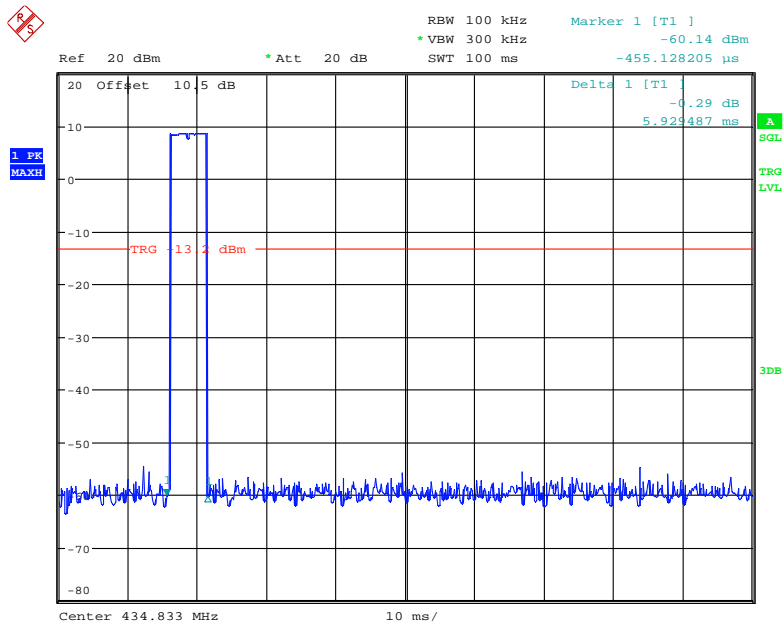
Duty cycle factor = 20*log(T_{on}/T_p) = 20*log(5.9/100) = -24.58

Duty Cycle for 433.107 MHz



Date: 31.MAR.2018 18:13:28

Duty Cycle for 434.833 MHz

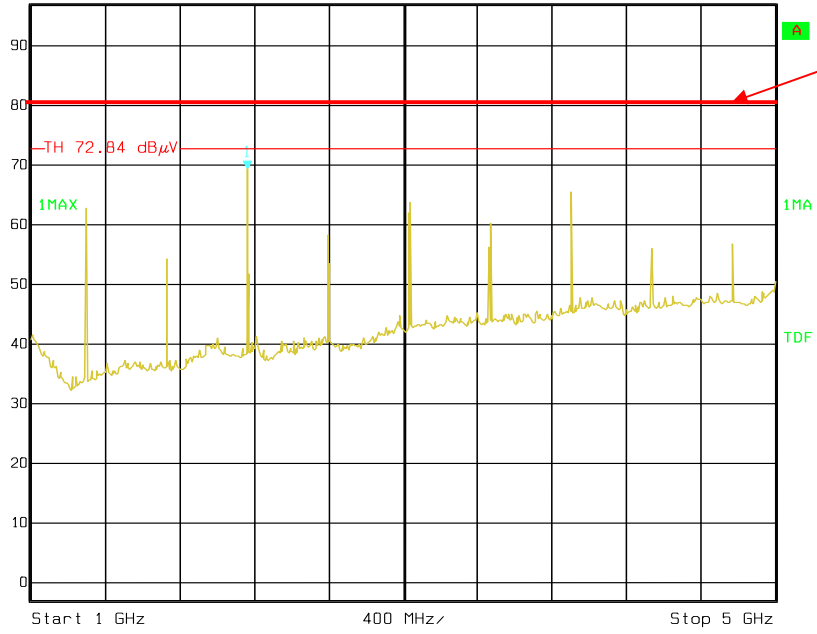


Date: 31.MAR.2018 18:02:36

Note: Test with normal use sample for Duty cycle.

Pre-scan with 433.107 MHz - Horizontal

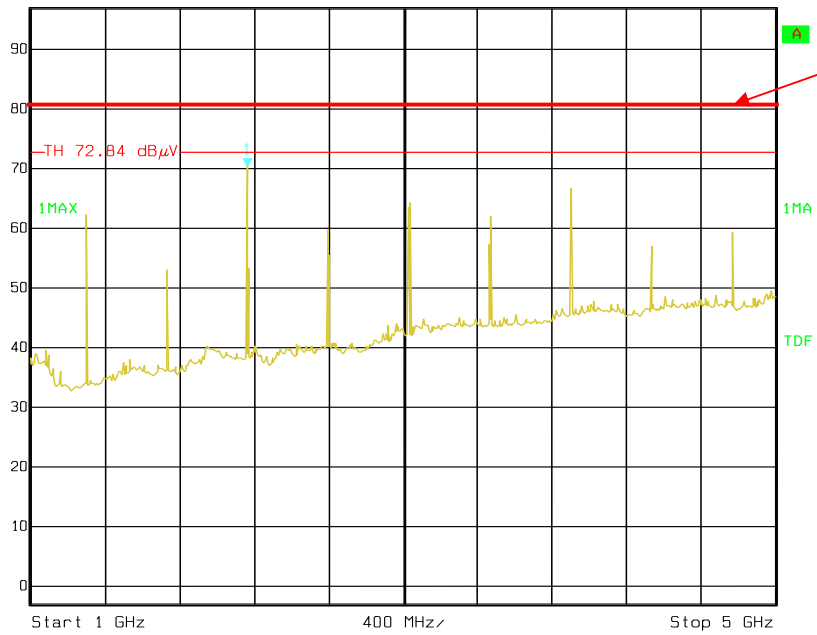
Ref Lvl 97 dB μ V
Marker 1 [T1] 69.42 dB μ V
2.16232465 GHz
RBW 1 MHz
RF Att 0 dB
VBW 3 MHz
SWT 10 ms
Unit dB μ V



Date: 5.MAR.2018 21:45:24

Pre-scan with 433.107 MHz - Vertical

Ref Lvl 97 dB μ V
Marker 1 [T1] 70.40 dB μ V
2.16232465 GHz
RBW 1 MHz
RF Att 0 dB
VBW 3 MHz
SWT 10 ms
Unit dB μ V



Date: 5.MAR.2018 21:40:25

FCC §15.231(a) (2) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (2), a transmitter activated automatically shall cease transmission within 5 seconds after activation.

Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100kHz/ VBW=300kHz/ Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Data

Environmental Conditions

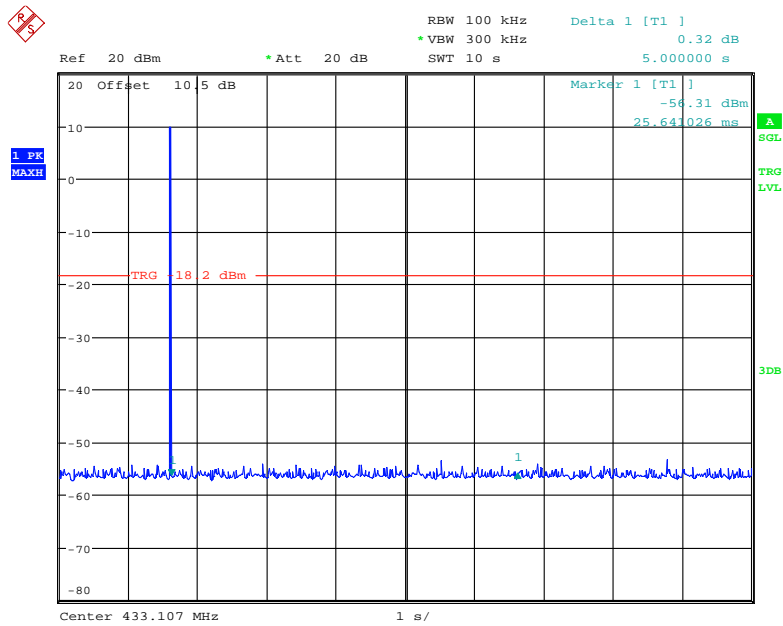
Temperature:	25 °C
Relative Humidity:	53 %
ATM Pressure:	100.1 kPa

The testing was performed by Hill He on 2018-03-29.

Test mode: Transmitting

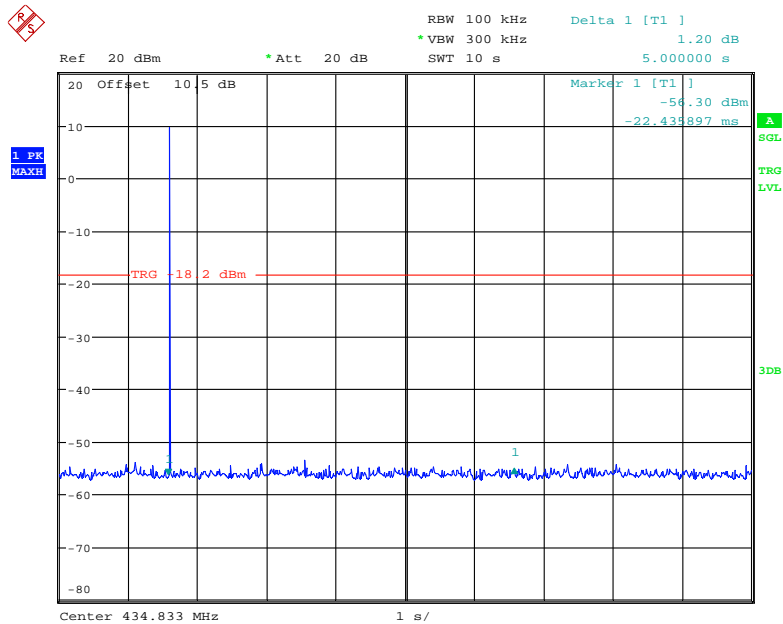
Test Result: Compliant. This product will cease transmission within 5 seconds after activation. Please refer to following plots.

433.107 MHz



Date: 29.MAR.2018 19:51:58

434.833 MHz



Date: 29.MAR.2018 19:47:10

FCC §15.231(c) – 20 dB EMISSION BANDWIDTH TESTING

Applicable Standard

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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Hill He on 2018-03-31.

Test Mode: Transmitting

Please refer to following table and plots.

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	<Limit (kHz)	Result
433.107	129.81	1082.77	Pass
434.833	129.33	1087.08	Pass

Note:

For 433.107 MHz:

Limit = 0.25% * center frequency = 0.25% * 433.107 MHz = 1082.77 kHz

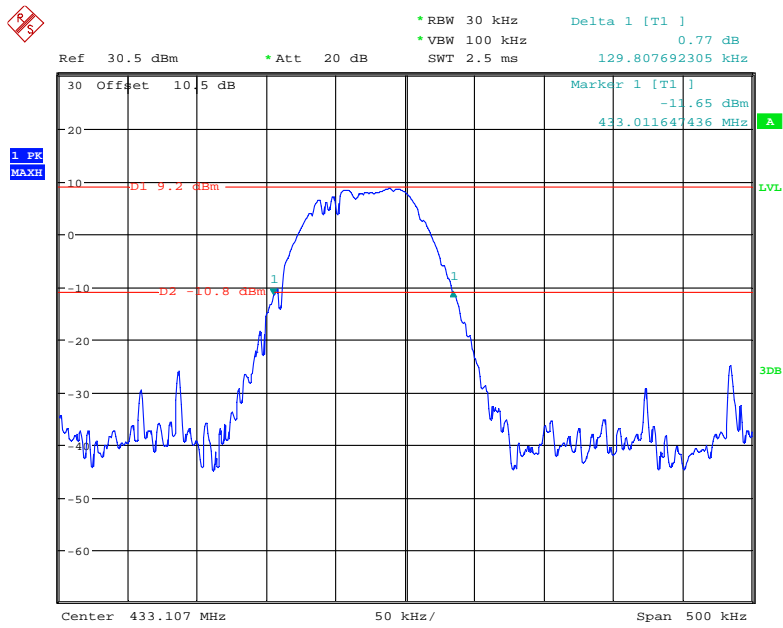
20dB bandwidth = 129.81 kHz < 1082.77 kHz

For 434.833 MHz:

Limit = 0.25% * center frequency = 0.25% * 434.833 MHz = 1087.08 kHz

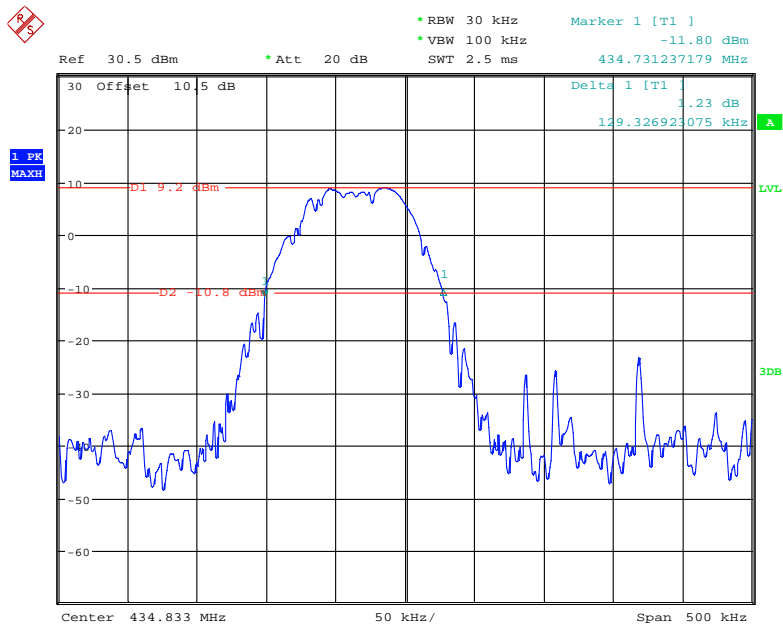
20dB bandwidth = 129.33 kHz < 1087.08 kHz

433.107 MHz, 20 dB Emission Bandwidth



Date: 31.MAR.2018 17:46:08

434.833 MHz, 20 dB Emission Bandwidth



Date: 31.MAR.2018 17:50:35

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