



FCC- TEST REPORT

Report Number : **68.950.16.448.01** Date of Issue: **June 13, 2016**Model : **RODEO 150**

Product Type : 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, ChinaTest Result : **Positive** **Negative**Total pages including
Appendices : **24**

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2 Details about the Test Laboratory

Details about the Test Laboratory

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3 Description of the Equipment under Test

Description of the Equipment Under Test

| | |
|----------------------------|--|
| Product: | R/C Helicopter |
| Model no.: | RODEO 150 |
| FCC ID: | S29RODEO150 |
| Rating Voltage: | DC 7.4V 850mAn supplied by Li-ion rechargeable battery |
| RF Transmission Frequency: | 5725-5850MHz |
| No. of Operated Channel: | 7 (5733MHz, 5752MHz, 5771MHz, 5790MHz, 5809MHz, 5825MHz, 5847MHz) |
| Modulation: | DSSS |
| Duty Cycle: | ≥98% |
| Antenna Type: | External Integral Antenna |
| Antenna Gain: | 2dBi |
| Description of the EUT: | The Equipment Under Test (EUT) is a helicopter with a 5.8G Transmitter system and a 2.4G Receive system. |



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).

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 | --- | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247 (b) (1) | Conducted peak output power | 10 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.247(a)(1) | 20dB bandwidth | --- | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1) | Carrier frequency separation | --- | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii) | Number of hopping frequencies | --- | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii) | Dwell Time | --- | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(2) | 6dB bandwidth and 99% Occupied Bandwidth | 11 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.247(e) | Power spectral density | 13 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.247(d) | Spurious RF conducted emissions | 14 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.247(d) | Band edge | 18 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.247(d) & §15.209 | Spurious radiated emissions for transmitter | 20 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.203 | Antenna requirement | See note 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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.



6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: S29RODEO150 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

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 -

Reviewed by:

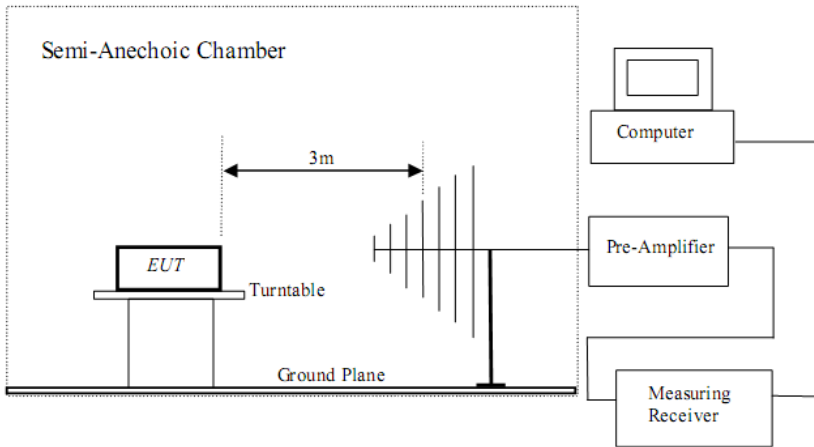
Prepared by:

John Zhi
EMC Project Manager

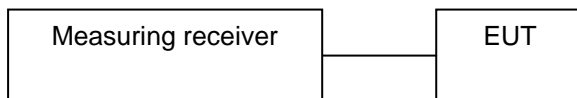
Alan Xiong
EMC Project Engineer

7 Test Setups

7.1 Radiated test setups



7.2 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|-------------|--------------|-------------------|-------------|
| --- | --- | --- | --- |

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 \geq 3RBW, Span \geq 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 |
|------------------------|------------|--------------|
| 5725-5875 | ≤ 1 | ≤ 30 |

Test result as below table

| Frequency MHz | Conducted Peak Output Power dBm | Result |
|------------------------|---------------------------------------|--------|
| Low channel 5733MHz | 0.74 | Pass |
| Middle channel 5790MHz | 0.99 | Pass |
| High channel 5847MHz | 1.41 | Pass |

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

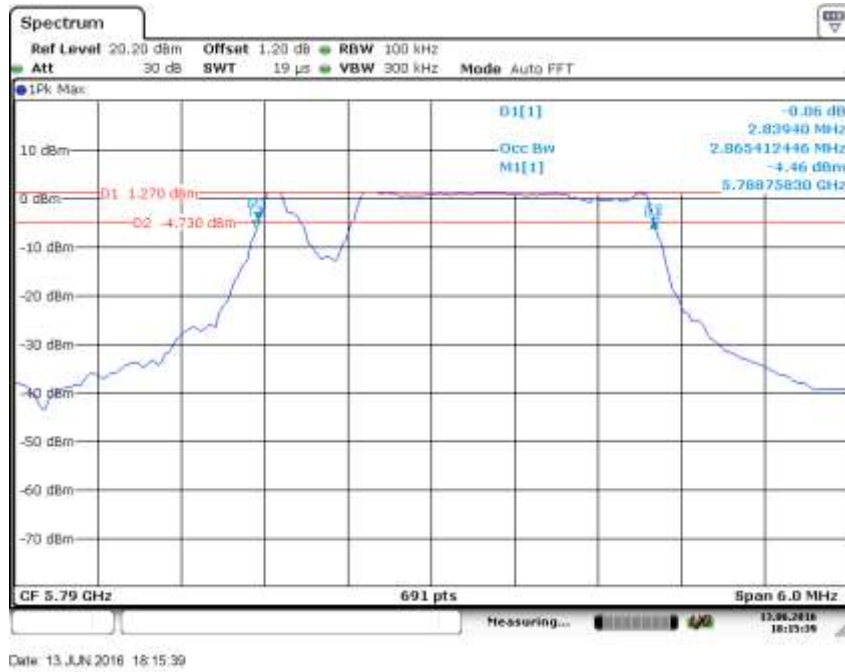
Test result

| Frequency MHz | 6dB bandwidth kHz | Result |
|------------------------|----------------------|--------|
| Low channel 5733MHz | 2822.0 | Pass |
| Middle channel 5790MHz | 2839.4 | Pass |
| High channel 5847MHz | 2960.9 | Pass |

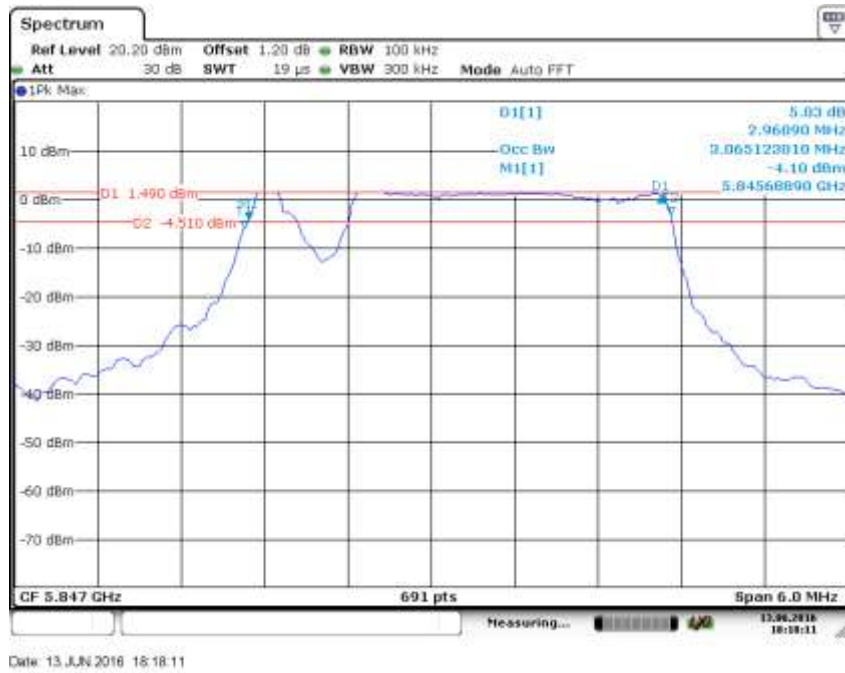
5733MHz



5790MHz



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 \geq 3RBW, Span=1.5 times DTS bandwidth, Detector=Average, Sweep=auto, The number of measurement points in the sweep \geq 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 MHz | Power spectral density dBm | Result |
|------------------------|----------------------------------|--------|
| Low channel 5733MHz | -0.73 | Pass |
| Middle channel 5809MHz | -0.76 | Pass |
| High channel 5847MHz | -1.71 | Pass |

9.4 Spurious RF conducted emissions

Test Method

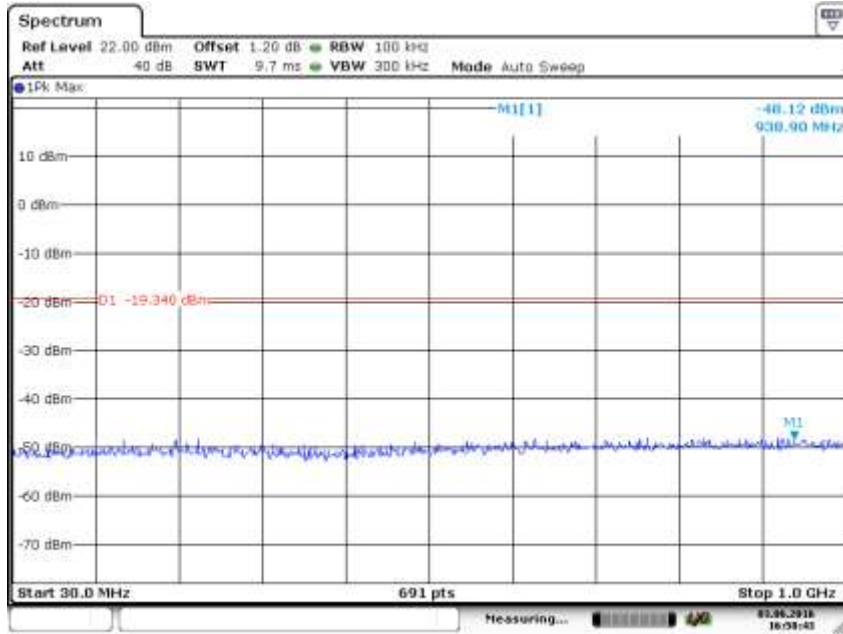
1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to 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

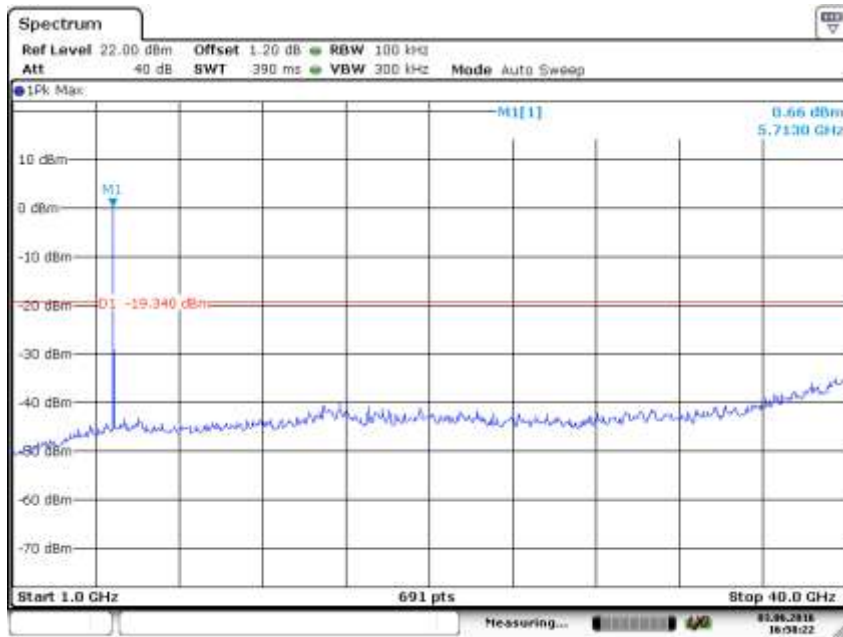
| Frequency Range MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000 | -20 |

Spurious RF conducted emissions

5733MHz



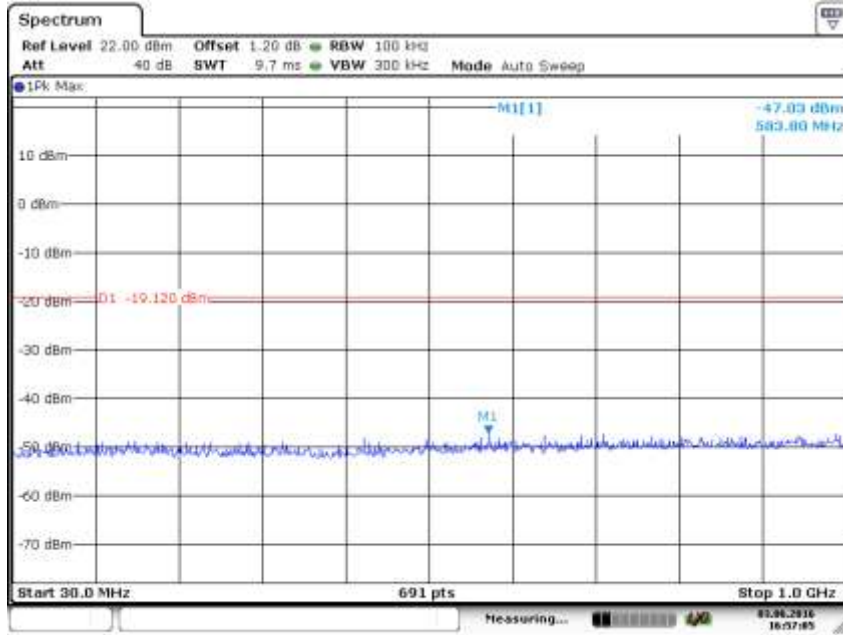
Date: 3 JUN 2016 16:58:43



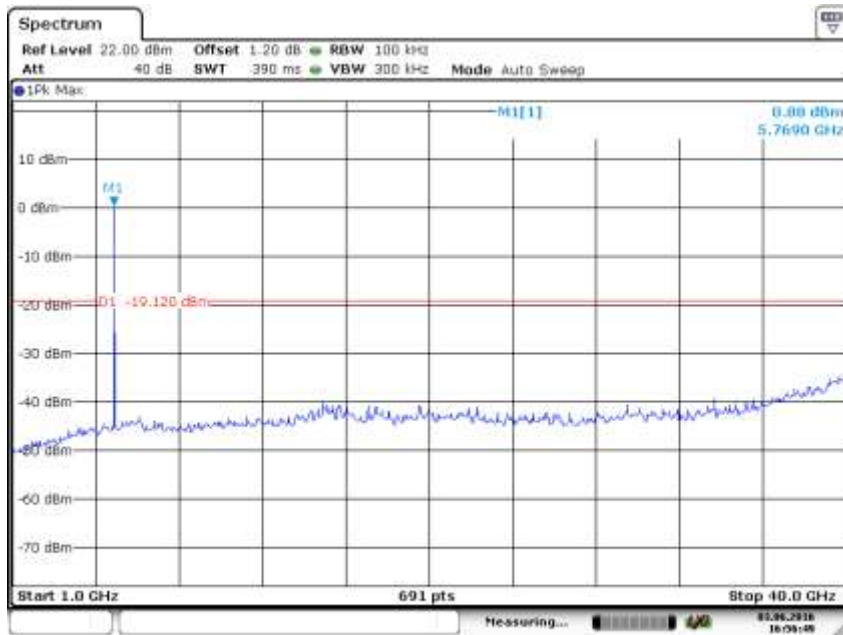
Date: 3 JUN 2016 16:58:21



5809MHz



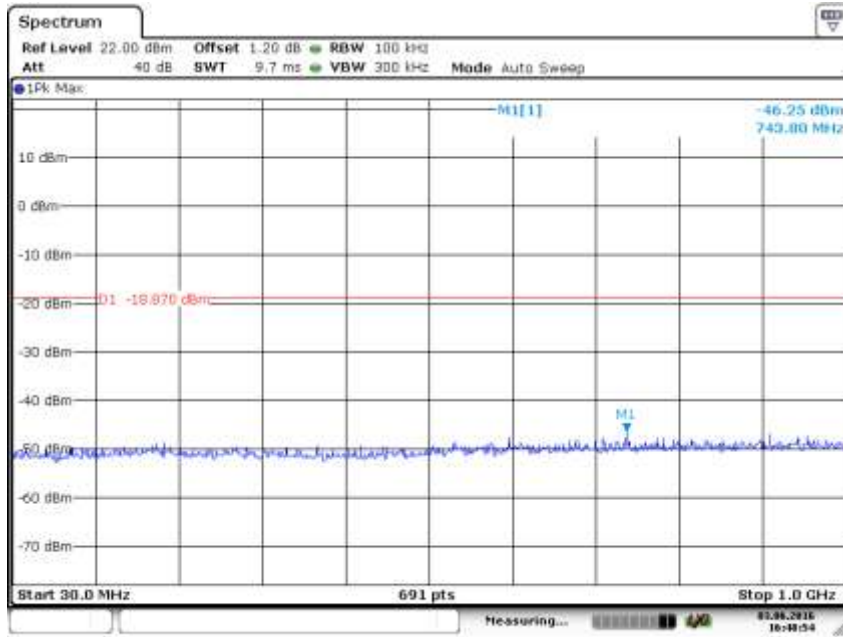
Date: 3 JUN 2016 16:57:05



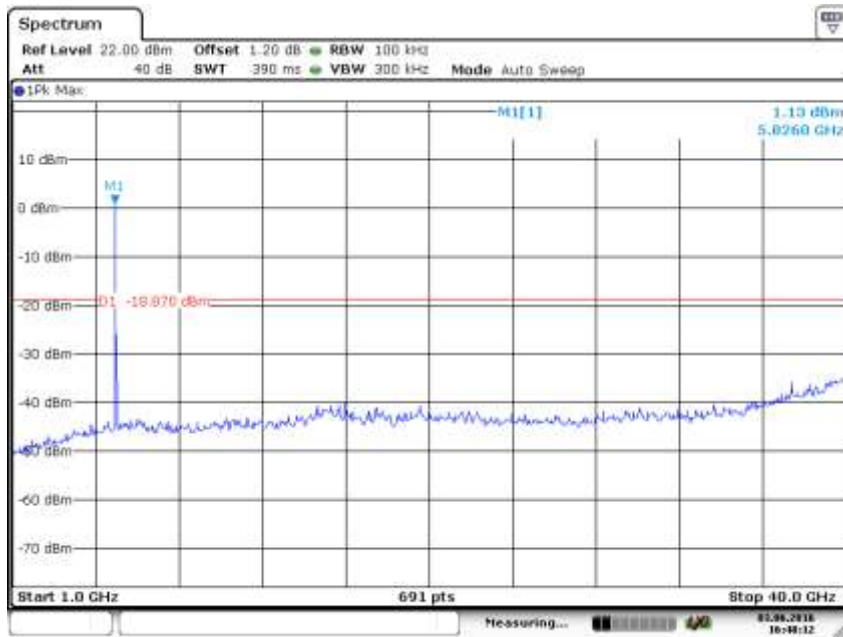
Date: 3 JUN 2016 16:58:08



5847MHz



Date: 3 JUN 2016 18 48 54



Date: 3 JUN 2016 18 48 12

9.5 Band edge

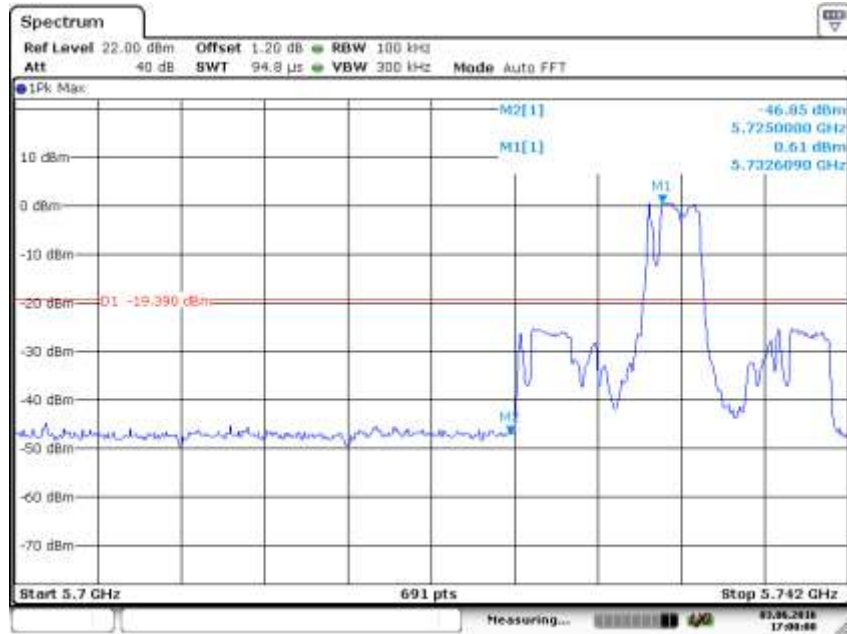
Test Method

- 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

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

Test result



Date: 3 JUN 2016 17:00:08



Date: 3 JUN 2016 16:54:48

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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, VBW \geq 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 $20\log(\text{duty cycle}/100 \text{ ms})$, 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 section 15.205, must comply with the radiated emission limits specified in section 15.209.

| Frequency MHz | Field Strength uV/m | Field Strength dB μ V/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.

Transmitting spurious emission test result as below:

5733MHz

| | | | | | | |
|--|-----------------------|---------------------|------------------------------|-----------------|------------------------------|---------------|
| Fundamental emission level | | 96.84 | dB μ V/m | Peak | | |
| Limited for emission outside of restricted bands: | | 76.84 | dB μ V/m | Peak | | |
| Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
| MHz | dBuV/m | | dBμV/m | | dBμV/m | |
| 46.27 | 18.40 | Horizontal | 40.00 | QP | 21.60 | Pass |
| 287.59 | 21.63 | Horizontal | 46.00 | QP | 24.37 | Pass |
| 858.97 | 28.87 | Horizontal | 46.00 | QP | 17.13 | Pass |
| 143.76 | 12.88 | Vertical | 43.50 | QP | 30.62 | Pass |
| 287.59 | 24.15 | Vertical | 46.00 | QP | 21.85 | Pass |
| 869.59 | 31.09 | Vertical | 46.00 | QP | 14.91 | Pass |
| *11466 | 47.47 | Horizontal | 74 | Peak | 26.53 | Pass |
| *11466 | 48.65 | Vertical | 74 | Peak | 25.35 | Pass |
| 17199 | 49.85 | Horizontal | 76.84 | Peak | 26.99 | Pass |
| 17199 | 50.15 | Vertical | 76.84 | Peak | 26.69 | Pass |

5790MHz

| | | | | | | |
|--|-----------------------|---------------------|------------------------------|-----------------|------------------------------|---------------|
| Fundamental emission level | | 97.20 | dB μ V/m | Peak | | |
| Limited for emission outside of restricted bands: | | 77.20 | dB μ V/m | Peak | | |
| Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
| MHz | dBuV/m | | dBμV/m | | dBμV/m | |
| *11580 | 47.96 | Horizontal | 74 | Peak | 26.04 | Pass |
| *11580 | 43.98 | Vertical | 74 | Peak | 30.02 | Pass |
| 17370 | 50.27 | Horizontal | 77.20 | Peak | 26.93 | Pass |
| 17370 | 50.28 | Vertical | 77.20 | Peak | 26.92 | Pass |

5847MHz

| | | | | | | |
|--|-----------------------|---------------------|------------------------------|-----------------|------------------------------|---------------|
| Fundamental emission level | | 98.09 | dB μ V/m | Ave | | |
| Limited for emission outside of restricted bands: | | 78.09 | dB μ V/m | Ave | | |
| Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
| MHz | dBuV/m | | dBμV/m | | dBμV/m | |
| *11694 | 45.19 | Horizontal | 74 | Peak | 28.81 | Pass |
| *11694 | 46.40 | Vertical | 74 | Peak | 27.60 | Pass |
| 17541 | 50.26 | Horizontal | 78.09 | Peak | 27.83 | Pass |
| 17541 | 50.02 | Vertical | 78.09 | Peak | 28.07 | Pass |



Remark:

- (1) AV Emission Level= PK Emission Level+20log (duty cycle)
- (2) Testing is carried out with frequency range 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.

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

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) |