TEST REPORT
Part 15 Subpart E 15.407

Equipment under test LOAA Analyzer

Model name On-Point

FCC ID 2AYU4LOAA-ONPOINT

Applicant OPTOLANE Technologies, Inc.

Manufacturer OPTOLANE Technologies, Inc.

Date of test(s) 2021.02.08 ~ 2021.03.05

Date of issue 2021.03.10

Issued to

OPTOLANE Technologies, Inc.

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Revision history

Revision	Date of issue	Test report No.	Description
-	2021.03.10	KES-RF1-21T0022	Initial

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1. General information

Applicant:	OPTOLANE Technologies, Inc.
Applicant address:	6F, 20, Pangyoyeok-ro 241 beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13494, S.Korea
Test site:	KES Co., Ltd.
Test site address:	40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Test Facility	FCC Accreditation Designation No.: KR0100, Registration No.: 444148
FCC rule part(s):	15.407
FCC ID:	2AYU4LOAA-ONPOINT
Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	LOAA Analyzer	
Frequency range		2 402 ㎒ ~ 2 480 ㎒ (BDR/EDR)
		2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20)
		2 422 ㎒ ~ 2 452 ㎒ (11n_HT40)
	UNII-1	**5 180 ㎒ ~ 5 240 ㎒ (11a/n_HT20/ac_VHT20)**
		5 190 ㎒ ~ 5 230 ㎒ (11n_HT40/ac_VHT40)
		5 210 ㎒ (11ac_VHT80)
	UNII-2A	**5 260 ㎒ ~ 5 320 ㎒ (11a/n_HT20/ac_VHT20)**
		5 270 ㎒ ~ 5 310 ㎒ (11n_HT40/ac_VHT40)
		5 290 ㎒ (11ac_VHT80)
	UNII-2C	**5 500 ㎒ ~ 5 700 ㎒ (11a/n_HT20/ac_VHT20)**
		5 510 ㎒ ~ 5 670 ㎒ (11n_HT40/ac_VHT40)
		5 530 ㎒ ~ 5 610 ㎒ (11ac_VHT80)
	UNII-3	**5 745 ㎒ ~ 5 825 ㎒ (11a/n_HT20/ac_VHT20)**
		5 755 ㎒ ~ 5 795 ㎒ (11n_HT40/ac_VHT40)
		5 775 ㎒ (11ac_VHT80)
Model:	On-Point	
Modulation technique	WIFI : DSSS, OFDM	
	BT : GFSK, π/4DQPSK, 8DPSK	
Antenna specification	2.4 ㎓_ WIFI&BT // Dipole Antenna & 3.18 ㏈i	
	5 ㎓_UNII 1 // Dipole Antenna & 3.52 ㏈i	
	5 ㎓_UNII 2A // Dipole Antenna & 4.35 ㏈i	
	5 ㎓_UNII 2C // Dipole Antenna & 4.25 ㏈i	
	5 ㎓_UNII 3 // Dipole Antenna & 3.14 ㏈i	
Power source	AC 220 V	

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Number of channels 2 402 ㎒ ~ 2 480 ㎒ (BDR/EDR) : 79ch
2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20) : 11ch
2 422 ㎒ ~ 2 452 ㎒ (11n_HT40) : 7ch
5 180 ㎒ ~ 5 240 ㎒ (11a/n_HT20/ac_VHT20) : 4ch
5 190 ㎒ ~ 5 230 ㎒ (11n_HT40/ac_VHT40) : 2ch
5 210 ㎒ (11ac_VHT80) : 1ch
5 260 ㎒ ~ 5 320 ㎒ (11a/n_HT20/ac_VHT20) : 4ch
5 270 ㎒ ~ 5 310 ㎒ (11n_HT40/ac_VHT40) : 2ch
5 290 ㎒ (11ac_VHT80) : 1ch
5 500 ㎒ ~ 5 700 ㎒ (11a/n_HT20/ac_VHT20) : 11ch
5 510 ㎒ ~ 5 670 ㎒ (11n_HT40/ac_VHT40) : 5ch
5 530 ㎒ ~ 5 610 ㎒ (11ac_VHT80) : 2ch
5 745 ㎒ ~ 5 825 ㎒ (11a/n_HT20/ac_VHT20) : 5ch
5 755 ㎒ ~ 5 795 ㎒ (11n_HT40/ac_VHT40) : 2ch
5 775 ㎒ (11ac_VHT80) : 1ch

1.2. Test configuration

The **OPTOLANE Technologies, Inc. LOAA Analyzer FCC ID: 2AYU4LOAA-ONPOINT** was tested according to the specification of EUT, the EUT must comply with following standards and KDB documents.

FCC Part 15.407
KDB 789033 D02 v02r01
ANSI C63.10-2013

1.3. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

1.4. Software and Firmware description

The software and firmware installed in the EUT is version 3.0.0

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1.5. Measurement results explanation example

For all conducted test items :

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 3.14 + 10 = 13.14 (dB)

1.6. Measurement Uncertainty

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.62 dB
Uncertainty for Radiation emission test (include Fundamental emission)	9kHz - 30MHz	4.54 dB
	30MHz - 1GHz	4.36 dB
	Above 1GHz	5.00 dB
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

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1.7. Frequency/channel operations

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
36	5 180	52	5 260	100	5 500	149	5 745
44	5 220	56	5 280	120	5 600	157	5 785
48	5 240	64	5 320	140	5 700	165	5 825

Table 1.7-1. 802.11a/n_HT20/ac_VHT20 Mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
38	5 190	54	5 270	102	5 510	151	5 755
46	5 230	62	5 310	118	5 590	159	5 795
				134	5 670		

Table 1.7-2. 802.11n_HT40/ac_VHT40 Mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
42	5 210	58	5 290	106	5 530	155	5 775
				122	5 610		

Table 1.7-3. 802.11ac_VHT80 Mode

1.8. Maximum average output power

Refer to the average output power.

Note.

1. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.
2. Worst-case data rates as provided by the client were:
   UNII-1 a : **6 Mbps**, n_HT20 : **MCS9,** ac_VHT20 : **MCS8**, n_HT40 : **MCS9**
   n_HT40 : **MCS9**, ac_VHT40 : **MCS9**, ac_VHT80 : **MCS9**
   UNII-2A a : **6 Mbps**, n_HT20 : **MCS9,** ac_VHT20 : **MCS8**, n_HT40 : **MCS9**
   n_HT40 : **MCS9**, ac_VHT40 : **MCS9**, ac_VHT80 : **MCS9**
   UNII-2C a : **6 Mbps**, n_HT20 : **MCS9,** ac_VHT20 : **MCS8**, n_HT40 : **MCS9**
   n_HT40 : **MCS9**, ac_VHT40 : **MCS9**, ac_VHT80 : **MCS9**
   UNII-3 a : **6 Mbps**, n_HT20 : **MCS9,** ac_VHT20 : **MCS8**, n_HT40 : **MCS9**
   n_HT40 : **MCS9**, ac_VHT40 : **MCS9**, ac_VHT80 : **MCS9**
3. This report contains the worst case data from the following mode of the test in 20/40/80 MHz signal bandwidth.

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2. Summary of tests

Reference	Parameter	Test results
15.407(a)	26 dB bandwidth & 99 % Occupied Bandwidth	Pass
15.407(e)	6 dB bandwidth	Pass
15.407(a)	Maximum conducted output power	Pass
15.407(a)	Power spectral density	Pass
15.407(g)	Frequency stability	Pass
15.205 15.209	Radiated restricted band and emission	Pass
15.407(d)	General field strength limit (Restricted bands and radiated emission limit)	Pass
15.207	AC power line conducted emissions	Pass

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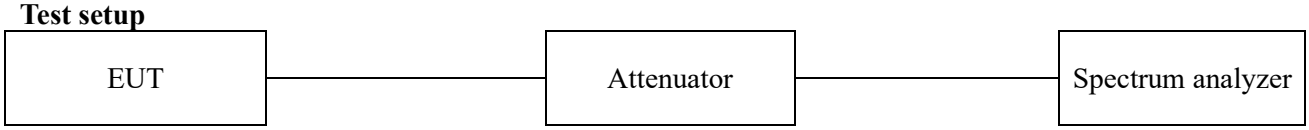
3. Test results

3.1. 26 dB bandwidth & 99% Occupied Bandwidth

Test setup



Test procedure

<u>26 dB bandwidth</u>
KDB 789033 D02 v02r01– Section C.1

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Limit
N/A

<u>99 % bandwidth</u>
KDB 789033 D02 v02r01– Section D

1. Set span = 1.5 times to 5.0 times the OBW.
2. Set RBW = 1% to 5% of the OBW
3. Set the VBW > 3 x RBW.
4. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak bandwidth function of the instrument (if available).
5. Use the 99% power bandwidth function of the instrument (if available).
6. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

In the result,
-DFS requirements are not applicable in the 5 150 ㎒ ~ 5 250 ㎒.

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Test results

Band	Frequency(㎒)	Mode	26 ㏈ bandwidth(㎒)	99 % bandwidth(㎒)
UNII-1	5 180	a	21.056	16.932
	5 220		21.129	17.149
	5 240		21.056	17.221
UNII-2A	5 260		21.274	17.149
	5 280		21.201	17.438
	5 320		21.346	17.438
UNII-2C	5 500		21.274	17.221
	5 600		22.793	18.017
	5 700		33.285	22.431
UNII-3	5 745		33.792	24.457
	5 785		39.436	26.049
	5 825		39.074	25.543
UNII-1	5 180	HT20	21.201	18.162
	5 220		21.274	18.379
	5 240		21.346	18.234
UNII-2A	5 260		21.346	18.162
	5 280		21.418	18.234
	5 320		21.418	18.162
UNII-2C	5 500		21.997	18.234
	5 600		21.997	18.452
	5 700		34.443	22.359
UNII-3	5 745		39.146	26.411
	5 785		43.054	29.957
	5 825		42.475	30.463
UNII-1	5 190	HT40	41.330	37.048
	5 230		42.950	37.048
UNII-2A	5 270		47.700	37.511
	5 310		49.900	37.511
UNII-2C	5 510		41.330	37.164
	5 590		47.350	37.627
	5 670		66.160	42.836
UNII-3	5 755		81.040	47.120
	5 795		83.700	47.931

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Band	Frequency(㎒)	Mode	26 ㏈ bandwidth(㎒)	99 % bandwidth(㎒)
UNII-1	5 180	VHT20	21.201	18.234
	5 220		25.832	18.307
	5 240		22.431	18.307
UNII-2A	5 260		23.444	18.307
	5 280		24.096	18.669
	5 320		26.049	18.524
UNII-2C	5 500		21.491	18.162
	5 600		32.200	19.609
	5 700		38.857	25.687
UNII-3	5 745		42.258	29.305
	5 785		45.300	32.489
	5 825		43.990	30.825
UNII-1	5 190	VHT40	40.289	36.903
	5 230		42.981	36.990
UNII-2A	5 270		49.928	37.337
	5 310		48.278	37.250
UNII-2C	5 510		40.897	36.990
	5 590		49.841	37.250
	5 670		66.570	38.032
UNII-3	5 755		80.030	41.331
	5 795		91.000	40.897
UNII-1	5 210	VHT80	81.970	75.716
UNII-2A	5 290		83.360	75.890
UNII-2C	5 530		85.790	75.890
	5 610		124.380	77.106
UNII-3	5 775		245.660	87.873

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26 dB bandwidth

UNII-1_a	UNII-2A_a

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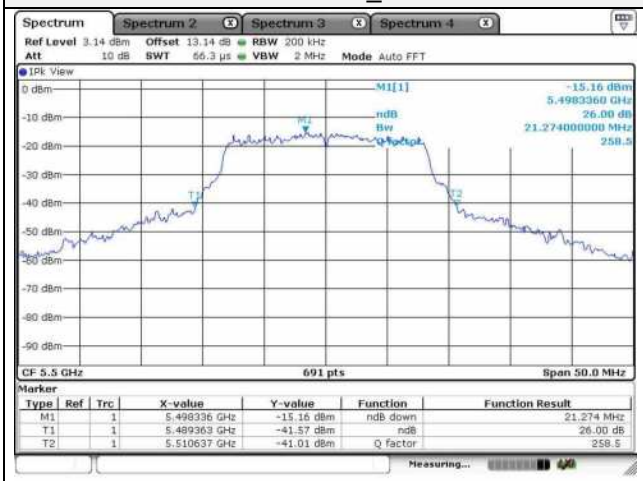
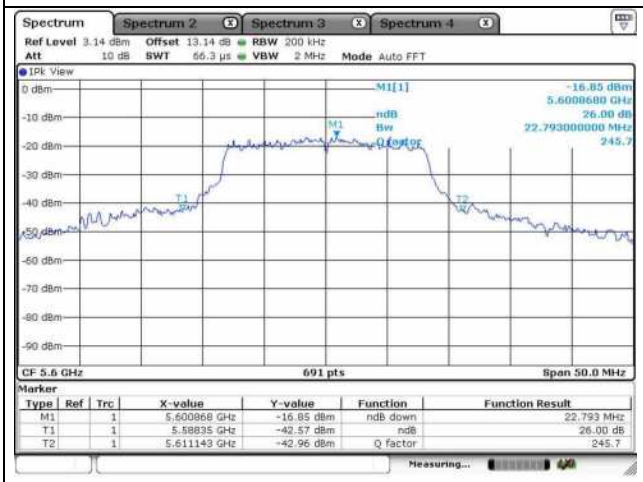
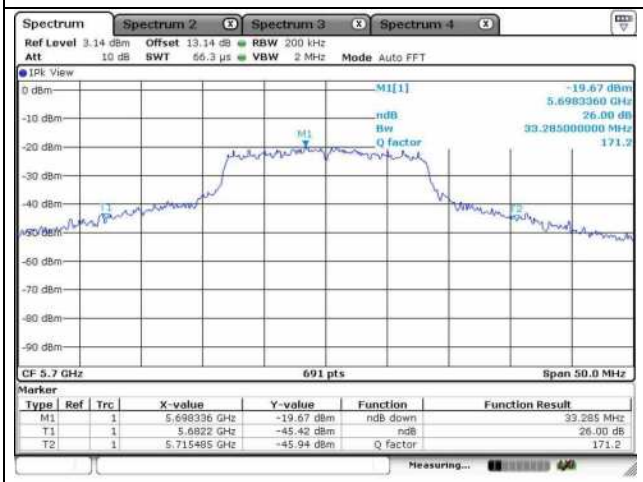
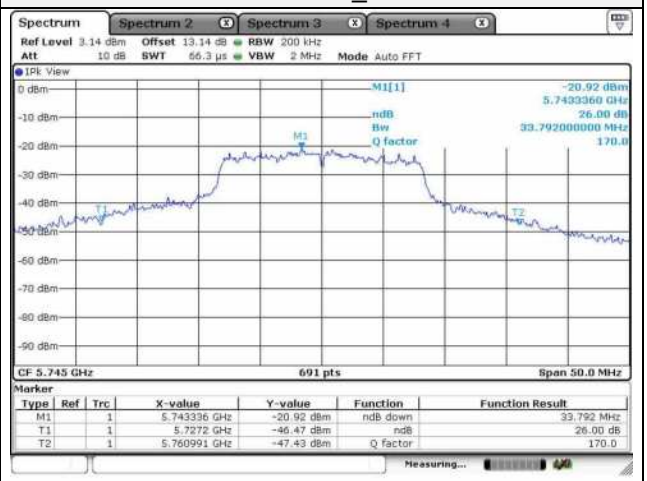
UNII-2C_a

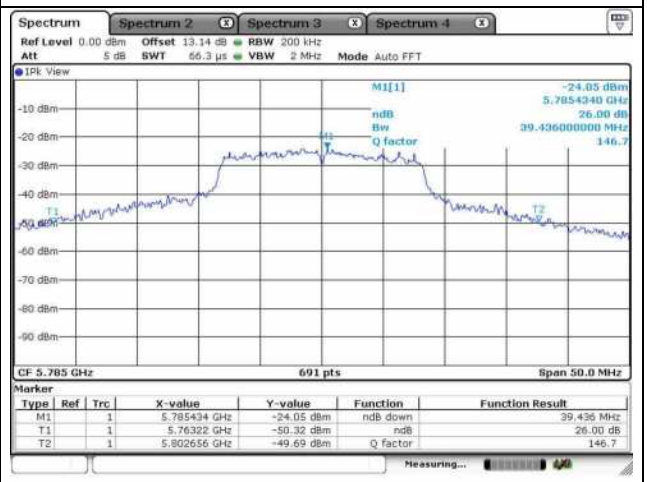


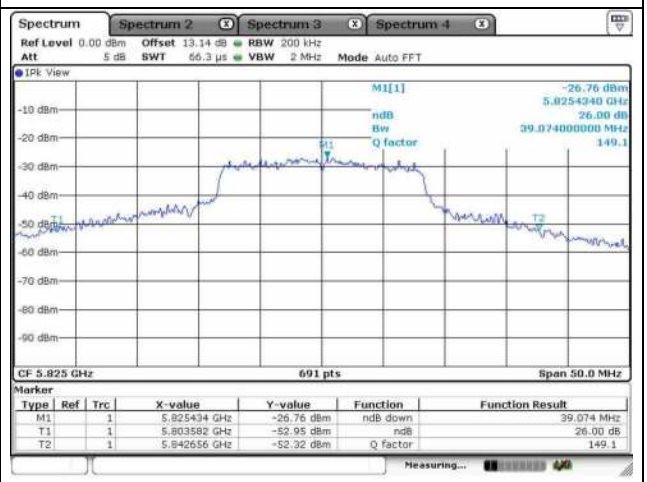




UNII-3_a







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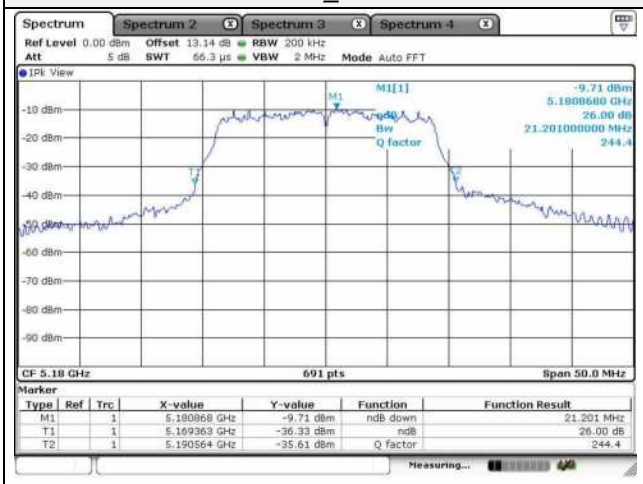
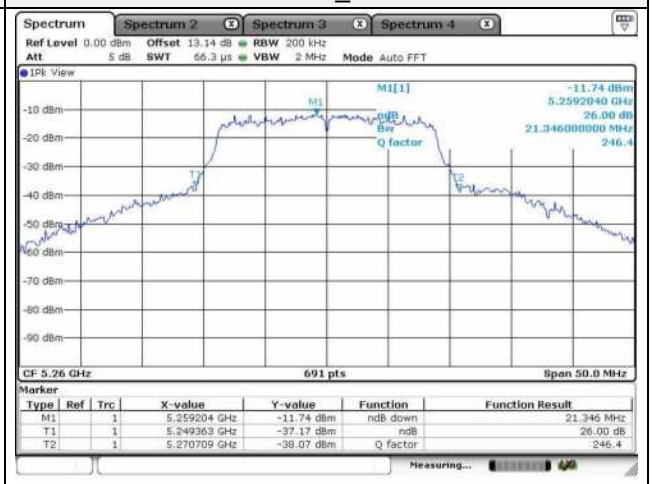
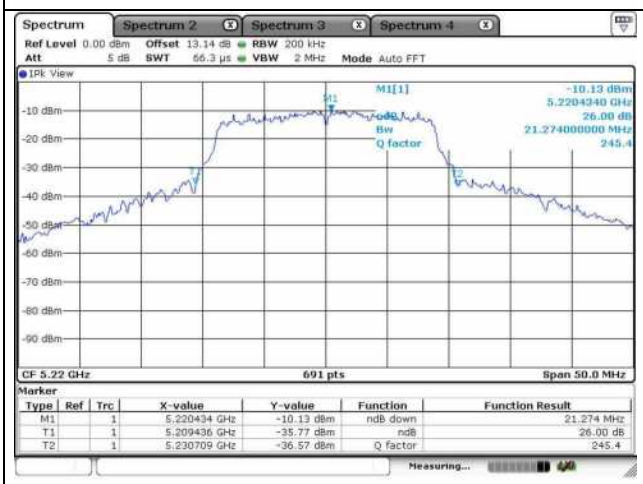
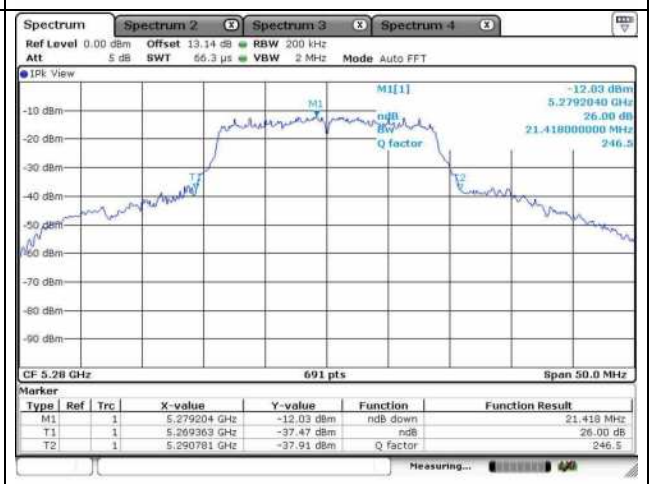
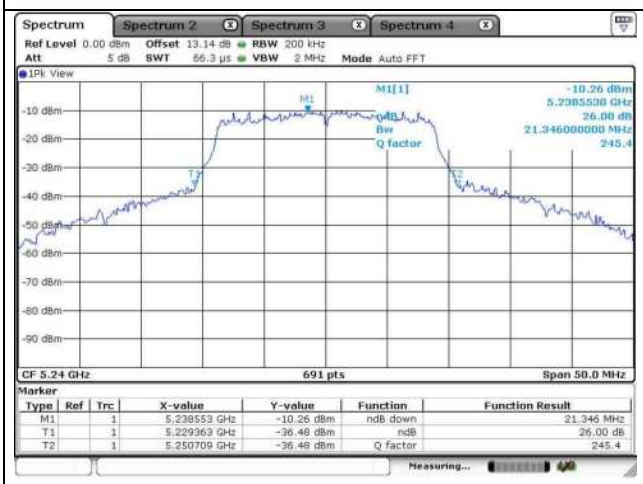
UNII-1_ HT20	UNII-2A_ HT20

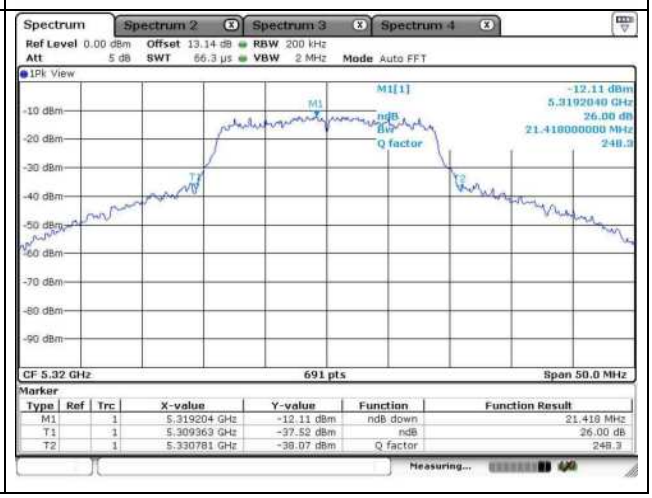












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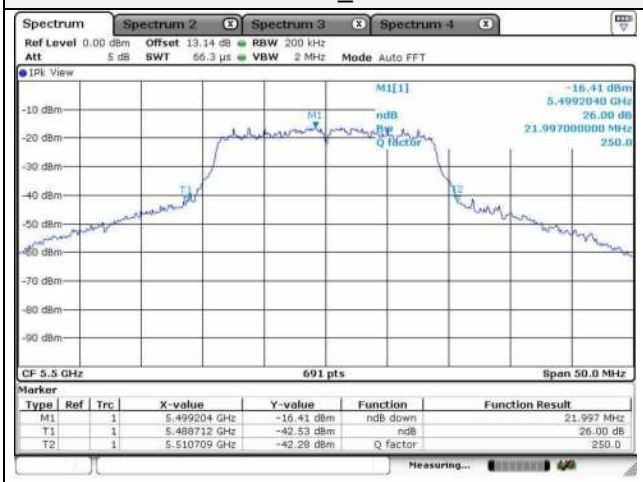
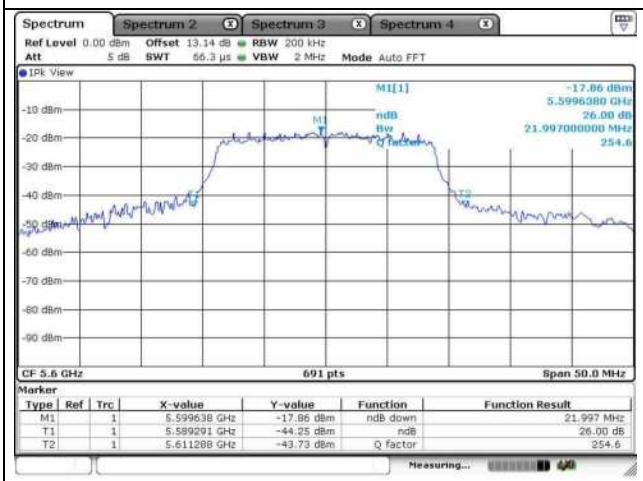
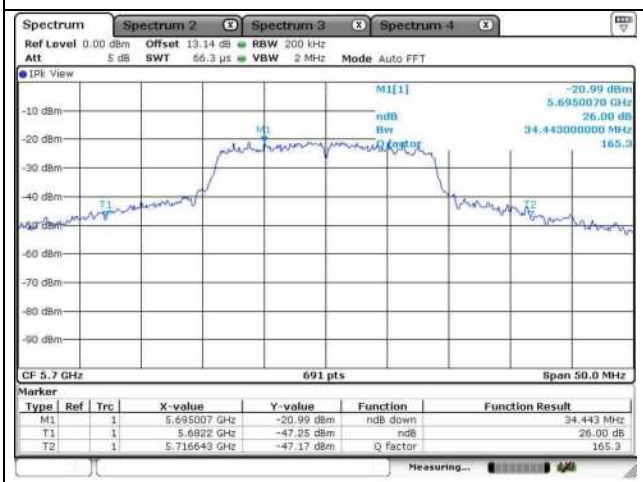
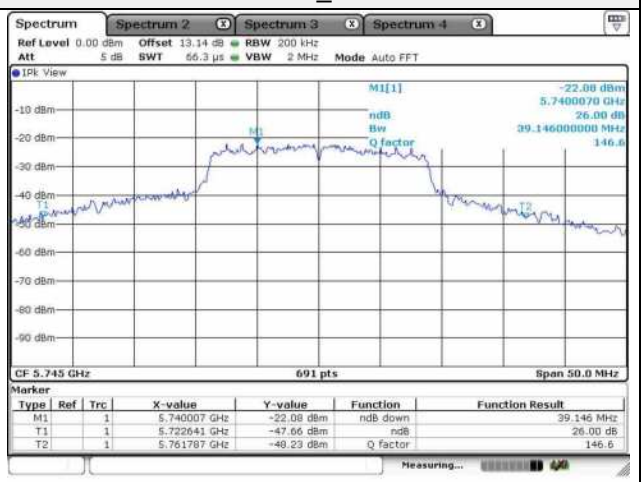
UNII-2C_HT20

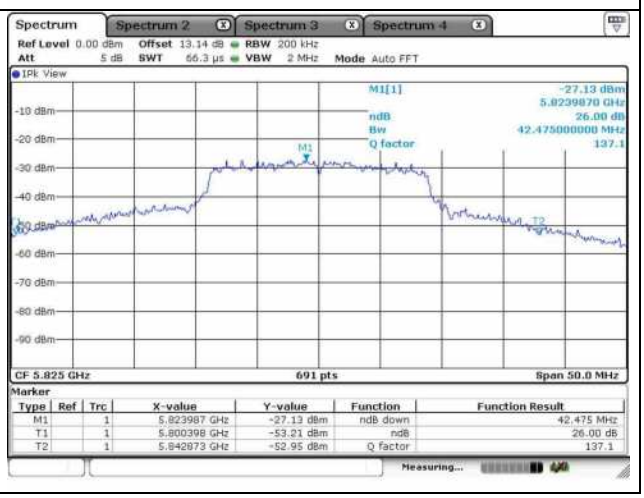






UNII-3_ HT20





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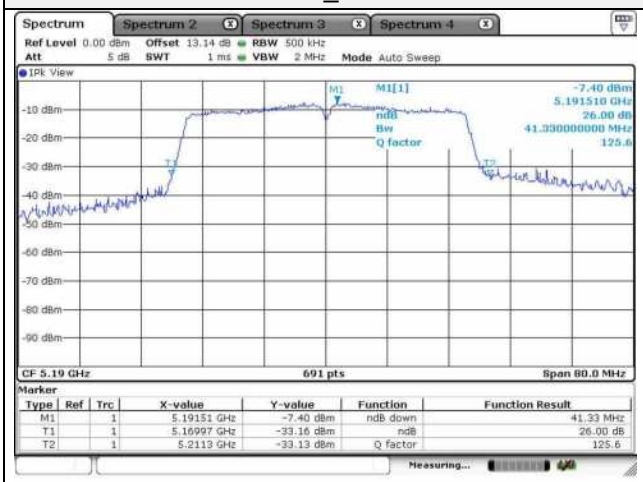
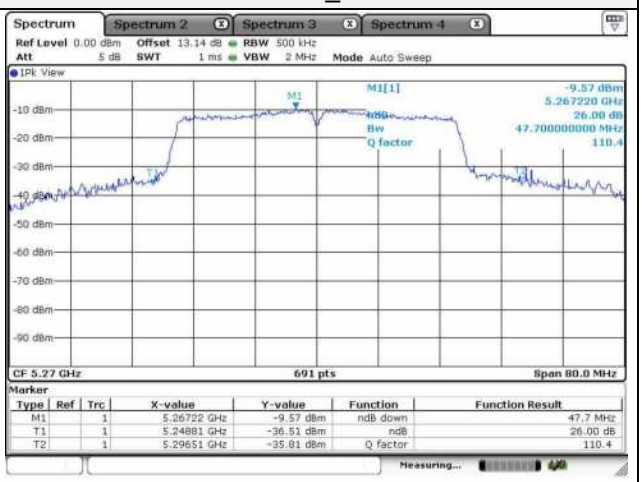
UNII-1_ HT40	UNII-2A_ HT40
	
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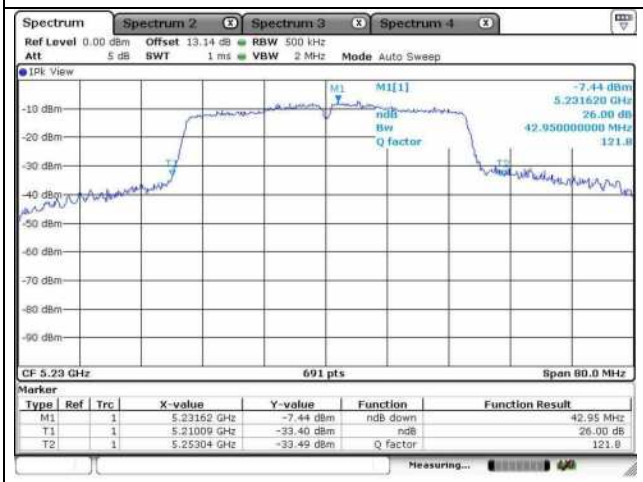	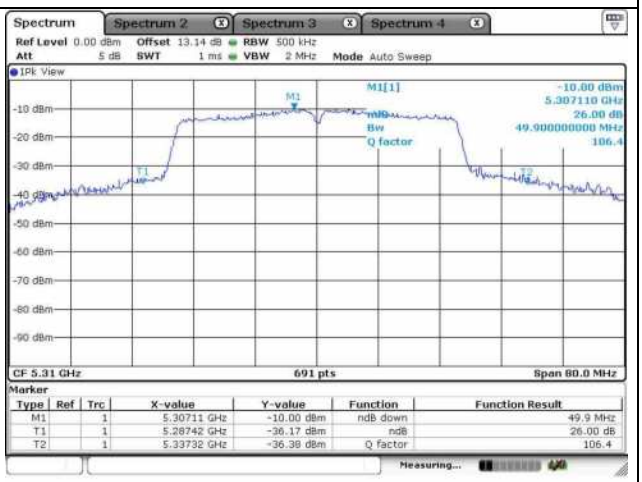

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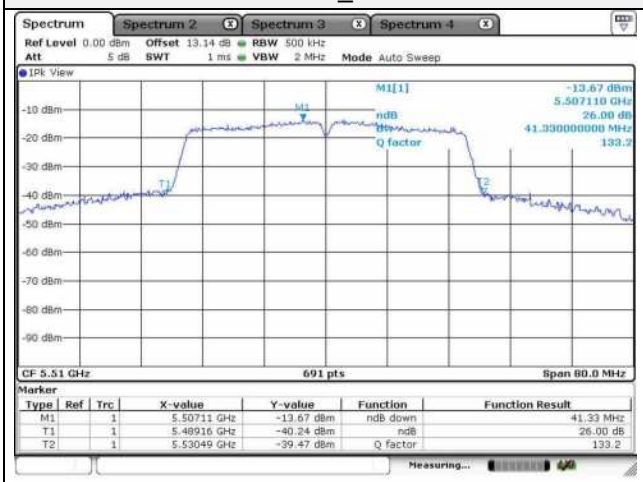

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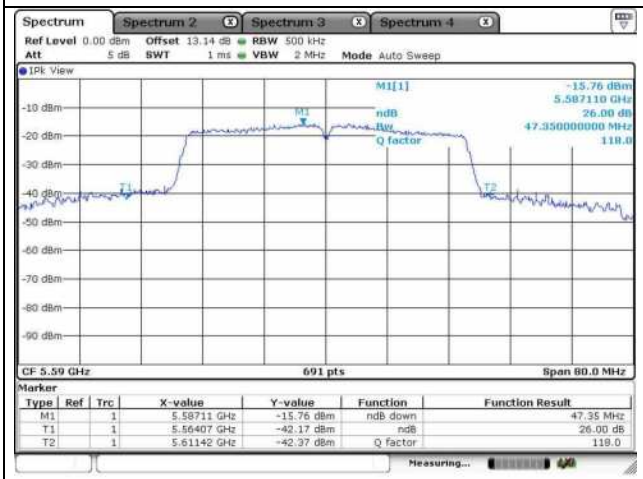

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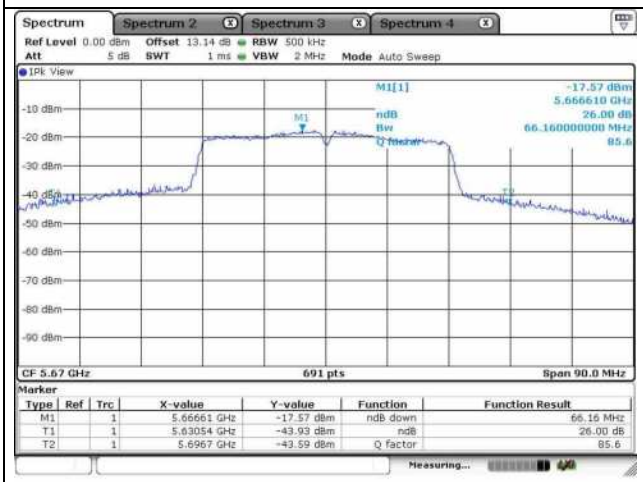

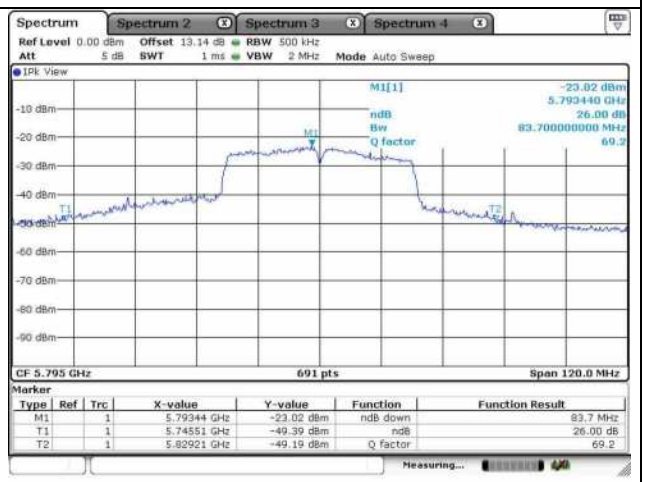

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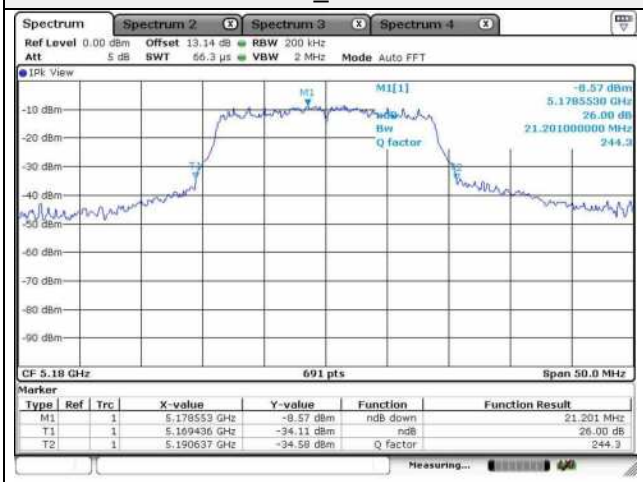
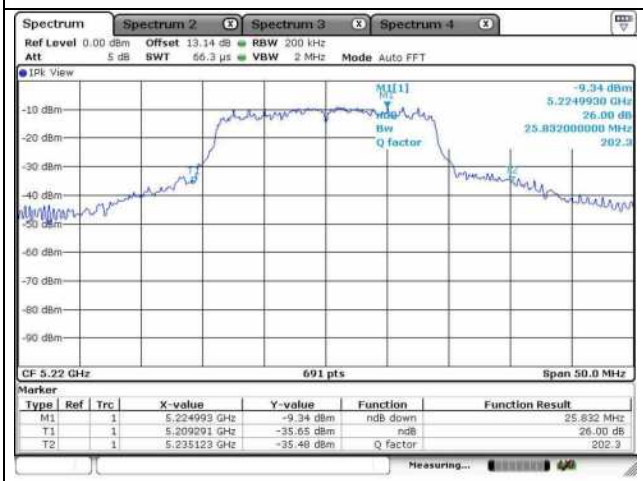
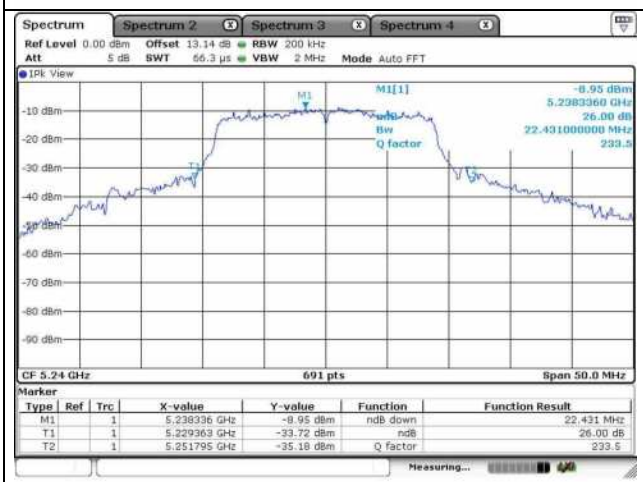
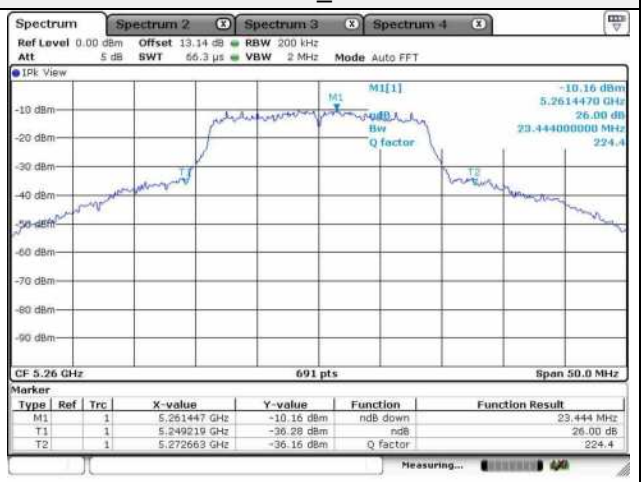
UNII-1_ VHT20

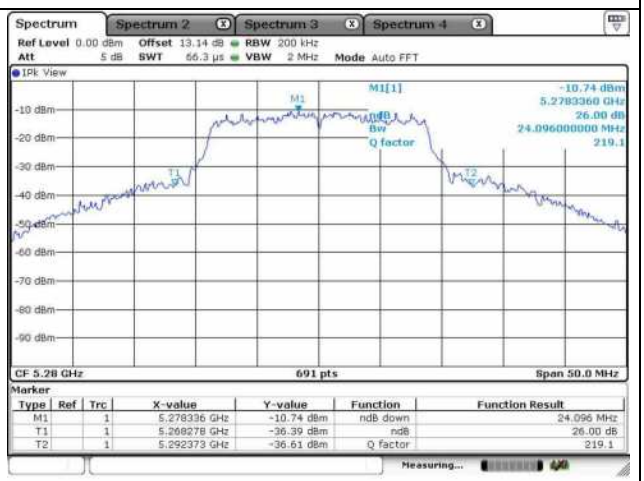


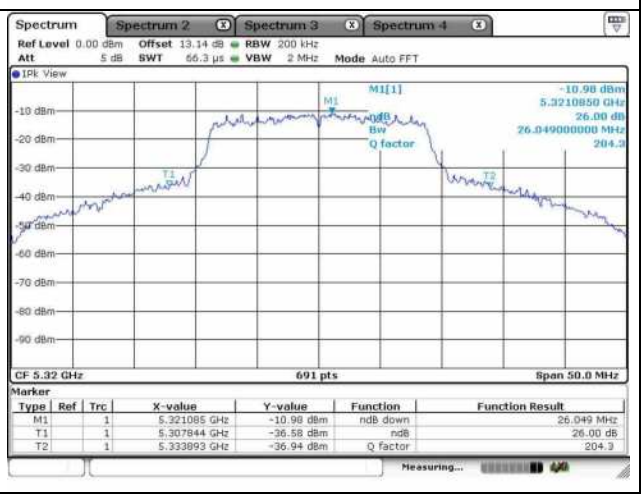




UNII-2A_ VHT20







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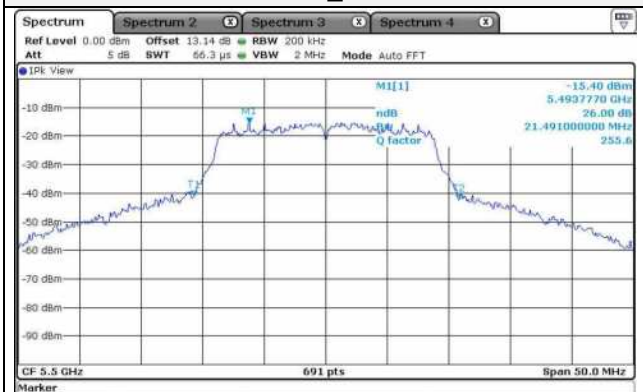
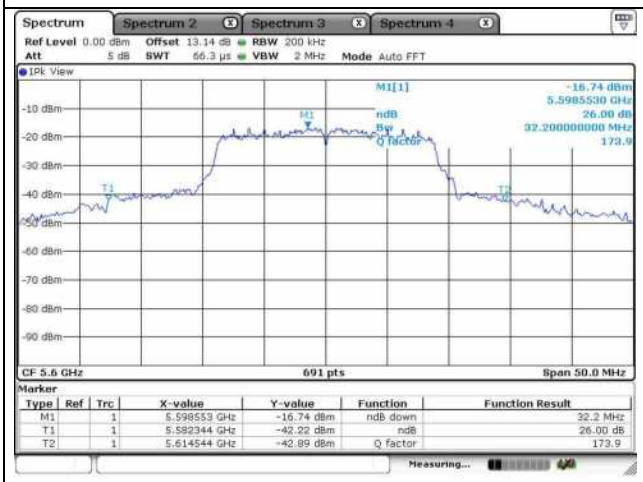
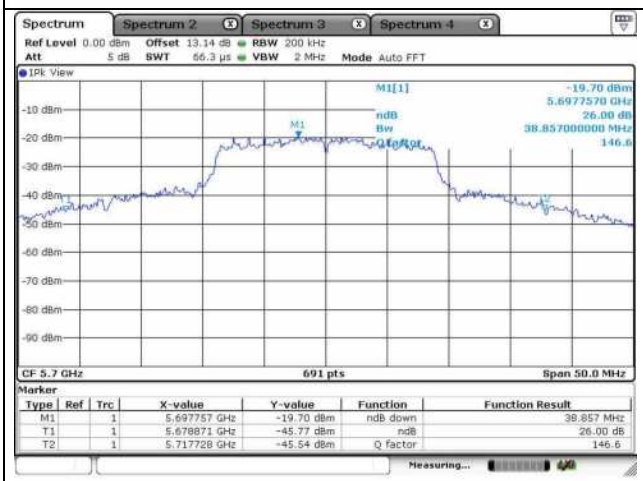
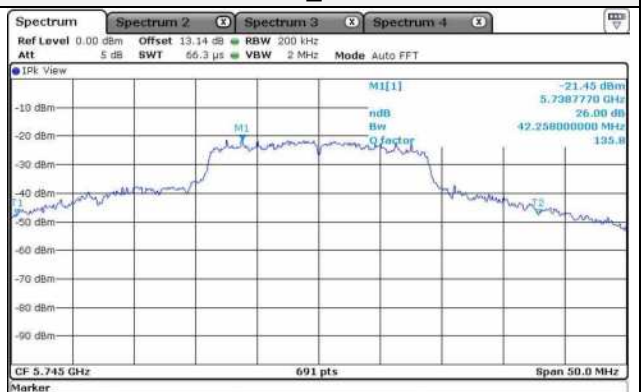
UNII-2C_VHT20

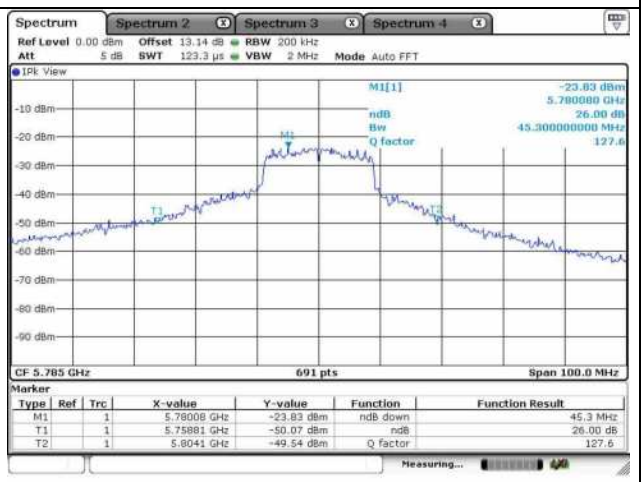






UNII-3_ VHT20





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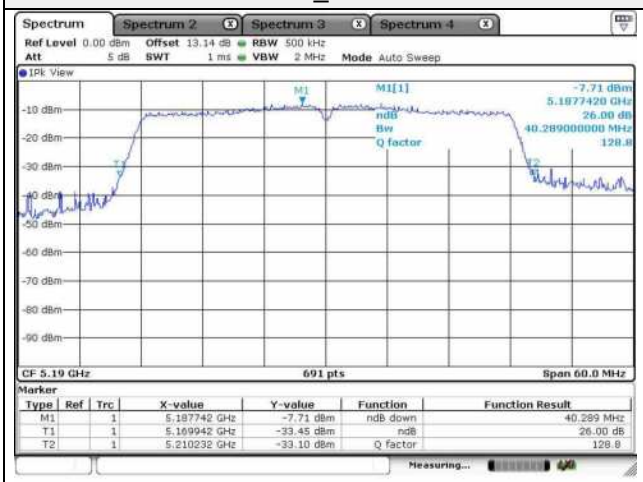
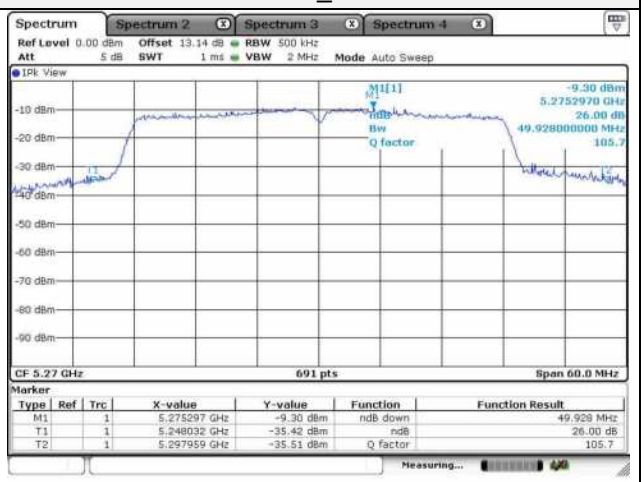
UNII-1_ VHT40	UNII-2A_ VHT40
	
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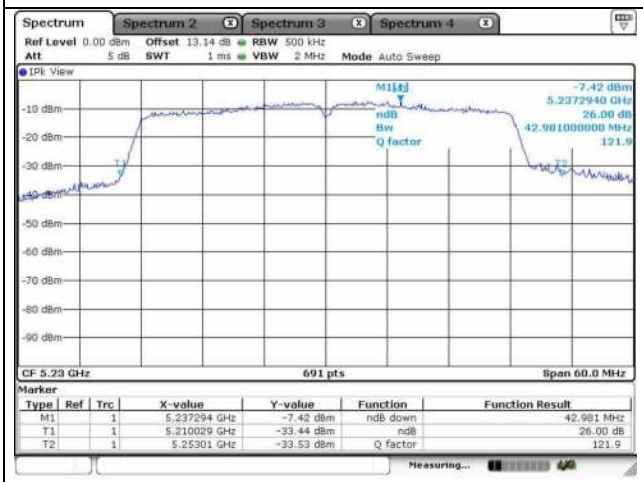
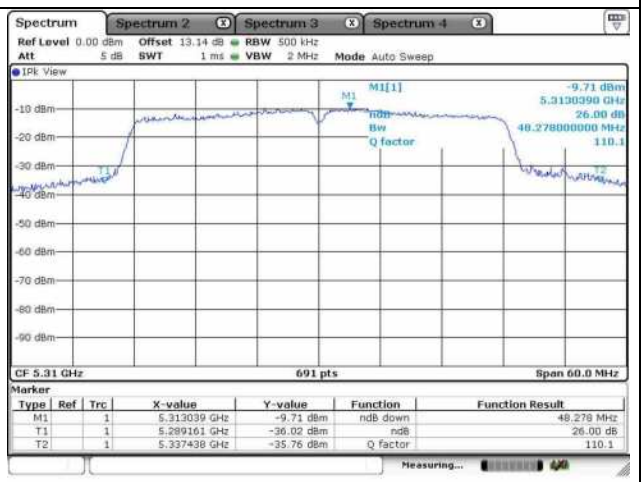
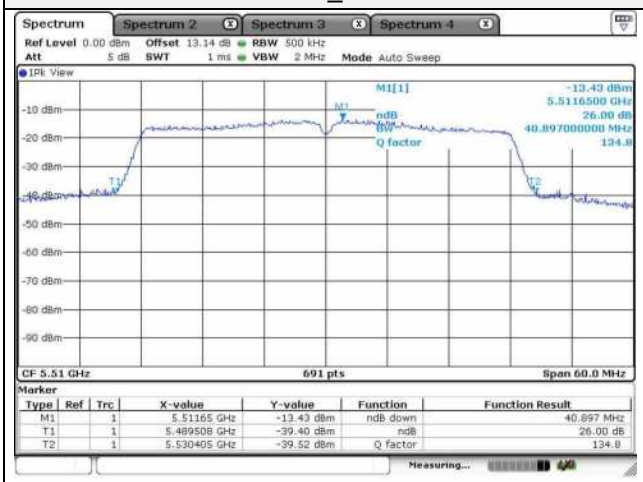
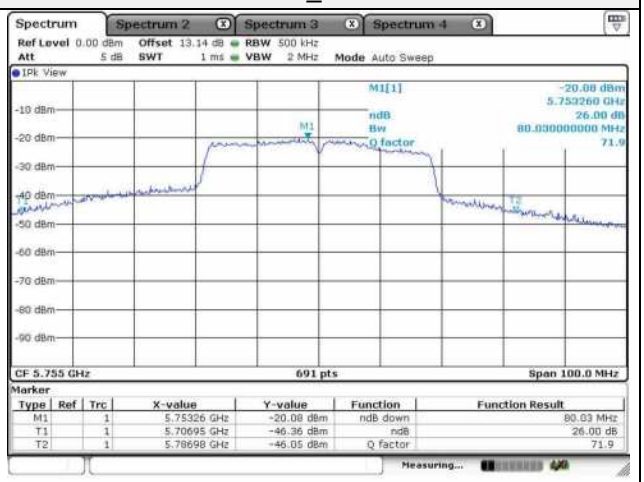
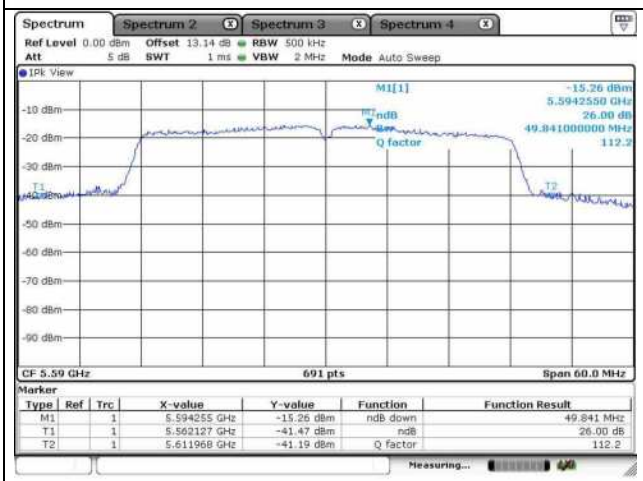
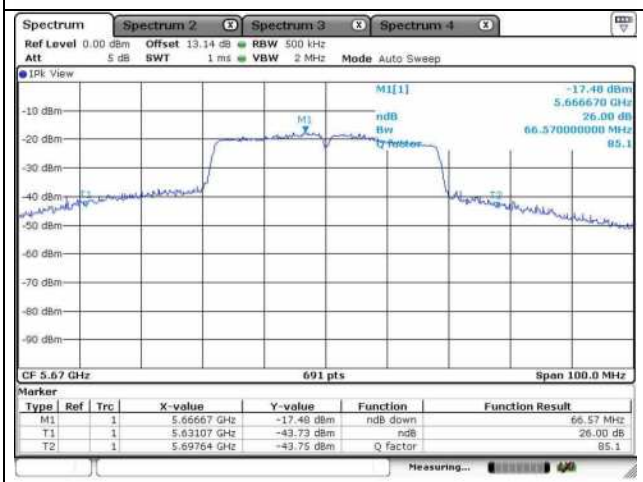
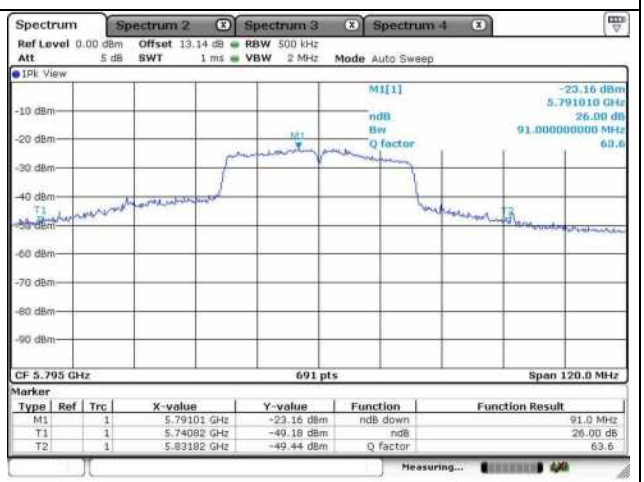
	

UNII-2C_VHT40	UNII-3_ VHT40
	
	Blank
	

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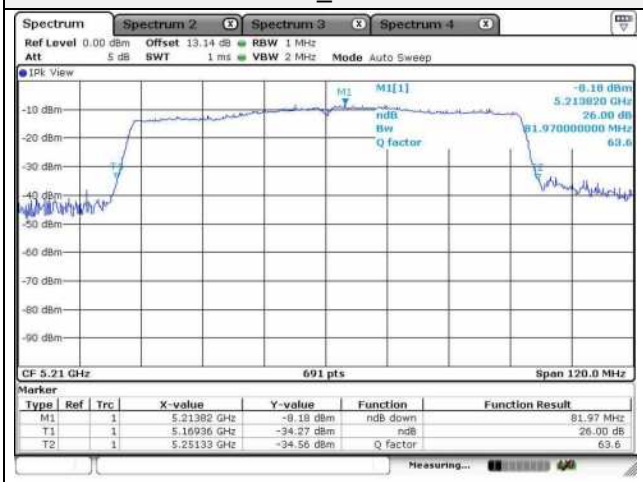
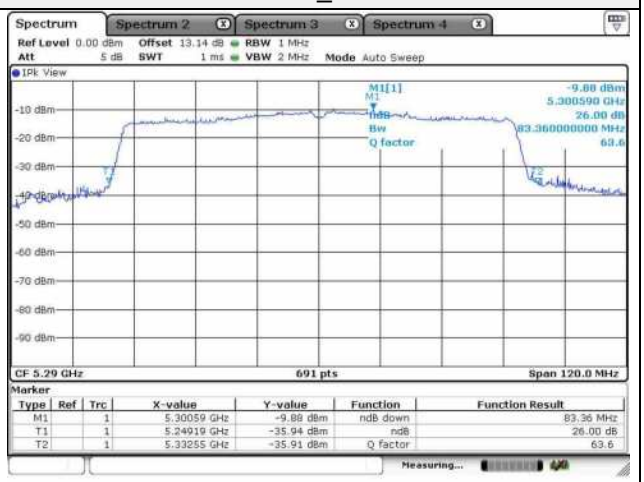
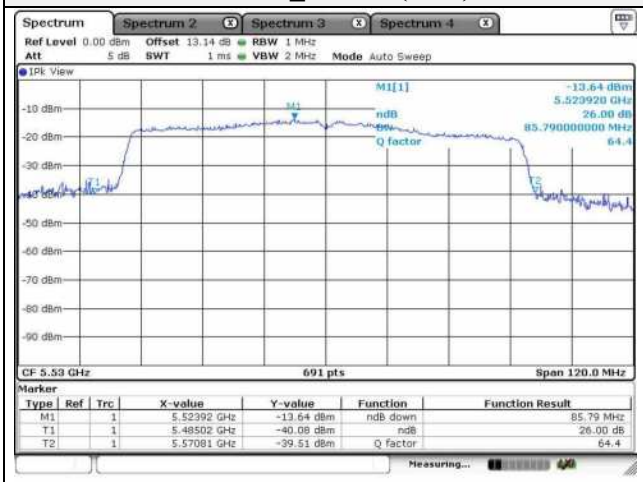
UNII-1_VHT80



UNII-2A_ VHT80



UNII-2C_VHT80(Low)



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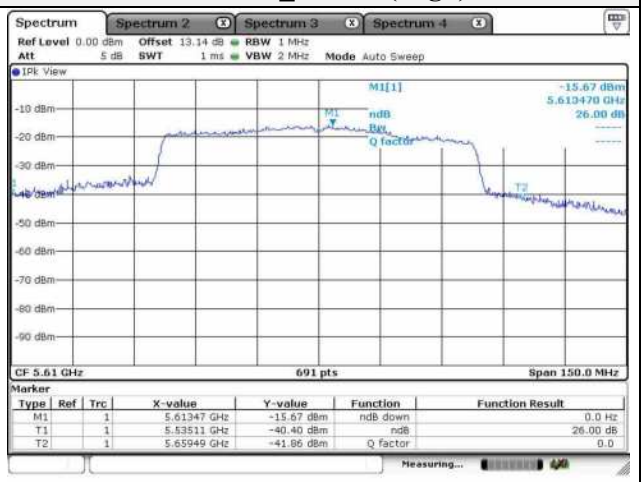
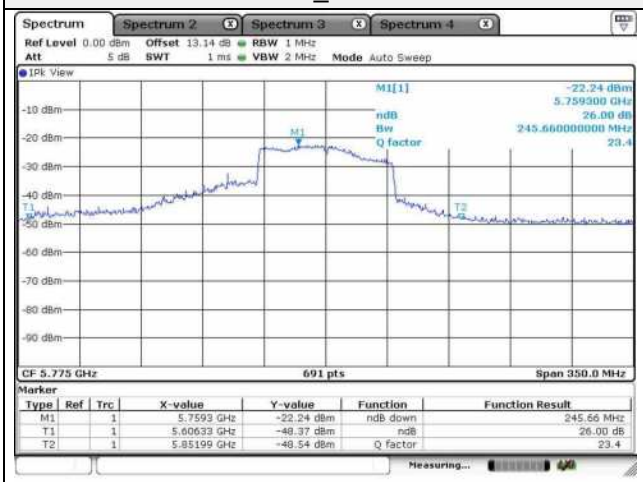


UNII-3_ VHT80



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UNII-1_a	UNII-2A_a

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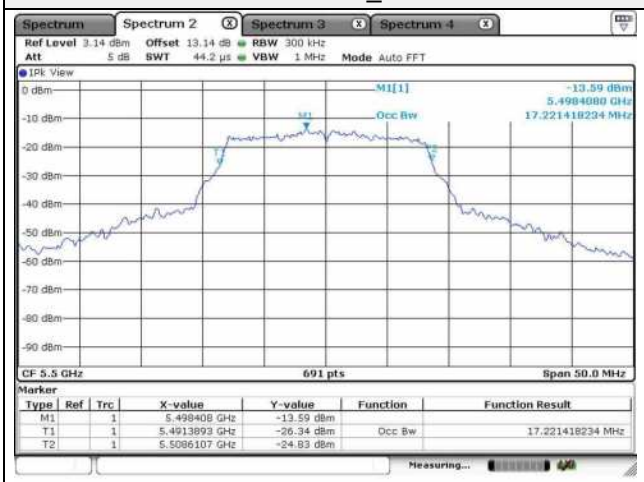
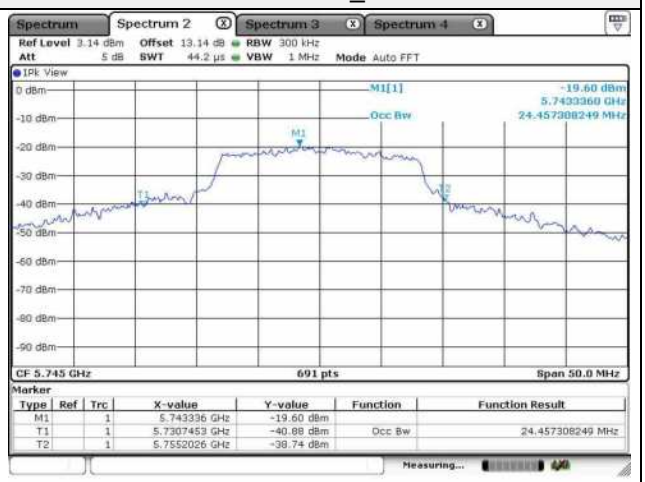
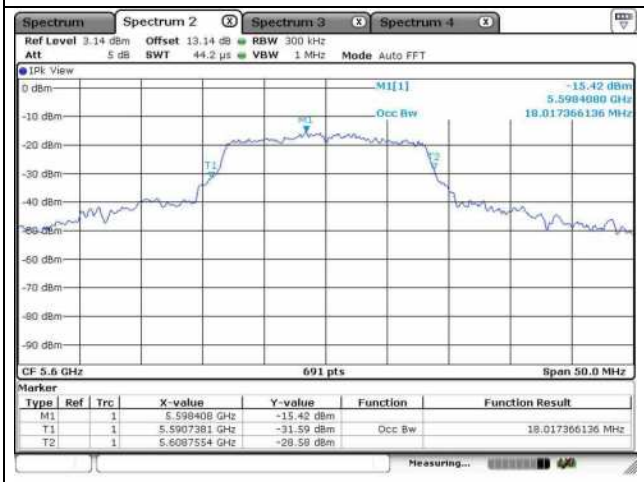
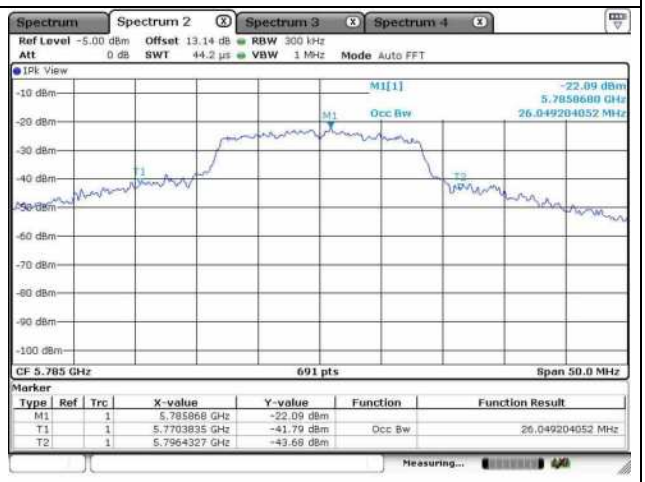
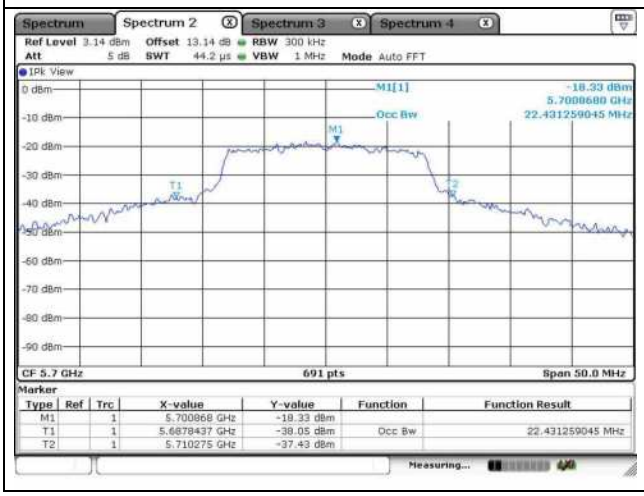
UNII-2C_a	UNII-3_a

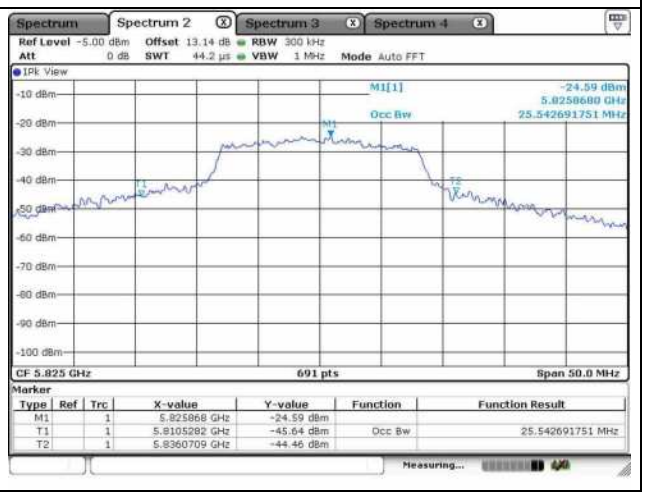












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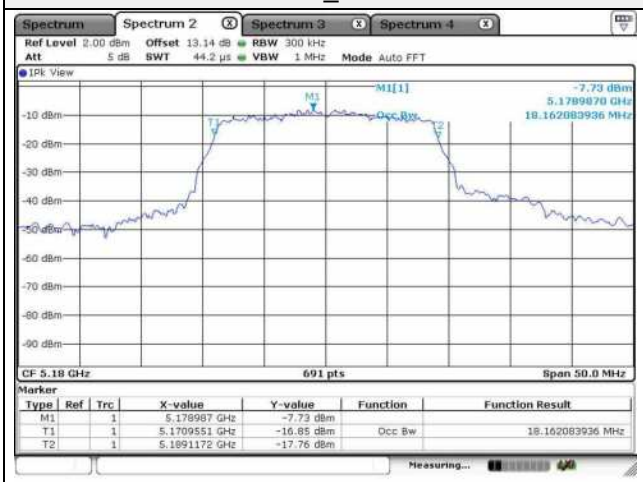
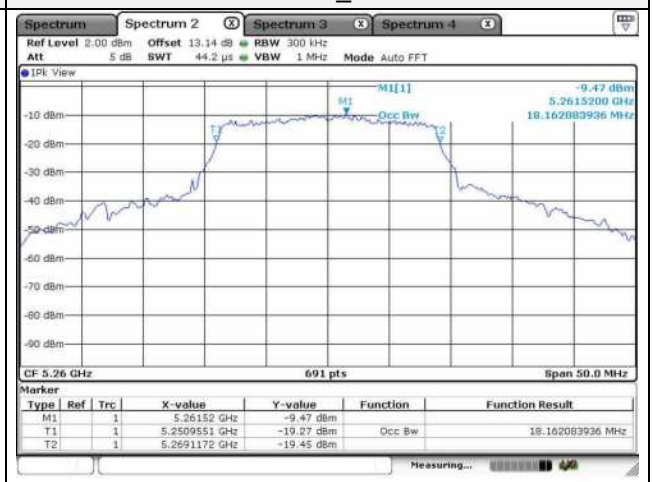
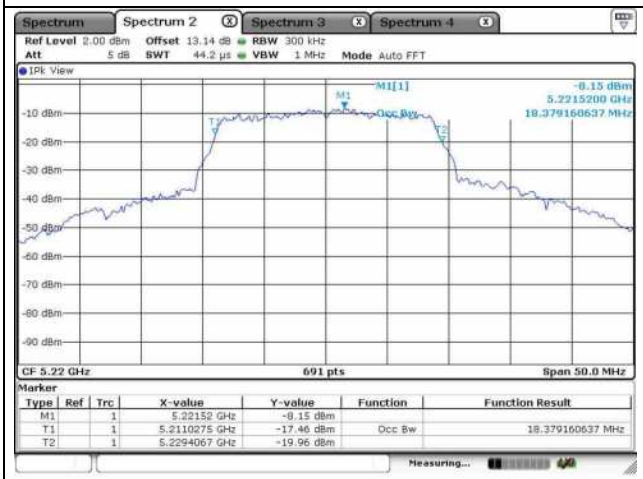
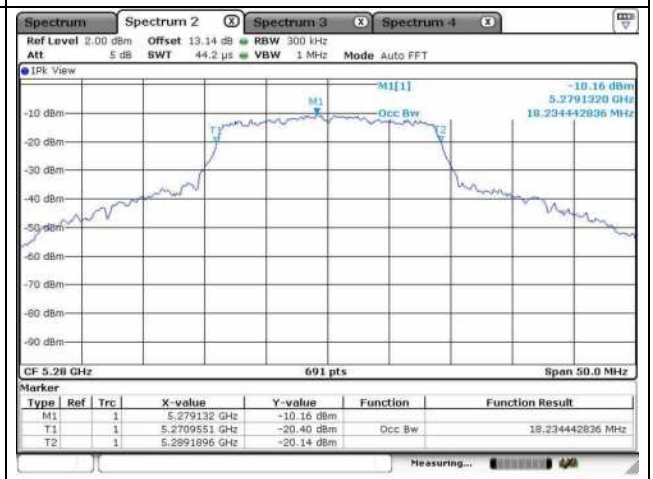
UNII-1_ HT20

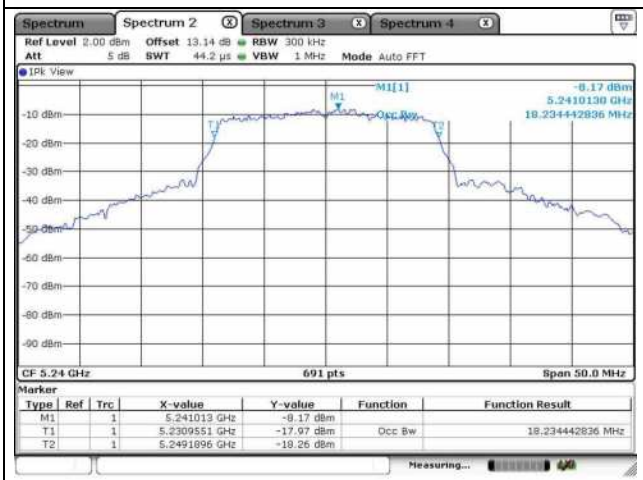


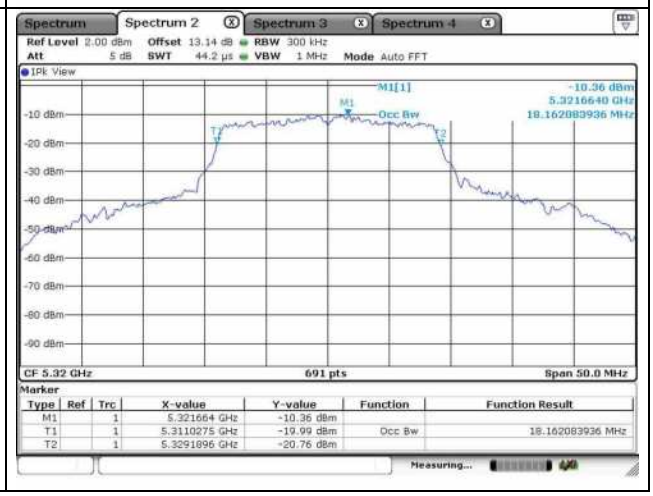
UNII-2A_ HT20











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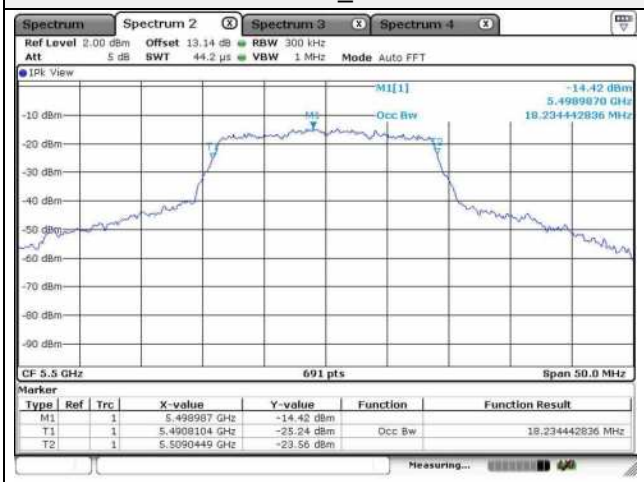
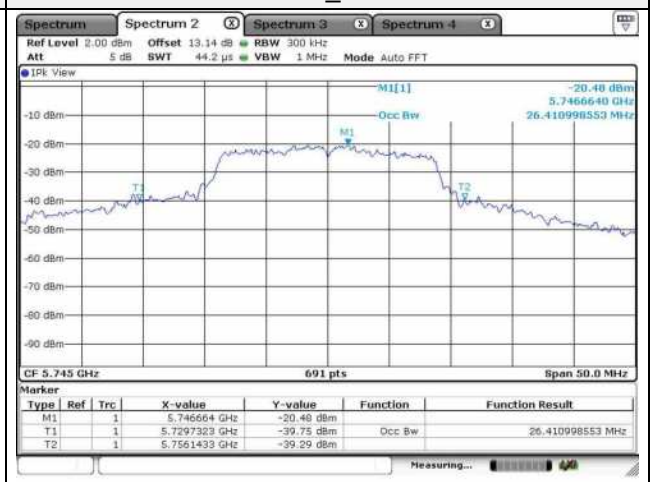
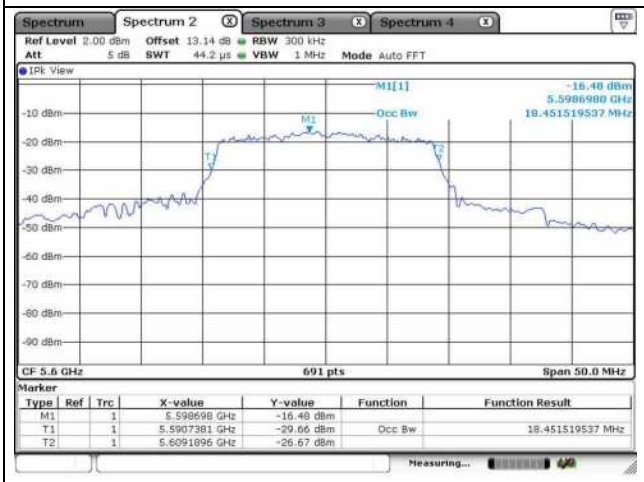
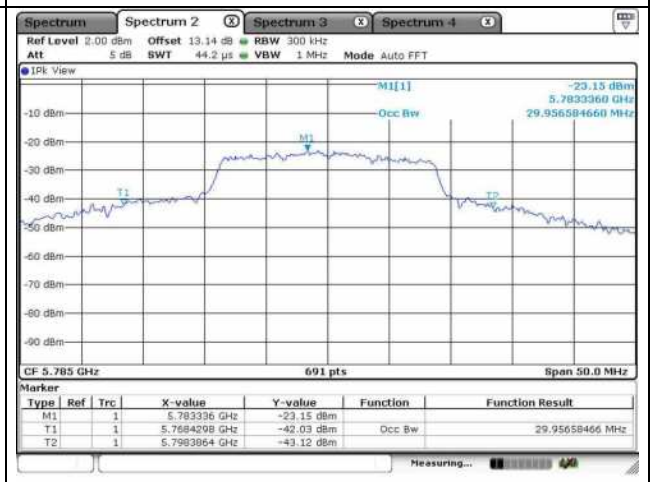
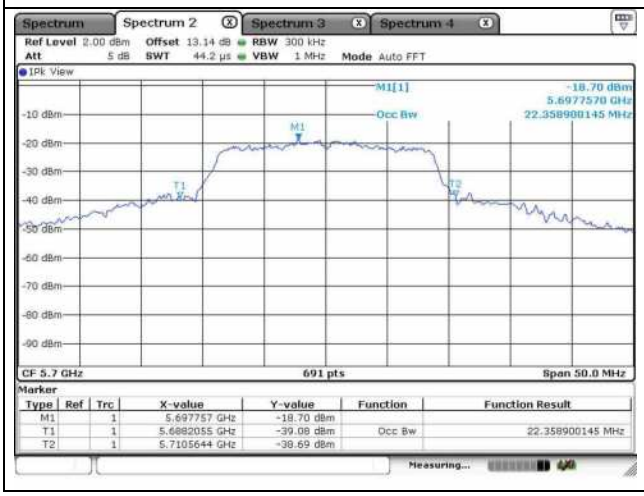
UNII-2C_HT20	UNII-3_ HT20

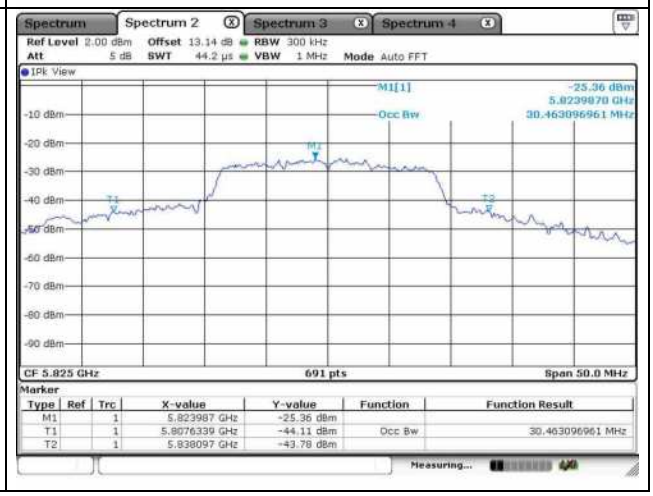












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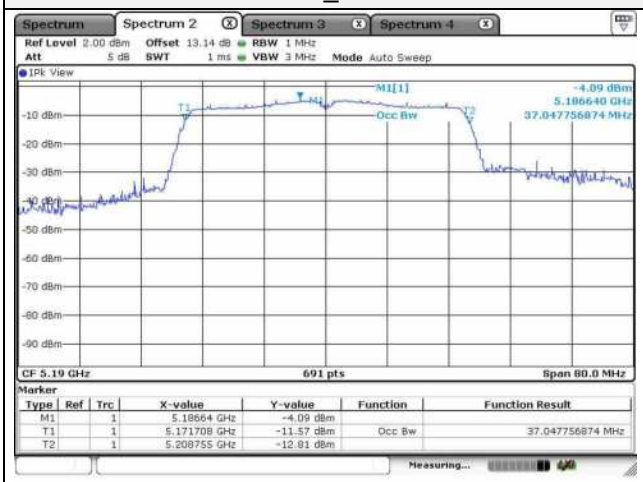
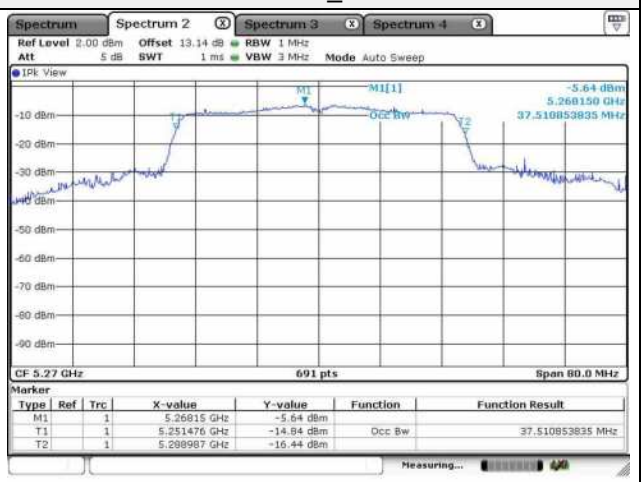
UNII-1_ HT40	UNII-2A_ HT40
	
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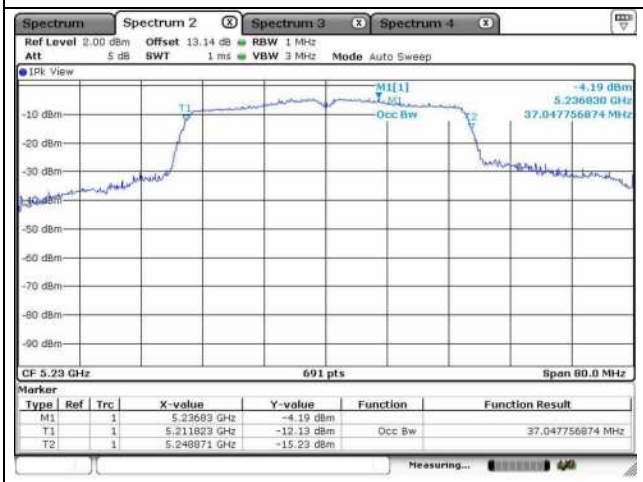	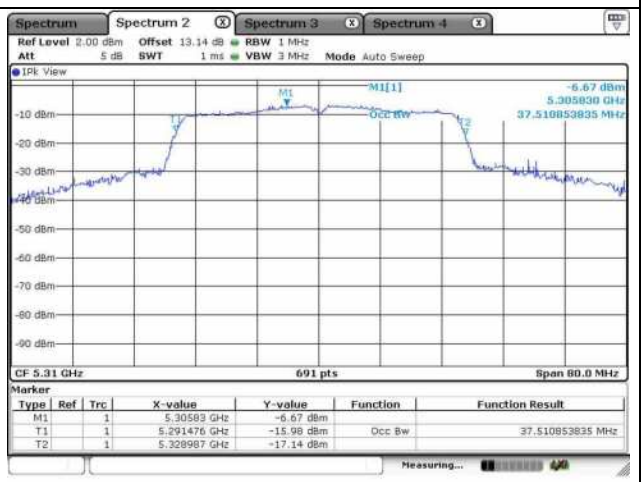

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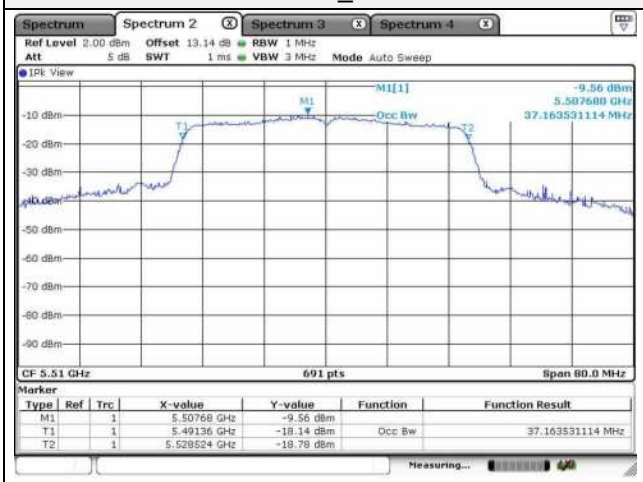
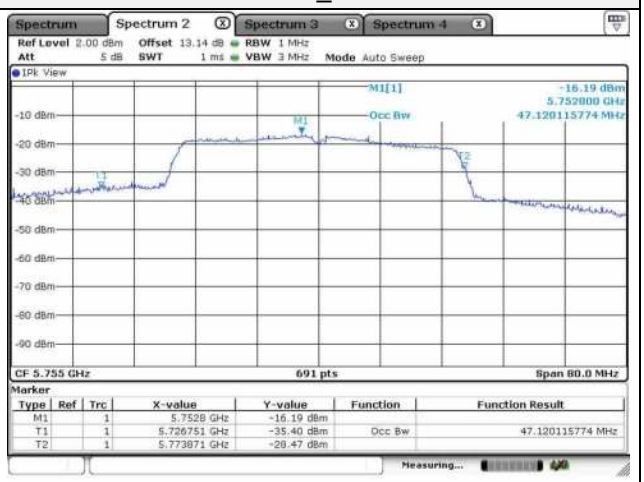
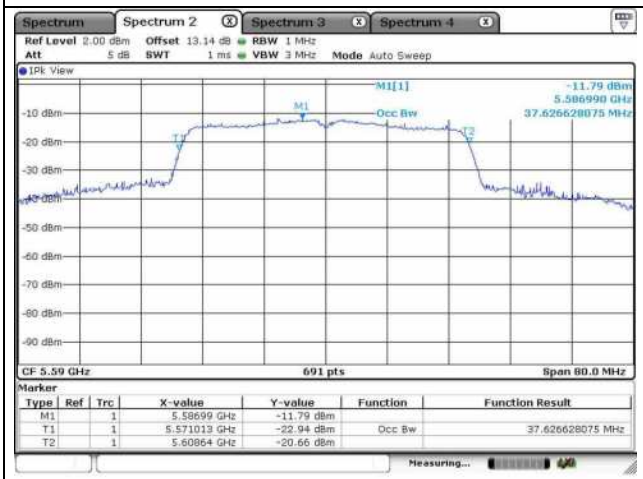
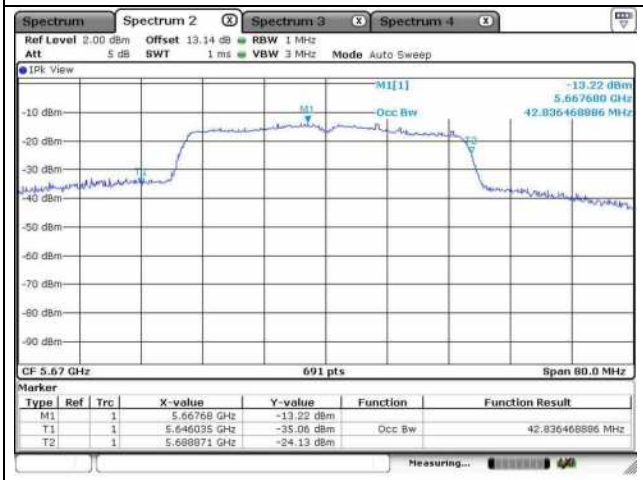
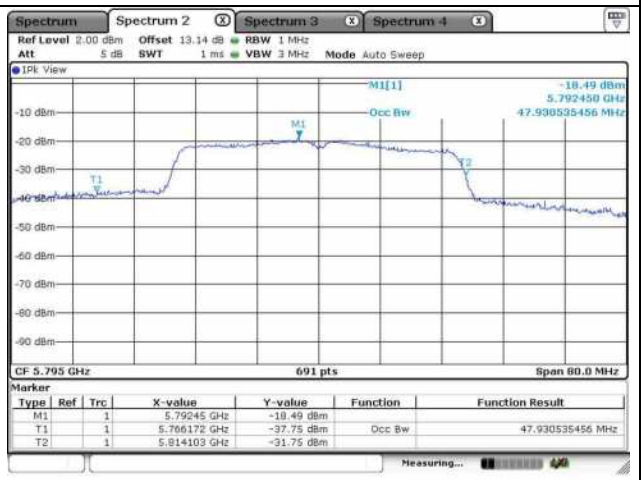
UNII-2C_HT40	UNII-3_ HT40
	
	Blank
	

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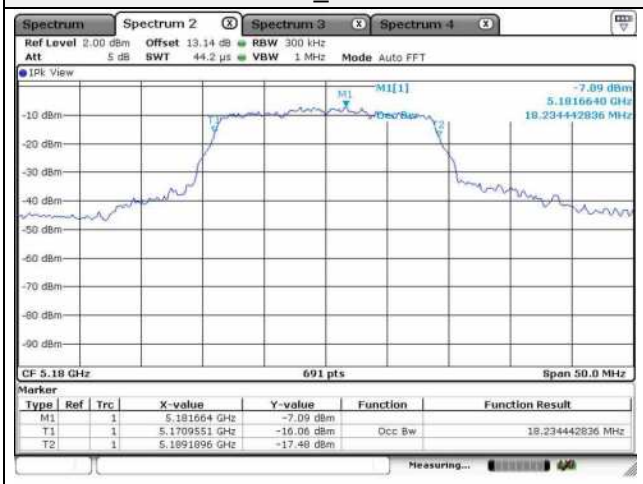
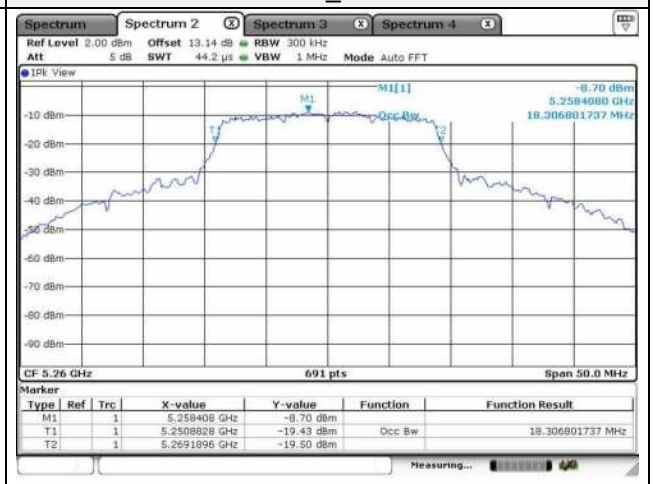
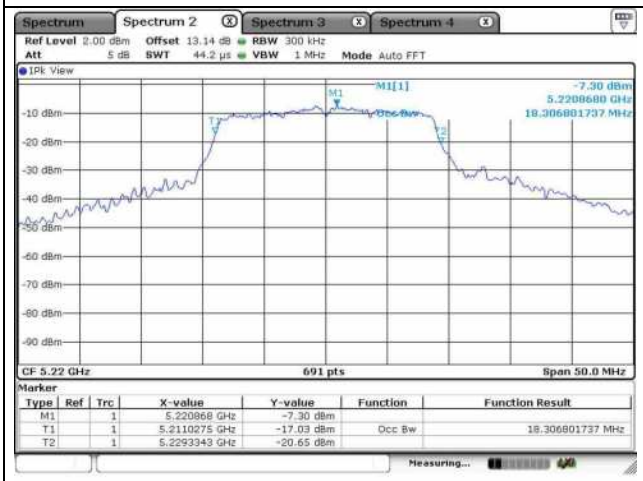
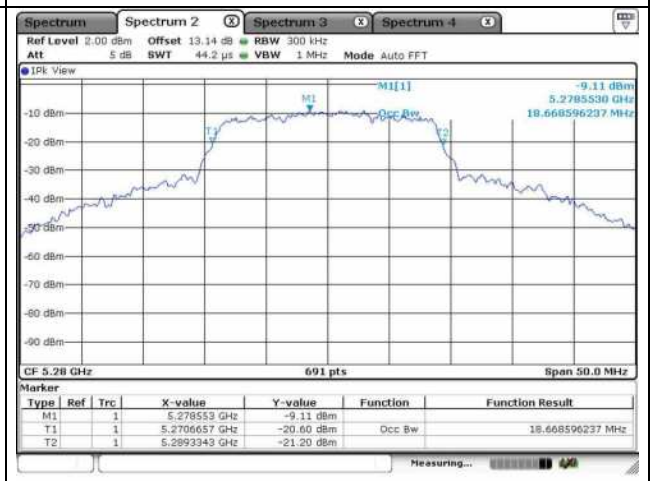
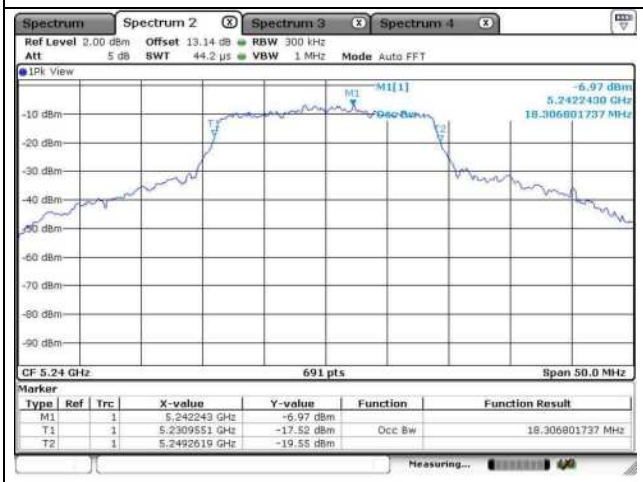
UNII-1_ VHT20	UNII-2A_ VHT20

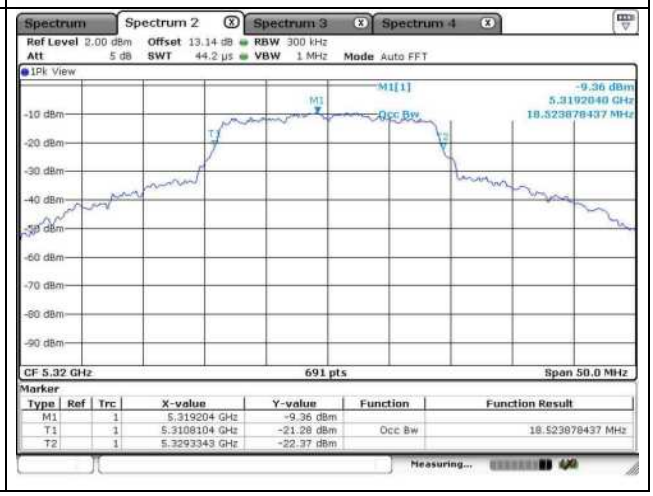












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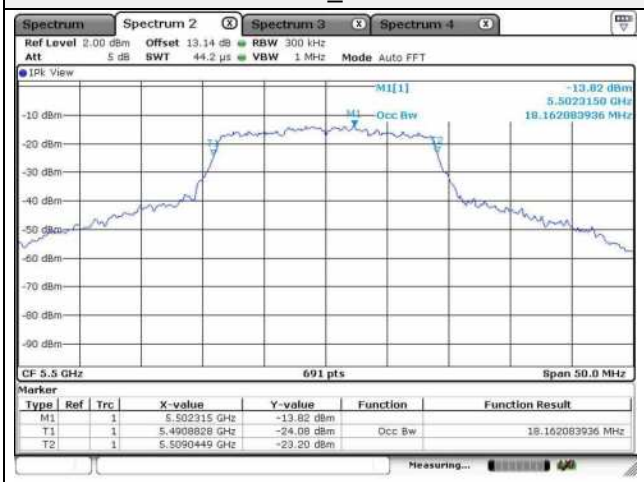
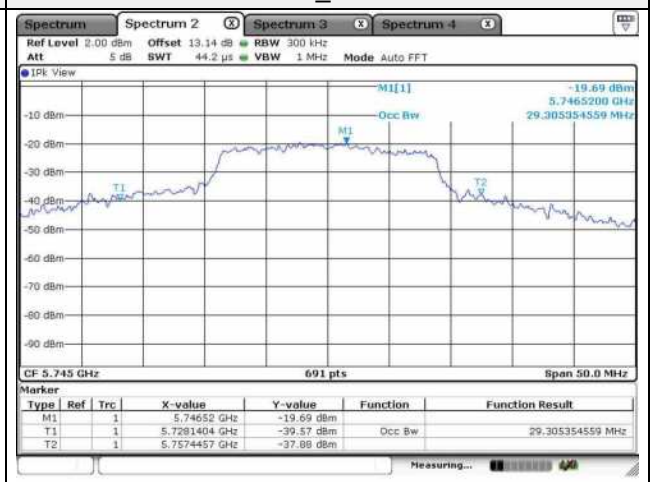
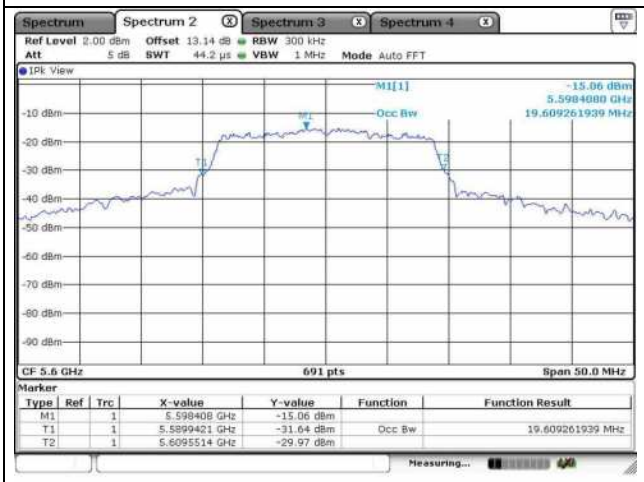
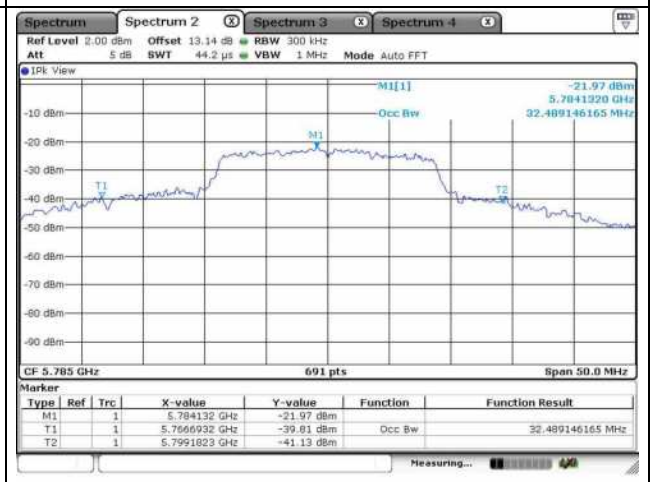
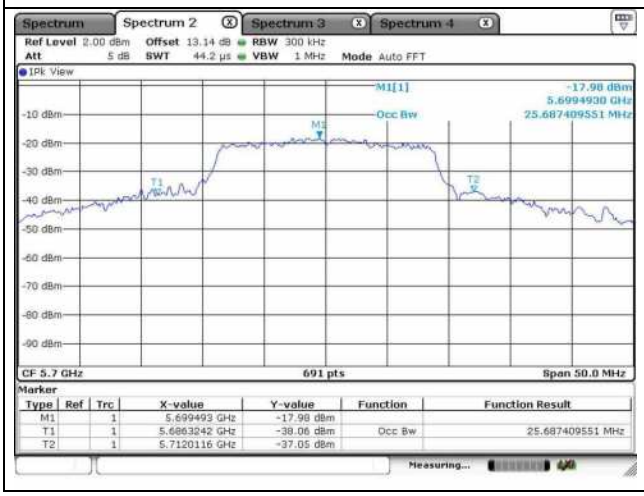
UNII-2C_VHT20	UNII-3_ VHT20

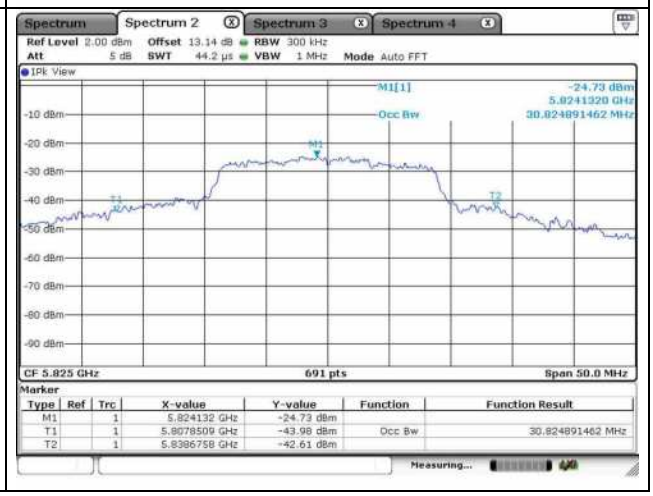












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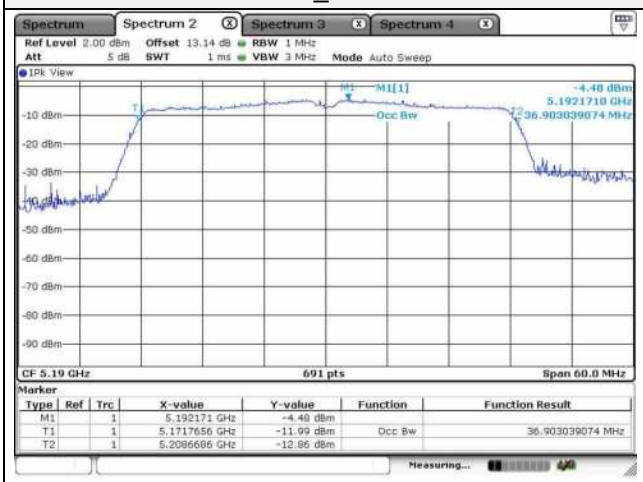
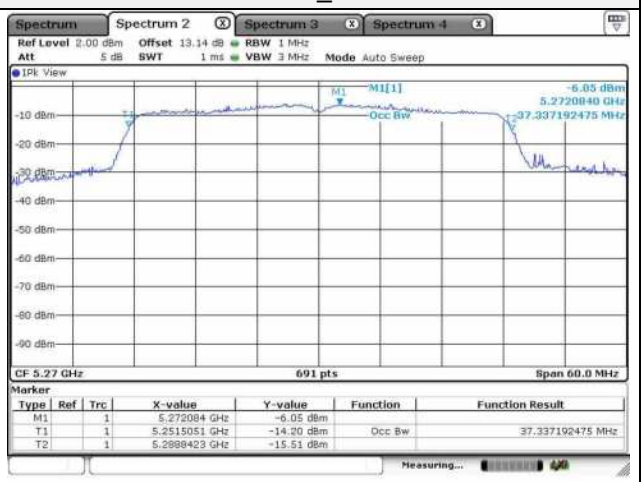
UNII-1_ VHT40	UNII-2A_ VHT40
	
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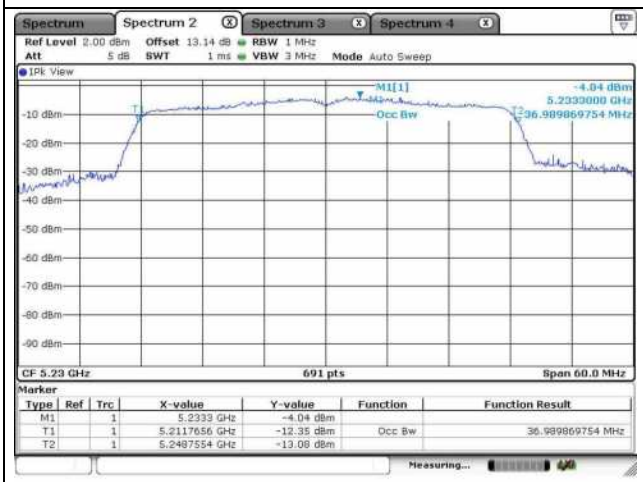
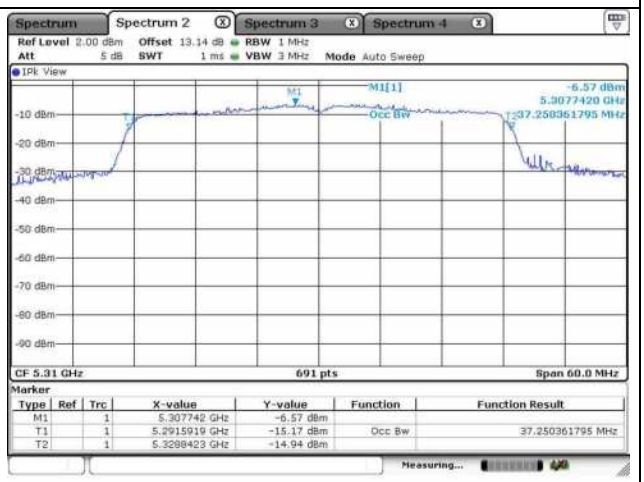
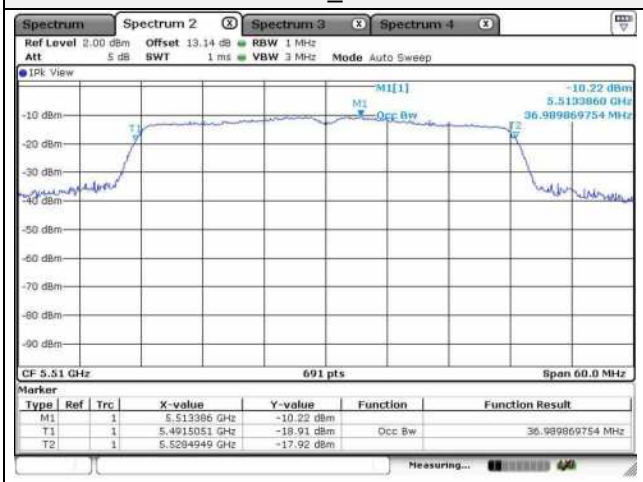
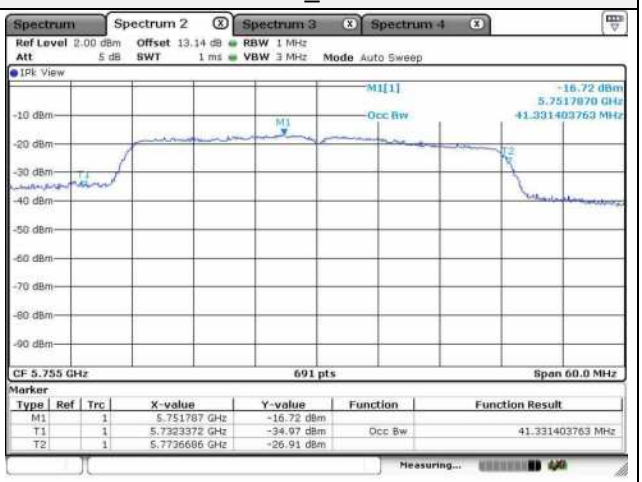
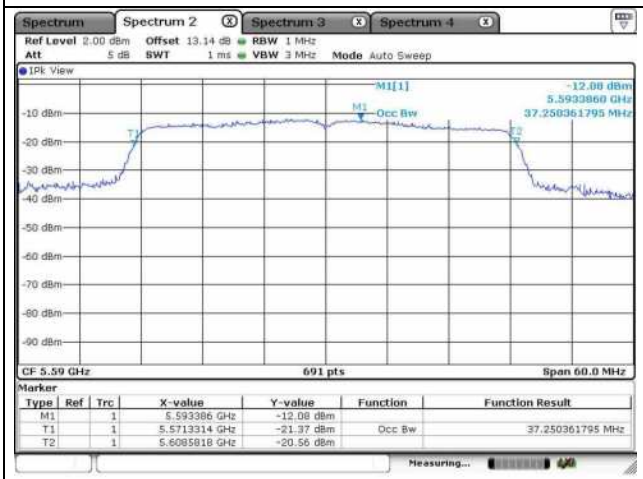
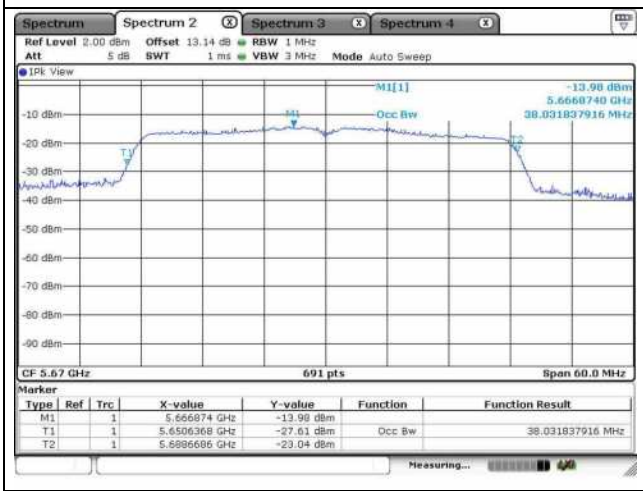
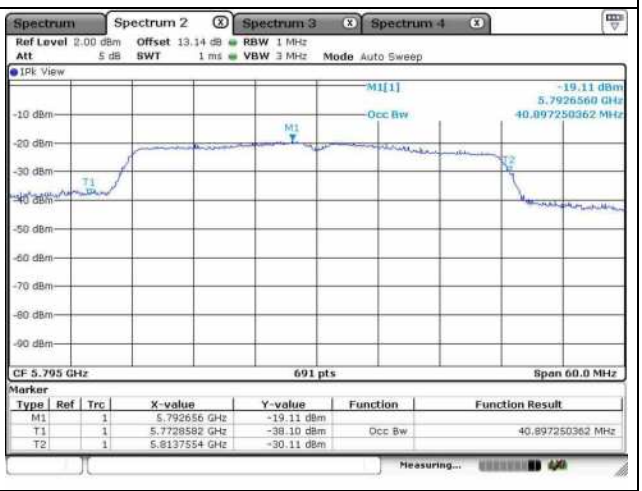
	

UNII-2C_VHT40	UNII-3_ VHT40
	
	Blank
	

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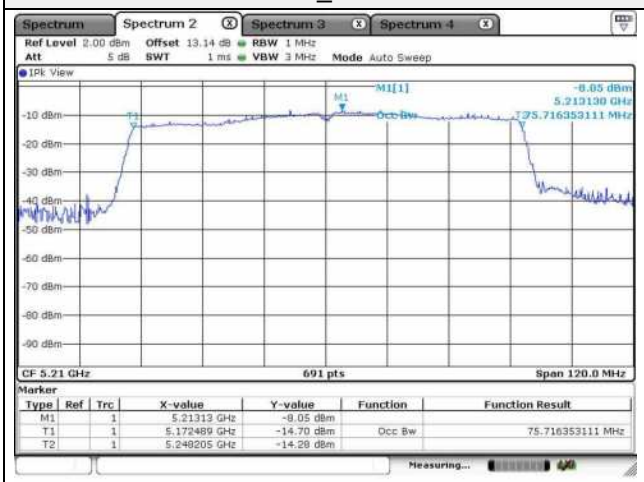
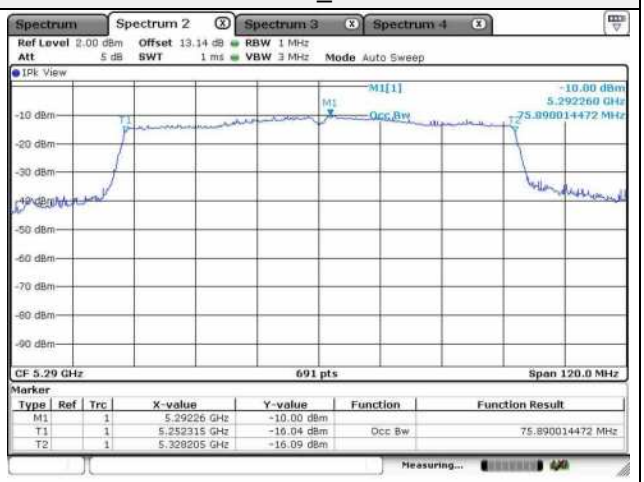
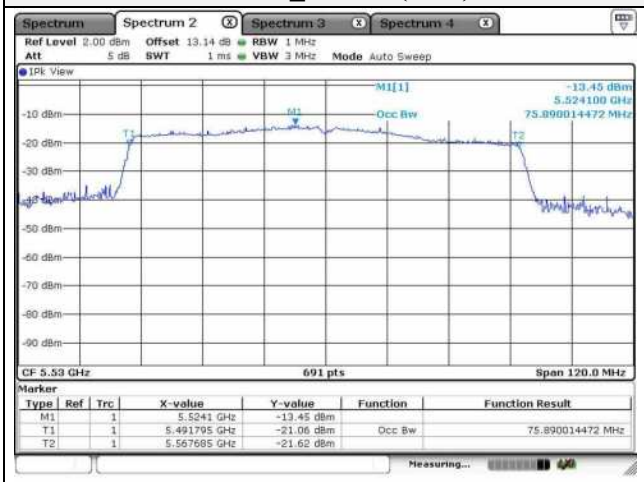
UNII-1_VHT80



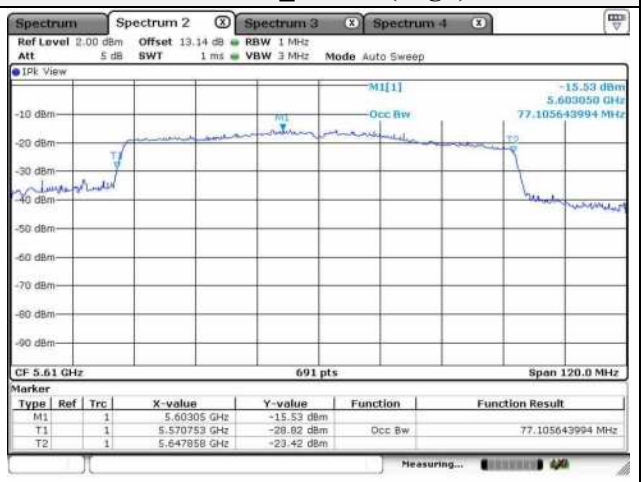
UNII-2A_ VHT80



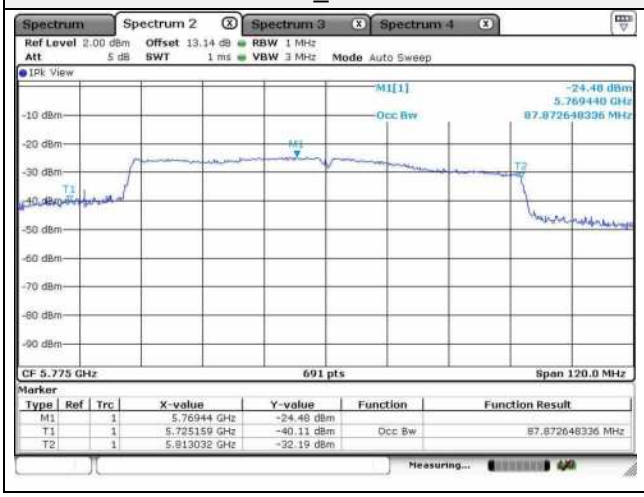
UNII-2C_VHT80(Low)



UNII-2C_VHT80(High)



UNII-3_ VHT80



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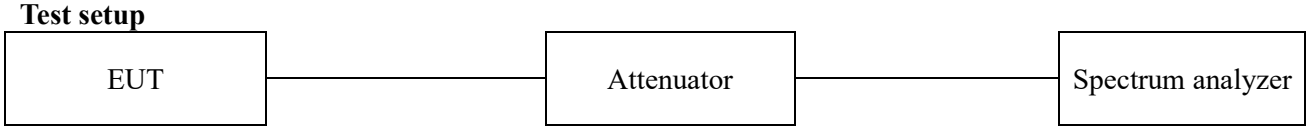
3.2. 6 dB bandwidth

Test procedure

KDB 789033 D02 v02r01– Section C.2

Test setup



Section C.2

1. Set RBW = 100 ㎑
2. Set the video bandwidth (VBW) ≥ 3 × RBW.
3. Detector = peak.
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 frequencies) that are attenuated by 6 ㏈ relative to the maximum level measured in the fundamental emission.

Limit

Within the 5.725-5.85 ㎓ band, the minimum 6 ㏈ bandwidth of U-NII devices shall be at least 500 ㎑.

According to RSS-247 6.1 (1), equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

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Test results

Band	Frequency(㎒)	Mode	6 dB bandwidth(㎒)
UNII-3	5 745	a	16.353
	5 785		16.353
	5 825		16.353
	5 745	HT20	16.643
	5 785		17.511
	5 825		17.583
	5 755	HT40	35.880
	5 795		36.060
	5 745	VHT20	17.004
	5 785		16.643
	5 825		16.570
	5 755	VHT40	35.770
	5 795		36.060
	5 775	VHT80	75.750

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