

No discernible emissions detected from 18GHz – 26GHz.

8 Emissions in Restricted Frequency Bands (Band Edge)

8.1 Test Result

Test Description	Test Specification		Test Result
Restricted Band Emissions	15.205 / 15.209	RSS-GEN S8.9 / 8.10	Compliant

8.2 Test Method

Measurements were made using the conducted methods defined in ANSI C63.10, Section 11.12.2.

The test system reported the following duty-cycles used for correcting the average measurements:

- SISO
 - 802.11b – 65.9% (1.8dB) – WF2
 - 802.11g – 59.2% (2.3dB) – WF2
 - 802.11n(HT20) – 18.2% (7.4dB) – WF2
 - 802.11n(HT40) – 18.7% (7.3dB) – WF2
 - 802.11n(HT20) – 42.2% (3.7dB) – WF1
- MIMO
 - 802.11n(HT20) – 13.1% (8.8dB) – WF2+WF1

8.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6 °C

Relative Humidity: 48.4 %

Atmospheric Pressure: 98.98 kPa

8.4 Test Equipment

Test End Date: 4-Nov-2022

Tester: AB

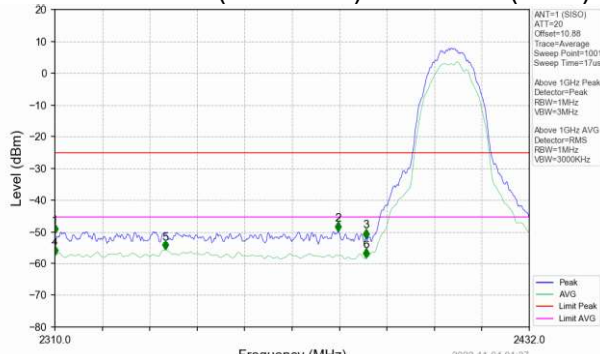
Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ATTENUATOR, 10DB	BW-S10W2	MINI-CIRCUITS	15031	3-Oct-2022	3-Oct-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20108	16-Mar-2022	16-Mar-2023
USB WIDEBAND POWER SENSOR	U2021XA	TSTPASS (KEYSIGHT TECHNOLOGIES)	20168C	24-Aug-2022	24-Aug-2023
USB WIDEBAND POWER SENSOR	U2021XA	TSTPASS (KEYSIGHT TECHNOLOGIES)	20168D	24-Sep-2022	24-Sep-2023
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
ATTENUATOR, 10DB	BW-S10W2	MINI-CIRCUITS	15032	3-Oct-2022	3-Oct-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20107	16-Mar-2022	16-Mar-2023
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
DC POWER SUPPLY, PROGRAMMABLE	DP711	RIGOL	18027	CNR	CNR
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

Software Profile:

TSTPASS Version: 1.1.0, build 2020.11.15.01

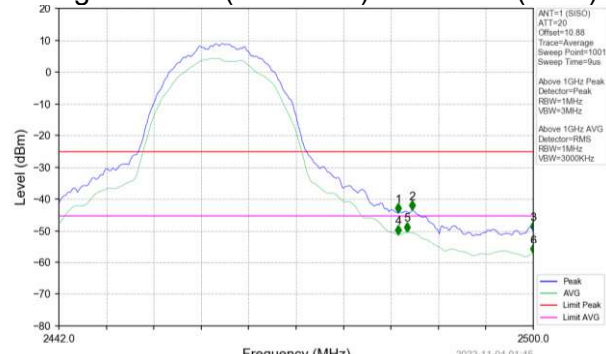
8.5 Test Data – Restricted Band Edges - SISO

Low Channel(2412MHz) – 802.11b (WF2)



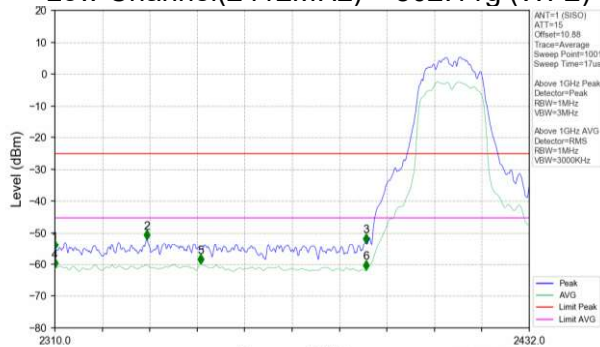
Marker No	Frequency (MHz)	Level (dBm)	Remark	Marker No	Frequency (MHz)	Level (dBm)	Remark
1	2310.000	-50.554	Peak	5	2310.000	-57.611	AVG
2	2382.834	-49.850	Peak	6	2338.426	-55.892	AVG
3	2390.000	-52.051	Peak		2390.000	-58.488	AVG

High Channel(2462MHz) – 802.11b (WF2)



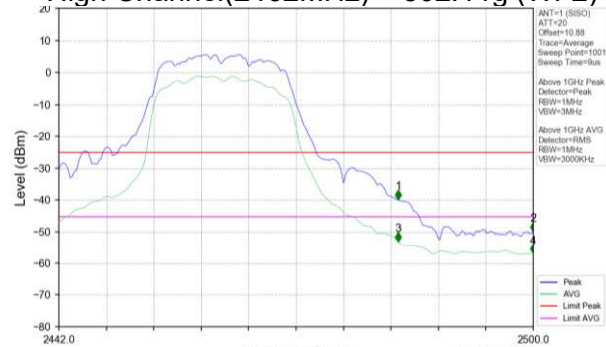
Marker No	Frequency (MHz)	Level (dBm)	Remark	Marker No	Frequency (MHz)	Level (dBm)	Remark
1	2483.500	-44.322	Peak	5	2483.500	-51.176	AVG
2	2485.210	-43.564	Peak	6	2484.572	-50.293	AVG
3	2500.000	-50.044	Peak		2500.000	-57.333	AVG

Low Channel(2412MHz) – 802.11g (WF2)



Marker No	Frequency (MHz)	Level (dBm)	Remark	Marker No	Frequency (MHz)	Level (dBm)	Remark
1	2310.000	-55.428	Peak	5	2310.000	-61.324	AVG
2	2333.668	-52.121	Peak	6	2347.454	-60.081	AVG
3	2390.000	-53.291	Peak		2390.000	-61.932	AVG

High Channel(2462MHz) – 802.11g (WF2)



Marker No	Frequency (MHz)	Level (dBm)	Remark	Marker No	Frequency (MHz)	Level (dBm)	Remark
1	2483.500	-39.982	Peak	3	2483.500	-53.159	AVG
2	2500.000	-50.097	Peak	4	2500.000	-57.029	AVG

Low Channel(2412MHz) – 802.11b (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310	-57.61	4	41.59	54	-12.41	AVG
	-50.55	4	48.65	74	-25.35	Peak
2338.426	-55.89	4	43.31	54	-10.69	AVG
2382.834	-49.85	4	49.35	74	-24.65	Peak
2390	-58.49	4	40.71	54	-13.29	AVG
	-52.05	4	47.15	74	-26.85	Peak

High Channel(2462MHz) – 802.11b (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	-51.18	4	48.02	54	-5.98	AVG
	-44.32	4	54.88	74	-19.12	Peak
2484.572	-50.29	4	48.91	54	-5.09	AVG
2485.21	-43.56	4	55.64	74	-18.36	Peak
2500	-57.33	4	41.87	54	-12.13	AVG
	-50.04	4	49.16	74	-24.84	Peak

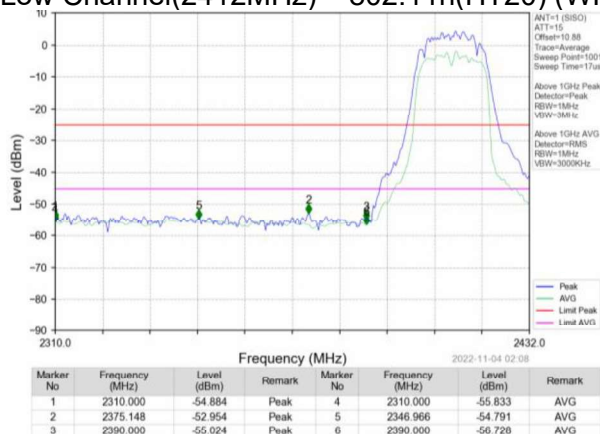
Low Channel(2412MHz) – 802.11g (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310	-61.32	4	37.88	54	-16.12	AVG
	-55.43	4	43.77	74	-30.23	Peak
2333.668	-52.12	4	47.08	74	-26.92	Peak
2347.454	-60.08	4	39.12	54	-14.88	AVG
2390	-61.93	4	37.27	54	-16.73	AVG
	-53.29	4	45.91	74	-28.09	Peak

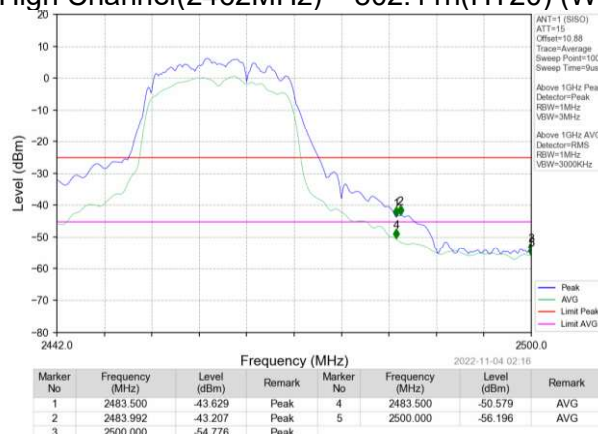
High Channel(2462MHz) – 802.11g (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	-53.16	4	46.04	54	-7.96	AVG
	-39.98	4	59.22	74	-14.78	Peak
2500	-57.03	4	42.17	54	-11.83	AVG
	-50.1	4	49.1	74	-24.9	Peak

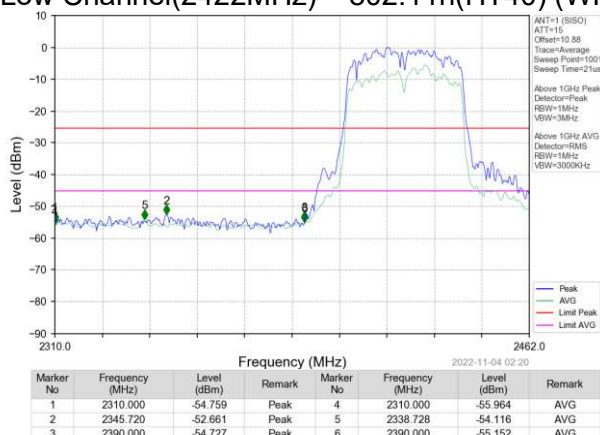
Low Channel(2412MHz) – 802.11n(HT20) (WF2)



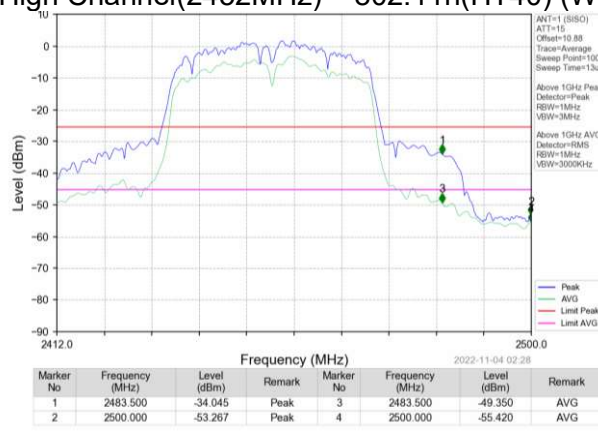
High Channel(2462MHz) – 802.11n(HT20) (WF2)



Low Channel(2422MHz) – 802.11n(HT40) (WF2)



High Channel(2452MHz) – 802.11n(HT40) (WF2)



Low Channel(2412MHz) – 802.11n(HT20) (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310	-55.83	4	43.37	54	-10.63	AVG
	-54.88	4	44.32	74	-29.68	Peak
2346.966	-54.79	4	44.41	54	-9.59	AVG
2375.148	-52.95	4	46.25	74	-27.75	Peak
2390	-56.73	4	42.47	54	-11.53	AVG
	-55.02	4	44.18	74	-29.82	Peak

High Channel(2462MHz) – 802.11n(HT20) (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	-50.58	4	48.62	54	-5.38	AVG
	-43.63	4	55.57	74	-18.43	Peak
2483.992	-43.21	4	55.99	74	-18.01	Peak
2500	-56.2	4	43	54	-11	AVG

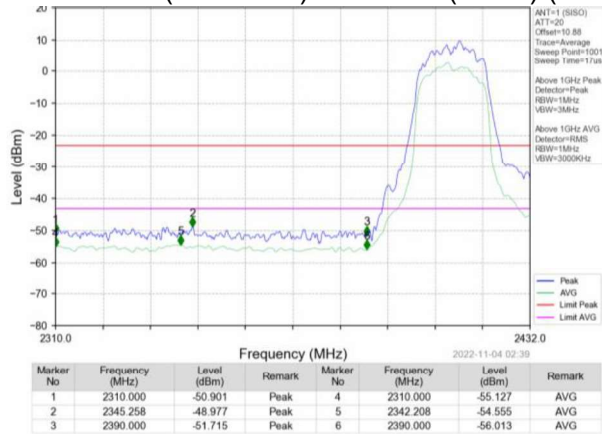
Low Channel(2422MHz) – 802.11n(HT40) (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310	-55.96	4	43.24	54	-10.76	AVG
	-54.76	4	44.44	74	-29.56	Peak
2338.728	-54.12	4	45.08	54	-8.92	AVG
2345.72	-52.66	4	46.54	74	-27.46	Peak
2390	-55.15	4	44.05	54	-9.95	AVG
	-54.73	4	44.47	74	-29.53	Peak

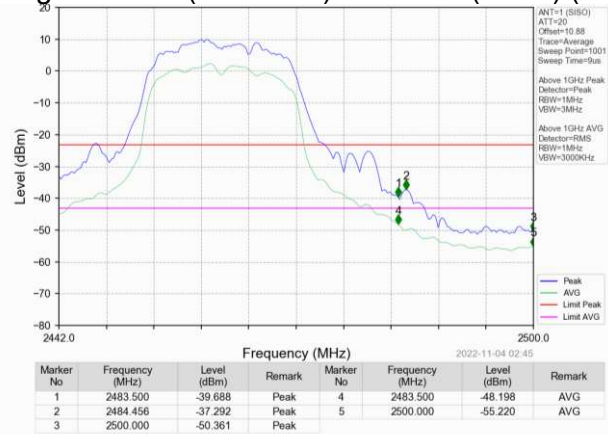
High Channel(2452MHz) – 802.11n(HT40) (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	-49.35	4	49.85	54	-4.15	AVG
	-34.05	4	65.16	74	-8.85	Peak
2500	-55.42	4	43.78	54	-10.22	AVG
	-53.27	4	45.93	74	-28.07	Peak

Low Channel(2412MHz) – 802.11n(HT20) (WF1)



High Channel(2462MHz) – 802.11n(HT20) (WF1)



Low Channel(2412MHz) – 802.11n(HT20) (WF1)

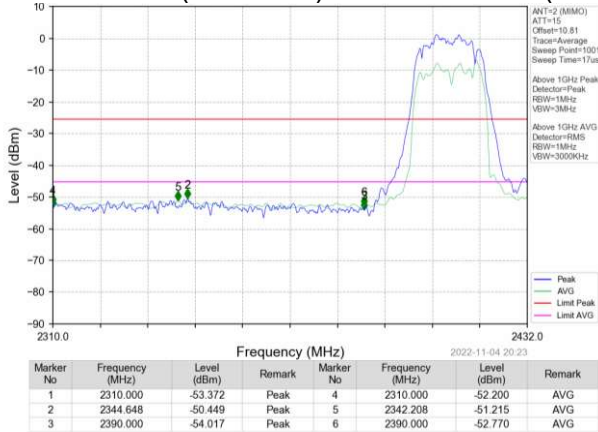
Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310	-55.13	2	42.07	54	-11.93	AVG
	-50.9	2	46.3	74	-27.7	Peak
2342.208	-54.55	2	42.65	54	-11.36	AVG
2345.258	-48.98	2	48.22	74	-25.78	Peak
	-56.01	2	41.19	54	-12.81	AVG
2390	-51.72	2	45.48	74	-28.52	Peak

High Channel(2462MHz) – 802.11n(HT20) (WF1)

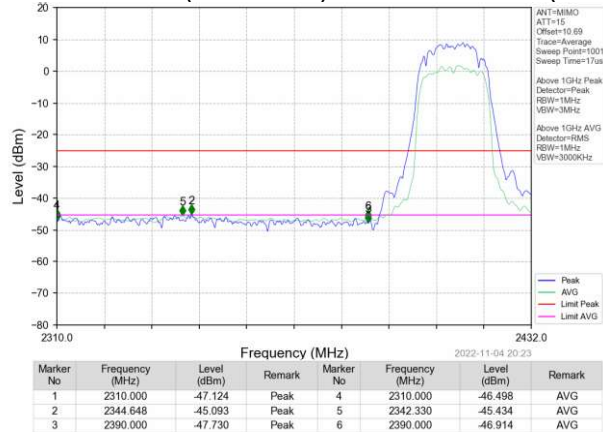
Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
	-48.2	2	49	54	-5	AVG
2483.5	-39.69	2	57.51	74	-16.49	Peak
2484.456	-37.29	2	59.91	74	-14.09	Peak
	-55.22	2	41.98	54	-12.02	AVG
2500	-50.36	2	46.84	74	-27.16	Peak

8.6 Data – Restricted Band Edges - MIMO

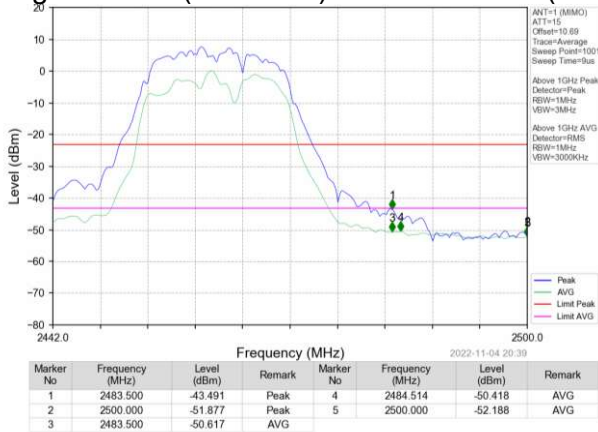
Low Channel(2412MHz) – 802.11nHT20 (WF1)



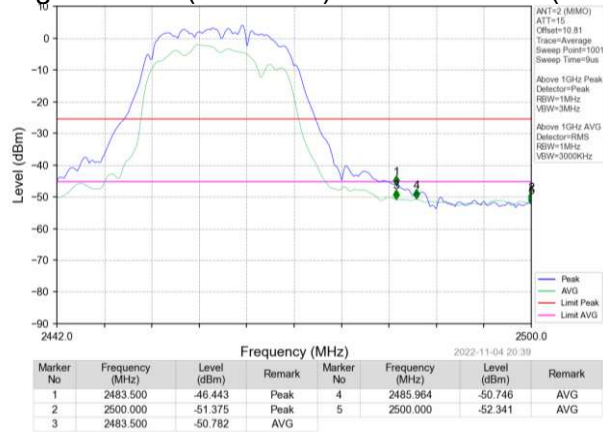
Low Channel(2412MHz) – 802.11nHT20 (WF2)



High Channel(2462MHz) – 802.11nHT20 (WF1)



High Channel(2462MHz) – 802.11nHT20 (WF2)



Low Channel(2412MHz) – 802.11nHT20 (WF1)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310	-52.2	4	47	54	-7	AVG
	-53.37	4	45.83	74	-28.17	Peak
2342.208	-51.22	4	47.98	54	-6.01	AVG
2344.648	-50.45	4	48.75	74	-25.25	Peak

Low Channel(2412MHz) – 802.11nHT20 (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310	-46.5	4	48.7	54	-5.3	AVG
	-47.12	4	48.08	74	-25.92	Peak
2342.33	-45.43	4	49.77	54	-4.23	AVG
2344.648	-45.09	4	50.11	74	-23.89	Peak

High Channel(2462MHz) – 802.11nHT20 (WF1)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	-50.62	2	46.58	54	-7.42	AVG
	-43.49	2	53.71	74	-20.29	Peak
2484.514	-50.42	2	46.78	54	-7.22	AVG
2500	-52.19	2	45.01	54	-8.99	AVG
	-51.88	2	45.32	74	-28.68	Peak

High Channel(2462MHz) – 802.11nHT20 (WF2)

Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	-50.78	4	48.42	54	-5.58	AVG
	-46.44	4	52.76	74	-21.24	Peak
2485.964	-50.75	4	48.45	54	-5.55	AVG
2500	-52.34	4	46.86	54	-7.14	AVG
	-51.38	4	47.83	74	-26.18	Peak

9 Measurement Uncertainty

The measurement uncertainty figures are be calculated in accordance with TR 100 028-1 [2] and correspond to an expansion factor (coverage factor) $k = 2$ (which provide confidence levels of 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Parameter	Expanded Uncertainty for Normal k factor equal to 2	
	Required	Laboratory Actual
Radio Frequency	$\pm 1 \times 10^{-5}$	$\pm 9.8 \times 10^{-8}$
total RF power, conducted	± 1.5 dB	± 1.2 dB
RF power density, conducted	± 3 dB	± 0.7 dB
spurious emissions, conducted	± 3 dB	± 2.1 dB
all emissions, radiated	± 6 dB	± 4.8 dB
temperature	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
humidity	± 5 %	± 3.5 %
DC and low frequency voltages	± 3 %	± 0.4 %

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	30 November 2022
1	Section 1 was updated for FCC 15.203 internal antennas. Section 2 Client information was updated. Equipment tables were updated for test software. Section 4.6 limits were updated and formula added WF1 and WF2 antenna usage was clarified throughout report. Corrected frequency on page 26 & 28 plots. dBuV/m data was added to restricted band band edges. Fixed plot for 802.11g – MCH – 3-18GHz – Vertical Update plot for radiated spurious emissions.	24 February 2023
2	Updated Section 7.4 to include 18GHz – 26GHz data in the Equipment List.	28 February 2023