

TEST REPORT



Dt&C Co., Ltd.

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1. Report No : DRTFCC2308-0114

2. Customer

- Name (FCC) : HANWHA CORPORATION / Name (IC) : HANWHA CORPORATION
- Address (FCC) : 86, Cheonggyecheon-ro, Jung-gu, Seoul South Korea
Address (IC) : 86, Cheonggyecheon-ro, Jung-gu Seoul 04541 Korea (Republic Of)

3. Use of Report : FCC & IC Certification

4. Product Name / Model Name : HiTRONIC BLASTER / HEBS-B-3A

FCC ID : 2ATCL-HEBS-B-3A

IC : 31141-HEBSB3A

5. FCC Regulation(s): Part 15.407

IC Standard(s): RSS-247 Issue 2, RSS-Gen Issue 5

Test Method used: ANSI C63.10-2013, KDB789033 D02v02r01, KDB662911 D01v02r01

6. Date of Test : 2023.06.16 ~ 2023.07.14

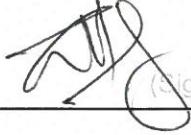
7. Location of Test : Permanent Testing Lab On Site Testing

8. Testing Environment : See appended test report.

9. Test Result : Refer to the attached test result.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test report is not related to KOLAS accreditation.

Affirmation	Tested by Name : JaeHyeok Bang	Technical Manager Name : JaeJin Lee	  (Signature)
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2023 . 08 . 18 .

Dt&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2308-0114	Aug. 18, 2023	Initial issue	JaeHyeok Bang	JaeJin Lee

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1. General Information

1.1. Description of EUT

Equipment Class	Unlicensed National Information Infrastructure TX(NII)
Product Name	HiTRONIC BLASTER
Product Marketing Name (PMN)	HEBS-B-3A
Model Name	HEBS-B-3A
Add Model Name	-
Firmware Version Identification Number	1.0.0
EUT Serial Number	Conducted: F220301000038, Radiated: F220301000317
Power Supply	DC 10.8 V
Modulation Technique	OFDM
Antenna Specification	Antenna Type: Chip Antenna Antenna Gain: Refer to the clause 3 in test report

1.2. Declaration by the applicant / manufacturer

N/A

1.3. Testing Laboratory

Dt&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.

The test site complies with the requirements of Part 2.948 according to ANSI C63.4-2014.

- FCC & IC MRA Designation No. : KR0034

- ISED#: 5740A

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1.4. Testing Environment

Ambient Condition

▪ Temperature	+21 °C ~ +24 °C
▪ Relative Humidity	+40 % ~ +43 %

1.5. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014 and ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
Antenna-port conducted emission	1.0 dB (The confidence level is about 95 %, $k = 2$)
AC power-line conducted emission	3.4 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz Below)	4.8 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz ~ 18 GHz)	4.8 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (18 GHz Above)	4.94 dB (The confidence level is about 95 %, $k = 2$)

1.6. Test Equipment List

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	23/06/23	24/06/24	MY46471622
Spectrum Analyzer	Agilent Technologies	N9020A	22/12/16	23/12/16	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	23/06/23	24/06/24	US47360812
Spectrum Analyzer	KEYSIGHT	N9030B	22/12/16	23/12/16	MY55480168
DC Power Supply	Agilent Technologies	66332A	23/06/23	24/06/24	US37474125
Multimeter	FLUKE	17B+	22/12/16	23/12/16	36390701WS
Signal Generator	Rohde Schwarz	SMBV100A	22/12/16	23/12/16	255571
Signal Generator	ANRITSU	MG3695C	22/12/16	23/12/16	173501
Thermohygrometer	BODYCOM	BJ5478	22/12/16	23/12/16	120612-1
Thermohygrometer	BODYCOM	BJ5478	22/12/16	23/12/16	120612-2
Thermohygrometer	BODYCOM	BJ5478	23/06/22	24/06/22	N/A
Loop Antenna	ETS-Lindgren	6502	22/04/22	24/04/22	00203480
Hybrid Antenna	Schwarzbeck	VULB 9160	22/12/16	23/12/16	3362
Horn Antenna	ETS-Lindgren	3117	23/06/23	24/06/23	00143278
Horn Antenna	A.H.Systems Inc.	SAS-574	23/06/23	24/06/23	155
PreAmplifier	tsj	MLA-0118-B01-40	22/12/16	23/12/16	1852267
PreAmplifier	tsj	MLA-1840-J02-45	23/06/23	24/06/23	16966-10728
PreAmplifier	H.P	8447D	22/12/16	23/12/16	2944A07774
High Pass Filter	Wainwright Instruments	WHKX12-935-1000-15000-40SS	23/06/23	24/06/23	8
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300-18000-60SS	23/06/23	24/06/23	1
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5-6SS	23/06/23	24/06/23	3
Attenuator	Hefei Shunze	SS5T2.92-10-40	23/06/23	24/06/23	16012202
Attenuator	Aeroflex/Weinschel	56-3	23/06/23	24/06/23	Y2370
Attenuator	SMAJK	SMAJK-2-3	23/06/23	24/06/23	3
Attenuator	SMAJK	SMAJK-2-3	23/06/23	24/06/23	2
Attenuator	Aeroflex/Weinschel	86-10-11	23/06/23	24/06/23	408
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A MA2411B	22/12/16	23/12/16	1338004 1911481
EMI Test Receiver	ROHDE&SCHWARZ	ESCI7	23/01/31	24/01/31	100910
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	22/08/22	23/08/22	101333
LISN	SCHWARZBECK	NSLK 8128 RC	22/10/26	23/10/26	8128 RC-387
Thermo Hygro Meter	TESTO	608-H1	23/01/13	24/01/13	45084791
Cable	Dt&C	Cable	23/01/04	24/01/04	G-2
Cable	HUBER+SUHNER	SUCOFLEX 100	23/01/04	24/01/04	G-3
Cable	Dt&C	Cable	23/01/04	24/01/04	G-4
Cable	OMT	YSS21S	23/01/04	24/01/04	G-5
Cable	Junkosha	MWX241	23/01/03	24/01/03	mmW-1
Cable	Junkosha	MWX241	23/01/03	24/01/03	mmW-4
Cable	HUBER+SUHNER	SUCOFLEX100	23/01/04	24/01/04	M-01
Cable	HUBER+SUHNER	SUCOFLEX100	23/01/04	24/01/04	M-02
Cable	JUNKOSHA	MWX241/B	23/01/04	24/01/04	M-03
Cable	JUNKOSHA	J12J101757-00	23/01/04	24/01/04	M-07
Cable	HUBER+SUHNER	SUCOFLEX106	23/01/04	24/01/04	M-09
Cable	Dt&C	Cable	23/01/04	24/01/04	RFC-69
Cable	Radiall	TESTPRO3	23/01/04	24/01/04	RFC-70
Test Software (AC Line Conducted)	tsj	EMI Measurement	NA	NA	Version 2.00.0185
Test Software (Radiated)	tsj	EMI Measurement	NA	NA	Version 2.00.0185

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.

Note2: The cable is not a regular calibration item, so it has been calibrated by Dt&C itself.

2. Test Methodology

The measurement procedures described in the ANSI C63.10-2013 and the guidance provided in KDB789033 D02v02r01 were used in measurement of the EUT.

The EUT was tested per the guidance of KDB789033 D02v02r01. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

2.1. 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.

2.2. 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 15.407 under the FCC Rules Part 15 Subpart E.

2.3. General Test Procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB789033 D02v02r01.

So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2013.

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

Radiated Emissions

Basically the radiated tests were performed with KDB789033 D02v02r01. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2013 as stated on KDB789033 D02v02r01.

The EUT is placed on a non-conductive table, which is 0.8 m above ground plane. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 1 m or 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.

2.4. 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 equipment, which is traceable to recognized national standards.

2.5. Description of Test Modes

The EUT has been tested with the operating condition for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting.

Transmitting Configuration of EUT

Mode	SISO		MIMO (CDD)	MIMO (SDM)
	Ant 1	Ant 2	Ant 1 & 2	Ant 1 & 2
	Data rate			
802.11a	6 ~ 54 Mbps	6 ~ 54 Mbps	6 ~ 54 Mbps	-
802.11n(HT20)	MCS 0 ~ 7	MCS 0 ~ 7	MCS 0 ~ 7	MCS 8 ~ 15
802.11ac(VHT20)	MCS 0 ~ 8(1SS)	MCS 0 ~ 8(1SS)	MCS 0 ~ 8(1SS)	MCS 0 ~ 8(2SS)
802.11n(HT40)	MCS 0 ~ 7	MCS 0 ~ 7	MCS 0 ~ 7	MCS 8 ~ 15
802.11ac(VHT40)	MCS 0 ~ 9(1SS)	MCS 0 ~ 9(1SS)	MCS 0 ~ 9(1SS)	MCS 0 ~ 9(2SS)
802.11ac(VHT80)	MCS 0 ~ 9(1SS)	MCS 0 ~ 9(1SS)	MCS 0 ~ 9(1SS)	MCS 0 ~ 9(2SS)

Note1: SDM = Spatial Diversity Multiplexing, CDD = Cycle Delay Diversity, SS = Spatial Streams

EUT Operation test setup

- **Test Software:** Tera Term 4.104.0.0, Qualcomm Radio Control Tool 4.0.74.0

- **Power setting:** Refer to the table below.

Tested frequency and power setting

Band	Channel	Frequency (MHz)	802.11a
			Power Setting
U-NII 1	36	5 180	8.5
	40	5 200	8
	48	5 240	8.5
U-NII 2A	52	5 260	13
	60	5 300	13
	64	5 320	13
U-NII 2C	100	5 500	8
	116	5 580	13
	144	5 700	5.5
U-NII 3	149	5 745	13
	157	5 785	13
	165	5 825	13

Band	Channel	Frequency (MHz)	802.11n(HT20), 802.11ac(VHT20)
			Power Setting
U-NII 1	36	5 180	9.5
	40	5 200	9
	48	5 240	9
U-NII 2A	52	5 260	12
	60	5 300	12
	64	5 320	12
U-NII 2C	100	5 500	7.5
	116	5 580	12
	144	5 700	5.5
U-NII 3	149	5 745	12
	157	5 785	12
	165	5 825	12

Band	Channel	Frequency (MHz)	802.11n(HT40), 802.11ac(VHT40)
			Power Setting
U-NII 1	38	5 190	10.5
	46	5 230	10
U-NII 2A	54	5 270	12
	62	5 310	9.5
U-NII 2C	102	5 510	4
	110	5 550	12
	142	5 670	10
U-NII 3	151	5 755	12
	159	5 795	12

Band	Channel	Frequency (MHz)	802.11ac(VHT80)
			Power Setting
U-NII 1	42	5 210	7
U-NII 2A	58	5 290	6
U-NII 2C	106	5 530	7.5
	138	5 610	11
U-NII 3	155	5 775	11

Tested Mode

Test Mode		ANT configuration	Worst data rate
TM 1	802.11a	CDD Multiple transmitting	6Mbps
TM 2	802.11n(HT20)	CDD Multiple transmitting	MCS0
TM 3	802.11n(HT40)	CDD Multiple transmitting	MCS0
TM 4	802.11ac(VHT80)	CDD Multiple transmitting	MCS0

3. Antenna Requirements

According to Part 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 antenna is permanently attached on the device.

Therefore this E.U.T complies with the requirement of Part 15.203

Directional antenna gain:

Bands	SISO		MIMO (CDD) <small>Note 1.</small>	MIMO (SDM) <small>Note 2</small>
	ANT 1 [dBi]	ANT 2 [dBi]	Directional Gain[dBi]	Directional Gain[dBi]
U-NII 1	3.87	3.87	6.88	3.87
U-NII 2A	3.87	3.87	6.88	3.87
U-NII 2C	4.05	4.05	7.06	4.05
U-NII 3	3.92	3.92	6.93	3.92

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

$$10 \log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N^{ANT}] \text{ dBi}$$

Note 2. Directional gain(completely uncorrelated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / N^{ANT}] \text{ dBi}$$

4. Summary of Test Result

FCC Part Section(s)	RSS Section(s)	Test Description	Limit	Test Condition	Status Note 1
15.407(a)	RSS-247[6.2]	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	NT Note 4
15.407(e)	RSS-247[6.2]	Minimum Emission Bandwidth (6 dB Bandwidth)	> 500 kHz in 5 725 ~ 5 850 MHz		NT Note 4
15.407(a)	RSS-247[6.2]	Maximum Conducted Output Power	Part 15.407(a) (Refer to section 5.1)		NT Note 4
15.407(a)	RSS-247[6.2]	Peak Power Spectral Density	Part 15.407(a) (Refer to section 5.4)		NT Note 4
-	RSS-Gen[6.7]	Occupied Bandwidth (99 %)	N/A		NT Note 4
15.407(h)	RSS-247[6.3]	Dynamic Frequency Selection	Part 15.407(h) (Refer to the DFS test report)		NT Note 4
15.205 15.209 15.407(b)	RSS-Gen[8.9] RSS-Gen[8.10] RSS-247[6.2]	Unwanted Emissions	Part 15.209, 15.407(b) (Refer to section 5.2)	Radiated	C Note 3
15.207	RSS-Gen[8.8]	AC Conducted Emissions	Part 15.207 (Refer to section 5.3)	AC Line Conducted	C
15.203	-	Antenna Requirements	Part 15.203 (Refer to section 3)	-	C

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

Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

Note 3: This test item was performed in three orthogonal EUT positions and the worst case data was reported.

Note 4: These test items were not performed because this device uses the granted module.

(FCC ID: MCQ-CCIMX8, IC: 1846A-CCIMX8)

Please refer to the test report of the granted module

5. TEST RESULT

5.1 Unwanted Emissions

■ Test Requirements

- Part 15.407(b) & RSS-Gen[6.2]

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

- (1) For transmitters operating in the **5.15 GHz - 5.25 GHz band**: all emissions outside of the **5.15 GHz - 5.35 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
- (2) For transmitters operating in the **5.25 GHz - 5.35 GHz band**: all emissions outside of the **5.15 GHz - 5.35 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
- (3) For transmitters operating in the **5.47 GHz - 5.725 GHz band**: all emissions outside of the **5.47 GHz - 5.725 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
- (4) For transmitters operating in the **5.725 GHz - 5.85 GHz band**: (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (5) Unwanted emissions **below 1 GHz** must comply with the general field strength limits set forth in **Section 15.209**.

Further, any U-NII devices using an **AC power line** are required to comply also with the conducted limits set forth in **Section 15.207**.

- Part 15.209 & RSS-247[8.9]: General requirements

Frequency (MHz)	FCC Limit (uV/m)	IC Limit (μA/m)	Measurement Distance (m)
0.009 – 0.490	2 400 / F (kHz)	6.37/F (F in kHz)	300
0.490 – 1.705	24 000 / F (kHz)	63.7/F (F in kHz)	30
1.705 – 30.0	30	0.08	30

Frequency (MHz)	FCC Limit (uV/m)	IC Limit (uV/m)	Measurement Distance (m)
30 ~ 88	100 **	100	3
88 ~ 216	150 **	150	3
216 ~ 960	200 **	200	3
Above 960	500	500	3

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

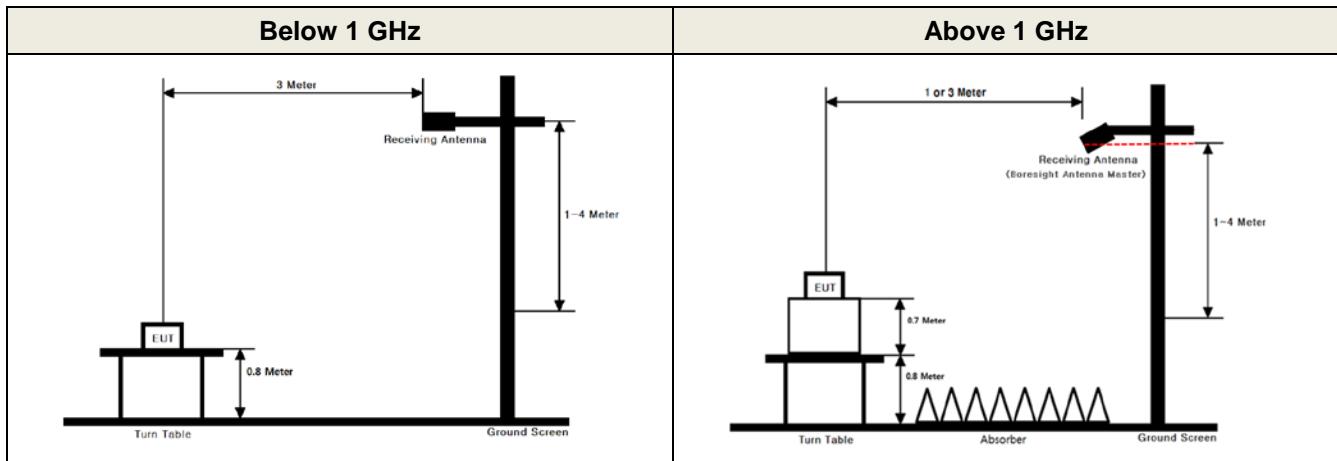
- Part 15.205(a): Restricted band of operation

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.414 25 ~ 8.414 75	108 ~ 121.94	1 300 ~ 1 427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1 435 ~ 1 626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.173 5 ~ 2.190 5	12.519 75 ~ 12.520 25	149.9 ~ 150.05	1 645.5 ~ 1 646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.576 75 ~ 12.577 25	156.524 75 ~ 156.525 25	1 660 ~ 1 710	8.025 ~ 8.5	22.01 ~ 23.12
4.177 25 ~ 4.177 75	13.36 ~ 13.41	156.7 ~ 156.9	1 718.8 ~ 1 722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.207 25 ~ 4.207 75	16.42 ~ 16.423	162.012 5 ~ 167.17	2 200 ~ 2 300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.694 75 ~ 16.695 25	167.72 ~ 173.2	2 310 ~ 2 390	10.6 ~ 12.7	36.43 ~ 36.5
6.267 75 ~ 6.268 25	16.804 25 ~ 16.804 75	240 ~ 285	2 483.5 ~ 2 500	13.25 ~ 13.4	Above 38.6
6.311 75 ~ 6.312 25	25.5 ~ 25.67	322 ~ 335.4	2 655 ~ 2 900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3 260 ~ 3 267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3 332 ~ 3 339		
8.376 25 ~ 8.386 75	12.29 ~ 12.293	149.9 ~ 150.05	3 345.8 ~ 3 358	9.0 ~ 9.2	
8.414 25 ~ 8.414 75	108 ~ 121.94	156.524 75 ~ 156.525 25	3 500 ~ 4 400	9.3 ~ 9.5	
12.519 75 ~ 12.520 25	123 ~ 138	162.012 5 ~ 167.17	4 500 ~ 5 150	10.6 ~ 12.7	
12.576 75 ~ 12.577 25	149.9 ~ 150.05	167.72 ~ 173.2	5 350 ~ 5 460	13.25 ~ 13.4	
13.36 ~ 13.41	156.524 75 ~ 156.525 25	240 ~ 285	7 250 ~ 7 750	14.47 ~ 14.5	
16.42 ~ 16.423	167.72 ~ 173.2	322 ~ 335.4	8 025 ~ 8 500	15.35 ~ 16.2	
16.694 75 ~ 16.695 25	240 ~ 285	399.90 ~ 410	17.7 ~ 21.4		
16.804 25 ~ 16.804 75	322 ~ 335.4	608 ~ 614	2 200 ~ 2 300	22.01 ~ 23.12	
25.5 ~ 25.67	399.90 ~ 410	3 260 ~ 3 267	2 310 ~ 2 390	23.6 ~ 24.0	
37.5 ~ 38.25	608 ~ 614	3 332 ~ 3 339	2 483.5 ~ 2 500	31.2 ~ 31.8	
			2 655 ~ 2 900	3 345.8 ~ 3 358	36.43 ~ 36.5
			3 260 ~ 3 267	3 500 ~ 4 400	Above 38.6
			3 332 ~ 3 339	4 500 ~ 5 150	
			7 250 ~ 7 750	5 350 ~ 5 460	
			8 025 ~ 8 500	7 250 ~ 7 750	
			17.7 ~ 21.4	8 025 ~ 8 500	
			22.01 ~ 23.12	17.7 ~ 21.4	
			23.6 ~ 24.0	22.01 ~ 23.12	
			31.2 ~ 31.8	23.6 ~ 24.0	
			36.43 ~ 36.5	31.2 ~ 31.8	
			Above 38.6	36.43 ~ 36.5	

- RSS-Gen[8.10]: Restricted frequency bands

MHz	MHz	MHz	MHz	MHz	GHz
0.090 ~ 0.110	8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3 345.8 ~ 3 358	9.0 ~ 9.2
0.495 ~ 0.505	8.376 25 ~ 8.386 75	74.8 ~ 75.2	960 ~ 1 427	3 500 ~ 4 400	9.3 ~ 9.5
2.173 5 ~ 2.190 5	8.414 25 ~ 8.414 75	108 ~ 138	1 435 ~ 1 626.5	4 500 ~ 5 150	10.6 ~ 12.7
3.020 ~ 3.026	12.29 ~ 12.293	149.9 ~ 150.05	1 645.5 ~ 1 646.5	5 350 ~ 5 460	13.25 ~ 13.4
4.125 ~ 4.128	12.519 75 ~ 12.520 25	156.524 75 ~ 156.525 25	1 660 ~ 1 710	7 250 ~ 7 750	14.47 ~ 14.5
4.177 25 ~ 4.177 75	12.576 75 ~ 12.577 25	162.012 5 ~ 167.17	1 718.8 ~ 1 722.2	8 025 ~ 8 500	15.35 ~ 16.2
4.207 25 ~ 4.207 75	13.36 ~ 13.41	167.72 ~ 173.2	2 200 ~ 2 300		17.7 ~ 21.4
5.677 ~ 5.683	16.42 ~ 16.423	240 ~ 285	2 310 ~ 2 390		22.01 ~ 23.12
6.215 ~ 6.218	16.694 75 ~ 16.695 25	322 ~ 335.4	2 483.5 ~ 2 500		23.6 ~ 24.0
6.267 75 ~ 6.268 25	16.804 25 ~ 16.804 75	399.90 ~ 410	2 655 ~ 2 900		31.2 ~ 31.8
6.311 75 ~ 6.312 25	25.5 ~ 25.67	608 ~ 614	3 260 ~ 3 267		36.43 ~ 36.5
8.291 ~ 8.294	37.5 ~ 38.25	3 332 ~ 3 339	3 345.8 ~ 3 358		Above 38.6

■ Test Configuration



■ 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.
2. The turn table shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 1 m or 3 m away from the receiving antenna, which is varied from 1 m to 4 m 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.

Radiated spurious emission measured using following Measurement Procedure of **KDB789033 D02v02r01**

► General Requirements for Unwanted Emissions Measurements

The following requirements apply to all unwanted emissions measurements, both in and outside of the restricted bands:

- EUT Duty Cycle
 - (1) The EUT shall be configured or modified to **transmit continuously** except as stated in (ii), below. The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (**to no lower than 98 percent**) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.
 - (2) If **continuous transmission (or at least 98 percent duty cycle) cannot be achieved** due to hardware limitations of the EUT (e.g., overheating), the following additions to the measurement and reporting procedures are required:
 - The EUT shall be configured to operate at the maximum achievable duty cycle.
 - Measure the duty cycle, x, of the transmitter output signal.
 - Adjustments to measurement procedures (e.g., increasing test time and number of traces averaged) shall be performed as described in the procedures below.
 - The test report shall include the following additional information:
 - The reason for the duty cycle limitation.
 - The duty cycle achieved for testing and the associated transmit duration and interval between transmissions.
 - The sweep time and the amount of time used for trace stabilization during max-hold measurements for peak emission measurements.
 - (3) Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.

► **Measurements below 1 000 MHz**

- a) Follow the requirements in section II.G.3, "General Requirements for Unwanted Emissions Measurements".
- b) Compliance shall be demonstrated using **CISPR quasi-peak detection**; however, **peak detection** is permitted as an alternative to quasi-peak detection.

► **Measurements Above 1 000 MHz (Peak)**

- a) Follow the requirements in section II.G.3, "General Requirements for Unwanted Emissions Measurements".
- b) Peak emission levels are measured by setting the analyzer as follows:
 - (i) **RBW = 1 MHz**.
 - (ii) **VBW \geq 3 MHz**.
 - (iii) **Detector = Peak**.
 - (iv) Sweep time = Auto.
 - (v) Trace mode = Max hold.
 - (vi) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately $1/x$, where x is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

► **Measurements Above 1000 MHz (Method AD)**

- (i) **RBW = 1 MHz**.
- (ii) **VBW \geq 3 MHz**.
- (iii) **Detector = RMS**, if $\text{span} / (\# \text{ of points in sweep}) \leq \text{RBW} / 2$. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, the detector mode shall be set to peak.
- (iv) Averaging type = power (i.e., RMS)
 - As an alternative, the detector and averaging type may be set for linear voltage averaging. Some analyzers require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
- (v) Sweep time = Auto.
- (vi) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of $1/x$, where x is the duty cycle. For example, with 50 percent duty cycle, at least 200 traces shall be averaged.
- (vii) If tests are performed with the EUT transmitting at a duty cycle less than 98 percent, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
 - **If power averaging (RMS) mode was used in step (iv) above, the correction factor is $10 \log(1/x)$, where x is the duty cycle.** For example, if the transmit duty cycle was 50 percent, then 3 dB must be added to the measured emission levels.
 - If linear voltage averaging mode was used in step (iv) above, the correction factor is $20 \log(1/x)$, where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 6 dB must be added to the measured emission levels.
 - If a specific emission is demonstrated to be continuous (100 percent duty cycle) rather than turning on and off with the transmit cycle, no duty cycle correction is required for that emission.

Duty Cycle Correction factor

Test Mode	Date rate	T_{on} (ms)	T_{on+off} (ms)	$x = T_{on} / (T_{on+off})$	DCCF = $10 \log(1/x)$ (dB)
TM 1	6 Mbps	2.028	2.135	0.949 9	0.22
TM 2	MCS 0	1.888	1.995	0.946 4	0.24
TM 3	MCS 0	0.928	1.025	0.905 4	0.43
TM 4	MCS 0	0.456	0.553	0.824 7	0.84

Note1: Where, T = Transmission duration / x = Duty cycle

Note2: Please refer to the appendix II for duty cycle plots.

Test Results

Test Notes

1. The radiated emissions were investigated 9 kHz to 40 GHz. And no other spurious and harmonic emissions were found below listed frequencies.

2. Information of Distance Correction Factor

For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.

In this case, the distance factor is applied to the result.

- Calculation of distance correction factor

At frequencies below 30 MHz = $40 \log(\text{tested distance} / \text{specified distance})$

At frequencies at or above 30 MHz = $20 \log(\text{tested distance} / \text{specified distance})$

When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + TF + DCCF + DCF / TF = AF + CL + HL + AL - AG

Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss, AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

4. The limit is converted to field strength.

$E(\text{dBuV/m}) = \text{EIRP}(\text{dBm}) + 95.2 \text{ dB} = -27 \text{ dBm} + 95.2 = 68.2 \text{ dBuV/m}$

Unwanted Emissions data(9 kHz ~ 40 GHz) : TM1

Band	Tested Frequency (MHz)	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	5 180	5 148.45	H	X	PK	54.26	3.09	N/A	N/A	57.35	74.00	16.65
		5 148.53	H	X	AV	42.03	3.09	0.22	N/A	45.34	54.00	8.66
	10 359.59	H	X	PK	44.00	10.01	N/A	N/A	54.01	68.20	14.19	
	10 401.10	H	X	PK	44.12	10.28	N/A	N/A	54.40	68.20	13.80	
	5 240	10 479.40	H	X	PK	43.28	11.01	N/A	N/A	54.29	68.20	13.91
U-NII 2A	5 260	10 521.80	H	X	PK	44.47	11.26	N/A	N/A	55.73	68.20	12.47
	5 300	10 599.07	H	X	PK	43.72	11.27	N/A	N/A	54.99	68.20	13.21
		10 600.80	H	X	PK	45.13	11.27	N/A	N/A	56.40	74.00	17.60
		10 600.03	H	X	AV	33.63	11.27	0.22	N/A	45.12	54.00	8.88
	5 320	5 352.38	H	X	PK	63.53	3.62	N/A	N/A	67.15	74.00	6.85
		5 353.01	H	X	AV	43.28	3.62	0.22	N/A	47.12	54.00	6.88
		10 639.16	H	X	PK	44.51	11.25	N/A	N/A	55.76	74.00	18.24
		10 639.28	H	X	AV	33.81	11.25	0.22	N/A	45.28	54.00	8.72
U-NII 2C	5 500	5 458.01	H	X	PK	51.83	3.47	N/A	N/A	55.30	74.00	18.70
		5 467.68	H	X	PK	55.19	3.47	N/A	N/A	58.66	68.20	9.54
		5 458.15	H	X	AV	41.89	3.47	0.22	N/A	45.58	54.00	8.42
		10 998.79	H	X	PK	45.21	11.34	N/A	N/A	56.55	74.00	17.45
		10 998.64	H	X	AV	34.66	11.34	0.22	N/A	46.22	54.00	7.78
	5 580	11 159.81	H	X	PK	45.71	10.74	N/A	N/A	56.45	74.00	17.55
		11 159.75	H	X	AV	35.43	10.74	0.22	N/A	46.39	54.00	7.61
U-NII 3	5 745	5 648.60	H	X	PK	53.83	3.90	N/A	N/A	57.73	68.20	10.47
		5 713.93	H	X	PK	65.13	4.00	N/A	N/A	69.13	109.10	39.97
		11 490.92	H	X	PK	46.99	9.46	N/A	N/A	56.45	74.00	17.55
		11 491.00	H	X	AV	36.92	9.46	0.22	N/A	46.60	54.00	7.40
	5 785	11 570.41	H	X	PK	46.50	9.24	N/A	N/A	55.74	74.00	18.26
		11 570.48	H	X	AV	36.42	9.24	0.22	N/A	45.88	54.00	8.12
	5 825	5 902.91	H	X	PK	51.88	4.20	N/A	N/A	56.08	84.55	28.47
		5 934.70	H	X	PK	51.46	4.48	N/A	N/A	55.94	68.20	12.26
		11 650.02	H	X	PK	47.42	9.23	N/A	N/A	56.65	74.00	17.35
		11 650.42	H	X	AV	37.86	9.23	0.22	N/A	47.31	54.00	6.69

Unwanted Emissions data(9 kHz ~ 40 GHz) : TM2

Band	Tested Frequency (MHz)	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	
U-NII 1	5 180	5 146.65	H	X	PK	61.09	3.08	N/A	N/A	64.17	74.00	9.83	
		5 146.01	H	X	AV	44.00	3.08	0.24	N/A	47.32	54.00	6.68	
		10 358.62	H	X	PK	43.81	10.00	N/A	N/A	53.81	68.20	14.39	
	5 200	10 400.48	H	X	PK	44.16	10.28	N/A	N/A	54.44	68.20	13.76	
	5 240	10 481.07	H	X	PK	43.34	11.03	N/A	N/A	54.37	68.20	13.83	
U-NII 2A	5 300	5 260	10 518.94	H	X	PK	43.77	11.26	N/A	N/A	55.03	68.20	13.17
		10 599.42	H	X	PK	43.81	11.27	N/A	N/A	55.08	68.20	13.12	
		10 601.47	H	X	PK	44.01	11.27	N/A	N/A	55.28	74.00	18.72	
		10 601.00	H	X	AV	33.58	11.27	0.24	N/A	45.09	54.00	8.91	
	5 320	5 354.23	H	X	PK	59.38	3.62	N/A	N/A	63.00	74.00	11.00	
		5 355.19	H	X	AV	43.10	3.62	0.24	N/A	46.96	54.00	7.04	
		10 638.64	H	X	PK	44.11	11.25	N/A	N/A	55.36	74.00	18.64	
		10 638.65	H	X	AV	33.85	11.25	0.24	N/A	45.34	54.00	8.66	
U-NII 2C	5 500	5 458.96	H	X	PK	54.47	3.47	N/A	N/A	57.94	74.00	16.06	
		5 466.32	H	X	PK	57.08	3.47	N/A	N/A	60.55	68.20	7.65	
		5 459.45	H	X	AV	41.84	3.47	0.24	N/A	45.55	54.00	8.45	
		10 999.38	H	X	PK	45.51	11.34	N/A	N/A	56.85	74.00	17.15	
		10 998.92	H	X	AV	34.66	11.34	0.24	N/A	46.24	54.00	7.76	
	5 580	11 159.72	H	X	PK	45.32	10.74	N/A	N/A	56.06	74.00	17.94	
		11 159.71	H	X	AV	34.96	10.74	0.24	N/A	45.94	54.00	8.06	
U-NII 3	5 745	5 643.60	H	X	PK	52.45	3.89	N/A	N/A	56.34	68.20	11.86	
		5 676.25	H	X	PK	52.25	3.94	N/A	N/A	56.19	87.63	31.44	
		11 493.03	H	X	PK	47.83	9.46	N/A	N/A	57.29	74.00	16.71	
		11 492.60	H	X	AV	36.03	9.46	0.24	N/A	45.73	54.00	8.27	
	5 785	11 571.90	H	X	PK	45.94	9.24	N/A	N/A	55.18	74.00	18.82	
		11 572.21	H	X	AV	35.81	9.24	0.24	N/A	45.29	54.00	8.71	
	5 825	5 877.02	H	X	PK	51.72	3.96	N/A	N/A	55.68	103.70	48.02	
		5 928.72	H	X	PK	51.42	4.43	N/A	N/A	55.85	68.20	12.35	
		11 649.82	H	X	PK	47.44	9.23	N/A	N/A	56.67	74.00	17.33	
		11 649.87	H	X	AV	36.81	9.23	0.24	N/A	46.28	54.00	7.72	

Unwanted Emissions data(9 kHz ~ 40 GHz) : TM3

Band	Tested Frequency (MHz)	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	5 190	5 149.30	H	X	PK	65.91	3.09	N/A	N/A	69.00	74.00	5.00
		5 149.76	H	X	AV	47.33	3.09	0.43	N/A	50.85	54.00	3.15
		10 380.04	H	X	PK	42.65	10.14	N/A	N/A	52.79	68.20	15.41
	5 230	10 459.98	H	X	PK	43.77	10.81	N/A	N/A	54.58	68.20	13.62
U-NII 2A	5 270	10 539.83	H	X	PK	44.37	11.29	N/A	N/A	55.66	68.20	12.54
		5 350.21	H	X	PK	63.14	3.62	N/A	N/A	66.76	74.00	7.24
	5 310	5 350.28	H	X	AV	47.01	3.62	0.43	N/A	51.06	54.00	2.94
		10 618.38	H	X	PK	43.25	11.26	N/A	N/A	54.51	74.00	19.49
		10 618.91	H	X	AV	33.48	11.26	0.43	N/A	45.17	54.00	8.83
U-NII 2C	5 510	5 459.93	H	X	PK	52.22	3.47	N/A	N/A	55.69	74.00	18.31
		5 459.57	H	X	AV	40.42	3.47	0.43	N/A	44.32	54.00	9.68
		11 020.22	H	X	PK	45.47	11.25	N/A	N/A	56.72	74.00	17.28
		11 020.49	H	X	AV	35.03	11.25	0.43	N/A	46.71	54.00	7.29
	5 550	11 099.33	H	X	PK	45.44	10.90	N/A	N/A	56.34	74.00	17.66
		11 099.44	H	X	AV	34.59	10.90	0.43	N/A	45.92	54.00	8.08
U-NII 3	5 755	5 640.88	H	X	PK	54.19	3.89	N/A	N/A	58.08	68.20	10.12
		5 693.33	H	X	PK	55.94	3.97	N/A	N/A	59.91	100.26	40.35
		11 509.99	H	X	PK	46.02	9.41	N/A	N/A	55.43	74.00	18.57
		11 509.63	H	X	AV	35.46	9.41	0.43	N/A	45.30	54.00	8.70
	5 795	5 885.96	H	X	PK	51.47	4.04	N/A	N/A	55.51	97.09	41.58
		5 934.00	H	X	PK	48.48	4.48	N/A	N/A	52.96	68.20	15.24
		11 590.98	H	X	PK	45.92	9.21	N/A	N/A	55.13	74.00	18.87
		11 591.36	H	X	AV	35.35	9.21	0.43	N/A	44.99	54.00	9.01

Unwanted Emissions data(9 kHz ~ 40 GHz) : TM4

Band	Tested Frequency (MHz)	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	5 210	5 149.26	H	X	PK	54.88	3.09	N/A	N/A	57.97	74.00	16.03
		5 149.30	H	X	AV	43.22	3.09	0.84	N/A	47.15	54.00	6.85
		10 420.41	H	X	PK	44.14	10.45	N/A	N/A	54.59	68.20	13.61
U-NII 2A	5 290	5 350.59	H	X	PK	57.09	3.62	N/A	N/A	60.71	74.00	13.29
		5 350.92	H	X	AV	45.21	3.62	0.84	N/A	49.67	54.00	4.33
		10 578.63	H	X	PK	43.87	11.28	N/A	N/A	55.15	68.20	13.05
U-NII 2C	5 530	5 457.27	H	X	PK	55.73	3.48	N/A	N/A	59.21	74.00	14.79
		5 468.47	H	X	PK	55.59	3.47	N/A	N/A	59.06	68.20	9.14
		5 456.64	H	X	AV	44.31	3.48	0.84	N/A	48.63	54.00	5.37
		11 059.29	H	X	PK	45.61	11.08	N/A	N/A	56.69	74.00	17.31
		11 058.78	H	X	AV	34.61	11.08	0.84	N/A	46.53	54.00	7.47
	5 610	11 219.48	H	X	PK	46.02	10.51	N/A	N/A	56.53	74.00	17.47
		11 219.83	H	X	AV	34.87	10.51	0.84	N/A	46.22	54.00	7.78
U-NII 3	5 775	5 646.45	H	X	PK	52.78	3.90	N/A	N/A	56.68	68.20	11.52
		5 694.98	H	X	PK	59.00	3.97	N/A	N/A	62.97	101.48	38.51
		5 879.20	H	X	PK	50.71	3.98	N/A	N/A	54.69	102.09	47.40
		5 950.28	H	X	PK	49.53	4.58	N/A	N/A	54.11	68.20	14.09
		11 549.27	H	X	PK	44.65	9.27	N/A	N/A	53.92	74.00	20.08
		11 549.25	H	X	AV	34.45	9.27	0.84	N/A	44.56	54.00	9.44

5.2 AC Power-Line Conducted Emissions

■ Test Requirements, §15.207 & RSS-Gen[8.8]

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

Compliance with the provision of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5.0	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 Configuration

See test photographs for the actual connections between EUT and support equipment.

■ Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10-2013.

1. The test procedure is performed in a 6.5 m x 3.5 m x 3.5 m (L x W x H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) x 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

■ Test Results: Comply

Refer to the next page. The worst case data was reported.

AC Power-Line Conducted Emissions (Graph)

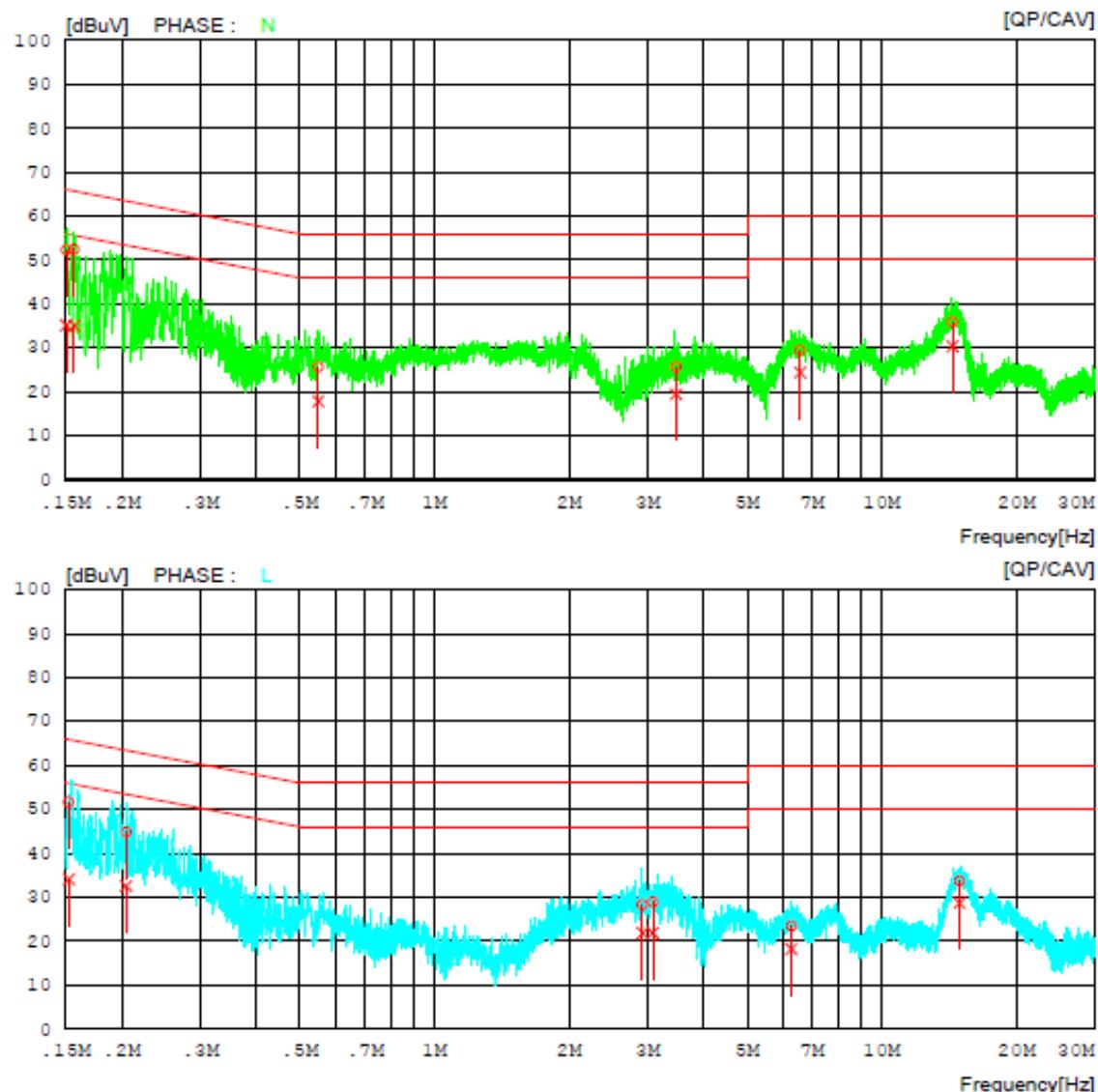
Test Mode: U-NII 1 & TM 1 & 5 180 MHz

Results of Conducted Emission

DTNC

Date 2023-07-14

Order No.	HEBS-B-3A	Reference No.
Model No.		Power Supply
Serial No.		Temp/Humi.
Test Condition	WLAN 5.1G	Operator
Memo	a_5180	21 'C / 41 % J.H.Bang

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

AC Power-Line Conducted Emissions (Data List)

Test Mode: U-NII 1 & TM 1 & 5 180 MHz

Results of Conducted Emission

DTNC

Date 2023-07-14

Order No.		Referrence No.
Model No.	HEBS-B-3A	Power Supply
Serial No.		Temp/Humi.
Test Condition	WLAN 5.1G	Operator
Memo	a_5180	21 'C / 41 % J.H.Bang

LIMIT : FCC P15.207 AV

FCC P15.207 QP

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN [dBuV]	PHASE
		QP [dBuV]	CAV [dBuV]		QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]		
1	0.15031	42.44	25.26	9.91	52.35	35.17	65.98	55.98	13.63	20.81
2	0.15664	42.57	25.13	9.91	52.48	35.04	65.64	55.64	13.16	20.60
3	0.55013	15.76	7.93	9.90	25.66	17.83	56.00	46.00	30.34	28.17
4	3.46960	15.73	9.49	9.96	25.69	19.45	56.00	46.00	30.31	26.55
5	6.56900	19.39	14.40	10.03	29.42	24.43	60.00	50.00	30.58	25.57
6	14.39760	25.67	20.23	10.17	35.84	30.40	60.00	50.00	24.16	19.60
7	0.15237	41.66	24.19	9.91	51.57	34.10	65.87	55.87	14.30	21.77
8	0.20459	34.96	22.65	9.88	44.84	32.53	63.42	53.42	18.58	20.89
9	2.92080	18.24	11.86	9.96	28.20	21.82	56.00	46.00	27.80	24.18
10	3.07480	18.90	11.85	9.96	28.86	21.81	56.00	46.00	27.14	24.19
11	6.27940	13.40	8.17	10.03	23.43	18.20	60.00	50.00	36.57	31.80
12	14.92400	23.46	18.51	10.18	33.64	28.69	60.00	50.00	26.36	21.31

AC Power-Line Conducted Emissions (Graph)

Test Mode: U-NII 2A & TM 1 & 5 260 MHz

Results of Conducted Emission

DTNC

Date 2023-07-14

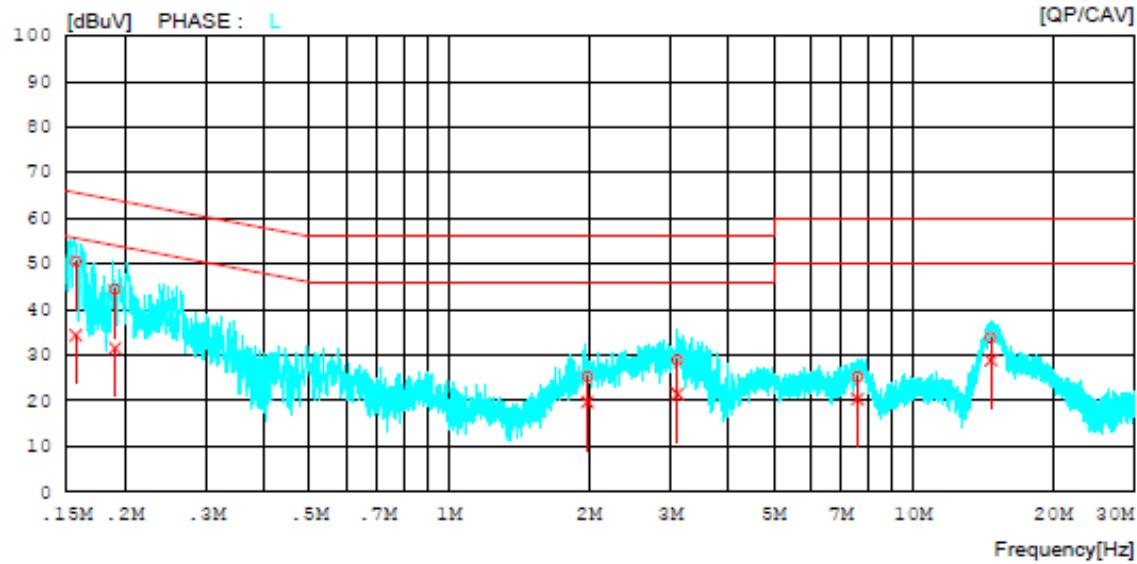
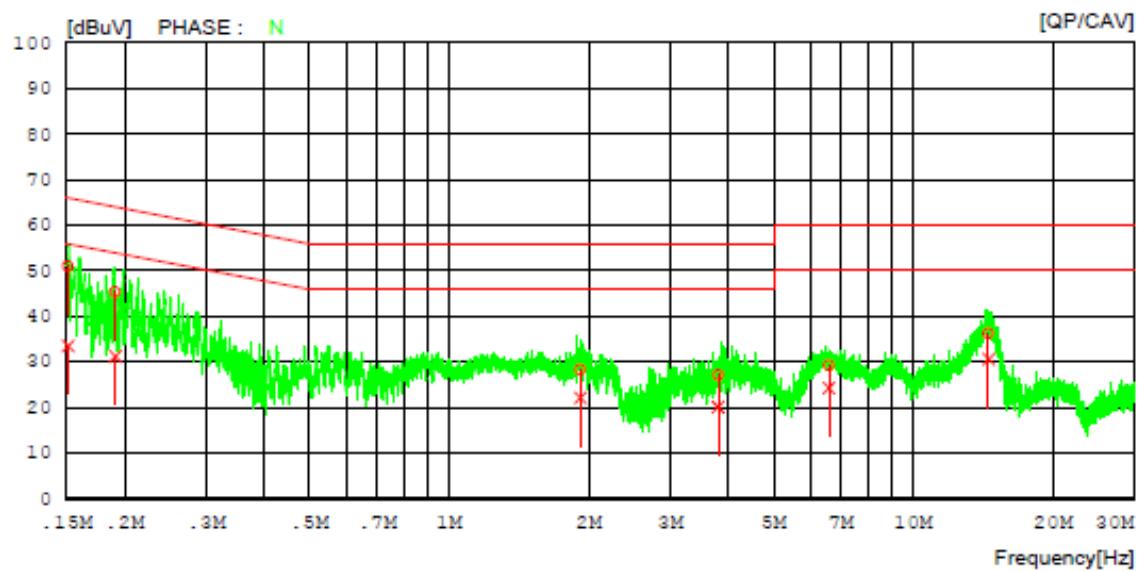
Order No.
Model No.
Serial No.
Test Condition

HEBS-B-3A
WLAN 5.3G

Reference No.
Power Supply
Temp/Humi.
Operator

21 °C / 41 %
J.H.Bang

Memo a_5260

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

AC Power-Line Conducted Emissions (Data List)

Test Mode: U-NII 2A & TM 1 & 5 260 MHz

Results of Conducted Emission

DTNC

Date 2023-07-14

Order No.		Referrence No.
Model No.	HEBS-B-3A	Power Supply
Serial No.		Temp/Humi.
Test Condition	WLAN 5.3G	Operator
Memo	a_5260	21 'C / 41 % J.H.Bang

LIMIT : FCC P15.207 AV

FCC P15.207 QP

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT [dBuV]		LIMIT [dBuV]		MARGIN [dBuV]	PHASE
		QP [dBuV]	CAV [dBuV]		QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]		
1	0.15103	41.15	23.64	9.91	51.06	33.55	65.94	55.94	14.88	22.39 N
2	0.19092	35.42	21.31	9.89	45.31	31.20	64.00	54.00	18.69	22.80 N
3	1.91760	18.29	12.23	9.94	28.23	22.17	56.00	46.00	27.77	23.83 N
4	3.80240	17.16	10.15	9.97	27.13	20.12	56.00	46.00	28.87	25.88 N
5	6.58060	19.31	14.24	10.03	29.34	24.27	60.00	50.00	30.66	25.73 N
6	14.54280	26.11	20.46	10.18	36.29	30.64	60.00	50.00	23.71	19.36 N
7	0.15686	40.57	24.49	9.91	50.48	34.40	65.63	55.63	15.15	21.23 L
8	0.19062	34.54	21.63	9.89	44.43	31.52	64.01	54.01	19.58	22.49 L
9	1.98800	15.23	9.79	9.94	25.17	19.73	56.00	46.00	30.83	26.27 L
10	3.10480	18.96	11.48	9.96	28.92	21.44	56.00	46.00	27.08	24.56 L
11	7.58620	15.23	10.26	10.05	25.28	20.31	60.00	50.00	34.72	29.69 L
12	14.70360	23.59	18.68	10.18	33.77	28.86	60.00	50.00	26.23	21.14 L

AC Power-Line Conducted Emissions (Graph)

Test Mode: U-NII 2C & TM 1 & 5 500 MHz

Results of Conducted Emission

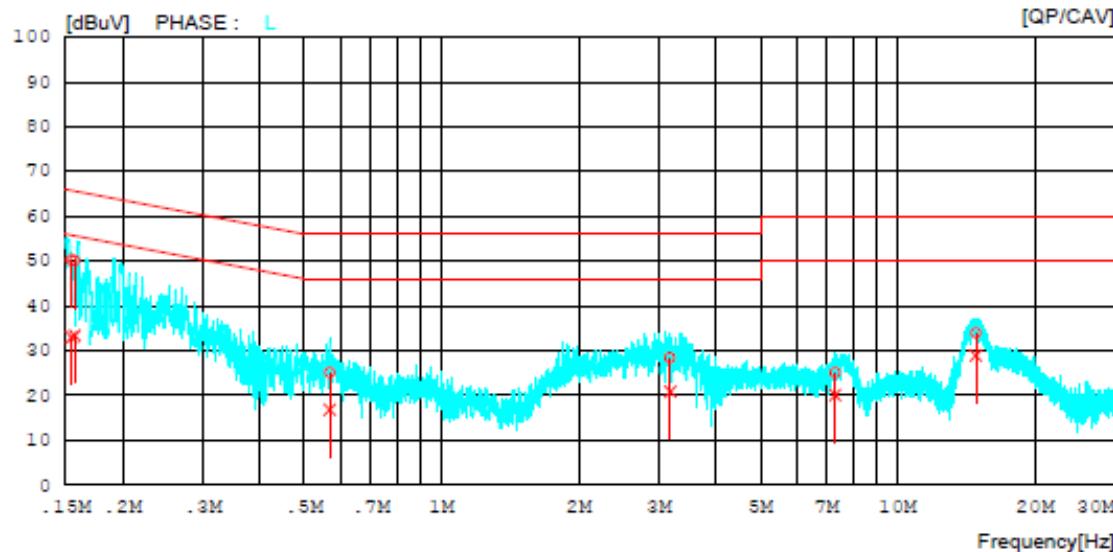
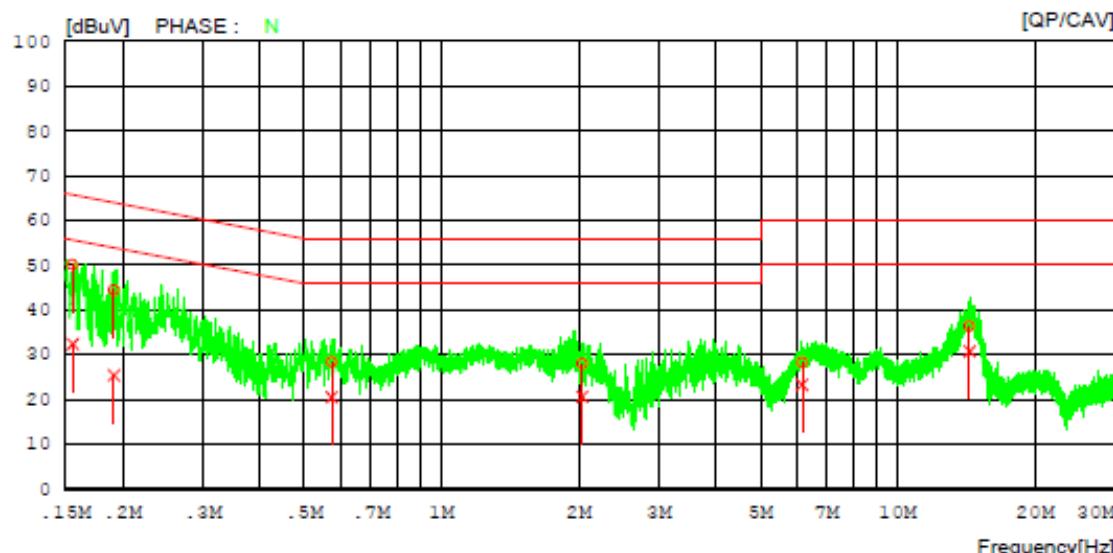
DTNC

Date 2023-07-14

Order No. HEBS-B-3A
Model No. HEBS-B-3A
Serial No.
Test Condition WLAN 5.5G

Reference No.
Power Supply
Temp/Humi.
Operator
21 °C / 41 %
J.H.Bang

Memo a_5500

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

AC Power-Line Conducted Emissions (Data List)

Test Mode: U-NII 2C & TM 1 & 5 500 MHz

Results of Conducted Emission

DTNC

Date 2023-07-14

Order No.		Reference No.
Model No.	HEBS-B-3A	Power Supply
Serial No.		Temp/Humi.
Test Condition	WLAN 5.5G	21 'C / 41 %
Memo	a_5500	J.H.Bang

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

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT [dBuV]		LIMIT [dBuV]		MARGIN [dBuV]	PHASE
		QP [dBuV]	CAV [dBuV]		QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]		
1	0.15526	40.27	22.43	9.91	50.18	32.34	65.71	55.71	15.53	23.37
2	0.19143	34.51	15.50	9.89	44.40	25.39	63.97	53.97	19.57	28.58
3	0.57418	18.53	10.58	9.90	28.43	20.48	56.00	46.00	27.57	25.52
4	2.03440	18.07	10.68	9.94	28.01	20.62	56.00	46.00	27.99	25.38
5	6.17660	18.24	13.24	10.03	28.27	23.27	60.00	50.00	31.73	26.73
6	14.37020	26.20	20.60	10.17	36.37	30.77	60.00	50.00	23.63	19.23
7	0.15439	40.31	23.08	9.91	50.22	32.99	65.76	55.76	15.54	22.77
8	0.15702	40.15	23.49	9.91	50.06	33.40	65.62	55.62	15.56	22.22
9	0.56912	15.19	6.94	9.90	25.09	16.84	56.00	46.00	30.91	29.16
10	3.17240	18.37	10.85	9.96	28.33	20.81	56.00	46.00	27.67	25.19
11	7.29420	15.08	9.99	10.05	25.13	20.04	60.00	50.00	34.87	29.96
12	14.84460	23.79	18.81	10.18	33.97	28.99	60.00	50.00	26.03	21.01

AC Power-Line Conducted Emissions (Graph)

Test Mode: U-NII 3 & TM 1 & 5 745 MHz

Results of Conducted Emission

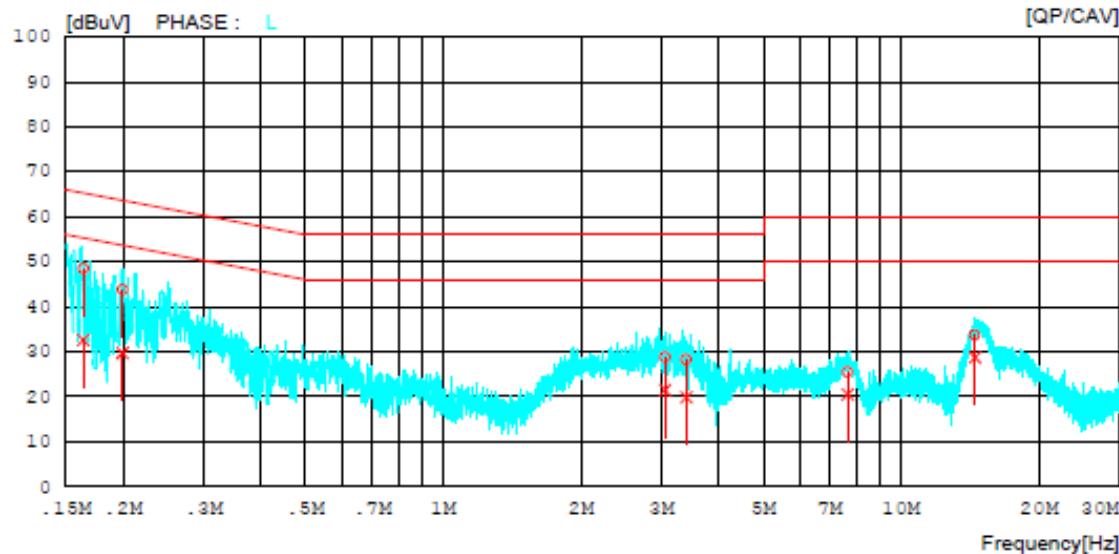
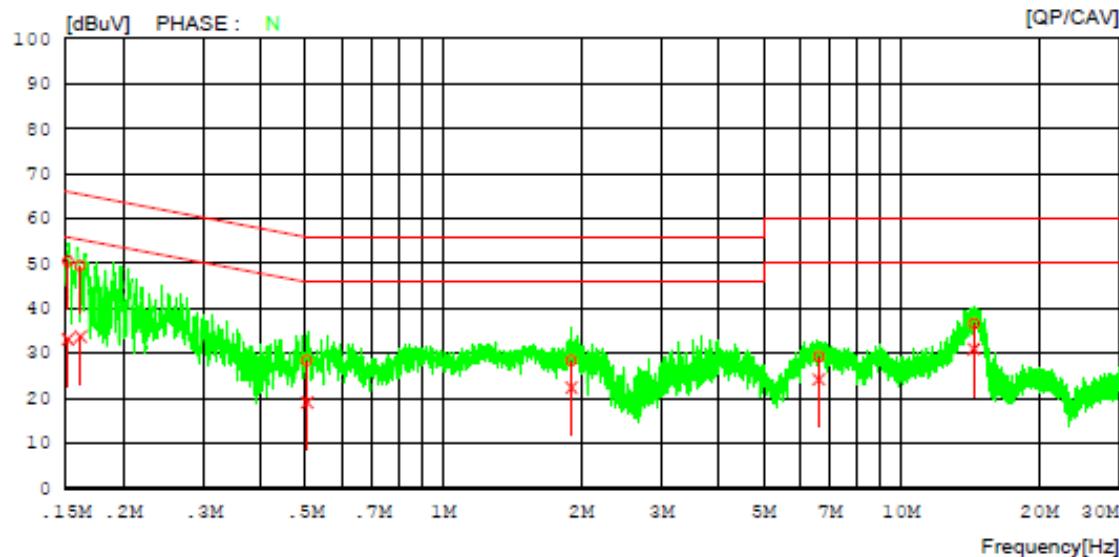
DTNC

Date 2023-07-14

Order No.
Model No. HEBS-B-3A
Serial No.
Test Condition WLAN 5.7G

Reference No.
Power Supply
Temp/Humi.
Operator 21 'C / 41 %
J.H.Bang

Memo a_5745

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

AC Power-Line Conducted Emissions (Data List)

Test Mode: U-NII 3 & TM 1 & 5 745 MHz

Results of Conducted Emission

DTNC

Date 2023-07-14

Order No.		Reference No.
Model No.	HEBS-B-3A	Power Supply
Serial No.		Temp/Humi.
Test Condition	WLAN 5.7G	Operator
Memo	a_5745	21 'C / 41 % J.H.Bang

LIMIT : FCC P15.207 AV

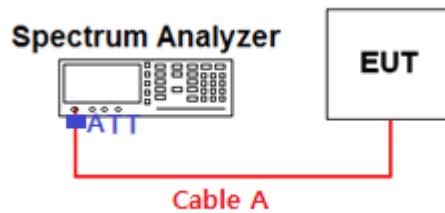
FCC P15.207 QP

NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN [dBuV]	PHASE
		QP [dBuV]	CAV [dBuV]		QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]		
1	0.15150	40.67	23.21	9.91	50.58	33.12	65.92	55.92	15.34	22.80
2	0.16127	39.63	23.90	9.90	49.53	33.80	65.40	55.40	15.87	21.60
3	0.50397	18.57	9.24	9.90	28.47	19.14	56.00	46.00	27.53	26.86
4	1.90540	18.47	12.43	9.94	28.41	22.37	56.00	46.00	27.59	23.63
5	6.61940	19.24	14.22	10.03	29.27	24.25	60.00	50.00	30.73	25.75
6	14.42020	26.45	20.84	10.17	36.62	31.01	60.00	50.00	23.38	18.99
7	0.16369	38.52	22.72	9.90	48.42	32.62	65.27	55.27	16.85	22.65
8	0.19935	33.90	19.77	9.88	43.78	29.65	63.64	53.64	19.86	23.99
9	3.05280	18.72	11.54	9.96	28.68	21.50	56.00	46.00	27.32	24.50
10	3.39480	18.32	9.86	9.96	28.28	19.82	56.00	46.00	27.72	26.18
11	7.64100	15.43	10.37	10.05	25.48	20.42	60.00	50.00	34.52	29.58
12	14.49680	23.43	18.53	10.17	33.60	28.70	60.00	50.00	26.40	21.30

APPENDIX I

Conducted Test set up Diagram

• Conducted Measurement



APPENDIX II

Duty Cycle Information

■ Test Procedure

Duty Cycle [X = On Time / (On + Off time)] is measured using Measurement Procedure of **KDB789033 D02v02r01**

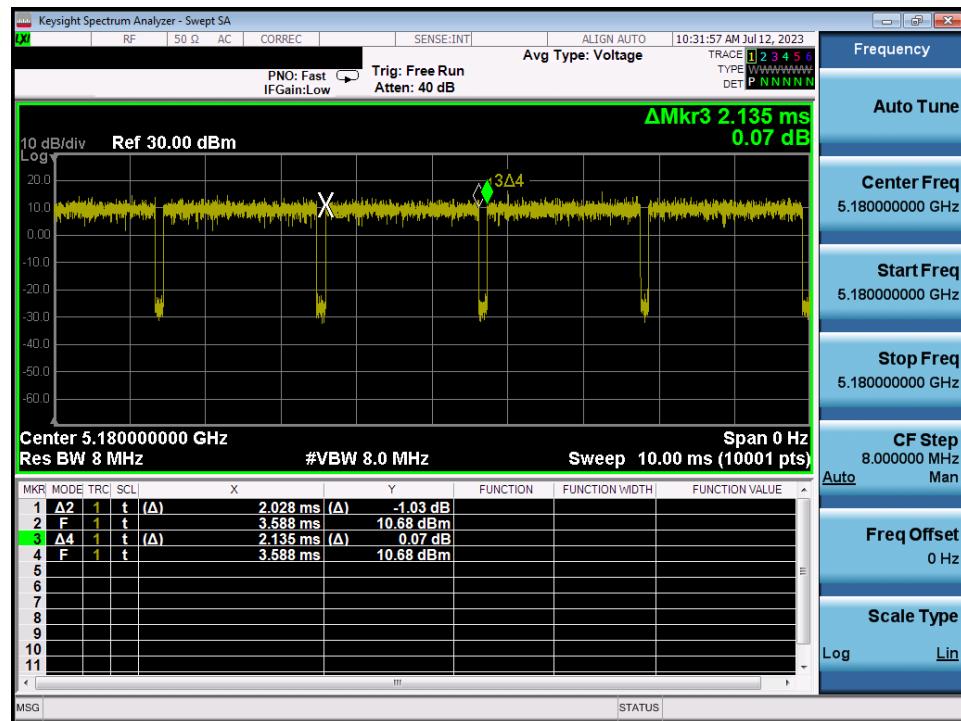
1. Set the center frequency of the spectrum analyzer to the center frequency of the transmission.
2. Set RBW \geq EBW if possible; otherwise, set RBW to the largest available value.
3. Set VBW \geq RBW. Set detector = peak.
4. Note : The zero-span measurement method shall not be used unless both **RBW and VBW are $> 50 / T$** , where T is defined in section II.B.1.a), 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 $T \leq 16.7$ microseconds.)

T : The minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

(T = **On time** of the above table since the EUT operates with above fixed Duty Cycle and it is the minimum On time)

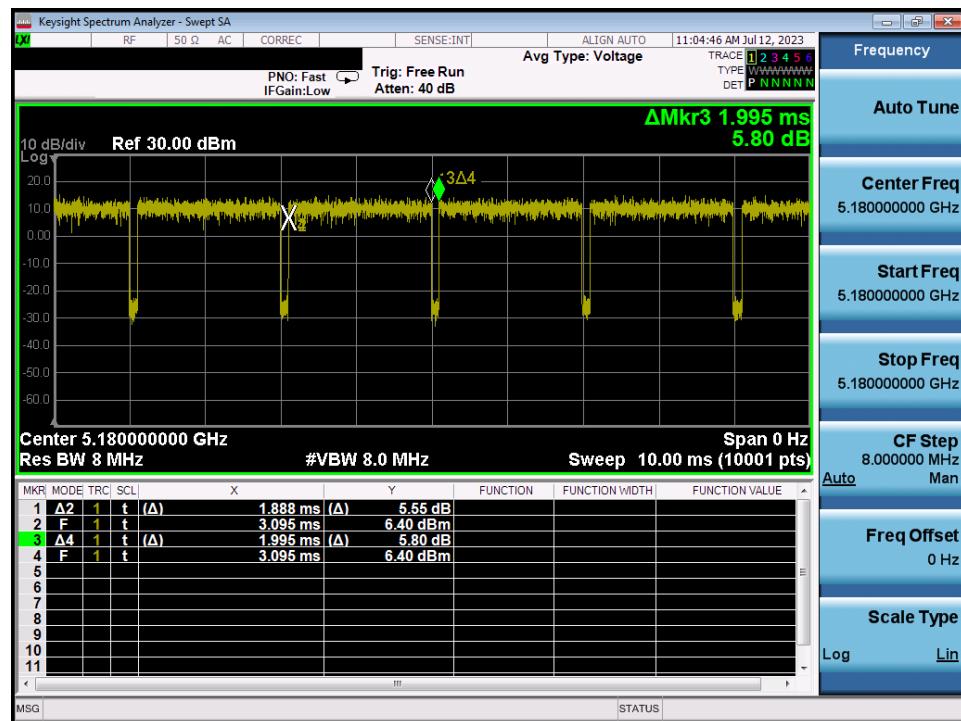
Duty Cycle

Test Mode: TM1 & Ch.36



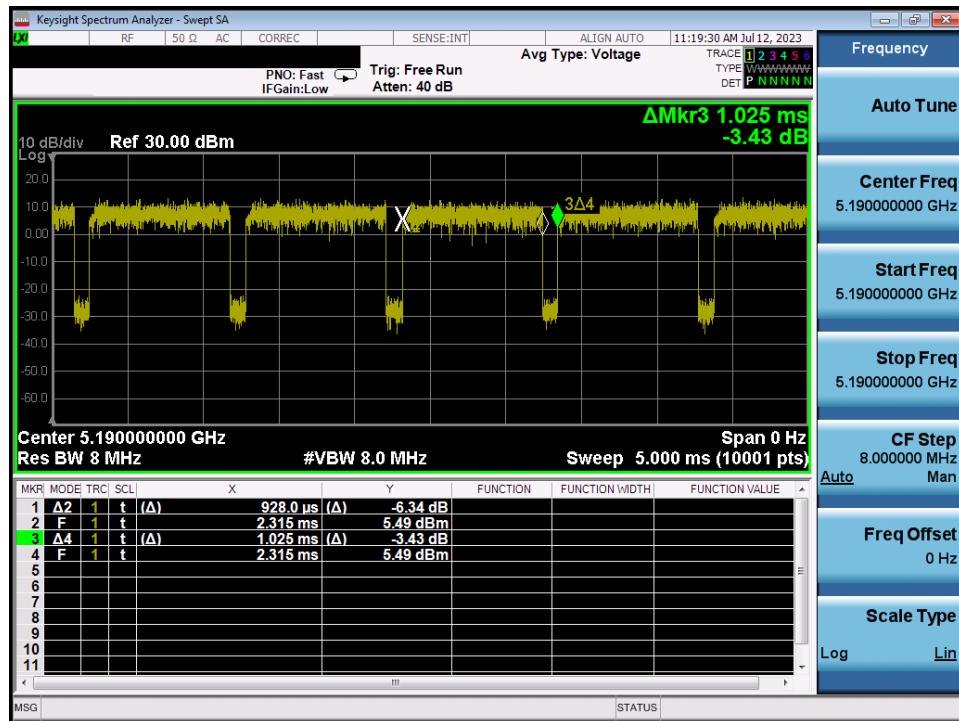
Duty Cycle

Test Mode: TM 2 & Ch.36



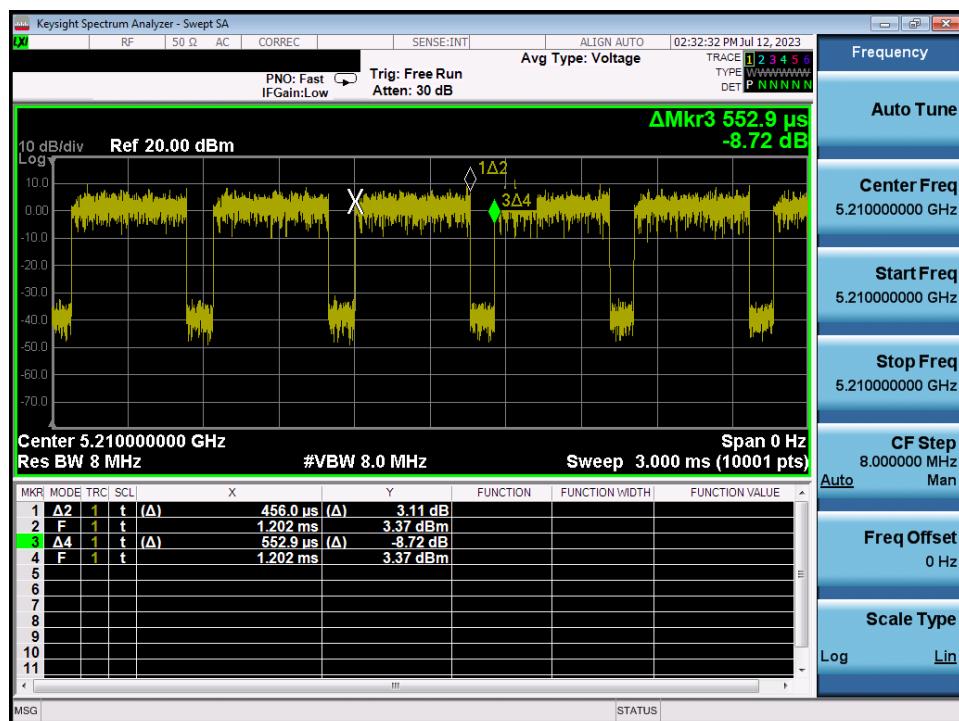
Duty Cycle

Test Mode: TM 3 & Ch.38



Duty Cycle

Test Mode: TM 4 & Ch.42

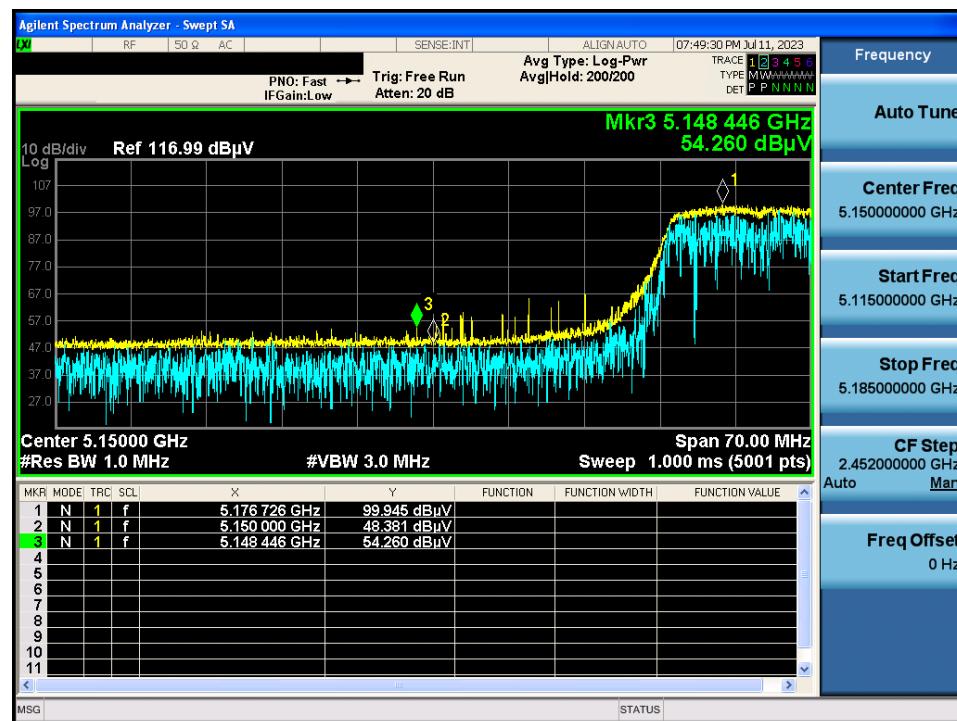


APPENDIX III

Unwanted Emissions (Radiated) Test Plot:

TM 1 & U-NII 1 & 5 180 & X axis & Hor

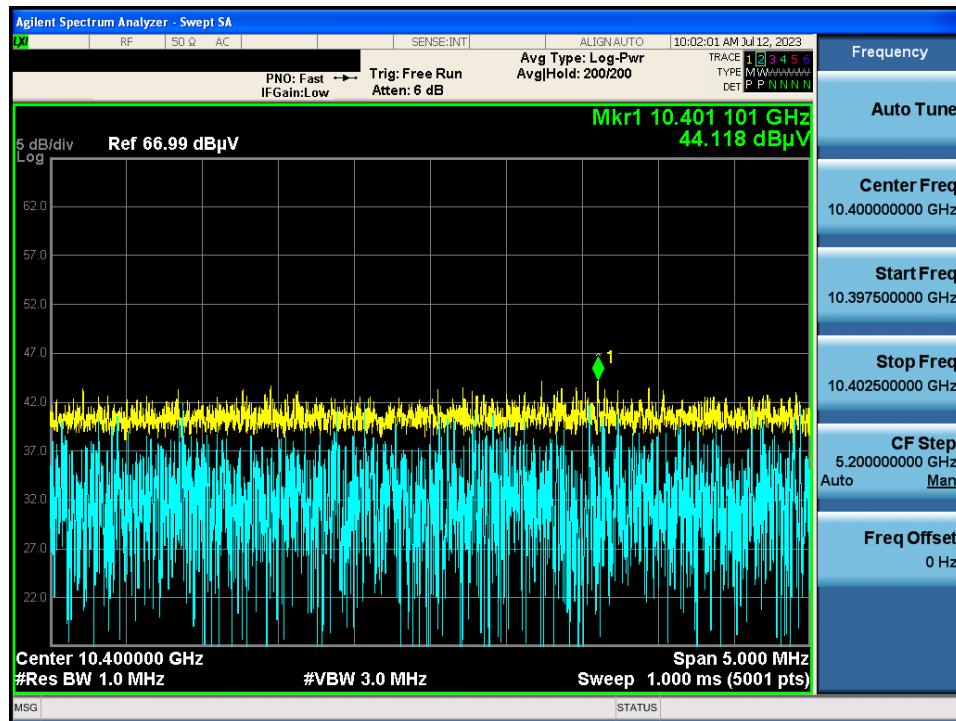
Detector Mode : PK

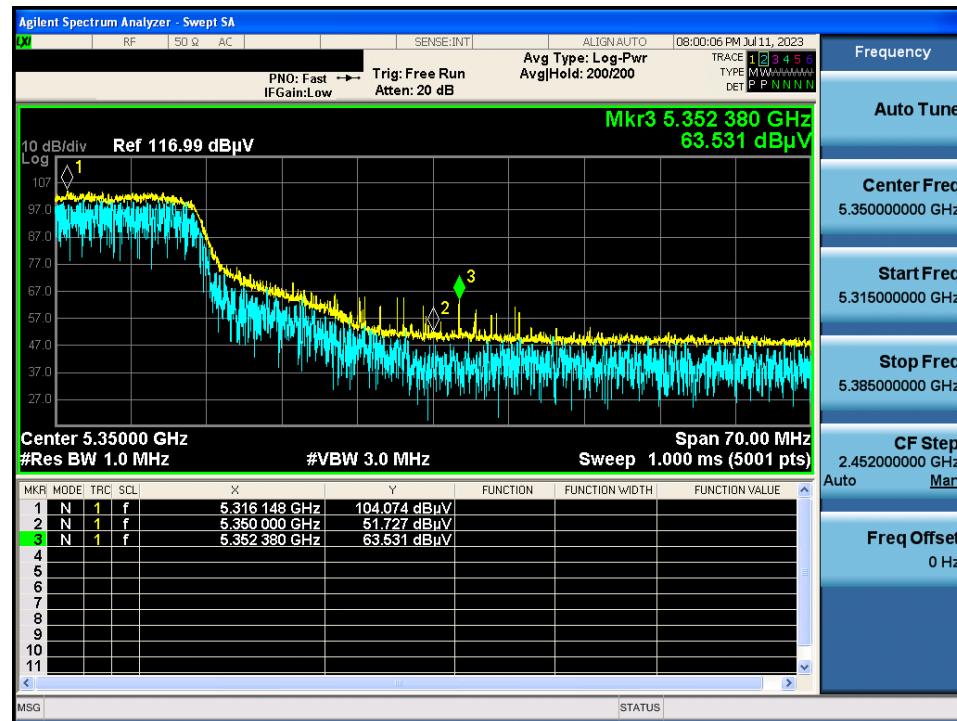


TM 1 & U-NII 1 & 5 180 & X axis & Hor

Detector Mode : AV

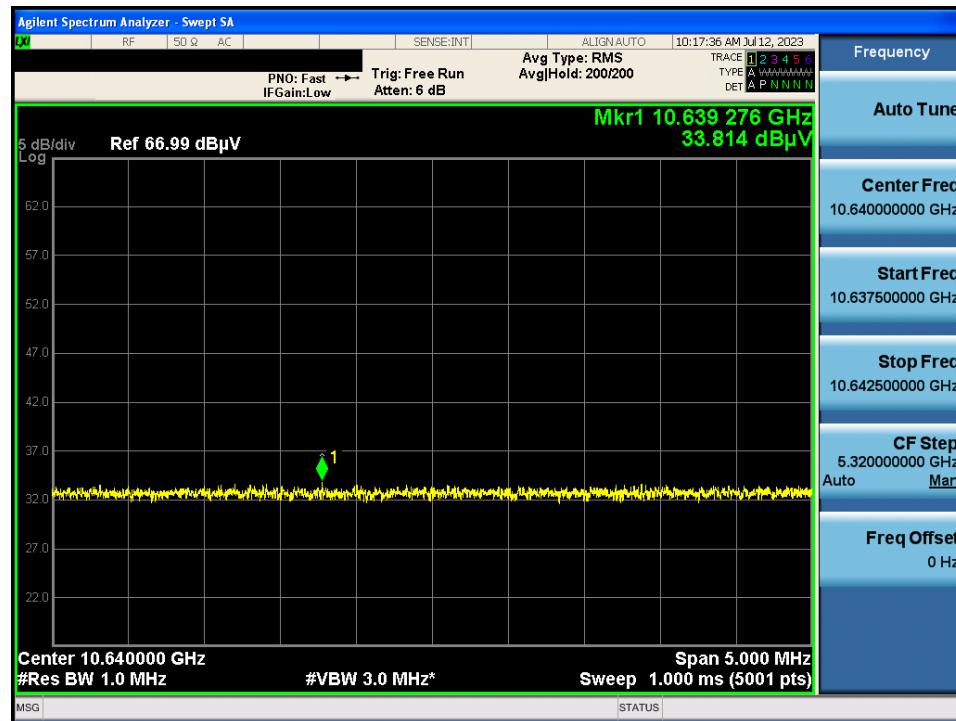


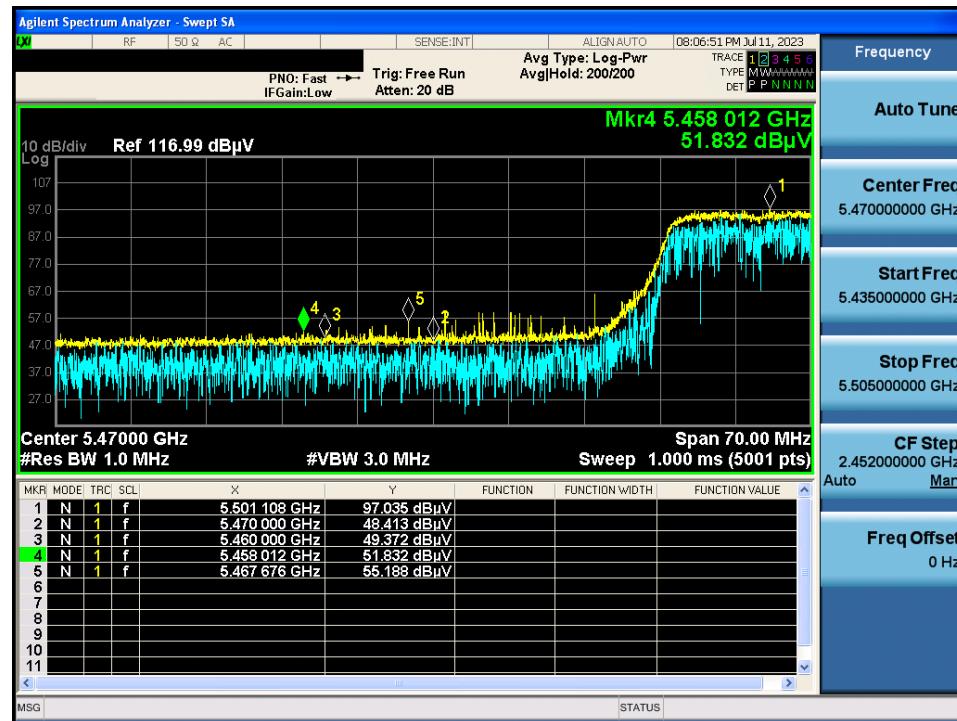
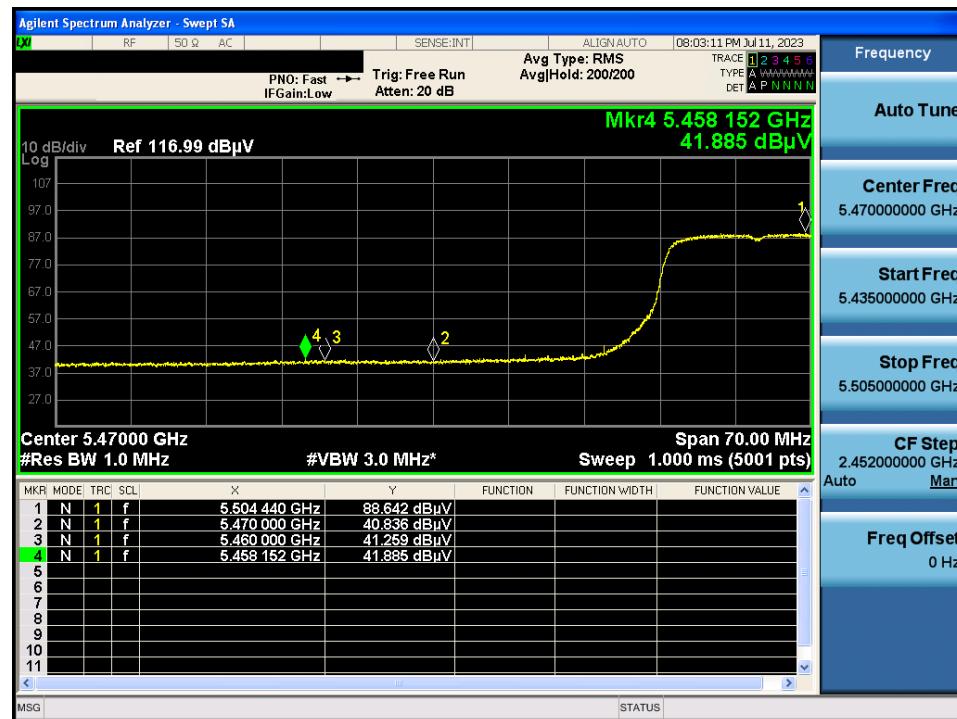
TM 1 & U-NII 1 & 5 200 & X axis & Hor
Detector Mode : PK


TM 1 & U-NII 2A & 5 320 & X axis & Hor
Detector Mode : PK

TM 1 & U-NII 2A & 5 320 & X axis & Hor
Detector Mode : AV


TM 1 & U-NII 2A & 5 320 & X axis & Hor

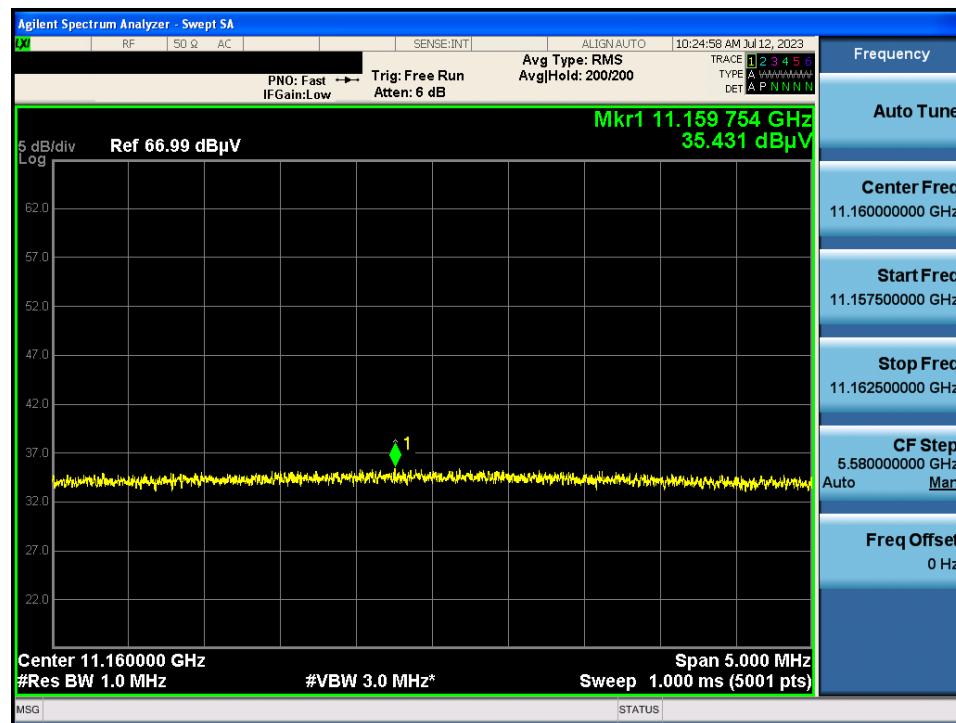
Detector Mode : AV

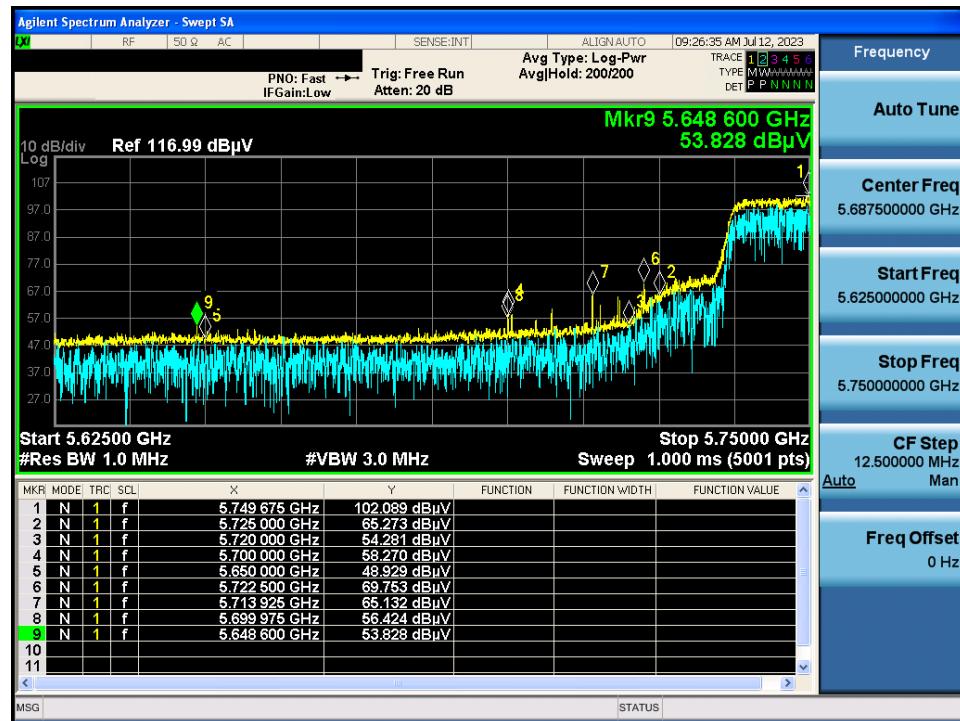
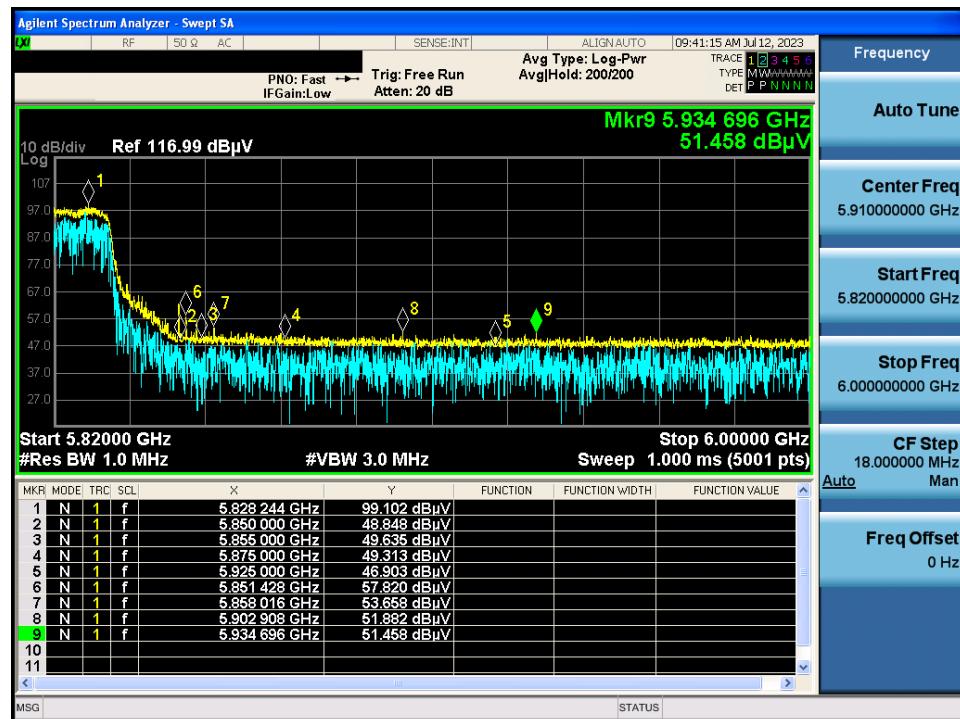


TM 1 & U-NII 2C & 5 500 & X axis & Hor
Detector Mode : PK

TM 1 & U-NII 2C & 5 500 & X axis & Hor
Detector Mode : AV


TM 1 & U-NII 2C & 5 580 & X axis & Hor

Detector Mode : AV

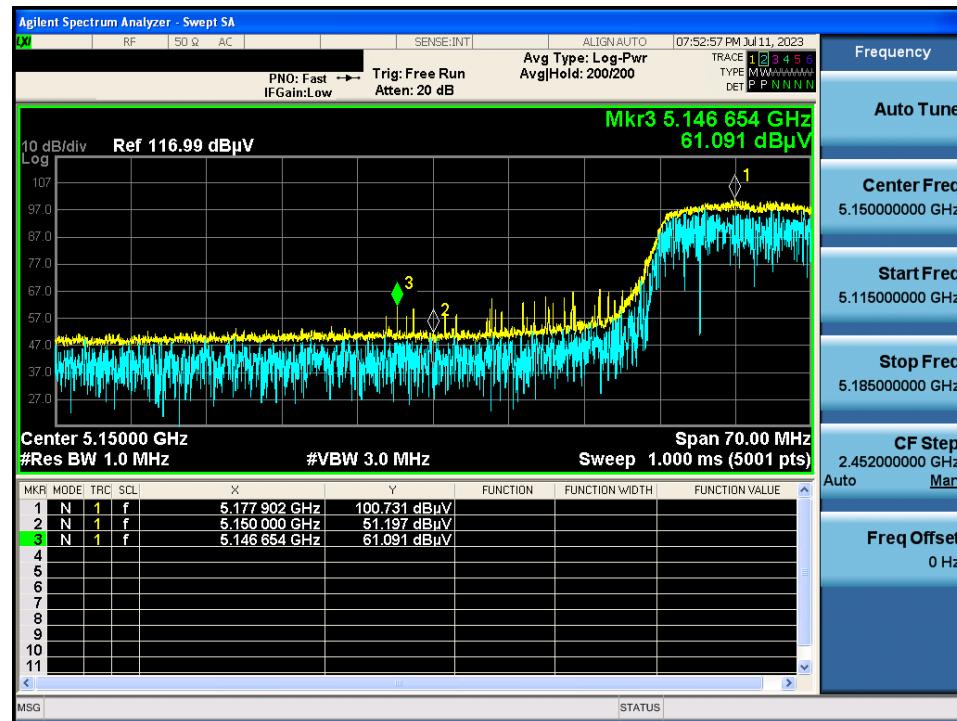


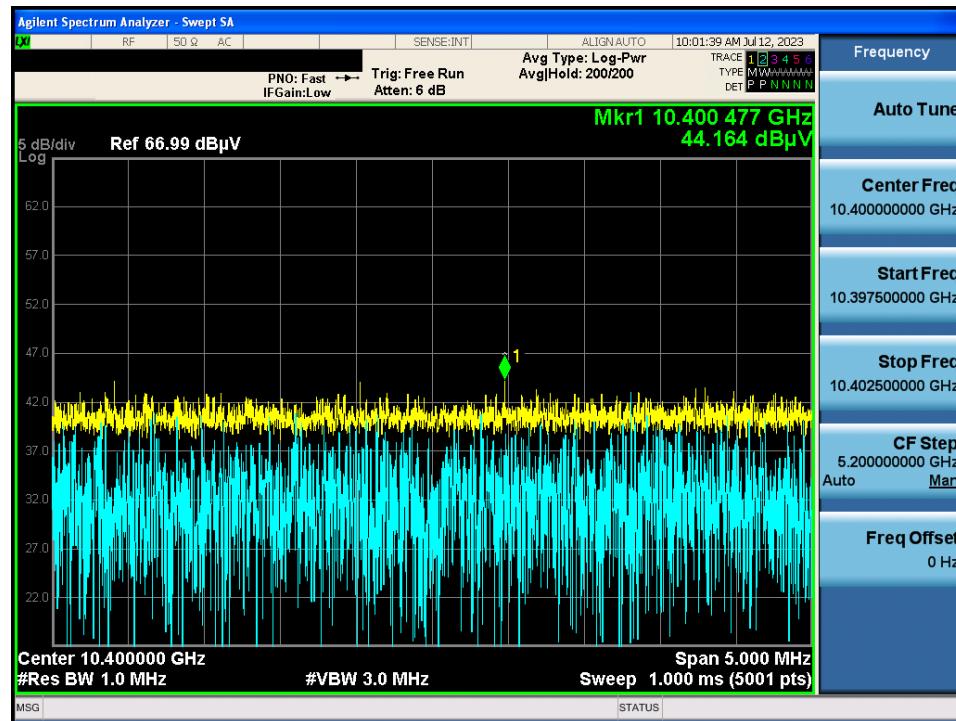
TM 1 & U-NII 3 & 5 745 & X axis & Hor
Detector Mode : PK

TM 1 & U-NII 3 & 5 825 & X axis & Hor
Detector Mode : PK


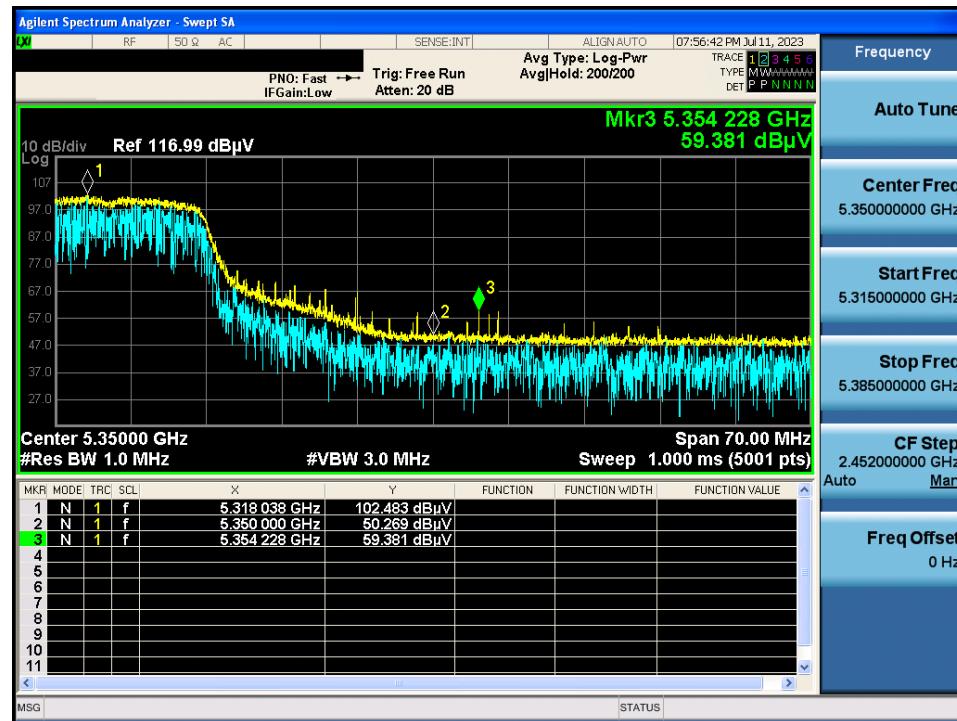
TM 1 & U-NII 3 & 5 825 & X axis & Hor

Detector Mode : AV



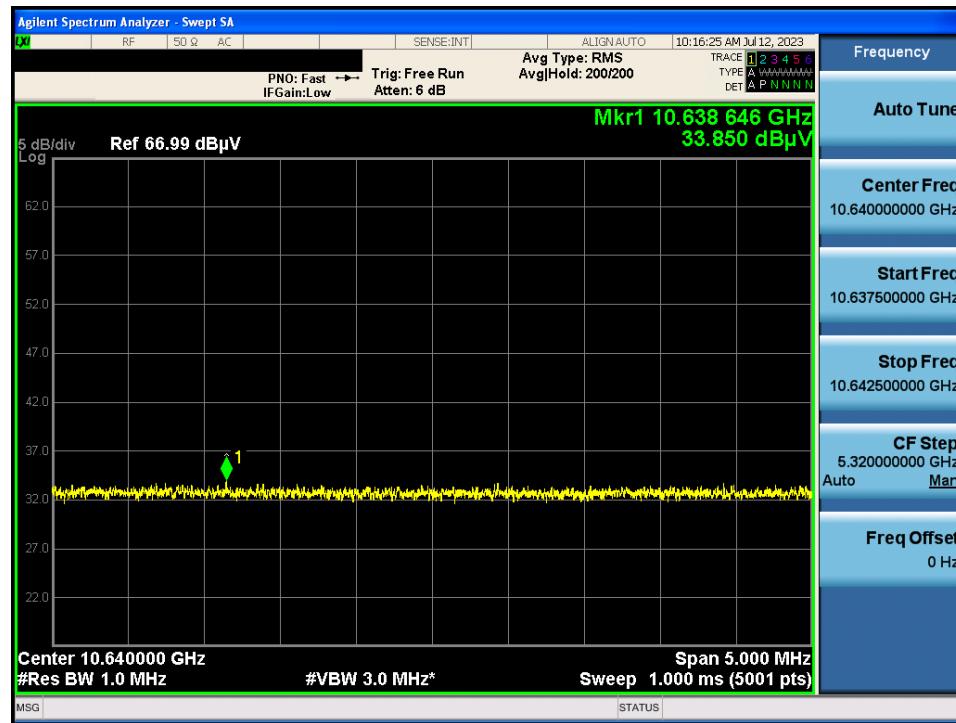
TM 2 & U-NII 1 & 5 180 & X axis & Hor
Detector Mode : PK

TM 2 & U-NII 1 & 5 180 & X axis & Hor
Detector Mode : AV

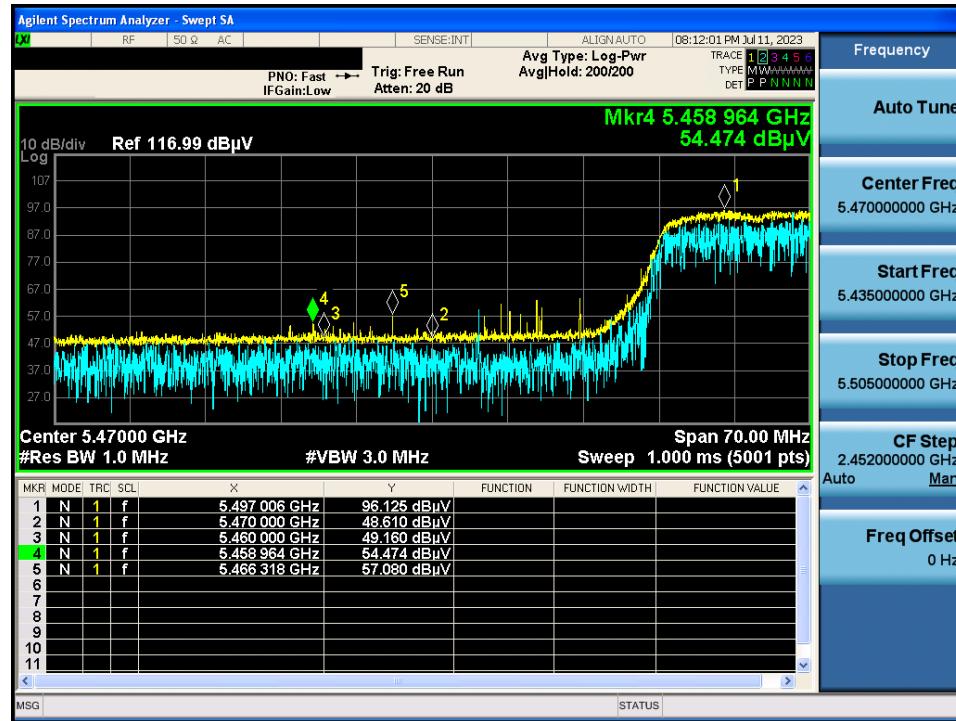
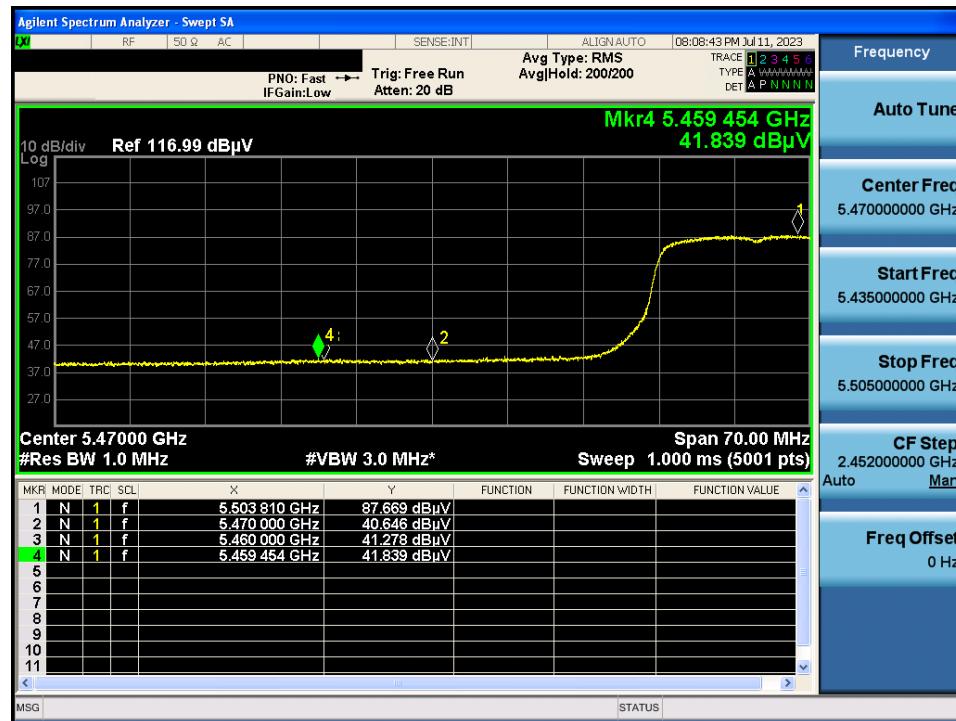

TM 2 & U-NII 1 & 5 200 & X axis & Hor
Detector Mode : PK


TM 2 & U-NII 2A & 5 320 & X axis & Hor
Detector Mode : PK

TM 2 & U-NII 2A & 5 320 & X axis & Hor
Detector Mode : AV


TM 2 & U-NII 2A & 5 320 & X axis & Hor

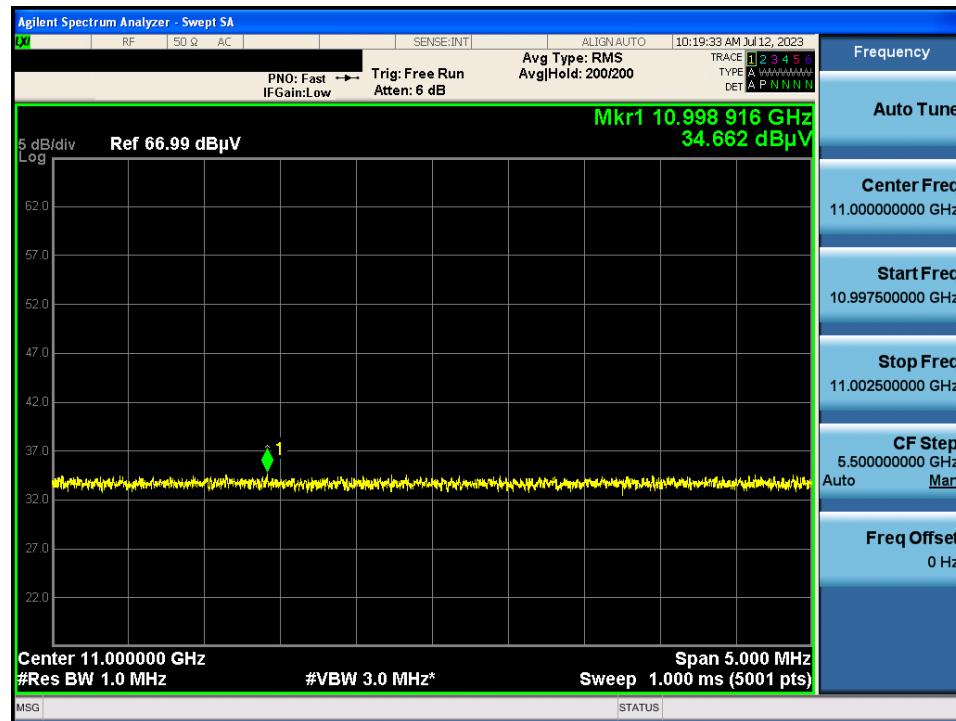
Detector Mode : AV

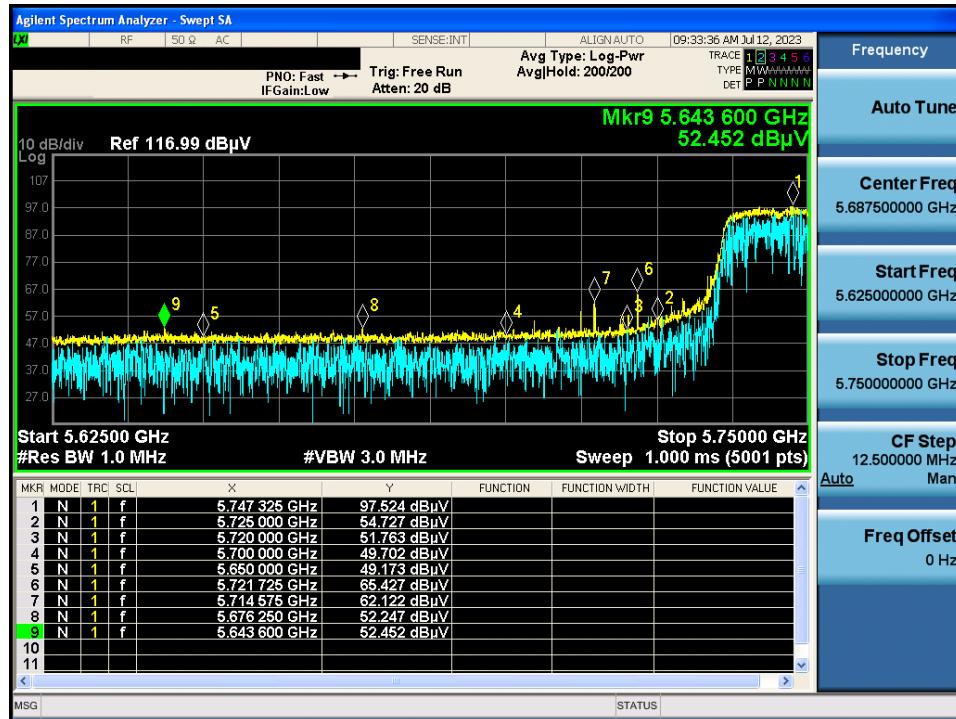
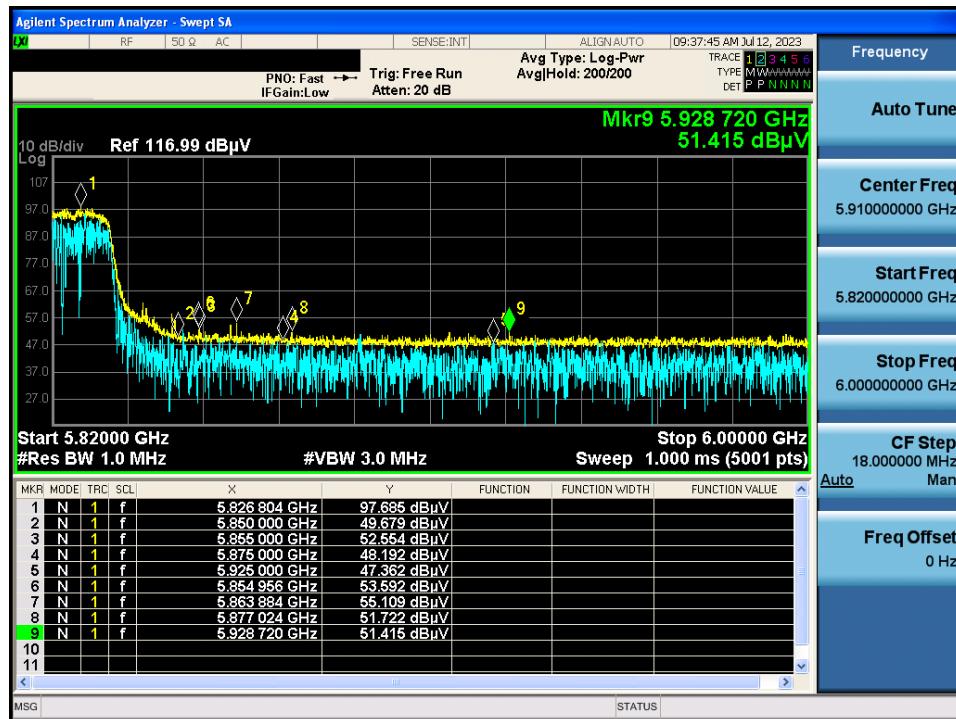


TM 2 & U-NII 2C & 5 500 & X axis & Hor
Detector Mode : PK

TM 2 & U-NII 2C & 5 500 & X axis & Hor
Detector Mode : AV


TM 2 & U-NII 2C & 5 500 & X axis & Hor

Detector Mode : AV

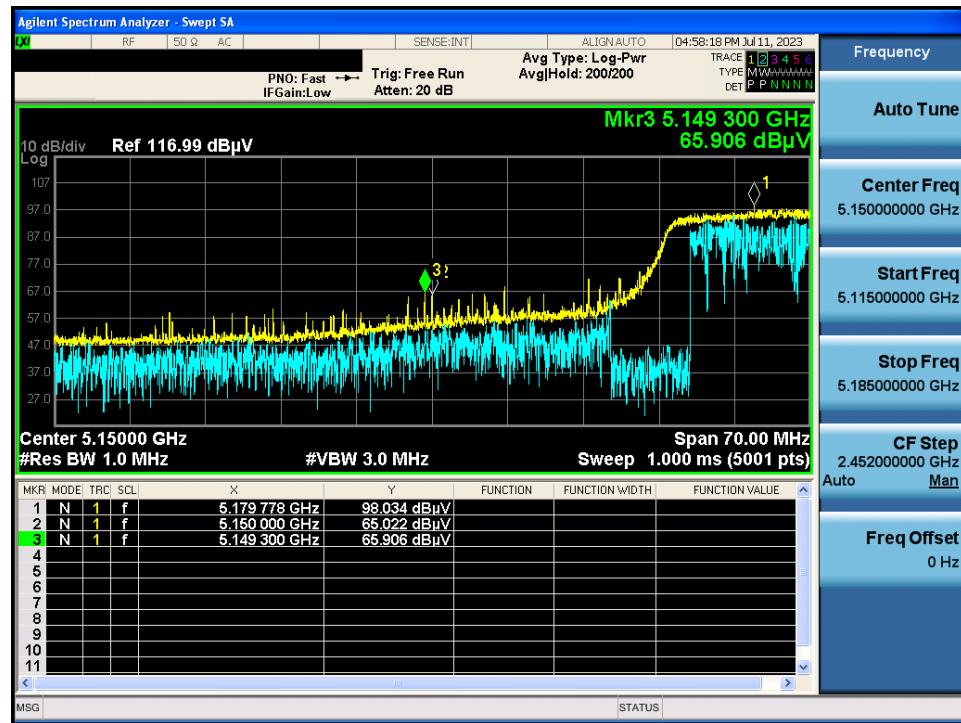
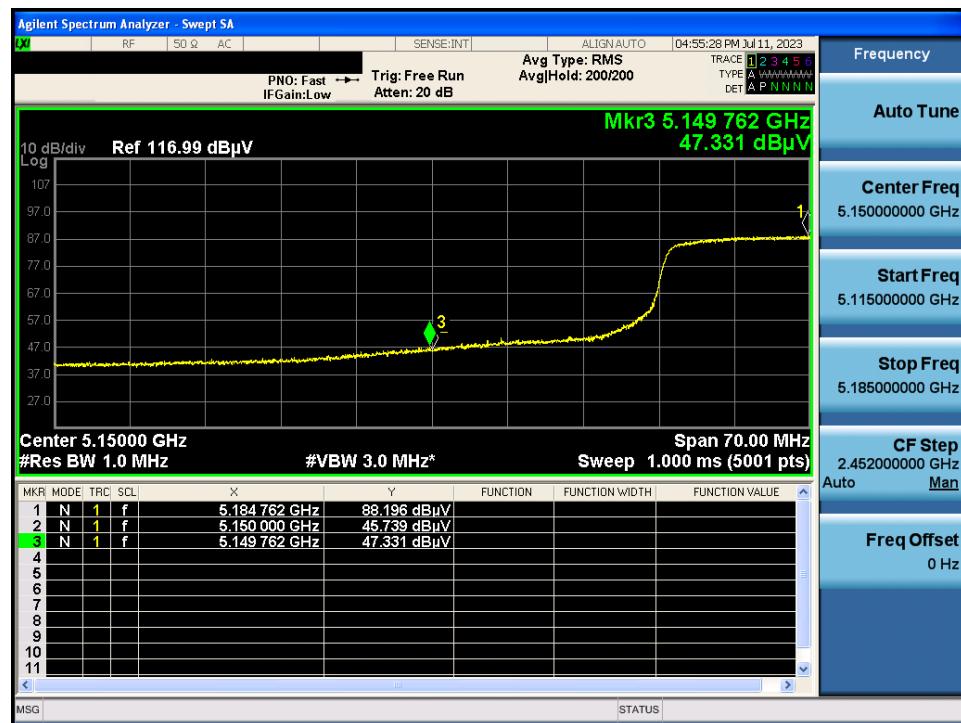


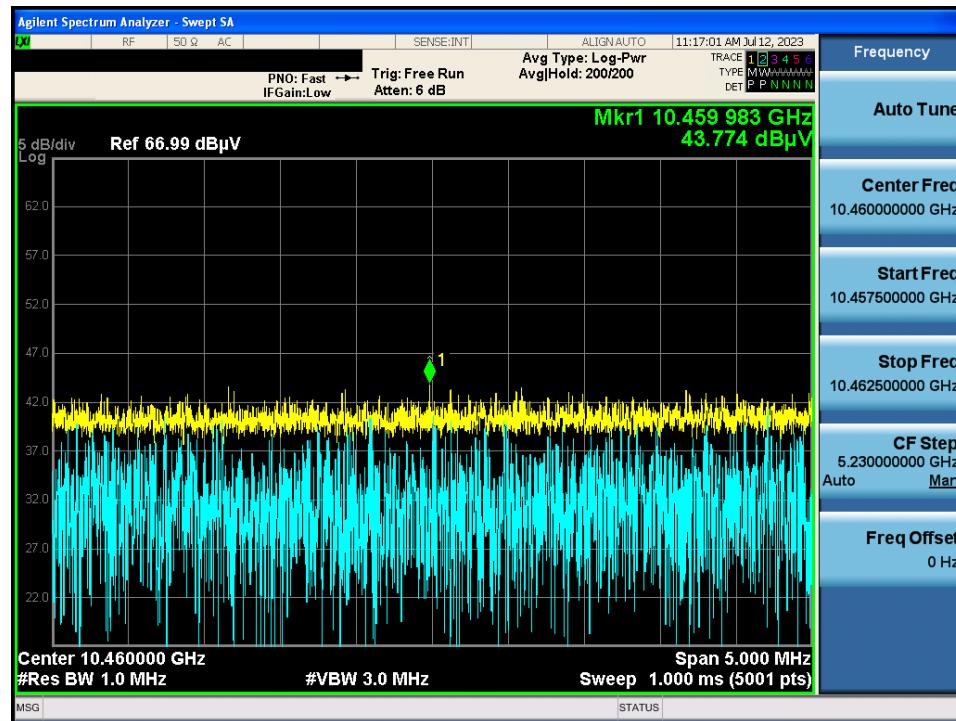
TM 2 & U-NII 3 & 5 745 & X axis & Hor
Detector Mode : PK

TM 2 & U-NII 3 & 5 825 & X axis & Hor
Detector Mode : PK


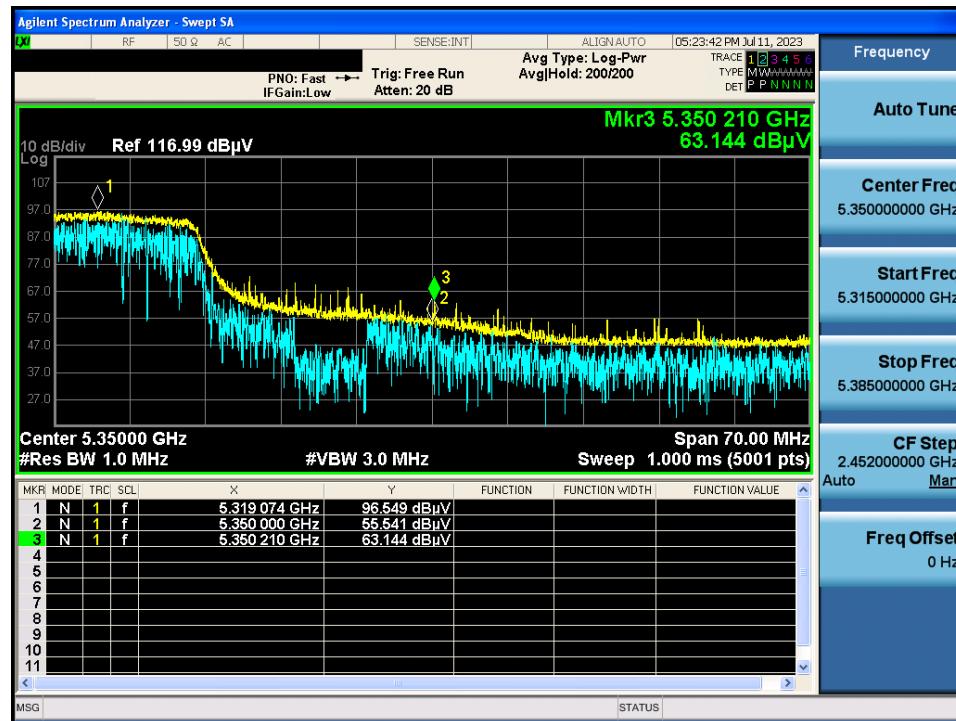
TM 2 & U-NII 3 & 5 825 & X axis & Hor

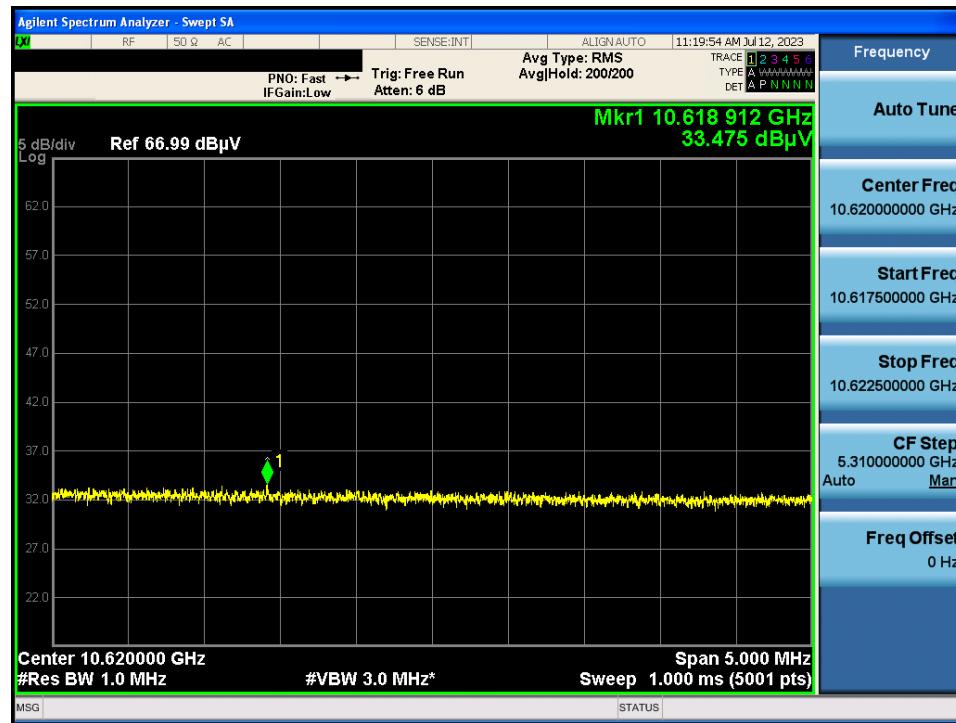
Detector Mode : AV

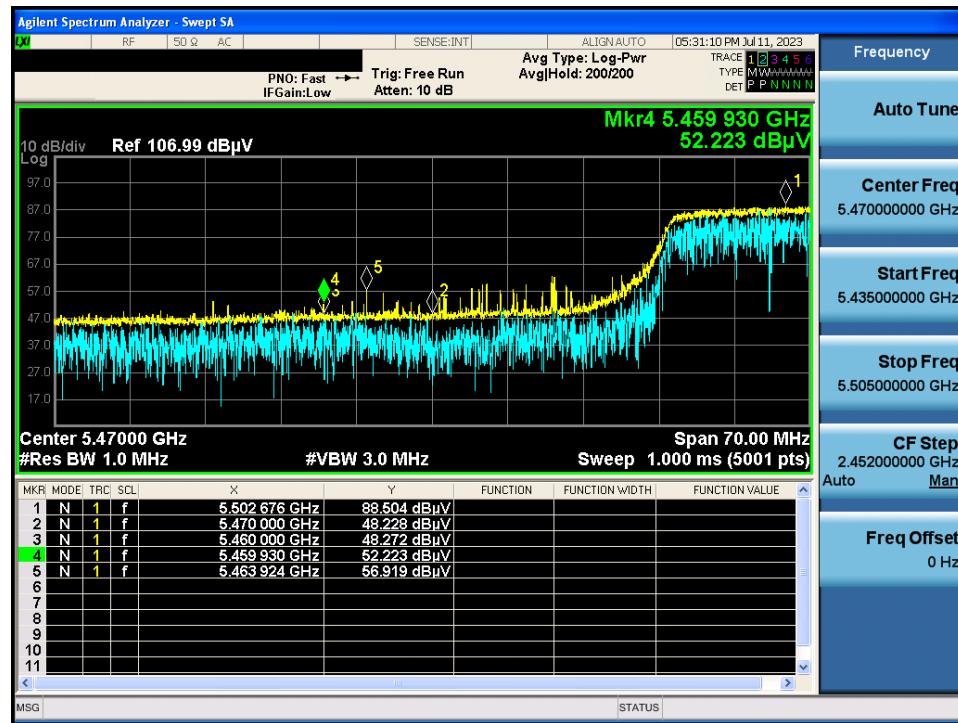
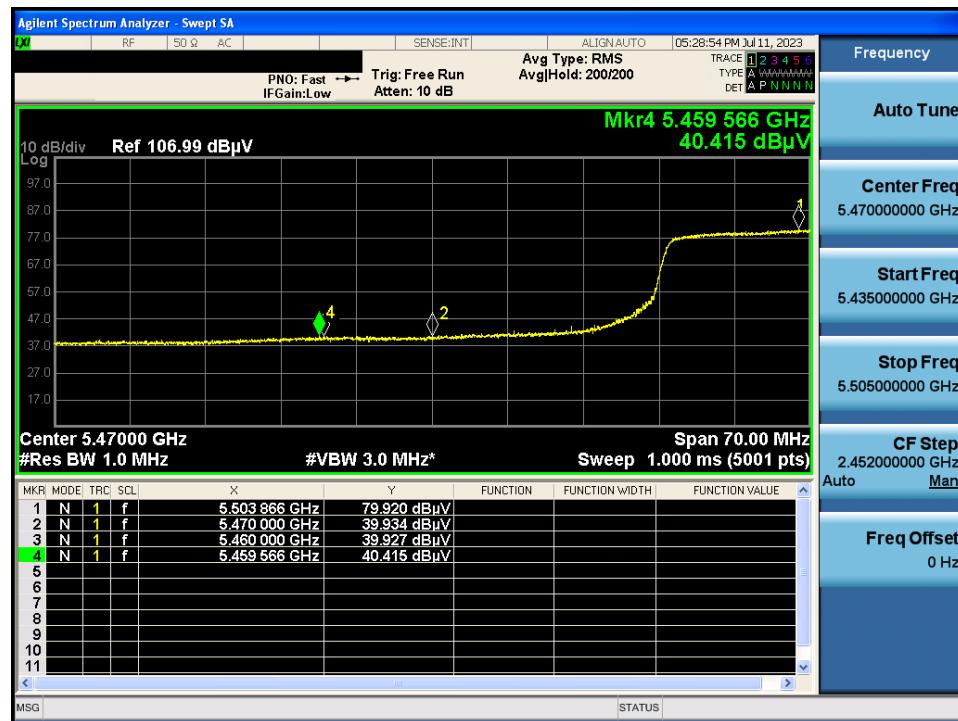


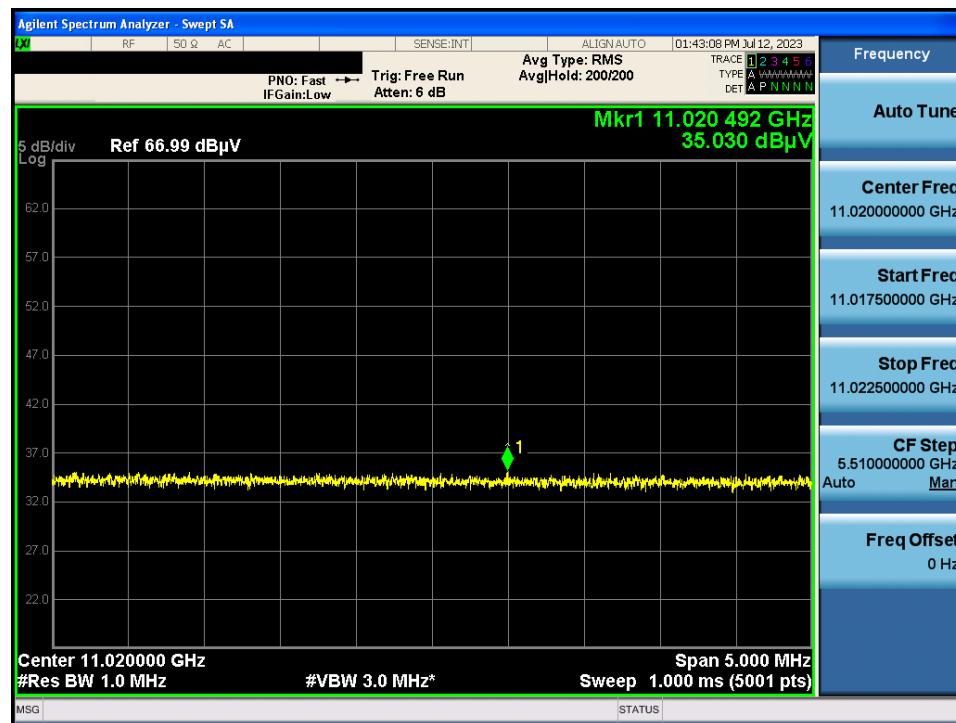
TM 3 & U-NII 1 & 5 190 & X axis & Hor
Detector Mode : PK

TM 3 & U-NII 1 & 5 190 & X axis & Hor
Detector Mode : AV


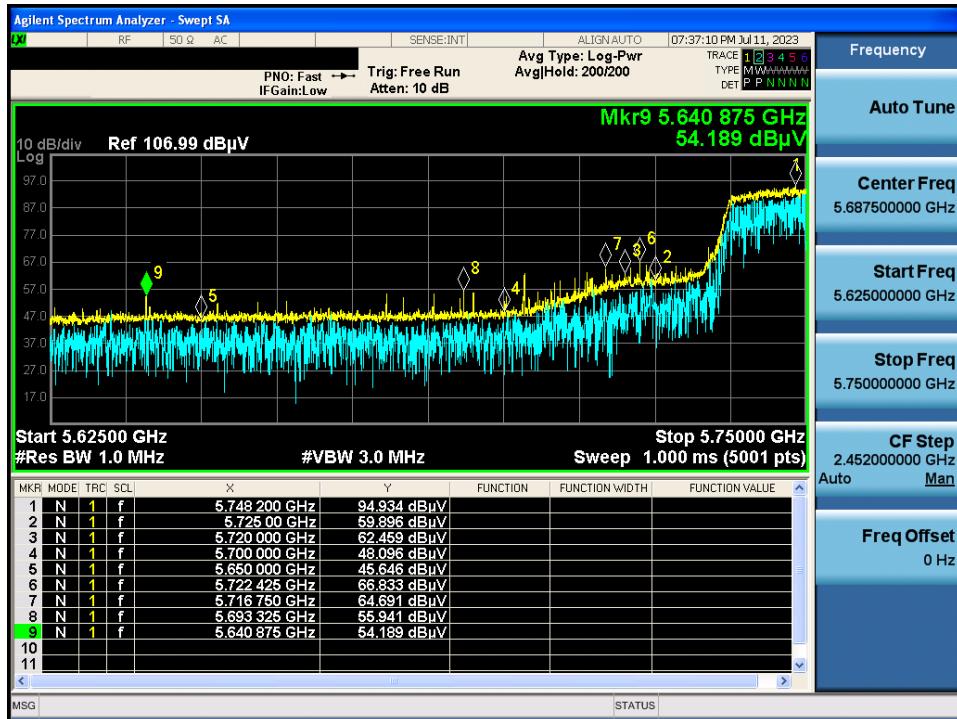
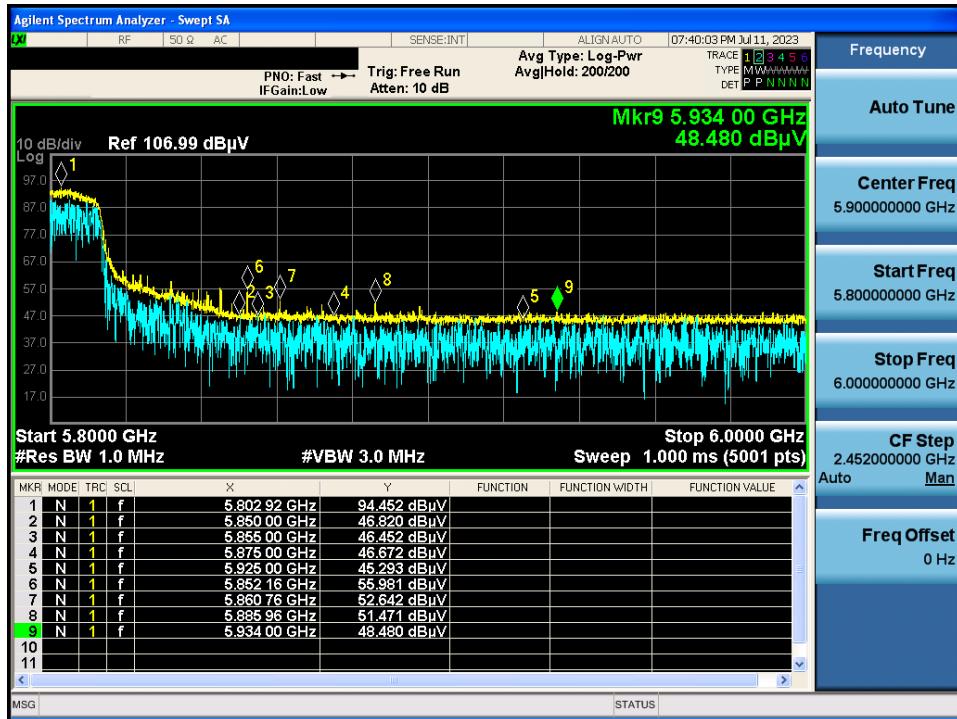
TM 3 & U-NII 1 & 5 230 & X axis & Hor**Detector Mode : PK**

TM 3 & U-NII 2A & 5 310 & X axis & Hor
Detector Mode : PK

TM 3 & U-NII 2A & 5 310 & X axis & Hor
Detector Mode : AV

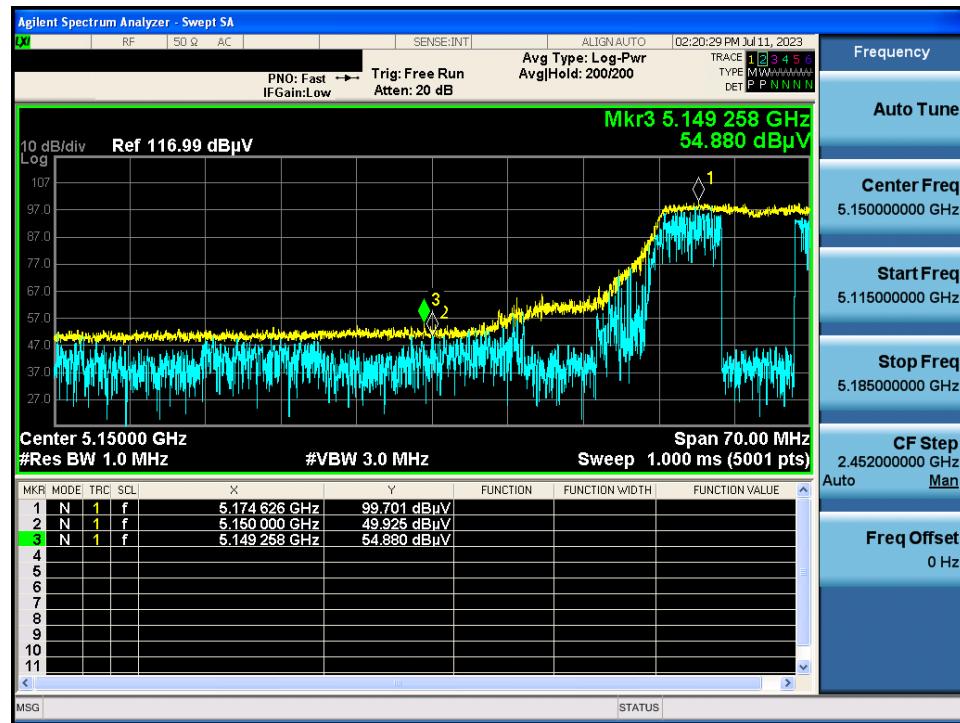
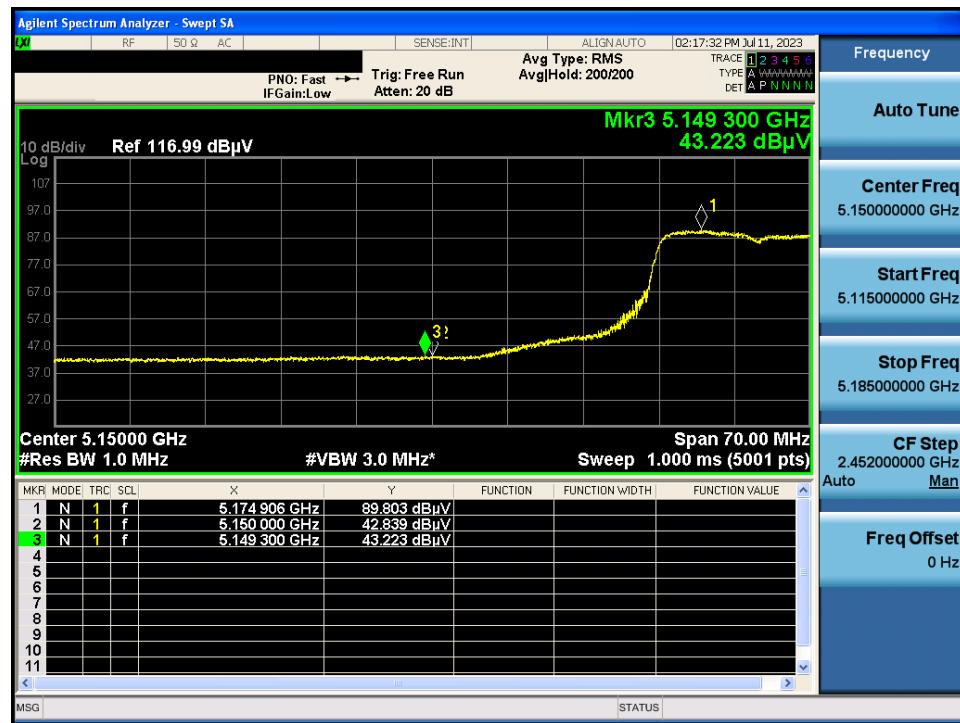

TM 3 & U-NII 2A & 5 310 & X axis & Hor
Detector Mode : AV


TM 3 & U-NII 2C & 5 510 & X axis & Hor
Detector Mode : PK

TM 3 & U-NII 2C & 5 510 & X axis & Hor
Detector Mode : AV


TM 3 & U-NII 2C & 5 510 & X axis & Hor
Detector Mode : AV


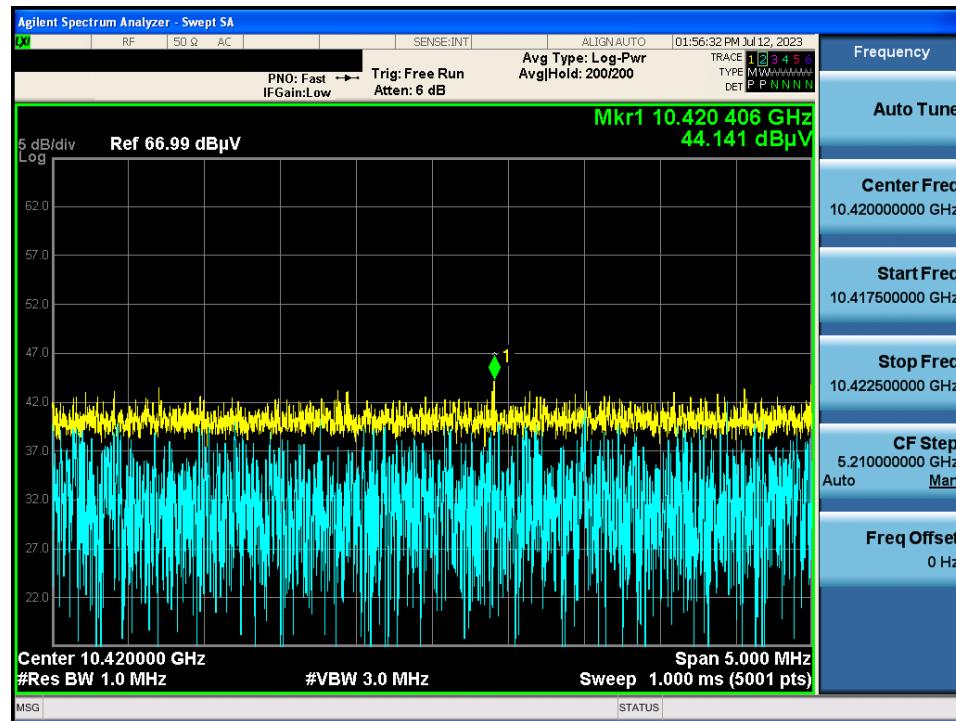
TM 3 & U-NII 3 & 5 755 & X axis & Hor
Detector Mode : PK

TM 3 & U-NII 3 & 5 795 & X axis & Hor
Detector Mode : PK


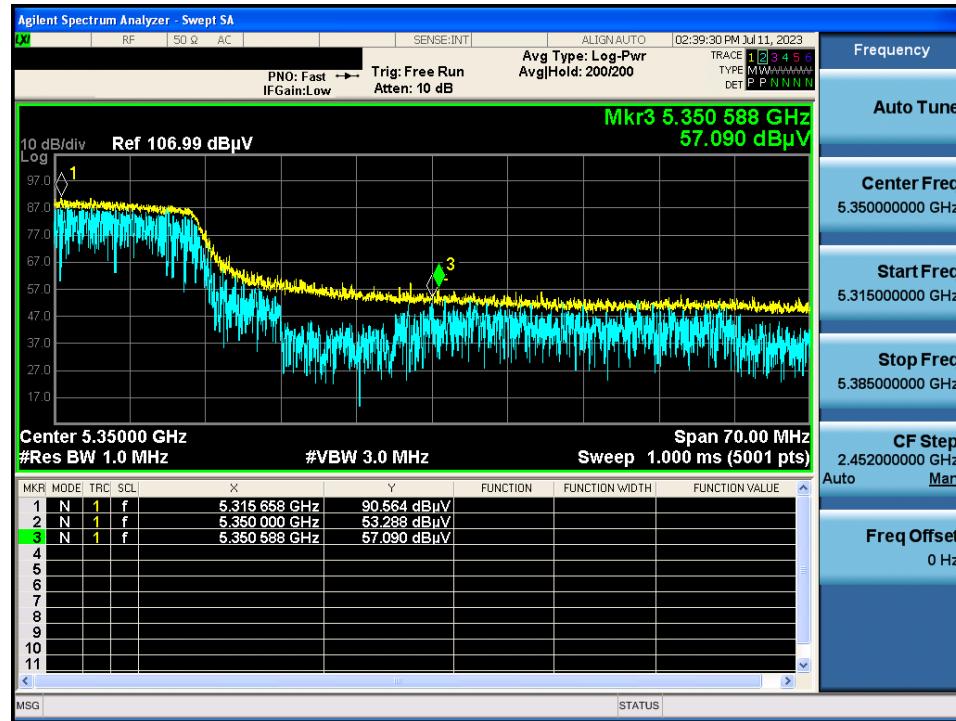
TM 3 & U-NII 3 & 5 755 & X axis & Hor
Detector Mode : AV

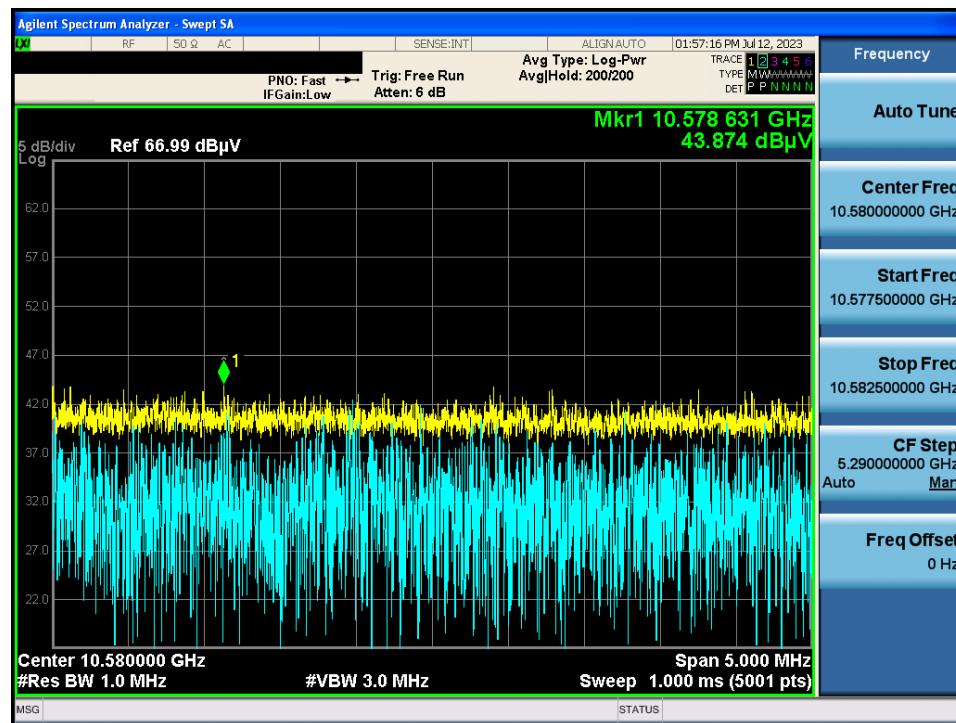

TM 4 & U-NII 1 & 5 210 & X axis & Hor
Detector Mode : PK

TM 4 & U-NII 1 & 5 210 & X axis & Hor
Detector Mode : AV


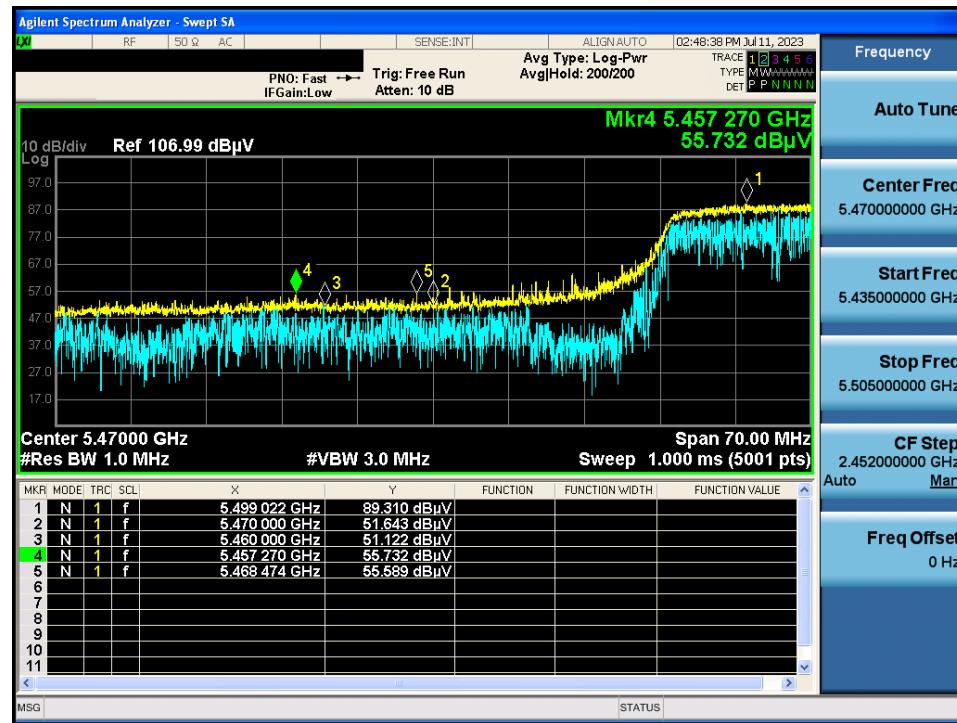
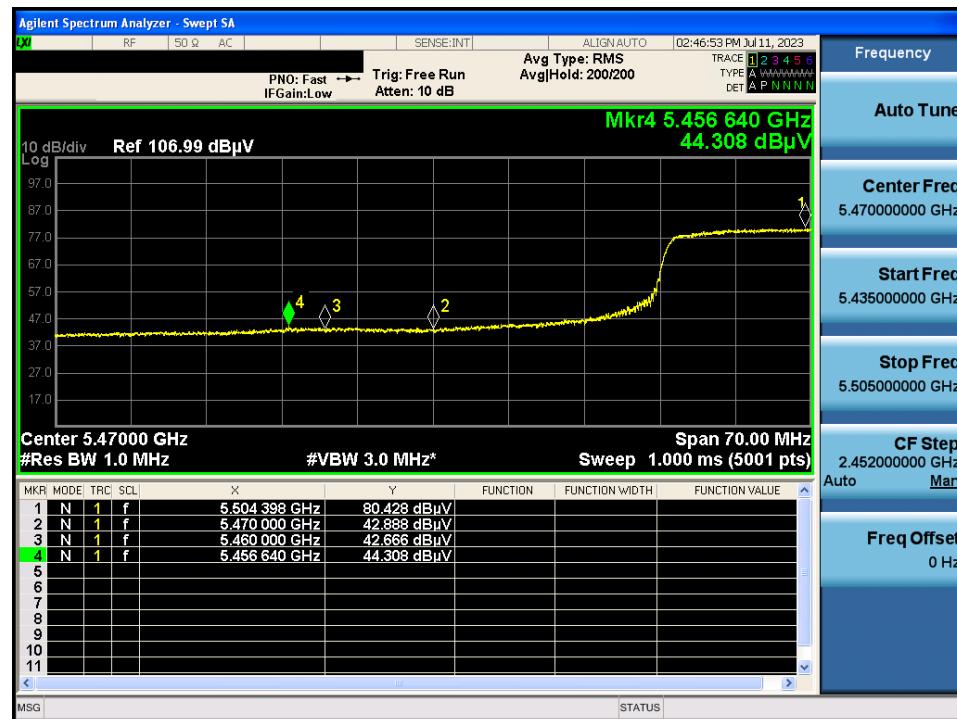
TM 4 & U-NII 1 & 5 210 & X axis & Hor

Detector Mode : PK



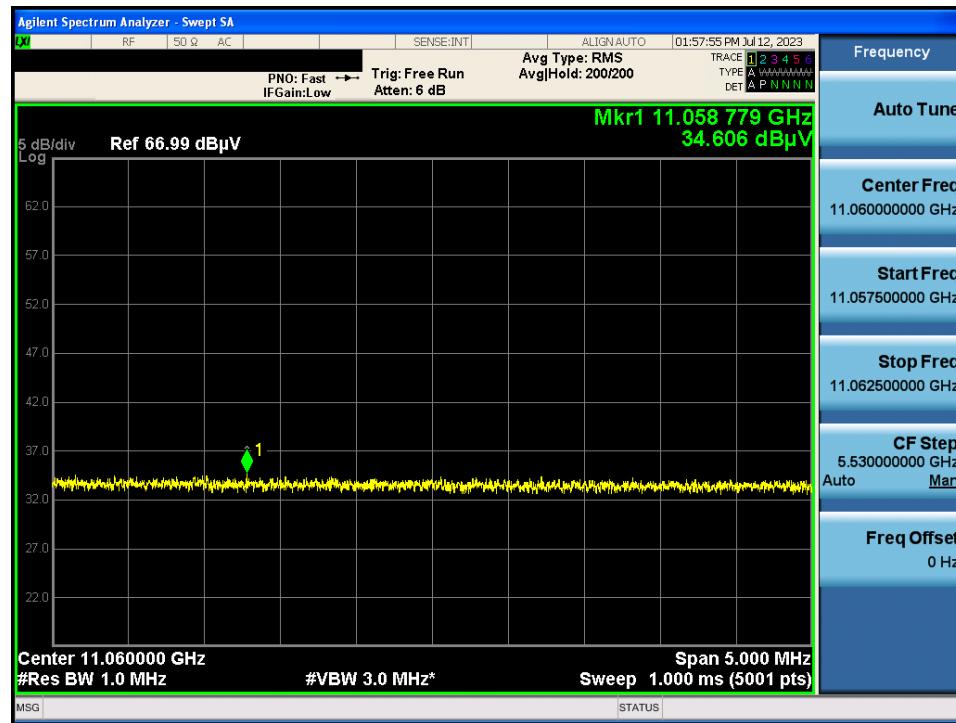
TM 4 & U-NII 2A & 5 290 & X axis & Hor
Detector Mode : PK

TM 4 & U-NII 2A & 5 290 & X axis & Hor
Detector Mode : AV

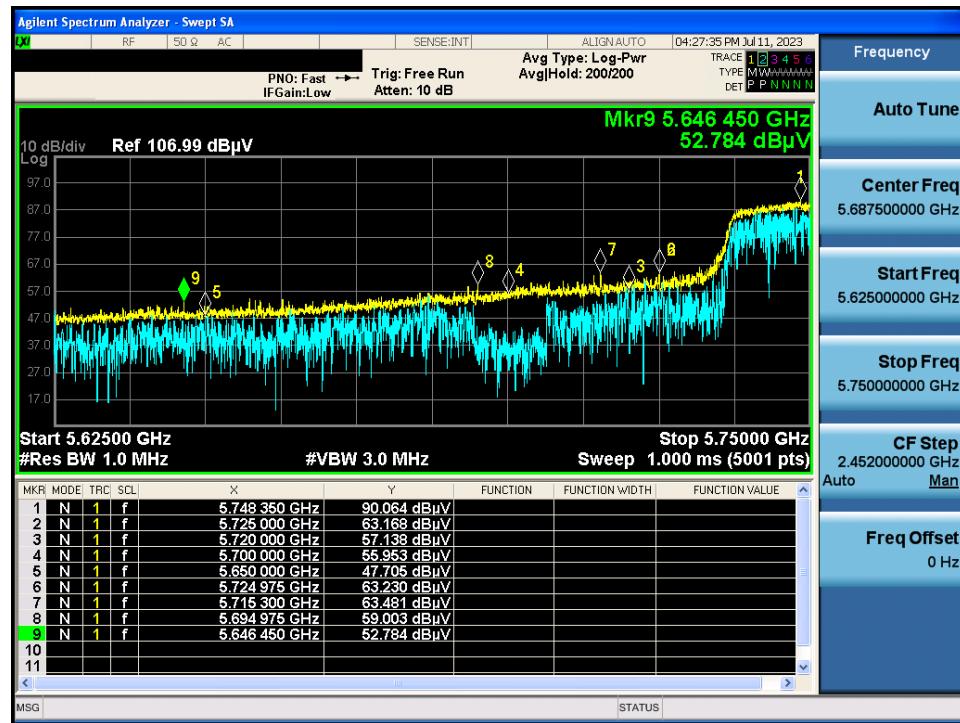
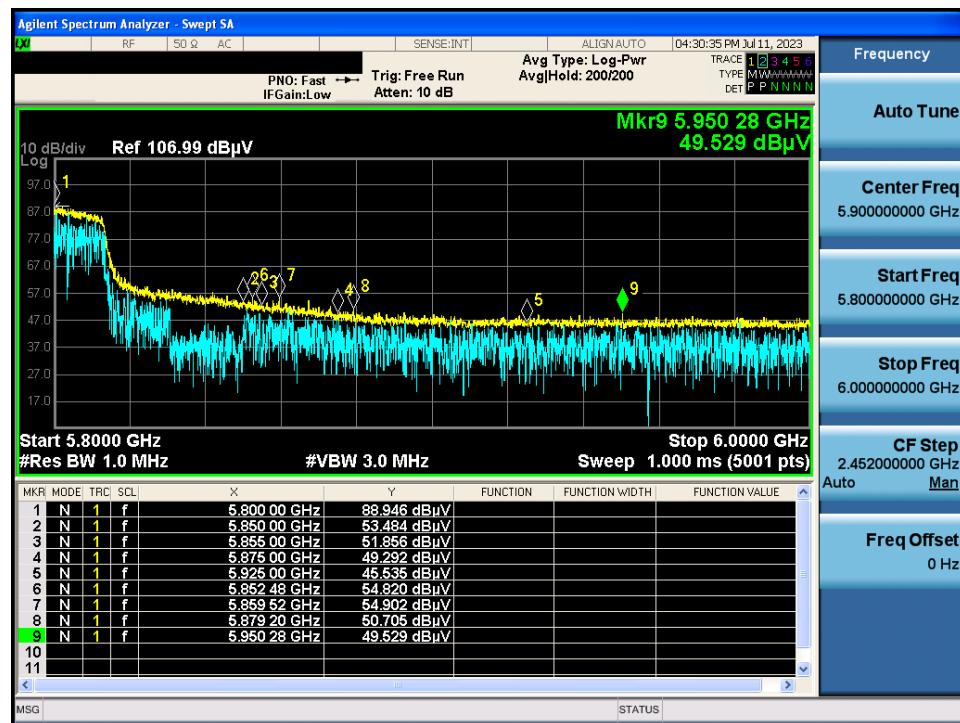

TM 4 & U-NII 2A & 5 290 & X axis & Hor
Detector Mode : PK


TM 4 & U-NII 2C & 5 530 & X axis & Hor
Detector Mode : PK

TM 4 & U-NII 2C & 5 530 & X axis & Hor
Detector Mode : AV


TM 4 & U-NII 2C & 5 530 & X axis & Hor

Detector Mode : AV



TM 4 & U-NII 3 & 5 775 & X axis & Hor
Detector Mode : PK

TM 4 & U-NII 3 & 5 775 & X axis & Hor
Detector Mode : PK


TM 4 & U-NII 3 & 5 775 & X axis & Hor

Detector Mode : AV

