



FCC TEST REPORT

Report No: STS1506069F01

Issued for  
Relay2, Inc.

1525 McCarthy Blvd., Suite 209, Milpitas, CA 95035, USA

Product Name:	Wireless Router
Brand Name:	Relay2
Model No.:	RA200
Series Model:	N/A
FCC ID:	2AAA9-RA200
Test Standard:	FCC Part 15.407

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## TEST RESULT CERTIFICATION

**Applicant's name** ..... : Relay2, Inc.

**Address** ..... : 1525 McCarthy Blvd., Suite 209, Milpitas, CA 95035, USA

**Manufacture's Name** ..... : Relay2, Inc.

**Address** ..... : 1525 McCarthy Blvd., Suite 209, Milpitas, CA 95035, USA

### Product description

**Product name**..... : Wireless Router

**Model and/or type reference** : RA200

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

**Standards**..... : FCC Part15.407

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

This device described above has been tested by STS, and the test results show that the equipment under test (EUT) is in compliance with the FCC&IC 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**..... : 24 July. 2015 ~31 July. 2015

**Date of Issue**..... : 01 Aug. 2015

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

Testing Engineer :

(Tony Liu)

Technical Manager :

(Vita Li)

Authorized Signatory :

(Bovey Yang)





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**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	01 Aug. 2015	STS1506069F01	ALL	Initial Issue





## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.407)		
FCC standard	Test Item	Judgment
15.207	AC Conducted Emission	PASS
§ 15.407 (2) (26 dB) / § 15.407 (e) (6 dB) / § 15.407 (a) (99%)	26dB/6dB &99% Bandwidth	PASS
15.407(a) (1).(2).(3).(4).(5)	Maximum Conducted Output Power	PASS
15.407(b)	Peak Excursion Ratio	PASS
15.407(b)& 15.209	Radiated Emission And ( Unwanted Emissions) Measurement	PASS
15.407(b)7	Conducted Emission And ( Unwanted Emissions) Measurement	PASS
15.407(a) (1).(2).(3).(4).(5)	Power Spectral Density	PASS
15.407(g)	Frequency Stability	PASS
15.407(c)	Automatically Discontinue Transmission	PASS
15.203/15.204	Antenna Requirement	PASS

NOTE:

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



## 1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.

Add. : 1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road,

Fuyong Street, Bao'an District, Shenzhen, Guangdong,China

CNAS Registration No.: L7649;

FCC Registration No.: 842334; IC Registration No.: 12108A-1

## 1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.70\text{dB}$
4	Spurious emissions,conducted	$\pm 1.19\text{dB}$
5	All emissions,radiated(<1G) 30MHz-200MHz	$\pm 2.83\text{dB}$
6	All emissions,radiated(<1G) 200MHz-1000MHz	$\pm 2.94\text{dB}$
7	All emissions,radiated(>1G)	$\pm 3.03\text{dB}$
8	Temperature	$\pm 0.5^{\circ}\text{C}$
9	Humidity	$\pm 2\%$





## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Router	
Trade Name	Relay2	
Model Name	RA200	
Serial Model	N/A	
Model Difference	N/A	
Product Description	The EUT is a Wireless Router	
	Operation Frequency:	IEEE 802.11a/ n(HT20/40) 5.180GHz-5.240GHz IEEE 802.11a/ n(HT20/40)5.745GHz-5.825GHz
	Modulation Type:	IEEE for 802.11a: OFDM(BPSK/QPSK/16QAM/64QAM) IEEE for 802.11n : OFDM(BPSK/QPSK/16QAM/64QAM)
	Bit Rate of Transmitter	802.11a:54/48/36/24/18/12/9/6Mbps 802.11n(20MHz):300/150/144.44/130/117/115.56/104/86.67/78/52/6.5 Mbps
	Antenna Designation:	See Note 3
	Max.Output Power(Conducted):	11.76dBm
	The duty cycle of WLAN 802.11a/n were 95 %	
	More details of EUT technical specification, please refer to the User's Manual.	
Test Channel	Please refer to the Note 2.	
Adapter	Input: AC100-240V, 700mA, 50/60 Hz Output: DC48V, 520mA	
Connecting I/O Port(s)	Please refer to the User's Manual	

Note: For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

Operation Frequency of channel			
5.180GHz-5.240GHz		5.745GHz-5.825GHz	
Channel	Frequency	Channel	Frequency
36	5180	149	5745
38	5190	151	5755
40	5200	153	5765
42	5210	157	5785
44	5220	159	5795
46	5230	161	5805
48	5240	165	5825

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Carrier Frequency Channel



5GHz:

For 802.11a (HT20)

Channel	Freq.(MHz)	Channel	Freq.(MHz)
36	5180	149	5745
40	5200	157	5785
48	5240	165	5825

For 802.11n (HT20)

Channel	Freq.(MHz)	Channel	Freq.(MHz)
36	5180	149	5745
40	5200	157	5785
48	5240	165	5825

For 802.11n (HT40)

Channel	Freq.(MHz)	Channel	Freq.(MHz)
38	5190	151	5755
46	5230	159	5795

### 3. Emissions Testing of Transmitters with Multiple Outputs in the Same Band.

For devices having two outputs driving a cross-polarized pair of antennas, see Attachment 662911 D02 of this publication for additional guidance.

d) *Unequal antenna gains, with equal transmit powers.* For antenna gains given by  $G_1$ ,  $G_2$ , ...,  $G_N$  dBi

(i) If transmit signals are *correlated*, then Directional gain =  $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / NANT]$  dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

(ii) If all transmit signals are *completely uncorrelated*, then Directional gain =  $10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / NANT]$  dBi

Not: If transmit signals are *correlated*, then Directional gain.

ANT-A=5.924 dBi

ANT-B=4.425 dBi

ANT-C=6.431 dBi

Total gain= $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / NANT]$  dBi

$10 * \log_{10}((10^{(5.924/20)} + 10^{(4.425/20)} + 10^{(6.431/20)})^2 / 3) = 10.4055 \approx 10.4$

Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
A	Relay2	RA200	PIFA Antenna	Input Connector	10.4dbi	WIFI Antenna



## 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly 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(20)
Mode 2	802.11n(20/40)
Mode 3	Link Mode

For Conducted Emission	
Final Test Mode	Description
Mode 3	Link Mode

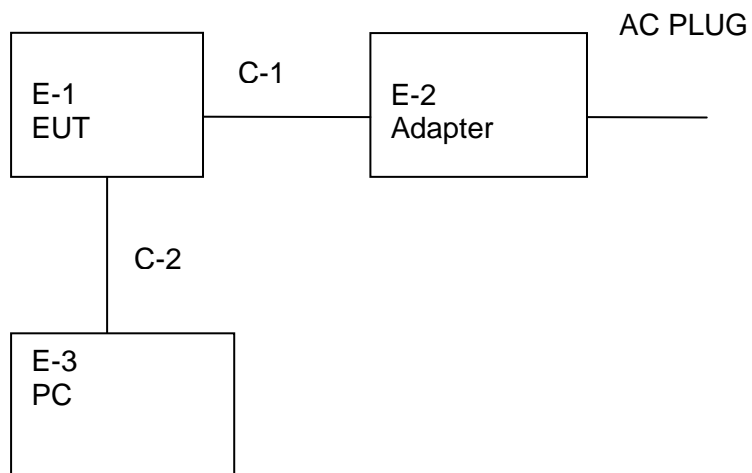
For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11a(20)
Mode 2	802.11n(20/40)

Note:

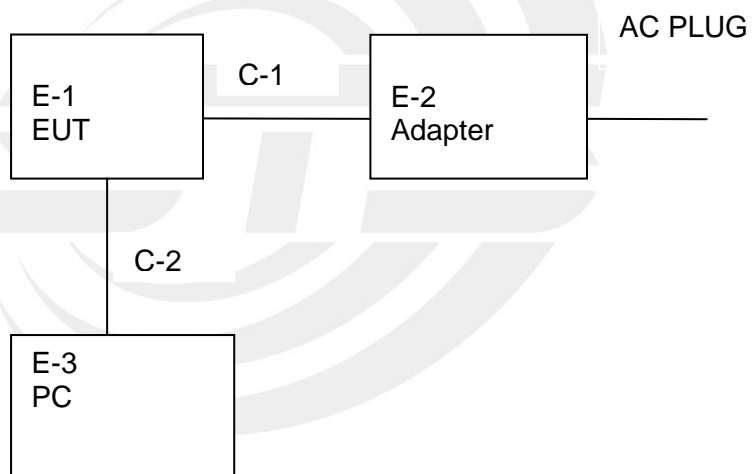
- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported
- (3) The EUT's duty cycle is set to 100%

## 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	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Wireless Router	Relay2	RA200	N/A	EUT
E-2	Adapter	N/A	FSP025-1AD207A	N/A	N/A
E-3	PC	HP	500-320cx	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	unshielded	NO	121cm	
C-2	unshielded	NO	120cm	

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

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Spectrum Analyzer	Agilent	E4407B	MY50140340	2014.10.25	2015.10.24
Test Receiver	R&S	ESCI	101427	2014.10.25	2015.10.24
Bilog Antenna	TESEQ	CBL6111D	34678	2014.11.25	2015.11.24
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2015.03.06	2016.03.05
50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.06.06	2016.06.05
PreAmplifier	Agilent	8449B	60538	2014.10.25	2015.10.24
Loop Antenna	ARA	PLA-1030/B	1029	2015.06.08	2016.06.07
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2014.10.25	2015.10.24

### Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	102086	2014.11.20	2015.11.19
LISN	R&S	ENV216	101242	2014.10.25	2015.10.24
LISN	EMCO	3810/2NM	000-23625	2014.10.25	2015.10.24



### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

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

FREQUENCY (MHz)	Class B (dBuV)		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

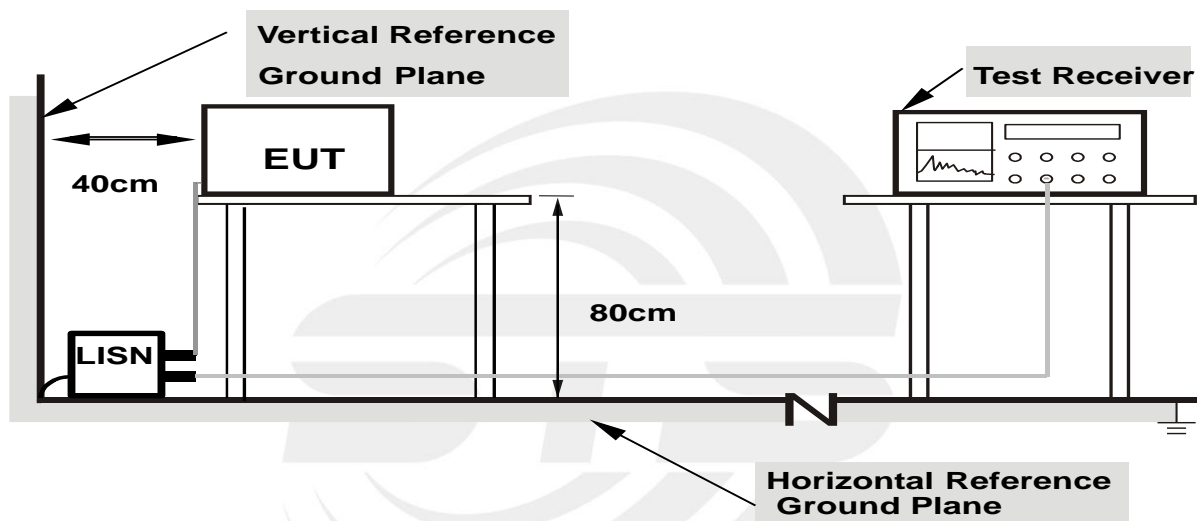
### 3.1.2 TEST PROCEDURE

- The EUT was placed 0.4 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.





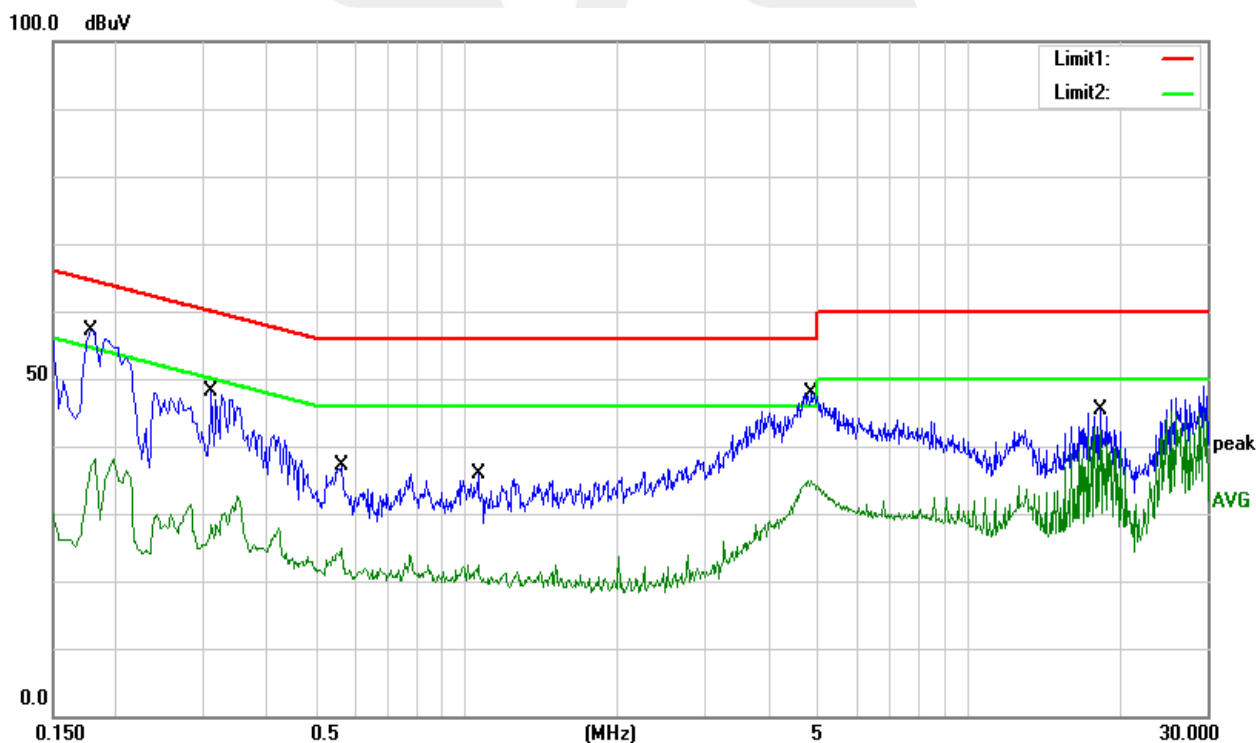
### 3.1.6 TEST RESULTS

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	L
Test Voltage :	AC 120V/50Hz	Test Mode :	Mode 3

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.1767	43.11	10.00	53.11	64.64	-11.53	QP
2	0.1767	20.73	10.00	30.73	54.64	-23.91	AVG
3	0.3073	32.07	9.92	41.99	60.04	-18.05	QP
4	0.3073	16.75	9.92	26.67	50.04	-23.37	AVG
5	0.5632	23.92	9.93	33.85	56.00	-22.15	QP
6	0.5632	14.42	9.93	24.35	46.00	-21.65	AVG
7	1.0560	20.55	9.91	30.46	56.00	-25.54	QP
8	1.0560	11.44	9.91	21.35	46.00	-24.65	AVG
9	4.9290	30.73	10.20	40.93	56.00	-15.07	QP
10	4.9290	23.79	10.20	33.99	46.00	-12.01	AVG
11	18.3765	32.87	10.64	43.51	60.00	-16.49	QP
12	18.3765	32.13	10.64	42.77	50.00	-7.23	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





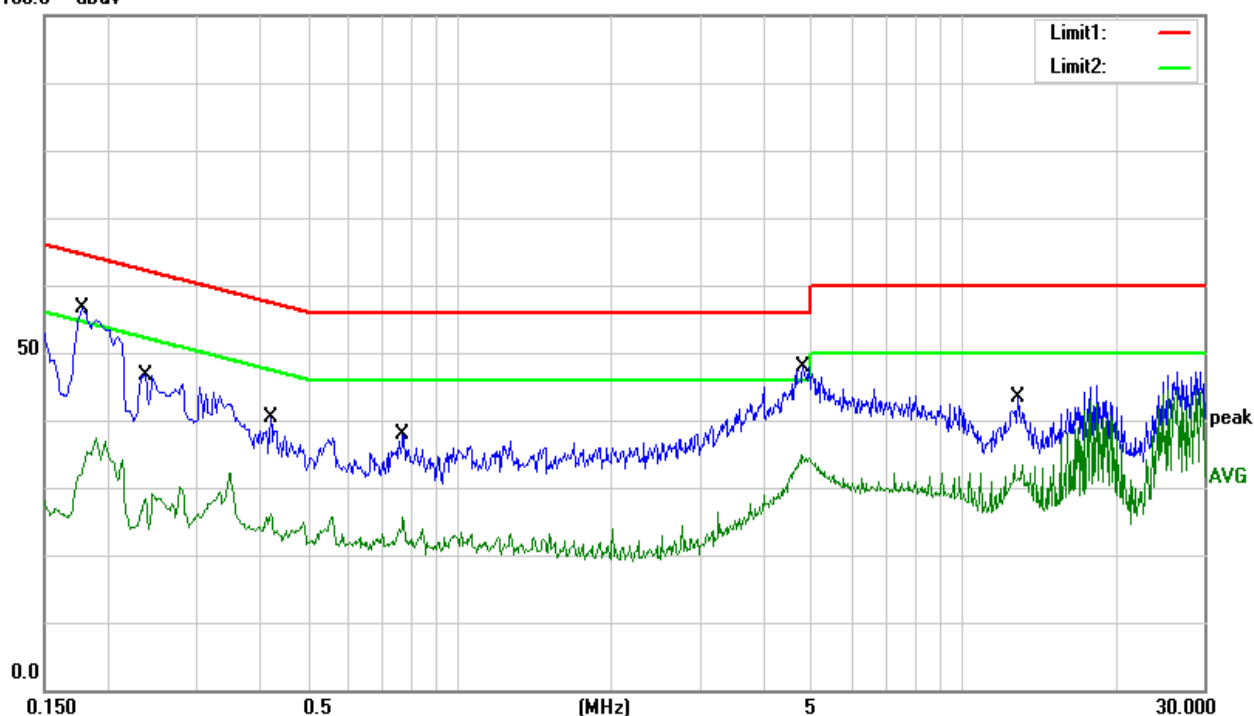
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N
Test Voltage :	AC 120V/50Hz	Test Mode :	Mode 3

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.1765	42.24	10.00	52.24	64.65	-12.41	QP
2	0.1765	20.40	10.00	30.40	54.65	-24.25	AVG
3	0.2350	32.80	9.96	42.76	62.27	-19.51	QP
4	0.2350	15.70	9.96	25.66	52.27	-26.61	AVG
5	0.4197	23.77	9.98	33.75	57.45	-23.70	QP
6	0.4197	14.93	9.98	24.91	47.45	-22.54	AVG
7	0.7665	23.03	10.00	33.03	56.00	-22.97	QP
8	0.7665	13.73	10.00	23.73	46.00	-22.27	AVG
9	4.8502	30.77	10.20	40.97	56.00	-15.03	QP
10	4.8502	23.94	10.20	34.14	46.00	-11.86	AVG
11	12.7876	24.99	10.30	35.29	60.00	-24.71	QP
12	12.7876	20.02	10.30	30.32	50.00	-19.68	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

100.0 dBuV



## 3.2 RADIATED EMISSION AND ( UNWANTED EMISSIONS) 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 15.407(b)7& 15.205/209(a), then the (a); limit in the table below has to be followed.

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

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

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

Notes:

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

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier harmonic(Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 1 MHz, AV=1 MHz /3 MHz

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

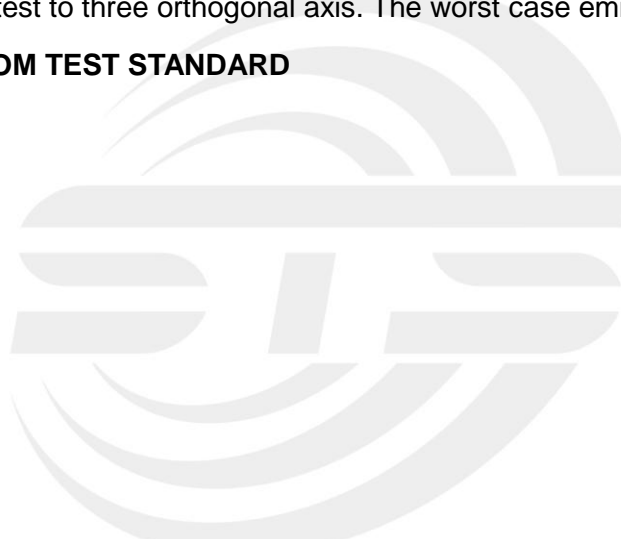
- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 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; 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

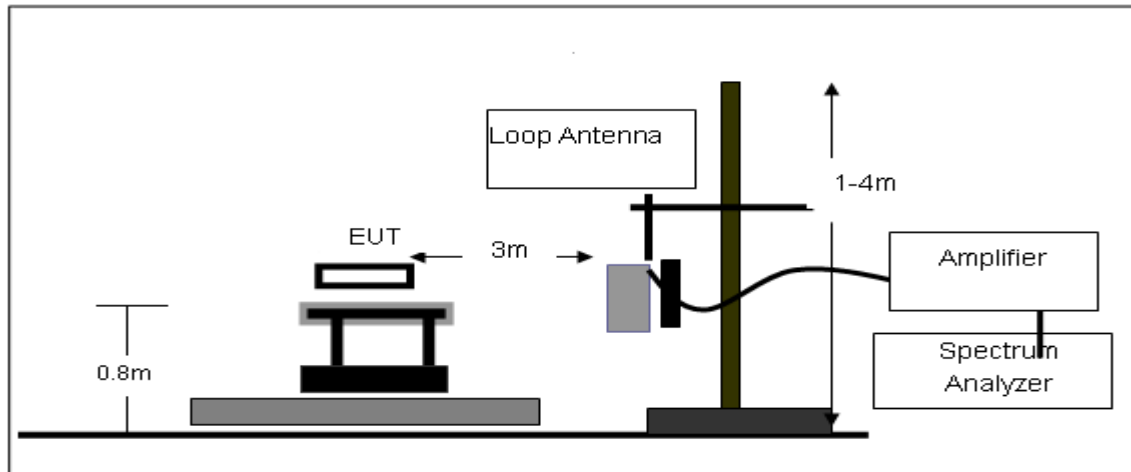
### 3.2.3 DEVIATION FROM TEST STANDARD

No deviation

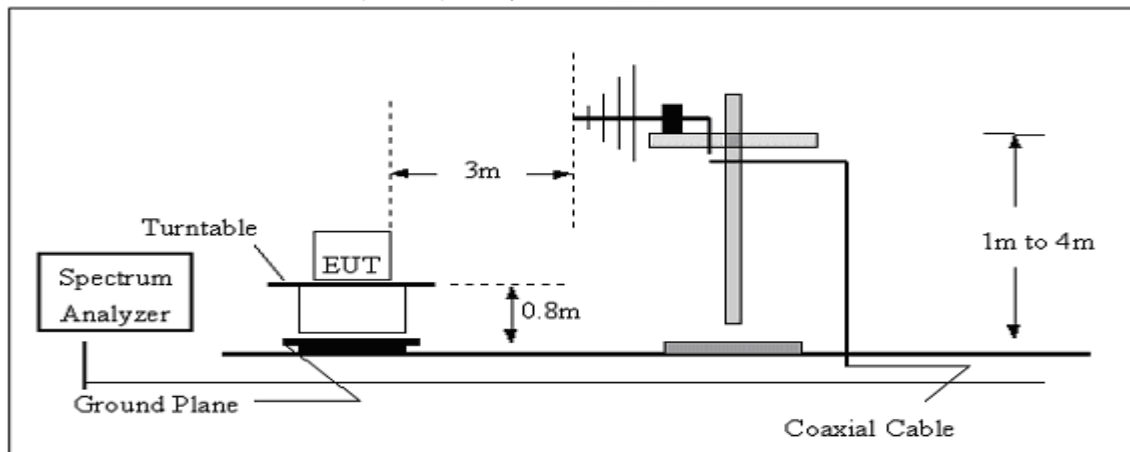


### 3.2.4 TEST SETUP

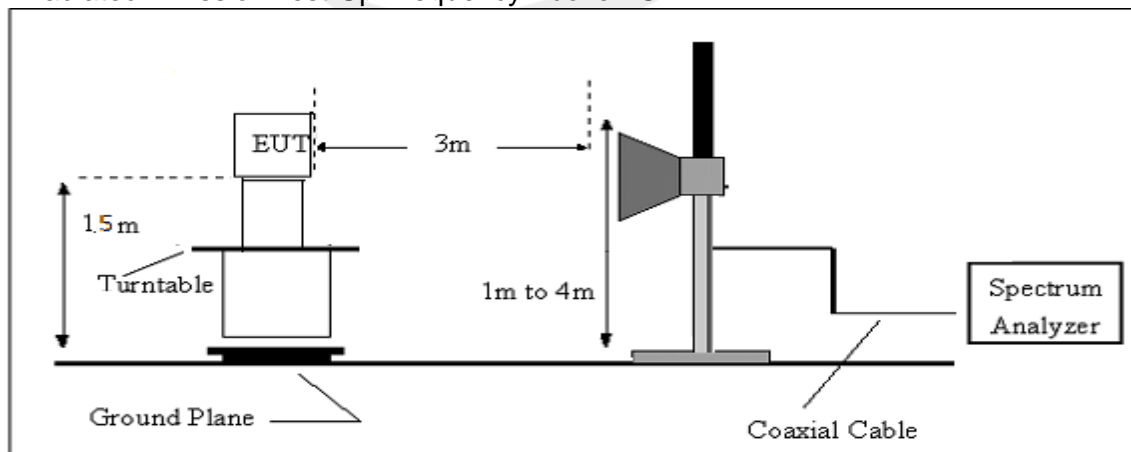
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (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)**

Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 48V from PC
Test Mode :	N/A	Polarization :	--

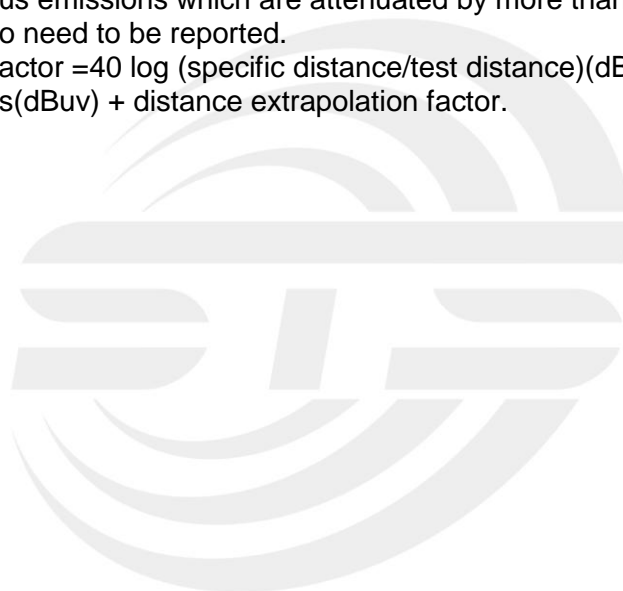
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

**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.





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

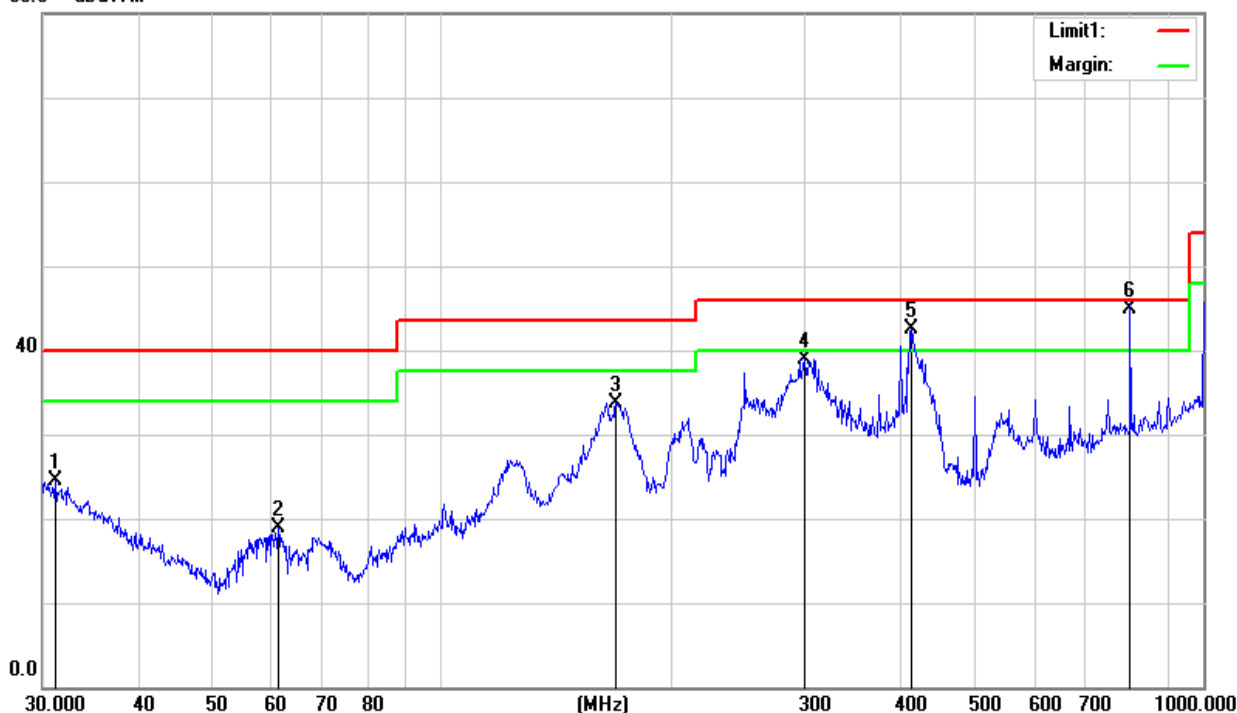
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 48V
Test Mode :	Mode 1/2/3(worst mode)	Polarization :	Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	31.1798	6.38	18.08	24.46	40.00	-15.54	QP
2	61.1315	13.48	5.39	18.87	40.00	-21.13	QP
3	169.5990	23.07	10.58	33.65	43.50	-9.85	QP
4	300.3672	24.23	14.69	38.92	46.00	-7.08	QP
5	414.7223	23.97	18.62	42.59	46.00	-3.41	QP
6	799.9863	19.50	25.40	44.90	46.00	-1.10	QP

Remark:

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

80.0 dBuV/m





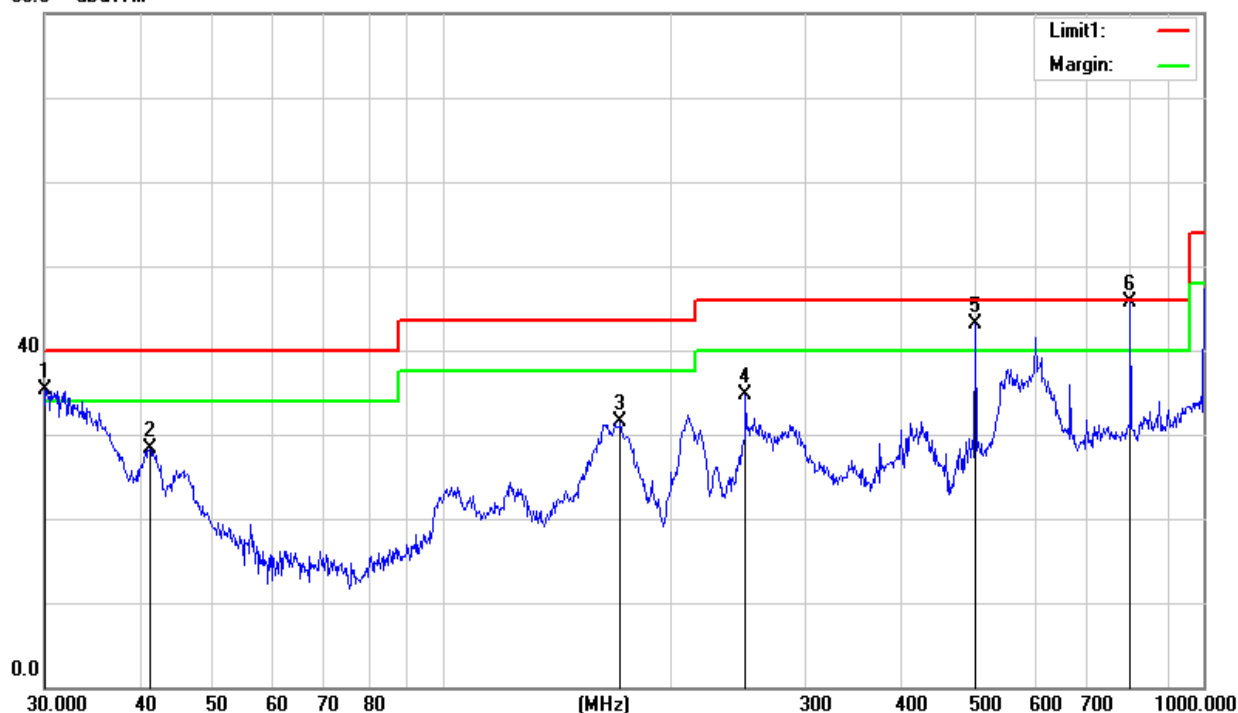
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 48V
Test Mode :	Mode 1/2/3(worst mode)	Polarization :	Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.1053	16.75	18.65	35.40	40.00	-4.60	QP
2	41.2764	15.51	12.75	28.26	40.00	-11.74	QP
3	171.3925	20.99	10.45	31.44	43.50	-12.06	QP
4	250.3011	21.08	13.70	34.78	46.00	-11.22	QP
5	501.1790	22.71	20.38	43.09	46.00	-2.91	QP
6	799.9863	20.36	25.40	45.76	46.00	-0.24	QP

## Remark:

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

80.0 dBuV/m





**3.2.8 TEST RESULTS (ABOVE 1000 MHZ)**

(worst mode)

**Band I(5.15-5.25) GHz**

Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Comment
Low Channel (802.11/ 5180 MHz)							
10360.13	36.57	16.85	53.42	74	-20.58	PK	Vertical
10360.12	27.02	17.86	44.88	54	-9.12	AV	Vertical
11540.19	32.19	21.55	53.74	74	-20.26	PK	Vertical
11540.22	21.31	21.55	42.86	54	-11.14	AV	Vertical
10360.12	32.59	16.85	49.44	74	-24.56	PK	Horizontal
10360.12	24.24	16.85	41.09	54	-12.91	AV	Horizontal
Mid Channel (802.11/ 5200 MHz)							
10400.12	35.87	16.95	52.82	74	-21.18	PK	Vertical
10400.12	27.18	16.95	44.13	54	-9.87	AV	Vertical
15600.23	31.91	21.65	53.56	74	-20.44	PK	Vertical
15600.15	21.67	21.65	43.32	54	-10.68	AV	Vertical
10400.12	32.18	16.95	49.13	74	-24.87	PK	Horizontal
10400.12	24.10	16.95	41.05	54	-12.95	AV	Horizontal
High Channel (802.11/ 5240 MHz)							
10480.26	61.58	17.15	78.73	74	4.73	PK	Vertical
10480.26	45.39	17.15	62.54	54	8.54	AV	Vertical
15720.26	61.00	21.75	82.75	74	8.75	PK	Vertical
15720.26	45.74	21.75	67.49	54	13.49	AV	Vertical
10480.26	61.61	17.15	78.76	74	4.76	PK	Horizontal
10480.26	45.78	17.15	62.93	54	8.93	AV	Horizontal
Remark:							
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.							
2. Scan with 802.11a,802.11n (HT-20/40) , the worst case is 802.11a.							

**Band IV(5.725-5.850) GHz**

Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Comment
Low Channel (802.11/ 5745 MHz)							
11490.128	35.83	17.86	53.69	74	-20.31	PK	Vertical
11490.114	27.11	17.86	44.97	54	-9.03	AV	Vertical
17235.192	32.15	22.93	55.08	74	-18.92	PK	Vertical
17235.217	21.90	22.93	44.83	54	-9.17	AV	Vertical
11490.128	32.34	17.86	50.2	74	-23.8	PK	Horizontal
11490.114	24.61	17.86	42.47	54	-11.53	AV	Horizontal
Mid Channel (802.11/ 5785 MHz)							
11570.122	36.40	18.25	54.65	74	-19.35	PK	Vertical
11570.124	27.31	18.25	45.56	54	-8.44	AV	Vertical
17355.228	32.49	23.35	55.84	74	-18.16	PK	Vertical
17355.145	21.44	23.35	44.79	54	-9.21	AV	Vertical
11570.122	32.07	18.25	50.32	74	-23.68	PK	Horizontal
11570.124	23.97	18.25	42.22	54	-11.78	AV	Horizontal
High Channel (802.11/ 5825 MHz)							
11650.26	60.96	18.65	79.61	74	5.61	PK	Vertical
11650.26	45.62	18.65	64.27	54	10.27	AV	Vertical
17475.26	61.00	23.75	84.75	74	10.75	PK	Vertical
17475.26	45.75	23.75	69.5	54	15.5	AV	Vertical
11650.26	61.32	18.65	79.97	74	5.97	PK	Horizontal
11650.26	45.73	18.65	64.38	54	10.38	AV	Horizontal
Remark: 3. Factor = Antenna Factor + Cable Loss – Pre-amplifier. 4. Scan with 802.11a,802.11n (HT-20/40) , the worst case is 802.11a.							

**3.2.9 (Band Edge) (worst mode)****Band I(5.15-5.25) GHz**

Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBμV/m)	Limit (dBuV/m)	Margin (dB)	Detect or	Comment
802.11a BW20MHz							
5150	42.07	10.25	52.32	74	-21.68	PK	Vertical
5150	32.00	10.25	42.25	54	-11.75	AV	Vertical
5150	42.40	10.25	52.65	74	-21.35	PK	Horizontal
5150	31.93	10.25	42.18	54	-11.82	AV	Horizontal
5350	42.38	12.45	54.83	74	-19.17	PK	Vertical
5350	32.14	12.45	44.59	54	-9.41	AV	Vertical
5350	42.12	12.45	54.57	74	-19.43	PK	Horizontal
5350	32.16	12.45	44.61	54	-9.39	AV	Horizontal
802.11n BW20MHz							
5150	42.35	10.25	52.6	74	-21.4	PK	Vertical
5150	32.34	10.25	42.59	54	-11.41	AV	Vertical
5150	42.21	10.25	52.46	74	-21.54	PK	Horizontal
5150	32.13	10.25	42.38	54	-11.62	AV	Horizontal
5350	42.19	12.45	54.64	74	-19.36	PK	Vertical
5350	31.96	12.45	44.41	54	-9.59	AV	Vertical
5350	42.23	12.45	54.68	74	-19.32	PK	Horizontal
5350	32.09	12.45	44.54	54	-9.46	AV	Horizontal
802.11n BW40MHz							
5150	42.14	10.25	52.39	74	-21.61	PK	Vertical
5150	32.15	10.25	42.4	54	-11.6	AV	Vertical
5150	41.94	10.25	52.19	74	-21.81	PK	Horizontal
5150	31.95	10.25	42.2	54	-11.8	AV	Horizontal
5350	42.03	12.45	54.48	74	-19.52	PK	Vertical
5350	32.18	12.45	44.63	54	-9.37	AV	Vertical
5350	42.34	12.45	54.79	74	-19.21	PK	Horizontal
5350	32.21	12.45	44.66	54	-9.34	AV	Horizontal

**Band IV(5.725-5.85 GHz)**

Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Comment
802.11a BW20MHz							
5725	42.00	10.65	52.65	74	-21.35	PK	Vertical
5725	31.94	10.65	42.59	54	-11.41	AV	Vertical
5725	42.10	10.65	52.75	74	-21.25	PK	Horizontal
5725	32.16	10.65	42.81	54	-11.19	AV	Horizontal
5850	42.29	12.98	55.27	74	-18.73	PK	Vertical
5850	32.23	12.98	45.21	54	-8.79	AV	Vertical
5850	42.05	12.98	55.03	74	-18.97	PK	Horizontal
5850	31.93	12.98	44.91	54	-9.09	AV	Horizontal
802.11n BW20MHz							
5725	41.96	10.65	52.61	74	-21.39	PK	Vertical
5725	32.34	10.65	42.99	54	-11.01	AV	Vertical
5725	42.22	10.65	52.87	74	-21.13	PK	Horizontal
5725	32.30	10.65	42.95	54	-11.05	AV	Horizontal
5850	42.35	12.98	55.33	74	-18.67	PK	Vertical
5850	31.93	12.98	44.91	54	-9.09	AV	Vertical
5850	42.10	12.98	55.08	74	-18.92	PK	Horizontal
5850	32.13	12.98	45.11	54	-8.89	AV	Horizontal
802.11n BW40MHz							
5725	42.07	10.65	52.72	74	-21.28	PK	Vertical
5725	32.23	10.65	42.88	54	-11.12	AV	Vertical
5725	42.19	10.65	52.84	74	-21.16	PK	Horizontal
5725	32.07	10.65	42.72	54	-11.28	AV	Horizontal
5850	41.95	12.98	54.93	74	-19.07	PK	Vertical
5850	31.99	12.98	44.97	54	-9.03	AV	Vertical
5850	42.15	12.98	55.13	74	-18.87	PK	Horizontal
5850	32.17	12.98	45.15	54	-8.85	AV	Horizontal

## 4. CONDUCTED SPURIOUS EMISSIONS

### 4.1 APPLIED PROCEDURES / LIMIT

*Undesirable emission limits.* Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) 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 e.i.r.p. of  $-27$  dBm/MHz.

(2) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of  $-17$  dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.

#### 4.1.1 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	1000 KHz/3000 KHz
Trace-Mode:	Max hold

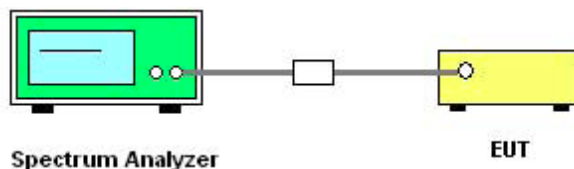
For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 5700 to 5725 MHz Upper Band Edge: 5850 to 5870 MHz
RB / VB (emission in restricted band)	1000 KHz/3000 KHz
Trace-Mode:	Max hold

#### 4.1.2 DEVIATION FROM STANDARD

No deviation.

#### 4.1.3 TEST SETUP



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 1000 kHz. In order to make an accurate measurement, set the span greater than RBW.

#### 4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

## 4.1.5 TEST RESULTS

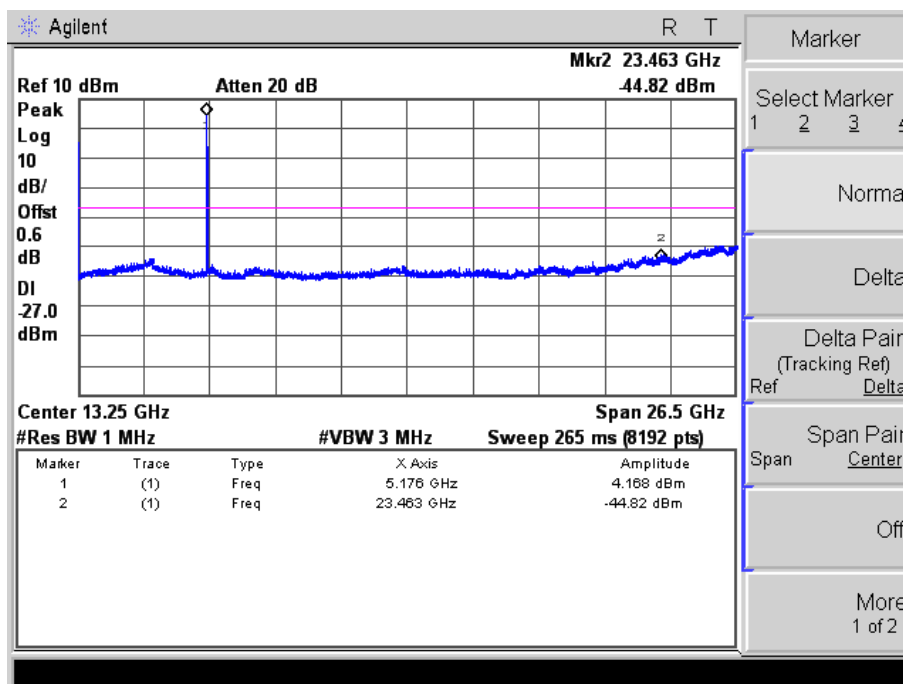
Not:

1:A/B/C Represent the value of antennaA/B/C,The worst data is Antenna A ,only shown Antenna A

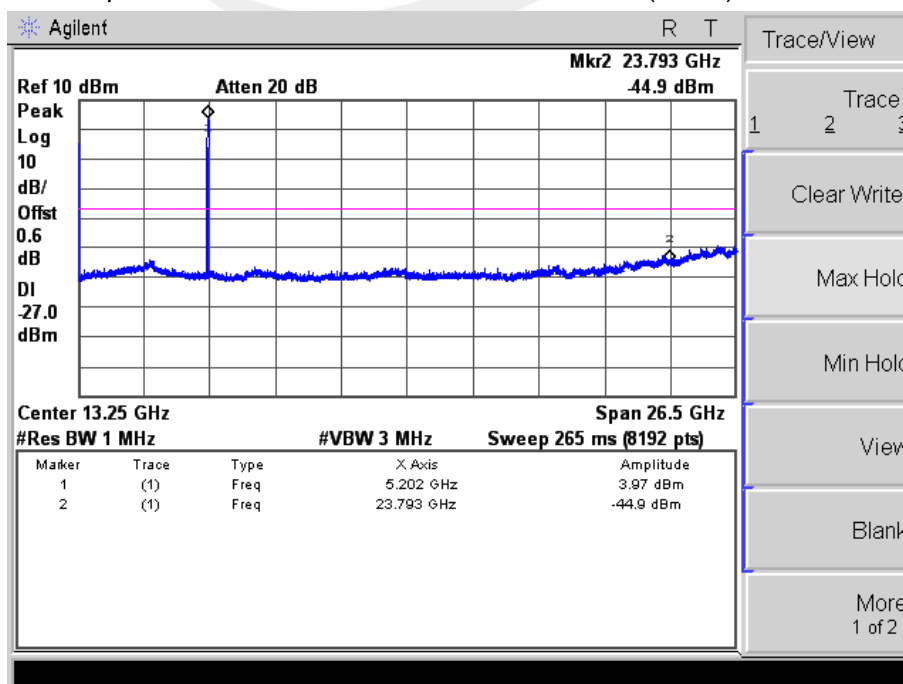
2:Above 26.5GHz amplitude of spurious emissions which are attenuated by more than 10dB below the permissible value has.

### Band I (5.15-5.25GHz)

TX Spurious Emissions /802.11a Mode CH 36 (Ant A) worst data

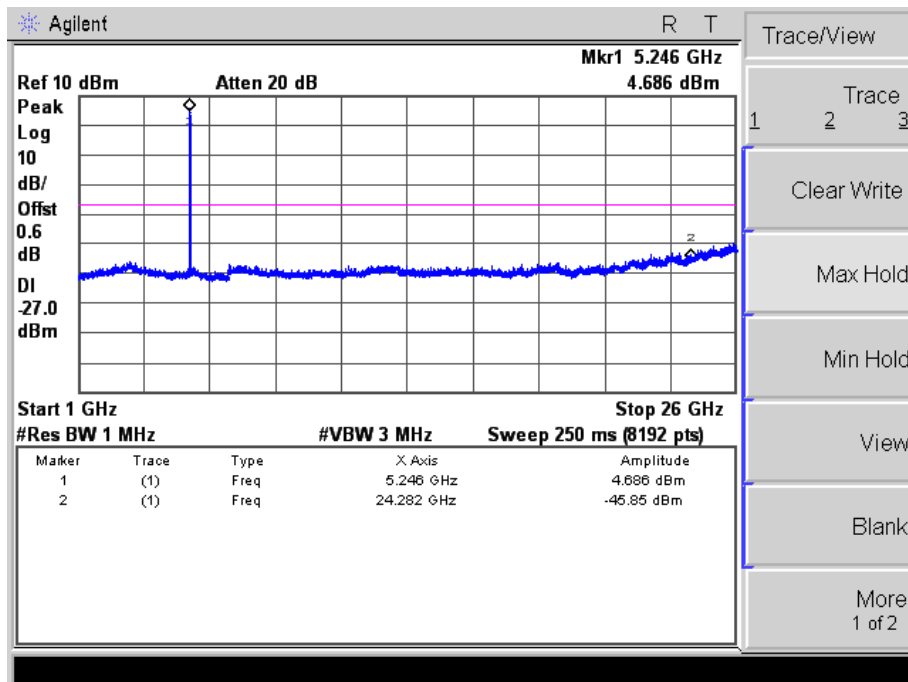


TX Spurious Emissions /802.11a Mode CH 40 (Ant A) worst data





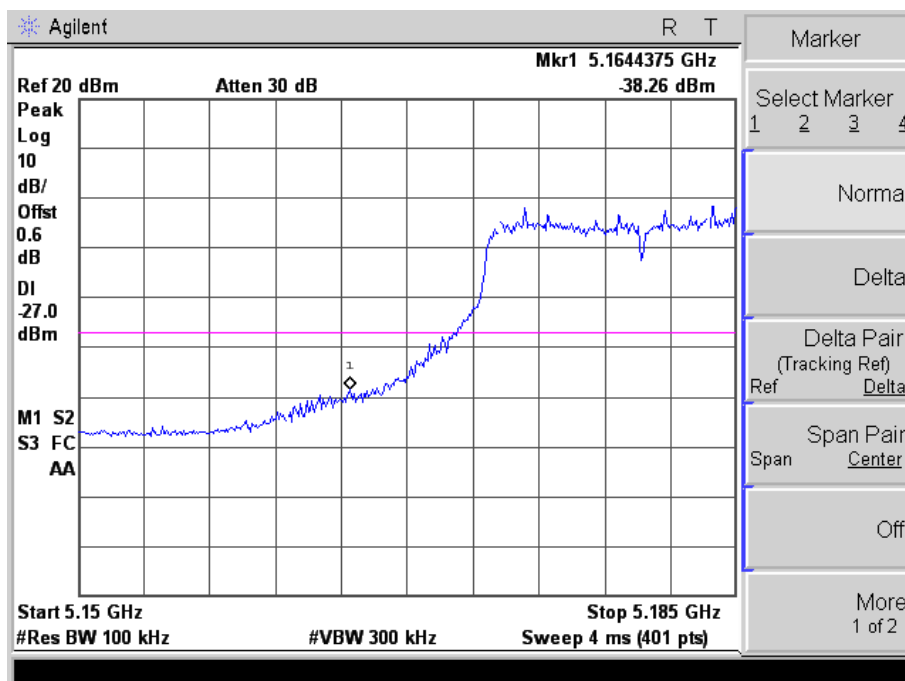
## TX Spurious Emissions /802.11a Mode CH 48 (Ant A) worst data



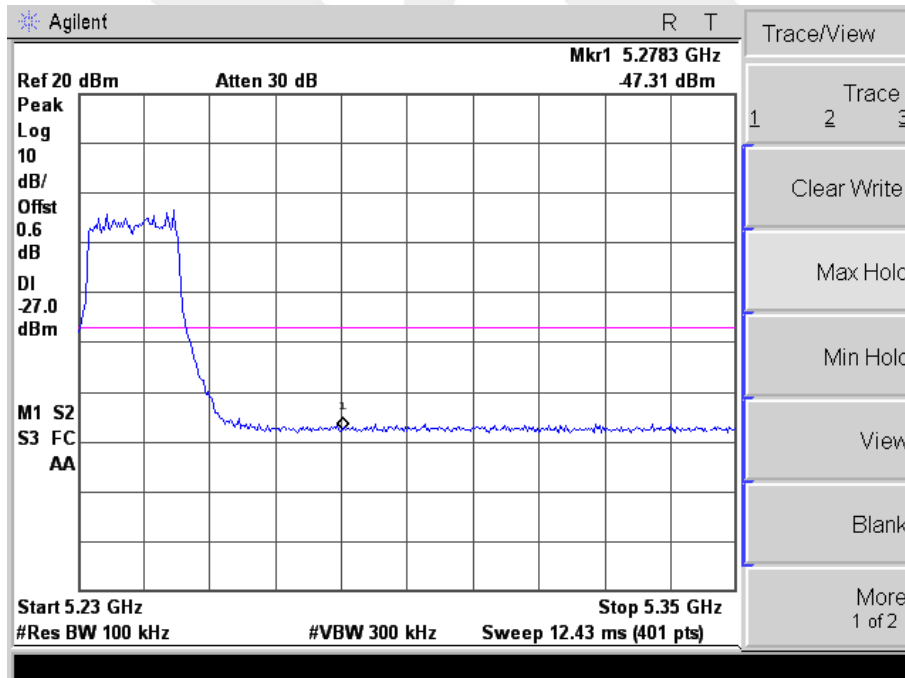


## Band edge

## TX Band edge /802.11a Mode CH 36 (Ant A) worst data



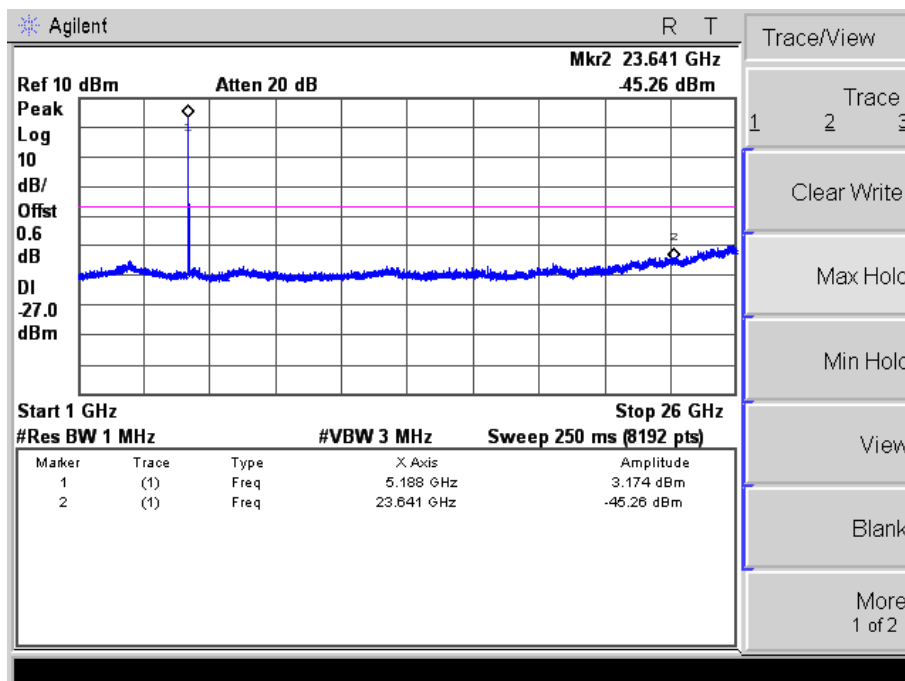
## TX Band edge /802.11a Mode CH 48 (Ant A) worst data



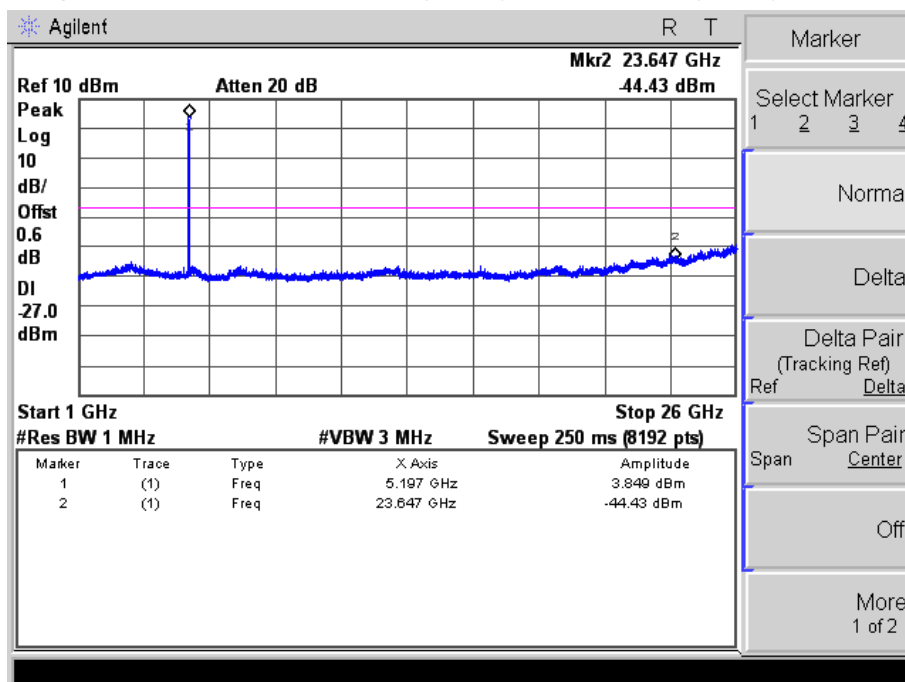


# Band I (5.15-5.25GHz)

TX Spurious Emissions /802.11n(HT20) Mode CH 36 (Ant A) worst data

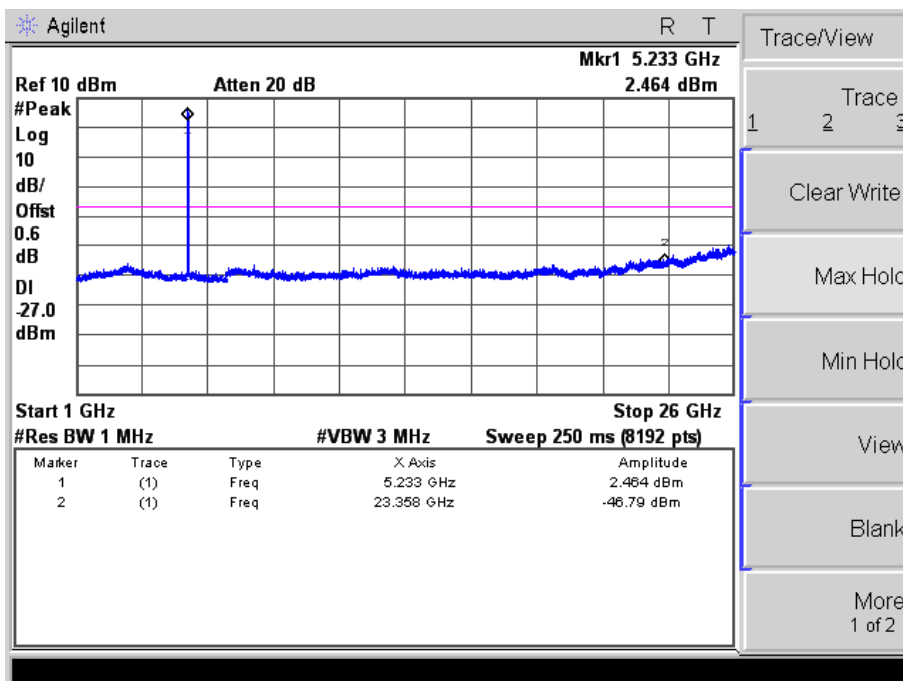


TX Spurious Emissions /802.11n(HT20) Mode CH 40 (Ant A) worst data





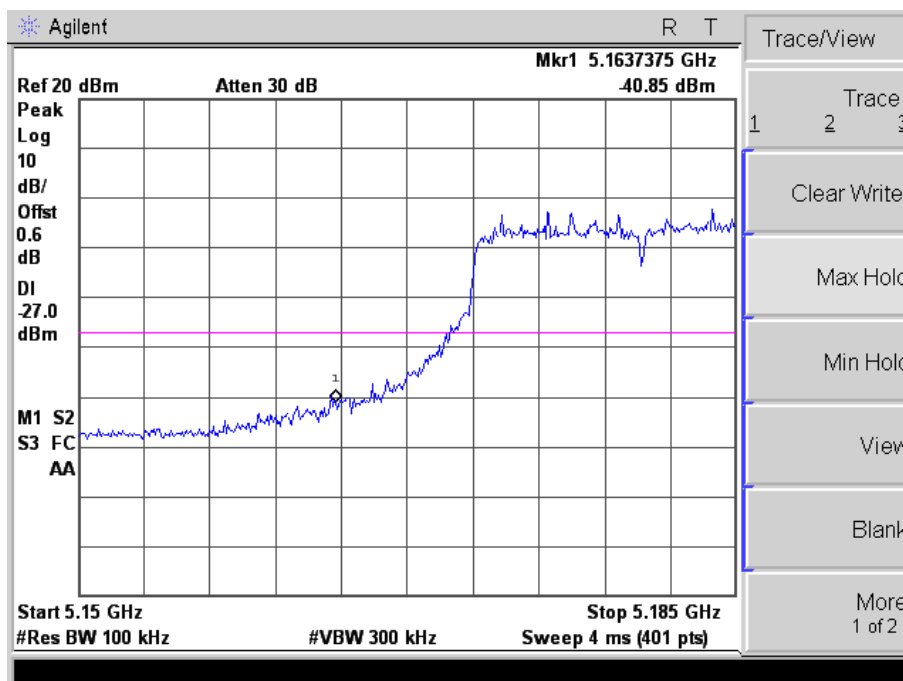
## TX Spurious Emissions /802.11n(HT20) Mode CH 48 (Ant A) worst data



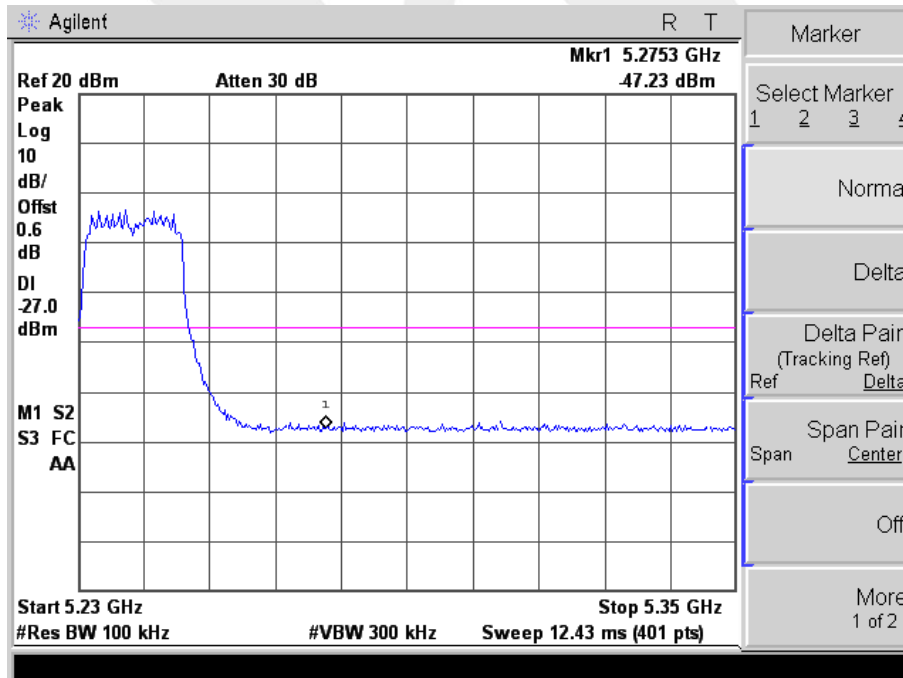


## Band edge

## TX Band edge /802.11n(HT20) Mode CH 36 (Ant A) worst data

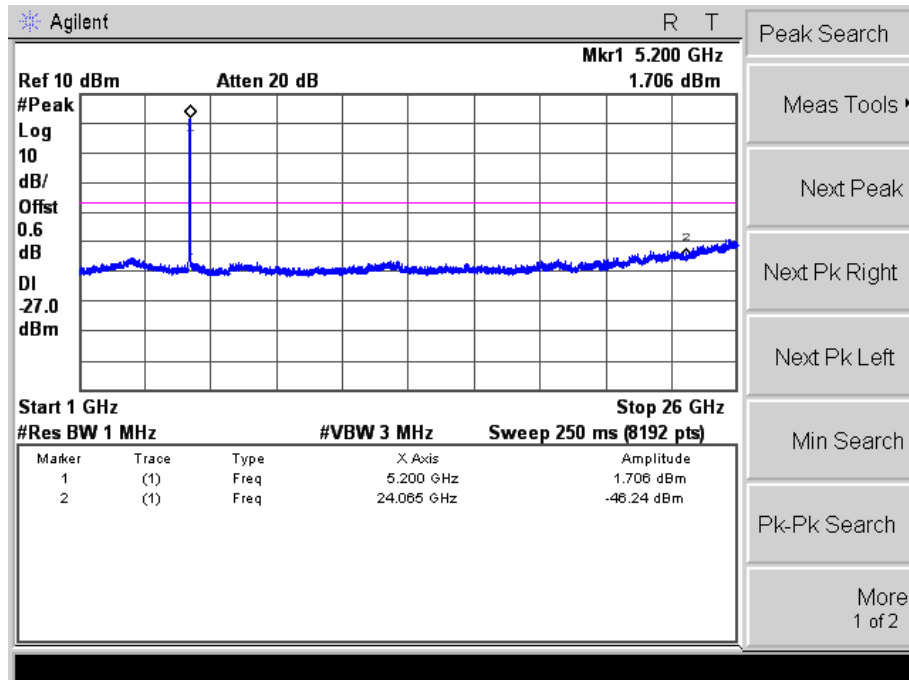


## TX Band edge /802.11n(HT20) Mode CH 48 (Ant A) worst data

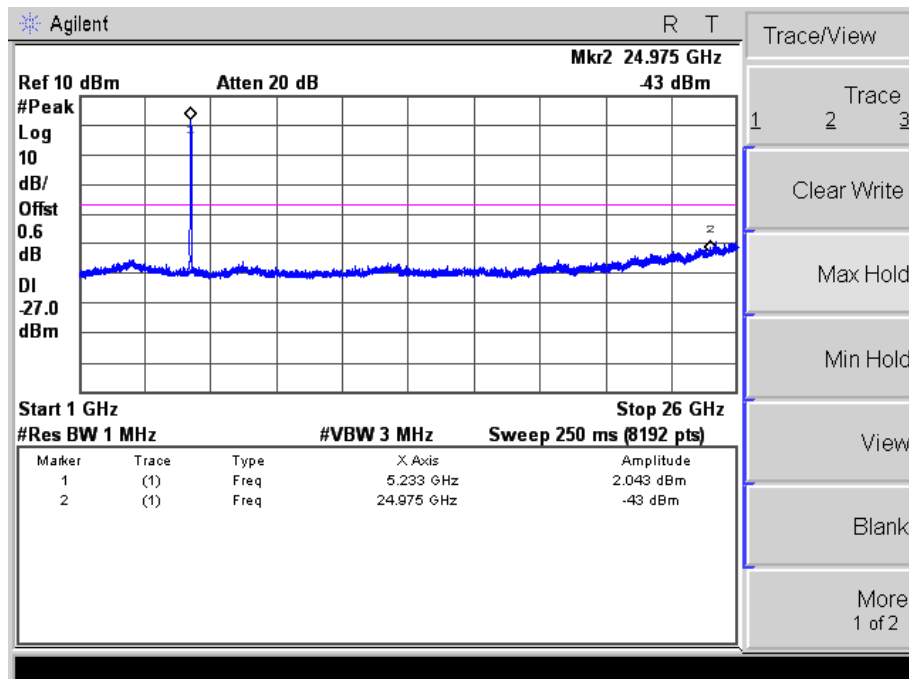


# Band I (5.15-5.25GHz)

TX Spurious Emissions /802.11n(HT40) Mode CH 38 (Ant A) worst data



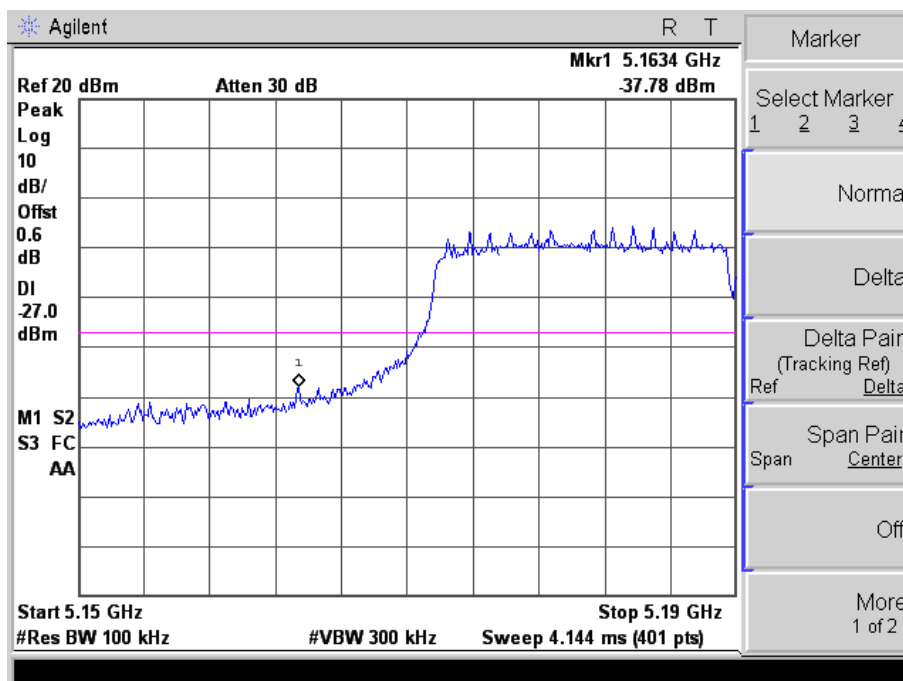
TX Spurious Emissions /802.11n(HT40) Mode CH 46 (Ant A) worst data



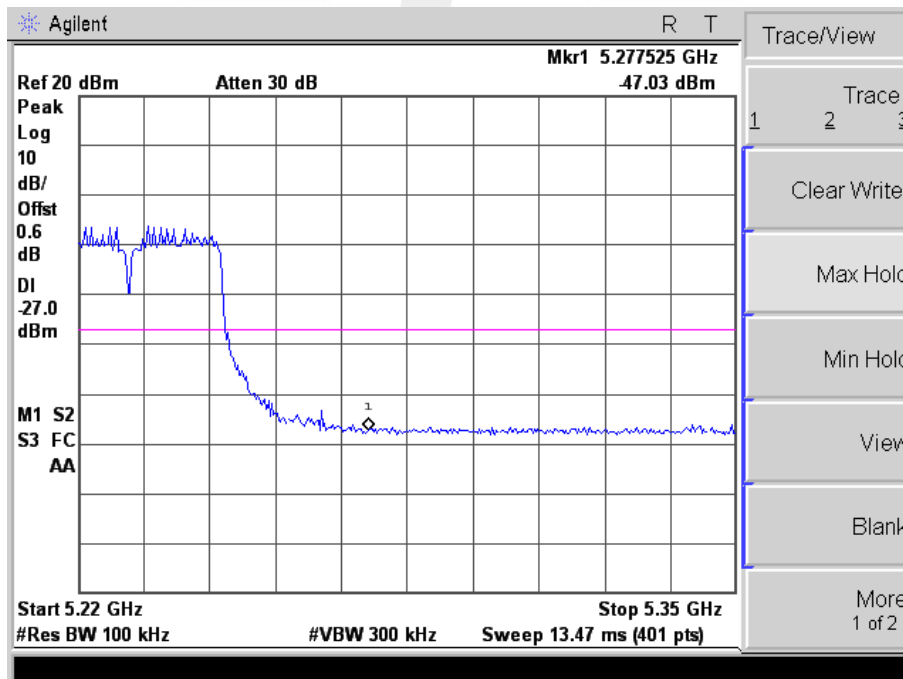


## Band edge

## TX Band edge /802.11n(HT40) Mode CH 38 (Ant A) worst data



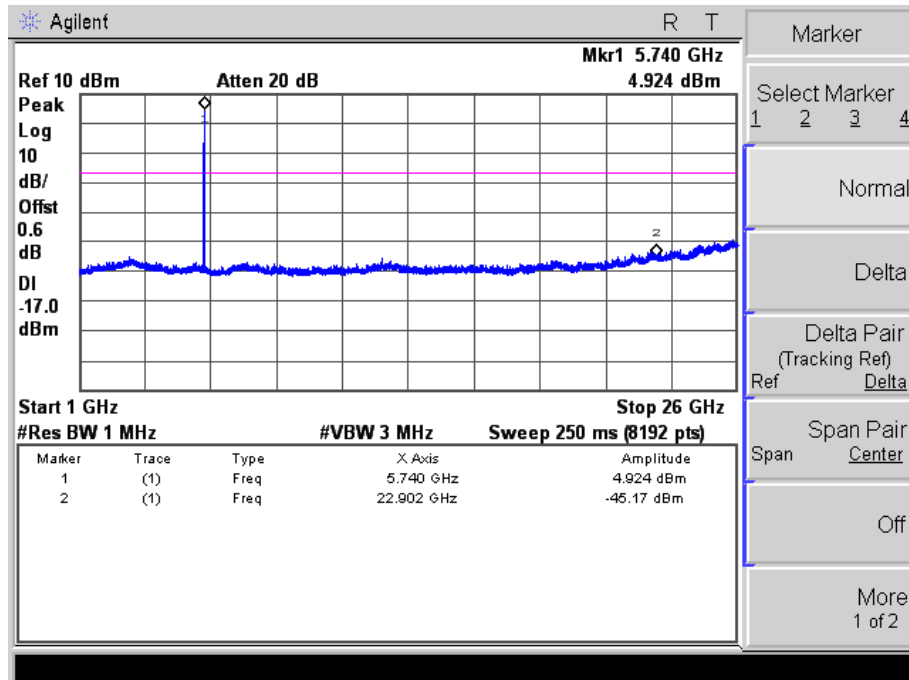
## TX Band edge /802.11n(HT40) Mode CH 46 (Ant A) worst data



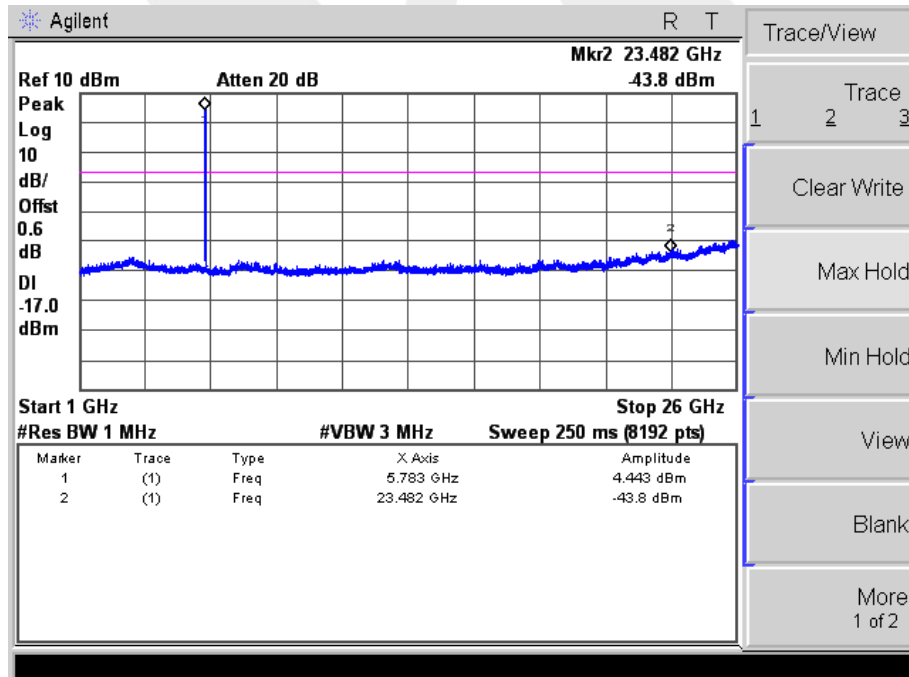


## Band I (5.725-5.85GHz)

## TX Spurious Emissions /802.11a Mode CH 149 (Ant A) worst data

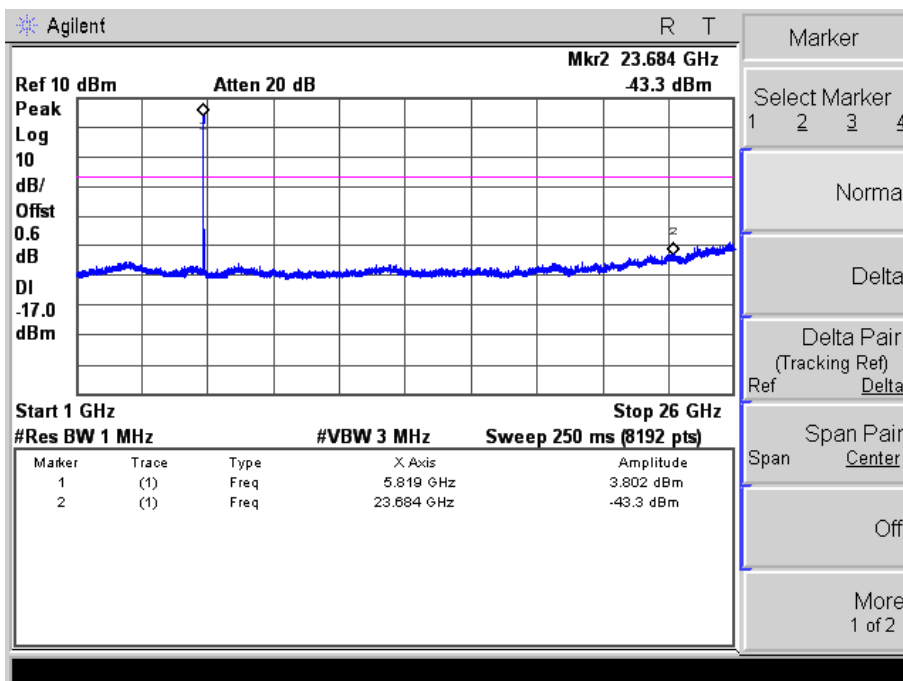


## TX Spurious Emissions /802.11a Mode CH 157 (Ant A) worst data





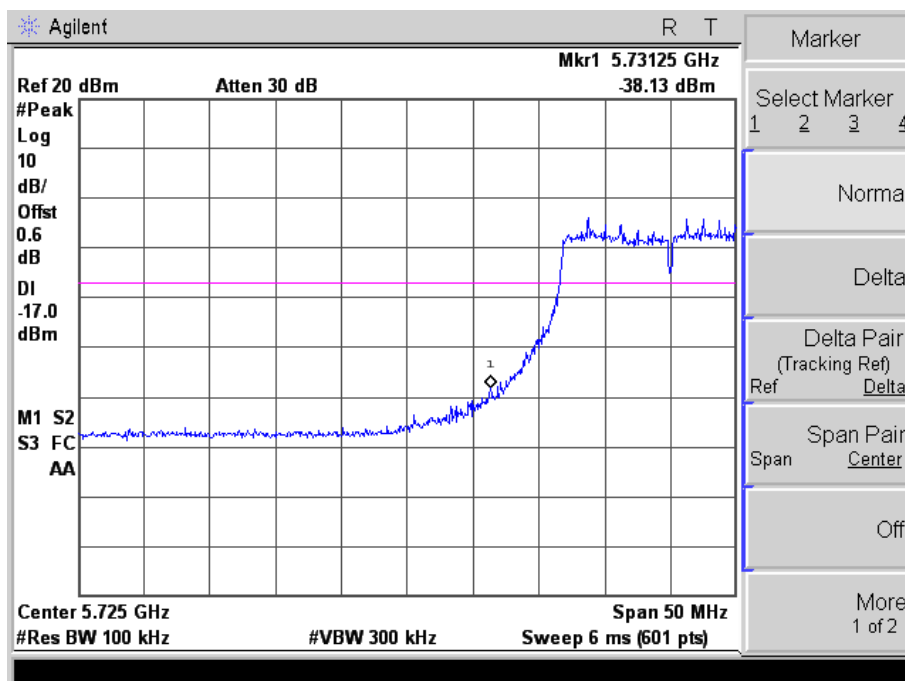
## TX Spurious Emissions /802.11a Mode CH 161 (Ant A) worst data



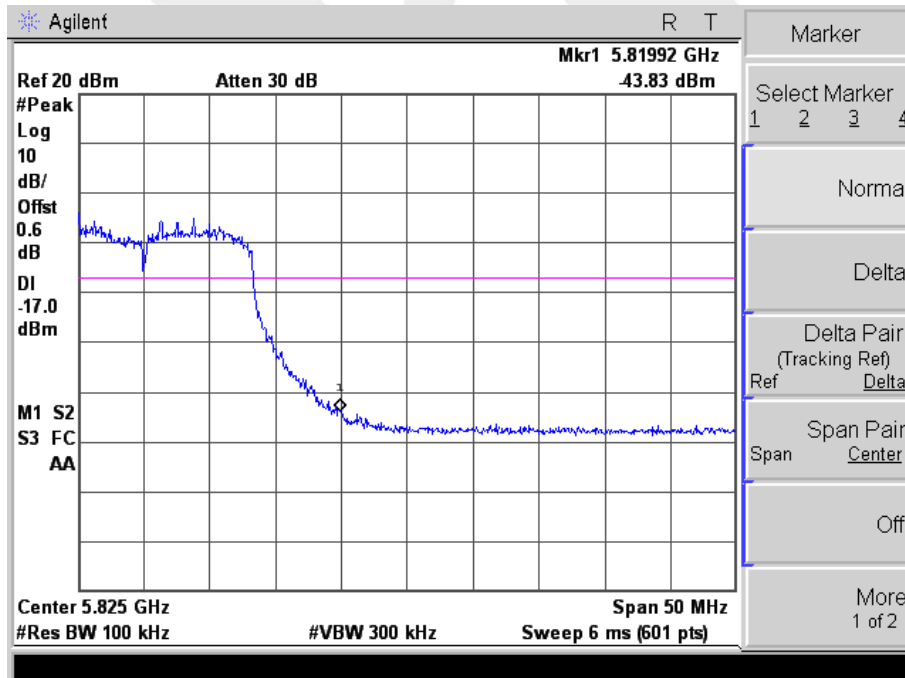


Band edge

TX Band edge /802.11a Mode CH 149 (Ant A) worst data



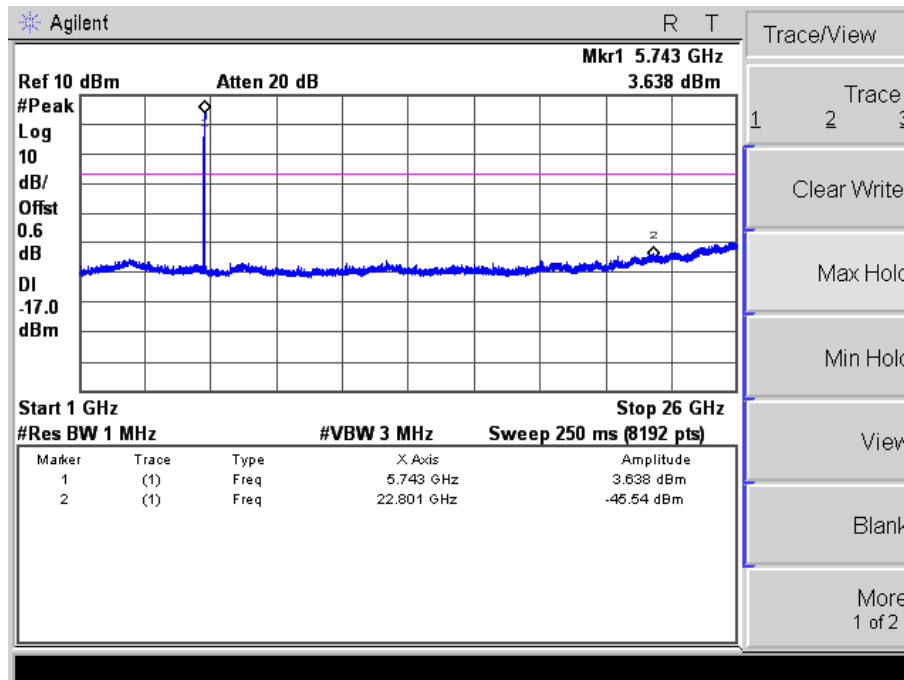
TX Band edge /802.11a Mode CH 161 (Ant A) worst data



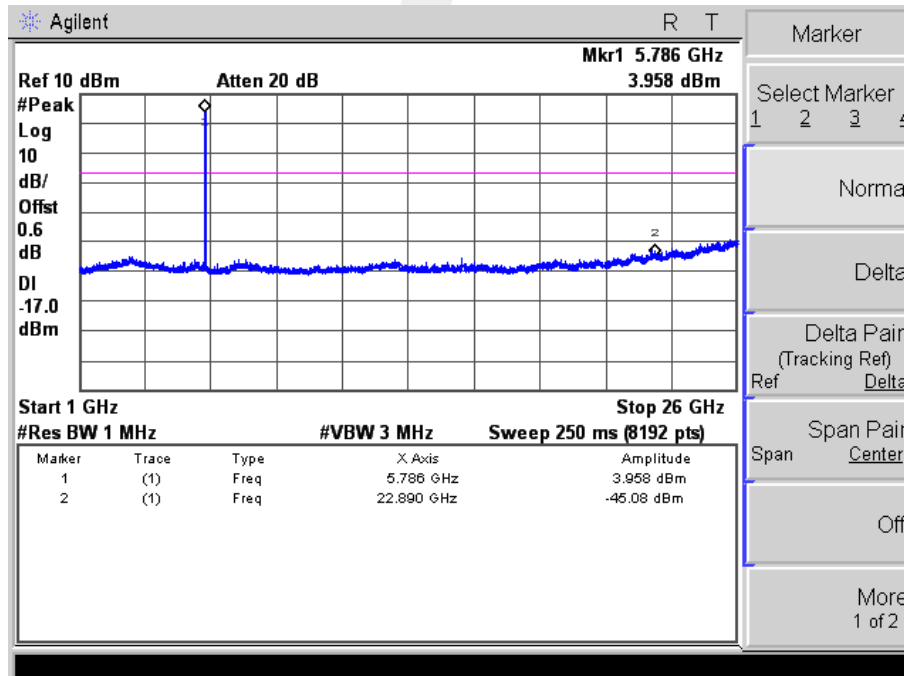


## Band I (5.725-5.85GHz)

TX Spurious Emissions /802.11n(HT20) Mode CH 149 (Ant A) worst data

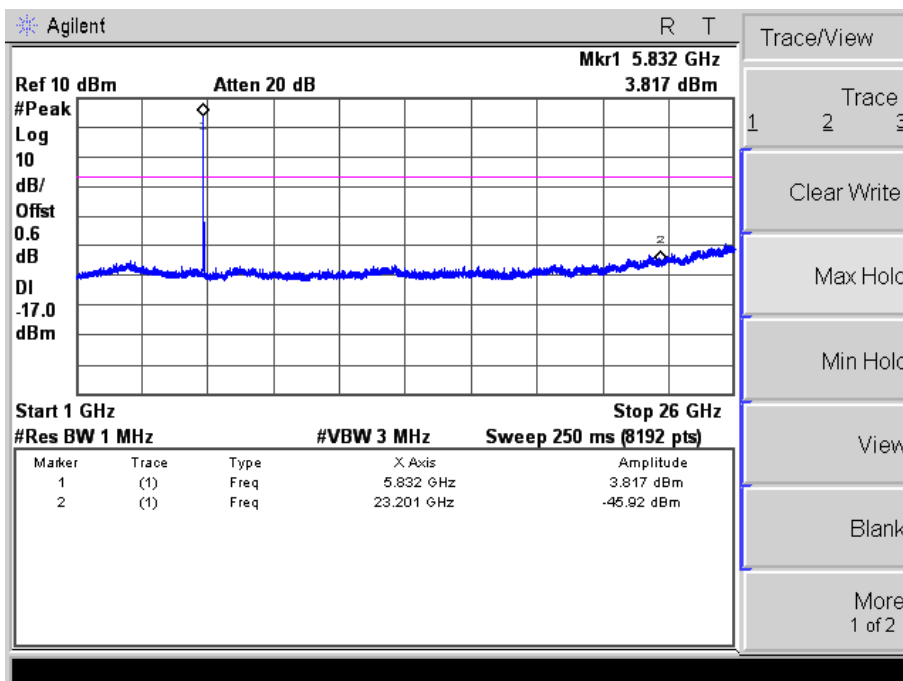


TX Spurious Emissions /802.11n(HT20) Mode CH 157 (Ant A) worst data





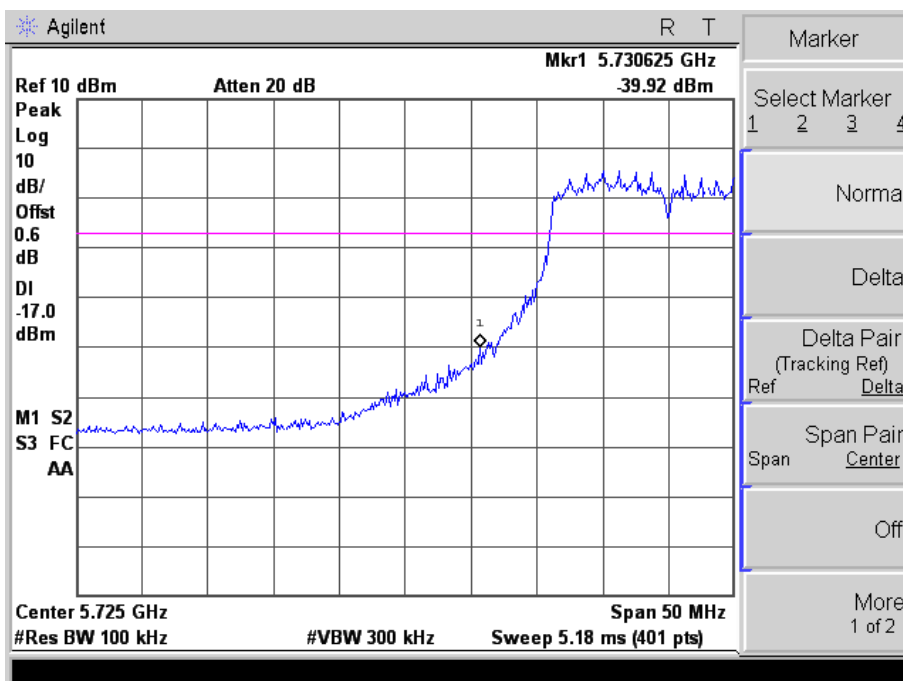
## TX Spurious Emissions /802.11n(HT20) Mode CH 161 (Ant A) worst data



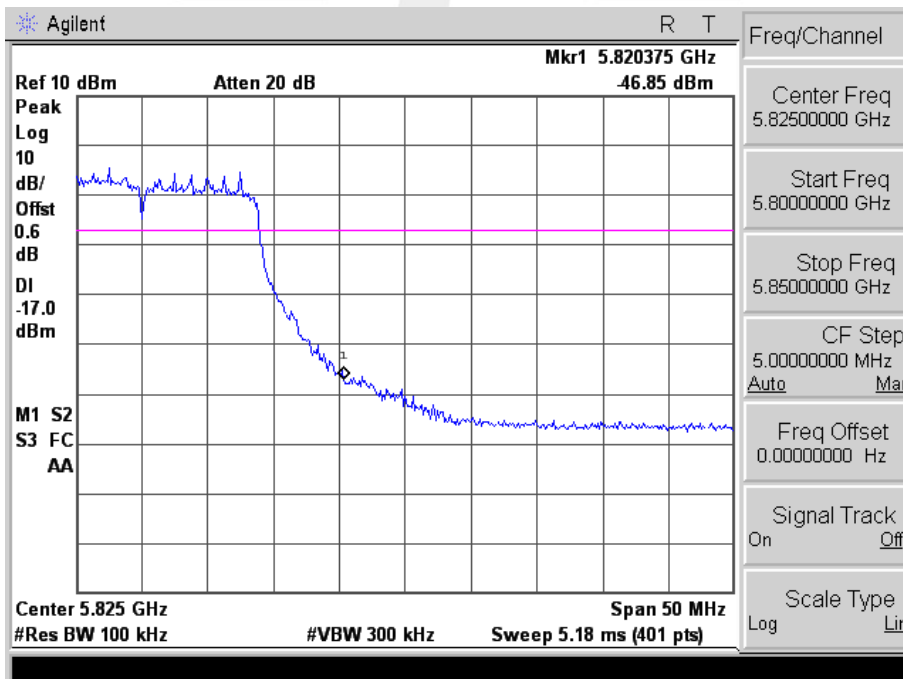


## Band edge

## TX Band edge /802.11n(HT20) Mode CH 149 (Ant A) worst data

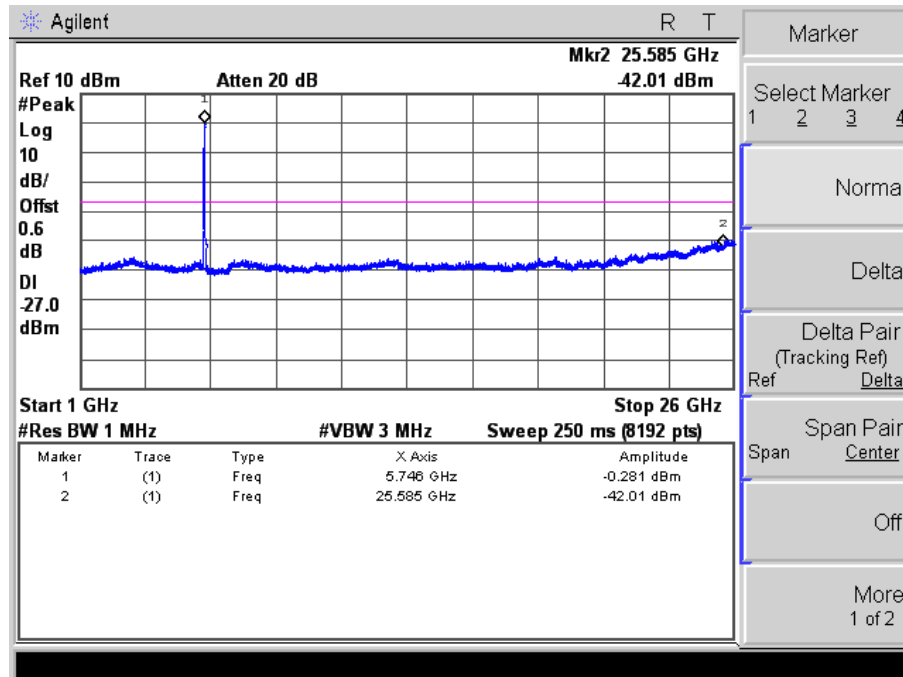


## TX Band edge /802.11n(HT20) Mode CH 161 (Ant A) worst data

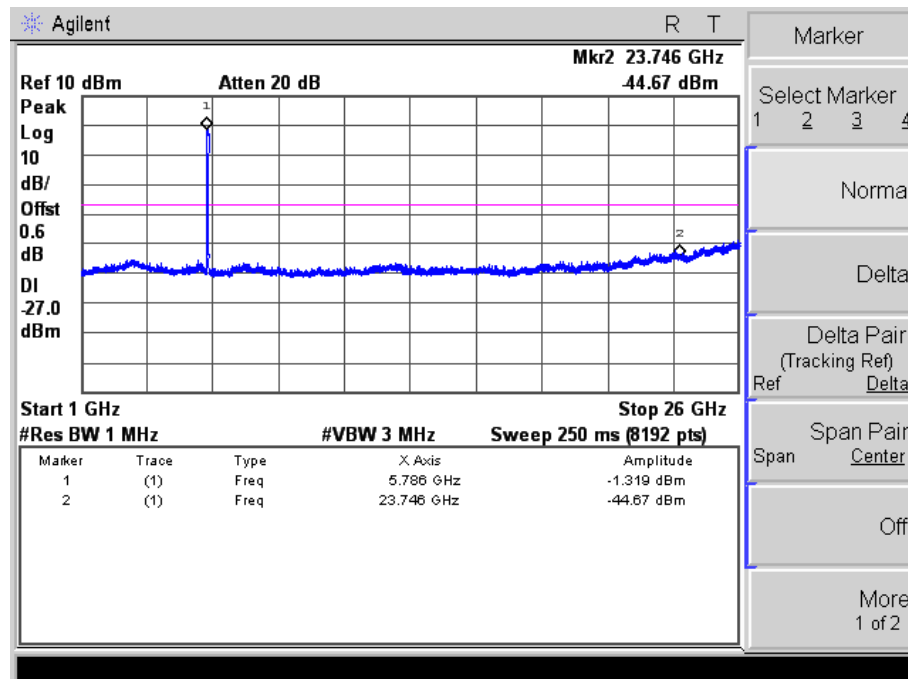


# Band I (5.725-5.85GHz)

TX Spurious Emissions /802.11n(HT40) Mode CH 151 (Ant A) worst data



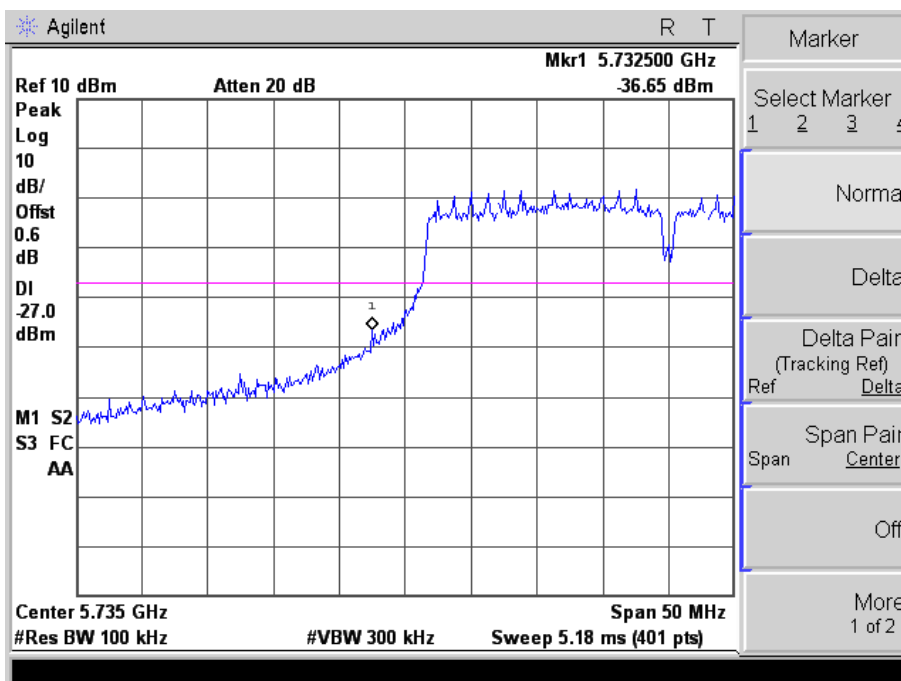
TX Spurious Emissions /802.11n(HT40) Mode CH 159 (Ant A) worst data



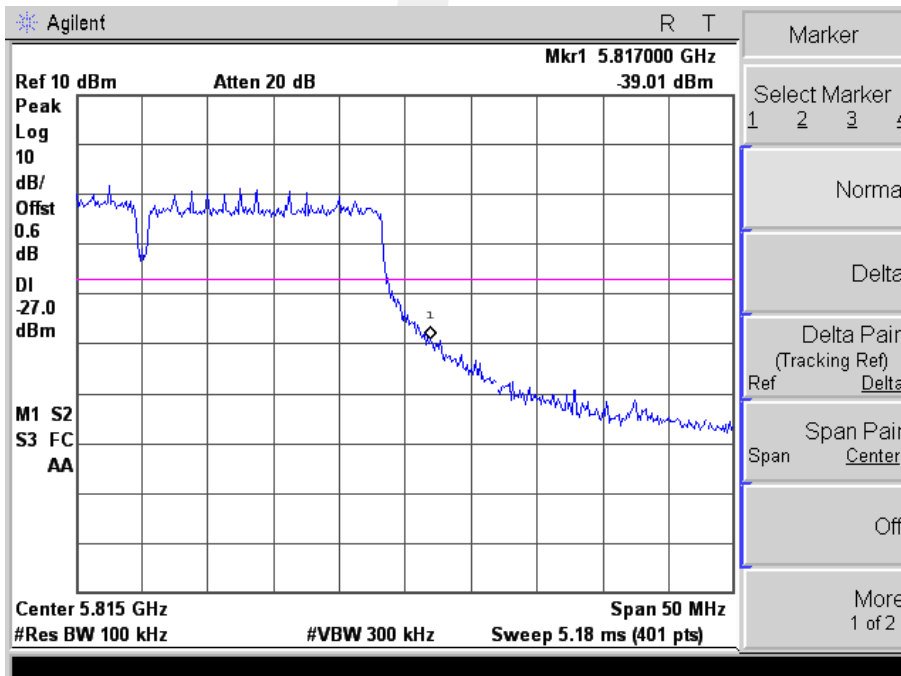


## Band edge

## TX Band edge /802.11n(HT40) Mode CH 151 (Ant A) worst data



## TX Band edge /802.11n(HT40) Mode CH 159 (Ant A) worst data



## 5. POWER SPECTRAL DENSITY TEST

### 5.1 APPLIED PROCEDURES / LIMIT

1. For the band 5.150-5.250 GHz, the peak power spectral density shall not exceed 11 dBm in any 1MHz band.
2. For the band 5.725-5.850 GHz, the peak power spectral density shall not exceed 30 dBm in any 500KHz band. If transmitting antenna directional gain is greater than 6 dBi, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 5.1.1 TEST PROCEDURE

1. The setting follows Method SA-1 of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01 .

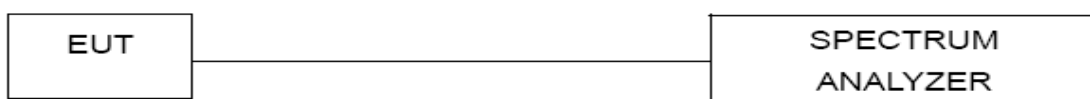
For devices operating in the band, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ( $< 1$  MHz, or  $< 500$  kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

- a) Set  $RBW \geq 1/T$ , where  $T$  is defined in section II.B.I.a).
- b) Set  $VBW \geq 3$  RBW.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500\text{kHz}/RBW)$  to the measured result, whereas RBW ( $< 500$  KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10\log(1\text{MHz}/RBW)$  to the measured result, whereas RBW ( $< 1$  MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

#### 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP



#### 5.1.4 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.

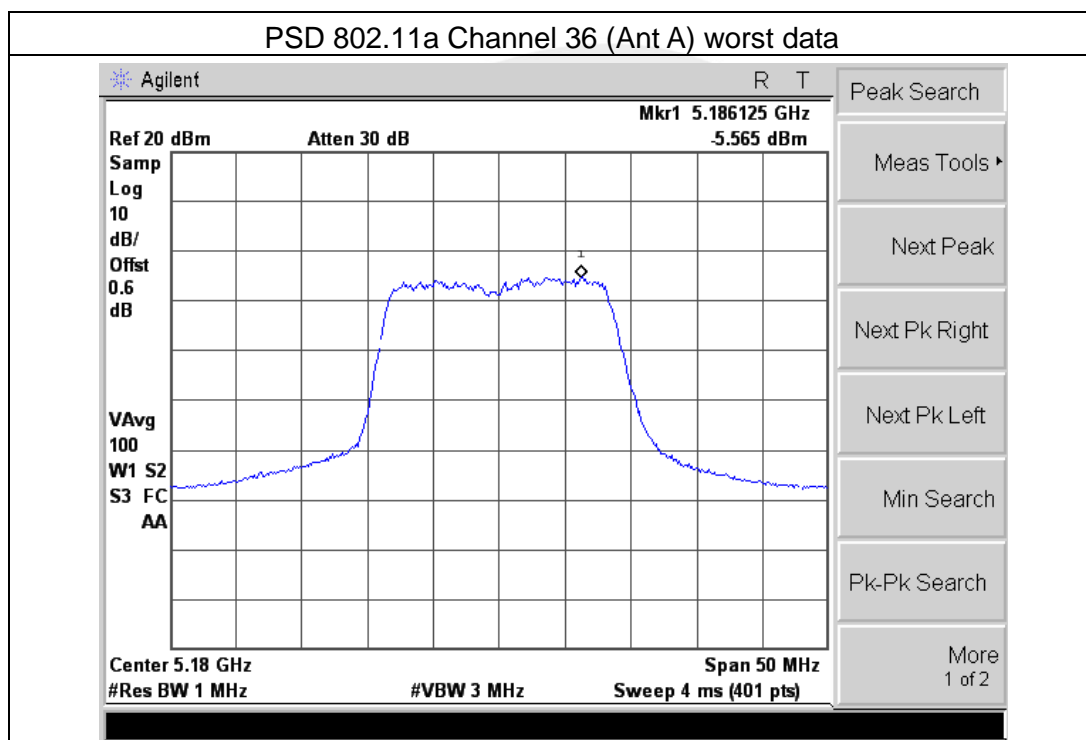


## 5.1.5 TEST RESULTS

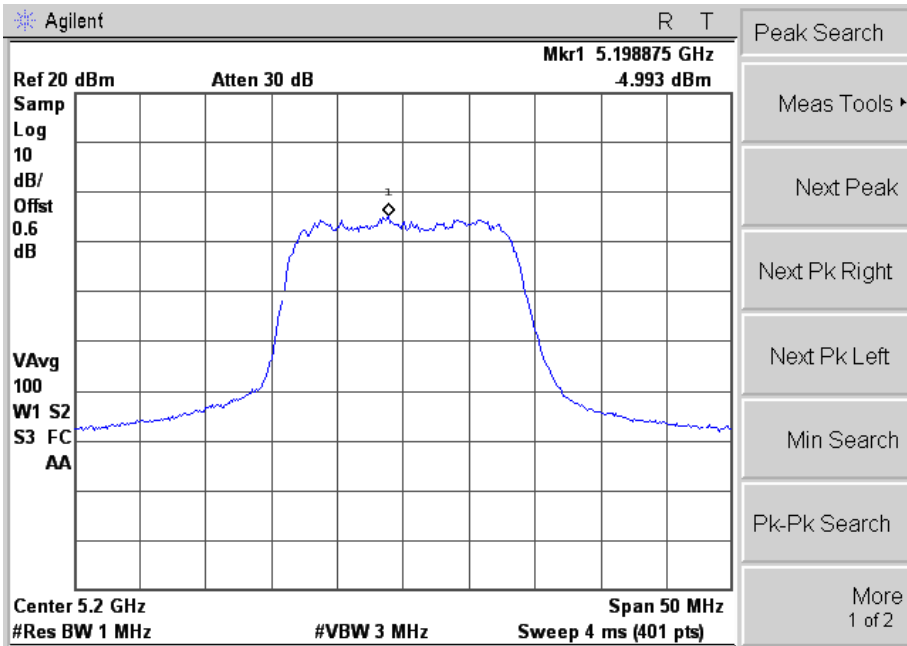
### Band I (5.15-5.25GHz)802.11a

Not: Power density is the sum of the power density (A+B+C), The worst data is Antenna A ,only shown Antenna A Plot.

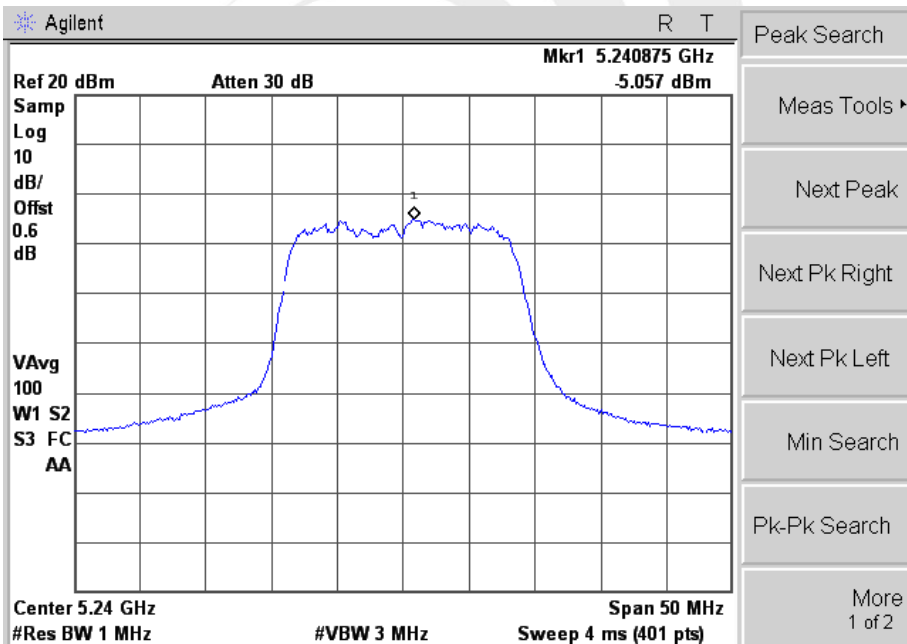
Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
5180	-5.565	-5.887	-5.776	-0.97	6.6	PASS
5200	-4.993	-5.905	-6.524	-0.99	6.6	PASS
5240	-5.057	-4.762	-6.468	-0.60	6.6	PASS



## PSD 802.11a Channel 40 (Ant A) worst data



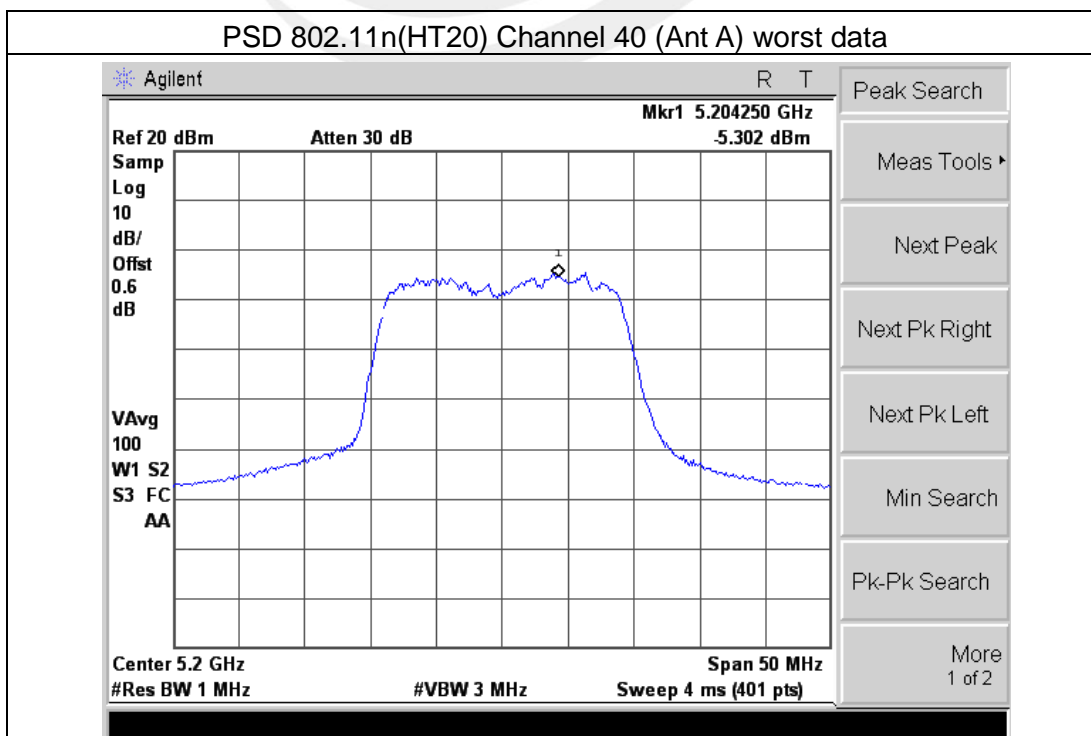
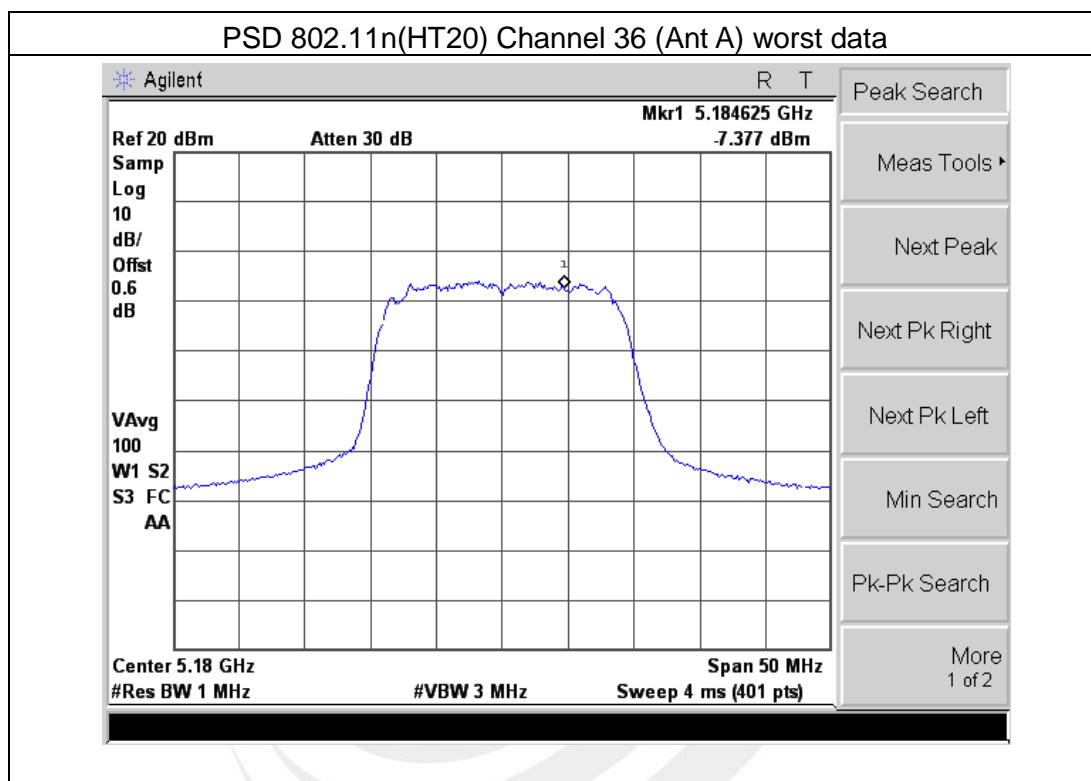
## PSD 802.11a Channel 48 (Ant A) worst data

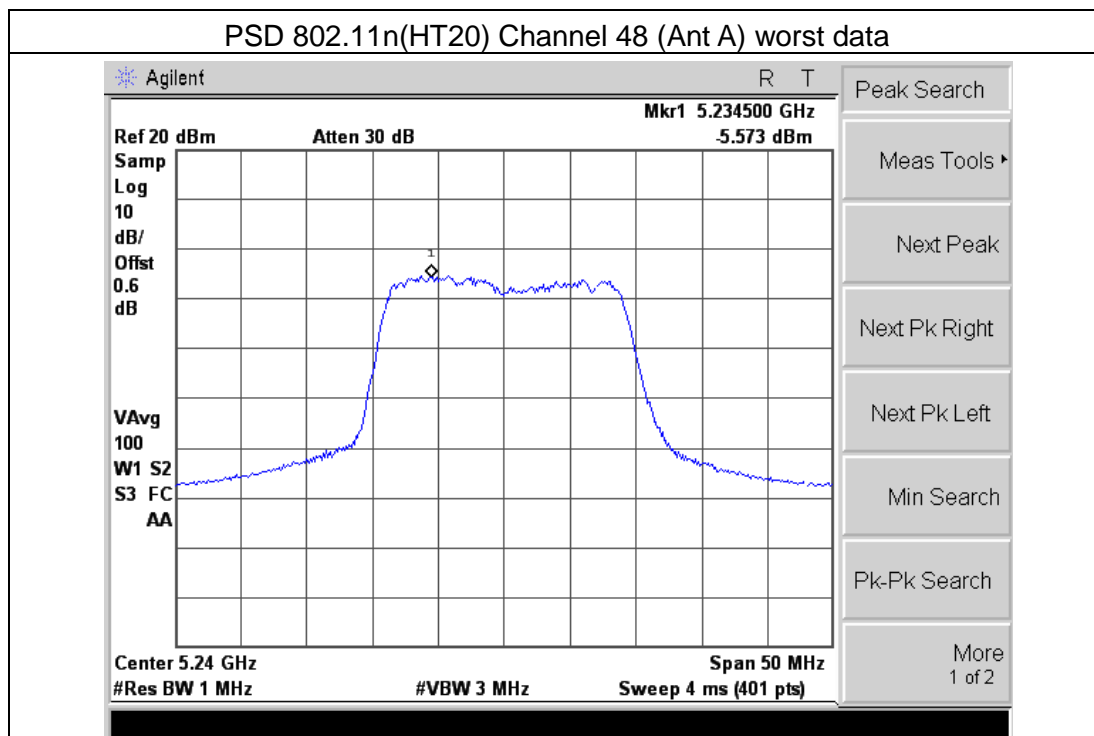




### Band I (5.15-5.25GHz) 802.11n(HT20)

Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
5180	-7.377	-6.654	-5.86	-1.81	6.6	PASS
5200	-5.302	-4.964	-5.313	-0.42	6.6	PASS
5240	-5.753	-5.144	-5.864	-0.80	6.6	PASS



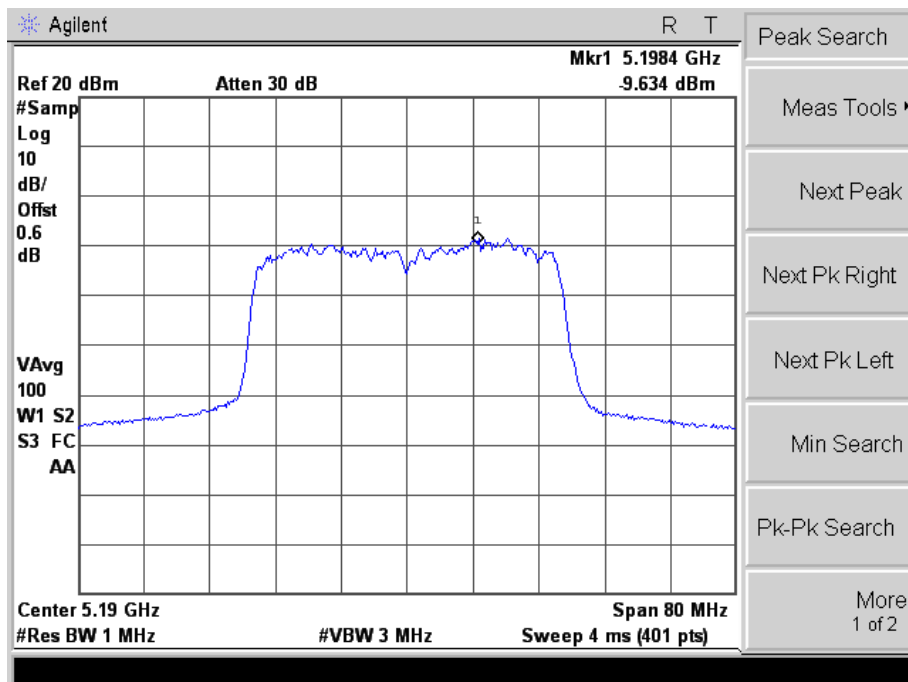




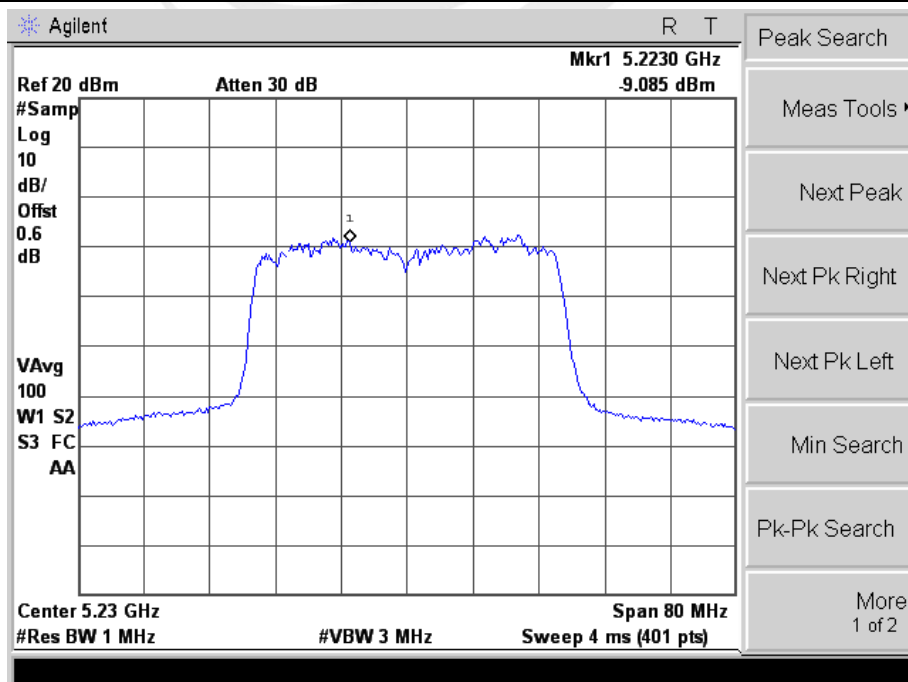
## Band I (5.15-5.25GHz) 802.11n(HT40)

Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
5190	-9.634	-8.655	-8.518	-4.14	6.6	PASS
5230	-9.085	-8.594	-8.876	-4.08	6.6	PASS

## PSD 802.11n(HT40) Channel 38 (Ant A) worst data



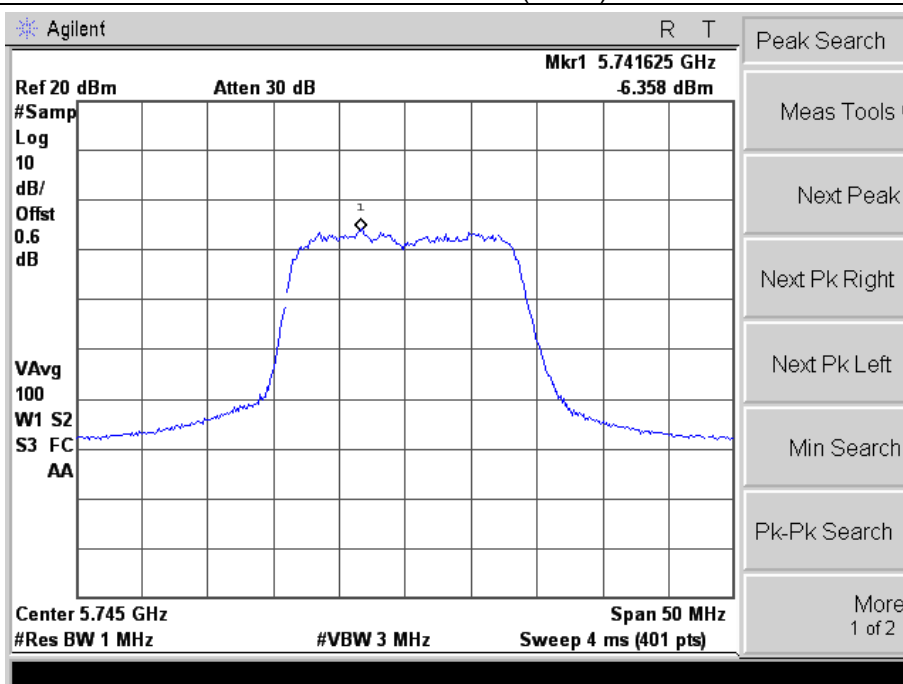
## PSD 802.11n(HT40) Channel 46 (Ant A) worst data



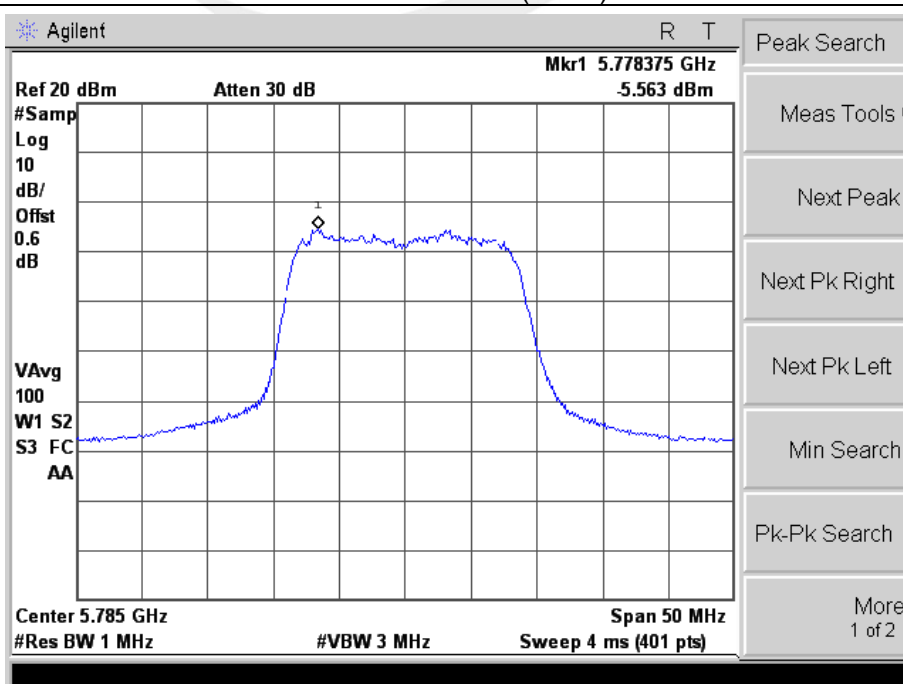
### Band IV (5.725-5.850GHz)802.11a

Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
5745	-6.358	-5.932	-6.318	-1.43	25.6	<b>PASS</b>
5785	-5.563	-6.296	-6.133	-1.21	25.6	<b>PASS</b>
5825	-6.675	-7.231	-6.649	-2.07	25.6	<b>PASS</b>

#### PSD 802.11a Channel 149 (Ant A) worst data

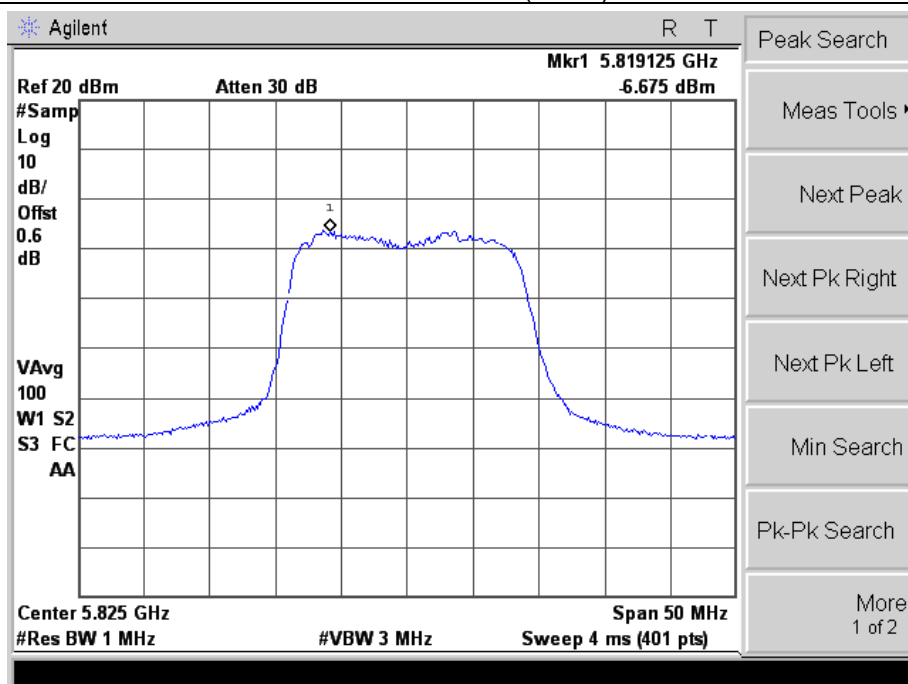


#### PSD 802.11a Channel 157 (Ant A) worst data





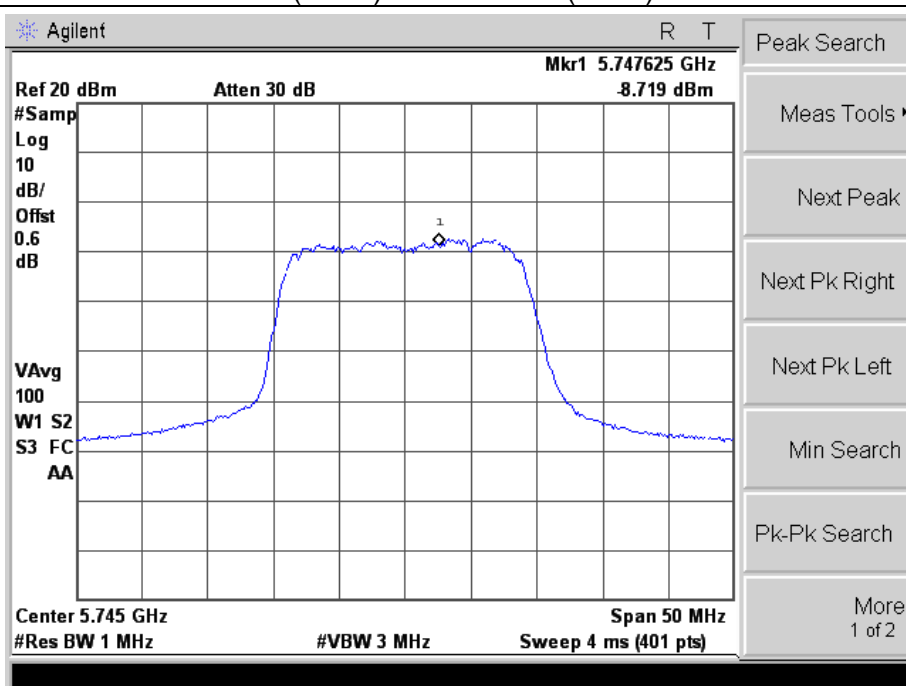
## PSD 802.11a Channel 165 (Ant A) worst data



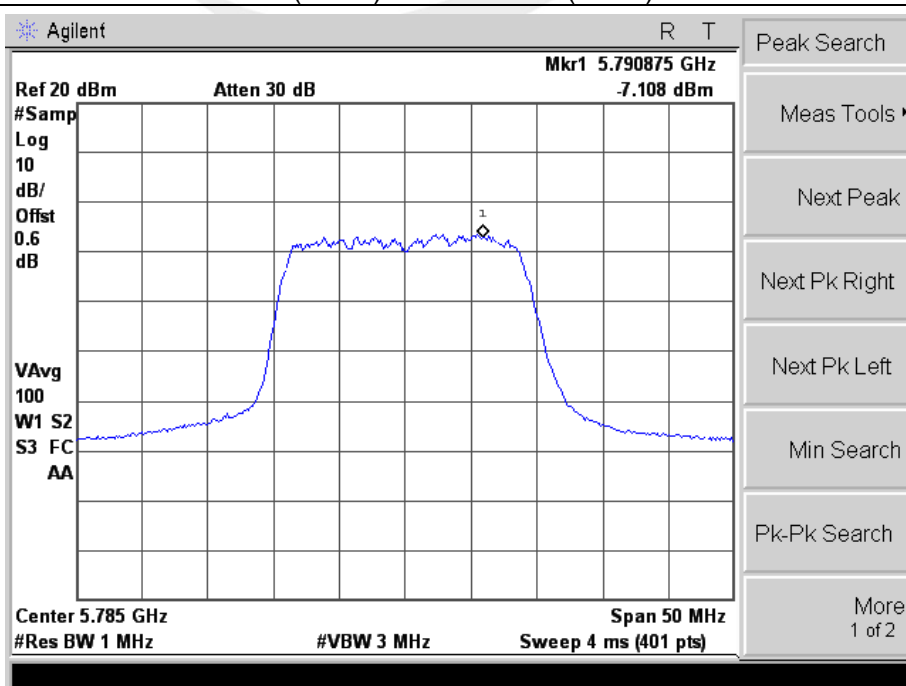
### Band IV (5.725-5.850GHz)802.11n(HT20)

Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
5745	-8.719	-7.892	-7.673	-3.30	25.6	PASS
5785	-7.108	-6.83	-6.387	-1.99	25.6	PASS
5825	-7.187	-7.54	-6.978	-2.46	25.6	PASS

PSD 802.11n(HT20) Channel 149 (Ant A) worst data

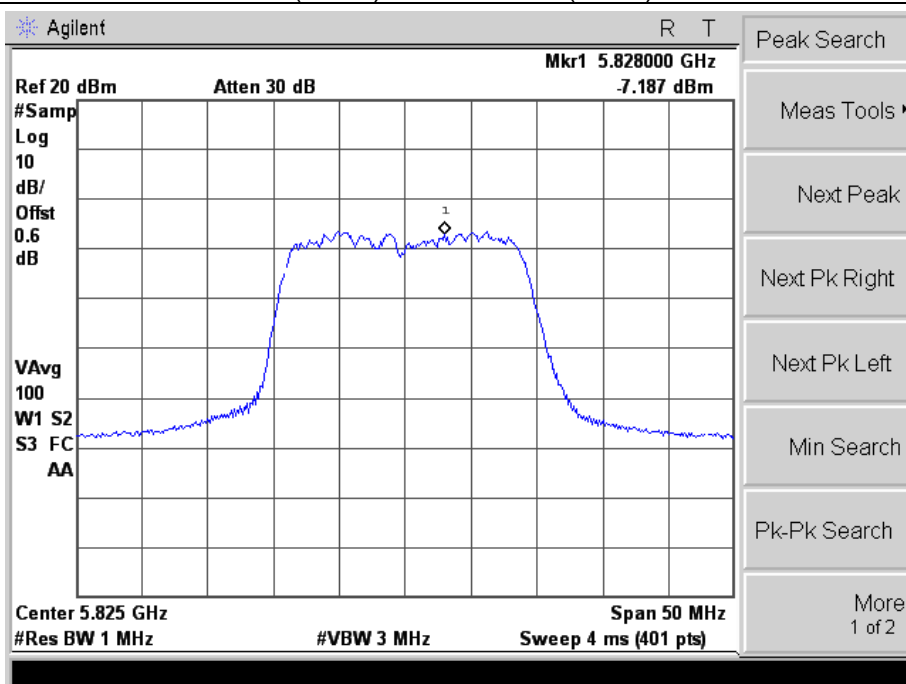


PSD 802.11n(HT20) Channel 157 (Ant A) worst data





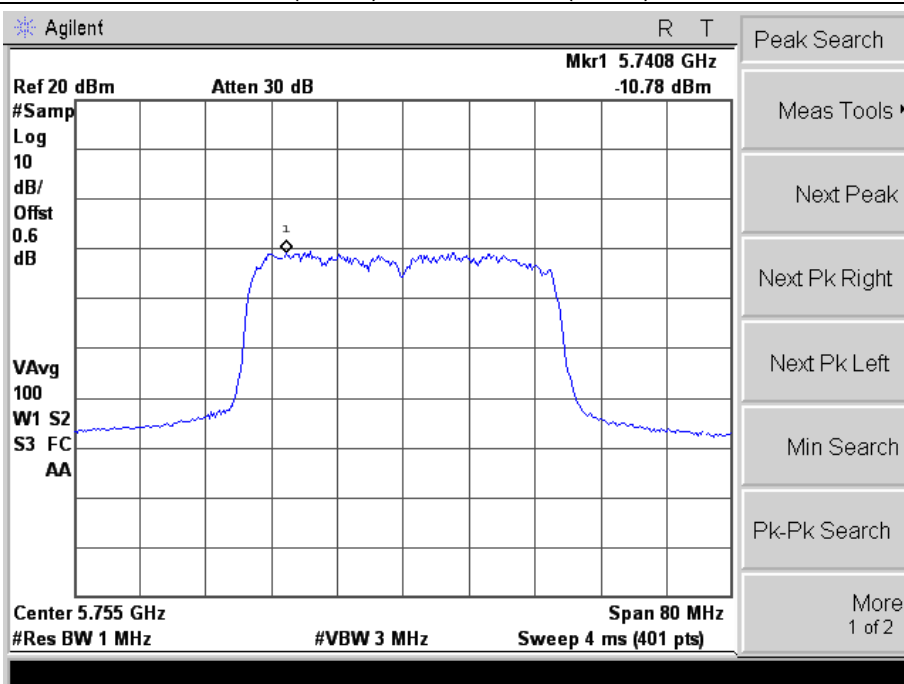
## PSD 802.11n(HT20) Channel 165 (Ant A) worst data



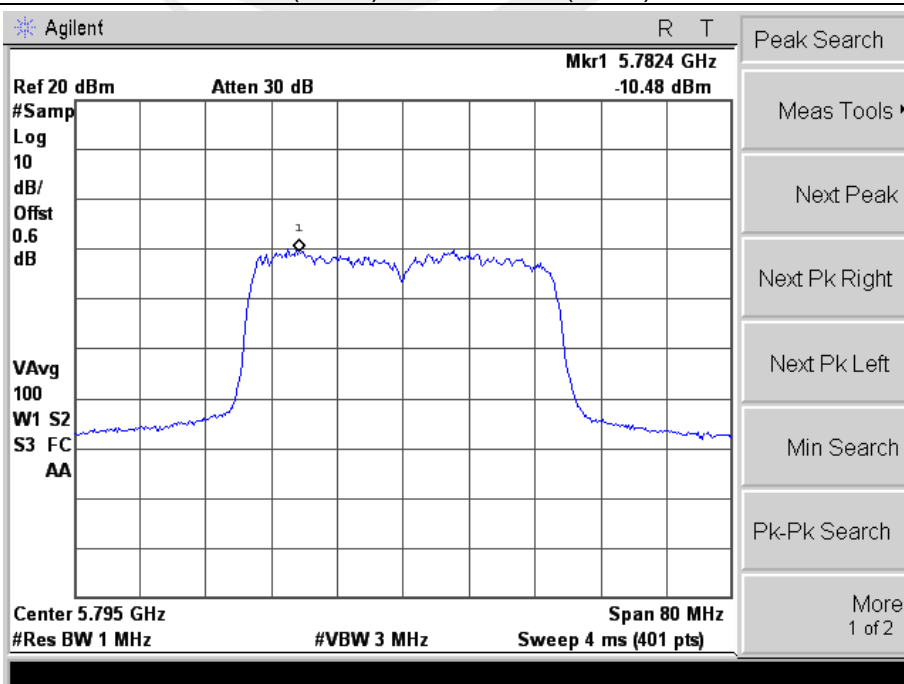
### Band IV (5.725-5.850GHz)802.11n(HT40)

Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
5755	-10.78	-10.67	-11.43	-6.18	25.6	PASS
5795	-10.48	-10.79	-10.78	-5.91	25.6	PASS

#### PSD 802.11n(HT40) Channel 151 (Ant A) worst data



#### PSD 802.11n(HT40) Channel 159 (Ant A) worst data





## 6. BANDWIDTH MEASUREMENT

### 6.1 EMISSION BANDWIDTH (EBW) 26 BANDWID PROCEDURES / LIMIT

See list of measuring instruments of this test report.

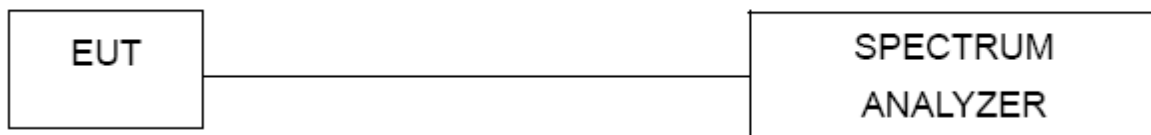
#### 6.1.1 TEST PROCEDURE

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW  $\geq$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the peak 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%.

#### 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

### Band I (5.150-5.250GHz)

Not: A/B/C Represent the value of antenna A /B/C, The worst data is Antenna A ,only shown Antenna A.

Frequency (MHz)	802.11a 26dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5180	23.070	23.288	23.246	N/A
5200	23.041	22.974	23.111	N/A
5240	23.096	22.418	22.480	N/A

Note: N/A, 26 db bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT20) 26dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5180	24.441	24.058	23.536	N/A
5200	23.853	23.725	23.468	N/A
5240	23.379	24.068	23.205	N/A

Note: N/A, 26 db bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT40) 26dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5190	46.872	47.200	48.190	N/A
5230	47.671	47.891	46.863	N/A

Note: N/A, 26 db bandwidth measurement limit only embodied in the report.

### Band IV (5.725-5.850GHz)

Frequency (MHz)	802.11a 26dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5745	23.651	22.733	22.539	N/A
5785	22.924	22.894	22.821	N/A
5825	22.792	22.565	23.216	N/A

Note: N/A, 26 db bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT20) 26dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5745	23.380	23.338	23.170	N/A
5785	23.471	23.580	23.914	N/A
5825	23.503	22.824	23.370	N/A

Note: N/A, 26 db bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT40) 26dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5755	48.939	47.135	47.203	N/A
5795	48.065	47.150	48.140	N/A

Note: N/A, 26 db bandwidth measurement limit only embodied in the report.

## 6.2 OCCUPIED BANDWIDTH ( 99%) TEST APPLIED PROCEDURES / LIMIT

The following procedure shall be used for measuring (99 %) power bandwidth:

### 6.2.1 TEST PROCEDURE

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures v01.
2. Set center frequency to the nominal EUT channel center frequency.
3. Set span = 1.5 times to 5.0 times the OBW.
4. Set RBW = 1 % to 5 % of the OBW
5. Set VBW  $\geq 3 \cdot$  RBW
6. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
7. Use the 99 % power bandwidth function of the instrument (if available).

### 6.2.2 DEVIATION FROM STANDARD

No deviation.

### 6.2.3 TEST SETUP



### 6.2.4 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.

**6.2.5 TEST RESULTS****Band I (5.150-5.250GHz)**

Not: A/B/C Represent the value of antenna A /B/C, The worst data is Antenna A ,only shown Antenna A.

Frequency (MHz)	802.11a 99% Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5180	16.982	16.972	17.051	N/A
5200	17.010	16.968	17.067	N/A
5240	16.979	16.920	16.910	N/A

Note: N/A, 99% bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT20) 99% Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5180	18.006	17.964	17.981	N/A
5200	17.930	17.852	17.923	N/A
5240	17.856	17.876	17.889	N/A

Note: N/A, 99% bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT40) 99% Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5190	37.154	37.105	37.150	N/A
5230	37.149	37.076	37.185	N/A

Note: N/A, 99% bandwidth measurement limit only embodied in the report.

**Band IV (5.725-5.850GHz)**

Frequency (MHz)	802.11a 99% Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5745	17.000	16.962	16.996	N/A
5785	16.943	16.964	16.941	N/A
5825	16.966	16.875	16.874	N/A

Note: N/A, 99% bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT20) 99% Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5745	18.014	18.065	18.063	N/A
5785	17.942	17.913	17.948	N/A
5825	17.853	17.902	17.921	N/A

Note: N/A, 99% bandwidth measurement limit only embodied in the report.

Frequency (MHz)	802.11n(HT40) 99% Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5755	37.534	37.299	37.124	N/A
5795	37.033	37.045	37.294	N/A

Note: N/A, 99% bandwidth measurement limit only embodied in the report.



### 6.3 Minimum Emission Bandwidth(6 dB) procedures / limit

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

#### 6.3.1 TEST PROCEDURE

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures v01.

a) Set RBW = 100 kHz.

b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

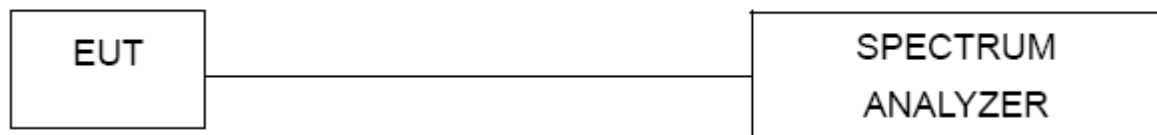
f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 6.3.2 DEVIATION FROM STANDARD

No deviation.

#### 6.3.3 TEST SETUP



#### 6.3.4 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.



### 6.3.5 TEST RESULTS

#### Band IV (5.725-5.850GHz)

Frequency (MHz)	802.11a 6dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5745	16.296	16.316	16.069	>500KHz
5785	16.351	16.351	16.344	>500KHz
5825	16.080	15.726	16.029	>500KHz

Note: N/A, 6 db bandwidth measurement limit only embodied in the report

Frequency (MHz)	802.11n(HT20) 6dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5745	16.978	17.148	17.324	>500KHz
5785	17.012	17.351	17.190	>500KHz
5825	16.367	16.385	16.387	>500KHz

Note: N/A, 6 db bandwidth measurement limit only embodied in the report

Frequency (MHz)	802.11n(HT40) 6dB Bandwidth(MHz)			Pass/Fail
	Ant A	Ant B	Ant C	
5755	36.380	36.520	36.395	>500KHz
5795	36.022	36.180	36.243	>500KHz

Note: N/A, 6 db bandwidth measurement limit only embodied in the report

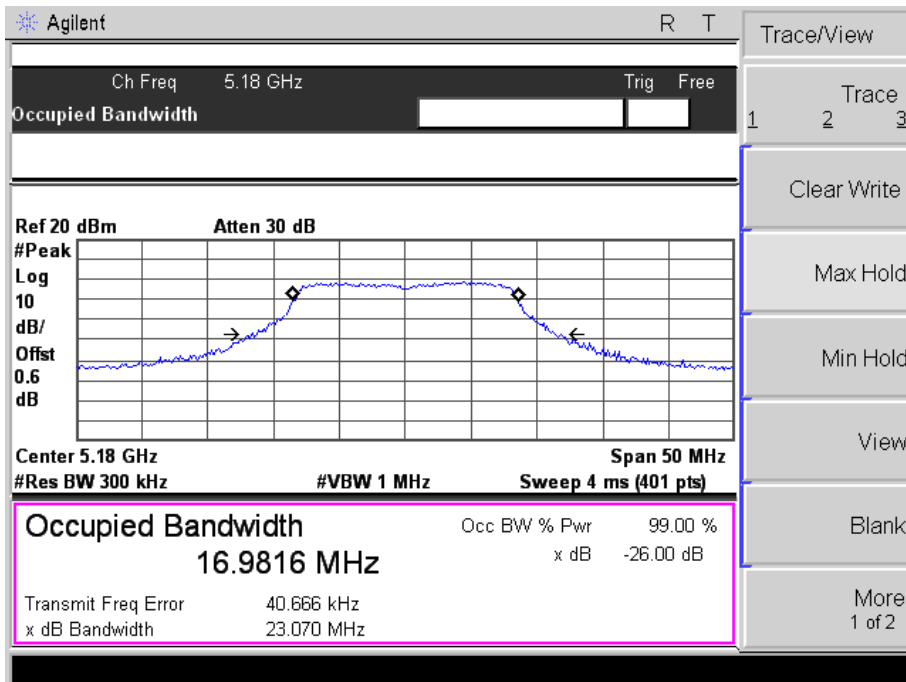




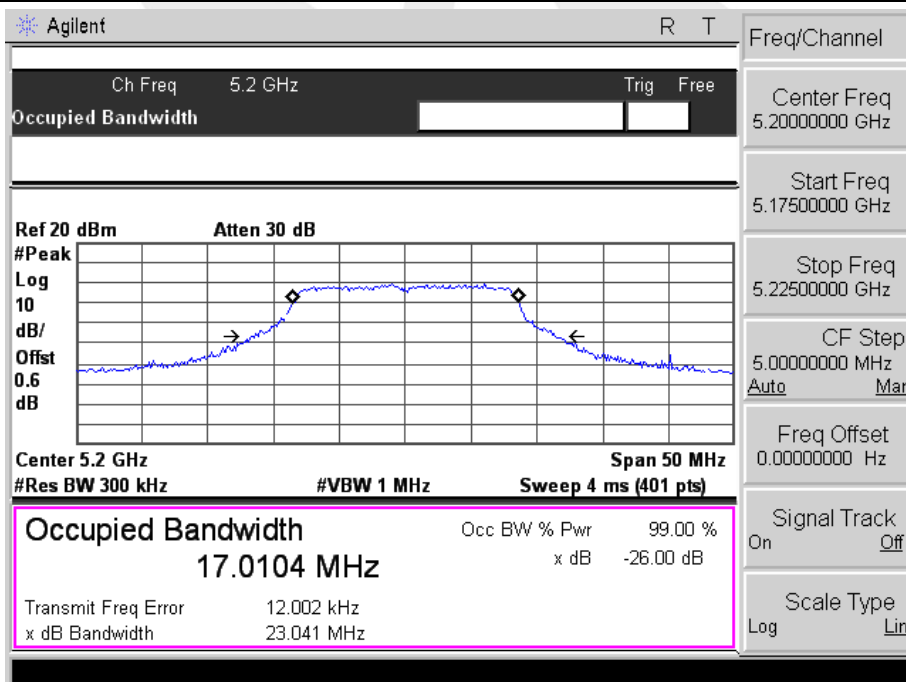
## 6.4 BANDWIDTH TEST POLT

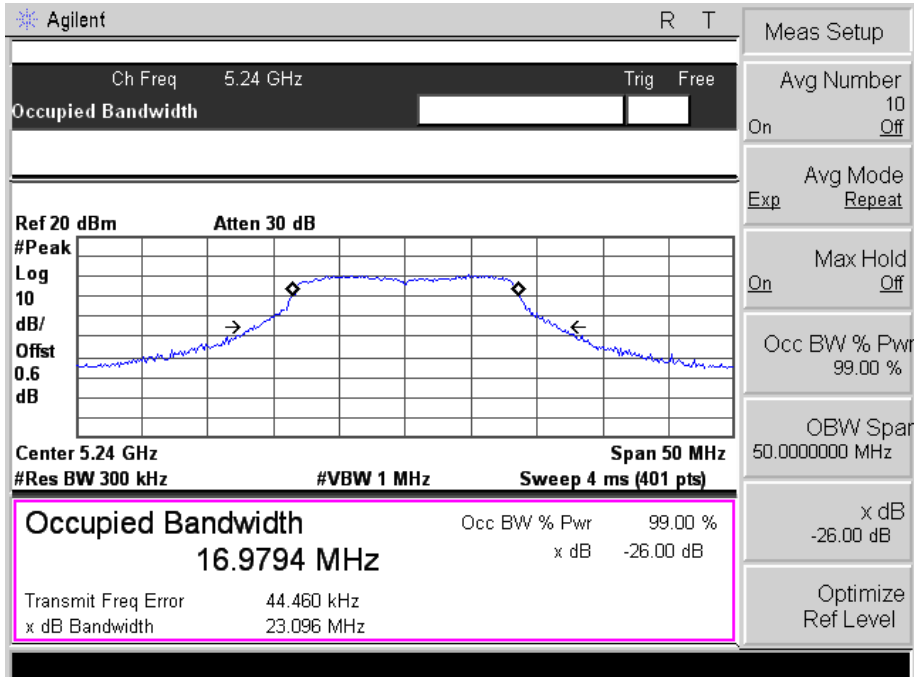
## Band I (5.15-5.25GHz) 802.11a

## 26 dB &amp;99% Bandwidth 802.11a Channel 36 (Ant A) worst data



## 26 dB &amp;99% Bandwidth 802.11a Channel 40 (Ant A) worst data

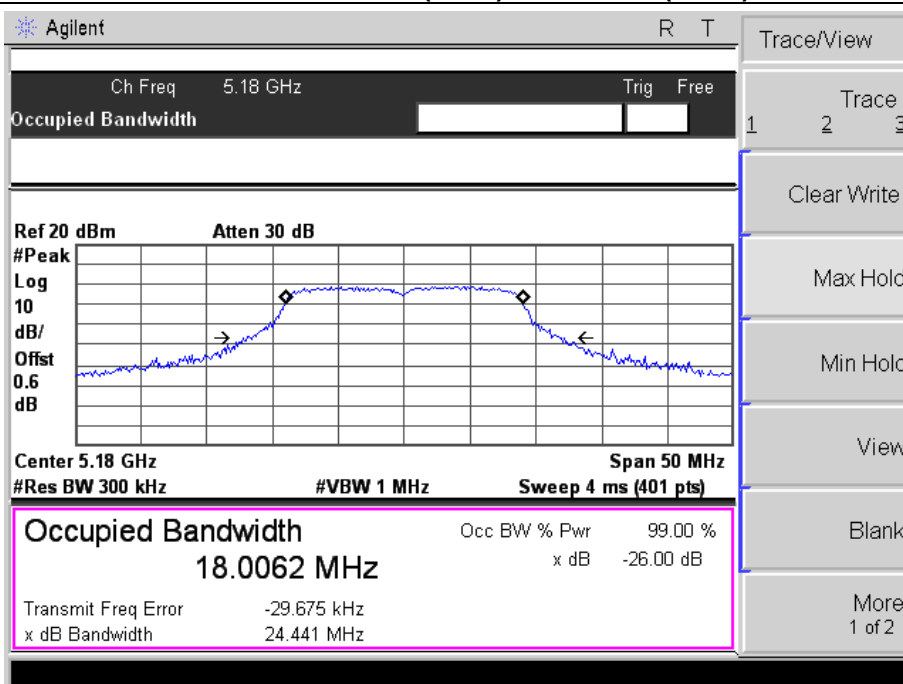


**26 dB & 99% Bandwidth 802.11a Channel 48 (Ant A) worst data**

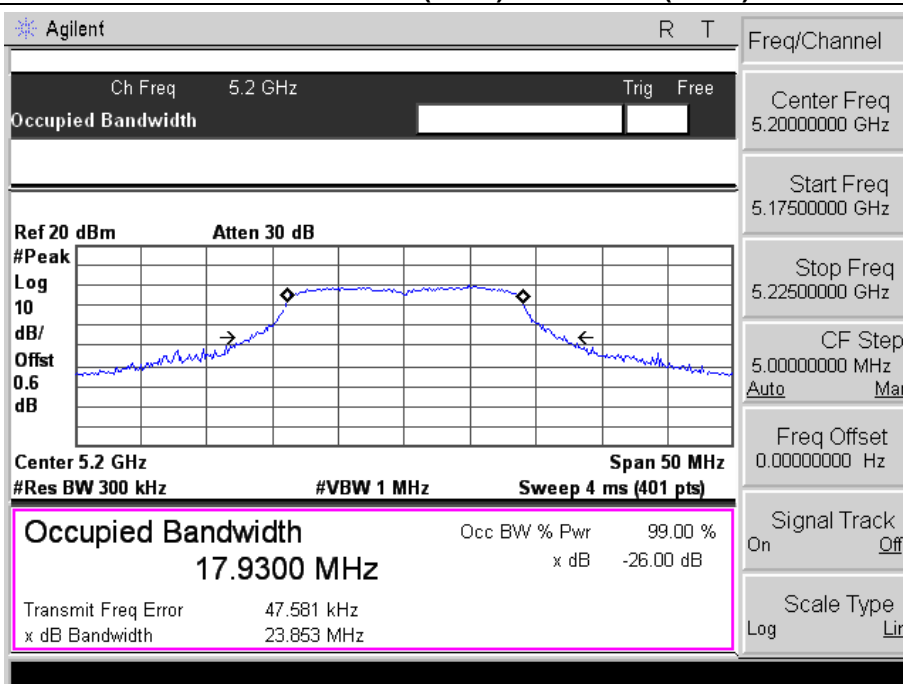


# Band I (5.15-5.25GHz) 802.11n(HT20)

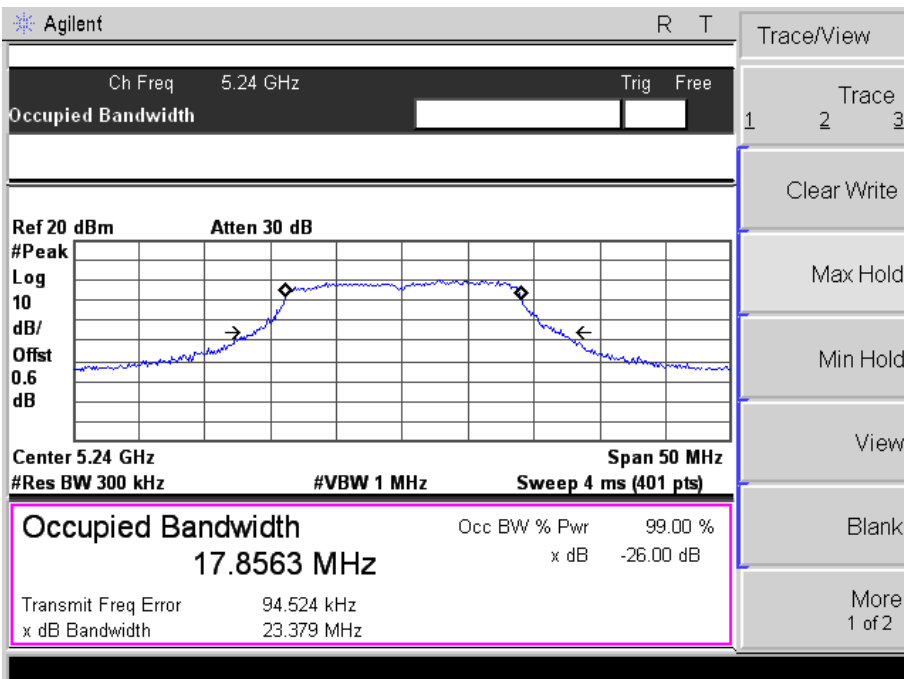
## 26 dB &99% Bandwidth 802.11n(HT20) Channel 36 (Ant A) worst data



## 26 dB &99% Bandwidth 802.11n(HT20) Channel 40 (Ant A) worst data

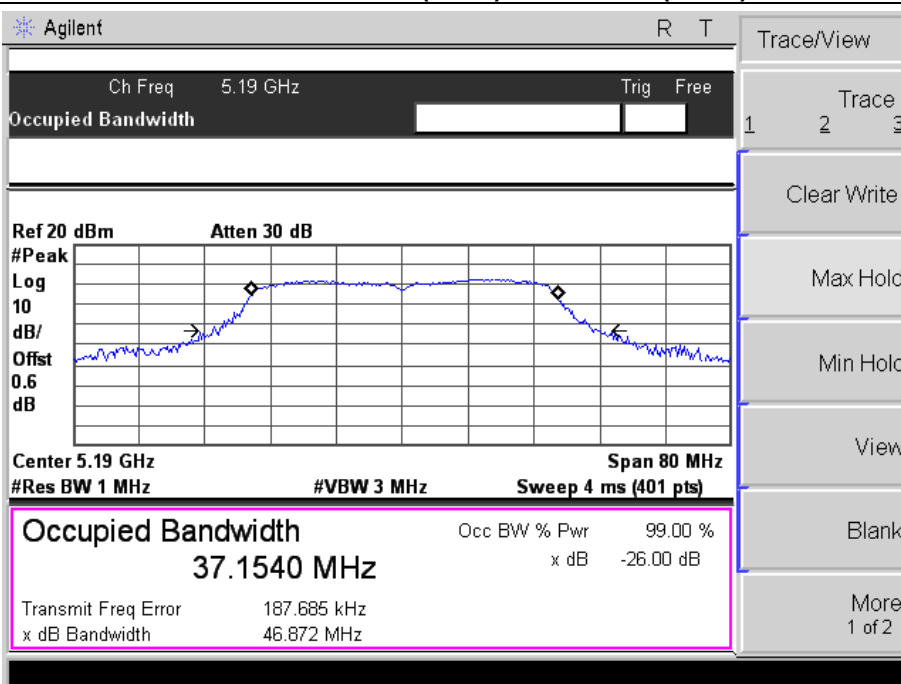


### 26 dB & 99% Bandwidth 802.11n(HT20) Channel 48 (Ant A) worst data

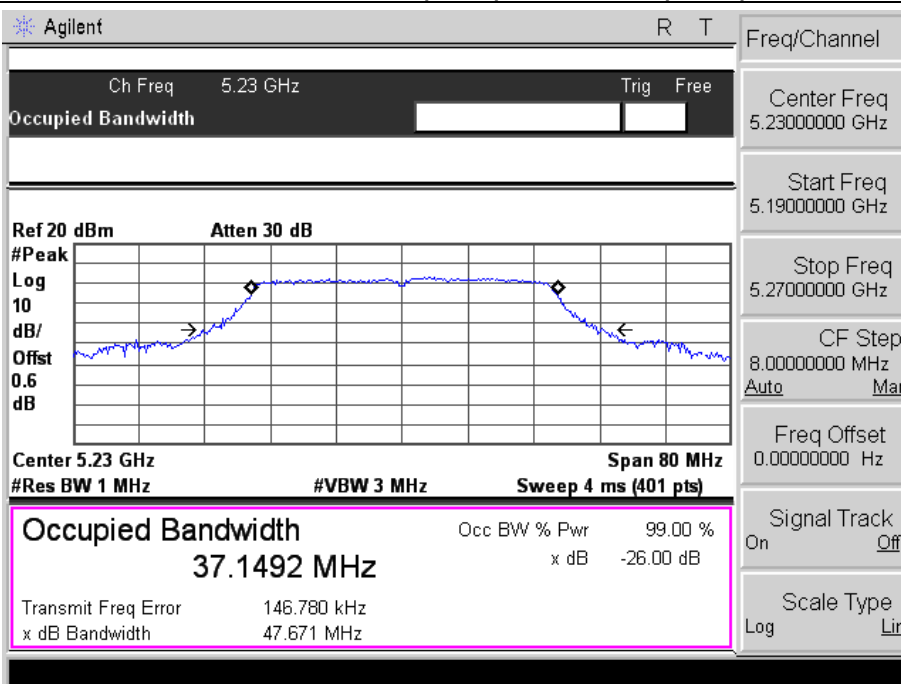


# Band I (5.15-5.25GHz) 802.11n(HT40)

## 26 dB &99% Bandwidth 802.11n(HT40) Channel 38 (Ant A) worst data



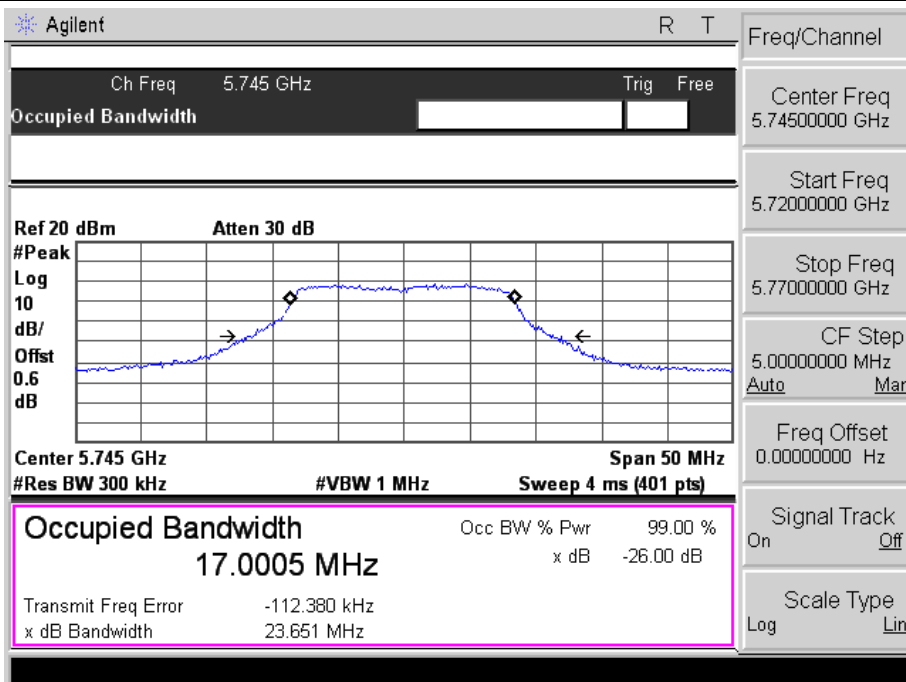
## 26 dB &99% Bandwidth 802.11n(HT40) Channel 46 (Ant A) worst data



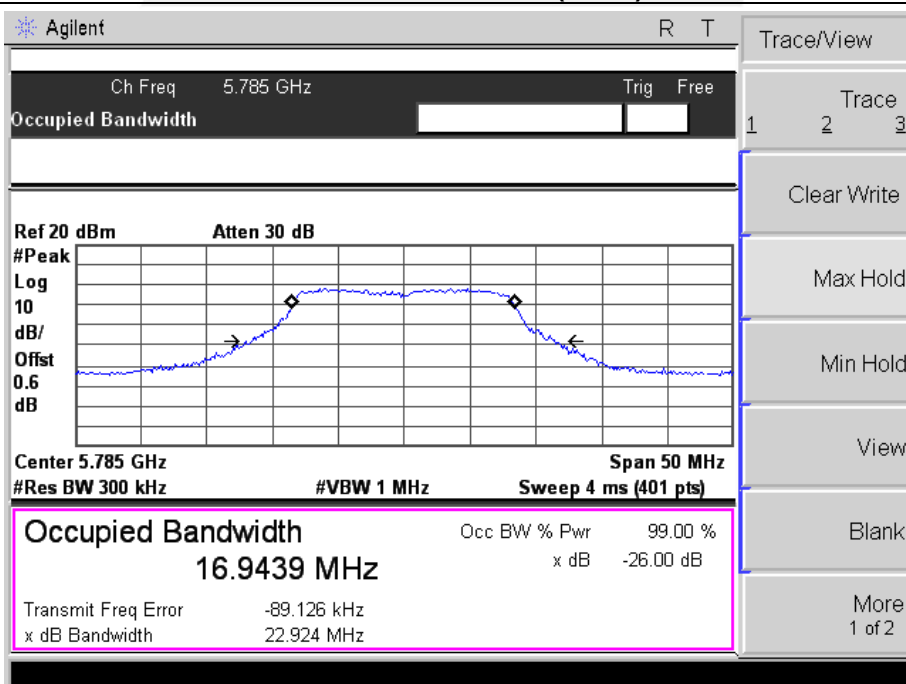


## Band IV (5.725-5.85GHz) 802.11a

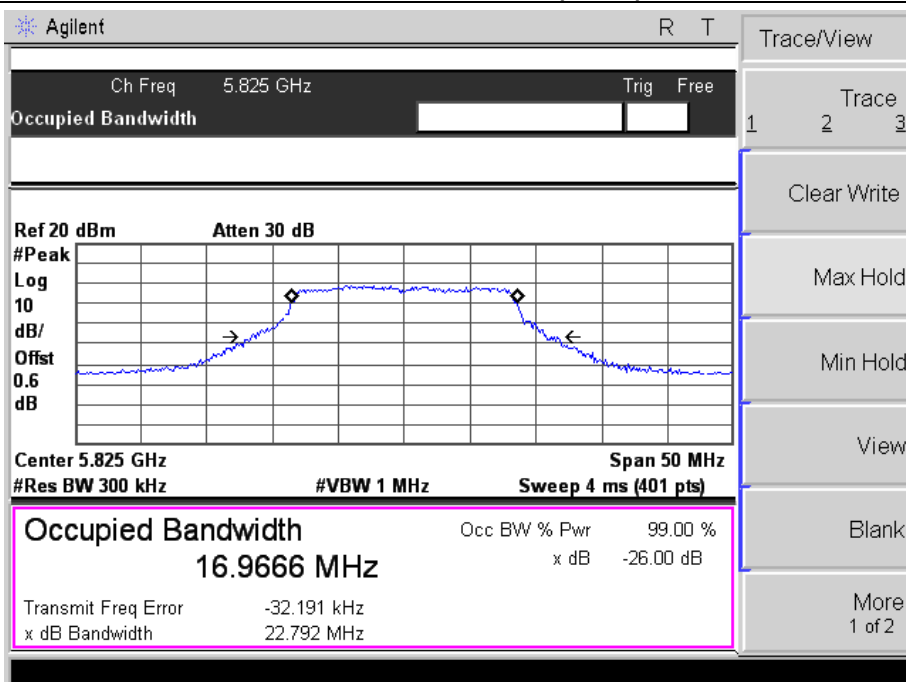
## 26 dB &amp; 99% 802.11a Channel 149 (Ant A) worst data



## 26 dB &amp; 99% 802.11a Channel 157 (Ant A) worst data



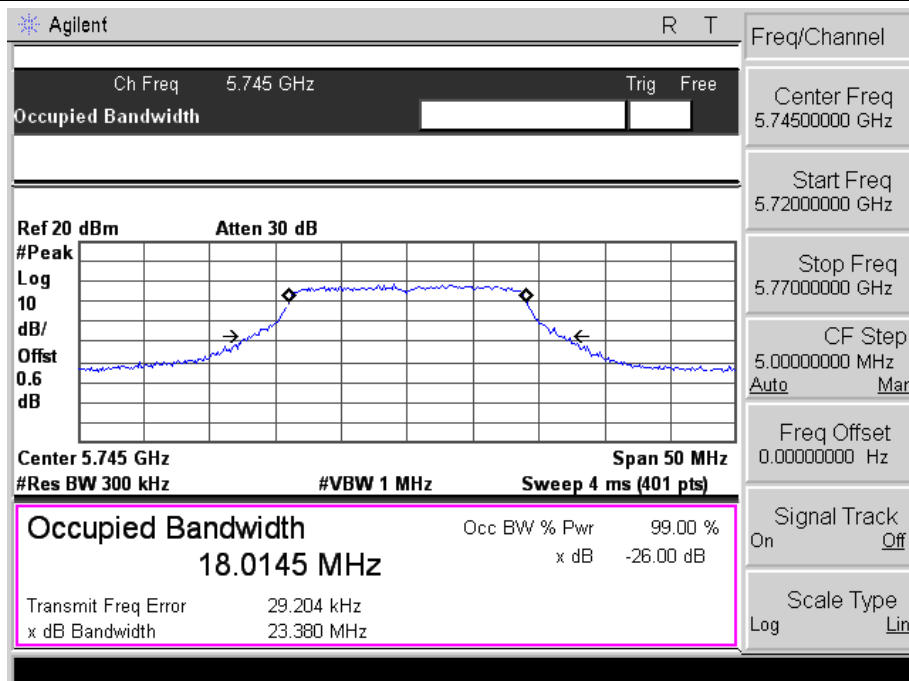
### 26 dB & 99% 802.11a Channel 165 (Ant A) worst data



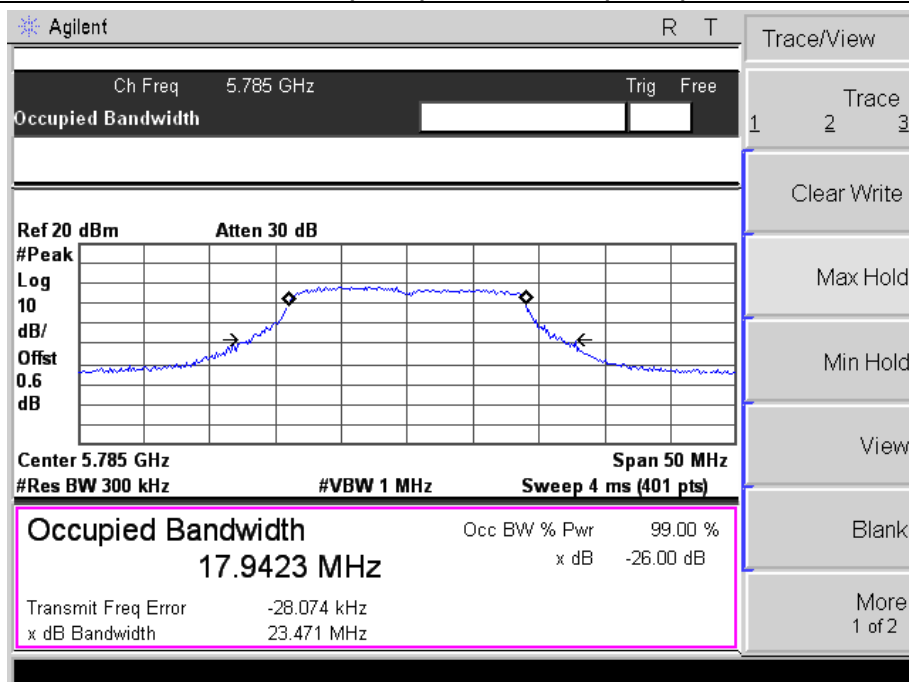


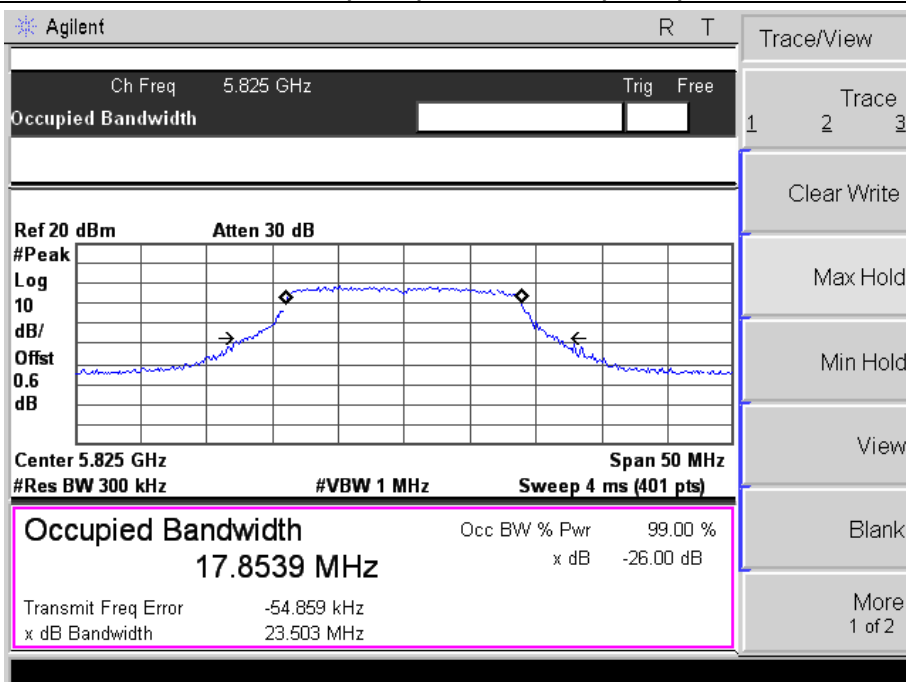
## Band IV (5.725-5.85GHz) 802.11n(HT20)

## 26 dB &amp; 99% 802.11n(HT20) Channel 149 (Ant A) worst data



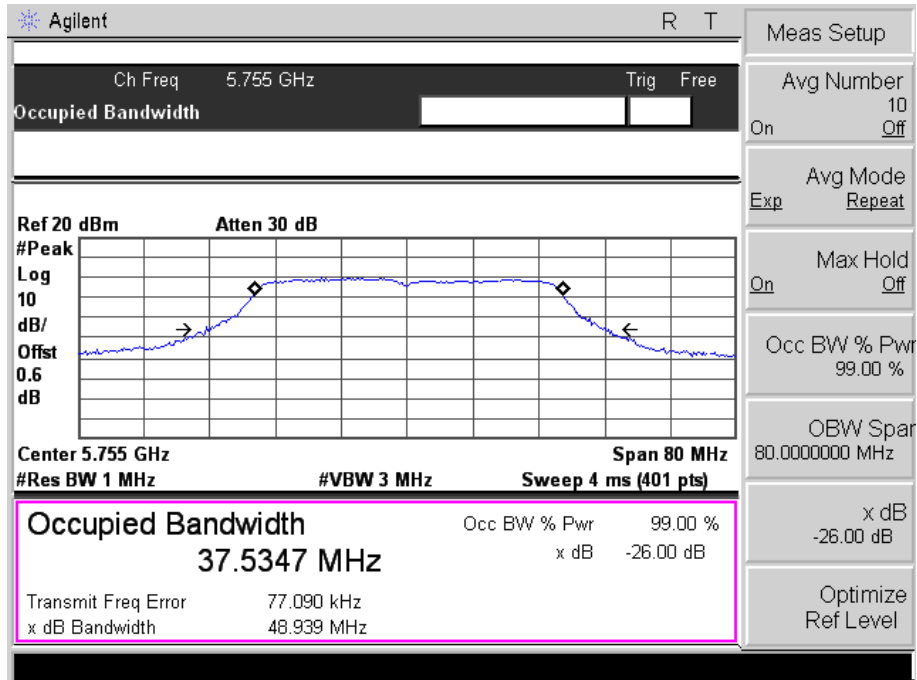
## 26 dB &amp; 99% 802.11n(HT20) Channel 157 (Ant A) worst data



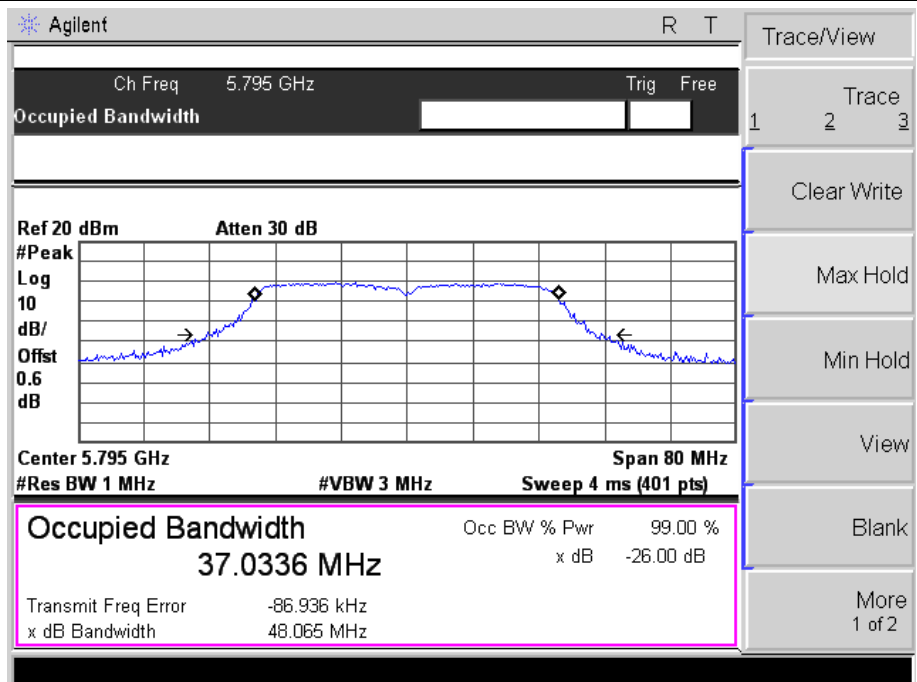
**26 dB & 99% 802.11n(HT20) Channel 165 (Ant A) worst data**

### Band IV (5.725-5.85GHz) 802.11n(HT40)

#### 26 dB & 99% 802.11n(HT40) Channel 151 (Ant A) worst data



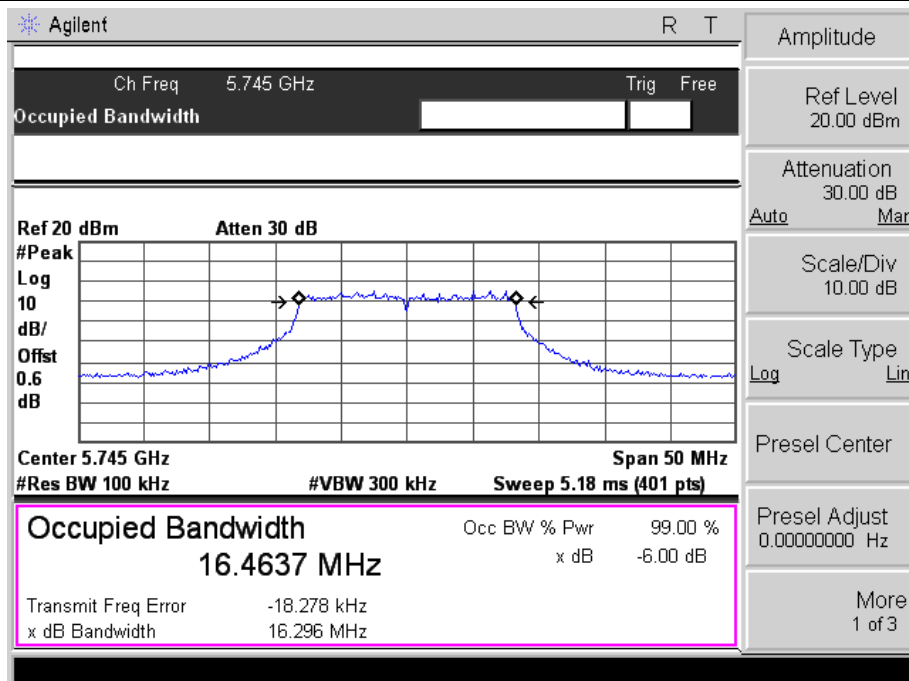
#### 26 dB & 99% 802.11n(HT40) Channel 159 (Ant A) worst data



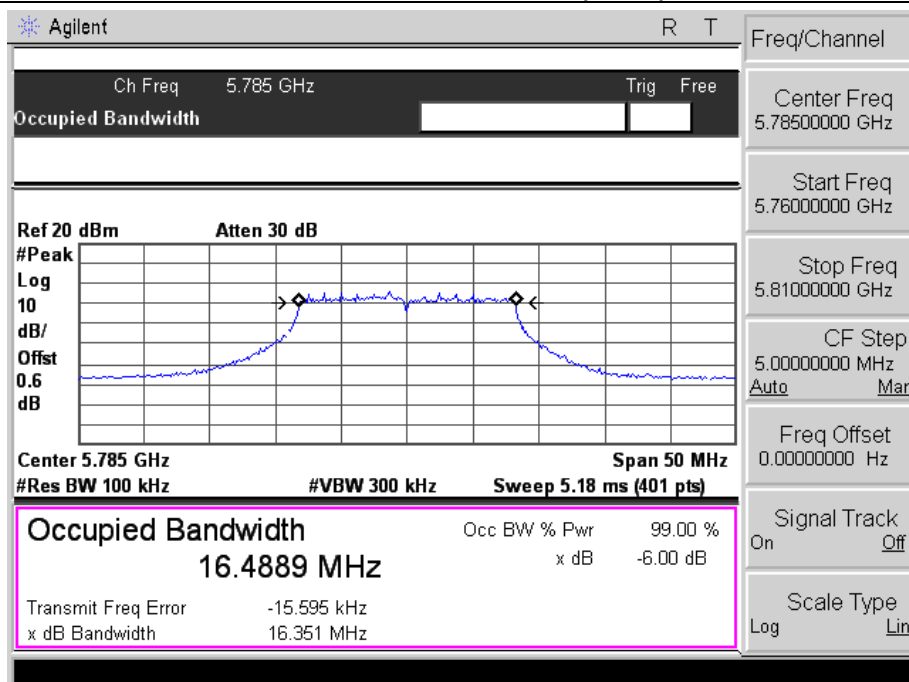


# Band IV (5.725-5.85GHz) 802.11a

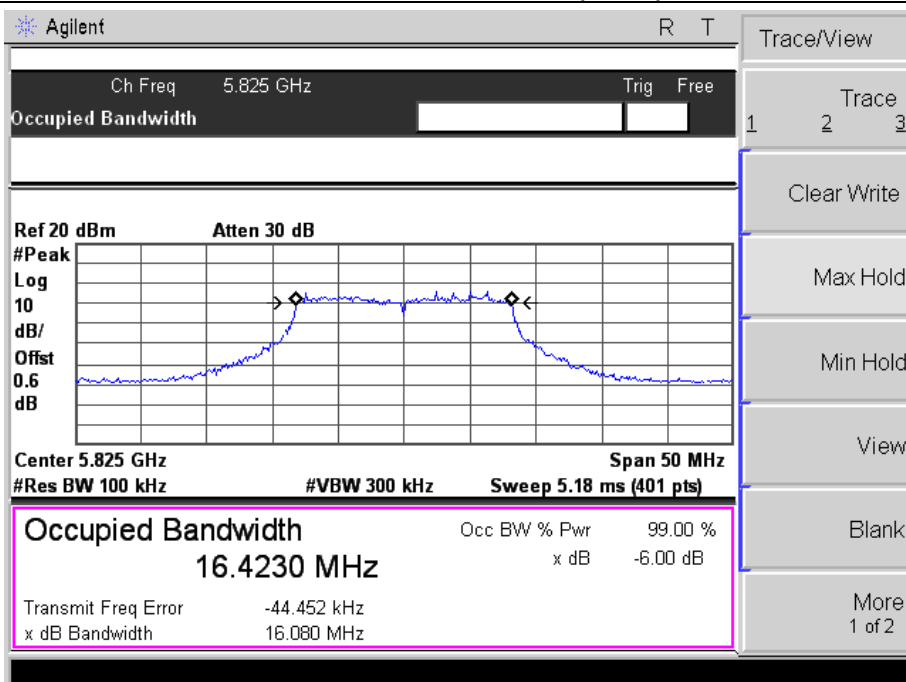
## 6dB Bandwidth 802.11a Channel 149 (Ant A) worst data



## 6dB Bandwidth 802.11a Channel 157 (Ant A) worst data



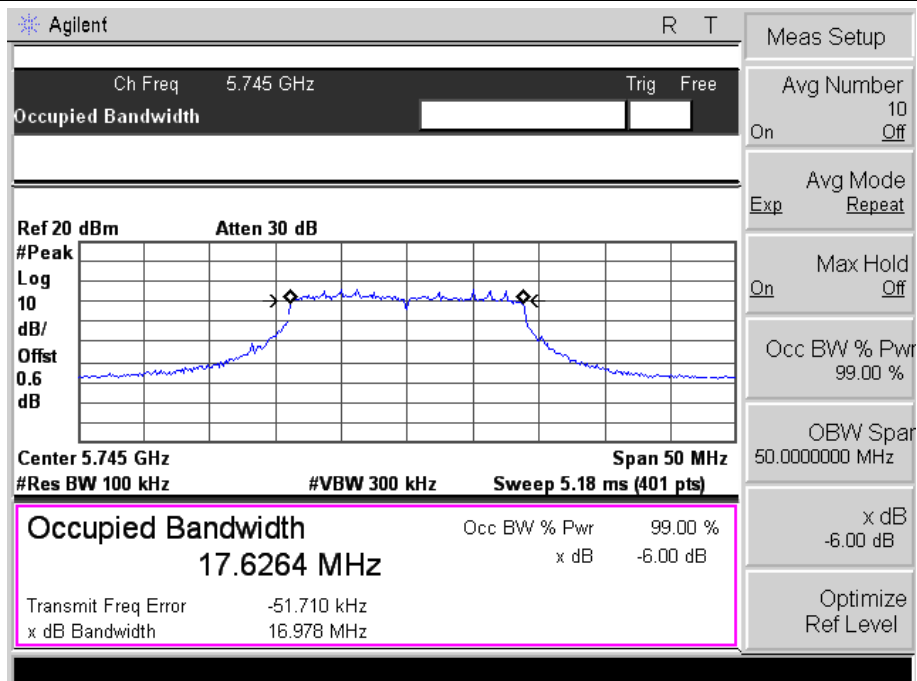
### 6dB Bandwidth 802.11a Channel 165 (Ant A) worst data



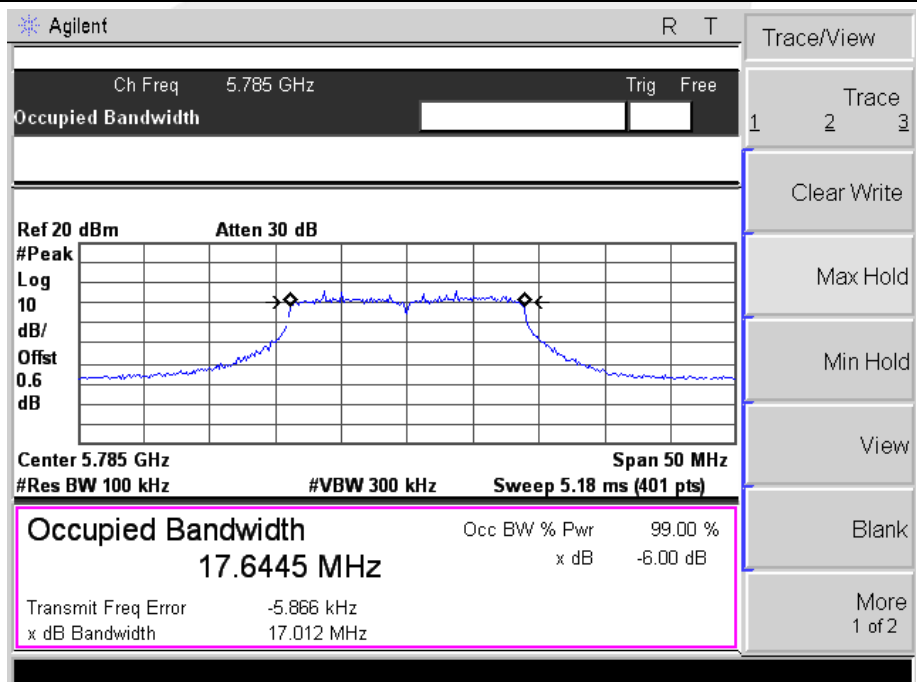


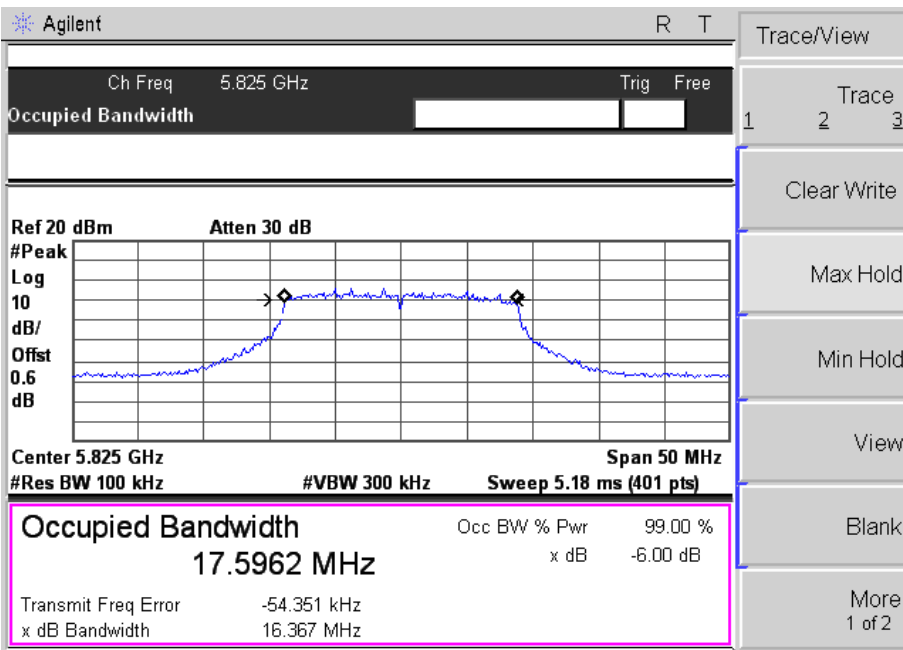
## Band IV (5.725-5.85GHz) 802.11n(HT20)

## 6dB Bandwidth 802.11n(HT20) Channel 149 (Ant A) worst data



## 6dB Bandwidth 802.11n(HT20) Channel 157 (Ant A) worst data

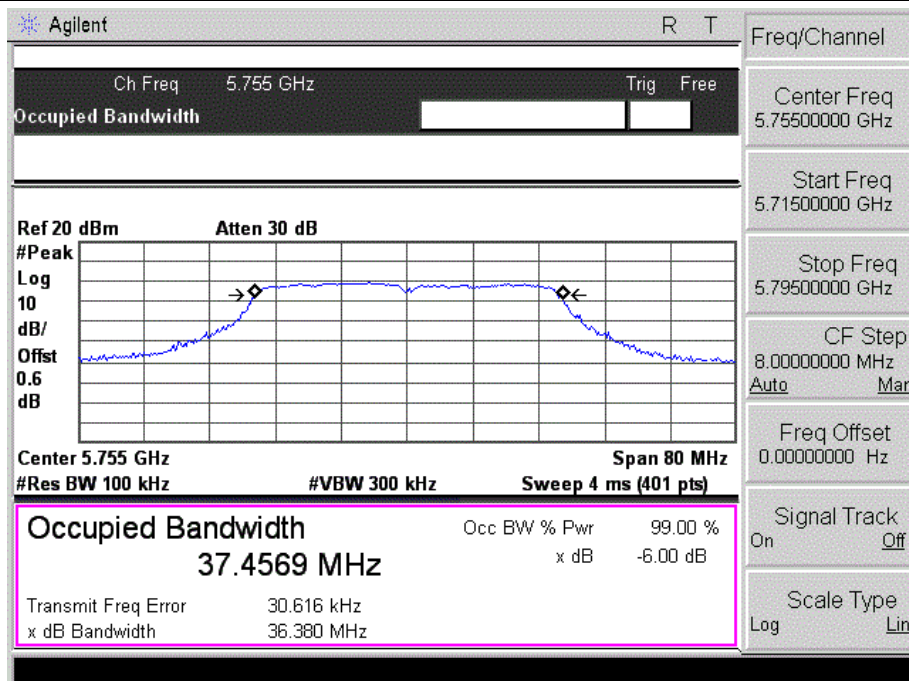


**6dB Bandwidth 802.11n(HT20) Channel 165 (Ant A) worst data**

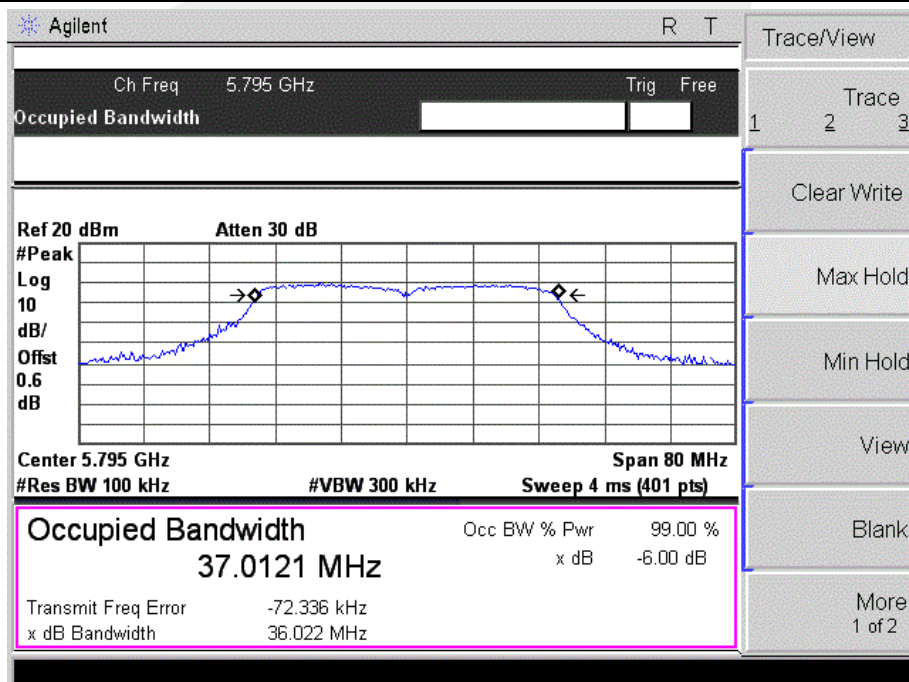


## Band IV (5.725-5.85GHz) 802.11n(HT40)

## 6dB Bandwidth 802.11n(HT40) Channel 151 (Ant A) worst data



## 6dB Bandwidth 802.11n(HT40) Channel 159 (Ant A) worst data





## 7. MAXIMUM CONDUCTED OUTPUT POWER

### 7.1 APPLIED PROCEDURES / LIMIT

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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

#### FCC Part15 (15.407) , Subpart E

Section	Test Item	Limit	Frequency Range (MHz)	Result
15.407(E) (ii)/(3)	Peak Output Power	0.25 watt or 1 watt	5150-5250 5725-5825	PASS

### 7.1.1 TEST PROCEDURE

The EUT was directly connected to the Power Sensor&Power meter

### 7.1.2 DEVIATION FROM STANDARD

No deviation.

### 7.1.3 TEST SETUP



## 7.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 5 Unless otherwise a special operating condition is specified in the follows during the testing.

## 7.1.5 TEST RESULTS

### Band I (5.15-5.25GHz)

Test Channel	Frequency	Total Output Power (dBm)				LIMIT
	(MHz)	Ant A	Ant B	Ant C	Total power (dBm)	dBm
802.11a						
36	5180	6.52	6.66	6.17	11.23	19.6
40	5200	6.67	7.1	6.81	11.63	19.6
48	5240	7.16	7.56	7.36	12.13	19.6
802.11n(HT20)						
36	5180	5.82	6.25	6.01	10.80	19.6
40	5200	6.48	6.08	5.81	10.90	19.6
48	5240	8.03	7.67	8.04	12.69	19.6
802.11n(HT40)						
38	5190	6.23	5.46	5.34	10.47	19.6
46	5230	6.39	6.35	6.4	11.15	19.6

#### Note:

- For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 0.25 W, Output Power is the sum of the Output power (A+B+C).

### Band IV (5.725-5.85GHz)

Test Channel	Frequency	Total Output Power (dBm)				LIMIT
	(MHz)	Ant A	Ant B	Ant C	Total power (dBm)	dBm
802.11a						
149	5745	11.68	11.80	11.93	16.58	25.6
157	5785	11.87	11.50	11.37	16.36	25.6
161	5825	11.94	12.01	12.01	16.76	25.6
802.11n(HT20)						
149	5745	6.40	5.97	6.15	10.95	25.6
157	5785	5.97	5.73	5.69	10.57	25.6
161	5825	5.78	5.41	6.27	10.61	25.6
802.11n(HT40)						
151	5755	4.31	3.15	3.84	8.56	25.6
159	5795	3.72	4.54	4.72	9.12	25.6

#### Note:

- For the band 5.745-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W, Output Power is the sum of the Output power (A+B+C).



## 8. FREQUENCY STABILITY MEASUREMENT

### 8.1 LIMIT OF FREQUENCY STABILITY

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an Emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

#### 8.1.1 MEASURING INSTRUMENTS

See list of measuring instruments of this test report.

#### 8.1.2 TEST PROCEDURES

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

#### 8.1.3 TEST SETUP





**8.1.4 TEST RESULTS**

<b>Voltage</b>	<b>Band I (5.15-5.25GHz) Measurement Frequency(MHz)</b>
(V)	5200
126.50	5199.9745
110.00	5199.9542
93.50	5199.9542
Max.Deviation(MHz)	0.0458
Max.Deviation(ppm)	8.8

Temperature Vs. Frequency Stability:

<b>Temperature</b>	<b>Measurement Frequency(MHz)</b>
(°C)	5200
-30	5199.9678
-20	5199.9689
-10	5199.9643
0	5199.9667
10	5199.9668
20	5199.9679
30	5199.9668
40	5199.9679
50	5199.9669
Max.Deviation(MHz)	0.0357
Max.Deviation(ppm)	6.86



Voltage	Band IV (5.725-5.85GHz) Measurement Frequency(MHz)
(V)	5785
126.50	5784.9665
110.00	5784.9646
93.50	5784.9632
Max.Deviation(MHz)	0.0368
Max.Deviation(ppm)	6.36

Temperature Vs. Frequency Stability:

Temperature	Measurement Frequency(MHz)
(°C)	5785
-30	5785.9656
-20	5785.9648
-10	5785.9569
0	5785.9646
10	5785.9622
20	5785.9645
30	5785.9668
40	5785.9664
50	5785.9666
Max.Deviation(MHz)	0.9668
Max.Deviation(ppm)	1



## 9. AUTOMATICALLY DISCONTINUE TRANSMISSION

### 9.1 LIMIT OF AUTOMATICALLY DISCONTINUE TRANSMISSION

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

### 9.2 TEST RESULT OF AUTOMATICALLY DISCONTINUE TRANSMISSION

During no any information transmission, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission





## 10. ANTENNA REQUIREMENT

### 10.1 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.

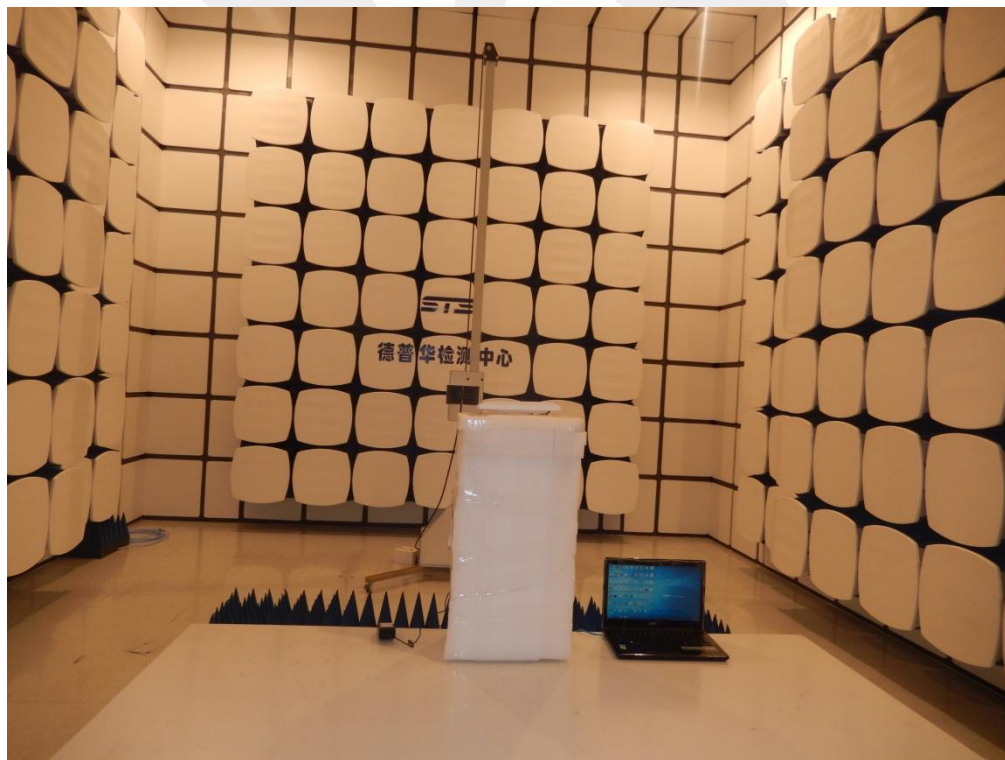
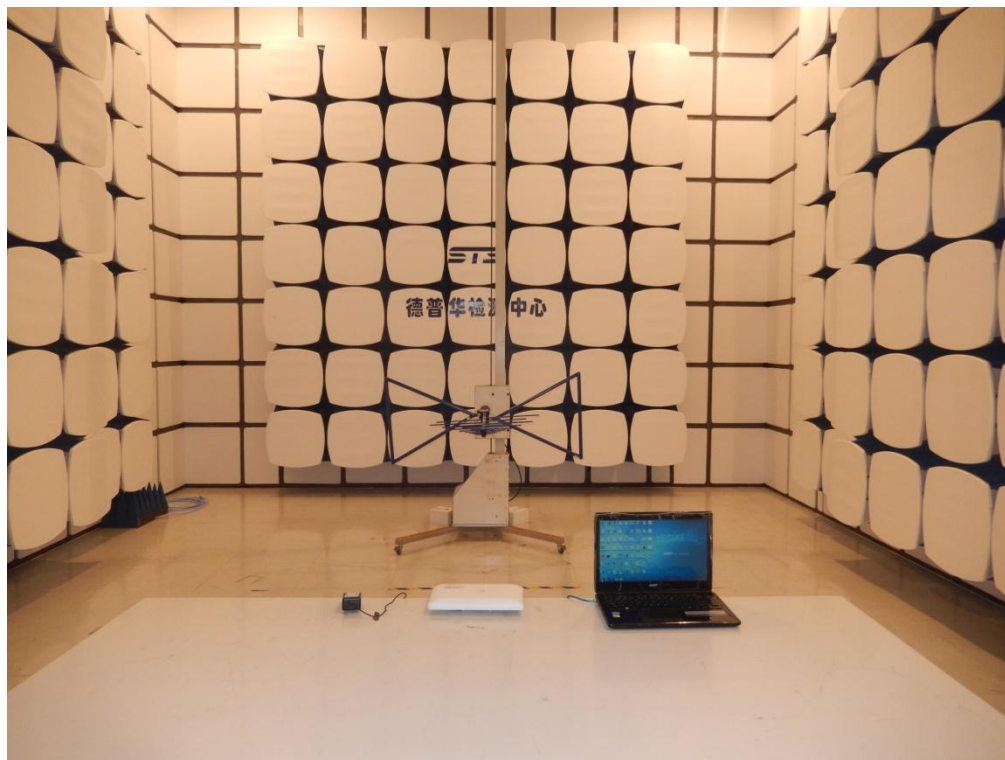
### 10.2 EUT ANTENNA

The EUT antenna is PIFA Antenna. It comply with the standard requirement.



## APPENDIX - PHOTOS OF TEST SETUP

### Radiated Measurement Photos



## Conducted Measurement Photos

