Shenzhen CTL Testing Technology Co., Ltd.
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TEST REPORT

FCC Part 90S

Report Reference No. ..... : **CTL1909294031-WF12**

Compiled by: (position+printed name+signature)	Happy Guo (File administrators)	Happy Guo
Tested by: (position+printed name+signature)	Nice Nong (Test Engineer)	Nice Nong
Approved by: (position+printed name+signature)	Ivan Xie (Manager)	Ivan Xie

Product Name ..... :	Sentek IoT
Model/Type reference ..... :	Sentek Modem SM200 V1.3
List Model(s)..... :	N/A
Trade Mark..... :	N/A
FCC ID..... :	**2ARQB-SM200**
Applicant's name ..... :	**Sentek Pty Ltd**
Address of applicant ..... :	77 Magill Road, Stepney 5069, South Australia, Australia
Test Firm..... :	**Shenzhen CTL Testing Technology Co., Ltd.**
Address of Test Firm ..... :	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Test specification..... :	
Standard ..... :	**FCC CFR Title 47 Part 2, Part 90S** **ANSI/TIA/EIA-603-E:2016** **KDB 971168 D01**
TRF Originator ..... :	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF..... :	Dated 2011-01
Date of receipt of test item ..... :	Sep. 30, 2019
Date of sampling..... :	Sep. 30, 2019
Date of Test Date..... :	Sep. 30, 2019–May 19, 2020
Data of Issue..... :	May 25, 2020
Result..... :	**Pass**

TEST REPORT

Test Report No. :	CTL1909294031-WF12	May 25, 2020 Date of issue

Equipment under Test	:	Sentek IoT
Model /Type	:	Sentek Modem SM200 V1.3
Listed Models	:	N/A
Applicant	:	**Sentek Pty Ltd**
Address	:	77 Magill Road, Stepney 5069, South Australia, Australia
Manufacturer	:	**Sentek Pty Ltd**
Address	:	77 Magill Road, Stepney 5069, South Australia, Australia

Test result	Pass *

*In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

** Modified History **

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2020-05-25	CTL1909294031-WF12	Tracy Qi

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:
FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES
ANSI/TIA/EIA-603-E March 2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
KDB971168 D01:v02r02 MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS
ANSI C63.10-2013 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.2. Test Description

Test Item	Section in CFR 47	Result
RF Output Power	Part 2.1046 Part 90.635(a)(7)	Pass
Peak-to-Average Ratio	N/A	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 90.209	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 90.210	Pass
Field Strength of Spurious Radiation	Part 2.1051 Part 90.691	Pass
Out of band emission, Band Edge	Part 2.1051 Part 90.691	Pass
Frequency stability	Part 2.1055 Part 90.213	Pass

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9618B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B on Jan. 22, 2019.

FCC-Registration No.: 399832

Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Sentek IoT		
Model/Type reference:	Sentek Modem SM200 V1.3		
Power supply:	DC 11.1V from battery		
Hardware version:	V1.0		
Software version:	V1.0		
LTE Band 26			
Operation Band:	Band 26		
Modulation Type:	Cat-M1	QPSK, 16QAM	
Frequency range:	LTE Band 26(Channel Bandwidth:1.4MHz)		814.7~823.3MHz
Max. ERP power	559.76mW		
Emission Designator	1M09G7D		
Antenna Type:	External antenna		
Antenna Gain:	7 dBi		

Note: For more details, refer to the user's manual of the EUT.

2.3. Description of Test Modes

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis.
The worst-case was found when positioned as the table below, Following channel(s) was(were) selected for the final test as listed below.

Band	ERP	Radiated Emission
LTE Band 26	Z-plane	Z-plane

Test Item	Available channel	Test channel	Channel Bandwidth	Modulation	Mode
ERP	814.7~823.3MHz	26697(814.7MHz), 26740(819.0MHz), 26783(823.3MHz)	1.4MHz	QPSK, 16QAM	1 RB/5 RB Offset
Peak-to-Average Ratio	814.7~823.3MHz	26697(814.7MHz), 26740(819.0MHz), 26783(823.3MHz)	1.4MHz	QPSK	1 RB/0 RB Offset
Occupied Bandwidth	814.7~823.3MHz	26697(814.7MHz), 26740(819.0MHz), 26783(823.3MHz)	1.4MHz	QPSK	6 RB/0 RB Offset
Conducted Emission	814.7~823.3MHz	26697(814.7MHz), 26740(819.0MHz), 26783(823.3MHz)	1.4MHz	QPSK	1 RB/5 RB Offset

Radiated Emission	814.7~823.3MHz	26697(814.7MHz), 26740(819.0MHz), 26783(823.3MHz)	1.4MHz	QPSK	1 RB/5 RB Offset
Band Edge compliance	814.7~823.3MHz	26697(814.7MHz), 26783(823.3MHz)	1.4MHz	QPSK	1 RB/0 RB Offset 6 RB/0 RB Offset
Frequency stability	814.7~823.3MHz	26697(814.7MHz), 26783(823.3MHz)	1.4MHz	QPSK, 16QAM	1 RB/0 RB Offset

Note:This device was tested under all RB configurations and modulations. The worst case was found in QPSK modulation.

2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2019/05/20	2020/05/19
Bilog Antenna	Sunol Sciences Corp.	JB1	A061714	2019/05/20	2020/05/19
EMI Test Receiver	R&S	ESCI	103710	2019/05/20	2020/05/19
Spectrum Analyzer	Agilent	E4407B	MY41440676	2019/05/20	2020/05/19
Spectrum Analyzer	Agilent	N9020	US46220290	2019/05/20	2020/05/19
EXA Signal Analyzer	Keysight	N9010B	MY57110481	2019/05/20	2020/05/19
Controller	EM Electronics	Controller EM 1000	N/A	2019/05/20	2020/05/19
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2019/05/20	2020/05/19
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062014	2019/05/20	2020/05/19
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2019/05/20	2020/05/19
Amplifier	Agilent	8449B	3008A02306	2019/05/20	2020/05/19
Amplifier	Agilent	8447D	2944A10176	2019/05/20	2020/05/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2019/05/20	2020/05/19
Wideband Radio Communication Tester	R&S	CMW500	101814	2019/05/20	2020/05/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2019/05/20	2020/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2019/05/20	2020/05/19
RF Cable	HUBER+SUHNER	RG214	N/A	2019/05/20	2020/05/19
Climate Chamber	ESPEC	EL-10KA	A20120523	2019/05/20	2020/05/19
SIGNAL GENERATOR	Agilent	E4421B	US40051744	2019/05/20	2020/05/19
Directional Coupler	Agilent	87300B	3116A03638	2019/05/20	2020/05/19

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with of the Part 90.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

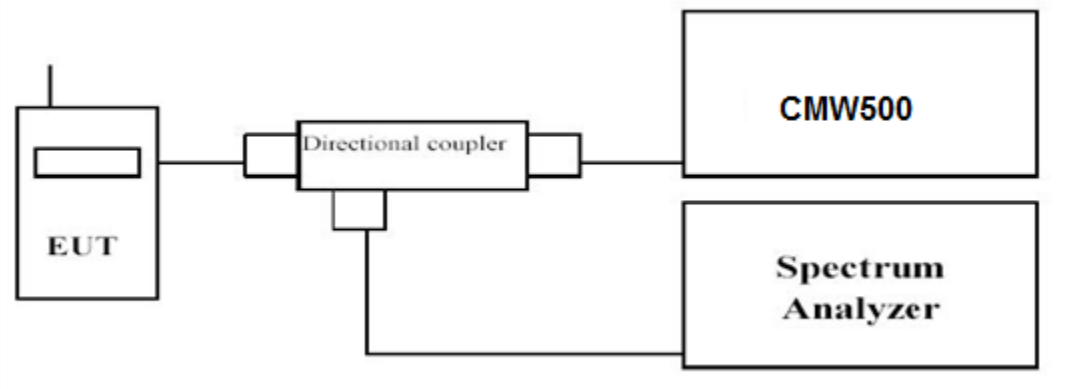
3.1. Output Power

LIMIT

The Maximum output power of the transmitter for mobile stations is 100 watts (20dBw) ERP.

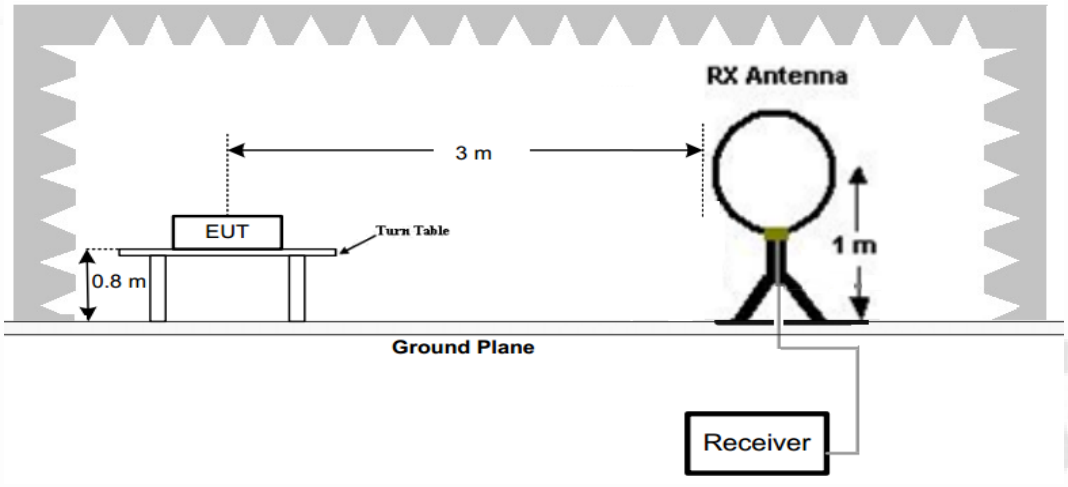
TEST CONFIGURATION

Conducted Power Measurement

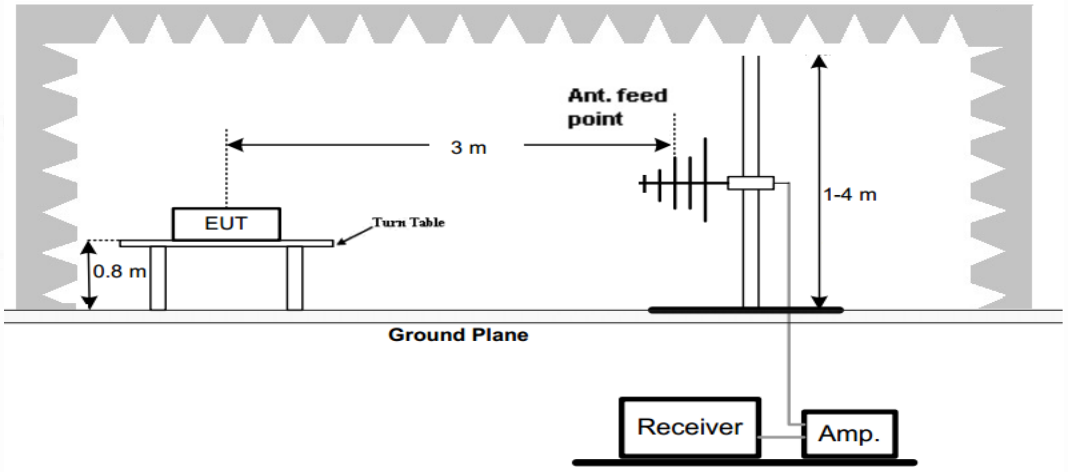


Radiated Power Measurement:

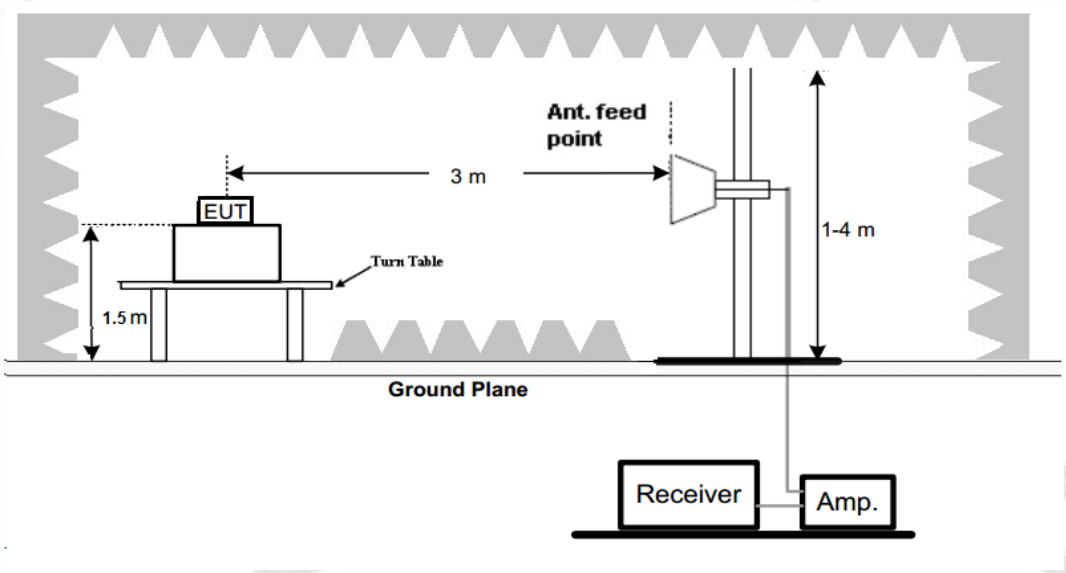
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

The EUT was setup according to ANSI/TIA/EIA-603-E

Conducted Power Measurement:

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c) EUT Communicate with CMW500 then selects a channel for testing.
d) Add a correction factor to the display of spectrum, and then test.

Radiated Power Measurement:

a) The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b) The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
c) The output of the test antenna shall be connected to the measuring receiver.
d) The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
e) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
f) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
g) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
h) The maximum signal level detected by the measuring receiver shall be noted.
i) The transmitter shall be replaced by a substitution antenna.
j) The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
k) The substitution antenna shall be connected to a calibrated signal generator.

l) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

m) The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.

n) The input signal to the 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 attenuator setting of the measuring receiver.

o) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

p) The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

q) Test site anechoic chamber refer to ANSI C63.4.

TEST RESULTS

Conducted Measurement:

LTE band 26							
TX Channel Bandwidth	Frequency (MHz)	Test Configuration Initial of Power				EUT	
		Modulation	RB Size	RB Offset	Narrow band index	Cell Power (dBm/ 15KHz)	Power (dBm)
1.4 MHz	814.7	QPSK	1	0	0	-85	23.60
		QPSK	1	5	0	-85	23.56
		QPSK	3	3	0	-85	21.73
		QPSK	6	0	0	-85	21.68
		16QAM	1	0	3	-85	23.42
		16QAM	1	5	0	-85	23.40
		16QAM	3	0	1	-85	21.63
		16QAM	5	0	3	-85	21.58
	819.0	QPSK	1	0	0	-85	23.66
		QPSK	1	5	0	-85	23.61
		QPSK	3	3	0	-85	21.74
		QPSK	6	0	0	-85	21.71
		16QAM	1	0	3	-85	23.62
		16QAM	1	5	0	-85	23.59
		16QAM	3	0	1	-85	21.69
		16QAM	5	0	3	-85	21.68
	823.3	QPSK	1	0	0	-85	23.58
		QPSK	1	5	0	-85	23.55
		QPSK	3	3	0	-85	21.68
		QPSK	6	0	0	-85	21.64
		16QAM	1	0	3	-85	23.52
		16QAM	1	5	0	-85	23.47
		16QAM	3	0	1	-85	21.62
		16QAM	5	0	3	-85	21.57

Radiated Measurement:

Channel Bandwidth 1.4MHz/QPSK							
Plane	Channel	Frquency (MHz)	Reading (dBm)	Correction Factor(dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26697	814.7	0.70	21.86	20.41	109.90	H
	26740	819.0	0.77	21.86	20.48	111.69	
	26783	823.3	0.64	21.86	20.35	108.39	
	26697	814.7	7.77	21.86	27.48	559.76	V
	26740	819.0	7.72	21.86	27.43	553.35	
	26783	823.3	6.39	21.86	27.03	504.66	
Channel Bandwidth 1.4MHz/16QAM							
Z	26697	814.7	0.93	21.86	20.64	115.88	H
	26740	819.0	0.67	21.86	20.38	109.14	
	26783	823.3	0.54	21.86	20.25	105.93	
	26697	814.7	7.18	21.86	26.89	488.65	V
	26740	819.0	6.96	21.86	26.67	464.52	
	26783	823.3	6.65	21.86	26.36	432.51	

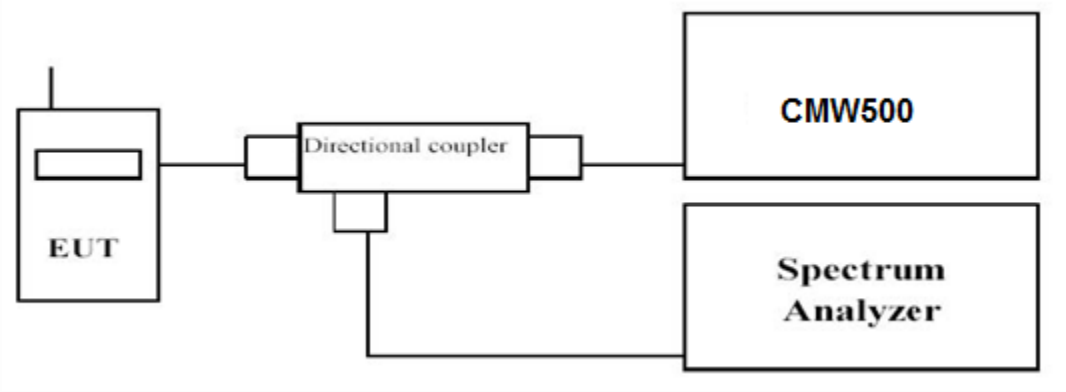
Note: ERP(dBm)= Reading(dBm)+ Correction Factor(dB)-2.15

3.2. Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



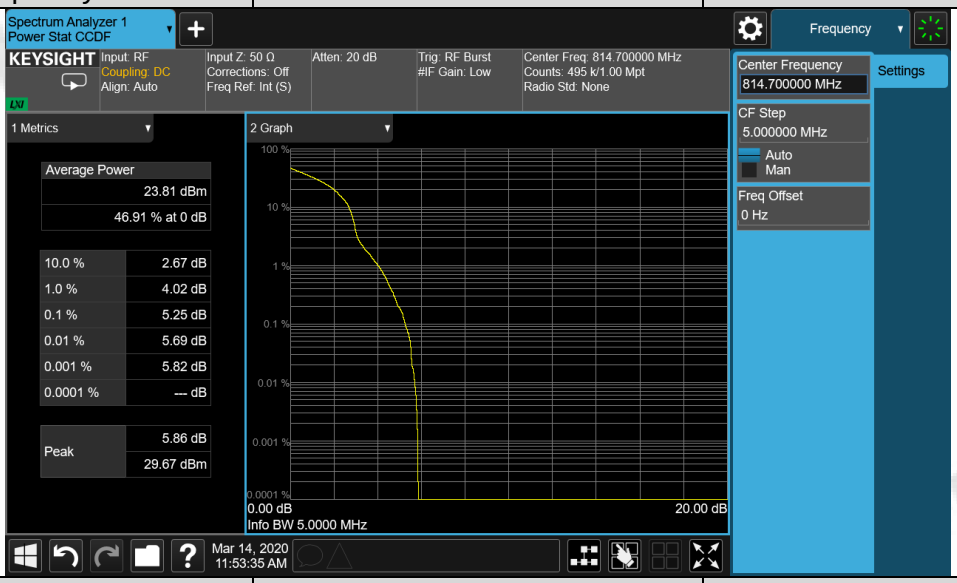
TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
   1). for continuous transmissions, set to 1 ms,
   2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

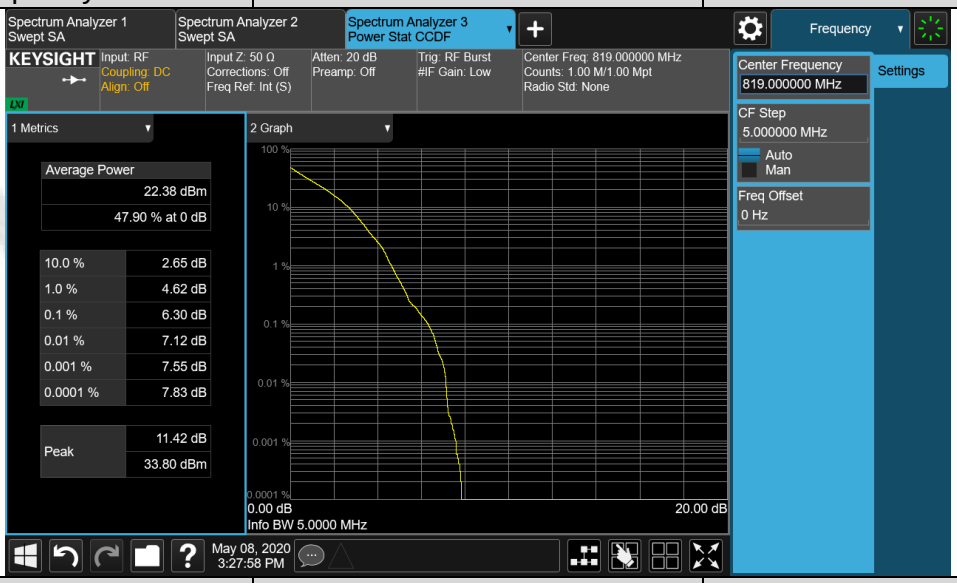
TEST RESULTS

Channel Bandwidth 1.4MHz/QPSK			
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	PAPR (dB)
1.4 MHz	814.7	1 RB/0 RB Offset	5.25
	819.0		6.30
	823.3		5.82

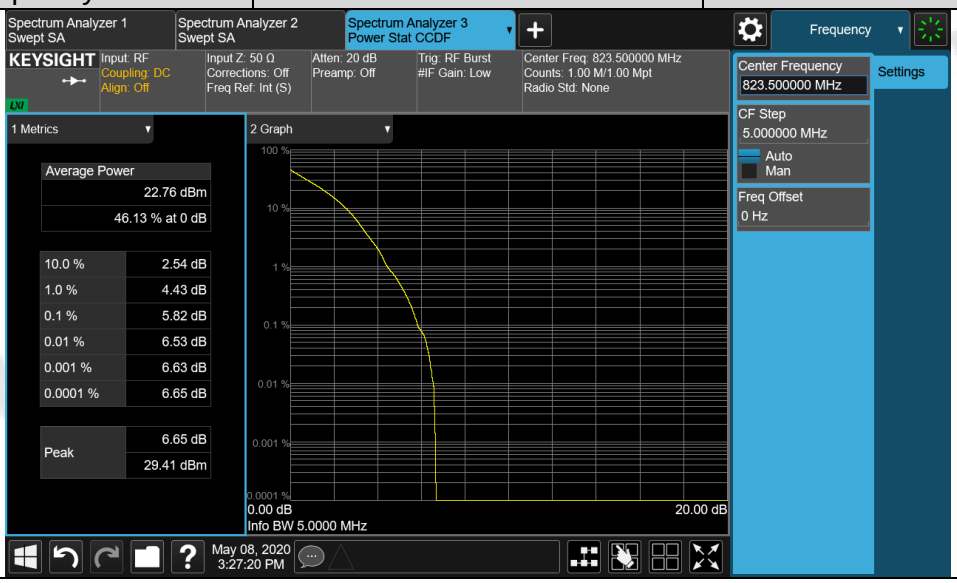
Frequency	814.7MHz	1 RB/0 RB Offset



Frequency	819.0MHz	1 RB/0 RB Offset



Frequency	823.3MHz	1 RB/0 RB Offset

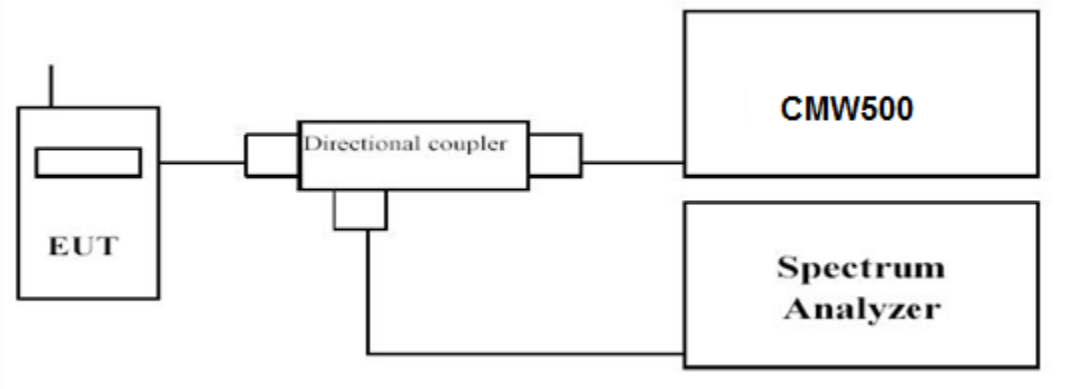


3.3. Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



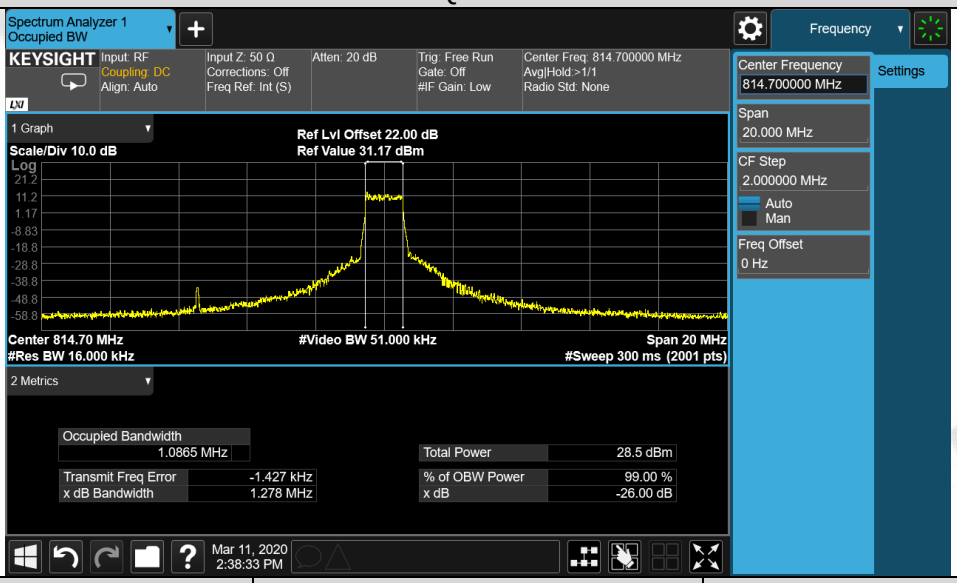
TEST PROCEDURE

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 low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded.
Set RBW was set to about 1% of emission BW, VBW≥3 times RBW.
-26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

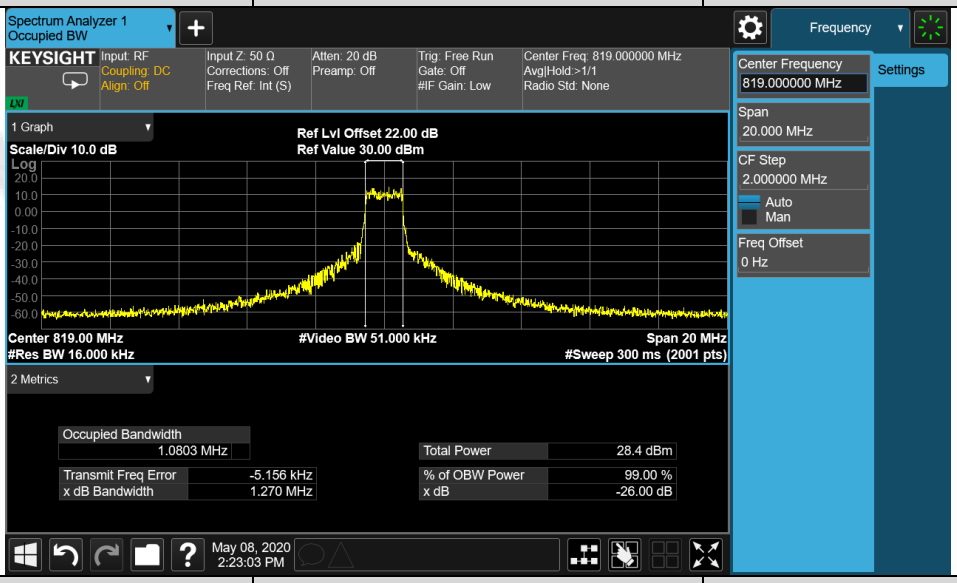
TEST RESULTS

Channel Bandwidth 1.4MHz				
TX Channel Bandwidth	RB Size/Offset	Frequency (MHz)	-26dBc Emission bandwidth (MHz)	99% Occupied bandwidth (MHz)
			QPSK	QPSK
1.4 MHz	6 RB / 0 RB Offset	814.7	1.278	1.0865
		819.0	1.270	1.0803
		823.3	1.257	1.0896

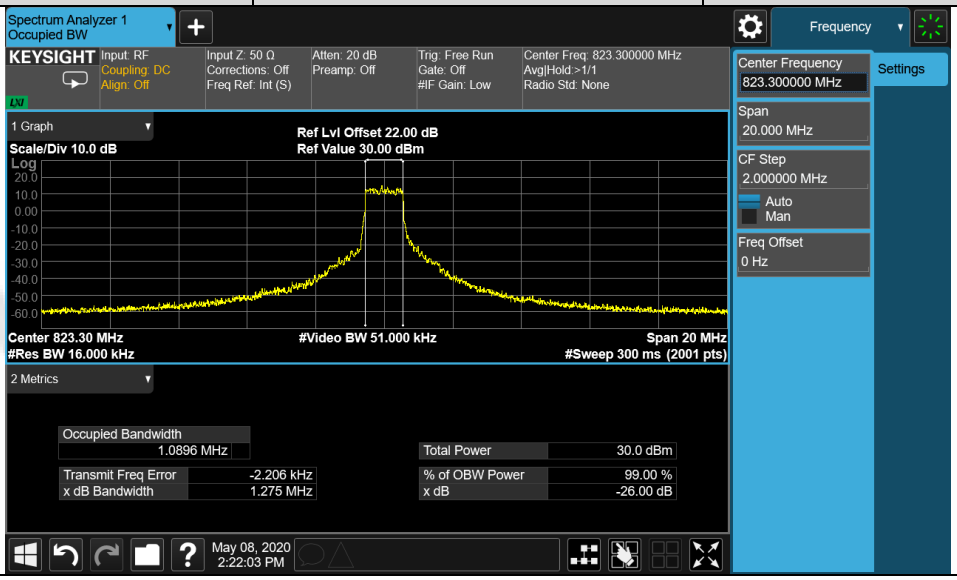
Frequency	814.7MHz	6 RB/0 RB Offset
QPSK		



Frequency	819.0MHz	6 RB/0 RB Offset



Frequency	823.3MHz	6 RB/0 RB Offset

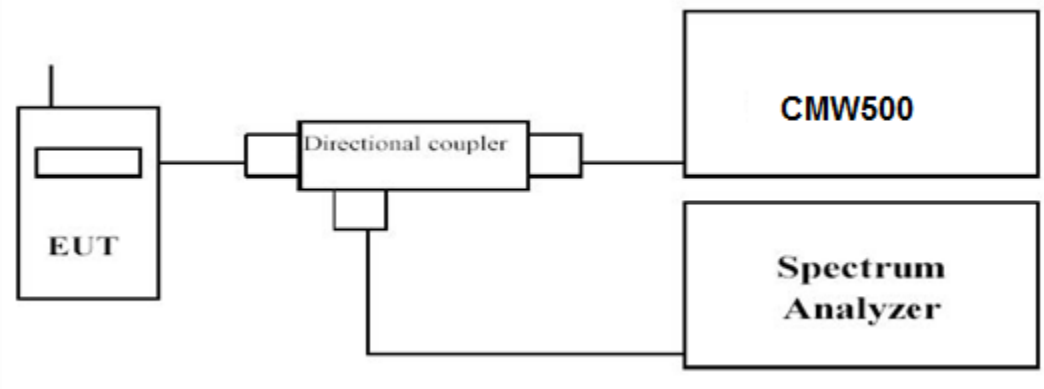


3.4. Band Edge compliance

LIMIT

Per 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 + 10log(P) dB.

TEST CONFIGURATION



TEST PROCEDURE

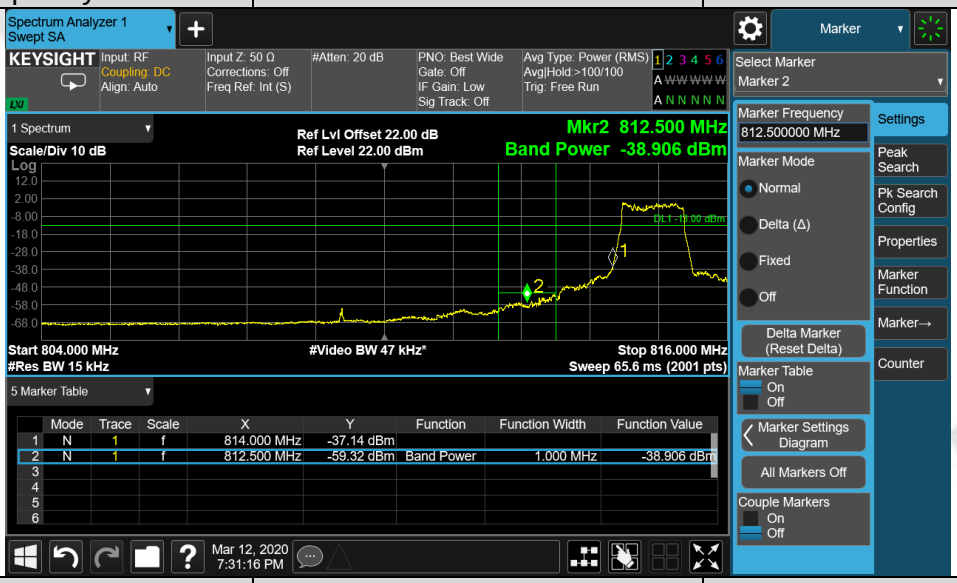
1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum

TEST RESULTS

Channel Bandwidth 1.4MHz/QPSK		
Frequency	814.7MHz	1 RB/0 RB Offset

Frequency	823.3MHz	1 RB/0 RB Offset

Channel Bandwidth 1.4MHz/QPSK		
Frequency	814.7MHz	6 RB/0 RB Offset



Frequency	823.3MHz	6 RB/0 RB Offset

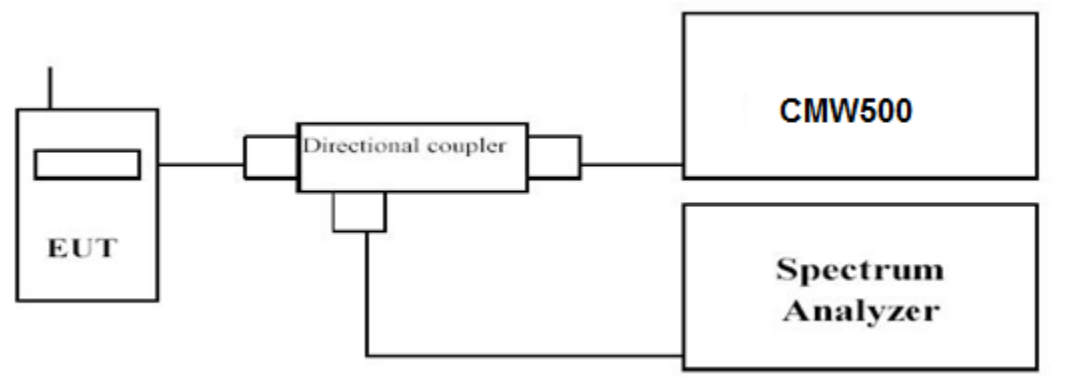
3.5. Spurious Emission

LIMIT

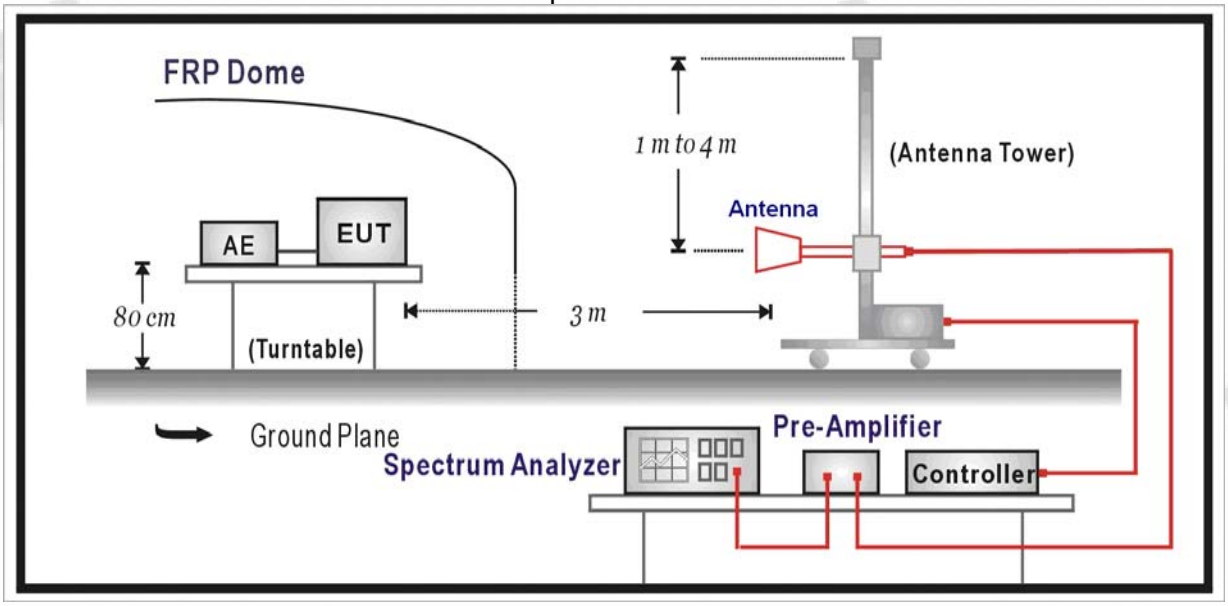
Per FCC §24.238, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

TEST CONFIGURATION

Conducted Spurious Measurement:



Radiated Spurious Measurement:



TEST PROCEDURE

The EUT was setup according to ANSI/TIA/EIA-603-E

Conducted Spurious Measurement:

a. Place the EUT on a bench and set it in transmitting mode.
b. Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c. EUT Communicate with CMW500 then selects a channel for testing.
d. Add a correction factor to the display of spectrum, and then test.
e. The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to10th harmonic.

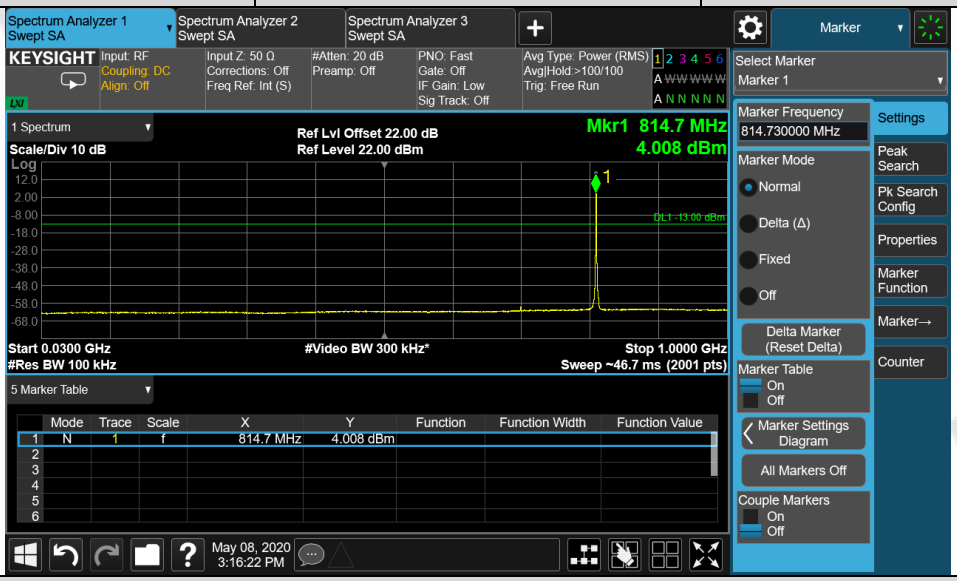
Radiated Spurious Measurement:

a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
c. The output of the test antenna shall be connected to the measuring receiver.
d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
h. The maximum signal level detected by the measuring receiver shall be noted.
i. The transmitter shall be replaced by a substitution antenna.
j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
k. The substitution antenna shall be connected to a calibrated signal generator.
l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
n. The input signal to the 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 attenuator setting of the measuring receiver.
o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
q. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for Part 22 and 1MHz for Part 24. The frequency range was checked up to 10th harmonic.
r. Test site anechoic chamber refer to ANSI C63.

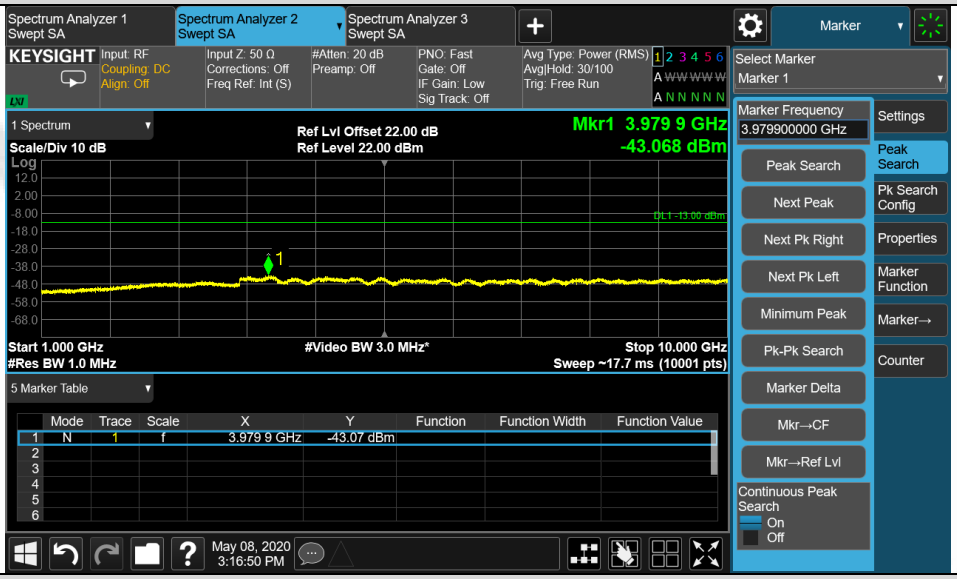
TEST RESULTS

Conducted Measurement:

Channel Bandwidth 1.4MHz/QPSK		
Frequency	814.7MHz	1 RB/5 RB Offset

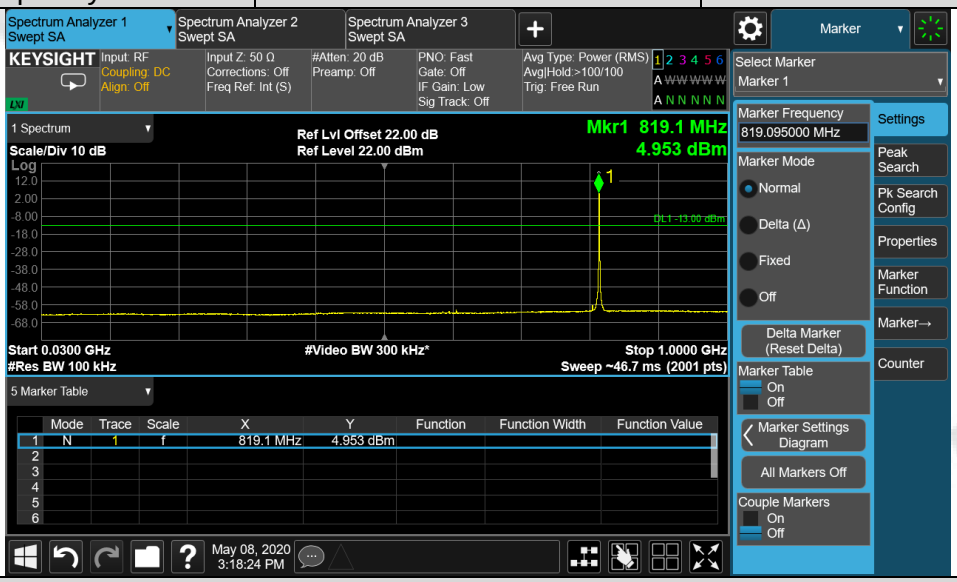


30MHz~1GHz

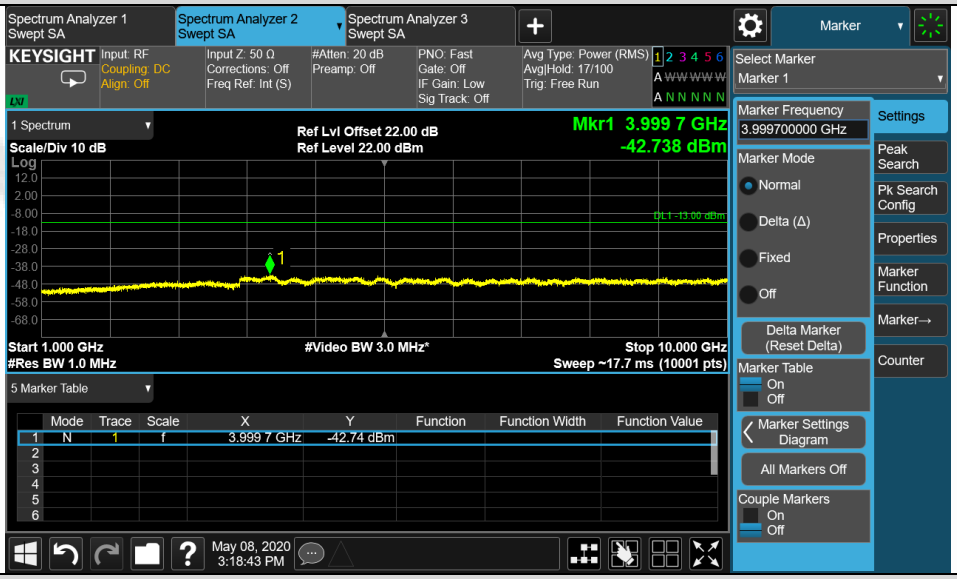


1GHz~10GHz

Channel Bandwidth 1.4MHz/QPSK		
Frequency	819.0MHz	1 RB/5 RB Offset

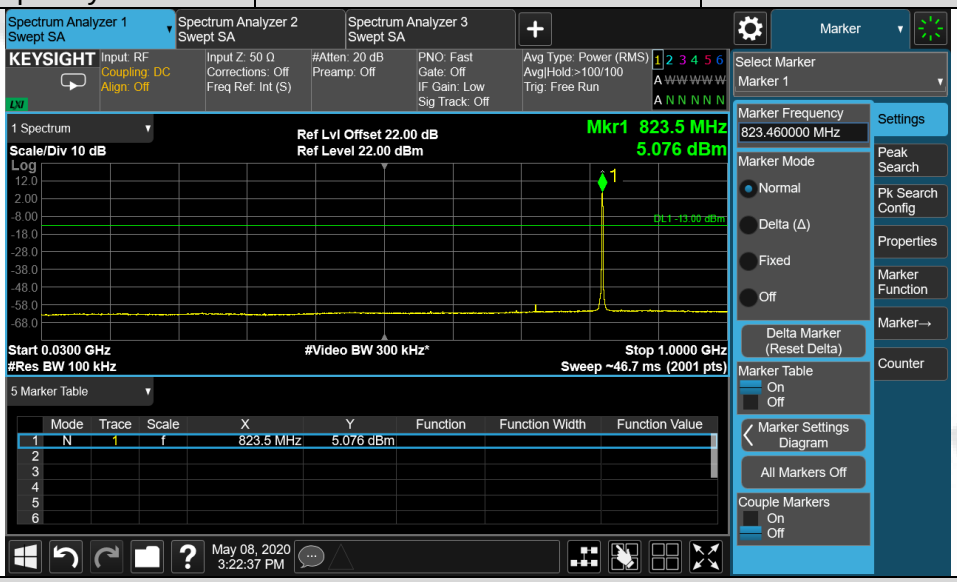


30MHz~1GHz

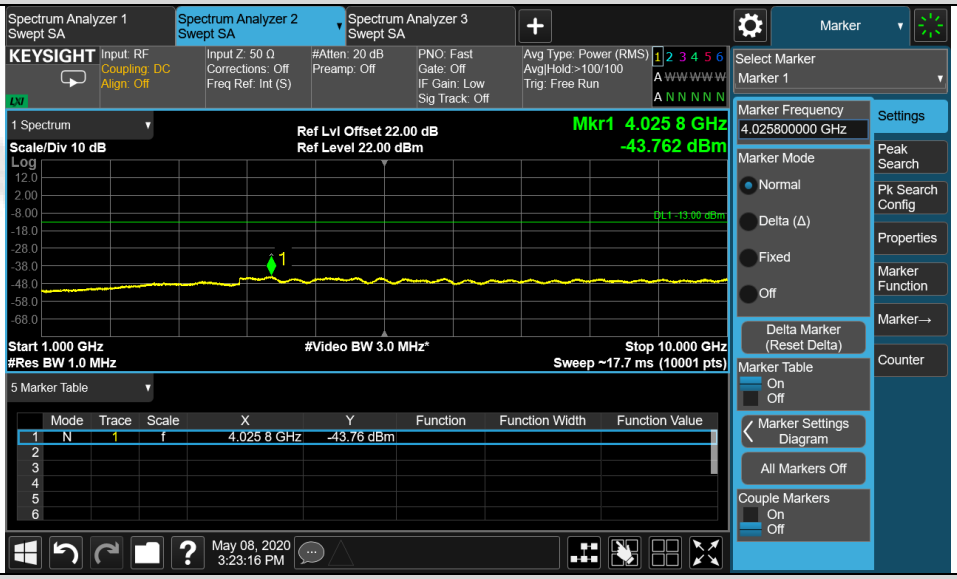


1GHz~10GHz

Channel Bandwidth 1.4MHz/QPSK		
Frequency	823.3MHz	1 RB/5 RB Offset



30MHz~1GHz



1GHz~10GHz

Radiated Measurement:

LTE FDD Band 26_Channel Bandwidth 1.4MHz_QPSK_ Low Channel

Frequency (MHz)	PMea (dBm)	Distance (m)	Correction Factor(dB) (dB)	Reading (dBm) (dBm)	Limit (dBm)	Margin (dB)	Polarization
1629.4	-46.20	3	8.80	-55.00	-13	33.20	H
2444.1	-52.17	3	11.47	-63.64	-13	39.17	H
1629.4	-43.65	3	8.76	-52.41	-13	30.65	V
2444.1	-51.92	3	12.18	-64.10	-13	38.92	V

Note: Margin(dB)= Limit (dBm)-PMea(dBm)

LTE FDD Band 26_Channel Bandwidth 1.4MHz_QPSK_ Middle Channel

Frequency (MHz)	PMea (dBm)	Distance (m)	Correction Factor(dB) (dB)	Reading (dBm) (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-48.47	3	8.80	-57.27	-13	35.47	H
2457.0	-55.11	3	11.47	-66.58	-13	42.11	H
1638.0	-44.09	3	8.76	-52.85	-13	31.09	V
2457.0	-52.36	3	12.18	-64.54	-13	39.36	V

Note: Margin(dB)= Limit (dBm)-PMea(dBm)

LTE FDD Band 26_Channel Bandwidth 1.4MHz_QPSK_ High Channel

Frequency (MHz)	PMea (dBm)	Distance (m)	Correction Factor(dB) (dB)	Reading (dBm) (dBm)	Limit (dBm)	Margin (dB)	Polarization
1646.6	-47.44	3	8.80	-56.24	-13	34.44	H
2469.9	-53.37	3	11.47	-64.84	-13	40.37	H
1646.6	-45.12	3	8.76	-53.88	-13	32.12	V
2469.9	-52.48	3	12.18	-64.66	-13	39.48	V

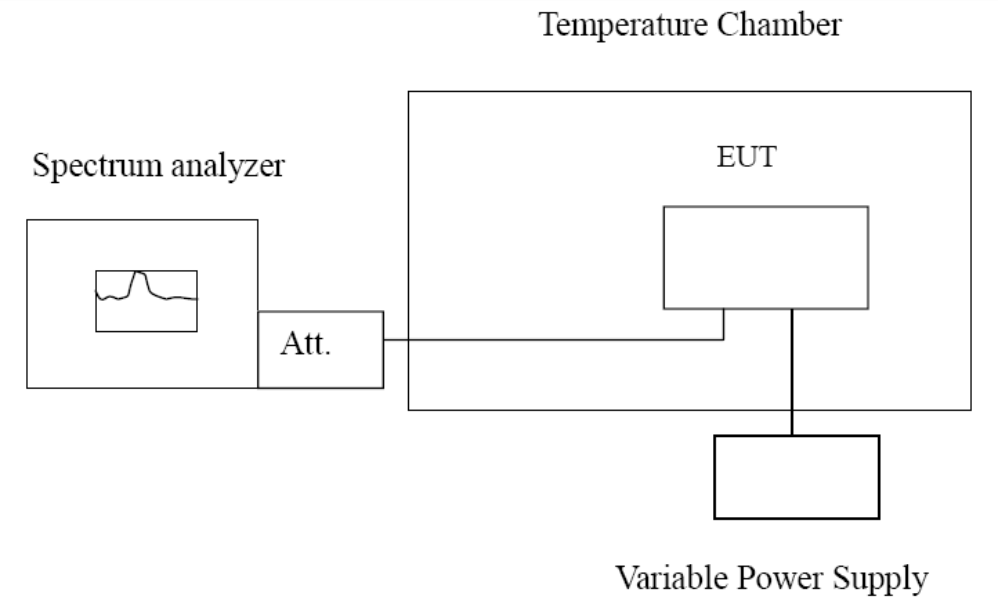
Note: Margin(dB)= Limit (dBm)-PMea(dBm)

3.6. Frequency Stability under Temperature & Voltage Variations

LIMIT

According to §24.235, §2.1055 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to ANSI/TIA/EIA-603-E

Frequency Stability under Temperature Variations:
In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE Band 26, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +85℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +85℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ increments from +85℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

Frequency Stability under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

TEST RESULTS

Frequency Error vs Voltage

Channel Bandwidth 1.4MHz					
Frequency		814.7MHz		1 RB/0 RB Offset	
Voltage (V)	Frequency(MHz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
11.1	814.700004	814.700004	0.005	0.005	2.50
12.8	814.700005	814.700004	0.006	0.005	2.50
9.4	814.700005	814.700005	0.006	0.006	2.50

Frequency Error vs Voltage

Channel Bandwidth 1.4MHz					
Frequency		823.3MHz		1 RB/0 RB Offset	
Voltage (V)	Frequency(MHz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
11.1	823.300005	823.300005	0.006	0.006	2.50
12.8	823.300005	823.300005	0.006	0.006	2.50
9.4	823.300006	823.300006	0.007	0.007	2.50

Frequency Error vs Temperature

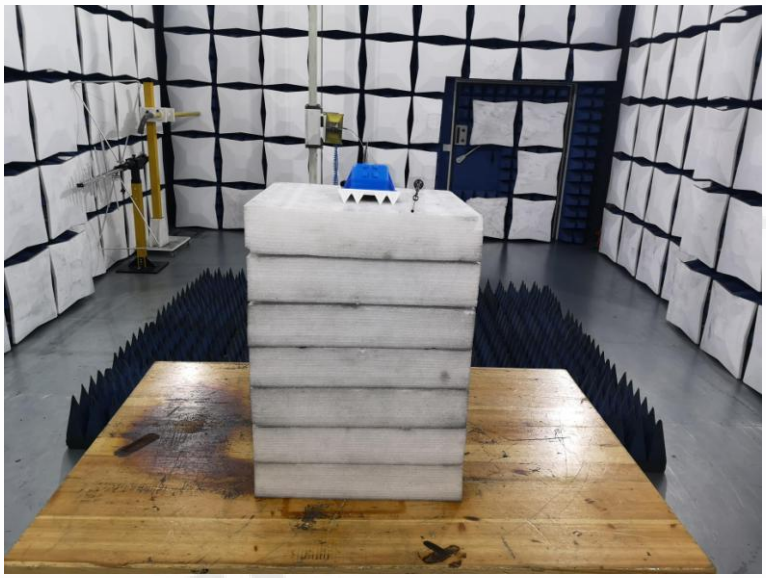
Channel Bandwidth 1.4MHz					
Frequency		814.7MHz		1 RB/0 RB Offset	
Temperature (℃)	Frequency(MHz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
-30	814.700005	814.700005	0.006	0.006	2.50
-20	814.700004	814.700004	0.005	0.005	2.50
-10	814.700005	814.700004	0.006	0.005	2.50
0	814.700004	814.700005	0.005	0.006	2.50
10	814.700004	814.700004	0.005	0.005	2.50
20	814.700004	814.700003	0.005	0.004	2.50
30	814.699993	814.699996	-0.009	-0.005	2.50
40	814.699997	814.699996	-0.004	-0.005	2.50
50	814.699997	814.699995	-0.004	-0.006	2.50
60	814.699996	814.699996	-0.005	-0.005	2.50
70	814.699997	814.699995	-0.004	-0.006	2.50
80	814.699996	814.699996	-0.005	-0.005	2.50
85	814.699995	814.699995	-0.006	-0.006	2.50

Frequency Error vs Temperature

Channel Bandwidth 1.4MHz					
Frequency		823.3MHz		1 RB/0 RB Offset	
Temperature (℃)	Frequency(MHz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
-30	823.300005	823.300004	0.006	0.005	2.50
-20	823.300004	823.300005	0.005	0.006	2.50
-10	823.300005	823.300004	0.006	0.005	2.50
0	823.300005	823.300005	0.006	0.006	2.50
10	823.300005	823.300005	0.006	0.006	2.50
20	823.300004	823.300004	0.005	0.005	2.50
30	823.300003	823.300003	0.004	0.004	2.50
40	823.299996	823.299997	-0.005	-0.004	2.50

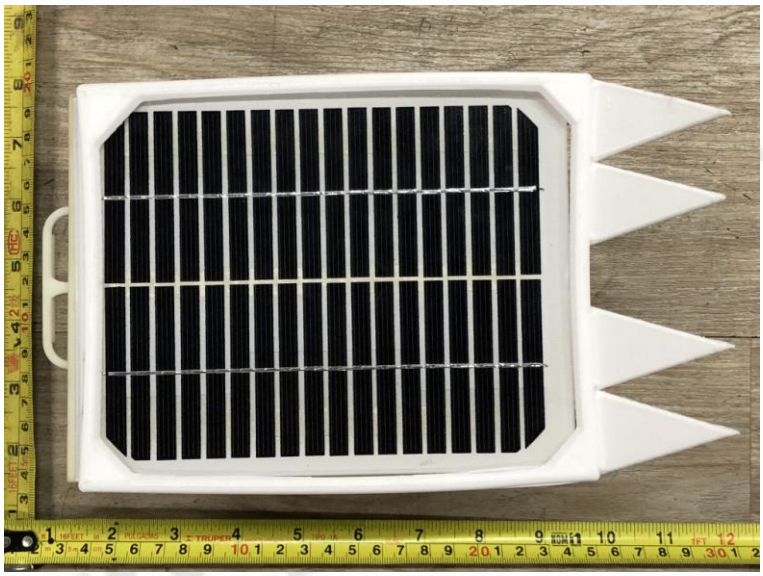
50	823.299996	823.299996	-0.005	-0.005	2.50
60	823.299997	823.299996	-0.004	-0.005	2.50
70	823.299996	823.299995	-0.005	-0.006	2.50
80	823.299996	823.299996	-0.005	-0.005	2.50
85	823.299995	823.299995	-0.006	-0.006	2.50

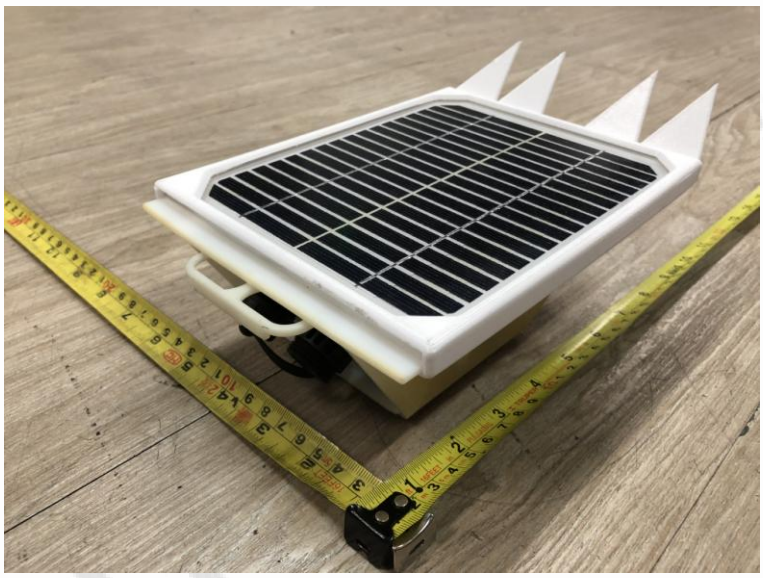
4. Test Setup Photos of the EUT



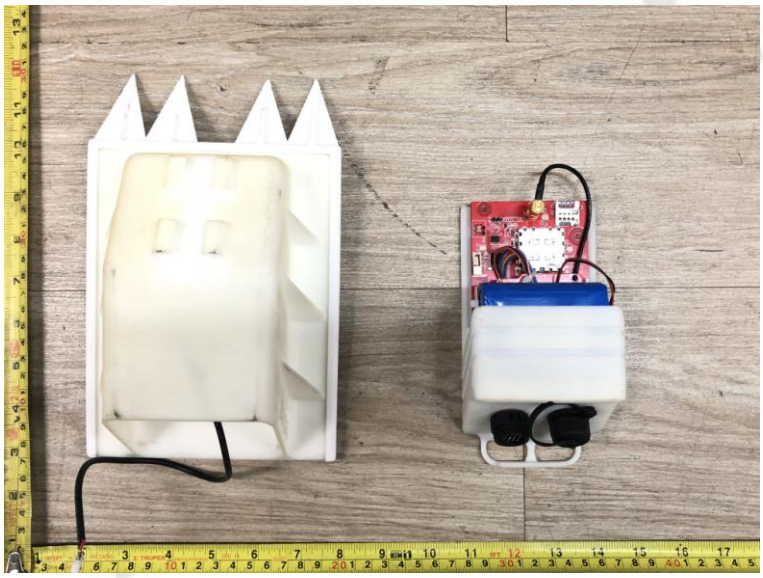
5. Photos of the EUT

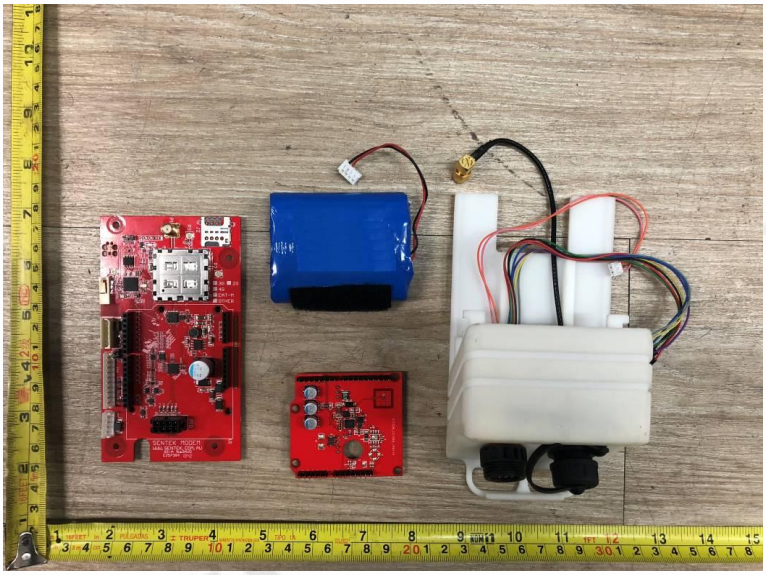
External Photos

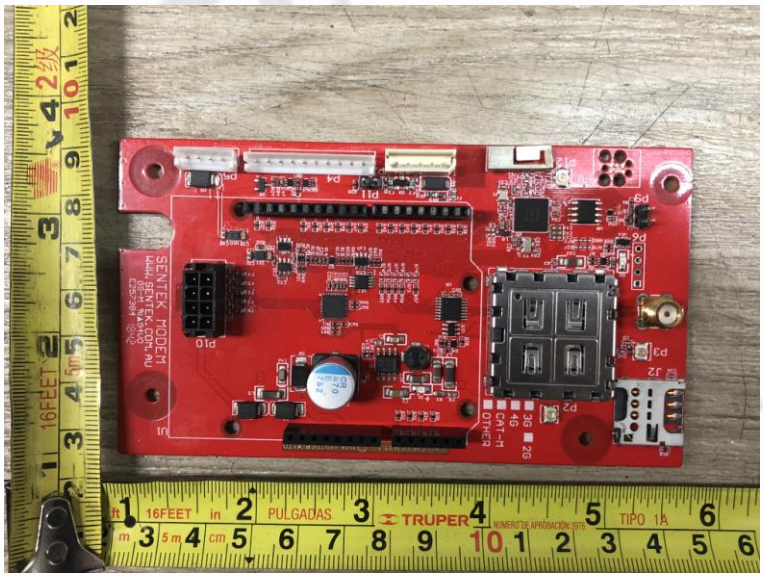


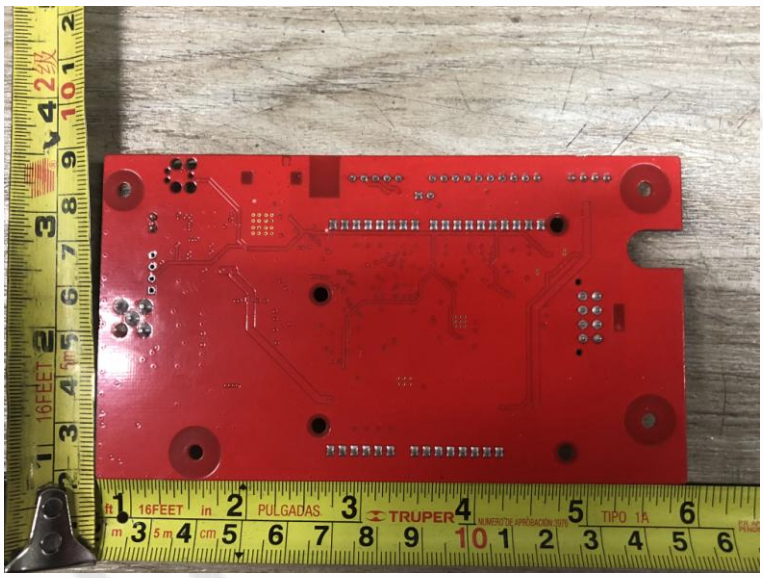


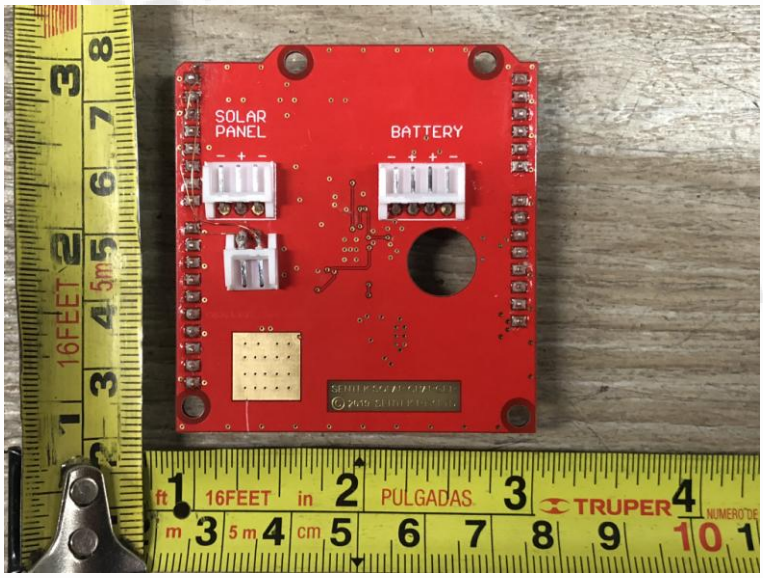
Internal Photos

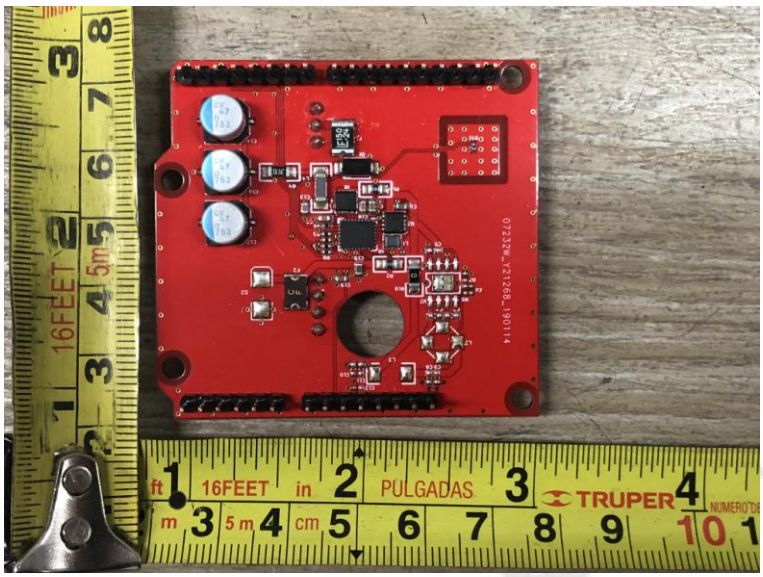







16FEET
PULGADAS
TRUPER


SOLAR
PANEL
BATTERY
16FEET
PULGADAS
TRUPER


16FEET
PULGADAS
TRUPER

********** End of Report **********