FCC Test Report (Part 96)

Report No.:	RF191018C26
FCC ID:	2AAGMCB410L
Test Model:	CB410L
Received Date:	Oct. 18, 2019
Test Date:	Dec. 30, 2019 ~ Jan. 02, 2020
Issued Date:	Jan. 16, 2020
Applicant:	SEQUANS Communications
Address:	15/55 boulevard Charles De Gaulle 92700 Colombes - FRANCE
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

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF191018C26	Original release.	Jan. 16, 2020

1 Certificate of Conformity

Product:	CB410L
Brand:	SEQUANS Communications
Test Model:	CB410L
Sample Status:	Engineering sample
Applicant:	SEQUANS Communications
Test Date:	Dec. 30, 2019 ~ Jan. 02, 2020
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:** Jan. 16, 2020

Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Jan. 16, 2020

Bruce Chen / Senior 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.
2.1047 96.41(a)	Modulation Characteristics	Pass	Meet the requirement
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 -0.2dB at 7105.00MHz.

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	9 kHz ~ 30MHz	3.04 dB
	30 MHz ~ 200 MHz	3.59 dB
	200 MHz ~ 1000 MHz	3.60 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	CB410L			
Brand	SEQUANS Communications			
Test Model	CB410L			
Status of EUT	Engineering sample			
Modulation Type	QPSK, 16QAM			
Operating Frequency	LTE Band 48	Channel Bandwidth 5MHz	TX: 3552.5 ~ 3697.5 MHz	
			RX: 3552.5 ~ 3697.5 MHz	
		Channel Bandwidth 10MHz	TX: 3555 ~ 3695 MHz	
			RX: 3555 ~ 3695 MHz	
		Channel Bandwidth 15MHz	TX: 3557.5 ~ 3692.5 MHz	
			RX: 3557.5 ~ 3692.5 MHz	
		Channel Bandwidth 20MHz	TX: 3560 ~ 3690 MHz	
			RX: 3560 ~ 3690 MHz	
Max. EIRP Power	LTE Band 48		QPSK	16QAM
		Per 10M		
		Channel Bandwidth 5MHz	122.180mW (20.87dBm)	117.220mW (20.69dBm)
		Channel Bandwidth 10MHz	113.240mW (20.54dBm)	111.173mW (20.46dBm)
		Channel Bandwidth 15MHz	97.949mW (19.91dBm)	102.094mW (20.09dBm)
		Channel Bandwidth 20MHz	126.474mW (21.02dBm)	117.761mW (20.71dBm)
		Full Power		
		Channel Bandwidth 5MHz	122.180mW (20.87dBm)	117.220mW (20.69dBm)
		Channel Bandwidth 10MHz	113.240mW (20.54dBm)	111.173mW (20.46dBm)
		Channel Bandwidth 15MHz	99.083mW (19.96dBm)	102.094mW (20.09dBm)
		Channel Bandwidth 20MHz	127.938mW (21.07dBm)	118.577mW (20.74dBm)
Emission Designator	LTE Band 48	Channel Bandwidth 5MHz	4M46G7D	4M47D7W
		Channel Bandwidth 10MHz	8M93G7D	8M90D7W
		Channel Bandwidth 15MHz	13M4G7D	13M4D7W
		Channel Bandwidth 20MHz	17M9G7D	17M9D7W
Antenna Type	Dipole Antenna with 0.14dBi gain			
Accessory Device	NA			
Data Cable Supplied	NA			

Note:

1. The EUT uses following adapter. (Support unit)

Adapter	
Brand	Liteon
Model	PA-1050-39
Input Power	100-240Vac~50/60Hz 0.25A
Output Power	5.2Vdc / 1A

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

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation
Maximum Output Power	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK, 16QAM
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK, 16QAM
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK, 16QAM
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK, 16QAM
Modulation Characteristics	55340 to 56640	55990 (3625.0MHz)	20MHz	QPSK, 16QAM
Frequency Stability	55265 to 56715	55265 (3552.5MHz), 56715 (3697.5MHz)	5MHz	QPSK
	55290 to 56690	55290 (3555.0MHz), 56690 (3695.0MHz)	10MHz	QPSK
	55315 to 56665	55315 (3557.5MHz), 56665 (3692.5MHz)	15MHz	QPSK
	55340 to 56640	55340 (3560.0MHz), 56640 (3690.0MHz)	20MHz	QPSK
Occupied Bandwidth	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK, 16QAM
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK, 16QAM
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK, 16QAM
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK, 16QAM
Peak to Average Ratio	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK, 16QAM
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK, 16QAM
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK, 16QAM
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK, 16QAM

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation
Conducted Emission	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK
Radiated Emission Below 1GHz	55265 to 56715	55265 (3552.5MHz)	5MHz	QPSK
	55340 to 56640	55340 (3560.0MHz)	20MHz	QPSK
Radiated Emission Above 1GHz	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission below 1GHz, low, mid and high channels were pre-tested in chamber. Low channel was found to be the worst case and therefore had been chosen for all final tests.
3. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the 5MHz & highest channel bandwidth for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Maximum Output Power	25deg. C, 63%RH	120Vac, 60Hz	Matthew Yang
Modulation characteristics	25deg. C, 63%RH	120Vac, 60Hz	Matthew Yang
Frequency Stability	25deg. C, 63%RH	120Vac, 60Hz	Matthew Yang
Occupied Bandwidth	25deg. C, 63%RH	120Vac, 60Hz	Matthew Yang
Peak to Average Ratio	25deg. C, 63%RH	120Vac, 60Hz	Matthew Yang
Condcudeted Emission	25deg. C, 63%RH	120Vac, 60Hz	Matthew Yang
Radiated Emission	22deg. C, 66%RH	120Vac, 60Hz	Han Wu

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.	Wideband Radio Communication Tester	R&S	CMW500	151084	NA	-
B.	Adapter	Liteon	PA-1050-39	NA	NA	

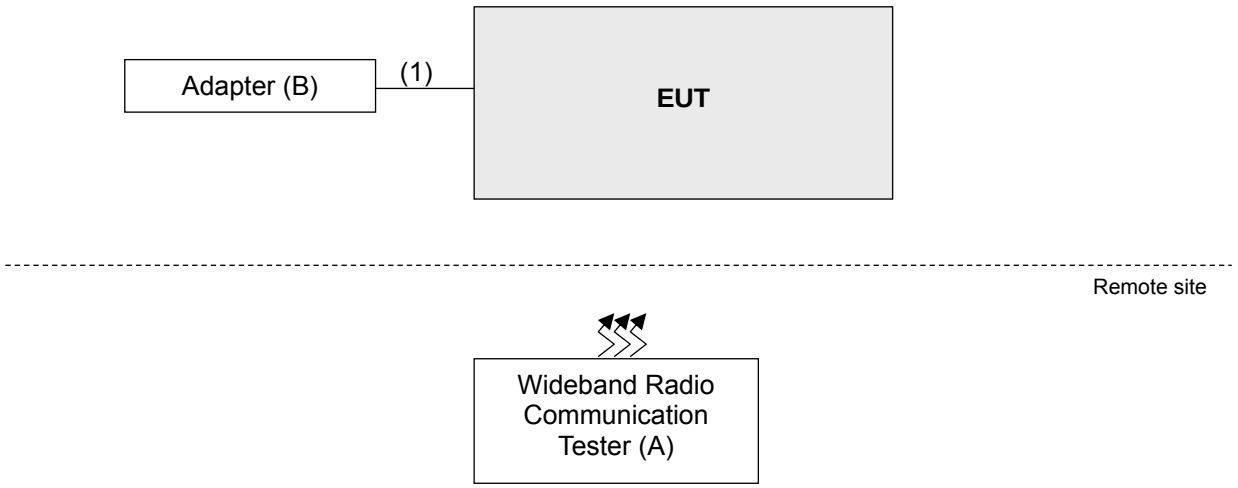
Note:

1. All power cords of the above support units are non-shielded (1.8m).

2. Items A acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Micro USB Cable	1	0.9	Y	0	-

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

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

FCC 47 CFR Part 2

FCC 47 CFR Part 96

KDB 971168 D01 Power Meas License Digital Systems v02r02

KDB 662911 D01 Multiple Transmitter Output v02r01

KDB 940660 D01 Part 96 CBRS Eqpt v02

ANSI/TIA/EIA-603-D-2010

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

4 Test Types and Results

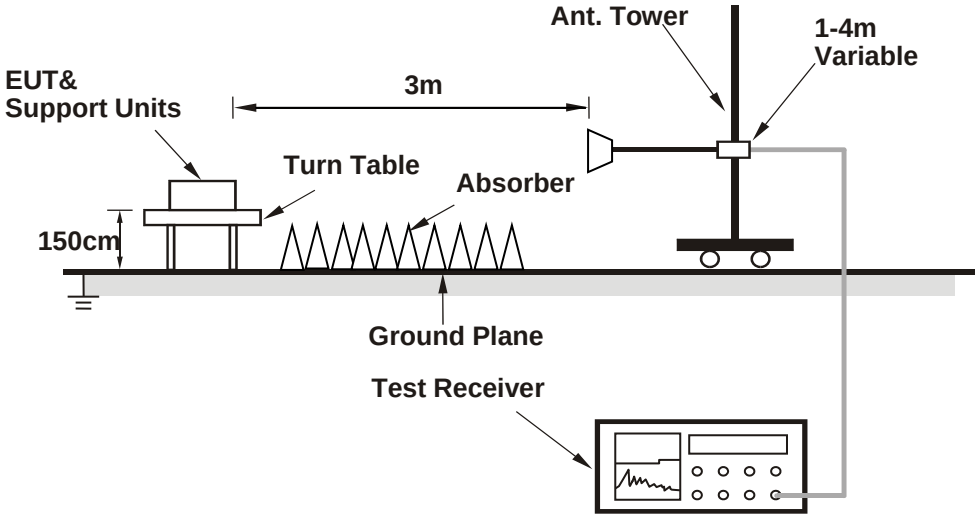
4.1 Maximum Output Power Measurement

4.1.1 Limits of Maximum Output Power Measurement

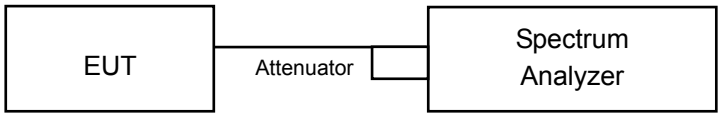
Device		Maximum Output Power (dBm/10 MHz)
☒	End User Device	23
☐	Category A CBSD	30
☐	Category B CBSD	47

4.1.2 Test Setup

Radiated Measurement Method



Conducted Measurement Method



4.1.3 Test Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 04, 2019	Jun. 03, 2020
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	Jul. 01, 2019	Jun. 30, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jul. 11, 2019	Jul. 10, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 19, 2019	Feb. 18, 2020
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 19, 2019	Jan. 18, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jul. 11, 2019	Jul. 10, 2020
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 30, 2019	Jul. 29, 2020
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. 03, 2019	Jun. 02, 2020
JFW 20dB attenuation	50HF-020-SMA	NA	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.
2. The test was performed in HwaYa Chamber 9.

4.1.4 Test Procedures

Radiated Measurement Method

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to peak and/or average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
6. EIRP = Output power level of S.G + Correction Factor (including Cable loss, Antenna gain, etc…)

Conducted Measurement Method

1. Connect the DUT transmitter output to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
4. Set VBW ≥ 3 × RBW.
5. Set number of points in sweep ≥ 2 × span / RBW.
6. Sweep time = auto-couple.
7. Detector = RMS (power averaging).
8. If the EUT can be configured to transmit continuously (i.e., burst duty cycle ≥ 98%), then set the trigger to free run.
9. 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.
10. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
11. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band 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.

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) / Per 10M

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55265	Mid CH 55990	High CH 56715	Low CH 55265	Mid CH 55990	High CH 56715
			3552.5 MHz	3625 MHz	3697.5 MHz	3552.5 MHz	3625 MHz	3697.5 MHz
48 / 5M	1	0	20.48	20.04	19.85	20.15	20.03	19.55
	1	12	**20.73**	20.19	19.96	**20.55**	20.37	19.90
	1	24	20.55	20.08	19.87	20.24	19.98	19.58
	12	0	20.35	19.92	19.75	20.36	20.21	19.72
	12	6	20.38	19.88	19.77	20.47	20.30	19.85
	12	13	20.26	19.95	19.72	20.33	20.16	19.71
	25	0	20.43	19.96	19.76	20.38	20.14	19.73

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55290	Mid CH 55990	High CH 56690	Low CH 55290	Mid CH 55990	High CH 56690
			3555 MHz	3625 MHz	3695 MHz	3555 MHz	3625 MHz	3695 MHz
48 / 10M	1	0	20.29	19.81	19.66	19.63	19.15	18.97
	1	24	**20.40**	19.95	19.78	**20.32**	19.99	19.78
	1	49	20.33	19.87	19.72	19.59	19.20	19.00
	25	0	20.36	19.98	19.85	20.08	19.63	19.45
	25	12	20.33	19.96	19.84	20.30	19.85	19.65
	25	25	20.38	19.98	19.90	20.05	19.67	19.49
	50	0	20.36	19.94	19.84	19.99	19.61	19.43

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55315	Mid CH 55990	High CH 56665	Low CH 55315	Mid CH 55990	High CH 56665
			3557.5 MHz	3625 MHz	3692.5 MHz	3557.5 MHz	3625 MHz	3692.5 MHz
48 / 15M	1	0	19.28	18.93	18.72	18.96	18.63	18.39
	1	37	**19.77**	19.05	18.80	19.23	19.79	19.51
	1	74	19.33	18.99	18.83	18.92	18.66	18.44
	36	0	19.46	19.43	19.02	19.60	19.32	19.05
	36	19	19.41	19.44	19.15	**19.95**	19.67	19.39
	36	39	19.42	19.41	19.13	19.57	19.30	19.06
	75	0	18.39	18.06	17.92	18.35	18.05	17.95

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55340	Mid CH 55990	High CH 56640	Low CH 55340	Mid CH 55990	High CH 56640
			3560 MHz	3625 MHz	3690 MHz	3560 MHz	3625 MHz	3690 MHz
48 / 20M	1	0	**20.88**	20.44	20.26	**20.57**	20.08	19.95
	1	50	20.71	20.24	20.22	19.97	19.62	19.44
	1	99	20.62	20.29	20.17	20.55	20.00	19.97
	50	0	20.33	19.87	19.62	20.21	19.91	19.52
	50	25	20.18	19.82	19.72	20.04	19.62	19.55
	50	50	20.25	19.81	19.70	20.26	19.79	19.71
	100	0	17.55	17.16	17.02	17.55	17.16	17.04

EIRP Power / Per 10M

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55265	Mid CH 55990	High CH 56715	Low CH 55265	Mid CH 55990	High CH 56715
			3552.5 MHz	3625 MHz	3697.5 MHz	3552.5 MHz	3625 MHz	3697.5 MHz
48 / 5M	1	0	20.62	20.18	19.99	20.29	20.17	19.69
	1	12	**20.87**	20.33	20.10	**20.69**	20.51	20.04
	1	24	20.68	20.22	20.01	20.38	20.12	19.72
	12	0	20.49	20.06	19.89	20.50	20.35	19.86
	12	6	20.52	20.02	19.91	20.61	20.44	19.99
	12	13	20.40	20.09	19.86	20.47	20.30	19.85
	25	0	20.57	20.10	19.90	20.52	20.28	19.87

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55290	Mid CH 55990	High CH 56690	Low CH 55290	Mid CH 55990	High CH 56690
			3555 MHz	3625 MHz	3695 MHz	3555 MHz	3625 MHz	3695 MHz
48 / 10M	1	0	20.43	19.95	19.80	19.77	19.29	19.11
	1	24	**20.54**	20.09	19.92	**20.46**	20.13	19.92
	1	49	20.47	20.01	19.86	19.73	19.34	19.14
	25	0	20.50	20.12	19.99	20.22	19.77	19.59
	25	12	20.47	20.10	19.98	20.44	19.99	19.79
	25	25	20.52	20.12	20.04	20.19	19.81	19.63
	50	0	20.50	20.08	19.98	20.13	19.75	19.57

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55315	Mid CH 55990	High CH 56665	Low CH 55315	Mid CH 55990	High CH 56665
			3557.5 MHz	3625 MHz	3692.5 MHz	3557.5 MHz	3625 MHz	3692.5 MHz
48 / 15M	1	0	19.42	19.07	18.86	19.10	18.77	18.53
	1	37	**19.91**	19.19	18.94	19.37	19.93	19.65
	1	74	19.47	19.13	18.97	19.06	18.80	18.58
	36	0	19.60	19.57	19.16	19.74	19.46	19.19
	36	19	19.55	19.58	19.29	**20.09**	19.81	19.53
	36	39	19.56	19.55	19.27	19.71	19.44	19.20
	75	0	18.53	18.20	18.06	18.49	18.19	18.09

*EIRP = Conducted + antenna gain.

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55340	Mid CH 55990	High CH 56640	Low CH 55340	Mid CH 55990	High CH 56640
			3560 MHz	3625 MHz	3690 MHz	3560 MHz	3625 MHz	3690 MHz
48 / 20M	1	0	**21.02**	20.58	20.40	**20.71**	20.22	20.09
	1	50	20.85	20.38	20.36	20.11	19.76	19.58
	1	99	20.76	20.43	20.31	20.69	20.14	20.11
	50	0	20.47	20.01	19.76	20.35	20.05	19.66
	50	25	20.32	19.96	19.86	20.18	19.76	19.69
	50	50	20.39	19.95	19.84	20.40	19.93	19.85
	100	0	17.69	17.30	17.16	17.69	17.30	17.18

*EIRP = Conducted + antenna gain.

Conducted Output Power (dBm) / Full Power

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55265	55990	56715	55265	55990	56715
			3552.5 MHz	3625 MHz	3697.5 MHz	3552.5 MHz	3625 MHz	3697.5 MHz
48 / 5M	1	0	20.48	20.04	19.85	20.15	20.03	19.55
	1	12	**20.73**	20.19	19.96	**20.55**	20.37	19.90
	1	24	20.54	20.08	19.87	20.24	19.98	19.58
	12	0	20.35	19.92	19.75	20.36	20.21	19.72
	12	6	20.38	19.88	19.77	20.47	20.30	19.85
	12	13	20.26	19.95	19.72	20.33	20.16	19.71
	25	0	20.43	19.96	19.76	20.38	20.14	19.73

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55290	55990	56690	55290	55990	56690
			3555 MHz	3625 MHz	3695 MHz	3555 MHz	3625 MHz	3695 MHz
48 / 10M	1	0	20.29	19.81	19.66	19.63	19.15	18.97
	1	24	**20.40**	19.95	19.78	**20.32**	19.99	19.78
	1	49	20.33	19.87	19.72	19.59	19.20	19.00
	25	0	20.36	19.98	19.85	20.08	19.63	19.45
	25	12	20.33	19.96	19.84	20.30	19.85	19.65
	25	25	20.38	19.98	19.90	20.05	19.67	19.49
	50	0	20.36	19.94	19.84	19.99	19.61	19.43

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55315	55990	56665	55315	55990	56665
			3557.5 MHz	3625 MHz	3692.5 MHz	3557.5 MHz	3625 MHz	3692.5 MHz
48 / 15M	1	0	19.68	18.93	18.72	18.96	18.63	18.39
	1	37	**19.82**	19.11	18.99	19.25	19.79	19.51
	1	74	19.77	19.02	18.83	18.92	18.66	18.44
	36	0	19.52	19.43	19.02	19.60	19.32	19.05
	36	19	19.44	19.77	19.01	**19.95**	19.67	19.39
	36	39	19.60	19.41	18.89	19.57	19.30	19.06
	75	0	19.52	19.46	19.05	19.56	19.32	19.04

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55340	Mid CH 55990	High CH 56640	Low CH 55340	Mid CH 55990	High CH 56640
			3560 MHz	3625 MHz	3690 MHz	3560 MHz	3625 MHz	3690 MHz
48 / 20M	1	0	**20.93**	20.50	20.32	**20.60**	20.15	19.98
	1	50	20.82	20.33	20.16	20.01	19.68	19.50
	1	99	20.88	20.35	20.25	20.59	20.06	20.07
	50	0	20.35	19.94	19.67	20.23	19.85	19.60
	50	25	20.26	19.87	19.66	20.09	19.69	19.60
	50	50	20.22	19.85	19.74	20.30	19.81	19.72
	100	0	20.26	19.92	19.71	20.24	19.87	19.70

EIRP Power / Full Power

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55265	Mid CH 55990	High CH 56715	Low CH 55265	Mid CH 55990	High CH 56715
			3552.5 MHz	3625 MHz	3697.5 MHz	3552.5 MHz	3625 MHz	3697.5 MHz
48 / 5M	1	0	20.62	20.18	19.99	20.29	20.17	19.69
	1	12	**20.87**	20.33	20.10	**20.69**	20.51	20.04
	1	24	20.68	20.22	20.01	20.38	20.12	19.72
	12	0	20.49	20.06	19.89	20.50	20.35	19.86
	12	6	20.52	20.02	19.91	20.61	20.44	19.99
	12	13	20.40	20.09	19.86	20.47	20.30	19.85
	25	0	20.57	20.10	19.90	20.52	20.28	19.87

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55290	Mid CH 55990	High CH 56690	Low CH 55290	Mid CH 55990	High CH 56690
			3555 MHz	3625 MHz	3695 MHz	3555 MHz	3625 MHz	3695 MHz
48 / 10M	1	0	20.43	19.95	19.80	19.77	19.29	19.11
	1	24	**20.54**	20.09	19.92	**20.46**	20.13	19.92
	1	49	20.47	20.01	19.86	19.73	19.34	19.14
	25	0	20.50	20.12	19.99	20.22	19.77	19.59
	25	12	20.47	20.10	19.98	20.44	19.99	19.79
	25	25	20.52	20.12	20.04	20.19	19.81	19.63
	50	0	20.50	20.08	19.98	20.13	19.75	19.57

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55315	Mid CH 55990	High CH 56665	Low CH 55315	Mid CH 55990	High CH 56665
			3557.5 MHz	3625 MHz	3692.5 MHz	3557.5 MHz	3625 MHz	3692.5 MHz
48 / 15M	1	0	19.82	19.07	18.86	19.10	18.77	18.53
	1	37	**19.96**	19.25	19.13	19.39	19.93	19.65
	1	74	19.91	19.16	18.97	19.06	18.80	18.58
	36	0	19.66	19.57	19.16	19.74	19.46	19.19
	36	19	19.58	19.91	19.15	**20.09**	19.81	19.53
	36	39	19.74	19.55	19.03	19.71	19.44	19.20
	75	0	19.66	19.60	19.19	19.70	19.46	19.18

*EIRP = Conducted + antenna gain.

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH 55340	Mid CH 55990	High CH 56640	Low CH 55340	Mid CH 55990	High CH 56640
			3560 MHz	3625 MHz	3690 MHz	3560 MHz	3625 MHz	3690 MHz
48 / 20M	1	0	**21.07**	20.64	20.46	**20.74**	20.29	20.12
	1	50	20.96	20.47	20.30	20.15	19.82	19.64
	1	99	21.02	20.49	20.39	20.73	20.20	20.21
	50	0	20.49	20.08	19.81	20.37	19.99	19.74
	50	25	20.40	20.01	19.80	20.23	19.83	19.74
	50	50	20.36	19.99	19.88	20.44	19.95	19.86
	100	0	20.40	20.06	19.85	20.38	20.01	19.84

*EIRP = Conducted + antenna gain.

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

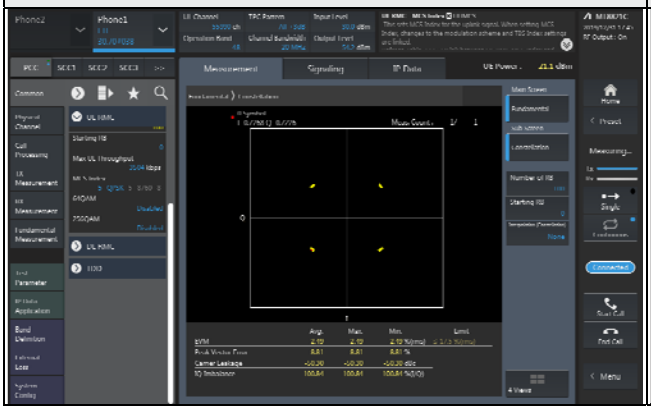
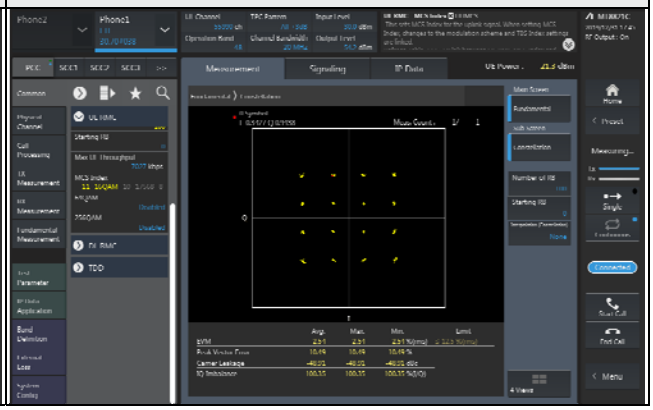
N/A

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 48	
Spectrum Plot of Measurement Value	
Channel: 55990 / Frequency (MHz): 3625.0MHz	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stabiliity Measurement

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

4.3.2 Test Procedure

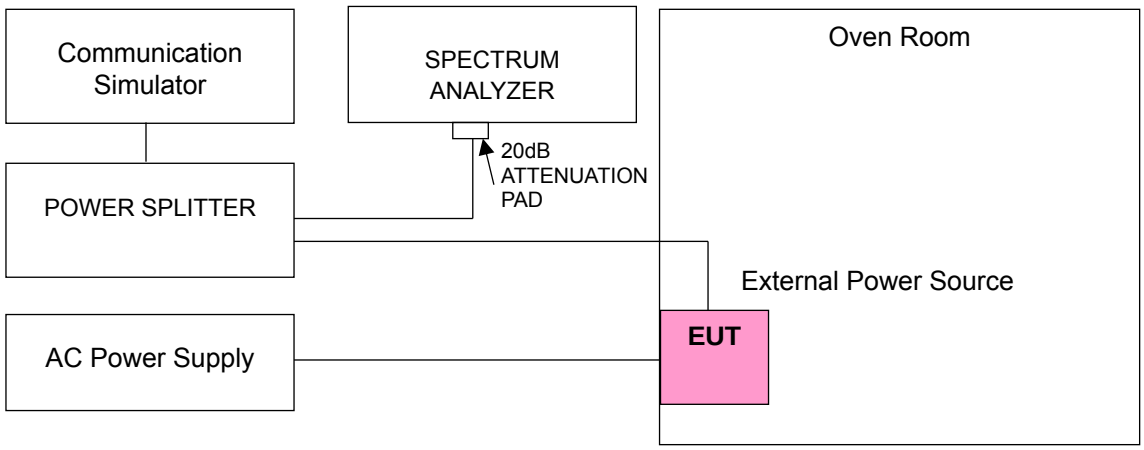
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

b. EUT is connected the external power supply to control the AC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.

c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5 ℃ 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.

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 48, Channel Bandwidth: 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3552.500004	0.001	3697.500003	0.001
-20	3552.500004	0.001	3697.500002	0.001
-10	3552.500004	0.001	3697.500004	0.001
0	3552.500004	0.001	3697.500001	0.000
10	3552.500001	0.000	3697.500002	0.000
20	3552.499999	0.000	3697.499998	-0.001
30	3552.499998	0.000	3697.499996	-0.001
40	3552.499999	0.000	3697.499997	-0.001
50	3552.499999	0.000	3697.499998	-0.001
60	3552.499997	-0.001	3697.499996	-0.001

Temp. (℃)	LTE Band 48, Channel Bandwidth: 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3555.000001	0.000	3695.000001	0.000
-20	3555.000003	0.001	3695.000003	0.001
-10	3555.000001	0.000	3695.000003	0.001
0	3555.000002	0.001	3695.000002	0.001
10	3555.000002	0.001	3695.000002	0.001
20	3554.999997	-0.001	3694.999998	-0.001
30	3554.999998	-0.001	3694.999998	-0.001
40	3554.999998	-0.001	3694.999997	-0.001
50	3554.999996	-0.001	3694.999998	-0.001
60	3554.999999	0.000	3694.999998	0.000

Temp. (℃)	LTE Band 48, Channel Bandwidth: 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3557.500001	0.000	3692.500003	0.001
-20	3557.500002	0.001	3692.500003	0.001
-10	3557.500002	0.001	3692.500001	0.000
0	3557.500003	0.001	3692.500004	0.001
10	3557.500003	0.001	3692.500004	0.001
20	3557.499998	-0.001	3692.499998	-0.001
30	3557.499999	0.000	3692.499999	0.000
40	3557.499998	-0.001	3692.499997	-0.001
50	3557.499997	-0.001	3692.499997	-0.001
60	3557.499999	0.000	3692.499998	0.000

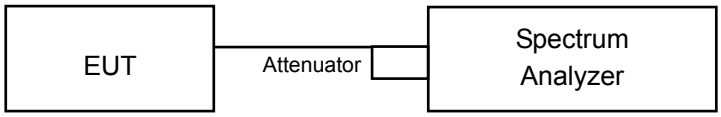
Temp. (℃)	LTE Band 48, Channel Bandwidth: 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3560.000003	0.001	3690.000001	0.000
-20	3560.000002	0.001	3690.000003	0.001
-10	3560.000003	0.001	3690.000001	0.000
0	3560.000001	0.000	3690.000003	0.001
10	3560.000001	0.000	3690.000002	0.000
20	3559.999999	0.000	3689.999999	0.000
30	3559.999997	-0.001	3689.999999	0.000
40	3559.999999	0.000	3689.999998	-0.001
50	3559.999998	-0.001	3689.999997	-0.001
60	3559.999997	-0.001	3689.999997	-0.001

4.4 Emission Bandwidth Measurement

4.4.1 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 Bandwdith:
All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

26dBc Bandwidth:
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 =51 kHz (5 MHz bandwidth), 100 kHz (10 MHz bandwidth), 150 kHz (15 MHz bandwidth), 200 kHz (20 MHz bandwidth). The 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 26 dB below the transmitter power.

4.4.5 Deviation fromTest Standard

No deviation.

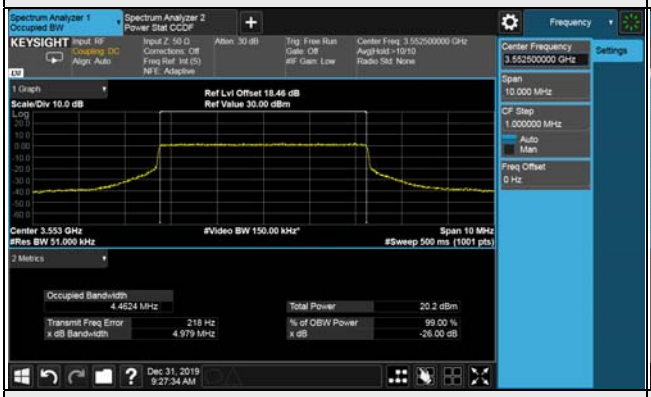
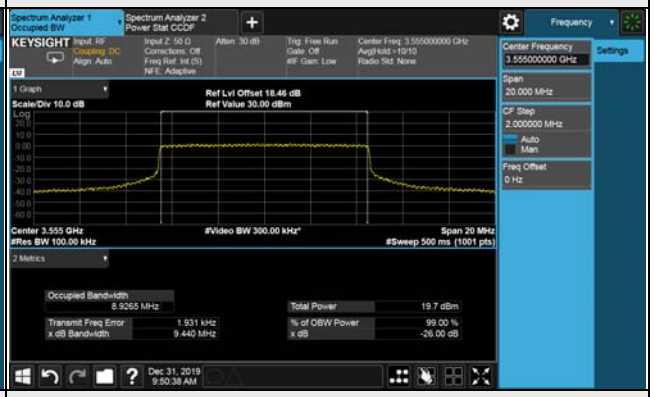
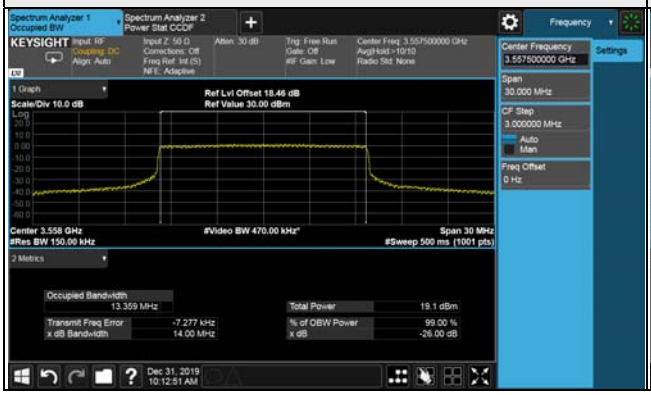
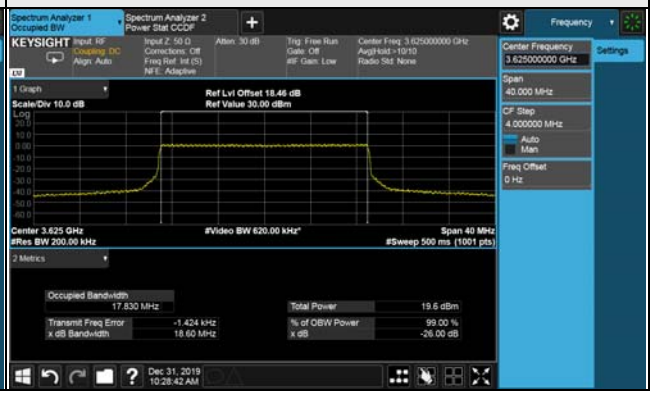
4.4.6 EUT Operating Conditions

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 (-26dB Bandwidth)

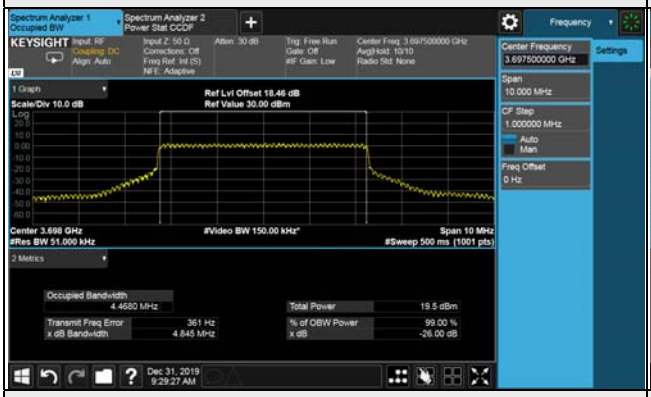
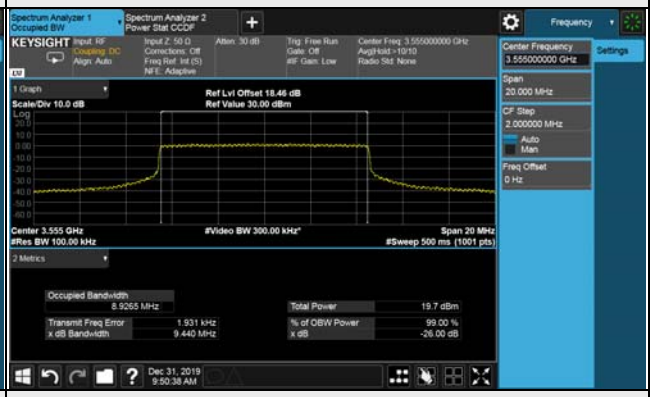
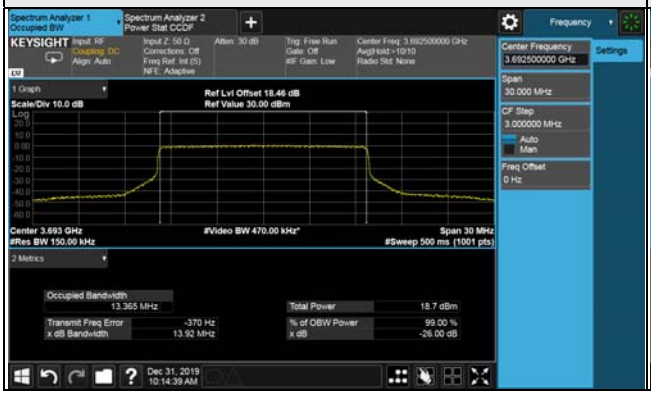
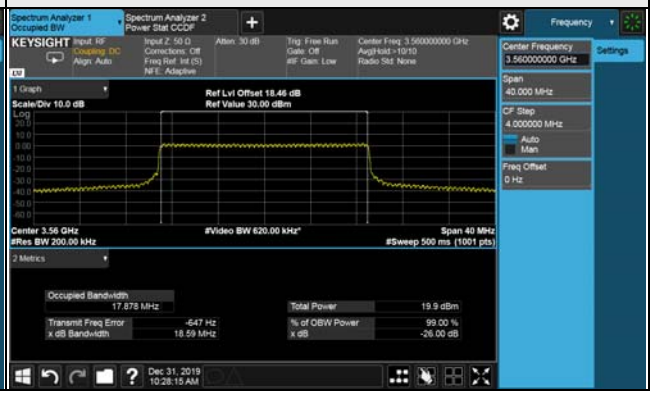
LTE Band 48

LTE Band 48, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55265	3552.5	4.98	4.90
55990	3625.0	4.96	4.90
56715	3697.5	4.90	4.84
LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55290	3555.0	9.44	9.40
55990	3625.0	9.38	9.41
56690	3695.0	9.40	9.34
LTE Band 48, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55315	3557.5	14.00	13.91
55990	3625.0	13.95	13.90
56665	3692.5	13.94	13.92
LTE Band 48, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55340	3560.0	18.59	18.57
55990	3625.0	18.60	18.60
56640	3690.0	18.53	18.56

Spectrum Plot of Worst Value	
5MHz / QPSK	10MHz / QPSK
	
15MHz / QPSK	20MHz / QPSK
	

4.4.8 Test Result (Occupied Bandwidth)

LTE Band 48, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55265	3552.5	4.46	4.45
55990	3625.0	4.46	4.46
56715	3697.5	4.46	4.47
LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55290	3555.0	8.93	8.90
55990	3625.0	8.91	8.90
56690	3695.0	8.92	8.89
LTE Band 48, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55315	3557.5	13.35	13.35
55990	3625.0	13.33	13.37
56665	3692.5	13.33	13.37
LTE Band 48, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55340	3560.0	17.88	17.83
55990	3625.0	17.83	17.83
56640	3690.0	17.83	17.85

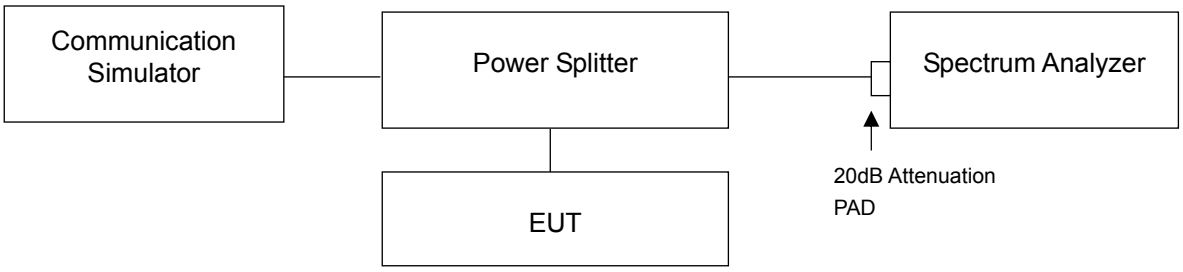
Spectrum Plot of Worst Value	
5MHz / 16QAM	10MHz / QPSK
	
15MHz / 16QAM	20MHz / QPSK
	

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 Procedures

a. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;

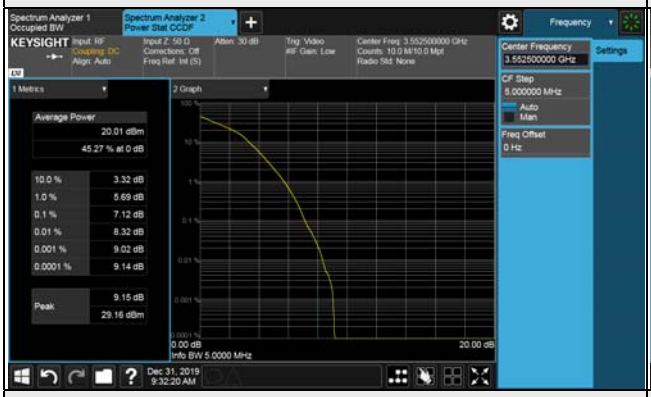
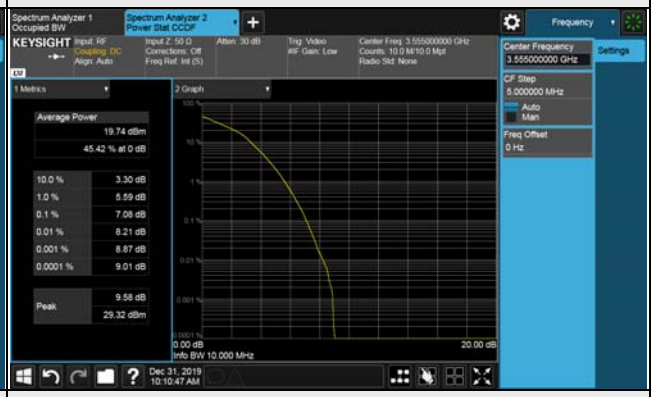
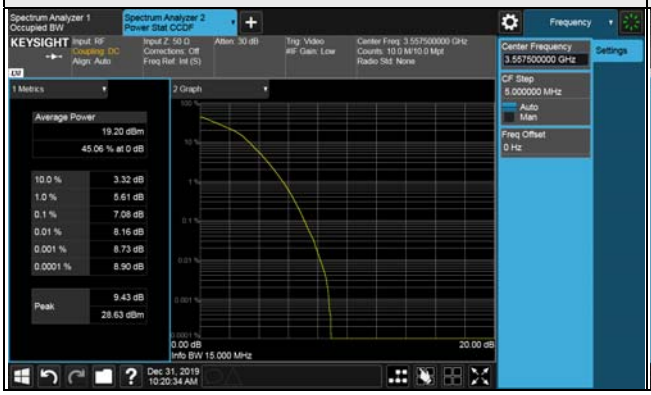
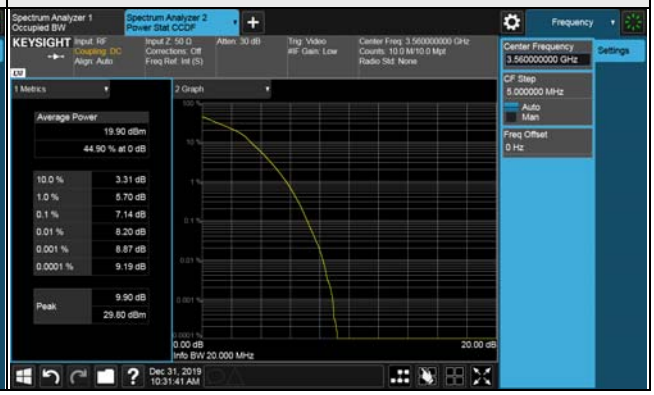
b. Set the number of counts to a value that stabilizes the measured CCDF curve;

c. Record the maximum PAPR level associated with a probability of 0.1%.

4.5.4 Test Results

LTE Band 48

LTE Band 48, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55265	3552.5	7.12	6.45
55990	3625.0	6.93	6.29
56715	3697.5	6.87	6.31
LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55290	3555.0	7.08	6.33
55990	3625.0	6.78	6.17
56690	3695.0	6.91	6.16
LTE Band 48, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55315	3557.5	7.08	6.20
55990	3625.0	6.84	5.99
56665	3692.5	6.90	6.00
LTE Band 48, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55340	3560.0	7.14	6.54
55990	3625.0	6.93	6.23
56640	3690.0	6.85	6.26

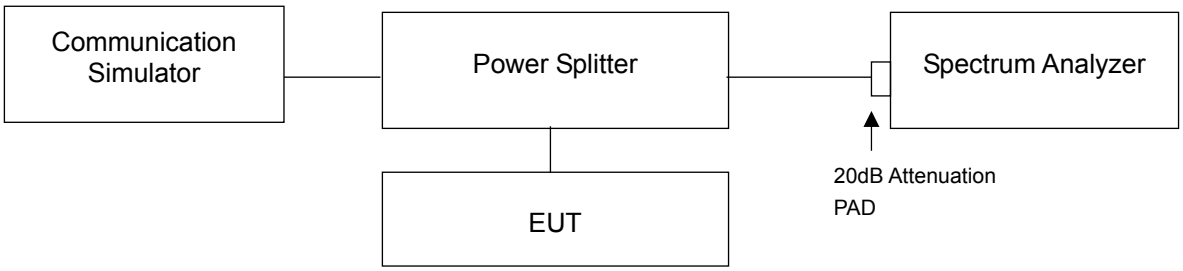
Spectrum Plot of Worst Value	
5MHz / QPSK	10MHz / QPSK
	
15MHz / QPSK	20MHz / QPSK
	

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 0-10MHz above the Assigned Channel	-25 dBm/MHz
Greater than 0-10MHz below the Assigned Channel	
Power of any emission below 3530MHz	-40 dBm/MHz
Power of any emission above 3720MHz	

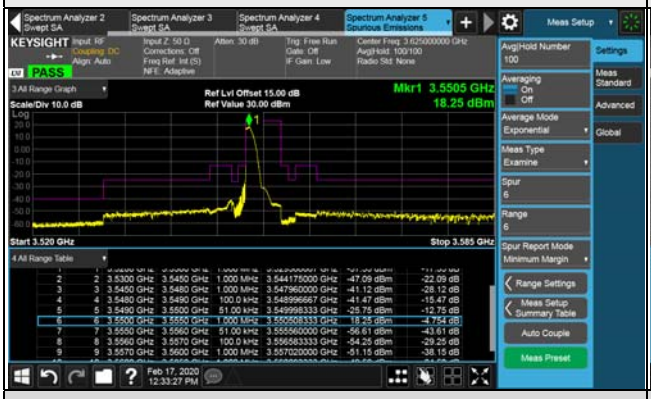
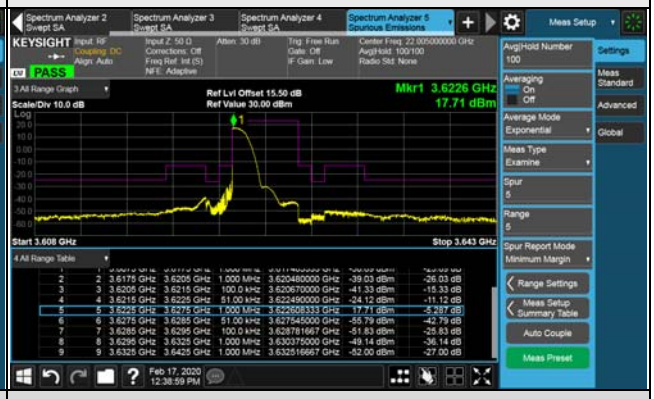
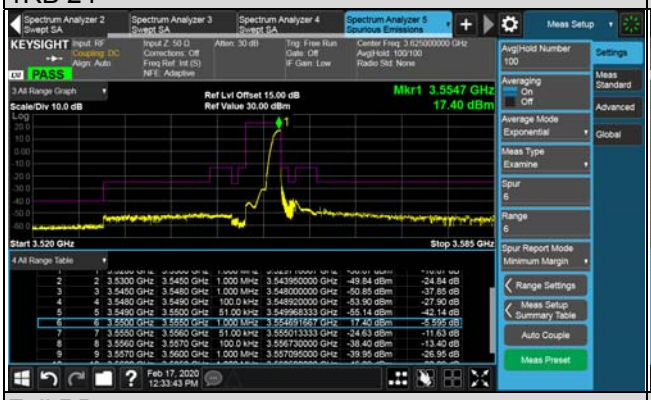
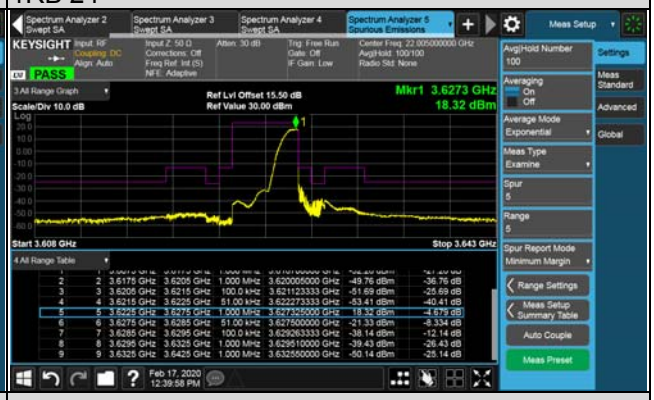
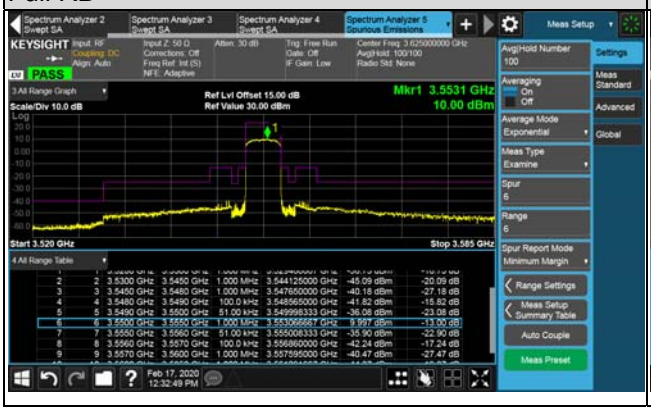
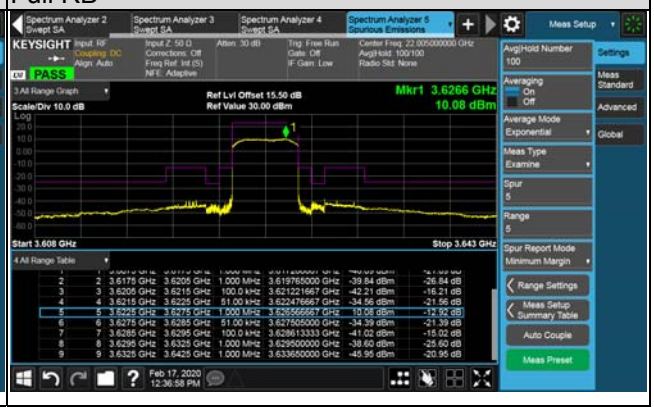
4.6.2 Test Setup

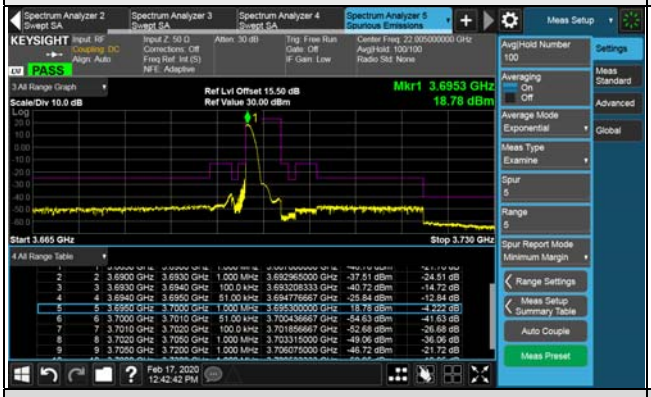
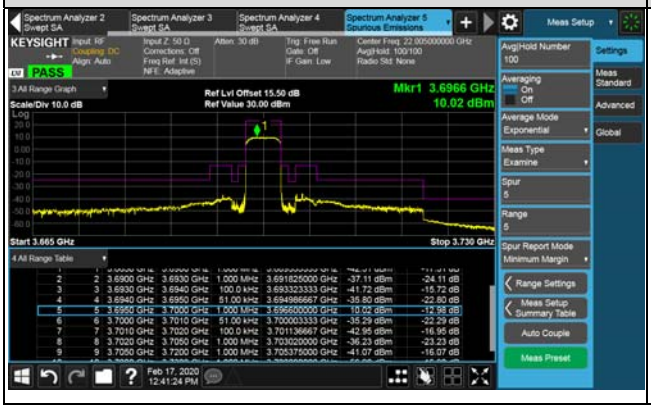


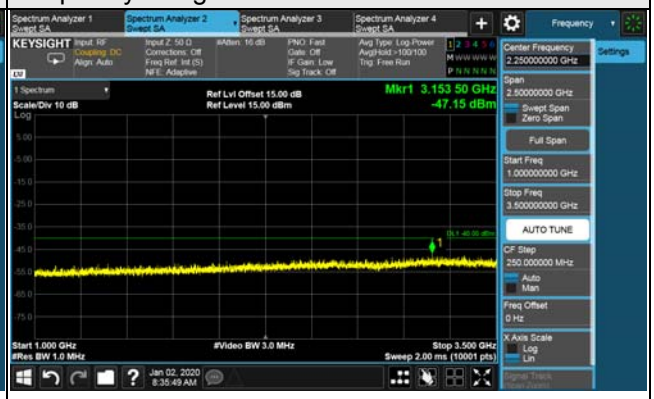
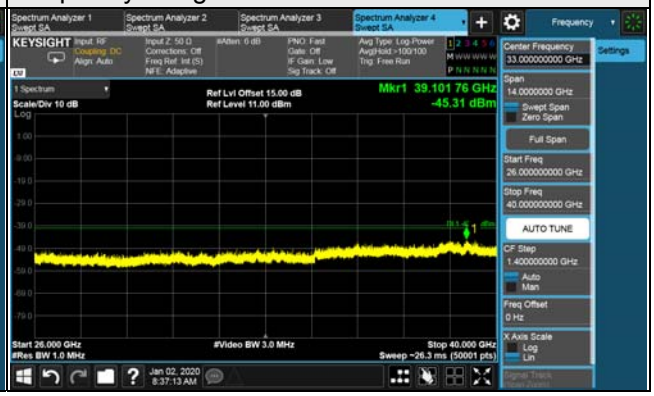
4.6.3 Test Procedure

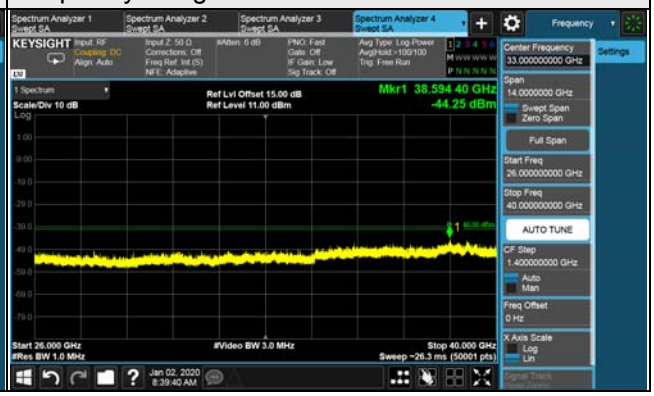
a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9 kHz to 37 GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.
c. Measuring frequency band edge, 20dB attenuation pad is connected with spectrum. 1% of the fundamental emission bandwidth is used for conducted emission measurement.
d. For 5MHz channel BW mode, extend the 1% range form 1M to 2M above and below the channel edge and then reduce the limit further by 10 log (1000/51)=13dB (i.e. total -13 + -13=-26dB) to compensate for the integration from 51k to 1M.

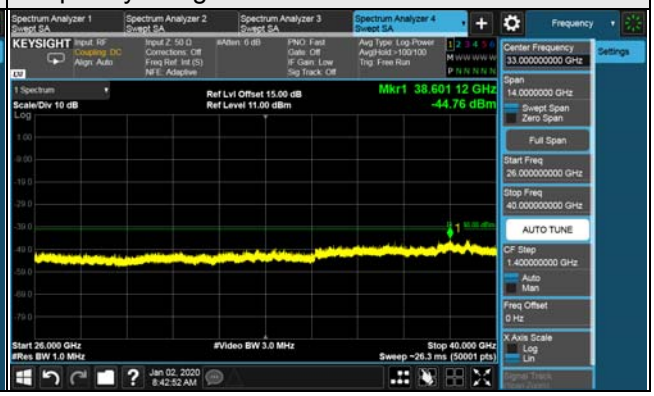
4.6.4 Test Results

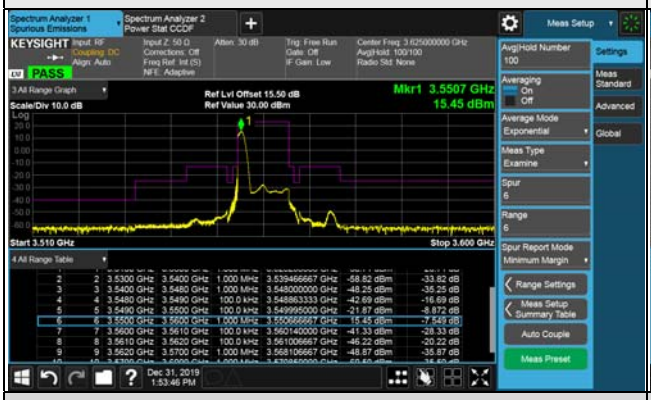
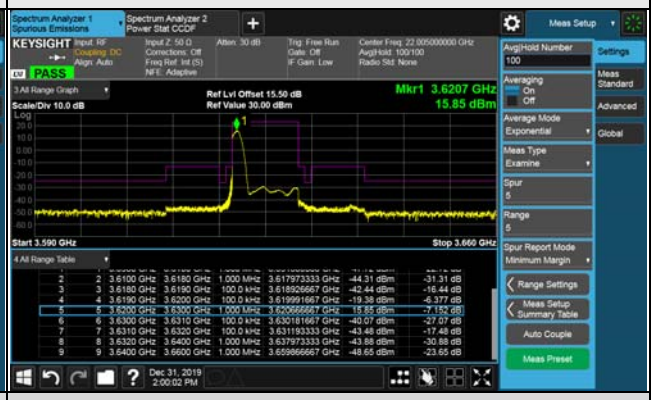
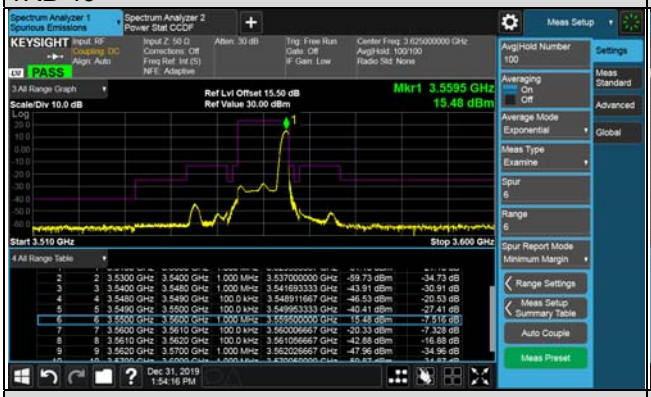
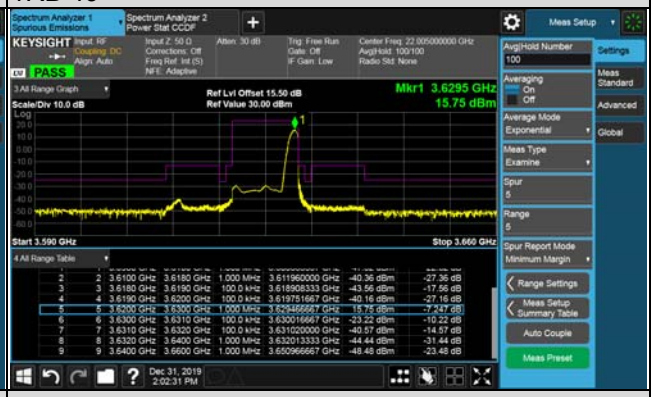
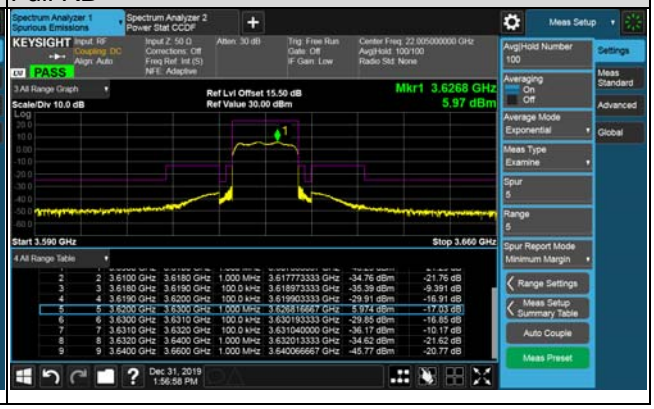
LTE Band 48, Channel Bandwidth 5MHz	
Channel 55265 (3552.5MHz)	Channel 55990 (3625.0MHz)
1RB	1RB
	
1RB 24	1RB 24
	
Full RB	Full RB
	

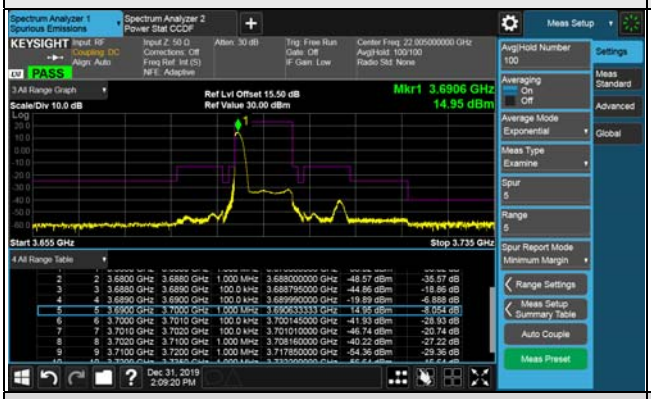
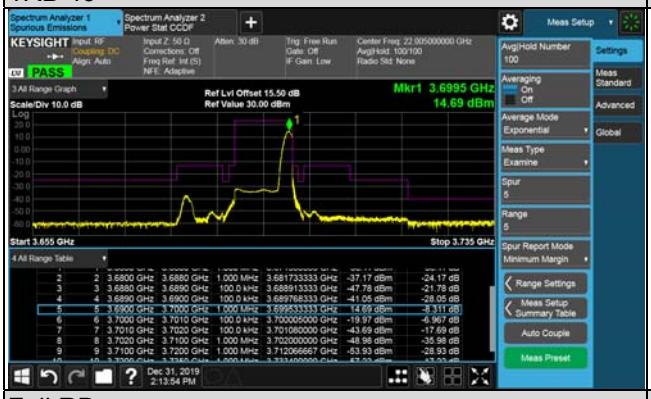
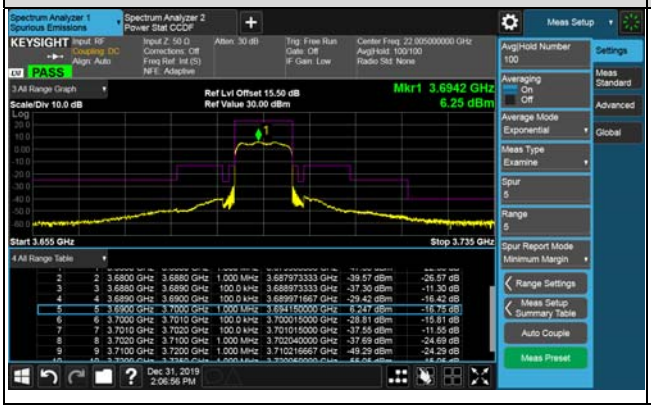
LTE Band 48, Channel Bandwidth 5MHz	
Channel 56715 (3697.5MHz)	
1RB	
	
1RB 24	
	
Full RB	
	

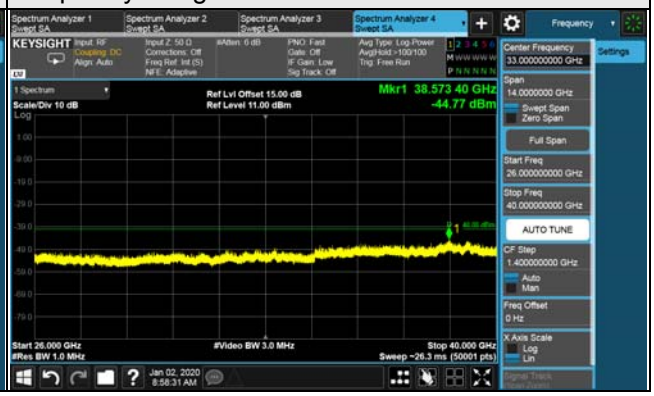
LTE Band 48, Channel Bandwidth 5MHz	
Channel 55265 (3552.5MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

LTE Band 48, Channel Bandwidth 5MHz	
Channel 55990 (3625.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

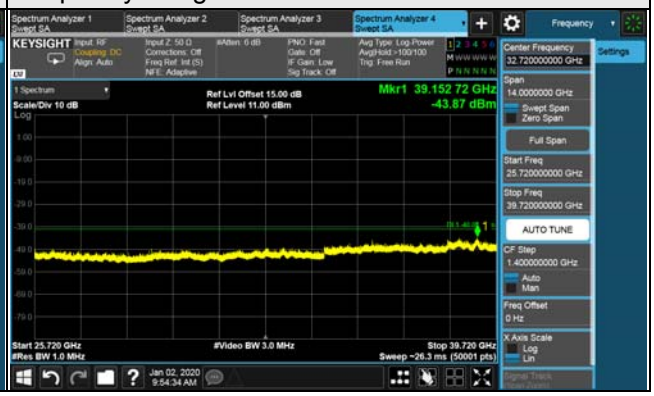
LTE Band 48, Channel Bandwidth 5MHz	
Channel 56715 (3697.50MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

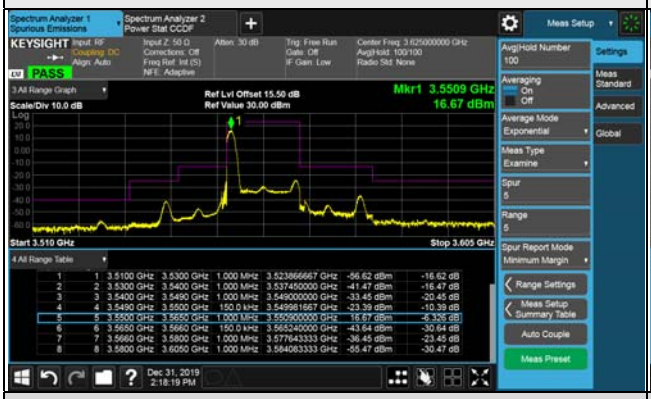
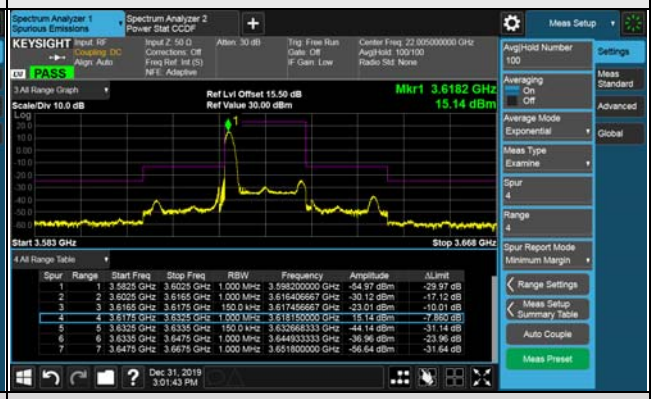
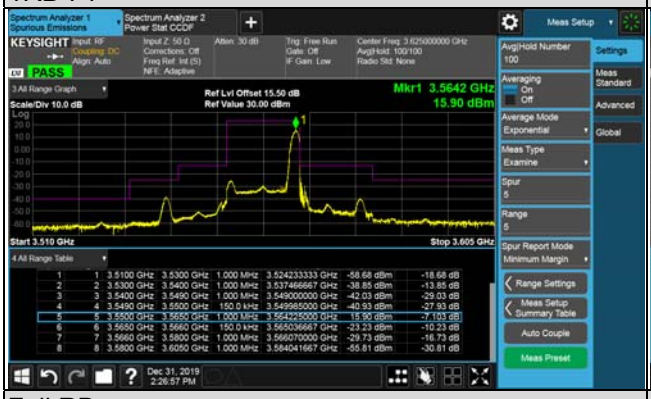
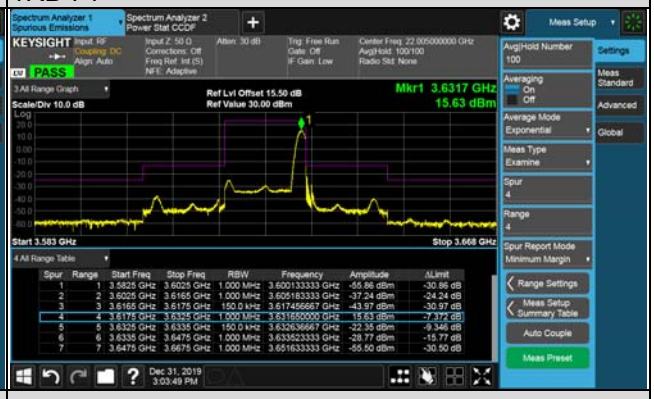
LTE Band 48, Channel Bandwidth 10MHz	
Channel 55290 (3555.0MHz)	Channel 55990 (3625.0MHz)
1RB	1RB
	
1RB 49	1RB 49
	
Full RB	Full RB
	

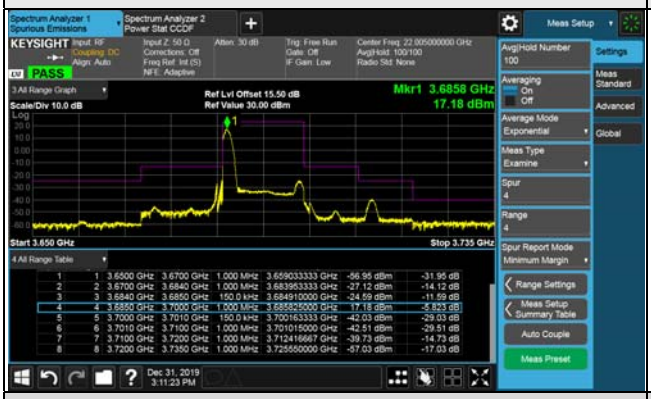
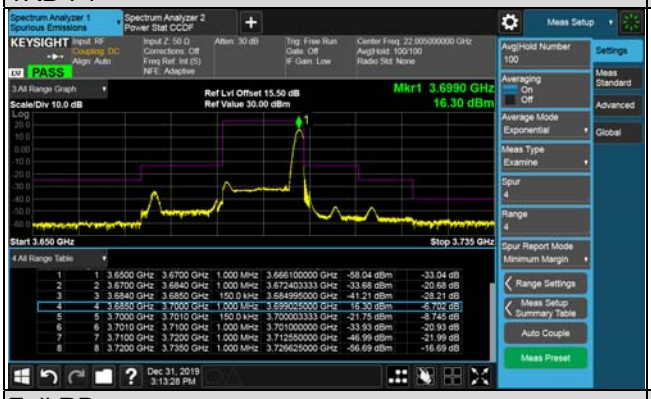
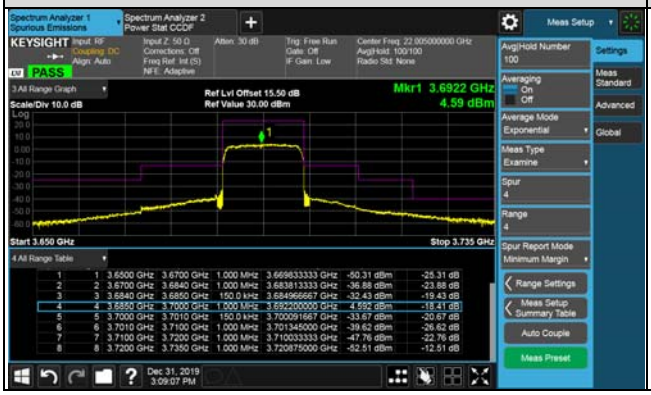
LTE Band 48, Channel Bandwidth 10MHz	
Channel 56690 (3695.0MHz)	
1RB	
	
1RB 49	
	
Full RB	
	

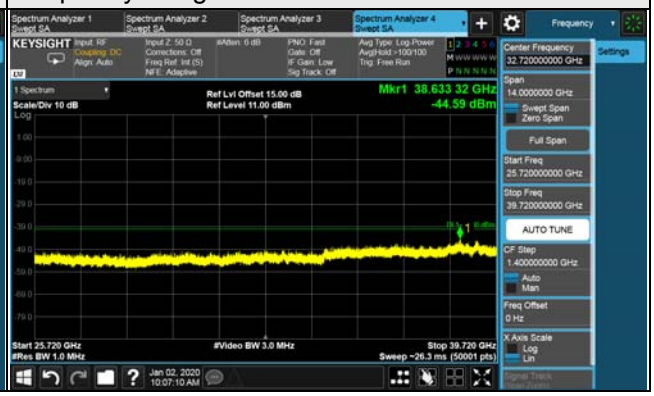
LTE Band 48, Channel Bandwidth 10MHz	
Channel 55290 (3555.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

LTE Band 48, Channel Bandwidth 10MHz	
Channel 55990 (3625.00MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

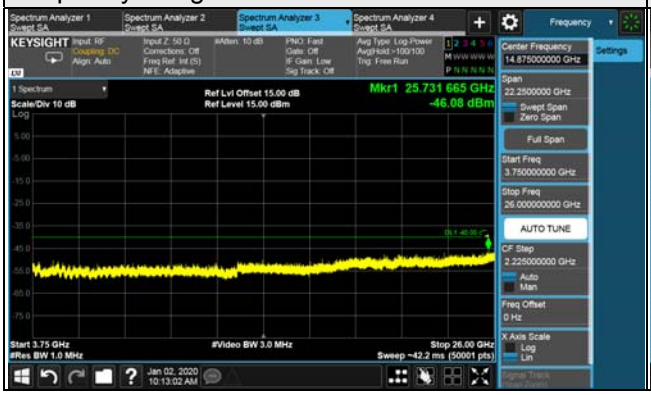
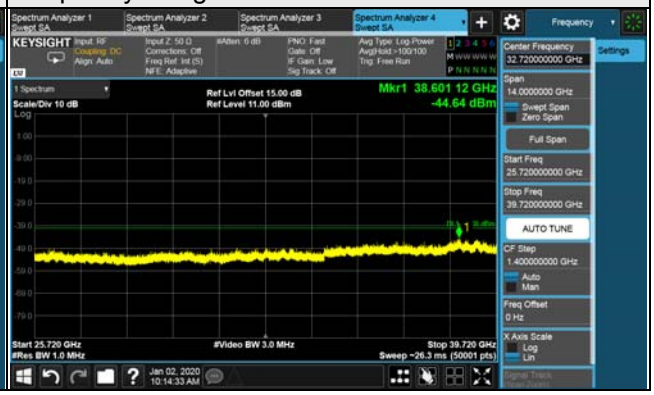
LTE Band 48, Channel Bandwidth 10MHz	
Channel 56690 (3695.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

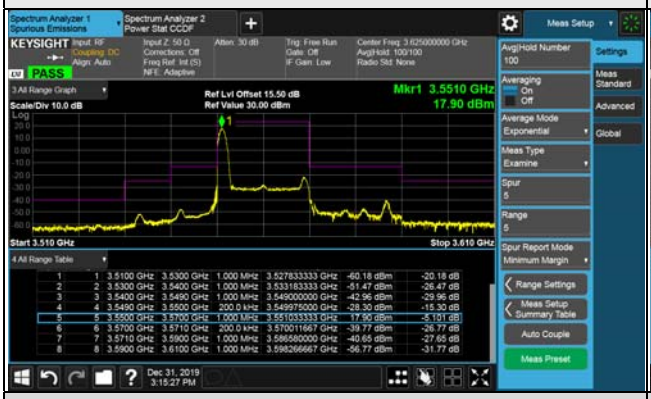
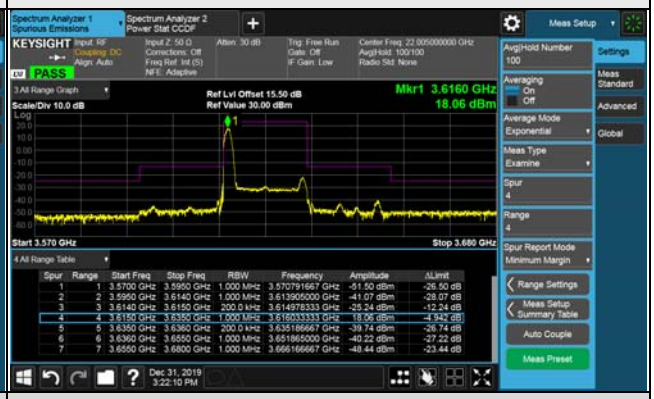
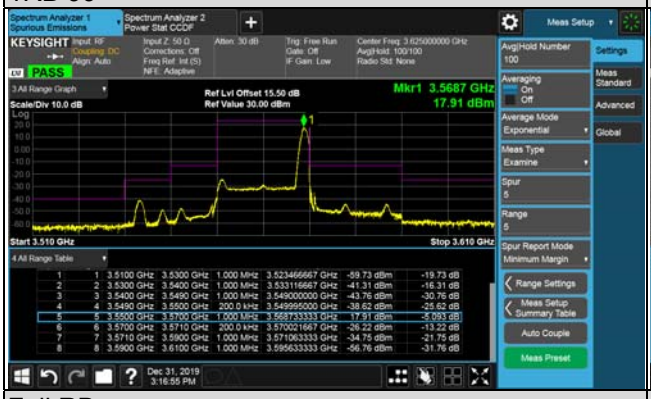
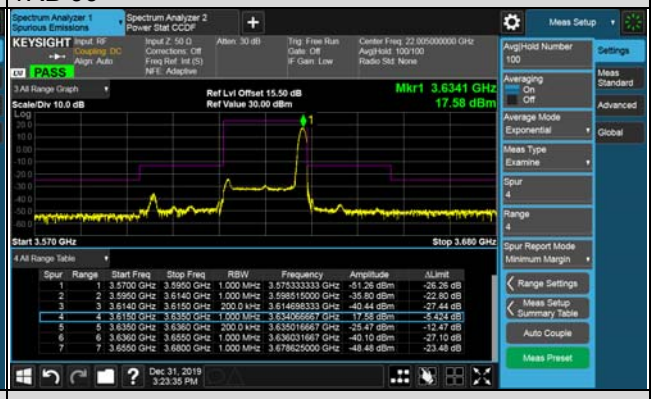
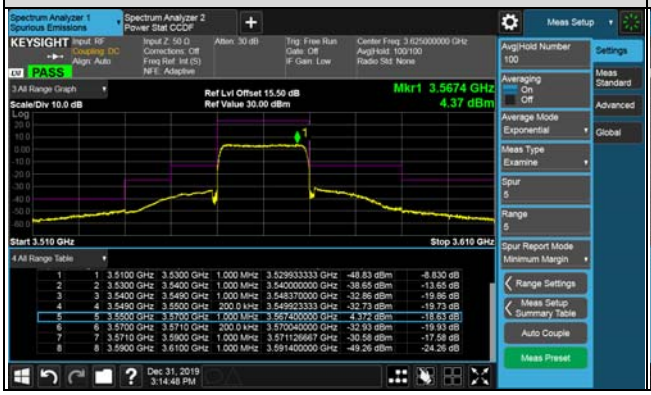
LTE Band 48, Channel Bandwidth 15MHz	
Channel 55315 (3557.50MHz)	Channel 55990 (3625.0MHz)
1RB	1RB
	
1RB 74	1RB 74
	
Full RB	Full RB
	

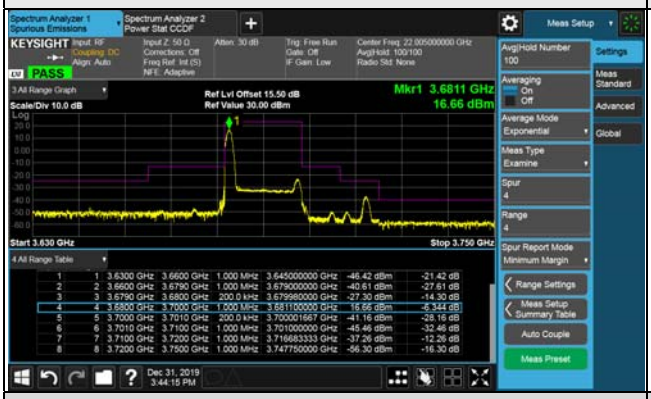
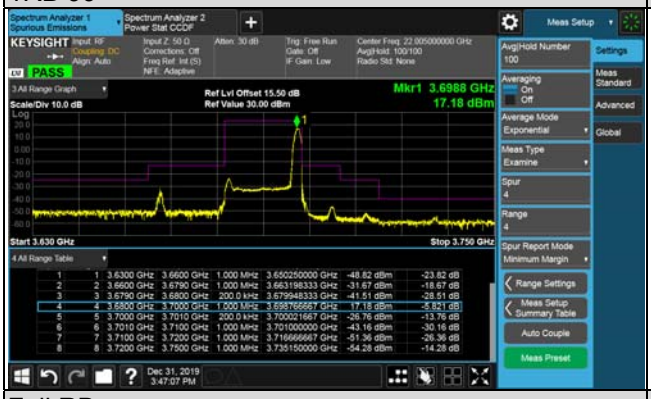
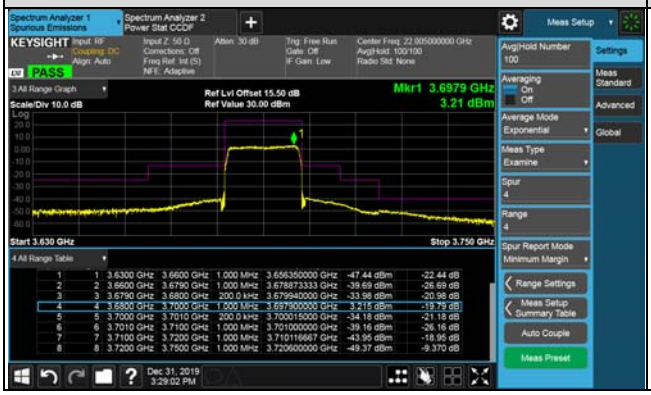
LTE Band 48, Channel Bandwidth 15MHz	
Channel 56665 (3692.5MHz)	
1RB	
	
1RB 74	
	
Full RB	
	

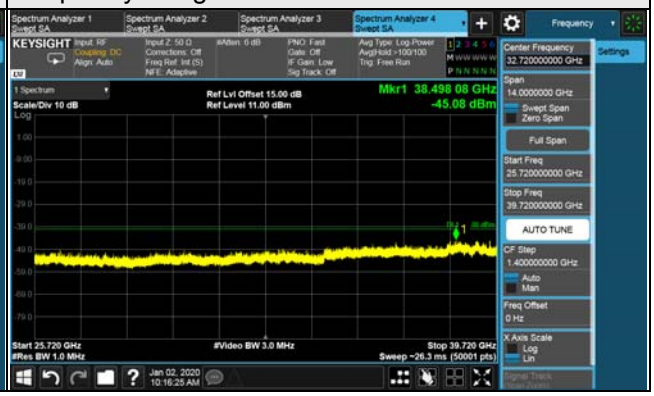
LTE Band 48, Channel Bandwidth 15MHz	
Channel 55315 (3557.50MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

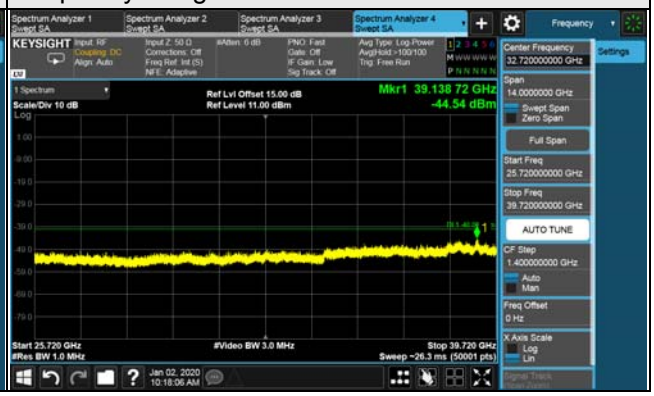
LTE Band 48, Channel Bandwidth 15MHz	
Channel 55990 (3625.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

LTE Band 48, Channel Bandwidth 15MHz	
Channel 56665 (3692.50MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

LTE Band 48, Channel Bandwidth 20MHz	
Channel 55340 (3560.0MHz)	Channel 55990 (3625.0MHz)
1RB	1RB
	
1RB 99	1RB 99
	
Full RB	Full RB
	

LTE Band 48, Channel Bandwidth 20MHz	
Channel 56640 (3690.0MHz)	
1RB	
	
1RB 99	
	
Full RB	
	

LTE Band 48, Channel Bandwidth 20MHz	
Channel 55340 (3560.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

LTE Band 48, Channel Bandwidth 20MHz	
Channel 55990 (3625.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

LTE Band 48, Channel Bandwidth 20MHz	
Channel 56640 (3690.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~3.5GHz
	
Frequency Range : 3.75GHz~26.5GHz	Frequency Range : 26.5GHz~40GHz
	

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 Instruments

Refer to section 4.1.3 to get information of above instrument.

4.7.3 Test Procedures

a. Substitution method is used for EIRP measurement. In the semi-anechoic chamber, EUT placed on the 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for 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.

b. The substitution antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G

c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

d. ERP power can be calculated form EIRP power by subtracting the gain of dipole, ERP power = EIRP power - 2.15dBi.

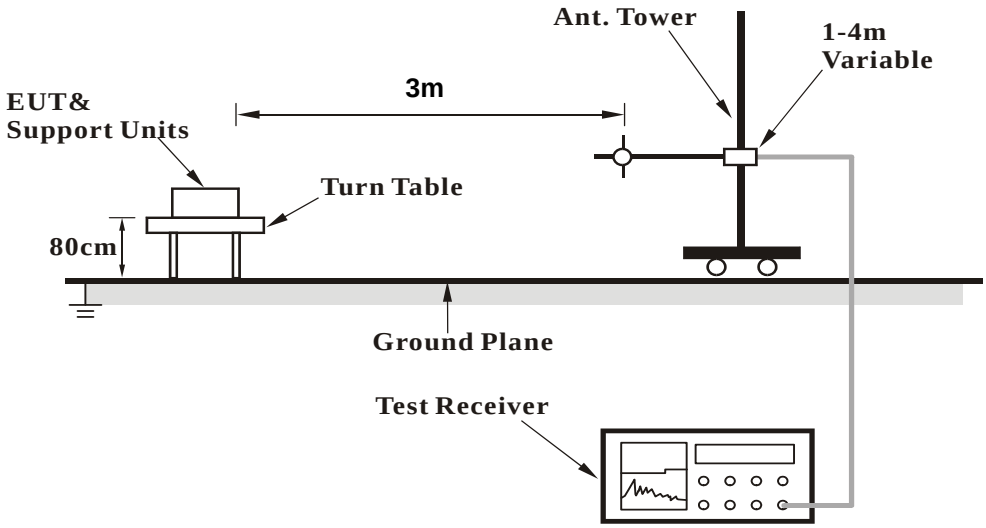
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.7.4 Deviation from Test Standard

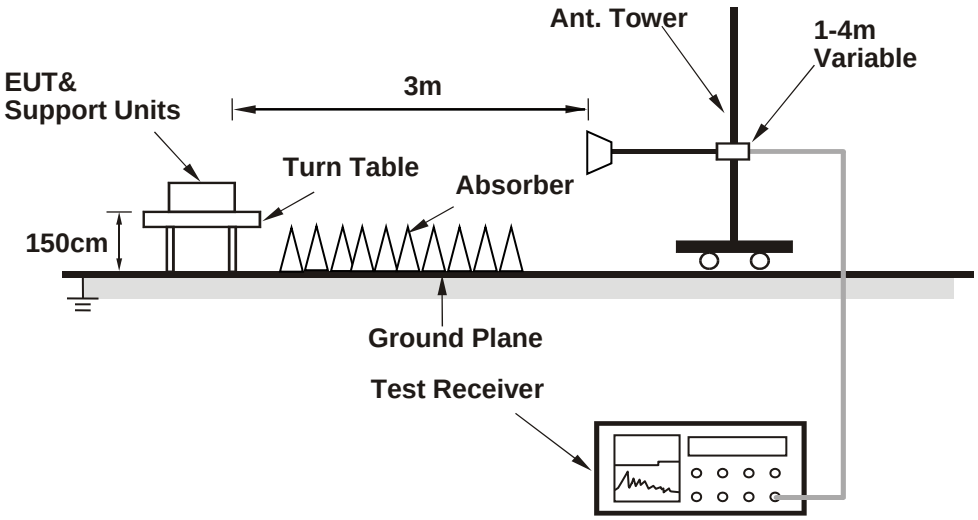
No deviation.

4.7.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.7.6 Test Results

Test was done with 50ohm terminator on antenna port.

Below 1GHz Data：

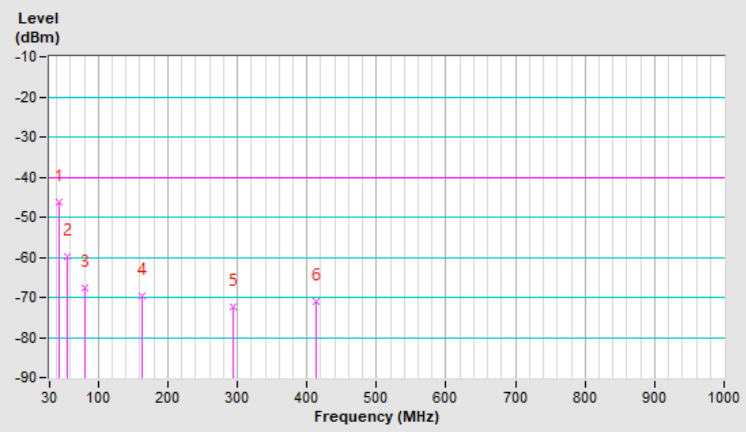
LTE Band 48

Channel Bandwidth: 5 MHz / QPSK

Mode	TX channel 55265 (3552.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	44.55	-47.7	-35.5	-10.9	-46.4	-40.0	-6.4
2	55.22	-57.3	-54.5	-5.4	-59.9	-40.0	-19.9
3	81.41	-62.5	-68.1	0.5	-67.6	-40.0	-27.6
4	162.89	-63.8	-66.7	-2.9	-69.6	-40.0	-29.6
5	293.84	-69.1	-70.5	-1.8	-72.3	-40.0	-32.3
6	414.12	-71.0	-74.5	3.4	-71.1	-40.0	-31.1

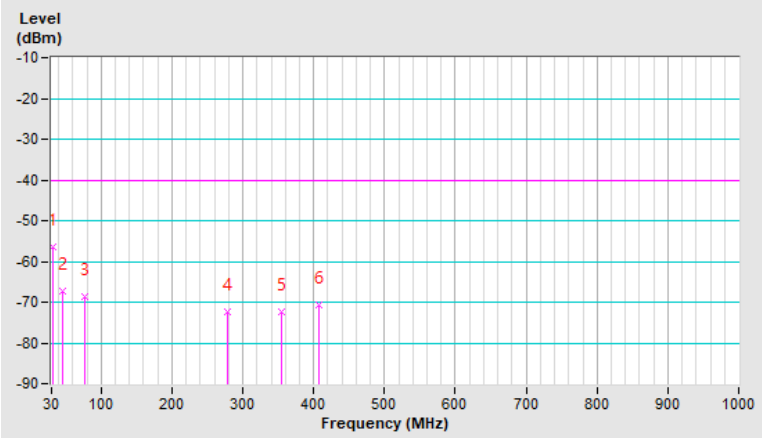
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



Mode	TX channel 55265 (3552.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	31.94	-46.0	-38.2	-18.3	-56.5	-40.0	-16.5
2	45.52	-59.0	-56.9	-10.4	-67.3	-40.0	-27.3
3	76.56	-63.1	-69.1	0.3	-68.8	-40.0	-28.8
4	279.29	-75.8	-70.9	-1.6	-72.5	-40.0	-32.5
5	353.98	-72.1	-76.4	3.9	-72.5	-40.0	-32.5
6	408.30	-70.1	-73.9	3.2	-70.7	-40.0	-30.7

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

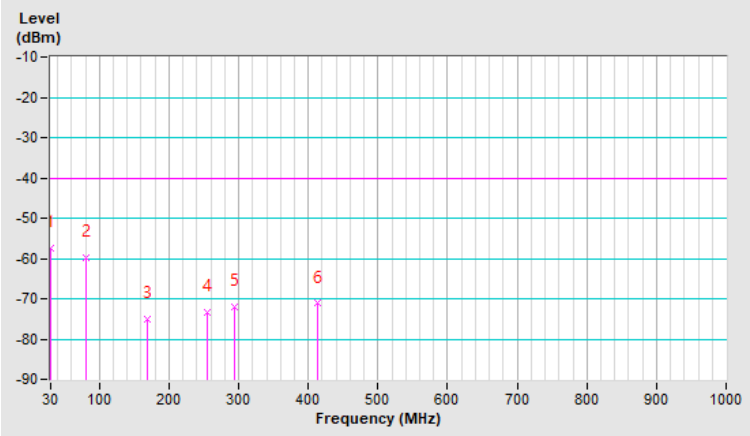


Channel Bandwidth: 20 MHz / QPSK

Mode	TX channel 55340 (3560.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	30.00	-61.3	-37.9	-19.4	-57.3	-40.0	-17.3
2	80.44	-54.8	-60.2	0.5	-59.7	-40.0	-19.7
3	168.71	-68.2	-72.2	-2.8	-75.0	-40.0	-35.0
4	254.07	-68.0	-72.1	-1.4	-73.5	-40.0	-33.5
5	294.81	-68.9	-70.2	-1.8	-72.0	-40.0	-32.0
6	414.12	-71.1	-74.6	3.4	-71.2	-40.0	-31.2

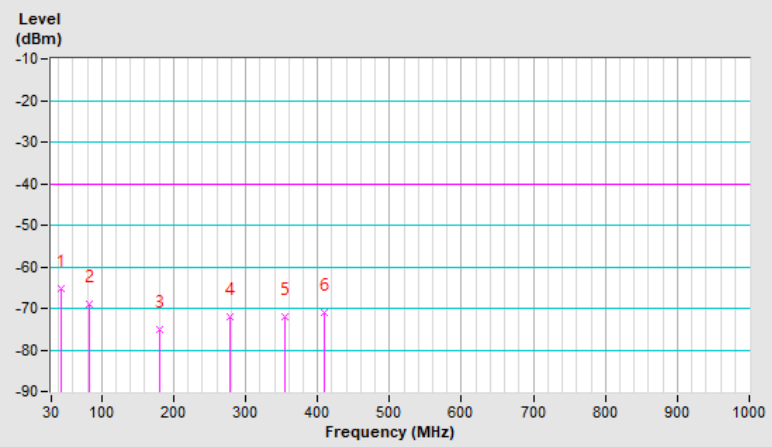
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



Mode	TX channel 55340 (3560.0MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	44.55	-56.7	-54.2	-10.9	-65.1	-40.0	-25.1
2	82.38	-64.5	-69.4	0.4	-69.0	-40.0	-29.0
3	180.35	-71.7	-72.2	-2.9	-75.1	-40.0	-35.1
4	279.29	-75.5	-70.6	-1.6	-72.2	-40.0	-32.2
5	353.98	-71.5	-75.8	3.9	-71.9	-40.0	-31.9
6	409.27	-70.5	-74.2	3.2	-71.0	-40.0	-31.0

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



Above 1GHz

LTE Band 48, Channel Bandwidth 5MHz

Mode	TX channel 55265 (3552.5MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	**7105.00**	**-59.0**	**-40.9**	**0.7**	**-40.2**	**-40.0**	**-0.2**
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7105.00	-58.7	-41.0	0.7	-40.3	-40.0	-0.3

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 55990 (3625.0MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.00	-65.0	-47.2	0.9	-46.3	-40.0	-6.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.00	-62.6	-44.7	0.9	-43.8	-40.0	-3.8

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 56715 (3697.5MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7395.00	-68.8	-50.2	0.9	-49.3	-40.0	-9.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7395.00	-64.4	-46.7	0.9	-45.8	-40.0	-5.8

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340 (3560.0MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7120.00	-59.4	-41.4	0.7	-40.7	-40.0	-0.7
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7120.00	-59.0	-41.3	0.7	-40.6	-40.0	-0.6

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 55990 (3625.00MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.00	-65.4	-47.6	0.9	-46.7	-40.0	-6.7
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.00	-63.2	-45.3	0.9	-44.4	-40.0	-4.4

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 56640 (3690.00MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7380.00	-69.5	-51.0	0.9	-50.1	-40.0	-10.1
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7380.00	-65.4	-47.7	0.9	-46.8	-40.0	-6.8

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

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 accredited and approved according to ISO/IEC 17025.

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

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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.

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