

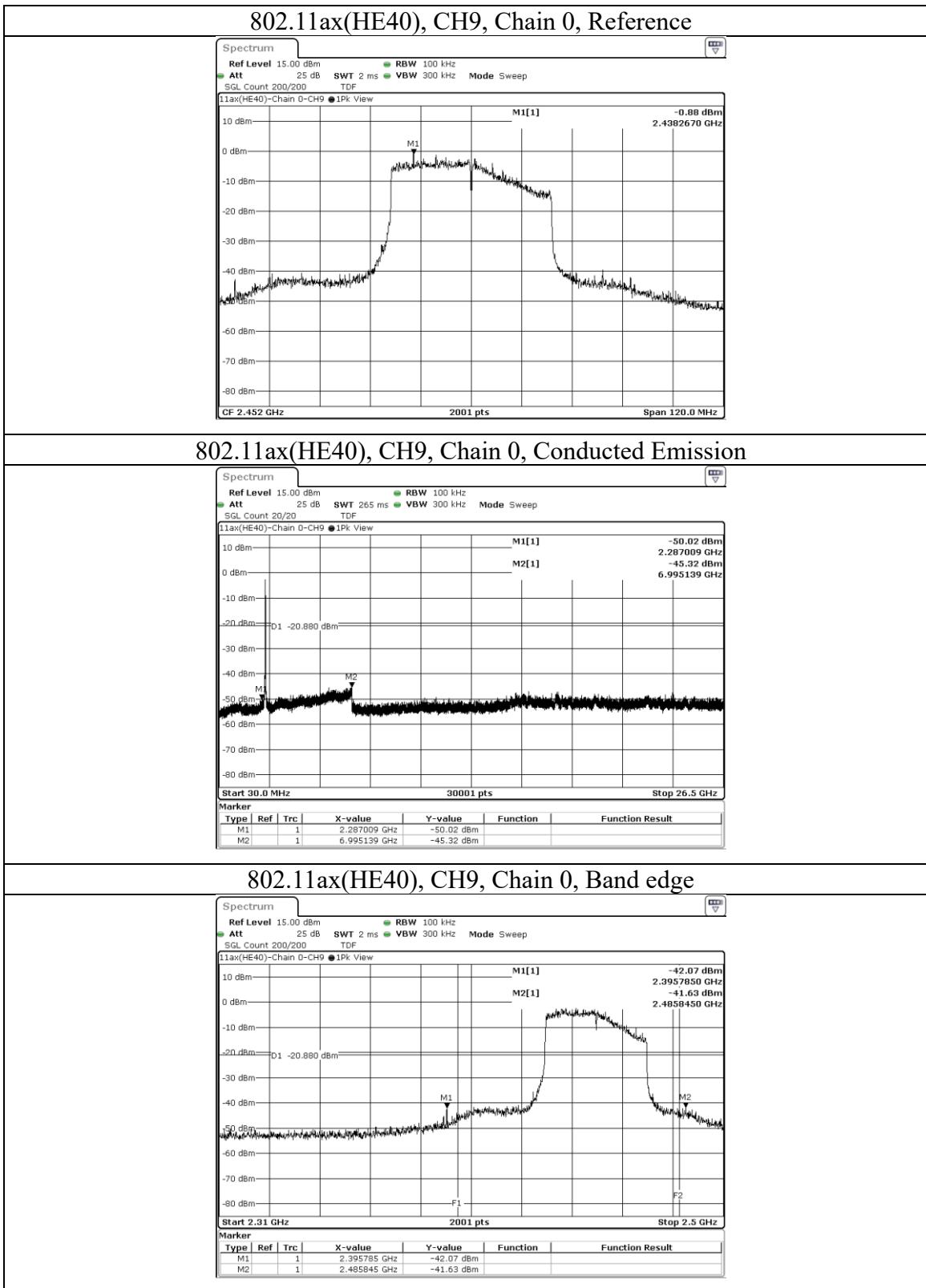
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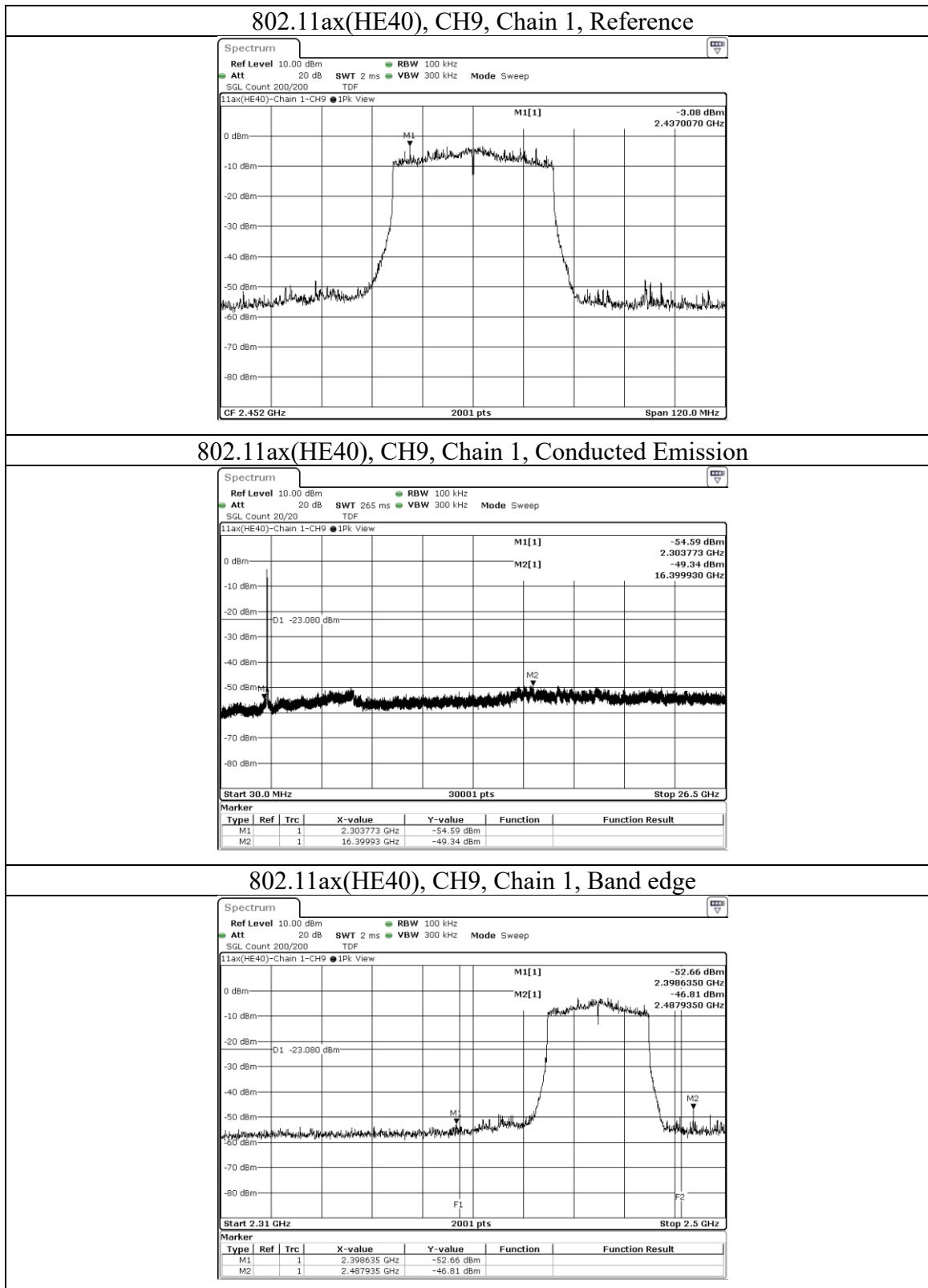
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9.5. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB_BV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

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Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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Note:

- a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.

Configuration	Average	
	RBW	VBW
802.11b	1MHz	Refer to section 6.6 for duty cycle
802.11g		
802.11ax (HE20)		
802.11ax (HE40)		

Note: Refer to section 6.6 for duty cycle.

- d. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
- e. Test data of Result value (dB_{UV}/m) = Reading value (dB_{UV}) + Correction Factor (dB/m).
- f. Test data of Margin(dB) = Result value (dB_{UV}/m) - Limit value (dB_{UV}/m).
- g. Test data of Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamplifier Factor (dB).
- h. Test data of Notation "@" = Fundamental Frequency
- i. Test data of Notation "*" = The peak result under 20 dB above and complies with AVG limit, AVG result is deemed to comply with AVG limit.

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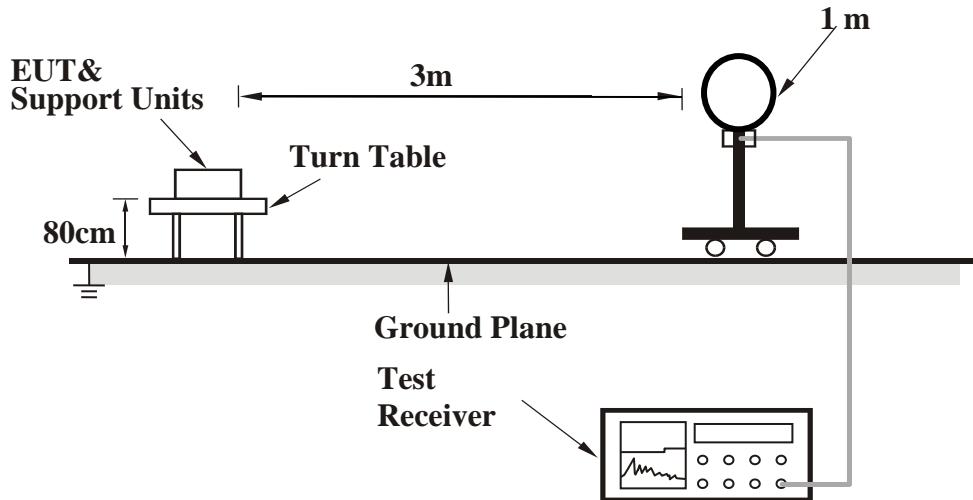
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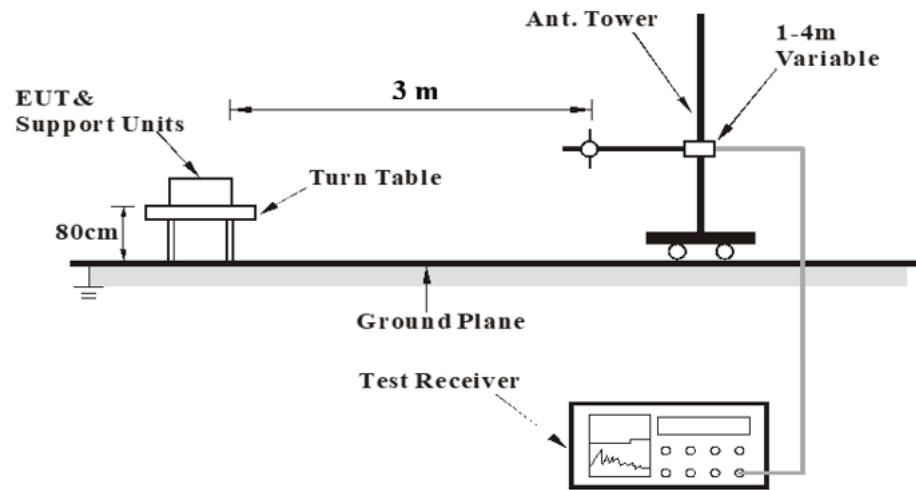
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Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



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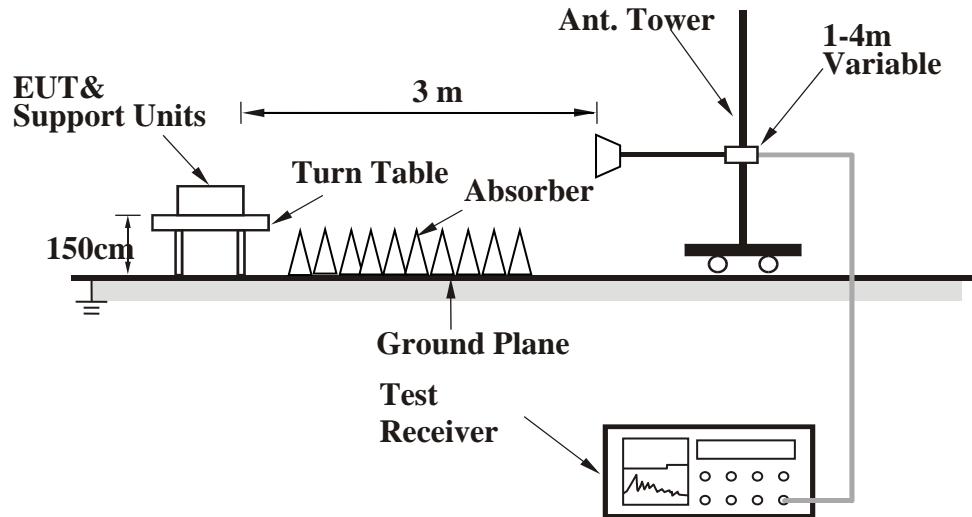
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<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.

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Test Data

Above 1 GHz

Mode	802.11b	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2377.83	33.83	5.84	39.67	54	-14.33	AVG
		2389.04	47.74	5.81	53.55	74	-20.45	PK
	@	2412	95.95	5.83	101.78	N/A	N/A	PK
	@	2412	92.35	5.83	98.18	N/A	N/A	AVG
	*	4824	43.47	2.35	45.82	74	-28.18	PK
Vertical		2383.72	47.62	5.84	53.46	54	-0.54	AVG
		2387.52	58.41	5.82	64.23	74	-9.77	PK
	@	2412	105.31	5.83	111.14	N/A	N/A	PK
	@	2412	101.54	5.83	107.37	N/A	N/A	AVG
	*	4824	51.47	2.35	53.82	74	-20.18	PK
	*	7236	36.61	10.32	46.93	74	-27.07	PK

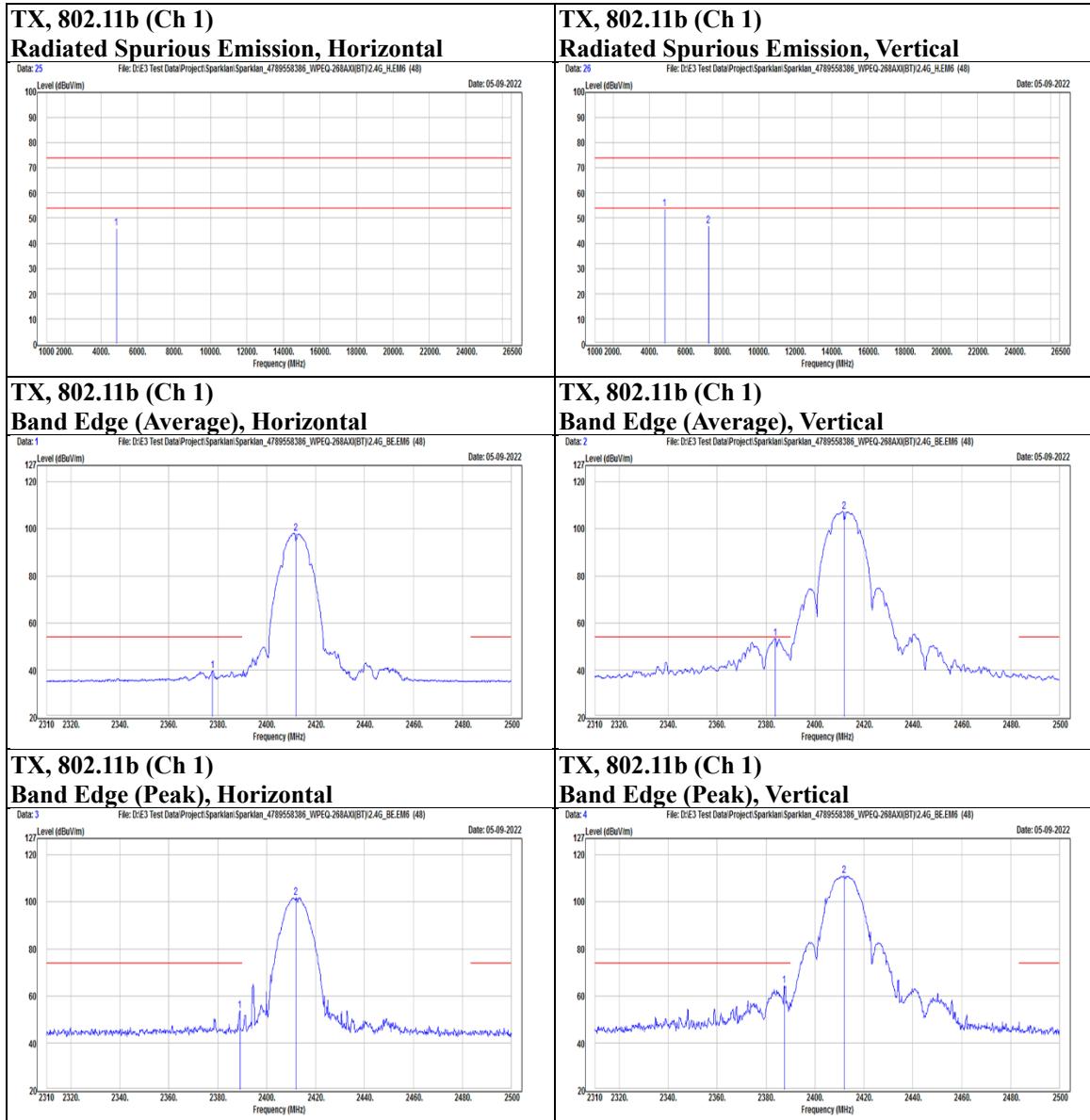
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Mode	802.11b	Channel	6
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2383.91	42.62	5.83	48.45	74	-25.55	PK
		2386.38	34.79	5.82	40.61	54	-13.39	AVG
	@	2437	98.25	5.92	104.17	N/A	N/A	PK
	@	2437	94.69	5.92	100.61	N/A	N/A	AVG
		2484.8	43.69	5.67	49.36	74	-24.64	PK
		2485.94	32.88	5.67	38.55	54	-15.45	AVG
	*	4874	43.15	2.4	45.55	74	-28.45	PK
	*	7311	35.18	10.28	45.46	74	-28.54	PK
Vertical		2386.76	46.91	5.82	52.73	54	-1.27	AVG
		2388.47	50.92	5.82	56.74	74	-17.26	PK
	@	2437	106.15	5.92	112.07	N/A	N/A	PK
	@	2437	101.74	5.92	107.66	N/A	N/A	AVG
		2485.75	47.8	5.67	53.47	54	-0.53	AVG
		2486.32	51.21	5.67	56.88	74	-17.12	PK
	*	4874	50.39	2.4	52.79	74	-21.21	PK
	*	7311	38.52	10.28	48.8	74	-25.2	PK

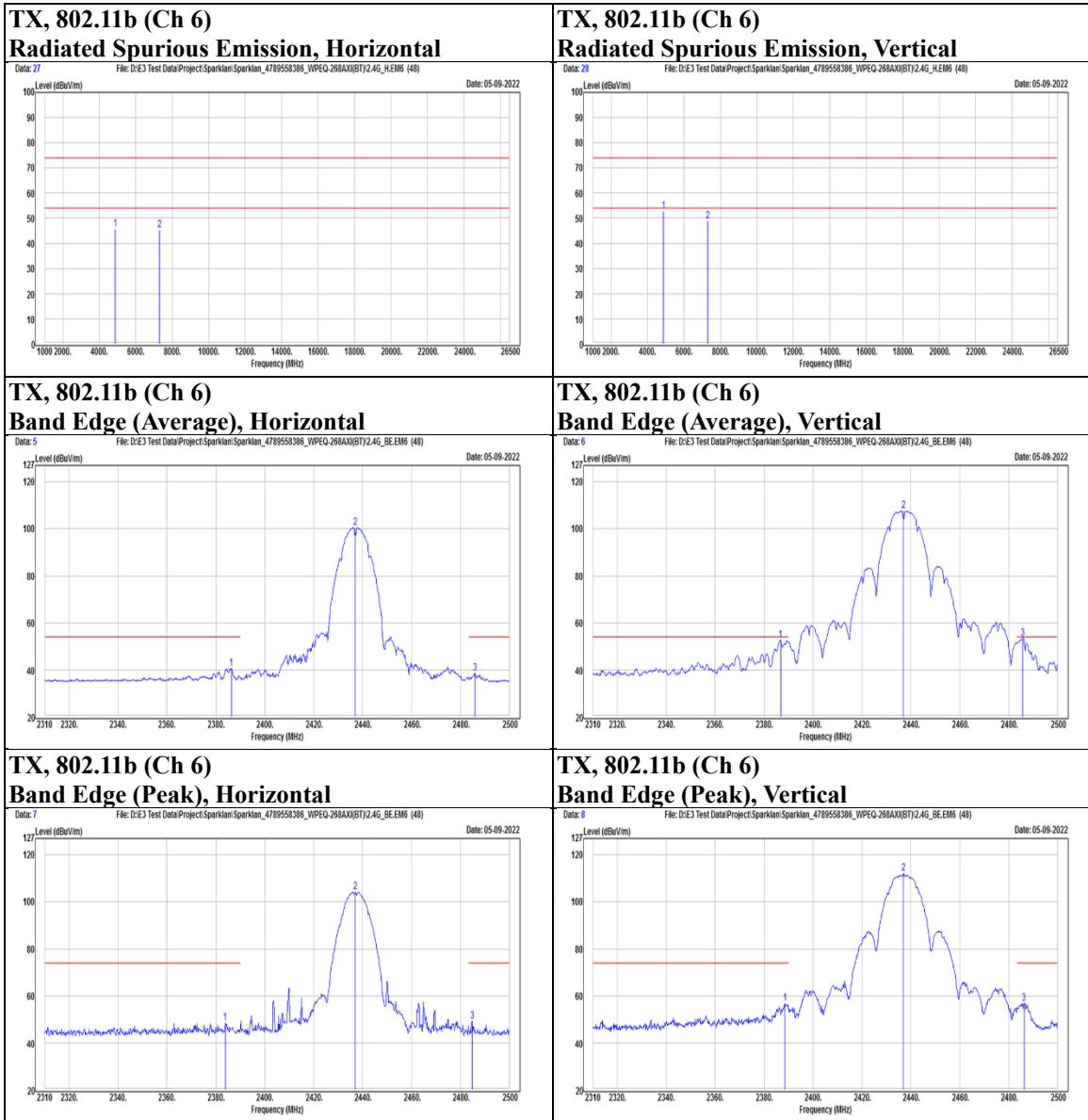
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Mode	802.11b	Channel	11
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2462	93.53	5.87	99.4	N/A	N/A	PK
	@	2462	89.87	5.87	95.74	N/A	N/A	AVG
		2493.16	42.07	5.61	47.68	74	-26.32	PK
		2498.48	32.84	5.57	38.41	54	-15.59	AVG
	*	4924	43.01	2.4	45.41	74	-28.59	PK
Vertical	@	2462	105.48	5.87	111.35	N/A	N/A	PK
	@	2462	101.19	5.87	107.06	N/A	N/A	AVG
		2488.79	47.59	5.64	53.23	54	-0.77	AVG
		2489.74	55.99	5.63	61.62	74	-12.38	PK
	*	4924	49.1	2.4	51.5	74	-22.5	PK

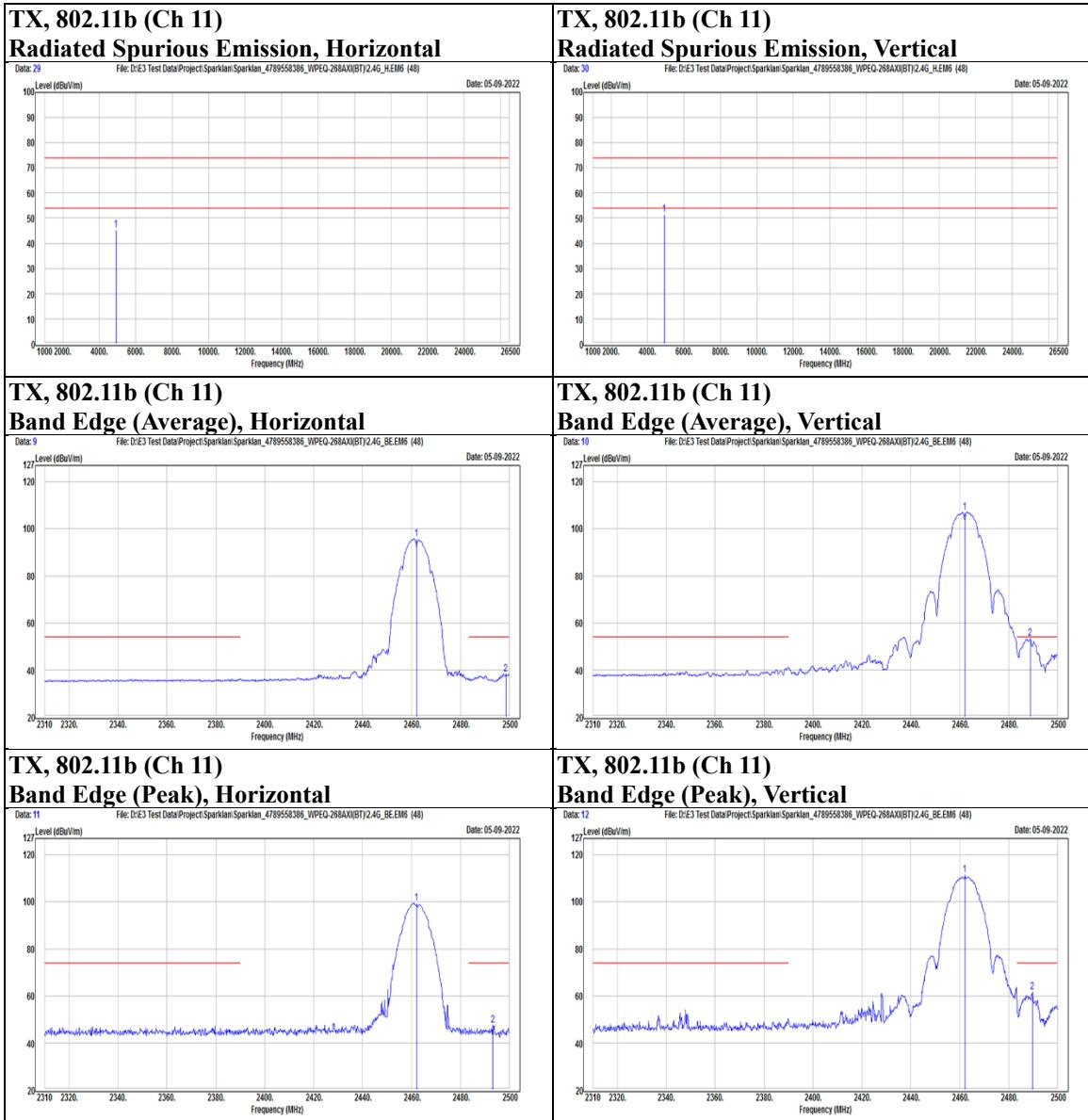
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Mode	802.11g	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2389.23	45.25	5.82	51.07	74	-22.93	PK
		2389.99	34.9	5.82	40.72	54	-13.28	AVG
	@	2412	95.17	5.83	101	N/A	N/A	PK
	@	2412	88.16	5.83	93.99	N/A	N/A	AVG
	*	4824	39.58	2.35	41.93	74	-32.07	PK
Vertical		2389.8	61.49	5.82	67.31	74	-6.69	PK
		2389.99	47.54	5.82	53.36	54	-0.64	AVG
	@	2412	107.24	5.83	113.07	N/A	N/A	PK
	@	2412	99.41	5.83	105.24	N/A	N/A	AVG
	*	4824	44.74	2.35	47.09	74	-26.91	PK

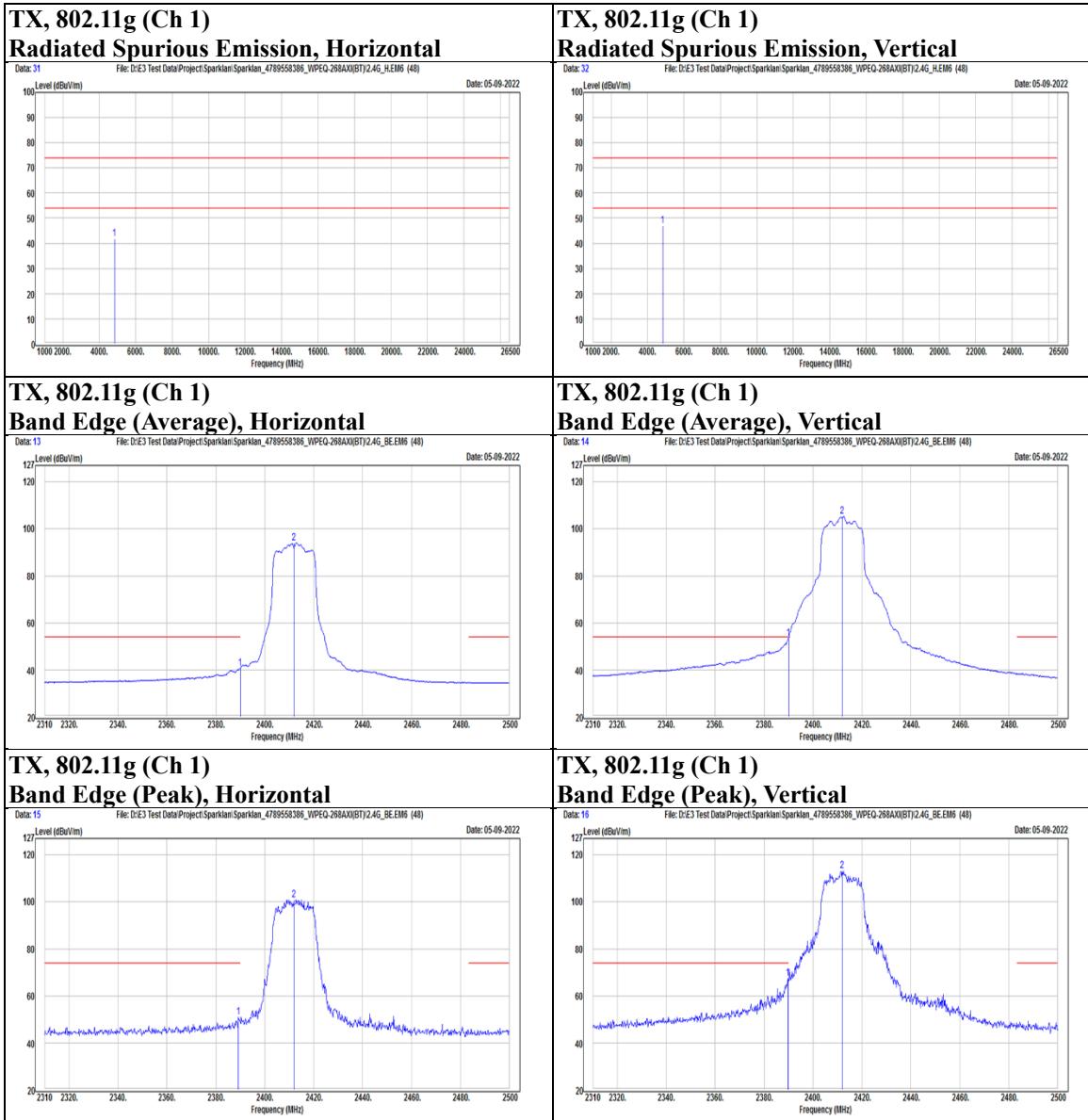
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Mode	802.11g	Channel	6
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2386.57	32.74	5.82	38.56	54	-15.44	AVG
		2389.42	43.2	5.82	49.02	74	-24.98	PK
	@	2437	98.52	5.92	104.44	N/A	N/A	PK
	@	2437	90.95	5.92	96.87	N/A	N/A	AVG
		2484.42	30.17	5.68	35.85	54	-18.15	AVG
		2489.74	40.84	5.63	46.47	74	-27.53	PK
	*	4874	40.68	2.4	43.08	74	-30.92	PK
Vertical		2383.91	51.12	5.83	56.95	74	-17.05	PK
		2389.99	41.2	5.82	47.02	54	-6.98	AVG
	@	2437	108.22	5.92	114.14	N/A	N/A	PK
	@	2437	100.79	5.92	106.71	N/A	N/A	AVG
		2483.66	40.97	5.68	46.65	54	-7.35	AVG
		2484.04	51.89	5.68	57.57	74	-16.43	PK
	*	4874	47.49	2.4	49.89	74	-24.11	PK
	*	7311	38.86	10.28	49.14	74	-24.86	PK

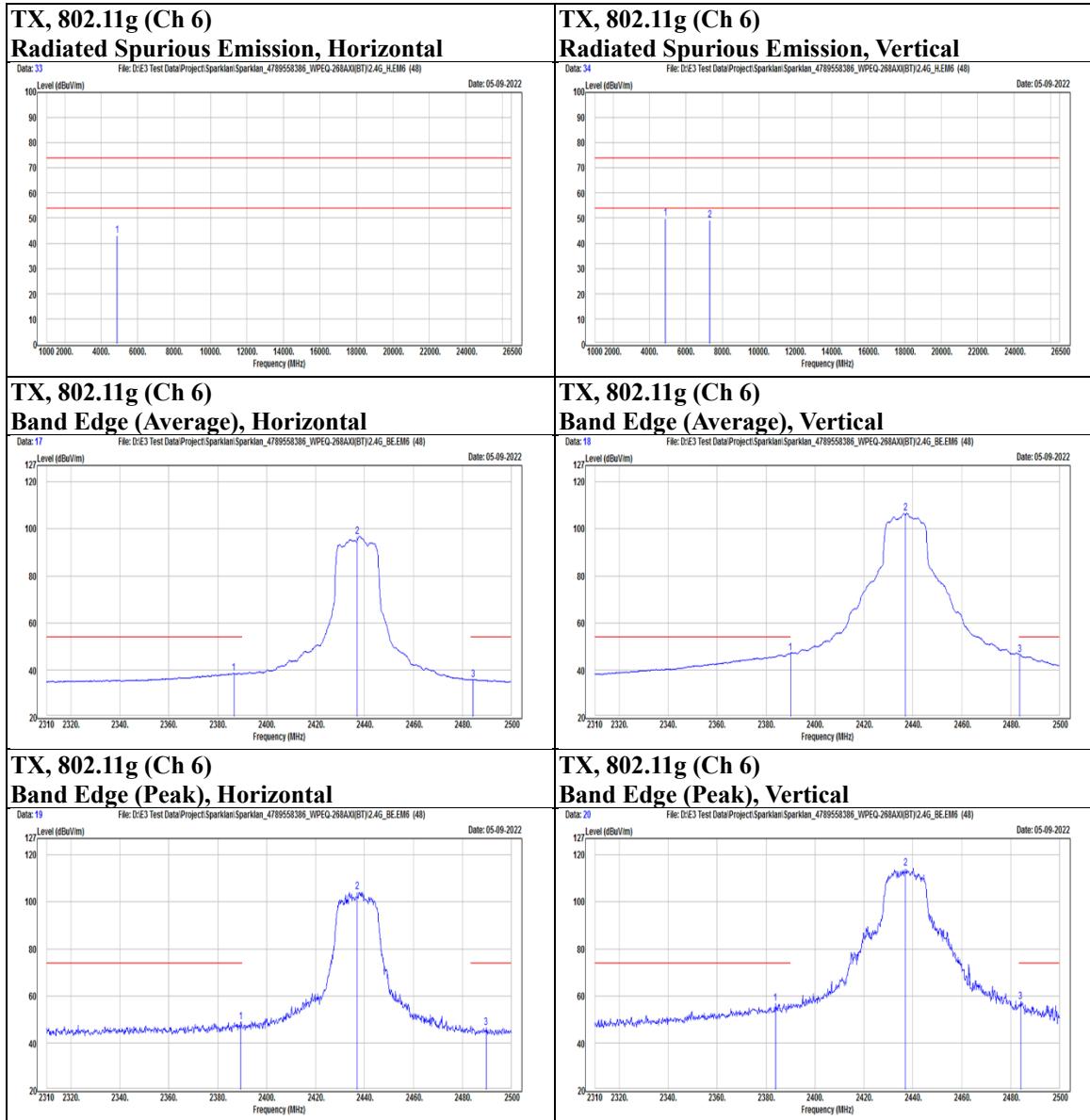
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Mode	802.11g	Channel	11
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2462	93.27	5.87	99.14	N/A	N/A	PK
	@	2462	85.06	5.87	90.93	N/A	N/A	AVG
		2483.66	31.68	5.68	37.36	54	-16.64	AVG
		2484.99	42.11	5.67	47.78	74	-26.22	PK
	*	4924	39.03	2.4	41.43	74	-32.57	PK
Vertical	@	2462	106.15	5.87	112.02	N/A	N/A	PK
	@	2462	98.58	5.87	104.45	N/A	N/A	AVG
		2483.66	46.63	5.68	52.31	54	-1.69	AVG
		2485.18	56.72	5.67	62.39	74	-11.61	PK
	*	4924	45.94	2.4	48.34	74	-25.66	PK

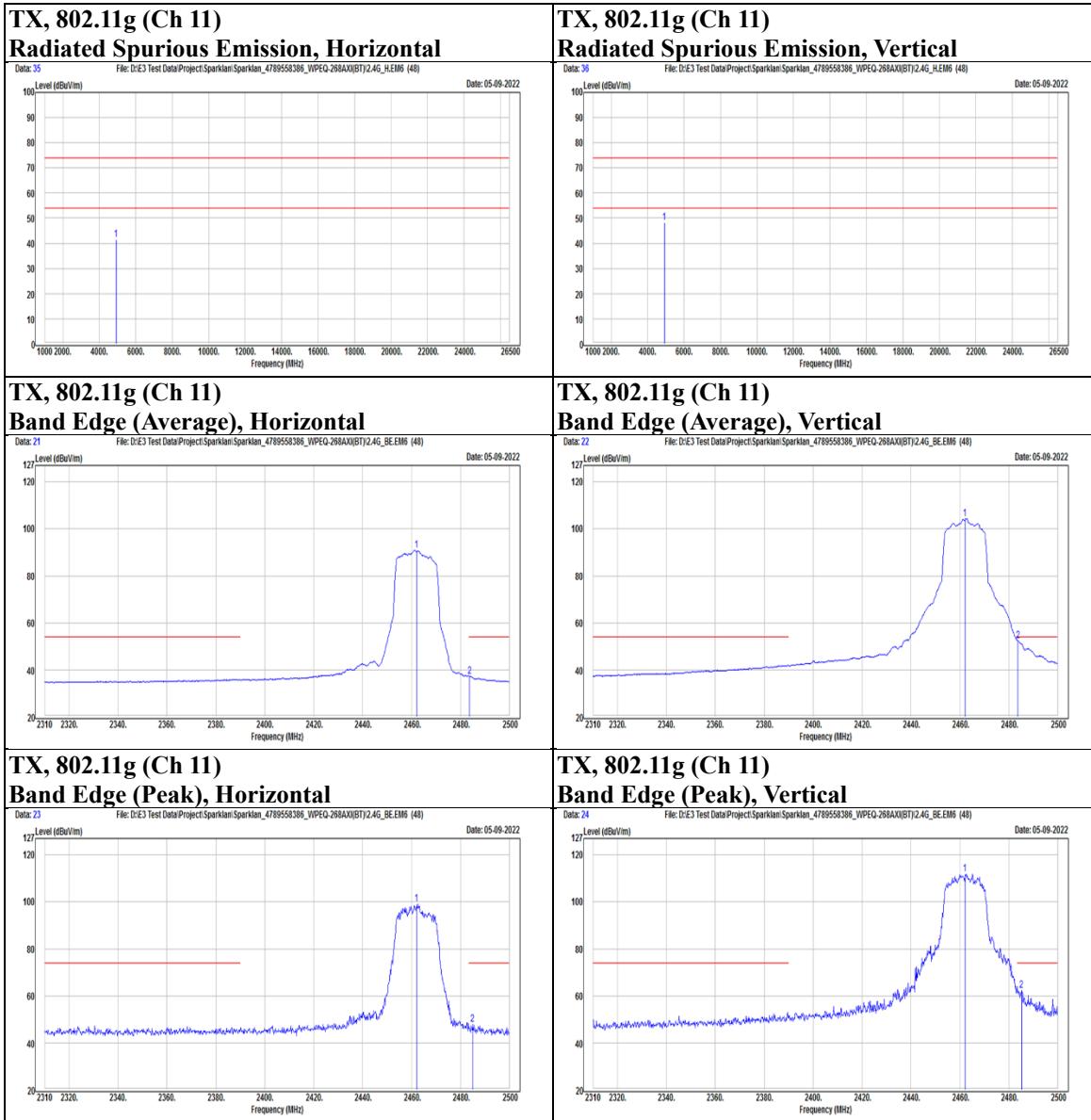
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Mode	802.11ax(HE20)	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2389.61	46.79	5.82	52.61	74	-21.39	PK
		2389.99	36.78	5.82	42.6	54	-11.4	AVG
	@	2412	96.73	5.83	102.56	N/A	N/A	PK
	@	2412	86.88	5.83	92.71	N/A	N/A	AVG
	*	4824	38.84	2.35	41.19	74	-32.81	PK
Vertical		2387.33	47.65	5.82	53.47	54	-0.53	AVG
		2388.09	67.55	5.82	73.37	74	-0.63	PK
	@	2412	108.45	5.83	114.28	N/A	N/A	PK
	@	2412	99	5.83	104.83	N/A	N/A	AVG
	*	4824	44.68	2.35	47.03	74	-26.97	PK

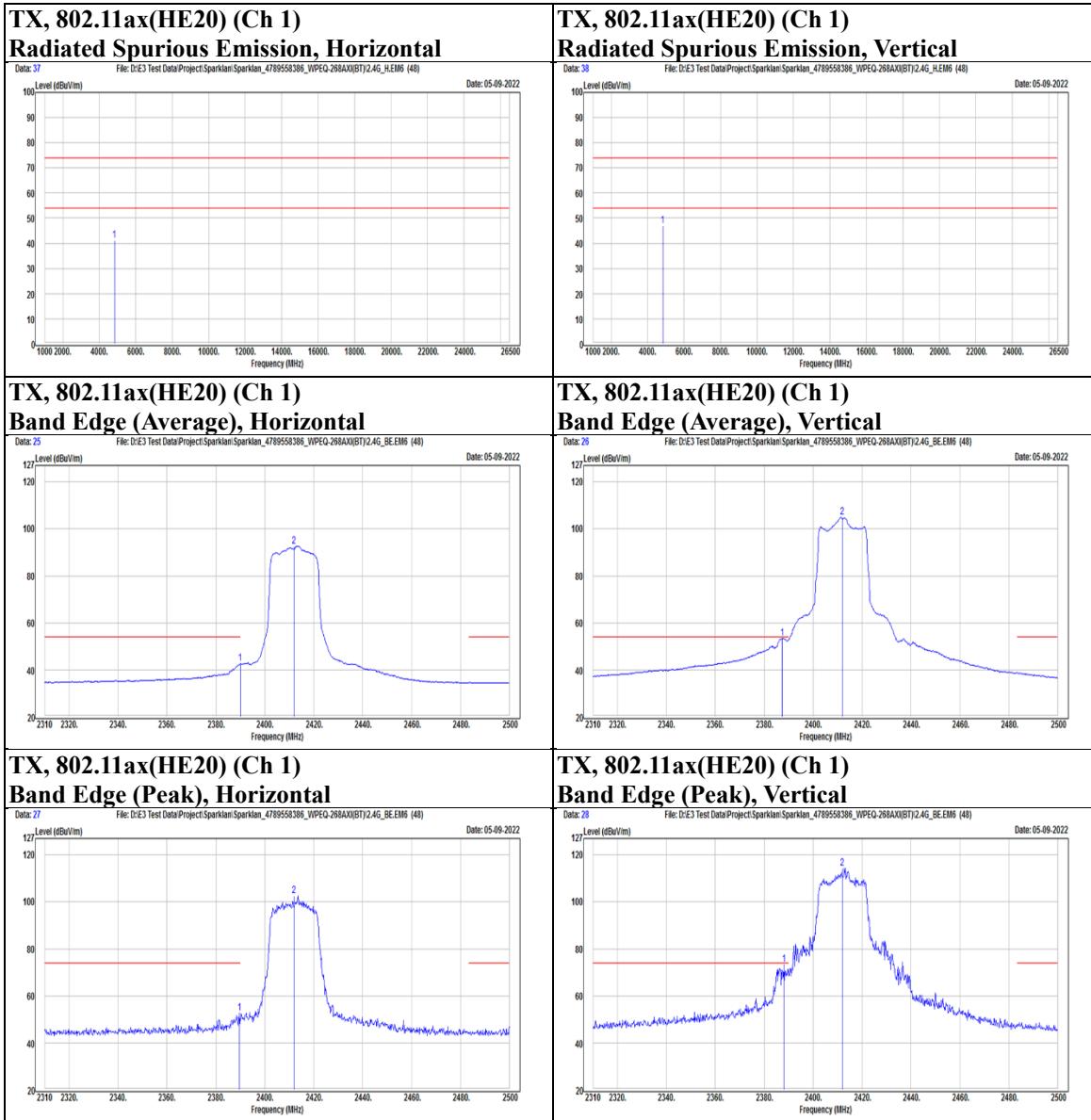
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Mode	802.11ax(HE20)	Channel	6
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2386.76	42.42	5.82	48.24	74	-25.76	PK
		2388.85	32.99	5.81	38.8	54	-15.2	AVG
	@	2437	99.03	5.92	104.95	N/A	N/A	PK
	@	2437	89.84	5.92	95.76	N/A	N/A	AVG
		2483.85	30.37	5.68	36.05	54	-17.95	AVG
		2484.42	42.4	5.68	48.08	74	-25.92	PK
	*	4874	38.72	2.4	41.12	74	-32.88	PK
Vertical		2381.44	51.8	5.83	57.63	74	-16.37	PK
		2389.99	42.02	5.82	47.84	54	-6.16	AVG
	@	2437	109.28	5.92	115.2	N/A	N/A	PK
	@	2437	100.43	5.92	106.35	N/A	N/A	AVG
		2484.99	41.9	5.67	47.57	54	-6.43	AVG
		2485.37	52.69	5.67	58.36	74	-15.64	PK
	*	4874	47.01	2.4	49.41	74	-24.59	PK

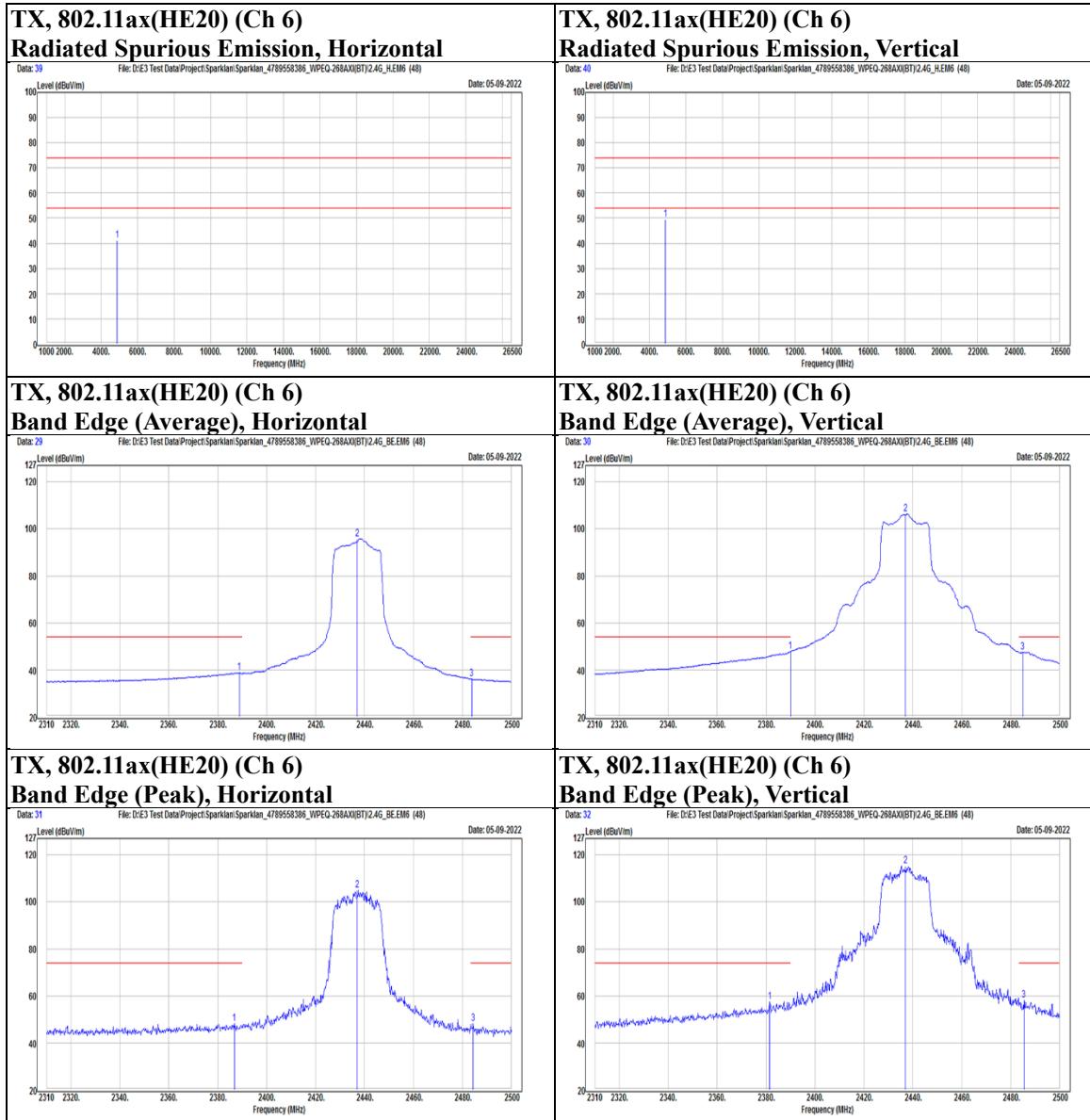
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Mode	802.11ax(HE20)	Channel	11
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2462	94.75	5.87	100.62	N/A	N/A	PK
	@	2462	84.66	5.87	90.53	N/A	N/A	AVG
		2483.66	32.47	5.68	38.15	54	-15.85	AVG
		2485.18	43.28	5.67	48.95	74	-25.05	PK
	*	4924	38.25	2.4	40.65	74	-33.35	PK
Vertical	@	2462	107.65	5.87	113.52	N/A	N/A	PK
	@	2462	98.44	5.87	104.31	N/A	N/A	AVG
		2483.66	47.69	5.68	53.37	54	-0.63	AVG
		2484.04	63.71	5.68	69.39	74	-4.61	PK
	*	4924	45.1	2.4	47.5	74	-26.5	PK

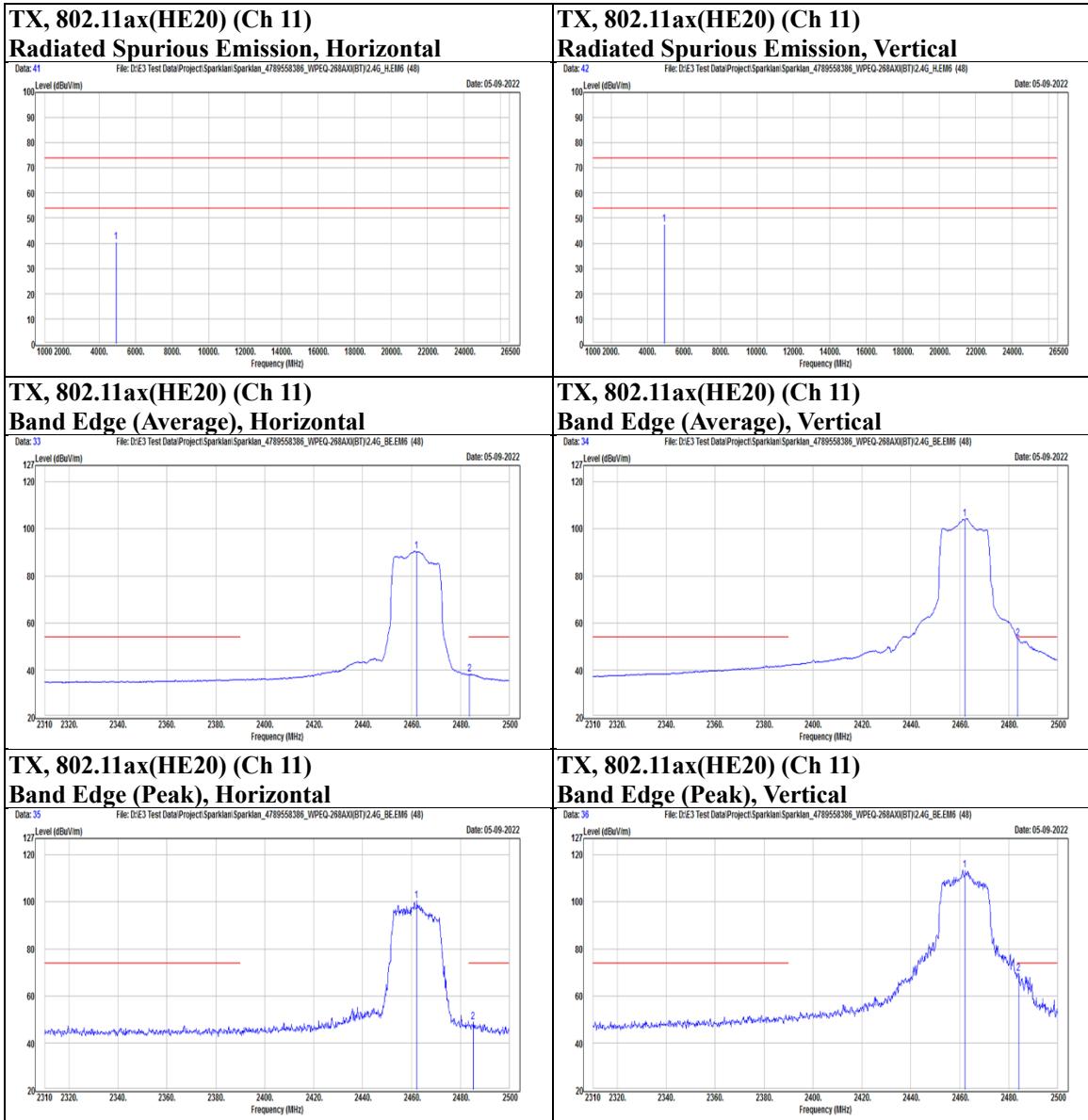
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Mode	802.11ax(HE40)	Channel	3
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2387.14	30.57	5.82	36.39	54	-17.61	AVG
		2387.71	43	5.82	48.82	74	-25.18	PK
	@	2422	92.95	5.86	98.81	N/A	N/A	PK
	@	2422	81.67	5.86	87.53	N/A	N/A	AVG
	*	4844	36.54	2.38	38.92	74	-35.08	PK
Vertical		2386.76	63.04	5.82	68.86	74	-5.14	PK
		2389.8	47.08	5.82	52.9	54	-1.1	AVG
	@	2422	103.78	5.86	109.64	N/A	N/A	PK
	@	2422	94.5	5.86	100.36	N/A	N/A	AVG
	*	4844	41.32	2.38	43.7	74	-30.3	PK

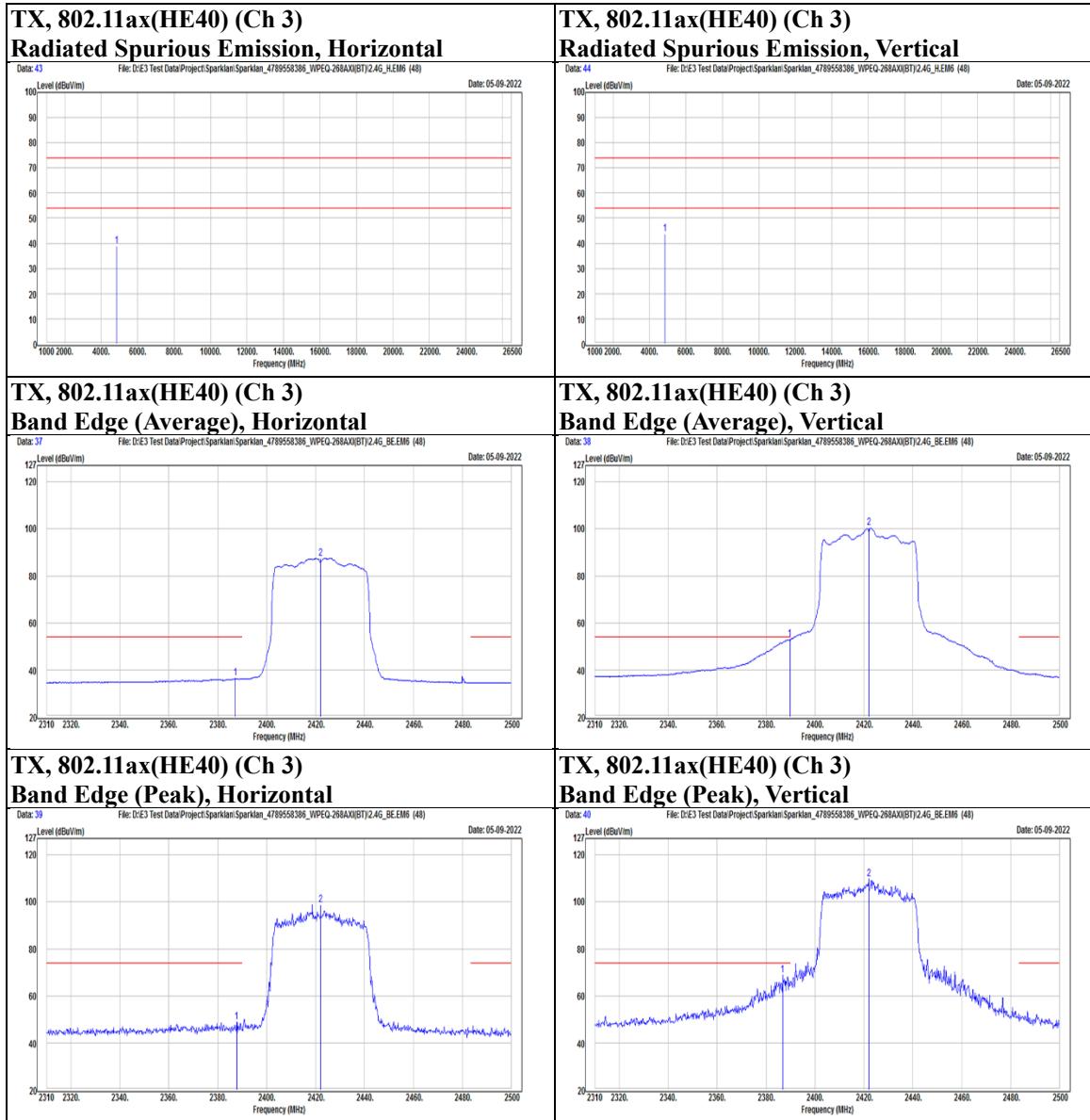
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Mode	802.11ax(HE40)	Channel	6
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2384.1	42.38	5.83	48.21	74	-25.79	PK
		2384.48	31.98	5.83	37.81	54	-16.19	AVG
	@	2437	91.22	5.92	97.14	N/A	N/A	PK
	@	2437	82.72	5.92	88.64	N/A	N/A	AVG
		2484.23	29.96	5.68	35.64	54	-18.36	AVG
		2486.13	40.46	5.67	46.13	74	-27.87	PK
	*	4874	36.88	2.4	39.28	74	-34.72	PK
Vertical		2389.61	57.58	5.82	63.4	74	-10.6	PK
		2389.99	46.42	5.82	52.24	54	-1.76	AVG
	@	2437	103.13	5.92	109.05	N/A	N/A	PK
	@	2437	94.76	5.92	100.68	N/A	N/A	AVG
		2483.66	57.11	5.68	62.79	74	-11.21	PK
		2483.66	46.56	5.68	52.24	54	-1.76	AVG
	*	4874	40.28	2.4	42.68	74	-31.32	PK

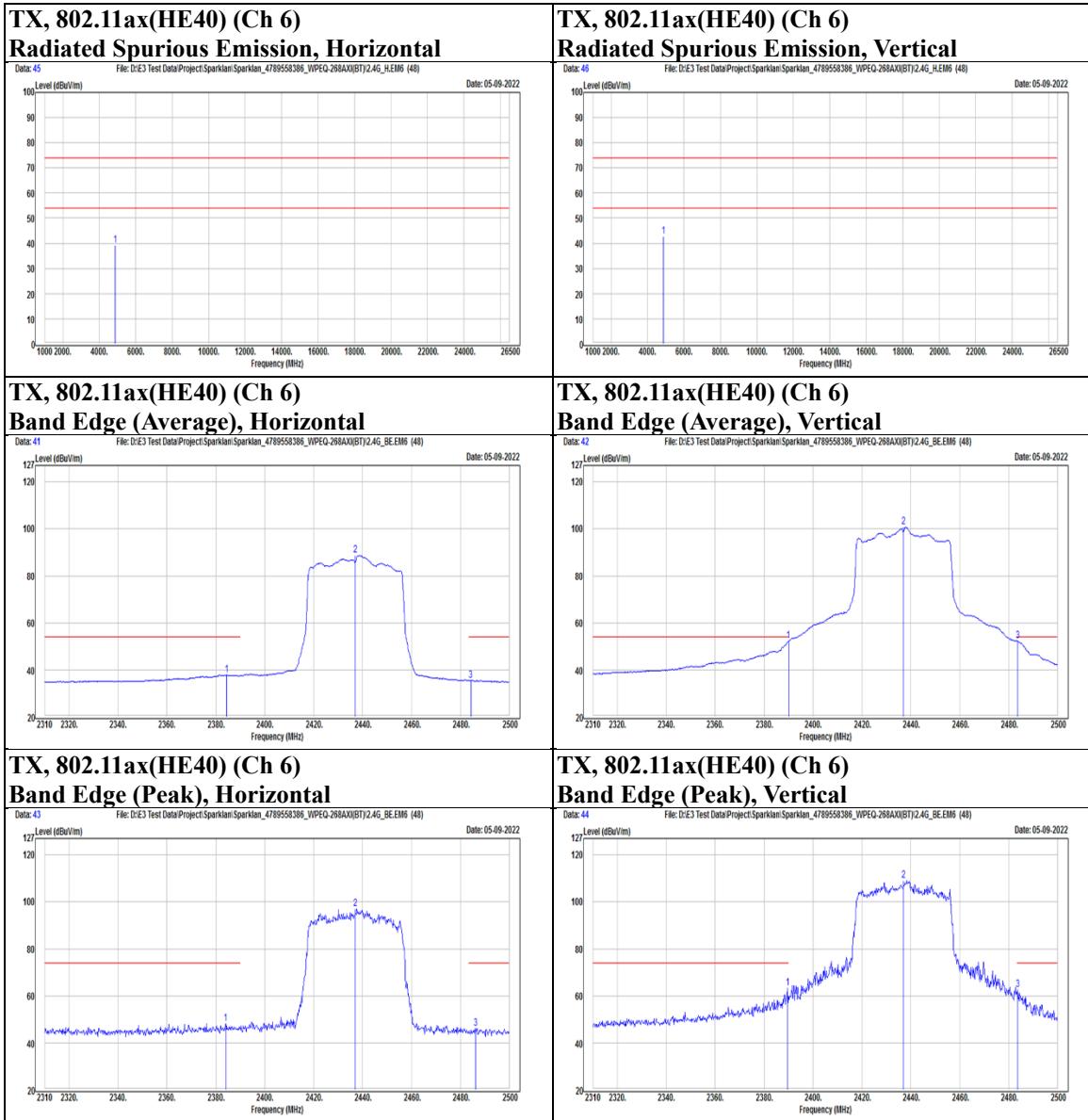
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Mode	802.11ax(HE40)	Channel	9
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2452	92.41	5.96	98.37	N/A	N/A	PK
	@	2452	81.57	5.96	87.53	N/A	N/A	AVG
		2487.65	30.6	5.65	36.25	54	-17.75	AVG
		2493.16	42.07	5.61	47.68	74	-26.32	PK
	*	4904	36.61	2.42	39.03	74	-34.97	PK
Vertical	@	2452	103.65	5.96	109.61	N/A	N/A	PK
	@	2452	94.39	5.96	100.35	N/A	N/A	AVG
		2484.42	47.32	5.68	53	54	-1	AVG
		2487.08	64.66	5.66	70.32	74	-3.68	PK
	*	4904	41.46	2.42	43.88	74	-30.12	PK

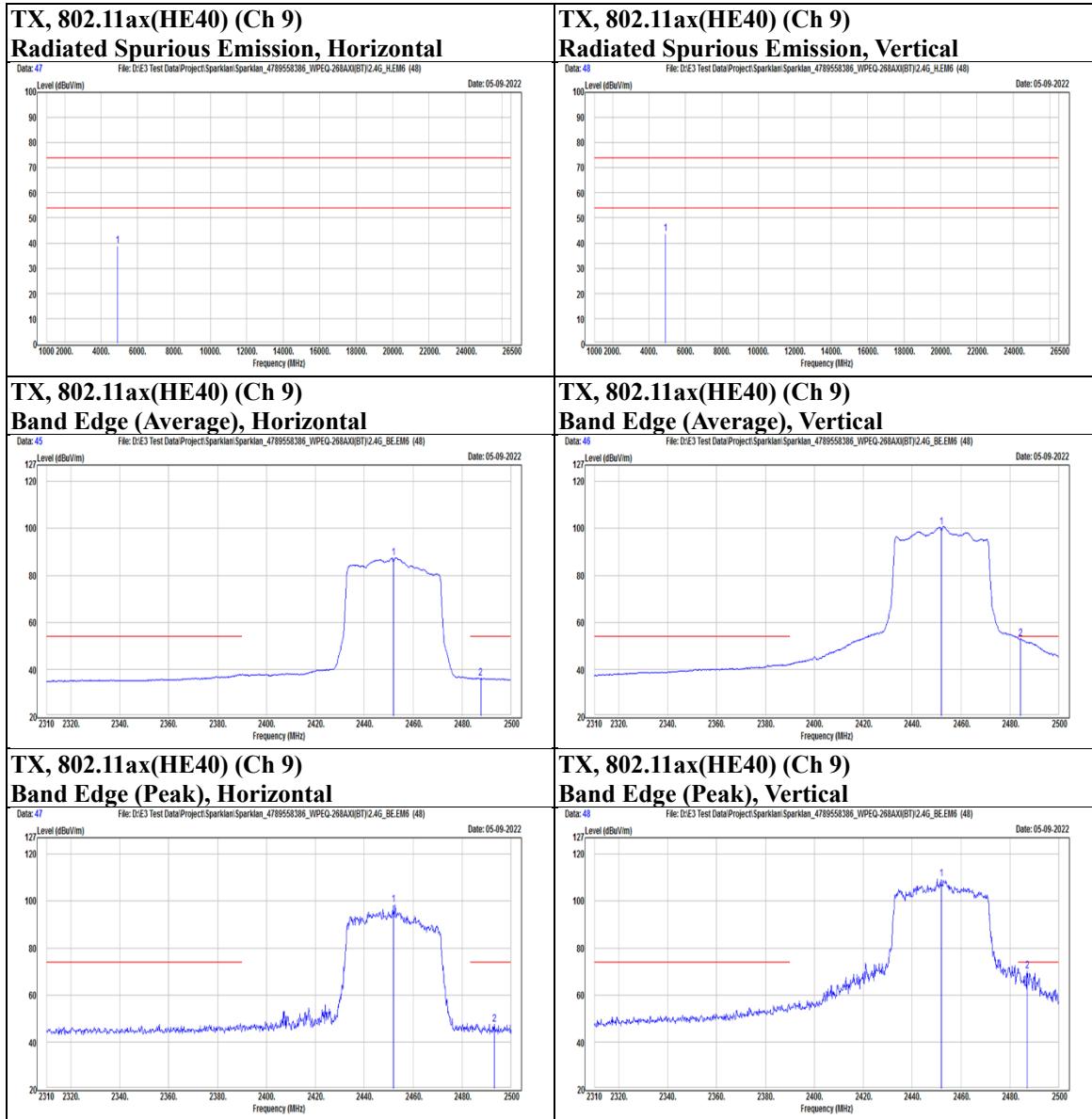
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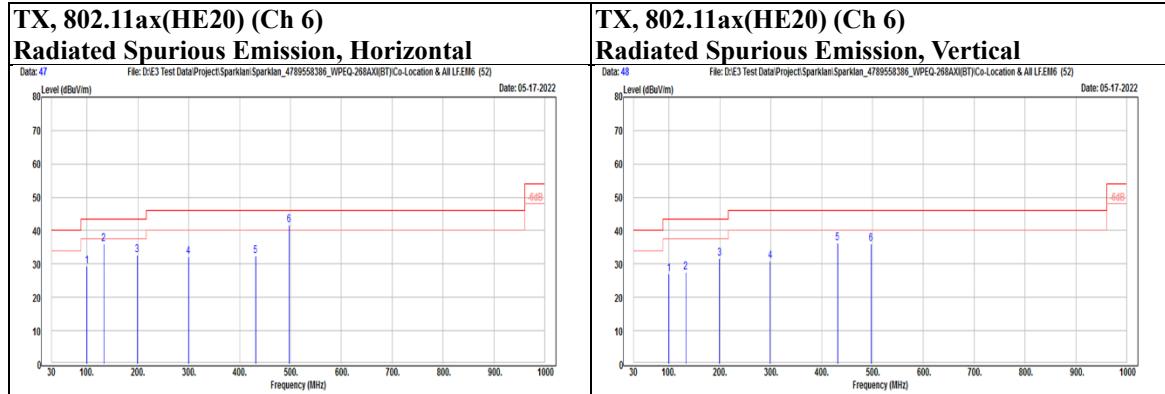
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Below 1 GHz

Mode	802.11ax(HE20)	Channel	6
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		99.84	45.76	-16.47	29.29	43.5	-14.21	PK
		132.82	48.88	-12.95	35.93	43.5	-7.57	PK
		198.78	46.7	-13.93	32.77	43.5	-10.73	QP
		299.66	42.05	-9.99	32.06	46	-13.94	PK
		431.58	38.57	-6.25	32.32	46	-13.68	PK
		497.54	46.51	-4.86	41.65	46	-4.35	PK
Vertical		99.84	43.57	-16.47	27.1	43.5	-16.4	PK
		132.82	40.47	-12.95	27.52	43.5	-15.98	PK
		199.75	45.71	-13.94	31.77	43.5	-11.73	PK
		298.69	40.83	-10.04	30.79	46	-15.21	PK
		431.58	42.51	-6.25	36.26	46	-9.74	PK
		497.54	40.9	-4.86	36.04	46	-9.96	QP



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9 kHz ~ 30 MHz Data:

For 9 kHz to 30 MHz radiated emission have performed all modes of operation were investigated. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

No non-compliance noted:

KDB 414788 D01 OATS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- OATs and chamber correlation testing had been performed and chamber measured test results is the worst case test result.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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9.6. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
3. Test data of Result value (dB μ V) = Reading value (dB μ V) + Correction Factor (dB).
4. Test data of Margin(dB) = Result value (dB μ V) - Limit value (dB μ V).
5. Test data of Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).

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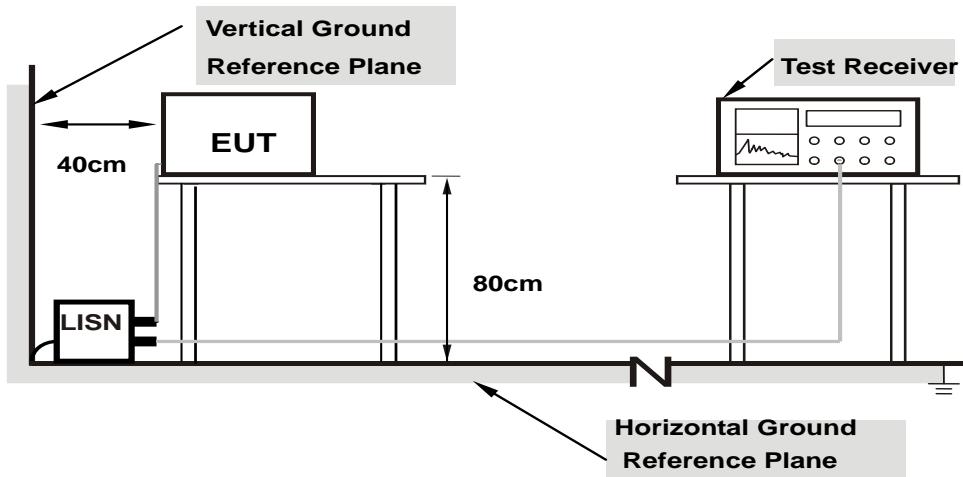
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Test Setup



Note: 1. Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

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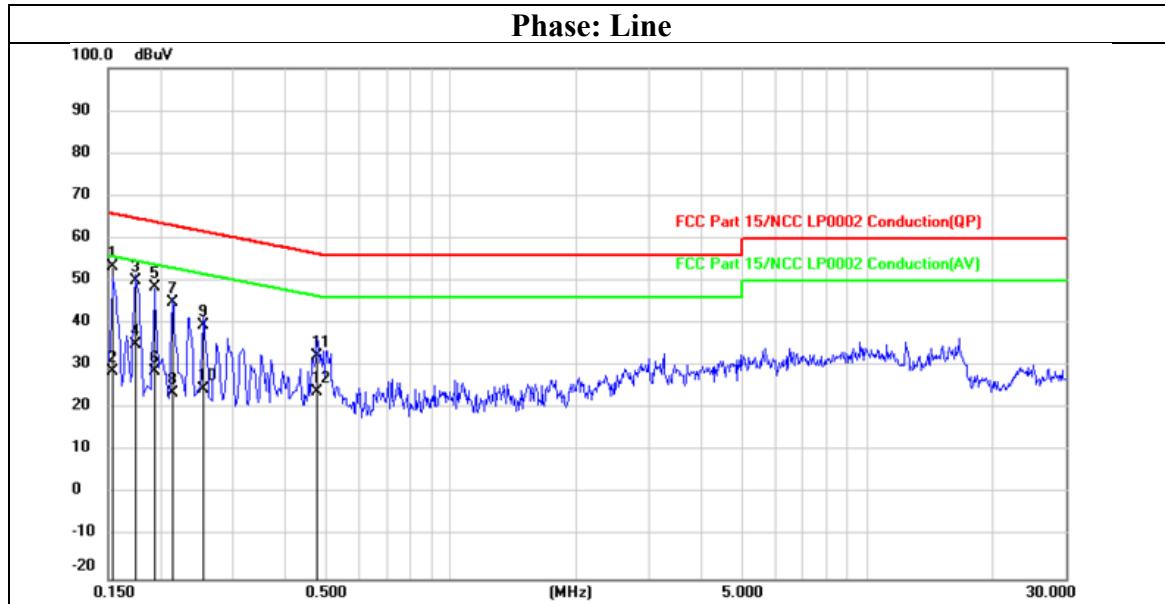
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Test Data

Mode	802.11ax(HE20) TX2437	Channel	6
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1539	33.72	19.51	53.23	65.79	-12.56	QP
2	0.1539	9.23	19.51	28.74	55.79	-27.05	AVG
3	0.1740	30.53	19.51	50.04	64.77	-14.73	QP
4	0.1740	15.66	19.51	35.17	54.77	-19.60	AVG
5	0.1940	28.91	19.51	48.42	63.86	-15.44	QP
6	0.1940	9.26	19.51	28.77	53.86	-25.09	AVG
7	0.2140	25.32	19.51	44.83	63.05	-18.22	QP
8	0.2140	4.09	19.51	23.60	53.05	-29.45	AVG
9	0.2540	20.03	19.51	39.54	61.63	-22.09	QP
10	0.2540	4.96	19.51	24.47	51.63	-27.16	AVG
11	0.4780	12.71	19.51	32.22	56.37	-24.15	QP
12	0.4780	4.58	19.51	24.09	46.37	-22.28	AVG

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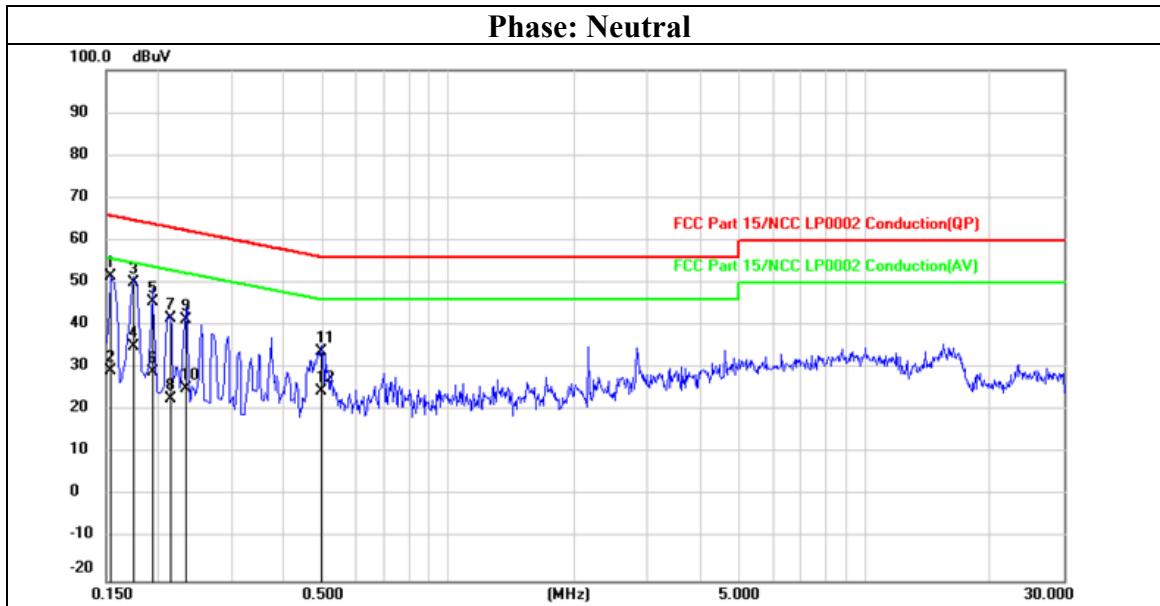
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1539	31.95	19.51	51.46	65.79	-14.33	QP
2	0.1539	9.74	19.51	29.25	55.79	-26.54	AVG
3	0.1740	30.45	19.51	49.96	64.77	-14.81	QP
4	0.1740	15.50	19.51	35.01	54.77	-19.76	AVG
5	0.1940	26.14	19.51	45.65	63.86	-18.21	QP
6	0.1940	9.45	19.51	28.96	53.86	-24.90	AVG
7	0.2140	22.15	19.51	41.66	63.05	-21.39	QP
8	0.2140	3.34	19.51	22.85	53.05	-30.20	AVG
9	0.2340	21.97	19.51	41.48	62.31	-20.83	QP
10	0.2340	5.62	19.51	25.13	52.31	-27.18	AVG
11	0.4940	14.27	19.51	33.78	56.10	-22.32	QP
12	0.4940	5.11	19.51	24.62	46.10	-21.48	AVG

END OF REPORT

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