

5.3 Output Power Measurement

5.3.1 Limit

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.2 Method of Measurement

Reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01: Section E.2.d) Method SA-2 (Trace averaging across on and off time of the EUT transmissions, followed by duty cycle correction)

The cable assembly insertion loss was entered as an offset in the spectrum analyzer to allow for direct reading of power.

5.3.3 Test Data for Output Power

5.3.3.1 Operating Mode: 802.11a

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11a (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 180	12.11	0.27	12.38	23.98	11.60	
Middle	5 220	12.26	0.27	12.53	23.98	11.45	
High	5 240	12.18	0.27	12.45	23.98	11.53	
Operating Mode: 802.11a (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 260	12.33	0.27	12.60	23.98	11.38	
Middle	5 300	12.47	0.27	12.74	23.98	11.24	
High	5 320	12.71	0.27	12.98	23.98	11.00	

Operating Mode: 802.11a (U-NII 2-C)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 500	12.60	0.27	12.87	23.98	11.11
Middle	5 560	12.33	0.27	12.60	23.98	11.38
High	5 700	11.93	0.27	12.20	23.98	11.78
Operating Mode: 802.11a (U-NII 3)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 745	7.20	0.27	7.47	30.00	22.53
Middle	5 785	6.44	0.27	6.71	30.00	23.29
High	5 825	5.80	0.27	6.07	30.00	23.93

NOTE. 1. Margin = Limit - Total Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.9387
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.27

5.3.3.2 Operating Mode: 802.11n HT20

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11n HT20 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 180	12.03	0.28	12.31	23.98	17.69	
Middle	5 220	12.23	0.28	12.51	23.98	17.49	
High	5 240	12.29	0.28	12.57	23.98	17.43	
Operating Mode: 802.11n HT20 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 260	12.23	0.28	12.51	23.98	17.49	
Middle	5 300	12.42	0.28	12.70	23.98	17.30	
High	5 320	12.52	0.28	12.80	23.98	17.20	
Operating Mode: 802.11n HT20 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 500	12.62	0.28	12.90	23.98	17.10	
Middle	5 560	12.29	0.28	12.57	23.98	11.41	
High	5 700	11.95	0.28	12.23	23.98	17.77	
Operating Mode: 802.11n HT20 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 745	7.00	0.28	7.28	30.00	22.72	
Middle	5 785	6.24	0.28	6.52	30.00	23.48	
High	5 825	5.68	0.28	5.96	30.00	24.04	

NOTE. 1. Margin = Limit - Total Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.9366
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.28

5.3.3.3 Operating Mode: 802.11n HT40

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11n HT40 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 190	7.26	0.57	7.83	23.98	16.15	
High	5 230	7.34	0.57	7.91	23.98	16.07	
Operating Mode: 802.11n HT40 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 270	7.14	0.57	7.71	23.98	16.27	
High	5 310	7.38	0.57	7.95	23.98	16.03	
Operating Mode: 802.11n HT40 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 510	9.07	0.57	9.64	23.98	14.34	
Middle	5 550	8.53	0.57	9.10	23.98	14.88	
High	5 670	7.98	0.57	8.55	23.98	15.43	
Operating Mode: 802.11n HT40 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Low	5 755	4.71	0.57	5.28	30.00	24.72	
High	5 795	4.19	0.57	4.76	30.00	25.24	

- NOTE. 1. Margin = Limit - Total Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.8773
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.57

5.3.3.4 Operating Mode: 802.11ac VHT20

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C
				Relative humidity		(50.0 ± 3.0) % R.H.
Test Result		PASS		Tested by		In-yong Song
Operating Mode: 802.11ac VHT20 (U-NII 1)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 180	12.11	0.28	12.39	23.98	11.59
Middle	5 220	12.25	0.28	12.53	23.98	11.45
High	5 240	12.23	0.28	12.51	23.98	11.47
Operating Mode: 802.11ac VHT20 (U-NII 2-A)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 260	12.31	0.28	12.59	23.98	11.39
Middle	5 300	12.45	0.28	12.73	23.98	11.25
High	5 320	12.53	0.28	12.81	23.98	11.17
Operating Mode: 802.11ac VHT20 (U-NII 2-C)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 500	12.63	0.28	12.91	23.98	11.07
Middle	5 560	12.39	0.28	12.67	23.98	11.31
High	5 700	11.96	0.28	12.24	23.98	11.74
Operating Mode: 802.11ac VHT20 (U-NII 3)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 745	6.96	0.28	7.24	30.00	22.76
Middle	5 785	6.24	0.28	6.52	30.00	23.48
High	5 825	5.67	0.28	5.95	30.00	24.05

NOTE. 1. Margin = Limit - Total Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.9366
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.28

5.3.3.5 Operating Mode: 802.11ac VHT40

5.3.3 Operating Mode: 802.11ac VHT40

Date of Test	2020.04.09 – 2020.04.10	Temperature	(23.0 ± 1.0) °C			
		Relative humidity	(50.0 ± 3.0) % R.H.			
Test Result	PASS	Tested by	In-yong Song			
Operating Mode: 802.11ac VHT40 (U-NII 1)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 190	7.27	0.55	7.82	23.98	16.16
Middle	5 230	7.33	0.55	7.88	23.98	16.10
Operating Mode: 802.11ac VHT40 (U-NII 2-A)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 270	7.16	0.55	7.71	23.98	16.27
High	5 310	7.49	0.55	8.04	23.98	15.94
Operating Mode: 802.11ac VHT40 (U-NII 2-C)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 510	9.04	0.55	9.59	23.98	14.39
Middle	5 550	8.57	0.55	9.12	23.98	14.86
High	5 670	8.02	0.55	8.57	23.98	15.41
Operating Mode: 802.11ac VHT40 (U-NII 3)						
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5 755	4.71	0.55	5.26	30.00	24.74
High	5 795	4.20	0.55	4.75	30.00	25.25

- NOTE. 1. Margin = Limit - Total Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.8809
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.55

5.3.3.6 Operating Mode: 802.11ac VHT80

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11ac VHT80 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Middle	5 210	6.84	1.09	7.93	23.98	16.05	
Operating Mode: 802.11ac VHT80 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Middle	5 290	7.63	1.09	8.72	23.98	15.26	
Operating Mode: 802.11ac VHT80 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Middle	5 530	4.82	1.09	5.91	23.98	18.07	
Operating Mode: 802.11ac VHT80 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
Middle	5 775	4.56	1.09	5.65	30.00	24.35	

NOTE. 1. Margin = Limit - Total Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.7775
 4. Duty factor ($10 \cdot \log(1/x)$) : 1.09

5.3.3.7 Operating Mode: Straddle channel

Date of Test	2020.04.10	Temperature	(23.0 ± 1.0) °C			
		Relative humidity	(50.0 ± 3.0) % R.H.			
Test Result	PASS	Tested by	In-yong Song			
Operating Mode: 802.11a ((U-NII 2-C & 3 Band))						
Frequency Range (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
5 470 – 5 725	10.53	0.27	10.80	23.98	13.18	
5 725 – 5 850	4.47	0.27	4.74	30.00	25.26	
Operating Mode: 802.11n HT20 ((U-NII 2-C & 3 Band))						
Frequency Range (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
5 470 – 5 725	10.32	0.28	10.60	23.98	13.38	
5 725 – 5 850	4.79	0.28	5.07	30.00	24.93	
Operating Mode: 802.11n HT40 ((U-NII 2-C & 3 Band))						
Frequency Range (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
5 470 – 5 725	7.57	0.57	8.14	23.98	15.84	
5 725 – 5 850	-3.08	0.57	-2.51	30.00	32.51	
Operating Mode: 802.11ac VHT20 ((U-NII 2-C & 3 Band))						
Frequency Range (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
5 470 – 5 725	10.30	0.28	10.58	23.98	13.40	
5 725 – 5 850	4.69	0.28	4.97	30.00	25.03	
Operating Mode: 802.11ac VHT40 (U-NII 2-C & 3 Band)						
Frequency Range (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
5 470 – 5 725	7.53	0.55	8.08	23.98	15.90	
5 725 – 5 850	-3.14	0.55	-2.59	30.00	32.59	
Operating Mode: 802.11ac VHT80 (U-NII 2-C & 3 Band)						
Frequency Range (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)	
5 470 – 5 725	3.92	1.09	5.01	23.98	18.97	
5 725 – 5 850	-11.24	1.09	-10.15	30.00	40.15	

NOTE. 1. Margin = Limit - Total Power
2. Total Power = Measured value + Duty factor

5.4 Power Spectral Density

5.4.1 Limit

For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.4.2 Method of Measurement

Reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01: Section F Maximum Power Spectral Density.

5.4.3 Test Data – Operating Mode: 802.11a

5.4.3.1 Tabulated Test Data - Operating Mode: 802.11a

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11a (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 180	0.04	0.27	0.31	11.00	10.69	
Middle	5 220	0.62	0.27	0.89	11.00	10.11	
High	5 240	0.48	0.27	0.75	11.00	10.25	
Operating Mode: 802.11a (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 260	0.69	0.27	0.96	11.00	10.04	
Middle	5 300	0.85	0.27	1.12	11.00	9.88	
High	5 320	0.93	0.27	1.20	11.00	9.80	

NOTE. 1. Margin = Limit - Total PSD power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.9387
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.27

Operating Mode: 802.11a (U-NII 2-C)						
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Low	5 500	1.14	0.27	1.41	11.00	9.59
Middle	5 560	0.78	0.27	1.05	11.00	9.95
High	5 700	0.32	0.27	0.59	11.00	10.41
Operating Mode: 802.11a (U-NII 3)						
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Low	5 745	-4.46	0.27	-4.19	30.00	34.19
Middle	5 785	-5.19	0.27	-4.92	30.00	34.92
High	5 825	-5.67	0.27	-5.40	30.00	35.40

NOTE. 1. Margin = Limit - Total PSD power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.9387
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.27

5.4.4 Test Data – Operating Mode: 802.11n HT20

5.4.4.1 Tabulated Test Data - Operating Mode: 802.11n HT20

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11n HT20 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 180	-0.13	0.28	0.15	11.00	10.85	
Middle	5 220	0.43	0.28	0.71	11.00	10.29	
High	5 240	0.36	0.28	0.64	11.00	10.36	
Operating Mode: 802.11n HT20 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 260	0.59	0.28	0.87	11.00	10.13	
Middle	5 300	0.58	0.28	0.86	11.00	10.14	
High	5 320	0.53	0.28	0.81	11.00	10.19	
Operating Mode: 802.11n HT20 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 500	1.01	0.28	1.29	11.00	9.71	
Middle	5 560	1.16	0.28	1.44	11.00	9.56	
High	5 700	-0.02	0.28	0.26	11.00	10.74	
Operating Mode: 802.11n HT20 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 745	-4.72	0.28	-4.44	30.00	34.44	
Middle	5 785	-5.54	0.28	-5.26	30.00	35.26	
High	5 825	-5.89	0.28	-5.61	30.00	35.61	

NOTE. 1. Margin = Limit - Total PSD Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.9366
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.28

5.4.5 Test Data – Operating Mode: 802.11n HT40

5.4.5.1 Tabulated Test Data - Operating Mode: 802.11n HT40

Date of Test		2020.04.09 -2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11n HT40 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 190	-7.93	0.57	-7.36	11.00	18.36	
Middle	5 230	-7.19	0.57	-6.62	11.00	17.62	
Operating Mode: 802.11n HT40 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 270	-7.49	0.57	-6.92	11.00	17.92	
High	5 310	-7.43	0.57	-6.86	11.00	17.86	
Operating Mode: 802.11n HT40 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 510	-5.61	0.57	-5.04	11.00	16.04	
Middle	5 550	-6.03	0.57	-5.46	11.00	16.46	
High	5 670	-6.69	0.57	-6.12	11.00	17.12	
Operating Mode: 802.11n HT40 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 755	-9.92	0.57	-9.35	30.00	39.35	
High	5 795	-10.68	0.57	-10.11	30.00	40.11	

- NOTE. 1. Margin = Limit - Total PSD Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.8773
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.57

5.4.6 Test Data – Operating Mode: 802.11ac VHT20

5.4.6.1 Tabulated Test Data - Operating Mode: 802.11ac VHT20

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11ac VHT20 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 180	-0.16	0.28	0.12	11.00	10.88	
Middle	5 220	0.48	0.28	0.76	11.00	10.24	
High	5 240	0.44	0.28	0.72	11.00	10.28	
Operating Mode: 802.11ac VHT20 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 260	0.47	0.28	0.75	11.00	10.25	
Middle	5 300	0.61	0.28	0.89	11.00	10.11	
High	5 320	0.62	0.28	0.90	11.00	10.10	
Operating Mode: 802.11ac VHT20 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 500	0.82	0.28	1.10	11.00	9.90	
Middle	5 560	0.60	0.28	0.88	11.00	10.12	
High	5 700	0.03	0.28	0.31	11.00	10.69	
Operating Mode: 802.11ac VHT20 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 745	-4.71	0.28	-4.43	30.00	34.43	
Middle	5 785	-5.39	0.28	-5.11	30.00	35.11	
High	5 825	-5.99	0.28	-5.71	30.00	35.71	

NOTE. 1. Margin = Limit - Total PSD Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.9366
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.28

5.4.7 Test Data – Operating Mode: 802.11ac VHT40

5.4.7.1 Tabulated Test Data - Operating Mode: 802.11ac VHT40

Date of Test		2020.04.09 – 2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11ac VHT40 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 190	-7.87	0.55	-7.32	11.00	18.32	
Middle	5 230	-7.31	0.55	-6.76	11.00	17.76	
Operating Mode: 802.11ac VHT40 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 270	-7.46	0.55	-6.91	11.00	17.91	
High	5 310	-7.45	0.55	-6.90	11.00	17.90	
Operating Mode: 802.11ac VHT40 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 510	-5.54	0.55	-4.99	11.00	15.99	
Middle	5 550	-6.02	0.55	-5.47	11.00	16.47	
High	5 670	-6.87	0.55	-6.32	11.00	17.32	
Operating Mode: 802.11ac VHT40 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Low	5 755	-9.94	0.55	-9.39	30.00	39.39	
High	5 795	-10.64	0.55	-10.09	30.00	40.09	

- NOTE. 1. Margin = Limit - Total PSD Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.8809
 4. Duty factor ($10 \cdot \log(1/x)$) : 0.55

5.4.8 Test Data – Operating Mode: 802.11ac VHT80

5.4.8.1 Tabulated Test Data - Operating Mode: 802.11ac VHT80

Date of Test		2020.04.09 -2020.04.10		Temperature		(23.0 ± 1.0) °C	
				Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result		PASS		Tested by		In-yong Song	
Operating Mode: 802.11ac VHT40 (U-NII 1)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Middle	5 210	-11.27	1.09	-10.18	11.00	21.18	
Operating Mode: 802.11ac VHT40 (U-NII 2-A)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Middle	5 290	-10.28	1.09	-9.19	11.00	20.19	
Operating Mode: 802.11ac VHT40 (U-NII 2-C)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Middle	5 530	-12.65	1.09	-11.56	11.00	22.56	
Operating Mode: 802.11ac VHT40 (U-NII 3)							
Channel	Frequency (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	
Middle	5 775	-13.05	1.09	-11.96	30.00	41.96	

NOTE. 1. Margin = Limit - Total PSD Power
 2. Total Power = Measured value + Duty factor
 3. Duty cycle(x) : 0.7775
 4. Duty factor ($10 \cdot \log(1/x)$) : 1.09

5.4.9 Test Data – Operating Mode: Straddle Channel

Date of Test	2020.04.10	Temperature		(23.0 ± 1.0) °C	
		Relative humidity		(50.0 ± 3.0) % R.H.	
Test Result	PASS	Tested by		In-yong Song	
Operating Mode: 802.11a (U-NII 2-C & 3 Band)					
Frequency Range (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5 470 – 5 725	0.58	0.27	0.85	11.00	10.15
5 725 – 5 850	0.31	0.27	0.58	30.00	29.42
Operating Mode: 802.11n HT20 (U-NII 2-C & 3 Band)					
Frequency Range (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5 470 – 5 725	-0.43	0.28	-0.15	11.00	11.15
5 725 – 5 850	-0.76	0.28	-0.48	30.00	30.48
Operating Mode: 802.11n HT40 (U-NII 2-C & 3 Band)					
Frequency Range (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5 470 – 5 725	-6.45	0.57	-5.88	11.00	16.88
5 725 – 5 850	-7.38	0.57	-6.81	30.00	36.81
Operating Mode: 802.11ac VHT20 (U-NII 2-C & 3 Band)					
Frequency Range (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5 470 – 5 725	-0.33	0.28	-0.05	11.00	11.05
5 725 – 5 850	-0.67	0.28	-0.39	30.00	30.39
Operating Mode: 802.11ac VHT40 (U-NII 2-C & 3 Band)					
Frequency Range (MHz)	Measured Value (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5 470 – 5 725	-6.74	0.55	-6.19	11.00	17.19
5 725 – 5 850	-7.48	0.55	-6.93	30.00	36.93
Operating Mode: 802.11ac VHT80 (U-NII 2-C & 3 Band)					
Frequency Range (MHz)	Measured Value (dBm)	Duty Factor	Total Power (dBm)	Limit (dBm)	Margin (dB)
5 470 – 5 725	-14.03	1.09	-12.94	11.00	23.94
5 725 – 5 850	-15.72	1.09	-14.63	30.00	44.63

NOTE. 1. Margin = Limit - Total Power
2. Total Power = Measured value + Duty factor

5.5 FREQUENCY STABILITY

5.5.1 Limit

Acc. to section 15.407(g),

Measurements of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

5.5.2 Method of Measurement

5.5.2.1 Frequency Stability Under Temperature Variation.

The EUT was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a spectrum analyzer. the EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency deviation and measure the operating or fundamental frequency of the EUT at 20 °C.

Turn the EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes record the frequency. Repeat step measure with 10 °C decreased per stage until the lowest temperature reached.

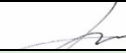
5.5.2.2 Frequency Stability Under Voltage Variations.

Set chamber temperature to 20 °C. Use a variable AC or DC power supply to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer low enough to obtain the desired frequency resolution and record the frequency.

Reduce the input voltage to specify extreme voltage variation $\pm 15\%$ and end point and record the maximum frequency variation.

Reference to KDB 558074 D01 DTS Meas Guidance v05r02: 8.5 Emissions in non-restricted frequency bands. The transmitter output is connected to a spectrum analyzer with the RBW set to 100 kHz, VBW $\geq 3 \times$ RBW, peak detector and max hold. Measurements utilizing these settings are made of the in-band reference level, band-edge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

5.5.3 Test Data

Date of Test		2020.04.16	Temperature		(25.2 ± 2.8) °C
			Relative humidity		(37.9 ± 6.8) % R.H.
Test Result		PASS	Tested by		In-yong Song 
Operating Mode: 802.11a, U-NII 1 Band					
Voltage (%)	Input Voltage (DC)	Temperature (°C)	Frequency (Hz)	Freq. Devi. (Hz)	Deviation (%)
100	3.3 V	-20	5 220.042 497	42 497	0.000 8
		-10	5 220.045 205	45 205	0.000 9
		0	5 220.040 615	40 615	0.000 8
		+10	5 220.030 291	30 291	0.000 6
		+20	5 220.019 090	19 090	0.000 4
		+30	5 220.010 483	10 483	0.000 2
		+40	5 220.006 877	6 877	0.000 1
		+50	5 220.012 194	12 194	0.000 2
115	3.86 V	+20	5 220.019 078	19 078	0.000 4
85	2.80 V	+20	5 220.019 112	19 112	0.000 4
Operating Mode: 802.11a, U-NII 2-A Band					
Voltage (%)	Input Voltage (DC)	Temperature (°C)	Frequency (Hz)	Freq. Devi. (Hz)	Deviation (%)
100	3.3 V	-20	5 300.043 118	43 118	0.000 8
		-10	5 300.045 781	45 781	0.000 9
		0	5 300.041 103	41 103	0.000 8
		+10	5 300.030 456	30 456	0.000 6
		+20	5 300.019 231	19 231	0.000 4
		+30	5 300.010 524	10 524	0.000 2
		+40	5 300.006 904	6 904	0.000 1
		+50	5 300.012 266	12 266	0.000 2
115	3.86 V	+20	5 300.019 221	19 221	0.000 4
85	2.80 V	+20	5 300.019 228	19 228	0.000 4

Operating Mode: 802.11a, U-NII 2-C Band					
Voltage (%)	Input Voltage (DC)	Temperature (°C)	Frequency (Hz)	Freq. Devi. (Hz)	Deviation (%)
100	3.3 V	-20	5 600.046 069	46 069	0.000 8
		-10	5 600.048 450	48 450	0.000 9
		0	5 600.043 239	43 239	0.000 8
		+10	5 600.031 943	31 943	0.000 6
		+20	5 600.020 286	20 286	0.000 4
		+30	5 600.011 143	11 143	0.000 2
		+40	5 600.007 438	7 438	0.000 1
		+50	5 600.013 295	13 295	0.000 2
115	3.86 V	+20	5 600.020 180	20 180	0.000 4
85	2.80 V	+20	5 600.020 068	20 068	0.000 4
Operating Mode: 802.11a, U-NII 3 Band					
Voltage (%)	Input Voltage (DC)	Temperature (°C)	Frequency (Hz)	Freq. Devi. (Hz)	Deviation (%)
100	3.3 V	-20	5 785.047 808	47 808	0.000 8
		-10	5 785.049 989	49 989	0.000 9
		0	5 785.044 048	44 048	0.000 8
		+10	5 785.032 851	32 851	0.000 6
		+20	5 785.020 506	20 506	0.000 4
		+30	5 785.011 203	11 203	0.000 2
		+40	5 785.007 553	7 553	0.000 1
		+50	5 785.013 842	13 842	0.000 2
115	3.86 V	+20	5 785.020 418	20 418	0.000 4
85	2.80 V	+20	5 785.020 470	20 470	0.000 4

5.6 Undesirable Emission

5.6.1 Limit

Acc. To section 15.205, 15.209, RSS-GEN 8.9, following table shall be applied.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 – 88	100	40
88 – 216	150	43.5
216 – 960	200	46
Above 960	500	24

Acc. To section 15.407(b)(1) and (b)(4)(i):

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

NOTE: Emission Level (dBuV/m) = EIRP Level (dBm) - 95.2 @ 3 m measurement distance

Ex) 68.2 dBuV/m = -27 dBm/MHz and 105.2 dBuV/m = 10 dBm/MHz and 110.8 dBuV/m = 15.6 dBm/MHz, 122.2 dBuV/m = 27 dBm/MHz

5.6.2 Method of Measurement

Reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section G.3 General Requirement for Unwanted Emissions Measurements.

The radiated emissions measurements were on 3 m, semi-anechoic chamber. The EUT and other support equipment were placed on a non-conductive table 80 cm for below 1 GHz and 1.5 m for above 1 GHz above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 40 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

For measurement below 1 GHz, the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For peak emission measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth

is set to 3 MHz and for average measurement, resolution bandwidth is set to 1 MHz; and the video bandwidth is set to 3 MHz, when duty cycle is more than 98 %. If duty cycle is less than 98 %, the video bandwidth is set to $\geq 1/T$, where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

5.6.3 Test Site Requirement for KDB 414788 D01

Acc. to KDB 414788 D01 Radiated Test Site v01, Semi Anechoic Chamber (SAC) shall be verified test results below 30 MHz with Open Area Test Site (OATS), so we compared test results between the measurements from our SAC and an OATS and found test results almost same, so we **declare test result for below 30 MHz from our SAC is valid and met the requirement acc. to KDB 414788 D01 Radiated Test Site v01.**

5.6.4 Measurement Uncertainty

Measurement uncertainties were not taken into account and following uncertainty levels have been estimated for tests performed on the apparatus. The measurement uncertainties are given with at least 95 % confidence.

Frequency Range	Uncertainty	Frequency Range	Uncertainty
9 kHz ~ 30 MHz	± 2.6 dB	30 MHz ~ 1 GHz	± 4.4 dB
1 GHz ~ 18 GHz	± 5.0 dB	18 GHz ~40 GHz	± 5.2 dB

5.6.5 Sample Calculated Example

At 80 MHz

Limit = 40.0 dBuV/m

Result (dBuV/m)

= Receiver Reading (dBuV) + Antenna Factor (dB/m) - Pre-amplifier Gain (dB) + Cable Loss (dB) = 30

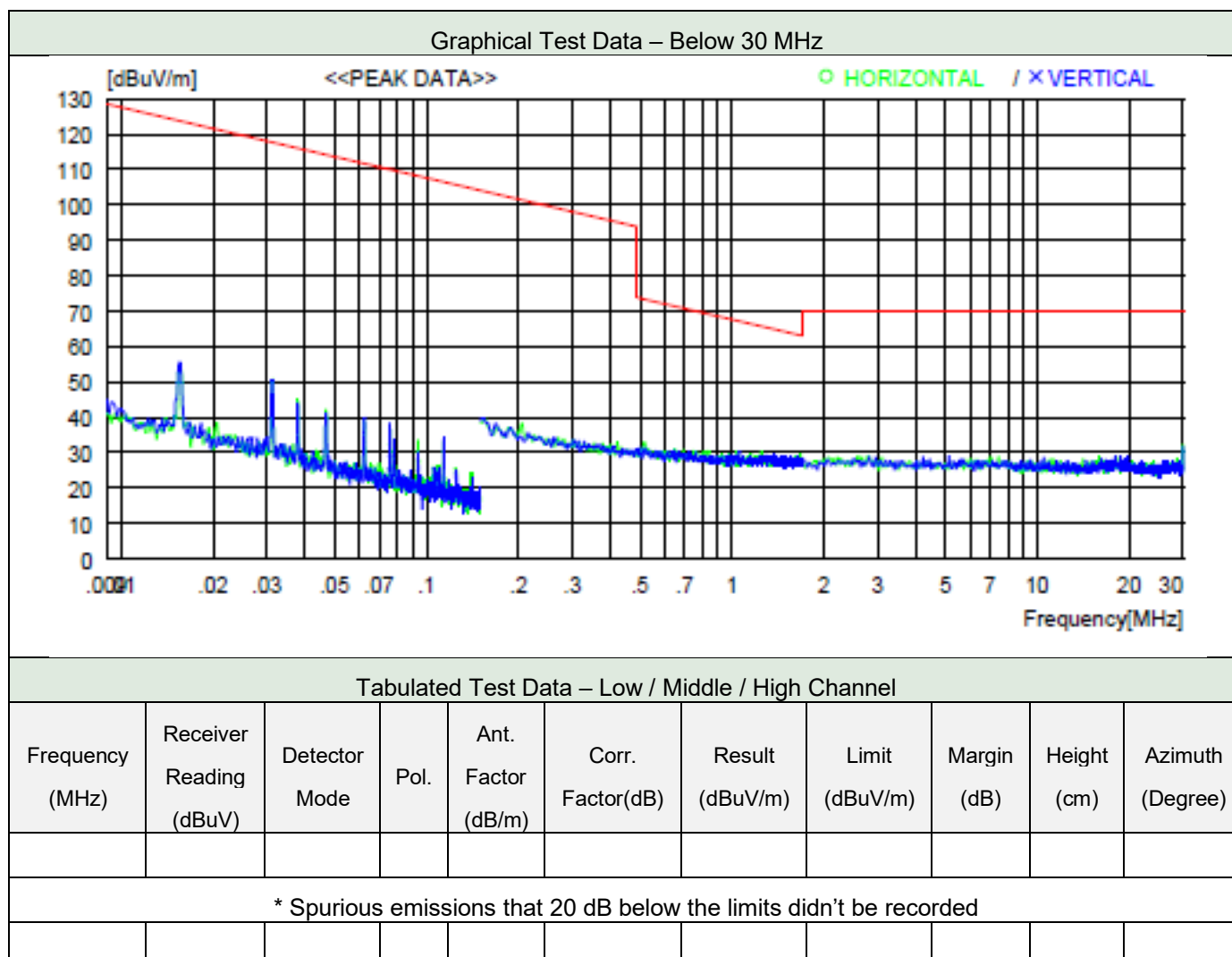
Margin = Limit – Result = 40 – 30 = 10

so the EUT has 10.0 dB margin at 80 MHz

5.6.6 Radiated Spurious Emission Test Data

Date of Test	2020.03.24 2020.03.25	–	Temperature	(20.0 ± 1.5) °C	
			Relative humidity	(39.5 ± 0.8) % R.H.	
Measurement Frequency Range			9 kHz ~ 40 GHz		
Test Result	PASS		Tested By		Do-heon Kim 
Frequency range	Detector Mode	Resolution BW	Video BW	Video Filtering	Measurement distance
Below 30 MHz	Peak or Q.P.	9 kHz	100 kHz	-	3 m
30 MHz ~ 1 000 MHz	Peak or Q.P.	100 kHz	300 kHz	-	3 m
Above 1 GHz	Peak	1 MHz	3 MHz		3 m
	Average	1 MHz	3 MHz		3 m

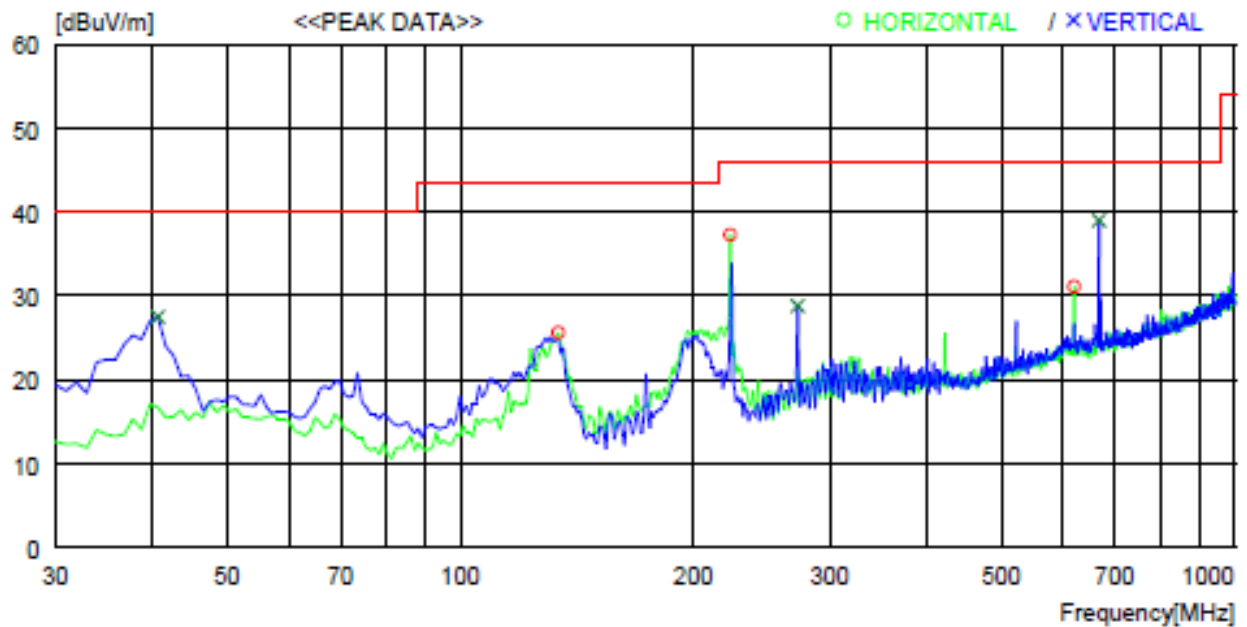
5.6.6.1 Test Data below 30 MHz



5.6.6.2 Test Data from 30 MHz to 1 GHz

5.6.6.2.1 Operating mode: 802.11a (CH. 36)

Graphical Test Data – Below 1 GHz – **Low Channel (Peak)**



No.	FREQ [MHz]	READING [dBuV]	ANT PEAK FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	133.790	41.4	8.4	8.4	32.6	25.6	43.5	17.9	200	190
2	223.030	49.1	11.7	9.1	32.6	37.3	46.0	8.7	200	359
3	619.757	33.2	19.5	11.4	33.0	31.1	46.0	14.9	200	252
----- Vertical -----										
4	40.670	39.7	13.3	7.2	32.7	27.5	40.0	12.5	100	200
5	272.500	39.2	12.8	9.4	32.6	28.8	46.0	17.2	100	146
6	667.286	40.7	19.7	11.6	33.0	39.0	46.0	7	200	359

Note: 1 Only the worst data plots were reported for radiated undesirable emissions.

2. "H" means Horizontal polarity, "V" means Vertical polarity.

5.6.6.3 Test Data for Harmonic & Spurious emission (1 GHz to 18 GHz)

5.6.6.3.1 Operating mode: 802.11a (UNII 1 Band)

Worst case: 802.1a (UNII 1 Band)											
Freq. (MHz)	Detector Mode	Pol.	Receiver Reading (dBuV)	Ant. Factor (dB/m)	Corr. Factor (dB)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
Low Channel											
1 017.0	Peak	V	56.2	24.3	-13.0	0.0	43.2	74.0	30.8	100	214
1 051.0	Peak	V	55.1	24.4	-12.9	0.0	42.2	74.0	31.8	200	272
2 275.0	Peak	H	48.7	28.5	-7.2	0.0	41.5	74.0	32.5	100	359
3 448.0	Peak	H	48.3	31.4	-3.7	0.0	44.6	74.0	29.4	100	359
5 165.0	Peak	H	47.9	33.9	0.4	0.0	48.3	74.0	25.7	100	359
2 649.0	Peak	V	48.2	29.2	-6.3	0.0	41.9	74.0	32.1	100	359
Middle Channel											
1 017.0	Peak	H	55.2	24.3	-13.0	0.0	42.2	74.0	31.8	200	0
1 051.0	Peak	H	56.7	24.4	-12.9	0.0	43.8	74.0	30.2	200	23
1 476.0	Peak	V	48.7	25.4	-11.4	0.0	37.3	74.0	36.7	200	0
1 646.0	Peak	V	48.7	26.3	-10.2	0.0	38.5	74.0	35.5	200	0
3 482.0	Peak	H	47.8	31.5	-3.6	0.0	44.2	74.0	29.8	200	0
5 216.0	Peak	H	41.6	33.9	0.4	0.0	42.0	74.0	32.0	100	359
High Channel											
1 051.0	Peak	V	52.4	24.4	-12.9	0.0	39.5	74.0	34.5	200	0
1 187.0	Peak	H	54.1	24.7	-12.4	0.0	41.7	74.0	32.3	153	133
1 595.0	Peak	V	50.5	26.0	-10.6	0.0	39.9	74.0	34.1	100	206
2 122.0	Peak	V	46.5	28.3	-7.5	0.0	39.0	74.0	35.0	200	0
3 482.0	Peak	H	49.3	31.5	-3.6	0.0	45.7	74.0	28.3	100	89
5 233.0	Peak	V	44.5	34.0	0.5	0.0	45.0	74.0	29.0	200	85

Note. Peak results are met average limit, so average measurement was not performed.

5.6.6.3.2 Operating mode: 802.11a (UNII 2-A Band)

Worst case: 802.11a (UNII 2-A Band)											
Freq. (MHz)	Detector Mode	Pol.	Receiver Reading (dBuV)	Ant. Factor (dB/m)	Corr. Factor (dB)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
Low Channel											
1 051.0	Peak	H	53.0	24.4	-12.9	0.0	40.1	74.0	33.9	100	359
1 102.0	Peak	H	51.4	24.5	-12.7	0.0	38.7	74.0	35.3	200	215
1 595.0	Peak	V	49.1	26.0	-10.6	0.0	38.5	74.0	35.5	200	309
3 499.0	Peak	H	50.2	31.5	-3.6	0.0	46.6	74.0	27.4	100	81
5 267.0	Peak	H	43.8	34.0	0.4	0.0	44.2	74.0	29.8	200	230
5 981.0	Peak	V	43.3	34.2	0.7	0.0	44.0	74.0	30.0	100	144
Middle Channel											
1 051.0	Peak	V	52.9	24.4	-12.9	0.0	40.0	74.0	34.0	100	190
1 102.0	Peak	H	49.6	24.5	-12.7	0.0	36.9	74.0	37.1	155	0
1 595.0	Peak	H	50.5	26.0	-10.6	0.0	39.9	74.0	34.1	100	359
2 377.0	Peak	H	48.6	28.6	-7.1	0.0	41.5	74.0	32.5	100	359
3 533.0	Peak	H	50.0	31.6	-3.4	0.0	46.6	74.0	27.4	155	0
5 284.0	Peak	H	43.8	34.0	0.4	0.0	44.2	74.0	29.8	155	257
High Channel											
1 000.0	Peak	H	57.6	24.2	-13.2	0.0	44.4	74.0	29.6	100	134
1 595.0	Peak	H	50.0	26.0	-10.6	0.0	39.4	74.0	34.6	152	0
2 122.0	Peak	H	48.5	28.3	-8.8	0.0	39.7	74.0	34.3	200	0
3 533.0	Peak	H	50.1	31.6	-5.0	0.0	45.1	74.0	28.9	200	77
5 318.0	Peak	H	48.8	34.0	-1.8	0.0	47.0	74.0	27.0	200	84
5 981.0	Peak	V	43.3	34.2	0.7	0.0	44.0	74.0	30.0	100	243

Note. Peak results are met average limit, so average measurement was not performed.

5.6.6.3.3 Operating mode: 802.11a (UNII 2-C Band)

Worst case: 802.1a (UNII 2-C Band)											
Freq. (MHz)	Detector Mode	Pol.	Receiver Reading (dBuV)	Ant. Factor (dB/m)	Corr. Factor (dB)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
Low Channel											
1 187.0	Peak	H	53.6	24.7	-12.4	0.0	41.2	74.0	32.8	200	0
1 850.0	Peak	V	49.7	27.4	-8.7	0.0	41.0	74.0	33.0	200	0
3 193.0	Peak	V	46.5	30.8	-4.4	0.0	42.1	74.0	31.9	200	0
3 669.0	Peak	H	47.5	31.9	-3.1	0.0	44.4	74.0	29.6	100	82
5 488.0	Peak	H	52.8	34.0	0.2	0.0	53.0	74.0	21.0	100	359
10 996.0	Peak	V	40.7	36.7	5.2	0.0	45.9	74.0	28.1	100	42
Middle Channel											
1 051.0	Peak	V	54.8	24.4	-12.8	0.0	42.0	74.0	32.0	200	358
3 176.0	Peak	V	44.6	30.8	-4.4	0.0	40.2	74.0	33.8	100	359
3 720.0	Peak	H	46.0	32.0	-3.1	0.0	42.9	74.0	31.1	100	359
5 590.0	Peak	H	41.0	34.1	0.4	0.0	41.4	74.0	32.6	100	59
5 998.0	Peak	V	42.0	34.2	0.9	0.0	42.9	74.0	31.1	100	355
11 200.0	Peak	V	42.5	36.8	5.5	0.0	48.0	74.0	26.0	100	345
High Channel											
1 051.0	Peak	H	53.3	24.4	-12.8	0.0	40.5	74.0	33.5	100	359
1 187.0	Peak	H	52.9	24.7	-12.4	0.0	40.5	74.0	33.5	154	0
2 377.0	Peak	H	49.5	28.6	-7.0	0.0	42.5	74.0	31.5	100	359
3 788.0	Peak	H	46.3	32.1	-2.9	0.0	43.4	74.0	30.6	154	83
5 692.0	Peak	H	52.6	34.1	0.5	0.0	53.1	74.0	20.9	100	359
11 404.0	Peak	V	45.3	36.9	5.8	0.0	51.1	74.0	22.9	100	331

Note. Peak results are met average limit, so average measurement was not performed.

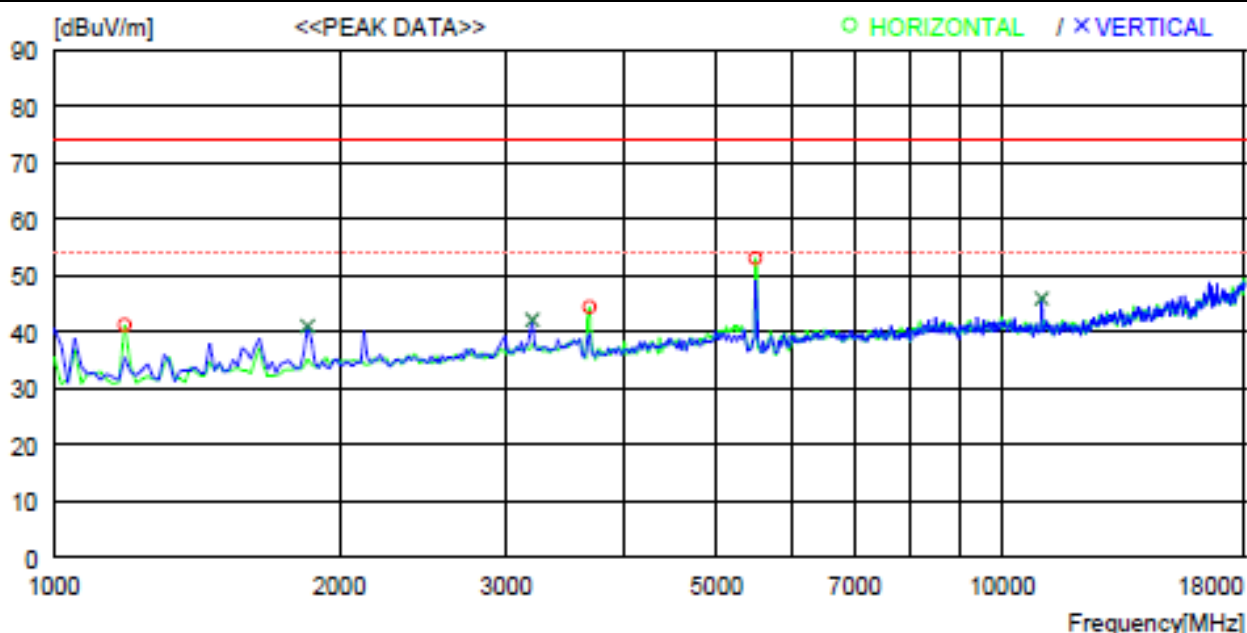
5.6.6.3.1 Operating mode: 802.11a (UNII 3 Band)

Worst case: 802.1a (UNII 3 Band)											
Freq. (MHz)	Detector Mode	Pol.	Receiver Reading (dBuV)	Ant. Factor (dB/m)	Corr. Factor (dB)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
Low Channel											
1 000.0	Peak	H	54.8	24.2	-13.1	0.0	41.7	74.0	32.3	152	2
1 102.0	Peak	H	51.4	24.5	-12.6	0.0	38.8	74.0	35.2	100	359
2 122.0	Peak	V	47.6	28.3	-7.5	0.0	40.1	74.0	33.9	154	0
3 822.0	Peak	H	46.0	32.2	-2.8	0.0	43.2	74.0	30.8	100	359
5 726.0	Peak	V	50.7	34.1	0.8	0.0	51.5	74.0	22.5	100	253
5 981.0	Peak	V	42.7	34.2	1.2	0.0	43.9	74.0	30.1	100	154
Middle Channel											
1 000.0	Peak	H	55.2	24.2	-13.1	0.0	42.1	74.0	31.9	100	359
1 051.0	Peak	V	51.6	24.4	-12.8	0.0	38.8	74.0	35.2	200	274
3 176.0	Peak	V	44.9	30.8	-4.4	0.0	40.5	74.0	33.5	200	0
3 586.0	Peak	H	46.4	32.3	-2.7	0.0	43.7	74.0	30.3	154	72
5 777.0	Peak	V	47.0	34.1	1.0	0.0	48.0	74.0	26.0	100	251
11 574.0	Peak	V	43.4	36.9	5.9	0.0	49.3	74.0	24.7	100	339
High Channel											
1 017.0	Peak	H	54.4	24.3	-12.9	0.0	41.5	74.0	32.5	154	22
2 122.0	Peak	H	46.7	28.3	-7.5	0.0	39.2	74.0	34.8	100	221
3 176.0	Peak	H	51.4	30.8	-6.0	0.0	45.4	74.0	28.6	200	210
3 873.0	Peak	H	46.9	32.3	-2.9	0.0	44.0	74.0	30.0	100	88
5 811.0	Peak	H	43.3	34.2	-0.8	0.0	42.5	74.0	31.5	200	256
11 642.0	Peak	V	44.6	36.9	3.8	0.0	48.4	74.0	25.6	100	322

Note. Peak results are met average limit, so average measurement was not performed.

Worst case: 802.11a (CH. 100)

Graphical Test Data – Low Channel (Peak)



No.	FREQ [MHz]	READING [dBuV]	ANT PEAK FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1187.000	53.6	24.7	2.7	39.8	41.2	74.0	32.8	200	0
2	3669.000	47.5	31.9	4.7	39.7	44.4	74.0	29.6	100	82
3	5488.000	52.8	34.0	6.3	40.1	53.0	74.0	21	100	359
----- Vertical -----										
4	1850.000	49.7	27.4	3.4	39.5	41.0	74.0	33	200	0
5	3193.000	46.5	30.8	4.4	39.6	42.1	74.0	31.9	200	0
6	10996.000	40.7	36.7	8.3	39.8	45.9	74.0	28.1	100	42

Note. Only the worst data plots were reported for radiated undesirable emissions.

Peak results are met average limit, so average measurement was not performed.

"H" means Horizontal polarity, "V" means Vertical polarity.

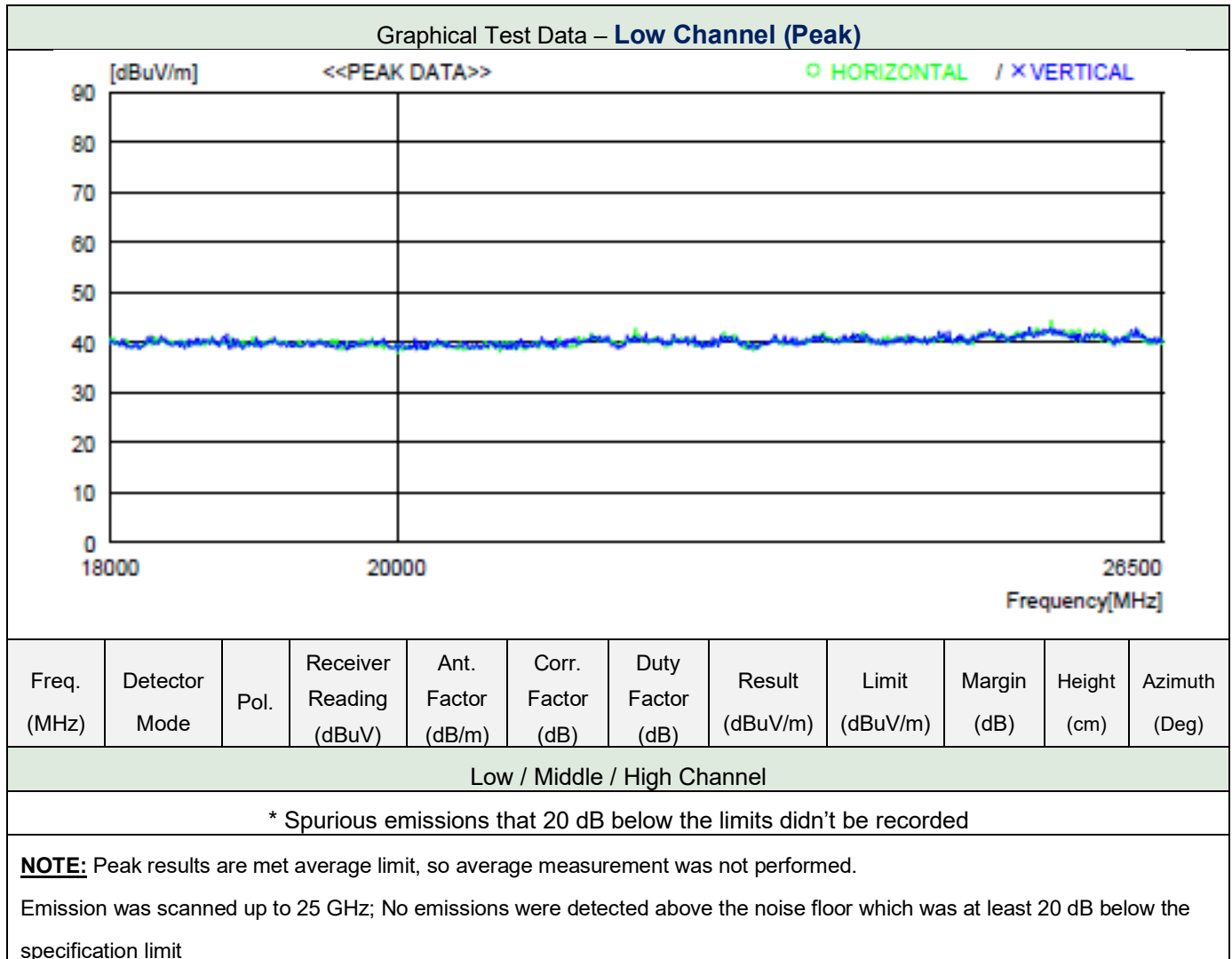
Corr. Factor (dB) = Pre-amplifier gain - Cable Loss

Result = Receiver Reading + Antenna Factor - Corr. Factor + Duty factor

Margin = Limit – Result

5.6.6.4 Test Data for Harmonic & Spurious emission (18 GHz to 25 GHz)

5.6.6.4.1 Operating mode: 802.11a (CH. 36)



Note. Only the worst data plots were reported for radiated undesirable emissions.

Peak results are met average limit, so average measurement was not performed.

"H" means Horizontal polarity, "V" means Vertical polarity.

Corr. Factor (dB) = Pre-amplifier gain - Cable Loss

Result = Receiver Reading + Antenna Factor - Corr. Factor + Duty factor

Margin = Limit – Result

Test plots of 802.11n HT20/HT40/ac VHT20/VHT40/VHT80 were almost same with 802.11a, so the plot is not included in this test report.

5.6.6.5 Radiated Restricted band edge

5.6.6.5.1 Duty Cycle

Date of Test	2020.03.24 – 2020.03.25	Temperature	(20.0 ± 1.5) °C	
		Relative humidity	(39.5 ± 0.8) % R.H.	
Measurement Distance	3 m	Tested By	Do-heon Kim 	
Detector Mode	Resolution BW	Video BW	Sweep Time	
PEAK	1 MHz	3 MHz	Auto	
AVERAGE	1 MHz	3 MHz	Auto	
Tabulated Test Data				
Operating Mode	On Time (ms)	On + Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11a	1.429 7	1.531 3	93.37	0.30
802.11n HT20	1.341 9	1.443 5	92.97	0.32
802.11n HT40	0.666 3	0.764 8	87.12	0.60
802.11ac VHT20	1.343 7	1.445 3	92.98	0.32
802.11ac VHT40	0.669 3	0.769 8	86.94	0.61
802.11ac VHT80	0.333 6	0.432 6	77.12	1.13

5.6.6.5.2 Test Data for Band edge (UNII 1 & UNII 2-A Band)

Operating Mode: 802.11a (UNII 1 & UNII 2-A Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 150.0	Peak	H	59.6	-	59.6	74.0	14.4	100	200
5 150.0	Average	H	48.9	0.3	49.2	54.0	4.8	100	200
5 150.0	Peak	V	59.8	-	59.8	74.0	14.2	100	233
5 150.0	Average	V	48.5	0.3	48.8	54.0	5.2	100	233
5 351.1	Peak	H	63.0	0.0	63.0	74.0	11.0	100	200
5 350.0	Average	H	50.1	0.3	50.4	54.0	3.6	100	200
5 351.1	Peak	V	63.6	0.0	63.6	74.0	10.4	100	233
5 350.0	Average	V	49.5	0.3	49.8	54.0	4.2	100	233

Operating Mode: 802.11n HT20 (UNII 1 & UNII 2-A Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 145.7	Peak	H	61.9	-	61.9	74.0	12.1	100	200
5 150.0	Average	H	49.1	0.3	49.4	54.0	4.6	100	200
5 150.0	Peak	V	60.0	-	60.0	74.0	14.0	100	233
5 150.0	Average	V	48.5	0.3	48.8	54.0	5.2	100	233
5 352.9	Peak	H	62.5	0.0	62.5	74.0	11.5	100	200
5 350.0	Average	H	50.6	0.3	50.8	54.0	3.1	100	200
5 352.9	Peak	V	61.0	0.0	61.0	74.0	13.0	100	233
5 350.0	Average	V	50.3	0.3	50.6	54.0	3.4	100	233

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

Operating Mode: 802.11n HT40 (UNII 1 & UNII 2-A Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 143.5	Peak	H	65.5	-	65.5	74.0	8.5	100	200
5 150.0	Average	H	51.9	0.6	52.5	54.0	1.5	100	200
5 150.0	Peak	V	65.0	-	65.0	74.0	9.0	100	233
5 150.0	Average	V	52.2	0.6	52.8	54.0	1.2	100	233
5 353.1	Peak	H	63.4	0.0	63.4	74.0	10.6	100	200
5 350.0	Average	H	51.0	0.6	51.5	54.0	2.4	100	200
5 350.0	Peak	V	61.8	0.0	61.8	74.0	12.2	100	233
5 350.0	Average	V	51.8	0.6	52.4	54.0	1.6	100	233

Operating Mode: 802.11ac VHT20 (UNII 1 & UNII 2-A Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 150.0	Peak	H	60.9	-	60.9	74.0	13.1	100	200
5 150.0	Average	H	49.6	0.3	49.9	54.0	4.1	100	200
5 150.0	Peak	V	61.3	-	61.3	74.0	12.7	100	233
5 150.0	Average	V	48.0	0.3	48.3	54.0	5.7	100	233
5 350.0	Peak	H	59.7	0.0	59.7	74.0	14.3	100	200
5 350.0	Average	H	51.1	0.3	51.4	54.0	2.6	100	200
5 352.4	Peak	V	60.9	0.0	60.9	74.0	13.1	100	233
5 350.0	Average	V	51.0	0.3	51.3	54.0	2.7	100	233

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

Operating Mode: 802.11ac VHT40 UNII 1 & UNII 2-A Band)

Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 150.0	Peak	H	65.3	-	65.3	74.0	8.7	100	200
5 150.0	Average	H	52.2	0.6	52.8	54.0	1.2	100	200
5 150.0	Peak	V	64.9	-	64.9	74.0	9.1	100	233
5 150.0	Average	V	52.4	0.6	52.9	54.0	1.1	100	233
5 350.0	Peak	H	63.0	0.0	63.0	74.0	11.0	100	200
5 350.0	Average	H	52.4	0.6	53.0	54.0	1.0	100	200
5 350.0	Peak	V	63.7	0.0	63.7	74.0	10.3	100	233
5 350.0	Average	V	51.6	0.6	52.2	54.0	1.8	100	233

Operating Mode: 802.11ac VHT80 (UNII 1 & UNII 2-A Band)

Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 150.0	Peak	H	62.8	-	62.8	74.0	11.2	100	200
5 150.0	Average	H	51.1	1.1	52.2	54.0	1.8	100	200
5 139.2	Peak	V	63.0	-	63.0	74.0	10.9	100	233
5 150.0	Average	V	51.2	1.1	52.3	54.0	1.7	100	233
5 350.9	Peak	H	61.5	0.0	61.5	74.0	12.5	100	200
5 350.0	Average	H	51.2	1.1	52.3	54.0	1.7	100	200
5 350.0	Peak	V	62.5	0.0	62.5	74.0	11.5	100	233
5 350.0	Average	V	50.9	1.1	52.0	54.0	2.0	100	233

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

5.6.6.5.3 Test Data for Band edge (UNII 2-C Band)

Operating Mode: 802.11a (UNII 2-C Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 456.6	Peak	H	57.3	0.0	57.3	74.0	16.6	100	243
5 460.0	Average	H	47.2	0.3	47.4	54.0	6.6	100	243
5 456.1	Peak	V	56.8	0.0	56.8	74.0	17.2	110	260
5 460.0	Average	V	46.9	0.3	47.2	54.0	6.8	110	260
5 728.9	Peak	H	62.3	0.0	62.3	68.3	5.9	100	243
5 725.0	Average	H	51.8	0.3	52.1	68.3	16.2	100	243
5 730.7	Peak	V	58.0	0.0	58.0	68.3	10.2	110	260
5 725.0	Average	V	49.1	0.3	49.3	68.3	18.9	110	260

Operating Mode: 802.11n HT20 (UNII 2-C Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 460.0	Peak	H	57.7	0.0	57.7	74.0	16.3	100	243
5 460.0	Average	H	47.7	0.3	48.0	54.0	6.0	100	243
5 453.6	Peak	V	60.0	0.0	60.0	74.0	14.0	110	260
5 460.0	Average	V	47.6	0.3	47.9	54.0	6.1	110	260
5 725.0	Peak	H	64.1	0.0	64.1	68.3	4.2	100	243
5 725.0	Average	H	52.3	0.3	52.6	68.3	15.7	100	243
5 725.0	Peak	V	65.5	0.0	65.5	68.3	2.7	110	260
5 725.0	Average	V	55.9	0.3	56.1	68.3	12.1	110	260

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

Operating Mode: 802.11n HT40 (UNII 2-C Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 458.9	Peak	H	61.2	0.0	61.2	74.0	12.8	100	243
5 460.0	Average	H	50.2	0.6	50.8	54.0	3.2	100	243
5 460.0	Peak	V	62.6	0.0	62.6	74.0	11.3	110	260
5 460.0	Average	V	51.5	0.6	52.0	54.0	2.0	110	260
5 728.1	Peak	H	55.6	0.0	55.6	68.3	12.7	100	243
5 725.0	Average	H	45.4	0.6	45.9	68.3	22.3	100	243
5 731.6	Peak	V	53.1	0.0	53.1	68.3	15.2	110	260
5 725.0	Average	V	44.1	0.6	44.6	68.3	23.6	110	260

Operating Mode: 802.11ac VHT20 (UNII 2-C Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 460.0	Peak	H	57.4	0.0	57.4	74.0	16.6	100	243
5 460.0	Average	H	47.0	0.3	47.3	54.0	6.7	100	243
5 459.1	Peak	V	58.7	0.0	58.7	74.0	15.3	110	260
5 460.0	Average	V	47.4	0.3	47.6	54.0	6.3	110	260
5 729.1	Peak	H	63.3	0.0	63.3	68.3	4.9	100	243
5 725.0	Average	H	52.8	0.3	53.1	68.3	15.1	100	243
5 730.6	Peak	V	59.0	0.0	59.0	68.3	9.3	110	260
5 725.0	Average	V	50.0	0.3	50.3	68.3	18.0	110	260

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

Operating Mode: 802.11ac VHT40 (UNII 2-C Band)

Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 460.0	Peak	H	60.5	0.0	60.5	74.0	13.4	100	243
5 460.0	Average	H	50.9	0.6	51.5	54.0	2.5	100	243
5 460.0	Peak	V	62.3	0.0	62.3	74.0	11.7	110	260
5 460.0	Average	V	50.8	0.6	51.4	54.0	2.6	110	260
5 727.2	Peak	H	55.9	0.0	55.9	68.3	12.4	100	243
5 725.0	Average	H	45.6	0.6	46.2	68.3	22.1	100	243
5 727.3	Peak	V	54.9	0.0	54.9	68.3	13.3	110	260
5 725.0	Average	V	45.3	0.6	45.8	68.3	22.4	110	260

Operating Mode: 802.11ac VHT80 (UNII 2-C Band)

Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 453.8	Peak	H	63.1	0.0	63.1	74.0	10.9	100	243
5 460.0	Average	H	50.8	1.1	51.9	54.0	2.1	100	243
5 457.8	Peak	V	60.8	0.0	60.8	74.0	13.2	110	260
5 460.0	Average	V	50.6	1.1	51.7	54.0	2.3	110	260
5 822.6	Peak	H	54.8	0.0	54.8	68.3	13.4	100	243
5 863.1	Average	H	43.5	1.1	44.6	68.3	23.6	100	243
5 847.6	Peak	V	53.1	0.0	53.1	68.3	15.2	110	260
5 868.6	Average	V	43.2	1.1	44.3	68.3	24.0	110	260

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

5.6.6.5.4 Test Data for Band edge (UNII 3 Band)

Operating Mode: 802.11a (UNII 3 Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 725.0	Peak	H	62.5	0.0	62.5	68.3	5.8	100	242
5 725.0	Average	H	52.1	0.3	52.3	68.3	15.9	100	242
5 725.0	Peak	V	62.4	0.0	62.4	68.3	5.8	100	260
5 725.0	Average	V	51.4	0.3	51.6	68.3	16.6	100	260
5 856.7	Peak	H	57.1	0.0	57.1	68.3	11.2	100	242
5 850.0	Average	H	44.5	0.3	44.7	68.3	23.5	100	242
5 865.4	Peak	V	53.4	0.0	53.4	68.3	14.9	100	260
5 850.0	Average	V	43.9	0.3	44.2	68.3	24.1	100	260

Operating Mode: 802.11n HT20 (UNII 3 Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 723.0	Peak	H	64.1	0.0	64.1	68.3	4.1	100	242
5 725.0	Average	H	52.3	0.3	52.5	68.3	15.7	100	242
5 725.0	Peak	V	63.6	0.0	63.6	68.3	4.7	100	260
5 725.0	Average	V	52.4	0.3	52.7	68.3	15.6	100	260
5 850.0	Peak	H	55.2	0.0	55.2	68.3	13.0	100	242
5 850.0	Average	H	45.5	0.3	45.8	68.3	22.5	100	242
5 855.3	Peak	V	53.4	0.0	53.4	68.3	14.9	100	260
5 850.0	Average	V	44.6	0.3	44.9	68.3	23.4	100	260

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

Operating Mode: 802.11n HT40 (UNII 3 Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 717.1	Peak	H	63.6	0.0	63.6	68.3	4.6	100	242
5 725.0	Average	H	52.9	0.6	53.5	68.3	14.8	100	242
5 718.6	Peak	V	62.0	0.0	62.0	68.3	6.2	100	260
5 725.0	Average	V	51.3	0.6	51.8	68.3	16.4	100	260
5 854.0	Peak	H	53.5	0.0	53.5	68.3	14.7	100	242
5 850.0	Average	H	43.8	0.6	44.4	68.3	23.9	100	242
5 957.8	Peak	V	53.8	0.0	53.8	68.3	14.4	100	260
5 850.0	Average	V	43.3	0.6	43.9	68.3	24.3	100	260

Operating Mode: 802.11ac VHT20 (UNII 3 Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 725.0	Peak	H	63.4	0.0	63.4	68.3	4.9	100	242
5 725.0	Average	H	51.9	0.3	52.2	68.3	16.0	100	242
5 722.2	Peak	V	66.0	0.0	66.0	68.3	2.2	100	260
5 725.0	Average	V	51.6	0.3	51.9	68.3	16.3	100	260
5 850.0	Peak	H	55.3	0.0	55.3	68.3	12.9	100	242
5 850.0	Average	H	45.6	0.3	45.9	68.3	22.4	100	242
5 850.0	Peak	V	57.4	0.0	57.4	68.3	10.9	100	260
5 850.0	Average	V	44.4	0.3	44.7	68.3	23.6	100	260

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

Result = Measured value + Duty factor

Duty cycle(x):

Duty factor ($10 \cdot \log(1/x)$):

Operating Mode: 802.11ac VHT40 (UNII 3 Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 719.7	Peak	H	65.3	0.0	65.3	68.3	3.0	100	242
5 725.0	Average	H	52.9	0.6	53.5	68.3	14.8	100	242
5 720.2	Peak	V	62.6	0.0	62.6	68.3	5.6	100	260
5 725.0	Average	V	51.0	0.6	51.6	68.3	16.7	100	260
5 860.6	Peak	H	53.3	0.0	53.3	68.3	15.0	100	242
5 850.0	Average	H	43.0	0.6	43.6	68.3	24.7	100	242
5 857.1	Peak	V	54.4	0.0	54.4	68.3	13.8	100	260
5 850.0	Average	V	43.2	0.6	43.8	68.3	24.5	100	260

Operating Mode: 802.11ac VHT80 (UNII 3 Band)									
Freq. (MHz)	Detector Mode	Pol.	Measured Value (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
5 716.4	Peak	H	64.9	0.0	64.9	68.3	3.4	100	242
5 717.9	Average	H	52.8	1.1	53.9	68.3	14.3	100	242
5 721.9	Peak	V	62.0	0.0	62.0	68.3	6.3	100	260
5 721.7	Average	V	51.2	1.1	52.3	68.3	15.9	100	260
5 857.7	Peak	H	58.8	0.0	58.8	68.3	9.5	100	242
5 857.7	Average	H	46.6	1.1	47.7	68.3	20.6	100	242
5 852.1	Peak	V	56.4	0.0	56.4	68.3	11.9	100	260
5 853.9	Average	V	46.1	1.1	47.2	68.3	21.1	100	260

NOTE: "H" means Horizontal polarity, "V" means Vertical polarity.

Measured Value = Receiver reading + Antenna Factor + Cable Loss - Pre-amplifier Gain

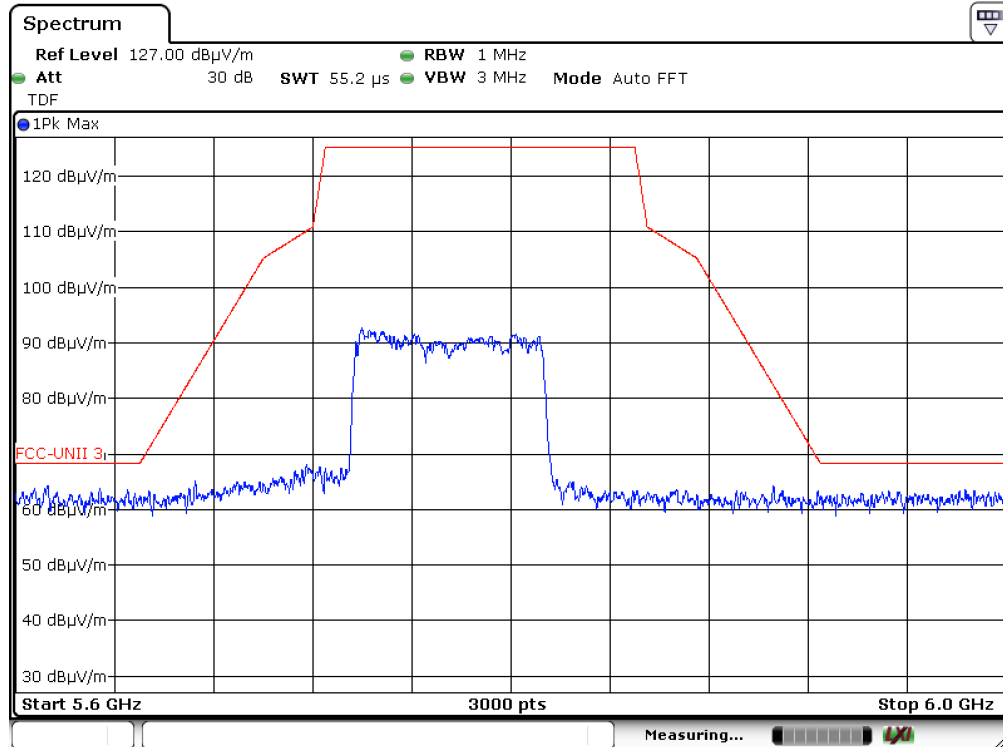
Result = Measured value + Duty factor

Duty cycle(x):

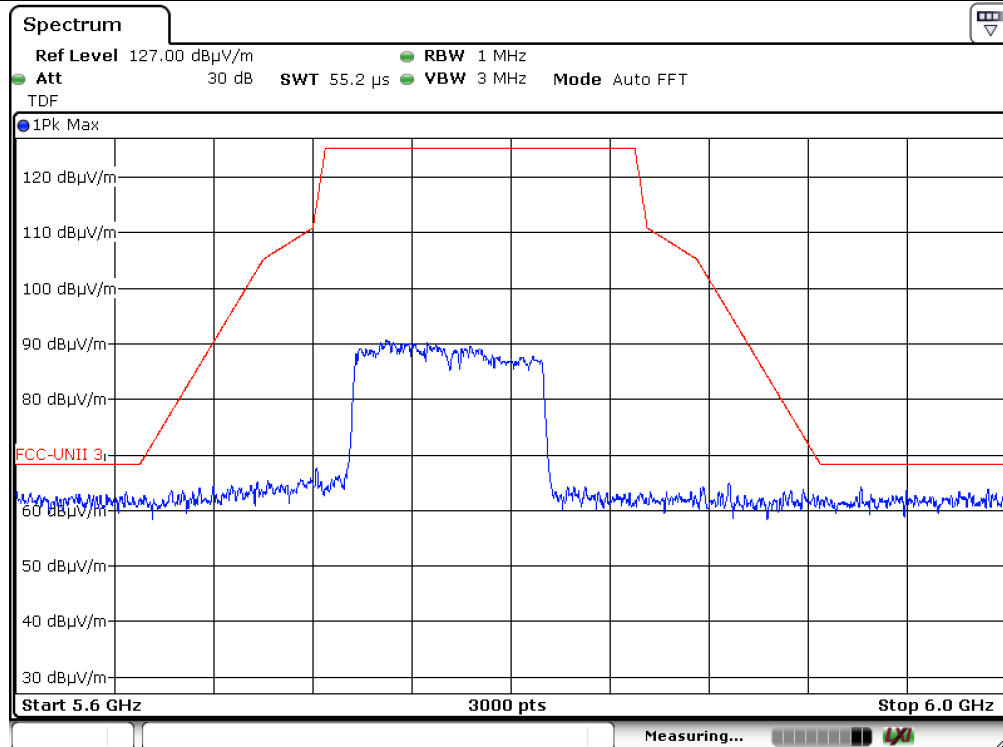
Duty factor ($10 \cdot \log(1/x)$):

Graphical Test Data – UNII 3 band (802.11ac VHT80)

Horizontal



Vertical



Note. Only the worst data plots were reported for radiated undesirable emissions.

5.7 AC Power Line Conducted Emission

5.7.1 Limit

Acc. to section 15.207 (a), RSS-GEN 8.8 following table shall be applied.

Frequency Range (MHz)	Quasi-Peak (dBuV)	Average (dBuV)
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

5.7.2 Method of Measurement

The EUT was placed on a wooden table, 0.8 m height above the horizontal ground plane and 40 cm from the vertical ground plane. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

The test was performed for both Neutral and Hot lines.

5.7.3 Measurement Uncertainty

Measurement uncertainties were not taken into account and following uncertainty levels have been estimated for tests performed on the apparatus. The measurement uncertainties are given with at least 95 % confidence.

Frequency Range	Uncertainty	Frequency Range	Uncertainty
9 kHz ~ 150 kHz	$\pm$ 2.0 dB	150 kHz ~ 30 MHz	$\pm$ 2.0 dB

5.7.4 Sample Calculated Example

At 5.31 MHz

QP Limit = 60.0 dBuV

Correction Factor (C. Factor) of LISN, Pulse Limiter and cable loss at 5.31 MHz = 9.7 dB

Q.P Reading from the Test receiver = 20.8 dBuV

(Calculated value for system losses by software EMC32 manufactured by Rohde & Schwarz)

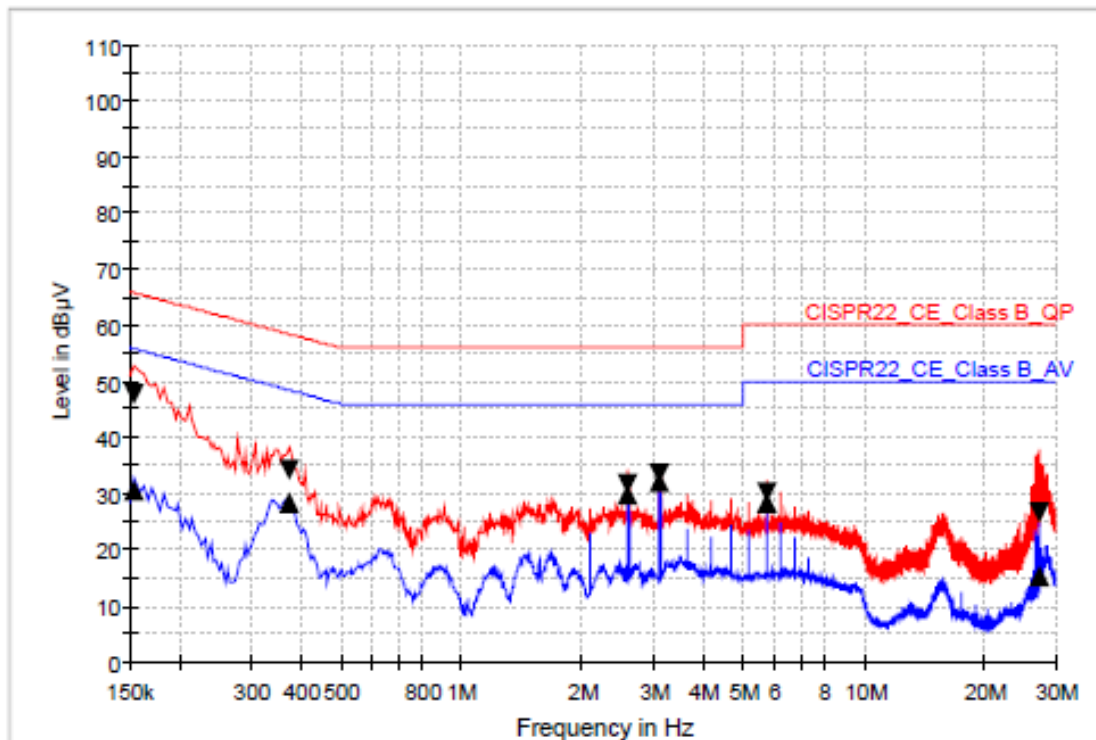
Therefore Q.P Margin = 60 - 20.8 = 39.2

so the EUT has 39.2 dB margin at 5.31 MHz

5.7.5 Worst Case Test Data

Date of Test	2020-04-21	Temperature	(21.3 ± 0.9) °C
		Relative humidity	(41.3 ± 0.8) % R.H.
Measurement Frequency Range		9 kHz ~ 30MHz	
Test Result	PASS	Tested By	Do-heon Kim 

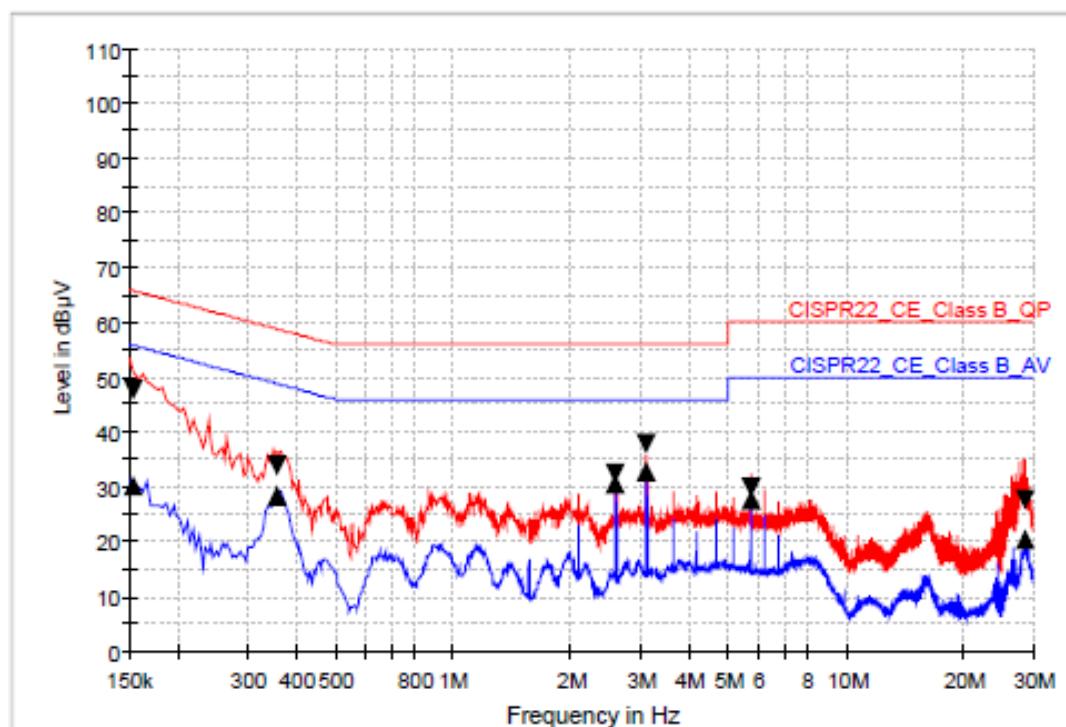
Hot Line



Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.154000	47.8	30.5	9.000	L1	9.7	17.9	65.8	25.3	55.8
0.374000	34.4	28.4	9.000	L1	9.7	24.0	58.4	20.0	48.4
2.602000	31.7	29.7	9.000	L1	9.8	24.3	56.0	16.3	46.0
3.122000	33.6	31.9	9.000	L1	9.9	22.4	56.0	14.1	46.0
5.726000	30.3	28.3	9.000	L1	10.1	29.8	60.0	21.7	50.0
27.522000	26.5	15.3	9.000	L1	11.2	33.5	60.0	34.7	50.0

Neutral Line



Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.154000	47.8	30.2	9.000	N	9.7	18.0	65.8	25.6	55.8
0.358000	34.0	28.4	9.000	N	9.7	24.8	58.8	20.4	48.8
2.602000	32.3	30.5	9.000	N	9.8	23.7	56.0	15.5	46.0
3.122000	37.8	32.9	9.000	N	9.9	18.2	56.0	13.1	46.0
5.722000	29.7	27.7	9.000	N	10.1	30.3	60.0	22.3	50.0
28.518000	27.6	20.3	9.000	N	11.2	32.4	60.0	29.7	50.0

5.8 Automatically Discontinue Transmission

5.8.1 Limit

According to FCC CFR 47 Part 15 section 15.407 (c), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

5.8.2 Conclusion

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving.

The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

Appendix I – Test Instrumentation

Description	Model No.	Serial No.	Manufacturer.	Due for Cal. Date	Cal. Interval
Signal & Spectrum Analyzer	FSW 43	100578	Rohde & Schwarz	2021-04-20	1 Y
Spectrum Analyzer	FSV 13	101243	Rohde & Schwarz	2021-01-16	1 Y
Signal Generator	SMF100A	257560	Rohde & Schwarz	2021-01-26	1 Y
Vector Signal Generator	SMBV100A	101441	Rohde & Schwarz	2021-01-26	1 Y
Power Module	OSP 120	101389	Rohde & Schwarz	2021-01-16	1 Y
Attenuator	56-10	58769	WEINSCHTEL	2021-01-20	1 Y
Attenuator	10 dB	ENG-1	Rohde & Schwarz	2021-01-16	1 Y
Test Receiver	ESU 26	100303	Rohde & Schwarz	2021-01-21	1 Y
Loop Antenna	HFH2-Z2	100341	Rohde & Schwarz	2021-04-22	2 Y
DC Power Supply	6032A	SG41000637	Agilent	2021-03-25	1 Y
TRILOG Broadband Antenna	VULB9163	9163.799	Schwarzbeck	2021-09-17	2 Y
Dipole Antenna	3121C	9001-509 9001-530	EMCO	2022-05-22	2Y
Dipole Antenna	UHA9105	N/A	Schwarzbeck	2022-05-22	2Y
Horn Antenna	HF 907	102426	Rohde & Schwarz	2020-11-20	2 Y
DOPPEL STEG Horn Antenna	HF 906	100332	Rohde & Schwarz	2021-02-14	2 Y
Horn Antenna	BBHA 9170	BBHA 9170 #783	Schwarzbeck	2020-11-26	2 Y
Notch Filter	BRM50702	G318	MICRO-TRONICS	2020-11-07	1 Y
Notch Filter	BRC50703	G139	MICRO-TRONICS	2020-11-07	1 Y
Notch Filter	BRC50704	G122	MICRO-TRONICS	2020-11-07	1 Y
Notch Filter	BRC50705	G126	MICRO-TRONICS	2020-11-07	1 Y
Attenuator	6dB	272.4110.50	Rohde & Schwarz	2021-01-16	1 Y
Pre-Amplifier	310N	344015	Sonoma Instrument	2021-01-16	1 Y
Pre-Amplifier	SCU 18D	19006450	Rohde & Schwarz	2021-04-17	1 Y
Pre-Amplifier	CBL18265035	28706	CERNEX	2021-03-24	1 Y
Pre-Amplifier	CBL26405040	28707	CERNEX	2021-03-24	1 Y

Turn Table	DT3000-3t	1310814	INNCO SYSTEM	-	N/A
Antenna Master	MA4000-EP	4600814	INNCO SYSTEM	-	N/A
Antenna Master	MA4000-XP-ET	-	INNCO SYSTEM	-	N/A
Camera Controller	HDCon4102	6531445048	PONTIS	-	N/A
CO3000 Controller	Co3000-4Port	CO3000/806/ 34130814/L	INNCO SYSTEM	-	N/A
CO3000 Controller	Co3000-4Port	CO3000/807/ 34130814/L	INNCO SYSTEM	-	N/A
EMI Test Receiver	ESCI 7	100722	Rohde & Schwarz	2021-01-16	1 Y
LISN	ENV216	100110	Rohde & Schwarz	2021-01-22	1 Y
Directional Coupler	AAMCS-UDC-0.5G-18G-SF	000757	AAMCS	2021-01-17	1 Y
Splitter	1580	SC321	WEINSCHEL	2021-01-20	1 Y
Splitter	ZFRSC-42-S+	UU90901305	Minicircuits	2021-01-17	1 Y
Attenuator	8496A	3308A3798S	HP	2021-01-16	1 Y
Attenuator	8494B	3308a38821	HP	2021-01-16	1 Y
Temperature & Humidity Chamber	SM-1.0-3800	38025	THERMOTRON	2020-08-21	1 Y
Bluetooth Tester	TC-3000C	3000C000534	TESCOM	2020-07-16	1 Y
Wireless Access Point	WAC720	4D7689EP000FB	NETGEAR	-	N/A

The measuring equipment utilized to perform the tests documented in this test report has been calibrated in accordance with manufacturer's recommendations, and is traceable to recognized national standards.