

FCC Test Report (Part 96: LTE Band 48)

Report No.: RF190801D01-1

FCC ID: P27LU211

Test Model: Adventure Wingle LU211

Received Date: Aug. 1, 2019

Test Date: Sep. 18 to 23, 2019

Issued Date: Sep. 26, 2019

Applicant: Sercomm Corp.

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

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Release Control Record

Issue No.	Description	Date Issued
RF190801D01-1	Original release.	Sep. 26, 2019

1 Certificate of Conformity

Product: LTE Wi-Fi Dongle

Brand: Sercomm

Test Model: Adventure Wingle LU211

Sample Status: Engineering sample

Applicant: Sercomm Corp.

Test Date: Sep. 18 to 23, 2019

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 :



Date: Sep. 26, 2019

Celia Chen / Supervisor

Approved by :



Date: Sep. 26, 2019

Rex Lai / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 96			
FCC Clause	Test Item	Result	Remarks
2.1046 96.41(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1046 96.41(b)	Maximum Power Spectral Density	Pass	Meet the requirement of limit.
2.1047 96.41(a)	Digital Modulation Characteristics	Pass	Meet the requirement.
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 -6.73dB at 7245.86MHz.

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

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.42 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	LTE Wi-Fi Dongle			
Brand	Sercomm			
Test Model	Adventure Wingle LU211			
Status of EUT	Engineering sample			
Power Supply Rating	DC 5V from USB interface			
Modulation Type	QPSK, 16QAM			
Operating Frequency	LTE Band 48	Channel Bandwidth 5MHz	3552.5 MHz ~ 3697.5 MHz	
		Channel Bandwidth 10MHz	3555 MHz ~ 3695 MHz	
		Channel Bandwidth 15MHz	3557.5 MHz ~ 3692.5 MHz	
		Channel Bandwidth 20MHz	3560 MHz ~ 3690 MHz	
Max. EIRP Power (dBm / 10MHz)	LTE Band 48		QPSK	16QAM
		Channel Bandwidth 5MHz	144.212mW (21.59dBm)	142.561mW (21.54dBm)
		Channel Bandwidth 10MHz	146.555mW (21.66dBm)	143.549mW (21.57dBm)
		Channel Bandwidth 15MHz	102.565mW (20.11dBm)	103.039mW (20.13dBm)
		Channel Bandwidth 20MHz	82.414mW (19.16dBm)	83.176mW (19.20dBm)
Max. FULL EIRP Power (dBm)	LTE Band 48		QPSK	16QAM
		Channel Bandwidth 5MHz	145.546mW (21.63dBm)	143.219mW (21.56dBm)
		Channel Bandwidth 10MHz	147.231mW (21.68dBm)	144.877mW (21.61dBm)
		Channel Bandwidth 15MHz	146.218mW (21.65dBm)	148.252mW (21.71dBm)
		Channel Bandwidth 20MHz	149.279mW (21.74dBm)	148.594mW (21.72dBm)
Emission Designator	LTE Band 48	Channel Bandwidth 5MHz	4M47G7D	4M47D7W
		Channel Bandwidth 10MHz	8M93G7D	8M93D7W
		Channel Bandwidth 15MHz	13M4G7D	13M4D7W
		Channel Bandwidth 20MHz	17M9G7D	17M9D7W
Antenna Type	Monopole antenna with 3.8dBi gain			
Antenna Connector	N/A			
Accessory Device	N/A			
Data Cable Supplied	N/A			

Note:

1. The EUT provides 1 completed transmitter and 2 receivers.
2. LTE and WiFi technologies cannot transmit at same time.
3. 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
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
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 in 5MHz 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 lowest & highest channel bandwidth (in 5MHz & 20MHz) for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power (System)	Tested By
Maximum Output Power	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee
Frequency Stability	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee
Occupied Bandwidth	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee
Peak to Average Ratio	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee
Condcudeted Emission	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee
Radiated Emission	21deg. C, 73%RH	120Vac, 60Hz	Starltaly 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.

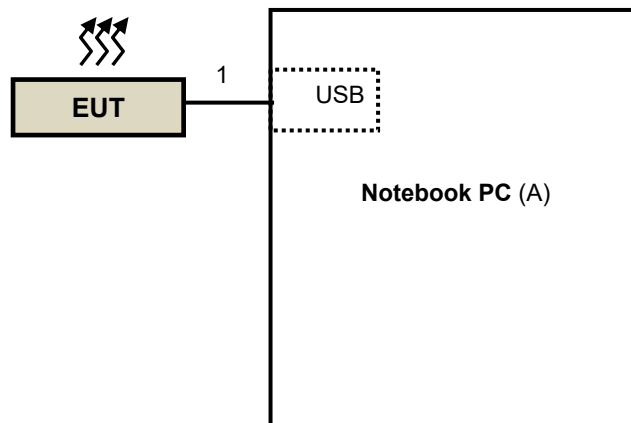
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook PC	Lenovo	80WG	YD01YRC9	N/A	Provided by Lab

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB cable	1	1.0	Y	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s)

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 v03r01

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

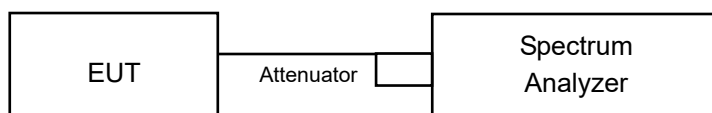
4.1 Maximum Output Power Measurement

4.1.1 Limits of Maximum Output Power Measurement

Device		Maximum Output Power (dBm/10 MHz)
<input checked="" type="checkbox"/>	End User Device	23
<input type="checkbox"/>	Category A CBSD	30
<input type="checkbox"/>	Category B CBSD	47

4.1.2 Test Setup

Conducted Measurement Method



4.1.3 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 20, 2019	Feb. 19, 2020
HP Preamplifier	8449B	3008A01201	Feb. 21, 2019	Feb. 20, 2020
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 20, 2019	Feb. 19, 2020
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 05, 2019	Mar. 04, 2020
Schwarzbeck Antenna	VULB 9168	139	Nov. 26, 2018	Nov. 25, 2019
Schwarzbeck Antenna	VHBA 9123	480	Jun. 3, 2019	Jun. 2, 2021
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 25, 2018	Nov. 24, 2019
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 25, 2018	Nov. 24, 2019
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Jul. 10, 2019	Jul. 9, 2020
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Jul. 10, 2019	Jul. 9, 2020
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 11, 2019	Jun. 10, 2020
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 30, 2019	Jul. 29, 2020
Loop Antenna EMCI	LPA600	270	Aug. 23, 2019	Aug. 22, 2021
EMCO Horn Antenna	3115	00028257	Nov. 25, 2018	Nov. 24, 2019
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
Anritsu Power Sensor	MA2411B	0738404	Apr. 16, 2019	Apr. 15, 2020
Anritsu Power Meter	ML2495A	0842014	Apr. 16, 2019	Apr. 15, 2020
Temperature & Humidity Chamber	MHU-225AU	920409	May 24, 2019	May 23, 2020
DIGITAL POWER METER IDRC	CP-240	240515	Sep. 18, 2019	Sep. 17, 2020
AC Power Source ExTech	CFW-105	E000603	NA	NA
Anritsu Radio Communication Analyzer	MT8821C	6261806803	Jan. 22, 2019	Jan. 21, 2020

- NOTE:** 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.

4.1.4 Test Procedures

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 $\geq 3 \times$ RBW.
5. Set number of points in sweep $\geq 2 \times$ 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 $\geq 98\%$), 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 or channel power measurement function (per 10 MHz), with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
12. Determine the EIRP by adding the effective antenna gain to the adjusted power level.

Maximum EIRP

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

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

where

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

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

G_{T} gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.5 Deviation from Test Standard

No deviation.

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

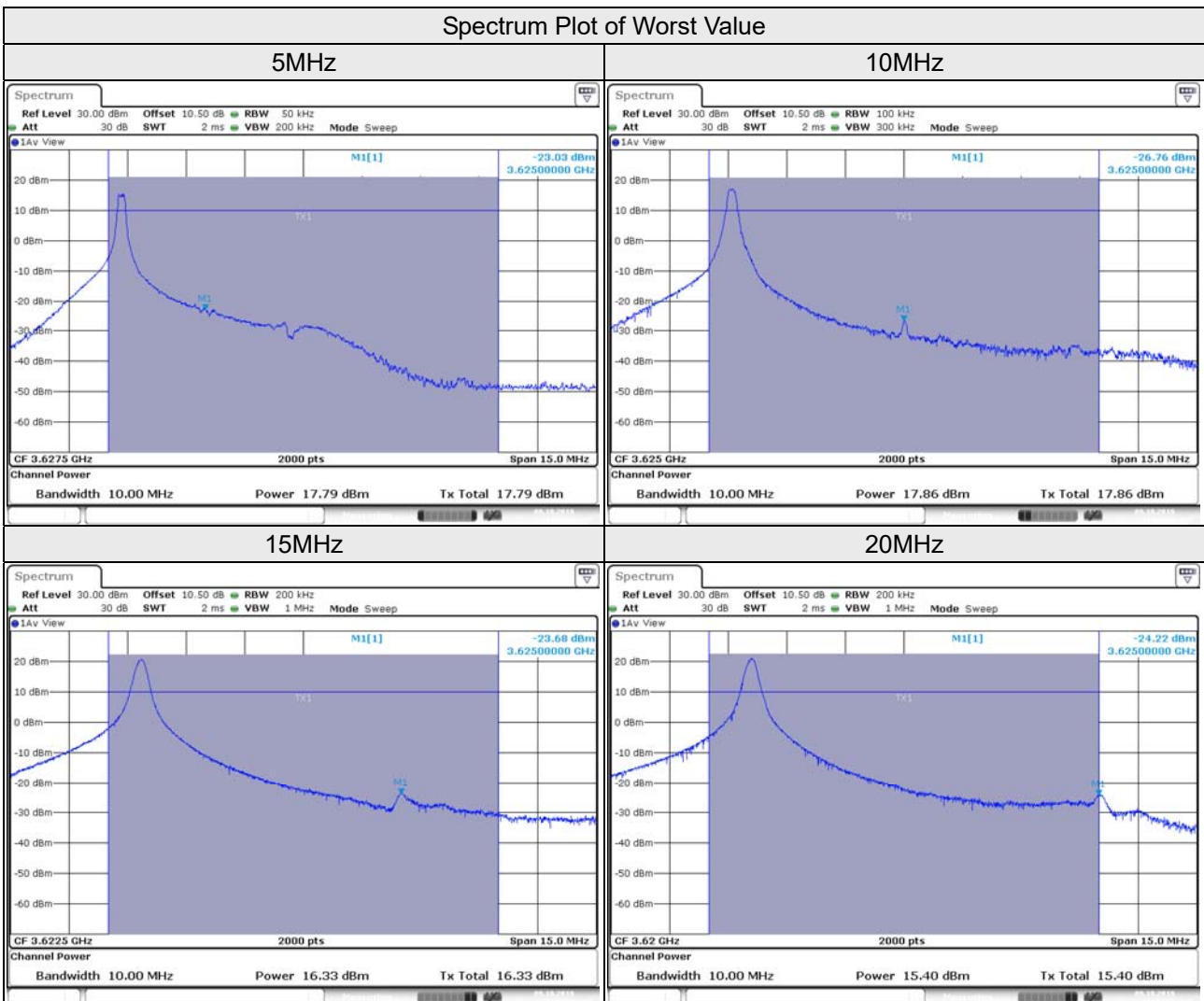
Conducted Output Power (dBm / 10MHz)

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55265	55990	56715	55265	55990	56715
			3552.5	3625	3697.5	3552.5	3625	3697.5
			MHz	MHz	MHz	MHz	MHz	MHz
48 / 5M	1	0	17.30	17.79	17.79	17.18	17.74	17.14
	1	12	16.75	17.34	17.34	16.91	17.34	16.82
	1	24	16.88	17.64	17.64	16.92	17.61	16.85
	12	0	16.98	17.50	17.50	16.96	17.61	16.92
	12	6	16.71	17.37	17.37	16.82	17.54	16.89
	12	13	16.94	17.60	17.60	16.75	17.37	16.80
	25	0	16.73	17.40	17.40	16.74	17.32	16.84

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	3625	3695	3555	3625	3695
			MHz	MHz	MHz	MHz	MHz	MHz
48 / 10M	1	0	17.19	17.86	17.10	17.07	17.77	17.06
	1	24	16.82	17.39	16.61	16.91	17.44	16.84
	1	49	16.85	17.59	16.91	16.90	17.52	16.91
	25	0	16.99	17.46	16.85	16.86	17.56	16.94
	25	12	16.79	17.37	16.68	16.86	17.48	16.83
	25	25	16.90	17.37	16.79	16.80	17.35	16.76
	50	0	16.93	17.51	16.84	16.84	17.40	16.75

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	3625	3692.5	3557.5	3625	3692.5
			MHz	MHz	MHz	MHz	MHz	MHz
48 / 15M	1	0	15.68	16.31	15.66	15.70	16.33	15.69
	1	37	15.25	15.82	15.21	15.38	15.96	15.41
	1	74	15.51	16.17	15.51	15.53	16.03	15.46
	36	0	15.54	16.06	15.44	15.50	16.10	15.47
	36	19	15.30	15.94	15.35	15.34	16.01	15.34
	36	39	15.41	16.02	15.46	15.33	15.96	15.27
	75	0	15.39	15.99	15.31	15.32	16.04	15.41

Band / BW	RB Size	RB Offset	QPSK			16QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55340	55990	56640	55340	55990	56640
			3560	3625	3690	3560	3625	3690
			MHz	MHz	MHz	MHz	MHz	MHz
48 / 20M	1	0	14.80	15.36	14.72	14.70	15.40	14.77
	1	50	14.34	14.93	14.26	14.43	15.11	14.42
	1	99	14.55	15.14	14.53	14.52	15.14	14.49
	50	0	14.54	15.10	14.53	14.55	15.13	14.51
	50	25	14.42	14.97	14.37	14.47	15.06	14.40
	50	50	14.42	15.10	14.40	14.37	14.99	14.38
	100	0	14.40	15.07	14.40	14.47	15.05	14.41



EIRP Power (dBm / 10MHz)

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	21.10	21.59	21.59	20.98	21.54	20.94
	1	12	20.55	21.14	21.14	20.71	21.14	20.62
	1	24	20.68	21.44	21.44	20.72	21.41	20.65
	12	0	20.78	21.30	21.30	20.76	21.41	20.72
	12	6	20.51	21.17	21.17	20.62	21.34	20.69
	12	13	20.74	21.40	21.40	20.55	21.17	20.60
	25	0	20.53	21.20	21.20	20.54	21.12	20.64
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	20.99	21.66	20.90	20.87	21.57	20.86
	1	24	20.62	21.19	20.41	20.71	21.24	20.64
	1	49	20.65	21.39	20.71	20.70	21.32	20.71
	25	0	20.79	21.26	20.65	20.66	21.36	20.74
	25	12	20.59	21.17	20.48	20.66	21.28	20.63
	25	25	20.70	21.17	20.59	20.60	21.15	20.56
	50	0	20.73	21.31	20.64	20.64	21.20	20.55
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	19.48	20.11	19.46	19.50	20.13	19.49
	1	37	19.05	19.62	19.01	19.18	19.76	19.21
	1	74	19.31	19.97	19.31	19.33	19.83	19.26
	36	0	19.34	19.86	19.24	19.30	19.90	19.27
	36	19	19.10	19.74	19.15	19.14	19.81	19.14
	36	39	19.21	19.82	19.26	19.13	19.76	19.07
	75	0	19.19	19.79	19.11	19.12	19.84	19.21
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	18.60	19.16	18.52	18.50	19.20	18.57
	1	50	18.14	18.73	18.06	18.23	18.91	18.22
	1	99	18.35	18.94	18.33	18.32	18.94	18.29
	50	0	18.34	18.90	18.33	18.35	18.93	18.31
	50	25	18.22	18.77	18.17	18.27	18.86	18.20
	50	50	18.22	18.90	18.20	18.17	18.79	18.18
	100	0	18.20	18.87	18.20	18.27	18.85	18.21

Note: EIRP (dBm / 10MHz) = Conducted Output Power (dBm / 10MHz) + Antenna Gain (3.8dBi)

FULL EIRP Power (dBm)

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	
			Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP
48 / 5M	1	0	17.32	21.12	17.83	21.63	17.15	20.95	17.20	21.00	17.76	21.56	17.17	20.97
	1	12	16.77	20.57	17.37	21.17	16.59	20.39	16.92	20.72	17.39	21.19	16.84	20.64
	1	24	16.91	20.71	17.67	21.47	16.93	20.73	16.94	20.74	17.65	21.45	16.89	20.69
	12	0	17.02	20.82	17.54	21.34	16.87	20.67	16.97	20.77	17.63	21.43	16.94	20.74
	12	6	16.74	20.54	17.41	21.21	16.76	20.56	16.84	20.64	17.58	21.38	16.92	20.72
	12	13	16.99	20.79	17.63	21.43	16.92	20.72	16.78	20.58	17.42	21.22	16.85	20.65
	25	0	16.78	20.58	17.44	21.24	16.75	20.55	16.78	20.58	17.36	21.16	16.88	20.68
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	
			Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP
48 / 10M	1	0	17.23	21.03	17.88	21.68	17.15	20.95	17.10	20.90	17.81	21.61	17.09	20.89
	1	24	16.85	20.65	17.43	21.23	16.63	20.43	16.95	20.75	17.46	21.26	16.86	20.66
	1	49	16.89	20.69	17.60	21.40	16.92	20.72	16.91	20.71	17.56	21.36	16.95	20.75
	25	0	17.03	20.83	17.50	21.30	16.87	20.67	16.89	20.69	17.60	21.40	16.96	20.76
	25	12	16.80	20.60	17.41	21.21	16.72	20.52	16.88	20.68	17.51	21.31	16.85	20.65
	25	25	16.91	20.71	17.40	21.20	16.83	20.63	16.83	20.63	17.39	21.19	16.80	20.60
	50	0	16.95	20.75	17.55	21.35	16.88	20.68	16.86	20.66	17.44	21.24	16.78	20.58
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	
			Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP
48 / 15M	1	0	17.25	21.05	17.85	21.65	17.24	21.04	17.26	21.06	17.91	21.71	17.26	21.06
	1	37	16.76	20.56	17.40	21.20	16.76	20.56	16.95	20.75	17.56	21.36	16.93	20.73
	1	74	17.06	20.86	17.71	21.51	17.04	20.84	17.08	20.88	17.60	21.40	16.98	20.78
	36	0	17.08	20.88	17.59	21.39	16.97	20.77	17.06	20.86	17.66	21.46	17.08	20.88
	36	19	16.83	20.63	17.50	21.30	16.89	20.69	16.94	20.74	17.55	21.35	16.90	20.70
	36	39	16.96	20.76	17.59	21.39	16.97	20.77	16.84	20.64	17.54	21.34	16.86	20.66
	75	0	16.95	20.75	17.50	21.30	16.87	20.67	16.90	20.70	17.61	21.41	16.93	20.73
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	
			Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP	Conducted Power	EIRP
48 / 20M	1	0	17.32	21.12	17.94	21.74	17.30	21.10	17.30	21.10	17.92	21.72	17.28	21.08
	1	50	16.86	20.66	17.48	21.28	16.84	20.64	17.00	20.80	17.62	21.42	16.98	20.78
	1	99	17.10	20.90	17.72	21.52	17.08	20.88	17.08	20.88	17.70	21.50	17.06	20.86
	50	0	17.07	20.87	17.69	21.49	17.05	20.85	17.11	20.91	17.73	21.53	17.09	20.89
	50	25	16.93	20.73	17.55	21.35	16.91	20.71	17.00	20.80	17.62	21.42	16.98	20.78
	50	50	17.02	20.82	17.64	21.44	17.00	20.80	16.92	20.72	17.54	21.34	16.90	20.70
	100	0	16.98	20.78	17.60	21.40	16.96	20.76	16.99	20.79	17.61	21.41	16.97	20.77

Note: EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (3.8dBi)

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

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

4.2.2 Test Procedure

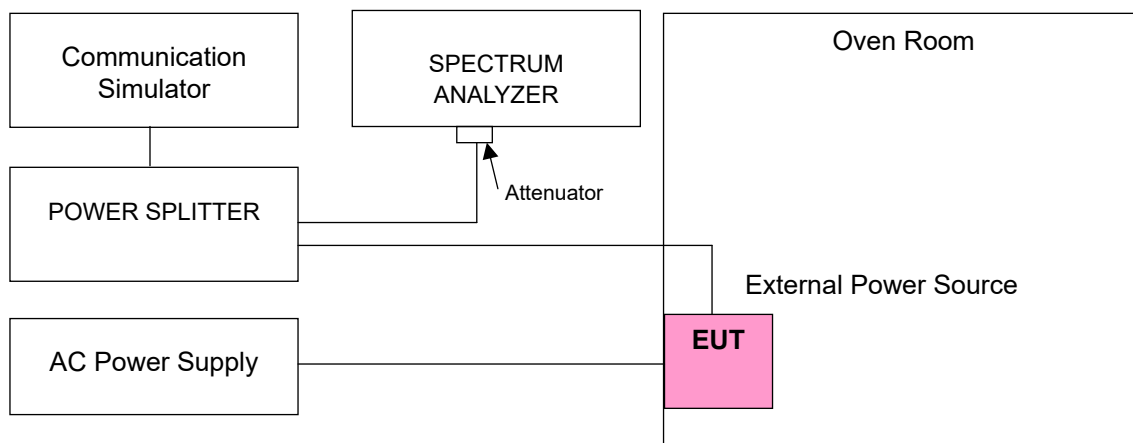
- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the AC input power. The test voltage range is from 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.

4.2.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.2.4 Test Setup



4.2.5 Test Results

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 48, Channel Bandwidth: 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	3552.500001	0.00028	3697.500003	0.00092
120	3552.500002	0.00048	3697.500002	0.00062
138	3552.500003	0.00093	3697.500003	0.00068

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 48, Channel Bandwidth: 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3552.500001	0.00034	3697.500003	0.00084
-20	3552.500002	0.00045	3697.500002	0.00057
-10	3552.500004	0.00104	3697.500001	0.00032
0	3552.500003	0.00090	3697.500002	0.00057
10	3552.500001	0.00031	3697.500004	0.00103
20	3552.499996	-0.00113	3697.499996	-0.00100
30	3552.499996	-0.00110	3697.499996	-0.00105
40	3552.499997	-0.00093	3697.499998	-0.00065
50	3552.499998	-0.00056	3697.499996	-0.00100
60	3552.499997	-0.00082	3697.499998	-0.00068

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 48, Channel Bandwidth: 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	3555.000004	0.00104	3695.000004	0.00100
120	3555.000002	0.00062	3695.000002	0.00065
138	3555.000003	0.00070	3695.000003	0.00089

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 48, Channel Bandwidth: 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3555.000001	0.00039	3695.000001	0.00032
-20	3555.000002	0.00053	3695.000001	0.00030
-10	3555.000001	0.00037	3695.000003	0.00092
0	3555.000004	0.00113	3695.000003	0.00070
10	3555.000001	0.00028	3695.000003	0.00089
20	3554.999998	-0.00053	3694.999997	-0.00084
30	3554.999997	-0.00093	3694.999997	-0.00089
40	3554.999999	-0.00031	3694.999998	-0.00043
50	3554.999998	-0.00059	3694.999997	-0.00092
60	3554.999998	-0.00068	3694.999999	-0.00035

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 48, Channel Bandwidth: 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	3557.500003	0.00070	3692.500002	0.00043
120	3557.500003	0.00084	3692.500002	0.00043
138	3557.500001	0.00034	3692.500003	0.00076

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 48, Channel Bandwidth: 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3557.500004	0.00101	3692.500004	0.00108
-20	3557.500002	0.00048	3692.500002	0.00041
-10	3557.500001	0.00028	3692.500001	0.00035
0	3557.500001	0.00039	3692.500002	0.00062
10	3557.500002	0.00062	3692.500003	0.00079
20	3557.499997	-0.00073	3692.499997	-0.00092
30	3557.499997	-0.00073	3692.499999	-0.00027
40	3557.499998	-0.00051	3692.499998	-0.00060
50	3557.499998	-0.00048	3692.499996	-0.00097
60	3557.499998	-0.00062	3692.499997	-0.00087

Frequency Error vs. Voltage

Voltage (Vac)	LTE Band 48, Channel Bandwidth: 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
102	3560.000002	0.00042	3690.000002	0.00065
120	3560.000003	0.00096	3690.000003	0.00081
138	3560.000003	0.00079	3690.000002	0.00065

Frequency Error vs. Temperature

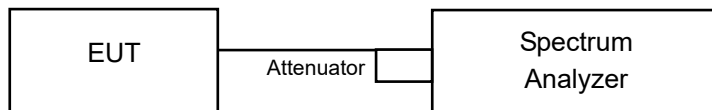
Temp. (°C)	LTE Band 48, Channel Bandwidth: 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3560.000002	0.00042	3690.000003	0.00076
-20	3560.000004	0.00101	3690.000004	0.00108
-10	3560.000001	0.00031	3690.000002	0.00065
0	3560.000003	0.00081	3690.000002	0.00065
10	3560.000003	0.00090	3690.000003	0.00079
20	3559.999999	-0.00031	3689.999999	-0.00033
30	3559.999998	-0.00059	3689.999999	-0.00038
40	3559.999998	-0.00065	3689.999999	-0.00027
50	3559.999999	-0.00034	3689.999997	-0.00089
60	3559.999996	-0.00101	3689.999997	-0.00084

4.3 Emission Bandwidth Measurement

4.3.1 Emission Bandwidth Measurement

Reference only

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.3.4 Test Procedure

Occupied Bandwidth:

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.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result (-26dB Bandwidth)

LTE Band 48

LTE Band 48, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55265	3552.5	4.94	4.92
55990	3625.0	4.94	4.90
56715	3697.5	4.94	4.89
LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55290	3555.0	9.43	9.39
55990	3625.0	9.43	9.39
56690	3695.0	9.41	9.37
LTE Band 48, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55315	3557.5	13.99	14.03
55990	3625.0	13.98	14.03
56665	3692.5	13.96	14.02
LTE Band 48, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
55340	3560.0	18.56	18.55
55990	3625.0	18.57	18.55
56640	3690.0	18.54	18.55

Spectrum Plot of Worst Value

5MHz / QPSK



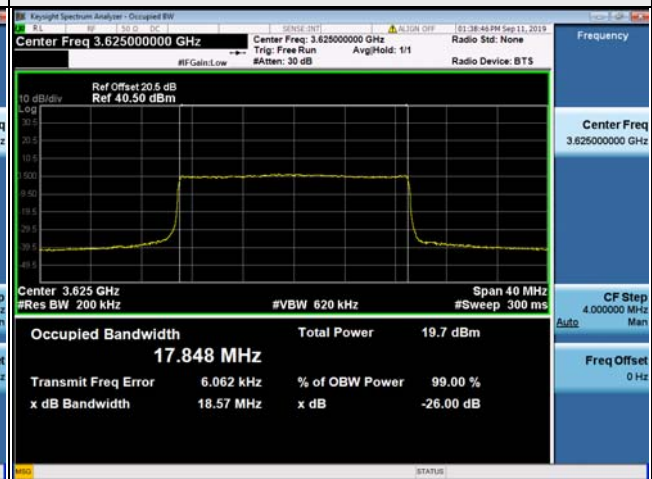
10MHz / QPSK



15MHz / 16QAM



20MHz / QPSK



4.3.8 Test Result (Occupied Bandwidth)

LTE Band 48, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55265	3552.5	4.47	4.47
55990	3625.0	4.47	4.47
56715	3697.5	4.47	4.47
LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55290	3555.0	8.93	8.93
55990	3625.0	8.93	8.93
56690	3695.0	8.93	8.93
LTE Band 48, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55315	3557.5	13.39	13.40
55990	3625.0	13.39	13.40
56665	3692.5	13.39	13.39
LTE Band 48, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
55340	3560.0	17.85	17.85
55990	3625.0	17.85	17.85
56640	3690.0	17.84	17.85

Spectrum Plot of Worst Value

5MHz / QPSK



10MHz / QPSK



15MHz / 16QAM



20MHz / QPSK

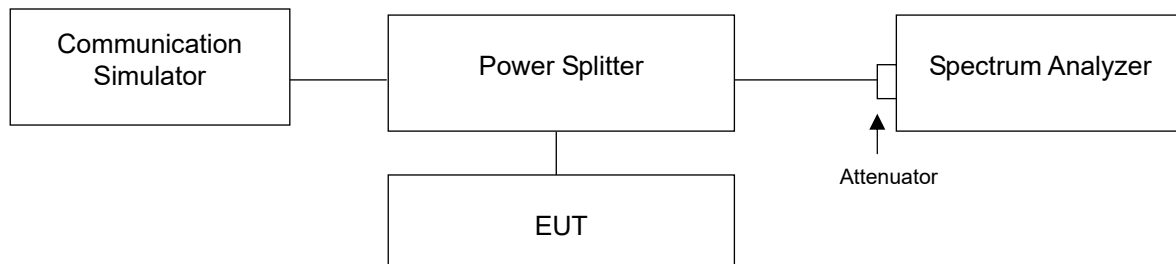


4.4 Peak to Average Ratio Measurement

4.4.1 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

4.4.2 Test Setup



4.4.3 Test Procedures

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

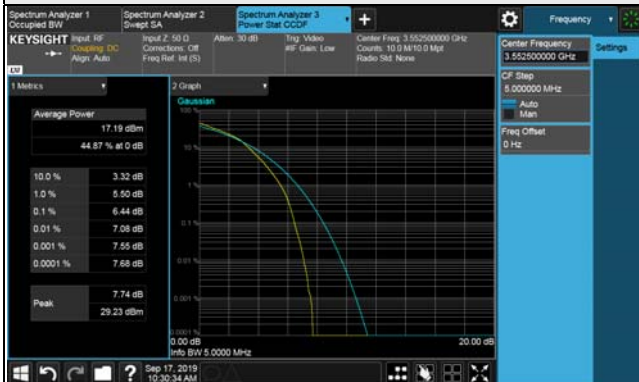
4.4.4 Test Results

LTE Band 48

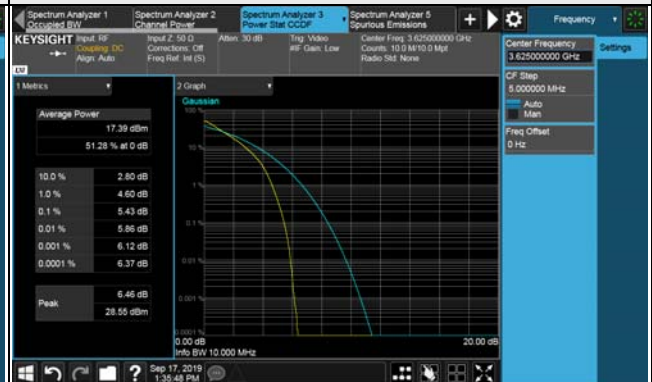
LTE Band 48, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55265	3552.5	4.97	6.44
55990	3625.0	5.20	5.41
56715	3697.5	4.96	4.98
LTE Band 48, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55290	3555.0	5.39	5.38
55990	3625.0	5.43	5.39
56690	3695.0	5.40	5.33
LTE Band 48, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55315	3557.5	5.32	5.32
55990	3625.0	5.42	5.49
56665	3692.5	5.36	5.35
LTE Band 48, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	Peak To Average Ratio (dB)	
		QPSK	16QAM
55340	3560.0	5.31	5.40
55990	3625.0	5.37	5.39
56640	3690.0	5.35	5.33

Spectrum Plot of Worst Value

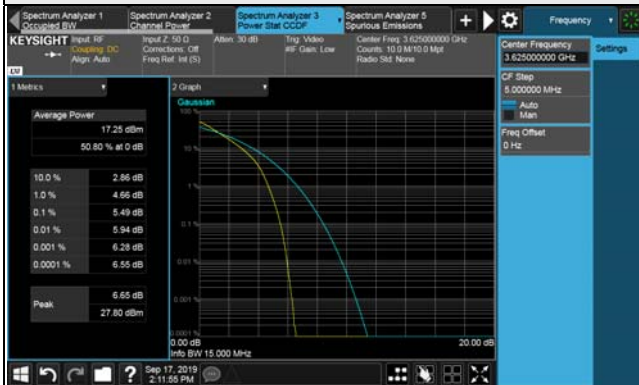
5MHz / 16QAM



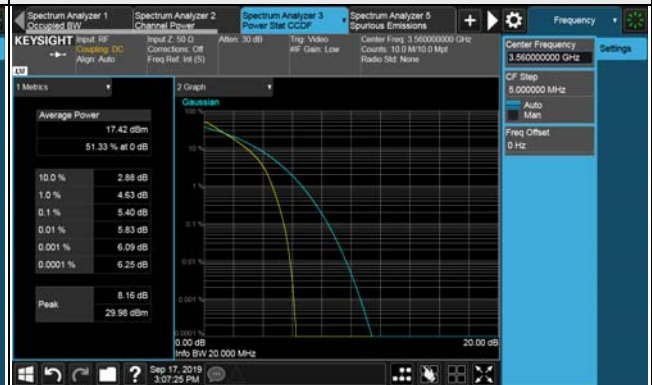
10MHz / QPSK



15MHz / 16QAM



20MHz / 16QAM

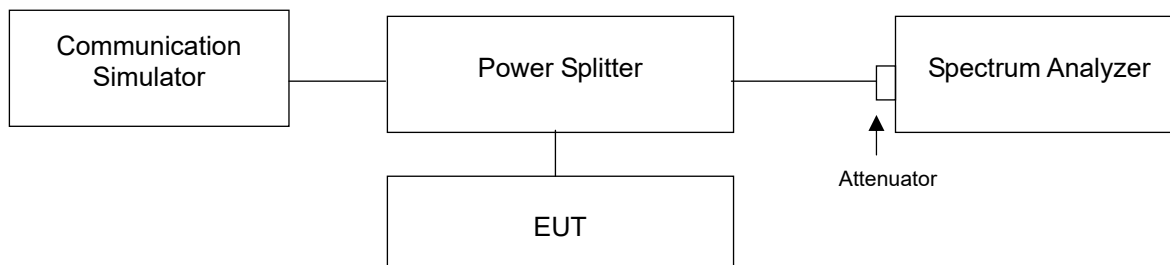


4.5 Conducted Spurious Emissions

4.5.1 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	

4.5.2 Test Setup



4.5.3 Test Procedure

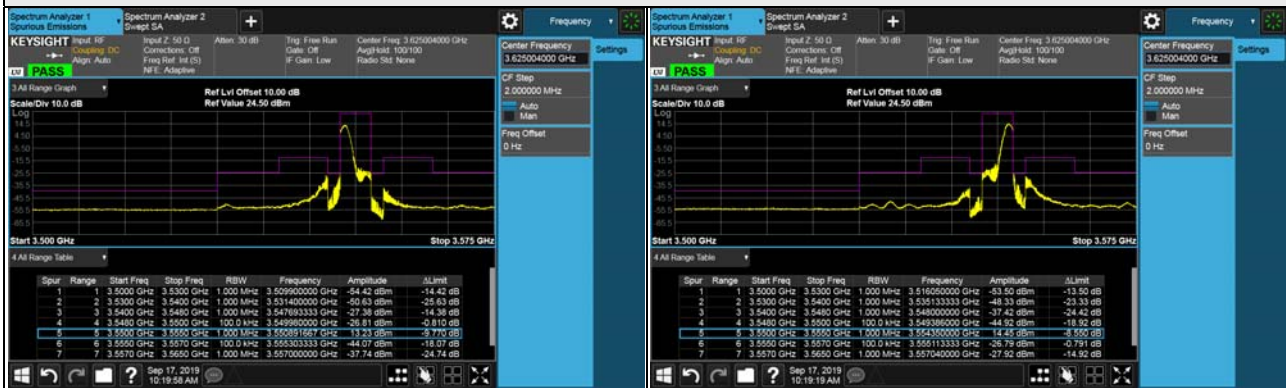
- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 37 GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.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

4.5.4 Test Results

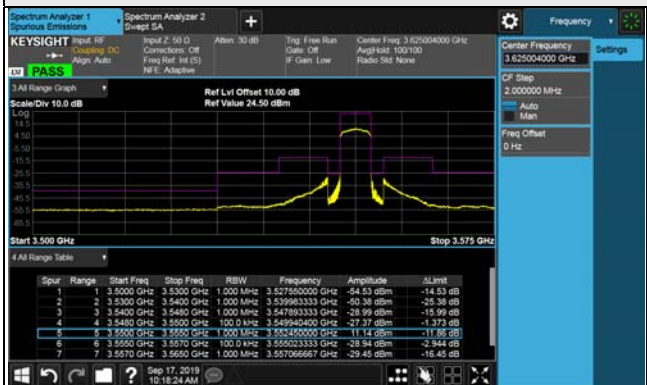
LTE Band 48, Channel Bandwidth 5MHz

Channel 55265 (3552.5MHz)

1RB



Full RB



Channel 55990 (3625.0MHz)

1RB

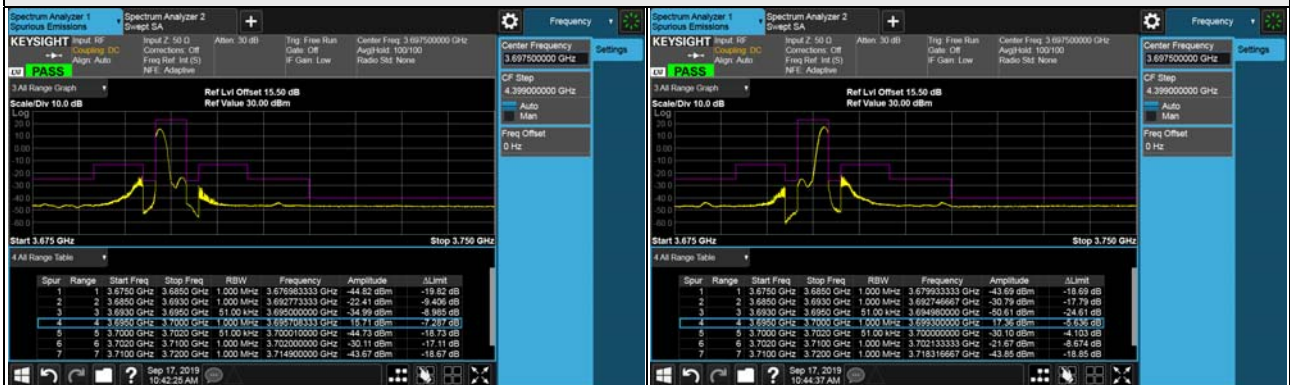


Full RB

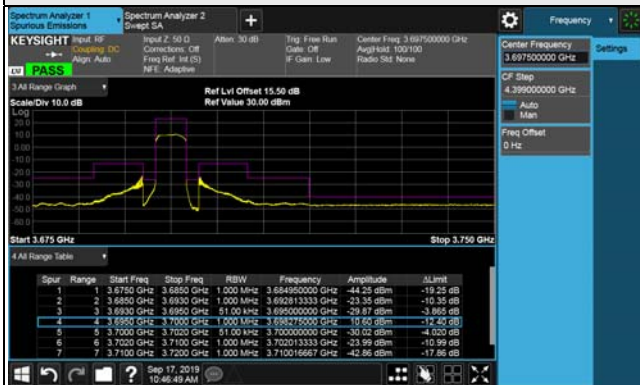


Channel 56715 (3697.5MHz)

1RB



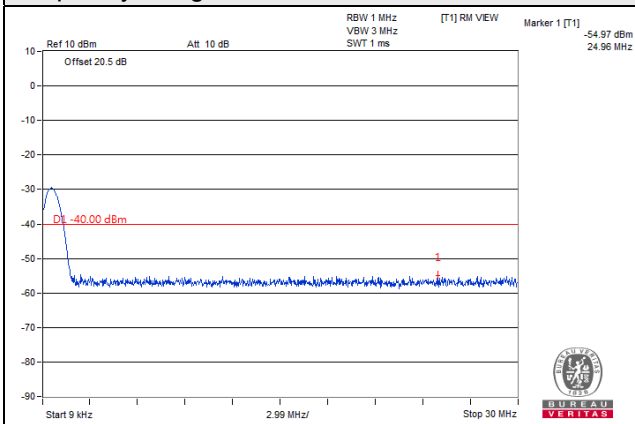
Full RB



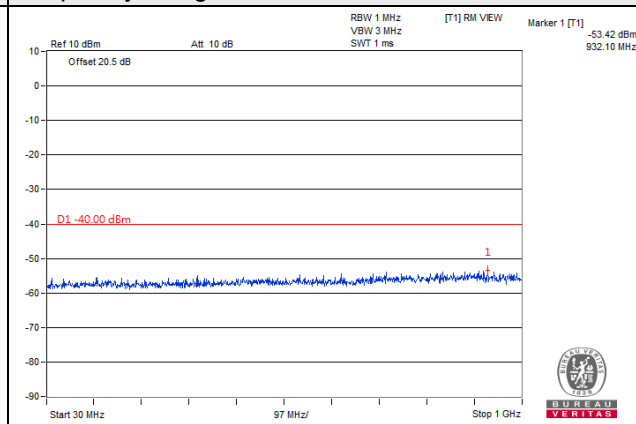
LTE Band 48, Channel Bandwidth 5MHz

Channel 55265 (3552.5MHz)

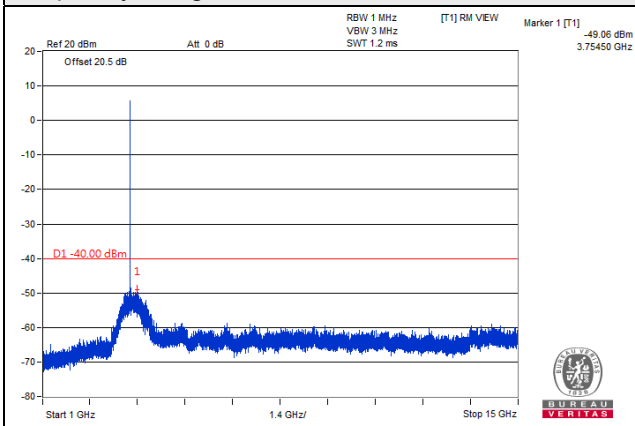
Frequency Range : 9kHz~30MHz



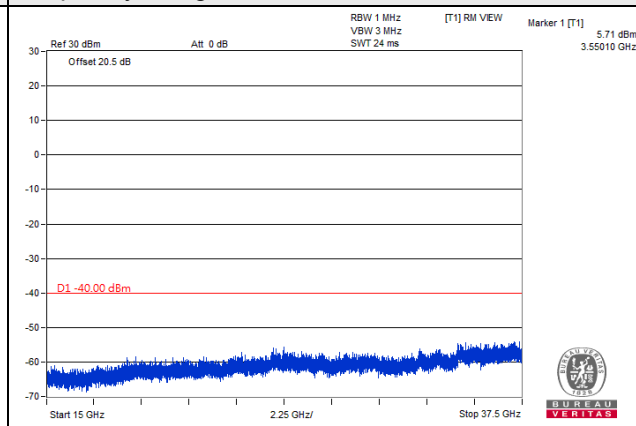
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

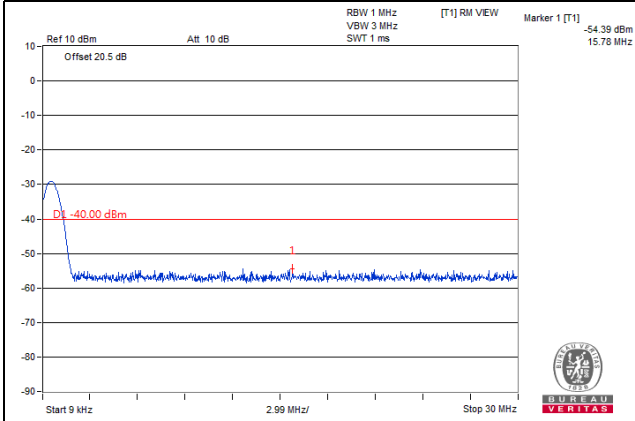


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

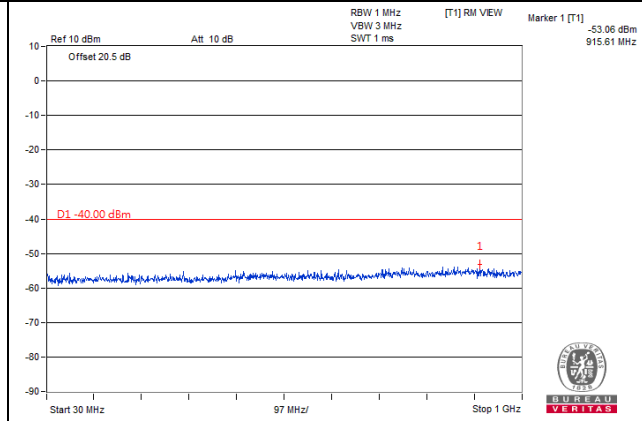
LTE Band 48, Channel Bandwidth 5MHz

Channel 55990 (3625.0MHz)

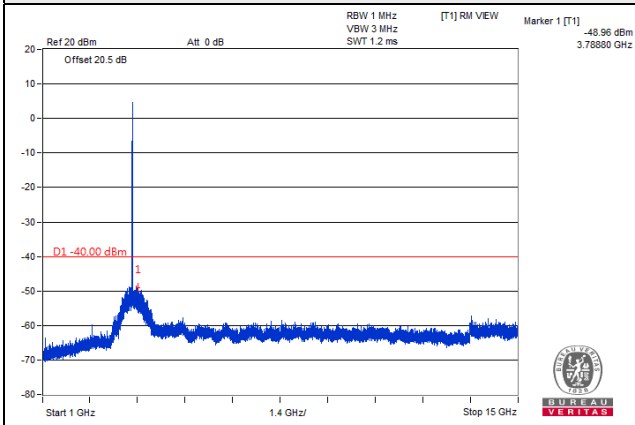
Frequency Range : 9kHz~30MHz



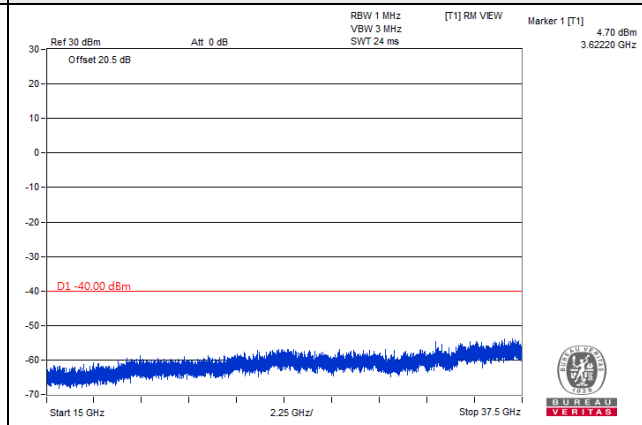
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

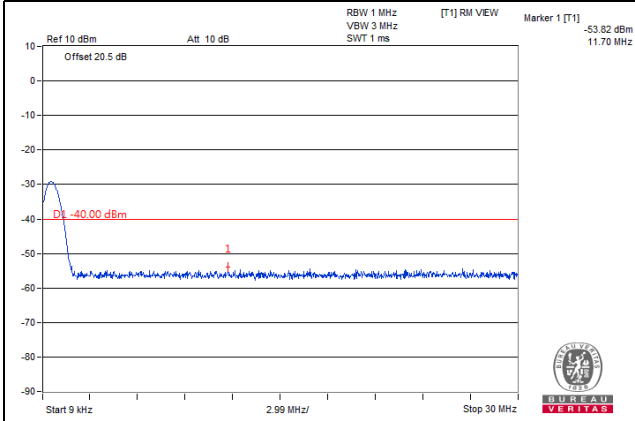


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

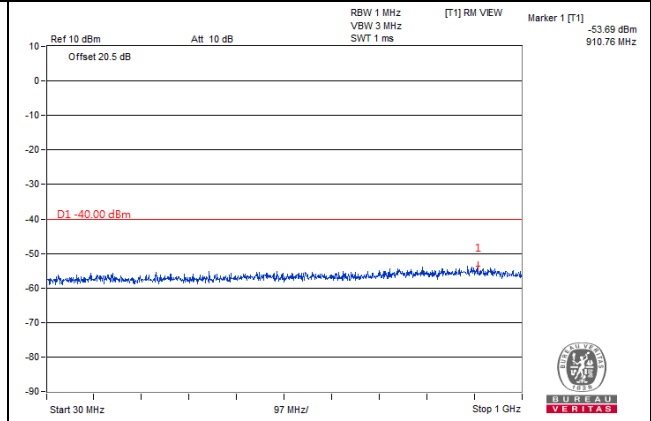
LTE Band 48, Channel Bandwidth 5MHz

Channel 56715 (3697.50MHz)

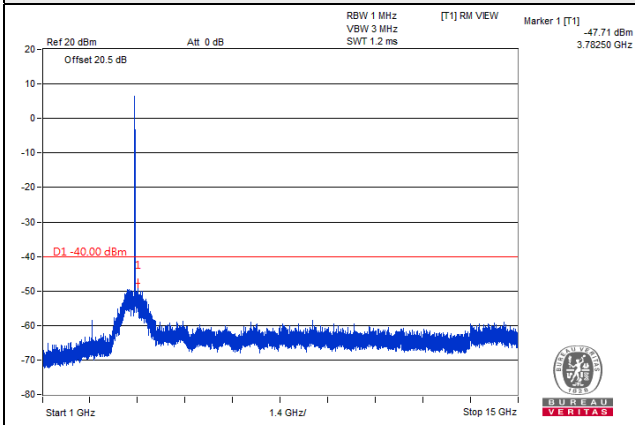
Frequency Range : 9kHz~30MHz



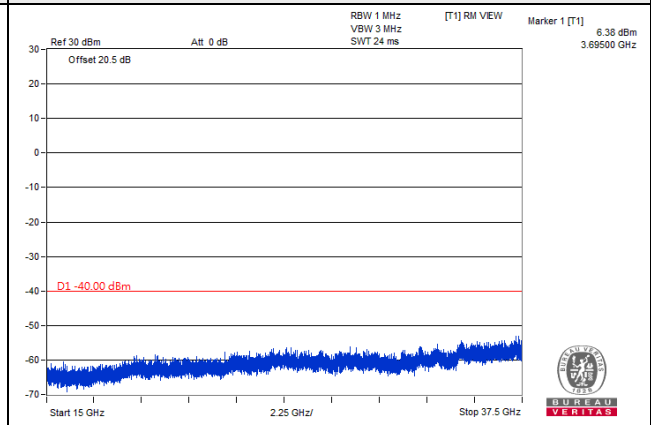
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

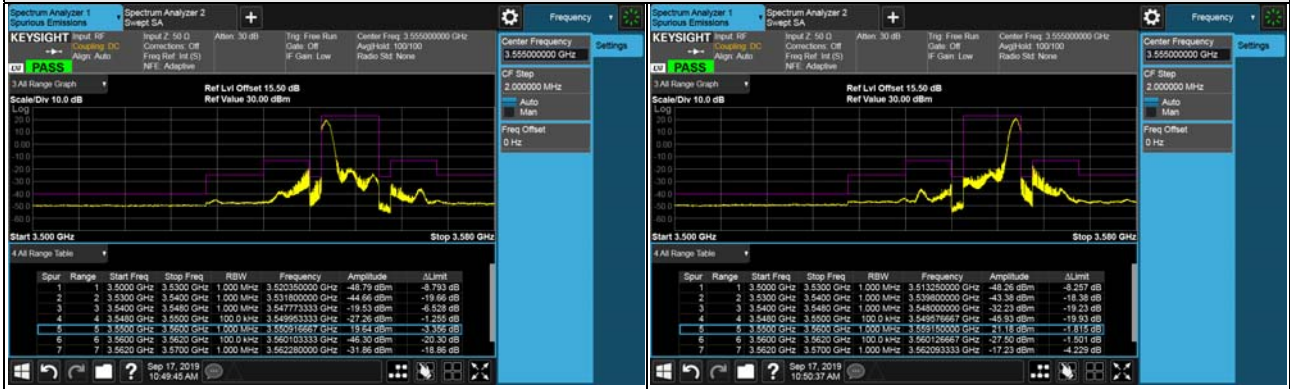


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 10MHz

Channel 55290 (3555.0MHz)

1RB



Full RB

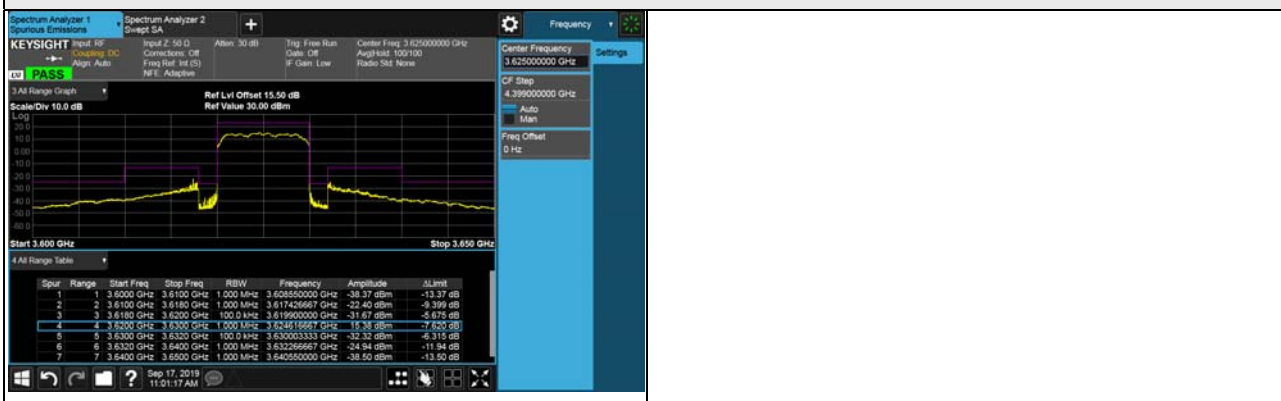


Channel 55990 (3625.00MHz)

1RB



Full RB



Channel 56690 (3695.0MHz)

1RB



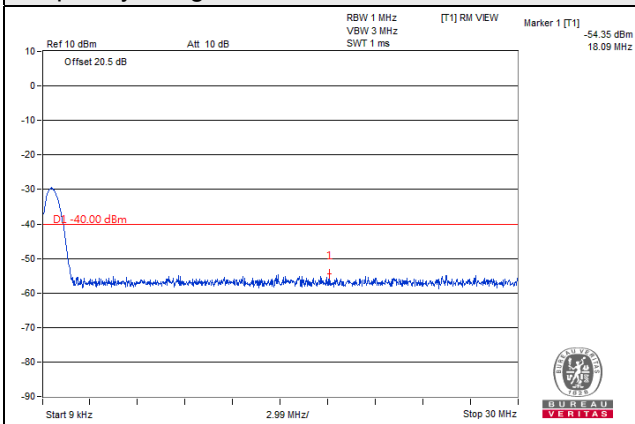
Full RB



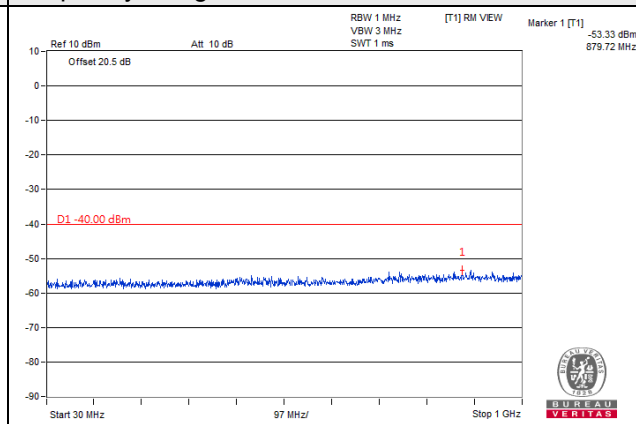
LTE Band 48, Channel Bandwidth 10MHz

Channel 55290 (3555.0MHz)

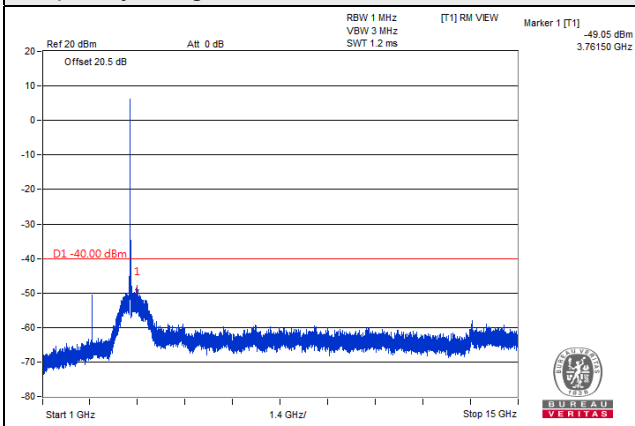
Frequency Range : 9kHz~30MHz



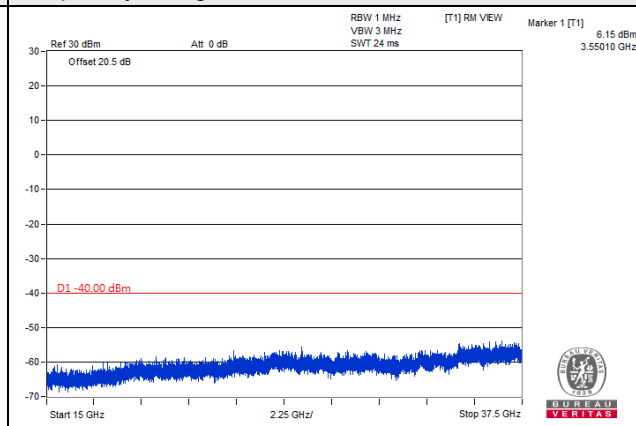
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

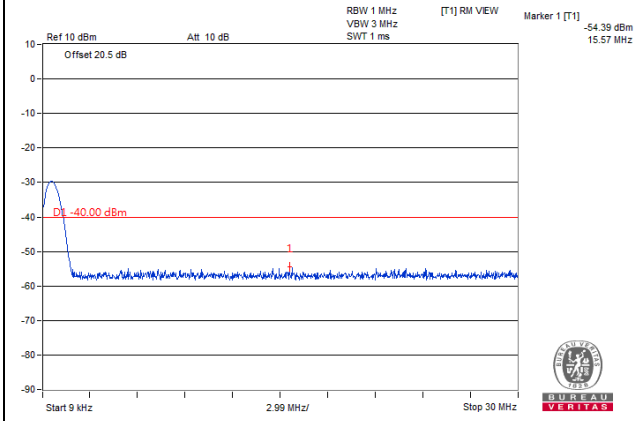


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

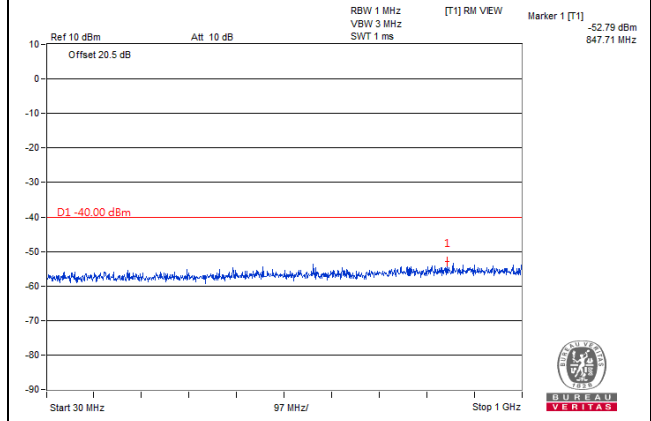
LTE Band 48, Channel Bandwidth 10MHz

Channel 55990 (3625.00MHz)

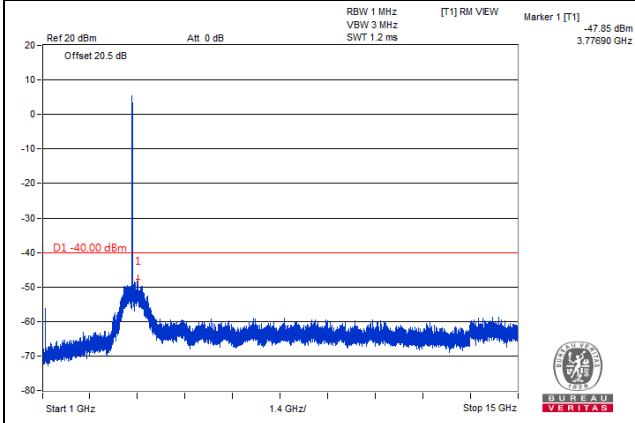
Frequency Range : 9kHz~30MHz



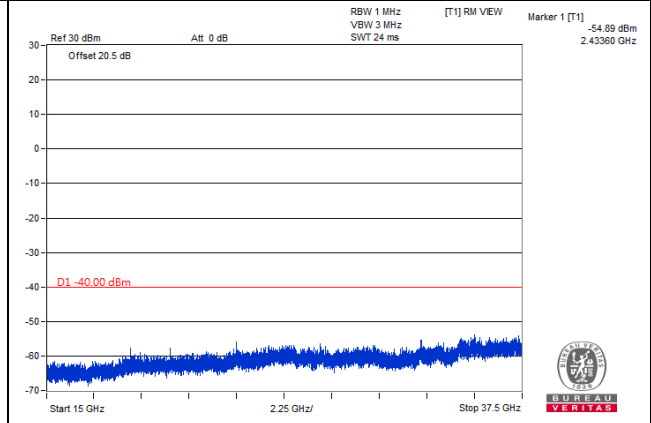
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

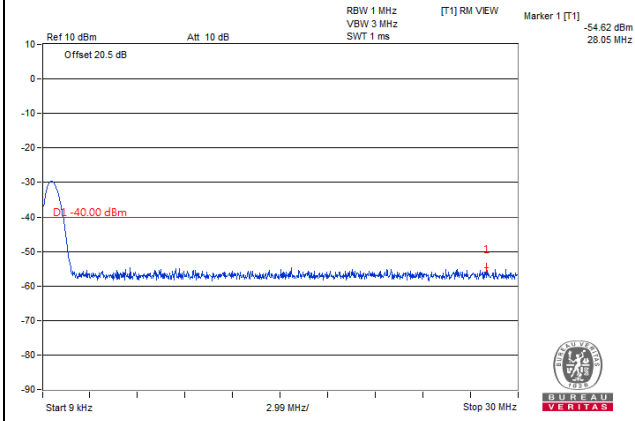


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

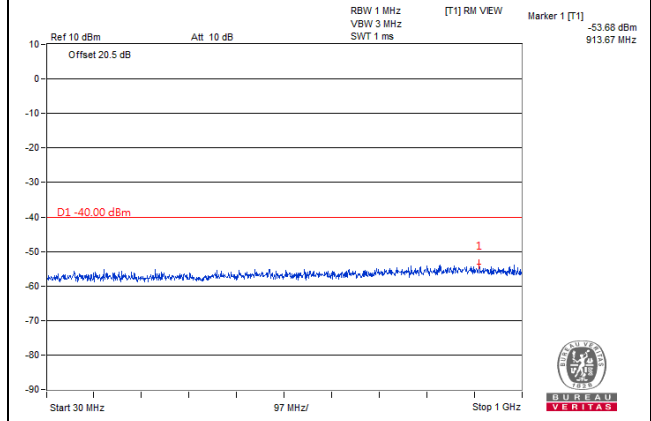
LTE Band 48, Channel Bandwidth 10MHz

Channel 56690 (3695.0MHz)

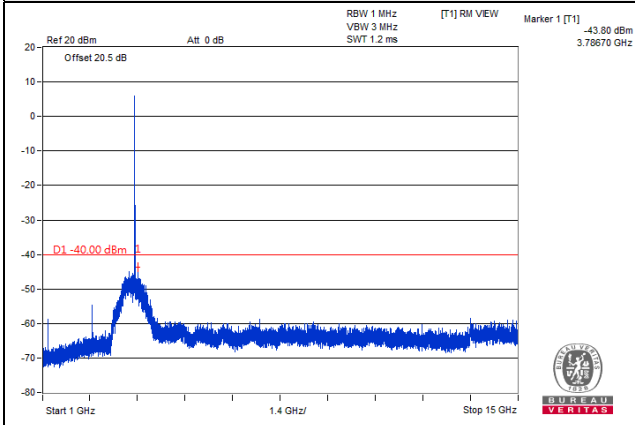
Frequency Range : 9kHz~30MHz



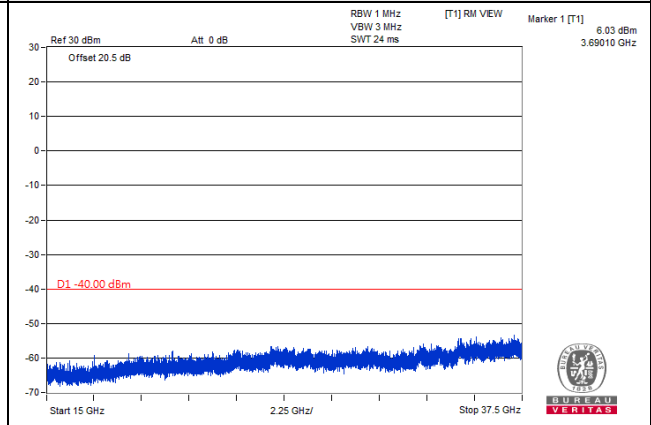
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

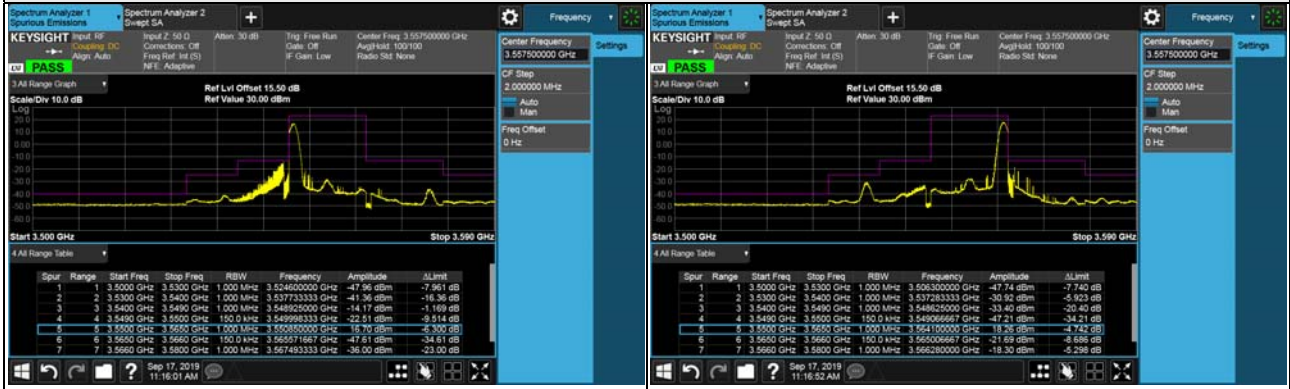


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 15MHz

Channel 55315 (3557.50MHz)

1RB

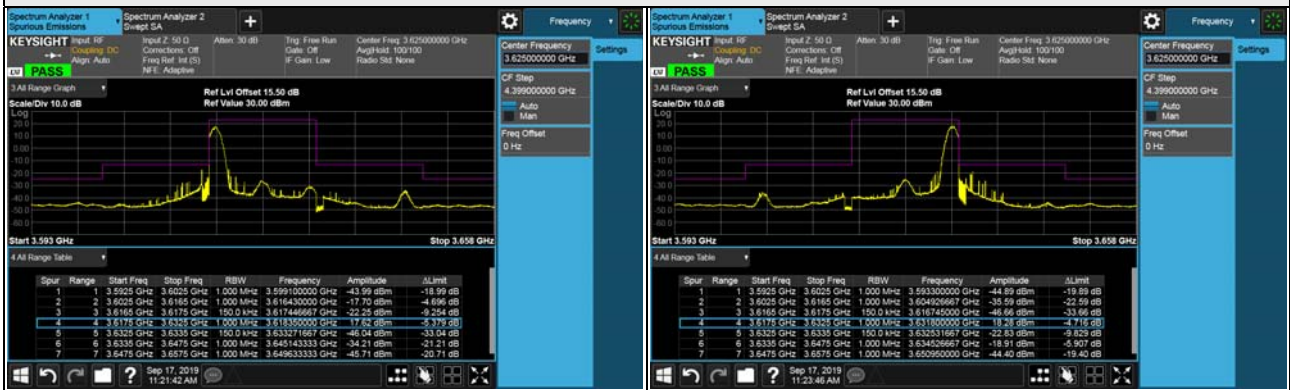


Full RB

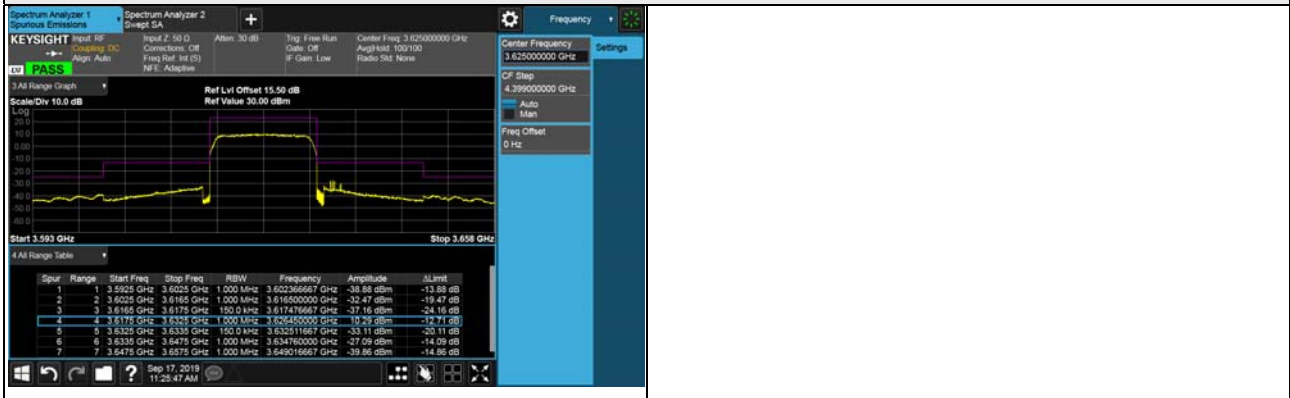


Channel 55990 (3625.0MHz)

1RB



Full RB

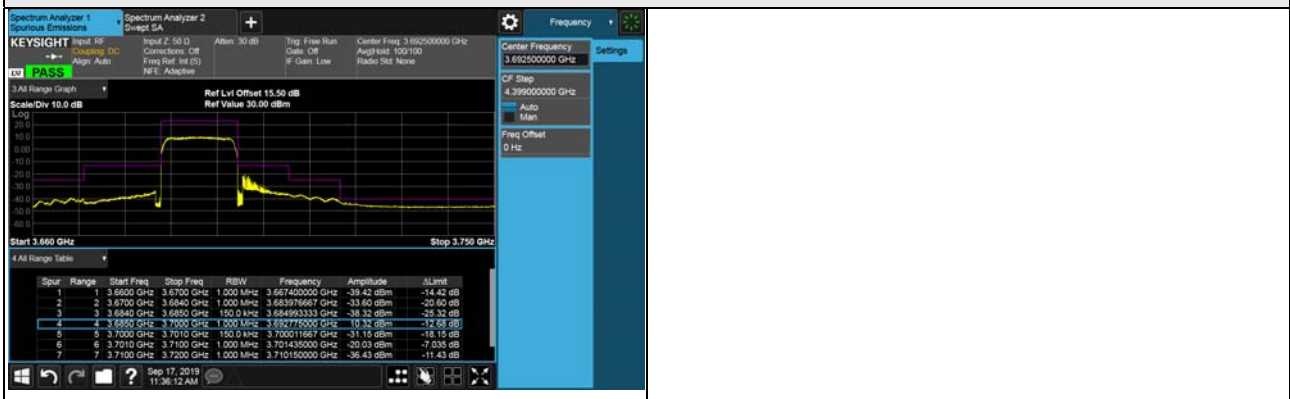


Channel 56665 (3692.5MHz)

1RB



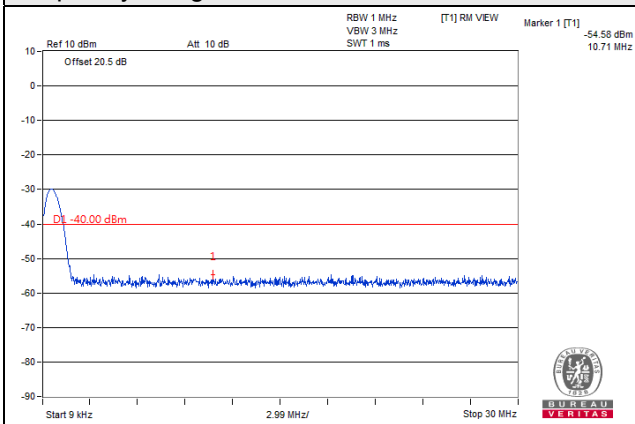
Full RB



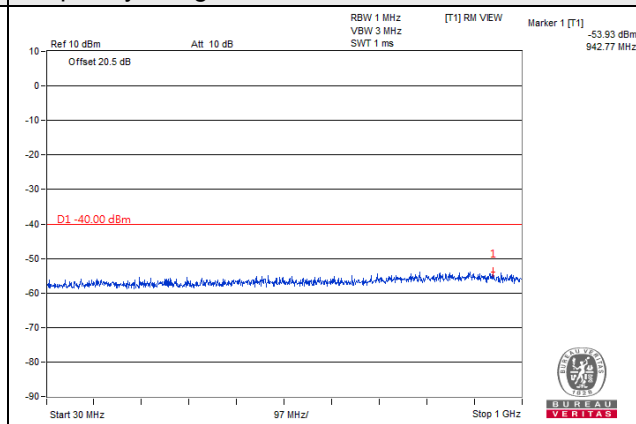
LTE Band 48, Channel Bandwidth 15MHz

Channel 55315 (3557.50MHz)

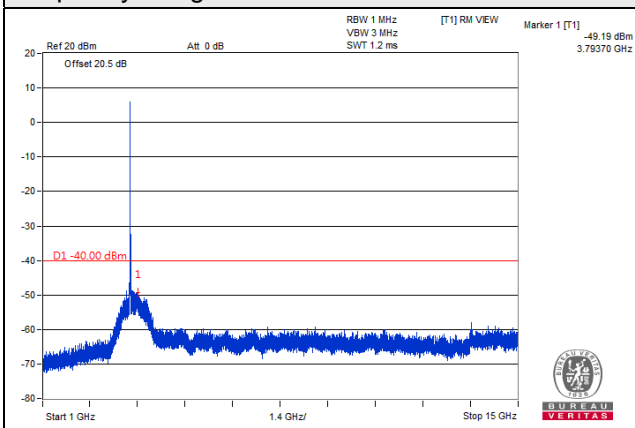
Frequency Range : 9kHz~30MHz



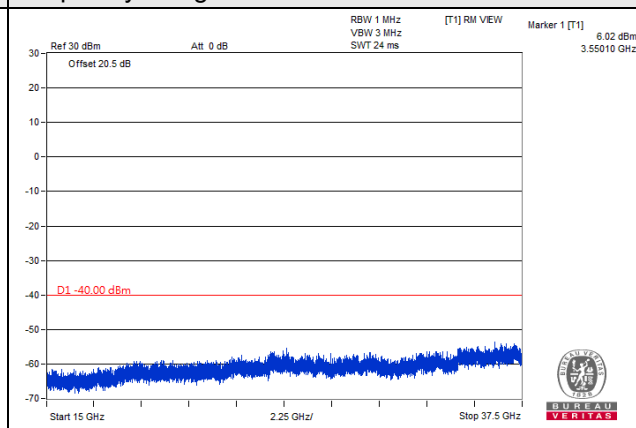
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

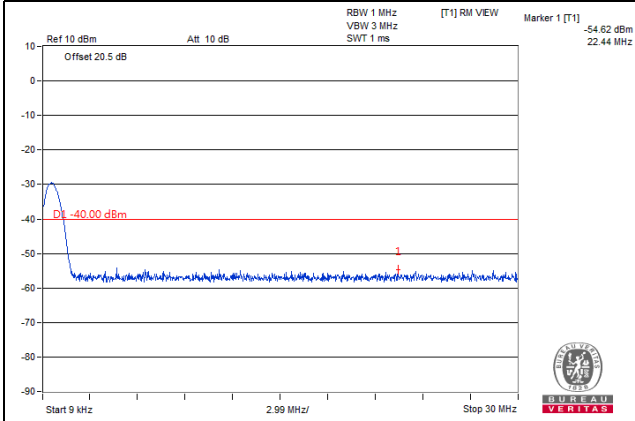


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

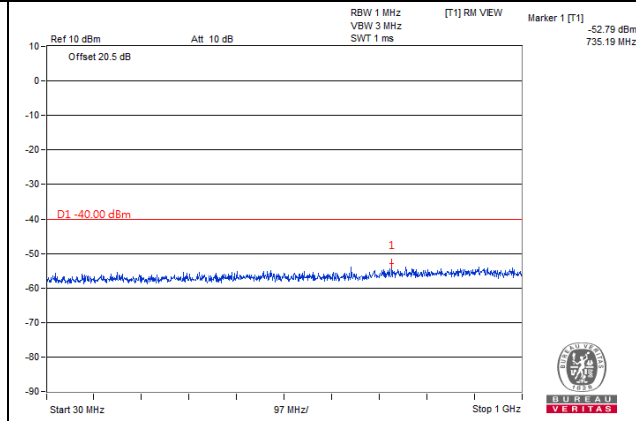
LTE Band 48, Channel Bandwidth 15MHz

Channel 55990 (3625.0MHz)

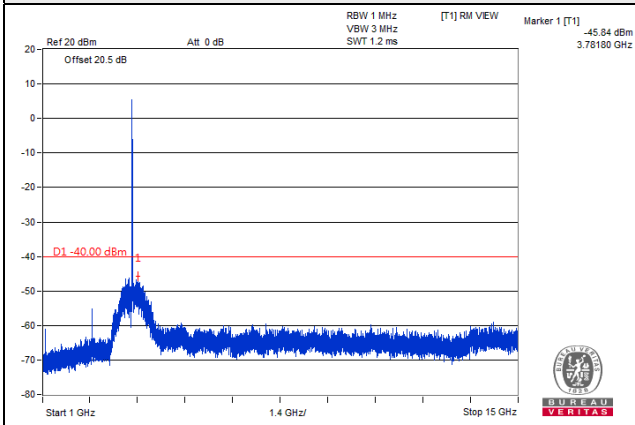
Frequency Range : 9kHz~30MHz



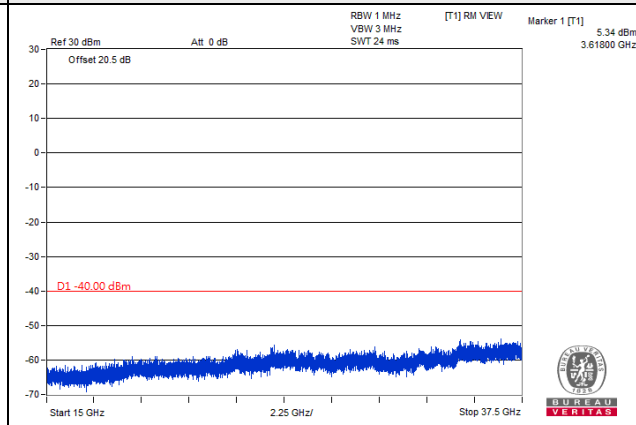
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

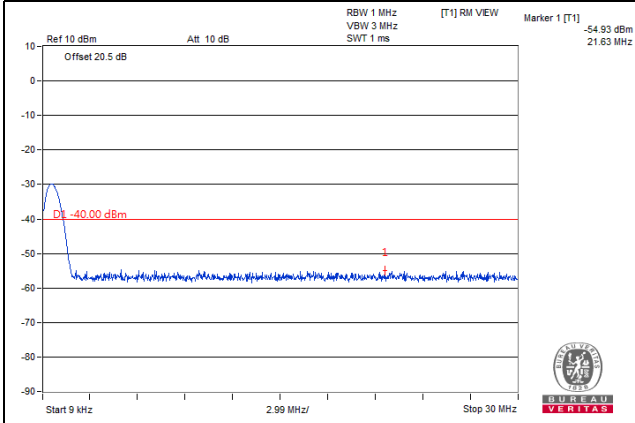


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

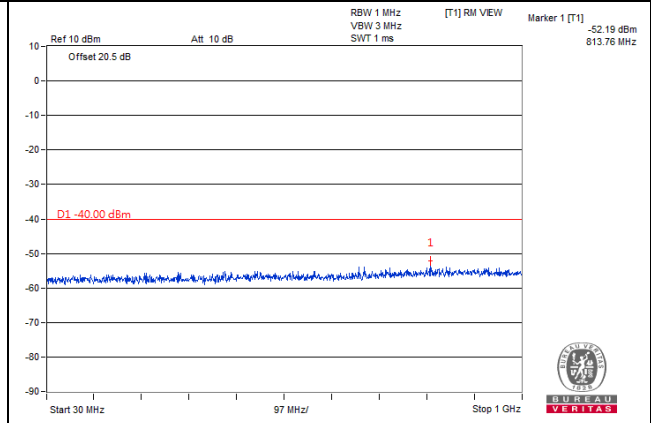
LTE Band 48, Channel Bandwidth 15MHz

Channel 56665 (3692.50MHz)

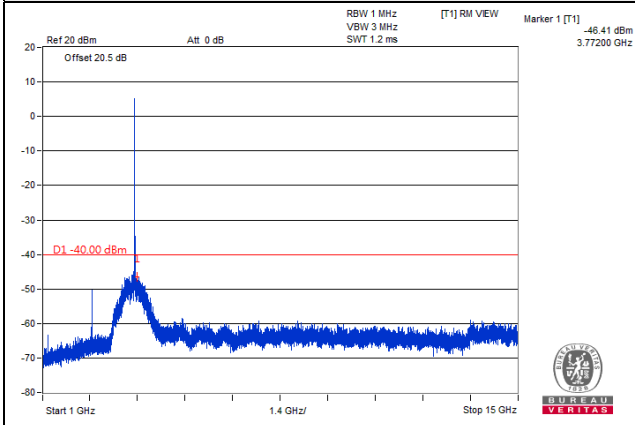
Frequency Range : 9kHz~30MHz



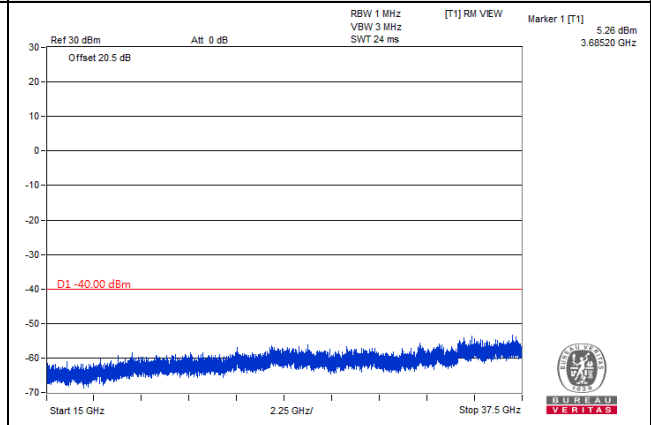
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

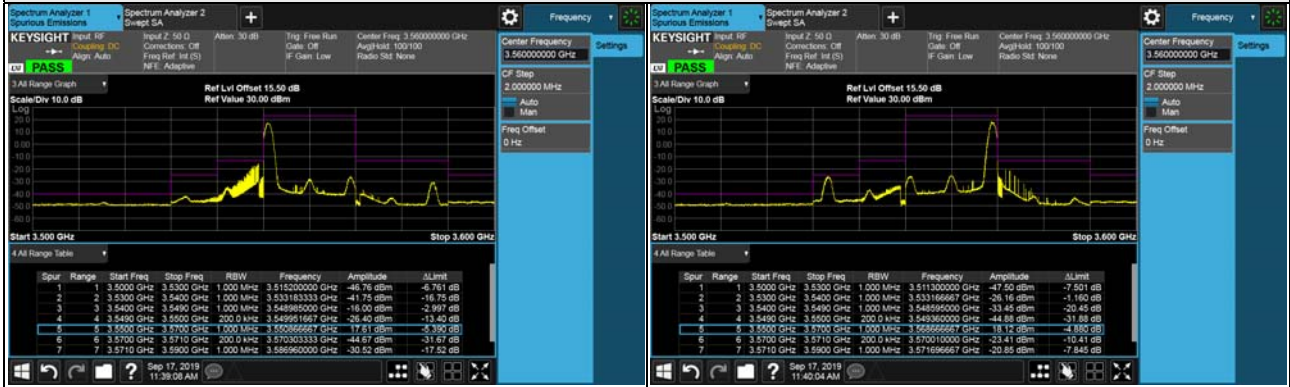


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 20MHz

Channel 55340 (3560.0MHz)

1RB

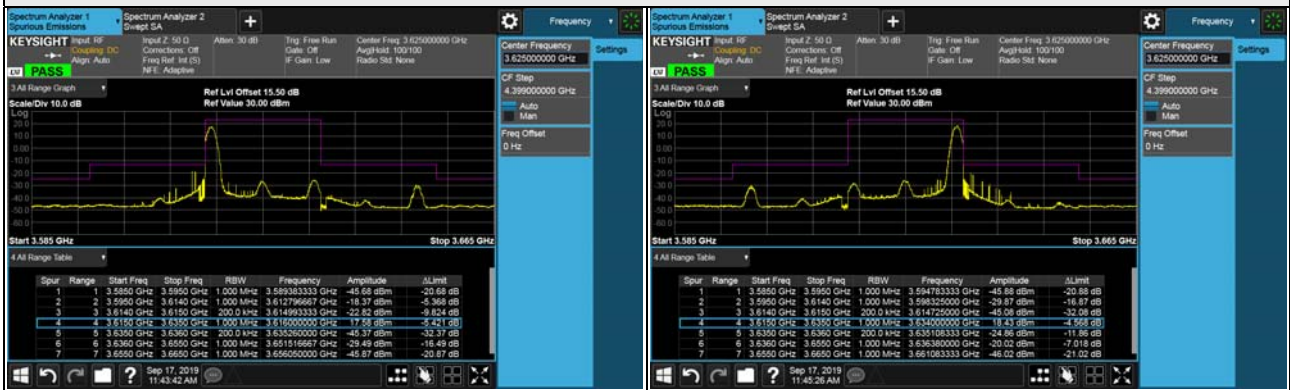


Full RB

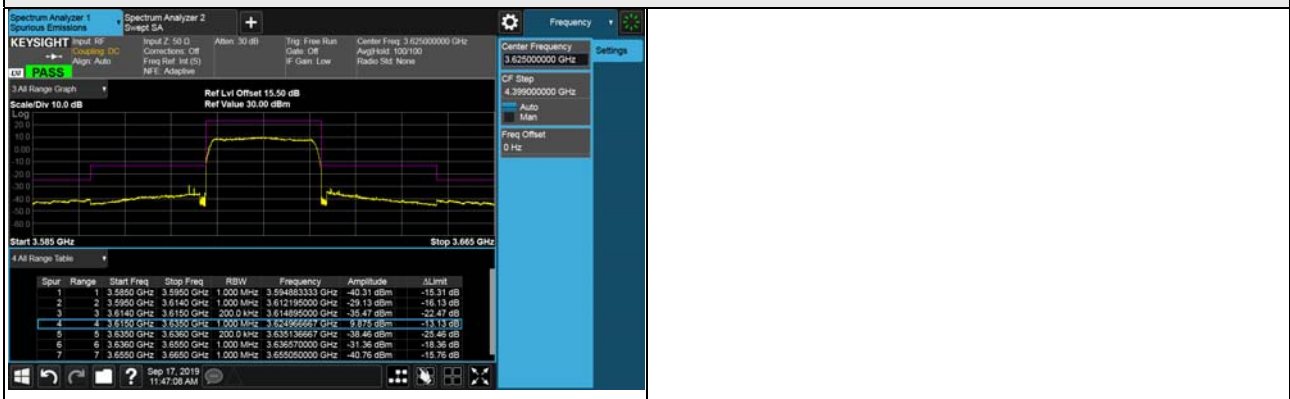


Channel 55990 (3625.0MHz)

1RB

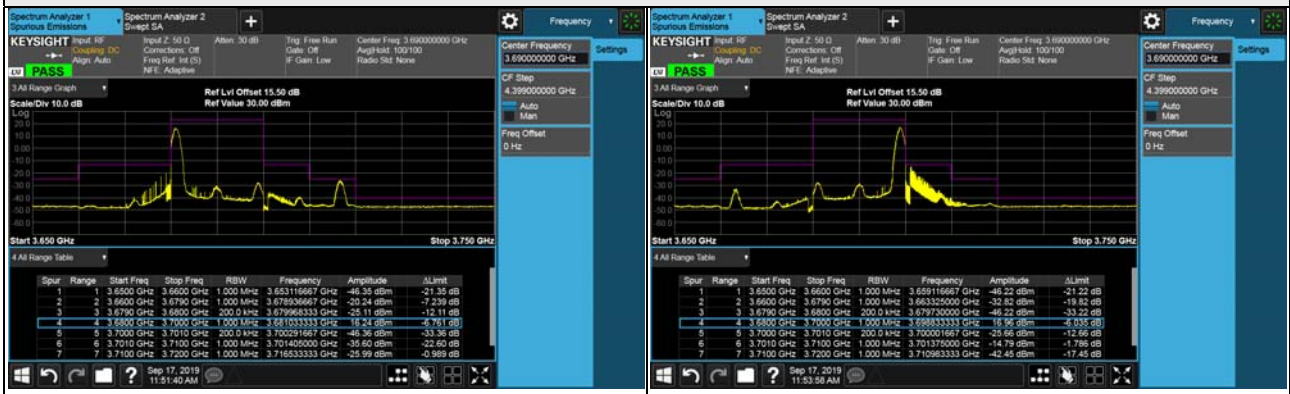


Full RB

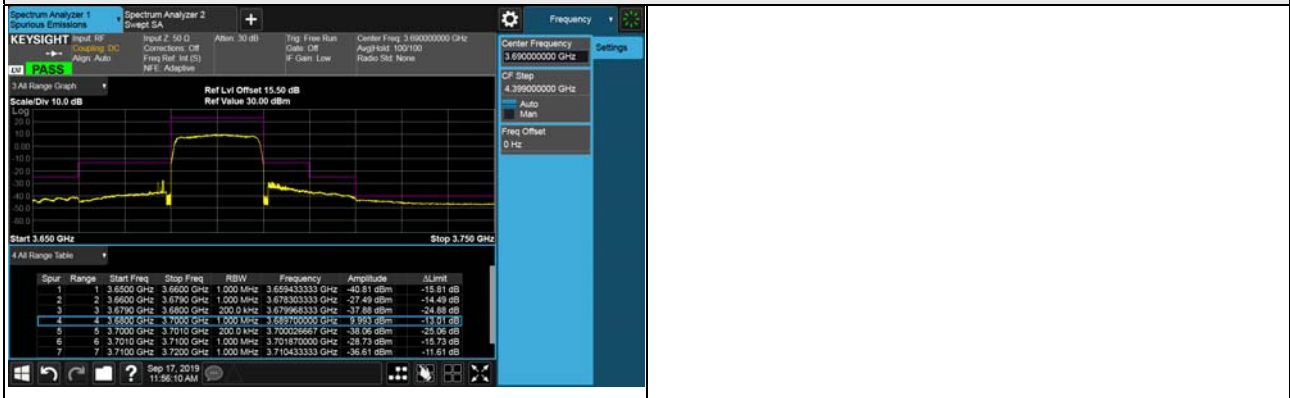


Channel 56640 (3690.0MHz)

1RB



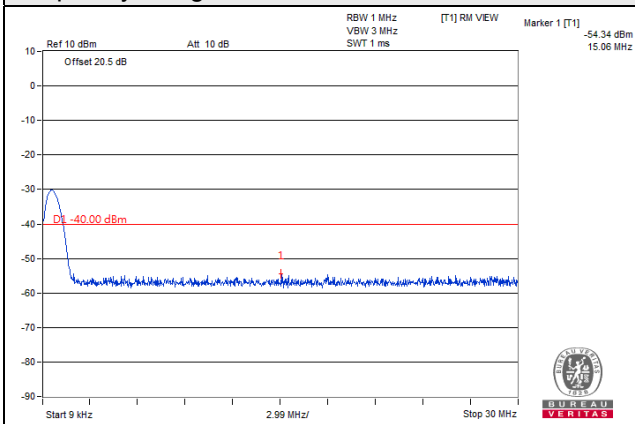
Full RB



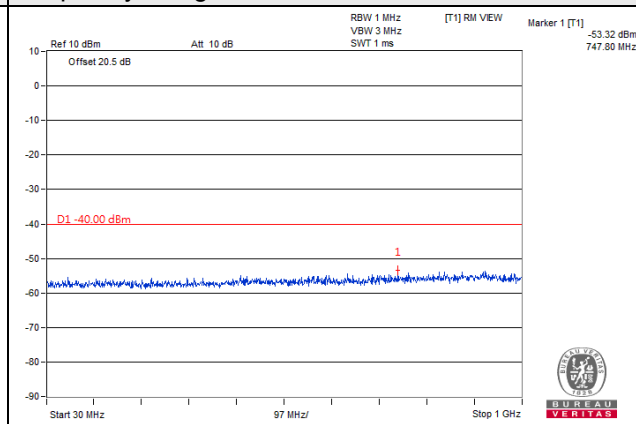
LTE Band 48, Channel Bandwidth 20MHz

Channel 55340 (3560.0MHz)

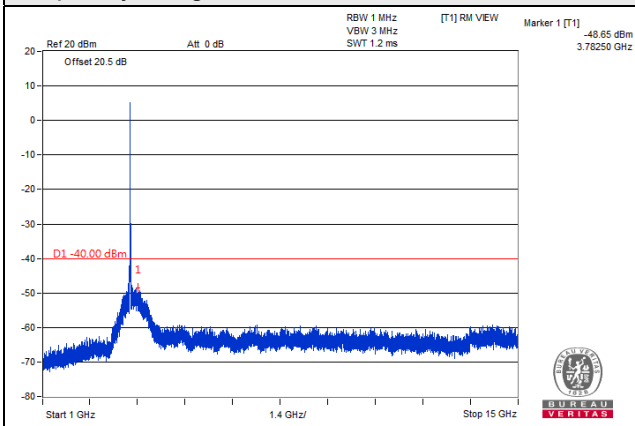
Frequency Range : 9kHz~30MHz



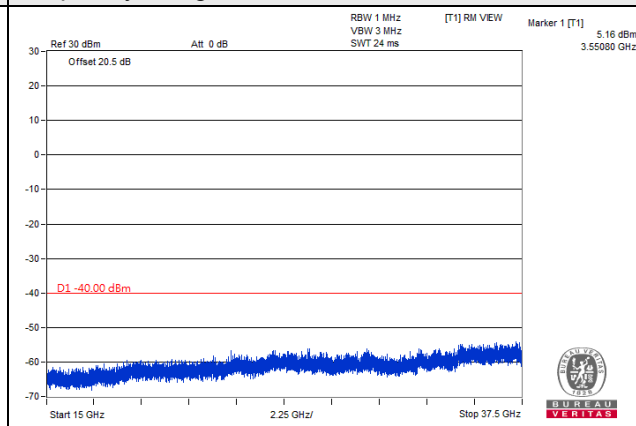
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

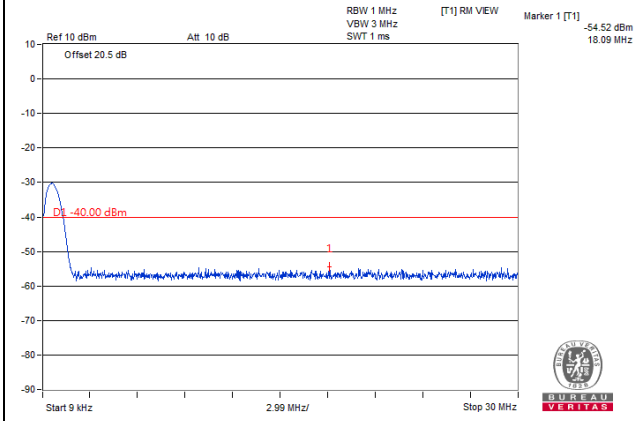


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

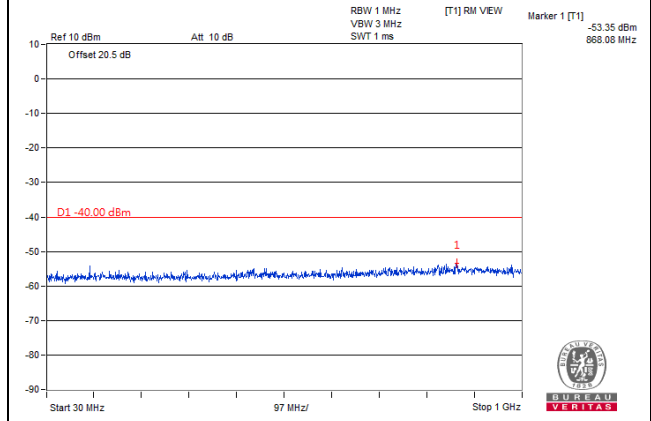
LTE Band 2, Channel Bandwidth 20MHz

Channel 55990 (3625.0MHz)

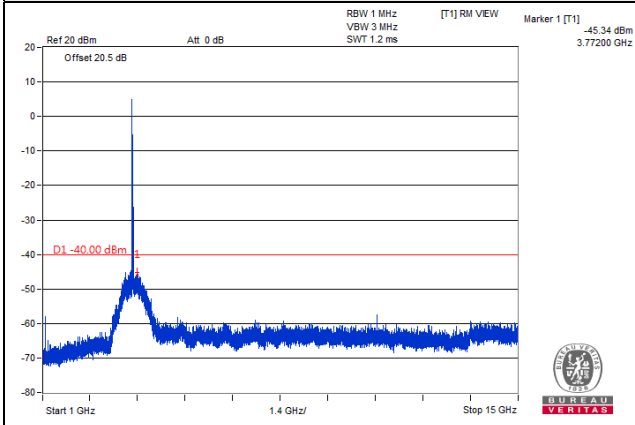
Frequency Range : 9kHz~30MHz



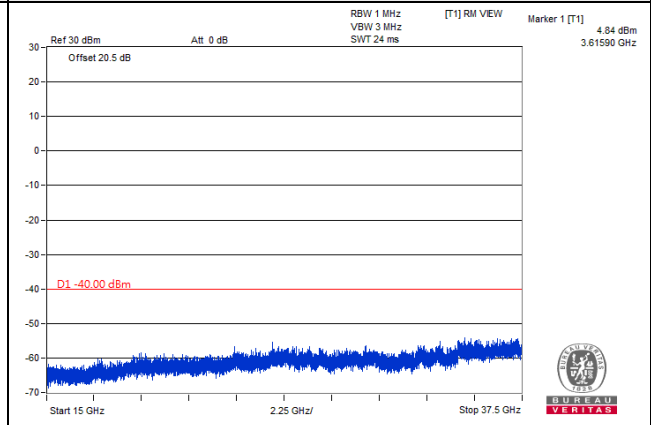
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz

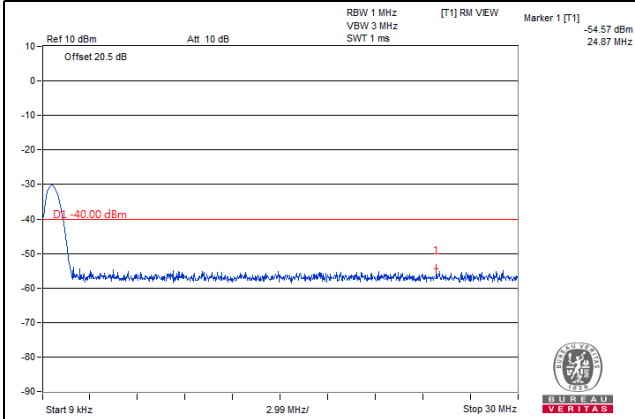


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

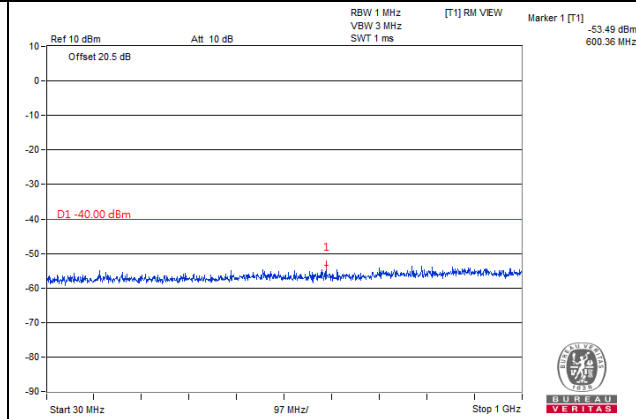
LTE Band 48, Channel Bandwidth 20MHz

Channel 56640 (3690.0MHz)

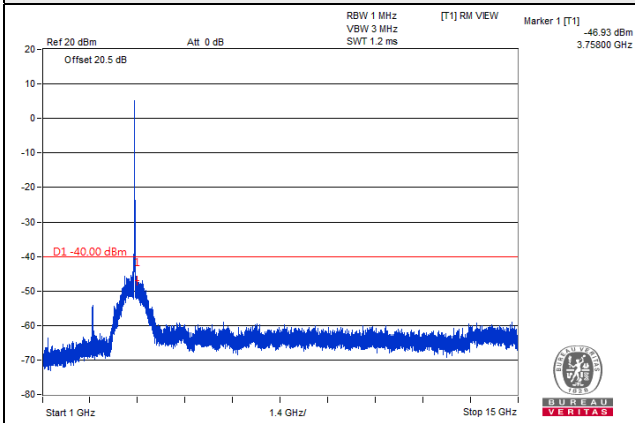
Frequency Range : 9kHz~30MHz



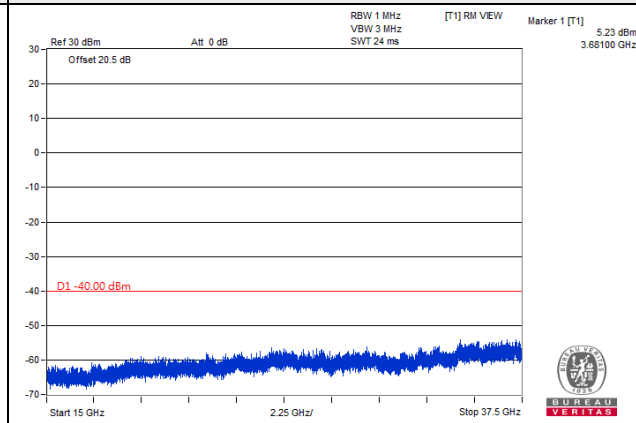
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz



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

4.6 Radiated Emission Measurement

4.6.1 Limits of Radiated Emission Measurement

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

4.6.2 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.6.3 Test Procedures

- a. Substitution method is used for EIRP measurement. In the semi-anechoic chamber, EUT placed on the 0.8m 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. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$.
- d. ERP power can be calculated form EIRP power by subtracting the gain of dipole, $\text{ERP power} = \text{EIRP power} - 2.15\text{dBi}$.

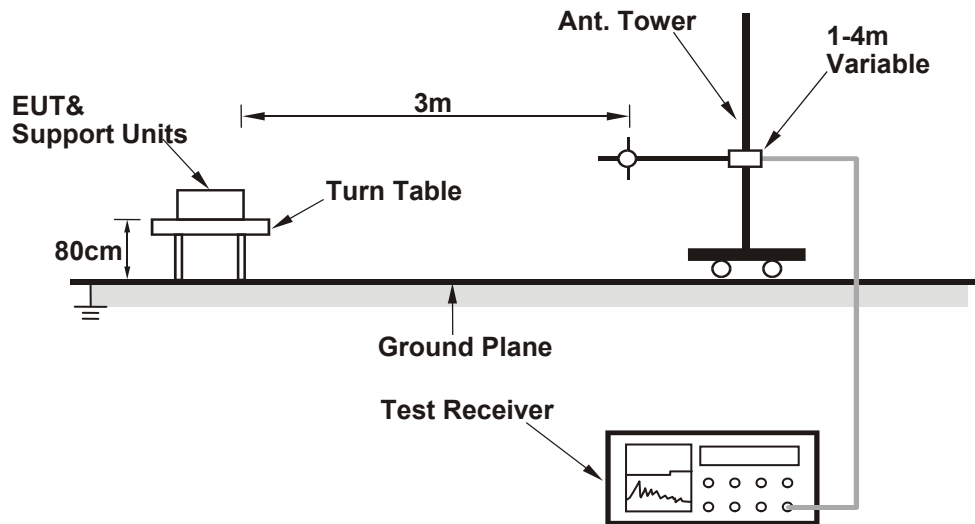
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.6.4 Deviation from Test Standard

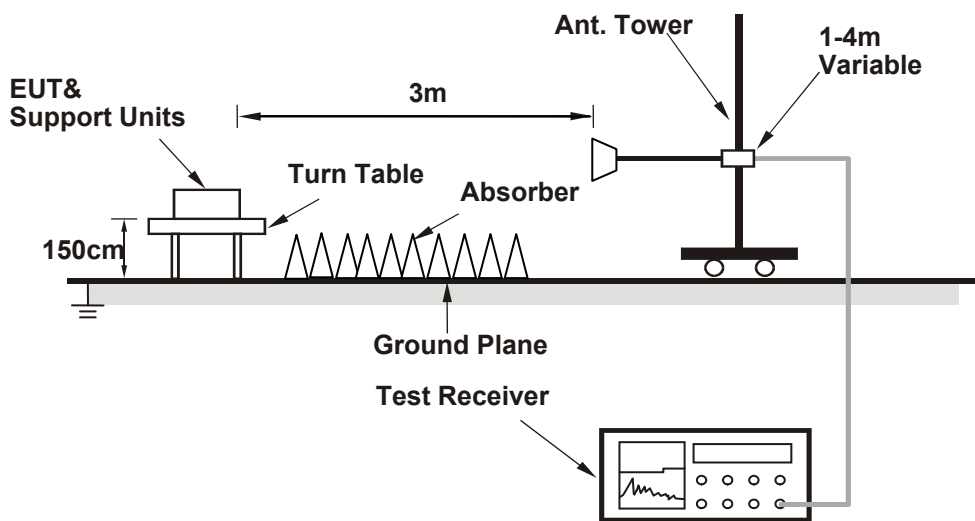
No deviation.

4.6.5 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).

4.6.6 Test Results

Below 1GHz Data :

LTE Band 48

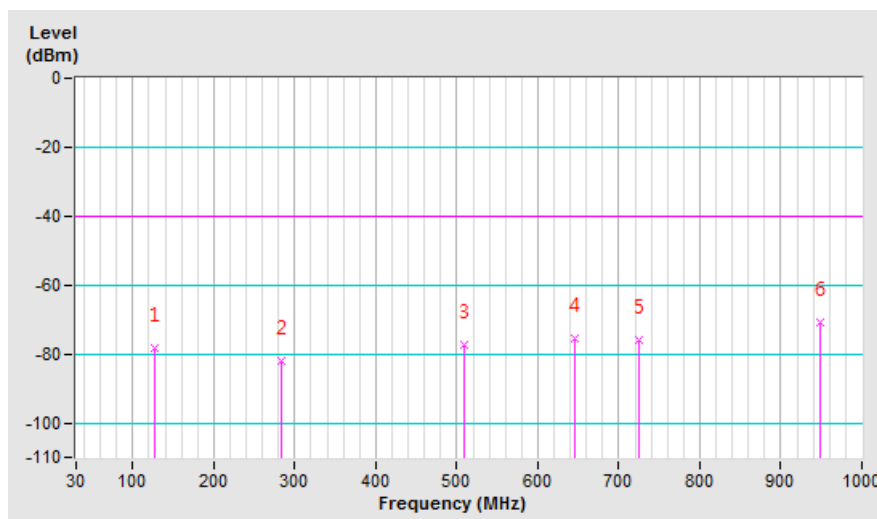
Channel Bandwidth: 5 MHz / QPSK

Mode	TX channel 55265 (3552.5MHz)	Frequency Range	Below 1000 MHz
------	---------------------------------	-----------------	----------------

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	126.39	-71.65	-91.76	13.36	-78.40	-40.00	-38.40
2	283.41	-78.23	-97.96	15.76	-82.20	-40.00	-42.20
3	509.79	-79.45	-98.99	21.54	-77.45	-40.00	-37.45
4	644.98	-80.01	-100.09	24.46	-75.63	-40.00	-35.63
5	725.61	-80.15	-101.62	25.59	-76.03	-40.00	-36.03
6	948.71	-81.09	-99.88	29.03	-70.85	-40.00	-30.85

Remarks:

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

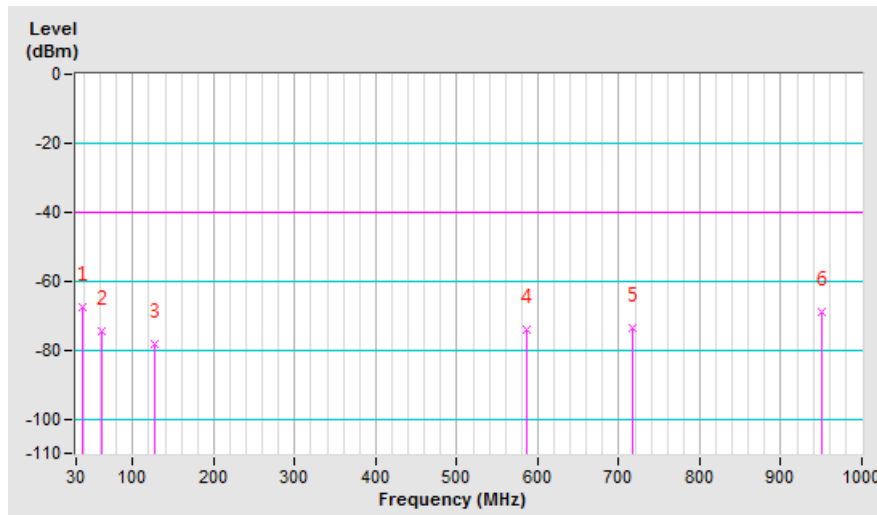


Mode	TX channel 55265 (3552.5MHz)	Frequency Range	Below 1000 MHz
------	---------------------------------	-----------------	----------------

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	37.15	-63.52	-81.21	13.45	-67.76	-40.00	-27.76
2	62.62	-69.33	-88.32	13.79	-74.53	-40.00	-34.53
3	127.12	-70.83	-91.55	13.36	-78.19	-40.00	-38.19
4	585.69	-77.45	-97.55	23.37	-74.18	-40.00	-34.18
5	716.40	-78.18	-99.13	25.36	-73.77	-40.00	-33.77
6	950.17	-78.98	-98.14	29.00	-69.14	-40.00	-29.14

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 ~ 37GHz
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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	7100.60	-63.55	-103.68	49.45	-54.23	-40.00	-14.23
2	10650.99	-68.84	-108.93	54.57	-54.36	-40.00	-14.36
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	7100.94	-58.46	-98.71	49.45	-49.26	-40.00	-9.26
2	10650.75	-62.57	-102.67	54.57	-48.10	-40.00	-8.10

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 ~ 37GHz
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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	7245.61	-61.29	-101.41	49.47	-51.94	-40.00	-11.94
2	10868.20	-70.58	-110.99	55.01	-55.98	-40.00	-15.98
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	7245.86	-55.97	-96.21	49.48	-46.73	-40.00	-6.73
2	10868.38	-65.94	-106.32	55.01	-51.31	-40.00	-11.31

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 ~ 37GHz
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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	7390.97	-63.99	-104.30	49.70	-54.60	-40.00	-14.60
2	11085.84	-71.96	-112.27	55.04	-57.23	-40.00	-17.23
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	7390.65	-57.88	-98.31	49.70	-48.61	-40.00	-8.61
2	11086.12	-68.65	-108.96	55.05	-53.91	-40.00	-13.91

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 ~ 37GHz
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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	7102.34	-63.60	-103.73	49.45	-54.28	-40.00	-14.28
2	10653.00	-67.83	-107.92	54.57	-53.35	-40.00	-13.35

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	7102.28	-57.53	-97.78	49.45	-48.33	-40.00	-8.33
2	10653.32	-62.23	-102.32	54.57	-47.75	-40.00	-7.75

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 ~ 37GHz
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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	7232.29	-61.17	-101.27	49.45	-51.82	-40.00	-11.82
2	10848.39	-70.33	-110.70	54.96	-55.74	-40.00	-15.74

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	7232.25	-56.93	-97.15	49.45	-47.70	-40.00	-7.70
2	10848.25	-65.43	-105.77	54.96	-50.81	-40.00	-10.81

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 ~ 37GHz
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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	7362.19	-66.07	-106.45	49.76	-56.69	-40.00	-16.69
2	11043.05	-70.43	-109.70	53.98	-55.72	-40.00	-15.72
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	7362.10	-56.63	-97.13	49.76	-47.37	-40.00	-7.37
2	11043.20	-65.89	-105.14	53.98	-51.16	-40.00	-11.16

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 FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

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