FCC- TEST REPORT

Report Number	:	**68.950.16.452.01**	Date of Issue:	**June 13, 2016**
Model	:	**DEVO F8**		
Product Type	:	Transmitter for R/C Helicopter		
Applicant	:	GUANGZHOU Walkera Technology Co.,LTD		
Address	:	Taishi Industrial Park, Dongchong Town, Nansha District, 511475 Guangzhou, China		
Production Facility	:	GUANGZHOU Walkera Technology Co.,LTD		
Address	:	Taishi Industrial Park, Dongchong Town, Nansha District, 511475 Guangzhou, China		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	24		

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2 Details about the Test Laboratory

Details about the Test Laboratory

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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P. R. China

FCC Registration Number: 502708

Telephone: 86 755 8828 6998
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3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	Transmitter for R/C Helicopter
Model no.:	DEVO F8
FCC ID:	S29DEVOF8
Rating Voltage:	Built-in 7.4Vdc, 44.4Wh Li-ion battery charged by an external adapter Adapter model: BC101223020 Adapter input: 100-240VAC~50/60Hz, 2.2A Max Adapter output:26.1VDC, 2.0A
RF Transmission Frequency:	2405-2479MHz
No. of Operated Channel:	75
Modulation:	DSSS
Duty Cycle:	≥98%
Antenna Type:	External Antenna
Antenna Gain:	3dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Transmitter for R/C Helicopter which operated at 2.4GHz.

Channel List:

2405	2406	2407	2408	2409	2410	2411	2412	2413
2414	2415	2416	2417	2418	2419	2420	2421	2422
2423	2424	2425	2426	2427	2428	2429	2430	2431
2432	2433	2434	2435	2436	2437	2438	2439	2440
2441	2442	2443	2444	2445	2446	2447	2448	2449
2450	2451	2452	2453	2454	2455	2456	2457	2458
2459	2460	2461	2462	2463	2464	2465	2466	2467
2468	2469	2470	2471	2472	2473	2474	2475	2476
2477	2478	2479	Unit (MHz)					

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2015 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 and ANSI C63.10 (2013).

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5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C					
Test Condition		Pages	Test Result		
			Pass	Fail	N/A
§15.207	Conducted emission AC power port	---	☐	☐	☒
§15.247 (b) (1)	Conducted peak output power	10	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	---	☐	☐	☒
§15.247(a)(1)	Carrier frequency separation	---	☐	☐	☒
§15.247(a)(1)(iii)	Number of hopping frequencies	---	☐	☐	☒
§15.247(a)(1)(iii)	Dwell Time	---	☐	☐	☒
§15.247(a)(2)	6dB bandwidth and 99% Occupied Bandwidth	11	☒	☐	☐
§15.247(e)	Power spectral density	13	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	14	☒	☐	☐
§15.247(d)	Band edge	18	☒	☐	☐
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	20	☒	☐	☐
§15.203	Antenna requirement	See note 1	☒	☐	☐

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses an integral antenna, which gain is 3.0dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: S29DEVOF8 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

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SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: May 25, 2016

Testing Start Date: May 30, 2016

Testing End Date: June 7, 2016

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

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EMC Project Manager

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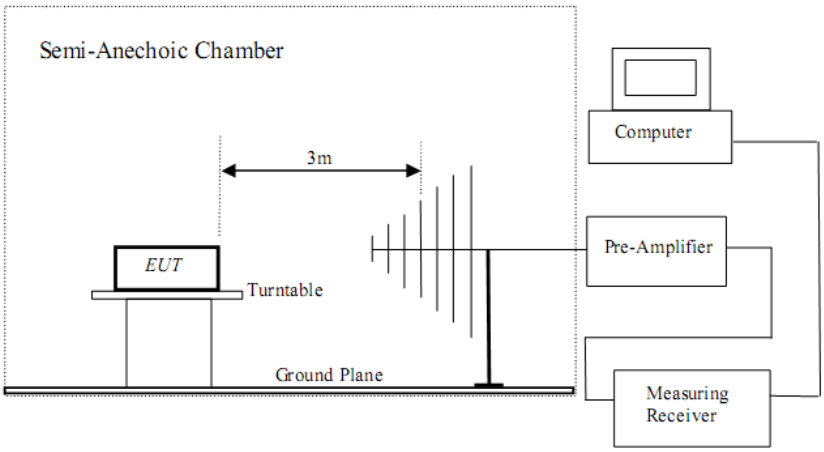
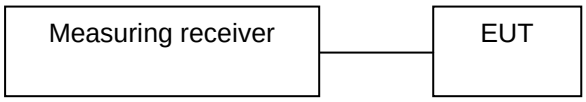
7 Test Setups

7.1 Radiated test setups



7.2 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
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9 Technical Requirement

9.1 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Limits

According to §15.247 (b) (1), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2405MHz	19.63	Pass
Middle channel 2441MHz	18.39	Pass
High channel 2479MHz	18.57	Pass

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9.2 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X Db bandwidth mode with X set to 6 Db, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 Db.
3. Allow the trace to stabilize, record the X Db Bandwidth value.

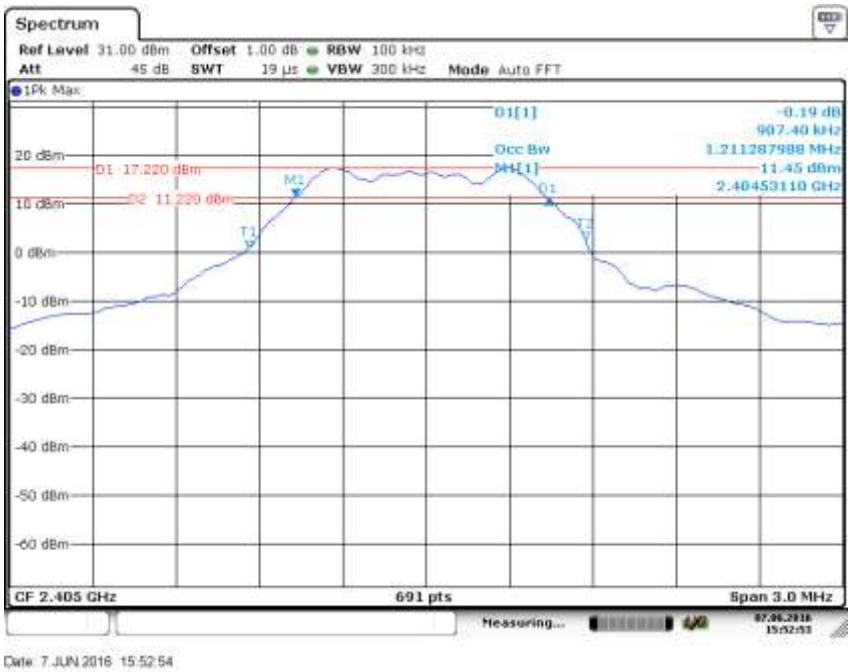
Limit

Limit [kHz]
≥500

Test result

Frequency MHz	6dB bandwidth kHz	Result
Low channel 2405MHz	907.4	Pass
Middle channel 2441MHz	885.7	Pass
High channel 2479MHz	894.4	Pass

2405MHz



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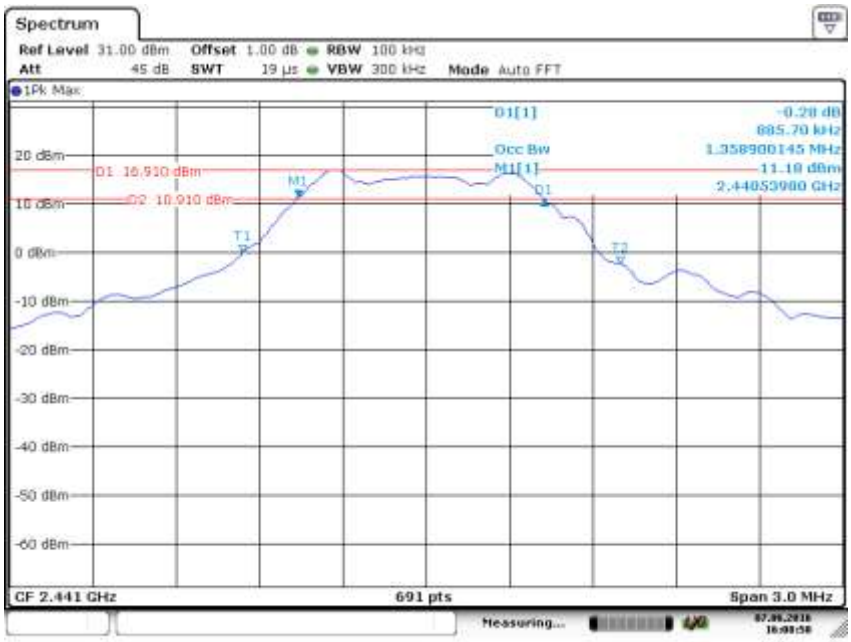
2441MHz



2479MHz

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9.3 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Avergae, Sweep=auto, The number of measurement points in the sweep≥2x span/RBW, Employ trace averaging (RMS) mode over a minimum of 100 traces.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]
≤8

Test result

Frequency	Power spectral density	Result
MHz	**dBm**	
Low channel 2405MHz	5.87	Pass
Middle channel 2441MHz	4.03	Pass
High channel 2479MHz	4.76	Pass

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9.4 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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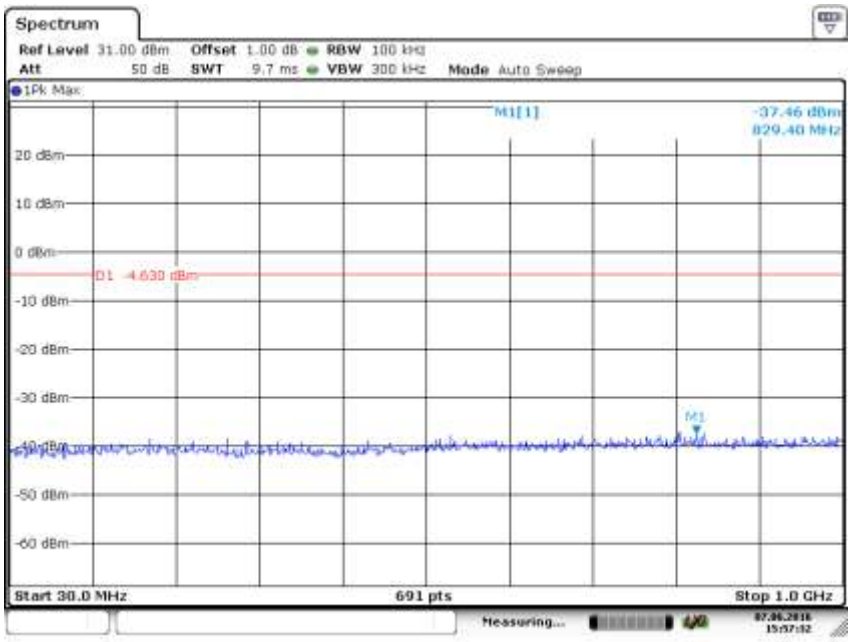
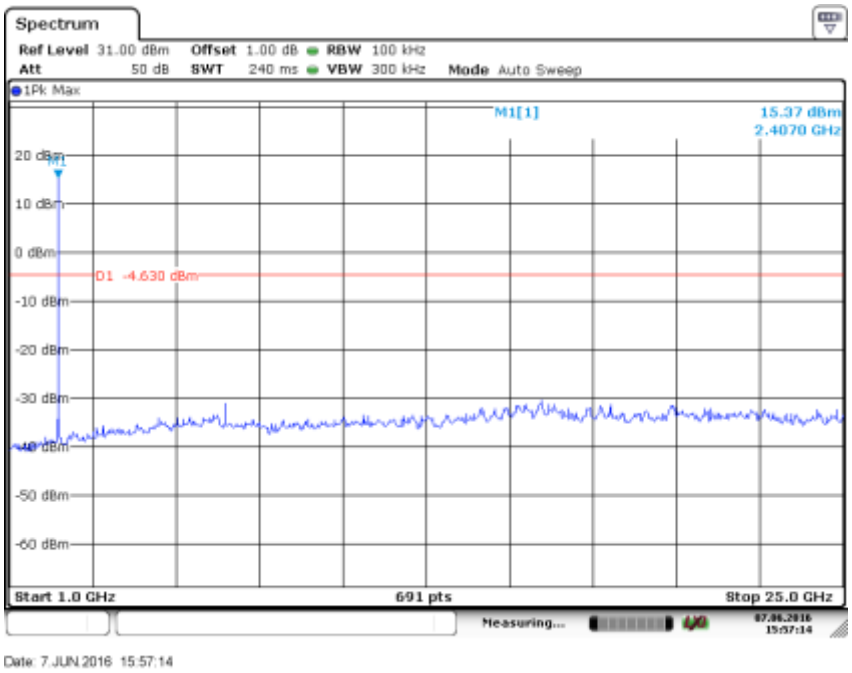
Spurious RF conducted emissions

2405MHz





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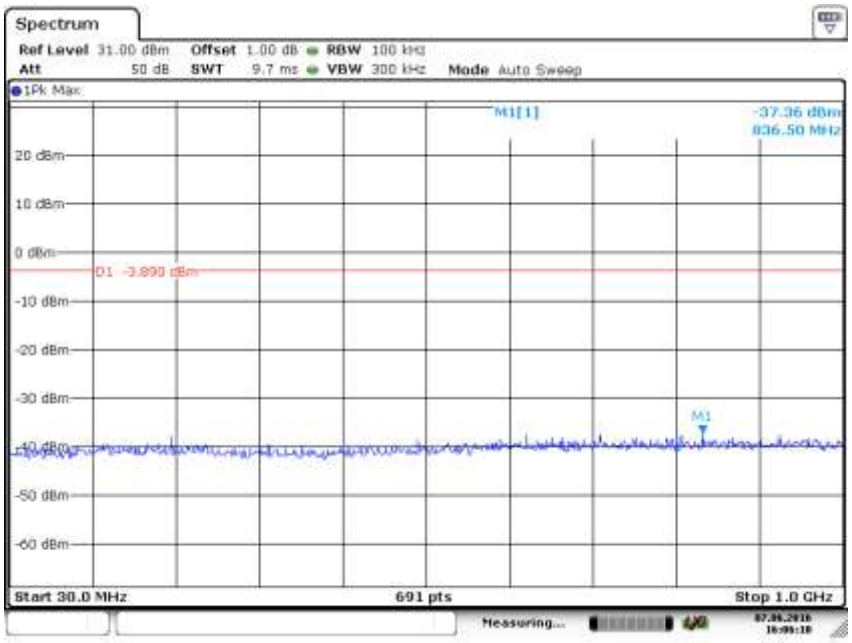
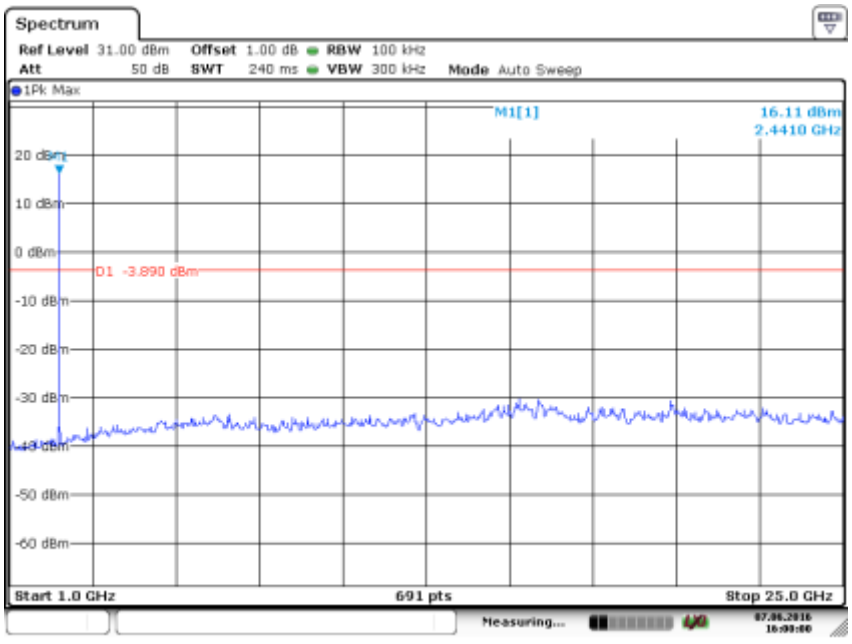
2441MHz





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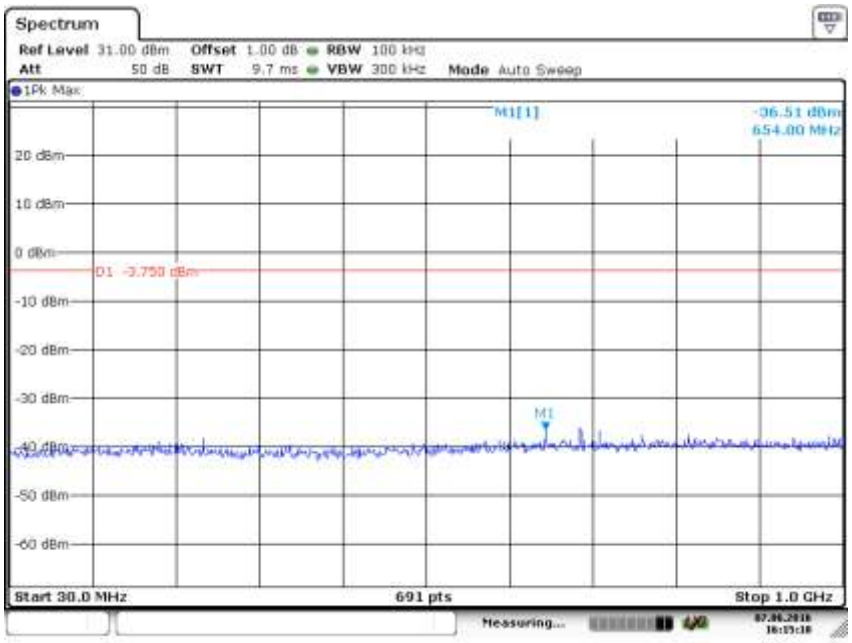
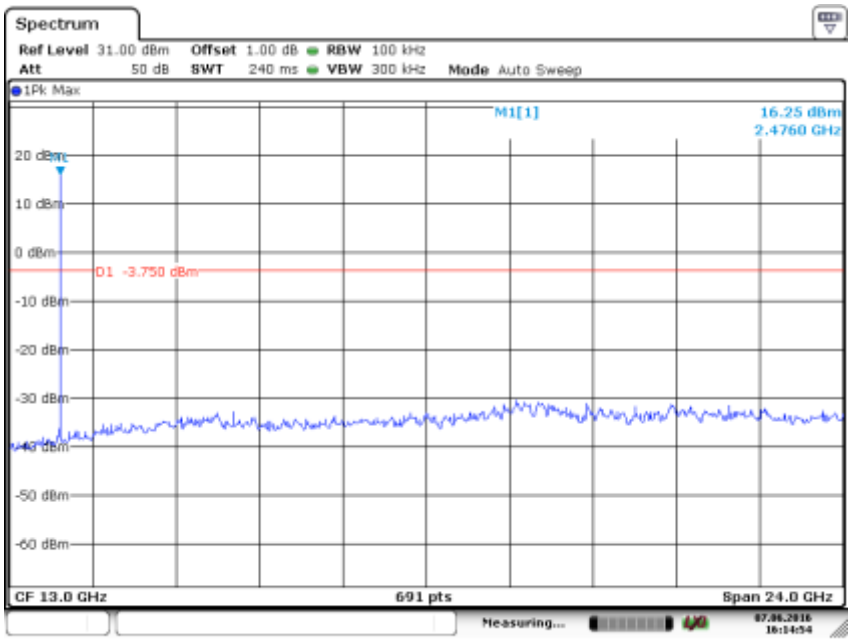
2479MHz





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9.5 Band edge

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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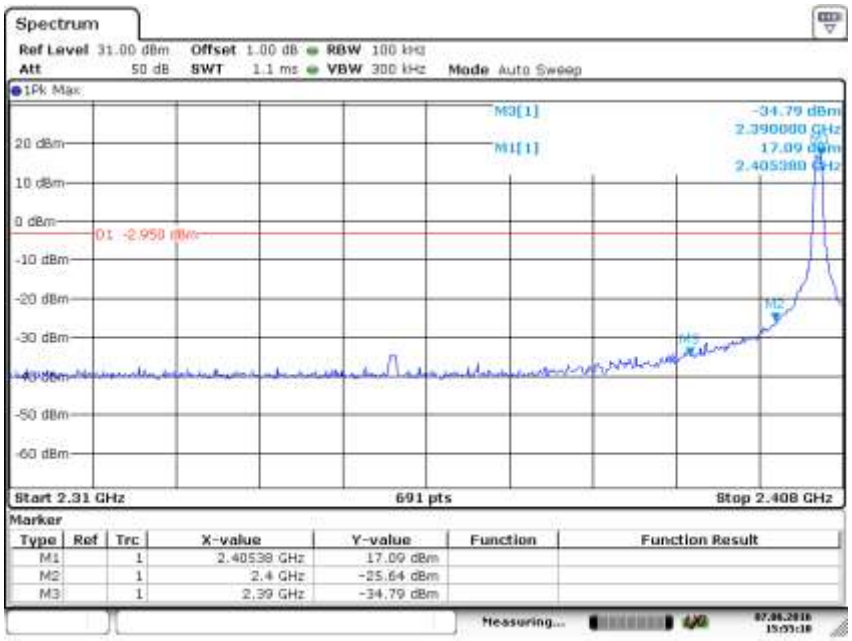
Test result



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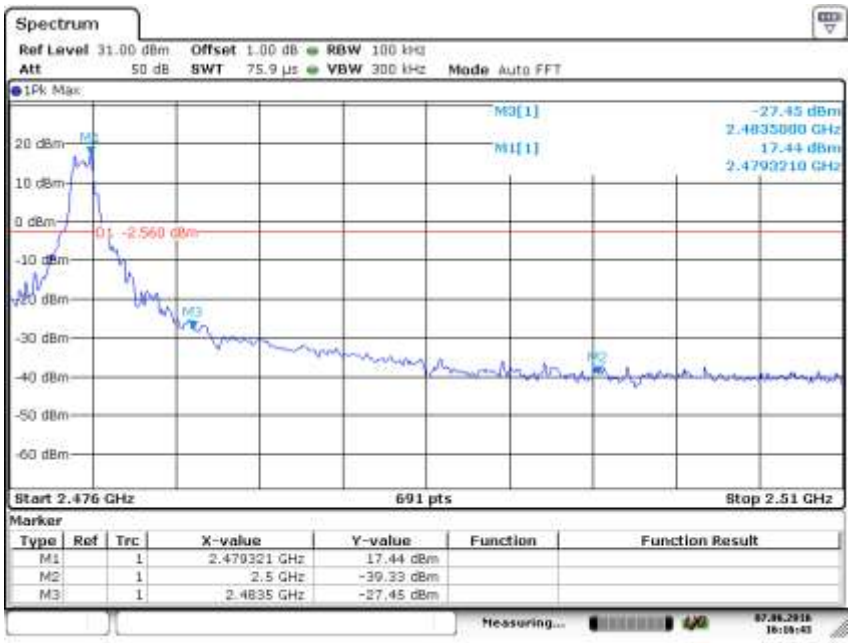

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9.6 Spurious radiated emissions for transmitter

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
   The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, 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 duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

According to part 15.247(d), the radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Transmitting spurious emission test result as below:

2405MHz

Fundamental emission level				103.62	dBµV/m	Peak
Limited for emission outside of restricted bands:				83.62	dBµV/m	Peak
Frequency	**Emission Level**	**Polarization**	**Limit**	**Detector**	**Margin**	**Result**
MHz	**dBuV/m**		**dBµV/m**		**dBµV/m**	
43.85	17.93	Horizontal	40.00	QP	22.07	Pass
200.24	20.20	Horizontal	43.50	QP	23.30	Pass
288.02	38.01	Horizontal	46.00	QP	7.99	Pass
877.08	34.12	Horizontal	46.00	QP	11.88	Pass
43.80	19.70	Vertical	40.00	QP	20.30	Pass
60.50	21.30	Vertical	40.00	QP	18.70	Pass
288.02	34.38	Vertical	46.00	QP	11.62	Pass
*4810	53.29	Horizontal	74.00	Peak	20.71	Pass
7215	58.93	Horizontal	83.62	Peak	24.69	Pass
9620	51.28	Horizontal	83.62	Peak	32.34	Pass
*12025	53.97	Horizontal	74.00	Peak	20.03	Pass
*4810	48.87	Vertical	74.00	Peak	25.13	Pass
7215	58.16	Vertical	83.62	Peak	25.46	Pass
9620	56.75	Vertical	83.62	Peak	26.87	Pass
*12025	47.37	Vertical	74.00	Peak	26.63	Pass

2441MHz

Fundamental emission level				105.41	dBµV/m	Peak
Limited for emission outside of restricted bands:				85.41	dBµV/m	Peak
Frequency	**Emission Level**	**Polarization**	**Limit**	**Detector**	**Margin**	**Result**
MHz	**dBuV/m**		**dBµV/m**		**dBµV/m**	
*4882	49.60	Horizontal	74.00	Peak	24.40	Pass
*7323	54.32	Horizontal	74.00	Peak	19.68	Pass
*7323	52.72	Horizontal	54.00	Ave	1.28	Pass
9764	48.31	Horizontal	85.41	Peak	37.10	Pass
*12205	43.92	Horizontal	74.00	Peak	30.08	Pass
*4882	50.42	Vertical	74.00	Peak	23.58	Pass
*7323	53.10	Vertical	74.00	Peak	20.90	Pass
9764	44.88	Vertical	85.41	Peak	40.53	Pass
*12205	45.94	Vertical	74.00	Peak	28.06	Pass

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2479MHz

Fundamental emission level				104.28	dBµV/m	Peak
Limited for emission outside of restricted bands:				84.28	dBµV/m	Peak
Frequency	**Emission Level**	**Polarization**	**Limit**	**Detector**	**Margin**	**Result**
MHz	**dBuV/m**		**dBµV/m**		**dBµV/m**	
*4958	48.64	Horizontal	74.00	Peak	25.36	Pass
*7437	52.75	Horizontal	74.00	Peak	21.25	Pass
9916	50.43	Horizontal	84.28	Peak	33.85	Pass
*12395	51.04	Horizontal	74.00	Peak	22.96	Pass
*4958	48.31	Vertical	74.00	Peak	25.69	Pass
*7437	54.20	Vertical	74.00	Peak	19.80	Pass
*7437	51.03	Vertical	54.00	Ave	2.97	Pass
9916	51.15	Vertical	84.28	Peak	33.13	Pass
*12395	55.86	Vertical	74.00	Peak	18.14	Pass
*12395	53.44	Vertical	74.00	Peak	0.56	Pass

Remark:

(1) AV Emission Level= PK Emission Level+20log (dutycycle)

(2) Testing is carried out with frequency rang 30MHz to 40GHz, which above 3th harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

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10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101030	2016-7-24
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2016-7-24
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2016-8-14
	Horn Antenna	Rohde & Schwarz	HF907	102294	2016-7-24
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2016-7-24
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- Power spectral density
- Spurious RF conducted emissions
- Band edge

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

Items	Extended Uncertainty
Radiation emission	Horizontal: 4.83dB; (30MHz-1GHz) Vertical: 4.91dB; (30MHz-1GHz) Horizontal: 4.89dB; (1Hz-18GHz) Vertical: 4.88dB; (1Hz-18GHz)

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