



**CENTRE OF TESTING SERVICE  
INTERNATIONAL**

**OPERATE ACCORDING TO ISO/IEC 17025**

# **FCC ID/IC TEST REPORT**

**TEST REPORT NUMBER : CGZ3160707-01177-EFI**



**CENTRE OF TESTING SERVICE CO., LTD.**

A101, No.65, Zhuji Highway, Tianhe District, Guangzhou, China



|  |  |
|--|--|
| <b>TEST REPORT For FCC ID/IC</b>   |  |
| <b>47 CFR PART 15 OCT, 2016; RSS-210 Issue 9</b>   |  |
| <b>Report Reference No.</b> .....  | CGZ3160707-01177-EFI   |
| <b>Date of issue</b> .....   | 28 March 2017  |
| <b>Testing Laboratory Name</b> .....   | <b>CENTRE OF TESTING SERVICE CO., LTD.</b>   |
| <b>Address</b> .....   | A101, No.65, Zhuji Highway, Tianhe District, Guangzhou, China  |
| <b>Testing location/ procedure</b> .....   | Full application of Harmonised standards <input checked="" type="checkbox"/><br>Partial application of Harmonised standards <input type="checkbox"/><br>Other standard testing method <input type="checkbox"/> |
| <b>Applicant's name</b> .....  | Horizon Hobby, LLC   |
| <b>Address</b> .....   | 4105 Fieldstone Road, Champaign, IL 61822, USA   |
| <b>Test specification</b> .....  |  |
| <b>Standard</b> .....  | <b>47 CFR PART 15 OCT, 2016; RSS-210 Issue 9; RSS-Gen Issue 4<br/>ANSI C63.10:2013</b>   |
| <b>Test Report Form No.</b> .....  | CTSEMC-1.0   |
| <b>TRF Originator</b> .....  | CENTRE OF TESTING SERVICE CO., LTD.  |
| <b>Master TRF</b> .....  | Dated 2009-01  |
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| <b>Test item description</b> .....   | Spektrum FPV Racing Serial Receiver  |
| <b>Trade Mark</b> .....  | Spektrum   |
| <b>Manufacturer</b> .....  | Horizon Hobby, LLC   |
| <b>Model/Type reference</b> .....  | SPM4648  |
| <b>Ratings</b> .....   | DC 3.3V  |
| <b>Operating Frequency</b> .....   | 2404.0MHz ~2476.0MHz   |
| <b>Result</b> .....  | <b>Positive</b>  |

**Compiled by:**

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Vincent yao / Manager

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**FCC ID/IC -- TEST REPORT**

|   |                                       |
|---|---------------------------------------|
| <b>Test Report No. :</b> CGZ3160707-01177-EFI | <u>28 March 2017</u><br>Date of issue |
|---|---------------------------------------|

|                          |  |
|--------------------------|--|
| Type / Model.....        | SPM4648  |
| EUT.....                 | Spektrum FPV Racing Serial Receiver            |
| <b>Applicant.....</b>    | Horizon Hobby, LLC                             |
| Address.....             | 4105 Fieldstone Road, Champaign, IL 61822, USA |
| Telephone.....           | +1-217 4033657                                 |
| Fax.....                 | /  |
| Contact.....             | Erin Hassan                                    |
| <b>Manufacturer.....</b> | Horizon Hobby, LLC                             |
| Address.....             | 4105 Fieldstone Road, Champaign, IL 61822, USA |
| Telephone.....           | +1-217 4033657                                 |
| Fax.....                 | /  |
| Contact.....             | Erin Hassan                                    |
| <b>Factory.....</b>      | Horizon Hobby, LLC                             |
| Address.....             | 4105 Fieldstone Road, Champaign, IL 61822, USA |
| Telephone.....           | +1-217 4033657                                 |
| Fax.....                 | /  |
| Contact.....             | Erin Hassan                                    |

|  |
|--|
| <b>Test Result</b> according to the standards on page 1: <b>PASSED</b> |
|--|

The test report merely corresponds to the test sample.  
 It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## TABLE OF CONTENTS

| <b>Description</b>   | <b>Page</b> |
|--|-------------|
| <b>1.TEST STANDARDS</b> .....  | <b>5</b>    |
| <b>2.SUMMARY</b> .....   | <b>5</b>    |
| <b>2.1 GENERAL REMARKS</b> .....                                     | <b>5</b>    |
| <b>2.2 FINAL ASSESSMENT</b> .....                                    | <b>5</b>    |
| <b>3.EQUIPMENT UNDER TEST</b> .....                                  | <b>5</b>    |
| <b>3.1 POWER SUPPLY SYSTEM UTILISED</b> .....                        | <b>5</b>    |
| <b>3.2 SHORT DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)</b> ..... | <b>5</b>    |
| <b>3.3 EUT OPERATION MODE</b> .....                                  | <b>5</b>    |
| <b>3.4 EUT CONFIGURATION</b> .....                                   | <b>6</b>    |
| <b>4.TEST ENVIRONMENT</b> .....                                      | <b>7</b>    |
| <b>4.1 ADDRESS OF THE TEST LABORATORY</b> .....                      | <b>7</b>    |
| <b>4.2 TEST FACILITY</b> .....                                       | <b>7</b>    |
| <b>4.3 ENVIRONMENTAL CONDITIONS</b> .....                            | <b>7</b>    |
| <b>4.4 DEFINITIONS OF SYMBOLS USED IN THIS TEST REPORT</b> .....     | <b>7</b>    |
| <b>4.5 STATEMENT OF THE MEASUREMENT UNCERTAINTY</b> .....            | <b>7</b>    |
| <b>4.6 MEASUREMENT UNCERTAINTY</b> .....                             | <b>8</b>    |
| <b>5.SUMMARY OF STANDARDS AND RESULTS</b> .....                      | <b>8</b>    |
| <b>5.1.DESCRPTION OF STANDARDS AND RESULTS</b> .....                 | <b>8</b>    |
| <b>6.POWER LINE CONDUCTED EMISSION TEST</b> .....                    | <b>9</b>    |
| <b>6.1.TEST EQUIPMENT</b> .....                                      | <b>9</b>    |
| <b>6.2. BLOCK DIAGRAM OF TEST SETUP</b> .....                        | <b>9</b>    |
| <b>6.3. POWER LINE CONDUCTED EMISSION TEST LIMITS</b> .....          | <b>9</b>    |
| <b>6.4.TEST PROCEDURE</b> .....                                      | <b>9</b>    |
| <b>6.5. POWER LINE CONDUCTED EMISSION TEST RESULTS</b> .....         | <b>9</b>    |
| <b>7.RADIATED DISTURBANCE (ELECTRIC FIELD)</b> .....                 | <b>10</b>   |
| <b>7.1.TEST EQUIPMENT</b> .....                                      | <b>10</b>   |
| <b>7.2.BLOCK DIAGRAM OF TEST SETUP</b> .....                         | <b>10</b>   |
| <b>7.3.RADIATED EMISSION LIMIT :</b> .....                           | <b>11</b>   |
| <b>7.4.TEST PROCEDURE</b> .....                                      | <b>12</b>   |
| <b>7.5.RADIATED EMISSION TEST RESULTS</b> .....                      | <b>12</b>   |
| <b>8.BAND EDGE COMPLIANCE TEST</b> .....                             | <b>24</b>   |
| <b>8.1. TEST EQUIPMENT</b> .....                                     | <b>24</b>   |
| <b>8.2. TEST INFORMATION</b> .....                                   | <b>24</b>   |

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|  |           |
|--|-----------|
| 8.3. TEST PROCEDURE .....                            | 24        |
| 8.4. TEST RESULTS .....                              | 24        |
| <b>9. 99% BANDWIDTH .....</b>                        | <b>29</b> |
| 9.1 TEST PROCEDURE .....                             | 29        |
| 9.2. TEST EQUIPMENT .....                            | 29        |
| 9.3. TEST RESULTS .....                              | 29        |
| <b>10 ANTENNA REQUIREMENTS .....</b>                 | <b>32</b> |
| 10.1 STANDARD APPLICABLE .....                       | 32        |
| 10.2 ANTENNA CONSTRUCTION AND DIRECTIONAL GAIN ..... | 32        |
| <b>11.DEVIATION TO TEST SPECIFICATIONS .....</b>     | <b>32</b> |

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## 1. TEST STANDARDS

The tests were performed according to following standards:

- 47 CFR PART 15 OCT, 2016
- RSS-210 Issue 9
- RSS-Gen Issue 4
- ANSI C63.10:2013

## 2. SUMMARY

### 2.1 GENERAL REMARKS

|                                |                            |
|--------------------------------|----------------------------|
| Date of receipt of test sample | 07 July 2016               |
| Testing commenced on           | 07 July 2016~28 March 2017 |
| Testing concluded on           | 28 March 2017              |

### 2.2 FINAL ASSESSMENT

The FCC/IC requirements pertaining to the technical standards and tested operation modes are

- - fulfilled.
- - **not** fulfilled.

The equipment under test

- - fulfils the FCC/IC requirements cited on page 1.
- - **does not** fulfil the FCC/IC requirements cited on page 1.

## 3. EQUIPMENT UNDER TEST

### 3.1 Power supply system utilised

Power supply voltage : ■ DC 3.3V

### 3.2 Short description of the Equipment under Test (EUT)

Number of tested samples: 1

Serial number: Prototype

### 3.3 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

- TX- Y position
- TX- Z position
- TX- X position
- RX

Operation mode 1: TX-X Position Low (2404MHz) , TX-X Position Middle (2440MHz) ,  
TX-X Position High (2476MHz)  
RX

Note: Operation mode 1 TX -X position of EUT is the radiated test worst case; so only these test results be recorded in the test report.



### 3.4 EUT configuration

#### 3.4.1. Description of configuration (EUT)

|                       |   |  |
|-----------------------|---|--|
| Description           | : | Spektrum FPV Racing Serial Receiver                      |
| Model Number          | : | SPM4648  |
| Operation frequency   | : | 2404~ 2476 MHz ISM Band                                  |
| Modulation Technology | : | GFSK Modulation  |
| Antenna               | : | External antenna, met requirement of FCC 15.203;<br>2dBi |

#### 3.4.2. Tested Supporting System Details

N/A

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## 4. TEST ENVIRONMENT

### 4.1 Address of the test laboratory

A101, No.65, Zhuji Highway, Tianhe District, Guangzhou, China

Tel: +86-20-85543113 (32 lines) Fax: +86-20-38780406

### 4.2 Test facility

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

#### **CNAS-Lab Code: L3394**

CENTRE OF TESTING SERVICE CO., LTD has been assessed and proved to be in compliance with CNAS-CL01: 2006 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### **IC-Registration No.: 8374A**

The 3m Alternate Test Site of CENTRE OF TESTING SERVICE CO., LTD has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 8374A on June 6, 2011.

#### **FCC-Registration No.: 971995**

CENTRE OF TESTING SERVICE 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 No.791995, July 13,2012.

### 4.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

|                       |            |
|-----------------------|------------|
| Temperature:          | 15~35 ° C  |
| Humidity:             | 25~75 %    |
| Atmospheric pressure: | 86~106 kPa |

### 4.4 Definitions of symbols used in this test report

- - The black square indicates that the listed condition, standard or equipment is applicable for this report.
- - The empty square indicates that the listed condition, standard or equipment is **not** applicable for this report.

### 4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the CTS quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.



#### 4.6 Measurement Uncertainty

| Test Item               | Frequency Range | Uncertainty | Note |
|-------------------------|-----------------|-------------|------|
| Conduction disturbance  | 150kHz~30MHz    | ±1.22dB     | (1)  |
| Power disturbance       | 30MHz~300MHz    | ±1.38dB     | (1)  |
| Radiation emission (3m) | 30MHz~300MHz    | ±3.14dB     | (1)  |
|                         | 300MHz~1000MHz  | ±3.18dB     | (1)  |
|                         | 1GHz~26.5GHz    | ±3.54dB     | (1)  |

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 5. Summary of standards and results

#### 5.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

| EMISSION                                   |   |         |
|--|---|---------|
| Description of Test Item                   | Standard  | Results |
| Conducted Emission Test                    | FCC Part 15 § 15.207<br>RSS-Gen Issue 4§ 7.2.4<br>ANSI C63.10:2013  | N/A     |
| Radiated Emission Test                     | RSS-Gen Issue 4§ 7.2<br>RSS-210 Issue 9 § B.10<br>FCC Part 15 C § 15.249<br>FCC Part 15 § 209<br>ANSI C63.10:2013 | PASSED  |
| Receiver Spurious Emissions                | RSS-Gen Issue 4§ 4.10<br>ANSI C63.10:2013   | PASSED  |
| Band Edge Compliance Test                  | RSS-210 Issue 9 § 4.1<br>RSS-Gen Issue 4 § 8.10<br>FCC Part 15 C § 15.249<br>ANSI C63.10:2013                     | PASSED  |
| 99% Bandwidth                              | RSS-210 Issue 9 § A.1.3<br>RSS-Gen Issue 4 § 6.6<br>ANSI C63.10:2013  | PASSED  |
| N/A is an abbreviation for Not Applicable. |   |         |

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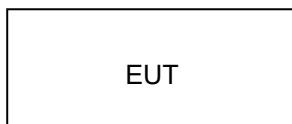
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## 6. Power Line Conducted Emission Test

### 6.1. Test Equipment

| Conducted Disturbance |                   |                 |           |            |           |
|-----------------------|-------------------|-----------------|-----------|------------|-----------|
| Item                  | Test Equipment    | Manufacturer    | Model No. | Serial No. | Last Cal. |
| 1                     | EMI Test Receiver | ROHDE & SCHWARZ | ESHS10    | 842884/012 | 2016/10   |
| 2                     | Artificial Mains  | ROHDE & SCHWARZ | ESH3-Z5   | 832479/025 | 2016/10   |
| 3                     | Artificial Mains  | ROHDE & SCHWARZ | ESH3-Z5   | 832479/026 | 2016/10   |
| 4                     | Pulse Limiter     | ROHDE & SCHWARZ | ESHSZ2    | 100301     | 2016/10   |
| 5                     | EMI Test Software | ROHDE & SCHWARZ | ESK1      | N/A        | 2016/10   |

### 6.2. Block Diagram of Test Setup



(EUT: Spektrum FPV Racing Serial Receiver)

### 6.3. Power Line Conducted Emission Test Limits

Standard:RSS-Gen:7.2.4, FCC Part 15 : 15.207,ANSI C63.10:2013

| Frequency       | Maximum RF Line Voltage    |                         |
|-----------------|----------------------------|-------------------------|
|                 | Quasi-Peak Level<br>dB(μV) | Average Level<br>dB(μV) |
| 150kHz ~ 500kHz | 66 ~ 56*                   | 56 ~ 46*                |
| 500kHz ~ 5MHz   | 56                         | 46                      |
| 5MHz ~ 30MHz    | 60                         | 50                      |

Notes: 1. \* Decreasing linearly with logarithm of frequency.  
 2. The lower limit shall apply at the transition frequencies.

### 6.4. Test Procedure

The Notebook Power connected to the power mains through a line impedance stabilization network (L.I.S.N.#2). This provides a 50 ohm coupling impedance for the EUT. Please refer the block diagram of the test setup and photographs. The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#1). Power on the PC and let it work normally, we use a keyboard test soft ware, let EUT working in test mode, then test it. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC Part 15C on Conducted Emission Test.

### 6.5. Power Line Conducted Emission Test Results

N/A

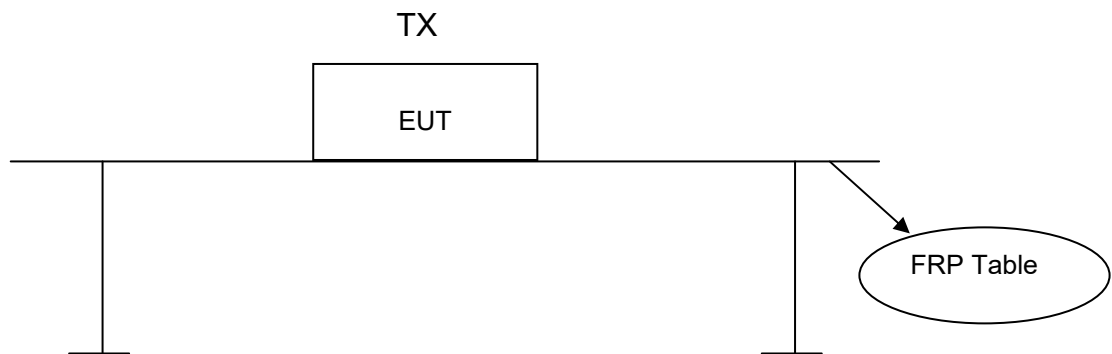
## 7. Radiated disturbance (electric field)

### 7.1. Test Equipment

| Radiated disturbance (electric field) |                   |                 |            |            |           |
|---------------------------------------|-------------------|-----------------|------------|------------|-----------|
| Item                                  | Test Equipment    | Manufacturer    | Model No.  | Serial No. | Last Cal. |
| 1                                     | EMI Test Receiver | ROHDE & SCHWARZ | ESCI       | 100868     | 2016/10   |
| 2                                     | Biconical Antenna | ROHDE & SCHWARZ | HK116      | 100221     | 2017/03   |
| 3                                     | Log per Antenna   | ROHDE & SCHWARZ | HL223      | 100226     | 2017/03   |
| 4                                     | Log per Antenna   | ROHDE & SCHWARZ | HL050      | 100186     | 2017/03   |
| 5                                     | Signal analyzer   | ROHDE & SCHWARZ | FSIQ26     | 100311     | 2017/03   |
| 6                                     | Loop Antenna      | A.R.A           | PLA-1030/B | 1030       | 2016/10   |

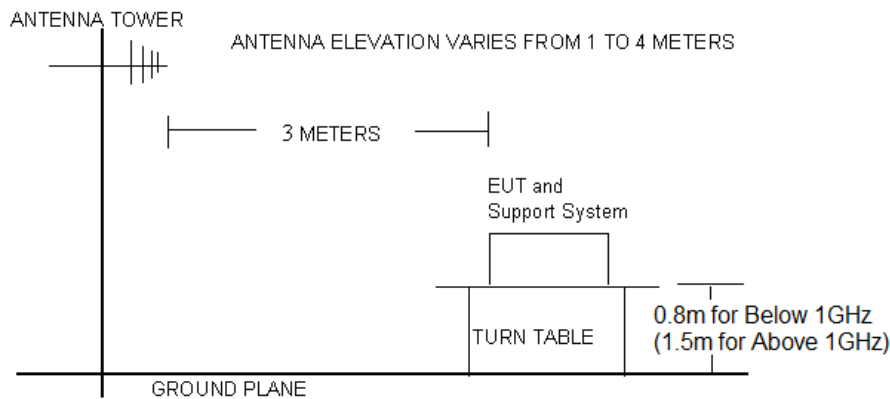
### 7.2. Block Diagram of Test Setup

#### 7.2.1 Block Diagram of connection between EUT and simulators



(EUT: Spektrum FPV Racing Serial Receiver)

### 7.2.2 Anechoic Chamber Setup Diagram



### 7.3. Radiated Emission Limit :

**Standard: FCC 15.249 , FCC 15.209; RSS-Gen:7.2; RSS-210 B.10.**

Except as provided in paragraph (a) 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 (mV/m) | Field Strength of Harmonics (µV/m) |
|-----------------------------|--------------------------------------|------------------------------------|
| 902-928                     | 50                                   | 500                                |
| 2400-2483.5                 | 50                                   | 500                                |
| 5725-5875                   | 50                                   | 500                                |
| 24000-24250                 | 250                                  | 2500                               |

| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT                                 |          |
|---------------|-----------------|---|----------|
|               |                 | µV/m  | dB(µV)/m |
| 0.009 ~ 0.490 | 300             | 2400/F(kHz)   | ---      |
| 0.490 ~ 1.705 | 30              | 24000/F(kHz)  | ---      |
| 1.705 ~ 30    | 30              | 30  | ---      |
| 30 ~ 88       | 3               | 100   | 40.0     |
| 88 ~ 216      | 3               | 150   | 43.5     |
| 216 ~ 960     | 3               | 200   | 46.0     |
| 960 ~ 1000    | 3               | 500   | 54.0     |
| Above 1000    | 3               | Other:74.0 dB(µV)/m (Peak)<br>54.0 dB(µV)/m (Average) |          |

- Remark:
- (1) Emission level  $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$
  - (2) The smaller limit shall apply at the cross point between two frequency bands.
  - (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

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## 7.4. Test Procedure

The EUT and its simulators are placed on a turn table, which is 0.8 meter high (1.5m for above 1GHz) above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna is set on Test. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.10:2013 on radiated emission Test.

The frequency range from 30MHz to 1000MHz and above 1GHz. is investigated. Please see the following pages.

All measurements for radiated emissions within the restricted bands were performed using a Quasi-Peak detector with 120kHz RBW below 1GHz and a Peak and Average detector with 2MHz RBW above 1GHz,

All measurements for radiated emissions within the restricted bands were performed using a Quasi-Peak detector with 300kHz VBW below 1GHz and a Peak detector with 1MHz VBW above 1GHz, A average detector with 10Hz VBW above 1GHz

Pretest x, y, z position of EUT, final, select the worst case x position test and record the test results in the report.

The test modes (TX Mode) is tested in Anechoic Chamber and all the scanning waveforms are reported on section 7.5

## 7.5. Radiated Emission Test Results

**PASSED.**

The frequency range from 9KHz~30MHz, 30MHz to 230MHz, 230MHz to 1000MHz and above 1GHz. is investigated. Please see the following pages.



|                  |                     |         |  |
|------------------|---------------------|---------|--|
| Test Mode:       | TX -X Position Mode | Result: | <input checked="" type="checkbox"/> - passed |
| Frequency range: | 9KHz~30MHz          |         | <input type="checkbox"/> - not passed        |

| No.  | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|--|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| Remark: The test result reading value is to low, margin all > 20dB of the limit. |                 |             |                |                |                |             |      |

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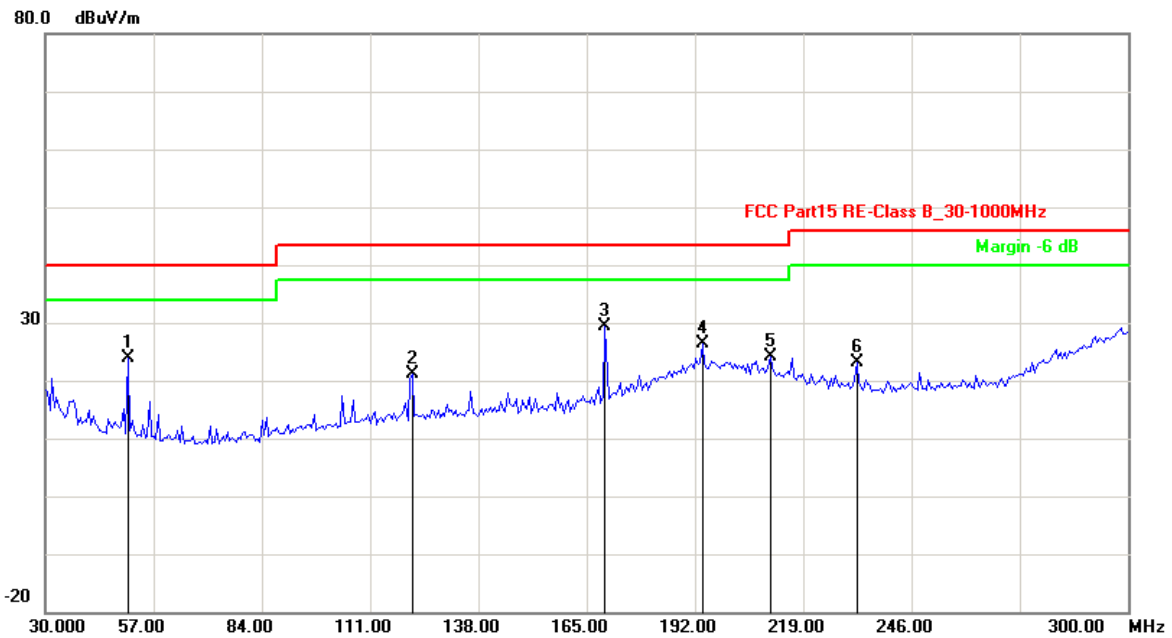
E-mail: cts@cts-lab.com.cn

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|                  |                |         |  |
|------------------|----------------|---------|--|
| Channel:         | TX -X Position | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Horizontal     |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 30MHz-1GHz     |         |  |

|                |   |
|----------------|---|
| EUT            | Spektrum FPV Racing Serial Receiver     |
| Test Condition | Ambient Temperature: 25°C Humidity: 56% |
| Test distance  | 3 Meter                                 |
| Test Date:     | 07July 2016~28 March 2017               |
| Operator       | Duke                                    |
| MODEL NO       | SPM4648                                 |



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 50.5611         | -18.68      | 42.64          | 23.96          | 40.00          | -16.04      | QP   |
| 2   | 121.4429        | -16.64      | 37.73          | 21.09          | 43.50          | -22.41      | QP   |
| 3   | 169.5992        | -15.98      | 45.24          | 29.26          | 43.50          | -14.24      | QP   |
| 4   | 193.9479        | -13.55      | 39.84          | 26.29          | 43.50          | -17.21      | QP   |
| 5   | 210.7214        | -10.24      | 34.30          | 24.06          | 43.50          | -19.44      | QP   |
| 6   | 232.3647        | -11.63      | 34.75          | 23.12          | 46.00          | -22.88      | QP   |

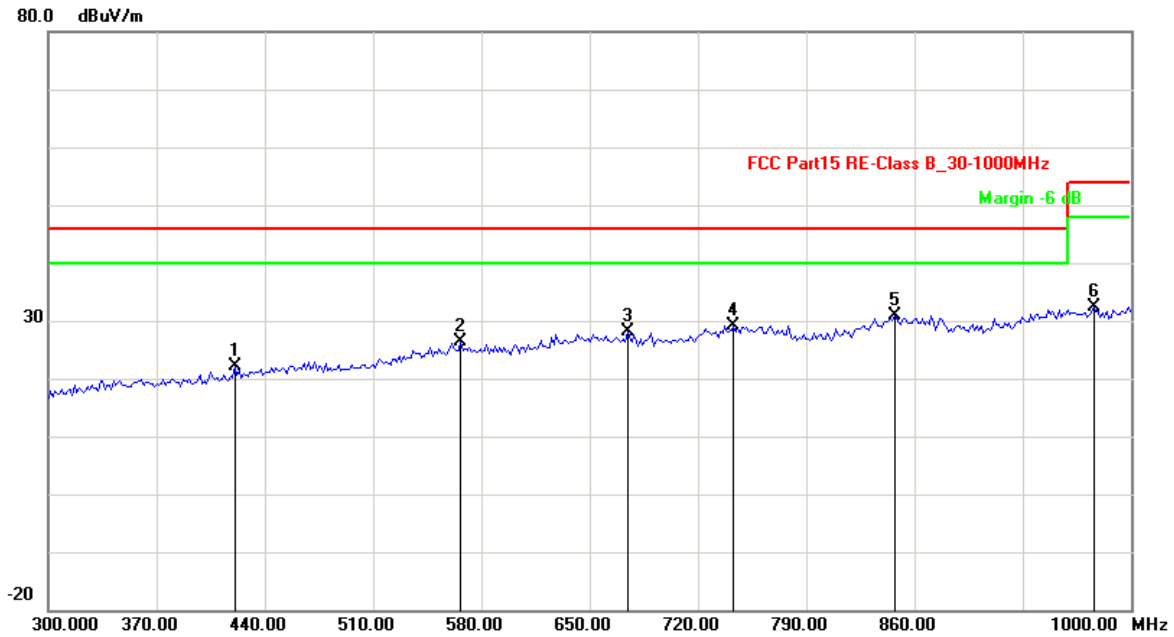
Remark: Other frequency mini margin all >6 dB of Limit

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| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 420.6413        | -9.66       | 31.76          | 22.10          | 46.00          | -23.90      | QP   |
| 2   | 566.5331        | -5.64       | 31.94          | 26.30          | 46.00          | -19.70      | QP   |
| 3   | 674.5491        | -3.47       | 31.70          | 28.23          | 46.00          | -17.77      | QP   |
| 4   | 743.2866        | -1.88       | 31.07          | 29.19          | 46.00          | -16.81      | QP   |
| 5   | 847.0942        | -0.46       | 31.43          | 30.97          | 46.00          | -15.03      | QP   |
| 6   | 976.1523        | 0.17        | 32.12          | 32.29          | 54.00          | -21.71      | QP   |

Remark: Other frequency mini margin all >6 dB of Limit

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|                  |                       |         |  |
|------------------|-----------------------|---------|--|
| Channel:         | TX -X Position Low CH | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Horizontal            |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 1GHz-26.5GHz          |         |  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 2404.00         | -6.83       | 87.11          | 80.28          | 114.00         | -33.72      | Peak |
| 2   | 2404.00         | -6.83       | 85.68          | 78.85          | 94.00          | -15.15      | AVG  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 1595.190        | -11.90      | 58.09          | 46.19          | 74.00          | -27.81      | peak |
| 2   | 1595.190        | -11.90      | 42.95          | 31.05          | 54.00          | -22.95      | AVG  |
| 3   | 4813.627        | 2.67        | 51.65          | 54.32          | 74.00          | -19.68      | peak |
| 4   | 4813.627        | 2.67        | 37.60          | 40.27          | 54.00          | -13.73      | AVG  |

Remark: Other frequency mini margin all >20 dB of Limit

|                  |                          |         |  |
|------------------|--------------------------|---------|--|
| Channel:         | TX -X Position Middle CH | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Horizontal               |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 1GHz-26.5GHz             |         |  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 2440.00         | -6.62       | 86.86          | 80.24          | 114.00         | -33.76      | Peak |
| 2   | 2440.00         | -6.62       | 85.27          | 78.65          | 94.00          | -15.35      | AVG  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 1617.235        | -11.76      | 60.56          | 48.80          | 74.00          | -25.20      | peak |
| 2   | 1617.235        | -11.76      | 45.02          | 33.26          | 54.00          | -20.74      | AVG  |
| 3   | 4879.760        | 2.89        | 46.91          | 49.80          | 74.00          | -24.20      | peak |
| 4   | 4879.760        | 2.89        | 31.68          | 34.57          | 54.00          | -19.43      | AVG  |

Remark: Other frequency mini margin all >20 dB of Limit

|                  |                        |         |  |
|------------------|------------------------|---------|--|
| Channel:         | TX -X Position High CH | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Horizontal             |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 1GHz-26.5GHz           |         |  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 2476.00         | -6.40       | 86.44          | 80.04          | 114.00         | -33.96      | Peak |
| 2   | 2476.00         | -6.40       | 84.55          | 78.15          | 94.00          | -15.85      | AVG  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 1639.279        | -11.61      | 60.71          | 49.10          | 74.00          | -24.90      | peak |
| 2   | 1639.279        | -11.61      | 46.87          | 35.26          | 54.00          | -18.74      | AVG  |
| 3   | 4945.892        | 3.11        | 42.20          | 45.31          | 74.00          | -28.69      | peak |
| 4   | 4945.892        | 3.11        | 27.13          | 30.24          | 54.00          | -23.76      | AVG  |

Remark: Other frequency mini margin all >20 dB of Limit

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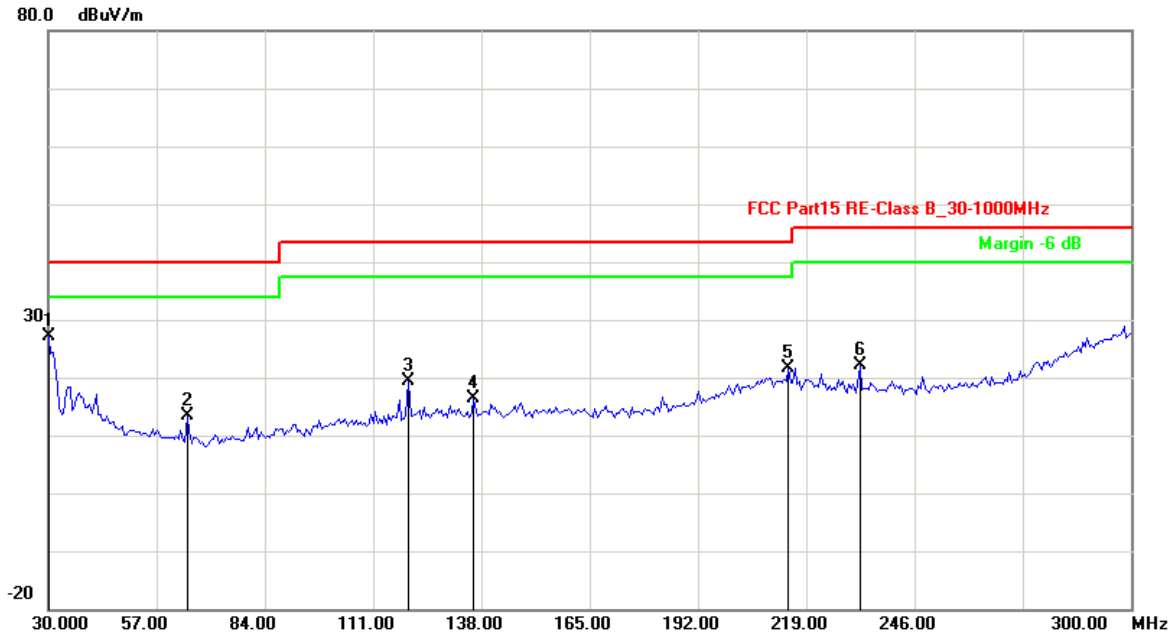
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|                  |                |         |                |
|------------------|----------------|---------|----------------|
| Channel:         | TX -X Position | Result: | ■ - passed     |
| Test point:      | Vertical       |         | □ - not passed |
| Frequency range: | 30MHz-1GHz     |         |                |



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 30.0000         | -16.04      | 43.09          | 27.05          | 40.00          | -12.95      | QP   |
| 2   | 64.6293         | -20.19      | 33.59          | 13.40          | 40.00          | -26.60      | QP   |
| 3   | 119.8196        | -16.73      | 36.08          | 19.35          | 43.50          | -24.15      | QP   |
| 4   | 136.0521        | -16.09      | 32.44          | 16.35          | 43.50          | -27.15      | QP   |
| 5   | 214.5090        | -10.52      | 32.21          | 21.69          | 43.50          | -21.81      | QP   |
| 6   | 232.3647        | -11.63      | 33.73          | 22.10          | 46.00          | -23.90      | QP   |

Remark: Other frequency mini margin all >6 dB of Limit

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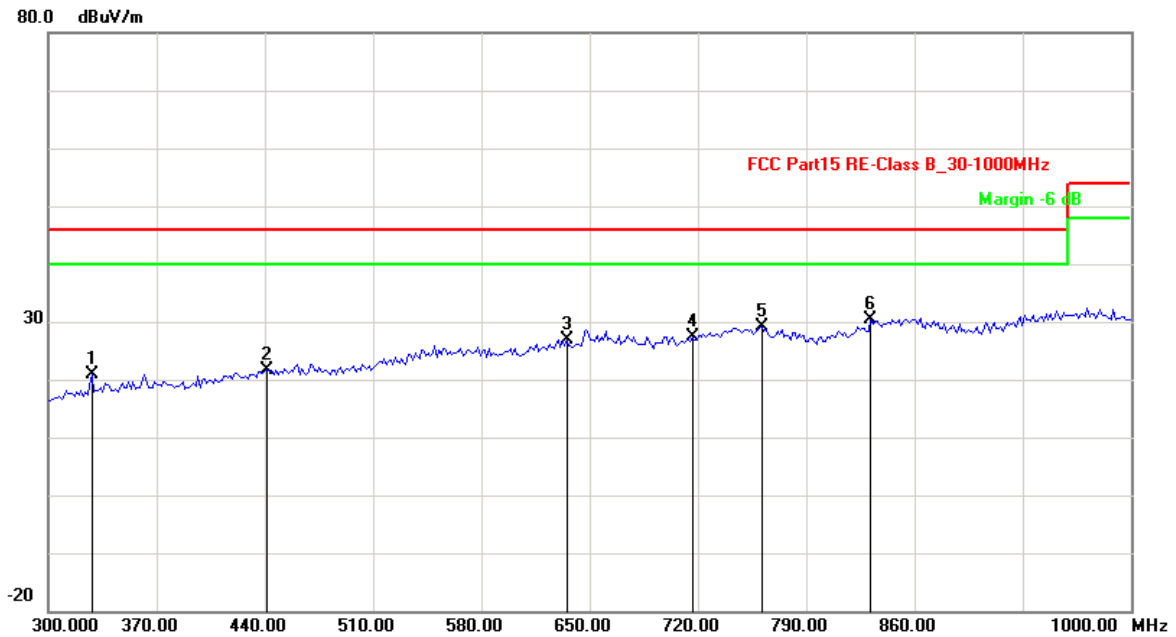
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| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 328.0561        | -12.35      | 33.30          | 20.95          | 46.00          | -25.05      | QP   |
| 2   | 441.6834        | -8.80       | 30.46          | 21.66          | 46.00          | -24.34      | QP   |
| 3   | 635.2705        | -3.91       | 30.76          | 26.85          | 46.00          | -19.15      | QP   |
| 4   | 716.6333        | -3.01       | 30.49          | 27.48          | 46.00          | -18.52      | QP   |
| 5   | 761.5230        | -1.98       | 31.06          | 29.08          | 46.00          | -16.92      | QP   |
| 6   | 831.6633        | -1.38       | 31.77          | 30.39          | 46.00          | -15.61      | QP   |

Remark: Other frequency mini margin all >6 dB of Limit

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|                  |                       |         |  |
|------------------|-----------------------|---------|--|
| Channel:         | TX -X Position Low CH | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Vertical              |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 1GHz-26.5GHz          |         |  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 2404.00         | -6.83       | 85.56          | 78.73          | 114.00         | -35.27      | Peak |
| 2   | 2404.00         | -6.83       | 83.67          | 76.84          | 94.00          | -17.16      | AVG  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 1595.190        | -11.90      | 57.93          | 46.03          | 74.00          | -27.97      | peak |
| 2   | 1595.190        | -11.90      | 43.15          | 31.25          | 54.00          | -22.75      | AVG  |
| 3   | 4813.627        | 2.67        | 50.05          | 52.72          | 74.00          | -21.28      | peak |
| 4   | 4813.627        | 2.67        | 33.90          | 36.57          | 54.00          | -17.43      | AVG  |

Remark: Other frequency mini margin all >20 dB of Limit

|                  |                          |         |  |
|------------------|--------------------------|---------|--|
| Channel:         | TX -X Position Middle CH | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Vertical                 |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 1GHz-26.5GHz             |         |  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 2440.00         | -6.62       | 85.01          | 78.39          | 114.00         | -35.61      | Peak |
| 2   | 2440.00         | -6.62       | 83.13          | 76.51          | 94.00          | -17.49      | AVG  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 1617.234        | -11.76      | 53.66          | 41.90          | 74.00          | -32.10      | peak |
| 2   | 1617.234        | -11.76      | 38.11          | 26.35          | 54.00          | -27.65      | AVG  |
| 3   | 4879.760        | 2.89        | 45.16          | 48.05          | 74.00          | -25.95      | peak |
| 4   | 4879.760        | 2.89        | 30.39          | 33.28          | 54.00          | -20.72      | AVG  |

Remark: Other frequency mini margin all >20 dB of Limit

|                  |                        |         |  |
|------------------|------------------------|---------|--|
| Channel:         | TX -X Position High CH | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Vertical               |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 1GHz-26.5GHz           |         |  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 2476.00         | -6.40       | 85.32          | 78.92          | 114.00         | -35.08      | Peak |
| 2   | 2476.00         | -6.40       | 82.72          | 76.32          | 94.00          | -17.68      | AVG  |

| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 1639.279        | -11.61      | 56.30          | 44.69          | 74.00          | -29.31      | peak |
| 2   | 1639.279        | -11.61      | 41.75          | 30.14          | 54.00          | -23.86      | AVG  |
| 3   | 4945.892        | 3.11        | 46.06          | 49.17          | 74.00          | -24.83      | peak |
| 4   | 4945.892        | 3.11        | 31.46          | 34.57          | 54.00          | -19.43      | AVG  |

Remark: Other frequency mini margin all >20 dB of Limit

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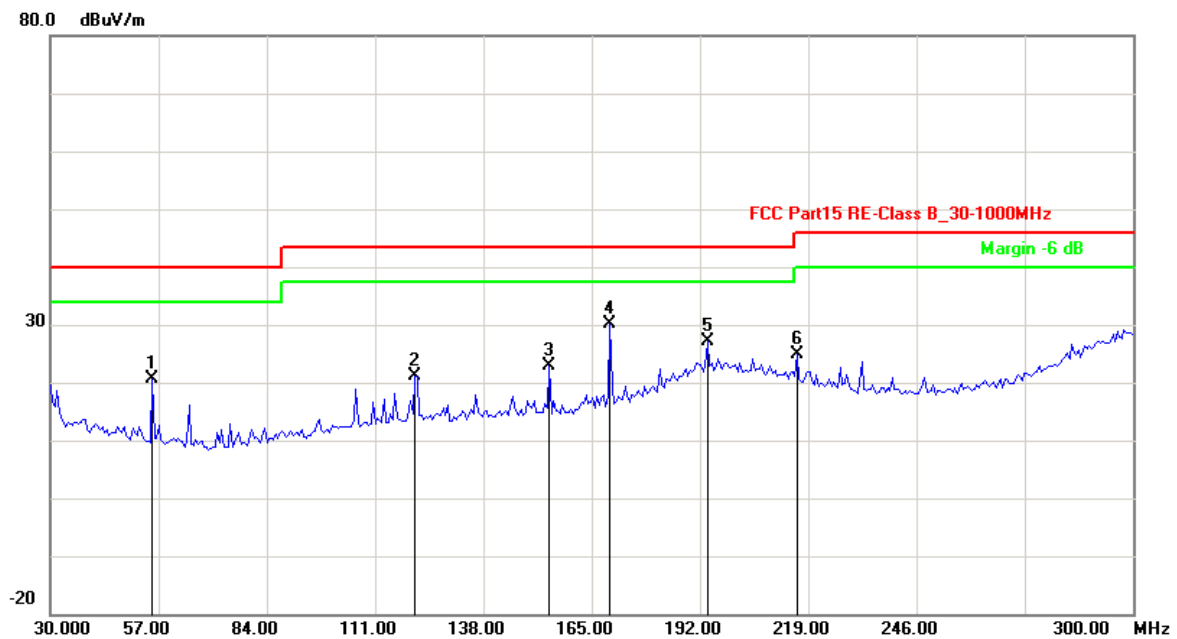
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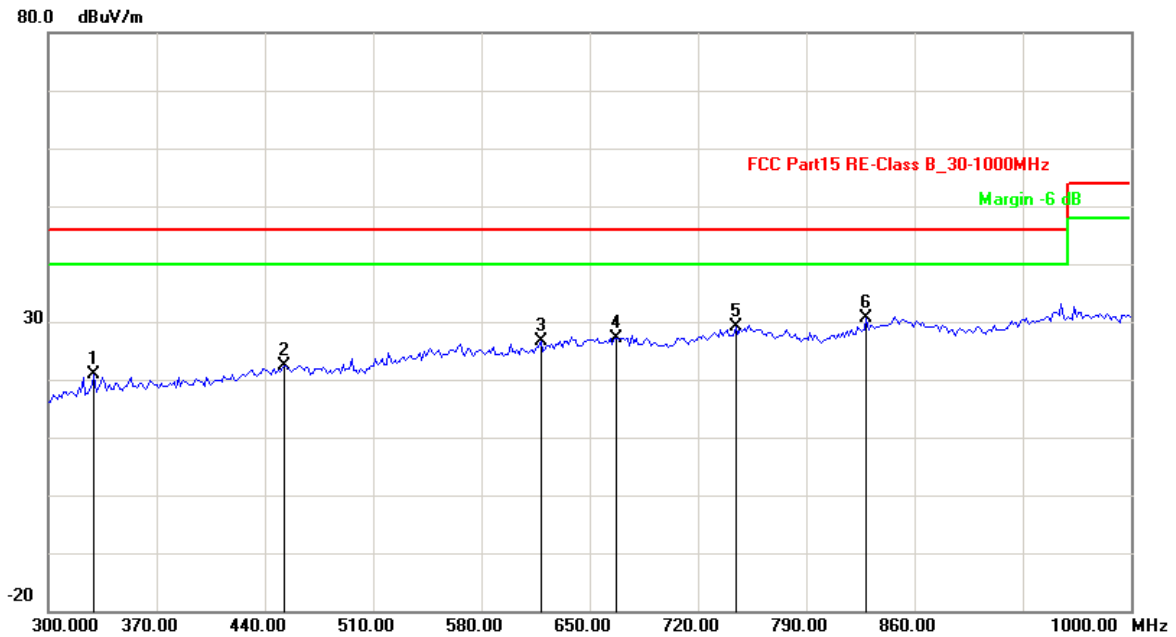
|                  |            |         |  |
|------------------|------------|---------|--|
| Channel:         | RX         | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Horizontal |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 30MHz-1GHz |         |  |

|                |   |
|----------------|---|
| EUT            | Spektrum FPV Racing Serial Receiver     |
| Test Condition | Ambient Temperature: 25°C Humidity: 56% |
| Test distance  | 3 Meter                                 |
| Test Date:     | 07July 2016~28 March 2017               |
| Operator       | Duke                                    |
| MODEL NO       | SPM4648                                 |



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 55.4309         | -19.20      | 39.82          | 20.62          | 40.00          | -19.38      | QP   |
| 2   | 120.9018        | -16.67      | 37.85          | 21.18          | 43.50          | -22.32      | QP   |
| 3   | 154.4489        | -15.96      | 38.95          | 22.99          | 43.50          | -20.51      | QP   |
| 4   | 169.5992        | -15.98      | 46.18          | 30.20          | 43.50          | -13.30      | QP   |
| 5   | 193.9479        | -13.55      | 40.56          | 27.01          | 43.50          | -16.49      | QP   |
| 6   | 216.1323        | -10.64      | 35.53          | 24.89          | 46.00          | -21.11      | QP   |

Remark: Other frequency mini margin all >6 dB of Limit



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 329.4589        | -12.28      | 33.06          | 20.78          | 46.00          | -25.22      | QP   |
| 2   | 452.9058        | -8.44       | 30.81          | 22.37          | 46.00          | -23.63      | QP   |
| 3   | 618.4369        | -4.69       | 31.31          | 26.62          | 46.00          | -19.38      | QP   |
| 4   | 667.5351        | -3.40       | 30.55          | 27.15          | 46.00          | -18.85      | QP   |
| 5   | 744.6894        | -1.82       | 31.04          | 29.22          | 46.00          | -16.78      | QP   |
| 6   | 828.8577        | -1.55       | 32.25          | 30.70          | 46.00          | -15.30      | QP   |

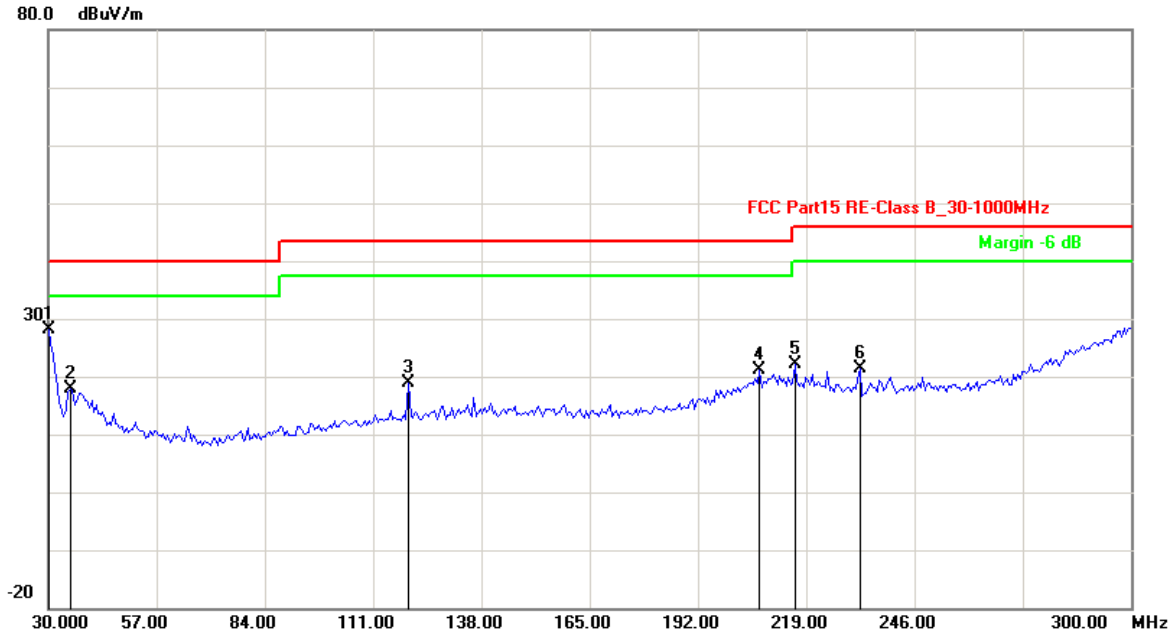
Remark: Other frequency mini margin all >6 dB of Limit

Above 1GHz:  
 On RX mode the test result margin all >20 dB of Limit.

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|                  |            |         |  |
|------------------|------------|---------|--|
| Channel:         | RX         | Result: | <input checked="" type="checkbox"/> - passed |
| Test point:      | Vertical   |         | <input type="checkbox"/> - not passed        |
| Frequency range: | 30MHz-1GHz |         |  |



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 30.0000         | -16.04      | 44.09          | 28.05          | 40.00          | -11.95      | QP   |
| 2   | 35.4108         | -16.74      | 34.68          | 17.94          | 40.00          | -22.06      | QP   |
| 3   | 119.8196        | -16.73      | 35.55          | 18.82          | 43.50          | -24.68      | QP   |
| 4   | 207.4750        | -10.72      | 31.89          | 21.17          | 43.50          | -22.33      | QP   |
| 5   | 216.1323        | -10.64      | 32.69          | 22.05          | 46.00          | -23.95      | QP   |
| 6   | 232.3647        | -11.63      | 32.99          | 21.36          | 46.00          | -24.64      | QP   |

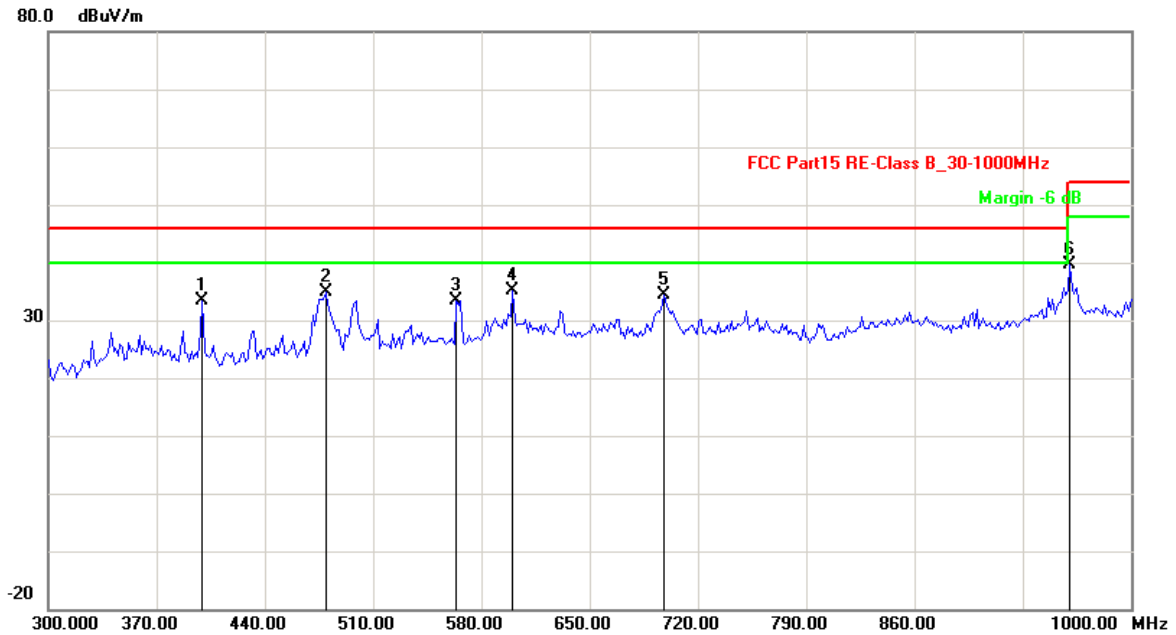
Remark: Other frequency mini margin all >6 dB of Limit

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| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. |
|-----|-----------------|-------------|----------------|----------------|----------------|-------------|------|
| 1   | 450.1002        | -8.46       | 30.45          | 21.99          | 46.00          | -24.01      | QP   |
| 2   | 552.5050        | -5.67       | 31.12          | 25.45          | 46.00          | -20.55      | QP   |
| 3   | 653.5070        | -3.26       | 31.77          | 28.51          | 46.00          | -17.49      | QP   |
| 4   | 688.5772        | -3.60       | 31.55          | 27.95          | 46.00          | -18.05      | QP   |
| 5   | 758.7174        | -1.89       | 30.96          | 29.07          | 46.00          | -16.93      | QP   |
| 6   | 844.2886        | -0.63       | 31.66          | 31.03          | 46.00          | -14.97      | QP   |

Remark: Other frequency mini margin all >6 dB of Limit

Above 1GHz:  
 On RX mode the test result margin all >20 dB of Limit.

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## 8. Band Edge Compliance test

### 8.1. Test Equipment

| Band Edge Compliance test |                   |                 |           |            |           |
|---------------------------|-------------------|-----------------|-----------|------------|-----------|
| Item                      | Test Equipment    | Manufacturer    | Model No. | Serial No. | Last Cal. |
| 1                         | EMI Test Receiver | ROHDE & SCHWARZ | ESCI      | 10868      | 2016/10   |
| 2                         | Log per Antenna   | ROHDE & SCHWARZ | HL050     | 100186     | 2017/03   |
| 3                         | Signal analyzer   | ROHDE & SCHWARZ | FSIQ26    | 100311     | 2017/03   |

### 8.2. Test Information

|                |   |
|----------------|---|
| EUT            | Spektrum FPV Racing Serial Receiver     |
| Test Condition | Ambient Temperature: 25°C Humidity: 56% |
| Test distance  | 3 Meter                                 |
| Test Date:     | 07 July 2016~28 March 2017              |
| Operator       | Duke                                    |
| MODEL NO       | SPM4648                                 |

### 8.3. Test procedure

- The EUT operates at hopping-off test mode. The lowest or highest channels are tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.
- Max hold the trace of the setp 1, and the EUT operates at hopping-on test mode to verify the largest spurious emissions power.
- Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - AVERAGE: RBW=1MHz ; VBW=3KHz(1/On time) / Sweep=AUTO

### 8.4. Test Results

**PASSED.**

The EUT operates at hopping-off test mode. The lowest and highest channels are tested to verify the band edge emissions.

| Test Mode    | Channel Marked Frequency | Test Result Highest Emission (dBuV/m) |         |          |         |
|--------------|--------------------------|---------------------------------------|---------|----------|---------|
|              |                          | Horizontal                            |         | Vertical |         |
|              |                          | Peak                                  | Average | Peak     | Average |
| Low Channel  | 2390MHz                  | 39.92                                 | 19.15   | 42.84    | 19.20   |
|              | 2400MHz                  | 52.80                                 | 27.11   | 53.74    | 26.21   |
| High Channel | 2483.5MHz                | 51.20                                 | 19.65   | 47.54    | 19.22   |
|              | 2500MHz                  | 42.94                                 | 19.10   | 35.86    | 18.90   |

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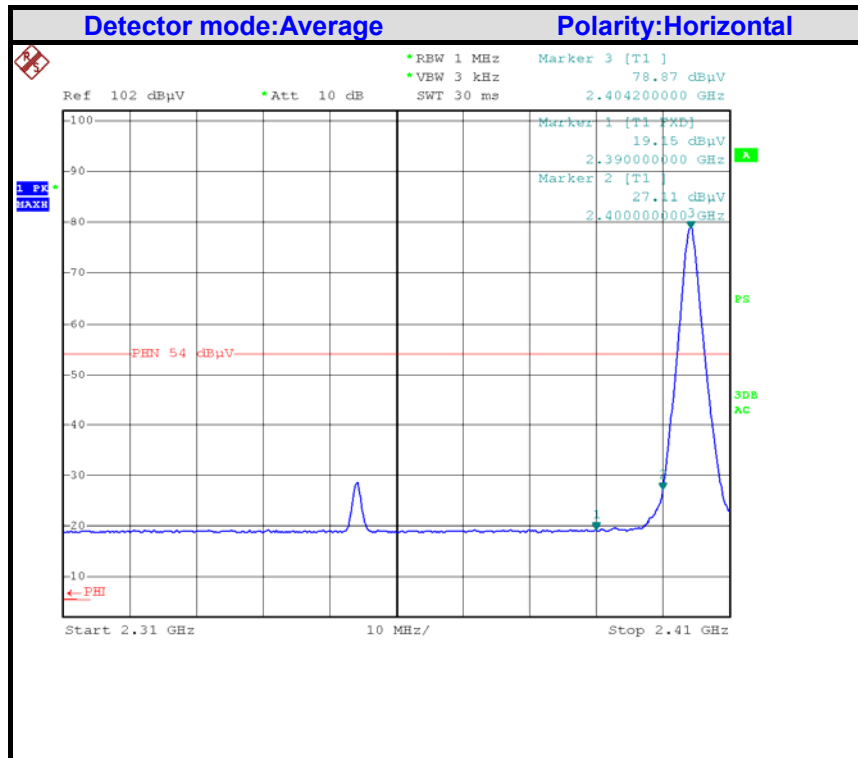
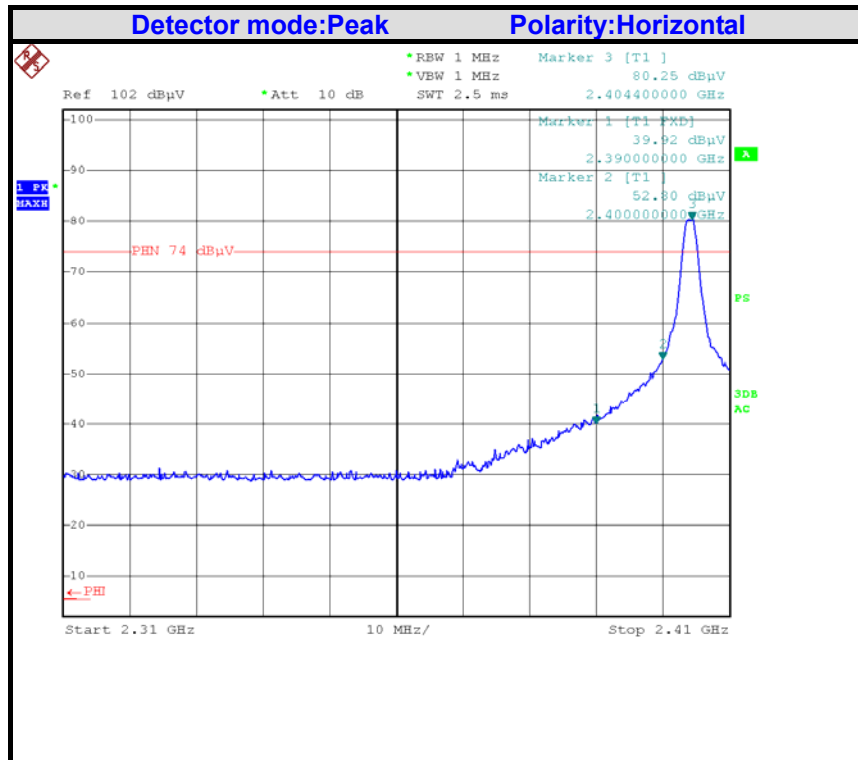
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### Band Edges (Low)

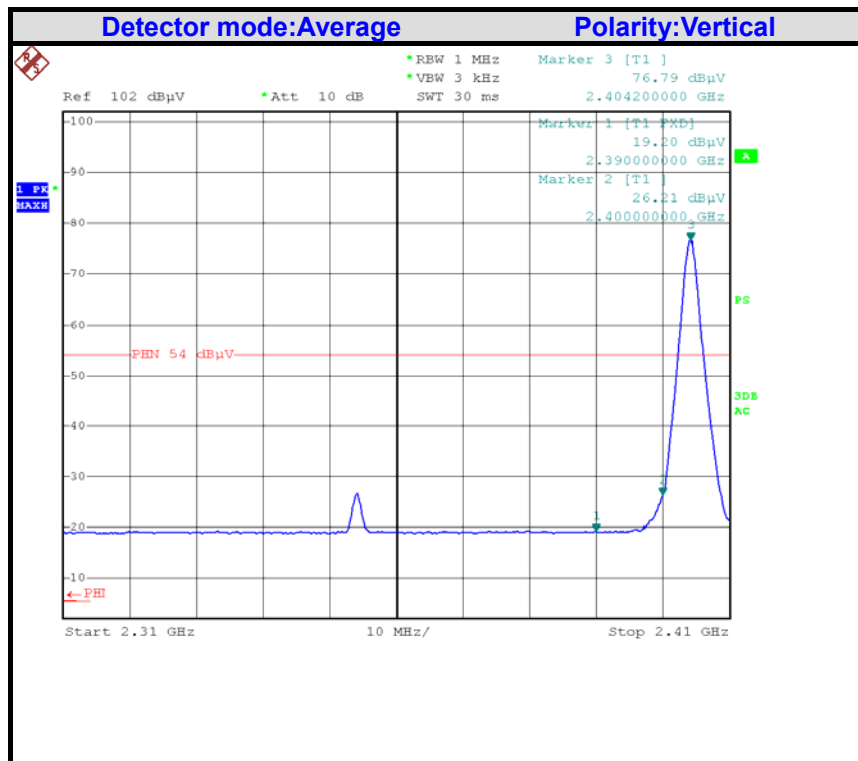
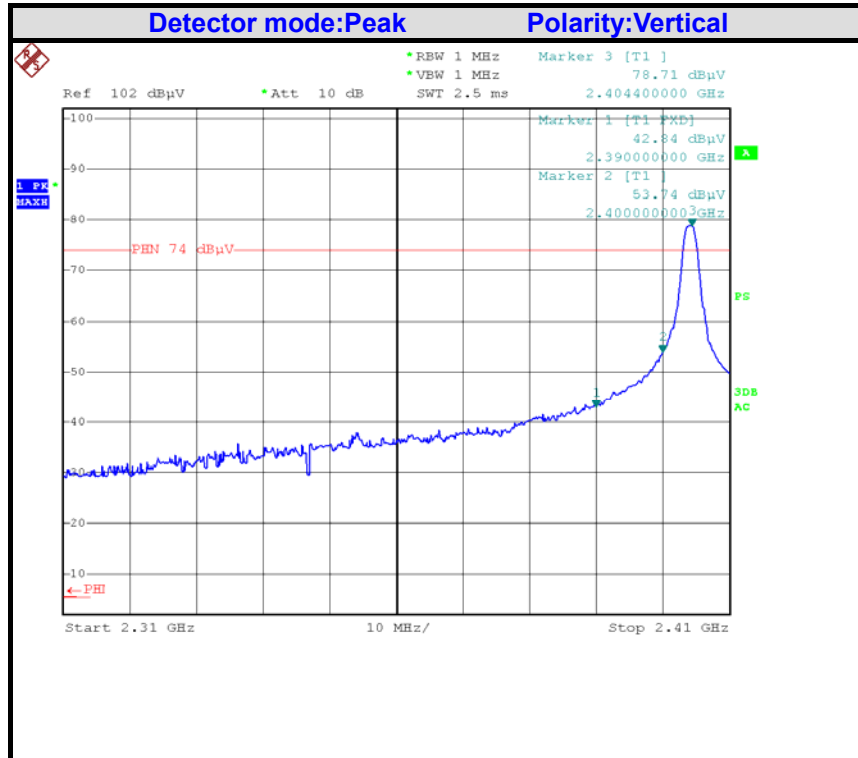


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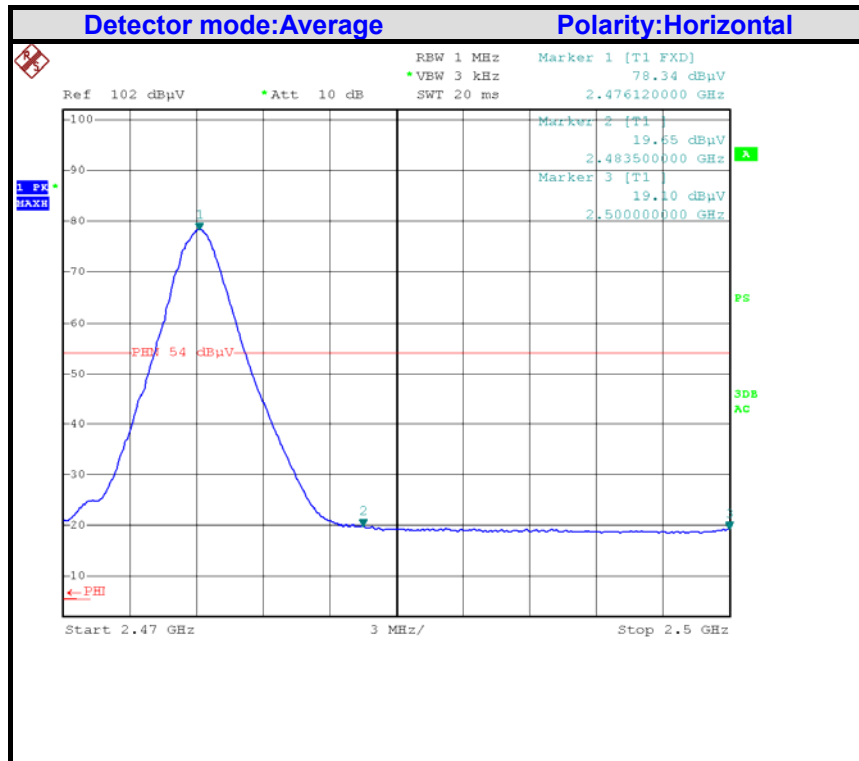
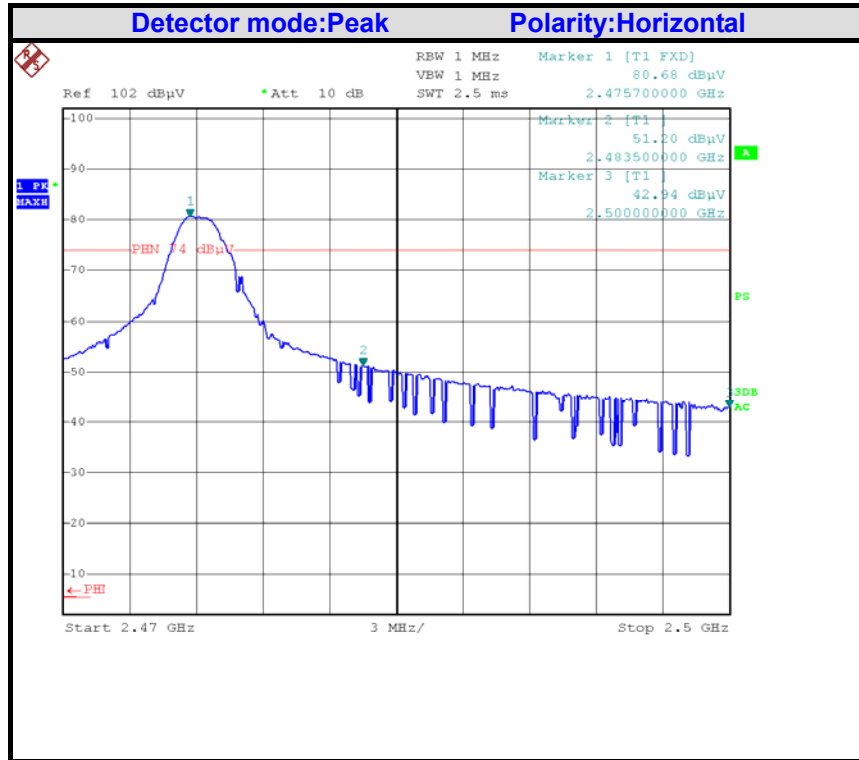
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### Band Edges (High)

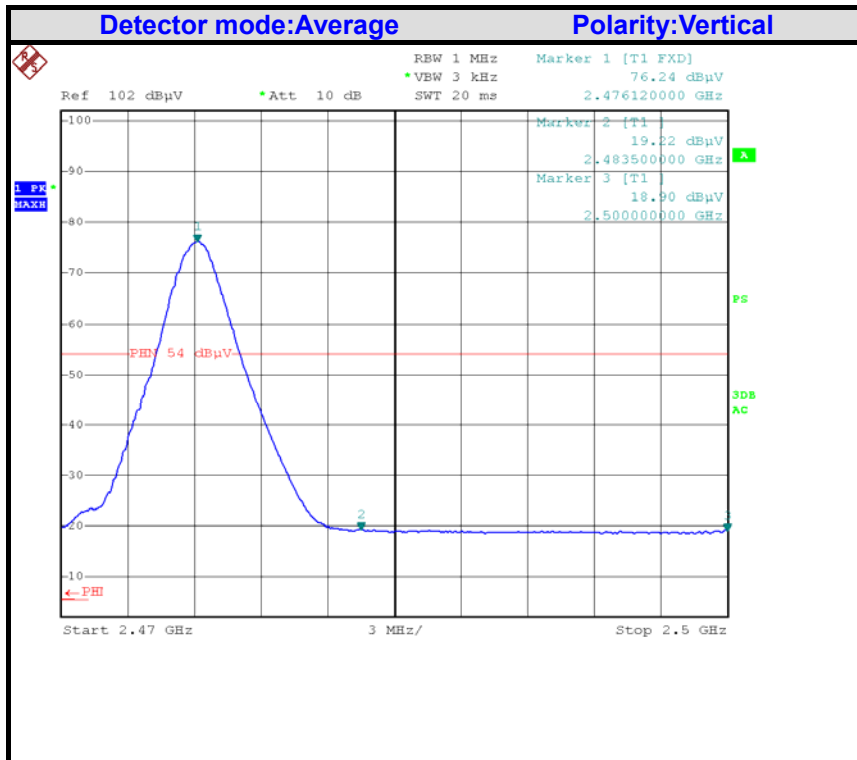
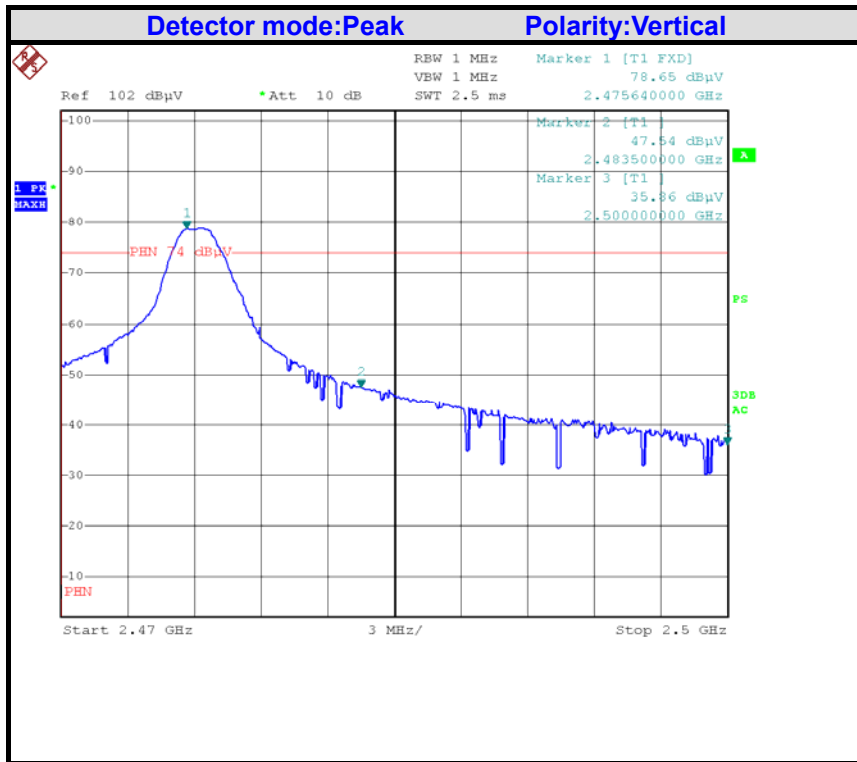


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## 9. 99% bandwidth

### 9.1 Test procedure

According to RSS-210 A1.3 and RSS-Gen 4.6.1 The Spektrum FPV Racing Serial Receiver output is connected to the spectrum analyzer. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The sweep time is coupled.

### 9.2. Test Equipment

| Band Edge Compliance test |                 |                 |           |            |            |
|---------------------------|-----------------|-----------------|-----------|------------|------------|
| Item                      | Test Equipment  | Manufacturer    | Model No. | Serial No. | Last Cal.  |
| 1                         | Log per Antenna | ROHDE & SCHWARZ | HL050     | 100186     | 2017/03/26 |
| 2                         | Signal analyzer | ROHDE & SCHWARZ | FSIQ26    | 100311     | 2017/03/24 |

### 9.3. Test Results

**PASSED.**

| Channel | Frequency (MHz) | Bandwidth (MHz) |
|---------|-----------------|-----------------|
| Low     | 2404            | 1.218           |
| Middle  | 2440            | 1.266           |
| High    | 2476            | 1.356           |

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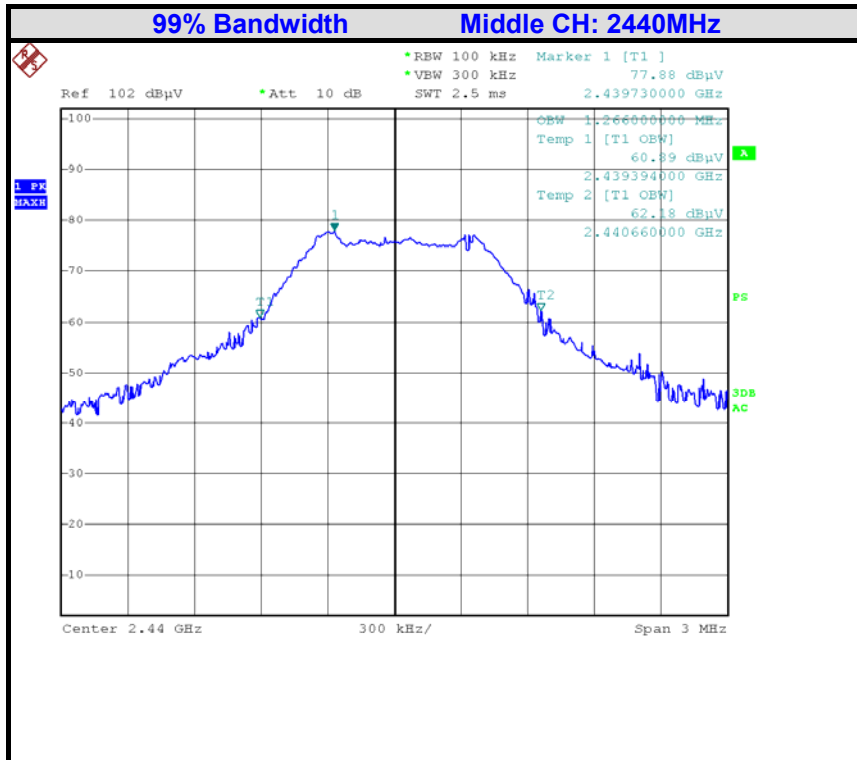
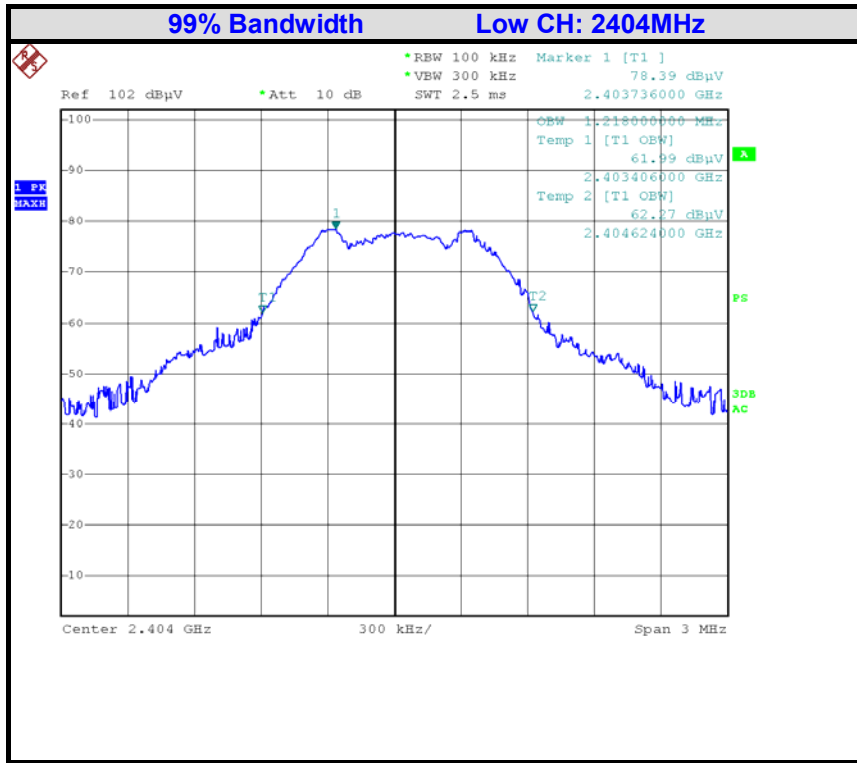
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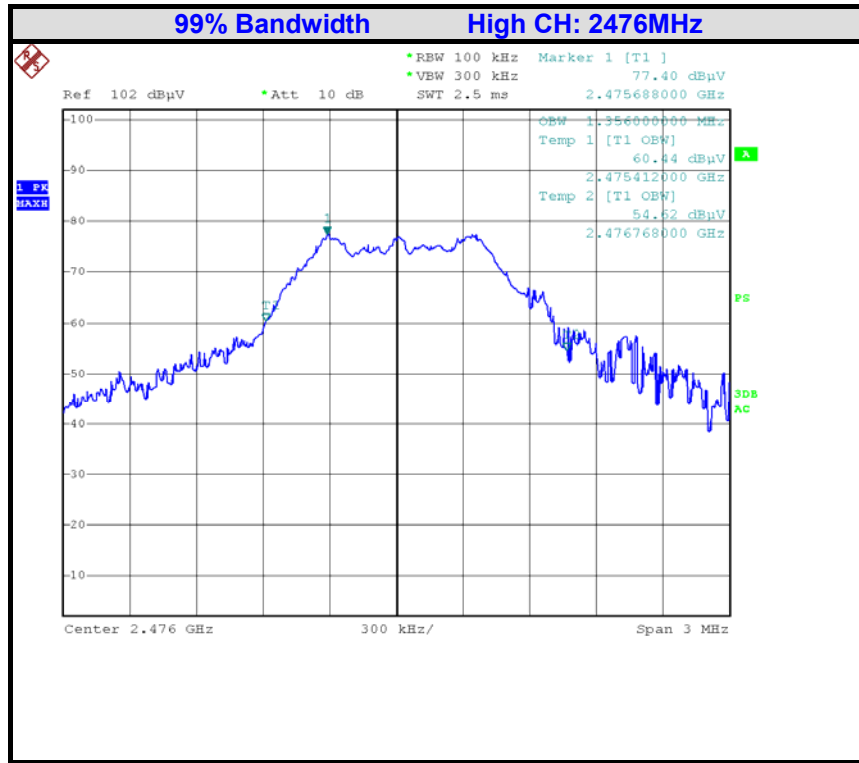


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## 10 Antenna Requirements

### 10.1 Standard Applicable

The EUT is External antenna with 2dBi, according to FCC 47 CFR Section 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.

### 10.2 Antenna Construction and Directional Gain

Antenna type: External Antenna  
Antenna Gain: 2dBi

## 11.Deviation to test specifications

The following identical model(s):

N/A

Belong to the tested device:

Product description: **Spektrum FPV Racing Serial Receiver**  
Model name: **SPM4648**