<Band-edge Unmodulated>

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE20 Full (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE20 Full CH 01 2412MHz		2389.695	69.7	-4.3	74	55.95	27.6	17.32	31.17	334	180	P	H
		2390	53.61	-0.39	54	39.85	27.6	17.33	31.17	334	180	A	H
	*	2412	118.09	-	-	104.37	27.52	17.36	31.16	334	180	P	H
	*	2412	109.21	-	-	95.49	27.52	17.36	31.16	334	180	A	H
													H
		2387.07	68.6	-5.4	74	54.76	27.69	17.32	31.17	264	136	P	V
		2390	53.62	-0.38	54	39.8	27.66	17.33	31.17	264	136	A	V
	*	2412	119.45	-	-	105.72	27.53	17.36	31.16	264	136	P	V
	*	2412	111.48	-	-	97.75	27.53	17.36	31.16	264	136	A	V
													V
8802.11ax HE20 Full CH 11 2462MHz	*	2462	119.18	-	-	105.39	27.48	17.44	31.13	366	145	P	H
	*	2462	109.51	-	-	95.72	27.48	17.44	31.13	366	145	A	H
		2487	70.16	-3.84	74	56.28	27.52	17.48	31.12	366	145	P	H
		2483.52	49.06	-4.94	54	35.19	27.51	17.48	31.12	366	145	A	H
													H
	*	2462	117.19	-	-	103.46	27.42	17.44	31.13	256	138	P	V
	*	2462	108.77	-	-	95.04	27.42	17.44	31.13	256	138	A	V
		2484.48	72.26	-1.74	74	58.41	27.49	17.48	31.12	256	138	P	V
		2484.2	53.38	-0.62	54	39.53	27.49	17.48	31.12	256	138	A	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE40 Full (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 Full CH 03 2422MHz		2389.66	70.45	-3.55	74	56.7	27.6	17.32	31.17	380	146	P	H
		2389.94	53.38	-0.62	54	39.63	27.6	17.32	31.17	380	146	A	H
	*	2422	113.75	-	-	100.02	27.5	17.38	31.15	380	146	P	H
	*	2422	105.41	-	-	91.68	27.5	17.38	31.15	380	146	A	H
		2486	62.4	-11.6	74	48.52	27.52	17.48	31.12	380	146	P	H
		2484.96	45	-9	54	31.12	27.52	17.48	31.12	380	146	A	H
		2389.1	73.29	-0.71	74	59.47	27.67	17.32	31.17	263	132	P	V
		2388.82	52.95	-1.05	54	39.13	27.67	17.32	31.17	263	132	A	V
	*	2422	114.5	-	-	100.77	27.5	17.38	31.15	263	132	P	V
	*	2422	105.47	-	-	91.74	27.5	17.38	31.15	263	132	A	V
		2486.56	62.06	-11.94	74	48.21	27.49	17.48	31.12	263	132	P	V
		2484.48	45.22	-8.78	54	31.37	27.49	17.48	31.12	263	132	A	V
802.11ax HE40 Full CH 09 2452MHz		2328.62	55.51	-18.49	74	41.56	27.92	17.23	31.2	195	230	P	H
		2389.52	44.54	-9.46	54	30.79	27.6	17.32	31.17	195	230	A	H
	*	2452	111.4	-	-	97.65	27.46	17.43	31.14	195	230	P	H
	*	2452	102.4	-	-	88.65	27.46	17.43	31.14	195	230	A	H
		2487.36	68.06	-5.94	74	54.18	27.52	17.48	31.12	195	230	P	H
		2484.24	47.95	-6.05	54	34.08	27.51	17.48	31.12	195	230	A	H
		2380.28	55.63	-18.37	74	41.74	27.75	17.31	31.17	288	138	P	V
		2343.18	44.8	-9.2	54	30.74	28	17.25	31.19	288	138	A	V
	*	2452	112.41	-	-	98.72	27.4	17.43	31.14	288	138	P	V
	*	2452	103.42	-	-	89.73	27.4	17.43	31.14	288	138	A	V
		2484.72	71.86	-2.14	74	58.01	27.49	17.48	31.12	288	138	P	V
		2484.4	50.34	-3.66	54	36.49	27.49	17.48	31.12	288	138	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz WIFI 802.11ax HE20 (LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11ax HE20 LF		36.79	22.35	-17.65	40	32.23	21.53	1.06	32.47	-	-	P	H
		105.66	24.8	-18.7	43.5	38.86	16.67	1.69	32.42	-	-	P	H
		135.73	27.19	-16.31	43.5	39.91	17.7	2.01	32.43	-	-	P	H
		746.83	31.8	-14.2	46	31.54	28.2	4.46	32.4	-	-	P	H
		782.72	32.04	-13.96	46	31.63	28.1	4.56	32.25	100	0	P	H
		962.17	34.15	-19.85	54	29.13	31	5.09	31.07	-	-	P	H
													H
													H
													H
													H
													H
													H
		37.76	27.48	-12.52	40	37.86	21.02	1.06	32.46	100	0	P	V
		60.07	26.49	-13.51	40	45.61	11.7	1.62	32.44	-	-	P	V
		123.12	29	-14.5	43.5	42.02	17.6	1.8	32.42	-	-	P	V
		412.18	23.28	-22.72	46	30.18	22.39	3.19	32.48	-	-	P	V
		730.34	29.42	-16.58	46	29.78	27.61	4.45	32.42	-	-	P	V
		960.23	33.94	-20.06	54	28.94	31	5.08	31.08	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

<Middle Unmodulated>

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE20 Full (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ax HE20 Full CH 01 2412MHz		2389.38	67.63	-6.37	74	53.88	27.6	17.32	31.17	377	225	P	H
		2389.695	49.17	-4.83	54	35.42	27.6	17.32	31.17	377	225	A	H
	*	2412	111.46	-	-	97.74	27.52	17.36	31.16	377	225	P	H
	*	2412	103.42	-	-	89.7	27.52	17.36	31.16	377	225	A	H
													H
		2388.75	69.82	-4.18	74	56	27.67	17.32	31.17	300	222	P	V
		2390	52.87	-1.13	54	39.05	27.66	17.33	31.17	300	222	A	V
	*	2412	111.69	-	-	97.96	27.53	17.36	31.16	300	222	P	V
	*	2412	103.99	-	-	90.26	27.53	17.36	31.16	300	222	A	V
													V
8802.11ax HE20 Full CH 11 2462MHz	*	2462	109.31	-	-	95.52	27.48	17.44	31.13	376	229	P	H
	*	2462	100.75	-	-	86.96	27.48	17.44	31.13	376	229	A	H
		2483.52	69.49	-4.51	74	55.62	27.51	17.48	31.12	376	229	P	H
		2483.52	52.32	-1.68	54	38.45	27.51	17.48	31.12	376	229	A	H
													H
	*	2462	111.06	-	-	97.33	27.42	17.44	31.13	295	213	P	V
	*	2462	103.04	-	-	89.31	27.42	17.44	31.13	295	213	A	V
		2484.28	70.87	-3.13	74	57.02	27.49	17.48	31.12	295	213	P	V
		2485.8	52.4	-1.6	54	38.55	27.49	17.48	31.12	295	213	A	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE40 Full (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 Full CH 03 2422MHz		2389.52	67.5	-6.5	74	53.75	27.6	17.32	31.17	340	225	P	H
		2388.88	49.06	-4.94	54	35.31	27.6	17.32	31.17	340	225	A	H
	*	2422	111.26	-	-	97.53	27.5	17.38	31.15	340	225	P	H
	*	2422	102.39	-	-	88.66	27.5	17.38	31.15	340	225	A	H
		2488.64	58.73	-15.27	74	44.84	27.52	17.49	31.12	340	225	P	H
		2484.48	45.46	-8.54	54	31.58	27.52	17.48	31.12	340	225	A	H
		2390	65.49	-8.51	74	51.67	27.66	17.33	31.17	297	225	P	V
		2390	49.74	-4.26	54	35.92	27.66	17.33	31.17	297	225	A	V
	*	2422	112.23	-	-	98.5	27.5	17.38	31.15	297	225	P	V
	*	2422	103.46	-	-	89.73	27.5	17.38	31.15	297	225	A	V
		2490.88	58.77	-15.23	74	44.89	27.5	17.49	31.11	297	225	P	V
		2490.16	45.88	-8.12	54	32.01	27.5	17.49	31.12	297	225	A	V
802.11ax HE40 Full CH 09 2452MHz		2330.64	55.24	-18.76	74	41.29	27.91	17.24	31.2	304	225	P	H
		2319.76	44.83	-9.17	54	30.85	27.97	17.22	31.21	304	225	A	H
	*	2452	110.28	-	-	96.53	27.46	17.43	31.14	304	225	P	H
	*	2452	101.15	-	-	87.4	27.46	17.43	31.14	304	225	A	H
		2484.56	64.56	-9.44	74	50.68	27.52	17.48	31.12	304	225	P	H
		2483.52	50.53	-3.47	54	36.66	27.51	17.48	31.12	304	225	A	H
		2378.16	55.11	-18.89	74	41.22	27.76	17.31	31.18	300	214	P	V
		2315.12	44.93	-9.07	54	30.94	27.99	17.21	31.21	300	214	A	V
	*	2452	111.77	-	-	98.08	27.4	17.43	31.14	300	214	P	V
	*	2452	102.52	-	-	88.83	27.4	17.43	31.14	300	214	A	V
		2484.4	68.68	-5.32	74	54.83	27.49	17.48	31.12	300	214	P	V
		2489.36	52.35	-1.65	54	38.48	27.5	17.49	31.12	300	214	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz WIFI 802.11ax HE20 (LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11ax HE20 LF		33.88	20.97	-19.03	40	29.36	23.07	1.01	32.47	-	-	P	H
		108.57	22.72	-20.78	43.5	36.48	16.96	1.7	32.42	-	-	P	H
		139.61	25.15	-18.35	43.5	37.9	17.6	2.07	32.42	-	-	P	H
		638.19	28.47	-17.53	46	30.52	26.46	4.06	32.57	-	-	P	H
		763.32	32.52	-13.48	46	32.28	28.1	4.5	32.36	100	0	P	H
		973.81	34.44	-19.56	54	29.44	30.82	5.17	30.99	-	-	P	H
													H
													H
													H
													H
													H
													H
		35.82	26.27	-13.73	40	35.61	22.09	1.04	32.47	-	-	P	V
		59.1	27.88	-12.12	40	47.03	11.7	1.59	32.44	-	-	P	V
		120.21	19.85	-23.65	43.5	33	17.52	1.75	32.42	-	-	P	V
		123.12	28	-15.5	43.5	41.02	17.6	1.8	32.42	-	-	P	V
		336.52	25.11	-20.89	46	34.66	20.01	2.87	32.43	-	-	P	V
		937.92	34.34	-11.66	46	30.24	30.42	4.99	31.31	100	0	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Radiated Spurious Emission Plots

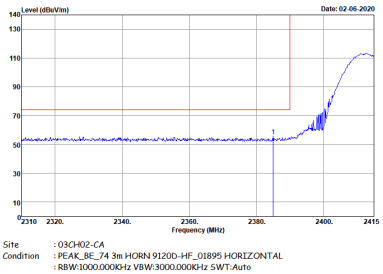
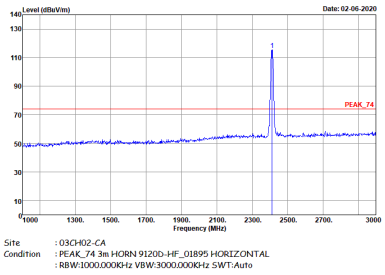
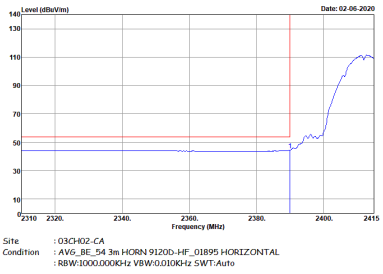
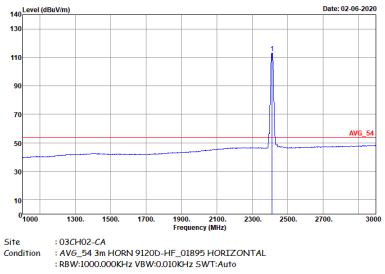
Test Engineer :	Calvin Wu, Leo Luo, and Jacky Hong	**Temperature :**	19~22℃
		Relative Humidity :	36 ~45%

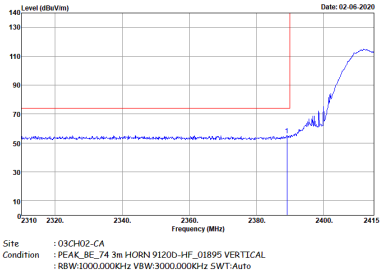
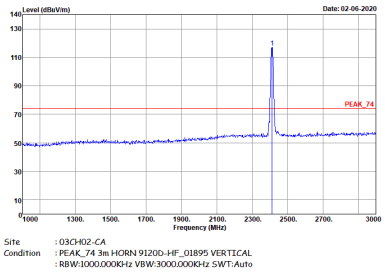
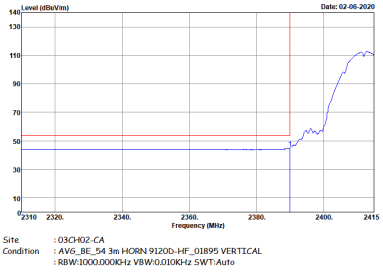
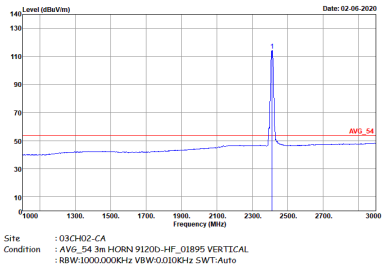
Note symbol

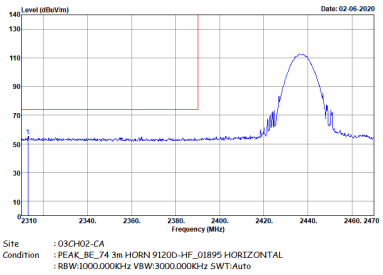
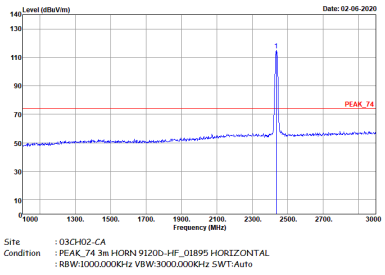
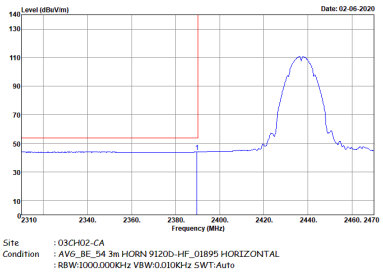
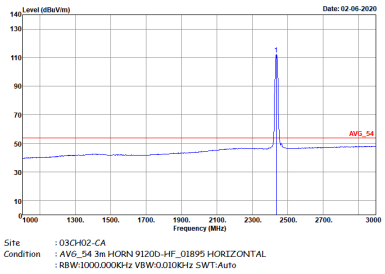
-L	**Low channel location**
-R	**High channel location**

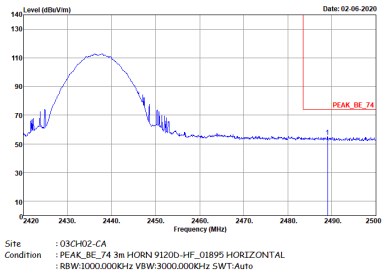
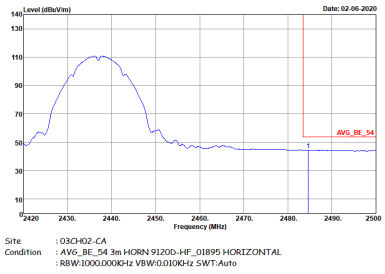
2.4GHz 2400~2483.5MHz

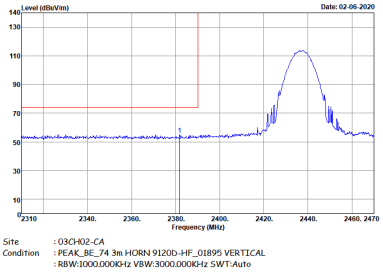
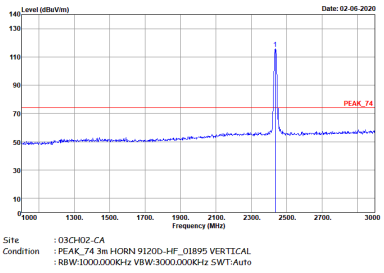
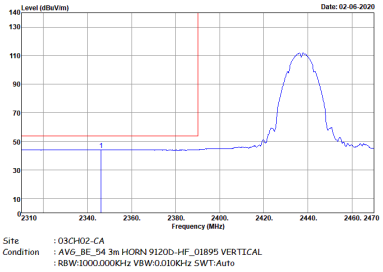
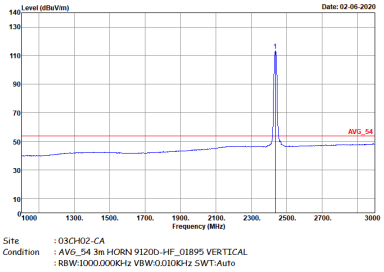
WIFI 802.11b (Band Edge @ 3m)

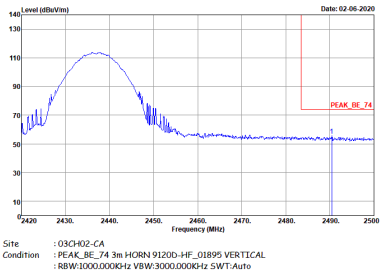
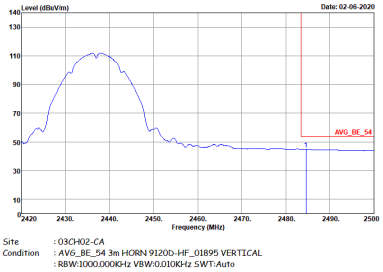
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

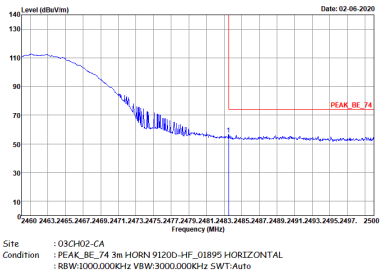
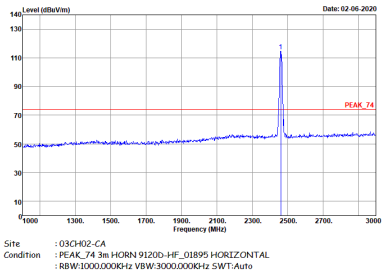
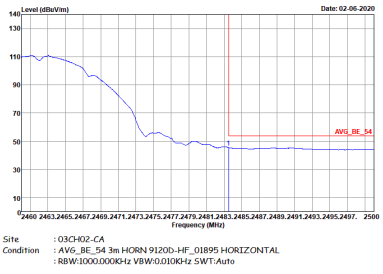
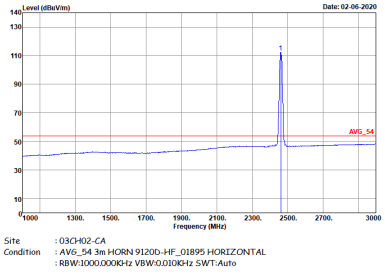
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

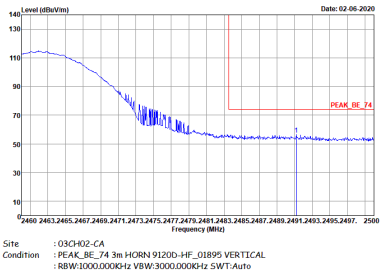
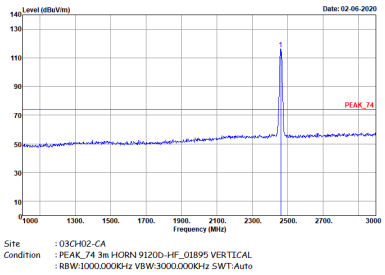
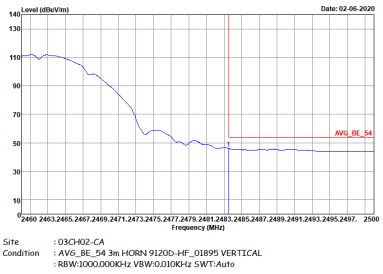
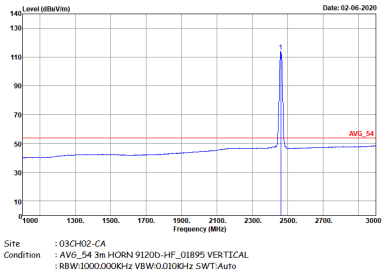
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

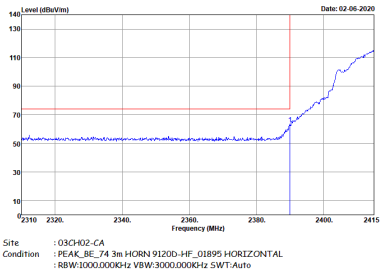
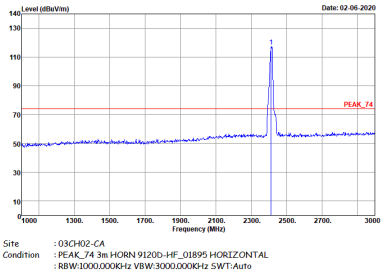
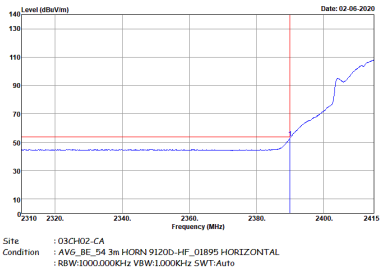
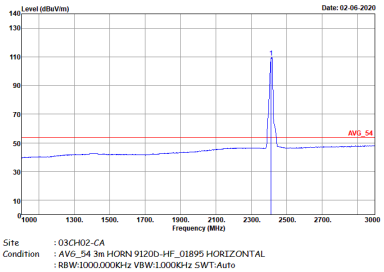
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

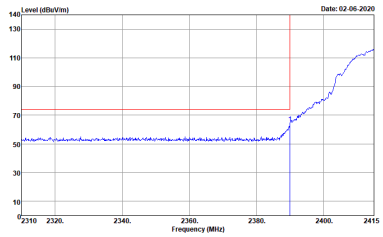
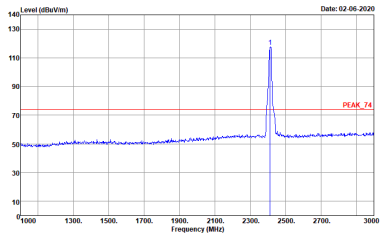
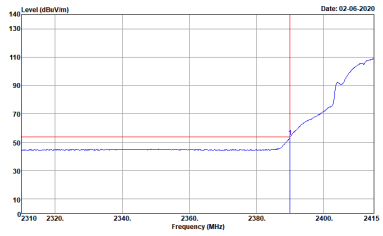
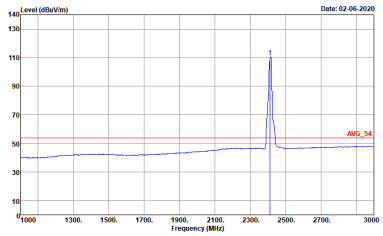
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

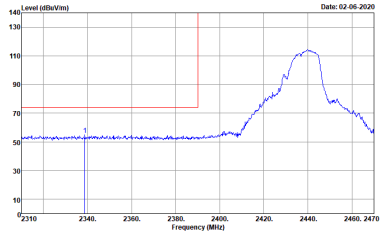
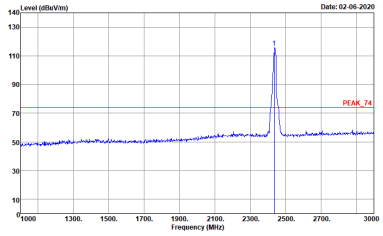
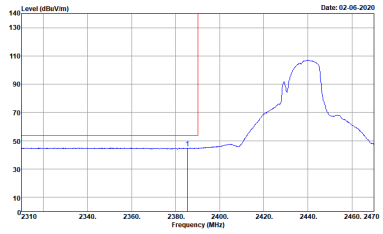
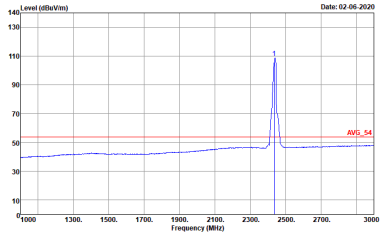
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

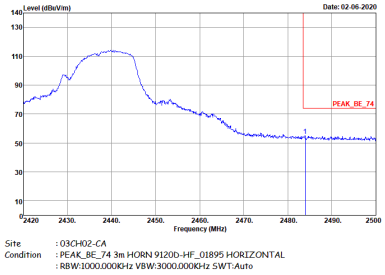
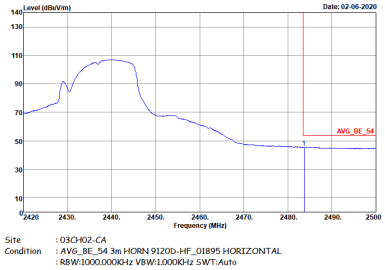
2.4GHz 2400~2483.5MHz

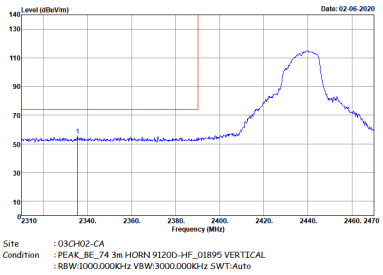
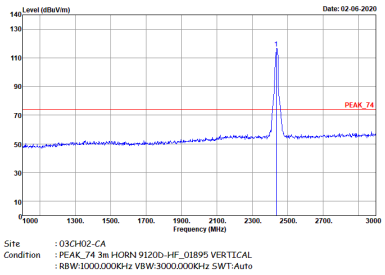
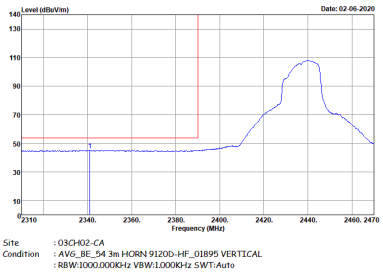
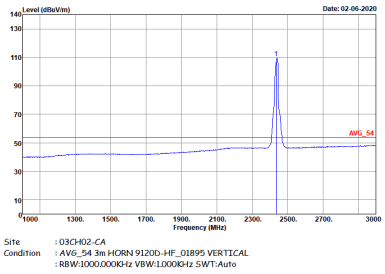
WIFI 802.11g (Band Edge @ 3m)

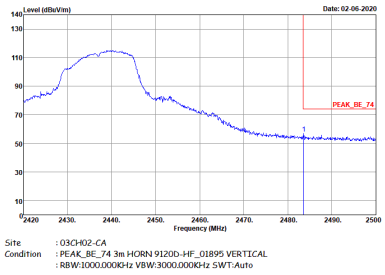
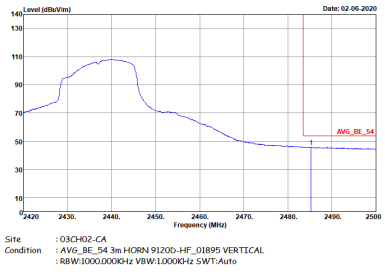
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

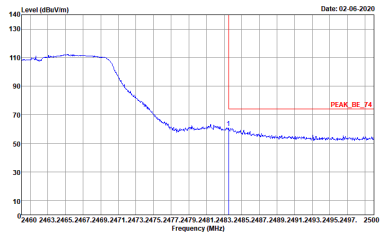
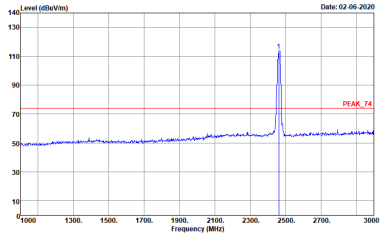
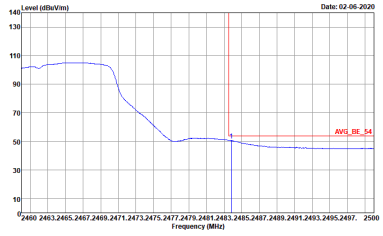
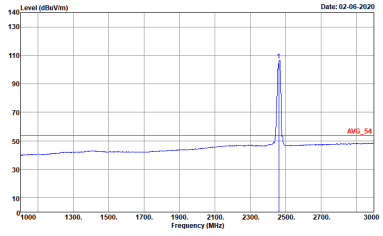
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_01895 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_01895 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_01895 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

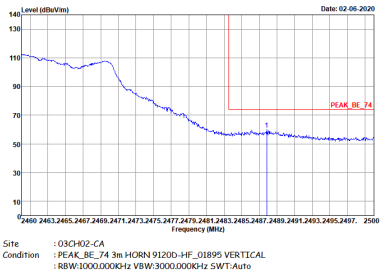
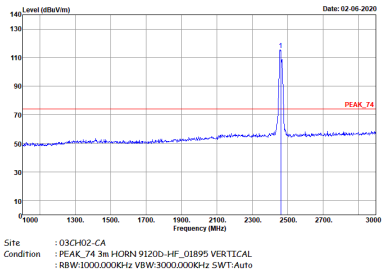
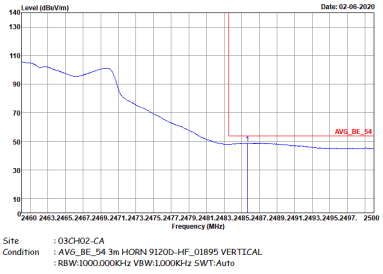
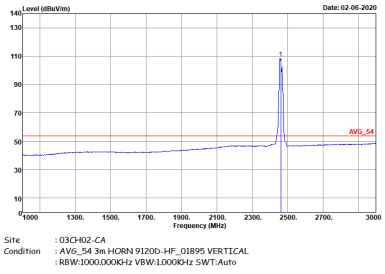
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AV6_BE_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH02-CA Condition : AV6_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

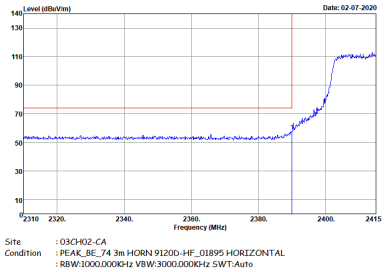
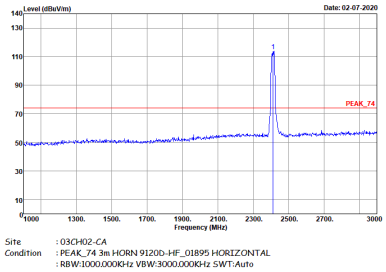
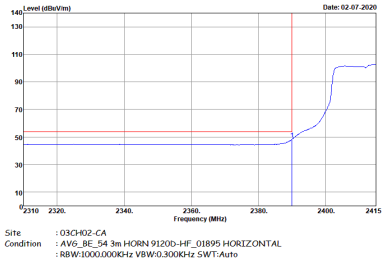
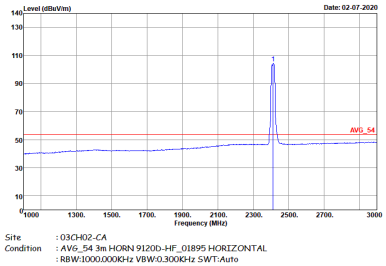
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak		Left Blank
Avg.		Left Blank

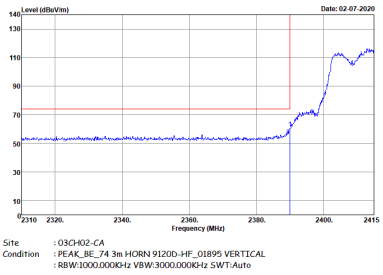
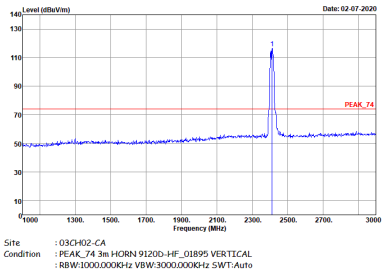
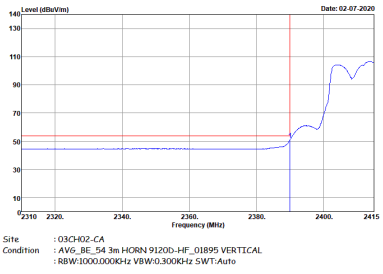
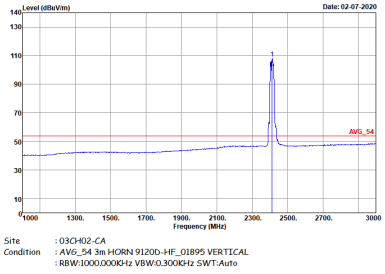
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

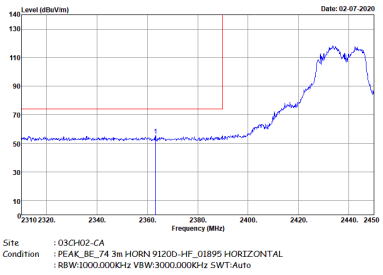
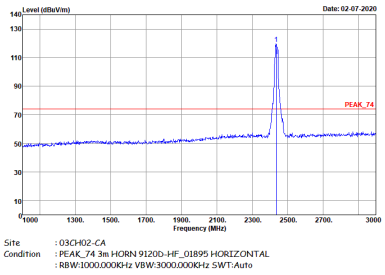
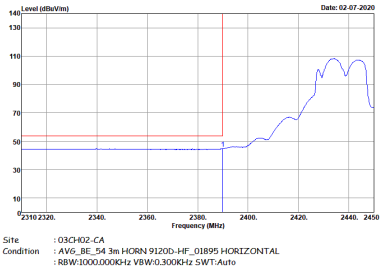
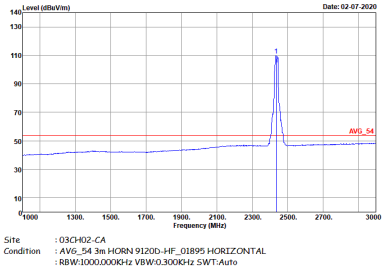
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

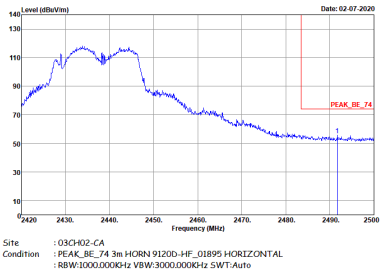
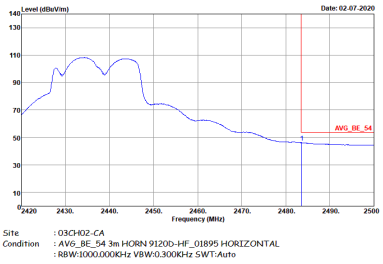
2.4GHz 2400~2483.5MHz

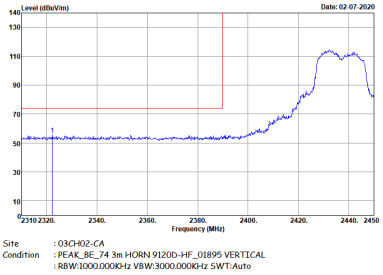
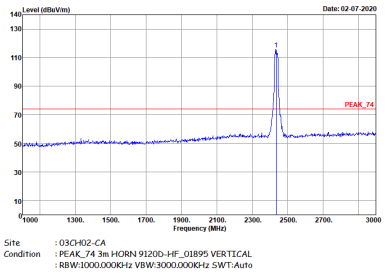
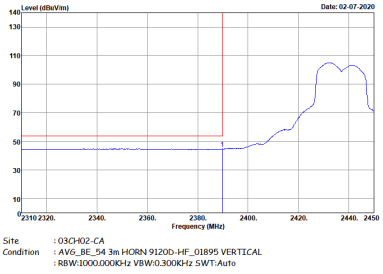
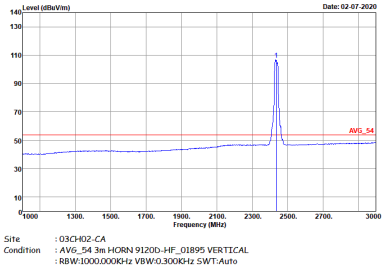
WIFI 802.11ax HE20 Full (Band Edge @ 3m)

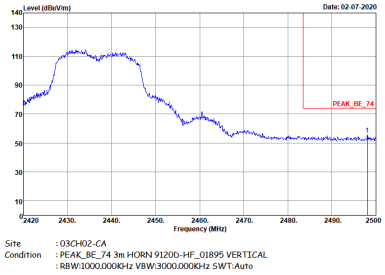
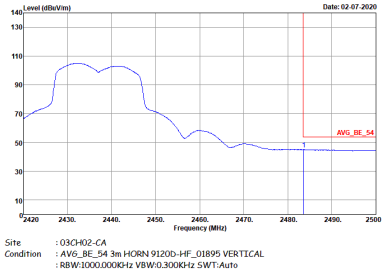
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

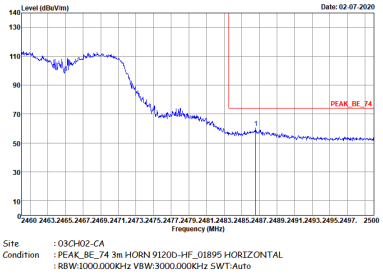
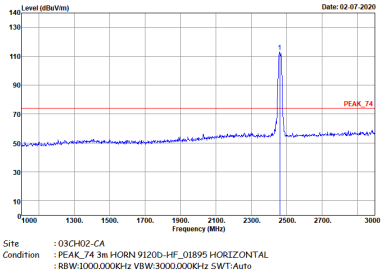
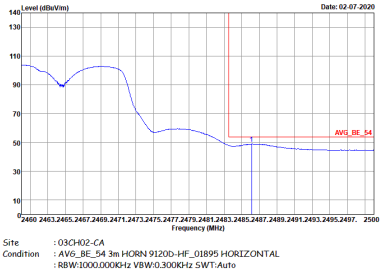
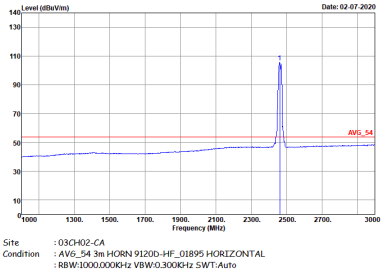
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

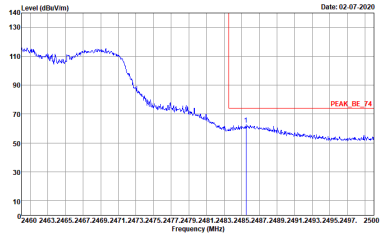
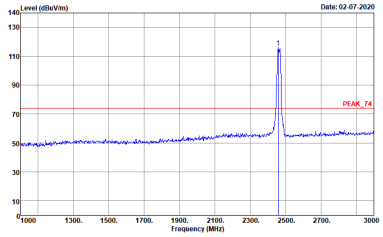
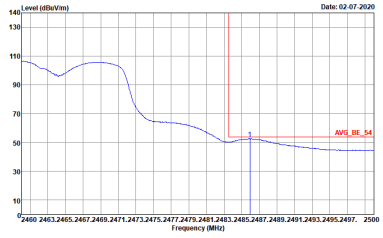
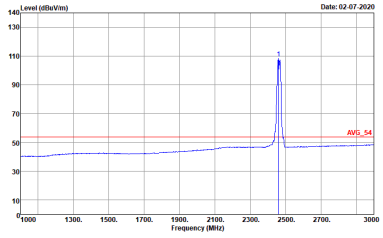
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

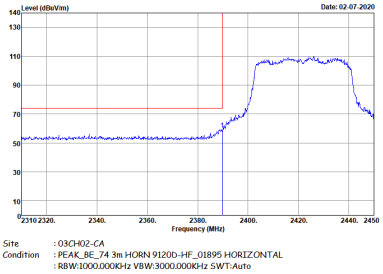
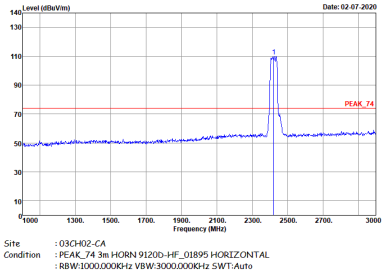
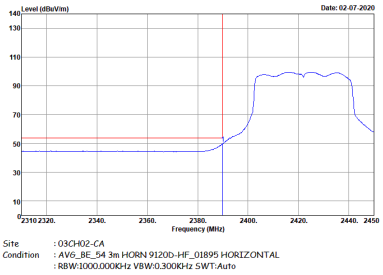
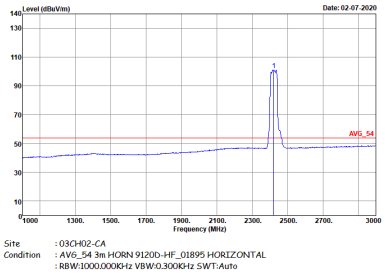
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

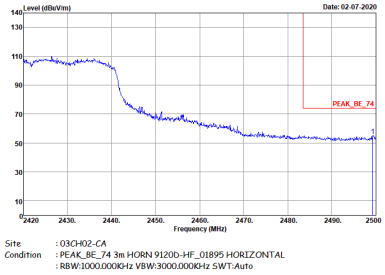
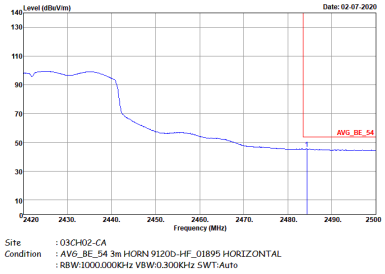
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

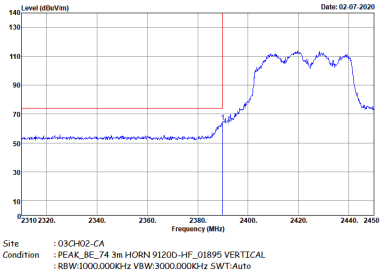
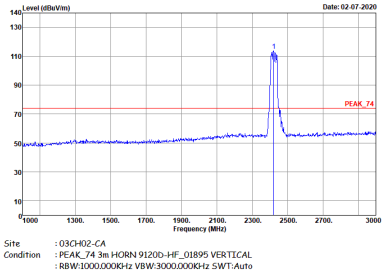
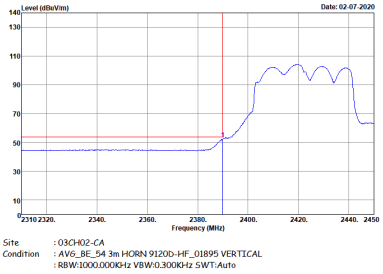
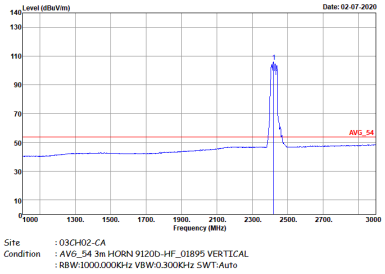
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

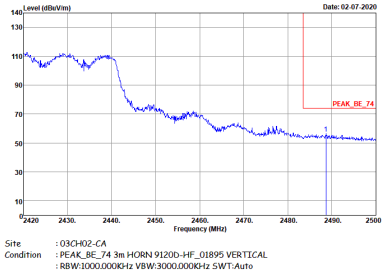
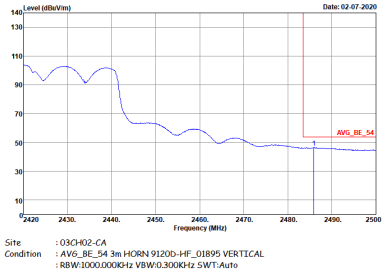
2.4GHz 2400~2483.5MHz

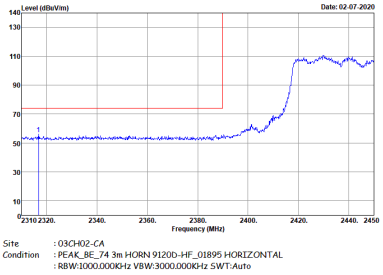
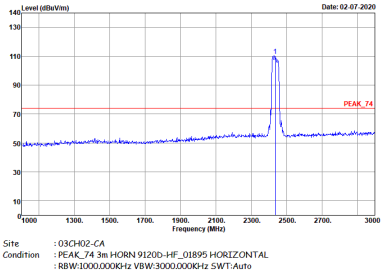
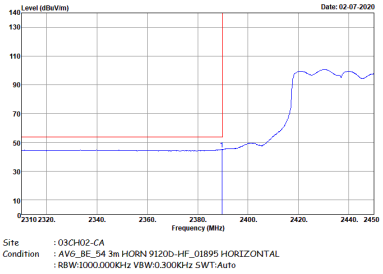
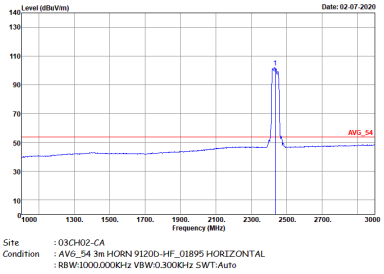
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

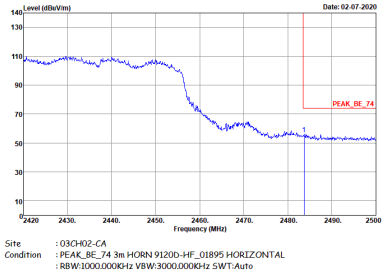
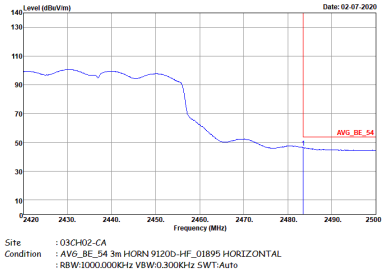
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

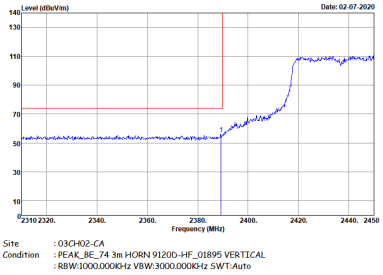
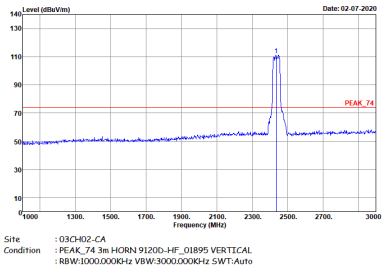
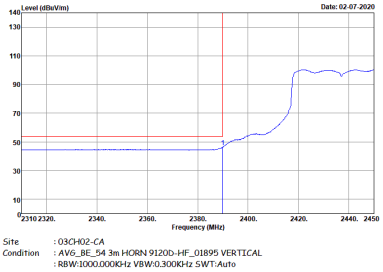
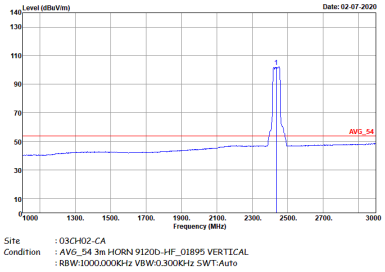
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

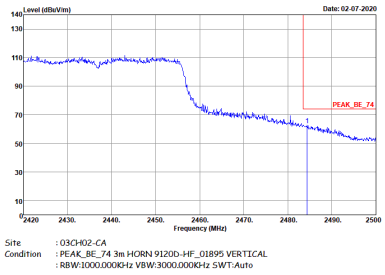
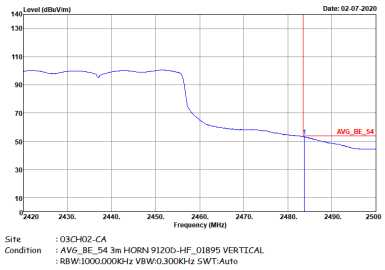
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

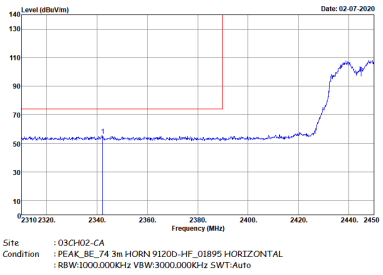
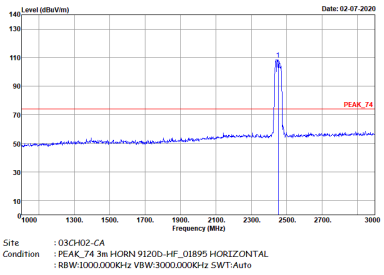
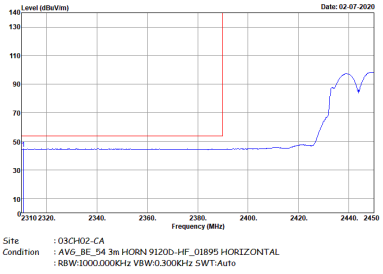
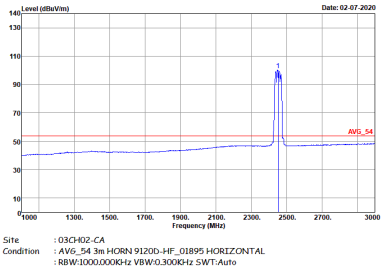
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

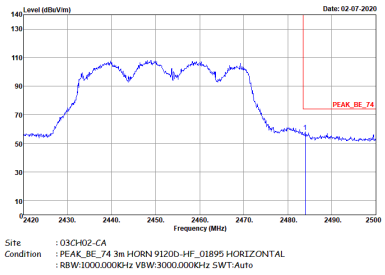
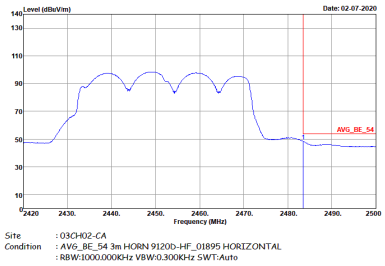
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

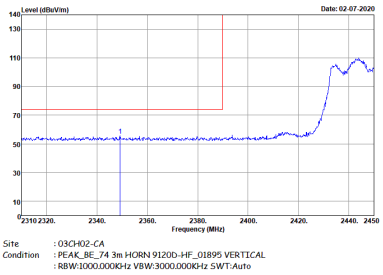
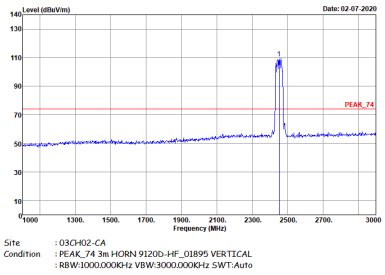
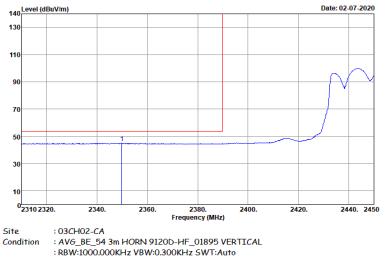
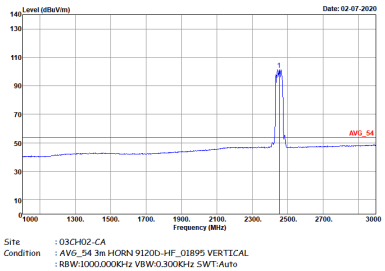
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

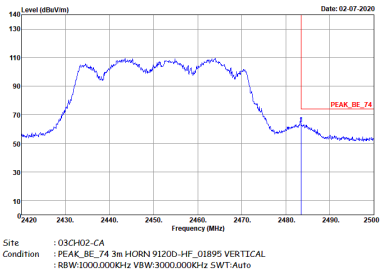
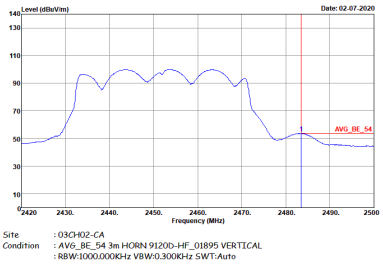
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

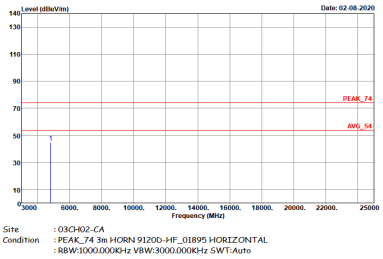
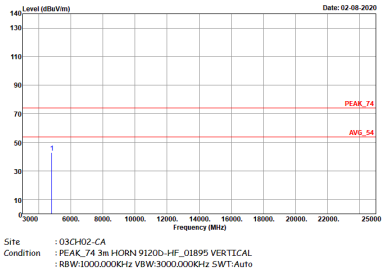
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

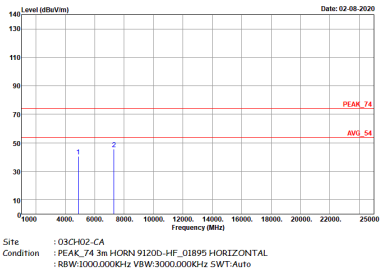
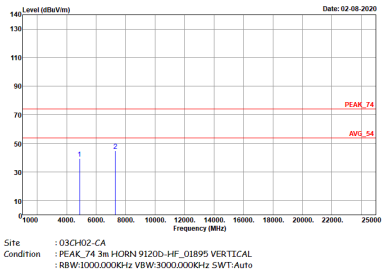
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

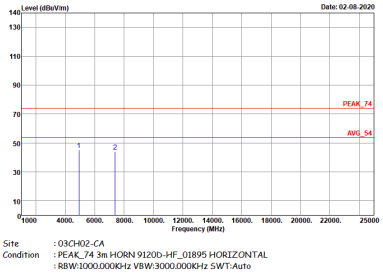
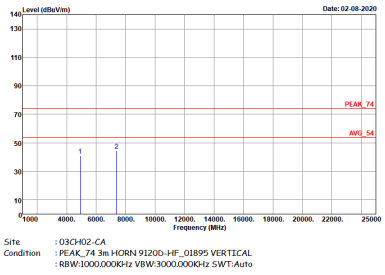
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

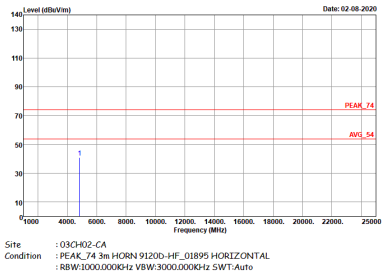
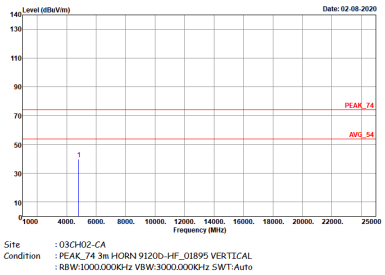
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH01 2412MHz	
1+2	Horizontal	Vertical
Peak Avg.		

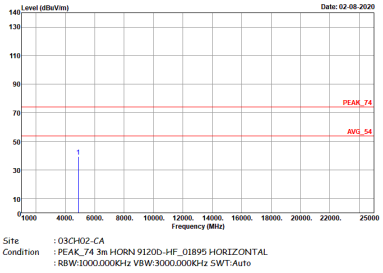
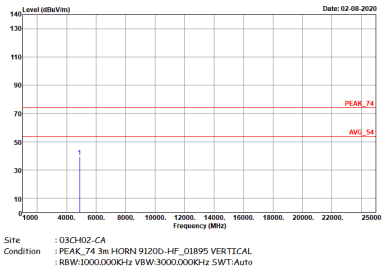
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.		

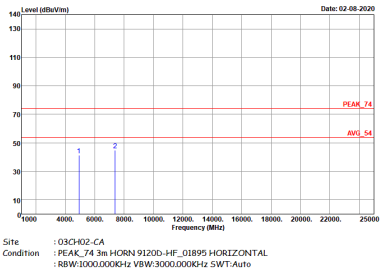
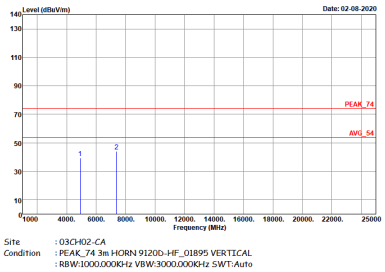
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH11 2462MHz	
1+2	Horizontal	Vertical
Peak Avg.		

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

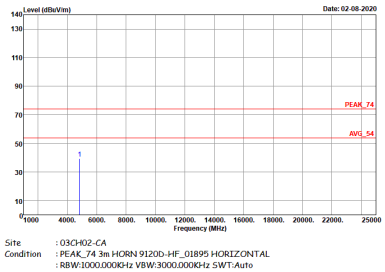
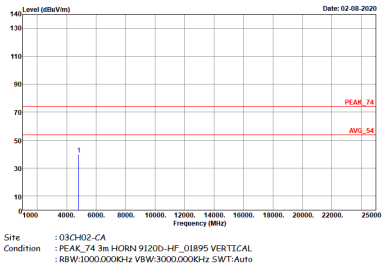
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Horizontal	Vertical
Peak Avg.		

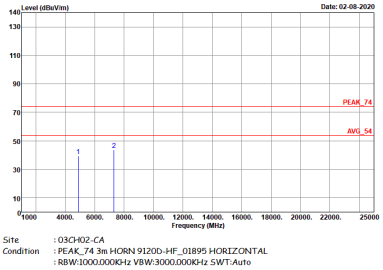
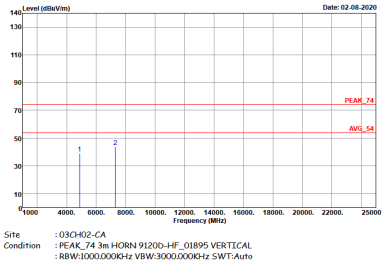
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.		

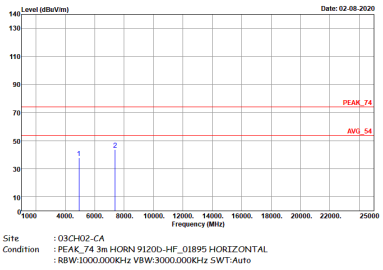
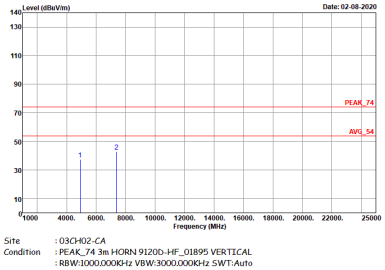
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH11 2462MHz	
1+2	Horizontal	Vertical
Peak Avg.		

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE20 Full (Harmonic @ 3m)

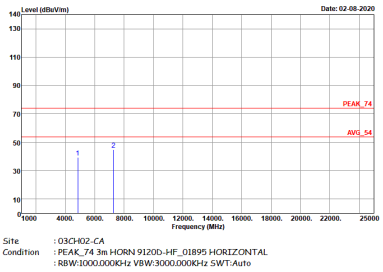
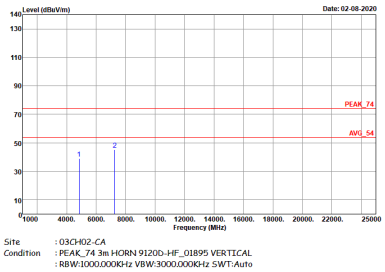
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE20 Full CH01 2412MHz	
1+2	Horizontal	Vertical
Peak Avg.		

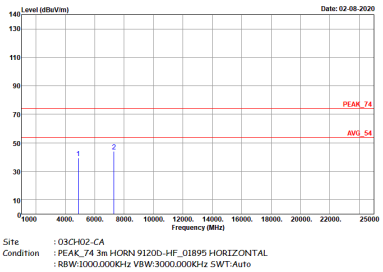
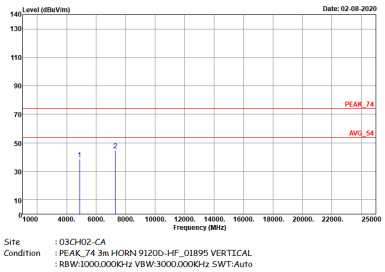
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE20 Full CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.		

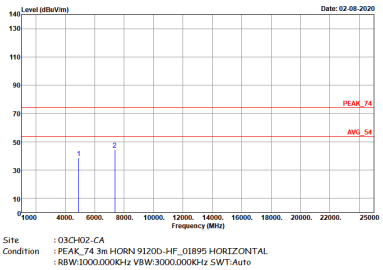
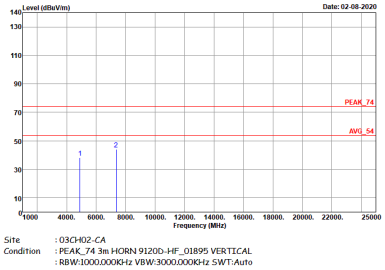
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE20 Full CH11 2462MHz	
1+2	Horizontal	Vertical
Peak Avg.		

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE40 Full (Harmonic @ 3m)

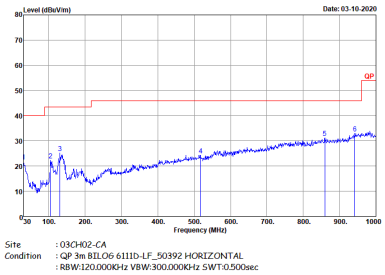
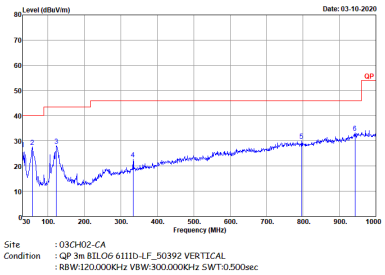
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE40 Full CH03 2422MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE40 Full CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE40 Full CH09 2452MHz	
1+2	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

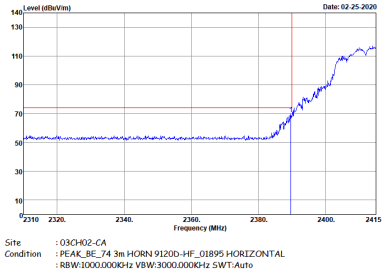
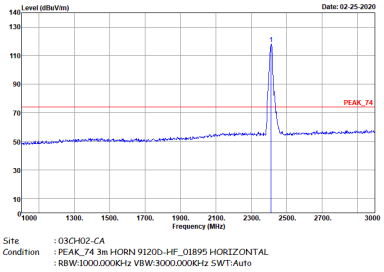
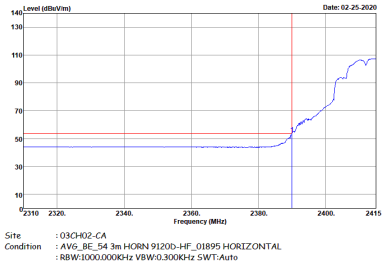
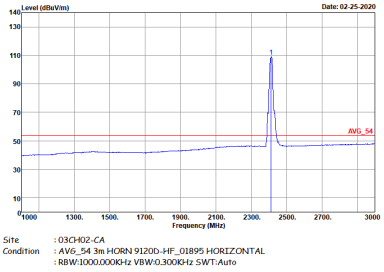
2.4GHz WIFI 802.11g (LF)

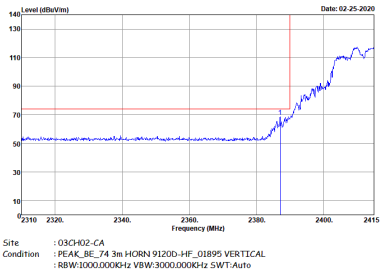
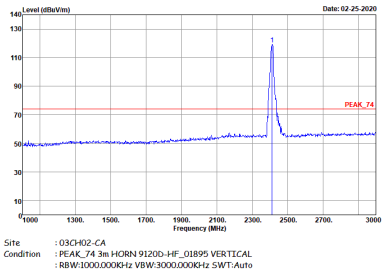
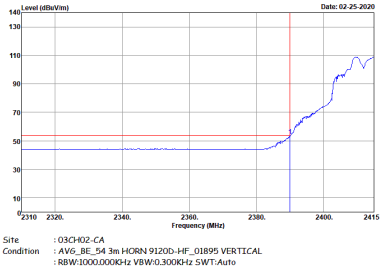
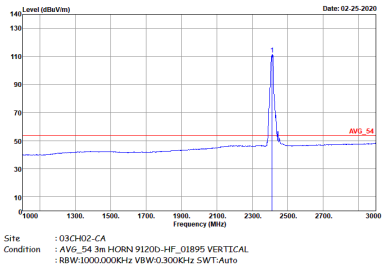
WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11g LF	
1+2	Horizontal	Vertical
QP / Peak		

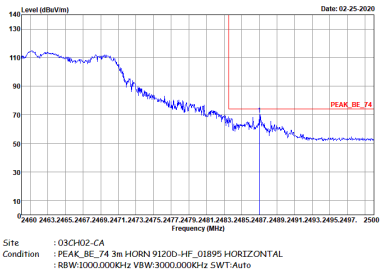
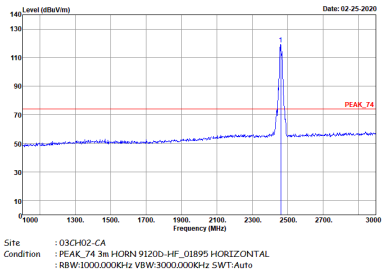
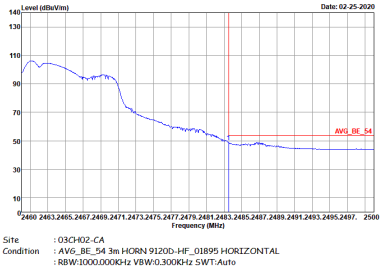
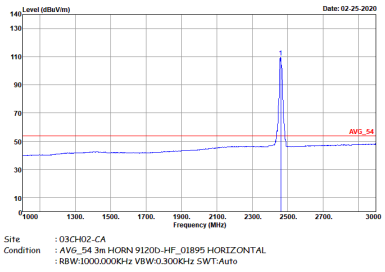
<Band-edge Unmodulated>

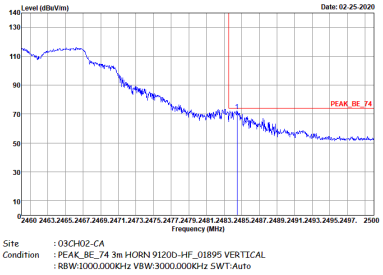
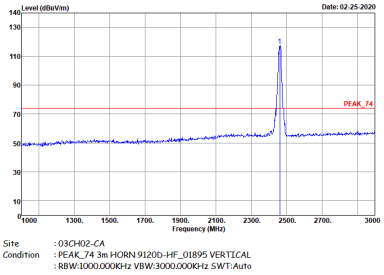
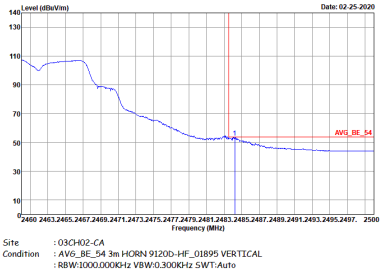
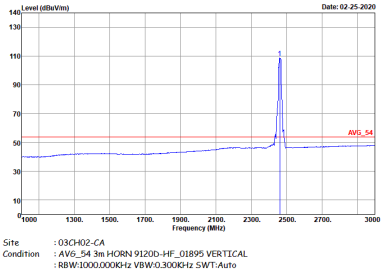
2.4GHz 2400~2483.5MHz

WIFI 802.11ax HE20 Full (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

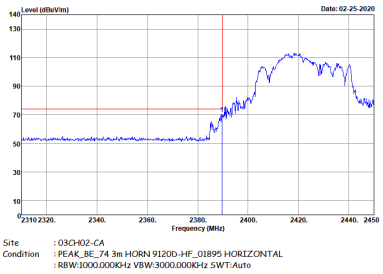
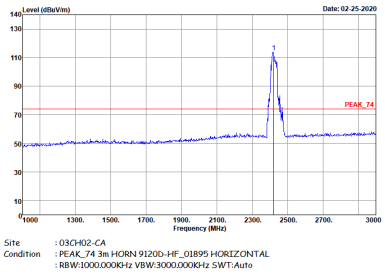
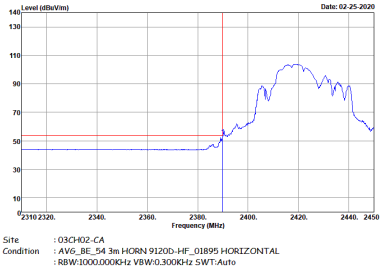
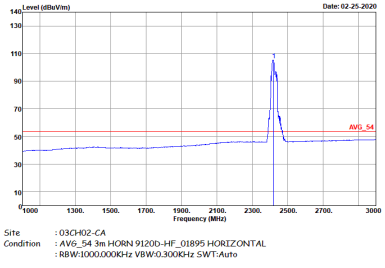
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

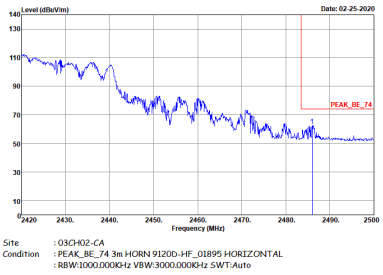
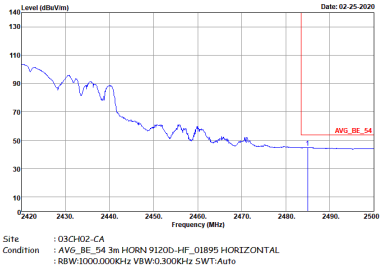
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

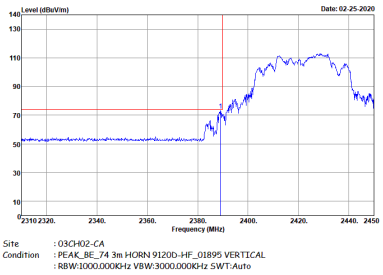
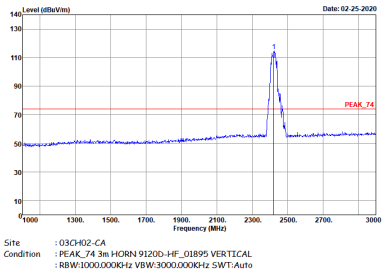
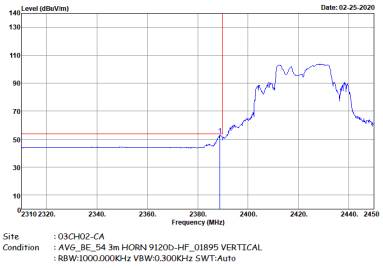
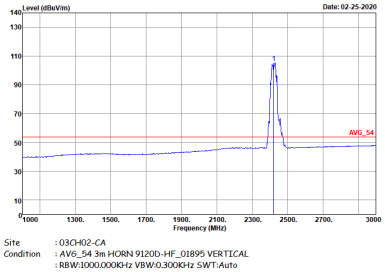
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

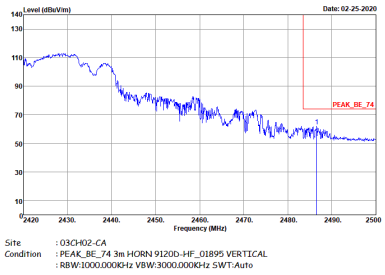
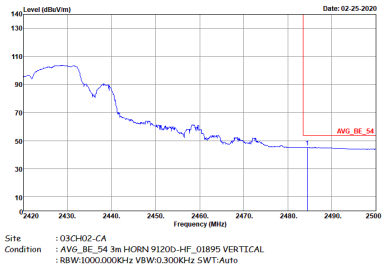
2.4GHz 2400~2483.5MHz

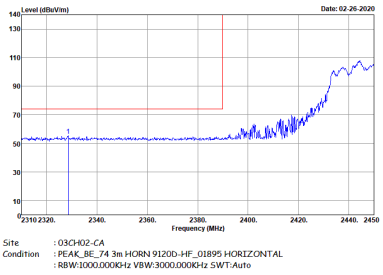
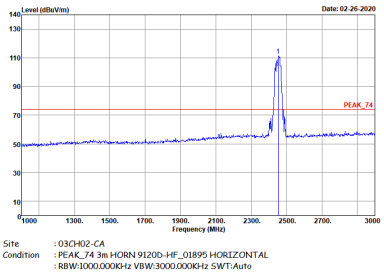
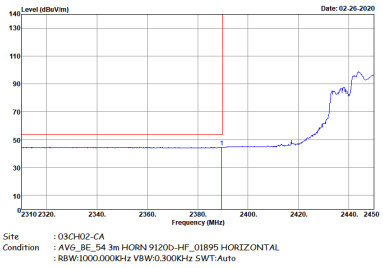
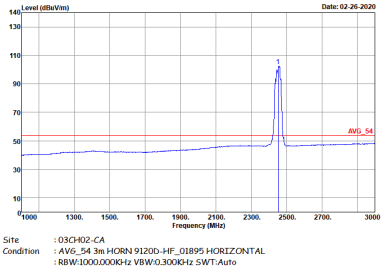
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

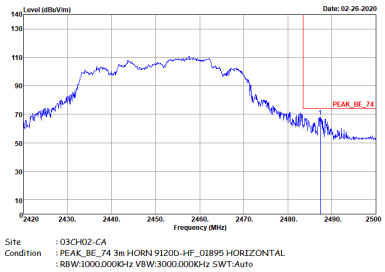
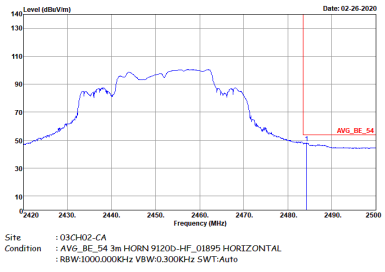
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

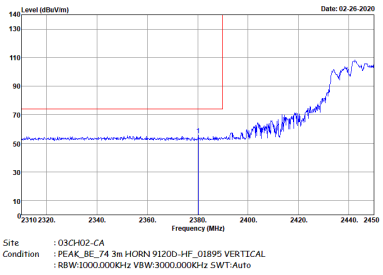
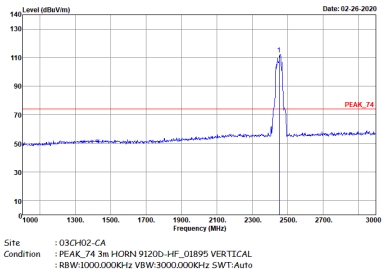
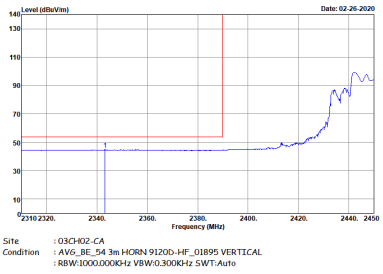
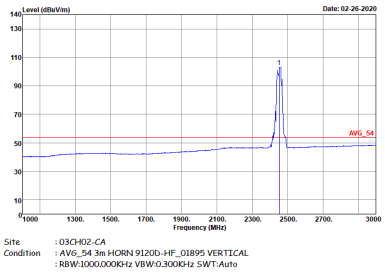
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

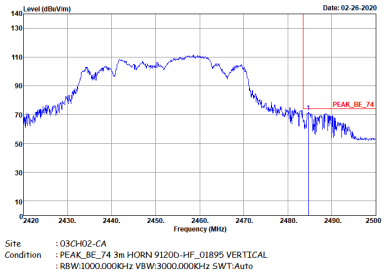
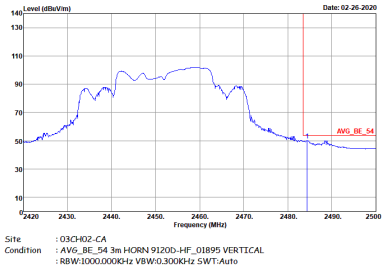
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

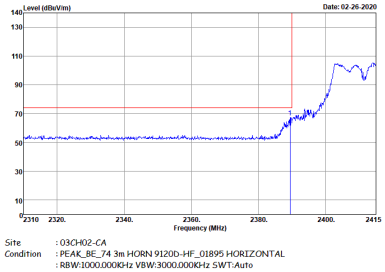
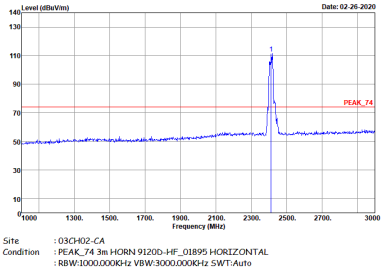
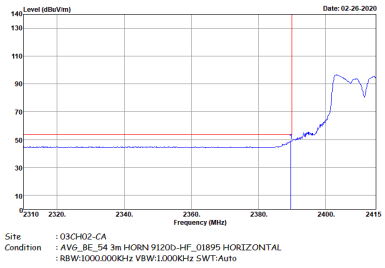
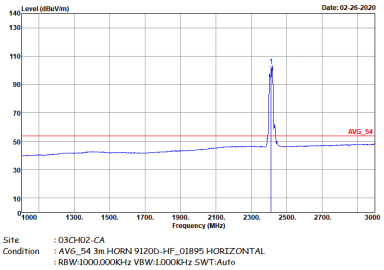
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

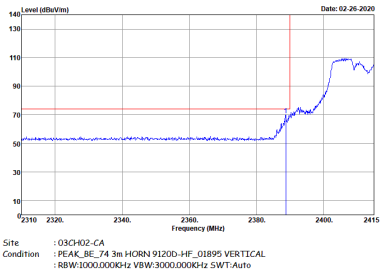
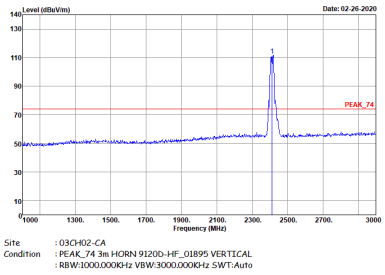
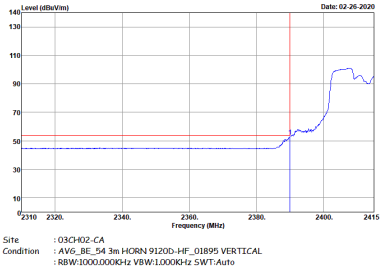
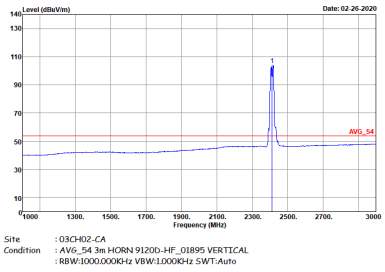
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

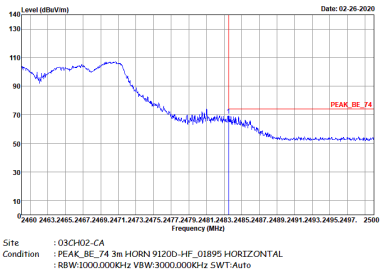
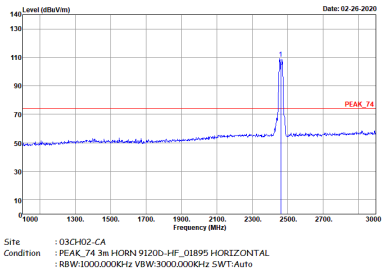
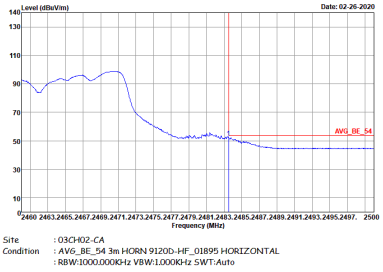
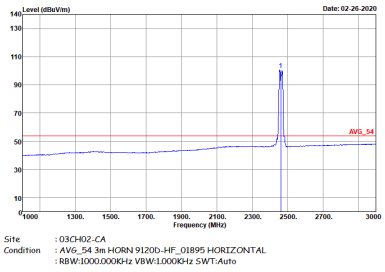
<Middle Unmodulated>

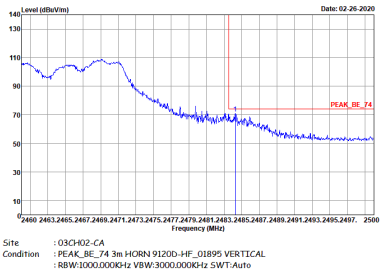
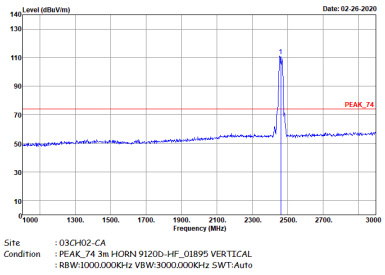
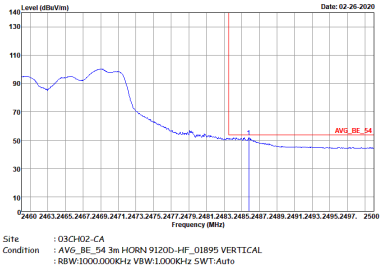
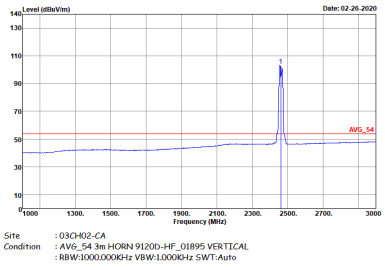
2.4GHz 2400~2483.5MHz

WIFI 802.11ax HE20 Full (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

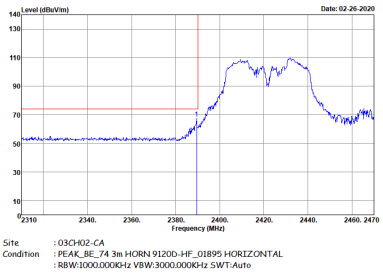
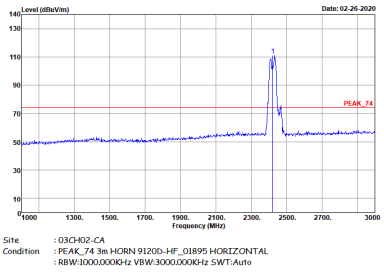
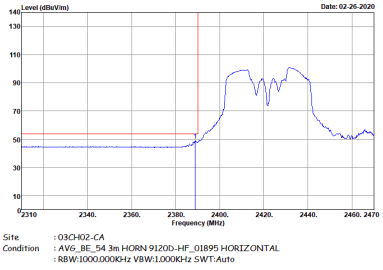
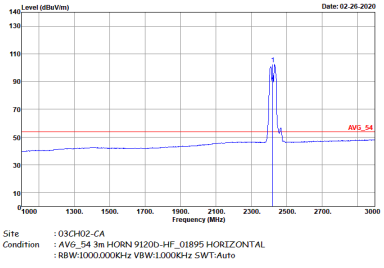
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

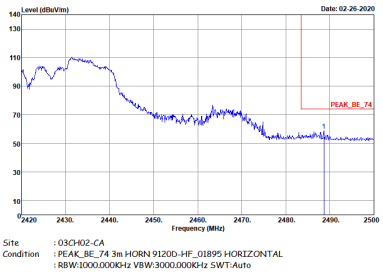
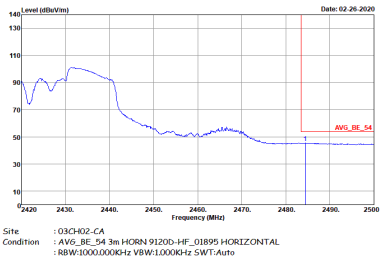
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

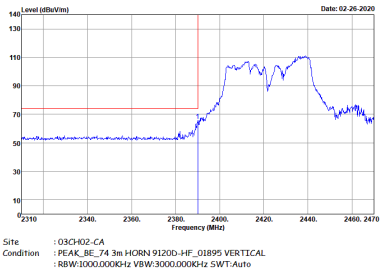
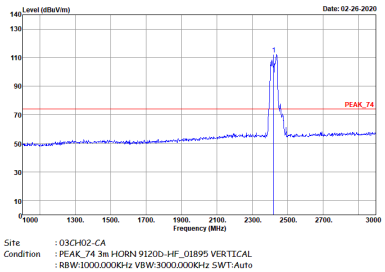
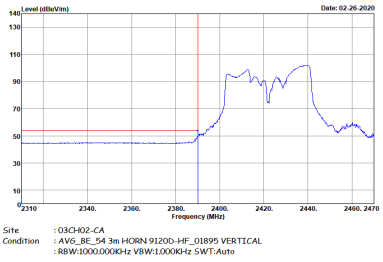
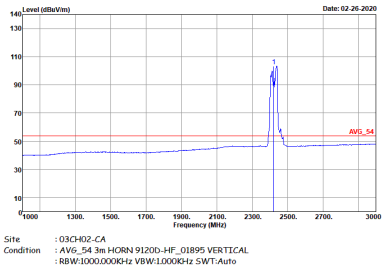
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

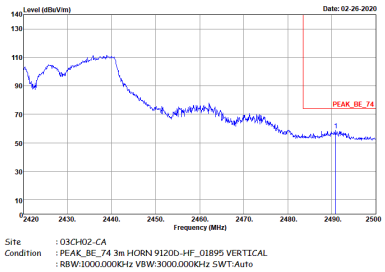
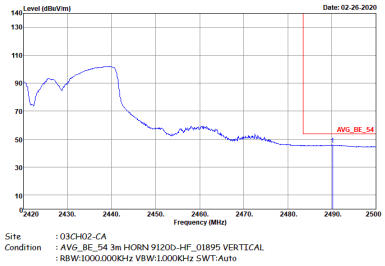
2.4GHz 2400~2483.5MHz

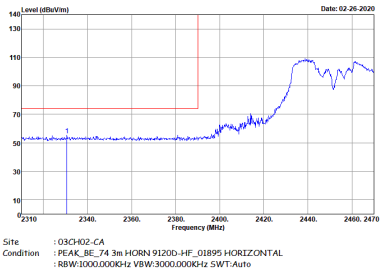
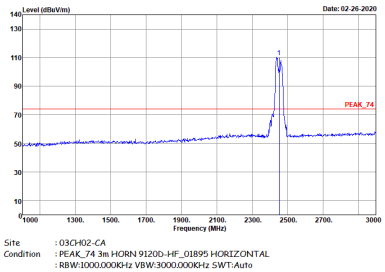
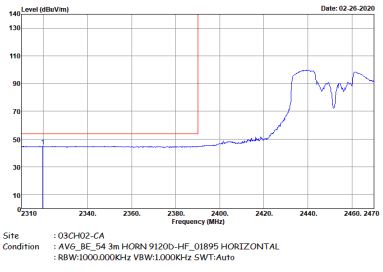
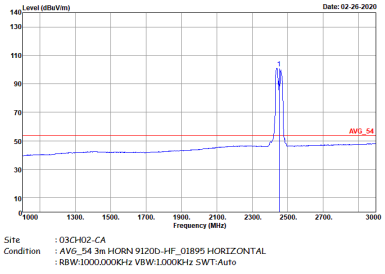
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

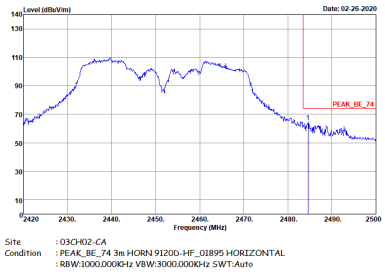
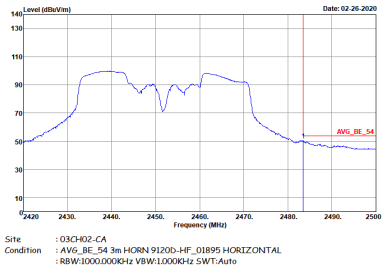
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

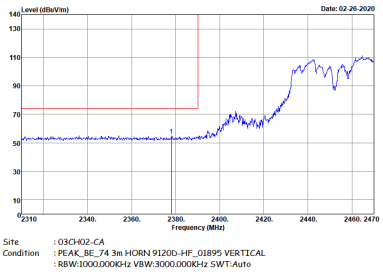
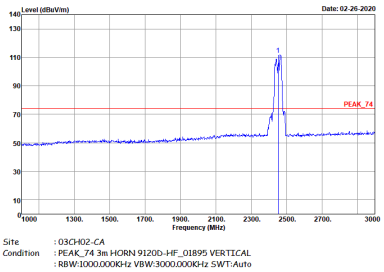
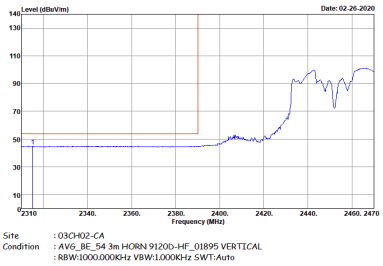
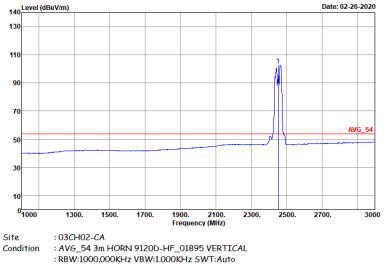
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

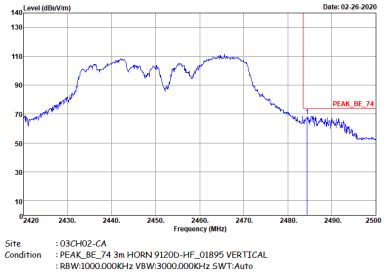
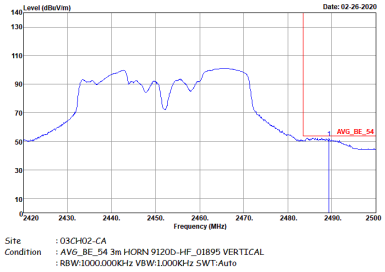
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

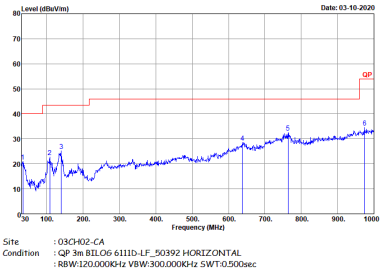
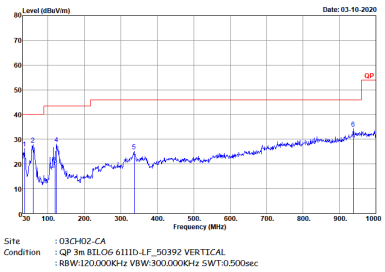
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

Emission above 18GHz

2.4GHz WIFI 802.11ax HE20 Full (LF)

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11ax HE20 Full LF	
1+2	Horizontal	Vertical
QP / Peak		

Annex. B Maximum Power Density

B.1 RF Exposure Limit Introduction

According to NCC LP0002, the criteria listed in Table shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §5.20.2.1 and §5.20.2.2.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

B.2 Standalone Power Density Calculation

<For WLAN 2.4GHz>

Maximum Power Density				
Max. Power	Gain	EIRP	20 cm PSD	Limit
25.74	4.02	29.76	0.1883	1
dBm	dBi	dBm	mW/cm^2	mW/cm^2

<For WLAN 2.4GHz Band-edge Unmodulated>

Maximum Power Density				
Max. Power	Gain	EIRP	20 cm PSD	Limit
20.45	4.02	24.47	0.0557	1
dBm	dBi	dBm	mW/cm^2	mW/cm^2

<For WLAN 2.4GHz Middle Unmodulated>

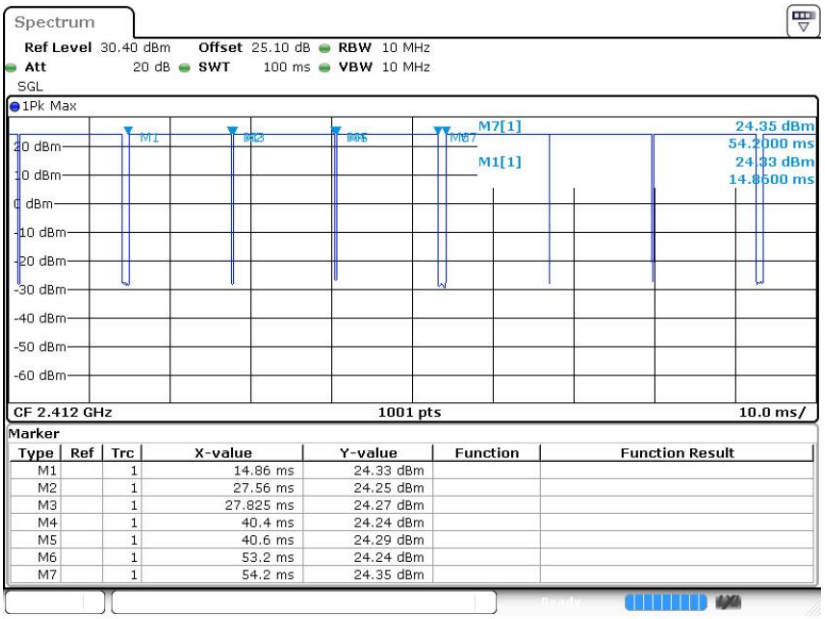
Maximum Power Density				
Max. Power	Gain	EIRP	20 cm PSD	Limit
20.96	4.02	24.98	0.0627	1
dBm	dBi	dBm	mW/cm^2	mW/cm^2

Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1+2	802.11b for Ant.1	96.28	12600	0.08	100Hz	0.16
1+2	802.11b for Ant.2	96.52	12600	0.08	100Hz	0.15
1+2	802.11g for Ant.1	94.19	1977	0.51	1kHz	0.26
1+2	802.11g for Ant.2	94.05	1975	0.51	1kHz	0.27
1+2	802.11ax HE20 for Ant.1	94.93	5435	0.18	300Hz	0.23
1+2	802.11ax HE20 for Ant.2	96.55	5450	0.18	300Hz	0.15
1+2	802.11ax HE40 for Ant.1	94.83	5410	0.18	300Hz	0.23
1+2	802.11ax HE40 for Ant.2	95.16	5415	0.18	300Hz	0.22

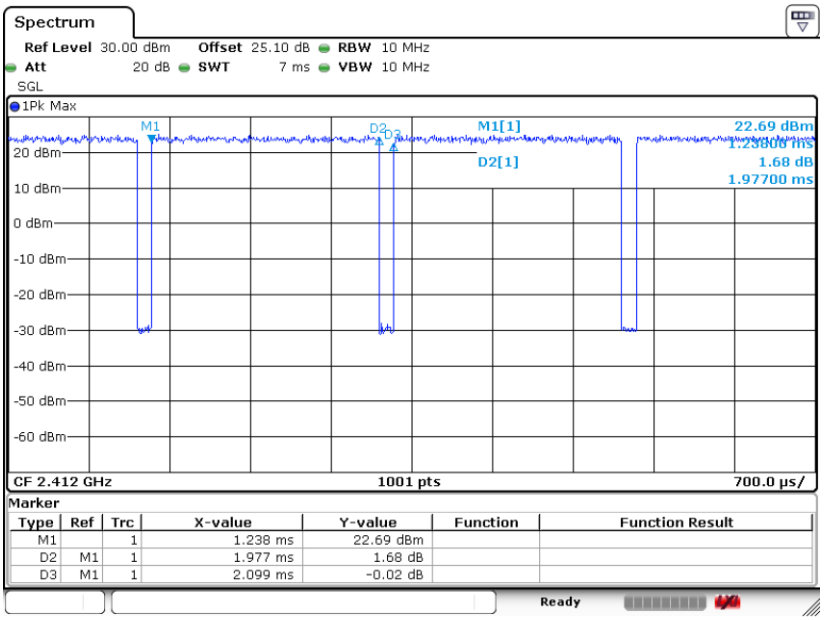
MIMO <Ant. 1>

802.11b



Date: 27.JAN.2020 11:20:44

802.11g



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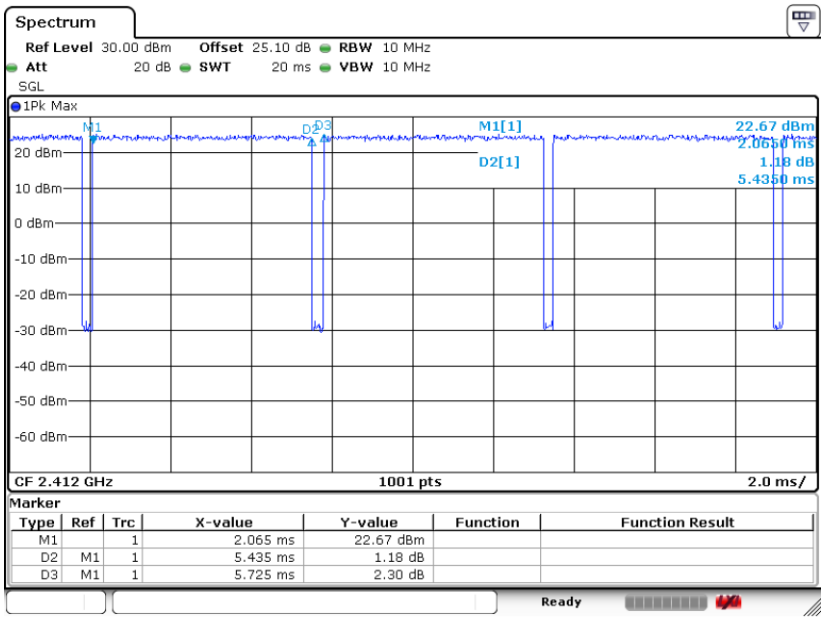
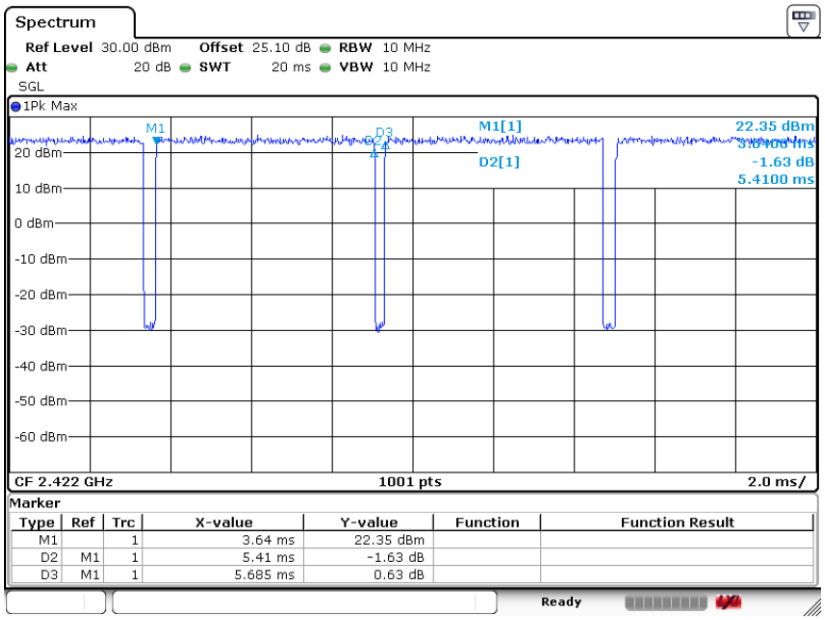
802.11ax HE20



Date: 27.JAN.2020 13:21:53

802.11ax HE40



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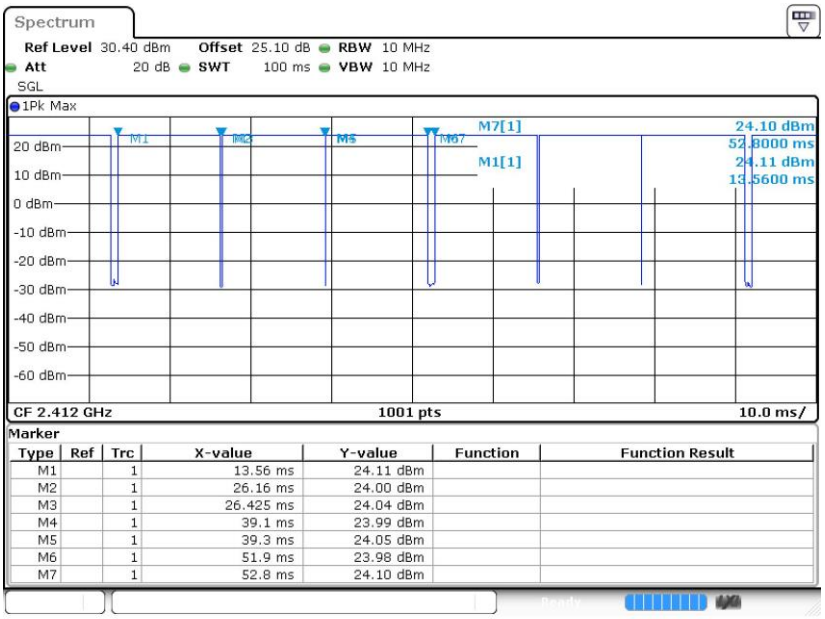
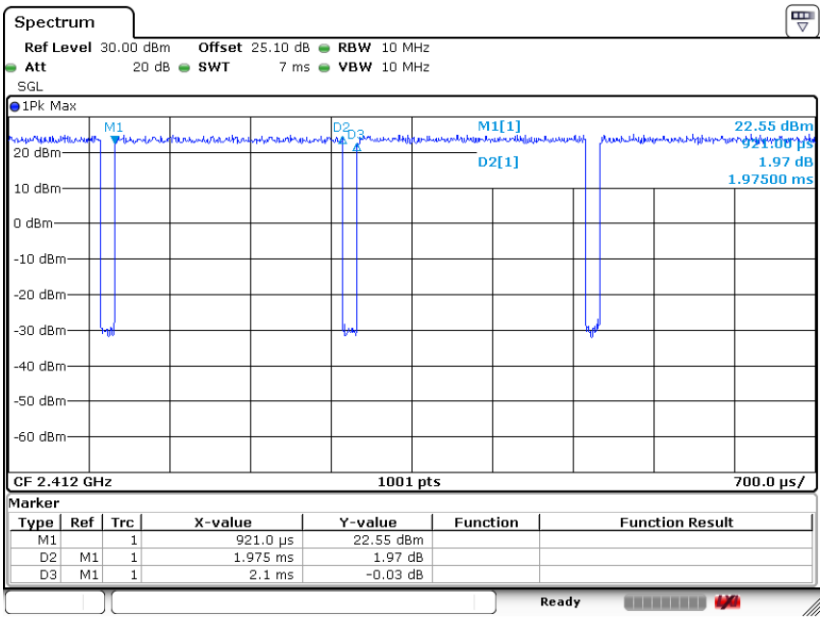
MIMO <Ant. 2>

802.11b



Date: 27.JAN.2020 11:17:04

802.11g



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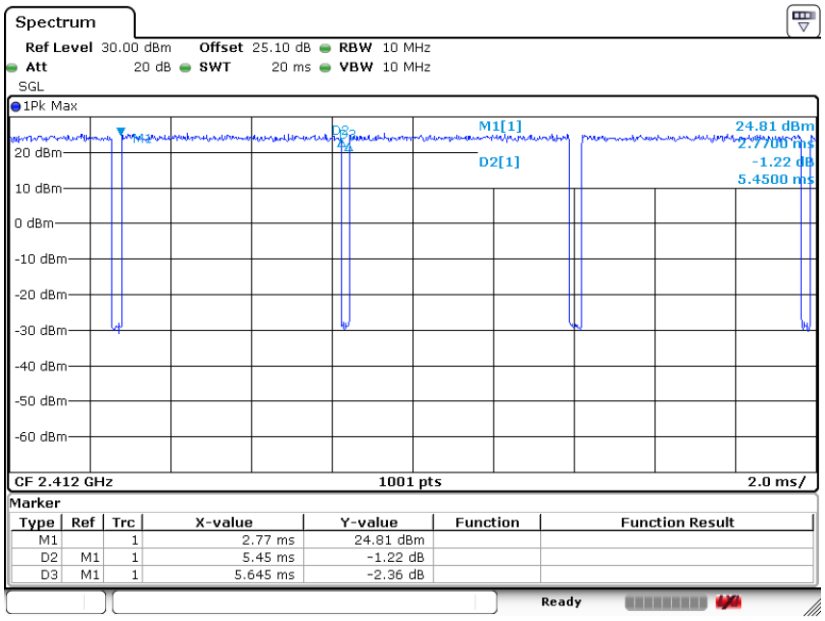
802.11ax HE20



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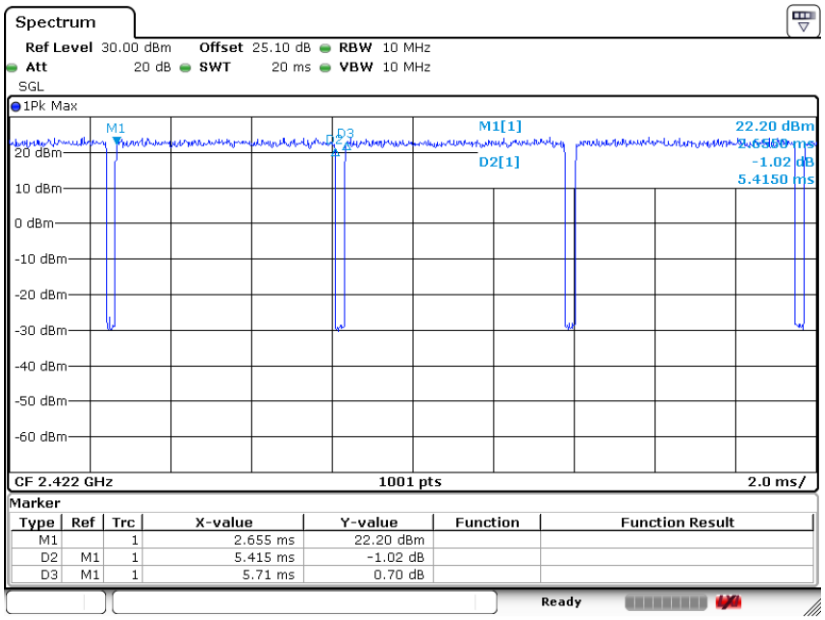
802.11ax HE40



Date: 27.JAN.2020 13:27:01

Appendix G. External Subcontractors to Perform Testing Data

The test report as below presents all the conduction emission test data performed by the subcontracted Sporton laboratory located in Taiwan.

NCC RADIO TEST REPORT

Equipment	:	**Wireless Access Point**
Brand Name	:	**Ruckus**
Model Name	:	**R550**
Applicant	:	**Ruckus Wireless Inc.** **350 W. Java Dr., Sunnyvale CA 94089 USA**
Manufacturer	:	**Ruckus Wireless Inc.** **350 W. Java Dr., Sunnyvale CA 94089 USA**
Standard	:	**NCC LP0002 (2018-01-10)**

The product was received on Mar. 20, 2020 and testing was started from Mar. 25, 2020 and completed on Apr. 08, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures NCC LP0002 (2018-01-10) and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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Appendix A. AC Conducted Emission Test Result
Appendix B. Receiver Radiated Emission
Appendix C. Setup Photographs

History of this test report

Report No.	Version	Description	Issued Date
TR021504C	01	Initial issue of report	May 07, 2020
TR021504C	02	Revise Antenna type information	Jun. 29, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	LP0002 2.11	Receiver Radiated Emission	Pass	Under limit 0.09 dB at 55.220 MHz
3.2	LP0002 2.3	AC Conducted Emission	Pass	Under limit 3.05 dB at 0.465 MHz

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Dara Chiu

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax and Zigbee.

Product Specification subjective to this standard	
Antenna Type	WLAN (Brand Name: Ruckus / Model Name: A550h25br): <Ant. 1> Internal Antenna / 2.4GHz: -1.5dBi, 5GHz: -2.5dBi <Ant. 2> Internal Antenna / 2.4GHz: -0.5dBi, 5GHz: -1.5dBi Bluetooth (Brand Name: Ruckus / Model Name: IOT): Metal Antenna /1dBi Zigbee (Brand Name: Ruckus / Model Name: IOT): Metal Antenna / 1dBi

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH16-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW0007

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- NCC LP0002 (2018-01-10)
- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Test Cases	
AC Conducted Emission	Mode 1: WLAN (2.4GHz) Idle + WLAN (5GHz) Idle + Zigbee Idle + Adapter + LAN Link Mode 2: WLAN (2.4GHz) Idle + WLAN (5GHz) Idle + Zigbee Idle + PoE + LAN Link Mode 3: Bluetooth-LE RX + PoE + LAN Link
Receiver Radiated Emission	Mode 1: WLAN (2.4GHz) Rx + WLAN (5GHz) Rx + Zigbee Rx + Adapter + LAN Link Mode 2: WLAN (2.4GHz) Rx + WLAN (5GHz) Rx + Zigbee Rx + PoE + LAN Link Mode 3: Bluetooth-LE Rx + PoE + LAN Link

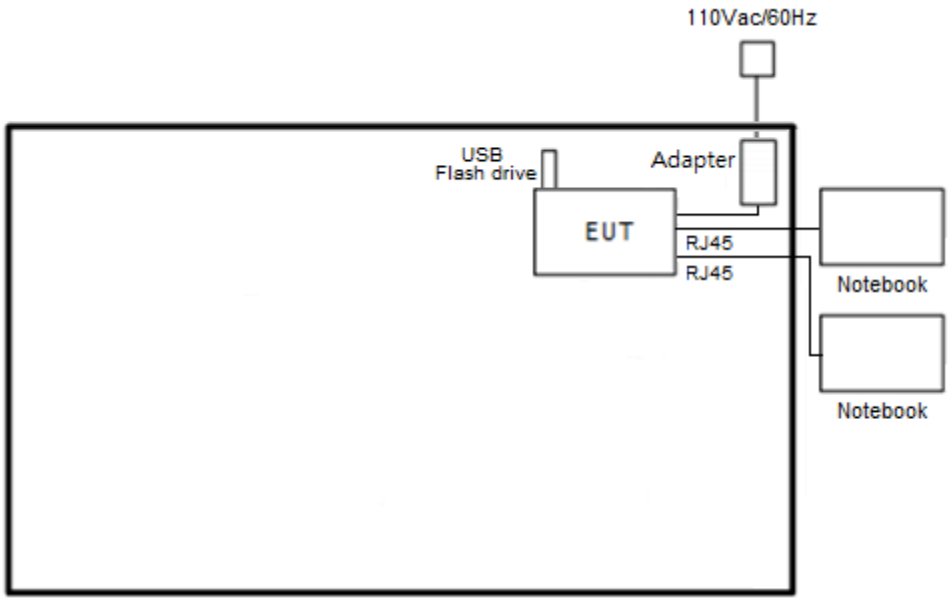
Remark:

1. The worst case of AC is mode 2; only the test data of this mode was reported.

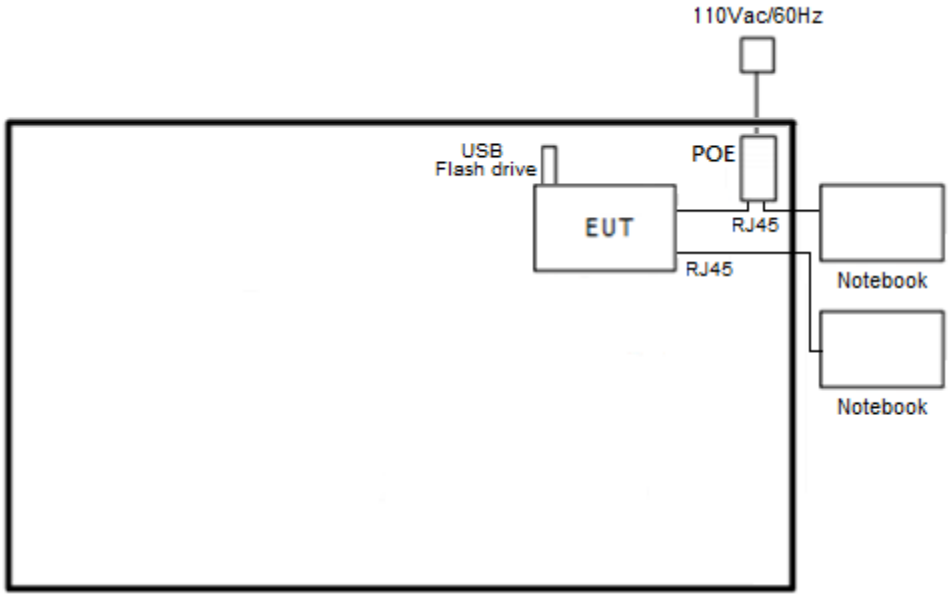
2. The worst case of RE is mode 3; only the test data of this mode was reported.

2.2 Connection Diagram of Test System

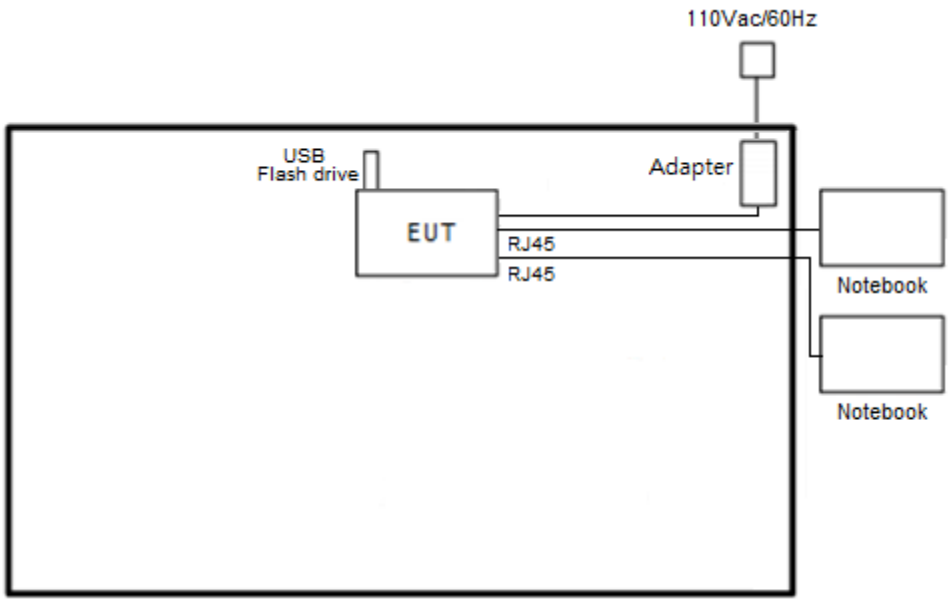
<AC Conducted Emission with Adapter Mode>



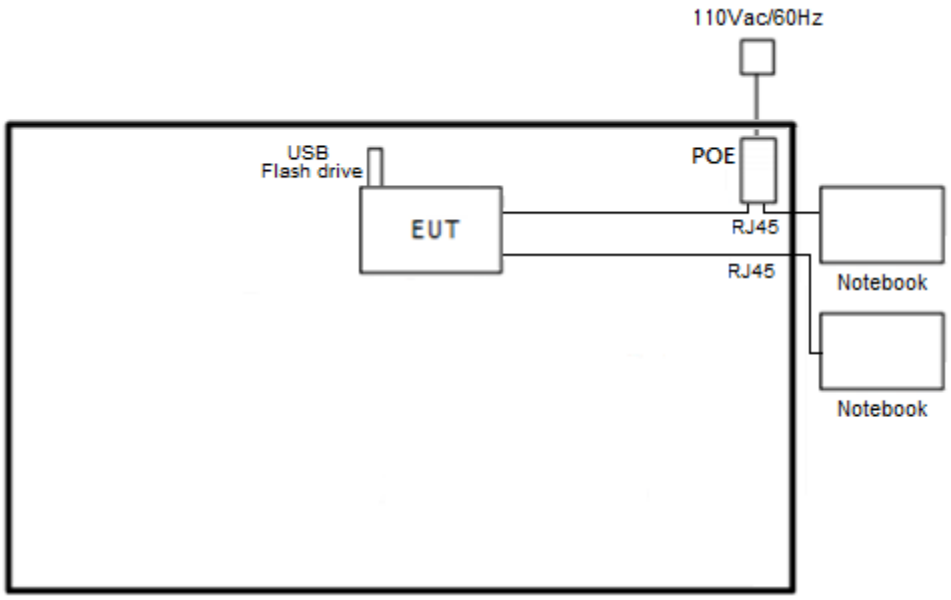
<AC Conducted Emission with PoE Mode>



<Receiver Radiated Emission with Adapter Mode>



<Receiver Radiated Emission with PoE Mode>



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Notebook	DELL	Latitude 5480	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Notebook	Lenovo	L570	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	USB Flash Drive	Kingston	DTDUO3C	FCC DoC	N/A	N/A
5.	Adapter	Ruckus Wireless Inc.	APH-5020	N/A	N/A	N/A
6.	PoE Adapter	Ruckus Wireless Inc.	N/A	N/A	N/A	N/A

Remark: Applicant has ensured accessory would not be attached with the product on the market, accessory is provided by lab or applicant for testing.

2.4 EUT Operation Test Setup

The RF test items, utility “Putty” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous receiver signals.

3 Test Result

3.1 Receiver Radiated Emission Measurement

3.1.1 Limit of Receiver Radiated Emission

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.1.2 Measuring Instruments

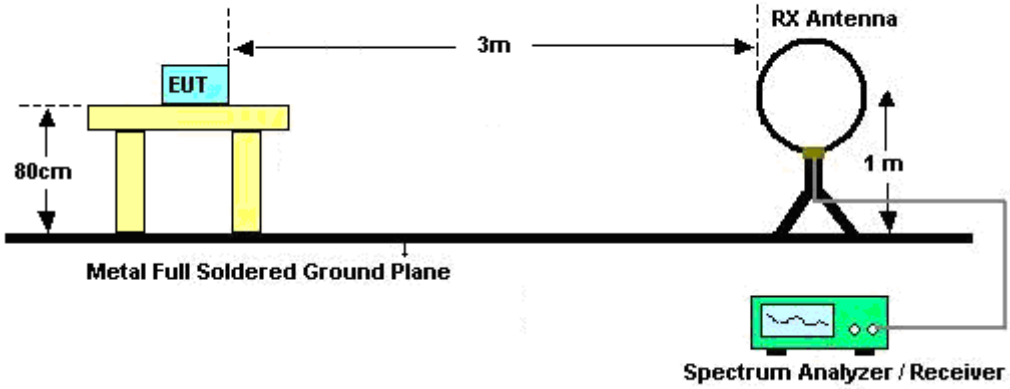
See list of measuring equipment of this test report.

3.1.3 Test Procedures

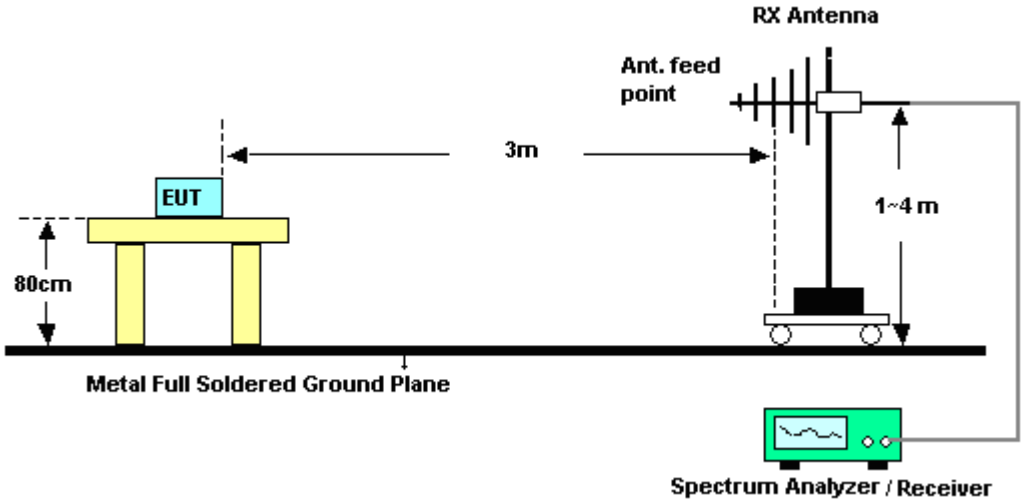
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBμV/m) = 20 log Emission level (μV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.1.4 Test Setup

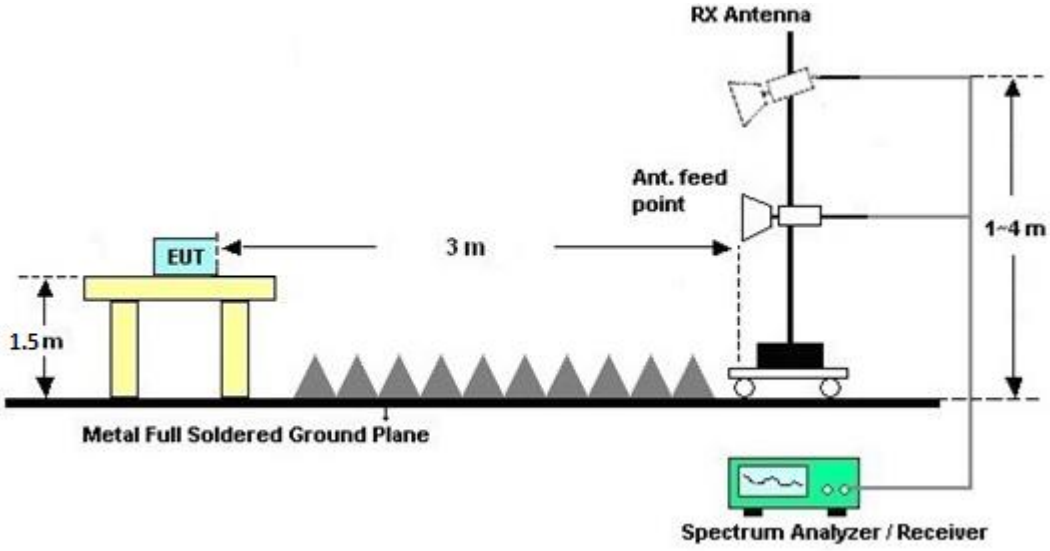
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5 Test Result of Receiver Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per NCC LP0002 section 5.13 was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.1.6 Test Result

Please refer to Appendix B.

3.2 AC Conducted Emission Measurement

3.2.1 Limit of AC Conducted Emission

For equipment 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.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

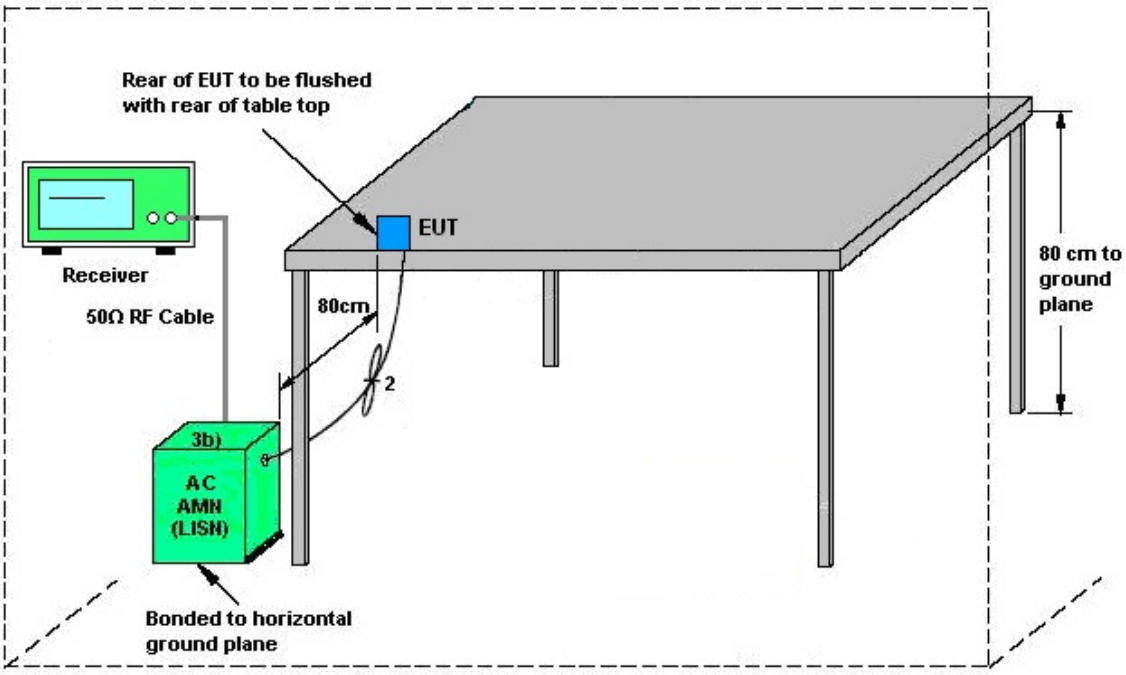
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.2.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.2.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Dec. 26, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Dec. 25, 2020	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL6111D&00802N1D01N-06	47020&06	30MHz to 1GHz	Oct. 13, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Oct. 12, 2020	Radiation (03CH16-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1G~18GHz	Sep. 19, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Sep. 18, 2020	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May 14, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	May 13, 2020	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1000MHz	Oct. 01, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Sep. 30, 2020	Radiation (03CH16-HY)
Preamplifier	Jet-Power	JPA0118-55-303	17100018000 55007	1GHz~18GHz	Apr. 01, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Mar. 31, 2020	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 11, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Dec. 10, 2020	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Dec. 12, 2020	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A (MXE)	MY57290111	3Hz~26.5GHz	Dec. 05, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Dec. 04, 2020	Radiation (03CH16-HY)
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	Apr. 29, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Apr. 28, 2020	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11680/4PE	NA	Aug. 30, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Aug. 29, 2020	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11688/4PE	NA	Aug. 30, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Aug. 29, 2020	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-5757	NA	Aug. 30, 2019	Mar. 27, 2020 ~ Mar. 28, 2020	Aug. 29, 2020	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Feb. 25, 2020	Mar. 27, 2020 ~ Mar. 28, 2020	Feb. 24, 2021	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz~40GHz	Feb. 25, 2020	Mar. 27, 2020 ~ Mar. 28, 2020	Feb. 24, 2021	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Mar. 27, 2020 ~ Mar. 28, 2020	N/A	Radiation (03CH16-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 25, 2020 ~ Apr. 08, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Mar. 25, 2020 ~ Apr. 08, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 07, 2019	Mar. 25, 2020 ~ Apr. 08, 2020	Nov. 06, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	Mar. 25, 2020 ~ Apr. 08, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Mar. 25, 2020 ~ Apr. 08, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Mar. 25, 2020 ~ Apr. 08, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Mar. 25, 2020 ~ Apr. 08, 2020	Jan. 01, 2021	Conduction (CO05-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.3

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.9

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.7

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.9

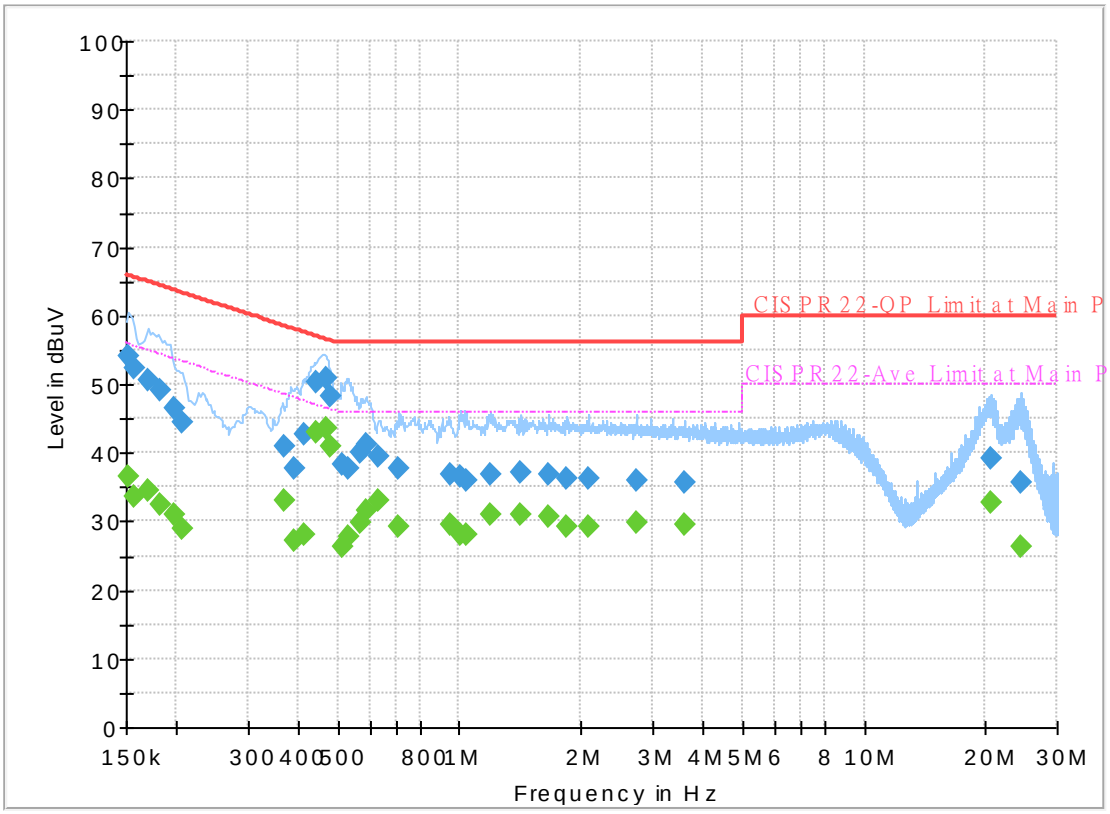
Appendix A. AC Conducted Emission Test Results

Test Engineer :	Howard Huang	**Temperature :**	21~25℃
		Relative Humidity :	42~50%

EUT Information

Report NO :	021504
Test Mode :	Mode 2
Test Voltage :	110Vac/60Hz
Phase :	Line

Full Spectrum



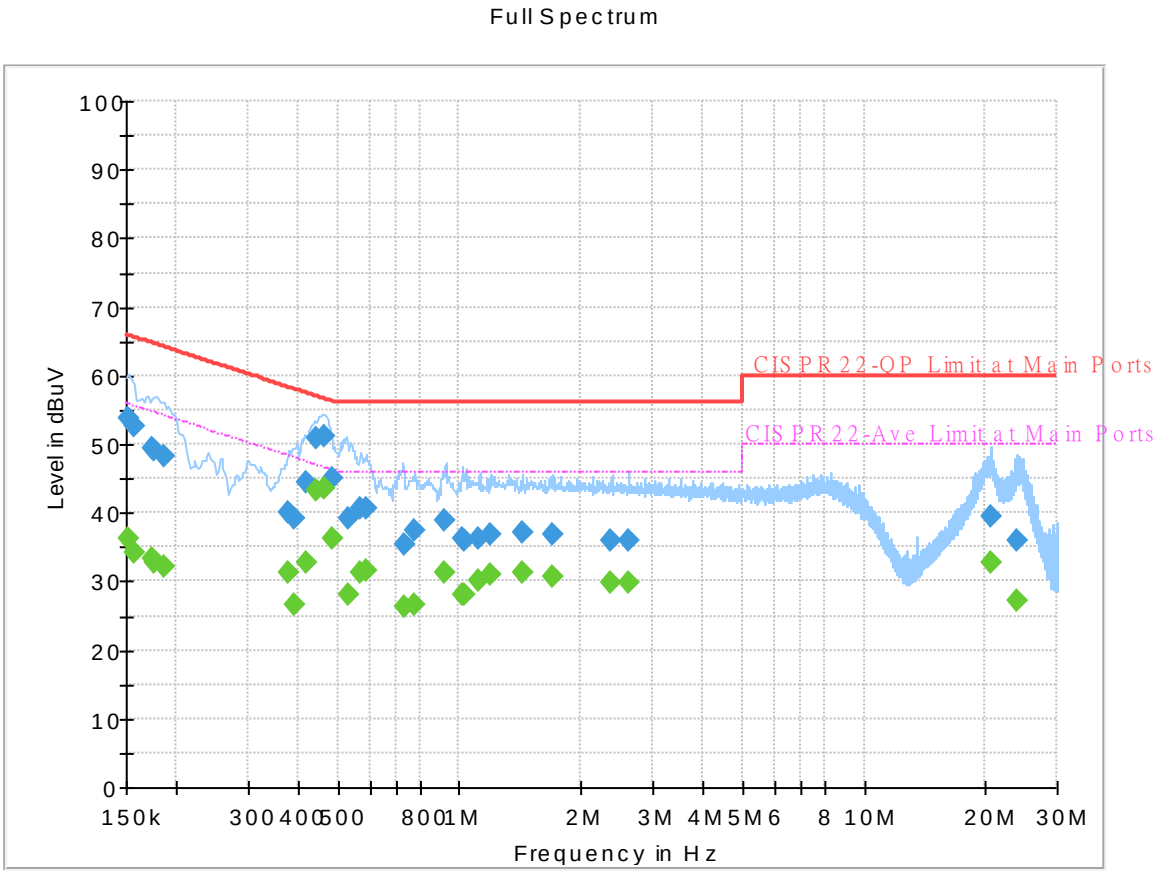
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152160	54.18	---	65.88	11.70	L1	OFF	19.5
0.152160	---	36.49	55.88	19.39	L1	OFF	19.5
0.157470	52.35	---	65.60	13.25	L1	OFF	19.5
0.157470	---	33.72	55.60	21.88	L1	OFF	19.5
0.170340	50.58	---	64.94	14.36	L1	OFF	19.5
0.170340	---	34.38	54.94	20.56	L1	OFF	19.5
0.181050	49.15	---	64.44	15.29	L1	OFF	19.5
0.181050	---	32.57	54.44	21.87	L1	OFF	19.5
0.196980	46.56	---	63.74	17.18	L1	OFF	19.5
0.196980	---	30.95	53.74	22.79	L1	OFF	19.5
0.207150	44.39	---	63.32	18.93	L1	OFF	19.5
0.207150	---	28.87	53.32	24.45	L1	OFF	19.5
0.367710	40.89	---	58.55	17.66	L1	OFF	19.5
0.367710	---	33.17	48.55	15.38	L1	OFF	19.5
0.388500	37.66	---	58.10	20.44	L1	OFF	19.5
0.388500	---	27.19	48.10	20.91	L1	OFF	19.5
0.413610	42.63	---	57.58	14.95	L1	OFF	19.5
0.413610	---	28.20	47.58	19.38	L1	OFF	19.5
0.442140	50.34	---	57.02	6.68	L1	OFF	19.5
0.442140	---	42.95	47.02	4.07	L1	OFF	19.5
0.467250	50.77	---	56.56	5.79	L1	OFF	19.5

0.467250	---	43.48	46.56	3.08	L1	OFF	19.5
0.478500	48.39	---	56.37	7.98	L1	OFF	19.5
0.478500	---	41.05	46.37	5.32	L1	OFF	19.5
0.514500	38.40	---	56.00	17.60	L1	OFF	19.5
0.514500	---	26.34	46.00	19.66	L1	OFF	19.5
0.531780	37.69	---	56.00	18.31	L1	OFF	19.5
0.531780	---	27.91	46.00	18.09	L1	OFF	19.5
0.566250	40.06	---	56.00	15.94	L1	OFF	19.5
0.566250	---	29.97	46.00	16.03	L1	OFF	19.5
0.587850	41.17	---	56.00	14.83	L1	OFF	19.5
0.587850	---	31.58	46.00	14.42	L1	OFF	19.5
0.632670	39.49	---	56.00	16.51	L1	OFF	19.5
0.632670	---	33.09	46.00	12.91	L1	OFF	19.5
0.705750	37.59	---	56.00	18.41	L1	OFF	19.5
0.705750	---	29.38	46.00	16.62	L1	OFF	19.5
0.945150	36.86	---	56.00	19.14	L1	OFF	19.5
0.945150	---	29.55	46.00	16.45	L1	OFF	19.5
1.008870	36.42	---	56.00	19.58	L1	OFF	19.5
1.008870	---	28.16	46.00	17.84	L1	OFF	19.5
1.036500	35.83	---	56.00	20.17	L1	OFF	19.5
1.036500	---	28.08	46.00	17.92	L1	OFF	19.5
1.187250	36.92	---	56.00	19.08	L1	OFF	19.6
1.187250	---	31.03	46.00	14.97	L1	OFF	19.6
1.419270	37.05	---	56.00	18.95	L1	OFF	19.6
1.419270	---	31.04	46.00	14.96	L1	OFF	19.6
1.664250	36.84	---	56.00	19.16	L1	OFF	19.6
1.664250	---	30.62	46.00	15.38	L1	OFF	19.6
1.836150	36.22	---	56.00	19.78	L1	OFF	19.6
1.836150	---	29.10	46.00	16.90	L1	OFF	19.6
2.080500	36.26	---	56.00	19.74	L1	OFF	19.6
2.080500	---	29.34	46.00	16.66	L1	OFF	19.6
2.727780	35.94	---	56.00	20.06	L1	OFF	19.6
2.727780	---	29.81	46.00	16.19	L1	OFF	19.6
3.621750	35.67	---	56.00	20.33	L1	OFF	19.6
3.621750	---	29.64	46.00	16.36	L1	OFF	19.6
20.600250	39.23	---	60.00	20.77	L1	OFF	19.8
20.600250	---	32.63	50.00	17.37	L1	OFF	19.8
24.425520	35.75	---	60.00	24.25	L1	OFF	19.8
24.425520	---	26.28	50.00	23.72	L1	OFF	19.8

EUT Information

Report NO :	021504
Test Mode :	Mode 2
Test Voltage :	110Vac/60Hz
Phase :	Neutral



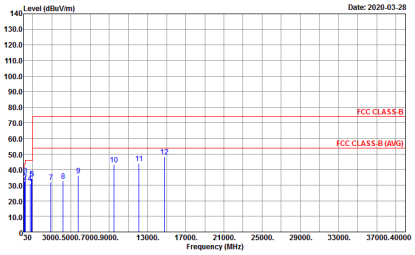
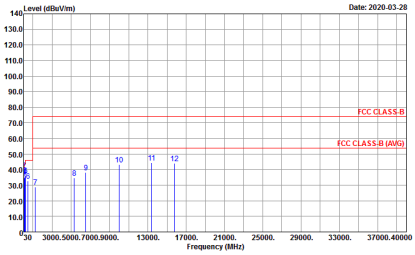
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.151350	---	36.38	55.93	19.55	N	OFF	19.5
0.151350	53.76	---	65.93	12.17	N	OFF	19.5
0.156750	---	34.36	55.63	21.27	N	OFF	19.5
0.156750	52.64	---	65.63	12.99	N	OFF	19.5
0.173760	---	33.45	54.78	21.33	N	OFF	19.5
0.173760	49.29	---	64.78	15.49	N	OFF	19.5
0.176190	---	32.86	54.66	21.80	N	OFF	19.5
0.176190	48.98	---	64.66	15.68	N	OFF	19.5
0.186000	---	32.14	54.21	22.07	N	OFF	19.5
0.186000	48.33	---	64.21	15.88	N	OFF	19.5
0.376170	---	31.30	48.36	17.06	N	OFF	19.5
0.376170	40.14	---	58.36	18.22	N	OFF	19.5
0.390750	---	26.48	48.05	21.57	N	OFF	19.5
0.390750	39.23	---	58.05	18.82	N	OFF	19.5
0.420000	---	32.70	47.45	14.75	N	OFF	19.5
0.420000	44.34	---	57.45	13.11	N	OFF	19.5
0.443940	---	43.24	46.99	3.75	N	OFF	19.5
0.443940	50.73	---	56.99	6.26	N	OFF	19.5
0.465000	---	43.55	46.60	3.05	N	OFF	19.5
0.465000	51.22	---	56.60	5.38	N	OFF	19.5
0.487500	---	36.13	46.21	10.08	N	OFF	19.5

0.487500	44.91	---	56.21	11.30	N	OFF	19.5
0.531420	---	28.16	46.00	17.84	N	OFF	19.5
0.531420	39.10	---	56.00	16.90	N	OFF	19.5
0.567420	---	31.18	46.00	14.82	N	OFF	19.5
0.567420	40.77	---	56.00	15.23	N	OFF	19.5
0.591900	---	31.58	46.00	14.42	N	OFF	19.5
0.591900	40.72	---	56.00	15.28	N	OFF	19.5
0.729780	---	26.43	46.00	19.57	N	OFF	19.5
0.729780	35.32	---	56.00	20.68	N	OFF	19.5
0.775770	---	26.56	46.00	19.44	N	OFF	19.6
0.775770	37.33	---	56.00	18.67	N	OFF	19.6
0.919950	---	31.38	46.00	14.62	N	OFF	19.6
0.919950	38.81	---	56.00	17.19	N	OFF	19.6
1.020750	---	28.12	46.00	17.88	N	OFF	19.6
1.020750	36.32	---	56.00	19.68	N	OFF	19.6
1.032990	---	28.16	46.00	17.84	N	OFF	19.6
1.032990	36.02	---	56.00	19.98	N	OFF	19.6
1.117500	---	30.10	46.00	15.90	N	OFF	19.6
1.117500	36.22	---	56.00	19.78	N	OFF	19.6
1.198590	---	30.90	46.00	15.10	N	OFF	19.6
1.198590	36.79	---	56.00	19.21	N	OFF	19.6
1.437000	---	31.19	46.00	14.81	N	OFF	19.6
1.437000	37.08	---	56.00	18.92	N	OFF	19.6
1.702770	---	30.66	46.00	15.34	N	OFF	19.6
1.702770	36.72	---	56.00	19.28	N	OFF	19.6
2.373000	---	29.87	46.00	16.13	N	OFF	19.6
2.373000	36.05	---	56.00	19.95	N	OFF	19.6
2.619240	---	29.80	46.00	16.20	N	OFF	19.6
2.619240	35.98	---	56.00	20.02	N	OFF	19.6
20.541480	---	32.84	50.00	17.16	N	OFF	19.9
20.541480	39.47	---	60.00	20.53	N	OFF	19.9
23.869500	---	27.24	50.00	22.76	N	OFF	20.0
23.869500	35.90	---	60.00	24.10	N	OFF	20.0

Appendix B. Receiver Radiated Emission Measurement

Test Engineer :	Andy Yang	**Temperature :**	20~25°C
		Relative Humidity :	50~60%
Frequency	55.220 MHz	**Margin**	Under 0.09 dB
Test Mode	Bluetooth-LE Rx + PoE + LAN Link		

	Horizontal	Vertical
Peak **Avg.**	 Site : 03CH16-HY Condition : FCC CLASS-B 3m 9120D_1522 HORIZONTAL Detector : Peak Project : 021504 (Freq, Level, Over Limit, Limit Line, ReadAntenna Level, Factor, Cable Loss, Preamp Factor, A/Pos, T/Pos, Remark) 1 90.14 34.70 -8.80 43.50 50.77 14.61 1.59 32.29 100 0 Peak 2 168.71 32.45 -11.05 43.50 46.77 15.69 2.19 32.30 --- --- Peak 3 250.19 36.27 -9.73 46.00 47.26 18.58 2.70 32.34 --- --- Peak 4 711.91 31.36 -14.64 46.00 32.32 26.64 4.45 32.18 --- --- Peak 5 874.87 34.12 -11.88 46.00 32.04 29.02 4.93 32.03 --- --- Peak 6 932.10 34.22 -11.78 46.00 30.60 29.90 5.09 31.54 --- --- Peak 7 2908.00 31.81 -42.19 74.00 55.33 28.40 9.05 60.97 --- --- Peak 8 4180.00 32.62 -41.38 74.00 51.47 29.82 11.07 59.74 --- --- Peak 9 5758.00 36.39 -37.61 74.00 50.46 32.02 13.21 59.30 --- --- Peak 10 9508.00 43.44 -30.56 74.00 46.31 38.58 17.76 59.21 --- --- Peak 11 12104.00 44.13 -29.87 74.00 47.09 38.90 20.76 62.62 --- --- Peak 12 14777.00 48.50 -25.50 74.00 45.02 42.07 23.39 61.98 100 0 Peak	 Site : 03CH16-HY Condition : FCC CLASS-B 3m 9120D_1522 VERTICAL Detector : Peak Project : 021504 (Freq, Level, Over Limit, Limit Line, ReadAntenna Level, Factor, Cable Loss, Preamp Factor, A/Pos, T/Pos, Remark) 1 40.67 35.43 -4.57 40.00 47.77 18.91 1.06 32.32 100 0 QP 2 55.22 39.91 -0.09 40.00 58.76 12.29 1.26 32.41 100 0 QP 3 64.92 34.82 -5.18 40.00 54.17 11.68 1.34 32.38 100 0 QP 4 167.74 35.80 -7.70 43.50 50.06 15.75 2.19 32.30 --- --- Peak 5 250.19 36.46 -9.54 46.00 47.45 18.58 2.70 32.34 --- --- Peak 6 499.48 32.70 -13.30 46.00 37.14 23.90 3.70 32.09 --- --- Peak 7 1264.00 29.00 -45.00 74.00 60.58 25.66 5.89 63.13 --- --- Peak 8 5332.00 34.56 -39.44 74.00 50.13 31.24 12.52 59.33 --- --- Peak 9 6514.00 38.10 -35.90 74.00 49.23 33.96 14.11 59.20 --- --- Peak 10 9992.00 43.33 -30.67 74.00 45.92 39.12 18.18 59.89 --- --- Peak 11 13402.00 44.46 -29.54 74.00 45.46 39.91 21.39 62.30 100 0 Peak 12 15789.00 43.98 -30.02 74.00 44.07 37.30 23.86 61.25 --- --- Peak