FCC TEST REPORT

For

Boost Auto Parts LLC

remote

Test Model: BAP# 0307

Prepared for	:	Boost Auto Parts LLC
Address	:	Boost Auto Parts 2948 Kirk Road.Suite 106, #324 Aurora Illinois 60502, United States
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Tel	:	(+86)755-82591330
Fax	:	(+86)755-82591332
Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	October 26, 2017
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	October 26, 2017 ~ November 16, 2017
Date of Report	:	November 21, 2017

FCC TEST REPORT

FCC CFR 47 PART 15C(15.231)

Report Reference No. ..... :		**LCS181025025AEA**
Date of Issue ..... :		November 21, 2017
Testing Laboratory Name..... :		**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address ..... :		1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure ..... :		Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name..... :		**Boost Auto Parts LLC**
Address ..... :		Boost Auto Parts 2948 Kirk Road.Suite 106, #324 Aurora Illinois 60502, United States
Test Specification		
Standard..... :		FCC CFR 47 PART 15 Subpart C; ANSI C63.10
Test Report Form No. ..... :		LCSEMC-1.0
TRF Originator ..... :		Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ..... :		Dated 2011-03

Test Item Description. ..... :		**remote**
Trade Mark..... :		N/A
Test Model ..... :		BAP# 0307
Ratings ..... :		DC 3V
Result ..... :		**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Raing Ye / File administrators	Calvin Weng / Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCS181025025AEA**	November 21, 2017 Date of issue

Test Mode.....	:	BAP# 0307
EUT.....	:	remote
Applicant.....	**:**	**Boost Auto Parts LLC**
Address.....	:	Boost Auto Parts 2948 Kirk Road.Suite 106, #324 Aurora Illinois 60502, United States
Telephone.....	:	/
Fax.....	:	/
Manufacturer.....	**:**	**Wuxi Keyoung Electronic Technology Co., Ltd**
Address.....	:	5-301, 5-301 Huaqing Creative Park, Huishan Economic Development Zone, Wuxi, Jiangsu
Telephone.....	:	/
Fax.....	:	/
Factory.....	**:**	**Wuxi Keyoung Electronic Technology Co., Ltd**
Address.....	:	5-301, 5-301 Huaqing Creative Park, Huishan Economic Development Zone, Wuxi, Jiangsu
Telephone.....	:	/
Fax.....	:	/

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
00	November 21, 2017	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: remote
Test Model	: BAP# 0307
Power Supply	: DC3V
Hardware version	: 1.0
Software version	: 1.0
Transmit Frequency	: 315MHz
Number of Channels	: 1
Modulation Type	: FSK
Antenna Description	: PCB Antenna, 5dBi (Max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
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1.3. External I/O Cable

I/O Port Description	Quantity	Cable
--	--	--

1.4. Description of Test Facility

FCC Registration Number. is 254912.

Industry Canada Registration Number. is 9642A-1.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

NVLAP Registration Code is 600167-0

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10:2013 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7. Description of Test Modes

The EUT has been tested under engineering mode. Press any one of the buttons on the EUT can transmit 315MHz control signal. All buttons were tested for the pre-test, and we found that pressed the Button 1 was the worst case. Only recorded the worst test case in this report.

The field strength of radiation emission was measured in the following position: EUT stand-up position (Y axis), lie-down position (X, Z axis).

The worst case of X axis was reported.

***Note: The active time of the transmitter is depended on the time how long the user pressed the button.

2. 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.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.231 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

1.1.1.2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

1.1.2.2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmit condition.

Using sample to test, which was automatically launched

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C		
FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.205	Restricted Bands Of Operation	Compliant
§15.207	AC Mains Conducted Emission	N/A*
§15.209	Radiated Emission Limits, General Requirements.	Compliant
§15.231 (b)	Field Strength Of Fundamental And Harmonics	Compliant
§15.231 (c)	99% and 20dB Bandwidth	Compliant
§15.231 (a)(1)	Transmission Cease Time	Compliant

Note:
1. All buttons have been taken into consideration and only worst case reported.
2. N/A – Not Applicable!!!

5. TEST ITEMS AND RESULTS

5.1. Transmission Cease Time

5.1.1. Limit

According to § 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.

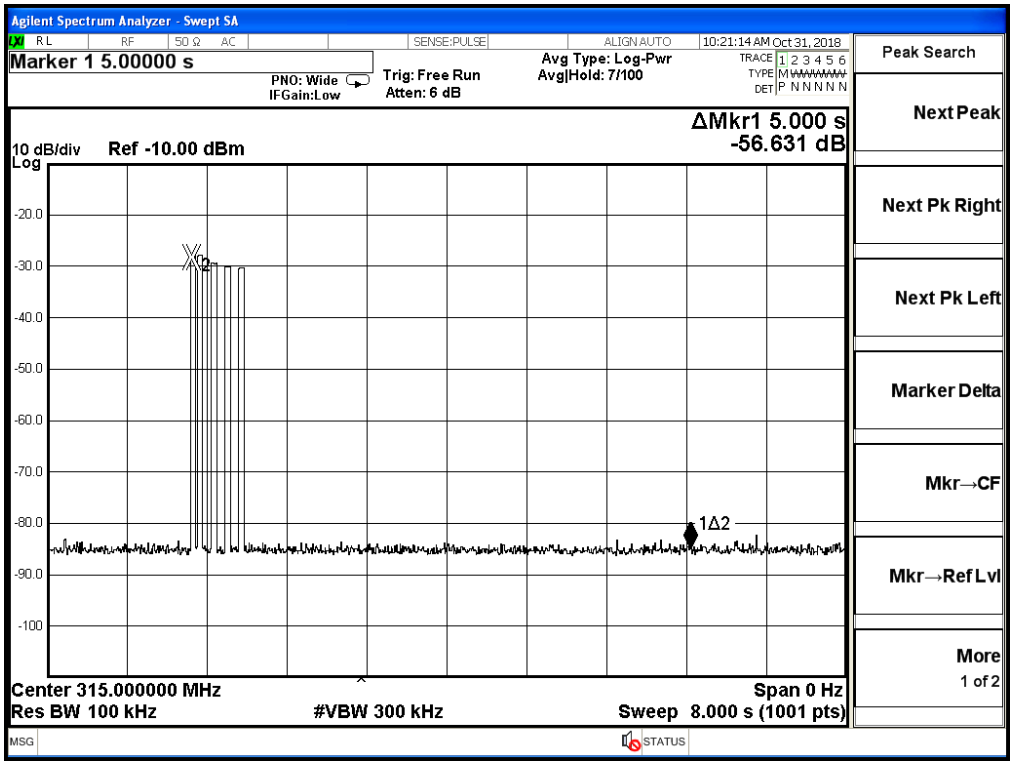
According to § 15.231 (a) (2), A transmitter activated automatically shall cease transmission within 5 seconds after activation.

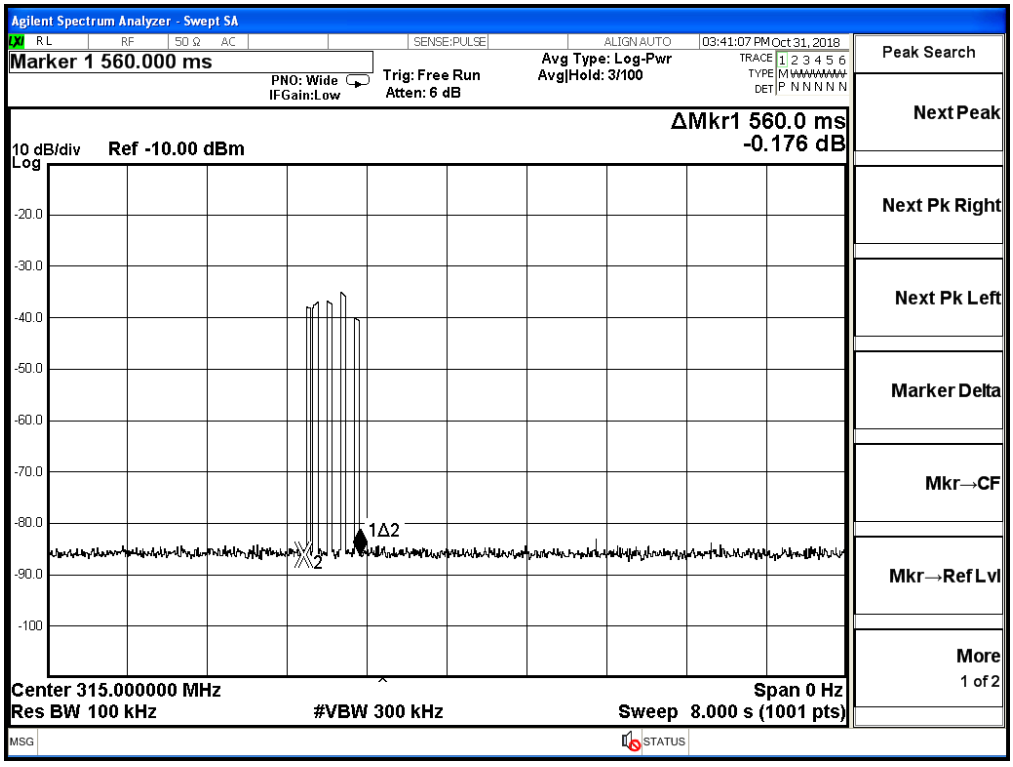
5.1.2. Test Procedure

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

5.1.3. Test Results

Frequency (MHz)	Deactivation Time (s)	Limit: not more than 5 seconds of being released (s)	Conclusion
315.00	0.560	5	PASS




Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
03:41:07 PM Oct 31, 2018
Marker 1 560.000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
ΔMkr1 560.0 ms
-0.176 dB
10 dB/div
Log
Ref -10.00 dBm
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100
1Δ2
Center 315.000000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 8.000 s (1001 pts)
MSG
STATUS
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

5.2. Transmitter Field Strength of Emissions

5.2.1. Limit

According to § 15.231 (b), In addition to the provisions of §15.205, 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	2,250	225
71-130	1,250	125
130-174	11,250 to 3,750	1125 to 375
174-260	3,750	375
260-470	13,750 to 12,500	1375 to 1,250
Above 470	1 12,500	1,250

[1]Linear interpolations.

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

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) 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.

Frequencies(MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

According to § 15.231 (e), Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	1,000	100
71-130	500	50
130-174	500 to 1,500[1]	50 to 150[1]
174-260	1,500	150
260-470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

5.2.2 Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/Average
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/Average
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.2.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.5 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height is 1.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum found antenna polarization and turntable position of the premeasurement the software maximizes the peaks by rotating the turntable position (0° to 360°). This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps). This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

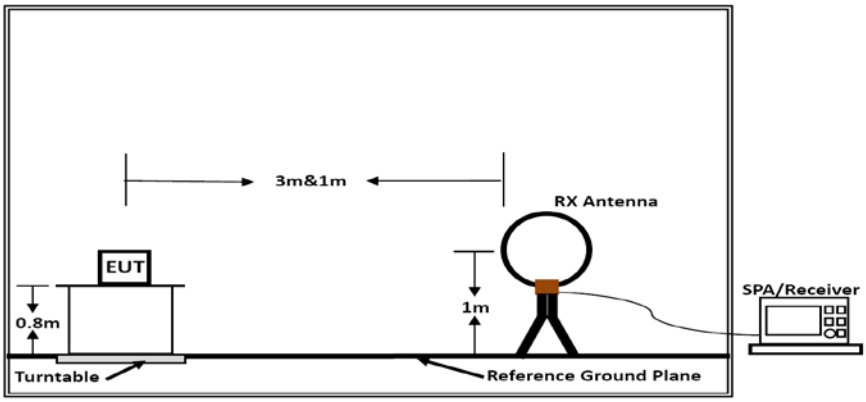
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

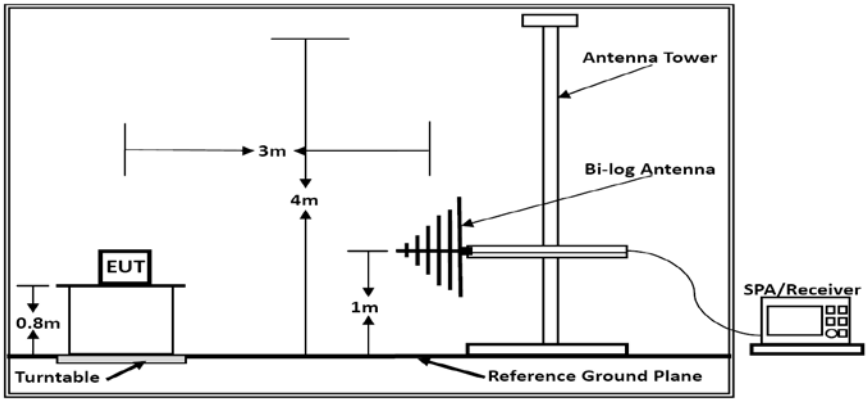
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and RMS detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

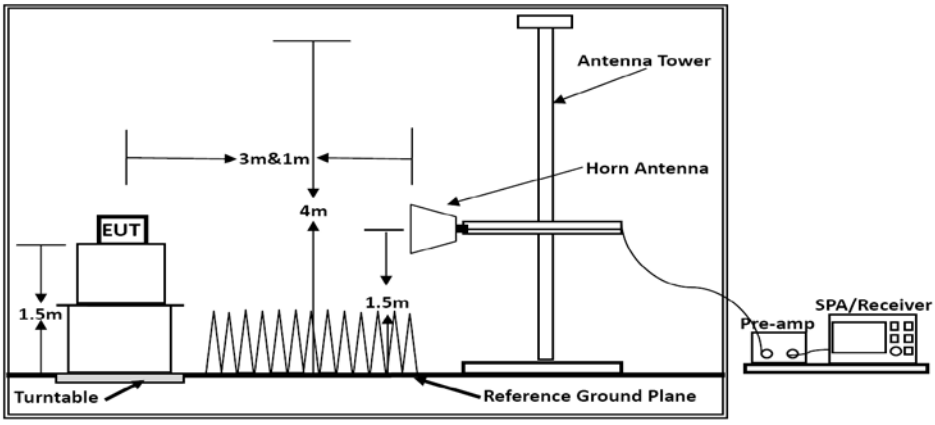
5.2.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	23.5℃	Humidity	51.3%
Test Engineer	Tom Liu	Configurations	TX

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dB)	Remark
-	-	-	-	See Note

Note:

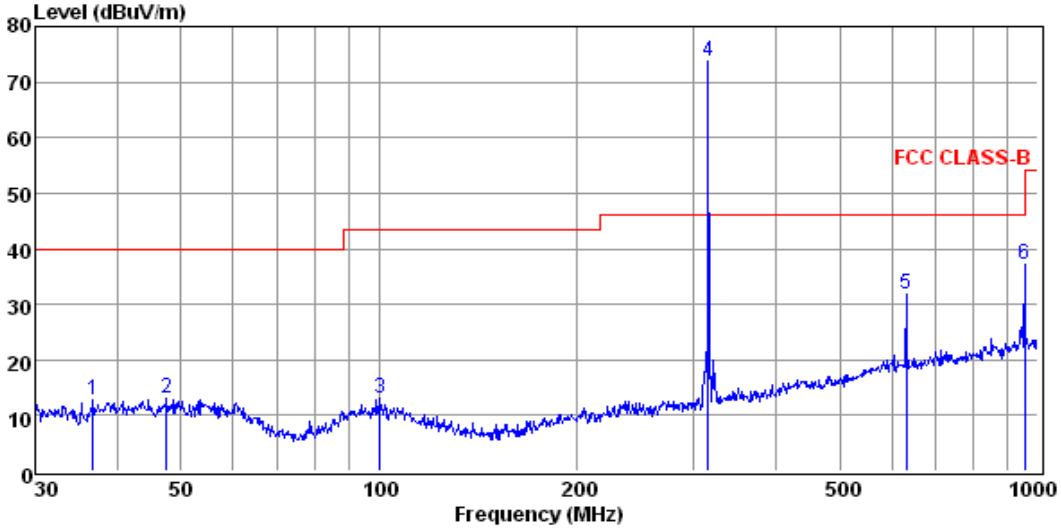
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

5.2.7. Results of Radiated Emissions (30MHz~1GHz)

Horizontal



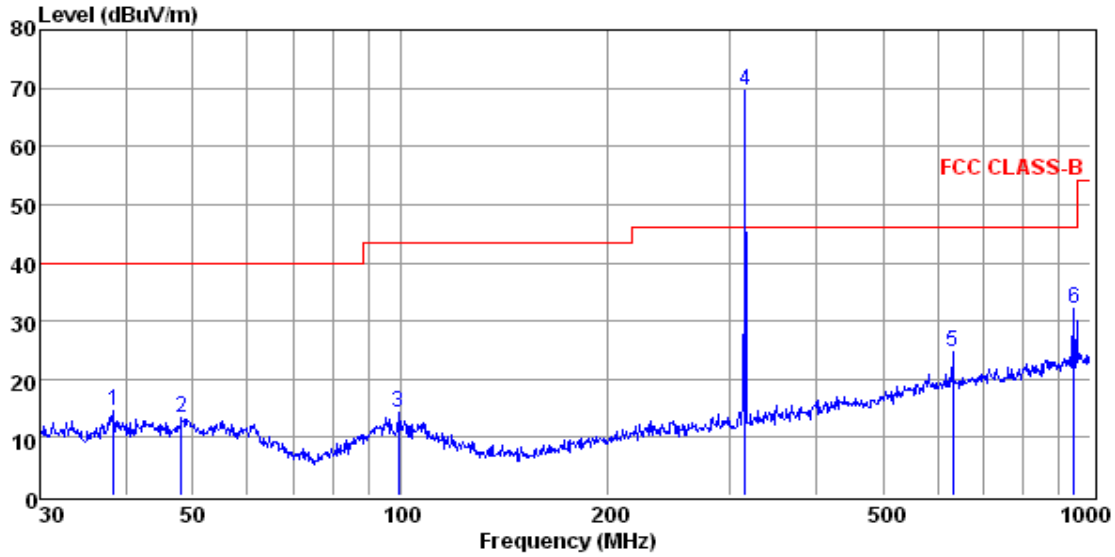
Env./Ins: 25.1℃/53.1%
pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	36.77	-0.50	0.41	12.75	12.66	40.00	-27.34	QP
2	47.49	-0.71	0.35	13.40	13.04	40.00	-26.96	QP
3	100.23	-0.80	0.60	13.14	12.94	43.50	-30.56	QP
4	315.48	59.47	1.09	13.27	73.83	46.00	27.83	Peak
5	631.69	11.85	1.50	18.56	31.91	46.00	-14.09	QP
6	945.44	13.86	1.89	21.45	37.20	46.00	-8.80	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that are 20db below the official limit are not reported

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
315.48	73.83	-13.13	60.70	82.36	-21.66	PASS
631.69	31.91	-13.13	18.78	62.36	-43.58	PASS
945.44	37.20	-13.13	24.07	62.36	-38.29	PASS

Vertical



Env./Ins: 25.1℃/53.1%
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	38.35	1.05	0.38	13.16	14.59	40.00	-25.41	QP
2	48.16	-0.43	0.35	13.36	13.28	40.00	-26.72	QP
3	99.18	0.48	0.61	13.11	14.20	43.50	-29.30	QP
4	315.48	55.16	1.09	13.27	69.52	46.00	23.52	Peak
5	631.69	4.54	1.50	18.56	24.60	46.00	-21.40	QP
6	945.44	8.66	1.95	21.39	32.00	46.00	-14.00	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that are 20db below the official limit are not reported

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
315.48	69.52	-13.13	56.39	82.36	-25.97	PASS
631.69	24.60	-13.13	11.47	62.36	-50.89	PASS
945.44	32.00	-13.13	18.87	62.36	-43.49	PASS

5.2.8. Results of Radiated Emissions (Above1GHz)

Temperature	25.1℃	Humidity	53.1%
Test Engineer	MINA XU	Configurations	Harmonics Emissions/ Spurious Emission

Peak Value				
Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1259.94	45.20	74.00	-28.80	Horizontal
1575.05	46.28	74.00	-27.72	Horizontal
1890.14	46.88	74.00	-27.12	Horizontal
1259.93	46.91	74.00	-27.09	Vertical
1575.06	46.54	74.00	-27.46	Vertical
1890.10	47.06	74.00	-26.94	Vertical

Average Value:						
Frequency (MHz)	Peak Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1259.88	45.20	-13.13	32.07	54.00	-21.93	Horizontal
1575.06	46.28	-13.13	33.15	54.00	-20.85	Horizontal
1890.13	46.88	-13.13	33.75	54.00	-20.25	Horizontal
1259.92	46.91	-13.13	33.78	54.00	-20.22	Vertical
1575.07	46.54	-13.13	33.41	54.00	-20.59	Vertical
1890.14	47.06	-13.13	33.93	54.00	-20.07	Vertical

Remark:

1. Measuring frequencies from 9 KHz~10th harmonic (ex. 5GHz), No emission found between lowest internal used/generated frequency to 30MHz.

2. Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex. 5GHz) were made with an instrument using Peak detector mode.

3. Average values = Peak values + DC factor = Peak values – 13.13

3. 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.

5.3. 99% and 20dB Bandwidth Emissions

5.3.1. Limit

According to § 15.231 (d), 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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

☒0.25% of the center operating frequency

☐0.5% of the center operating frequency

5.4.2. Block Diagram of Test Setup

5.3.2. Test Procedure

Use the following spectrum analyzer settings:

Span = 2MHz

RBW = 10 KHz

VBW = 30 KHz

Sweep = auto

Detector function = peak

Trace = max hold

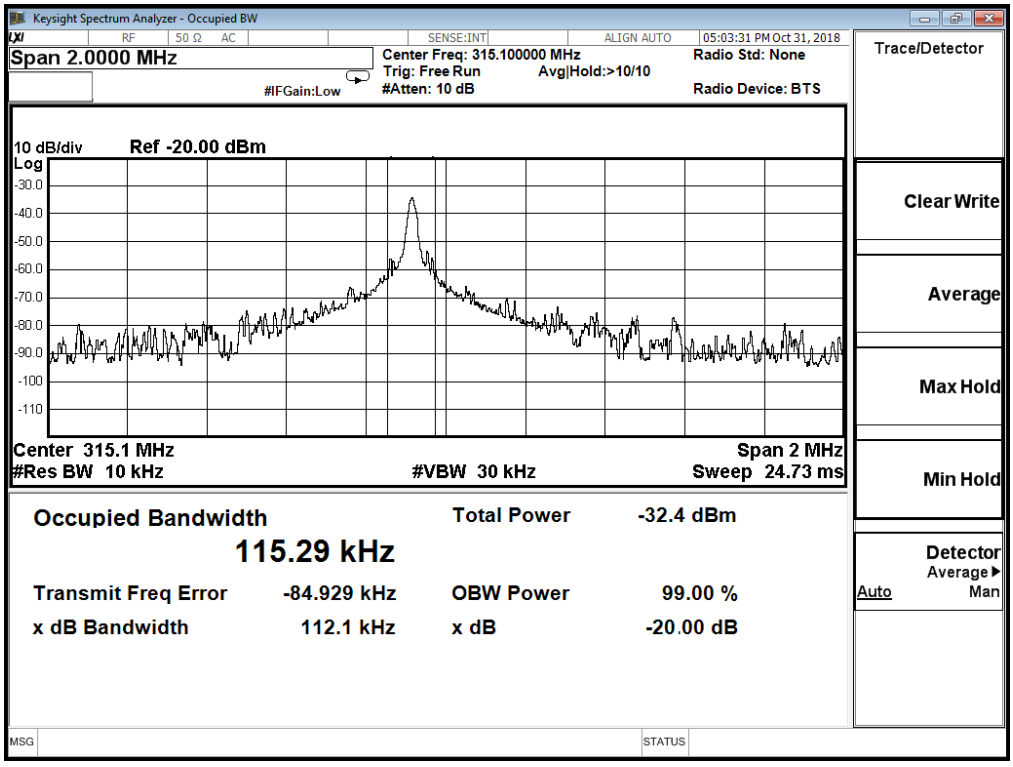
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

5.3.3. Test Data

Transmit Frequency (MHz)	Limit (kHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	Result
315.00	787.50	112.10	115.29	PASS

Remark:

1. *Test results including cable loss;*
2. *Please refer following test plots;*

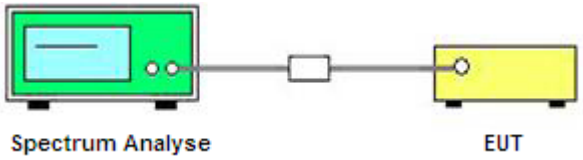

Keysight Spectrum Analyzer - Occupied BW
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:03:31 PM Oct 31, 2018
Span 2.0000 MHz
Center Freq: 315.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Log
Ref -20.00 dBm
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100
-110
Center 315.1 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 2 MHz
Sweep 24.73 ms
Occupied Bandwidth
115.29 kHz
Total Power
-32.4 dBm
Transmit Freq Error
-84.929 kHz
OBW Power
99.00 %
x dB Bandwidth
112.1 kHz
x dB
-20.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man
MSG
STATUS

5.4. Duty cycle

5.4.1. Limit

No dedicated limit specified in the Rules.

5.4.2. Block Diagram of Test Setup



5.4.3. Test Procedure

a. Place the EUT on the table and set it in transmitting mode.

b. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

c. Set centre frequency of spectrum analyzer=operating frequency.

d. Set the spectrum analyzer as RBW=100 KHz, VBW=300 KHz, Span=0Hz, Adjust Sweep=100ms.

e. Repeat above procedures until all frequency measured was complete.

5.4.3. Test Results

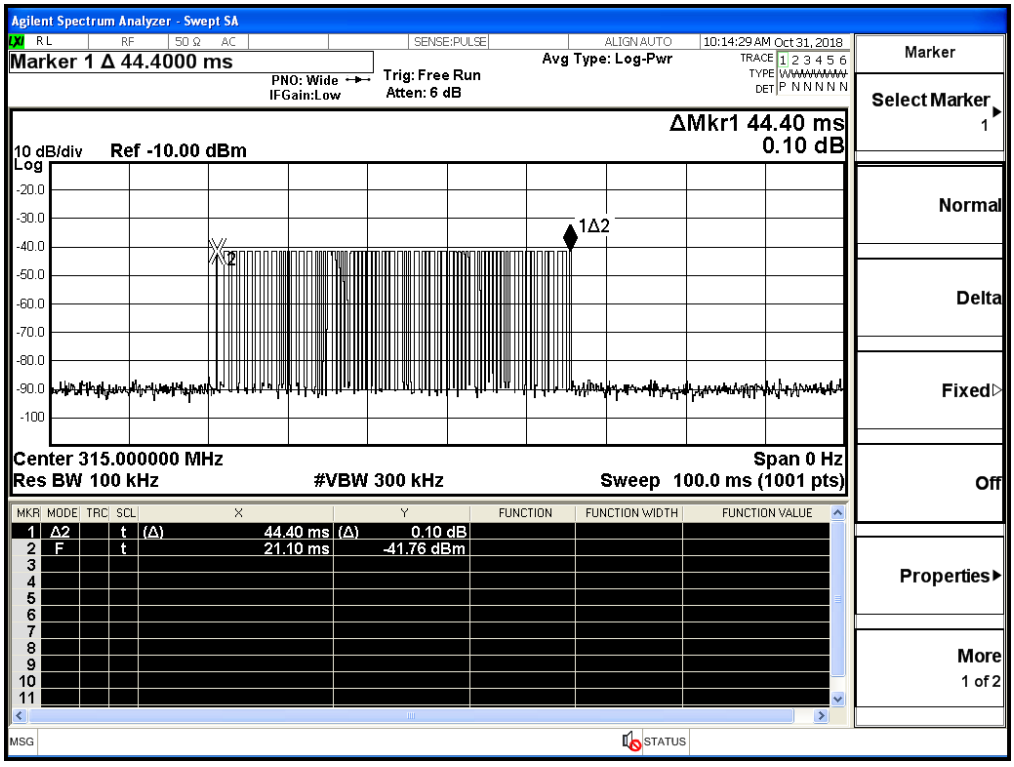
T_{on} = (1*0.05 + 30*0.5 + 35*0.2) = 22.05 ms

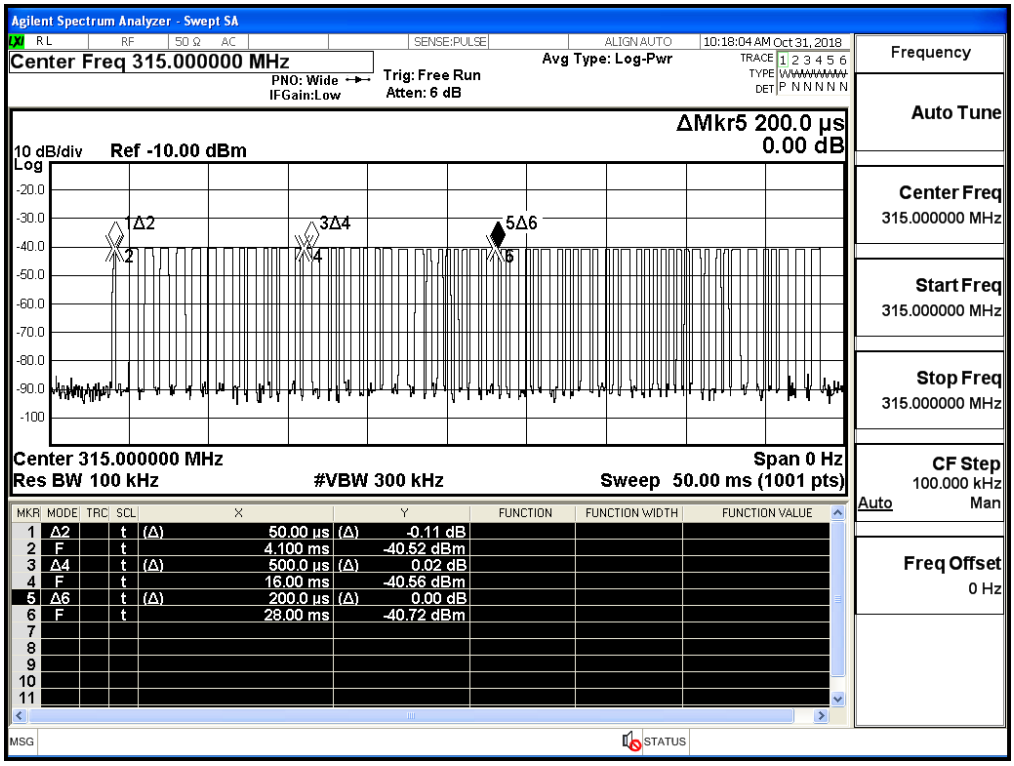
T_p = 100 ms

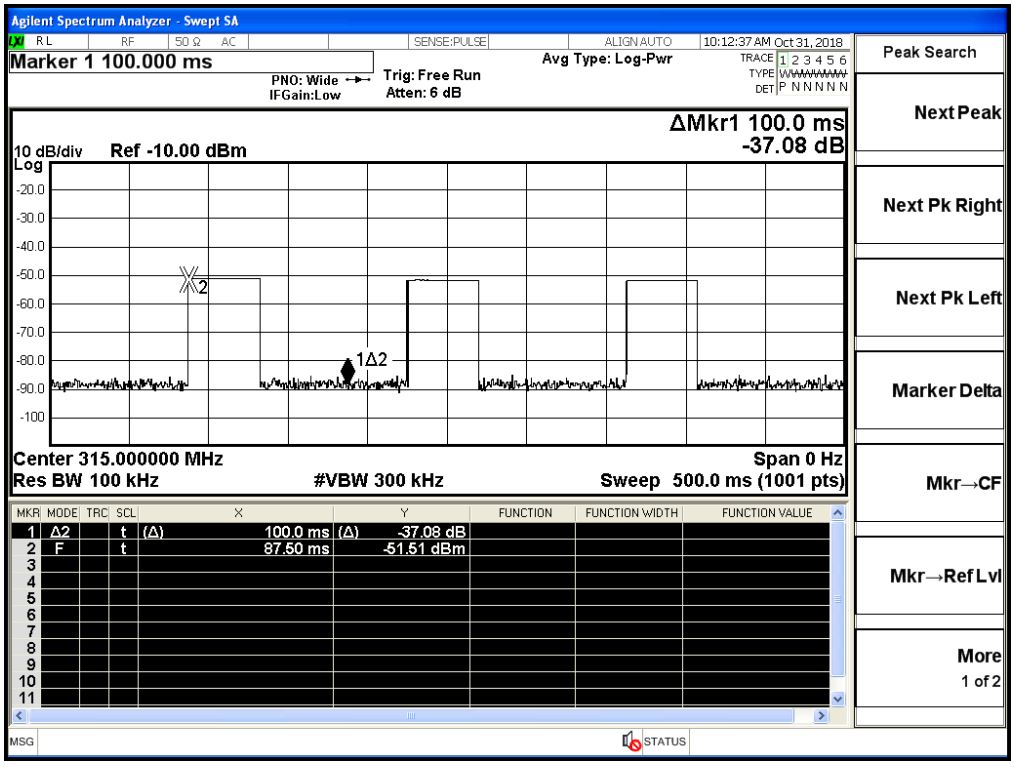
The duty cycle= (1*0.05 + 30*0.5 + 35*0.2)/100 = 22.05%

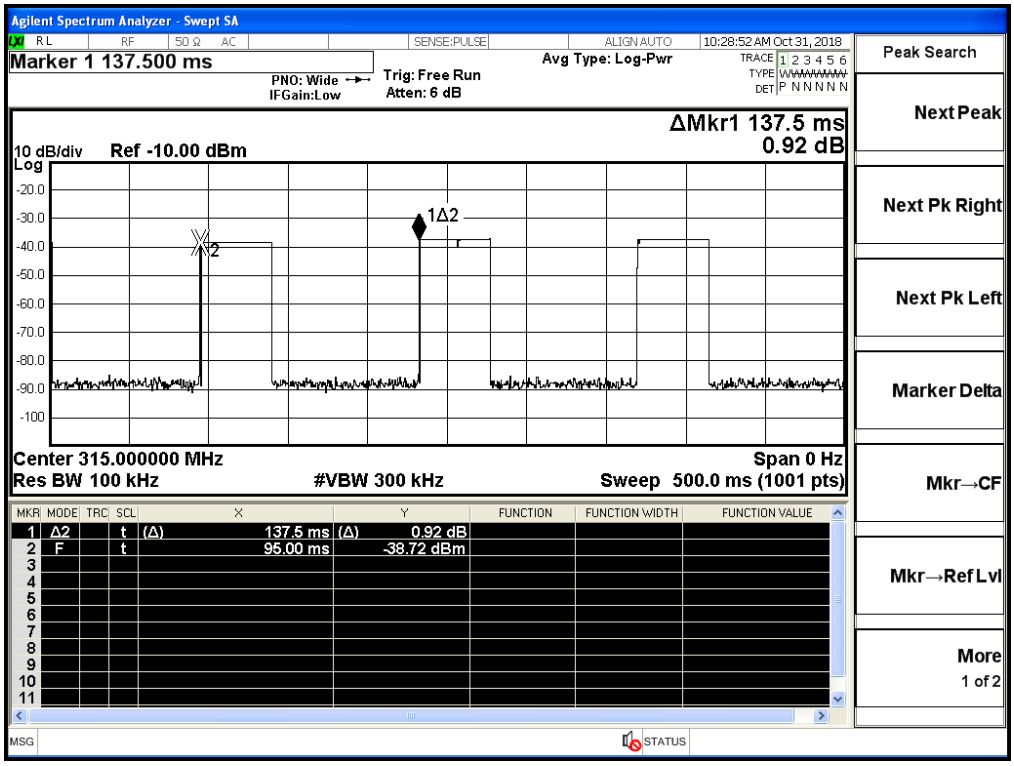
Average Correction Factory = 20log (T_{on}/T_p) =20log (22.05/100) = -13.13 dB

Note: The signal bandwidth was measured and less than 100 kHz RBW so PDCF factor is not required to correct the fundamental signal peak result.


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 44.4000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
10:14:29 AM Oct 31, 2018
ΔMkr1 44.40 ms
0.10 dB
10 dB/div
Log
Ref -10.00 dBm
Center 315.000000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 100.0 ms (1001 pts)
1 Δ2 44.40 ms 0.10 dB
2 F 21.10 ms -41.76 dBm
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Center Freq 315.000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
10:18:04 AM Oct 31, 2018
ΔMkr5 200.0 µs
0.00 dB
10 dB/div
Log
Ref -10.00 dBm
Center 315.000000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 50.00 ms (1001 pts)
1 Δ2 50.00 µs -0.11 dB
2 F 4.100 ms -40.52 dBm
3 Δ4 500.0 µs 0.02 dB
4 F 16.00 ms -40.56 dBm
5 Δ6 200.0 µs 0.00 dB
6 F 28.00 ms -40.72 dBm
Frequency
Auto Tune
Center Freq
315.000000 MHz
Start Freq
315.000000 MHz
Stop Freq
315.000000 MHz
CF Step
100.000 kHz
Auto
Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - Swept SA
Marker 1 100.000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
10:12:37 AM Oct 31, 2018
ΔMkr1 100.0 ms
-37.08 dB
10 dB/div
Log
Ref -10.00 dBm
Center 315.000000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 500.0 ms (1001 pts)
1 Δ2 100.0 ms (Δ) -37.08 dB
2 F 87.50 ms -51.51 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 137.500 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
10:28:52 AM Oct 31, 2018
ΔMkr1 137.5 ms
0.92 dB
10 dB/div
Log
Ref -10.00 dBm
Center 315.000000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 500.0 ms (1001 pts)
1 Δ2 137.5 ms (Δ) 0.92 dB
2 F 95.00 ms -38.72 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

5.5. AC Power Line Conducted Emissions (Not Applicable)

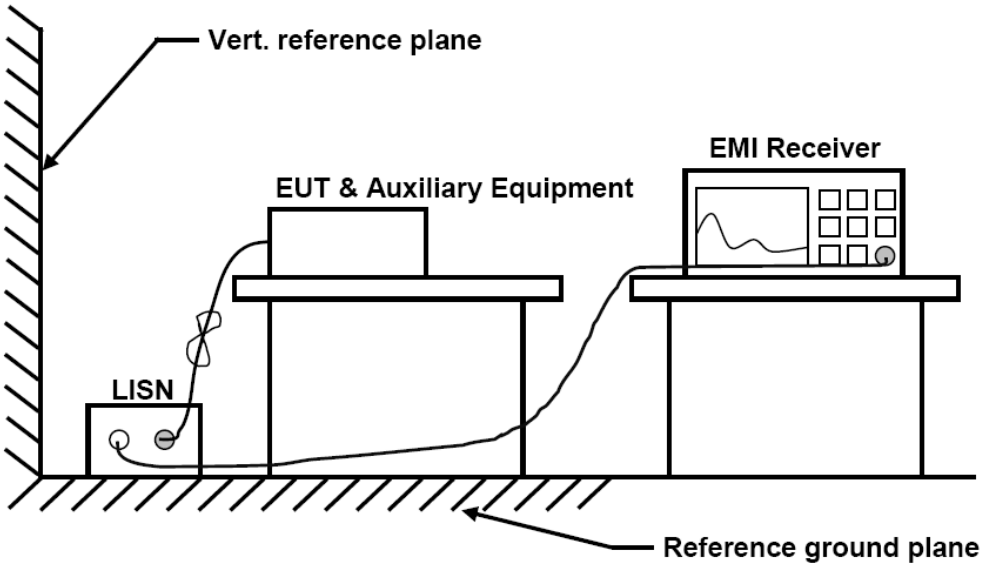
5.5.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.5.2 Block Diagram of Test Setup



5.5.3 Test Results

Not Applicable!!!!

The device was powered by DC battery!!!

5.6. Antenna Requirement

5.6.1. Standard Applicable

According to § 15.203 and RSS-Gen, 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.

5.6.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 5.0.dBi, and the antenna is an Internal PCB antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.6.3 Result

Compliance.

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2018-11-15	2019-11-14
2	DC Power Supply	Agilent	E3642A	N/A	2018-11-15	2019-11-14
3	Temperature & Humidity Chamber	GUANGZHOU GOGNWEN	GDS-100	70932	2018-10-10	2019-10-09
4	EMI Test Software	AUDIX	E3	/	2018-06-16	2019-06-15
5	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2018-06-16	2019-06-15
6	Positioning Controller	MF	MF-7082	/	N/A	N/A
7	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018-07-26	2019-07-25
8	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2019-07-25
9	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018-07-02	2019-07-01
10	EMI Test Receiver	R&S	ESR 7	101181	2018-06-16	2019-06-15
11	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2018-11-15	2019-11-14
12	AMPLIFIER	QuieTek	QTK	CHM/0809065	2018-11-15	2019-11-14
13	RF Cable-R03m	Jye Bao	RG142	CB021	2018-06-16	2019-06-15
14	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2018-06-16	2019-06-15
Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD.						

7. PHOTOGRAPHS OF TEST SETUP

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF TEST REPORT----------