



## Shenzhen Asia Test Technology Co., Ltd.

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# FCC RADIO TEST REPORT

## FCC ID: 2AKLL-POLAR3D20

**Product :** POLAR 3D PRINTER

**Trade Name :** POLAR3D

**Model Name :** POLAR 3D 2.0

**Serial Model :** POLAR3D20

### Prepared for

Zhejiang Flashforge 3D Technology CO., Ltd.

No.518, Xianyuan Road, Jinhua, Zhejiang, China

### Prepared by

Shenzhen Asia Test Technology Co.,Ltd.

7 / F, Xinwei Building, Gushu Village, Xixiang Town, Baoan District,  
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## TEST RESULT CERTIFICATION

**Manufacture's Name**... Zhejiang Flashforge 3D Technology CO., Ltd.

Address ..... No.518, Xianyuan Road, Jinhua, Zhejiang, China

### Product description

Product name ..... POLAR 3D PRINTER

Model and/or type ..... POLAR 3D 2.0  
reference .....

Additional Model ..... POLAR3D20

**Standards** ..... FCC Part15.247

Test procedure ..... ANSI C63.10-2013

This device described above has been tested by ATT, 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.

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

Date (s) of performance of tests ..... May 22 2017 ~Jun. 02 2017

Date of Issue ..... Jun. 02 2017

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

Testing Engineer : Jack Yu  
(Jack Yu)

Technical Manager : Jerry You  
(Jerry You)

Authorized Signatory : Can Liu  
(Can Liu)

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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Test Item	FCC Part No.	Requirements	Verdict
DTS (6 dB) Bandwidth	15.247(a)(2)	≥ 500 kHz.	PASS
Maximum Peak Conducted Output Power	15.247(b)(3)	For directional gain:< 30dBm – (G[dBi] –6 [dB]),peak; Otherwise :< 30dBm, peak.	PASS
Transmitter Power Spectral Density	15.247(e)	For directional gain :< 8dBm/3 kHz – (G[dBi] –6[dB]), peak. Otherwise :< 8dBm/3 kHz, peak.	PASS
Conducted Out of band emission measurement	15.247(d)	< -20dB/100 kHz if total peak power ≤power limit.	PASS
Spurious Radiated Emissions	15.247(d) 15.209 15.35(b)	FCC Part 15.209&15.35(b) field strength limit;	PASS
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit;	PASS

### NOTE:

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

### Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	802.11b	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e)	Power spectral density	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.24	Maximu	802.11b	<input checked="" type="checkbox"/> Lowest	802.11b	<input checked="" type="checkbox"/> Lowest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

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7(b)(3)	Maximum output power	802.11g 802.11n HT20	<input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11g 802.11n HT20	<input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>					Pass
§15.247(d)	Band edge compliance conducted	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Complies
§15.205	Band edge compliance radiated	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Complies
§15.247(d)	TX spurious emissions conducted	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Complies
§15.247(d)	TX spurious emissions radiated	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	802.11b	-/-	802.11b	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	802.11b	-/-	802.11b	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Complies

This device support 802.11abgn 2.4g+5g mode. This device is not supported simultaneous transmission(2.4G WIFI+5GWIFI), When used 2,4g wifi, the 5g wifi is unactivated. and vice versa.

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## 1.1 TEST FACILITY

Shenzhen Asia Test Technology Co.,Ltd.  
7 / F, Xinwei Building, Gushu Village, Xixiang Town, Baoan District, Shenzhen, China  
FCC Registration No.: 348715

## 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	$\pm 2\%$



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## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	POLAR 3D PRINTER
Model Name	POLAR 3D 2.0
Serial number	N/A
Serial Model	POLAR3D20
Model Difference	All models are identical except model name and colors.
WLAN FCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)
Antenna	0dbi, PCB antenna
Ratings	DC 12V, 5.42A
Adapter	M/N:KPL-065F-VI Input:100-240V~, 50/60Hz, 1.7A Output:12Vdc, 5.42A, 65W
Battery	N/A
HW:	N/A
SW:	N/A





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## 2.2 DESCRIPTION OF TEST MODES

IEEE 802.11b/g/n: The product support thirteen channels but only use Eleventh channels in USA.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432		
6	2437		
7	2442		

### 2.2.1 TEST MODES

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H
Maximum Peak Conducted Output Power	Measurement Method	FCC KDB 558074§9.1.2
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 §10.2 (peak PSD).
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H
Unwanted Emissions into Non-Restricted Frequency Bands	Measurement Method	FCC KDB 558074§11.0.
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H
Unwanted Emissions into Restricted Frequency Bands (Conducted)	Measurement Method	FCC KDB 558074§12.2, Conducted (antenna-port).
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H

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		11n HT20_L, 11n HT20_M, 11n HT20_H
Unwanted Emissions into Restricted	Measurement Method	FCC KDB 558074§12.1,Radiated(cabinet/case emissions with Impedance matching for antenna-port).
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H

Test Case	Test Conditions	
	Configuration	Description
AC Power Line Conducted Emissions	Measurement Method	AC mains conducted.
	Test Environment	NTNV
	EUT Configuration	11g_M (Worst Conf.).

**Remark:**

1. For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.
2. Typical working modes for each IEEE 802.11 mode are selected to perform tests. The manufacturer provide special test software(WLAN facility) to control TX duty cycle >98% for TX test. Set the output power to max(PK) as Prescribed by the manufacturer.

Test Mode	Test Modes Description
IEEE 802.11b	IEEE 802.11b with data rate of 1 Mbps using SISO mode.
IEEE 802.11g	IEEE 802.11g with data rate of 6 Mbps using SISO mode.
IEEE 802.11n HT20	IEEE 802.11n with data rate of MCS0 and bandwidth of 20MHz using SISO mode.



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## 2.2.2 EUT operation mode

Test Mode	RF Ch.	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]
IEEE 802.11b	L	Ch No. 1 / 2412MHz	---	20
	M	Ch No. 6 / 2437 MHz	---	20
	H	Ch No. 11/ 2462MHz	---	20
IEEE 802.11g	L	Ch No. 1 / 2412MHz	---	20
	M	Ch No. 6 / 2437 MHz	---	20
	H	Ch No. 11/ 2462MHz	---	20
IEEE 802.11n HT20	L	Ch No. 1 / 2412MHz	---	20
	M	Ch No. 6 / 2437 MHz	---	20
	H	Ch No. 11/ 2462MHz	---	20

## 2.2.3 EUT configuratio

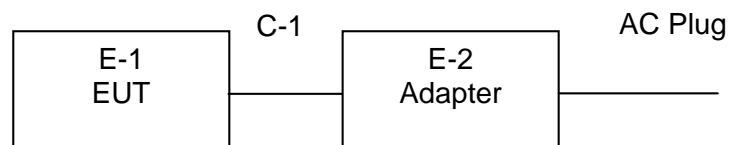
**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer

○ - supplied by the lab

<input type="radio"/> Power Cable	Length (m) :	/
	Shield :	/
	Detachable :	/
<input type="radio"/> Multimeter	Manufacturer :	/
	Model No. :	/

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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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	POLAR 3D PRINTER	<b>POLAR3D</b>	POLAR 3D 2.0	N/A	EUT
E-2	Adapter	N/A	KPL-065F-VI	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.8m	

**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.



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### 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Equipment No.	Instrument	Manufacturer	Model Name	Serial Number	Specification	Cal. Data	due date
1	Semi-anechoic chamber	Changzhou Chengyu	EC3088	N/A	9*6*6m	10/25/2016	10/24/2017
2	Broadband antenna	R&S	VULB 9160	VULB91 60-516	30MHz-1500 MHz	10/25/2016	10/24/2017
3	Horn antenna	R&S	BBHA 9120D	10087	1GHz-18GH z	06/05/2016	10/24/2017
4	Test receiver	R&S	ESCI	101686	9KHz-3GHz	10/25/2016	10/24/2017
5	EMI Measuring Receiver	R&S	ESR	101660	9KHz-40GHz	10/25/2016	10/24/2017
6	Multi-device controller	MF	MF-7868	MF78680 8762	N/A	10/25/2016	10/24/2017
7	Amplifier	EM	EM-30180	060538	1GHz-18GH z	10/25/2016	10/24/2017
8	Amplifier	Schwarzbeck	BBV 9475	BBV 9475-663	1GHz-18GH z	06/05/2016	06/04/2017
9	Spectrum Analyzer	agilent	E4440B	US44300368	1GHz-26.5GH z	06/05/2016	06/04/2017
10	Test receiver	R&S	ESCI	101689	9KHz-3GHz	10/25/2016	10/24/2017
11	LISN	R&S	NSLK81 26	8126466	9k-30MHz	10/25/2016	10/24/2017
12	LISN	Narda	L2-16B	5589756	9k-30MHz	10/25/2016	10/24/2017
13	Power Meter	Anritsu	ML2495A	N/A	40MHz	10/25/2016	10/24/2017
14	Power sensor	Anritsu	MA2411B	N/A	40MHz	10/25/2016	10/24/2017
15	Radiated Cable 1#	FUJIKURA	5D-2W	01	30MHz-1GHz	10/25/2016	10/24/2017

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16	Radiated Cable 2#	FUJIKURA	10D2W	02	1GHz -25GHz	10/25/2016	10/24/2017
17	Conducted Cable 1#	FUJIKURA	1D-2W	01	9KHz-30MHz	10/25/2016	10/24/2017
18	SMA Antenna connector	Dosin	Dosin-SMA	N/A	N/A	10/25/2016	10/24/2017

Note: The SMA antenna connector is soldered on the PCB board in order to perform conducted tests and this SMA antenna connector is listed in the equipment list.  
The Cal.Interval was one year

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### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

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

FREQUENCY (MHz)			Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	56.00	46.00	CISPR
5.0 -30.0	60.00	50.00	CISPR

0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	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



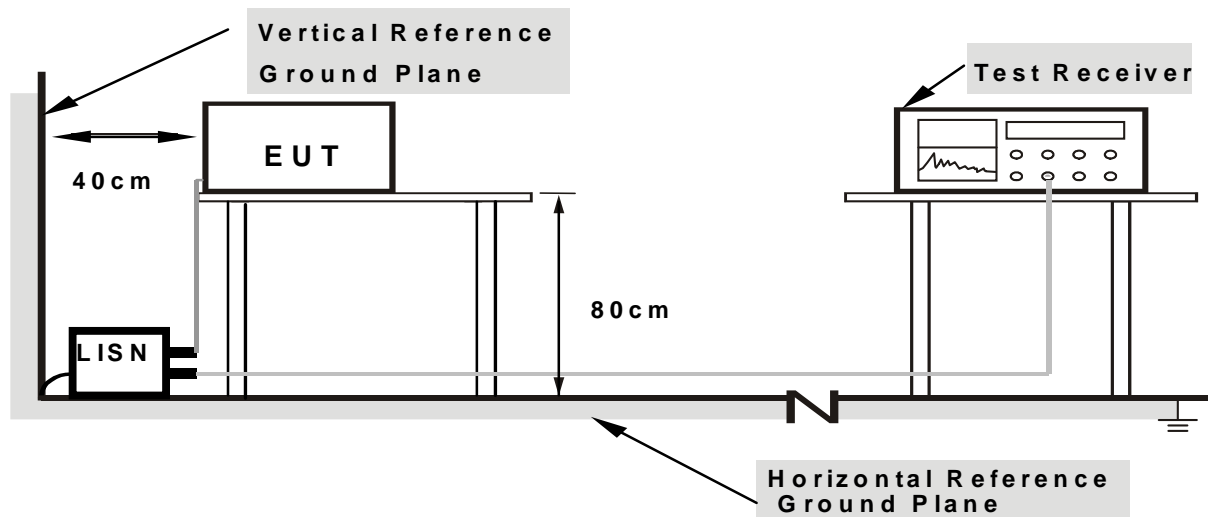
### 3.1.2 TEST PROCEDURE

- 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 cm 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.





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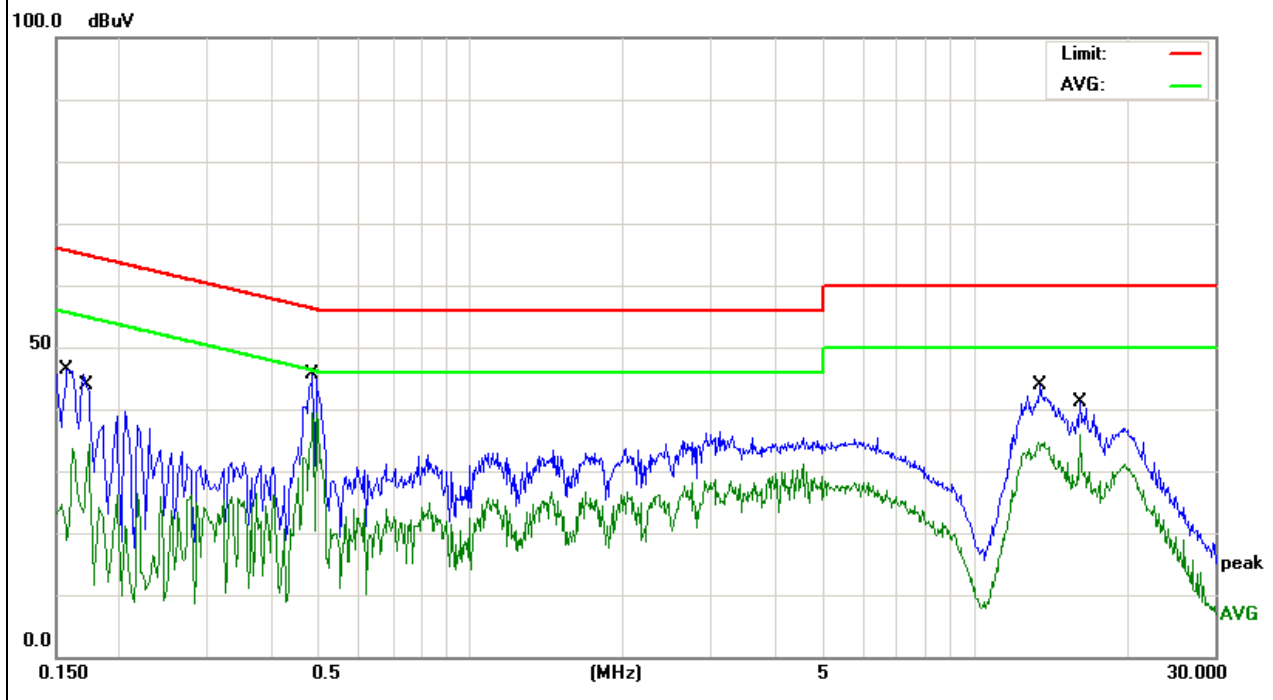
## 3.1.6 TEST RESULTS

Phase : L Test Voltage : DC 12V from adapter AC 120V/60Hz

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1580	34.60	11.75	46.35	65.56	-19.21	QP	
2		0.1740	22.89	11.48	34.37	54.76	-20.39	AVG	
3		0.4860	35.49	10.03	45.52	56.24	-10.72	QP	
4	*	0.4860	29.37	10.03	39.40	46.24	-6.84	AVG	
5		13.5020	33.58	10.37	43.95	60.00	-16.05	QP	
6		16.1700	25.21	10.58	35.79	50.00	-14.21	AVG	

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit



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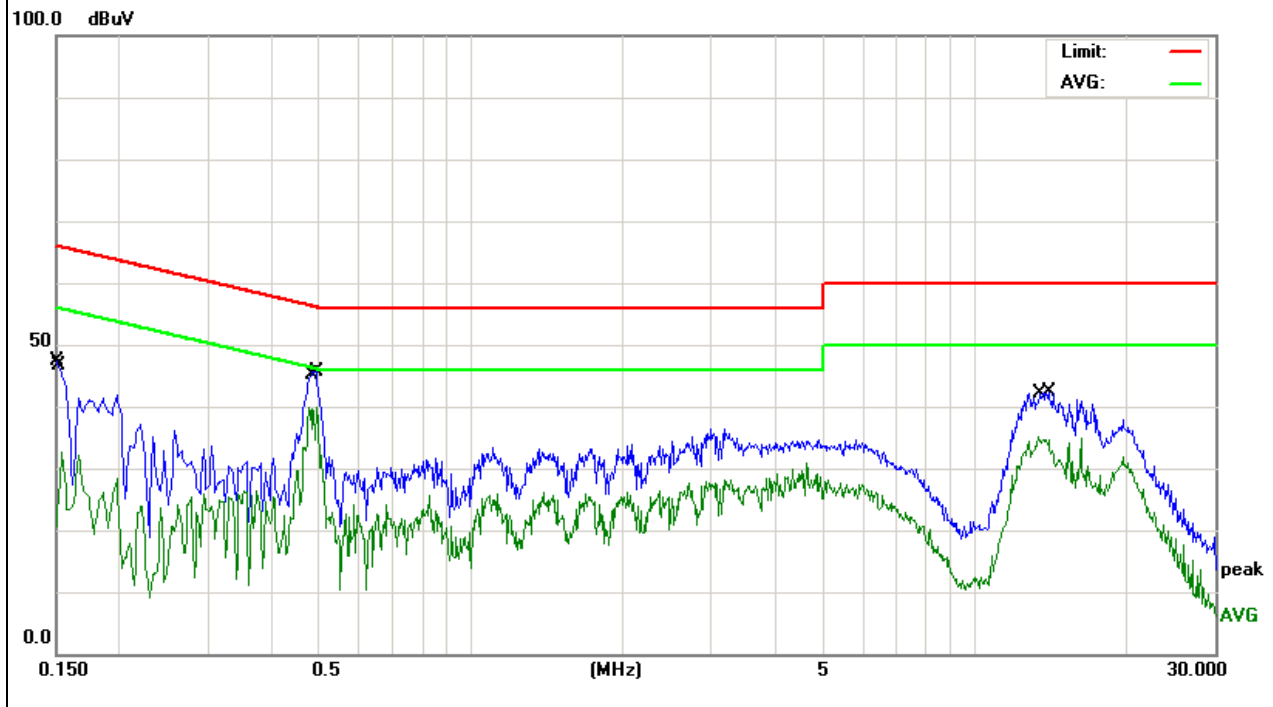
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Phase : N Test Voltage : DC 12V from adapter AC 120V/60Hz

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	35.48	11.94	47.42	65.99	-18.57	QP	
2		0.1539	20.66	11.84	32.50	55.78	-23.28	AVG	
3	*	0.4780	29.82	10.04	39.86	46.37	-6.51	AVG	
4		0.4940	35.72	10.02	45.74	56.10	-10.36	QP	
5		13.3980	24.82	10.37	35.19	50.00	-14.81	AVG	
6		14.0300	32.08	10.39	42.47	60.00	-17.53	QP	

**Remark:**

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit



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**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

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**

- 1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and 1.50m above ground plane for above 1GHz.



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- Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until all frequency measurements have been completed.
- The EUT minimum operation frequency was 24MHz and maximum operation frequency was 2480MHz. so radiated emission test frequency band from 9 KHz to 25GHz.
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antenna	3

- Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

More procedure as follows;

## 1) Sequence of testing 9 kHz to 30 MHz

### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

### Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.

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- The antenna height is 1.0 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

## **Final measurement:**

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

## **2) Sequence of testing 30 MHz to 1 GHz**

### **Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

### **Premeasurement:**

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 4 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### **Final measurement:**

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

## **3) Sequence of testing 1 GHz to 18 GHz**

### **Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or



described by manufacturer.

- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

#### **Premeasurement:**

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

#### **Final measurement:**

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

#### **4) Sequence of testing above 18 GHz**

##### **Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

##### **Premeasurement:**

- The antenna is moved spherical over the EUT in different polarizations of the antenna.

##### **Final measurement:**

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

#### **Field Strength Calculation**

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The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dB $\mu$ V/m)	RA (dB $\mu$ V/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

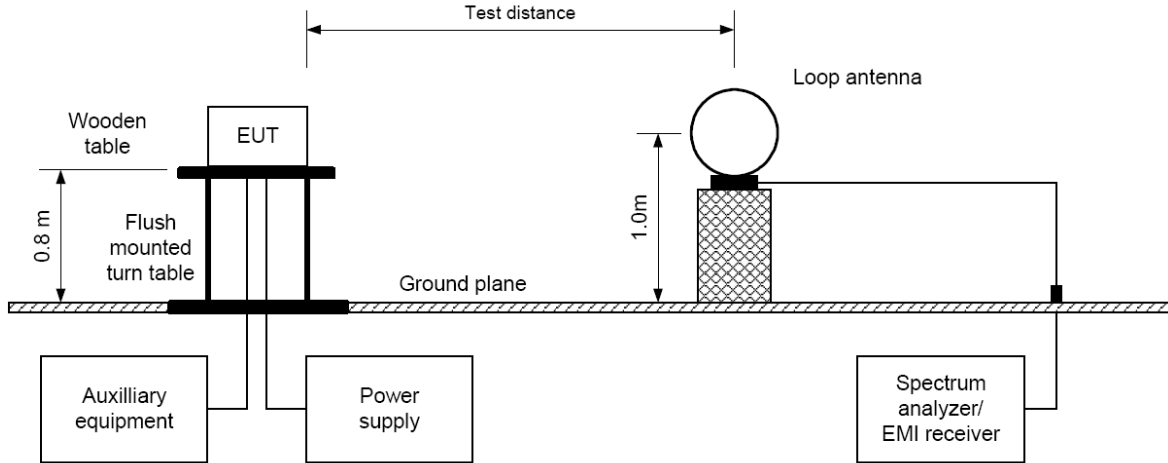
### 3.2.3 DEVIATION FROM TEST STANDARD

No deviation

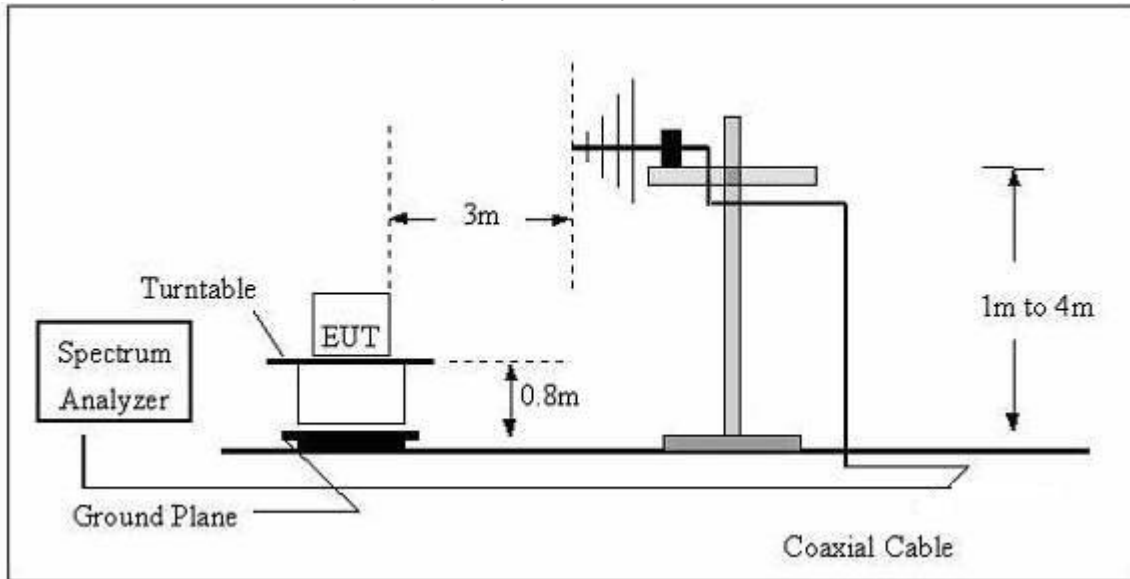


3.2.4 TEST SETUP

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



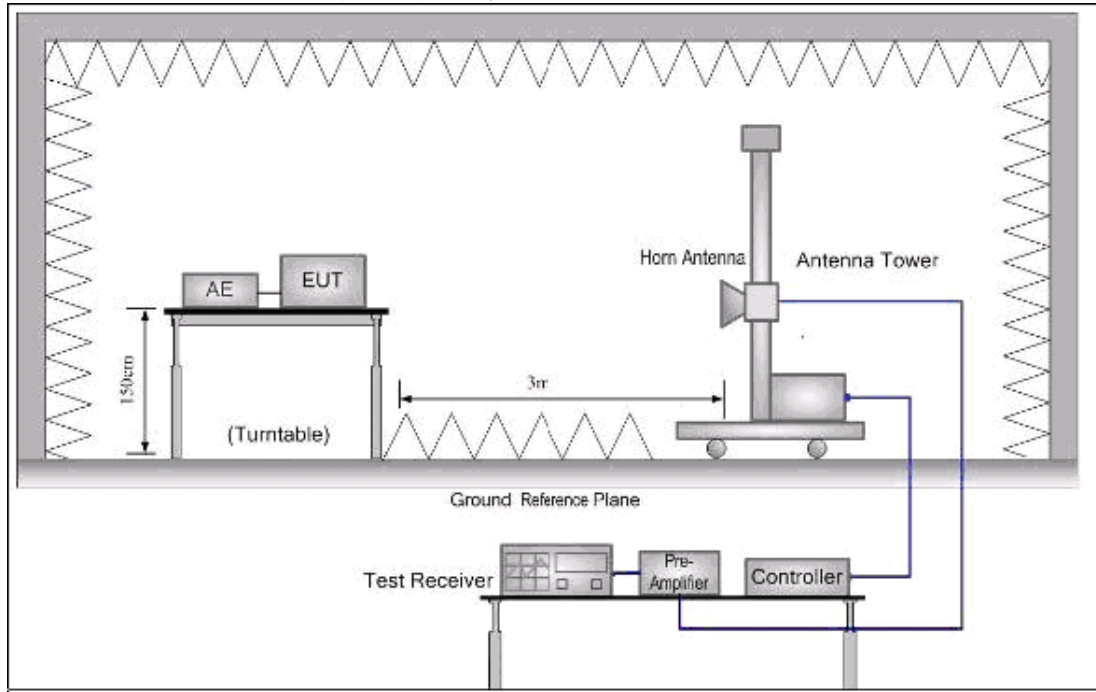
(B) Radiated Emission Test-Up Frequency 30MHz~1GHz







(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.



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

EUT:	POLAR 3D PRINTER	Model Name. :	POLAR 3D 2.0
Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	TX	Polarization :	--

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

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

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



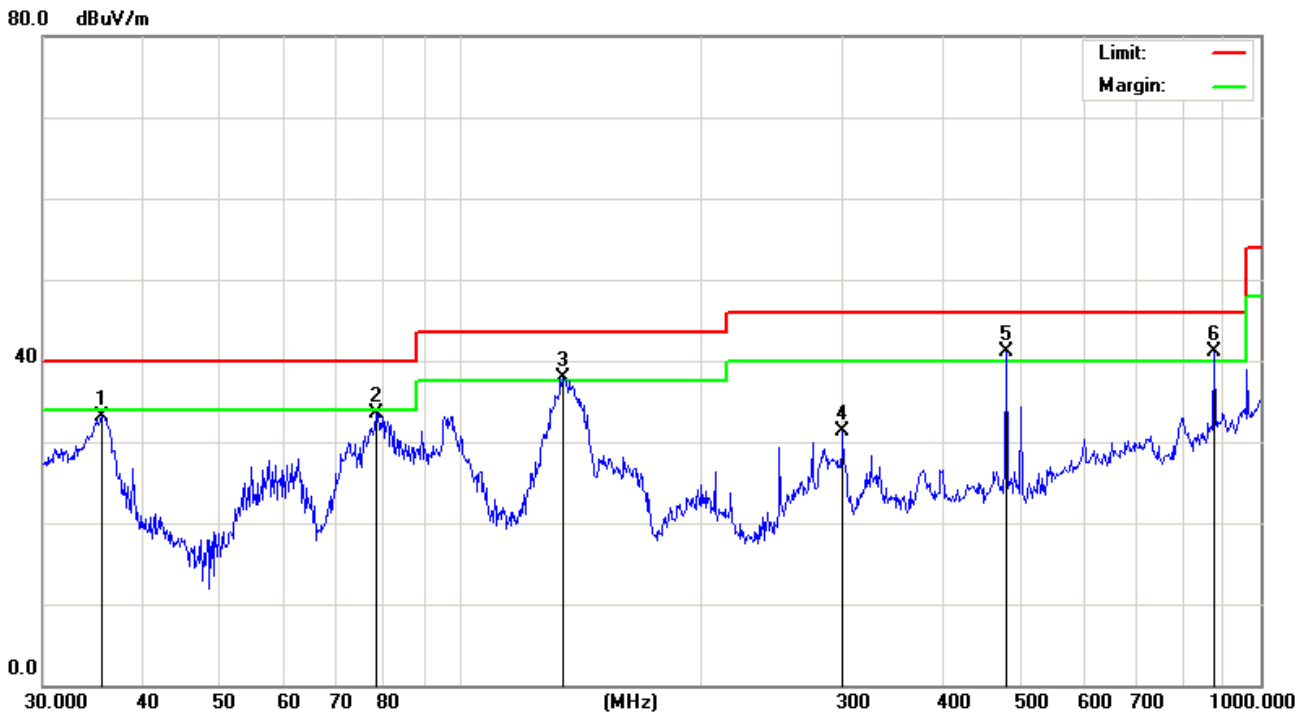
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## 3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Polarization:	Horizontal	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2412		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		35.4993	49.98	-16.78	33.20	40.00	-6.80	QP		
2		78.4133	52.63	-19.14	33.49	40.00	-6.51	QP		
3	!	134.0882	52.70	-14.75	37.95	43.50	-5.55	QP		
4		300.3672	40.98	-9.59	31.39	46.00	-14.61	QP		
5	*	480.5276	47.02	-5.90	41.12	46.00	-4.88	QP		
6	!	875.2470	38.84	2.21	41.05	46.00	-4.95	QP		



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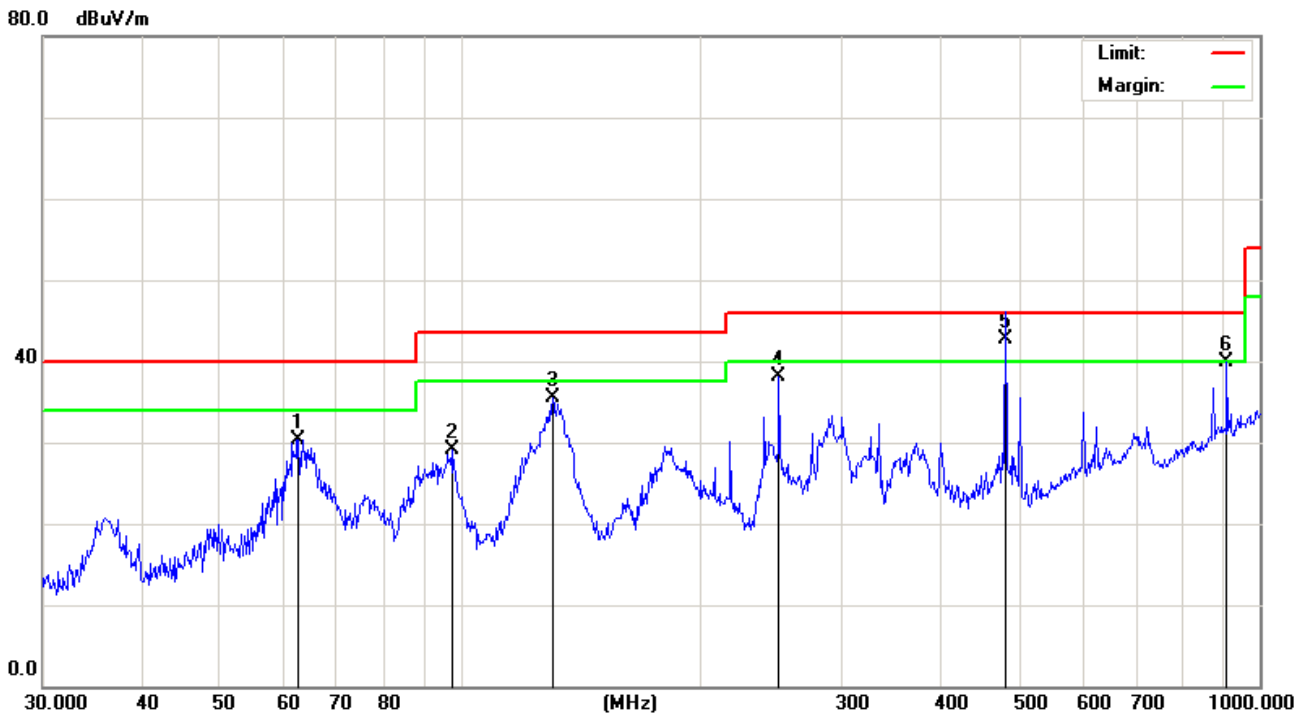


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Polarization:	Vertical	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2412		

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	62.6507	48.36	-18.02	30.34	40.00	-9.66	QP			
2	97.7982	45.36	-16.24	29.12	43.50	-14.38	QP			
3	130.3788	50.37	-14.92	35.45	43.50	-8.05	QP			
4	250.3011	51.62	-13.57	38.05	46.00	-7.95	QP			
5 *	480.0526	48.70	-5.92	42.78	46.00	-3.22	QP	100	360	
6	909.6666	37.13	2.84	39.97	46.00	-6.03	QP			



Note: test performed on 802.11b/g/n mode, "802.11b TX2412" mode is the worst mode and has been reported.

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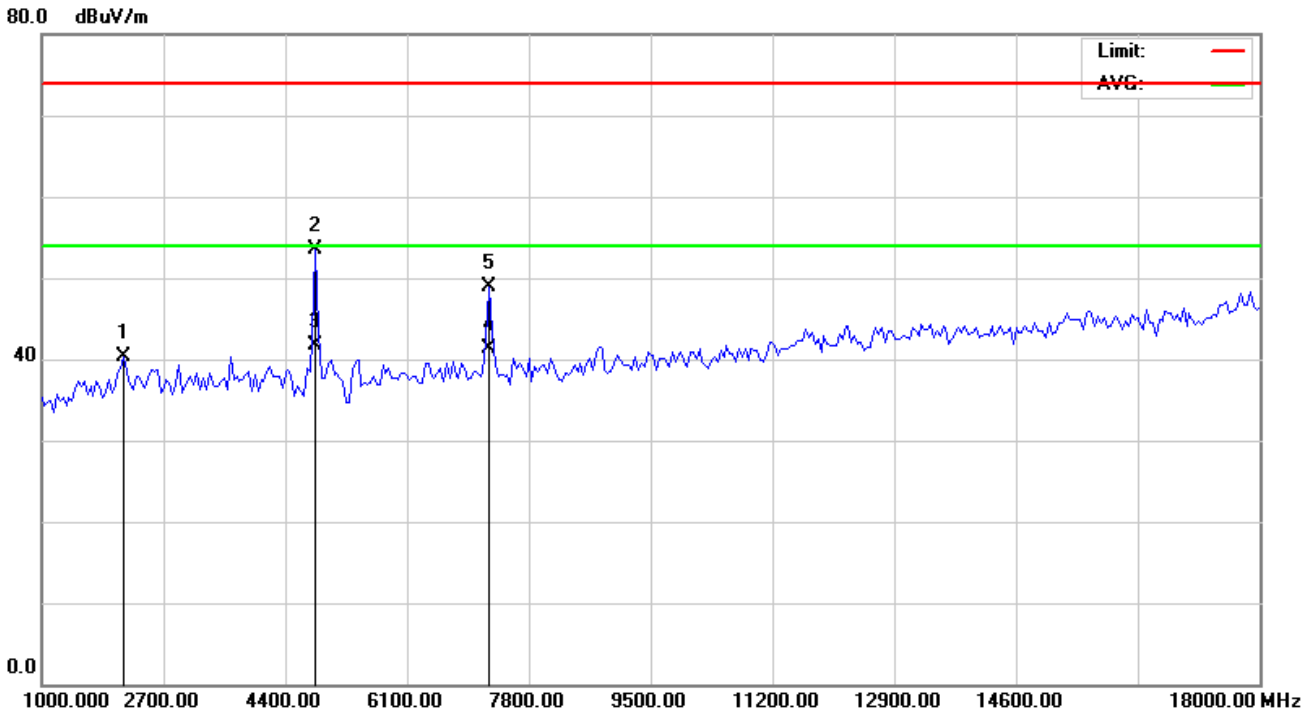


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## 3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

Polarization:	Horizontal	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2412		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2147.500	45.80	-5.50	40.30	74.00	-33.70			peak
2		4824.000	45.44	8.14	53.58	74.00	-20.42			peak
3	*	4824.000	33.66	8.14	41.80	54.00	-12.20			AVG
4		7236.100	29.52	11.73	41.25	54.00	-12.75			AVG
5		7246.100	37.11	11.77	48.88	74.00	-25.12			peak

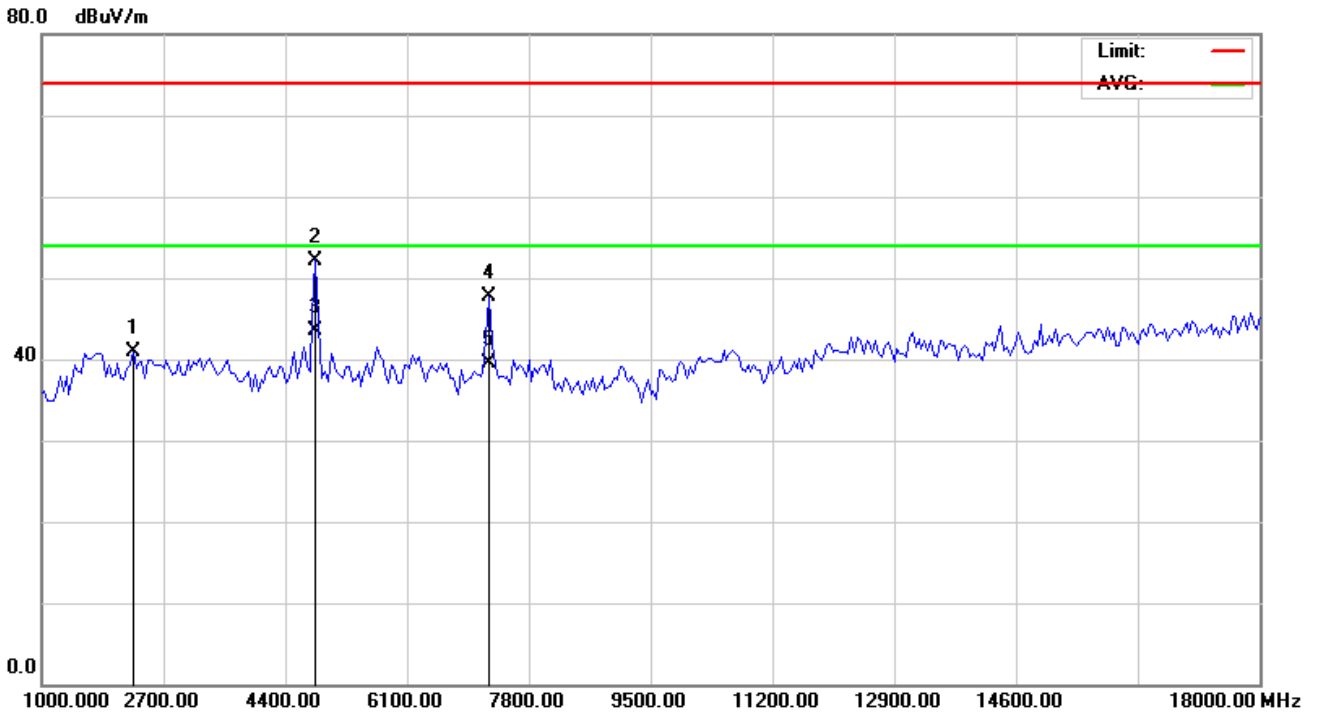
Note: test performed on 802.11b/g/n mode, "802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 18G.



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Polarization:	Vertical	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2412		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		2275.000	45.14	-4.24	40.90	74.00	-33.10	peak			
2		4824.000	44.06	8.14	52.20	74.00	-21.80	peak			
3	*	4824.000	35.35	8.14	43.49	54.00	-10.51	AVG			
4		7236.100	35.97	11.73	47.70	74.00	-26.30	peak			
5		7236.100	27.83	11.73	39.56	54.00	-14.44	AVG			

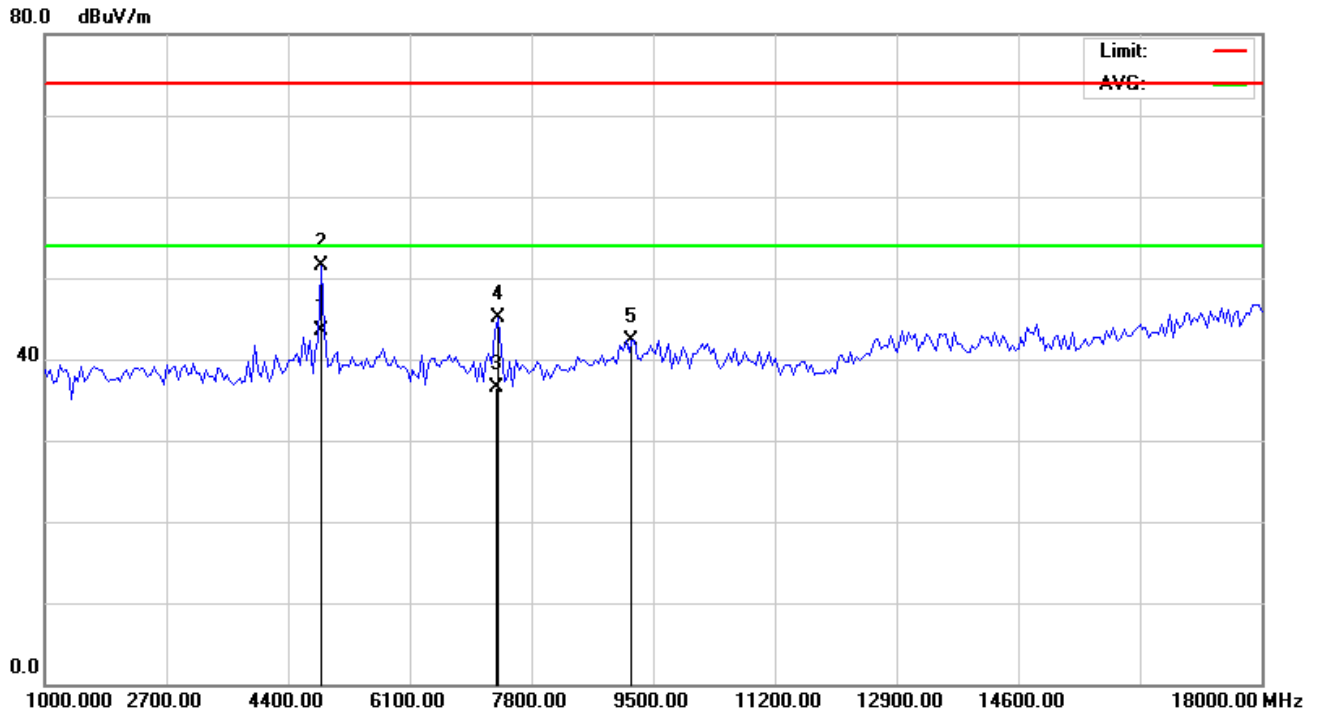
Note: test performed on 802.11b/g/n mode, "802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 18G.



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Polarization:	Horizontal	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2437		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	4874.000	35.28	8.17	43.45	54.00	-10.55	AVG			
2		4874.500	43.37	8.17	51.54	74.00	-22.46	peak			
3		7311.000	24.52	12.07	36.59	54.00	-17.41	AVG			
4		7332.500	32.88	12.16	45.04	74.00	-28.96	peak			
5		9202.500	25.86	16.54	42.40	74.00	-31.60	peak			

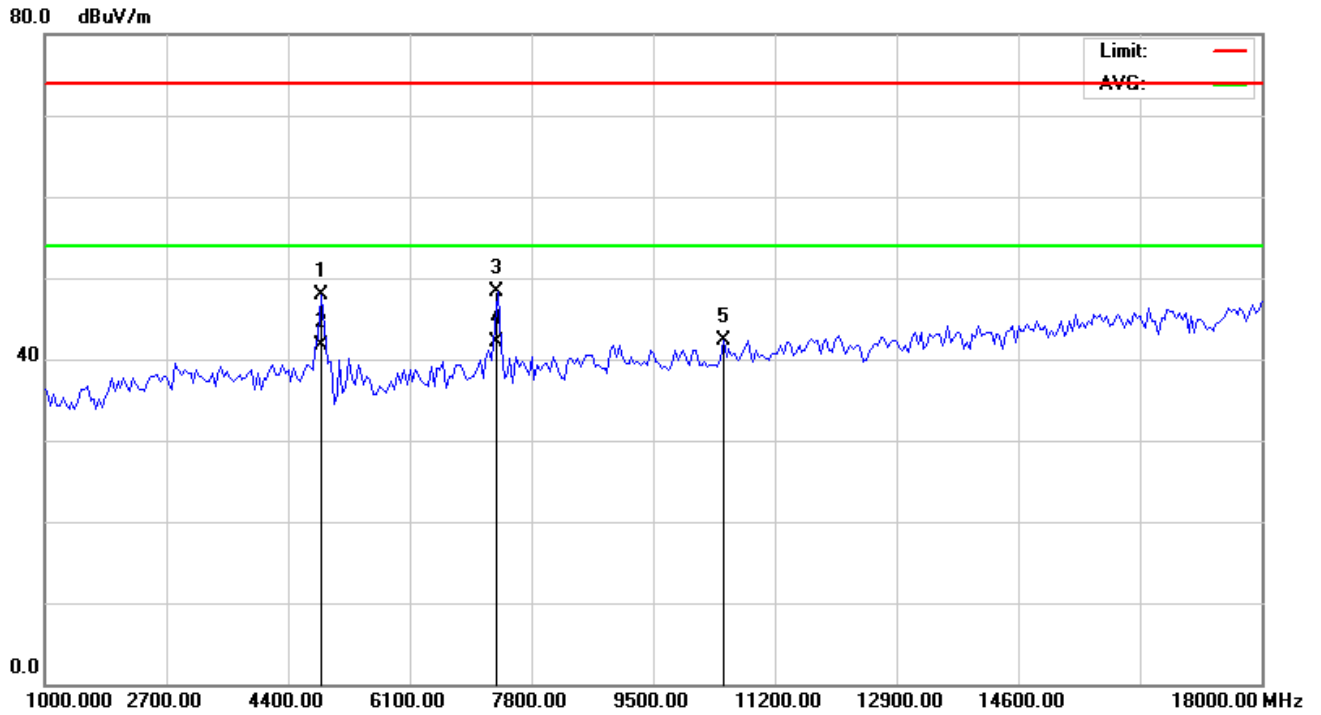
Note: test performed on 802.11b/g/n mode, "802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 18G.



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Polarization:	Vertical	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2437		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		4874.000	39.78	8.17	47.95	74.00	-26.05	peak			
2		4874.000	33.56	8.17	41.73	54.00	-12.27	AVG			
3		7311.000	36.28	12.07	48.35	74.00	-25.65	peak			
4	*	7311.000	29.94	12.07	42.01	54.00	-11.99	AVG			
5		10477.50	21.34	21.06	42.40	74.00	-31.60	peak			

Note: test performed on 802.11b/g/n mode, "802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 18G.

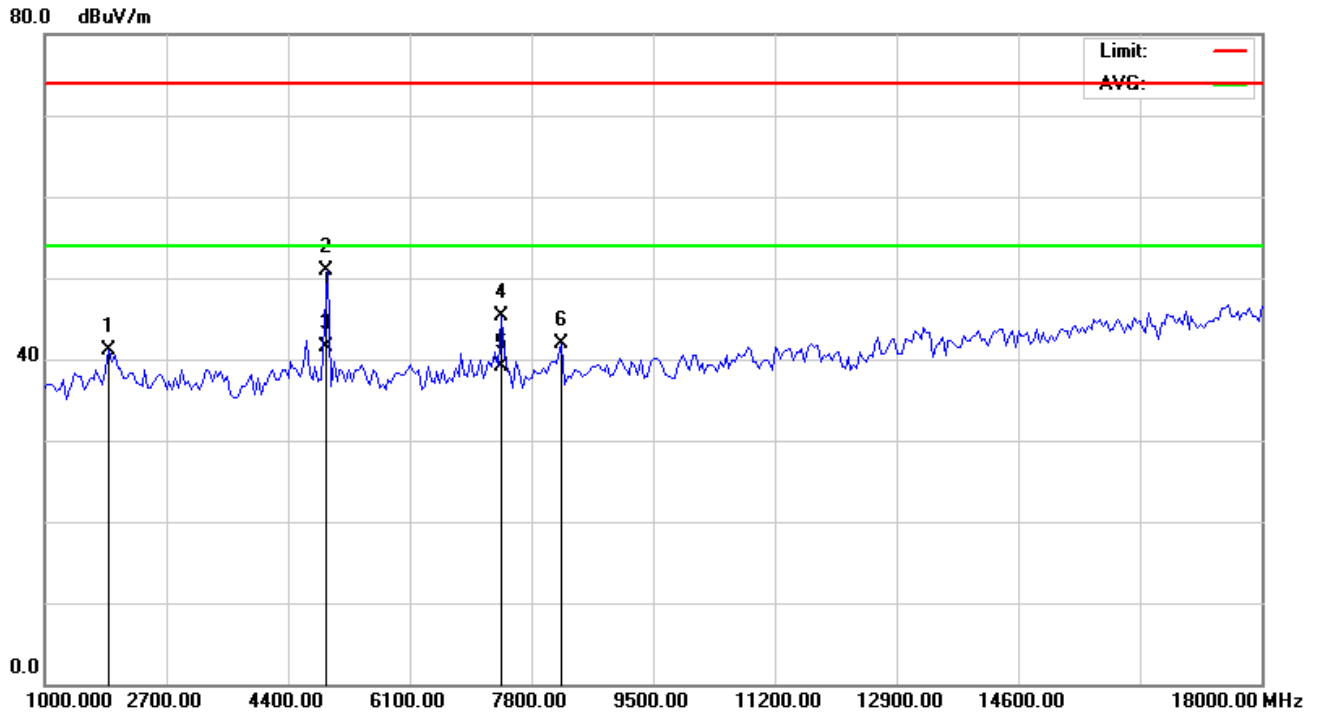




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Polarization:	Horizontal	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2462		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		1892.500	48.26	-7.06	41.20	74.00	-32.80	peak			
2		4924.200	42.69	8.20	50.89	74.00	-23.11	peak			
3	*	4924.200	33.34	8.20	41.54	54.00	-12.46	AVG			
4		7386.000	32.98	12.41	45.39	74.00	-28.61	peak			
5		7386.000	26.77	12.41	39.18	54.00	-14.82	AVG			
6		8225.000	25.80	16.10	41.90	74.00	-32.10	peak			

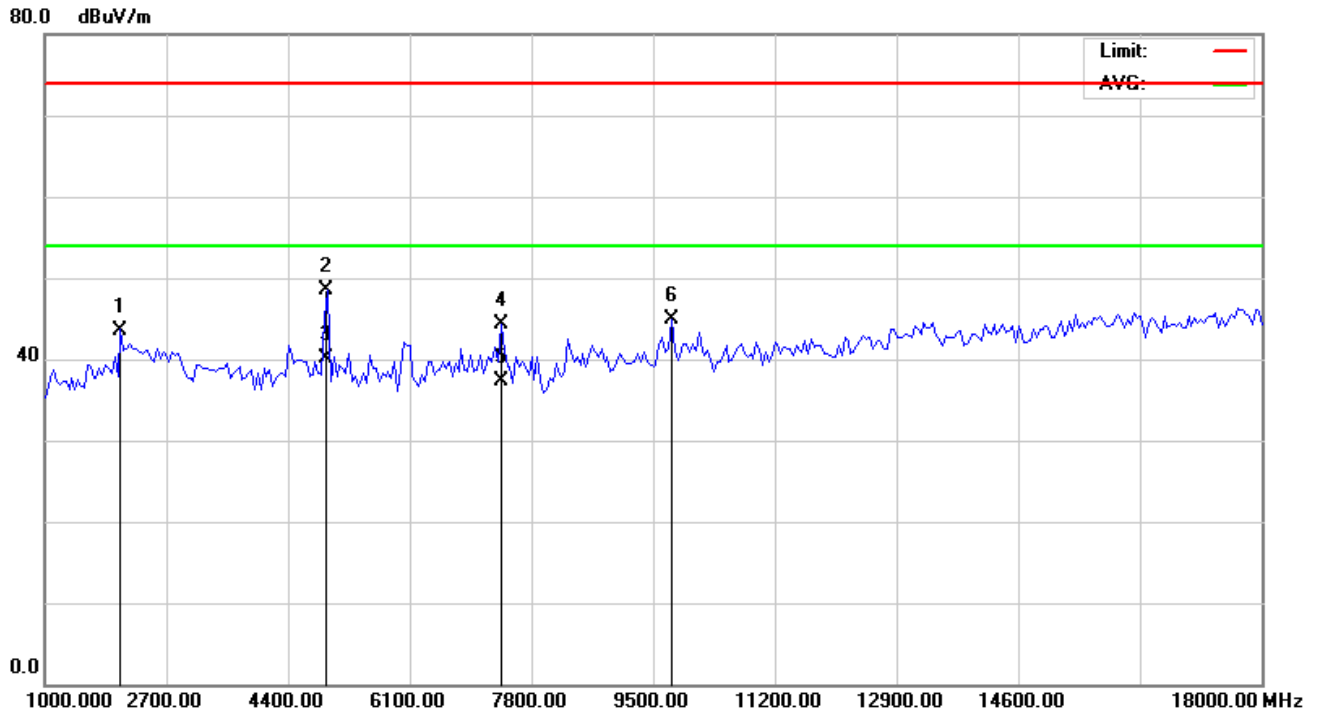
Note: test performed on 802.11b/g/n mode, "802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 18G.



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Polarization:	Vertical	Test Voltage :	DC 12V from adapter AC 120V/60Hz
Test Mode :	802.11B TX 2462		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		2062.500	49.91	-6.31	43.60	74.00	-30.40			peak
2		4924.200	40.36	8.20	48.56	74.00	-25.44			peak
3	*	4924.200	32.00	8.20	40.20	54.00	-13.80			AVG
4		7386.000	31.95	12.41	44.36	74.00	-29.64			peak
5		7386.000	24.93	12.41	37.34	54.00	-16.66			AVG
6		9755.000	26.66	18.24	44.90	74.00	-29.10			peak

Note: test performed on 802.11b/g/n mode, "802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 18G.

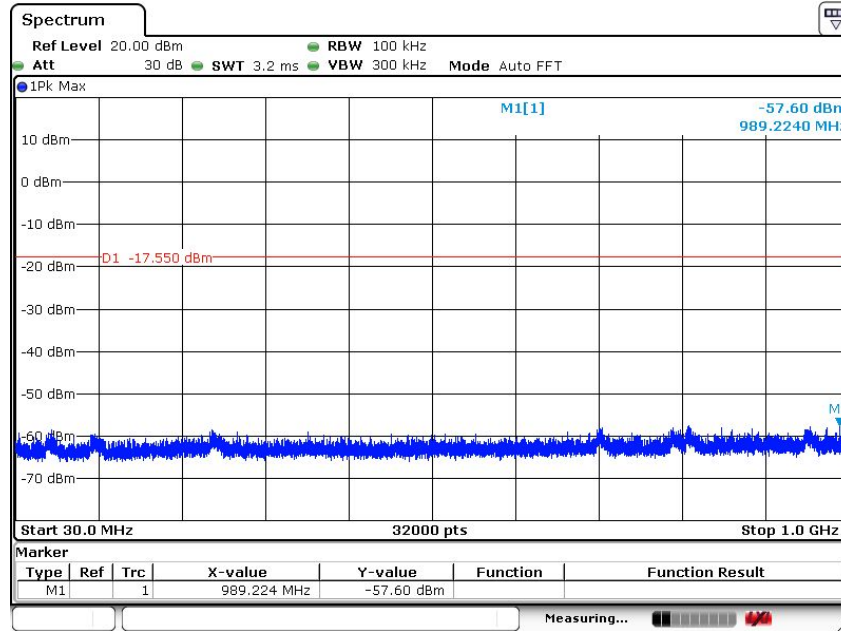


# Shenzhen Asia Test Technology Co., Ltd.

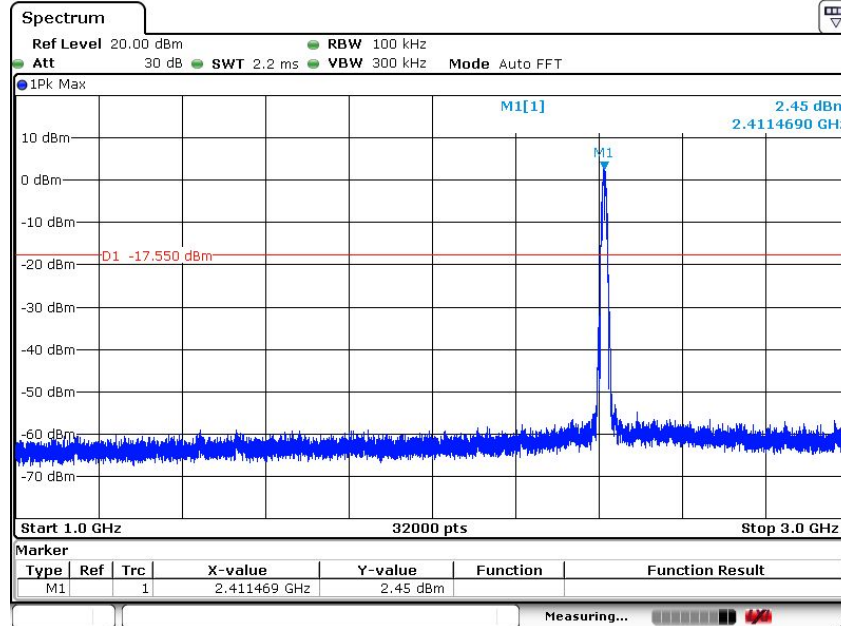
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## Conducted Spurious Emissions at Antenna Port: 802.11b Low Channel



Date: 1 JUN 2017 15:49:11



Date: 1 JUN 2017 15:48:59

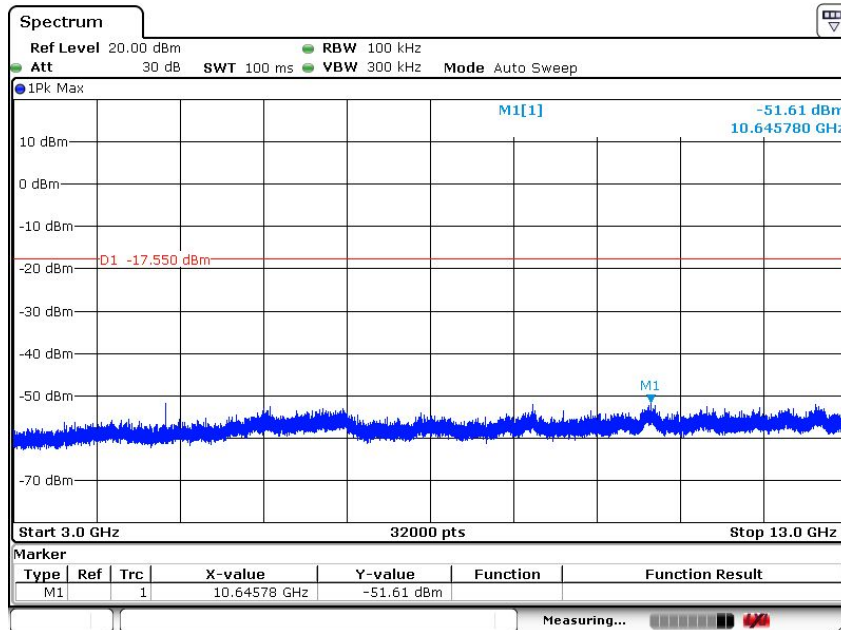
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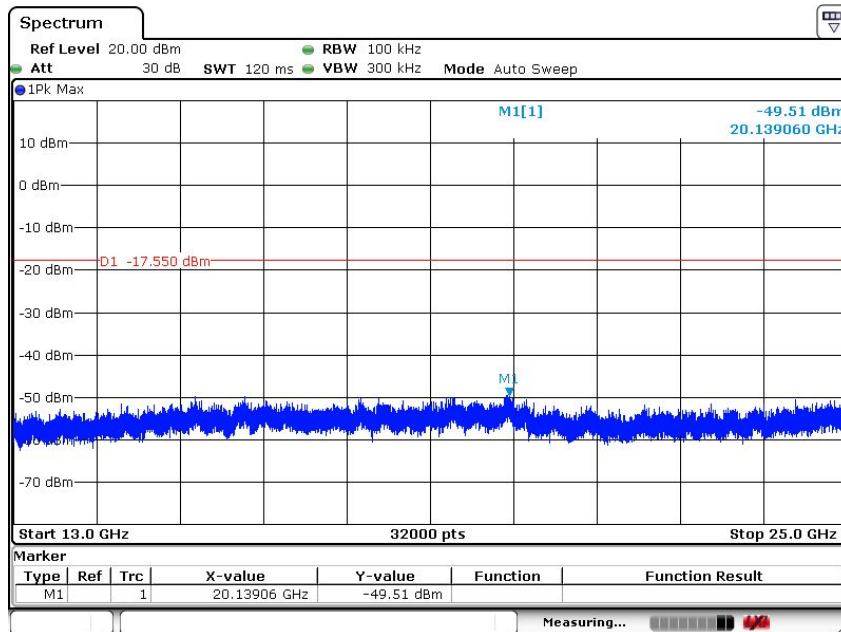
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Date: 1 JUN 2017 15:49:49



Date: 1 JUN 2017 15:50:00

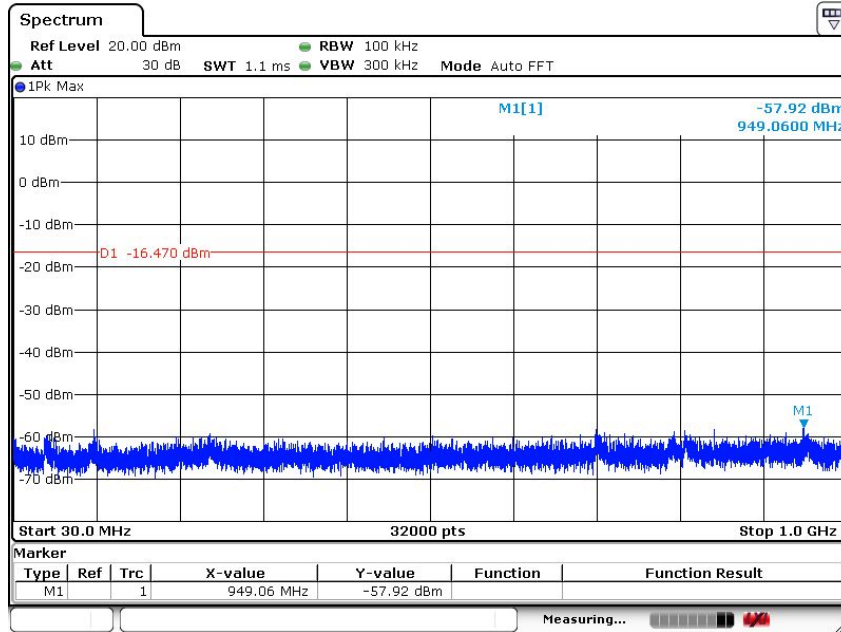
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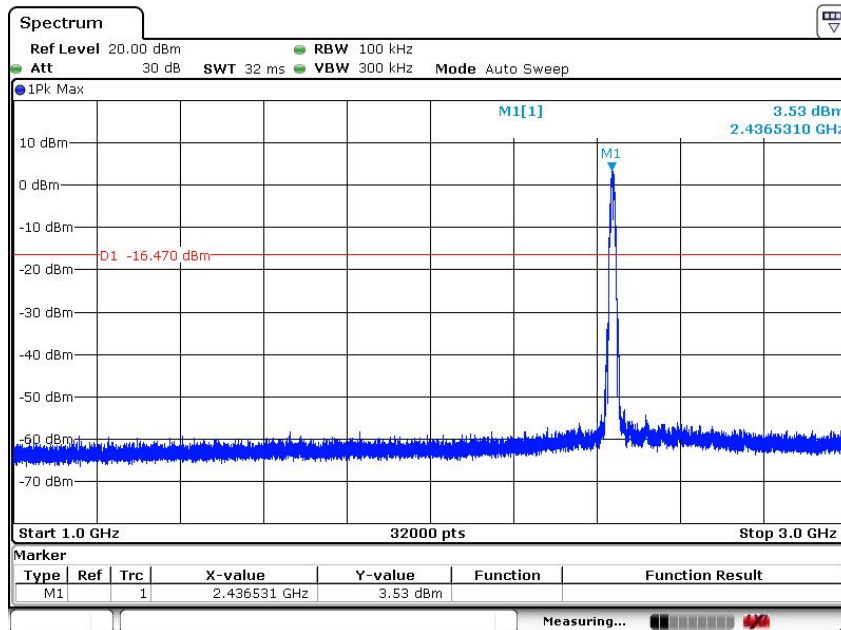
# Shenzhen Asia Test Technology Co., Ltd.

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## 802.11b Middle Channel



Date: 1 JUN 2017 15:59:59



Date: 1 JUN 2017 15:59:47

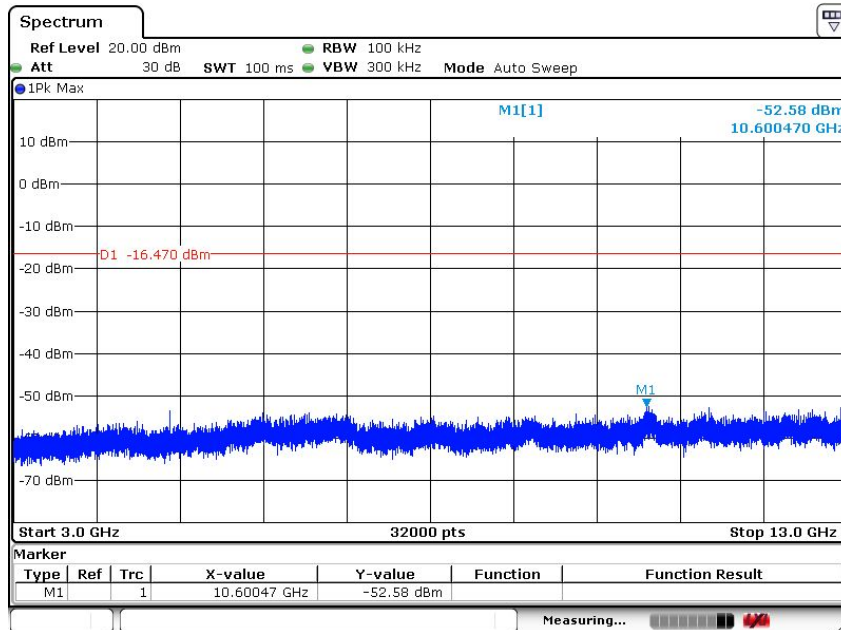
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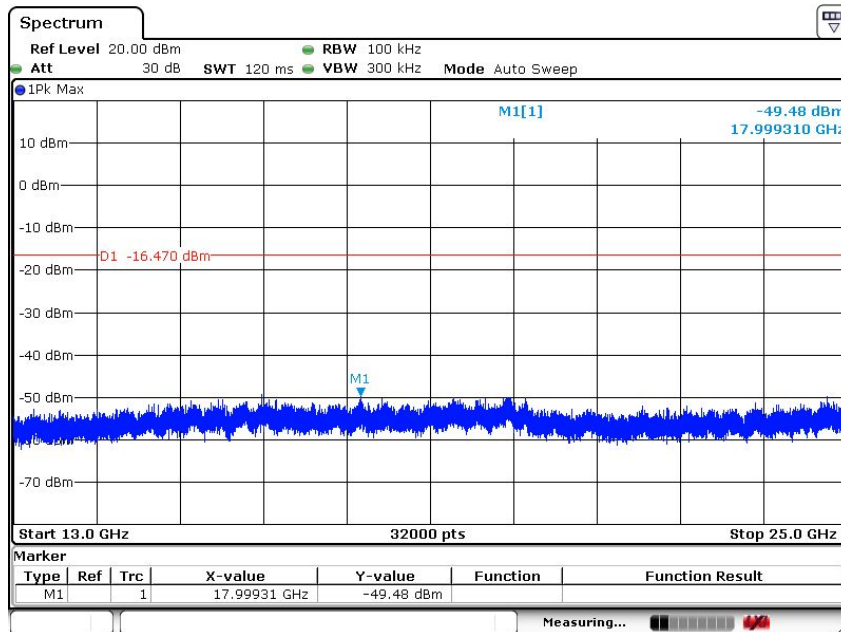
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Date: 1 JUN 2017 16:00:10



Date: 1 JUN 2017 16:00:22

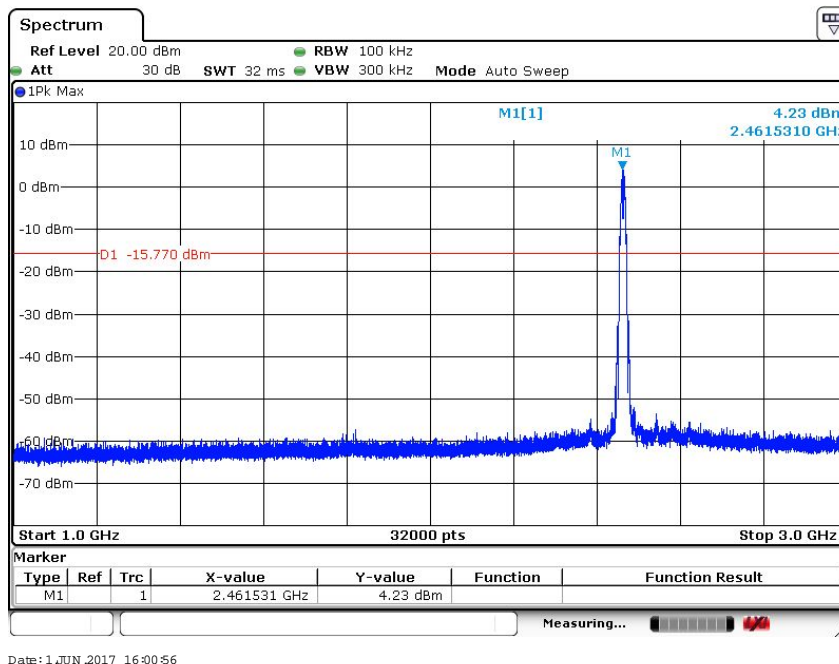
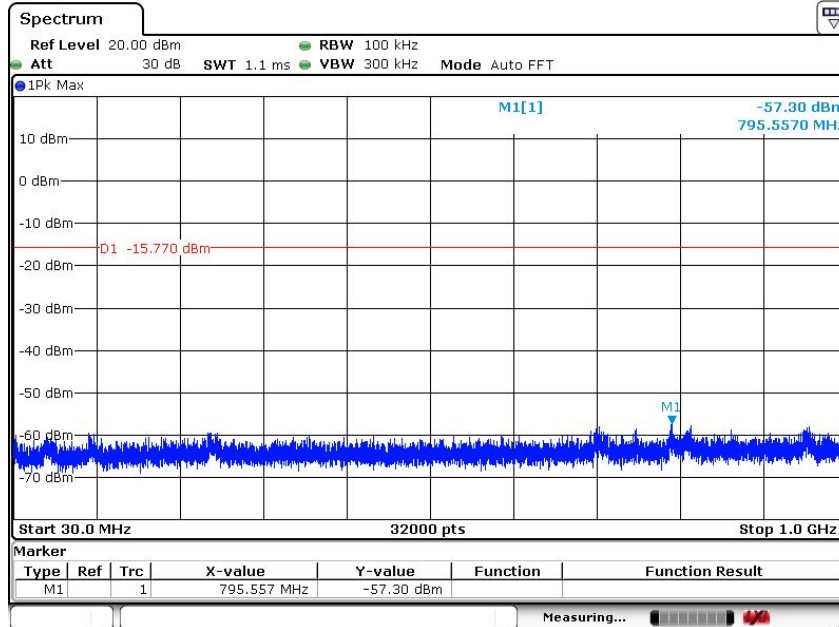
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## 802.11b High Channel



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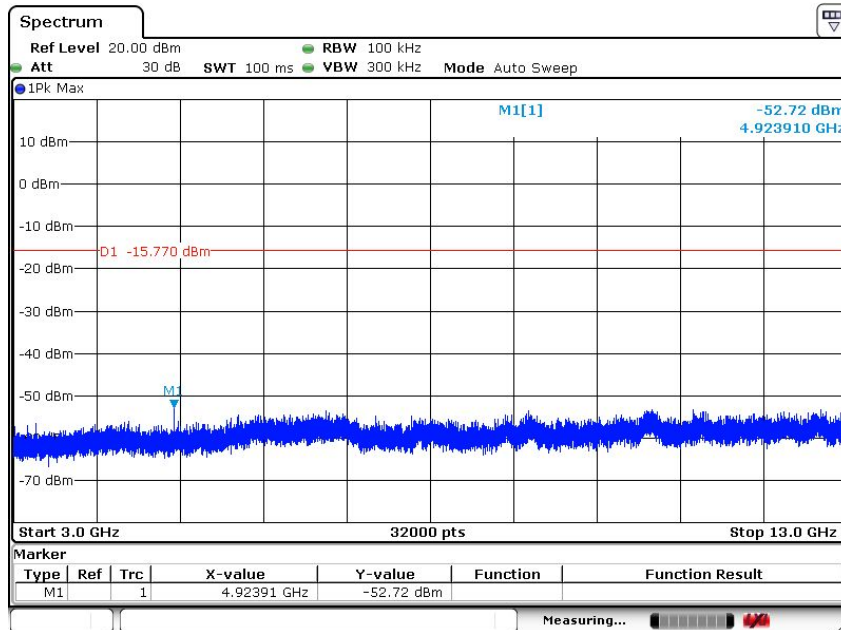




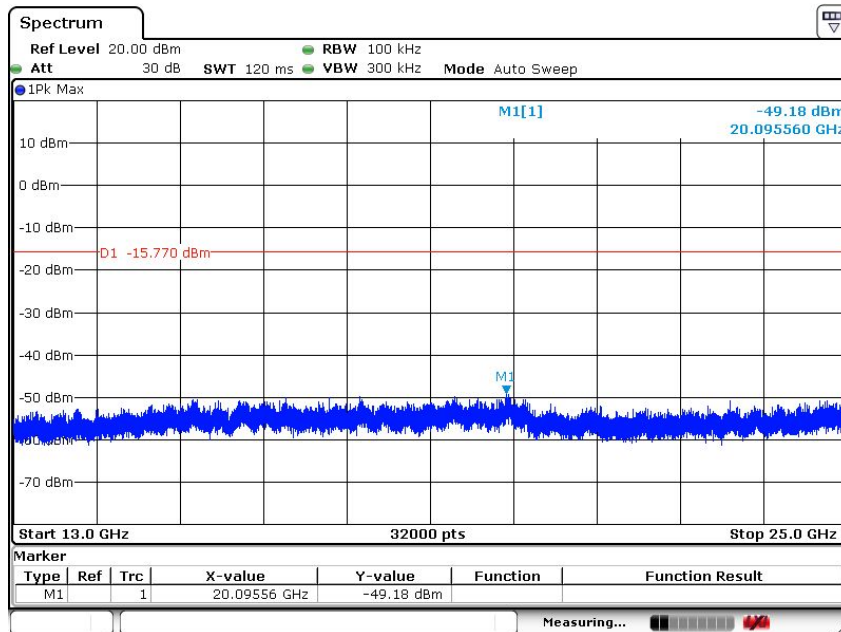
# Shenzhen Asia Test Technology Co., Ltd.

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Date: 1 JUN 2017 16:01:21



Date: 1 JUN 2017 16:01:33

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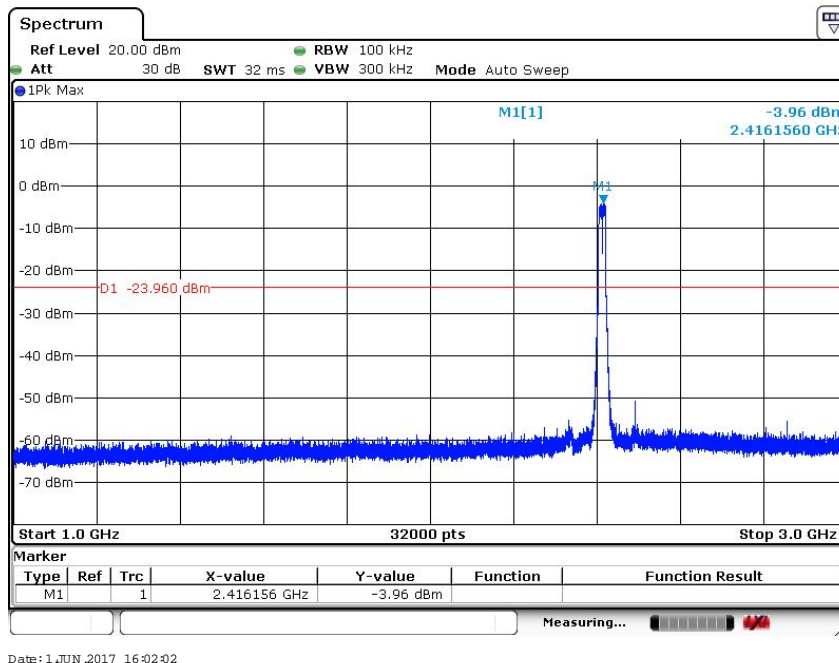
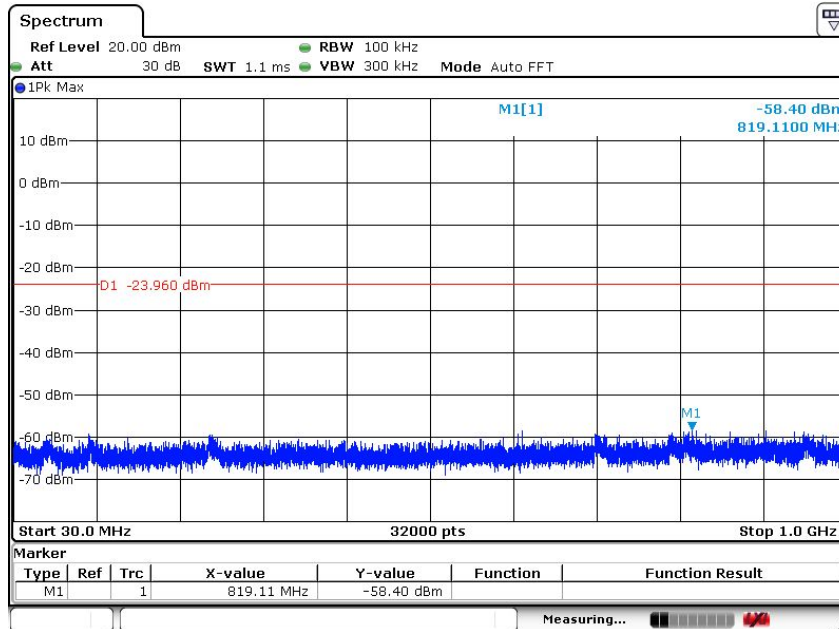


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## 802.11g Low Channel



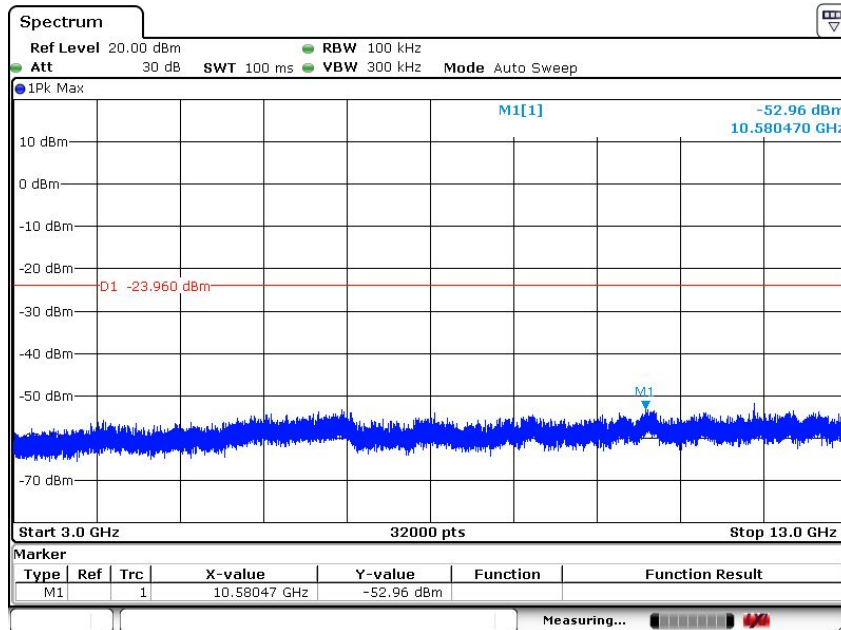
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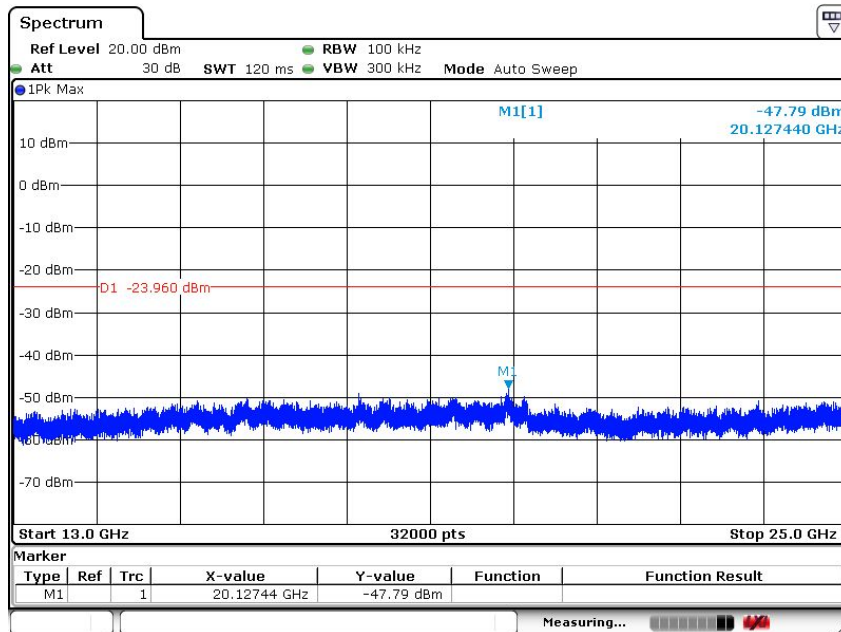
# Shenzhen Asia Test Technology Co., Ltd.

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Date: 1 JUN 2017 16:02:30



Date: 1 JUN 2017 16:02:46

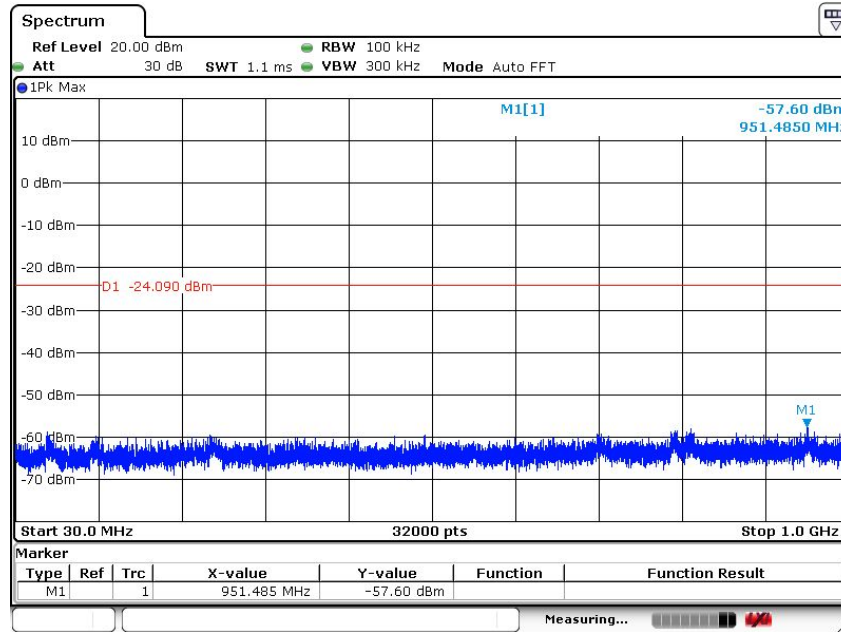
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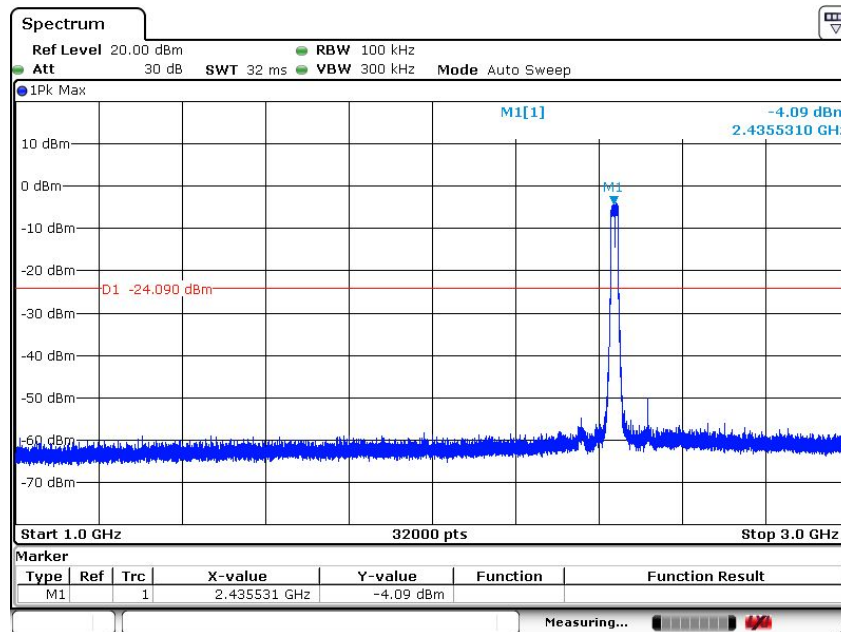
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## 802.11g Middle Channel



Date: 1 JUN 2017 16:03:26



Date: 1 JUN 2017 16:03:15

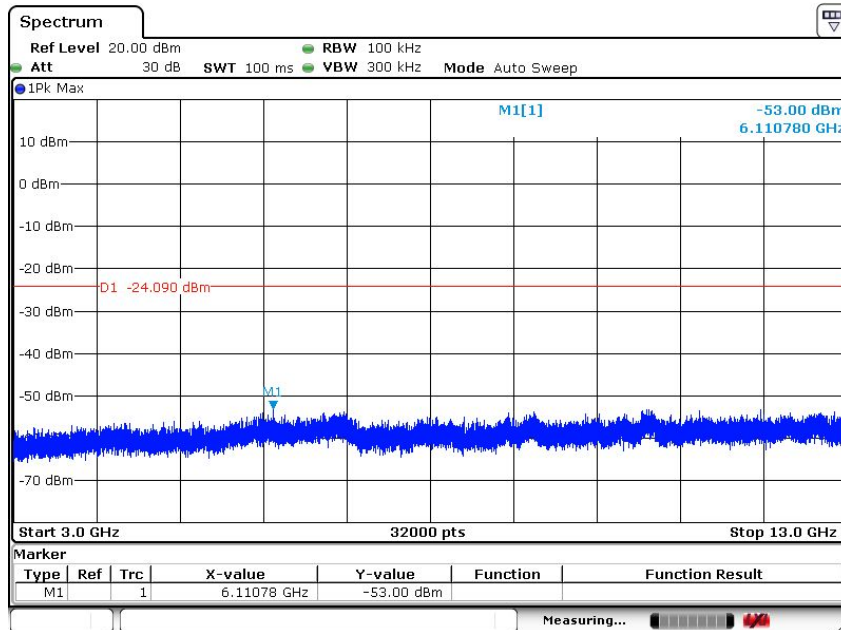
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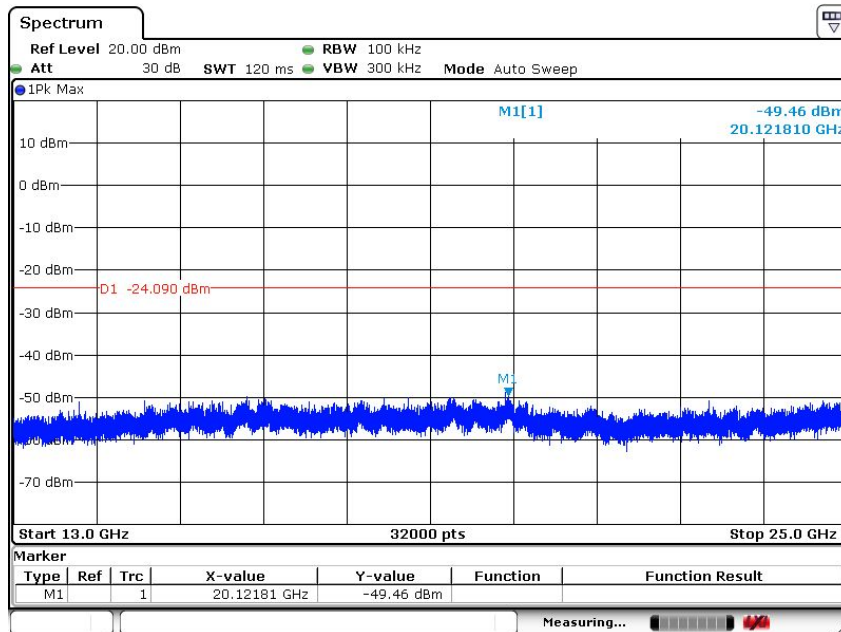
# Shenzhen Asia Test Technology Co., Ltd.

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Date: 1 JUN 2017 16:03:41



Date: 1 JUN 2017 16:04:01

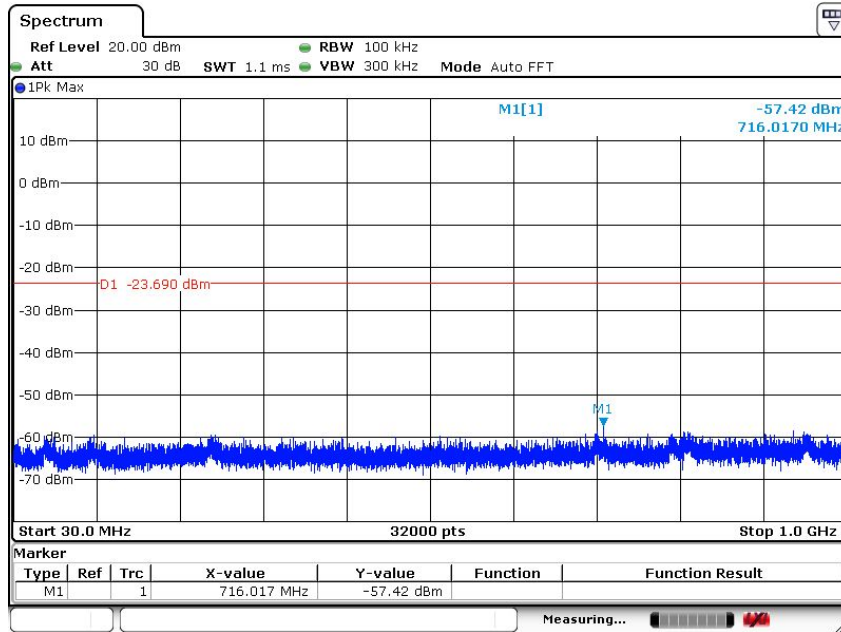
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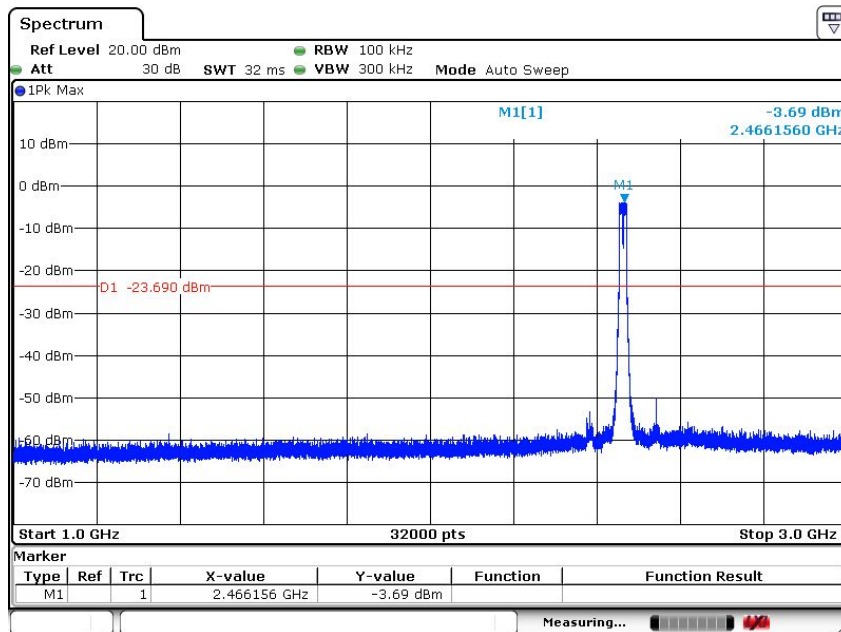
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## 802.11g High Channel



Date: 1 JUN 2017 16:04:46



Date: 1 JUN 2017 16:04:33

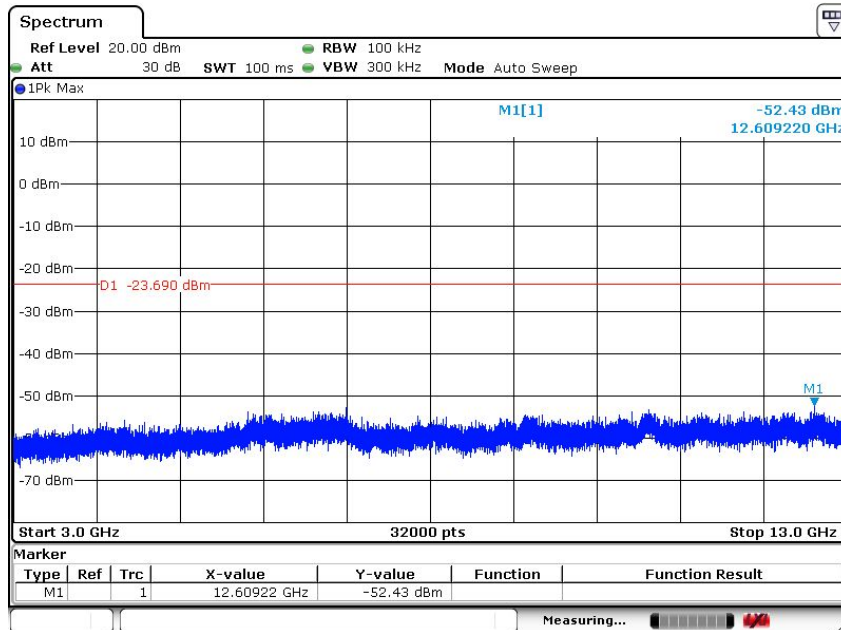
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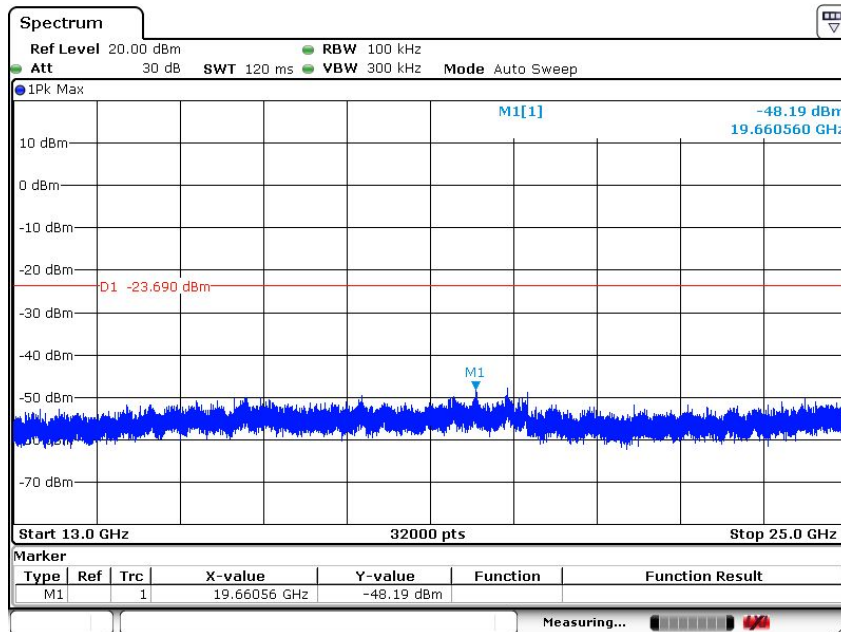
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Date: 1 JUN 2017 16:04:57



Date: 1 JUN 2017 16:05:09

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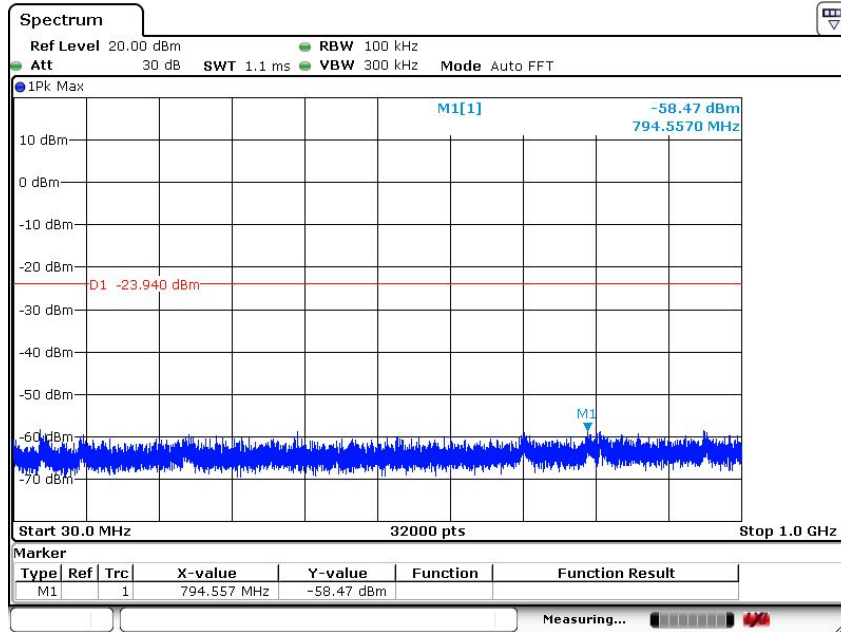




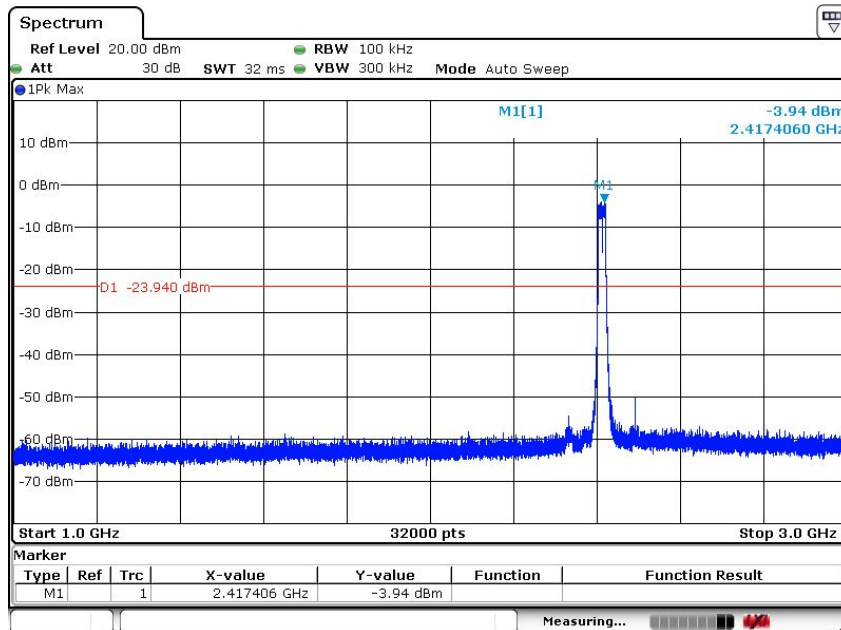
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## 802.11n(HT20) Low Channel



Date: 1 JUN 2017 16:05:54



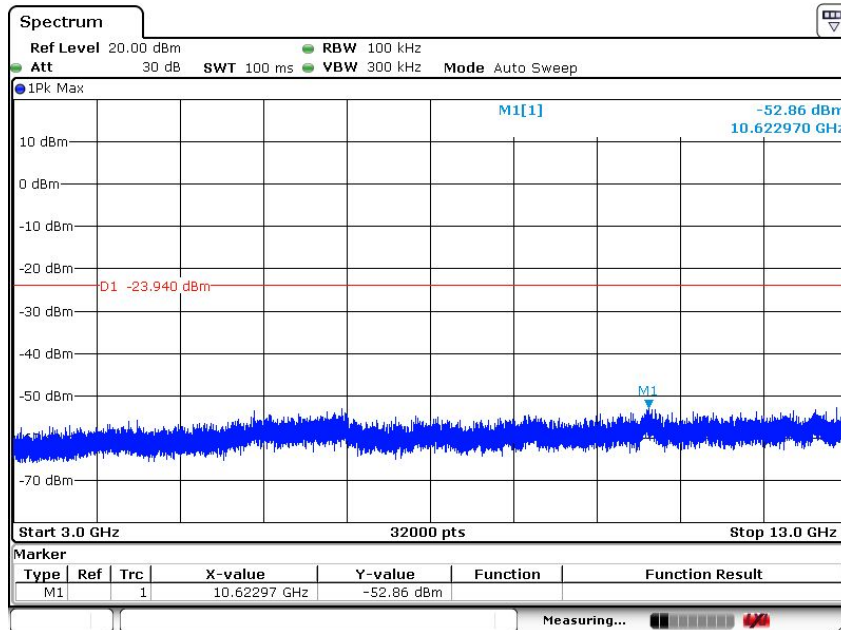
Date: 1 JUN 2017 16:05:43

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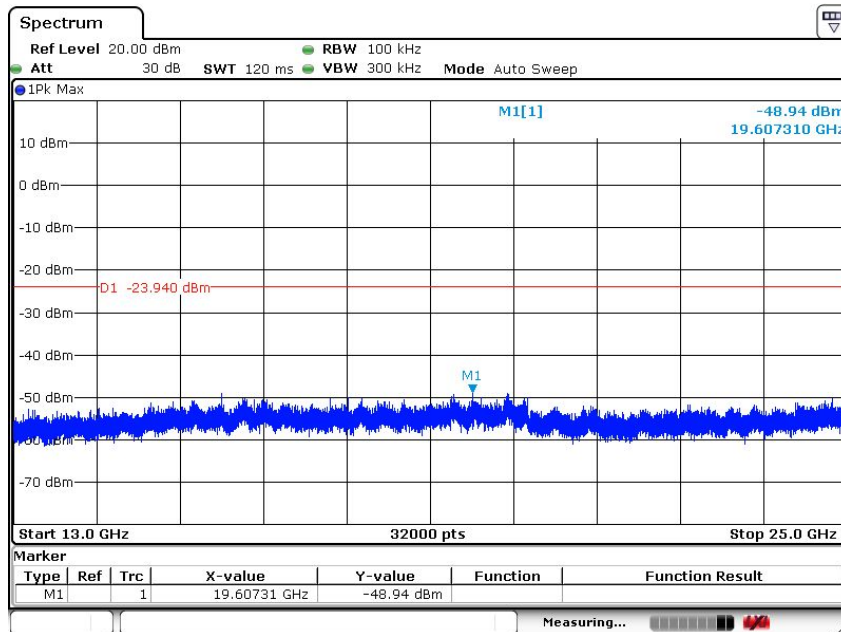


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Date: 1 JUN 2017 16:06:05



Date: 1 JUN 2017 16:06:17

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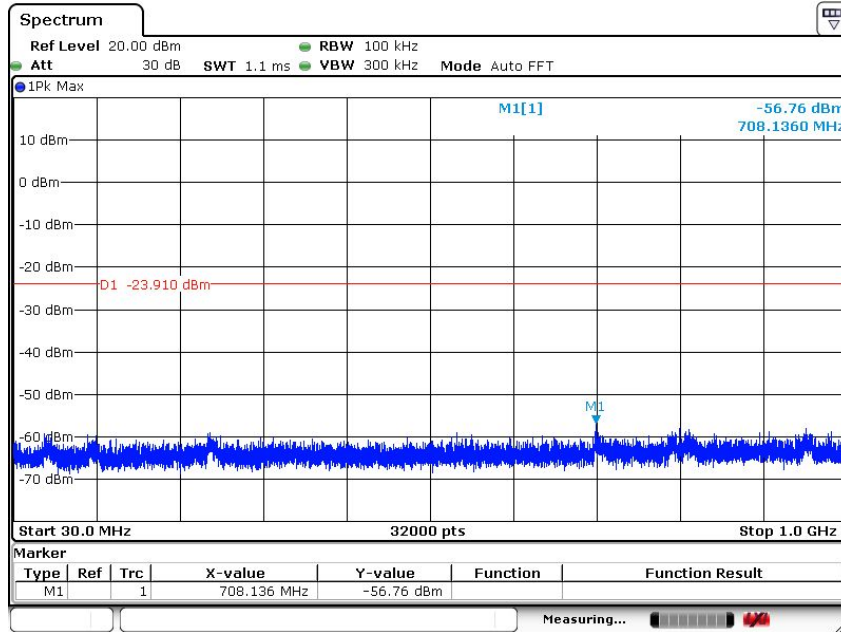




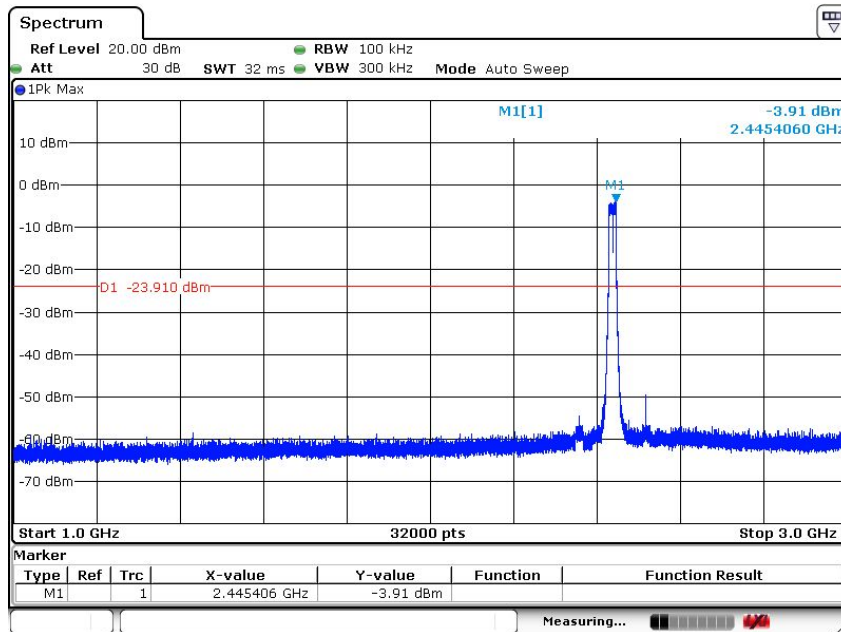
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## 802.11n(HT20) Middle Channel



Date: 1 JUN 2017 16:07:00



Date: 1 JUN 2017 16:06:50

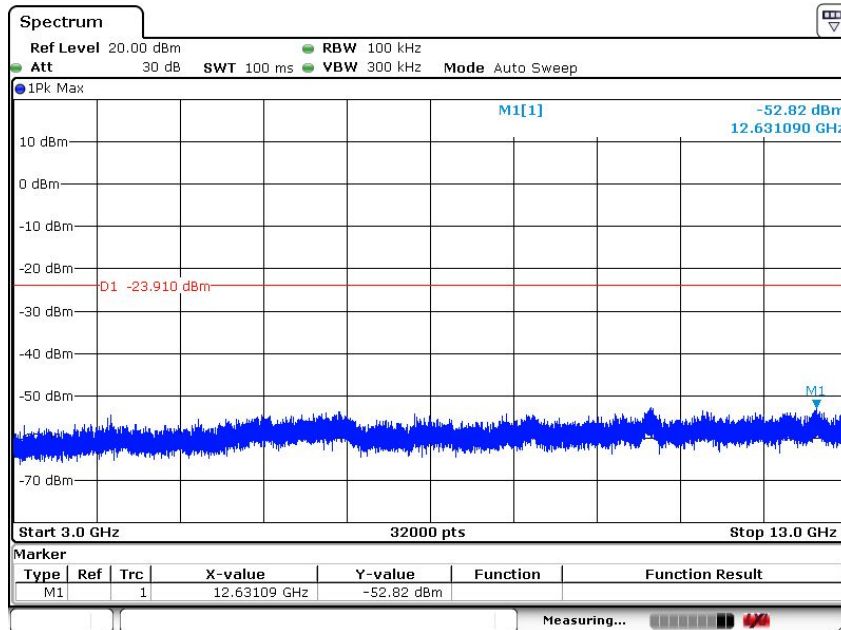
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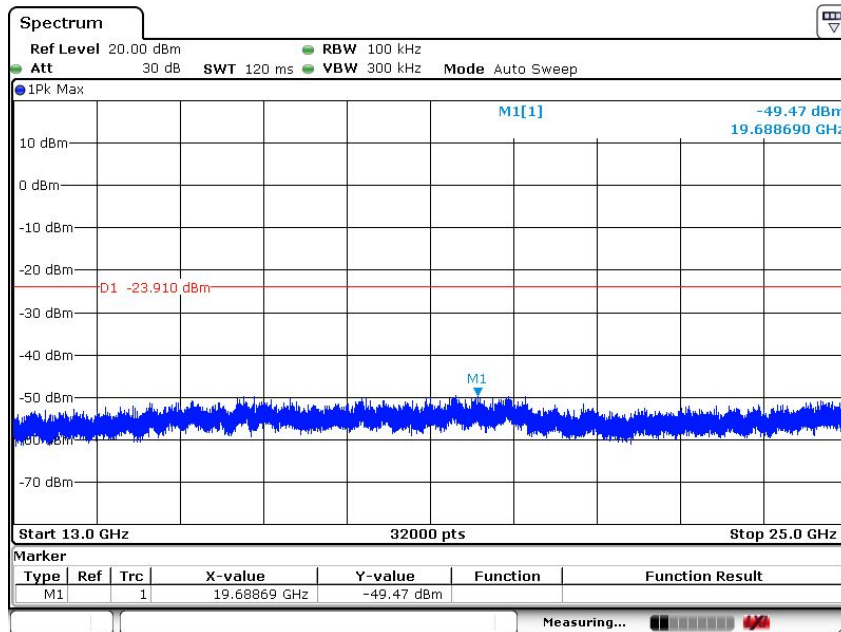
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Date: 1 JUN 2017 16:07:12



Date: 1 JUN 2017 16:07:25

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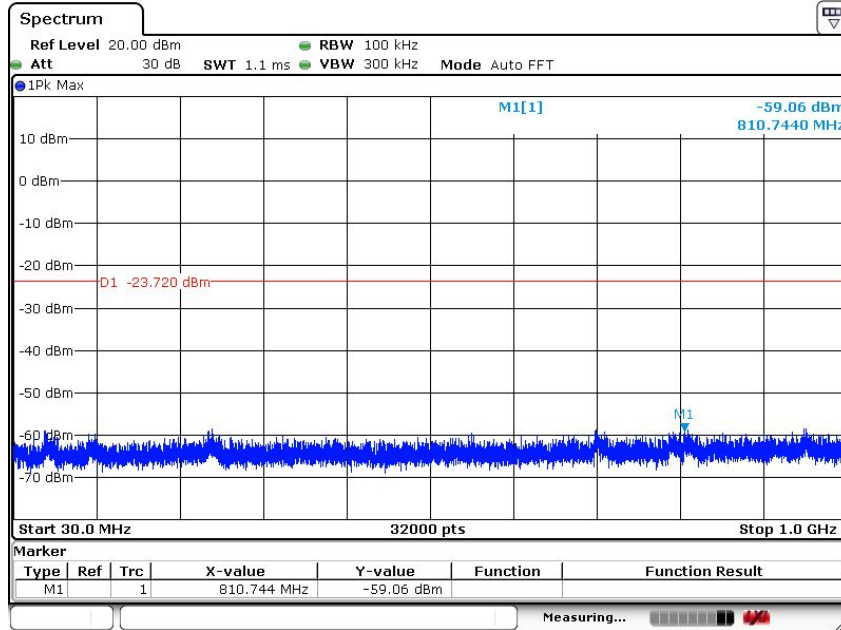


# Shenzhen Asia Test Technology Co., Ltd.

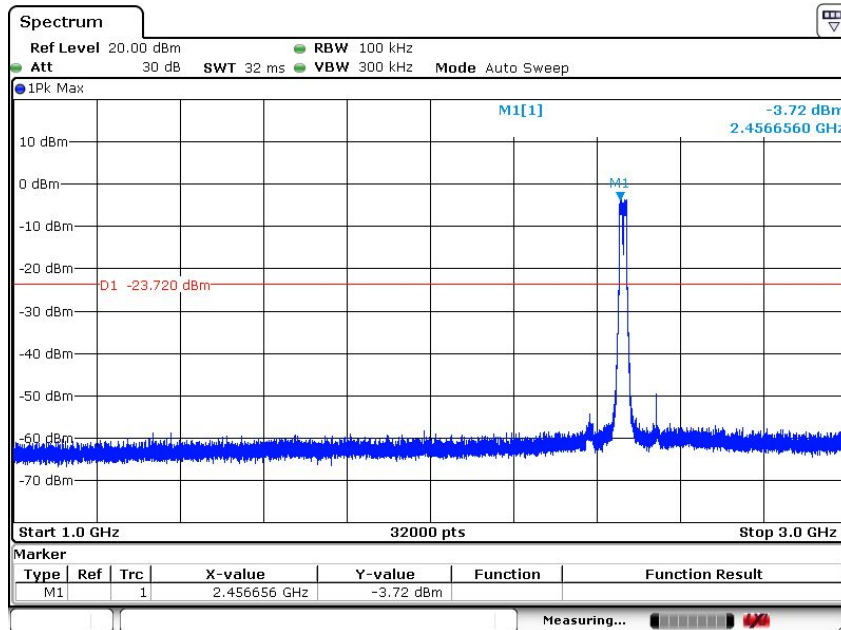
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## 802.11n(HT20) High Channel



Date: 1 JUN 2017 16:08:00



Date: 1 JUN 2017 16:07:49

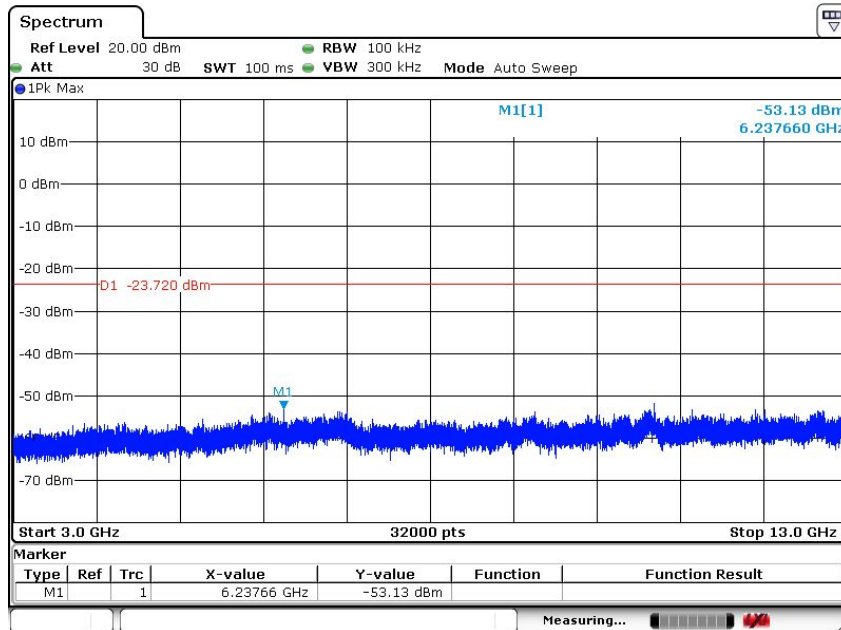
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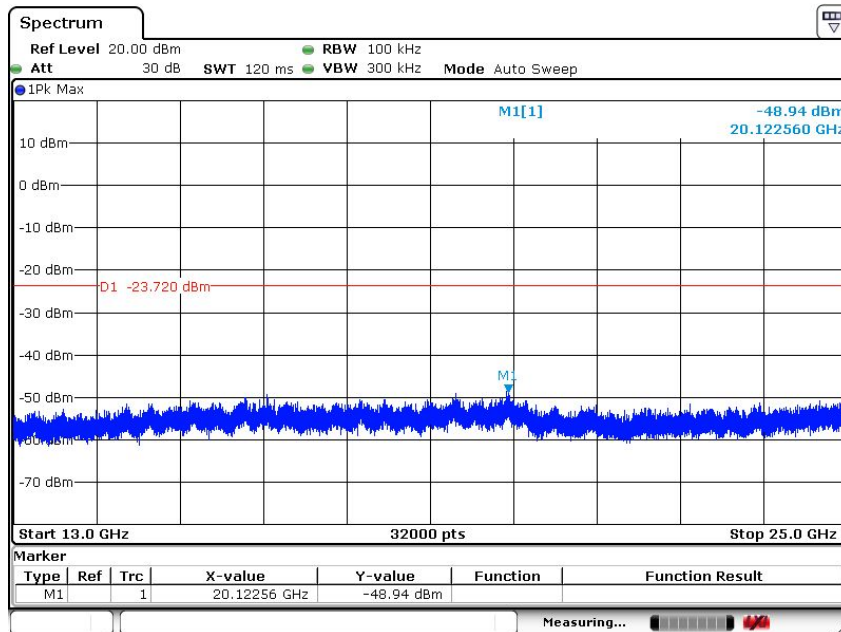
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Date: 1 JUN 2017 16:08:12



Date: 1 JUN 2017 16:08:25

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