



# **FCC RADIO TEST REPORT**

## **FCC ID:2AFZT-L1**

**Product :** Intelligent micro laser projection

**Trade Name :** LTV

**Model Name :** L1

**Serial Model :** N/A

**Report No. :** NTEK-2015NT07162286F5

### **Prepared for**

ILLUMINANCE(CANTON) Co.,LTD.

Room 17B, 17th floor, building A, central avenue, No.2002 BaoYuan Road,  
XiXiang, Bao'an district, Shenzhen, Guangdong, P. R. China

### **Prepared by**

Shenzhen NTEK Testing Technology Co., Ltd.

1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street  
Bao'an District, Shenzhen P.R. China

Tel.: +86-0755-61156588 Fax.: +86-0755-61156599

Website:www.ntek.org.cn

## TEST RESULT CERTIFICATION

**Applicant's name** ..... ILLUMINANCE(CANTON) Co.,LTD.  
**Address** ..... Room 17B, 17th floor, building A, central avenue, No.2002  
 BaoYuan Road,XiXiang, Bao'an disrict, Shenzhen, Guangdong,  
 P. R. China

**Manufacture's Name**... ILLUMINANCE(CANTON) Co.,LTD.  
**Address** ..... Room 17B, 17th floor, building A, central avenue, No.2002  
 BaoYuan Road,XiXiang, Bao'an disrict, Shenzhen, Guangdong,  
 P. R. China

### Product description

**Product name** ..... Intelligent micro laser projection

**Model and/or type** ..... L1  
**reference** .....

**Serial Model** ..... N/A

**Standards** ..... FCC Part15.407 01 Oct. 2014

**Test procedure** ..... ANSI C63.10-2013 and KDB 789033 D01 v01r04

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.


This report shall not be reproduced except in full, without the written approval of NTEK, this document may be altered or revised by NTEK, personnel only, and shall be noted in the revision of the document.

**Date of Test** .....


**Date (s) of performance of tests** ..... 16 Jul. 2015 ~01 Sep. 2015

**Date of Issue** ..... 01 Sep. 2015

**Test Result** ..... **Pass**

**Testing Engineer** :   
 (Allen Liu)

**Technical Manager** :   
 (Brown Lu)

**Authorized Signatory** :   
 (Sam Chen)

## Table of Contents

	Page
<b>1 . SUMMARY OF TEST RESULTS</b>	<b>5</b>
1.1 TEST FACILITY	6
1.2 MEASUREMENT UNCERTAINTY	6
<b>2 . GENERAL INFORMATION</b>	<b>7</b>
2.1 GENERAL DESCRIPTION OF EUT	7
2.2 DESCRIPTION OF TEST MODES	9
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	10
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	11
2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	12
<b>3 . EMC EMISSION TEST</b>	<b>13</b>
3.1 CONDUCTED EMISSION MEASUREMENT	13
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS	13
3.1.2 TEST PROCEDURE	14
3.1.3 DEVIATION FROM TEST STANDARD	14
3.1.4 TEST SETUP	14
3.1.5 EUT OPERATING CONDITIONS	14
3.1.6 TEST RESULTS	15
3.2 RADIATED EMISSION MEASUREMENT	23
3.2.1 RADIATED EMISSION LIMITS	23
3.2.2 TEST PROCEDURE	24
3.2.3 DEVIATION FROM TEST STANDARD	24
3.2.4 TEST SETUP	25
3.2.5 EUT OPERATING CONDITIONS	26
3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)	27
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)	28
3.2.8 TEST RESULTS (ABOVE 1000 MHZ)	30
<b>4 . POWER SPECTRAL DENSITY TEST</b>	<b>31</b>
4.1 APPLIED PROCEDURES / LIMIT	31
4.1.1 TEST PROCEDURE	31
4.1.2 DEVIATION FROM STANDARD	31
4.1.3 TEST SETUP	31
4.1.4 EUT OPERATION CONDITIONS	32
4.1.5 TEST RESULTS	33
<b>5 . 26 DB &amp; 99% EMISSION BANDWIDTH</b>	<b>37</b>
5.1 APPLIED PROCEDURES	37
5.1.1 TEST PROCEDURE	37

## Table of Contents

	Page
5.1.2 EUT OPERATION CONDITIONS	37
5.1.3 TEST RESULTS	38
6 . PEAK OUTPUT POWER TEST	42
6.1 APPLIED PROCEDURES / LIMIT	42
6.1.1 TEST PROCEDURE	42
6.1.2 DEVIATION FROM STANDARD	42
6.1.3 TEST SETUP	42
6.1.4 EUT OPERATION CONDITIONS	42
6.1.5 TEST RESULTS	43
7 . OUT OF BAND EMISSIONS	44
7.1 DEVIATION FROM STANDARD	44
7.2 TEST SETUP	44
7.3 EUT OPERATION CONDITIONS	44
7.4 TEST RESULTS	45
8 . PEAK EXCURSION RATIO	48
8.1 APPLIED PROCEDURES / LIMIT	48
8.1.1 TEST PROCEDURE	48
8.1.2 DEVIATION FROM STANDARD	48
8.1.3 TEST SETUP	48
8.1.4 EUT OPERATION CONDITIONS	48
8.1.5 TEST RESULTS	49
9 . ANTENNA REQUIREMENT	53
9.1 STANDARD REQUIREMENT	53
9.2 EUT ANTENNA	53
10 . EUT TEST PHOTO	54
APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS	

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.407) , Subpart E			
Standard Section	Test Item	Judgment	Remark
FCC §15.207	AC Power Line Conducted Emissions	PASS	
FCC §15.209(a), 15.407(b)	Spurious Radiated Emissions	PASS	
FCC §15.407(a)	26 dB and 99% Emission Bandwidth	PASS	
FCC §407(a)(1)	Peak Output Power Measurement	PASS	
FCC §2.1051, §15.407(b)	Band Edges	PASS	
FCC §15.407(a)(1)	Power Spectral Density	PASS	
FCC §15.407(a)(6)	Peak Excursion Ratio	PASS	
FCC §2.1051, §15.407(b)	Spurious Emissions at Antenna Terminals	PASS	
FCC §15.203	Antenna Requirement	PASS	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

## 1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd

Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

FCC Registration No.:238937; IC Registration No.:9270A-1

CNAS Registration No.:L5516

## 1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Intelligent micro laser projection	
Trade Name	LTV	
Model Name	L1	
Serial Model	N/A	
Model Difference	N/A	
Product Description	Operation Frequency:	802.11a/n(20):5180 MHz ~ 5240 MHz
	Modulation Type:	OFDM (BPSK / QPSK / 16QAM / 64QAM)
	Bit Rate of Transmitter	802.11a:54/48/36/24/18/12/9/6Mbps 802.11n(20MHz):150/144.44/130/117/115.56/104/86.67/78/52/6.5Mbps
	Number Of Channel	802.11a/n20MHz:7CH
	Antenna Designation:	Please see Note 3.
	Antenna Gain (dBi)	1.0dBi
Channel List	Please refer to the Note 2.	
Ratings	DC 3.7V	
Adapter	Mode : S31A22 Input: 100-240V~, 50/60Hz, 0.35A Output: 5.0V---, 2.0A	
Battery	DC 3.7V, 3000mAh	
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.

802.11a/n(20)Carrier Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	40	5200	42	5210
44	5220	46	5230	48	5240	-	-

3.

Table for Filed Antenna

Ant .	Brand	Model Name	Antenna Type	Gain (dBi)	NOTE
A	N/A	N/A	FPCB Antenna	1.0	Wifi Antenna



## 2.2 DESCRIPTION OF TEST MODES

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 above was evaluated respectively.

Pretest Mode	Description
Mode 1	802.11a CH36/ CH40/ CH 48
Mode 2	802.11n CH36/ CH40/ CH 48
Mode 3	Link Mode

For Conducted Emission	
Final Test Mode	Description
Mode 3	Link Mode

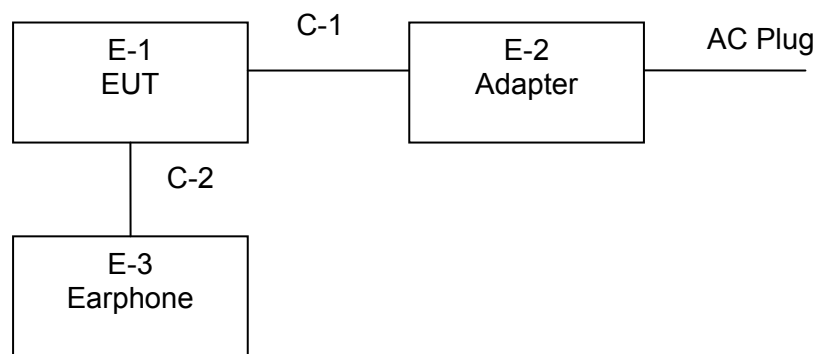
For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11a CH36/ CH40/ CH 48
Mode 2	802.11n CH36/ CH40/ CH 48
Mode 3	Link Mode

Note:

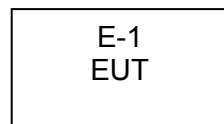
- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

### Conducted Emission Test



### Radiated Spurious Emission Test



## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	Intelligent micro laser projection	LTV	L1	N/A	EUT
E-2	Adapter	N/A	S31A22	N/A	
E-3	Earphone	N/A	2688		

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1.2m	
C-2	NO	NO	1.0m	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

## 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

### Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2015.07.06	2016.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.06.07	2016.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2015.07.06	2016.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.06.07	2016.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2015.06.07	2016.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2015.07.06	2016.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2015.07.06	2016.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2014.12.22	2015.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2015.06.08	2016.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2015.07.06	2016.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2015.07.06	2016.07.05	1 year

### Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2015.06.06	2016.06.05	1 year
2	LISN	R&S	ENV216	101313	2015.08.24	2016.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2015.08.24	2016.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2015.06.07	2016.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2015.06.07	2016.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2015.06.08	2016.06.07	1 year

2	LISN	R&S	ENV216	101313	2014.08.24	2015.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2014.08.24	2015.08.23	1 year

1	Attenuation	MCE	24-10-34	BN9258	2015.06.08	2016.06.07	1 year
---	-------------	-----	----------	--------	------------	------------	--------

### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

### 3.1.2 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.
- 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.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP



**Note: 1.**Support units were connected to second LISN .

**2.**Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

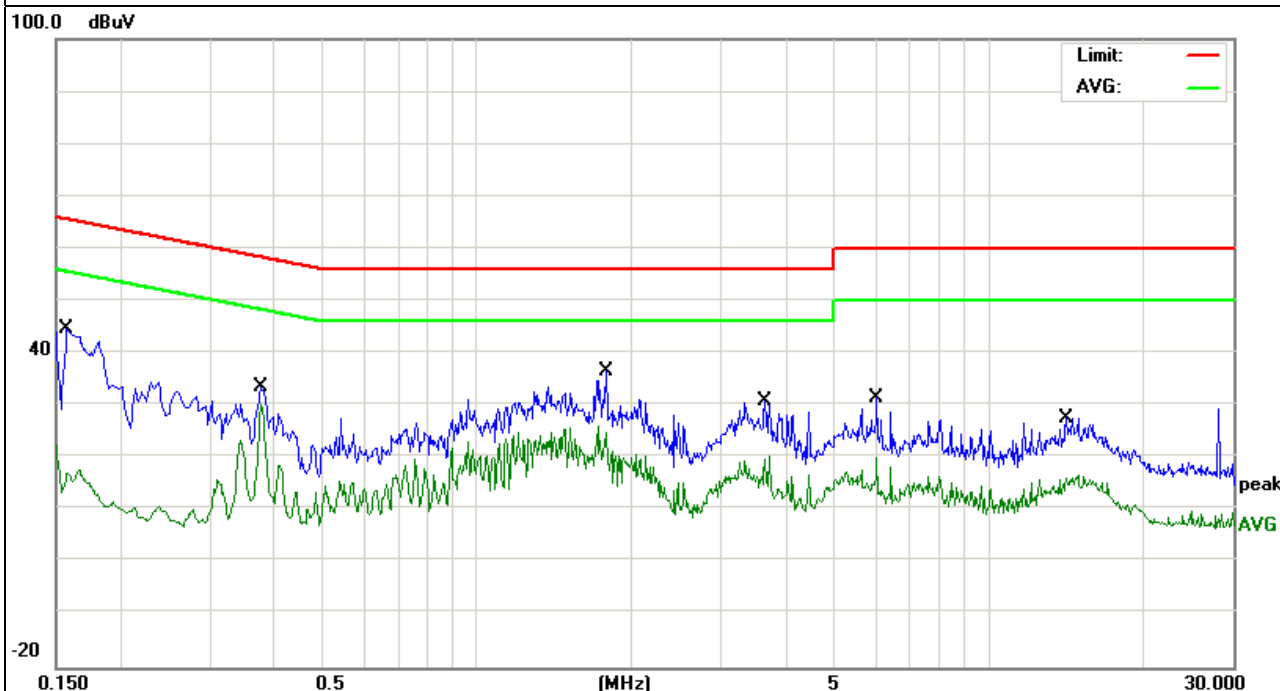
### 3.1.6 TEST RESULTS

EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 5V From adapter AC120V/60Hz	Test Mode :	Mode 3

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1580	34.97	9.62	44.59	65.56	-20.97	QP
0.1580	14.03	9.62	23.65	55.56	-31.91	AVG
0.3780	24.03	9.44	33.47	58.32	-24.85	QP
0.3780	16.00	9.44	25.44	48.32	-22.88	AVG
1.7820	26.84	9.67	36.51	56.00	-19.49	QP
1.7820	14.35	9.67	24.02	46.00	-21.98	AVG
3.6539	21.27	9.69	30.96	56.00	-25.04	QP
3.6539	13.56	9.69	23.25	46.00	-22.75	AVG
6.0419	21.80	9.70	31.50	60.00	-28.50	QP
6.0419	12.19	9.70	21.89	50.00	-28.11	AVG
14.1577	17.83	9.79	27.62	60.00	-32.38	QP
14.1577	10.79	9.79	20.58	50.00	-29.42	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

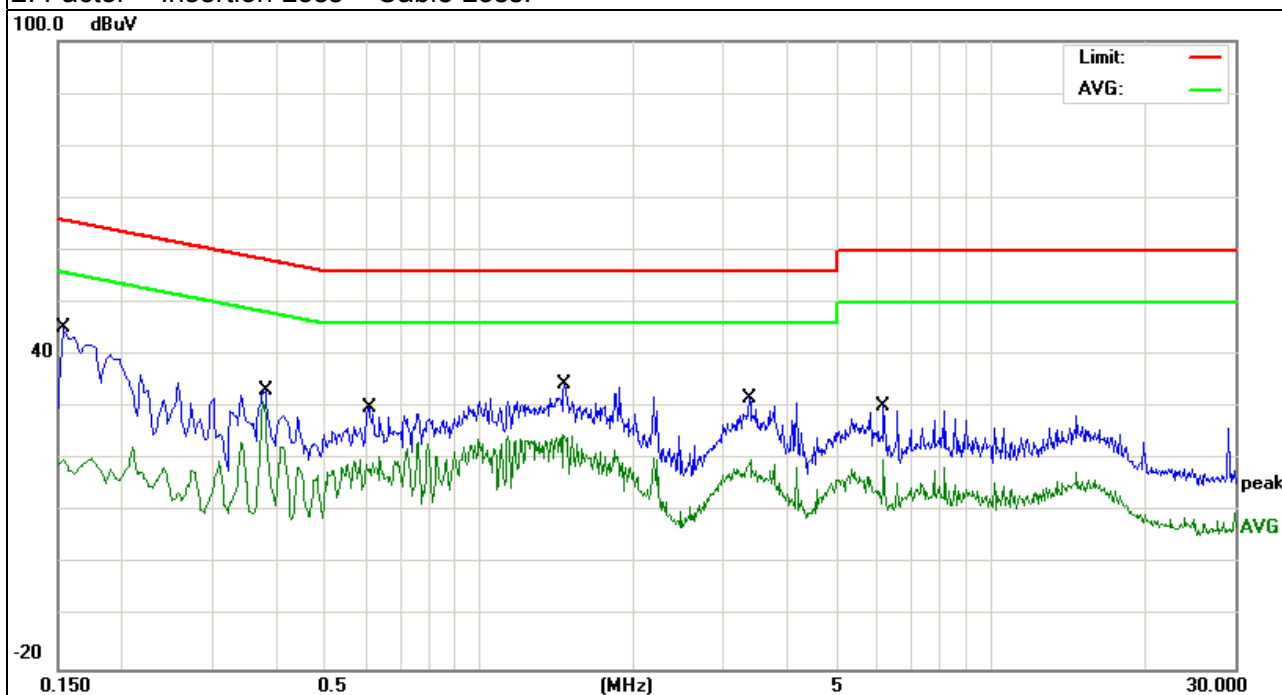


EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 5V From adapter AC120V/60Hz	Test Mode :	Mode 3

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1539	35.56	9.60	45.16	65.78	-20.62	QP
0.1539	26.84	9.60	36.44	55.78	-19.34	AVG
0.3820	23.51	9.63	33.14	58.23	-25.09	QP
0.3820	13.99	9.63	23.62	48.23	-24.61	AVG
0.6097	20.28	9.65	29.93	56.00	-26.07	QP
0.6097	9.93	9.65	19.58	46.00	-26.42	AVG
1.4658	24.74	9.58	34.32	56.00	-21.68	QP
1.4658	15.44	9.58	25.02	46.00	-20.98	AVG
3.3780	22.37	9.51	31.88	56.00	-24.12	QP
3.3780	15.14	9.51	24.65	46.00	-21.35	AVG
6.1619	20.80	9.51	30.31	60.00	-29.69	QP
6.1619	15.60	9.51	25.11	50.00	-24.89	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



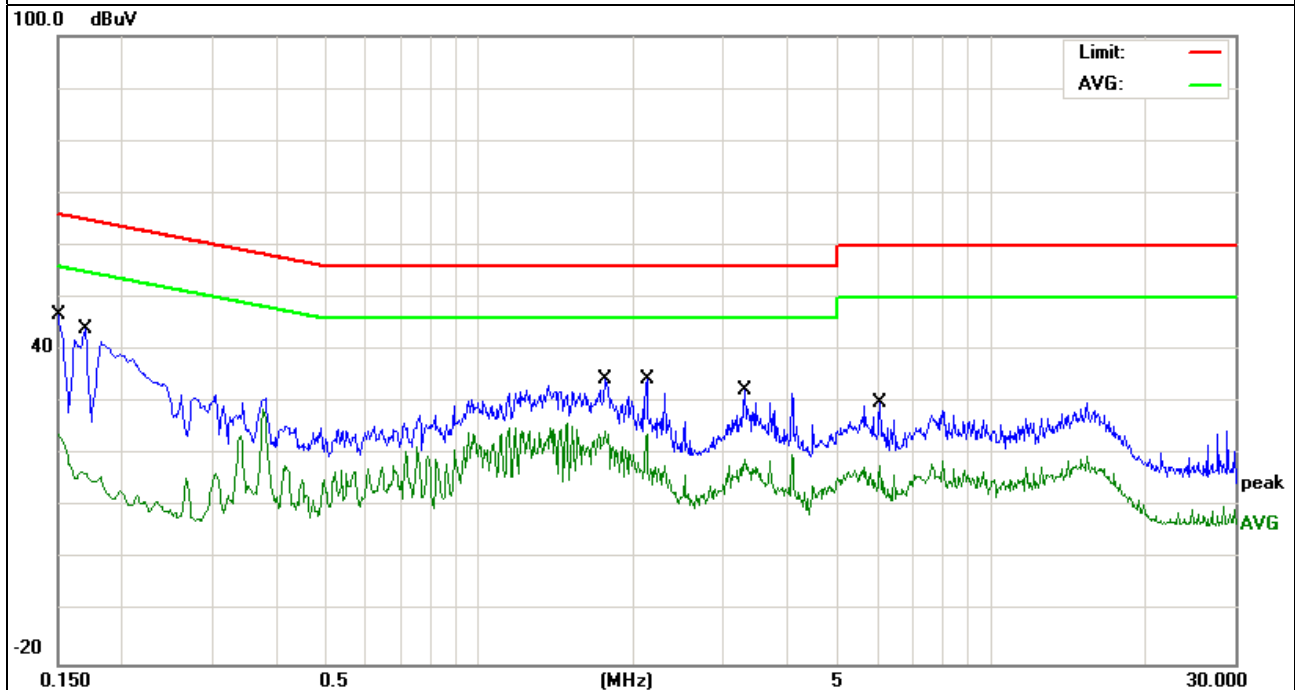


EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 5V From adapter AC 240V/60Hz	Test Mode :	Mode 3

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1499	37.13	9.63	46.76	66.00	-19.24	QP
0.1499	24.02	9.63	33.65	56.00	-22.35	AVG
0.1700	34.52	9.62	44.14	64.96	-20.82	QP
0.1700	22.97	9.62	32.59	54.96	-22.37	AVG
1.7620	24.64	9.67	34.31	56.00	-21.69	QP
1.7620	18.91	9.67	28.58	46.00	-17.42	AVG
2.1218	24.89	9.65	34.54	56.00	-21.46	QP
2.1218	19.71	9.65	29.36	46.00	-16.64	AVG
3.3060	22.81	9.68	32.49	56.00	-23.51	QP
3.3060	15.77	9.68	25.45	46.00	-20.55	AVG
6.0739	20.36	9.70	30.06	60.00	-29.94	QP
6.0739	12.65	9.70	22.35	50.00	-27.65	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

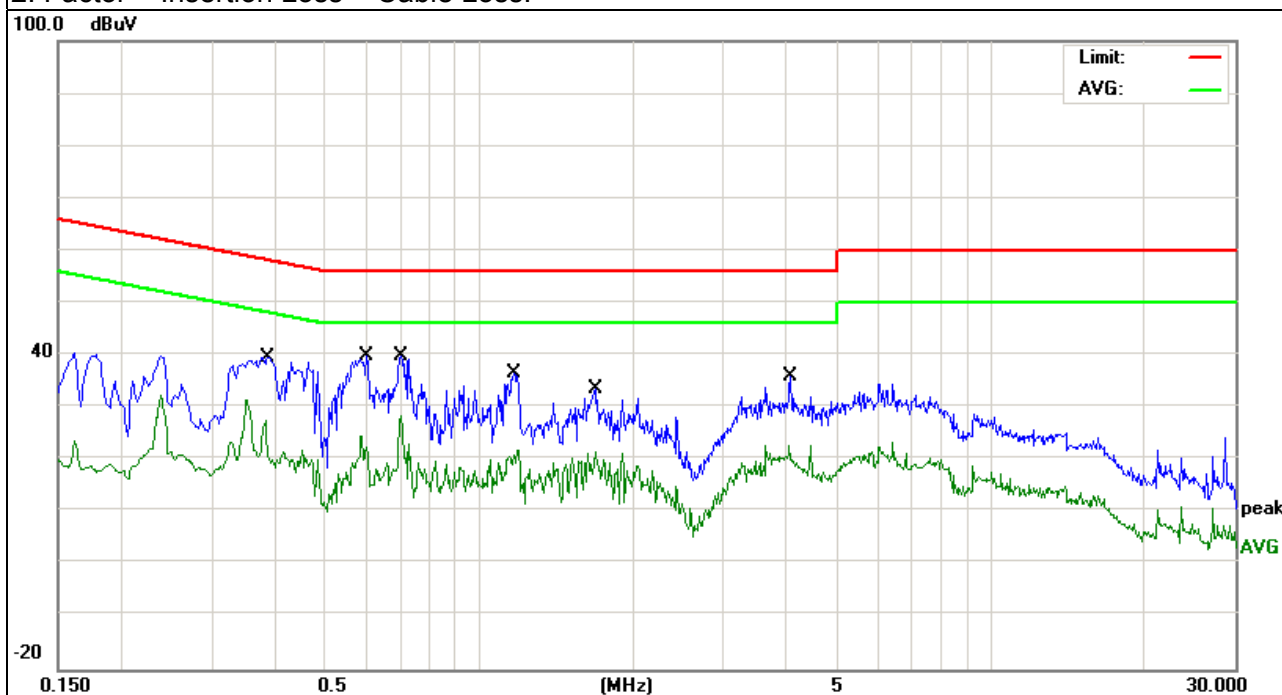


EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 5V From adapter AC240V/60Hz	Test Mode :	Mode 3

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.3860	29.99	9.63	39.62	58.15	-18.53	QP
0.3860	20.59	9.63	30.22	48.15	-17.93	AVG
0.6018	30.25	9.65	39.90	56.00	-16.10	QP
0.6018	19.93	9.65	29.58	46.00	-16.42	AVG
0.7017	30.23	9.64	39.87	56.00	-16.13	QP
0.7017	22.38	9.64	32.02	46.00	-13.98	AVG
1.1657	26.82	9.60	36.42	56.00	-19.58	QP
1.1657	17.87	9.60	27.47	46.00	-18.53	AVG
1.6817	23.92	9.56	33.48	56.00	-22.52	QP
1.6817	16.74	9.56	26.30	46.00	-19.70	AVG
4.0579	26.33	9.51	35.84	56.00	-20.16	QP
4.0579	17.74	9.51	27.25	46.00	-18.75	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

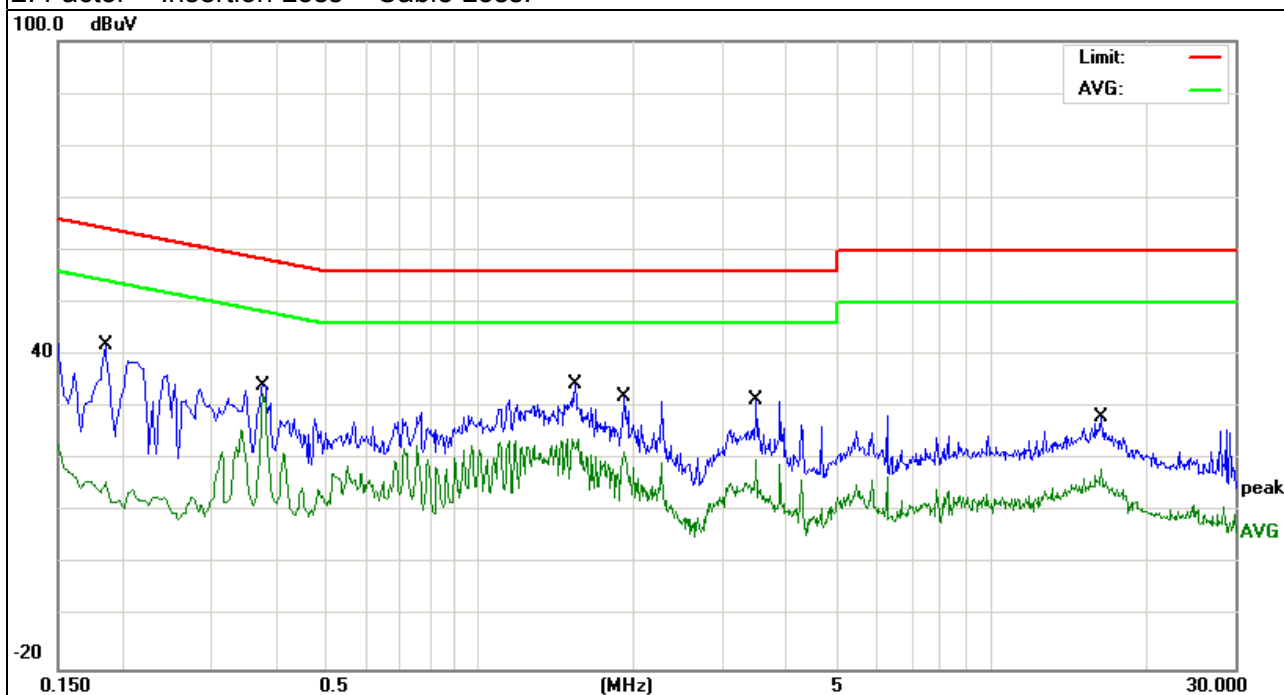


EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 5V From PC AC 120V/60Hz	Test Mode :	Mode 3

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1859	32.34	9.61	41.95	64.21	-22.26	QP
0.1859	18.41	9.61	28.02	54.21	-26.19	AVG
0.3780	24.69	9.44	34.13	58.32	-24.19	QP
0.3780	16.81	9.44	26.25	48.32	-22.07	AVG
1.5420	24.67	9.68	34.35	56.00	-21.65	QP
1.5420	17.34	9.68	27.02	46.00	-18.98	AVG
1.9218	22.38	9.66	32.04	56.00	-23.96	QP
1.9218	16.69	9.66	26.35	46.00	-19.65	AVG
3.4740	21.89	9.68	31.57	56.00	-24.43	QP
3.4740	12.91	9.68	22.59	46.00	-23.41	AVG
16.4139	18.40	9.85	28.25	60.00	-31.75	QP
16.4139	10.62	9.85	20.47	50.00	-29.53	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

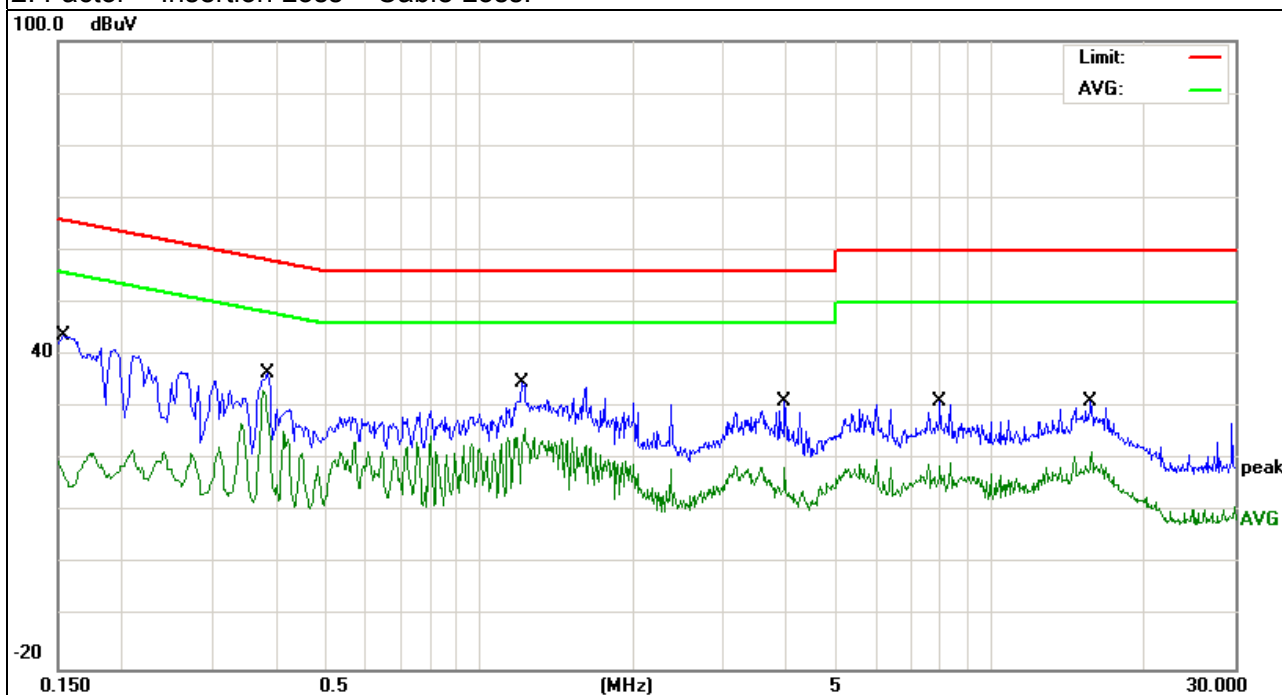


EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 5V From PC AC120V/60Hz	Test Mode :	Mode 3

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1539	34.04	9.60	43.64	65.78	-22.14	QP
0.1539	16.42	9.60	26.02	55.78	-29.76	AVG
0.3860	27.03	9.63	36.66	58.15	-21.49	QP
0.3860	15.95	9.63	25.58	48.15	-22.57	AVG
1.2098	25.13	9.60	34.73	56.00	-21.27	QP
1.2098	14.05	9.60	23.65	46.00	-22.35	AVG
3.9620	21.63	9.51	31.14	56.00	-24.86	QP
3.9620	15.94	9.51	25.45	46.00	-20.55	AVG
7.9618	21.68	9.55	31.23	60.00	-28.77	QP
7.9618	14.23	9.55	23.78	50.00	-26.22	AVG
15.6819	21.52	9.77	31.29	60.00	-28.71	QP
15.6819	14.25	9.77	24.02	50.00	-25.98	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

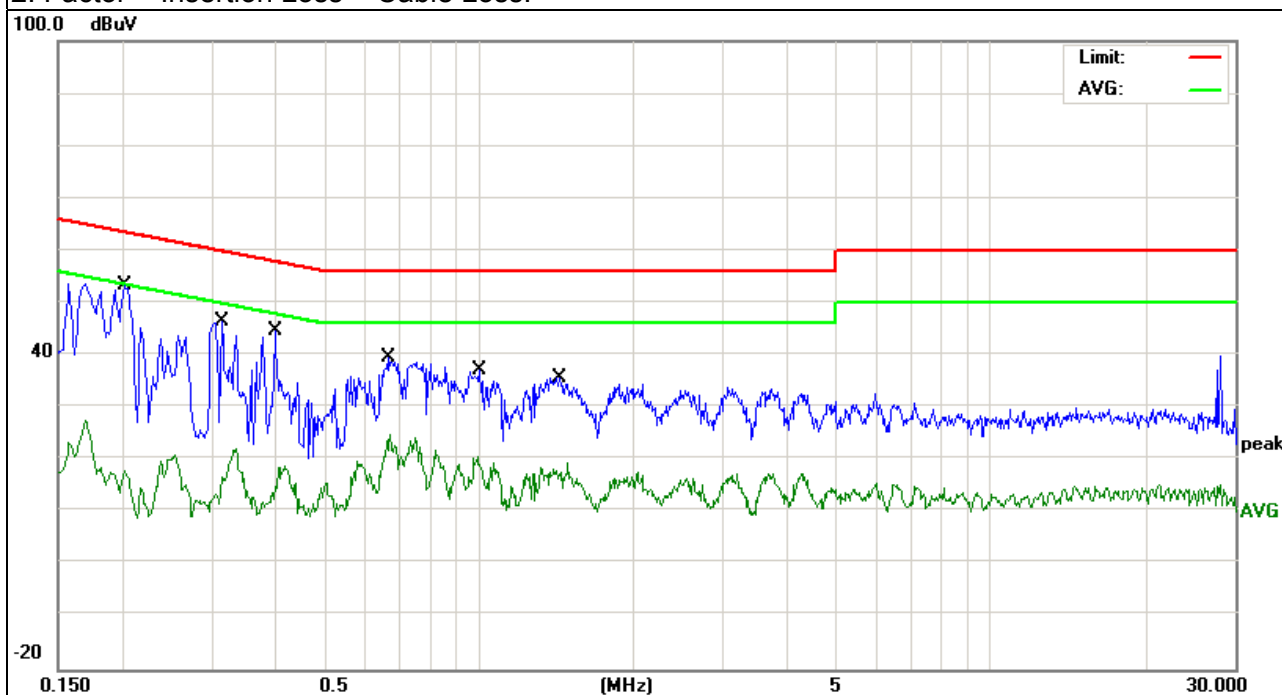


EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 5V From PC AC 240V/60Hz	Test Mode :	Mode 3

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.2020	43.69	9.60	53.29	63.52	-10.23	QP
0.2020	32.42	9.60	42.02	53.52	-11.50	AVG
0.3140	36.75	9.69	46.44	59.86	-13.42	QP
0.3140	26.33	9.69	36.02	49.86	-13.84	AVG
0.3980	35.40	9.37	44.77	57.89	-13.12	QP
0.3980	21.88	9.37	31.25	47.89	-16.64	AVG
0.6620	29.91	9.78	39.69	56.00	-16.31	QP
0.6620	18.80	9.78	28.58	46.00	-17.42	AVG
1.0020	27.50	9.73	37.23	56.00	-18.77	QP
1.0020	16.29	9.73	26.02	46.00	-19.98	AVG
1.4338	25.99	9.70	35.69	56.00	-20.31	QP
1.4338	14.95	9.70	24.65	46.00	-21.35	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

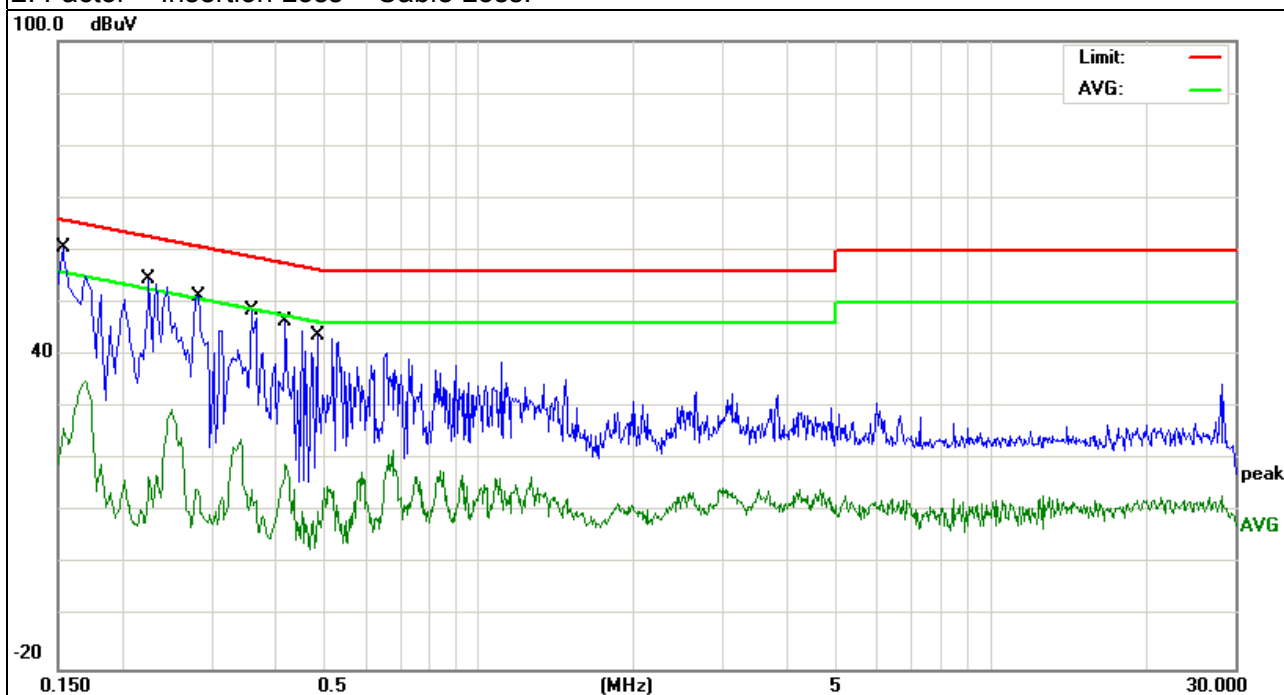


EUT :	Intelligent micro laser projection	Model Name. :	L1
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 5V From PC AC240V/60Hz	Test Mode :	Mode 3

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1539	50.84	9.60	60.44	65.78	-5.34	QP
0.1539	35.42	9.60	45.02	55.78	-10.76	AVG
0.2260	44.81	9.61	54.42	62.59	-8.17	QP
0.2260	33.64	9.61	43.25	52.59	-9.34	AVG
0.2818	41.66	9.61	51.27	60.76	-9.49	QP
0.2818	30.54	9.61	40.15	50.76	-10.61	AVG
0.3578	39.00	9.63	48.63	58.78	-10.15	QP
0.3578	29.62	9.63	39.25	48.78	-9.53	AVG
0.4178	36.78	9.64	46.42	57.49	-11.07	QP
0.4178	19.74	9.64	29.38	47.49	-18.11	AVG
0.4818	34.11	9.68	43.79	56.31	-12.52	QP
0.4818	26.34	9.68	36.02	46.31	-10.29	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (dBuV/m) (at 3M)		Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80	60	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

**3.2.2 TEST PROCEDURE**

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. 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.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

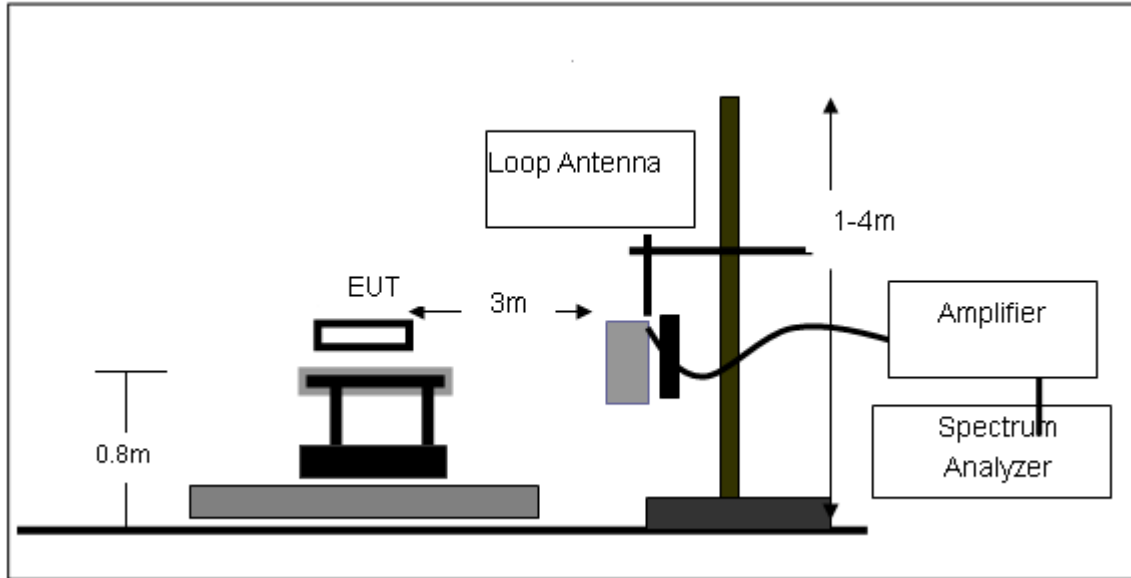
**3.2.3 DEVIATION FROM TEST STANDARD**

No deviation

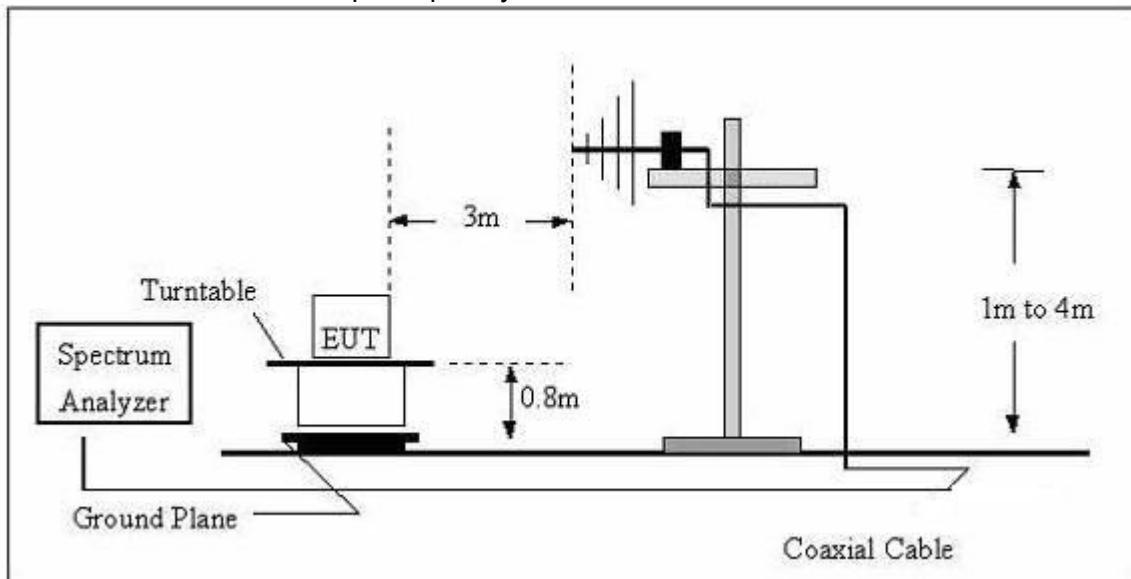


### 3.2.4 TEST SETUP

#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (B) Radiated Emission Test-Up Frequency 30MHz~1GHz



## (C) Radiated Emission Test-Up Frequency Above 1GHz

**3.2.5 EUT OPERATING CONDITIONS**

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

EUT:	Intelligent micro laser projection	Model Name. :	L1
Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	N/A
--	--	--	--	N/A

#### NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance/test distance})(\text{dB})$ ;

Limit line = specific limits(dBuv) + distance extrapolation factor.

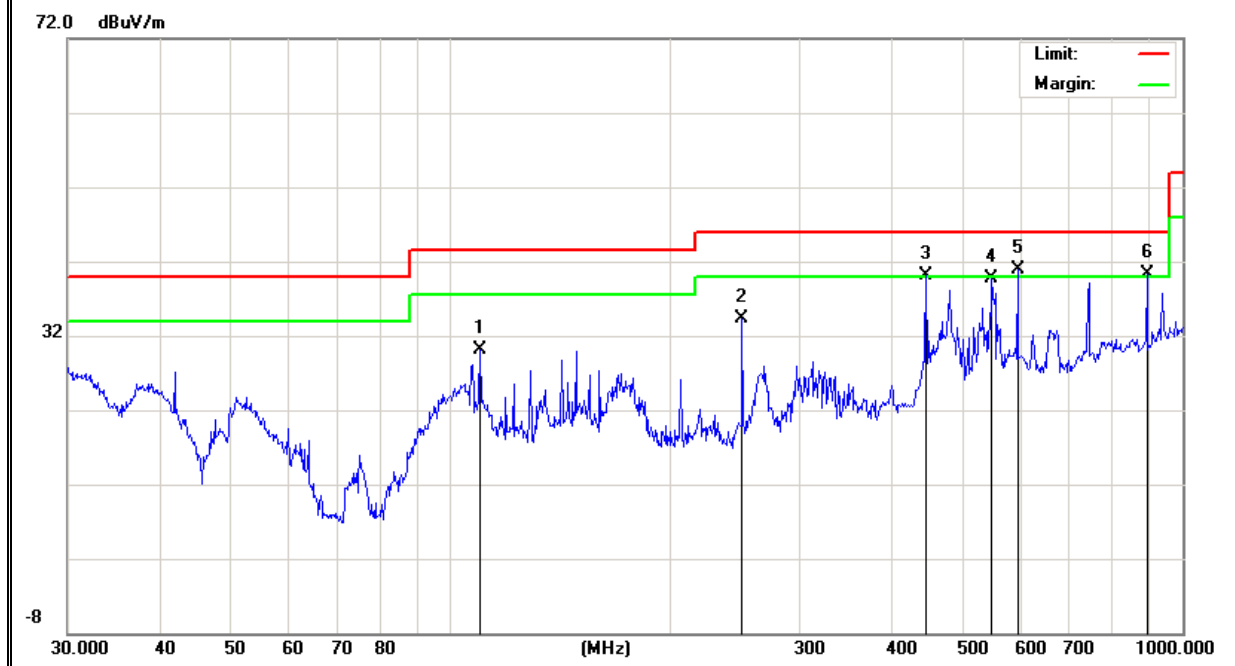
### 3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX (5.0G)		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	109.7960	20.27	9.93	30.20	43.50	-13.30	QP
V	250.3010	20.68	13.59	34.27	46.00	-11.73	QP
V	446.4141	20.83	19.23	40.06	46.00	-5.94	QP
V	549.0193	18.39	21.31	39.70	46.00	-6.30	QP
V	595.1327	18.56	22.31	40.87	46.00	-5.13	QP
V	893.8567	13.31	27.03	40.34	46.00	-5.66	QP

#### Remark:

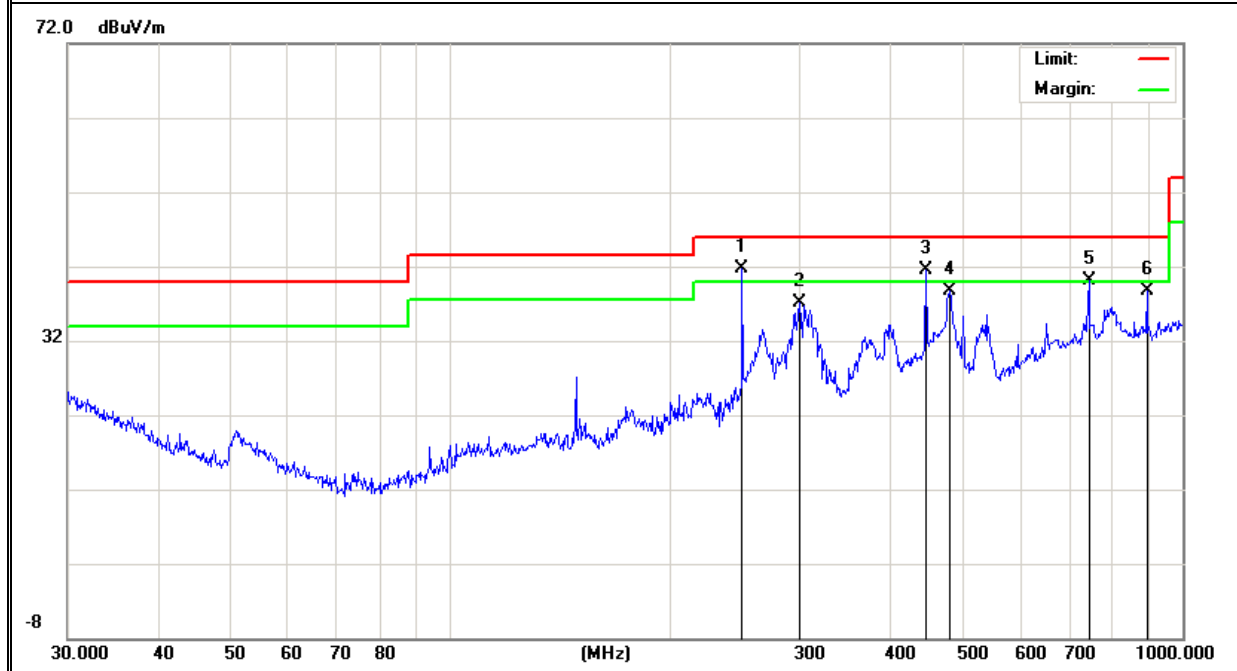
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	250.3009	28.02	13.59	41.61	46.00	-4.39	QP
H	299.3158	22.90	14.15	37.05	46.00	-8.95	QP
H	446.4141	22.29	19.23	41.52	46.00	-4.48	QP
H	480.5276	18.73	19.91	38.64	46.00	-7.36	QP
H	744.8659	14.23	25.96	40.19	46.00	-5.81	QP
H	893.8567	11.64	27.03	38.67	46.00	-7.33	QP

**Remark:**

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



### 3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX (5.0G)		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel (5180 MHz)-Above 1G							
Vertical	10360.214	37.46	14.32	51.78	74	-22.22	Pk
Vertical	15540.052	34.14	16.39	50.53	74	-23.47	Pk
Horizontal	10360.178	36.35	14.32	50.67	74	-23.33	Pk
Horizontal	15540.264	34.88	16.39	51.27	74	-22.73	Pk
middle Channel (5200 MHz)-Above 1G							
Vertical	10400.305	38.65	14.34	52.99	74	-21.01	Pk
Vertical	15600.088	35.37	16.42	51.79	74	-22.21	Pk
Horizontal	10400.174	34.14	14.34	48.48	74	-25.52	Pk
Horizontal	15600.251	35.09	16.42	51.51	74	-22.49	Pk
High Channel (5240 MHz)-Above 1G							
Vertical	10480.211	39.25	14.42	53.67	74	-20.33	Pk
Vertical	15720.306	36.98	16.48	53.46	74	-20.54	Pk
Horizontal	10480.091	33.25	14.42	47.67	74	-26.33	Pk
Horizontal	15720.147	36.14	16.57	52.71	74	-21.29	Pk

Note: "802.11a(5G)" mode is the worst mode. When PK value is lower than the Average value limit, average didn't record.

## 4. POWER SPECTRAL DENSITY TEST

### 4.1 APPLIED PROCEDURES / LIMIT

#### According to FCC §15.407(a)(1)

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

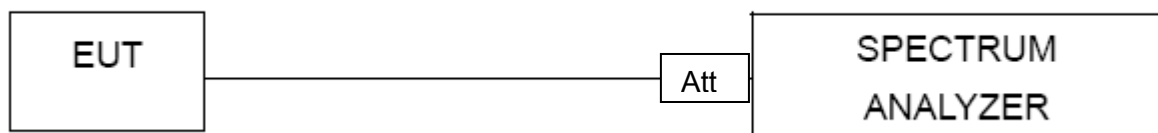
#### 4.1.1 TEST PROCEDURE

- (i) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- (ii) Set RBW = 1 MHz.
- (iii) Set VBW  $\geq$  3 MHz.
- (iv) Number of points in sweep  $\geq$  2 Span / RBW. (This ensures that bin-to-bin spacing is  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)
- (v) Sweep time = auto.
- (vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- (vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle  $\geq$  98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
- (viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- (ix) Compute power by integrating the spectrum across the 26 dB EBW of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges. If the spectrum analyzer does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

#### 4.1.2 DEVIATION FROM STANDARD

No deviation.

#### 4.1.3 TEST SETUP



#### **4.1.4 EUT OPERATION CONDITIONS**

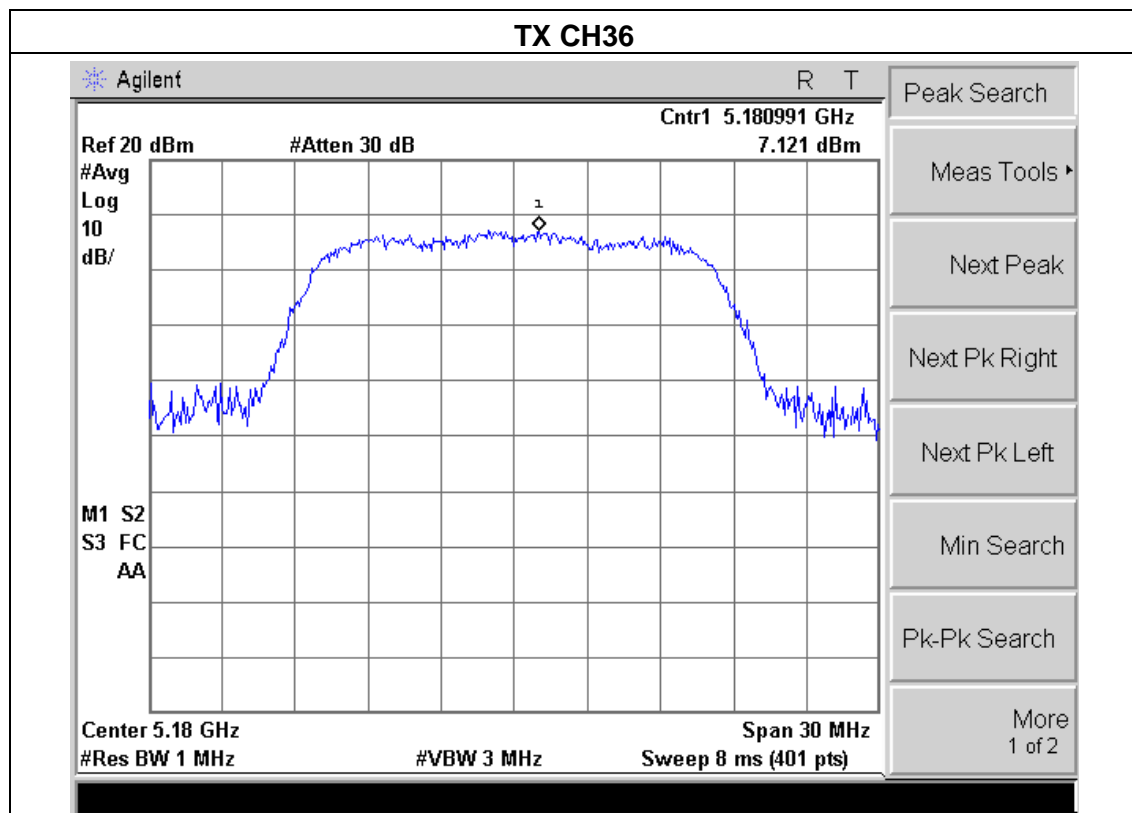
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

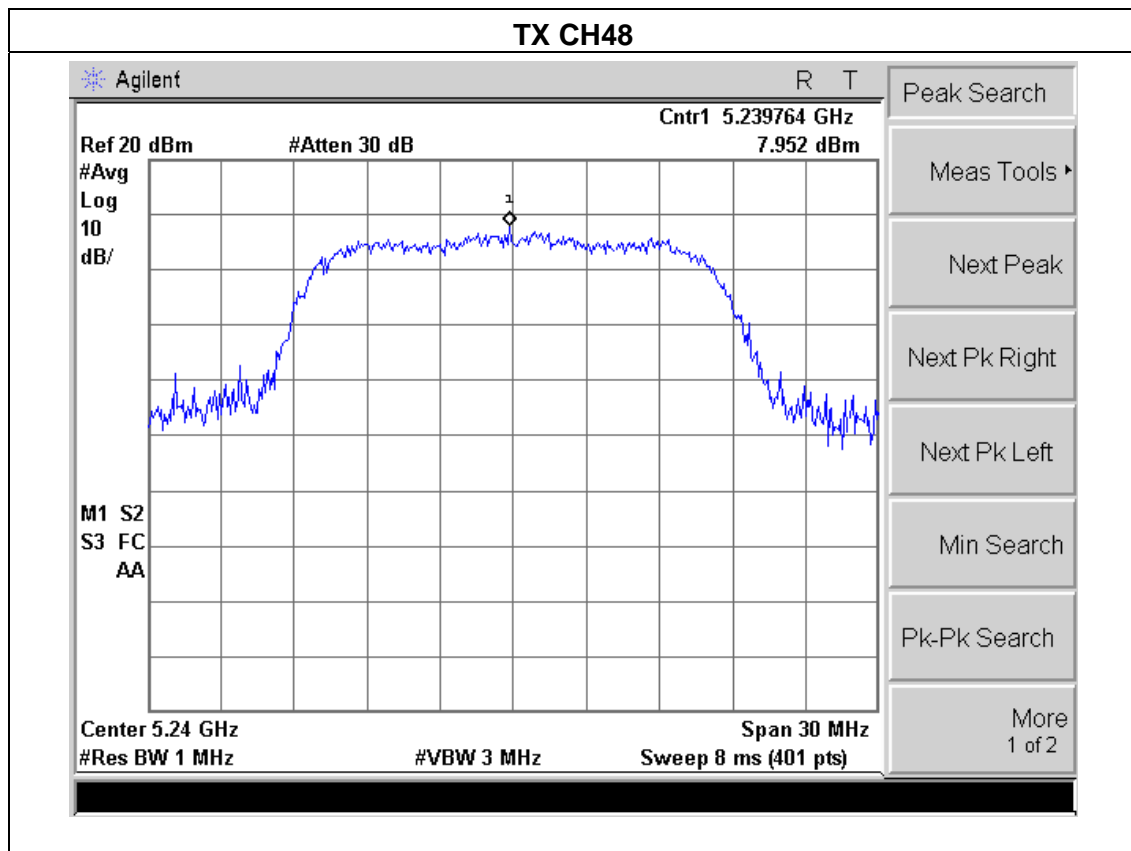
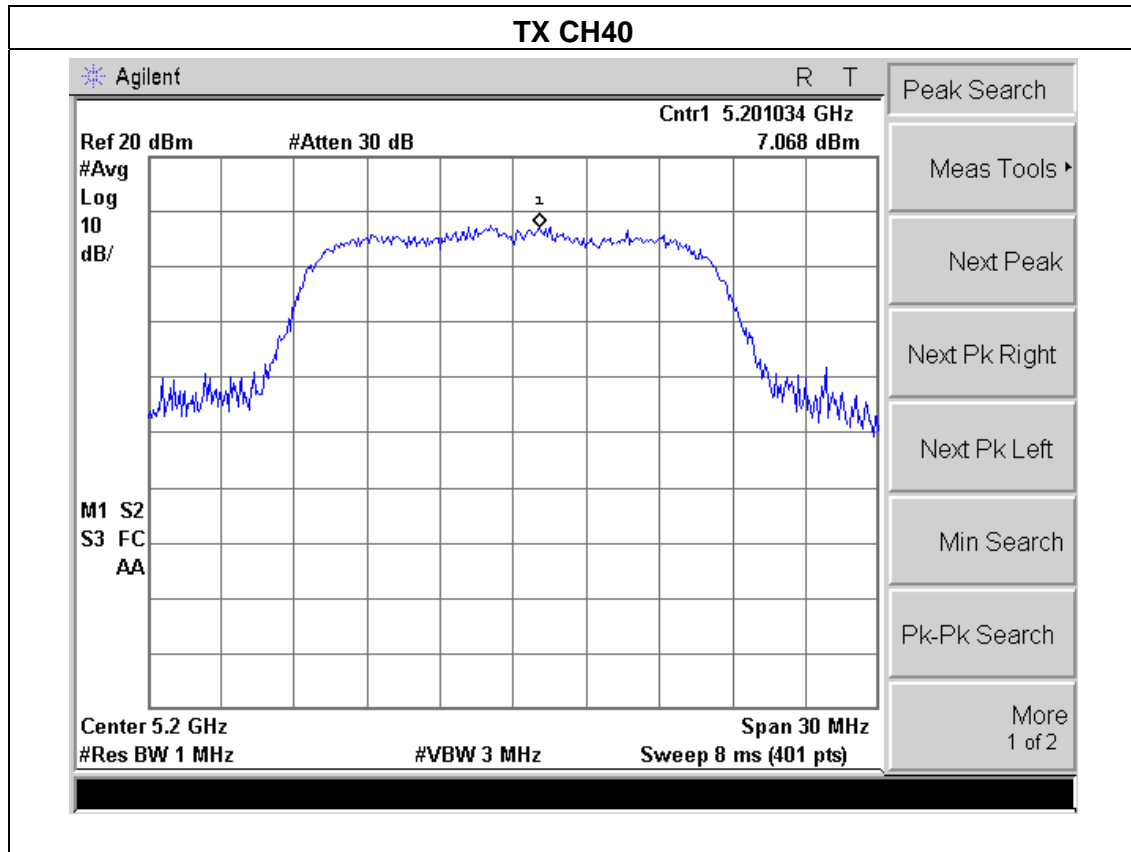


#### 4.1.5 TEST RESULTS

EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1015 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX a Mode /CH36, CH40, CH48		

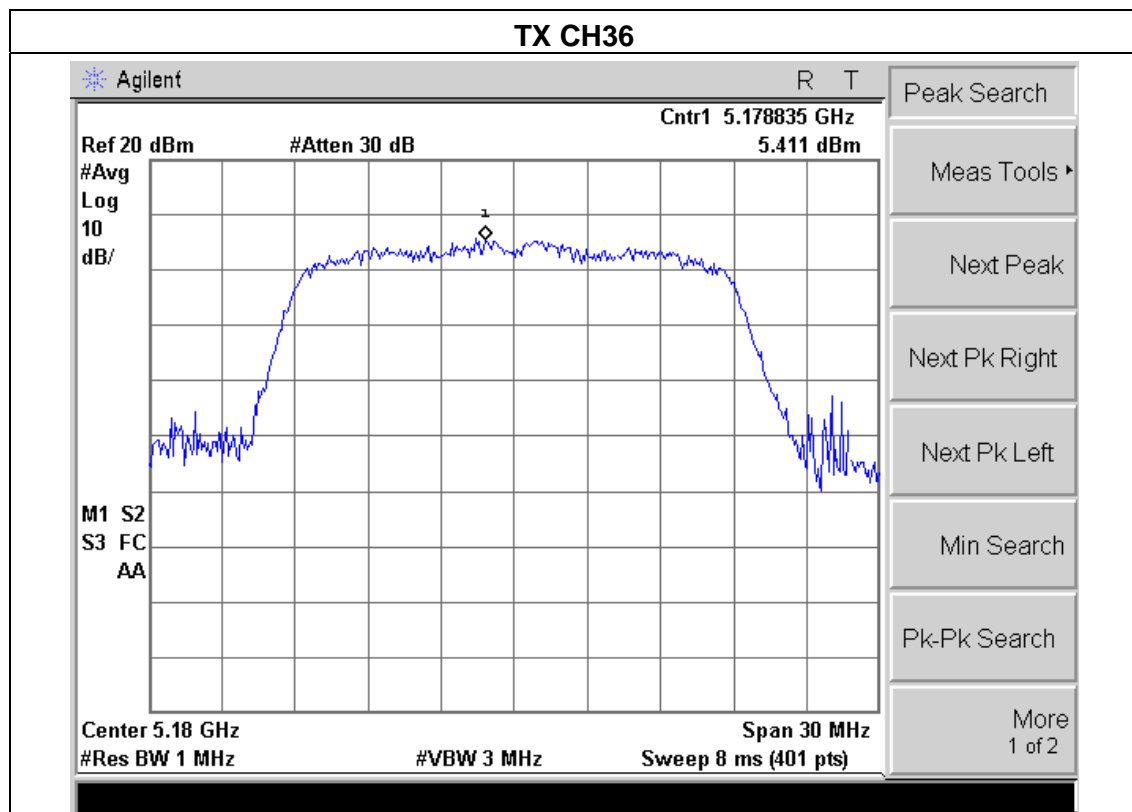
Frequency	Power Density (dBm)	Limit (dBm)	Result
5180 MHz	7.121	11	PASS
5200 MHz	7.068	11	PASS
5240 MHz	7.952	11	PASS



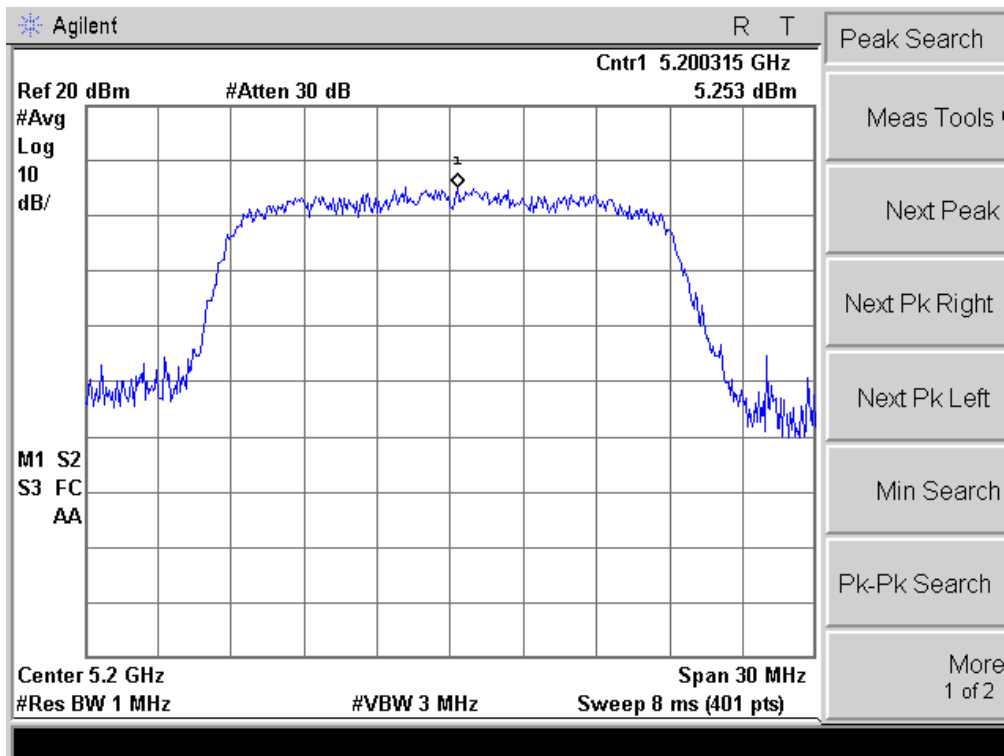


EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1015 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX n(20) Mode(5G) /CH36, CH40, CH48		

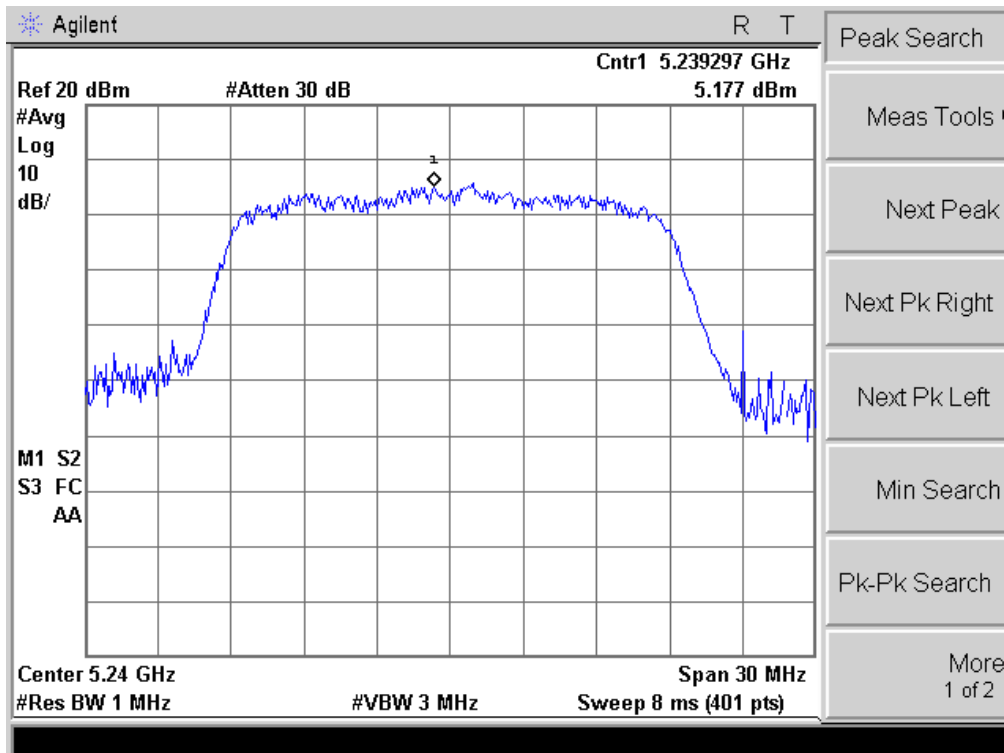
Frequency	Power Density (dBm)	Limit (dBm)	Result
5180 MHz	5.411	11	PASS
5200 MHz	5.253	11	PASS
5240 MHz	5.177	11	PASS



### TX CH40



### TX CH48

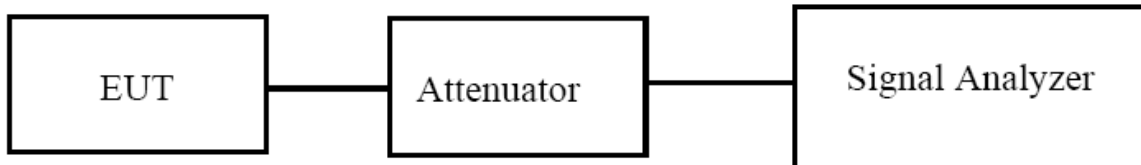


## 5. 26 DB & 99% EMISSION BANDWIDTH

### 5.1 APPLIED PROCEDURES

#### 5.1.1 TEST PROCEDURE

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.



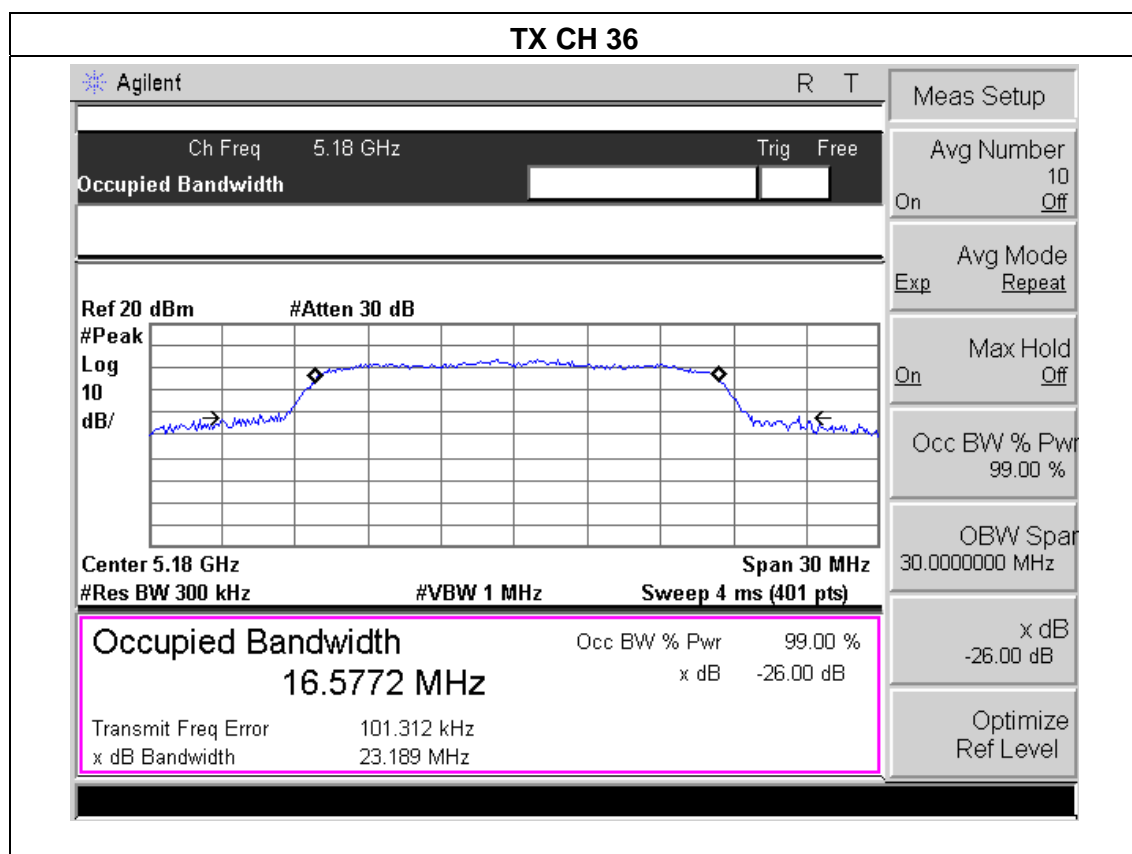
#### 5.1.2 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

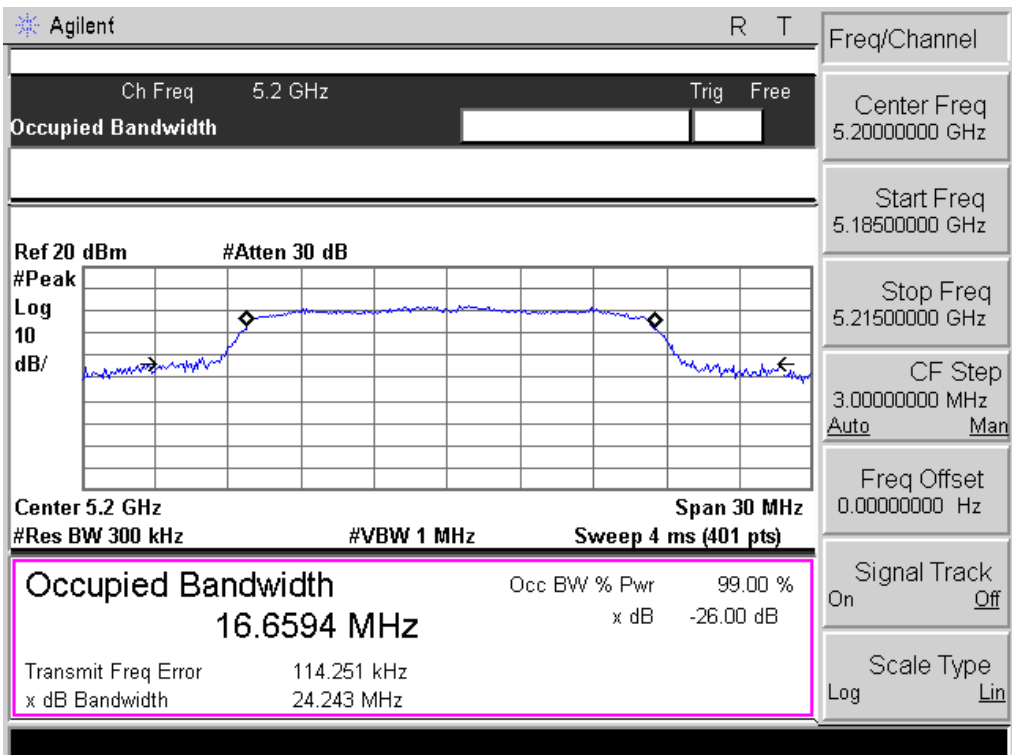
### 5.1.3 TEST RESULTS

EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX a Mode /CH36, CH40, CH48		

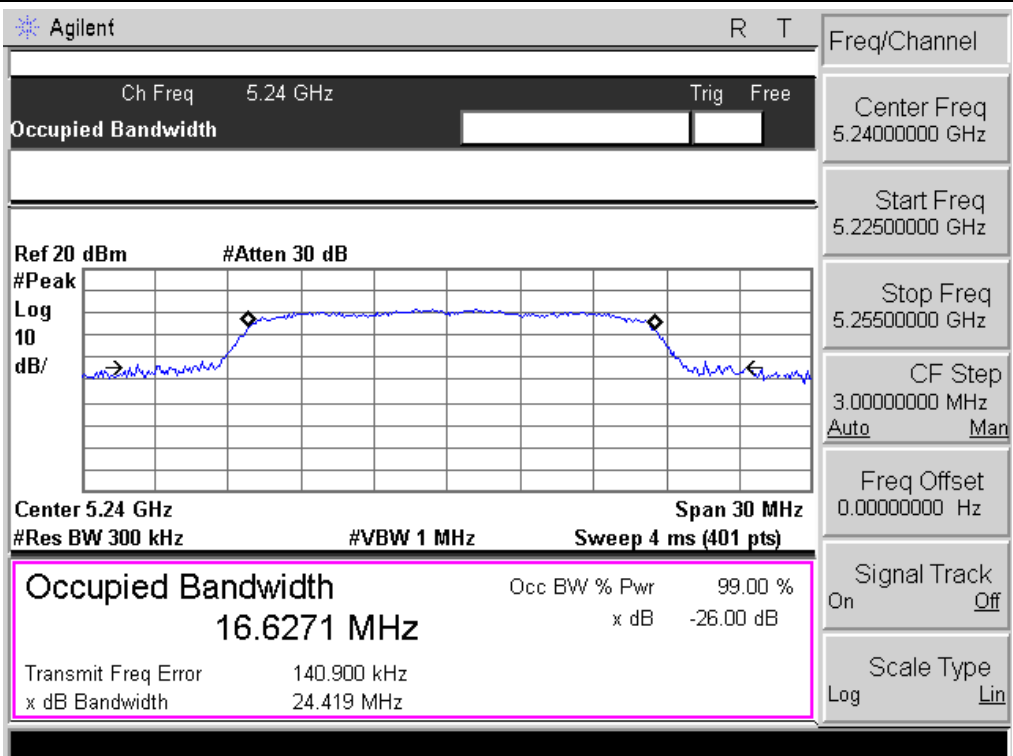
Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit (kHz)	Result
	802.11a mode				
Low	5180	16.577	23.189	500	Pass
Middle	5200	16.659	24.243	500	Pass
High	5240	16.627	24.419	500	Pass



### TX CH 40

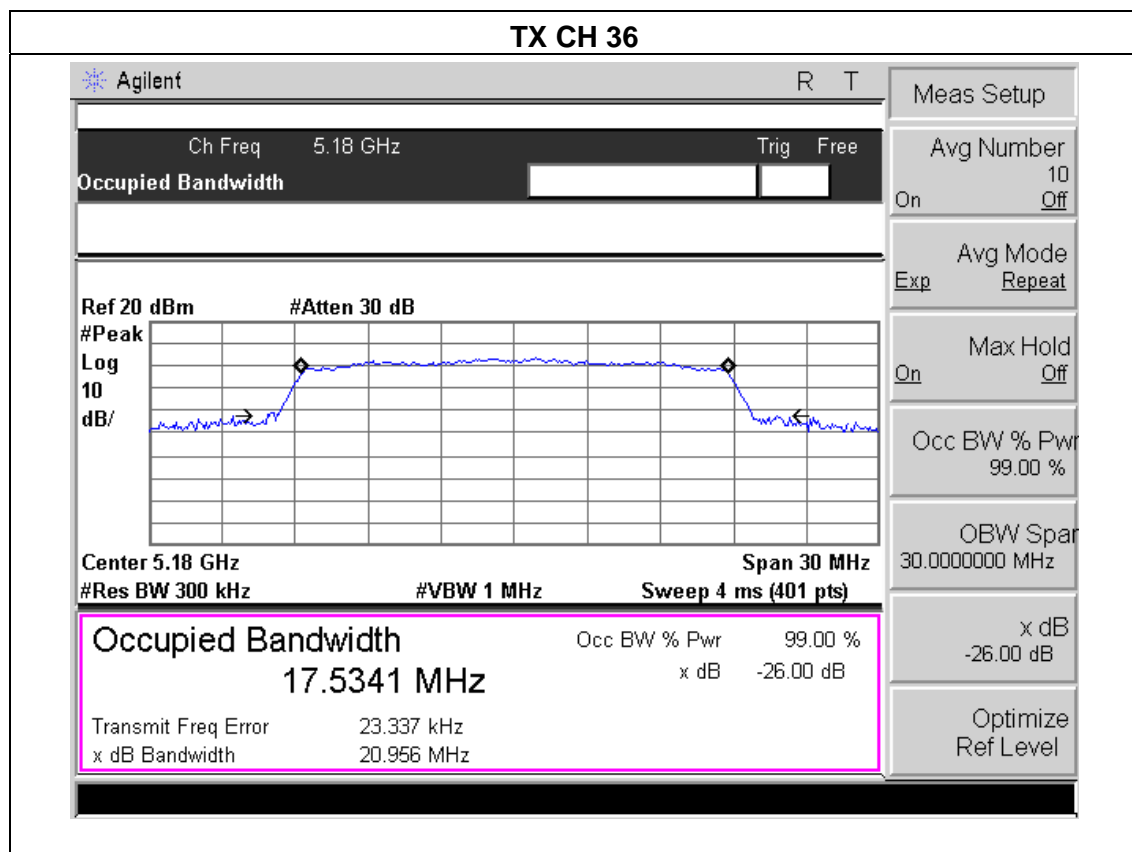


### TX CH 48



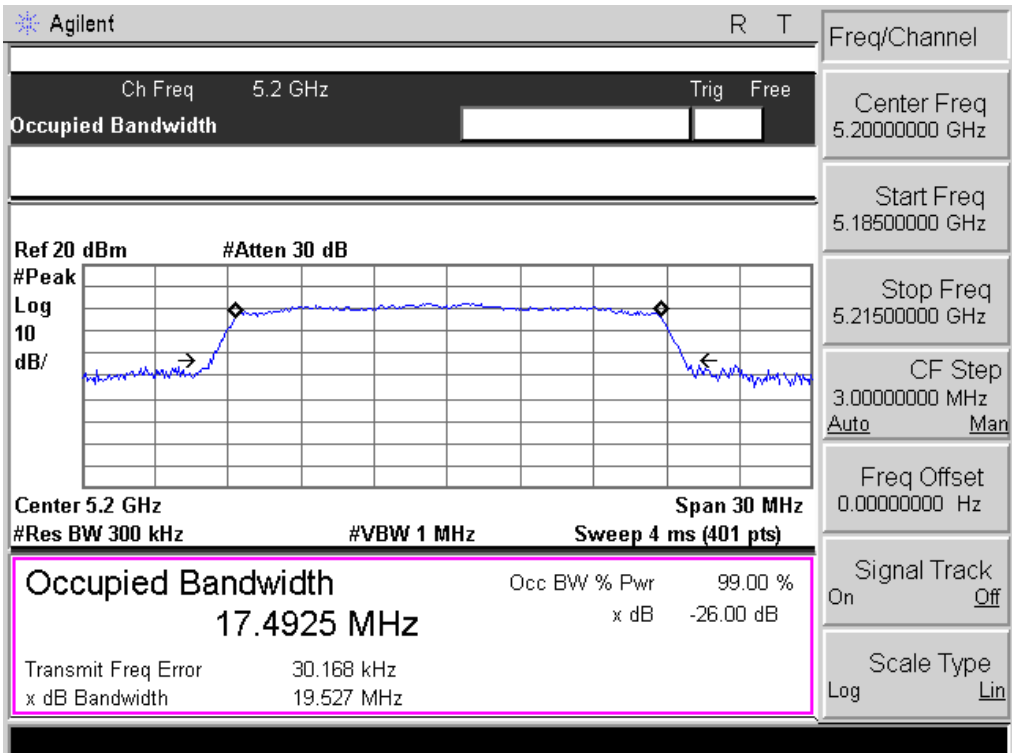
EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX n(20) Mode(5G) /CH36, CH40, CH48		

Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Result
802.11N20 mode				
Low	5180	17.534	20.956	Pass
Middle	5200	17.493	19.527	Pass
High	5240	17.499	20.476	Pass

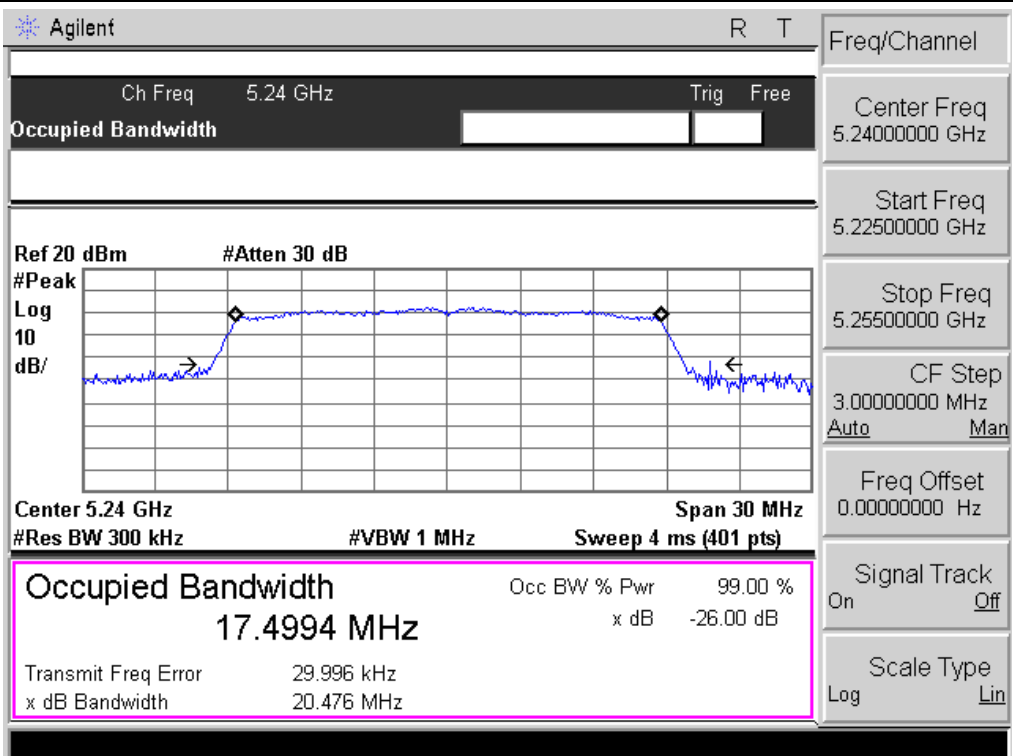




### TX CH 40



### TX CH 48



## 6. PEAK OUTPUT POWER TEST

### 6.1 APPLIED PROCEDURES / LIMIT

#### According to FCC §15.407(a)(1)

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

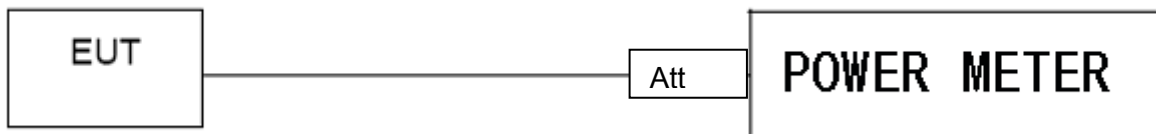
#### 6.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the Power meter

#### 6.1.2 DEVIATION FROM STANDARD

No deviation.

#### 6.1.3 TEST SETUP



#### 6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

### 6.1.5 TEST RESULTS

EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	25 °C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX a/n(5G) Mode		

Test Channe	Frequency	Maximum output power. Antenna port		LIMIT
		(PK)	(AV)	
	(MHz)	(dBm)	(dBm)	dBm
TX 802.11a Mode				
CH36	5180	13.11	11.31	24
CH40	5200	13.02	11.12	24
CH48	5240	13.25	11.33	24
TX 802.11 n20M Mode				
CH36	5180	12.75	10.54	24
CH40	5200	12.97	10.02	24
CH48	5240	12.84	10.36	24

## 7. OUT OF BAND EMISSIONS

### APPLICABLE STANDARD

#### According to FCC §15.407(b)

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz

#### According to RSS-210 §A8.5,

in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

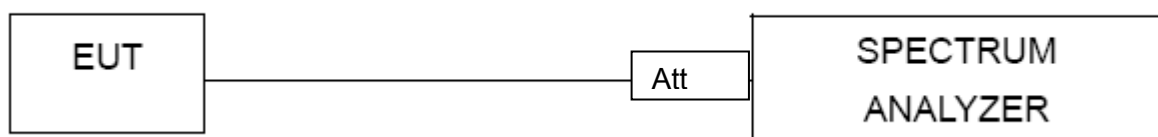
### TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

#### 7.1 DEVIATION FROM STANDARD

No deviation.

#### 7.2 TEST SETUP



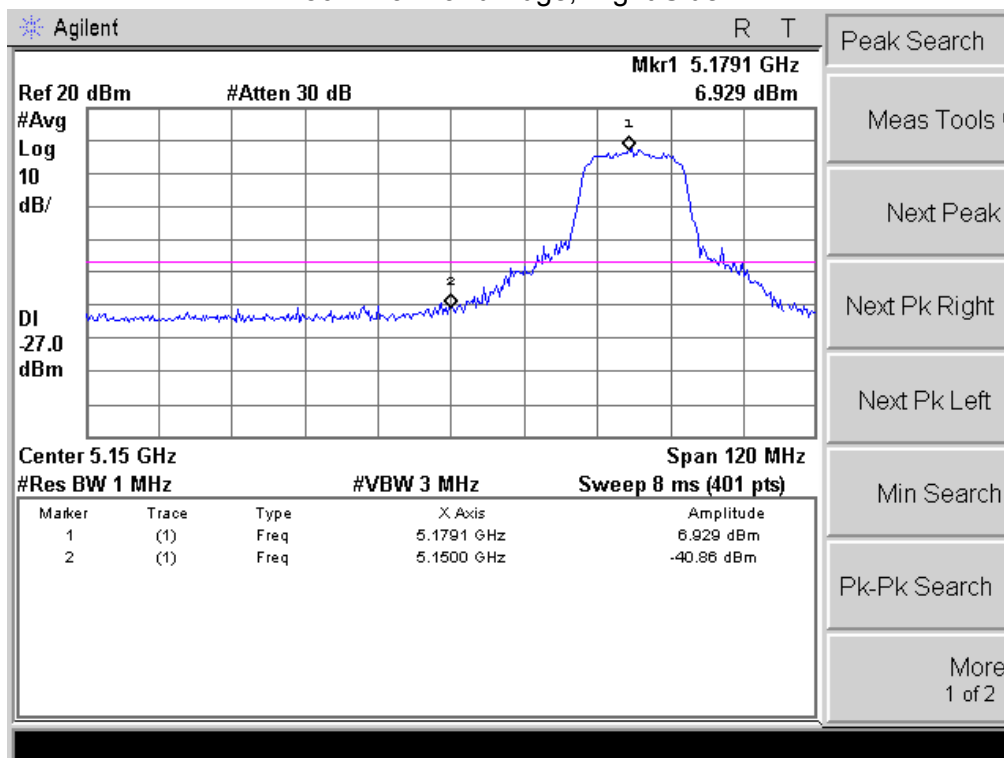
#### 7.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

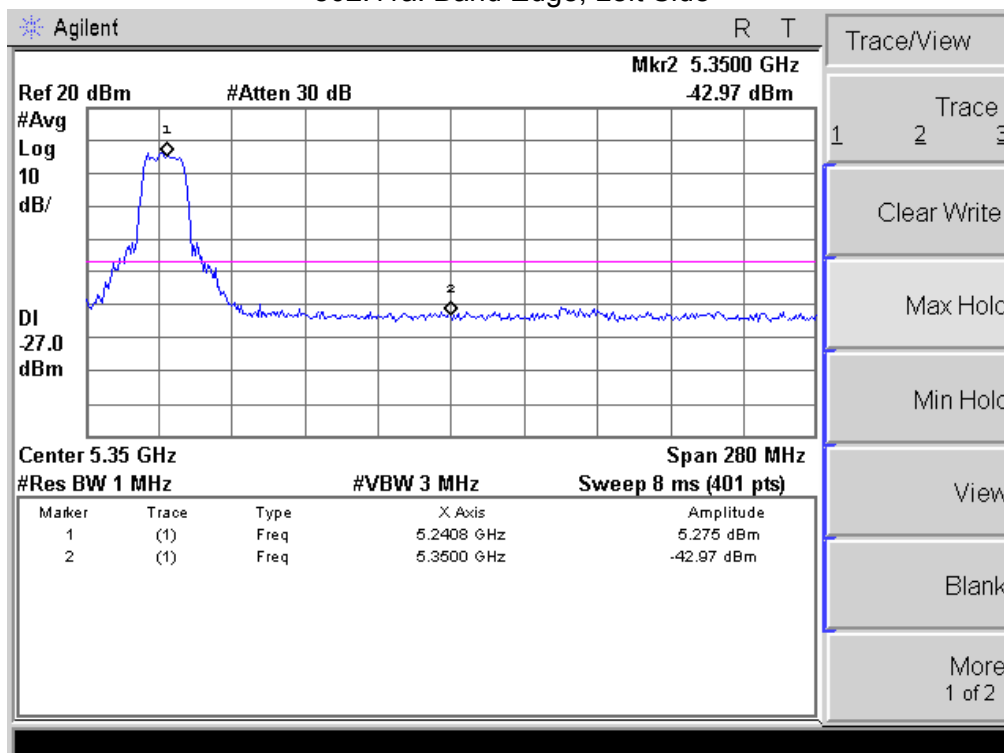
#### 7.4 TEST RESULTS

EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 3.7V

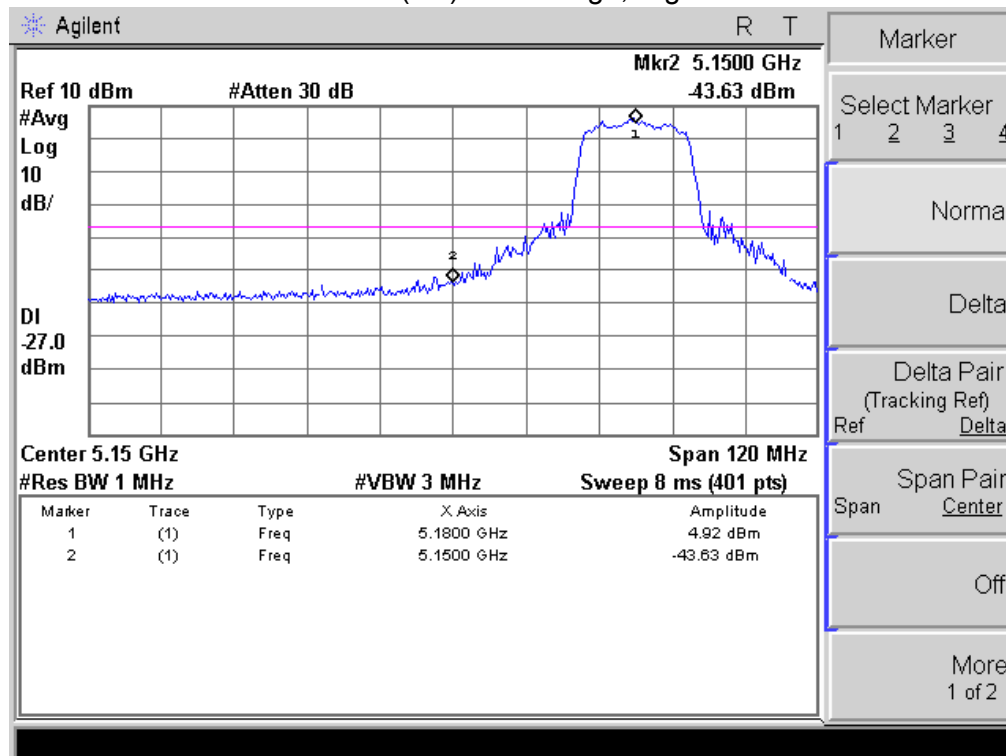
## 802.11a: Band Edge, Right Side



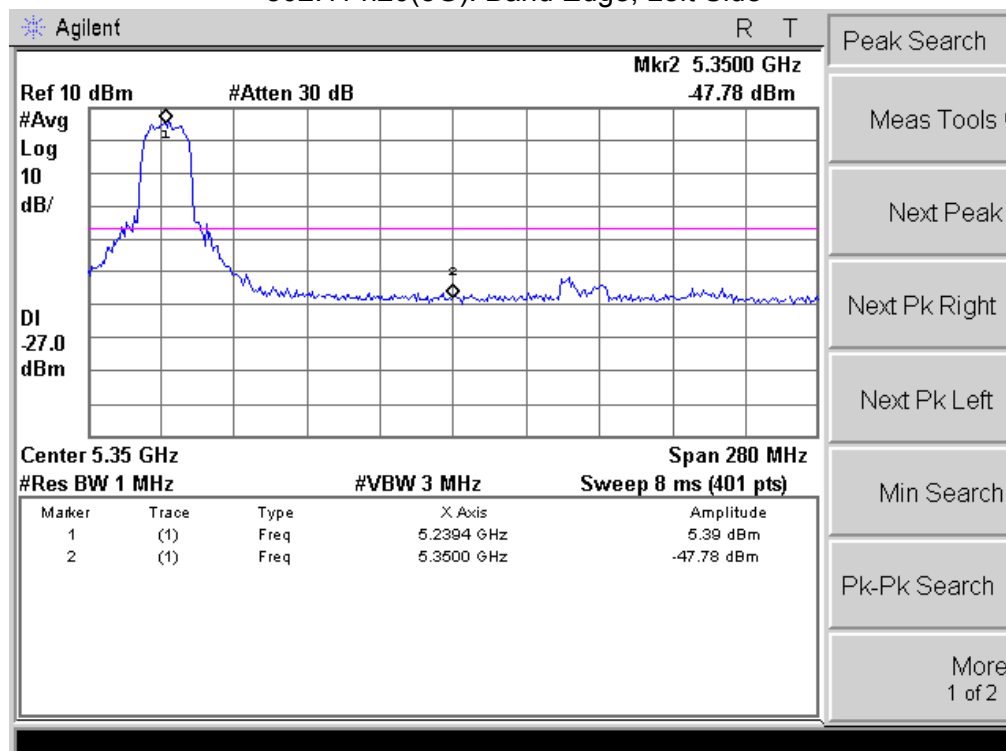
## 802.11a: Band Edge, Left Side



### 802.11 n20(5G): Band Edge, Right Side



### 802.11 n20(5G): Band Edge, Left Side



## 8. PEAK EXCURSION RATIO

### 8.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(a) (6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

#### 8.1.1 TEST PROCEDURE

The largest difference between the following two traces must be  $\leq 13$  dB for all frequencies across the emission

bandwidth. Submit a plot.

1st Trace:

- Set RBW = 1 MHz, VBW  $\geq 3$  MHz with peak detector and maxhold settings.

2nd Trace:

- create the 2nd trace using the settings described in the setion “FCC §15.407(a)(1)(2) –

CONDUCTED

TRANSMITTER OUTPUT POWER”.

#### 8.1.2 DEVIATION FROM STANDARD

No deviation.

#### 8.1.3 TEST SETUP



#### 8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

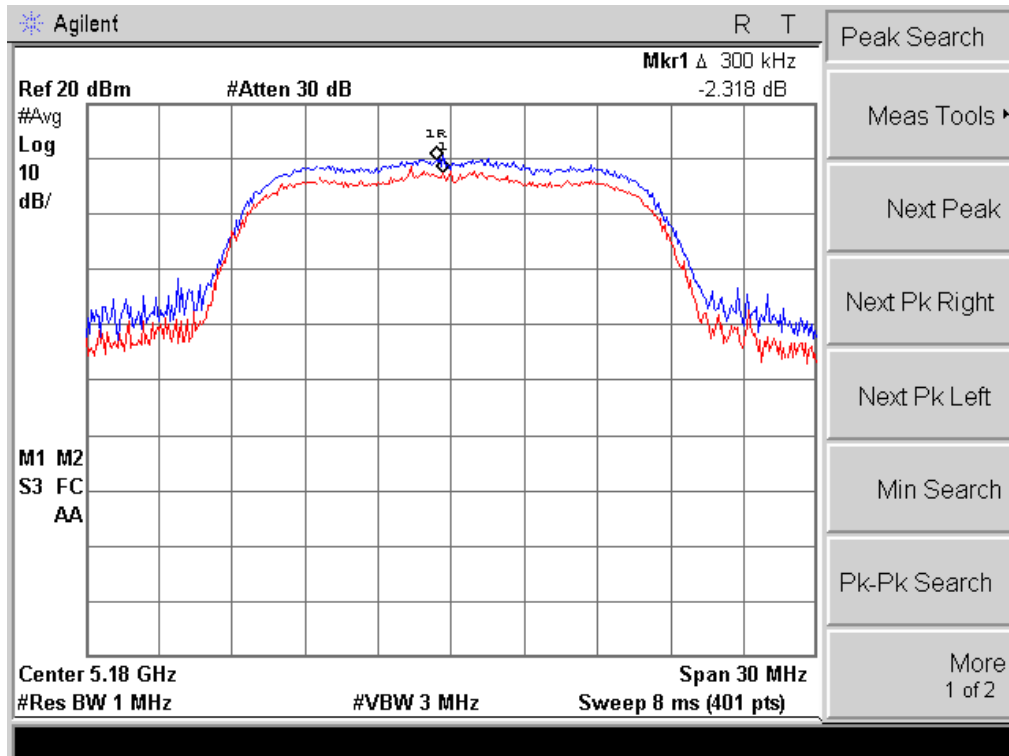


### 8.1.5 TEST RESULTS

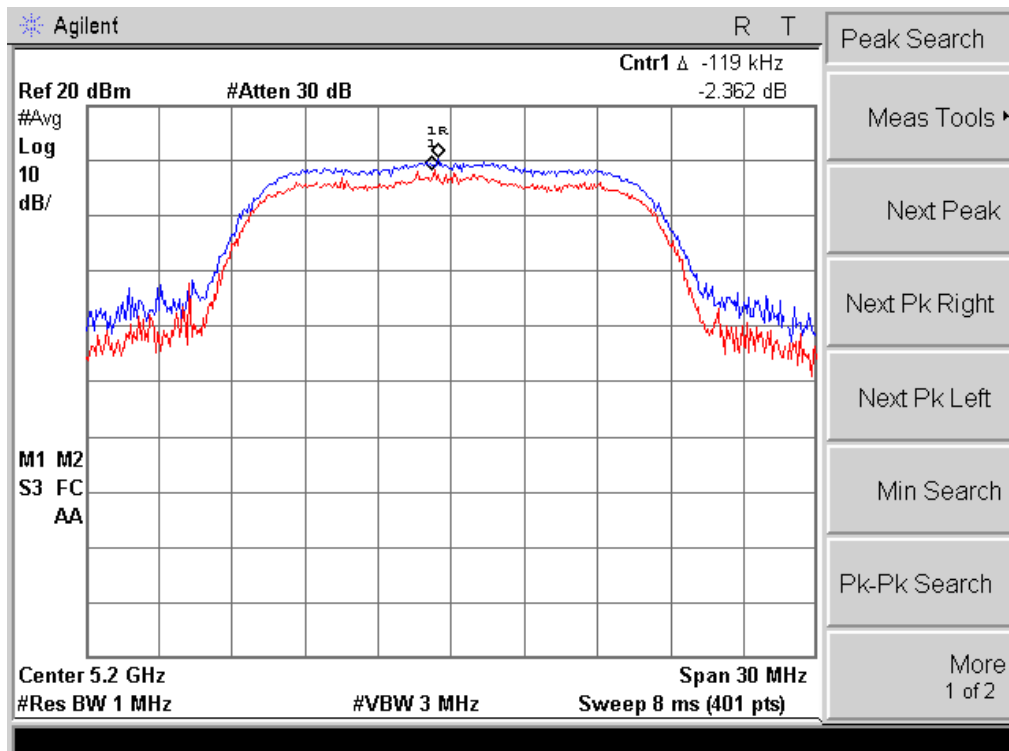
EUT :	Intelligent micro laser projection	Model Name :	L1
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 3.7V

Channel	Frequency (MHz)	TX PER(dB)	Limit (dB)
802.11a mode			
Low	5180	2.318	13
Middle	5200	2.362	
High	5240	2.801	
802.11n HT20 mode			
Low	5180	3.570	13
Middle	5200	4.045	
High	5240	3.016	

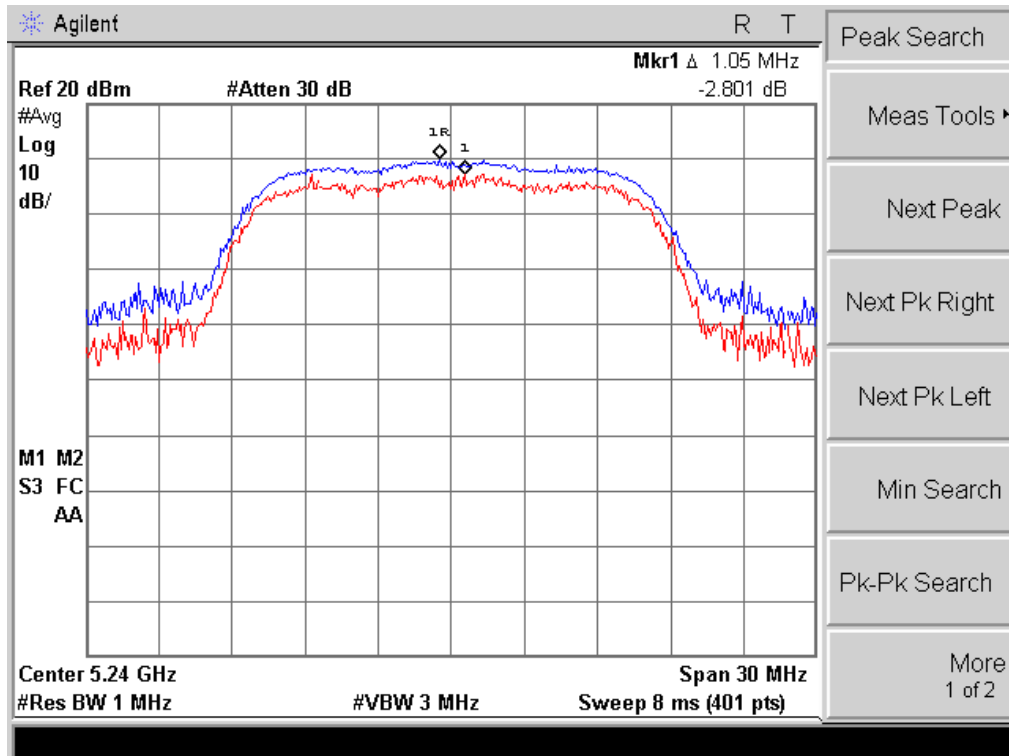
802.11a:CH 36



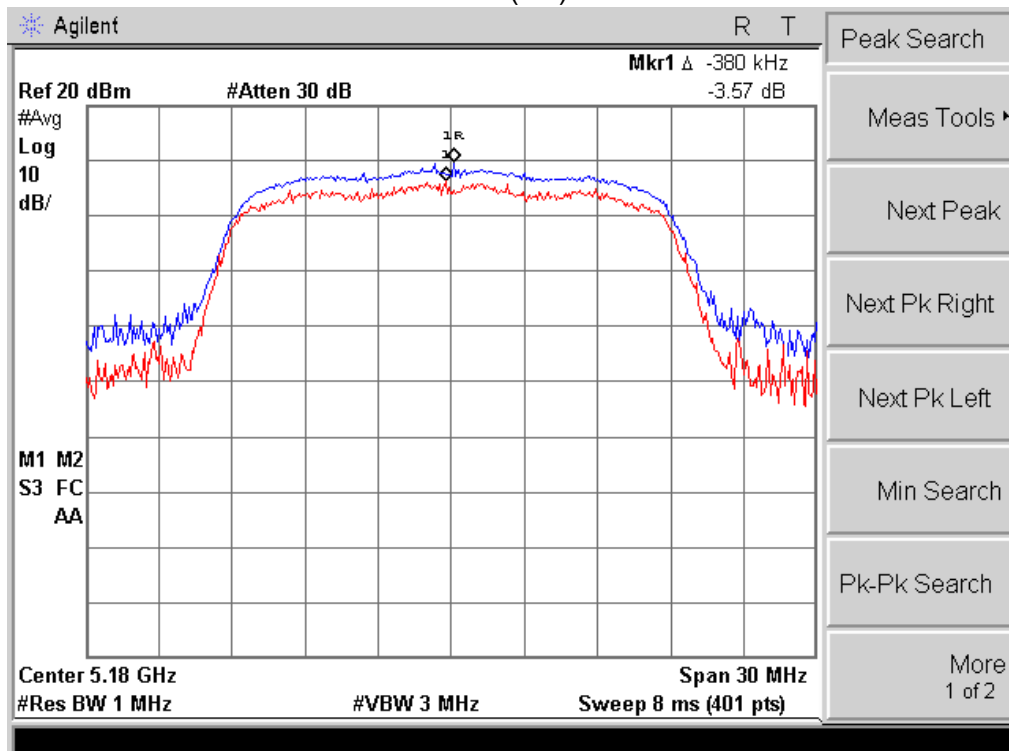
CH 40



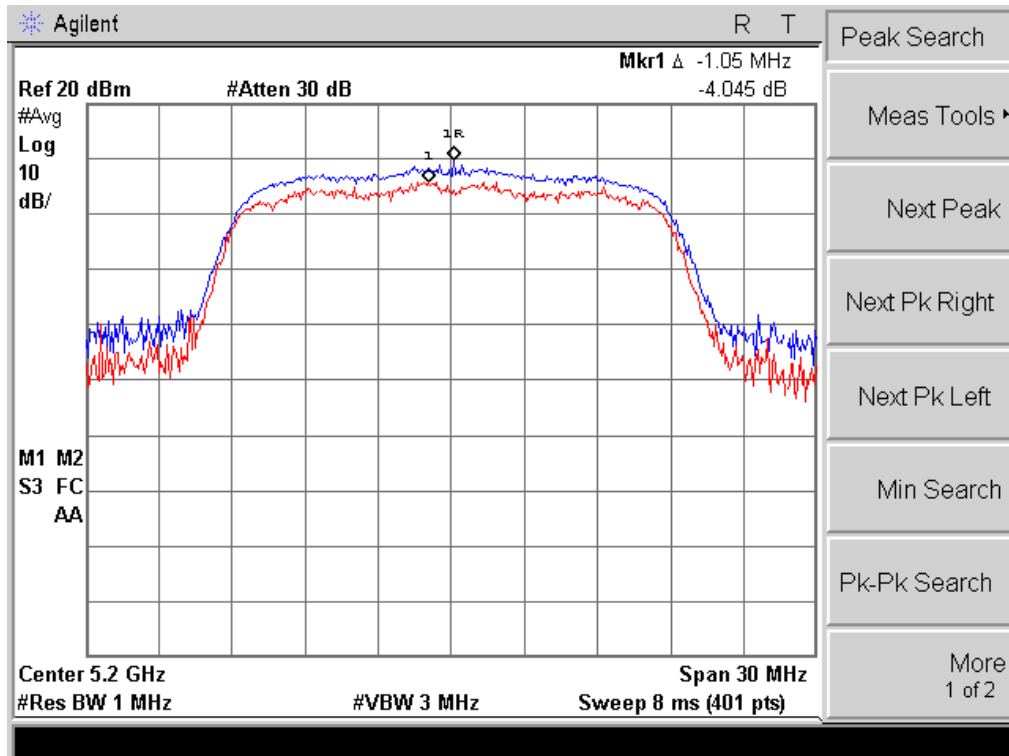
## CH 48



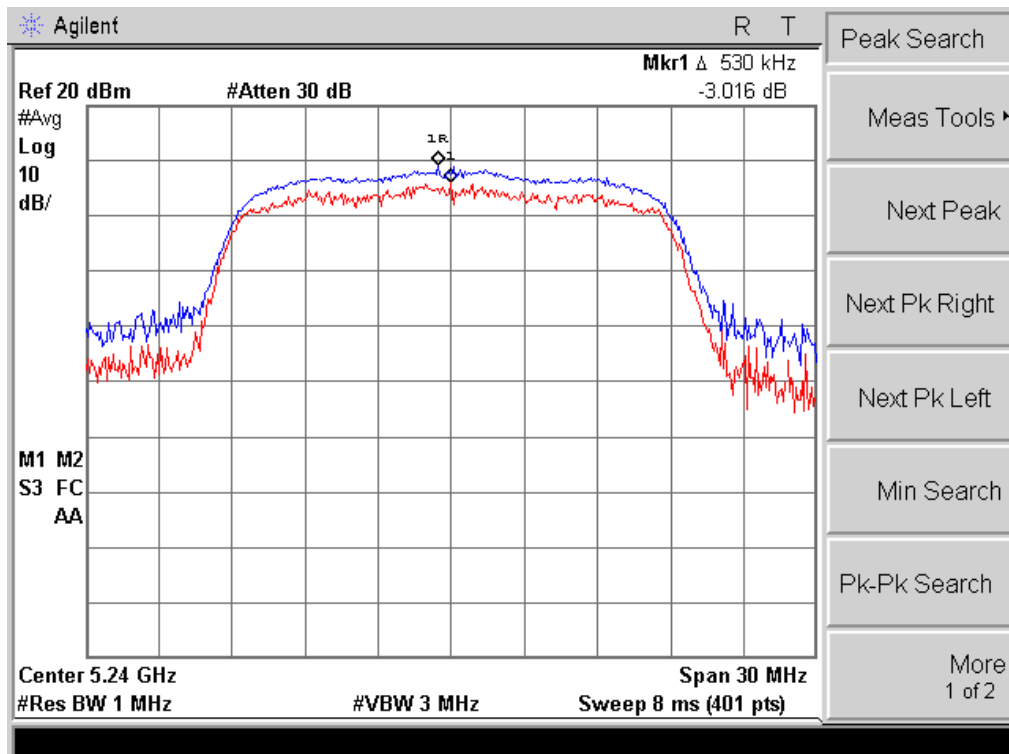
## 802.11 n20(5G):CH 36



## CH 40



## CH 48



## **9. ANTENNA REQUIREMENT**

### **9.1 STANDARD REQUIREMENT**

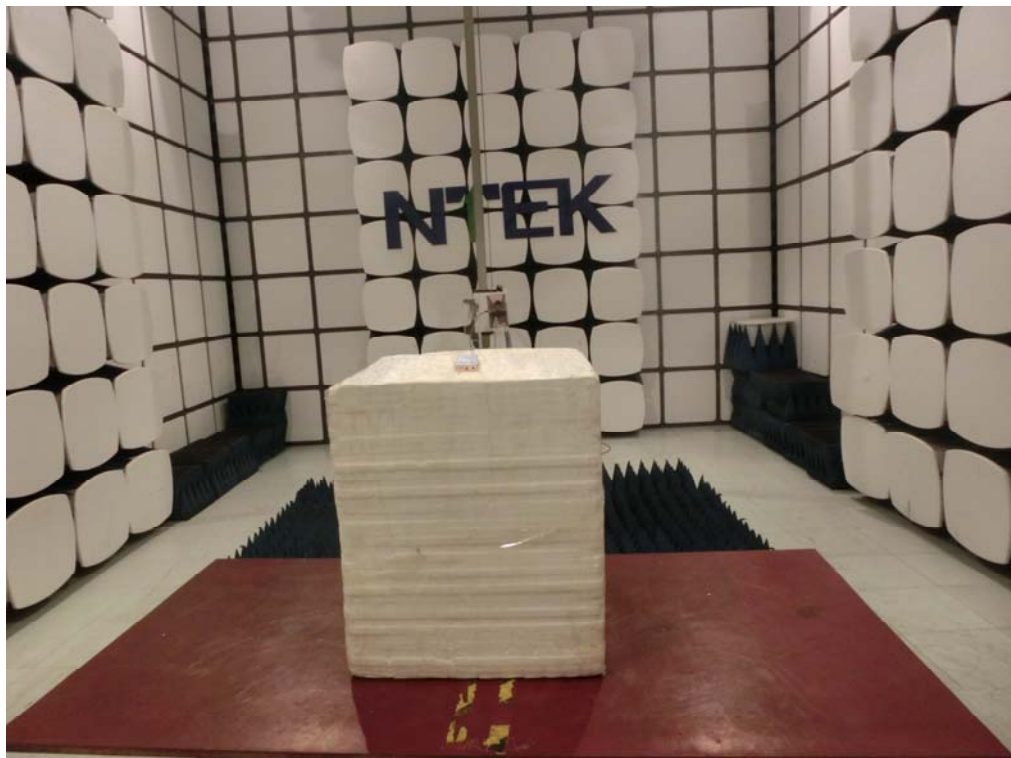
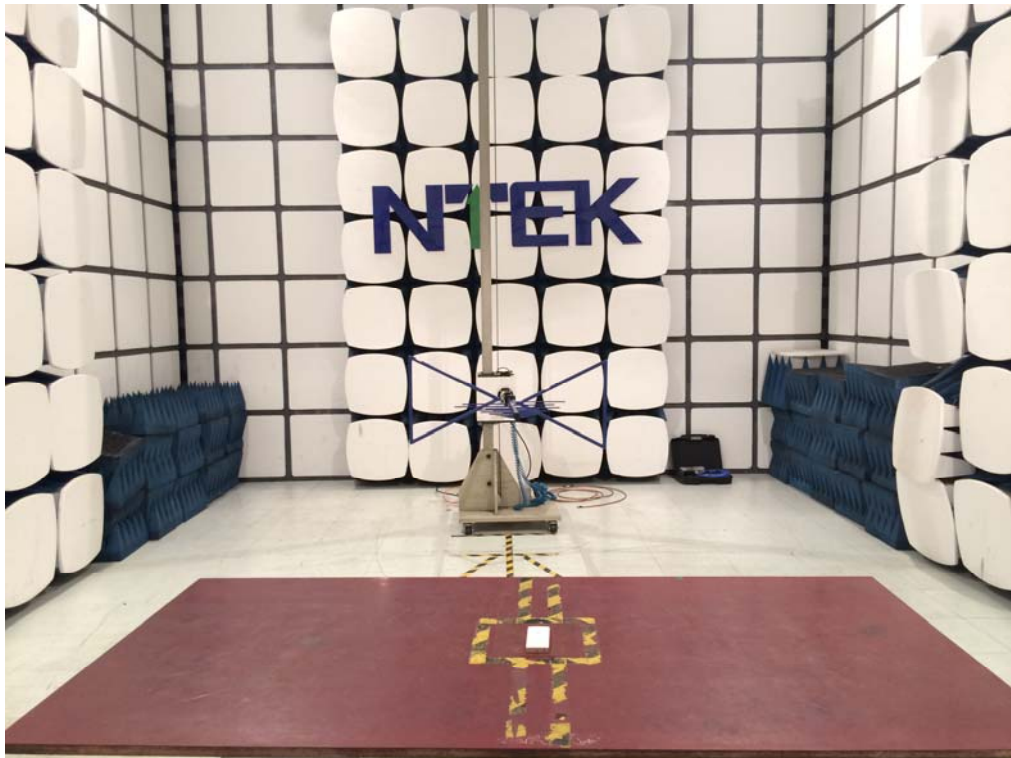
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### **9.2 EUT ANTENNA**

The EUT antenna is permanent attached antenna. It comply with the standard requirement.

## 10. EUT TEST PHOTO

### Radiated Measurement Photos



**Conducted Measurement Photos**