

FCC Test Report (Part 27)

Report No.: RF190531C22E

FCC ID: VBNAHIB-01

Test Model: AHIB

Received Date: Jun. 03, 2020

Test Date: Jul. 09 ~ Jul. 24, 2020

Issued Date: Jul. 24, 2020

Applicant: Nokia Solutions and Networks

Address: 3201 Olympus Blvd, Dallas, Texas 75019

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 / 788550 / TW0003

Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF190531C22E	Original release	Jul. 24, 2020

1 Certificate of Conformity

Product: AirScale Base Station RRH 2100MHz
Brand: Nokia
Test Model: AHIB
Sample Status: MASS-PRODUCTION
Applicant: Nokia Solutions and Networks
Test Date: Jul. 09 ~ Jul. 24, 2020
Standards: FCC Part 27, Subpart C, L
FCC Part 2, Subpart J

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:** Jul. 24, 2020
Pettie Chen / Senior Specialist

Approved by : Bruce Chen, **Date:** Jul. 24, 2020
Bruce Chen / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2			
Standard Section	Test Item	Result	Remarks
2.1046 27.50 (d)(2)	Equivalent Isotropically Radiated Power / Equivalent Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement of limit.
27.50 (d)(5)	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1055 27.54	Frequency Stability Stay with the authorized bands of operation	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -17.2dB at 36.79Hz.

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) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna TESEQ	HLA 6121	45745	Jun. 06, 2020	Jun. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM80 00	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 01, 2020	May 31, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021

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 HwaYa Chamber 9.

3 General Information

3.1 General Description of EUT

Product	AirScale Base Station RRH 2100MHz					
Brand	Nokia					
Test Model	AHIB					
Status of EUT	MASS-PRODUCTION					
Power Supply Rating	DC: -40.5VDC to -57VDC AC: 100-240VAC					
Modulation Type	LTE: QPSK, 16QAM, 64QAM, 256QAM					
Operating Frequency	Multi Carrier					
	LTE Band 66	Channel Bandwidth 70MHz	2110.0~2200.0MHz			
Max. EIRP Power	Multi Carrier					
			QPSK	16QAM	64QAM	256QAM
	LTE Band 66	Channel Bandwidth 70MHz (LTE(20M)+LTE(20M)+LTE(20M)+LTE(10M))	374973.002mW (55.74dBm)	368977.599mW (55.67dBm)	369828.180mW (55.68dBm)	370680.722mW (55.69dBm)
		Channel Bandwidth 70MHz (LTE(10M)+LTE(10M)+LTE(10M)+LTE(10M)) (ETC1)	376703.799mW (55.76dBm)	374110.588mW (55.73dBm)	373250.158mW (55.72dBm)	374973.002mW (55.74dBm)
Channel Bandwidth 70MHz (LTE(10M)+LTE(10M)) (ETC3)		374973.002mW (55.74dBm)	374110.588mW (55.73dBm)	374110.588mW (55.73dBm)	374110.588mW (55.73dBm)	
Emission Designator	Multi Carrier					
			QPSK	16QAM	64QAM	256QAM
	LTE Band 66	Channel Bandwidth 70MHz (LTE(20M)+LTE(20M)+LTE(20M)+LTE(10M))	68M1G7D	68M1D7W	68M1D7W	68M1D7W
		Channel Bandwidth 70MHz (LTE(10M)+LTE(10M)+LTE(10M)+LTE(10M)) (ETC1)	69M7G7D	69M7D7W	69M7D7W	69M7D7W
Channel Bandwidth 70MHz (LTE(10M)+LTE(10M)) (ETC3)		70M0G7D	70M0D7W	70M0D7W	70M0D7W	
Antenna Type	Direction Panel antenna with 12.5dBi gain					
Antenna Model	AAFA					
Antenna Ports	Nex10					
Antenna Connector	N type					
Accessory Device	Refer to Note as below					
Cable Supplied	NA					

*This device operate with Multiple Antennas Using Multiple-input, Multiple-output (MIMO) Technology for Uncorrelated Transmission.

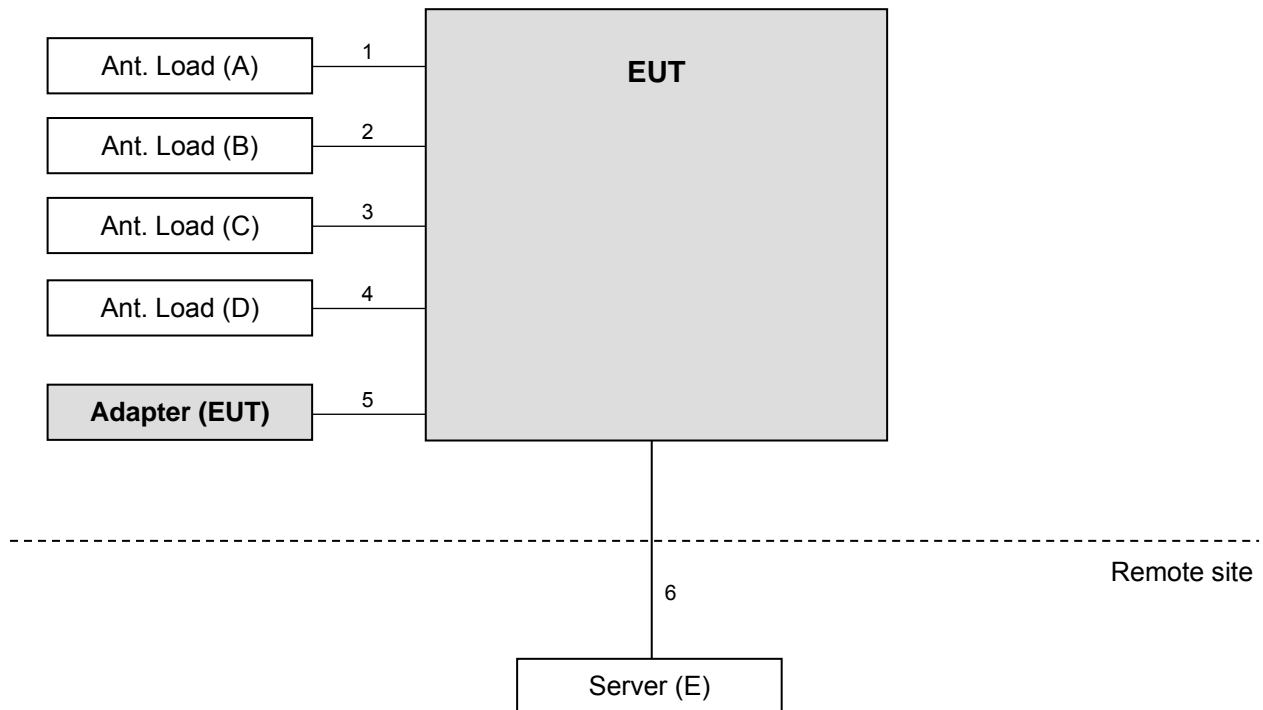
Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of BV CPS report no.: RF190531C22D. Difference compared with the original report is adding LTE Multiple carrier (up to 70MHz). Therefore, the EUT was re-tested and presented in the test report.
2. The EUT contains following accessory devices.

AC PSU (Optional)	
Brand	Nokia
Model	APAB
Sales Item	474130A.102
S/N	U7174800066
Remark	SUPLET/S818A16
Input Power	100-240Vac, 50-60Hz, 3A MAX
Output Power	-54Vdc, 3A MAX

3. A representative Nokia antenna, AAFA 12.5dBi antenna, is referred to comply with the EIRP limits.
4. 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.

3.2 Configuration of System under Test



3.2.1 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.	Ant. Load	NA	NA	NA	NA	Provided by manufacturer
B.	Ant. Load	NA	NA	NA	NA	Provided by manufacturer
C.	Ant. Load	NA	NA	NA	NA	Provided by manufacturer
D.	Ant. Load	NA	NA	NA	NA	Provided by manufacturer
E.	Server	Nokia	ASIA	L1182006990	NA	Provided by manufacturer

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Ant. Cable	1	0.3	Y	0	-
2.	Ant. Cable	1	0.3	Y	0	-
3.	Ant. Cable	1	0.3	Y	0	-
4.	Ant. Cable	1	0.3	Y	0	-
5.	DC Cable	1	0.55	N	0	Provided by manufacturer
6.	Fiber Cable	1	2	N	0	-

3.3 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 on X-plane. Following channel(s) was (were) selected for the final test as listed below.

LTE Band 66

Multi Carrier:

Test Mode	Test Condition
A	LTE Band 66 QPSK (LTE(20M)+LTE(20M)+LTE(20M)+LTE(10M))
B	LTE Band 66 QPSK (LTE(10M)+LTE(10M)+LTE(10M)+LTE(10M)) (ETC1)
C	LTE Band 66 QPSK (LTE(10M)+LTE(10M)) (ETC3)

EUT Configure Mode	Test Item	Available Channel	Tested Channel		Channel Bandwidth	Modulation	Mode
A	EIRP	66536 to 67086	2145.0MHz	CH 66536(2120MHz)+ CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67086(2175MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66636 to 67186	2155.0MHz	CH 66636(2130MHz)+ CH 66836(2150MHz)+ CH 67036(2170MHz)+ CH 67186(2185MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66736 to 67286	2165.0MHz	CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67136(2180MHz)+ CH 67286(2195MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
B		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67011(2167.5MHz)+ CH 67061(2172.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67111(2177.5MHz)+ CH 67161(2182.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67211(2187.5MHz)+ CH 67261(2192.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
C		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
A	Modulation Characteristics	66636 to 67186	2155.0MHz	CH 66636(2130MHz)+ CH 66836(2150MHz)+ CH 67036(2170MHz)+ CH 67186(2185MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB

EUT Configure Mode	Test Item	Available Channel	Tested Channel		Channel Bandwidth	Modulation	Mode
A	Frequency Stability	66536 to 67086	2145.0MHz	CH 66536(2120MHz)+ CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67086(2175MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67136(2180MHz)+ CH 67286(2195MHz)	70MHz	QPSK	Full RB
A	Band Edge	66536 to 67086	2145.0MHz	CH 66536(2120MHz)+ CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67086(2175MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67136(2180MHz)+ CH 67286(2195MHz)	70MHz	QPSK	Full RB
B		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67011(2167.5MHz)+ CH 67061(2172.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67211(2187.5MHz)+ CH 67261(2192.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK	Full RB
C		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK	Full RB
A	Peak To Average Ratio	66536 to 67086	2145.0MHz	CH 66536(2120MHz)+ CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67086(2175MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66636 to 67186	2155.0MHz	CH 66636(2130MHz)+ CH 66836(2150MHz)+ CH 67036(2170MHz)+ CH 67186(2185MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66736 to 67286	2165.0MHz	CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67136(2180MHz)+ CH 67286(2195MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
B		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67011(2167.5MHz)+ CH 67061(2172.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67111(2177.5MHz)+ CH 67161(2182.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67211(2187.5MHz)+ CH 67261(2192.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
C		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK / 16QAM / 64QAM / 256QAM	Full RB

EUT Configure Mode	Test Item	Available Channel	Tested Channel		Channel Bandwidth	Modulation	Mode
A	Conducted Emission	66536 to 67086	2145.0MHz	CH 66536(2120MHz)+ CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67086(2175MHz)	70MHz	QPSK	Full RB
		66636 to 67186	2155.0MHz	CH 66636(2130MHz)+ CH 66836(2150MHz)+ CH 67036(2170MHz)+ CH 67186(2185MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67136(2180MHz)+ CH 67286(2195MHz)	70MHz	QPSK	Full RB
B		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67011(2167.5MHz)+ CH 67061(2172.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67111(2177.5MHz)+ CH 67161(2182.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67211(2187.5MHz)+ CH 67261(2192.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK	Full RB
C		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK	Full RB
A	Radiated Emission Below 1GHz	66536 to 67086	2145.0MHz	CH 66536(2120MHz)+ CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67086(2175MHz)	70MHz	QPSK	Full RB
B		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67011(2167.5MHz)+ CH 67061(2172.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB
C		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB

EUT Configure Mode	Test Item	Available Channel	Tested Channel		Channel Bandwidth	Modulation	Mode
A	Radiated Emission Above 1GHz	66536 to 67086	2145.0MHz	CH 66536(2120MHz)+ CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67086(2175MHz)	70MHz	QPSK	Full RB
		66636 to 67186	2155.0MHz	CH 66636(2130MHz)+ CH 66836(2150MHz)+ CH 67036(2170MHz)+ CH 67186(2185MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66736(2140MHz)+ CH 66936(2160MHz)+ CH 67136(2180MHz)+ CH 67286(2195MHz)	70MHz	QPSK	Full RB
B		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67011(2167.5MHz)+ CH 67061(2172.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67111(2177.5MHz)+ CH 67161(2182.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67211(2187.5MHz)+ CH 67261(2192.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK	Full RB
C		66536 to 67086	2145.0MHz	CH 66461(2112.5MHz)+ CH 67111(2177.5MHz)	70MHz	QPSK	Full RB
		66636 to 67186	2155.0MHz	CH 66561(2122.5MHz)+ CH 67211(2187.5MHz)	70MHz	QPSK	Full RB
		66736 to 67286	2165.0MHz	CH 66661(2132.5MHz)+ CH 67311(2197.5MHz)	70MHz	QPSK	Full RB

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	25deg. C, 70%RH	120Vac, 60Hz	Han Wu
Modulation Characteristics	25deg. C, 70%RH	120Vac, 60Hz	Han Wu
Frequency Stability	24deg. C, 64%RH	-48Vdc	James Yang
Occupied Bandwidth	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Band Edge	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Peak To Average Ratio	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Conducted Emission	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Radiated Emission	22deg. C, 68%RH	120Vac, 60Hz	Han Wu

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 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 and References:

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 27

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

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

The radiated peak output power shall be according to the specific rule Part 27.50(d)(2) that are limited to EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

4.1.2 Test Procedures

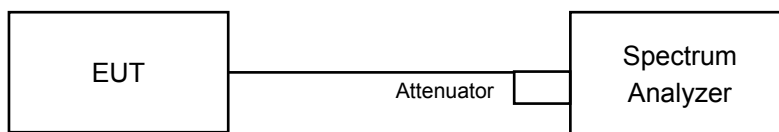
Conducted Power Measurement:

The EUT was set up for the maximum power with LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

$EIRP = \text{Conducted power} + \text{antenna gain}$

4.1.3 Test Setup

Conducted Power Measurement:



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

4.1.4 Test Results

Conducted Output Power (dBm)

Test Mode A

1TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0	37.19	37.21	37.16	37.16	37.15	37.12	37.15	37.14	37.20	37.16	37.15	37.18
	1	37.30	37.29	37.22	37.24	37.21	37.24	37.26	37.23	37.22	37.19	37.17	37.19
	2	37.18	37.23	37.27	37.18	37.16	37.11	37.12	37.16	37.08	37.16	37.14	37.14
	3	37.11	37.14	37.19	37.05	37.09	37.12	37.12	37.07	37.10	37.11	37.18	37.16

2TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1	40.26	40.26	40.20	40.21	40.19	40.19	40.22	40.20	40.22	40.19	40.17	40.20
	2+3	40.16	40.20	40.24	40.13	40.14	40.13	40.13	40.13	40.10	40.15	40.17	40.16

3TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2	41.99	42.01	41.99	41.96	41.94	41.93	41.95	41.95	41.94	41.94	41.92	41.94

4TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2+3	43.22	43.24	43.23	43.18	43.17	43.17	43.18	43.17	43.17	43.18	43.18	43.19

*All available TX Chain combination as below:

2TX:

1. Chain 0+ Chain 1
2. Chain 0+ Chain 2
3. Chain 0+ Chain 3
4. Chain 1+ Chain 2
5. Chain 1+ Chain 3
6. Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1 & Chain 2+Chain 3, therefore they were chosen for the final test.

3TX:

1. Chain 0+ Chain 1+ Chain 2
2. Chain 0+ Chain 1+ Chain 3
3. Chain 1+ Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1+Chain 2, therefore it was chosen for the final test.

Test Mode B

1TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0	37.22	37.26	37.24	37.16	37.20	37.21	37.24	37.20	37.20	37.24	37.25	37.19
	1	37.31	37.29	37.31	37.25	37.28	37.26	37.22	37.23	37.24	37.26	37.22	37.29
	2	37.20	37.16	37.18	37.19	37.19	37.18	37.16	37.21	37.15	37.19	37.18	37.22
	3	37.18	37.20	37.22	37.12	37.17	37.14	37.18	37.15	37.18	37.18	37.14	37.16

2TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1	40.28	40.29	40.29	40.22	40.25	40.25	40.24	40.23	40.23	40.26	40.25	40.25
	2+3	40.20	40.19	40.21	40.17	40.19	40.17	40.18	40.19	40.18	40.20	40.17	40.20

3TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2	42.01	42.01	42.01	41.97	41.99	41.99	41.98	41.98	41.97	42.00	41.99	42.00

4TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2+3	43.25	43.25	43.26	43.20	43.23	43.22	43.22	43.22	43.21	43.24	43.22	43.24

*All available TX Chain combination as below:

2TX:

1. Chain 0+ Chain 1
2. Chain 0+ Chain 2
3. Chain 0+ Chain 3
4. Chain 1+ Chain 2
5. Chain 1+ Chain 3
6. Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1 & Chain 2+Chain 3, therefore they were chosen for the final test.

3TX:

1. Chain 0+ Chain 1+ Chain 2
2. Chain 0+ Chain 1+ Chain 3
3. Chain 1+ Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1+Chain 2, therefore it was chosen for the final test.

Test Mode C

1TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0	37.23	37.19	37.22	37.16	37.19	37.23	37.22	37.25	37.26	37.22	37.25	37.19
	1	37.29	37.30	37.28	37.22	37.24	37.25	37.25	37.26	37.24	37.28	37.21	37.25
	2	37.21	37.18	37.16	37.18	37.21	37.16	37.16	37.15	37.18	37.16	37.20	37.18
	3	37.16	37.19	37.18	37.16	37.20	37.18	37.22	37.17	37.16	37.11	37.15	37.22

2TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1	40.27	40.26	40.26	40.20	40.23	40.25	40.25	40.27	40.26	40.26	40.24	40.23
	2+3	40.20	40.20	40.18	40.18	40.22	40.18	40.20	40.17	40.18	40.15	40.19	40.21

3TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2	42.01	41.99	41.99	41.96	41.98	41.98	41.98	41.99	42.00	41.99	41.99	41.98

4TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2+3	43.24	43.24	43.23	43.20	43.23	43.23	43.23	43.23	43.23	43.21	43.22	43.23

*All available TX Chain combination as below:

2TX:

1. Chain 0+ Chain 1
2. Chain 0+ Chain 2
3. Chain 0+ Chain 3
4. Chain 1+ Chain 2
5. Chain 1+ Chain 3
6. Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1 & Chain 2+Chain 3, therefore they were chosen for the final test.

3TX:

1. Chain 0+ Chain 1+ Chain 2
2. Chain 0+ Chain 1+ Chain 3
3. Chain 1+ Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1+Chain 2, therefore it was chosen for the final test.

EIRP Power (dBm)

Test Mode A

1TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0	49.69	49.71	49.66	49.66	49.65	49.62	49.65	49.64	49.70	49.66	49.65	49.68
	1	49.80	49.79	49.72	49.74	49.71	49.74	49.76	49.73	49.72	49.69	49.67	49.69
	2	49.68	49.73	49.77	49.68	49.66	49.61	49.62	49.66	49.58	49.66	49.64	49.64
	3	49.61	49.64	49.69	49.55	49.59	49.62	49.62	49.57	49.60	49.61	49.68	49.66

2TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1	52.76	52.76	52.70	52.71	52.69	52.69	52.72	52.70	52.72	52.69	52.67	52.70
	2+3	52.66	52.70	52.74	52.63	52.64	52.63	52.63	52.63	52.60	52.65	52.67	52.66

3TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2	54.49	54.51	54.49	54.46	54.44	54.43	54.45	54.45	54.44	54.44	54.42	54.44

4TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2+3	55.72	55.74	55.73	55.68	55.67	55.67	55.68	55.67	55.67	55.68	55.68	55.69

*All available TX Chain combination as below:

Note: EIRP = Conducted Power + Gain

2TX:

1. Chain 0+ Chain 1
2. Chain 0+ Chain 2
3. Chain 0+ Chain 3
4. Chain 1+ Chain 2
5. Chain 1+ Chain 3
6. Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1 & Chain 2+Chain 3, therefore they were chosen for the final test.

3TX:

1. Chain 0+ Chain 1+ Chain 2
2. Chain 0+ Chain 1+ Chain 3
3. Chain 1+ Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1+Chain 2, therefore it was chosen for the final test.

Test Mode B

1TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0	49.72	49.76	49.74	49.66	49.70	49.71	49.74	49.70	49.70	49.74	49.75	49.69
	1	49.81	49.79	49.81	49.75	49.78	49.76	49.72	49.73	49.74	49.76	49.72	49.79
	2	49.70	49.66	49.68	49.69	49.69	49.68	49.66	49.71	49.65	49.69	49.68	49.72
	3	49.68	49.70	49.72	49.62	49.67	49.64	49.68	49.65	49.68	49.68	49.64	49.66

2TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1	52.78	52.79	52.79	52.72	52.75	52.75	52.74	52.73	52.73	52.76	52.75	52.75
	2+3	52.70	52.69	52.71	52.67	52.69	52.67	52.68	52.69	52.68	52.70	52.67	52.70

3TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2	54.51	54.51	54.51	54.47	54.49	54.49	54.48	54.48	54.47	54.50	54.49	54.50

4TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2+3	55.75	55.75	55.76	55.70	55.73	55.72	55.72	55.72	55.71	55.74	55.72	55.74

*All available TX Chain combination as below:

Note: EIRP = Conducted Power + Gain

2TX:

1. Chain 0+ Chain 1
2. Chain 0+ Chain 2
3. Chain 0+ Chain 3
4. Chain 1+ Chain 2
5. Chain 1+ Chain 3
6. Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1 & Chain 2+Chain 3, therefore they were chosen for the final test.

3TX:

1. Chain 0+ Chain 1+ Chain 2
2. Chain 0+ Chain 1+ Chain 3
3. Chain 1+ Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1+Chain 2, therefore it was chosen for the final test.

Test Mode C

1TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0	49.73	49.69	49.72	49.66	49.69	49.73	49.72	49.75	49.76	49.72	49.75	49.69
	1	49.79	49.80	49.78	49.72	49.74	49.75	49.75	49.76	49.74	49.78	49.71	49.75
	2	49.71	49.68	49.66	49.68	49.71	49.66	49.66	49.65	49.68	49.66	49.70	49.68
	3	49.66	49.69	49.68	49.66	49.70	49.68	49.72	49.67	49.66	49.61	49.65	49.72

2TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1	52.77	52.76	52.76	52.70	52.73	52.75	52.75	52.77	52.76	52.76	52.74	52.73
	2+3	52.70	52.70	52.68	52.68	52.72	52.68	52.70	52.67	52.68	52.65	52.69	52.71

3TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2	54.51	54.49	54.49	54.46	54.48	54.48	54.48	54.49	54.50	54.49	54.49	54.48

4TX:

Band / BW	Chain	QPSK			16QAM			64QAM			256QAM		
		Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
		2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz	2145 MHz	2155 MHz	2165 MHz
66 / 70M	0+1+2+3	55.74	55.74	55.73	55.70	55.73	55.73	55.73	55.73	55.73	55.71	55.72	55.73

*All available TX Chain combination as below:

Note: EIRP = Conducted Power + Gain

2TX:

1. Chain 0+ Chain 1
2. Chain 0+ Chain 2
3. Chain 0+ Chain 3
4. Chain 1+ Chain 2
5. Chain 1+ Chain 3
6. Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1 & Chain 2+Chain 3, therefore they were chosen for the final test.

3TX:

1. Chain 0+ Chain 1+ Chain 2
2. Chain 0+ Chain 1+ Chain 3
3. Chain 1+ Chain 2+ Chain 3

The worst combination is Chain 0+Chain 1+Chain 2, therefore it was chosen for the final test.

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

4.2.2 Test Procedure

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.

4.2.3 Test Setup



4.2.4 Test Results

LTE Band 66: 2155MHz

Spectrum Plot of Measurement Value

QPSK



16QAM



64QAM



256QAM



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$.

4.3.2 Test Instruments

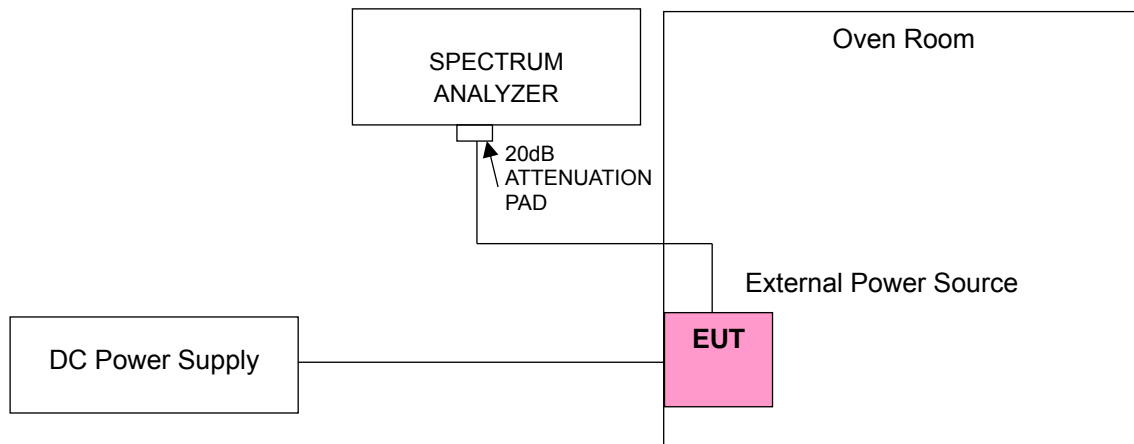
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 01, 2020	May 31, 2021
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2020	Jun. 22, 2021
DC Power Supply Topward	6306A	727263	NA	NA
True RMS Clamp Meter / Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021

4.3.3 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 $\pm 0.5^{\circ}\text{C}$ 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.

4.3.4 Test Setup



4.3.5 Test Results

Test Mode A

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 66			
	Channel Bandwidth: 70 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-48.0	2145.000001	0.001	2165.000003	0.002
-40.5	2145.000003	0.001	2165.000003	0.001
-57.0	2145.000003	0.001	2165.000003	0.001

Note: The applicant defined the normal working voltage is from -40.5Vdc to -57.0Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth: 70 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	2145.000003	0.001	2165.000002	0.001
-30	2145.000002	0.001	2165.000003	0.001
-20	2145.000003	0.001	2165.000002	0.001
-10	2145.000001	0.001	2165.000002	0.001
0	2145.000002	0.001	2165.000004	0.002
10	2145.000004	0.002	2165.000003	0.002
20	2144.999998	-0.001	2164.999998	-0.001
30	2144.999996	-0.002	2164.999997	-0.002
40	2144.999997	-0.002	2164.999997	-0.001
50	2144.999996	-0.002	2164.999996	-0.002
55	2144.999999	-0.001	2164.999997	-0.002

Test Mode B

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 66			
	Channel Bandwidth: 70 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-48.0	2145.000002	0.001	2165.000004	0.002
-40.5	2145.000003	0.002	2165.000004	0.002
-57.0	2145.000002	0.001	2165.000003	0.001

Note: The applicant defined the normal working voltage is from -40.5Vdc to -57.0Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth: 70 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	2145.000003	0.001	2165.000003	0.002
-30	2145.000003	0.001	2165.000004	0.002
-20	2145.000003	0.001	2165.000001	0.000
-10	2145.000002	0.001	2165.000003	0.001
0	2145.000002	0.001	2165.000002	0.001
10	2145.000003	0.001	2165.000003	0.001
20	2144.999998	-0.001	2164.999997	-0.001
30	2144.999997	-0.002	2164.999998	-0.001
40	2144.999997	-0.002	2164.999997	-0.001
50	2144.999999	-0.001	2164.999998	-0.001
55	2144.999998	-0.001	2164.999998	-0.001

Test Mode C

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 66			
	Channel Bandwidth: 70 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-48.0	2145.000002	0.001	2165.000002	0.001
-40.5	2145.000004	0.002	2165.000003	0.001
-57.0	2145.000001	0.001	2165.000002	0.001

Note: The applicant defined the normal working voltage is from -40.5Vdc to -57.0Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth: 70 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	2145.000003	0.001	2165.000002	0.001
-30	2145.000003	0.002	2165.000002	0.001
-20	2145.000003	0.001	2165.000003	0.001
-10	2145.000004	0.002	2165.000001	0.001
0	2145.000004	0.002	2165.000003	0.001
10	2145.000002	0.001	2165.000004	0.002
20	2144.999999	-0.001	2164.999998	-0.001
30	2144.999996	-0.002	2164.999997	-0.001
40	2144.999997	-0.002	2164.999998	-0.001
50	2144.999996	-0.002	2164.999997	-0.001
55	2144.999998	-0.001	2164.999998	-0.001

4.4 Emission Bandwidth Measurement

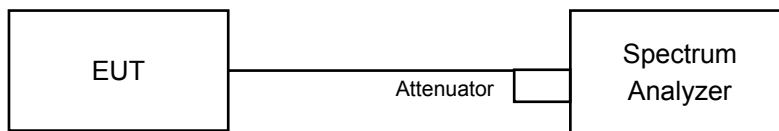
4.4.1 Limits of Emission Bandwidth Measurement

According to FCC 27.53(m)(6) specified that emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

4.4.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 750kHz and VBW = 2.4MHz for LTE Band 66 Multi Carrier.

4.4.3 Test Setup



4.4.4 Test Result

Test Mode A

Chain 0

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	70.22	70.22	70.23	70.22	68.04	68.04	68.05	68.04
2155.0	70.23	70.23	70.23	70.23	68.06	68.06	68.06	68.07
2165.0	70.23	70.23	70.23	70.23	68.05	68.06	68.06	68.05

Chain 1

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	70.22	70.22	70.22	70.22	68.03	68.03	68.03	68.03
2155.0	70.23	70.23	70.23	70.23	68.06	68.06	68.07	68.06
2165.0	70.23	70.23	70.23	70.23	68.05	68.04	68.04	68.05

Chain 2

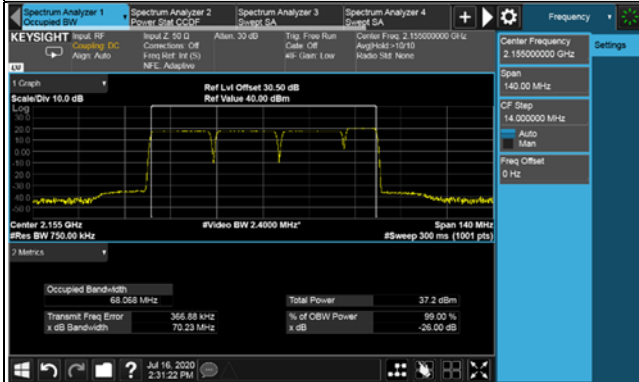
Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	70.22	70.22	70.22	70.22	68.04	68.04	68.04	68.03
2155.0	70.23	70.23	70.23	70.23	68.07	68.07	68.08	68.07
2165.0	70.23	70.23	70.23	70.23	68.06	68.06	68.05	68.05

Chain 3

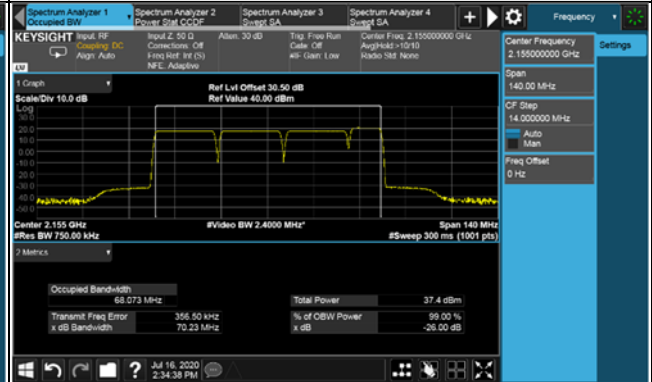
Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	70.23	70.22	70.22	70.22	68.04	68.03	68.04	68.03
2155.0	70.23	70.23	70.23	70.23	68.05	68.07	68.07	68.06
2165.0	70.23	70.23	70.23	70.22	68.05	68.05	68.05	68.05

26dBc Bandwidth
Spectrum Plot of Worst Value

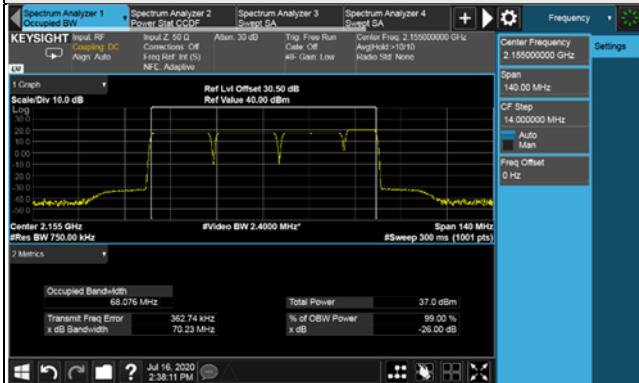
Chain 0 / 256QAM



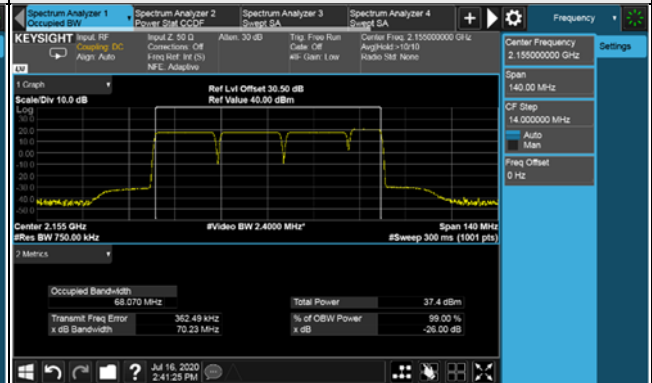
Chain 1 / 64QAM



Chain 2 / 64QAM

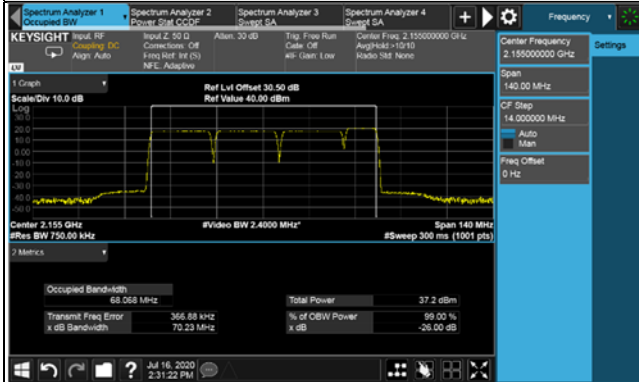


Chain 3 / 64QAM

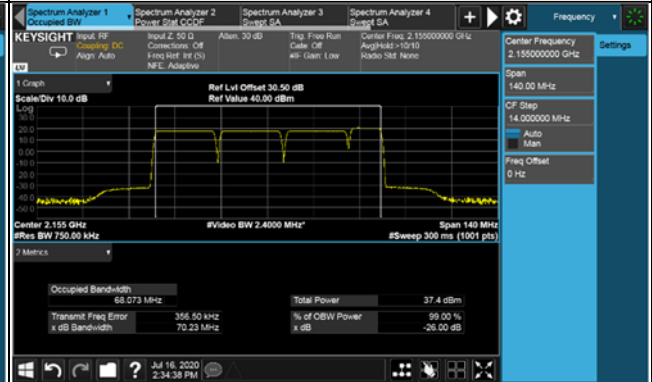


Occupied Bandwidth
Spectrum Plot of Worst Value

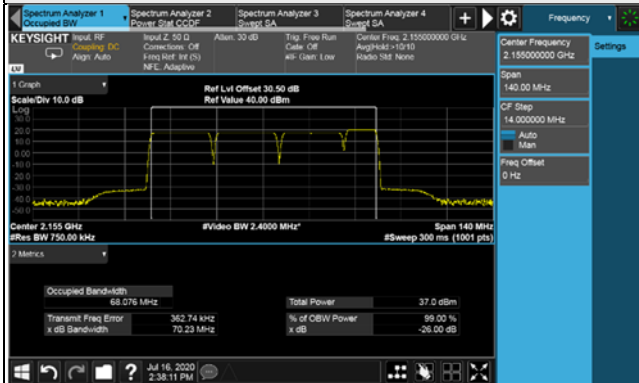
Chain 0 / 256QAM



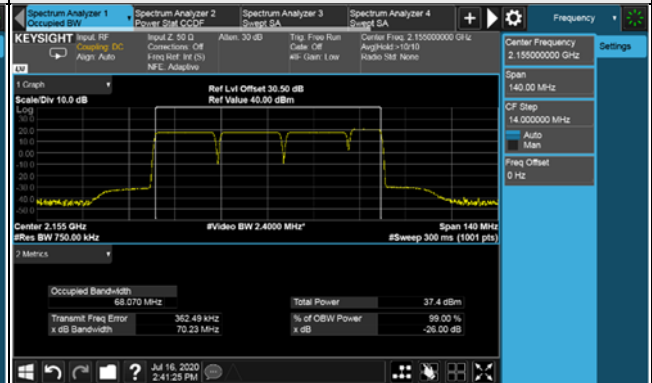
Chain 1 / 64QAM



Chain 2 / 64QAM



Chain 3 / 64QAM



Test Mode B

Chain 0

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.29	71.29	71.29	71.29	69.67	69.67	69.66	69.67
2155.0	71.30	71.30	71.30	71.30	69.68	69.70	69.69	69.60
2165.0	71.28	71.27	71.29	71.29	69.68	69.67	69.68	69.68

Chain 1

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.29	71.29	71.29	71.29	69.68	69.67	69.67	69.68
2155.0	71.30	71.29	71.30	71.30	69.69	69.69	69.69	69.69
2165.0	71.28	71.27	71.28	71.28	69.68	69.67	69.67	69.68

Chain 2

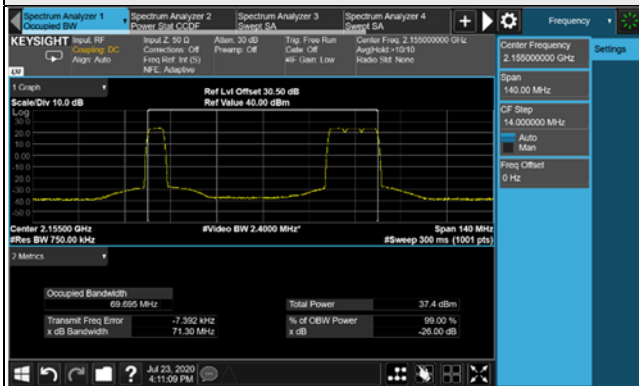
Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.29	71.29	71.29	71.29	69.67	69.68	69.67	69.67
2155.0	71.30	71.30	71.30	71.29	69.69	69.69	69.69	69.70
2165.0	71.27	71.28	71.28	71.28	69.67	69.68	69.67	69.67

Chain 3

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.29	71.29	71.29	71.29	69.67	69.67	69.66	69.67
2155.0	71.30	71.30	71.30	71.29	69.68	69.69	69.69	69.68
2165.0	71.28	71.27	71.29	71.28	69.68	69.67	69.68	69.68

26dBc Bandwidth
Spectrum Plot of Worst Value

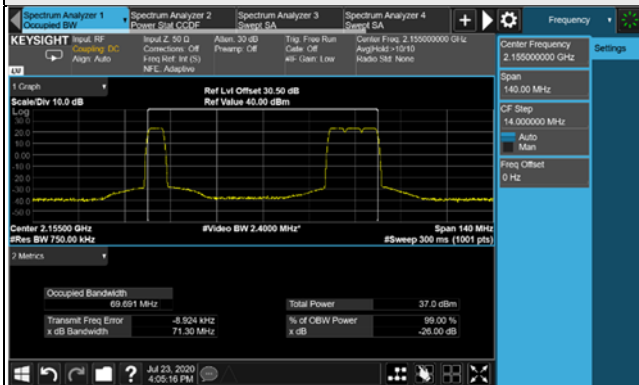
Chain 0 / 16QAM



Chain 1 / QPSK



Chain 2 / 64QAM

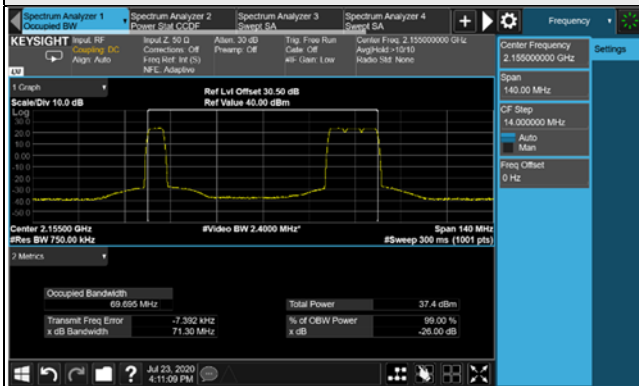


Chain 3 / 64QAM

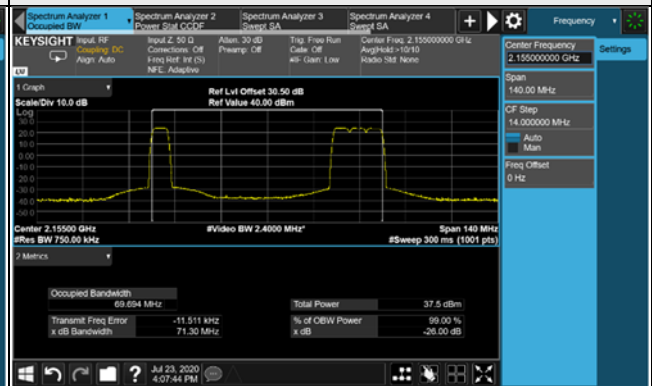


Occupied Bandwidth
Spectrum Plot of Worst Value

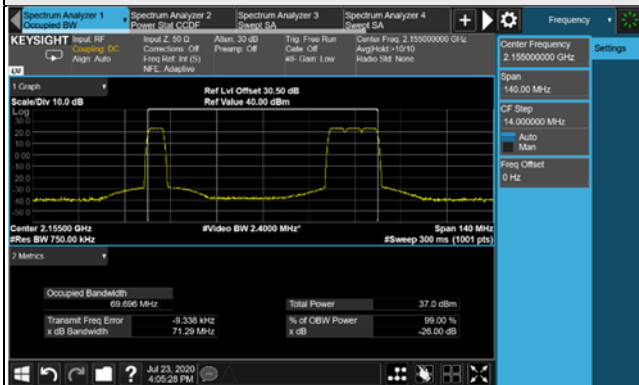
Chain 0 / 16QAM



Chain 1 / QPSK



Chain 2 / 256QAM



Chain 3 / 64QAM



Test Mode C

Chain 0

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.29	71.29	71.30	71.30	69.97	69.97	69.96	69.97
2155.0	71.30	71.30	71.30	71.30	69.98	69.97	69.97	69.99
2165.0	71.26	71.28	71.28	71.28	69.96	69.96	69.96	69.95

Chain 1

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.30	71.29	71.29	71.29	69.97	69.97	69.96	69.97
2155.0	71.30	71.29	71.29	71.30	69.98	69.97	69.97	69.97
2165.0	71.27	71.28	71.27	71.29	69.96	69.96	69.96	69.96

Chain 2

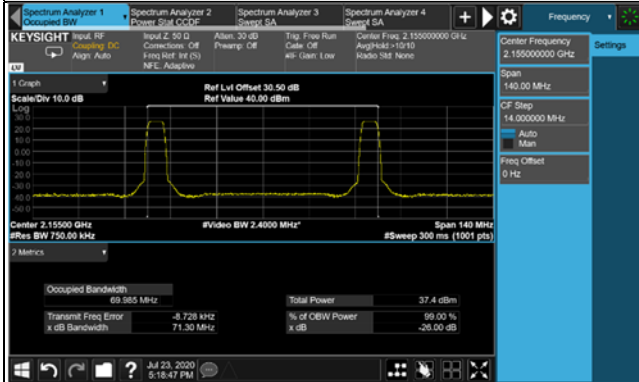
Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.30	71.30	71.29	71.29	69.97	69.97	69.97	69.97
2155.0	71.29	71.30	71.30	71.30	69.97	69.98	69.97	69.98
2165.0	71.29	71.28	71.28	71.27	69.96	69.96	69.96	69.96

Chain 3

Frequency (MHz)	26dBc Bandwidth (MHz)				Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
2145.0	71.29	71.29	71.29	71.29	69.97	69.96	69.96	69.97
2155.0	71.30	71.30	71.30	71.30	69.97	69.99	69.97	69.98
2165.0	71.28	71.28	71.28	71.28	69.96	69.96	69.97	69.96

26dBc Bandwidth
Spectrum Plot of Worst Value

Chain 0 / 256QAM



Chain 1 / QPSK



Chain 2 / 256QAM

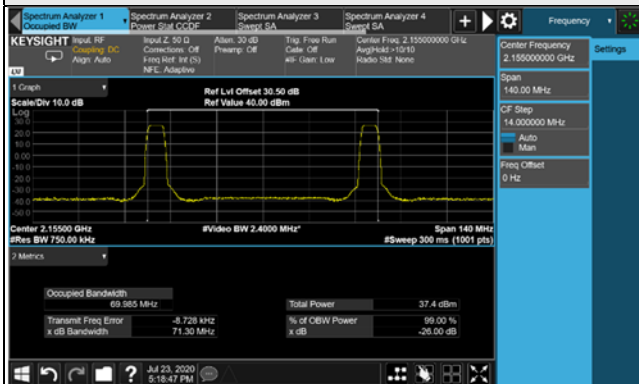


Chain 3 / 16QAM



Occupied Bandwidth Spectrum Plot of Worst Value

Chain 0 / 256QAM



Chain 1 / QPSK



Chain 2 / 256QAM



Chain 3 / 16QAM

