TEST REPORT

Applicant:	JACS Solutions, Inc.
EUT Description:	5G DONGLE
Model:	TD0211
Brand:	JACS
FCC ID:	2AGCDJACSTD0211
Standards:	FCC CFR Title 47 Part 2
	FCC CFR Title 47 Part 22
	FCC CFR Title 47 Part 24
	FCC CFR Title 47 Part 27
	FCC CFR Title 47 Part 90
	FCC CFR Title 47 Part 96
	FCC KDB 940660 D01 Part 96 CBRS Eqpt v03
	WINNF-TS-0122-V1.0.2 CBRS CBSD Test Specification
	WINNF-18-IN-00178 CBRS End User Device as UUT Test Guidelines
Date of Receipt:	2023/11/07
Date of Test:	2023/11/07 to 2023/11/28
Date of Issue:	2023/12/01

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.

Approved By: **Reviewed By:**

Revision History

Rev.	Issue Date	Description	Revised by
01	2023/12/01	Original	陈呈福

Summary of Test Results

FCC Part	Test Item	Test Result	Verdict
§2.1046 §22.913(a)(5) §27.50(b)(10) §27.50(c)(10) §90.541(c)	Effective Radiated Power (LTE Band 5/12/13/14/71)	Appendix	Pass
§2.1046 §24.232(c) §27.50(a)(3) §27.50(d)(4) §27.50(h)(2)	Effective Isotropic Radiated Power (LTE Band 2/4/30/41/41C/66)	Appendix	Pass
§2.1046 §96.41(b)	Effective Isotropic Radiated Power (LTE Band 48)	Appendix	Pass
§22.913(d) §24.232(d) §27.50(d)(5) §96.41	Peak-Average Ratio	Refer to Remark[1] Refer to Remark[2]	Pass
§2.1049	Occupied Bandwidth	Refer to Remark[1] Refer to Remark[2]	Pass
§2.1051 §22.917(a) §24.238(a) §27.53(c) §27.53(g) §27.53(h) §90.543(e)(2)(3)	Band Edge (LTE Band 2/4/5/12/13/14/66/71)	Refer to Remark[1]	Pass
§2.1051 §27.53(a)	Band Edge (LTE Band 30)	Refer to Remark[1]	Pass
§2.1051 §27.53(m)	Band Edge (LTE Band 41/41C)	Refer to Remark[1]	Pass
§2.1051 §96.41(e)	Band Edge (LTE Band 48)	Refer to Remark[2]	Pass
§2.1051 §90.210(n) §90.691(a)	Emission Mask (LTE Band 14)	Refer to Remark[1]	Pass
§2.1051 §22.917(a) §24.238(a) §27.53(c)&(f) §27.53(g) §27.53(h) §90.543(c)&(f)	Spurious Emission at Antenna Terminals (LTE Band 2/4/5/12/13/14/66/71)	Refer to Remark[1]	Pass
§27.53(m)	Spurious Emission at Antenna Terminals (LTE Band 41/41C)	Refer to Remark[1]	Pass
§27.53(a)	Spurious Emission at Antenna Terminals (LTE Band 30)	Refer to Remark[1]	Pass
§96.41(e)	Spurious Emission at Antenna Terminals	Refer to Remark[2]	Pass

	(LTE Band 48)		
§2.1053 §22.917(a)	Field Strength of Spurious Radiation (LTE Band 5)	Appendix	Pass
§2.1053 §24.238(a) §27.53(a) §27.53(h)	Field Strength of Spurious Radiation (LTE Band2/4/30/66/71)	Appendix	Pass
§2.1053 §27.53(g)	Field Strength of Spurious Radiation (LTE Band 12)	Appendix	Pass
§2.1053 §90.543(c)&(f)	Field Strength of Spurious Radiation (LTE Band 14)	Appendix	Pass
§2.1053 §27.53(c)&(f)	Field Strength of Spurious Radiation (LTE Band 13)	Appendix	Pass
§2.1053 §27.53(m)	Field Strength of Spurious Radiation (LTE Band 41/41C)	Appendix	Pass
§2.1053 §96.41(e)	Field Strength of Spurious Radiation (LTE Band 48)	Appendix	Pass
§2.1055 §22.355	Frequency Stability (LTE Band 5)	Refer to Remark[1]	Pass
§2.1055 §24.235 §27.54 §90.213 §96.41	Frequency Stability (Other Band)	Refer to Remark[1] Refer to Remark[2]	Pass
§96.47	End User Device additional requirement	Refer to Remark[3]	Pass
Remark[1]: Reference Module Report (FCC ID: ZMOFM160NA), provided by SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd. Remark[2]: Reference Module Report (FCC ID: ZMOFM160NA), provided by Compliance Certification Services (Kunshan) Inc. Shenzhen Branch Remark[3]: Reference Module Report (FCC ID: ZMOFM160NA), provided by Compliance Certification Services (Kunshan) Inc.			

Table of Contents

1 General Description

1.1 Lab Information

1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014
Tel.: +86-755-27212361
Contact Email: info@towewireless.com

1.1.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

ISED CAB identifier: CN0152
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0152
Company Number: 31000

1.2 Client Information

1.2.1 Applicant

Applicant:	JACS Solutions, Inc.
Address:	809 Pinnacle Drive, Suite R, Linthicum Heights, MD 21090

1.2.2 Manufacturer

Manufacturer:	JACS Solutions, Inc.
Address:	809 Pinnacle Drive, Suite R, Linthicum Heights, MD 21090

1.3 Product Information

EUT Description:	5G DONGLE		
Model:	TD0211		
Brand:	JACS		
Hardware Version:	V2.0		
Software Version:	89610.100.00.02.02.12		
IMEI:	862513050026243 862513050026599		
Device Capabilities:			
Modulation Type:	LTE:	☒ QPSK, ☒ 16QAM, ☒ 64QAM, ☒ 256QAM	
Operation Frequency Range:	Band	TX Frequency	RX Frequency
	LTE Band 2	1850 ~ 1910 MHz	1930 ~ 1990 MHz
	LTE Band 4	1710 ~ 1755 MHz	2110 ~ 2155 MHz
	LTE Band 5	824 ~ 849 MHz	869 ~ 894 MHz
	LTE Band 12	699 ~ 716 MHz	729 ~ 746 MHz
	LTE Band 13	777 ~ 787 MHz	746 ~ 756 MHz
	LTE Band 14	788 ~ 798 MHz	758 ~ 768 MHz
	LTE Band 29	/	717 ~ 728 MHz
	LTE Band 30	2305 ~ 2315 MHz	2350 ~ 2360 MHz
	LTE Band 41	2496 ~ 2690 MHz	2496 ~ 2690 MHz
	LTE Band 46	/	5150 ~ 5925 MHz
	LTE Band 48	3550 ~ 3700 MHz	3550 ~ 3700 MHz
	LTE Band 66	1710 ~ 1780 MHz	2110 ~ 2200 MHz
	LTE Band 71	663 ~ 698 MHz	617 ~ 652 MHz
	LTE UL CA: LTE CA_41C; LTE CA_2A-12A; LTE CA_2A-13A; LTE CA_4A-13A; LTE CA_14A-30A; LTE CA_12A-66A; LTE CA_13A-66A		
Power Class:	Band 41(PC2)		
Antenna Type:	☐ External, ☒ Integrated		
Antenna Gain:	LTE Band 2:	0.1dBi (Ant0)	
	LTE Band 4:	-0.72dBi (Ant0)	
	LTE Band 5:	-2.8dBi (Ant3)	
	LTE Band 12:	-0.11dBi (Ant3)	
	LTE Band 13:	-2.57dBi (Ant3)	
	LTE Band 14:	-2.57dBi (Ant3)	
	LTE Band 30:	0.52dBi (Ant0)	
	LTE Band 41:	2.41dBi (Ant0)	
	LTE CA_41C:	2.41dBi (Ant0)	
	LTE Band 48:	0.65dBi (Ant0)	
	LTE Band 66:	-0.02dBi (Ant0)	
	LTE Band 71:	-0.07dBi (Ant3)	
Remark: The above EUT's information was declared by applicant, please refer to the specifications or user manual for more detailed description.			

2 Test Configuration

2.1 Test Channel

Band	Bandwidth	TX Frequency			RX Frequency		
		Range	Channel	Frequency	Range	Channel	Frequency
LTE band 2	1.4MHz	Low	18607	1850.7 MHz	Low	607	1930.7 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19193	1909.3 MHz	High	1193	1989.3 MHz
	3MHz	Low	18615	1851.5 MHz	Low	615	1931.5 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19185	1908.5 MHz	High	1185	1988.5 MHz
	5MHz	Low	18625	1852.5 MHz	Low	625	1932.5 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19175	1907.5 MHz	High	1175	1987.5 MHz
	10MHz	Low	18650	1855 MHz	Low	650	1935 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19150	1935 MHz	High	1150	1985 MHz
	15MHz	Low	18675	1857.5 MHz	Low	675	1937.5 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19125	1902.5 MHz	High	1125	1982.5 MHz
	20MHz	Low	18700	1860 MHz	Low	700	1940 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19100	1900 MHz	High	1100	1980 MHz
LTE band 4	1.4MHz	Low	19957	1710.7 MHz	Low	1975	2110.7 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20393	1754.3 MHz	High	2375	2154.3 MHz
	3MHz	Low	19965	1711.5 MHz	Low	2000	2115 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20385	1753.5 MHz	High	2350	2150 MHz
	5MHz	Low	19975	1712.5 MHz	Low	1975	2112.5 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20375	1752.5 MHz	High	2375	2152.5 MHz
	10MHz	Low	20000	1715 MHz	Low	2115	2115 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20350	1750 MHz	High	2350	2150 MHz
	15MHz	Low	20025	1717.5 MHz	Low	2025	2117.5 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20325	1747.5 MHz	High	2325	2147.5 MHz
	20MHz	Low	20050	1720 MHz	Low	2050	2120 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20300	1745 MHz	High	2300	2145 MHz
LTE band 5	1.4MHz	Low	20407	824.7 MHz	Low	2407	869.7 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20643	848.3 MHz	High	2643	893.3 MHz
	3MHz	Low	20415	825.5 MHz	Low	2415	870.5 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20635	847.5 MHz	High	2635	892.5 MHz
	5MHz	Low	20425	826.5 MHz	Low	2425	871.5 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20625	846.5 MHz	High	2625	891.5 MHz
	10MHz	Low	20450	829 MHz	Low	2450	874 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20600	844 MHz	High	2600	889 MHz
LTE band 12	1.4MHz	Low	23017	699.7 MHz	Low	5017	729.7 MHz
		Middle	23095	707.5 MHz	Middle	5095	737.5 MHz
		High	23173	715.3 MHz	High	5173	745.3 MHz
	3MHz	Low	23025	700.5 MHz	Low	5025	730.5 MHz

		Middle	23095	707.5 MHz	Middle	5095	737.5 MHz
		High	23165	714.5 MHz	High	5165	744.5 MHz
	5MHz	Low	23035	701.5 MHz	Low	5035	731.5 MHz
		Middle	23095	707.5 MHz	Middle	5095	737.5 MHz
		High	23155	713.5 MHz	High	5155	743.5 MHz
	10MHz	Low	23060	704 MHz	Low	5060	734 MHz
		Middle	23095	707.5 MHz	Middle	5095	737.5 MHz
		High	23130	711 MHz	High	5130	741 MHz
LTE band 13	5MHz	Low	23025	779.5 MHz	Low	5205	748.5 MHz
		Middle	23230	782 MHz	Middle	5230	751 MHz
		High	23255	784.5 MHz	High	5255	753.5 MHz
	10MHz	Low	23230	782 MHz	Low	5230	751 MHz
		Middle	23230	782 MHz	Middle	5230	751 MHz
		High	23230	782 MHz	High	5230	751 MHz
LTE band 14	5MHz	Low	23305	790.5 MHz	Low	5305	760.5 MHz
		Middle	23330	793 MHz	Middle	5330	763 MHz
		High	23355	795.5 MHz	High	5355	765.5 MHz
	10MHz	Low	23330	793 MHz	Low	5330	763 MHz
		Middle	23330	793 MHz	Middle	5330	763 MHz
		High	23330	793 MHz	High	5330	763 MHz
LTE band 30	5MHz	Low	27685	2307.5 MHz	Low	9795	2352.5MHz
		Middle	27710	2310MHz	Middle	9820	2355 MHz
		High	27735	2312.5 MHz	High	9845	2357.5MHz
	10MHz	Low	27710	2310 MHz	Low	9820	2355 MHz
		Middle	27710	2310 MHz	Middle	9820	2355 MHz
		High	27710	2310 MHz	High	9820	2355 MHz
LTE band 41	5MHz	Low	39675	2498.5 MHz	Low	39675	2498.5 MHz
		Middle	40620	2593 MHz	Middle	40620	2593 MHz
		High	41565	2687.5 MHz	High	41565	2687.5 MHz
	10MHz	Low	39700	2501 MHz	Low	39700	2501 MHz
		Middle	40620	2593 MHz	Middle	40620	2593 MHz
		High	41540	2685 MHz	High	41540	2685 MHz
	15MHz	Low	39725	2503.5 MHz	Low	39725	2503.5 MHz
		Middle	40620	2593 MHz	Middle	40620	2593 MHz
		High	41515	2682.5 MHz	High	41515	2682.5 MHz
	20MHz	Low	39750	2506 MHz	Low	39750	2506 MHz
		Middle	40620	2593 MHz	Middle	40620	2593 MHz
		High	41490	2680 MHz	High	41490	2680 MHz
LTE band 48	5MHz	Low	55265	3552.5 MHz	Low	55265	3552.5 MHz
		Middle	55990	3625.0 MHz	Middle	55990	3625.0 MHz
		High	56715	3697.5 MHz	High	56715	3697.5 MHz
	10MHz	Low	55290	3555.0 MHz	Low	55290	3555.0 MHz
		Middle	55990	3625.0 MHz	Middle	55990	3625.0 MHz
		High	56690	3695.0 MHz	High	56690	3695.0 MHz
	15MHz	Low	55315	3557.5 MHz	Low	55315	3557.5 MHz
		Middle	55990	3625.0 MHz	Middle	55990	3625.0 MHz
		High	56665	3692.5 MHz	High	56665	3692.5 MHz
	20MHz	Low	55340	3560.0 MHz	Low	55340	3560.0 MHz
		Middle	55990	3625.0 MHz	Middle	55990	3625.0 MHz
		High	56640	3690.0 MHz	High	56640	3690.0 MHz

LTE band 66	1.4MHz	Low	131979	1710.7 MHz	Low	66443	2110.7 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132665	1779.3 MHz	High	67329	2199.3 MHz
	3MHz	Low	131987	1711.5 MHz	Low	66451	2111.5 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132657	1778.5MHz	High	67321	2198.5MHz
	5MHz	Low	131997	1712.5 MHz	Low	66461	2112.5 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132647	1777.5 MHz	High	67311	2197.5 MHz
	10MHz	Low	132022	1715 MHz	Low	66486	2115 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132622	1775 MHz	High	67286	2195 MHz
	15MHz	Low	132047	1717.5 MHz	Low	66511	2117.5 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132597	1772.5 MHz	High	67261	2192.5 MHz
	20MHz	Low	132072	1720 MHz	Low	66536	2120 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132572	1770 MHz	High	67236	2190 MHz
LTE band 71	5MHz	Low	133147	665.5 MHz	Low	68611	619.5 MHz
		Middle	133297	680.5 MHz	Middle	68761	634.5 MHz
		High	133447	695.5 MHz	High	68911	649.5 MHz
	10MHz	Low	133172	668 MHz	Low	68636	622 MHz
		Middle	133297	680.5 MHz	Middle	68761	634.5 MHz
		High	133422	693 MHz	High	68886	647 MHz
	15MHz	Low	133197	670.5 MHz	Low	68661	624.5 MHz
		Middle	133297	680.5 MHz	Middle	68761	634.5 MHz
		High	133397	690.5 MHz	High	68861	644.5 MHz
	20MHz	Low	133222	673 MHz	Low	68686	627 MHz
		Middle	133297	680.5 MHz	Middle	68761	634.5 MHz
		High	133372	688 MHz	High	68836	642 MHz

Table 4.3.1.2.9A-1: Test frequencies for CA_41C

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1			CC2 Note1		
		BW [RB]	$N_{UL/DL}$	$f_{UL/DL}$ [MHz]	BW [RB]	$N_{UL/DL}$	$f_{UL/DL}$ [MHz]
Low	25+100	25	39683	2499.3	100	39800	2511
		100	39750	2506	25	39867	2517.7
	50+75	50	39703	2501.3	75	39823	2513.3
		75	39725	2503.5	50	39845	2515.5
	50+100	50	39705	2501.5	100	39849	2515.9
		100	39750	2506	50	39894	2520.4
	75+75	75	39725	2503.5	75	39875	2518.5
	75+100	75	39728	2503.8	100	39899	2520.9
		100	39750	2506	75	39921	2523.1
	100+100	100	39750	2506	100	39948	2525.8
Mid	25+100	25	40528	2583.8	100	40645	2595.5
		100	40595	2590.5	25	40712	2602.2
	50+75	50	40549	2585.9	75	40669	2597.9
		75	40571	2588.1	50	40691	2600.1
	50+100	50	40526	2583.6	100	40670	2598.0
		100	40571	2588.1	50	40715	2602.5
	75+75	75	40545	2585.5	75	40695	2600.5
	75+100	75	40523	2583.3	100	40694	2600.4
		100	40546	2585.6	75	40717	2602.7
	100+100	100	40521	2583.1	100	40719	2602.9
High	25+100	25	41373	2668.3	100	41490	2680
		100	41440	2675	25	41557	2686.7
	50+75	50	41395	2670.5	75	41515	2682.5
		75	41417	2672.7	50	41537	2684.7
	50+100	50	41346	2665.6	100	41490	2680
		100	41391	2670.1	50	41535	2684.5
	75+75	75	41365	2667.5	75	41515	2682.5
	75+100	75	41319	2662.9	100	41490	2680
		100	41341	2665.1	75	41512	2682.2
	100+100	100	41292	2660.2	100	41490	2680
Note 1:	Carriers in increasing frequency order.						

2.2 Test Mode

Test Mode	Description
TM 1	EUT communication with simulated station in LTE/QPSK mode
TM 2	EUT communication with simulated station in LTE/16QAM mode
TM 3	EUT communication with simulated station in LTE/64QAM mode
TM 4	EUT communication with simulated station in LTE/256QAM mode

2.3 Support Unit used in test

Description	Manufacturer	Model	Serial Number
Laptop	Apple	MacBook Pro	C02SPBESFVH3
Adapter	Apple	A1435	/
USB Cable	JACS	/	/

2.4 Test Environment

Temperature:	Normal: 15℃ ~ 35℃, Extreme: -30℃ ~ +50℃
Relative Humidity	30-75 % RH Ambient
Voltage:	Nominal: 5.0 Vdc

2.5 Test RF Cable

For all conducted test items: The offset level is set spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.

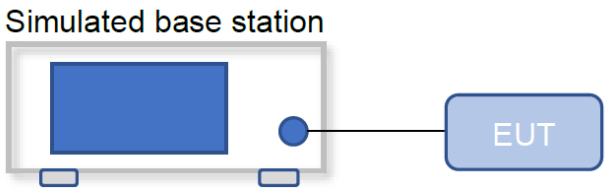
2.6 Modifications

No modifications were made during testing.

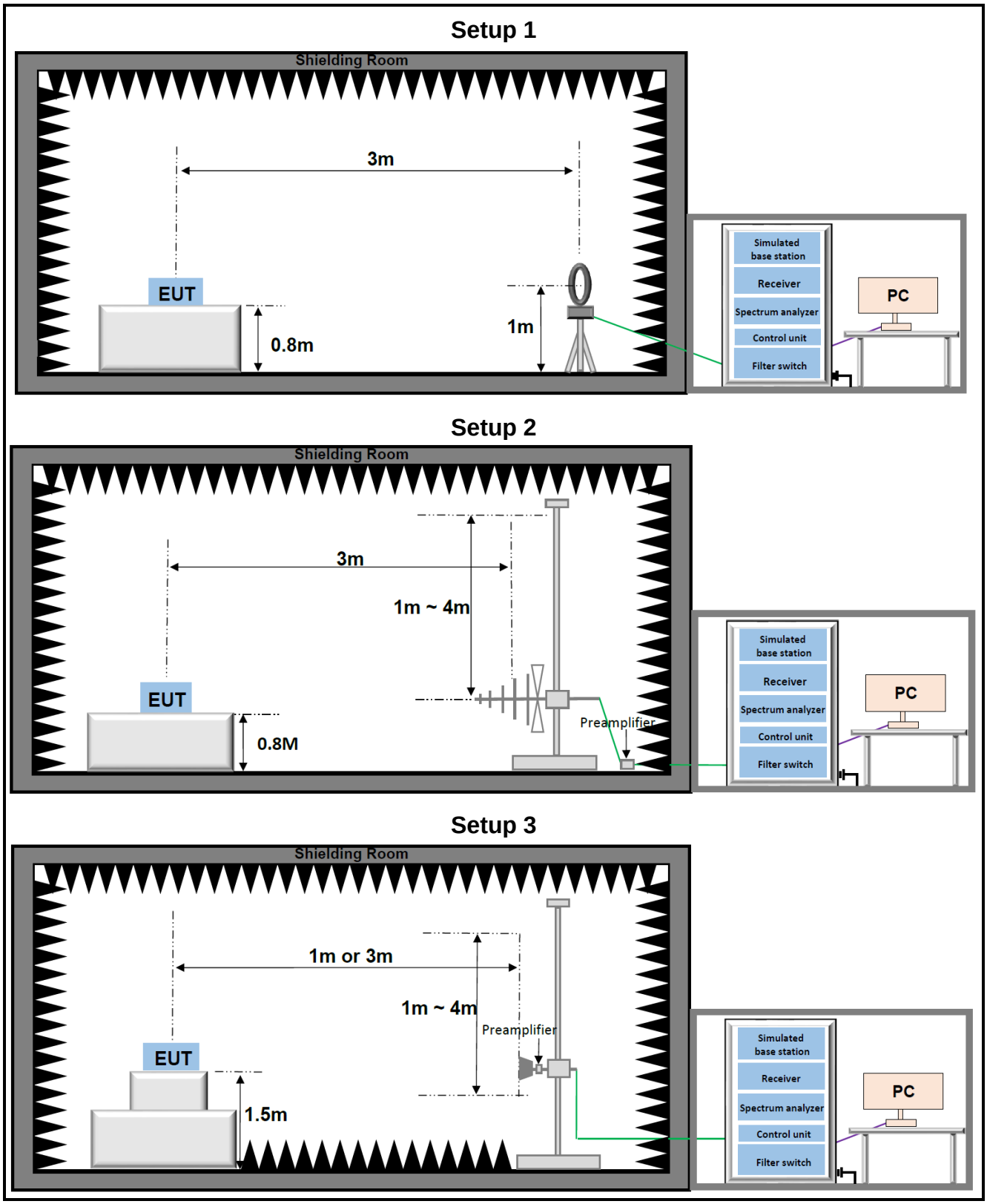
2.7 Test Setup Diagram

2.7.1 Conducted Configuration

Setup 1



2.7.2 Radiated Configuration



3 Equipment and Measurement Uncertainty

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, whichever is less, and where applicable is traceable recognized national standards.

3.1 Test Equipment List

Conducted Test					
Description	**Manufacturer**	**Model**	**SN**	**Last Due**	**Cal Due**
AVG Power Sensor	R&S	NRP-Z21	101651	04/08/2023	04/07/2024
AVG Power Sensor	R&S	NRP-Z21	104189	04/08/2023	04/07/2024
Radio Communication Analyzer	Anritsu	MT8821C	6262170463	04/08/2023	04/07/2024

Radiated Emission					
Description	**Manufacturer**	**Model**	**S.N.**	**Last Due**	**Cal Due**
Biconic Logarithmic Periodic Antennas	Schwarzbeck	VULB9163	1643	06/25/2023	06/24/2025
Double-Ridged Horn Antennas	Schwarzbeck	BBHA 9120D	2809	06/25/2023	06/24/2025
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	1290	06/25/2023	06/24/2025
Signal Analyzer	Keysight	N9020A	MY49100252	04/08/2023	04/07/2024
EMI Tester Receiver	Rohde & Schwarz	ESR7	102719	08/17/2023	08/16/2024
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	150645	04/08/2023	04/07/2024
Low Noise Amplifier	Tonscend	TAP9K3G40	AP23A8060273	04/08/2023	04/07/2025
Low Noise Amplifier	Tonscend	TAP01018050	AP22G806258	04/08/2023	04/07/2025
Band Reject Filter Group	Townshend	JS0806-F	23A806F0652	N/A	N/A
Test Software	Tonscend	TS+	Version: 5.0.0	N/A	N/A

3.2 Measurement Uncertainty

Parameter	U_{lab}
Output power	0.76dB
Radiation 9kHz~30MHz	2.4dB
Radiation 30MHz~1000MHz	4.66dB
Radiation 1000MHz~18GHz	5.42dB
Radiated 18GHz~40GHHz	5.46dB

Uncertainty figures are valid to a confidence level of 95%

4 Test Results

4.1 Output Power (ERP / EIRP / Conducted Power)

Limits

FCC Part	Test Band	Limit
§22.913(a)(5)	LTE Band 5	The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7watts.
§24.232(c)	LTE Band 2	Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.
§27.50(h)(2)	LTE Band 41 LTE Band CA_41C	Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power
§27.50(d)(4)	LTE Band 4/66	Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780MHz bands are limited to 1watt EIRP. Fixed stations operating in the 1710-1755MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.
§27.50(c)(10)	LTE Band 12/71	Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3watts ERP.
§27.50(b)(10)	LTE Band /13	Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788MHz, and 805-806 MHz bands are limited to 3 watts ERP.
§90.541(c)	LTE Band 14	The transmitting power of a mobile unit must not exceed 100 watts ERP.
§27.50(a)(3)	LTE Band 30	Mobile and portable stations. (i) For mobile and portable stations transmitting int he 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth.
§96.41(b)	LTE Band 48	Maximum EIRP 23dBm/10MHz

Test Procedure

KDB 971168 D01 V03r01 Section 5.2.1, for Conducted Output Power
KDB 971168 D01 V03r01 Section 5.2, for Effective (Isotropic) Radiated Power

Test Settings

Conducted Output Power:

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to the simulated base station. The simulated station was set to force the EUT to its maximum power setting, Transmitter output power was read off in dBm, read values have added cable loss and attenuation.

Radiated Power:

The formula for calculating ERP/EIRP based on conduction power is as follows:
EIRP (dBm) = Conducted Power (dBm) + antenna gain (dBi)
ERP=EIRP - 2.15dB

Test Setup

Refer to section 2.7.1 Setup 1

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Results

The detailed test data see: **Appendix.**

4.2 Field Strength of Spurious Radiation

Limits

FCC part	Test Band	Limit
§22.917(a)	LTE Band 5	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB, In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.
§24.238(a) §27.53(c) §27.53(h)	LTE Band 2/4/66/71	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
§27.53(g)	LTE Band 12	The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.
§27.53(c)(f)	LTE Band 13	The power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB; Shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.
§90.543(e)(f)	LTE Band 14	least 43 + 10 log (P) dB. For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotopically radiated power (EIRP) for wideband signals.
§27.53(m)	LTE Band 41/CA_41C	All frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.
§27.53(a)	LTE Band 30	By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 +

		10 log (P) dB below 2288 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.
§96.41(e)	LTE Band 48	The conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB. For CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

Test Procedure

KDB 971168 D01 V03r01 Section 7

Test Settings

1. For radiated emissions measurements performed at frequencies less than or equal to 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the reference ground plane.
2. For radiated emissions measurements performed at frequencies above 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 150cm above the ground plane.
3. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1m to 4m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e, field strength or received power), when orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25cm.
4. For each suspected emission, the EUT was ranged its worst case and then tune the antenna tower(from 1~4m) and turntable(from 0~360°) find the maximum reading. Preamplifier and a high pass filter are used for the test in order get better signal level comply with the guidelines.
5. The simulated base station was set to force the EUT to its maximum transmitting power.
6. spectrum analyzer setting:
   Measurements 9KHz~150KHz: RBW = 300Hz; VBW ≥ 3 kHz; Detector = RMS
   Measurements 150KHz~30MHz: RBW = 10KHz; VBW ≥ 30 kHz; Detector = RMS
   Measurements 30MHz~1000MHz: RBW = 100KHz or 1MHz; VBW ≥ 1MHz or 3MHz; Detector = RMS
   Measurements Above 1000MHz: RBW = 1 MHz; VBW ≥ 3 MHz; Detector = RMS
7. The field strength is calculated by adding the Antenna Factor, Cable Factor. The basic equation with a sample calculation is as follows:
   E(dBμV/m) = Measured amplitude level (dBμV) + Cable Loss (dB) + Antenna Factor (dB/m).
   E(dBμV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m).
   E(dBuV/m) = EIRP(dBm) - 20log(D) + 104.8; where D is the measurement distance(in the far field region) in m.
   EIRP(dBm) = E(dBμV/m) + 20log(D) - 104.8; where D is the measurement distance(in the far field region) in m.
   *So, from d: The measuring distance is usually at 3m, then 20*Log(3)=9.5424*

Then, EIRP (dBm)= E (dBμV/m) +9.5424-104.8=E (dBμV/m)-95.2576

8. Repeat above procedures until all frequencies measured was complete.
9. Measure and record the results in the test report.

Test notes

1. This device employs GSM, GPRS, and EGPRS capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
2. This device employs UMTS technology with WCDMA(AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2kbps RMC and TPC bits all set to “1”.
3. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
4. Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.
5. Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. the disturbance between 9KHz to 30MHz and 18GHz to 40GHz was very low. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be recorded, so only the harmonics had been displayed.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Test Setup

Refer to section 2.7.2 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.3 Test Setup Photos

The detailed test Setup Photos see: **Appendix.**

Appendix

Appendix List:

Appendix A-LTE BAND2
Appendix A-LTE BAND4
Appendix A-LTE BAND5
Appendix A-LTE BAND12
Appendix A-LTE BAND13
Appendix A-LTE BAND14
Appendix A-LTE BAND30
Appendix A-LTE BAND41
Appendix A-LTE CA_41C
Appendix A-LTE BAND48
Appendix A-LTE BAND66
Appendix A-LTE BAND71
Appendix C-Test Setup Photos

~The End~