

# Shenzhen Toby Technology Co., Ltd.

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# **FCC Radio Test Report** FCC ID: 2AFPV-M1

## **Original Grant**

Report No. TB-FCC145045

**Applicant** Shenzhen Yuan Co., Ltd.

**Equipment Under Test (EUT)** 

**EUT Name DLP LED Projector** 

Model No. M1

M1BK, M1BL, M1R, M1Y, M1W, M1S+, M1MAX Series Model No.

**Brand Name ZECO** 

**Receipt Date** 2015-08-10

**Test Date** 2015-08-10 to 2015-08-24

**Issue Date** 2015-08-25

**Standards** FCC Part 15: 2014, Subpart C(15.247)

**Test Method** ANSI C63.10:2013

**Conclusions PASS** 

In the configuration tested, the EUT complied with the standards specified above,

The EUT technically complies with the FCC requirements

**Test/Witness Engineer** 

**Approved& Authorized** 

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0

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## 1. General Information about EUT

### 1.1 Client Information

**Applicant**: Shenzhen Yuan Co., Ltd.

Address : 2308 Floor 23.Zhantao Technology Building, Minzhi Road, Minzhi

Street ,Baoan District, Shenzhen City, China

Manufacturer: Shenzhen Yuan Co., Ltd.

Address : 2308 Floor 23. Zhantao Technology Building, Minzhi Road, Minzhi

Street ,Baoan District, Shenzhen City, China

## 1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	DLP LED Projector		
Models No.	<u>)</u> :	M1, M1BK, M1BL, M1R, M	11Y, M1W, M1S+, M1MAX	
Model Difference	18		these models are identical in the same PCB, layout and electrical uit, the only difference is model name for commercial.	
		Operation Frequency: Bluetooth:2402~2480MHz	THE PARTY OF THE P	
		Number of Channel:	Bluetooth:79 Channels see note (2)	
Product Description		Max Peak Output Power:	π/4-DQPSK:7.345dBm	
Description		Antenna Gain:	2.5 dBi Embedded Antenna	
		Modulation Type:	GFSK 1Mbps(1 Mbps)	
			π /4-DQPSK(2 Mbps)	
Value of the same			8-DPSK(3 Mbps)	
Power Supply	:		Host System by USB cable.	
	d	DC power supplied by AC/DC Adapter.		
Miles of		DC power by Li-ion Battery		
Power Rating	:	DC 5.0V by USB cable.		
		DC 3.7V Li-ion Battery.		
	7	AC/DC Adapter:		
		Input:100~240V, 0.4A, 50/	60Hz	
		Output:5V, 2A		
Connecting I/O Port(S)		Please refer to the User's	Manual	

### Note:

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- (2) This Test Report is FCC Part 15.247 for Bluetooth, and test procedure in accordance with Public Notice: DA 00-705.
- (3) Channel List:



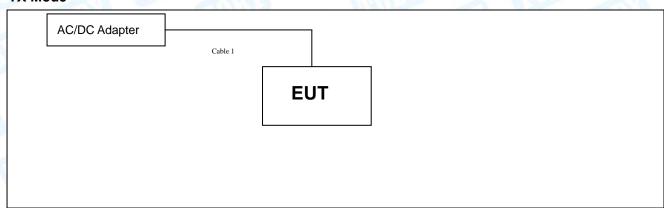
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Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454	9 7 6	111
26	2428	53	2455	1000	

(4) The Antenna information about the equipment is provided by the applicant.

# 1.3 Block Diagram Showing the Configuration of System Tested

## **TX Mode**





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## 1.4 Description of Support Units

	Eq	uipment Informatio	on	
Name	Model	FCC ID/DOC	Manufacturer	Used "√"
333		100		Till 1
		Cable Information		
Number	Shielded Type	Ferrite Core	Length	Note
Cable 1	YES	NO	1.0M	Accessories

## 1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

	For Conducted Test
Final Test Mode	Description
Mode 1	AC Charging with TX GFSK Mode

For Radiated Test			
Final Test Mode Description			
Mode 1	AC Charging with TX GFSK Mode		
Mode 2	TX Mode(GFSK) Channel 00/39/78		
Mode 3	TX Mode( π /4-DQPSK) Channel 00/39/78		
Mode 4	TX Mode(8-DPSK) Channel 00/39/78		
Mode 5	Hopping Mode(GFSK)		
Mode 6	Hopping Mode( π /4-DQPSK)		
Mode 7	Hopping Mode(8-DPSK)		

### Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate. We have pretested all the test mode above.



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According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

TX Mode: GFSK (1 Mbps)

TX Mode: π/4-DQPSK (2 Mbps)

TX Mode: 8-DPSK (3 Mbps)

(2) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on X-plane as the normal use. Therefore only the test data of this X-plane was used for radiated emission measurement test.

## 1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of Bluetooth mode.

Test Software Version		VLAN Test Tool Version 1.	0.4
Frequency	2402 MHz	2441MHz	2480 MHz
GFSK	DEF	DEF	DEF
π /4-DQPSK	DEF	DEF	DEF
8-DPSK	DEF	DEF	DEF

## 1.7 Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (U <sub>Lab</sub> )
a U	Level Accuracy:	THE TOTAL
Conducted Emission	9kHz~150kHz	±3.42 dB
	150kHz to 30MHz	±3.42 dB
Dadiated Emission	Level Accuracy:	. 4 CO dD
Radiated Emission	9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy:	±4.40 dB
Radiated Effilssion	30MHz to 1000 MHz	±4.40 db
Radiated Emission	Level Accuracy:	.4.20 dD
Radiated Emission	Above 1000MHz	±4.20 dB



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## 1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

### **CNAS (L5813)**

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

### FCC List No.: (811562)

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

### IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

May 22, 2014 certificated by TUV Rheinland(China) Co., Ltd. with TUV certificate No.: UA 50282953 0001 and report No.: 17026822 002. The certificate is valid until the next scheduled audit or up to 18 months, at the discretion of TUV Rhineland.



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# 2. Test Summary

	F	CC Part 15 Subpart C(15.247)/ RSS	247 Issue 1		
Standard Section		Total Manua	landarra and		
FCC	IC	Test Item	Judgment	Remark	
15.203	9	Antenna Requirement	PASS	N/A	
15.207	RSS-GEN 7.2.2	Conducted Emission	PASS	N/A	
15.205	RSS-Gen 7.2.3	Restricted Bands	PASS	N/A	
15.247(a)(1)	RSS 247 5.1 (2)	Hopping Channel Separation	PASS	N/A	
15.247(a)(1)	RSS 247 5.1 (4)	Dwell Time	PASS	N/A	
15.247(b)(1)	RSS 247 5.4 (2)	Peak Output Power	PASS	N/A	
15.247(b)(1)	RSS 247 5.1 (4)	Number of Hopping Frequency	PASS	N/A	
15.247(c)	RSS 247 5.5	Radiated Spurious Emission	PASS	N/A	
15.247(a)	RSS 247 5.1 (1)	99% Occupied Bandwidth & 20dB Bandwidth	PASS	99%OBW GFSK:997.8113kHz π/4-DQPSK: 1076.20kHz 8-DPSK: 1126.10kHz	



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# 3. Test Equipment

Conducted	d Emission Te	est			
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Aug. 07, 2015	Aug. 06, 2016
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Aug. 07, 2015	Aug. 06, 2016
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Aug. 07, 2015	Aug. 06, 2016
LISN	Rohde & Schwarz	ENV216	101131	Aug. 07, 2015	Aug. 06, 2016
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
	Emission Tes				Cal. Due
Spectrum	Agilopt	E4407B	MV45106456	Son 01 2014	
Analyzer	Agilent	E4407B	MY45106456	Sep. 01, 2014	Aug. 31, 2015
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Aug. 07, 2015	Aug. 06, 2016
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 28, 2015	Mar. 27, 2016
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 28, 2015	Mar. 27, 2016
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 28, 2015	Mar. 27, 2016
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 28, 2015	Mar. 27, 2016
Pre-amplifier	Sonoma	310N	185903	Mar. 28, 2015	Mar. 27, 2016
Pre-amplifier	HP	8447B	3008A00849	Mar. 28, 2015	Mar. 27, 2016
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 28, 2015	Mar. 27, 2016
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A



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## 4. Conducted Emission Test

#### 4.1 Test Standard and Limit

4.1.1Test Standard FCC Part 15.207

#### 4.1.2 Test Limit

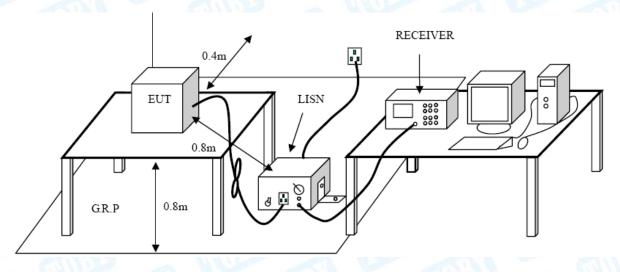
#### **Conducted Emission Test Limit**

Eroguopov	Maximum RF Line Voltage (dBμV)		
Frequency	Quasi-peak Level	Average Level	
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *	
500kHz~5MHz	56	46	
5MHz~30MHz	60	50	

#### Notes:

- (1) \*Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 4.2 Test Setup



### 4.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.



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I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis

The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.

## 4.4 EUT Operating Mode

Please refer to the description of test mode.

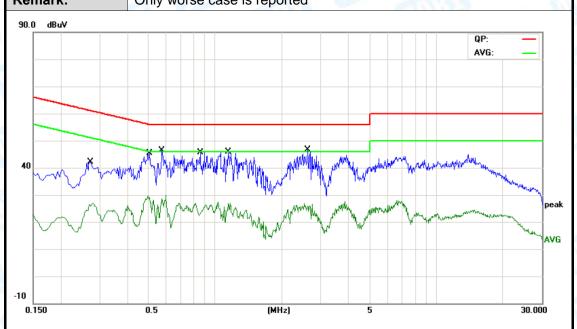
### 4.5 Test Data

Please see the next page.





EUT: **DLP LED Projector Model Name:** M1 **Relative Humidity:** Temperature: 25 ℃ 55% Test Voltage: AC 120V/60 Hz Terminal: Line **Test Mode:** AC Charging with TX GFSK Mode 2402 MHz Remark: Only worse case is reported



No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
	MHz	dBu∨	dB	dBuV	dBu∀	dB	Detector
1	0.2740	27.35	10.02	37.37	60.99	-23.62	QP
2	0.2740	15.76	10.02	25.78	50.99	-25.21	AVG
3	0.5060	28.81	10.02	38.83	56.00	-17.17	QP
4	0.5060	16.82	10.02	26.84	46.00	-19.16	AVG
5 *	0.5740	31.95	10.06	42.01	56.00	-13.99	QP
6	0.5740	18.04	10.06	28.10	46.00	-17.90	AVG
7	0.8540	26.88	10.09	36.97	56.00	-19.03	QP
8	0.8540	12.64	10.09	22.73	46.00	-23.27	AVG
9	1.1460	28.48	10.06	38.54	56.00	-17.46	QP
10	1.1460	15.49	10.06	25.55	46.00	-20.45	AVG
11	2.6220	26.30	10.04	36.34	56.00	-19.66	QP
12	2.6220	14.26	10.04	24.30	46.00	-21.70	AVG



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Model Name : M1
<b>Relative Humidity:</b> 55%
FSK Mode 2402 MHz
orted
QP: — AVG: —
peak AVG
Hz) 5 30.000
rect Measure- ctor ment Limit Over
3 dBuV dBuV dB Detector
03 38.05 56.37 -18.32 QP
03 26.20 46.37 -20.17 AVG
02 41.18 56.00 -14.82 QP
02 41.18 56.00 -14.82 QP 02 24.69 46.00 -21.31 AVG
02 24.69 46.00 -21.31 AVG
02 24.69 46.00 -21.31 AVG 14 38.83 56.00 -17.17 QP

10.06

10.06

10.06

10.06

34.05

21.14

38.46

27.64

56.00 -21.95

46.00 -24.86

60.00 -21.54

50.00 -22.36

**Emission Level= Read Level+ Correct Factor** 

23.99

11.08

28.40

17.58

3.7540

3.7540

7.1300

7.1300

9

10

11 12 QP

AVG

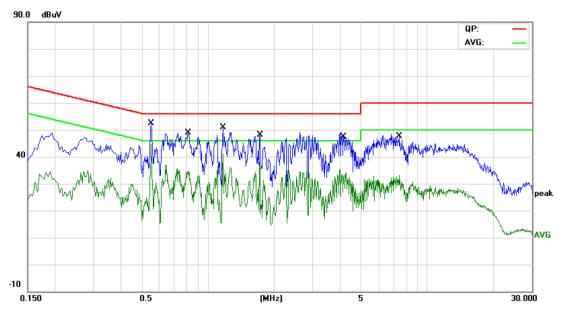
QP

AVG



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EUT:	DLP LED Projector	Model Name :	M1
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 240V/60 Hz		33
Terminal:	Line		
Test Mode:	AC Charging with TX GFSk	Mode 2402 MHz	CHILL
Remark:	Only worse case is reported	d Comment	
90.0 dBuV			OP:



No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBu∨	dB	dBu∀	dBu∀	dB	Detector
1	0.5500	40.24	10.04	50.28	56.00	-5.72	QP
2 *	0.5500	31.84	10.04	41.88	46.00	-4.12	AVG
3	0.8100	35.06	10.10	45.16	56.00	-10.84	QP
4	0.8100	24.35	10.10	34.45	46.00	-11.55	AVG
5	1.1700	38.75	10.06	48.81	56.00	-7.19	QP
6	1.1700	27.04	10.06	37.10	46.00	-8.90	AVG
7	1.7180	33.57	10.06	43.63	56.00	-12.37	QP
8	1.7180	22.39	10.06	32.45	46.00	-13.55	AVG
9	4.1500	32.81	9.99	42.80	56.00	-13.20	QP
10	4.1500	21.57	9.99	31.56	46.00	-14.44	AVG
11	7.4140	31.37	10.07	41.44	60.00	-18.56	QP
12	7.4140	18.41	10.07	28.48	50.00	-21.52	AVG





EUT: DLP LED Projector Model Name: M1

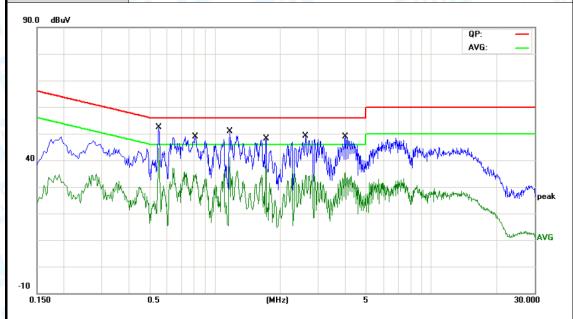
Temperature: 25 °C Relative Humidity: 55%

Test Voltage: AC 240V/60 Hz

Terminal: Neutral

Test Mode: AC Charging with TX GFSK Mode 2402 MHz

Remark: Only worse case is reported



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∨	dB	dBu∀	dBu∀	dB	Detector
1		0.5500	33.85	10.02	43.87	56.00	-12.13	QP
2	*	0.5500	26.43	10.02	36.45	46.00	-9.55	AVG
3		0.8100	30.41	10.07	40.48	56.00	-15.52	QP
4		0.8100	21.40	10.07	31.47	46.00	-14.53	AVG
5		1.1700	32.11	10.14	42.25	56.00	-13.75	QP
6		1.1700	19.43	10.14	29.57	46.00	-16.43	AVG
7		1.7180	26.24	10.09	36.33	56.00	-19.67	QP
8		1.7180	14.20	10.09	24.29	46.00	-21.71	AVG
9		2.6220	31.06	10.06	41.12	56.00	-14.88	QP
10		2.6220	22.31	10.06	32.37	46.00	-13.63	AVG
11		3.9860	26.04	10.06	36.10	56.00	-19.90	QP
12		3.9860	14.98	10.06	25.04	46.00	-20.96	AVG



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## 5. Radiated Emission Test

## 5.1 Test Standard and Limit

5.1.1 Test Standard FCC Part 15.209

5.1.2 Test Limit

### Radiated Emission Limit (9 kHz~1000MHz)

Frequency (MHz	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

## Radiated Emission Limit (Above 1000MHz)

Frequency	Class B (dBuV/m)(at 3m)				
(MHz)	Peak	Average			
Above 1000	74	54			

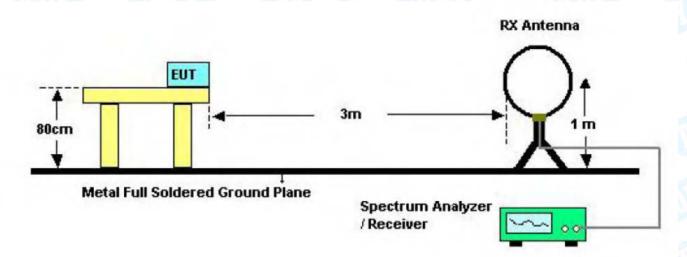
### Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m)

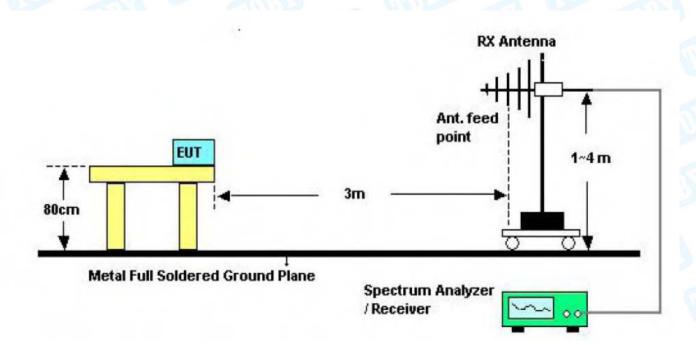


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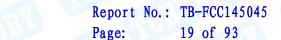
## 5.2 Test Setup



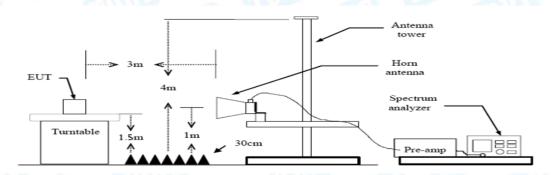
Bellow 30MHz Test Setup



Bellow 1000MHz Test Setup







Above 1GHz Test Setup

### 5.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz. The EUT was placed on a rotating 0.8m high above the ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

## 5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power in TX mode.

#### 5.5 Test Data

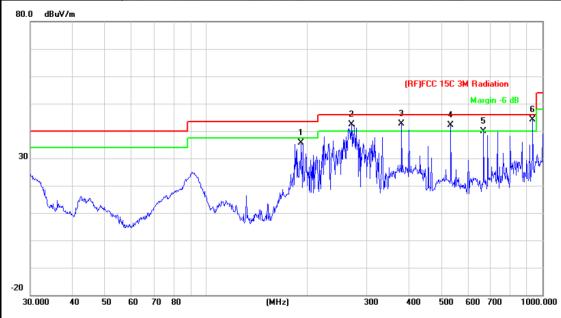
Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

Test data please refer the following pages.



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EUT:	DLP LED Projector	Model Name :	M1
Temperature:	<b>25</b> ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		19
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2402MHz		dilli
Remark:	Only worse case is reported		
Remark:	Only worse case is reported		



No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		191.7450	56.38	-20.81	35.57	43.50	-7.93	peak
2	İ	270.3747	60.04	-17.68	42.36	46.00	-3.64	peak
3	ļ	381.2485	56.74	-14.05	42.69	46.00	-3.31	peak
4	į	533.8318	52.39	-10.14	42.25	46.00	-3.75	peak
5		668.1422	47.63	-7.87	39.76	46.00	-6.24	peak
6	*	935.5461	49.05	-4.82	44.23	46.00	-1.77	peak

<sup>\*:</sup>Maximum data x:Over limit !:over margin



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EUT:	DLP LE	D Projector	- CA	Model Nam	e :	M1	1
Temperature:	25 ℃			Relative Hu	midity:	55%	10.
Test Voltage:	AC 12	0V/60Hz		A B		33	
Ant. Pol.	Vertica	al	all his		I Man		350
Test Mode:	TX GF	TX GFSK Mode 2402MHz					
Remark:	Only w	Only worse case is reported					
80.0 dBuV/m							
					(RF)FCC 15C	3M Radiation	
						Margin -6 dB	Щ
				3	* 5 * *	¥	$+\Pi$
		2		- Albin			,
30		X	رانان			Malalata	
$\sim$	J. J.		الآار	Aut. Malility		" """/W/W/W	W
	Way work		us Mark T	. 40/	u, ,		T
			V				
							+
-20							
30.000 40 5	0 60 70	80	(MHz)	300	400 500	600 700	1000.000
		<b>.</b>					
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB D	etector
1 50	1 4N80	56.00	-24.40	32.50	40.00	-7.50	naak

No.	Mk.	Freq.	Level	Factor	ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		50.4089	56.90	-24.40	32.50	40.00	-7.50	peak
2		85.8983	53.98	-22.94	31.04	40.00	-8.96	peak
3		274.1938	56.32	-17.60	38.72	46.00	-7.28	peak
4	ļ	400.4318	54.68	-12.80	41.88	46.00	-4.12	peak
5	!	533.8318	53.45	-10.14	43.31	46.00	-2.69	peak
6	*	687.1507	50.68	-7.22	43.46	46.00	-2.54	peak

<sup>\*:</sup>Maximum data x:Over limit !:over margin



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25 ℃		Model Nan	ne :	M1	
25 C	111	Relative H	umidity:	55%	MAR
AC 120V/60Hz		1 Fr		33	
Horizontal	THE STATE		Miles		666
TX GFSK Mode	2441MHz	CATALOR S	)	( UII	The same
Only worse case	is reported	12			
			(RF)FCC 15C		dB T
Reading eq. Level	(MHz) Correct Factor	Measure- ment	400 500 Limit	600 700 Over	1000.00
Hz dBuV	dB/m	dBuV/m	dBuV/m	dB	Detecto
5192 58.60	-19.33	39.27	46.00	-6.73	peak
3747 58.54	-17.68	40.86	46.00	-5.14	peak
2485 55.74	-14.05	41.69	46.00	-4.31	peak
		36.75			peak
					peak
1422 49.13	-7.87		46.00	-4.74	peak
	TX GFSK Mode Only worse case  Only worse case  Reading Level  Z dBuV 5192 58.60 6747 58.54 2485 55.74	TX GFSK Mode 2441MHz  Only worse case is reported  Reading Correct Eq. Level Factor  12 dBuV dB/m  192 58.60 -19.33  1747 58.54 -17.68  12485 55.74 -14.05  1072 48.95 -12.20	TX GFSK Mode 2441MHz Only worse case is reported  Reading Correct Measure- eq. Level Factor ment  dBuV dB/m dBuV/m 3192 58.60 -19.33 39.27 3747 58.54 -17.68 40.86 2485 55.74 -14.05 41.69 3072 48.95 -12.20 36.75	TX GFSK Mode 2441MHz  Only worse case is reported  REJECT 15C  (REJECT	TX GFSK Mode 2441MHz  Only worse case is reported  (RFJFCC 15C 3M Radiation Margin 6  70 80 (MHz) 300 400 500 600 700  Reading Correct Measure- eq. Level Factor ment Limit Over  12 dBuV dB/m dBuV/m dBuV/m dB  13192 58.60 -19.33 39.27 46.00 -6.73  13747 58.54 -17.68 40.86 46.00 -5.14  1485 55.74 -14.05 41.69 46.00 -9.25



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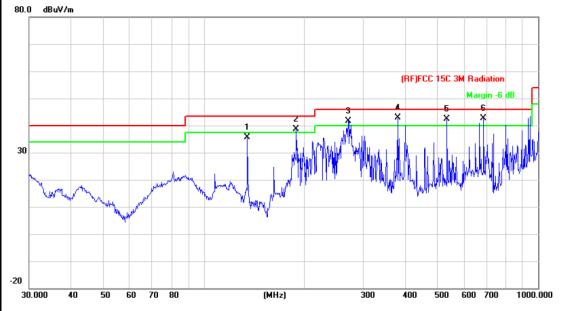
EUT:	DLP L	ED Projector		Model Nam	e:	M1	
Temperature	25 °C	C	13	Relative Humidity:			Maria
Test Voltage	: AC 1	20V/60Hz		A Comment		33	
Ant. Pol.	Vertic	cal	CARE.		A Part		130
Test Mode:	TX G	FSK Mode 2	441MHz	CATTIVE STATE		CHI.	J. Bar
Remark:	Only	worse case i	s reported	63	11111	3	6
80.0 dBuV/m							
30			w~~^^#\	2 **	(RF)FCC 15C	3M Radiation Margin -6	6 X
-20 30.000 40	50 60 70	80	(MHz)	300	400 500	600 700	1000.000
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	<b>Limit</b>	<b>Over</b>	Detector
1	50.4089	56.90	-24.40	32.50	40.00	-7.50	peak
2	274.1938	55.82	-17.60	38.22	46.00	-7.78	peak
3 !	400.4318	54.18	-12.80	41.38	46.00	-4.62	peak
4 !	533.8318	50.45	-10.14	40.31	46.00	-5.69	peak
5 *	687.1507	48.68	-7.22	41.46	46.00	-4.54	peak

<sup>\*:</sup>Maximum data x:Over limit !:over margin



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EUT:	DLP LED Projector	Model Name :	M1				
Temperature:	<b>25</b> ℃	Relative Humidity:	55%				
Test Voltage: AC 120V/60Hz							
Ant. Pol.	Horizontal		The state of the s				
Test Mode:	TX GFSK Mode 2480MHz		CHILL				
Remark:	Only worse case is reported						
80.0 dBuV/m							



No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		135.0319	57.66	-22.08	35.58	43.50	-7.92	peak
2	İ	189.0741	59.61	-20.88	38.73	43.50	-4.77	peak
3	ļ	270.3747	59.30	-17.68	41.62	46.00	-4.38	peak
4	*	381.2485	56.93	-14.05	42.88	46.00	-3.12	peak
5	ļ	533.8318	52.48	-10.14	42.34	46.00	-3.66	peak
6	ļ	687.1507	49.87	-7.22	42.65	46.00	-3.35	peak

<sup>\*:</sup>Maximum data x:Over limit !:over margin



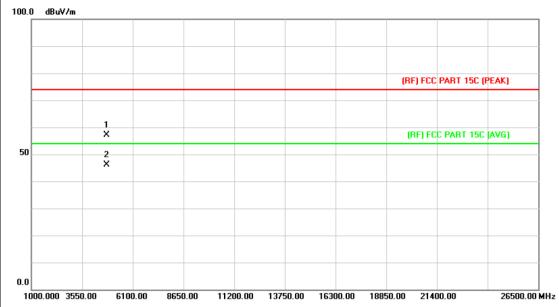
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				M1	M1	
25 ℃	110	Relative	Humidity:	55%	MAR	
AC 120V/60Hz		1 B		33		
Vertical			Man		137	
TX GFSK Mode	2480MHz		) <u> </u>	( GH)	J. J.	
Only worse case	e is reported	6.30			. (	
60 70 80	(MHz)	332	(RF)FCC 15C		1000.000	
Reading eq. Level	Correct I Factor	Measure- ment	Limit	Over		
Hz dBuV	dB/m	dBuV/m	dBuV/m	d₿	Detecto	
200 55.95	-21.90	34.05	40.00	-5.95	peak	
5169 54.62	-19.50	35.12	46.00	-10.88	peak	
1852 55.54	-17.71	37.83	46.00	-8.17	peak	
318 53.53	-12.80	40.73	46.00	-5.27	peak	
3318 49.93	-10.14	39.79	46.00	-6.21	peak	
507 48.77	-7.22	41.55	46.00	-4.45	peak	
	Vertical  TX GFSK Mode Only worse case  Only worse case  Reading Level  Z dBuV  200 55.95 6169 54.62 852 55.54 8318 53.53	Vertical  TX GFSK Mode 2480MHz  Only worse case is reported  Reading Correct Factor  Level Factor  Z dBuV dB/m  200 55.95 -21.90  8169 54.62 -19.50  8852 55.54 -17.71  1318 53.53 -12.80	Vertical  TX GFSK Mode 2480MHz  Only worse case is reported  Reading Correct Measure- eq. Level Factor ment  dBuV dB/m dBuV/m  200 55.95 -21.90 34.05 3669 54.62 -19.50 35.12 4852 55.54 -17.71 37.83 4318 53.53 -12.80 40.73	Vertical  TX GFSK Mode 2480MHz  Only worse case is reported  REFFCC 15C  (REFFCC 15C)   Vertical  TX GFSK Mode 2480MHz  Only worse case is reported  (RF)FCC 15C 3M Radiation Margin 6 0  80 70 80 (MHz) 300 400 500 600 700  Reading Correct Measure- eq. Level Factor ment Limit Over		



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EUT:	DLP LED Projector	Model Name :	M1			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	AC 120V/60Hz					
Ant. Pol.	Horizontal		1			
Test Mode:	TX GFSK Mode 2402MHz		CHILL			
Remark:	Remark: No report for the emission which more than 10 dB below the prescribed limit.					

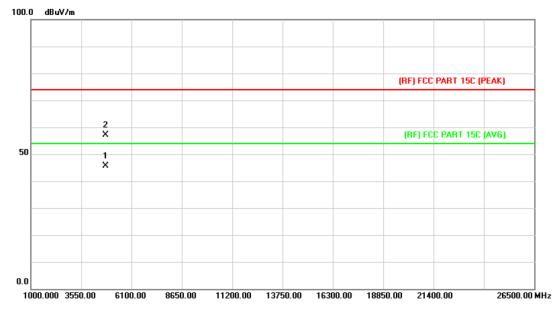


No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4804.050	43.73	13.44	57.17	74.00	-16.83	peak
2	*	4804.203	32.60	13.44	46.04	54.00	-7.96	AVG



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EUT:	UT: DLP LED Projector		M1					
Temperature:	25 ℃ Relative Hum		55%					
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz						
Ant. Pol.	Vertical	Vertical						
Test Mode:	TX GFSK Mode 2402MHz		CHILL					
Remark: No report for the emission which more than 10 dB below the prescribed limit.								

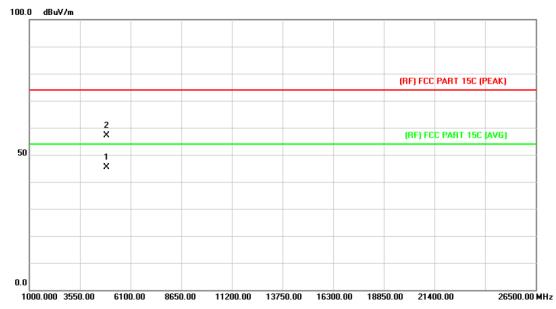


No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4803.507	32.19	13.44	45.63	54.00	-8.37	AVG
2		4803.934	43.68	13.44	57.12	74.00	-16.88	peak



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EUT:	DLP LED Projector	Model Name :	M1				
Temperature:	25 ℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz						
Ant. Pol.	Horizontal	Horizontal					
Test Mode:	TX GFSK Mode 2441MHz		CHILL				
Remark: No report for the emission which more than 10 dB below the prescribed limit.							

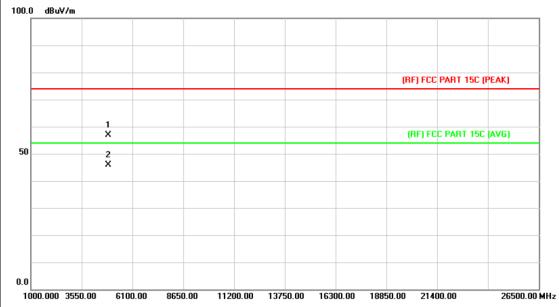


No	o. Mk	ι. Freq.	_	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4882.247	31.36	13.90	45.26	54.00	-8.74	AVG
2		4882.342	43.26	13.90	57.16	74.00	-16.84	peak



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EUT:	DLP LED Projector	Model Name :	M1			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	AC 120V/60Hz					
Ant. Pol.	Vertical					
Test Mode:	TX GFSK Mode 2441MHz		CHILL			
Remark:	No report for the emission w prescribed limit.	hich more than 10 dB b	elow the			

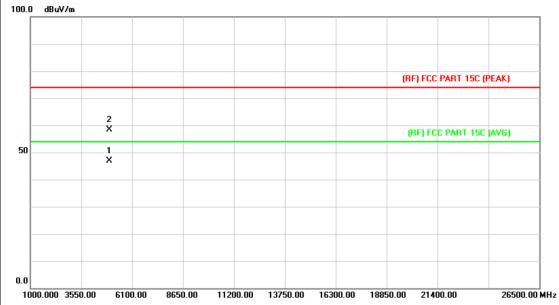


No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.987	42.89	13.90	56.79	74.00	-17.21	peak
2	*	4882.347	31.99	13.90	45.89	54.00	-8.11	AVG



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EUT:	DLP LED Projector	Model Name :	M1			
Temperature:	25 ℃	25 ℃ Relative Humidity: 55%				
Test Voltage:	AC 120V/60Hz		33			
Ant. Pol.	Horizontal	Horizontal				
Test Mode:	TX GFSK Mode 2480MHz		CHILL			
Remark:	No report for the emission wh prescribed limit.	ich more than 10 dB be	elow the			

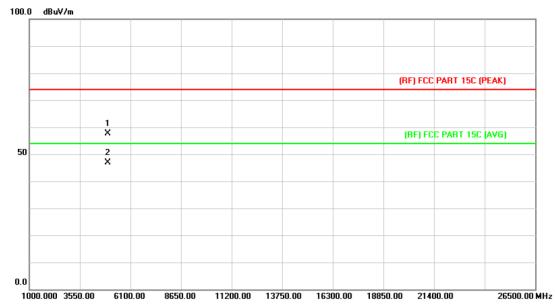


No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4959.837	32.46	14.36	46.82	54.00	-7.18	AVG
2		4959.949	44.03	14.36	58.39	74.00	-15.61	peak



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EUT:	DLP LED Projector	Model Name :	M1			
Temperature:	25 ℃	25 ℃ Relative Humidity: 55%				
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz				
Ant. Pol.	Vertical	Vertical				
Test Mode:	TX GFSK Mode 2480MHz		CHULL			
Remark:	No report for the emission which more than 10 dB below the prescribed limit.					

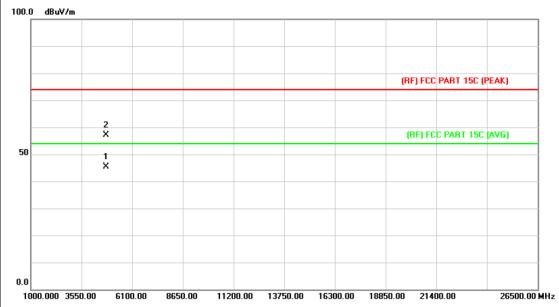


No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.909	43.32	14.36	57.68	74.00	-16.32	peak
2	*	4960.208	32.50	14.36	46.86	54.00	-7.14	AVG



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EUT:	DLP LED Projector	Model Name :	M1				
Temperature:	25 ℃	25 °C Relative Humidity: 55%					
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz					
Ant. Pol.	Horizontal	Horizontal					
Test Mode:	TX 8-DPSK Mode 2402MHz		CHI.				
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

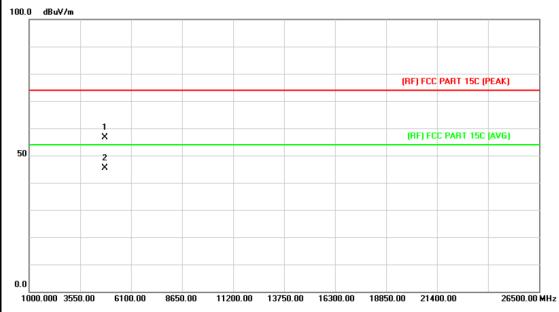


No	. Mk	. Freq.	_	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4804.155	31.95	13.44	45.39	54.00	-8.61	AVG
2		4804.460	43.75	13.44	57.19	74.00	-16.81	peak



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EUT:	DLP LED Projector	Model Name :	M1			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	AC 120V/60Hz					
Ant. Pol.	Vertical					
Test Mode:	TX 8-DPSK Mode 2402MHz		CITIE			
Remark:	No report for the emission which prescribed limit.	h more than 10 dB bel	ow the			
400.0 10.44						



No	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	O∨er	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4804.412	43.07	13.44	56.51	74.00	-17.49	peak
2	*	4804.461	31.83	13.44	45.27	54.00	-8.73	AVG



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EUT:	DLP LED Projector	Model Name :	M1			
Temperature:	25 ℃	25 ℃ Relative Humidity: 55				
Test Voltage:	AC 120V/60Hz					
Ant. Pol.	Horizontal					
Test Mode:	TX 8-DPSK Mode 2441MHz		CHILITIES			
Remark: No report for the emission which more than 10 dB below the prescribed limit.						

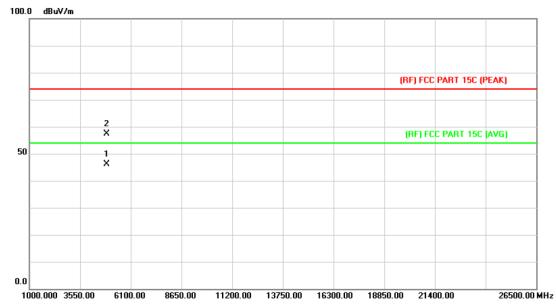


No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4882.027	43.09	13.90	56.99	74.00	-17.01	peak
2	*	4882.339	31.98	13.90	45.88	54.00	-8.12	AVG



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EUT:	DLP LED Projector	Model Name :	M1				
Temperature:	25 ℃	55%					
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz					
Ant. Pol.	Vertical	Vertical					
Test Mode:	TX 8-DPSK Mode 2441MHz		CHILL				
Remark:	No report for the emission who prescribed limit.	ich more than 10 dB b	elow the				



No	. Mk	Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.986	32.35	13.90	46.25	74.00	-27.75	peak
2	*	4882.143	43.52	13.90	57.42	54.00	3.42	AVG



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EUT:	DLP LED Projector	Model Name :	M1			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	AC 120V/60Hz					
Ant. Pol.	Horizontal					
Test Mode:	TX 8-DPSK Mode 2480MHz					
Remark:	No report for the emission which more than 10 dB below the prescribed limit.					

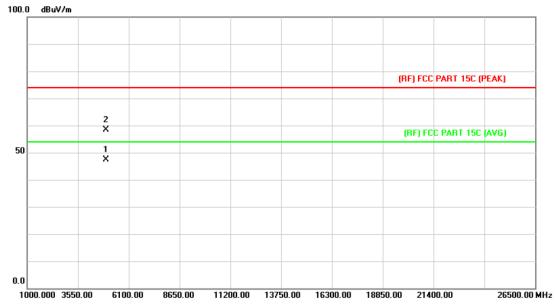


No	. Mk	. Freq.	_	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4959.743	32.37	14.36	46.73	54.00	-7.27	AVG
2		4959.800	44.05	14.36	58.41	74.00	-15.59	peak



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EUT:	DLP LED Projector	Model Name :	M1							
Temperature:	25 ℃	Relative Humidity:	55%							
Test Voltage:	age: AC 120V/60Hz									
Ant. Pol.	Vertical									
Test Mode:	TX 8-DPSK Mode 2480MHz		CHURCH							
Remark:	No report for the emission w prescribed limit.	hich more than 10 dB	below the							



N	lo. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4960.130	33.09	14.36	47.45	54.00	-6.55	AVG
2		4960.423	43.92	14.36	58.28	74.00	-15.72	peak



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# 6. Restricted Bands Requirement

#### 6.1 Test Standard and Limit

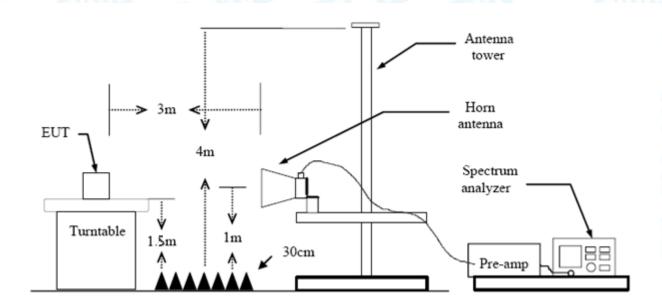
6.1.1 Test Standard FCC Part 15.209 FCC Part 15.205

6.1.2 Test Limit

Restricted Frequency	Class B (dBuV/m)(at 3m)					
Band (MHz)	Peak	Average				
310 ~2390	74	54				
2483.5 ~2500	74	54				

Note: All restriction bands have been tested, only the worst case is reported.

## 6.2 Test Setup



#### 6.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz. The EUT was placed on a rotating 0.8m high above the ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.



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(3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.

- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

## 6.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

#### 6.4 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=1 KHz with Peak Detector for Average Values.

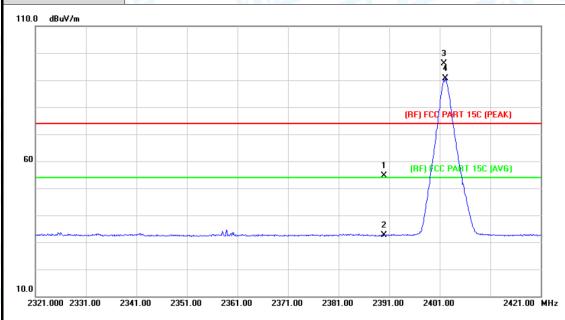
All restriction bands have been tested, only the worst case is reported.



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# (1) Radiation Test

EUT:	DLP LED Projector	Model Name :	M1
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2402MHz		
Remark:	N/A		

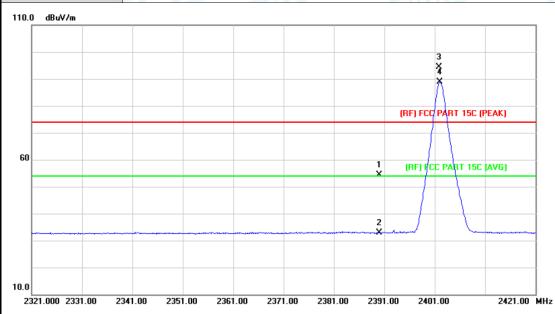


No	. Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	53.83	0.77	54.60	74.00	-19.40	peak
2		2390.000	31.76	0.77	32.53	54.00	-21.47	AVG
3	Χ	2401.900	95.19	0.82	96.01	Fundamenta	I Frequency	peak
4	*	2402.100	89.79	0.82	90.61	Fundamenta	I Frequency	AVG



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EUT:	DLP LED Projector	Model Name :	M1
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		(3)
Ant. Pol.	Vertical		
Test Mode:	TX GFSK Mode 2402MHz		CHITTE STATE
Remark:	N/A		



No.	Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	53.50	0.77	54.27	74.00	-19.73	peak
2		2390.000	32.17	0.77	32.94	54.00	-21.06	AVG
3	Х	2401.900	93.51	0.82	94.33	Fundamental	Frequency	peak
4	*	2402.000	88.09	0.82	88.91	Fundamental	Frequency	AVG



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EUT:	DLP LED Projecto	or	Model Na	me :	me: M1		
Temperature:	25 ℃		Relative I	lumidity:	55%	HILL	
Test Voltage:	AC 120V/60Hz		10		33		
Ant. Pol.	Horizontal			1 100		660	
Test Mode:	TX GFSK Mode	e 2480 MHz					
Remark:	N/A						
110.0 dBuV/m							
60	2 X X X				RT 15C (PEAK ART 15C (AVG		
10.0 2459.000 2469.00	2479.00 2489.00 2	2499.00 2509.00	2519.00 25	29.00 2539.00	) 2!	559.00 MHz	
No. Mk.	Reading Freq. Level	g Correct Factor	Measure- ment	Limit	Over		
	MHz dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	
1 * 247	79.900 89.20	1.15	90.35	Fundamental	Frequency	AVG	
2 X 248	80.100 94.64	1.15	95.79	Fundamental	Frequency	peak	
3 248	83.500 67.35	1.17	68.52	74.00	-5.48	peak	

**Emission Level= Read Level+ Correct Factor** 

50.57

1.17

2483.500

4

AVG

-2.26

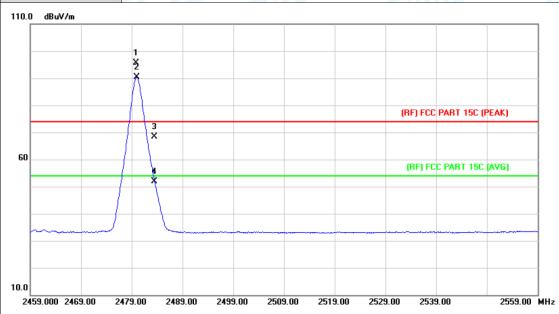
54.00

51.74



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Ę	EUT:	DLP LED Projector	Model Name :	M1
	Temperature:	25 ℃	Relative Humidity:	55%
	Test Voltage:	AC 120V/60Hz		
	Ant. Pol.	Vertical		
	Test Mode:	TX GFSK Mode 2480 MHz		CITIZE IN
	Remark:	N/A		



No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2479.800	94.58	1.15	95.73	Fundamental	Frequency	peak
2	*	2480.000	89.20	1.15	90.35	Fundamental	Frequency	AVG
3		2483.500	67.27	1.17	68.44	74.00	-5.56	peak
4		2483.500	50.77	1.17	51.94	54.00	-2.06	AVG



3

4

Х

Report No.: TB-FCC145045

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EUT:		DLP L	ED Proje	ector		0	Mode	l Nar	ne :	N	M1		
Ten	peratur	e:	25 °C	C	100			Relat	ive H	umidity	: 5	55%	MAIN
Tes	t Voltag	e:	AC 1	20V/60I	Hz		*			A		3	
Ant	. Pol.		Horiz	ontal		OH!	٧			1 1/12			1
Tes	t Mode:		TX 8	X 8-DPSK Mode 2402MHz									
Ren	nark:		N/A	B. M.				63		-TIT	N/A		
110.0	) dBuV/m												
												4 × 3	
										(RF) FCC	PART	15C (PEAK	)
60										(BF) FC	C PARI	15C AVG	i
										×		1	
		- بادر در							2 X		/	·	
10.0	314.000 2324	100 2	334.00	2344.00	2354.0	00 2364.	20	2374.00	2384	4.00 239 <i>4</i>	1.00		414.00 MHz
2.0	514.000 2324	2	334.00	2344.00	2334.0	00 2304.0	JU	2374.00	230-	1.00 2334	+.00	2	414.00 MHZ
1	No. Mk	. Fr	eq.	Read Leve		Correc Facto		Measu men		Limit	C	over	
		MI	Hz	dBu\	V	dB/m		dBuV	/m	dBuV/m	1	dB	Detector
1		2390	.000	51.0	)5	0.77		51.8	32	74.00	ı -:	22.18	peak
2		2390	.000	31.5	3	0.77		32.3	30	54.00	-:	21.70	AVG

83.97

91.62

Fundamental Frequency

**Fundamental Frequency** 

AVG

peak

**Emission Level= Read Level+ Correct Factor** 

83.15

90.80

0.82

0.82

2402.000

2402.100



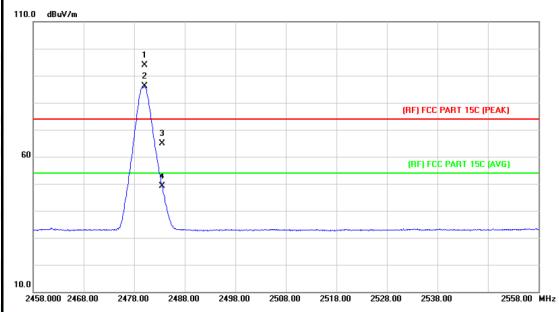
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EUT	<b>:</b>		DLP	LED Pro	ojector	~ G	M	odel Nar	ne :	M1	M1		
Tem	peratu	re:	25 °	С	1	18	R	elative H	umidity:	55%	BAIL		
Test	t Voltag	je:	AC 1	120V/6	0Hz		50	B		133			
Ant.	Pol.		Verti	Vertical									
Test	t Mode	•	TX 8	B-DPSk	( Mod	e 2402Mł	Ηz				Militar		
Ren	nark:		N/A	1111				600	- Till	8.0			
110.0	) dBuV/m												
60										3 X 4 X X PART 15C (P			
10.0 23	314.000 23	24.00 2	334.00	2344.00	235	4.00 2364.	00 2	2374.00 2	384.00 239	4.00	2414.00 M		
N	lo. Mk	. Fre	=q.	Rea	_	Correc Facto		leasure- ment	Limit	Ove	r		
		MF	łz	dBi	٧L	dB/m		dBuV/m	dBuV/n	n dB	Detect		
1		2390.	000	51.	76	0.77		52.53	74.00	-21.4	l7 pea		
2		2390.	000	31.	83	0.77		32.60	54.00	-21.4	O AV		
3	Х	2402.	000	91.	34	0.82		92.16	Fundamen	tal Frequenc	<sub>cy</sub> pea		
$\frac{3}{4}$	*	2402.		83.		0.82		84.57		tal Frequenc	· —		
						<del>-</del>				-			



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EUT:	DLP LED Projector	Model Name :	M1		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz				
Ant. Pol.	Horizontal				
Test Mode:	TX 8-DPSK Mode 2480MHz				
Remark:	N/A				



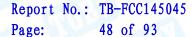
N	lo. N	/lk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
			MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х		2480.000	92.72	1.15	93.87	Fundamental	Frequency	peak
2	*		2480.000	84.93	1.15	86.08	Fundamental	Frequency	AVG
3			2483.500	63.76	1.17	64.93	74.00	-9.07	peak
4			2483.500	47.97	1.17	49.14	54.00	-4.86	AVG



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EUT:	DLP LED Projector	Model Name :	M1				
Temperature:	25 ℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz		133				
Ant. Pol.	Vertical		1				
Test Mode:	TX 8-DPSK Mode 248	TX 8-DPSK Mode 2480MHz					
Remark:	N/A	N/A					
110.0 dBuV/m							
60	1 × 2 × × × × × × × × × × × × × × × × ×		PART 15C (PEAK)				
		(HF) FL	L PART 15L [AV6]				
10.0							

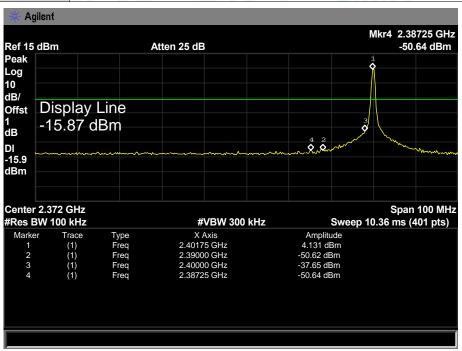
No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	O∨er	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2479.900	93.88	1.15	95.03	Fundamental	Frequency	peak
2	*	2480.000	86.07	1.15	87.22	Fundamental	Frequency	AVG
3		2483.500	65.71	1.17	66.88	74.00	-7.12	peak
4		2483.500	49.22	1.17	50.39	54.00	-3.61	AVG

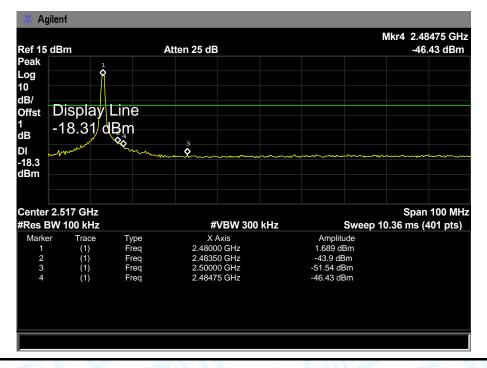




(2) Conducted Test

EUT:	DLP LED Projector	Model Name :	M1		
Temperature:	25 ℃	55%			
Test Voltage:	AC 120V/60Hz				
Test Mode:	TX GFSK Mode 2402MHz / 2480 MHz				
Remark:	N/A				







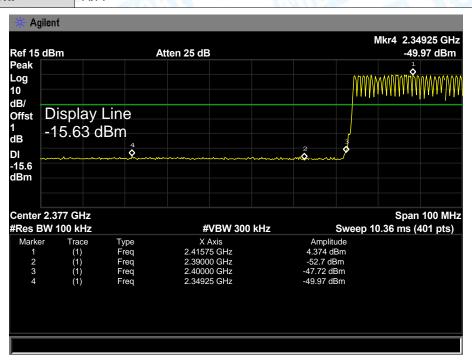
EUT: DLP LED Projector Model Name: M1

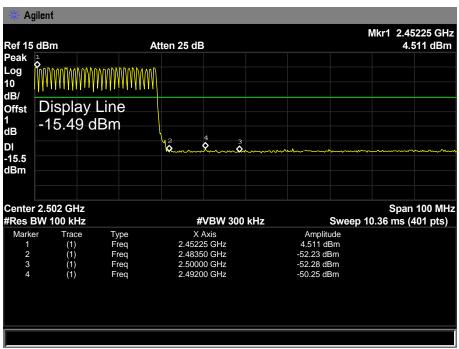
Temperature: 25 °C Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

Test Mode: GFSK Hopping Mode

Remark: N/A

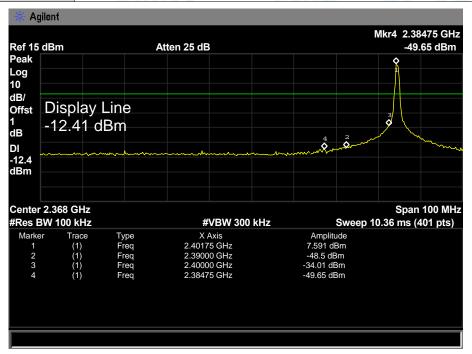


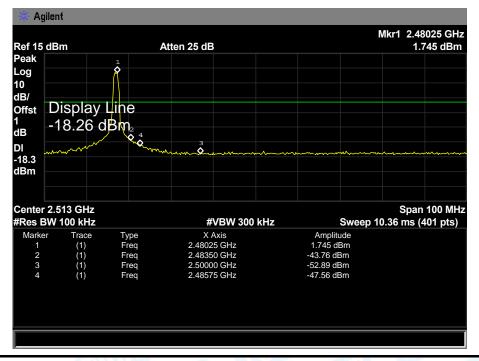




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EUT:	DLP LED Projector	Model Name :	M1		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz				
Test Mode:	TX 8-DPSK Mode 2402MHz / 2480 MHz				
Remark:	N/A				







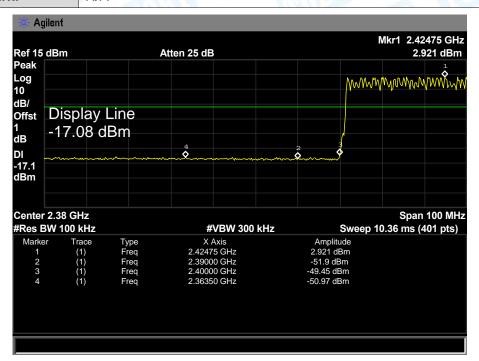
EUT: DLP LED Projector Model Name : M1

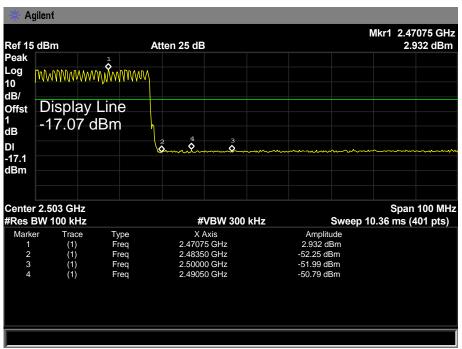
Temperature: 25 °C Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

Test Mode: 8-DPSK Hopping Mode

Remark: N/A







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# 7. Number of Hopping Channel

## 7.1 Test Standard and Limit

6.1.1 Test Standard FCC Part 15.247 (a)(1)

6.1.2 Test Limit

Section	Test Item	Limit
15.247	Number of Hopping Channel	>15

## 7.2 Test Setup



#### 7.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=100 KHz, VBW=100 KHz, Sweep time= Auto.

## 7.4 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

## 7.5 Test Data

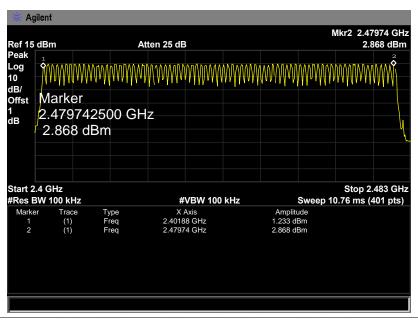


EUT:	DLP LED Projector	Model Name :	M1
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		3.0

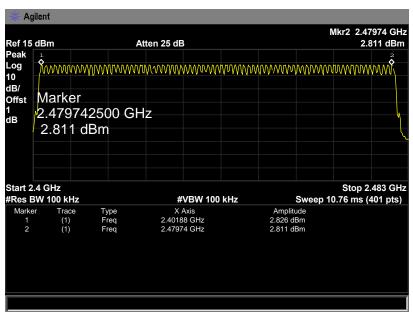
Test Mode: Hopping Mode (GFSK/ 8-DPSK)

Frequency Range	Quantity of Hopping Channel	Limit
2402MHz~2480MHz	79	>15
240210172~240010172	79	>15

#### **GFSK Mode**



## 8-DPSK Mode





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# 8. Average Time of OcCupancy

#### 8.1 Test Standard and Limit

8.1.1 Test Standard FCC Part 15.247 (a)(1)

8.1.2 Test Limit

Section	Test Item	Limit
15.247(a)(1)/ RSS-210	Average Time of	0.4.000
Annex 8(A8.1d)	OcCupancy	0.4 sec

## 8.2 Test Setup



#### 8.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=1MHz, VBW=1MHz.
- (3) Use video trigger with the trigger level set to enable triggering only on full pulses.
- (4) Sweep Time is more than once pulse time.
- (5) Set the center frequency on any frequency would be measure and set the frequency span to zero.
- (6) Measure the maximum time duration of one single pulse.
- (7) Set the EUT for packet transmitting.
- (8) Measure the maximum time duration of one single pulse.

# 8.4 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

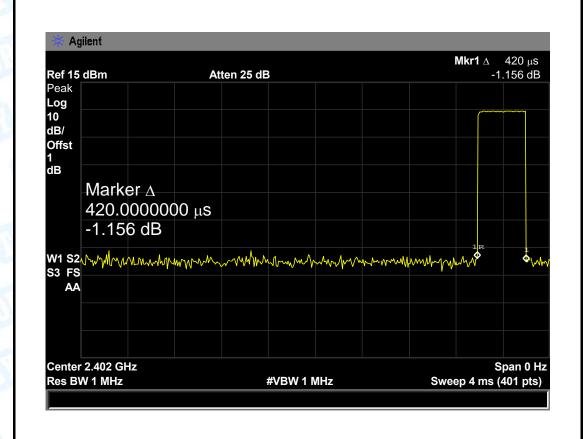


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## 8.5 Test Data

EUT:		DLP LED Projector		Model Name	:	M1
Temperature		25 ℃	Comment of the last	Relative Humidity:		55%
Test Voltage: AC 120V/60Hz						
Test Mode: Hopping Mode (GFSK DH1)			CANTO S		MAG	
Channel	Pu	lse Time	Total of Dwell	Period Time	Limit	Result
(MHz)		(ms)	(ms)	(s)	(ms)	Result
2402		0.420	134.40			
2441		0.420	134.40	31.60	400	PASS
2480		0.420	134.40			
			OFOK Hammina	Mada DUA		

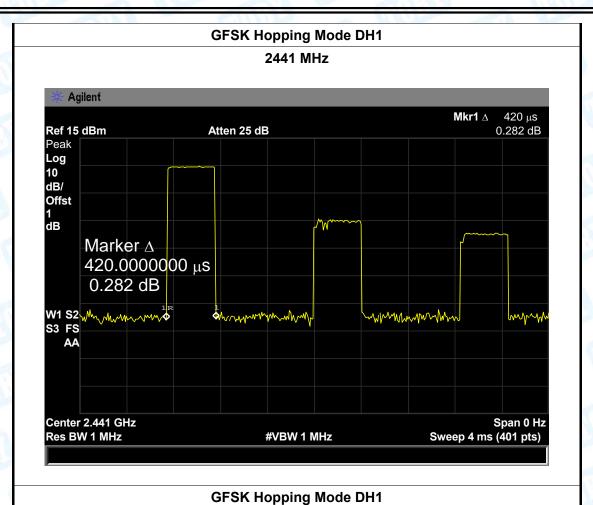
#### **GFSK Hopping Mode DH1**

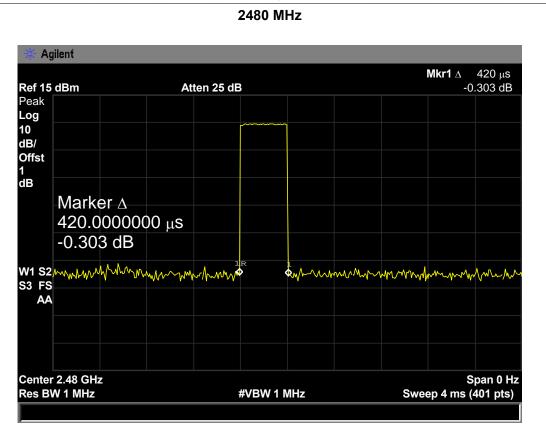






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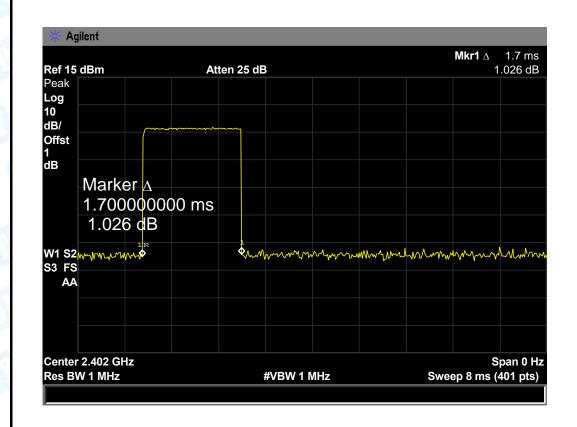


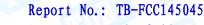


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EUT:	EUT: DLP LED Projector		rojector	Model Na	me :	M1
Temperature: 25 ℃		Relative Humidity:		55%		
Test Voltage: AC 120V/60Hz			60Hz	183		3
Test Mode: Hopping		Hopping N	Mode (GFSK DH3)		All Comments	ATTEN A
Channel (MHz)	Pu	lse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2402		1.700	272.00			
2441		1.700	272.00	31.60	400	PASS
2480		1.720	275.20			

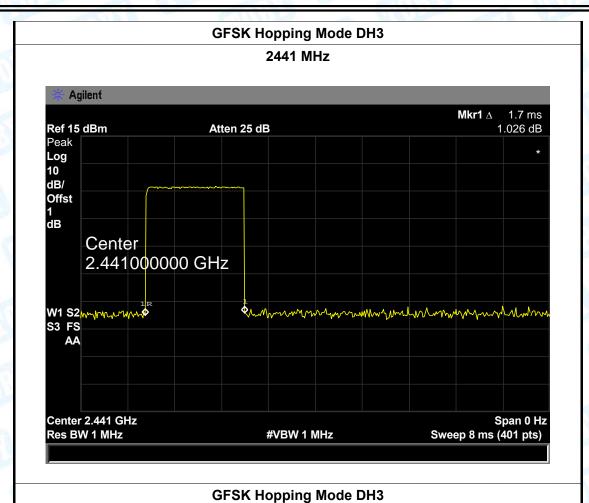
## **GFSK Hopping Mode DH3**

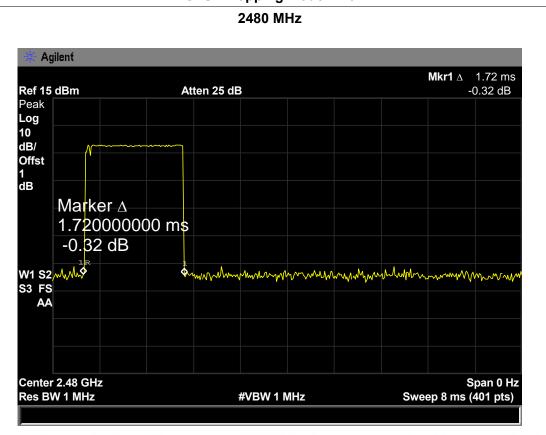






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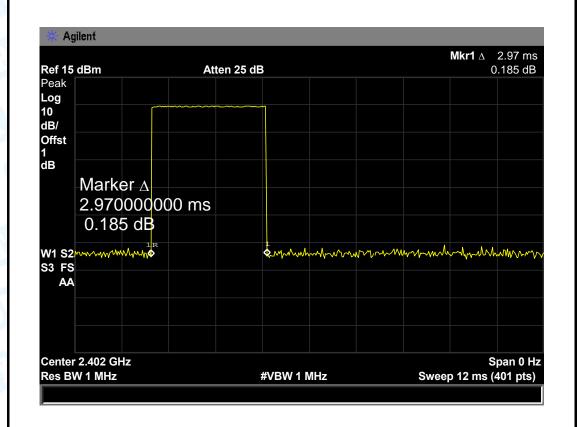


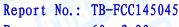


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EUT: DLP LED		DLP LED F	rojector	Model Name :		M1
Temperature:		25 ℃		Relative Humidity:		55%
Test Voltage:		AC 120V/	60Hz	63		3
Test Mode:		Hopping I	Mode (GFSK DH5)		Alle	15.5
Channel (MHz)	Pu	lse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2402		2.970	316.80			
2441		3.000	320.00	31.60	400	PASS
2480		2.970	316.80			
	•		OFOK Hammin w Mad	- DUE		

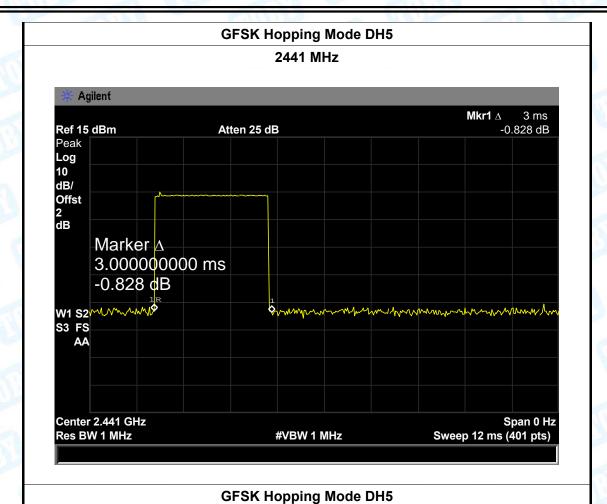
## **GFSK Hopping Mode DH5**

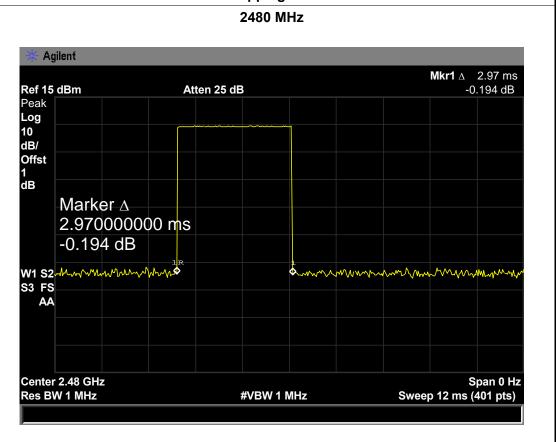






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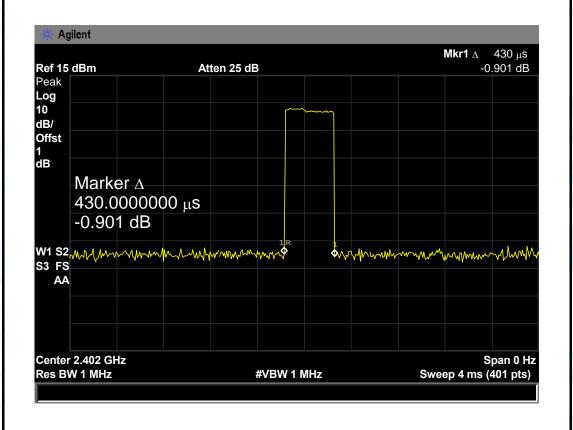




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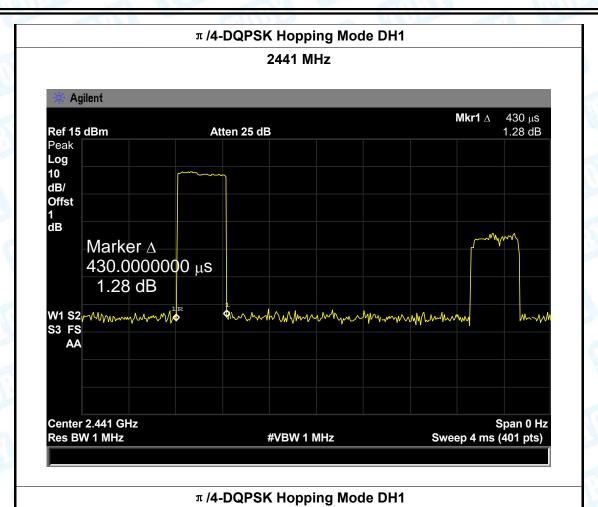
EUT:		DLP LED P	rojector	Model Name :		M1
Temperature:		25 ℃		Relative Humidity:		55%
Test Voltage:		AC 120V/	60Hz			
Test Mode:		Hopping N	Mode (π/4-DQPSK [	DH1)	130	A STORY
Channel	Pu	Ise Time	Total of Dwell	Period Time	Limit	Result
(MHz)		(ms)	(ms)	(s)	(ms)	Result
2402		0.430	137.60			
2441		0.430	137.60	31.60	400	PASS
2480		0.430	137.60			
			/4 DODOK II	Mada DUA		•

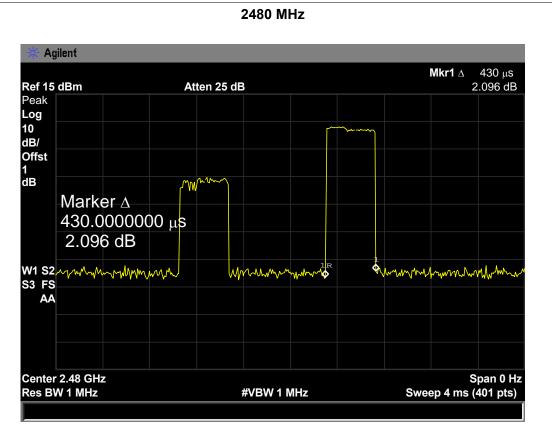
#### π /4-DQPSK Hopping Mode DH1





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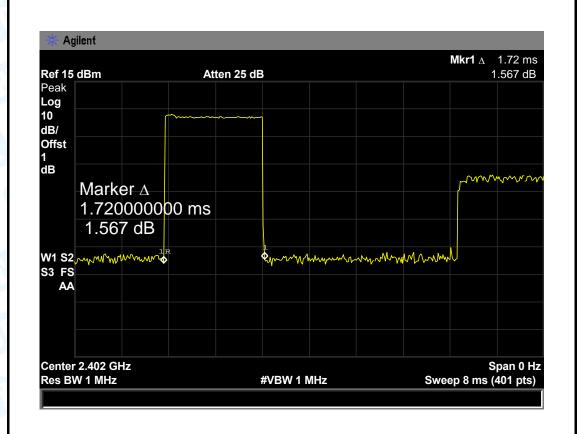




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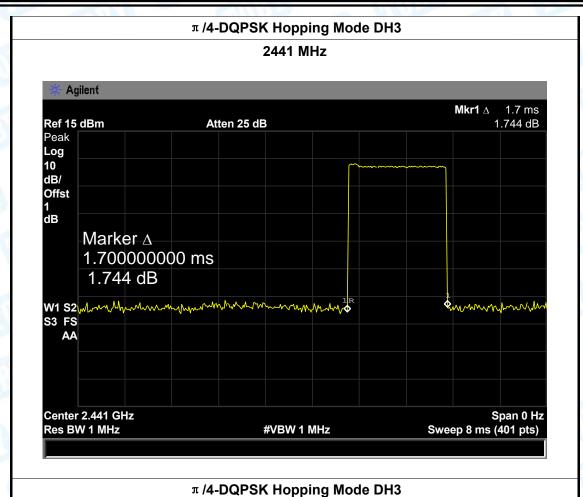
EUT: DLP LEG		DLP LED P	rojector	Model Name :		M1
Temperature:		25 ℃		Relative Humidity:		55%
Test Voltage:		AC 120V/	60Hz			3
Test Mode:		Hopping N	Mode (π/4-DQPSK	DH3)	A BUT	THE REAL PROPERTY.
Channel	Pu	lse Time	Total of Dwell	Period Time	Limit	Popult
(MHz)		(ms)	(ms)	(s)	(ms)	Result
2402		1.720	275.20	31.60	400	PASS
2441		1.700	272.00			
2480		1.700	272.00			
	1	-	// DODSK Honnin	a Mada DU2		

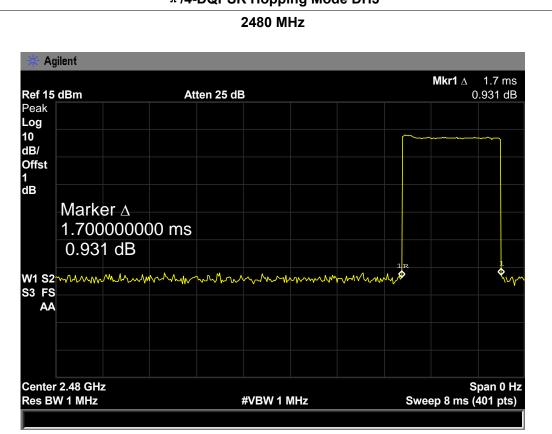
### π /4-DQPSK Hopping Mode DH3





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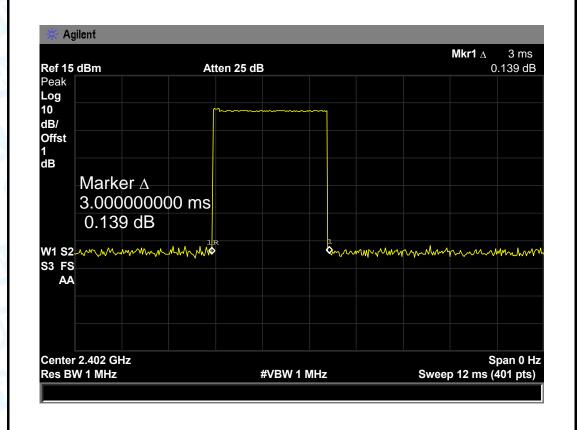




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EUT:		DLP LED P	rojector	Model Name :		M1
Temperature:		25 ℃		Relative Humidity:		55%
Test Voltage:		AC 120V/	60Hz	1		3
Test Mode:		Hopping N	Mode (π/4-DQPSK [	DH5)	130	THE REAL PROPERTY.
Channel	Pu	Ise Time	Total of Dwell	Period Time	Limit	Result
(MHz)		(ms)	(ms)	(s)	(ms)	Result
2402		3.000	320.00			
2441		3.000	320.00	31.60	400	PASS
2480		3.000	320.00			
	ı	π	/4-DOPSK Honning	Mode DH5		1

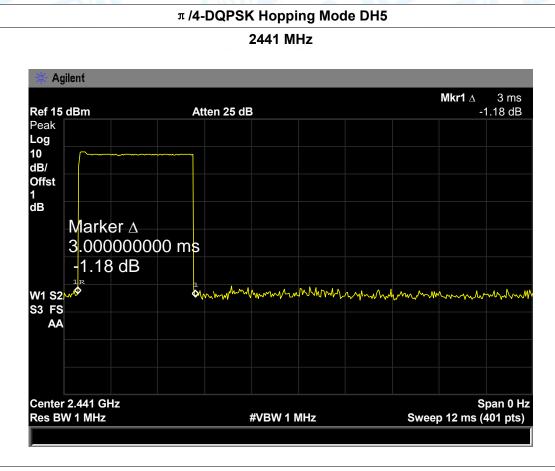
### $\pi$ /4-DQPSK Hopping Mode DH5

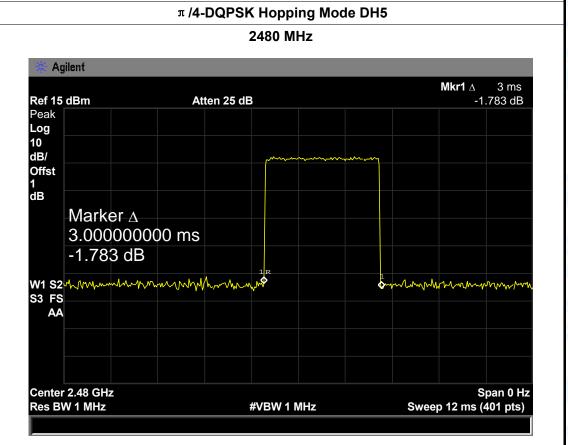






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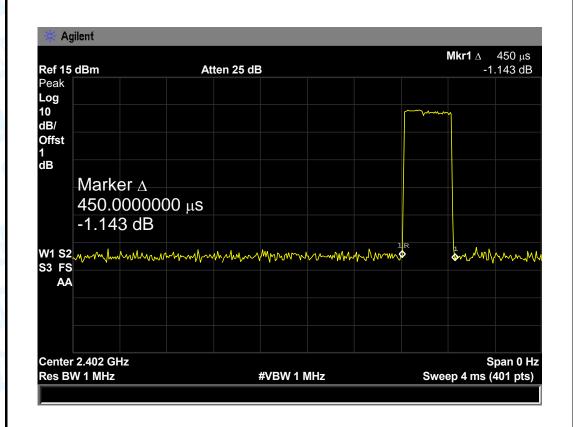




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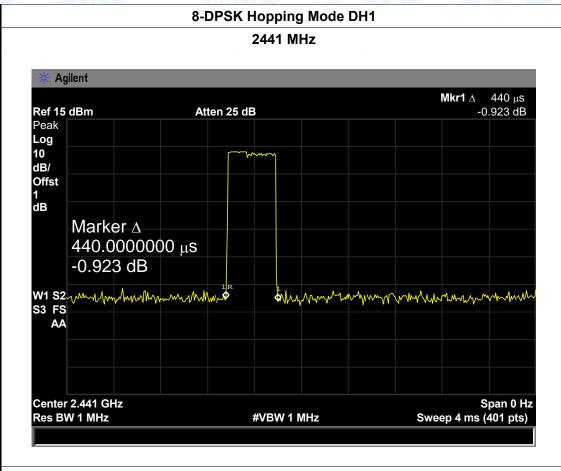
EUT: DLP LED P		rojector	Model Name :		M1	
Temperature: 25 °C		25 ℃		Relative Humidity:		55%
Test Voltage:		AC 120V/	60Hz	1		3
Test Mode:		Hopping I	Mode (8-DPSK DH1)		Alle	A STORES
Channel (MHz)	Pu	lse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2402		0.450	144.00			
2441		0.440	140.80	31.60	400	PASS
2480		0.440	140.80			

## 8-DPSK Hopping Mode DH1

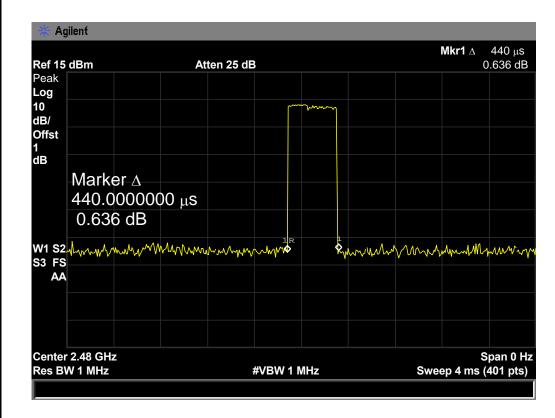




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## 8-DPSK Hopping Mode DH1

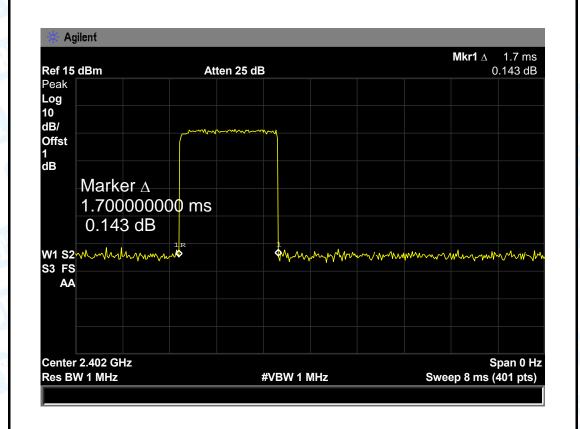




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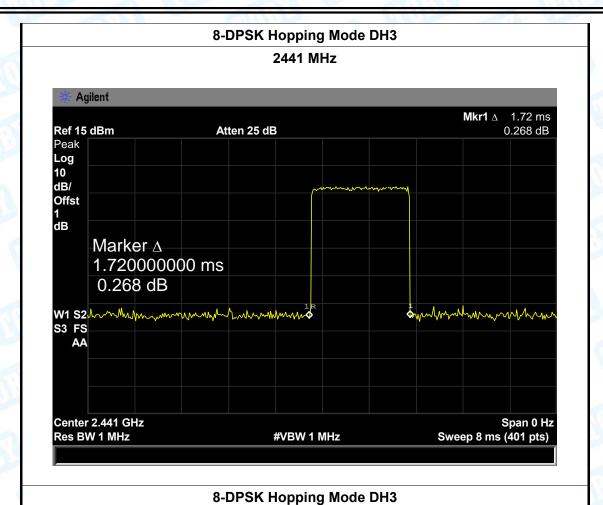
EUT:		DLP LED P	rojector	Model Name :		M1
Temperature:		25 ℃		Relative Humidity:		55%
Test Voltage:		AC 120V/	60Hz	1		3
Test Mode:		Hopping I	Mode (8-DPSK DH3)		Aller	Till I
Channel (MHz)	Pu	lse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2402		1.700	272.00			
2441		1.720	275.20	31.60	400	PASS
2480		1.700	272.00			

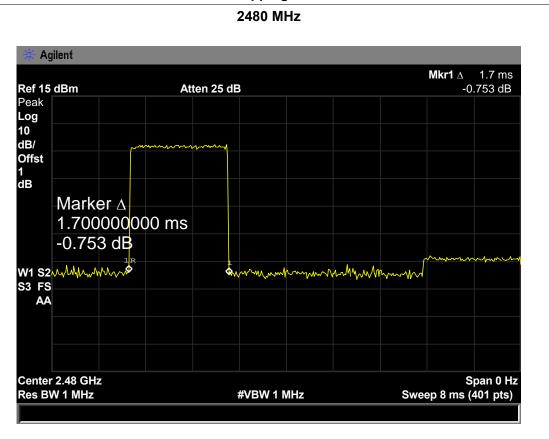
## 8-DPSK Hopping Mode DH3





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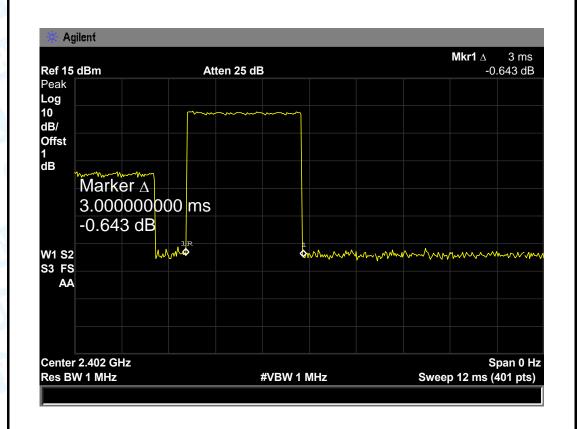




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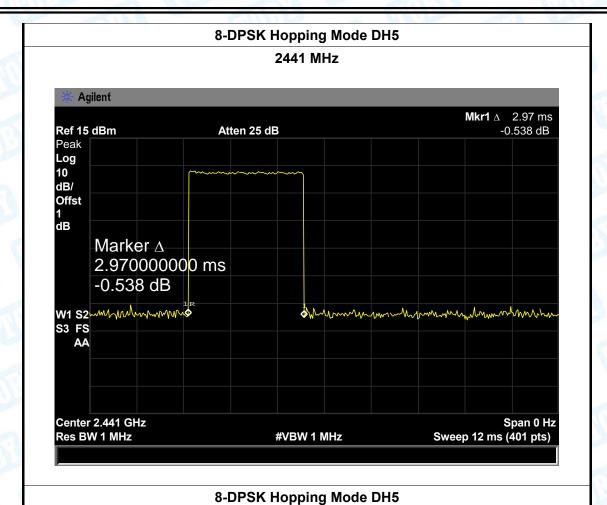
EUT:		DLP LED P	Projector	Model Name :		M1
Temperature:		25 ℃	100	Relative Humidity:		55%
Test Voltage:		AC 120V/	60Hz	8300		3
Test Mode:		Hopping N	Mode (8-DPSK DH5)		Marie	1
Channel (MHz)	Pu	lse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2402		3.000	320.00			
2441		2.970	316.80	31.60	400	PASS
2480		2.970	316.80			

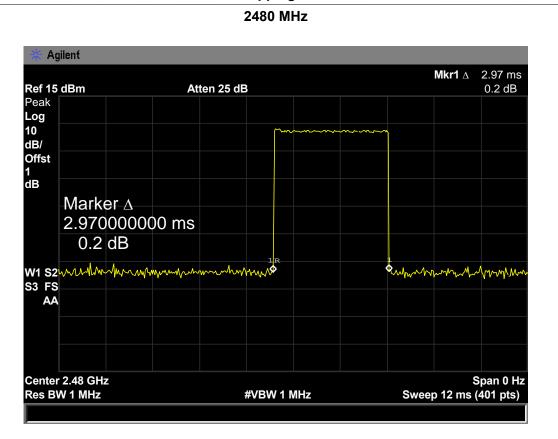
## 8-DPSK Hopping Mode DH5





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## 9. Channel Separation and Bandwidth Test

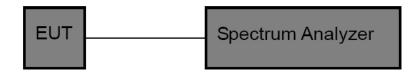
#### 9.1 Test Standard and Limit

9.1.1 Test Standard FCC Part 15.247

9.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Bandwidth	<=1 MHz (20dB bandwidth)	2400~2483.5
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5

## 9.2 Test Setup



## 9.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Channel Separation: RBW=30 kHz, VBW=100 kHz.

Bandwidth: RBW=30 kHz, VBW=100 kHz.

- (3) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
  - (4) Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:30 kHz, and Video Bandwidth:100 kHz. Sweep Time set auto.

## 9.4 EUT Operating Condition

The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Bandwidth Test.

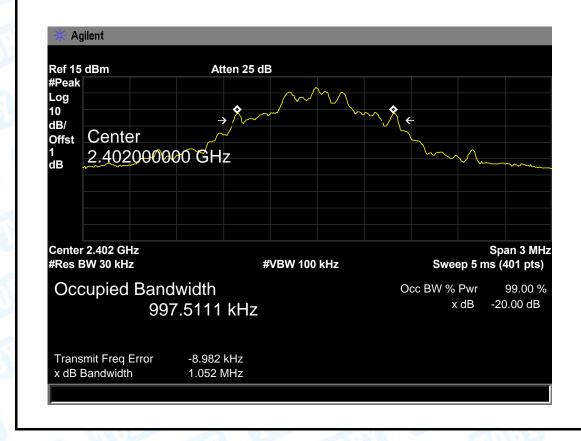


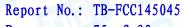
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## 9.5 Test Data

EUT:	DLP LED Projector	Model Name :	M1		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz				
Test Mode:	TX Mode (GFSK)				
Channel frequenc	99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth*2/3 (kHz)		
2402	997.5111	1052.00	701.33		
2441	997.2073	1051.00	700.67		
2480	997.8113	1052.00	701.33		
	GES	SK TX Mode			

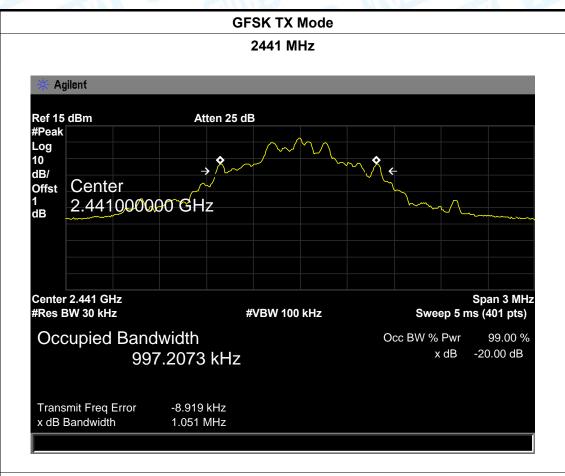
#### GFSK TX Mode



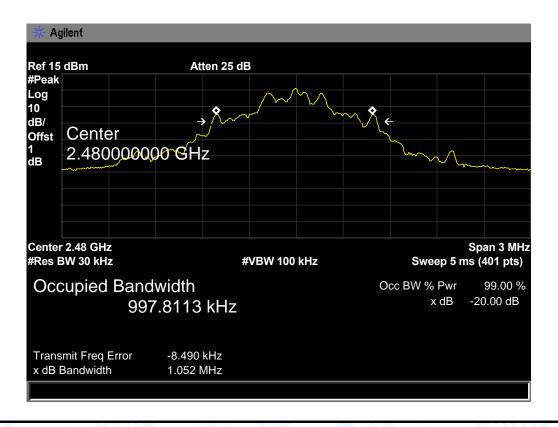




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## **GFSK TX Mode**





2441

2480

Report No.: TB-FCC145045

739.33

747.33

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EUT:	DLP LED Projector	Model Name :	M1		
Temperature:	<b>25</b> ℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz	133			
Test Mode:	TX Mode (π/4-DQPSK)				
Channel frequency 99% OBW (MHz) (kHz)		20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)		
2402	1076 20	1121 00	747 33		

#### π/4-DQPSK TX Mode

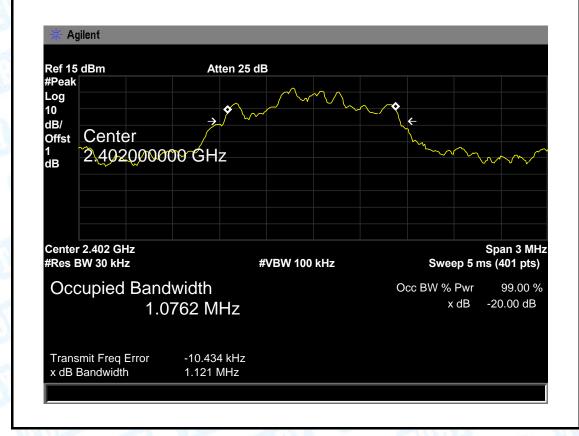
1109.00

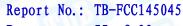
1121.00

#### 2402 MHz

1068.70

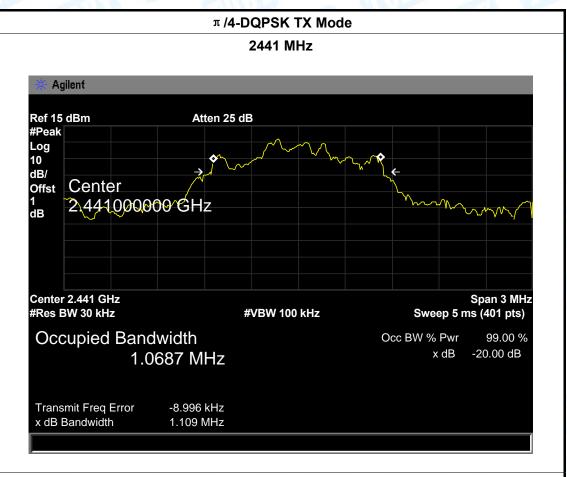
1073.90



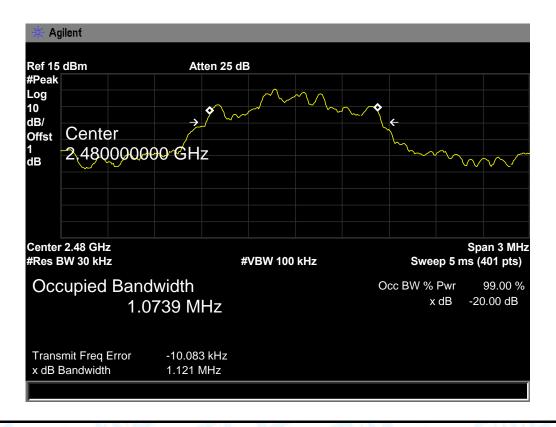




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## π/4-DQPSK TX Mode

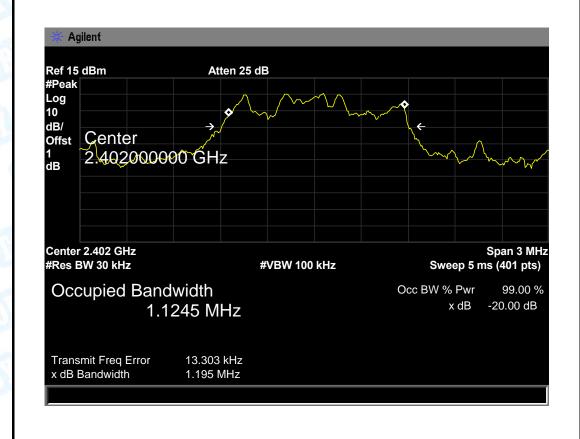




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EUT:	DLP LED Projector	Model Name :	M1
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		1339
Test Mode:	TX Mode (8-DPSK)		100
Channel frequency 99% OBW		20dB Bandwidth	20dB
(MHz)	(kHz)	(kHz)	Bandwidth *2/3
			(kHz)
2402	1124.50	1195.00	796.67
2441	1125.20	1200.00	800.00
2480	1126.10	1201.00	800.67

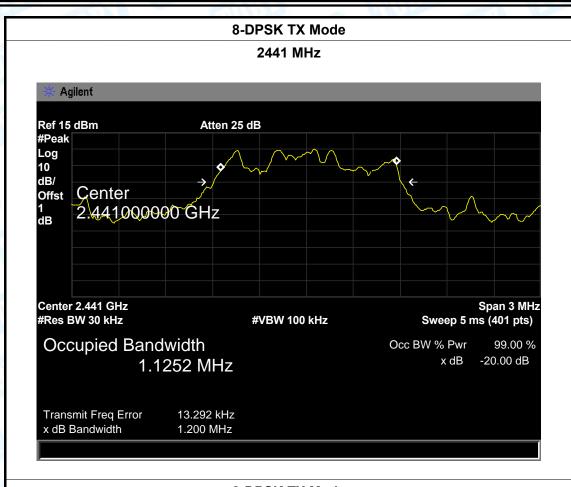
## 8-DPSK TX Mode 2402 MHz



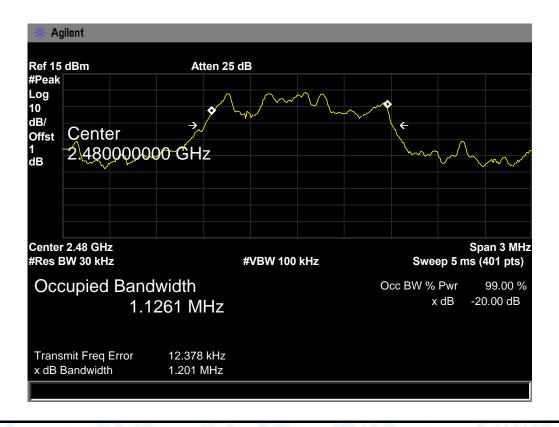




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## 8-DPSK TX Mode





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EUT:	DLP LED Projector	Model Name :	M1
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		

Test Mode: Hopping Mode (GFSK)

Channel frequency (MHz)	Separation Read Value	Separation Limit (kHz)
	(kHz)	
2402	1005.00	701.33
2441	1005.00	700.67
2480	1005.00	701.33

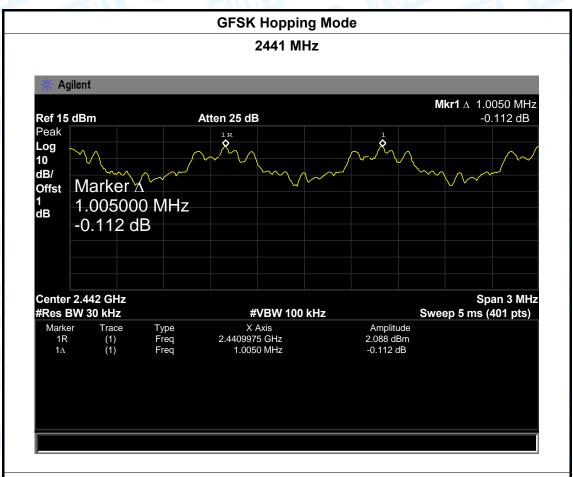
#### **GFSK Hopping Mode**







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## GFSK Hopping Mode 2480 MHz





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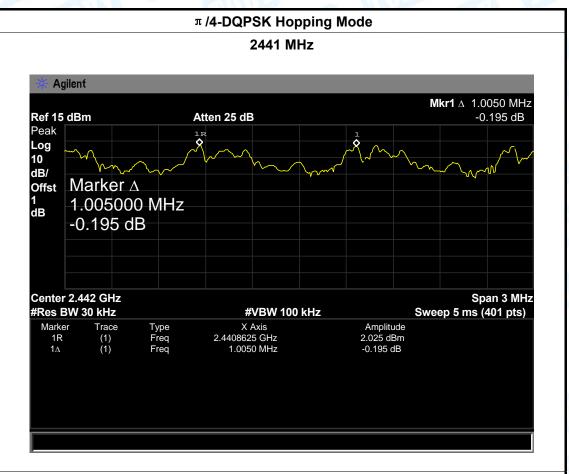
EUT:	DLP LED Projector		Model Name :		M1	
Temperature:	25 ℃	Relative Humidity:		55%		
Test Voltage:	AC 120V/	AC 120V/60Hz			3	
Test Mode:	Hopping N	Hopping Mode (π/4-DQPSK)				
Channel frequen	nel frequency (MHz) Separation Read Value Separation Limit (k			Limit (kHz)		
		(kHz)				
2402	2402 1005.00 747.33			7.33		
2441		1005.00	1005.00 739.33			
2480	2480 1005.00 747.33			7.33		
		π/4-DQPSK Hopping	Mode			







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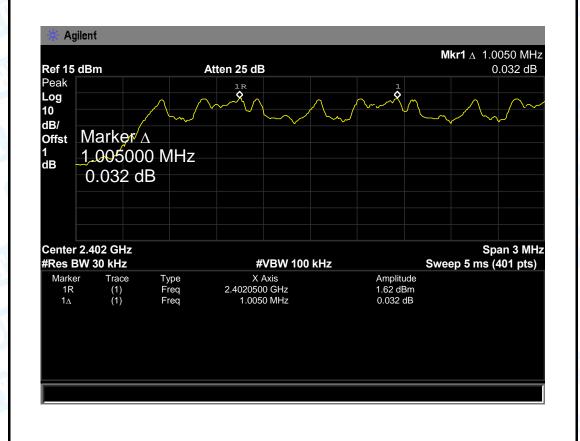
## $\pi$ /4-DQPSK Hopping Mode

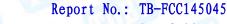




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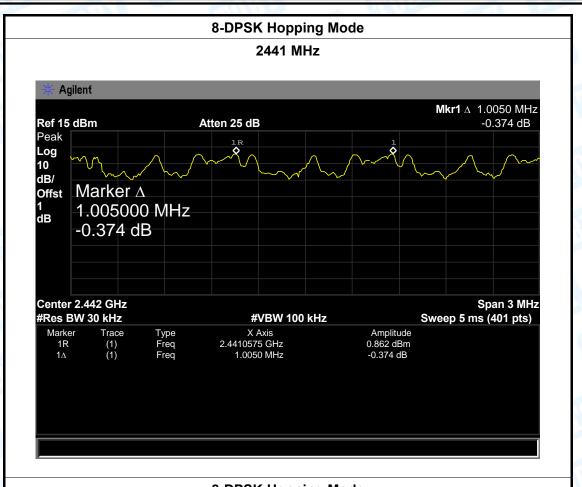
EUT:	DLP LED Projector		Model Name :		M1	
Temperature:	25 ℃	Relative Humidity:		55%		
Test Voltage:	AC 120V/	AC 120V/60Hz			3	
Test Mode:	Hopping N	Hopping Mode (8-DPSK)				
Channel frequen	ency (MHz) Separation Read Value Separation Limit (kHz			Limit (kHz)		
		(kHz)				
2402	2402 1005.00 796.67			6.67		
2441		1005.00	1005.00 800.00			
2480	1005.00 800.67			0.67		
		8-DPSK Hopping N	/lode			



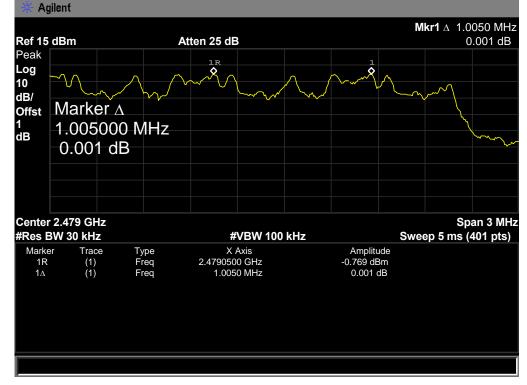




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# 8-DPSK Hopping Mode 2480 MHz





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## 10. Peak Output Power Test

### 10.1 Test Standard and Limit

10.1.1 Test Standard FCC Part 15.247 (b) (1)

10.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Peak Output Power	Hopping Channels>75 Power<1W(30dBm) Other <125 mW(21dBm)	2400~2483.5

## 10.2 Test Setup



### 10.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Peak Detector: RBW=1 MHz, VBW=3 MHz for bandwidth less than 1MHz. RBW=3 MHz, VBW=3 MHz for bandwidth more than 1MHz.

## 10.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.



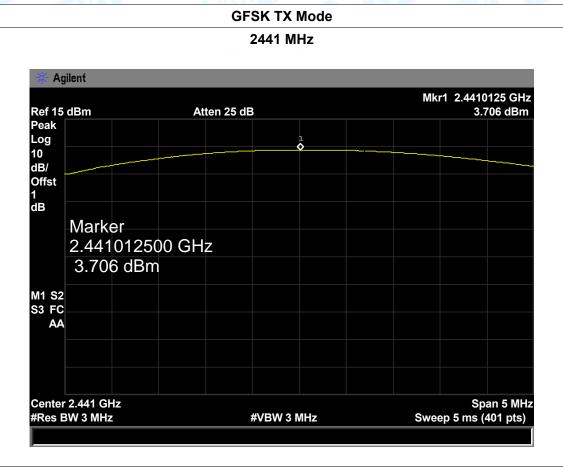
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## 10.5 Test Data

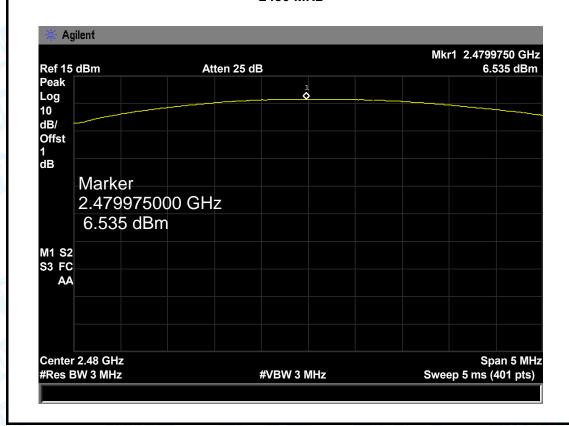
JT:		DLP LED	Projector		Me	odel Name :		M1	
mperati	ıre:	25 ℃		BATT.	Re	lative Humid	dity:	55%	
st Volta	ge:	AC 120\	//60Hz		671	1929		AHIL	
st Mode	):	TX Mode	e (GFSK)		13	-10	N. B.		
hannel f	requen	cy (MHz)	Tes	st Result (	dBm)	L	_imit	(dBm)	
	2402			4.394					
	2441			3.706			2	21	
	2480			6.535					
			G	FSK TX M	ode				
				2402 MH	Z				
Ref 15 c	IBIII		Atten 25	1				4.394 dBn	
Peak Log 10 dB/ Offst			Atten 25	dB				4.394 dBn	
Peak Log 10 dB/ Offst 1 dB	Marke	000000		1				4.394 dBn	
Peak Log 10 dB/ Offst 1 dB	Marke 2.4020	000000		1				4.394 dBn	



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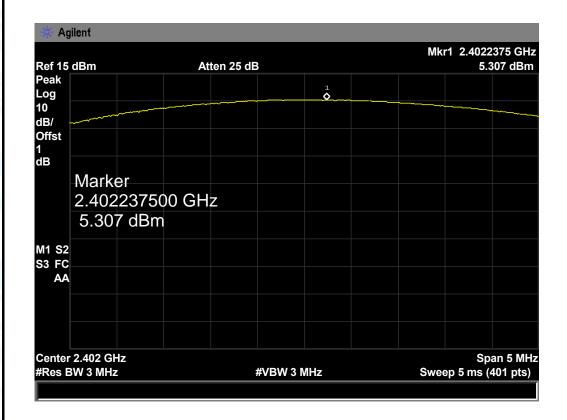
#### **GFSK TX Mode**





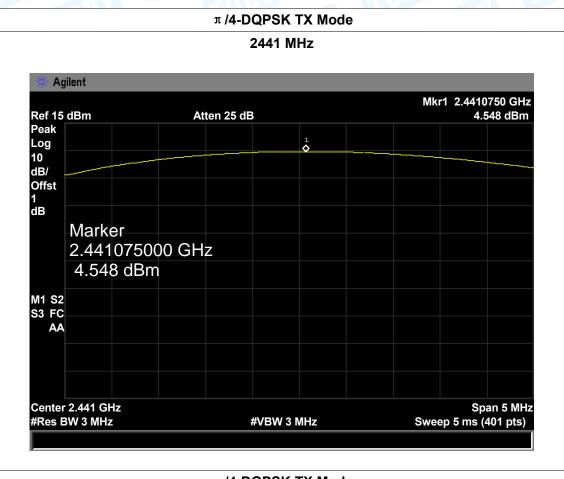
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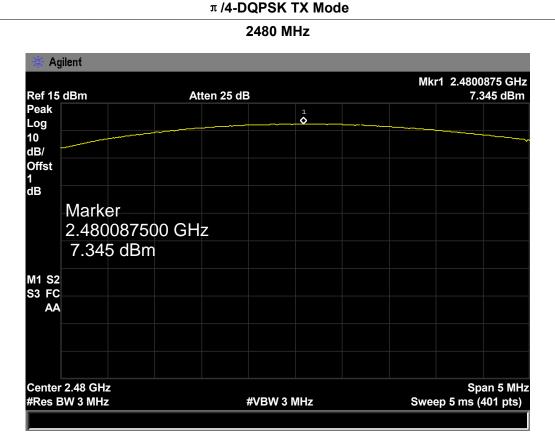
EUT:	DLP LED P	rojector	Model Name :	M1
Temperature:	25 ℃	-000	Relative Humidity:	55%
Test Voltage:	AC 120V/	AC 120V/60Hz		
Test Mode:	TX Mode	( π /4-DQPSK)		N. S. S.
Channel frequen	Channel frequency (MHz) Test Result (dBm)			
2402		5.307		
2441		4.548		21
2480		7.345		
		π /4-DQPSK TX	Mode	





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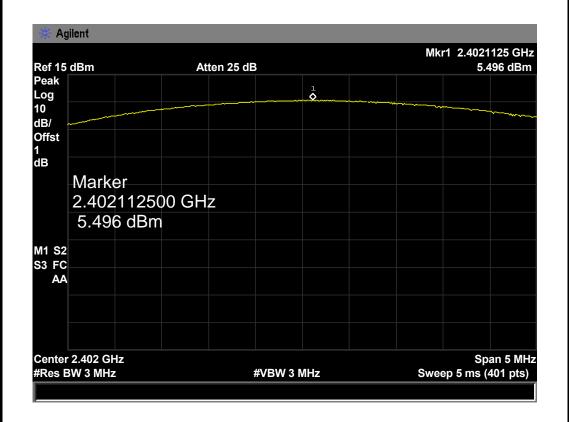






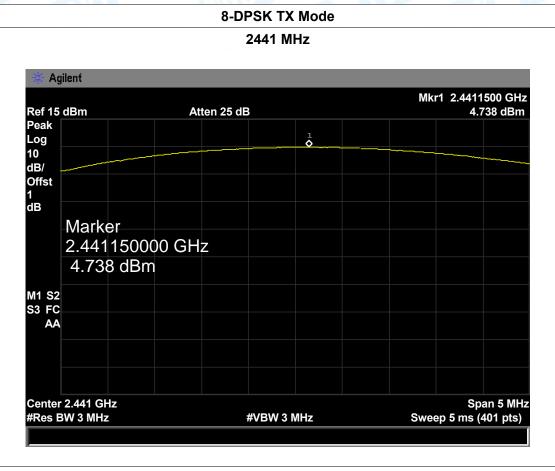
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EUT:	DLP LED P	rojector	Model Name :	M1
Temperature:	25 ℃		Relative Humidity:	55%
Test Voltage:	AC 120V/	AC 120V/60Hz		
Test Mode:	TX Mode	(8-DPSK)		1000
Channel frequen	Channel frequency (MHz) Test Result (dBm)			nit (dBm)
2402		5.496		
2441		4.738		21
2480		3.450		
		8-DPSK TX N	lode	

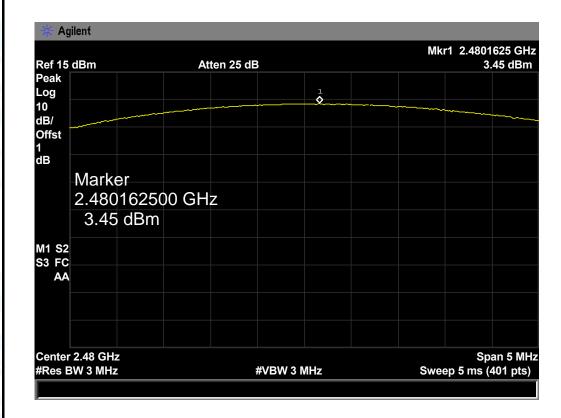




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#### 8-DPSK TX Mode





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## 11. Antenna Requirement

## 11.1 Standard Requirement

11.1.1 Standard FCC Part 15.203

#### 11.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### 11.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 2.5 dBi, and the antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

#### Result

The EUT antenna is an Embedded Antenna. It complies with the standard requirement.

Antenna Type	
▼ Permanent attached antenna	
□ Unique connector antenna	100
☐ Professional installation antenna	