

## FCC 15.247 2.4 GHz Report

for

**FUTABA Corporation**

**1080 YabutsukaChosei-son Chosei-gun  
Chiba, 299-4395 Japan.**

**Product Name : Radio Control**  
**Model Name : FMR-03**  
**Brand : Futaba**  
**FCC ID : AZP-FMR-03-24G**  
**IC : 2914D-FMR03**

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



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## TEST REPORT CERTIFICATION

Applicant : FUTABA Corporation  
Manufacture : FUTABA Corporation  
EUT Description  
(1) Product : Radio Control  
(2) Model : FMR-03  
(3) Brand : Futaba

Applicable Standards:

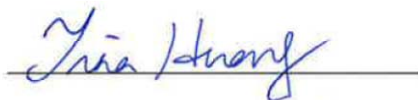
47 CFR FCC Part 15 Subpart C  
RSS-Gen (Issue 4), November 2014  
RSS-247 (Issue 2), February 2017  
ANSI C63.10:2013  
KDB 558074 D01 DTS Meas Guidance v04

**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: 2017. 04. 24

Reviewed by:



(Tina Huang/Administrator)

Approved by:



(Ben Cheng/Manager)

## 1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2017. 04. 24	Original Report	EM-F170247

## 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)/ 15.205	RSS-Gen §8.9 RSS-247 §5.5	Radiated Band Edge and 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 Conducted Spurious Emission	<b>PASS</b>
15.247 (e)	RSS-247 §5.2(2)	Peak Power Spectral Density	<b>PASS</b>
15.203	----	Antenna Requirement	<b>PASS</b>

Note: The EUT only employs battery power for operation, so it is unnecessary to test.

### 3. GENERAL INFORMATION

#### 3.1. Description of Application

Applicant	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken, 299-4395 Japan.
Manufacturer	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken, 299-4395 Japan.
Product	Radio Control
Model	FMR-03
Brand	Futaba

#### 3.2. Description of EUT

Test Model	FMR-03
Serial Number	N/A
Power Rating	3.7V~7.4Vdc
RF Features	FASSTest
Transmit Type	1T1R
Date of Receipt	2016. 11. 24
Date of Test	2017. 04. 17 ~ 19

### 3.3. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (kbps)
FASSTest	2405.376 to 2472.960	23	DSSS	136

Mode: FASSTest			
Channel List			
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
00	2405.376	12	2442.240
01	2408.448	13	2445.312
02	2411.520	14	2448.384
03	2414.592	15	2451.456
04	2417.664	16	2454.528
05	2420.736	17	2457.600
06	2423.808	18	2460.672
07	2426.880	19	2463.744
08	2429.952	20	2466.816
09	2433.024	21	2469.888
10	2436.096	22	2472.960
11	2439.168		

### 3.4. Antenna Information

No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	---	---	1/2 $\lambda$ antenna	2400 ~ 2483.5	-1.16



### 3.6. Test Configuration

Mode	Duty Cycle (x)	T (ms)	Duty Cycle Factor (dB)
FASSTest	1.00	N/A	N/A

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.

	Item	Mode	Test Channel
Radiated Test Case	Radiated Band Edge <sup>Note1</sup>	FASSTest	0/22
	Radiated Spurious Emission <sup>Note1</sup>	FASSTest	0/11/22
Conducted Test Case	6dB Bandwidth	FASSTest	0/11/22
	Peak Power Spectral Density	FASSTest	0/11/22
	Peak Output Power	FASSTest	0/11/22
	Band Edge	FASSTest	0/22
	Spurious Emission	FASSTest	0/11/22

Note 1:

Mobile Device.

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

Lie

Side

Stand

### 3.7. Tested Supporting System List

#### 3.7.1. Support Peripheral Unit

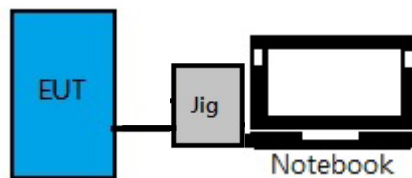
No.	Product	Brand	Model No.	Serial No.	Approval
1.	Notebook PC	acer	Acer Aspire 4755G	N/A	FCC ID: HLZ-AR5B97
2.	Test Jig	N/A	N/A	N/A	N/A
3.	DC Power Supply	TOP WARD	3303A	N/A	N/A

#### 3.7.2. Cable Lists

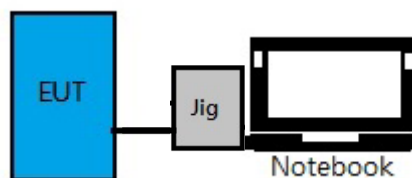
No.	Cable Description Of The Above Support Units
1.	Adapter: DELTA, M/N ADP-90CDD DC Power Cord: Unshielded, Undetachable, 1.8m, Bonded a ferrite core AC Power Cord: I/P: Unshielded, Detachable, 1.8m
2.	USB Cable: Unshielded, Detachable, 1.1m Data Cable: Unshielded, Detachable, 0.6m
3.	DC Power Cord*2: Unshielded, Detachable, 0.5m AC Power Cord: Unshielded, Undetachable, 1.8m

### 3.8. Setup Configuration

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



#### 3.8.2. EUT Configuration for RF Radiated Test Item



### 3.9. Operating Condition of EUT

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

### 3.10. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: sales@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2005 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724 (3) FCC OET Designation No. TW1004 & TW1090
Test Facilities	(1) Semi-Anechoic Chamber (IC Test Site Registration No.: 5183B-1)

### 3.11. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark : Uncertainty =  $ku_c(y)$

Test Item	Uncertainty
6dB Bandwidth	± 0.05kHz
Maximum peak output power	± 0.33dB
Power spectral density	± 0.13dB
Conducted Emission Limitations	± 0.13dB

## 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	2016. 09. 19	1 Year
2.	Test Receiver	R & S	ESCS30	100338	2016. 06. 22	1 Year
3.	Amplifier	HP	8447D	2944A06305	2017. 02. 16	1 Year
4.	Amplifier	HP	8449B	3008A00529	2017. 02. 08	1 Year
5.	Bilog Antenna	CHASE	CBL6112D	33821	2017. 01. 21	1 Year
6.	HornAntenna	EMCO	3115	9609-4927	2016. 06. 27	1 Year
7.	Double-Ridged Waveguide Horn	ETS-Lindgren	3117	00135902	2017. 03. 08	1 Year
8.	2.4GHz Notch Filter	K&L	7NSL10-244 1.5E130.5-00	1	2016. 07. 28	1 Year
9.	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	Agilent	N9010A-507	MY52220264	2016. 08. 09	1 Year

## 5. CONDUCTED EMISSION

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

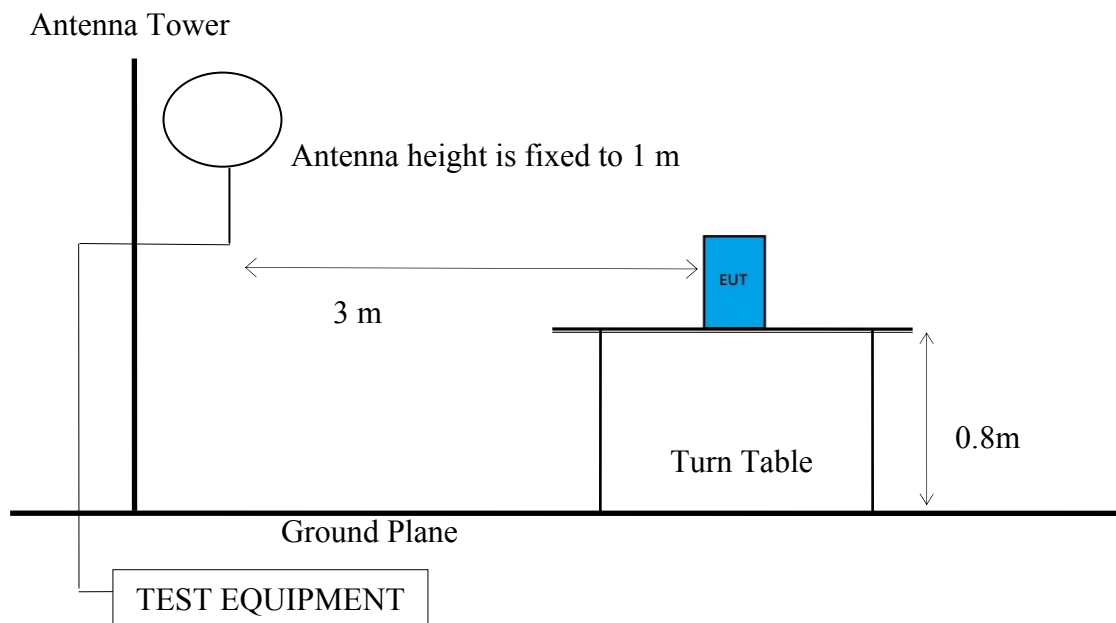
## 6. RADIATED EMISSION

### 6.1. Block Diagram of Test Setup

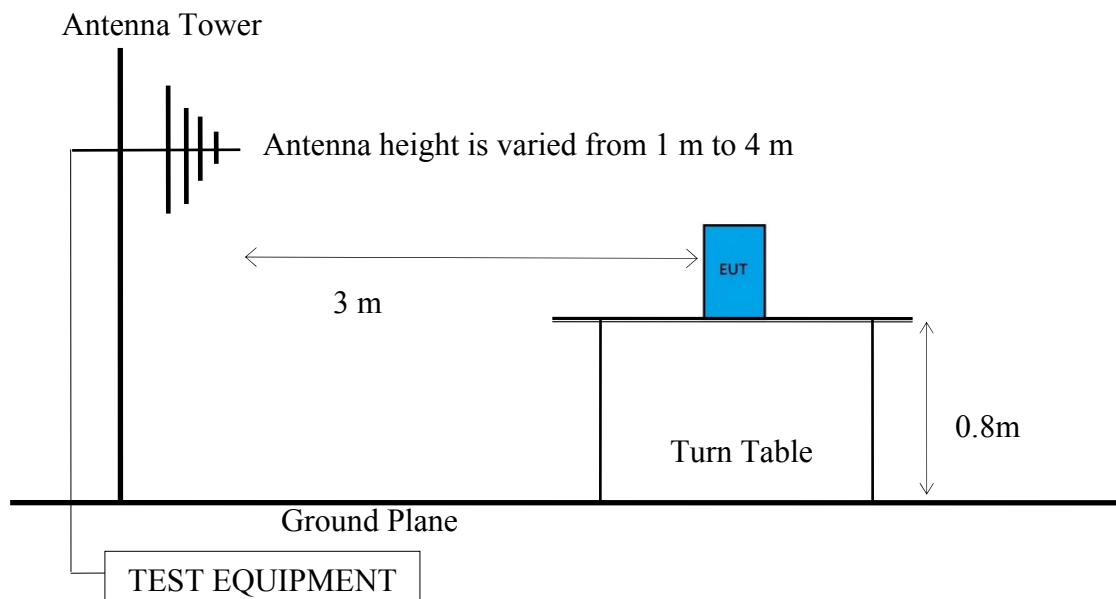
#### 6.1.1. Block Diagram of EUT

Indicated as section 3.8

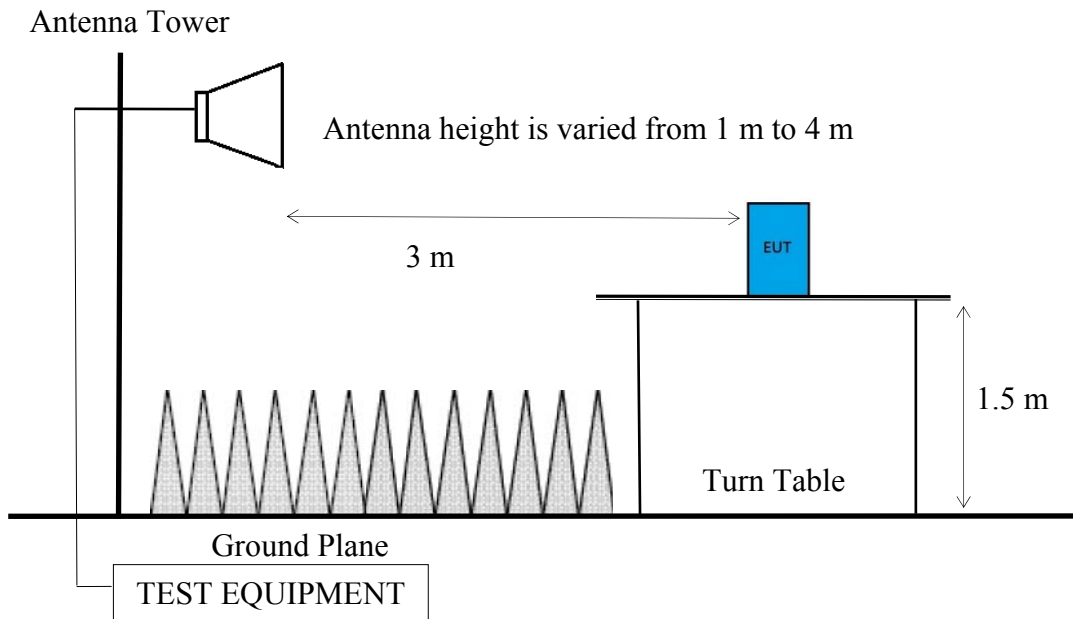
#### 6.1.2. Setup Diagram for 9kHz-30MHz



#### 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	2400/kHz
0.490 - 1.705	30	87.6	24000/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) 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 find 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 finally 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 finally 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	10

N/A: 1/ T is not implemented when duty cycle presented in section 3.7 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:**

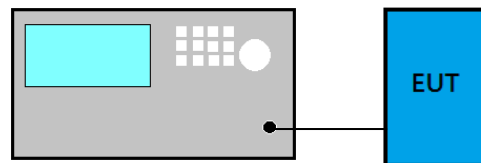
Average Emission Level = Peak Emission Level + D.C.C.F.

**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 3.7 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 v04:

- (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 v04:

#### ■ PKPM1 Peak power meter method:

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

#### 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 3.6 is < 98%.

#### Method AVGSA-2 (Spectrum channel power)

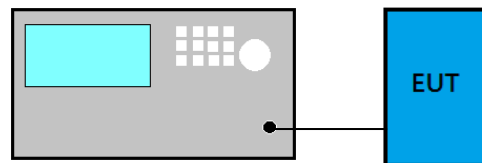
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 -5% of OBW
- (3) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of 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 3.6 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 v04:

#### ■ 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

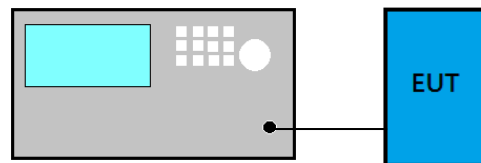
- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW  $\geq 3 \times$  RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully 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 v04:

#### 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 3.6  $< 98\%$ .
- (7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 10.4. Test Results

Please refer to Appendix A

## **11.DEVIATION TO TEST SPECIFICATIONS**

**【NONE】**



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*APPENDIX A*

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# APPDNDIX A

## TEST DATA AND PLOTS

(Model: FMR-03)



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## A.1 RADIATED EMISSION

Test Date	2017/04/17	Temp./Hum.	26°C/58%
Test Voltage	DC 6.6V (Via DC 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 2405.376MHz
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### Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
30.97	24.28	1.22	1.62	27.12	40.00	12.88	Peak
101.78	17.38	2.29	5.03	24.70	43.50	18.80	Peak
191.99	15.57	3.26	9.16	27.99	43.50	15.51	Peak

### Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
30.00	24.78	1.20	1.36	27.34	40.00	12.66	Peak
101.78	17.38	2.29	4.03	23.70	43.50	19.80	Peak
584.84	24.60	6.71	3.72	35.03	46.00	10.97	Peak

Mode	FASSTest	Frequency	TX 2439.168MHz
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## Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
30.97	24.28	1.22	0.98	26.48	40.00	13.52	Peak
101.78	17.38	2.29	4.93	24.60	43.50	18.90	Peak
191.99	15.57	3.26	9.17	28.00	43.50	15.50	Peak

## Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
30.00	24.78	1.20	1.24	27.22	40.00	12.78	Peak
101.78	17.38	2.29	4.29	23.96	43.50	19.54	Peak
374.35	22.06	5.27	2.77	30.10	46.00	15.90	Peak

Mode	FASSTest	Frequency	TX 2472.96MHz
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## Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
30.97	24.28	1.22	0.05	25.55	40.00	14.45	Peak
101.78	17.38	2.29	5.16	24.83	43.50	18.67	Peak
191.99	15.57	3.26	9.17	28.00	43.50	15.50	Peak

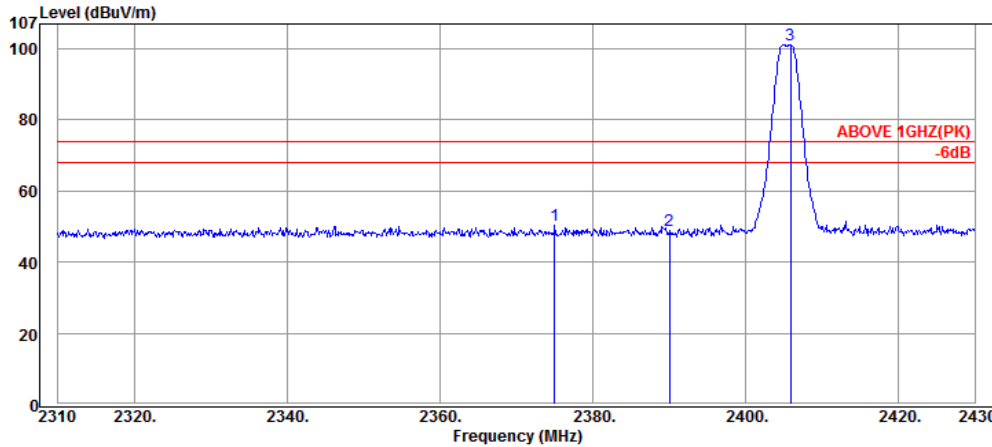
## Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
30.00	24.78	1.20	0.98	26.96	40.00	13.04	Peak
101.78	17.38	2.29	4.64	24.31	43.50	19.19	Peak
372.41	21.99	5.24	2.98	30.21	46.00	15.79	Peak

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

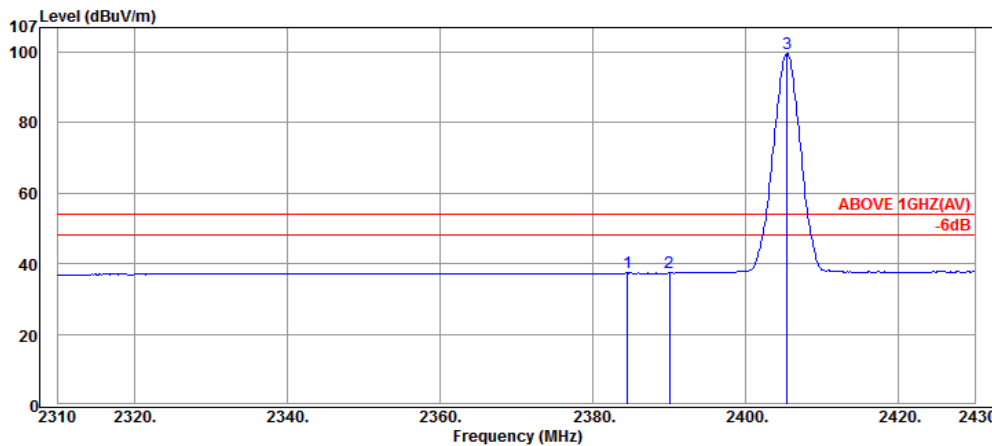
**Band Edge:**

Mode	FASSTest	Frequency	TX 2405.376MHz
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**Antenna at Horizontal Polarization**

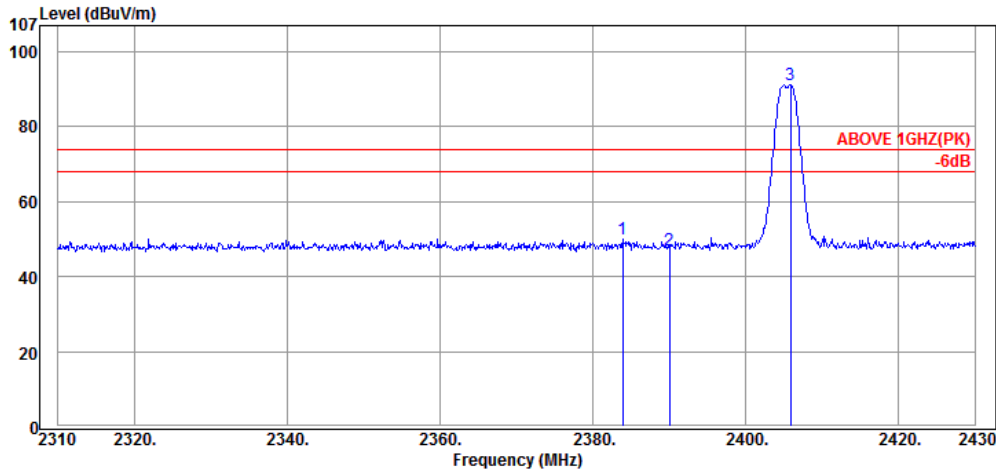
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2375.04	28.34	5.23	16.64	50.21	74.00	23.79	Peak
2390.04	28.35	5.24	15.32	48.91	74.00	25.09	Peak
2405.88	28.38	5.25	67.57	101.20	---	---	Peak



**Antenna at Horizontal Polarization**

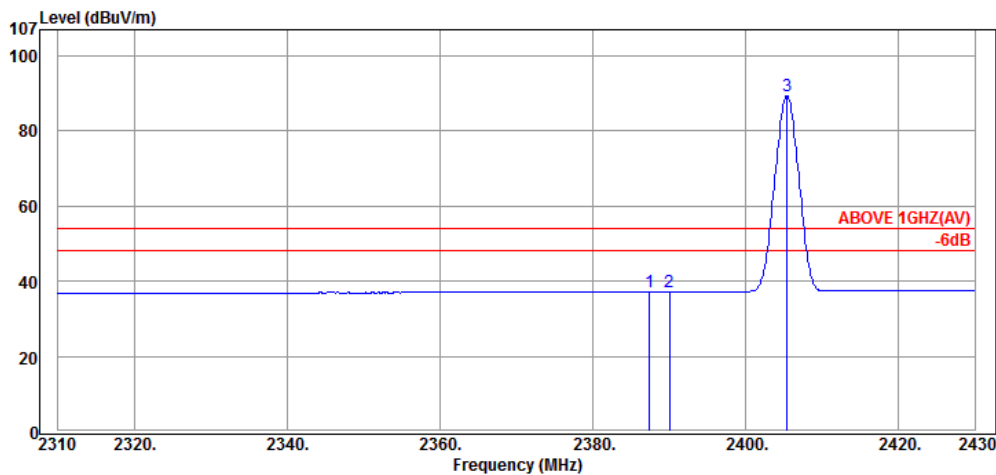
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2384.52	28.35	5.23	3.76	37.34	54.00	16.66	Average
2390.04	28.35	5.24	3.75	37.34	54.00	16.66	Average
2405.40	28.38	5.25	65.90	99.53	---	---	Average

Mode	FASSTest	Frequency	TX 2405.376MHz
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**Antenna at Vertical Polarization**

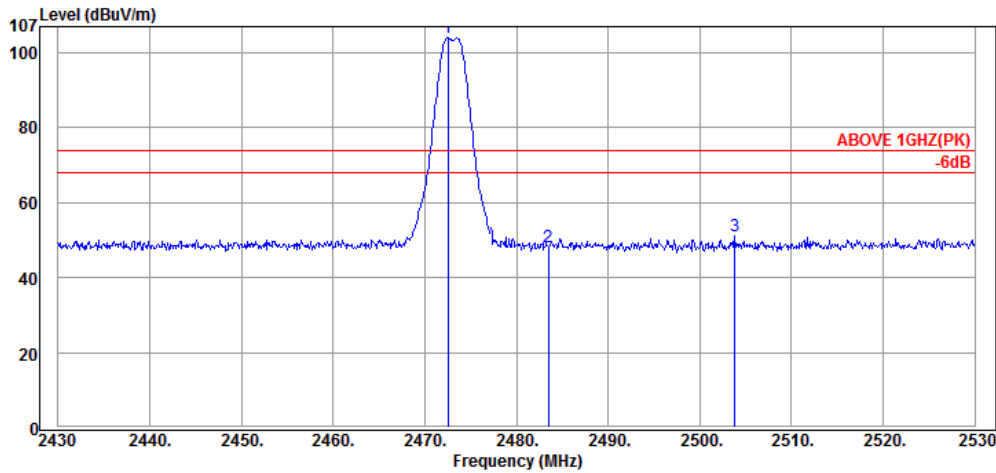
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2383.92	28.35	5.23	16.50	50.08	74.00	23.92	Peak
2390.04	28.35	5.24	13.58	47.17	74.00	26.83	Peak
2405.88	28.38	5.25	57.44	91.07	---	---	Peak



**Antenna at Vertical Polarization**

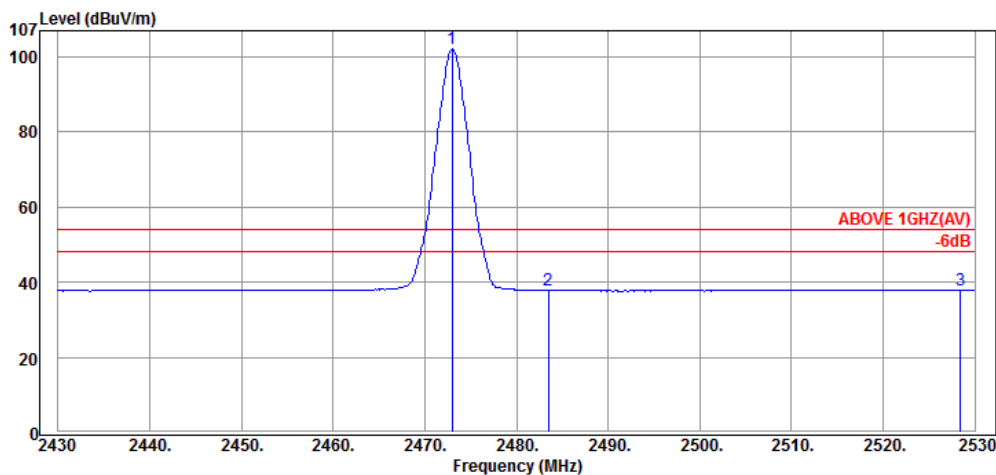
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2387.40	28.35	5.23	3.60	37.18	54.00	16.82	Average
2390.04	28.35	5.24	3.54	37.13	54.00	16.87	Average
2405.40	28.38	5.25	55.65	89.28	---	---	Average

Mode	FASSTest	Frequency	TX 2472.960MHz
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**Antenna at Horizontal Polarization**

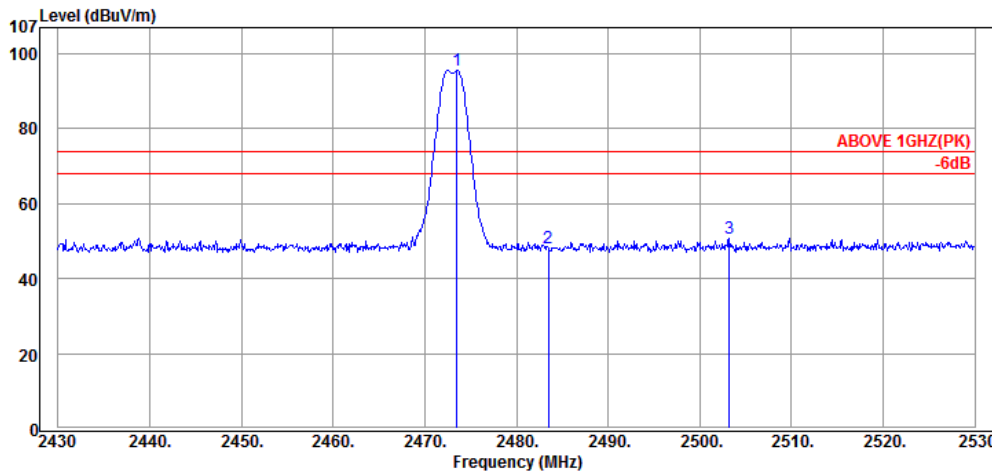
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2472.50	28.46	5.30	70.20	103.96	---	---	Peak
2483.50	28.48	5.31	14.41	48.20	74.00	25.80	Peak
2503.80	28.53	5.32	17.43	51.28	74.00	22.72	Peak



**Antenna at Horizontal Polarization**

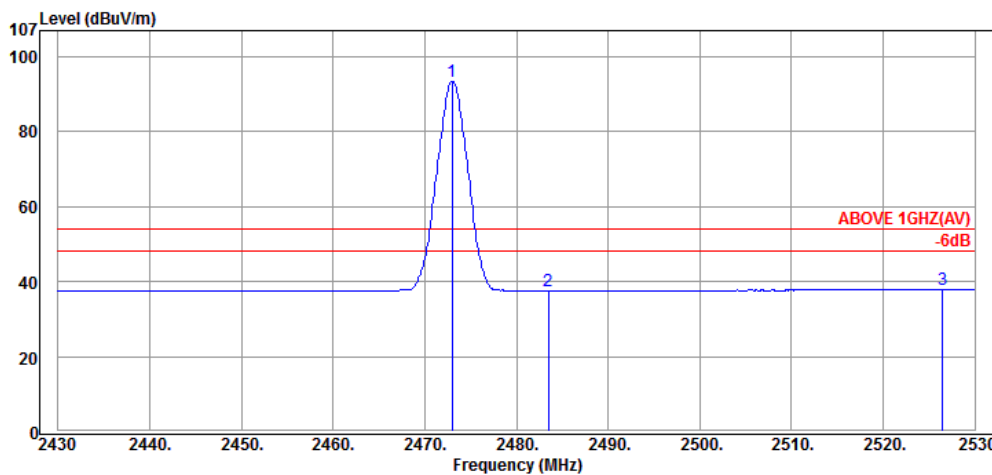
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2473.00	28.46	5.30	68.28	102.04	---	---	Average
2483.50	28.48	5.31	4.03	37.82	54.00	16.18	Average
2528.40	28.60	5.35	4.08	38.03	54.00	15.97	Average

Mode	FASSTest	Frequency	TX 2472.960MHz
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**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
2473.50	28.46	5.30	61.72	95.48	---	---	Peak
2483.50	28.48	5.31	14.22	48.01	74.00	25.99	Peak
2503.20	28.50	5.32	16.99	50.81	74.00	23.19	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
2473.00	28.46	5.30	59.79	93.55	---	---	Average
2483.50	28.48	5.31	3.75	37.54	54.00	16.46	Average
2526.50	28.60	5.34	4.04	37.98	54.00	16.02	Average

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
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**Antenna at Horizontal Polarization**

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
4810.00	32.82	8.98	-0.22	41.58	54.00	12.42	Average
4810.00	32.82	8.98	12.02	53.82	74.00	20.18	Peak
7215.00	35.74	10.46	0.18	46.38	54.00	7.62	Average
7215.00	35.74	10.46	10.74	56.94	74.00	17.06	Peak
9620.00	37.87	11.70	3.48	53.05	54.00	0.95	Average
9620.00	37.87	11.70	14.02	63.59	74.00	10.41	Peak

**Antenna at Vertical Polarization**

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
4810.00	32.82	8.98	11.85	53.65	54.00	0.35	Average
4810.00	32.82	8.98	19.43	61.23	74.00	12.77	Peak
7215.00	35.74	10.46	6.75	52.95	54.00	1.05	Average
7215.00	35.74	10.46	16.88	63.08	74.00	10.92	Peak
9620.00	37.87	11.70	2.40	51.97	54.00	2.03	Average
9620.00	37.87	11.70	12.80	62.37	74.00	11.63	Peak



Mode	FASSTest	Frequency	TX 2439.168MHz
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**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
3255.00	30.52	6.31	11.66	48.49	54.00	5.51	Peak
4880.00	32.96	9.08	11.24	53.28	54.00	0.72	Peak
7320.00	36.03	10.56	0.97	47.56	54.00	6.44	Average
7320.00	36.03	10.56	11.10	57.69	74.00	16.31	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
3250.00	30.52	6.29	12.94	49.75	54.00	4.25	Peak
4880.00	32.96	9.08	10.11	52.15	54.00	1.85	Average
4880.00	32.96	9.08	18.69	60.73	74.00	13.27	Peak
7320.00	36.03	10.56	6.25	52.84	54.00	1.16	Average
7320.00	36.03	10.56	16.88	63.47	74.00	10.53	Peak

Mode	FASSTest	Frequency	TX 2472.96MHz
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**Antenna at Horizontal Polarization**

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
2200.00	28.10	5.09	10.91	44.10	54.00	9.90	Peak
4945.00	33.09	9.18	10.91	53.18	54.00	0.82	Peak
7420.00	36.27	10.69	0.97	47.93	54.00	6.07	Average
7420.00	36.27	10.69	7.86	54.82	74.00	19.18	Peak

**Antenna at Vertical Polarization**

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
3295.00	30.60	6.39	11.29	48.28	54.00	5.72	Peak
4945.00	33.09	9.18	7.69	49.96	54.00	4.04	Average
4945.00	33.09	9.18	17.67	59.94	74.00	14.06	Peak
7420.00	36.27	10.69	5.02	51.98	54.00	2.02	Average
7420.00	36.27	10.69	15.78	62.74	74.00	11.26	Peak

A.1.3 Emissions in Non-restricted Frequency Bands:

Pursuant to KDB 558074 D01 DTS Meas Guidance v04 that emission levels below the 15.209/RSS-Gen Section 8.9 table 4 general radiated emissions limits is not required.

## A.2 6dB BANDWIDTH

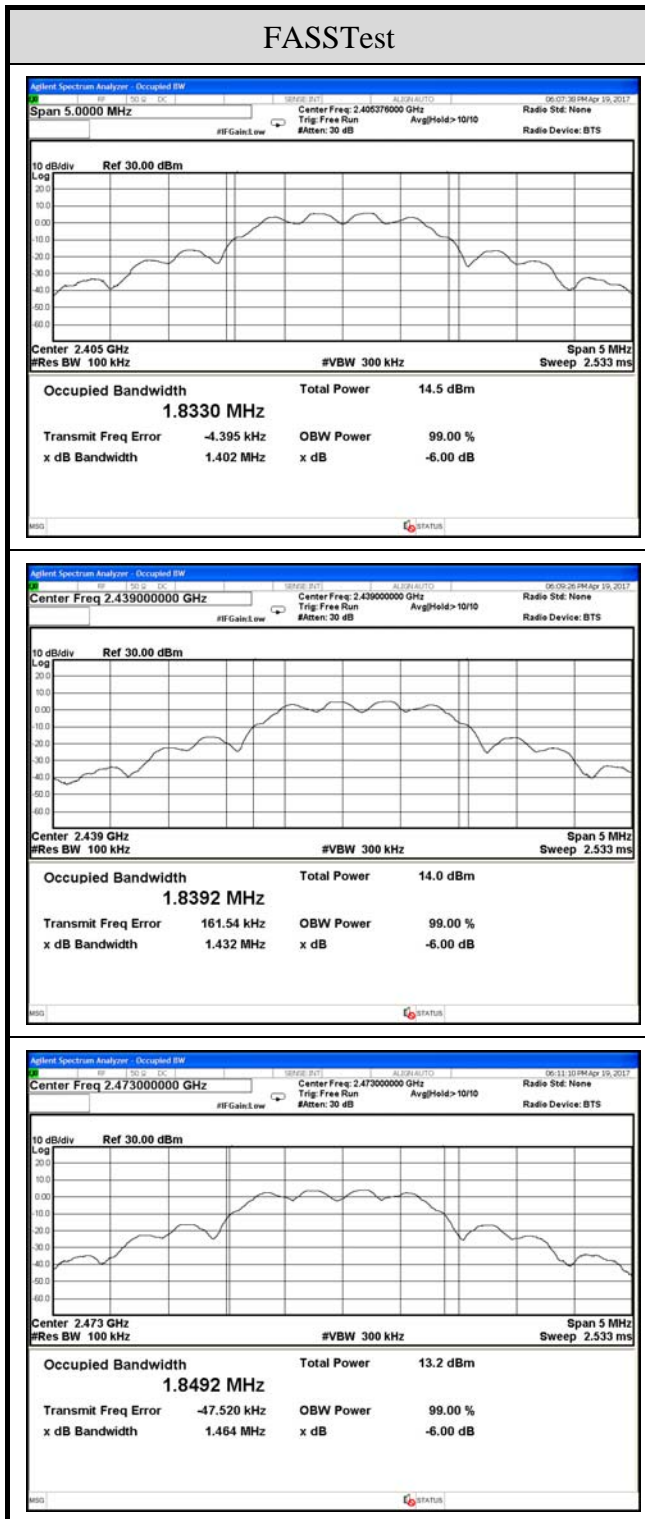
Test Date	2017/04/19	Temp./Hum.	25°C/39%
Cable Loss	N/A	Test Voltage	DC 6.6V (Via DC Power Supply)

### A.2.1 6dB Bandwidth Result

Mode	Centre Frequency (MHz)	6 dB Bandwidth (MHz)	Limit
FASSTest	2405.376	1.420	>500kHz
	2439.168	1.432	
	2472.960	1.464	

Note: The worst antenna A was tested on this test item.

A.2.2 Measurement Plots



### A.3 MAXIMUM PEAK OUTPUT POWER

Test Date	2017/04/19	Temp./Hum.	25°C/39%
Cable Loss	0.5dB	Test Voltage	DC 6.6V (Via DC Power Supply)

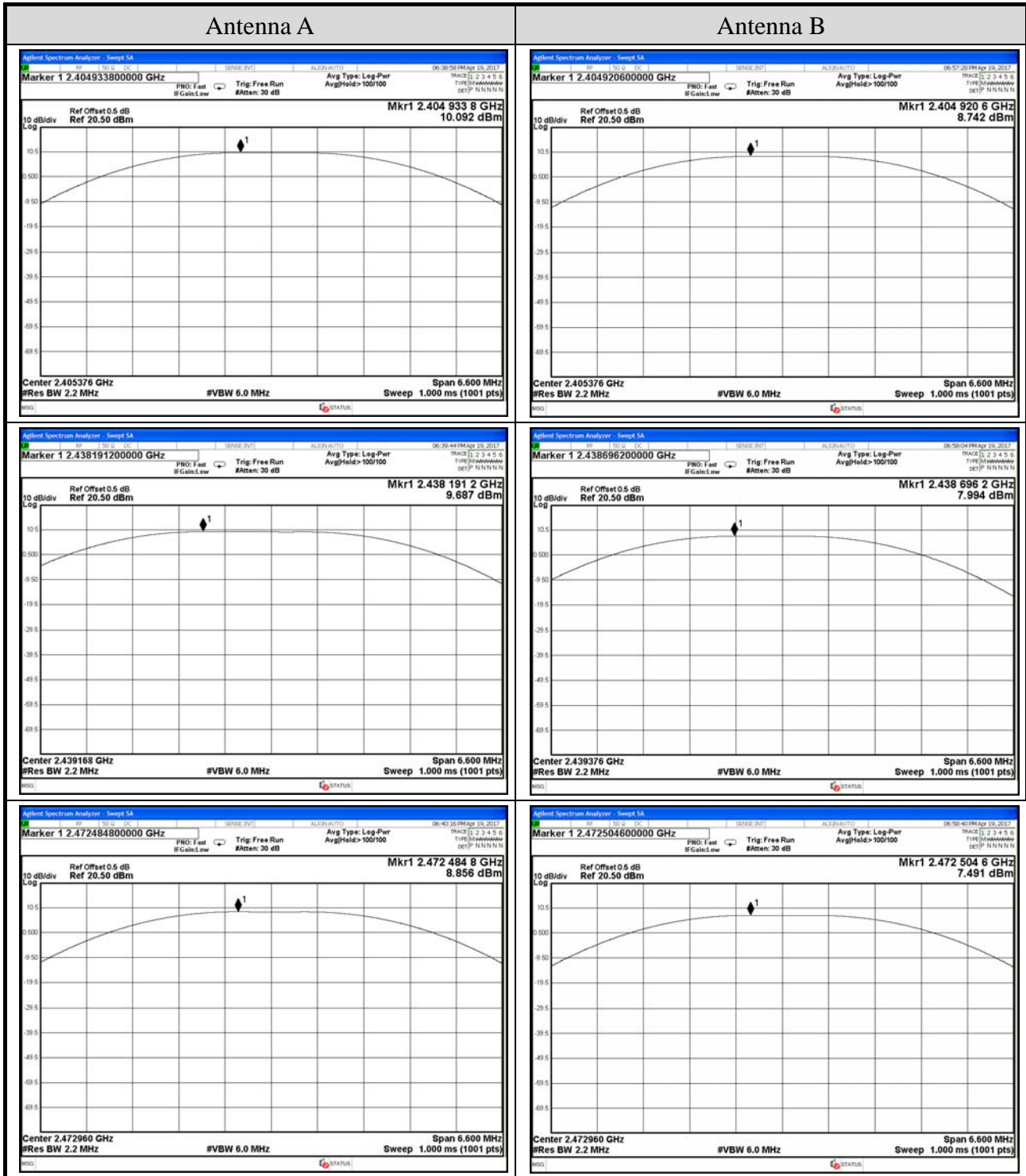
#### A.3.1 Peak Output Power

Antenna A							
Mode	Centre Frequency (MHz)	Peak Output Power		Antenna Gain (dBi)	Output Power (E.I.R.P.)		Limit
		(dBm)	(W)		(dBm)	(W)	
FASSTest	2405.376	10.092	0.010214	-1.16	8.93	0.007816	< 30dBm (1W) (Maximum Peak Output Power) < 36dBm (4W) (E.I.R.P)
	2439.168	9.687	0.009305		8.53	0.007129	
	2472.960	8.856	0.007684		7.70	0.005888	

Antenna B							
Mode	Centre Frequency (MHz)	Peak Output Power		Antenna Gain (dBi)	Output Power (E.I.R.P.)		Limit
		(dBm)	(W)		(dBm)	(W)	
FASSTest	2405.376	8.742	0.007485	-1.16	7.58	0.005728	< 30dBm (1W) (Maximum Peak Output Power) < 36dBm (4W) (E.I.R.P)
	2439.168	7.994	0.006301		6.83	0.004819	
	2472.960	7.491	0.005612		6.33	0.004295	

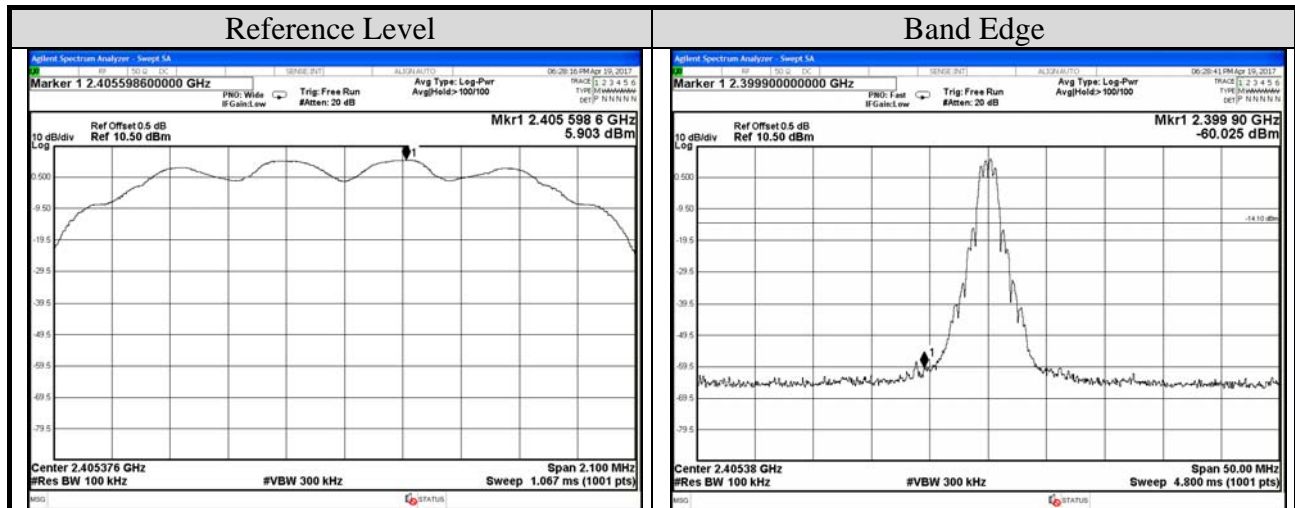
Note: The results have been included cable loss.

A.3.2 Measurement Plots



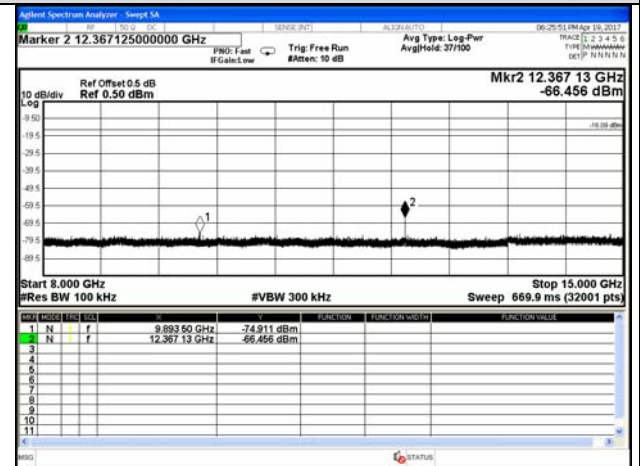
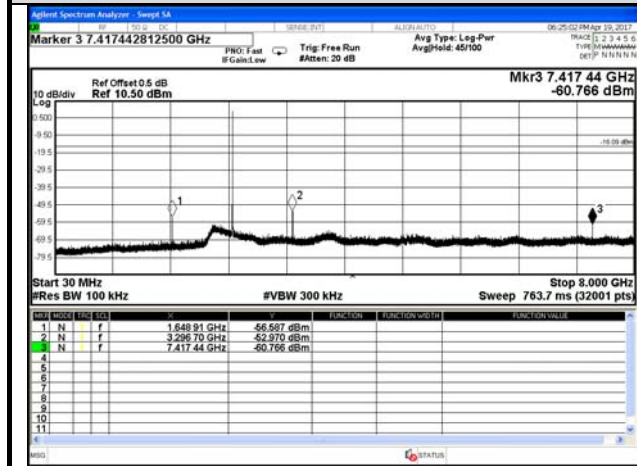
### A.4 EMISSION LIMITATIONS

Test Date	2017/04/19	Temp./Hum.	25°C/39%
Cable Loss	0.5dB	Test Voltage	DC 6.6V (Via DC Power Supply)
Mode	FASSTest	Frequency	TX 2405.376MHz
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0

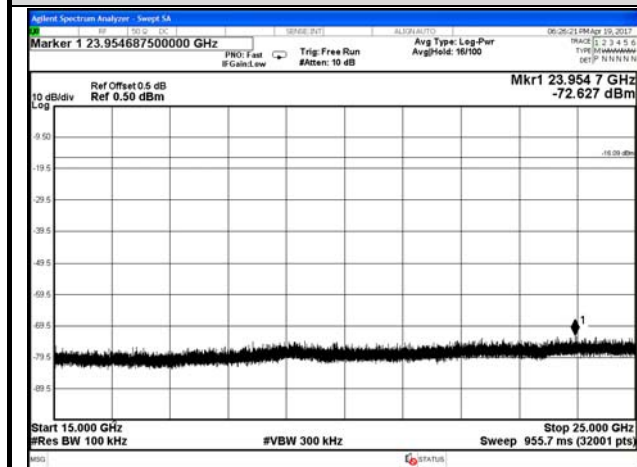


30MHz – 8GHz

8GHz – 15GHz



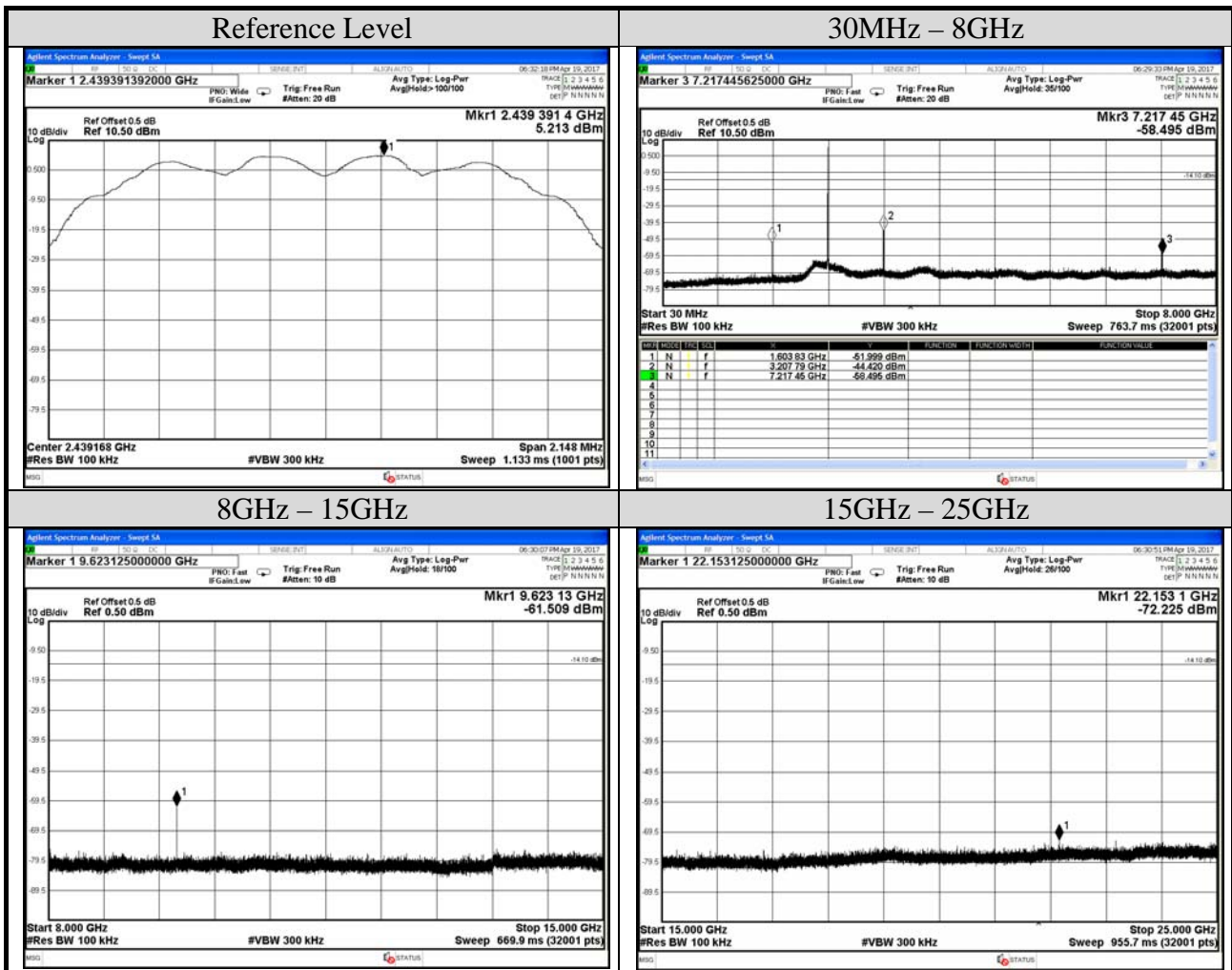
15GHz – 25GHz



Note: The worst antenna A was tested on this test item.



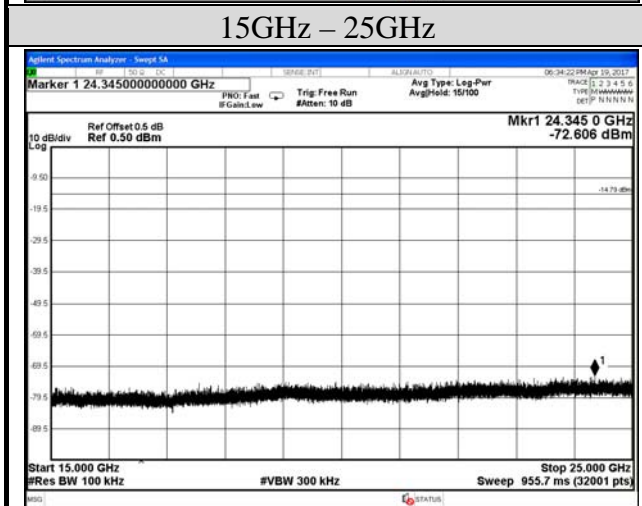
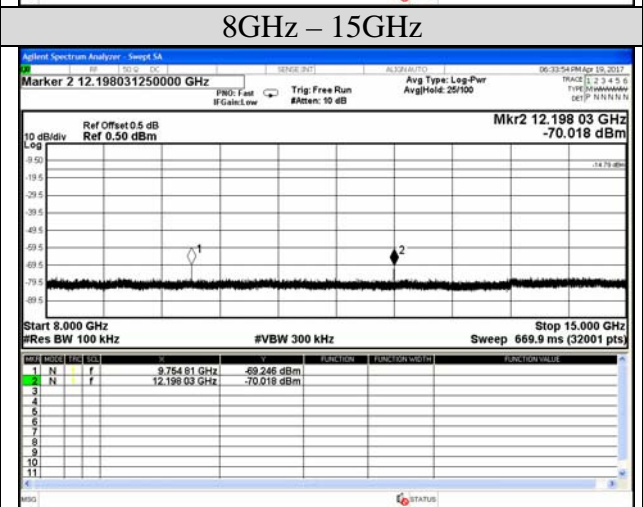
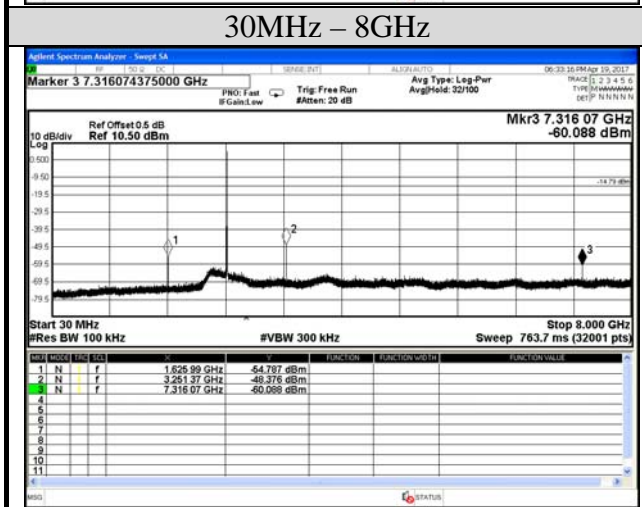
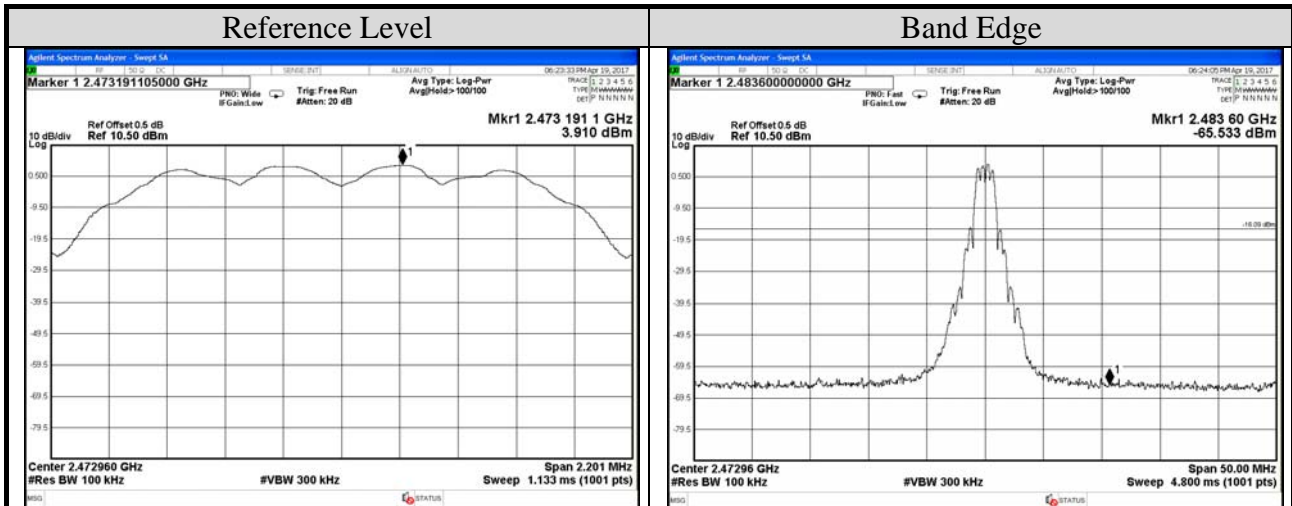
Test Date	2017/04/19	Temp./Hum.	25°C/39%
Cable Loss	0.5dB	Test Voltage	DC 6.6V (Via DC Power Supply)
Mode	FASSTest	Frequency	TX 2439.168MHz
Simultaneous Factor10 log(n) (Note: “n” is antenna number)		0	



Note: The worst antenna A was tested on this test item.



Test Date	2017/04/19	Temp./Hum.	25°C/39%
Cable Loss	0.5dB	Test Voltage	DC 6.6V (Via DC Power Supply)
Mode	FASSTest	Frequency	TX 2472.960MHz
Simultaneous Factor10 log(n) (Note: "n" is antenna number)		0	



Note: The worst antenna A was tested on this test item.

## A.5 POWER SPECTRAL DENSITY

Test Date	2017/04/19	Temp./Hum.	25°C/39%
Cable Loss	0.5	Test Voltage	DC 6.6V (Via DC Power Supply)
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0

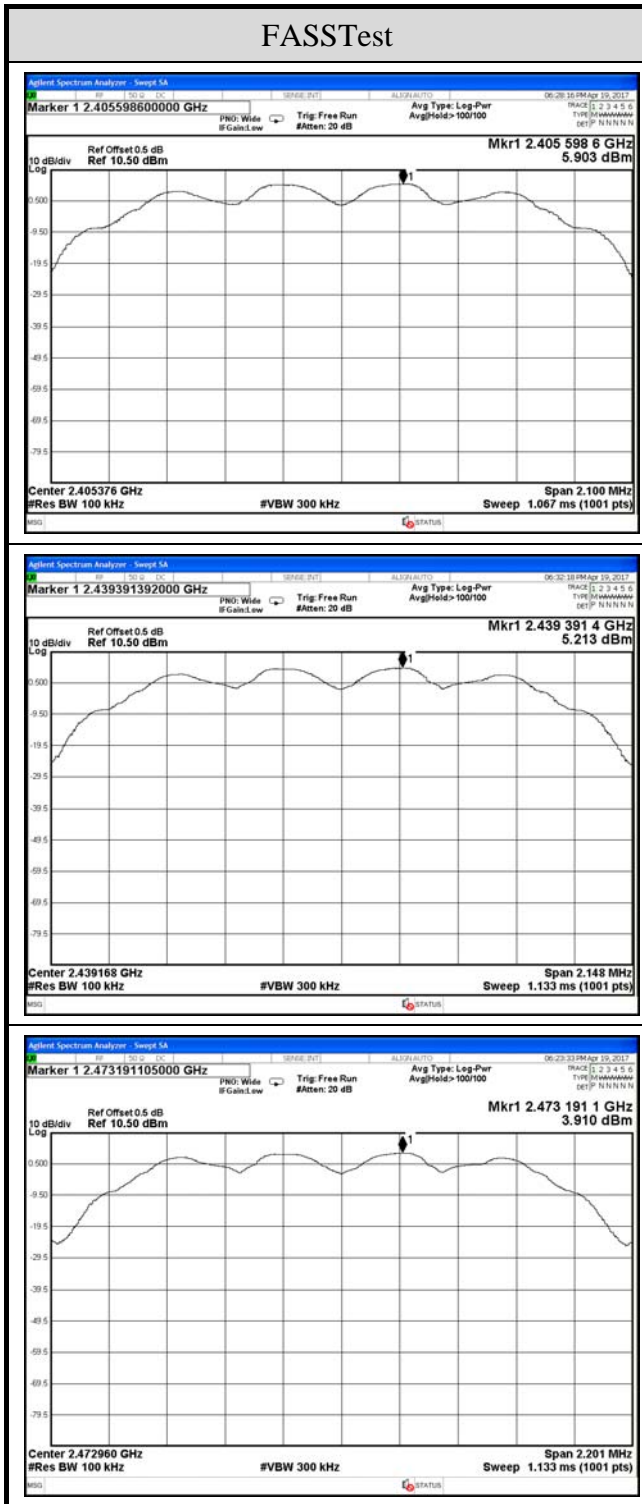
### A.5.1 Power Spectral Density Result

Mode	Centre Frequency (MHz)	Power Spectral Density (dBm)	Limit
FASSTest	2405.376	5.093	< 8 dBm/3kHz
	2439.168	5.213	
	2472.960	3.910	

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

2 The worst antenna A was tested on this test item.

A.5.2 Measurement Plots



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



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# APPDNDIX B

## TEST PHOTOGRAPHS

(Model: FMR-03)