



SLG Asia Test Labs & Service (HK) Limited

Test Report

According to

FCC PART 15 Subpart C

FCC ID: S292402D

Test Report Number: H1M21204-0024-P-15



TEST REPORT

Summary | FCC Part 15C

Test Report No.: H1M21204-0024-P-15

Date of issue.....: 04.05.2012

Testing Laboratory name: SLG Asia Test Labs & Service (HK) Limited

Address.....: 26/F., Tamson Plaza, 161 Wai Yip Street,
Kwun Tong, Kowloon, Hong Kong

Applicant's name: GUANGZHOU Walkera Technology Co., Ltd.

Address.....: Taishi Industrial Park, Dongchong Town, Panyu District, 511475
Guangzhou, China

Manufacturer's name: GUANGZHOU Walkera Technology Co., Ltd.

Address.....: Taishi Industrial Park, Dongchong Town, Panyu District, 511475
Guangzhou, China

Test specification

Standard(s) applied: FCC Rules 47 CFR Part 15 Subpart C

Test item description: Transmitter for R/C Helicopter

Brand Name: devention, WALKERA

Model and/or type reference.....: 2402D

Rating(s): 12 VDC (8 x AA size batteries) or 9.6V Ni-MH battery pack

Summary of Test Results

Pass

The Summary of Test Results based on a technical opinion belongs to the applied standard(s).

Disclaimer

Further details of testing are provided in particular chapters of this Test Report.

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1 General Information

1.1 Test Report

Tested by:

04.05.2012

Mr. Karl Lau

Date

Test Engineer

Signature

Approved by:

04.05.2012

Mr. F. Schulz

Date

Laboratory Manager

Signature



1.2 Test Location

All tests were carrying by personnel from:

Name: SLG Asia Test Labs & Service (HK) Limited
Address: 26/F., Tamson Plaza, 161 Wai Yip Street
Kwun Tong, Kowloon, Hong Kong

Telephone: +852 2389 2200
Fax: +852 2389 3073

The Test facility for radiated measurements is located at:

Name : Hong Kong Productivity Council
Address: EMC Centre, LG1, HKPC Building, 78 Tat Chee Avenue
Kowloon, Hong Kong

The Hong Kong Laboratory Accreditation Scheme (HOKLAS)
Reg. No.082

FCC registered measurement facility
Reg. No.90656

1.3 Details of applicant

Name: GUANGZHOU Walkera Technology Co., Ltd.
Address: Taishi Industrial Park, Dongchong Town, Panyu District
511475 Guangzhou, China

Contact: Mr. Ya
Telephone: +86 20 8491 5116
Fax: +86 20 8491 5117

1.4 Manufacturer

Name: GUANGZHOU Walkera Technology Co., Ltd.
Address: Taishi Industrial Park, Dongchong Town, Panyu District
511475 Guangzhou, China

Contact: Mr. Ya
Telephone: +86 20 8491 5116
Fax: +86 20 8491 5117



1.5 Application details

Date of receipt of application: 25.04.2012
Date of receipt of test item: 25.04.2012
Date (s) of performance of tests: 25.04.2012 - 04.05.2012

1.6 Test item

Description of test item: Transmitter for R/C Helicopter
Type identification: 2402D
Brand Name: devention, WALKERA

Equipment category: 2.4GHz DSSS Spread Spectrum Transmitter
Equipment classification: Portable use
Permitted frequency range: 2400 – 2483.5 MHz
Operation frequency range: 2405 – 2479 MHz
Lowest Operation frequency: 2405 MHz
Middles Operation frequency: 2441 MHz
Highest Operation frequency: 2479 MHz
Emission designator: F7D
Antenna gain: ≤ 0 dBi
Type of modulation: DSSS
Operation mode: simplex
Type of antenna: integral
Power supply: 12 VDC (8 x AA size batteries) or 9.6V Ni-MH battery pack

All information was provided by the applicant)



1.7 General Test Conditions

Environmental reference conditions

If not defined otherwise by the Technical Committee responsible for the generic standard and/or the product standard the climatic conditions during the tests are to be within the limits specified by the manufacturer for the operation of the EUT and the test equipment.

The climatic conditions during the tests were within the following limits:

Temperature	Humidity	Atmospheric pressure
15 °C - 35 °C	30 % - 60 %	860 hPa - 1060 hPa

If explicitly required in the test base (basic) the climatic values are recorded and documented separately for the respective test.

Calibration of measurement and test equipment

All measurement and testing equipment that has a significant influence on the accuracy of qualitative measurements and tests is subject to a periodical in-house system of calibration and servicing that is part of the quality management system of the EMC laboratory of SLG Asia Test Labs & Service (HK) Limited.

Measurement uncertainties

All tests are subject to measurement uncertainties. The overall measurement uncertainty of a measurement is defined as the range of which can be supposed that it contains the true value with a specified probability. This probability is 95 % for the generally specified measurement uncertainty (so-called expanded measurement uncertainty).

The limits for emission measurements and the test levels for immunity tests in the applied standards were defined taking into consideration the accuracy limits for measurement and testing equipment required by the basic standards.

All measurement and test results of the EMC laboratory of SLG Asia Test Labs & Service (HK) Limited fulfil the requirements for measurement uncertainties according to the standards applied.



2 Test result Summary

Digital Transmission system (2400-2483.5MHz)

Requirements according standard:				
FCC Rule	Test description	Results/Notes	Limits/Requirements	Verdict
15.247(a)	Digital modulation	System uses DSSS techniques		P
15.247(a) (2)	6dB Bandwidth	> 894.2 KHz	> 500kHz	P
15.247(b) (3)	Maximum peak E Power	-0.32 dBm (EIRP) (0.93 mW)	1W, EIRP limited to 4W	P
15.247(e)	Power Spectral Density	-17.36 dBm/3kHz	< 8dBm/3kHz	P
15.247(d) / 15.209, 15.205	Out-of-band Emission 30MHz – 25GHz	All signals below Limits	15.209, 15.205 restricted bands, all others < -20dBc	P
15.247(d)	Band-edge requirements in 100kHz Bandwidth	All frequencies inside the band	Within range 2405-2483.5MHz	P
15.203	RF Connector	EUT has integral antenna		P
15.247 (b)/ 15.407 (f)	RF Exposure requirements	EIRP radiated power is below 10mW (SAR evaluation is not required)	Refer to OET 65	P

Test case verdicts

- P* - Pass *Test item does meet the requirement*
F - Fail *Test item does not meet the requirement*
N.A. - Not Applicable *Test case does not apply to the test object*



3 Test results

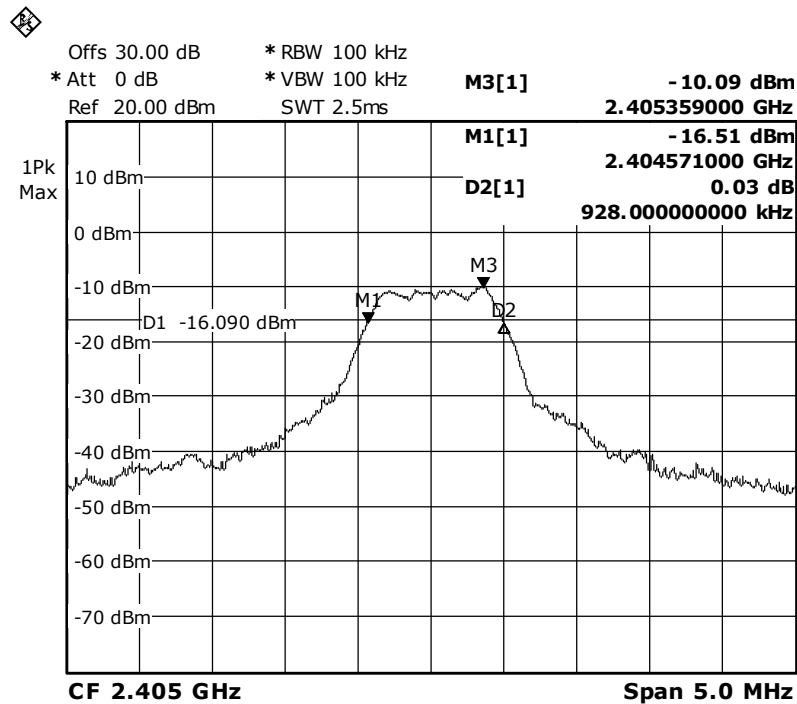
3.1. 6dB Bandwidth

Measurement Results:

FCC part 15.247 (a) (2): Signal Bandwidth

Frequency (MHz)	Resolution bandwidth	6dB bandwidth (kHz)	Limit (kHz)	Results
2405	100kHz	928.00	>500	Pass
2441	100kHz	894.20	>500	Pass
2479	100kHz	914.20	>500	Pass

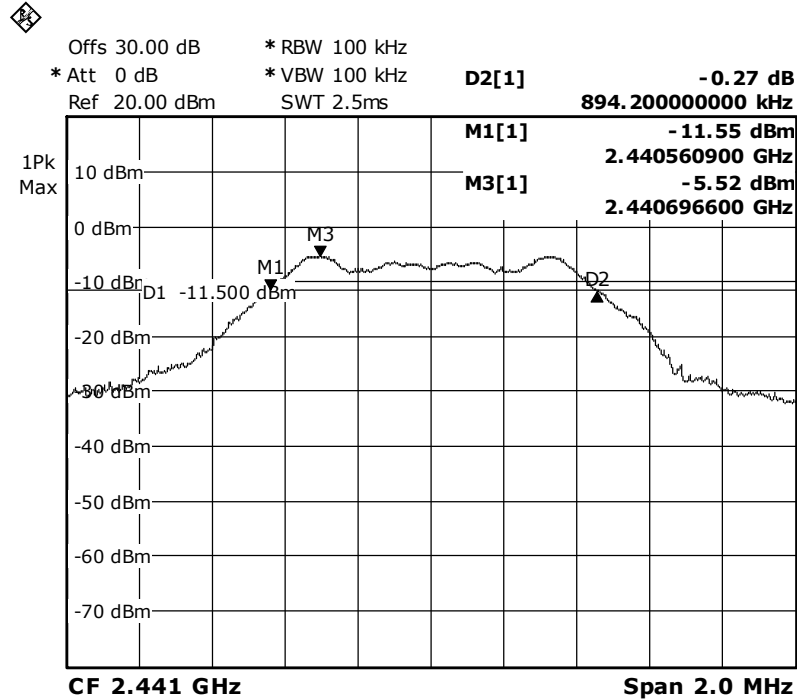
Lowest Operation frequency: 2405 MHz



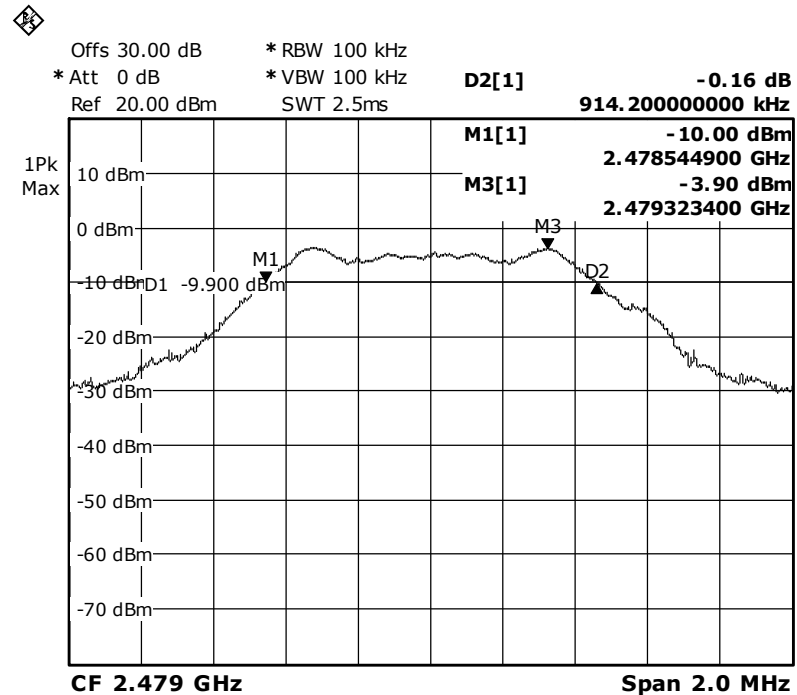
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Middles Operation frequency: 2441 MHz



Highest Operation frequency: 2479 MHz



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3.2. Output power

Measurement Results:

FCC part 15.247 (b) (3): Output Power

Frequency MHz	Output Power		Antenna Gain dBi	Results	EIRP	
	dBm	mW			dBm	mW
2405	-0.32	0.93	0	Pass	-0.32	0.93
2441	-1.76	0.67	0	Pass	-1.76	0.67
2479	-3.56	0.44	0	Pass	-3.56	0.44

All results were measured with peak power meter.

Measurement Equipment Used:

Test equipment	Type	S/N	Manufacturer	Cal Due Date
Spectrum Analyzer	FSEK 20	836043/003	Rohde & Schwarz	Sep 12



3.3. Power Spectral Density

Measurement Results:

FCC part 15.247 (e): Power spectral Density

Frequency MHz	PSD dBm/3kHz	Limit dBm/3kHz	Results
2405	-21.73	8	Pass
2441	-17.91	8	Pass
2479	-17.36	8	Pass

Note 1:	Power spectral density measured using RBW=3kHz, VBW=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using
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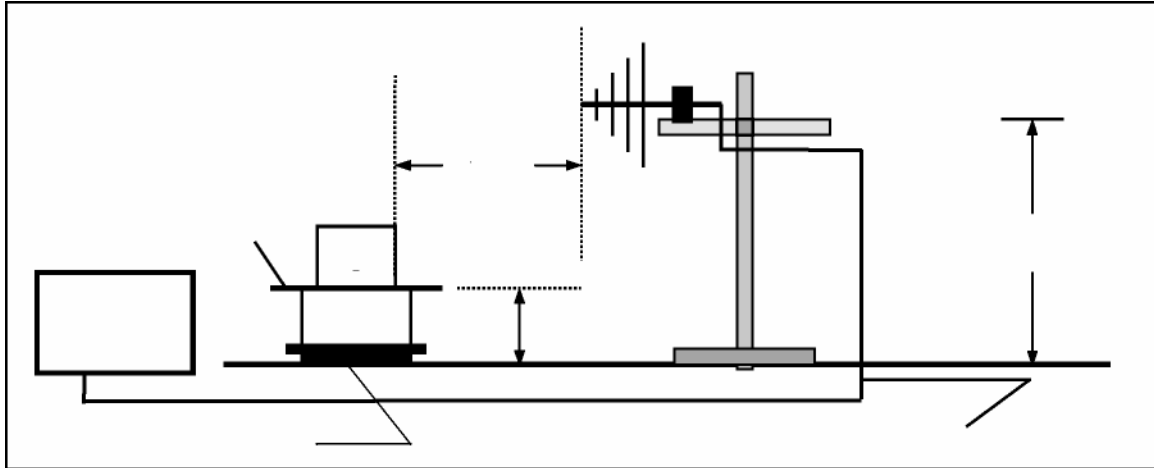
Measurement Equipment Used:

Test equipment	Type	S/N	Manufacturer	Cal Due Date
Spectrum Analyzer	FSEK 20	836043/003	Rohde & Schwarz	Sep 12



3.4. Out-of-band Emission

Measurement Procedure



The equipment under test is placed on a non metallic table with 0.8 m height. The power supply and the RF connection points are close to the equipment under test at the floor inside a connection box. The cables to this connection box are shielded and below the double floor. The receiving antenna is placed in a height at 1.0 m to 4.0 m and in a distance of 3 m.

Measurement Equipment Used:

Test equipment	Type	S/N	Manufacturer	Cal Due Date
Semi-anechoic Chamber	Nil	Nil	Frankonia	May 13
Test Reciever	ESU 26	100050	Rohde & Schwarz	Aug 12
Bi-conical Antenna	HK116	841489/016	Rohde & Schwarz	Mar 13
Log.-Periodic Antenna	HL223	841516/020	Rohde & Schwarz	Feb 13
Horn Antenna	3115	9002-3351	EMCO	Feb 13
Active Loop Antenna	6502	9107-2651	EMCO	Dec 12

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Measurement Results:

Low Frequency @ 2405 MHz

Fundamental emission level @3m in 100khz RBV				94.91	dB μ V/m	
Limit for emission outside of restricted bands:				74.91	dB μ V/m	
Frequency	Level	Pol	15.209/15.247		Detector	Comments
MHz	dBμV/m	V/H	Limit	Margin	Pk/QP/Avg	
192.285	34.89	V	74.91	40.02	Pk	RB/VB 100kHz
192.285	31.37	H	43.5	12.13	Pk	RB/VB 100kHz
400.400	37.82	V	43.5	5.68	Pk	RB/VB 100kHz
272.140	28.99	H	43.5	14.51	Pk	RB/VB 100kHz
4810	38.67	V	54	15.33	Avg	RB/VB 1MHz
4810	40.68	H	54	13.32	Avg	RB/VB 1MHz
7214	35.00	V	74.91	39.91	Avg	RB/VB 1MHz
7214	32.08	H	74.91	42.83	Avg	RB/VB 1MHz

For emission in restricted band, the limit of 15,209 was used. For all other emission, the limit was set 20dB below the level of fundamental and measured in 100kHz

Middle Frequency @ 2441 MHz

Fundamental emission level @3m in 100khz RBV				93.47	dB μ V/m	
Limit for emission outside of restricted bands:				73.47	dB μ V/m	
Frequency	Level	Pol	15.209/15.247		Detector	Comments
MHz	dBmV/m	V/H	Limit	Margin	Pk/QP/Avg	
192.194	35.43	V	73.47	38.04	Pk	RB/VB 100kHz
128.116	31.26	H	43.5	12.24	Pk	RB/VB 100kHz
208.016	35.42	V	73.47	38.05	Pk	RB/VB 100kHz
400.401	29.47	H	43.5	14.03	Pk	RB/VB 100kHz
4882	42.45	V	54	11.55	Avg	RB/VB 1MHz
4882	45.01	H	54	8.99	Avg	RB/VB 1MHz
7323	-36.18	V	54	90.18	Avg	RB/VB 1MHz
7323	31.27	H	54	22.73	Avg	RB/VB 1MHz

For emission in restricted band. the limit of 15.209 was used. For all other emission. the limit was set 20dB below the level of fundamental and measured in 100kHz

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High Frequency @ 2479 MHz

Fundamental emission level @3m in 100kHz RBV	91.67	dB μ V/m
Limit for emission outside of restricted bands:	71.67	dB μ V/m

Frequency MHz	Level dBmV/m	Pol V/H	15.209/15.247		Detector Pk/QP/Avg	Comments
			Limit	Margin		
192.285	36.64	V	43.5	6.86	Pk	RB/VB 100kHz
192.285	31.56	H	43.5	11.94	Pk	RB/VB 100kHz
224.048	34.42	V	71.67	37.25	Pk	RB/VB 100kHz
416.433	30.07	H	71.67	41.60	Pk	RB/VB 100kHz
4958	41.33	V	54	12.67	Avg	RB/VB 1MHz
4958	44.37	H	54	9.63	Avg	RB/VB 1MHz
7436	32.04	V	54	21.96	Avg	RB/VB 1MHz
7436	29.92	H	54	24.08	Avg	RB/VB 1MHz

For emission in restricted band the limit of 15.209 was used. For all other emission. the limit was set 20dB below the level of fundamental and measured in 100kHz

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics which above 5th Harmonics is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4. Emissions 20dB lower than the limit are not reported.

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FCC Part 15. Subpart C. §15.209. Radiated Emission Limits

Frequency of Emission [MHz]	Field strength [$\mu\text{V/m}$]	Field Strength [$\text{dB}\mu\text{V/m}$]
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

FCC Part 15. Subpart C. §15.205. Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
10.495 - 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	
13.36-13.41			

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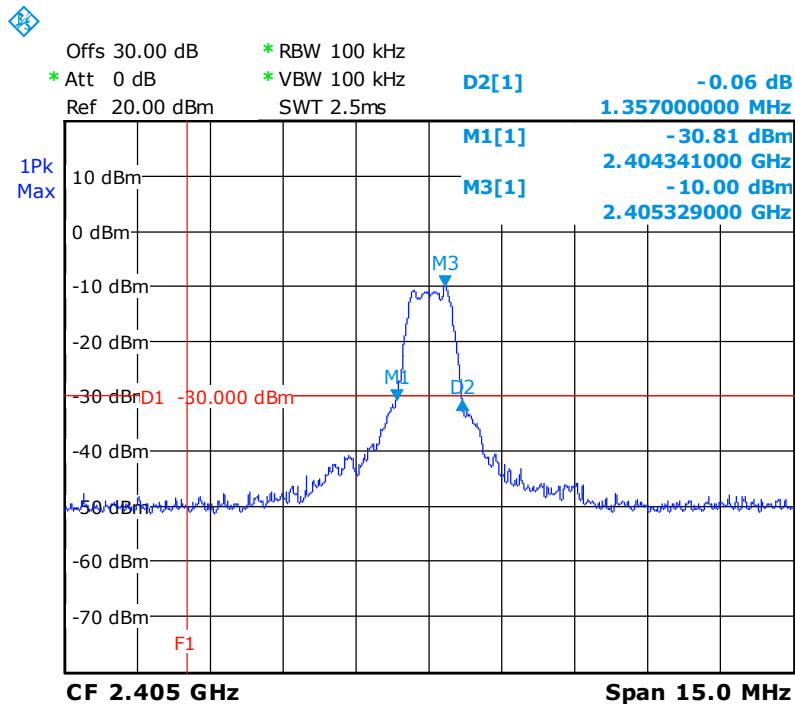
3.5. Band edge requirement

Measurement Results:

FCC part 15.247 (d): Band edge requirements

Frequency (MHz)	Resolution bandwidth	20 dB band edge (kHz)	Limit (MHz)	Results
2405	100kHz	2404.3	> 2400.0	Pass
2479	100kHz	2479.7	< 2483.5	Pass

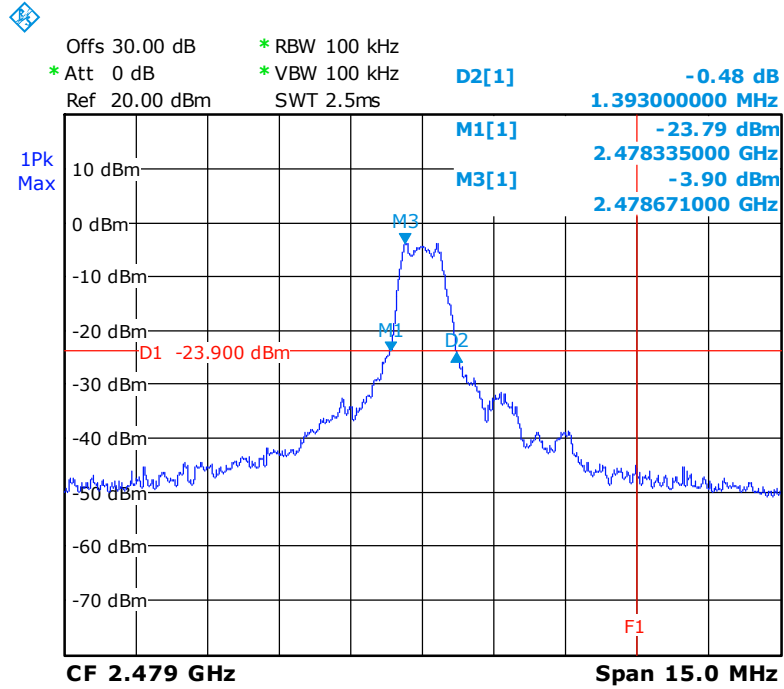
Lowest Operation frequency: 2405 MHz



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Highest Operation frequency: 2479 MHz



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4 Normative references

- /1/ FCC Rules 47 CFR PART 15 Subpart: 2011
Radio Frequency Devices
- /2/ ANSI C63.4-2003
Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and
Electronic Equipment in the Range of 9 kHz to 40 GHz



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5.1 Revision Notes

This revised Report replaces the all former Test Reports based on number H1M21204-0024-P-15. These former Test Reports are not longer valid. Every Revision of the original report is recorded below and identified by the || symbol beside the text.

Revision No.	Revision
H1M21204-0024-P-15	Original Test Report