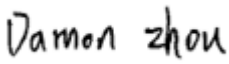
TEST REPORT

Application No.:	KSCR2408001581AT
Name of Testing Laboratory preparing the Report:	Compliance Certification Services (Kunshan) Inc.
Address of Testing Laboratory preparing the Report:	No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.
FCC ID:	2AI7FR42841
Applicant:	Parallel Wireless, Inc.
Address of Applicant:	300 Innovative Way #2310 Nashua, NH 3062 United States
Manufacturer:	Parallel Wireless, Inc.
Address of Manufacturer:	300 Innovative Way #2310 Nashua, NH 3062 United States
Equipment Under Test (EUT):	
EUT Name:	Remote Unit
Model No.:	DRRU-R428
Trade mark:	Parallel WIRELESS
Standard(s) :	47 CFR Part 2 47 CFR Part 27M
Date of Receipt:	2024-08-20
Date of Test:	2024-08-22 to 2024-10-08
Date of Issue:	2024-10-09
Test Result:	**Pass**

* In the configuration tested, the EUT complied with the standards specified above.

Revision Record			
Version	**Description**	***Date***	***Remark***
00	Original	2024-10-09	/

Authorized for issue by:				
Tested By				
		Damon Zhou /Project Engineer		
Approved By				
		Terry Hou /Reviewer		

2 Test Summary

Test Item	FCC Rule No.	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50	PASS
Peak-Average Ratio	§27.50	PASS
Modulation Characteristics	§2.1047	PASS
Bandwidth	§2.1049	PASS
Band Edge Compliance	§2.1051, §27.53	PASS
Spurious emissions at antenna terminals	§2.1051, §27.53	PASS
Field strength of spurious radiation	§2.1051, §27.55	PASS
Frequency stability	§2.1055, §27.54	PASS

3 Contents

4 General Information

4.1 Details of E.U.T.

Product Name:	Remote Unit
Model No.:	DRRU-R428
Antenna Type:	External Antenna
Antenna Gain:	Max Antenna Gain 10 dBi(Provided by manufacturer)
Power Supply:	AC 120V/60Hz or DC 48V
Test Voltage:	AC 120V/60Hz
Number of Carriers:	1CC,2CC
Support Bandwidth:	5MHz,10MHz,15MHz,20MHz,5+5MHz,10+10MHz,15+15MHz,20+20MHz
Type of Modulation:	QPSK,16QAM,64QAM,256QAM
Frequency Band:	LTE Band41
Frequency Range:	2496MHz-2690MHz
Normal Output Power:	Max. 46dBm for SISO Max. 49dBm for 2x2 MIMO Max. 52dBm for 4x4 MIMO
Antenna Delivery:	4T4R MIMO,2T2R MIMO,SISO

4.2 Test Frequency

	Carrier	Bandwidth (MHz)	Frequency (MHz)		
			Bottom Channel	Middle Channel	Top Channel
LTE Band n41 (2496-2690MHz)	1CC	5	2498.5	2593	2687.5
	1CC	10	2501	2593	2685
	1CC	15	2503.5	2593	2682.5
	1CC	20	2506	2593	2680
	2CC	5+5	CC1:2498.5 CC2:2503.3	CC1:2590.6 CC2:2595.4	CC1:2682.7 CC2:2687.5
	2CC	10+10	CC1:2501 CC2:2510.9	CC1:2588.1 CC2:2598	CC1:2675.1 CC2:2685
	2CC	15+15	CC1:2503.5 CC2:2518.5	CC1:2585.5 CC2:2600.5	CC1:2667.5 CC2:2682.5
	2CC	20+20	CC1:2506 CC2:2525.8	CC1:2583.1 CC2:2602.9	CC1:2660.2 CC2:2680

4.3 Test Support Unit

Description	Manufacture	Model No.	S/N
DC power supply	Agilent	E3632A	/

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.5 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1.SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).

2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).

3. Sample source: sent by customer.

4.6 Test Facility

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

• A2LA

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

• VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
RF Conducted Test						
1	Spectrum Analyzer	Keysight	N9020A	KUS1911E004-2	08/01/2024	07/31/2025
2	Spectrum Analyzer	Keysight	N9020A	KUS2001M001-2	08/01/2024	07/31/2025
3	Spectrum Analyzer	Keysight	N9030B	KSEM021-1	01/15/2024	01/14/2025
4	Signal Generator	R&S	SMBV100B	KSEM032	03/19/2024	03/18/2025
5	Signal Generator	R&S	SMW200A	KSEM020-1	08/02/2024	08/01/2025
6	Signal Generator	Agilent	N5182A	KUS2001M001-1	08/01/2024	07/31/2025
7	Radio Communication Test Station	Anritsu	MT8000A	KSEM001-1	08/01/2024	07/31/2025
8	Radio Communication Analyzer	Anritsu	MT8821C	KSEM002-1	03/19/2024	03/18/2025
9	Universal Radio Communication Tester	R&S	CMW500	KUS1911E004-1	08/13/2024	08/12/2025
10	Switcher	CCSRF	FY562	KUS2001M001-3	08/02/2024	08/01/2025
11	AC Power Source	EXTECH	6605	KS301178	N.C.R	N.C.R
12	DC Power Supply	Aglient	E3632A	KS301180	N.C.R	N.C.R
13	Conducted Test Cable	Thermax	RF01-RF04	CZ301111-CZ301120	02/02/2024	02/01/2025
14	Temp. / Humidity Chamber	TERCHY	MHK-120AK	KS301190	08/26/2024	08/25/2025
15	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-5	03/21/2024	03/20/2025
16	Software	BST	TST-PASS	/	N/A	N/A
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	08/05/2024	08/04/2025
2	Universal Radio Communication Tester	R&S	CMW500	KSEM009-1	03/19/2024	03/18/2025
3	Signal Generator	Agilent	E8257C	KS301066	08/05/2024	08/04/2025
4	Loop Antenna	COM-POWER	AL-130R	KUS1806E001	03/18/2023	03/17/2025
5	Bilog Antenna	TESEQ	CBL 6112D	KUS1806E005	06/29/2023	06/28/2025
7	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	KS301079	03/23/2024	03/22/2025
9	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	CZ301058	01/17/2024	01/16/2025
10	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	KS301187	01/17/2024	01/16/2025
11	Amplifier(30MHz~18GHz)	PANSHAN TECHNOLOGY	LNA:1~18G	KSEM010-1	01/15/2024	01/14/2025
12	Amplifier(18~40GHz)	TST	LNA180400G40	KSEM038	08/12/2024	08/11/2025
13	RE Test Cable	REBES MICROWAVE	/	CZ301097	11/11/2023	11/10/2024
14	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	03/21/2024	03/20/2025

15	Software	Faratronic	EZ_EMC-v 3A1	/	N/A	N/A

6 Radio Spectrum Matter Test Results

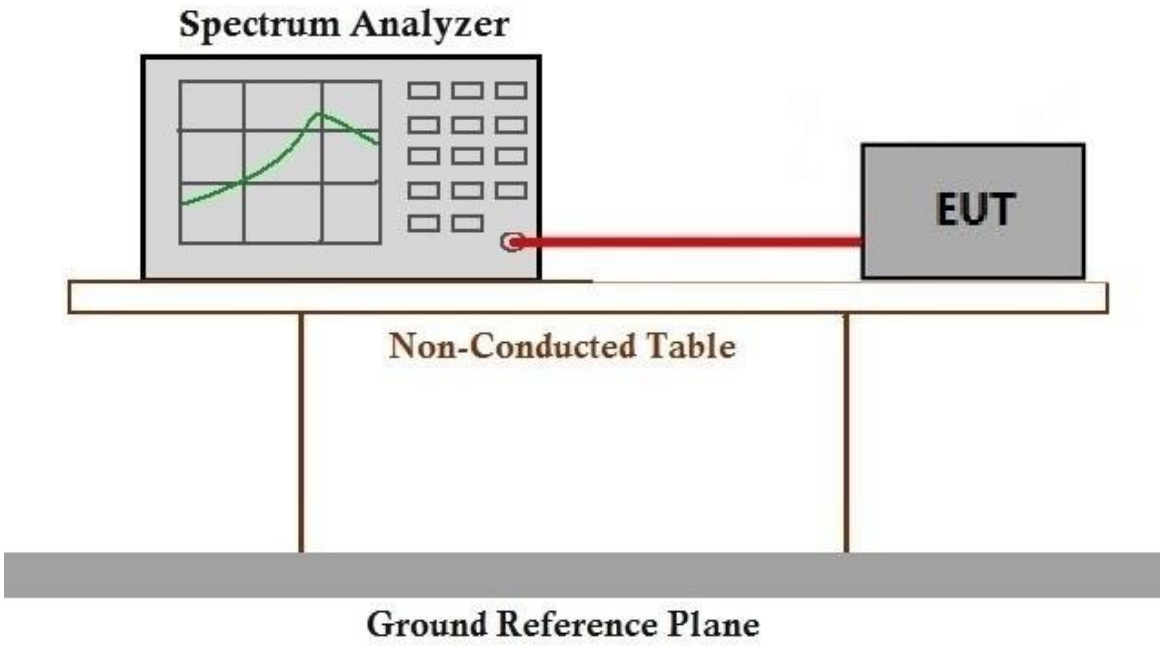
6.1 Effective (Isotropic) Radiated Power Output Data

Test Requirement: §2.1046, §27.50
Test Method: ANSI C63.26, KDB 971168 D01 v03
Limit: EIRP≤ 63dBm

6.1.1 E.U.T. Operation

Operating Environment:
Temperature: 20.4 °C Humidity: 56.4 % RH Atmospheric Pressure: 1030 mbar
Test mode: 00: Tx mode, Keep the EUT in transmitting mode.

6.1.2 Test Setup Diagram



6.1.3 Measurement Data

Test Procedure:

Many contemporary EUTs utilize multiple output ports to accommodate multiple-input and multiple-output (MIMO) technologies. In these cases it may be necessary to measure the RF power at each output port and then sum the measured power levels (in linear terms) to determine the effective total RF output power.

EUT supports MIMO and each antenna port is the same, according to C63.26 6.4,a coefficient is added to the single antenna port power to calculate the total power.2x2 MIMO add 10lg(2)=3.01 dB,4x4 MIMO add 10lg(4)=6.02 dB.

Please refer to Appendix for KSCR2408001581AT

6.2 Peak-Average Ratio

Test Requirement: §27.50

Test Method: ANSI C63.26, KDB 971168 D01 v03

Limit: ≤13dB

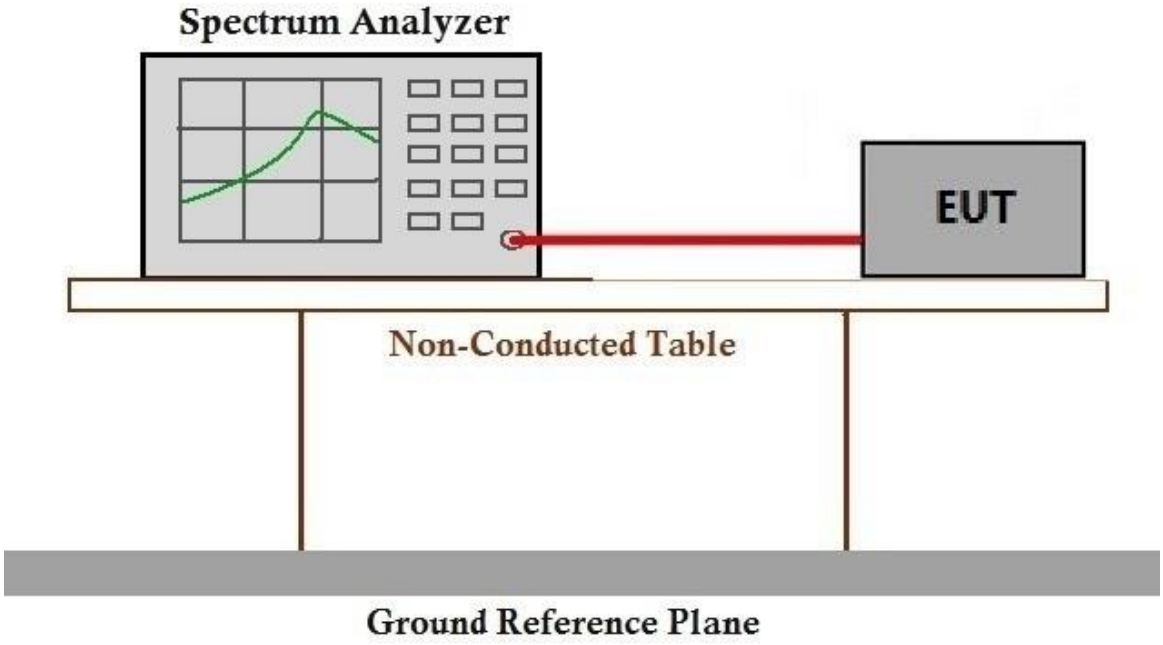
6.2.1 E.U.T. Operation

Operating Environment:

Temperature: 20.4 °C Humidity: 56.4 % RH Atmospheric Pressure: 1030 mbar

Test mode: 00: Tx mode, Keep the EUT in transmitting mode.

6.2.2 Test Setup Diagram



6.2.3 Measurement Data

Please refer to Appendix for KSCR2408001581AT

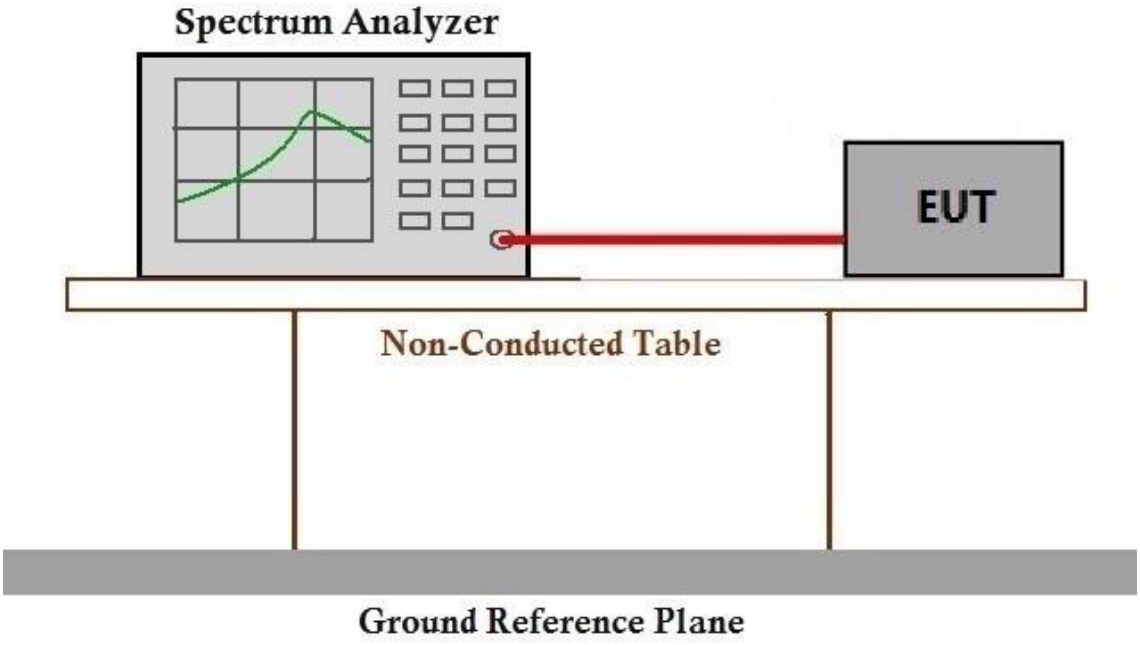
6.3 Band Edge Compliance

Test Requirement: §2.1051, §27.53
Test Method: ANSI C63.26, KDB 971168 D01 v03
Limit: ≤-13dBm/MHz

6.3.1 E.U.T. Operation

Operating Environment:
Temperature: 20.4 °C Humidity: 56.4 % RH Atmospheric Pressure: 1030 mbar
Test mode: 00: Tx mode, Keep the EUT in transmitting mode.

6.3.2 Test Setup Diagram



6.3.3 Measurement Data

Please refer to Appendix for KSCR2408001581AT

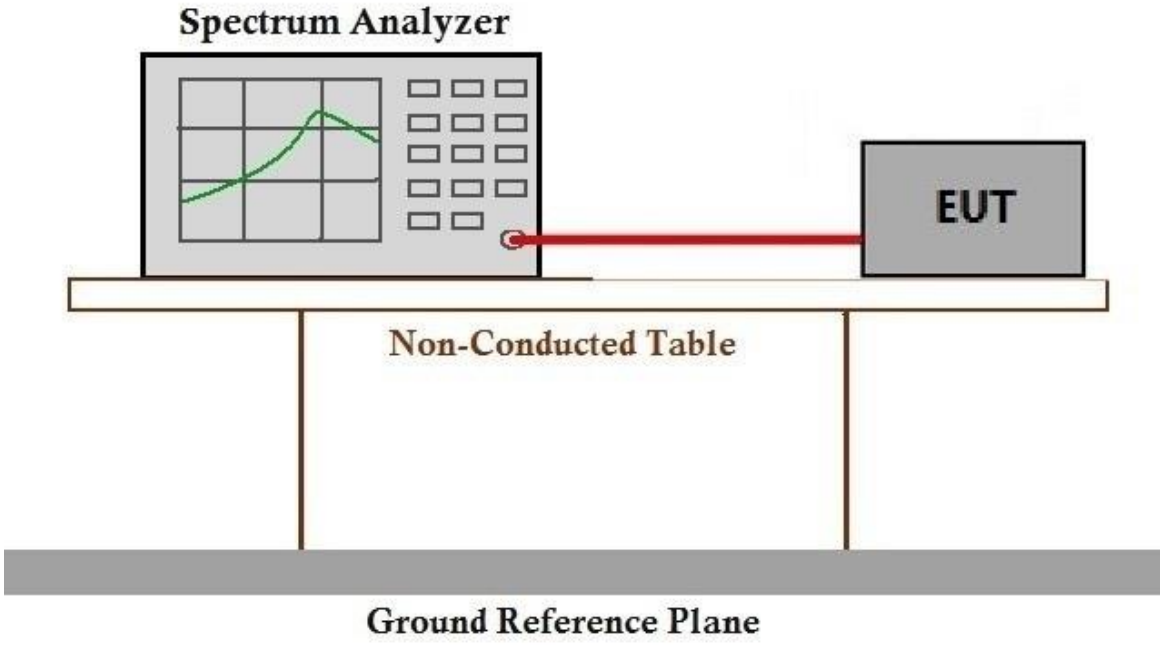
6.4 Spurious emissions at antenna terminals

Test Requirement: §2.1051, §27.53
Test Method: ANSI C63.26, KDB 971168 D01 v03
Limit: ≤-13dBm/MHz

6.4.1 E.U.T. Operation

Operating Environment:
Temperature: 20.4 °C Humidity: 56.4 % RH Atmospheric Pressure: 1030 mbar
Test mode: 00: Tx mode, Keep the EUT in transmitting mode.

6.4.2 Test Setup Diagram



6.4.3 Measurement Data

Please refer to Appendix for KSCR2408001581AT

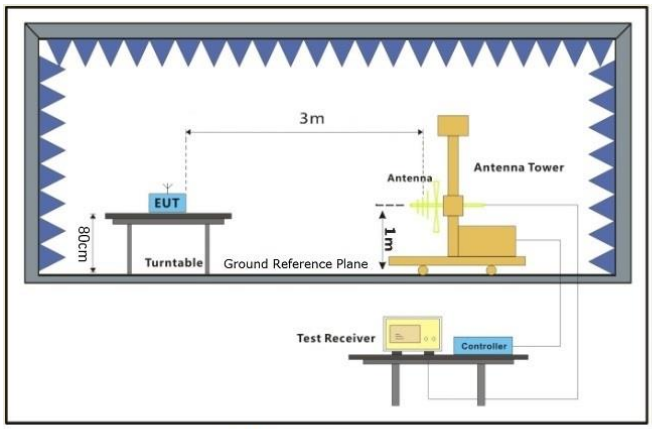
6.5 Field strength of spurious radiation

Test Requirement: §2.1051, §27.55
Test Method: ANSI C63.26, KDB 971168 D01 v03
Limit: ≤-13dBm/MHz

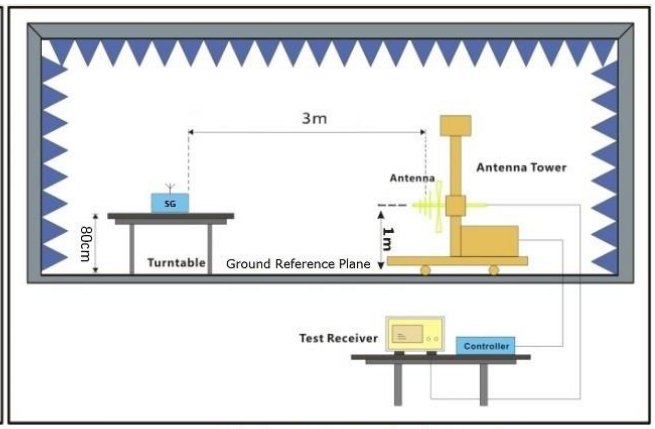
6.5.1 E.U.T. Operation

Operating Environment:
Temperature: 20.4 °C Humidity: 56.4 % RH Atmospheric Pressure: 1030 mbar
Test mode: 00: Tx mode, Keep the EUT in transmitting mode.

6.5.2 Test Setup Diagram



EUT



Substiute Antenna+Signal Generator

6.5.3 Measurement Procedure and Data

Test Procedure:

(1)On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
(2)The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
(3)The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
(4)The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
(5)The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
(6)The transmitter shall than be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
(7)The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
(8)The maximum signal level detected by the measuring receiver shall be noted.
(9)The measurement shall be repeated with the test antenna set to horizontal polarization.
(10) Replace the antenna with a proper Antenna (substitution antenna).
(11)The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
(12)The substitution antenna shall be connected to a calibrated signal generator.
(13)If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
(14)The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
(15)The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
(16)The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
(17)The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

1CC 5MHz Bottom Channel					
Frequency	Spurious Emission Polarization and Level		Limit	Over Limit	Verdict
MHz	Polarization	dBm	dBm	dB	
375.8	Horizontal	-67.57	-13	-54.57	Pass
572.9	Horizontal	-62.64	-13	-49.64	Pass
956.8	Horizontal	-58.13	-13	-45.13	Pass
1335.2	Horizontal	-59.59	-13	-46.59	Pass
2744.7	Horizontal	-56.54	-13	-43.54	Pass
6478.4	Horizontal	-48.65	-13	-35.65	Pass
360.7	Vertical	-67.93	-13	-54.93	Pass
583.4	Vertical	-63.16	-13	-50.16	Pass
948.1	Vertical	-57.08	-13	-44.08	Pass
1338.1	Vertical	-61.81	-13	-48.81	Pass
2742.7	Vertical	-56.56	-13	-43.56	Pass
6513.8	Vertical	-46.96	-13	-33.96	Pass

1CC 5MHz Middle Channel					
Frequency	Spurious Emission Polarization and Level		Limit	Over Limit	Verdict
MHz	Polarization	dBm	dBm	dB	
367.4	Horizontal	-68.46	-13	-55.46	Pass
589.2	Horizontal	-62.75	-13	-49.75	Pass
949.7	Horizontal	-59.36	-13	-46.36	Pass
1340.3	Horizontal	-60.60	-13	-47.60	Pass
2729.5	Horizontal	-51.89	-13	-38.89	Pass
6523.8	Horizontal	-49.77	-13	-36.77	Pass
360.5	Vertical	-68.87	-13	-55.87	Pass
588.5	Vertical	-64.34	-13	-51.34	Pass
937.8	Vertical	-56.74	-13	-43.74	Pass
1373.6	Vertical	-57.29	-13	-44.29	Pass

2758.2	Vertical	-52.63	-13	-39.63	Pass
6517.6	Vertical	-47.45	-13	-34.45	Pass

1CC 5MHz Top Channel					
Frequency	Spurious Emission Polarization and Level		Limit	Over Limit	Verdict
MHz	Polarization	dBm	dBm	dB	
367.3	Horizontal	-67.88	-13	-54.88	Pass
598.7	Horizontal	-61.72	-13	-48.72	Pass
927.9	Horizontal	-59.39	-13	-46.39	Pass
1360.3	Horizontal	-60.71	-13	-47.71	Pass
2761.6	Horizontal	-55.91	-13	-42.91	Pass
6492.3	Horizontal	-47.03	-13	-34.03	Pass
371.3	Vertical	-71.49	-13	-58.49	Pass
585.7	Vertical	-64.27	-13	-51.27	Pass
943.6	Vertical	-56.33	-13	-43.33	Pass
1334.3	Vertical	-60.14	-13	-47.14	Pass
2762.0	Vertical	-51.05	-13	-38.05	Pass
6524.6	Vertical	-47.90	-13	-34.90	Pass

2CC 5+5MHz Bottom Channel					
Frequency	Spurious Emission Polarization and Level		Limit	Over Limit	Verdict
MHz	Polarization	dBm	dBm	dB	
408.7	Horizontal	-68.55	-13	-55.55	Pass
580.5	Horizontal	-61.97	-13	-48.97	Pass
945.5	Horizontal	-58.49	-13	-45.49	Pass
1367.0	Horizontal	-59.25	-13	-46.25	Pass
2726.8	Horizontal	-52.71	-13	-39.71	Pass
6475.7	Horizontal	-50.93	-13	-37.93	Pass
397.8	Vertical	-66.78	-13	-53.78	Pass
599.9	Vertical	-61.36	-13	-48.36	Pass
939.7	Vertical	-60.29	-13	-47.29	Pass
1339.0	Vertical	-56.16	-13	-43.16	Pass

2742.7	Vertical	-53.53	-13	-40.53	Pass
6513.1	Vertical	-47.75	-13	-34.75	Pass

2CC 5+5MHz Middle Channel					
Frequency	Spurious Emission Polarization and Level		Limit	Over Limit	Verdict
MHz	Polarization	dBm	dBm	dB	
407.3	Horizontal	-70.88	-13	-57.88	Pass
590.0	Horizontal	-65.51	-13	-52.51	Pass
947.5	Horizontal	-61.56	-13	-48.56	Pass
1346.4	Horizontal	-56.34	-13	-43.34	Pass
2767.3	Horizontal	-56.11	-13	-43.11	Pass
6521.5	Horizontal	-51.38	-13	-38.38	Pass
397.0	Vertical	-71.87	-13	-58.87	Pass
593.9	Vertical	-61.21	-13	-48.21	Pass
949.0	Vertical	-56.73	-13	-43.73	Pass
1334.3	Vertical	-60.24	-13	-47.24	Pass
2759.0	Vertical	-56.17	-13	-43.17	Pass
6521.8	Vertical	-47.00	-13	-34.00	Pass

2CC 5+5MHz Top Channel					
Frequency	Spurious Emission Polarization and Level		Limit	Over Limit	Verdict
MHz	Polarization	dBm	dBm	dB	
389.4	Horizontal	-68.50	-13	-55.50	Pass
579.2	Horizontal	-66.63	-13	-53.63	Pass
962.2	Horizontal	-57.03	-13	-44.03	Pass
1327.3	Horizontal	-58.45	-13	-45.45	Pass
2753.2	Horizontal	-51.44	-13	-38.44	Pass
6501.6	Horizontal	-46.68	-13	-33.68	Pass
371.0	Vertical	-71.98	-13	-58.98	Pass
575.2	Vertical	-66.22	-13	-53.22	Pass
969.9	Vertical	-61.52	-13	-48.52	Pass
1354.2	Vertical	-58.15	-13	-45.15	Pass
2760.1	Vertical	-51.80	-13	-38.80	Pass
6500.4	Vertical	-48.82	-13	-35.82	Pass

Note: All Bandwidth and modes have been tested and only record the worst test result.

6.6 Frequency stability

Test Requirement: §2.1055, §27.54

Test Method: ANSI C63.26, KDB 971168 D01 v03

Limit: Fundamental emission stays within authorized frequency block

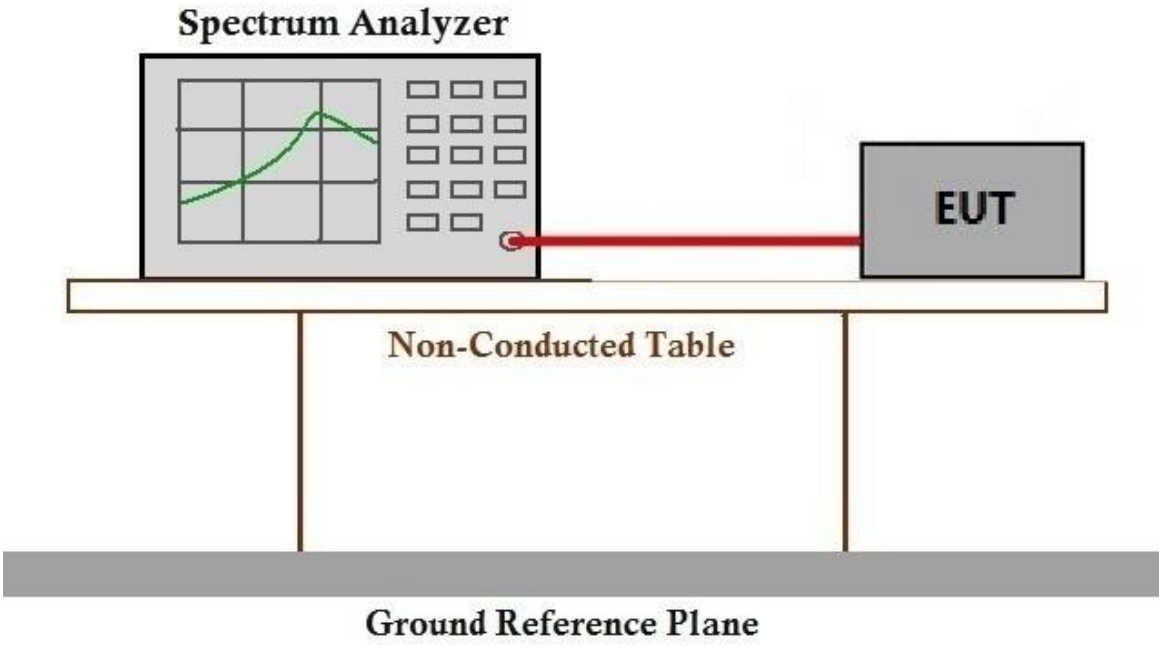
6.6.1 E.U.T. Operation

Operating Environment:

Temperature: 20.4 °C Humidity: 56.4 % RH Atmospheric Pressure: 1030 mbar

Test mode: 00: Tx mode, Keep the EUT in transmitting mode.

6.6.2 Test Setup Diagram



6.6.3 Measurement Data

Please refer to Appendix for KSCR2408001581AT

7 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

8 EUT Constructional Details

Refer to the < External Photos > & < Internal Photos >.

- End of the Report -