


Report No.: SEWM2306000190RG09
 Rev.: 01
 Page: 1 of 17

TEST REPORT

Application No.: SEWM2306000190RG
Applicant: NetComm Wireless Pty Ltd
Address of Applicant: Level 5, 18-20 Orion Road, Lane Cove, NSW, Australia
Manufacturer: Casa Systems, Inc.
Address of Manufacturer: 100 Old River Road Andover, MA 01810
EUT Description: 5G Wi-Fi 6 Residential Gateway
Model No.: CFW-4222
Trade Mark: 
 casa systems
FCC ID: XIA-CFW4222A
Standards: 47 CFR Part 2.1091
 FCC KDB 447498 D01 v06
Date of Receipt: 2022/11/01
Date of Issue: 2023/06/25

Test Result:	PASS*
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* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Well Wei
 Wireless Laboratory Manager



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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023/06/25		Original

Prepared By		 <hr/> (Nick Hu) / Test Engineer
Checked By		 <hr/> (Stone Gu) / Reviewer



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2 General Information

2.1 Client Information

Applicant:	NetComm Wireless Pty Ltd
Address of Applicant:	Level 5, 18-20 Orion Road, Lane Cove, NSW, Australia
Manufacturer:	Casa Systems, Inc.
Address of Manufacturer:	100 Old River Road Andover, MA 01810

2.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 6336.01)**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

• **FCC –Designation Number: CN1312**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.

Designation Number: CN1312.


Test Firm Registration Number: 717327



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2.3 General Description of EUT

EUT Description:	5G Wi-Fi 6 Residential Gateway			
Model No.:	CFW-4222			
Trade Mark:	 casa systems			
Hardware Version:	V1.1			
Software Version:	CFW4222-CS.NA			
Antenna Type:	PCB Antenna			
Antenna Gain:	LTE Band 2:	3.03dBi (Ant0)	LTE Band 4:	1.65dBi (Ant0)
	LTE Band 5:	1.46dBi (Ant0)	LTE Band 7:	1.91dBi (Ant3)
	LTE Band 12:	0.4dBi (Ant0)	LTE Band 13:	-0.07dBi (Ant0)
	LTE Band 14:	0.63dBi (Ant0)	LTE Band 17:	1.64dBi (Ant0)
	LTE Band 25:	3.03dBi (Ant0)	LTE Band 26:	1.46dBi (Ant0)
	LTE Band 30:	2.84dBi (Ant3)	LTE Band 38:	2.46dBi (Ant0)
	LTE Band 41:	2.51dBi (Ant0)	LTE Band 48:	2.94dBi (Ant0)
	LTE Band 66:	2.26dBi (Ant0)	LTE Band 71:	-0.63dBi (Ant0)
	LTE CA_2C:	3.03dBi (Ant0)	LTE CA_5B:	1.46dBi (Ant0)
	LTE CA_7C:	1.91dBi (Ant3)	LTE CA_38C:	2.46dBi (Ant0)
	LTE CA_41C:	2.51dBi (Ant0)	LTE CA_48C:	2.94dBi (Ant0)
	LTE CA_66B:	2.26dBi (Ant0)	LTE CA_66C:	-0.63dBi (Ant0)
	NR Band n2:	3.03dBi (Ant0)	NR Band n5:	1.46dBi (Ant0)
	NR Band n7:	1.91dBi (Ant3)	NR Band n12:	0.4dBi (Ant0)
	NR Band n13:	-0.07dBi (Ant0)	NR Band n14:	0.63dBi (Ant0)
	NR Band n25:	3.03dBi (Ant0)	NR Band n26:	1.46dBi (Ant0)
	NR Band n30:	2.8dBi (Ant3)	NR Band n38:	2.14dBi (Ant3) 2.14dBi (Ant0)
	NR Band n41:	2.14dBi (Ant3) 2.14dBi (Ant0)	NR Band n48:	2.94dBi (Ant0)
	NR Band n66:	2.26dBi (Ant0)	NR Band n70:	0.76dBi (Ant0)
	NR Band n71:	-0.77dBi (Ant0)	NR Band n77:	3.33dBi (Ant0) 3.33dBi (Ant3)
NR Band n78:	2.94dBi (Ant0) 2.94dBi (Ant3)			
BT/BLE:	4.08dBi (Ant1)	2.4G WIFI:	2.61dBi (Ant1)	



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			1.57dBi (Ant2)
5150MHz to 5250MHz:	1.79dBi (Ant3) 1.63dBi (Ant4) 1.49dBi (Ant5) 1.44dBi (Ant6)	5250MHz to 5350MHz:	0.82dBi (Ant3) 1.25dBi (Ant4) 1.63dBi (Ant5) 1.04dBi (Ant6)
5470MHz to 5725MHz:	2.05dBi (Ant3) 1.89dBi (Ant4) 1.64dBi (Ant5) 2.12dBi (Ant6)	5725MHz to 5850MHz:	2.14dBi (Ant3) 2.3dBi (Ant4) 2.33dBi (Ant5) 2.49dBi (Ant6)
<p>LTE CA: LTE UL CA_2C; LTE UL CA_5B; LTE UL CA_7C; LTE UL CA_38C; LTE UL CA_41C; LTE UL CA_48C; LTE UL CA_66B; LTE UL CA_66C;</p> <p>ENDC: DC_5A_n2A; DC_14A_n2A; DC_30A_n2A; DC_12A_n2A; DC_66A_n2A; DC_71A_n2A; DC_13A_n2A; DC_7A_n2A; DC_4A_n2A; DC_13A_n5A; DC_2A_n5A; DC_12A_n5A; DC_30A_n5A; DC_66A_n5A DC_7A_n5A; DC_48A_n5A; DC_5A_n7A; DC_12A_n7A; DC_66A_n7A; DC_71A_n7A; DC_13A_n7A; DC_2A_n7A; DC_4A_n7A; DC_2A_n12A; DC_30A_n12A; DC_66A_n12A; DC_7A_n12A; DC_5A_n12A; DC_48A_n12A; DC_2A_n14A; DC_30A_n14A; DC_66A_n14A; DC_66A_n25A; DC_12A_n25A; DC_48A_n25A; DC_7A_n25A; DC_71A_n25A; DC_5A_n25A; DC_26A_n25A; DC_13A_n25A; DC_2A_n30A; DC_5A_n30A; DC_12A_n30A; DC_14A_n30A; DC_66A_n30A DC_66A_n38A; DC_2A_n38A; DC_12A_n38A; DC_4A_n38A; DC_5A_n38A; DC_71A_n38A; DC_2A_n41A; DC_66A_n41A; DC_25A_n41A; DC_26A_n41A; DC_5A_n41A; DC_4A_n41A; DC_12A_n41A; DC_71A_n41A; DC_2A_n48A; DC_5A_n48A; DC_13A_n48A; DC_66A_n48A; DC_13A_n66A; DC_2A_n66A; DC_5A_n66A; DC_12A_n66A; DC_14A_n66A; DC_30A_n66A; DC_71A_n66A; DC_48A_n66A; DC_7A_n66A; DC_2A_n71A; DC_66A_n71A; DC_5A_n71A; DC_7A_n71A; DC_48A_n71A; DC_41A_n77A; DC_7A_n77A; DC_2A_n77A; DC_5A_n77A; DC_13A_n77A; DC_66A_n77A; DC_12A_n77A; DC_14A_n77A; DC_30A_n77A; DC_25A_n77A; DC_71A_n77A; DC_7A_n78A; DC_38A_n78A; DC_5A_n78A; DC_66A_n78A; DC_2A_n78A; DC_12A_n78A; DC_13A_n78A; DC_41A_n78A; DC_4A_n78A; DC_71A_n78A; DC_26A_n78A; DC_25A_n78A</p> <p>NR UL CA: n2-n48; n2-n77; n2-n78; n2-n41; n5-n77; n5-n78; n7-n77; n7-n78; n12-n41; n12-n48; n12-n77; n12-n78; n14-n77; n25-n38; n25-n41; n25-n77; n25-n78; n30-n77; n38-n66; n41-n66; n41-n71; n48-n66; n48-n71; n66-n77; n66-n78; n71-n77; n71-n78;</p> <p>Note: The antenna gain are derived from the gain information report provided by the manufacturer.</p>			
<p>Remark:As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.</p>			



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3 RF Exposure Evaluation

3.1 RF Exposure Compliance Requirement

3.1.1 Limits

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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				
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

F=frequency in MHz
 *=Plane-wave equivalent power density
 RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules. The emissions should be within the limits at 300kHz in Table 1 of 1.1310(use the 300kHz limits for 150kHz:614V/m,1.63A/m).

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.



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3.1.2 Test Procedure

Software provided by client enabled the EUT to transmit data at lowest, middle and highest channel individually

3.1.3 EUT RF Exposure Evaluation

Output Power Into Antenna & RF Exposure Evaluation Distance:

This confirmed that the device comply with MPE limit.

Operating Band	Frequency (MHz)	Antenna Gain (dBi)	Max Conducted Power (dBm)	EIRP(ERP) (dBm)	EIRP(ERP) Limit (dBm)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Gain according to EIRP(ERP) (dBi)	Gain according to Pd (dBi)	Max Gain Allowed (dBi)	conclusion
LTE Band 2/LTE CA_2C	1850.7	3.03	25.00	28.03	33.00	0.1264	1.0000	8.00	12.01	8.00	Pass
LTE Band 4	1710.7	1.65	25.00	26.65	30.00	0.0920	1.0000	5.00	12.01	5.00	Pass
LTE Band 5/LTE CA_5B	824.7	1.46	25.00	24.31	38.45	0.0881	0.5498	15.60	9.41	9.41	Pass
LTE Band 7/LTE CA_7C	2502.5	1.91	25.00	26.91	33.00	0.0977	1.0000	8.00	12.01	8.00	Pass
LTE Band 12	699.7	0.40	25.00	23.25	34.77	0.0690	0.4665	11.92	8.70	8.70	Pass
LTE Band 13	779.5	-0.07	25.00	22.78	34.77	0.0619	0.5197	11.92	9.16	9.16	Pass
LTE Band 14	790.5	0.63	25.00	23.48	34.77	0.0727	0.5270	11.92	9.23	9.23	Pass
LTE Band 17	706.5	1.64	25.00	24.49	34.77	0.0918	0.4710	11.92	8.74	8.74	Pass
LTE Band 25	1850.7	3.03	25.00	28.03	33.00	0.1264	1.0000	8.00	12.01	8.00	Pass
LTE Band 26(814-824)	814.7	1.46	25.00	24.31	NA	0.0881	0.5431	NA	9.36	9.36	Pass
LTE Band 26(824-849)	824.7	1.46	25.00	24.31	38.45	0.0881	0.5498	15.60	9.41	9.41	Pass
LTE Band 30	2307.5	2.84	21.00	23.84	23.98	0.0482	1.0000	2.98	16.01	2.98	Pass
LTE Band 38/LTE CA_38C	2572.5	2.46	25.00	27.46	33.00	0.1108	1.0000	8.00	12.01	8.00	Pass
LTE Band 38/LTE CA_38C(PC2)	2572.5	2.46	28.00	30.46	33.00	0.2212	1.0000	5.00	9.01	5.00	Pass
LTE Band 41/LTE CA_41C	2498.5	2.51	25.00	27.51	33.00	0.1121	1.0000	8.00	12.01	8.00	Pass
LTE Band 41/LTE CA_41C(PC2)	2498.5	2.51	28.00	30.51	33.00	0.2237	1.0000	5.00	9.01	5.00	Pass
LTE Band 48/LTE CA_48C	3552.5	2.94	20.00	22.94	23.00	0.0391	1.0000	3.00	17.01	3.00	Pass
LTE Band 66/LTE CA_66B/LTE CA_66C	1710.7	2.26	25.00	27.26	30.00	0.1059	1.0000	5.00	12.01	5.00	Pass
LTE Band 71	665.5	-0.63	25.00	22.22	34.77	0.0544	0.4437	11.92	8.48	8.48	Pass



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Operating Band	Frequency (MHz)	Antenna Gain (dBi)	MIMO Directional gain	Max Conducted Power (dBm)	EIRP(ERP) (dBm)	EIRP(ERP) Limit (dBm)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Gain according to EIRP(ERP) (dBi)	Gain according to Pd (dBi)	Max Gain Allowed (dBi)	conclusion
NR Band n2	1852.5	3.03	NA	25.00	28.03	33.00	0.1264	1.0000	8.00	12.01	8.00	Pass
NR Band n5	826.5	1.46	NA	25.00	24.31	38.45	0.0881	0.5510	15.60	9.42	9.42	Pass
NR Band n7	2502.5	1.91	NA	25.00	26.91	33.00	0.0977	1.0000	8.00	12.01	8.00	Pass
NR Band n12	701.5	0.40	NA	25.00	23.25	34.77	0.0690	0.4677	11.92	8.71	8.71	Pass
NR Band n13	779.5	-0.07	NA	25.00	22.78	34.77	0.0619	0.5197	11.92	9.16	9.16	Pass
NR Band n14	790.5	0.63	NA	25.00	23.48	34.77	0.0727	0.5270	11.92	9.23	9.23	Pass
NR Band n25	1852.5	3.03	NA	25.00	28.03	33.00	0.1264	1.0000	8.00	12.01	8.00	Pass
NR Band n26(814-824)	816.5	1.46	NA	25.00	24.31	NA	0.0881	0.5443	NA	9.37	9.37	Pass
NR Band n26(824-849)	826.5	1.46	NA	25.00	24.31	38.45	0.0881	0.5510	15.60	9.42	9.42	Pass
NR Band n30	2307.5	2.80	NA	21.00	23.80	23.98	0.0477	1.0000	2.98	16.01	2.98	Pass
NR Band n38	2575.0	2.14	NA	25.00	27.14	33.00	0.1030	1.0000	8.00	12.01	8.00	Pass
NR Band n38(PC2/MIMO)	2575.0	2.14	2.14	28.00	30.14	33.00	0.2055	1.0000	5.00	9.01	5.00	Pass
NR Band n41	2506.0	2.14	NA	25.00	27.14	33.00	0.1030	1.0000	8.00	12.01	8.00	Pass
NR Band n41(PC1.5/MIMO)	2506.0	2.14	2.14	29.00	31.14	33.00	0.2587	1.0000	4.00	8.01	4.00	Pass
NR Band n48	3555.0	2.94	NA	20.00	22.94	23.00	0.0391	1.0000	3.00	17.01	3.00	Pass
NR Band n66	1712.5	2.26	NA	25.00	27.26	30.00	0.1059	1.0000	5.00	12.01	5.00	Pass
NR Band n70	1697.5	0.76	NA	25.00	25.76	30.00	0.0749	1.0000	5.00	12.01	5.00	Pass
NR Band n71	665.5	-0.77	NA	25.00	22.08	34.77	0.0527	0.4437	11.92	8.48	8.48	Pass
NR Band n77 (3450-3550)	3455.0	3.33	NA	25.00	28.33	30.00	0.1354	1.0000	5.00	12.01	5.00	Pass
NR Band n77 (3450-3550)(PC1.5/MIMO)	3455.0	3.33	3.33	26.50	29.83	30.00	0.1913	1.0000	3.50	10.51	3.50	Pass
NR Band n77 (3700-3980)	3705.0	3.33	NA	25.00	28.33	30.00	0.1354	1.0000	5.00	12.01	5.00	Pass
NR Band n77 (3700-3980)(PC1.5/MIMO)	3705.0	3.33	3.33	26.50	29.83	30.00	0.1913	1.0000	3.50	10.51	3.50	Pass
NR Band n78 (3450-3550)	3455.0	2.94	NA	25.00	27.94	30.00	0.1238	1.0000	5.00	12.01	5.00	Pass
NR Band n78 (3450-3550)(PC1.5/MIMO)	3455.0	2.94	2.94	26.50	29.44	30.00	0.1749	1.0000	3.50	10.51	3.50	Pass
NR Band n78 (3700-3800)	3705.0	2.94	NA	25.00	27.94	30.00	0.1238	1.0000	5.00	12.01	5.00	Pass
NR Band n78 (3700-3800)(PC1.5/MIMO)	3705.0	2.94	2.94	26.50	29.44	30.00	0.1749	1.0000	3.50	10.51	3.50	Pass
Bluetooth	2402.0	4.08	NA	14.00	18.08	30.00	0.0128	1.0000				Pass
2.4G WiFi	2412.0	2.61	2.61	20.00	22.61	30.00	0.0363	1.0000		NA		Pass
5G WiFi	5320.0	2.49	2.49	23.00	25.49	30.00	0.0704	1.0000				Pass



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Due to the EUT support NR ENDC and CA

Both LTE and NR/LTE band can transmit simultaneously, the formula of the calculated the MPE is:

$$\sum_{i=1}^n \frac{S_{E_i}(\text{duty factor})}{MPE_{E_i}} < 1$$

NOTE The corresponding MEs must be expressed in terms of power density in the above summation
 Therefore, the worst-case(DC_5A_n12A) situation is 0.1602+0.1475=0.3077, which is less than “1”, this confirmed that the device comply with MPE limit.



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3.1.4 Exposure calculations for multiple sources

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of E2, H2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

The product also has multiple transmitters The Simultaneous Transmission Possibilities are as below:

Simultaneous Tx Combination	Configuration
1	WWAN + Bluetooth+ WiFi 2.4G+ WiFi 5G

No.	Mode	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	Result Ratio	Total Ratio	Limit	Result
1	NR Band n71	0.0527	0.4437	0.1188	0.2383	1.00	Pass
	Bluetooth	0.0128	1.0000	0.0128			
	WiFi 2.4G	0.0363	1.0000	0.0363			
	WiFi 5G	0.0704	1.0000	0.0704			

---End of Report---



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