

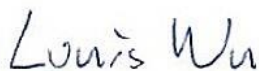


FCC RADIO TEST REPORT

FCC ID : UZ7TC5301
Equipment : Touch Computer
Brand Name : Zebra
Model Name : TC5301
Applicant : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Manufacturer : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Standard : FCC Part 15 Subpart E §15.407

The product was received on Dec. 21, 2021 and testing was performed from Dec. 28, 2021 to May 18, 2022. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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



Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issue Date
FR1D2108H	01	Initial issue of report	Mar. 18, 2022
FR1D2108H	02	1. Revise test data 2. Revise TAF Logo	May 30, 2022



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.403(i) 15.407(a)(10)	26dB Emission Bandwidth	-	See Note
-	2.1049	99% Occupied Bandwidth	-	See Note
3.1	15.407(a)(7)(8)	Fundamental Maximum EIRP	Pass	-
-	15.407(a)(8)	Fundamental Power Spectral Density	-	See Note
-	15.407(b)(6)	In-Band Emissions (Channel Mask)	-	See Note
-	15.407(d)(6)	Contention Based Protocol	-	See Note
-	15.407(b)	Unwanted Emissions	-	See Note
-	15.207	AC Conducted Emission	-	See Note
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

Note: Except Fundamental Maximum EIRP test item is carrying out, other test items please refer to Sporton report number FR1D2108G.

Declaration of Conformity:

The test results (PASS/FAIL) 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.

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Wei Chen

Report Producer: Amy Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Touch Computer
Brand Name	Zebra
Model Name	TC5301
FCC ID	UZ7TC5301
Sample1	Lowell + Premium config
Sample2	SE4720 + Base config
Sample3	Lowell + Base config
EUT supports Radios application	NFC WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE
HW Version	EV2
SW Version	11-05-19.00-RG-U00-PRD-ATH-04 99 test-keys
FW Version	FUSION_QA_4_1.0.0.007_R
MFD	03DEC21
EUT Stage	Identical Prototype

Remark: The EUT's information above is declared by manufacturer.

Specification of Accessories				
Adapter	Brand Name	Zebra	Part Number	PWR-WUA5V12W0US
Battery 1X	Brand Name	Zebra	Part Number	BT-000442-0020
USB TYPE A to TYPE C cable	Brand Name	Zebra	Part Number	CBL-TC5X-USBC2A-01
3.5mm Earphone	Brand Name	Zebra	Part Number	HDST-35MM-PTVP-01
Headset Jumper	Brand Name	Zebra	Part Number	CBL-TC51-HDST35-01
Trigger Handle	Brand Name	Zebra	Part Number	TRG-NGTC5-ELEC-01
Soft Holster	Brand Name	Zebra	Part Number	SG-NGTC5TC7-HLSTR-01
TC53/TC58 RUGGED BOOT	Brand Name	Zebra	Part Number	SG-NGTC5EXO1-01

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard																																																														
Tx/Rx Frequency Range	5925 MHz ~ 6425 MHz 6425 MHz ~ 6525 MHz 6525 MHz ~ 6875 MHz 6875 MHz ~ 7125 MHz																																																													
Maximum Output Power to Antenna <TXBF Mode>	<Indoor Client> MIMO <Ant. 9+8> <UNII-5> <table border="1"> <thead> <tr> <th></th><th>dBm</th><th>W</th></tr> </thead> <tbody> <tr> <td>802.11ax HE20</td><td>4.24</td><td>0.0027</td></tr> <tr> <td>802.11ax HE40</td><td>7.31</td><td>0.0054</td></tr> <tr> <td>802.11ax HE80</td><td>9.23</td><td>0.0084</td></tr> <tr> <td>802.11ax HE160</td><td>9.01</td><td>0.0080</td></tr> </tbody> </table> <UNII-6> <table border="1"> <thead> <tr> <th></th><th>dBm</th><th>W</th></tr> </thead> <tbody> <tr> <td>802.11ax HE20</td><td>3.51</td><td>0.0022</td></tr> <tr> <td>802.11ax HE40</td><td>7.06</td><td>0.0051</td></tr> <tr> <td>802.11ax HE80</td><td>9.51</td><td>0.0089</td></tr> <tr> <td>802.11ax HE160</td><td>9.91</td><td>0.0098</td></tr> </tbody> </table> <UNII-7> <table border="1"> <thead> <tr> <th></th><th>dBm</th><th>W</th></tr> </thead> <tbody> <tr> <td>802.11ax HE20</td><td>4.48</td><td>0.0028</td></tr> <tr> <td>802.11ax HE40</td><td>7.08</td><td>0.0051</td></tr> <tr> <td>802.11ax HE80</td><td>9.91</td><td>0.0098</td></tr> <tr> <td>802.11ax HE160</td><td>9.28</td><td>0.0085</td></tr> </tbody> </table> <UNII-8> <table border="1"> <thead> <tr> <th></th><th>dBm</th><th>W</th></tr> </thead> <tbody> <tr> <td>802.11ax HE20</td><td>4.63</td><td>0.0029</td></tr> <tr> <td>802.11ax HE40</td><td>7.92</td><td>0.0062</td></tr> <tr> <td>802.11ax HE80</td><td>9.56</td><td>0.0090</td></tr> <tr> <td>802.11ax HE160</td><td>10.07</td><td>0.0102</td></tr> </tbody> </table>			dBm	W	802.11ax HE20	4.24	0.0027	802.11ax HE40	7.31	0.0054	802.11ax HE80	9.23	0.0084	802.11ax HE160	9.01	0.0080		dBm	W	802.11ax HE20	3.51	0.0022	802.11ax HE40	7.06	0.0051	802.11ax HE80	9.51	0.0089	802.11ax HE160	9.91	0.0098		dBm	W	802.11ax HE20	4.48	0.0028	802.11ax HE40	7.08	0.0051	802.11ax HE80	9.91	0.0098	802.11ax HE160	9.28	0.0085		dBm	W	802.11ax HE20	4.63	0.0029	802.11ax HE40	7.92	0.0062	802.11ax HE80	9.56	0.0090	802.11ax HE160	10.07	0.0102
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Product Specification is subject to this standard				
Antenna Type	<UNII-5> <Ant. 9>: PIFA Antenna with gain 2.9 dBi <Ant. 8>: PIFA Antenna with gain 4.0 dBi <UNII-6> <Ant. 9>: PIFA Antenna with gain 3.2 dBi <Ant. 8>: PIFA Antenna with gain 4.0 dBi <UNII-7> <Ant. 9>: PIFA Antenna with gain 3.3 dBi <Ant. 8>: PIFA Antenna with gain 3.9 dBi <UNII-8> <Ant. 9>: PIFA Antenna with gain 3.4 dBi <Ant. 8>: PIFA Antenna with gain 2.8 dBi			
	Type of Modulation			
	802.11ax: OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)			
	Antenna Function Description		Ant. 9	Ant. 8
		802.11 ax TXBF	V	V

Remark:

1. MIMO Ant. 9+8 Directional Gain is a calculated result from MIMO Ant. 9 and MIMO Ant. 8. The formula used in calculation is documented in section 3.8.
2. Power of MIMO Ant. 9 + Ant. 8 is a calculated result from sum of the power MIMO Ant. 9 and MIMO Ant. 8.
3. The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.
4. Since the frequency range from U-NII-5 CH01 to U-NII-5 CH33 do not supported by the WLAN AP, thus, the manufacturer declares that the output power of CH01 to CH33 which were under 3dB than non-Beamforming mode, and the non-Beamforming test result which referred to Sporton Report No. FR1D2108G.

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. TH05-HY

FCC designation No.: TW3786



1.5 Applicable Standards

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

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 987594 D02 U-NII 6 GHz EMC Measurement v01
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency and Channel

BW 20M	Channel	1	5	9	13	17	21	25	29
	Freq. (MHz)	5955	5975	5995	6015	6035	6055	6075	6095
BW 40M	Channel	3		11		19		27	
	Freq. (MHz)	5965		6005		6045		6085	
BW 80M	Channel	7				23			
	Freq. (MHz)	5985				6065			
BW 160M	Channel	15							
	Freq. (MHz)	6025							

BW 20M	Channel	33	37	41	45	49	53	57	61
	Freq. (MHz)	6115	6135	6155	6175	6195	6215	6235	6255
BW 40M	Channel	35		43		51		59	
	Freq. (MHz)	6125		6165		6205		6245	
BW 80M	Channel	39				55			
	Freq. (MHz)	6145				6225			
BW 160M	Channel	47							
	Freq. (MHz)	6185							

BW 20M	Channel	65	69	73	77	81	85	89	93
	Freq. (MHz)	6275	6295	6315	6335	6355	6375	6395	6415
BW 40M	Channel	67		75		83		91	
	Freq. (MHz)	6285		6325		6365		6405	
BW 80M	Channel	71				87			
	Freq. (MHz)	6305				6385			
BW 160M	Channel	79							
	Freq. (MHz)	6345							

BW 20M	Channel	97	101	105	109	113	117	121	125
	Freq. (MHz)	6435	6455	6475	6495	6515	6535	6555	6575
BW 40M	Channel	99		107		115		123	
	Freq. (MHz)	6445		6485		6525		6565	
BW 80M	Channel	103				119			
	Freq. (MHz)	6465				6545			
BW 160M	Channel	111							
	Freq. (MHz)	6505							



BW 20M	Channel	129	133	137	141	145	149	153	157
	Freq. (MHz)	6595	6615	6635	6655	6675	6695	6715	6735
BW 40M	Channel	131		139		147		155	
	Freq. (MHz)	6605		6645		6685		6725	
BW 80M	Channel	135				151			
	Freq. (MHz)	6625				6705			
BW 160M	Channel	143							
	Freq. (MHz)	6665							

BW 20M	Channel	161	165	169	173	177	181	185	189
	Freq. (MHz)	6755	6775	6795	6815	6835	6855	6875	6895
BW 40M	Channel	163		171		179		187	
	Freq. (MHz)	6765		6805		6845		6885	
BW 80M	Channel	167				183			
	Freq. (MHz)	6785				6865			
BW 160M	Channel	175							
	Freq. (MHz)	6825							

BW 20M	Channel	193	197	201	205	209	213	217	221
	Freq. (MHz)	6915	6935	6955	6975	6995	7015	7035	7055
BW 40M	Channel	195		203		211		219	
	Freq. (MHz)	6925		6965		7005		7045	
BW 80M	Channel	199				215			
	Freq. (MHz)	6945				7025			
BW 160M	Channel	207							
	Freq. (MHz)	6985							

BW 20M	Channel	225				229			
	Freq. (MHz)	7075				7095			
BW 40M	Channel	227							
	Freq. (MHz)	7085							

BW 20M	Channel	233							
	Freq. (MHz)	7115							

2.2 Test Mode

The indoor client mode has no higher power and PSD than standard client mode, thus the standard client mode is chosen as main test configuration, and the indoor client mode is verified the power and PSD.

Since the verify EIRP power, the smaller power can be covered by the higher power. All the conducted and Radiated Spurious Emission test items the TXBF Mode cover by SDM Mode.

The final test modes consider the modulation and the worst data rates as shown in the table below.

<Standard Client>

Modulation	Data Rate
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0
802.11ax HE160	MCS0

<Indoor Client>

Modulation	Data Rate
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0
802.11ax HE160	MCS0



<TXBF Mode>

MIMO <Ant. 9+8>

<Indoor Client>

802.11ax HE20 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
CH 049	6195	Full	4.02	CH 093	4.14	4.08	4.04	4.10	4.04	4.03	4.03	4.04	4.04	4.14	4.14
CH 093	6415	Full	4.24												
CH 097	6435	Full	3.31												
CH 105	6475	Full	3.21												
CH 113	6515	Full	3.51	CH 113	3.41	3.41	3.36	3.31	3.31	3.26	3.21	3.26	3.31	3.36	3.36
CH 117	6535	Full	3.81												
CH 149	6695	Full	3.88												
CH 181	6855	Full	4.48												
CH 185*	6875	Full	4.63	CH 185	4.53	4.47	4.43	4.38	4.33	4.37	4.37	4.43	4.38	4.48	4.47
CH 189	6895	Full	3.93												
CH 209	6995	Full	4.17												
CH 233	7115	Full	-6.89												
CH 209	6995	Full	4.17	CH 209	4.27	4.22	4.17	4.11	4.12	4.17	4.12	4.22	4.27	4.32	4.27

Note: The above Frequency and Channel in "*" were straddle Channel.

802.11ax HE40 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
CH 051	6205	Full	6.23	CH 091	7.21	7.16	7.11	7.06	7.06	7.01	7.11	7.06	7.16	7.21	7.16
CH 091	6405	Full	7.31												
CH 099	6445	Full	6.56												
CH 107	6485	Full	7.06		6.96	6.91	6.81	6.76	6.81	6.81	6.81	6.81	6.91	6.86	6.96
CH 115*	6525	Full	6.93	CH 107											
CH 123	6565	Full	6.78												
CH 147	6685	Full	7.08												
CH 179	6845	Full	6.87												
CH 187*	6885	Full	7.92	CH 187*	7.82	7.77	7.77	7.77	7.67	7.67	7.62	7.72	7.72	7.72	7.82
CH 195	6925	Full	7.13												
CH 211	7005	Full	7.11												
CH 227	7085	Full	7.76		7.61	7.56	7.56	7.46	7.46	7.51	7.51	7.56	7.61	7.66	7.66

Note: The above Frequency and Channel in "*" were straddle Channel.



802.11ax HE80 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
Duty Cycle (%)			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
CH 055	6225	Full	9.23	CH 055	9.13	9.08	8.98	8.98	8.97	8.97	9.03	8.97	9.03	9.08	9.13
CH 087	6385	Full	9.06	CH 119*	9.41	9.36	9.21	9.26	9.31	9.36	9.21	9.36	9.21	9.26	9.36
CH 103	6465	Full	8.81		CH 151	9.81	9.77	9.76	9.71	9.61	9.57	9.61	9.57	9.61	9.71
CH 119*	6545	Full	9.51												
CH 135	6625	Full	9.31												
CH 151	6705	Full	9.91												
CH 167	6785	Full	9.53	CH 199	9.46	9.36	9.26	9.26	9.36	9.31	9.41	9.31	9.41	9.36	9.46
CH 183*	6865	Full	9.27												
CH 199	6945	Full	9.56												
CH 215	7025	Full	9.21	CH 199	9.46	9.36	9.26	9.26	9.36	9.31	9.41	9.31	9.41	9.36	9.46

Note: The above Frequency and Channel in "*" were straddle Channel.

802.11ax HE160 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
Duty Cycle (%)			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
CH 047	6185	Full	8.97	CH 079	8.91	8.86	8.86	8.81	8.81	8.81	8.81	8.71	8.81	8.86	8.91
CH 079	6345	Full	9.01	CH 111*	9.81	9.76	9.66	9.66	9.61	9.67	9.71	9.71	9.77	9.76	9.81
CH 111*	6505	Full	9.91	CH 175*	9.97	9.97	9.87	9.91	9.87	9.87	9.82	9.77	9.87	9.87	9.91
CH 143	6665	Full	9.28												
CH 175*	6825	Full	10.07	CH 207	9.21	9.17	9.12	9.02	9.07	9.01	9.01	9.17	9.16	9.11	9.21
CH 207	6985	Full	9.31												

Note: The above Frequency and Channel in "*" were straddle Channel.

<Standard Client>

802.11ax HE20 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
Duty Cycle (%)															
CH 049	6195	Full	9.02	CH 093	9.37	9.27	9.27	9.22	9.23	9.17	9.27	9.23	9.33	9.27	9.37
CH 093	6415	Full	9.47												
CH 117	6535	Full	10.76												
CH 149	6695	Full	11.77	CH 149	11.67	11.57	11.52	11.57	11.52	11.53	11.47	11.57	11.67	11.57	11.62
CH 181	6855	Full	10.88												

802.11ax HE40 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
Duty Cycle (%)			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
CH 051	6205	Full	9.07	CH 091	12.37	12.31	12.32	12.31	12.21	12.17	12.27	12.31	12.27	12.32	12.37
CH 091	6405	Full	9.47												
CH 123	6565	Full	11.08												
CH 147	6685	Full	11.28	CH 147	11.18	11.18	11.08	11.14	11.08	11.04	11.03	11.04	11.04	11.03	11.13
CH 179	6845	Full	11.03												

802.11ax HE80 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
Duty Cycle (%)			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
CH 055	6225	Full	9.33	CH 055	9.23	9.17	9.18	9.17	9.07	9.03	9.08	9.03	9.08	9.18	9.23
CH 087	6385	Full	9.17	CH 151	11.33	11.28	11.28	11.27	11.27	11.17	11.22	11.17	11.22	11.27	11.28
CH 135	6625	Full	11.42												
CH 151	6705	Full	11.43												
CH 167	6785	Full	11.42												

802.11ax HE160 RF Output Power (dBm)															
Power vs. Channel				Power vs Data Rate											
Ch.	Frequency (MHz)	RU Con.	MCS Index	Ch.	MCS Index										
			MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
Duty Cycle (%)															
CH 047	6185	Full	9.01	CH 047	8.91	8.91	8.81	8.81	8.91	8.81	8.71	8.81	8.81	8.91	8.91
CH 079	6345	Full	8.97												
CH 143	6665	Full	11.15	CH 143	11.08	11.08	10.98	11.08	10.98	10.88	10.88	10.98	10.98	11.08	11.08

2.3 EUT Operation Test Setup

For TXBF mode, the modulation modes and data rates manipulated by the command lines in the engineering program made the EUT link to another EUT by power under the normal operation. The "Magic iPerf Ver.1.0" software tool was used to enable the EUT to transmit signals continuously.

3 Test Result

3.1 Fundamental Maximum EIRP Measurement

3.1.1 Limit of Fundamental Maximum EIRP

<FCC 14-30 CFR 15.407>

(a)(8) For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.

(a)(7) For client devices, except for fixed client devices as defined in this subpart, the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm and the device must limit its power to no more than 6 dB below its associated standard power access point's authorized transmit power.

3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.3 Test Procedures

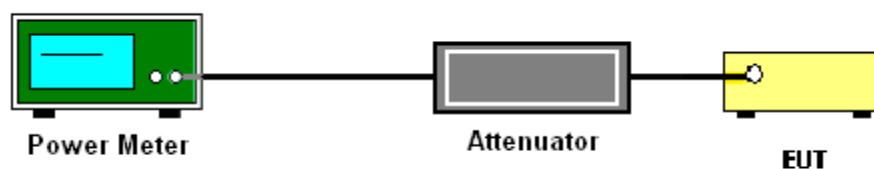
<TXBF Modes>

The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM-G (Measurement using a gated RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.1.4 Test Setup





3.1.5 Test Result of Fundamental Maximum EIRP

<TXBF Mode>

Test Engineer :	Jacob Yu and Hank Hsu	Temperature :	17.7~22.5℃
		Relative Humidity :	45.1~61.9%

<Indoor Client>

FCC Band V MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8			
HE20	MCS0	2	049	6195	Full	1.70	0.20	4.02	6.48		10.50	24.00	Pass
HE20	MCS0	2	093	6415	Full	1.70	0.70	4.24	6.48		10.72	24.00	Pass
HE40	MCS0	2	051	6205	Full	3.60	2.80	6.23	6.48		12.71	24.00	Pass
HE40	MCS0	2	091	6405	Full	4.40	4.20	7.31	6.48		13.79	24.00	Pass
HE80	MCS0	2	055	6225	Full	6.60	5.80	9.23	6.48		15.71	24.00	Pass
HE80	MCS0	2	087	6385	Full	6.20	5.90	9.06	6.48		15.54	24.00	Pass
HE160	MCS0	2	047	6185	Full	5.70	6.20	8.97	6.48		15.45	24.00	Pass
HE160	MCS0	2	079	6345	Full	6.10	5.90	9.01	6.48		15.49	24.00	Pass

FCC Band VI MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8	SUM		
HE20	MCS0	2	097	6435	Full	0.40	0.20	3.31	6.62		9.93	24.00	Pass
HE20	MCS0	2	105	6475	Full	0.20	0.20	3.21	6.62		9.83	24.00	Pass
HE20	MCS0	2	113	6515	Full	0.60	0.40	3.51	6.62		10.13	24.00	Pass
HE40	MCS0	2	099	6445	Full	3.70	3.40	6.56	6.62		13.18	24.00	Pass
HE40	MCS0	2	107	6485	Full	4.20	3.90	7.06	6.62		13.68	24.00	Pass
HE80	MCS0	2	103	6465	Full	5.90	5.70	8.81	6.62		15.43	24.00	Pass

FCC Band VI straddle channel MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8			
HE40	MCS0	2	115	6525	Full	4.30	3.50	6.93	6.62		13.55	24.00	Pass
HE80	MCS0	2	119	6545	Full	6.60	6.40	9.51	6.62		16.13	24.00	Pass
HE160	MCS0	2	111	6505	Full	7.10	6.70	9.91	6.62		16.53	24.00	Pass



FCC Band VII MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8			
HE20	MCS0	2	117	6535	Full	1.00	0.60	3.81	6.62		10.43	24.00	Pass
HE20	MCS0	2	149	6695	Full	1.30	0.40	3.88	6.62		10.50	24.00	Pass
HE20	MCS0	2	181	6855	Full	1.90	1.00	4.48	6.62		11.10	24.00	Pass
HE40	MCS0	2	123	6565	Full	4.20	3.30	6.78	6.62		13.40	24.00	Pass
HE40	MCS0	2	147	6685	Full	4.50	3.60	7.08	6.62		13.70	24.00	Pass
HE40	MCS0	2	179	6845	Full	4.20	3.50	6.87	6.62		13.49	24.00	Pass
HE80	MCS0	2	135	6625	Full	6.50	6.10	9.31	6.62		15.93	24.00	Pass
HE80	MCS0	2	151	6705	Full	7.10	6.70	9.91	6.62		16.53	24.00	Pass
HE80	MCS0	2	167	6785	Full	6.90	6.10	9.53	6.62		16.14	24.00	Pass
HE160	MCS0	2	143	6665	Full	6.70	5.80	9.28	6.62		15.90	24.00	Pass

Band VIII MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8	SUM		
HE20	MCS0	2	189	6895	Full	1.30	0.50	3.93	6.12		10.04	24.00	Pass
HE20	MCS0	2	209	6995	Full	1.40	0.90	4.17	6.12		10.28	24.00	Pass
HE20	MCS0	2	233	7115	Full	-9.90	-9.90	-6.89	6.12		-0.77	24.00	Pass
HE40	MCS0	2	195	6925	Full	4.50	3.70	7.13	6.12		13.24	24.00	Pass
HE40	MCS0	2	211	7005	Full	4.30	3.90	7.11	6.12		13.23	24.00	Pass
HE40	MCS0	2	227	7085	Full	4.90	4.60	7.76	6.12		13.88	24.00	Pass
HE80	MCS0	2	199	6945	Full	6.70	6.40	9.56	6.12		15.68	24.00	Pass
HE80	MCS0	2	215	7025	Full	6.40	6.00	9.21	6.12		15.33	24.00	Pass
HE160	MCS0	2	207	6985	Full	6.50	6.10	9.31	6.12		15.43	24.00	Pass

FCC Band VIII straddle channel MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8	SUM		
HE20	MCS0	2	185	6875	Full	2.00	1.20	4.63	6.12		10.74	24.00	Pass
HE40	MCS0	2	187	6885	Full	5.20	4.60	7.92	6.12		14.04	24.00	Pass
HE80	MCS0	2	183	6865	Full	6.60	5.90	9.27	6.12		15.39	24.00	Pass
HE160	MCS0	2	175	6825	Full	7.30	6.80	10.07	6.12		16.18	24.00	Pass



<Standard Client>

FCC Band V MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8			
HE20	MCS0	2	049	6195	Full	6.30	5.70	9.02	6.48		15.50	30.00	Pass
HE20	MCS0	2	093	6415	Full	6.80	6.10	9.47	6.48		15.95	30.00	Pass
HE40	MCS0	2	051	6205	Full	6.40	5.70	9.07	6.48		15.55	30.00	Pass
HE40	MCS0	2	091	6405	Full	9.60	9.10	12.37	6.48		18.85	30.00	Pass
HE80	MCS0	2	055	6225	Full	6.70	5.90	9.33	6.48		15.81	30.00	Pass
HE80	MCS0	2	087	6385	Full	6.50	5.80	9.17	6.48		15.65	30.00	Pass
HE160	MCS0	2	047	6185	Full	6.20	5.80	9.01	6.48		15.49	30.00	Pass
HE160	MCS0	2	079	6345	Full	6.20	5.70	8.97	6.48		15.45	30.00	Pass

FCC Band VII MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant 9	Ant 8	SUM	Ant 9	Ant 8	SUM		
HE20	MCS0	2	117	6535	Full	7.90	7.60	10.76	6.62		17.38	30.00	Pass
HE20	MCS0	2	149	6695	Full	9.10	8.40	11.77	6.62		18.39	30.00	Pass
HE20	MCS0	2	181	6855	Full	8.30	7.40	10.88	6.62		17.50	30.00	Pass
HE40	MCS0	2	123	6565	Full	8.50	7.60	11.08	6.62		17.70	30.00	Pass
HE40	MCS0	2	147	6685	Full	8.70	7.80	11.28	6.62		17.90	30.00	Pass
HE40	MCS0	2	179	6845	Full	8.40	7.60	11.03	6.62		17.64	30.00	Pass
HE80	MCS0	2	135	6625	Full	8.70	8.10	11.42	6.62		18.04	30.00	Pass
HE80	MCS0	2	151	6705	Full	8.80	8.00	11.43	6.62		18.04	30.00	Pass
HE80	MCS0	2	167	6785	Full	8.70	8.10	11.42	6.62		18.04	30.00	Pass
HE160	MCS0	2	143	6665	Full	8.60	7.70	11.18	6.62		17.80	30.00	Pass

3.2 Antenna Requirements

3.2.1 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.2 Antenna Gain

<TXBF Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

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

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k / 20}$ if the k th antenna is being fed by spatial stream j , or zero if it is not;
 G_k is the gain in dBi of the k th antenna.

The EUT supports beamforming for 802.11ac modes.

The directional gain calculation is following F)2)e)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

			DG for Power	DG for PSD
	Ant. 9 (dBi)	Ant. 8 (dBi)	(dBi)	(dBi)
5925 MHz ~ 6425 MHz	2.90	4.00	6.48	6.48
6425 MHz ~ 6525 MHz	3.20	4.00	6.62	6.62
6525 MHz ~ 6875 MHz	3.30	3.90	6.62	6.62
6875 MHz ~ 7125 MHz	3.40	2.80	6.12	6.12

Calculation example:

For the band 5925~6425MHz, the DG for PSD is derived from formula is

$$10 \times \log \left\{ \left[10^{\frac{2.9}{20}} + 10^{\frac{4.0}{20}} \right]^2 / 2 \right\}$$

$$= 6.48 \text{ dBi}$$



4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Dec. 28 ,2021~ May 18, 2022	Nov. 15, 2022	Conducted (TH05-HY)
USB Power Sensor	Raditeq	RPR3008W	RPR8W-2101 001 (NO:75)	10MHz~8GHz	Aug. 17, 2021	Dec. 28 ,2021~ May 18, 2022	Aug. 16, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Dec. 28 ,2021~ May 18, 2022	Aug. 29, 2022	Conducted (TH05-HY)
Switch Control Manframe	E-IUSTRUMENT	ETF-1405-0	EC1900067 (BOX7)	N/A	Aug. 12, 2021	Dec. 28 ,2021~ May 18, 2022	Aug. 11, 2022	Conducted (TH05-HY)

————THE END————