

FCC Test Report (Part 96 – LTE Band 48)

Report No.: RFBEIH-WTW-P22090270-1

FCC ID: P27BC950C

Test Model: BC950C

Received Date: Sep. 07, 2022

Test Date: Sep. 13 ~ Sep. 15, 2022

Issued Date: Oct. 17, 2022

Applicant: Sercomm Corp.

Address: 8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, Taiwan

**FCC Registration /
Designation Number:** 788550 / TW0003



This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Test Mode Applicability and Tested Channel Detail	8
3.3 Description of Support Units	9
3.3.1 Configuration of System under Test	9
3.4 General Description of Applied Standards and References	10
4 Test Types and Results	11
4.1 Maximum Output Power Measurement	11
4.1.1 Limits of Maximum Output Power Measurement	11
4.1.2 Test Setup	11
4.1.3 Test Instruments	11
4.1.4 Test Procedures	12
4.1.5 Deviation from Test Standard	12
4.1.6 EUT Operating Conditions	12
4.1.7 Test Results	13
4.2 Modulation Characteristics Measurement	14
4.2.1 Limits of Modulation Characteristics	14
4.2.2 Test Setup	14
4.2.3 Test Instruments	14
4.2.4 Deviation from Test Standard	14
4.2.5 EUT Operating Conditions	14
4.2.6 Test Results	14
4.3 Frequency Stability Measurement	15
4.3.1 Limits of Frequency Stability Measurement	15
4.3.2 Test Setup	15
4.3.3 Test Instruments	15
4.3.4 Test Procedure	15
4.3.5 Test Results	16
4.4 Emission Bandwidth Measurement	17
4.4.1 Limits of Emission Bandwidth Measurement	17
4.4.2 Test Setup	17
4.4.3 Test Instruments	17
4.4.4 Test Procedure	17
4.4.5 Deviation from Test Standard	17
4.4.6 EUT Operating Conditions	17
4.4.7 Test Result	18
4.5 Peak to Average Ratio Measurement	19
4.5.1 Limits of Peak to Average Ratio Measurement	19
4.5.2 Test Setup	19
4.5.3 Test Instruments	19
4.5.4 Test Procedures	19
4.5.5 Deviation from Test Standard	19
4.5.6 EUT Operating Conditions	19
4.5.7 Test Results	20
4.6 Conducted Spurious Emissions	21
4.6.1 Limits of Conducted Spurious Emissions Measurement	21
4.6.2 Test Setup	21

4.6.3	Test Instruments	21
4.6.4	Test Procedure	21
4.6.5	Deviation from Test Standard	21
4.6.6	EUT Operating Conditions.....	21
4.6.7	Test Results	22
4.7	Radiated Emission Measurement	26
4.7.1	Limits of Radiated Emission Measurement	26
4.7.2	Test Set Up	26
4.7.3	Test Instruments	27
4.7.4	Test Procedures.....	28
4.7.5	Deviation from Test Standard	28
4.7.6	EUT Operating Conditions.....	28
4.7.7	Test Results	29
5	Pictures of Test Arrangements.....	33
	Appendix – Information of the Testing Laboratories	34

Release Control Record

Issue No.	Description	Date Issued
RFBEIH-WTW-P22090270-1	Original release	Oct. 17, 2022

1 Certificate of Conformity

Product: CBRS Battery Camera

Brand: Sercomm, MosoLabs

Test Model: BC950C

Sample Status: Engineering sample

Applicant: Sercomm Corp.

Test Date: Sep. 13 ~ Sep. 15, 2022

Standards: 47 CFR FCC Part 96

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by :

Pettie Chen

, **Date:** Oct. 17, 2022

Pettie Chen / Senior Specialist

Approved by :

Jeremy Lin

, **Date:** Oct. 17, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 96			
FCC Clause	Test Item	Result	Remarks
2.1046 96.41(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1046 96.41(b)	Maximum Power Spectral Density	Pass	Meet the requirement of limit.
96.41(g)	Peak to Average Ration	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1055	Frequency Stability	Pass	Meet the requirement of limit.
2.1051 96.41(e)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 96.41(e)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -3.15dB at 53.28MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	2.93 dB
	200MHz ~ 1000MHz	2.95 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	CBRS Battery Camera		
Brand	Sercomm, MosoLabs		
Test Model	BC950C		
Sample Status	Engineering sample		
Power Supply Rating	4.2Vdc from battery 5.0Vdc from adapter		
Modulation Type	QPSK, 16QAM		
Operating Frequency	LTE Band 48 (Channel Bandwidth 10MHz)	3555.0 ~ 3695.0 MHz	
Max. EIRP Power		QPSK	16QAM
	LTE Band 48 (Channel Bandwidth 10MHz)	176.604mW (22.47dBm)	163.682mW (22.14dBm)
Emission Designator		QPSK	16QAM
	LTE Band 48 (Channel Bandwidth 10MHz)	8M97G7D	8M97D7W
Antenna Type	Refer to Note as below		
Antenna Connector	Refer to Note as below		
Accessory Device	Adapter		
Cable Supplied	1.0m shielded USB cable		

Note:

- The EUT provides 1 completed transmitter and 1 receiver. The antenna provided to the EUT, please refer to the following table:

TX Antenna	Antenna Type	Antenna Connector	Antenna Gain (dBi)	Frequency Range
0	PIFA	IPEX	4.02	3550MHz - 3700 MHz

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

- The EUT uses following battery and adapters

Battery	
Brand	MosoLabs
Model	BC950C
Power Rating	4.2Vdc, 6140mAh

Adapter 1 (gray)	
Brand	PHIHONG
Model	PSAF10A-050Q
AC Input	100-240Vac, 50/60Hz, 0.28A
DC Output	5Vdc, 2A

Adapter 2 (white)	
Brand	PHIHONG
Model	PSAF10A-050Q
AC Input	100-240Vac, 50/60Hz, 0.28A
DC Output	5Vdc, 2A

- The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. 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	Radiated Emission
LTE Band 48	Z-axis

LTE Band 48

Test Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation
-	Maximum Output Power	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM
-	Modulation characteristics	55340 to 56640	55990 (3625.0MHz)	10MHz	QPSK / 16QAM
-	Frequency Stability	55290 to 56690	55290 (3555.0MHz), 56690 (3695.0MHz)	10MHz	QPSK
-	Occupied Bandwidth	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM
-	Peak to Average Ratio	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM
-	Conducted Emission	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK
-	Radiated Emission Below 1GHz	55290 to 56690	55290 (3555.0MHz)	10MHz	QPSK
-	Radiated Emission Above 1GHz	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under QPSK mode only.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Maximum Output Power	25deg. C, 60%RH	120Vac, 60Hz	Vincent Chen
Modulation Characteristics	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Frequency Stability	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Occupied Bandwidth	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Peak To Average Ratio	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Conducted Emission	25deg. C, 60%RH	120Vac, 60Hz	Willy Cheng
Radiated Emission	23deg. C, 67%RH	120Vac, 60Hz	Thomas Cheng

3.3 Description of Support Units

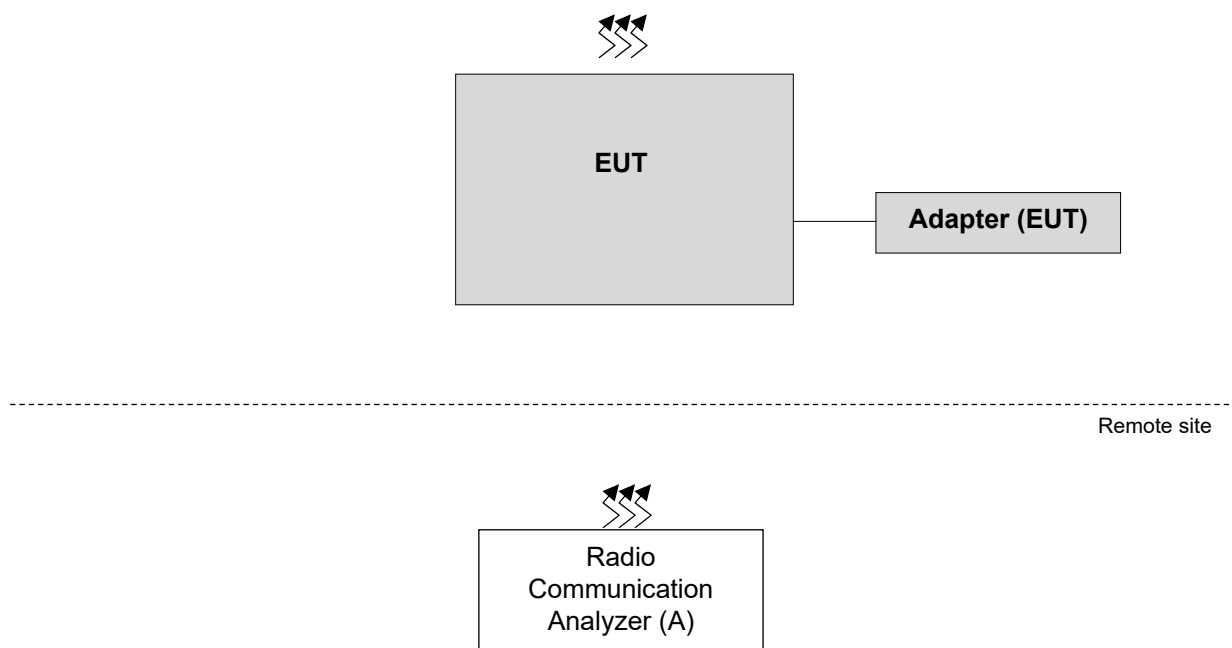
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Radio Communication Analyzer	Anritsu	MT8821C	6272278310	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as communication partners to transfer data.

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 96

ANSI/TIA/EIA-603-E-2016

ANSI 63.26-2015

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

KDB 940660 D01 Part 96 CBRS Eqpt v03

All test items have been performed as a reference to the above KDB test guidance.

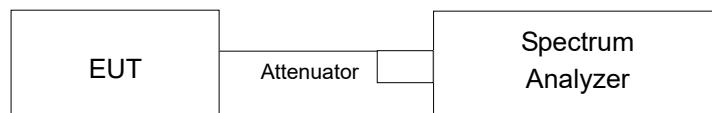
4 Test Types and Results

4.1 Maximum Output Power Measurement

4.1.1 Limits of Maximum Output Power Measurement

Device		Maximum EIRP (dBm/10 MHz)
☒	End User Device	23
☐	Category A CBSD	30
☐	Category B CBSD	47

4.1.2 Test Setup



4.1.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer KEYSIGHT	N9030B	MY57140953	Jul. 01, 2022	Jun. 30, 2023
Radio Communication Analyzer Anritsu	MT8821C	6272278310	Jun. 22, 2022	Jun. 21, 2023
RF cable	JB200	Cable-OVEN-02	NA	NA
DC-6GHz 20dB 50W Fixed attenuator Woken	MDC9331N-20	0724	Jul. 01, 2022	Jun. 30, 2023
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 03, 2022	Jan. 02, 2023
AC Power Supply Extech	CFW-105	E000603	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2022	Jun. 22, 2023

Note: The calibration interval of the above test instruments is 12/24 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1.4 Test Procedures

Conducted output power measurement

- Connect the DUT transmitter output to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
- Set span to at least 1.5 times the OBW.
- Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- Set VBW $\geq 3 \times$ RBW.
- Set number of points in sweep $\geq 2 \times$ span / RBW.
- Sweep time = auto-couple.
- Detector = RMS (power averaging).
- If the EUT can be configured to transmit continuously (i.e., burst duty cycle $\geq 98\%$), then set the trigger to free run.
- If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle $< 98\%$), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
- Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- Measurement method refers to ANSI C63.26 section 5.2.7 & 5.2.4.

Maximum EIRP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_T$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively
(expressed in the same units as P_{Meas} , e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.5 Deviation from Test Standard

No deviation.

4.1.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.1.7 Test Results

Conducted Output Power (dBm/10MHz)

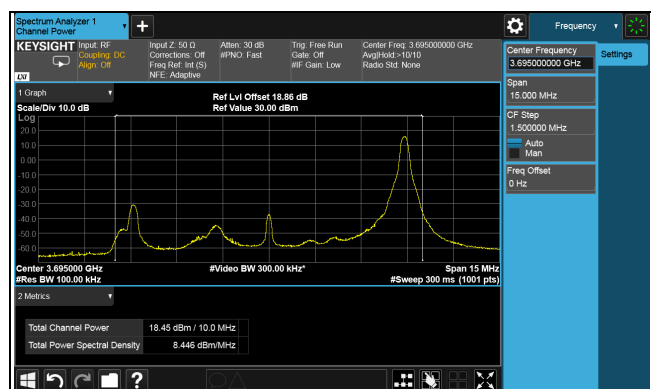
Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			L-CH	M-CH	H-CH		L-CH	M-CH	H-CH	
			55290	55990	56690		55290	55990	56690	
			3555 MHz	3625 MHz	3695 MHz		3555 MHz	3625 MHz	3695 MHz	
48 / 10M	1	0	17.76	17.34	18.10	0	17.61	17.32	17.89	1
	1	24	17.85	17.23	18.33	0	17.73	17.09	18.12	1
	1	49	17.76	17.13	18.45	0	17.58	16.88	18.10	1
	25	0	17.55	16.92	17.94	1	17.46	16.84	17.92	2
	25	12	17.63	17.00	18.05	1	17.54	16.92	18.00	2
	25	25	17.50	16.82	18.03	1	17.33	16.78	17.87	2
	50	0	17.62	16.78	18.06	1	17.39	16.87	17.92	2

EIRP Power (dBm/10MHz)

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			L-CH	M-CH	H-CH		L-CH	M-CH	H-CH	
			55290	55990	56690		55290	55990	56690	
			3555 MHz	3625 MHz	3695 MHz		3555 MHz	3625 MHz	3695 MHz	
48 / 10M	1	0	21.78	21.36	22.12	0	21.63	21.34	21.91	1
	1	24	21.87	21.25	22.35	0	21.75	21.11	22.14	1
	1	49	21.78	21.15	22.47	0	21.60	20.90	22.12	1
	25	0	21.57	20.94	21.96	1	21.48	20.86	21.94	2
	25	12	21.65	21.02	22.07	1	21.56	20.94	22.02	2
	25	25	21.52	20.84	22.05	1	21.35	20.80	21.89	2
	50	0	21.64	20.80	22.08	1	21.41	20.89	21.94	2

Note:

- Gain = 4.02dBi
- EIRP (dBm/10MHz) = Total Conducted Output Power (dBm/10MHz) + Antenna Gain



4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.4.3 to get information of above instrument.

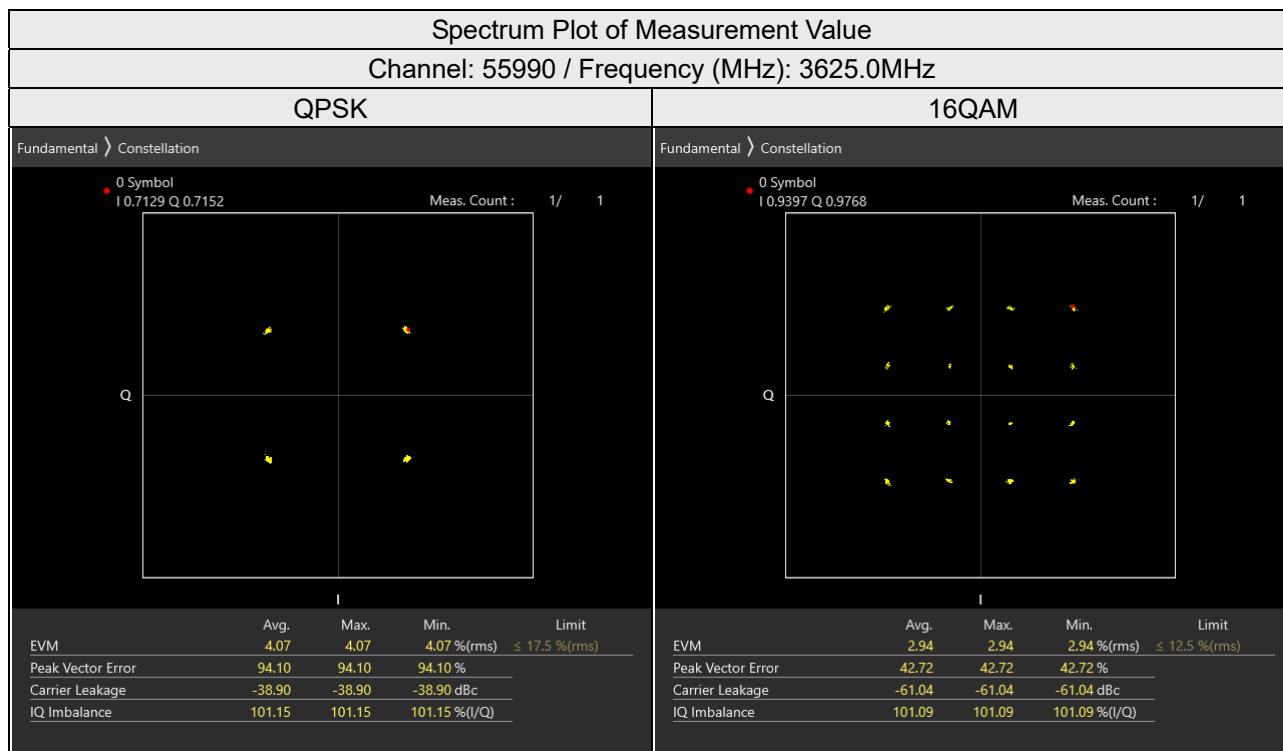
4.2.4 Deviation from Test Standard

No deviation.

4.2.5 EUT Operating Conditions

Connect the EUT to Communication Simulator via the antenna connector, the frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

4.2.6 Test Results

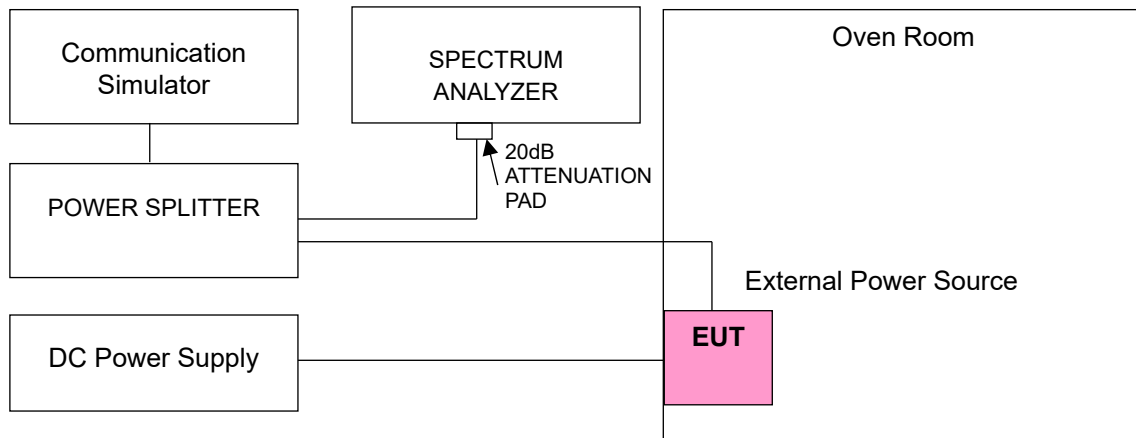


4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency band.

4.3.2 Test Setup



4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8821C	6272278310	Jun. 22, 2022	Jun. 21, 2023
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 03, 2022	Jan. 02, 2023
Three-phase coupling / decoupling network TESEQ	CDN 3063	4006	Mar. 08, 2022	Mar. 07, 2023
DC Power Supply Topward	6306A	727263	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.4 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ± 0.5 °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

Note: The frequency error was recorded frequency error from the communication simulator.

4.3.5 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 48, Channel Bandwidth: 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.57	3554.9999990	0.000	3695.0000040	0.001
4.2	3554.9999960	-0.001	3694.9999970	-0.001
4.83	3555.0000010	0.000	3694.9999980	-0.001

Note: The applicant defined the normal working voltage is from 3.57Vac to 4.83Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 48, Channel Bandwidth: 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	NA (Note)	NA (Note)	NA (Note)	NA (Note)
-20	3555.0000040	0.001	3695.0000020	0.001
-10	3555.0000030	0.001	3695.0000040	0.001
0	3555.0000030	0.001	3694.9999960	-0.001
10	3554.9999960	-0.001	3695.0000040	0.001
20	3554.9999980	-0.001	3695.0000020	0.001
30	3555.0000020	0.001	3694.9999960	-0.001
40	3555.0000040	0.001	3695.0000040	0.001
50	3555.0000030	0.001	3695.0000010	0.000

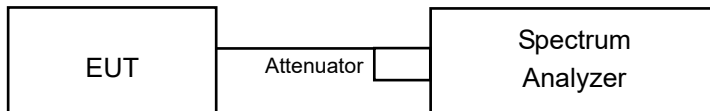
Note: When the temperature drops to -30°C, the EUT will shut down.

4.4 Emission Bandwidth Measurement

4.4.1 Limits of Emission Bandwidth Measurement

Reference only

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.4.4 Test Procedure

Occupied Bandwidth & 26dBc Bandwidth

1. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
2. The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
3. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
NOTE—Step 1), step 2), and step 3) may require iteration to adjust within the specified tolerances.
4. The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
5. Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
6. Determine the reference value by either of the following:
 - a) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
 - b) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.
7. Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

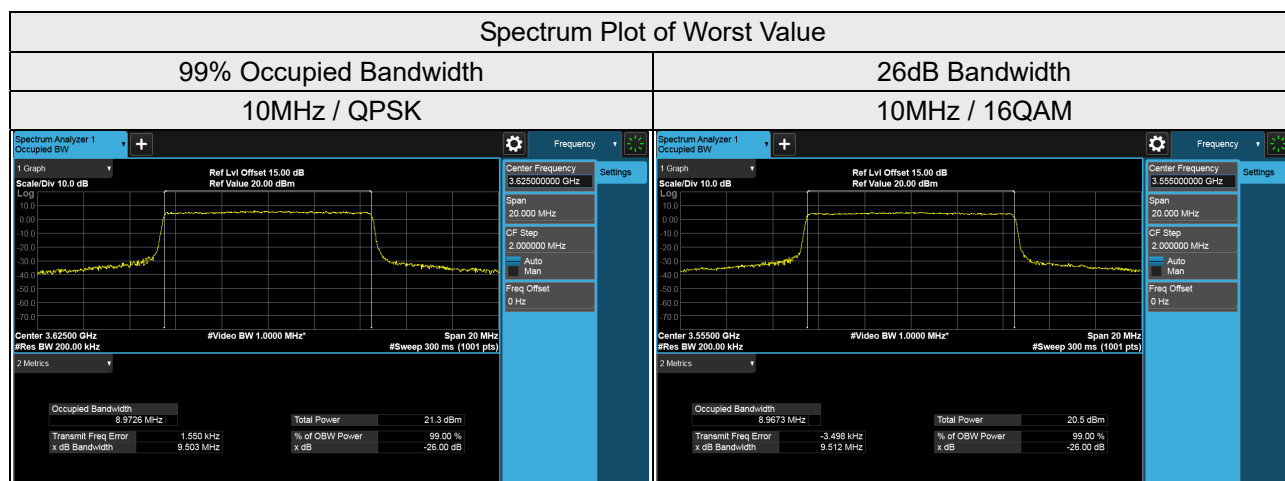
4.4.7 Test Result

Occupied Bandwidth

LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55290	3555.0	8.963	8.967
55990	3625.0	8.973	8.964
56690	3695.0	8.965	8.967

26dB Bandwidth

LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55290	3555.0	9.507	9.512
55990	3625.0	9.503	9.488
56690	3695.0	9.502	9.510

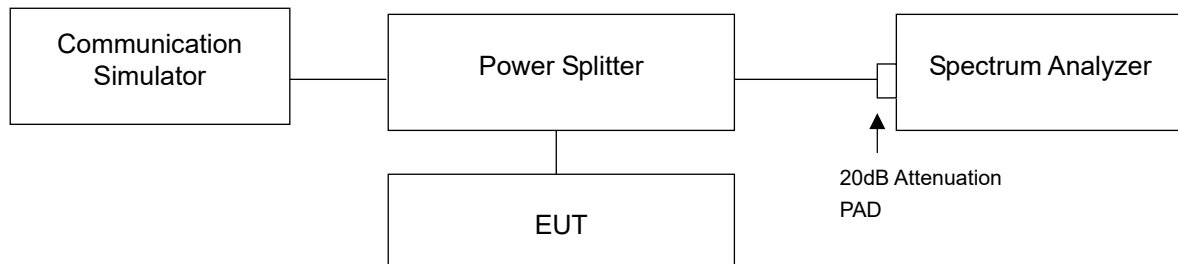


4.5 Peak to Average Ratio Measurement

4.5.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.4.3 to get information of above instrument.

4.5.4 Test Procedures

- Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Record the maximum PAPR level associated with a probability of 0.1%.

4.5.5 Deviation from Test Standard

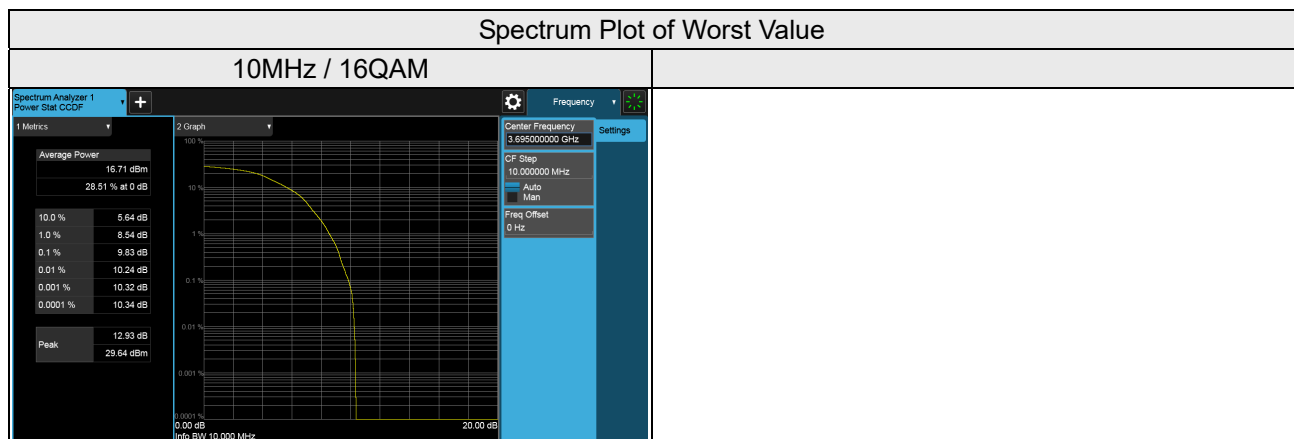
No deviation.

4.5.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55290	3555.0	9.42	9.49
55990	3625.0	7.97	9.51
56690	3695.0	8.01	9.83

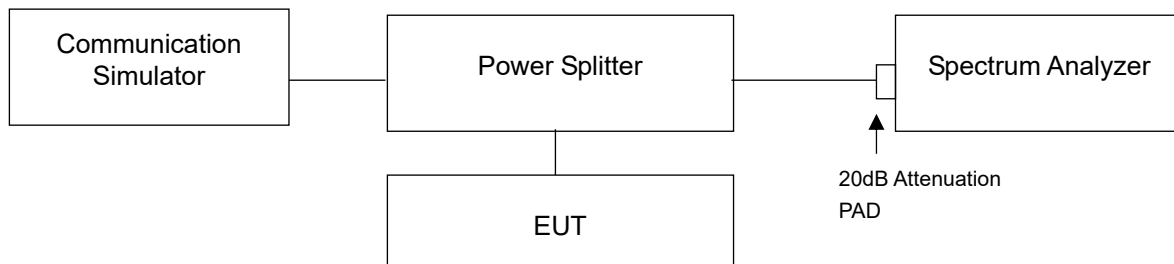


4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

Power of any emissions outside the Fundamental	Limit
Within 0-10MHz above the Assigned Channel	-13 dBm/MHz
Within 0-10MHz below the Assigned Channel	
Greater than 10MHz above the Assigned Channel	-25 dBm/MHz
Greater than 10MHz below the Assigned Channel	
Power of any emission below 3530MHz	-40 dBm/MHz
Power of any emission above 3720MHz	

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.4.3 to get information of above instrument.

4.6.4 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range are from 9 kHz to 40GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz and Detector = RMS are used for conducted emission measurement.
- Measuring frequency band edge, 20dB attenuation pad is connected with spectrum. 1% of the fundamental emission bandwidth is used for conducted emission measurement.
- For 10 MHz channel BW mode, extend the 1% range from 1M to 2M above and below the channel edge and then reduce the limit further by $10 \log (1000/100)=10\text{dB}$ (i.e. total $-13 + -10=-23\text{dB}$) to compensate for the integration from 100k to 1M.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Conditions

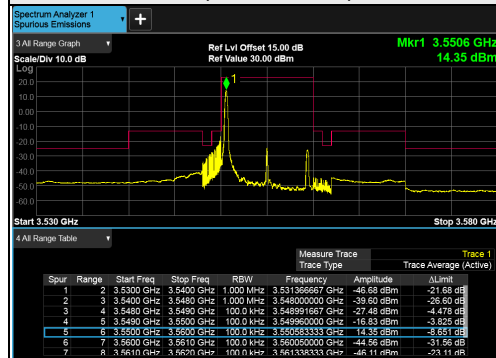
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 Test Results

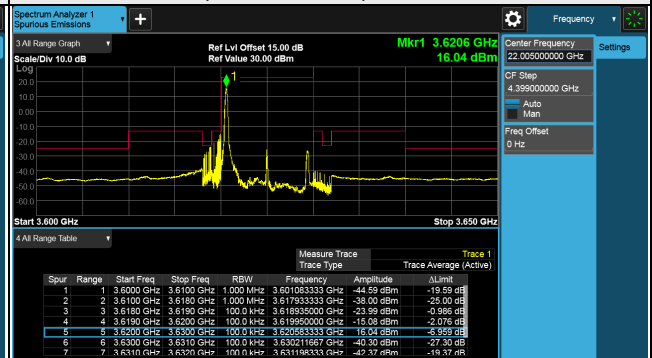
1RB#0

LTE Band 48, Channel Bandwidth 10MHz

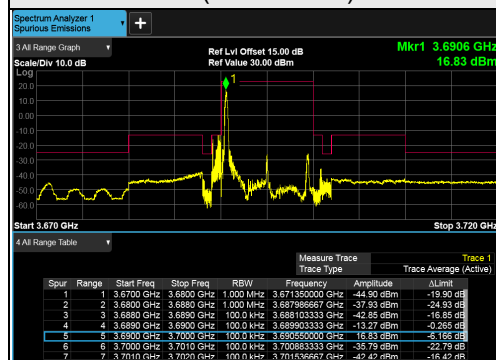
Channel 55290 (3555.0MHz)



Channel 55990 (3625.0MHz)



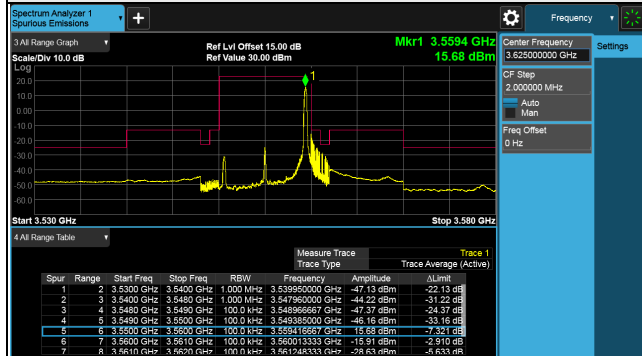
Channel 56690 (3695.0MHz)



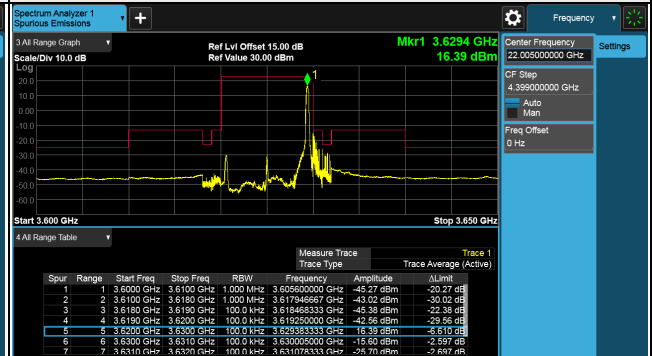
1RB#MAX

LTE Band 48, Channel Bandwidth 10MHz

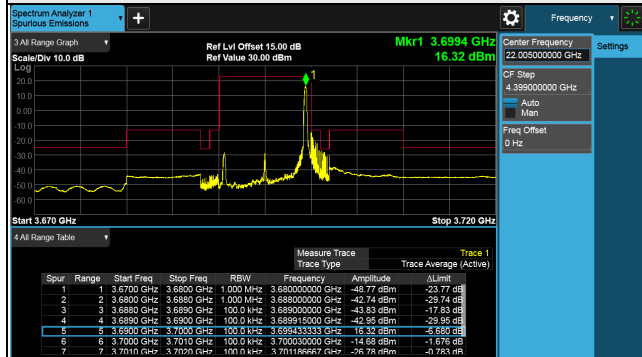
Channel 55290 (3555.0MHz)



Channel 55990 (3625.00MHz)



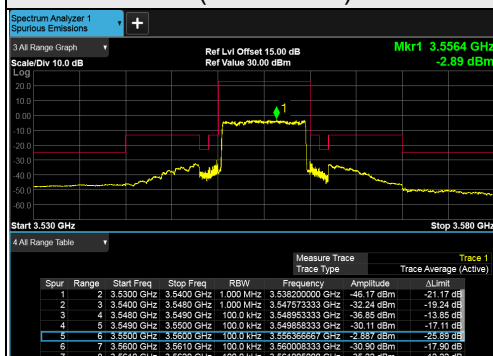
Channel 56690 (3695.0MHz)



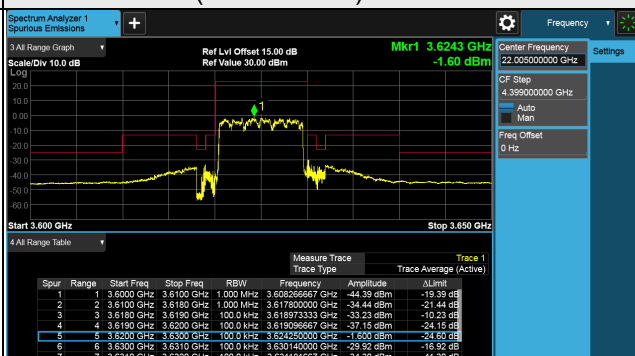
FULL

LTE Band 48, Channel Bandwidth 10MHz

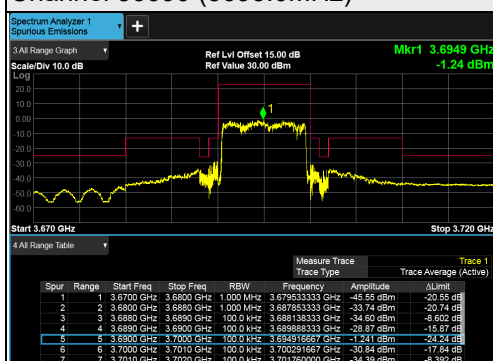
Channel 55290 (3555.0MHz)



Channel 55990 (3625.0MHz)



Channel 56690 (3695.0MHz)

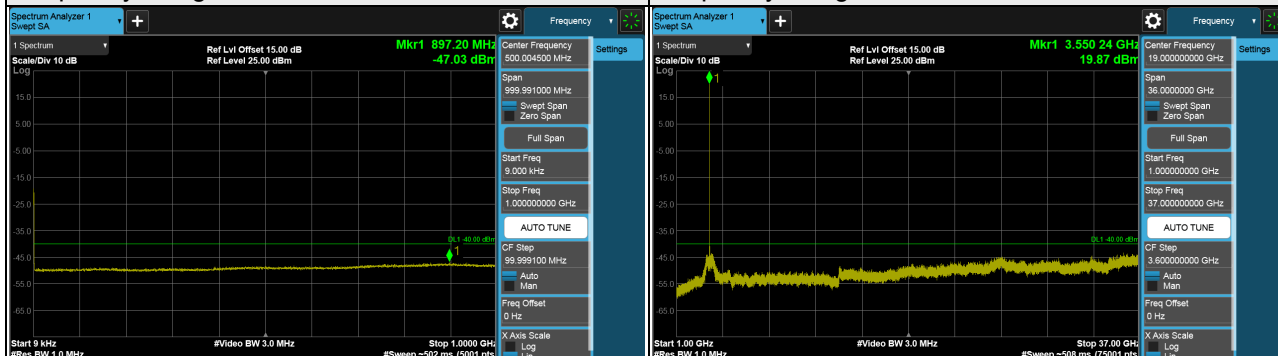


LTE Band 48, Channel Bandwidth 10MHz

Channel 55290 (3555.0MHz)

Frequency Range : 9kHz ~ 1GHz

Frequency Range : 1GHz ~ 37GHz



Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 10MHz

Channel 55990 (3625.00MHz)

Frequency Range : 9kHz ~ 1GHz

Frequency Range : 1GHz ~ 37GHz



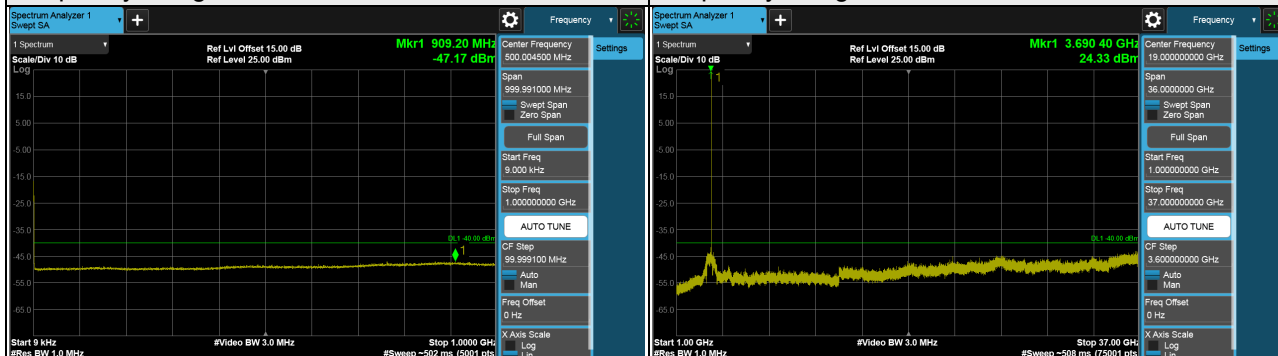
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 10MHz

Channel 56690 (3695.0MHz)

Frequency Range : 9kHz ~ 1GHz

Frequency Range : 1GHz ~ 37GHz



Note: The signal at 9 kHz is IF signal from spectrum analyzer.

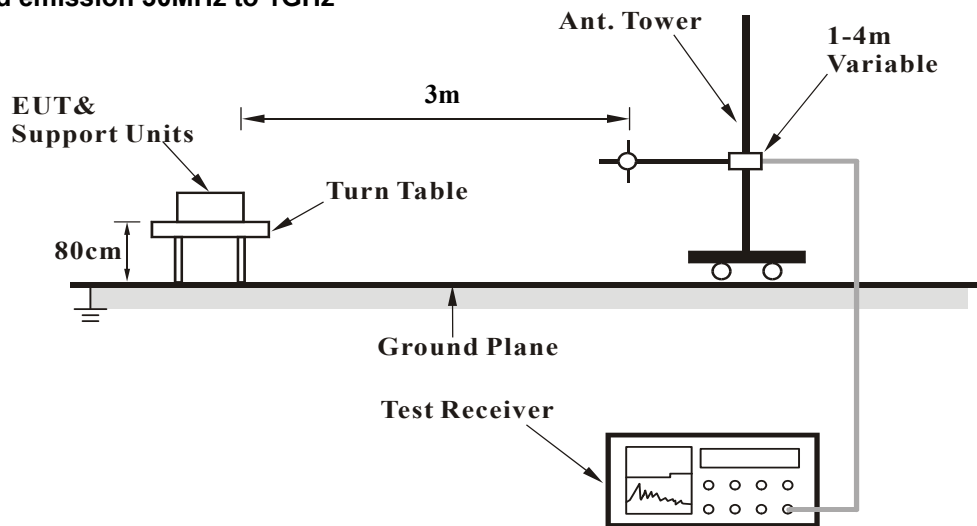
4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

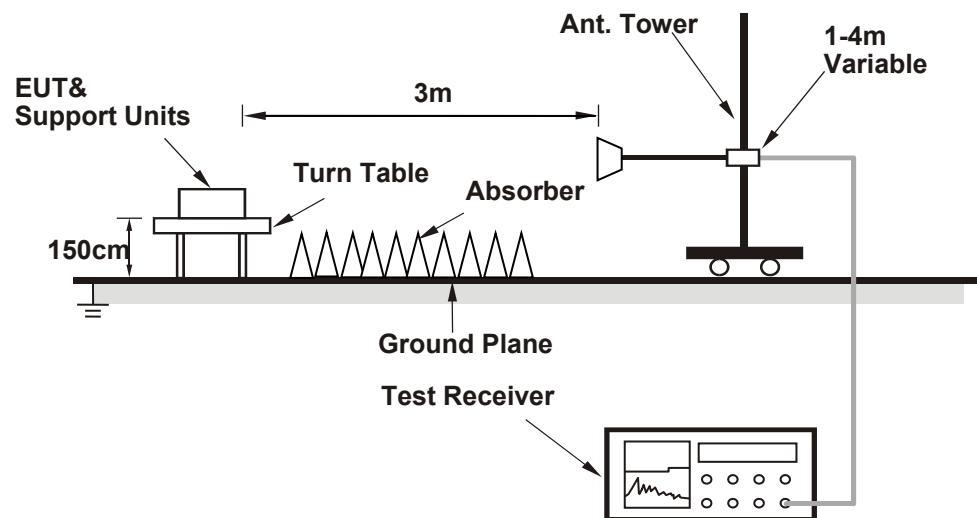
The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz .

4.7.2 Test Set Up

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.7.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Agilent	N9038A	MY51210203	Sep. 22, 2021	Sep. 21, 2022
Signal Analyzer Agilent	N9010A	MY52220314	Dec. 03, 2021	Dec. 02, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 27, 2022	Jul. 26, 2023
Pre-amplifier EMCI	EMC001340	980142	Jun. 02, 2022	Jun. 01, 2023
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	Jan. 15, 2022	Jan. 14, 2023
Preamplifier EMCI	EMC 330H	980112	Oct. 05, 2021	Oct. 04, 2022
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Oct. 28, 2021	Oct. 27, 2022
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 05, 2021	Oct. 04, 2022
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 14, 2021	Nov. 13, 2022
Preamplifier EMCI	EMC 012645	980115	Oct. 05, 2021	Oct. 04, 2022
RF Coaxial Cable EMCI	EMC104-SM-SM-8000	171005	Oct. 05, 2021	Oct. 04, 2022
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 05, 2021	Oct. 04, 2022
RF FLITER MICRO-TRONICS	BRM50716	060	Jan. 10, 2022	Jan. 09, 2023
RF FLITER MICRO-TRONICS	BRM17690	004	Jan. 10, 2022	Jan. 09, 2023
Pre-Amplifier EMCI	EMC 184045	980116	Oct. 05, 2021	Oct. 04, 2022
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 14, 2021	Nov. 13, 2022
RF Coaxial Cable HUBER+SUHNER&EMCI	SUCOFLEX 104& EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 15, 2022	Jan. 14, 2023
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250 795/4)	Jan. 15, 2022	Jan. 14, 2023
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Jul. 09, 2022	Jul. 08, 2023
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Jul. 09, 2022	Jul. 08, 2023
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-440H	AT93021705	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller Max-Full	MF-7802	NA	NA	NA
Boresight antenna tower fixture BV	BAF-02	7	NA	NA

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8821C	6272278310	Jun. 22, 2022	Jun. 21, 2023

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HY - 966 chamber 5.

4.7.4 Test Procedures

- In the semi-anechoic chamber, EUT placed on the 0.8m(below or equal 1GHz) and/or 1.5m(above 1GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.
- Following C63.26 section 5.5 and 5.2.7
 - $EIRP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.
 - $ERP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8 - 2.15$; where D is the measurement distance (in the far field region) in m.

Note:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
- The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
 The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results

Below 1GHz Data

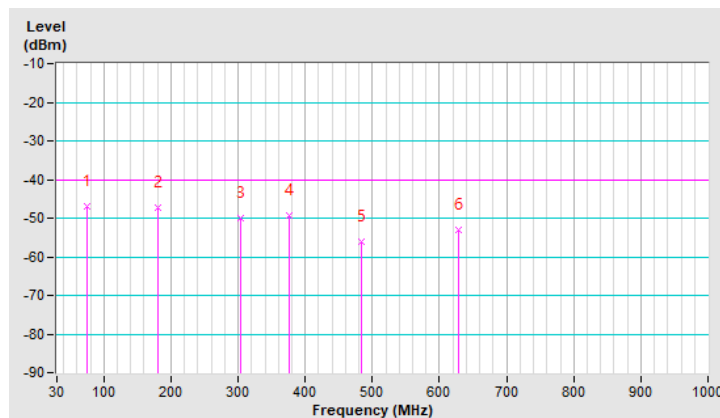
LTE Band 48, Channel Bandwidth 10MHz

Mode	TX channel 55290 (3555.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Thomas Cheng		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	75.59	-46.93	-40.00	-6.93	2.44 H	250	64.70	-111.63
2	181.32	-47.24	-40.00	-7.24	1.09 H	17	62.48	-109.72
3	304.51	-50.09	-40.00	-10.09	2.66 H	117	57.06	-107.15
4	376.29	-49.32	-40.00	-9.32	2.99 H	157	55.58	-104.90
5	482.99	-56.21	-40.00	-16.21	1.24 H	134	45.72	-101.93
6	628.49	-53.21	-40.00	-13.21	2.36 H	123	44.79	-98.00

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$.
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

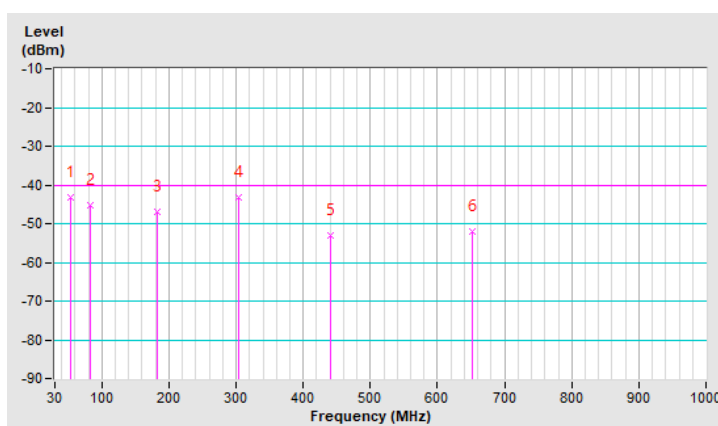


Mode	TX channel 55290 (3555.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Thomas Cheng		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	53.28	-43.15	-40.00	-3.15	1.63 V	300	64.84	-107.99
2	83.35	-45.29	-40.00	-5.29	3.37 V	278	68.12	-113.41
3	182.29	-46.78	-40.00	-6.78	2.83 V	212	63.05	-109.83
4	303.54	-43.30	-40.00	-3.30	1.86 V	154	63.90	-107.20
5	440.31	-53.08	-40.00	-13.08	1.43 V	161	49.62	-102.70
6	652.74	-52.15	-40.00	-12.15	3.22 V	173	45.67	-97.82

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$.
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. $Margin\ value = EIRP - Limit\ value$.
4. The other EIRP levels were very low against the limit.



Above 1GHz

LTE Band 48, Channel Bandwidth 10MHz

Mode	TX channel 55290 (3555.0MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Thomas Cheng		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7110.00	-52.31	-40.00	-12.31	2.84 H	93	54.38	-106.69
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7110.00	-50.25	-40.00	-10.25	1.28 V	226	56.44	-106.69

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m).$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Mode	TX channel 55990 (3625.00MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Thomas Cheng		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7250.00	-51.64	-40.00	-11.64	1.86 H	115	54.55	-106.19
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7250.00	-51.98	-40.00	-11.98	1.52 V	163	54.21	-106.19

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m).$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

Mode	TX channel 56690 (3695.0MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	23deg. C, 67%RH	Input Power	120Vac, 60Hz
Tested By	Thomas Cheng		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7390.00	-51.71	-40.00	-11.71	2.16 H	194	54.45	-106.16
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7390.00	-52.12	-40.00	-12.12	2.71 V	226	54.04	-106.16

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$.
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value.
4. The other EIRP levels were very low against the limit.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---