



FCC Part 15E TEST REPORT

Issued to

DFINE Technology Co., Ltd.

For

WHDI wireless transceiver module

Model Name : DF-W208/JDWHI200AA
 Trade Name : Dfine
 Brand Name : Dfine
 FCC ID : Y48DF-W208
 IC : 9679A-DFW208
 Standard : 47 CFR Part 15 Subpart E
 RSS 210
 Test date : 2012-05-22 to 2012-06-05
 Issue date : 2012-06-07

by

Shenzhen MORLAB Communication Technology Co., Ltd.

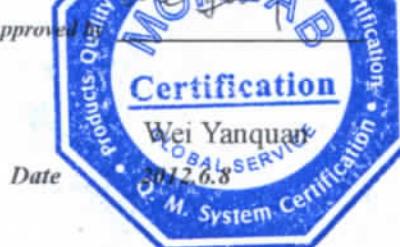
Tested by

Hou Yiyang

Date

Hou Yiyang
2012.6.8

Approved by



Review by

Wang wei

Date

Wang wei
2012.6.8

CTIA Authorized Test Lab
LAB CODE 20081222-00
IEEE 1725 OTA

OFTA
電訊管理局



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FCC
Reg. No.
741109
BQTF

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Change History		
Issue	Date	Reason for change
1.0	June 7, 2012	First edition

1. General Information

1.1. EUT Description

EUT Type : WHDI wireless transceiver module
Serial No. : N/A
Hardware Version : JD7.820.1442V3.1
Software Version : App: 2.1.42
Applicant : DFINE Technology Co., Ltd.
Building A2, Tianfu Software Park, Hi-tech Zone, South Extension
of Tianfu Wide Road, Chengdu, China
Manufacturer : DFINE Technology Co., Ltd.
Building A2, Tianfu Software Park, Hi-tech Zone, South Extension
of Tianfu Wide Road, Chengdu, China
Operating Frequency Range : 5.15GHz~5.25GHz & 5.725GHz~5.825GHz
Channel Information : 4 channels of two bands
Channel frequencies : 5190MHz, 5230MHz, 5755MHz, 5795MHz
Channel bandwidth : 40MHz
Channel Separation : 40MHz
Modulation Type : OFDM(16QAM)
Antenna Description : Manufacturer: DFINE Technology Co., Ltd.
Operating Frequency: 4.9GHz~5.9GHz
Gain: Max Gain 2dBi
Ant1: Transmit and Receive
Ant2: Transmit
Power Supply : Battery
Manufacturer: HCT ELECTRIC CO., LTD
10 Bldg , Fuhua Industrial Area
Model No.: 675776
Capacity: 3.7V/3000mAh
Rated Voltage: 3.7V
Charge Limit: 4.2V

Note 1: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 2: The equipment model DF-W208(for trade use) and JDWIFI200AA(for internal use), are the same WHDI wireless transceiver module.

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Wi-Fi, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-09 Edition)	Radio Frequency Devices
2	IC RSS -210	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	FCC§15.407(b)(6),§15.207(a) IC RSS-Gen §7.2.2	Conducted Emissions	Pass
2	FCC§15.205,§15.209§15.407(b)(4),(6),(7) IC RSS-210§A9.2	Undesirable Emission & Restricted Bands	Pass
3	FCC§15.407(a)(3) IC RSS-210§A9.2	26 dB bandwidth	Pass
4	FCC§15.407(a)(3) IC RSS-210§A9.2	Conducted Transmitter Output Power	Pass
5	FCC§15.407(a)(3),(5) IC RSS-210§A9.2	Power Spectral Density	Pass
6	FCC§15.407(a)(6) IC RSS-210§A9.2	Peak Excursion Ratio	Pass
7	IC RSS-210 §2.6,RSS-Gen§6	Receiver Spurious Radiated Emission	Pass
8	FCC§15.407(g)	Frequency Stability	Pass

1.3. Facilities and Accreditations

1.3.1. Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, 518055 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

1.3.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 15E&IC RSS Requirements

2.1. FCC §15.207& IC RSS-Gen §7.2.2 - Conducted Emission

2.1.1. Requirement

According to FCC section 15.207, 15.407(b) (6) and IC RSS – Gen §7.2.2 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

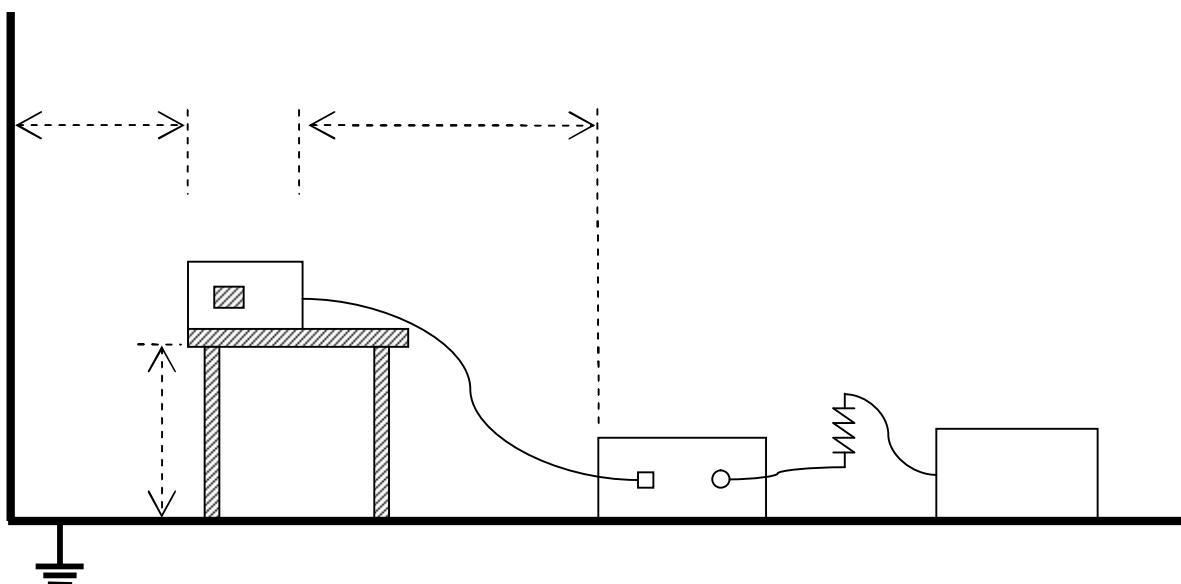
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.1.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

The EUT is powered by the Battery charged with the notebook computer which is powered by 120V, 60Hz AC mains supply. The factors of the site are calibrated to correct the reading. During the measurement, the EUT is in operating mode, and the Ipad2 provided HDMI source.

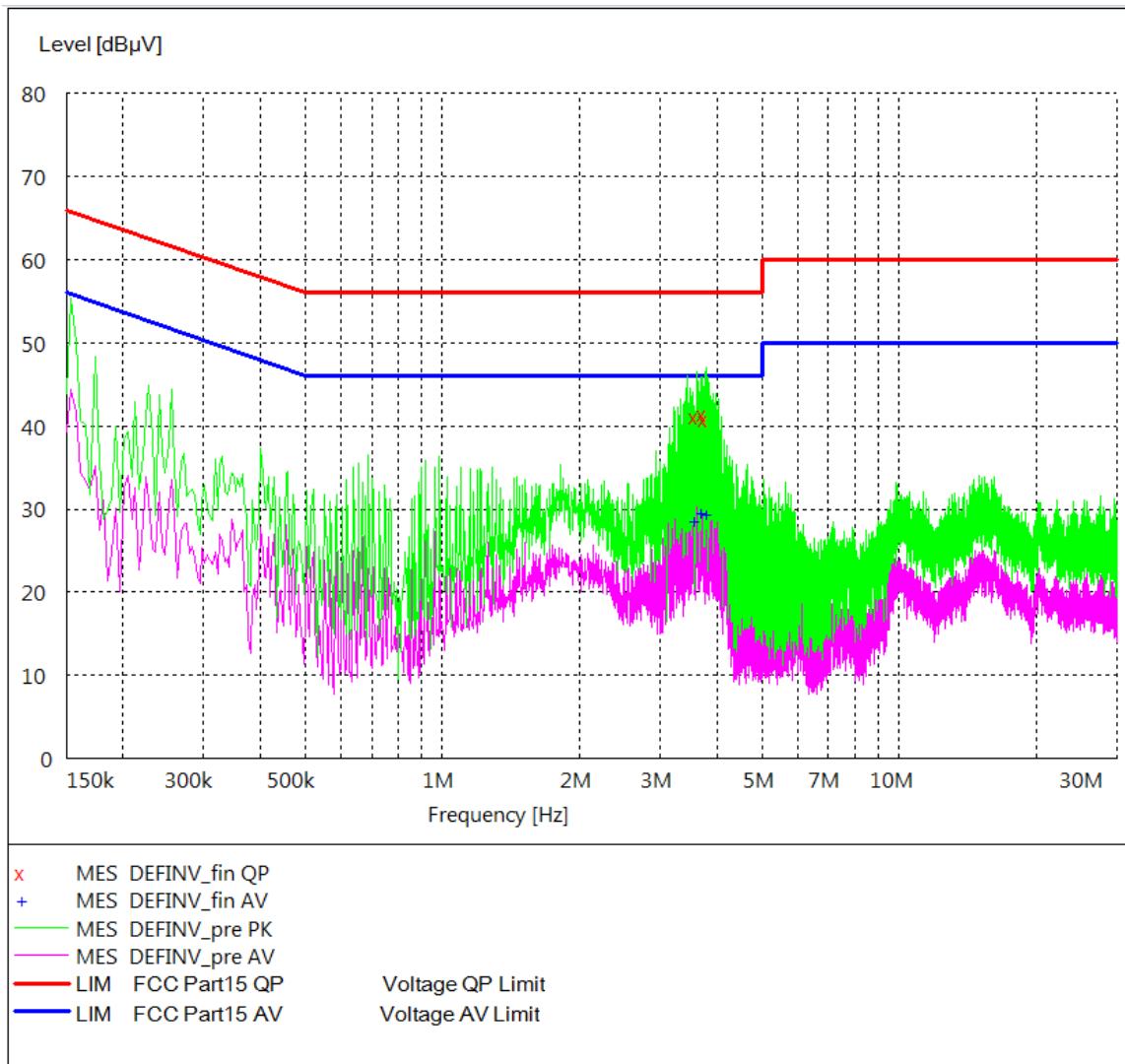
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Receiver	R&S	ESCS30	827413/001	2013.04
LISN	R&S	ESH3-Z5	827246/027	2012.11
Notebook Computer	Dell	PP09S	MM592A00	N/A
Ipad2	Apple	Ipad2	DMPGT2V3DFHW	N/A

2.1.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Test Record:



QP:

Frequency	Level	Limit	Margin	Line
MHz	dB μ V	dB μ V	dB	
3.5976	41.30	56	14.70	L1
3.7575	41.60	56	14.40	L1
3.7809	41.00	56	15.00	N

AV:

Frequency	Level	Limit	Margin	Line
MHz	dB μ V	dB μ V	dB	
3.5547	28.80	46	17.2	L1
3.6873	29.70	46	16.3	L1
3.8043	29.50	46	16.5	L1

Verdict: Pass

2.2. FCC § 15.407(b) & IC RSS-210 § A9.2 Undesirable Emission & Restricted Bands

2.2.1. Requirement

According to FCC section 15.407(b) (1,4, 6, 7) and IC RSS-210; for transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz; for transmitters operating in the 5.725–5.825 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 EIRP of –17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of –27 dBm/MHz. Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in section 15.209.

Unwanted Emission Blow 1GHz:

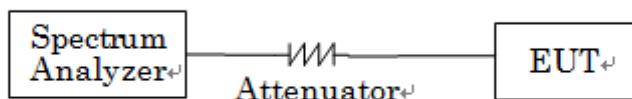
Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (m)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000F(KHz)	30
1.705-30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

In addition, radiated emissions which fall in the Restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

2.2.2. Test Description

2.2.2.1. Radiated Undesirable Emissions

A. Test Setup:



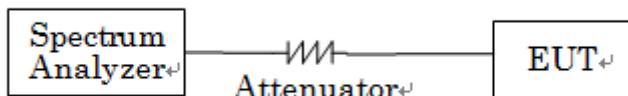
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	HP	E4407B	US39010211	2012.12
Spectrum Analyzer	Agilent	E4447A	US14721108	2013.03
Receiver	R&S	ESU	100204	2013.04
Semi-Anechoic Chamber	Albatross	9m*6m*6m	4771011001	2013.04

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Test Antenna-Loop	Schwarzbeck	FMZB	1519-022	2013.05
Test Antenna - Bi-Log	Schaffner	CBL6112B	2529	2013.05
Receiver	R&S	ESU	100204	2013.04
Semi-Anechoic Chamber	Albatross	9m*6m*6m	4771011001	2013.04

2.2.2.2. Conducted Undesirable Emissions at Antenna

A. Test Setup:

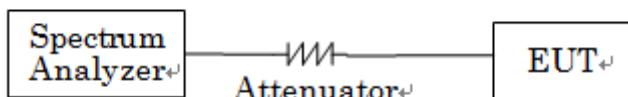


B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	HP	E4407B	US39010211	2012.12
Spectrum Analyzer	Agilent	E4447A	US14721108	2013.03

2.2.2.3. Band Edge

A. Test Setup:



B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	HP	E4407B	US39010211	2012.12
Spectrum Analyzer	Agilent	E4447A	US14721108	2013.03

2.2.3. Measurement Procedure

2.2.3.1. Radiated Undesirable Emissions

According to KDB 789033 D01 section G, unwanted emission measurements below 1000MHz will be using quasi – peak detector; unwanted emission measurements above 1000MHz will be using peak and average detector. If the unwanted emission is in the restricted bands, it must comply with FCC §15.209; else it must comply with §15.407(b).

Follow KDB 412172, $ERP/EIRP = P_T + G_T - L_C$

- $ERP/EIRP$ = effective (or equivalent) radiated power (in same units as P_T , typically dBW, dBm, or power spectral density (psd)), relative to either a dipole antenna (ERP) or an isotropic antenna (EIRP);
- P_T = transmitter output power, in dBW, dBm, or psd (power over a specified reference bandwidth);
- G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
- L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.2

In this report: $EIRP = \text{Receiving Reading} + \text{Correction Factor}$

2.2.3.2. Conducted Undesirable Emissions at Antenna

The EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) with a Attenuator; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is operating at the maximum output power.

2.2.3.3. Band Edge

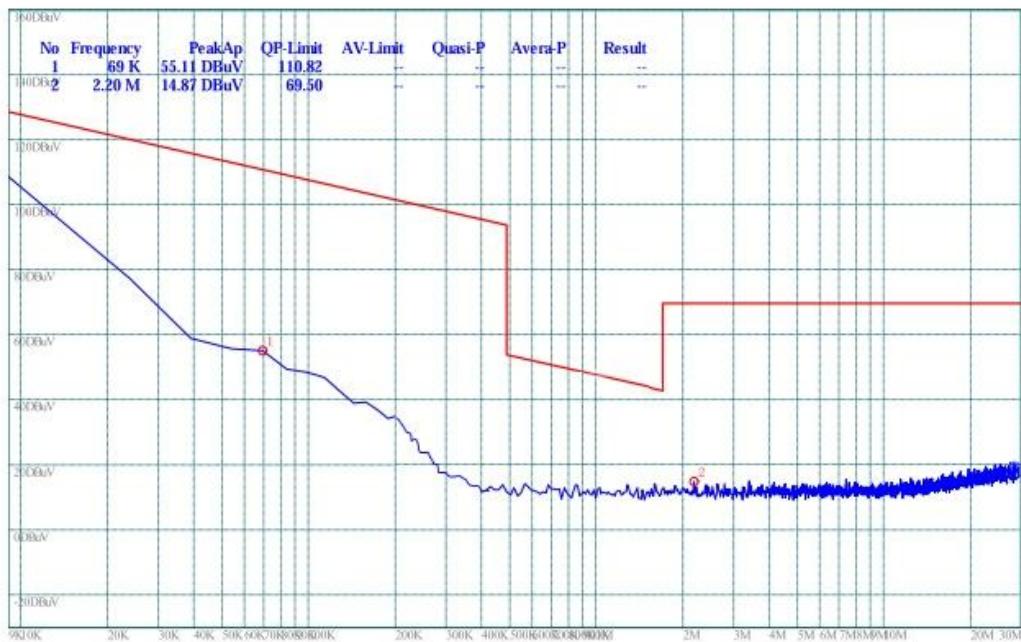
The EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) with a Attenuator; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is operating at the maximum output power.

2.2.4. Test Result

2.2.4.1. Radiated Undesirable Emission

A. 0.009~30MHz:

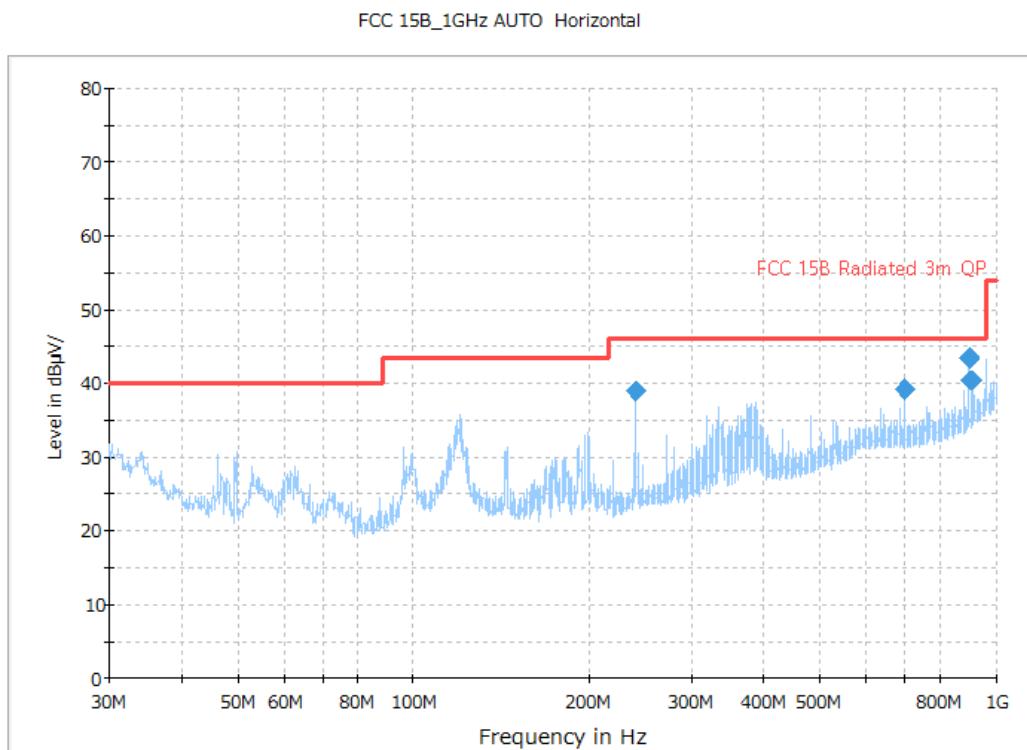
Operating in 5190MHz - Horizontal



NOTE: The emissions are too small to be measured and are at least 20dB below the limit. So all the data of marked are pass. The other frequency test results are at least 20dB below the limit. part 15.31(o) for the reporting of emissions that are more than 20dB below the limit. emissions more than 20dB below the limit need not be reported.

B. 30~1000MHz:

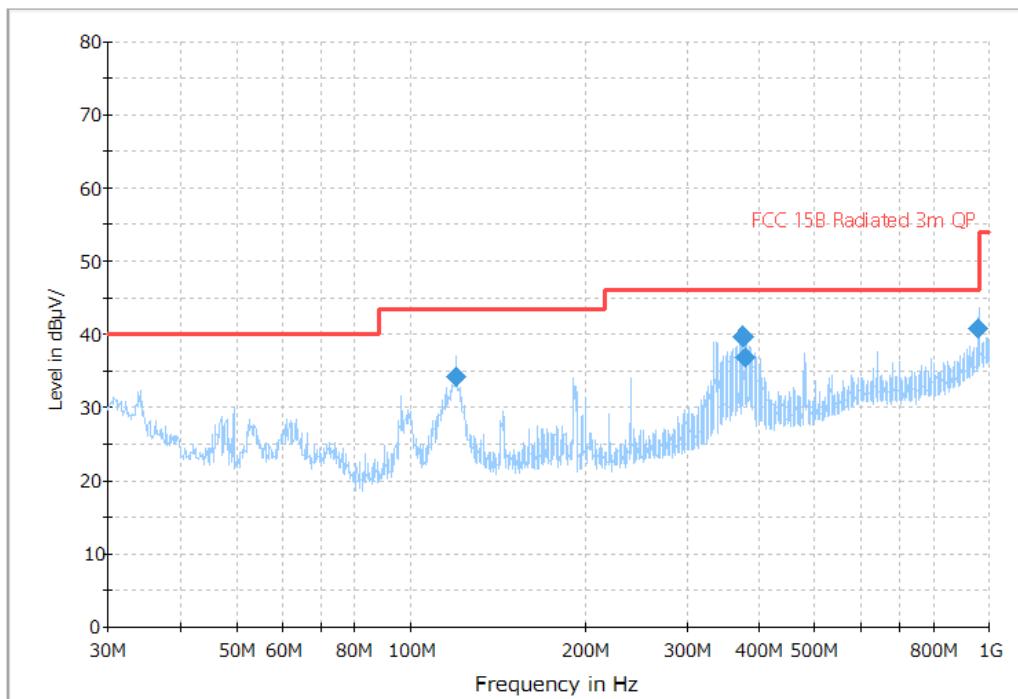
EUT Operating in 5190MHz - Horizontal



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
240.005	39.0	1	120	109.0	269.0	7.0	46.0
699.688	39.2	1	120	111.0	116.0	6.8	46.0
897.180	43.1	1	120	118.0	32.0	2.9	46.0
906.104	40.4	1	120	123.0	150.0	5.6	46.0

EUT Operating in 5190MHz – Vertical

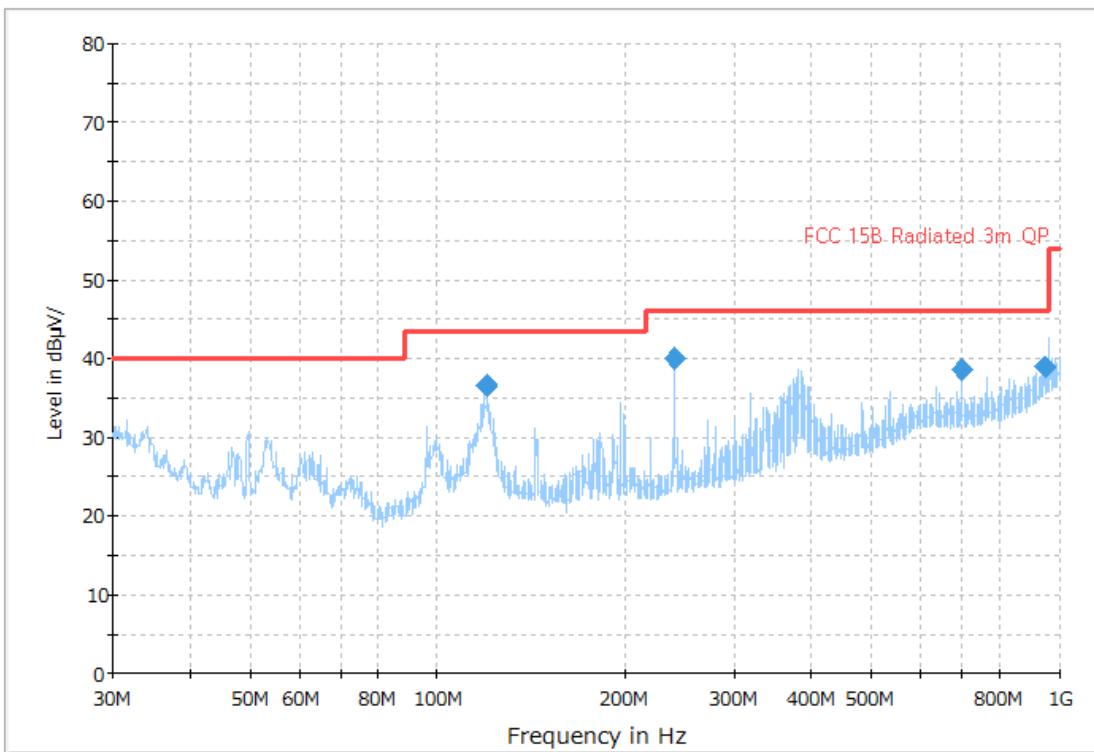
FCC 15B_1GHz AUTO Vertical



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
120.016	34.2	1	120	112.0	269.0	9.3	43.5
375.902	39.7	1	120	136.0	201.0	6.3	46.0
379.588	36.8	1	120	128.0	214.0	9.2	46.0
954.119	40.8	1	120	136.0	230.0	5.2	46.0

EUT Operating in 5230MHz – Horizontal

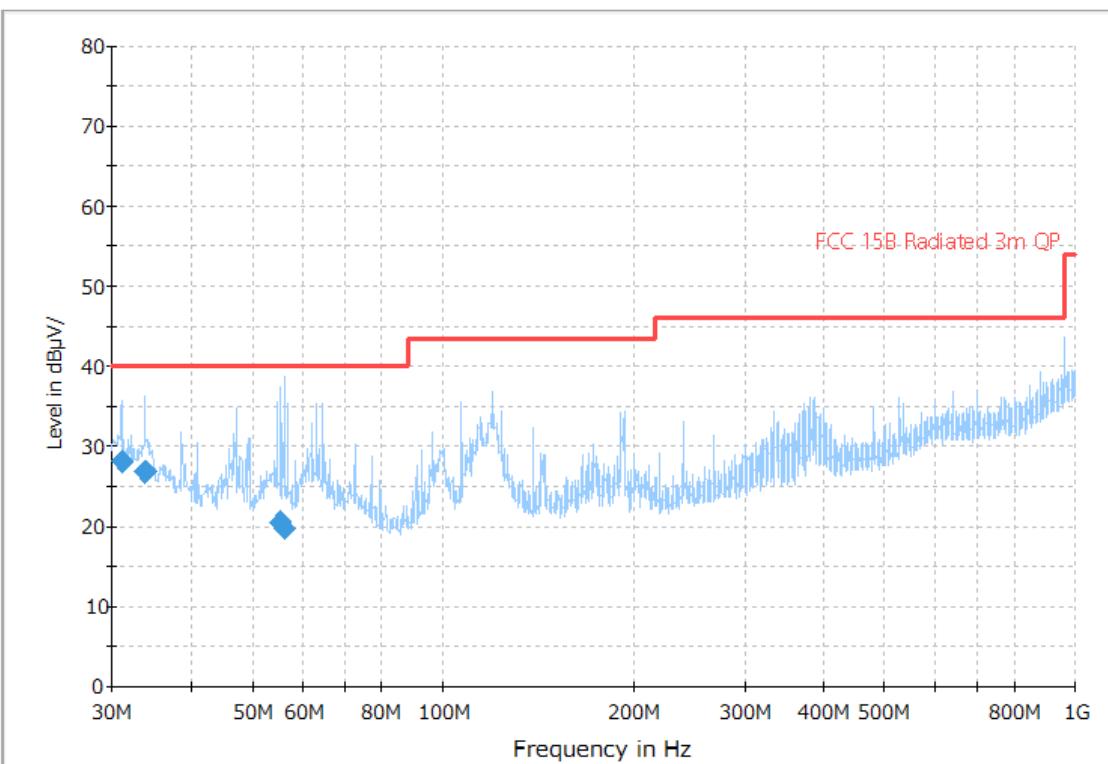
FCC 15B_1GHz AUTO Horizontal



Frequency (MHz)	Quasi Peak (dB µ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB µ V/m)
120.016	36.6	1	120	118.0	248.0	6.9	43.5
240.005	39.9	1	120	123.0	261.0	6.1	46.0
699.688	38.8	1	120	127.0	64.0	7.2	46.0
947.329	38.8	1	120	133.0	197.0	7.2	46.0

EUT Operating in 5230MHz - Vertical

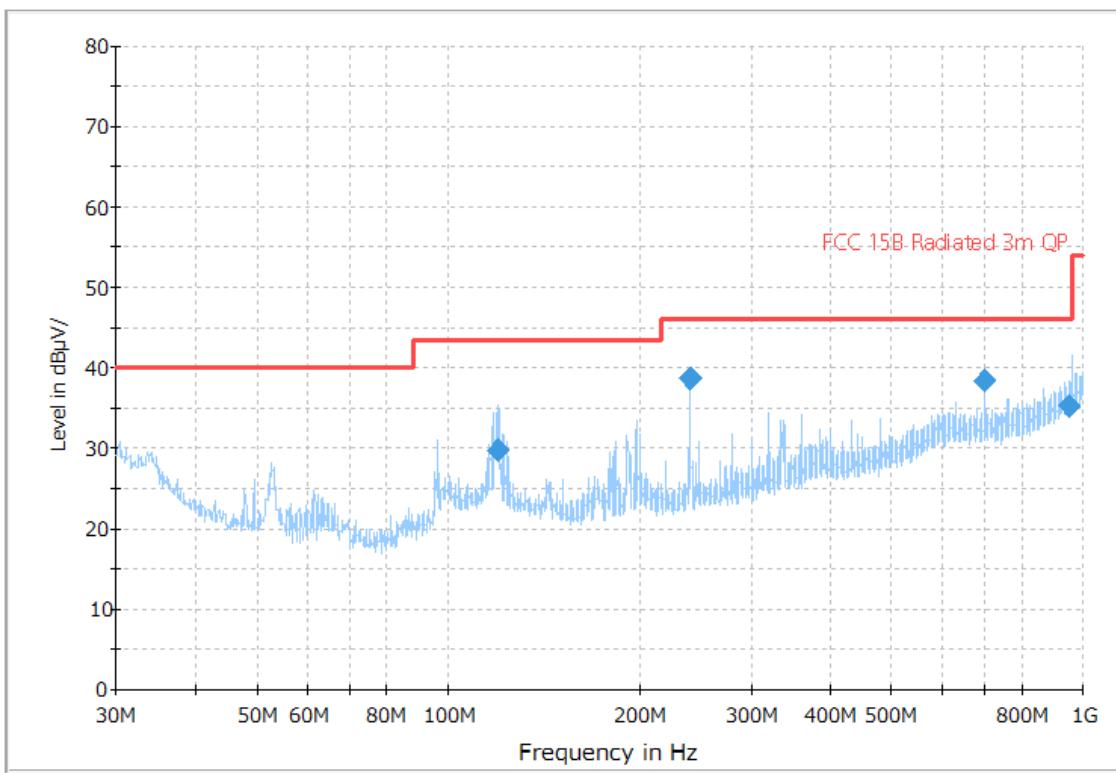
FCC 15B_1GHz AUTO Vertical



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
31.067	28.1	1	120	153.0	55.0	11.9	40.0
33.880	26.9	1	120	153.0	56.0	13.1	40.0
55.317	20.4	1	120	112.0	57.0	19.6	40.0
56.093	19.6	1	120	175.0	58.0	20.4	40.0

EUT Operating in 5755MHz - Horizontal

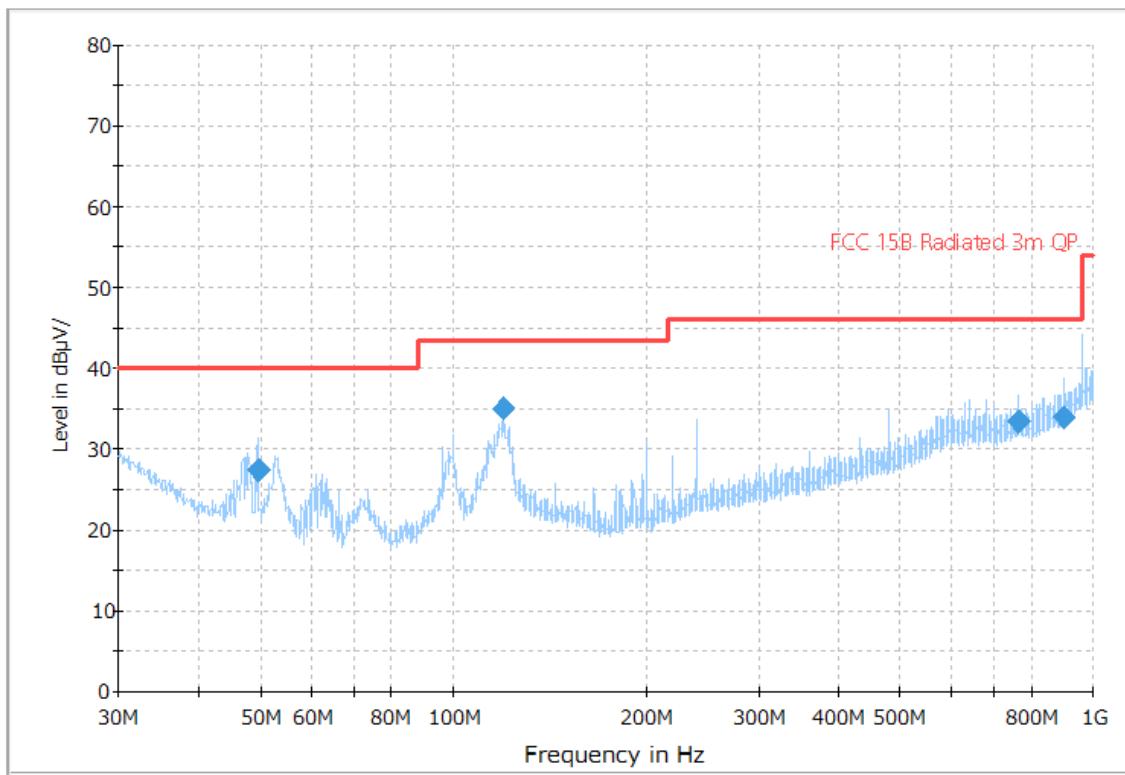
FCC 15B_1GHz AUTO Horizontal



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
120.307	29.7	1	120	277.0	351.0	13.8	43.5
240.005	38.7	1	120	128.0	0.0	7.3	46.0
699.688	38.4	1	120	100.0	64.0	7.6	46.0
948.687	35.2	1	120	200.0	38.0	10.8	46.0

EUT Operating in 5755MHz - Vertical

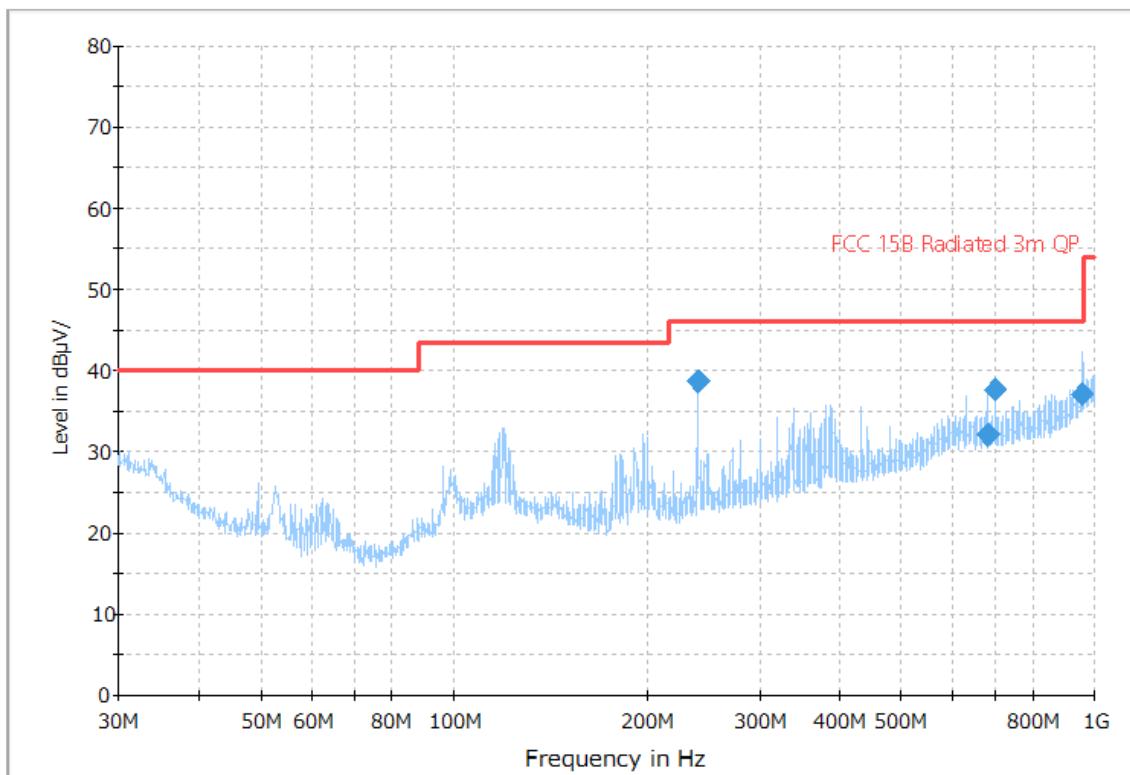
FCC 15B_1GHz AUTO Vertical



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
49.594	27.4	1	120	100.0	110.0	12.6	40.0
120.016	35.0	1	120	100.0	257.0	8.5	43.5
766.424	33.5	1	120	194.0	326.0	12.5	46.0
899.508	33.8	1	120	136.0	314.0	12.2	46.0

EUT Operating in 5795MHz - Horizontal

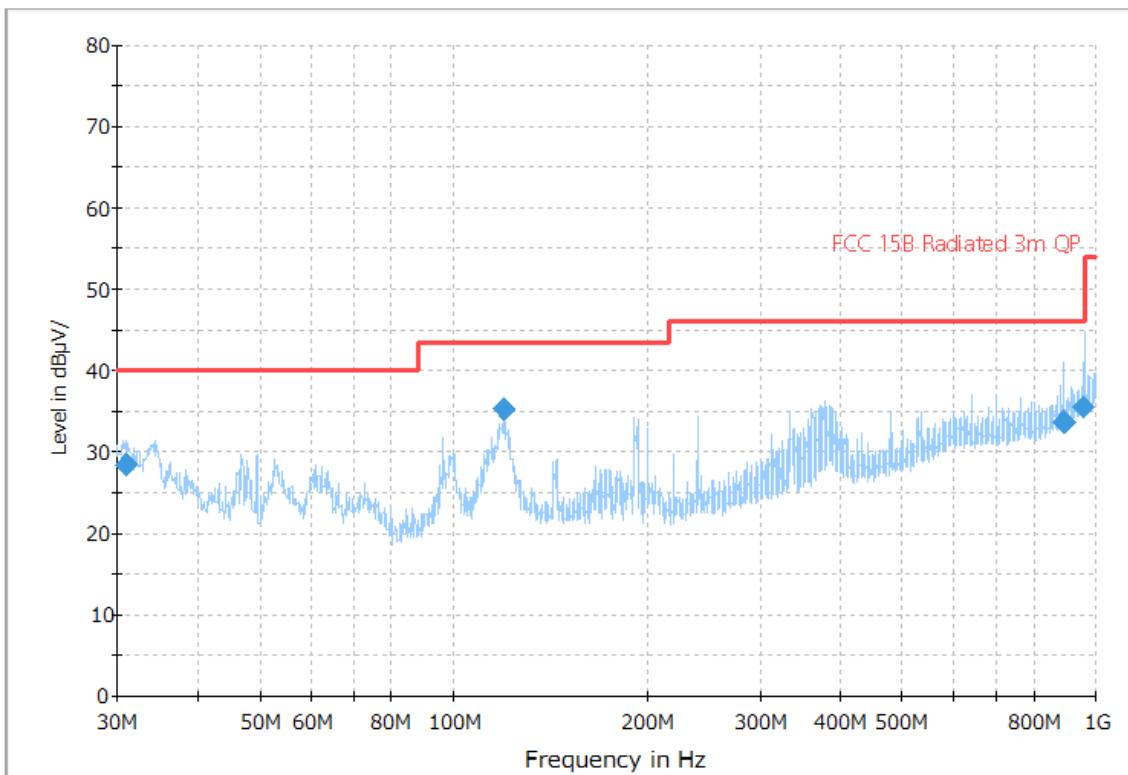
FCC 15B_1GHz AUTO Horizontal



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
240.005	38.6	1	120	100.0	354.0	7.4	46.0
680.094	32.0	1	120	128.0	44.0	14.0	46.0
699.688	37.7	1	120	100.0	165.0	8.3	46.0
954.119	37.0	1	120	100.0	215.0	9.0	46.0

EUT Operating in 5795MHz - Vertical

FCC 15B_1GHz AUTO Vertical



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
30.970	28.5	1	120	144.0	212.0	11.5	40.0
120.016	35.1	1	120	100.0	231.0	8.4	43.5
891.554	33.8	1	120	178.0	312.0	12.2	46.0
954.119	35.6	1	120	186.0	264.0	10.4	46.0

C. 1~40GHz:
Unwanted Emission in restricted bands

Frequency	Conducted Emission	Detector	Antenna Gain	EIRP	Field Strength in 3m	Limit	Margin
MHz	dBm	AV/PK	dBi	dBm	dBuv/m	dBuv/m	dB
Operating in 5190MHz							
15570	-52.22	PK	2	-50.22	44.98	74	29.02
20760	-55.87	PK		-53.87	41.33	74	32.67
15570	-58.30	AV		-56.3	38.90	54	15.10
20760	-60.92	AV		-58.92	36.28	54	17.72
Operating in 5230MHz							
15690	-52.33	PK	2	-50.33	44.87	74	29.13
20920	-55.83	PK		-53.83	41.37	74	32.63
31380	-50.09	PK		-48.09	47.11	74	26.89
15690	-58.91	AV		-56.91	38.29	54	15.71
20920	-61.42	AV		-59.42	35.78	54	18.22
31380	-56.37	AV		-54.37	40.83	54	13.17
Operating in 5755MHz							
11510	-54.90	PK	2	-52.9	42.30	74	31.70
23020	-52.19	PK		-50.19	45.01	74	28.99
11510	-59.19	AV		-57.19	38.01	54	15.99
23020	-57.48	AV		-55.48	39.72	54	14.28
Operating in 5795MHz							
11590	-53.78	PK	2	-51.78	43.42	74	30.58
11590	-57.02	AV		-55.02	40.18	54	13.82

Note: According to KDB 789033 D01 section G(1)(d), the field strength at 3m from EUT is:

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2$$

Unwanted Emission out of restricted bands

Frequency	Conducted Emission	Antenna Gain	EIRP	Limit	Margin
MHz	dBm/MHz	dBi	dBm/MHz	dBm/MHz	dB
Operating in 5190MHz					
10380	-54.82	2	-52.82	-27	25.82
25950	-56.73		-54.73	-27	27.73
31140	-50.87		-48.87	-27	21.87
36330	-44.43		-42.43	-27	15.43
Operating in 5230MHz					
10460	-53.75	2	-51.75	-27	24.75
26150	-54.81		-52.81	-27	25.81
36610	-43.99		-41.99	-27	14.99
Operating in 5755MHz					
17265	-52.37	2	-50.37	-27	23.37
28755	-54.80		-52.80	-27	25.80
34530	-47.11		-45.11	-27	18.11
Operating in 5795MHz					
17385	-54.86	2	-52.86	-27	25.86
23180	-51.73		-49.73	-27	22.73
28975	-53.92		-51.92	-27	24.92
34770	-46.93		-44.93	-27	17.93

Note: According to KDB 789033 D01 section G(1)(d), the field strength at 3m from EUT is:

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2$$

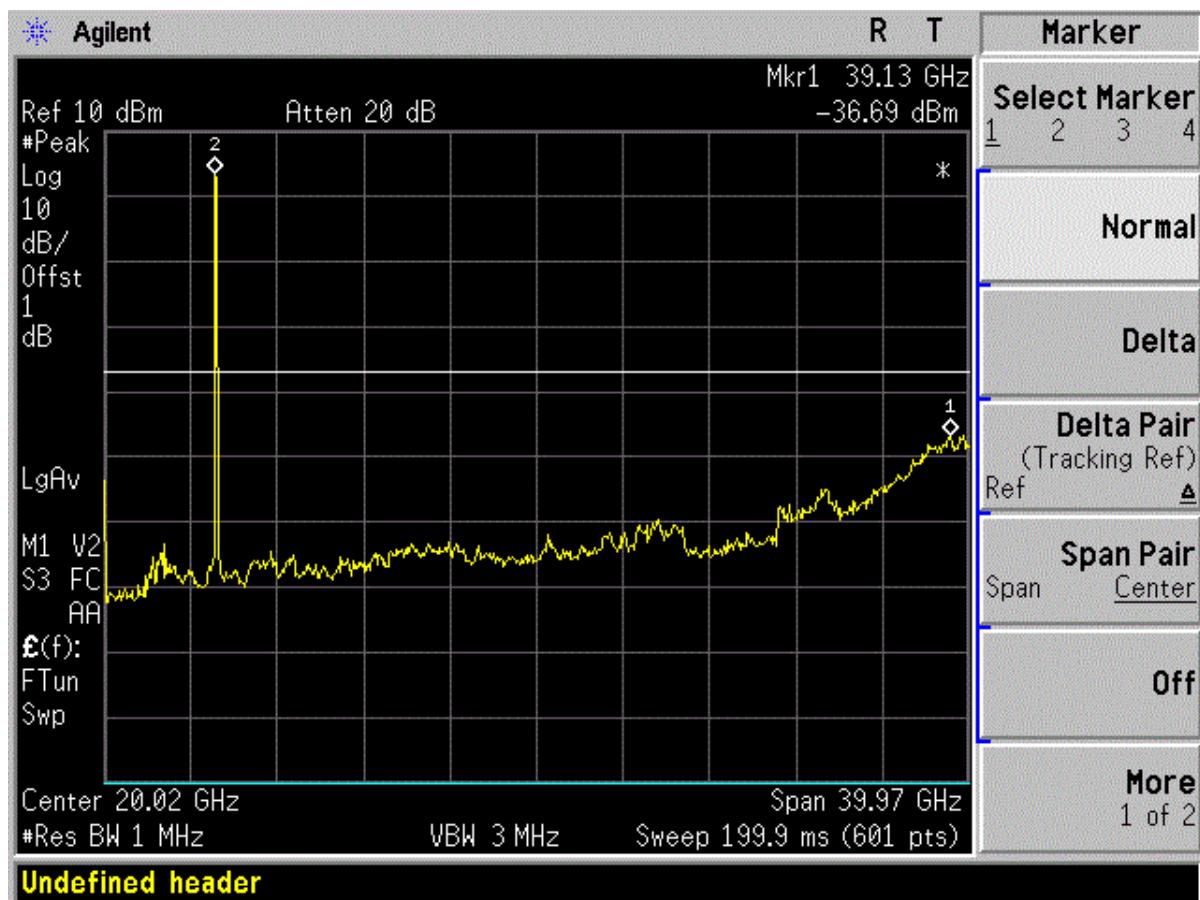
Verdict: Pass

2.2.4.2. Conducted Undesirable Emission

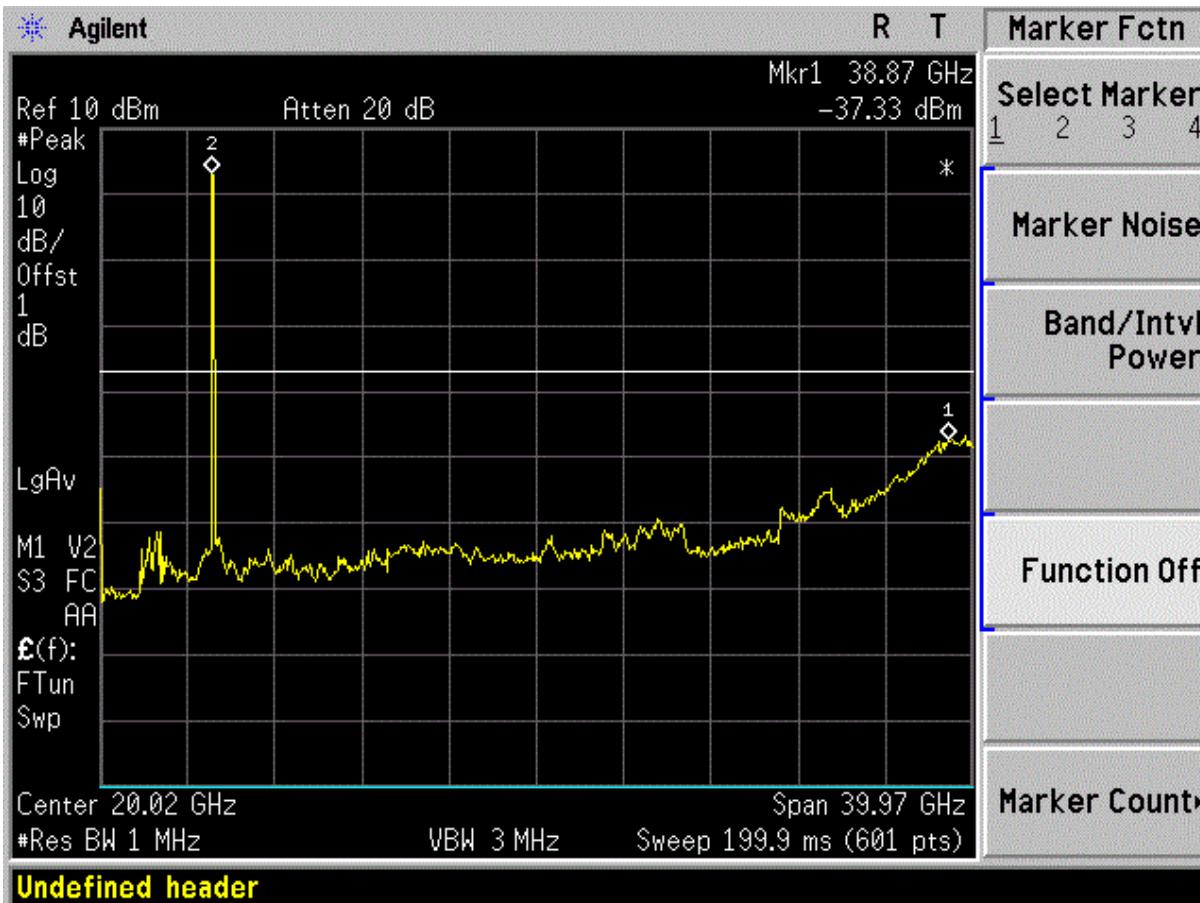
Frequency (GHz)	Max Peak (dBm)	RBW (MHz)	Margin (dB)	Limit (dBm)
Operating in 5190 – Ant 1				
39.13	-36.69	1	9.69	-27
Operating in 5190 – Ant 2				
39.87	-37.33	1	10.33	-27
Operating in 5230 – Ant 1				
39.67	-37.52	1	10.52	-27
Operating in 5230 – Ant 2				
39.67	-36.11	1	9.11	-27
Operating in 5755 – Ant 1				
39.13	-36.48	1	9.48	-27
Operating in 5755 – Ant 2				
39.73	-36.39	1	9.39	-27
Operating in 5795 – Ant 1				
39.73	-37.17	1	10.17	-27
Operating in 5795 – Ant 2				
39.67	-36.81	1	9.81	-27

Verdict: Pass

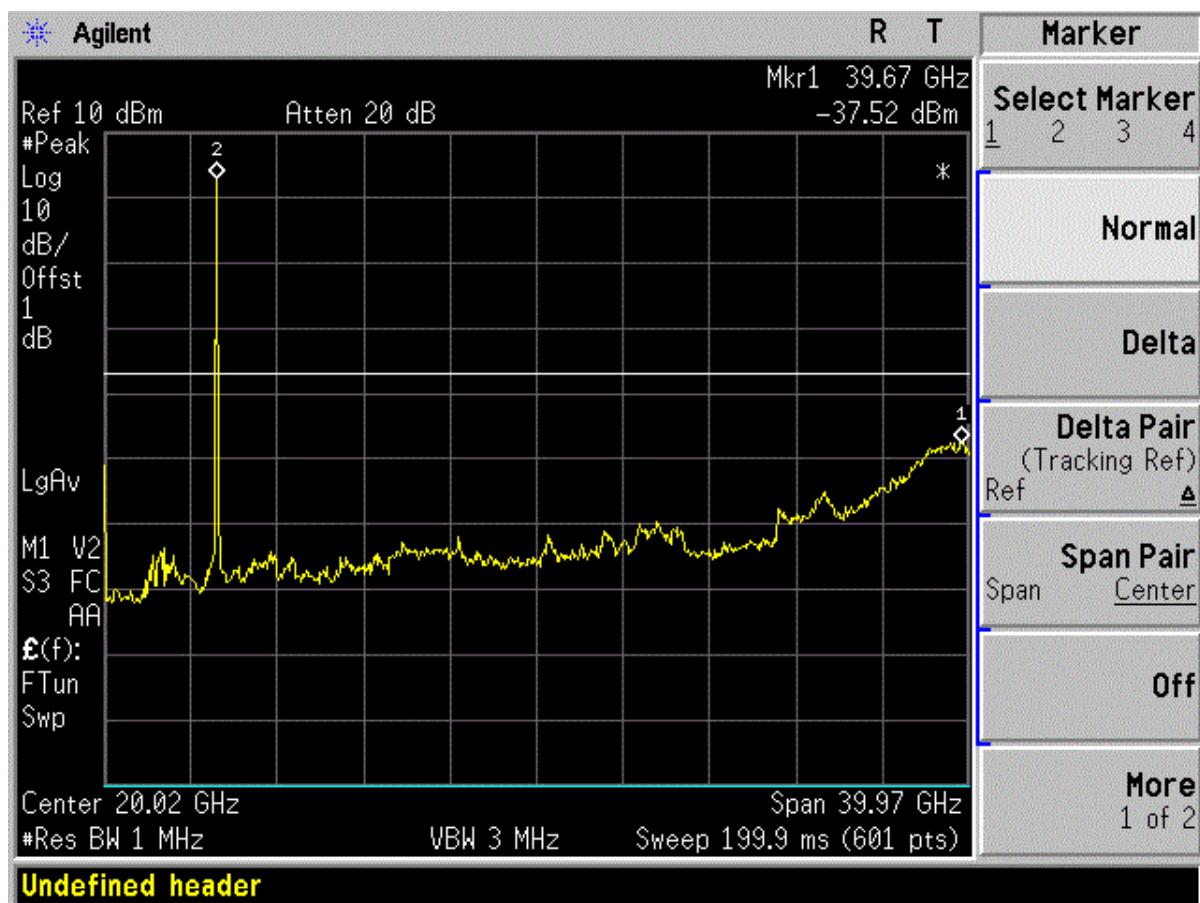
Conducted Undesirable Emission in 5190MHz – Ant 1



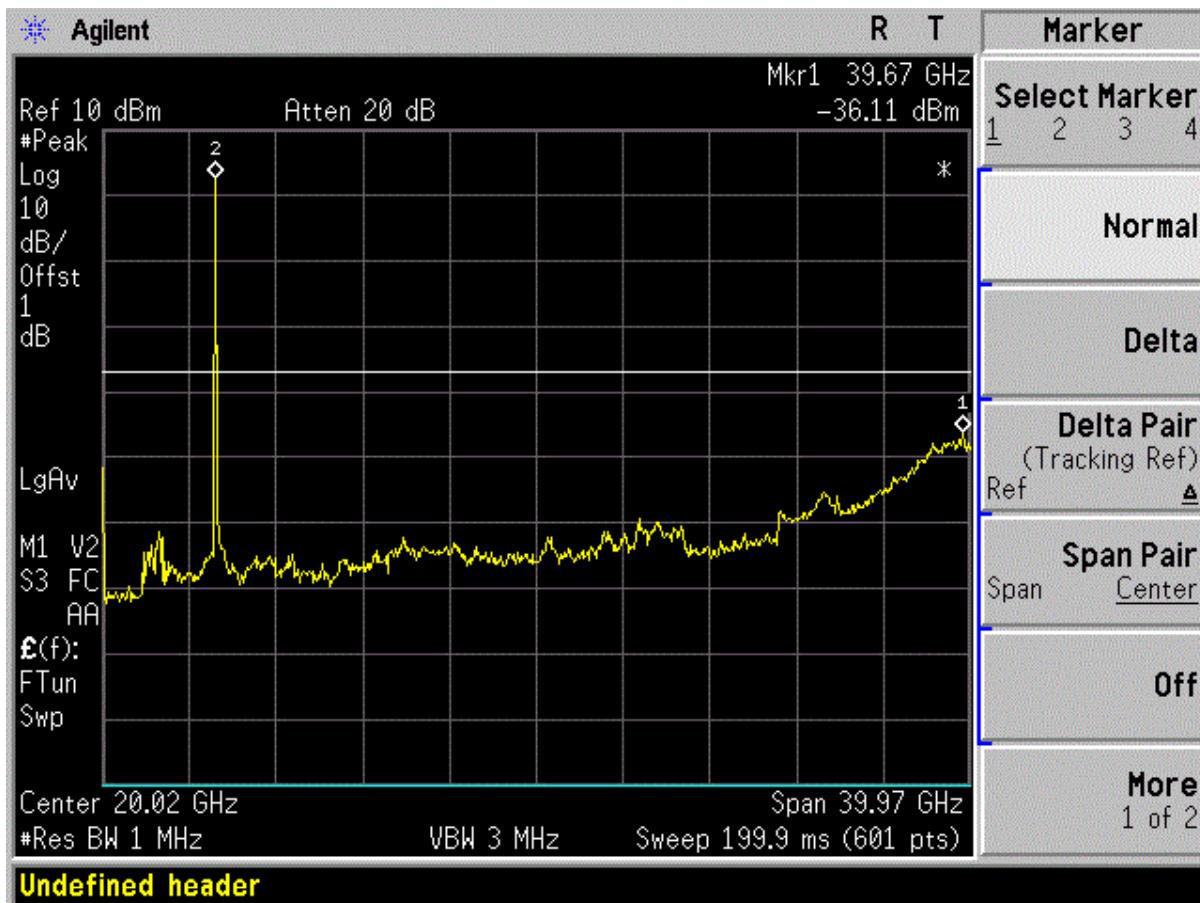
Conducted Undesirable Emission in 5190MHz – Ant 2



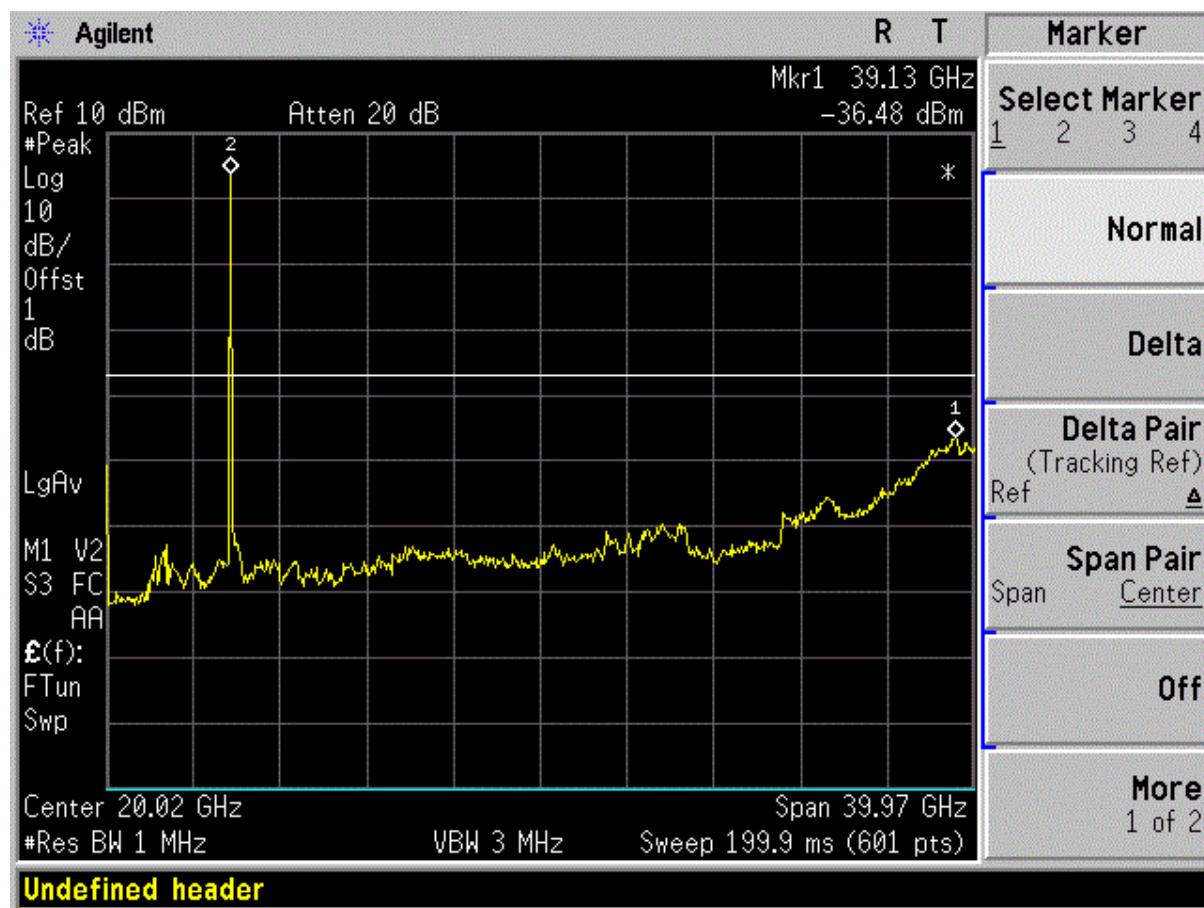
Conducted Undesirable Emission in 5230MHz – Ant 1



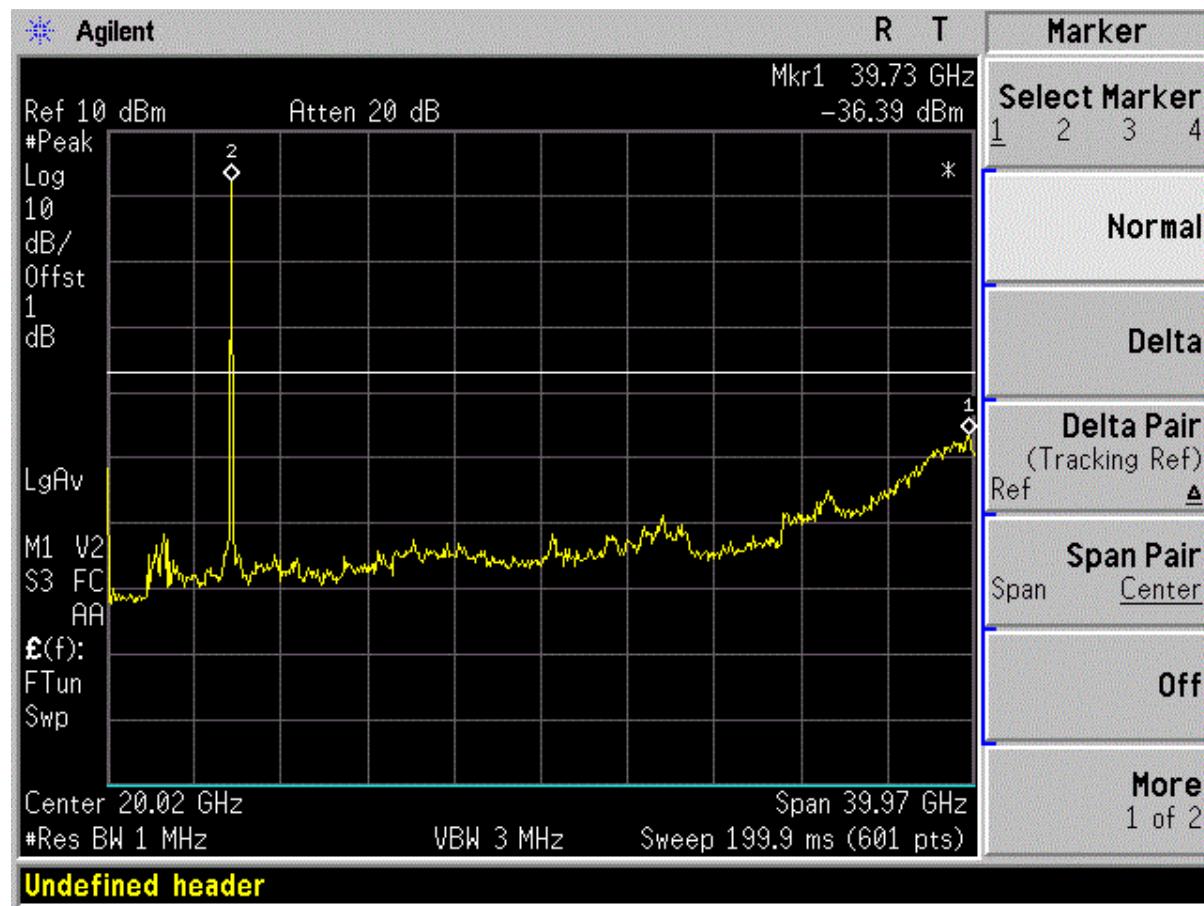
Conducted Undesirable Emission in 5230MHz – Ant 2



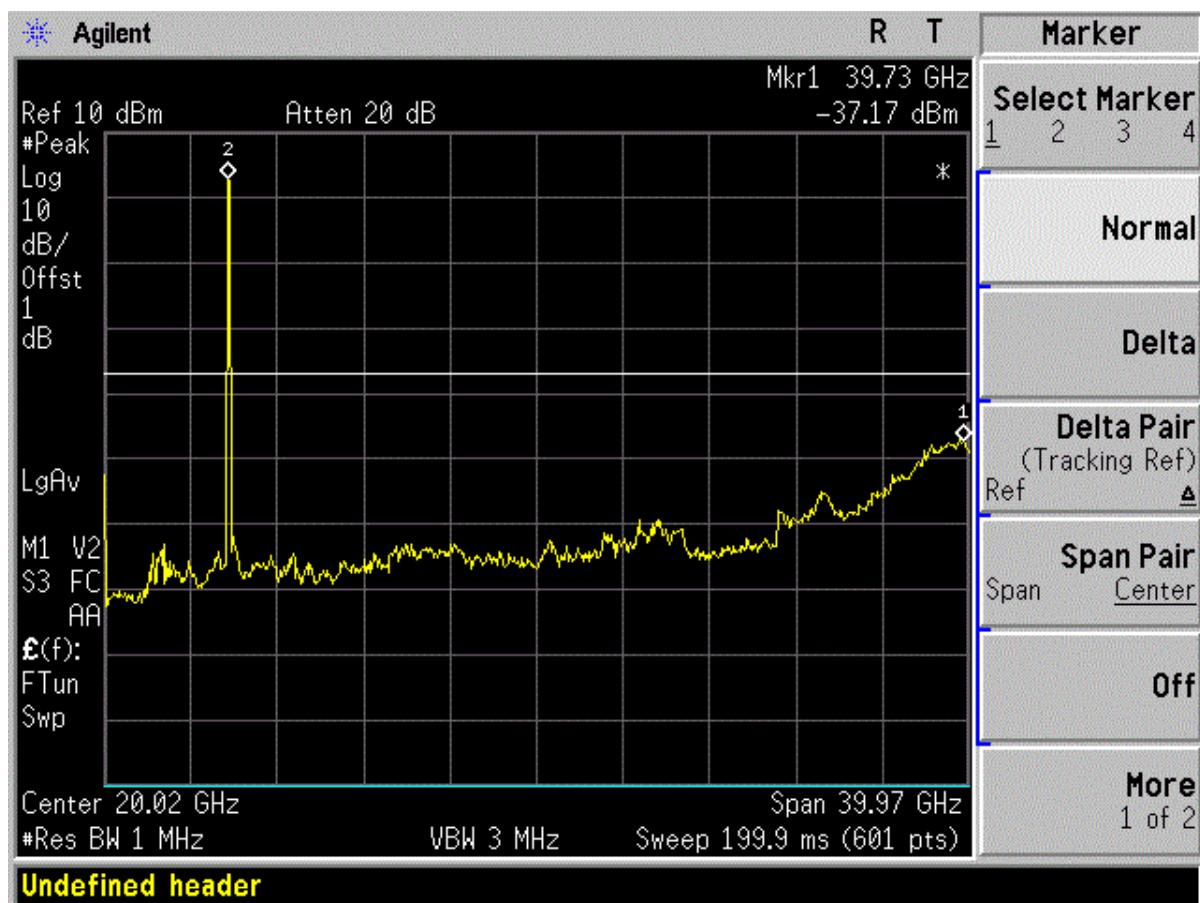
Conducted Undesirable Emission in 5755MHz – Ant 1



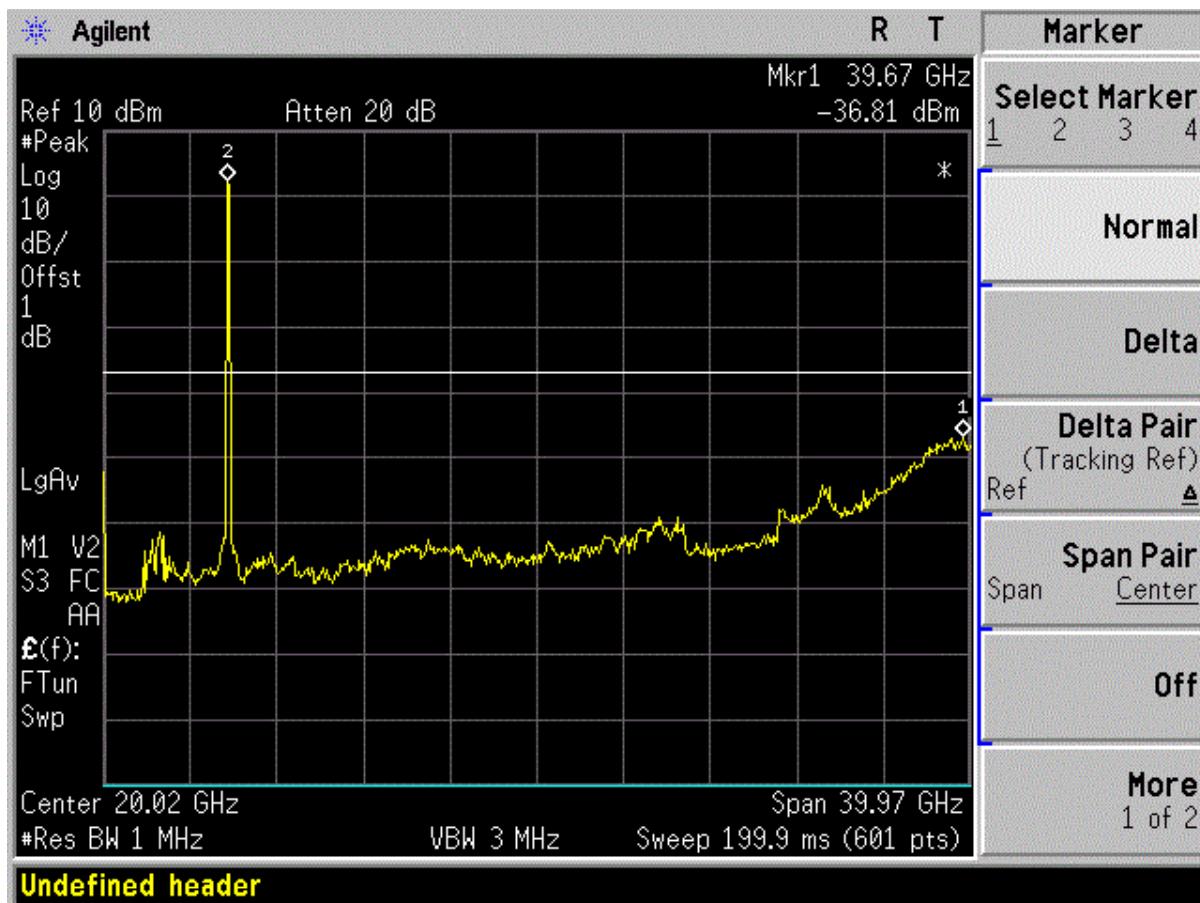
Conducted Undesirable Emission in 5755MHz – Ant 2



Conducted Undesirable Emission in 5795MHz – Ant 1



Conducted Undesirable Emission in 5795MHz – Ant 2

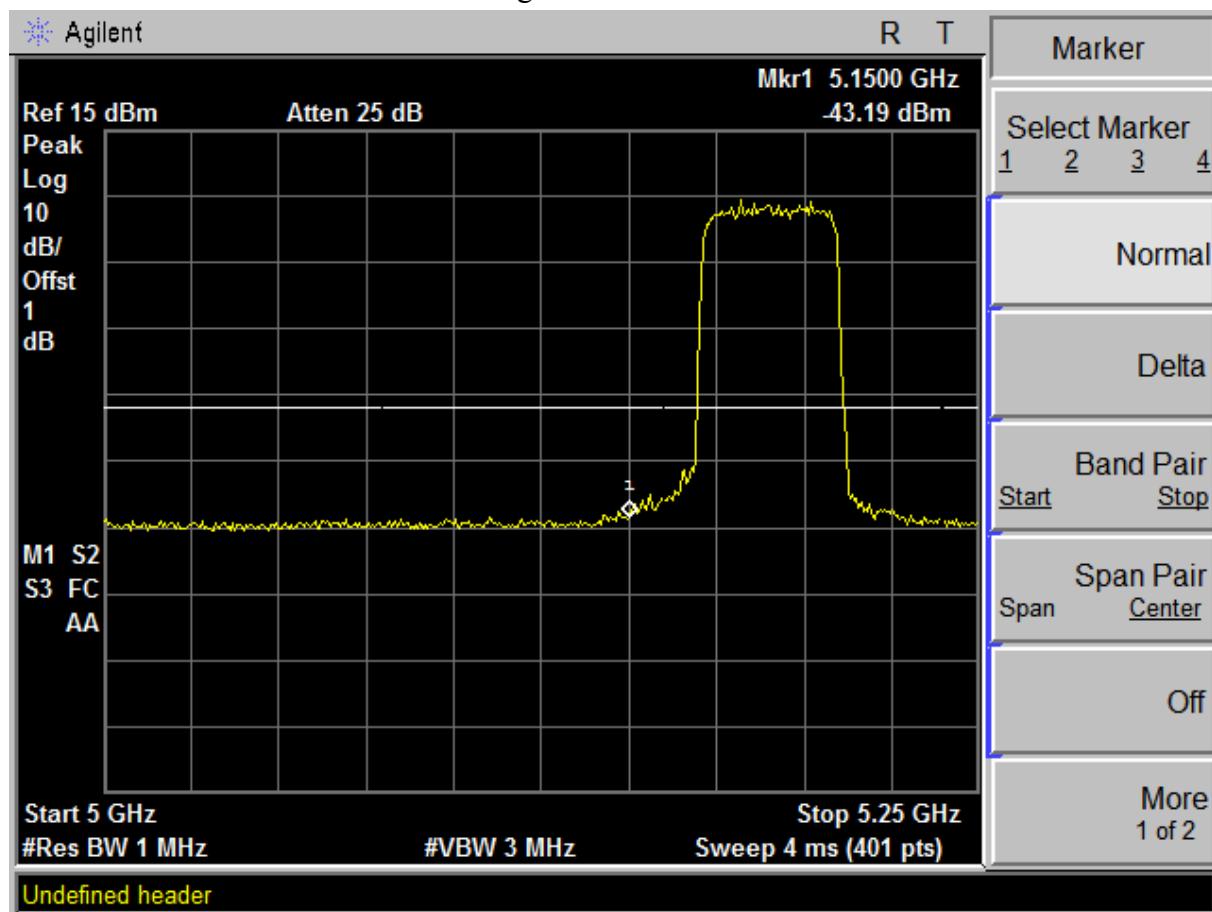


2.2.4.3. Band Edge

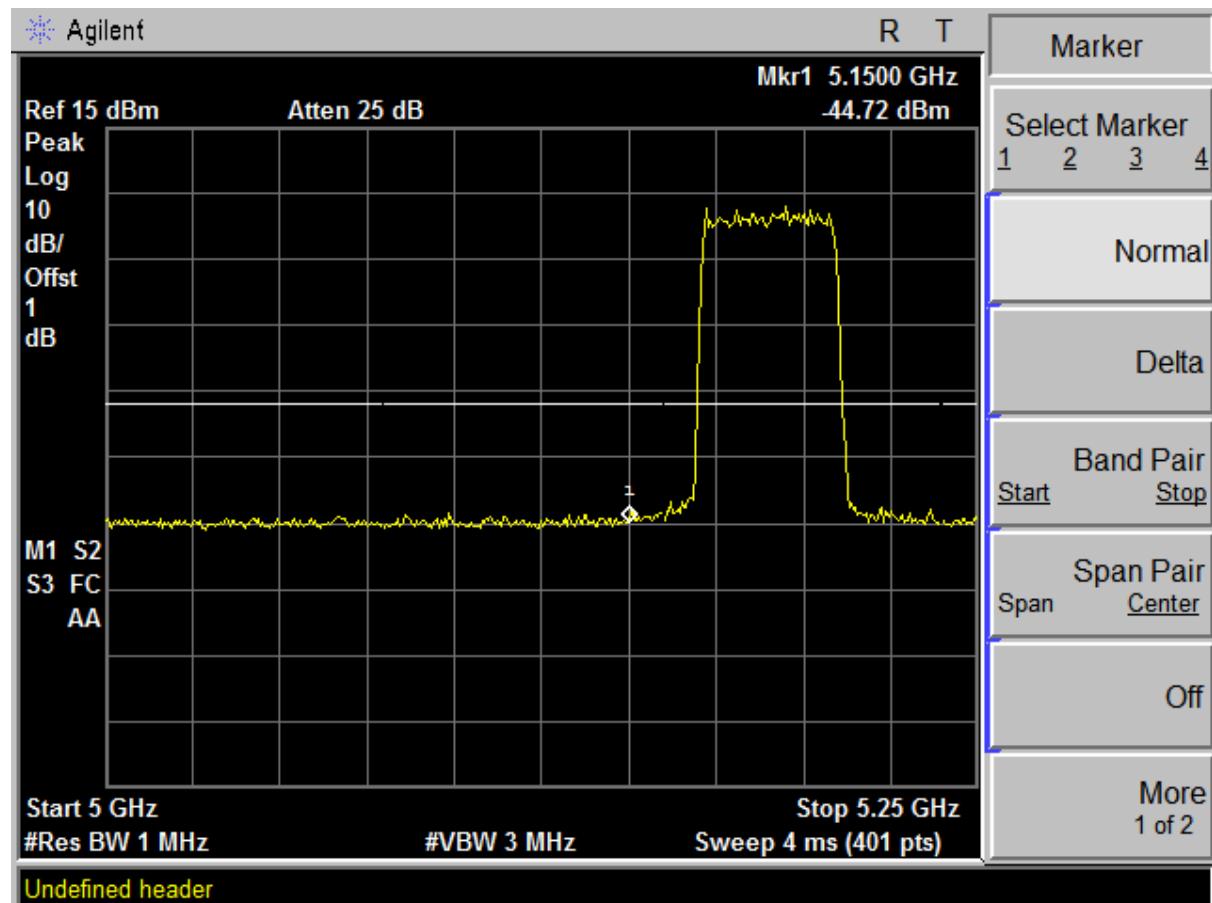
Frequency (GHz)	Max Peak (dBm)	RBW (MHz)	Margin (dB)	Limit (dBm)
Operating in 5190 – Ant 1				
5.15	-43.19	1	16.19	-27
Operating in 5190 – Ant 2				
5.15	-44.72	1	17.72	-27
Operating in 5230 – Ant 1				
5.35	-44.27	1	17.27	-27
Operating in 5230 – Ant 2				
5.35	-45.48	1	18.48	-27
Operating in 5755 – Ant 1				
5.715	-40.95	1	23.95	-17
5.725	-40.82	1	13.82	-27
Operating in 5755 – Ant 2				
5.715	-42.66	1	25.66	-17
5.725	-42.85	1	15.85	-27
Operating in 5795 – Ant 1				
5.825	-36.54	1	19.54	-17
5.835	-44.68	1	17.68	-27
Operating in 5795 – Ant 2				
5.825	-35.95	1	18.95	-17
5.835	-38.19	1	11.19	-27

Verdict: Pass

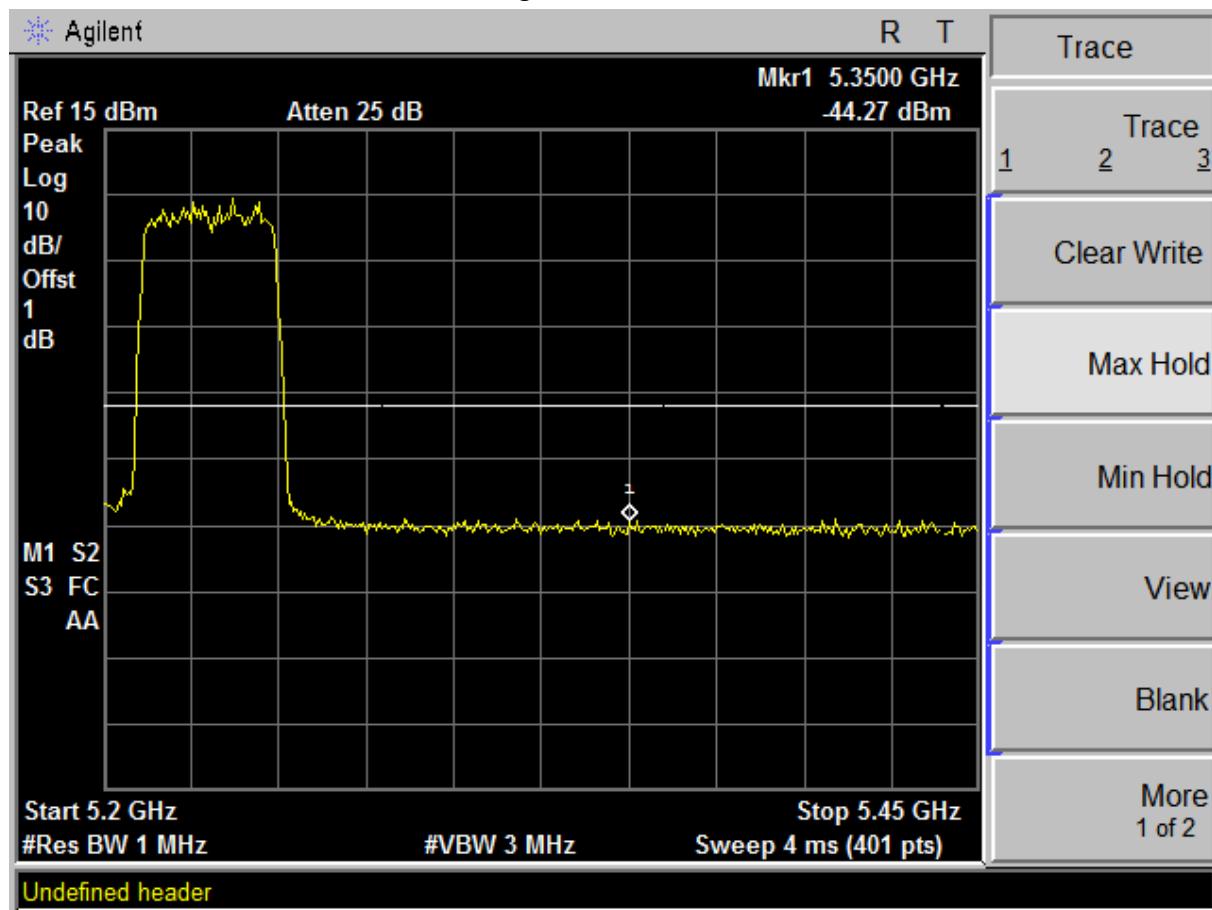
Band Edge in 5190MHz – Ant 1



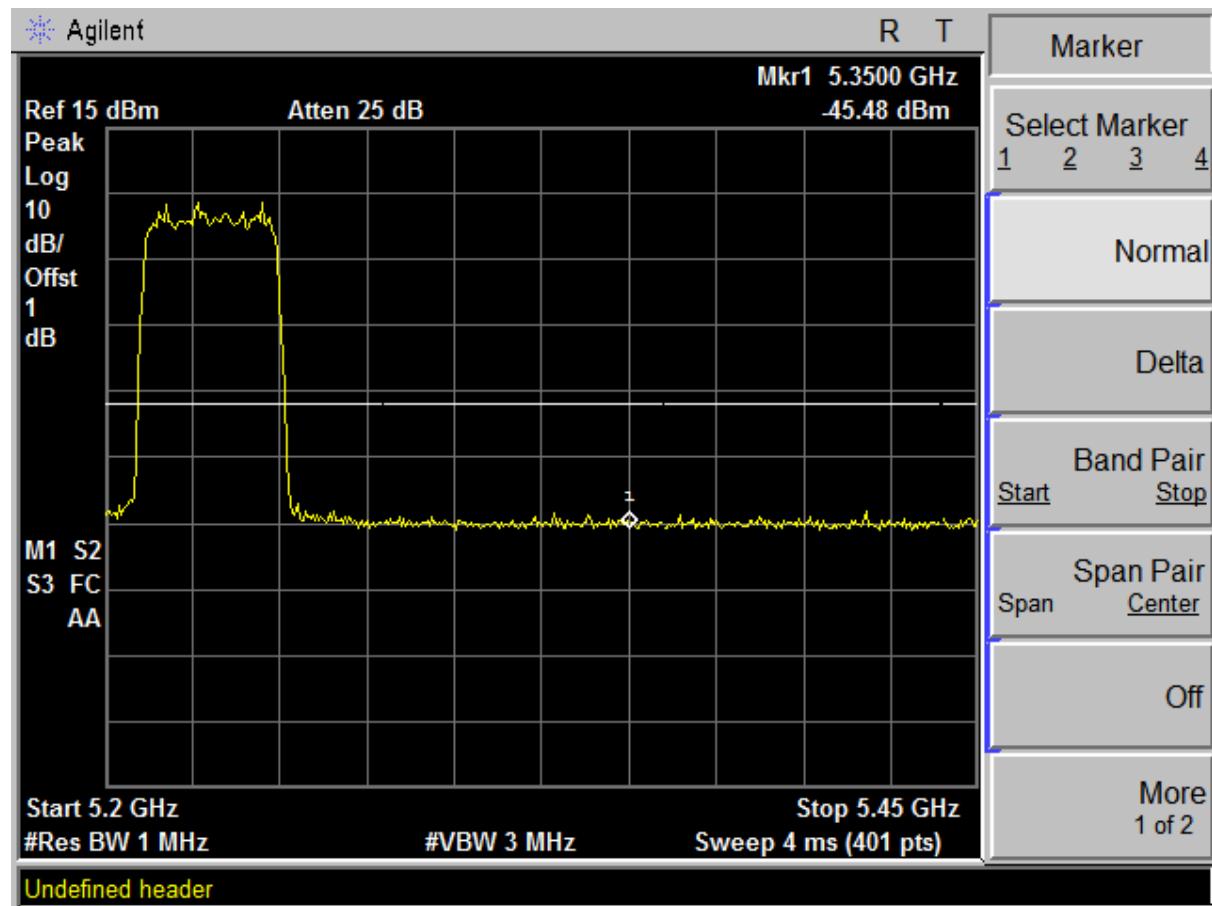
Band Edge in 5190MHz – Ant 2



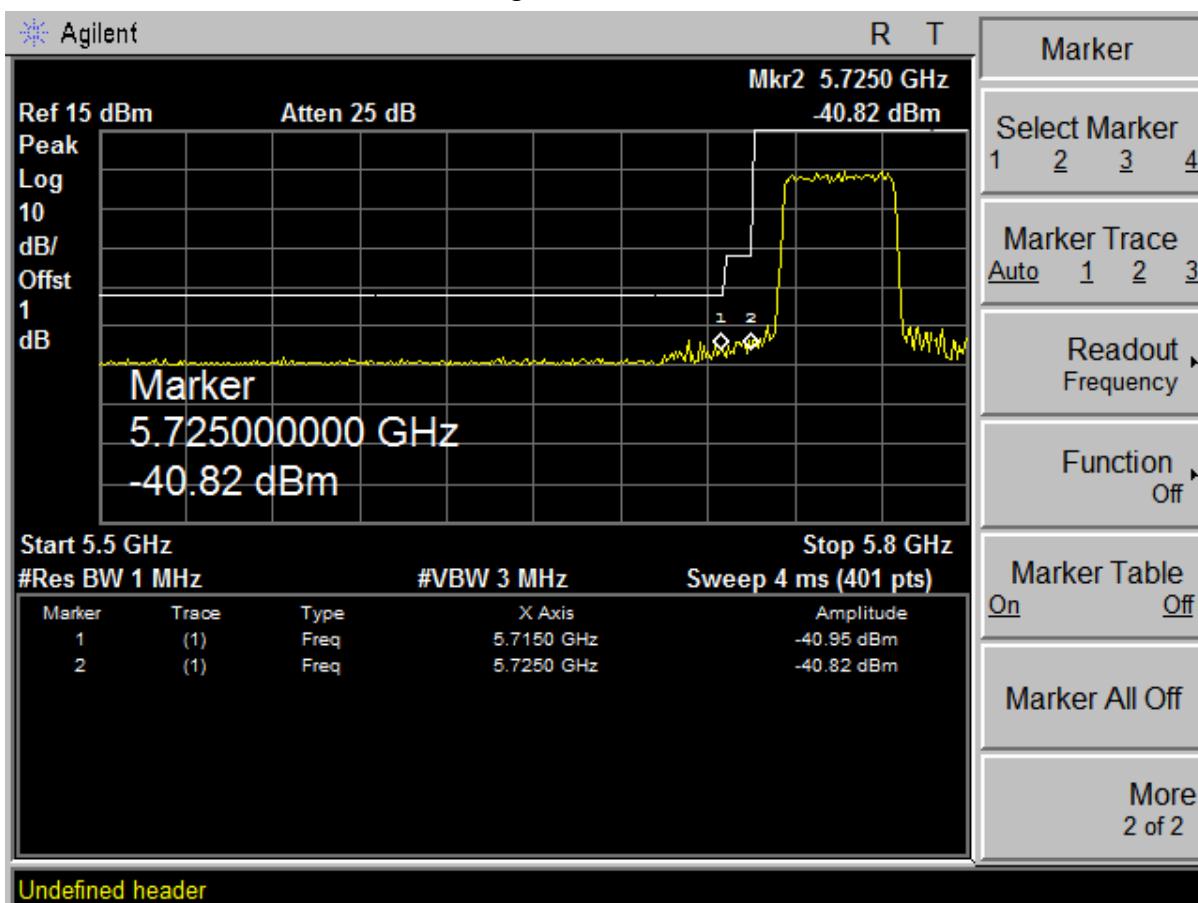
Band Edge in 5230MHz – Ant 1



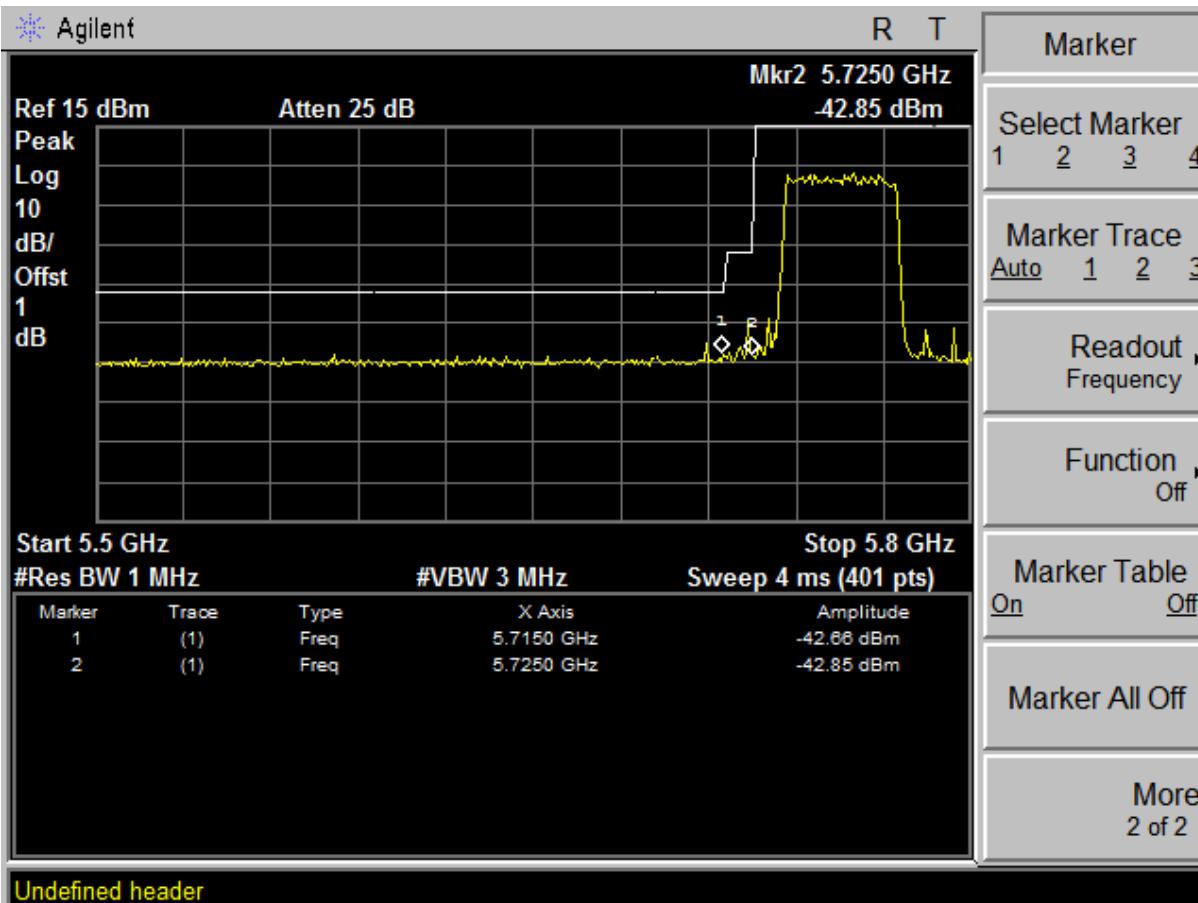
Band Edge in 5230MHz – Ant 2



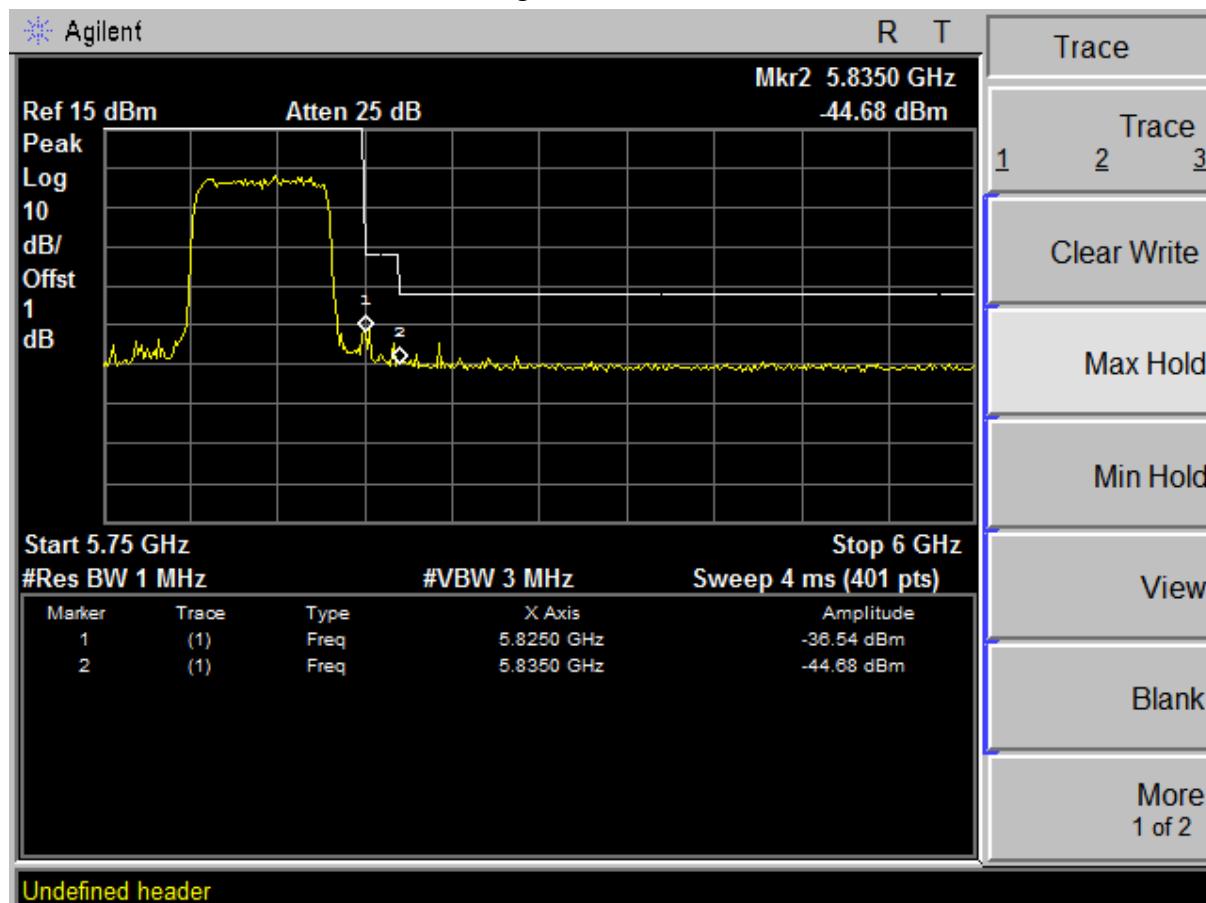
Band Edge in 5755MHz – Ant 1



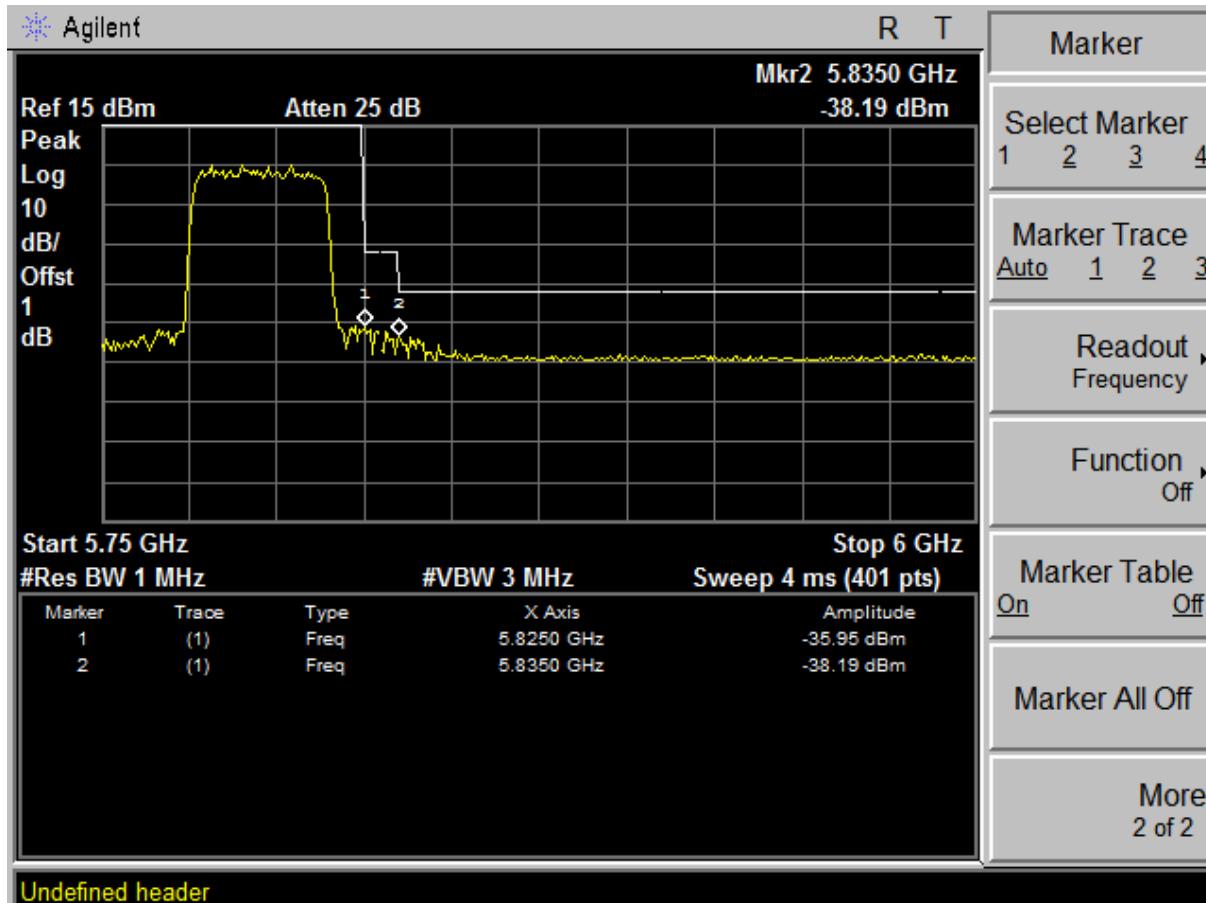
Band Edge in 5755MHz – Ant 2



Band Edge in 5795MHz – Ant 1



Band Edge in 5795MHz – Ant 2



2.3. FCC §15.407(a) & IC RSS-210 §A9.2 – 26dB Bandwidth and 99% Emission Bandwidth

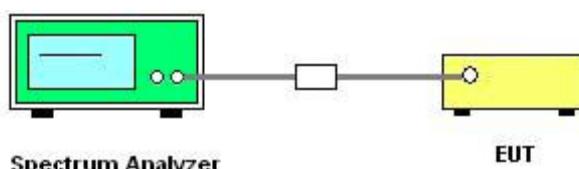
2.3.1. Definition

According to FCC section 15.407(a) (1, 3), 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 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the –26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, 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. For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, 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.

According to RSS -210 §A9.2, for the band 5.15–5.25 GHz, The maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band. For the band 5.725–5.825 GHz, The maximum conducted output power shall not exceed 1.0 W or $17 + 10 \log_{10} B$ dBm, whichever power is less. The power spectral density shall not exceed 17 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

2.3.2. Test Description

A. Test Setup:



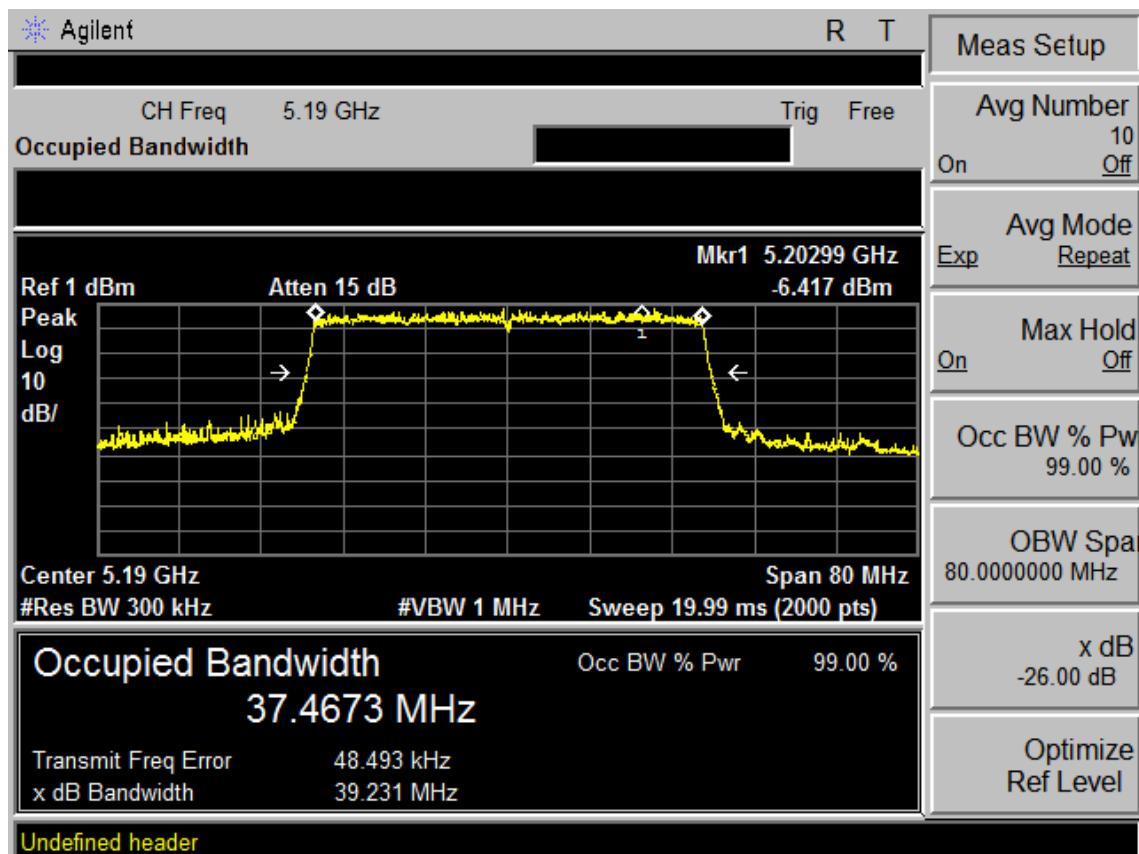
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	HP	E4407B	US39010211	2012.12

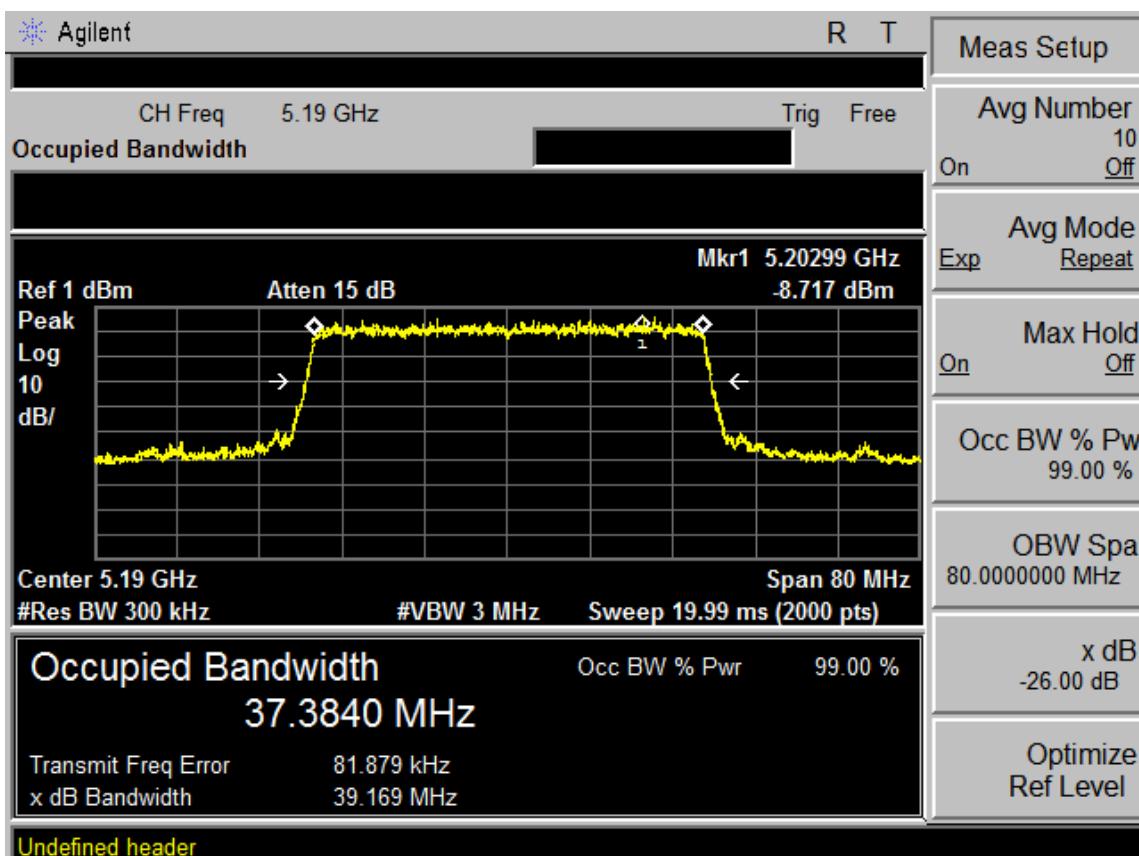
2.3.3. Test Result

Frequency Band (MHz)	Frequency (MHz)	Ant	-26 dB Bandwidth (MHz)	99% Emission Bandwidth (MHz)
5150~5250	5190	1	39.23	37.43
		2	39.17	37.38
	5230	1	39.24	37.38
		2	39.34	37.43
5725~5825	5755	1	39.24	37.42
		2	39.19	37.44
	5795	1	39.32	37.47
		2	39.21	37.35

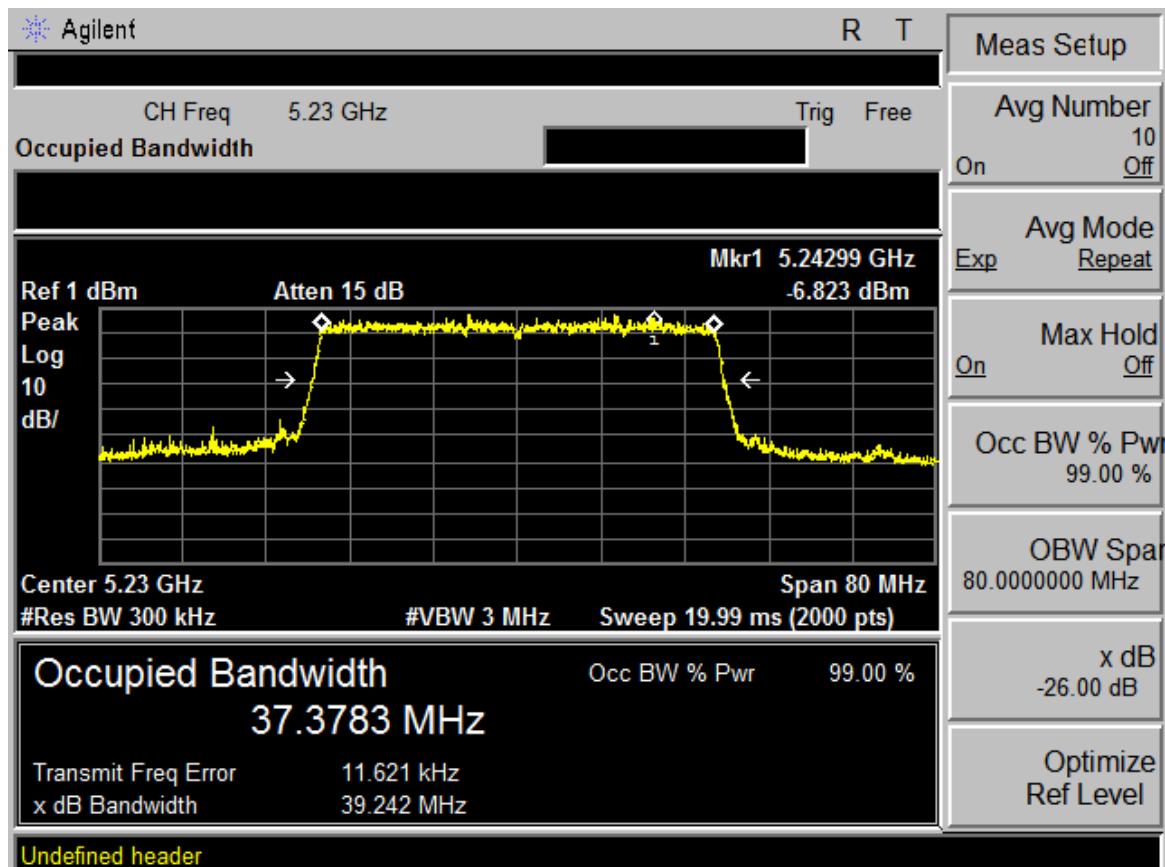
-26dB Bandwidth and 99% Emission Bandwidth in 5190MHz – Ant 1



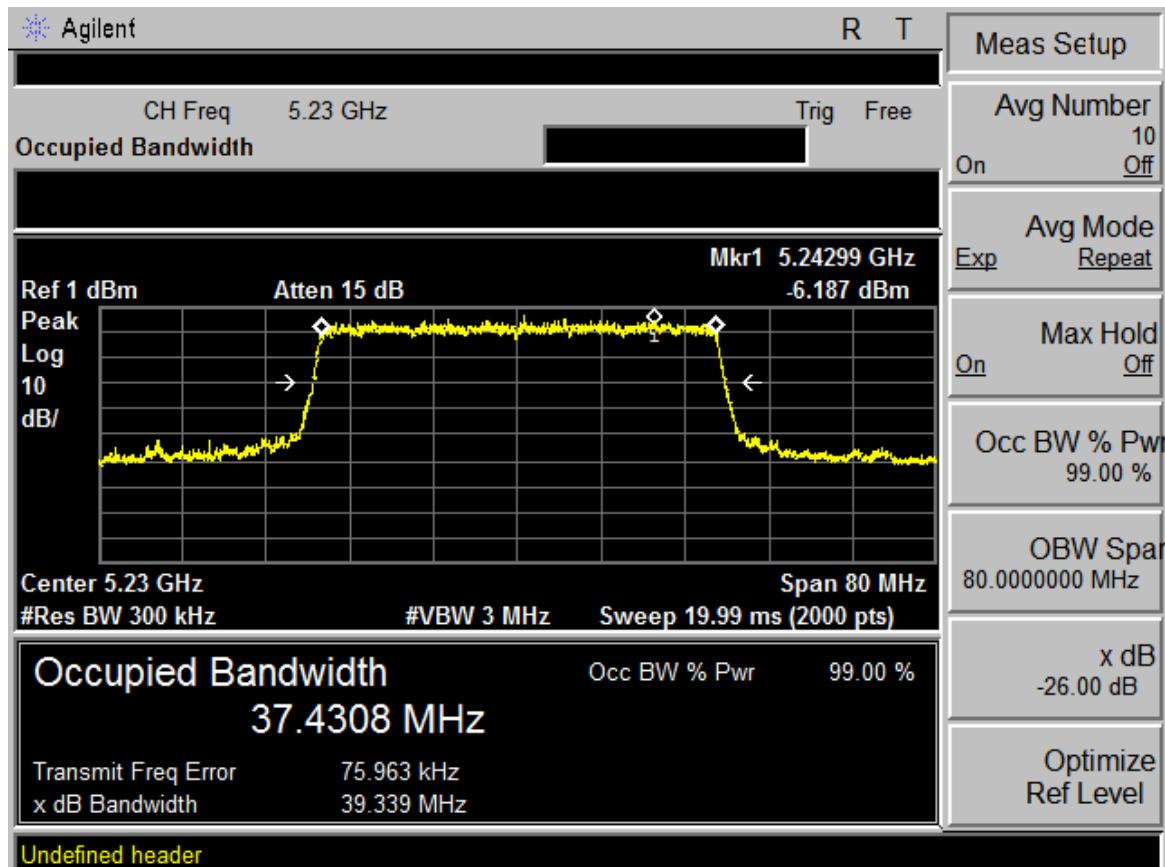
-26dB Bandwidth and 99% Emission Bandwidth in 5190MHz – Ant 2



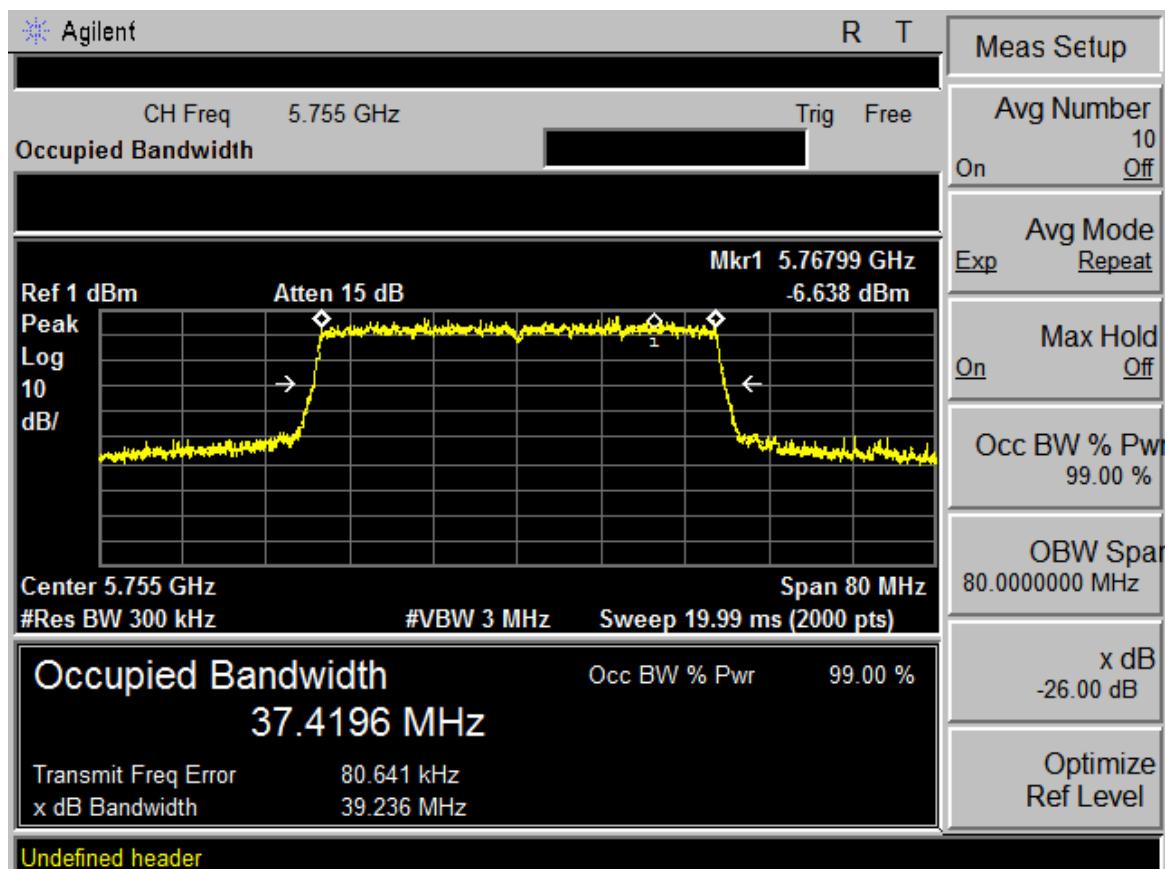
-26dB Bandwidth and 99% Emission Bandwidth in 5230MHz – Ant 1



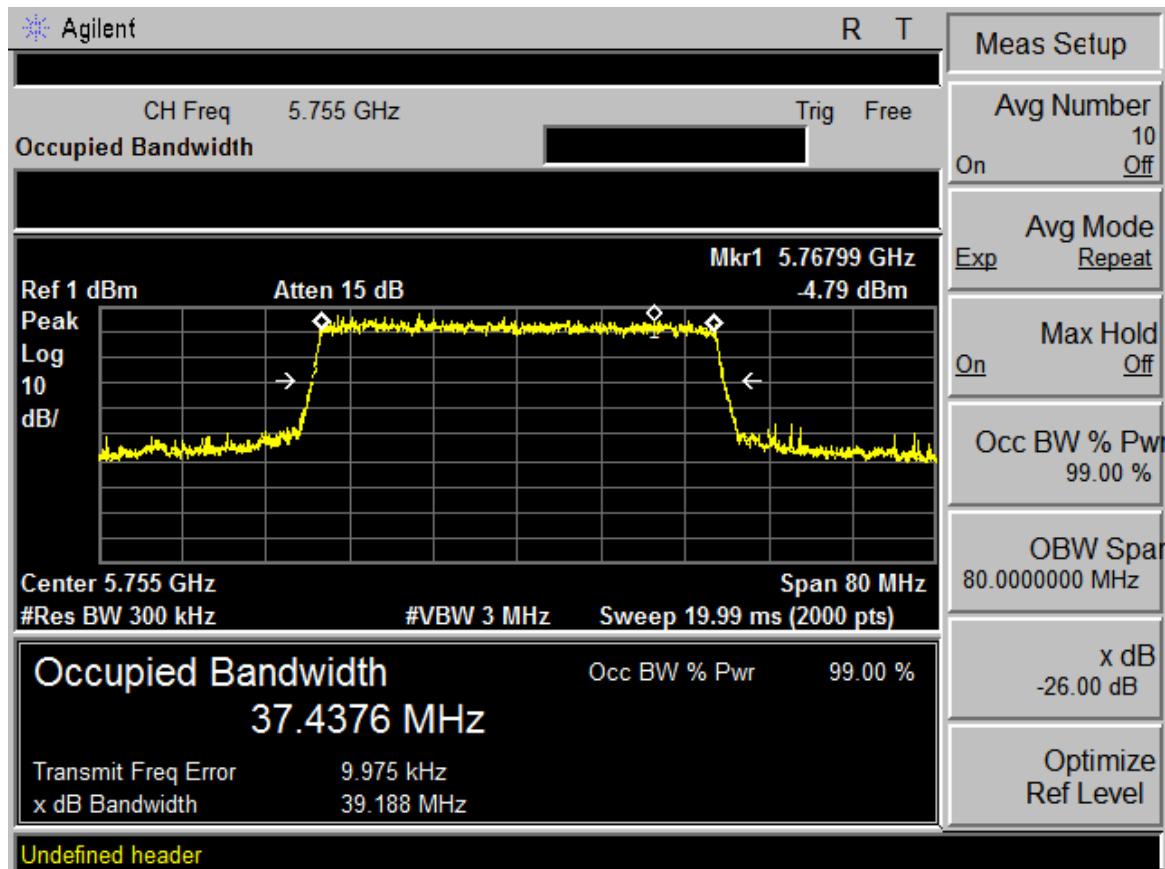
--26dB Bandwidth and 99% Emission Bandwidth in 5230MHz – Ant 2



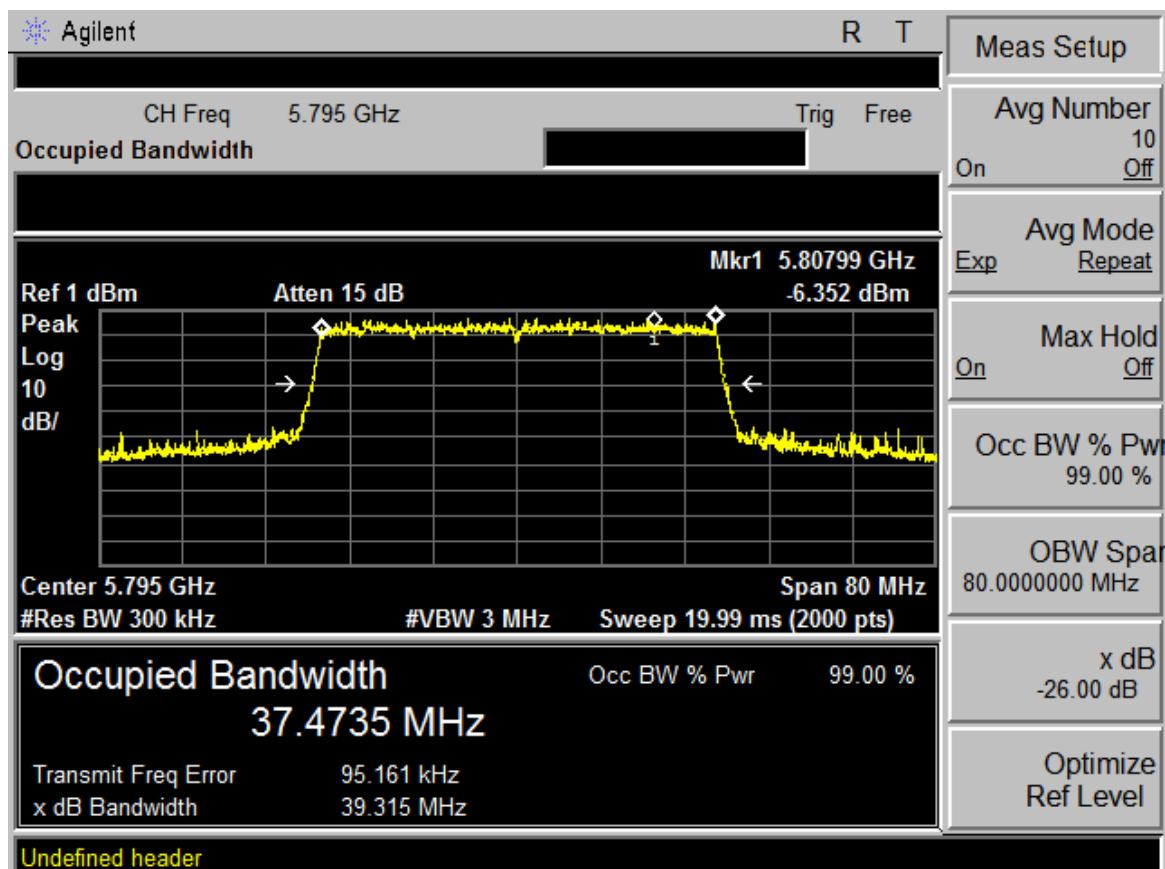
-26dB Bandwidth and 99% Emission Bandwidth in 5755MHz – Ant 1



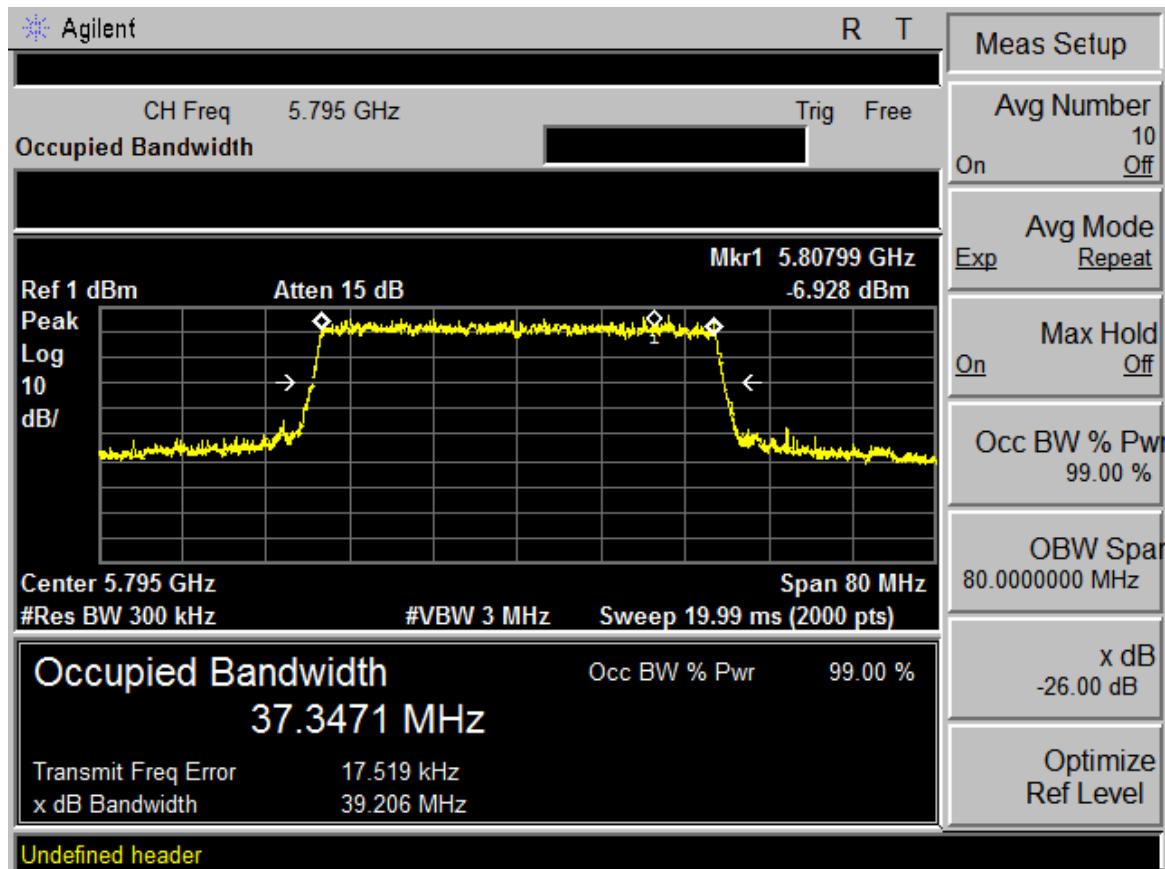
-26dB Bandwidth and 99% Emission Bandwidth in 5755MHz – Ant 2



-26dB Bandwidth and 99% Emission Bandwidth in 5795MHz – Ant 1



-26dB Bandwidth and 99% Emission Bandwidth in 5795MHz – Ant 2



2.4. FCC §407(a) & IC RSS – 210 §A9.2 - Peak Output Power

2.4.1. Requirement

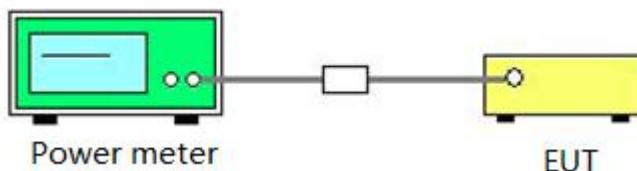
According to FCC section 15.407(a) (1, 3), for the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, 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. For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, 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.

According to IC RSS – 210 §A9.2, for the band 5.15-5.25GHz, The maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band. For the band, the maximum conducted output power shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 17 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

2.4.2. Test Description

According to KDB 789033 D01, maximum conducted output power will be measured by an RF power meter.

A. Test Setup:



B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Power meter	HP	EPM-441A	GB37482009	2013.02.

2.4.3. Test Result

Frequency Band (MHz)	Frequency (MHz)	Ant	Measured Peak Output Power		Total Power		FCC Limit dBm	IC Limit dBm		
			dBm	mW	mW	dBm				
5150~5250	5190	1	5.98	3.963	7.713	8.87	17	23		
		2	5.74	3.750						
	5230	1	6.36	4.325	8.371	9.23				
		2	6.07	4.046						
5725~5825	5755	1	6.44	4.406	9.073	9.58	30	30		
		2	6.69	4.667						
	5795	1	5.80	3.802	8.300	9.19				
		2	6.53	4.498						

Note: Duty cycle of the transmitter is 100%

Verdict: Pass

2.5. FCC §15.407(a) & IC RSS-210 §A9.2 - Power Spectral Density

2.5.1. Requirement

According to FCC section 15.407(a) (1, 3, and 5), 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 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, 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. For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, 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.

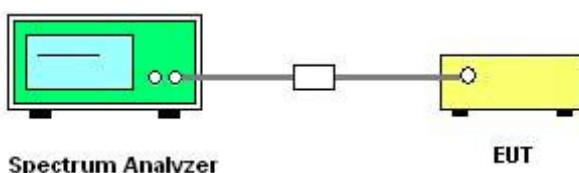
According to IC RSS-210 §A9.2, for the band 5.15–5.25 GHz, the e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band. For the band 5.725–5.825 GHz, the power spectral density shall not exceed 17 dBm in any 1.0 MHz band.

2.5.2. Test Description

According to KDB 789033 D01 part E, the Method SA-1 was used.

- (i) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- (ii) Set RBW = 1 MHz.
- (iii) Set VBW ≥ 3 MHz.
- (iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
- (v) Sweep time = auto.
- (vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

A. Test Setup:



B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	HP	E4407B	US39010211	2012.12

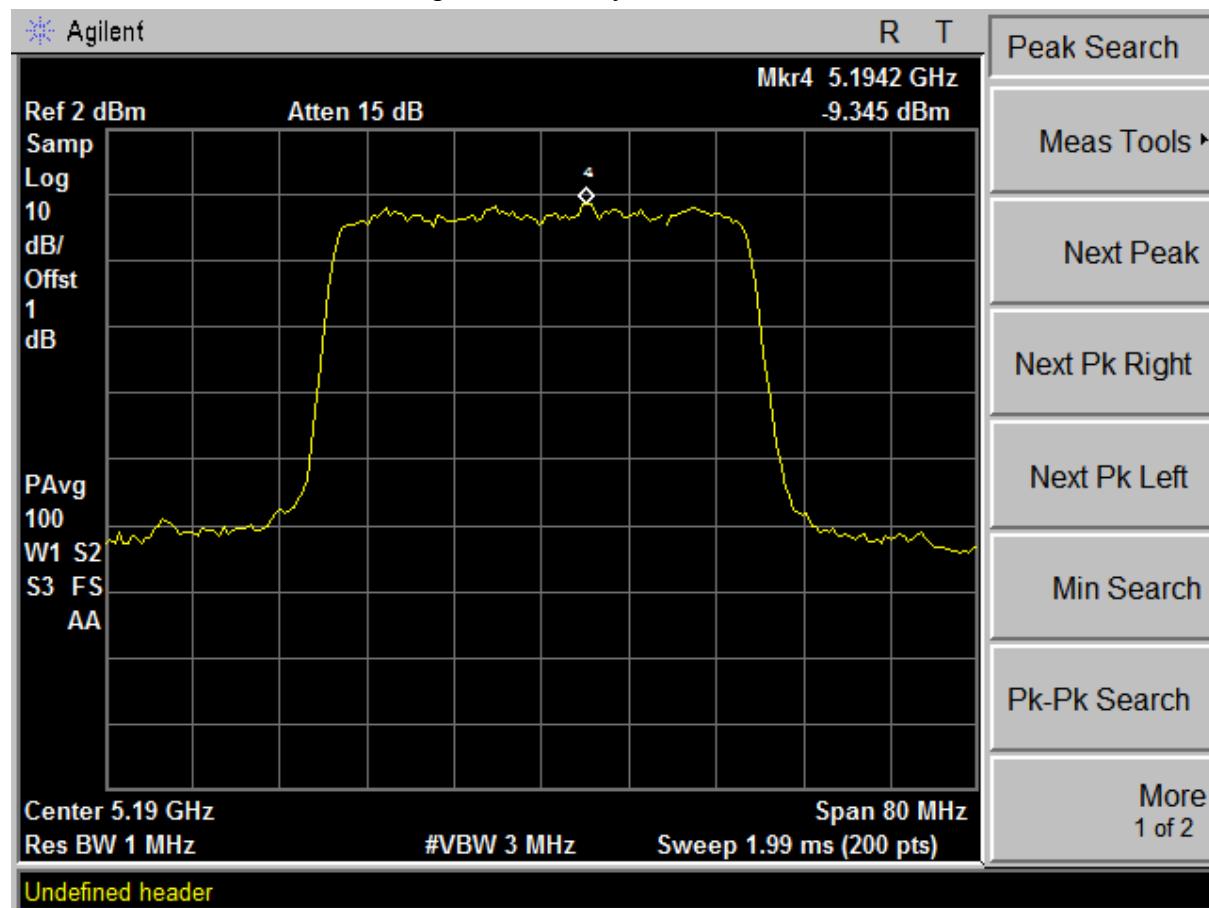
2.5.3. Test Result

Frequency Band	Frequency	Ant	Measured Spectral power density		Total Power density		FCC Limit	IC Limit		
			dBm/MHz	mW/MHz	mW/MHz	dBm/MHz				
MHz	MHz									
5150~5250	5190	1	-9.35	0.116	0.220	-6.57	4	10		
		2	-9.82	0.104						
	5230	1	-8.95	0.127	0.243	-6.14				
		2	-9.34	0.116						
5725~5825	5755	1	-8.88	0.129	0.279	-5.54	17	10		
		2	-8.24	0.150						
	5795	1	-9.21	0.120	0.270	-5.68				
		2	-8.23	0.150						

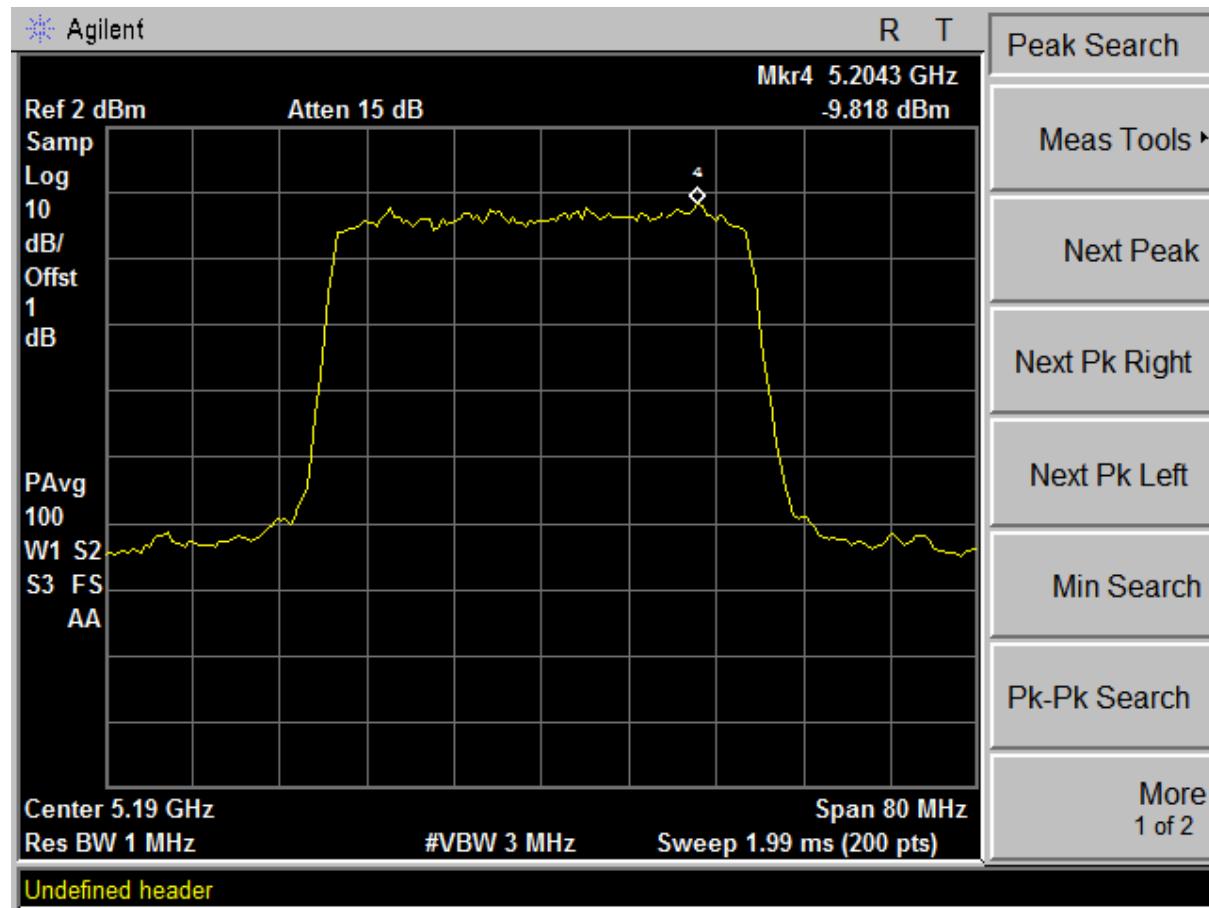
Note: Duty cycle of the transmitter is 100%

Verdict: Pass

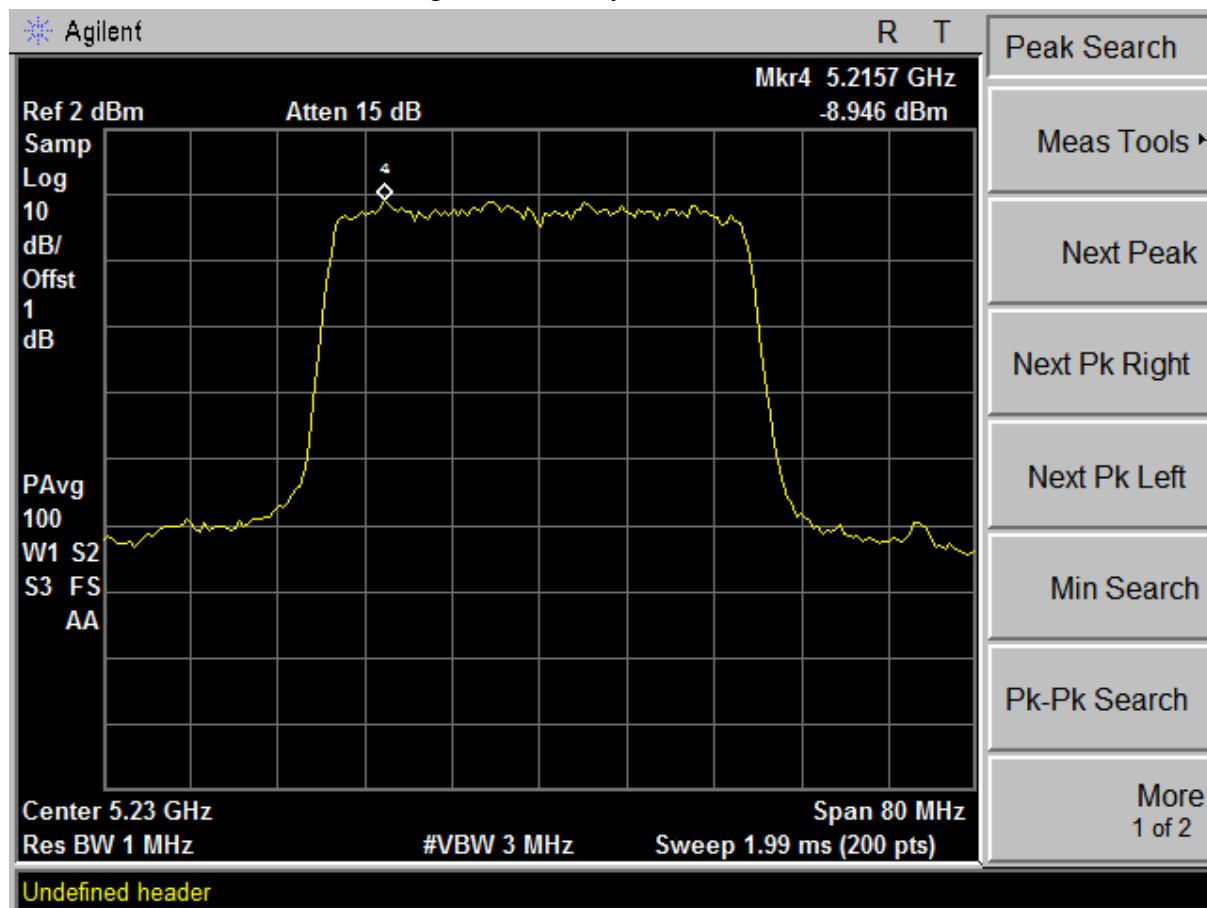
Power Spectral Density in 5190MHz – Ant 1



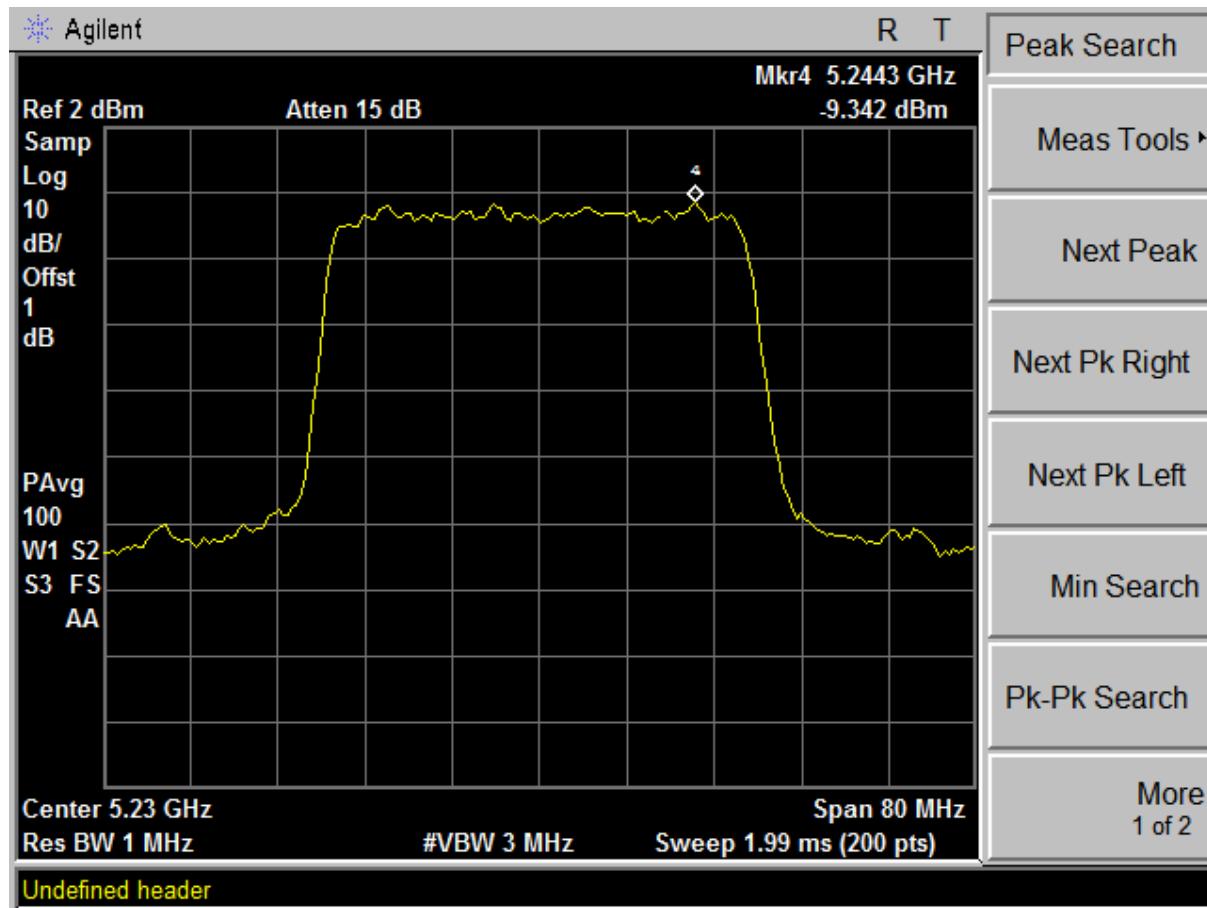
Power Spectral Density in 5190MHz – Ant 2



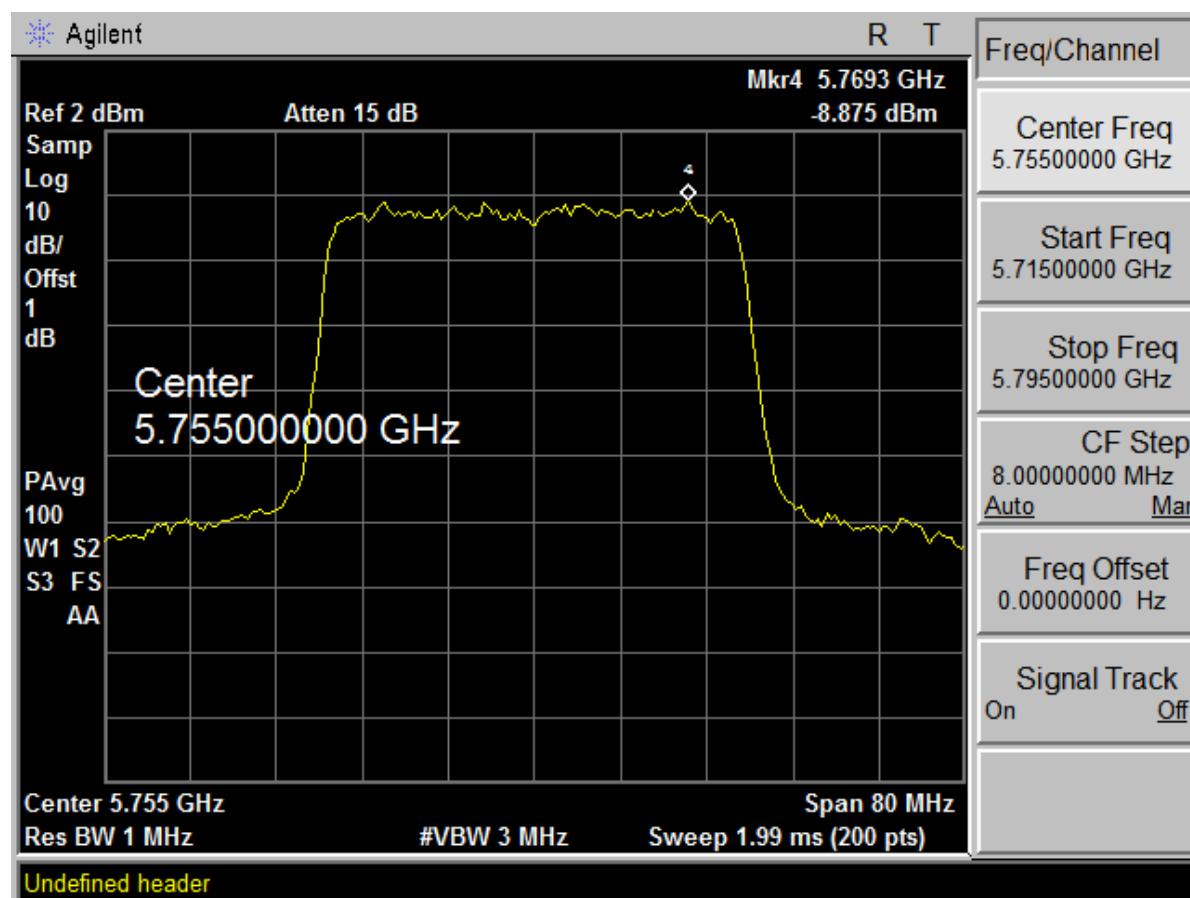
Power Spectral Density in 5230MHz – Ant 1



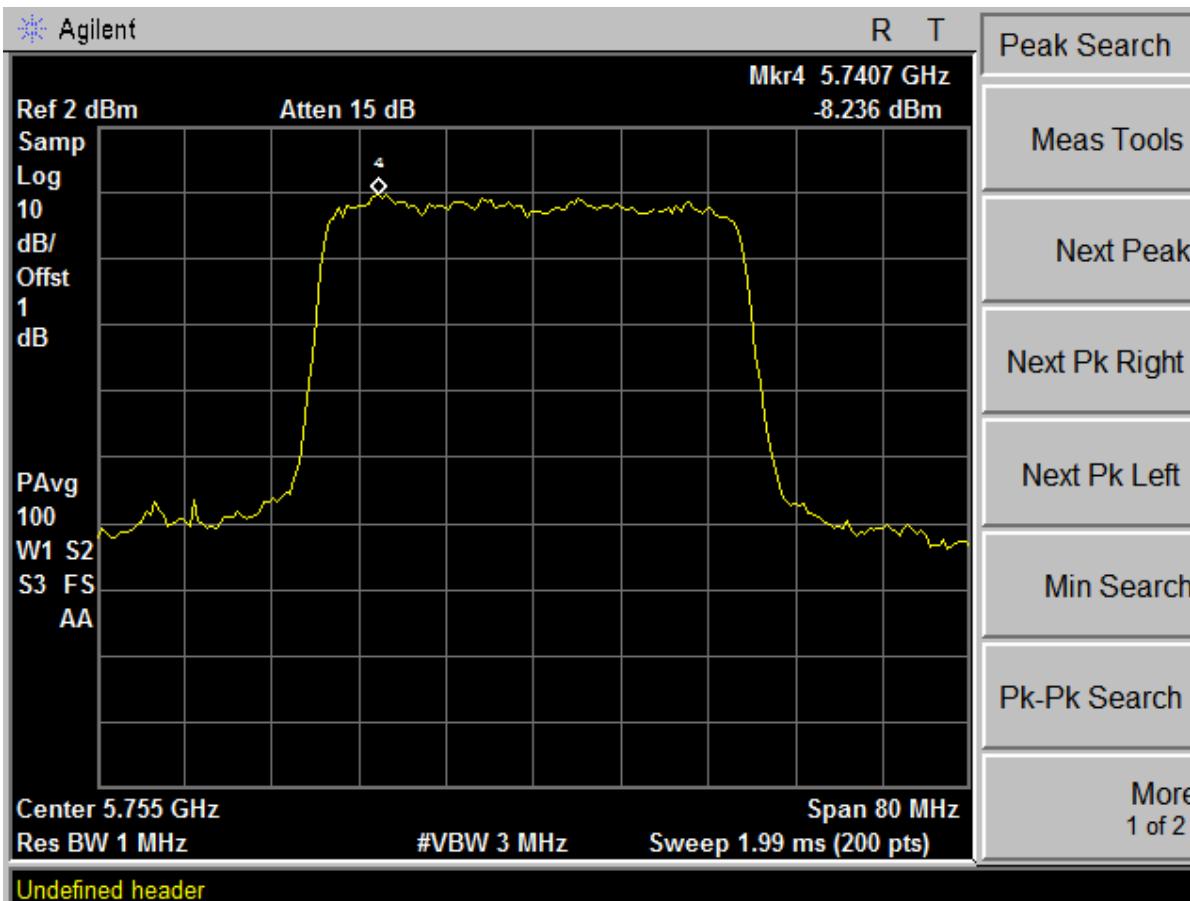
Power Spectral Density in 5230MHz – Ant 2



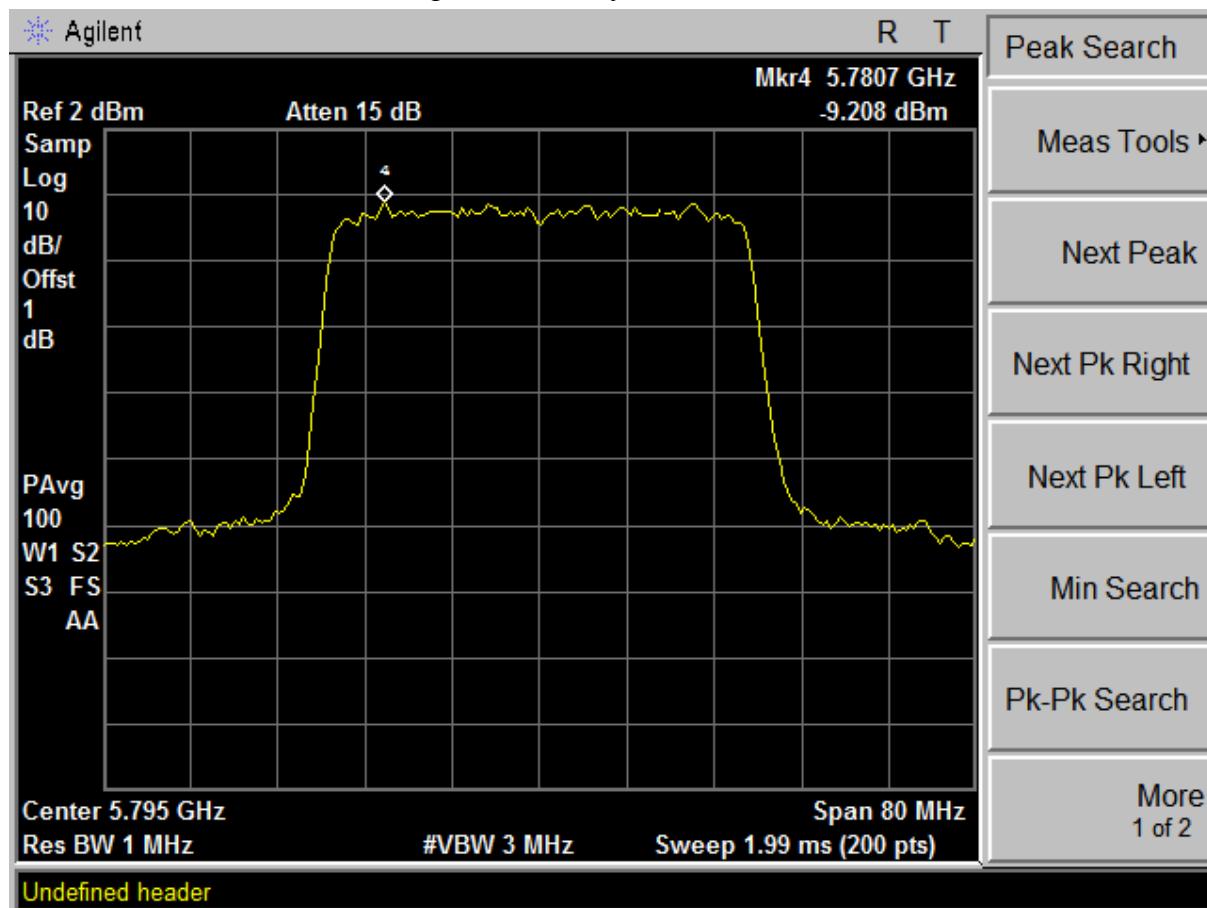
Power Spectral Density in 5755MHz – Ant 1



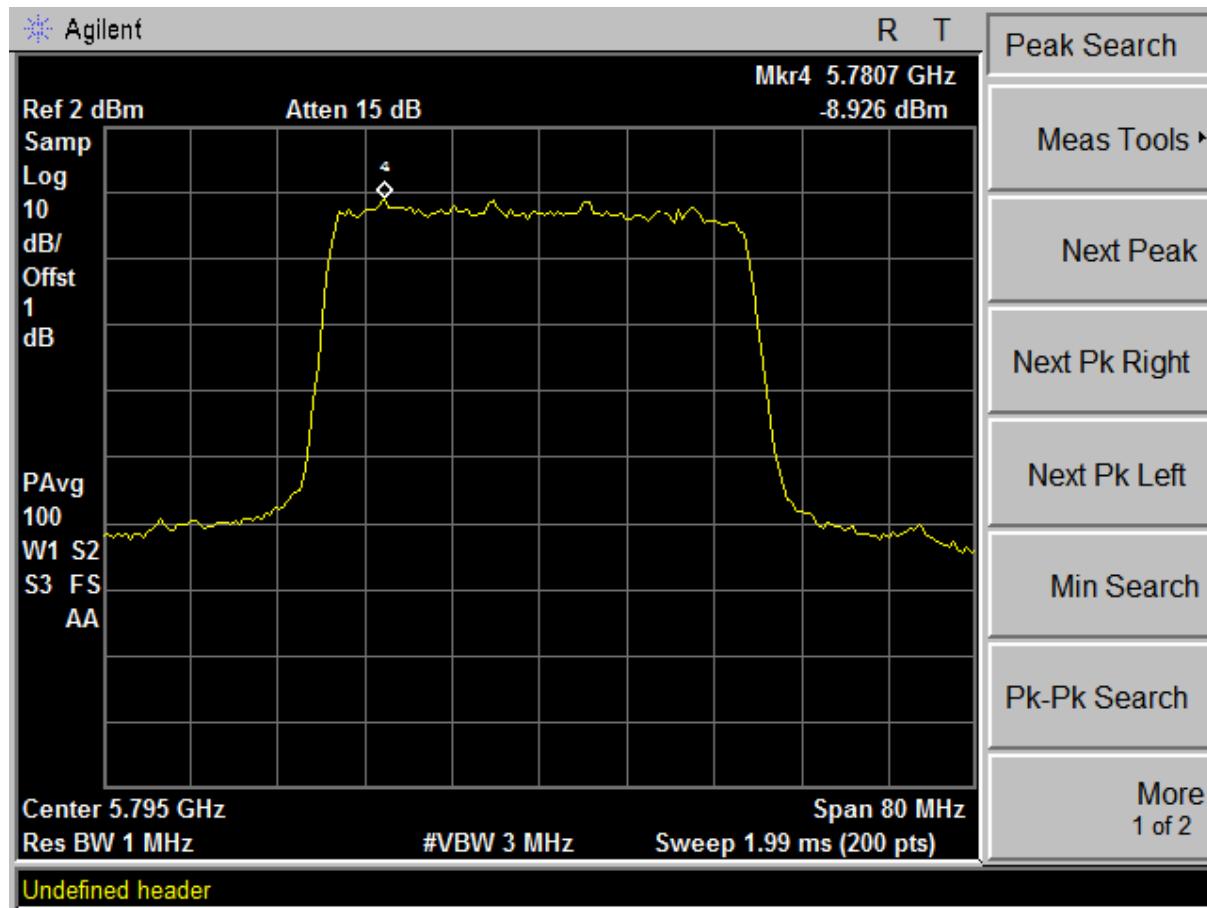
Power Spectral Density in 5755MHz – Ant 2



Power Spectral Density in 5795MHz – Ant 1



Power Spectral Density in 5795MHz – Ant 2



2.6. FCC §15.407(a)(6) - Peak Excursion Ratio

2.6.1. Requirement

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

2.6.2. Test Description

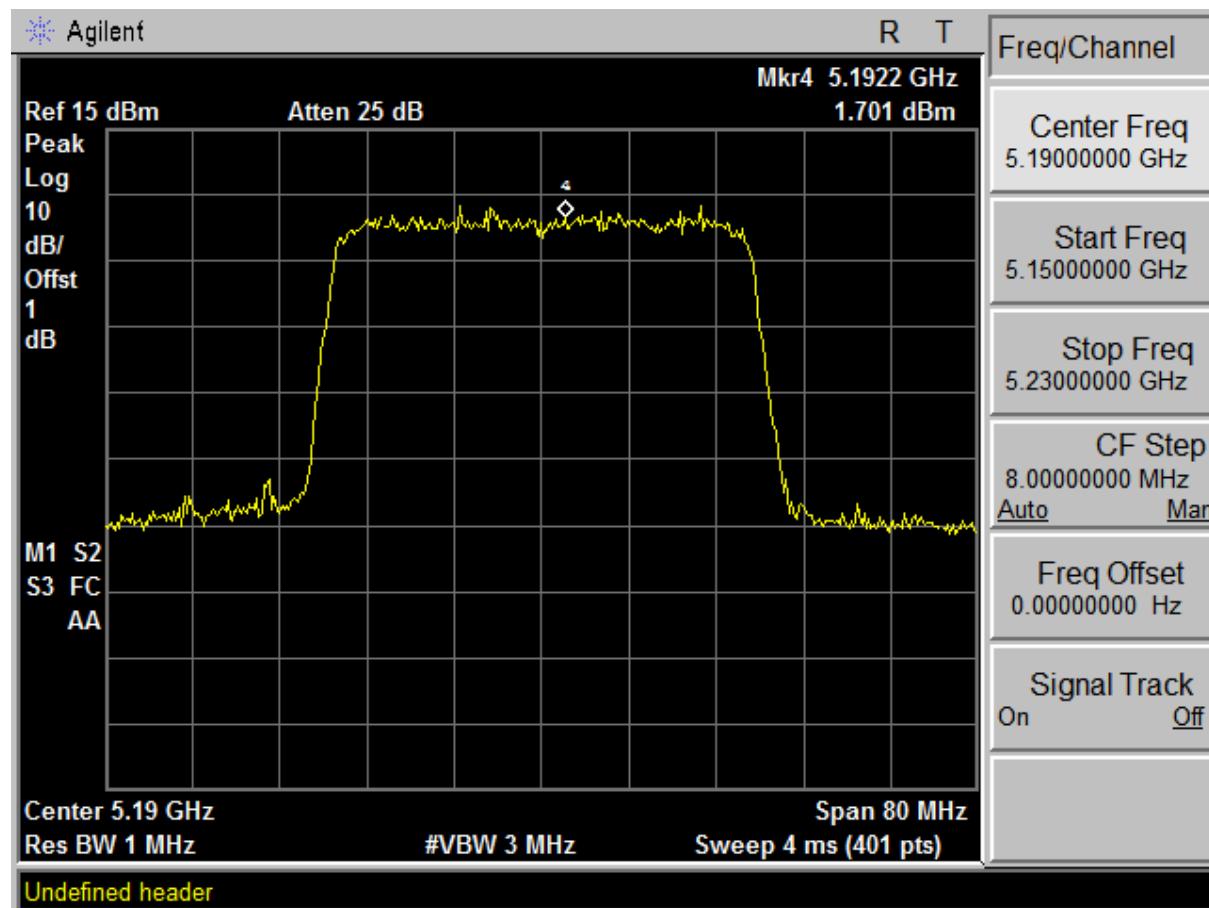
See section 2.4.2 of this report.

2.6.3. Test Result

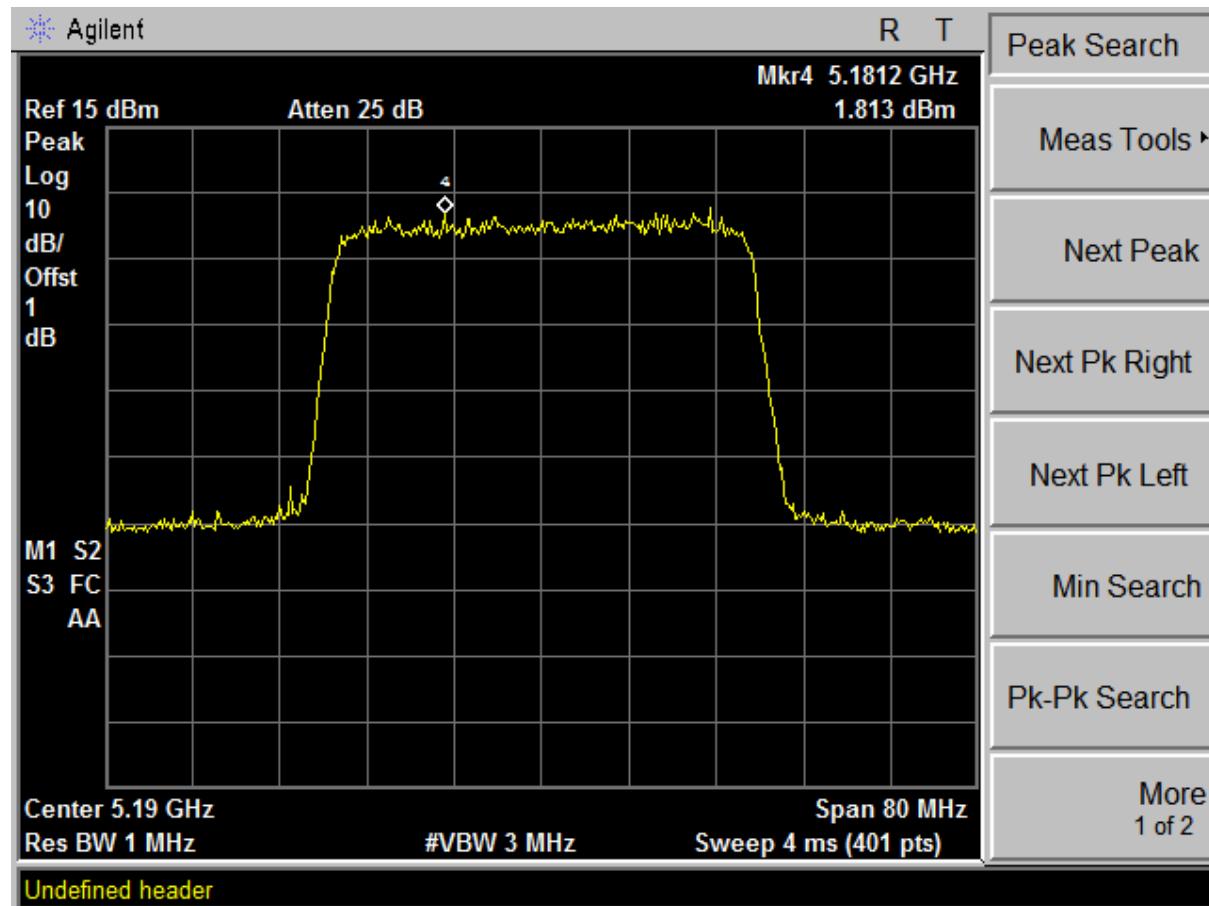
Frequency Band (MHz)	Frequency (MHz)	Ant	PPSD	Maximum of Peak-max-hold	Measured Peak Excursion Ratio	Limit dB
			dBm/MHz	dBm/MHz	dB	
5150~5250	5190	1	-9.35	1.70	11.05	13
		2	-9.82	1.81	11.63	
	5230	1	-8.95	2.78	11.73	
		2	-9.34	1.21	10.55	
5725~5825	5755	1	-8.88	2.25	11.13	13
		2	-8.24	2.97	11.21	
	5795	1	-9.21	2.16	11.37	
		2	-8.23	2.59	10.82	

Verdict: Pass

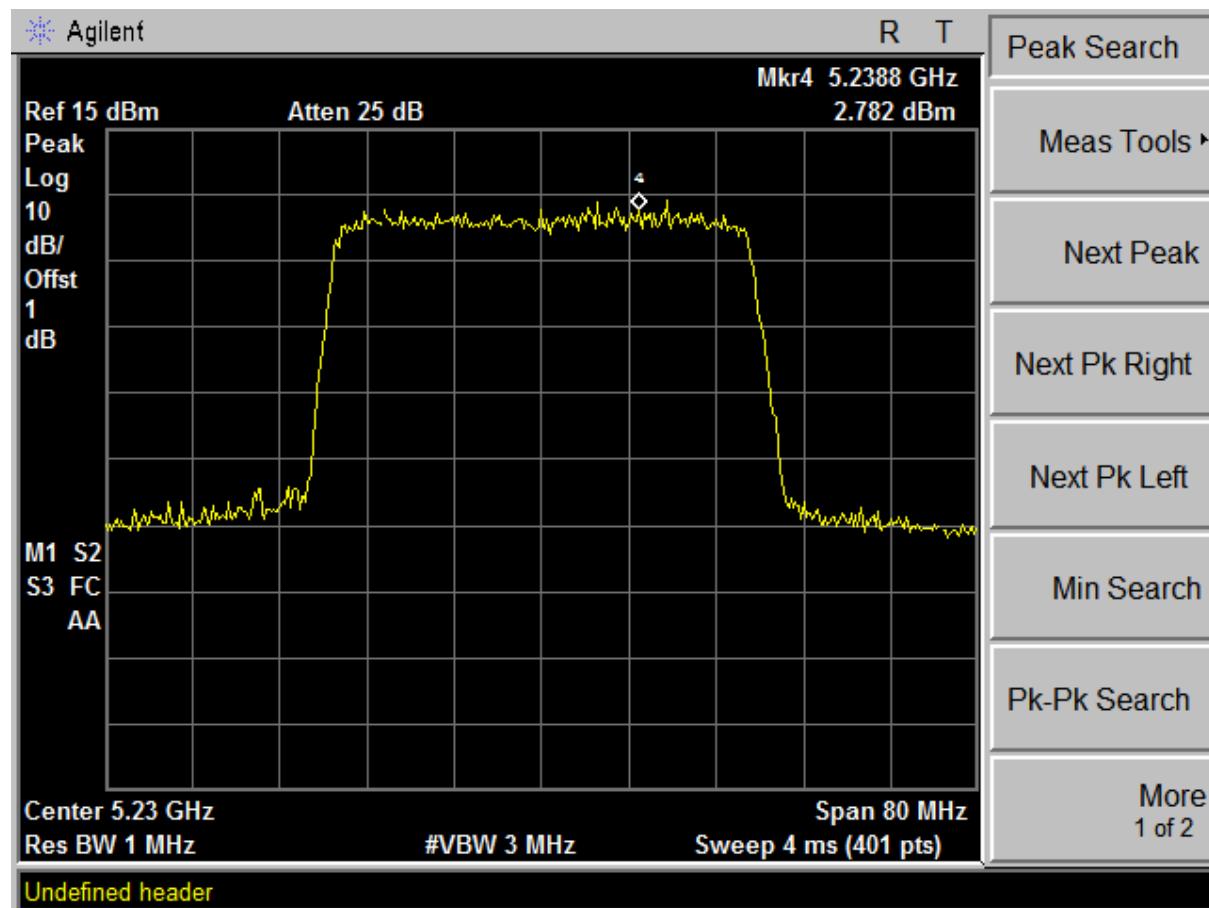
Peak Excursion Ratio in 5190MHz – Ant 1



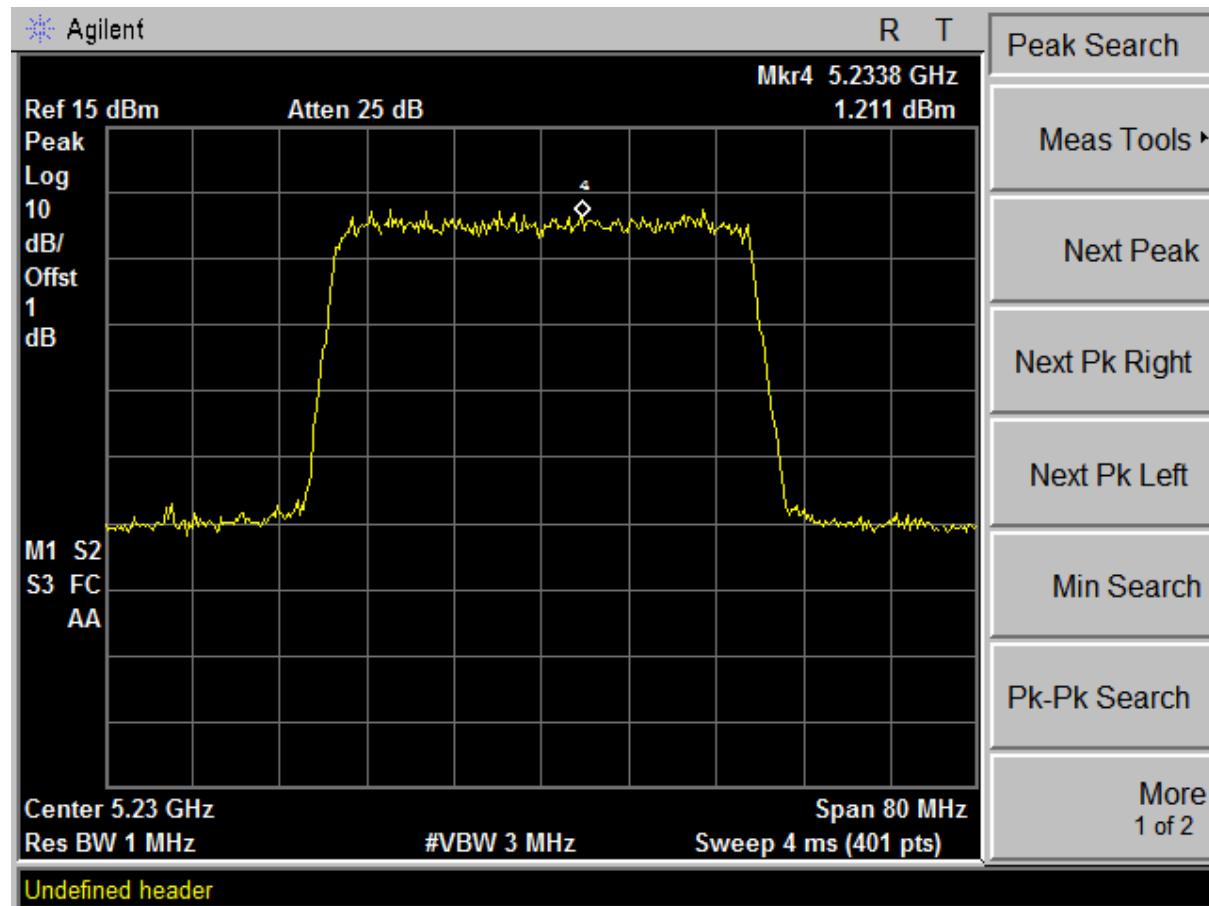
Peak Excursion Ratio in 5190MHz – Ant 2



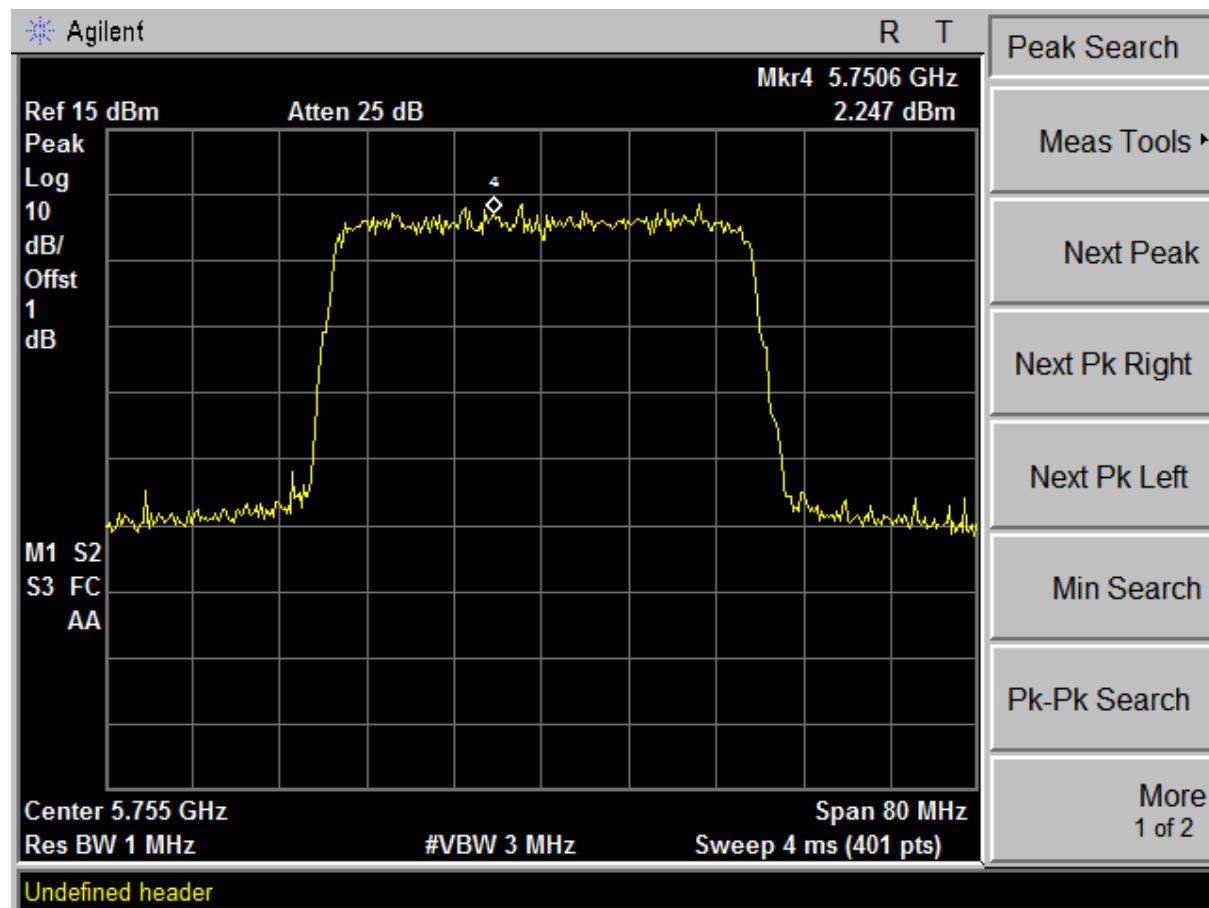
Peak Excursion Ratio in 5230MHz – Ant 1



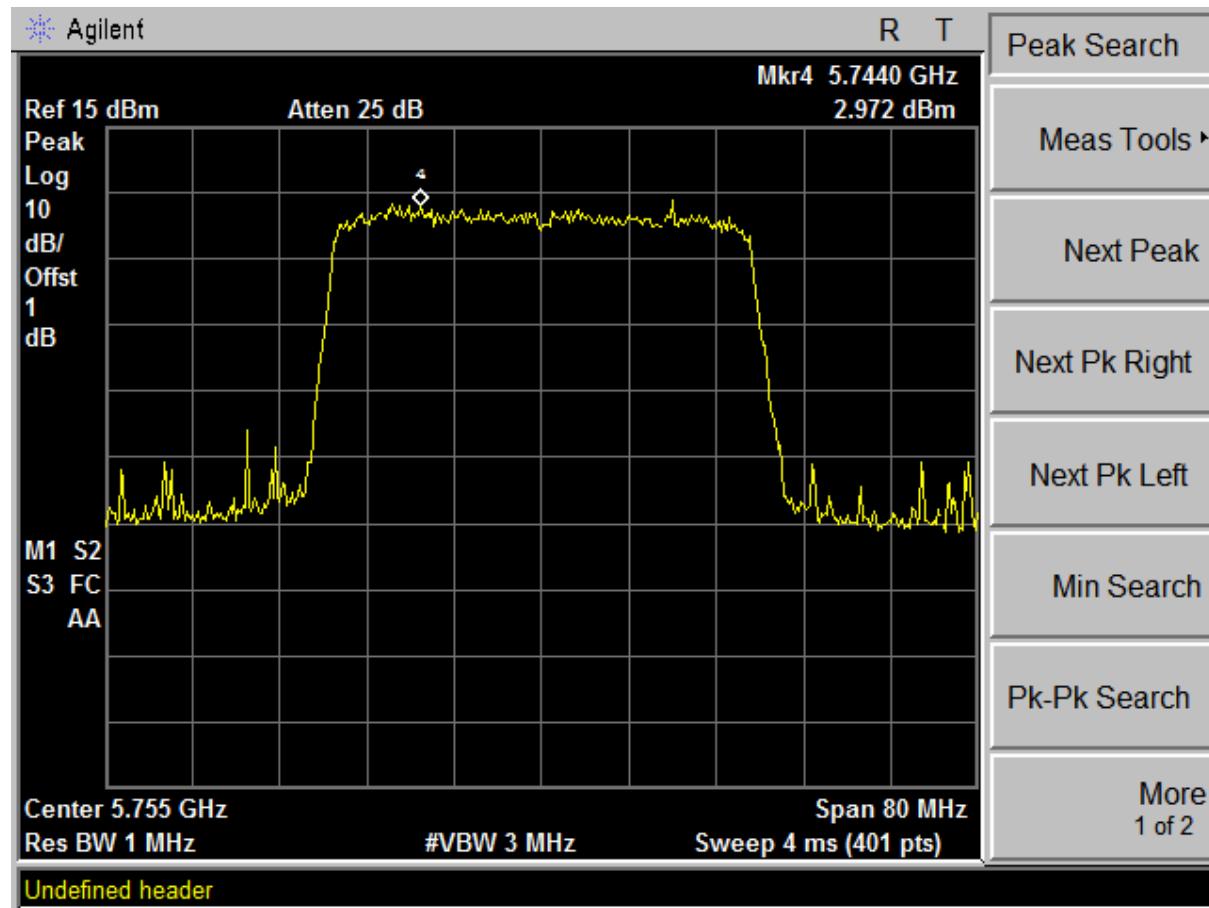
Peak Excursion Ratio in 5230MHz – Ant 2



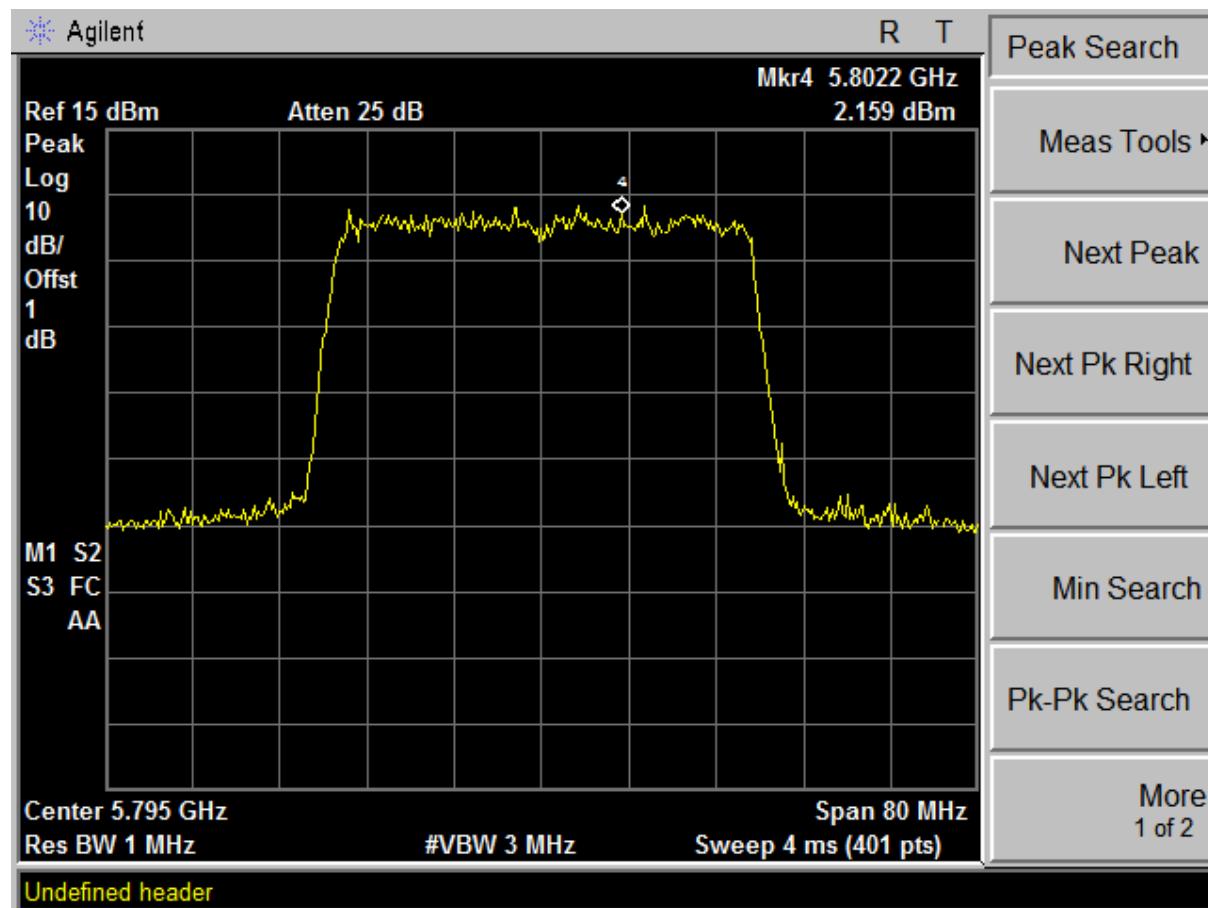
Peak Excursion Ratio in 5755MHz – Ant 1



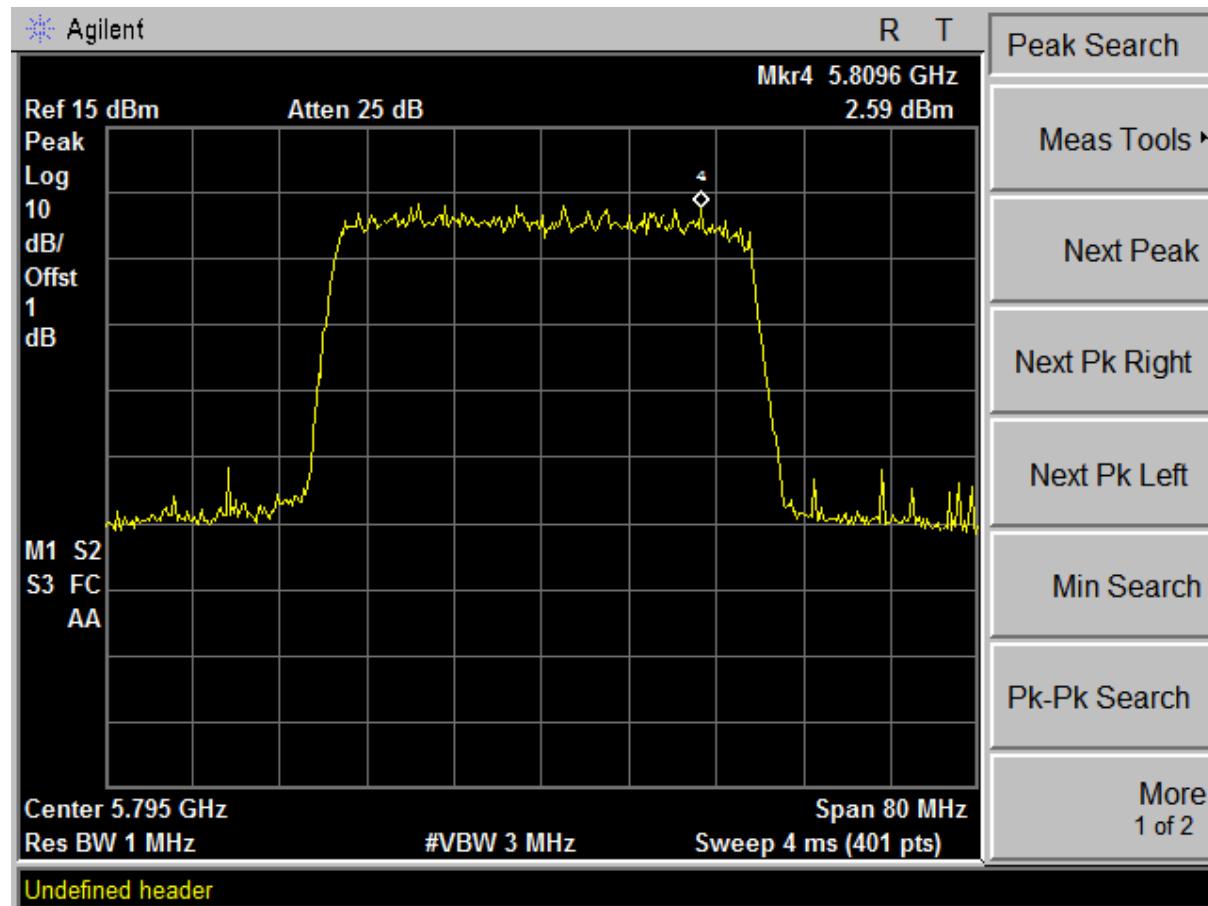
Peak Excursion Ratio in 5755MHz – Ant 2



Peak Excursion Ratio in 5795MHz – Ant 1



Peak Excursion Ratio in 5795MHz – Ant 2



2.7. IC RSS-210 §2.6 & RSS-Gen§6 – Receiver Spurious Radiated Emission

2.7.1. Requirements

According to RSS-Gen §4.10, the receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate. Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site. For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

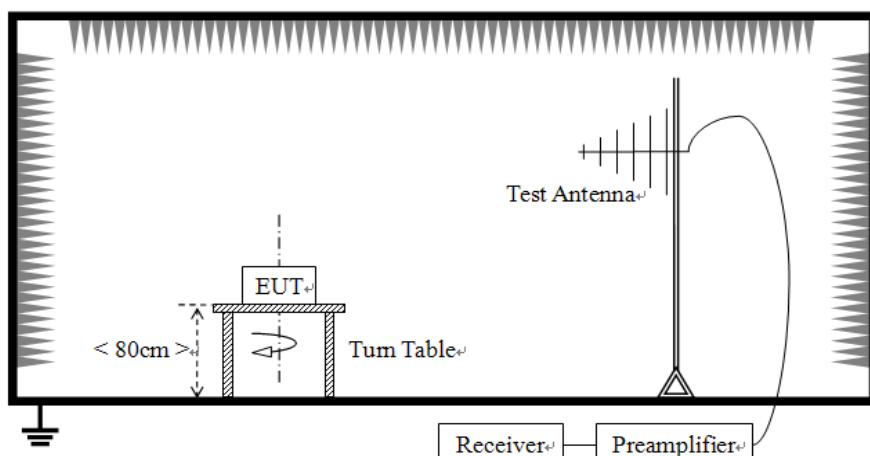
For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

General Field Strength Limits for Transmitters and Receivers at Frequencies above 30 MHz

Frequency (MHz)	Field Strength	
	Transmitters	Receivers
30~88	100(3nW)	100(3nW)
88~216	150(6.8nW)	150(6.8nW)
216~960	200(12nW)	200(12nW)
Above 960	500(75nW)	500(75nW)

2.7.2. Test Descriptions

A. Test Setup:



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The EUT is powered by the Battery charged with the notebook computer which is powered by 120V, 60Hz AC mains supply. The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the EUT is in receiving mode.

For the Test Antenna:

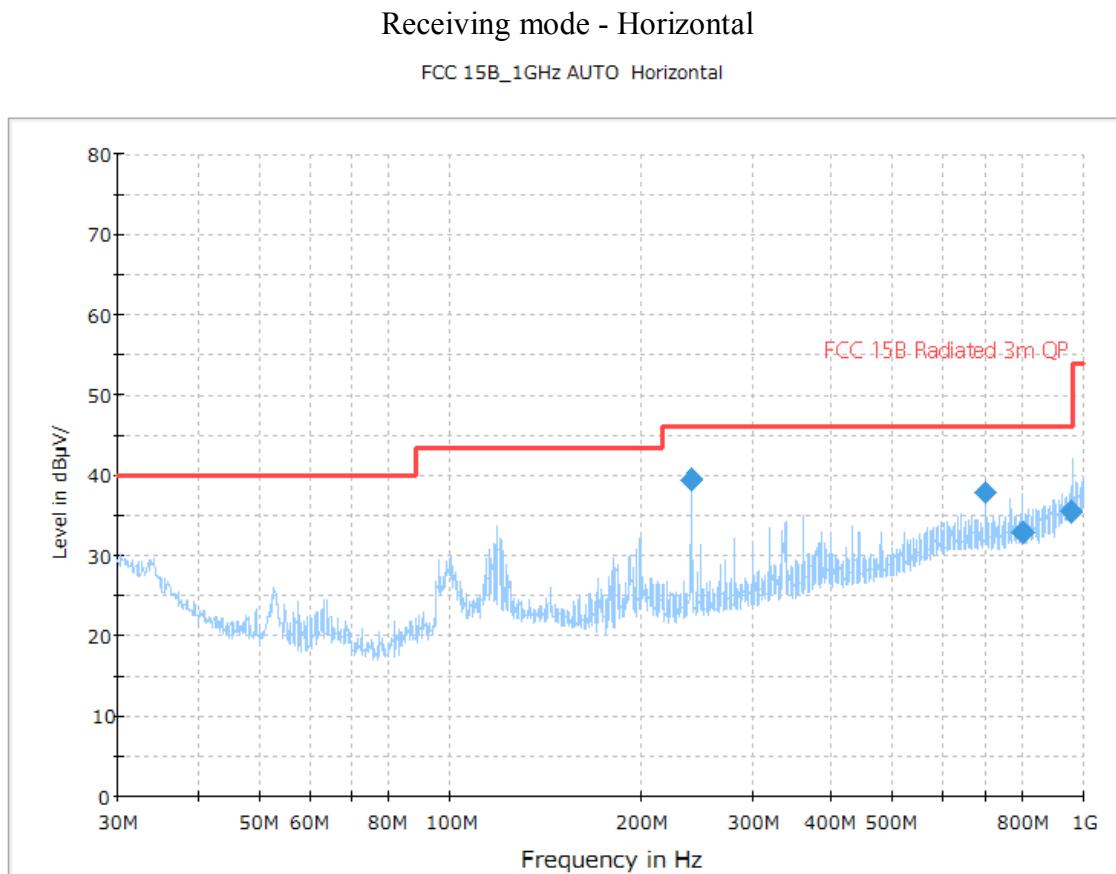
In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipment List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Receiver	R&S	ESU	100204	2013.04
Semi-Anechoic Chamber	Albatross	9m*6m*6m	4771011001	2013.04
Test Antenna - Bi-Log	Schaffner	CBL6112B	2529	2013.05
Test Antenna - Horn	Dahua	DH610-2	0911120001	2013.05
Test Antenna - Horn	Amplifier Research	AT4540	107382	2013.01
Test Antenna - Horn	Amplifier Research	AT4550	308276	2013.01
Signal Generator	HP	E4433B	US38330375	2013.06
Power Amplifier	Prana	AP32MT215	1021	2013.01
Power Amplifier	Milmega	AS0860-75/45	4677	2013.01
HDMI Receiver	Dfine	W210	N/A	N/A
Notebook Computer	Dell	PP09S	MM592A00	N/A

2.7.3. Test Result

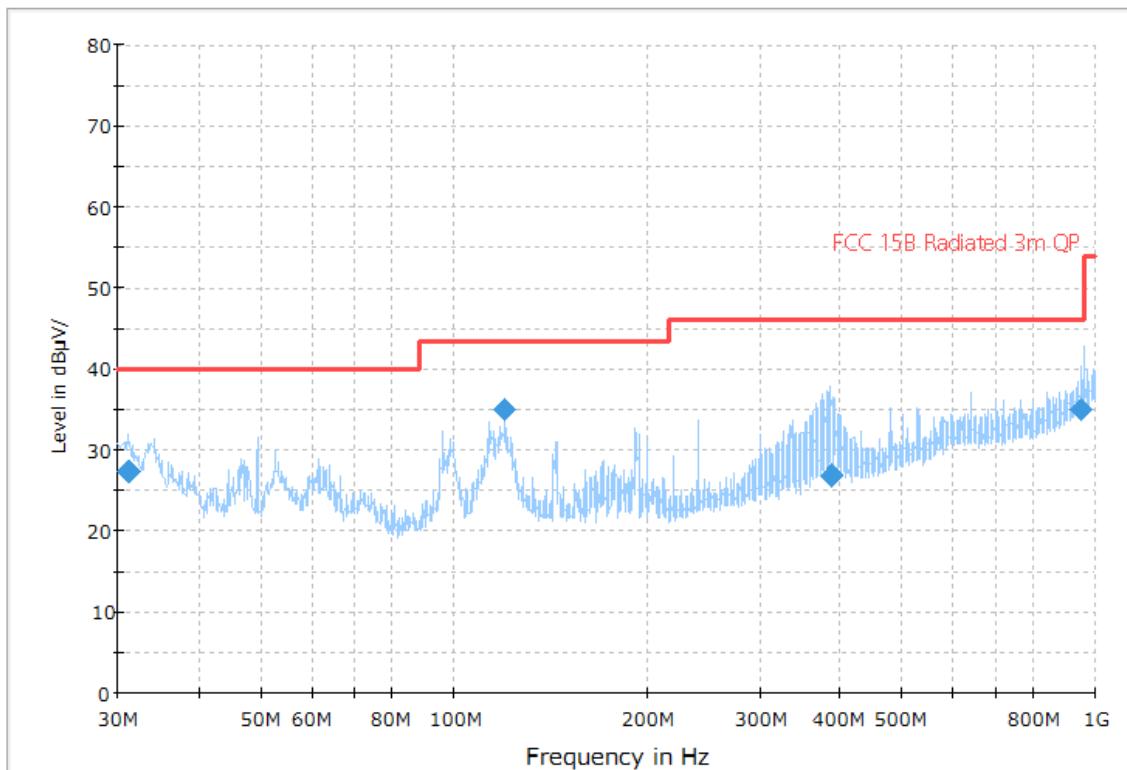
A. 30~1000MHz



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
240.005	39.5	1	120	128.0	264.0	6.5	46.0
699.688	37.9	1	120	100.0	64.0	8.1	46.0
800.083	32.9	1	120	100.0	199.0	13.1	46.0
958.678	35.5	1	120	170.0	233.0	10.5	46.0

Receiving mode - Vertical

FCC 15B_1GHz AUTO Vertical



Frequency (MHz)	Quasi Peak (dB μ V/m)	Meas. Time (s)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
31.067	27.2	1	120	200.0	178.0	12.8	40.0
120.016	34.9	1	120	100.0	229.0	8.6	43.5
387.348	26.7	1	120	180.0	190.0	19.3	46.0
946.553	35.1	1	120	100.0	137.0	10.9	46.0

B. 1~40GHz

Receiving mode – Horizontal

Frequency (MHz)	Peak Detector (dB μ V/m)	Bandwidth (MHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
1330.5	39.0	1	100.0	64.0	35.0	74
1762.5	39.2	1	100.0	199.0	34.8	74
5296.5	48.1	1	170.0	233.0	25.9	74
10593.0	40.4	1	200.0	105.0	33.6	74

Frequency (MHz)	Average Detector (dB μ V/m)	Meas. Time (s)	Bandwidth (MHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
1290.5	31.6	1	1	100.0	51.0	22.4	54
1983.0	28.5	1	1	128.0	50.0	25.5	54
5255.5	36.1	1	1	211.0	46.0	17.9	54
10511.0	29.4	1	1	189.0	218.0	24.6	54

Receiving mode – Vertical

Frequency (MHz)	Peak Detector (dB μ V/m)	Bandwidth (MHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
1453.5	34.1	1	100.0	0.0	39.9	74
2460.5	33.6	1	200.0	352.0	40.4	74
5553.0	38.9	1	178.0	81.0	35.1	74
10886.0	38.8	1	143.0	91.0	35.2	74

Frequency (MHz)	Average Detector (dB μ V/m)	Meas. Time (s)	Bandwidth (MHz)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
1239.0	26.3	1	1	100.0	0.0	27.7	54
2613.5	25.8	1	1	100.0	352.0	28.2	54
5328.5	31.4	1	1	100.0	81.0	22.6	54
10656.0	31.4	1	1	100.0	81.0	22.6	54

Verdict: Pass

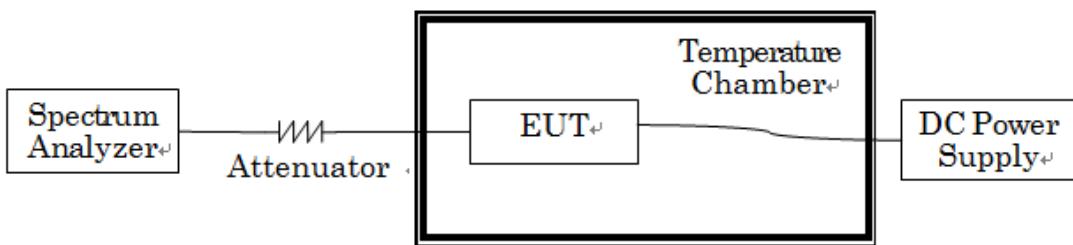
2.8. FCC §15.407 (g) - Frequency Stability

2.8.1. Requirement

According to FCC section 15.407(g), 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.

2.8.2. Test Description

A. Test Setup:



The EUT which is powered by the power supply and 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.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	R&S	FSU-8	200034	2013.06
Power Supply	Agilent	66319D	MY43000556	2013.06
Climate Chamber	Votsch	VT4002	585661087750080	2013.01

2.8.3. Test Result

Frequency Band (MHz)	Frequency (MHz)	Temperature °C	Power Supply V	Ant	Measurement Frequency
					MHz
5150~5250	5190	0	3.2	1	5189.9733
				2	5189.9974
			3.7	1	5189.9798
				2	5189.9923
		25	4.2	1	5189.9840
				2	5189.9917
			3.2	1	5189.9812
				2	5189.9923
		45	3.7	1	5189.9880
				2	5189.9914
			4.2	1	5189.9723
				2	5189.9987
5150~5250	5230	0	3.2	1	5230.0256
				2	5230.0297
			3.7	1	5230.0193
				2	5230.0255
		25	4.2	1	5230.0206
				2	5230.0114
			3.2	1	5230.0175
				2	5230.0238
		45	3.7	1	5230.0193
				2	5230.0177
			4.2	1	5230.0221
				2	5230.0070
		45	3.2	1	5230.0211
				2	5230.0176
			3.7	1	5230.0259
				2	5230.0113
		4.2	4.2	1	5230.0208
				2	5230.0145

Frequency Band (MHz)	Frequency (MHz)	Temperature	Power Supply	Ant	Measurement Frequency	
					MHz	
		°C	V			
5725~5825	5755	0	3.2	1	5755.0220	
				2	5755.0179	
			3.7	1	5755.0118	
				2	5755.0233	
		25	4.2	1	5755.0088	
				2	5755.0134	
			3.2	1	5755.0226	
				2	5755.0280	
			3.7	1	5755.0134	
				2	5755.0187	
			45	1	5755.0136	
				2	5755.0149	
				1	5755.0104	
				2	5755.0218	
			3.7	1	5755.0132	
				2	5755.0217	
		0	4.2	1	5755.0163	
				2	5755.0210	
				1	5795.0160	
	5795		3.2	2	5795.0234	
				1	5795.0142	
				2	5795.0213	
	25	4.2	1	5795.0149		
			2	5795.0231		
		3.2	1	5795.0124		
			2	5795.0092		
		3.7	1	5795.0256		
			2	5795.0217		
		45	1	5795.0142		
			2	5795.0110		
			1	5795.0137		
			2	5795.0108		
		3.7	1	5795.0214		
			2	5795.0113		
		4.2	1	5795.0219		
			2	5795.0202		

** END OF REPORT **