CFR 47 FCC PART 02
CFR 47 FCC PART 24

TEST REPORT

For

scoutlabs Mini

MODEL NUMBER: Mini V2

REPORT NUMBER: E04A24120948F00202

ISSUE DATE: February 12, 2025

FCC ID: 2BM4KMINIV2

Prepared for

SMAPP LABS Inc

Orange street 1209, Wilmington, Delaware, United States

Prepared by

Guangdong Global Testing Technology Co., Ltd.

Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	February 12, 2025	Initial Issue	

Summary of Test Results			
Standard(s) Section	**Description**	**Requirements**	**Result**
FCC			
§2.1046, §24.232(c)	Effective (Isotropic) Radiated Power of Transmitter	EIRP ≤ 2 W	PASS
§24.232(d)	Peak to Average Radio	Limit≤13 dB	PASS
§2.1049	Occupied Bandwidth	OBW: No limit EBW: No limit	PASS
§2.1051, §24.238(a)	Band Edge Compliance	≤ 43+10log10(P[W])/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	PASS
§2.1051, §24.238(a)	Spurious Emission at Antenna Terminal	≤ 43+10log10(P[W])/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	PASS
§2.1053, §24.238(a)	Radiated Spurious Emissions	≤ 43+10log10(P[W])	PASS
§2.1055(a)(1)(b), §2.1055(d)(1), §24.235	Frequency Stability	Within authorized bands of operation/frequency block.	PASS

Note:
1. This test report is only published to and used by the applicant, and it is not for evidence purpose in China.
2. The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 24 > when <Accuracy Method> decision rule is applied.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	SMAPP LABS Inc
Address:	Orange street 1209, Wilmington, Delaware, United States

Manufacturer Information

Company Name:	Shenzhen Arden Technology Limited
Address:	Huizhanwan DongCheng Blk1-708,Fuhai Street,Baoan District Shenzhen City,GuangDong Province

EUT Information

EUT Name:	scoutlabs Mini
Model:	Mini V2
Brand:	/
Serial Model:	/
Sample Received Date:	January 3, 2025
Sample Status:	Normal
Sample ID:	A24120948 001
Date of Tested:	January 8, 2025 to February 12, 2025

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 24	PASS

Prepared By:

Win Huang

Project Engineer

Checked By:

Alan He

Laboratory Leader

Approved By:

Shawn Wen

Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.26-2015, 971168 D01 Power Meas License Digital Systems v03r01, CFR 47 FCC Part 24.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 6947.01)** Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1343)** Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules **ISED (Company No.: 30714)** Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Items	k	Uncertainty
Occupied Bandwidth	2	±0.3 dB
Effective (Isotropic) Radiated Power Output Data	2	±0.3 dB
Conducted Spurious Emission	2	9 kHz-1 GHz: ± 0.2 dB 1GHz-12.75GHz: ± 0.3 dB 12.75 GHz-26.5 GHz: ± 0.5dB
Frequency Stability	2	±9.0 PPM
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

Test Item	Frequency Range	k	U(dB)
Conducted emissions from the AC mains power ports (AMN)	150 kHz ~ 30 MHz	2	3.37
Radiated emissions	9 kHz ~ 30 MHz	2	4.16
Radiated emissions	30 MHz ~ 1 GHz	2	3.79
Radiated emissions	1 GHz ~ 18 GHz	2	5.62
Radiated emissions	18 GHz ~ 40 GHz	2	5.54
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name		scoutlabs Mini
Model		Mini V2
Series Model		/
Model Difference		/
Hardware Version		V2.4.1
Software Version		V2.3.6
Ratings		Input: 4.2Vdc ⎓ 2A
Power Supply	DC	4.2V
	Battery	DC 3.6V 3000mAh, 10.8Wh
Note		1. The Antenna Gain was provided by customer, and this information may affect the validity of the results, customer should be responsible for this. 2. Solar charging panels and adapters, after testing and evaluation, only the worst-case data (adapters) are recorded in the report.

5.2. TECHNICAL INFORMATION

E-UTRA Band	Characteristics				
	E-UTRA operating bands		Bandwidth		
	Transmit	Receive			
2	1850MHz -1910MHz	1930MHz -1990MHz	☒1.4MHz	☒3MHz	☒5MHz
			☒10MHz	☒15MHz	☒20MHz

5.3. TEST CHANNEL CONFIGURATION

Mode	TX	Low	Middle	High
LTE Band 2	TX (1.4 MHz)	18607	18900	19193
		1850.7 MHz	1880 MHz	1909.3 MHz
	TX (3 MHz)	18615	18900	19185
		1851.5 MHz	1880 MHz	1908.5 MHz
	TX (5 MHz)	18625	18900	19175
		1852.5 MHz	1880 MHz	1907.5 MHz
	TX (10 MHz)	18650	18900	19150
		1855 MHz	1880 MHz	1905 MHz

	TX (15 MHz)	18675	18900	19125
		1857.5 MHz	1880 MHz	1902.5 MHz
	TX (20 MHz)	18700	18900	19100
		1860 MHz	1880 MHz	1900 MHz

5.4. MAXIMUM AVERAGE OUTPUT POWER

LTE Band 2

Part 24						
EIRP Limit(W)		2.00				
Antenna Gain (dBi)		2.59				
Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)
1.4	QPSK	1850.7	1910.3	21.36	23.95	0.25
	16QAM			21.39	23.98	0.25
3	QPSK	1851.5	1908.5	20.27	22.86	0.19
	16QAM			20.50	23.09	0.20
5	QPSK	1852.5	1907.5	21.88	24.47	0.28
	16QAM			21.44	24.03	0.25
10	QPSK	1855.0	1905.0	22.64	25.23	0.33
	16QAM			21.65	24.24	0.27
15	QPSK	1857.5	1902.5	22.77	25.36	0.34
	16QAM			22.03	24.62	0.29
20	QPSK	1860.0	1900.0	22.72	25.31	0.34
	16QAM			21.95	24.54	0.28

5.5. WORST-CASE CONFIGURATION AND MODE

During all testing, EUT is in link mode with base station emulator at maximum power level. The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM. All testing was performed using QPSK and 16QAM modulations to represent the worst case.

The radiated spurious emissions measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT was investigated in three orthogonal orientations X,Y and Z. It was determined that Y orientation was the worst-case orientation.

Radiated spurious emissions were investigated below 30 MHz, 30 MHz - 1 GHz and above 1 GHz. There were no emissions found on below 30 MHz. the emissions between 30 MHz – 1 GHz were tested the highest transmitting power channel and the worse configuration.

Test Items	Worst case test configuration			
Description	Modulation	Channel	Bandwidth (MHz)	RB Configuration

Occupied Bandwidth	QPSK, 16QAM	L, M, H	1.4,3,5,10,15,20	Full RB
Band Edge Compliance	QPSK, 16QAM	L, M, H	1.4,3,5,10,15,20	Full RB
Spurious Emission at Antenna Terminal	QPSK, 16QAM	L, M, H	1.4,3,5,10,15,20	Full RB
Radiated Spurious Emissions	QPSK	L, M, H	The Maximum BW	RB size=1, RB Location= Low

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Band	Antenna Type	MAX Antenna Gain (dBi)
1	LTE Band 2	FPC	2.59

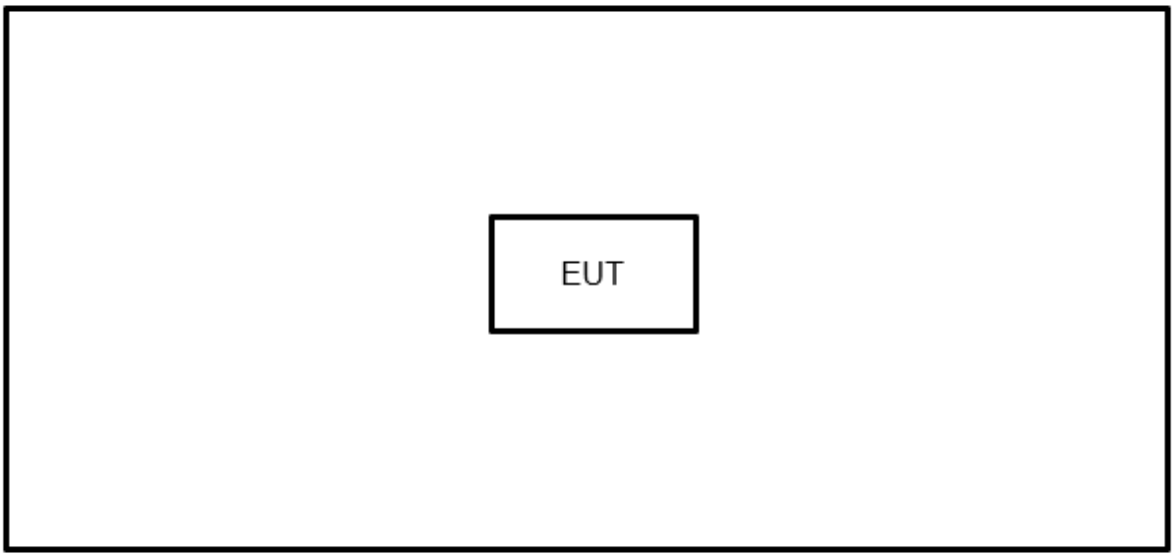
Band	Transmit and Receive Mode	Description
LTE Band 2	☒1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
Note: 1. BT & 4G LTE-FDD Band 2 can't transmit simultaneously. (declared by client)		

5.7. EUT ACCESSORY

Cable	
Accessory:	Solar Charging Panel USB-C Cable
Model No.:	/
Description:	Solar Charging Panel USB-C Cable
Cable Type:	Unshielded without ferrite
Length:	0.24 Meter
Accessory:	Battery Input Port USB-C Cable
Model No.:	/
Description:	Battery Input Port USB-C Cable
Cable Type:	Unshielded without ferrite
Length:	0.10 Meter
Accessory:	Battery Output Port USB-C Cable
Model No.:	/
Description:	Battery Output Port USB-C Cable
Cable Type:	Unshielded without ferrite

Length:	0.42 Meter

5.8. SETUP DIAGRAM



6. MEASURING INSTRUMENT AND SOFTWARE USED

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51285127	2024/09/14	2025/09/13
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2024/09/14	2025/09/13
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2024/09/14	2025/09/13
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2024/09/14	2025/09/13
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2024/09/14	2025/09/13
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2024/09/14	2025/09/13
temperature humidity chamber	Espec	SH-241	SH-241-2014	2024/09/14	2025/09/13
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

Test Equipment of Radiated emissions below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2146	2022/08/30	2025/08/29
EMI Test Receiver	Rohde & Schwarz	ESCI3	101409	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2024/09/14	2025/09/13
Pre-Amplifier	HzEMC	HPA-9K0130	HYPA21001	2024/09/14	2025/09/13
Biconilog Antenna	Schwarzbeck	VULB 9168	01315	2022/10/10	2025/10/09
Biconilog Antenna	ETS	3142E	00243646	2022/03/23	2025/03/22
Loop Antenna	ETS	6502	243668	2022/03/30	2025/03/29
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A	N/A

Test Equipment of Radiated emissions above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2149	2022/08/30	2025/08/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2024/09/14	2025/09/13
Pre-Amplifier	A-INFO	HPA-1G1850	HYPA21003	2024/09/14	2025/09/13
Horn antenna	A-INFO	3117	246069	2022/03/11	2025/03/10

Pre-Amplifier	ZKJC	HPA-184057	HYPA21004	2024/09/14	2025/09/13
Horn antenna	ZKJC	3116C	246265	2022/03/29	2025/03/28
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE+)	N/A	N/A	N/A

7. ANTENNA TERMINAL TEST RESULTS

7.1. EFFECTIVE (ISOTROPIC) RADIATED POWER OF TRANSMITTER

RULE PART(S)

FCC: §2.1046, §24.232

LIMITS

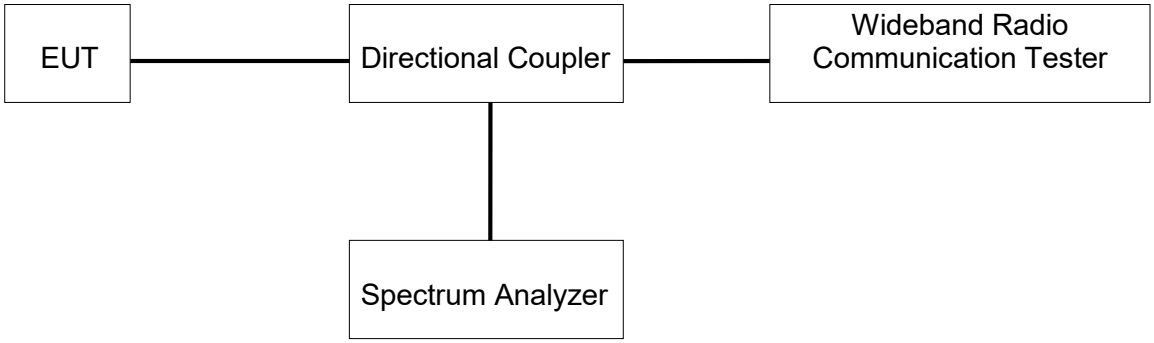
24.232(c) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

TEST PROCEDURE

Refer to ANSI C63.26:2015 and KDB 971168 D01 Section 5.6
ERP/ EIRP = PMeas + GT − LC
where:
ERP or EIRP = effective or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB

The transmitter has a maximum radiated ERP / EIRP output powers as follows:

TEST SETUP



TEST ENVIRONMENT

Temperature	21.5°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	DC 4.2V

RESULTS

Please refer to section "Test Data" - Appendix B

7.2. PEAK TO AVERAGE RADIO

LIMITS

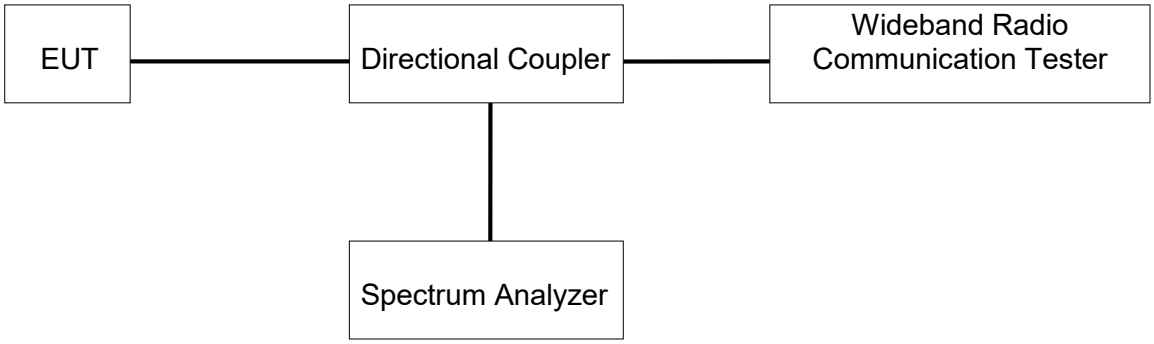
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

TEST PROCEDURE

Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01;

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The PAR was measured on the Spectrum Analyzer.

TEST SETUP



TEST ENVIRONMENT

Temperature	21.5°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	DC 4.2V

RESULTS

Please refer to section "Test Data" - Appendix B

7.3. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

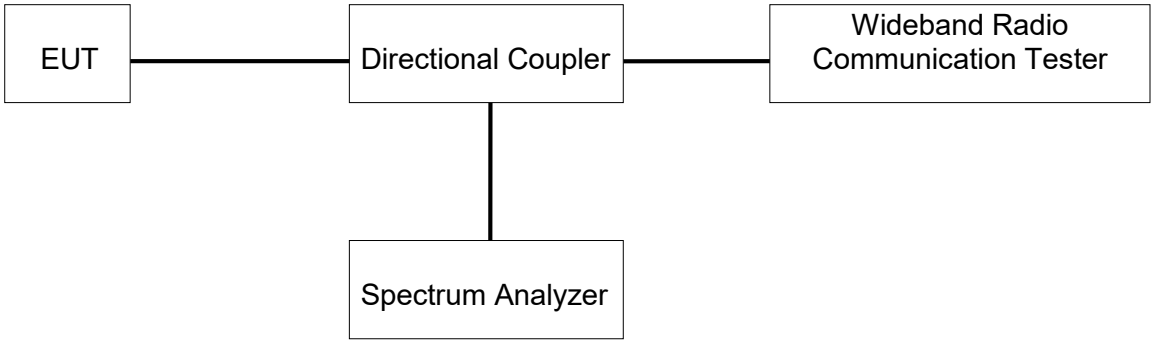
For reporting purposes only.

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

(Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01)

TEST SETUP



TEST ENVIRONMENT

Temperature	21.5°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	DC 4.2V

RESULTS

Please refer to section "Test Data" - Appendix B

7.4. BAND EDGE EMISSIONS

RULE PART(S)

FCC §2.1051, §24.238

LIMITS

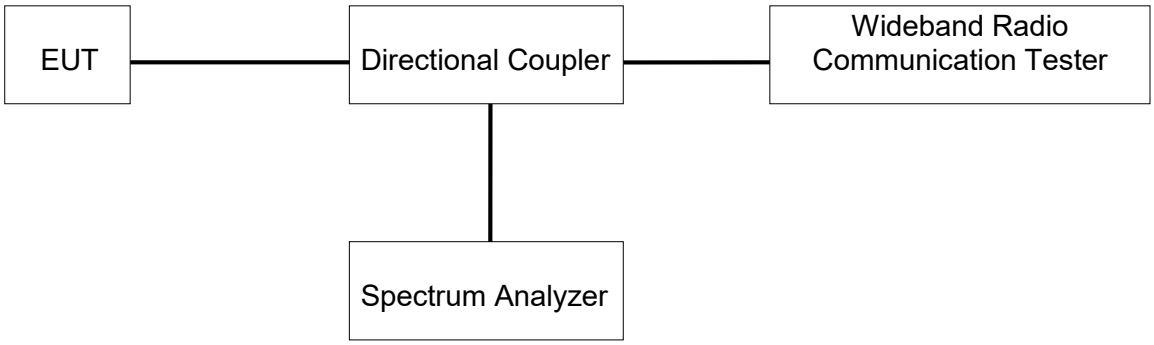
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01
The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

a) Set the RBW = 1 ~ 1.5 % of OBW (Typically limited to a minimum RBW of 1% of the OBW)
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = Auto;
e) Detector = RMS;
f) Ensure that the number of measurement points ≥ 2*Span/RBW;
g) Trace mode = Average (100);

TEST SETUP



TEST ENVIRONMENT

Temperature	21.5°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	DC 4.2V

RESULTS

Please refer to section "Test Data" - Appendix B

7.5. SPURIOUS EMISSION AT ANTENNA TERMINAL

RULE PART(S)

FCC: §2.1051, §24.238

LIMITS

FCC: §24.238
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.

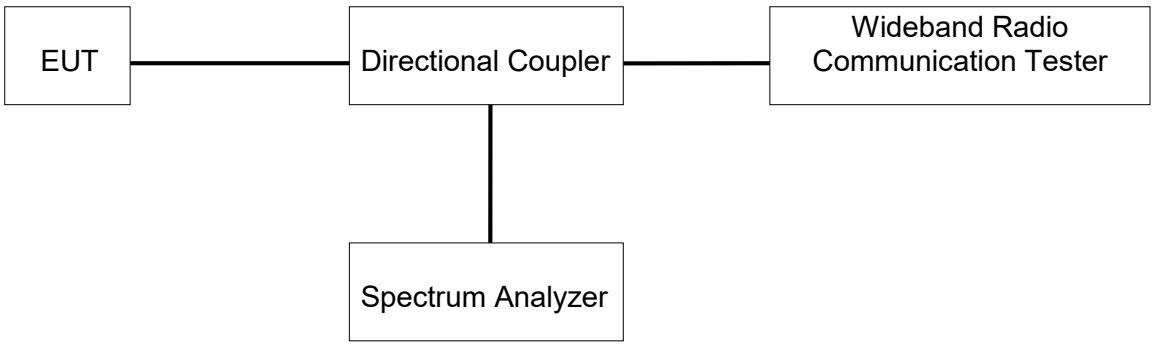
TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

a) Set the RBW = 100 kHz for emission below 1GHz and 1MHz for emissions above 1GHz
(Tests were performed 1 MHz [Worst case], to sweep 1 time for all frequency range)
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = auto couple;
e) Detector = rms;
f) Ensure that the number of measurement points = Max (40001);

Note: Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

TEST SETUP



TEST ENVIRONMENT

Temperature	21.5°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	DC 4.2V

RESULTS

Please refer to section "Test Data" - Appendix B

7.6. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §24.235

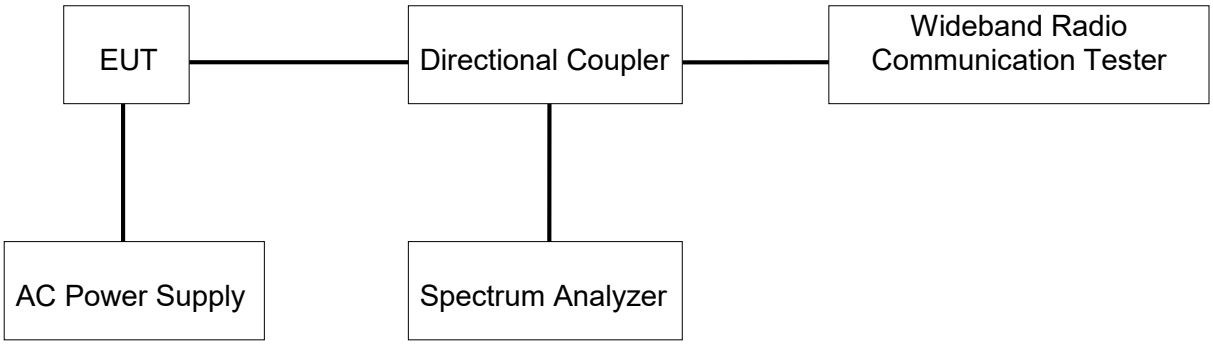
LIMITS

§24.235 The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

TEST PROCEDURE

Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01.

TEST SETUP



RESULTS

Please refer to section "Test Data" - Appendix B

7.7. RADIATED SPURIOUS EMISSIONS

RULE PART(S)

FCC: §2.1053, §24.238

LIMIT

§24.238(a)
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.

TEST PROCEDURE

KDB 971168 D01 Section 7

Below 1GHz test procedure as below:

1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. Calculate power in dBm by the following formula:
ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

Where:

Pd is the dipole equivalent power, Pg is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to Pg [dBm] – cable loss [dB]. The calculated Pd levels are then compared to the absolute spurious emission limit of -13 dBm which is equivalent to the required minimum attenuation of 43 + 10log10(Power [Watts]).

Above 1GHz test procedure as below:

1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.

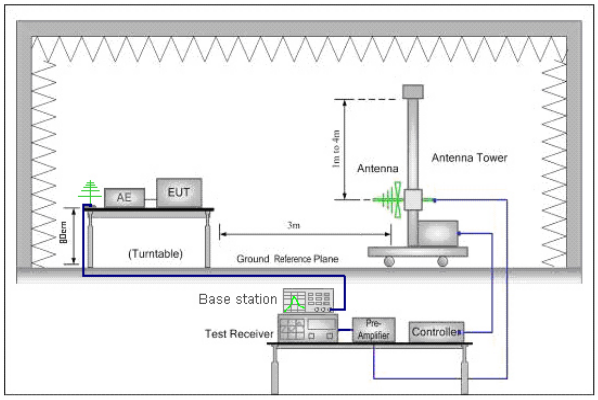
10. Calculate power in dBm by the following formula:
EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)
EIRP=ERP+2.15dB
Where: Pg is the generator output power into the substitution antenna.
11. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)
= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
= -13dBm.

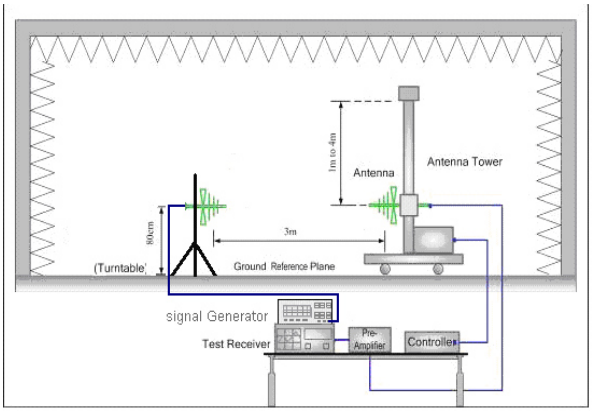
NOTE 1: Radiated spurious emissions were investigated below 30 MHz, 30 MHz – 1 GHz and above 1 GHz. There were no emissions found on below 30 MHz and 30 MHz – 1 GHz.
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

NOTE 2: Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

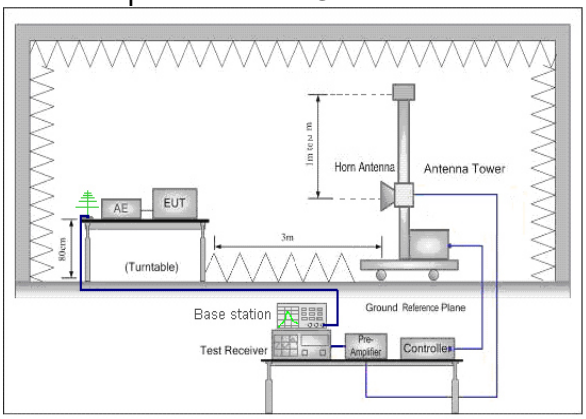
TEST SETUP

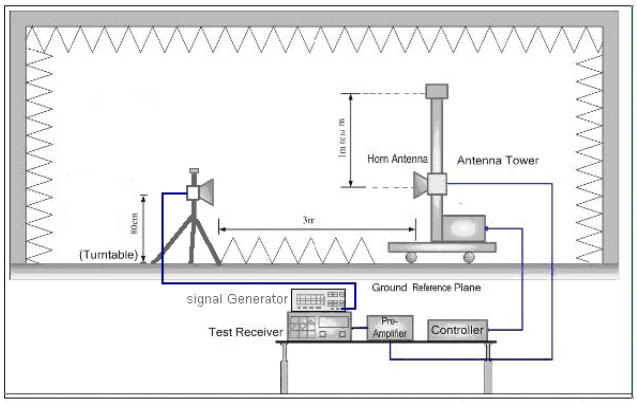
Test Setup for Below 1 GHz





Test Setup for Above 1 GHz





TEST ENVIRONMENT

Temperature	23.1°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	DC 4.2V

RESULTS

Please refer to section "Test Data" - Appendix B

END OF REPORT