RF TEST REPORT

Test item	:	LUKAS BLACK BOX CCTV
Model No.	:	LK-790 CCTV
Order No.	:	DTNC1504-01941
Date of receipt	:	2015-04-21
Test duration	:	2015-05-21 ~ 2015-06-09
Date of issue	:	2015-07-07
Use of report	:	FCC Original Grant

Applicant : QRONTECH CO., LTD.
A-1201, (Woorim Blue-nine, Yeomchang-dong) 583 Yangcheon-ro, Gangseo-gu, Seoul South Korea 157-779

Test laboratory : DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935

Test specification	:	FCC Part 15 Subpart C 247
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:

Engineer
KwiCheol Yeom

Reviewed by:

Technical Manager
WonJung Lee

Test Report Version

Test Report No.	Date	Description
DRTFCC1507-0172	Jul. 07, 2015	Initial issue

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1. EUT DESCRIPTION

FCC Equipment Class	Digital Transmission System(DTS)
Product	LUKAS BLACK BOX CCTV
Model Name	LK-790 CCTV
Add Model Name	LK-790 Nara Cam, LK-790 Vivi Cam, LK-790 Ami Cam
Power Supply	DC 15 V
Frequency Range	2412 MHz ~ 2462 MHz
Modulation Type	802.11n HT20(OFDM): BPSK, QPSK, 16QAM, 64QAM
Transmissions category	Completely correlated signal
Antenna Specification	**Antenna type**: Internal Antenna & External Antenna **Antenna gain** ▪ ANT 1(External): 5.950 dBi & ANT 2(Internal): -0.200 dBi **Antenna configuration** ▪ 802.11n HT20(MCS0 ~ 7): Single Transmitting (ANT 1 or ANT 2) ▪ 802.11n HT20(MCS8 ~ 15): Multiple Transmitting (ANT 1 and ANT 2)

2. INFORMATION ABOUT TESTING

2.1 Test mode

Transmitting Mode	Test mode	Worst case data rate	Tested Frequency(MHz)		
			Lowest	Middle	Highest
Multiple	**802.11n(HT20)**	**MCS 8**	2412	2437	2462

Note 1: The worst case data rate is determined as above test mode according to the power measurements. And all test items were performed at the worst case data rate.

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.3 Tested environment

Temperature	:	21 ~ 24 ℃
Relative humidity content	:	41 ~ 47 % R.H.
Details of power supply	:	DC 15 V

2.4 EMI suppression Device(s) / Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. SUMMARY OF TESTS

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
15.247(a)	6 dB Bandwidth	> 500 kHz	Conducted	C
15.247(b)	Transmitter Output Power	< 1 Watt		C
15.247(d)	Out of Band Emissions / Band Edge	20 dBc in any 100 kHz BW		C
15.247(e)	Transmitter Power Spectral Density	< 8 dBm / 3 kHz		C
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	C
15.207	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203 limits	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB 558074 D01 DTS Meas. Guidance v03r02 and KDB 662911 D01 v02r01 for the measure-and-sum technique. And ANSI C63.10-2009 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing

4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

4.3 General test procedures

Conducted Emissions

The EUT is placed on a non-conductive table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15MHz and 30MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

The EUT is placed on a non-conductive table. The turn table shall rotate360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axis.

4.4 Description of test modes

A test program is used to control the EUT for staying in continuous transmitting mode.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 Facilities

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935 The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number: 165783

6.2 Equipment

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. ANTENNA REQUIREMENTS

7.1 According to FCC 47 CFR §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The internal antenna is permanently attached using an adhesive and the external antenna uses an unique connector.(Refer to Internal Photo.)

7.2 Directional antenna gain(worst case):

Bands	ANT 1 [dBi]	ANT 2 [dBi]	Directional Gain [dBi]
2.4 GHz	5.950	-0.200	6.419

Note 1. Directional gain(correlated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G_1/20} + 10^{G_2/20} + \ldots + 10^{G_N/20})^2 / N^{ANT}] \, dBi$$

8. TEST RESULT

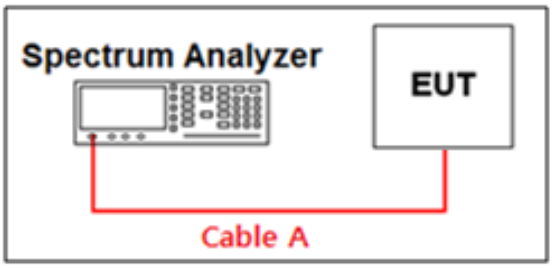
8.1 6dB bandwidth

▣ Test Requirements and limit, §15.247(a)

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣ Test Configuration



▣ Test Procedure: *KDB 558074 D01*

1. Set resolution bandwidth (RBW) = 100 kHz & video bandwidth (VBW) ≥ 3 x RBW. **(RBW: 100kHz & VBW: 300 kHz)**
2. Detector = **Peak**.
3. Trace mode = **max hold**.
4. Sweep = **auto couple**.
5. Allow the trace to stabilize.
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

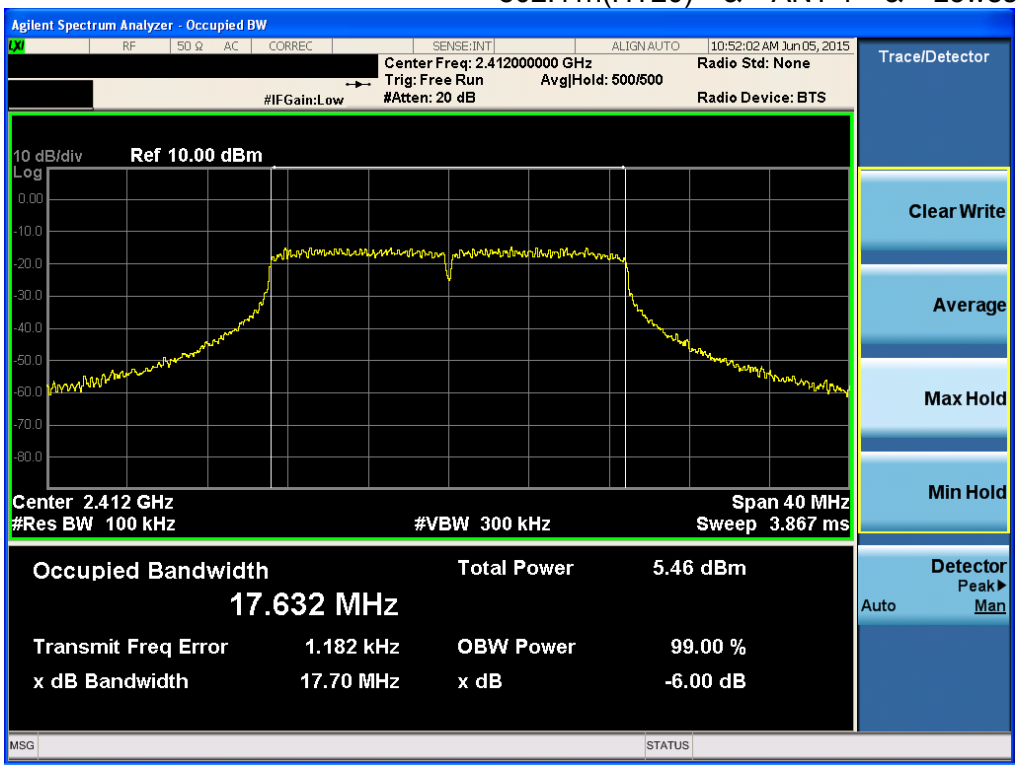
▣ Test Results: Comply

Test Mode	Frequency	Test Results[MHz]	
		ANT 1	ANT 2
802.11n(HT20)	Lowest	17.700	17.770
	Middle	17.720	17.780
	Highest	17.690	17.750

▣ Result Plots

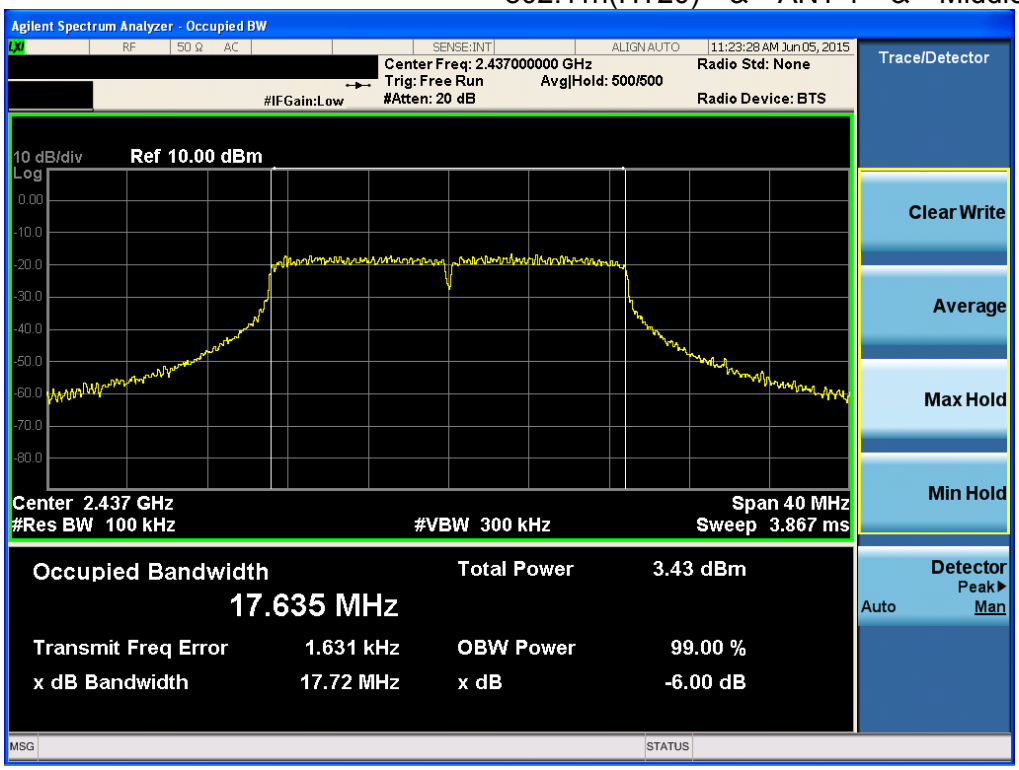
6 dB Bandwidth

802.11n(HT20) & ANT 1 & Lowest

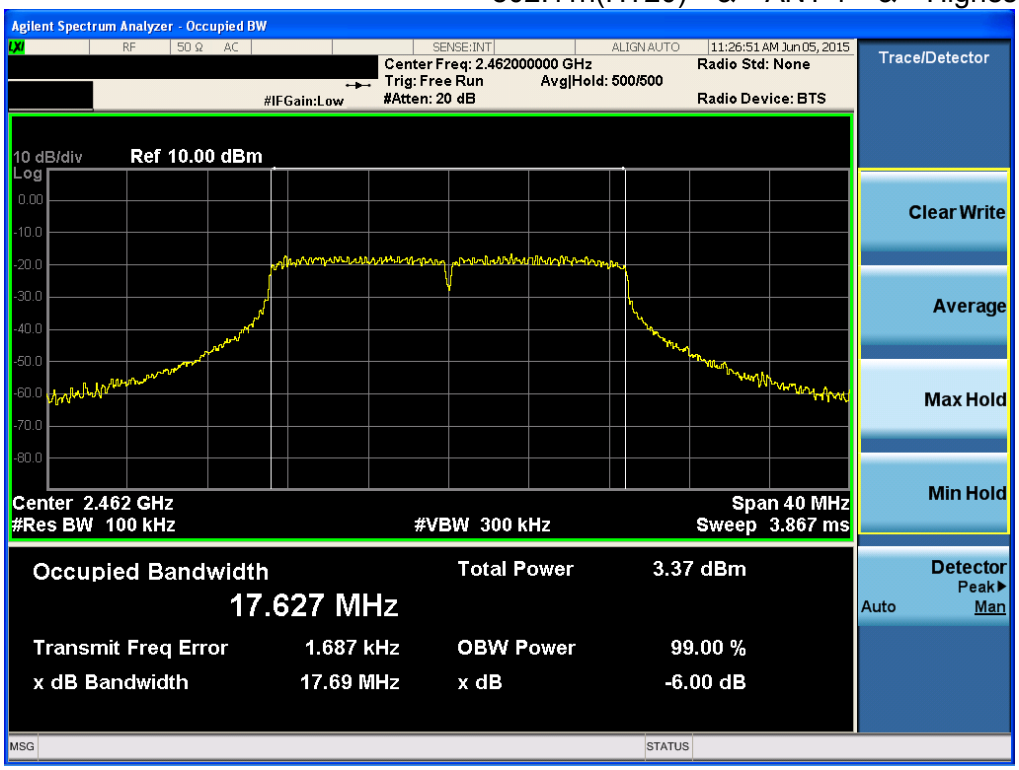


6 dB Bandwidth

802.11n(HT20) & ANT 1 & Middle

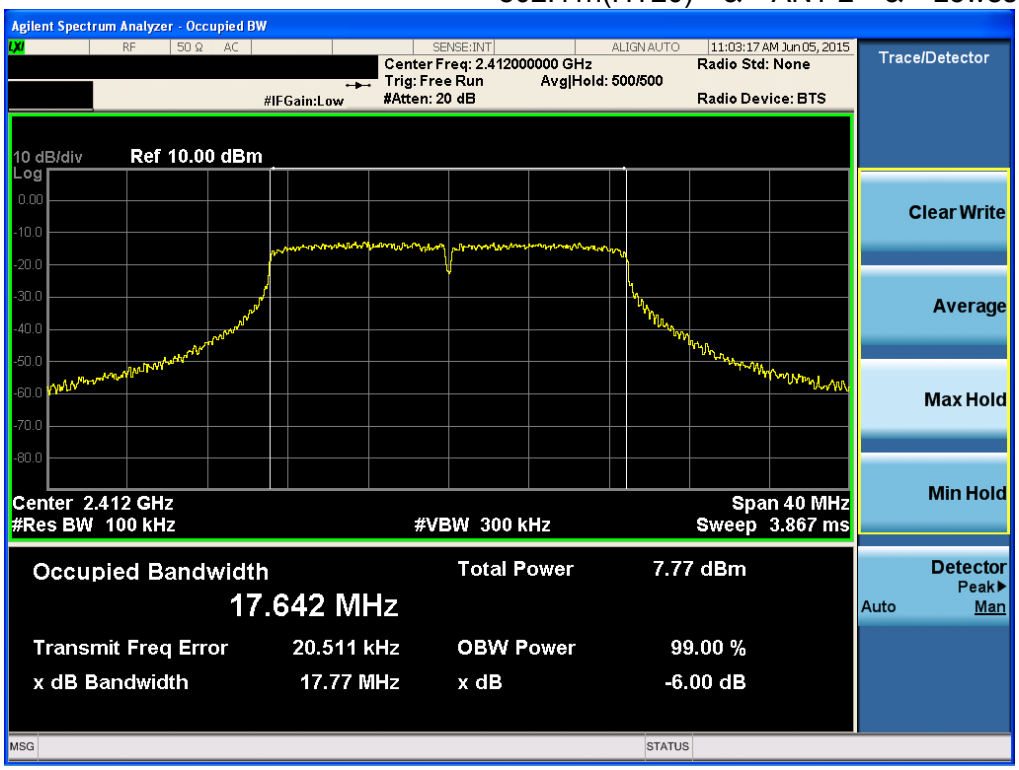


6 dB Bandwidth 802.11n(HT20) & ANT 1 & Highest



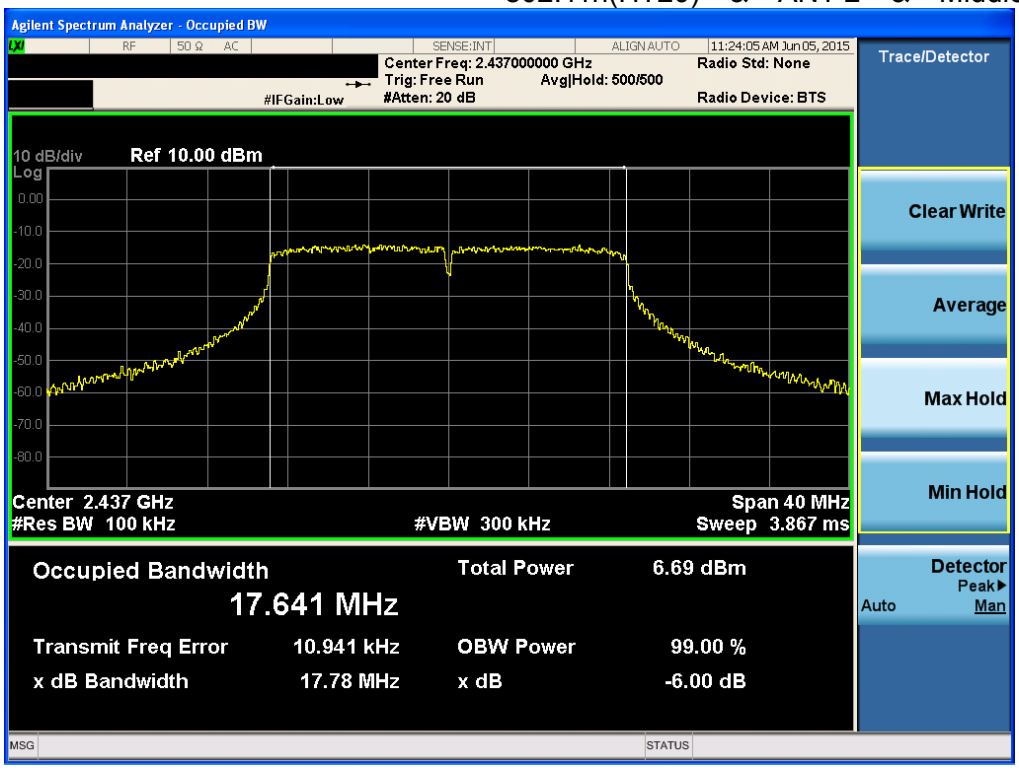
6 dB Bandwidth

802.11n(HT20) & ANT 2 & Lowest

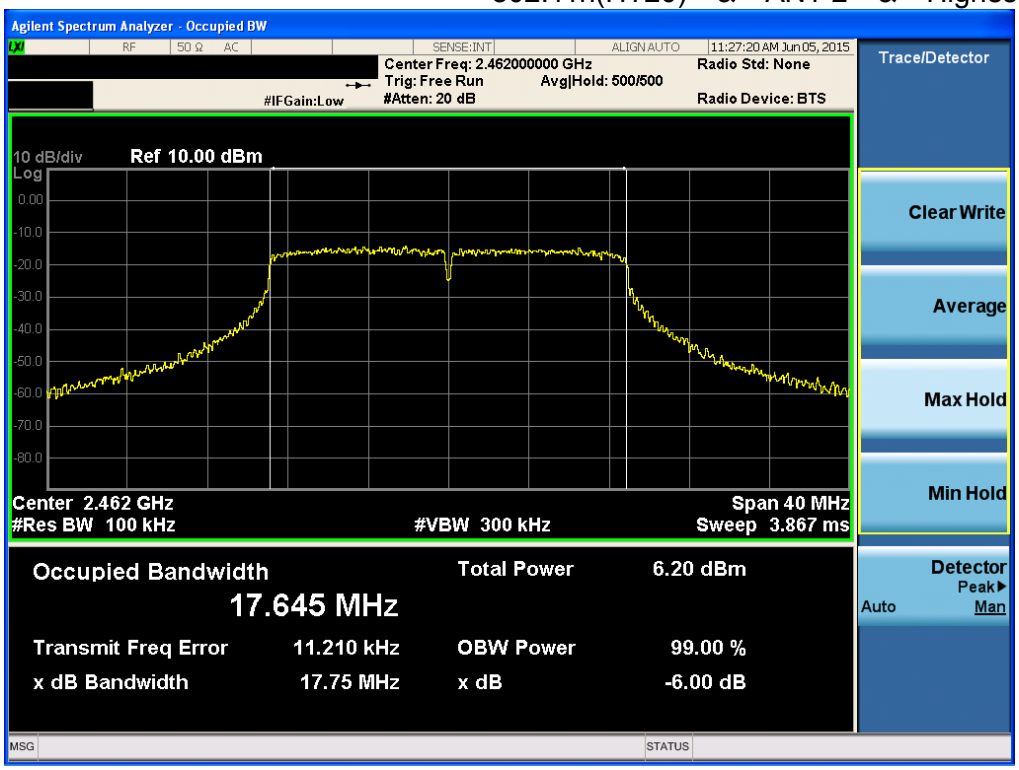


6 dB Bandwidth

802.11n(HT20) & ANT 2 & Middle



6 dB Bandwidth 802.11n(HT20) & ANT 2 & Highest

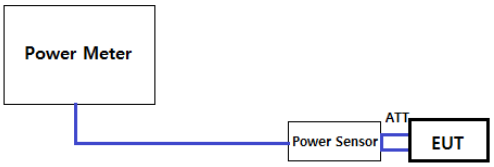


8.2 Maximum peak conducted output power

▣ Test Requirements and limit, §15.247(b)

The maximum permissible conducted output power is **1 Watt**.

▣ Test Configuration



▣ Test Procedure: *KDB 558074 D01*

1. **PKPM1 Peak power meter method**

   The maximum conducted output powers were measured using a broadband peak RF power meter which has greater video bandwidth than DUT's DTS bandwidth and utilize a fast-responding diode detector.

2. **Method AVGPM-G (Measurement using a gated RF average power meter)**

   The average conducted output powers were measured using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

Note: The measure-and-sum technique is used for test mode with multiple transmitting.

▣ Test Results: Comply

- **Single transmitting**

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for *802.11n(HT20)*							
			Modulation and Coding Scheme [MCS]							
			0	1	2	3	4	5	6	7
ANT 1	2412	PK	6.253	6.168	6.179	6.222	6.178	6.168	6.169	6.187
		AV	-2.124	-2.157	-2.182	-2.205	-2.197	-2.208	-2.172	-2.192
	2437	PK	6.224	6.165	6.147	6.142	6.134	6.118	6.161	6.152
		AV	-2.721	-2.771	-2.800	-2.787	-2.826	-2.787	-2.832	-2.795
	2462	PK	5.558	5.532	5.489	5.475	5.533	5.498	5.496	5.515
		AV	-3.401	-3.498	-3.473	-3.506	-3.465	-3.478	-3.490	-3.468
ANT 2	2412	PK	11.852	11.778	11.759	11.783	11.790	11.808	11.794	11.786
		AV	1.400	1.283	1.282	1.306	1.301	1.327	1.312	1.311
	2437	PK	10.412	10.305	10.378	10.343	10.331	10.356	10.328	10.357
		AV	0.863	0.804	0.797	0.792	0.823	0.830	0.846	0.781
	2462	PK	9.404	9.312	9.330	9.345	9.305	9.345	9.333	9.296
		AV	0.400	0.299	0.311	0.313	0.320	0.306	0.333	0.347

- **Multiple transmitting**

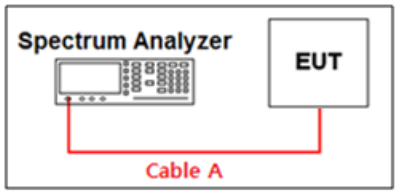
ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for *802.11n(HT20)*							
			Modulation and Coding Scheme [MCS]							
			8	9	10	11	12	13	14	15
ANT 1	2412	PK	**6.352**	6.265	6.274	6.285	6.265	6.258	6.264	6.264
		AV	-2.044	-2.104	-2.117	-2.111	-2.108	-2.139	-2.111	-2.138
	2437	PK	6.301	6.230	6.239	6.230	6.206	6.208	6.246	6.204
		AV	-2.652	-2.711	-2.708	-2.710	-2.742	-2.722	-2.734	-2.732
	2462	PK	5.644	5.587	5.549	5.575	5.594	5.592	5.590	5.582
		AV	-3.340	-3.411	-3.399	-3.425	-3.393	-3.399	-3.398	-3.415
ANT 2	2412	PK	**11.946**	11.861	11.857	11.883	11.852	11.883	11.889	11.869
		AV	1.467	1.378	1.373	1.393	1.392	1.398	1.396	1.399
	2437	PK	10.488	10.399	10.438	10.407	10.417	10.419	10.388	10.428
		AV	0.954	0.854	0.890	0.886	0.900	0.904	0.896	0.856
	2462	PK	9.461	9.397	9.386	9.411	9.373	9.406	9.391	9.365
		AV	0.457	0.392	0.390	0.372	0.407	0.394	0.383	0.403
Sum (ANT 1+2)	2412	PK	13.004	12.919	12.918	12.940	12.912	12.935	12.941	12.925
	2437	PK	11.891	11.807	11.838	11.813	11.814	11.816	11.804	11.821
	2462	PK	10.970	10.908	10.889	10.914	10.893	10.916	10.905	10.884

8.3 Maximum power spectral density

▣ Test requirements and limit, §15.247(e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

▣ Test Configuration



▣ Test Procedure: *KDB 558074 D01*

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to **1.5 times** the DTS bandwidth.
3. Set the RBW to: **3 kHz** ≤ RBW ≤ **100 kHz**
4. Set the VBW ≥ **3 x RBW**
5. Detector = **peak**
6. Sweep time = **auto couple**
7. Trace mode = **max hold.**
8. Allow trace to fully stabilize.
9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

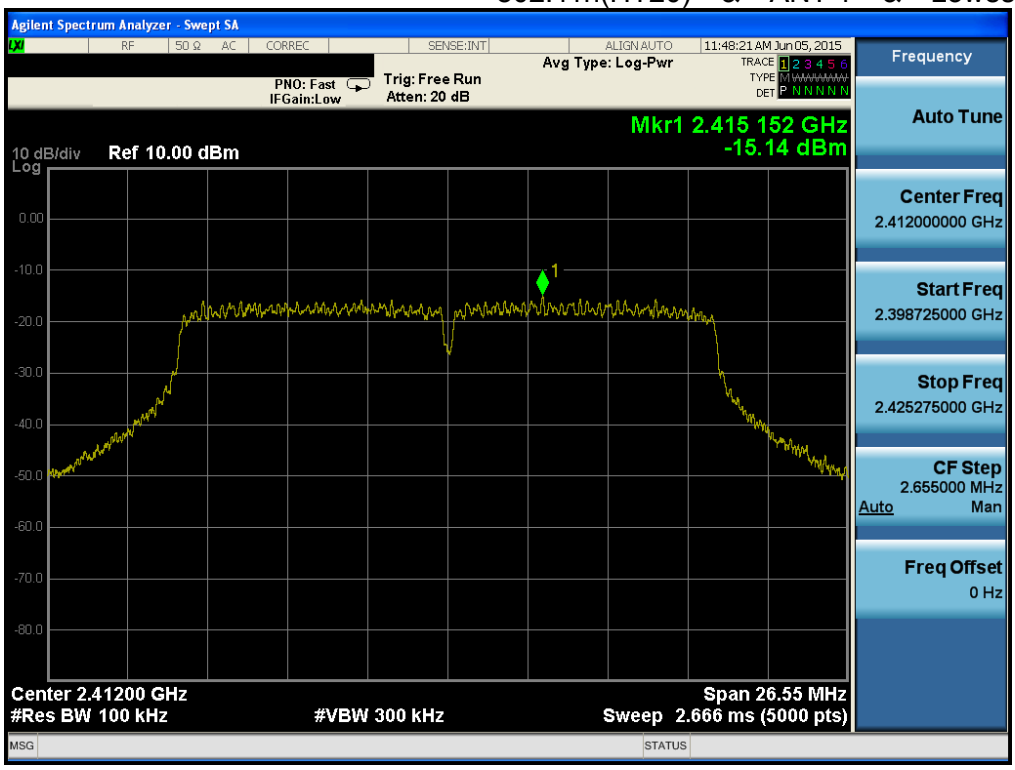
▣ Test Results: Comply

Test Mode	Frequency	RBW	PKPSD [dBm]		
			ANT 1	ANT 2	SUM (ANT 1 + ANT 2)
802.11n(HT20)	Lowest	3 kHz	-15.140	-12.260	-10.456
	Middle	3 kHz	-15.110	-12.620	-10.679
	Highest	3 kHz	-15.730	-13.250	-11.306

▣ Result Plots

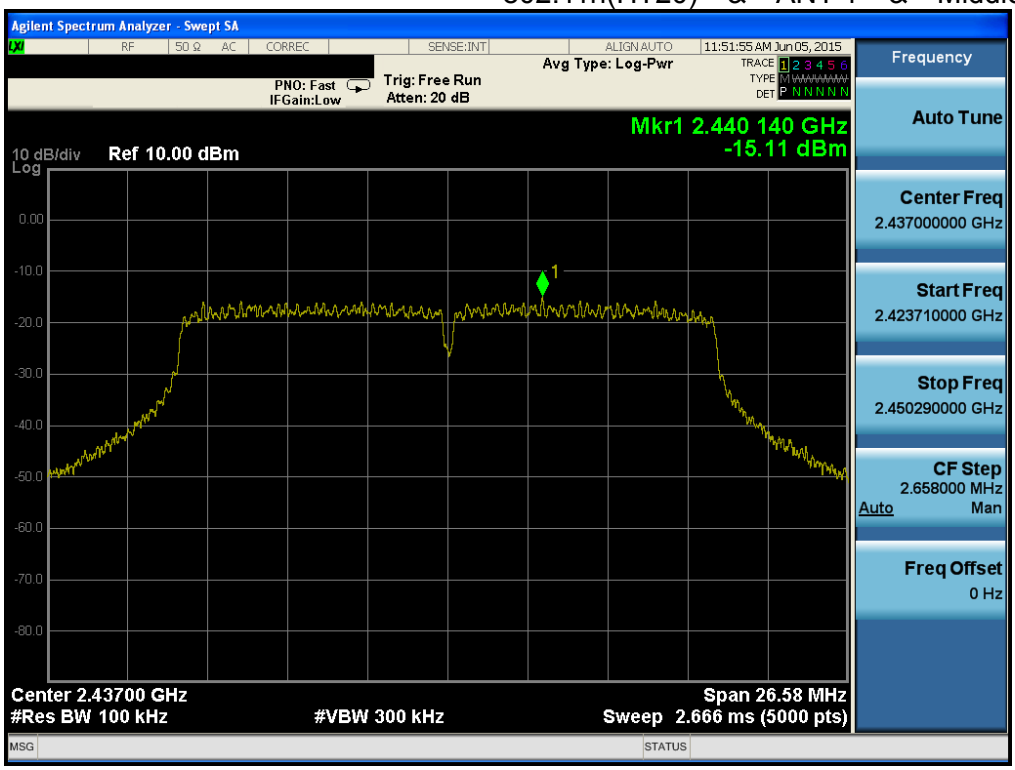
Maximum PPSD

802.11n(HT20) & ANT 1 & Lowest

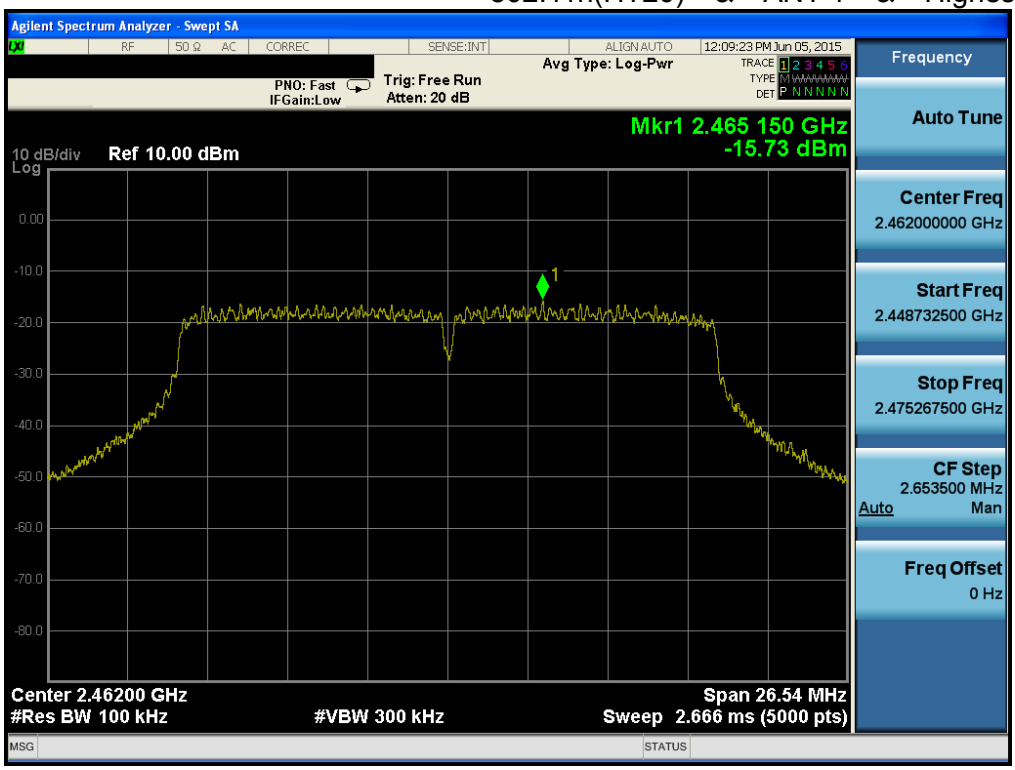


Maximum PPSD

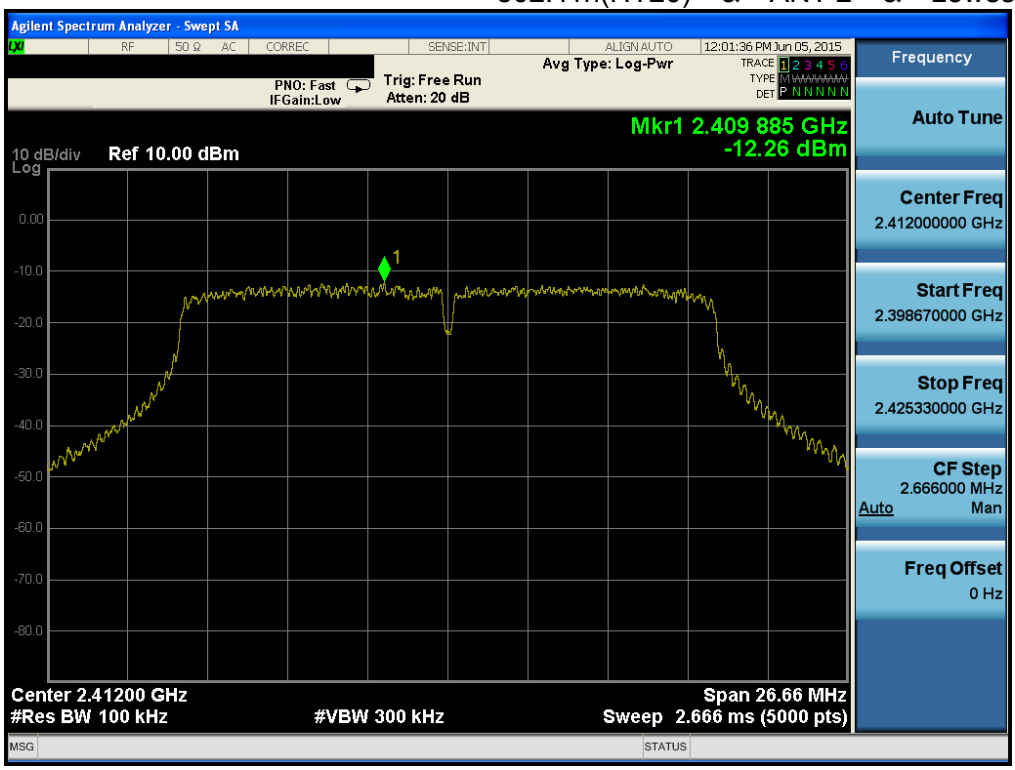
802.11n(HT20) & ANT 1 & Middle



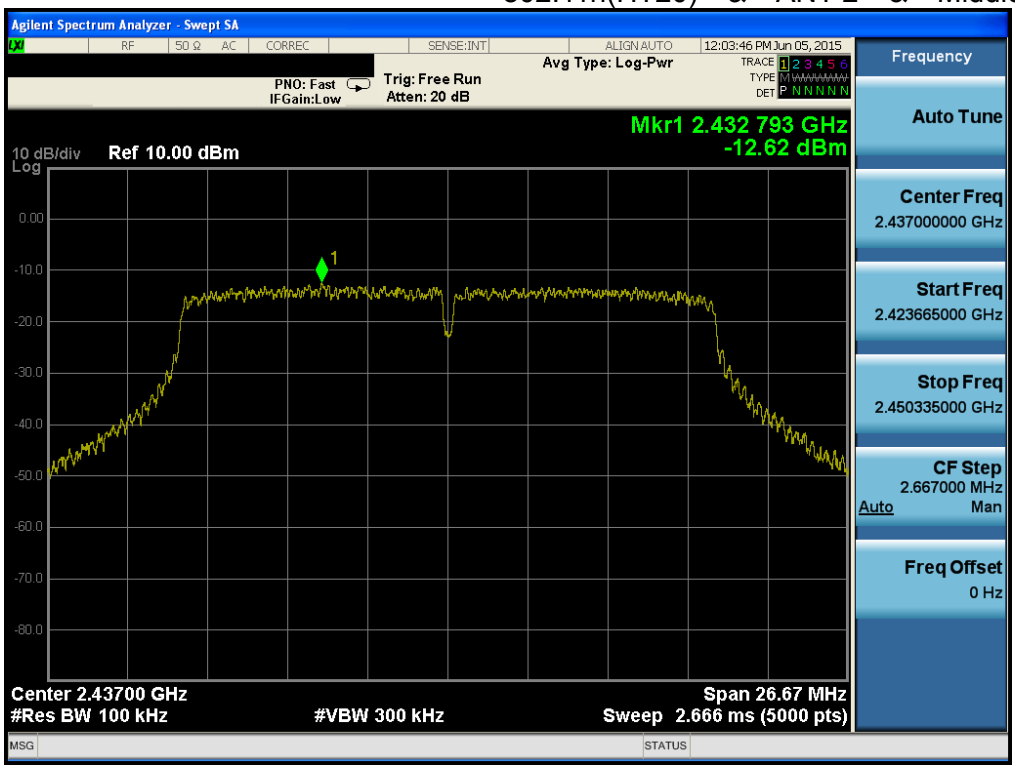
Maximum PPSD 802.11n(HT20) & ANT 1 & Highest



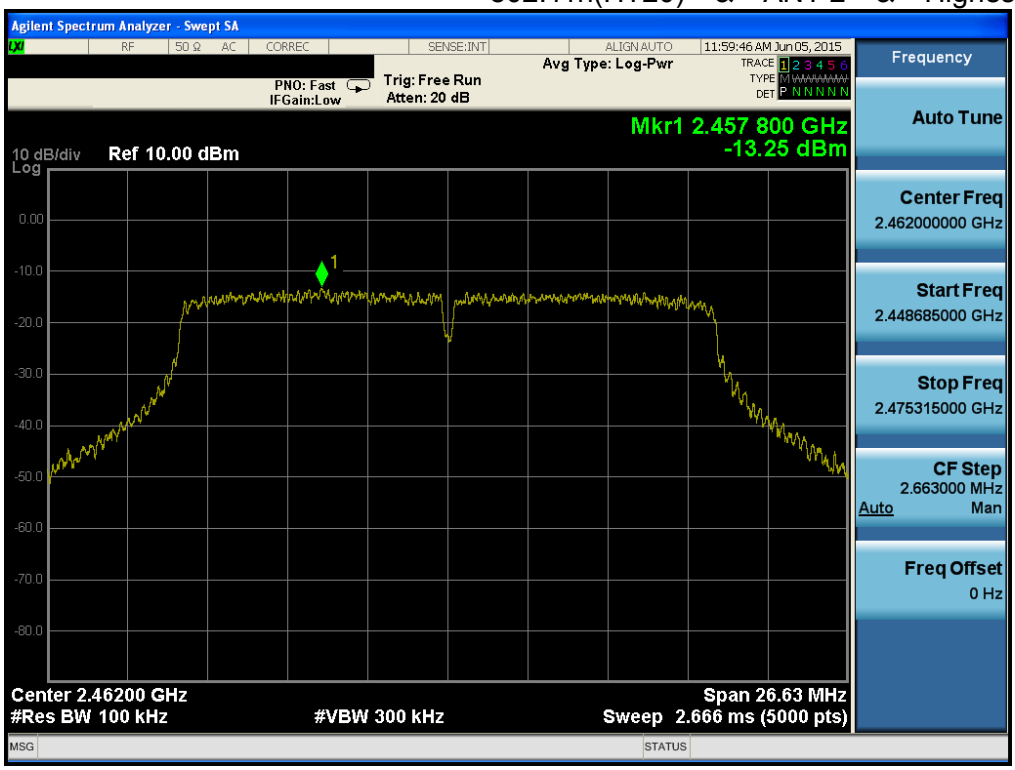
Maximum PPSD 802.11n(HT20) & ANT 2 & Lowest



Maximum PPSD 802.11n(HT20) & ANT 2 & Middle



Maximum PPSD 802.11n(HT20) & ANT 2 & Highest



8.4 Out of band emissions at the band edge / conducted spurious emissions

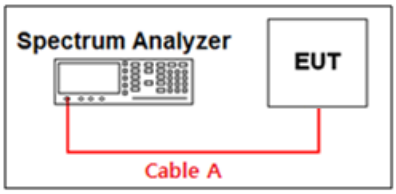
▣ Test requirements and limit, §15.247(d)

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If **the peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in band average PSD level.
In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

▣ Test Configuration



▣ Test Procedure: *KDB 558074 D01*

- Measurement Procedure 1 – Reference Level

1. Set instrument center frequency to DTS channel center frequency.
2. Set the span to ≥ 1.5 times the DTS bandwidth.
3. Set the RBW = 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum PSD level

- Measurement Procedure 2 - Unwanted Emissions

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = **100 kHz for below 1 GHz, 1 MHz for above 1 GHz(Actual 1 MHz , See below note)**
3. Set the VBW ≥ **3 x RBW (Actual 3 MHz, See below note)**
4. Detector = **peak**.
5. Ensure that the number of measurement points ≥ span/RBW
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. **Allow the trace to stabilize** (this may take some time, depending on the extent of the span).
9. Use the peak marker function to determine the maximum amplitude level.

Note: The conducted spurious emission was tested with below settings.

Frequency range: 9 kHz ~ 30 MHz
RBW= 100 kHz, VBW= 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 40001

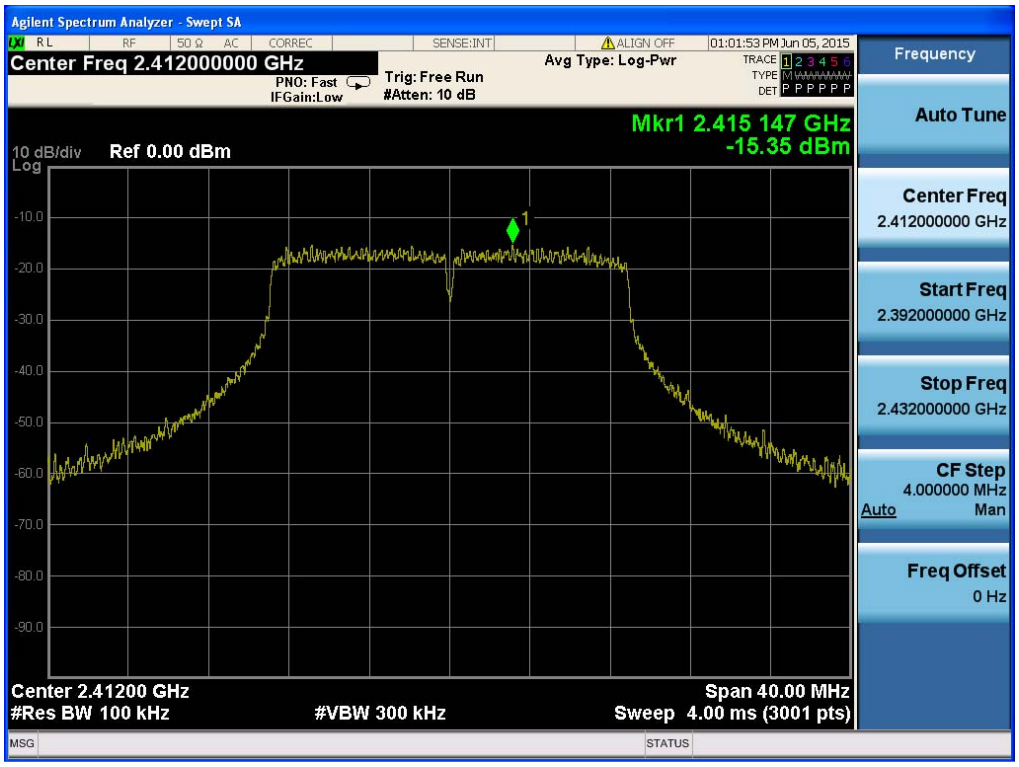
Frequency range: 30 MHz ~ 10 GHz, 10 GHz~25 GHz
RBW= 1MHz, VBW= 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 40001

If the emission level with above setting was close to the limit(less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SAPN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

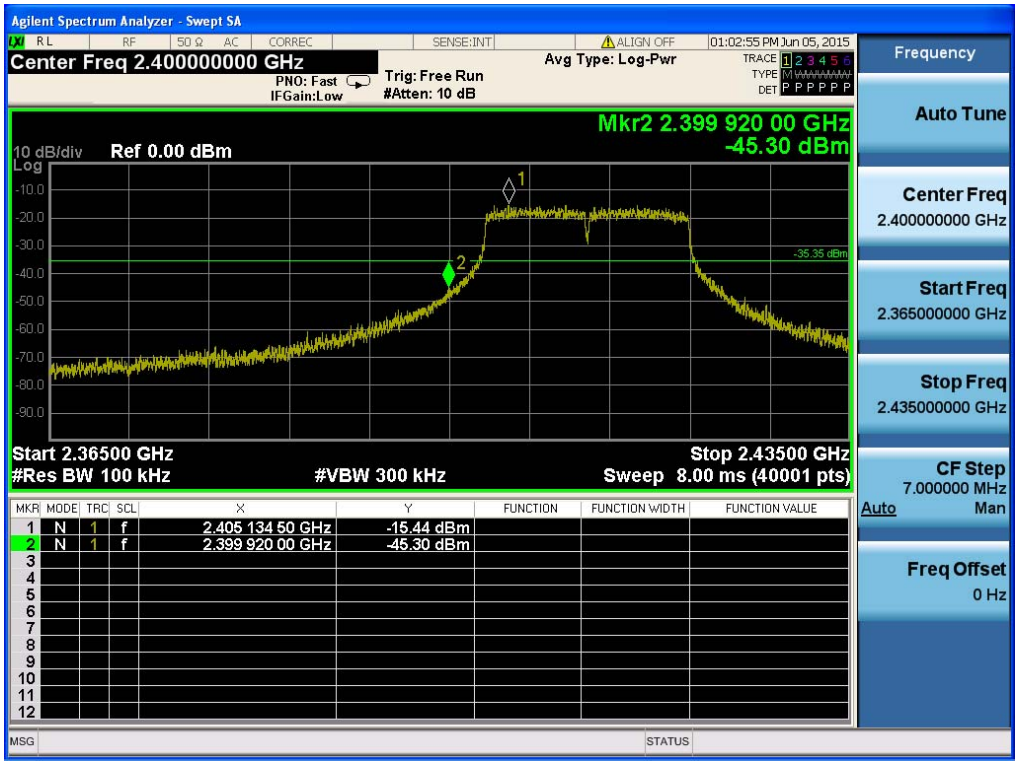
▣ Result Plots

802.11n(HT20) & ANT 1 & Lowest

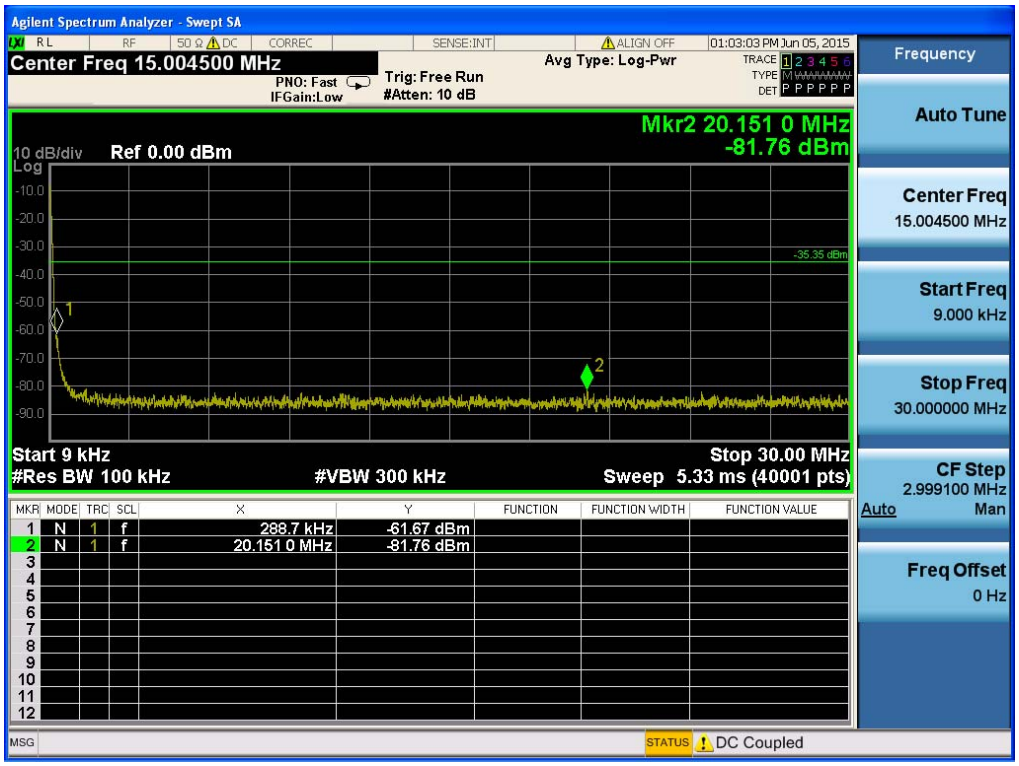
Reference

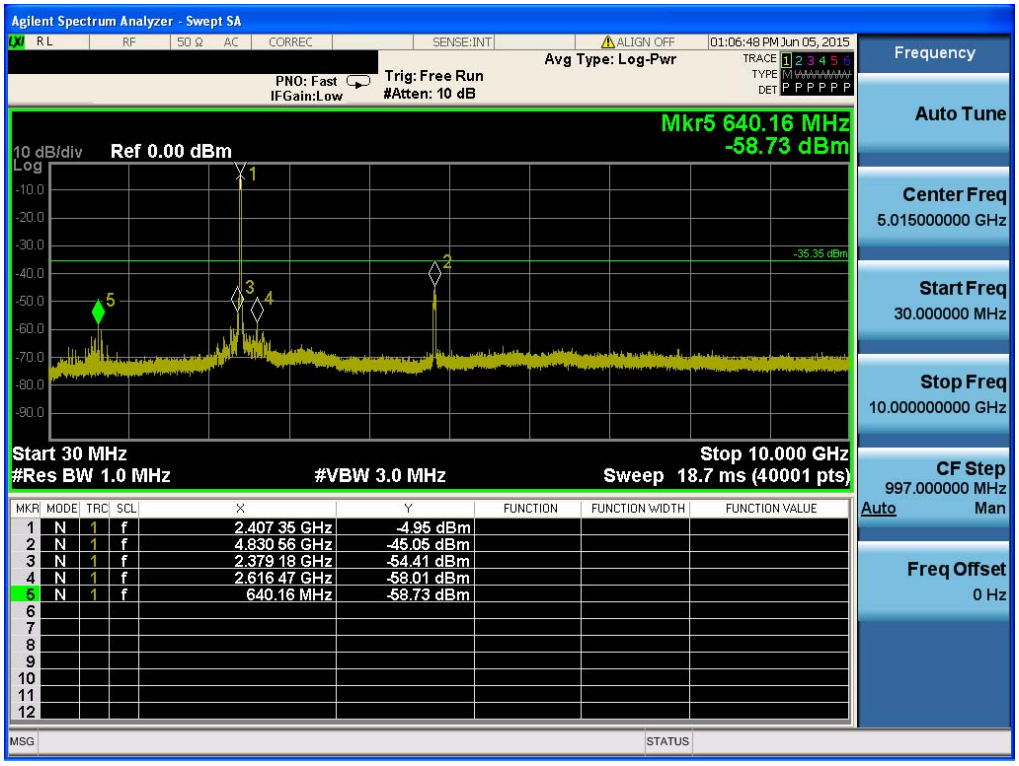


Low Band-edge

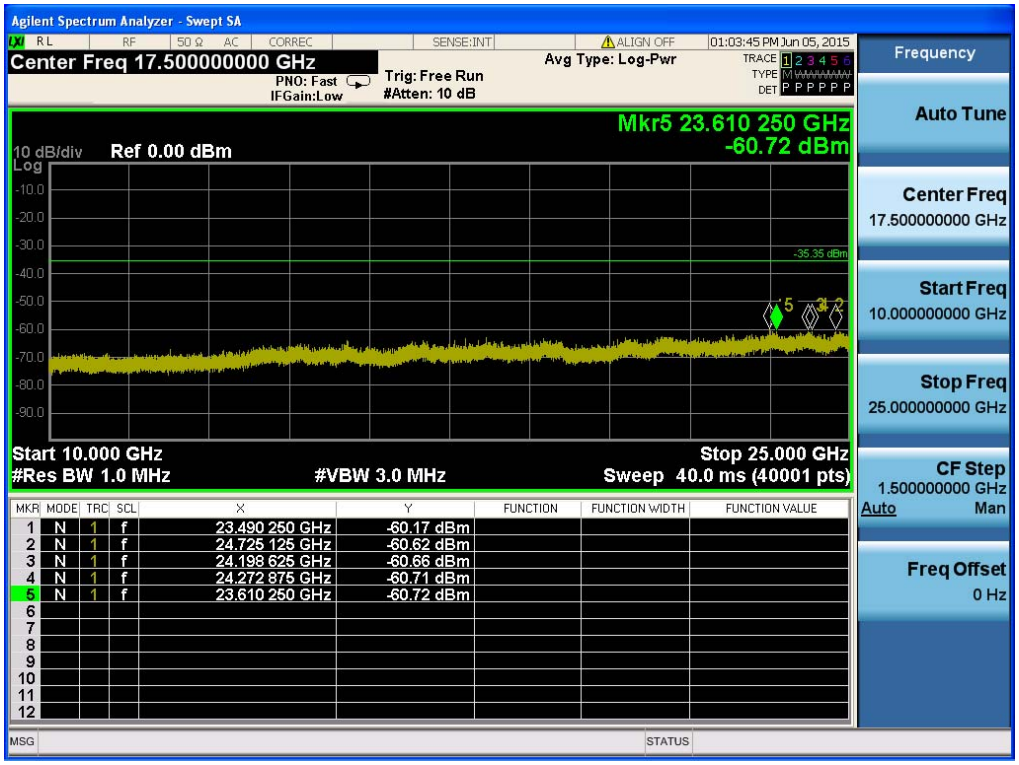


Conducted Spurious Emissions



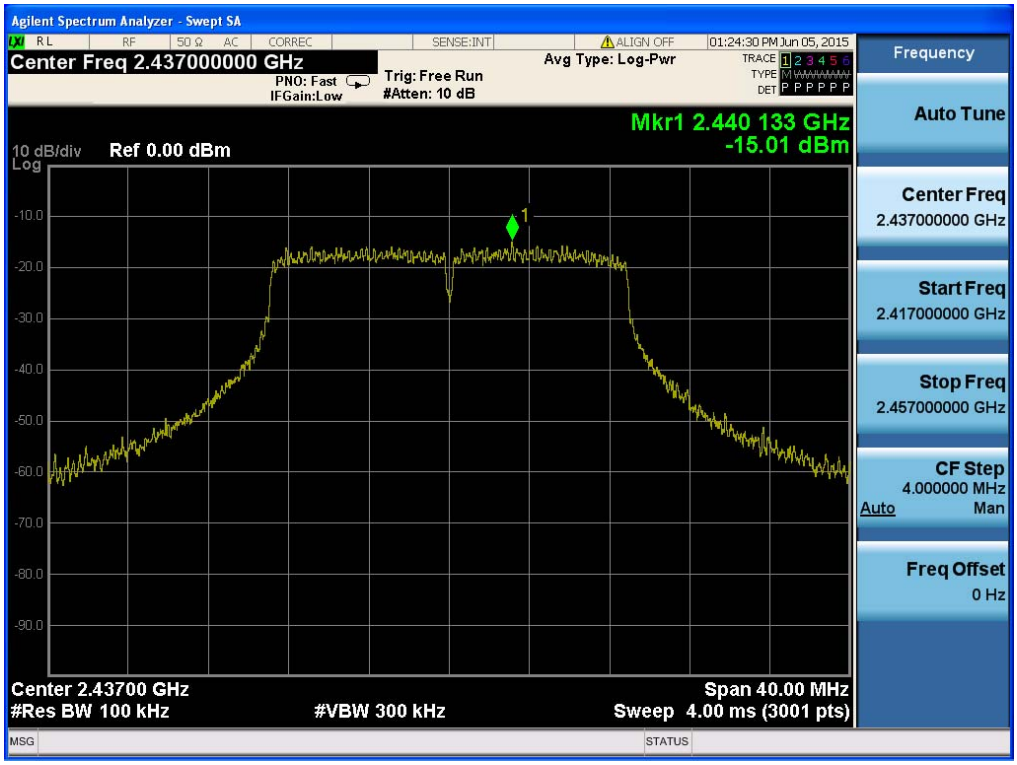


Conducted Spurious Emissions

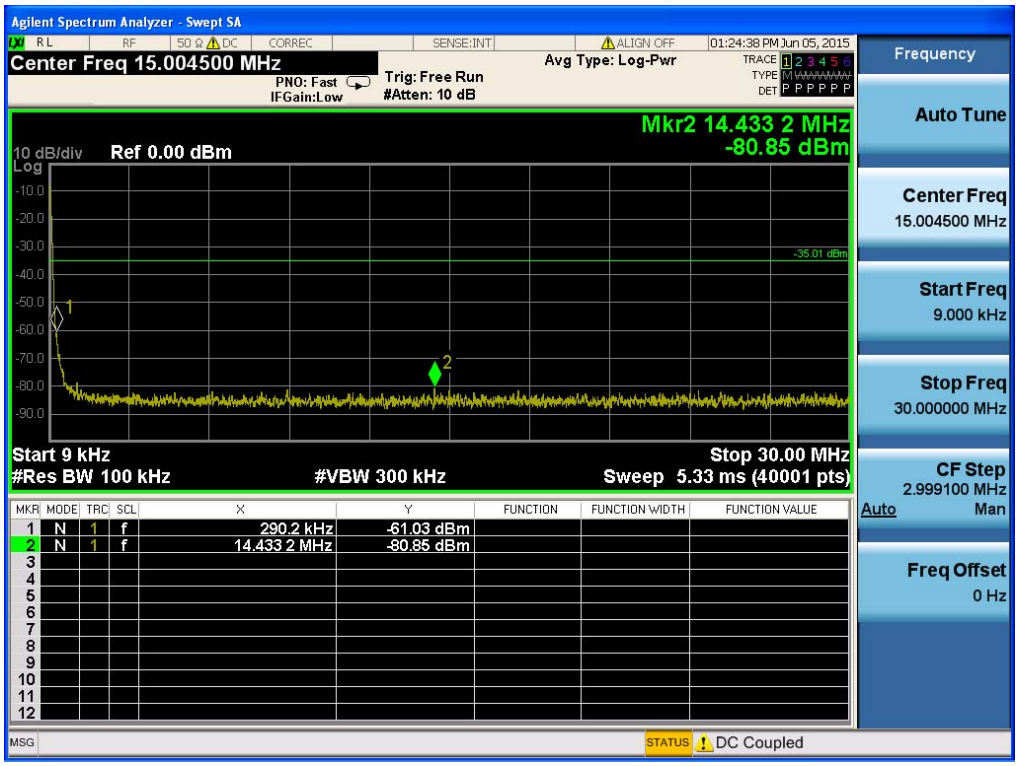


802.11n(HT20) & ANT 1 & Middle

Reference



Conducted Spurious Emissions



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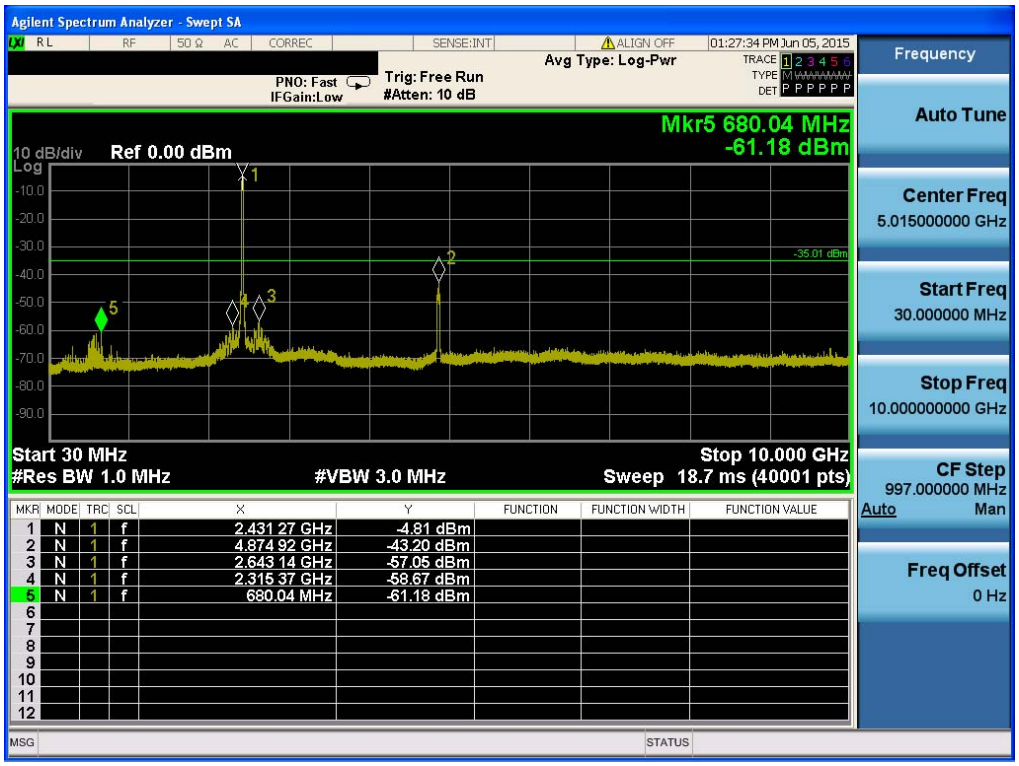
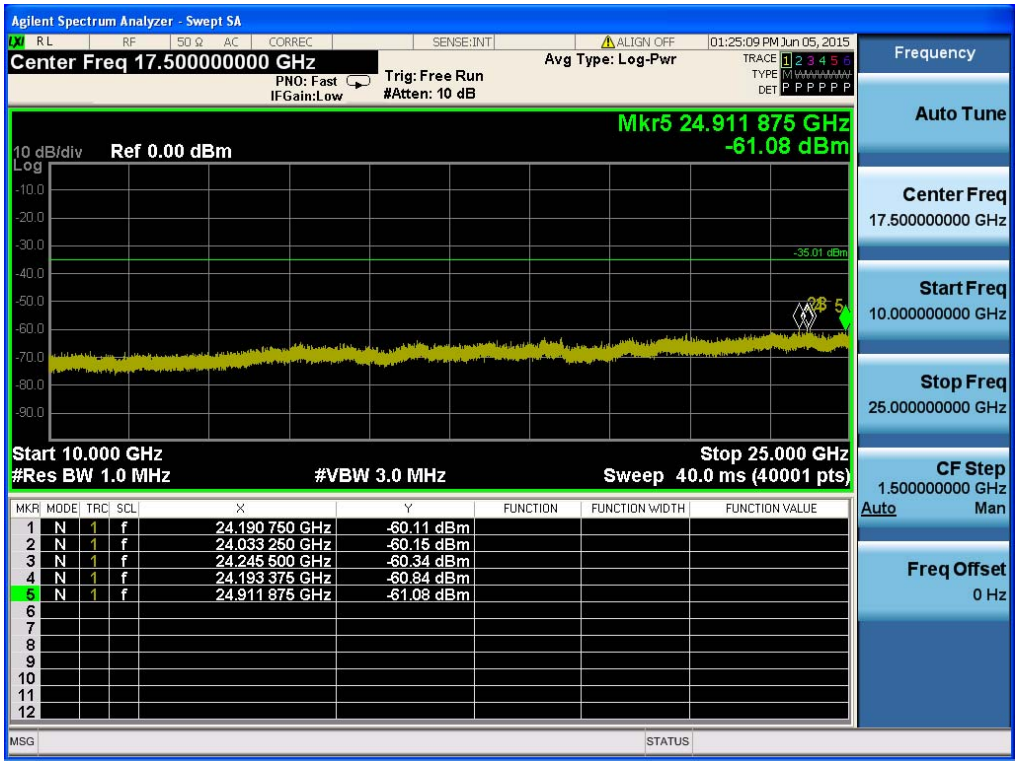
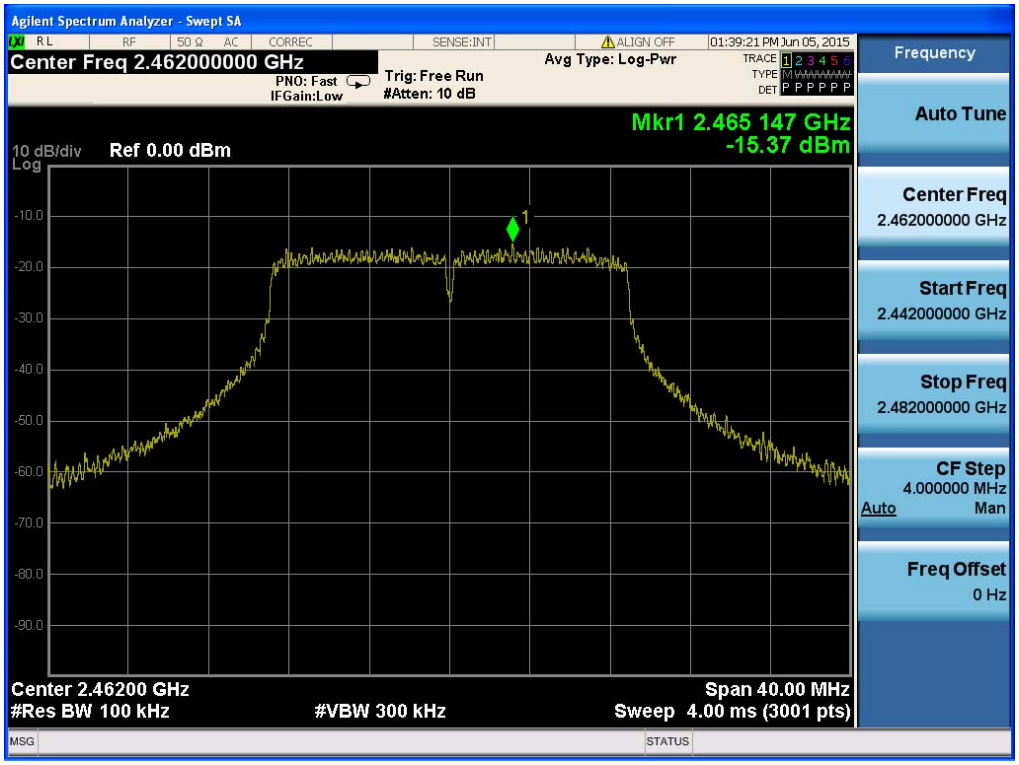


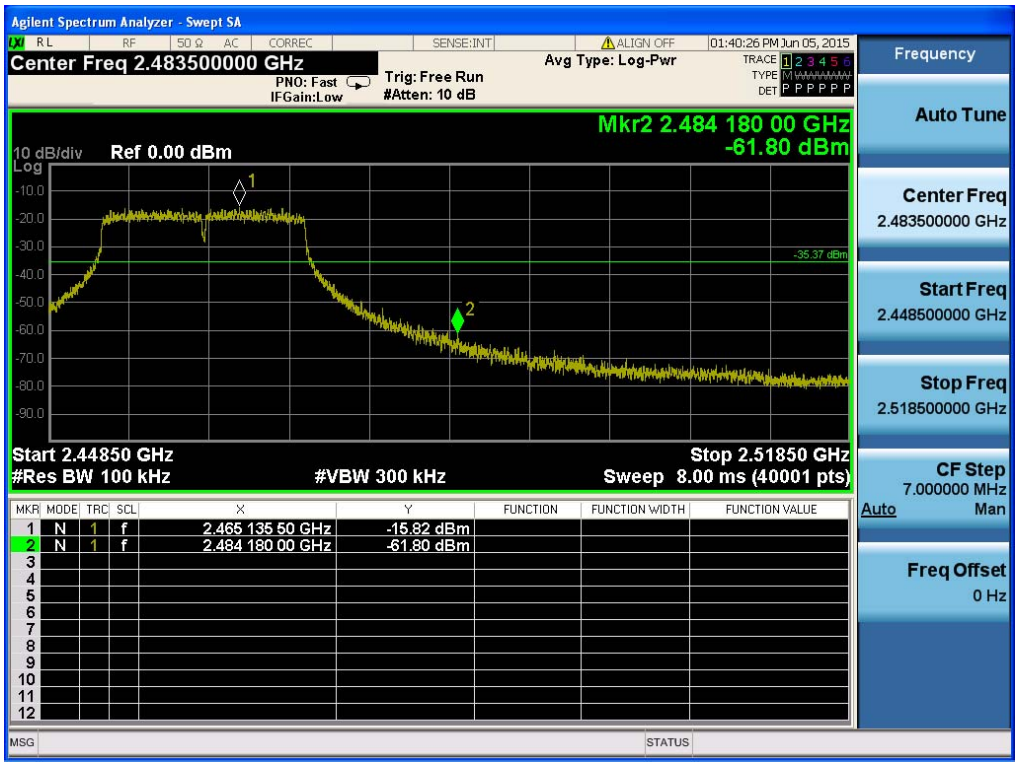


802.11n(HT20) & ANT 1 & Highest

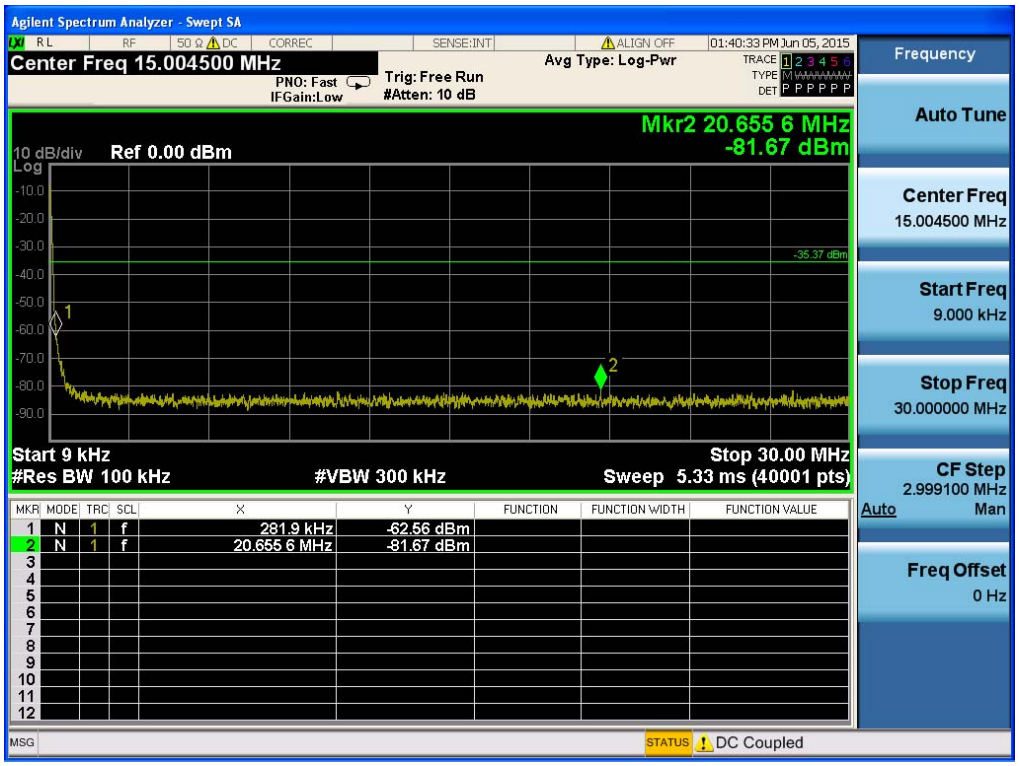
Reference

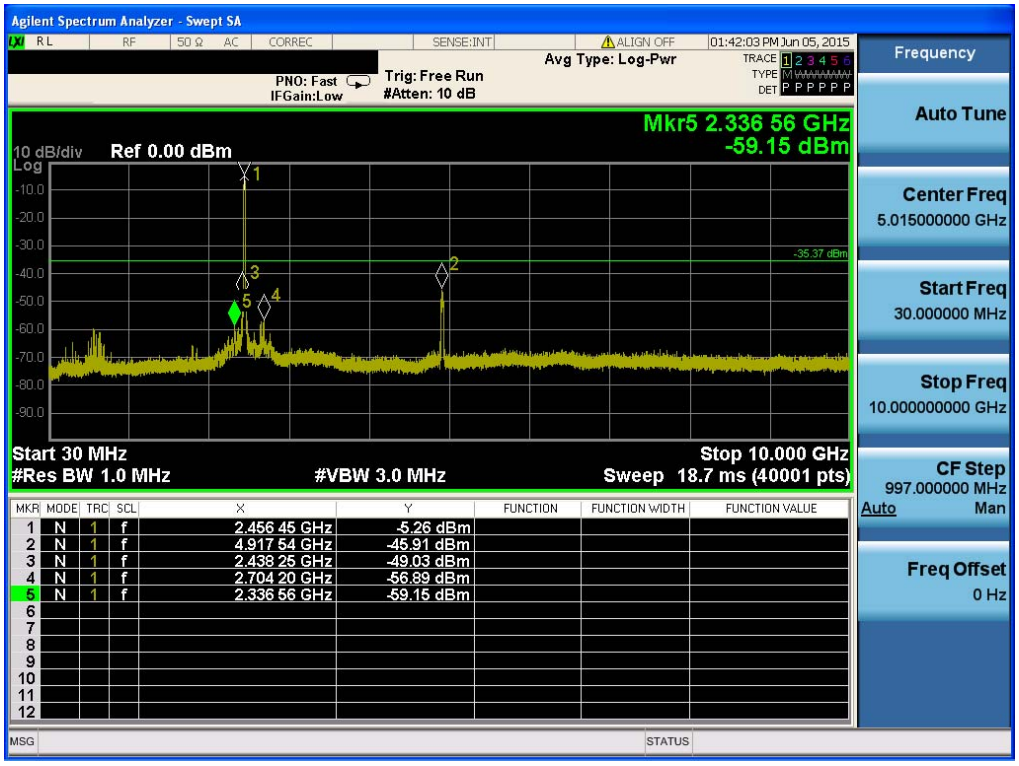


High Band-edge

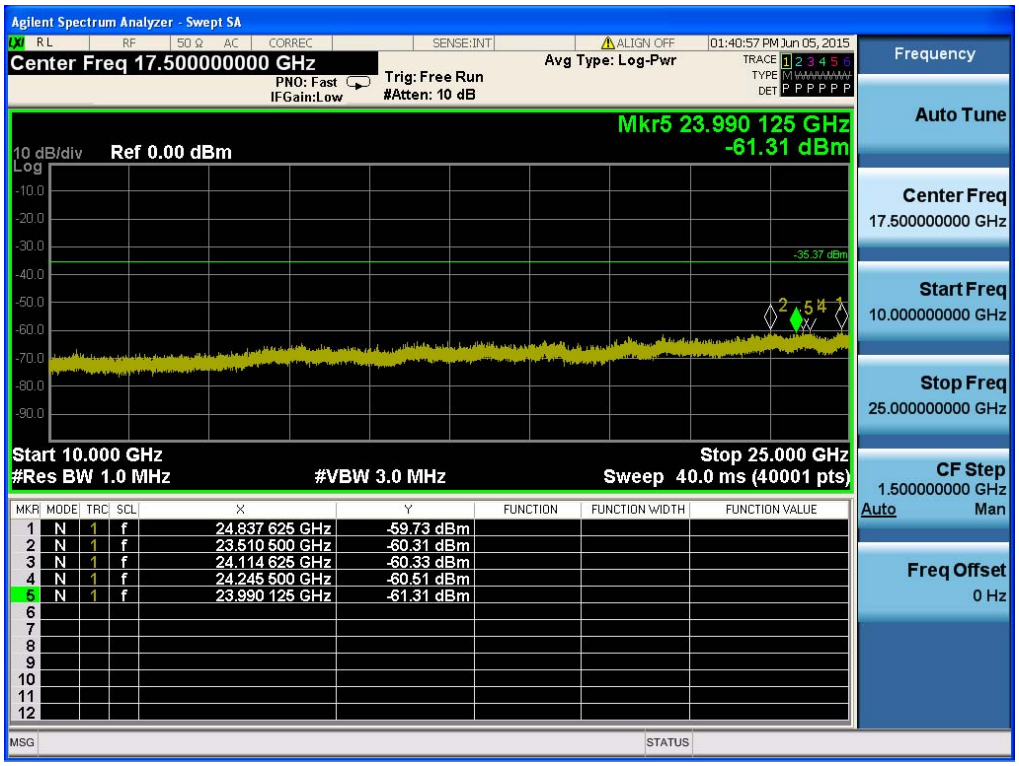


Conducted Spurious Emissions



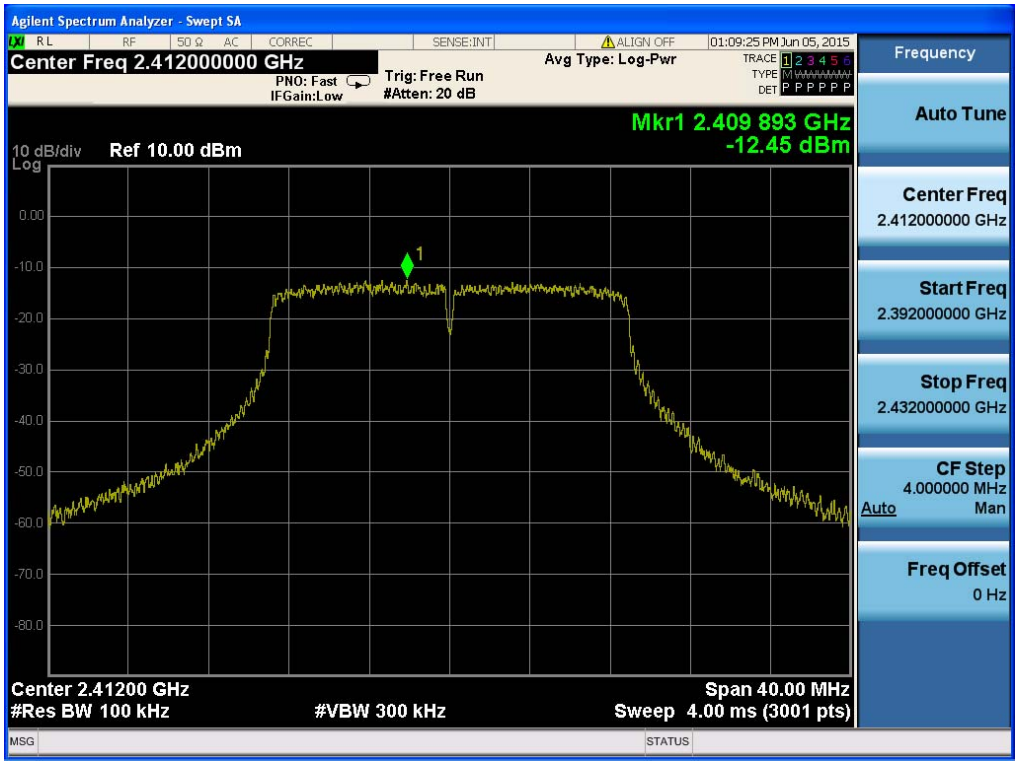


Conducted Spurious Emissions

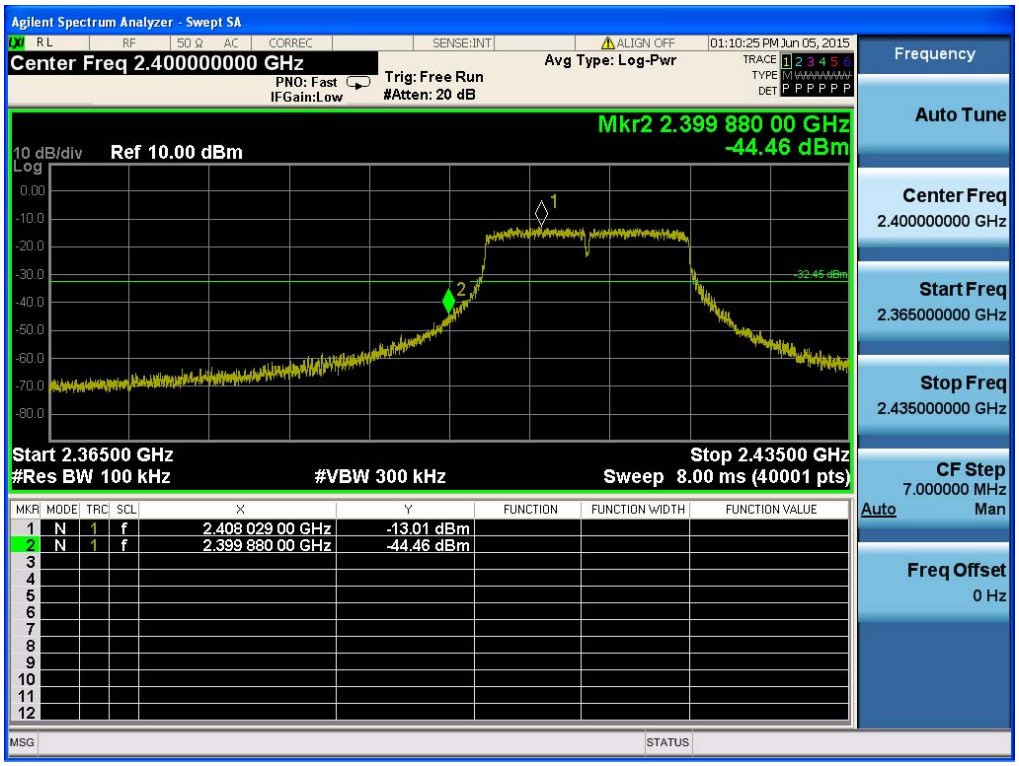


802.11n(HT20) & ANT 2 & Lowest

Reference



Low Band-edge



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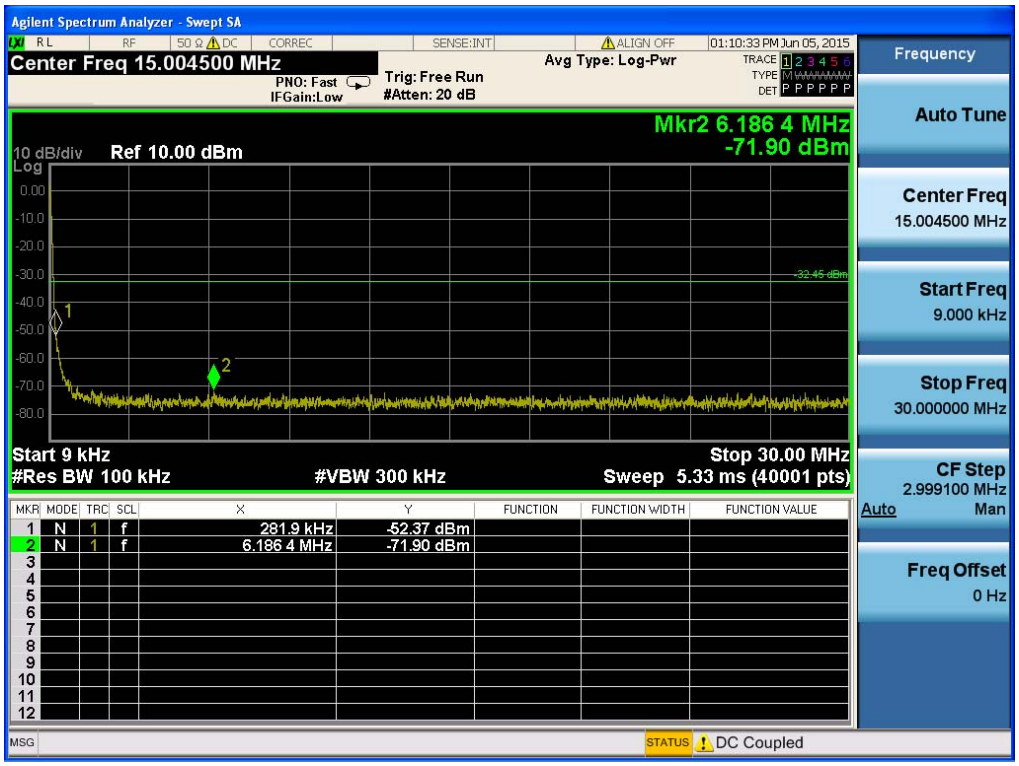

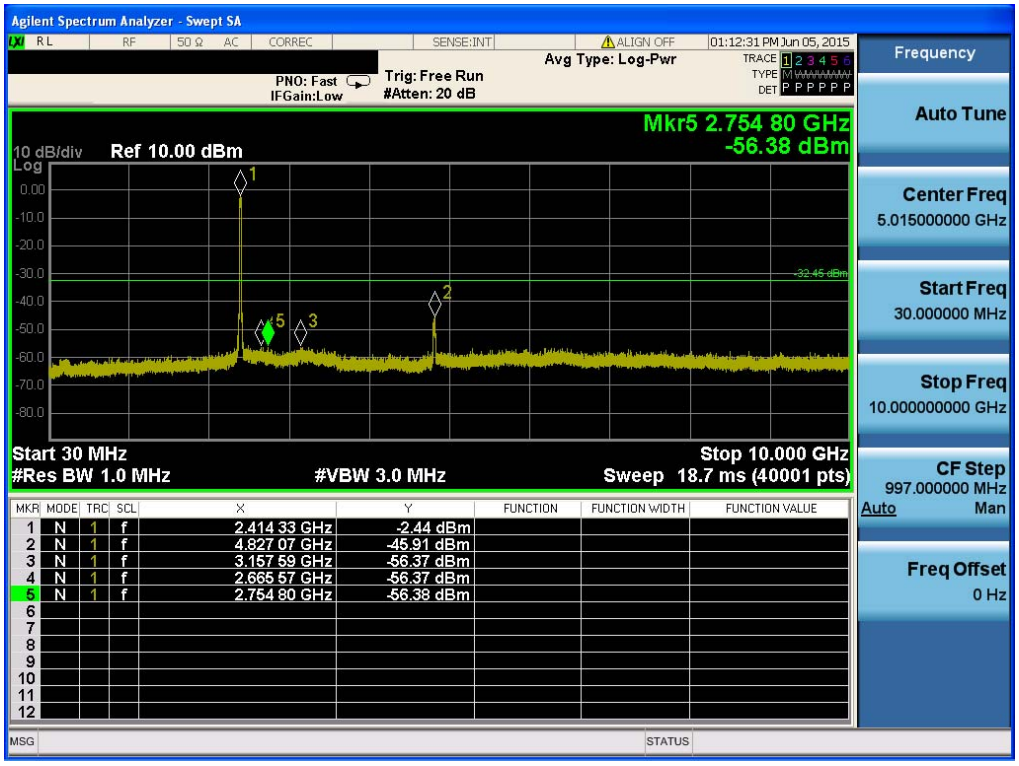

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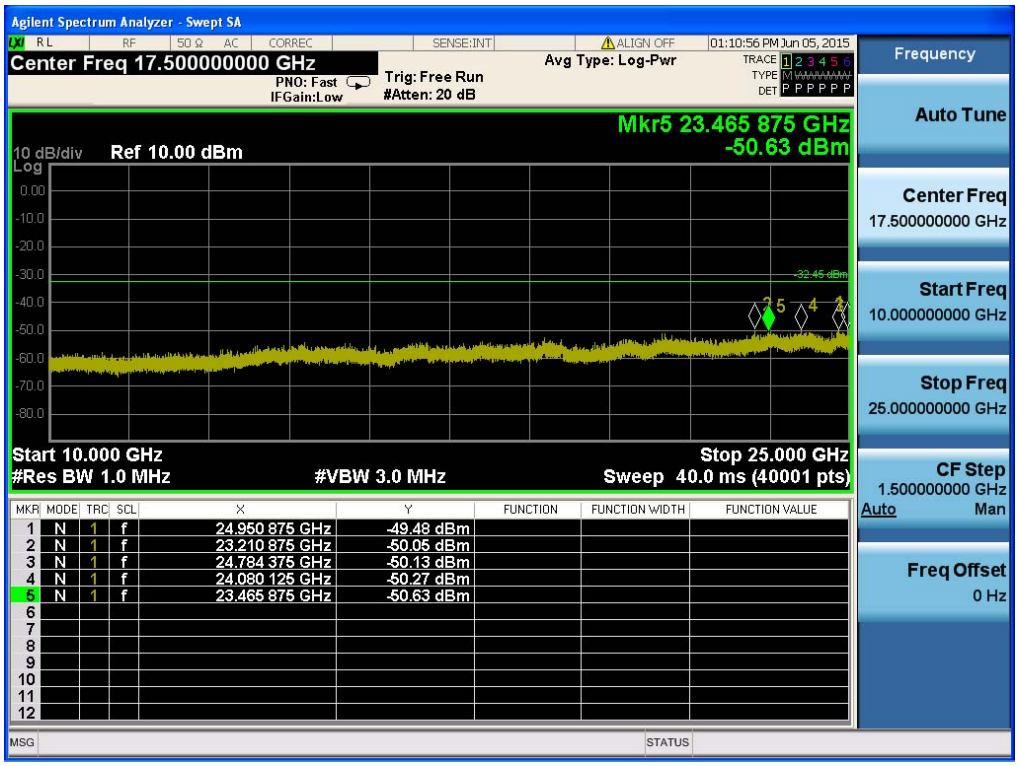
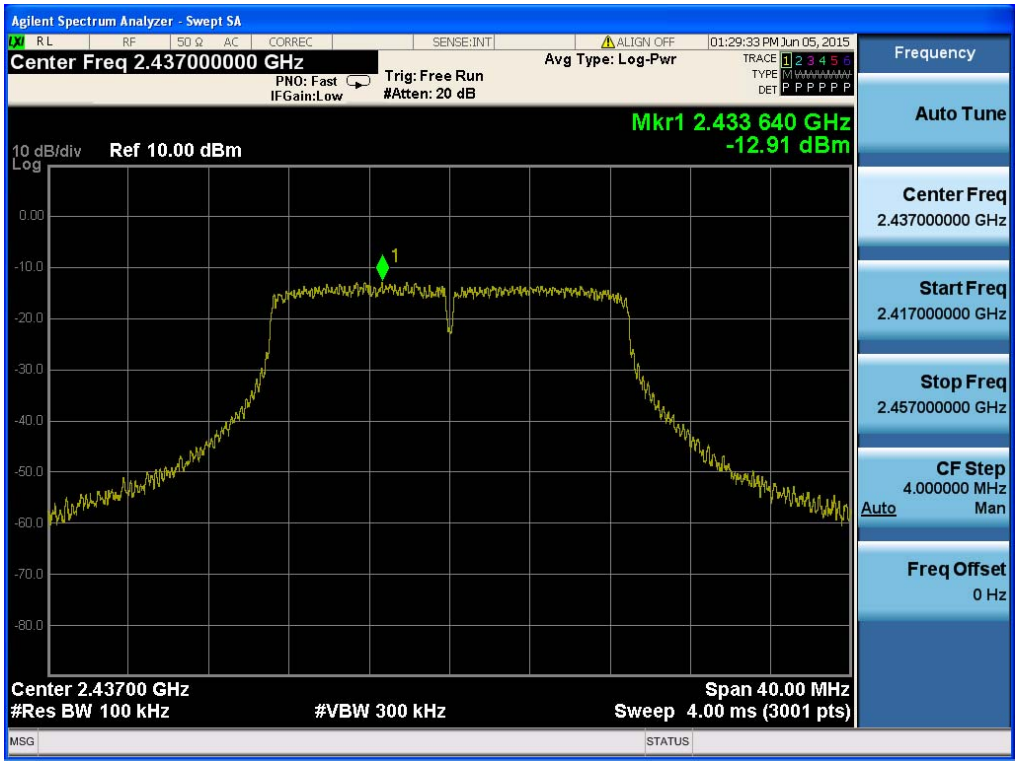


802.11n(HT20) & ANT 2 & Middle

Reference



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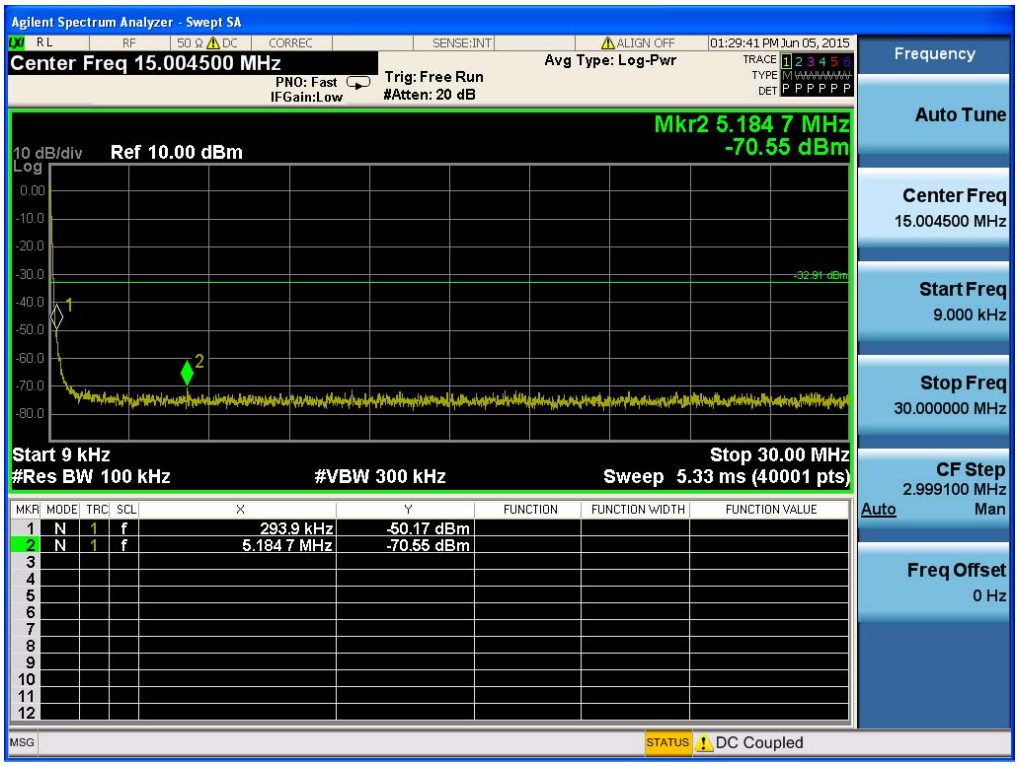

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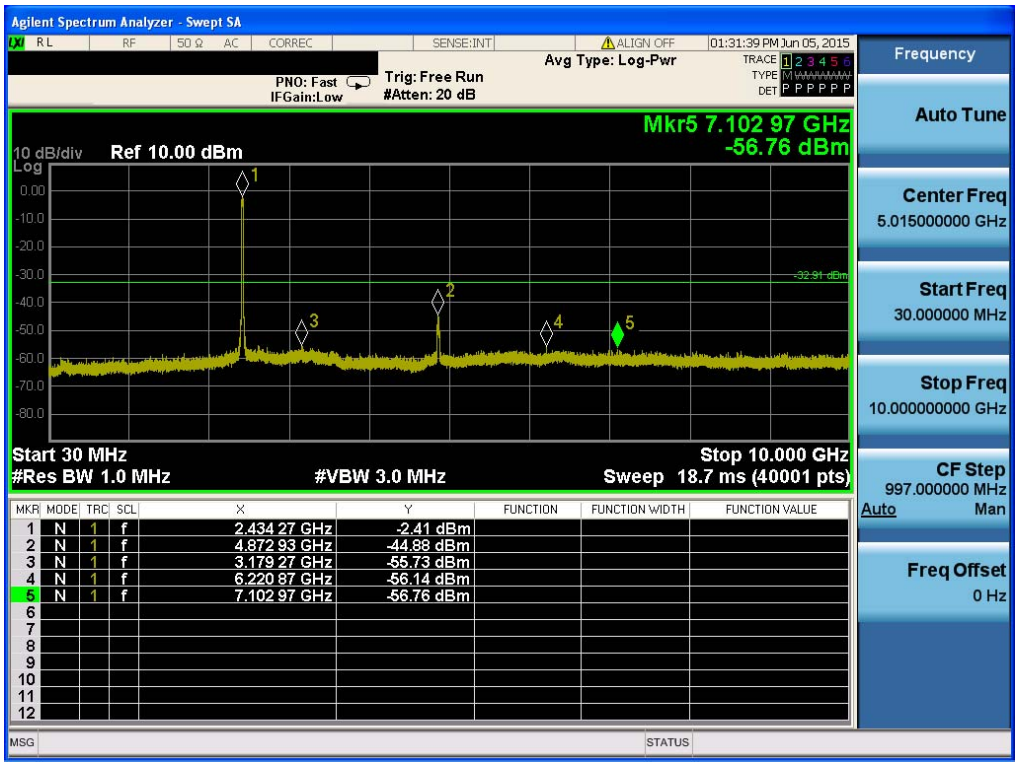
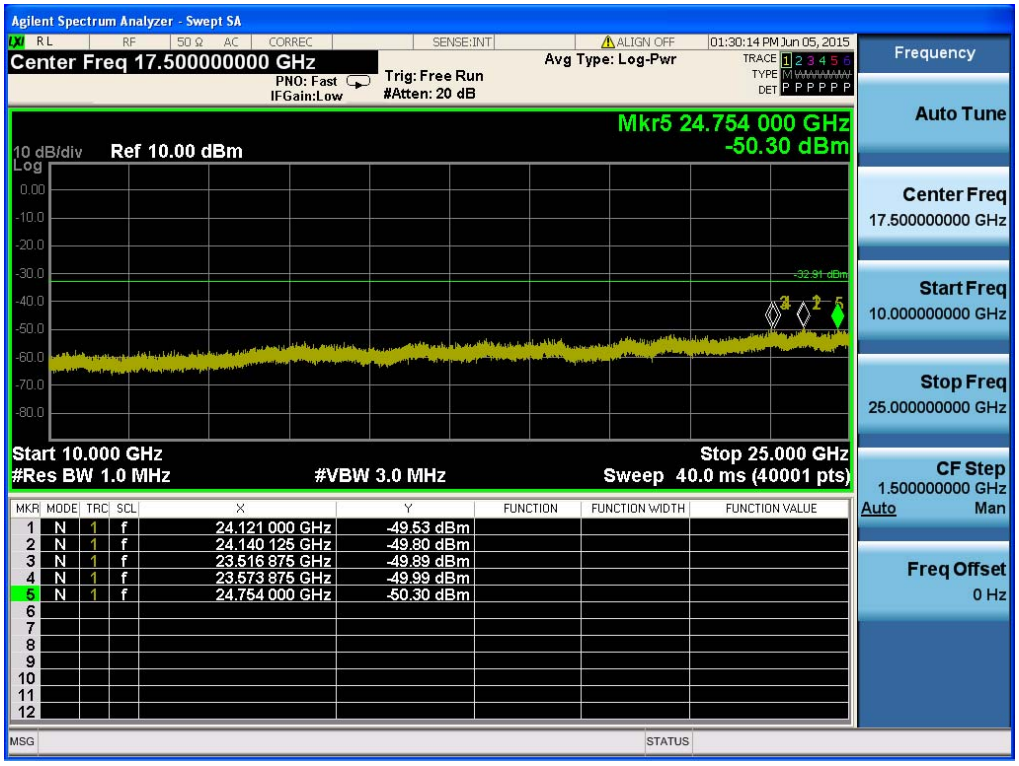
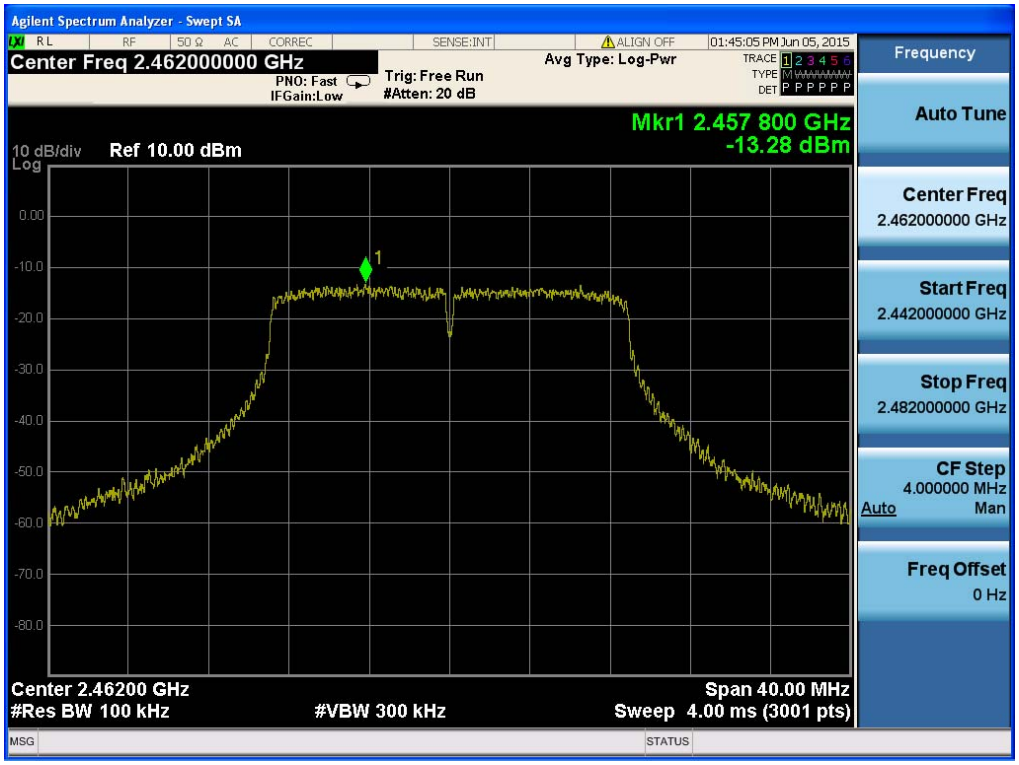


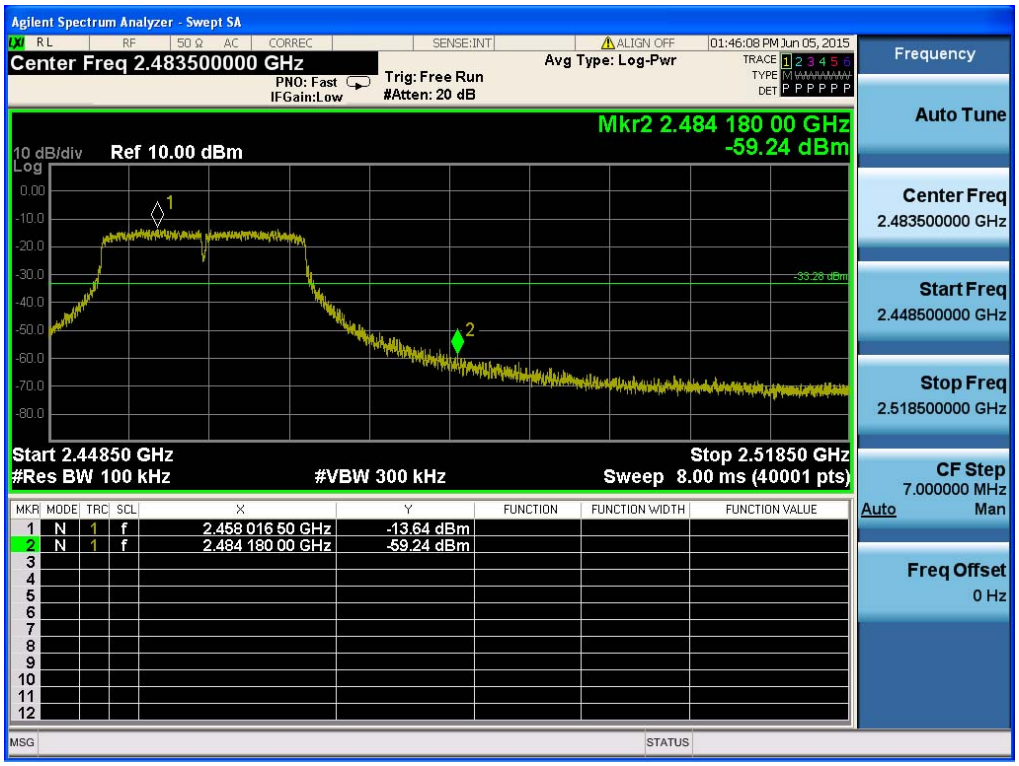


802.11n(HT20) & ANT 2 & Highest

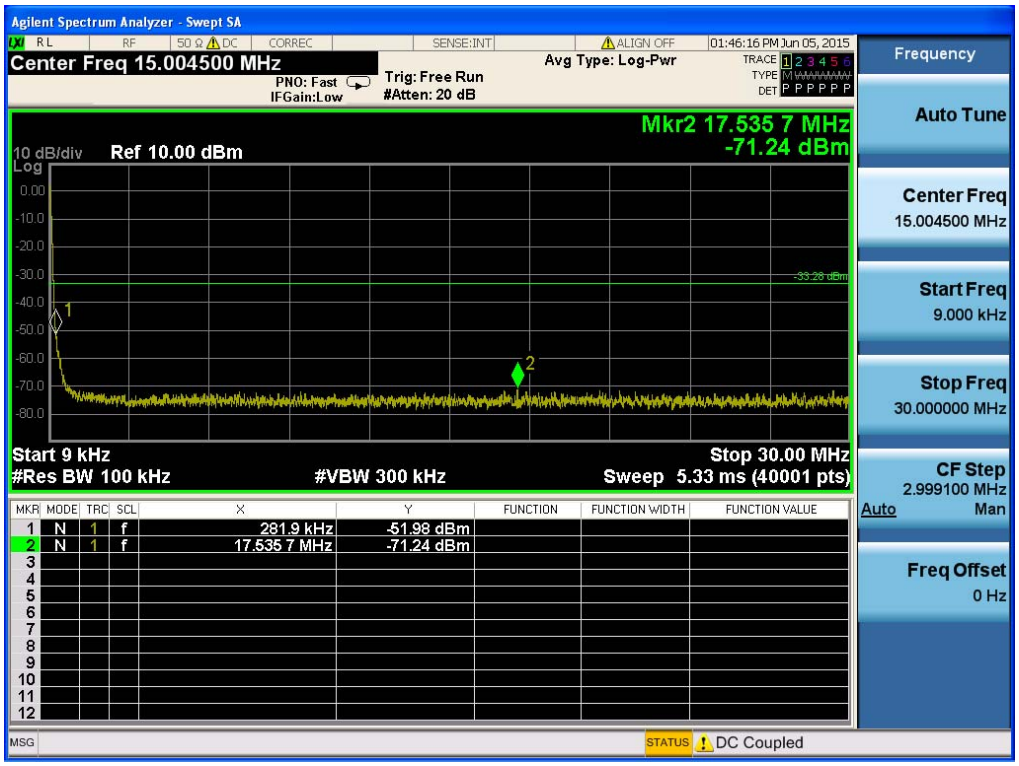
Reference

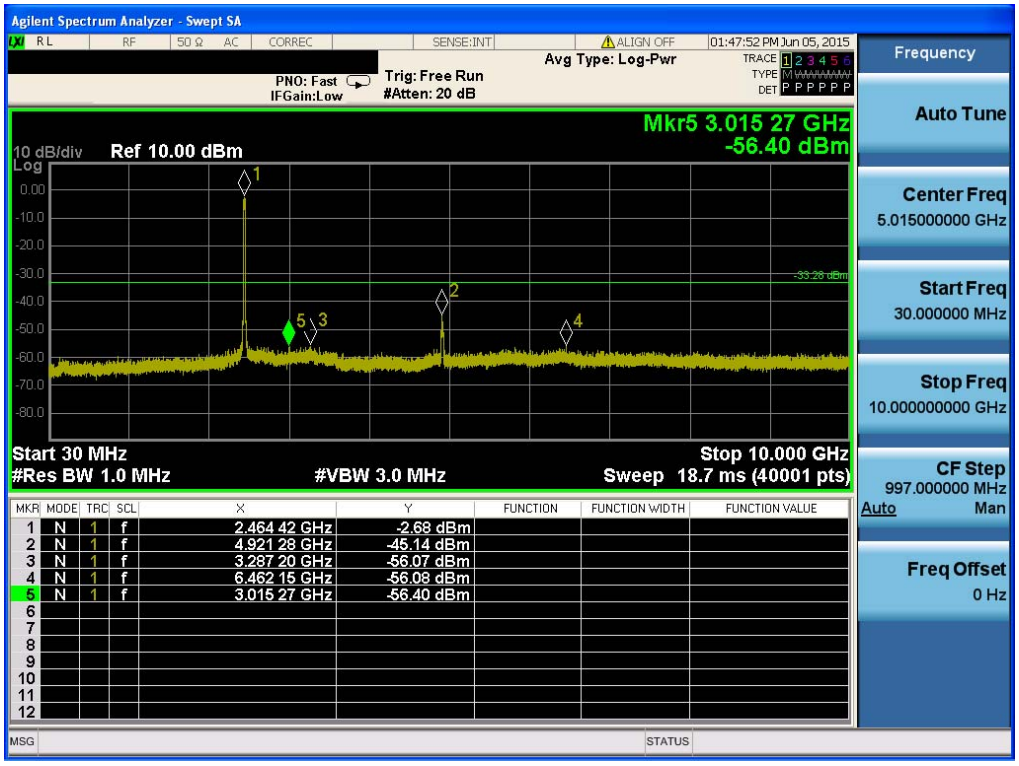


High Band-edge



Conducted Spurious Emissions





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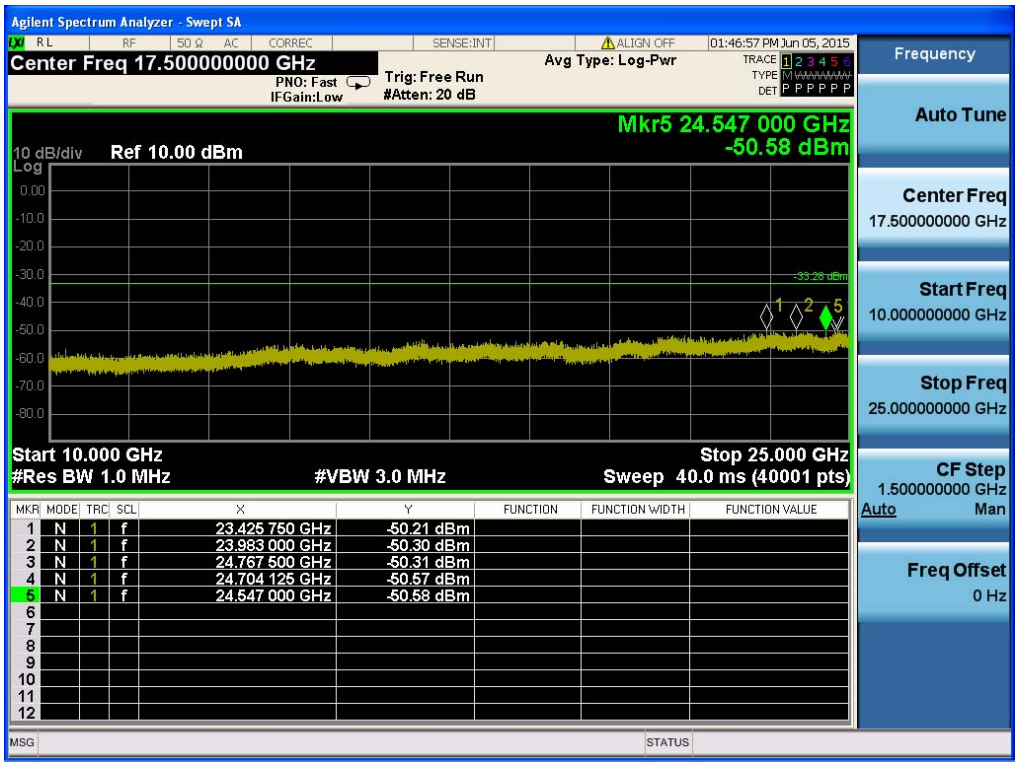


8.5 Radiated spurious emissions

▣ **Test Requirements and limit, §15.247(d), §15.205, §15.209**

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

▪ **FCC Part 15.209(a) and (b)**

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

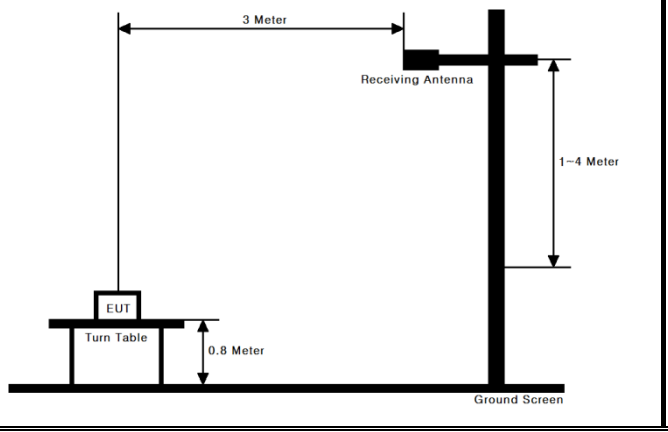
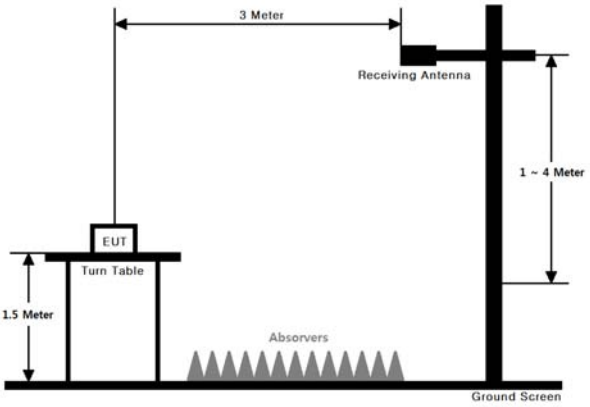
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240	3600 ~ 4400		

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▣ Test Configuration

Below 1GHz	Above 1GHz
	

▣ Test Procedure

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m..
   (Instead of 0.8m EUT height above 1GHz for FCC, 1.5m EUT height was used as allowed by FCC December 2014 TCB conference call.)
2. The turn table shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

▣ Measurement Instrument Setting for Radiated Emission Measurements.

Peak Measurement: *12.2.4 of KDB 558074 D01*

RBW = As specified in below table, VBW ≥ 3 x RBW, Sweep = Auto, Detector = Peak, Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

Average Measurement: *12.2.5.1 of KDB 558074 D01*

1. RBW = 1MHz(unless otherwise specified)
2. VBW ≥ 3 X RBW
3. Detector = RMS, if span / sweep point ≤ (RBW/2)
4. Averaging type = Power
5. Sweep time = auto
6. Trace average = At least 100 traces

Note: This test item was performed using the continuous transmission. Please refer to APPENDIX I.

Radiated Spurious Emissions data(9kHz ~ 25GHz) : *802.11n(HT20)*

Tested ANT	Freq.	Measured Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	DF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Multiple	Lowest	2389.92	V	X	PK	48.19	2.76	N/A	N/A	50.95	74.00	23.05
		2389.68	V	X	AV	37.17	2.76	N/A	N/A	39.93	54.00	14.07
		4823.98	V	X	PK	46.81	9.55	N/A	N/A	56.36	74.00	17.64
		4824.03	V	X	AV	35.40	9.55	N/A	N/A	44.95	54.00	9.05
	Middle	4874.45	V	X	PK	47.22	9.80	N/A	N/A	57.02	74.00	16.98
		4874.16	V	X	AV	36.15	9.80	N/A	N/A	45.95	54.00	8.05
	Highest	2483.52	V	X	PK	50.26	2.83	N/A	N/A	53.09	74.00	20.91
		2483.68	V	X	AV	39.17	2.83	N/A	N/A	42.00	54.00	12.00
		4923.95	V	X	PK	46.47	10.04	N/A	N/A	56.51	74.00	17.49
		4923.77	V	X	AV	35.63	10.04	N/A	N/A	45.67	54.00	8.33

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Information of Distance Factor(DF)
   For finding emissions, the test distance might be reduced from 3m to 1m.
   In this case, the distance factor(-9.54dB) is applied to the result.
   - Calculation of distance factor = 20log(applied distance / required distance) = 20log(1m / 3m) = -9.54dB
   When distance factor is “N/A”, the distance is 3m and distance factor is not applied.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF + DF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor, DF = Distance Factor

8.6 Power-line conducted emissions

▣ Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

▣ Test Procedure:

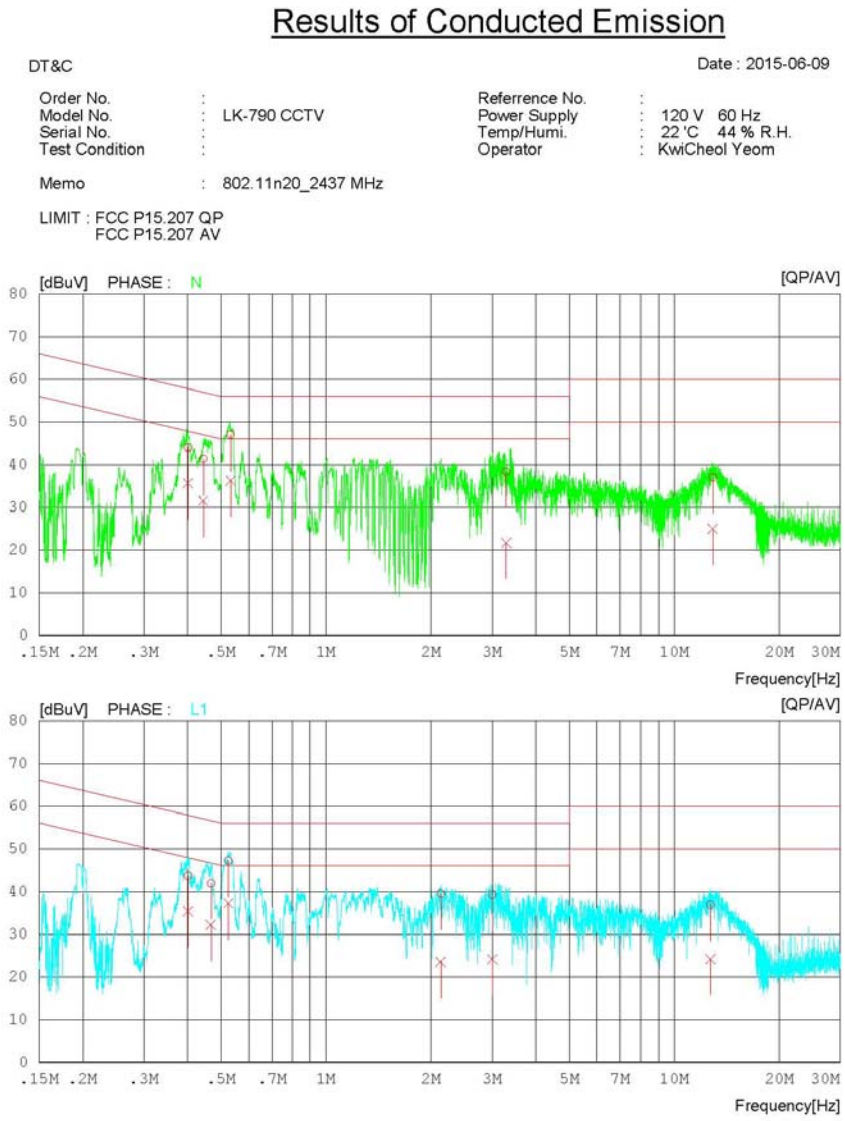
1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to the test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

▣ Test Results: Comply(Refer to next page.)

▣ RESULT PLOTS

AC Line Conducted Emissions (Graph)

802.11n(HT20) & Middle



AC Line Conducted Emissions (List)

802.11n(HT20) & Middle

Results of Conducted Emission

DT&C

Date : 2015-06-09

Order No.	:		Referrence No.	:	
Model No.	:	LK-790 CCTV	Power Supply	:	120 V 60 Hz
Serial No.	:		Temp/Humi.	:	22 'C 44 % R.H.
Test Condition	:		Operator	:	KwiCheol Yeom

Memo : 802.11n20_2437 MHz

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.40127	43.1	34.7	0.9	44.0	35.6	57.8	47.8	13.8	12.2	N
2	0.44402	40.5	30.7	0.8	41.3	31.5	57.0	47.0	15.7	15.5	N
3	0.53226	46.1	35.4	0.8	46.9	36.2	56.0	46.0	9.1	9.8	N
4	3.29320	37.8	21.1	0.5	38.3	21.6	56.0	46.0	17.7	24.4	N
5	12.91000	36.4	24.3	0.6	37.0	24.9	60.0	50.0	23.0	25.1	N
6	0.40150	42.7	34.4	0.9	43.6	35.3	57.8	47.8	14.2	12.5	L1
7	0.46696	41.1	31.4	0.8	41.9	32.2	56.6	46.6	14.7	14.4	L1
8	0.52393	46.3	36.4	0.8	47.1	37.2	56.0	46.0	8.9	8.8	L1
9	2.13480	38.9	23.0	0.5	39.4	23.5	56.0	46.0	16.6	22.5	L1
10	3.00400	38.7	23.6	0.5	39.2	24.1	56.0	46.0	16.8	21.9	L1
11	12.70200	36.2	23.6	0.6	36.8	24.2	60.0	50.0	23.2	25.8	L1

9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent	N9020A	15/01/06	16/01/06	MY46471172
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A MA2490A	15/03/26	16/03/26	1306007 1249001
Signal Generator	Rohde Schwarz	SMF100A	14/07/01	15/07/01	102341
Multimeter	HP	34401A	15/02/25	16/02/25	3146A13475
Dynamic Measurement DC Source	Agilent Technologies	66332A	15/01/07	16/01/07	US37476998
Thermohygrometer	BODYCOM	BJ5478	15/05/08	16/05/08	120612-1
EMI TEST RECEIVER	R&S	ESR7	14/10/21	15/10/21	101109
Low Noise Pre Amplifier	tsj	MLA-010K01-B01-27	15/04/09	16/04/09	1844538
PreAmplifier	Agilent	8449B	15/02/26	16/02/26	3008A00370
High-pass filter	Wainwright Instruments	WHKX3.0	15/01/06	16/01/06	12
Highpass Filter	Wainwright Instruments	WHNX6-6320-8000-26500-40CC	14/10/17	15/10/17	3
LOOP Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test-Antenna	Schwarzbeck	VULB 9160	14/04/30	16/0430	3358
Double-Ridged Guide Antenna	ETS	3117	14/05/12	16/05/12	140394
Horn Antenna	A.H.Systems	SAS-574	15/04/30	17/04/30	154
EMI TEST RECEIVER	R&S	ESCI	15/02/25	16/02/25	100364
FREQUENCY CONVERTER	Taejin Electronic	CVCF	14/09/11	15/09/11	ZU0033
ARTIFICIAL MAINS NETWORK	Narda S.T.S. / PMM	PMM L2-16B	14/06/26	15/06/26	000WX20305
DC BLOCK	Kyoritsu	KFL-007D	NA	NA	8-2259-4

APPENDIX I

Duty cycle information

▣ Test Procedure

Duty cycle measured using **section 6.0 b) of KDB 558074 D01 DTS Meas. Guidance :**

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

▣ Test Data for verifying the continuous transmission

Duty Cycle 802.11n(HT20) & ANT 2 & Middle