



RADIO EXPOSURE TEST REPORT

FCC ID : TLZ-XM455

Equipment : IEEE 802.11 2X2 WiFi 6 MIMO Wireless LAN + Bluetooth
5.3 Combo LGA Module

Brand Name : AzureWave

Model Name : AW-XM455

Applicant : AzureWave Technologies, Inc.
8F., No.94, Baozhong Rd. , Xindian Dist., New Taipei City ,
Taiwan 231

Manufacturer : AzureWave Technologies, Inc.
8F., No.94, Baozhong Rd. , Xindian Dist., New Taipei City ,
Taiwan 231

Standard : 47 CFR Part 2.1091

The product was received on Oct. 24, 2022, and testing was started from Nov. 05, 2022 and completed on Feb. 09, 2023. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

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Photographs of EUT v01 (Sporton report no.: EP2O0714)



History of this test report

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Report Version : 01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Vicky Huang



1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / $\pi/4$ -DQPSK / 8DPSK) LE: GFSK



1.2 Antenna Information

Ant.	Port			Brand	Model Name	Antenna Type	Connector	Gain (dBi)
	WLAN 2.4GHz	WLAN 5GHz	Bluetooth					
1	1/2	1/2	1	MAG. LAYERS	MSA-4008-25GC1-A2	PIFA	I-PEX	Note 1
2	1/2	1/2	1	SONY	IW611-IW620-D(100)	Dipole	I-PEX	
3	1/2	1/2	1	SONY	IW611-IW620-D(110)	Dipole	I-PEX	
4	1/2	1/2	1	SONY	IW611-IW620-D(120)	Dipole	I-PEX	
5	1/2	1/2	1	SONY	IW611-IW620-D(130)	Dipole	I-PEX	
6	1/2	1/2	1	SONY	IW611-IW620-D(140)	Dipole	I-PEX	
7	1/2	1/2	1	SONY	IW611-IW620-D(150)	Dipole	I-PEX	
8	1/2	1/2	1	SONY	IW611-IW620-D(160)	Dipole	I-PEX	
9	1/2	1/2	1	SONY	IW611-IW620-D(170)	Dipole	I-PEX	
10	1/2	1/2	1	SONY	IW611-IW620-D(180)	Dipole	I-PEX	
11	1/2	1/2	1	SONY	IW611-IW620-D(190)	Dipole	I-PEX	
12	1/2	1/2	1	SONY	IW611-IW620-D(200)	Dipole	I-PEX	
13	1/2	1/2	1	SONY	IW611-IW620-D(210)	Dipole	I-PEX	
14	1/2	1/2	1	SONY	IW611-IW620-D(220)	Dipole	I-PEX	
15	1/2	1/2	1	SONY	IW611-IW620-D(230)	Dipole	I-PEX	
16	1/2	1/2	1	SONY	IW611-IW620-D(240)	Dipole	I-PEX	
17	1/2	1/2	1	SONY	IW611-IW620-D(250)	Dipole	I-PEX	
18	1/2	1/2	1	SONY	IW611-IW620-D(260)	Dipole	I-PEX	
19	1/2	1/2	1	SONY	IW611-IW620-D(270)	Dipole	I-PEX	
20	1/2	1/2	1	SONY	IW611-IW620-D(280)	Dipole	I-PEX	
21	1/2	1/2	1	SONY	IW611-IW620-D(290)	Dipole	I-PEX	
22	1/2	1/2	1	SONY	IW611-IW620-D(300)	Dipole	I-PEX	
23	1/2	1/2	1	SONY	IW611-IW620-D(310)	Dipole	I-PEX	
24	1/2	1/2	1	SONY	IW611-IW620-D(320)	Dipole	I-PEX	
25	1/2	1/2	1	SONY	IW611-IW620-D(330)	Dipole	I-PEX	
26	1/2	1/2	1	SONY	IW611-IW620-D(340)	Dipole	I-PEX	
27	1/2	1/2	1	SONY	IW611-IW620-D(350)	Dipole	I-PEX	
28	1/2	1/2	1	SONY	IW611-IW620-D(360)	Dipole	I-PEX	
29	1/2	1/2	1	SONY	IW611-IW620-D(370)	Dipole	I-PEX	
30	1/2	1/2	1	SONY	IW611-IW620-D(380)	Dipole	I-PEX	
31	1/2	1/2	1	SONY	IW611-IW620-D(390)	Dipole	I-PEX	
32	1/2	1/2	1	SONY	IW611-IW620-D(400)	Dipole	I-PEX	
33	1/2	1/2	1	SONY	IW611-IW620-D(410)	Dipole	I-PEX	
34	1/2	1/2	1	SONY	IW611-IW620-D(420)	Dipole	I-PEX	
35	1/2	1/2	1	SONY	IW611-IW620-D(430)	Dipole	I-PEX	
36	1/2	1/2	1	SONY	IW611-IW620-D(440)	Dipole	I-PEX	
37	1/2	1/2	1	SONY	IW611-IW620-D(450)	Dipole	I-PEX	
38	1/2	1/2	1	SONY	IW611-IW620-D(460)	Dipole	I-PEX	

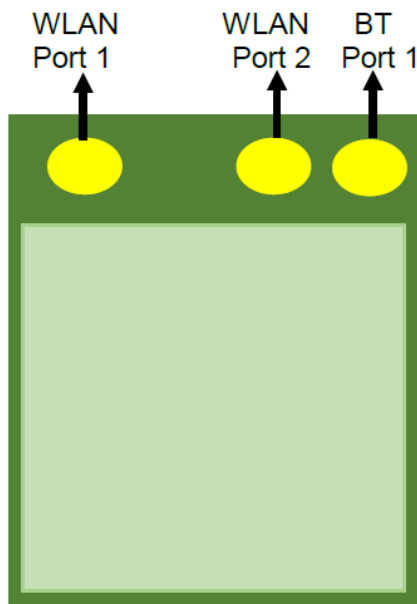


39	1/2	1/2	1	SONY	IW611-IW620-D(470)	Dipole	I-PEX	Note 1
40	1/2	1/2	1	SONY	IW611-IW620-D(480)	Dipole	I-PEX	
41	1/2	1/2	1	SONY	IW611-IW620-D(490)	Dipole	I-PEX	
42	1/2	1/2	1	SONY	IW611-IW620-D(500)	Dipole	I-PEX	
43	1/2	1/2	1	SONY	IW611-IW620-D(510)	Dipole	I-PEX	
44	1/2	1/2	1	SONY	IW611-IW620-D(520)	Dipole	I-PEX	
45	1/2	1/2	1	SONY	IW611-IW620-D(530)	Dipole	I-PEX	
46	1/2	1/2	1	SONY	IW611-IW620-D(540)	Dipole	I-PEX	
47	1/2	1/2	1	SONY	IW611-IW620-D(550)	Dipole	I-PEX	
48	1/2	1/2	1	SONY	IW611-IW620-D(560)	Dipole	I-PEX	
49	1/2	1/2	1	SONY	IW611-IW620-D(570)	Dipole	I-PEX	
50	1/2	1/2	1	SONY	IW611-IW620-D(580)	Dipole	I-PEX	
51	1/2	1/2	1	SONY	IW611-IW620-D(590)	Dipole	I-PEX	
52	1/2	1/2	1	SONY	IW611-IW620-D(600)	Dipole	I-PEX	
53	1/2	1/2	1	SONY	IW611-IW620-D(610)	Dipole	I-PEX	
54	1/2	1/2	1	SONY	IW611-IW620-D(620)	Dipole	I-PEX	
55	1/2	1/2	1	SONY	IW611-IW620-D(630)	Dipole	I-PEX	
56	1/2	1/2	1	SONY	IW611-IW620-D(640)	Dipole	I-PEX	
57	1/2	1/2	1	SONY	IW611-IW620-D(650)	Dipole	I-PEX	
58	1/2	1/2	1	SONY	IW611-IW620-D(660)	Dipole	I-PEX	
59	1/2	1/2	1	SONY	IW611-IW620-D(670)	Dipole	I-PEX	
60	1/2	1/2	1	SONY	IW611-IW620-D(680)	Dipole	I-PEX	
61	1/2	1/2	1	SONY	IW611-IW620-D(690)	Dipole	I-PEX	
62	1/2	1/2	1	SONY	IW611-IW620-D(700)	Dipole	I-PEX	
63	1/2	1/2	1	SONY	IW611-IW620-D(710)	Dipole	I-PEX	
64	1/2	1/2	1	SONY	IW611-IW620-D(720)	Dipole	I-PEX	
65	1/2	1/2	1	SONY	IW611-IW620-D(730)	Dipole	I-PEX	
66	1/2	1/2	1	SONY	IW611-IW620-D(740)	Dipole	I-PEX	
67	1/2	1/2	1	SONY	IW611-IW620-D(750)	Dipole	I-PEX	
68	1/2	1/2	1	SONY	IW611-IW620-D(760)	Dipole	I-PEX	
69	1/2	1/2	1	SONY	IW611-IW620-D(770)	Dipole	I-PEX	
70	1/2	1/2	1	SONY	IW611-IW620-D(780)	Dipole	I-PEX	
71	1/2	1/2	1	SONY	IW611-IW620-D(790)	Dipole	I-PEX	
72	1/2	1/2	1	SONY	IW611-IW620-D(800)	Dipole	I-PEX	
73	1/2	1/2	1	SONY	IW611-IW620-G(100)	Dipole	I-PEX	
74	1/2	1/2	1	SONY	IW611-IW620-G(110)	Dipole	I-PEX	
75	1/2	1/2	1	SONY	IW611-IW620-G(120)	Dipole	I-PEX	
76	1/2	1/2	1	SONY	IW611-IW620-G(130)	Dipole	I-PEX	
77	1/2	1/2	1	SONY	IW611-IW620-G(140)	Dipole	I-PEX	
78	1/2	1/2	1	SONY	IW611-IW620-G(150)	Dipole	I-PEX	
79	1/2	1/2	1	SONY	IW611-IW620-G(160)	Dipole	I-PEX	
80	1/2	1/2	1	SONY	IW611-IW620-G(170)	Dipole	I-PEX	



81	1/2	1/2	1	SONY	IW611-IW620-G(180)	Dipole	I-PEX	Note 1
82	1/2	1/2	1	SONY	IW611-IW620-G(190)	Dipole	I-PEX	
83	1/2	1/2	1	SONY	IW611-IW620-G(200)	Dipole	I-PEX	
84	1/2	1/2	1	SONY	IW611-IW620-G(210)	Dipole	I-PEX	
85	1/2	1/2	1	SONY	IW611-IW620-G(220)	Dipole	I-PEX	
86	1/2	1/2	1	SONY	IW611-IW620-G(230)	Dipole	I-PEX	
87	1/2	1/2	1	SONY	IW611-IW620-G(240)	Dipole	I-PEX	
88	1/2	1/2	1	SONY	IW611-IW620-G(250)	Dipole	I-PEX	
89	1/2	1/2	1	SONY	IW611-IW620-G(260)	Dipole	I-PEX	
90	1/2	1/2	1	SONY	IW611-IW620-G(270)	Dipole	I-PEX	
91	1/2	1/2	1	SONY	IW611-IW620-G(280)	Dipole	I-PEX	
92	1/2	1/2	1	SONY	IW611-IW620-G(290)	Dipole	I-PEX	
93	1/2	1/2	1	SONY	IW611-IW620-G(300)	Dipole	I-PEX	
94	1/2	1/2	1	SONY	IW611-IW620-G(310)	Dipole	I-PEX	
95	1/2	1/2	1	SONY	IW611-IW620-G(320)	Dipole	I-PEX	
96	1/2	1/2	1	SONY	IW611-IW620-G(330)	Dipole	I-PEX	
97	1/2	1/2	1	SONY	IW611-IW620-G(340)	Dipole	I-PEX	
98	1/2	1/2	1	SONY	IW611-IW620-G(350)	Dipole	I-PEX	
99	1/2	1/2	1	SONY	IW611-IW620-G(360)	Dipole	I-PEX	
100	1/2	1/2	1	SONY	IW611-IW620-G(370)	Dipole	I-PEX	
101	1/2	1/2	1	SONY	IW611-IW620-G(380)	Dipole	I-PEX	
102	1/2	1/2	1	SONY	IW611-IW620-G(390)	Dipole	I-PEX	
103	1/2	1/2	1	SONY	IW611-IW620-G(400)	Dipole	I-PEX	
104	1/2	1/2	1	SONY	IW611-IW620-G(410)	Dipole	I-PEX	Note 1
105	1/2	1/2	1	SONY	IW611-IW620-G(420)	Dipole	I-PEX	
106	1/2	1/2	1	SONY	IW611-IW620-G(430)	Dipole	I-PEX	
107	1/2	1/2	1	SONY	IW611-IW620-G(440)	Dipole	I-PEX	
108	1/2	1/2	1	SONY	IW611-IW620-G(450)	Dipole	I-PEX	
109	1/2	1/2	1	SONY	IW611-IW620-G(460)	Dipole	I-PEX	
110	1/2	1/2	1	SONY	IW611-IW620-G(470)	Dipole	I-PEX	
111	1/2	1/2	1	SONY	IW611-IW620-G(480)	Dipole	I-PEX	
112	1/2	1/2	1	SONY	IW611-IW620-G(490)	Dipole	I-PEX	
113	1/2	1/2	1	SONY	IW611-IW620-G(500)	Dipole	I-PEX	
114	1/2	1/2	1	SONY	IW611-IW620-G(510)	Dipole	I-PEX	
115	1/2	1/2	1	SONY	IW611-IW620-G(520)	Dipole	I-PEX	
116	1/2	1/2	1	SONY	IW611-IW620-G(530)	Dipole	I-PEX	
117	1/2	1/2	1	SONY	IW611-IW620-G(540)	Dipole	I-PEX	
118	1/2	1/2	1	SONY	IW611-IW620-G(550)	Dipole	I-PEX	
119	1/2	1/2	1	SONY	IW611-IW620-G(560)	Dipole	I-PEX	
120	1/2	1/2	1	SONY	IW611-IW620-G(570)	Dipole	I-PEX	
121	1/2	1/2	1	SONY	IW611-IW620-G(580)	Dipole	I-PEX	
122	1/2	1/2	1	SONY	IW611-IW620-G(590)	Dipole	I-PEX	

123	1/2	1/2	1	SONY	IW611-IW620-G(600)	Dipole	I-PEX	Note 1
124	1/2	1/2	1	SONY	IW611-IW620-G(610)	Dipole	I-PEX	
125	1/2	1/2	1	SONY	IW611-IW620-G(620)	Dipole	I-PEX	
126	1/2	1/2	1	SONY	IW611-IW620-G(630)	Dipole	I-PEX	
127	1/2	1/2	1	SONY	IW611-IW620-G(640)	Dipole	I-PEX	
128	1/2	1/2	1	SONY	IW611-IW620-G(650)	Dipole	I-PEX	
129	1/2	1/2	1	SONY	IW611-IW620-G(660)	Dipole	I-PEX	
130	1/2	1/2	1	SONY	IW611-IW620-G(670)	Dipole	I-PEX	
131	1/2	1/2	1	SONY	IW611-IW620-G(680)	Dipole	I-PEX	
132	1/2	1/2	1	SONY	IW611-IW620-G(690)	Dipole	I-PEX	
133	1/2	1/2	1	SONY	IW611-IW620-G(700)	Dipole	I-PEX	
134	1/2	1/2	1	SONY	IW611-IW620-G(710)	Dipole	I-PEX	
135	1/2	1/2	1	SONY	IW611-IW620-G(720)	Dipole	I-PEX	
136	1/2	1/2	1	SONY	IW611-IW620-G(730)	Dipole	I-PEX	
137	1/2	1/2	1	SONY	IW611-IW620-G(740)	Dipole	I-PEX	
138	1/2	1/2	1	SONY	IW611-IW620-G(750)	Dipole	I-PEX	
139	1/2	1/2	1	SONY	IW611-IW620-G(760)	Dipole	I-PEX	
140	1/2	1/2	1	SONY	IW611-IW620-G(770)	Dipole	I-PEX	
141	1/2	1/2	1	SONY	IW611-IW620-G(780)	Dipole	I-PEX	
142	1/2	1/2	1	SONY	IW611-IW620-G(790)	Dipole	I-PEX	
143	1/2	1/2	1	SONY	IW611-IW620-G(800)	Dipole	I-PEX	

WLAN Port1 / WLAN Port2 / BT Port 1 Location




Note 1:

Ant.	Gain (dBi)	
	WLAN 2.4GHz/Bluetooth	WLAN 5GHz
1	2.98	5.16
2	0.38	1.68
3	0.35	1.63
4	0.32	1.59
5	0.28	1.54
6	0.25	1.49
7	0.22	1.45
8	0.19	1.4
9	0.16	1.36
10	0.13	1.31
11	0.09	1.26
12	0.06	1.22
13	0.03	1.17
14	0.00	1.12
15	-0.03	1.08
16	-0.06	1.03
17	-0.10	0.99
18	-0.13	0.94
19	-0.16	0.89
20	-0.19	0.85
21	-0.22	0.8
22	-0.25	0.75
23	-0.29	0.71
24	-0.32	0.66
25	-0.35	0.62
26	-0.38	0.57
27	-0.41	0.52
28	-0.44	0.48
29	-0.48	0.43
30	-0.51	0.38
31	-0.54	0.34
32	-0.57	0.29
33	-0.60	0.24
34	-0.63	0.2
35	-0.67	0.15
36	-0.70	0.11
37	-0.73	0.06
38	-0.76	0.01



39	-0.79	-0.03
40	-0.82	-0.08
41	-0.86	-0.13
42	-0.89	-0.17
43	-0.92	-0.22
44	-0.95	-0.26
45	-0.98	-0.31
46	-1.01	-0.36
47	-1.05	-0.4
48	-1.08	-0.45
49	-1.11	-0.5
50	-1.14	-0.54
51	-1.17	-0.59
52	-1.21	-0.64
53	-1.24	-0.68
54	-1.27	-0.73
55	-1.30	-0.77
56	-1.33	-0.82
57	-1.36	-0.87
58	-1.40	-0.91
59	-1.43	-0.96
60	-1.46	-1.01
61	-1.49	-1.05
62	-1.52	-1.1
63	-1.55	-1.14
64	-1.59	-1.19
65	-1.62	-1.24
66	-1.65	-1.28
67	-1.68	-1.33
68	-1.71	-1.38
69	-1.74	-1.42
70	-1.78	-1.47
71	-1.81	-1.51
72	-1.84	-1.56
73	0.29	1.36
74	0.26	1.31
75	0.23	1.27
76	0.19	1.22
77	0.16	1.17
78	0.13	1.13
79	0.10	1.08



80	0.07	1.04
81	0.04	0.99
82	0.00	0.94
83	-0.03	0.9
84	-0.06	0.85
85	-0.09	0.8
86	-0.12	0.76
87	-0.15	0.71
88	-0.19	0.67
89	-0.22	0.62
90	-0.25	0.57
91	-0.28	0.53
92	-0.31	0.48
93	-0.34	0.43
94	-0.38	0.39
95	-0.41	0.34
96	-0.44	0.3
97	-0.47	0.25
98	-0.50	0.2
99	-0.53	0.16
100	-0.57	0.11
101	-0.60	0.06
102	-0.63	0.02
103	-0.66	-0.03
104	-0.69	-0.08
105	-0.72	-0.12
106	-0.76	-0.17
107	-0.79	-0.21
108	-0.82	-0.26
109	-0.85	-0.31
110	-0.88	-0.35
111	-0.91	-0.4
112	-0.95	-0.45
113	-0.98	-0.49
114	-1.01	-0.54
115	-1.04	-0.58
116	-1.07	-0.63
117	-1.10	-0.68
118	-1.14	-0.72
119	-1.17	-0.77
120	-1.20	-0.82



121	-1.23	-0.86
122	-1.26	-0.91
123	-1.30	-0.96
124	-1.33	-1
125	-1.36	-1.05
126	-1.39	-1.09
127	-1.42	-1.14
128	-1.45	-1.19
129	-1.49	-1.23
130	-1.52	-1.28
131	-1.55	-1.33
132	-1.58	-1.37
133	-1.61	-1.42
134	-1.64	-1.46
135	-1.68	-1.51
136	-1.71	-1.56
137	-1.74	-1.6
138	-1.77	-1.65
139	-1.80	-1.7
140	-1.83	-1.74
141	-1.87	-1.79
142	-1.90	-1.83
143	-1.93	-1.88

Note2: The above information was declared by manufacturer.

For the radiated test: The EUT has two types of antenna. Only the highest gain antenna was selected from each different type of antenna to test and record in this report. Thus, Antenna 1 and 2 were selected to perform the test.

For the conducted test: The EUT has two types of antenna. Only the highest gain antenna was selected to test and record in this report. Thus, Antenna 1 was selected to perform the test.

<For WLAN 2.4GHz function>

For IEEE 802.11b/g/n/VHT/ax (2TX/2RX):

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

<For WLAN 5GHz function>

For IEEE 802.11a/n/ac/ax (2TX/2RX):

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

<For Bluetooth function> (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

Each antenna port, please refer to the photographs of EUT.

Note 3: Directional gain information

Type	Maximum Output Power	Power Spectral Density
Non-BF	Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$
BF	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula :

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$$

$$NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2) = 10^{G2/20}$$

$$g_{j,k} = (NSS1(g1,1) + NSS1(g1,2))^2$$

$$DG = 10 \log[(NSS1(g1,1) + NSS1(g1,2))^2 / N_{ANT}]$$

$$\Rightarrow 10 \log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}]$$

Where ;

Antenna Gain

2.4G G1 = 2.98 dBi; G2 = 2.98 dBi

5G Band1 G1 = 5.16dBi; G2 = 5.16 dBi

5G Band2 G1 = 5.16dBi; G2 = 5.16 dBi

5G Band3 G1 = 5.16dBi; G2 = 5.16 dBi

5G Band4 G1 = 5.16dBi; G2 = 5.16 dBi

2.4G

DG = 5.99 dBi

5G

Band1 DG = 8.17 dBi

Band2 DG = 8.17 dBi

Band3 DG = 8.17 dBi

Band4 DG = 8.17 dBi



1.3 Table for Hardware Information

Hardware Version	Description
V04	The difference between V04 and V05 is the layout of DC-DC power and xtal. All RF layouts are the same.
V05	

Note: The above information was declared by manufacturer.

1.4 Table for EUT Combination

EUT	Hardware Version	Antenna Trace Type	Equip Antenna
1	V04	Design to PIFA use	Ant. 1
2	V05	Design to PIFA use	Ant. 1
3	V04	Design to Dipole use	Ant. 2~143
4	V05	Design to Dipole use	Ant. 2~143

Note: After evaluating, the EUT 2 was selected to test items.

1.5 Accessories

N/A

1.6 Applicable Standards

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

- ♦ 47 CFR Part 2.1091
 - ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01
- The following reference test guidance is not within the scope of accreditation of TAF.
- ♦ 47 CFR Part 1.1307
 - ♦ 47 CFR Part 1.1310

1.7 Testing Location

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
	Test site Designation No. TW3787 with FCC.
	Conformity Assessment Body Identifier (CABID) TW3787 with ISCED.



2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	*(100)	<6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1500	-	-	f/300	<6
1500-100,000	-	-	5	<6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1500	-	-	f/1500	<30
1500-100,000	-	-	1.0	<30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Method

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

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= P_{th}.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance

R between the person and the antenna / radiating structure, where $R > \lambda / 2 \pi$.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.
Note: R is in meters, f is in MHz.	



2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
2.4G;D1D	5.99	22.59	28.58	0.50	29.08	0.80910	20	0.16096	1.00000
5.2G;D1D	8.17	21.59	29.76	0.23	29.99	0.99770	20	0.19848	1.00000
5.3G;D1D	8.17	21.63	29.80	0.19	29.99	0.99770	20	0.19848	1.00000
5.6G;D1D	8.17	21.56	29.73	0.23	29.96	0.99083	20	0.19712	1.00000
5.8G;D1D	8.17	22.68	30.85	0.5	31.35	1.36458	20	0.27147	1.00000
2.4G;BT-BR	2.98	4.54	7.52	0.50	8.02	0.00634	20	0.00126	1.00000

MPE Exemption Option B						
Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.2	29.08	26.93	0.493	3.060	Complies
5795		31.35	29.20	0.832	3.060	Complies
2402		8.02	8.02	0.006	3.060	Complies

————THE END————