

FCC/IC- TEST REPORTReport Number : **68.950.17.012.01** Date of Issue: February 6, 2017Model : RODEO 110Product Type : R/C HelicopterApplicant : GUANGZHOU Walkera Technology Co., LTDAddress : Taishi Industrial Park, Dongchong Town, Nansha District,
511475 Guangzhou, ChinaProduction Facility : GUANGZHOU Walkera Technology Co., LTDAddress : Taishi Industrial Park, Dongchong Town, Nansha District,
511475 Guangzhou, ChinaTest Result : ☒ **Positive** ☐ **Negative**Total pages including
Appendices : 26

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Nantou Checkpoint Road 2, Nanshan District,
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3 Description of the Equipment under Test

Description of the Equipment Under Test

Product: R/C Helicopter

Model no.: RODEO 110

FCC ID: S29RODEO110

Options and accessories: NIL

Rating: DC 7.4V (Supplied by Li-ion rechargeable battery)

RF Transmission Frequency: 5733MHz -5866MHz

No. of Operated Channel: 7

Modulation: FSK

Duty Cycle: 94.6%

Antenna Type: Intergral Antenna

Description of the EUT: The Equipment Under Test (EUT) is a R/C Helicopter which supports 5G Transmitter and 2.4G Receiver functions.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 4 November 2014	General Requirements for the Certification of Radio Apparatus
RSS-247 Issue 1 May 2015	RSS-247— Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices

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

5 Summary of Test Results

Technical Requirements							
FCC Part 15 Subpart C, RSS-Gen, RSS-210							
Test Condition			Pages	Test Site	Test Result		
					Pass	Fail	N/A
§15.207	RSS-Gen A8.8	Conducted emission AC power port	---	---	☐	☐	☒
§15.247 (b) (1)	RSS-247 5.4(2)	Conducted peak output power	10	Site 1	☒	☐	☐
§15.247(a)(1)	RSS-247 5.1(1) & RSS-Gen 6.6	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)	RSS-247 5.1(2)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)	RSS-247 5.1(4)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)	RSS-247 5.1(4)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)	RSS-247 5.2(1)	6dB bandwidth and 99% Occupied Bandwidth	11	Site 1	☒	☐	☐
§15.247(e)	RSS-247 5.2(2)	Power spectral density	13	Site 1	☒	☐	☐
§15.247(d)	RSS-247 5.5	Spurious RF conducted emissions	15	Site 1	☒	☐	☐
§15.247(d)	RSS-247 5.5	Band edge	19	Site 1	☒	☐	☐
§15.247(d) & §15.209	RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	21	Site 1	☒	☐	☐
§15.203	RSS-Gen 8.3	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a patch antenna, which gain is 0dBi. In accordance to §15.203 and RSS-Gen 8.3 , It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for ID: S29RODEO110, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-210.

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: January 13, 2017

Testing Start Date: January 14, 2017

Testing End Date: February 6, 2017

- Jiangsu TÜV Product Service Ltd. – Shenzhen Branch -

Reviewed by:

Prepared by:



John Zhi
EMC Project Manager

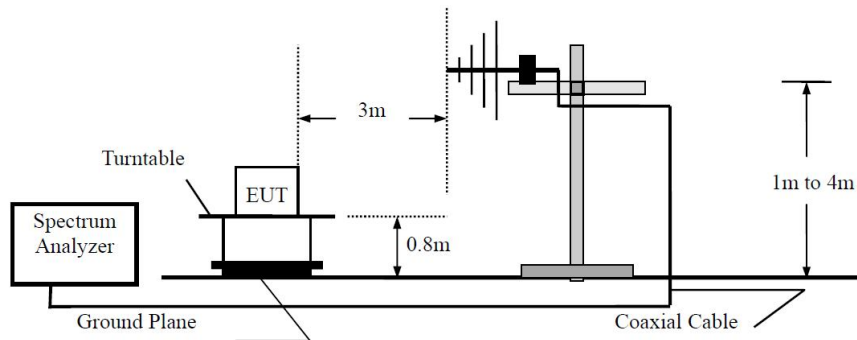


Leon Zhang
EMC Project Engineer

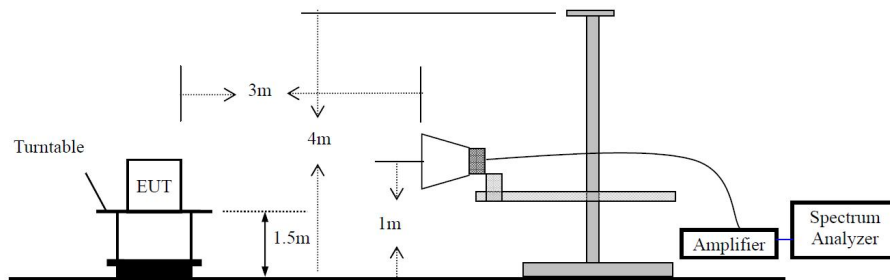
7 Test Setups

7.1 Radiated test setups

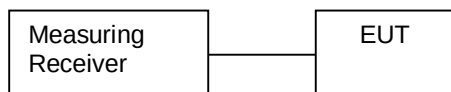
Below 1GHz



Above 1GHz



7.2 Conducted RF test setups



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

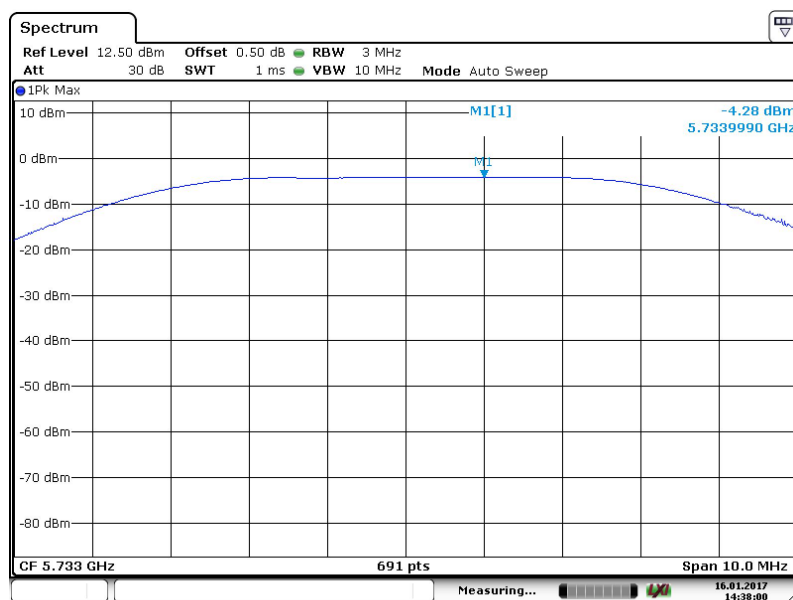
1. Use the following spectrum analyzer settings:
RBW > the 6 dB bandwidth of the emission being measured, VBW ≥ 3RBW, Span ≥ 3RBW
Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set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

Limits

Frequency Range MHz	Limit W	Limit dBm
5733-5847	≤1	≤30

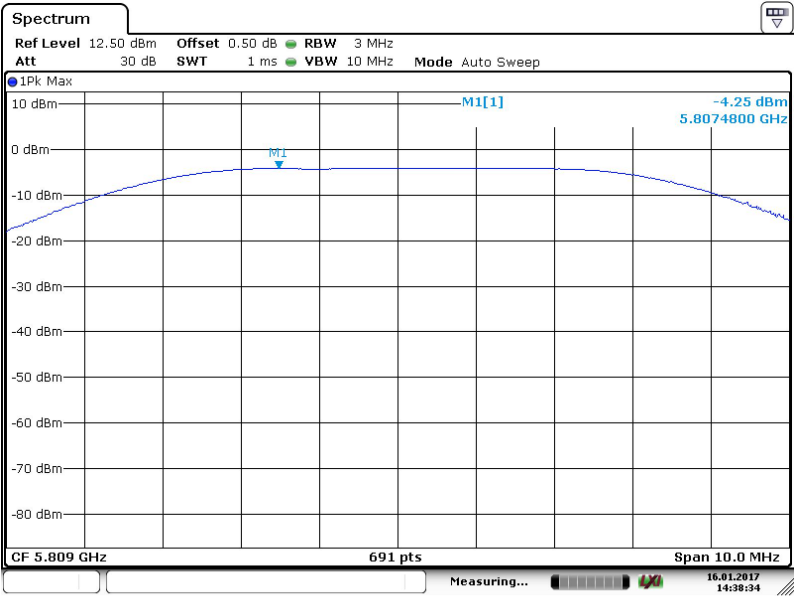
Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 5733MHz	-4.28	Pass
Middle channel 5809MHz	-4.25	Pass
High channel 5847MHz	-5.04	Pass



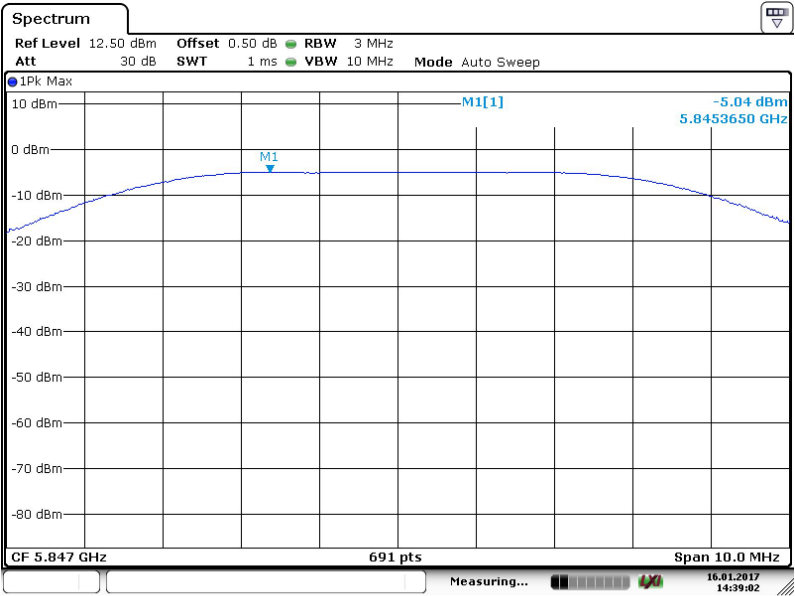
Date: 16.JAN.2017 14:38:00

5733MHz



Date: 16 JAN 2017 14:38:34

5809MHz



Date: 16 JAN 2017 14:39:02

5847MHz



9.2 6dB bandwidth and 99% Occupied 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.

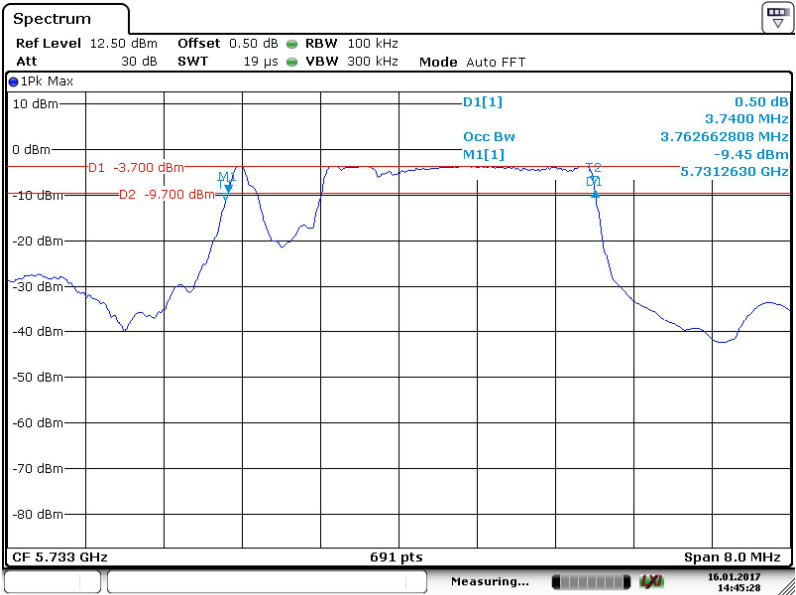
Limit

Limit [kHz]

≥500

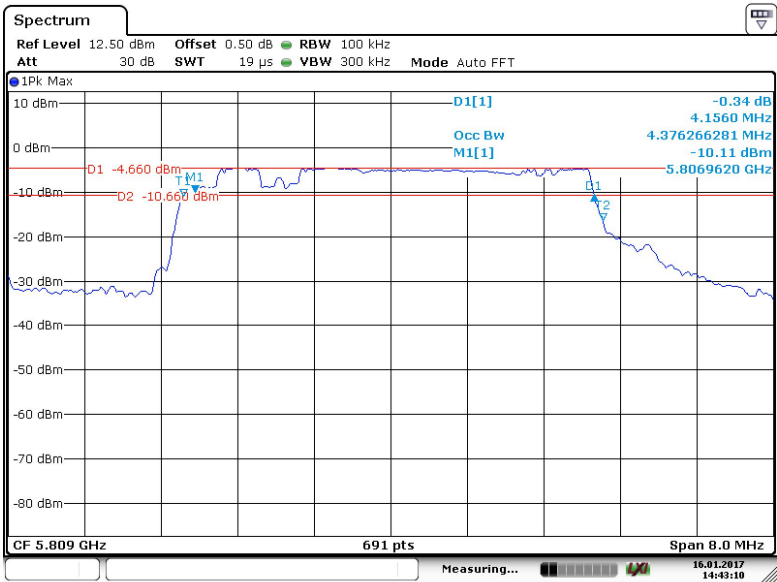
Test result

Frequency MHz	6dB bandwidth kHz	99% Bandwidth kHz	Result
Low channel 5733MHz	3740.0	3762.7	Pass
Middle channel 5809MHz	4156.0	4376.3	Pass
High channel 5847MHz	3994.0	4191.0	Pass



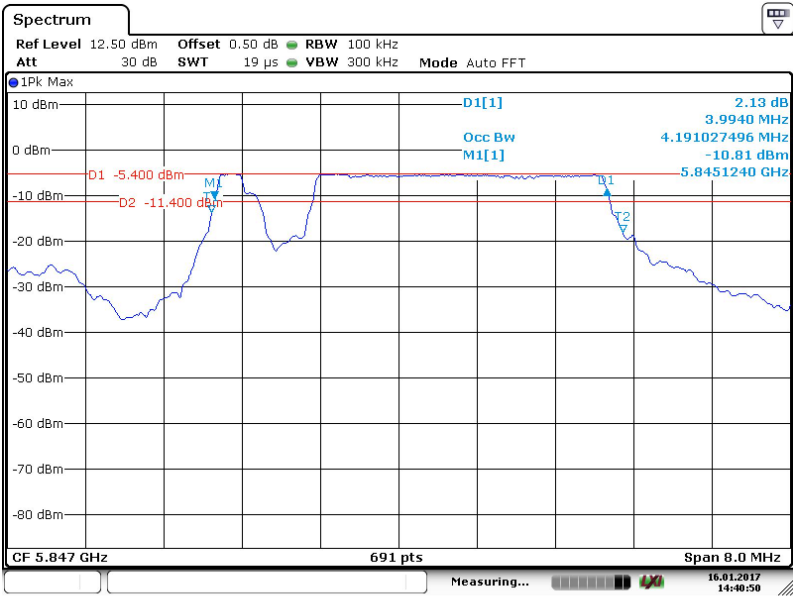
Date: 16.JAN.2017 14:45:28

5733MHz



Date: 16.JAN.2017 14:43:10

5809MHz



Date: 16.JAN.2017 14:40:50

5847MHz



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=Peak, Sweep=auto, Trace= max hold.
- 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.

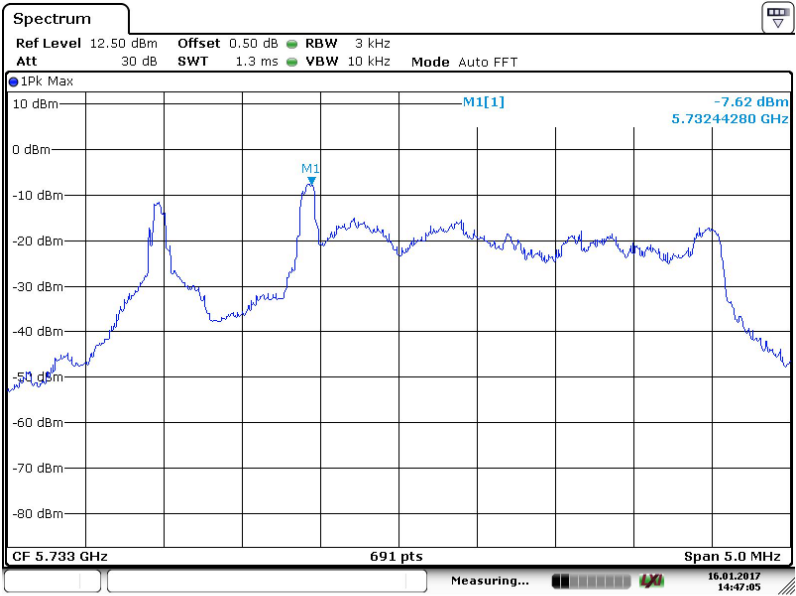
Limit

Limit [dBm]

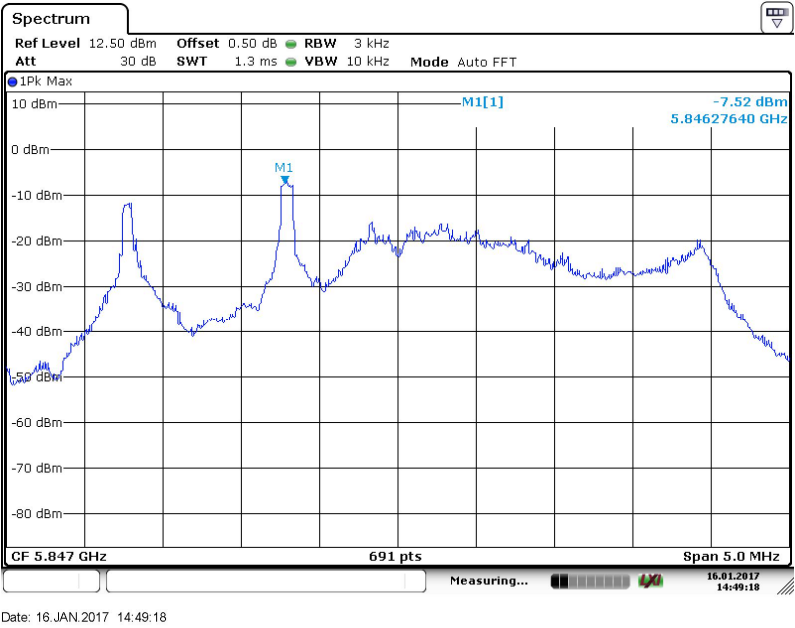
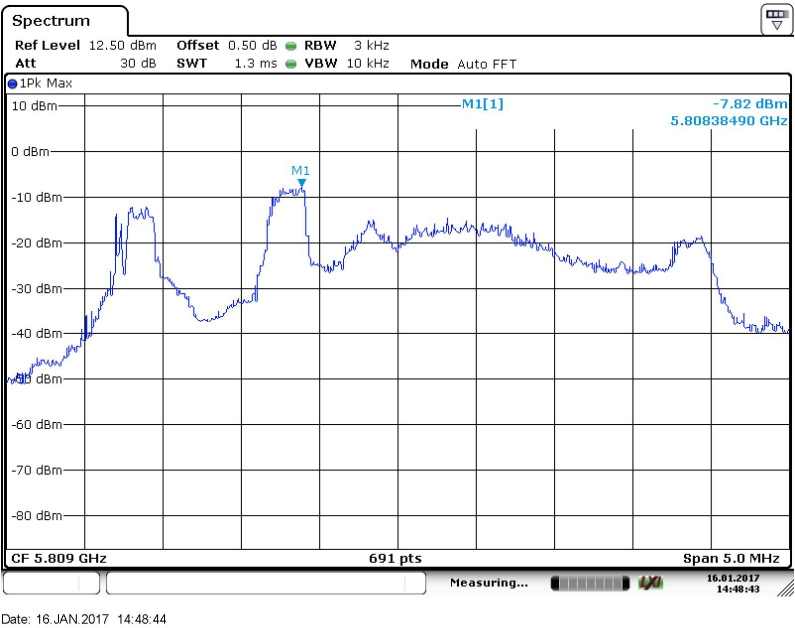
≤8

Test result

Frequency MHz	Power spectral density dBm	Result
Low channel 5733MHz	-7.62	Pass
Middle channel 5809MHz	-7.82	Pass
High channel 5847MHz	-7.52	Pass



Date: 16.JAN.2017 14:47:05



9.4 Spurious RF conducted emissions

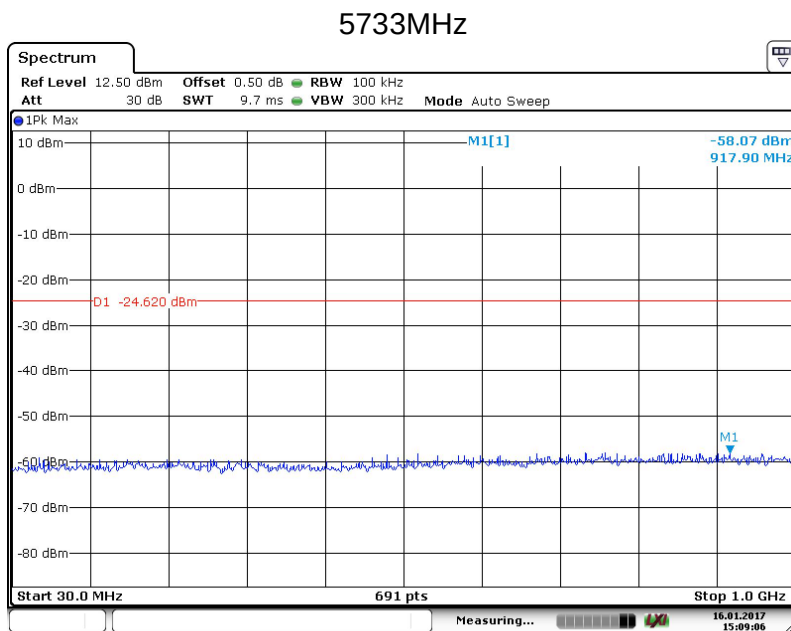
Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW $\geq$ 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.

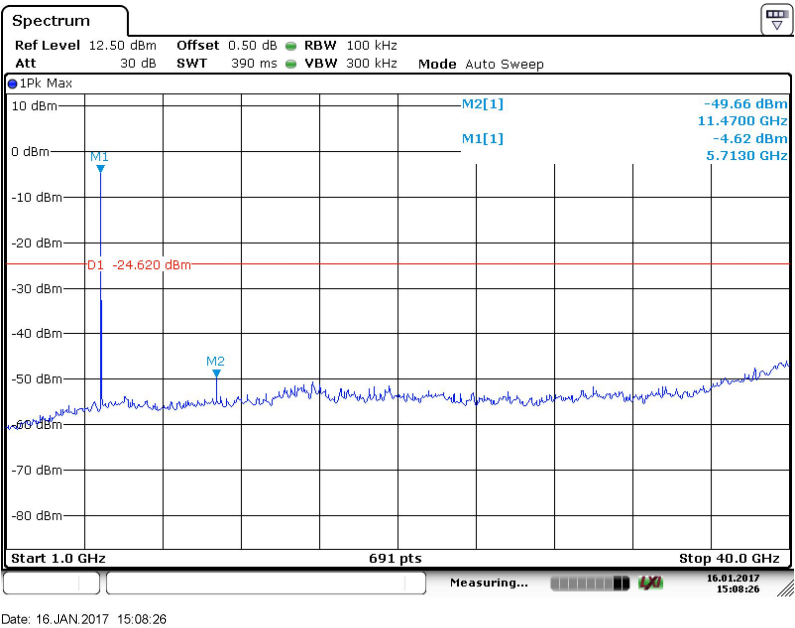
Limit

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

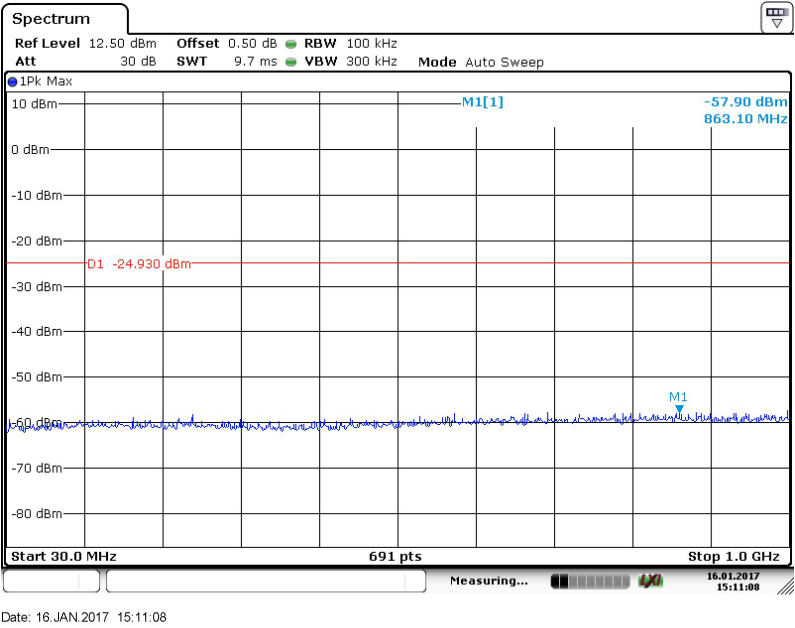
Spurious RF conducted emissions

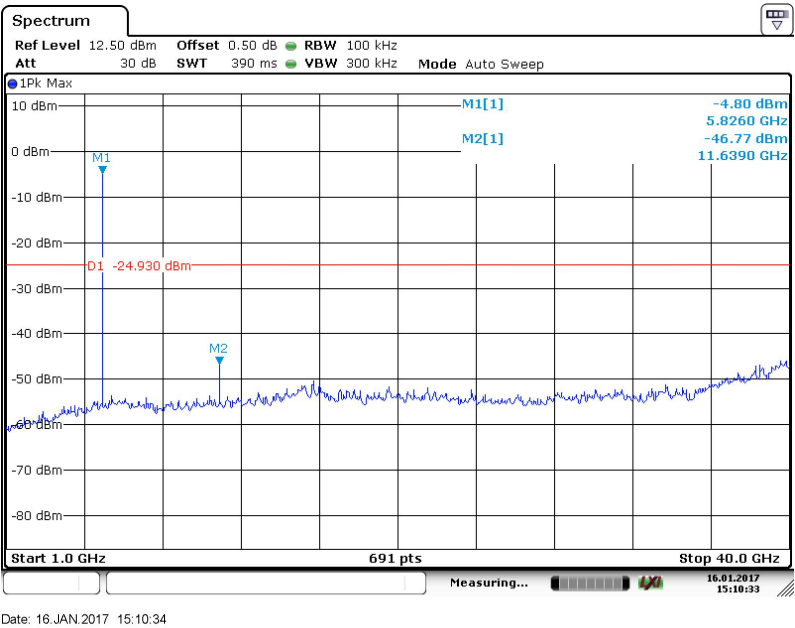


Date: 16.JAN.2017 15:09:07

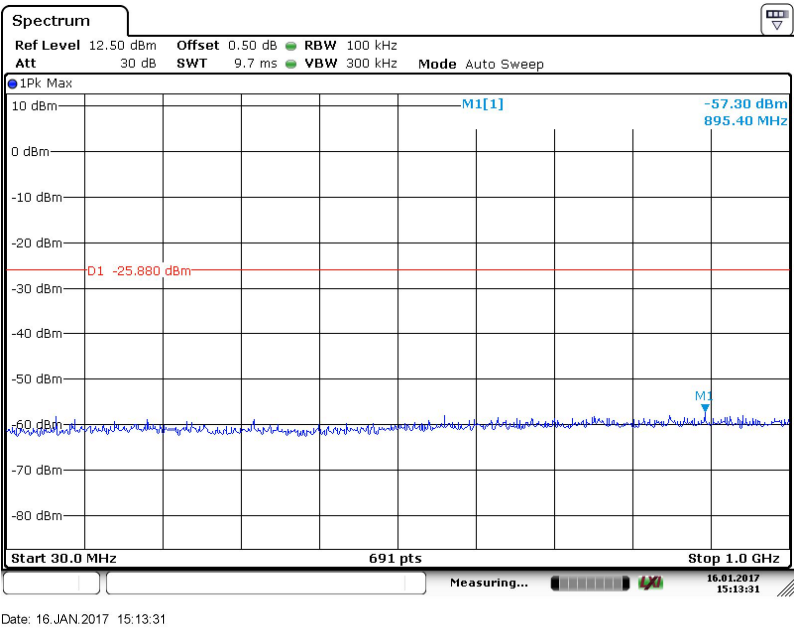


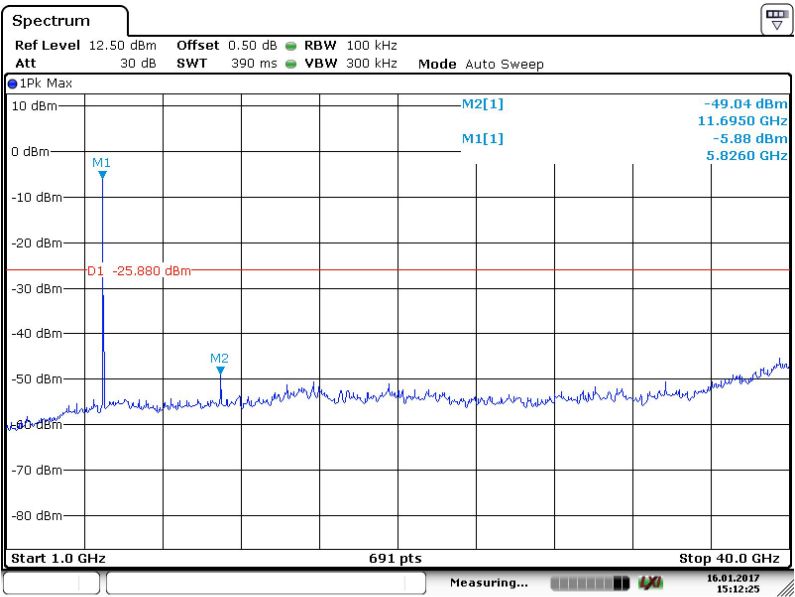
5809MHz





5847MHz





Date: 16.JAN.2017 15:12:26

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 $\geq$ 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.

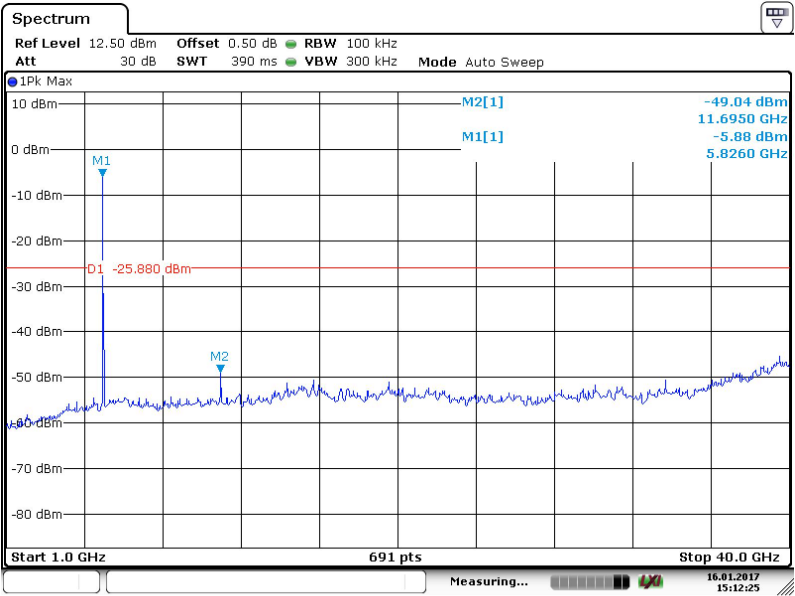
Limit

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen8.10, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

Test result



Date: 16 JAN 2017 15:05:56



Date: 16.JAN.2017 15:12:26

9.6 Spurious radiated emissions for transmitter

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW $\geq$ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

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 $\geq$ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($20\log(1/\text{duty cycle})$).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

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 section 15.205, 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

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, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

5733MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
22925.250	48.54	Horizontal	74	PK	25.46	Pass
22929.375	53.54	Vertical	74	PK	20.46	Pass

5809MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
23236.000	49.83	Horizontal	74	PK	24.17	Pass
23233.250	53.25	Vertical	74	PK	20.75	Pass

5847MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
23385.188	49.60	Horizontal	74	PK	24.40	Pass
23394.813	51.40	Vertical	74	PK	22.60	Pass

Remark:

- (1) Data of measurement within 30-1000MHz frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	Signal Generator	Rohde & Schwarz	SMB100A	108272	2017-7-15
	Signal Analyzer	Rohde & Schwarz	FSV40	101030	2017-7-15
	Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2017-7-15
	RF Switch Module	Rohde & Schwarz	OSP120/OS P-B157	101226/100851	2017-7-15
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2017-7-15
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2017-8-3
	Horn Antenna	Rohde & Schwarz	HF907	102294	2017-7-15
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2017-7-15
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

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	
Test Items	Extended Uncertainty
Radiation emission	U=4.32dB (30MHz-25GHz)
Output power test	0.94 dB
Power density test	2.10 dB
Bandwidth	1x10 ⁻⁹