JQA File No. : KL80150851
Issue Date : April 13, 2016

TEST REPORT

Applicant	:	SHARP CORPORATION, Consumer Electronics Company, Communication Systems Division
Address	:	2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
Products	:	Smart Phone
Model No.	:	506SH
Serial No.	:	004401/11/570776/8 004401/11/570796/6 004401/11/570778/4
FCC ID	:	APYHRO00233
Test Standard	:	CFR 47 FCC Rules and Regulations Part 15
Test Results	:	**Passed**
Date of Test	:	March 19 ~ March 29, 2016

ilac-MRA VLAC Lab Accreditation VLAC-001-2

Kousei Shibata
Manager
Japan Quality Assurance Organization
KITA-KANSAI Testing Center
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan.
- The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
- The test results presented in this report relate only to the offered test sample.
- The contents of this test report cannot be used for the purposes, such as advertisement for consumers.
- This test report shall not be reproduced except in full without the written approval of JQA.
- VLAC does not approve, certify or warrant the product by this test report.

TABLE OF CONTENTS

		Page
1	Description of the Equipment Under Test	3
2	Summary of Test Results	4
3	Test Procedure	5
4	Test Location	5
5	Recognition of Test Laboratory	5
6	Description of Test Setup	6
7	Test Requirements	11

DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT

EUT : Equipment Under Test
AE : Associated Equipment
N/A : Not Applicable
N/T : Not Tested
EMC : Electromagnetic Compatibility
EMI : Electromagnetic Interference
EMS : Electromagnetic Susceptibility

☑ - indicates that the listed condition, standard or equipment is applicable for this report.
☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

1 Description of the Equipment Under Test

1.	Manufacturer	:	SHARP CORPORATION, Consumer Electronics Company, Communication Systems Division 2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
2.	Products	:	Smart Phone
3.	Model No.	:	506SH
4.	Serial No.	:	004401/11/570776/8 004401/11/570796/6 004401/11/570778/4
5.	Product Type	:	Pre-production
6.	Date of Manufacture	:	February, 2016
7.	Power Rating	:	4.0VDC (Lithium-ion Battery UBATIA269AFN1 3000mAh)
8.	Grounding	:	None
9.	Operating Frequency	: : :	5180.0 MHz(36CH) –5700.0MHz(140CH): IEEE802.11a/n/ac(20MHz) 5190.0 MHz(38CH) –5670.0MHz(134CH): IEEE802.11n/ac(40MHz) 5210.0 MHz(42CH) –5610.0MHz(122CH): IEEE802.11ac(80MHz)
10.	Modulation	:	OFDM
11.	Antenna Type	:	Inverted-L Type Antenna (Integral)
12.	Antenna Gain	:	0 dBi (Main/Sub)
13.	Category	:	Spread Spectrum Transmitter(OFDM)/UNII*
14.	EUT Authorization	:	Certification
15.	Received Date of EUT	:	March 18, 2016

*The 80MHz BW + 80MHz BW mode is not supported. The EUT does not apply the contiguous 80 MHz BW mode and the straddled operations.

2 Summary of Test Results

Applied Standard : CFR 47 FCC Rules and Regulations Part 15
Subpart E – Unlicensed National Information Infrastructure Devices

The EUT described in clause 1 was tested according to the applied standard shown above.
Details of the test configuration is shown in clause 6.
The conclusion for the test items of which are required by the applied standard is indicated under the test result.

☑ - The test result was **passed** for the test requirements of the applied standard.

☐ - The test result was **failed** for the test requirements of the applied standard.

☐ - The test result was **not judged** the test requirements of the applied standard.

In the approval of test results,
- Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

Shigeru Kinoshita
Assistant Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

Tested by:

Shigeru Osawa
Deputy Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

3 Test Procedure

Test Requirements : CFR 47 FCC Rules and Regulations Part 15
Subpart E – Unlicensed National Information Infrastructure Devices

Test Procedure : ANSI C63.10–2013
Testing unlicensed wireless devices.

KDB 789033 D02
General UNII Test Procedures New Rules v01: June 6, 2014

KDB 905462 D02
UNII DFS Compliance Procedures New Rules v01r02: May 15, 2015

KDB 644545 D03
Guidance for IEEE 802 11ac New Rules v01: August 14, 2014

KDB 662911 D01
Multiple Transmitter Output v02r01: October 31, 2013

4 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

5 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No.	:	VLAC-001-2 (Expiry date : March 30, 2018)
VCCI Registration No.	:	A-0002 (Expiry date : March 30, 2018)
BSMI Registration No.	:	SL2-IS-E-6006, SL2-IN-E-6006, SL2-R1/R2-E-6006, SL2-A1-E-6006 (Expiry date : September 14, 2016)
IC Registration No.	:	2079E-3, 2079E-4 (Expiry date : July 16, 2017)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI. (Expiry date : February 22, 2019)

6 Description of Test Setup

6.1 Test Configuration

The equipment under test (EUT) consists of :

	Item	Manufacturer	Model No.	Serial No.	FCC ID
A	Smart Phone	Sharp	506SH	004401/11/570776/8 *1) 004401/11/570796/6 *2) 004401/11/570778/4 *3)	APYHRO00233
B	AC Adapter	Sharp	SHCEJ1	--	N/A
C	Earphone	Softbank	ZTCAA1	--	N/A
D	DTV Antenna	Sharp	--	--	N/A

*1) Used for AC Powerline Conducted Emission and Field Strength of Spurious Emission
*2) Used for Antenna Conducted Emission
*3) Used for DFS Measurement

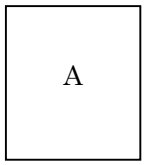
The auxiliary equipment used for testing :
None

Type of Cable:

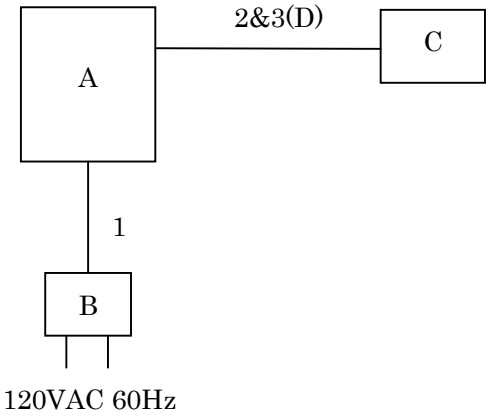
No.	Description	Identification (Manu. etc.)	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
1	USB conversion cable	--	--	NO	NO	1.5
2	Earphone Cable	--	--	NO	NO	0.5
3	DTV Antenna Cable	--	--	NO	NO	0.1

6.2 Test Arrangement (Drawings)

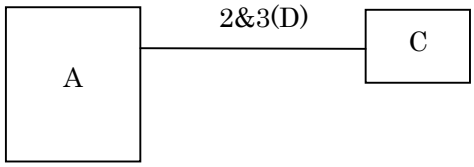
a) Single Unit



b) AC Adapter used



c) Earphone used



6.3 Operating Condition

Power Supply Voltage : 4.0 VDC (for Battery)
120 VAC, 60 Hz (For AC Adapter)

Operation Mode :
The EUT is set with the test mode, the specification of the test mode is as followings.

Transmitting frequency : 5180.0 MHz(36CH) –5700.0MHz(140CH): IEEE802.11a/n/ac(20MHz)
: 5190.0 MHz(38CH) –5670.0MHz(134CH): IEEE802.11n/ac(40MHz)
: 5210.0 MHz(42CH) –5610.0MHz(122CH): IEEE802.11ac(80MHz)

Receiver frequency : 5180.0 MHz(36CH) – 5700.0 MHz(140CH)

Modulation Type
1. 802.11a : OFDM
2. 802.11n/ac(20MHz) : OFDM
3. 802.11n/ac(40MHz) : OFDM
4. 802.11ac(80MHz) : OFDM

The equipment has two antennas(Main Antenna[ANT0]/Sub Antenna[ANT1]), and uses the MIMO technology.
This equipment works only in 2TX(Main+Sub) mode, and it does not operate in 1TX mode.
Therefore, the radiated emission tests were carried out in the following mode.
2TX (Main+Sub)

Other Clock Frequency
19.2MHz, 48MHz, 12MHz, 27.12MHz

The EUT was rotated through three orthogonal axis (X, Y and Z axis) in radiated measurement.
The EUT with temporary antenna port was used in conducted measurement.

The test were carried out using the following test program supplied by applicant;
- Software Name: WLAN_BT Manual test mode operation
- Software Version: -- (Dated 2016/03/10)
- Storage Location: Controller PC(supplied by applicant)

DIRECTIONAL ANTENNA GAIN

For Power: The TX chains are uncorrelated and the antenna gain is the same for each chain. The directional gain is equal to the antenna gain.

ANT0 Antenna Gain [dBi]	ANT1 Antenna Gain [dBi]	Uncorrelated Chains Directional Gain [dBi]
0.00	0.00	0.00

For PSD: The TX chains are correlated. The directional gain is:

ANT0 Antenna Gain [dBi]	ANT1 Antenna Gain [dBi]	Correlated Chains Directional Gain [dBi]
0.00	0.00	3.01

6.4 Maximum Output Power

The preliminary maximum peak conducted output power measurements were performed each TX rate and maximum value are listed as followings.

802.11a

Channel	36	44	48	52	56	64	100	116	140
Frequency(MHz)	5180	5220	5240	5260	5280	5320	5500	5580	5700
Power(dBm)	14.07	14.00	13.96	13.93	14.05	13.96	13.87	13.78	13.62

The TX rate 6Mbps was maximum case.

802.11n (20MHz BW)

Channel	36	44	48	52	56	64	100	116	140
Frequency(MHz)	5180	5220	5240	5260	5280	5320	5500	5580	5700
Power(dBm)	13.83	13.72	13.69	13.69	13.81	13.72	13.65	13.55	13.37

The TX rate 6.5Mbps was maximum case.(MCS0)

802.11n (40MHz BW)

Channel	38	46	54	62	102	134
Frequency(MHz)	5190	5230	5270	5310	5510	5670
Power(dBm)	14.37	14.31	14.24	14.32	14.21	14.00

The TX rate 13.5Mbps was maximum case.(MCS0)

802.11ac(80MHz BW)

Channel	42	58	106	122
Frequency(MHz)	5210	5290	5530	5610
Power(dBm)	13.23	13.17	13.04	13.01

The TX rate 29.3Mbps was maximum case.(MCS0)

All test cases were performed to the highest RF output power data rate listed above.

7 Test Requirements

7.0 Summary of the Test Results

Test Item	FCC Specification	Reference of the Test Report	Results	Remarks
Antenna Requirement	Section 15.203	Section 1.11	Passed	-
26dB Bandwidth	Section 15.407(2)(3)	Section 7.1	-	-
Maximum Conducted Output Power	Section 15.407(a)(1)(iv), (2),(3)	Section 7.2	Passed	For mobile and portable client device
Peak Power Spectral Density	Section 15.407(a)(1)(iv), (2),(3)	Section 7.3	Passed	For mobile and portable client device
Peak Excursion	--	Section 7.4	N/A	-
AC Powerline Conducted Emission	Section 15.407(b)(6) Section 15.207	Section 7.5	Passed	-
Unwanted Radiated Emission	Section 15.407(b) Section 15.205 Section 15.209	Section 7.6	Passed	-
Dynamic Frequency Selection	Section 15.407(h)(2)	Section 7.7	Passed	-

7.1 26dB Bandwidth

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.1.1 Test Results

For the standard, ☐ - **Passed** ☐ - **Failed** ☑ - **Not judged**

Uncertainty of Measurement Results ± 0.9 %(2σ)

Remarks : Reporting Purpose (No limitation applied)

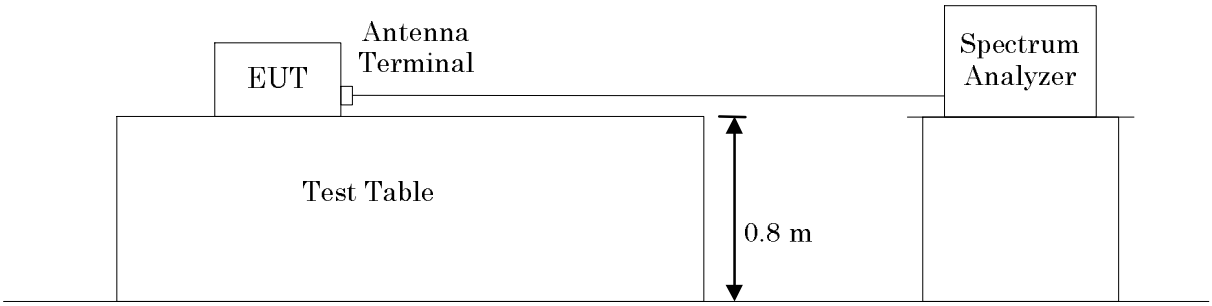
7.1.2 Test Instruments

Shielded Room S4				
Type	**Model**	**Serial No. (ID)**	**Manufacturer**	**Cal. Due**
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	54A-10	W5675 (D-28)	Weinschel	2016/08/16
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

NOTE : The calibration interval of the above test instruments is 12 months.

7.1.3 Test Method and Test Setup (Diagrammatic illustration)

The occupied bandwidth measurements were carried out connecting to the spectrum analyzer.
The spectrum analyzer was set in accordance with KDB 789033 D02 as follows;.
The RBW was set approximately 1% of the emission bandwidth.
Set the VBW > RBW., Detector = Peak, and Trace mode = max hold.
The bandwidth function in the analyzer was used.



7.1.4 Test Data

Test Date :March 19, 2016
Temp.: 22°C, Humi: 34%

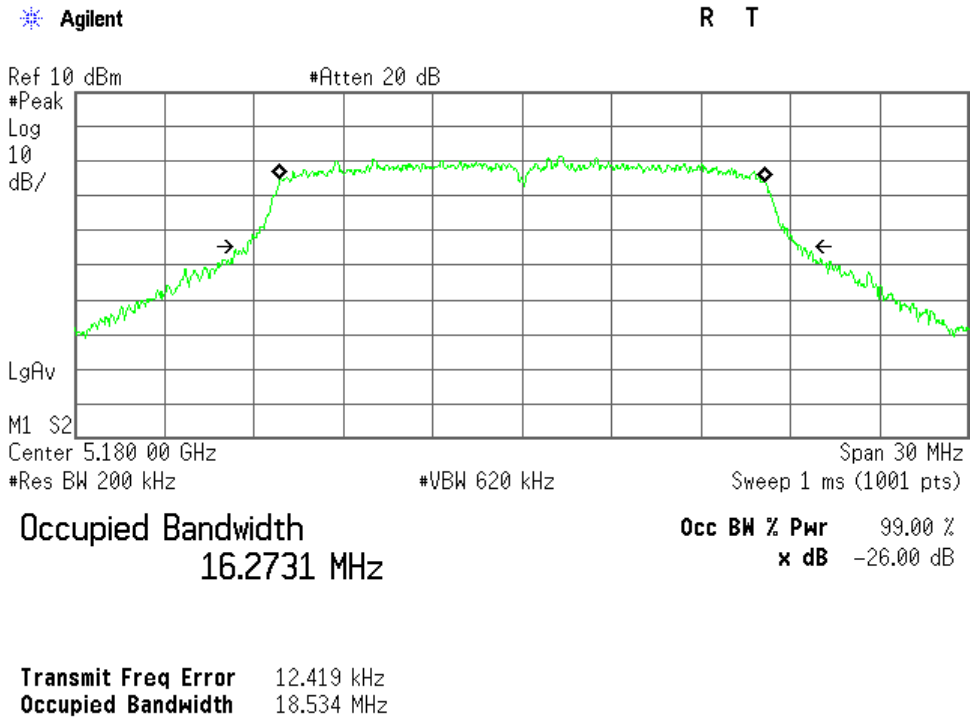
7.1.4.1 802.11a 26dB/ 99% OBW

a) Main Antenna

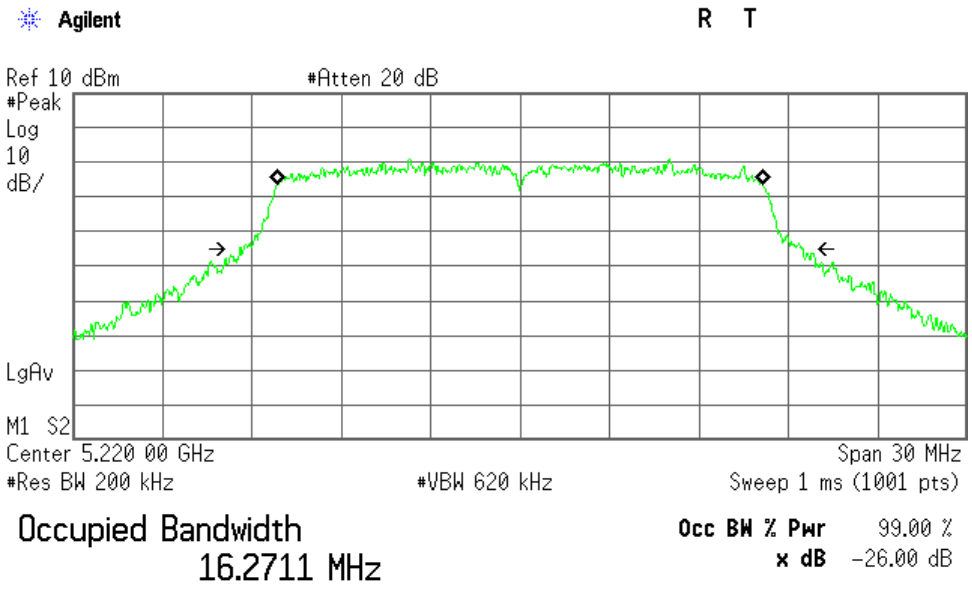
Mode of EUT: TX 802.11a
Test Port: Temporary antenna connector

Channel	Frequency	26dB OBW	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	18.534	16.273
44	5220	18.883	16.271
48	5240	18.555	16.263
52	5260	18.567	16.243
56	5280	18.576	16.248
64	5320	19.416	16.221
100	5500	18.492	16.263
116	5580	18.668	16.255
140	5700	18.833	16.246

802.11a 36ch (5180 MHz)

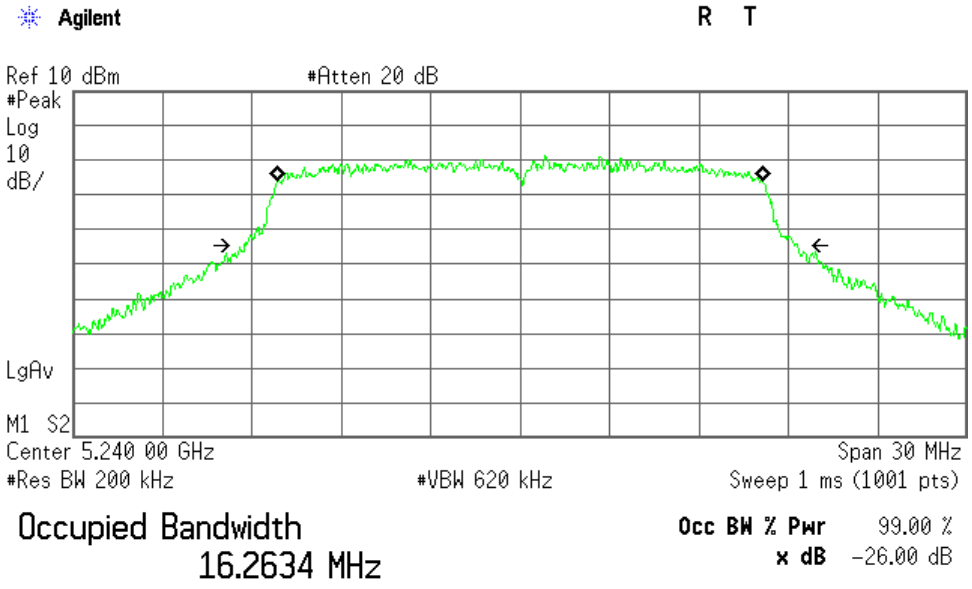


802.11a 44ch (5220 MHz)



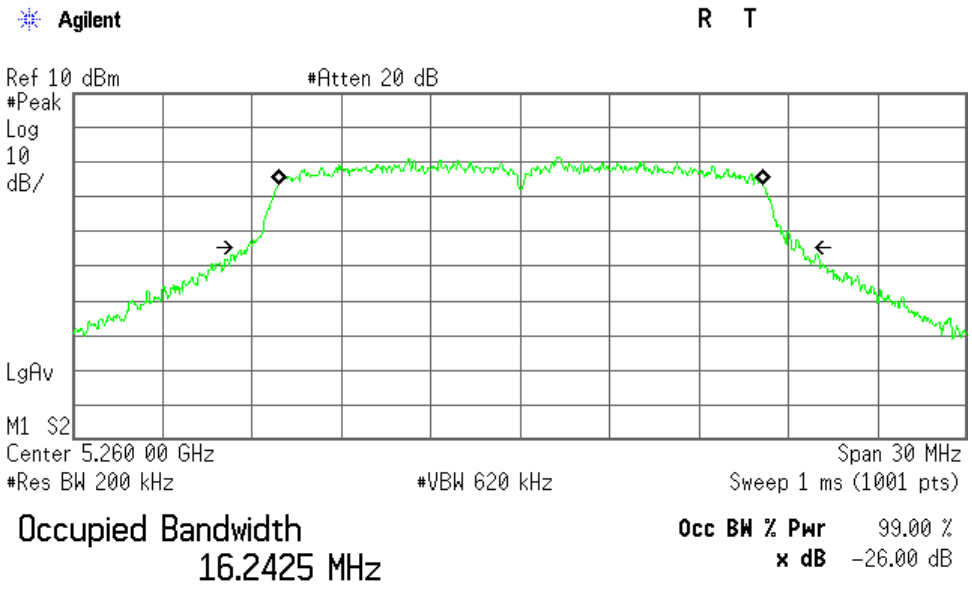
Transmit Freq Error 11.770 kHz
Occupied Bandwidth 18.883 MHz

802.11a 48ch (5240 MHz)



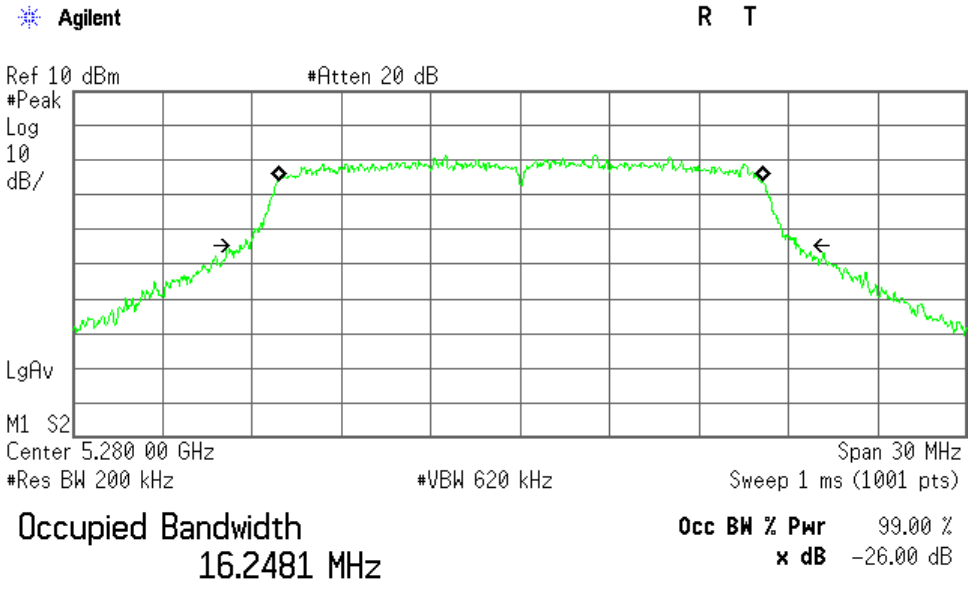
Transmit Freq Error 11.076 kHz
Occupied Bandwidth 18.555 MHz

802.11a 52ch (5260 MHz)



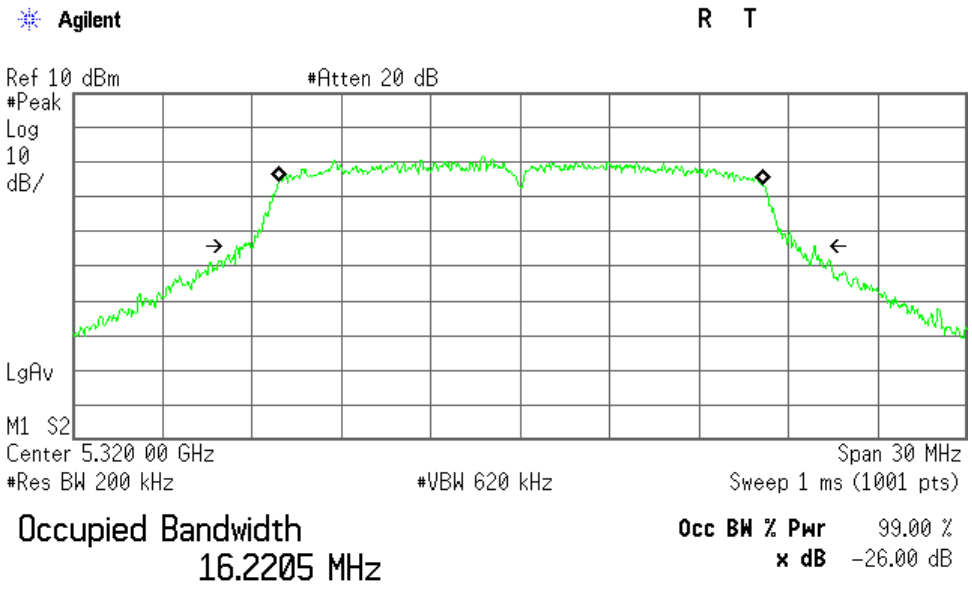
Transmit Freq Error 19.593 kHz
Occupied Bandwidth 18.567 MHz

802.11a 56ch (5280 MHz)



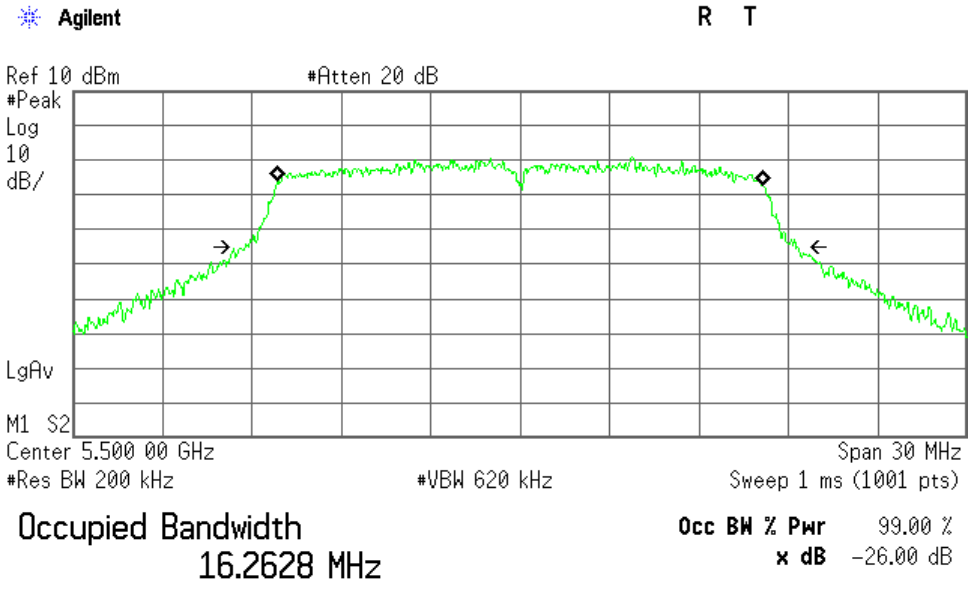
Transmit Freq Error 9.545 kHz
Occupied Bandwidth 18.576 MHz

802.11a 64ch (5320 MHz)



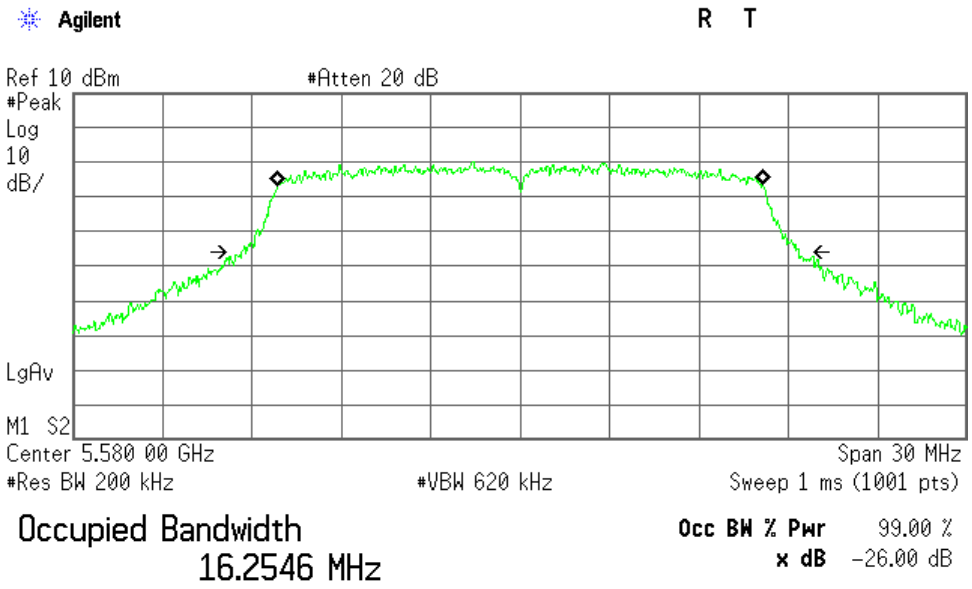
Transmit Freq Error	16.948 kHz
Occupied Bandwidth	19.416 MHz

802.11a 100ch (5500 MHz)



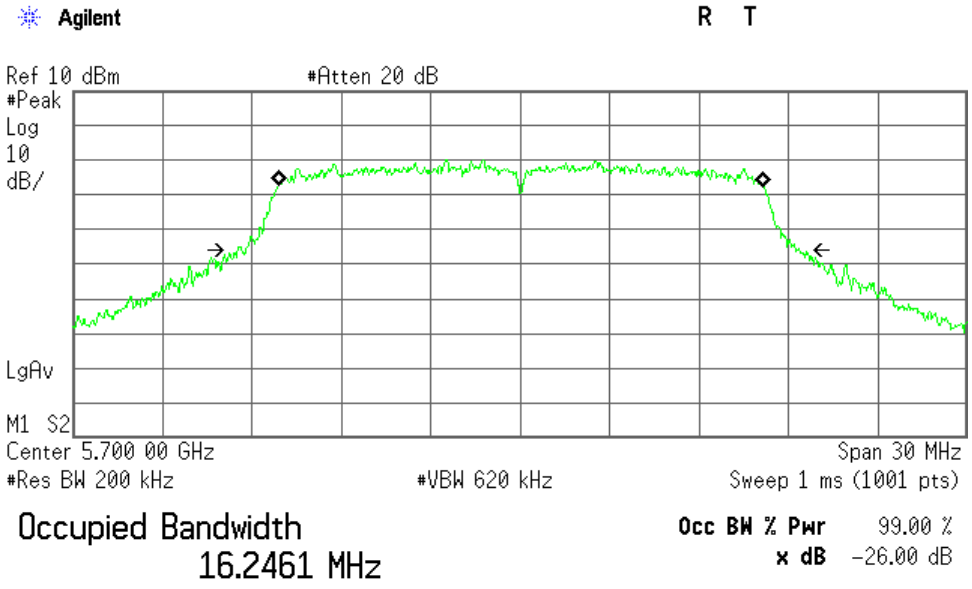
Transmit Freq Error	6.791 kHz
Occupied Bandwidth	18.492 MHz

802.11a 116ch (5580 MHz)



Transmit Freq Error 1.881 kHz
Occupied Bandwidth 18.668 MHz

802.11a 140ch (5700 MHz)



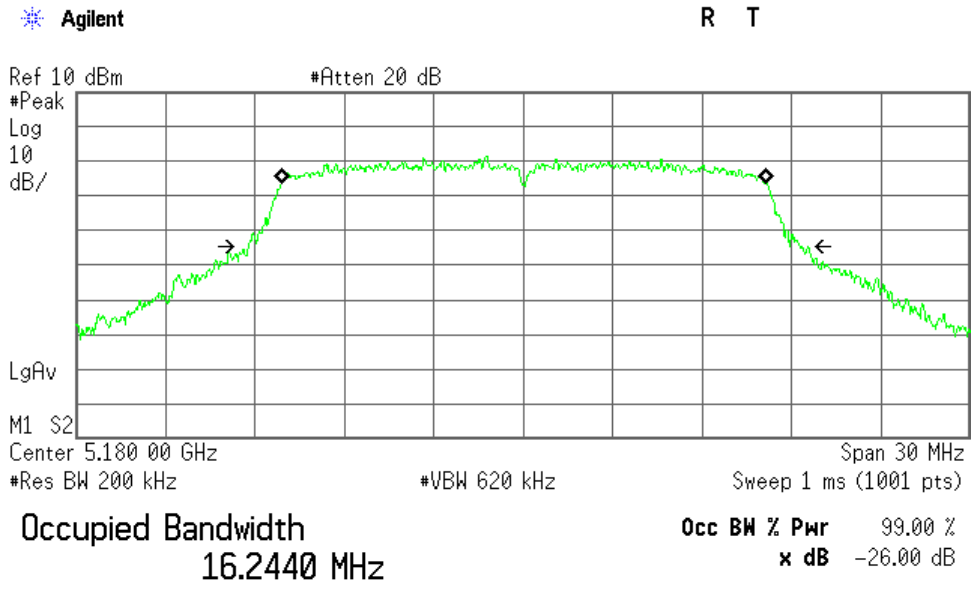
Transmit Freq Error 11.338 kHz
Occupied Bandwidth 18.833 MHz

b) Sub Antenna

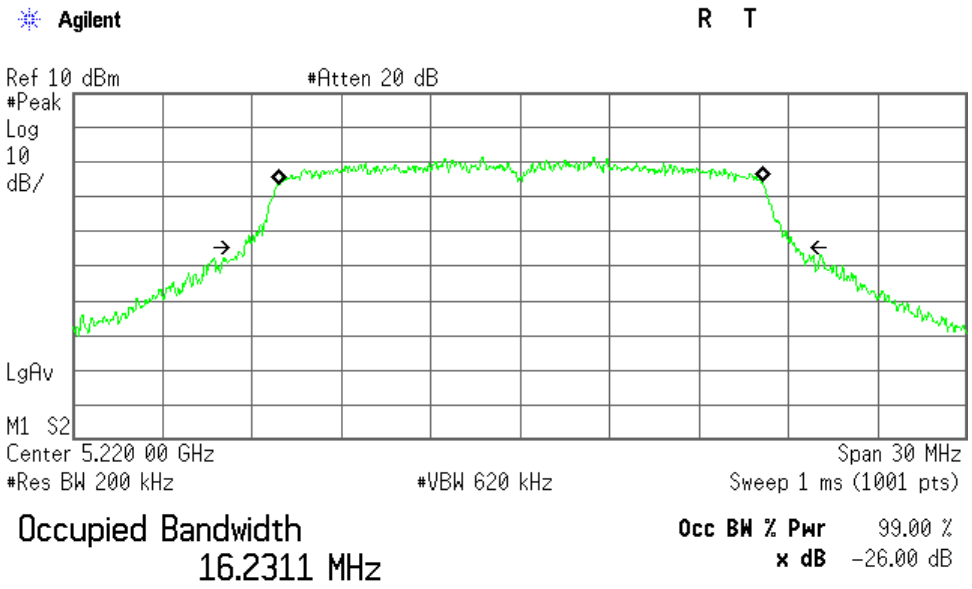
Mode of EUT: TX 802.11a
Test Port: Temporary antenna connector

Channel	Frequency	26dB OBW	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	18.502	16.244
44	5220	18.469	16.231
48	5240	18.765	16.250
52	5260	18.717	16.227
56	5280	18.938	16.251
64	5320	18.581	16.238
100	5500	18.816	16.270
116	5580	19.385	16.270
140	5700	18.711	16.261

802.11a 36ch (5180 MHz)

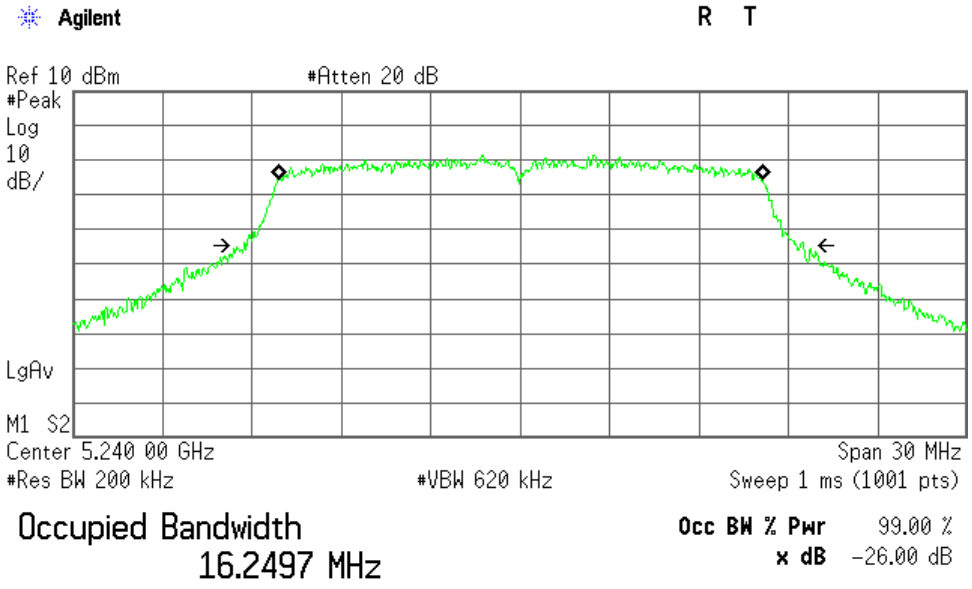


802.11a 44ch (5220 MHz)



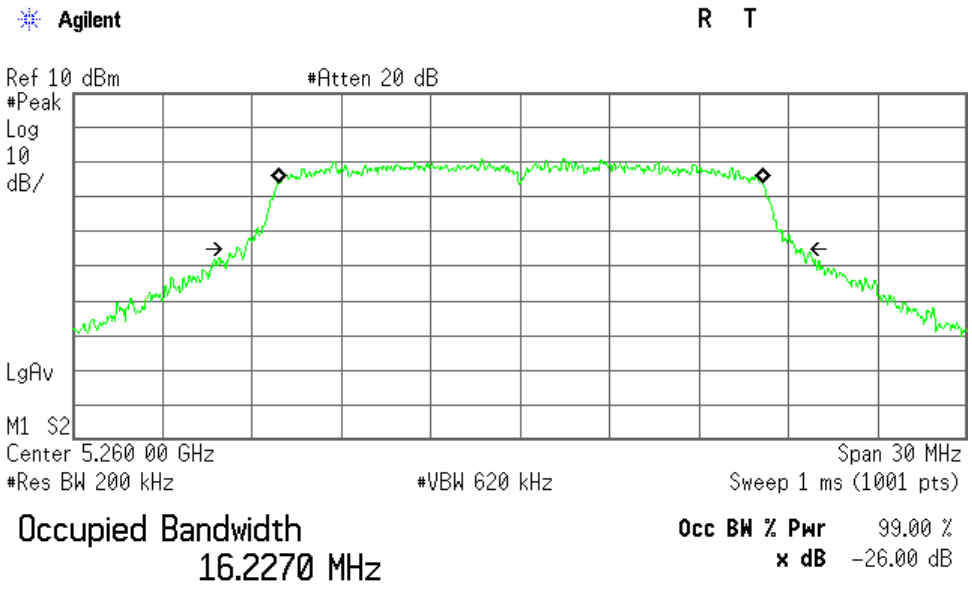
Transmit Freq Error 6.215 kHz
Occupied Bandwidth 18.469 MHz

802.11a 48ch (5240 MHz)



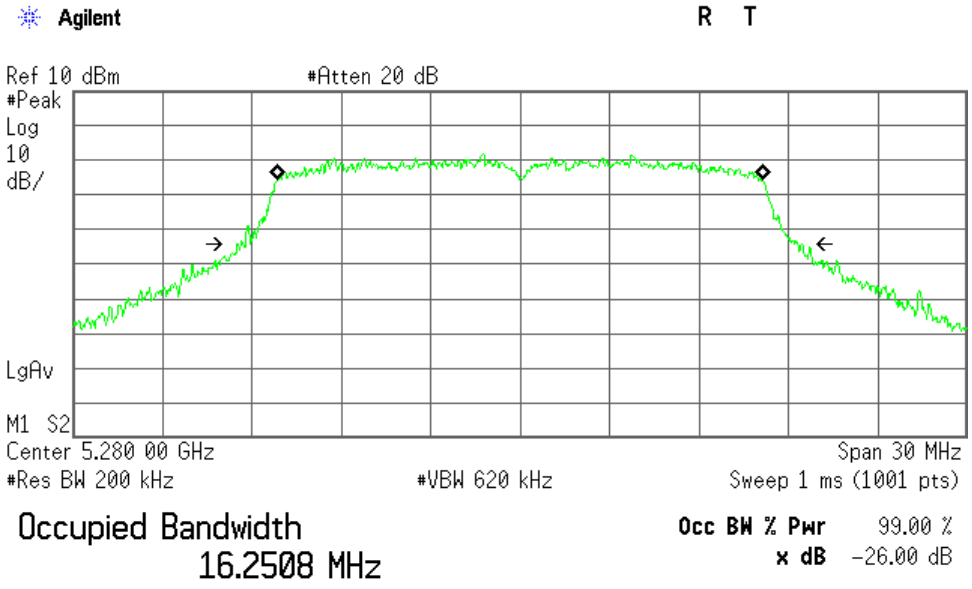
Transmit Freq Error 11.199 kHz
Occupied Bandwidth 18.765 MHz

802.11a 52ch (5260 MHz)



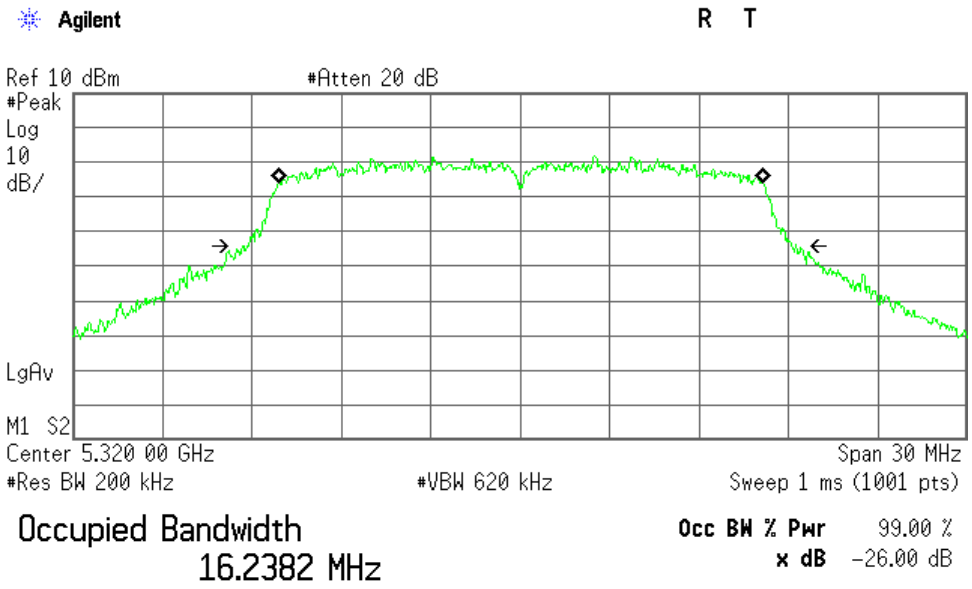
Transmit Freq Error 6.075 kHz
Occupied Bandwidth 18.717 MHz

802.11a 56ch (5280 MHz)



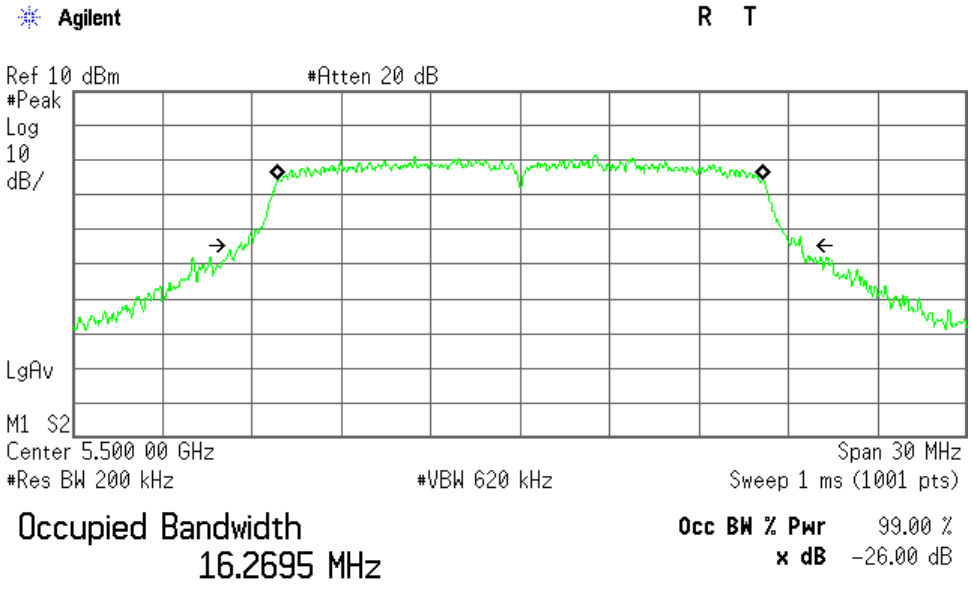
Transmit Freq Error -4.899 kHz
Occupied Bandwidth 18.938 MHz

802.11a 64ch (5320 MHz)



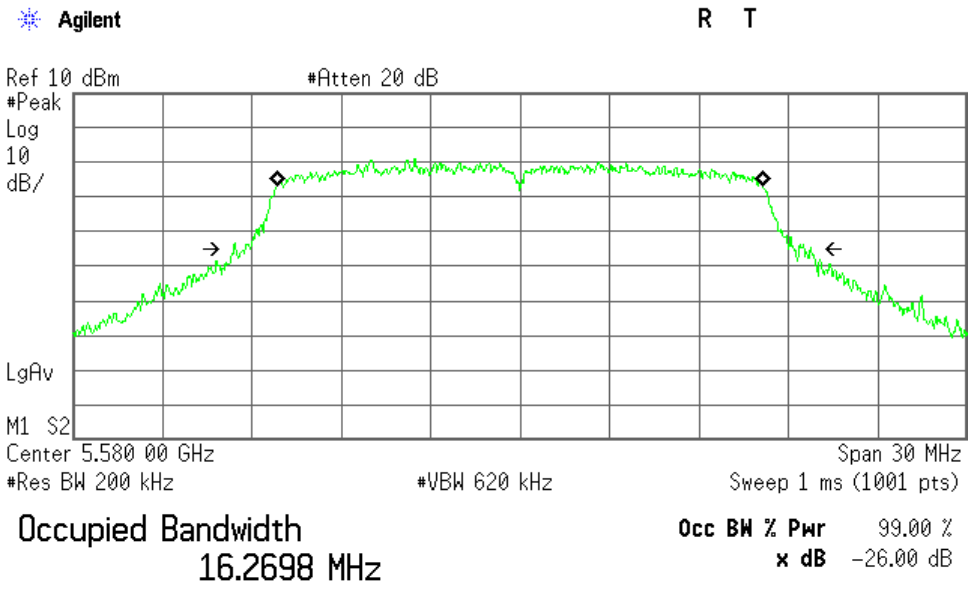
Transmit Freq Error 9.576 kHz
Occupied Bandwidth 18.581 MHz

802.11a 100ch (5500 MHz)



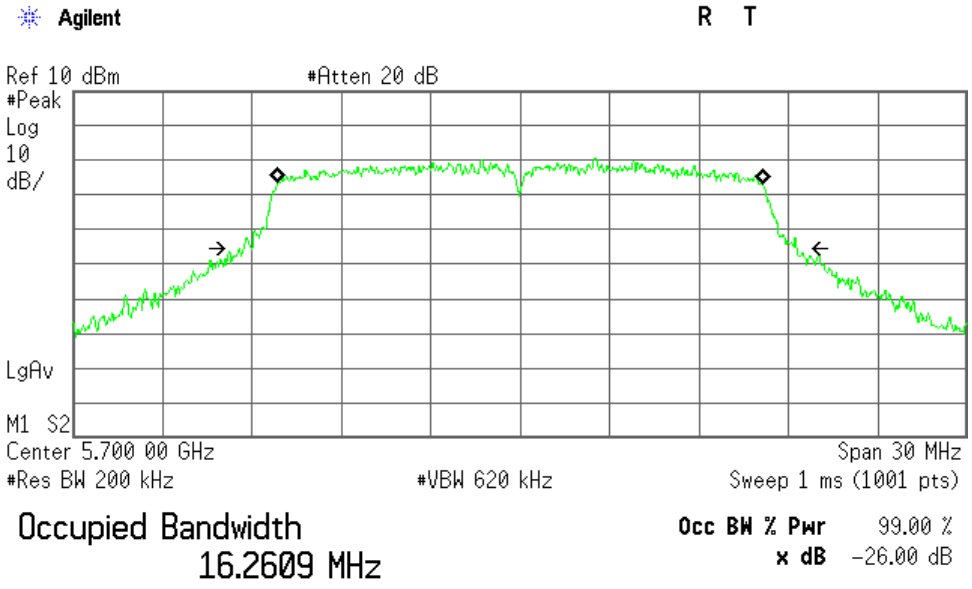
Transmit Freq Error 4.457 kHz
Occupied Bandwidth 18.816 MHz

802.11a 116ch (5580 MHz)



Transmit Freq Error 2.068 kHz
Occupied Bandwidth 19.385 MHz

802.11a 140ch (5700 MHz)



Transmit Freq Error -10.295 kHz
Occupied Bandwidth 18.711 MHz

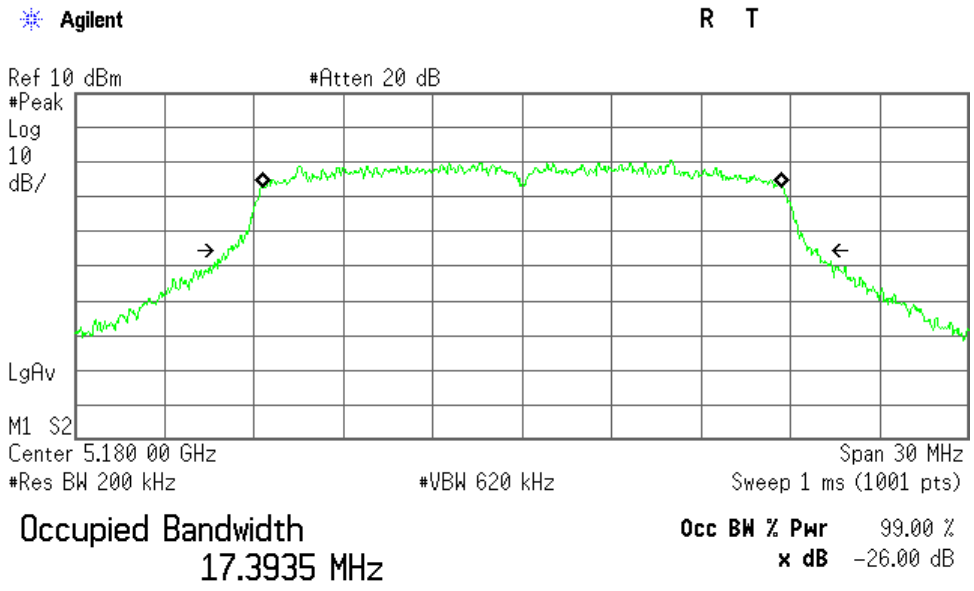
7.1.4.2 802.11n (20 MHz BW) 26dB/ 99% OBW

a) Main Antenna

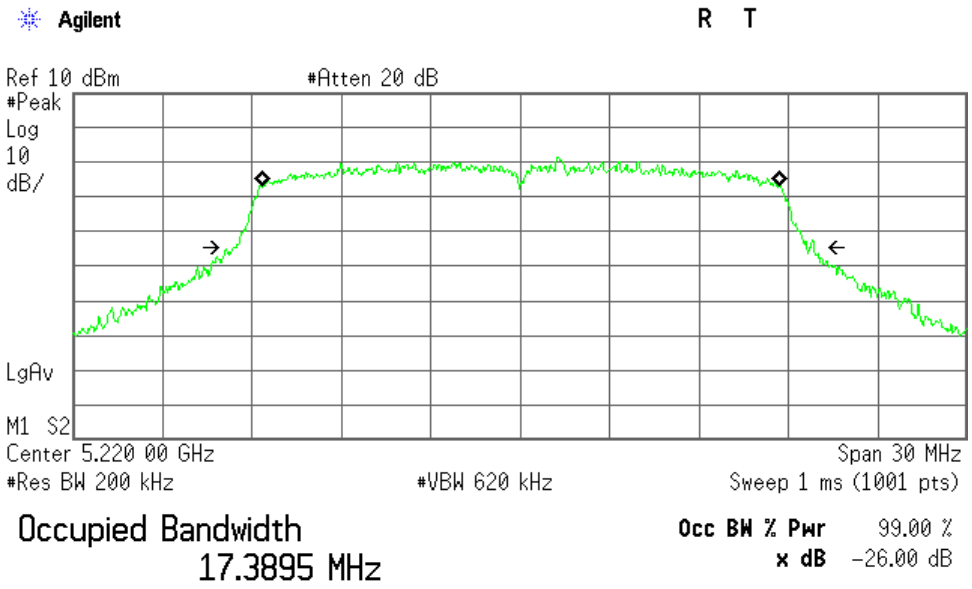
Mode of EUT: Tx 802.11n(20 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	26dB OBW	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	19.765	17.394
44	5220	19.510	17.390
48	5240	19.334	17.378
52	5260	19.868	17.395
56	5280	19.467	17.376
64	5320	19.349	17.377
100	5500	19.686	17.400
116	5580	19.466	17.370
140	5700	19.546	17.395

802.11n (20 MHz) 36ch (5180 MHz)

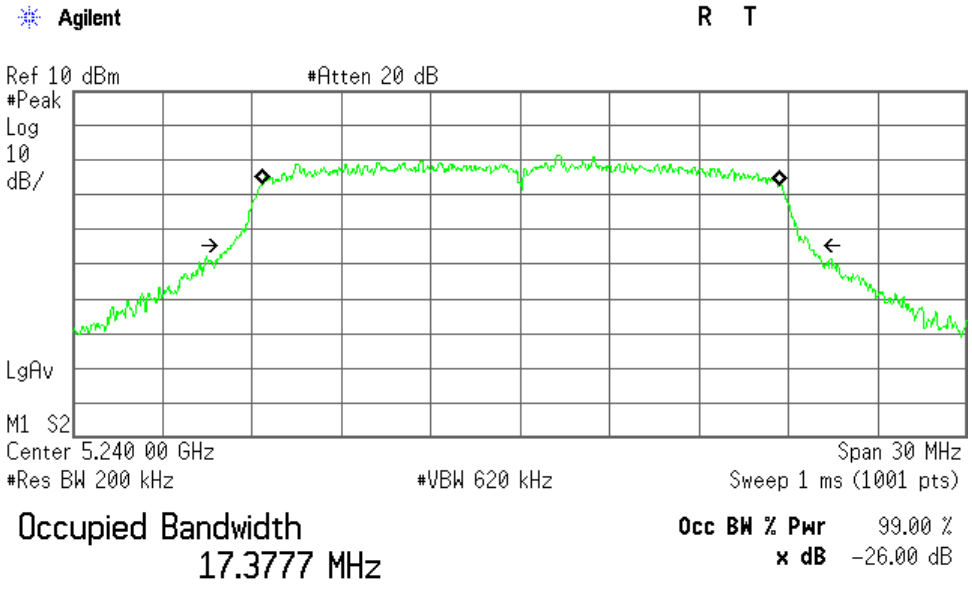


802.11n (20 MHz) 44ch (5220 MHz)



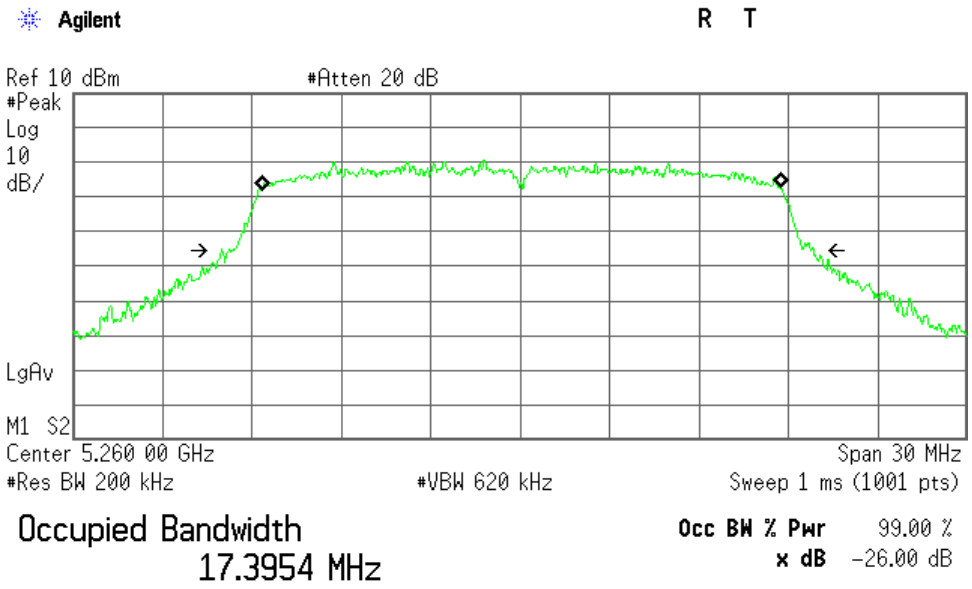
Transmit Freq Error 10.016 kHz
Occupied Bandwidth 19.510 MHz

802.11n (20 MHz) 48ch (5240 MHz)



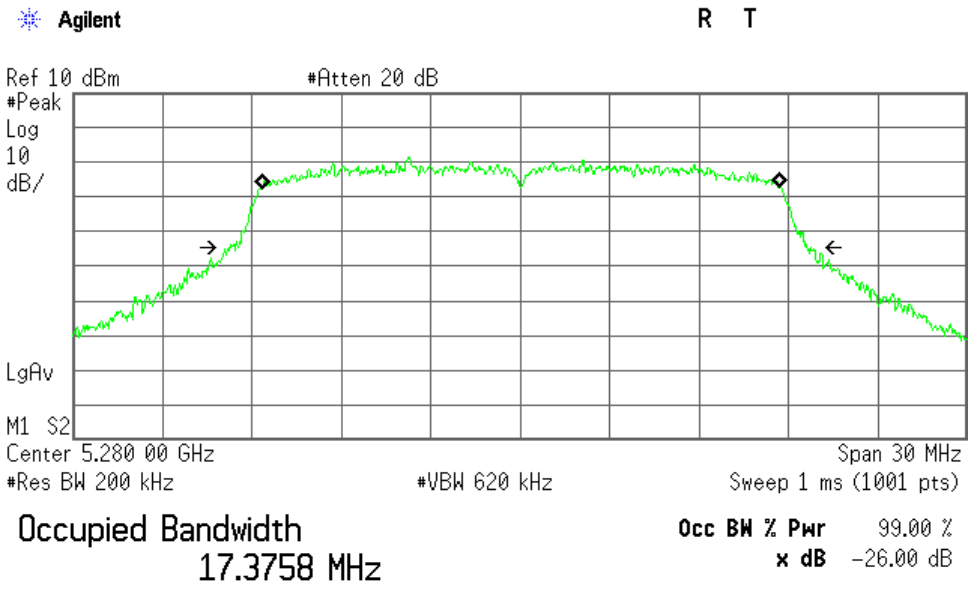
Transmit Freq Error 16.127 kHz
Occupied Bandwidth 19.334 MHz

802.11n (20 MHz) 52ch (5260 MHz)



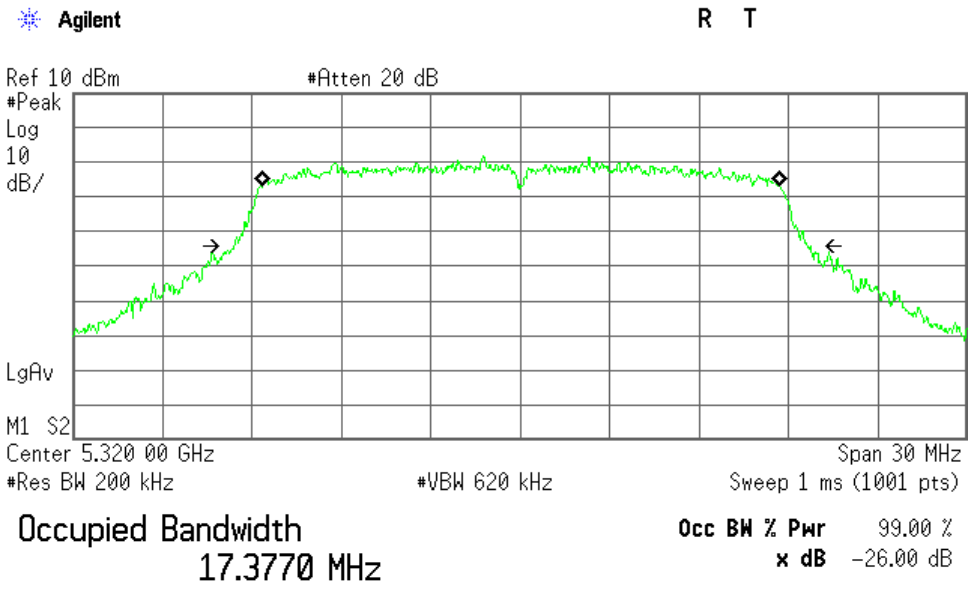
Transmit Freq Error 18.961 kHz
Occupied Bandwidth 19.868 MHz

802.11n (20 MHz) 56ch (5280 MHz)



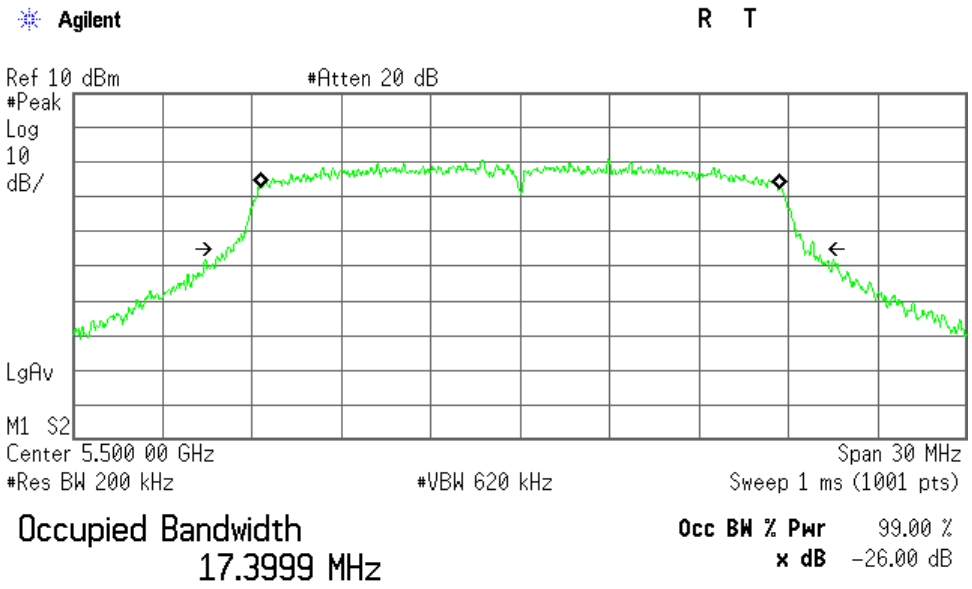
Transmit Freq Error 12.693 kHz
Occupied Bandwidth 19.467 MHz

802.11n (20 MHz) 64ch (5320 MHz)



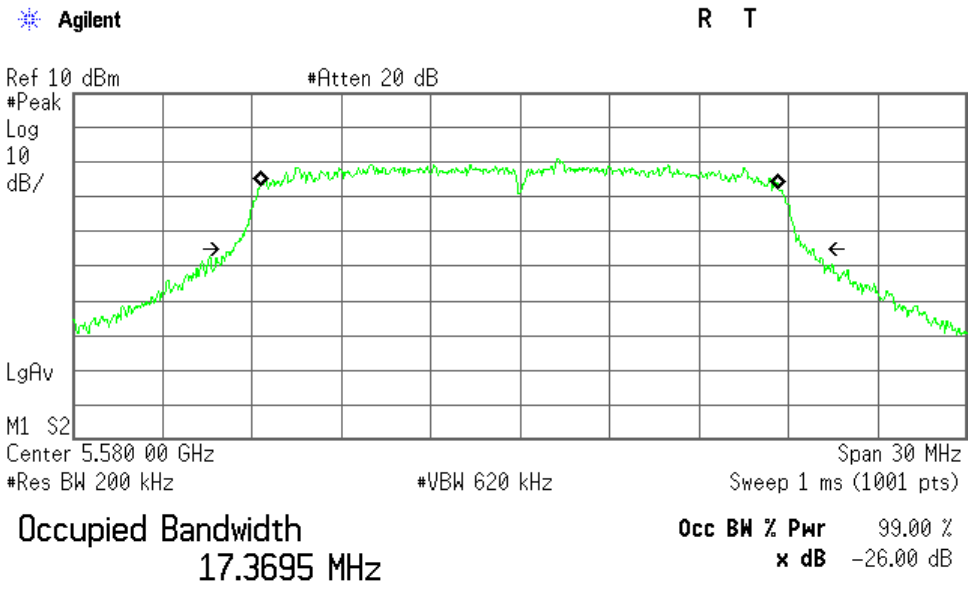
Transmit Freq Error 10.597 kHz
Occupied Bandwidth 19.349 MHz

802.11n (20 MHz) 100ch (5500 MHz)



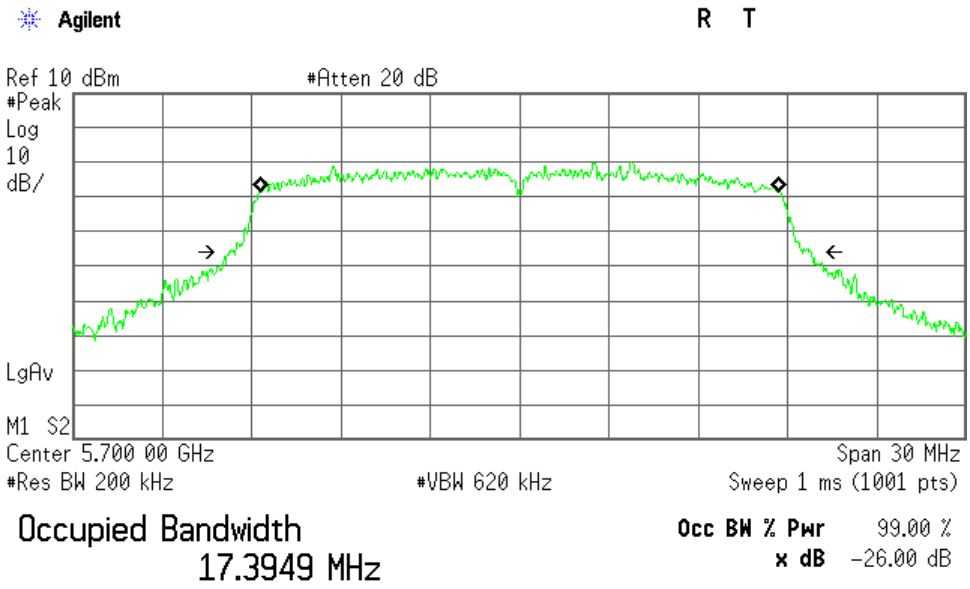
Transmit Freq Error 5.016 kHz
Occupied Bandwidth 19.686 MHz

802.11n (20 MHz) 116ch (5580 MHz)



Transmit Freq Error −6.294 kHz
Occupied Bandwidth 19.466 MHz

802.11n (20 MHz) 140ch (5700 MHz)



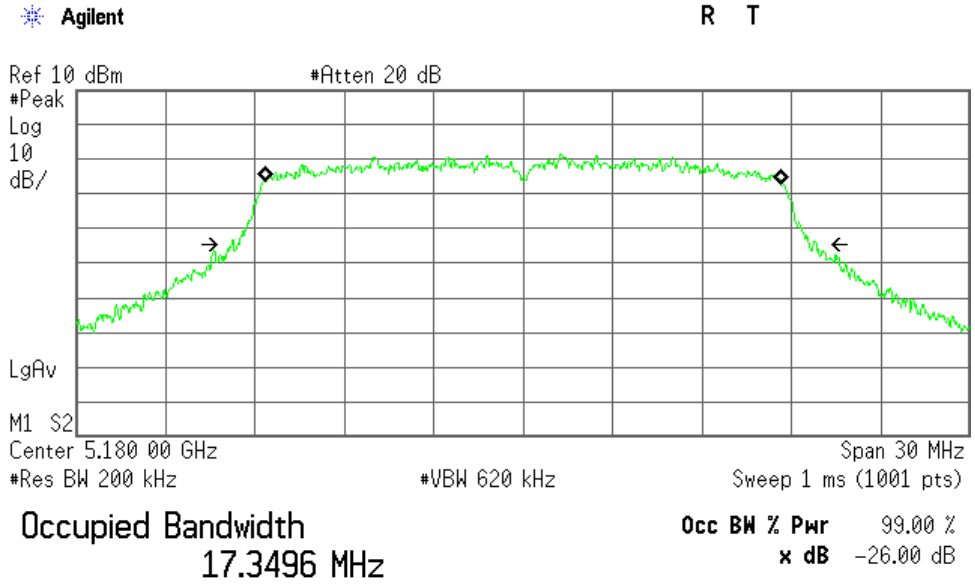
Transmit Freq Error 987.815 Hz
Occupied Bandwidth 19.546 MHz

b) Sub Antenna

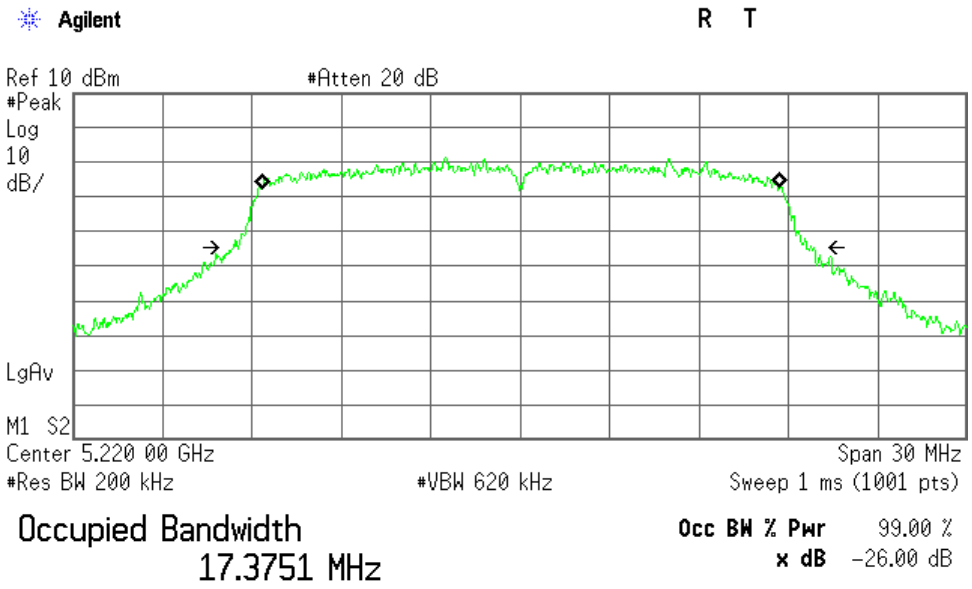
Mode of EUT: Tx 802.11n(20 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	26dB OBW	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	19.641	17.350
44	5220	19.515	17.375
48	5240	19.466	17.332
52	5260	19.548	17.383
56	5280	19.827	17.391
64	5320	19.493	17.391
100	5500	19.718	17.344
116	5580	19.620	17.371
140	5700	19.575	17.367

802.11n (20 MHz) 36ch (5180 MHz)

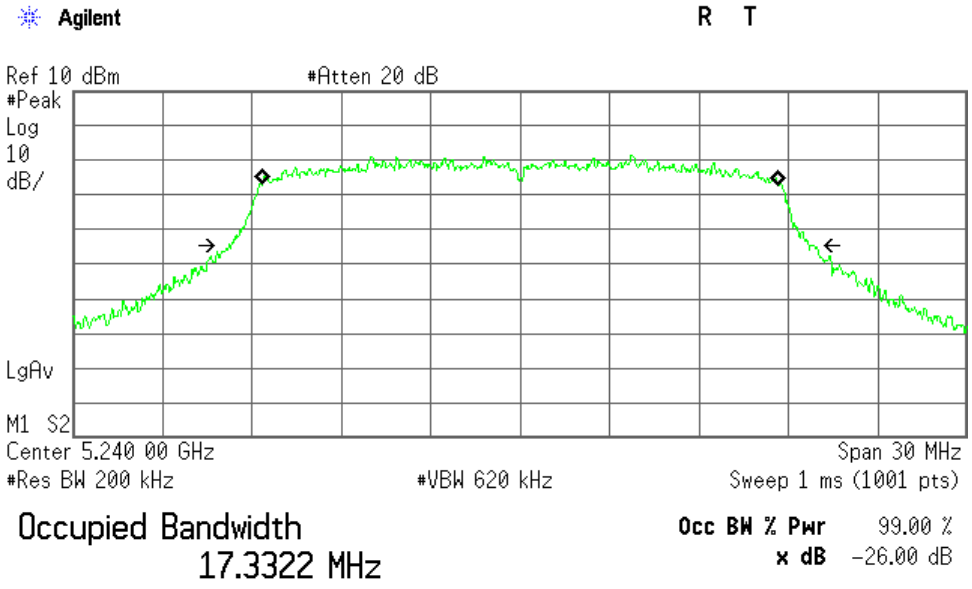


802.11n (20 MHz) 44ch (5220 MHz)



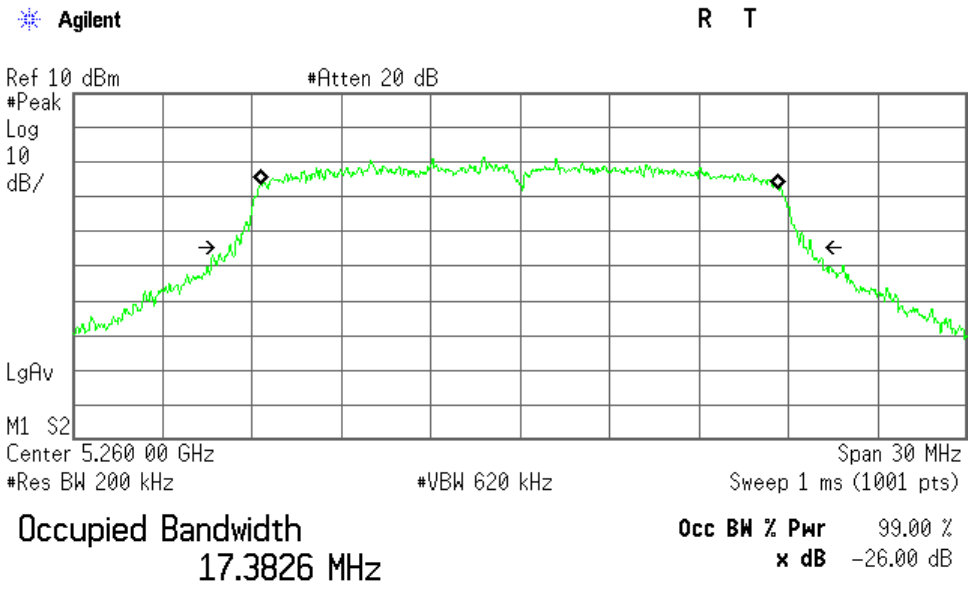
Transmit Freq Error 12.132 kHz
Occupied Bandwidth 19.515 MHz

802.11n (20 MHz) 48ch (5240 MHz)



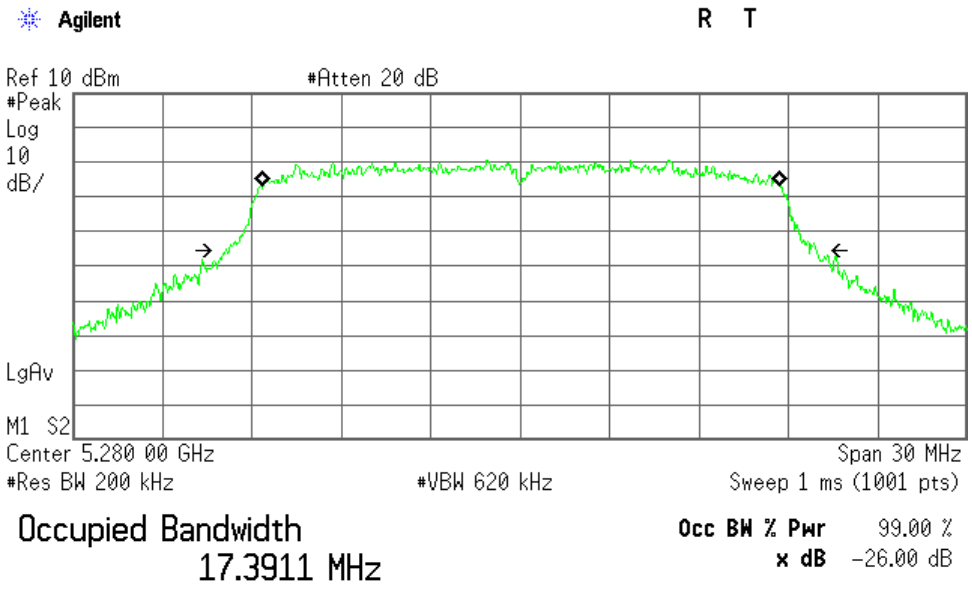
Transmit Freq Error 2.846 kHz
Occupied Bandwidth 19.466 MHz

802.11n (20 MHz) 52ch (5260 MHz)



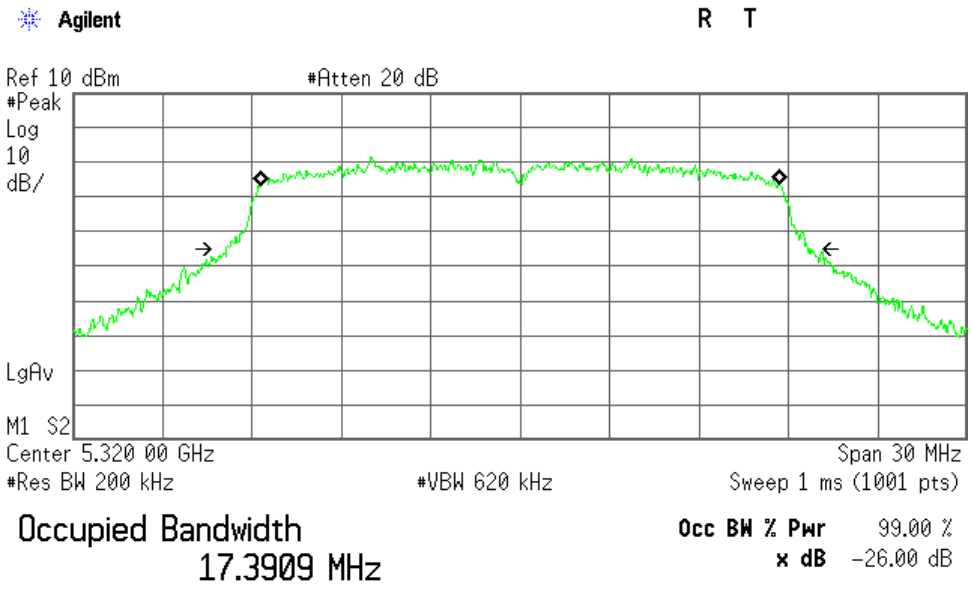
Transmit Freq Error −8.419 kHz
Occupied Bandwidth 19.548 MHz

802.11n (20 MHz) 56ch (5280 MHz)



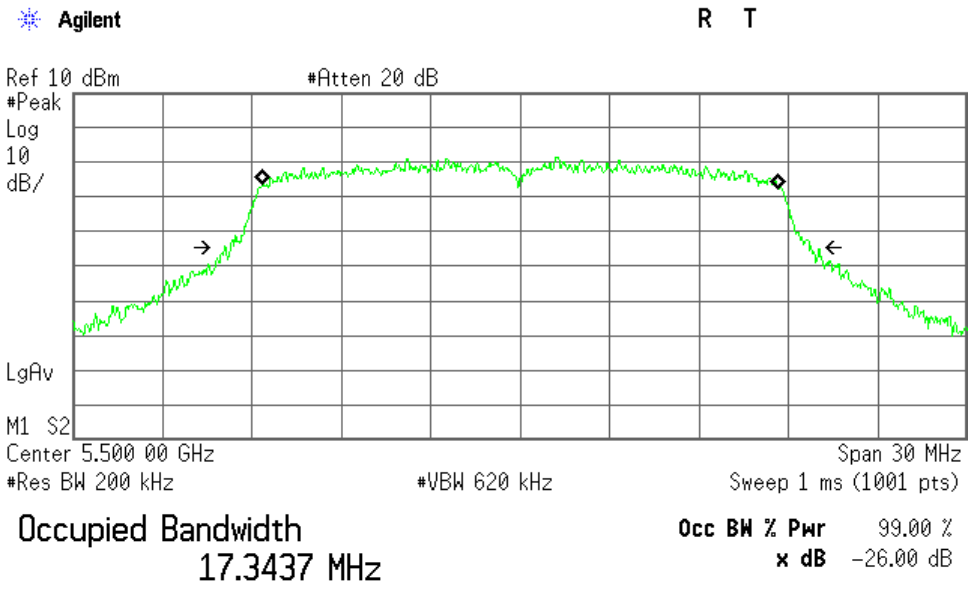
Transmit Freq Error 14.037 kHz
Occupied Bandwidth 19.827 MHz

802.11n (20 MHz) 64ch (5320 MHz)



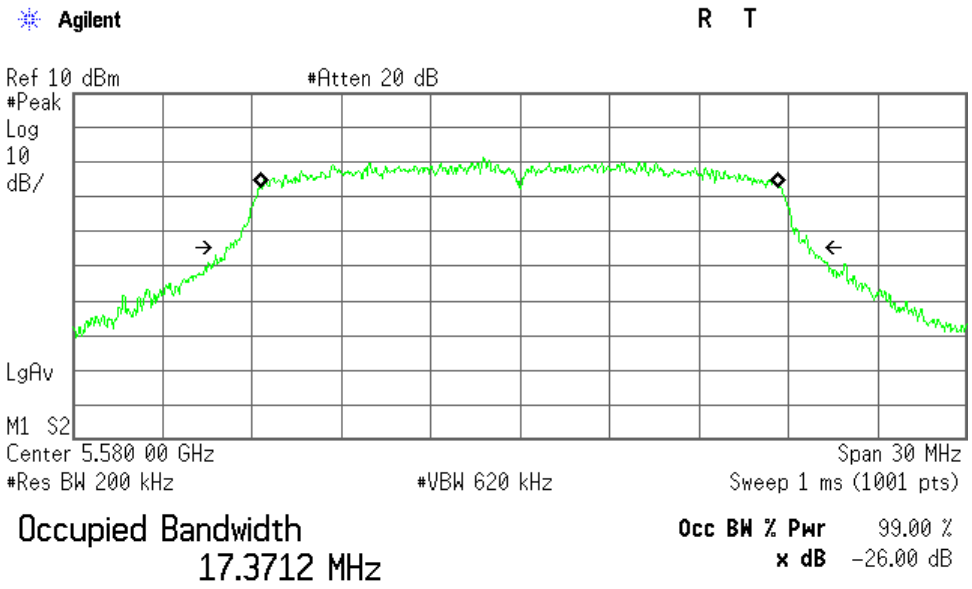
Transmit Freq Error -9.865 kHz
Occupied Bandwidth 19.493 MHz

802.11n (20 MHz) 100ch (5500 MHz)



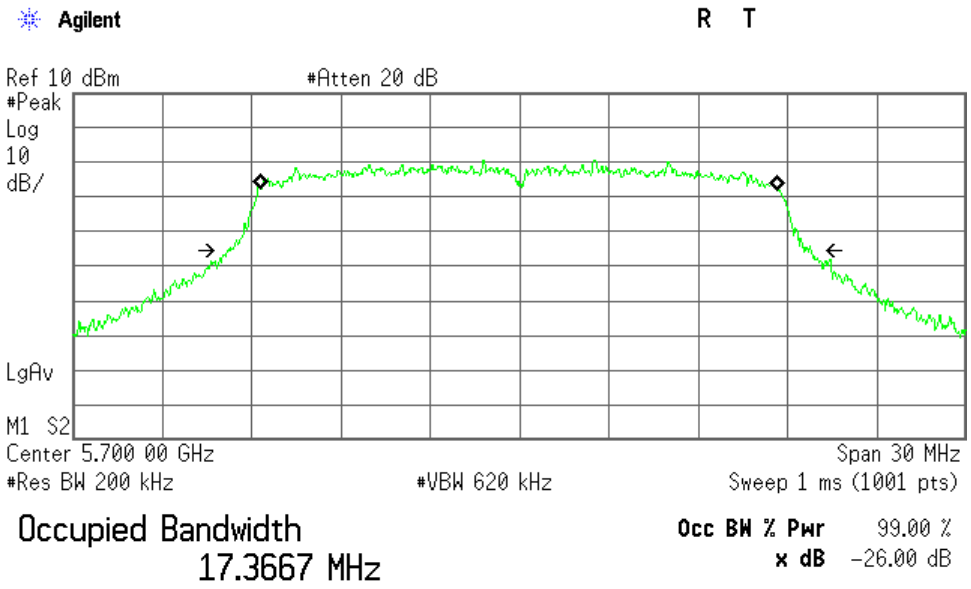
Transmit Freq Error 1.422 kHz
Occupied Bandwidth 19.718 MHz

802.11n (20 MHz) 116ch (5580 MHz)



Transmit Freq Error −2.904 kHz
Occupied Bandwidth 19.620 MHz

802.11n (20 MHz) 140ch (5700 MHz)



Transmit Freq Error −8.813 kHz
Occupied Bandwidth 19.575 MHz

7.1.4.3 802.11n (40 MHz BW) 26dB/ 99% OBW

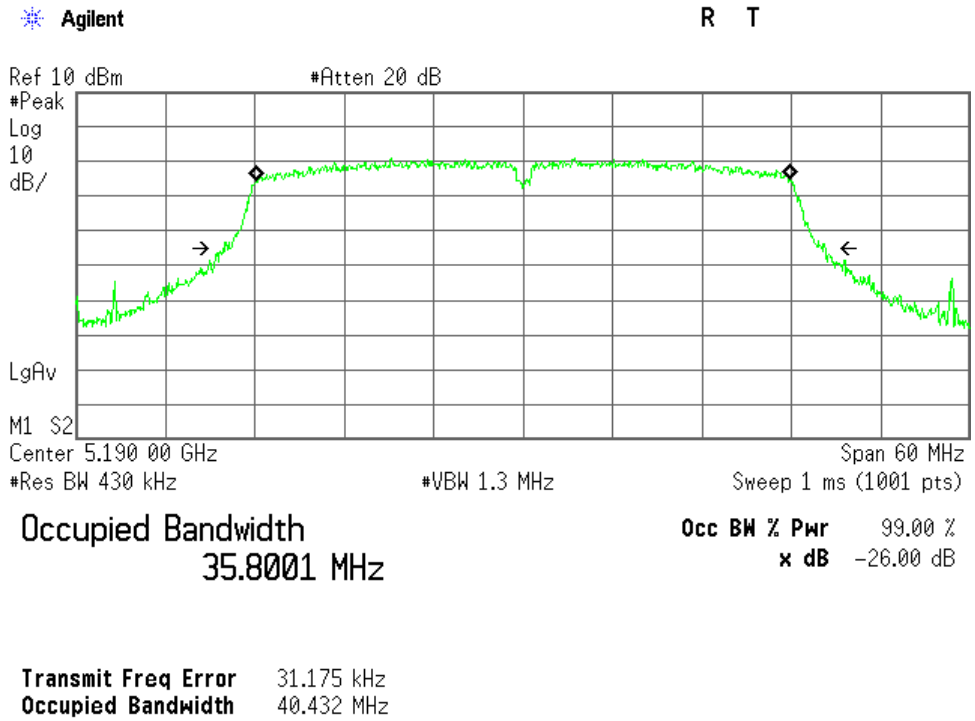
a) Main Antenna

Mode of EUT: Tx 802.11n(40 MHz)

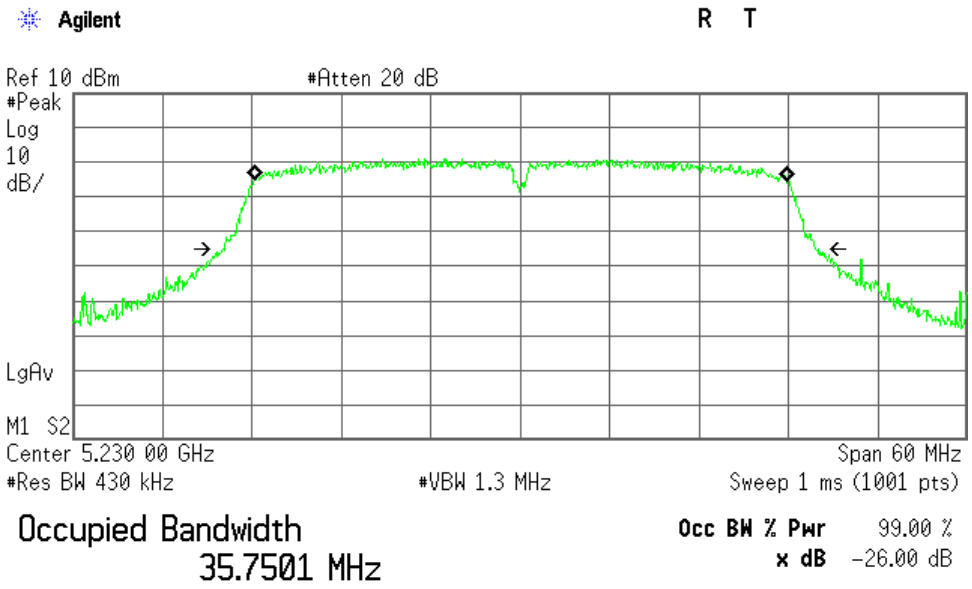
Test Port: Temporary antenna connector

Channel	Frequency (MHz)	26dB OBW (MHz)	99% OBW (MHz)
38	5190	40.432	35.800
46	5230	39.670	35.750
54	5270	39.771	35.794
62	5310	40.070	35.813
102	5510	39.648	35.740
134	5670	40.530	35.809

802.11n (40 MHz) 38ch (5190 MHz)

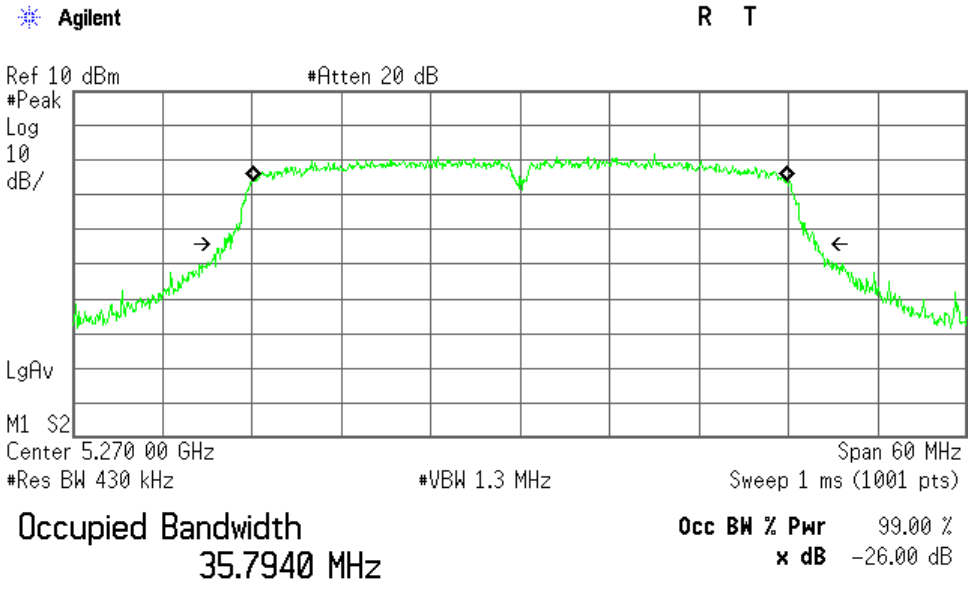


802.11n (40 MHz) 46ch (5230 MHz)



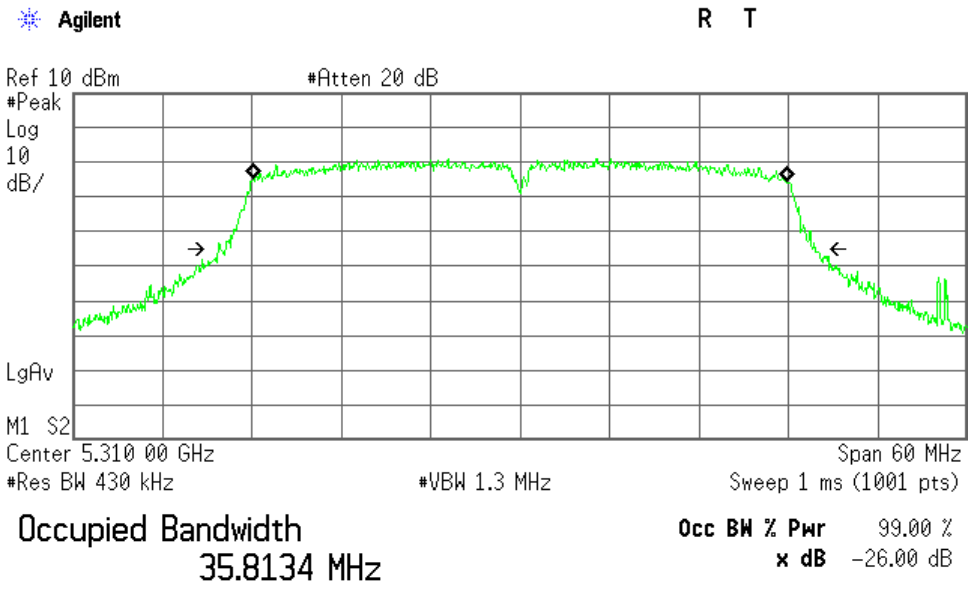
Transmit Freq Error 37.866 kHz
Occupied Bandwidth 39.670 MHz

802.11n (40 MHz) 54ch (5270 MHz)



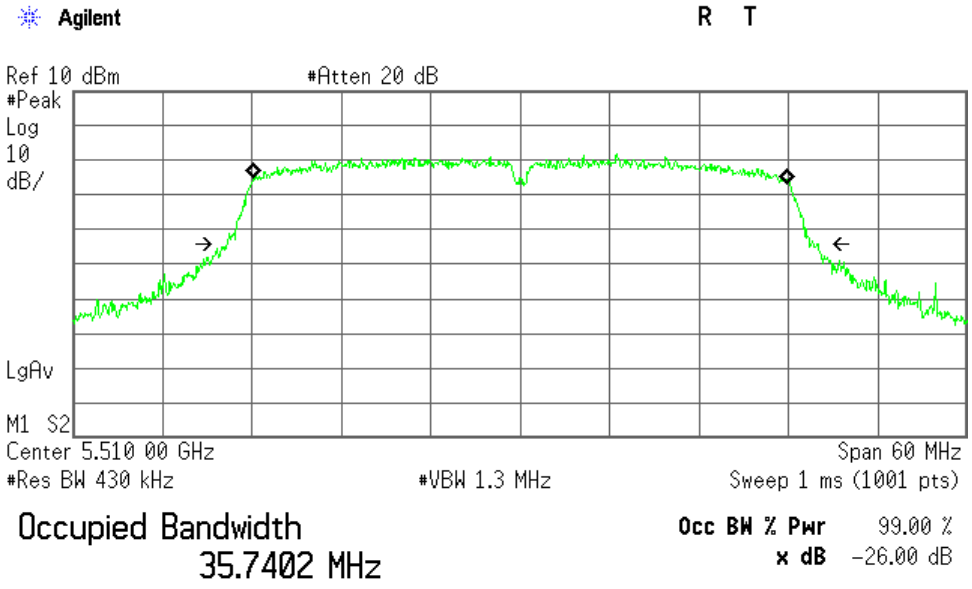
Transmit Freq Error 1.965 kHz
Occupied Bandwidth 39.771 MHz

802.11n (40 MHz) 62ch (5310 MHz)



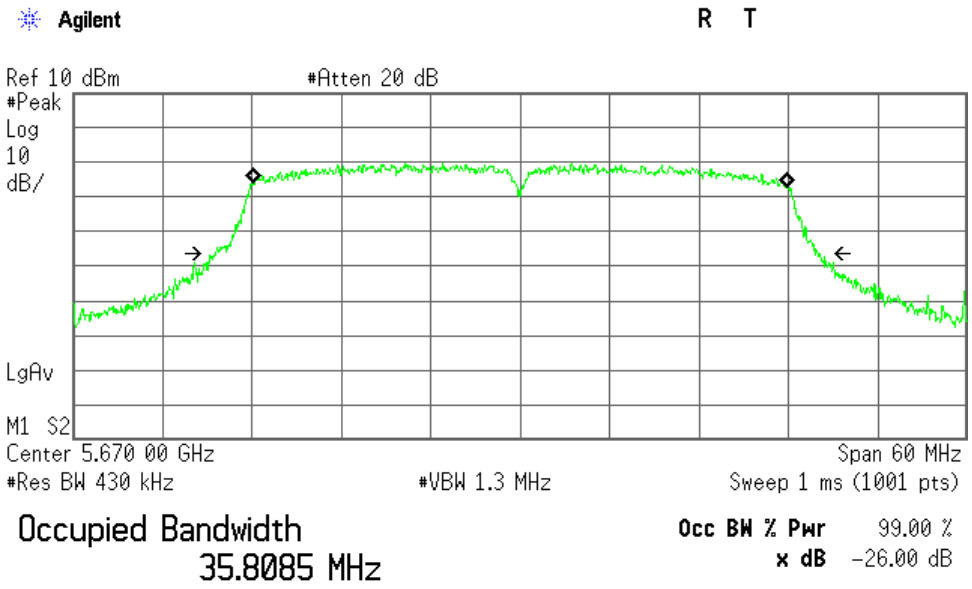
Transmit Freq Error 3.373 kHz
Occupied Bandwidth 40.070 MHz

802.11n (40 MHz) 102ch (5510 MHz)



Transmit Freq Error 12.482 kHz
Occupied Bandwidth 39.648 MHz

802.11n (40 MHz) 134ch (5670 MHz)



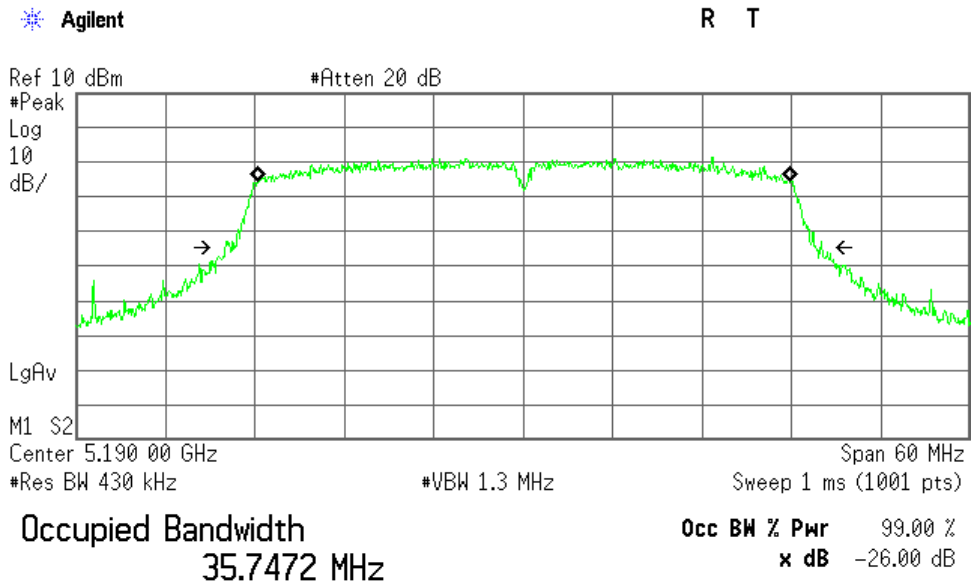
Transmit Freq Error	-35.721 kHz
Occupied Bandwidth	40.530 MHz

b) Sub Antenna

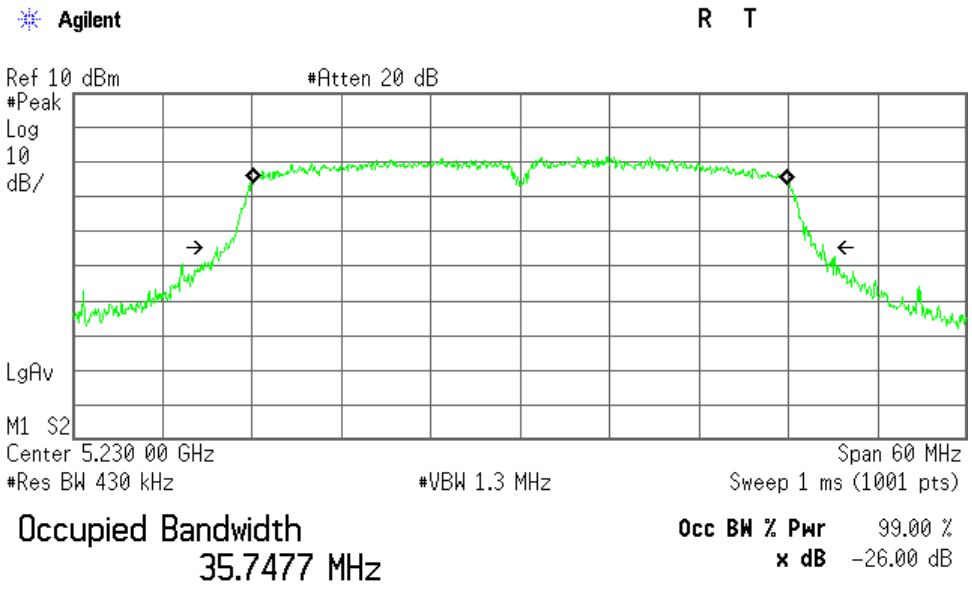
Mode of EUT: Tx 802.11n(40 MHz)
Test Port: Temporary antenna connector

Channel	Frequency (MHz)	26dB OBW (MHz)	99% OBW (MHz)
38	5190	40.021	35.747
46	5230	40.689	35.748
54	5270	40.152	35.775
62	5310	39.903	35.760
102	5510	40.349	35.731
134	5670	40.172	35.765

802.11n (40 MHz) 38ch (5190 MHz)

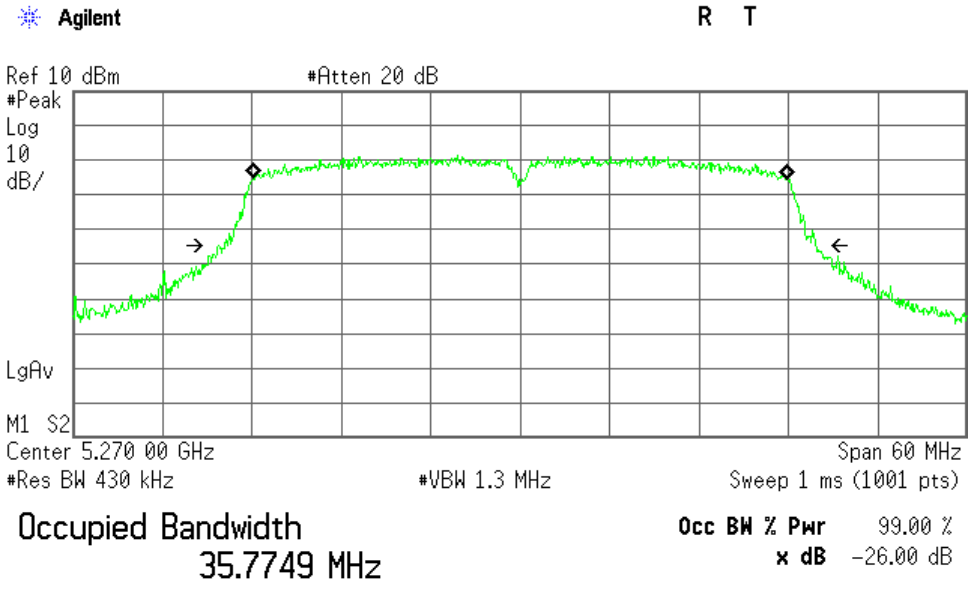


802.11n (40 MHz) 46ch (5230 MHz)



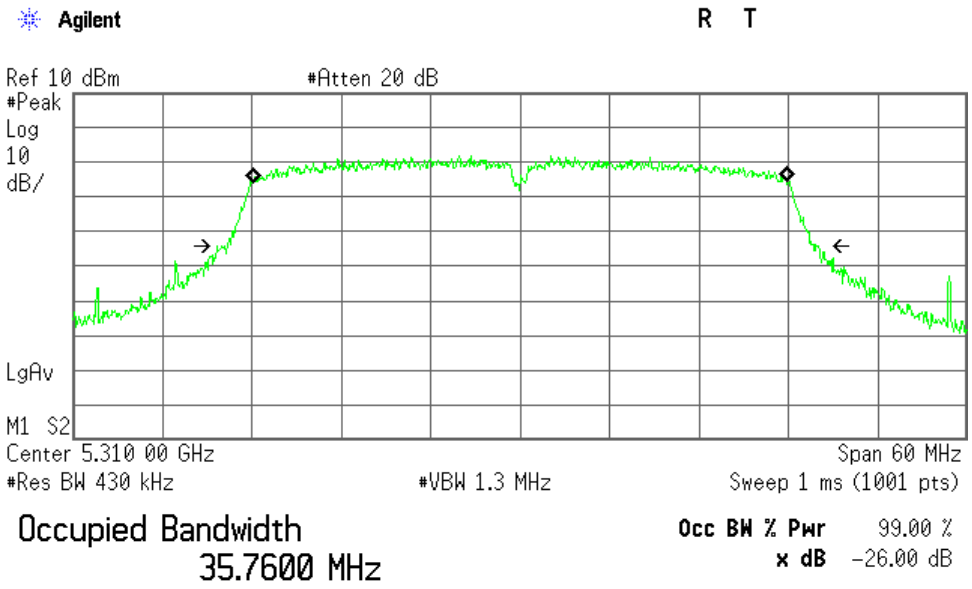
Transmit Freq Error 7.055 kHz
Occupied Bandwidth 40.689 MHz

802.11n (40 MHz) 54ch (5270 MHz)



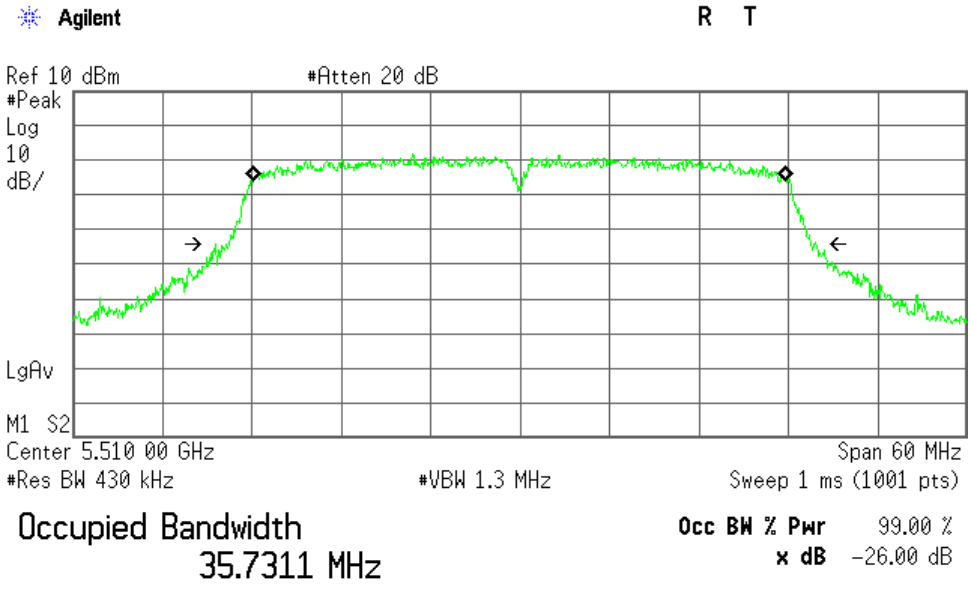
Transmit Freq Error 5.085 kHz
Occupied Bandwidth 40.152 MHz

802.11n (40 MHz) 62ch (5310 MHz)



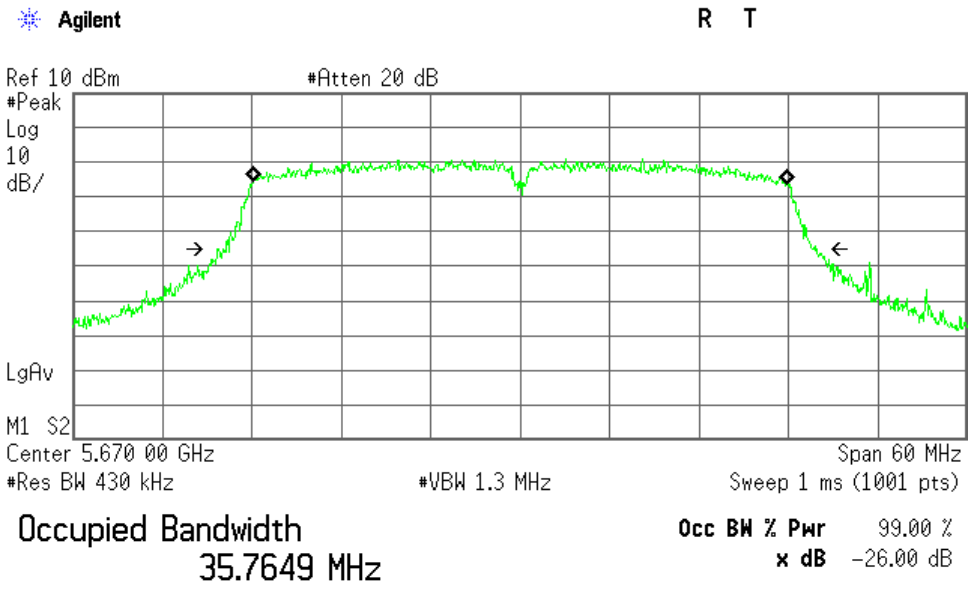
Transmit Freq Error -17.122 kHz
Occupied Bandwidth 39.903 MHz

802.11n (40 MHz) 102ch (5510 MHz)



Transmit Freq Error -16.399 kHz
Occupied Bandwidth 40.349 MHz

802.11n (40 MHz) 134ch (5670 MHz)



Transmit Freq Error	-17.054 kHz
Occupied Bandwidth	40.172 MHz

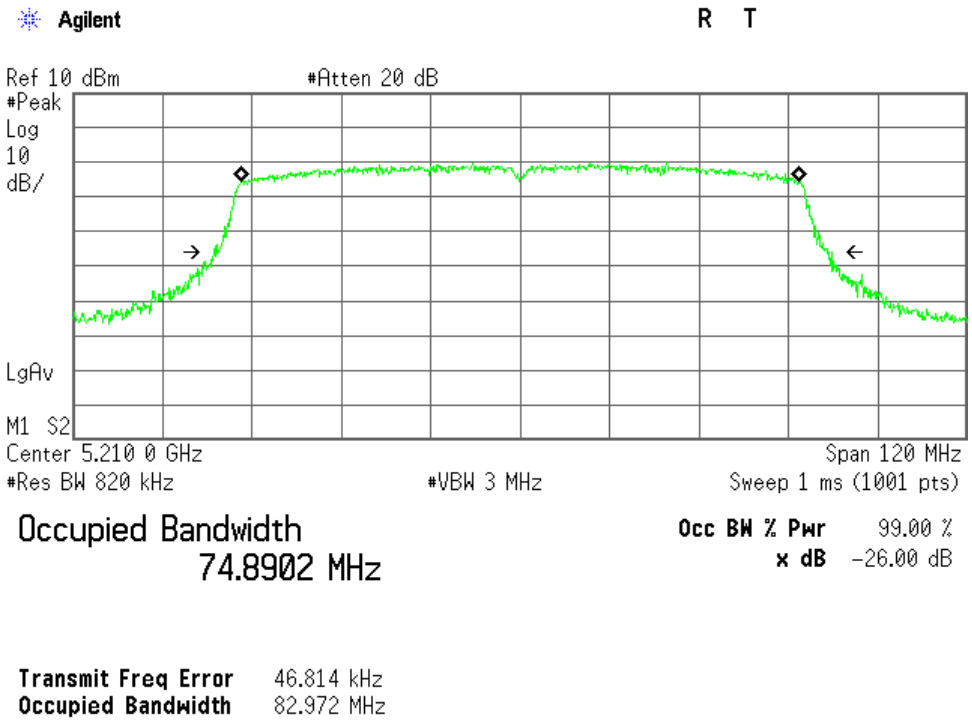
7.1.4.4 802.11ac (80 MHz BW) 26dB/ 99% OBW

a) Main Antenna

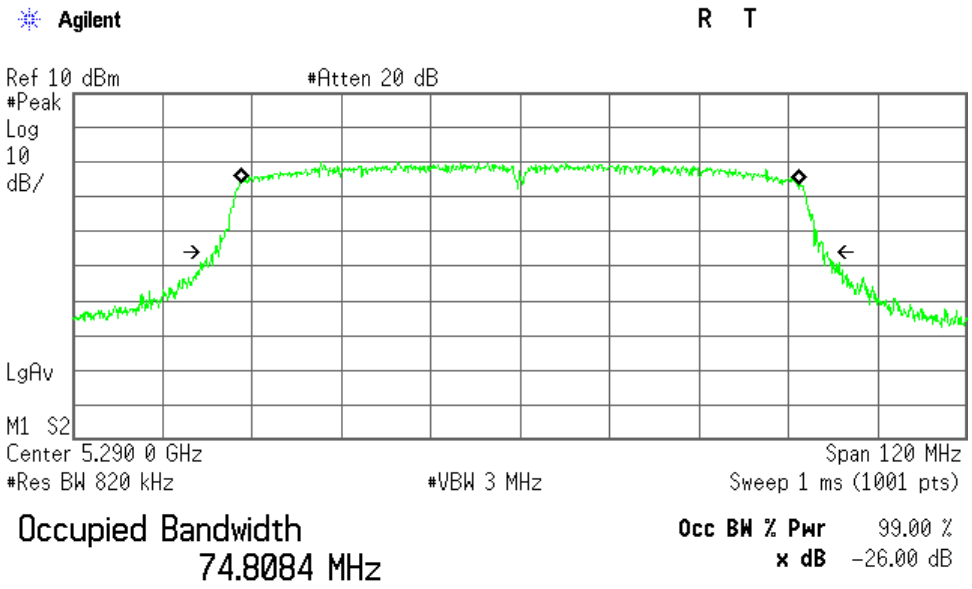
Mode of EUT: Tx 802.11ac(80 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	26dB OBW	99% OBW
	(MHz)	(MHz)	(MHz)
42	5210	82.972	74.890
58	5290	81.690	74.808
106	5530	81.444	74.649
122	5610	81.714	74.759

802.11ac (80 MHz) 42ch (5210 MHz)

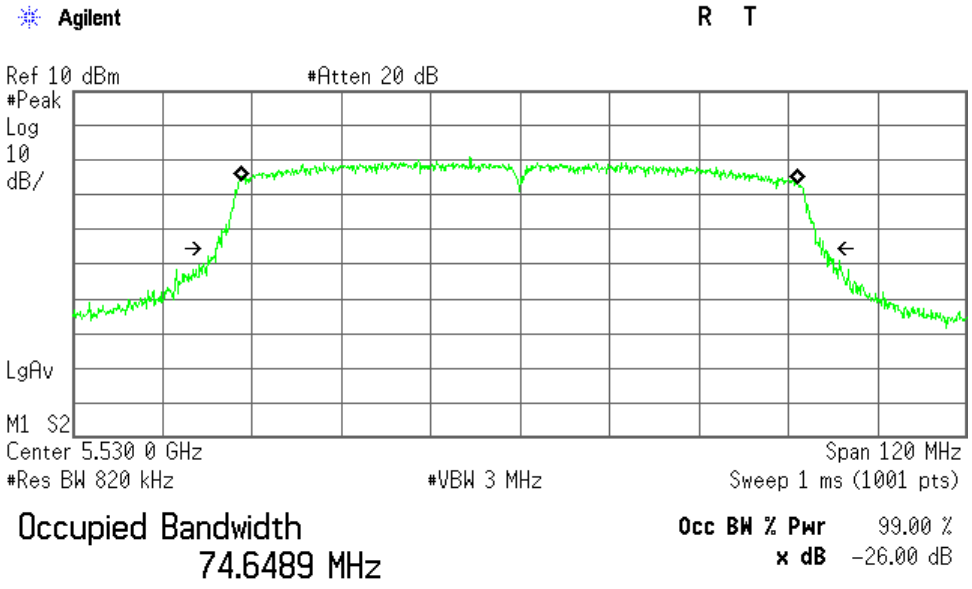


802.11ac (80 MHz) 58ch (5290 MHz)



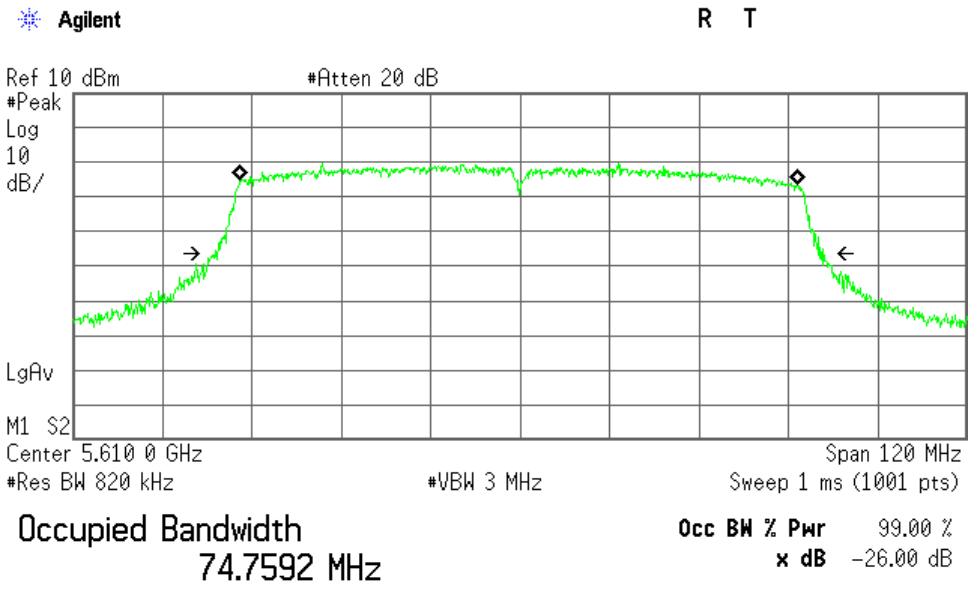
Transmit Freq Error 9.154 kHz
Occupied Bandwidth 81.690 MHz

802.11ac (80 MHz) 106ch (5530 MHz)



Transmit Freq Error -118.754 kHz
Occupied Bandwidth 81.444 MHz

802.11ac (80 MHz) 122ch (5610 MHz)



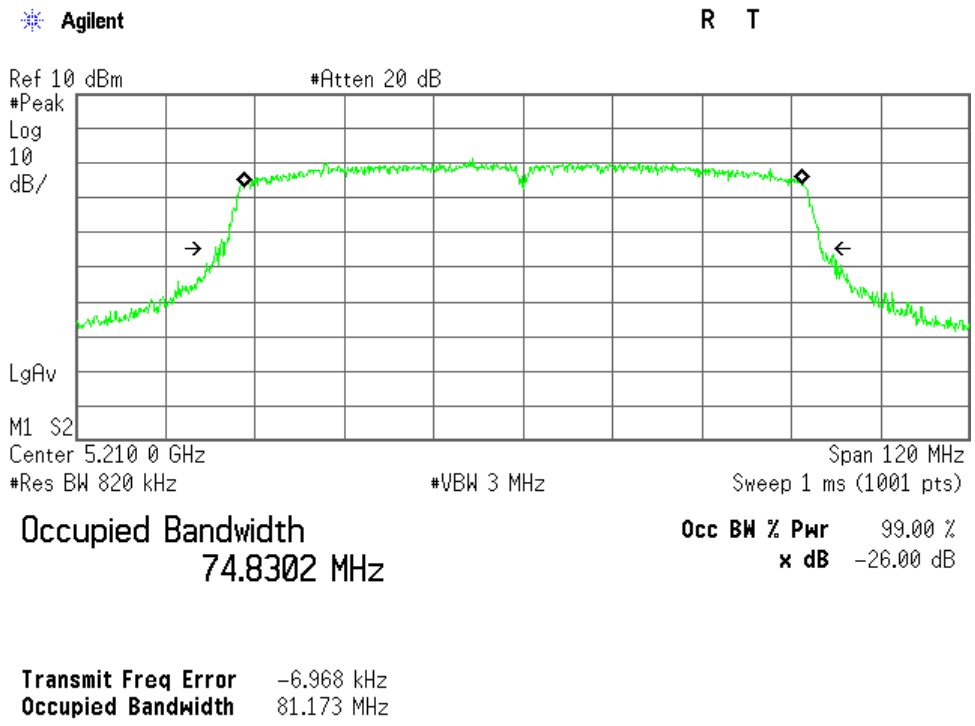
Transmit Freq Error	-138.976 kHz
Occupied Bandwidth	81.714 MHz

b) Sub Antenna

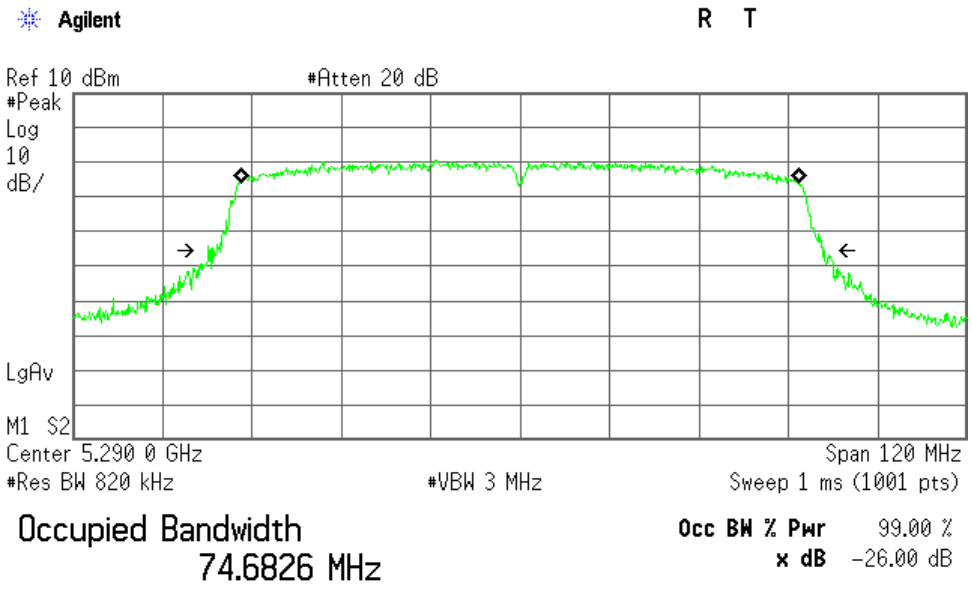
Mode of EUT: Tx 802.11ac(80 MHz)
Test Port: Temporary antenna connector

Channel	Frequency (MHz)	26dB OBW (MHz)	99% OBW (MHz)
42	5210	81.173	74.830
58	5290	82.594	74.683
106	5530	81.622	74.602
122	5610	81.863	74.698

802.11ac (80 MHz) 42ch (5210 MHz)

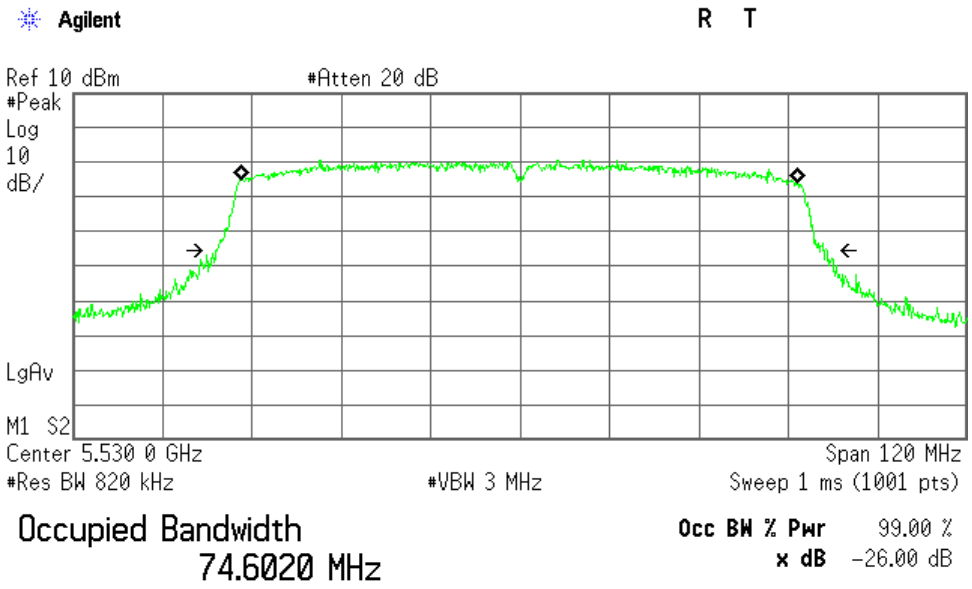


802.11ac (80 MHz) 58ch (5290 MHz)



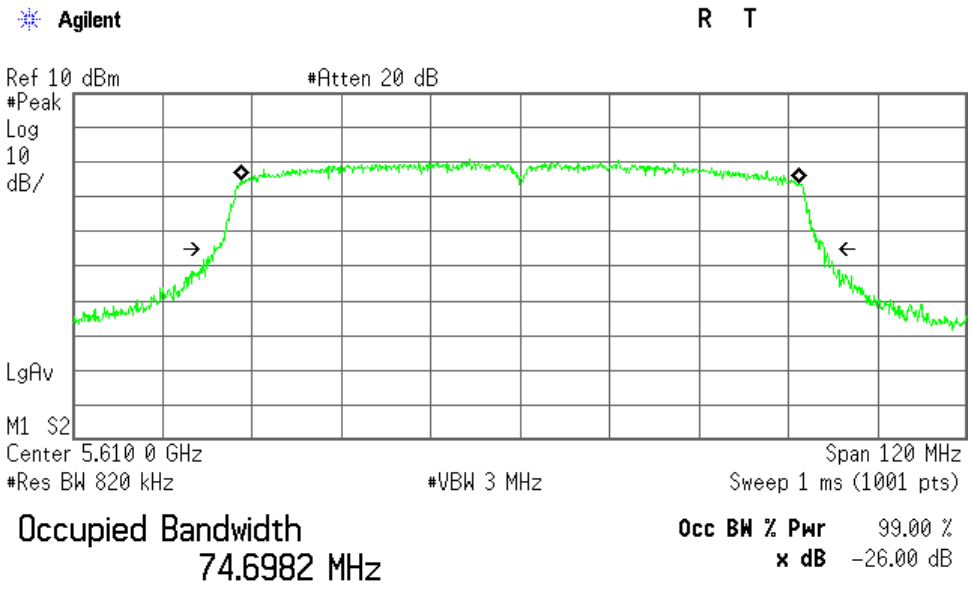
Transmit Freq Error −74.056 kHz
Occupied Bandwidth 82.594 MHz

802.11ac (80 MHz) 106ch (5530 MHz)



Transmit Freq Error −100.059 kHz
Occupied Bandwidth 81.622 MHz

802.11ac (80 MHz) 122ch (5610 MHz)



Transmit Freq Error	−83.022 kHz
Occupied Bandwidth	81.863 MHz

7.2 Maximum Conducted Output Power

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.2.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin 9.63 dB at 5190.0 MHz

Remarks : Worst case is 802.11n: 40MHz channel 38.

Max Output Power 14.37 dB at 5190.0 MHz

Remarks : Worst case is 802.11n: 40MHz channel 38.

Uncertainty of Measurement Results ± 0.9 dB(2σ)

7.2.2 Test Instruments

Shielded Room S4				
Type	**Model**	**Serial No. (ID)**	**Manufacturer**	**Cal. Due**
Power Meter	ML2495A	1423001 (B-16)	Anritsu	2016/07/16
Power Sensor	MA2411B	1339136 (B-18)	Anritsu	2016/07/16
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	54A-10	W5675 (D-28)	Weinschel	2016/08/16
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

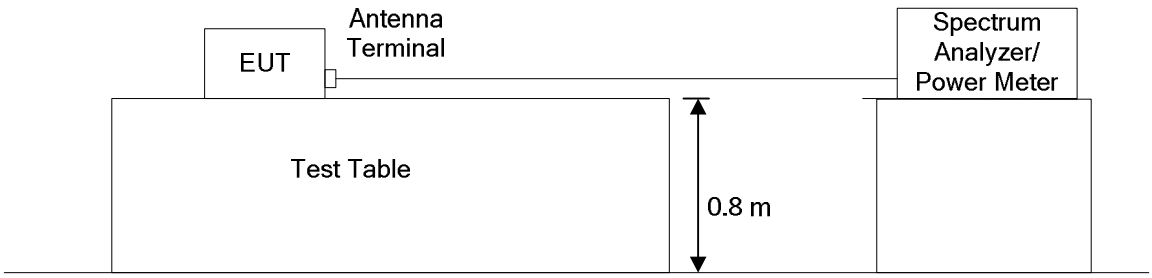
NOTE : The calibration interval of the above test instruments is 12 months.

7.2.3 Test Method and Test Setup (Diagrammatic illustration)

The maximum conducted output power measurements were carried out connecting to the power meter and the pulse power sensor or spectrum analyzer listed above.

Measurement Method:
1) WLAN 20 MHz/40 MHz BW mode
   KDB 789033 D02 E.3.a) Method PM (Measurement using an RF average power meter)
2) WLAN 80 MHz BW mode
   KDB 789033 D02 E.2.d) Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction)

The EUT transmits non-continuously therefore the duty cycle measurements were performed.
The measurements of duty cycle and transmission duration were performed connecting to the spectrum analyzer in accordance with KDB 789033 D02 Method B.2. as follows;
Span: Zero/ RBW: 8 MHz/ VBW ≥ 8 MHz/ Sweep: Auto/ Detector: Peak



7.2.4 Test Data

Test Date :March 25, 2016
Temp.: 20°C, Humi: 27%

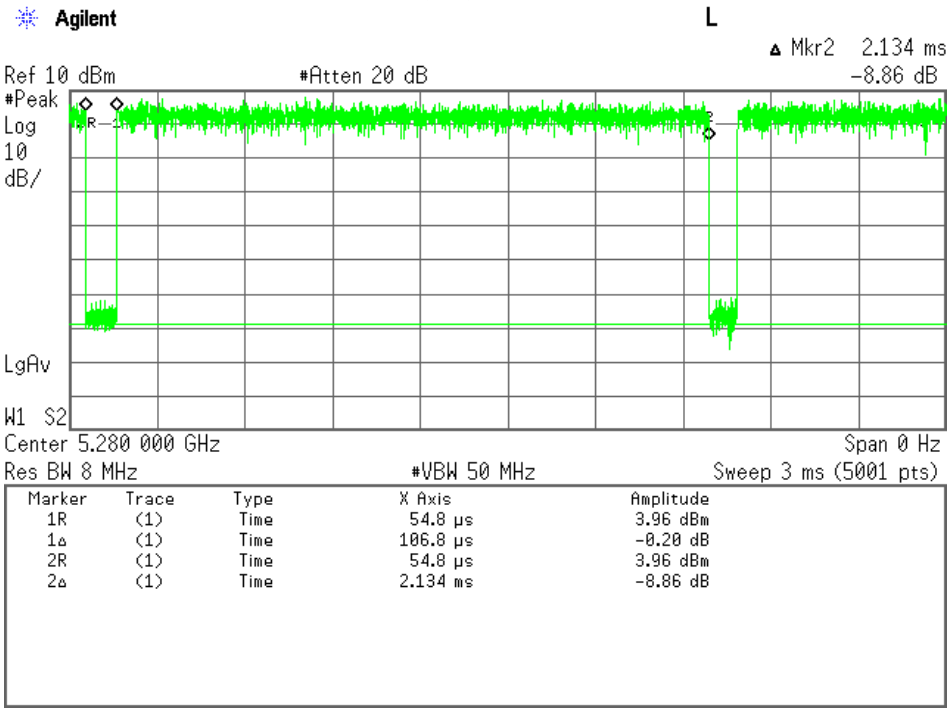
7.2.4.1 802.11a Maximum conducted output power

Mode of EUT: Tx Mode (802.11a)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			Power	EBW	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(MHz)	(dBm)	(dB)
36	5180	10.61	0.36	0.54	3.46	14.07	18.534	24.00	9.93
44	5220	10.61	0.25	0.50	3.39	14.00	18.883	24.00	10.00
48	5240	10.61	0.21	0.46	3.35	13.96	18.555	24.00	10.04
52	5260	10.62	0.16	0.43	3.31	13.93	18.567	23.69	9.76
56	5280	10.62	0.32	0.51	3.43	14.05	18.576	23.69	9.64
64	5320	10.62	0.25	0.41	3.34	13.96	19.416	23.88	9.92
100	5500	10.65	0.05	0.37	3.22	13.87	18.492	23.67	9.80
116	5580	10.66	-0.07	0.29	3.12	13.78	18.668	23.71	9.93
140	5700	10.66	-0.37	0.25	2.96	13.62	18.833	23.75	10.13

The test results (Power) is calculated as follows;
For 36 channel (5180 MHz)
Power = Correction Factor + Meter Reading = 10.61 + (3.46) = 14.07 dBm
Correction Factor = cable loss + 10 dB attenuator + Duty Factor
Duty Factor at 802.11a/ TX rate 6 Mbps is 0.22 dB
Frequency range 5150 MHz to 5250 MHz Limitation is lesser of 24 dBm(250 mW).
Frequency range 5250 MHz to 5350 MHz and 5470 MHz to 5725 MHz Limitation is lesser of 24 dBm(250 mW) or 11 dBm + 10log EBW.

Duty Cycle Plot



Duty Factor = 10 log ((Duty Cycle)/(Burst On-period))= 10 log (2134/(2134-106.8)) = 0.22 dB

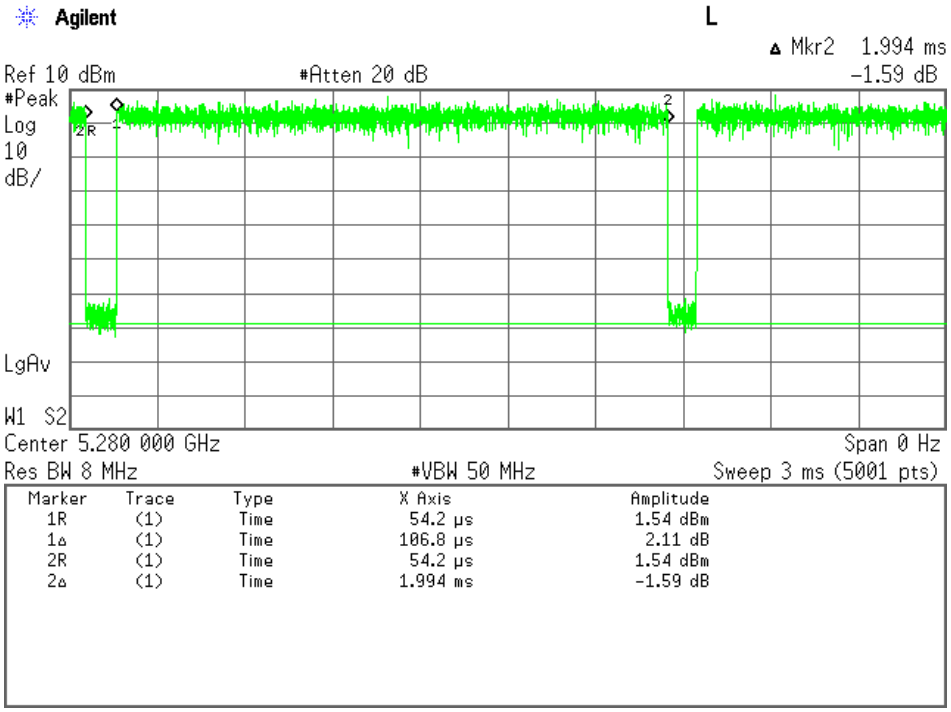
7.2.4.2 802.11n (20 MHz BW) Maximum conducted output power

Mode of EUT: Tx Mode (802.11n: 20 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			Power	EBW	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(MHz)	(dBm)	(dB)
36	5180	10.63	0.06	0.32	3.20	13.83	19.765	24.00	10.17
44	5220	10.63	-0.07	0.22	3.09	13.72	19.510	24.00	10.28
48	5240	10.63	-0.10	0.20	3.06	13.69	19.334	24.00	10.31
52	5260	10.64	-0.11	0.19	3.05	13.69	19.868	23.98	10.29
56	5280	10.64	0.05	0.27	3.17	13.81	19.467	23.89	10.08
64	5320	10.64	-0.03	0.17	3.08	13.72	19.349	23.87	10.15
100	5500	10.67	-0.22	0.15	2.98	13.65	19.686	23.94	10.29
116	5580	10.68	-0.36	0.06	2.87	13.55	19.466	23.89	10.34
140	5700	10.68	-0.63	-0.03	2.69	13.37	19.546	23.91	10.54

The test results (Power) is calculated as follows;
For 36 channel (5180 MHz)
Power = Correction Factor + Meter Reading = 10.63 + (3.20) = 13.83 dBm
Correction Factor = cable loss + 10 dB attenuator + Duty Factor
Duty Factor at 802.11n(20 MHz BW) / TX rate 6.5 Mbps is 0.24 dB
Frequency range 5150 MHz to 5250 MHz Limitation is lesser of 24 dBm(250 mW).
Frequency range 5250 MHz to 5350 MHz and 5470 MHz to 5725 MHz Limitation is lesser of 24 dBm(250 mW) or 11 dBm + 10log EBW.

Duty Cycle Plot



Duty Factor = 10 log ((Duty Cycle)/(Burst On-period))= 10 log (1994/(1994-106.8)) = 0.24 dB

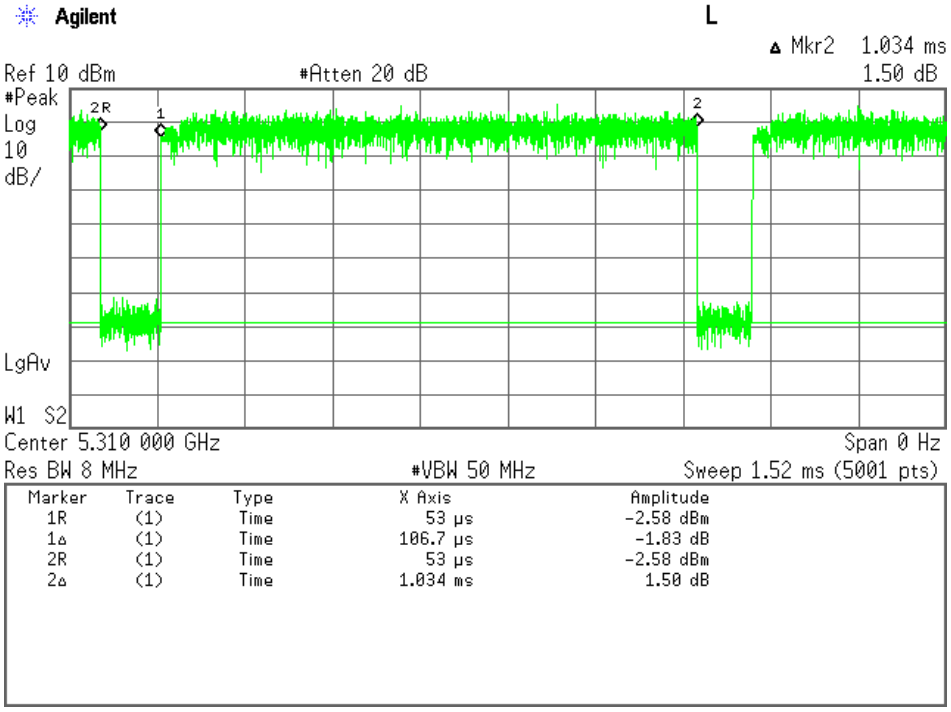
7.2.4.3 802.11n (40 MHz BW) Maximum conducted output power

Mode of EUT: Tx Mode (802.11n: 40 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			Power	EBW	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(MHz)	(dBm)	(dB)
38	5190	10.86	0.36	0.64	3.51	14.37	40.432	24.00	9.63
46	5230	10.86	0.29	0.58	3.45	14.31	39.670	24.00	9.69
54	5270	10.87	0.20	0.51	3.37	14.24	39.771	24.00	9.76
62	5310	10.87	0.32	0.56	3.45	14.32	40.070	24.00	9.68
102	5510	10.90	0.10	0.49	3.31	14.21	39.648	24.00	9.79
134	5670	10.91	-0.21	0.36	3.09	14.00	40.530	24.00	10.00

The test results (Power) is calculated as follows;
For 38 channel (5190 MHz)
Power = Correction Factor + Meter Reading = 10.86 + (3.51) = 14.37 dBm
Correction Factor = cable loss + 10 dB attenuator + Duty Factor
Duty Factor at 802.11n(40 MHz BW) / TX rate 13.5 Mbps is 0.47 dB
Frequency range 5150 MHz to 5250 MHz Limitation is lesser of 24 dBm(250 mW).
Frequency range 5250 MHz to 5350 MHz and 5470 MHz to 5725 MHz Limitation is lesser of 24 dBm(250 mW) or 11 dBm + 10log EBW.

Duty Cycle Plot



Duty Factor = 10 log ((Duty Cycle)/(Burst On-period))= 10 log (1034/(1034-106.7)) = 0.47 dB

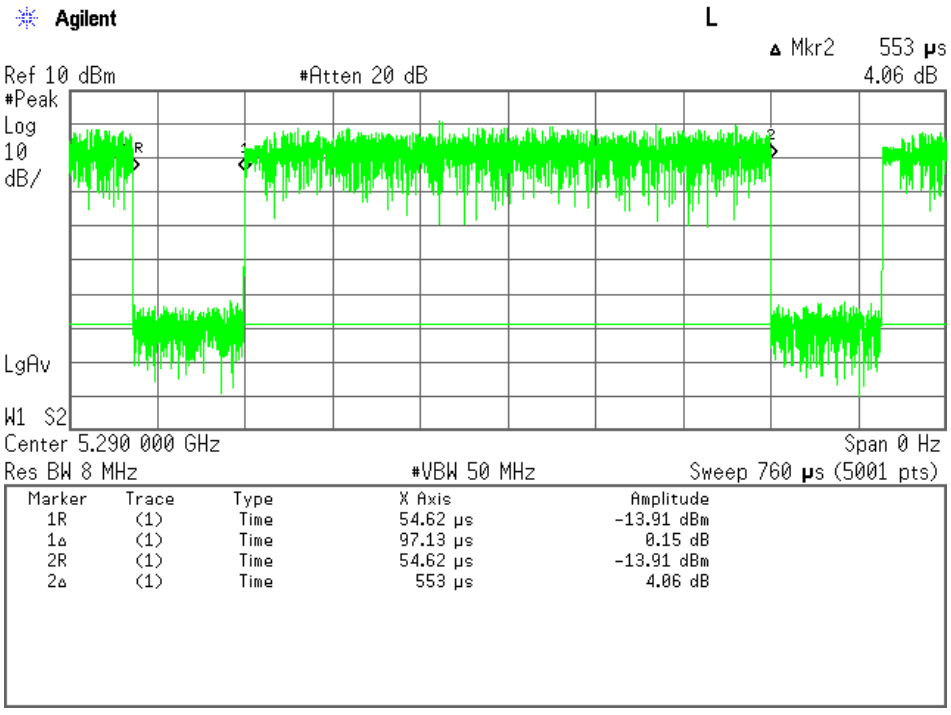
7.2.4.4 802.11ac (80 MHz BW) Maximum conducted output power

Mode of EUT: Tx Mode (802.11ac: 80 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			Power	EBW	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(MHz)	(dBm)	(dB)
42	5210	11.23	-1.17	-0.85	2.00	13.23	82.972	24.00	10.77
58	5290	11.24	-1.17	-0.99	1.93	13.17	81.690	24.00	10.83
106	5530	11.27	-1.48	-1.02	1.77	13.04	81.444	24.00	10.96
122	5610	11.28	-1.56	-1.02	1.73	13.01	81.714	24.00	10.99

The test results (Power) is calculated as follows;
For 42 channel (5210 MHz)
Power = Correction Factor + Meter Reading = 11.23 + (2.00) = 13.23 dBm
Correction Factor = cable loss + 10 dB attenuator + Duty Factor
Duty Factor at 802.11ac(80 MHz BW) / TX rate 29.3 Mbps is 0.84 dB
Frequency range 5150 MHz to 5250 MHz Limitation is lesser of 24 dBm(250 mW).
Frequency range 5250 MHz to 5350 MHz and 5470 MHz to 5725 MHz Limitation is lesser of 24 dBm(250 mW) or 11 dBm + 10log EBW.

Duty Cycle Plot

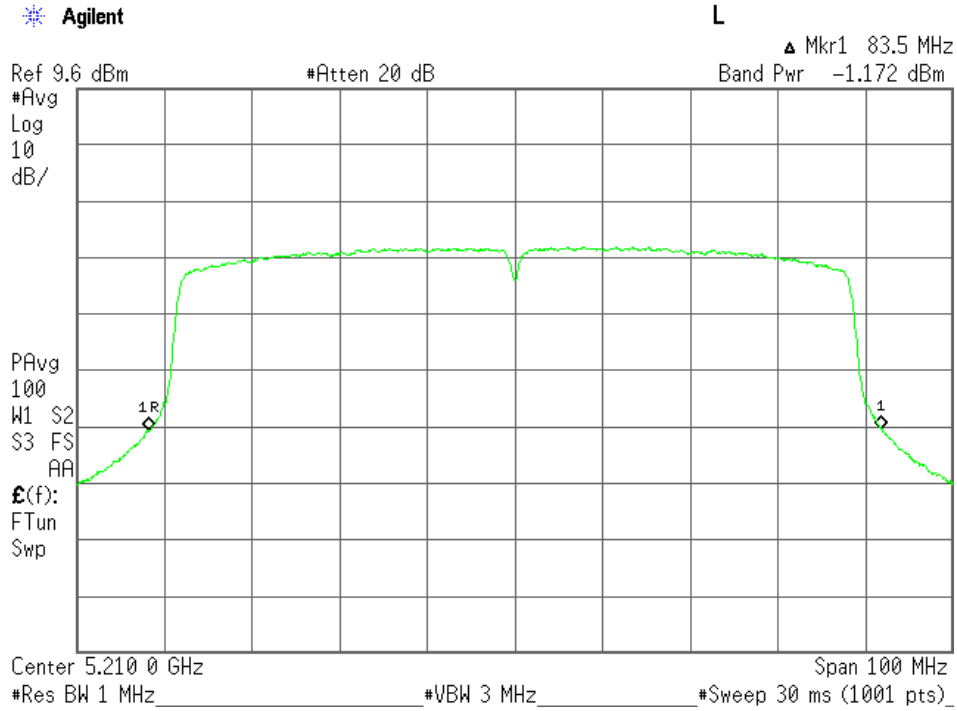


Duty Factor = 10 log ((Duty Cycle)/(Burst On-period))= 10 log (553.0/(553.0-97.1)) = 0.84 dB

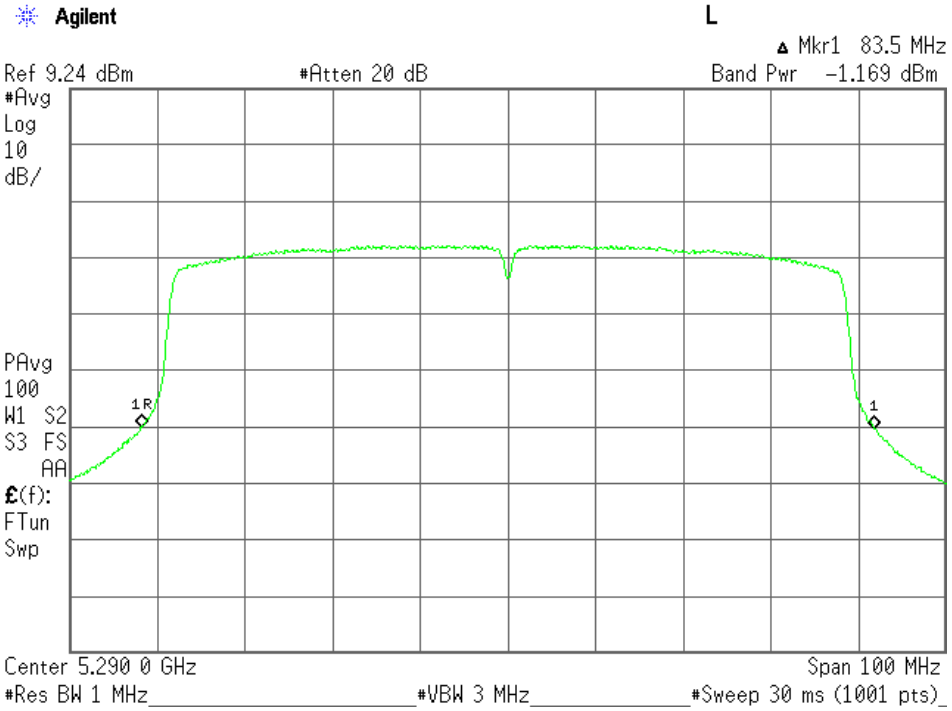
a) Main Antenna (ANT0)

Output Power Test Plot

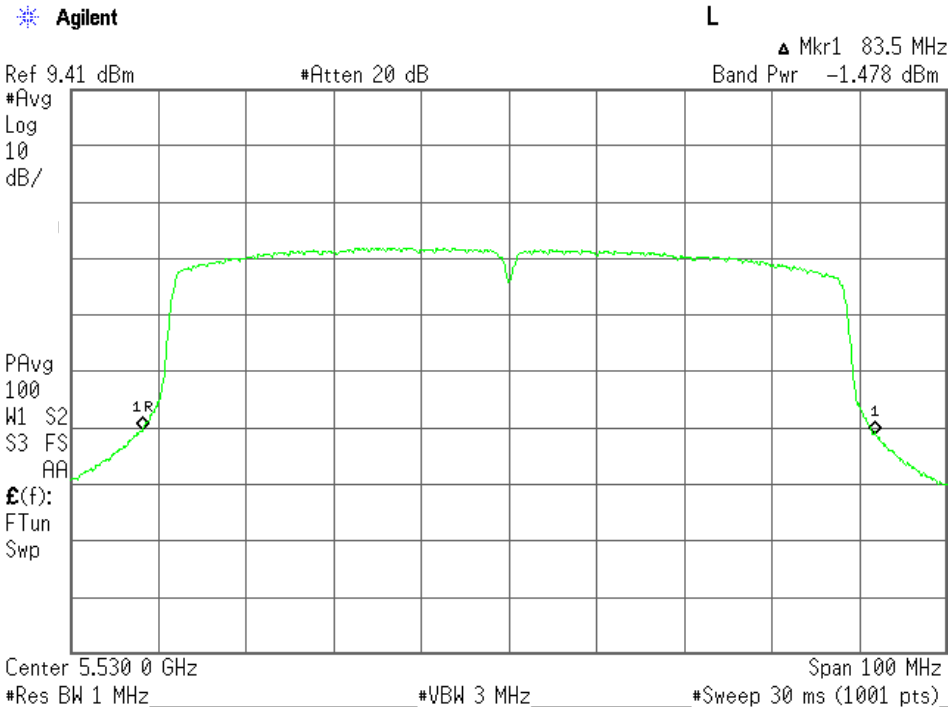
802.11ac (80 MHz BW) 42ch (5210 MHz)



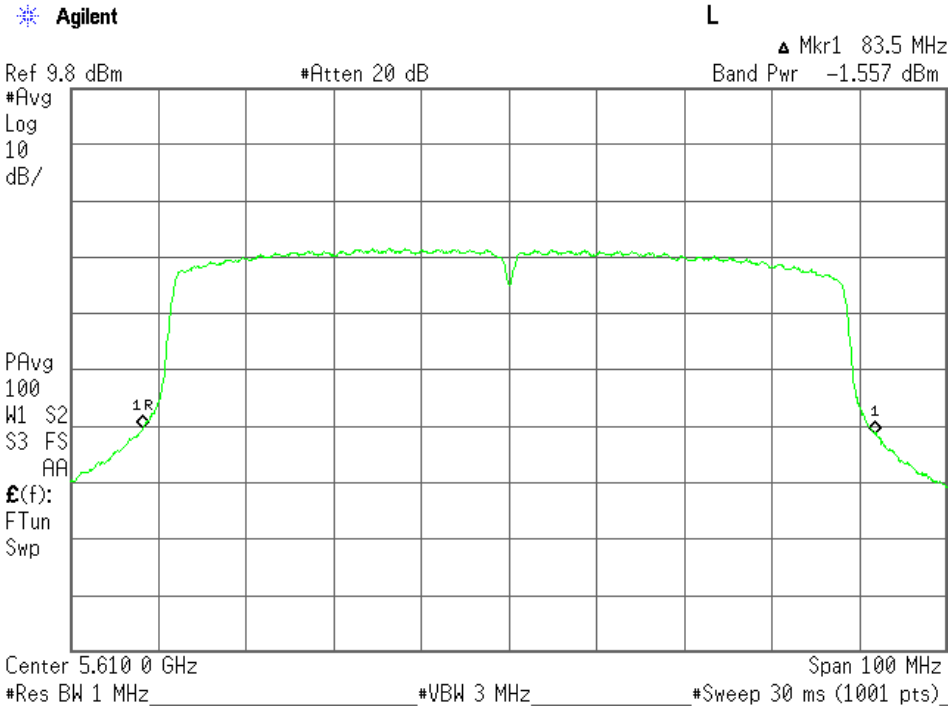
802.11ac (80 MHz BW) 58ch (5290 MHz)



802.11ac (80 MHz BW) 106ch (5530 MHz)



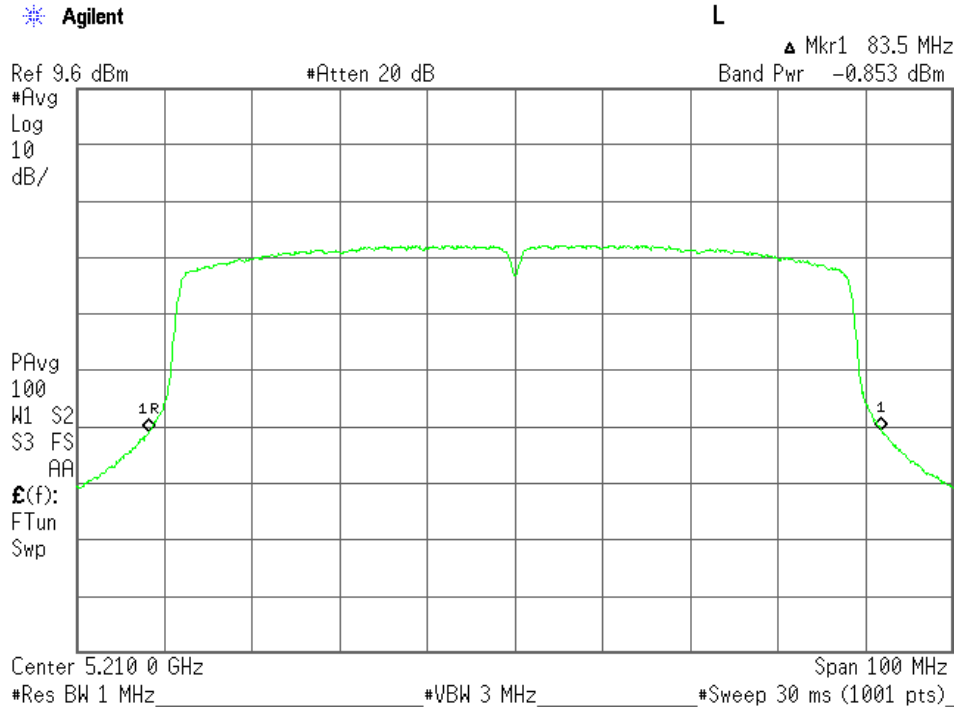
802.11ac (80 MHz BW) 122ch (5610 MHz)



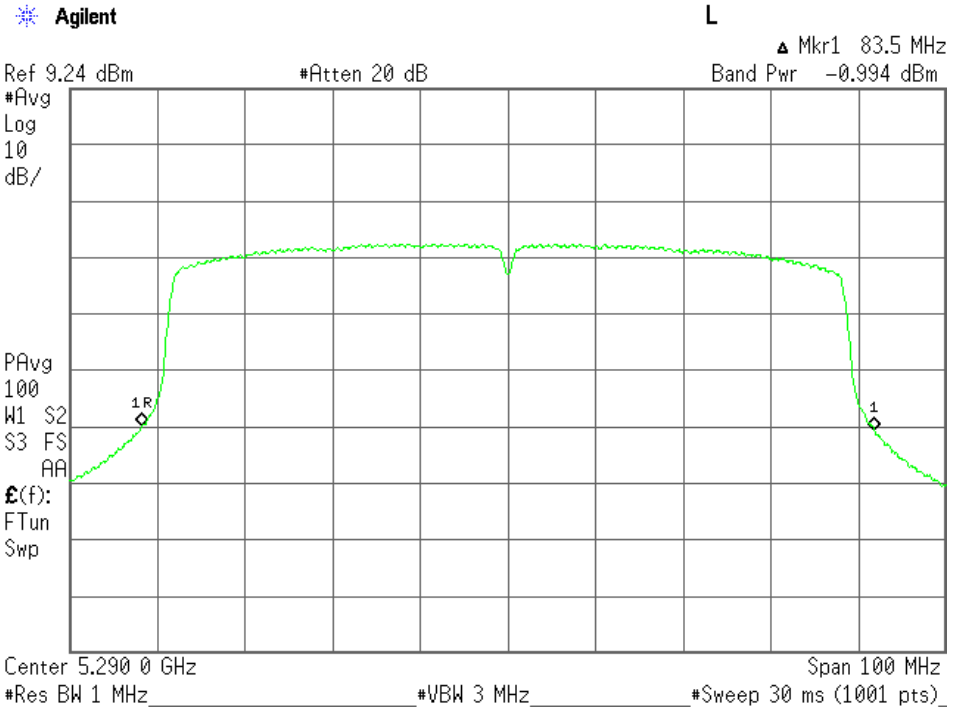
b) Sub Antenna (ANT1)

Output Power Test Plot

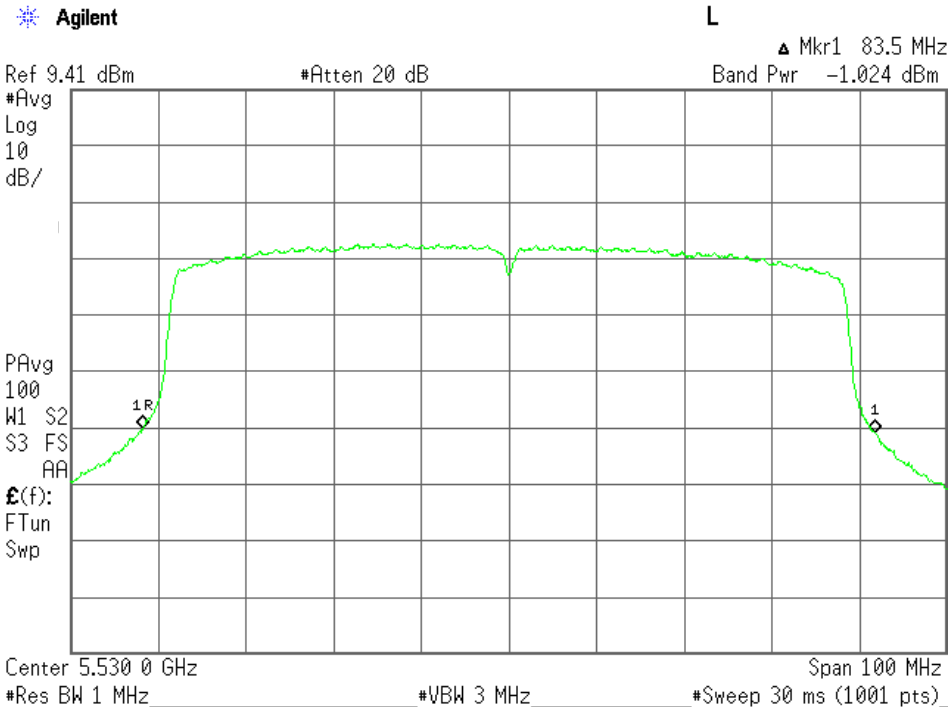
802.11ac (80 MHz BW) 42ch (5210 MHz)



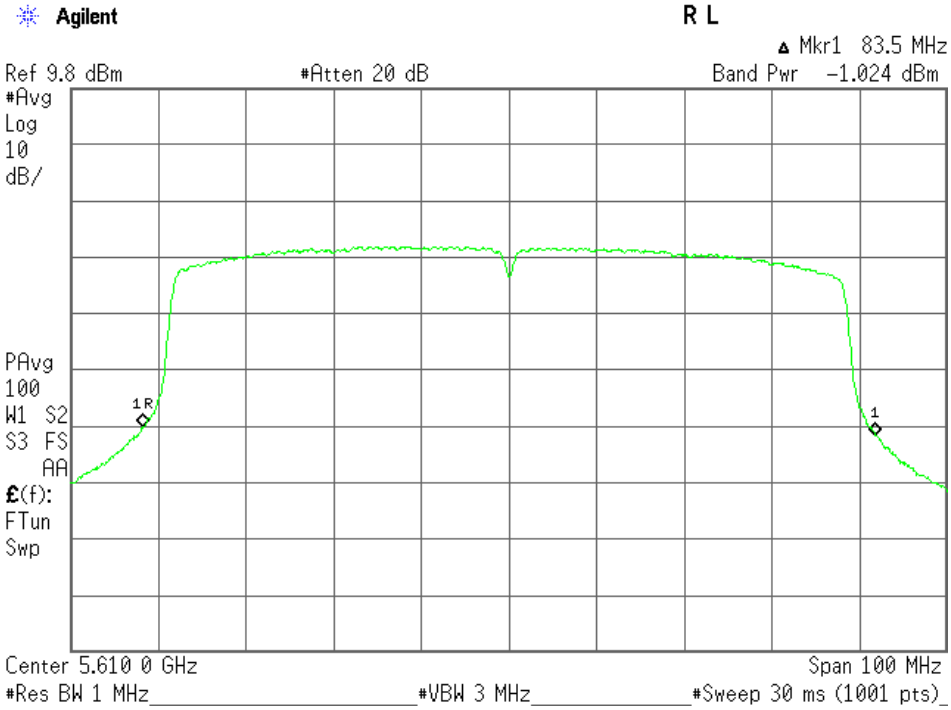
802.11ac (80 MHz BW) 58ch (5290 MHz)



802.11ac (80 MHz BW) 106ch (5530 MHz)



802.11ac (80 MHz BW) 122ch (5610 MHz)



7.3 Peak Power Spectral Density

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.3.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin 7.01 dB at 5320.0 MHz

Uncertainty of Measurement Results ± 1.7 dB(2σ)

Remarks : Worst case is 802.11a channel 64.

7.3.2 Test Instruments

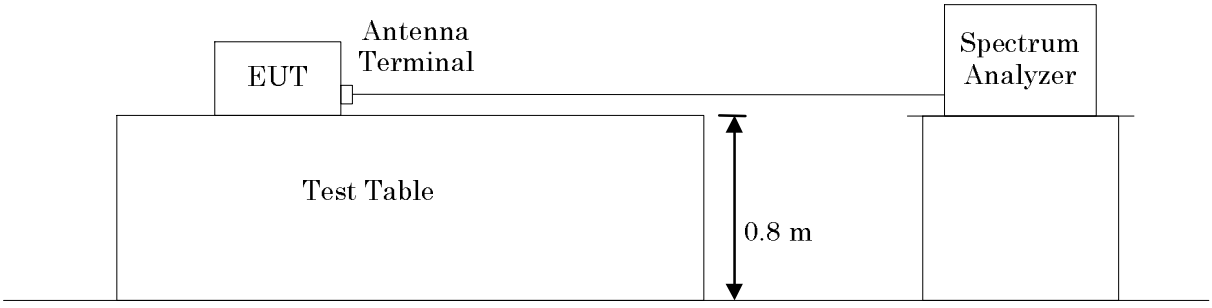
Shielded Room S4				
Type	**Model**	**Serial No. (ID)**	**Manufacturer**	**Cal. Due**
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	54A-10	W5675 (D-28)	Weinschel	2016/08/16
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

NOTE : The calibration interval of the above test instruments is 12 months.

7.3.3 Test Method and Test Setup (Diagrammatic illustration)

The peak power spectral density measurements were carried out connecting to the spectrum analyzer. The EUT transmits non-continuously therefore the spectrum analyzer was set in accordance with KDB 789033 D02 Method SA-3 as follows;.

Span: encompass the EBW/ RBW: 1 MHz/ VBW ≥ 3 MHz/ Sweep: Time: 100 msec.(enough to be short)/
Number Sweep Points: 1001 pts (≥2*Span/RBW)/
Detector: RMS(power averaging)/ Trace Mode: Max. Hold
The peak marker function in the analyzer was use for finding the peak point.



7.3.4 Test Data

Test Date :March 29, 2016
Temp.: 22C, Humi: 34%

7.3.4.1 802.11a Peak power spectral density

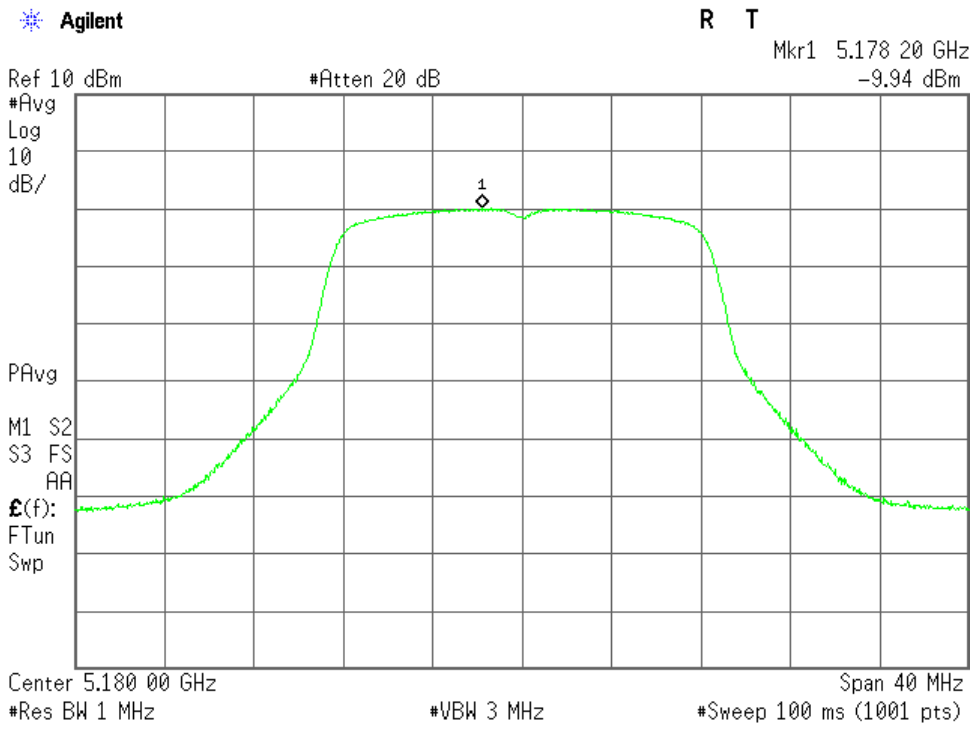
Mode of EUT: Tx Mode (802.11a)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			PPSD	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(dBm)	(dB)
36	5180	10.39	-9.94	-9.66	-6.79	3.60	11.00	7.40
44	5220	10.39	-9.74	-9.45	-6.58	3.81	11.00	7.19
48	5240	10.39	-9.66	-9.35	-6.49	3.90	11.00	7.10
52	5260	10.40	-9.80	-9.48	-6.63	3.77	11.00	7.23
56	5280	10.40	-9.56	-9.33	-6.43	3.97	11.00	7.03
64	5320	10.40	-9.58	-9.26	-6.41	3.99	11.00	7.01
100	5500	10.43	-9.85	-9.43	-6.62	3.81	11.00	7.19
116	5580	10.44	-10.23	-9.76	-6.98	3.46	11.00	7.54
140	5700	10.44	-11.05	-10.30	-7.65	2.79	11.00	8.21

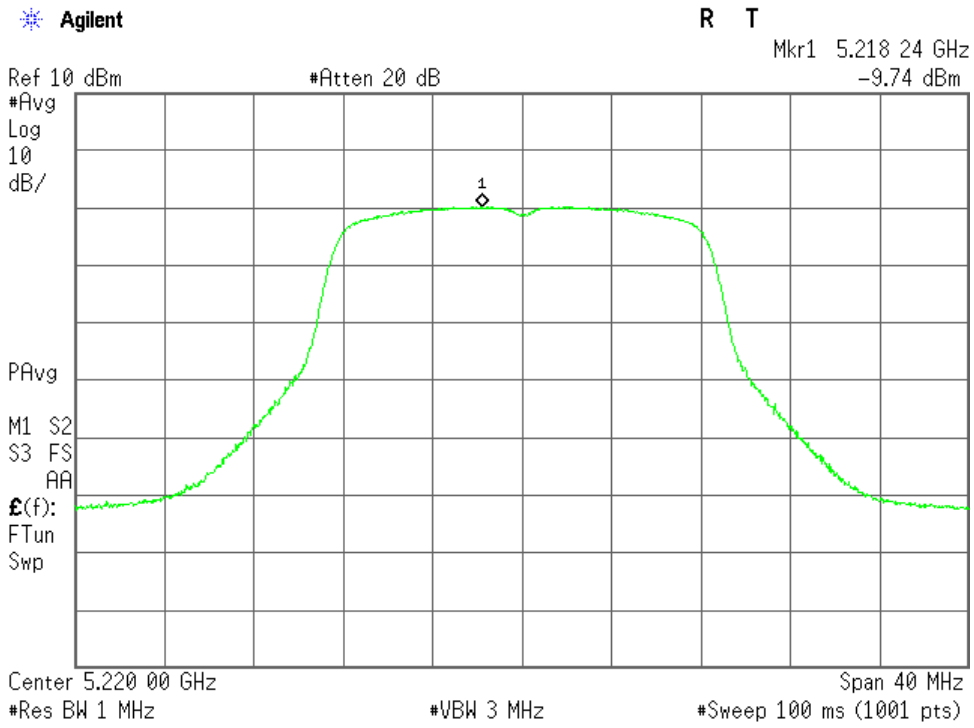
The test results (PPSD) is calculated as follows;
For 36 channel (5180 MHz)
PPSD = Correction Factor + Meter Reading = 10.39 + (-6.79) = 3.60 dBm
Correction Factor = cable loss + 10 dB attenuator

a) Main Antenna (ANT0)

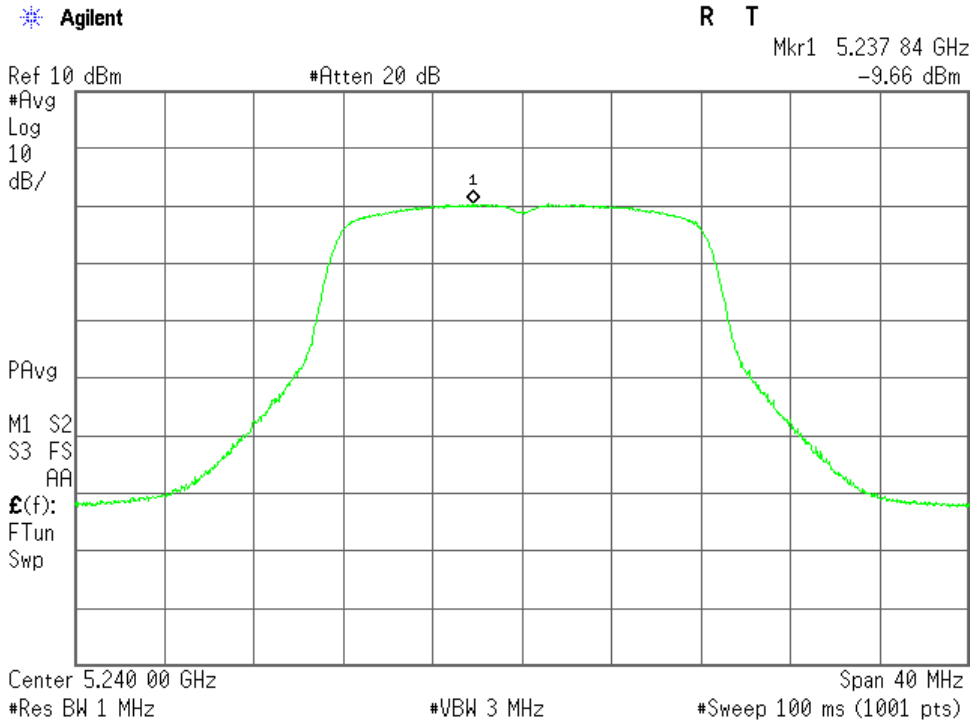
802.11a 36ch (5180 MHz)



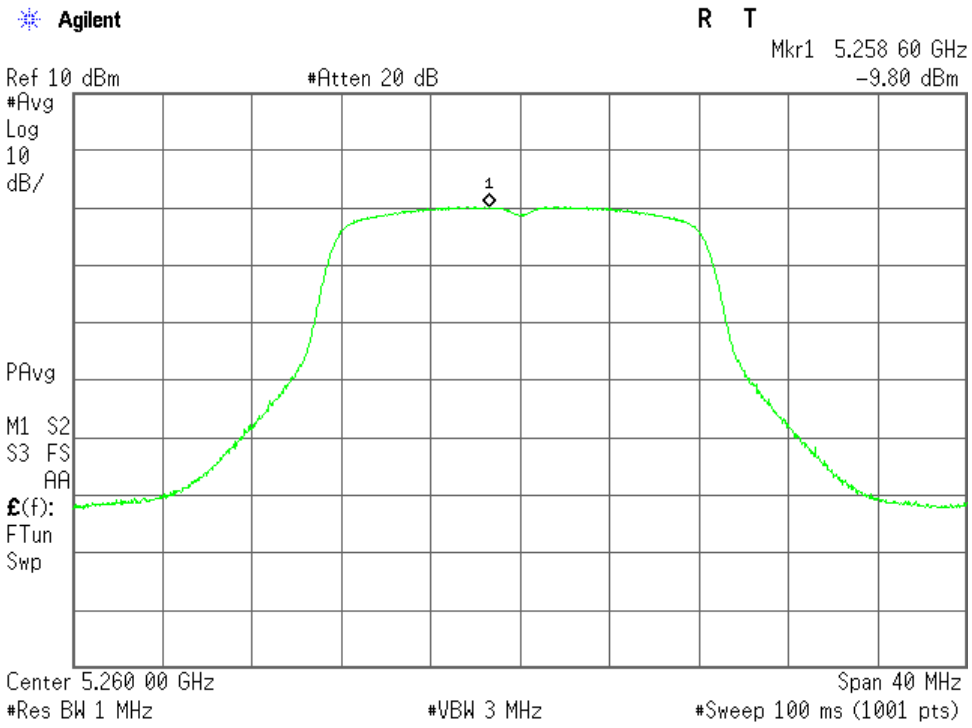
802.11a 44ch (5220 MHz)



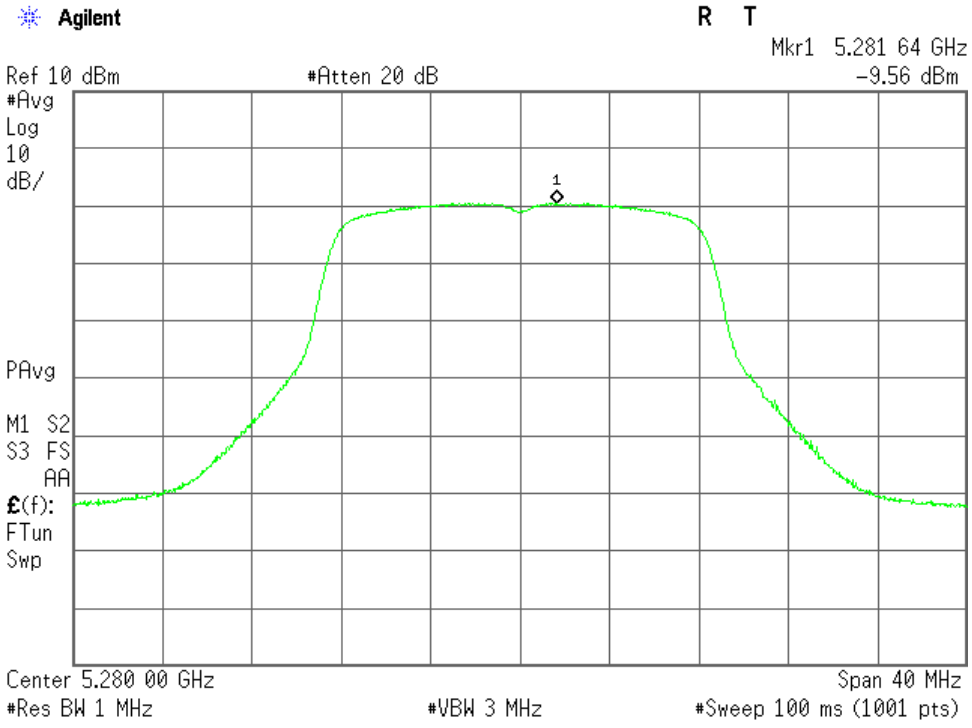
802.11a 48ch (5240 MHz)



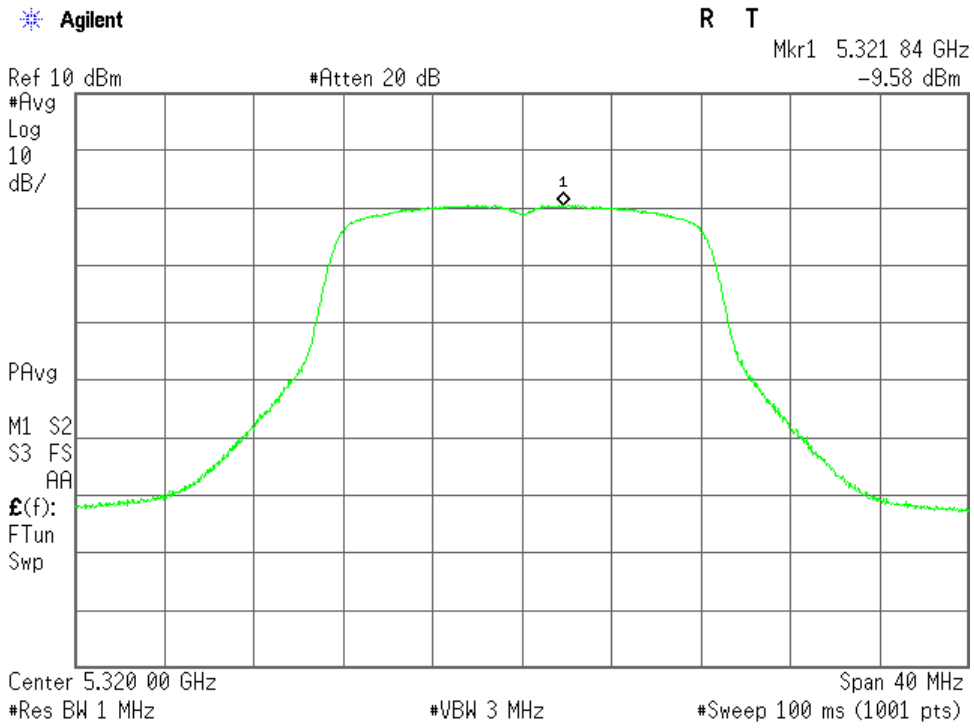
802.11a 52ch (5260 MHz)



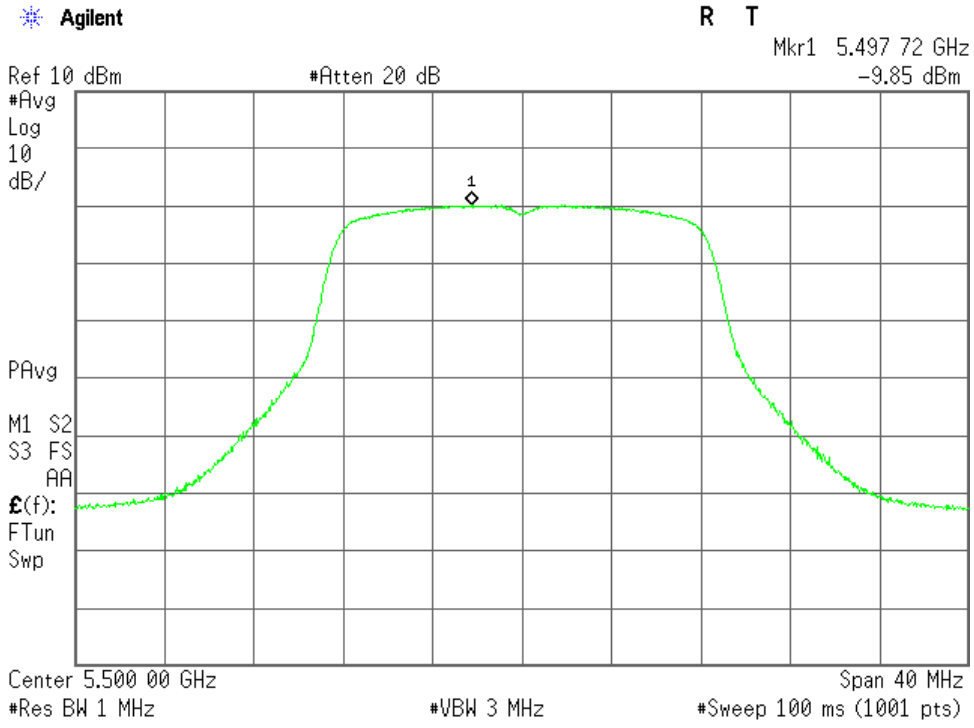
802.11a 56ch (5280 MHz)



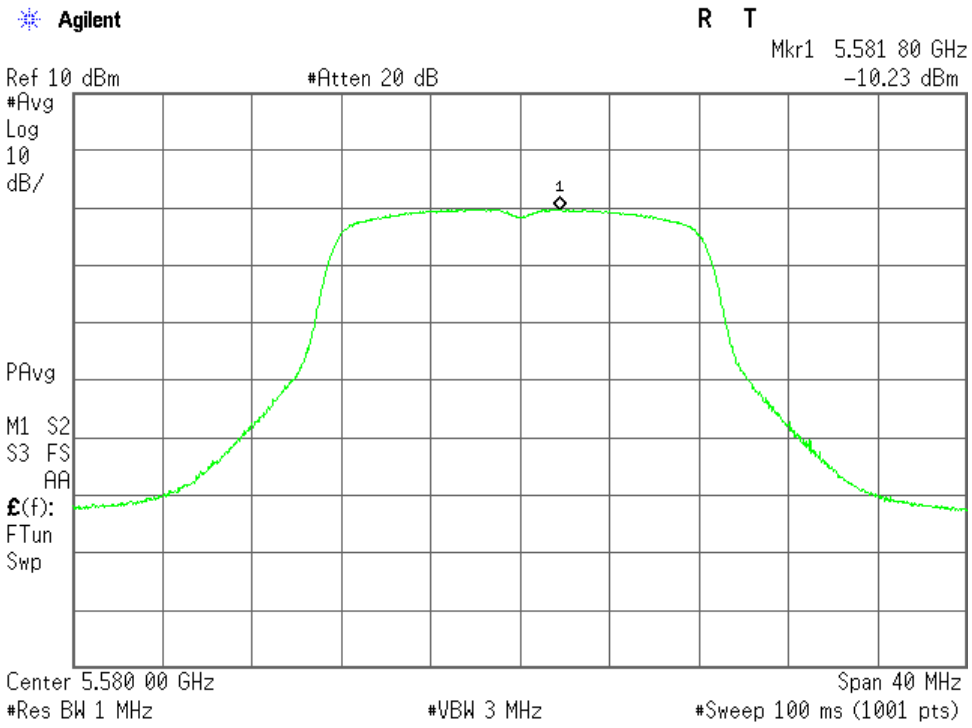
802.11a 64ch (5320 MHz)



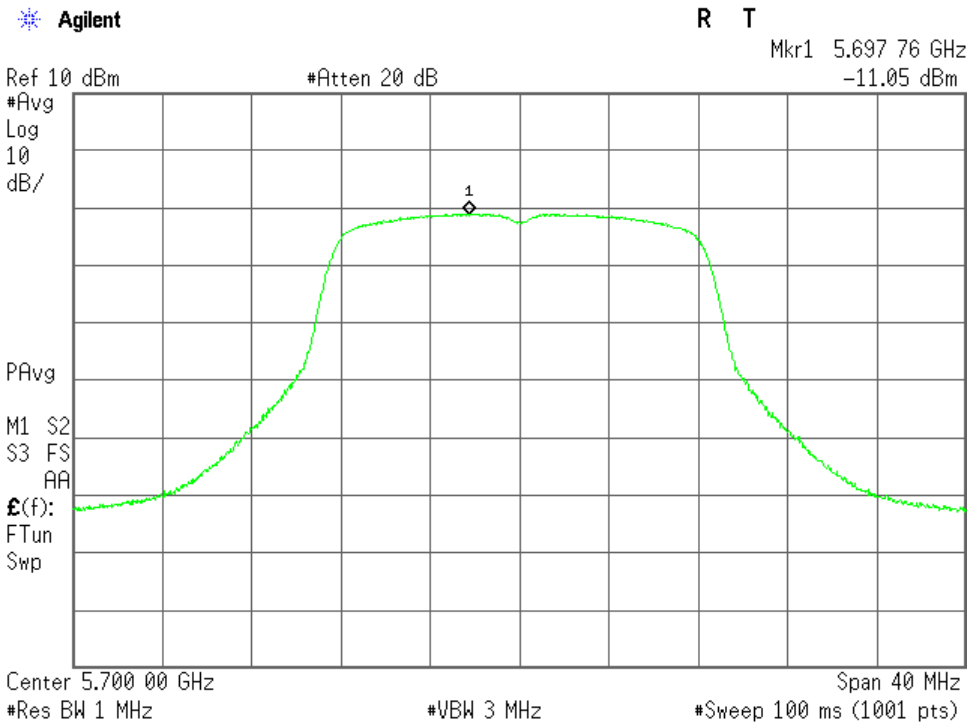
802.11a 100ch (5500 MHz)



802.11a 116ch (5580 MHz)

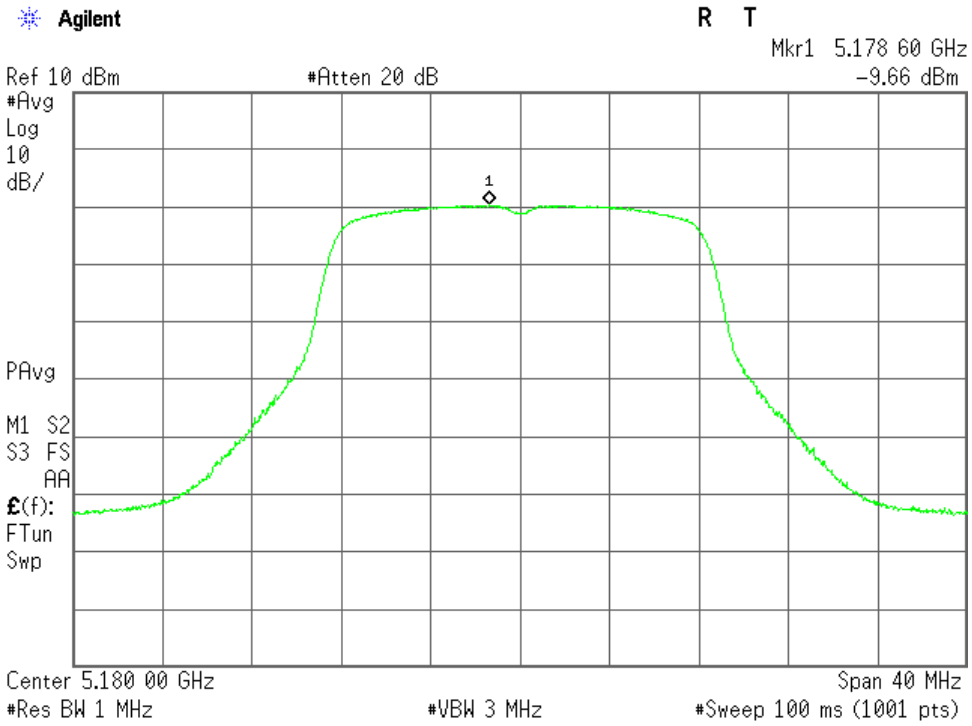


802.11a 140ch (5700 MHz)

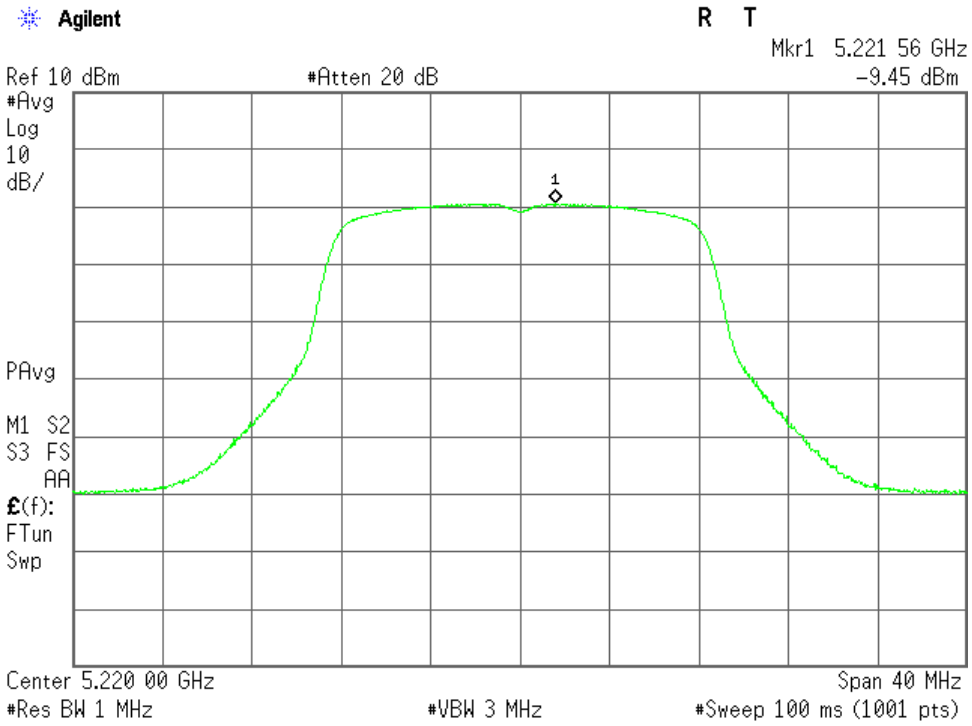


b) Sub Antenna (ANT1)

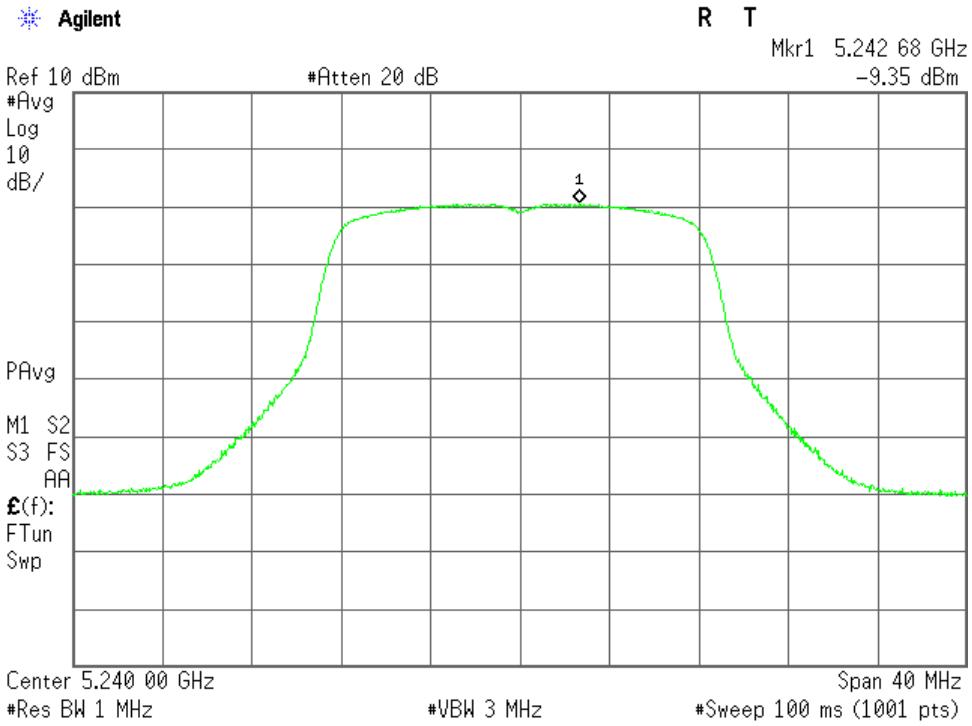
802.11a 36ch (5180 MHz)



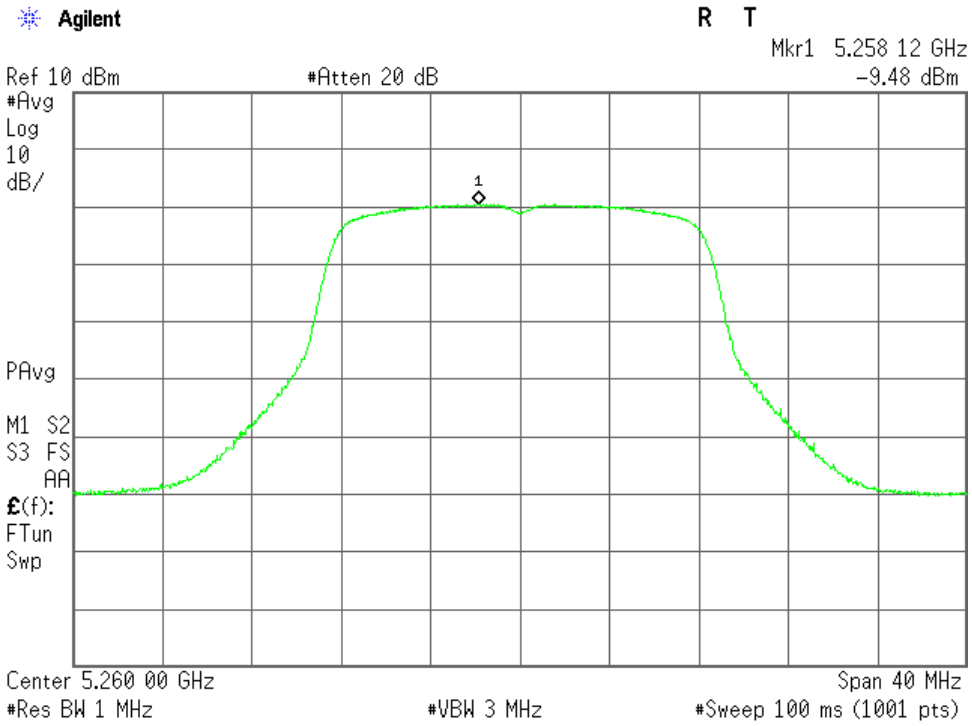
802.11a 44ch (5220 MHz)



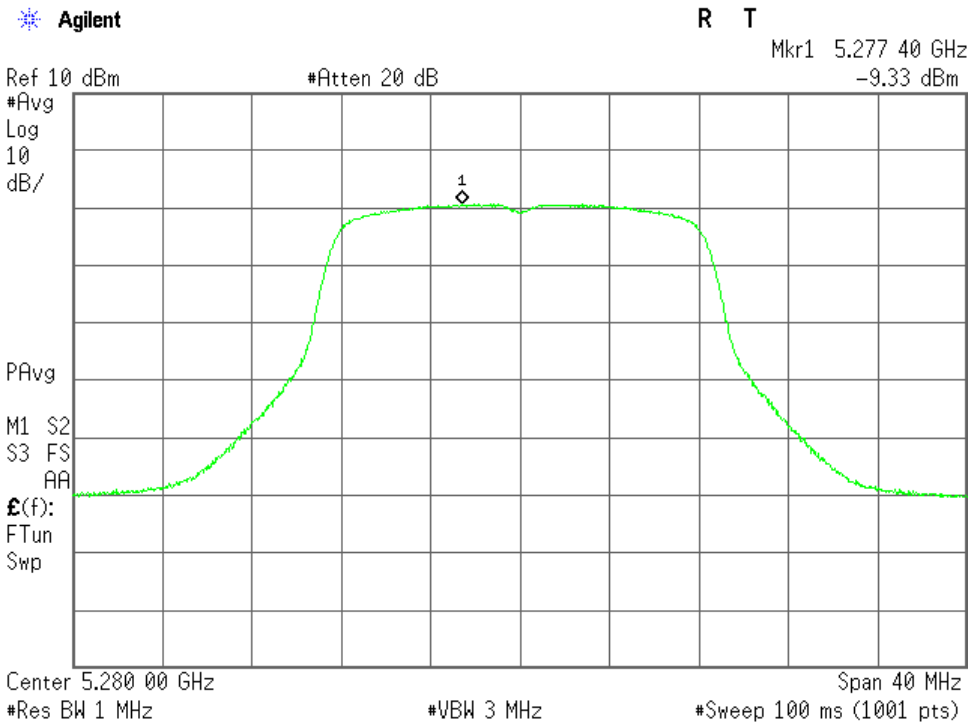
802.11a 48ch (5240 MHz)



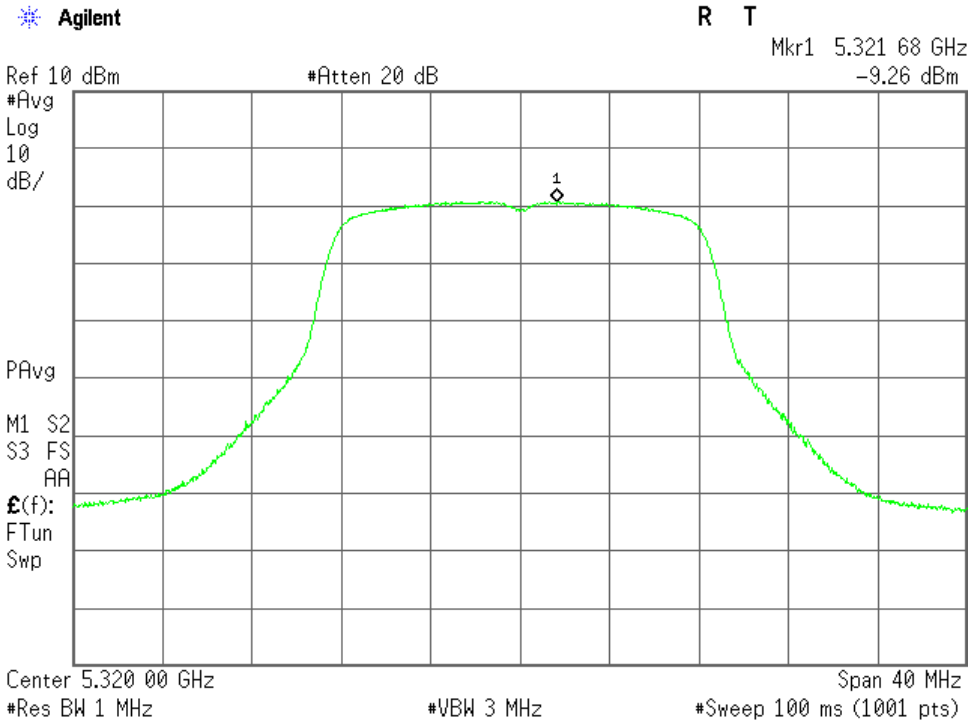
802.11a 52ch (5260 MHz)



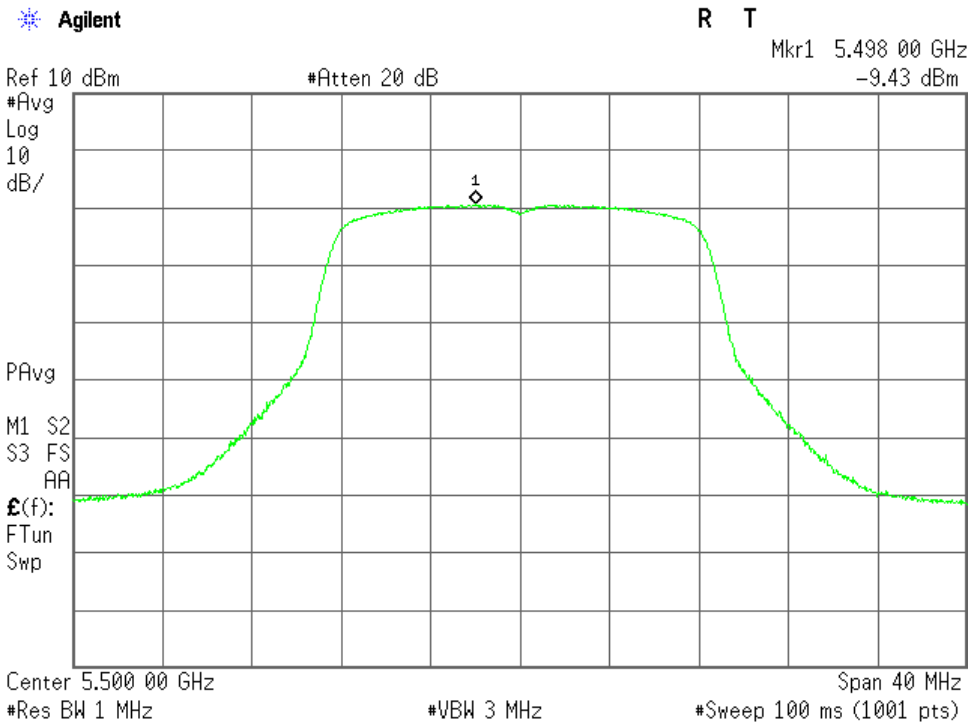
802.11a 56ch (5280 MHz)



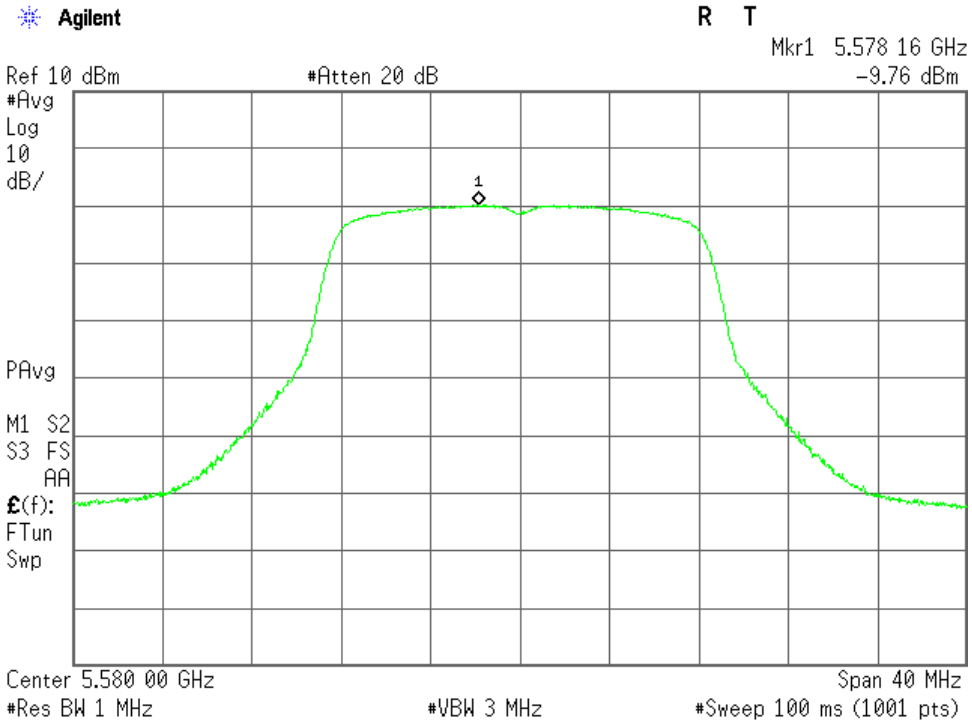
802.11a 64ch (5320 MHz)



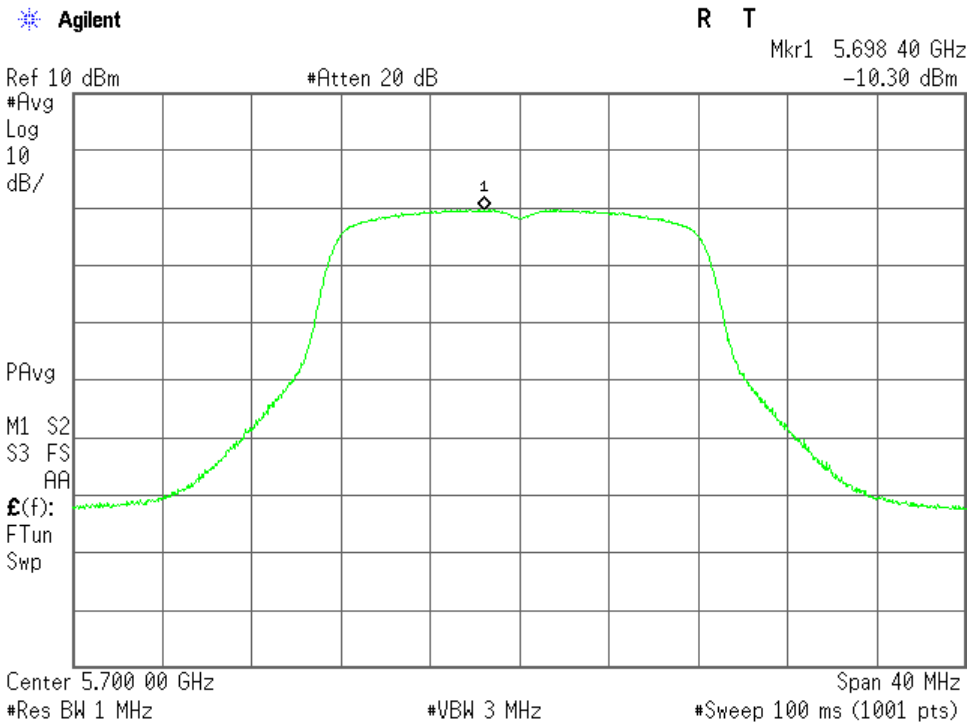
802.11a 100ch (5500 MHz)



802.11a 116ch (5580 MHz)



802.11a 140ch (5700 MHz)



7.3.4.2 802.11n (20 MHz BW) Peak power spectral density

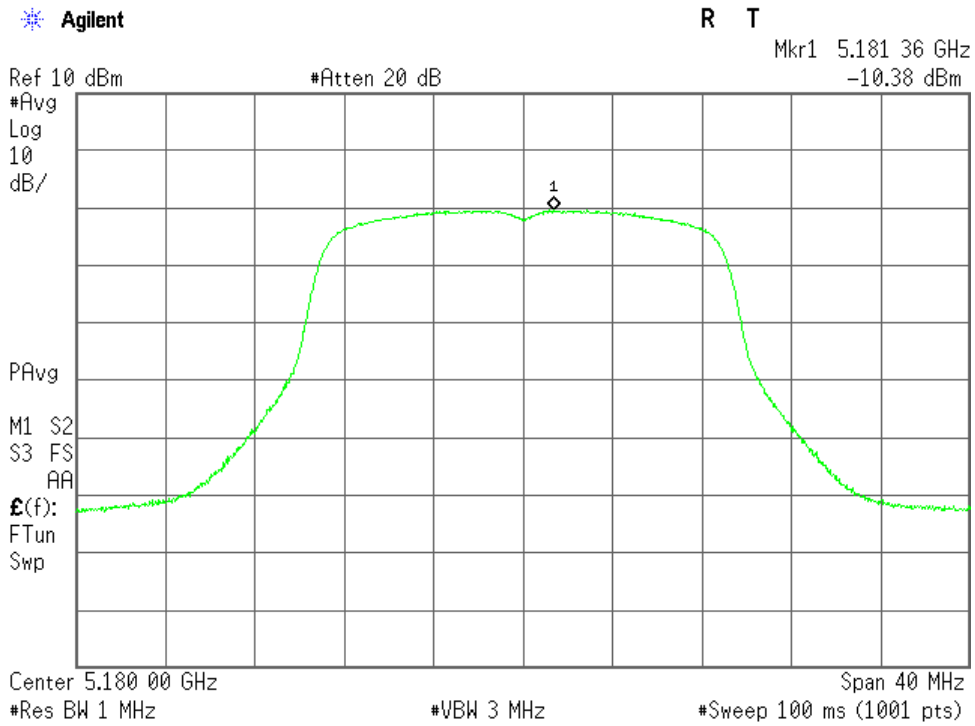
Mode of EUT: Tx Mode (802.11n: 20 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			PPSD	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(dBm)	(dB)
36	5180	10.39	-10.38	-10.11	-7.23	3.16	11.00	7.84
44	5220	10.39	-10.18	-9.82	-6.99	3.40	11.00	7.60
48	5240	10.39	-10.13	-9.83	-6.97	3.42	11.00	7.58
52	5260	10.40	-10.18	-9.78	-6.97	3.43	11.00	7.57
56	5280	10.40	-9.84	-9.68	-6.75	3.65	11.00	7.35
64	5320	10.40	-9.95	-9.55	-6.74	3.66	11.00	7.34
100	5500	10.43	-10.26	-9.56	-6.89	3.54	11.00	7.46
116	5580	10.44	-10.62	-10.15	-7.37	3.07	11.00	7.93
140	5700	10.44	-11.44	-10.67	-8.03	2.41	11.00	8.59

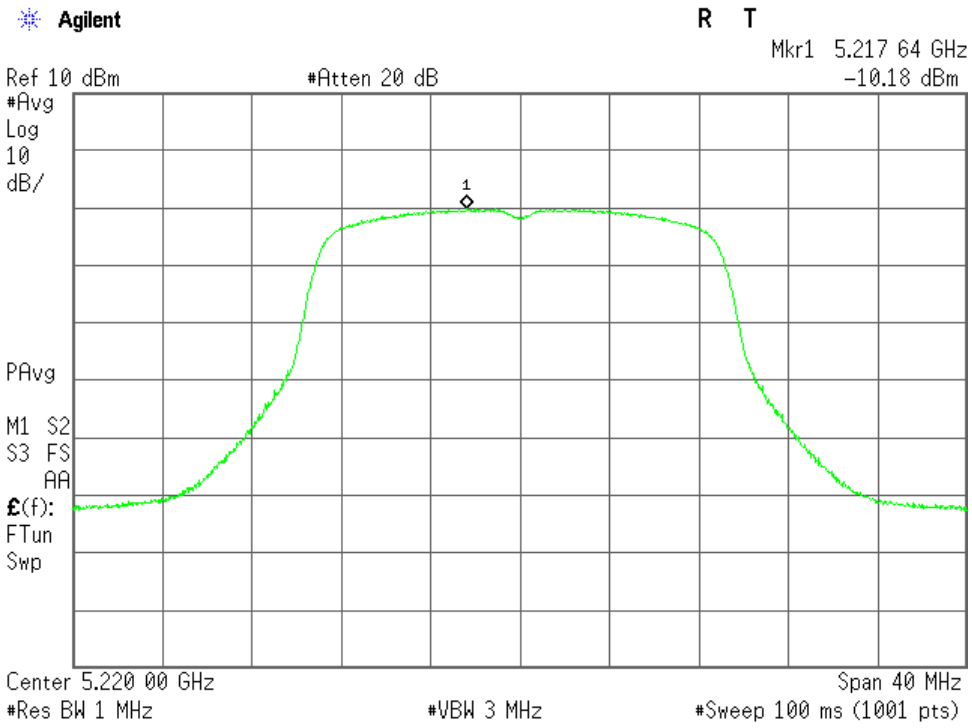
The test results (PPSD) is calculated as follows;
For 36 channel (5180 MHz)
PPSD = Correction Factor + Meter Reading = 10.39 + (-7.23) = 3.16 dBm
Correction Factor = cable loss + 10 dB attenuator

a) Main Antenna (ANT0)

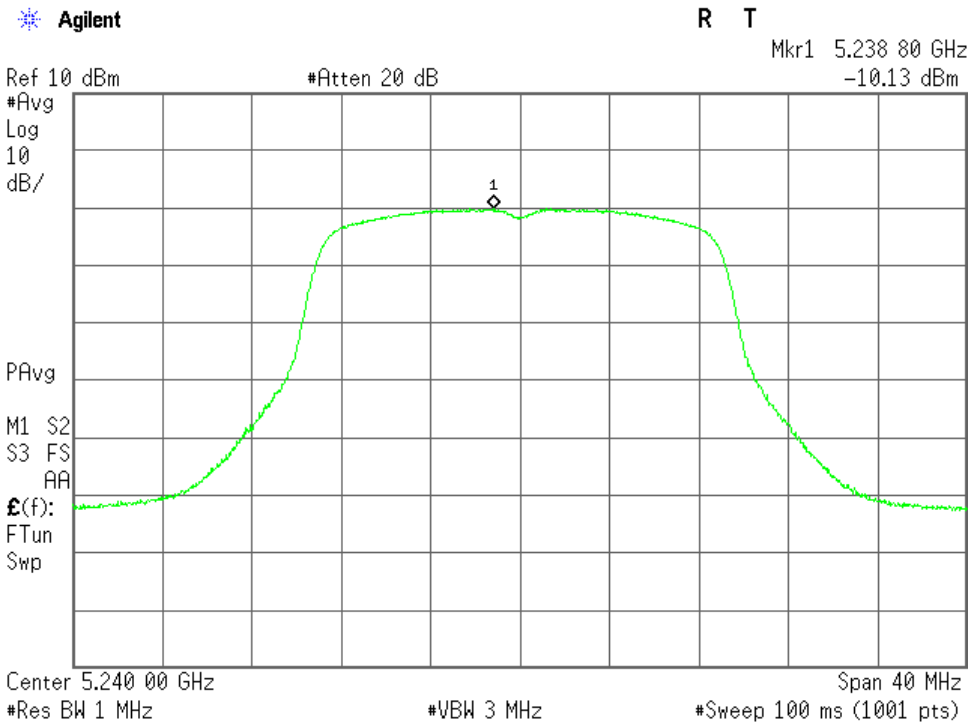
802.11n (20 MHz BW) 36ch (5180 MHz)



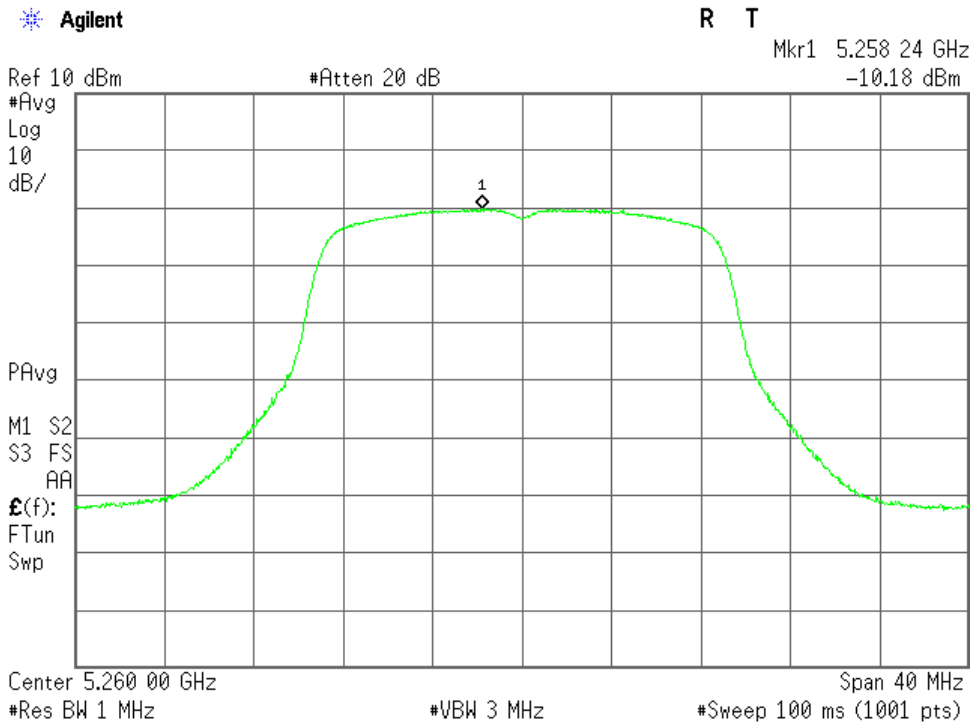
802.11n (20 MHz BW) 44ch (5220 MHz)



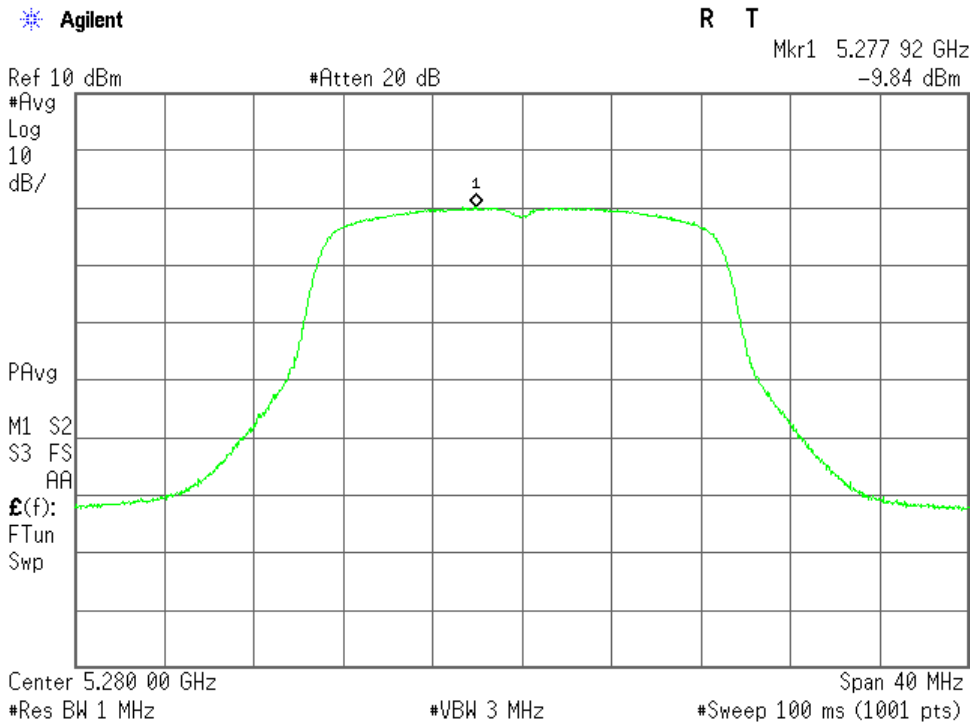
802.11n (20 MHz BW) 48ch (5240 MHz)



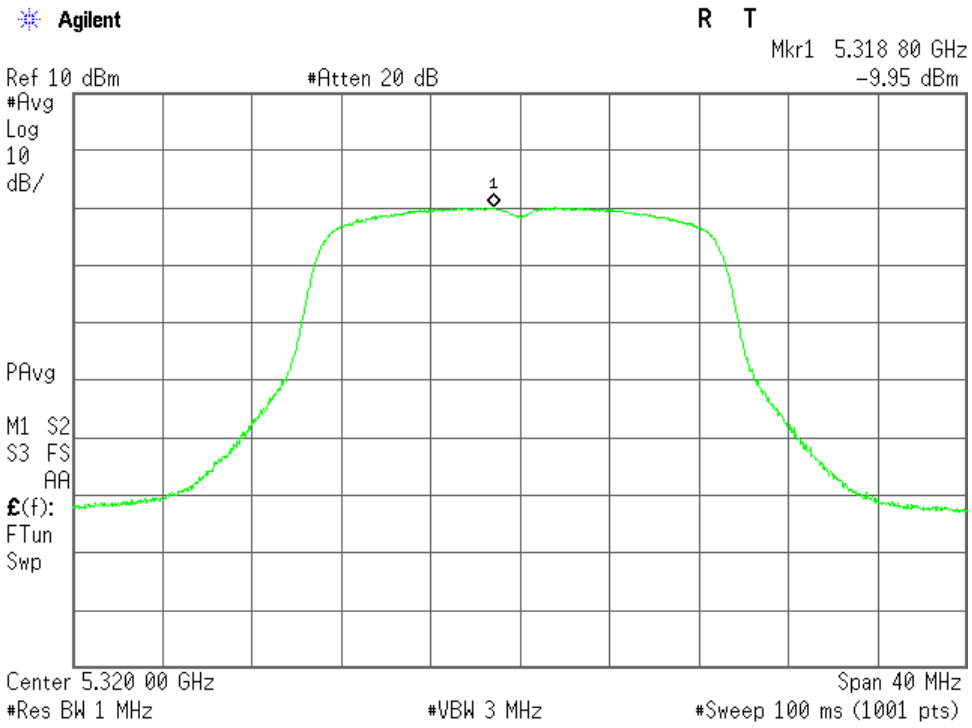
802.11n (20 MHz BW) 52ch (5260 MHz)



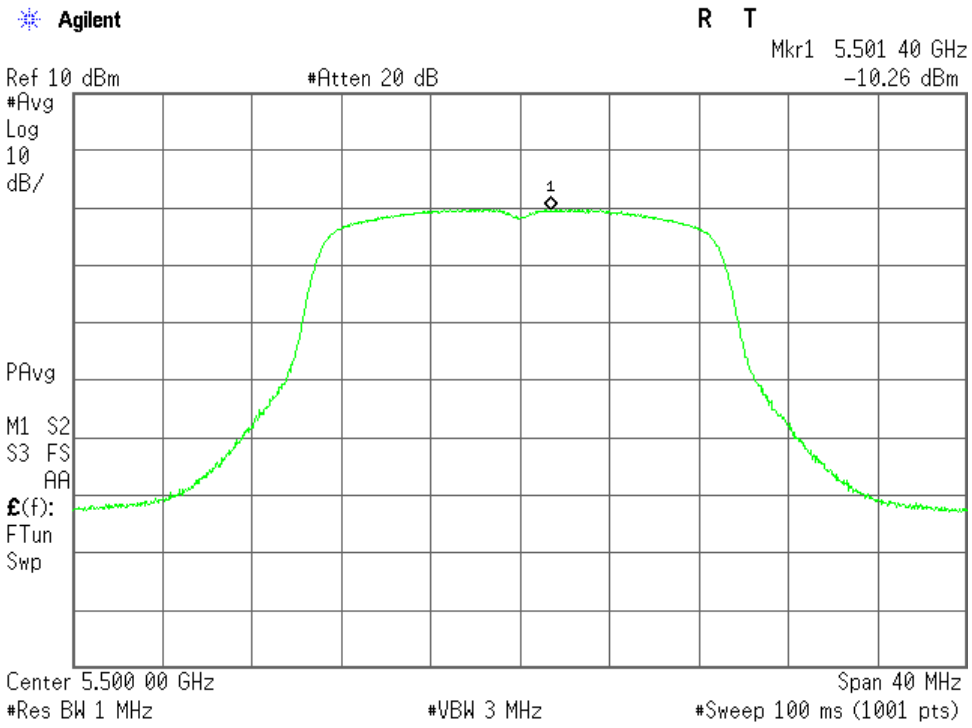
802.11n (20 MHz BW) 56ch (5280 MHz)



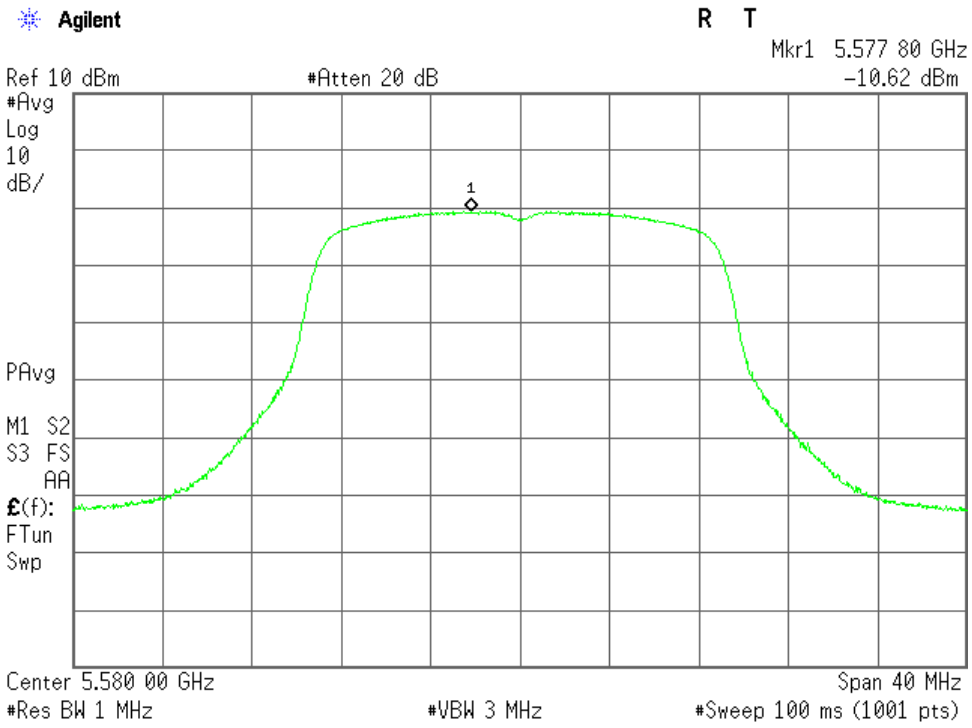
802.11n (20 MHz BW) 64ch (5320 MHz)



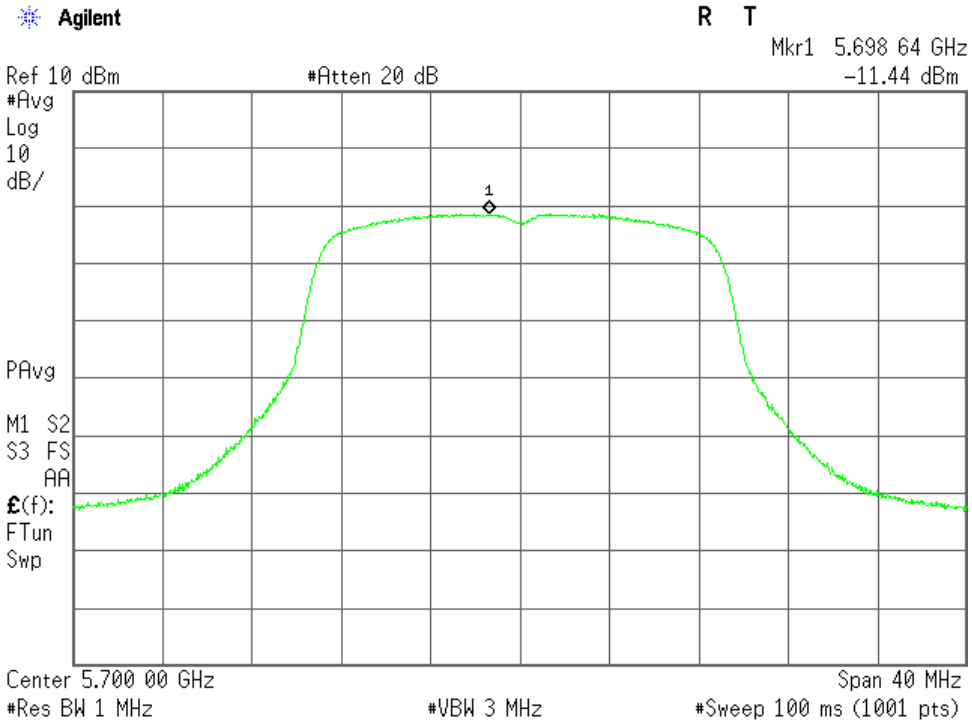
802.11n (20 MHz BW) 100ch (5500 MHz)



802.11n (20 MHz BW) 116ch (5580 MHz)

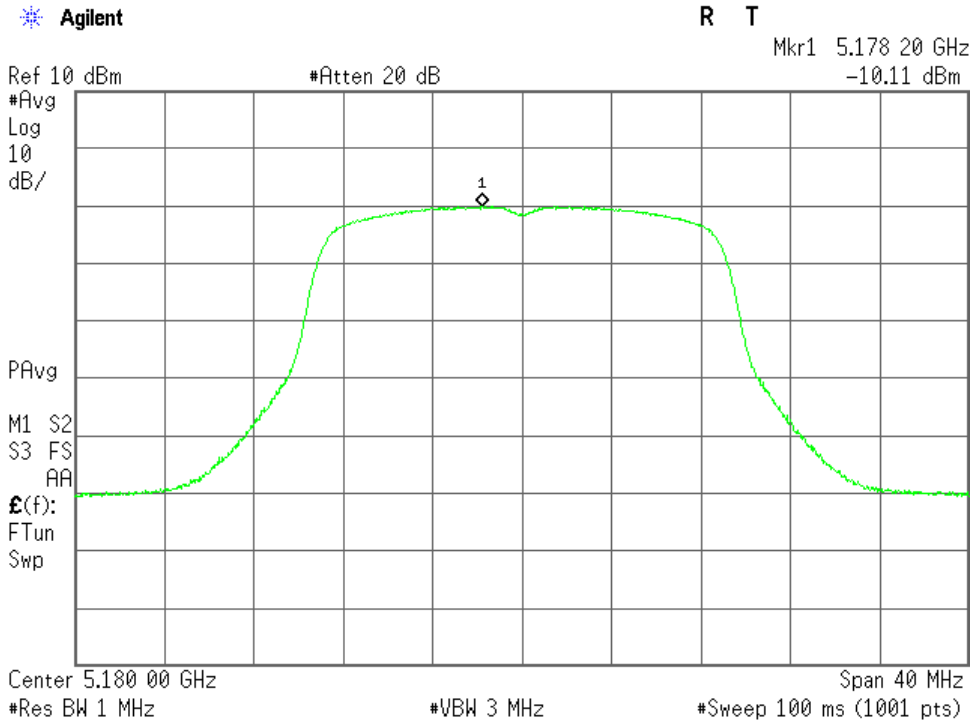


802.11n (20 MHz) 140ch (5700 MHz)

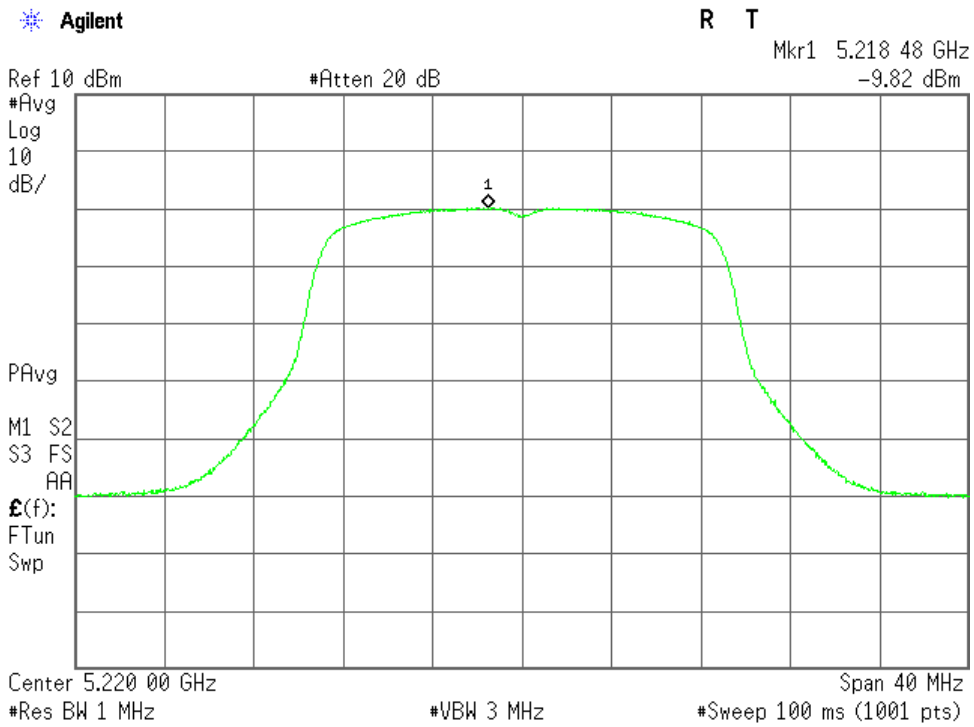


b) Sub Antenna (ANT1)

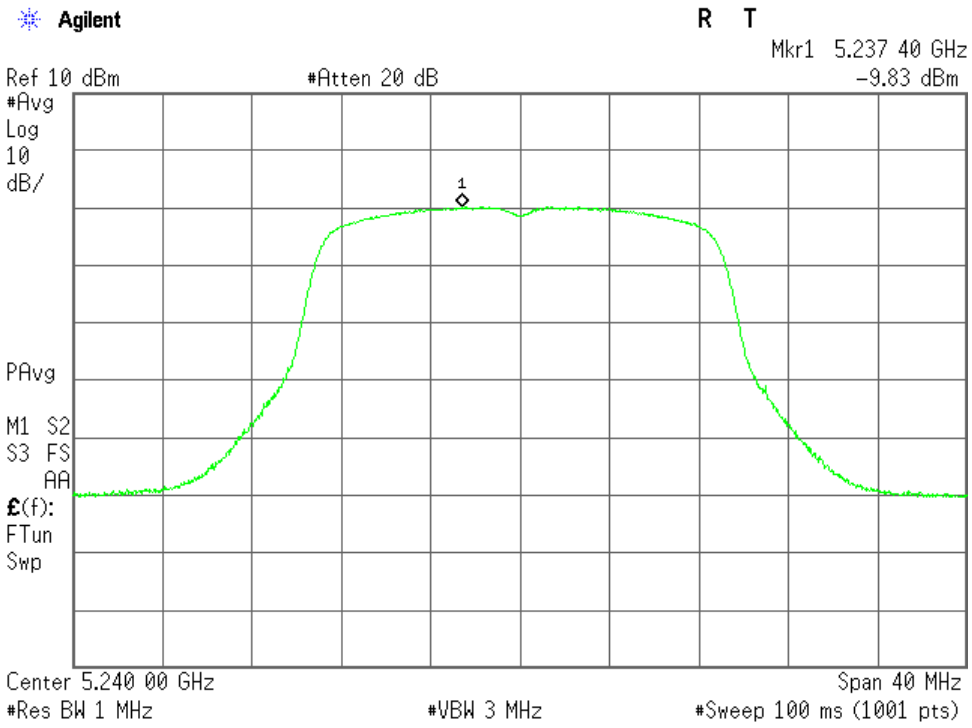
802.11n (20 MHz BW) 36ch (5180 MHz)



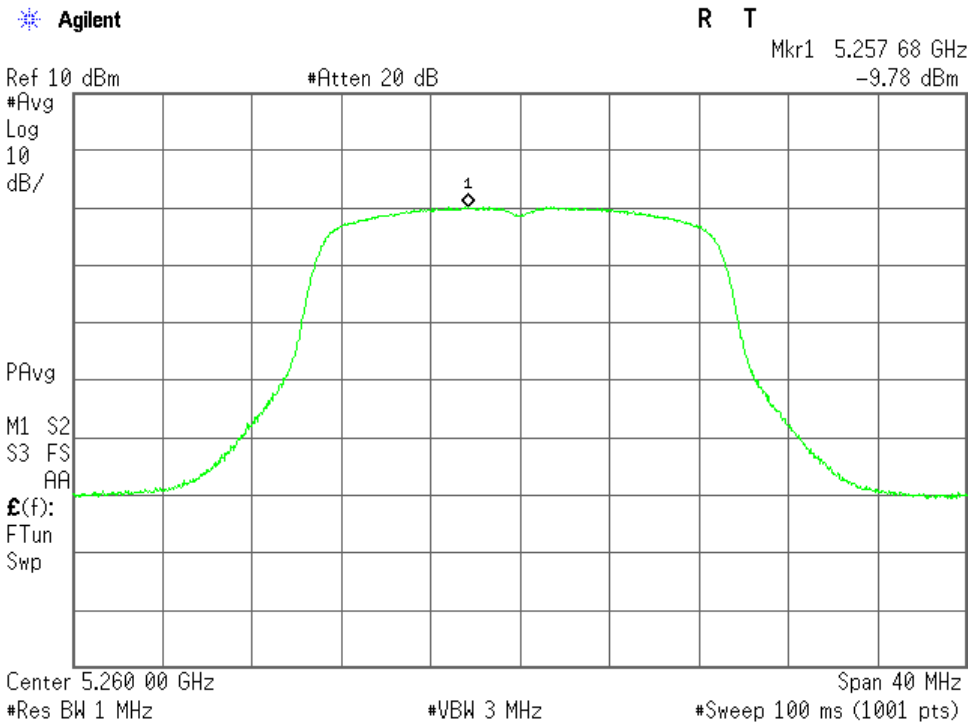
802.11n (20 MHz BW) 44ch (5220 MHz)



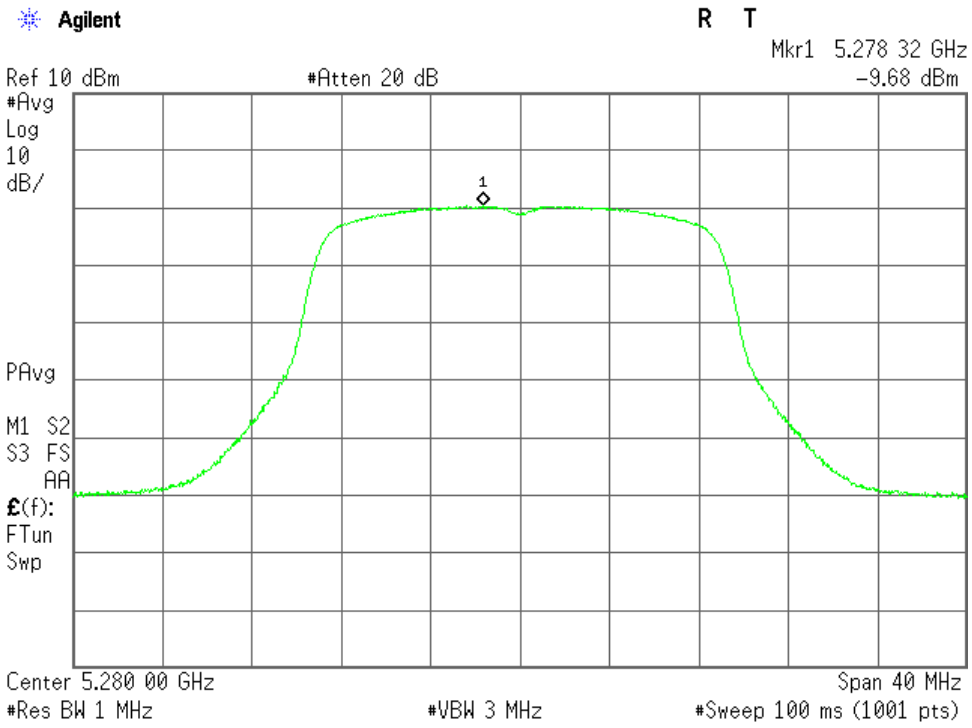
802.11n (20 MHz BW) 48ch (5240 MHz)



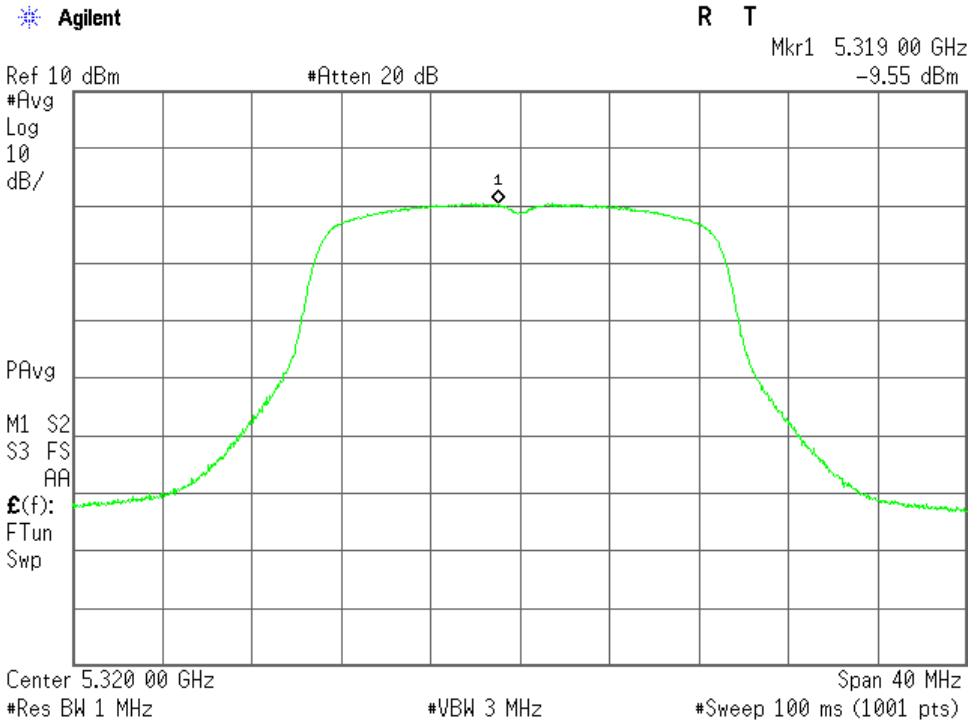
802.11n (20 MHz BW) 52ch (5260 MHz)



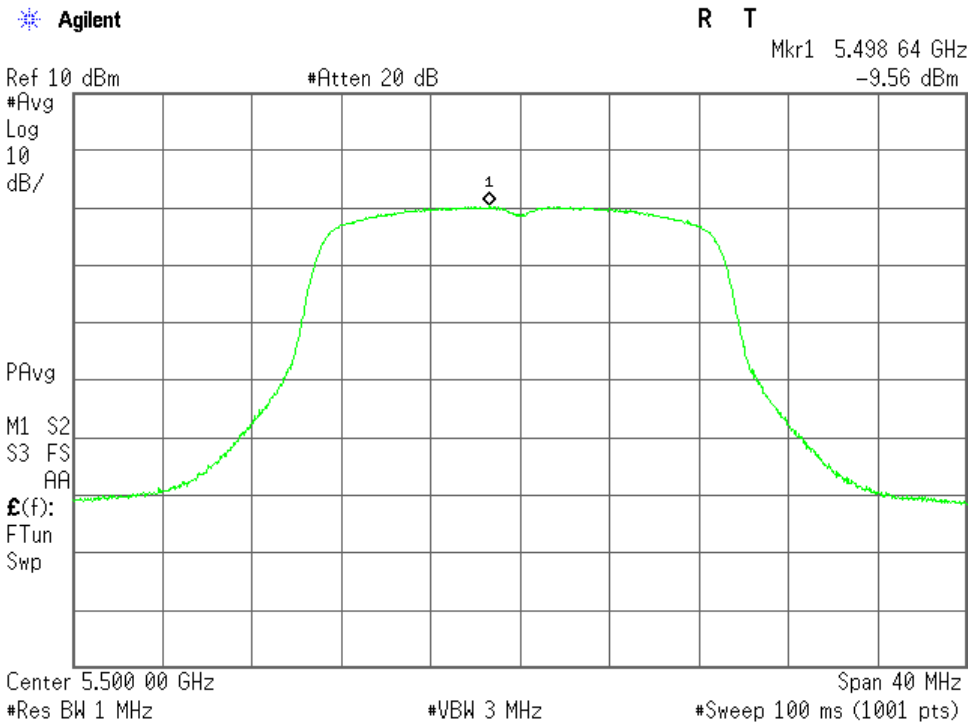
802.11n (20 MHz BW) 56ch (5280 MHz)



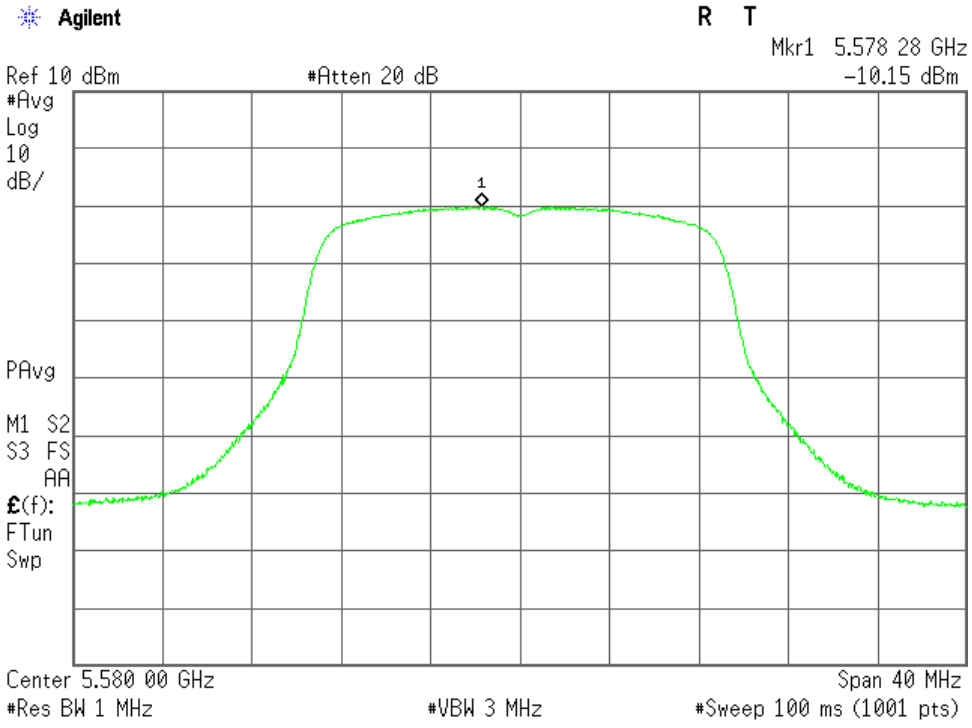
802.11n (20 MHz BW) 64ch (5320 MHz)



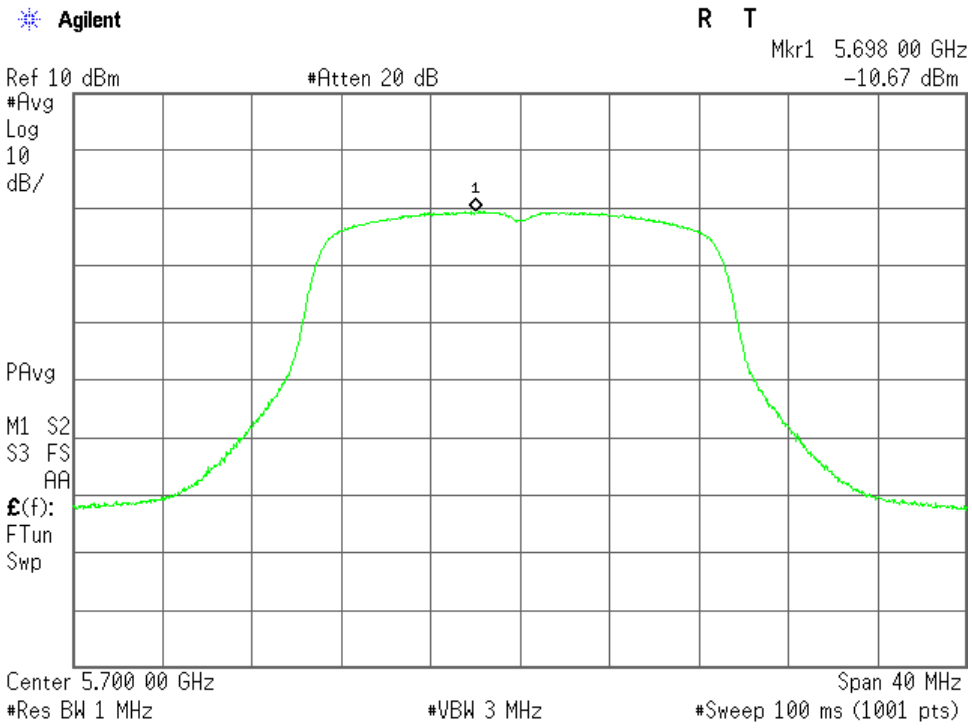
802.11n (20 MHz BW) 100ch (5500 MHz)



802.11n (20 MHz BW) 116ch (5580 MHz)



802.11n (20 MHz) 140ch (5700 MHz)



7.3.4.3 802.11n (40 MHz BW) Peak power spectral density

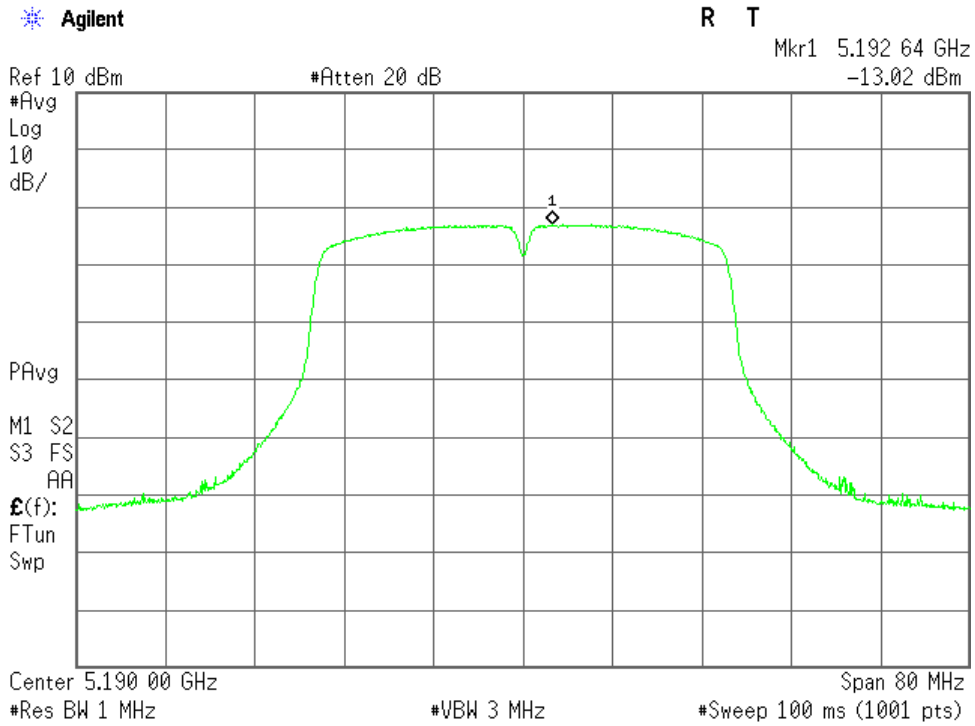
Mode of EUT: Tx Mode (802.11n: 40 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			PPSD	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(dBm)	(dB)
38	5190	10.39	-13.02	-12.56	-9.77	0.62	11.00	10.38
46	5230	10.39	-12.86	-12.48	-9.66	0.73	11.00	10.27
54	5270	10.40	-12.68	-12.40	-9.53	0.87	11.00	10.13
62	5310	10.40	-12.52	-12.19	-9.34	1.06	11.00	9.94
102	5510	10.43	-12.70	-12.35	-9.51	0.92	11.00	10.08
134	5670	10.44	-14.02	-13.11	-10.53	-0.09	11.00	11.09

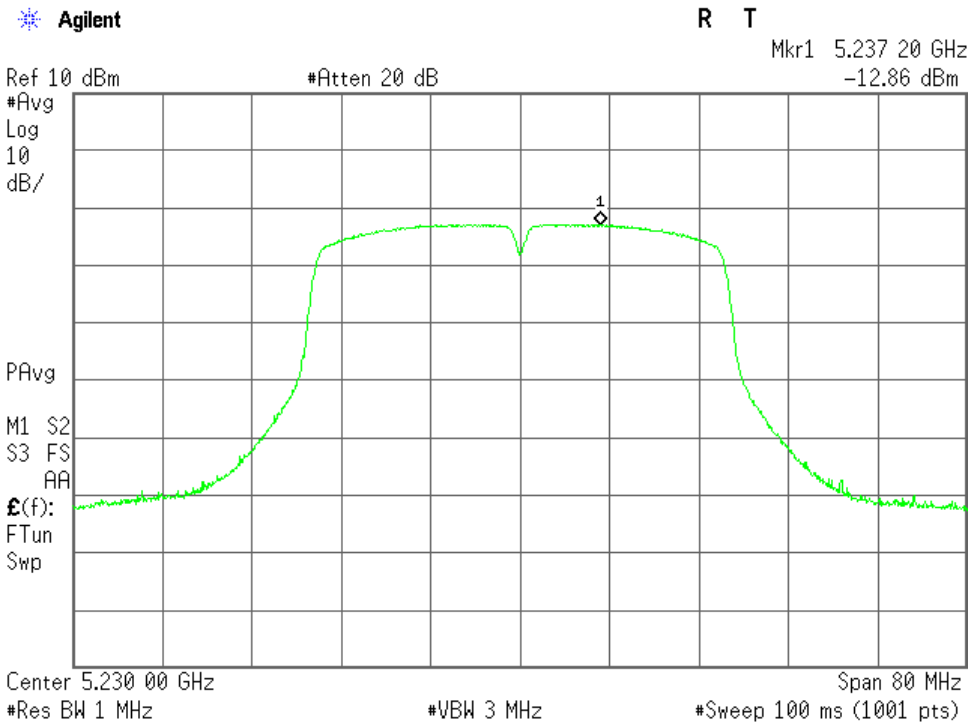
The test results (PPSD) is calculated as follows;
For 38 channel (5190 MHz)
PPSD = Correction Factor + Meter Reading = 10.39 + (-9.77) = 0.62 dBm
Correction Factor = cable loss + 10 dB attenuator

a) Main Antenna (ANT0)

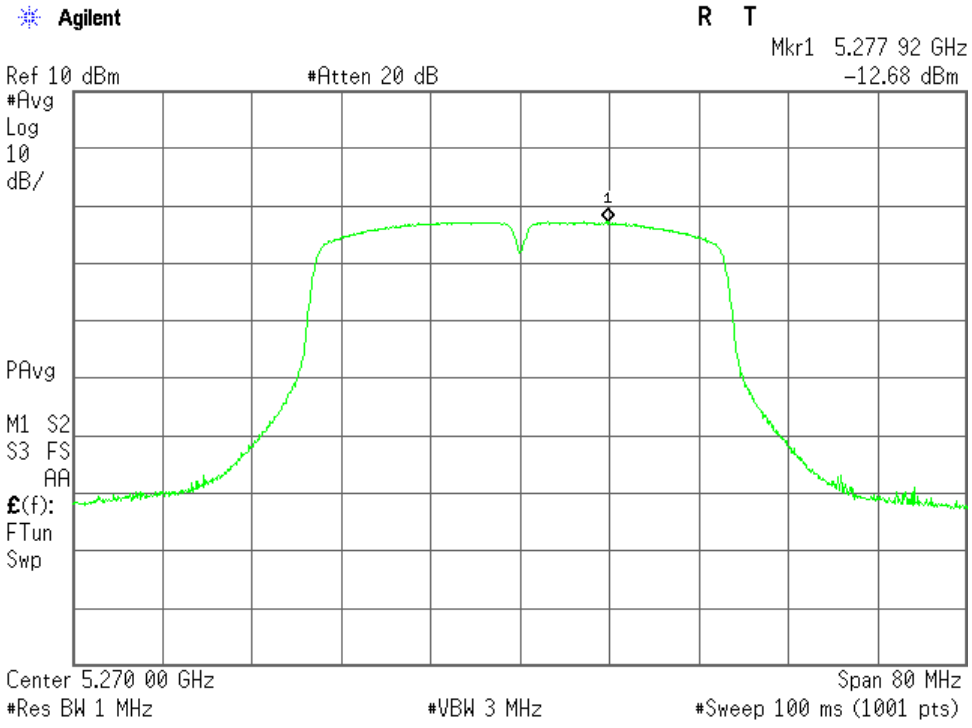
802.11n (40 MHz BW) 38ch (5190 MHz)



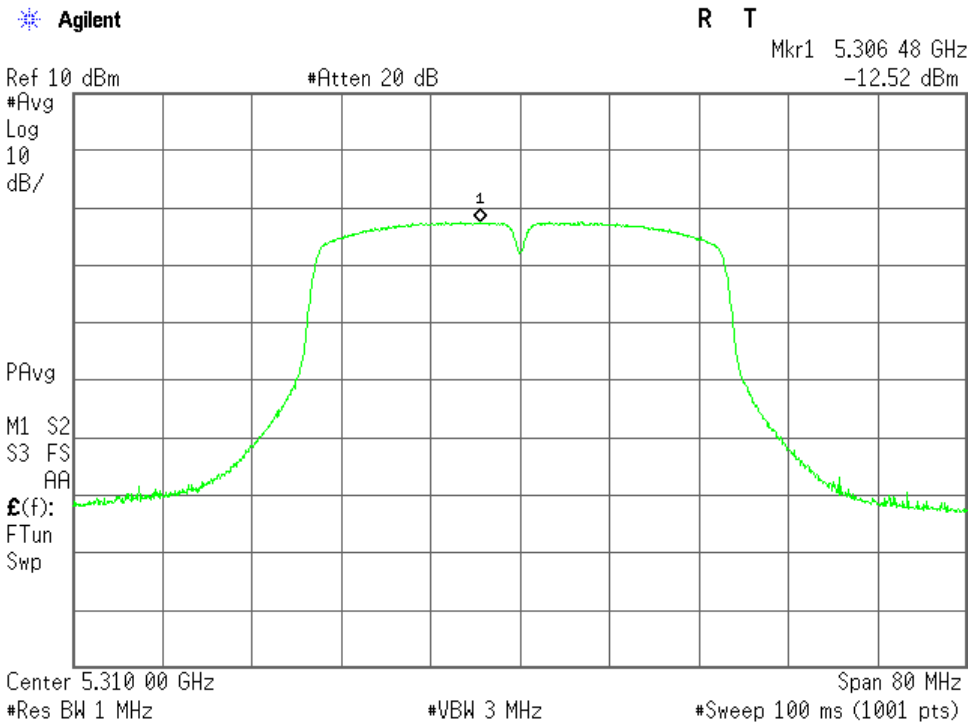
802.11n (40 MHz BW) 46ch (5230 MHz)



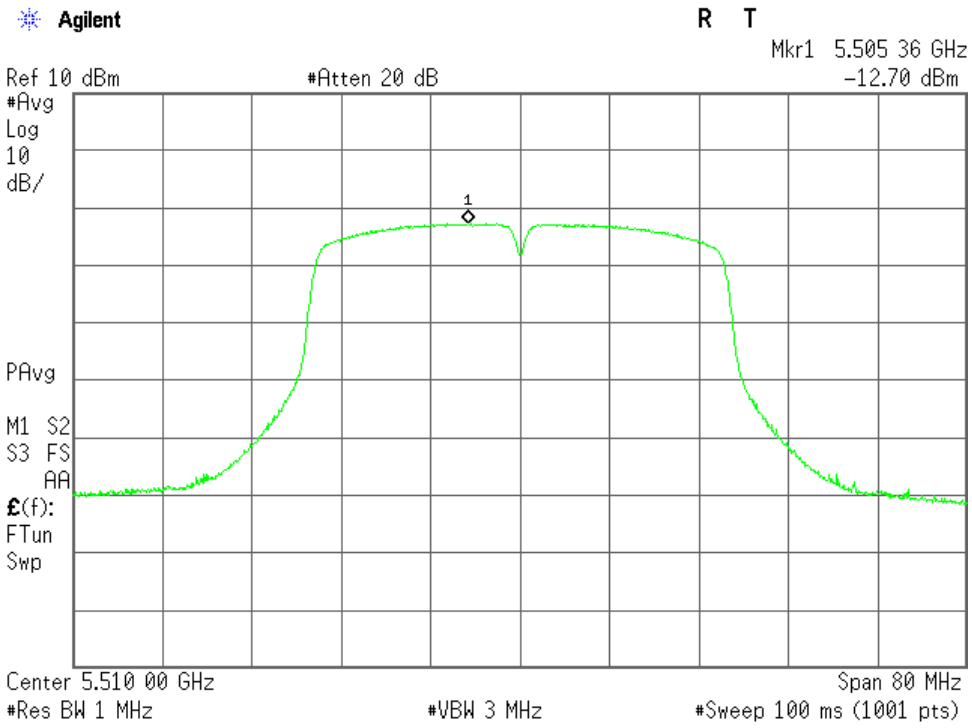
802.11n (40 MHz BW) 54ch (5270 MHz)



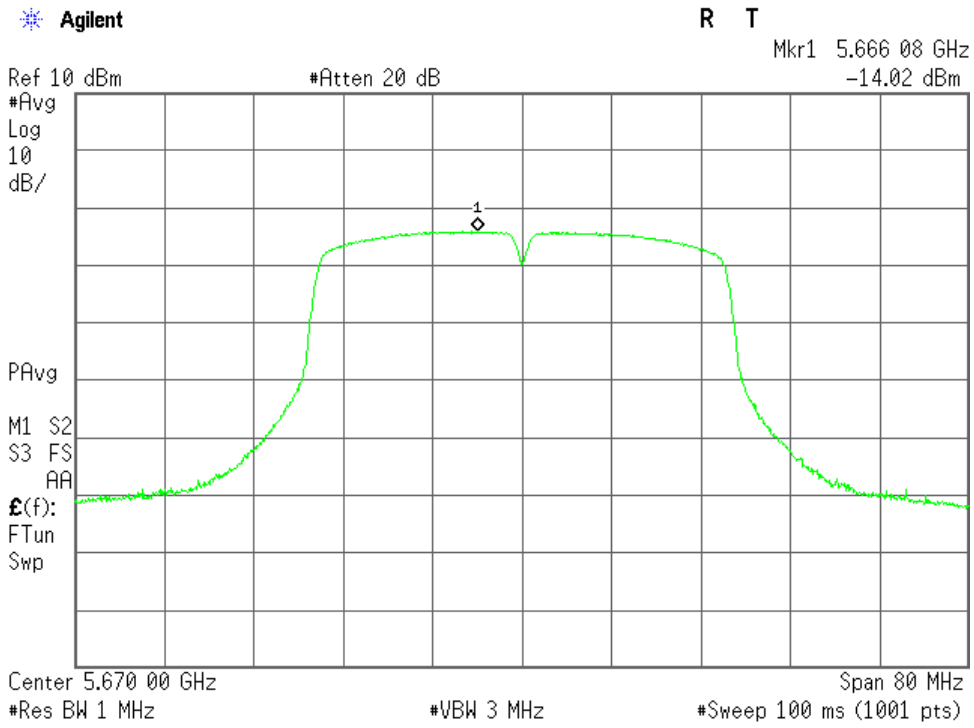
802.11n (40 MHz BW) 62ch (5310 MHz)



802.11n (40 MHz BW) 102ch (5510 MHz)

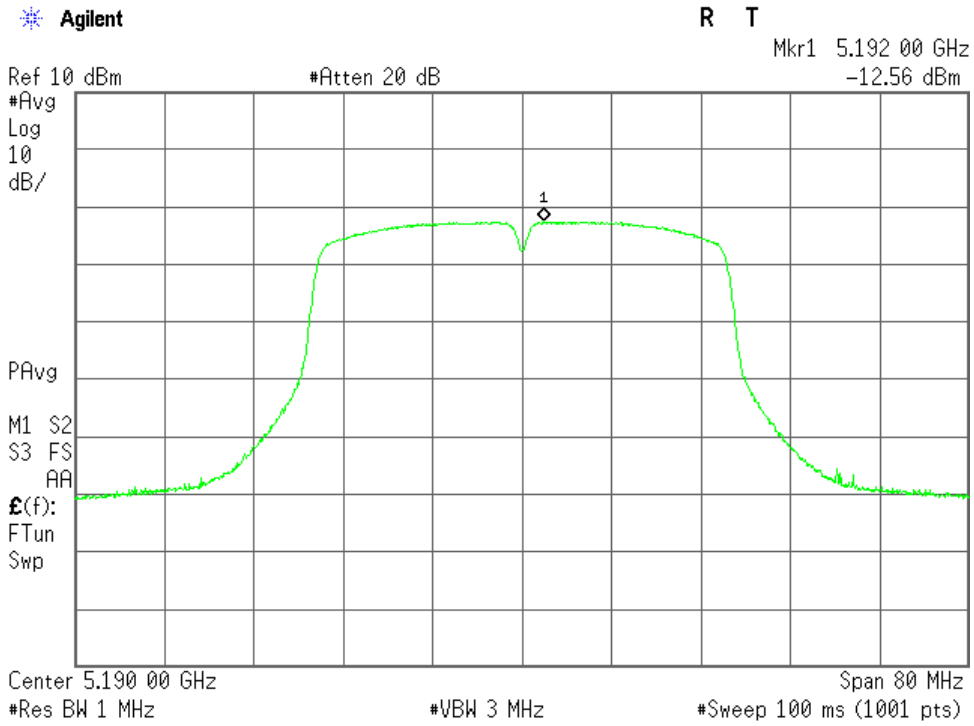


802.11n (40 MHz BW) 134ch (5670 MHz)

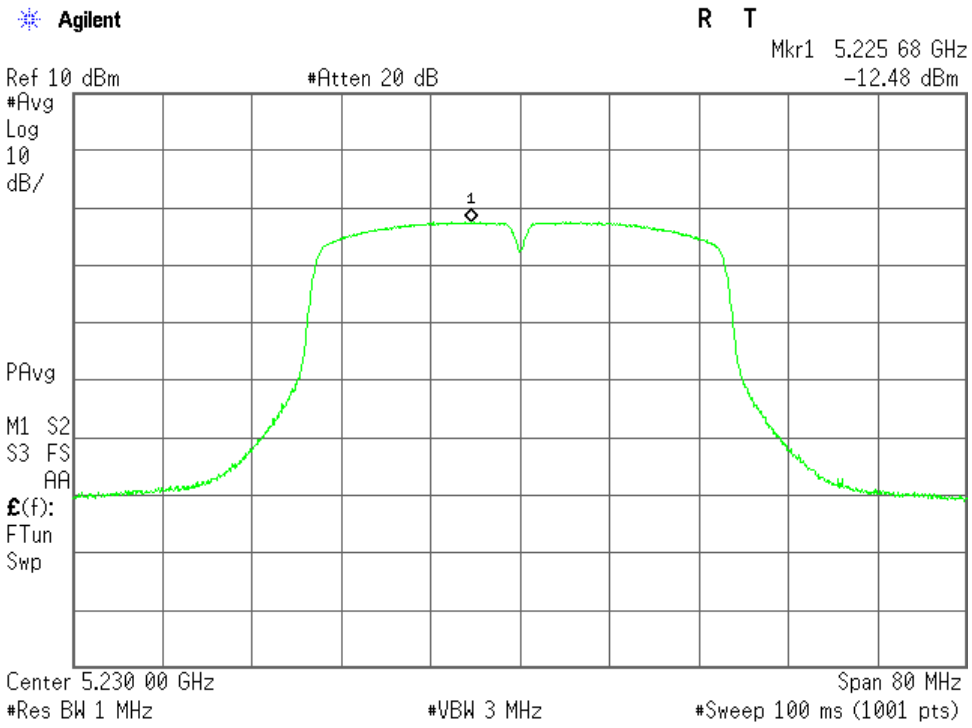


b) Sub Antenna (ANT1)

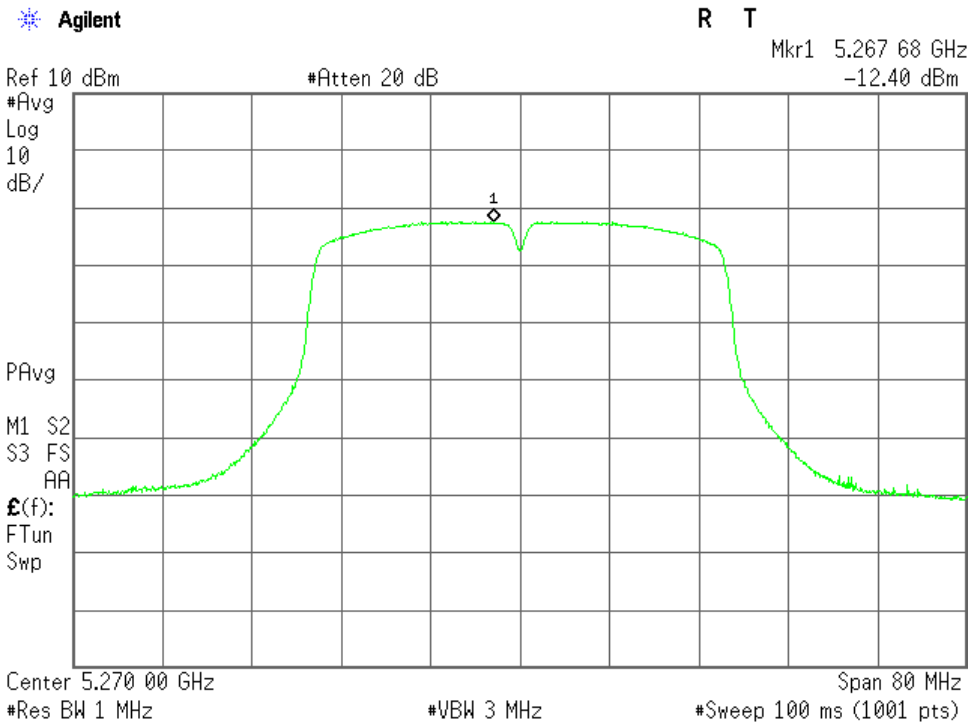
802.11n (40 MHz BW) 38ch (5190 MHz)



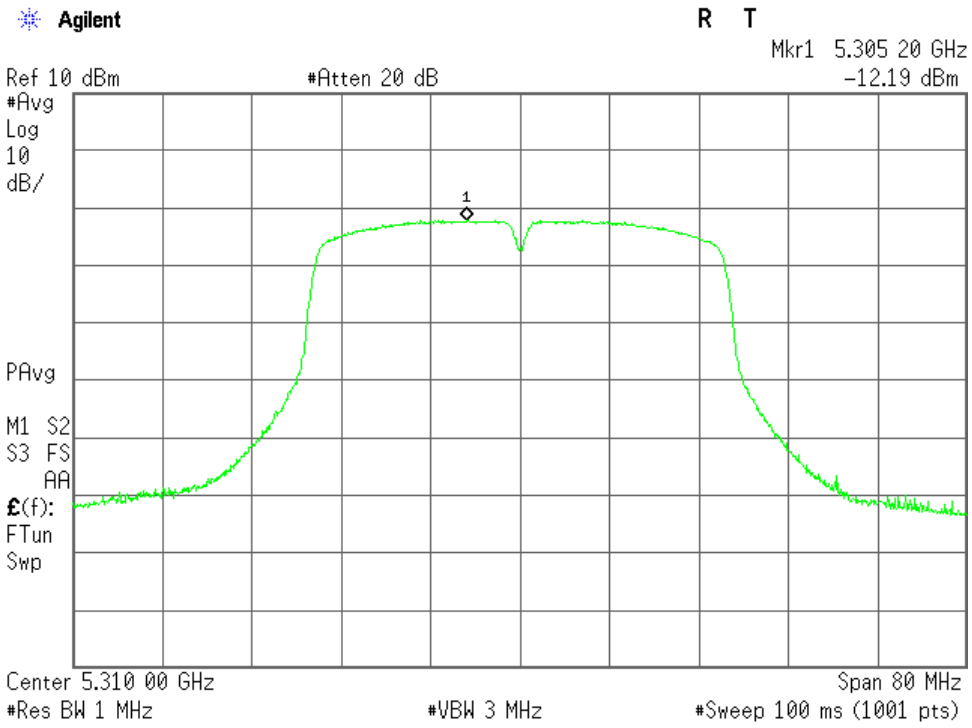
802.11n (40 MHz BW) 46ch (5230 MHz)



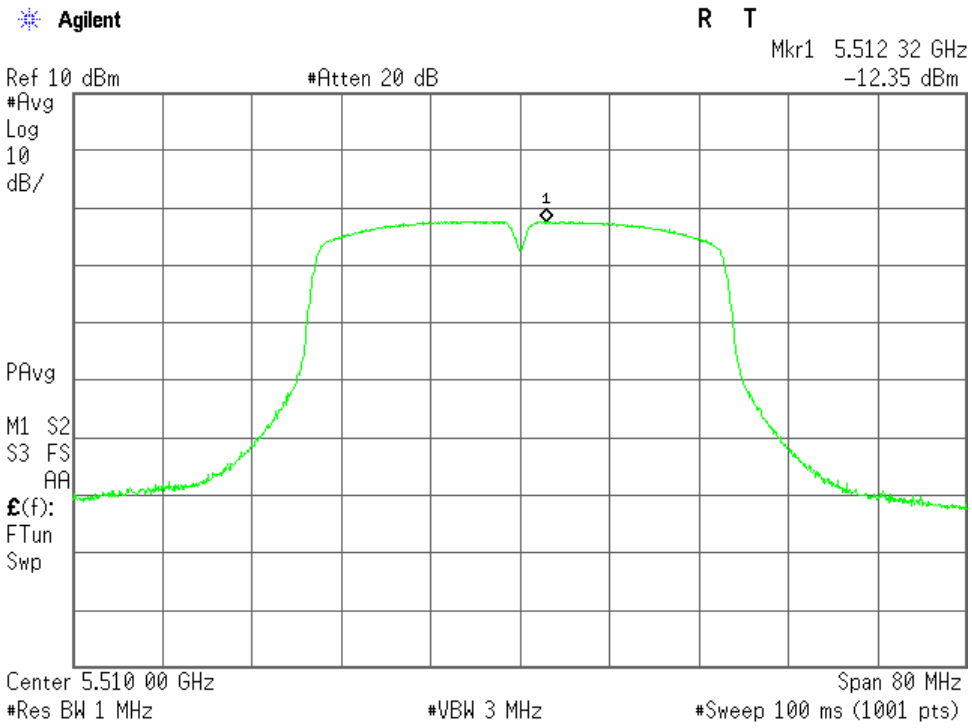
802.11n (40 MHz BW) 54ch (5270 MHz)



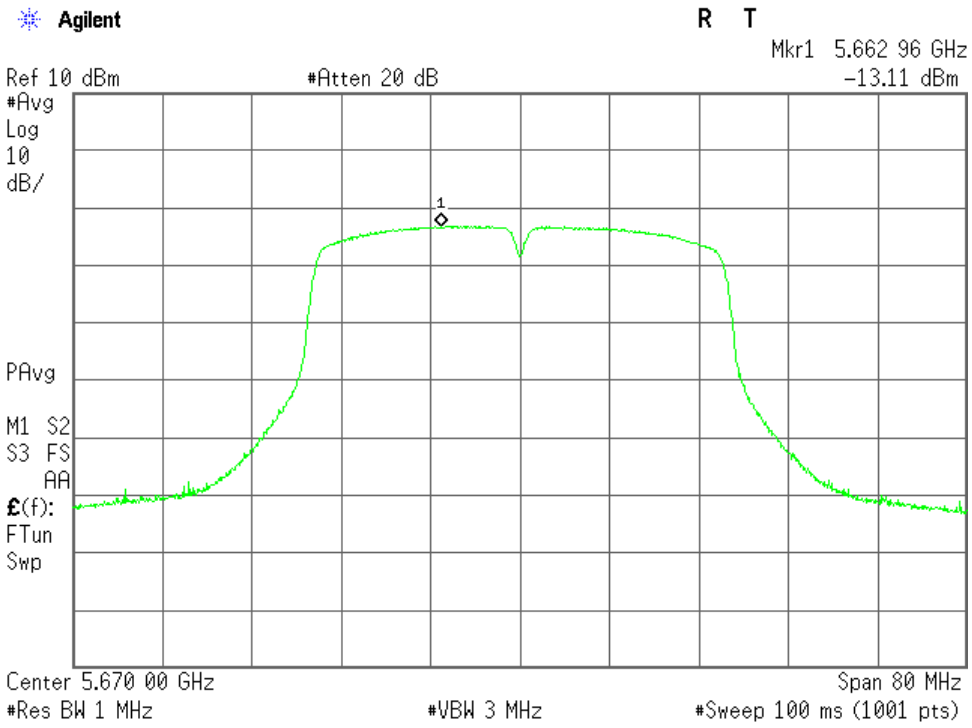
802.11n (40 MHz BW) 62ch (5310 MHz)



802.11n (40 MHz BW) 102ch (5510 MHz)



802.11n (40 MHz BW) 134ch (5670 MHz)



7.3.4.4 802.11ac (80 MHz BW) Peak power spectral density

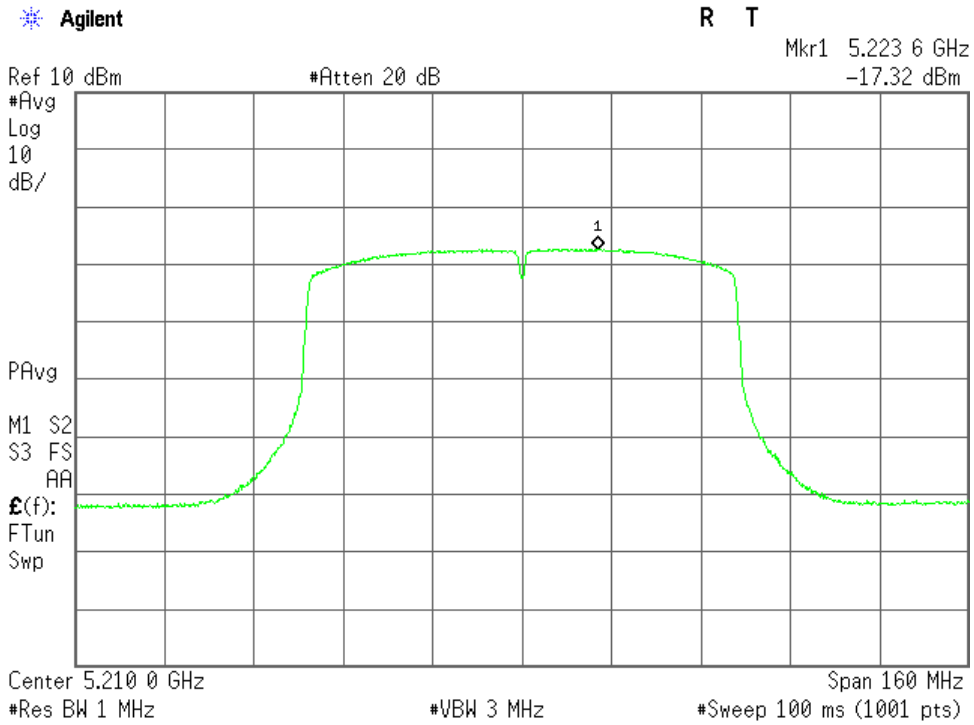
Mode of EUT: Tx Mode (802.11ac: 80 MHz)
Test Port: Temporary antenna connector

Channel	Frequency	Correction	Meter Reading(dBm)			PPSD	Limit	Margin
	(MHz)	Factor(dB)	ANT0	ANT1	Total	(dBm)	(dBm)	(dB)
42	5210	10.39	-17.32	-16.74	-14.01	-3.62	11.00	14.62
58	5290	10.40	-16.92	-16.50	-13.69	-3.29	11.00	14.29
106	5530	10.43	-17.17	-16.48	-13.80	-3.37	11.00	14.37
122	5610	10.44	-17.67	-16.71	-14.15	-3.71	11.00	14.71

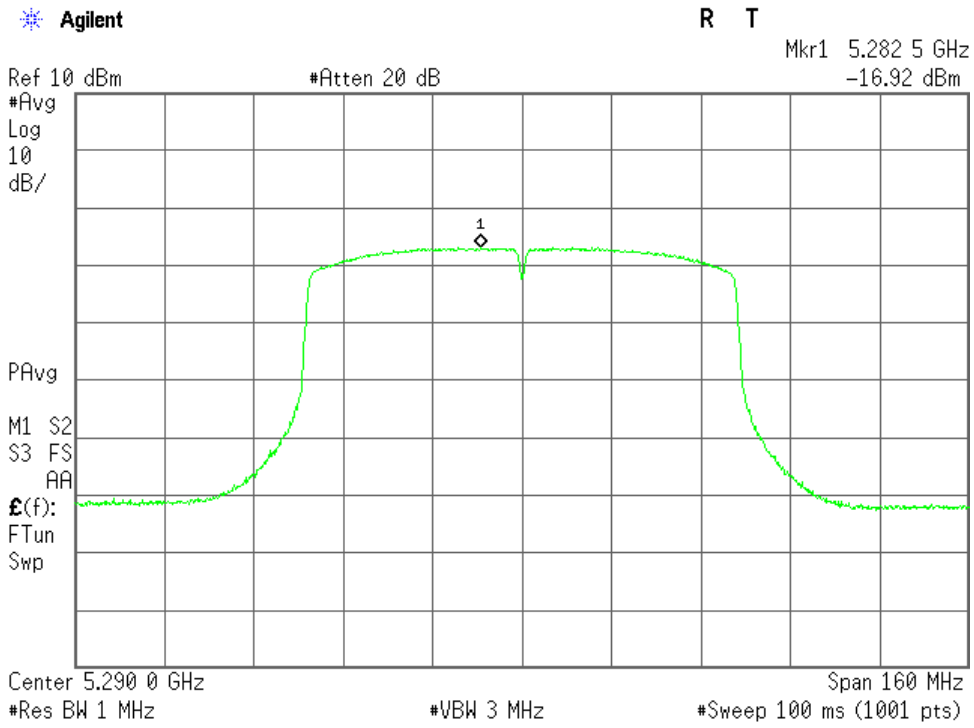
The test results (PPSD) is calculated as follows;
For 42 channel (5210 MHz)
PPSD = Correction Factor + Meter Reading = 10.39 + (-14.01) = -3.62 dBm
Correction Factor = cable loss + 10 dB attenuator

a) Main Antenna (ANT0)

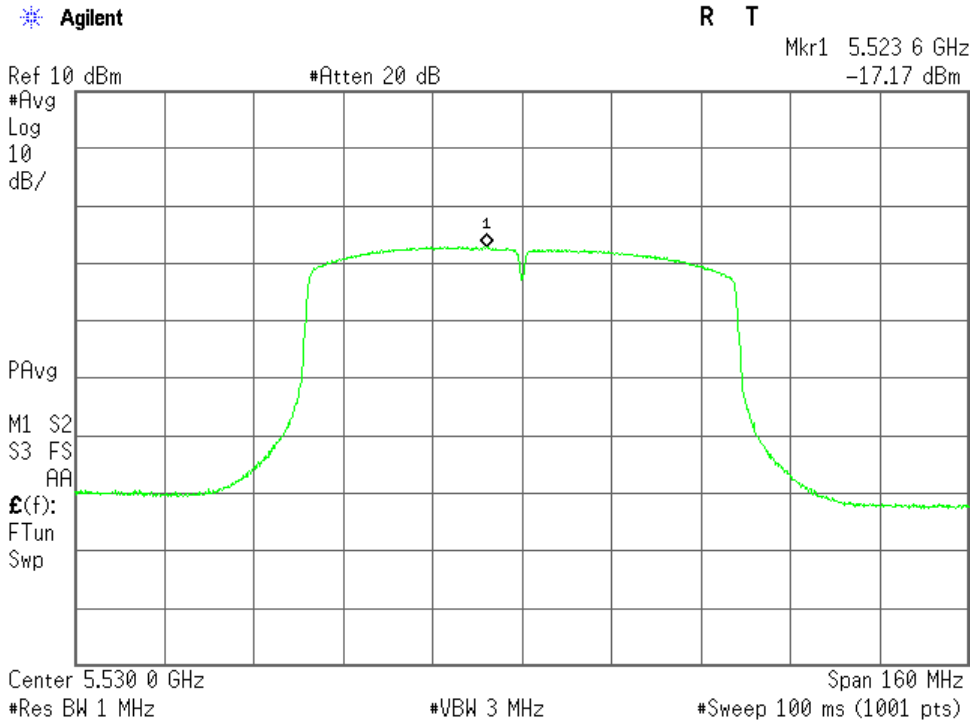
802.11ac (80 MHz BW) 42ch (5210 MHz)



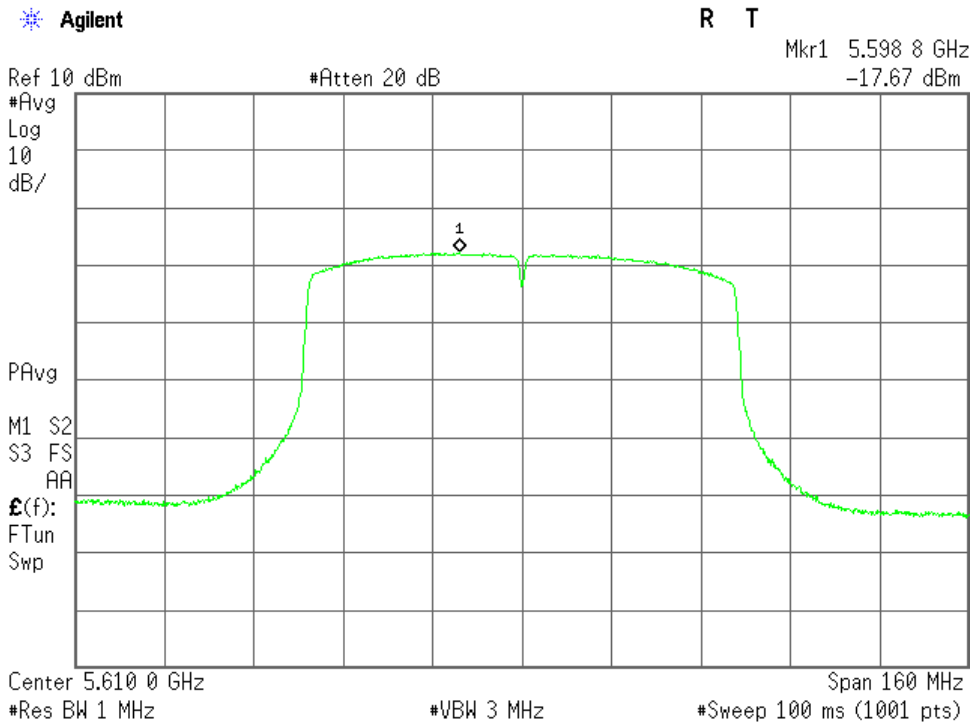
802.11ac (80 MHz BW) 58ch (5290 MHz)



802.11ac (80 MHz BW) 106ch (5530 MHz)

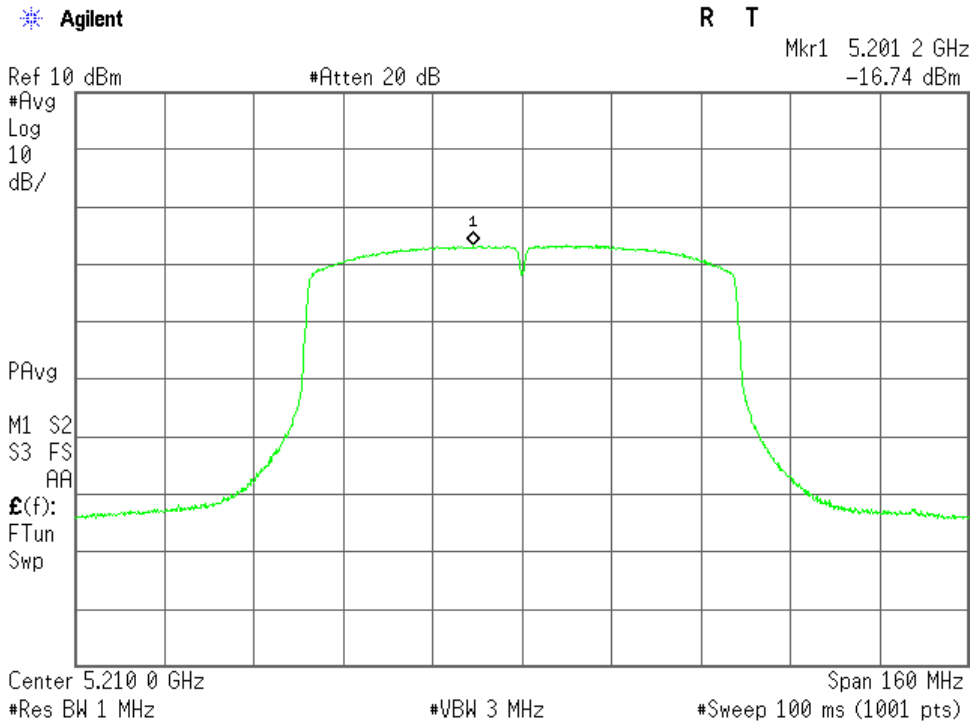


802.11ac (80 MHz BW) 122ch (5610 MHz)

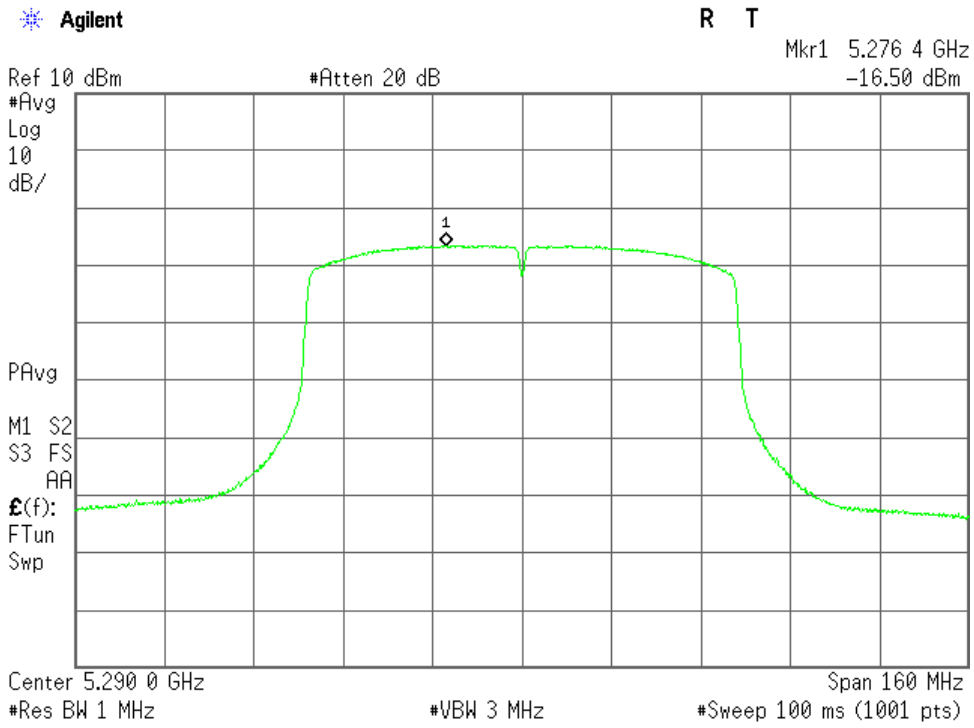


b) Sub Antenna (ANT1)

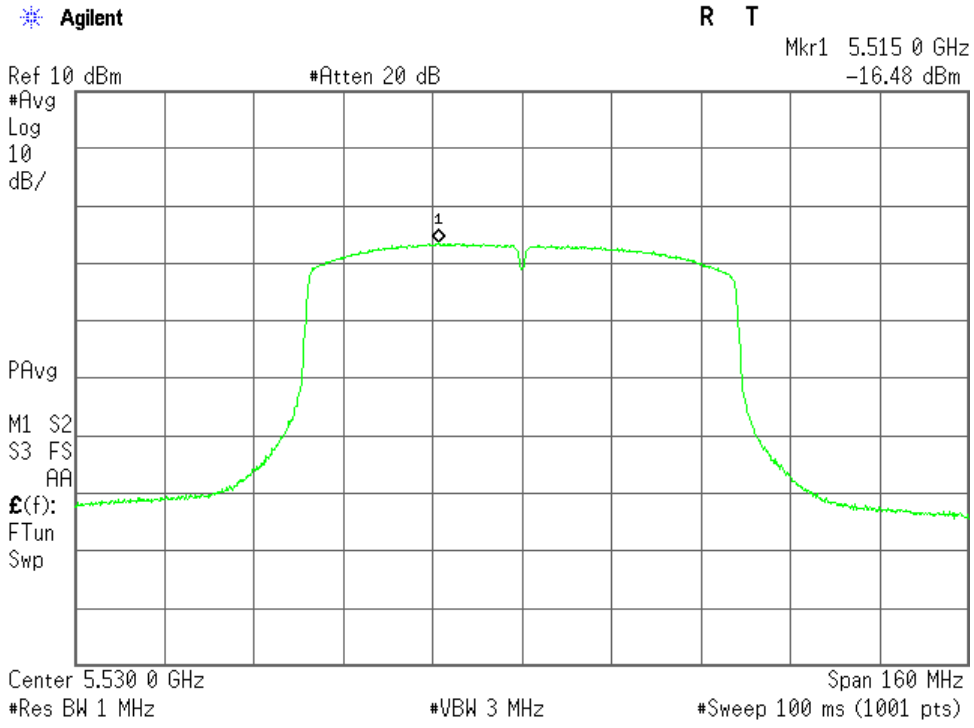
802.11ac (80 MHz BW) 42ch (5210 MHz)



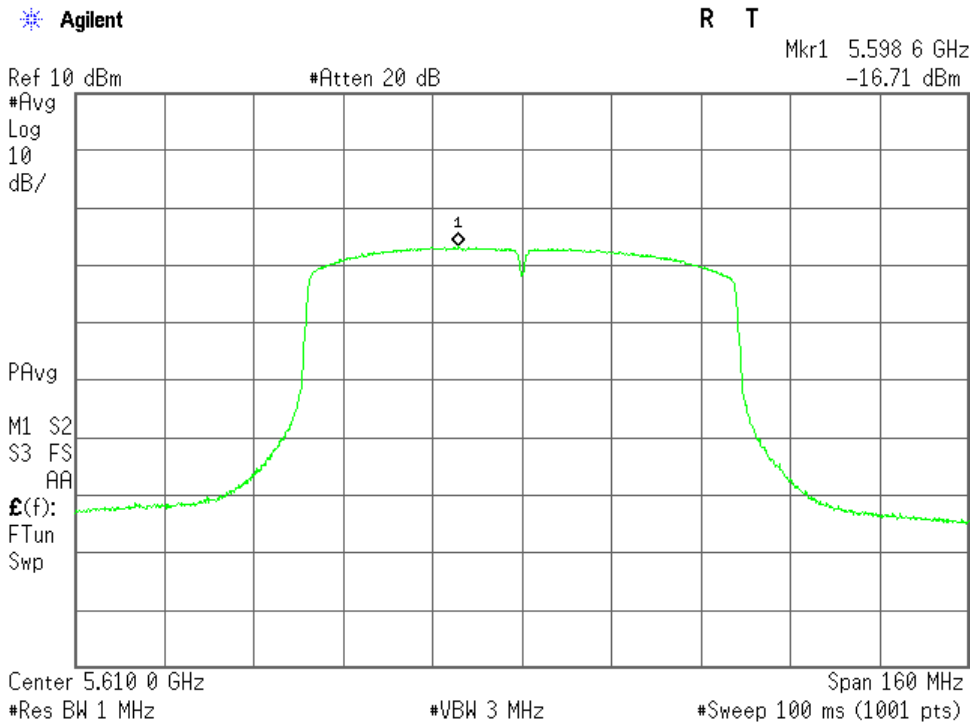
802.11ac (80 MHz BW) 58ch (5290 MHz)



802.11ac (80 MHz BW) 106ch (5530 MHz)



802.11ac (80 MHz BW) 122ch (5610 MHz)



7.4 Peak Excursion

For the requirements, ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☑ - Not Applicable

Remarks : _____

7.5 AC Powerline Conducted Emission

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.5.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin (Quasi-Peak) 11.2 dB at 1.515 MHz

Uncertainty of Measurement Results ± 2.6 dB(2σ)

Remarks : _____

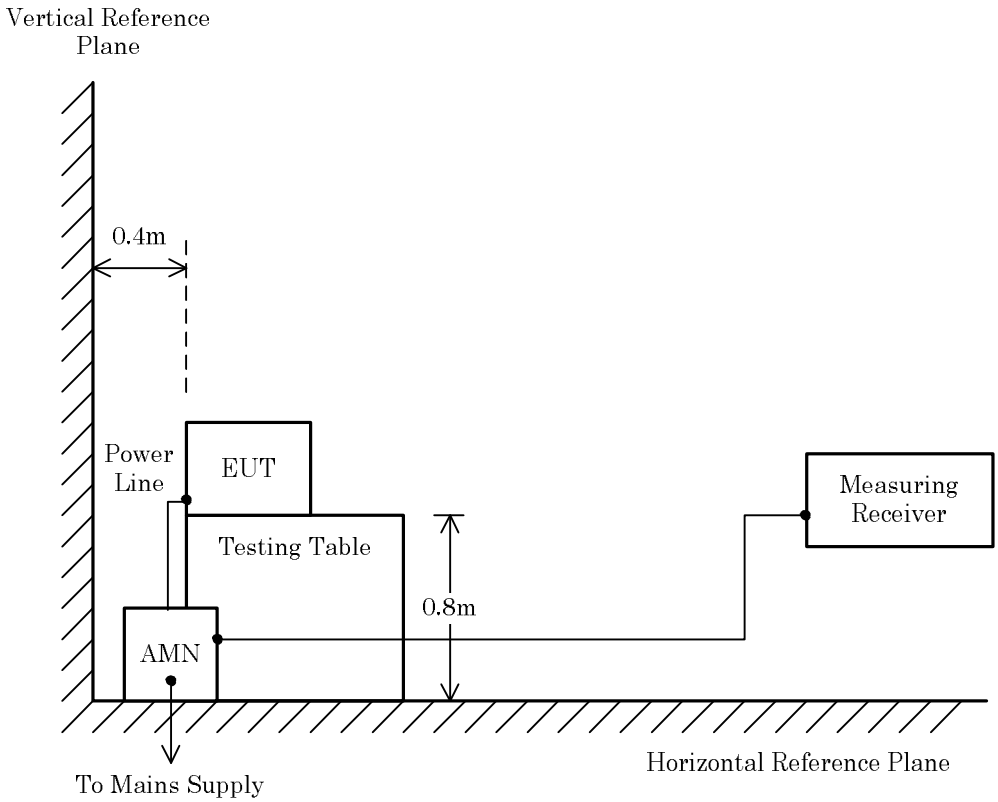
7.5.2 Test Instruments

Measurement Room M2				
Type	**Model**	**Serial No. (ID)**	**Manufacturer**	**Cal. Due**
Test Receiver	ESU 26	100170 (A-6)	Rohde & Schwarz	2016/04/25
AMN (main)	KNW-407FR	8-2019-1 (D-103)	Kyoritsu	2016/10/15
RF Cable	RG223/U	--- (H-34)	HUBER+SUHNER	2016/06/04

NOTE : The calibration interval of the above test instruments is 12 months.

7.5.3 Test Method and Test Setup (Diagrammatic illustration)

The preliminary tests were performed using the scan mode of test receiver or spectrum analyzer to observe the emissions characteristics of the EUT.
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for final tests.



NOTE
AMN : Artificial Mains Network

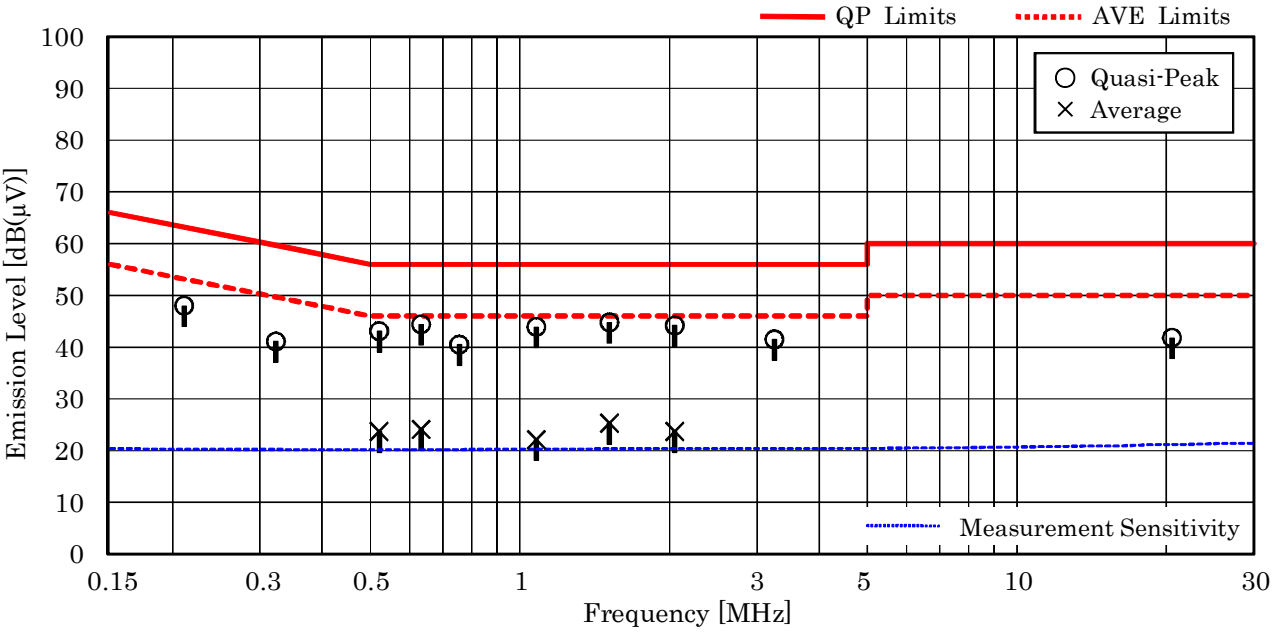
7.5.4 Test Data

Mode of EUT : All modes have been investigated and the worst case mode for channel (36ch: 5180MHz / IEEE 802.11a) has been listed.

Test Date: March 29, 2016
Temp.: 22 °C, Humi.: 38 %

Measured phase : L1

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)] QP	Meter Readings [dB(μV)] AVE	Limits [dB(μV)] QP	Limits [dB(μV)] AVE	Results [dB(μV)] QP	Results [dB(μV)] AVE	Margin [dB] QP	Margin [dB] AVE	Remarks
0.211	10.3	37.7	--	63.2	53.2	48.0	--	+15.2	--	-
0.323	10.2	30.9	--	59.6	49.6	41.1	--	+18.5	--	-
0.521	10.2	32.9	13.5	56.0	46.0	43.1	23.7	+12.9	+22.3	-
0.633	10.2	34.2	13.9	56.0	46.0	44.4	24.1	+11.6	+21.9	-
0.755	10.2	30.3	--	56.0	46.0	40.5	--	+15.5	--	-
1.079	10.3	33.6	11.8	56.0	46.0	43.9	22.1	+12.1	+23.9	-
1.515	10.3	34.5	15.0	56.0	46.0	44.8	25.3	+11.2	+20.7	-
2.050	10.4	33.8	13.3	56.0	46.0	44.2	23.7	+11.8	+22.3	-
3.251	10.4	31.1	--	56.0	46.0	41.5	--	+14.5	--	-
20.513	11.2	30.6	--	60.0	50.0	41.8	--	+18.2	--	-

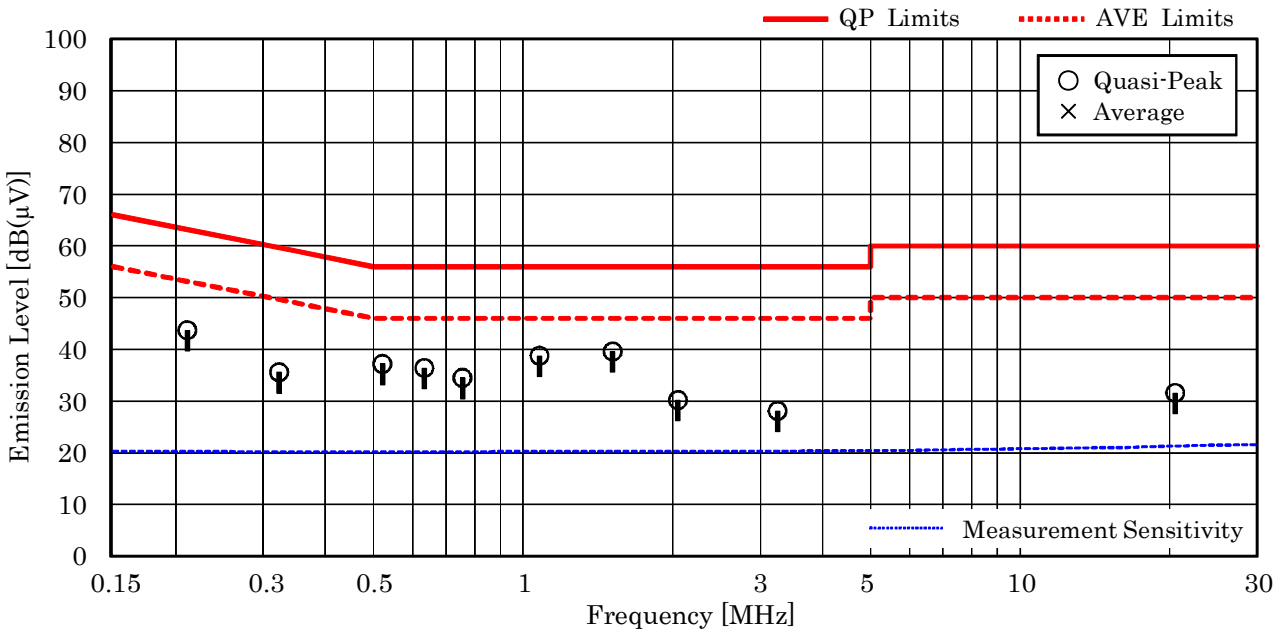


NOTES
1. The spectrum was checked from 150 kHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 1.515 MHz, as the worst point shown on underline:
   Correction Factor + Meter Reading (QP) = 10.3 + 34.5 = 44.8 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

Test Date: March 29, 2016
Temp.: 22 °C, Humi.: 38 %

Measured phase : L2

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)] QP	AVE	Limits [dB(μV)] QP	AVE	Results [dB(μV)] QP	AVE	Margin [dB] QP	AVE	Remarks
0.211	10.2	33.5	--	63.2	53.2	43.7	--	+19.5	--	-
0.323	10.2	25.4	--	59.6	49.6	35.6	--	+24.0	--	-
0.521	10.2	27.0	--	56.0	46.0	37.2	--	+18.8	--	-
0.633	10.2	26.2	--	56.0	46.0	36.4	--	+19.6	--	-
0.755	10.2	24.3	--	56.0	46.0	34.5	--	+21.5	--	-
1.079	10.3	28.5	--	56.0	46.0	38.8	--	+17.2	--	-
1.515	10.3	29.3	--	56.0	46.0	39.6	--	+16.4	--	-
2.050	10.3	19.9	--	56.0	46.0	30.2	--	+25.8	--	-
3.251	10.4	17.7	--	56.0	46.0	28.1	--	+27.9	--	-
20.513	11.3	20.3	--	60.0	50.0	31.6	--	+28.4	--	-



NOTES
1. The spectrum was checked from 150 kHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 1.515 MHz, as the worst point shown on underline:
   Correction Factor + Meter Reading (QP) = 10.3 + 29.3 = 39.6 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

7.6 Unwanted Radiated Emission

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.6.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin (Peak) 6.9 dB at 5463.5 MHz

Uncertainty of Measurement Results	9 kHz – 30 MHz	± 3.0	dB(2σ)
	30 MHz – 300 MHz	± 3.8	dB(2σ)
	300 MHz – 1000 MHz	± 4.8	dB(2σ)
	1 GHz – 6 GHz	± 4.7	dB(2σ)
	6 GHz – 18 GHz	± 4.6	dB(2σ)
	18 GHz – 40 GHz	± 5.5	dB(2σ)
Test Distance	9 kHz – 26.5 GHz	3	m
	26.5 GHz – 40 GHz	1	m

Remarks : Worst case is 802.11n(40MHz BW) channel 102 (Z axis position) at 5463.5MHz.

7.6.2 Test Instruments

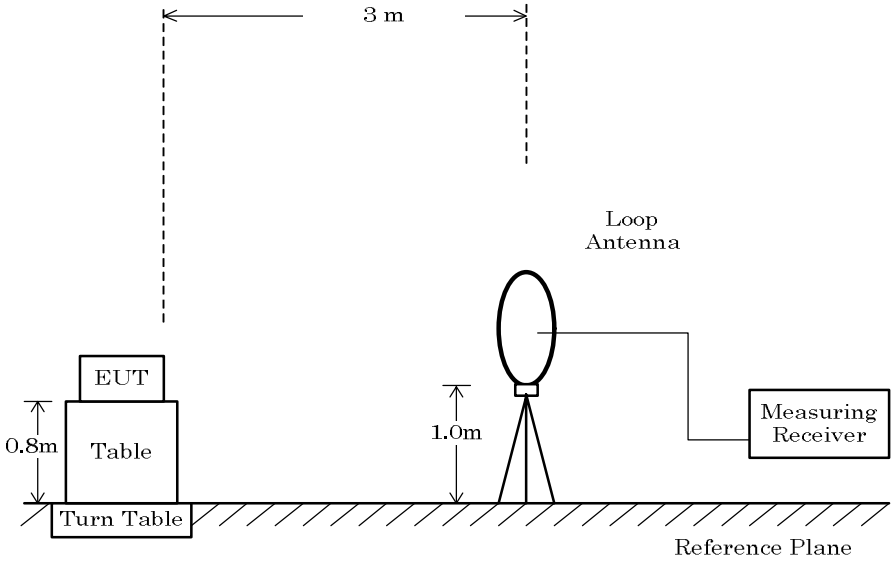
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Test Receiver	ESU 26	100170 (A-6)	Rohde & Schwarz	2016/04/25
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Loop Antenna	HFH2-Z2	872096/25 (C-2)	Rohde & Schwarz	2016/07/26
RF Cable	RG213/U	--- (H-28)	HUBER+SUHNER	2016/07/26
Pre-Amplifier	310N	304573 (A-17)	SONOMA	2016/04/15
Biconical Antenna	VHA9103/BBA9106	2355 (C-30)	Schwarzbeck	2016/05/24
Log-periodic Antenna	UHALP9108-A1	0694 (C-31)	Schwarzbeck	2016/05/24
RF Cable	S 10162 B-11 etc.	--- (H-4)	HUBER+SUHNER	2016/04/15
Site Attenuation	--	--- (H-15)	----	2017/01/03
Pre-Amplifier	TPA0118-36	1010 (A-37)	TOYO	2016/05/11
Horn Antenna	91888-2	562 (C-41-1)	EATON	2016/06/16
Horn Antenna	91889-2	568 (C-41-2)	EATON	2016/06/16
Horn Antenna	3160-04	9903-1053 (C-55)	EMCO	2016/06/29
Horn Antenna	3160-05	9902-1061 (C-56)	EMCO	2016/06/29
Horn Antenna	3160-06	9712-1045 (C-57)	EMCO	2016/06/29
Horn Antenna	3160-07	9902-1113 (C-58)	EMCO	2016/06/29
Horn Antenna	3160-08	9904-1099 (C-59)	EMCO	2016/06/29
Horn Antenna	3160-09	9808-1117 (C-48)	EMCO	2016/06/28
Horn Antenna	3160-10	9808-1072 (C-49)	EMCO	2016/06/28
Attenuator	54A-10	W5713 (D-29)	Weinschel	2016/08/16
Attenuator	2-10	BA6214 (D-79)	Weinschel	2016/11/19
RF Cable	SUCOFLEX104	267479/4 (C-66)	HUBER+SUHNER	2017/01/06
RF Cable	SUCOFLEX104	267414/4 (C-67)	HUBER+SUHNER	2017/01/06
RF Cable	SUCOFLEX102EA	3041/2EA (C-69)	HUBER+SUHNER	2017/01/06
Band Rejection Filter	BRM50716	063 (D-53)	MICRO-TRONICS	2016/06/28
SVSWR	--	--- (H-19)	----	2017/03/03

NOTE : The calibration interval of the above test instruments is 12 months.

7.6.3 Test Method and Test Setup (Diagrammatic illustration)

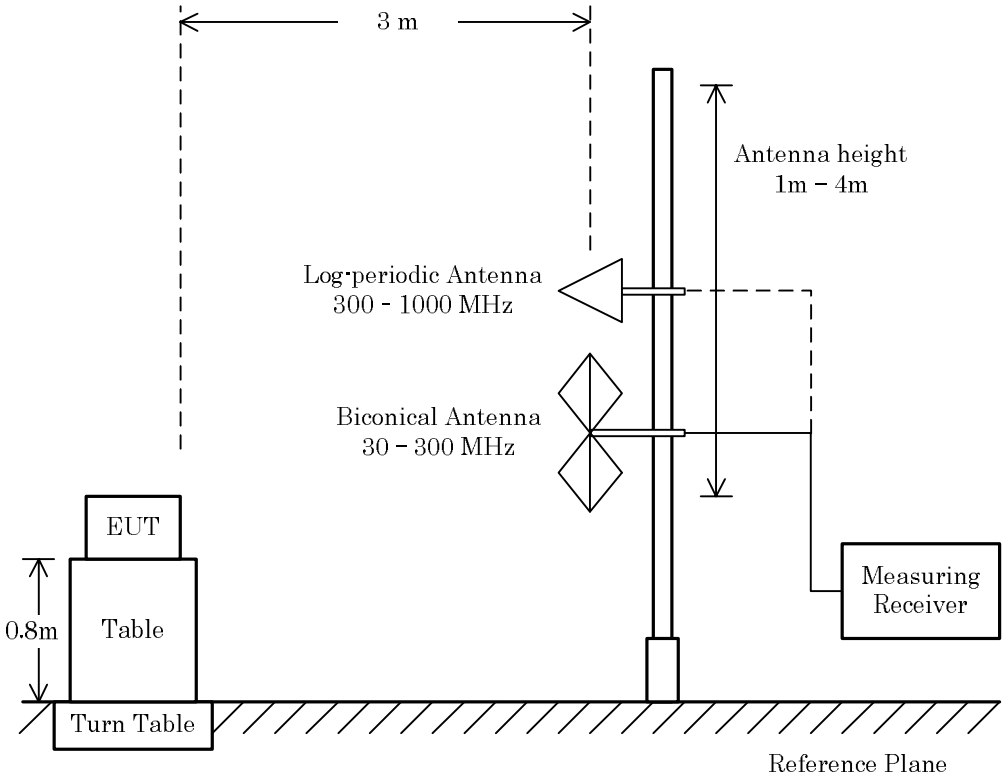
7.6.3.1 Radiated Emission 9 kHz – 30 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.
The measurement were performed about three antenna orientations (parallel, perpendicular, and ground-parallel).
This configurations was used for the final tests.



7.6.3.2 Radiated Emission 30 MHz – 1000 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.



7.6.3.3 Radiated Emission above 1 GHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.
The average unwanted emissions measurements were performed in accordance with KDB 789033 D02 Method VB described in G.6.d) in this document.

The setting of the measuring instruments are shown as follows:

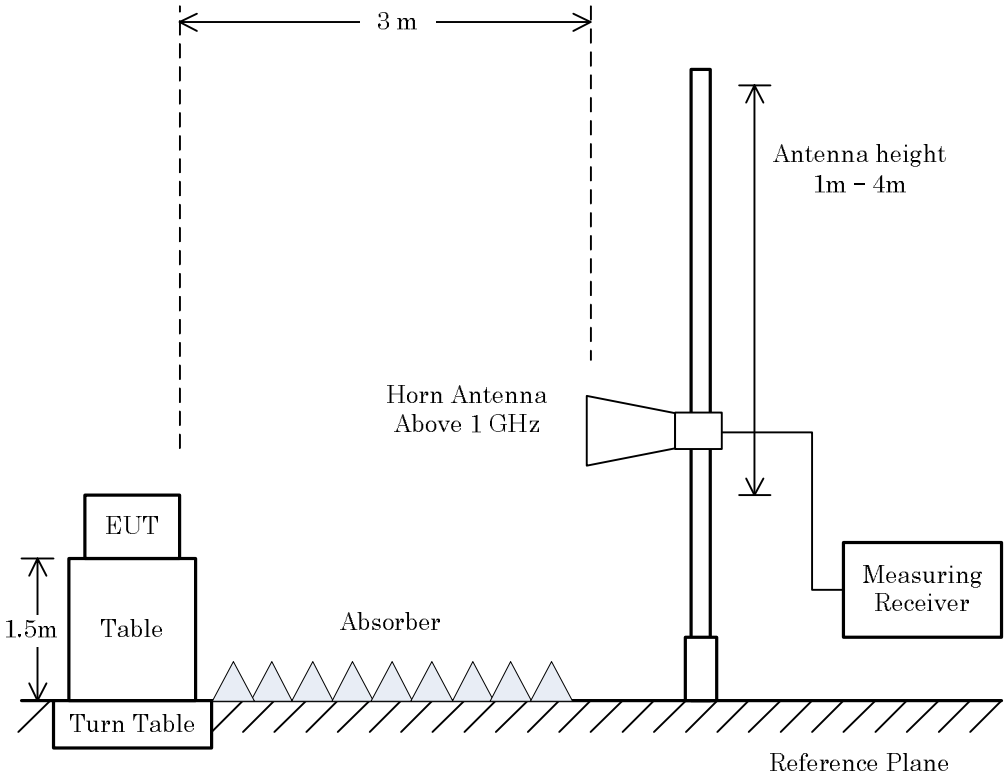
Type	Peak	Average
Detector Function	Peak	Peak
Res. Bandwidth	1 MHz	1 MHz
Video Bandwidth	3 MHz	≥ 1/T *1)
Video Filtering	Linear Voltage	Linear Voltage
Sweep Time	AUTO	AUTO
Trace	Max Hold	Max Hold

Note: 1. T: Minimum transmission duration

Average (VBW) Setting:

Mode	Interval	Cycle	Duty cycle	Burst on period(T)	Min. VBW(1/T)	VBW Setting
	(msec)	(msec)	(%)	(msec)	(kHz)	(kHz))
IEEE802.11a	0.107	2.134	95.0%	2.03	0.49	0.50
IEEE802.11n(HT20)	0.107	1.995	94.6%	1.89	0.53	1.00
IEEE802.11n(HT40)	0.107	1.034	89.7%	0.93	1.08	2.00
IEEE802.11ac(VHT80)	0.097	0.553	82.5%	0.46	2.19	2.00

– Side View –



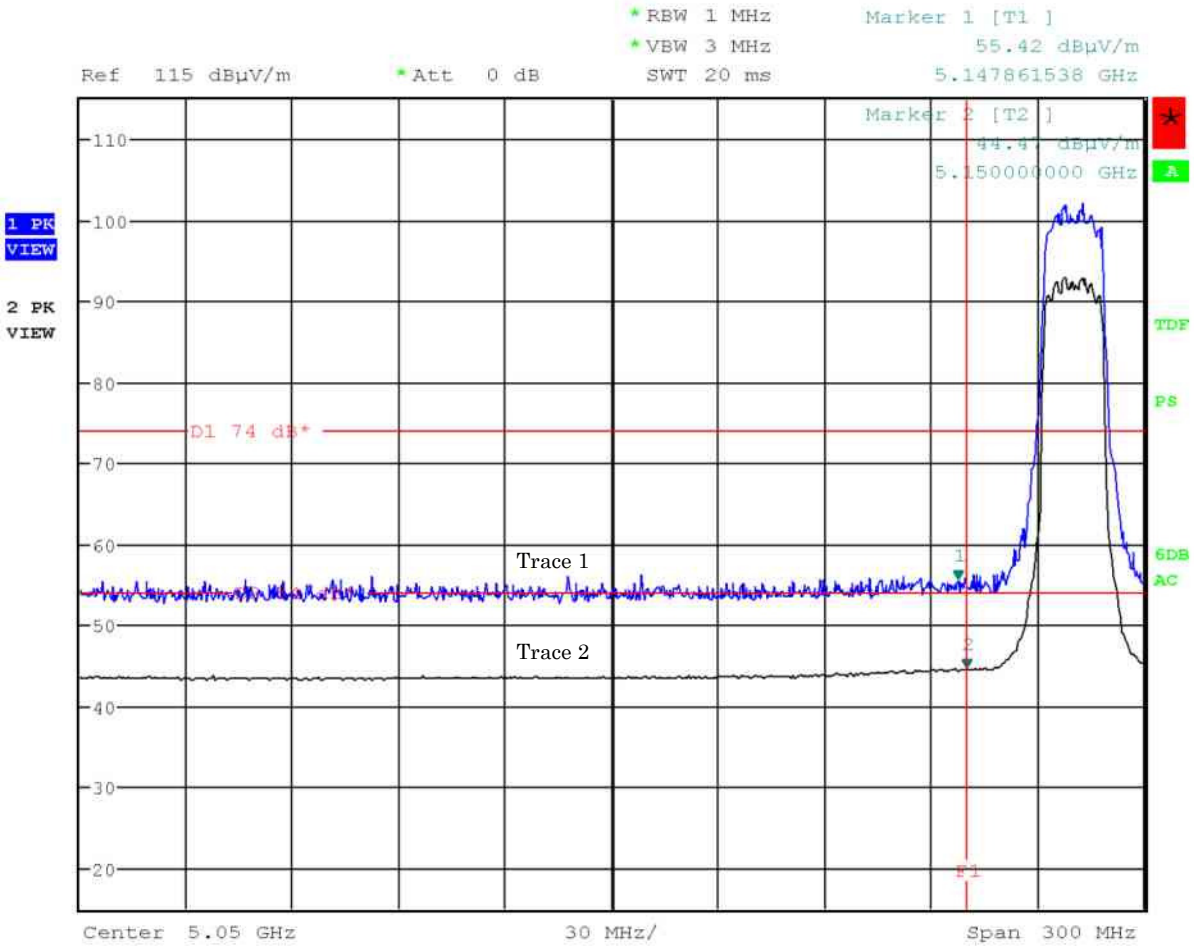
NOTE
When the EUT is manipulated through three different orientations, the scan height upper range for the measurement antenna is limited to 2.5 m or 0.5 m above the top of the EUT.

7.6.4 Test Data

7.6.4.1 Radiated Band Edge

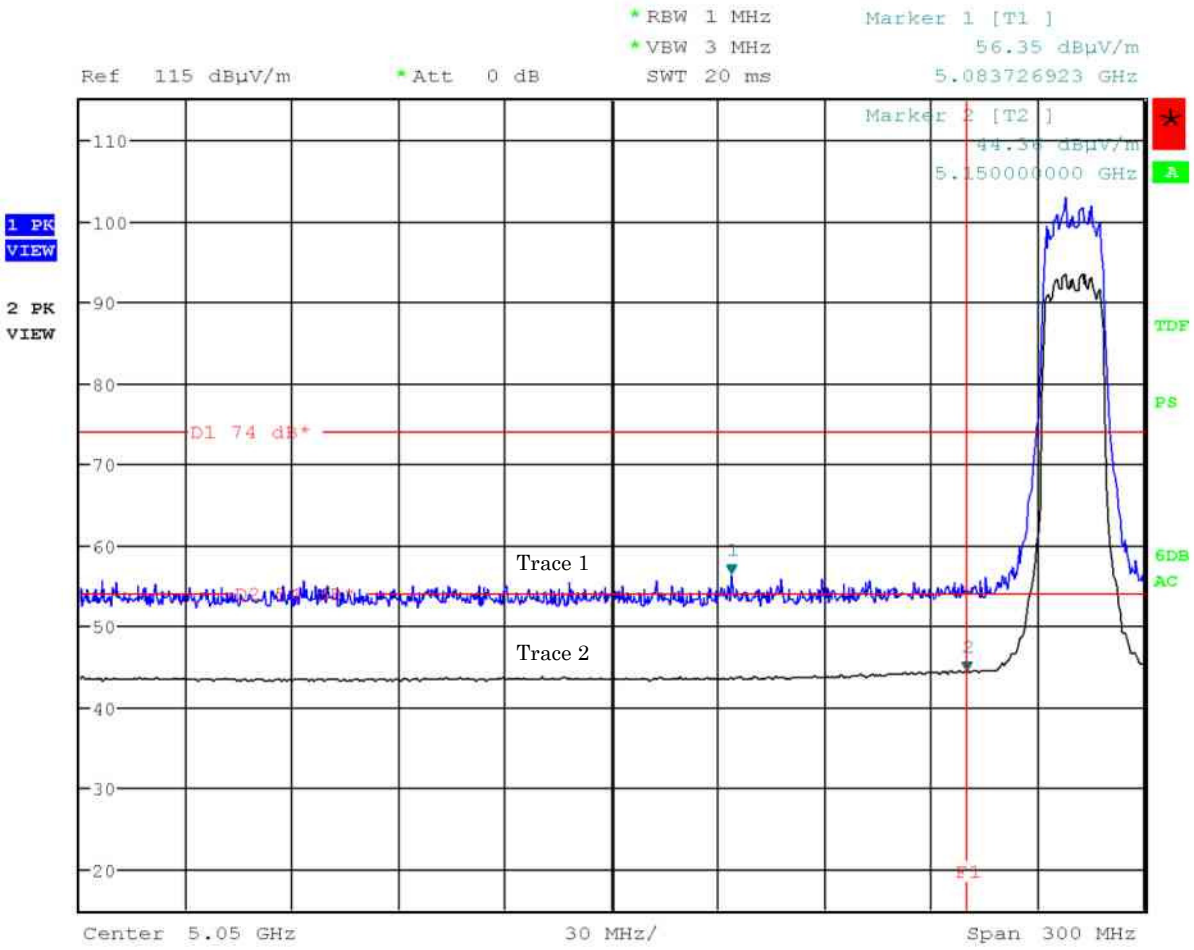
Test Date :March 28, 2016
Temp.:22°C, Humi:38%

Mode of EUT : TX mode (802.11a, 36ch: 5180 MHz)
Antenna Polarization : Horizontal



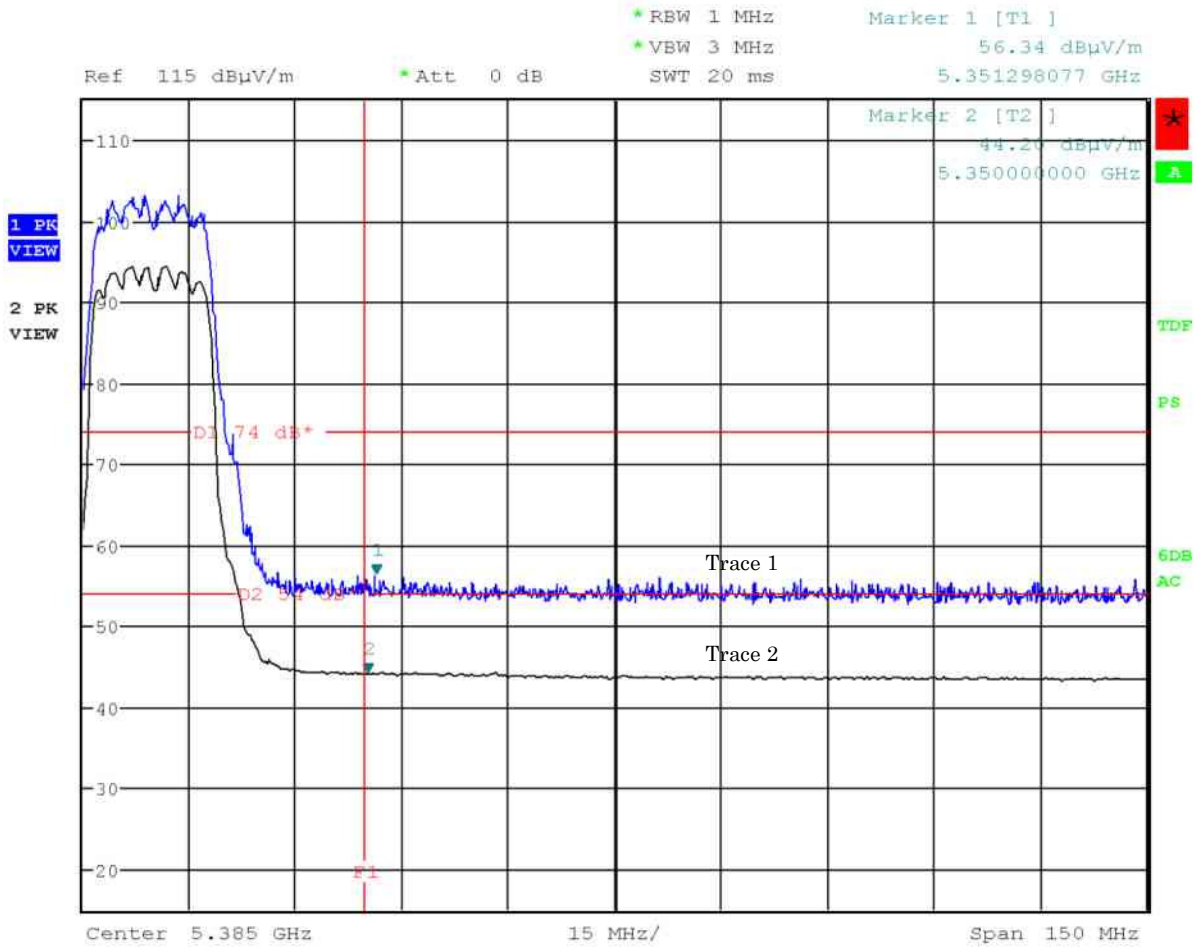
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11a, 36ch: 5180 MHz)
Antenna Polarization : Vertical



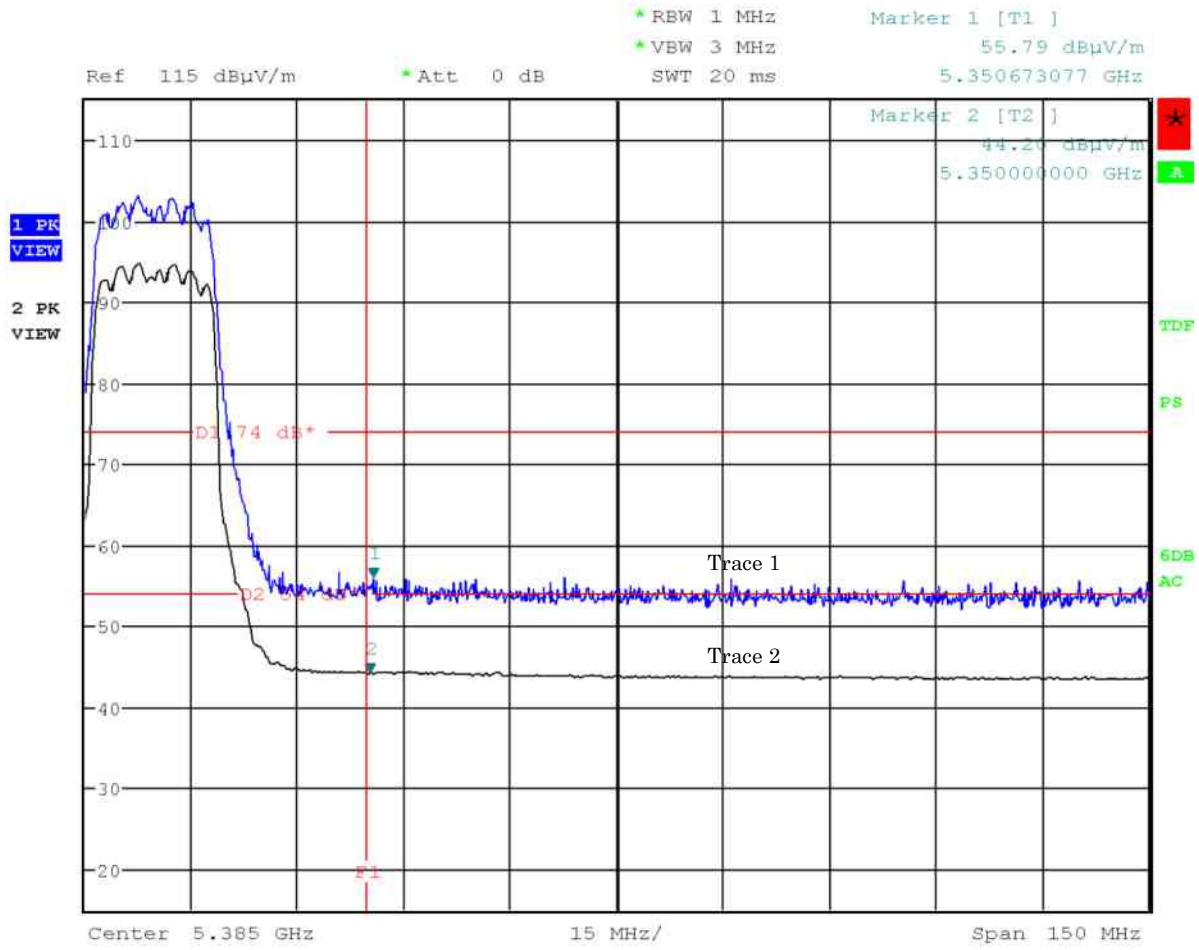
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11a, 64ch: 5320 MHz)
Antenna Polarization : Horizontal



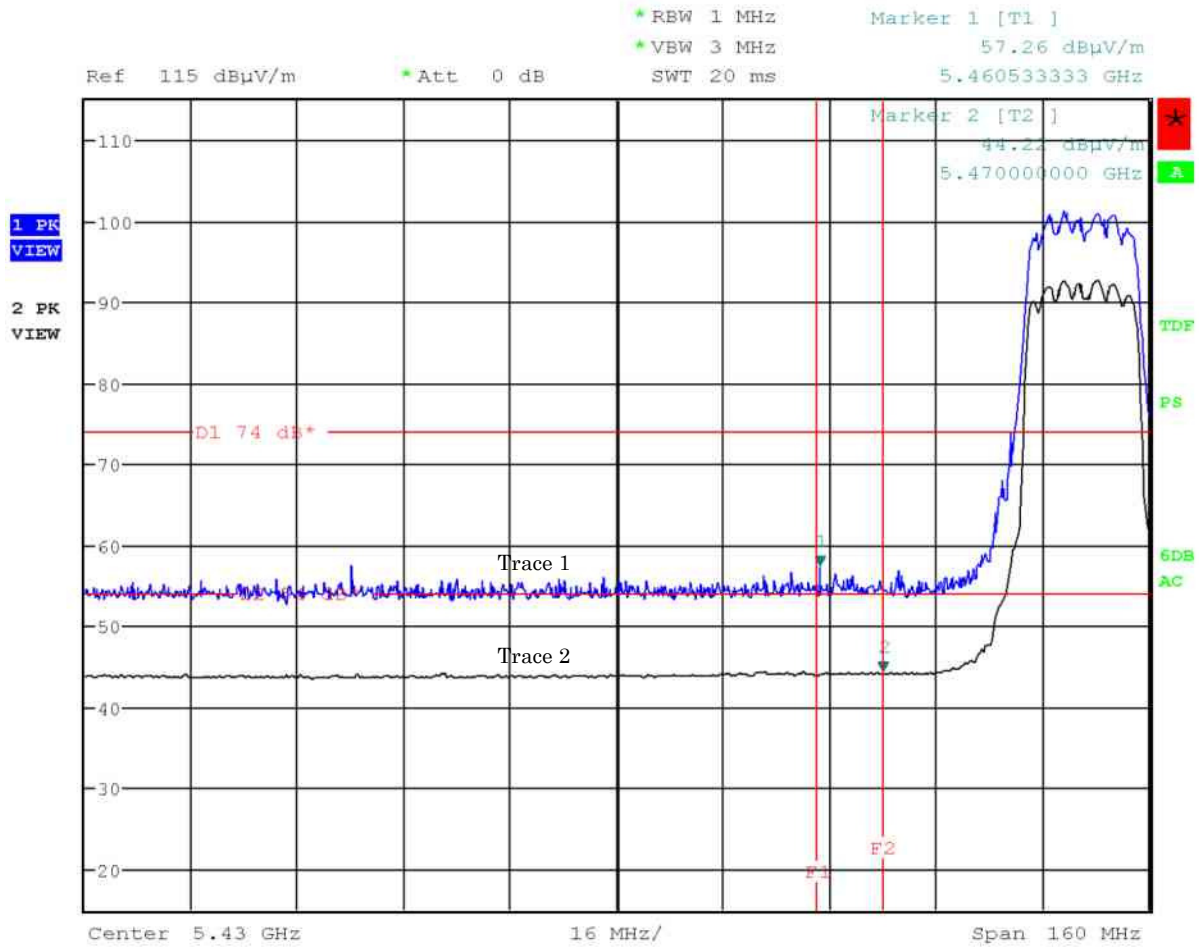
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11a, 64ch: 5320 MHz)
Antenna Polarization : Vertical



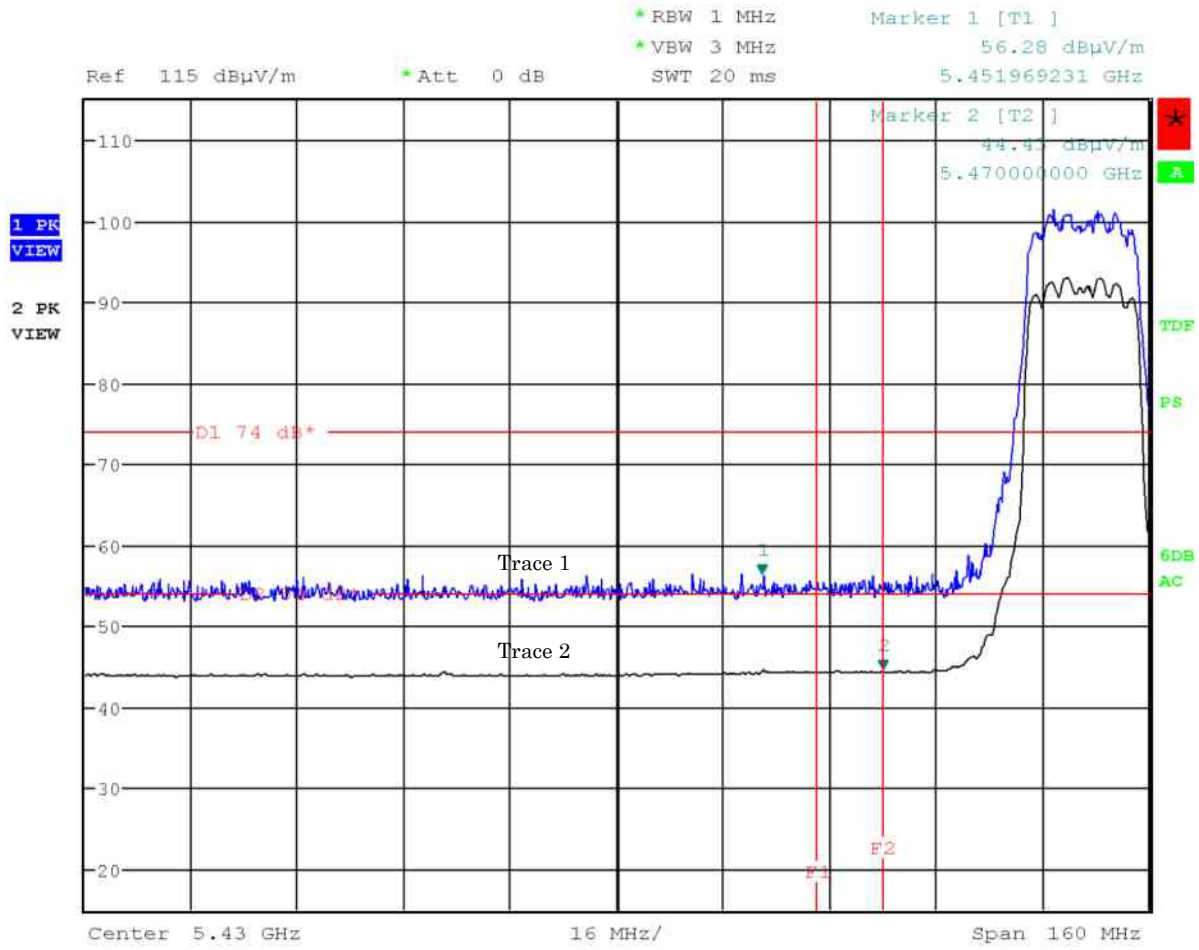
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11a, 100ch: 5500 MHz)
Antenna Polarization : Horizontal



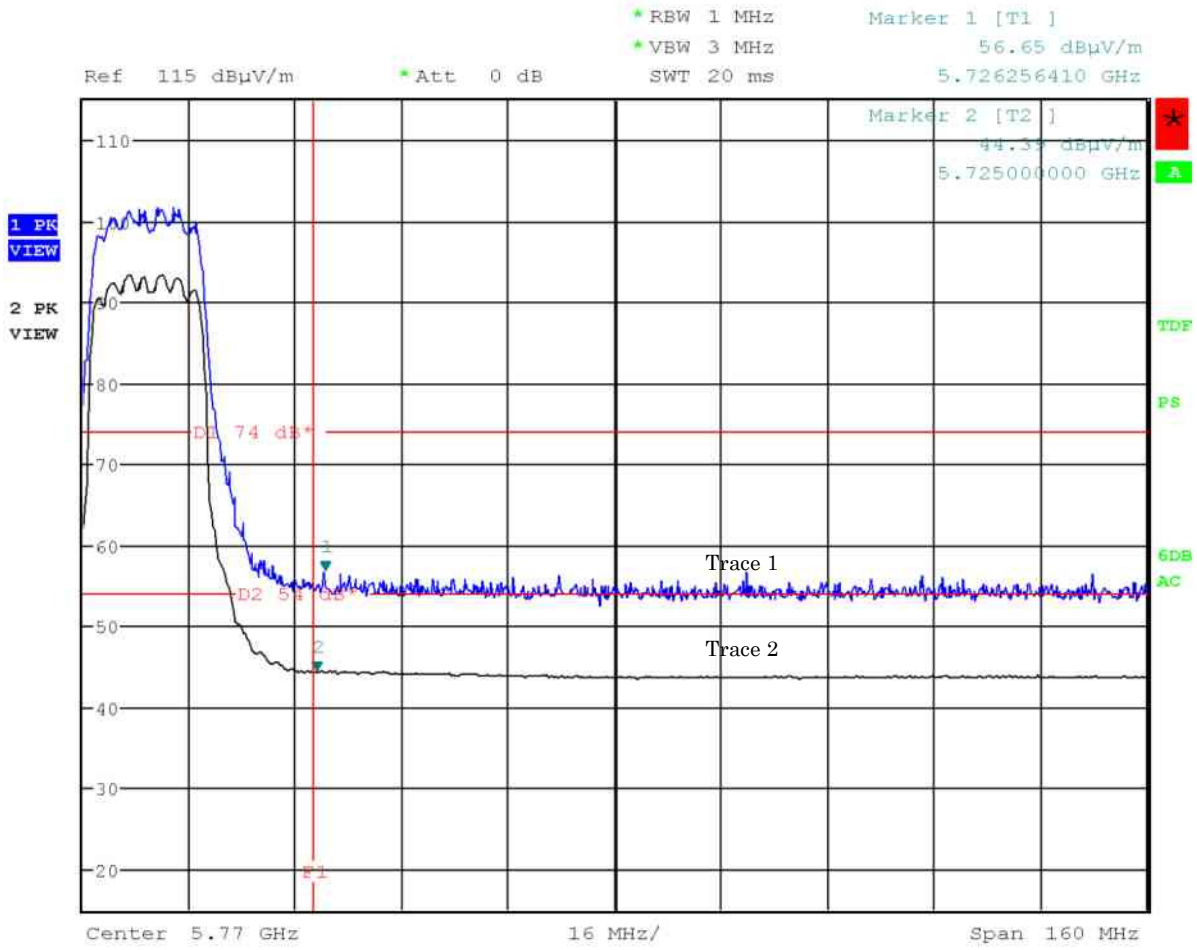
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11a, 100ch: 5500 MHz)
Antenna Polarization : Vertical



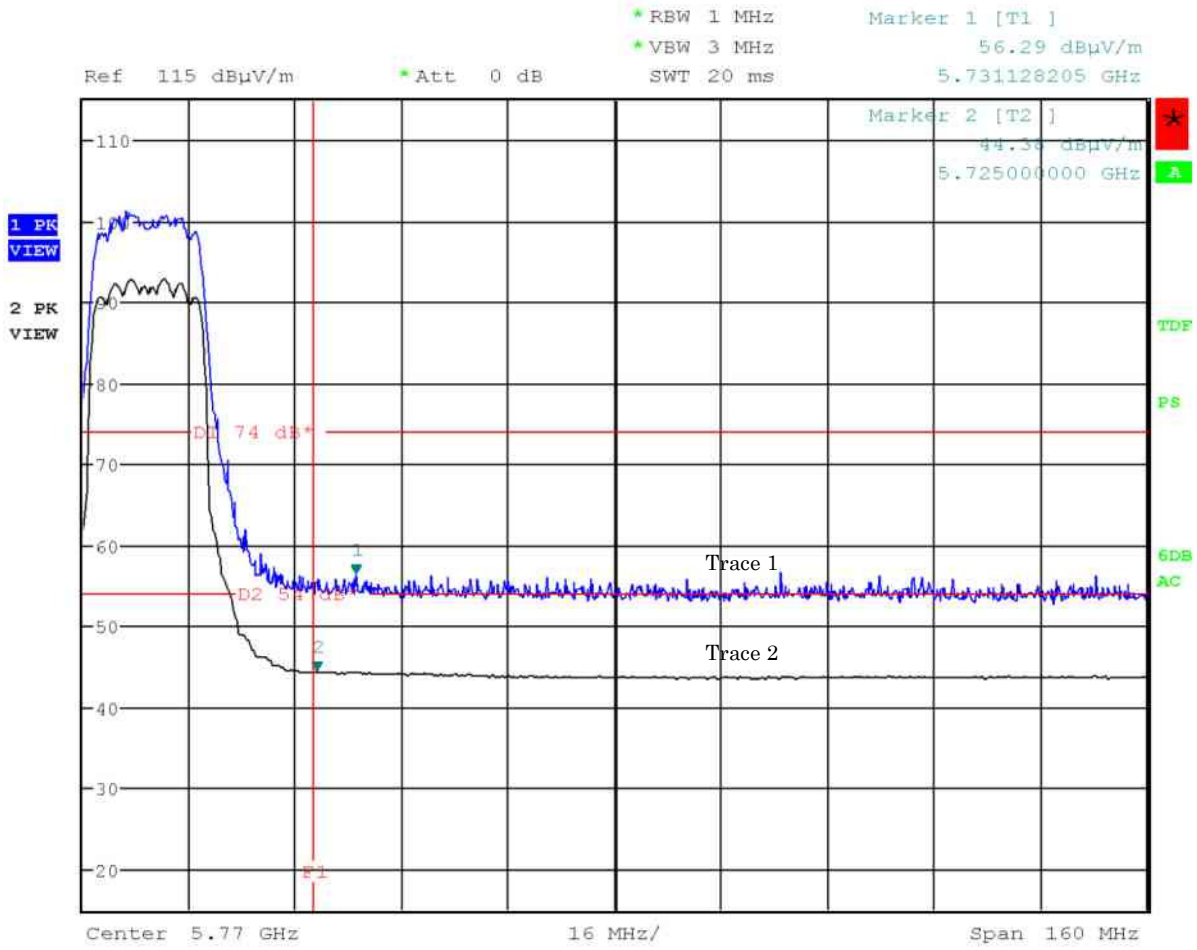
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11a, 140ch: 5700 MHz)
Antenna Polarization : Horizontal



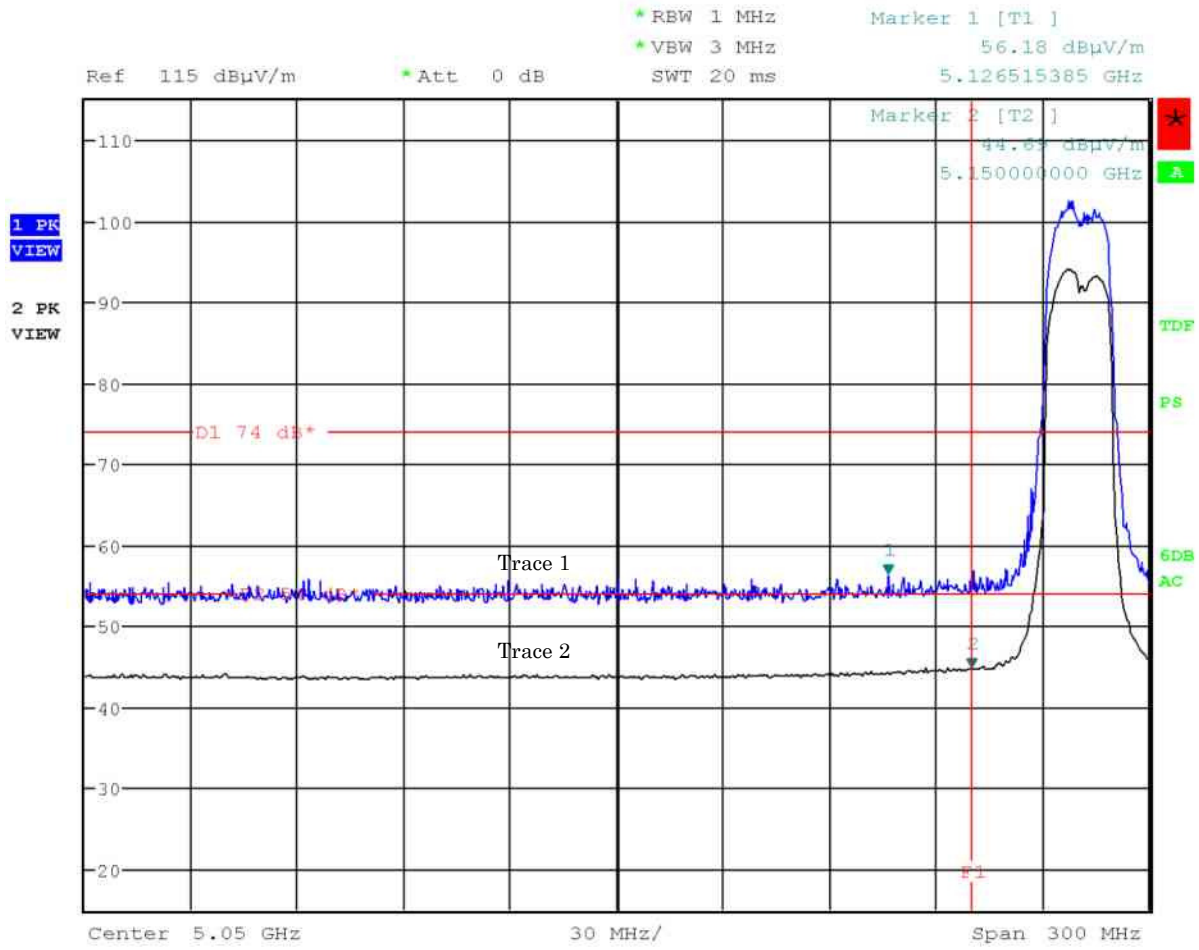
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11a, 140ch: 5700 MHz)
Antenna Polarization : Vertical



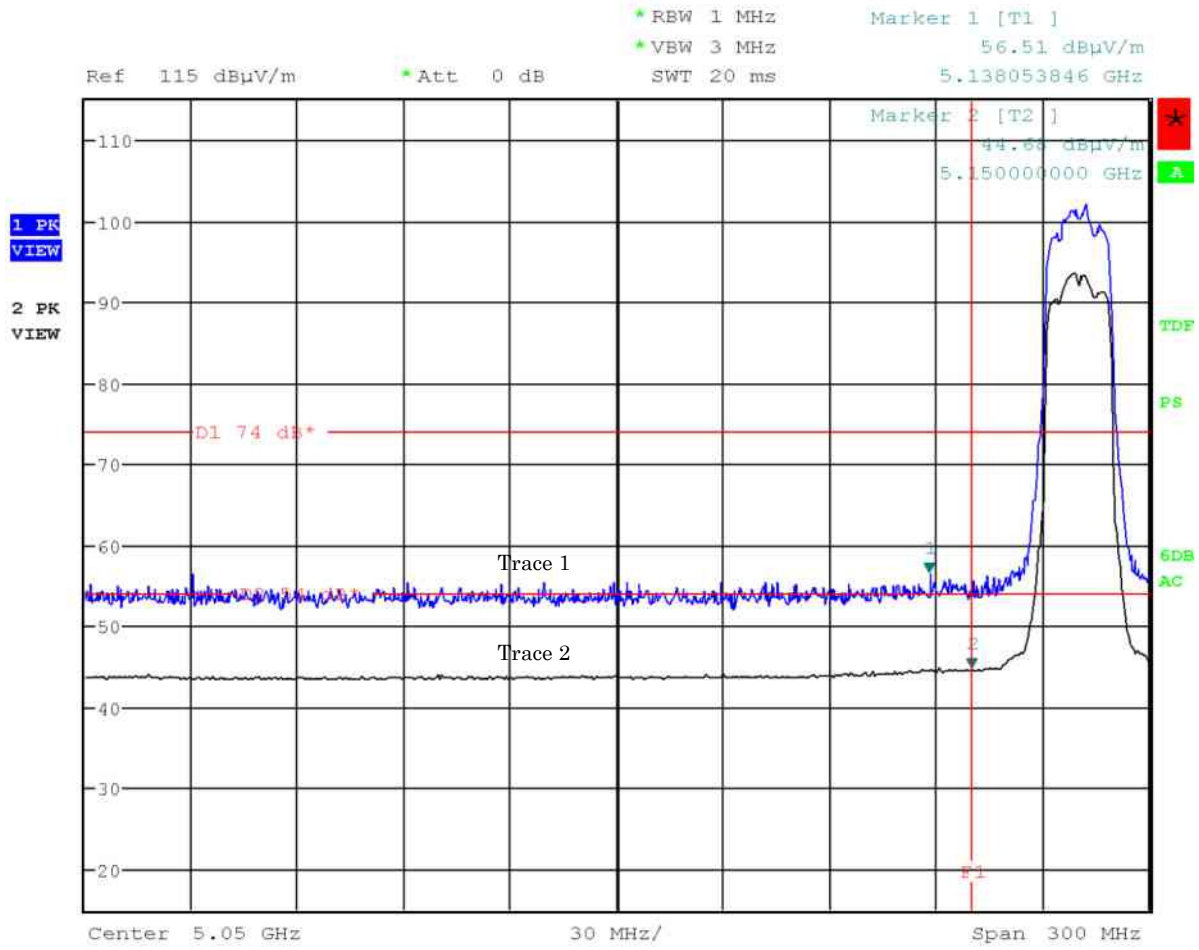
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 36ch: 5180 MHz)
Antenna Polarization : Horizontal



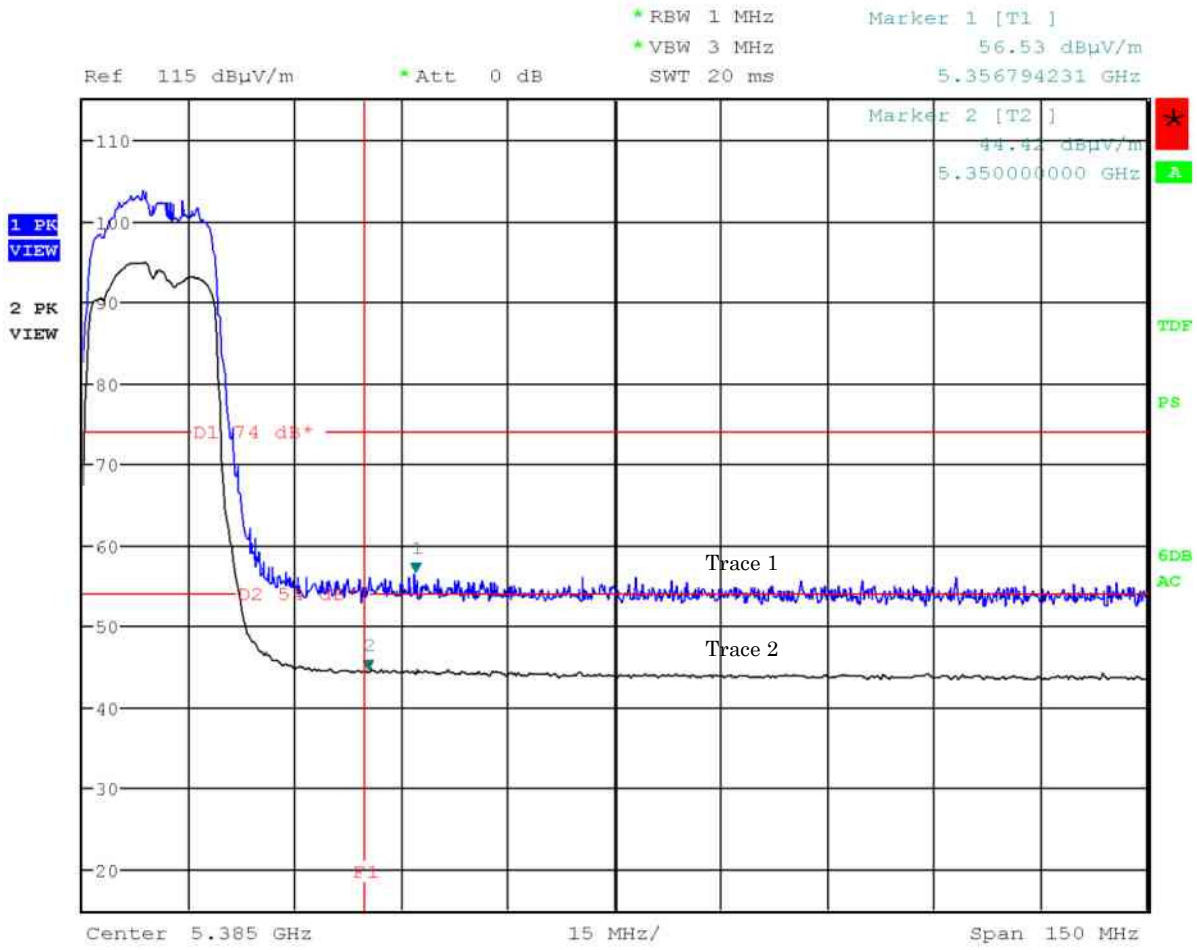
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 36ch: 5180 MHz)
Antenna Polarization : Vertical



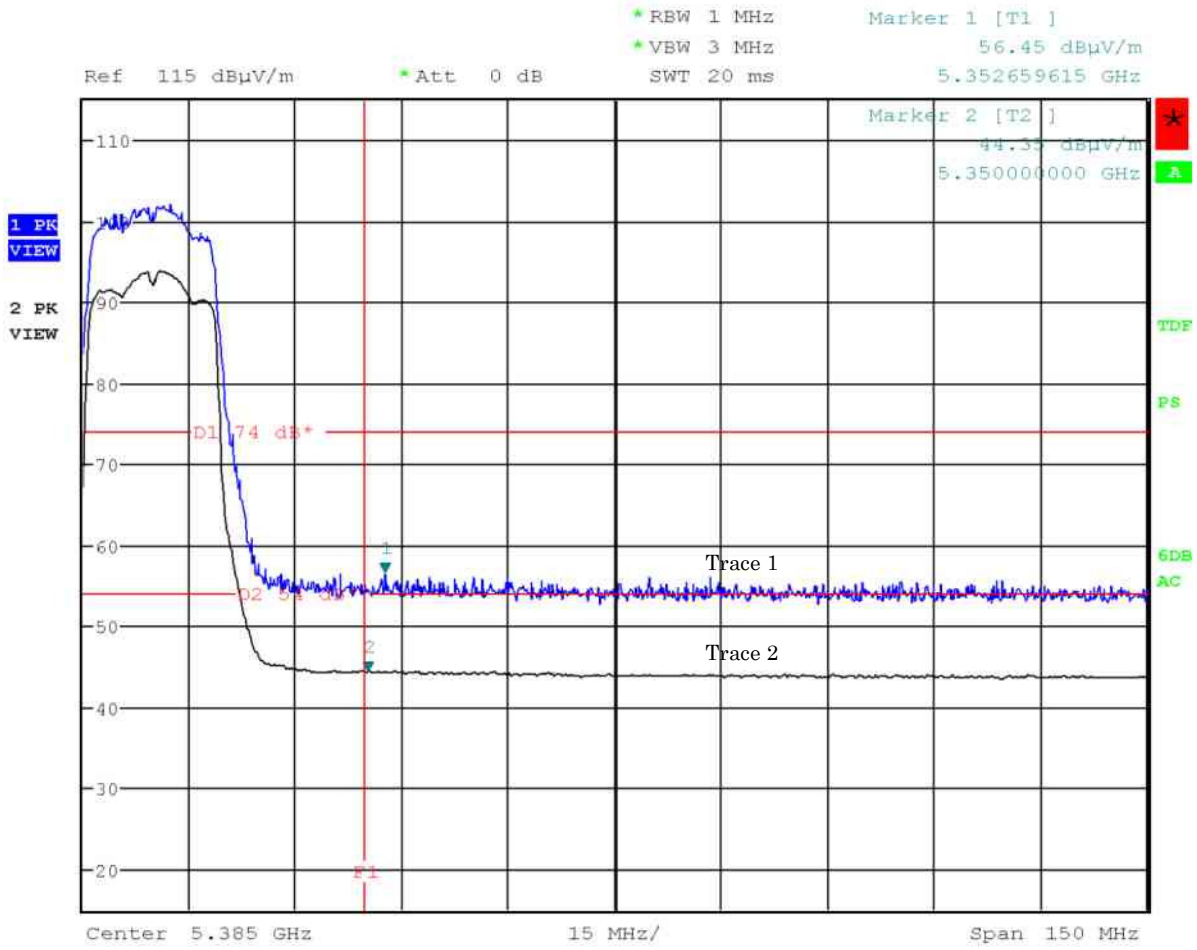
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 64ch: 5320 MHz)
Antenna Polarization : Horizontal



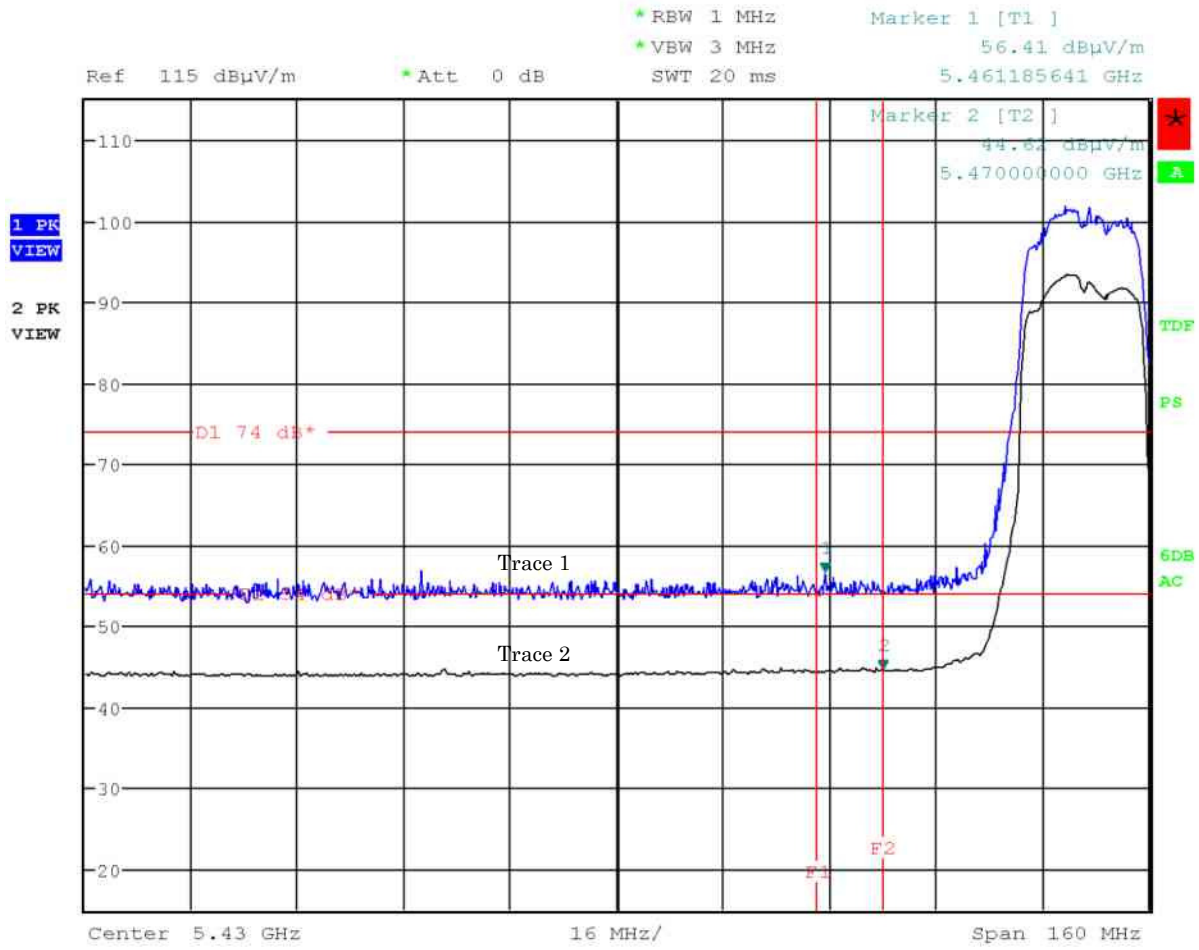
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 64ch: 5320 MHz)
Antenna Polarization : Vertical



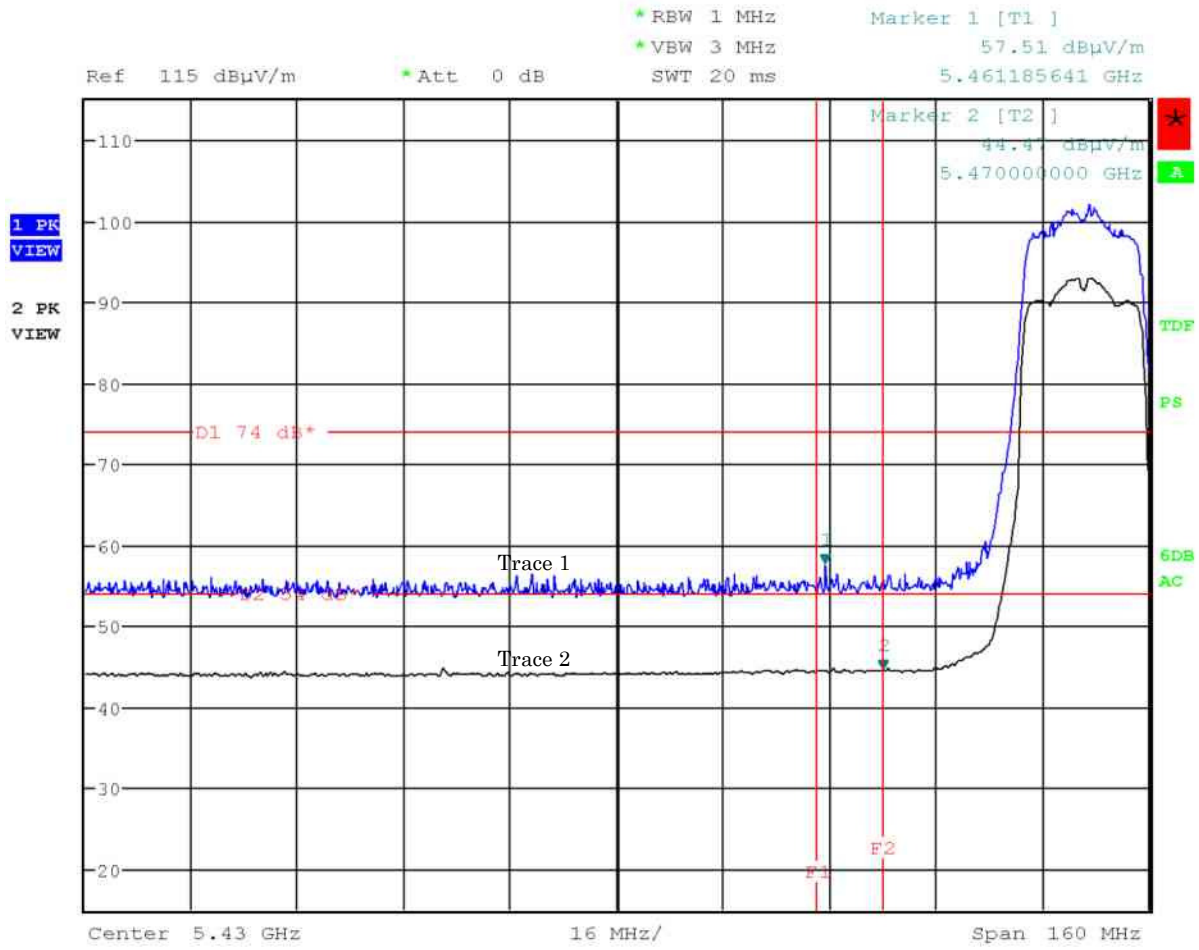
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 100ch: 5500 MHz)
Antenna Polarization : Horizontal



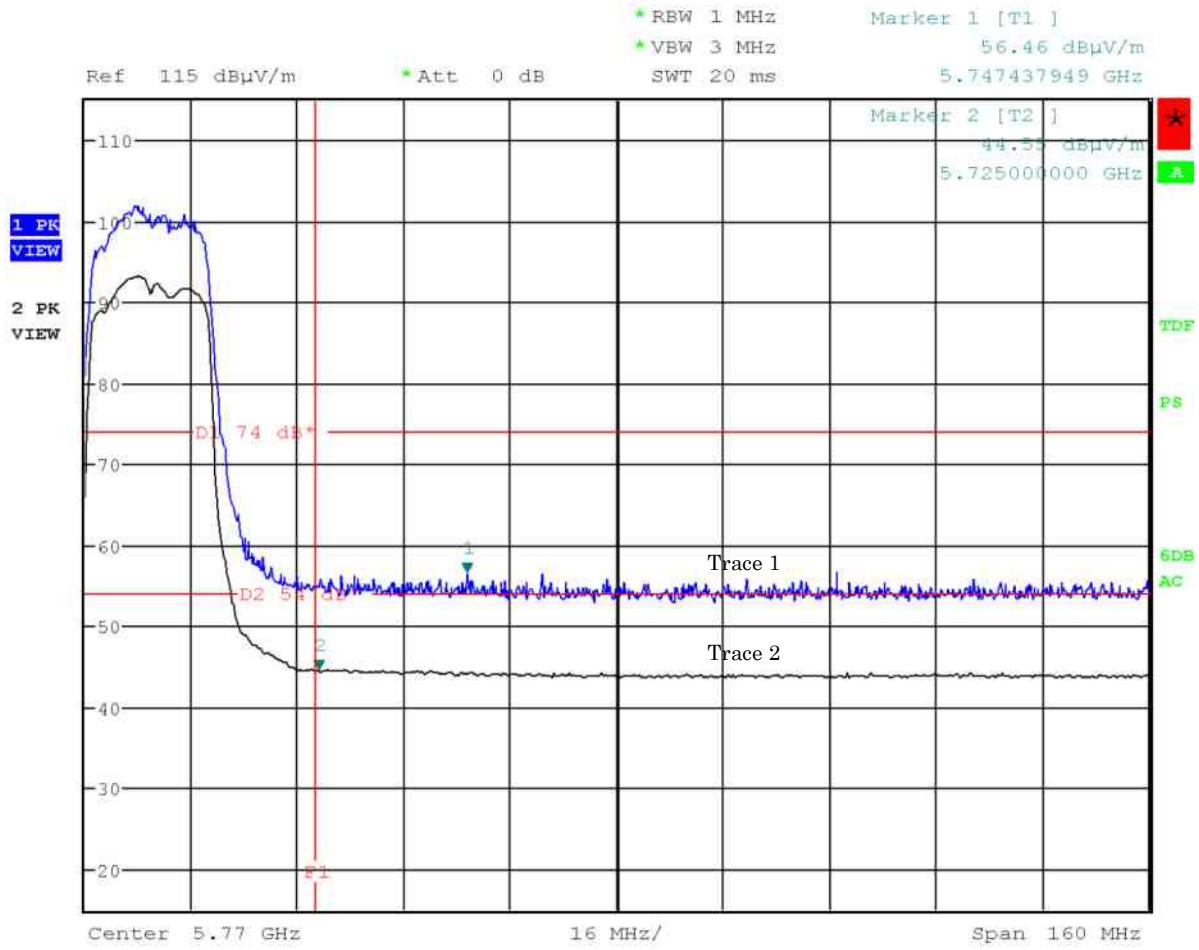
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 100ch: 5500 MHz)
Antenna Polarization : Vertical



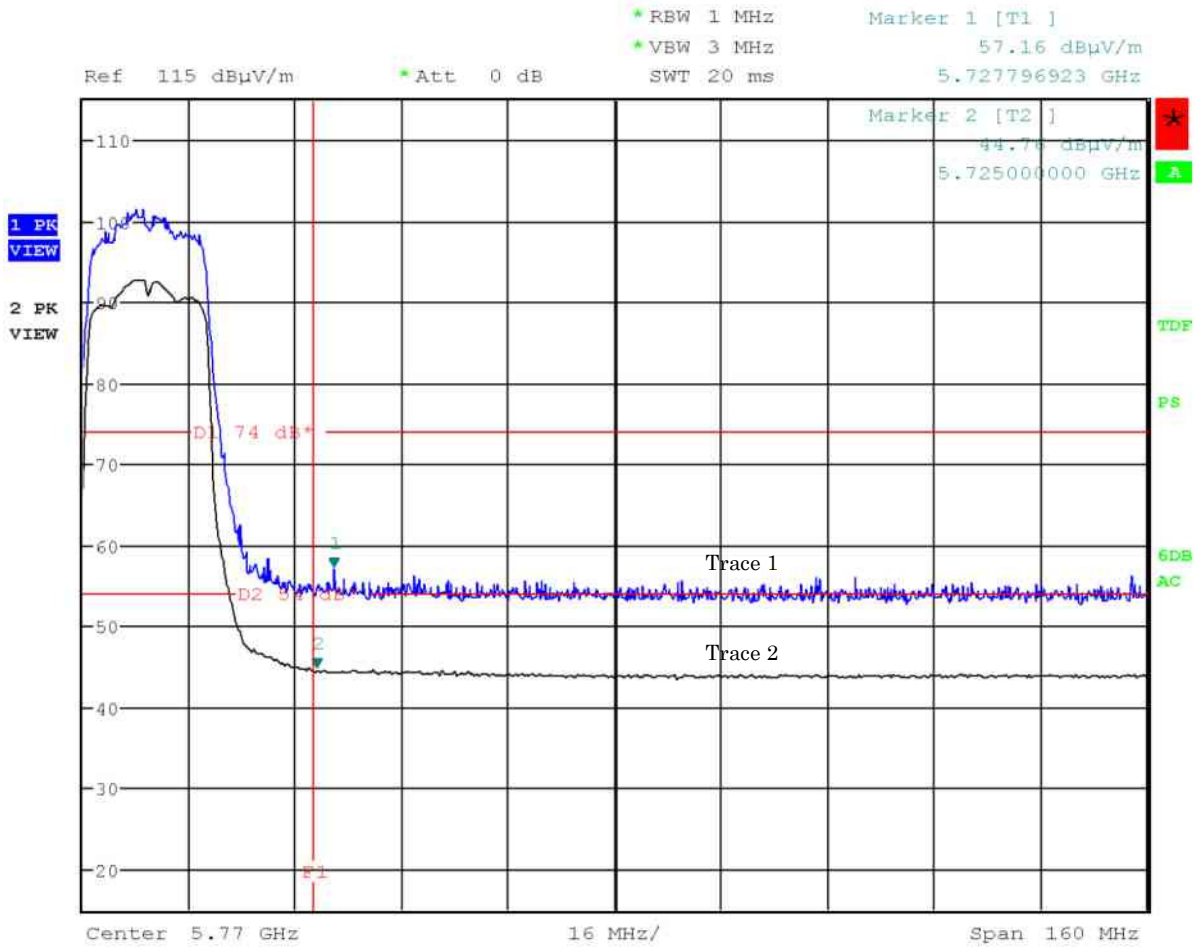
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 140ch: 5700 MHz)
Antenna Polarization : Horizontal



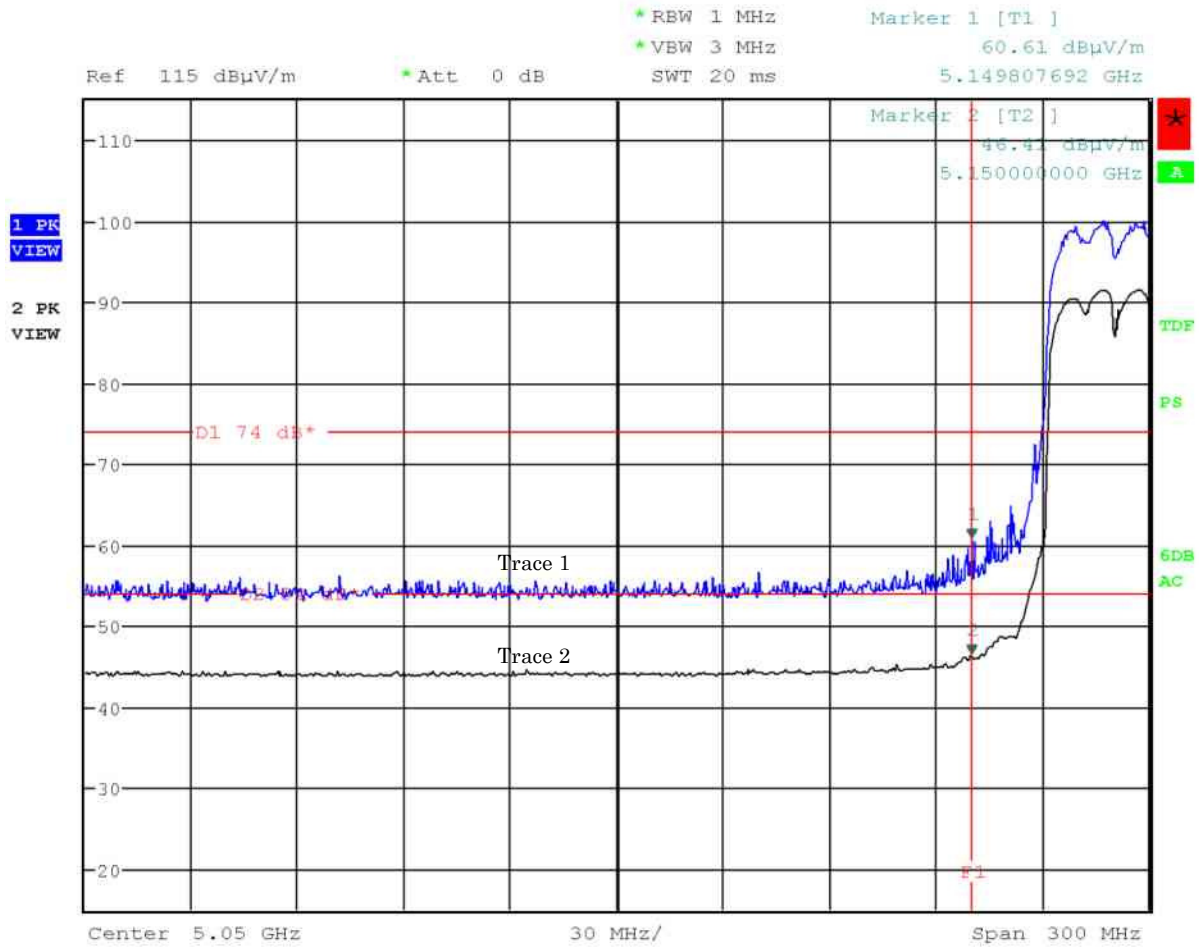
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 20 MHz BW, 140ch: 5700 MHz)
Antenna Polarization : Vertical



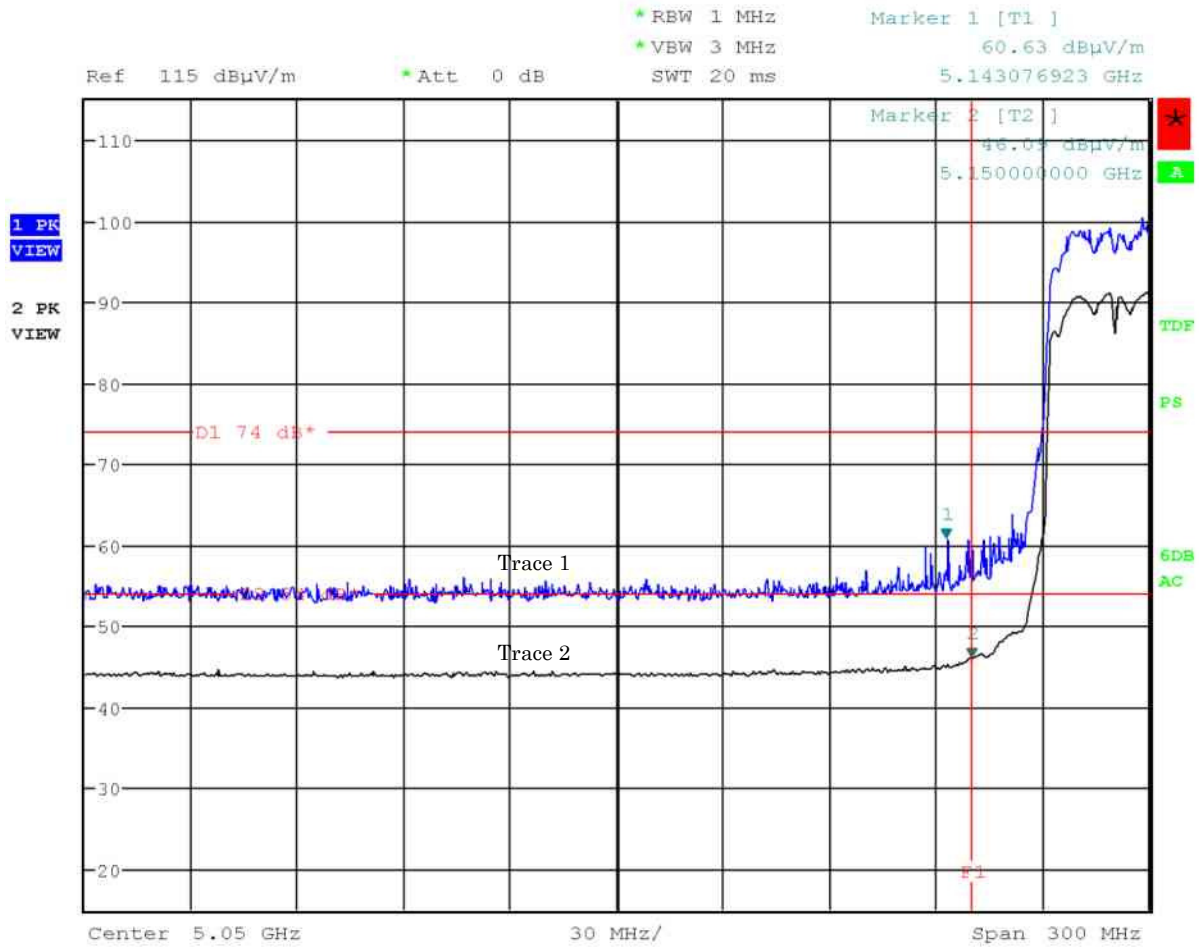
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 38ch: 5190 MHz)
Antenna Polarization : Horizontal



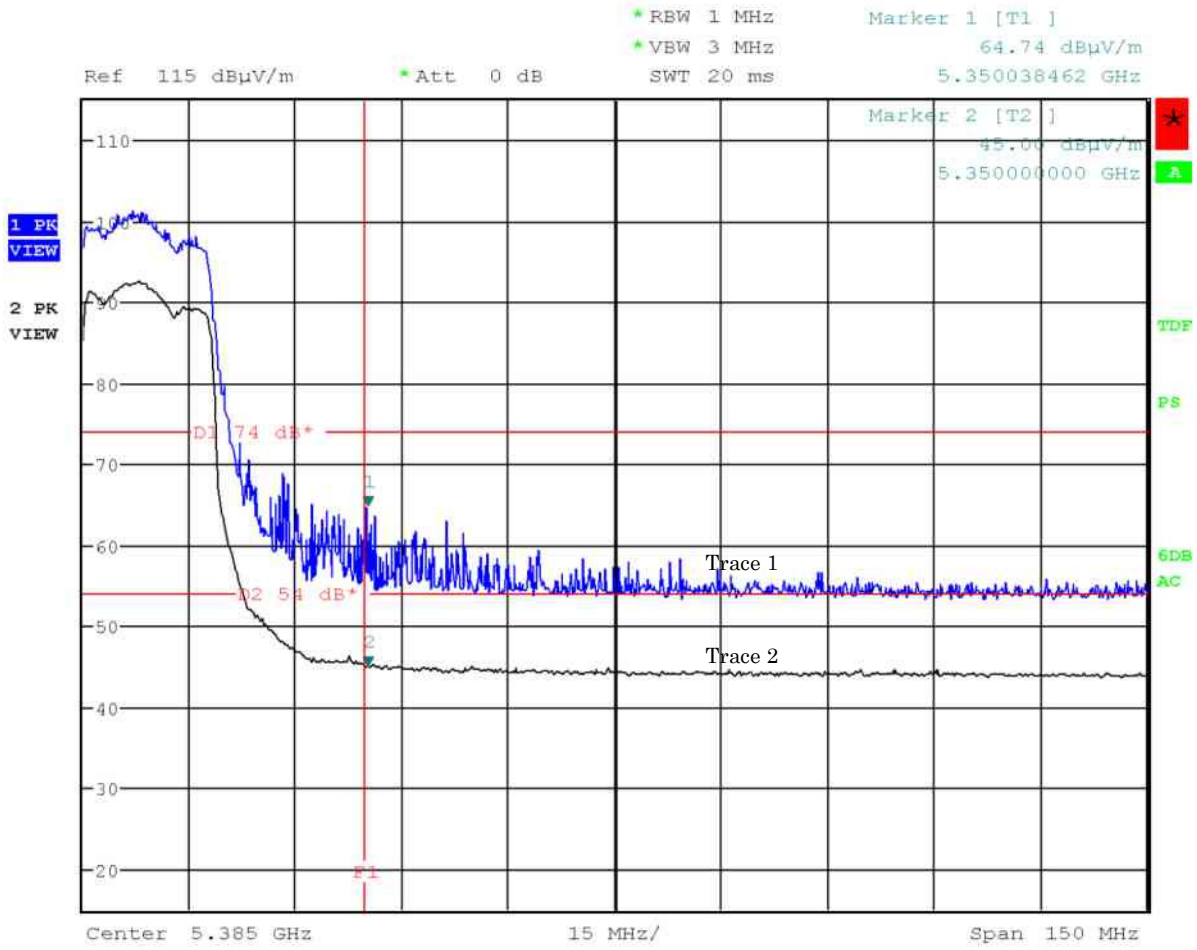
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 38ch: 5190 MHz)
Antenna Polarization : Vertical



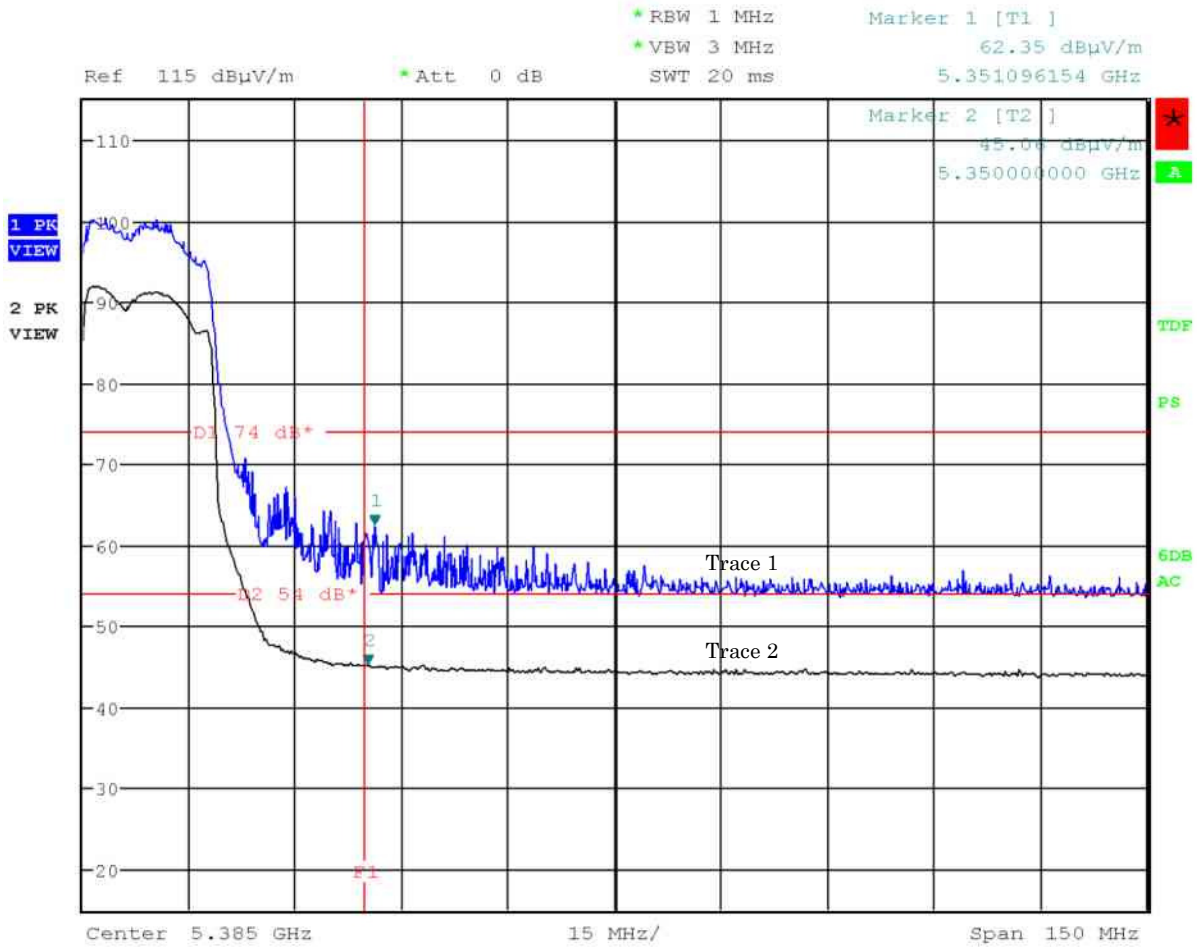
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 62ch: 5310 MHz)
Antenna Polarization : Horizontal



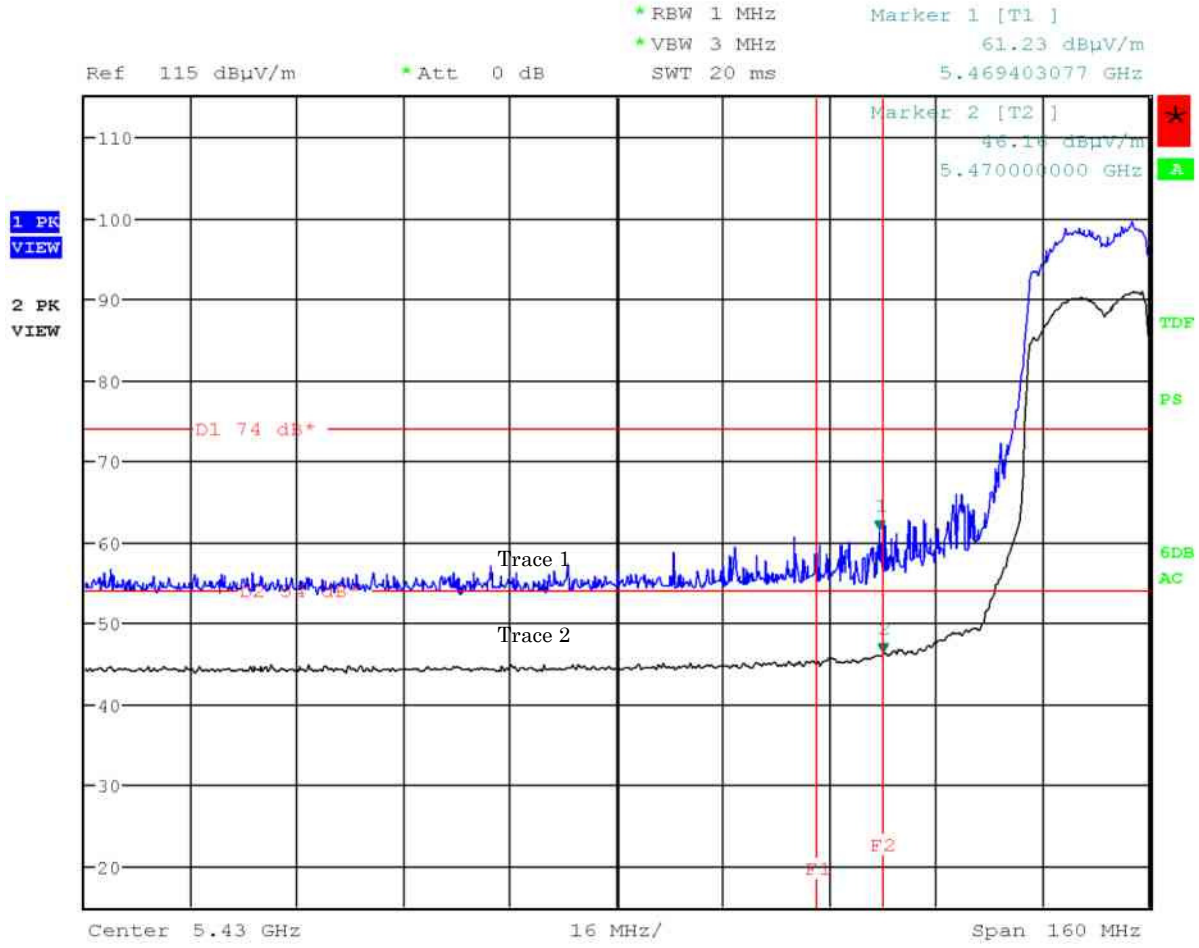
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 62ch: 5310 MHz)
Antenna Polarization : Vertical



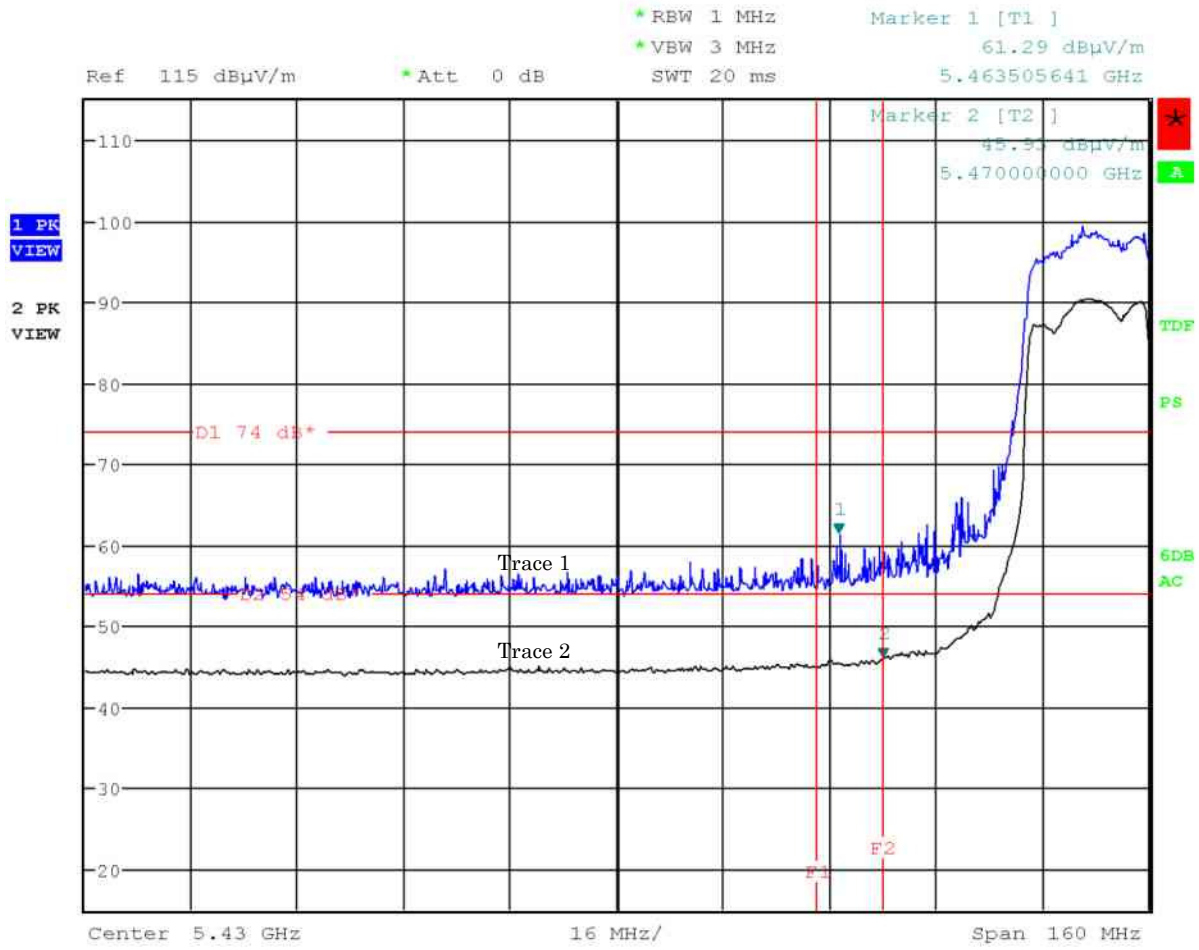
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 102ch: 5510 MHz)
Antenna Polarization : Horizontal



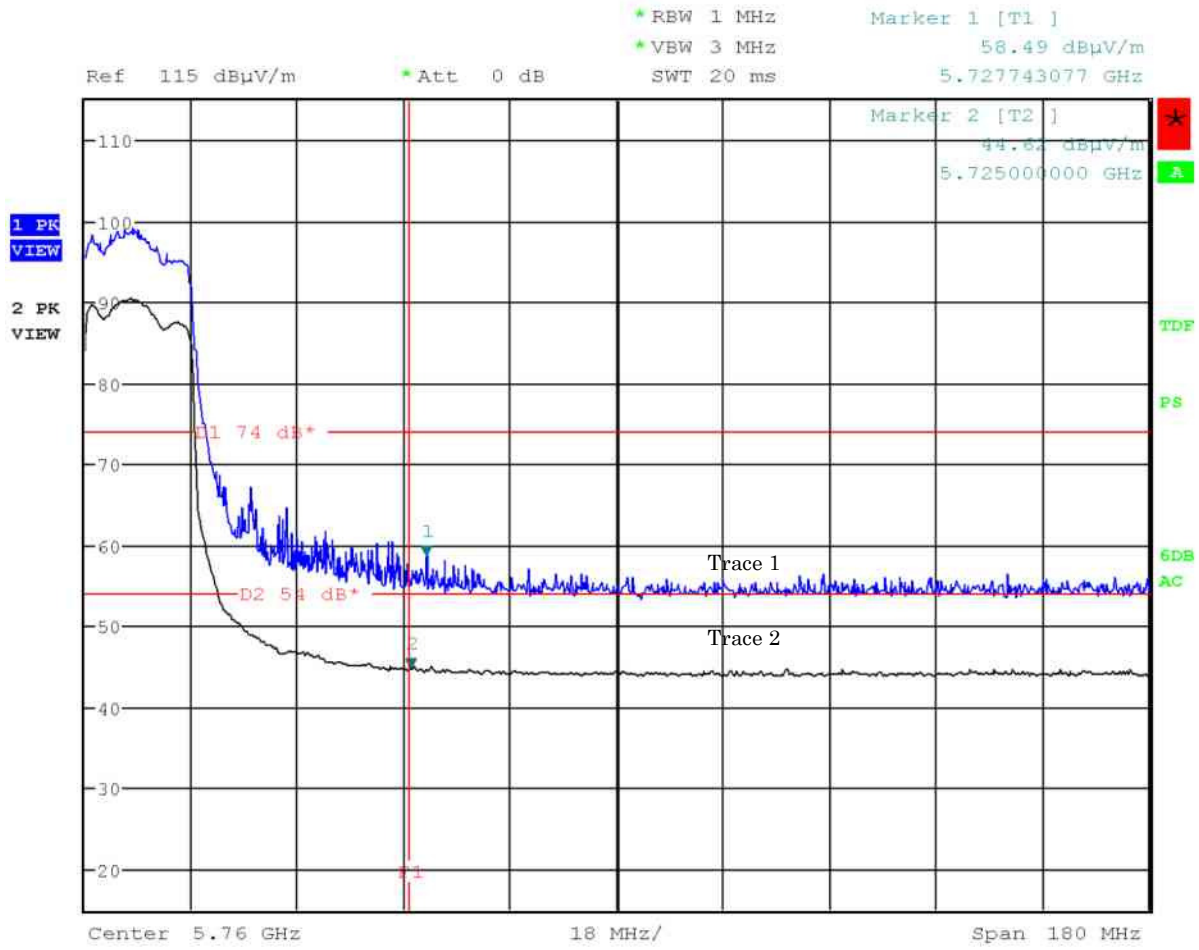
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 102ch: 5510 MHz)
Antenna Polarization : Vertical



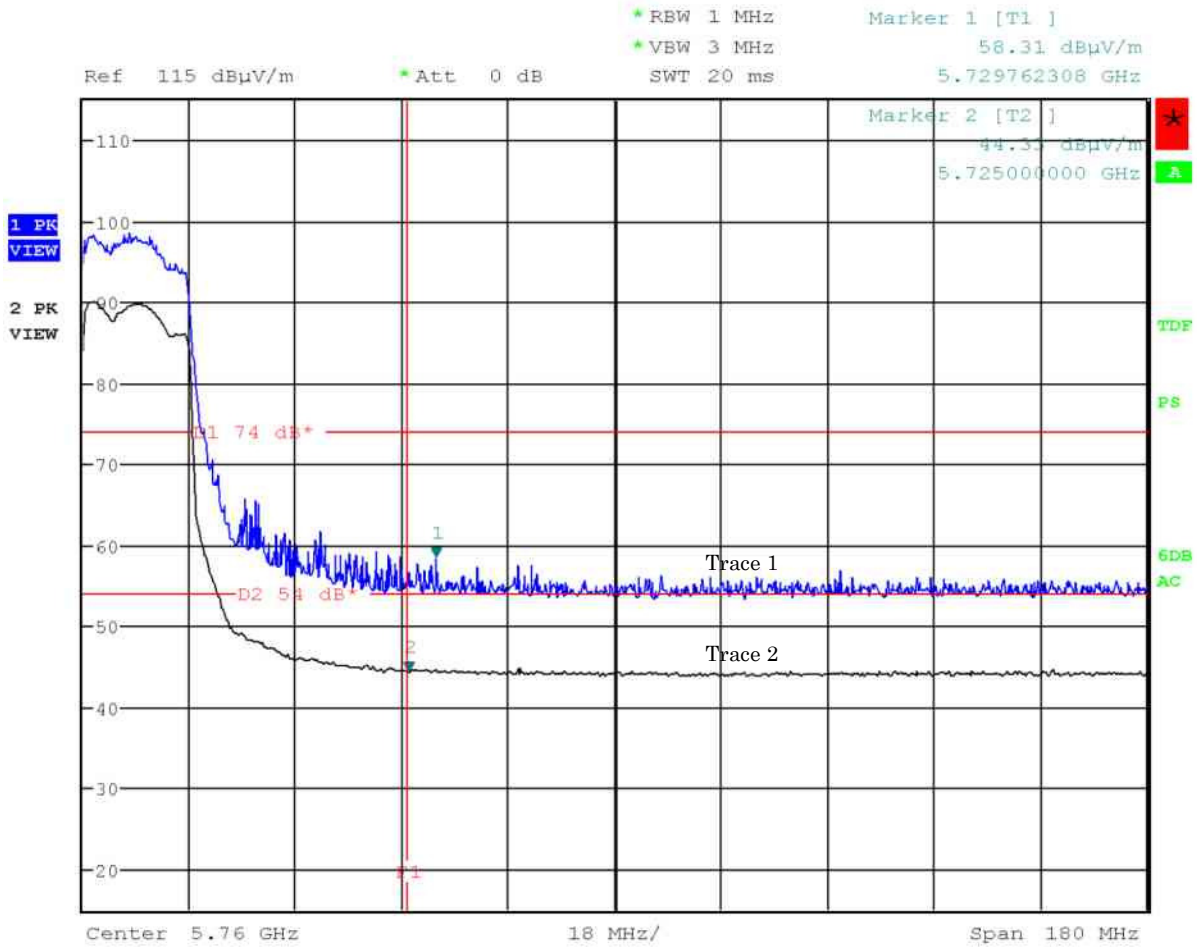
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 134ch: 5670 MHz)
Antenna Polarization : Horizontal



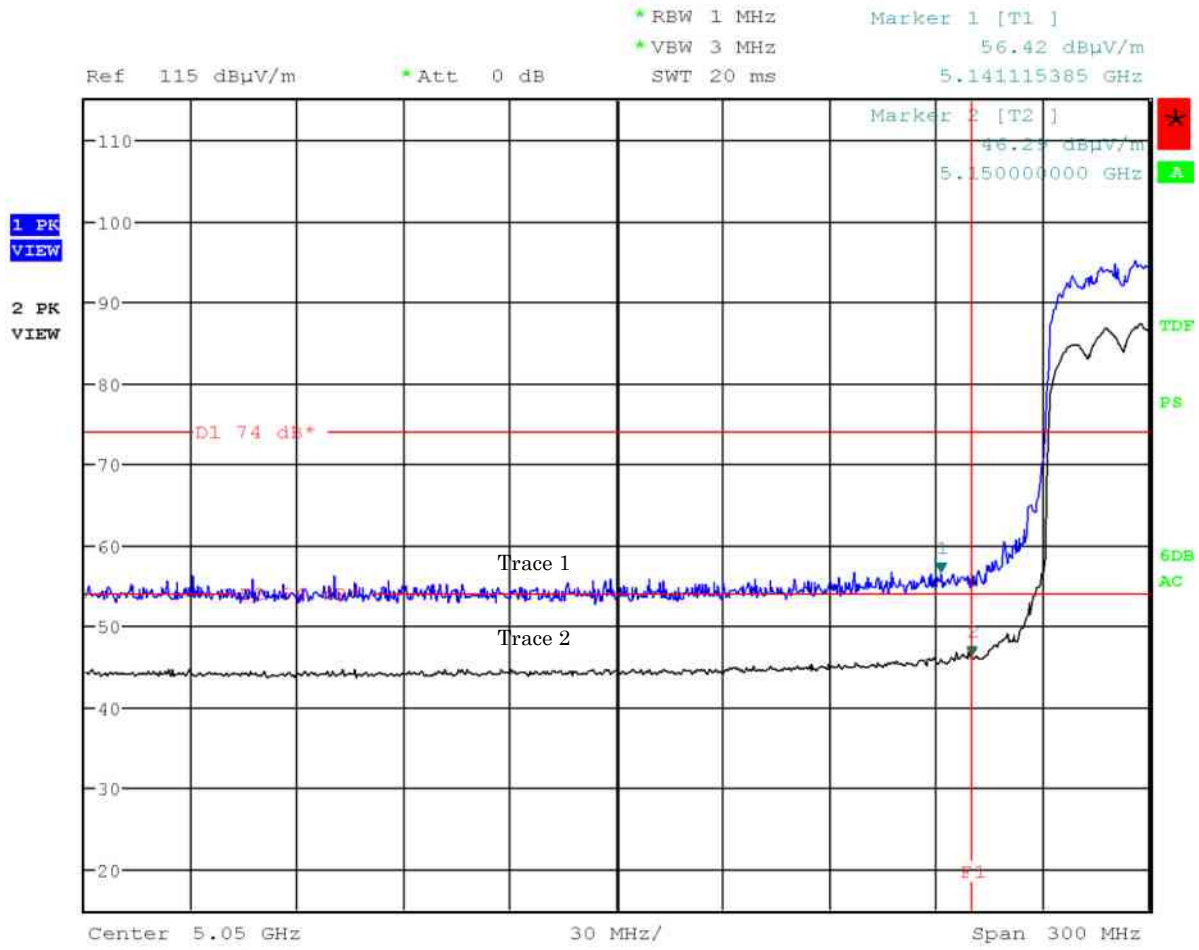
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11n: 40 MHz BW, 134ch: 5670 MHz)
Antenna Polarization : Vertical



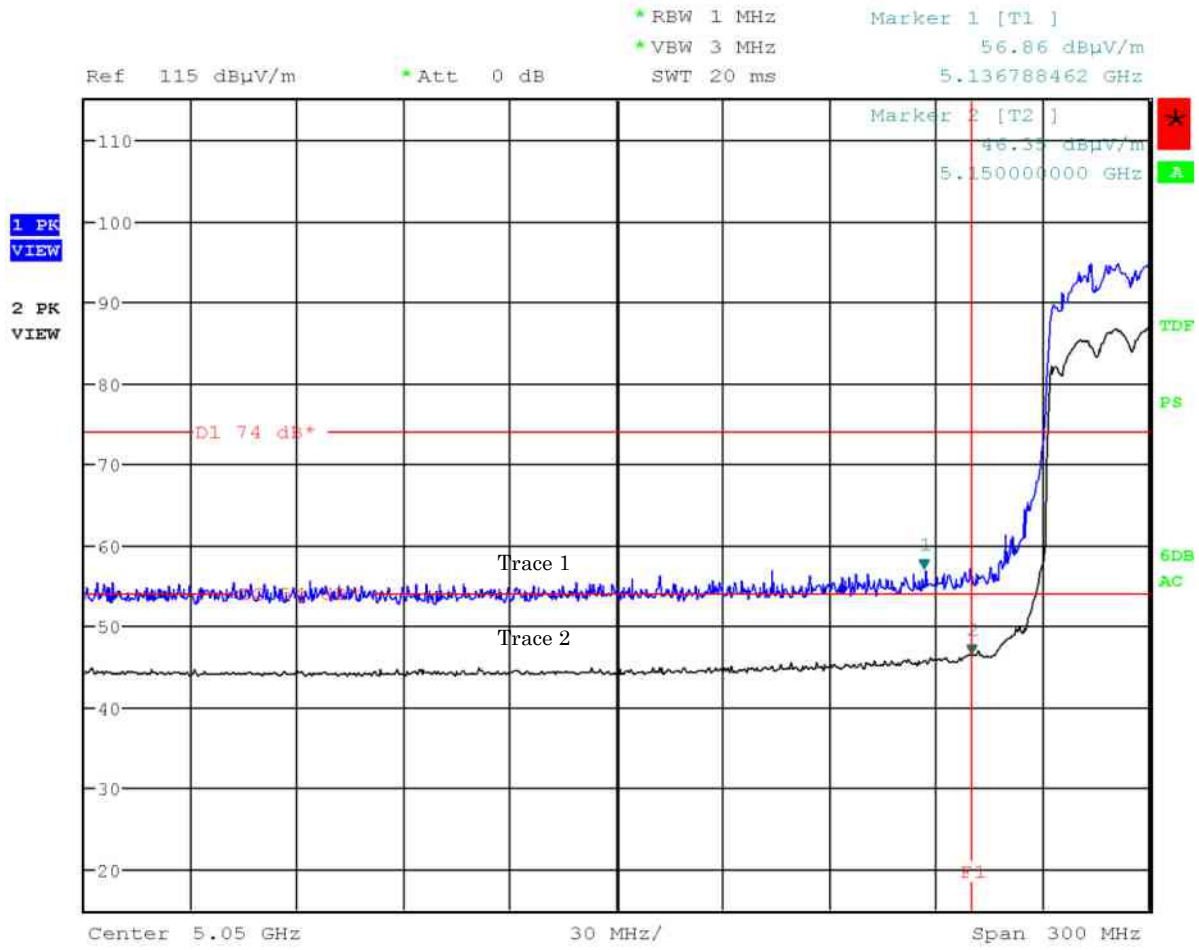
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11ac: 80 MHz BW, 42ch: 5210 MHz)
Antenna Polarization : Horizontal



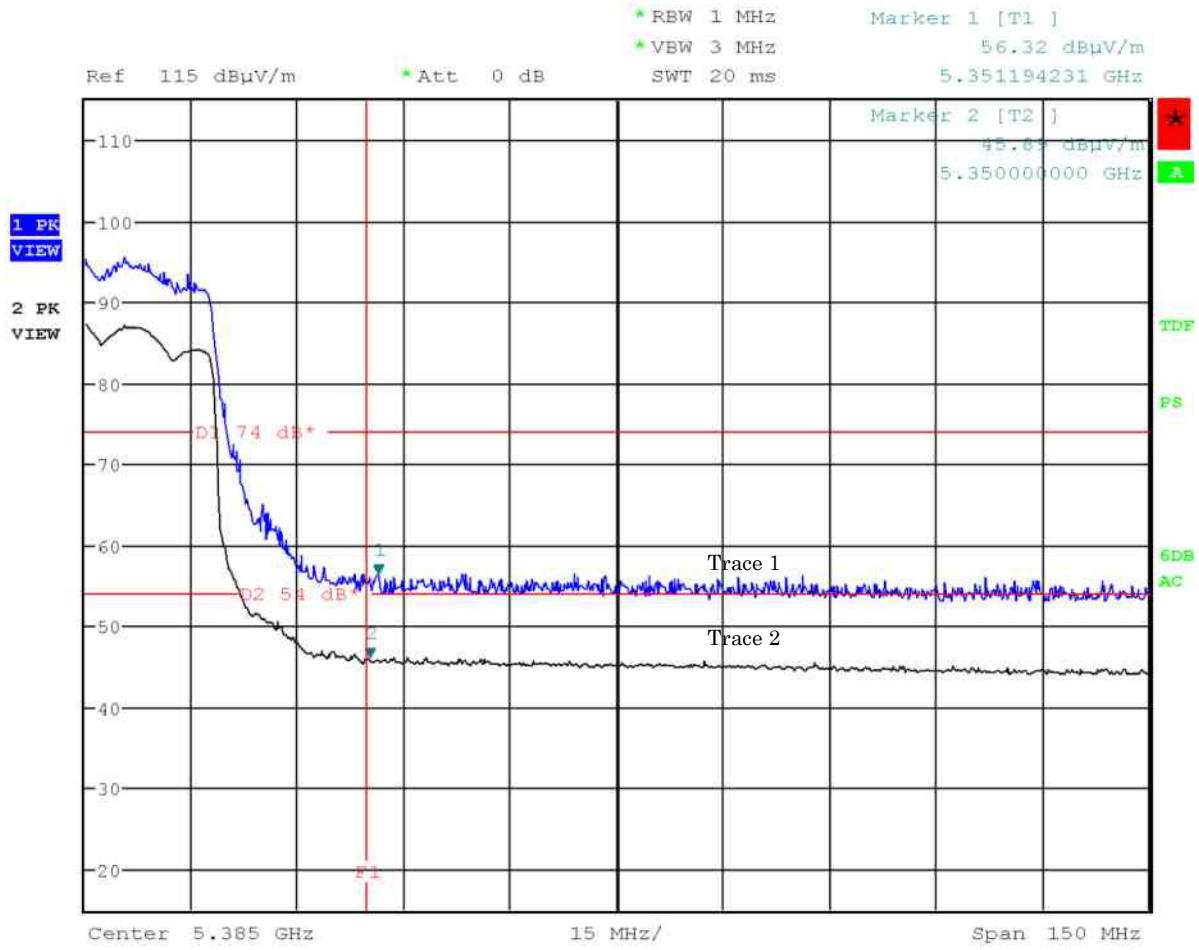
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11ac: 80 MHz BW, 42ch: 5210 MHz)
Antenna Polarization : Vertical



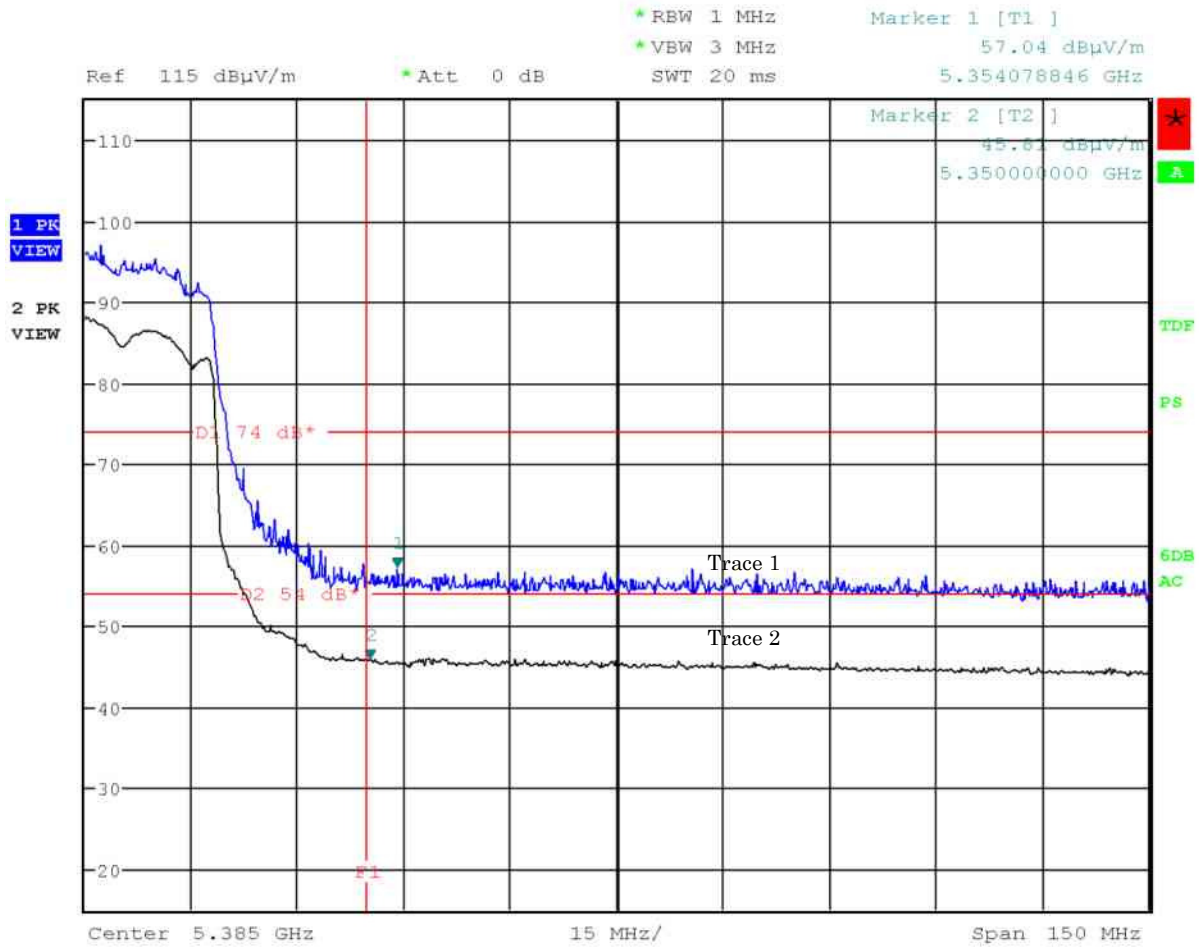
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11ac: 80 MHz BW, 58ch: 5290 MHz)
Antenna Polarization : Horizontal



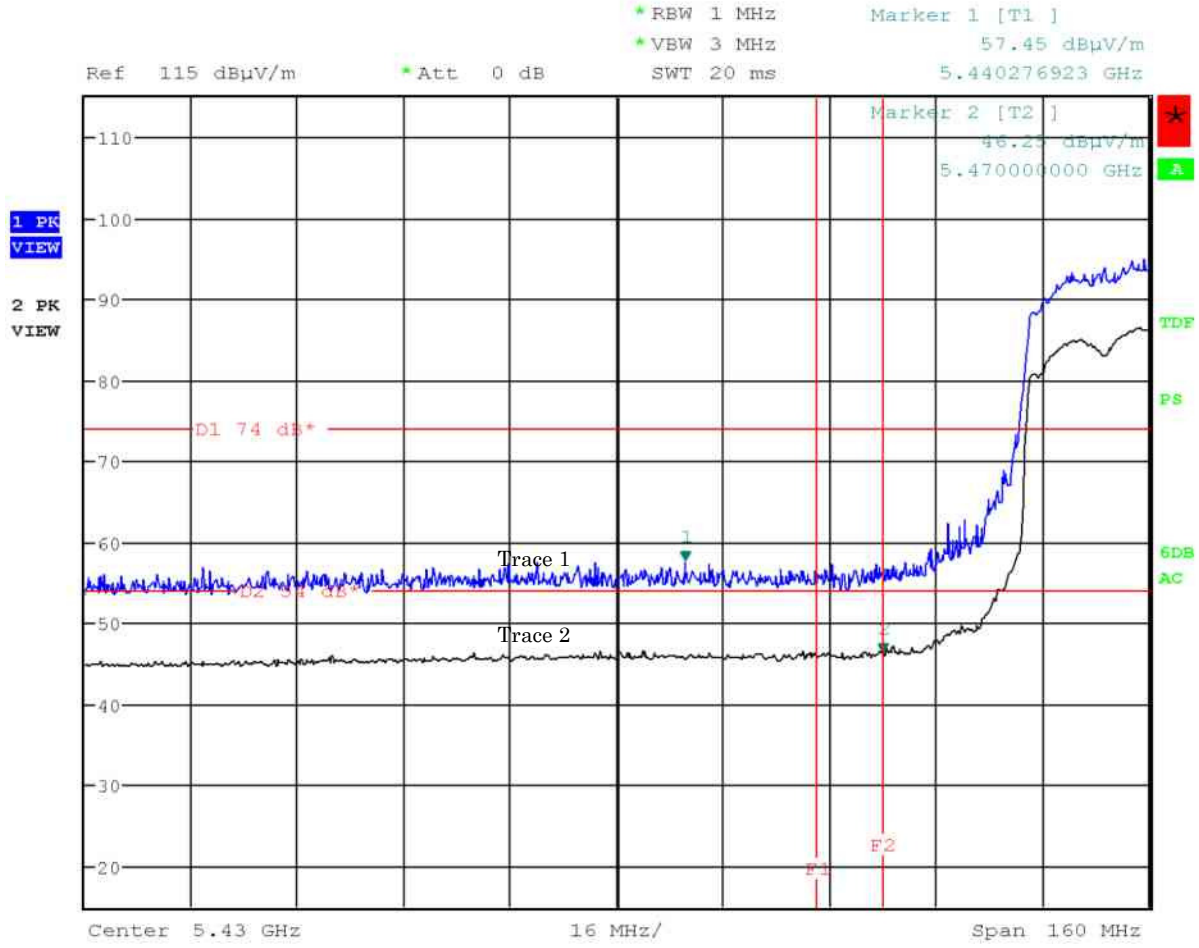
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11ac: 80 MHz BW, 58ch: 5290 MHz)
Antenna Polarization : Vertical



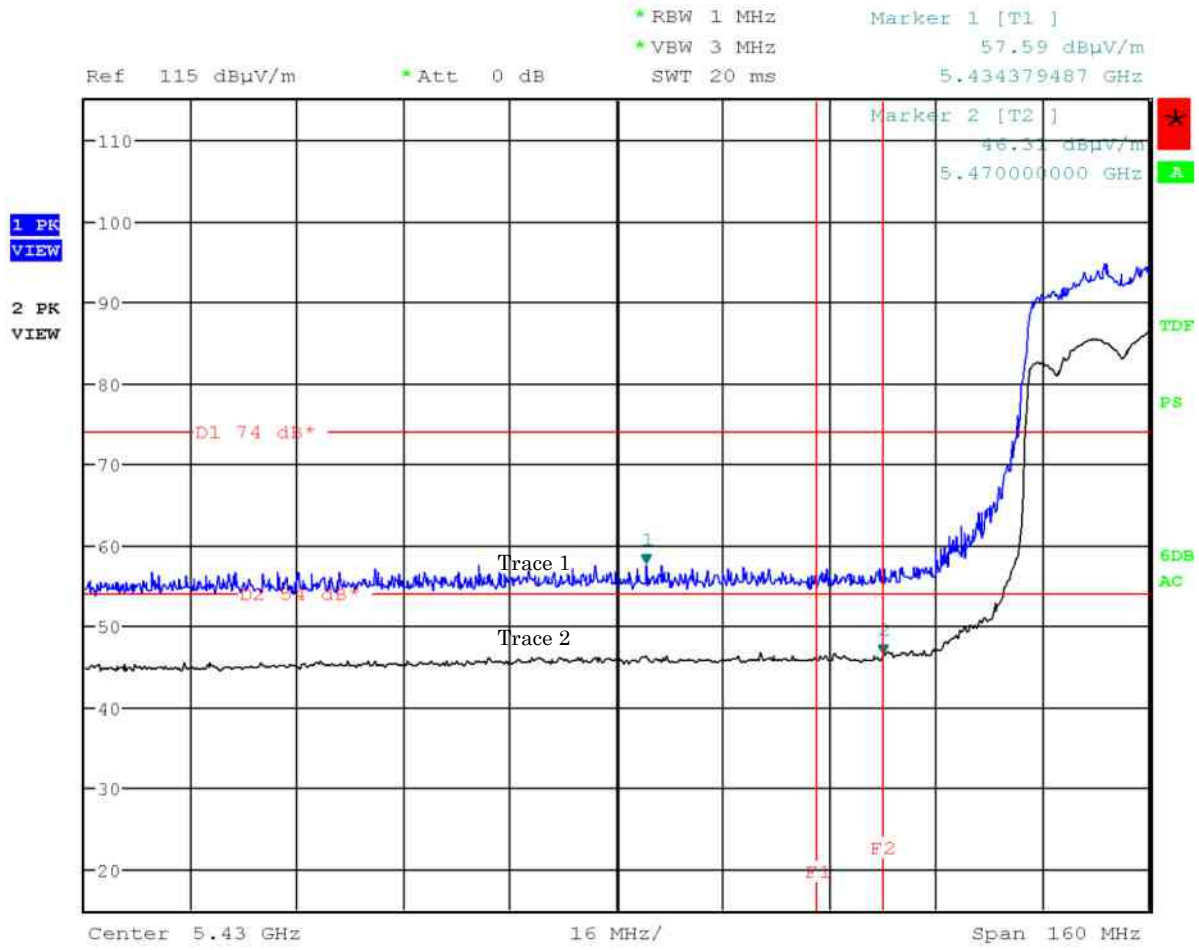
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11ac: 80 MHz BW, 106ch: 5530 MHz)
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : TX mode (802.11ac: 80 MHz BW, 106ch: 5530 MHz)
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

7.6.4.2 Unwanted Radiated Emission 9 kHz – 30 MHz

Test Date :March 19, 2016
Temp.:20°C, Humi:55%

Mode of EUT : All mode have been investigated in accordance with clause 6.3 in this report.
Results : No spurious emissions in the range 20dB below the limit.

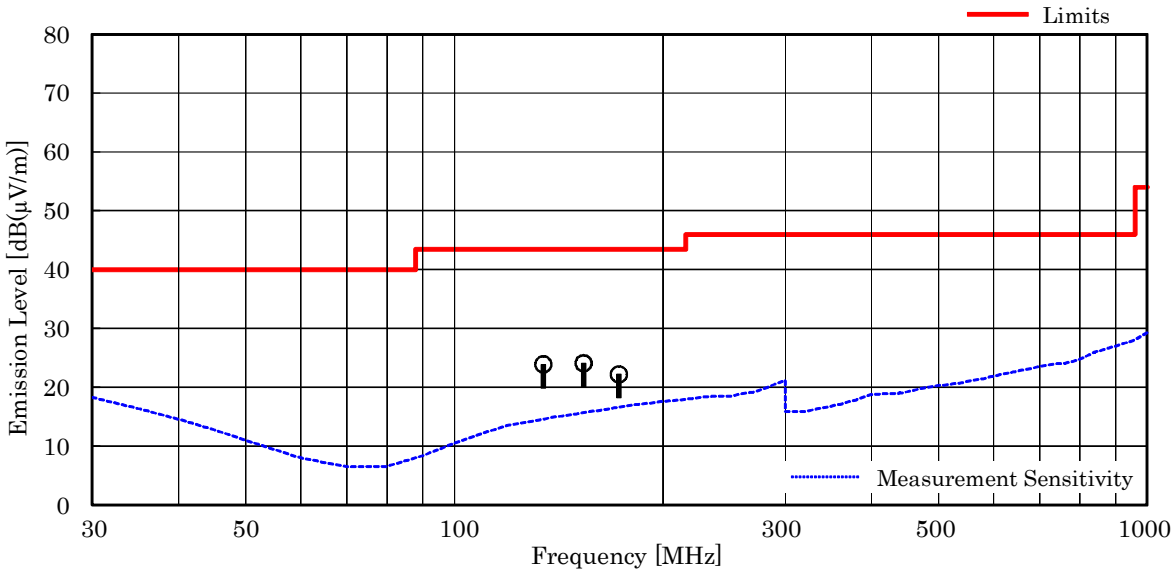
7.6.4.3 Unwanted Radiated Emission 30 MHz – 1000 MHz

Mode of EUT : All modes have been investigated and the worst case mode for channel (36ch: 5180MHz / IEEE802.11a) has been listed.

Test Date: March 19, 2016
Temp.: 20 °C, Humi: 55 %

Antenna pole : Horizontal

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
134.40	14.0	-26.3	36.2	43.5	23.9	+19.6	-
153.60	14.8	-26.2	35.5	43.5	24.1	+19.4	-
172.80	15.6	-26.0	32.6	43.5	22.2	+21.3	-

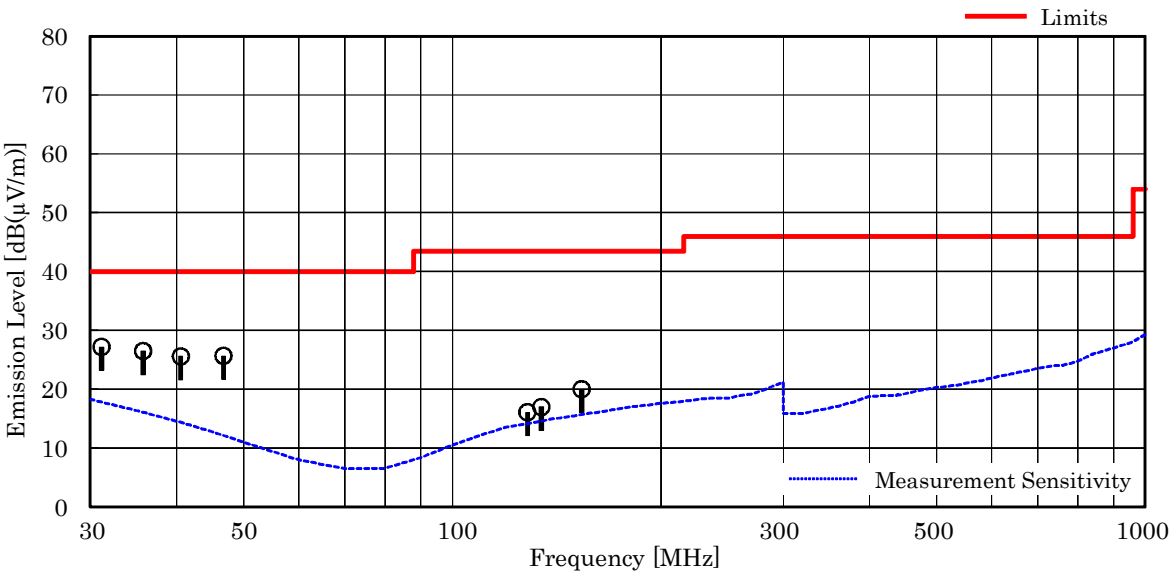


NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 153.60 MHz, as the worst point shown on underline:
   Antenna Factor + Coorection Factor + Meter Reading = 14.8 + (-26.2) + 35.5 = 24.1 dB(μV/m)
   Antenna Height : 208 cm, Turntable Angle : 75 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

Test Date: March 19, 2016
Temp.: 20 °C, Humi: 55 %

Antenna pole : Vertical

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
31.15	18.3	-27.5	36.4	40.0	27.2	+12.8	-
35.77	16.5	-27.4	37.4	40.0	26.5	+13.5	-
40.55	14.8	-27.3	38.1	40.0	25.6	+14.4	-
46.74	12.4	-27.2	40.5	40.0	25.7	+14.3	-
128.34	13.6	-26.4	28.9	43.5	16.1	+27.4	-
134.40	14.0	-26.3	29.3	43.5	17.0	+26.5	-
153.60	14.8	-26.2	31.4	43.5	20.0	+23.5	-



NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 31.15 MHz, as the worst point shown on underline:
   Antenna Factor + Coorection Factor + Meter Reading = 18.3 + (-27.5) + 36.4 = 27.2 dB(μV/m)
   Antenna Height : 100 cm, Turntable Angle : 359 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

7.6.4.4 Unwanted Radiated Emission(Above 1 GHz)

Mode of EUT : TX mode (802.11a, 5150 - 5250 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 36 Ch												
6906.7	29.9	-15.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.2	< 42.2	> +16.0	
10360.0	33.4	-24.9	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.5	< 36.5	> +21.7	
15540.0	37.2	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.4	< 39.4	> +14.6	
20720.0	40.2	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
25900.0	40.8	-41.8	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.0	< 39.0	> +19.2	
31080.0	43.9	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 39.3	< 29.3	> +28.9	
36260.0	44.2	-48.4	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 45.8	< 35.8	> +22.4	
Test condition : Tx 44 Ch												
6960.0	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10440.0	33.4	-24.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.6	< 36.6	> +21.6	
15660.0	37.2	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.4	< 39.4	> +14.6	
20880.0	40.3	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.2	< 37.2	> +16.8	
26100.0	40.7	-41.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.0	< 39.0	> +19.2	
31320.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
36540.0	44.4	-48.0	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.4	< 36.4	> +21.8	
Test condition : Tx 48 Ch												
6986.5	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10480.0	33.4	-24.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.7	< 36.7	> +21.5	
15720.0	37.3	-25.7	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.6	< 39.6	> +14.4	
20960.0	40.3	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.2	< 37.2	> +16.8	
26200.0	40.7	-41.6	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.1	< 39.1	> +19.1	
31440.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
36680.0	44.5	-48.1	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.4	< 36.4	> +21.8	

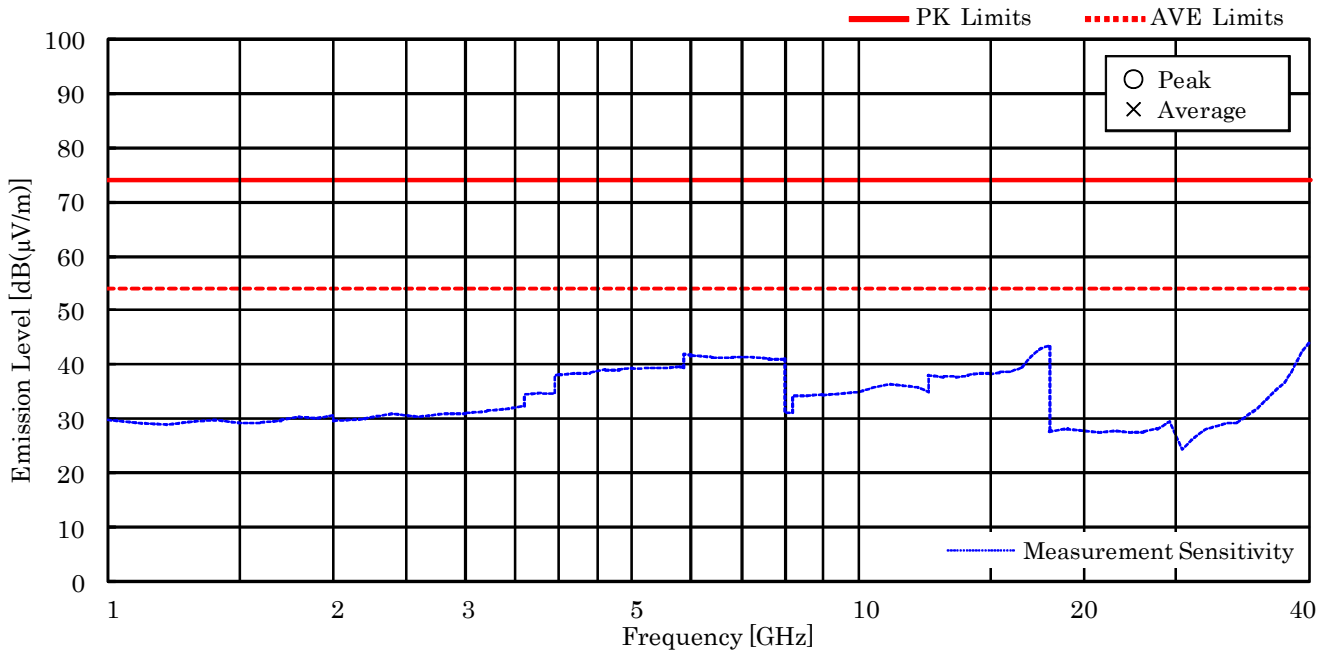
Calculated result at 15720.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	37.3 dB(1/m)
	Corr. Factor	=	-25.7 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<39.6 dB(μV/m)

Minimum Margin: 54.0 - <39.6 = >14.4 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11a, 5150 - 5250 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11a, 5250 – 5350 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits [dB(μV/m)] AVE	Results [dB(μV/m)] PK	Results [dB(μV/m)] AVE	Margin [dB]	Remarks
Test condition : Tx 52 Ch												
7013.3	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10520.0	33.4	-24.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.7	< 36.7	> +21.5	
15780.0	37.3	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.7	< 39.7	> +14.3	
21040.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26300.0	40.7	-41.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.2	< 39.2	> +19.0	
31560.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
36820.0	44.5	-47.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.8	< 36.8	> +21.4	
Test condition : Tx 56 Ch												
7040.0	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10560.0	33.4	-24.6	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.8	< 36.8	> +21.4	
15840.0	37.3	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.7	< 39.7	> +14.3	
21120.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26400.0	40.6	-41.4	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.2	< 39.2	> +19.0	
31680.0	43.8	-54.5	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.3	< 29.3	> +24.7	
36960.0	44.4	-47.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.7	< 36.7	> +21.5	
Test condition : Tx 64 Ch												
7093.3	30.0	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.2	< 42.2	> +16.0	
10640.0	33.4	-24.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.8	< 36.8	> +17.2	
15960.0	37.4	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.8	< 39.8	> +14.2	
21280.0	40.4	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26600.0	43.4	-60.2	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 41.2	< 31.2	> +27.0	
31920.0	43.7	-54.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 39.2	< 29.2	> +29.0	
37240.0	44.3	-47.3	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 47.0	< 37.0	> +21.2	

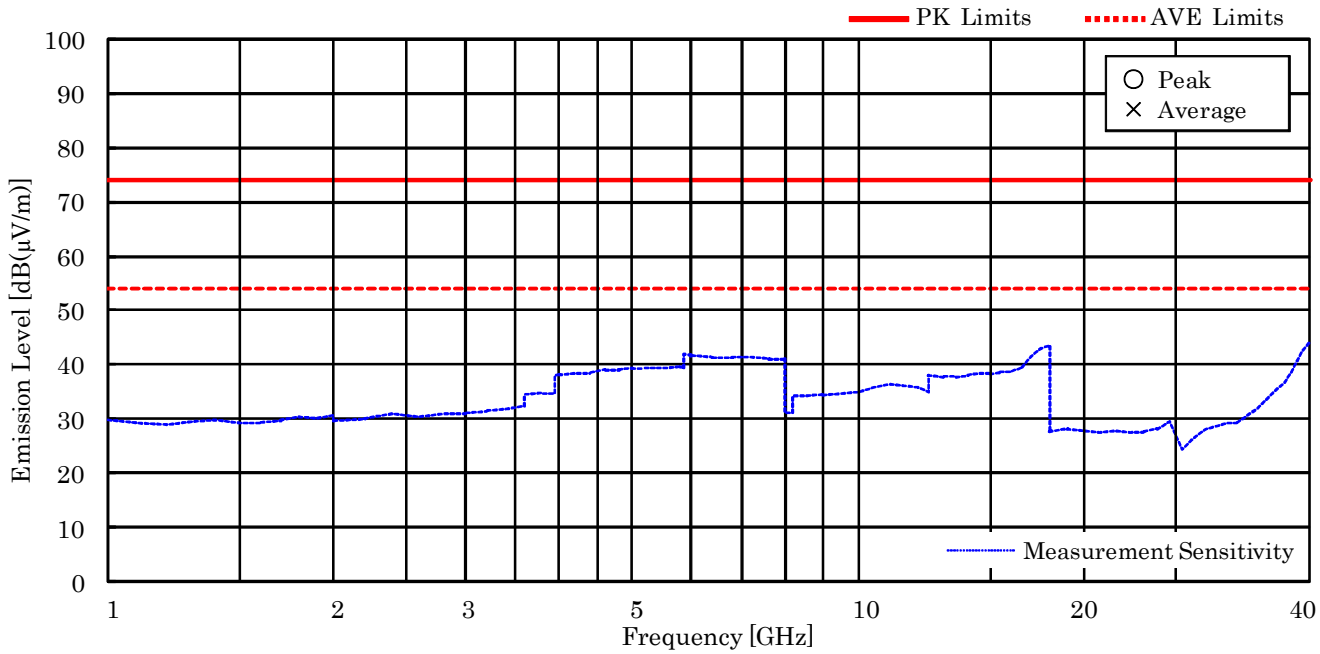
Calculated result at 15960.0 MHz, as the worst point shown on underline:

	Antenna Factor	= 37.4	dB(1/m)
	Corr. Factor	= -25.6	dB
+)	Meter Reading	= <28.0	dB(μV)
	Result	= <39.8	dB(μV/m)

Minimum Margin: 54.0 - <39.8 = >14.2 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11a, 5250 – 5350 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11a, 5470 – 5725 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 100 Ch												
7333.3	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 52.1	< 42.1	> +11.9	
11000.0	33.4	-24.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.9	< 36.9	> +17.1	
16500.0	37.4	-24.9	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 50.5	< 40.5	> +17.7	
22000.0	40.5	-43.0	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 47.5	< 37.5	> +20.7	
27500.0	43.9	-58.8	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 43.1	< 33.1	> +25.1	
33000.0	44.0	-53.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 40.5	< 30.5	> +27.7	
38500.0	44.3	-43.8	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 50.5	< 40.5	> +17.7	
Test condition : Tx 116 Ch												
7440.0	29.8	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 52.0	< 42.0	> +12.0	
11160.0	33.4	-24.3	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
16740.0	37.4	-24.1	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 51.3	< 41.3	> +16.9	
22320.0	40.6	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.4	< 37.4	> +16.6	
27900.0	43.8	-57.7	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 44.1	< 34.1	> +24.1	
33480.0	44.0	-53.0	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 41.0	< 31.0	> +27.2	
39060.0	44.3	-41.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 52.5	< 42.5	> +11.5	
Test condition : Tx 140 Ch												
7600.0	29.8	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.8	< 41.8	> +12.2	
11400.0	33.3	-24.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.9	< 36.9	> +17.1	
17100.0	37.5	-22.6	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.9	< 42.9	> +15.3	
22800.0	40.5	-43.4	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
28500.0	43.8	-56.4	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 45.4	< 35.4	> +22.8	
34200.0	44.0	-51.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 42.3	< 32.3	> +25.9	
39900.0	44.6	-41.0	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 53.6	< 43.6	> +10.4	

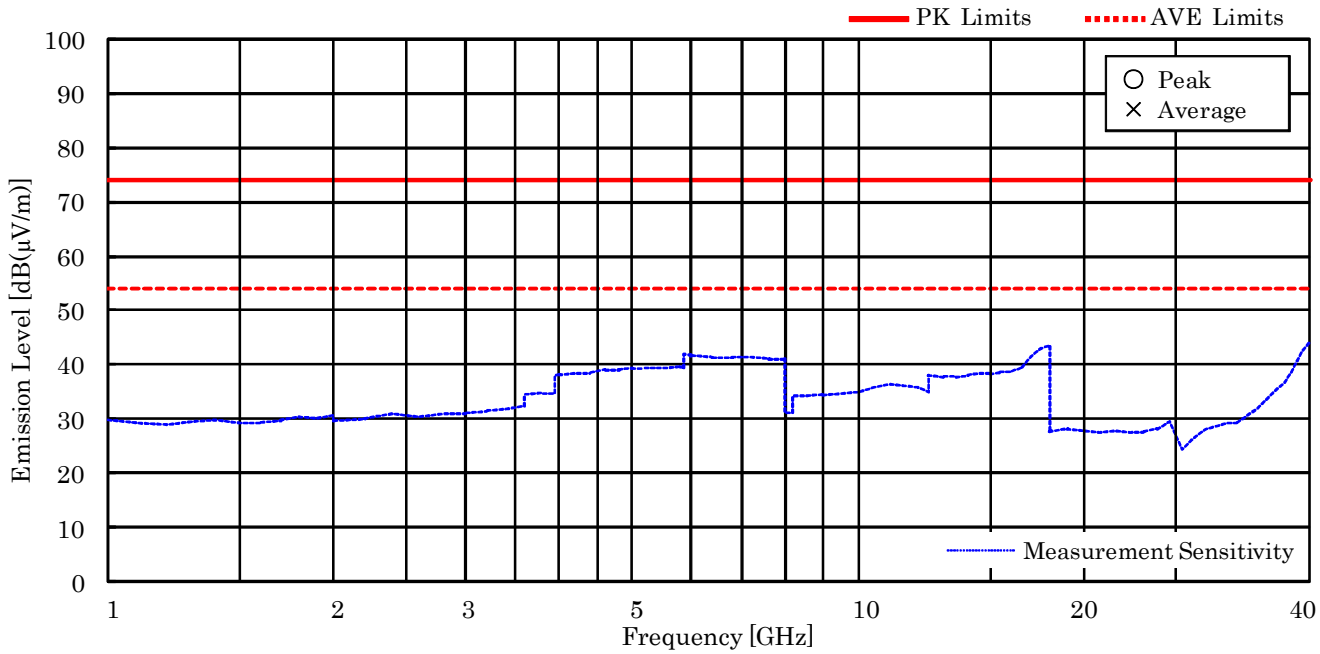
Calculated result at 39900.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	44.6 dB(1/m)
	Corr. Factor	=	-41.0 dB
+)	Meter Reading	=	<40.0 dB(μV)
	Result	=	<43.6 dB(μV/m)

Minimum Margin: 54.0 - <43.6 = >10.4 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11a, 5470 – 5725 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11n: 20 MHz BW, 5150 - 5250 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency	Antenna Factor	Corr. Factor	Meter Readings [dB(μV)] Horizontal		Vertical		Limits [dB(μV/m)]		Results [dB(μV/m)]		Margin [dB]	Remarks
[MHz]	[dB(1/m)]	[dB]	PK	AVE	PK	AVE	PK	AVE	PK	AVE		
Test condition : Tx 36 Ch												
6906.7	29.9	-15.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.2	< 42.2	> +16.0	
10360.0	33.4	-24.9	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.5	< 36.5	> +21.7	
15540.0	37.2	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.4	< 39.4	> +14.6	
20720.0	40.2	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
25900.0	40.8	-41.8	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.0	< 39.0	> +19.2	
31080.0	43.9	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 39.3	< 29.3	> +28.9	
36260.0	44.2	-48.4	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 45.8	< 35.8	> +22.4	
Test condition : Tx 44 Ch												
6960.0	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10440.0	33.4	-24.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.6	< 36.6	> +21.6	
15660.0	37.2	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.4	< 39.4	> +14.6	
20880.0	40.3	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.2	< 37.2	> +16.8	
26100.0	40.7	-41.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.0	< 39.0	> +19.2	
31320.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
36540.0	44.4	-48.0	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.4	< 36.4	> +21.8	
Test condition : Tx 48 Ch												
6986.5	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10480.0	33.4	-24.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.7	< 36.7	> +21.5	
15720.0	37.3	-25.7	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.6	< 39.6	> +14.4	
20960.0	40.3	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.2	< 37.2	> +16.8	
26200.0	40.7	-41.6	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.1	< 39.1	> +19.1	
31440.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
36680.0	44.5	-48.1	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.4	< 36.4	> +21.8	

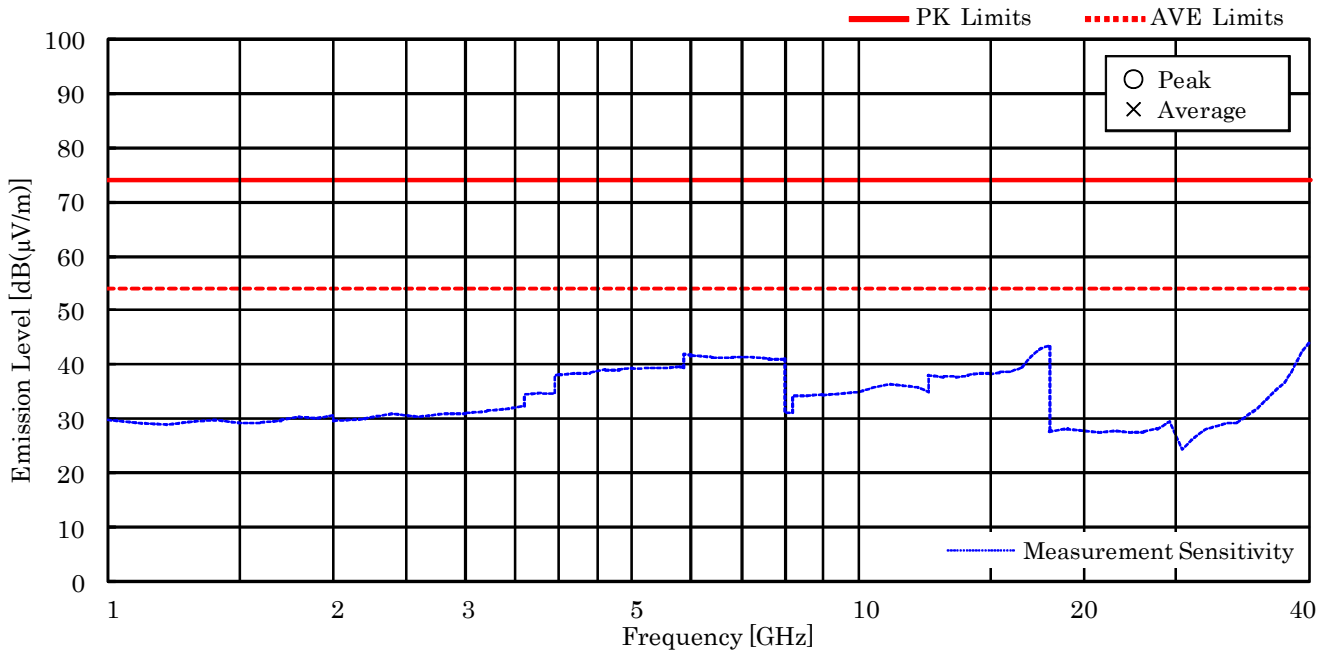
Calculated result at 15720.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	37.3 dB(1/m)
	Corr. Factor	=	-25.7 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<39.6 dB(μV/m)

Minimum Margin: 54.0 - <39.6 = >14.4 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11n: 20 MHz BW, 5150 - 5250 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11n: 20 MHz BW, 5250 – 5350 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 52 Ch												
7013.3	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10520.0	33.4	-24.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.7	< 36.7	> +21.5	
15780.0	37.3	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.7	< 39.7	> +14.3	
21040.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26300.0	40.7	-41.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.2	< 39.2	> +19.0	
31560.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
36820.0	44.5	-47.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.8	< 36.8	> +21.4	
Test condition : Tx 56 Ch												
7040.0	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10560.0	33.4	-24.6	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.8	< 36.8	> +21.4	
15840.0	37.3	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.7	< 39.7	> +14.3	
21120.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26400.0	40.6	-41.4	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.2	< 39.2	> +19.0	
31680.0	43.8	-54.5	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.3	< 29.3	> +24.7	
36960.0	44.4	-47.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.7	< 36.7	> +21.5	
Test condition : Tx 64 Ch												
7093.3	30.0	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.2	< 42.2	> +16.0	
10640.0	33.4	-24.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.8	< 36.8	> +17.2	
15960.0	37.4	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.8	< 39.8	> +14.2	
21280.0	40.4	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26600.0	43.4	-60.2	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 41.2	< 31.2	> +27.0	
31920.0	43.7	-54.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 39.2	< 29.2	> +29.0	
37240.0	44.3	-47.3	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 47.0	< 37.0	> +21.2	

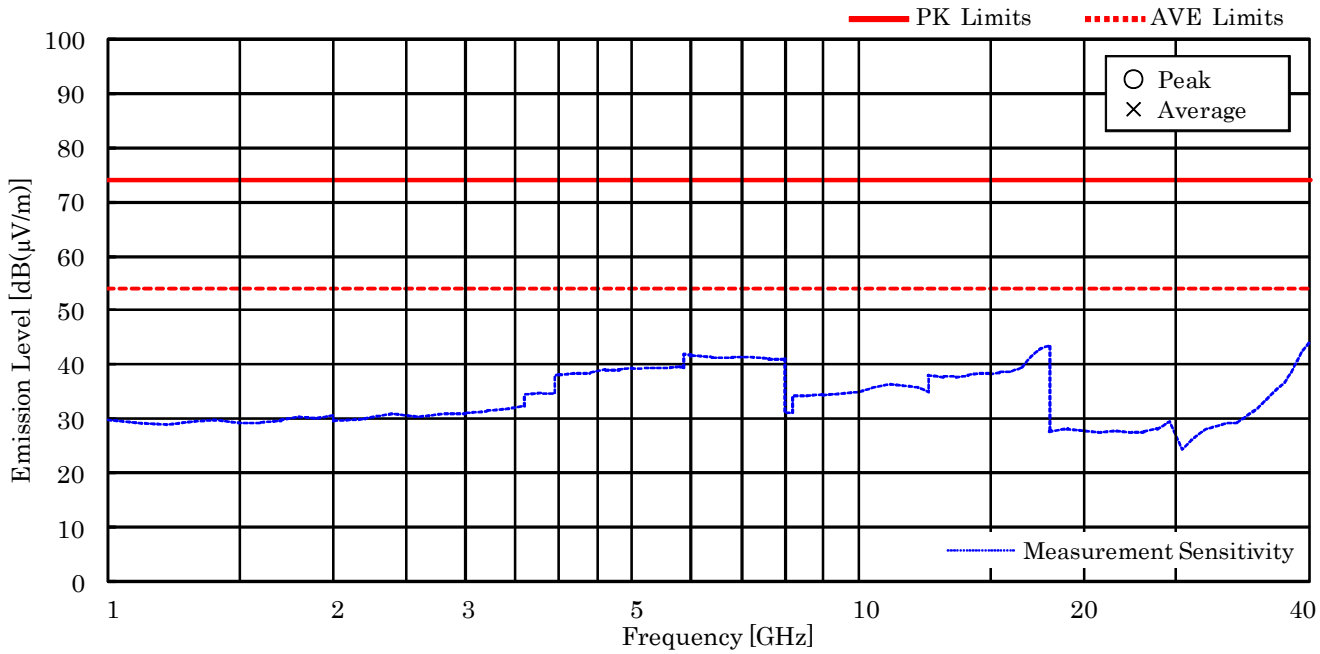
Calculated result at 15960.0 MHz, as the worst point shown on underline:

	Antenna Factor	= 37.4	dB(1/m)
	Corr. Factor	= -25.6	dB
+)	Meter Reading	= <28.0	dB(μV)
	Result	= <39.8	dB(μV/m)

Minimum Margin: 54.0 - <39.8 = >14.2 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11n: 20 MHz BW, 5250 – 5350 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11n: 20 MHz BW, 5470 – 5725 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 100 Ch												
7333.3	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 52.1	< 42.1	> +11.9	
11000.0	33.4	-24.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.9	< 36.9	> +17.1	
16500.0	37.4	-24.9	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 50.5	< 40.5	> +17.7	
22000.0	40.5	-43.0	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 47.5	< 37.5	> +20.7	
27500.0	43.9	-58.8	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 43.1	< 33.1	> +25.1	
33000.0	44.0	-53.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 40.5	< 30.5	> +27.7	
38500.0	44.3	-43.8	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 50.5	< 40.5	> +17.7	
Test condition : Tx 116 Ch												
7440.0	29.8	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 52.0	< 42.0	> +12.0	
11160.0	33.4	-24.3	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
16740.0	37.4	-24.1	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 51.3	< 41.3	> +16.9	
22320.0	40.6	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.4	< 37.4	> +16.6	
27900.0	43.8	-57.7	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 44.1	< 34.1	> +24.1	
33480.0	44.0	-53.0	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 41.0	< 31.0	> +27.2	
39060.0	44.3	-41.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 52.5	< 42.5	> +11.5	
Test condition : Tx 140 Ch												
7600.0	29.8	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.8	< 41.8	> +12.2	
11400.0	33.3	-24.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.9	< 36.9	> +17.1	
17100.0	37.5	-22.6	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.9	< 42.9	> +15.3	
22800.0	40.5	-43.4	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
28500.0	43.8	-56.4	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 45.4	< 35.4	> +22.8	
34200.0	44.0	-51.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 42.3	< 32.3	> +25.9	
39900.0	44.6	-41.0	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 53.6	< 43.6	> +10.4	

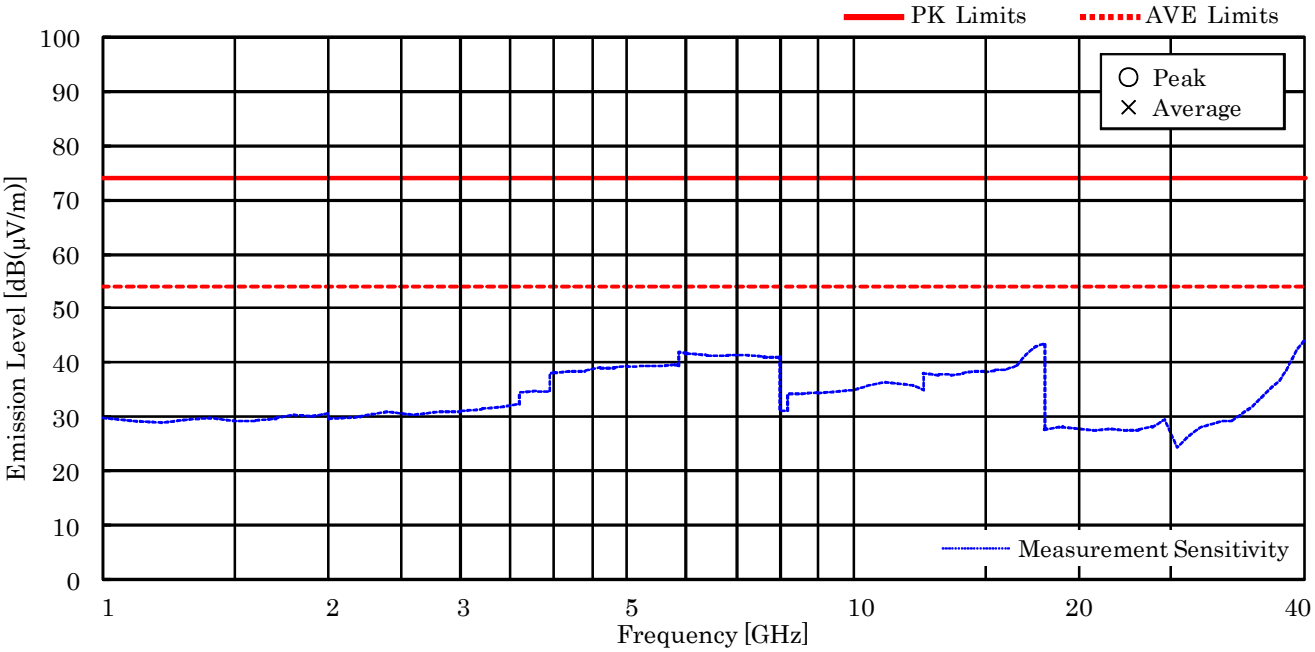
Calculated result at 39900.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	44.6 dB(1/m)
	Corr. Factor	=	-41.0 dB
+)	Meter Reading	=	<40.0 dB(μV)
	Result	=	<43.6 dB(μV/m)

Minimum Margin: 54.0 - <43.6 = >10.4 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11n: 20 MHz BW, 5470 – 5725 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11n: 40 MHz BW, 5150 - 5250 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits [dB(μV/m)] AVE	Results [dB(μV/m)] PK	Results [dB(μV/m)] AVE	Margin [dB]	Remarks
Test condition : Tx 38 Ch												
6920.0	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10380.0	33.4	-24.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.6	< 36.6	> +21.6	
15570.0	37.2	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.4	< 39.4	> +14.6	
20760.0	40.2	-43.0	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.2	< 37.2	> +16.8	
25950.0	40.8	-41.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.1	< 39.1	> +19.1	
31140.0	43.9	-54.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 39.2	< 29.2	> +29.0	
36330.0	44.2	-48.3	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 45.9	< 35.9	> +22.3	
Test condition : Tx 46 Ch												
6973.3	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10460.0	33.3	-24.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.6	< 36.6	> +21.6	
15690.0	37.3	-25.7	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.6	< 39.6	> +14.4	
20920.0	40.3	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.2	< 37.2	> +16.8	
26150.0	40.7	-41.7	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.0	< 39.0	> +19.2	
31380.0	43.9	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.3	< 29.3	> +24.7	
36610.0	44.4	-48.1	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.3	< 36.3	> +21.9	

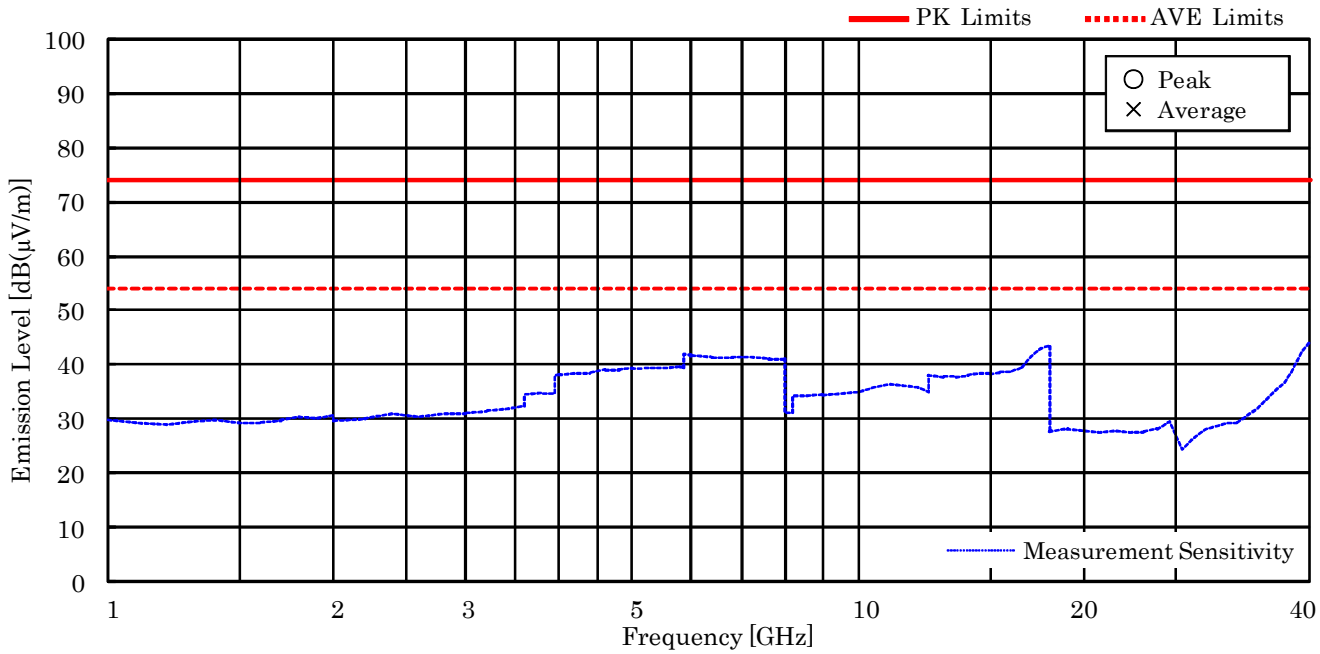
Calculated result at 15690.0 MHz, as the worst point shown on underline:

	Antenna Factor	= 37.3	dB(1/m)
	Corr. Factor	= -25.7	dB
+)	Meter Reading	= <28.0	dB(μV)
	Result	= <39.6	dB(μV/m)

Minimum Margin: 54.0 - <39.6 = >14.4 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11n: 40 MHz BW, 5150 - 5250 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11n: 40 MHz BW, 5250 – 5350 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 54 Ch												
7026.6	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10540.0	33.4	-24.7	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.7	< 36.7	> +21.5	
15810.0	37.3	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.7	< 39.7	> +14.3	
21080.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26350.0	40.6	-41.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.1	< 39.1	> +19.1	
31620.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
36890.0	44.5	-48.0	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.5	< 36.5	> +21.7	
Test condition : Tx 62 Ch												
7080.0	30.0	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.2	< 42.2	> +16.0	
10620.0	33.4	-24.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.8	< 36.8	> +17.2	
15930.0	37.3	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.7	< 39.7	> +14.3	
21240.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26550.0	43.5	-60.4	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 41.1	< 31.1	> +27.1	
31860.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 39.2	< 29.2	> +29.0	
37170.0	44.4	-47.3	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 47.1	< 37.1	> +21.1	

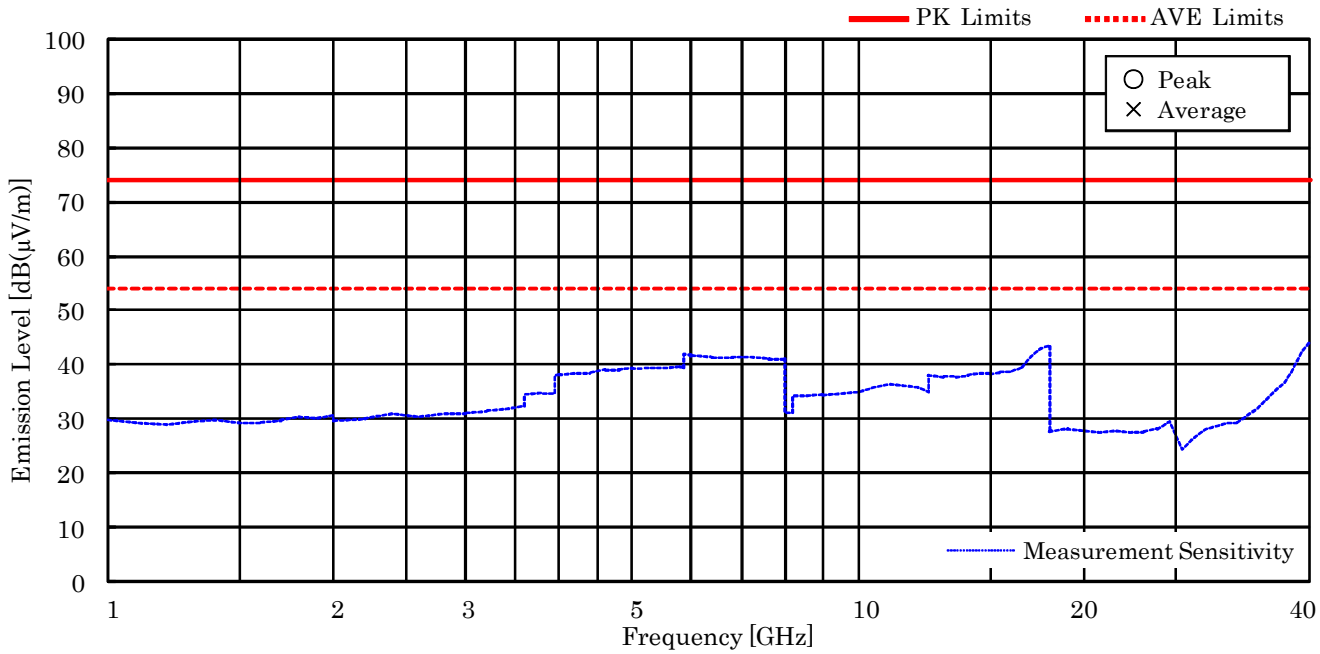
Calculated result at 15810.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	37.3 dB(1/m)
	Corr. Factor	=	-25.6 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<39.7 dB(μV/m)

Minimum Margin: 54.0 - <39.7 = >14.3 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11n: 40 MHz BW, 5250 – 5350 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11n: 40 MHz BW, 5470 – 5725 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency	Antenna Factor	Corr. Factor	Meter Readings [dB(μV)] Horizontal		Vertical		Limits [dB(μV/m)]		Results [dB(μV/m)]		Margin [dB]	Remarks
[MHz]	[dB(1/m)]	[dB]	PK	AVE	PK	AVE	PK	AVE	PK	AVE		
Test condition : Tx 102 Ch												
7346.6	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 52.1	< 42.1	> +11.9	
11020.0	33.4	-24.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 47.0	< 37.0	> +17.0	
16530.0	37.3	-24.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 50.5	< 40.5	> +17.7	
22040.0	40.5	-43.0	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.5	< 37.5	> +16.5	
27550.0	43.8	-58.7	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 43.1	< 33.1	> +25.1	
33060.0	44.0	-53.4	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 40.6	< 30.6	> +27.6	
38570.0	44.3	-43.8	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 50.5	< 40.5	> +17.7	
Test condition : Tx 134 Ch												
7560.0	29.8	-15.9	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.9	< 41.9	> +12.1	
11340.0	33.3	-24.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.9	< 36.9	> +17.1	
17010.0	37.5	-22.9	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.6	< 42.6	> +15.6	
22680.0	40.5	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.3	< 37.3	> +16.7	
28350.0	43.8	-56.6	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 45.2	< 35.2	> +23.0	
34020.0	44.0	-52.1	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 41.9	< 31.9	> +26.3	
39690.0	44.7	-41.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 53.5	< 43.5	> +10.5	

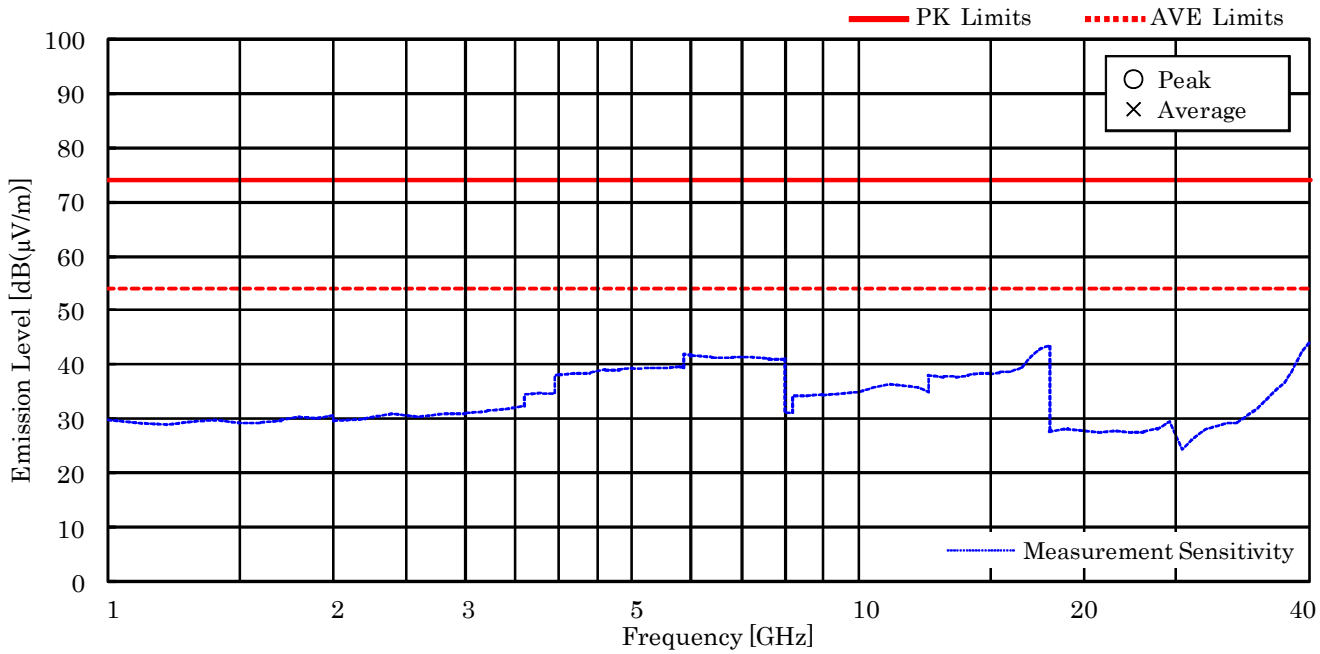
Calculated result at 39690.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	44.7 dB(1/m)
	Corr. Factor	=	-41.2 dB
+)	Meter Reading	=	<40.0 dB(μV)
	Result	=	<43.5 dB(μV/m)

Minimum Margin: 54.0 - <43.5 = >10.5 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11n: 40 MHz BW, 5470 – 5725 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11ac: 80 MHz BW, 5150 - 5250 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 42 Ch												
6946.6	29.9	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.1	< 42.1	> +16.1	
10420.0	33.4	-24.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.6	< 36.6	> +21.6	
15630.0	37.2	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.4	< 39.4	> +14.6	
20840.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26050.0	40.7	-41.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.2	< 39.2	> +19.0	
31260.0	43.8	-54.7	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.1	< 29.1	> +24.9	
36470.0	44.4	-48.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 46.3	< 36.3	> +17.7	

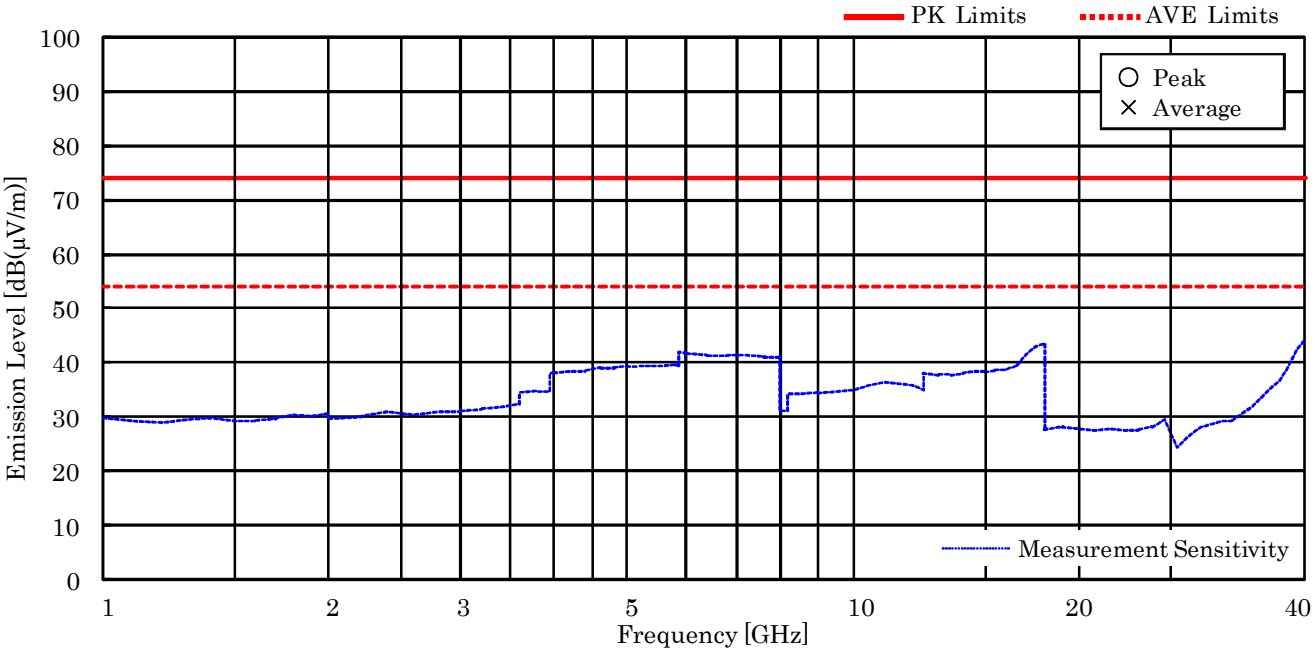
Calculated result at 15630.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	37.2 dB(1/m)
	Corr. Factor	=	-25.8 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<39.4 dB(μV/m)

Minimum Margin: 54.0 - <39.4 = >14.6 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11ac: 80 MHz BW, 5150 - 5250 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11ac: 80 MHz, 5250 – 5350 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 58 Ch												
7053.3	30.0	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 52.2	< 42.2	> +16.0	
10580.0	33.4	-24.6	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 46.8	< 36.8	> +21.4	
15870.0	37.3	-25.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.7	< 39.7	> +14.3	
21160.0	40.3	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.1	< 37.1	> +16.9	
26450.0	40.7	-41.5	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 49.2	< 39.2	> +19.0	
31740.0	43.8	-54.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 39.2	< 29.2	> +24.8	
37030.0	44.4	-47.6	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 46.8	< 36.8	> +21.4	

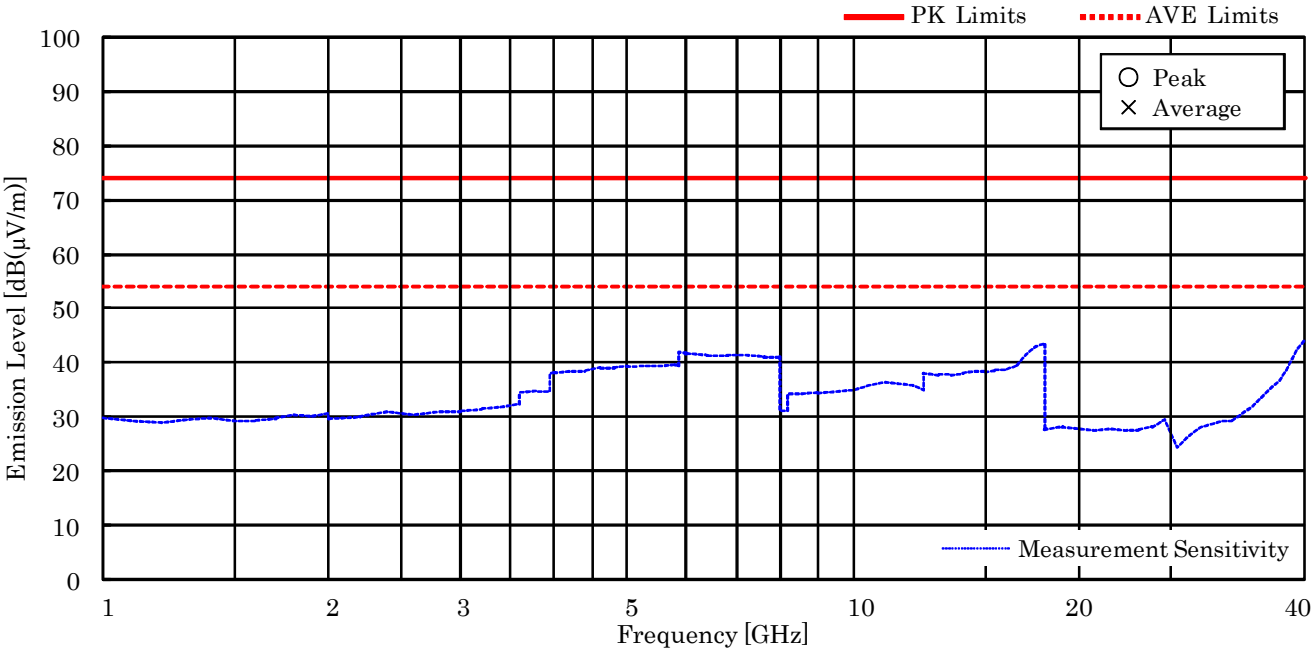
Calculated result at 15870.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	37.3 dB(1/m)
	Corr. Factor	=	-25.6 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<39.7 dB(μV/m)

Minimum Margin: 54.0 - <39.7 = >14.3 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11ac: 80 MHz, 5250 – 5350 MHz Band)
(Horizontal/Vertical)



Mode of EUT : TX mode (802.11ac: 80 MHz, 5470 – 5725 MHz Band)

Test Date: March 29, 2016
Temp.: 22 °C, Humi: 38 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx 106 Ch												
7373.3	29.8	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 52.0	< 42.0	> +12.0	
11060.0	33.4	-24.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 47.0	< 37.0	> +17.0	
16590.0	37.4	-24.6	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 50.8	< 40.8	> +17.4	
22120.0	40.6	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.5	< 37.5	> +16.5	
27650.0	43.7	-58.3	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 43.4	< 33.4	> +24.8	
33180.0	44.0	-53.2	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 40.8	< 30.8	> +27.4	
38710.0	44.3	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 51.2	< 41.2	> +12.8	
Test condition : Tx 122 Ch												
7480.0	29.8	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 52.0	< 42.0	> +12.0	
11220.0	33.3	-24.3	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 47.0	< 37.0	> +17.0	
16830.0	37.5	-23.6	< 38.0	< 28.0	< 38.0	< 28.0	68.2	-	< 51.9	< 41.9	> +16.3	
22440.0	40.6	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.4	< 37.4	> +16.6	
28050.0	43.8	-57.3	< 58.0	< 48.0	< 58.0	< 48.0	68.2	-	< 44.5	< 34.5	> +23.7	
33660.0	44.0	-52.9	< 50.0	< 40.0	< 50.0	< 40.0	68.2	-	< 41.1	< 31.1	> +27.1	
39270.0	44.4	-41.5	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 52.9	< 42.9	> +11.1	

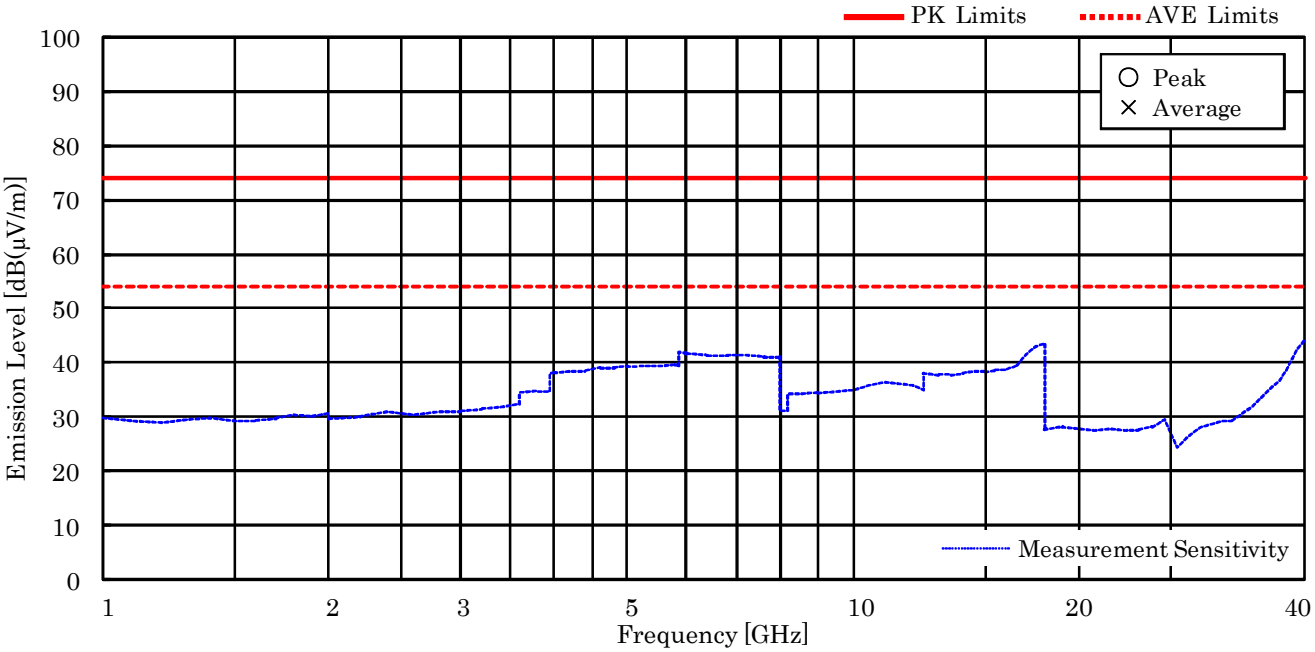
Calculated result at 39270.0 MHz, as the worst point shown on underline:

	Antenna Factor	= 44.4	dB(1/m)
	Corr. Factor	= -41.5	dB
+)	Meter Reading	= <40.0	dB(μV)
	Result	= <42.9	dB(μV/m)

Minimum Margin: 54.0 - <42.9 = >11.1 (dB)

NOTES
1. Test Distance : 3 m (1 GHz to 26.5 GHz) / 1m (26.5 GHz to 40 GHz)
2. The spectrum was checked from 1 GHz to 40 GHz.
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (18 - 26.5GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain - Distance Factor [dB] (over 26.5GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : TX mode (802.11ac: 80 MHz, 5470 – 5725 MHz Band)
(Horizontal/Vertical)



7.7 Dynamic Frequency Selection

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.7.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

7.7.1.1 Channel Moving Time (Limit : < 10 sec.)

802.11n 20 MHz	2.728	sec.	at	5500	MHz
802.11n 40 MHz	2.680	sec.	at	5510	MHz
802.11ac 80 MHz	2.736	sec.	at	5530	MHz

7.7.1.2 Channel Closing Transmission Time (Limit : < 60 msec.)

802.11n 20 MHz	16.0	msec.	at	5500	MHz
802.11n 40 MHz	16.0	msec.	at	5510	MHz
802.11ac 80 MHz	12.0	msec.	at	5530	MHz

7.7.1.3 Non-occupancy Period (Limit : ≥ 30 min.)

802.11n 20 MHz	> 30	min.	at	5500	MHz
802.11n 40 MHz	> 30	min.	at	5510	MHz
802.11ac 80 MHz	> 30	min.	at	5530	MHz

Uncertainty of Measurement Results 0.6 %B(2σ)

Remarks : The EUT is a client without radar detection therefore applicable requirements are only the above. Test was performed using a radar type 0.

7.7.2 Test Instruments

Shielded Room S1				
Type	**Model**	**Serial No. (ID)**	**Manufacturer**	**Cal. Due**
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Signal Generator	MG3710A	6201171711 (B-41)	Anritsu	2016/08/13
Horn Antenna(*2)	3160-05	9902-1061 (C-56)	EMCO	2016/06/29
Double-Ridge Guide Horn Antenna(*1)	TR17206	73370006 (C-29)	ADVANTEST	2016/06/23
RF Cable(*1)	SUCOFLEX104	267414/4 (C-67)	HUBER+SUHNER	2016/01/19
RF Cable(*2)	SUCOFLEX102E	6683/2E (C-70)	HUBER+SUHNER	2016/11/19

(*1) Radar Antenna and the cable
(*2) Monitor Antenna and the cable

NOTE : The calibration interval of the above test instruments is 12 months.

7.7.3 Test Method and Test Setup (Diagrammatic illustration)

The Dynamic Frequency Selection(DFS) measurements were carried out in accordance with FCC Part 15.407(h) and KDB905462 D02 UNII DFS Compliance Procedures New Rules " COMPLIANCE MEASUREMENT PROCEDURES FOR UNII DEVICES OPERATIONG IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

7.7.3.1 DFS Detection Threshold and DFS Response Requirement

DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	**Value (See Notes 1, 2 and 3)**
≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. **Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. **Note3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Table 4: DFS Response Requirement Values

Parameter	Value
Non-Occupancy Period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1.)
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. (See Notes 1 and 2.)
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. (See Note 3.)
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **Note 2:** The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the U-NII Detection Bandwidth detection test, radar type 0 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

7.7.3.2 Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note1	See Note1
1	1	See KDB905462 D02		60%	40
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. For Short Pulse Radar Type 0, the same waveform is used a minimum of 30 times. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of Short Pulse Radar Types 1-4.

Long Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per *Burst*	Number of *Bursts*	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type waveforms, then each additional waveform must also be unique and not repeated from the previous waveforms. Each waveform is defined as follows:

1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst_Count.
3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.
4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
5) Each pulse has a linear frequency modulated chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the random time interval between the first and second pulses is chosen independently of the random time interval between the second and third pulses.
7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst_Count. Each interval is of length (12,000,000 / Burst_Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst_Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen independently.

Frequency Hopping Radar Test Waveform

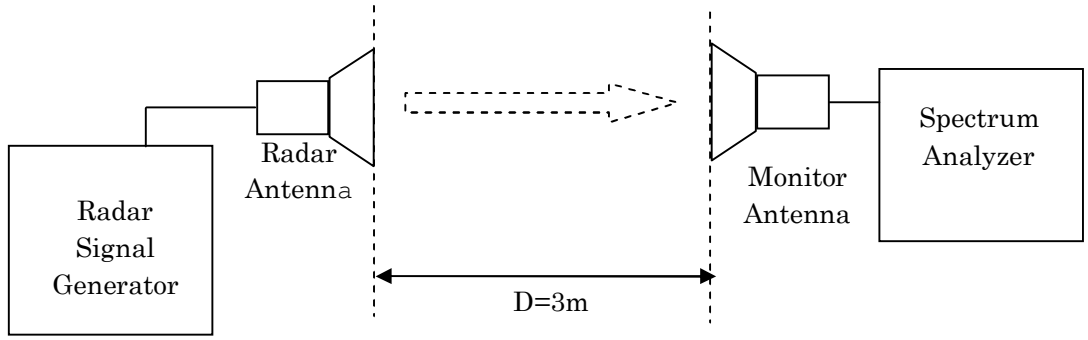
Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

7.7.3.3 Rader Waveform Calibration

Radiated Calibration Setup Diagram

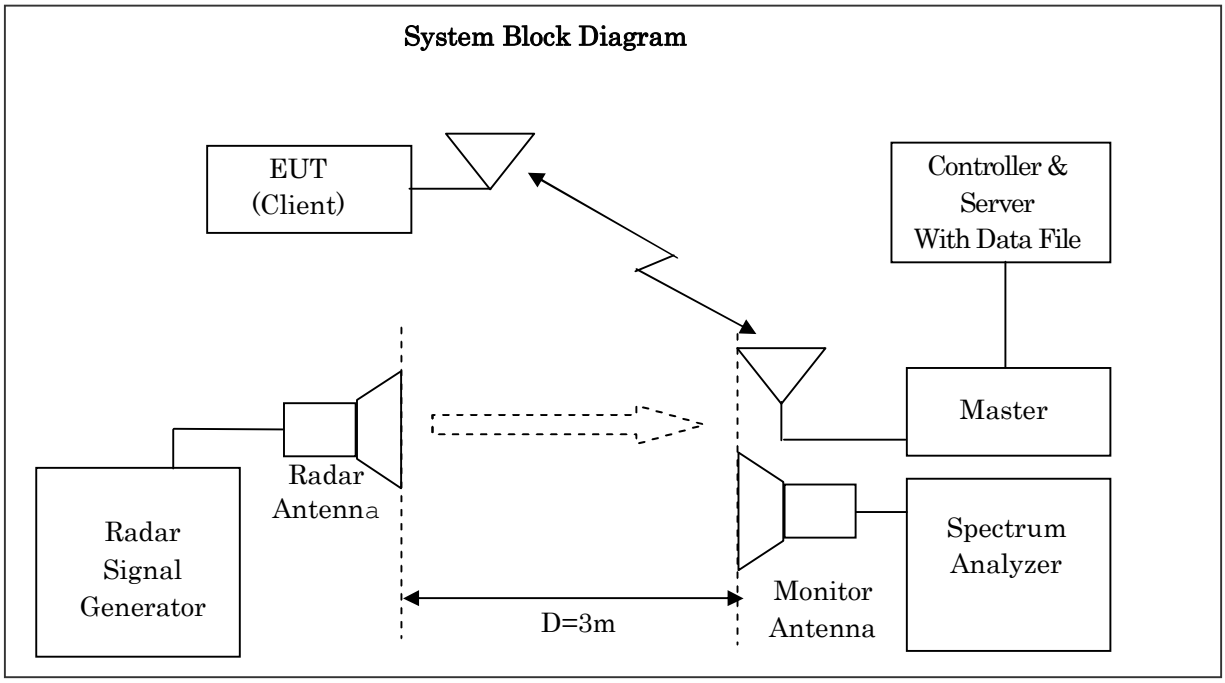


The EUT is the client device without radar detection, then master device is a RDD. Therefore the radar test signal level is set at the Radar Detection Threshold Level of master device.
The Radar Detection Threshold Level is employed -64dBm + 1dB = -63 dBm at the antenna port.
Where the antenna gain of master device is X dBi then the threshold level is corrected as
"-63 – X" dBm (Rated output power and Antenna Gain of the master device is described in EUT Description).
The spectrum analyzer is connected to the monitor antenna via a coaxial cable. The antenna is set vertical polarization for testing. The reference level offset of a spectrum analyzer set to "Monitoring Antenna Gain – Cable loss". The Radar Signal Generator is set to CW output mode and the signal level is adjusted to "-63 – X" dBm on the spectrum analyze setting as below;

Frequency: Radar Signal Frequency
Span: Zero Span(Time Domain)
RBW/VBW: 3 MHz
Detection: Peak

The spectrum analyzer plots of the calibrated radar waveform on the Channel frequency is attached in clause 7.7.4.1 in this report.

7.7.3.4 Test Setup and Operation Radiated Method



Support Equipment: The following support equipment was used for in this DFS testing

Item	Manufacturer	Model No.	Serial No.	FCC ID
Wireless Access Point	HP	JG993A	CN4AGTG05K	O9C-BJNGAFB0004
Unified WLAN Switch	HP	JG641A	CN49G5Q053	N/A
PC(Controller/Server)	HP Compaq	D330 uT	JPA42500TB	DoC

Used Test File and Displayed Traffic Level Adjustment:

The test is performed with the designated MPEG test file that is streamed from the access point to the client in full motion video mode using the media player with the V2.61 Codec package. This file is used by IP and Frame based systems for loading the test channel during the In-service compliance testing of the U-NII device.

By control PC, the radio link is established between the master and slave and the test file in sever(PC) is streamed via master(access point) to generate WLAN traffic.

The monitoring antenna is adjusted so that the WLAN traffic level on the spectrum analyzer is lower than the radar detection threshold level. (Channel loading was over 17 %.)

The spectrum analyzer plots of the slave(EUT) data traffic plot is attached in clause 7.7.4.2 and the nominal noise floor plots is attached in clause 7.7.4.3 in this report.

7.7.3.5 Description of EUT

Item	Specification
Operating Frequency(MHz)	5150 to 5250 / 5250 to 5350 / 5470 to 5725
Operating Mode of EUT	Client(Slave) Device without Radar Detection
FCC ID for Master Device(*1)	O9C-BJNGAFB0004 (Antenna Gain: 5.0 dBi)
Antenna Type of EUT	Inverted-L Type Antenna
Highest Power Level(EIRP)/ Antenna Gain of EUT	802.11a: 12.0 dBm Max. (Main/Sub) 802.11n(20/40 MHz BW): 12.0 dBm Max. (Main/Sub) 802.11ac(20/40/80 MHz): 11.0 dBm Max. (Main/Sub) Antenna Gain: 0 dBi (Main/Sub)
System Architecture	IEEE802.11 a/n/ac, IP based system
TPC Description	N/A(Not Required EIRP below 500 mW)
Data Rate/ Channel Bandwidth	Refer below table.
Power-on Cycle	N/A(No Channel Availability Check Function)

(*1) The rated output power of the master device is greater than 23dBm(EIRP), then the interference threshold level is employed -64 dBm. After correction for procedural adjustments, the radiated threshold level at the master device are;

-64 + 1 – 5 dBi(Master antenna Gain) = -68 dBm

Data Rate/ Channel Bandwidth

IEEE802.11 a			IEEE802.11 n		
Modulation	Data Rate (Mbps)	Channel Bandwidth (MHz)	Modulation	Data Rate(Mbps) Channel Bandwidth(MHz) 20	40
BPSK	6	20	BPSK	6.5	13.5
BPSK	9	20	QPSK	13.0	27.0
QPSK	12	20	QPSK	19.5	40.5
QPSK	18	20	16-QAM	26.0	54.0
16-QAM	24	20	16-QAM	39.0	81.0
16-QAM	36	20	64-QAM	52.0	108.0
64-QAM	48	20	64-QAM	58.5	121.5
64-QAM	54	20	64-QAM	65.0	135.0

IEEE802.11 ac			
Modulation	Data Rate(Mbps) Channel Bandwidth(MHz) 20	40	80
BPSK	6.5	13.5	29.3
QPSK	13.0	27.0	58.5
QPSK	19.5	40.5	87.8
16-QAM	26.0	54.0	117.0
16-QAM	39.0	81.0	175.5
64-QAM	52.0	108.0	234.0
64-QAM	58.5	121.5	263.3
64-QAM	65.0	135.0	292.5
256-QAM	78.0	162.0	351.0
256-QAM	N/A	180.0	390.0

7.7.3.6 Deviation to the procedures and equipment from the standards:

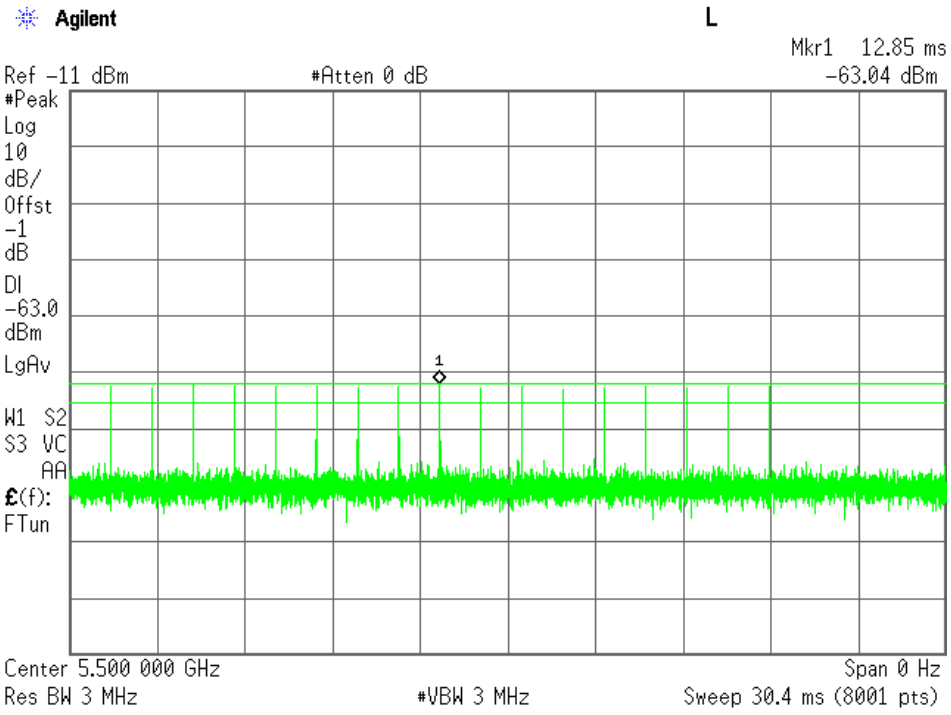
There is no deviation from FCC Rule and KDB905462 D02.

7.7.4 Test Data

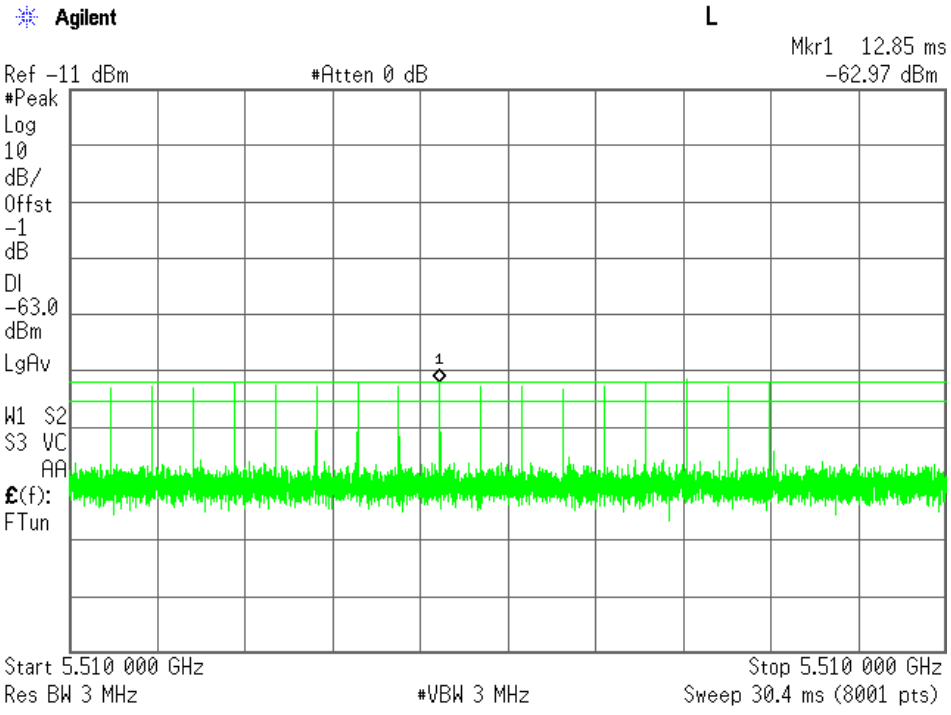
Test Date :March 25, 2016
Temp.: 22°C, Humi: 31%

7.7.4.1 Radar Waveform Calibration Results (Type 0 Short Pulse)

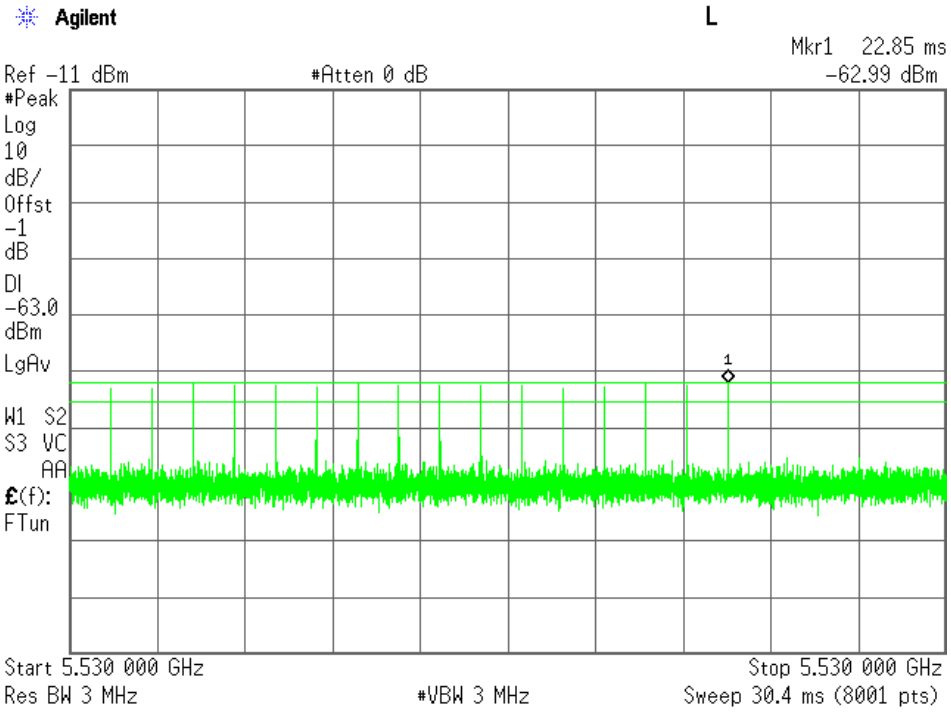
5500 MHz



5510 MHz

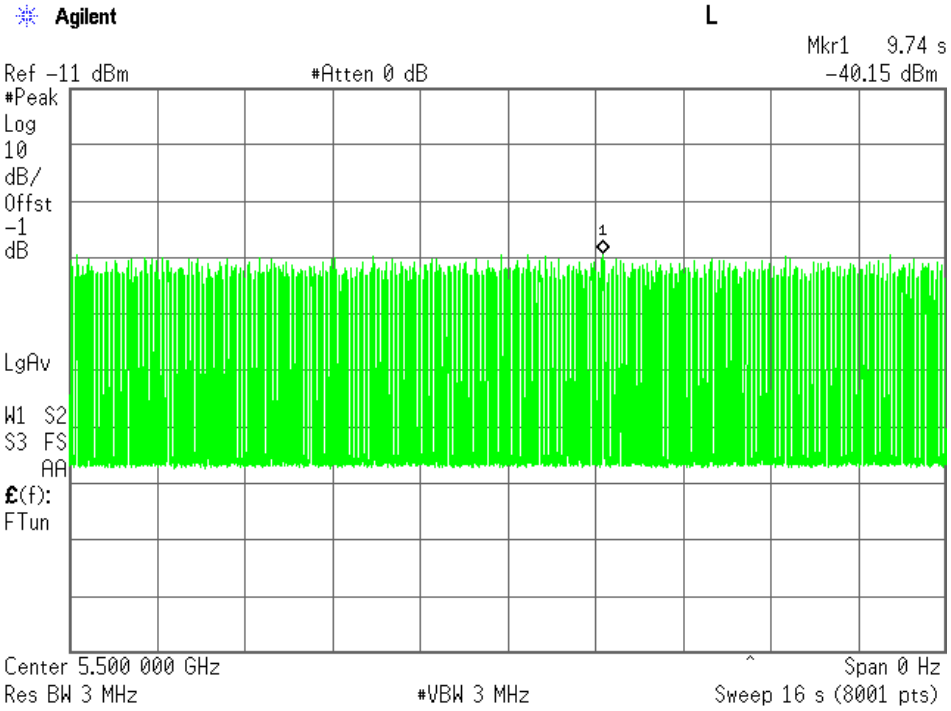


5530 MHz

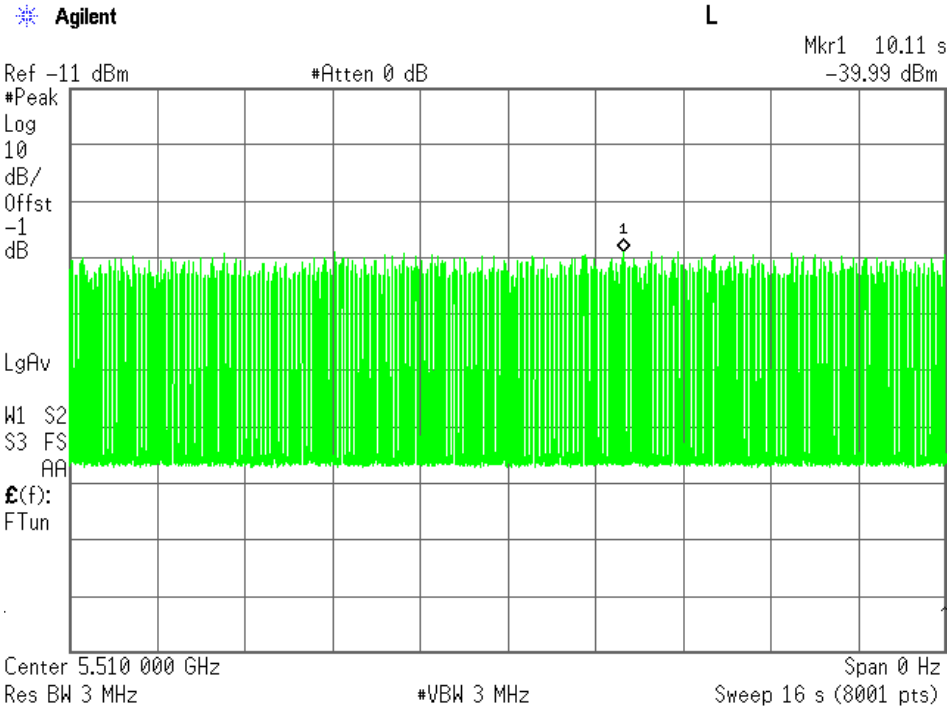

Agilent
L
Mkr1 22.85 ms
Ref -11 dBm
#Atten 0 dB
-62.99 dBm
#Peak
Log
10
dB/
Offst
-1
dB
Dl
-63.0
dBm
LgAv
W1 S2
S3 VC
AA
£(f):
FTun
Start 5.530 000 GHz
Stop 5.530 000 GHz
Res BW 3 MHz
#VBW 3 MHz
Sweep 30.4 ms (8001 pts)

7.7.4.2 EUT (Slave) Traffic Plots

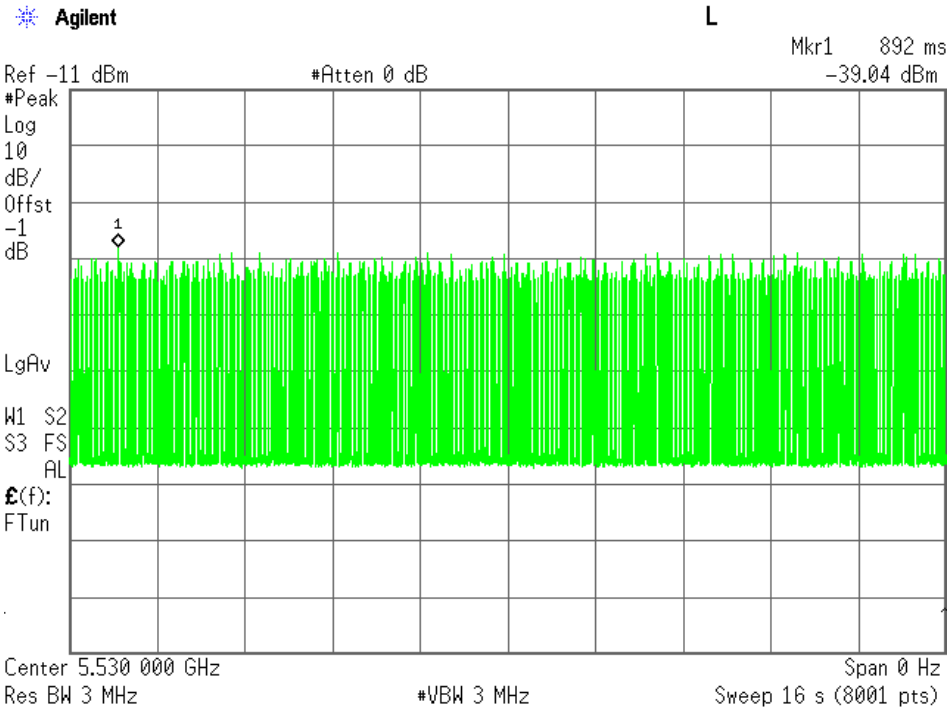
20 MHz BW, 5500 MHz



40 MHz BW, 5510 MHz

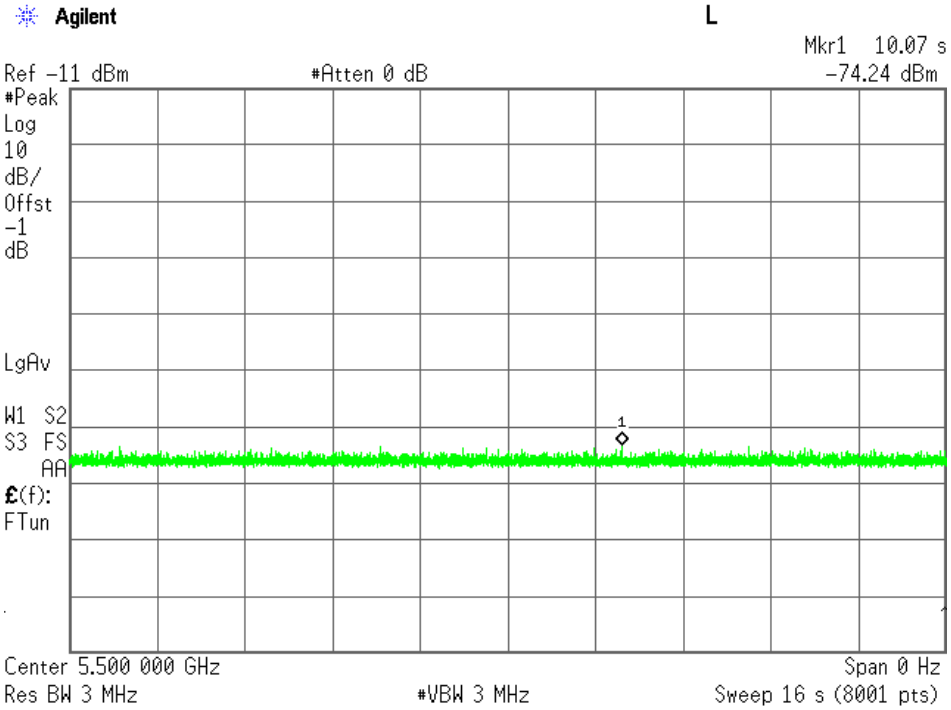


80 MHz BW, 5530 MHz

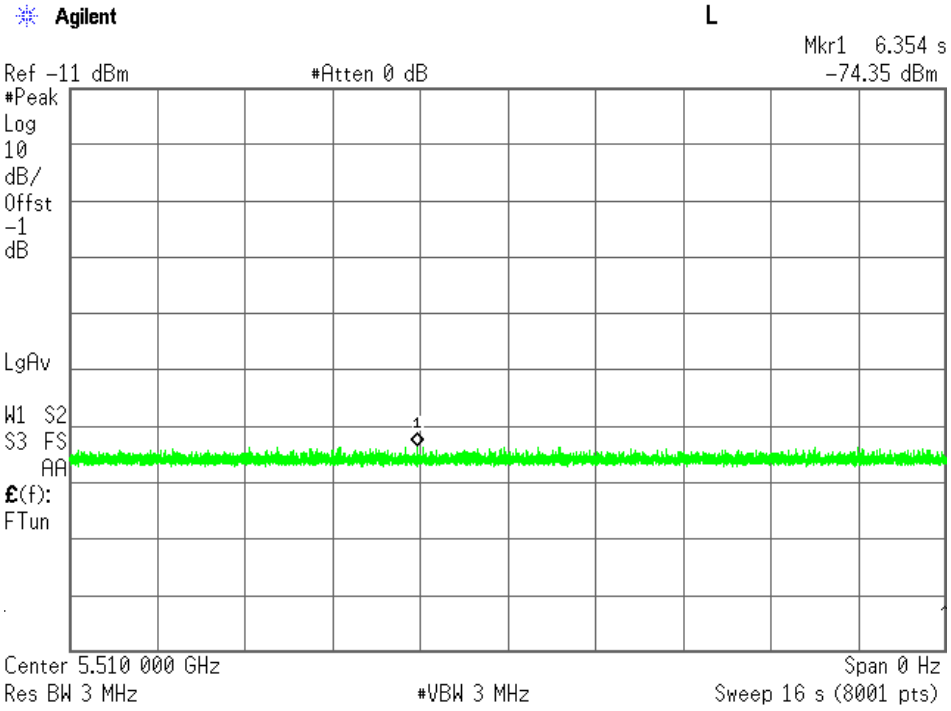


7.7.4.3 No Traffic (Noise Floor) Plots

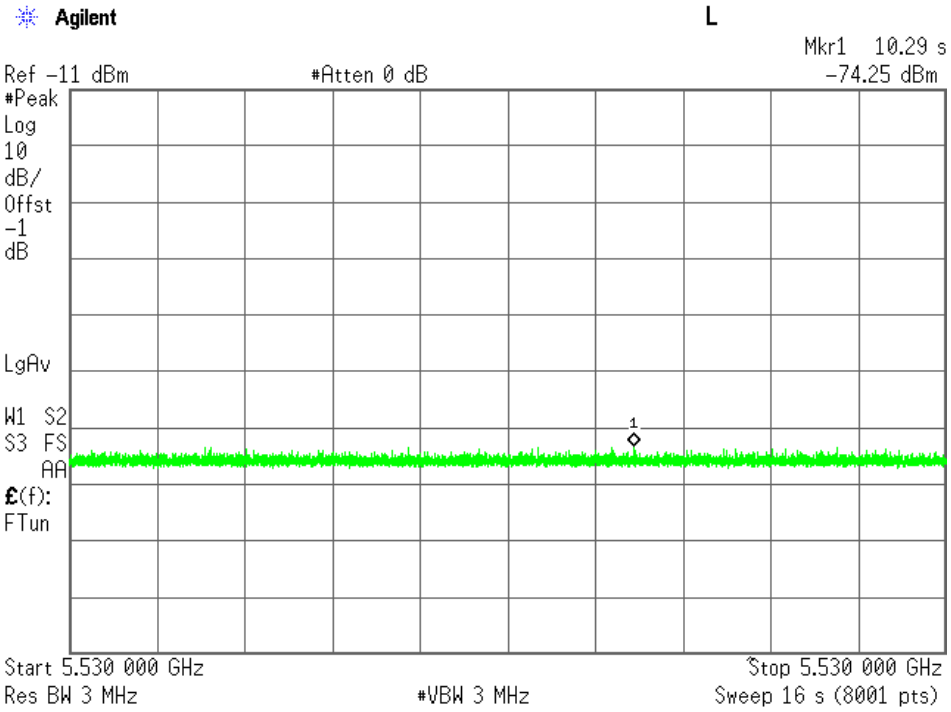
5500 MHz



5510 MHz



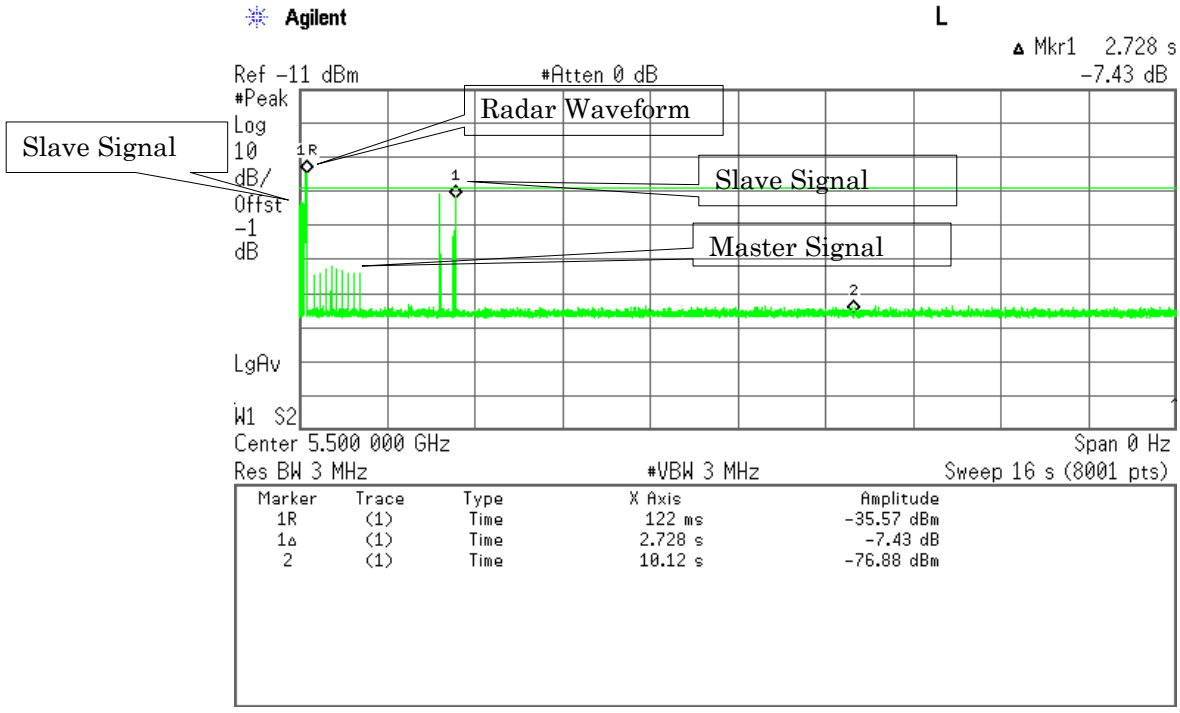
5530 MHz


Agilent
L
Mkr1 10.29 s
Ref -11 dBm
#Atten 0 dB
-74.25 dBm
#Peak
Log
10
dB/
Offst
-1
dB
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
1
Start 5.530 000 GHz
Stop 5.530 000 GHz
Res BW 3 MHz
#VBW 3 MHz
Sweep 16 s (8001 pts)

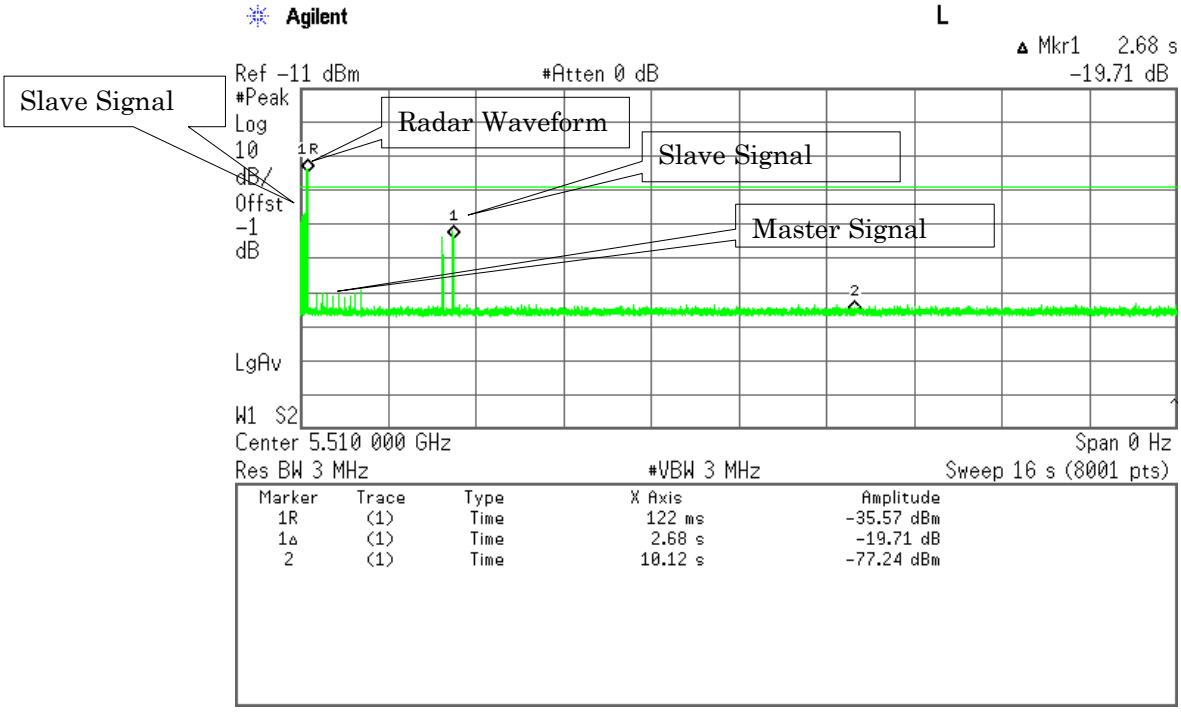
7.7.4.4 Channel Move Time

The channel move time is measured using delta-marker function of the spectrum analyzer. The reference marker is adjusted at the end of radar pulse and the delta marker is adjusted at the end the WLAN transmission. The displayed delta value is the result of move time. It shall be within the 10 seconds.
The measurements are carried out 802.11n CH.100 (5500MHz)/ 20 MHz BW, 802.11n CH.102(5510 MHz)/ 40 MHz BW and 802.11ac CH.106(5530 MHz)/ 80 MHz BW.

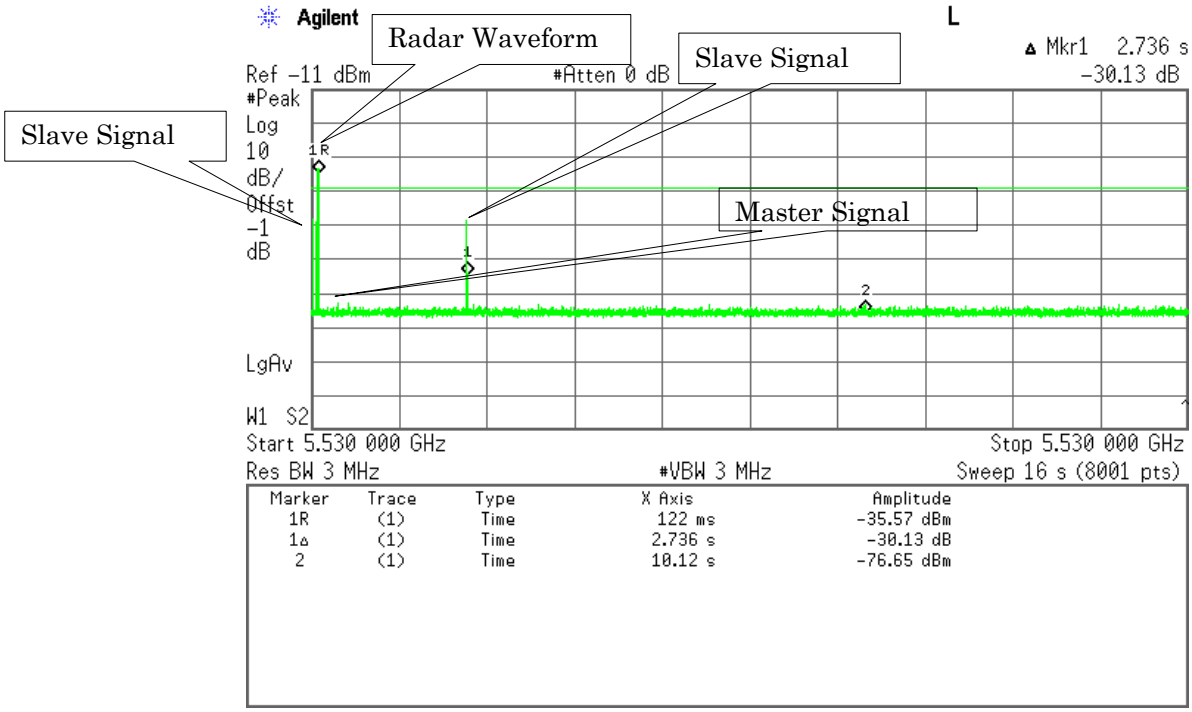
Channel Move Time Plots for 20 MHz BW, 5500 MHz



Channel Move Time Plots for 40 MHz BW, 5510 MHz



Channel Move Time Plots for 80 MHz BW, 5530 MHz



7.7.4.5 Channel Closing Transmission Time

The aggregate channel closing transmission time is calculated as follows;
D is the dwell time per spectrum analyzer sampling bin.
S is the sweep time.
B is the number of spectrum analyzer sampling bin.
N is the number of spectrum analyzer sampling bins showing a UNII transmission(intermittent control signal).

Channel Closing Time = D * N = S / B * N

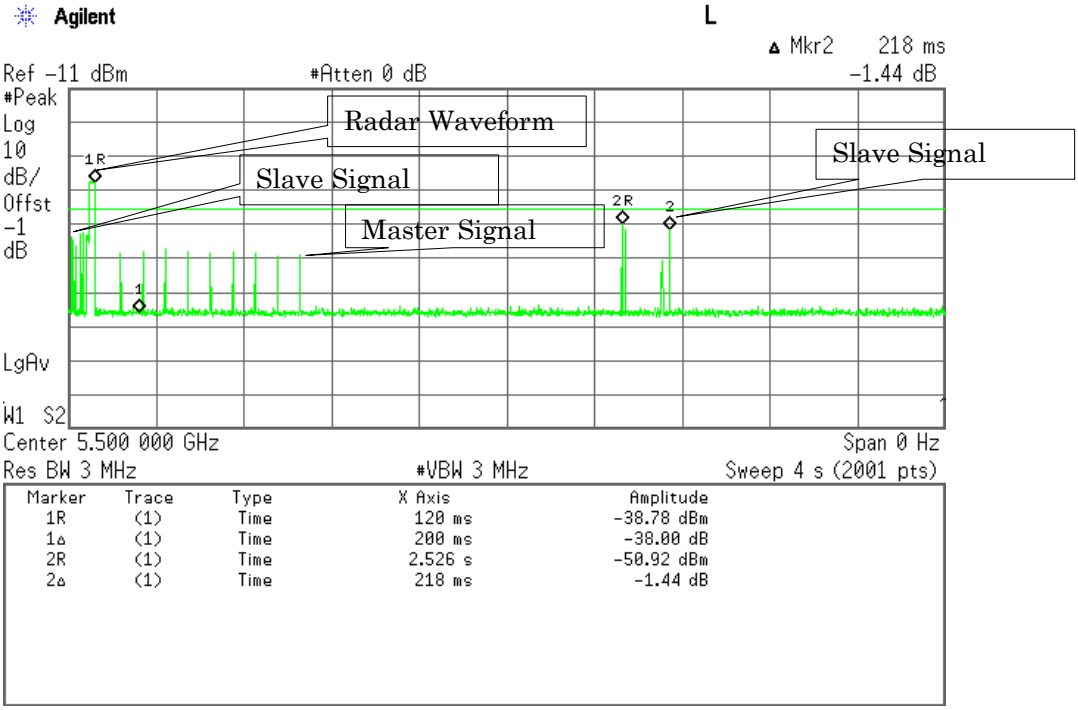
The observation period over which the aggregate transmission time is calculated begins at (the reference marker + 200 msec.) and end on earlier than (the reference marker + 10 sec.).
The measurements are carried out 802.11n CH.100 (5500MHz)/ 20 MHz BW, 802.11n CH.102(5510 MHz)/ 40 MHz BW and 802.11ac CH.106(5530 MHz)/ 80 MHz BW.

Test Results

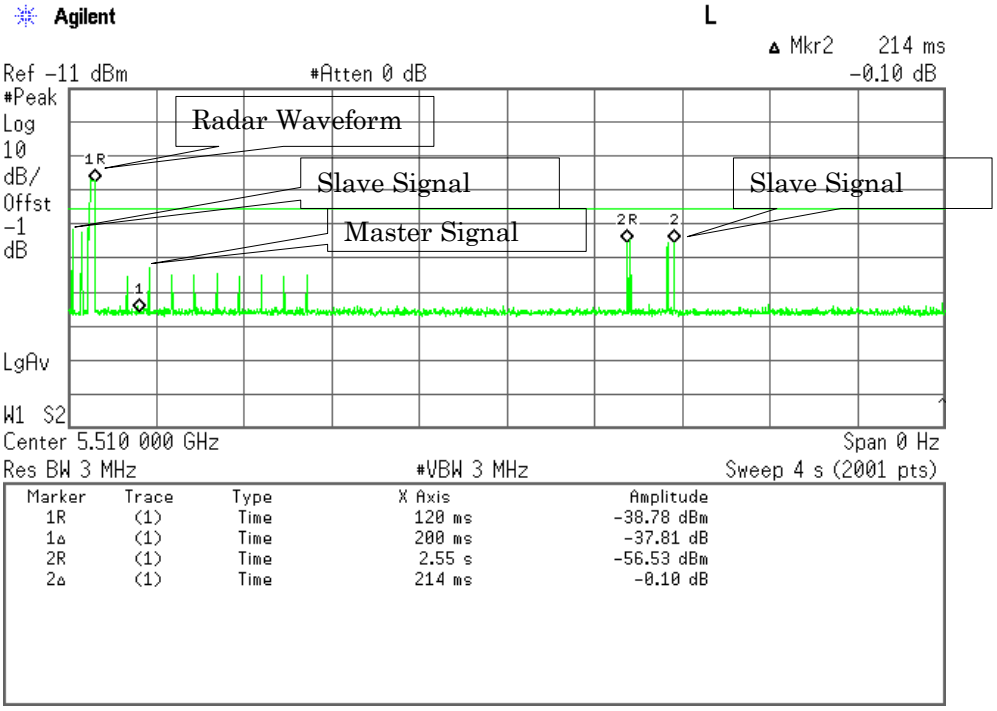
Channel	Frequency (MHz)	Mode	Sweep Time(**S**) (msec)	(**B**)	(**N**)	Channel Closing Time (msec)
100	5500	20 MHz BW	4000	2000	8	16
102	5510	40 MHz BW	4000	2000	8	16
106	5530	80 MHz BW	4000	2000	6	12

The test result (Channel Closing Time) is calculated as follows;
For 100 channel (5500 MHz)
Channel Closing Time = **D** * **N** = **S** / **B** * **N** = 4000 / 2000 * 8 = 16 msec.

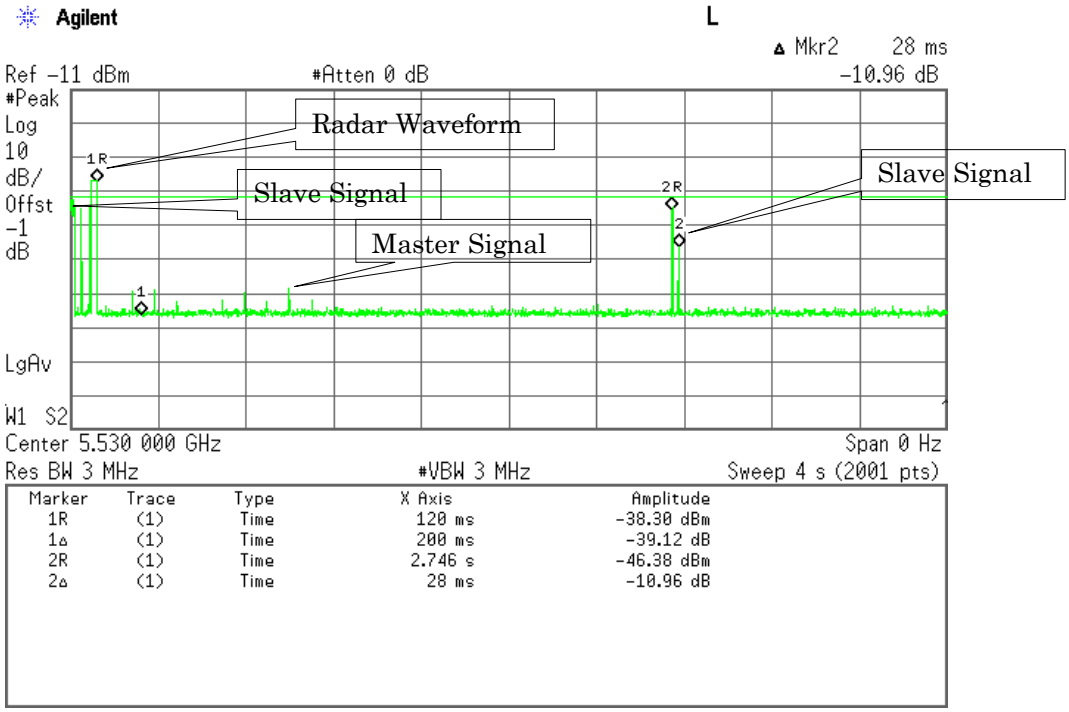
Channel Closing Transmission Time Plots for 20 MHz BW, 5500 MHz



Channel Closing Transmission Time Plots for 40 MHz BW, 5510 MHz



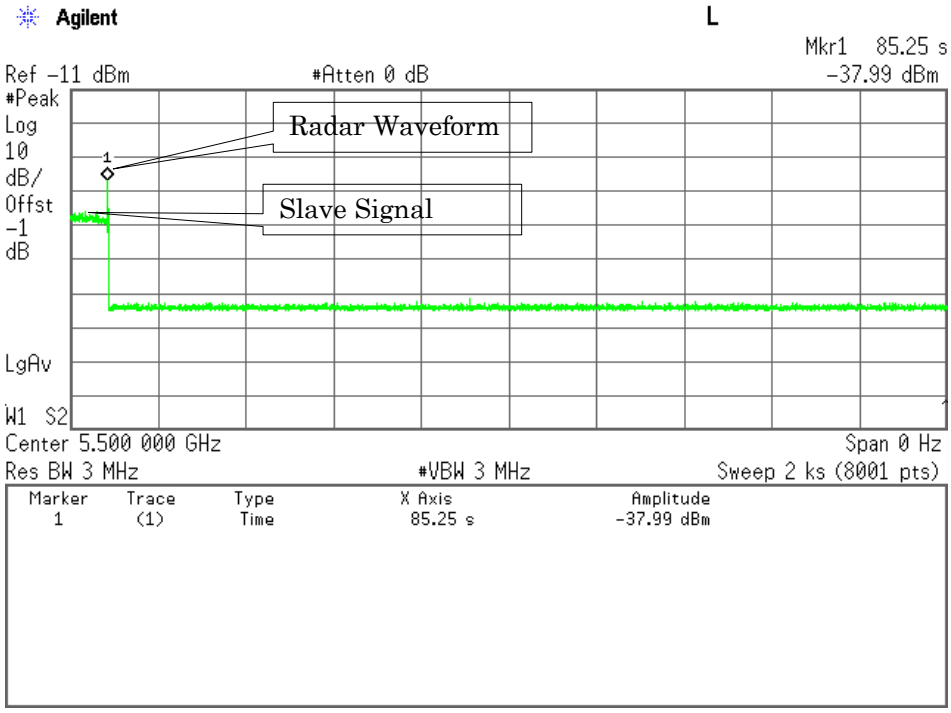
Channel Closing Transmission Time Plots for 80 MHz BW, 5530 MHz



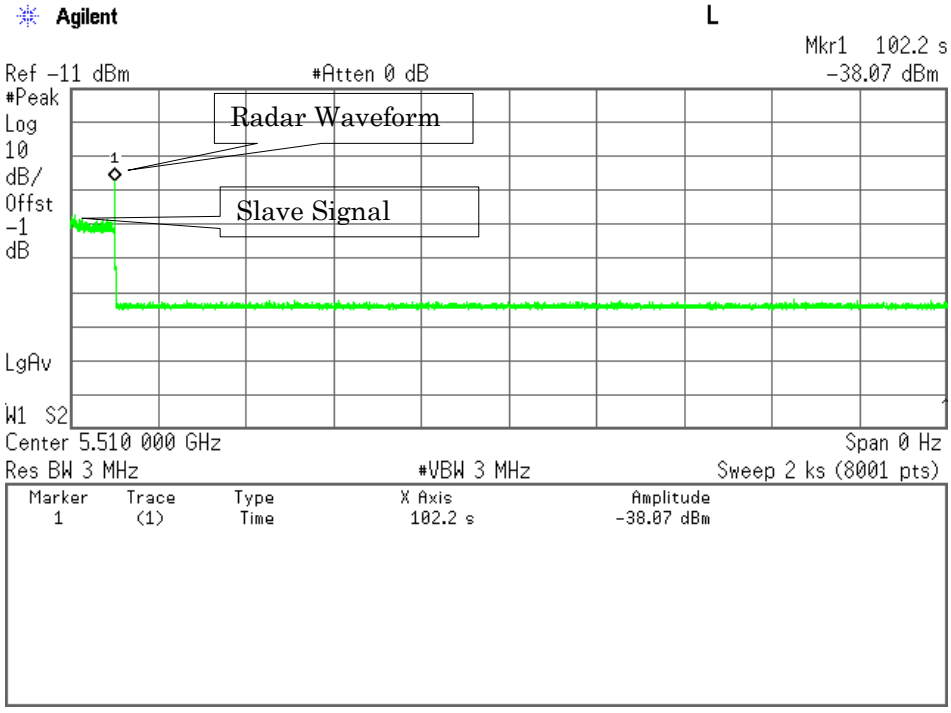
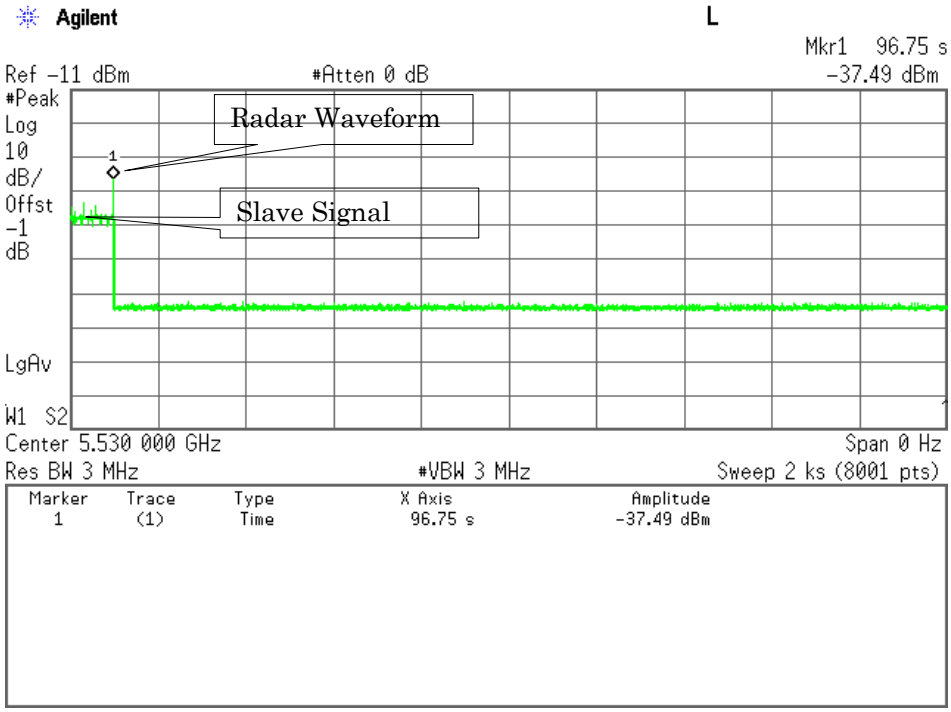
7.7.4.6 Non-Occupancy Period

During the 30 minutes observation time, EUT did not make any transmissions on a channel.
The measurements are carried out 802.11n CH.100 (5500MHz)/ 20 MHz BW, 802.11n CH.102(5510 MHz)/ 40 MHz BW and 802.11ac CH.106(5530 MHz)/ 80 MHz BW.

Non-Occupancy Period Plots for
20 MHz BW, 5500 MHz



40 MHz BW, 5510 MHz



80 MHz BW, 5530 MHz