

TEST REPORT

Product Name: Interactive Workstation
FCC ID: 2AFO3-CG12
Trademark: **KoPa**
Model Number: CG12, FS12, CY12, CS12, CF12, YG12, DF12, DB12, FY20, FS20, FF20, FU20, CY20, YY20, CS20, YS20, CF20, YF20, CU20, YU20, CG20, YG20, DF20, DB20, CF22, YF22, FY48, FS48, FF48, FU48, CY48, YY48, CS48, YS48, CF48, YF48, CU48, YU48, CG48, YG48
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Sample Received Date: Jun.06, 2022
Sample tested Date: Jun.06, 2022 to Jul. 18, 2022
Issue Date: Jul. 18, 2022
Report No.: CTB220706036RFX
Test Standards: 47 CFR Part 15 Subpart E
KDB 789033 V02r01
Test Results: PASS
Remark: This is WIFI-5GHz band radio test report.

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Approved by:

Bin Li Director

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

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(NOTE: N/A MEANS NOT APPLICABLE)

**1. VERSION**

Report No.	Issue Date	Description	Approved
CTB220706036RFX	Jul. 08, 2022	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart E Section 15.407 (b)(9)	ANSI C63.10-2013	PASS
Radiated Spurious emissions	47 CFR Part 15 Subpart E Section 15.205/15.407(b)	KDB789033v02r01	PASS
Band edge	47 CFR Part 15 Subpart E Section 15.205/15.407(b)	KDB789033v02r01	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart E Section 15.407 (a)	KDB789033v02r01	PASS
Emission Bandwidth & Occupied Bandwidth	47 CFR Part 15 Subpart E Section 15.407 (a)(e)	KDB789033v02r01	PASS
Power Spectral Density	47 CFR Part 15 Subpart E Section 15.407 (a)	KDB789033v02r01	PASS
Frequency stability	47 CFR Part 15 Subpart E Section 15.407 (g)	KDB789033v02r01	PASS
Operation in the absence of information to the transmit	47 CFR Part 15 Subpart E Section 15.407 (c)	47 CFR Part 15 Subpart E	PASS
Antenna Requirement	47 CFR Part 15 Subpart E Section 15.203	ANSI C63.10-2013	PASS

Remark:

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	Occupancy bandwidth	$U=\pm 54.3\text{Hz}$
2	Adjacent channel power	$U=\pm 1.3\text{dB}$
3	Conducted Adjacent channel power	$U=\pm 1.38\text{dB}$
4	Conducted output power Above 1G	$U=\pm 1.0\text{dB}$
5	Conducted output power below 1G	$U=\pm 0.9\text{dB}$
6	Power Spectral Density , Conduction	$U=\pm 1.0\text{dB}$
7	Conduction spurious emissions	$U=\pm 2.8\text{dB}$
8	Out of band emission	$U=\pm 54\text{Hz}$
9	3m chamber Radiated spurious emission(30MHz-1GHz)	$U=\pm 4.3\text{dB}$
10	3m chamber Radiated spurious emission(1GHz-18GHz)	$U=\pm 4.5\text{dB}$
11	humidity uncertainty	$U=\pm 5.3\%$
12	Temperature uncertainty	$U=\pm 0.59^{\circ}\text{C}$
13	Supply volyages	$U=\pm 3\%$
14	Time	$U=\pm 5\%$
15	Conducted Emission (150KHz-30MHz)	3.2 dB
16	3m camber Radiated spurious emission(9KHz-30MHz)	4.8dB
17	3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	CG12, FS12, CY12, CS12, CF12, YG12, DF12, DB12, FY20, FS20, FF20, FU20, CY20, YY20, CS20, YS20, CF20, YF20, CU20, YU20, CG20, YG20, DF20, DB20, CF22, YF22, FY48, FS48, FF48, FU48, CY48, YY48, CS48, YS48, CF48, YF48, CU48, YU48, CG48, YG48
Model Description:	All the model are the same circuit and RF module, only for model name. Test sample model: CG12
Wi-Fi Specification:	IEEE 802.11a/b/g/n/ac
Hardware Version:	V1.2
Software Version:	V1.1
Operation Frequency:	IEEE 802.11a/n/ac(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11ac(80M): 5150MHz ~5250MHz/ 1 channel IEEE 802.11a/n/ac(20M): 5250MHz ~5350 MHz/ 4 channel IEEE802.11n/ac(40M): 5250MHz ~5350 MHz/ 2 channel IEEE802.11ac(80M): 5250MHz ~5350 MHz/ 1 channel IEEE 802.11a/n/ac(20M): 5470MHz ~5725 MHz/ 11 channel IEEE802.11n/ac(40M): 5470MHz ~5725 MHz/ 5 channel IEEE802.11ac(80M): 5470MHz ~5725 MHz/ 3 channel IEEE 802.11a/n/ac(20M): 5725MHz ~5850MHz/ 5 channel IEEE 802.11n/ac(40M): 5725MHz ~5850MHz/ 2 channel IEEE 802.11ac(80M): 5725MHz ~5850MHz/ 1 channel
Max. RF output power:	WiFi (5G): 14.093dBm
Type of Modulation:	WiFi: DSSS, OFDM, CCK
Antenna installation:	WiFi: Internal Antenna
Antenna Gain:	1.0dBi
Ratings:	INPUT:AC100~240V 50/60Hz OUTPUT:DC12V5A

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series	Note
1	Laptop	DELL	Inspiron 5507	N/A	AE
2.	AX1800 Mesh Wi-Fi 6 Router	D-Link	FCC ID: KA2IRX1960B1	N/A	AE

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

For 802.11a/n/ac(20M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
36	5180MHz	44	5220MHz
40	5200MHz	48	5240MHz
For 802.11a/n/ac(20M) Operation in the 5250MHz ~5350 MHz band			
Channel	Frequency	Channel	Frequency
52	5260MHz	60	5300MHz
56	5280MHz	64	5320MHz
For 802.11a/n/ac(20M) Operation in the 5470MHz ~5725 MHz band			
Channel	Frequency	Channel	Frequency
100	5500MHz	124	5620 MHz
104	5520MHz	128	5640 MHz
108	5540MHz	132	5660 MHz
112	5560MHz	136	5680MHz
116	5580MHz	140	5700MHz
120	5600 MHz		
For 802.11a/n/ac(20M) Operation in the 5725MHz ~5850 MHz band			
Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz	NA	NA

For 802.11n/ac(40M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz
For 802.11n/ac(40M) Operation in the 5250MHz ~5350 MHz band			
Channel	Frequency	Channel	Frequency
54	5270MHz	62	5310MHz
For 802.11n/ac(40M) Operation in the 5470MHz ~5725 MHz band			
Channel	Frequency	Channel	Frequency
102	5510MHz	126	5630MHz
110	5550MHz	134	5670MHz
118	5590MHz		

For 802.11n/ac(40M)		Operation in the 5725MHz ~5850 MHz band	
Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

For 802.11ac(80M)		Operation in the 5150MHz ~5250 MHz band	
Channel	Frequency	Channel	Frequency
42	5210MHz	NA	NA
For 802.11ac(80M)		Operation in the 5250MHz ~5350 MHz band	
Channel	Frequency	Channel	Frequency
58	5290MHz	NA	NA
For 802.11ac(80M)		Operation in the 5470MHz ~5725 MHz band	
Channel	Frequency	Channel	Frequency
106	5530MHz	138	5690MHz
122	5610 MHz		
For 802.11ac(80M)		Operation in the 5725MHz ~5850 MHz band	
Channel	Frequency	Channel	Frequency
155	5775MHz	NA	NA

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
802.11a/n/ac(20M)	5150MHz ~5250 MHz	Channel 36	Channel 40	Channel 48
		5180MHz	5200MHz	5240MHz
802.11n/ac(40M)		Channel 38	N/A	Channel 46
		5190MHz	N/A	5230MHz
802.11ac(80M)		N/A	Channel 42	N/A
		N/A	5210MHz	N/A
802.11a/n/ac(20M)	5250MHz ~5350 MHz	Channel 52	Channel 56	Channel 64
		5260MHz	5280MHz	5320MHz
802.11n/ac(40M)		Channel 54	N/A	Channel 62
		5270MHz	N/A	5310MHz
802.11ac(80M)		N/A	Channel 58	N/A
		N/A	5290MHz	N/A
802.11a/n/ac(20M)	5470MHz ~5725 MHz	Channel 100	Channel 116	Channel 140
		5500MHz	5580MHz	5700MHz
802.11n/ac(40M)		Channel 102	N/A	Channel 134
		5510MHz	N/A	5670MHz
802.11ac(80M)		N/A	Channel 106	N/A
		N/A	5530MHz	N/A
802.11a/n/ac(20M)	5725MHz ~5850 MHz	Channel 149	Channel 157	Channel 165
		5745MHz	5785MHz	5825MHz
802.11n/ac(40M)		Channel 151	N/A	Channel 159
		5755MHz	N/A	5795MHz
802.11ac(80M)		N/A	Channel 155	N/A
		N/A	5775MHz	N/A

Test mode	rate
802.11a	54M
802.11n	500M
802.11/ac	500M

EUT has four External Antenna with Max Antenna Gain 1dBi on every antenna, CDD device with four spatial streams, according to KDB662911 D01 v02r01,

Directional gain= GANT + Array Gain, where Array Gain is as follows.

1) For power spectral density(PSD) measurements,

Array Gain=10log(NANT/NSS)dB=10log(4/1)=6.02dB,

So the directional gain for PSD is 7.02dBi

2) For power measurements,

The Array gain=0 dB for NANT≤4,

So the directional gain for Power measurements is 1dBi

NOTE: DutyCycle>98%.

4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(AC):NV	3.7V
Normal Temperature(°C):NT	23
Low Temperature(°C):LT	0
High Temperature(°C):HT	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2021.09.27	2022.08.05
2	Power Sensor	Agilent	U2021XA	MY56120032	2021.09.27	2022.08.05
3	Power Sensor	Agilent	U2021XA	MY56120034	2021.09.27	2022.08.05
4	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
5	Spectrum Analyzer	R&S	FSP40	100550	2021.09.27	2022.08.05
6	Signal Generator	Agilent	N5181A	MY49060920	2021.09.27	2022.08.16
7	Signal Generator	Agilent	N5182A	MY47420195	2021.09.27	2022.08.05
8	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.16
9	band rejection filter	Shenxiang	MSF2400-2483.5MS-115 4	20181015001	2021.09.27	2022.08.05
10	band rejection filter	Shenxiang	MSF5150-5850MS-1155	20181015001	2021.09.27	2022.08.05
11	band rejection filter	Xingbo	XBLBQ-DZA120	190821-1-1	2021.09.27	2022.08.05
12	BT&WI-FI Automatic test software	Microwave	MTS8310	Ver. 2.0.0.0	2021.09.27	2022.08.05
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2021.09.27	2022.08.05
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2021.09.27	2022.08.05
15	234G Automatic test software	Microwave	MTS8200	Ver. 2.0.0.0	2021.09.27	2022.08.05
16	966 chamber	C.R.T.	966 Room	966	2021.09.27	2024.08.11
17	Receiver	R&S	ESPI	100362	2021.09.27	2022.08.05

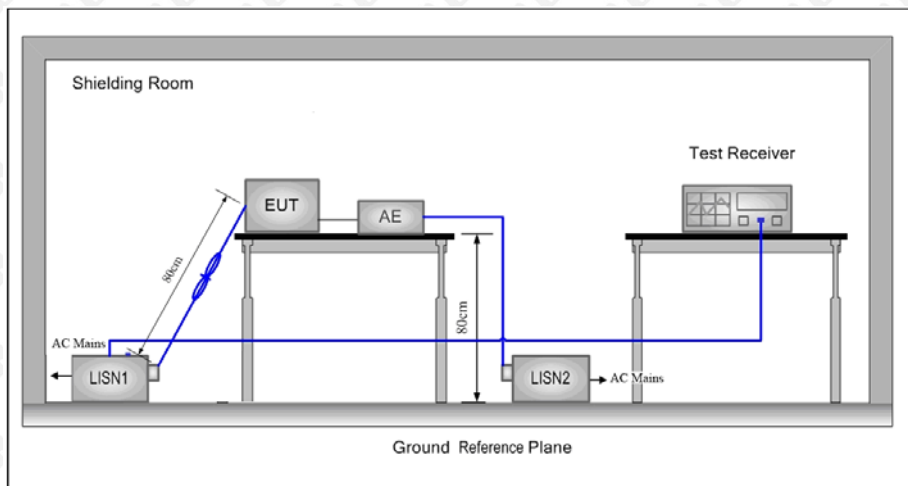
18	Amplifier	HP	8447E	2945A02747	2021.09.27	2022.08.05
19	Amplifier	Agilent	8449B	3008A01838	2021.09.27	2022.08.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	869	2021.09.27	2022.08.07
21	Horn Antenna	Schwarzbeck	BBHA9120D	1911	2021.09.27	2022.08.08
22	Software	Fala	EZ-EMC	FA-03A2 RE	2021.09.27	2022.08.05
23	3-Loop Antenna	Daze	ZN30401	17014	2021.09.27	2022.08.05
24	loop antenna	ZHINAN	ZN30900A	/	2021.09.27	2022.08.05
25	Horn antenna	A/H/System	SAS-574	588	2021.09.27	2022.08.05
26	Amplifier	AEROFLEX	/	S/N/ 097	2021.09.27	2022.08.05

Continuous disturbance						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	2021.09.27	2022.08.05
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2021.09.27	2022.08.05
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCS30	834115/006	2021.09.27	2022.08.05
4	Coaxial cable	ZDECL	Z302S	18091904	2021.09.27	2022.08.05
5	AAN	Schwarzbeck	NTFM8158	183	2021.09.27	2022.08.05
6	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.05
7	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
8	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

Radiated emission						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2021.09.27	2022.08.05
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2021.09.27	2022.08.05
3	Amplifier	Agilent	8449B	3008A01838	2021.09.27	2022.08.05
4	Amplifier	HP	8447E	2945A02747	2021.09.27	2022.08.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2021.09.27	2022.08.05
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2021.09.27	2022.08.05
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2021.09.27	2022.08.05
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2021.09.27	2022.08.05
9	Coaxial cable	ETS	RFC-NNS-100-NMS-300 NI	/	2021.09.27	2022.08.05
10	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.05
11	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
12	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Table 4 – AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 ^{Note 1}	56 to 46 ^{Note 1}
0.5 - 5	56	46
5 - 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

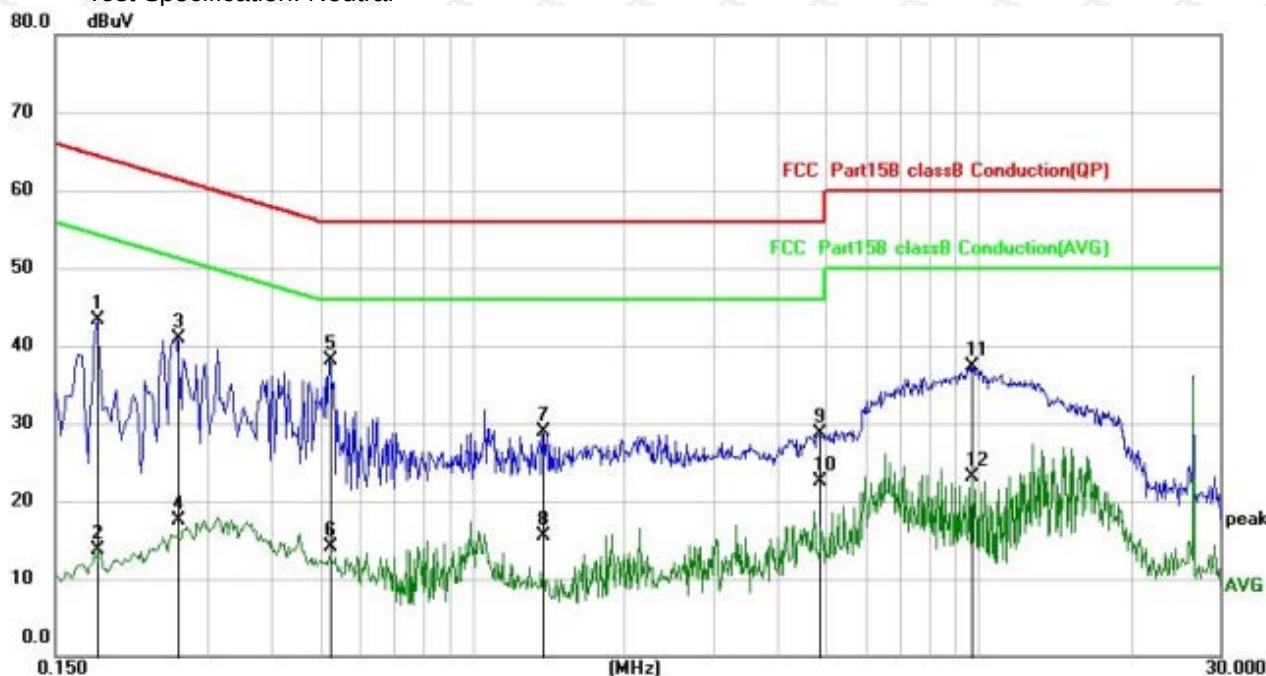
- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane.

This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

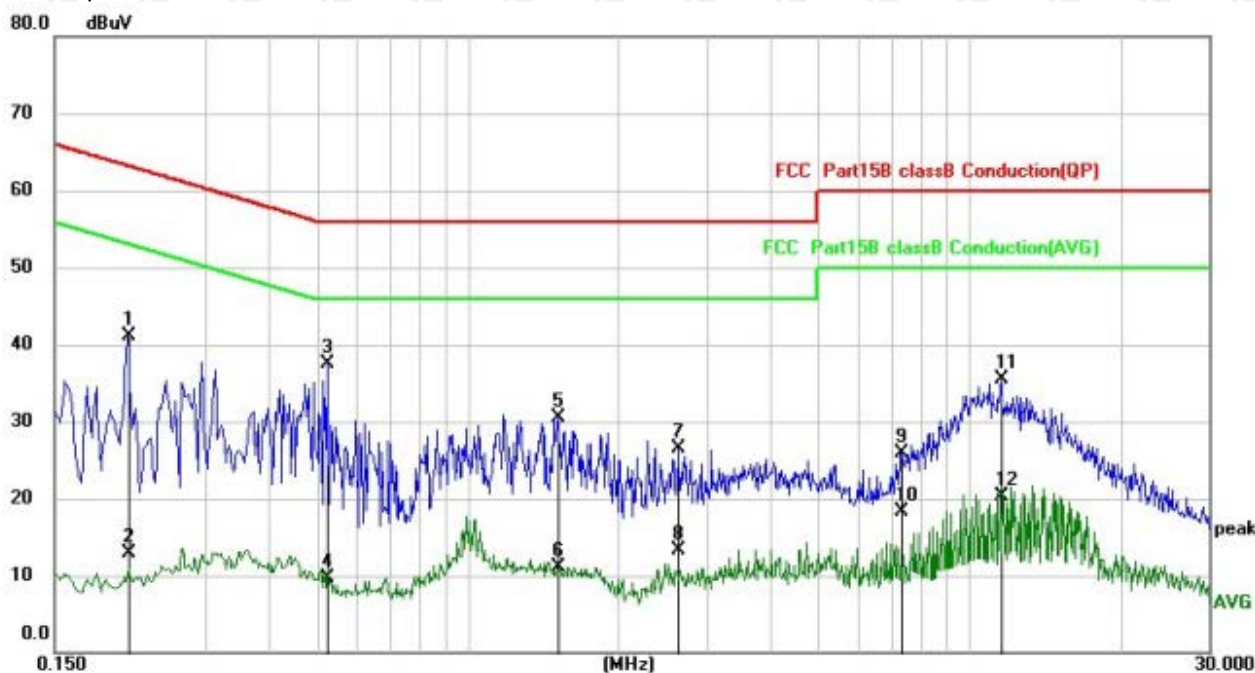
6.4 Test Result

Test Specification: Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector
1		0.1819	32.60	10.70	43.30	64.40	-21.10	QP
2		0.1819	3.10	10.70	13.80	54.40	-40.60	AVG
3		0.2620	30.29	10.66	40.95	61.37	-20.42	QP
4		0.2620	6.82	10.66	17.48	51.37	-33.89	AVG
5	*	0.5220	27.58	10.52	38.10	56.00	-17.90	QP
6		0.5220	3.53	10.52	14.05	46.00	-31.95	AVG
7		1.3779	18.36	10.62	28.98	56.00	-27.02	QP
8		1.3779	4.91	10.62	15.53	46.00	-30.47	AVG
9		4.8700	18.00	10.65	28.65	56.00	-27.35	QP
10		4.8700	11.80	10.65	22.45	46.00	-23.55	AVG
11		9.6580	26.40	10.81	37.21	60.00	-22.79	QP
12		9.6580	12.35	10.81	23.16	50.00	-26.84	AVG

Test Specification: Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector
1		0.2100	30.41	10.69	41.10	63.21	-22.11	QP
2		0.2100	2.28	10.69	12.97	53.21	-40.24	AVG
3	*	0.5260	27.03	10.53	37.56	56.00	-18.44	QP
4		0.5260	-0.89	10.53	9.64	46.00	-36.36	AVG
5		1.5140	19.97	10.62	30.59	56.00	-25.41	QP
6		1.5140	0.51	10.62	11.13	46.00	-34.87	AVG
7		2.6340	15.87	10.63	26.50	56.00	-29.50	QP
8		2.6340	2.72	10.63	13.35	46.00	-32.65	AVG
9		7.3060	15.23	10.73	25.96	60.00	-34.04	QP
10		7.3060	7.56	10.73	18.29	50.00	-31.71	AVG
11		11.5620	24.66	10.85	35.51	60.00	-24.49	QP
12		11.5620	9.38	10.85	20.23	50.00	-29.77	AVG

Remark:

- Factor = Cable loss + LISN factor, Margin = Limit – Level
- All modes were tested at AC 120V and 240V, only the worst result of AC 120V 60Hz was reported.
- All the test modes completed for test. Only the worst result of was reported.

7. RADIATED SPURIOUS EMISSIONS

7.1 Block Diagram Of Test Setup

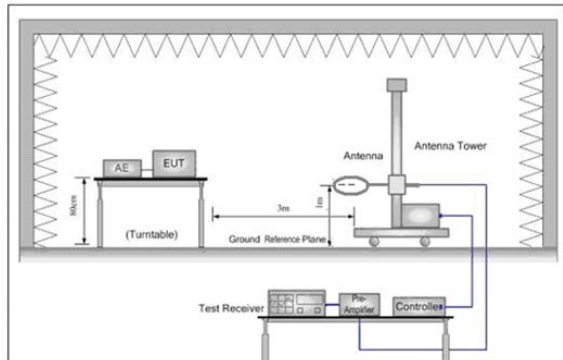


Figure 1. Below 30MHz

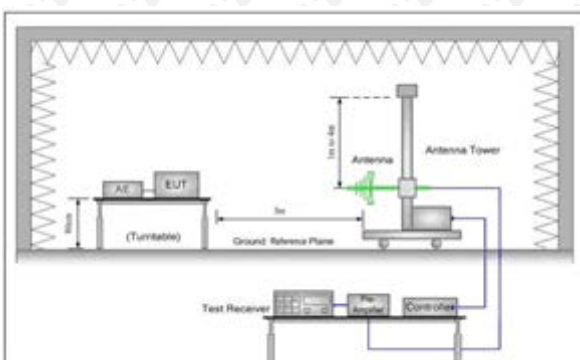


Figure 2. 30MHz to 1GHz

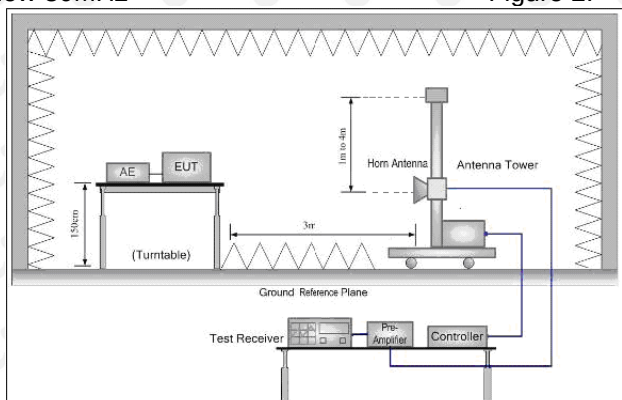


Figure 3. Above 1GHz

7.2 Limit

Spurious Emissions:

Frequency	Field strength (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	$20\log 2400/F \text{ (kHz)} + 80$	Quasi-peak	3
0.490MHz-1.705MHz	$20\log 24000/F \text{ (kHz)} + 40$	Quasi-peak	3
1.705MHz-30MHz	$20\log 30 + 40$	Quasi-peak	3
30MHz-88MHz	40.0	Quasi-peak	3
88MHz-216MHz	43.5	Quasi-peak	3
216MHz-960MHz	46.0	Quasi-peak	3
960MHz-1GHz	54.0	Quasi-peak	3
Above 1GHz	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

If radiated measurements are performed, field strength is then converted to EIRP as follows:

(i) $EIRP = ((E \cdot d)^2) / 30$

where:

- E is the field strength in V/m;
- d is the measurement distance in meters;
- EIRP is the equivalent isotropically radiated power in watts.

(ii) Working in dB units, the above equation is equivalent to:

$$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$$

(iii) Or, if d is 3 meters:

$$EIRP[dBm] = E[dB\mu V/m] - 95.2$$

7.3 Test procedure

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).

h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel

j. Repeat above procedures until all frequencies measured was complete.

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

7.4 Test Result

30MHz-1GHz Test Results:

Modulation : 802.11a (the worst data)

Test Channel : 5180MHz

Antenna polarity: H



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		38.6839	32.08	-5.59	26.49	40.00	-13.51	QP
2		85.8984	42.46	-9.75	32.71	40.00	-7.29	QP
3		185.7882	37.64	-7.96	29.68	43.50	-13.82	QP
4		331.3546	39.19	-4.11	35.08	46.00	-10.92	QP
5	*	628.3745	36.85	2.97	39.82	46.00	-6.18	QP
6		876.7829	32.34	6.17	38.51	46.00	-7.49	QP

Antenna polarity: V



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		38.6839	37.64	-5.59	32.05	40.00	-7.95	QP
2		88.9639	41.62	-9.74	31.88	43.50	-11.62	QP
3		114.7156	41.20	-7.47	33.73	43.50	-9.77	QP
4		250.3012	32.08	-5.70	26.38	46.00	-19.62	QP
5		500.3011	35.37	0.72	36.09	46.00	-9.91	QP
6	*	625.0250	45.95	2.92	48.87	46.00	2.87	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

- The margin of 9K-30MH measurement exceeds 20dB, so the test chart is not included. Test Mode: 802.11a20 (the worst)

Radiated Spurious Emission (Above 1GHz):

ANT 1+ANT 2:

Modulation : 802.11(a) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5180MHz									
10360	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
10360	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
10360	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
10360	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5240MHz									
10480	44.95	16.11	61.06	74	-12.94	PK	1.05	175	H
10480	28.22	16.11	44.33	54	-9.67	AV	1.39	139	H
10480	44.59	16.11	60.70	74	-13.30	PK	1.32	165	V
10480	29.46	16.11	45.57	54	-8.43	AV	1.04	197	V
Channel:5260MHz									
10520	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
10520	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
10520	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
10520	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5320MHz									
10640	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
10640	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
10640	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
10640	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5500MHz									
11000	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
11000	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
11000	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
11000	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5700MHz									
11400	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
11400	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
11400	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V

11400	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5745MHz									
11490	42.11	17.46	59.57	74	-14.43	PK	1.64	332	H
11490	26.99	17.46	44.45	54	-9.55	AV	1.06	187	H
11490	41.33	17.46	58.79	74	-15.21	PK	1.24	153	V
11490	29.98	17.46	47.44	54	-6.56	AV	1.09	351	V
Channel:5825MHz									
11650	41.59	17.57	59.16	74	-14.84	PK	1.56	128	H
11650	29.26	17.57	46.83	54	-7.17	AV	1.14	316	H
11650	43.61	17.57	61.18	74	-12.82	PK	1.45	183	V
11650	28.41	17.57	45.98	54	-8.02	AV	1.56	134	V

Modulation : 802.11(n40) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5190MHz									
10380	38.35	16.34	54.69	74	-19.31	PK	1.51	6	H
10380	22.70	16.34	39.04	54	-14.96	AV	1.33	155	H
10380	38.12	16.34	54.46	74	-19.54	PK	1.44	217	V
10380	24.84	16.34	41.18	54	-12.82	AV	1.74	216	V
Channel:5230MHz									
10460	43.85	16.15	60.00	74	-14.00	PK	1.05	30	H
10460	25.41	16.15	41.56	54	-12.44	AV	1.36	76	H
10460	40.64	16.15	56.79	74	-17.21	PK	1.16	95	V
10460	27.12	16.15	43.27	54	-10.73	AV	1.05	147	V
Channel:5270MHz									
10540	38.46	16.34	54.80	74	-19.20	PK	1.19	261	H
10540	23.33	16.34	39.67	54	-14.33	AV	1.14	307	H
10540	37.18	16.34	53.52	74	-20.48	PK	1.28	149	V
10540	22.21	16.34	38.55	54	-15.45	AV	1.32	167	V
Channel:5310MHz									
10620	39.78	16.34	56.12	74	-17.88	PK	1.81	164	H
10620	24.50	16.34	40.84	54	-13.16	AV	1.86	56	H
10620	39.62	16.34	55.96	74	-18.04	PK	1.05	328	V
10620	24.90	16.34	41.24	54	-12.76	AV	1.16	301	V
Channel:5510MHz									
11020	37.67	16.34	54.01	74	-19.99	PK	1.46	240	H
11020	23.88	16.34	40.22	54	-13.78	AV	1.16	40	H
11020	39.45	16.34	55.79	74	-18.21	PK	1.10	106	V
11020	24.26	16.34	40.60	54	-13.40	AV	1.08	60	V
Channel:5670MHz									
11340	39.81	16.34	56.15	74	-17.85	PK	1.15	41	H
11340	24.15	16.34	40.49	54	-13.51	AV	1.01	49	H
11340	37.54	16.34	53.88	74	-20.12	PK	1.23	152	V
11340	22.54	16.34	38.88	54	-15.12	AV	1.54	10	V



Channel:5755MHz									
11510	40.35	17.49	57.84	74	-16.16	PK	1.01	311	H
11510	25.35	17.49	42.84	54	-11.16	AV	1.29	160	H
11510	43.39	17.49	60.88	74	-13.12	PK	1.22	102	V
11510	25.20	17.49	42.69	54	-11.31	AV	1.48	184	V
Channel:5795MHz									
11590	41.15	17.52	58.67	74	-15.33	PK	1.13	74	H
11590	27.58	17.52	45.10	54	-8.90	AV	1.07	155	H
11590	39.95	17.52	57.47	74	-16.53	PK	1.58	261	V
11590	25.07	17.52	42.59	54	-11.41	AV	1.27	32	V

Modulation : 802.11(VH80) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5210MHz									
10420	40.19	16.25	56.44	74	-17.56	PK	1.85	213	H
10420	29.94	16.25	46.19	54	-7.81	AV	1.77	114	H
10420	43.82	16.25	60.07	74	-13.93	PK	1.55	154	V
10420	25.57	16.25	41.82	54	-12.18	AV	1.42	135	V
Channel:5290MHz									
10580	40.19	16.25	56.44	74	-17.56	PK	1.85	213	H
10580	29.94	16.25	46.19	54	-7.81	AV	1.77	114	H
10580	43.82	16.25	60.07	74	-13.93	PK	1.55	154	V
10580	25.57	16.25	41.82	54	-12.18	AV	1.42	135	V
Channel:5530MHz									
11060	40.19	16.25	56.44	74	-17.56	PK	1.85	213	H
11060	29.94	16.25	46.19	54	-7.81	AV	1.77	114	H
11060	43.82	16.25	60.07	74	-13.93	PK	1.55	154	V
11060	25.57	16.25	41.82	54	-12.18	AV	1.42	135	V
Channel:5775MHz									
11550	40.17	17.5	57.67	74	-16.33	PK	1.77	178	H
11550	27.04	17.5	44.54	54	-9.46	AV	1.50	156	H
11550	41.17	17.5	58.67	74	-15.33	PK	1.87	255	V
11550	29.55	17.5	47.05	54	-6.95	AV	1.25	324	V

ANT 3+ANT 4:

Modulation : 802.11(a) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5180MHz									
10360	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
10360	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
10360	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
10360	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5240MHz									
10480	44.95	16.11	61.06	74	-12.94	PK	1.05	175	H
10480	28.22	16.11	44.33	54	-9.67	AV	1.39	139	H
10480	44.59	16.11	60.70	74	-13.30	PK	1.32	165	V
10480	29.46	16.11	45.57	54	-8.43	AV	1.04	197	V
Channel:5260MHz									
10520	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
10520	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
10520	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
10520	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5320MHz									
10640	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
10640	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
10640	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
10640	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5500MHz									
11000	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
11000	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
11000	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V
11000	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5700MHz									
11400	44.05	16.39	60.44	74	-13.56	PK	1.36	148	H
11400	29.65	16.39	46.04	54	-7.96	AV	1.76	120	H
11400	43.79	16.39	60.18	74	-13.82	PK	1.79	165	V

11400	30.84	16.39	47.23	54	-6.77	AV	1.55	282	V
Channel:5745MHz									
11490	42.11	17.46	59.57	74	-14.43	PK	1.64	332	H
11490	26.99	17.46	44.45	54	-9.55	AV	1.06	187	H
11490	41.33	17.46	58.79	74	-15.21	PK	1.24	153	V
11490	29.98	17.46	47.44	54	-6.56	AV	1.09	351	V
Channel:5825MHz									
11650	41.59	17.57	59.16	74	-14.84	PK	1.56	128	H
11650	29.26	17.57	46.83	54	-7.17	AV	1.14	316	H
11650	43.61	17.57	61.18	74	-12.82	PK	1.45	183	V
11650	28.41	17.57	45.98	54	-8.02	AV	1.56	134	V

Modulation : 802.11(n40) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5190MHz									
10380	42.77	16.34	59.11	74	-14.89	PK	1.82	25	H
10380	25.44	16.34	41.78	54	-12.22	AV	1.82	226	H
10380	42.20	16.34	58.54	74	-15.46	PK	1.06	184	V
10380	28.13	16.34	44.47	54	-9.53	AV	1.82	58	V
Channel:5230MHz									
10460	43.85	16.15	60.00	74	-14.00	PK	1.05	30	H
10460	25.41	16.15	41.56	54	-12.44	AV	1.36	76	H
10460	40.64	16.15	56.79	74	-17.21	PK	1.16	95	V
10460	27.12	16.15	43.27	54	-10.73	AV	1.05	147	V
Channel:5270MHz									
10540	42.77	16.34	59.11	74	-14.89	PK	1.82	25	H
10540	25.44	16.34	41.78	54	-12.22	AV	1.82	226	H
10540	42.20	16.34	58.54	74	-15.46	PK	1.06	184	V
10540	28.13	16.34	44.47	54	-9.53	AV	1.82	58	V
Channel:5310MHz									
10620	42.77	16.34	59.11	74	-14.89	PK	1.82	25	H
10620	25.44	16.34	41.78	54	-12.22	AV	1.82	226	H
10620	42.20	16.34	58.54	74	-15.46	PK	1.06	184	V
10620	28.13	16.34	44.47	54	-9.53	AV	1.82	58	V
Channel:5510MHz									
11020	42.77	16.34	59.11	74	-14.89	PK	1.82	25	H
11020	25.44	16.34	41.78	54	-12.22	AV	1.82	226	H
11020	42.20	16.34	58.54	74	-15.46	PK	1.06	184	V
11020	28.13	16.34	44.47	54	-9.53	AV	1.82	58	V
Channel:5670MHz									
11340	42.77	16.34	59.11	74	-14.89	PK	1.82	25	H
11340	25.44	16.34	41.78	54	-12.22	AV	1.82	226	H
11340	42.20	16.34	58.54	74	-15.46	PK	1.06	184	V
11340	28.13	16.34	44.47	54	-9.53	AV	1.82	58	V

Channel:5755MHz									
11510	40.35	17.49	57.84	74	-16.16	PK	1.01	311	H
11510	25.35	17.49	42.84	54	-11.16	AV	1.29	160	H
11510	43.39	17.49	60.88	74	-13.12	PK	1.22	102	V
11510	25.20	17.49	42.69	54	-11.31	AV	1.48	184	V
Channel:5795MHz									
11590	41.15	17.52	58.67	74	-15.33	PK	1.13	74	H
11590	27.58	17.52	45.10	54	-8.90	AV	1.07	155	H
11590	39.95	17.52	57.47	74	-16.53	PK	1.58	261	V
11590	25.07	17.52	42.59	54	-11.41	AV	1.27	32	V

Modulation : 802.11(VH80) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5210MHz									
10420	40.19	16.25	56.44	74	-17.56	PK	1.85	213	H
10420	29.94	16.25	46.19	54	-7.81	AV	1.77	114	H
10420	43.82	16.25	60.07	74	-13.93	PK	1.55	154	V
10420	25.57	16.25	41.82	54	-12.18	AV	1.42	135	V
Channel:5290MHz									
10580	40.19	16.25	56.44	74	-17.56	PK	1.85	213	H
10580	29.94	16.25	46.19	54	-7.81	AV	1.77	114	H
10580	43.82	16.25	60.07	74	-13.93	PK	1.55	154	V
10580	25.57	16.25	41.82	54	-12.18	AV	1.42	135	V
Channel:5530MHz									
11060	40.19	16.25	56.44	74	-17.56	PK	1.85	213	H
11060	29.94	16.25	46.19	54	-7.81	AV	1.77	114	H
11060	43.82	16.25	60.07	74	-13.93	PK	1.55	154	V
11060	25.57	16.25	41.82	54	-12.18	AV	1.42	135	V
Channel:5775MHz									
11550	40.17	17.5	57.67	74	-16.33	PK	1.77	178	H
11550	27.04	17.5	44.54	54	-9.46	AV	1.50	156	H
11550	41.17	17.5	58.67	74	-15.33	PK	1.87	255	V
11550	29.55	17.5	47.05	54	-6.95	AV	1.25	324	V

Remark:

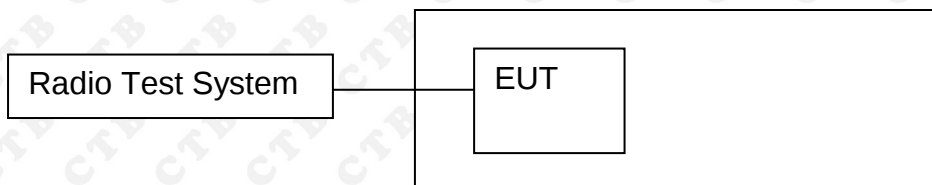
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

2. The EUT was tested in the low, high channel and the worst case position data was reported.

3. Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

8. BAND EDGE

8.1 Block Diagram Of Test Setup



8.2 Limit

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (5) 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.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

8.3 Test procedure

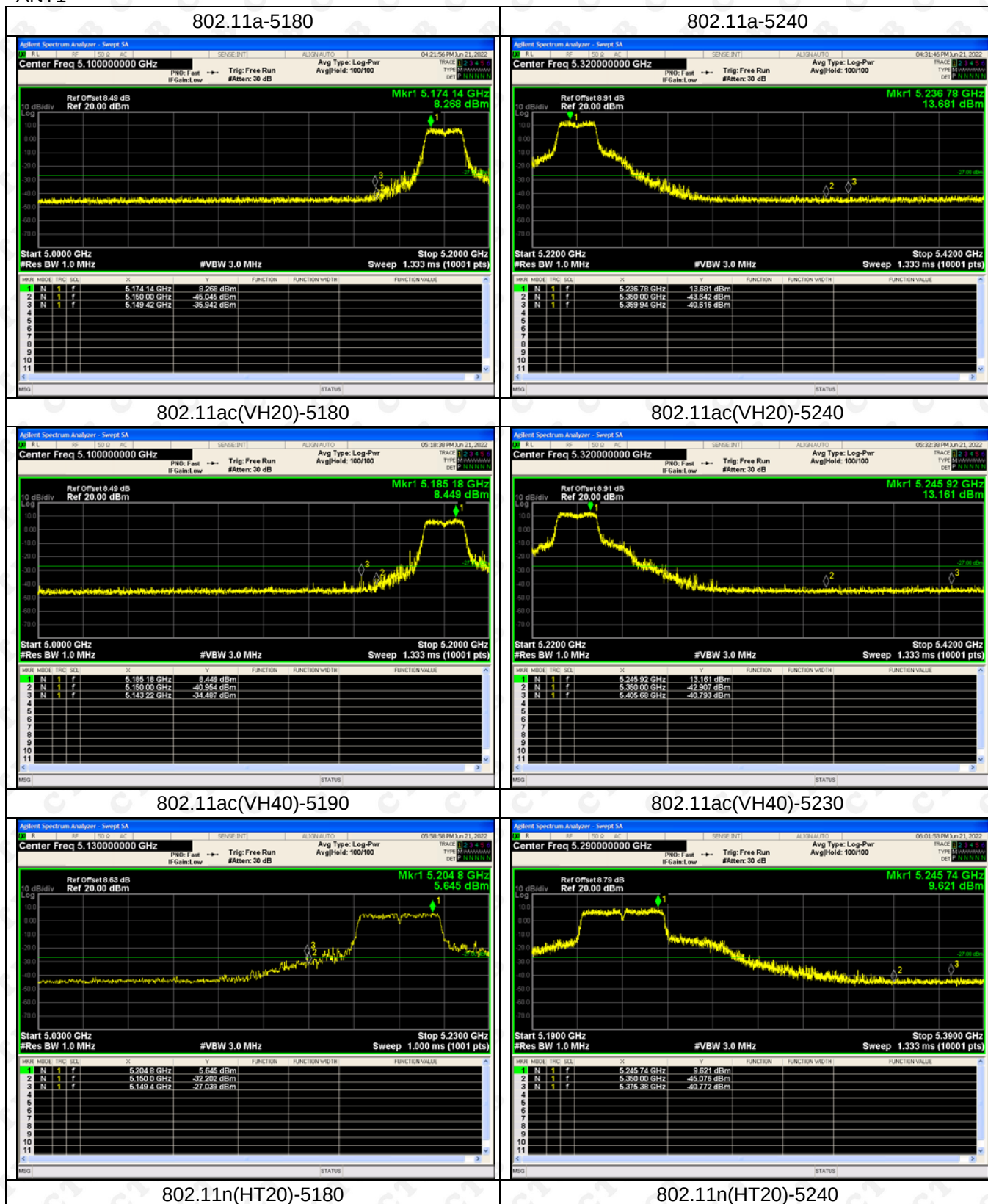
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

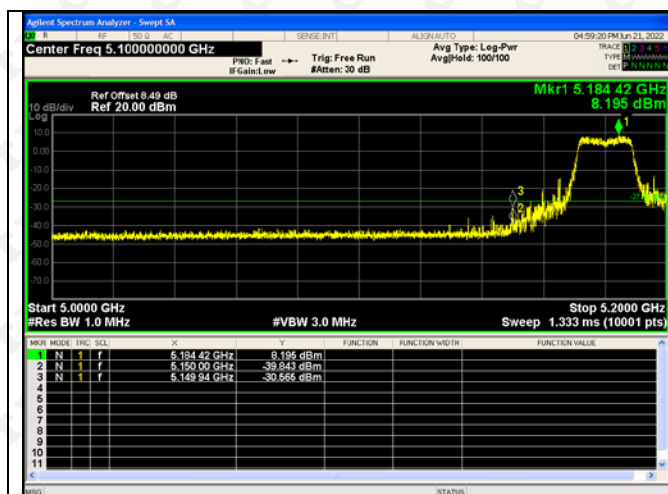
8.4 Test Result

Test Graph

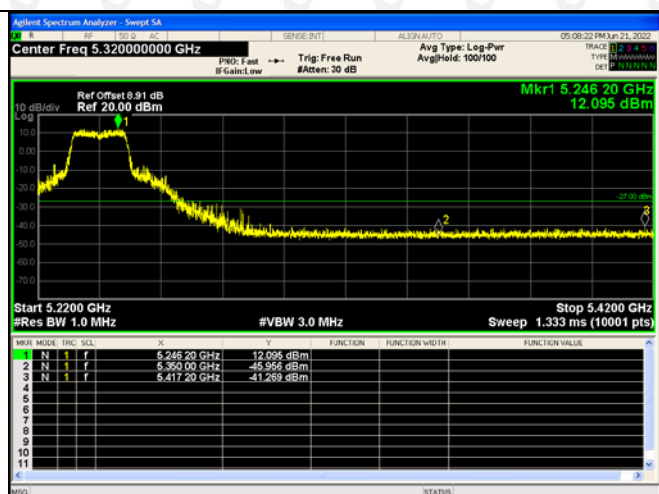
5150-5250MHz:

ANT1

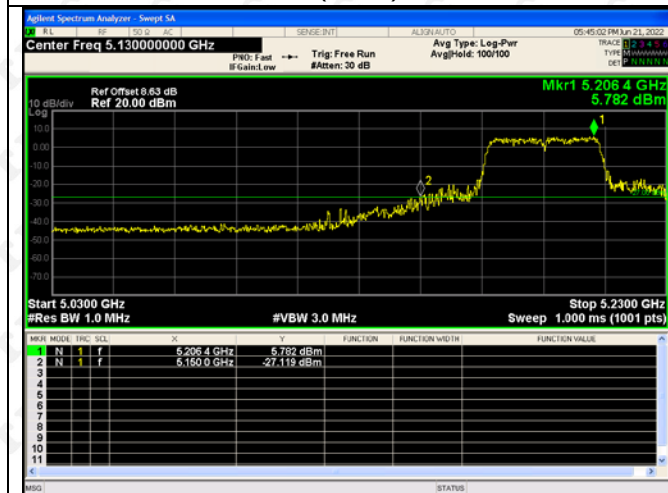




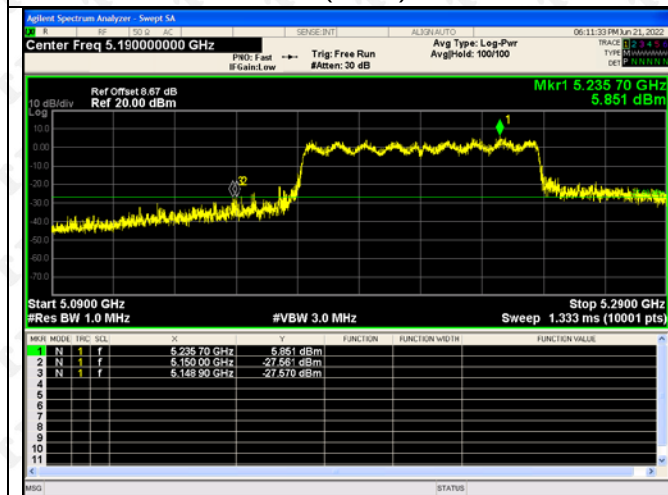
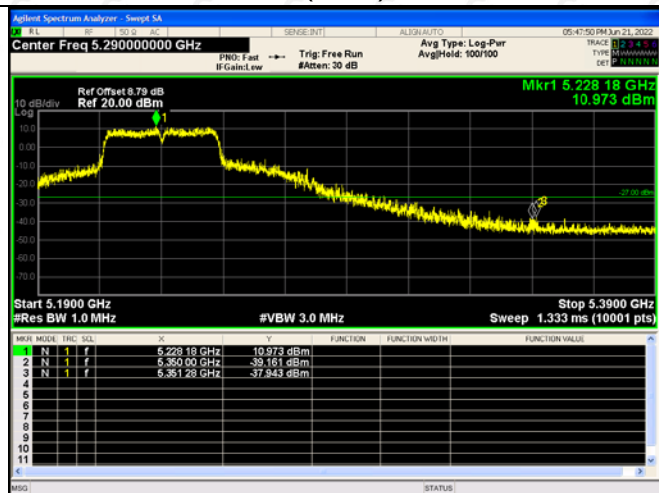
802.11n(HT40)-5190



802.11n(HT40)-5230

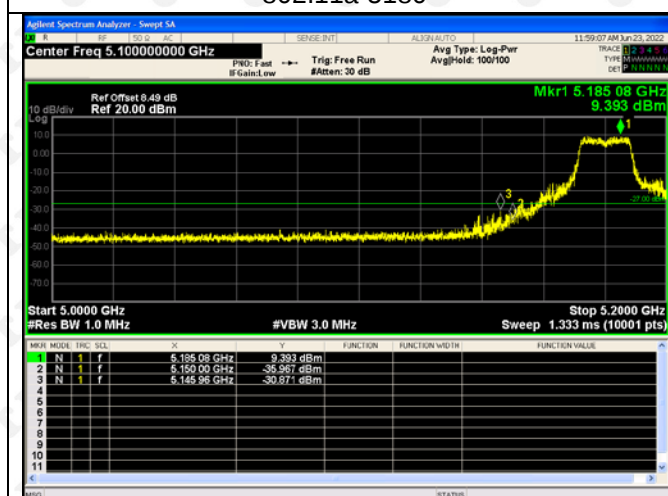


802.11ac(VH80)-5210

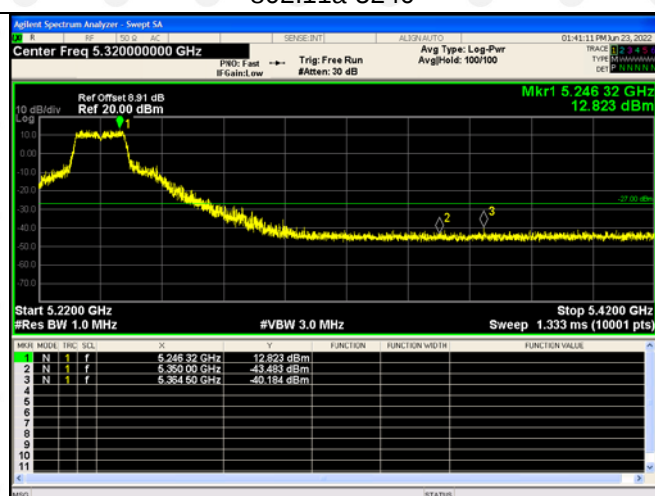


ANT2

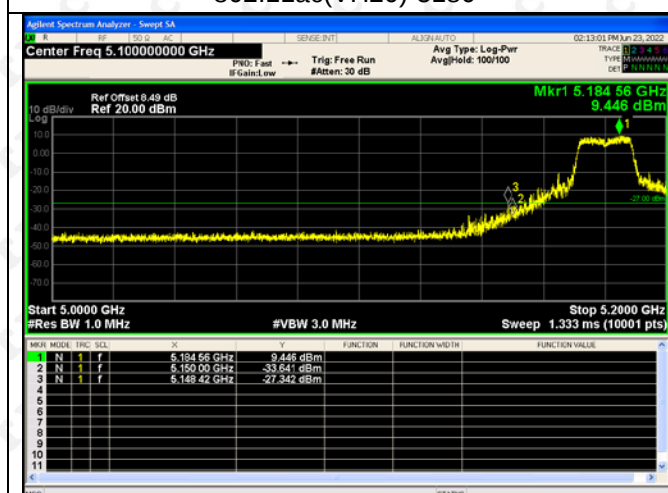
802.11a-5180



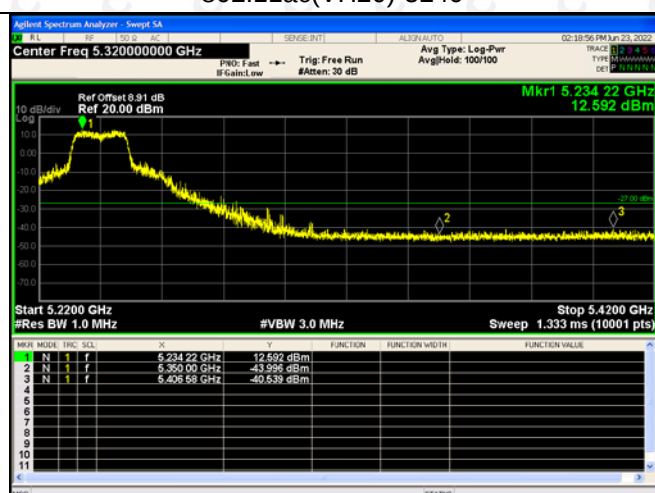
802.11a-5240



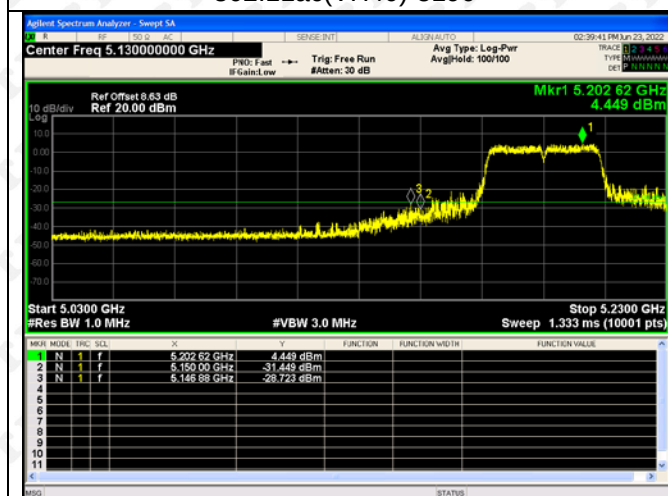
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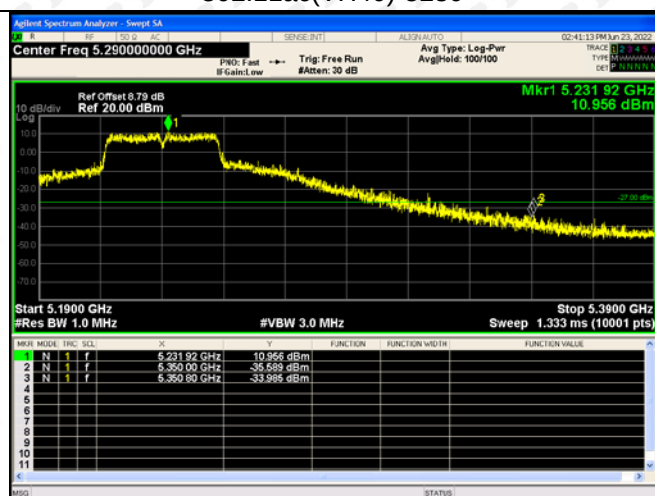
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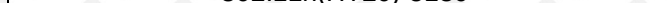
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802.11ac(VH40)-5230

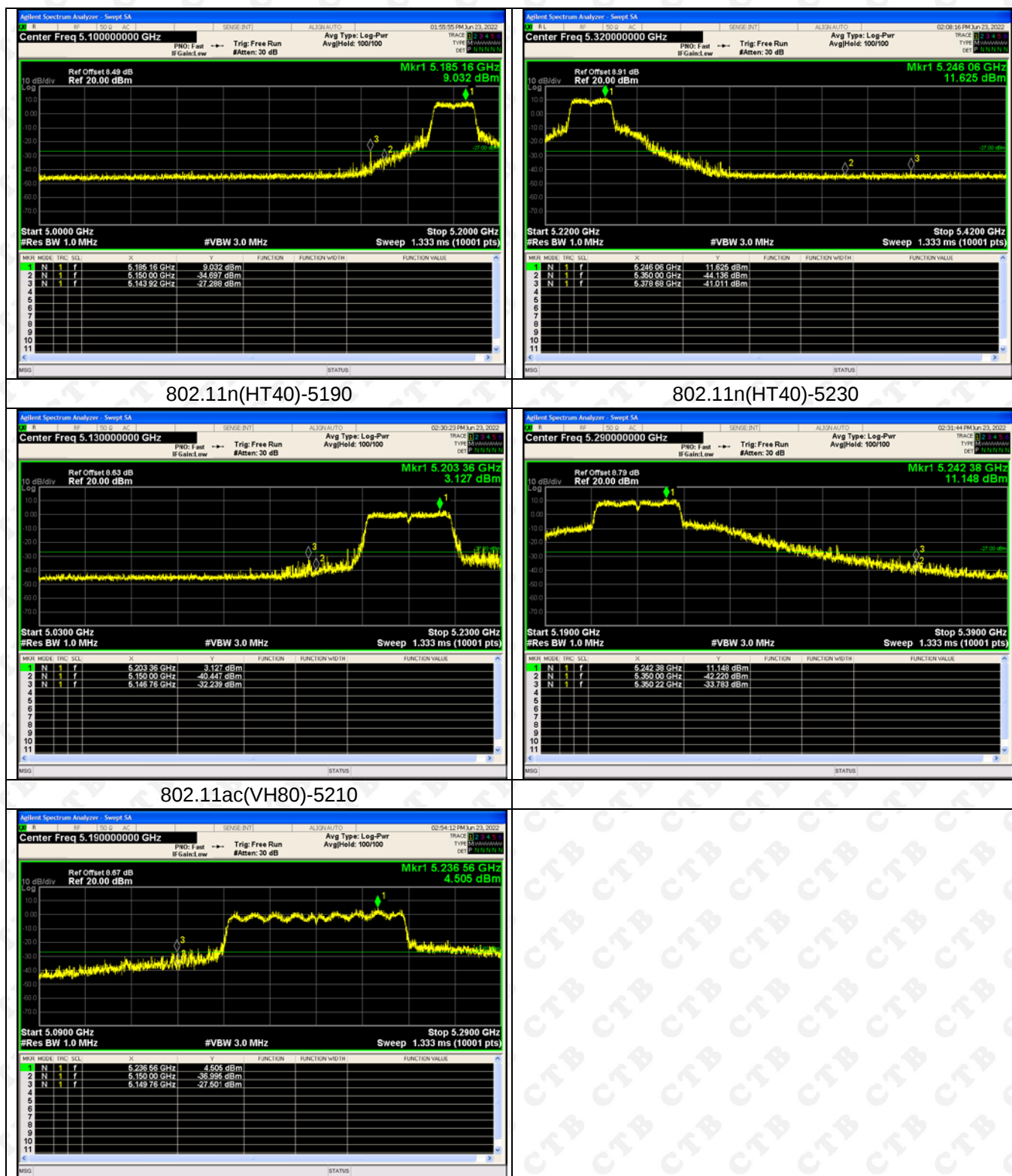


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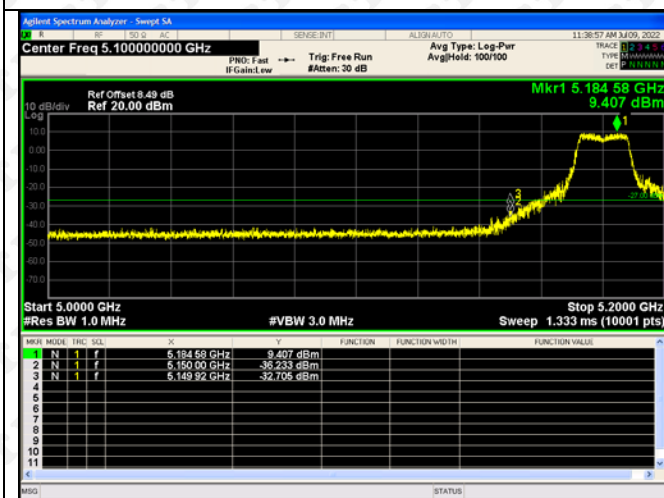
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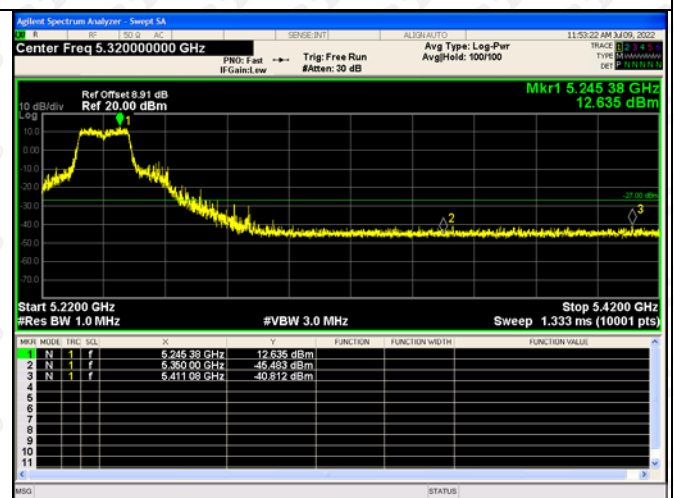


ANT3

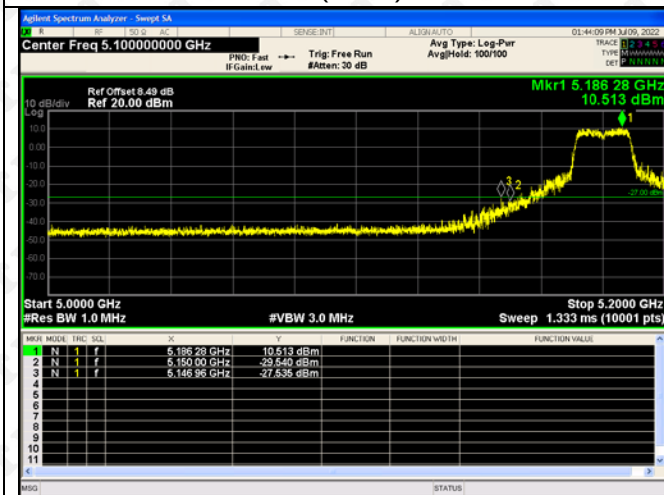
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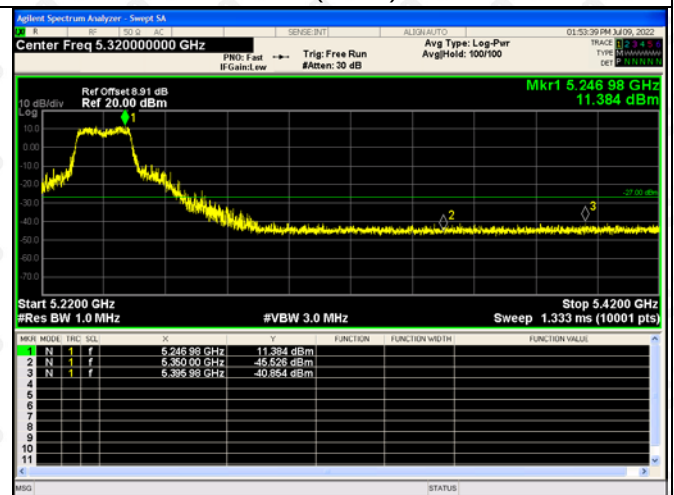
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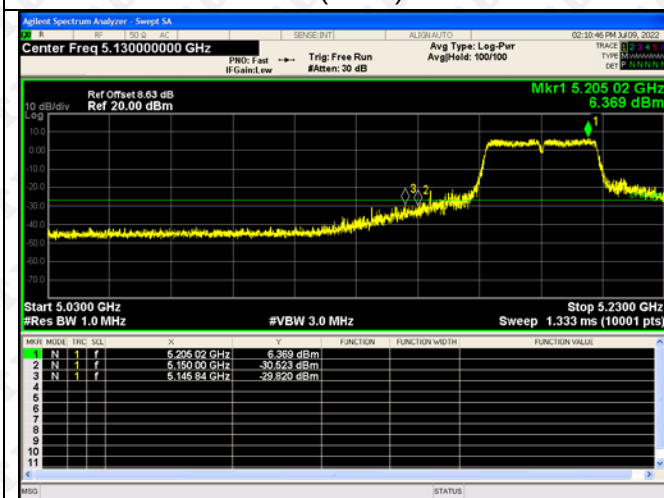
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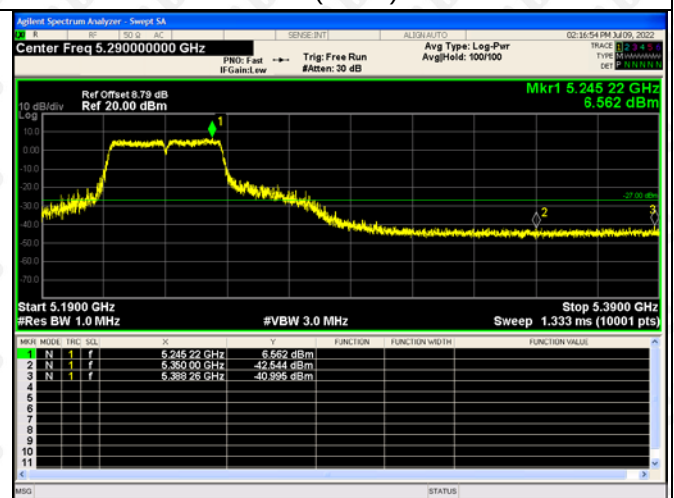
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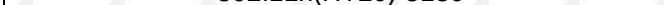
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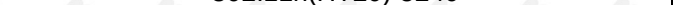
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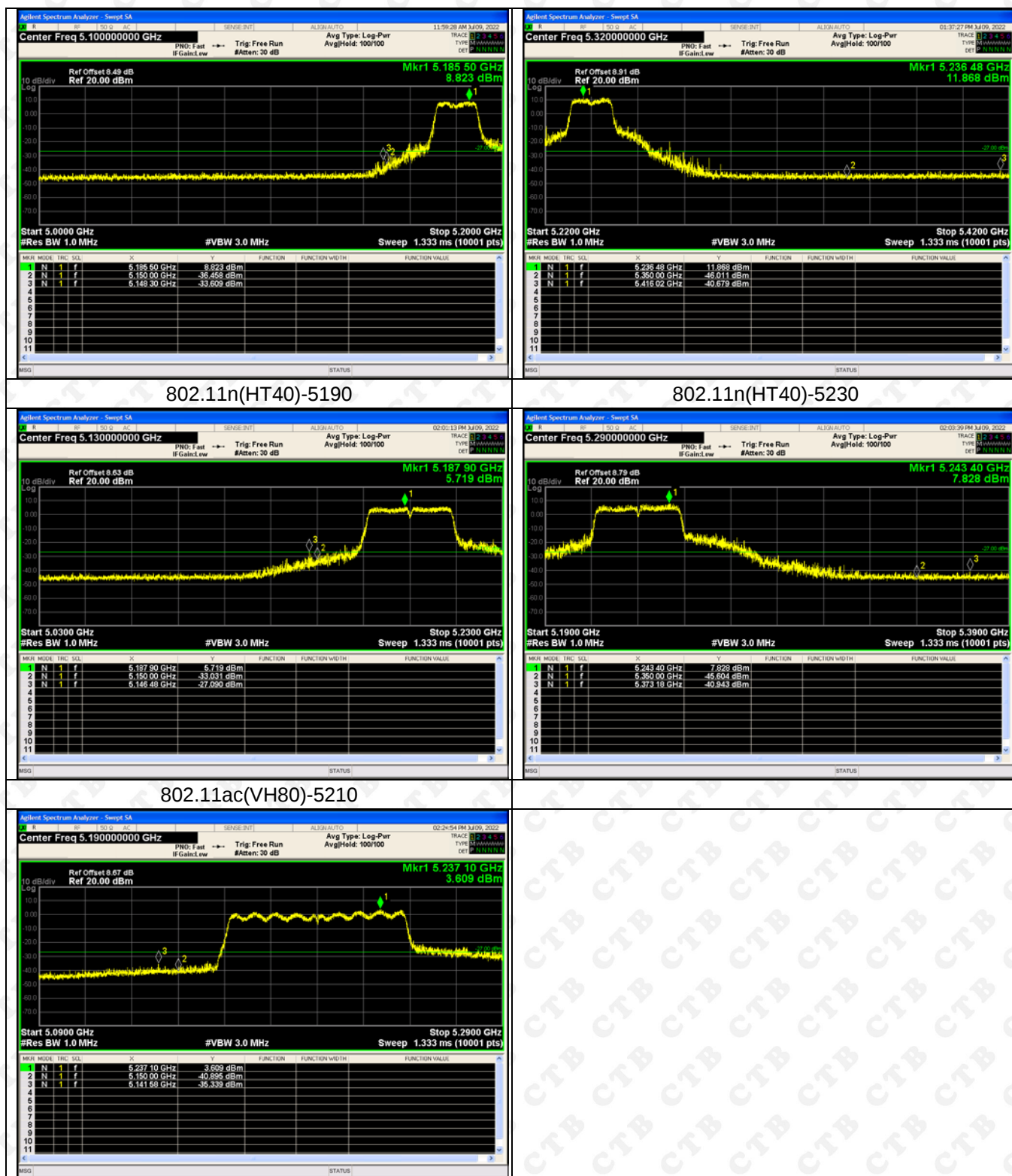


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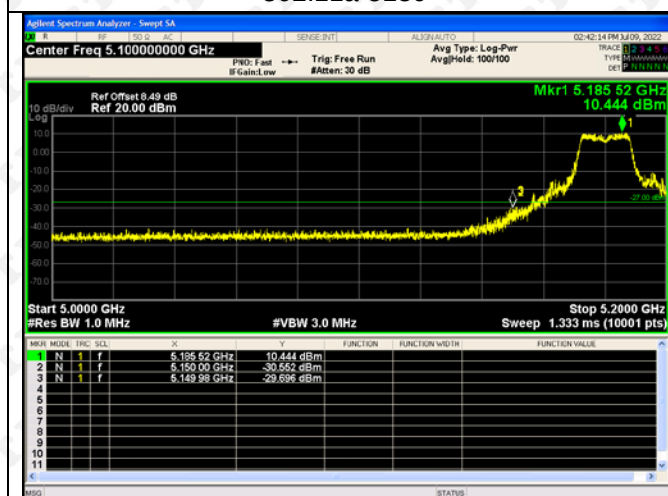
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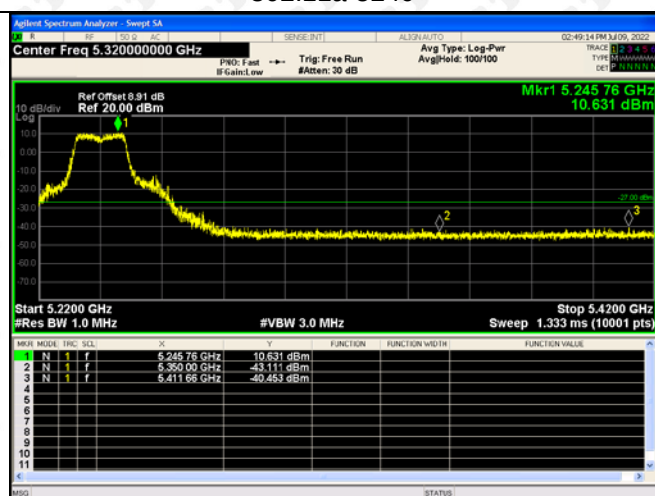


ANT4

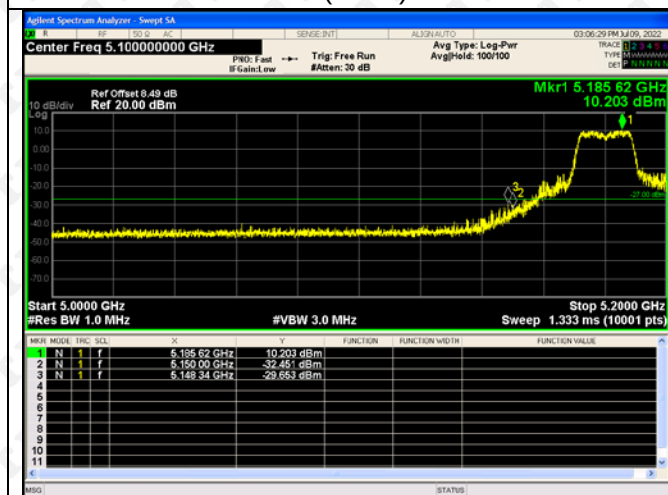
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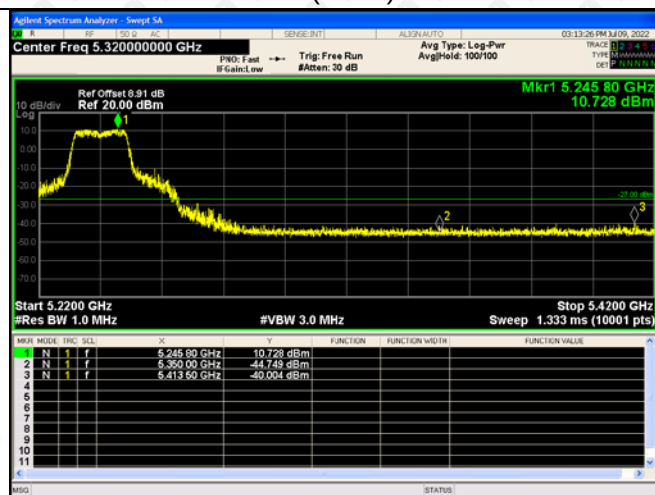
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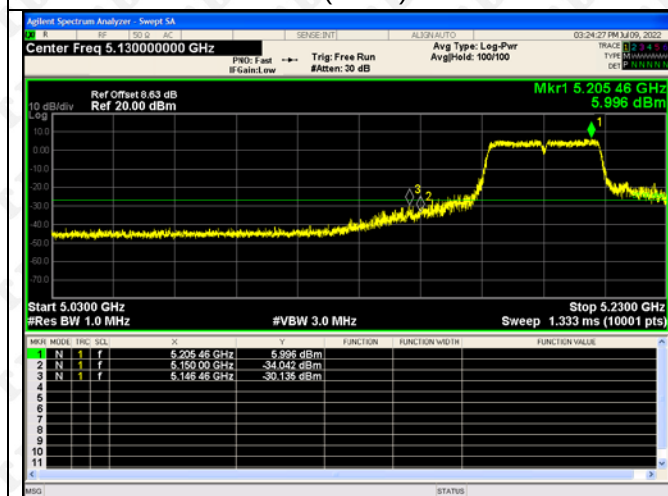
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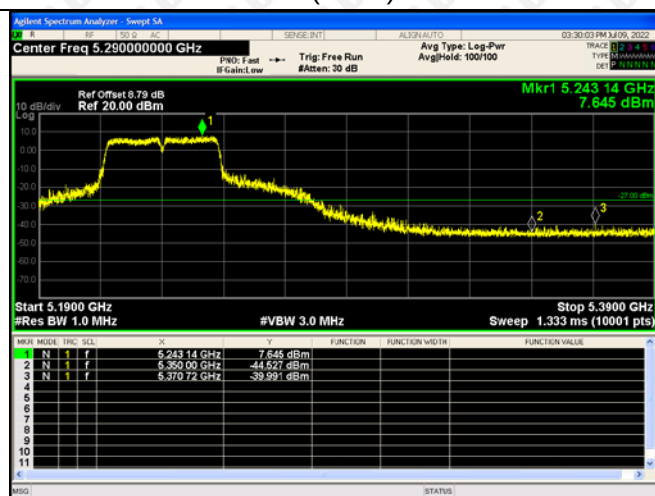
802.11ac(VH20)-5240



802.11ac(VH40)-5190



802.11ac(VH40)-5230



802.11n(HT20)-5180

802.11n(HT20)-5240

