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**JAPAN CERTIFICATION ORDINANCE ARTICLE 2 PARAGRAPH 1 OF ITEM 19  
For Low Power Data Communication System in the 2.4GHz Band**

**TEST REPORT**

For

**City Theatrical, Inc.**

**2400MHZ MULTIVERSE MODULE  
Model Number: 5995**

**Report Number: 0048-180401-01-JP**

*Prepared for*  
**City Theatrical, Inc.  
475 Barell Avenue  
Carlstadt, NJ, 07072, USA**

*Prepared by*  
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**Date: 05/24/2018**

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## 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** City Theatrical, Inc.  
475 Barell Avenue  
Carlstadt, NJ, 07072, USA

**EUT DESCRIPTION:** 2400MHZ MULTIVERSE MODULE

**MODEL:** 5995

**DATE TESTED:** 04/01/2018 to 05/24/2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
Japan Certification Ordinance Article 2 Paragraph 1 of Item 19	NO NON-COMPLIANCE NOTED

### Test Summary for FHSS Device

Testing Items Per MIC Notification. No. 88 of 2004, Annex 43	Section	Limit	Result
Frequency Tolerance	OT: Article 5 / Annex 1 Table	-/+50ppm	Complies
Occupied BandWidth	OT: Article 6/Annex 2 Table	Within 83.5MHz	Complies
Spread BandWidth	OT: Article 49-20	>=500KHz	Complies
Spreading Factor	OT: Article 49-20	>=5	Complies
Transmission Output Power	OT: Article 49-20	Conducted: <=3mW/MHz (2427-2470.75MHz) & <=10mW/MHz (2400-2483.5MHz except 2427-2470.75MHz)	Complies
Transmission Output Power Tolerance	OT: Article 14 7	Maximum +20%, Minimum -80%	Complies
E.I.R.P	OT: Article 49-20	6.9112-16.9112dBm/MHz (2427-2470.75MHz) & 12.14-22.14dBm/MHz (2400-2483.5MHz except 2427-2470.75MHz)	Complies

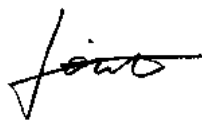
TX Spurious Emission Strength	OT: Article 7/Annex 2 26	$\leq 2.5\mu\text{W}$ or below for 10MHz-2387MHz and above 2496.5MHz (upto12.5GHz) $\leq 25\mu\text{W}$ or below for 2387MHz-2400MHz &2483.5MHz-2496.5MHz	Complies
RX Spurious Emission Strength	OT Article 24 2	$\leq 4\text{nW}$ or below for 10MHz-1GHz $\leq 20\text{nW}$ or below for above 1GHz (upto12.5GHz)	Complies
Dwell Time	OT: Article 49-20	$\leq 0.4\text{s}$	Complies
Antenna Absolute Gain	OT: Article 49-20	$\leq 12.14\text{dBi}$ (Compensating EIRP shortage)	Complies

Advanced Compliance Laboratory, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Advanced Compliance Laboratory, Inc. (ACL) and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by ACL, Advanced Compliance Laboratory, Inc. will constitute fraud and shall nullify the document.

Approved & Released For ACL By:

Tested By:



Wei Li

Manager  
Advanced Compliance Laboratory, Inc.



David Tu

EMC Engineer

## 2. EUT DESCRIPTION

The EUT for this certification is a low power transmitter, using digital modulation & operating in the 2400-2483.5MHz band.

The transmitter has a maximum conducted output power as following:

Frequency Range (MHz)	Declared RF Output Power (mW/MHz)	Measured Max. RF Output Power (mW/MHz)*	Max. EIRP (dBm/MHz)
2400.75-2480.00	0.7423	0.6537	0.2405
	Based on rated total power 50mW (17dBm)	-6.25%	

\*Output Power Tolerance meets the limit of -80% to 20%

The EUT can use the following antennas:

	Manufacture	Model	Type	Connector	Gain (dBi)	Freq. Hz
1	TekFun	W50-SR-V4	Omni Whip	RP-SMA	2/3	900M/2.4G
2	Nearson	S141AH-2450	Omni Whip	RP-SMA	2	2.4G
3	Microchip	TRF1001	Omni Whip	U.FL on 150mm cable	2	2.4G
4	TekFun	PL-M24-08X	Panel	N Female	8	2.4G
5	Tekfun	PL-W26-08M	Panel	N Female	6.5/8.5	900M/2.4G
6	Tekfun	LP-W28-110	Yagi	N Female	11	900M/2.4G
7	TekFun	YG-M04-14X	Yagi	N Female	14	2.4G
8	TekFun	M35-SR	Omni Whip	RP-SMA	2	2.4G

Max. 3dBi omni gain, 8dBi to 14dBi directional gain ( with HPBA considered) for 2.4GHz band antenna meets the limit in OT: Article 49-20, i.e. 12.14dBi+shortage of EUT's max. E.I.R.P. See Sec. 7.3 for details.

EUT Specification:

Data Speed (Mbps)	Operation Frequency (MHz)	Modulation Type	Measured E.I.R.P (dBm/MHz)	Measured RF Outpower (mW/MHz)	Occupied Bandwidth (MHz)	Spreading Bandwidth (MHz)
5	2402.10~2474.75	8FSK	0.2405	0.6189	77.6220	67.3613
2	2401.75~2480.00	GFSK	0.2330	0.6537	79.1194	71.7099
1	2400.75~2480.00	GFSK	0.2312	0.6356	79.4682	71.7449

Power Supply for RF Module: +3.3VDC



### 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4(2014)/C63.10(2013) & MIC notification No.88 of 2004, Annex 43 for Low Power Data Communication System in the 2.4GHz Band (2400-2483.5MHz) used in Private Land Radio Services, Data Communications, Wireless LAN, Bluetooth, Zigbee etc.

### 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at Hillsborough, New Jersey, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods"

ACL site is accepted by FCC to perform measurements under Part 15 or 18 (Designation Number US5347) and also designated by IC as "site IC 3130A". ACL is accredited by NVLAP, Laboratory Code 200101-0. The full accreditation can be viewed at <http://www.ac-lab.com>



No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

## 5. CALIBRATION AND UNCERTAINTY

### 5.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 5.2. MEASUREMENT UNCERTAINTY

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

	Prob. Dist.	Uncertainty(dB)	Uncertainty(dB)	Uncertainty(dB)
		30-1000MHz	1-6.5GHz	Conducted
Combined Std. Uncertainty $u_c$	norm.	$\pm 2.36$	$\pm 2.99$	$\pm 1.83$

### 5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Manufacturer	Model	Serial No.	Description	Calibrated By	Cal. Date mm/dd/yy
Agilent	E4440A	US40420700	3Hz-26.5GHz Spec. Analyzer	Micro Precision	6/17/17
R & S	ESPI	100018	9KHz-7GHz EMI Receiver	Micro Precision	8/25/17
HP	HP8546A	3448A00290	9kHz to 6.5GHz EMI Receiver	ACL	9/25/17
R&S	SMH	8942280/010	Signal Generator	ACL	9/25/17
RES-NET	RFA500NFF 30	0108	30dB in-line Power Attenuator		
Lorch Microwave	5NF-800/10 00-S	AC3	Notch Filter		
Lorch Microwave	5NF-1800/2 200-S	AE10	Notch Filter		
Narda	3022	80986	Directional Coupler		
Lorch Microwave	5NF-800/10 00-S	AC3	Notch Filter		

All Test Equipment Used is Calibrated, Traceable to NIST Standards. Calibration interval: 1 year

### 5.4. TEST CONDITIONS

#### ① Test Room Environment

- ◆ The testing room temperature and humidity shall be maintained within a normal temperature range of 5 - 35 degree and normal relative humidity range of 45 - 85% according to JIS Z8703.
- ◆ Normally the testing is performed at 18 - 28 degree and the relative humidity is roughly controlled.
- ◆ The thermometer and hygrometer need to calibrate and it's necessary to place on a test room.

#### ② Power Supply Voltage

- ◆ In case that the power source of the application equipment (EUT : Equipment Under Test) is DC voltage, a stabilized DC power supply is usually used to test the application equipment (EUT) at the rated voltage and  $\pm 10\%$  from the rated voltage. If the application equipment (EUT) obviously has no fluctuation with such voltage, only the rated voltage is supplied. (That to which rated voltage is supplied from the standard interface for international < For example >: Parallel USB, Serial USB, and so on)
- ◆ In the application equipment (EUT) which uses AC adapter or batteries, test even when  $\pm 10\%$  from the rated voltage is supplied. However, it's if it can be confirming that the voltage supplied to RF parts is fixed, only the rated voltage is supplied. Then record it.



## 6. SETUP OF EQUIPMENT UNDER TEST

### SUPPORT EQUIPMENT

None.

### TEST SETUP

Testing Frequency/Channel/Port Selection:

- **L**(owest), **M**(iddle), **H**(ighest) Channels of 2400MHz Band selected to perform the test
- Conducted measurement performed at EUT's antenna connector.
- Modulation: GFSK/8FSK
- EUT was set in continuous transmitting mode with modulation (hopping on /off) or non-modulation (Hopping off) or continuous receiving mode
- 3.3V DC power source provided via a "host platform" which can provide power and interface for testing software control.

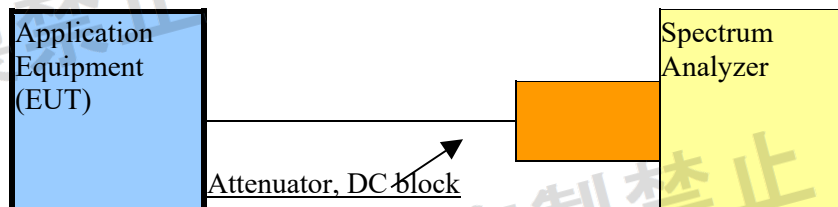
Frequency settings:

Mode	1	2	3
Modulation	5Mbps	2Mbps	1Mbps
Lowest Channel (L)	2402.10	2401.75	2400.75
Middle Channel (M)	2436.70	2442.00	2440.98
Highest Channel (H)	2474.75	2480.00	2480.00
No. of Hopping Channel	22	36	66
Channel Separation (MHz)	3.507	2.236	1.219

## 7. APPLICABLE LIMITS AND TEST RESULTS

### 7.1 Frequency Tolerance

#### ◆ Measurement System Diagram



#### ◆ Conditions of Application Equipment (EUT)

- Set the application equipment (EUT) to the measurement frequency.
- The modulation state shall be “continuous carrier wave without modulation” by stopping frequency-hopping mode.

#### ◆ Spectrum Analyzer Conditions

- Center Frequency : Frequency to measure (2402MHz or 2441MHz or 2480MHz)
- Span : 150kHz
- RBW : 1kHz, VBW : 30kHz
- Sweep time : Auto (300msec)
- Log scale : 10dB/Div, Data points : 501points (400 points or more)
- Reference level : 10dBm, Attenuator : 20dB
- Detection : Positive Peak, Sweep mode : Continuous
- Marker : Spot

#### ◆ Measurement Procedure and Capture Image

- Measure -> Frequency Count -> Count On
- Single Sweep
- Peak Search
- Record the value

#### ◆ Technical Regulation

Frequency Tolerance : 50ppm or below

( Radio Law Radio Equipment Regulations Article 5, Attached Table No.1 )

#### ◆ Calculation Method

- $FT(ppm) = \{ (RF) - (MF) / (MF) \} \times 1000000$

( FT : Frequency Tolerance , RF : Reading Frequency , MF : Measurement Frequency )

## RESULTS

No non-compliance noted.

Test Data for following conditions:

EUT powered by rated DC power via external 5V USB, Temperature range from -40C to 85C  
Set 20°C as normal operation condition.

For Model 1:

Low Channel f=2402.10MHz, Middle Channel f=2436.70MHz, High Channel f=2474.75MHz

Temperature (°C)	L Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)	M Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)	H Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)
-40	2402.065810	-12.56816952	2436.663278	-14.23337913	2474.712918	-14.98413981
-30	2402.080023	-8.269430915	2436.689347	-8.316473086	2474.739002	-4.444085261
-20	2402.091638	-3.173056909	2436.698102	-3.481120686	2474.749012	-0.399232246
-10	2402.105939	2.168935515	2436.703003	2.472419966	2474.753530	1.426406708
0	2402.108284	3.382457017	2436.707538	3.448649099	2474.757934	3.205980402
+10	2402.109015	3.709254402	2436.707923	3.752966155	2474.757834	3.16557228
<b>+20</b>	<b>2402.103403</b>	<b>1.306356938</b>	<b>2436.706320</b>	<b>1.416677074</b>	<b>2474.754685</b>	<b>1.893120517</b>
+30	2402.104920	1.798426377	2436.708739	2.048207818	2474.758173	3.302555814
+40	2402.106535	2.595229174	2436.707320	2.720536197	2474.757792	3.148600869
+50	2402.105917	2.217642896	2436.706923	2.463261313	2474.757284	2.943327609
+60	2402.106081	2.090254361	2436.705911	2.531534907	2474.756023	2.43378119
+70	2402.105103	2.078597894	2436.705508	2.124391158	2474.756101	2.465299525
+85	2402.105340	2.138961742	2436.708104	2.223054827	2474.755923	2.393373068

Max. frequency tolerance is -15ppm & +4ppm, which meets the limit, -/+50ppm.

For Model 2:

Low Channel f=2401.75MHz, Middle Channel f=2442.00MHz, High Channel f=2480.00MHz

Temperature (°C)	L Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)	M Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)	H Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)
-40	2401.721038	-12.05870719	2441.963032	-15.13841114	2479.961039	-15.71008065
-30	2401.731340	-7.76933486	2441.989523	-4.29033579	2479.987834	-4.905645161
-20	2401.742352	-3.184344749	2441.998137	-0.762899263	2479.997238	-1.113709677
-10	2401.755006	2.084313521	2442.003149	1.28951679	2480.005204	2.098387097
0	2401.758015	3.337149995	2442.007623	3.121621622	2480.008104	3.267741935
+10	2401.758704	3.624024149	2442.007945	3.253480753	2480.007851	3.165725806
<b>+20</b>	<b>2401.752974</b>	<b>1.238263766</b>	<b>2442.007350</b>	<b>3.00982801</b>	<b>2480.005023</b>	<b>2.025403226</b>
+30	2401.754129	1.71916311	2442.008934	3.658476658	2480.008092	3.262903226
+40	2401.756002	2.499011138	2442.007523	3.080671581	2480.007217	2.910080645
+50	2401.755137	2.138857083	2442.006823	2.794021294	2480.007254	2.925000003
+60	2401.754992	2.078484438	2442.006110	2.502047502	2480.005996	2.417741935
+70	2401.754682	1.949411887	2442.005828	2.386568387	2480.005195	2.094758065
+85	2401.754823	2.00811908	2442.005902	2.416871417	2480.004705	15562.94226

Max. frequency tolerance is -16ppm & +4ppm, which meets the limit, -/+50ppm.

For Model 3:

Low Channel f=2400.75MHz, Middle Channel f=2440.98MHz, High Channel f=2480.00MHz

Temperature (°C)	L Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)	M Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)	H Channel Frequency Reading (MHz)	Frequency Tolerance (ppm)
-40	2400.721050	-12.05870719	2440.943047	-15.13841114	2479.961039	-15.71008065
-30	2400.731348	-7.76933486	2440.969527	-4.29033579	2479.987834	-4.905645161
-20	2400.742355	-3.184344749	2440.978138	-0.762899263	2479.997238	-1.113709677
-10	2400.755004	2.084313521	2440.983148	1.28951679	2480.005204	2.098387097
0	2400.758012	3.337149995	2440.987622	3.121621622	2480.008104	3.267741935
+10	2400.758706	3.624024149	2440.987942	3.253480753	2480.007851	3.165725806
+20	2400.752973	1.238263766	2440.987347	3.00982801	2480.005023	2.025403226
+30	2400.754127	1.71916311	2440.988930	3.658476658	2480.008092	3.262903226
+40	2400.756005	2.499011138	2440.987521	3.080671581	2480.007217	2.910080645
+50	2400.755135	2.138857083	2440.986820	2.794021294	2480.007254	2.925000003
+60	2400.754990	2.078484438	2440.986107	2.502047502	2480.005996	2.417741935
+70	2400.754682	1.949411887	2440.985826	2.386568387	2480.005195	2.094758065
+85	2400.754821	2.00811908	2440.985905	2.416871417	2480.004705	15562.94226

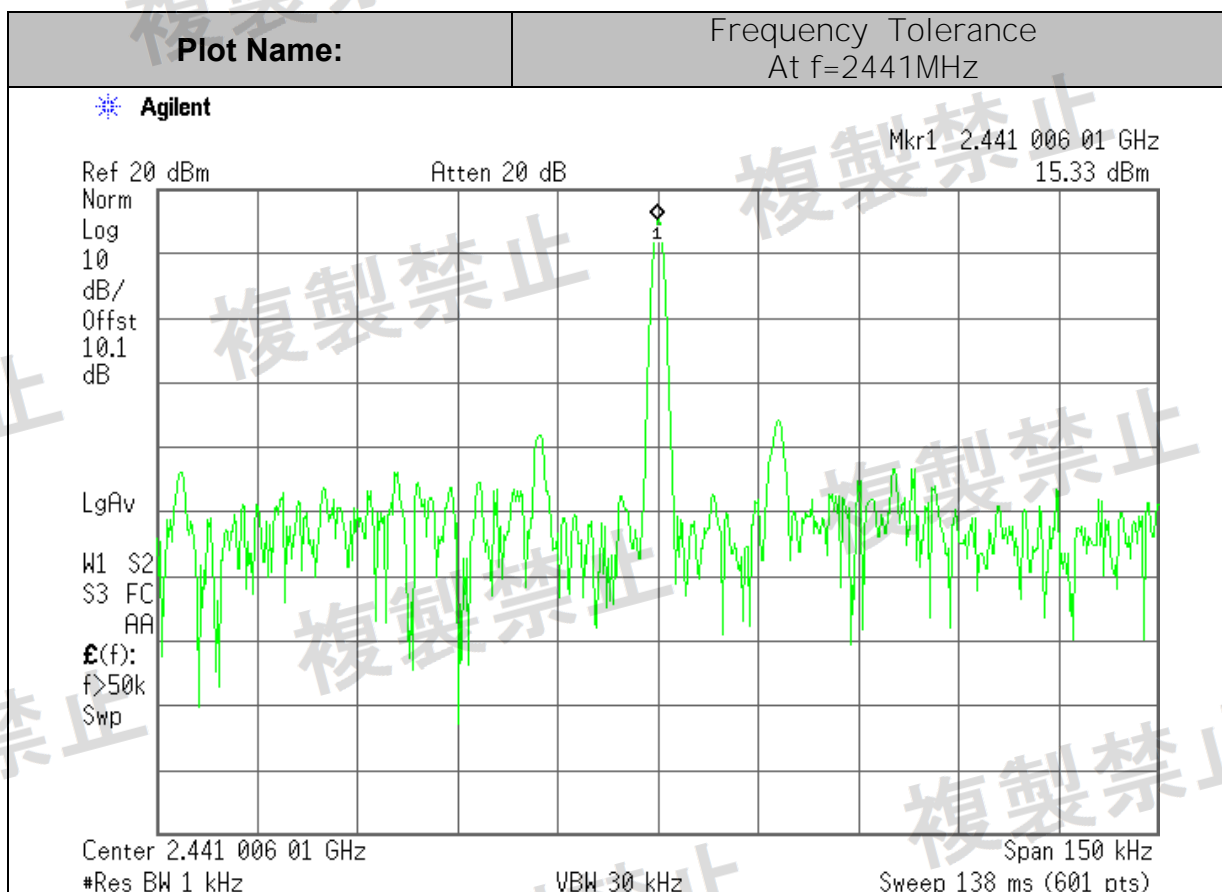
Max. frequency tolerance is -16ppm & +4ppm, which meets the limit,  $\pm 50\text{ppm}$ .

Overall Max. frequency tolerance is -16ppm & +4ppm, which meets the limit,  $\pm 50\text{ppm}$ .

For Unmodulated Signal set at f=2441 MHz @ 20C

Temperature (C)	Frequency Reading (MHz)	Frequency Tolerance (ppm)
-40	2440.961654	-15.7091356
-30	2440.986388	-5.576403114
-20	2440.995303	-1.924211389
-10	2441.002612	1.070053257
0	2441.007410	3.035641131
+10	2441.007932	3.249487915
<b>+20</b>	<b>2441.006010</b>	2.462105694
+30	2441.008434	3.455141335
+40	2441.007105	2.910692339
+50	2441.006635	2.7181483
+60	2441.006122	2.507988529
+70	2441.005918	2.424416223
+85	2441.009320	3.818107333

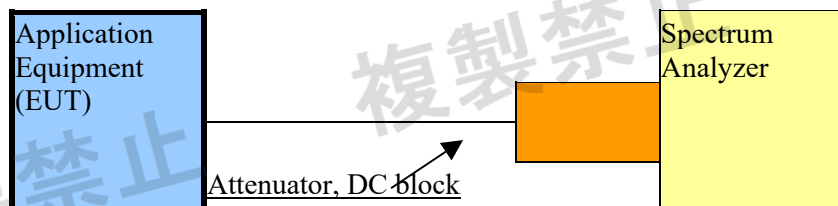
Max. frequency tolerance is -16ppm & +4ppm, which meets the limit, +/-50ppm.





## 7.2 Occupied BandWidth and Spread BandWidth

### ◆ Measurement System Diagram



### ◆ Conditions of Application Equipment (EUT)

- The modulation state shall be “continuous frequency-hopping mode” by spread spectrum.

### ◆ Spectrum Analyzer Conditions

- Center Frequency : 2441MHz
- Span : 200MHz
- RBW : 300kHz
- VBW : 300kHz
- Sweep time : Auto (10msec), Marker : Marker Off
- Log scale : 10dB/Div, Data points : 501points (400 points or more)
- Reference level : 0dBm, Attenuator : 10dB
- Detection : Positive Peak, Sweep mode : Continuous

### ◆ Measurement Procedure and Capture Image

- A,B -> Storage -> Max Hold
- Measure -> more -> Occupied Bandwidth -> N% Ratio -> 99% (O.B.W)
- Measure -> more -> Occupied Bandwidth -> Occupied Bandwidth On
- Read and record the value (O.B.W)
- Measure -> more -> Occupied Bandwidth -> N% Ratio -> 90% (S.B.W)
- Measure -> more -> Occupied Bandwidth -> Occupied Bandwidth On
- Read and record the value (S.B.W)

### ◆ Technical Regulation

Occupied Bandwidth : 83.5MHz or below

( Radio Law Radio Equipment Regulations Article 6, Attached Table No.2 )

Spread Bandwidth : 500kHz or more

( Radio Law Radio Equipment Regulations Article 49-20 )

Spreading Factor : 5 or more

( Radio Law Radio Equipment Regulations Article 49-20 )

### ◆ Calculation Method

- $\text{Spreading Factor} = (\text{S.B.W}) / (\text{Frequency equal to the transmission rate of the modulation signal})$

### ◆ Notes

- Regarding as Regulation of Spread Bandwidth and Spreading Factor, modulation system is applied only to the thing using Spectrum Spread system.

## RESULTS

No non-compliance noted.

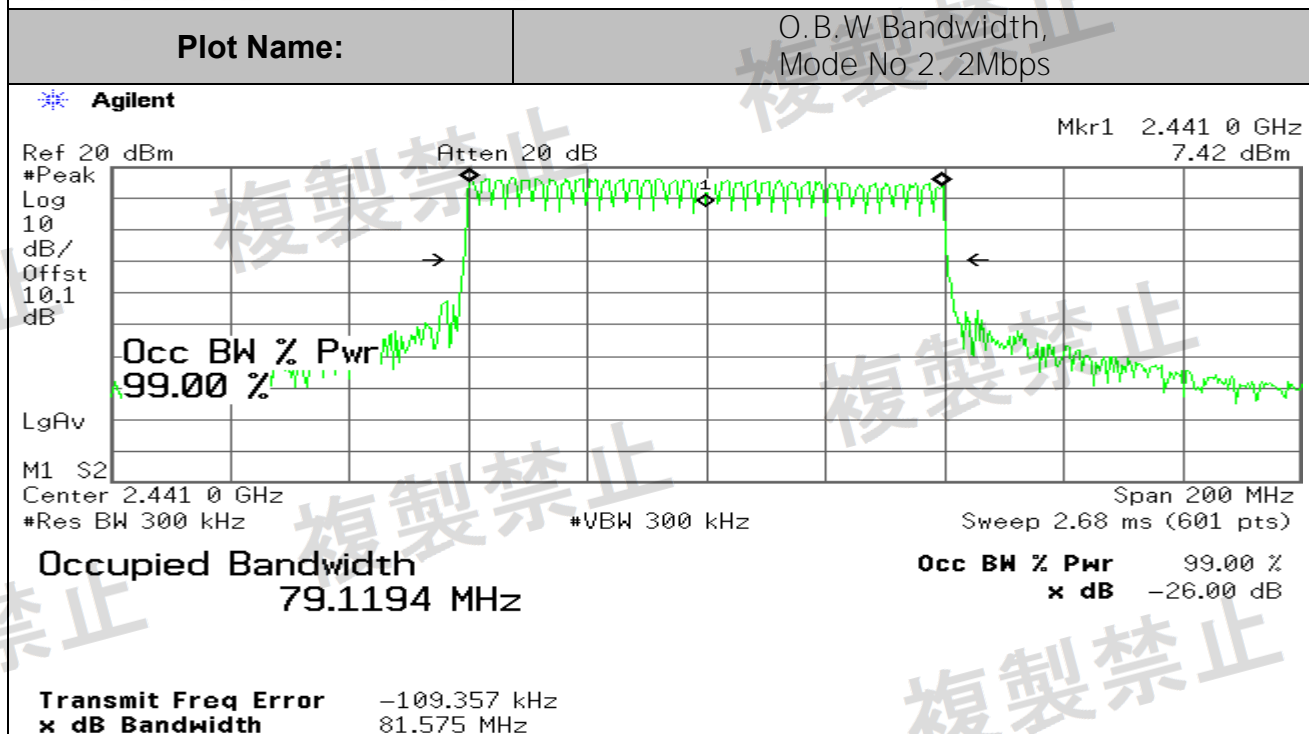
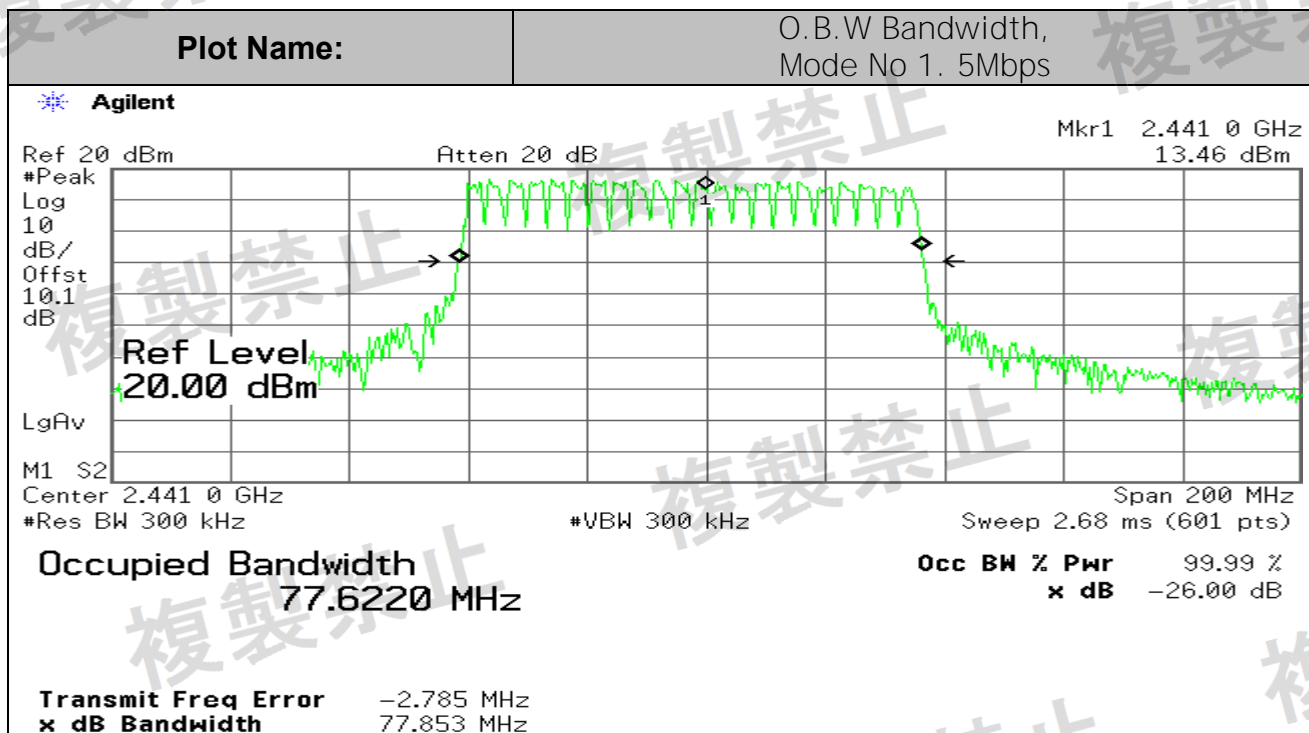
Test Data Summary

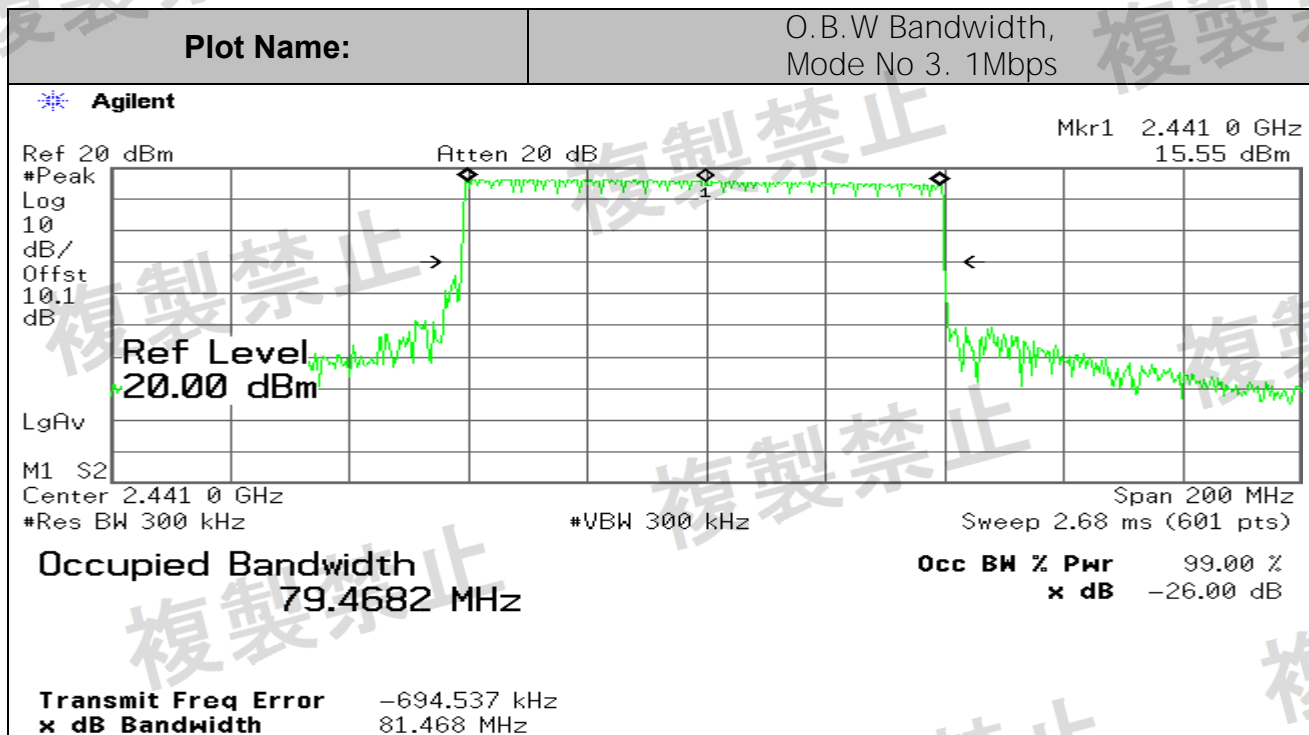
	<b>Mode No.1: 5Mbps</b>	<b>Mode No.2: 2Mbps</b>	<b>Mode No.3: 1Mbps</b>
Occupied .B.W (O.B.W) MHz	77.6220	79.1194	79.4682
Spread B.W (O.B.W) MHz	67.3613	71.7099	71.7449
Symbol Rate Mbps*	5/3	2/1	1/1
Spread Factor (SF)	40.42	35.85	71.75

\* Symbol rate =PHY Data rate/ Number of bits (3bits for 8FSK, 1bits for GFSK)

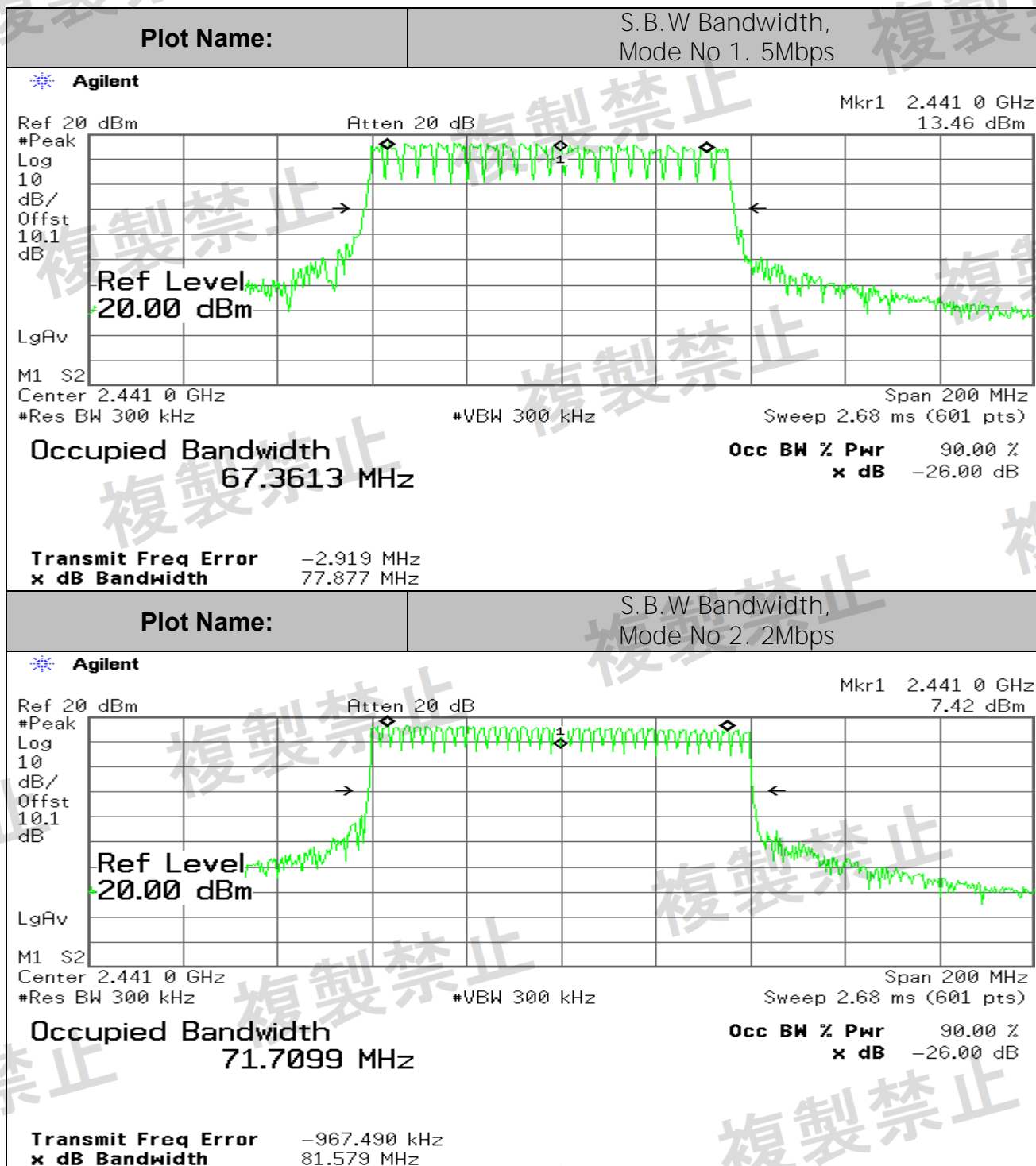
Therefore, all O.B.W > 500KHz, S.B.W <83.5MHz, SF >5, which all meet the limits.

Occupied B.W

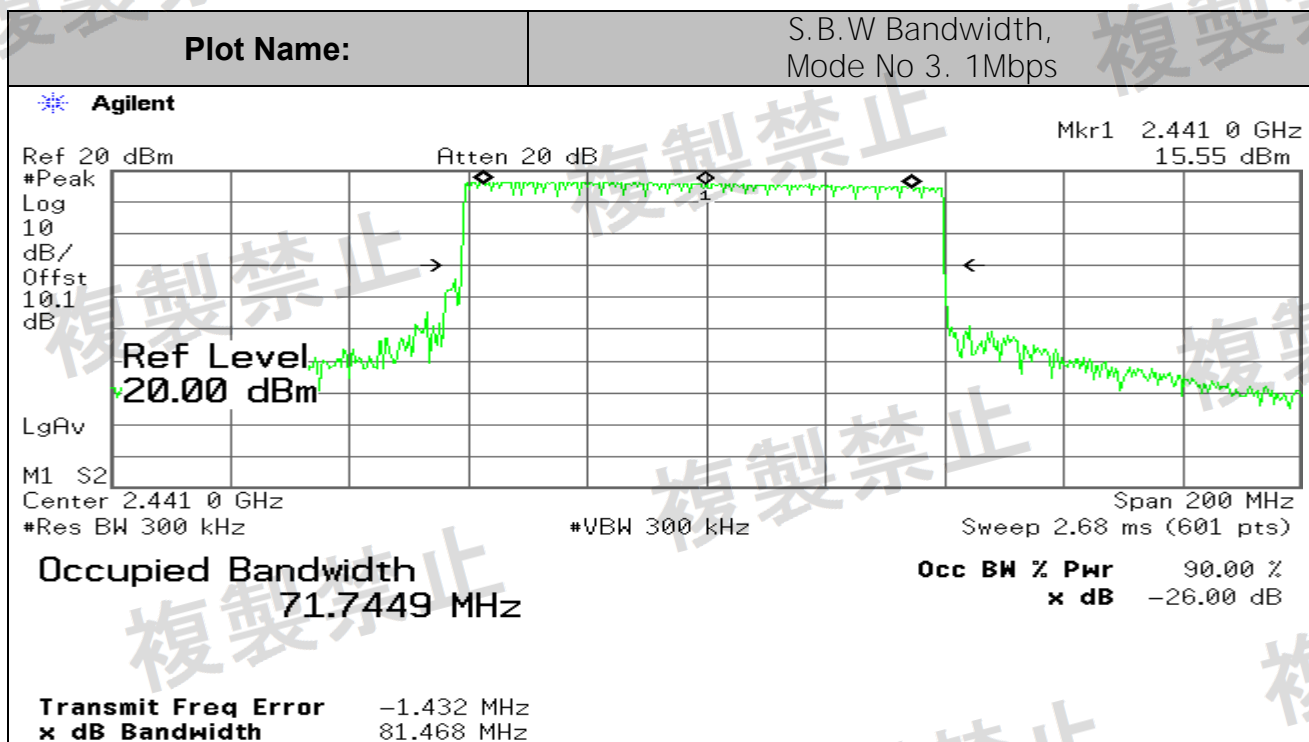




Spread B.W



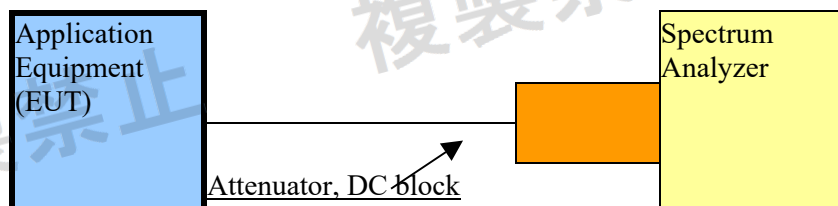




### 7.3 Transmission Output Power

(Channel Output Power <Power Density>)

◆ Measurement System Diagram



◆ Conditions of Application Equipment (EUT)

- Set the application equipment (EUT) to the measurement frequency.
- The modulation state shall be “continuous transmission mode” by stopping frequency-hopping mode. If impossible, it shall be “continuous frequency-hopping mode”.

◆ Spectrum Analyzer Conditions

- Center Frequency : Frequency to measure ( L or M or H channel)
- Span : 6MHz
- RBW : 10kHz ( about span(6MHz) / 1.2\*data points(501) )
- VBW : 100kHz (10 times of RBW or more)
- Sweep time : Auto (120msec)
- Log scale : 10dB/Div, Data points : 501points (400 points or more)
- Reference level : 0dBm, Attenuator : 10dB
- Sweep mode : Continuous
- Marker : Zone width -> 1MHz
- Measure -> Channel Power -> Meas On, Graph On
- Detection : Trace A -> Sample, Trace B -> Sample
- Active Trace : B

◆ Measurement Procedure and Capture Image in Spectrum Analyzer

- Measure -> Channel Power -> Average -> Averaging Count 100
- Measure -> Channel Power -> Average Measure On
- Single Sweep
- Peak Search
- iii. iv. repetition
- Read and record the maximum value

◆ Technical Regulation

- Output Power : 3mW/MHz or below  
( Radio Law Radio Equipment Regulations Article 49-20 )
- Transmission Output Power Tolerance :  
Maximum +20%, Minimum -80%  
( Radio Law Radio Equipment Regulations Article 14 )
- E.I.R.P ( Equivalent Isotropically Radiated Power ) :  
\*6.9112dBm/MHz or below  
\*16.9112dBm/MHz or below ( only Directional Antenna, depending on antenna's HBPA)

( Radio Law Radio Equipment Regulations Article 49-20 )

◆ Calculation Method

- $$\text{Output Power Tolerance} = [ \{ (\text{O.P}) - (\text{D.O.P}) \} / (\text{D.O.P}) ] * 100$$
  
( O.P : Output Power, D.O.P : Declaration Output Power )

**TEST RESULT**

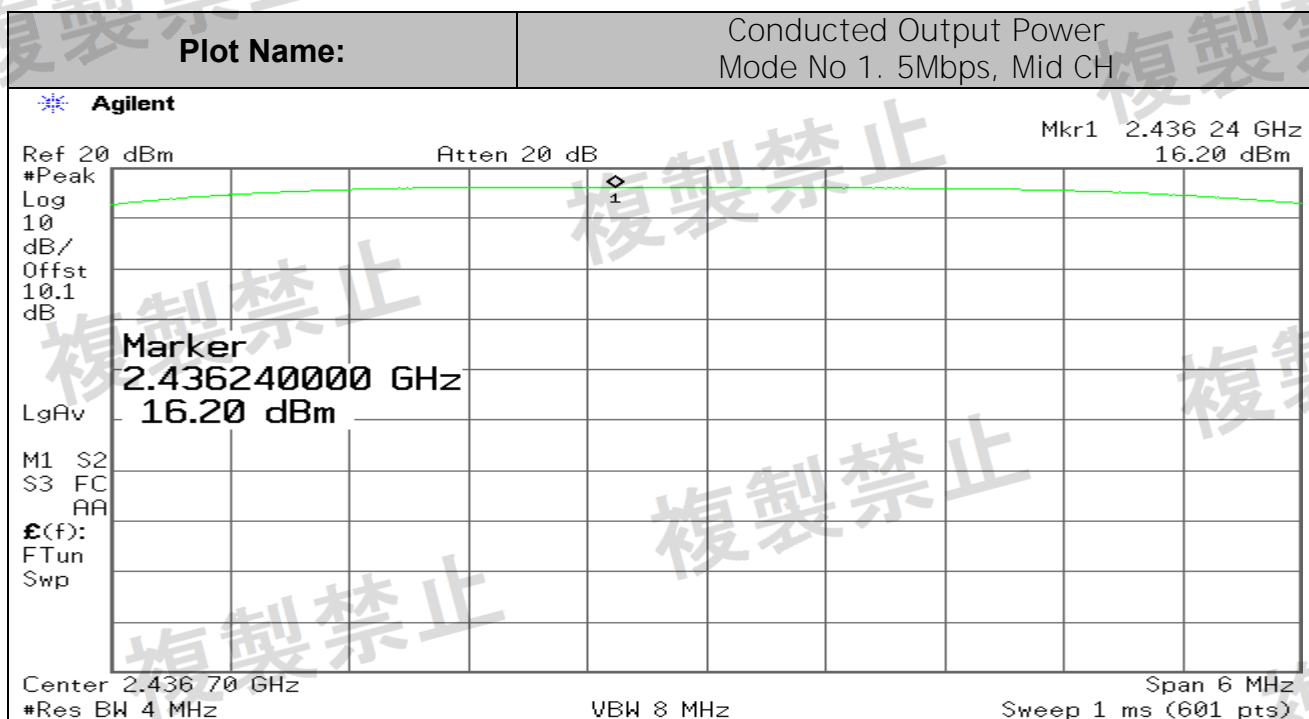
No non-compliance noted.

Test Data Summary

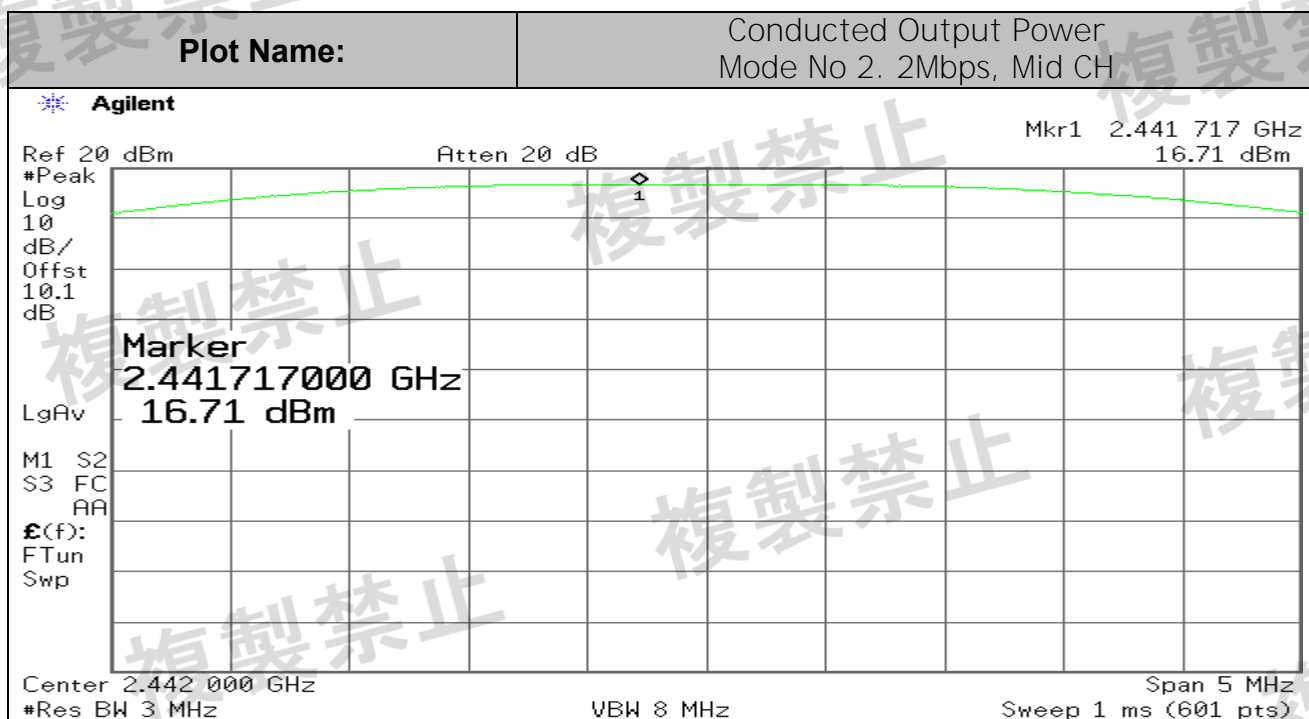
	Mode No.1: 5Mbps	Mode No.2: 2Mbps	Mode No.3: 1Mbps
Max. Channel Peak Power (dBm)	16.20	16.71	16.59
Max. Channel Peak Power (mW)	<b>41.69</b>	<b>46.88</b>	<b>45.60</b>
S.B.W (MHz)	67.3613	71.7099	71.7449
Antenna RF E.I.R.P (dBm/MHz)	0.2405	0.2330	0.2312
<b>Antenna RF Output Power (O.P) (mW/MHz)</b>	<b>0.6189</b>	<b>0.6537</b>	<b>0.6356</b>
D.O.P (mW/MHz) (rated 50mW Channel Peak Power)	0.7423	0.6973	0.6970
Output Power Tolerance (%)	-16.62	-6.25	-8.81
Max. allowed antenna gain (dBi) for HEPA=360°(Omni-directional), FHSS EIRP limit=6.91*	6.67	6.68	6.68
Max. allowed antenna gain (dBi) for HEPA=60° (directional), FHSS EIRP limit=12.91*	12.67	12.68	12.68
Max. allowed antenna gain (dBi) for HEPA=36° (directional) FHSS EIRP limit=16.91*	16.67	16.68	16.68

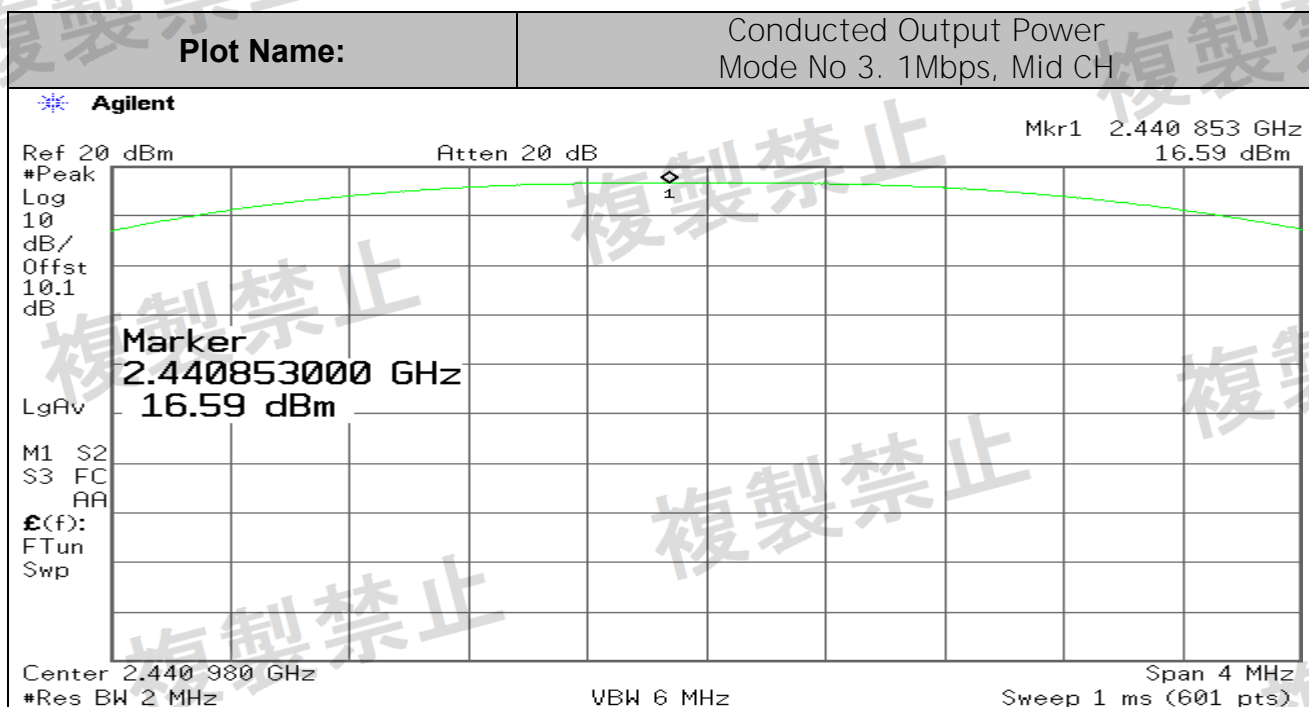
\* All for reference: Max antenna gain = EIRP limit - Rated conductive power

Therefore, all E.I.R.P, O.P and OP Tolerance and applied antenna's gain meet the limits.



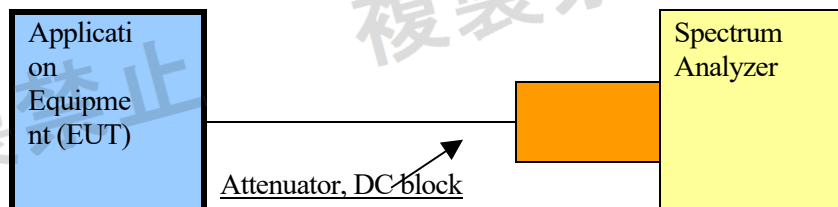






## 7.4 TX Spurious Emission Strength

### ◆ Measurement System Diagram



### ◆ Conditions of Application Equipment (EUT)

- The modulation state shall be “continuous frequency-hopping mode” by spread spectrum.

### ◆ Spectrum Analyzer Conditions

- Start Frequency : Start Frequency of frequency range to measure (10MHz or 2387MHz or 2483.5MHz or 2496.5MHz)
- Stop Frequency : Stop Frequency of frequency range to measure (2387MHz or 2400MHz or 2496.5MHz or highest upper frequency)
- Span : AUTO (Measurement Range)
- RBW : 1MHz , VBW : 1MHz
- Sweep time : Time which can be measured enough  
2.0sec(10MHz-2387MHz, 2496.5MHz- highest upper frequency)  
25.0msec(2387MHz-2400MHz, 2483.5MHz-2496.5MHz)
- Log scale : 10dB/Div, Data points : 501points (400 points or more)
- Reference level : 0dBm, Attenuator : 10dB
- Detection : Positive Peak, Sweep mode : Continuous
- Marker : Spot

### ◆ Measurement Procedure and Capture Image

- Single
- Peak Search
- Read and record the value

### ◆ Technical Regulation

TX Spurious Emission Strength :

2.5 micro W or below (i.e. -26dBm)

\*Frequency Range: 10MHz-2387MHz, 2496.5MHz- highest upper frequency  
(Radio Law Radio Equipment Regulations Article 7)

25 micro W or below (i.e. -16dBm)

\*Frequency Range: 2387MHz-2400MHz, 2483.5MHz-2496.5MHz,s (Radio Law  
Equipment Regulations Article 7)

Radio

## RESULTS

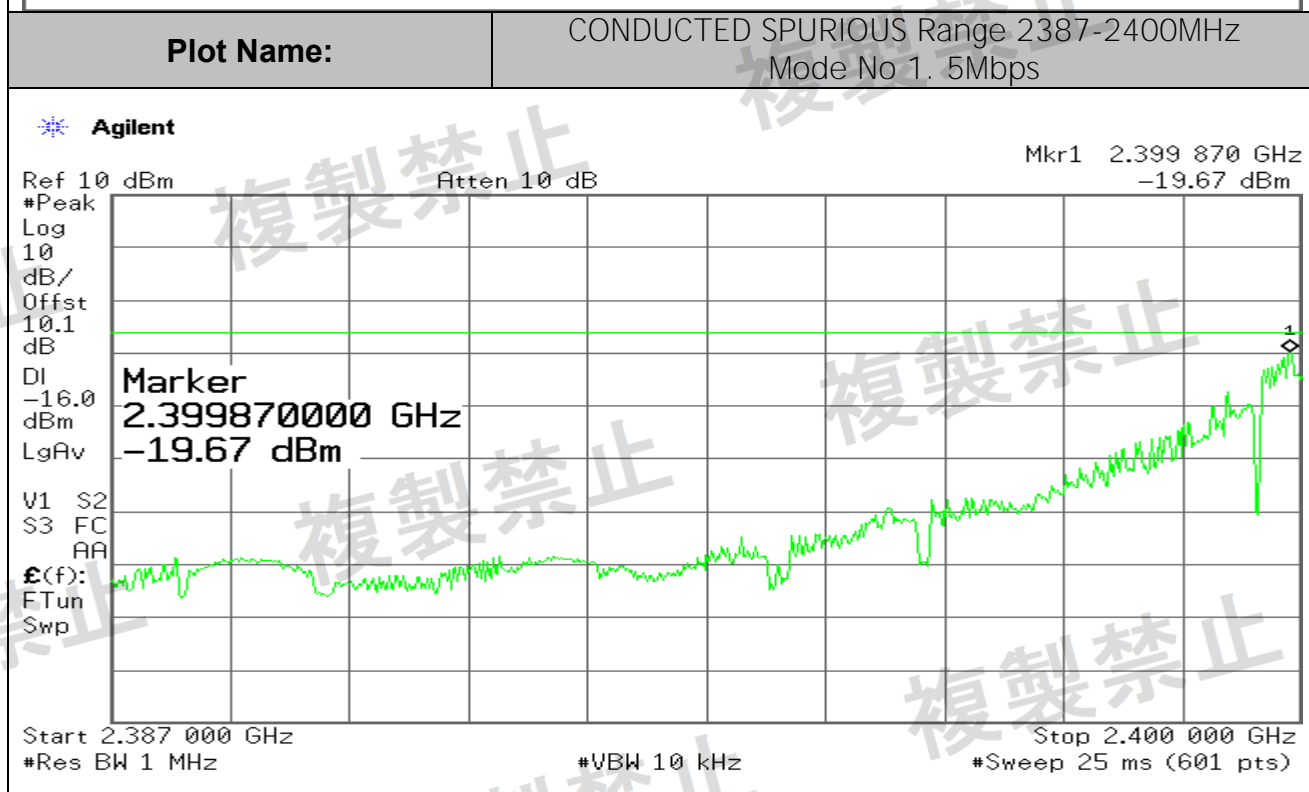
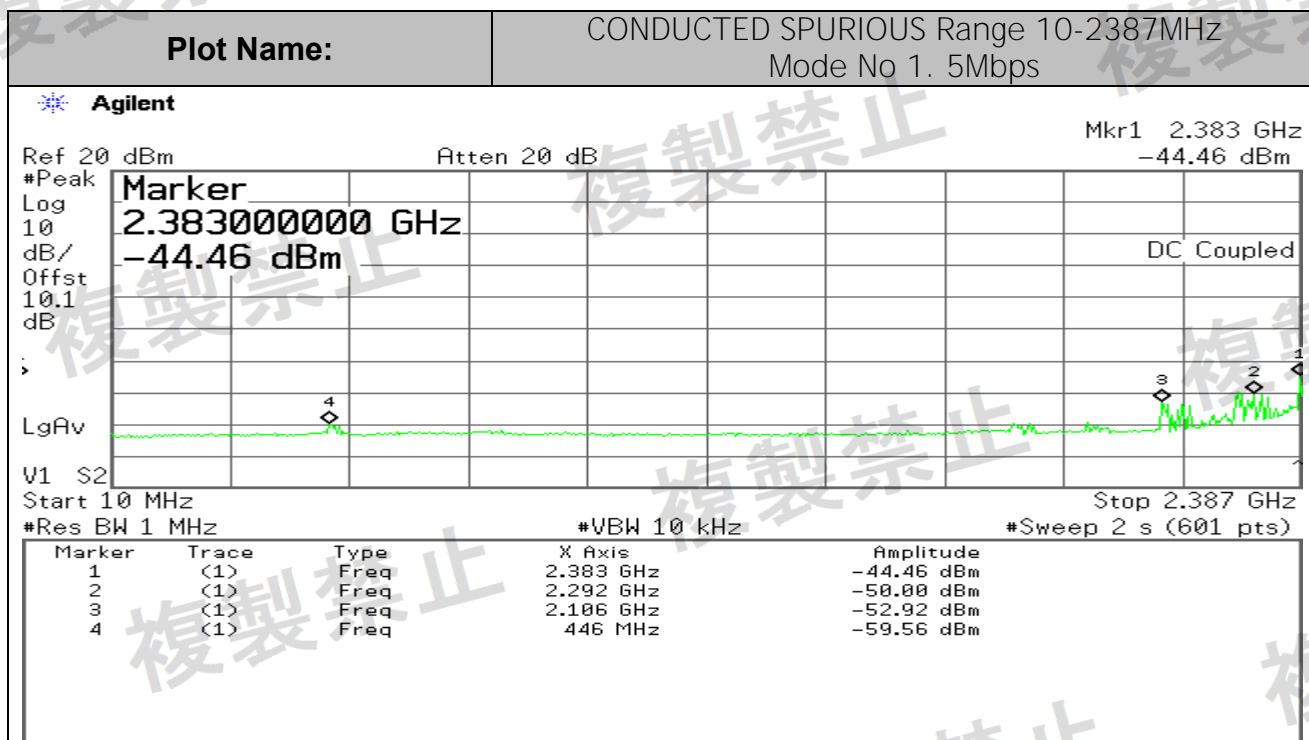
No non-compliance noted

Data Summary:

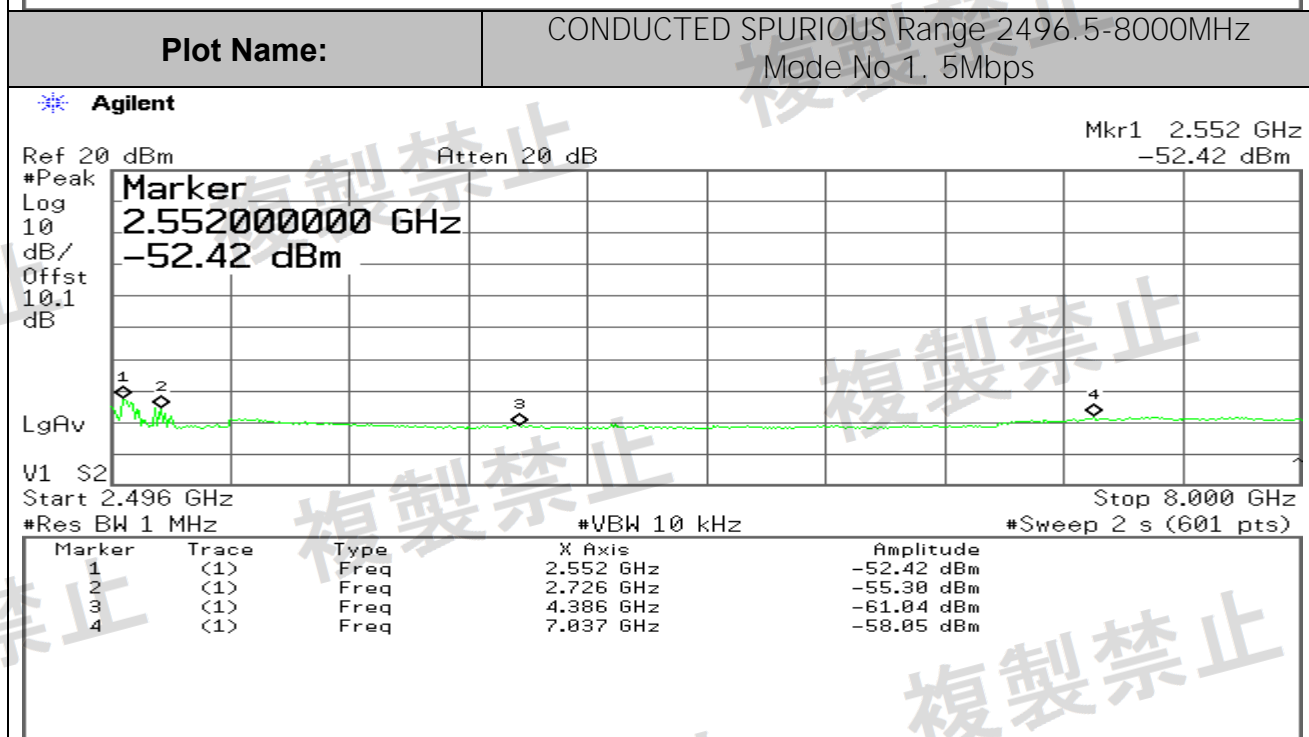
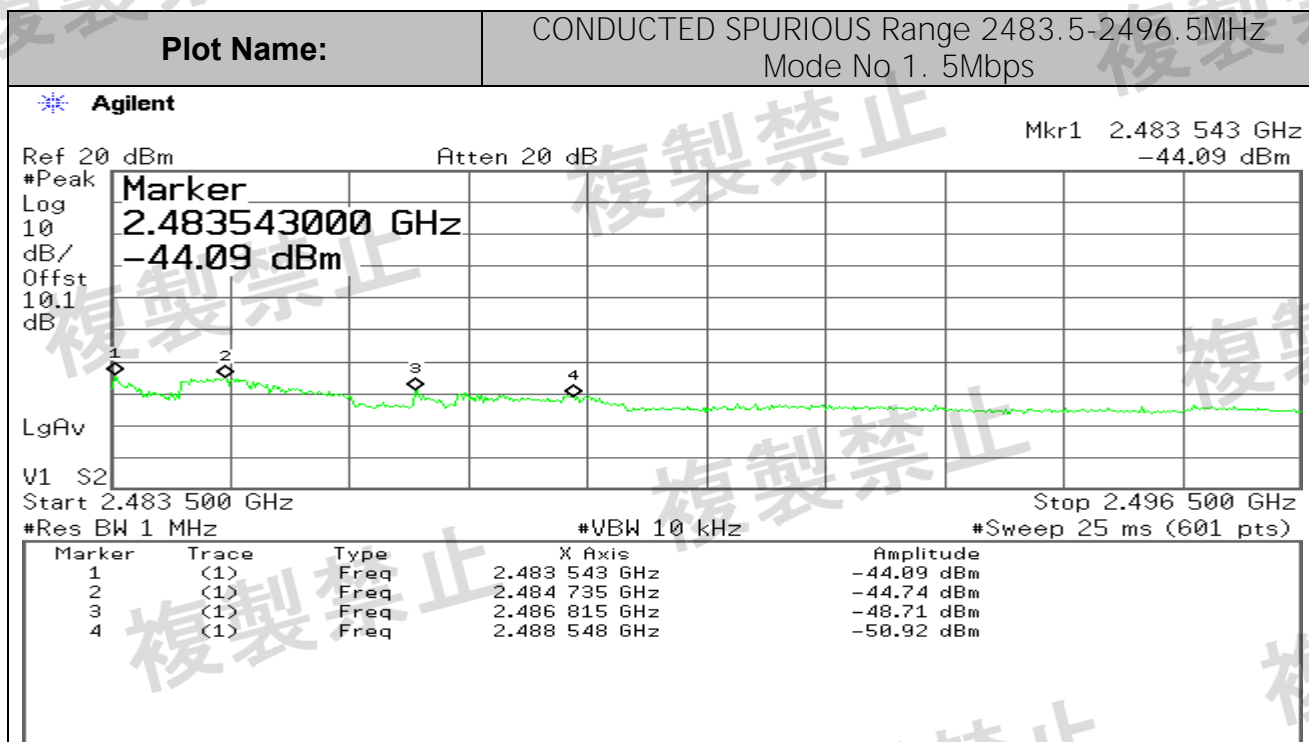
Frequency Range (MHz)	Limit (dBm/MHz)	Max. Spurious (dBm)			Meet Limit
		Mode No.1: 5Mbps	Mode No.2: 2Mbps	Mode No.3: 1Mbps	
10~2387	-26	-44.46	-43.45	-43.07	Yes
2387~2400	-16 (-36 for RBW=10KHz)	-19.67*	-23.47*	-37.89* (RBW=10KHz)	Yes
2483.5~2496.5	-16	-44.09	-40.88	-47.61	Yes
2496.5~8000	-26	-52.42	-51.59	-48.15	Yes

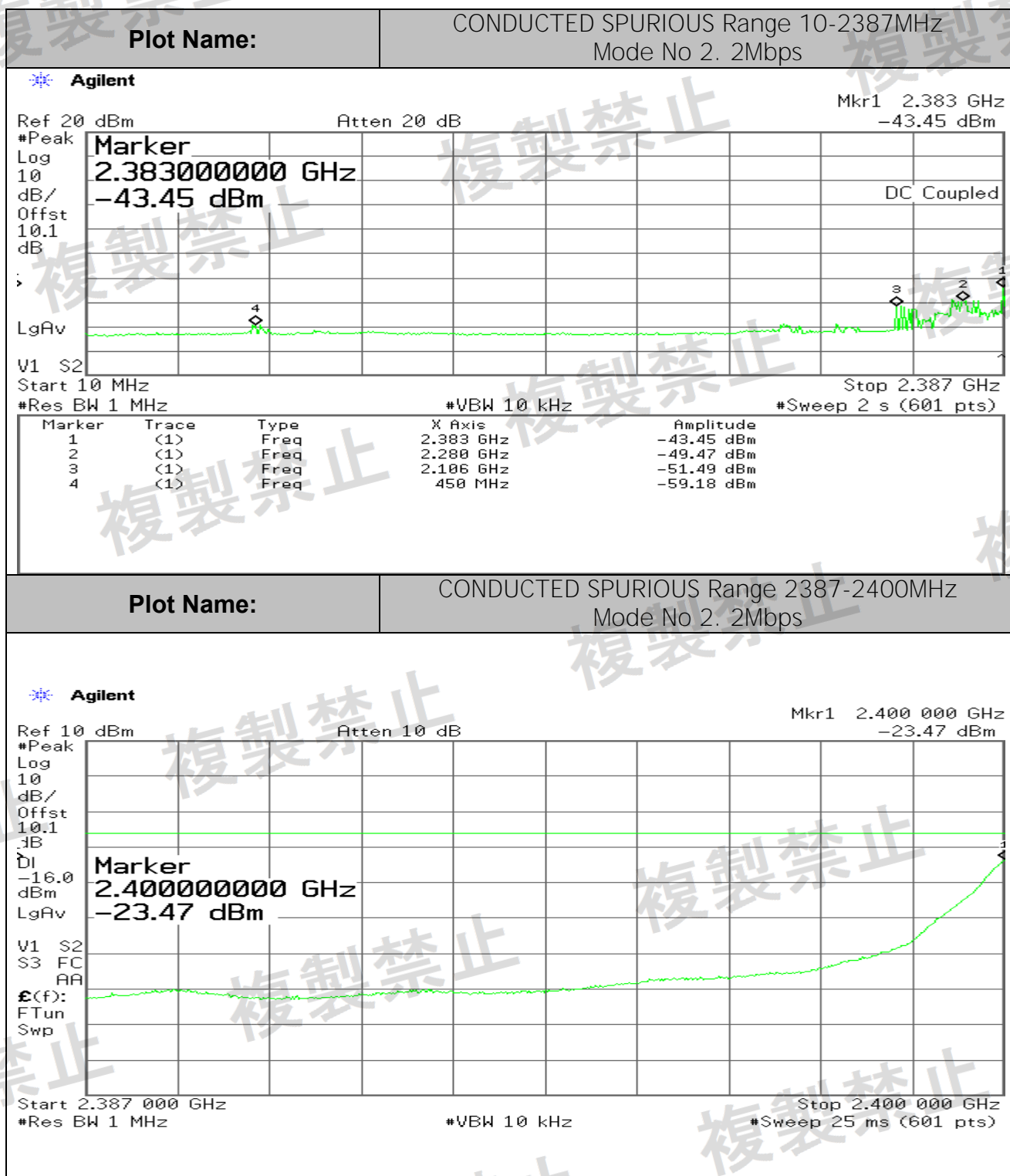
\* Proper RBW and channel power setting were chosen in order to meet the limit.

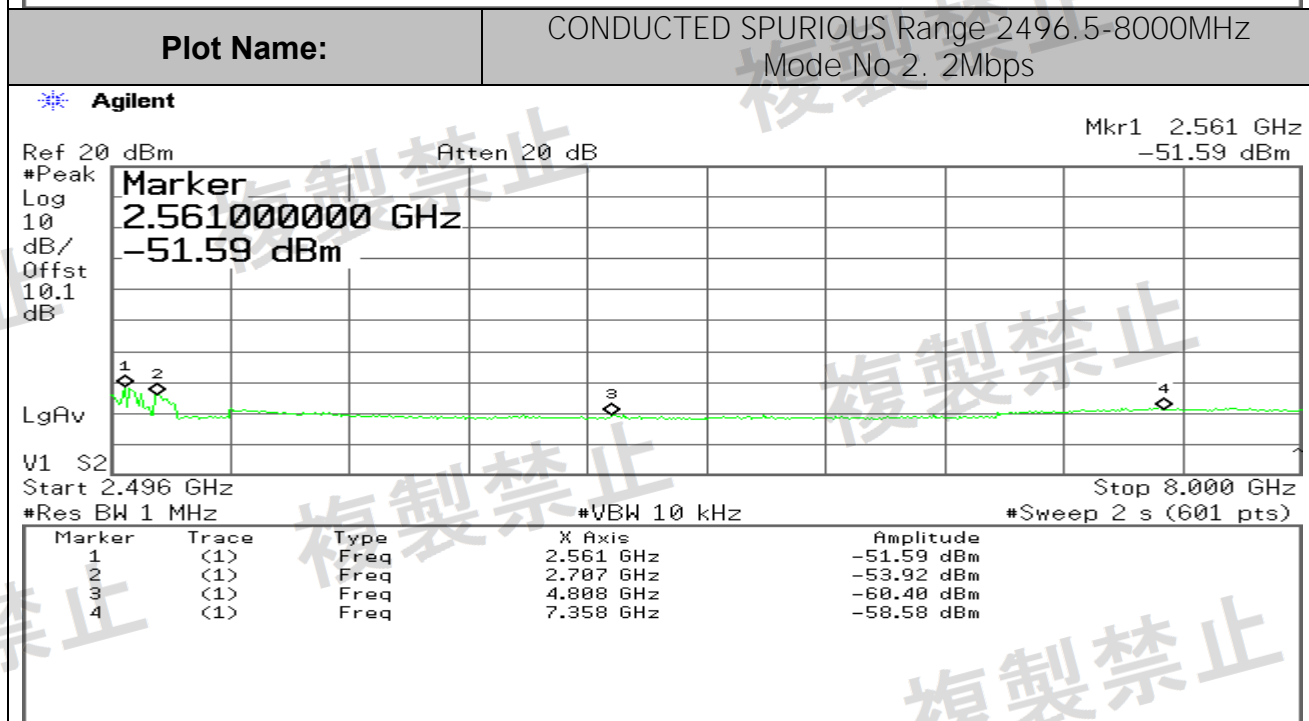
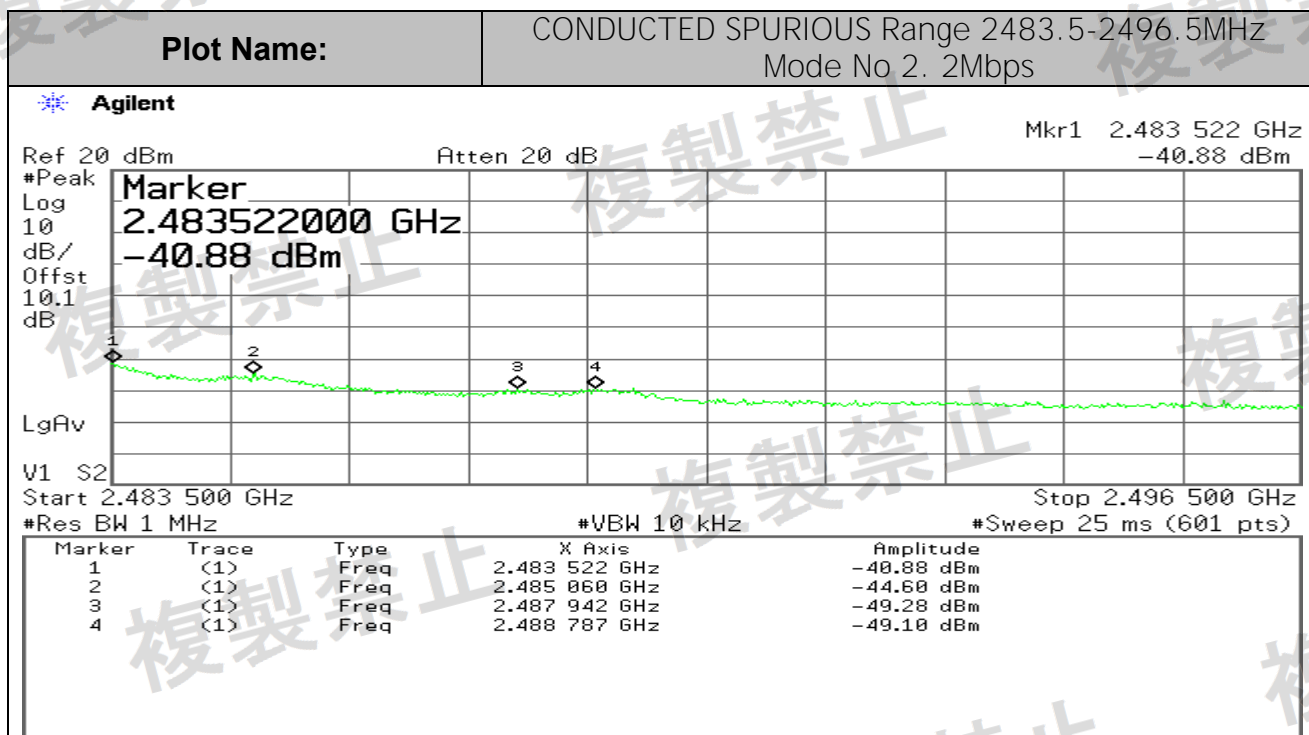
TX Spurious via Conducted Measurement:

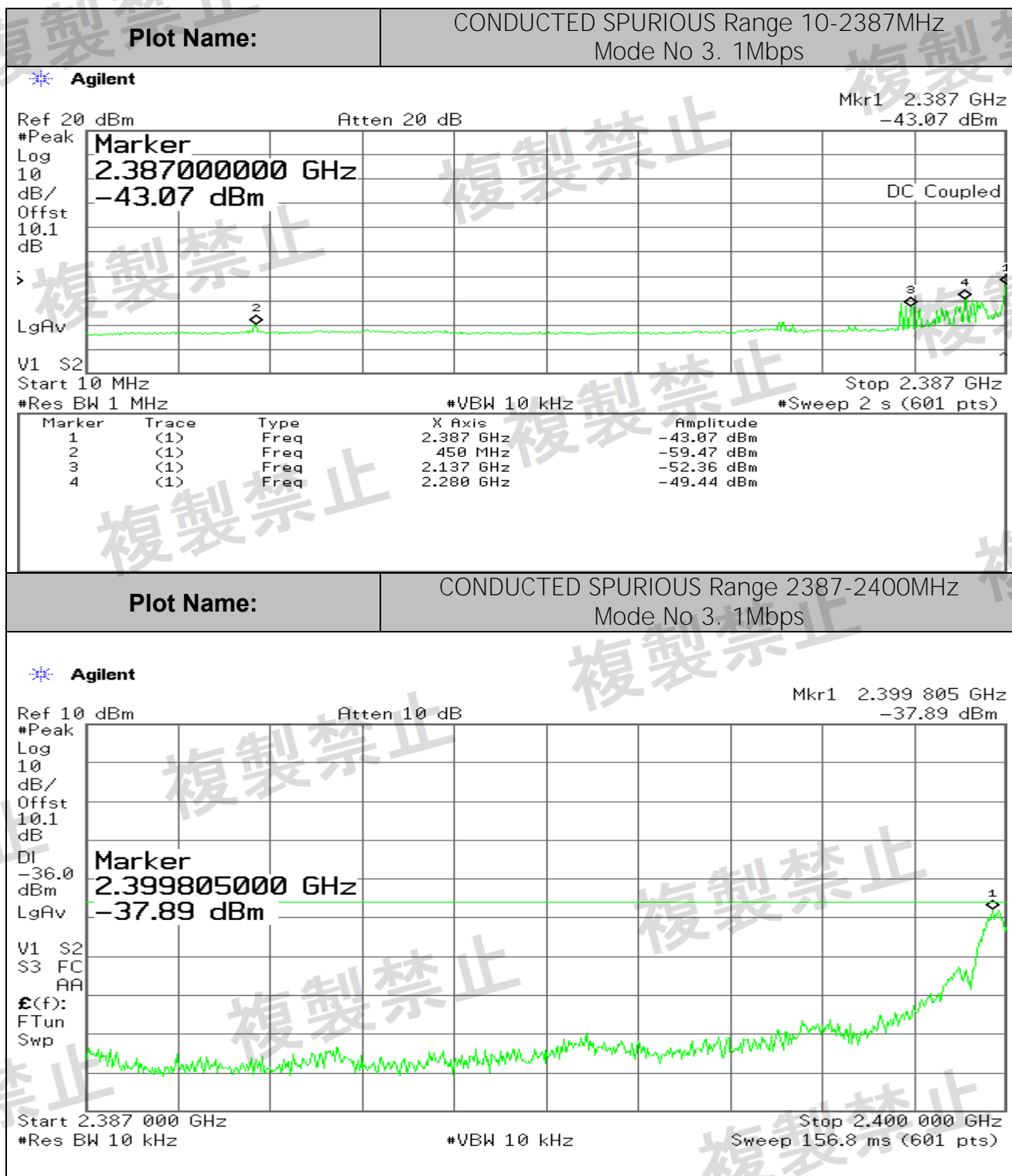


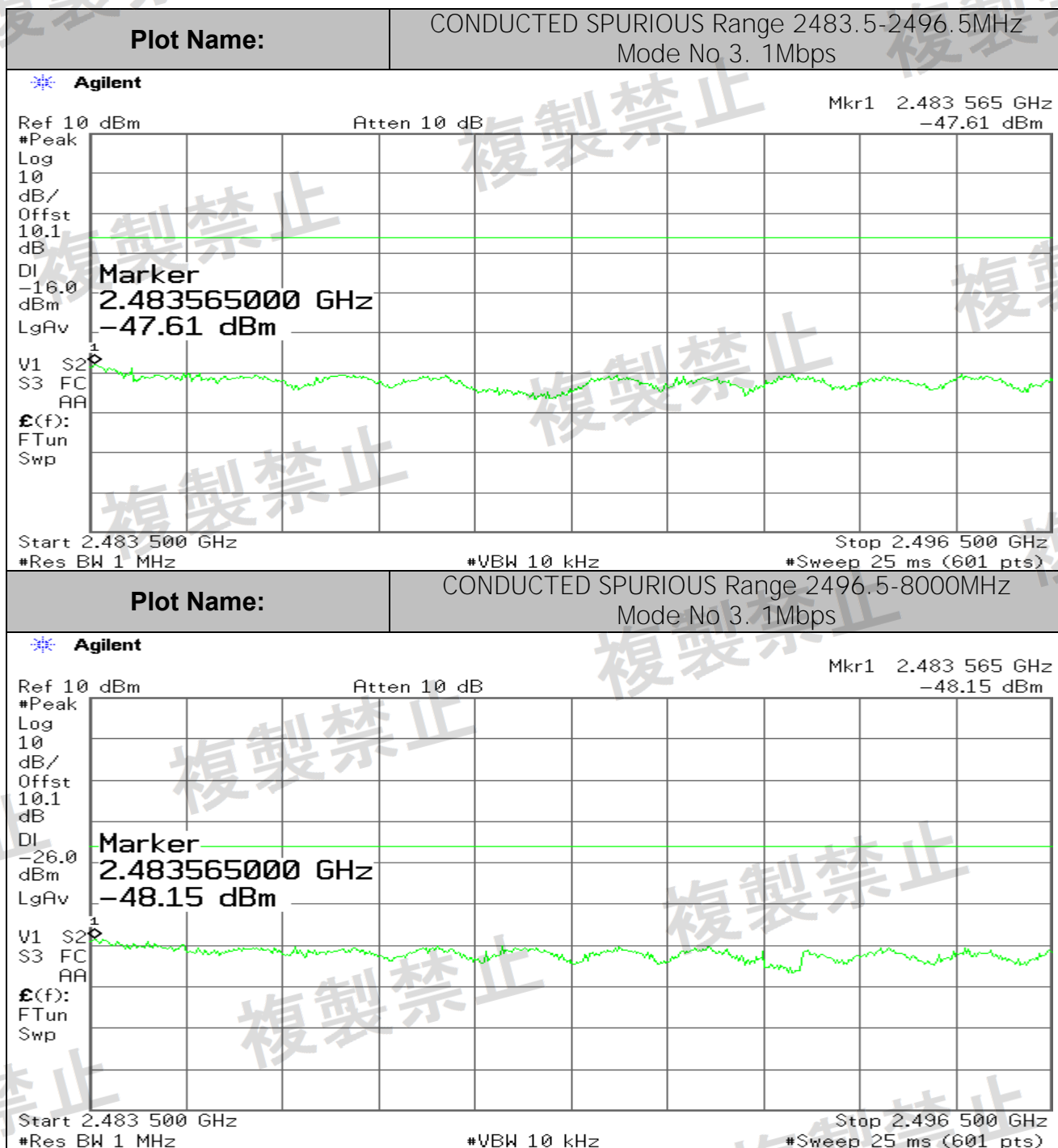








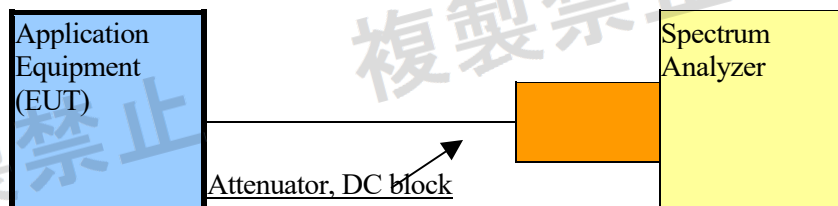






## 7.5. RX Spurious Emission

### ◆ Measurement System Diagram



- ◆ Conditions of Application Equipment (EUT)
  - The modulation state shall be “continuous receiving mode”.
- ◆ Spectrum Analyzer Conditions
  - Start Frequency : Start Frequency of frequency range to measure (10MHz or 1GHz or 3GHz)
  - Stop Frequency : Stop Frequency of frequency range to measure (1GHz or 3GHz or 8GHz)
  - Span : AUTO (Measurement Range)
  - RBW : 100kHz, VBW : 100kHz
  - Sweep time : AUTO or more
  - Log scale : 10dB/Div, Data points : 501points (400 points or more)
  - Reference level : -30dBm, Attenuator : 0dB
  - Detection : Positive Peak, Sweep mode : Continuous
  - Marker : Spot
- ◆ Measurement Procedure and Capture Image
  - i. Single
  - ii. Peak Search
  - iii. Read and record the value
- ◆ Technical Regulation
  - RX Spurious Emission Strength :  
4nW or below (i.e. -54dBm)  
\*Frequency Range: 10MHz-1GHz  
( Radio Law Radio Equipment Regulations Article 24)
  - 20nW or below (i.e. -47dBm)  
\*Frequency Range: 1GHz-8GHz  
( Radio Law Radio Equipment Regulations Article 24)

## RESULTS

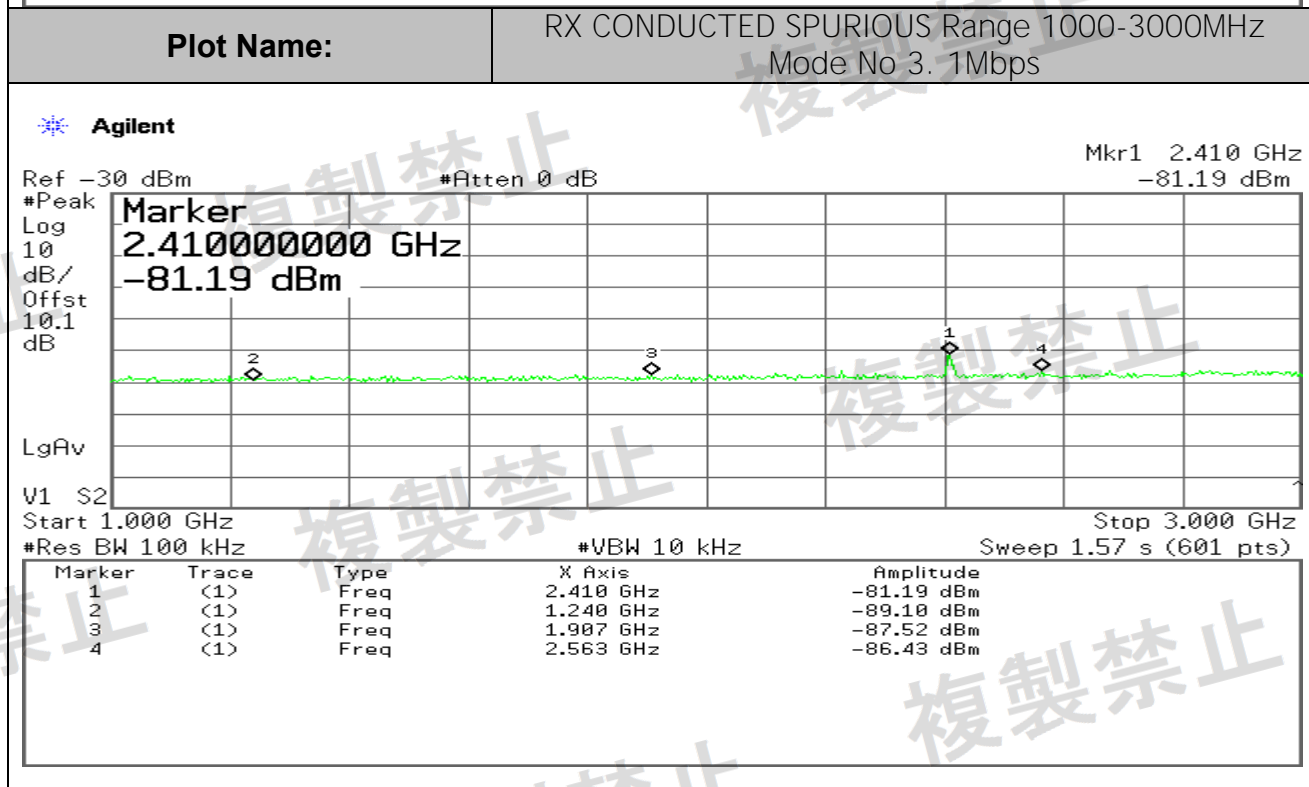
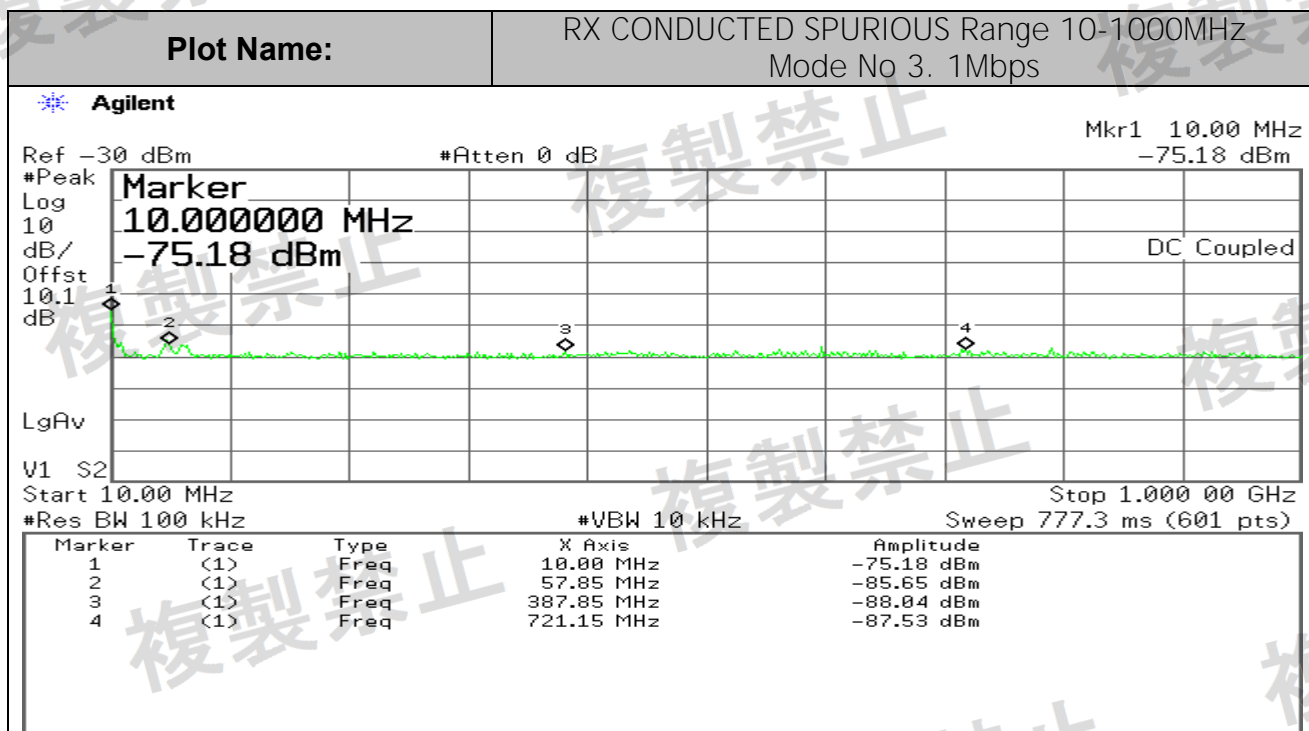
No non-compliance noted

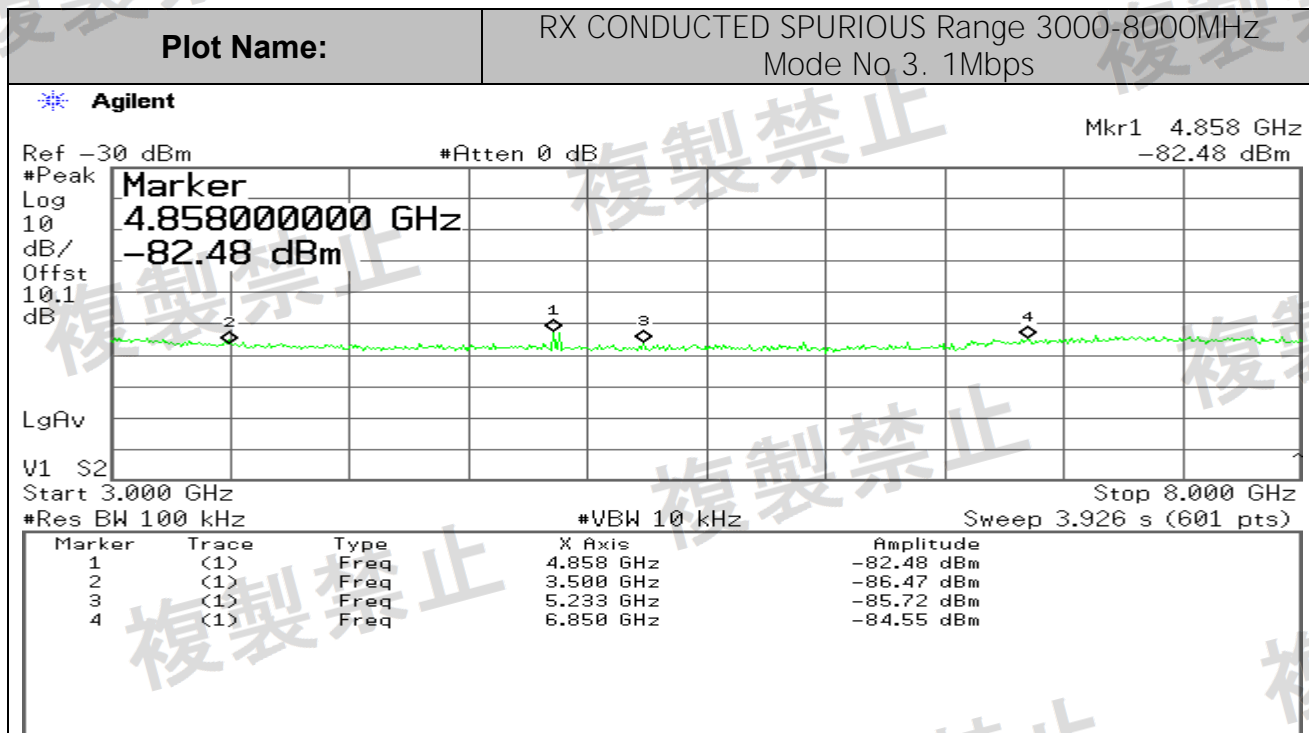
Data Summary:

Frequency Range (MHz)	Limit (dBm/100KHz)	Max. Spurious * (dBm)			Meet Limit
10~1000	-54	-75.18			Yes
1000-3000	-47	-81.19			Yes
3000-8000	-47	-82.48			Yes

\* Proper RBW and channel power setting were chosen in order to meet the limit. The worst case of all modes was recorded for final data.

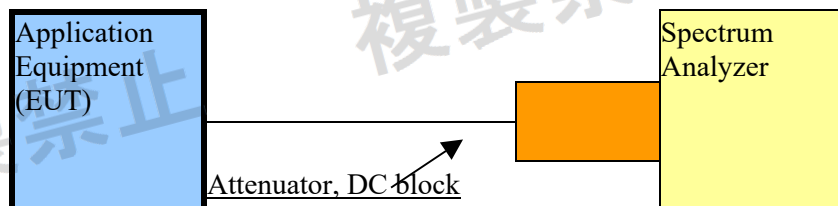
RX Spurious via Conducted Measurement:





## 7.6 Frequency Hopping Dwell Time

### ◆ Measurement System Diagram



- ◆ Conditions of Application Equipment (EUT)
  - Set the application equipment (EUT) to the measurement frequency.
  - The modulation state shall be “continuous(burst) transmission mode”. If impossible, it shall be “continuous frequency-hopping mode”.
- ◆ Spectrum Analyzer Conditions
  - Center Frequency : 2441MHz
  - Span : Zero Span, Time span : 5msec or 10msec(the case of continuous frequency-hopping mode)
  - RBW : 1MHz, VBW : 100kHz
  - Log scale : 10dB/Div, Data points : 501points (400 points or more)
  - Reference level : 0dBm, Attenuator : 10dB
  - Detection : Positive Peak, Sweep mode : Continuous
- ◆ Measurement Procedure and Capture Image in Spectrum Analyzer
  - i. Single Sweep (You need to stop by the picture which can be confirm on-time and off-time clearly.)
  - ii. Marker -> Normal Marker
  - iii. The marker is adjusted to the left end of a waveform to measure.
  - iv. Marker -> Delta Marker
  - v. The marker is adjusted to the right end of a waveform to measure.
  - vi. Read and record the maximum value
- ◆ Technical Regulation

Frequency Dwell Time : 0.4seconds or below  
( Radio Law Radio Equipment Regulations Article 49-20 )
- ◆ Calculation Method (Reference)
  - Burst Ratio (duty-cycle)= (ON time) / {(ON time) + (OFF time)}
  - Dwell time = [SBW/Symbol rate/hopping numbers] x (duty-cycle) x 0.4
  - = Spread Factor/hopping numbers] x (duty-cycle) x 0.4

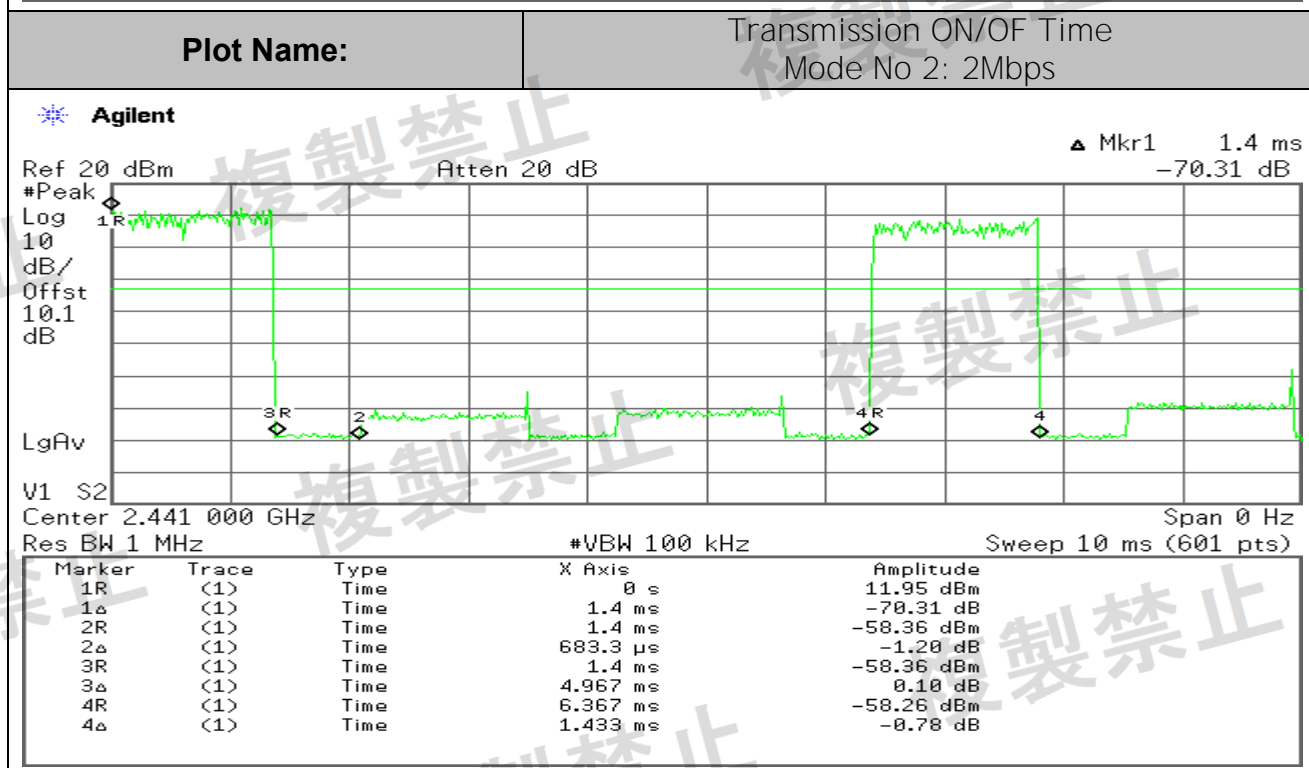
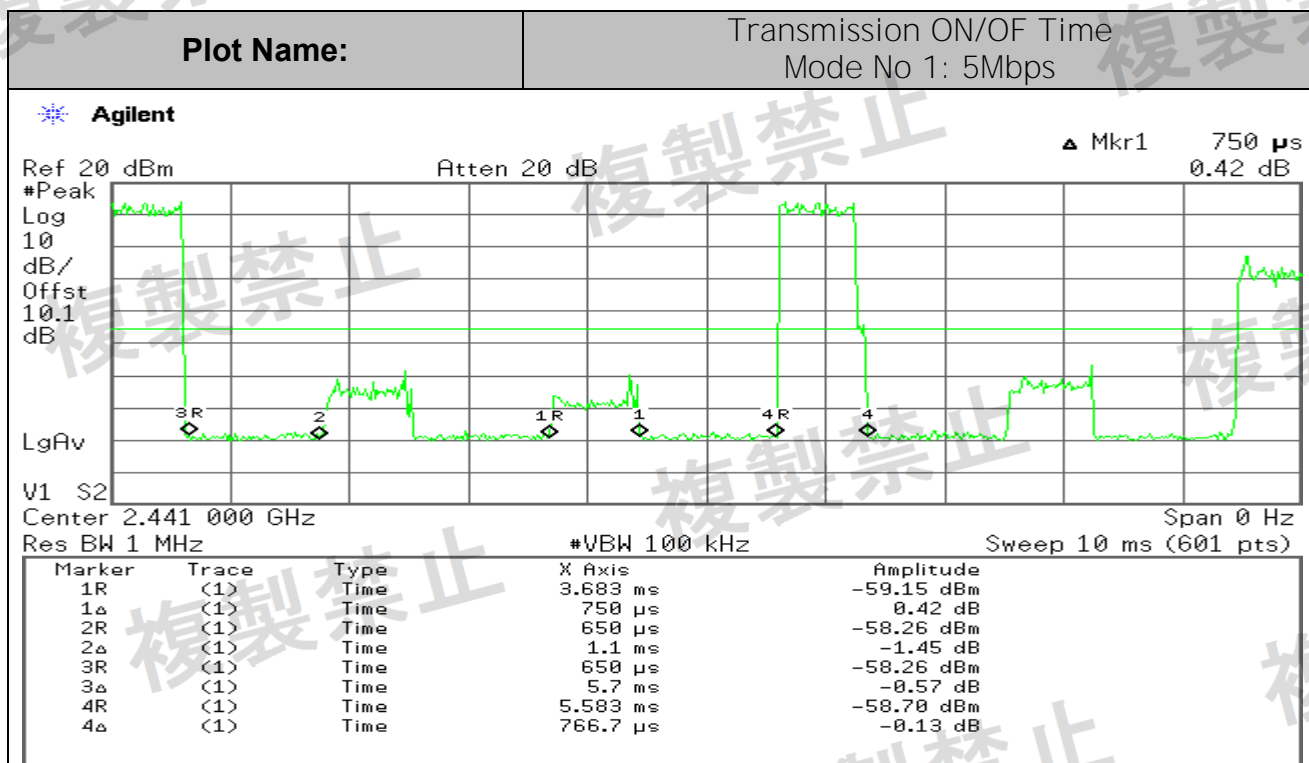
### RESULTS

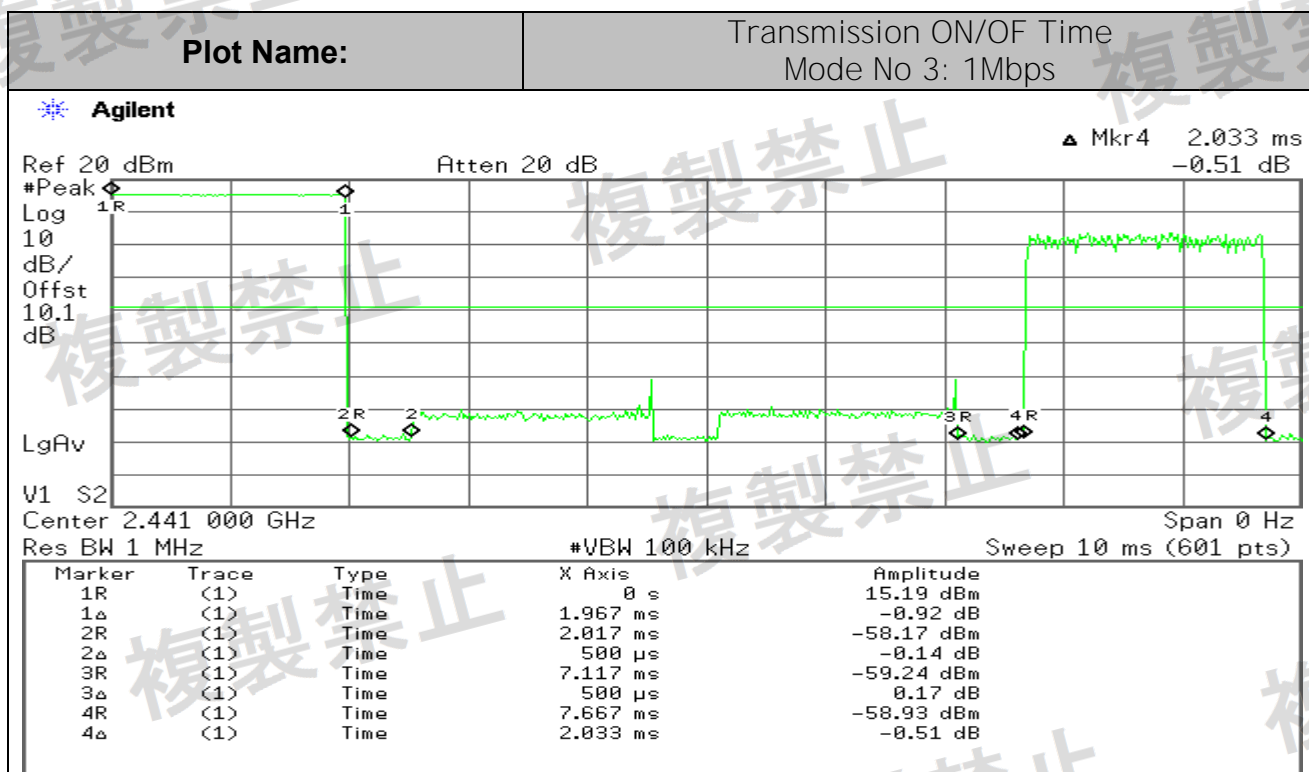
No non-compliance noted



Transmission ON/OFF Time, Burst Ratio & Dwell Time

Mod BW	ON Time (ms)	OFF Time (ms)	Burst Ratio	Spread Factor	Hopping Numbers	Dwell Time (s)
5M bps	0.750	1.1	0.43	40.42	22	0.316
2M bps	1.4	0.683	0.67	35.85	36	0.267
1M bps	1.967	0.500	0.80	71.75	66	0.348





Modulation	Channel Observed		
5Mbps	22		
2Mbps	36		
1Mbps	66		

## 8. SETUP PHOTOS

Conducted measurement at antenna port



### Frequency Tolerance Test





## 9. APPENDIX

LABEL

PRODUCT PHOTOS

Label on Modular

**City Theatrical**  
**2400MHZ MULTIVERSE MODULE**  
**Model No.: 5995**



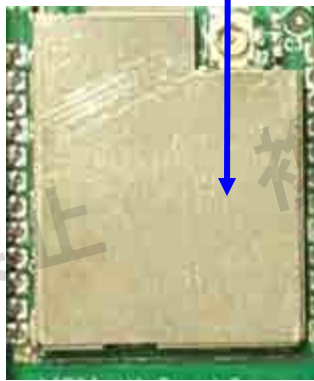
**R**

020-180084

**FCC ID: VU65995 IC: 7480A-5995**

( compliance statement shown in the manual)

**Product with ID**



## PRODUCT PHOTOS

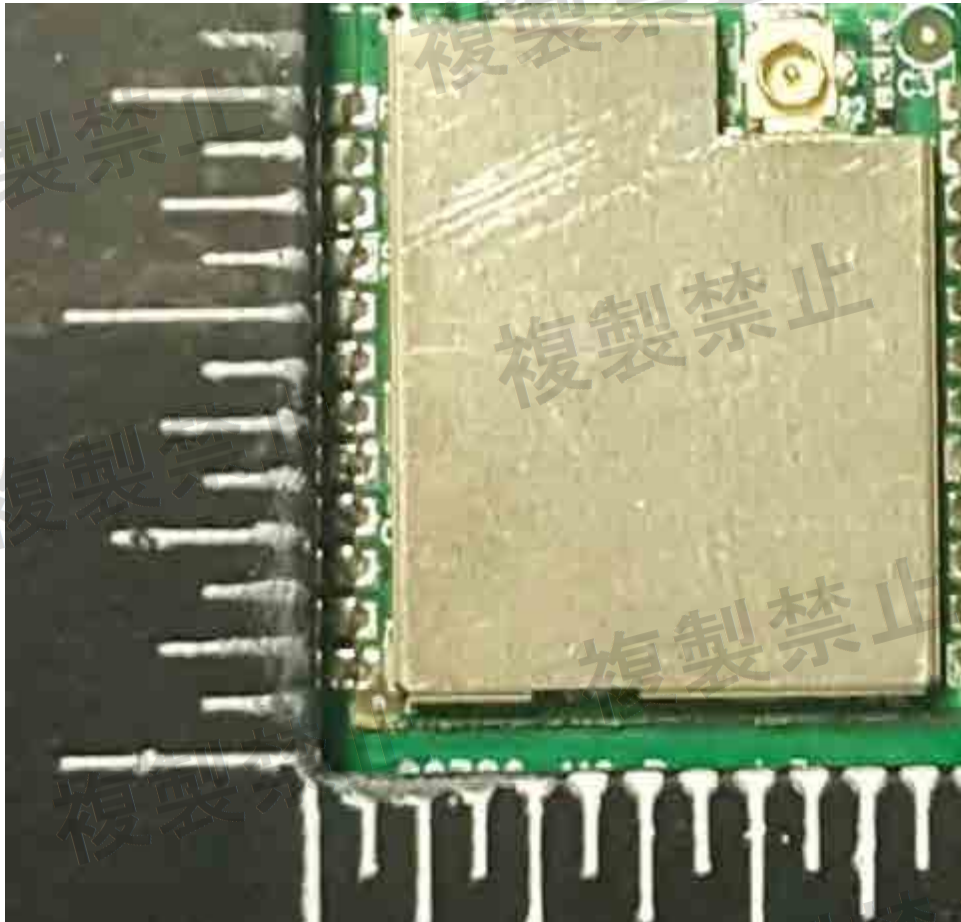


Fig. 1 Front View with Cover



Fig. 2 Back View





Fig 3 Inside View





Whip Antenna



Panel Antenna



Yagi Antenna