

TEST REPORT



DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1906-0206

2. Customer

- Name : SEGI LIMITED
- Address (FCC) : Unit J2, 4/F. Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories, HONGKONG, China
- Address (IC) : Unit J2, 4/F. Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories, Hongkong, 186 China(Peoples Republic Of)

3. Use of Report : FCC & IC Original Grant

4. Product Name / Model Name : Foglamp Transceiver System / MCJ311

FCC ID / IC : VA5MCJ311-2WLE / IC : 7087A-2WMCJ311LE



5. Test Method Used : ANSI C63.10-2013

Test Specification : FCC Part 15 Subpart C.249,
RSS-210 Issue 9, RSS-GEN Issue 5

6. Date of Test : 2019.05.22 ~ 2019.05.31

7. Testing Environment : See appended test report.

8. Test Result : Refer to the attached test result.

Affirmation	Tested by	Reviewed by
	Name : Woohyun Rim 	Name : GeunKi Son  (Signature)

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2019 . 06. 13 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1906-0206	Jun. 13, 2019	Initial issue

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1. General Information

1.1 Testing Laboratory

DT&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.

The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014.

- FCC MRA Accredited Test Firm No. : KR0034

- IC Test site No. : 5740A

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1.2 Test Environment

Ambient Condition

▪ Temperature	+22 °C ~ +27 °C
▪ Relative Humidity	35 % ~ 45%

1.3 Measurement Uncertainty

Test items	Measurement uncertainty
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

1.4 Details of Applicant

Applicant : SEGI LIMITED
 Address (FCC) : Unit J2, 4/F. Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories, HONGKONG, China
 Address (IC) : Unit J2, 4/F. Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories, Hongkong, 186 China(Peoples Republic Of)
 Contact person : Youngil Chang

1.5 Description of EUT

EUT	Foglamp Transceiver System
Model Name(HVIN)	MCJ311
Add Model Name	NA
Power Supply	DC 12 V
FVIN	1.0
Frequency Range	2402 MHz ~ 2480 MHz
Max. field strength (average)	82.94 dBuV/m
Modulation Type	GFSK
Antenna Specification	Pattern Antenna antenna ▪ Max. peak gain : 1.5 dBi

1.6 Test Mode

	Test Mode
TM 1	LE
TM 2	-

1.7 Tested Frequency

	TX Frequency (MHz)
Lowest Channel	2402
Middle Channel	2440
Highest Channel	2480

1.8 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

1.9 Test Equipment List

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY48010133
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY48011700
DC Power Supply	Agilent Technologies	66332A	18/07/02	19/07/02	US37473422
Multimeter	FLUKE	17B	18/12/18	19/12/18	26030065WS
Signal Generator	Rohde Schwarz	SMBV100A	18/12/19	19/12/19	255571
Signal Generator	ANRITSU	MG3695C	18/12/10	19/12/10	173501
Thermohygrometer	BODYCOM	BJ5478	18/12/27	19/12/27	120612-1
Thermohygrometer	BODYCOM	BJ5478	18/07/09	19/07/09	N/A
HYGROMETER	TESTO	608-H1	19/01/31	20/01/31	34862883
Loop Antenna	Schwarzbeck	FMZB1513	18/01/30	20/01/30	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	18/07/13	20/07/13	3359
Horn Antenna	ETS-Lindgren	3115	19/01/11	21/01/11	9202-3820
Horn Antenna	Schwarzbeck	BBHA 9120C	17/12/04	19/12/04	9120C-561
PreAmplifier	tsj	MLA-0118-J01-45	18/12/19	19/12/19	17138
PreAmplifier	tsj	MLA-1840-J02-45	18/07/06	19/07/06	16966-10728
PreAmplifier	tsj	MLA-10K01-B01-27	18/10/31	19/10/31	2005354
Attenuator	SMAJK	SMAJK-2-3	18/07/04	19/07/04	4
Attenuator	Aeroflex/Weinschel	56-3	18/07/02	19/07/02	Y2370
Attenuator	SRTechnology	F01-B0606-01	18/07/02	19/07/02	13092403
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5-6SS	18/07/03	19/07/03	3
High Pass Filter	Wainwright Instruments	WHKX12-935-1000-15000-40SS	18/07/02	19/07/02	8
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300-18000-60SS	18/07/02	19/07/02	1
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-1
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-2
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-3
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-4
Cable	Junkosha	MWX241	18/06/25	19/06/25	G-04
Cable	Junkosha	MWX241	18/06/25	19/06/25	G-07
Cable	DT&C	Cable	18/07/06	19/07/06	G-13
Cable	DT&C	Cable	18/07/06	19/07/06	G-14
Cable	HUBER+SUHNER	SUCOFLEX 104	18/07/06	19/07/06	G-15
Cable	DT&C	Cable	18/07/06	19/07/06	RF-18

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.

Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

2. SUMMARY OF TESTS

FCC Part	RSS Std.	Parameter	Limit	Test Condition	Status Note 1
15.249 (a)	RSS-210 [B.10(a)]	Field Strength Limits	FCC 15.249(a)	Radiated	C
15.205 15.209 15.249	RSS-GEN[8.9] RSS-GEN [8.10] RSS-210[B.10]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209, 249 limits	Radiated	C
15.207	RSS-Gen [8.8]	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA ^{Note2}
-	RSS-Gen [6.7]	Occupied Bandwidth (99 %)	RSS-Gen(6.6)	Conducted	C
15.203	-	Antenna Requirements	FCC 15.203	-	C
<p>Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable</p> <p>Note 2: This device is used battery for power supplying. Therefore this test item was not performed.</p>					

The sample was tested according to the following specification:
ANSI C63.10-2013

3. Transmitter requirements

3.1 AC Conducted Emissions

3.1.1 Test Requirements and limit, §15.207

According to §15.207(a) for an intentional radiator that 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 the limits in the following table, as measured using a 50 μ H/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

3.1.2 Test Configuration

-NA

3.1.3 Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

1. The test procedure is performed in a 6.5 m \times 3.5 m \times 3.5 m (L \times W \times H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) \times 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

3.1.4 Test Result

-NA

3.2 Radiated Emission

Test Requirements and limit, §15.249, §15.205, §15.209

▪ FCC Part 15.249

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Limit @ 3m	
	Field strength of fundamental (mV/m)	Field strength of harmonics (uV/m)
902 ~ 908	50	500
2400 ~ 2483.5	50	500
5725 ~ 5825	50	500
24,000 ~ 24,250	250	2500

(d) 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, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
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

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	12.29 ~ 12.293	149.9 ~ 150.05	1645.5 ~ 1646.5	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.51975 ~	156.52475 ~	1660 ~ 1710	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.52025	156.52525	1718.8 ~ 1722.2	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~	156.7 ~ 156.9	2200 ~ 2300	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57725	162.0125 ~ 167.17	2310 ~ 2390	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	13.36 ~ 13.41	167.72 ~ 173.2	2483.5 ~ 2500	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.42 ~ 16.423	240 ~ 285	2655 ~ 2900	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.69475 ~	322 ~ 335.4	3260 ~ 3267	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	16.69525	399.90 ~ 410	3332 ~ 3339		
8.291 ~ 8.294	16.80425 ~	608 ~ 614	3345.8 ~ 3358		
8.362 ~ 8.366	16.80475	960 ~ 1240	3600 ~ 4400		
8.37625 ~ 8.38675	25.5 ~ 25.67	1300 ~ 1427			
8.41425 ~ 8.41475	37.5 ~ 38.25	1435 ~ 1626.5			
	73 ~ 74.6				
	74.8 ~ 75.2				
	108 ~ 121.94				
	123 ~ 138				

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

3.2.1 Test Configuration

Refer to the APPENDIX I.

3.2.2 Test Procedures for Radiated Spurious Emissions

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
4. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed.
5. The antenna is a broadband antenna, and its height 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.
6. 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
7. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
8. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.

NOTE 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.

NOTE 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.

3.2.3 Test Result

Frequency Range: 9 kHz ~ 25 GHz

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2401.74	H	X	PK	101.59	-6.65	N/A	N/A	94.94	113.98	19.04
*2401.94	H	X	AV	88.14	-6.65	N/A	N/A	81.49	93.98	12.49
2366.10	H	X	PK	70.18	-7.21	N/A	N/A	62.97	74.00	11.03
2366.27	H	X	AV	43.18	-7.21	N/A	N/A	35.97	54.00	18.03
4804.45	H	X	PK	53.99	1.63	N/A	N/A	55.62	74.00	18.38
4803.97	H	X	AV	41.20	1.63	N/A	N/A	42.83	54.00	11.17

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2439.81	H	X	PK	102.71	-6.55	N/A	N/A	96.16	113.98	17.82
*2439.96	H	X	AV	89.49	-6.55	N/A	N/A	82.94	93.98	11.04
4879.74	H	X	PK	52.93	1.61	N/A	N/A	54.54	74.00	19.46
4879.98	H	X	AV	40.55	1.61	N/A	N/A	42.16	54.00	11.84

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2479.75	H	X	PK	102.14	-6.24	N/A	N/A	95.90	113.98	18.08
*2479.97	H	X	AV	88.81	-6.24	N/A	N/A	82.57	93.98	11.41
2487.17	H	X	PK	67.15	-6.47	N/A	N/A	60.68	74.00	13.32
2487.28	H	X	AV	42.98	-6.47	N/A	N/A	36.51	54.00	17.49
4959.37	H	X	PK	52.13	1.75	N/A	N/A	53.88	74.00	20.12
4959.89	H	X	AV	39.81	1.75	N/A	N/A	41.56	54.00	12.44

▪ Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} + \text{D.C.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

DCF = Duty Cycle Reduction Factor.

3. * is fundamental frequency.

3.3 Occupied Bandwidth

Test Requirements, RSS-Gen [6.6]

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.

■ TEST CONFIGURATION

Refer to the APPENDIX I.

■ TEST PROCEDURE

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

■ TEST RESULTS: **Comply**

Test Mode	Frequency	Test Results [MHz]
TM 1	Lowest	1.025
	Middle	1.012
	Highest	1.001

RESULT PLOTS

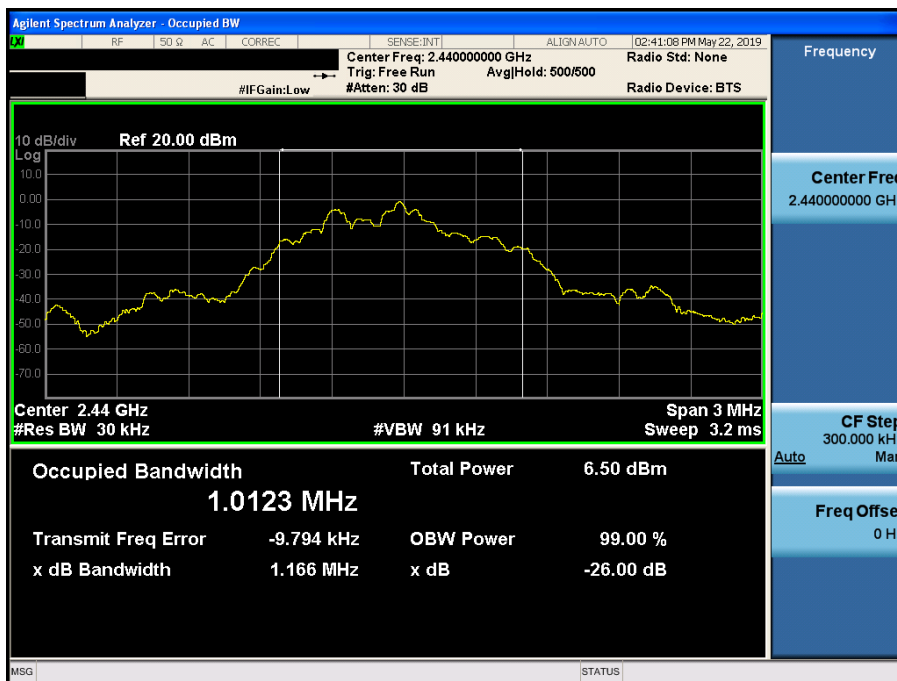
Occupied Bandwidth

TM 1 & Lowest



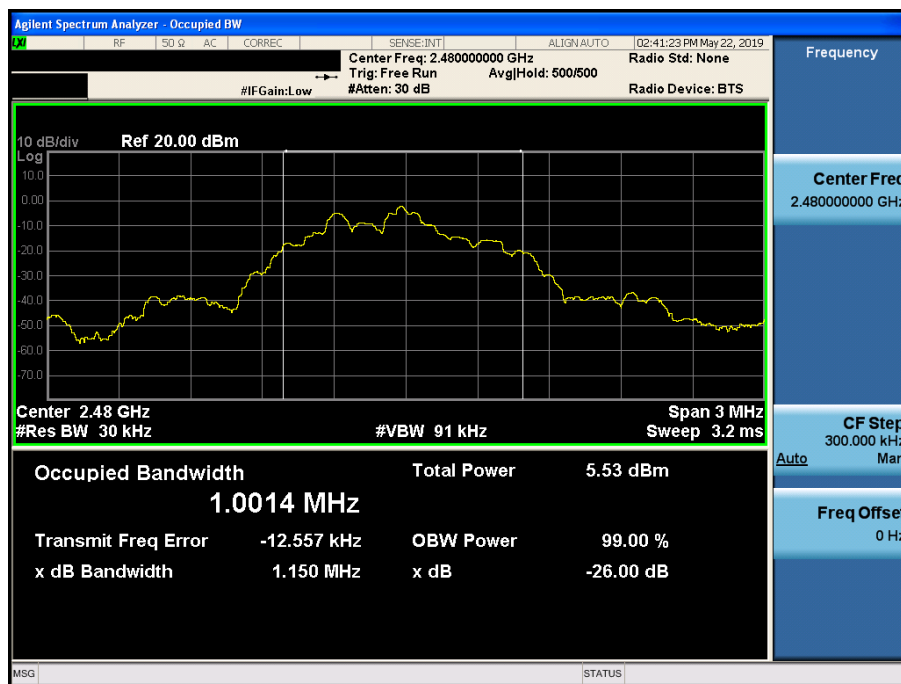
Occupied Bandwidth

TM 1 & Middle



Occupied Bandwidth

TM 1 & Highest



3.4 Antenna Requirements

- According to FCC 47 CFR §15.203:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.

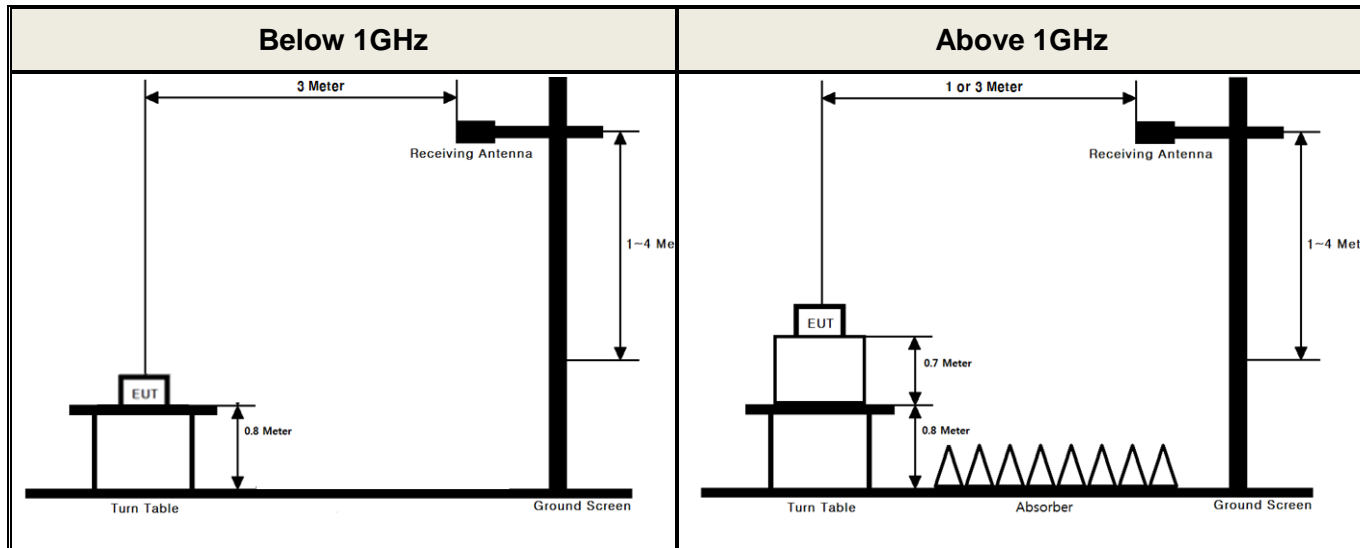
The antenna is permanently attached on PCB. (Refer to Internal photo file.)

Therefore this E.U.T Complies with the requirement of §15.203.

APPENDIX I

Test set up diagrams

▪ Radiated Measurement



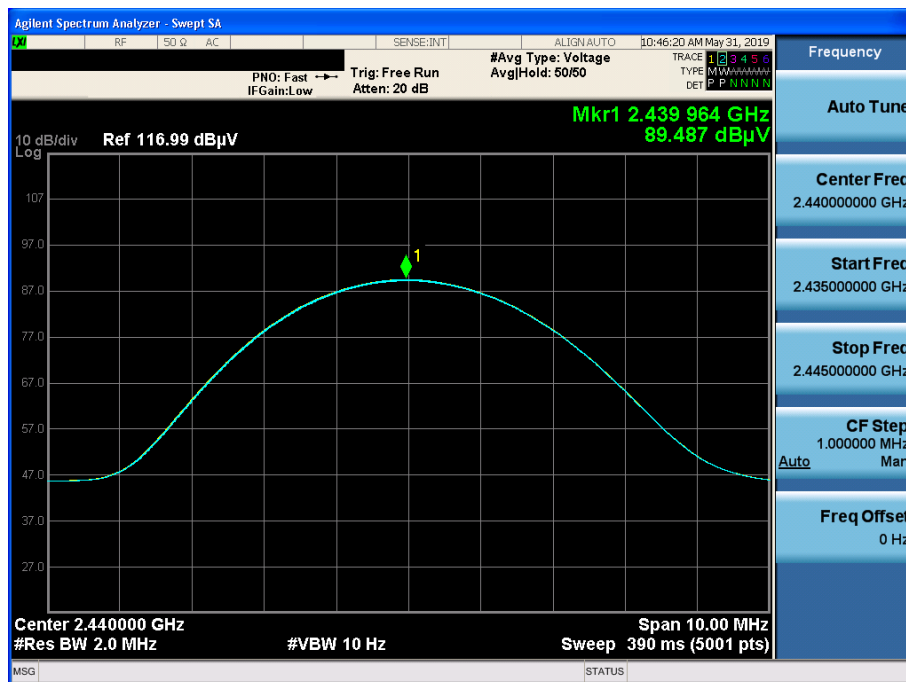
APPENDIX II

Worst data plot of radiated test

Field strength of fundamental

Middle & X & Hor

Detector Mode : AV

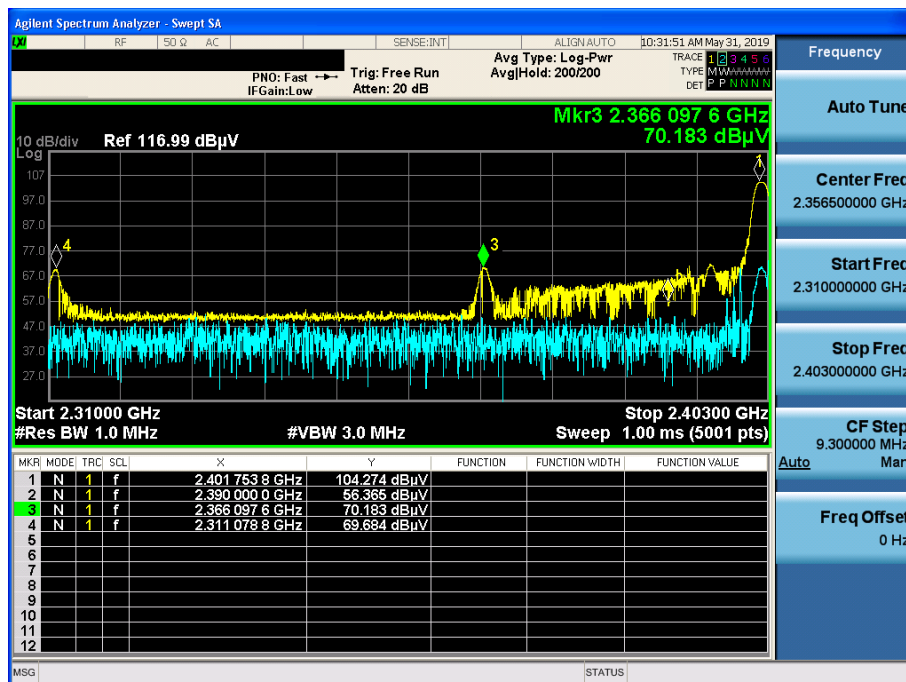


Note: The resolution bandwidth was set greater than occupied bandwidth of fundamental.

Restricted band edge

Lowest & X & Hor

Detector Mode : PK



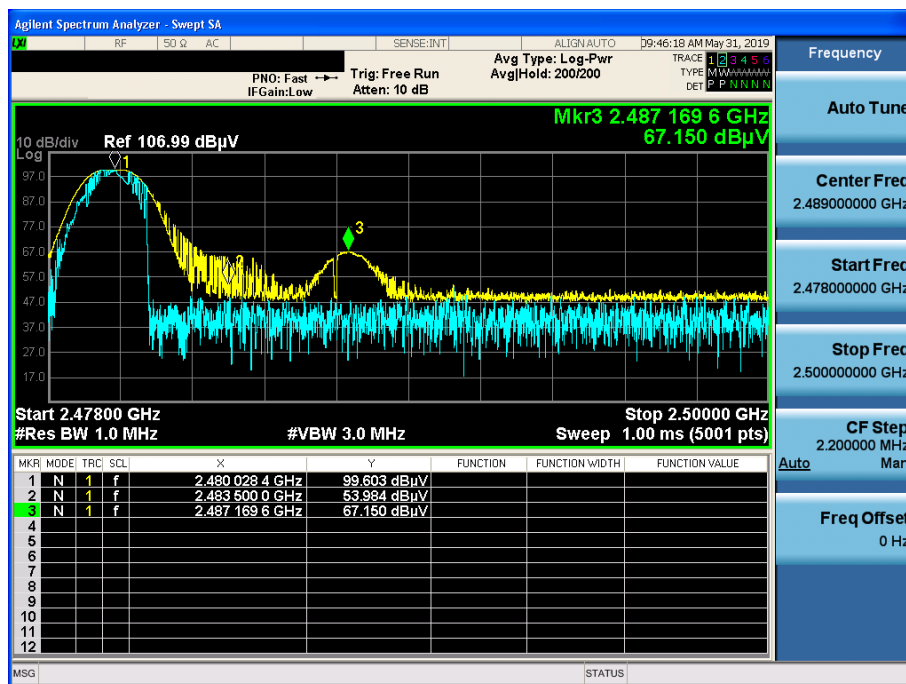
Lowest & X & Hor

Detector Mode : AV



Highest & X & Hor

Detector Mode : PK



Highest & X & Hor

Detector Mode : AV



Spurious emission

Lowest & X & Hor

Detector Mode : AV

