

FCC 15.247 DTS

2.4 GHz Report

for

FUTABA Corporation

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

Brand : Futaba
Product Name : Radio Control
Model Name : R7018SB
FCC ID : AZPR7018SB-24G

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APPENDIX A TEST PHOTOGRAPHS

TEST REPORT CERTIFICATION

Applicant : FUTABA Corporation
Manufacture : FUTABA Corporation
Product Name : Radio Control
Model No. : R7018SB
Serial No. : N/A
Brand : Futaba
Power Supply : DC 4.8~8.4V

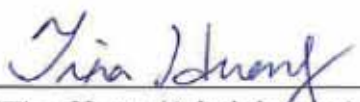
Applicable Standards:

FCC Rules and Regulations Part 15 Subpart C, Oct. 2014
ANSI C63.10:2013
KDB 558074 D01 DTS Meas Guidance v03r02

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 Test: 2015. 06. 16 ~ 24

Date of Report: 2015. 06. 30

Producer: 
(Tina Huang/Administrator)

Signatory: 
(Ben Cheng/Manager)

1. REPORT HISTORY

Revision	Date	Revision Summary	Report Number
0	2015. 06. 30	Original Report.	EM-F150354

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	N/A, Note
15.247(d)/15.209	Radiated Band Edge and Radiated Spurious Emission	PASS
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)(3)	Maximum Peak Output Power	PASS
15.247(d)/15.205	Conducted Band Edges and Conducted Spurious Emission	PASS
15.247 (e)	Peak Power Spectral Density	PASS
15.203	Antenna Requirement	PASS
Note: The EUT only employs battery power for operation, so it is unnecessary to test.		

3. GENERAL INFORMATION

3.1. Description of EUT

Product	Radio Control
Model Number	R7018SB
Serial Number	N/A
Brand Name	Futaba
Applicant	FUTABA Corporation 1080 YabutsukaChosei-son Chosei-gun Chiba, 299-4395 Japan.
Manufacture	FUTABA Corporation 1080 YabutsukaChosei-son Chosei-gun Chiba, 299-4395 Japan.
RF Features	2.4GHz
Transmit Type	2 Antennas (diversity)
Device Category	☐ Outdoor Access Point ☐ Fixed point-to-point Access Point ☐ Indoor Access Point ☒ Mobile and Portable client device
Date of Receipt of Sample	2015. 05. 28

3.2. EUT Specifications Assessed in Current Report

Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (kbps)
2405.376-2472.960	23	FASSTest (FSK)	136

Channel List			
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
0	2405.376	12	2442.240
1	2408.448	13	2445.312
2	2411.520	14	2448.384
3	2414.592	15	2451.456
4	2417.664	16	2454.528
5	2420.736	17	2457.600
6	2423.808	18	2460.672
7	2462.880	19	2463.744
8	2429.952	20	2466.816
9	2433.024	21	2469.888
10	2436.096	22	2472.960
11	2439.168		

3.3. Antenna Information

Manufacture	Antenna Type	Frequency	Max Gain (dBi)
SANSEI ELECTRIC CO., LTD	1/4 λ Antenna	2.4GHz	ANT A: -5.35 ANT B: -5.35

We performed conducted tests for both antennas and submit test data measured on antenna B as worse performance.

3.4. Test Configuration

Modulation	Duty Cycle (x)	T (ms)	Duty Cycle Factor (dB)
FASSTest	0.0493	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.

Antenna A		Antenna B	
Test Frequency	Output Power	Test Frequency	Output Power
2405.376	11.255	2405.376	11.151
2439.168	11.673	2439.168	11.468
2472.960	11.239	2472.960	11.018

Note: This device has 2 antennas for diversity, they cannot transmit simultaneously. The power of both antennas are listed as follow table. We assessed ANT A has worse power, thus all test items presented in this report were test in ANT A.

Item		Modulation	Test Channel
Radiated Test Case	Radiated Band Edge ^{Note1}	FASSTest	0/22
	Radiated Spurious Emission ^{Note1}	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

3.5. Tested Supporting System List

3.5.1. Support Peripheral Units

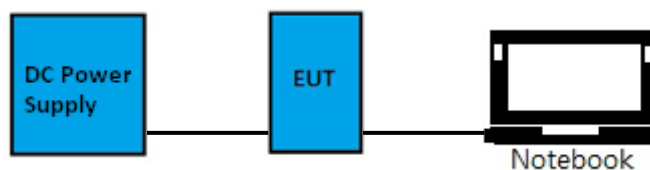
No.	Product	Brand	Model No.	Serial No.	Approval
1.	Notebook PC	IBM	2652	99NXMML	FCC ID: ANOVNCBDC80 211B
2.	USB Mouse	Targus	AMU94APZ-CN	1109001101	By DoC
3.	DC Power Supply	TOP WARD	3303A	N/A	N/A
4.	DC Power Supply	TOP WARD	6303A	N/A	N/A

3.5.2. Cable Lists

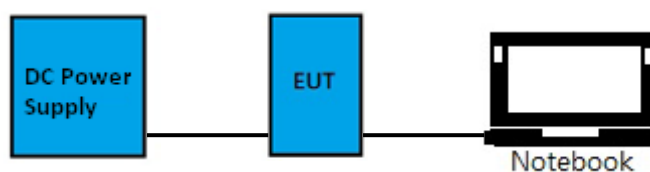
No.	Cable Description Of The Above Support Units
1.	Adapter: IBM, M/N 02K6747 DC Power Cord: Unshielded, Undetachable, 1.8m, Bonded a ferrite core AC Power Cord: Unshielded, Detachable, 1.0m
2.	USB Cable: Unshielded, Undetachable, 1.8m
3.	DC Power Cord*2: Unshielded, Detachable, 0.6m AC Power Cord: Unshielded, Undetachable, 1.8m
4.	DC Power Cord*2: Unshielded, Detachable, 0.6m AC Power Cord: Unshielded, Undetachable, 1.8m

3.6. Setup Configuration

3.6.1. EUT Configuration for Power Line Emission



3.6.2. EUT Configuration for Conducted Test Items



3.7. Operating Condition of EUT

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

3.8. Description of Test Facility

Test Firm Name	:	AUDIX Technology Corporation EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
Test Location & Facility	:	Semi-Anechoic Chamber No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan May 11, 2012 File on Federal Communication Commission Registration Number: 90993
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724

3.9. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test (Distance: 3m)	30MHz~300MHz	± 2.91dB
	300MHz~1000MHz	± 2.74dB
	Above 1GHz	± 5.02dB

Remark : Uncertainty = $k_{uc}(y)$

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

4.1.1. Frequency Range 30MHz~1000MHz

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2.	Test Receiver	R & S	ESCS30	100265	2014. 08. 21	1 Year
3.	Amplifier	HP	8447D	2944A06305	2015. 02. 12	1 Year
4.	Bilog Antenna	TESEQ	CBL6112D	33821	2014. 08. 02	1 Year

4.1.2. Frequency Range 30MHz~1000MHz

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2.	Test Receiver	R & S	ESCS30	100265	2014. 08. 21	1 Year
3.	Amplifier	Agilent	8449B	3008A00529	2015. 01. 22	1 Year
4.	2.4GHz Notch Filter	K&L	7NSL10-244 1.5E130.5-0 0	1	2014. 07. 23	1 Year
5.	3G High Pass Filter	Microwave Circuits	H3G018G1	484796	2014. 08. 25	1 Year
6.	Horn Antenna	EMCO	3115	9609-4927	2015. 06. 22	1 Year
7.	Horn Antenna	EMCO	3116	2653	2014. 10. 14	1 Year

4.2. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2015. 06. 10	1 Year

5. CONDUCTED EMISSION MEASUREMENT

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

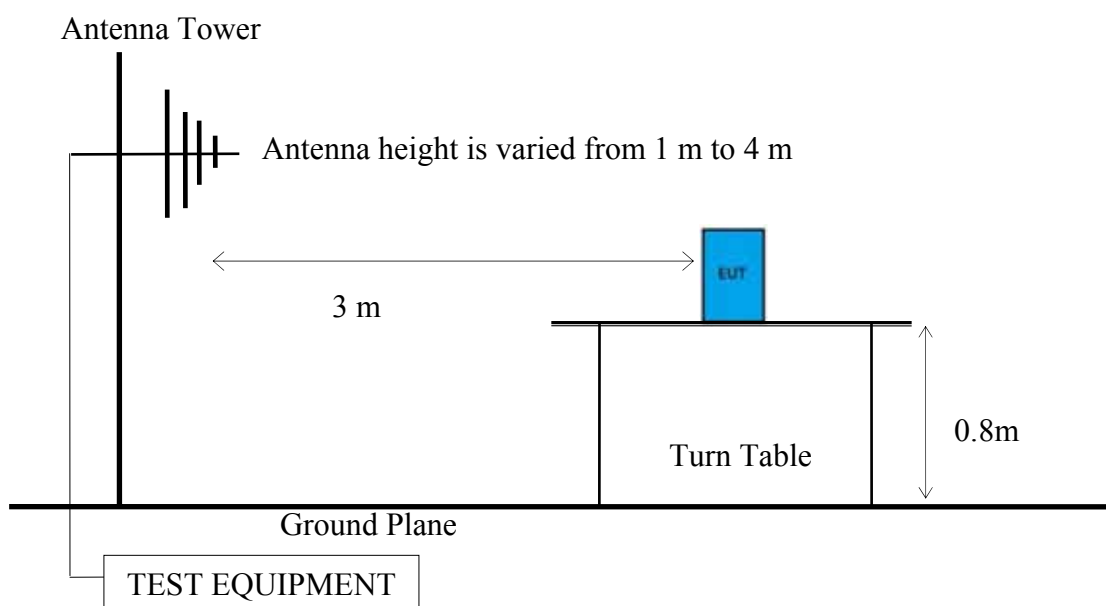
6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup

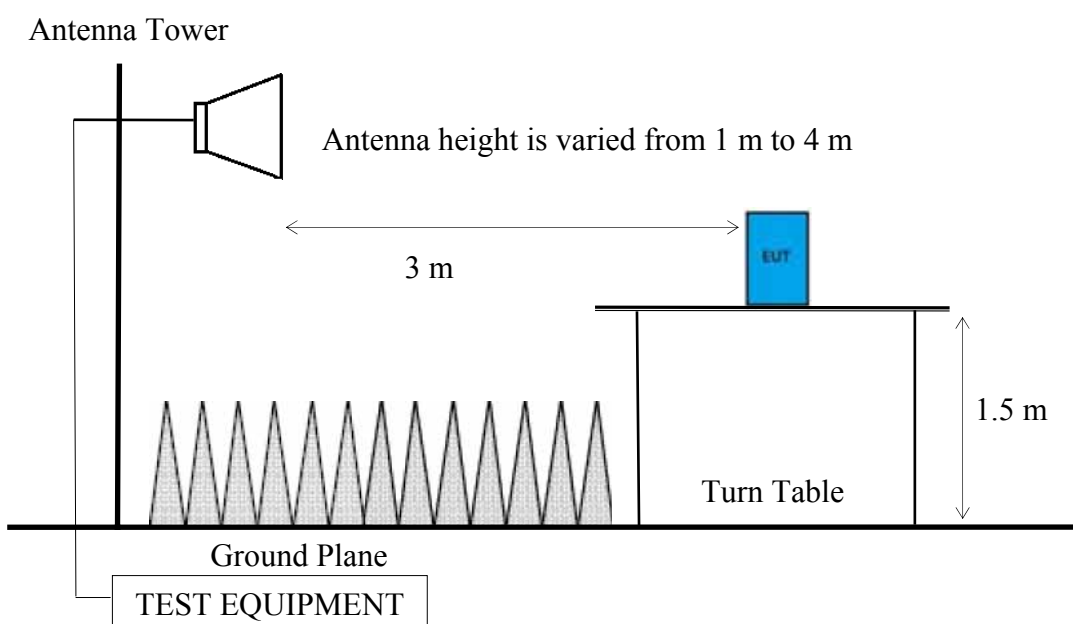
6.1.1. Block Diagram of connection between EUT and simulators

Indicated as section 3.7

6.1.2. Setup Diagram for 30-1000 MHz



6.1.3. Semi-Anechoic Chamber (3m) 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, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Field Strengths Limits	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (Average)	

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

- (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

The EUT setup on the turn table which has 1.5m 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 = 120 kHz
- (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:

Peak Detector:

- (1) RBW = 1 MHz
- (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 for finally measurement.

Average Detector:

☒ **Option 1:**

- (1) RBW = 1 MHz
- (2) VBW = 1/T
- (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 + DCCF
Duty Cycle Correction Factor (DCCF) = $20\log(TX_{on}/TX_{on+off})$ presented in section 3.5
- ☐ EPR = Peak Emission Level - 95.2dB - 2.14dBi

6.5. Test Results

PASSED.

Test Date	2015/06/24	Temp./Hum.	22°C/48%
Test Voltage	DC 6V(via DC Power Supply)		

6.5.1. Emissions within Restricted Frequency Bands

6.5.1.1. Frequency Below 1 GHz

Modulation	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
191.99	9.21	3.92	9.72	22.85	43.50	20.65	Peak
485.90	16.77	6.34	9.98	33.09	46.00	12.91	Peak
580.96	18.08	6.49	11.87	36.44	46.00	9.56	Peak
746.83	19.38	6.94	9.40	35.72	46.00	10.28	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
165.80	9.65	3.73	14.33	27.71	43.50	15.79	Peak
580.96	18.08	6.49	13.01	37.58	46.00	8.42	Peak
746.83	19.38	6.94	7.78	34.10	46.00	11.90	Peak
912.70	20.65	7.62	4.86	33.13	46.00	12.87	Peak

Modulation	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
191.99	9.21	3.92	10.66	23.79	43.50	19.71	Peak
485.90	16.77	6.34	5.60	28.71	46.00	17.29	Peak
580.96	18.08	6.49	11.29	35.86	46.00	10.14	Peak
746.83	19.38	6.94	8.16	34.48	46.00	11.52	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
165.80	9.65	3.73	9.60	22.98	43.50	20.52	Peak
365.62	14.79	5.34	6.79	26.92	46.00	19.08	Peak
580.96	18.08	6.49	10.92	35.49	46.00	10.51	Peak
746.83	19.38	6.94	8.90	35.22	46.00	10.78	Peak

Modulation	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
191.99	9.21	3.92	11.06	24.19	43.50	19.31	Peak
486.87	16.80	6.35	6.83	29.98	46.00	16.02	Peak
580.96	18.08	6.49	11.33	35.90	46.00	10.10	Peak
746.83	19.38	6.94	7.86	34.18	46.00	11.82	Peak
912.70	20.65	7.62	4.71	32.98	46.00	13.02	Peak

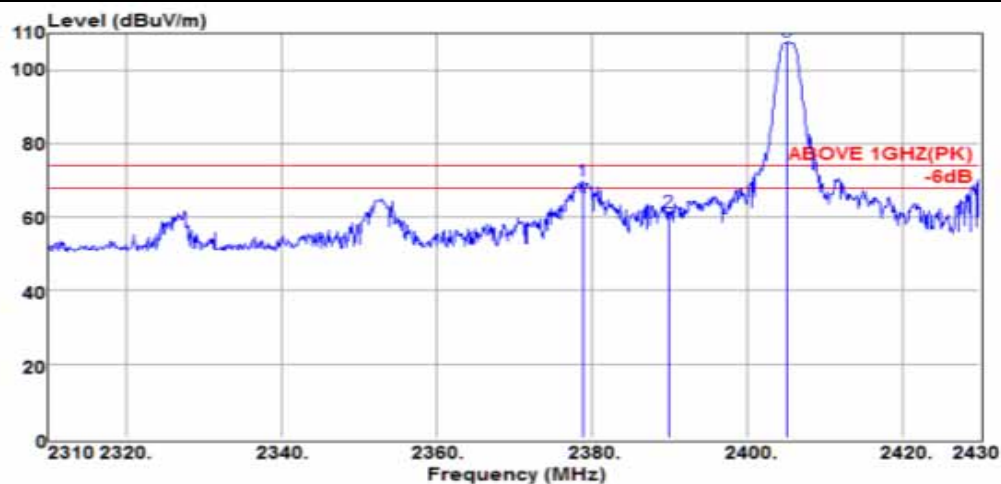
Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
165.80	9.65	3.73	7.51	20.89	43.50	22.61	Peak
485.90	16.77	6.34	7.01	30.12	46.00	15.88	Peak
580.96	18.08	6.49	11.16	35.73	46.00	10.27	Peak
746.83	19.38	6.94	8.40	34.72	46.00	11.28	Peak

6.5.1.2. Frequency Above 1 GHz to 10th harmonics

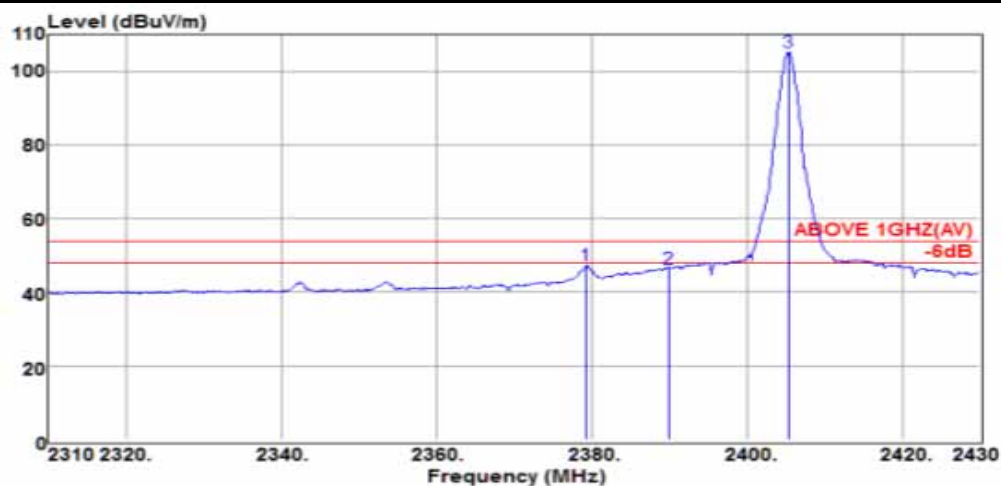
Band Edge:

Modulation	FASSTest	Frequency	TX 2405.376MHz
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Antenna at Horizontal Polarization

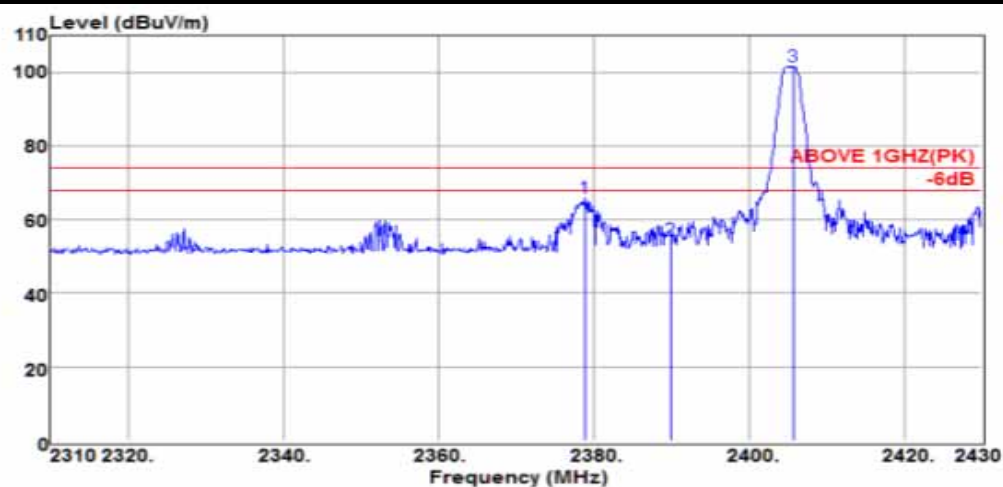
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2378.88	28.39	5.22	36.32	69.93	74.00	4.07	Peak
2390.04	28.40	5.24	27.66	61.30	74.00	12.70	Peak
2405.28	28.42	5.26	74.00	107.68	---	---	Peak



Antenna at Horizontal Polarization

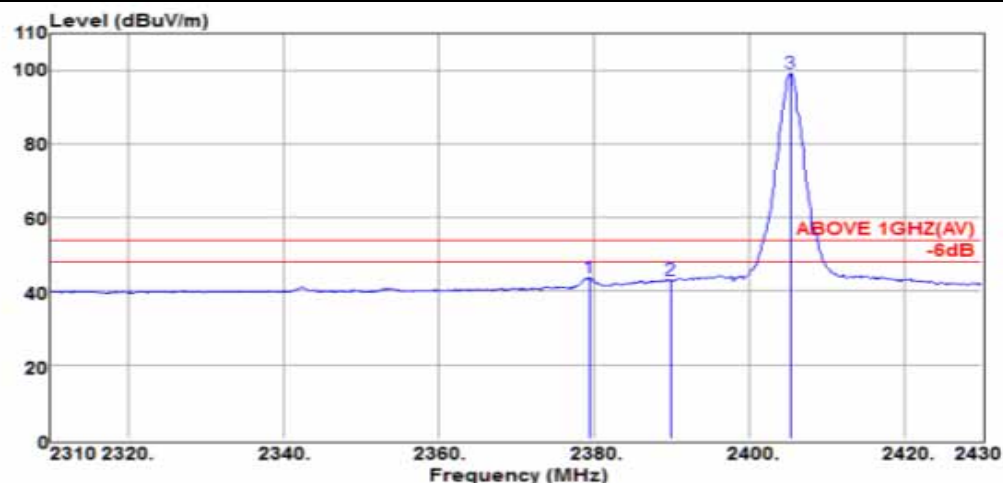
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2379.36	28.39	5.22	13.69	47.30	54.00	6.70	Average
2390.04	28.40	5.24	12.87	46.51	54.00	7.49	Average
2405.40	28.42	5.26	71.45	105.13	---	---	Average

Modulation	FASSTest	Frequency	TX 2405.376MHz
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Antenna at Vertical Polarization

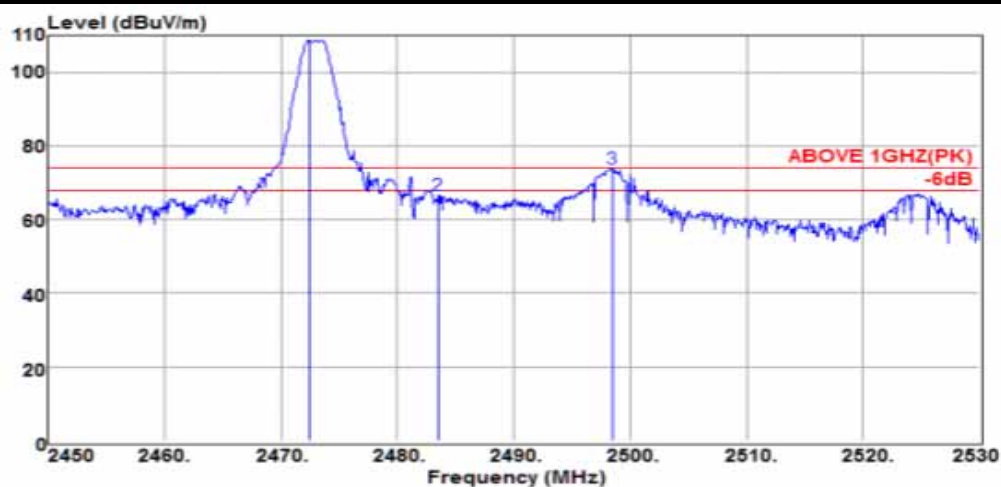
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2378.88	28.39	5.22	32.23	65.84	74.00	8.16	Peak
2390.04	28.40	5.24	20.87	54.51	74.00	19.49	Peak
2405.88	28.42	5.26	68.00	101.68	---	---	Peak



Antenna at Vertical Polarization

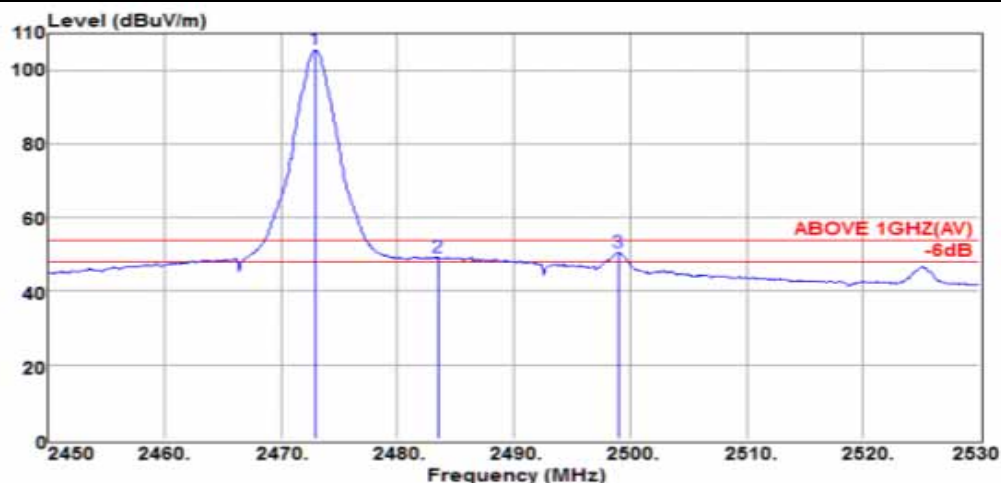
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2379.48	28.39	5.22	10.24	43.85	54.00	10.15	Average
2390.04	28.40	5.24	9.30	42.94	54.00	11.06	Average
2405.40	28.42	5.26	65.44	99.12	---	---	Average

Modulation	FASSTest	Frequency	TX 2472.960MHz
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Antenna at Horizontal Polarization

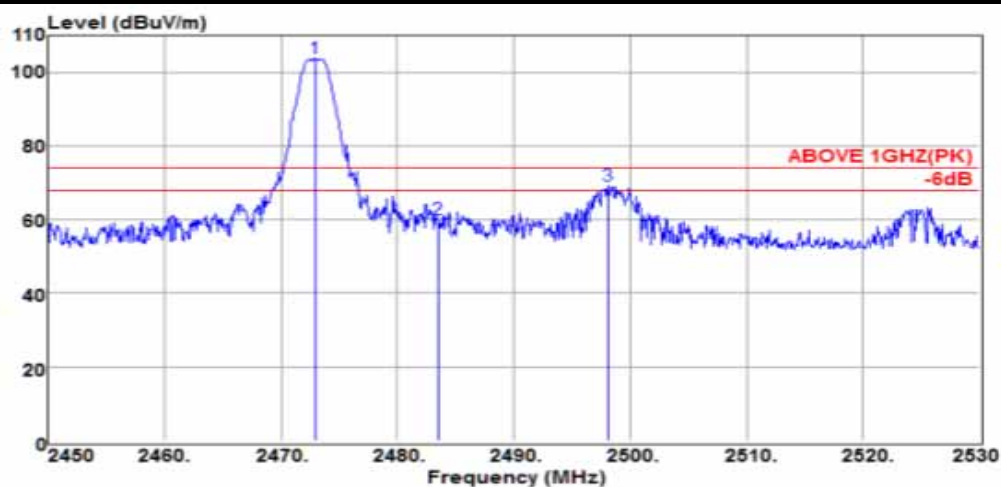
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2472.48	28.47	5.35	74.88	108.70	---	---	Peak
2483.52	28.49	5.37	32.74	66.60	74.00	7.40	Peak
2498.48	28.50	5.39	39.82	73.71	74.00	0.29	Peak



Antenna at Horizontal Polarization

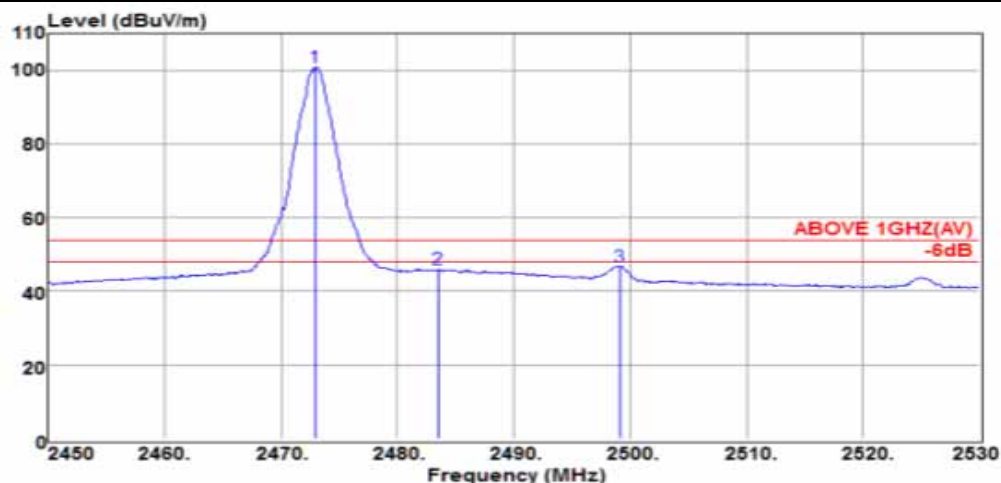
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2472.96	28.47	5.35	71.77	105.59	---	---	Average
2483.52	28.49	5.37	15.33	49.19	54.00	4.81	Average
2498.96	28.50	5.39	16.62	50.51	54.00	3.49	Average

Modulation	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
2472.96	28.47	5.35	70.04	103.86	---	---	Peak
2483.52	28.49	5.37	26.23	60.09	74.00	13.91	Peak
2498.16	28.50	5.39	35.41	69.30	74.00	4.70	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
2473.04	28.47	5.35	66.96	100.78	---	---	Average
2483.52	28.49	5.37	12.02	45.88	54.00	8.12	Average
2499.12	28.50	5.39	12.88	46.77	54.00	7.23	Average

6.5.2. Emissions outside the frequency band:

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

Modulation	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
4810.00	32.98	8.09	16.56	57.63	74.00	16.37	Peak
4810.00	32.98	8.09	5.95	47.02	54.00	6.98	Average

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
4810.00	32.98	8.09	19.46	60.53	74.00	13.47	Peak
4810.00	32.98	8.09	9.42	50.49	54.00	3.51	Average

Modulation	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
4900.00	33.19	8.18	17.57	58.94	74.00	15.06	Peak
4900.00	33.19	8.18	7.51	48.88	54.00	5.12	Average

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
4900.00	33.19	8.18	20.56	61.93	74.00	12.07	Peak
4900.00	33.19	8.18	10.53	51.90	54.00	2.10	Average

Modulation	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
4945.00	33.28	8.24	14.94	56.46	74.00	17.54	Peak
4945.00	33.28	8.24	4.85	46.37	54.00	7.63	Average

Antenna at Vertical Polarization

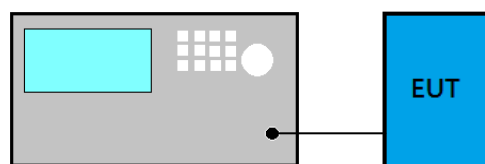
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4945.00	33.28	8.24	21.11	62.63	74.00	11.37	Peak
4945.00	33.28	8.24	10.52	52.04	54.00	1.96	Average

6.5.3. Emissions in Non-restricted Frequency Bands

Pursuant to KDB 558074 D01 v03r02 that emission levels below the 15.209 general radiated emissions limits is not required.

7. 6dB BANDWIDTH MEASUREMENT

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 v03r02:

■ Option 2

- (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.

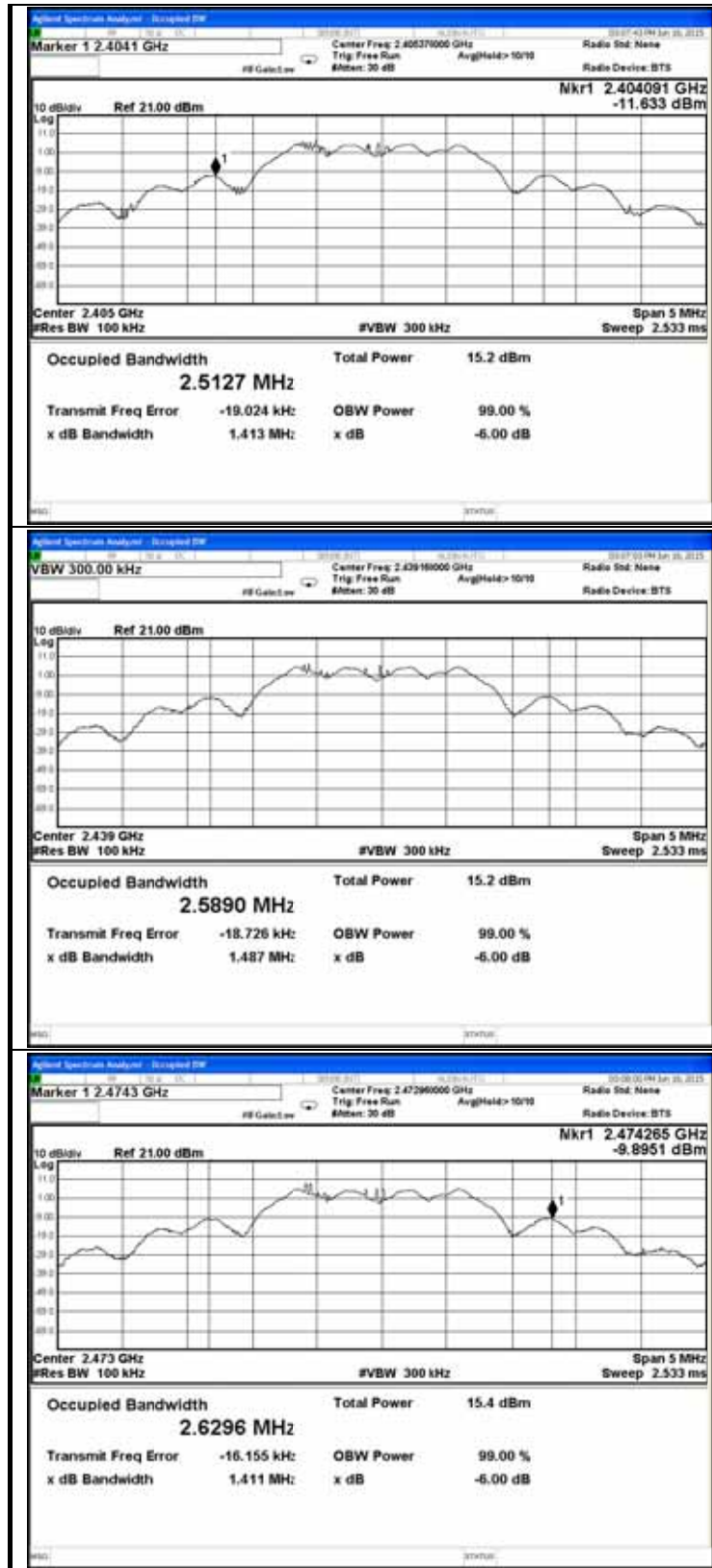
7.4. Test Results

Test Date	2015/06/16	Temp./Hum.	22°C/48%
Cable Loss	1dB	Test Voltage	DC 6V(via DC Power Supply)

7.4.1. 6dB Bandwidth Result

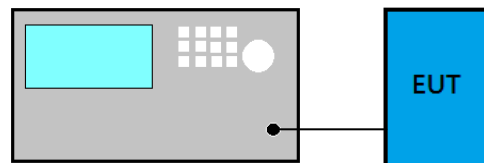
Modulation Type	Centre Frequency (MHz)	6 dB Bandwidth (MHz)
FASSTest	2405.376	1.413
	2439.168	1.487
	2472.960	1.411

7.4.2. Measurement Plots



8. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

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)

8.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v03r02:

☐ **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 3.5 is < 98%.

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

- (1) Set span to at least 3 times the OBW
- (2) Set $RBW \geq OBW$
- (3) Set the video bandwidth (VBW) $\geq 3 \times RBW$.
- (4) Detector = Peak
- (5) Trace mode = max hold
- (6) Sweep = auto couple.
- (7) To find the peak amplitude level.

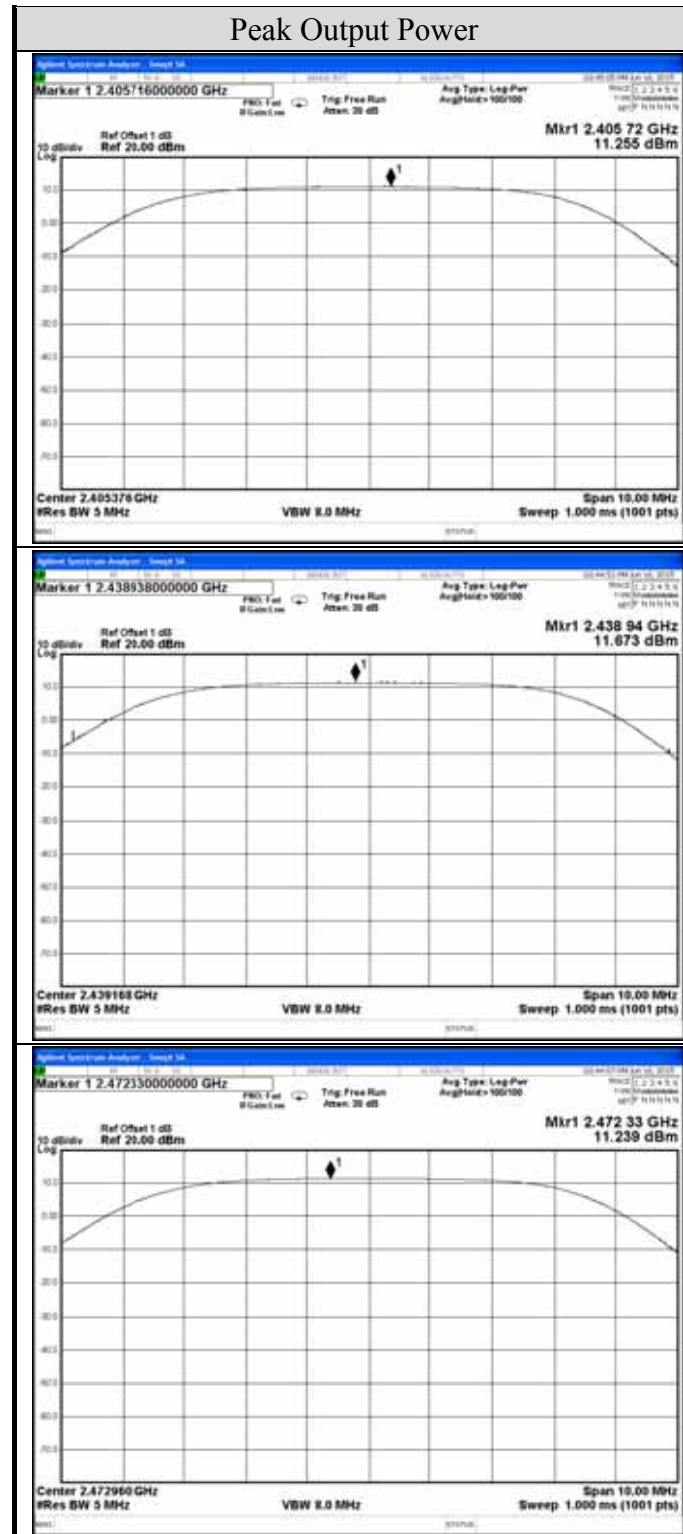
8.4. Test Results

Test Date	2015/06/16	Temp./Hum.	22°C/48%
Cable Loss	1dB	Test Voltage	DC 6V(via DC Power Supply)

Modulation Type	Centre Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(W)	
FASSTest	2405.376	11.255	0.013351	< 30 dBm (1 W)
	2439.168	11.673	0.014699	
	2472.960	11.239	0.013301	

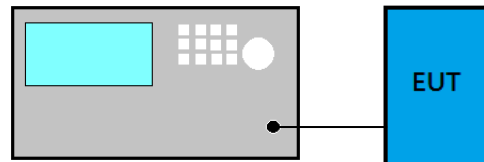
Note: The results have been included cable loss.

8.4.1. Peak Measurement Plots



9. EMISSION LIMITATIONS MEASUREMENT

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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).

9.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v03r02:

■Reference Level

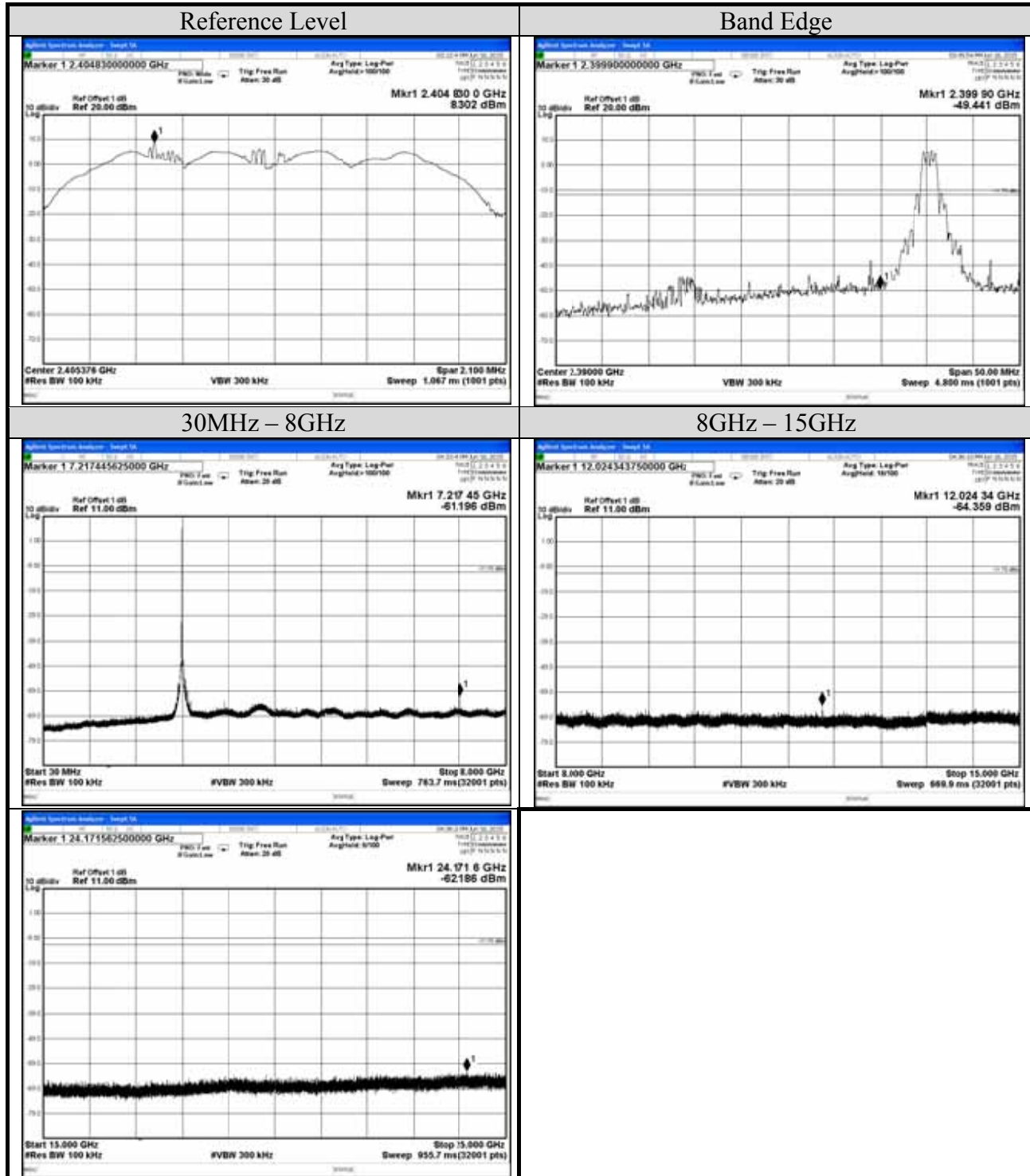
- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW $\geq 3 \times$ RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully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

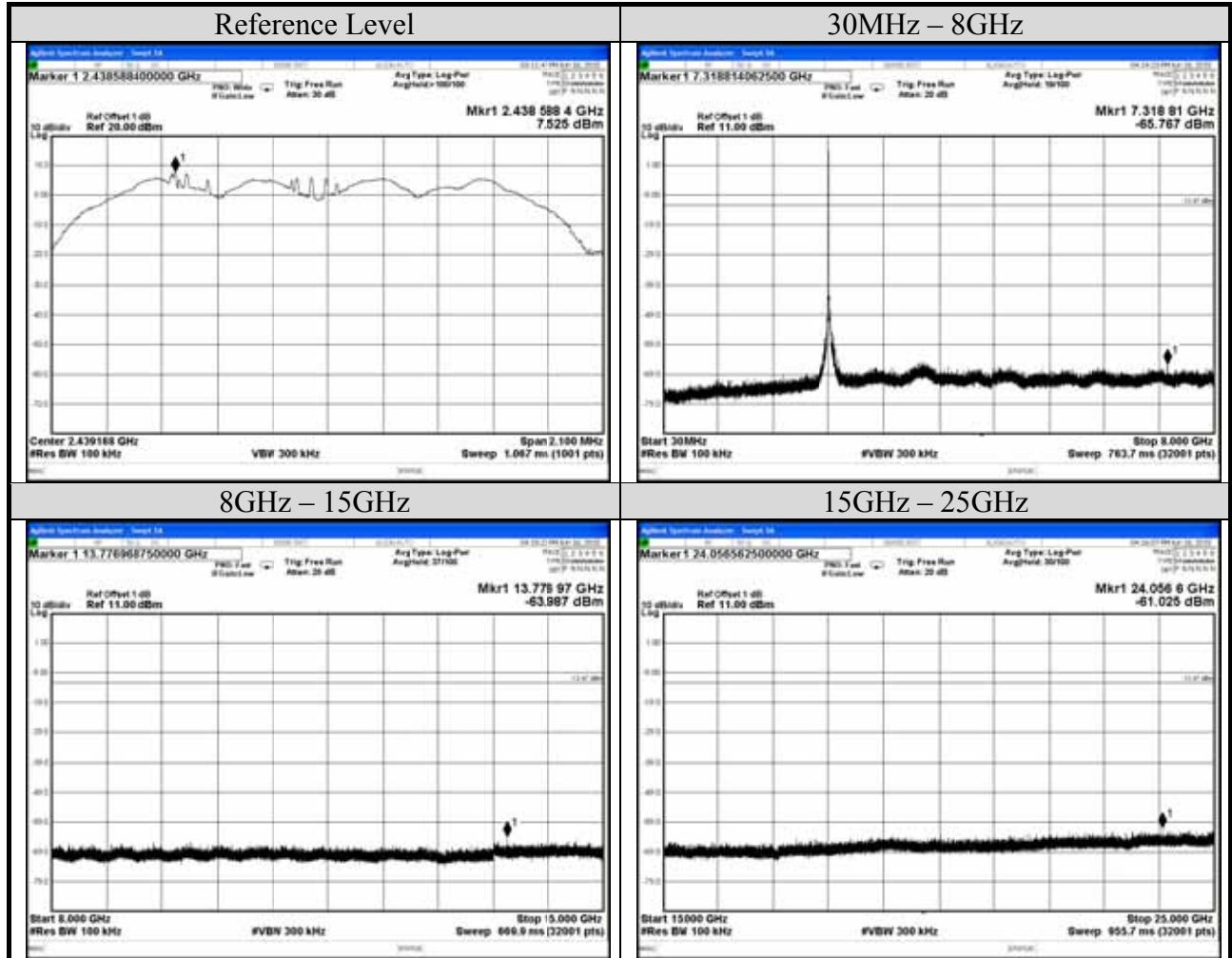
Test Date	2015/06/16	Temp./Hum.	22°C/48%
Modulation	FASSTest	Frequency	TX 2405.376MHz
Cable Loss	1dB	Test Voltage	DC 6V(via DC Power Supply)



AUDIX Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244, Taiwan

Tel: +886 2 26099301
Fax: +886 2 26099303

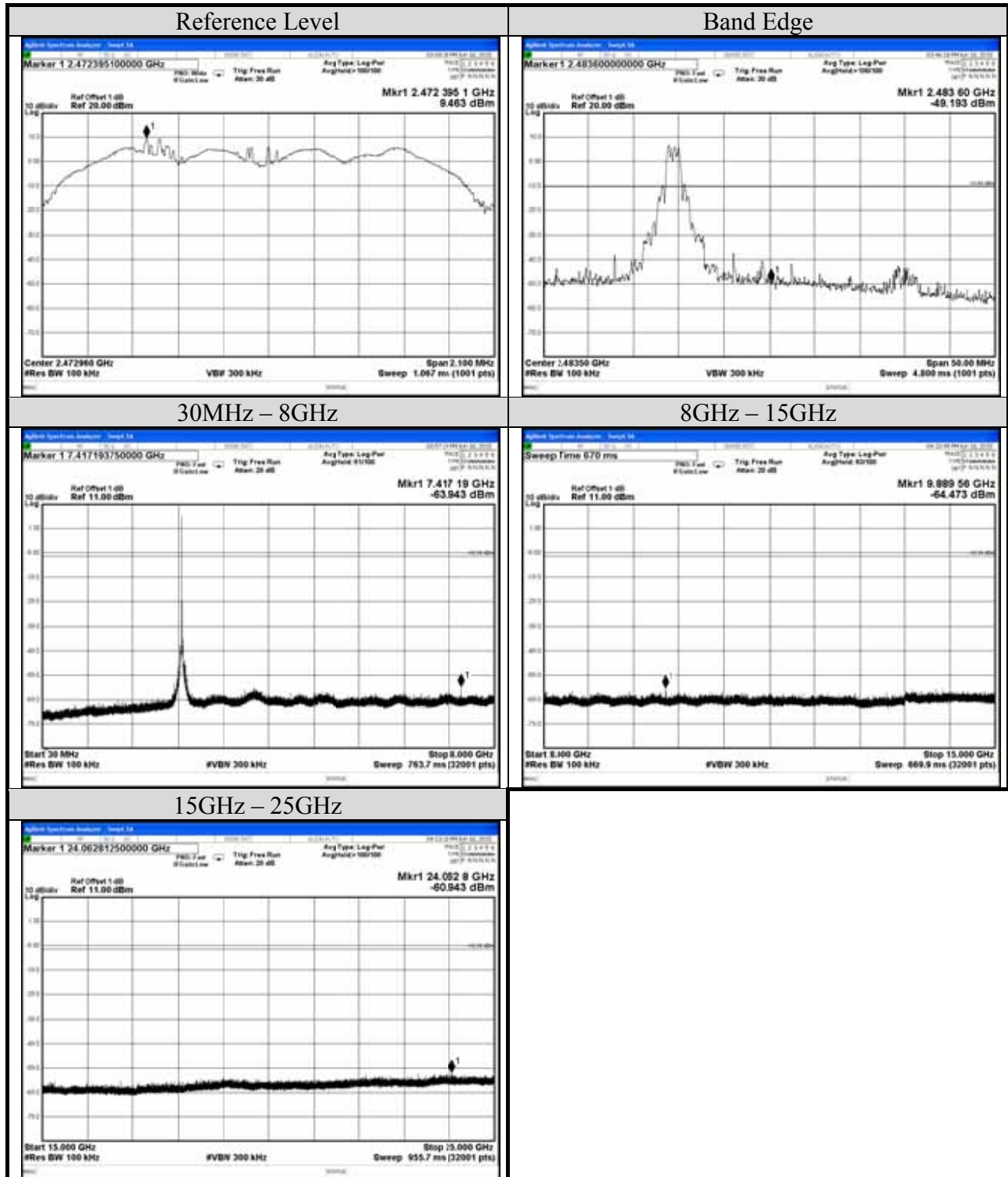
Test Date	2015/06/16	Temp./Hum.	22°C/48%
Modulation	FASSTest	Frequency	TX 2405.376MHz
Cable Loss	1dB	Test Voltage	DC 6V(via DC Power Supply)



AUDIX Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244, Taiwan

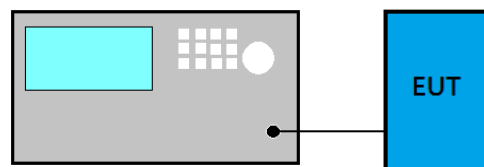
Tel: +886 2 26099301
Fax: +886 2 26099303

Test Date	2015/06/16	Temp./Hum.	22°C/48%
Modulation	FASSTest	Frequency	TX 2405.376MHz
Cable Loss	1dB	Test Voltage	DC 6V(via DC Power Supply)



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 v03r02:

■ 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 3.5.1. $< 98\%$.
- (7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

10.4. Test Results

Test Date	2015/06/16	Temp./Hum.	22°C/48%
Cable Loss	1dB	Test Voltage	DC 6V(via DC Power Supply)



11.DEVIATION TO TEST SPECIFICATIONS

【NONE】