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Report No.: GZEM140800441801
Page: 1 of 31
FCC ID: ZKW20140904001

TEST REPORT

Application No.:	GZEM1408004418RF
Applicant:	UDIRC TOYS INDUSTRY CO.,LTD
FCC ID:	ZKW20140904001
Product Name:	RC Boat Series
Product Description:	Remote control boat with 2.4GHz as carrier.
Model No.:	UDI001, UDI002, UDI003, UDI004, UDI005, UDI006, UDI007, UDI008, UDI009, UDI010, UDI011, UDI012, UDI013, UDI014, UDI015, UDI016, UDI017, UDI018, UDI019, UDI020, UDI021, UDI022, UDI023, UDI024, UDI025, UDI026, UDI027, UDI028, UDI029, UDI030 ♣
♣	Please refer to section 3 of this report for details
Standards:	CFR 47 PART 15 Subpart C: 2013 section 15.249
Date of Receipt:	2014-09-03
Date of Test:	2014-09-21 to 2014-10-10
Date of Issue:	2014-11-10
Test Result :	Pass*

* In the configuration tested, the EUT complied with the standards specified above.

Jerry Chan
Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.


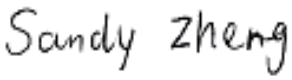

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2014-11-10		Original

Authorized for issue by:			
Tested By			2014-09-21 to 2014-10-10
	(Bill Ma) / Project Engineer		Date
Prepared By			2014-10-13
	(Sandy Zheng) / Clerk		Date
Checked By			2014-10-14
	(Fred Zhu) / Reviewer		Date



3 Test Summary

TEST	TEST REQUIREMENT	TEST METHOD	RESULT
Field Strength of Fundamental	FCC PART 15 C section 15.249 (a)	ANSI C63.10: Clause 6.6	PASS
Field Strength of Unwanted Emissions	FCC PART 15 C section 15.249 (a) section 15.249 (d)	ANSI C63.10: Clause 6.4, 6.6 and 6.7	PASS
Band Edges	FCC PART 15 C section 15.249 (d)	ANSI C63.10: Clause 6.9.2	PASS
Occupied Bandwidth	FCC PART 15 C section 15.215(c)	ANSI C63.10: Clause 6.9.1	PASS
Conducted Emissions at Mains Terminals	FCC PART 15 C section 15.207	ANSI C63.10: Clause 6.2	PASS

Remark:

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 C63.10:2009 in the whole report.

♣ Model No.: UDI001, UDI002, UDI003, UDI004, UDI005, UDI006, UDI007, UDI008, UDI009, UDI010, UDI011, UDI012, UDI013, UDI014, UDI015, UDI016, UDI017, UDI018, UDI019, UDI020, UDI021, UDI022, UDI023, UDI024, UDI025, UDI026, UDI027, UDI028, UDI029, UDI030

According to the confirmation from the applicant, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, only difference is the model names and appearance.

Therefore only one item **UDI001** was tested in this report.



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5 General Information

5.1 Client Information

Applicant: UDIRC TOYS INDUSTRY CO.,LTD
Address of Applicant: CHENGHAI DISTRICT, SHANTOU CITY, GUANGDONG PROVINCE, CHINA

5.2 General Description of E.U.T.

Product Name: RC Boat Series
Model No.: UDI001

5.3 Details of E.U.T.

Operating Frequency: 2405 MHz to 2475MHz
Type of Modulation: GFSK
Number of Channels: 71
Channel Separation: 1 MHz
Antenna Type: Integral Antenna
Antenna gain: 3 dBi
Function: Transmitter with GFSK modulation between 2.405GHz to 2.475GHz to transmit radio signal.
Power Supply: NI-MH SC600mAh 3.7V x 1 for Rx
DC 6.0V Size "AA" batteries x 4 for Tx
AC 120V for adapter
Adapter: Supply by SGS
Power cord: 0.8 m x4 unshielded cable for DC input

5.4 Description of Support Units

The EUT has been test as an independent unit.

Supplied by SGS:

Description	Model No.	SN/Certificate NO
adapter	HJ-UL-060250	N/A

5.5 Other Information Requested by the Customer

None.

5.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.



5.7 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory,
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

5.6 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01:2006-10 and Rules of procedure IECEE 02:2006-10, and the relevant IECEE CB-Scheme Operational documents.



6 Equipment Used during Test

RE in Chamber						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2013-12-5	2014-12-5
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2014-04-19	2015-04-19
EMC0056	EMI Test Receiver	Rohde & Schwarz	ESCI	100236	2014-03-03	2015-03-03
EMC0528	RI High frequency Cable	SGS	20 m	N/A	2014-05-09	2015-05-09
EMC2025	Trilog Broadband Antenna 30-1000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9160	9160-3372	2014-07-14	2017-07-14
EMC0524	Bi-log Type Antenna	Schaffner -Chase	CBL6112B	2966	2013-08-31	2016-08-31
EMC0519	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	2014-05-04	2017-05-04
EMC2026	Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-841	2013-08-31	2016-08-31
EMC0518	Horn Antenna	Rohde & Schwarz	HF906	100096	2012-07-01	2015-07-01
EMC0521	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A01649	2014-03-03	2015-03-03
EMC2065	Amplifier	HP	8447F	N/A	2014-08-25	2015-08-25
EMC0075	310N Amplifier	Sonoma	310N	272683	2014-03-03	2015-03-03
EMC0523	Active Loop Antenna	EMCO	6502	42963	2014-03-03	2016-03-03
EMC2041	Broad-Band Horn Antenna (14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9170	9170-375	2014-05-26	2017-05-26
EMC2069	2.4GHz filter	Micro-Tronics	BRM 50702	149	2014-04-19	2015-04-19
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2014-05-03	2016-05-03

General used equipment						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0006	DMM	Fluke	73	70681569	2014-09-15	2015-09-15
EMC0007	DMM	Fluke	73	70671122	2014-09-15	2015-09-15

7 Test Results

7.1 E.U.T. Operation

Test Voltage: DC 6.0V Size “AA” batteries x 4
Temperature: 20.0 -25.0 °C
Humidity: 38-50 % RH
Atmospheric Pressure: 1000 -1010 mbar

Test frequencies and frequency range: 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:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz 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

Frequency range of radiated emission measurements

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified



EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2405	27	2432	54	2459
1	2406	28	2433	55	2460
2	2407	29	2434	56	2461
3	2408	30	2435	57	2462
4	2409	31	2436	58	2463
5	2410	32	2437	59	2464
6	2411	33	2438	60	2465
7	2412	34	2439	61	2466
8	2413	35	2440	62	2467
9	2414	36	2441	63	2468
10	2415	37	2442	64	2469
11	2416	38	2443	65	2470
12	2417	39	2444	66	2471
13	2418	40	2445	67	2472
14	2419	41	2446	68	2473
15	2420	42	2447	69	2474
16	2421	43	2448	70	2475
17	2422	44	2449	/	/
18	2423	45	2450	/	/
19	2424	46	2451	/	/
20	2425	47	2452	/	/
21	2426	48	2453	/	/
22	2427	49	2454	/	/
23	2428	50	2455	/	/
24	2429	51	2456	/	/
25	2430	52	2457	/	/
26	2431	53	2458	/	/

Test frequencies are the lowest channel: 0 channel(2405 MHz), middle channel: 35 channel(2440 MHz) and highest channel: 70 channel(2475 MHz)

7.2 Antenna Requirement

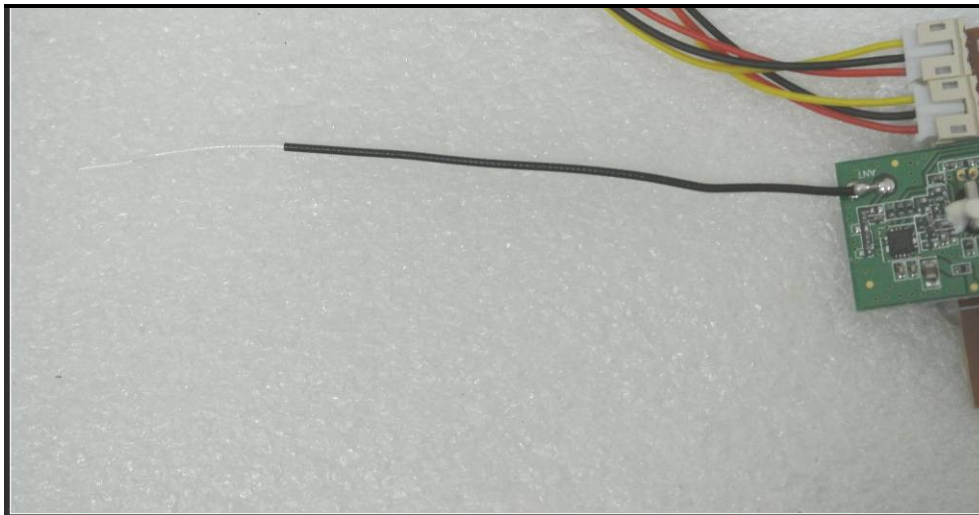
Standard requirement

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.

EUT Antenna

The antenna is an integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3 dBi.



Test result: The unit does meet the FCC requirements.



7.3 Field Strength of Fundamental& Field Strength of Unwanted Emissions& Band Edge

Test Requirement: FCC Part15 C section 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:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBµV/m @ 3m)	Field Strength of Harmonics (dBµV/m @ 3m)
902 to 928	94.0	54.0
2400 to 2483.5	94.0	54.0
5725 to 5875	94.0	54.0
24000 to 24250	108.0	68.0

(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 Section 15.209, whichever is the lesser attenuation.

Limits: The fundamental frequency rang is in the frequency band of the EUT is 2405MHz ~ 2475MHz.

The limit for Average field strength dBµV/m for the fundamental frequency = 94.0 dBµV/m.

The limit for Peak field strength dBµV/m for the fundamental frequency = 114.0 dBµV/m.

No fundamental is allowed in the restricted bands.

The limit for average field strength dBµV/m for the harmonics = 54.0 dBµV/m.

The limit for peak field strength dBµV/m for the harmonics = 74.0 dBµV/m.

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or 54.0 dBµV/m in 15.209. Here the limit for the other emission is 54.0 dBµV/m.

Test Method: ANSI C63.10: Clause 6.4, 6.6 and 6.7 for Field Strength of Fundamental& Field Strength of Unwanted Emissions

ANSI C63.10: Clause 6.9.2 for Band Edge

Status Pre-test the EUT in continuous transmitting mode with setup as stand-alone in X, Y, Z threes axes, found the worst case is X axes and report the data.

Measurement Distance: 3m (Semi-Anechoic Chamber)

Frequency range 9 kHz – 25 GHz for transmitting mode.
Test instrumentation resolution bandwidth
9 kHz (9 kHz - 30 MHz), 120 kHz (30 MHz - 1000 MHz), 1 MHz (1000 MHz – 25 GHz)

Test Procedure:

1) 9 kHz to 30 MHz emissions:

For testing performed with the loop antenna, testing was performed in accordance to ANSI C63.10. The centre of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT, During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

2) 30 MHz to 1 GHz emissions:

For testing performed with the bi-log type antenna, testing was performed in accordance to ANSI C63.10. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

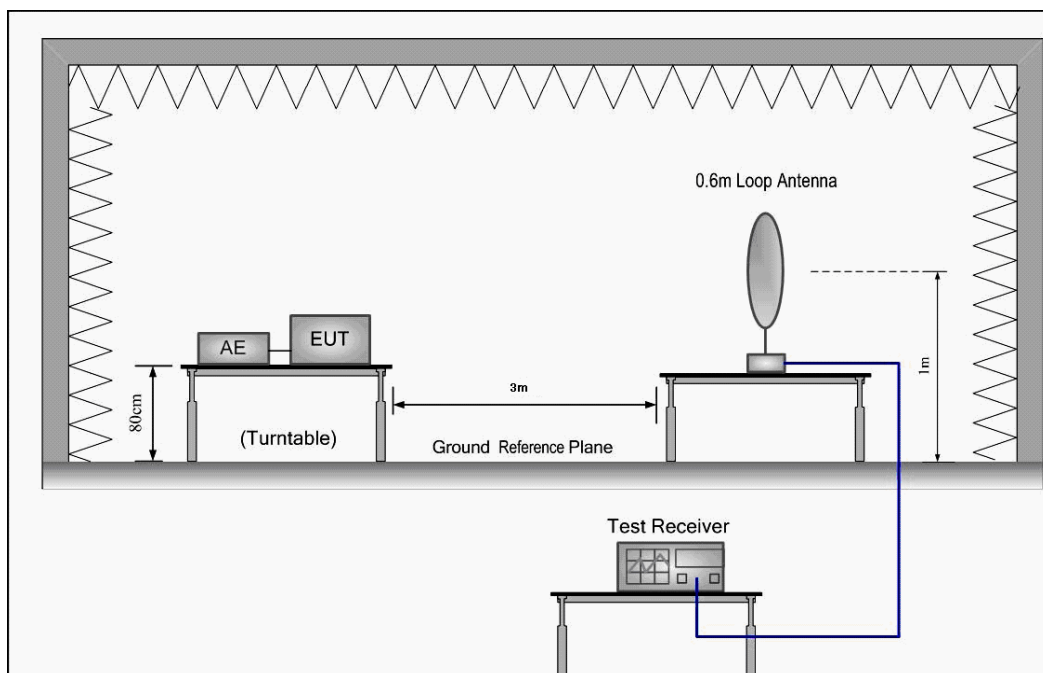
3) 1 GHz to 25 GHz emissions:

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.

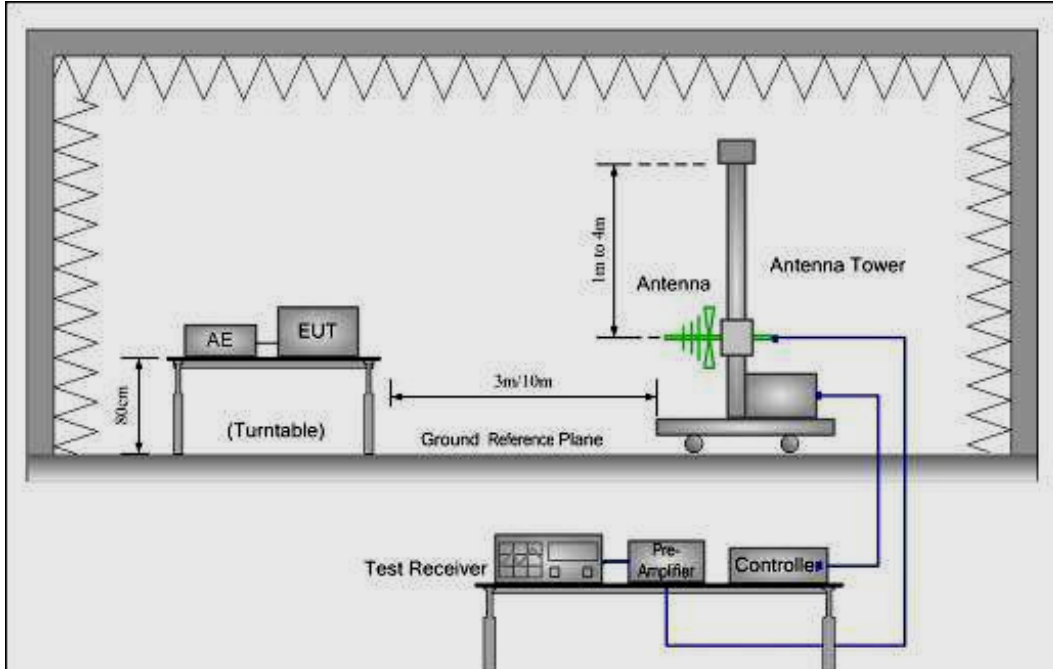
For testing performed with the horn antenna, testing was performed in accordance to ANSI C63.10. The measurement is performed with the EUT rotated 360°, the antenna height scan between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

Test Configuration:

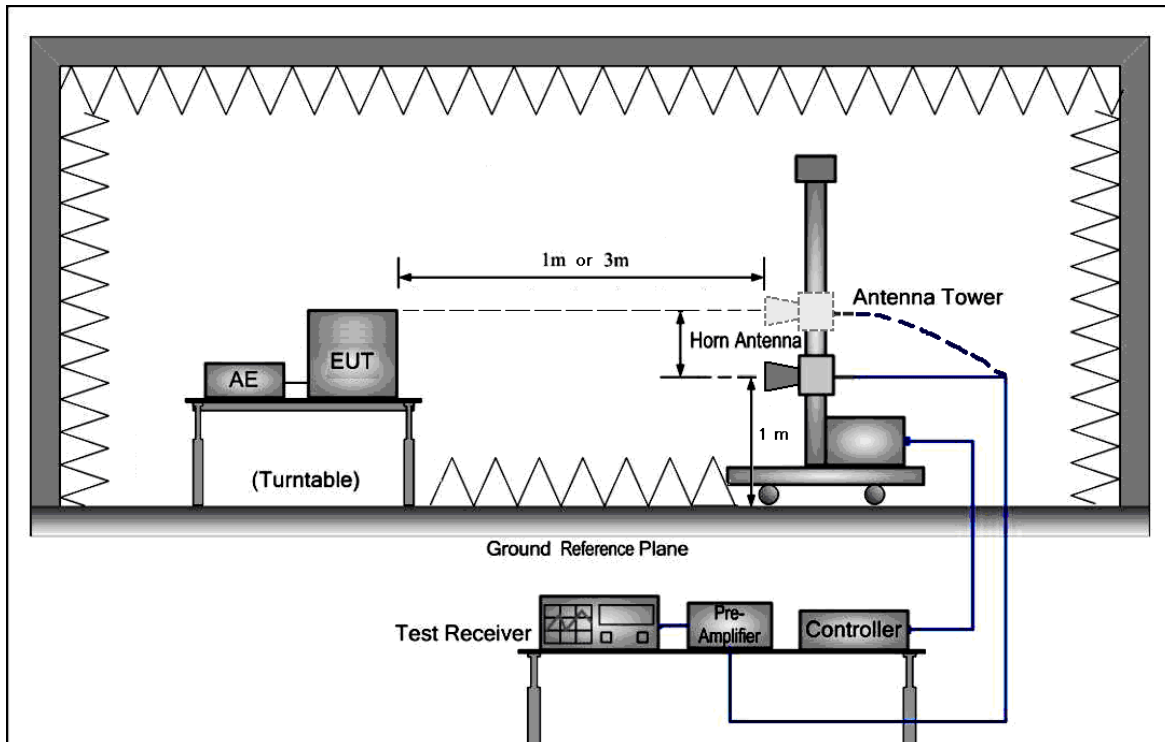
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



The field strength is calculated by adding the Antenna Factor, Cable Loss & Per-amplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Preamplifier Factor}$$



And according 15.35(a)

15.35(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

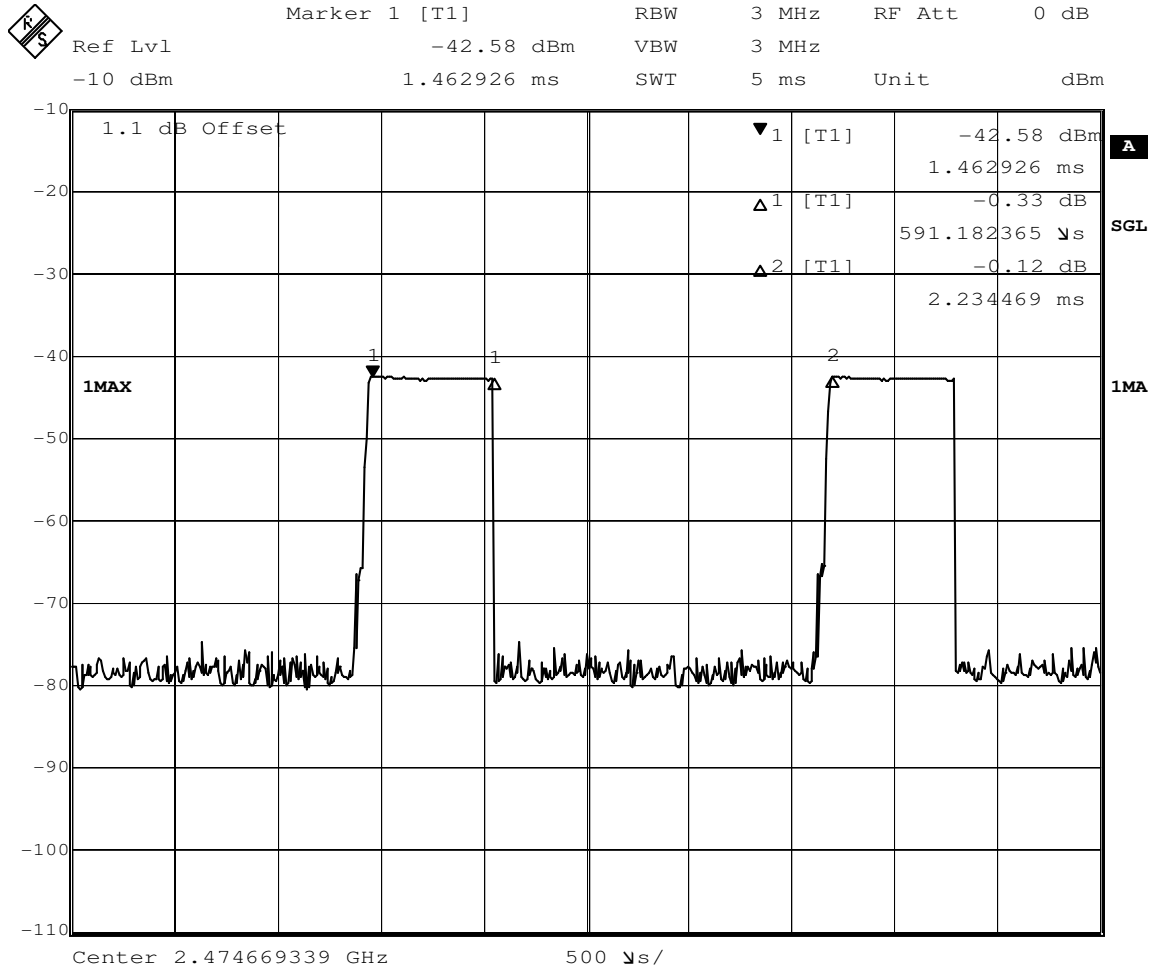
Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

According to 15.35 (b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.255, and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle), where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log(841.683367 \cdot 601.202405 / 841.683367) = 20\log(0.285714) = -11.549\text{dB}$$

Please refer to below plots for more details.



Remark: All operation modes were checked in the test and forward & swerve mode is the worst case.

Test at low Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

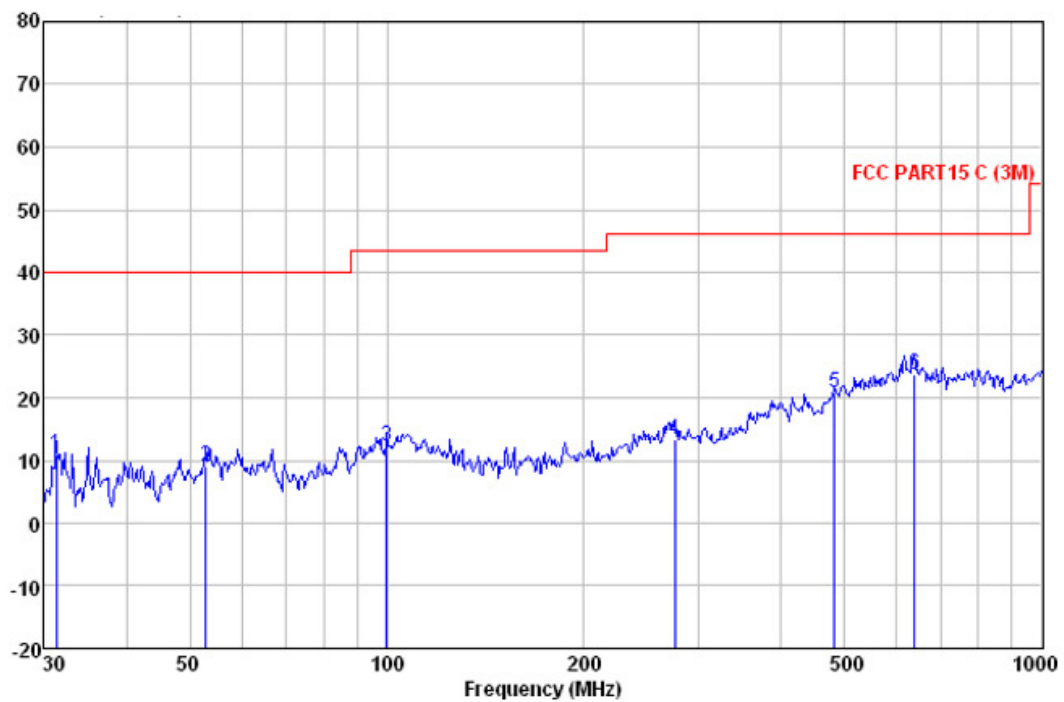
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

Vertical:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

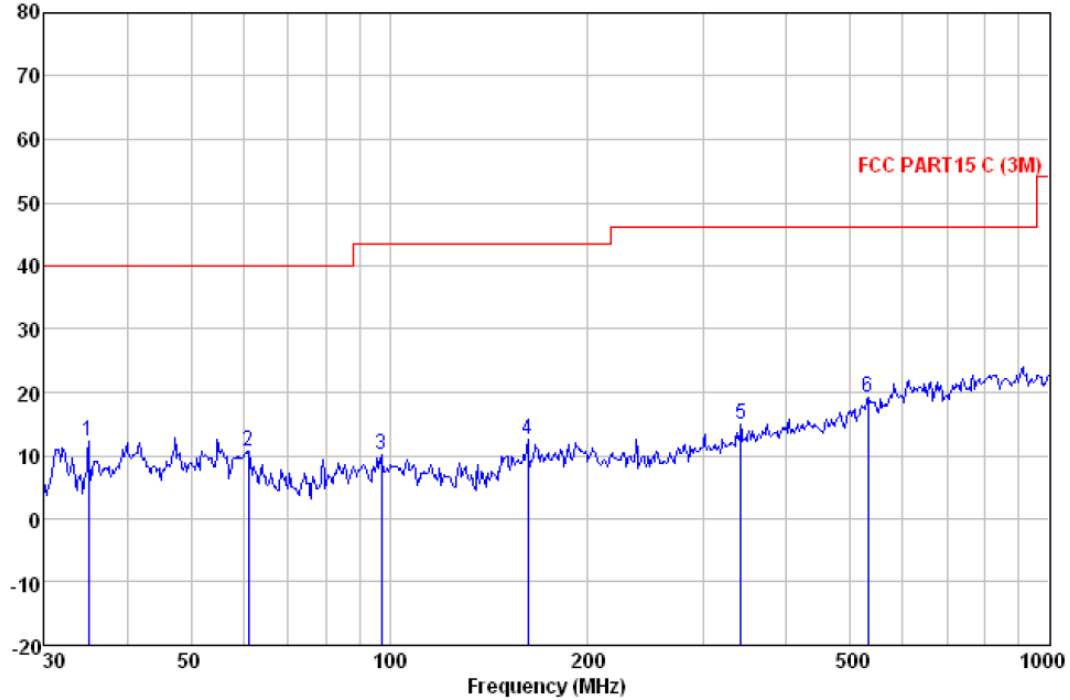
Freq MHz	Read Level dB μ V	Antenna Factor dB/m	Cable Loss dB	Preamp Factor dB	Level dB μ V/m	Limit Line dB μ V/m	Over Limit dB	Remark
31.289	29.49	12.32	0.84	31.60	11.05	40.00	-28.95	QP
52.945	26.53	13.11	1.04	31.60	9.08	40.00	-30.92	QP
99.878	29.20	13.16	1.43	31.60	12.19	43.50	-31.31	QP
275.157	29.72	12.55	2.25	31.30	13.22	46.00	-32.78	QP
482.216	32.94	16.13	3.04	31.19	20.92	46.00	-25.08	QP
638.369	32.99	18.59	3.41	31.26	23.73	46.00	-22.27	QP



Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamplifier Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
35.005	30.81	12.30	0.88	31.60	12.39	40.00	-27.61	QP
61.132	28.79	12.29	1.13	31.60	10.61	40.00	-29.39	QP
97.115	27.42	12.97	1.40	31.60	10.19	43.50	-33.31	QP
162.041	33.51	8.72	1.76	31.37	12.62	43.50	-30.88	QP
340.782	29.35	14.15	2.52	31.21	14.81	46.00	-31.19	QP
531.964	30.10	17.20	3.09	31.23	19.16	46.00	-26.84	QP



1~25 GHz Field Strength of Fundamental & Field Strength of Unwanted Emissions.

Peak & Average Measurement

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2405	27.58	6.60	38.25	83.71	79.64	114.00	V
4810	31.53	11.11	38.57	48.17	52.24	74.00	V
7215	36.47	12.96	38.85	42.45	53.03	74.00	V
9620	38.08	15.16	39.71	42.08	55.61	74.00	V
2405	27.58	6.60	38.25	87.38	83.31	114.00	H
4810	31.53	11.11	38.57	50.13	54.20	74.00	H
7215	36.47	12.96	38.85	43.03	53.61	74.00	H
9620	38.08	15.16	39.71	44.88	58.41	74.00	H
Average Measurement:							
Frequency (MHz)	20log (Duty cycle) (dB)		Peak Level (dBμV)	Average Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization	
2405	-11.55		79.64	68.09	94.00	V	
4810			52.24	40.69	54.00	V	
7215			53.03	41.48	54.00	V	
9620			55.61	44.06	54.00	V	
2405			83.31	71.76	94.00	H	
4810			54.20	42.65	54.00	H	
7215			53.61	42.06	54.00	H	
9620			58.41	46.86	54.00	H	



Band Edge:

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	38.25	46.71	42.60	74.00	V
2483.50	27.55	6.99	38.26	47.63	43.91	74.00	V
2400.00	27.58	6.56	38.25	46.37	42.26	74.00	H
2483.50	27.55	6.99	38.26	46.97	43.25	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	38.25	42.98	38.87	54.00	V
2483.50	27.55	6.99	38.26	43.23	39.51	54.00	V
2400.00	27.58	6.56	38.25	42.62	38.51	54.00	H
2483.50	27.55	6.99	38.26	42.83	39.11	54.00	H



Test at middle Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

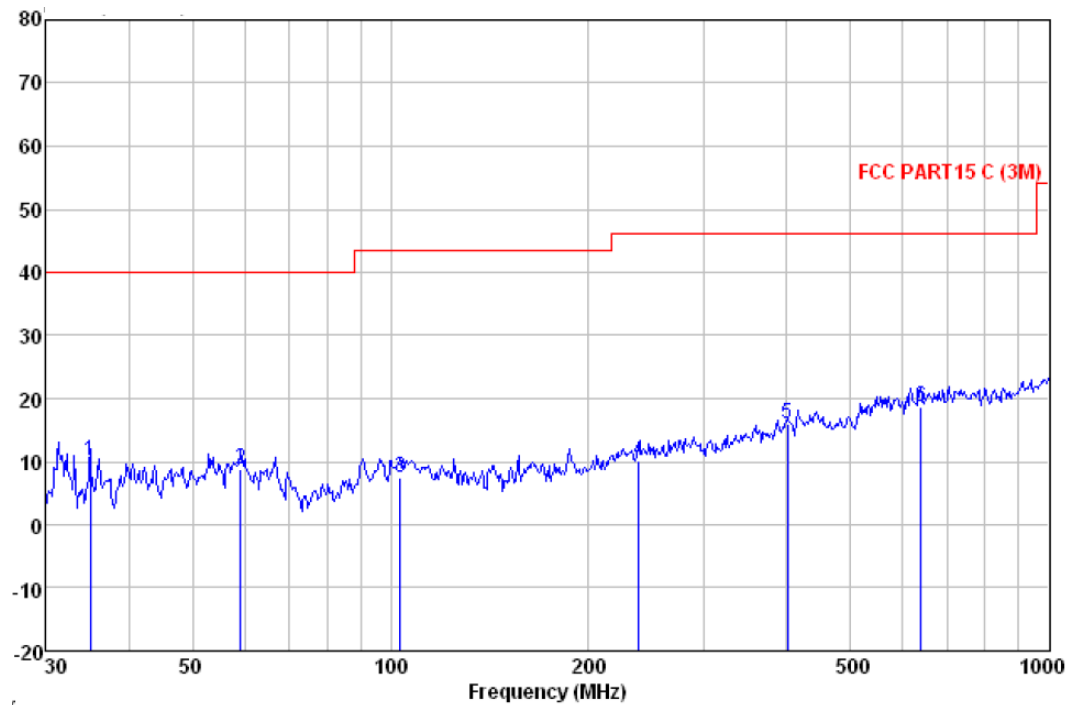
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



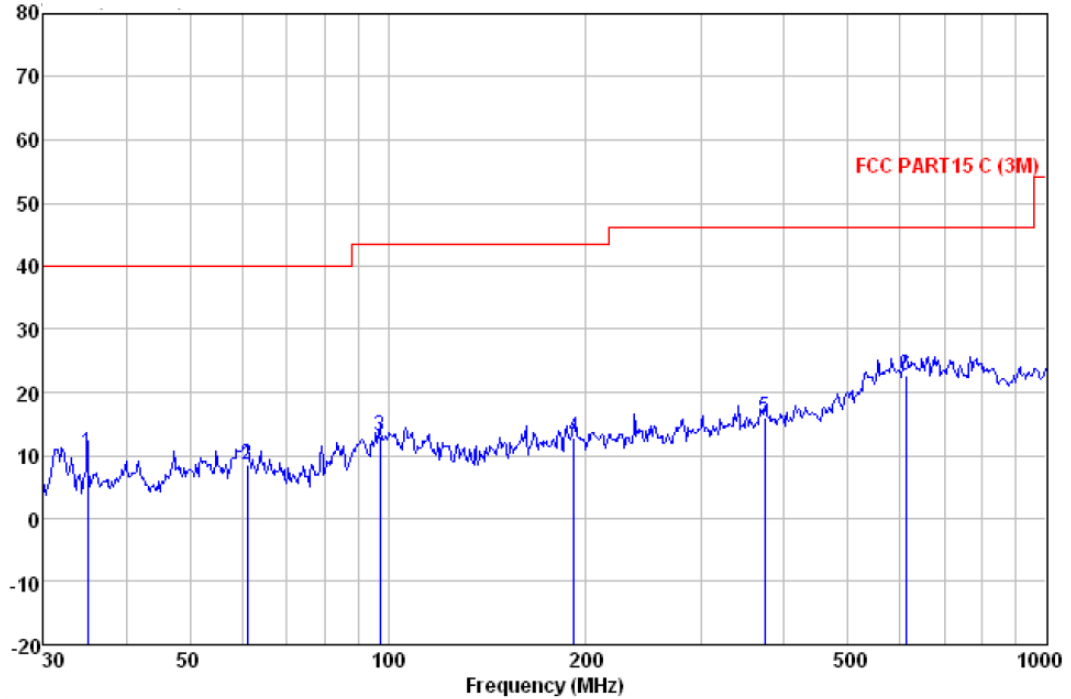
Quasi-peak measurement

Freq	ReadAntenna Level	ReadAntenna Factor	Cable Loss	Preamplifier Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
35.005	28.51	12.30	0.88	31.60	10.09	40.00	-29.91	QP
59.232	26.59	12.74	1.11	31.60	8.84	40.00	-31.16	QP
103.442	24.92	12.82	1.45	31.59	7.60	43.50	-35.90	QP
238.310	27.31	11.99	2.09	31.30	10.09	46.00	-35.91	QP
400.432	29.32	15.10	2.71	31.10	16.03	46.00	-29.97	QP
638.369	27.99	18.59	3.41	31.26	18.73	46.00	-27.27	QP

Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

Freq	ReadAntenna	Cable	Preamp	Limit	Over			
MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	dB μ V	dB/m	dB	dB	dB μ V/m	dB μ V/m	dB	
35.005	28.81	12.30	0.88	31.60	10.39	40.00	-29.61	QP
61.132	26.79	12.29	1.13	31.60	8.61	40.00	-31.39	QP
97.115	30.42	12.97	1.40	31.60	13.19	43.50	-30.31	QP
191.745	31.80	10.56	1.86	31.31	12.91	43.50	-30.59	QP
373.311	29.88	14.54	2.63	31.14	15.91	46.00	-30.09	QP
612.064	32.25	18.50	3.32	31.29	22.78	46.00	-23.22	QP



1~25 GHz Field Strength of Fundamental & Field Strength of Unwanted Emissions.

Peak & Average Measurement

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2440	27.57	6.81	38.26	89.63	85.75	114.00	V
4880	31.57	11.24	38.56	44.89	49.14	74.00	V
7320	36.50	13.28	38.88	42.75	53.65	74.00	V
9760	38.46	15.05	39.74	43.99	57.76	74.00	V
2440	27.57	6.81	38.26	86.25	82.37	114.00	H
4880	31.57	11.24	38.56	45.86	50.11	74.00	H
7320	36.50	13.28	38.88	44.03	54.93	74.00	H
9760	38.46	15.05	39.74	45.40	59.17	74.00	H
Average Measurement:							
Frequency (MHz)	20log (Duty cycle) (dB)		Peak Level (dBμV)	Average Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization	
2440	-11.55		85.75	74.20	94.00	V	
4880			49.14	37.59	54.00	V	
7320			53.65	42.10	54.00	V	
9760			57.76	46.21	54.00	V	
2440			82.37	70.82	94.00	H	
4880			50.11	38.56	54.00	H	
7320			54.93	43.38	54.00	H	
9760			59.17	47.62	54.00	H	



Band Edge:

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	38.25	46.40	42.29	74.00	V
2483.50	27.55	6.99	38.26	46.08	42.36	74.00	V
2400.00	27.58	6.56	38.25	46.72	42.61	74.00	H
2483.50	27.55	6.99	38.26	45.02	41.30	74.00	H

Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	38.25	42.95	38.84	54.00	V
2483.50	27.55	6.99	38.26	40.90	37.18	54.00	V
2400.00	27.58	6.56	38.25	41.64	37.53	54.00	H
2483.50	27.55	6.99	38.26	41.8	38.08	54.00	H

Test at high Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

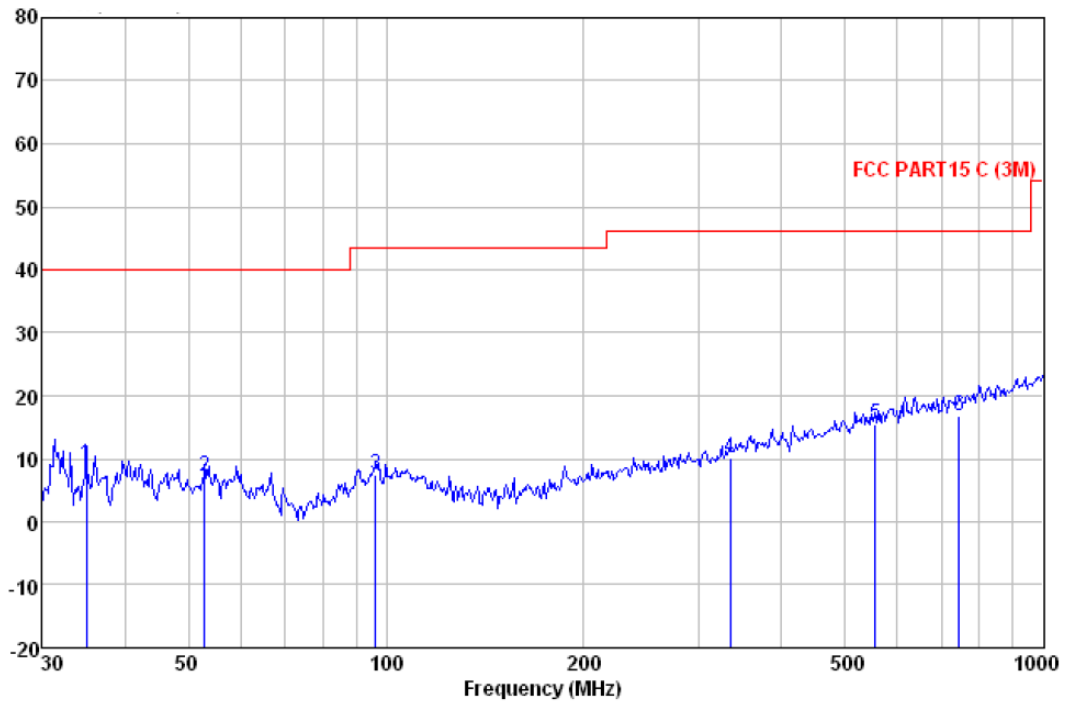
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

Vertical:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

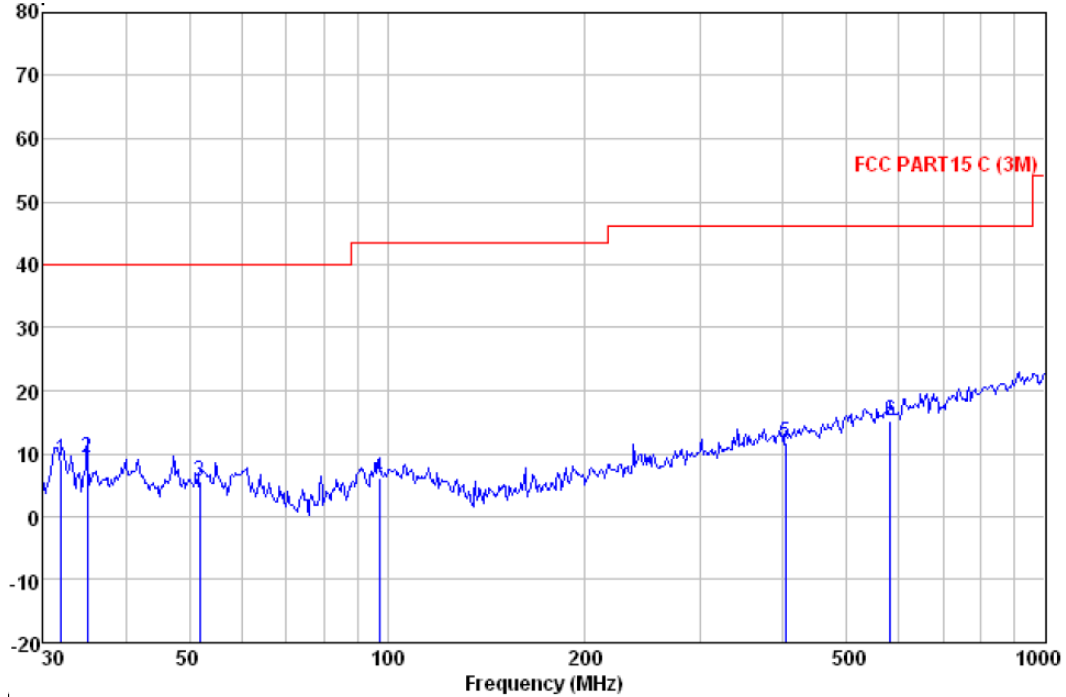
Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
MHz	dB μ V	dB/m	dB	dB	dB μ V/m	dB μ V/m	dB	
35.005	27.51	12.30	0.88	31.60	9.09	40.00	-30.91	QP
52.945	24.53	13.11	1.04	31.60	7.08	40.00	-32.92	QP
96.436	24.77	12.94	1.40	31.60	7.51	43.50	-35.99	QP
333.687	24.98	13.92	2.49	31.22	10.17	46.00	-35.83	QP
554.825	25.82	17.67	3.11	31.26	15.34	46.00	-30.66	QP
744.866	24.98	19.39	3.69	31.20	16.86	46.00	-29.14	QP



Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

Freq	ReadAntenna	Cable	Preamp	Limit	Over	Remark
MHz	Level	Factor	Loss	Line	Limit	
	dB μ V	dB/m	dB	dB	dB μ V/m	dB
31.955	27.56	12.32	0.85	31.60	9.13	40.00 -30.87 QP
35.005	27.81	12.30	0.88	31.60	9.39	40.00 -30.61 QP
51.843	23.10	13.16	1.02	31.60	5.68	40.00 -34.32 QP
97.115	23.42	12.97	1.40	31.60	6.19	43.50 -37.31 QP
403.250	24.94	15.14	2.72	31.10	11.70	46.00 -34.30 QP
582.743	25.22	18.14	3.22	31.29	15.29	46.00 -30.71 QP



**1~25 GHz Field Strength of Fundamental & Field Strength of Unwanted Emissions.
 Peak & Average Measurement**

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2475	27.56	6.98	38.26	86.77	83.05	114.00	V
4950	31.68	11.37	38.56	48.9	53.39	74.00	V
7425	36.6	13.60	38.90	43.31	54.61	74.00	V
9900	38.68	14.94	39.78	43.56	57.40	74.00	V
2475	27.56	6.98	38.26	85.11	81.39	114.00	H
4950	31.68	11.37	38.56	47.53	52.02	74.00	H
7425	36.6	13.60	38.90	43.79	55.09	74.00	H
9900	38.68	14.94	39.78	44.26	58.10	74.00	H
Average Measurement:							
Frequency (MHz)	20log (Duty cycle) (dB)		Peak Level (dBμV)	Average Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization	
2475	-11.55		83.05	71.50	94.00	V	
4950			53.39	41.84	54.00	V	
7425			54.61	43.06	54.00	V	
9900			57.40	45.85	54.00	V	
2475			81.39	69.84	94.00	H	
4950			52.02	40.47	54.00	H	
7425			55.09	43.54	54.00	H	
9900			58.10	46.55	54.00	H	



Band Edge:

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	38.25	45.43	41.32	74.00	V
2483.50	27.55	6.99	38.26	47.18	43.46	74.00	V
2400.00	27.58	6.56	38.25	45.57	41.46	74.00	H
2483.50	27.55	6.99	38.26	45.60	41.88	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	38.25	42.61	38.50	54.00	V
2483.50	27.55	6.99	38.26	43.29	39.57	54.00	V
2400.00	27.58	6.56	38.25	41.35	37.24	54.00	H
2483.50	27.55	6.99	38.26	40.51	36.79	54.00	H

Remark:

- 1). 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.
- 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. All operation modes were checked in the test and forward & swerve mode is the worst case.
- 4). For Radiated Emissions fall in the restricted bands (2400MHz is worse case than 2390MHz and report it as above), which set out in Section 15.205 Restricted bands.
Also there is not any other emission which falls in restricted bands can be detected and reported.

Test result: The unit does meet the FCC requirements.

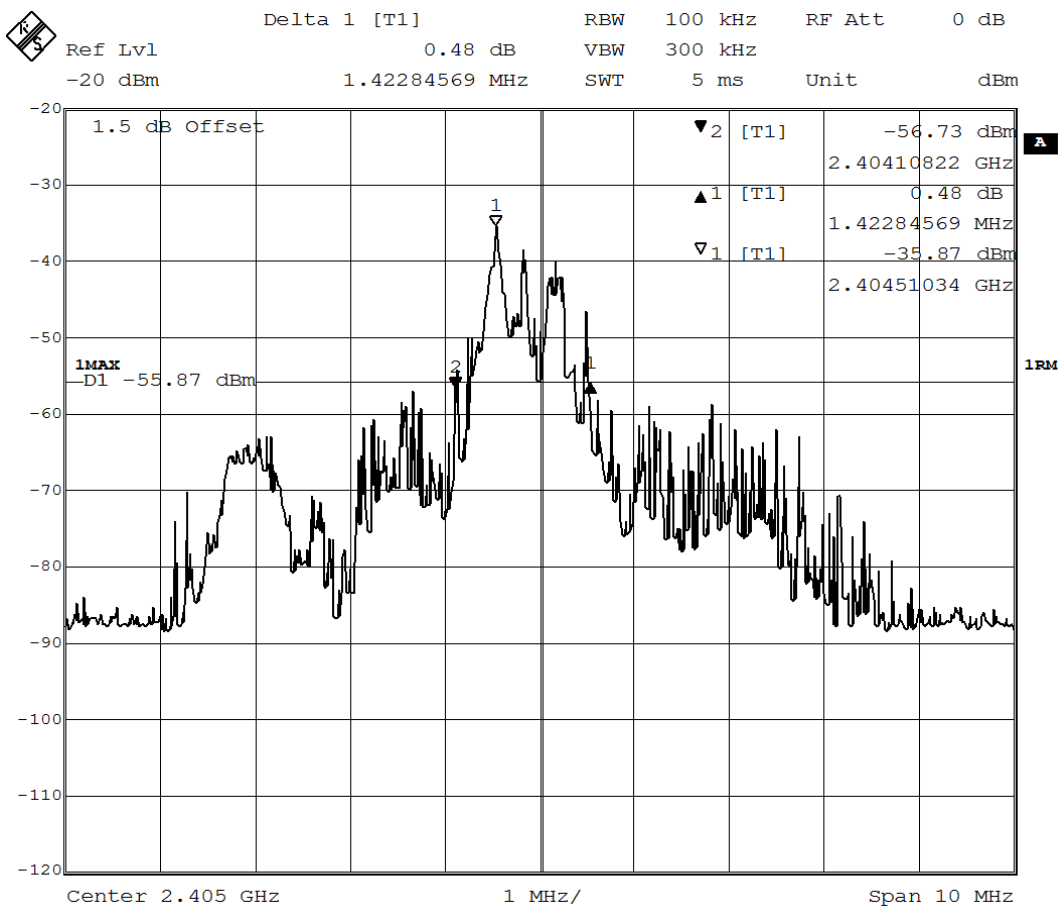
7.4 Occupied Bandwidth

Test Requirement: FCC Part 15 C section 15.249
 (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 Section 15.209, whichever is the lesser attenuation.

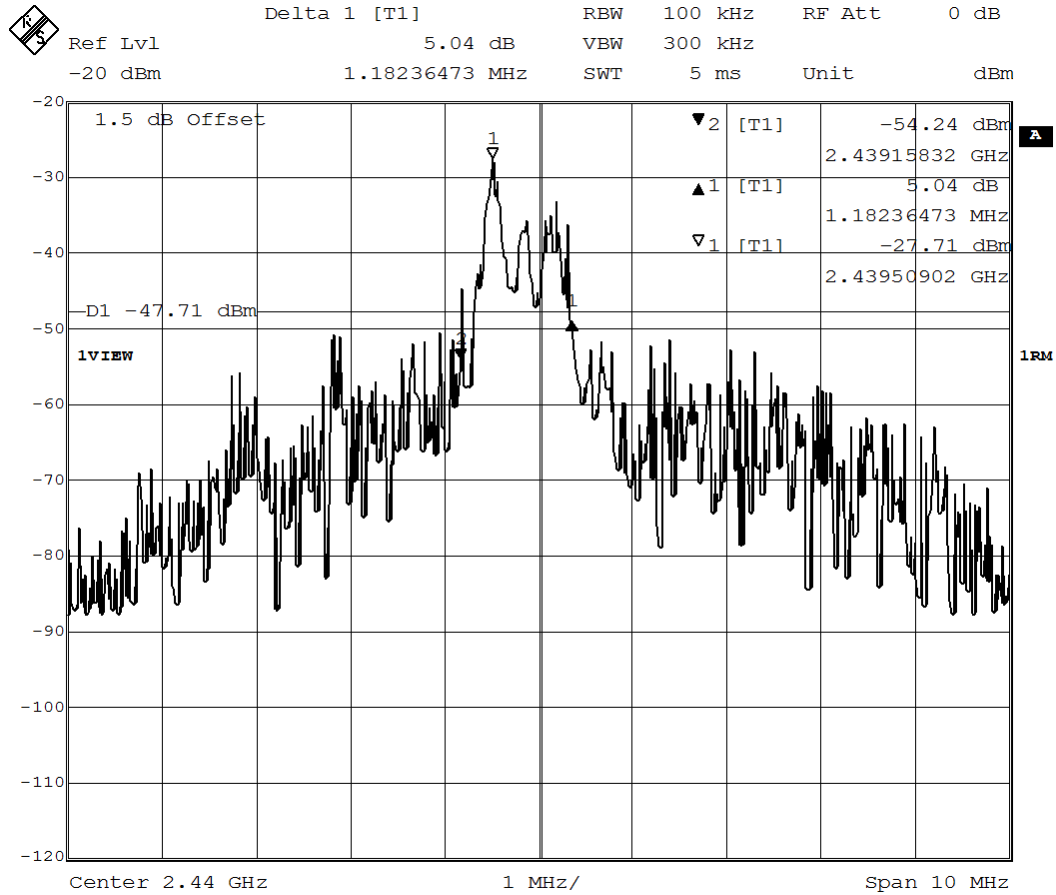
Test Method: ANSI C63.10: Clause 6.9.1
 Operation within the band 2.400 to 2.4835 GHz

Method of measurement: A small sample of the transmitter output was fed into the Spectrum Analyzer and the attached plot was taken.

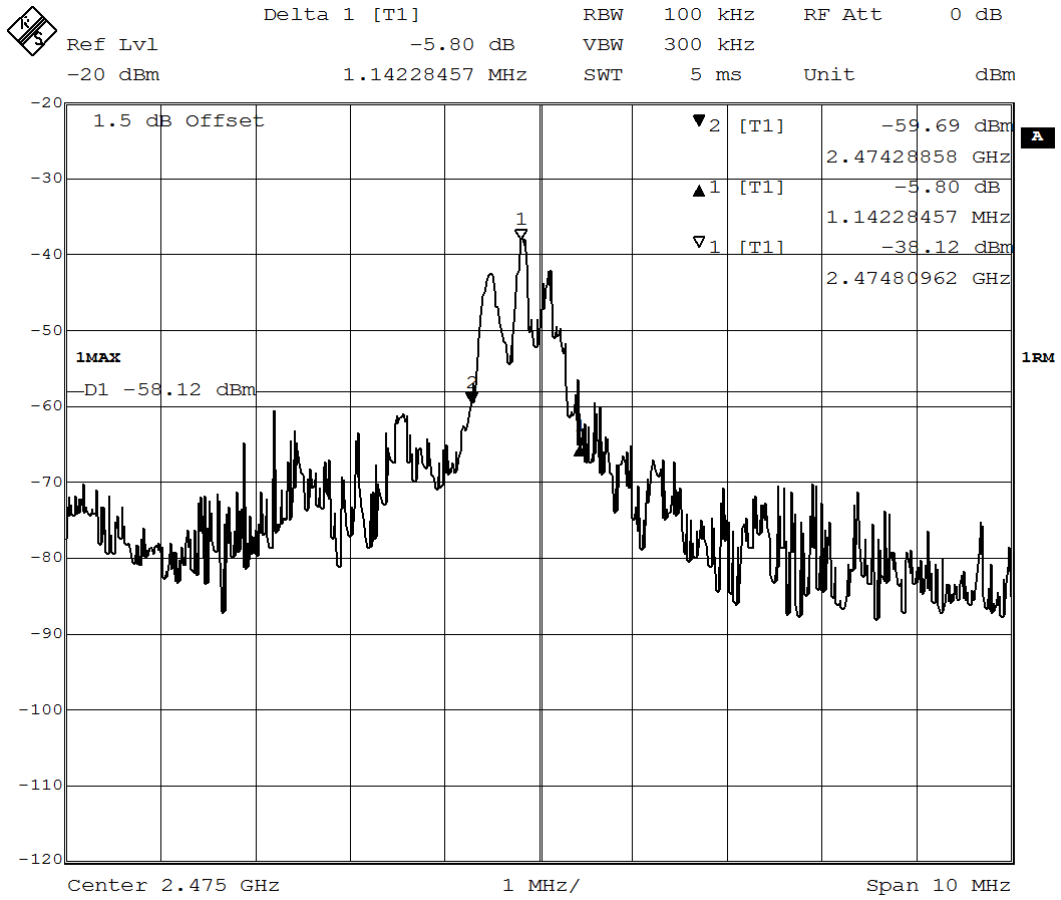
1. Test in the lowest frequency 2.405 GHz



2. Test in the middle frequency 2.440 GHz



3. Test in the highest frequency 2.475 GHz



The results: The unit does meet the FCC requirements.

--End of the report--