



FCC Test Report

Part 15 subpart C

Client Information:

Applicant: Fulham Electronic Co., Ltd
Applicant add.: No. 9 Xingchang Road, Nanshaozhen Changping Science Park Beijing
102200 P.R. China

Product Information:

Product Name: CONSTANT CURRENT DRIVER
Model No.: T1R1UNV160P-60C, T1R1UNV210P-60C, T1R1UNV150P-40C
Brand Name: N/A
FCC ID: 2AJ9LT1R1UNV210P60C

Standards: CFR 47 FCC PART 15 SUBPART C:2016 section 15.247

Prepared By:

UL-CCIC Company Limited

Add.: Electronic Building, Parage Electronic Industrial Park, No. 8 Nanyun Er Road,
Guangzhou Science Park, Guangzhou, 510663 China

Date of Receipt: Oct. 01, 2016

Date of Test: Oct. 02~ Oct. 31, 2016

Date of Issue: Nov. 01, 2016

Test Result: Pass

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

*This test report must not be used by the client to claim product endorsement by any agency of the U.S. government.

Reviewed by:

Lambert Tang

Approved by:

Richard Pi



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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00	--	Oct. 31, 2016	--	--



3 Test Summary

3.1 Compliance with FCC Part 15 subpart C

TEST	TEST REQUIREMENT	TEST METHOD	RESULT
Antenna Requirement	FCC PART 15 C section 15.247 (c) and Section 15.203	FCC PART 15 C section 15.247 (c) and Section 15.203	PASS
Conducted Emissions at Mains Terminals	FCC PART 15 C section 15.207	ANSI C63.10: Clause 6.2	PASS
Radiated Spurious Emission 30 MHz to 25 GHz)	FCC PART 15 C section 15.209 &15.247(d)	ANSI C63.10: Clause 6.4, 6.5 and 6.6	PASS
Maximum Peak Output Power	FCC PART 15 C section 15.247(b)(3)	FCC/KDB-558074 D01 v03r05 Clause 9.2.3	PASS

Remark:

N/A: not applicable. Refer to the relative section for the details.

EUT: In this whole report EUT means Equipment Under Test.

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radio Frequency.

ANSI C63.10: the detail version is ANSI C63.10:2013 in the whole report.

A stand-alone certified module (**FCC ID: TYOJN5168M6**) is applied to this product and the RF out put power of the EUT have tested similar to the original module. So only retest the RF out power, Conducted Emissions at Mains Terminals and Radiated Spurious Emission, Others please refer to report from **FCC ID: TYOJN5168M6**.



3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, the following measurements uncertainty Levels have estimated based on standards, the maximum value of the uncertainty as below:

No.	Item	Uncertainty
1	Conducted Emission Test	1.20dB
2	Radiated Emission Test	3.30dB

3.3 Test Location

All tests were performed at:

Dongguan Yaxu (AiT) Technology Limited
No.22, Jinqianling Third Street, Jitigang, Huangjiang,Dongguan, Guangdong, China
Tel.: +86.769.82020499 Fax.: +86.769.82020495



4 Test Facility

The test facility is recognized, certified or accredited by the following organizations:

.CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2005 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on Apr. 18, 2013

.FCC- Registration No: 248337

The 3m Semi-Anechoic Chamber, 3m/10m Open Area Test Site and Shielding Room of Dongguan Yaxu (AiT) Technology Limited have been registered by Federal Communications Commission (FCC) on Aug.29, 2014.

.Industry Canada(IC)-Registration No: IC6819A

The 3m Semi-Anechoic Chamber and 3m/10m Open Area Test Site of Dongguan Yaxu (AiT) Technology Limited have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing on Oct. 01, 2014.

.VCCI- Registration No: 2705

The 3m/10m Open Area Test Site, Shielding Room and 3m Chamber of Dngguan Yaxu (AiT) technology Limited have been registered by Voluntary Control Council for Interference on Nov. 21, 2012. The Telecommunication Ports Conducted Disturbance Measurement of Asia Institute Technology (Dongguan) Limited have been registered by Voluntary Control Council for Interference on May. 13, 2013.

4.1 Deviation from standard

None

4.2 Abnormalities from standard conditions

None



5 General Information

5.1 General Description of EUT

Manufacturer:	Fulham Electronic Co., Ltd
Manufacturer Address:	No. 9 Xingchang Road, Nanshaozhen Changping Science Park Beijing 102200 P.R. China
EUT Name:	CONSTANT CURRENT DRIVER
Brand Name:	N/A
Model No:	T1R1UNV210P-60C
Derivative model No.:	T1R1UNV160P-60C, T1R1UNV150P-40C
Operation frequency:	2405 MHz to 2480 MHz
Number of Channels:	16 Channels
Modulation Technology:	Zigbee: OQPSK(DSSS technique)
Transmit Data Rate:	250kbps
Channel Separation:	5 MHz
Antenna Type:	External antenna with the RP-SMA connector
Antenna Gain:	maximum 3 dBi
H/W No.:	V1.1
S/W No.:	V1.0
Power Supply Range:	AC120-277V 50/60Hz
Power Cord:	N/A
External Antenna Specifications:	WBT1R1UXX01, through-hole mount antenna, from Fulham Inc. Siretta Tango 24, 3dBi, IP67, through-hole mount. SMA MALE RP connector. Siretta, UK.
Note:	
1.	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2.	According to the declaration from the applicant, the electrical circuit design, layout and internal wiring were identical for all models, with only difference being the model name and power consumption of LED output. Therefore only worst-case model T1R1UNV210P-60C was tested in this report.

**EUT channels and frequencies list:**

1. Test frequencies are lowest channel: 2405 MHz, middle channel: 2445 MHz and highest channel: 2480 MHz

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405	9	2445
2	2410	10	2450
3	2415	11	2455
4	2420	12	2460
5	2425	13	2465
6	2430	14	2470
7	2435	15	2475
8	2440	16	2480



5.2 EUT Peripheral List

No.	Equipment	Manufacturer	Model No.	Serial No.	Power cord	signal cable
1	N/A	N/A	N/A	N/A	N/A	N/A

5.3 Test Peripheral List

No.	Equipment	Manufacturer	Model No.	Serial No.	Power cord	Remark
1	Notebook	ASUS	X401A	X16-96072	N/A	N/A
2	USB line	N/A	N/A	N/A	0.3m/unshielded /detachable	N/A
3	Transform board	N/A	N/A	N/A	N/A	N/A



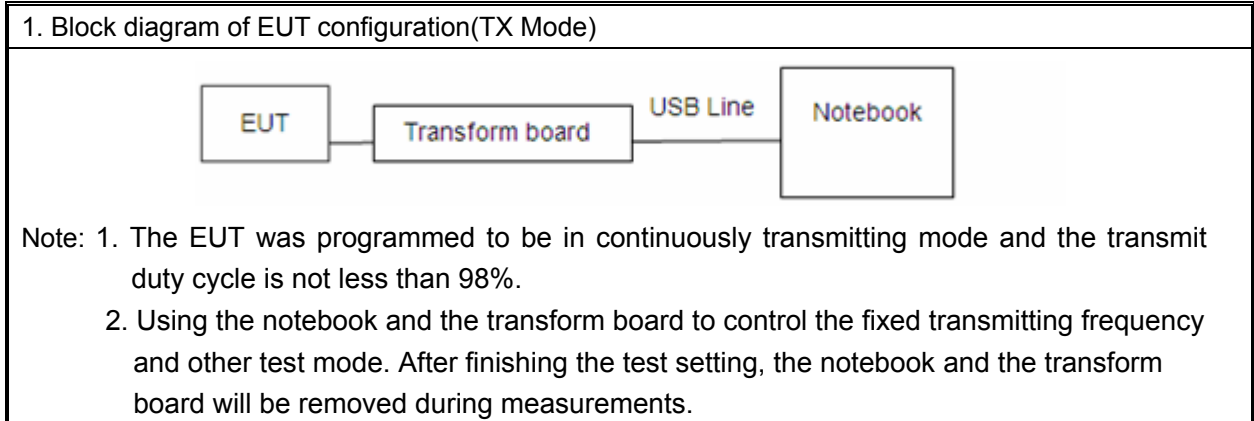
6 Equipments List for All Test Items

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	SIGNAL Analyzer	R&S	FSV40	101470	2016.06.29	2017.06.28
2	EMI Measuring Receiver	R&S	ESR	101660	2016.06.29	2017.06.28
3	Low Noise Pre Amplifier	Tsj	MLA-10K01-B01-27	1205323	2016.06.29	2017.06.28
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2016.06.29	2017.06.28
5	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2016.06.29	2017.06.28
6	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2016.06.29	2017.06.28
7	SHF-EHF Horn	SCHWARZBECK	BBHA9170	BBHA9170367	2016.06.29	2017.06.28
8	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.06.29	2017.06.28
9	Loop Antenna	ETS	6512	00165355	2016.06.29	2017.06.28
10	Radiated Cable 1# (30MHz-1GHz)	FUJIKURA	5D-2W	01	2015.12.25	2016.12.24
11	Radiated Cable 2# (1GHz -25GHz)	FUJIKURA	10D2W	02	2015.12.25	2016.12.24
12	Conducted Cable 1#(9KHz-30MHz)	FUJIKURA	1D-2W	01	2015.12.25	2016.12.24
13	EMI Test Receiver	R&S	ESCI	100124	2016.06.29	2017.06.28
14	LISN	Kyoritsu	KNW-242	8-837-4	2016.06.29	2017.06.28
15	LISN	Kyoritsu	KNW-407	8-1789-3	2016.06.29	2017.06.28
16	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2016.06.29	2017.06.28
17	Power Meter	Anritsu	ML2495A	N/A	2016.06.29	2017.06.28
18	Power sensor	Anritsu	MA2411B	N/A	2016.06.29	2017.06.28

7 Test Result

7.1 Description of Test conditions

- (1) EUT was tested in normal configuration (Please See following Block diagram)



- (2) E.U.T. test conditions:

15.31(e): For intentional radiators, measurements of the variation of the input power or the adiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

15.32: Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested as follows: Testing shall be in accordance with the procedures specified in Section 15.31 of this part.

- (3) Test frequencies:

According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and. If required reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

- (4) Frequency range of radiated measurements:

According to the 15.33, the test range will be up to the tenth harmonic of the highest fundamental frequency.

- (5) Pre-test the EUT in all transmitting mode at the lowest, middle and highest channel, only the worst-case results are recorded in this report.



7.2 Antenna Requirement

7.2.1 Standard requirement

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

7.2.2 EUT Antenna

The antenna is External antenna with the RP-SMA connector and no consideration of replacement. Antenna gain is maximum 3 dBi from 2.4GHz to 2.5GHz.



7.3 Conduction Emissions Measurement

Test Requirement:	FCC Part 15 C section 15.207
Test Method:	ANSI C63.10: Clause 6.2
Frequency Range:	150 kHz to 30 MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)
Test Limit	

Limits for conducted disturbance at the mains ports of class B

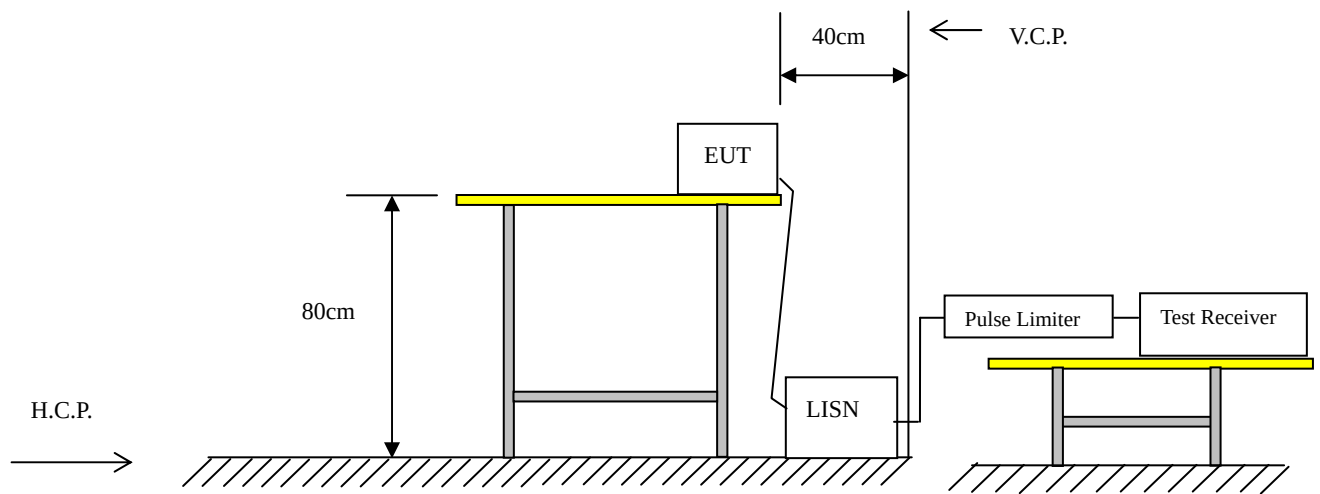
Frequency Range (MHz)	Class B Limit (dBuV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

EUT Operation: Test in normal operating mode. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test procedure

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

Test setup

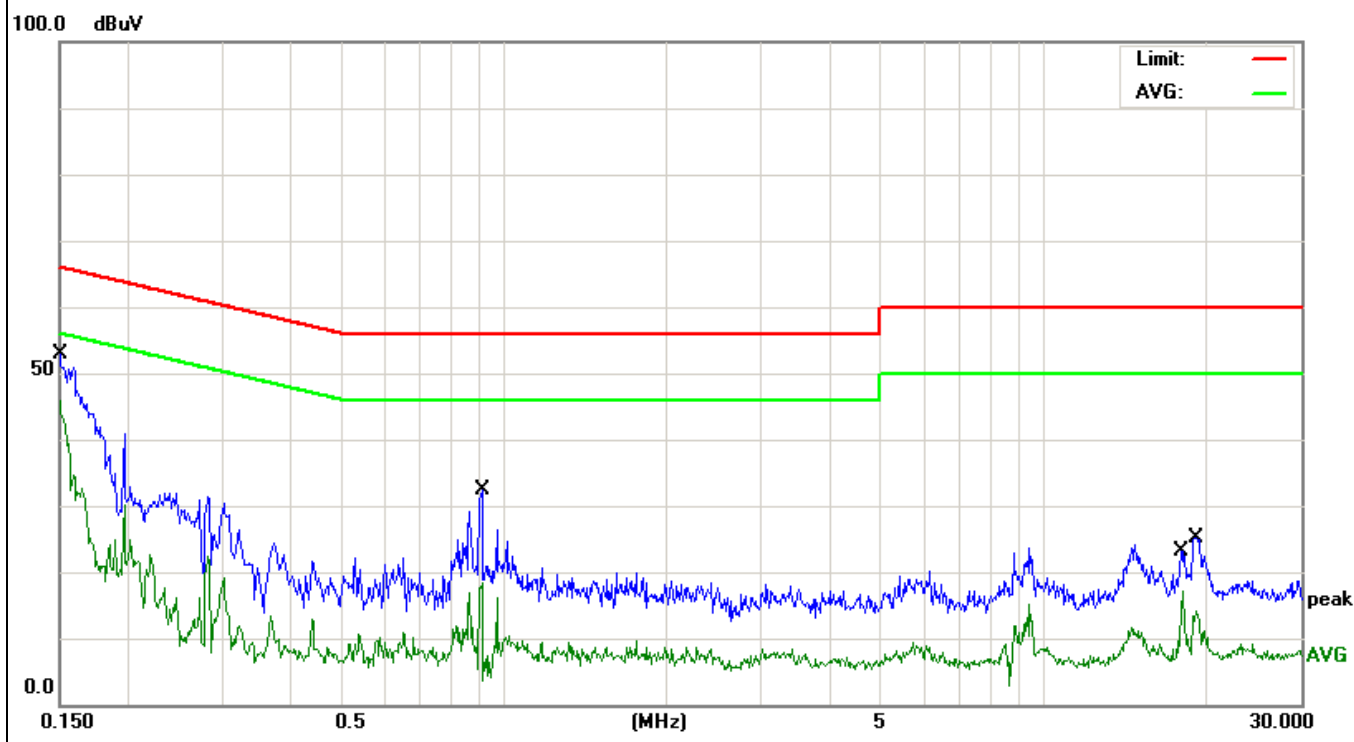


7.3.1 Test results

EUT:	CONSTANT CURRENT DRIVER	Model Name. :	T1R1UNV210P-60C
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Test Date :	2016-10-31
Test Mode:	TX CH1 (worst case)	Phase :	Line
Test Voltage :	AC 120V/60Hz		

Frequency (MHz)	Meter Reading (dBμV)	Factor(dB)	Emission Level (dBμV)	Limits (dBμV)	Over (dB)	Detector
0.1500	40.86	11.94	52.80	66.00	-13.20	Quasi-Peak
0.1500	34.01	11.94	45.95	56.00	-10.05	Average
0.9100	22.42	9.93	32.35	56.00	-23.65	Quasi-Peak
0.9100	8.39	9.93	18.32	46.00	-27.68	Average
19.1377	23.20	1.93	25.13	60.00	-34.87	Quasi-Peak
18.1097	15.45	1.80	17.25	50.00	-32.75	Average

Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.

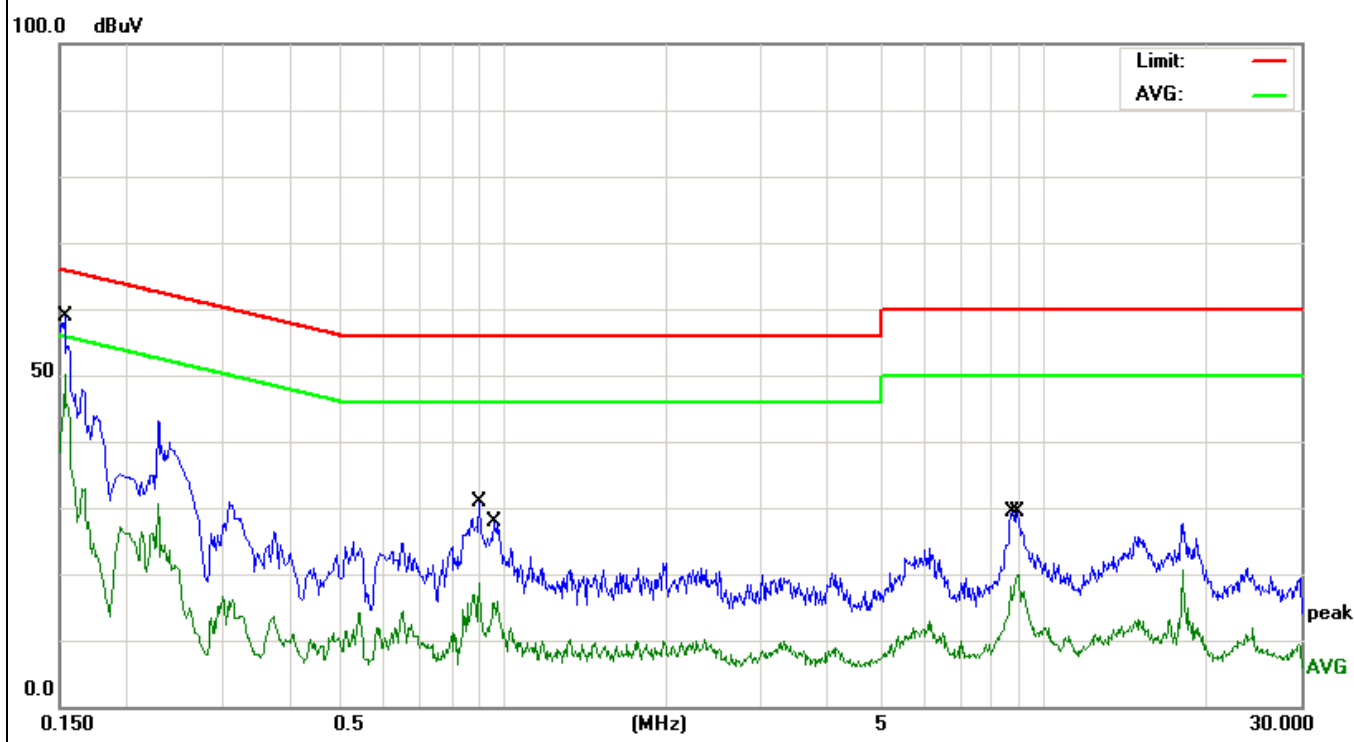




EUT:	CONSTANT CURRENT DRIVER	Model Name. :	T1R1UNV210P-60C
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Test Date :	2016-10-31
Test Mode:	TX CH1 (worst case)	Phase :	Neutral
Test Voltage :	AC 120V/60Hz		

Frequency (MHz)	Meter Reading (dBμV)	Factor(dB)	Emission Level (dBμV)	Limits (dBμV)	Over (dB)	Detector
0.1539	47.00	11.84	58.84	65.78	-6.94	Quasi-Peak
0.1539	38.33	11.84	50.17	55.78	-5.61	Average
0.9020	20.96	9.94	30.90	56.00	-25.10	Quasi-Peak
0.9699	5.84	9.93	15.77	46.00	-30.23	Average
8.7538	19.29	10.21	29.50	60.00	-30.50	Quasi-Peak
8.9978	9.64	10.21	19.85	50.00	-30.15	Average

Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.



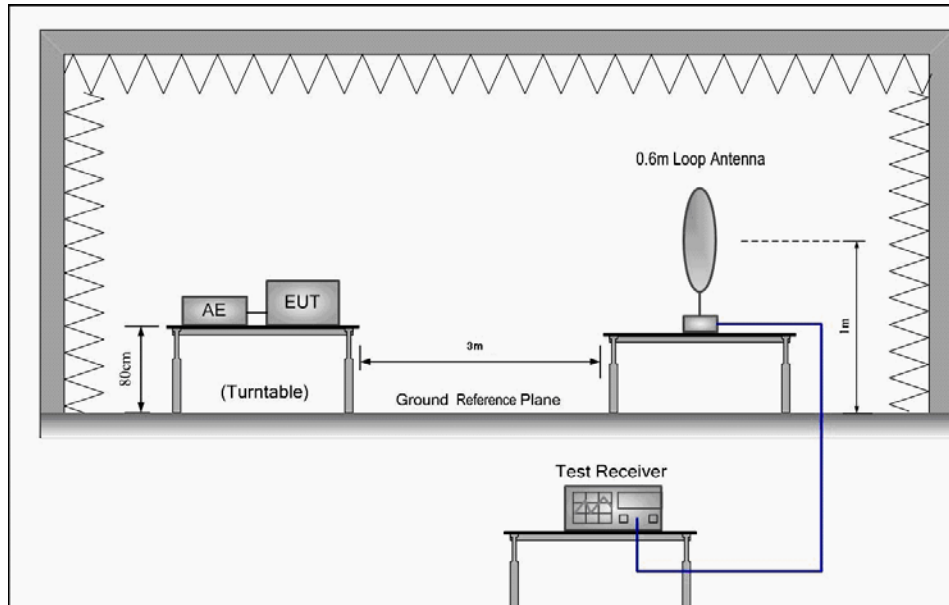


7.4 Radiated Emissions Measurement

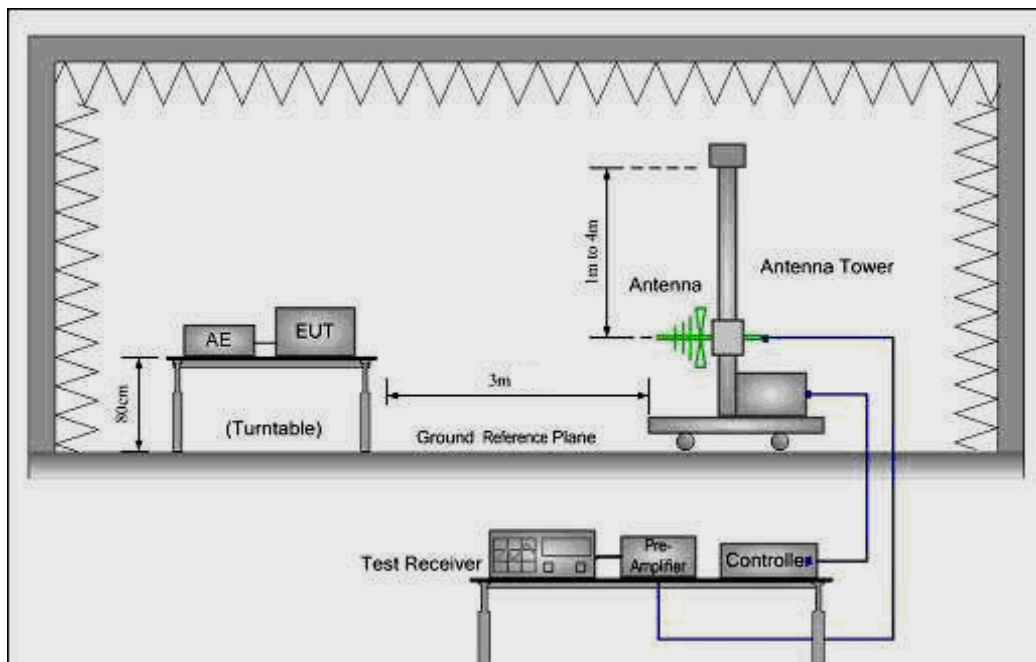
Test Requirement:	FCC Part 15 C section 15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, and provided the transmitter demonstrates compliance with the peak conducted power limits.
Test Method:	ANSI C63.10: Clause 6.4, 6.5 and 6.6
Test Status:	Pre-test the EUT in continuous transmitting mode with setup as stand-alone in X, Y, Z three axes, found the worst case is X axes and report the data. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Detector:	For PK value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW $\geq$ RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW = 10Hz Sweep = auto Detector function = peak Trace = max hold
15.209 Limit:	40.0 dB μ V/m between 30MHz & 88MHz 43.5 dB μ V/m between 88MHz & 216MHz 46.0 dB μ V/m between 216MHz & 960MHz 54.0 dB μ V/m above 960MHz

Test Configuration:

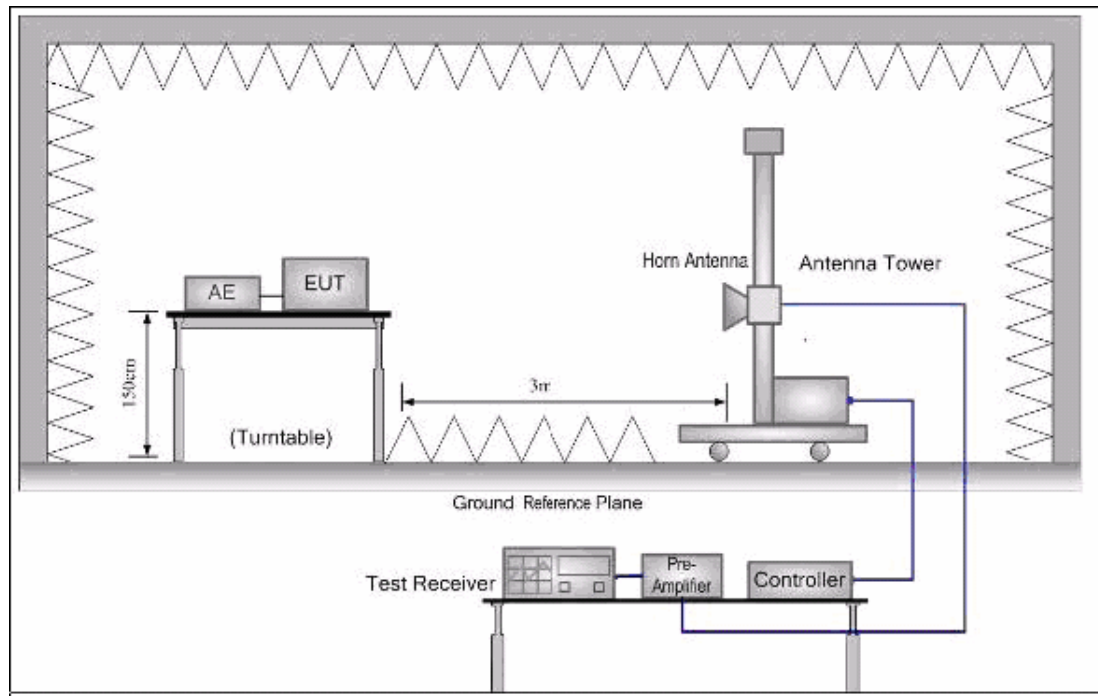
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 40 GHz emissions:



**Test procedure:**

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

The receiver was scanned from 30MHz to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

From 30MHz to 1GHz, read the Quasi-Peak field strength of the emissions with receiver QP detector RBW=120KHz.

Above 1GHz, read the Peak field strength and Average field strength.

Read the Peak field strength through RBW=1MHz,VBW=3MHz in spectrum analyzer setting;

Read the Average field strength through RBW=1MHz,VBW=10Hz in spectrum analyzer setting;

For measurement at frequency above 1GHz

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

While maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the average field strength reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit.



7.4.1 Test Result

7.4.1.1 Radiated Emissions Test Data Below 30MHz

EUT:	CONSTANT CURRENT DRIVER	Model Name :	T1R1UNV210P-60C
Temperature:	25 °C	Test Data	2016-10-27
Pressure:	1005 hPa	Relative Humidity:	60%
Test Mode :	TX	Test Voltage :	AC120V/60Hz
Measurement Distance	3 m	Frenqucy Range	9KHz to 30MHz
RBW/VBW	9KHz~150KHz/RB 200Hz for QP, 150KHz~30MHz/RB 9KHz for QP		

No emission found between lowest internal used/generated frequencies to 30MHz.



7.4.1.2 Radiated Emissions Test Data 30MHz-1000MHz

EUT:	CONSTANT CURRENT DRIVER	Model Name :	T1R1UNV210P-60C
Temperature:	25 °C	Test Data	2016-10-27
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX: 2.405 GHz	Test Voltage :	AC120V/60Hz
Measurement Distance	3 m	Frenqucy Range	30MHz to 1GHz
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

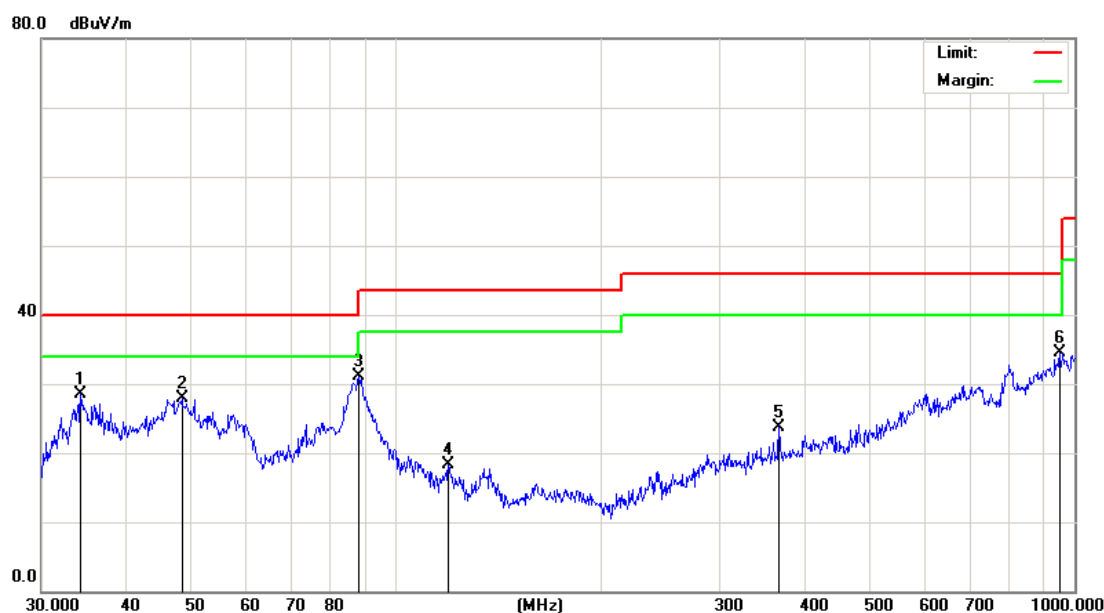
Test at Channel 1 (2.405 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)

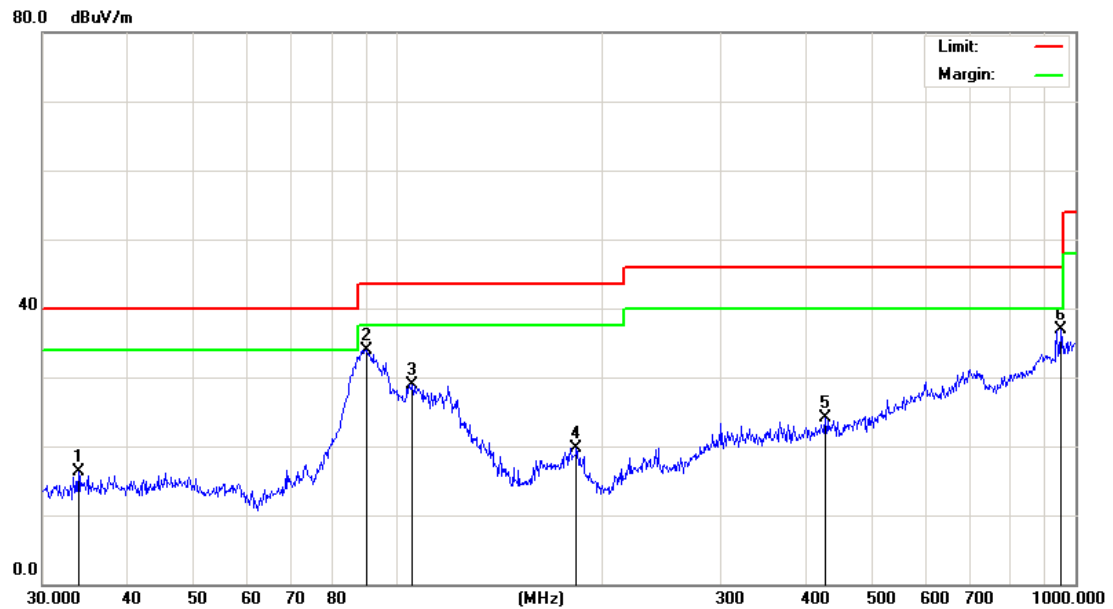


Quasi-peak measurement

No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV/m	Limit dBμV/m	Over dB	Detector
1	*	34.2760	45.38	-16.90	28.48	40.00	-11.52	QP
2		48.3318	46.34	-18.40	27.94	40.00	-12.06	QP
3		88.0329	49.62	-18.60	31.02	43.50	-12.48	QP
4		119.4361	33.12	-14.82	18.30	43.50	-25.20	QP
5		366.8231	31.18	-7.57	23.61	46.00	-22.39	QP
6		952.0937	30.69	3.77	34.46	46.00	-11.54	QP

**Horizontal:**

Peak scan

Level (dB μ V/m)

Quasi-peak measurement

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dB μ V	dB	dB μ V/m	dB μ V/m	dB	
1		33.9174	31.25	-14.94	16.31	40.00	-23.69	QP
2		90.2205	50.72	-16.79	33.93	43.50	-9.57	QP
3		105.2718	44.39	-15.54	28.85	43.50	-14.65	QP
4		183.8440	31.44	-11.72	19.72	43.50	-23.78	QP
5		428.0193	30.60	-6.57	24.03	46.00	-21.97	QP
6	*	952.0937	33.12	3.77	36.89	46.00	-9.11	QP



EUT:	CONSTANT CURRENT DRIVER	Model Name :	T1R1UNV210P-60C
Temperature:	25 °C	Test Data	2016-10-27
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX: 2.445 GHz	Test Voltage :	AC120V/60Hz
Measurement Distance	3 m	Frenqucy Range	30MHz to 1GHz
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

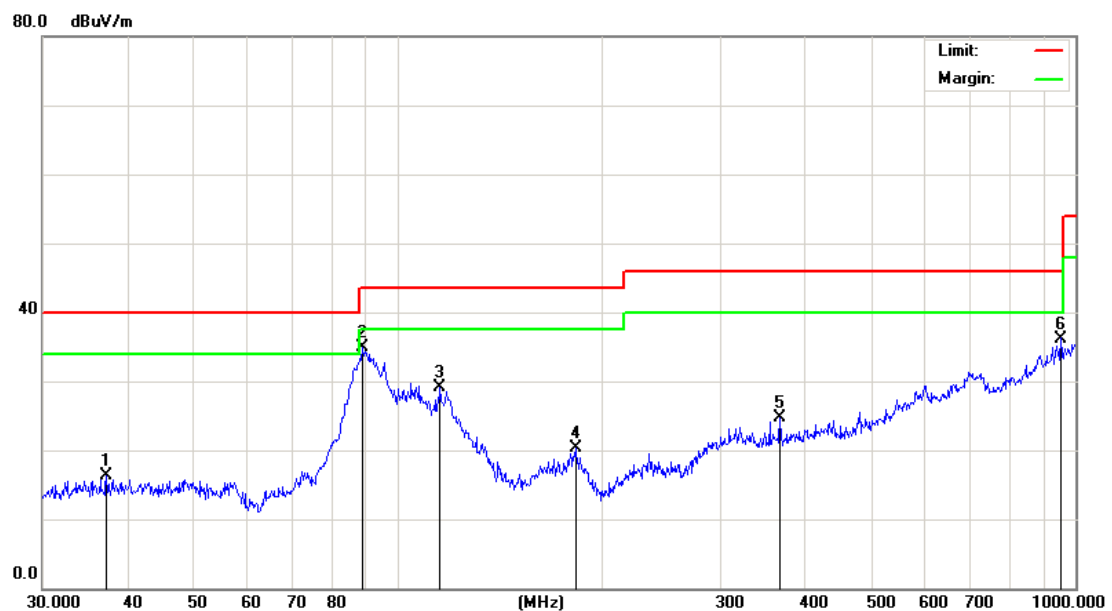
Test at Channel 9 (2.445 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

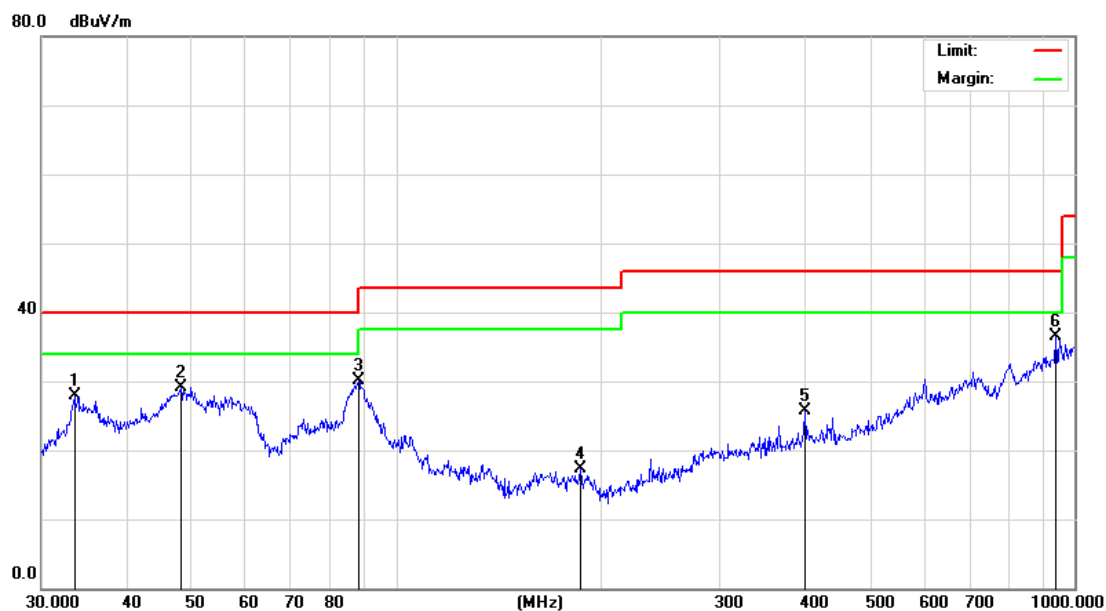
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		37.2855	30.80	-14.59	16.21	40.00	-23.79	QP
2	*	88.9639	51.98	-17.01	34.97	43.50	-8.53	QP
3		115.7256	44.19	-15.11	29.08	43.50	-14.42	QP
4		183.2005	31.67	-11.34	20.33	43.50	-23.17	QP
5		366.8231	32.18	-7.57	24.61	46.00	-21.39	QP
6		952.0937	32.43	3.77	36.20	46.00	-9.80	QP



Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

No.	Mk.	Freq. MHz	Reading Level dB μ V	Correct Factor dB	Measure- ment dB μ V/m	Limit dB μ V/m	Over dB	Detector
1		33.5624	44.90	-17.00	27.90	40.00	-12.10	QP
2		48.1626	47.56	-18.37	29.19	40.00	-10.81	QP
3		88.0329	48.78	-18.60	30.18	43.50	-13.32	QP
4		187.0958	32.96	-15.75	17.21	43.50	-26.29	QP
5		400.4319	31.57	-5.93	25.64	46.00	-20.36	QP
6	*	938.8326	33.05	3.51	36.56	46.00	-9.44	QP



EUT:	CONSTANT CURRENT DRIVER	Model Name :	T1R1UNV210P-60C
Temperature:	25 °C	Test Data	2016-10-27
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX: 2.48 GHz	Test Voltage :	AC120V/60Hz
Measurement Distance	3 m	Frenqucy Range	30MHz to 1GHz
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

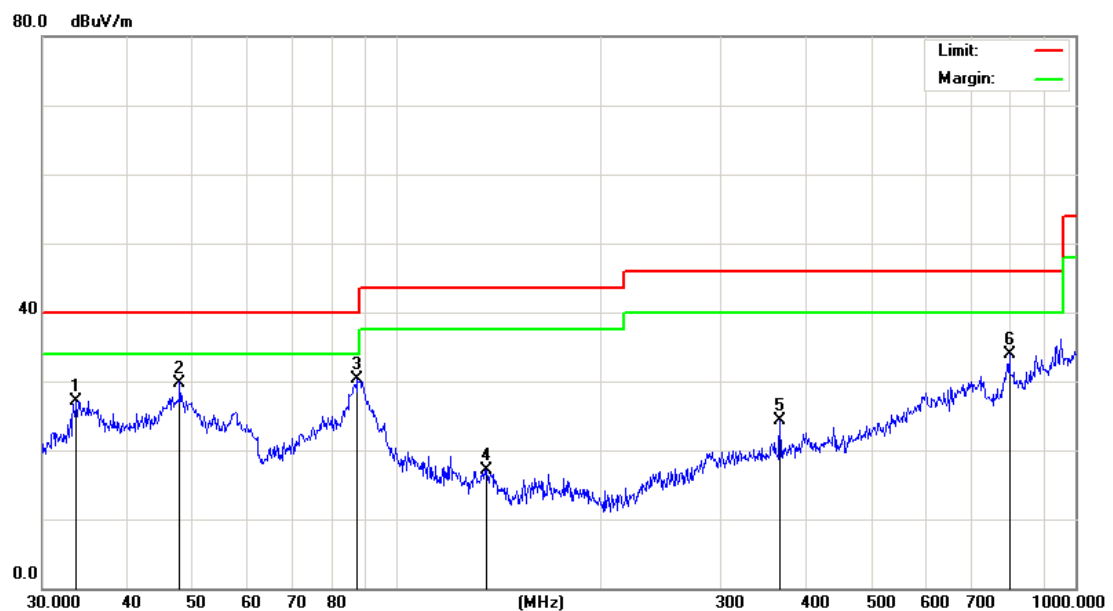
Test at Channel 16 (2.48 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

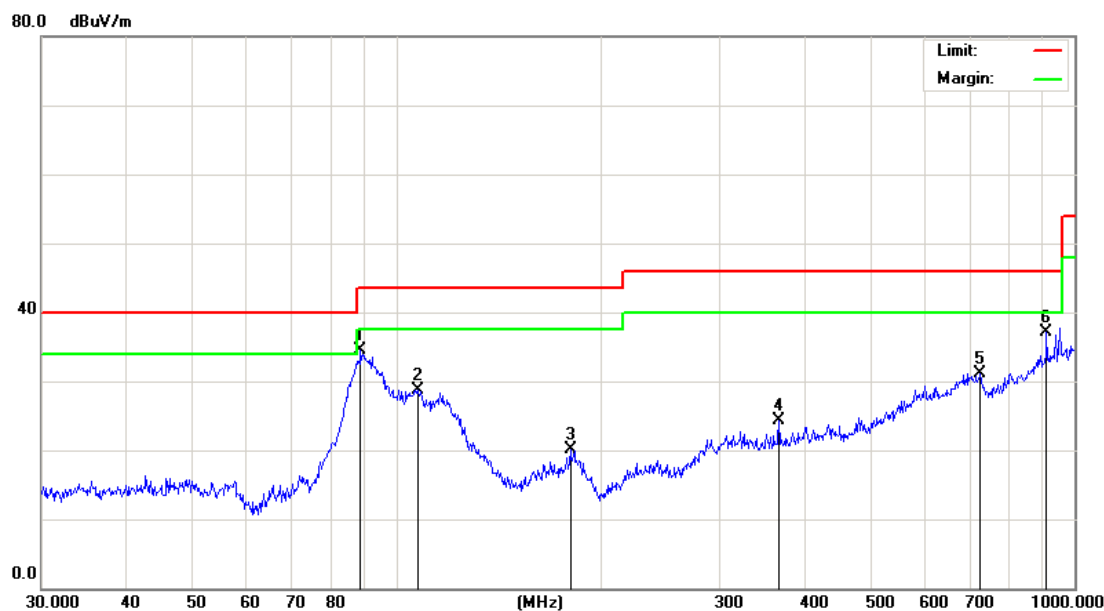
No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV/m	Limit dBμV/m	Over dB	Detector
1		33.6802	44.08	-16.99	27.09	40.00	-12.91	QP
2		47.8260	48.11	-18.31	29.80	40.00	-10.20	QP
3	*	87.4177	48.84	-18.60	30.24	40.00	-9.76	QP
4		135.5062	31.91	-14.74	17.17	43.50	-26.33	QP
5		366.8231	31.86	-7.57	24.29	46.00	-21.71	QP
6		798.9797	30.43	3.44	33.87	46.00	-12.13	QP



Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

No.	Mk.	Freq. MHz	Reading Level dB μ V	Correct Factor dB	Measure- ment dB μ V/m	Limit dB μ V/m	Over dB	Detector
1		88.6524	51.54	-17.07	34.47	43.50	-9.03	QP
2		107.5101	44.27	-15.48	28.79	43.50	-14.71	QP
3		180.6488	32.05	-12.00	20.05	43.50	-23.45	QP
4		366.8231	31.90	-7.57	24.33	46.00	-21.67	QP
5		726.8052	31.69	-0.51	31.18	46.00	-14.82	QP
6	*	909.6667	34.19	2.84	37.03	46.00	-8.97	QP

**7.4.1.3 Radiated Emissions Test Data above 1GHz**

EUT:	CONSTANT CURRENT DRIVER	Model Name :	T1R1UNV210P-60C
Temperature:	25 °C	Test Data	2016-10-27
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX: 2.405 GHz	Test Voltage :	AC120V/60Hz
Measurement Distance	3 m	Frenqucy Range	1GHz to 25GHz
RBW/VBW	Spurious emission: 1MHz/3MHz for Peak, 1MHz/10Hz for Average. non-restricted band: 100KHz/300KHz for Peak.		

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4810.000	55.76	5.07	60.83	74.00	-13.17	PEAK
4810.000	43.29	5.07	48.36	54.00	-5.64	AVERAGE
7215.000	45.82	7.07	52.89	74.00	-21.11	PEAK
7215.000	34.50	7.07	41.57	54.00	-12.43	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4810.000	54.12	5.07	59.19	74.00	-14.81	PEAK
4810.000	43.94	5.07	49.01	54.00	-4.99	AVERAGE
7215.000	44.37	7.07	51.44	74.00	-22.56	PEAK
7215.000	33.21	7.07	40.28	54.00	-13.72	AVERAGE



EUT:	CONSTANT CURRENT DRIVER	Model Name :	T1R1UNV210P-60C
Temperature:	25 °C	Test Data	2016-10-27
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX: 2.445 GHz	Test Voltage :	AC120V/60Hz
Measurement Distance	3 m	Frenqucy Range	1GHz to 25GHz
RBW/VBW	Spurious emission: 1MHz/3MHz for Peak, 1MHz/10Hz for Average. non-restricted band: 100KHz/300KHz for Peak.		

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4890.000	54.08	5.15	59.23	74.00	-14.77	PEAK
4890.000	45.35	5.15	50.50	54.00	-3.50	AVERAGE
7335.000	44.27	7.59	51.86	74.00	-22.14	PEAK
7335.000	33.60	7.59	41.19	54.00	-12.81	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4890.000	55.71	5.15	60.86	74.00	-13.14	PEAK
4890.000	44.96	5.15	50.11	54.00	-3.89	AVERAGE
7335.000	45.22	7.59	52.81	74.00	-21.19	PEAK
7335.000	34.85	7.59	42.44	54.00	-11.56	AVERAGE



EUT:	CONSTANT CURRENT DRIVER	Model Name :	T1R1UNV210P-60C
Temperature:	25 °C	Test Data	2016-10-27
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX:2.48 GHz	Test Voltage :	AC120V/60Hz
Measurement Distance	3 m	Frenqucy Range	1GHz to 25GHz
RBW/VBW	Spurious emission: 1MHz/3MHz for Peak, 1MHz/10Hz for Average. non-restricted band: 100KHz/300KHz for Peak.		

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4960.000	53.17	5.22	58.39	74.00	-15.61	PEAK
4960.000	42.68	5.22	47.90	54.00	-6.10	AVERAGE
7440.000	45.49	8.06	53.55	74.00	-20.45	PEAK
7440.000	33.52	8.06	41.58	54.00	-12.42	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4960.000	54.82	5.22	60.04	74.00	-13.96	PEAK
4960.000	42.73	5.22	47.95	54.00	-6.05	AVERAGE
7440.000	46.11	8.06	54.17	74.00	-19.83	PEAK
7440.000	34.26	8.06	42.32	54.00	-11.68	AVERAGE

The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Loss – Preamplifier Factor.

As shown in Section, for frequencies above 1000 MHz. the above field strength limits 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.

No any other emissions level which are attenuated less than 20dB below the limit.

According to 15.31(o), The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part.

Hence there no other emissions have been reported.

**Remark:**

- 1) .For this intentional radiator operates below 25 GHz. The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency. And above the second harmonic of this intentional radiator, the disturbance is very low. So the test result only displays to 2nd harmonic.
- 2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits 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.
- 3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the FCC requirements.



7.4.2 Radiated Emissions which fall in the restricted bands

Test Requirement:	FCC Part 15 C section 15.247 (d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10: Clause 6.4, 6.5 and 6.6
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	40.0 dB μ V/m between 30MHz & 88MHz; 43.5 dB μ V/m between 88MHz & 216MHz; 46.0 dB μ V/m between 216MHz & 960MHz; 54.0 dB μ V/m above 960MHz.
Detector:	For PK value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW $\geq$ RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW = 10Hz Sweep = auto Detector function = peak Trace = max hold



Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

**Test Result:****7.4.2.1 Test at Channel 1 (2.405 GHz) in transmitting status****Peak Measurement:**

Frequency (MHz)	Reading Level (dB μ V)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
2310.000	52.67	27.93	4.74	35.09	50.25	74.00	Vertical
2390.000	53.15	27.63	4.96	35.05	50.69	74.00	V
2483.500	53.68	27.55	4.9	34.99	51.14	74.00	V
2500.000	54.20	27.55	5.00	34.98	51.77	74.00	V
2310.000	53.85	27.93	4.74	35.09	51.43	74.00	Horizontal
2390.000	54.91	27.63	4.96	35.05	52.45	74.00	H
2483.500	52.60	27.55	4.9	34.99	50.06	74.00	H
2500.000	53.33	27.55	5.00	34.98	50.90	74.00	H

Average Measurement:

Frequency (MHz)	Reading Level (dB μ V)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
2310.000	43.31	27.93	4.74	35.09	40.89	54.00	Vertical
2390.000	44.66	27.63	4.96	35.05	42.20	54.00	V
2483.500	43.25	27.55	4.9	34.99	40.71	54.00	V
2500.000	44.78	27.55	5.00	34.98	42.35	54.00	V
2310.000	43.04	27.93	4.74	35.09	40.62	54.00	Horizontal
2390.000	42.98	27.63	4.96	35.05	40.52	54.00	H
2483.500	42.76	27.55	4.9	34.99	40.22	54.00	H
2500.000	43.30	27.55	5.00	34.98	40.87	54.00	H

**7.4.2.2 Test at Channel 9 (2.445 GHz) in transmitting status****Peak Measurement:**

Frequency (MHz)	Reading Level (dB μ V)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
2310.000	53.43	27.93	4.74	35.09	51.01	74.00	Vertical
2390.000	54.26	27.63	4.96	35.05	51.80	74.00	V
2483.500	53.95	27.55	4.90	34.99	51.41	74.00	V
2500.000	52.88	27.55	5.00	34.98	50.45	74.00	V
2310.000	53.40	27.93	4.74	35.09	50.98	74.00	Horizontal
2390.000	52.79	27.63	4.96	35.05	50.33	74.00	H
2483.500	53.14	27.55	4.90	34.99	50.60	74.00	H
2500.000	52.56	27.55	5.00	34.98	50.13	74.00	H

Average Measurement:

Frequency (MHz)	Reading Level (dB μ V)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
2310.000	43.10	27.93	4.74	35.09	40.68	54.00	Vertical
2390.000	42.55	27.63	4.96	35.05	40.09	54.00	V
2483.500	43.74	27.55	4.90	34.99	41.20	54.00	V
2500.000	44.06	27.55	5.00	34.98	41.63	54.00	V
2310.000	42.18	27.93	4.74	35.09	39.76	54.00	Horizontal
2390.000	43.53	27.63	4.96	35.05	41.07	54.00	H
2483.500	42.24	27.55	4.90	34.99	39.70	54.00	H
2500.000	43.41	27.55	5.00	34.98	40.98	54.00	H

**7.4.2.3 Test at Channel 16 (2.480 GHz) in transmitting status****Peak Measurement:**

Frequency (MHz)	Reading Level (dB μ V)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
2310.000	53.31	27.93	4.74	35.09	50.89	74.00	Vertical
2390.000	54.80	27.63	4.96	35.05	52.34	74.00	V
2483.500	55.72	27.55	4.90	34.99	53.18	74.00	V
2500.000	53.94	27.55	5.00	34.98	51.51	74.00	V
2310.000	55.19	27.93	4.74	35.09	52.77	74.00	Horizontal
2390.000	53.73	27.63	4.96	35.05	51.27	74.00	H
2483.500	54.22	27.55	4.90	34.99	51.68	74.00	H
2500.000	53.76	27.55	5.00	34.98	51.33	74.00	H

Average Measurement:

Frequency (MHz)	Reading Level (dB μ V)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Antenna polarization
2310.000	43.60	27.93	4.74	35.09	41.18	54.00	Vertical
2390.000	45.92	27.63	4.96	35.05	43.46	54.00	V
2483.500	44.76	27.55	4.90	34.99	42.22	54.00	V
2500.000	45.85	27.55	5.00	34.98	43.42	54.00	V
2310.000	44.07	27.93	4.74	35.09	41.65	54.00	Horizontal
2390.000	43.42	27.63	4.96	35.05	40.96	54.00	H
2483.500	44.15	27.55	4.90	34.99	41.61	54.00	H
2500.000	43.89	27.55	5.00	34.98	41.46	54.00	H

7.5 Maximum Peak Output Power

Test Requirement:

FCC Part 15 C section 15.247

(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1), (b) (2), and (b) (3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

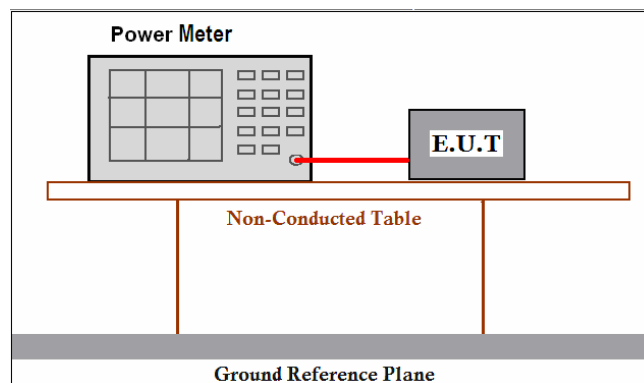
Test Method:

FCC/KDB-558074 D01 v03r05 9.2.3 Measurement using an RF average power meter

Test Status:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable
(Cable loss =0.5dB) from the antenna port to the power meter.
2. Measurement using an RF average power meter.
3. Report the worse case.

Test result:

Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Power (dBm)	Limit	Result
1	2405	TX	250 kbps	21.54	1W(30dBm)	Pass
9	2445		250 kbps	21.51		Pass
16	2480		250 kbps	21.58		Pass

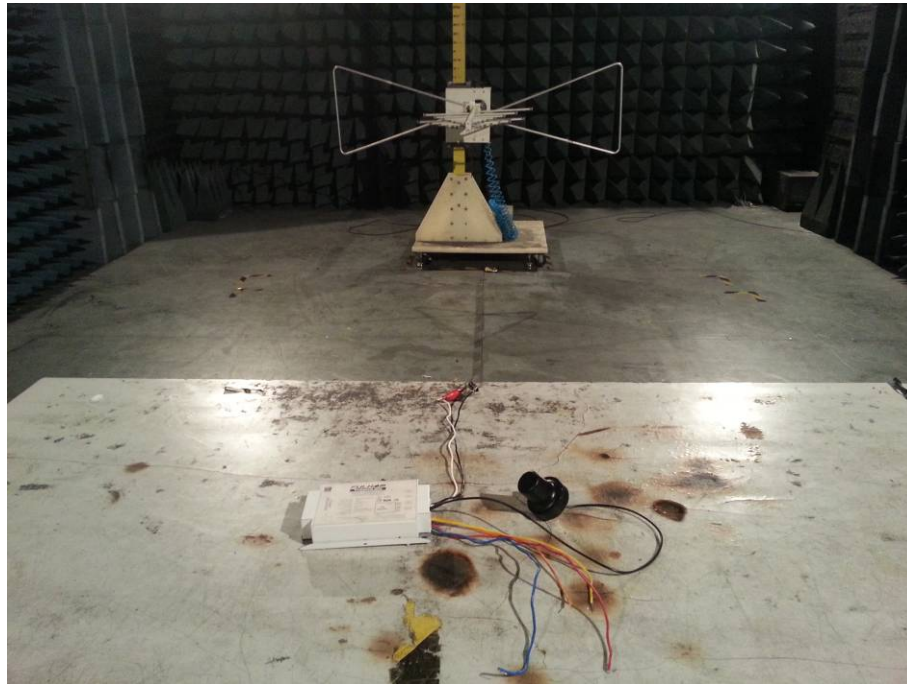
Remark: Level = Read Level + Cable Loss.

The unit does meet the FCC requirements.

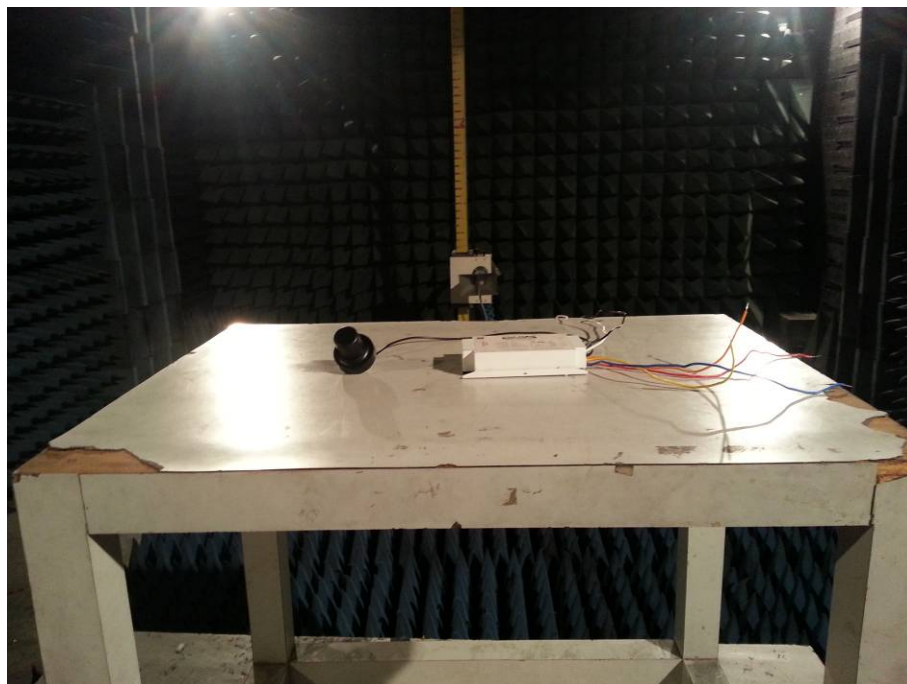
8 Photographs

8.1 Radiated Spurious Emission Test Setup

Below 1GHz:



Above 1GHz:

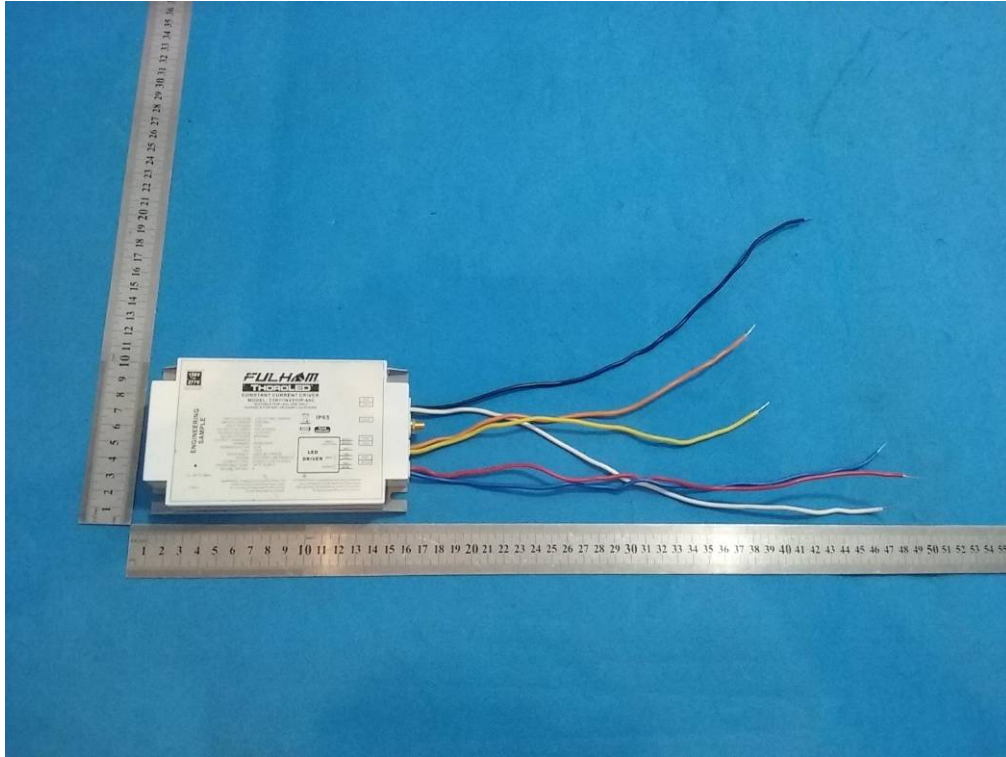


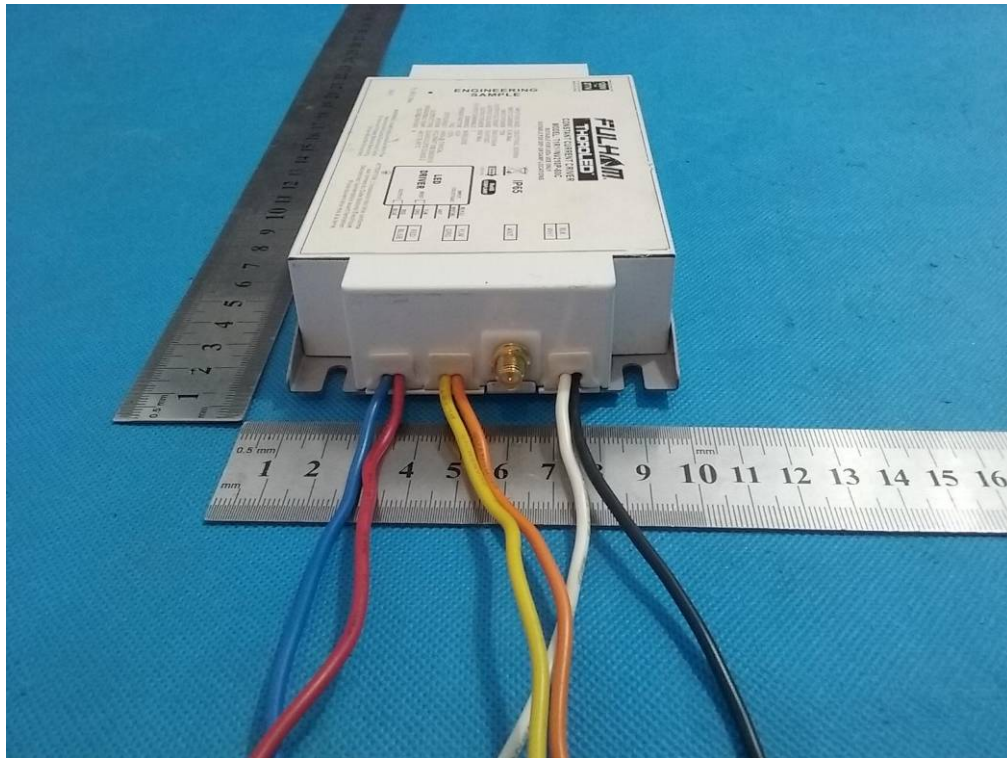


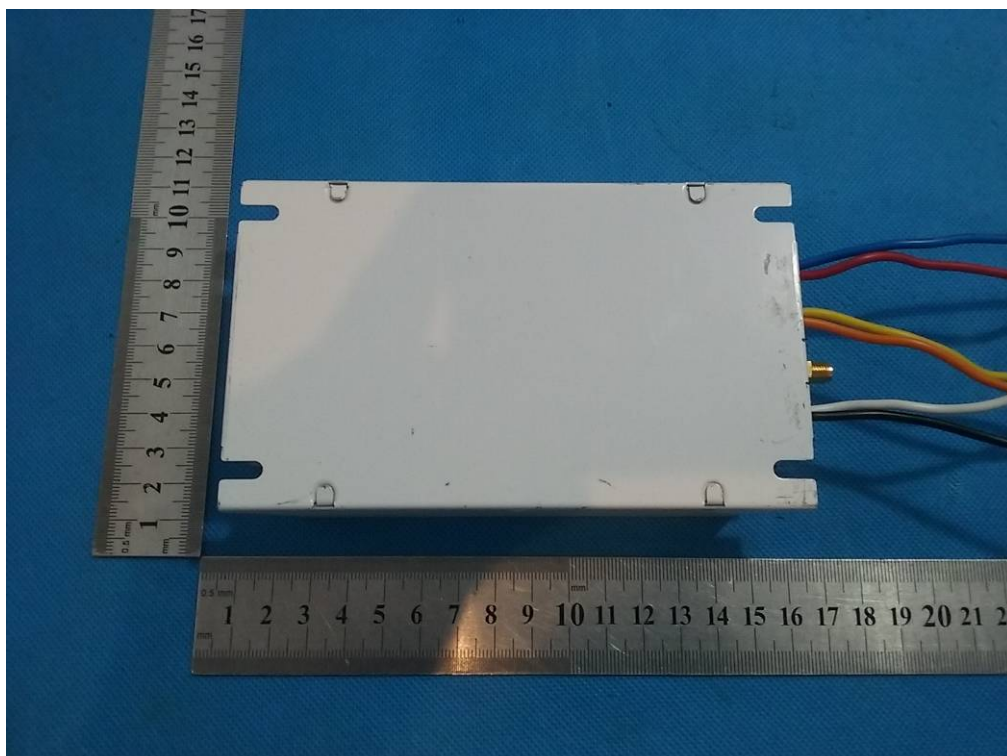
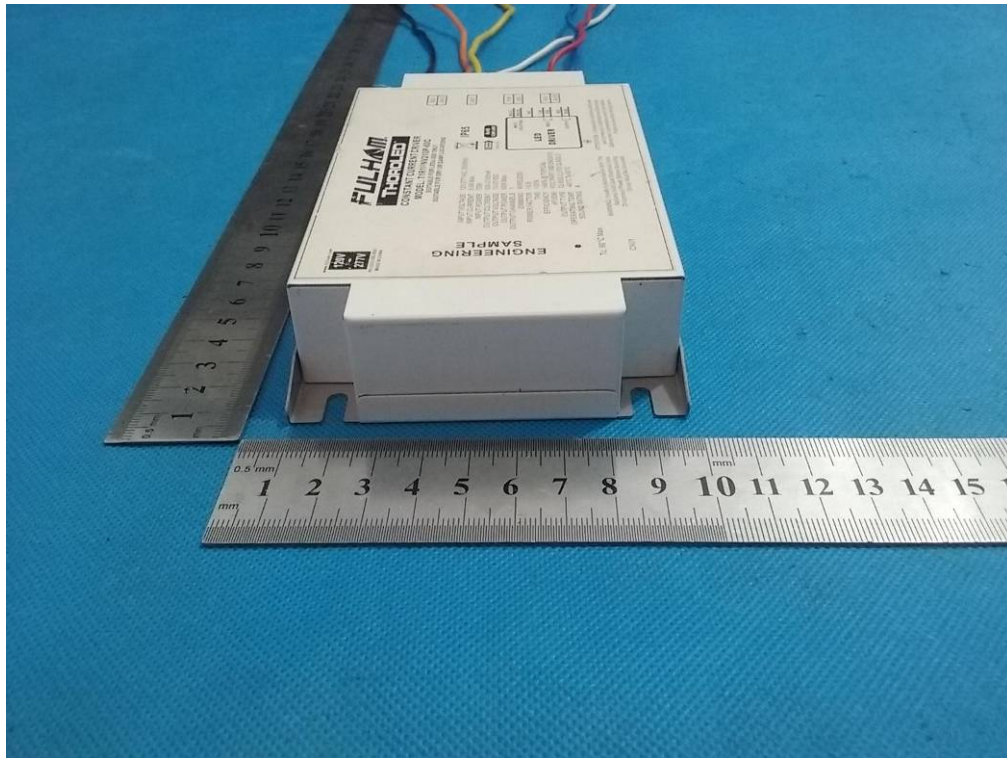
8.2 Conducted Emissions Test Setup



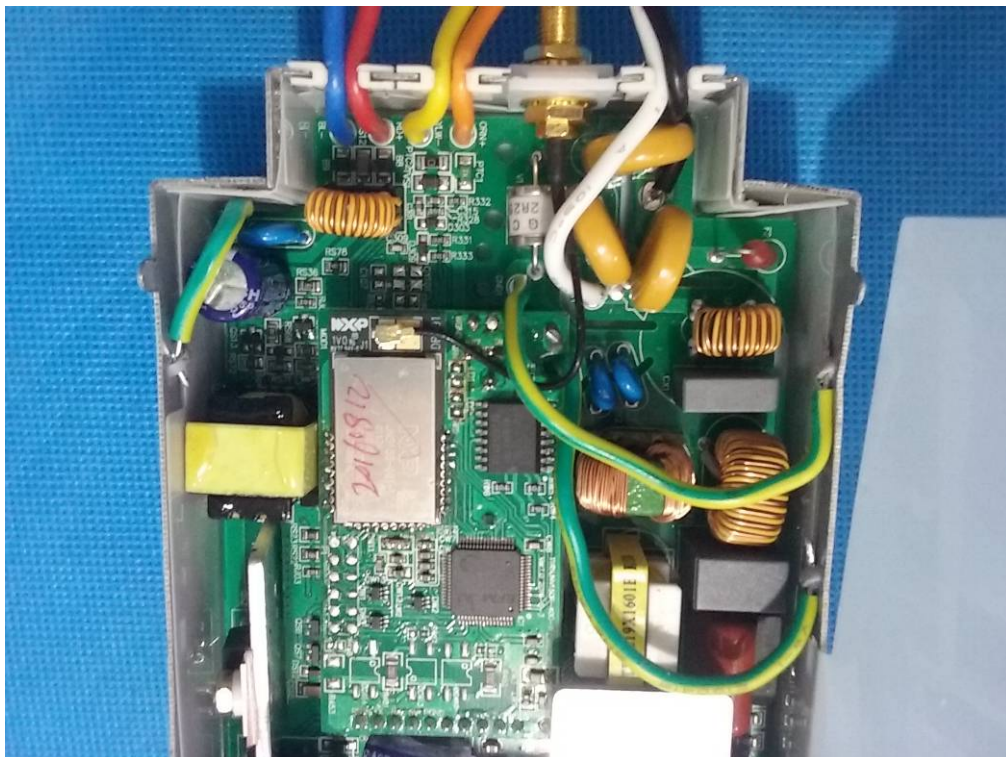
9 APPENDIX-Photographs of EUT Constructional Details

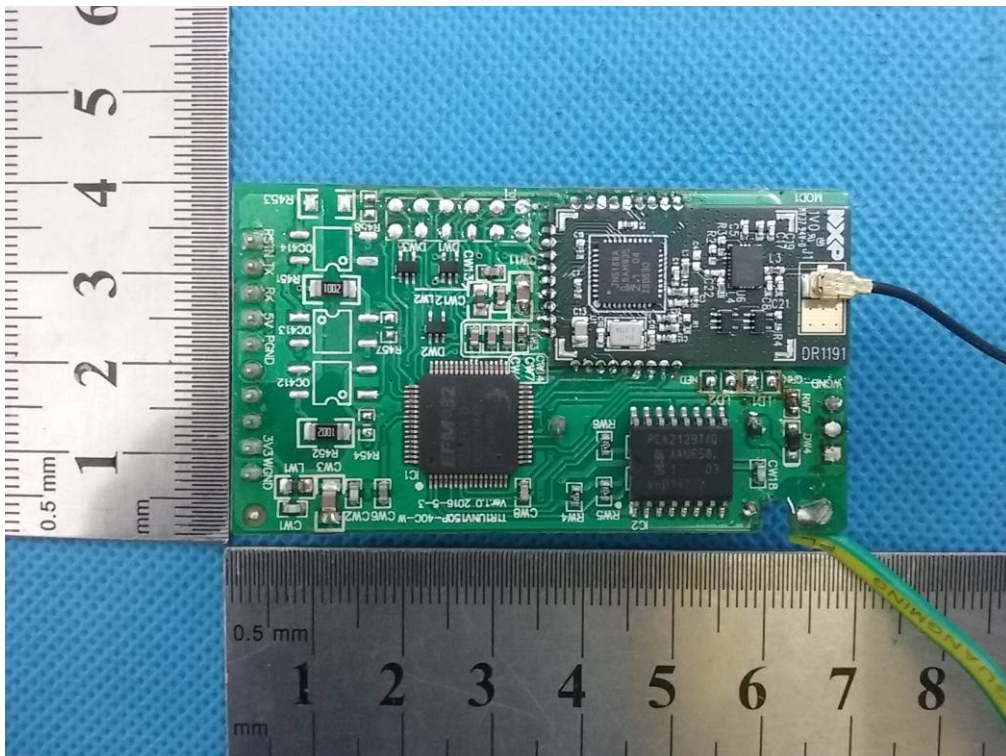
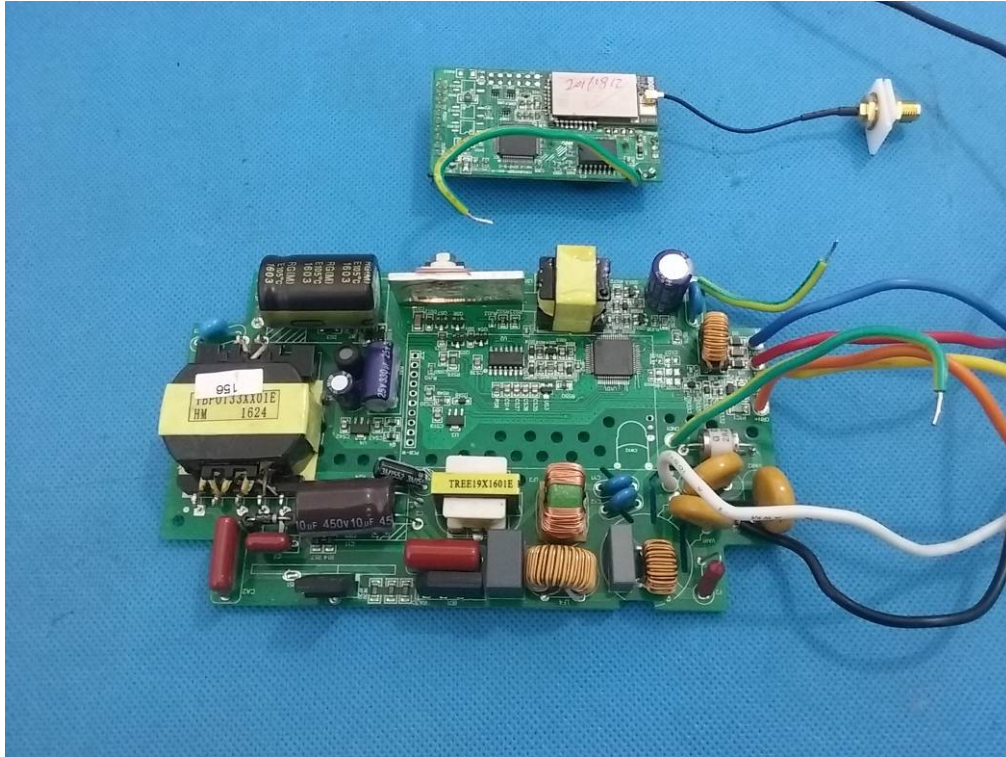


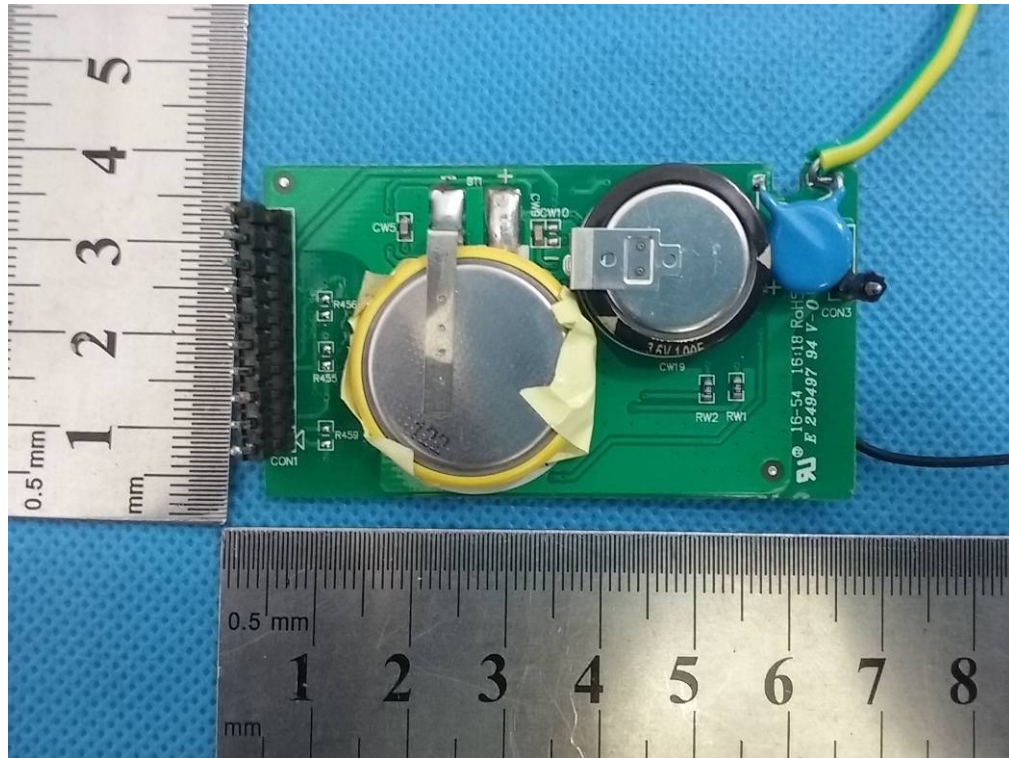


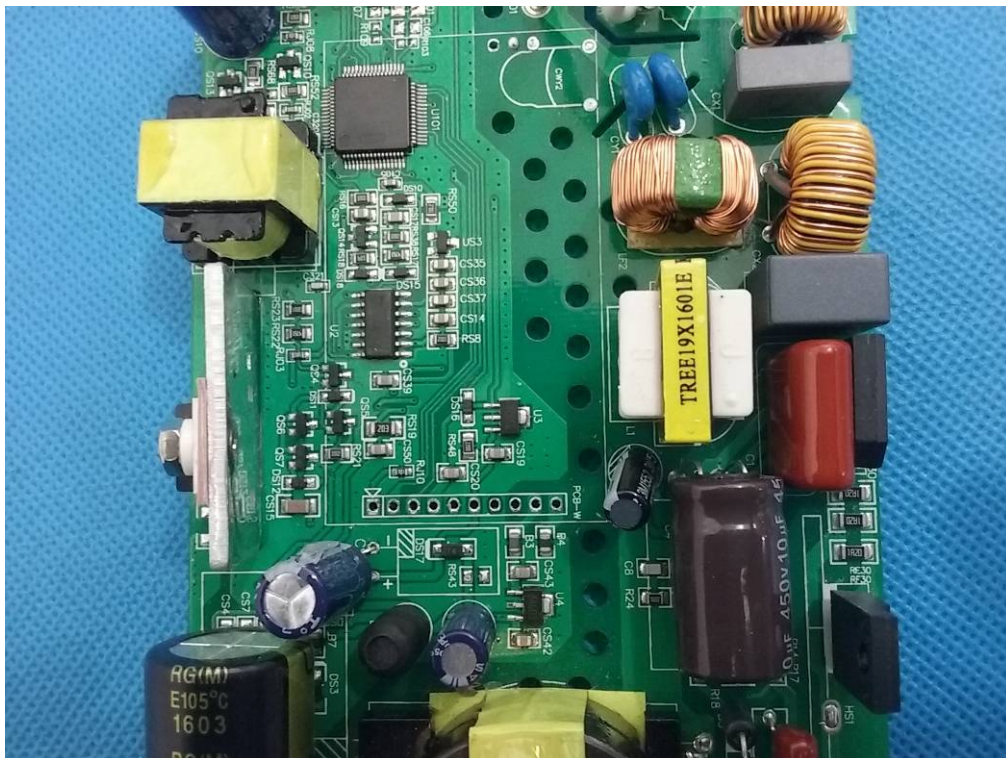
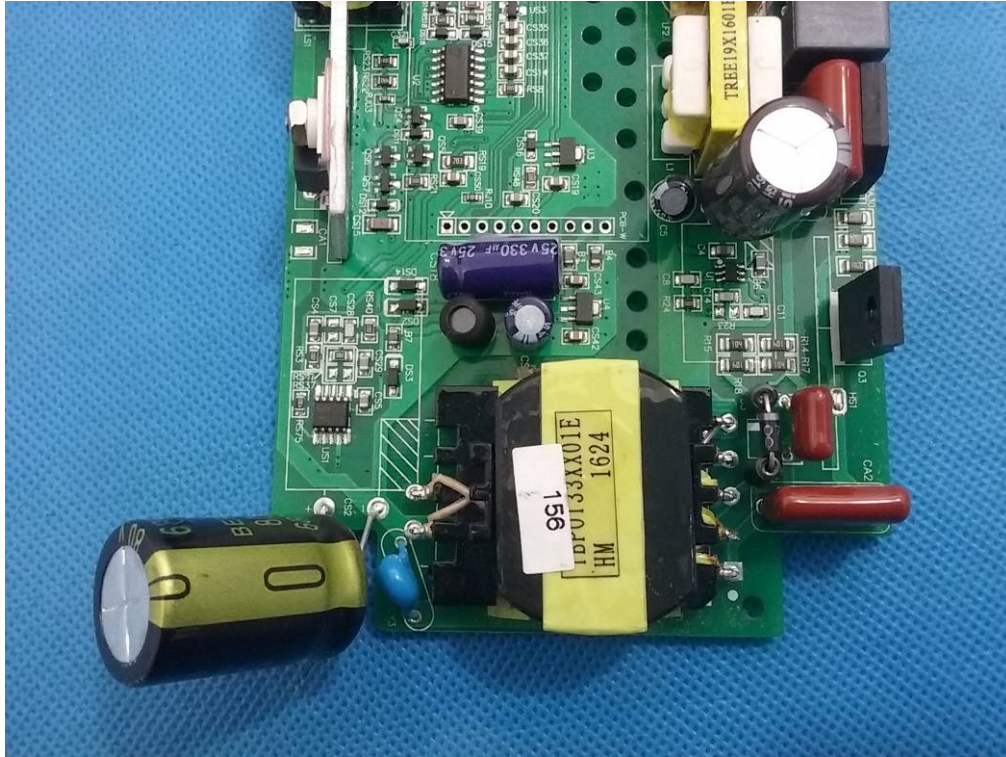


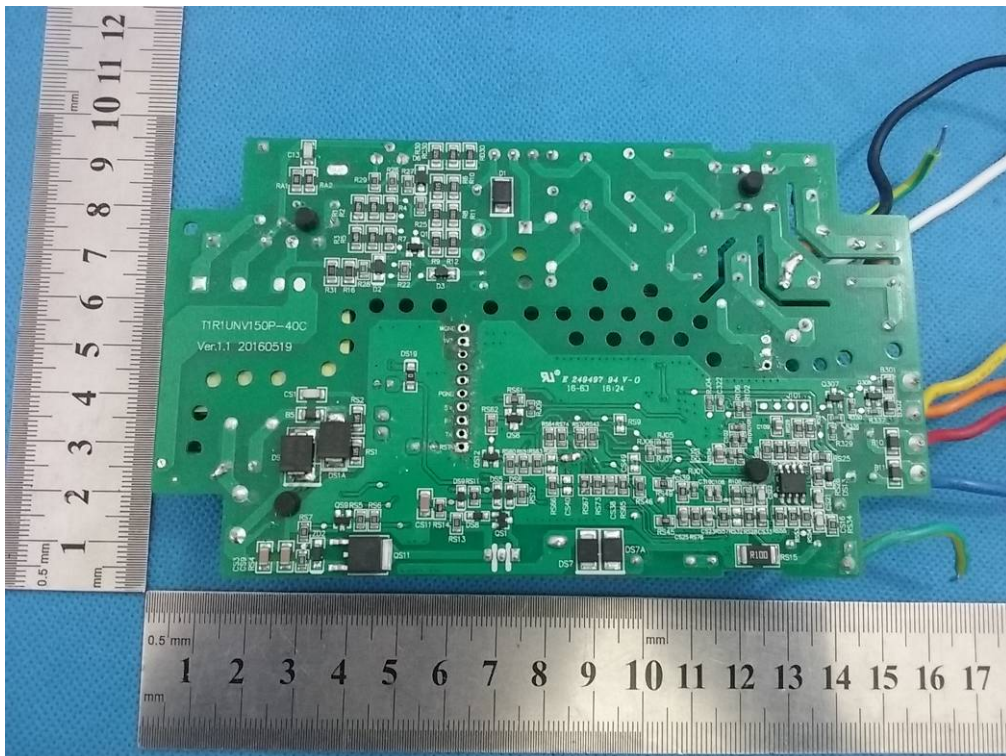
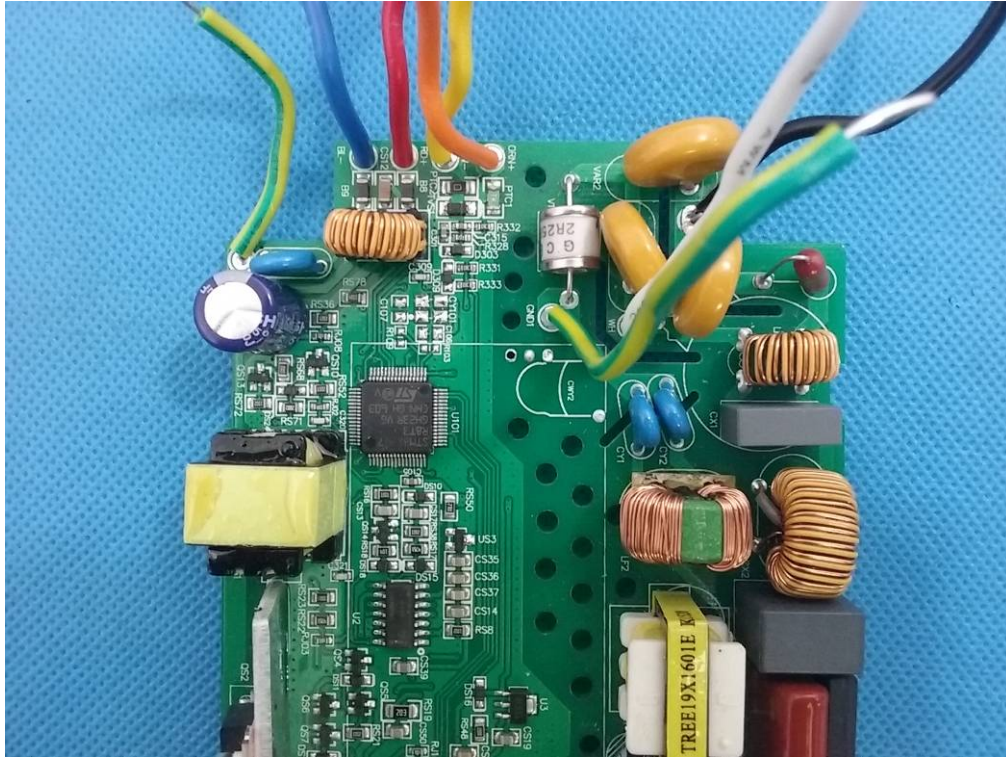


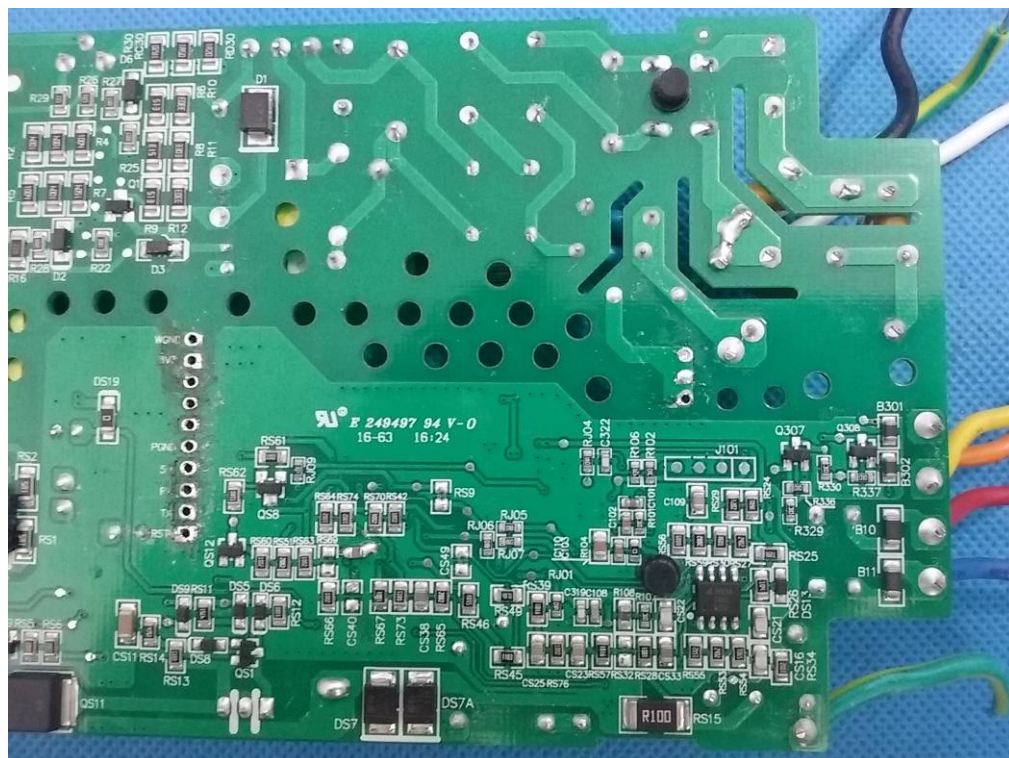
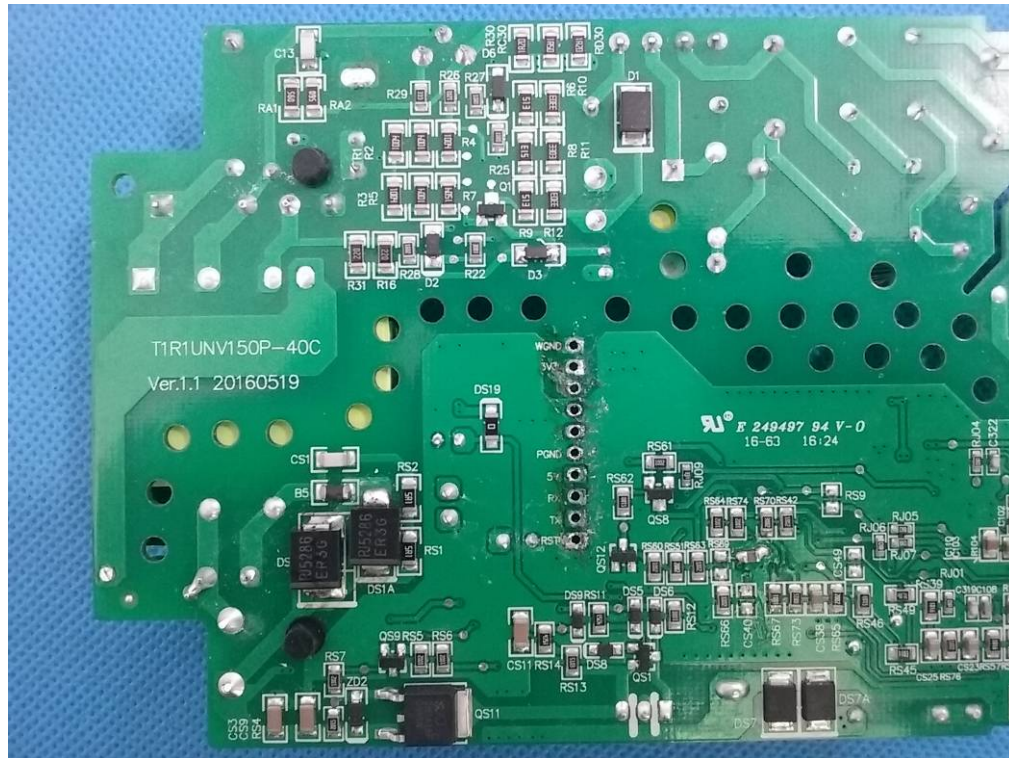


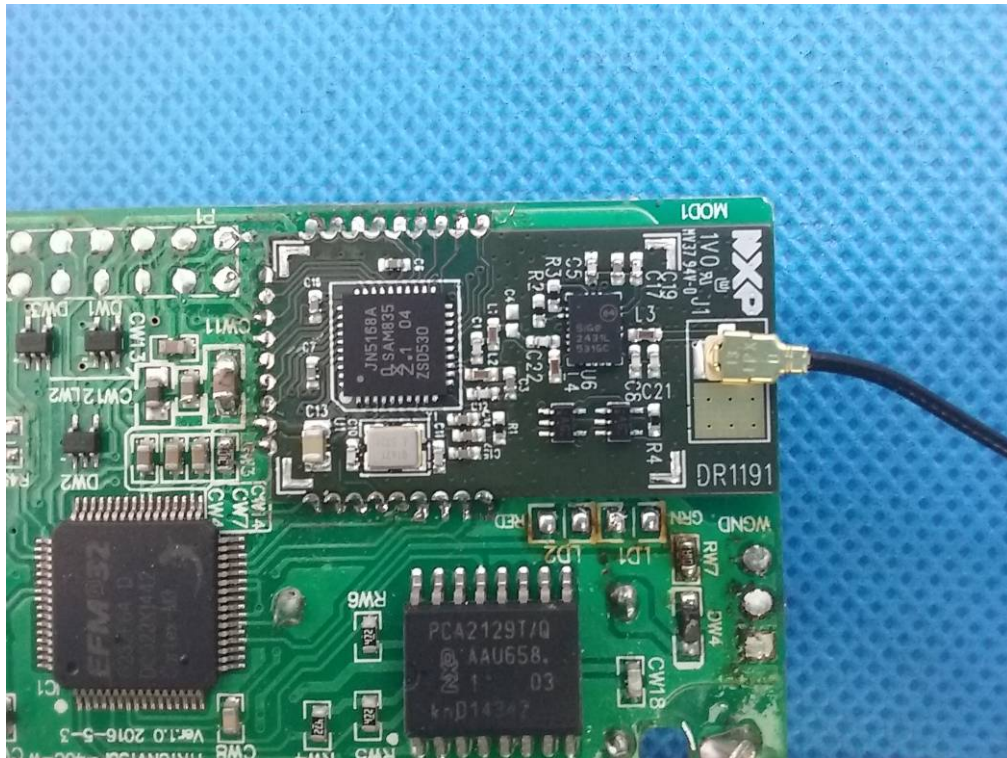












End of report