

## **FCC 15.247 & RSS-247 2.4 GHz Test Report**

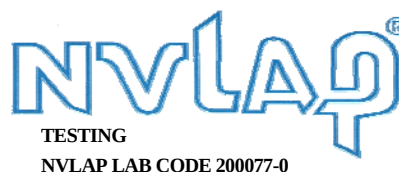
**for**

**FUTABA Corporation**

**1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken  
229-4395 JAPAN**

**Product Name : Radio Control**  
**Model Name : R7108SB**  
**Brand Futaba**  
**FCC ID : AZP-R7108SB-24G**  
**IC : 2914D-R7108SB**

**Prepared by: : AUDIX Technology Corporation,  
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.  
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

## TABLE OF CONTENTS

| Description                                              | Page      |
|----------------------------------------------------------|-----------|
| TEST REPORT CERTIFICATION.....                           | 4         |
| <b>1. REVISION RECORD OF TEST REPORT .....</b>           | <b>5</b>  |
| <b>2. SUMMARY OF TEST RESULTS .....</b>                  | <b>6</b>  |
| <b>3. GENERAL INFORMATION .....</b>                      | <b>7</b>  |
| 3.1. Description of Application .....                    | 7         |
| 3.2. Description of EUT .....                            | 7         |
| 3.3. Antenna Information .....                           | 7         |
| 3.4. EUT Specifications Assessed in Current Report ..... | 8         |
| 3.5. Descriptions of Key Components .....                | 8         |
| 3.6. Test Configuration .....                            | 9         |
| 3.7. Tested Supporting System List .....                 | 10        |
| 3.8. Setup Configuration .....                           | 10        |
| 3.9. Operating Condition of EUT .....                    | 10        |
| 3.10. Description of Test Facility .....                 | 11        |
| 3.11. Measurement Uncertainty .....                      | 11        |
| <b>4. MEASUREMENT EQUIPMENT LIST .....</b>               | <b>12</b> |
| 4.1. Radiated Emission Measurement .....                 | 12        |
| 4.2. RF Conducted Measurement .....                      | 12        |
| <b>5. CONDUCTED EMISSION .....</b>                       | <b>13</b> |
| <b>6. RADIATED EMISSION .....</b>                        | <b>14</b> |
| 6.1. Block Diagram of Test Setup .....                   | 14        |
| 6.2. Radiated Emission Limits .....                      | 15        |
| 6.3. Test Procedure .....                                | 16        |
| 6.4. Measurement Result Explanation .....                | 17        |
| 6.5. Test Results .....                                  | 17        |
| <b>7. 6dB BANDWIDTH .....</b>                            | <b>18</b> |
| 7.1. Block Diagram of Test Setup .....                   | 18        |
| 7.2. Specification Limits .....                          | 18        |
| 7.3. Test Procedure .....                                | 18        |
| 7.4. Test Results .....                                  | 18        |
| <b>8. MAXIMUM PEAK OUTPUT POWER .....</b>                | <b>19</b> |
| 8.1. Block Diagram of Test Setup .....                   | 19        |
| 8.2. Specification Limits .....                          | 19        |
| 8.3. Test Procedure .....                                | 20        |
| 8.4. Test Results .....                                  | 20        |
| <b>9. EMISSION LIMITATIONS .....</b>                     | <b>21</b> |
| 9.1. Block Diagram of Test Setup .....                   | 21        |
| 9.2. Specification Limits .....                          | 21        |
| 9.3. Test Procedure .....                                | 21        |
| 9.4. Test Results .....                                  | 22        |
| <b>10. POWER SPECTRAL DENSITY .....</b>                  | <b>23</b> |
| 10.1. Block Diagram of Test Setup .....                  | 23        |
| 10.2. Specification Limits .....                         | 23        |
| 10.3. Test Procedure .....                               | 23        |
| 10.4. Test Results .....                                 | 23        |



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**11. DEVIATION TO TEST SPECIFICATIONS ..... 24**

APPENDIX A TEST DATA AND PLOTS  
APPENDIX B TEST PHOTOGRAPHS

## TEST REPORT CERTIFICATION

Applicant : FUTABA Corporation  
Manufacturer : FUTABA Corporation  
EUT Description  
(1) Product : Radio Control  
(2) Model : R7108SB  
(3) Brand : Futaba  
(4) Power Rating : DC 3.5 ~ 8.4V

### Applicable Standards:

47 CFR FCC Part 15 Subpart C  
RSS-Gen (Issue 5), April 2018  
RSS-247 (Issue 2), February 2017  
ANSI C63.10:2013  
KDB 558074 D01 DTS Meas Guidance v05

**Audix Technology Corp.** tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

**Audix Technology Corp.** does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2018. 12. 17

Reviewed by:



(Sabrina Wang/Administrator)

Approved by:



(Ben Cheng/Manager)



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## 1. REVISION RECORD OF TEST REPORT

| Edition No | Issued Data  | Revision Summary | Report Number |
|------------|--------------|------------------|---------------|
| 0          | 2018. 12. 17 | Original Report  | EM-F180539    |

## 2. SUMMARY OF TEST RESULTS

| Rule                                         |                              | Description                                             | Results           |
|----------------------------------------------|------------------------------|---------------------------------------------------------|-------------------|
| FCC                                          | IC                           |                                                         |                   |
| 15.207                                       | RSS-Gen §8.8                 | Conducted Emission                                      | <b>N/A, Note</b>  |
| 15.247(d)/<br>15.205                         | RSS-Gen §8.9<br>RSS-247 §5.5 | Radiated Band Edge and<br>Radiated Spurious Emission    | <b>PASS</b>       |
| 15.247(a)(2)                                 | RSS-247 §5.2(1)              | 6dB Bandwidth                                           | <b>PASS</b>       |
| 15.247(b)(3)                                 | RSS-247 §5.4(4)              | Maximum Peak Output                                     | <b>PASS</b>       |
| 15.247(d)                                    | RSS-247 §5.5                 | Conducted Band Edges and<br>Conducted Spurious Emission | <b>PASS</b>       |
| 15.247 (e)                                   | RSS-247 §5.2(2)              | Peak Power Spectral Density                             | <b>PASS</b>       |
| 15.203                                       | RSS-Gen §8.3                 | Antenna Requirement                                     | <b>Compliance</b> |
| <b>Note:</b> The EUT only employs Batteries. |                              |                                                         |                   |

### 3. GENERAL INFORMATION

#### 3.1. Description of Application

|              |                                                                                      |
|--------------|--------------------------------------------------------------------------------------|
| Applicant    | FUTABA Corporation<br>1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 229-4395 JAPAN |
| Manufacturer | FUTABA Corporation<br>1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 229-4395 JAPAN |
| Product      | Radio Control                                                                        |
| Brand        | Futaba                                                                               |
| Model        | R7108SB                                                                              |

#### 3.2. Description of EUT

|                        |                                                |
|------------------------|------------------------------------------------|
| Test Model             | R7108SB                                        |
| Serial Number          | N/A                                            |
| Power Rating           | DC 3.5~8.4V                                    |
| RF Features            | DSSS<br>(1)FASSTest<br>(2)FASST (Receive only) |
| Sample Status          | Production                                     |
| Date of Receipt        | 2018. 10. 31                                   |
| Date of Test           | 2018. 12. 11 ~ 17                              |
| Interface Ports of EUT | • None                                         |
| Accessories Supplied   | • None                                         |

#### 3.3. Antenna Information

| Antenna Part Number | Manufacture                   | Frequency (MHz) | Antenna Type | Antenna Gain (dBi) |
|---------------------|-------------------------------|-----------------|--------------|--------------------|
| JA1R0227A           | Wanshih Electronic Co., Ltd., | 2.4GHz Ant A    | 1/4λ Antenna | -5.16dBi           |
|                     |                               | 2.4GHz Ant B    | 1/4λ Antenna | -5.16 dBi          |

### 3.4. EUT Specifications Assessed in Current Report

| Mode | Fundamental Range (MHz) | Channel Number | Modulation              | Data Rate (kbps) |
|------|-------------------------|----------------|-------------------------|------------------|
| DSSS | 2405.376 to 2472.960    | 23             | FASSTest                | Up to 214.3      |
| DSSS | 2405.376 to 2477.056    | 36             | FASST<br>(Receive only) | Up to 136        |

| FASSTest Channel List |                 |                |                 | FASST Channel List (Receive only) |                 |                |                 |
|-----------------------|-----------------|----------------|-----------------|-----------------------------------|-----------------|----------------|-----------------|
| Channel Number        | Frequency (MHz) | Channel Number | Frequency (MHz) | Channel Number                    | Frequency (MHz) | Channel Number | Frequency (MHz) |
| 00                    | 2405.376        | 18             | 2460.672        | 00                                | 2405.376        | 18             | 2442.240        |
| 01                    | 2408.448        | 19             | 2463.744        | 01                                | 2407.424        | 19             | 2444.288        |
| 02                    | 2411.520        | 20             | 2466.816        | 02                                | 2409.472        | 20             | 2446.336        |
| 03                    | 2414.592        | 21             | 2469.888        | 03                                | 2411.520        | 21             | 2448.384        |
| 04                    | 2417.664        | 22             | 2472.960        | 04                                | 2413.568        | 22             | 2450.432        |
| 05                    | 2420.736        |                |                 | 05                                | 2415.616        | 23             | 2452.480        |
| 06                    | 2423.808        |                |                 | 06                                | 2417.664        | 24             | 2454.528        |
| 07                    | 2462.880        |                |                 | 07                                | 2419.712        | 25             | 2456.576        |
| 08                    | 2429.952        |                |                 | 08                                | 2421.760        | 26             | 2458.624        |
| 09                    | 2433.024        |                |                 | 09                                | 2423.808        | 27             | 2460.672        |
| 10                    | 2436.096        |                |                 | 10                                | 2425.856        | 28             | 2462.720        |
| 11                    | 2439.168        |                |                 | 11                                | 2427.904        | 29             | 2464.768        |
| 12                    | 2442.240        |                |                 | 12                                | 2429.952        | 30             | 2466.816        |
| 13                    | 2445.312        |                |                 | 13                                | 2432.000        | 31             | 2468.864        |
| 14                    | 2448.384        |                |                 | 14                                | 2434.048        | 32             | 2470.912        |
| 15                    | 2451.456        |                |                 | 15                                | 2436.096        | 33             | 2472.960        |
| 16                    | 2454.528        |                |                 | 16                                | 2438.144        | 34             | 2475.008        |
| 17                    | 2457.600        |                |                 | 17                                | 2440.192        | 35             | 2477.056        |

### 3.5. Descriptions of Key Components

None

### 3.6. Test Configuration

| Mode     | Duty Cycle (x) | T (ms) | Duty Cycle Factor (dB) |
|----------|----------------|--------|------------------------|
| FASSTest | 1              | N/A    | 0                      |

Note: When duty cycle is less than 98% (0.98) that duty cycle factor  $10\log(1/x)$  is needed to add in conducted test items measured in average detector.

| Mode     | Duty Cycle (x)                                                                    |
|----------|-----------------------------------------------------------------------------------|
| FASSTest |  |

| Item                | Mode                                        | Test Channel |
|---------------------|---------------------------------------------|--------------|
| Radiated Test Case  | Radiated Band Edge <sup>Note1</sup>         | FASSTest     |
|                     | Radiated Spurious Emission <sup>Note1</sup> | FASSTest     |
| Conducted Test Case | 6dB Bandwidth                               | FASSTest     |
|                     | Peak Output Power <sup>Note2</sup>          | FASSTest     |
|                     | Band Edge                                   | FASSTest     |
|                     | Spurious Emission                           | FASSTest     |
|                     | Peak Power Spectral Density                 | FASSTest     |

Note 1: ☒ Mobile Device

☐ Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: ☐ Lie ☐ Side ☐ Stand

Note 2: Due to used different Antenna Type So this test item would be test.

Note 3: The worse Ant A was tested on this test item.

### 3.7. Tested Supporting System List

#### 3.7.1. Support Peripheral Unit

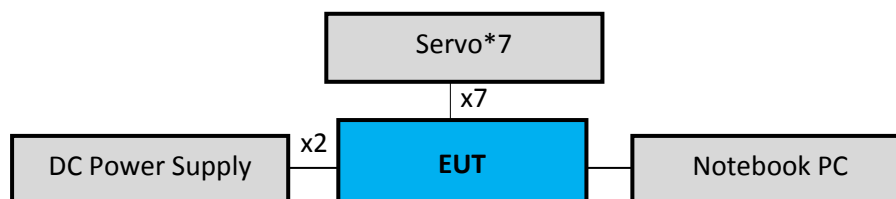
| No. | Product         | Brand    | Model No. | Serial No. | Approval                         |
|-----|-----------------|----------|-----------|------------|----------------------------------|
| 1.  | DC Power Supply | TOP WARD | 6303A     | N/A        | N/A                              |
| 2.  | Notebook PC     | ASUS     | X5502E    | N/A        | Contains FCC ID:<br>PPD-AAR5B225 |
| 3.  | Servo*7         | Futaba   | S3003     | N/A        | N/A                              |

#### 3.7.2. Cable Lists

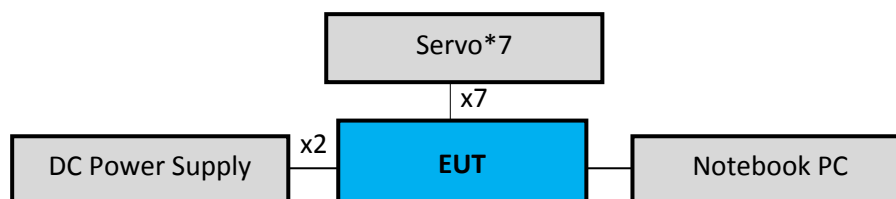
| No. | Cable Description Of The Above Support Units                                                                                                                                                            |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | DC Power Cord*2: Unshielded, Detachable, 0.7m<br>AC Power Cord: Unshielded, Undetectable, 1.8m                                                                                                          |
| 2.  | USB Jig Cable: Unshielded, Detachable, 0.5m<br>Adapter: Enerironix, M/N EXA1208UH,<br>AC Power Cord: Shielded, Detachable, 1.8m<br>DC Power Cord: Unshielded, Undetectable, 1.8m, Bonded a ferrite core |
| 3.  | Power Wire: Unshielded, Undetectable, 0.20m*7                                                                                                                                                           |

### 3.8. Setup Configuration

#### 3.8.1. EUT Configuration for Radiated Emission



#### 3.8.2. EUT Configuration for RF Conducted Test Items



### 3.9. Operating Condition of EUT

Test program “Futaba Term” is used for enabling EUT RF function under continue transmitting and choosing channel.

### 3.10. Description of Test Facility

|                   |                                                                                                                                                                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name of Test Firm | Audix Technology Corporation / EMC Department<br>No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan<br>Tel: +886-2-26092133<br>Fax: +886-2-26099303<br>Website : www.audixtech.com<br>Contact e-mail: attemc_report@audixtech.com |
| Accreditations    | The laboratory is accredited by following organizations under ISO/IEC 17025:2005<br>(1) NVLAP(USA)<br>NVLAP Lab Code 200077-0<br>(2) TAF(Taiwan)<br>No. 1724                                                                                |
| Test Facilities   | FCC OET Designation Number under APEC MRA by NCC is : TW1724<br>(1) No. 8 Shielding Room<br>(2) Semi-Anechoic Chamber<br>(IC Test Site Registration No.:5183B-1)                                                                            |

### 3.11. Measurement Uncertainty

| Test Item                        | Frequency Range | Uncertainty         |
|----------------------------------|-----------------|---------------------|
| Radiation Test<br>(Distance: 3m) | 30MHz~1000MHz   | $\pm 3.68\text{dB}$ |
|                                  | Above 1GHz      | $\pm 5.82\text{dB}$ |

Remark : Uncertainty =  $ku_c(y)$

| Test Item                      | Uncertainty          |
|--------------------------------|----------------------|
| 6dB Bandwidth                  | $\pm 0.05\text{kHz}$ |
| Maximum peak output power      | $\pm 0.33\text{dB}$  |
| Power spectral density         | $\pm 0.13\text{dB}$  |
| Conducted Emission Limitations | $\pm 0.13\text{dB}$  |

## 4. MEASUREMENT EQUIPMENT LIST

### 4.1. Radiated Emission Measurement

| Item | Type                       | Manufacturer | Model No.                  | Serial No.  | Cal. Date    | Cal. Interval |
|------|----------------------------|--------------|----------------------------|-------------|--------------|---------------|
| 1.   | Spectrum Analyzer          | Agilent      | N9010A-526                 | MY53400071  | 2018. 09. 12 | 1 Year        |
| 2.   | Test Receiver              | R & S        | ESCS30                     | 100338      | 2018. 06. 20 | 1 Year        |
| 3.   | Amplifier                  | HP           | 8447D                      | 2944A06305  | 2018. 01. 30 | 1 Year        |
| 4.   | Amplifier                  | HP           | 8449B                      | 3008A00529  | 2018. 01. 24 | 1 Year        |
| 5.   | Loop Antenna               | R&S          | HFH2-Z2                    | 891847/27   | 2017. 12. 18 | 1 Year        |
| 6.   | Bilog Antenna              | CHASE        | CBL6112D                   | 33821       | 2018. 01. 21 | 1 Year        |
| 7.   | Horn Antenna               | COM-POWER    | AH-840                     | 101092      | 2018. 05. 07 | 1 Year        |
| 8.   | Horn Antenna               | EMCO         | 3115                       | 9609-4927   | 2018. 06. 22 | 1 Year        |
| 9.   | 2.4GHz Notch Filter        | K&L          | 7NSL10-2441.<br>5E130.5-00 | 1           | 2018. 07. 24 | 1 Year        |
| 10.  | High-Pass Filter           | Microwave    | H3G018G1                   | 484796      | 2018. 08. 22 | 1 Year        |
| 11.  | Digital Thermo-Hygro Meter | iMax         | HTC-1                      | No.1 3m A/C | 2018. 04. 20 | 1 Year        |
| 12.  | Test Software              | Audix        | e3                         | V.6.110601  | N.C.R.       | N.C.R.        |

### 4.2. RF Conducted Measurement

| Item | Type                       | Manufacturer                 | Model No.  | Serial No. | Cal. Date    | Cal. Interval |
|------|----------------------------|------------------------------|------------|------------|--------------|---------------|
| 1.   | Spectrum Analyzer          | Keysight                     | N9010B-544 | MY55460198 | 2018. 04. 26 | 1 Year        |
| 2.   | Digital Thermo-Hygro Meter | Shenzhen Datronn Electronics | KT-905     | RF         | 2018. 04. 20 | 1 Year        |

## 5. CONDUCTED EMISSION

【The EUT only employs battery power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207 and RSS-Gen §8.8】

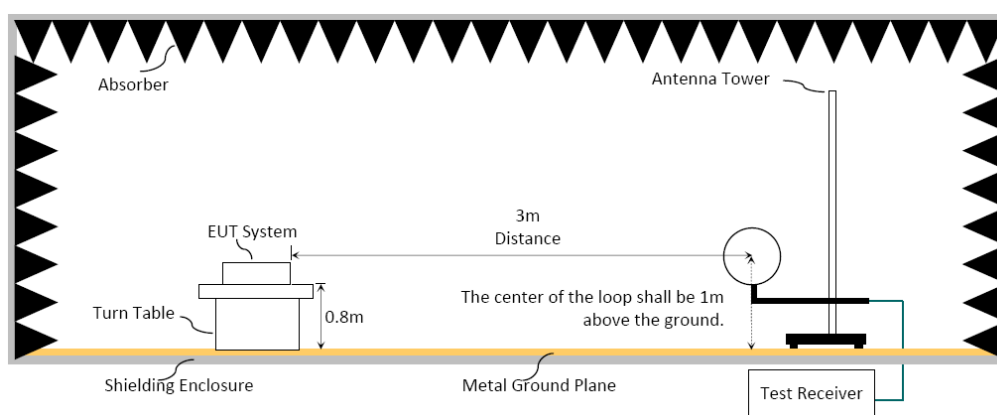
## 6. RADIATED EMISSION

### 6.1. Block Diagram of Test Setup

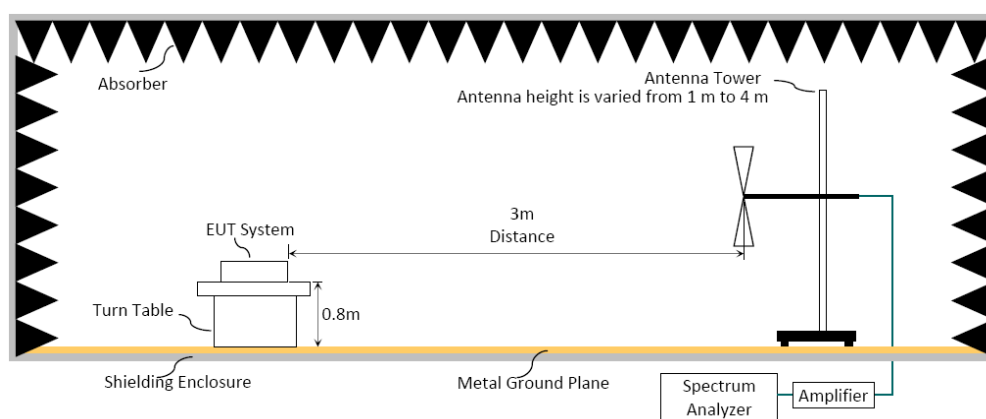
#### 6.1.1. Block Diagram of EUT

Indicated as section 3.8

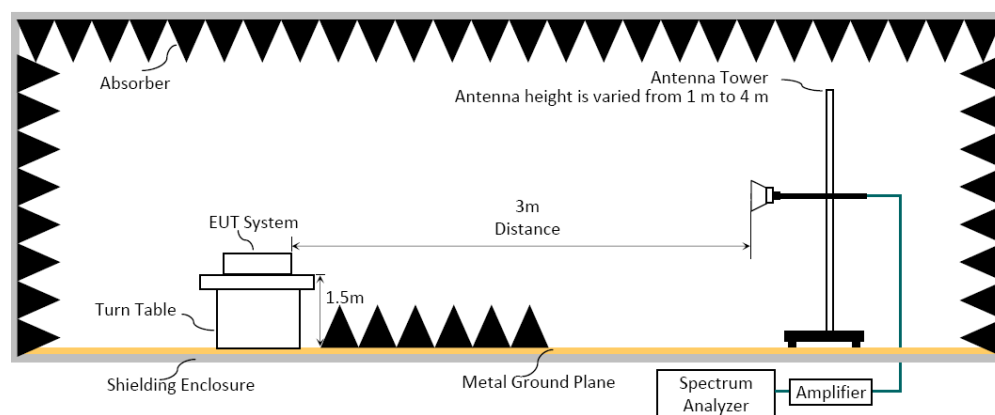
#### 6.1.2. Setup Diagram for 9kHz-30MHz



#### 6.1.3. Setup Diagram for 30-1000 MHz



#### 6.1.4. Setup Diagram for above 1GHz



## 6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

| Frequency (MHz) | Distance (m) | Limits                                                  |             |
|-----------------|--------------|---------------------------------------------------------|-------------|
|                 |              | dB $\mu$ V/m                                            | $\mu$ V/m   |
| 0.009 - 0.490   | 300          | 67.6-20 log f(kHz)                                      | 2400/f kHz  |
| 0.490 - 1.705   | 30           | 87.6-20 log f(kHz)                                      | 24000/f kHz |
| 1.705 - 30      | 30           | 29.5                                                    | 30          |
| 30 - 88         | 3            | 40.0                                                    | 100         |
| 88- 216         | 3            | 43.5                                                    | 150         |
| 216- 960        | 3            | 46.0                                                    | 200         |
| Above 960       | 3            | 54.0                                                    | 500         |
| Above 1000      | 3            | 74.0 dB $\mu$ V/m (Peak)<br>54.0 dB $\mu$ V/m (Average) |             |

Remark : (1) dB $\mu$ V/m = 20 log ( $\mu$ V/m)

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

### 6.3. Test Procedure

#### **Frequency Range 9kHz~30MHz:**

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)  
Q.P. (490kHz-30MHz)

#### **Frequency Range 30MHz ~ 25GHz:**

The EUT setup on the turn table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

#### **Frequency below 1 GHz:**

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120KHz
- (2) VBW  $\geq 3 \times$  RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

#### **Frequency above 1GHz to 10th harmonic (up to 25 GHz):**

##### **Peak Detector:**

- (1) RBW = 1MHz
- (2) VBW  $\geq 3 \times$  RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

**Average Detector:****■Option 1:**

(1)RBW = 1MHz

(2)VBW  $\geq$  1/ T.

| Modulation Type | T (ms) | 1/ T (kHz) | VBW Setting (kHz) |
|-----------------|--------|------------|-------------------|
| FASSTest        | N/A    | N/A        | 10Hz              |

N/A: 1/ T is not implemented when duty cycle presented in section 3.6 is  $\geq$ 98 %.

(1)Detector = Peak.

(2)Sweep time = auto.

(3)Trace mode = max hold.

(4)Allow sweeps to continue until the trace stabilizes.

**□Option 2:**

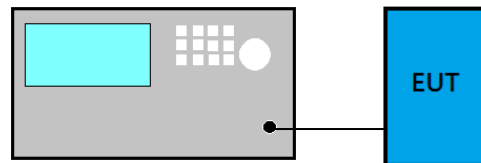
Average Emission Level= Peak Emission Level+ D.C.C.F.

**6.4. Measurement Result Explanation****■**Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading**■**Average Emission Level=Antenna Factor + Cable Loss + Meter Reading**□**Average Emission Level= Peak Emission Level+ DCCFDuty Cycle Correction Factor (DCCF)=  $20\log(TX_{on}/TX_{on+off})$  presented in section 3.6**□**ERP= Peak Emission Level-95.2dB-2.14dB**6.5. Test Results**

Please refer to Appendix A.

## 7. 6dB BANDWIDTH

### 7.1. Block Diagram of Test Setup



### 7.2. Specification Limits

The minimum 6dB bandwidth shall be at least 500kHz.

### 7.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05:

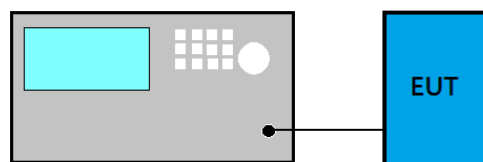
- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -6 dB to record the final bandwidth.

### 7.4. Test Results

Please refer to Appendix A

## 8. MAXIMUM PEAK OUTPUT POWER

### 8.1. Block Diagram of Test Setup



### 8.2. Specification Limits

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5MHz is : 1Watt. (30dBm), and E.I.R.P.: 4Watt (36dBm)

### 8.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05:

☐ **PKPM1 Peak power meter method:**

EUT is connected to power sensor and record the maximum output power.

☒ **Maximum peak conducted output power method:**

- (1) Set the RBW  $\geq$  DTS bandwidth
- (2) Set VBW  $\geq 3 \times$  RBW
- (3) Set span  $\geq 3 \times$  RBW.
- (4) Sweep time = auto couple
- (5) Detector = peak.
- (6) Trace mode = max hold.
- (7) Allow trace to fully stabilize.
- (8) Use peak marker function to determine the peak amplitude level.

☐ **Method AVGPM (Measurement using an RF average power meter):**

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.7 is  $< 98\%$ .

☐ **Method AVGSA-2 (Spectrum channel power)**

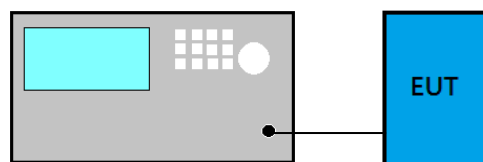
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 -5% of OBW
- (3) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is  $< 98\%$ .

### 8.4. Test Results

Please refer to Appendix A

## 9. EMISSION LIMITATIONS

### 9.1. Block Diagram of Test Setup



### 9.2. Specification Limits

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a)/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 (See Section 15.205(c)).

### 9.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05:

#### ■ Reference Level

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW  $\geq 3 \times$  RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max PSD as reference level.

#### ■ Emission Level Measurement

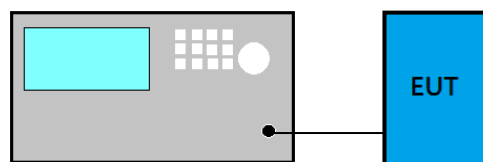
- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW  $\geq 3 \times$  RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max level.

### 9.4. Test Results

Please refer to Appendix A

## 10. POWER SPECTRAL DENSITY

### 10.1. Block Diagram of Test Setup



### 10.2. Specification Limits

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

### 10.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05:

#### ☒ Method PKPSD (peak PSD)

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- (4) Set the VBW  $\geq 3 \times \text{RBW}$ .
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize.
- (9) Use the peak marker function to determine the maximum amplitude level.
- (10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### ☐ Method AVGPSD-2

- (1) Using peak PSD procedure step 1 to step 4.
- (2) Detector = RMS detector
- (3) Sweep time = auto couple
- (4) Trace mode = trace averaging over a minimum of 100 traces
- (5) Use the peak marker function to determine the maximum amplitude level.
- (6) Duty cycle factor is added when duty cycle presented in section 3.7 < 98%.
- (7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 10.4. Test Results

Please refer to Appendix A



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## 11.DEVIATION TO TEST SPECIFICATIONS

【NONE】



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**APPENDIX A**

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# APPDNDIX A

## TEST DATA AND PLOTS

(Model: R7108SB)

## TABLE OF CONTENTS

|                                                         |           |
|---------------------------------------------------------|-----------|
| <b>A.1 RADIATED EMISSION .....</b>                      | <b>2</b>  |
| A.1.1 Emissions within Restricted Frequency Bands.....  | 2         |
| A.1.2 Emissions outside the frequency band:.....        | 7         |
| A.1.3 Emissions in Non-restricted Frequency Bands:..... | 8         |
| <b>A.2 6dB BANDWIDTH .....</b>                          | <b>9</b>  |
| A.2.1 6dB Bandwidth Result.....                         | 9         |
| A.2.2 Measurement Plots .....                           | 10        |
| <b>A.3 MAXIMUM PEAK OUTPUT POWER .....</b>              | <b>11</b> |
| A.3.1 Peak Output Power .....                           | 11        |
| A.3.2 Measurement Plots .....                           | 12        |
| <b>A.4 EMISSION LIMITATIONS .....</b>                   | <b>13</b> |
| <b>A.5 POWER SPECTRAL DENSITY .....</b>                 | <b>16</b> |
| A.5.1 Power Spectral Density Result .....               | 16        |
| A.5.2 Measurement Plots .....                           | 17        |

## A.1 RADIATED EMISSION

|              |                          |            |          |
|--------------|--------------------------|------------|----------|
| Test Date    | 2018/12/13               | Temp./Hum. | 22°C/55% |
| Test Voltage | DC 6V (Via Power Supply) |            |          |

### A.1.1 Emissions within Restricted Frequency Bands

#### A.2.1.1 Frequency 9kHz~30MHz

**The emissions (9kHz~30MHz) not reported for there is no emission be found.**

#### A.2.1.2 Frequency Below 1 GHz

|      |          |           |                |
|------|----------|-----------|----------------|
| Mode | FASSTest | Frequency | TX 2439.168MHz |
|------|----------|-----------|----------------|

#### Antenna at Horizontal Polarization

| Emission<br>Frequency<br>(MHz) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Meter<br>Reading<br>(dBμV) | Emission<br>Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector |
|--------------------------------|-----------------------------|-----------------------|----------------------------|-------------------------------|--------------------|----------------|----------|
| 72.68                          | 12.91                       | 2.12                  | 13.57                      | 28.60                         | 40.00              | 11.40          | Peak     |
| 120.21                         | 18.81                       | 2.99                  | 9.56                       | 31.36                         | 43.50              | 12.14          | Peak     |
| 261.83                         | 19.51                       | 4.07                  | 14.02                      | 37.60                         | 46.00              | 8.40           | Peak     |
| 431.58                         | 22.87                       | 5.87                  | 6.71                       | 35.45                         | 46.00              | 10.55          | Peak     |
| 886.51                         | 27.11                       | 8.03                  | 1.87                       | 37.01                         | 46.00              | 8.99           | Peak     |
| 982.54                         | 28.14                       | 8.50                  | 1.89                       | 38.53                         | 54.00              | 15.47          | Peak     |

#### Antenna at Vertical Polarization

| Emission<br>Frequency<br>(MHz) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Meter<br>Reading<br>(dBμV) | Emission<br>Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector |
|--------------------------------|-----------------------------|-----------------------|----------------------------|-------------------------------|--------------------|----------------|----------|
| 34.85                          | 22.53                       | 1.62                  | 11.92                      | 36.07                         | 40.00              | 3.93           | Peak     |
| 120.21                         | 18.81                       | 2.99                  | 7.07                       | 28.87                         | 43.50              | 14.63          | Peak     |
| 322.94                         | 20.51                       | 4.70                  | 8.58                       | 33.79                         | 46.00              | 12.21          | Peak     |
| 586.78                         | 24.81                       | 6.45                  | 2.71                       | 33.97                         | 46.00              | 12.03          | Peak     |
| 734.22                         | 25.72                       | 7.25                  | 2.64                       | 35.61                         | 46.00              | 10.39          | Peak     |
| 981.57                         | 28.14                       | 8.50                  | 2.59                       | 39.23                         | 54.00              | 14.77          | Peak     |

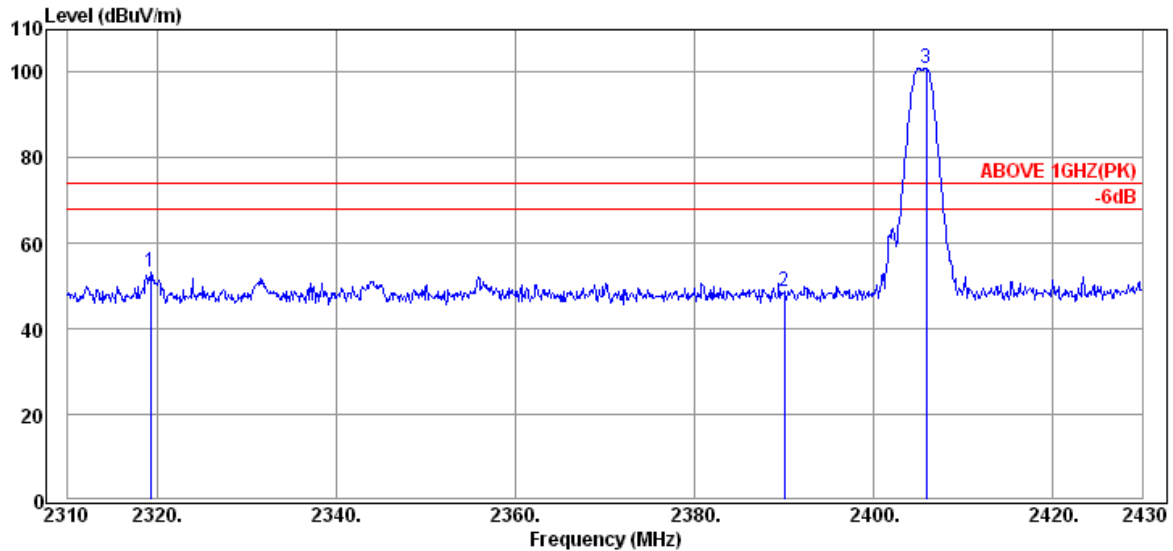
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### A.2.1.3 Frequency Above 1 GHz to 10<sup>th</sup> harmonics

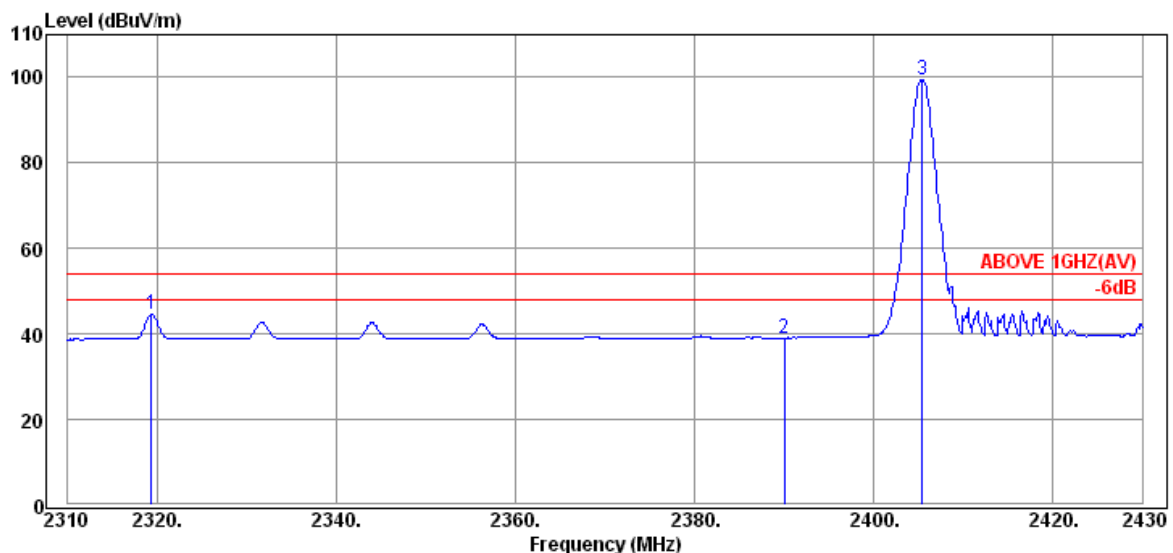
#### Band Edge:

| Mode | FASSTest | Frequency | TX 2405.376MHz |
|------|----------|-----------|----------------|
|------|----------|-----------|----------------|



#### Antenna at Horizontal Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 2319.24                  | 28.20                 | 5.19            | 19.94                | 53.33                   | 74.00           | 20.67       | Peak     |
| 2390.00                  | 28.28                 | 5.24            | 15.32                | 48.84                   | 74.00           | 25.16       | Peak     |
| @ 2405.88                | 28.30                 | 5.25            | 67.37                | 100.92                  | ---             | ---         | Peak     |



#### Antenna at Horizontal Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 2319.36                  | 28.20                 | 5.19            | 11.25                | 44.64                   | 54.00           | 9.36        | Average  |
| 2390.00                  | 28.28                 | 5.24            | 5.57                 | 39.09                   | 54.00           | 14.91       | Average  |
| @ 2405.40                | 28.30                 | 5.25            | 66.05                | 99.60                   | ---             | ---         | Average  |

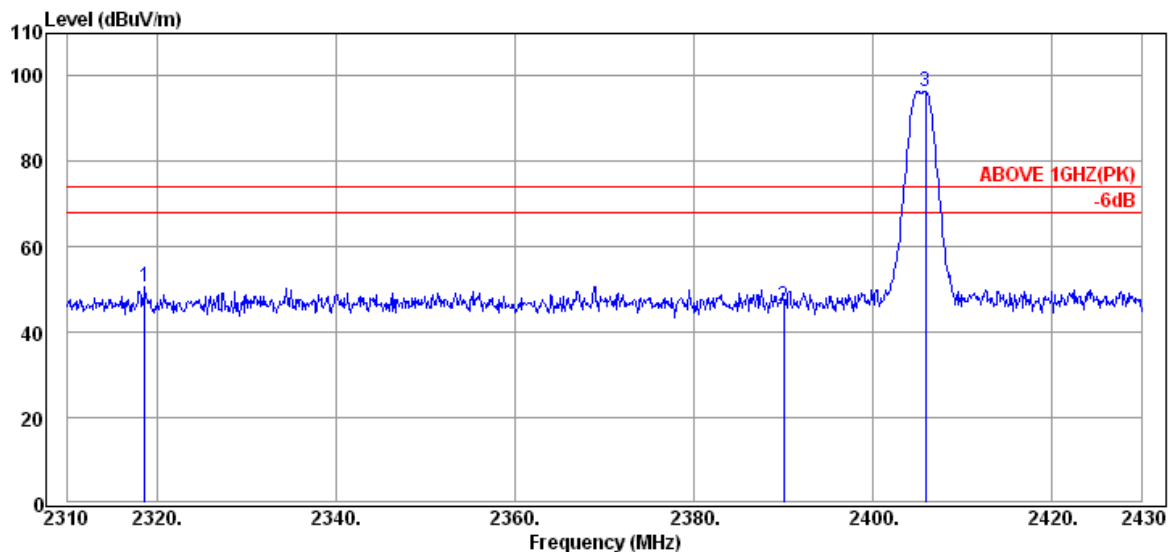
Remark: The "@" means fundamental frequency, it is ignored in this section.

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Report Number: EM-F180539

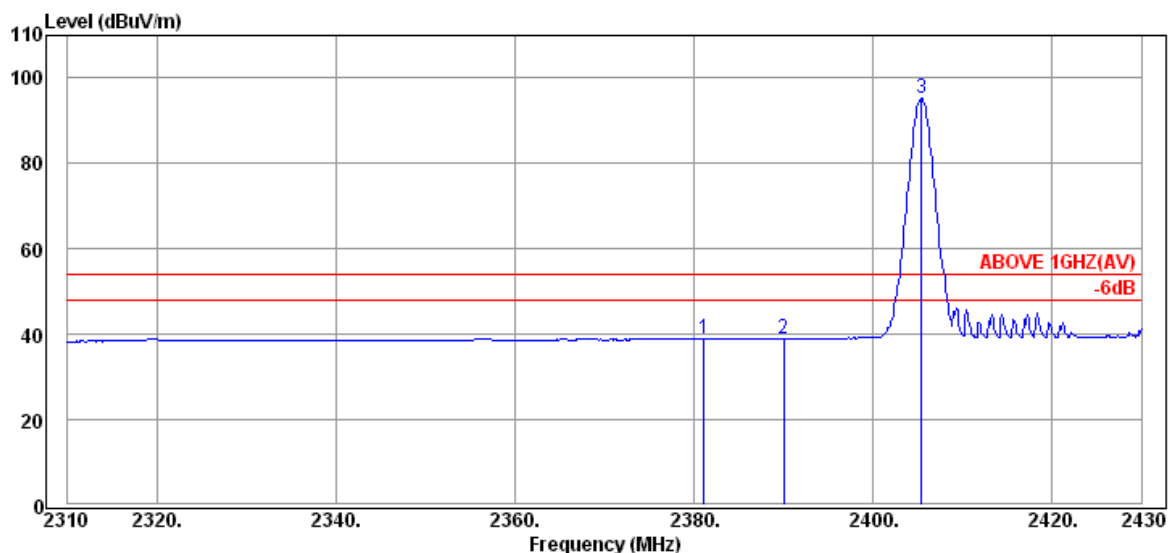
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| Mode | FASSTest | Frequency | TX 2405.376MHz |
|------|----------|-----------|----------------|
|------|----------|-----------|----------------|



### Antenna at Vertical Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 2318.64                  | 28.20                 | 5.19            | 17.15                | 50.54                   | 74.00           | 23.46       | Peak     |
| 2390.00                  | 28.28                 | 5.24            | 12.56                | 46.08                   | 74.00           | 27.92       | Peak     |
| @ 2405.88                | 28.30                 | 5.25            | 62.89                | 96.44                   | ---             | ---         | Peak     |

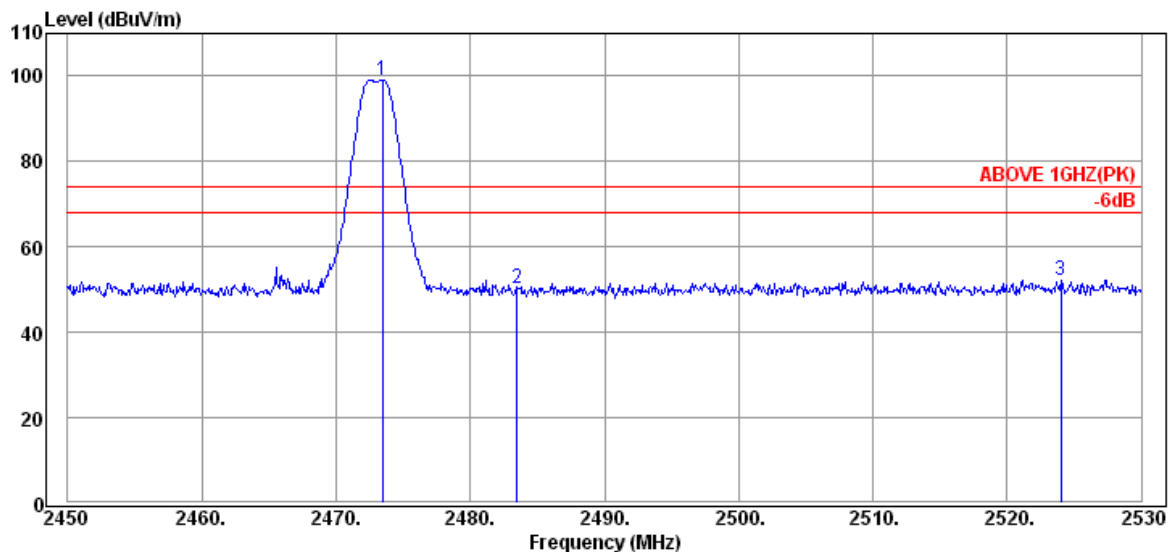


### Antenna at Vertical Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 2381.16                  | 28.27                 | 5.23            | 5.48                 | 38.98                   | 54.00           | 15.02       | Average  |
| 2390.00                  | 28.28                 | 5.24            | 5.40                 | 38.92                   | 54.00           | 15.08       | Average  |
| @ 2405.40                | 28.30                 | 5.25            | 61.56                | 95.11                   | ---             | ---         | Average  |

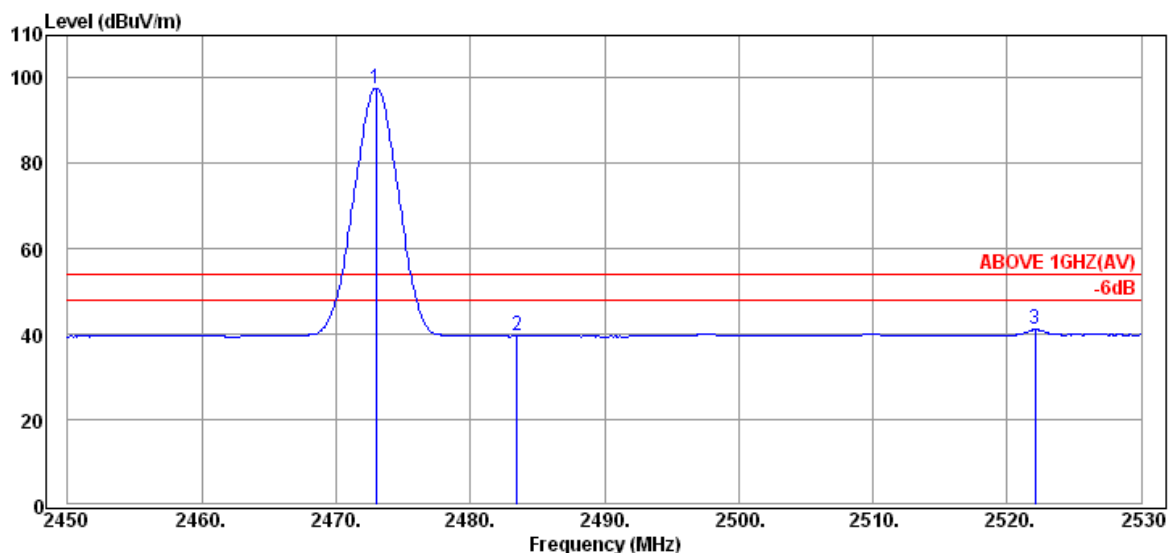
Remark: The "@" means fundamental frequency, it is ignored in this section.

| Mode | FASSTest | Frequency | TX 2472.96MHz |
|------|----------|-----------|---------------|
|------|----------|-----------|---------------|



#### Antenna at Horizontal Polarization

|   | Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|---|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| @ | 2473.44                  | 28.37                 | 5.30            | 65.54                | 99.21                   | ---             | ---         | Peak     |
|   | 2483.50                  | 28.38                 | 5.31            | 16.53                | 50.22                   | 74.00           | 23.78       | Peak     |
|   | 2524.00                  | 28.48                 | 5.34            | 18.32                | 52.14                   | 74.00           | 21.86       | Peak     |



#### Antenna at Horizontal Polarization

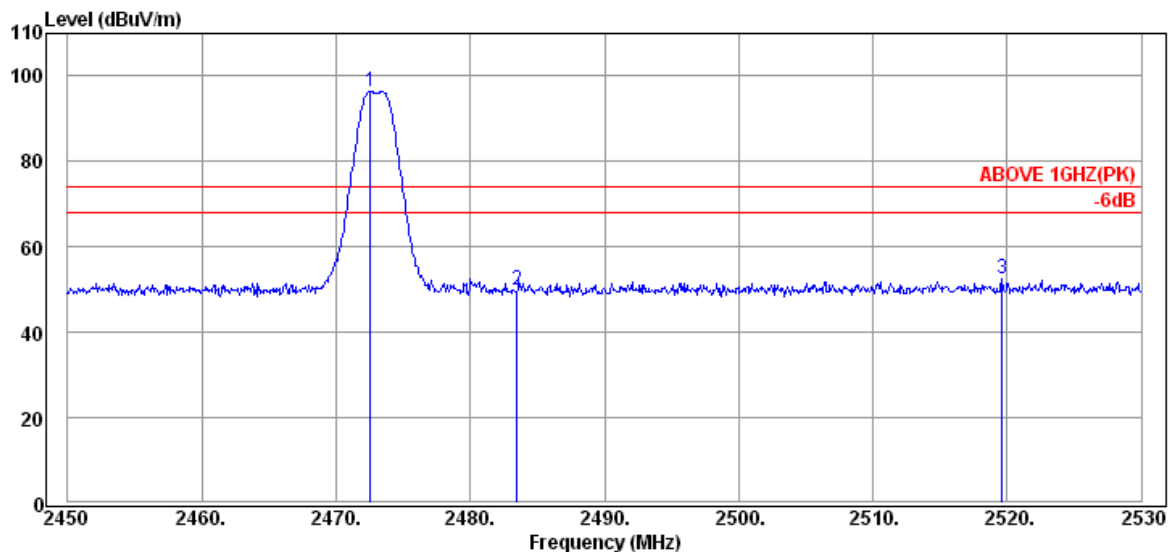
|   | Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|---|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| @ | 2472.96                  | 28.37                 | 5.30            | 63.99                | 97.66                   | ---             | ---         | Average  |
|   | 2483.50                  | 28.38                 | 5.31            | 5.90                 | 39.59                   | 54.00           | 14.41       | Average  |
|   | 2522.08                  | 28.48                 | 5.34            | 7.28                 | 41.10                   | 54.00           | 12.90       | Average  |

Remark: The "@" means fundamental frequency, it is ignored in this section.

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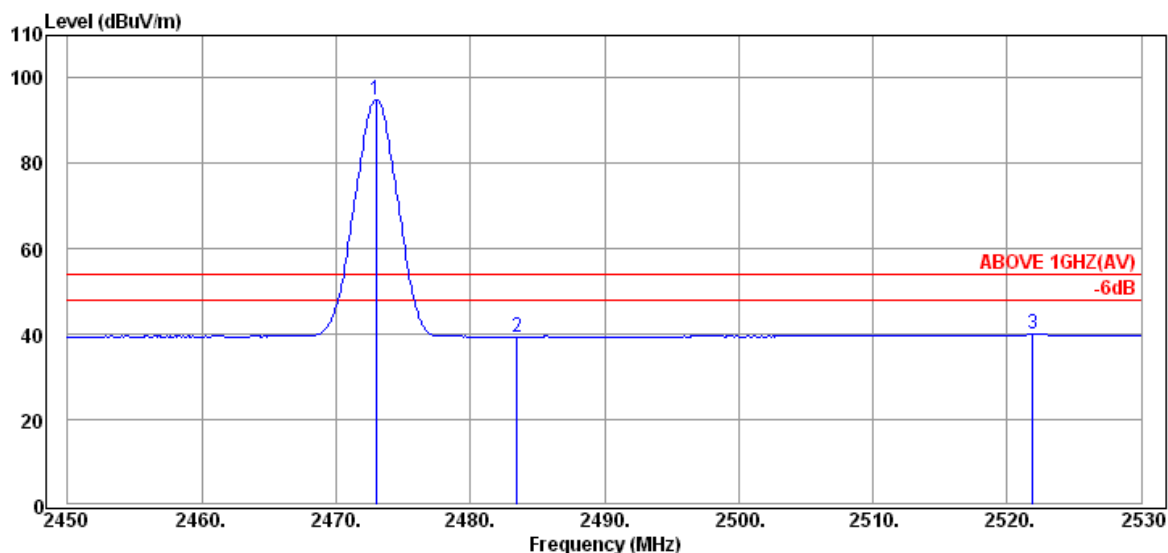
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| Mode | FASSTest | Frequency | TX 2472.96MHz |
|------|----------|-----------|---------------|
|------|----------|-----------|---------------|



## Antenna at Vertical Polarization

|   | Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|---|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| @ | 2472.56                  | 28.37                 | 5.30            | 62.73                | 96.40                   | ---             | ---         | Peak     |
|   | 2483.50                  | 28.38                 | 5.31            | 16.27                | 49.96                   | 74.00           | 24.04       | Peak     |
|   | 2519.60                  | 28.48                 | 5.33            | 18.84                | 52.65                   | 74.00           | 21.35       | Peak     |



## Antenna at Vertical Polarization

|   | Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|---|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| @ | 2472.96                  | 28.37                 | 5.30            | 61.22                | 94.89                   | ---             | ---         | Average  |
|   | 2483.50                  | 28.38                 | 5.31            | 5.74                 | 39.43                   | 54.00           | 14.57       | Average  |
|   | 2521.92                  | 28.48                 | 5.34            | 6.20                 | 40.02                   | 54.00           | 13.98       | Average  |

Remark: The "@" means fundamental frequency, it is ignored in this section.

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### A.1.2 Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

| Mode | FASSTest | Frequency | TX 2405.376MHz |
|------|----------|-----------|----------------|
|------|----------|-----------|----------------|

#### Antenna at Horizontal Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 3208.00                  | 30.49                 | 6.20            | 15.05                | 51.74                   | 54.00           | 2.26        | Peak     |

#### Antenna at Vertical Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 3208.00                  | 30.49                 | 6.20            | 16.26                | 52.95                   | 74.00           | 21.05       | Peak     |
| 4812.00                  | 32.85                 | 8.98            | 5.83                 | 47.66                   | 54.00           | 6.34        | Average  |
| 4812.00                  | 32.85                 | 8.98            | 12.68                | 54.51                   | 74.00           | 19.49       | Peak     |

| Mode | FASSTest | Frequency | TX 2439.168MHz |
|------|----------|-----------|----------------|
|------|----------|-----------|----------------|

#### Antenna at Horizontal Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 3252.00                  | 30.58                 | 6.31            | 10.28                | 47.17                   | 54.00           | 6.83        | Peak     |
| 4876.00                  | 32.96                 | 9.08            | 5.51                 | 47.55                   | 54.00           | 6.45        | Peak     |

#### Antenna at Vertical Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 3252.00                  | 30.58                 | 6.31            | 12.35                | 49.24                   | 74.00           | 24.76       | Peak     |
| 4878.00                  | 32.96                 | 9.08            | 7.17                 | 49.21                   | 54.00           | 4.79        | Average  |
| 4878.00                  | 32.96                 | 9.08            | 13.46                | 55.50                   | 74.00           | 18.50       | Peak     |

| Mode | FASSTest | Frequency | TX 2472.960MHz |
|------|----------|-----------|----------------|
|------|----------|-----------|----------------|

#### Antenna at Horizontal Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 3298.00                  | 30.66                 | 6.39            | 12.76                | 49.81                   | 54.00           | 4.19        | Peak     |
| 4944.00                  | 33.09                 | 9.16            | 5.47                 | 47.72                   | 54.00           | 6.28        | Peak     |

#### Antenna at Vertical Polarization

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Detector |
|--------------------------|-----------------------|-----------------|----------------------|-------------------------|-----------------|-------------|----------|
| 3298.00                  | 30.66                 | 6.39            | 13.87                | 50.92                   | 54.00           | 3.08        | Peak     |
| 4948.00                  | 33.09                 | 9.18            | 6.96                 | 49.23                   | 54.00           | 4.77        | Average  |
| 4948.00                  | 33.09                 | 9.18            | 14.52                | 56.79                   | 74.00           | 17.21       | Peak     |

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**A.1.3 Emissions in Non-restricted Frequency Bands:**

Pursuant to KDB 558074 D01 DTS Meas Guidance v05 that emission levels below the FCC 15.209(a)/RSS-Gen Section 8.9 table 4 general radiated emissions limits is not required.

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## A.2 6dB BANDWIDTH

|            |            |              |                          |
|------------|------------|--------------|--------------------------|
| Test Date  | 2018/12/11 | Temp./Hum.   | 22°C/55%                 |
| Cable Loss | 1.58dB     | Test Voltage | DC 6V (Via Power Supply) |

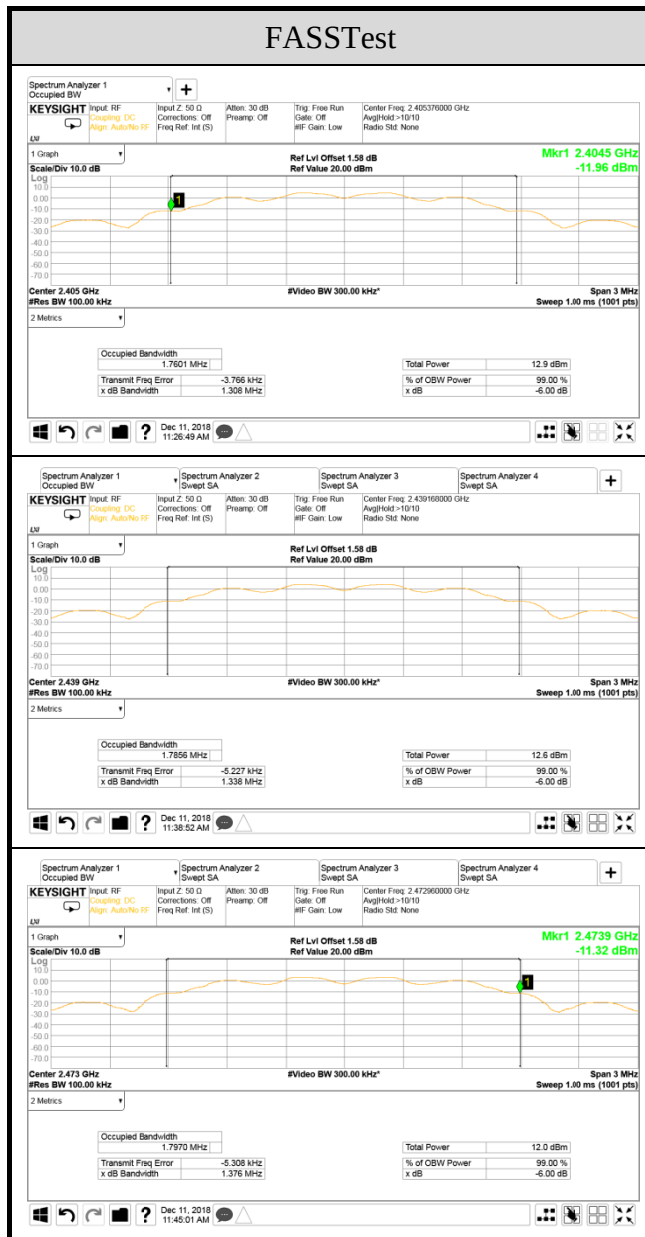
### A.2.1 6dB Bandwidth Result

| Mode     | Centre Frequency (MHz) | 6 dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) (Reference only) | Limit   |
|----------|------------------------|----------------------|-----------------------------------------------|---------|
| FASSTest | 2405.376               | 1.308                | 1.7601                                        | >500kHz |
|          | 2439.168               | 1.338                | 1.7856                                        |         |
|          | 2472.960               | 1.376                | 1.7970                                        |         |

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## A.2.2 Measurement Plots



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## A.3 MAXIMUM PEAK OUTPUT POWER

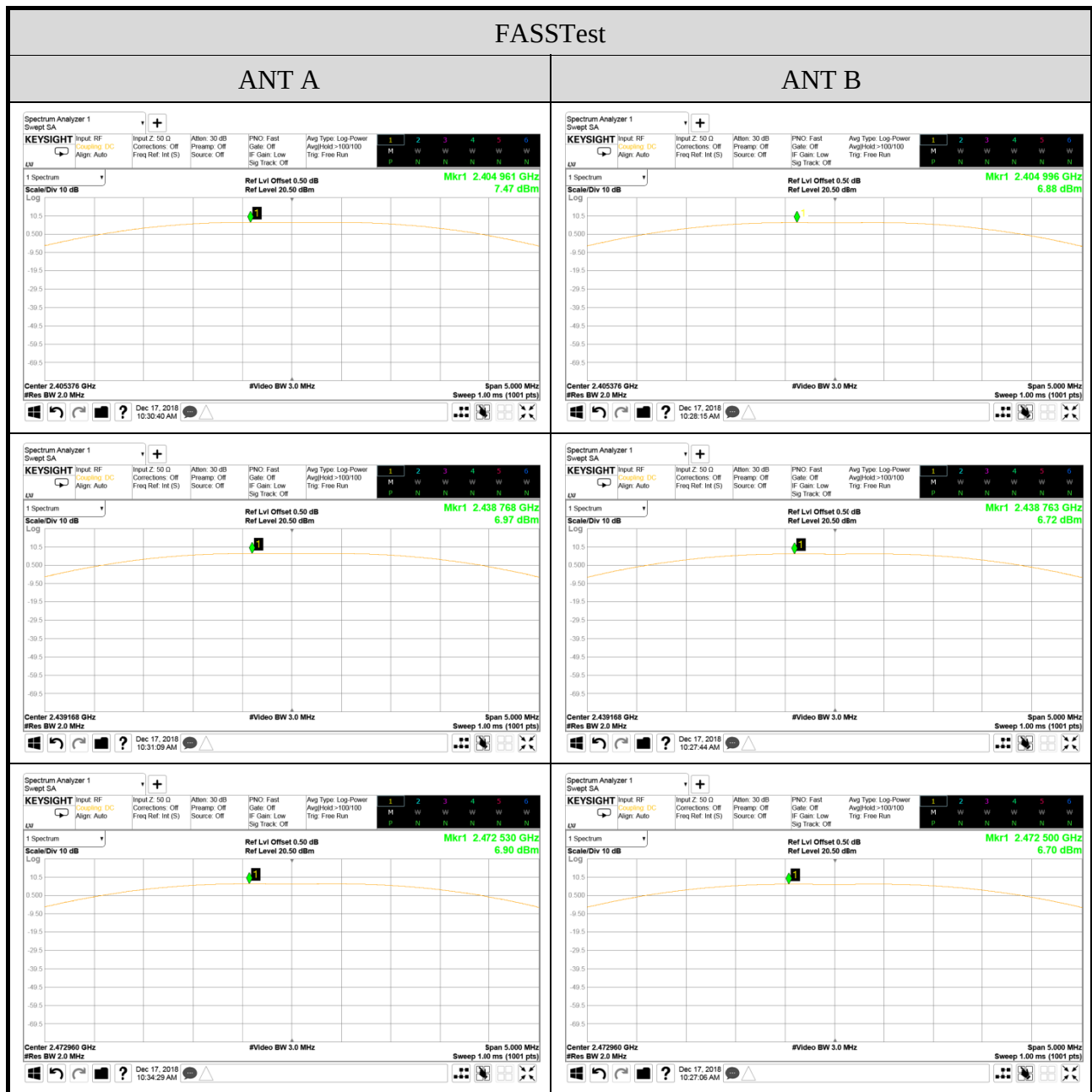
|            |            |              |                          |
|------------|------------|--------------|--------------------------|
| Test Date  | 2018/12/17 | Temp./Hum.   | 21°C/52%                 |
| Cable Loss | 0.50dB     | Test Voltage | DC 6V (Via Power Supply) |

### A.3.1 Peak Output Power

| Mode     | Centre Frequency (MHz) | Peak Output Power (dBm) |       | Max. Peak Output Power |        | Antenna Gain (dBi) | Output Power (E.I.R.P.) |        | Limit                                                                    |
|----------|------------------------|-------------------------|-------|------------------------|--------|--------------------|-------------------------|--------|--------------------------------------------------------------------------|
|          |                        | ANT A                   | ANT B | (dBm)                  | (W)    |                    | (dBm)                   | (W)    |                                                                          |
| FASSTest | 2405.376               | 7.47                    | 6.88  | 7.47                   | 0.0056 | -5.16              | 2.31                    | 0.0017 | < 30dBm (1W)<br>(Maximum Peak Output Power)<br>< 36dBm (4W)<br>(E.I.R.P) |
|          | 2439.168               | 6.97                    | 6.72  | 6.97                   | 0.0050 |                    | 1.81                    | 0.0015 |                                                                          |
|          | 2472.960               | 6.90                    | 6.70  | 6.90                   | 0.0049 |                    | 1.74                    | 0.0015 |                                                                          |

Note: The results have been included cable loss.

### A.3.2 Measurement Plots



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No. 53-11, Dingfu, Linkou, Dist.,

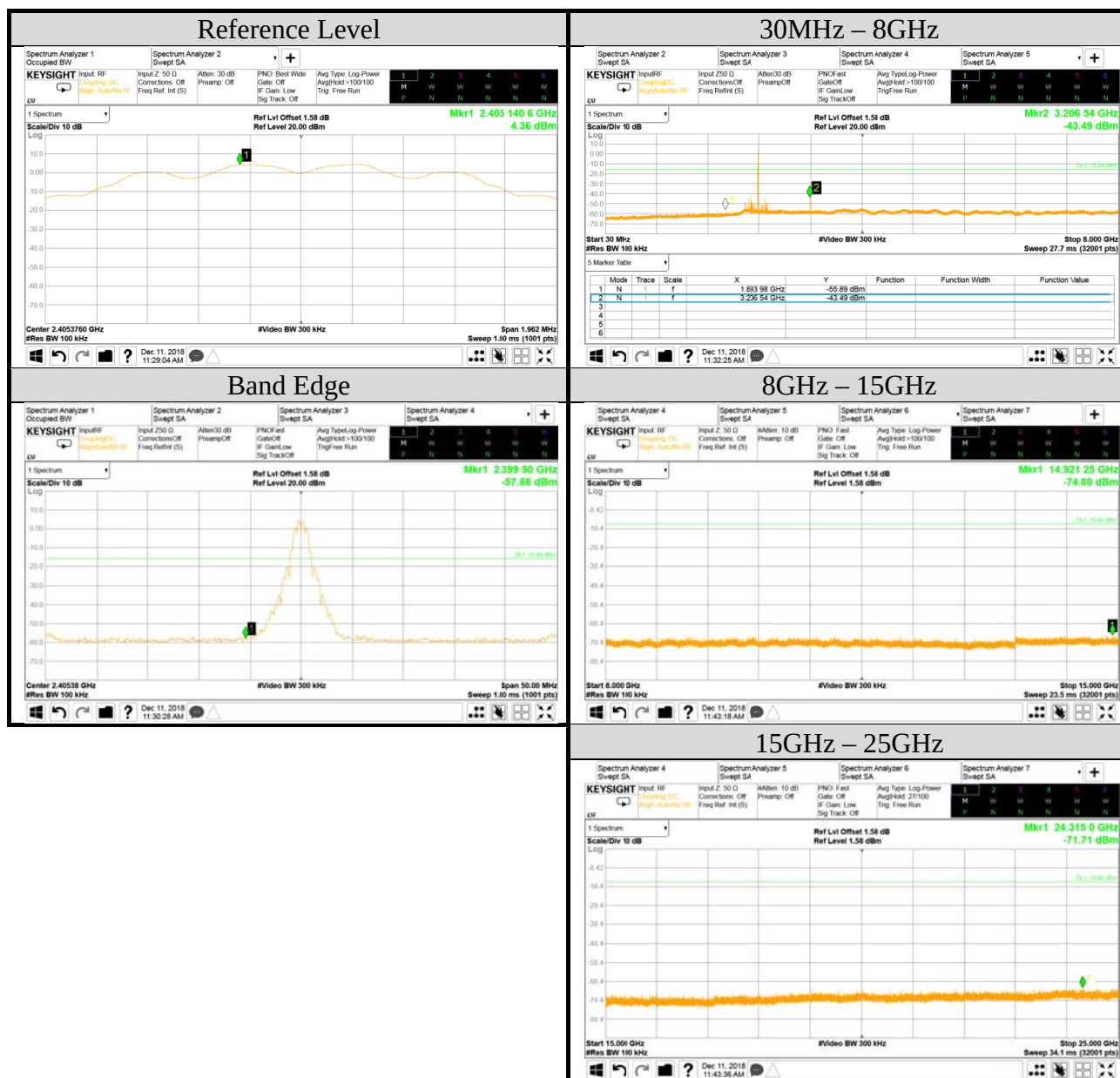
New Taipei City 244, Taiwan

Tel: +886 2 26099301

Fax: +886 2 26099303

## A.4 EMISSION LIMITATIONS

|                     |                                         |              |                          |
|---------------------|-----------------------------------------|--------------|--------------------------|
| Test Date           | 2018/12/11                              | Temp./Hum.   | 22°C/55%                 |
| Cable Loss          | 1.58dB                                  | Test Voltage | DC 6V (Via Power Supply) |
| Mode                | FASSTest                                | Frequency    | TX 2405.376MHz           |
| Simultaneous Factor | 10 log(n) (Note: "n" is antenna number) |              | 0                        |



**Audix Technology Corp.**

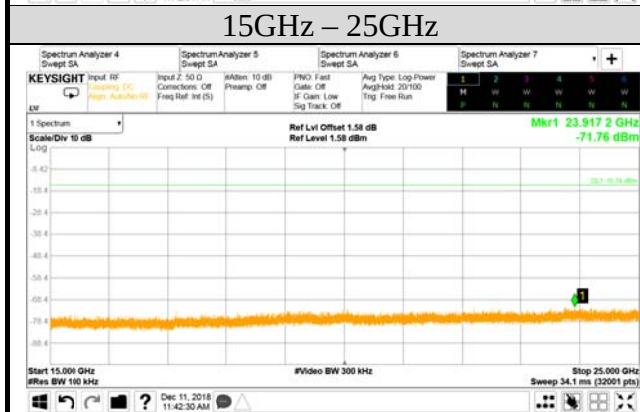
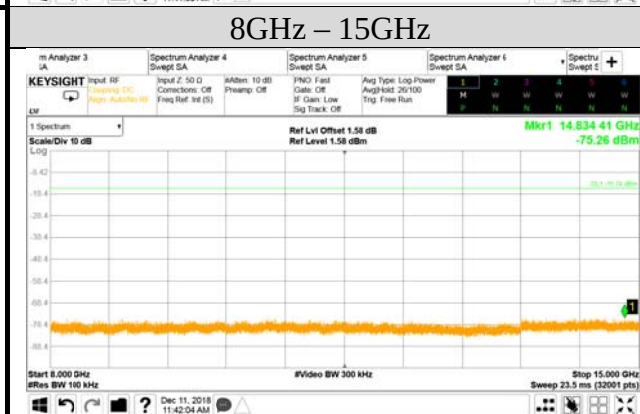
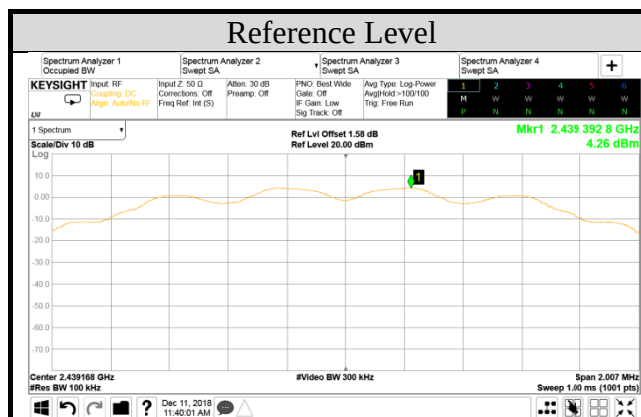
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|                     |                                         |              |                          |
|---------------------|-----------------------------------------|--------------|--------------------------|
| Test Date           | 2018/12/11                              | Temp./Hum.   | 22°C/55%                 |
| Cable Loss          | 1.58dB                                  | Test Voltage | DC 6V (Via Power Supply) |
| Mode                | FASSTest                                | Frequency    | TX 2439.168MHz           |
| Simultaneous Factor | 10 log(n) (Note: "n" is antenna number) |              | 0                        |



**Audix Technology Corp.**

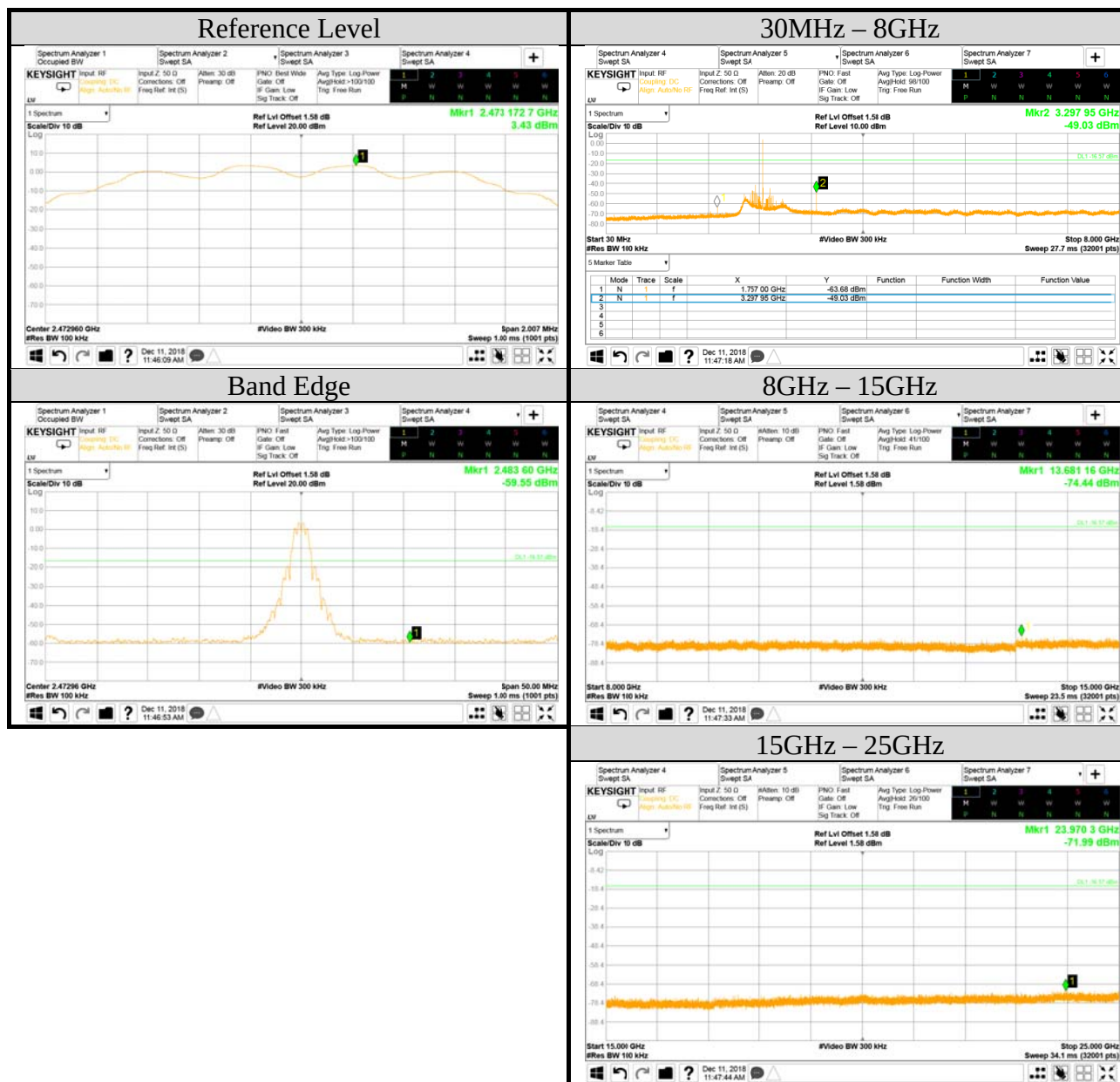
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|                     |                                         |              |                          |
|---------------------|-----------------------------------------|--------------|--------------------------|
| Test Date           | 2018/12/11                              | Temp./Hum.   | 22°C/55%                 |
| Cable Loss          | 1.58dB                                  | Test Voltage | DC 6V (Via Power Supply) |
| Mode                | FASSTest                                | Frequency    | TX 2472.96MHz            |
| Simultaneous Factor | 10 log(n) (Note: "n" is antenna number) |              | 0                        |



## A.5 POWER SPECTRAL DENSITY

|                                                             |            |              |                          |
|-------------------------------------------------------------|------------|--------------|--------------------------|
| Test Date                                                   | 2018/12/11 | Temp./Hum.   | 22°C/55%                 |
| Cable Loss                                                  | 1.58dB     | Test Voltage | DC 6V (Via Power Supply) |
| Simultaneous Factor 10 log(n) (Note: "n" is antenna number) |            |              | 0                        |

### A.5.1 Power Spectral Density Result

| Mode     | Centre Frequency (MHz) | Power Spectral Density (dBm) | Limit        |
|----------|------------------------|------------------------------|--------------|
| FASSTest | 2405.376               | 4.36                         | < 8 dBm/3kHz |
|          | 2439.168               | 4.26                         |              |
|          | 2472.960               | 3.43                         |              |

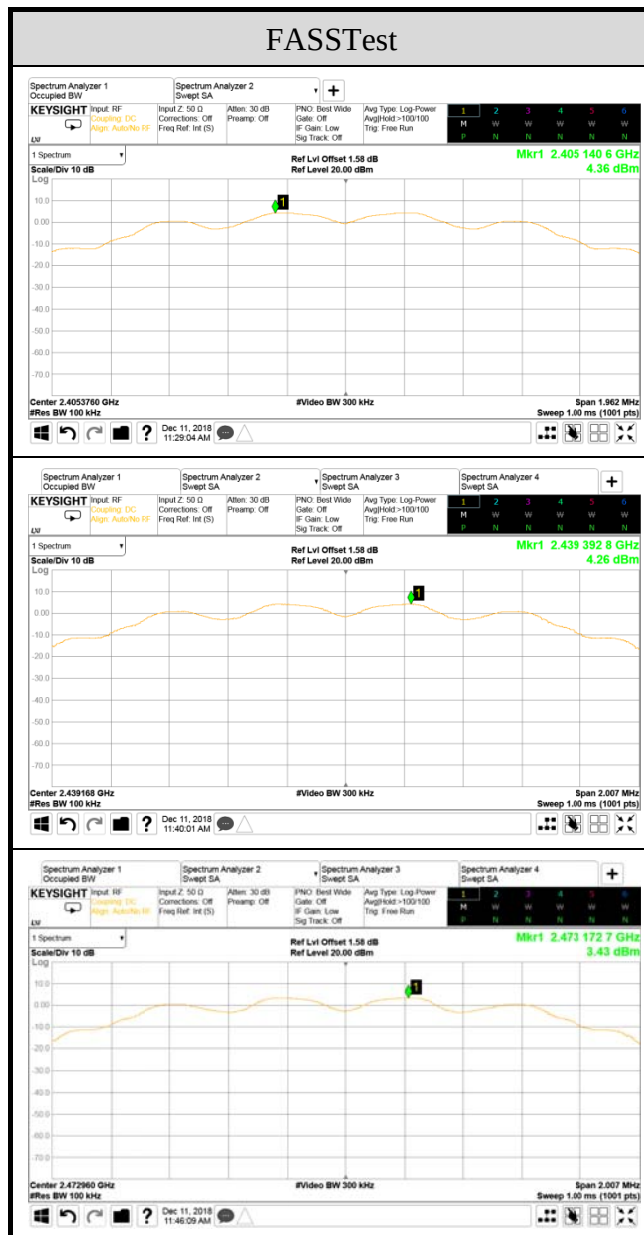
Note: 1. All results have been included cable loss and Simultaneous Factor.

2. For KDB558074 D01V05, in the test result, when RBW set at 100kHz is stricter than 3kHz.

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## A.5.2 Measurement Plots



Note: All results have been included cable loss and Simultaneous Factor.



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**APPENDIX B**

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# APPENDIX B

## TEST PHOTOGRAPHS

(Model: R7108SB)