FCC Test Report

(PART 90S)

Report No.:	RF180704C01-5
FCC ID:	ZMOL850GLD
Test Model:	L850-GL
Received Date:	Jul. 04, 2018
Test Date:	Jul. 10, 2018 ~ Jul. 16, 2018
Issued Date:	Jul. 19, 2018
Applicant:	Fibocom Wireless Inc.
Address:	5/F, Tower A, Technology Building II, 1057 Nanhai Blvd, Nanshan, Shenzhen, China
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C)
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF180704C01-5	Original Release	Jul. 19, 2018

1 Certificate of Conformity

Product:	LTE module
Brand:	Fibocom
Test Model:	L850-GL
Sample Status:	Identical Prototype
Applicant:	Fibocom Wireless Inc.
Test Date:	Jul. 10, 2018 ~ Jul. 16, 2018
Standards:	FCC Part 90, Subpart S FCC Part 2

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 : Rona Chen , **Date:** Jul. 19, 2018

Rona Chen / Specialist

Approved by : , **Date:** Jul. 19, 2018

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2 (LTE 26)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 90.635 (b)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 90.213	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 90.209	Occupied Bandwidth (*)	Pass	Meet the requirement of limit.
2.1051 90.209	Emission Masks	Pass	Meet the requirement of limit.
2.1051 90.691	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 90.691	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -31.93 dB at 42.61 MHz.

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	Expended Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 16, 2018	Mar. 15, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jan. 11, 2018	Jan. 10, 2019
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 30, 2017	Nov. 29, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer	MT8820C	6201300640	Aug. 16, 2017	Aug. 15, 2019
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 08, 2017	Sep. 07, 2018
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
Digital Multimeter Fluke	87-III	70360742	Jun. 29, 2018	Jun. 28, 2019

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 test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

3 General Information

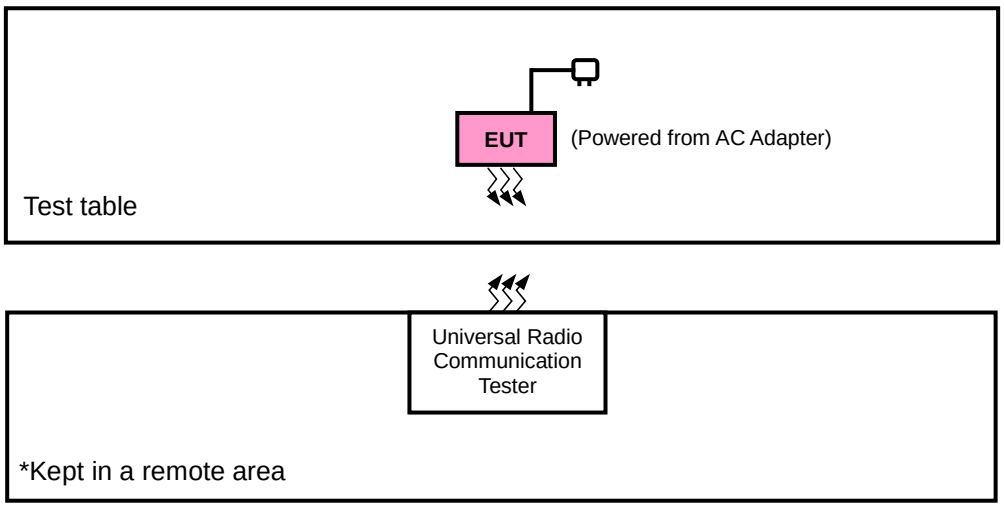
3.1 General Description of EUT

Product	LTE module	
Brand	Fibocom	
Test Model	L850-GL	
Status of EUT	Identical Prototype	
Power Supply Rating	3.3 Vdc (Host equipment)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE Band 26 (Channel Bandwidth: 1.4 MHz)	814.7 ~ 823.3 MHz
	LTE Band 26 (Channel Bandwidth: 3 MHz)	815.5 ~ 822.5 MHz
	LTE Band 26 (Channel Bandwidth: 5 MHz)	816.5 ~ 821.5 MHz
	LTE Band 26 (Channel Bandwidth: 10 MHz)	819 MHz
Emission Designator	LTE Band 26 (Channel Bandwidth: 1.4 MHz)	1M09G7D
	LTE Band 26 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 26 (Channel Bandwidth: 5 MHz)	4M50W7D
	LTE Band 26 (Channel Bandwidth: 10 MHz)	9M02G7D
Max. ERP Power	LTE Band 26 (Channel Bandwidth: 1.4 MHz)	217.77 mW
	LTE Band 26 (Channel Bandwidth: 3 MHz)	221.82 mW
	LTE Band 26 (Channel Bandwidth: 5 MHz)	226.99 mW
	LTE Band 26 (Channel Bandwidth: 10 MHz)	229.61 mW
Antenna Type	External Antenna with 3.0 dBi gain	
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

1. 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 Configuration of System under Test



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3 Test Mode Applicability and Tested Channel Detail

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

Band	Radiated Emission
LTE Band 26	Z-axis

LTE Band 26

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	26715 to 26765	26740	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
-	Frequency Stability	26697 to 26783	26697, 26783	1.4 MHz	QPSK	1 RB / 2 RB Offset
		26705 to 26775	26705, 26775	3 MHz	QPSK	1 RB / 7 RB Offset
		26715 to 26765	26715, 26765	5 MHz	QPSK	1 RB / 12 RB Offset
		26740	26740	10 MHz	QPSK	1 RB / 49 RB Offset
-	Occupied Bandwidth	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Emission Mask	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Conducted Emission	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK	1 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK	1 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK	1 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK	1 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK	1 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK	1 RB / 0 RB Offset

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

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	3.3 Vdc	Getaz Yang
Modulation Characteristics	25 deg. C, 65 % RH	3.3 Vdc	Getaz Yang
Frequency Stability	25 deg. C, 65 % RH	3.3 Vdc	Getaz Yang
Occupied Bandwidth	25 deg. C, 65 % RH	3.3 Vdc	Getaz Yang
Peak to Average Ratio	25 deg. C, 65 % RH	3.3 Vdc	Getaz Yang
Emission Mask	25 deg. C, 65 % RH	3.3 Vdc	Getaz Yang
Conducted Emission	25 deg. C, 65 % RH	3.3 Vdc	Getaz Yang
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Thomas Wei Jisyong Wang

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards

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 90
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016
ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 100 watts e.r.p.

4.1.2 Test Procedures

Conducted Power Measurement:

a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.

b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

EIRP / ERP Measurement:

a. EIRP = Conducted Output power level + Antenna gain.

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

c. ERP = Conducted Output power level + Antenna gain (dBi) - Isotropically Factor (2.15dB)

4.1.3 Test Setup

4.1.4 Test Results

Conducted Output Power (dBm)

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 26697	Mid Ch 26740	High Ch 26783		Low Ch 26697	Mid Ch 26740	High Ch 26783	
			814.7 MHz	819.0 MHz	823.3 MHz		814.7 MHz	819.0 MHz	823.3 MHz	
26 / 1.4M	1	0	22.53	22.21	22.01	0	21.48	21.14	20.99	1
	1	2	22.46	22.10	21.88	0	21.44	21.04	20.85	1
	1	5	22.23	21.92	21.66	0	21.20	20.88	20.55	1
	3	0	21.48	22.17	21.98	0	20.36	21.14	20.94	1
	3	1	21.28	21.97	21.87	0	20.19	20.99	20.70	1
	3	3	21.29	21.94	21.62	0	20.05	20.80	20.53	1
	6	0	21.47	21.17	20.93	1	20.30	19.93	19.75	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 26705	Mid CH 26740	High CH 26775		Low Ch 26705	Mid CH 26740	High CH 26775	
			815.5 MHz	819.0 MHz	822.5 MHz		815.5 MHz	819.0 MHz	822.5 MHz	
26 / 3M	1	0	22.61	22.30	22.13	0	21.36	21.28	21.04	1
	1	7	22.52	22.18	21.98	0	21.44	21.06	20.99	1
	1	14	22.35	22.02	21.82	0	21.22	21.00	20.79	1
	8	0	21.59	21.24	21.04	1	20.31	20.15	19.96	2
	8	3	21.41	21.04	20.84	1	20.25	20.00	19.79	2
	8	7	21.27	21.01	20.79	1	20.11	19.91	19.66	2
	15	0	21.43	21.14	20.91	1	20.29	20.09	19.98	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 26715	Mid Ch 26740	High Ch 26765		Low Ch 26715	Mid Ch 26740	High Ch 26765	
			816.5 MHz	819.0 MHz	821.5 MHz		816.5 MHz	819.0 MHz	821.5 MHz	
26 / 5M	1	0	22.71	22.43	22.25	0	21.43	21.34	21.21	1
	1	12	22.53	22.29	22.15	0	21.51	21.30	21.06	1
	1	24	22.41	22.16	21.97	0	21.36	21.07	20.88	1
	12	0	21.56	21.42	21.22	1	20.48	20.31	20.05	2
	12	6	21.42	21.30	21.13	1	20.32	20.27	20.03	2
	12	13	21.31	21.08	20.85	1	20.22	20.09	19.92	2
	25	0	21.50	21.34	21.21	1	20.38	20.34	20.15	2

Band / BW	RB Size	RB Offset	QPSK	3GPP MPR (dB)	16QAM	3GPP MPR (dB)
			Mid Ch 26740		Mid Ch 26740	
			819.0 MHz		819.0 MHz	
26 / 10M	1	0	22.76	0	21.51	1
	1	24	22.62	0	21.59	1
	1	49	22.42	0	21.42	1
	25	0	21.65	1	20.33	2
	25	12	21.40	1	20.29	2
	25	25	21.37	1	20.26	2
	50	0	21.51	1	20.49	2

ERP Power (dBm)

Note: ERP (dBm) = Max. Conducted Power (dBm) + Gain (dBi) – 2.15

Band 26 / 1.4M, 1RB#0						
Test Mode	QPSK			16QAM		
	Low Ch 26697	Mid Ch 26740	High Ch 26783	Low Ch 26697	Mid Ch 26740	High Ch 26783
	814.7 MHz	819.0 MHz	823.3 MHz	814.7 MHz	819.0 MHz	823.3 MHz
Max. Cond. Power (dBm)	22.53	22.21	22.01	21.48	21.14	20.99
Max. ERP Power (dBm)	23.38	23.06	22.86	22.33	21.99	21.84
Max. ERP Power (mW)	217.77	202.30	193.20	171.00	158.12	152.76

Band 26 / 3M, 1RB#0						
Test Mode	QPSK			16QAM		
	Low Ch 26705	Mid CH 26740	High CH 26775	Low Ch 26705	Mid CH 26740	High CH 26775
	815.5 MHz	819.0 MHz	822.5 MHz	815.5 MHz	819.0 MHz	822.5 MHz
Max. Cond. Power (dBm)	22.61	22.30	22.13	21.36	21.28	21.04
Max. ERP Power (dBm)	23.46	23.15	22.98	22.21	22.13	21.89
Max. ERP Power (mW)	221.82	206.54	198.61	166.34	163.31	154.53

Band 26 / 5M, 1RB#0						
Test Mode	QPSK			16QAM		
	Low Ch 26715	Mid Ch 26740	High Ch 26765	Low Ch 26715	Mid Ch 26740	High Ch 26765
	816.5 MHz	819.0 MHz	821.5 MHz	816.5 MHz	819.0 MHz	821.5 MHz
Max. Cond. Power (dBm)	22.71	22.43	22.25	21.43	21.34	21.21
Max. ERP Power (dBm)	23.56	23.28	23.10	22.28	22.19	22.06
Max. ERP Power (mW)	226.99	212.81	204.17	169.04	165.58	160.69

Band 26 / 10M, 1RB#0						
Test Mode	QPSK			16QAM		
		Mid Ch 26740			Mid Ch 26740	
		819.0 MHz			819.0 MHz	
Max. Cond. Power (dBm)		22.76			21.51	
Max. ERP Power (dBm)		23.61			22.36	
Max. ERP Power (mW)		229.61			172.19	

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

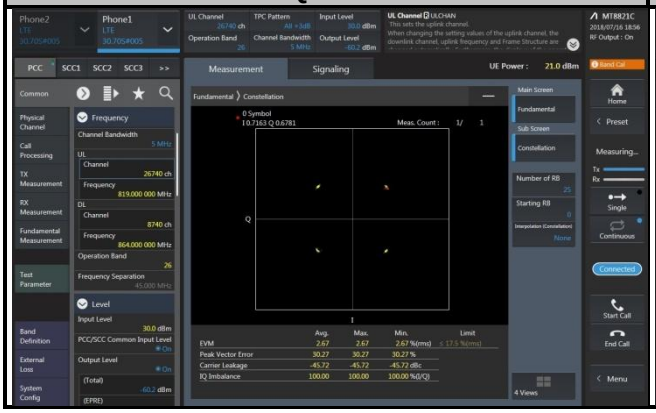
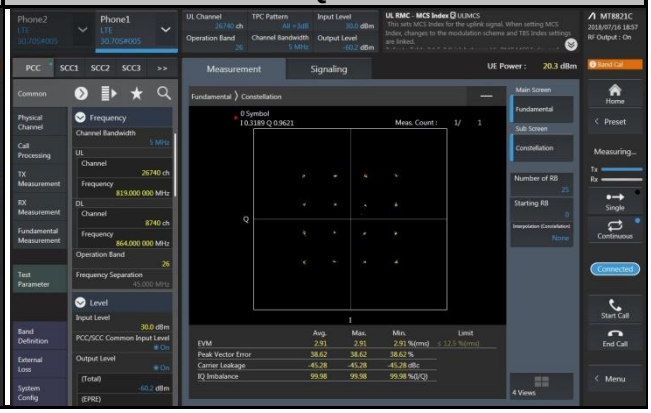
N/A

4.2.2 Test Setup

4.2.3 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.

4.2.4 Test Results

Spectrum Plot of Measurement	
LTE Band 26	
Channel 26740	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

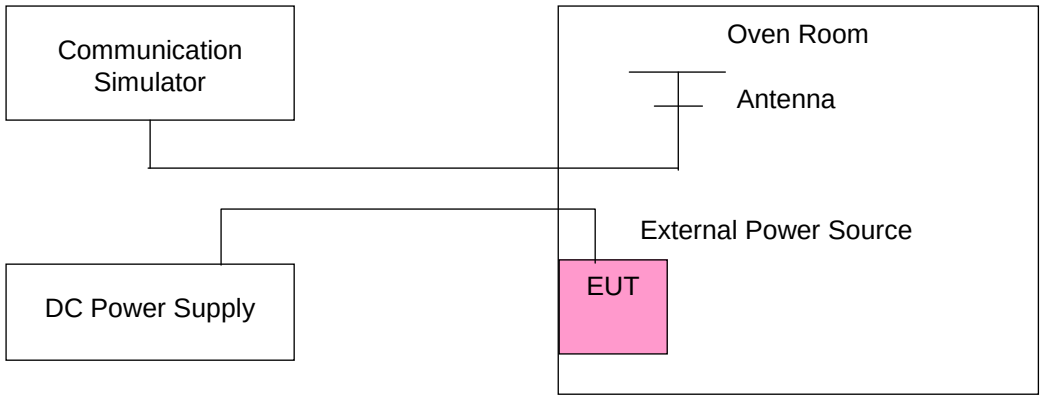
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

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 DC 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. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.3	814.700001	0.001	823.300001	0.001	2.5
3.135	814.700003	0.004	823.300004	0.004	2.5
4.4	814.700003	0.004	823.300002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	814.700003	0.004	823.300003	0.004	2.5
-20	814.700003	0.004	823.300004	0.005	2.5
-10	814.700003	0.003	823.300004	0.004	2.5
0	814.700002	0.002	823.300003	0.004	2.5
10	814.700003	0.003	823.300004	0.005	2.5
20	814.699997	-0.004	823.299999	-0.002	2.5
30	814.699997	-0.003	823.299998	-0.002	2.5
40	814.699999	-0.001	823.299999	-0.001	2.5
50	814.699999	-0.002	823.299997	-0.004	2.5
55	814.699999	-0.001	823.299999	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.3	815.500001	0.001	822.500002	0.002	2.5
3.135	815.500002	0.002	822.500002	0.002	2.5
4.4	815.500004	0.004	822.500003	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	815.500002	0.002	822.500002	0.003	2.5
-20	815.500002	0.002	822.500003	0.003	2.5
-10	815.500002	0.003	822.500002	0.002	2.5
0	815.500003	0.003	822.500001	0.002	2.5
10	815.500002	0.002	822.500001	0.001	2.5
20	815.499997	-0.003	822.499998	-0.003	2.5
30	815.499997	-0.003	822.499998	-0.002	2.5
40	815.499998	-0.003	822.499996	-0.005	2.5
50	815.499999	-0.002	822.499997	-0.004	2.5
55	815.499997	-0.004	822.499997	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.3	816.500004	0.005	821.500001	0.001	2.5
3.135	816.500002	0.003	821.500002	0.002	2.5
4.4	816.500003	0.004	821.500002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	816.500002	0.003	821.500003	0.004	2.5
-20	816.500001	0.001	821.500004	0.004	2.5
-10	816.500001	0.001	821.500003	0.003	2.5
0	816.500003	0.004	821.500001	0.002	2.5
10	816.500004	0.005	821.500003	0.004	2.5
20	816.499996	-0.005	821.499996	-0.005	2.5
30	816.499999	-0.001	821.499999	-0.002	2.5
40	816.499998	-0.002	821.499997	-0.003	2.5
50	816.499999	-0.001	821.499998	-0.002	2.5
55	816.499998	-0.002	821.499996	-0.005	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
3.3	819.000003	0.004	2.5
3.135	819.000002	0.002	2.5
4.4	819.000002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.135 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
-30	819.000004	0.005	2.5
-20	819.000004	0.005	2.5
-10	819.000003	0.003	2.5
0	819.000002	0.003	2.5
10	819.000002	0.002	2.5
20	818.999997	-0.004	2.5
30	818.999999	-0.002	2.5
40	818.999997	-0.004	2.5
50	818.999997	-0.003	2.5
55	818.999998	-0.002	2.5

4.4 Occupied Bandwidth Measurement

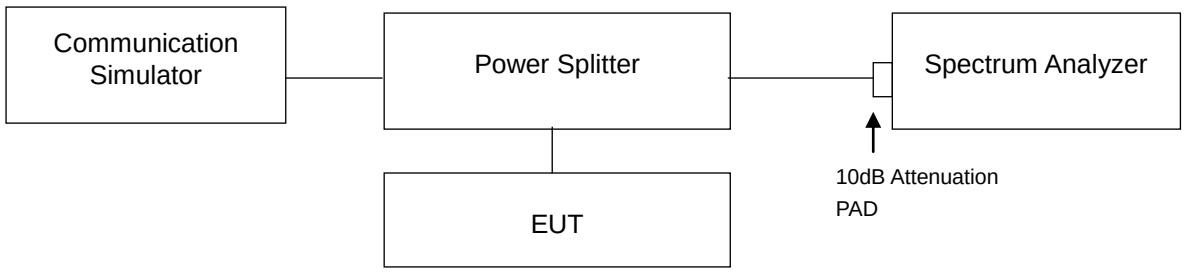
4.4.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.4.2 Test Procedure

The EUT makes a call to the communication simulator. 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.

4.4.3 Test Setup



4.4.4 Test Results

LTE Band 26							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
26697	814.7	1.09	1.09	26705	815.5	2.70	2.70
26740	819.0	1.09	1.09	26740	819.0	2.70	2.70
26783	823.3	1.09	1.09	26775	822.5	2.70	2.70

Spectrum Plot of Worst Value	
1.4 MHz / QPSK	3 MHz / QPSK
	

LTE Band 26							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
26715	816.5	4.49	4.50	26740	819.0	9.02	9.01
26740	819.0	4.50	4.50				
26765	821.5	4.50	4.50				

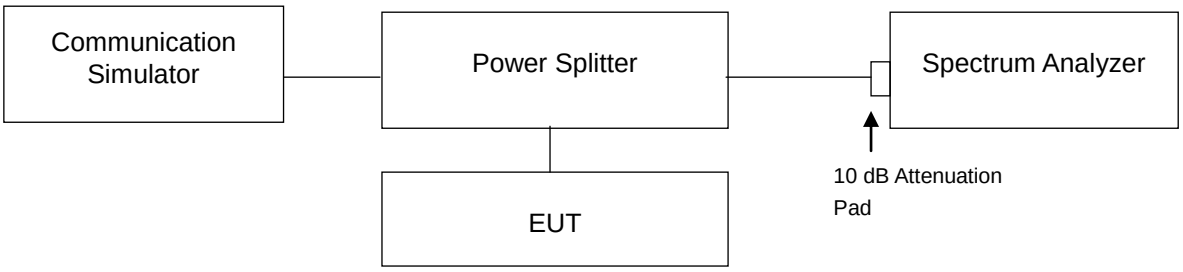
Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / QPSK
	

4.5 Emission Mask Measurement

4.5.1 Limits of Band Edge Measurement

According to FCC part 90.691 shall be tested the emission mask. For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50+10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

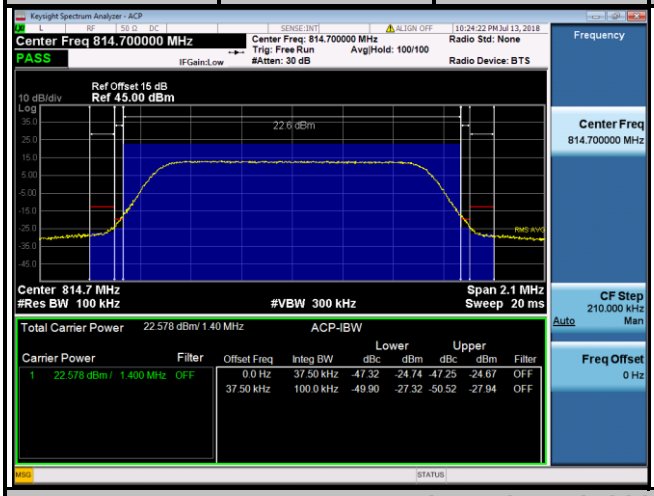
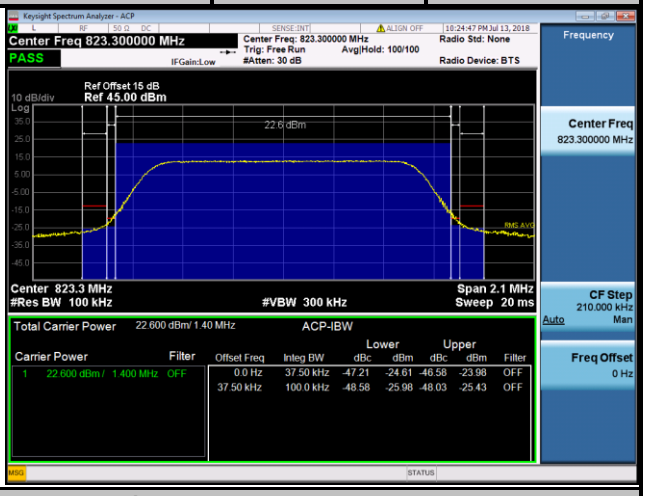
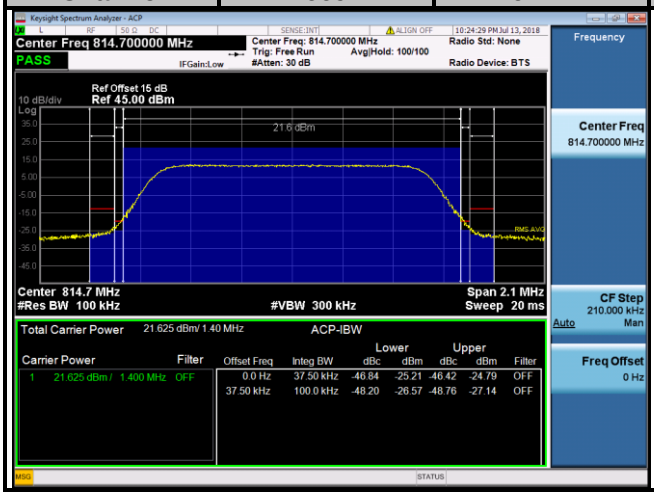
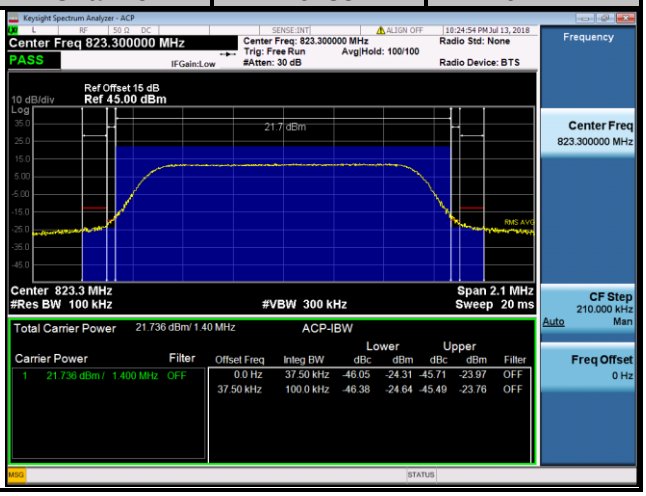
4.5.2 Test Setup

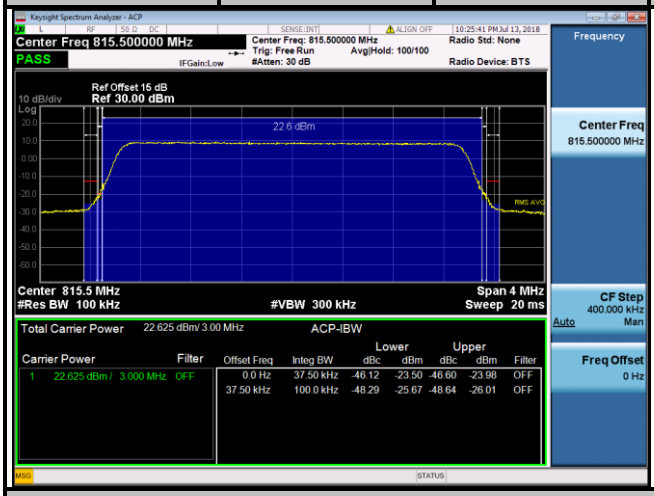
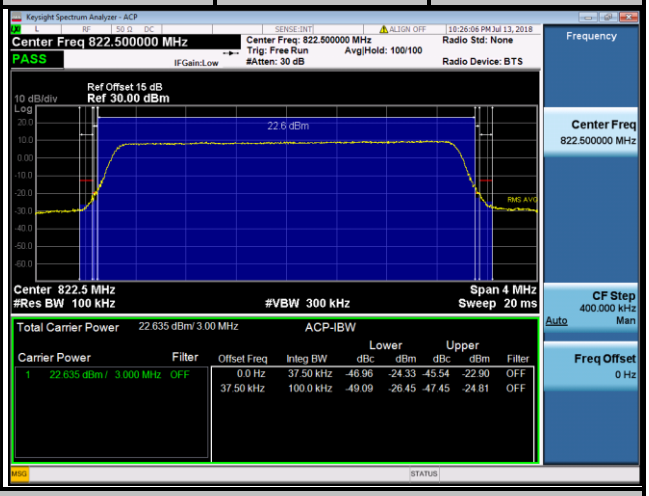
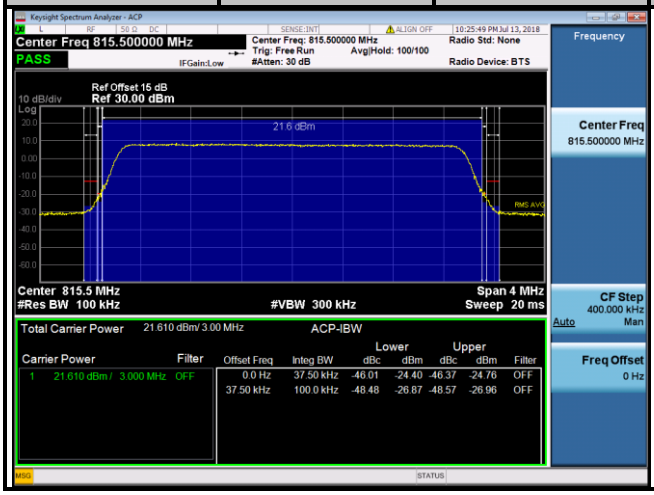
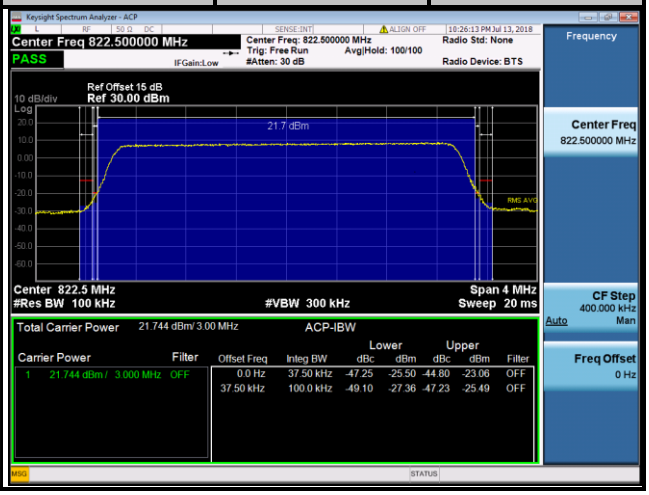


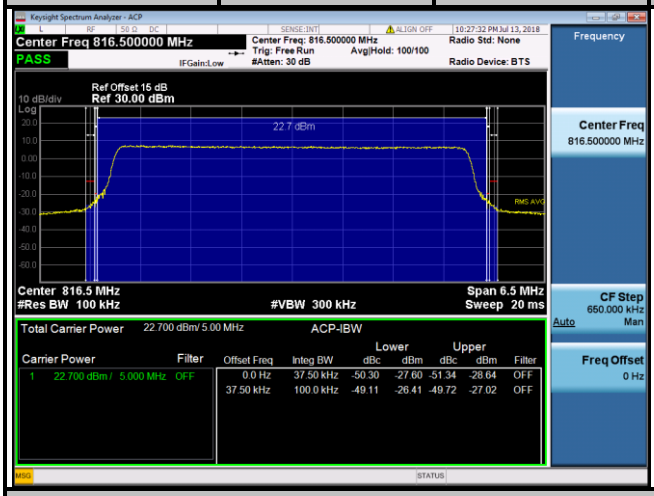
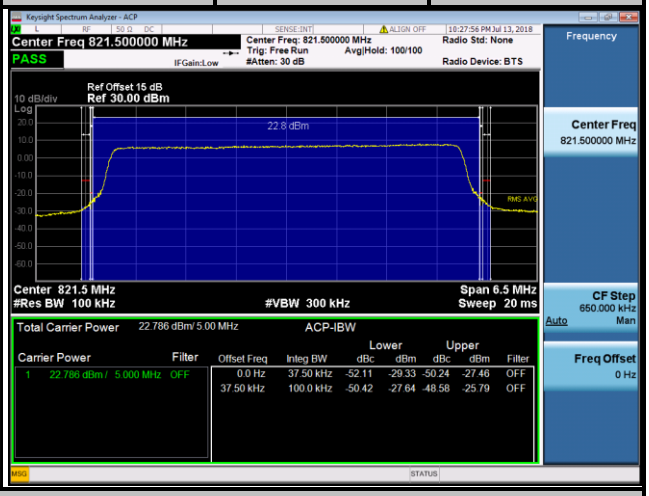
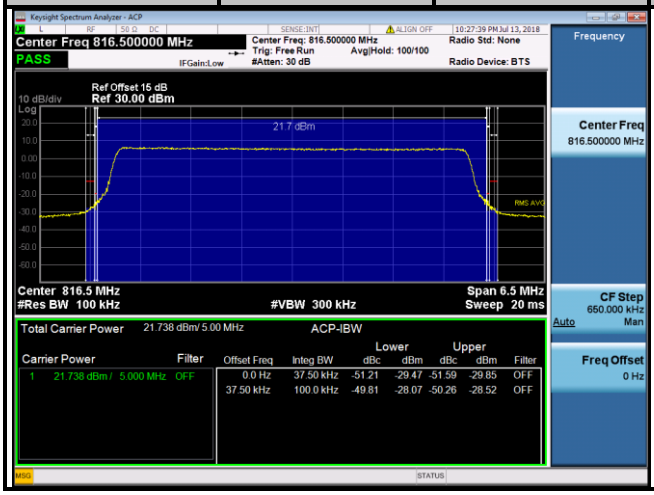
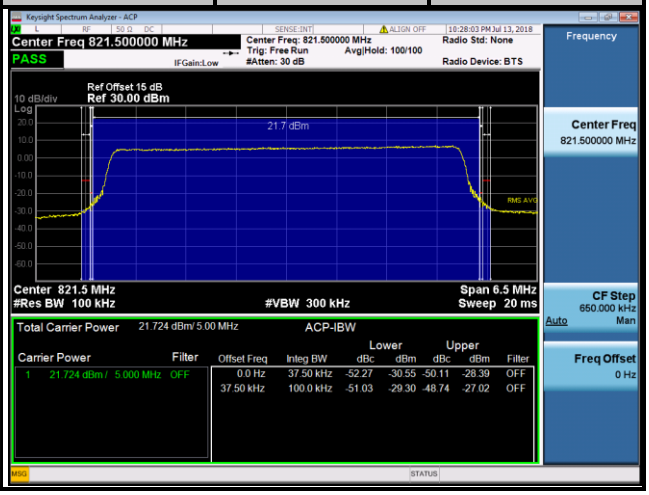
4.5.3 Test Procedures

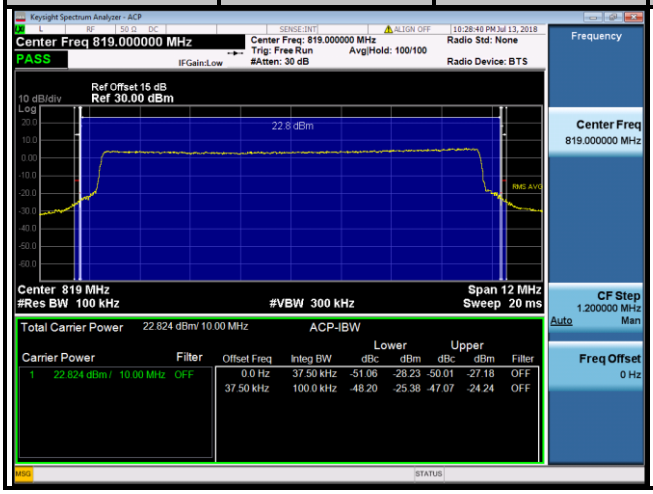
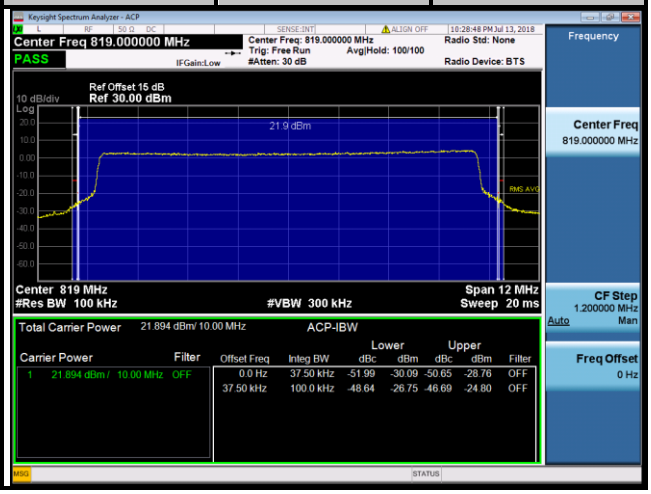
a. The measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Record the test plot.

4.5.4 Test Results

LTE Band 26					
Channel Bandwidth: 1.4 MHz / QPSK					
Channel	26697	6 RB	Channel	26783	6 RB
					
Channel Bandwidth: 1.4 MHz / 16QAM					
Channel	26697	6 RB	Channel	26783	6 RB
					

LTE Band 26					
Channel Bandwidth: 3 MHz / QPSK					
Channel	**26705**	**15 RB**	**Channel**	**26775**	**15 RB**
					
Channel Bandwidth: 3 MHz / 16QAM					
Channel	**26705**	**15 RB**	**Channel**	**26775**	**15 RB**
					

LTE Band 26					
Channel Bandwidth: 5 MHz / QPSK					
Channel	**267151**	**25 RB**	**Channel**	**26765**	**25 RB**
					
Channel Bandwidth: 5 MHz / 16QAM					
Channel	**267151**	**25 RB**	**Channel**	**26765**	**25 RB**
					

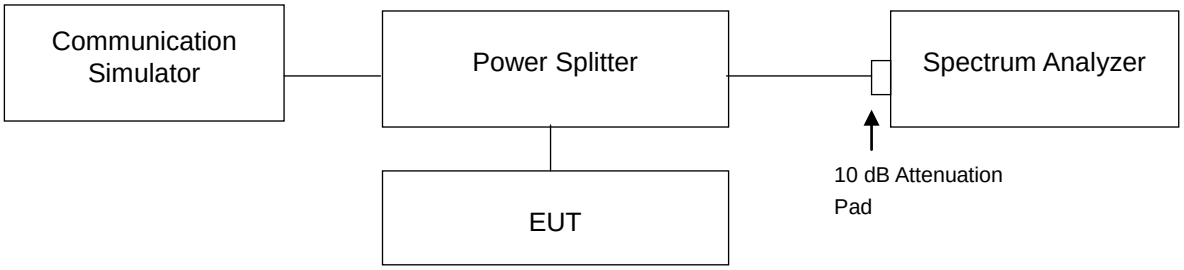
LTE Band 26					
Channel Bandwidth: 10 MHz / QPSK			Channel Bandwidth: 10 MHz / 16QAM		
Channel	26740	50 RB	Channel	26740	50 RB
					

4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log10(P) dB. The limit of emission is equal to -13 dBm.
On all frequencies between 769 – 775 MHz and 799 – 805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

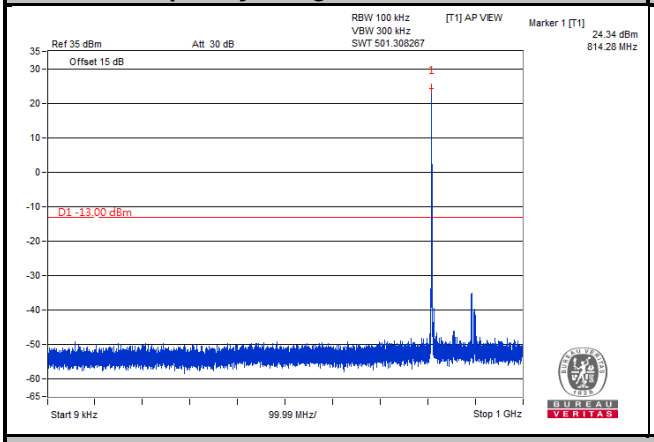
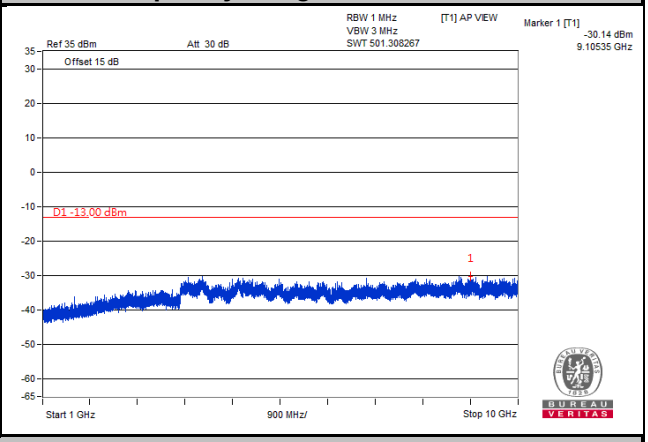
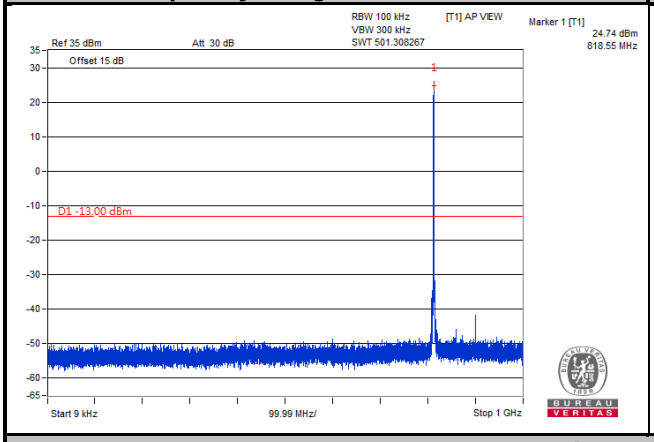
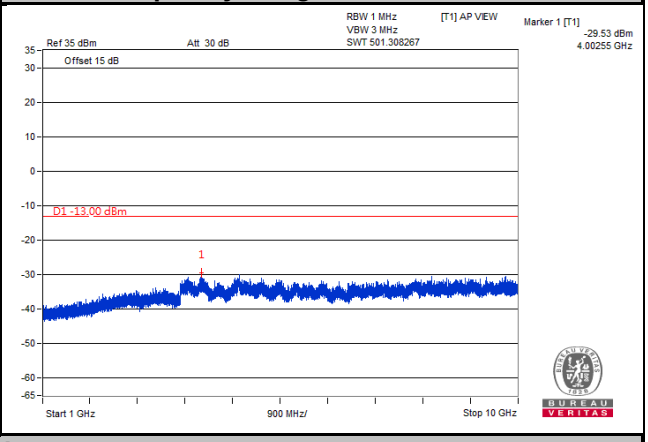
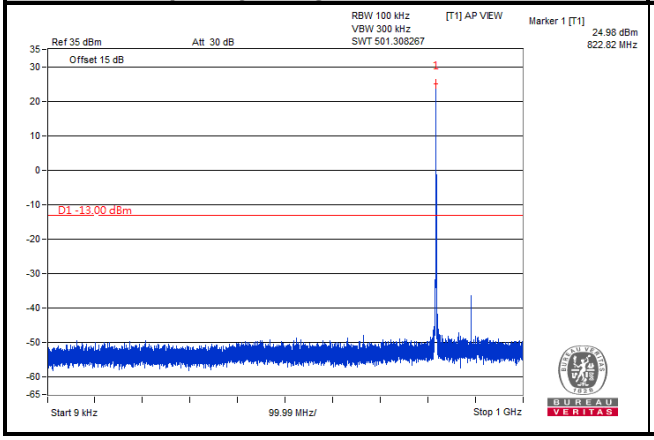
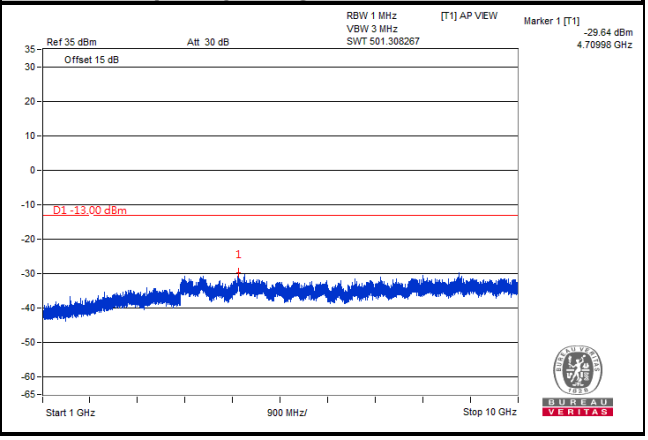
4.6.2 Test Setup

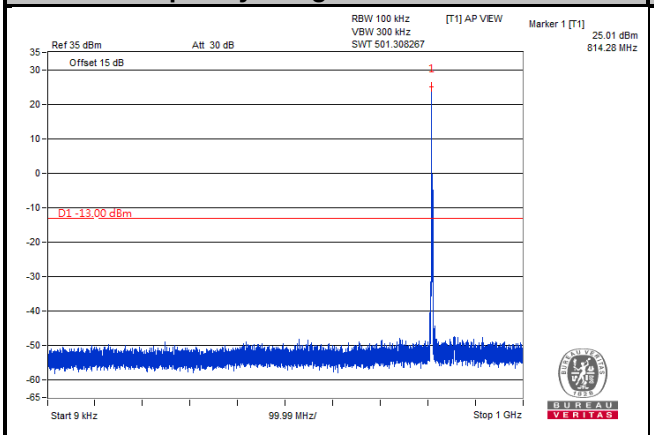
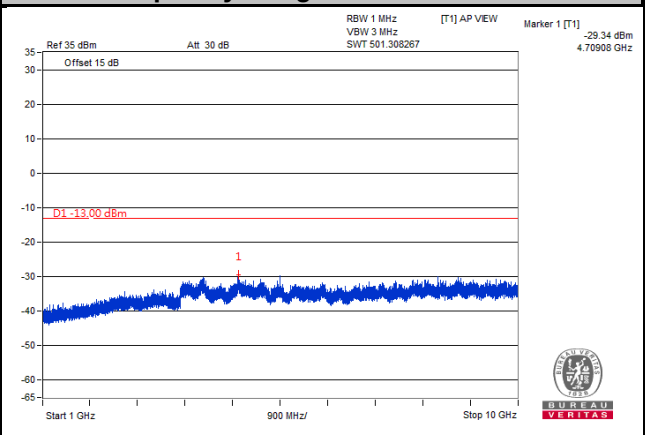
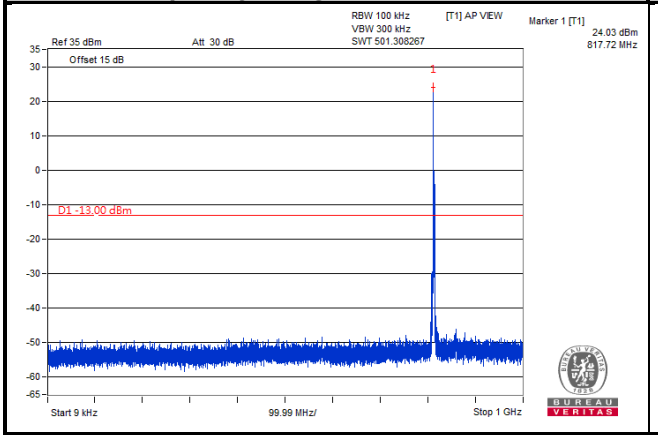
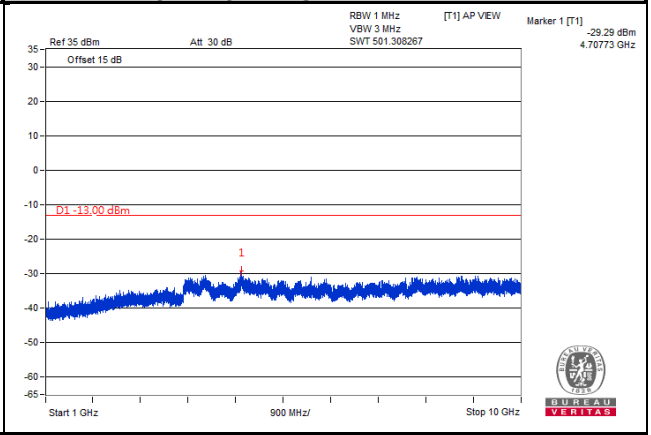
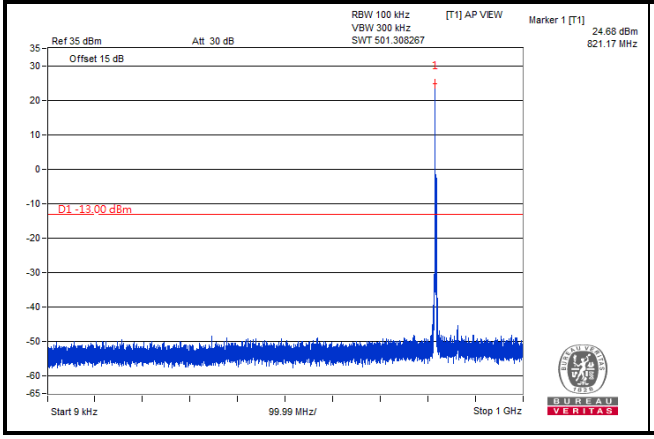
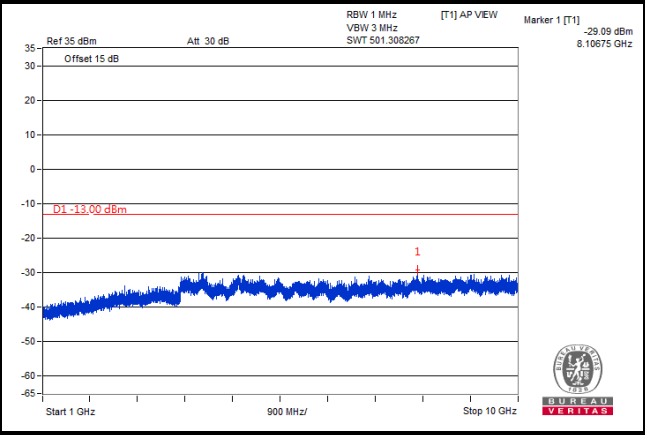


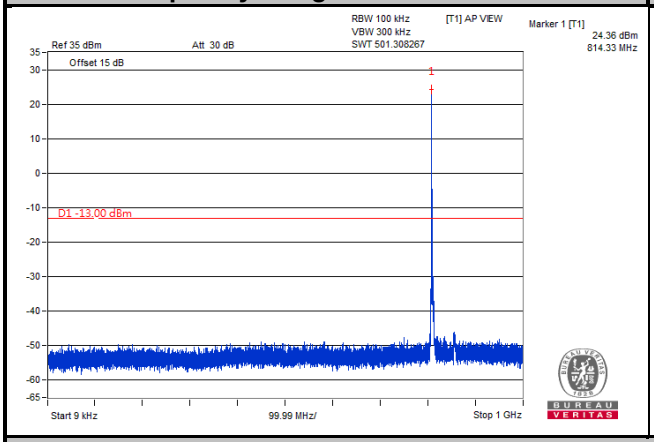
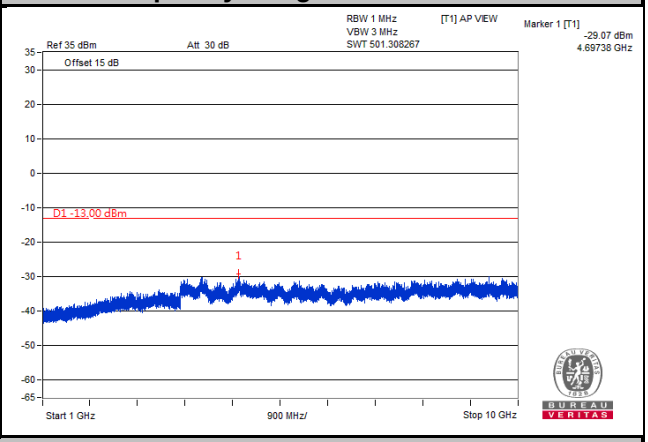
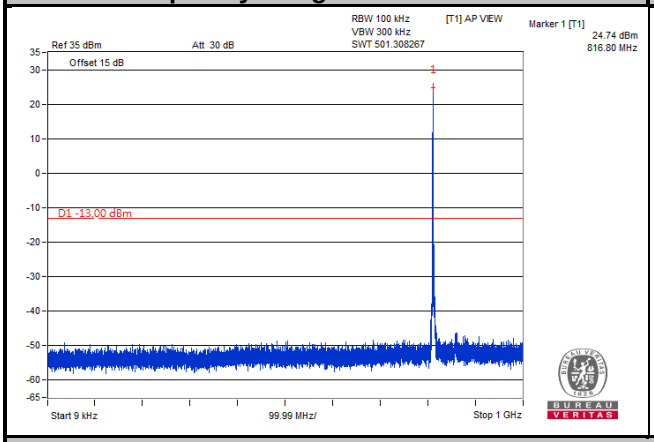
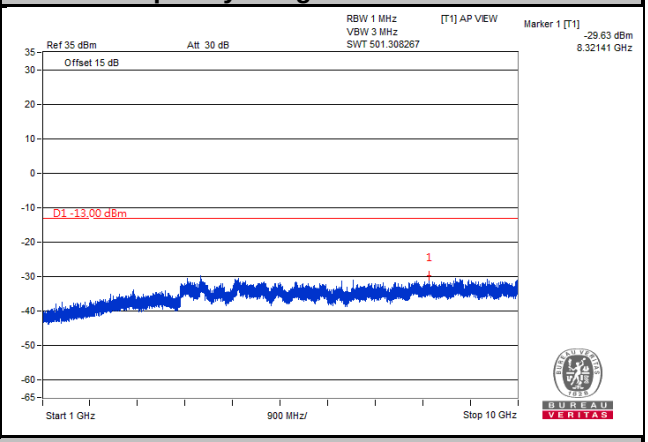
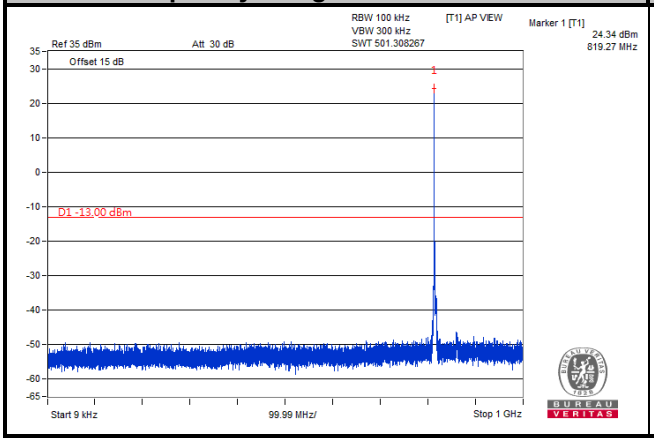
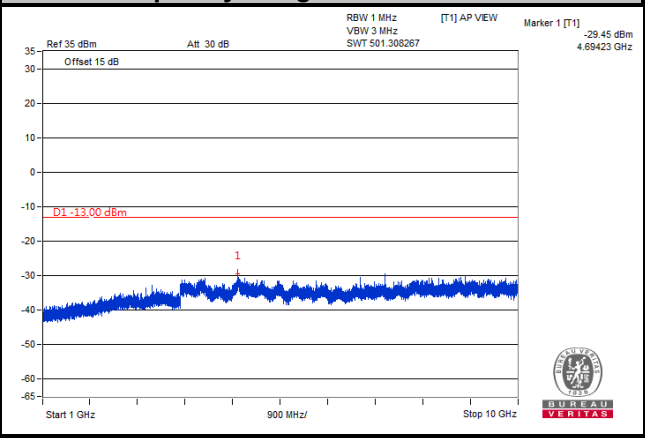
4.6.3 Test Procedure

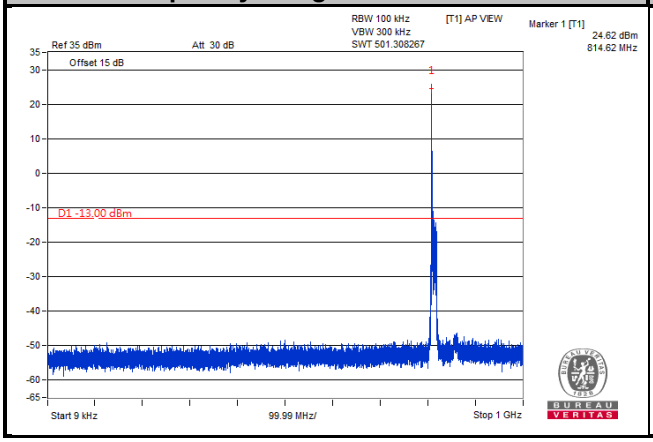
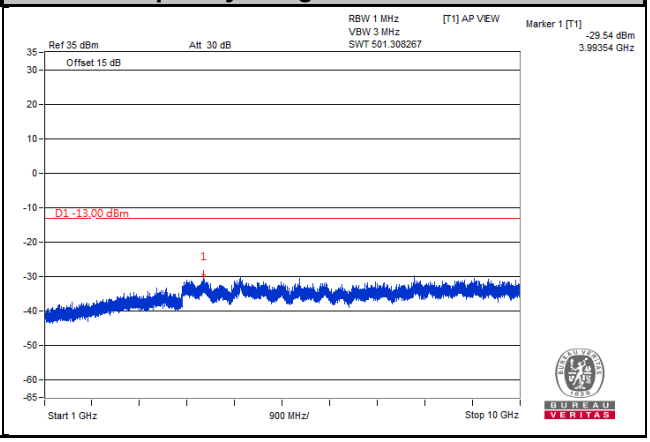
a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9 kHz to 10 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz for 9 kHz to 1 GHz and RBW = 1 MHz and VBW = 3 MHz for 1 GHz to 10 GHz is used for conducted emission measurement.

4.6.4 Test Results

LTE Band 26	
Channel Bandwidth: 1.4 MHz	
Channel 26697	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26740	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26783	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

LTE Band 26	
Channel Bandwidth: 3 MHz	
Channel 26705	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26740	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26775	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

LTE Band 26	
Channel Bandwidth: 5 MHz	
Channel 26715	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26740	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26765	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

LTE Band 26	
Channel Bandwidth: 10 MHz	
Channel 26740	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

(1) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log10(P) dB. The limit of emission is equal to -13 dBm.

(2) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

4.7.2 Test Procedure

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) 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 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.

b. The substitution horn 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. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dB.

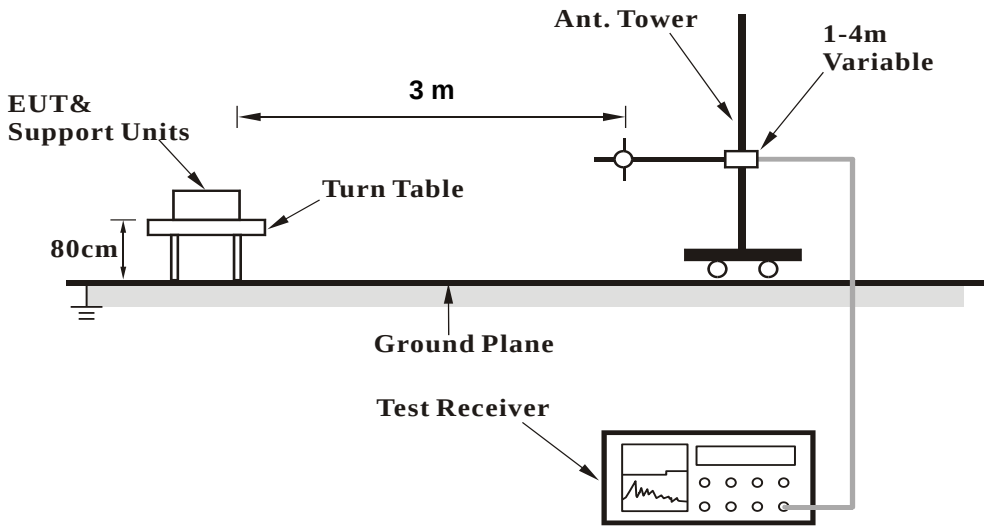
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.7.3 Deviation from Test Standard

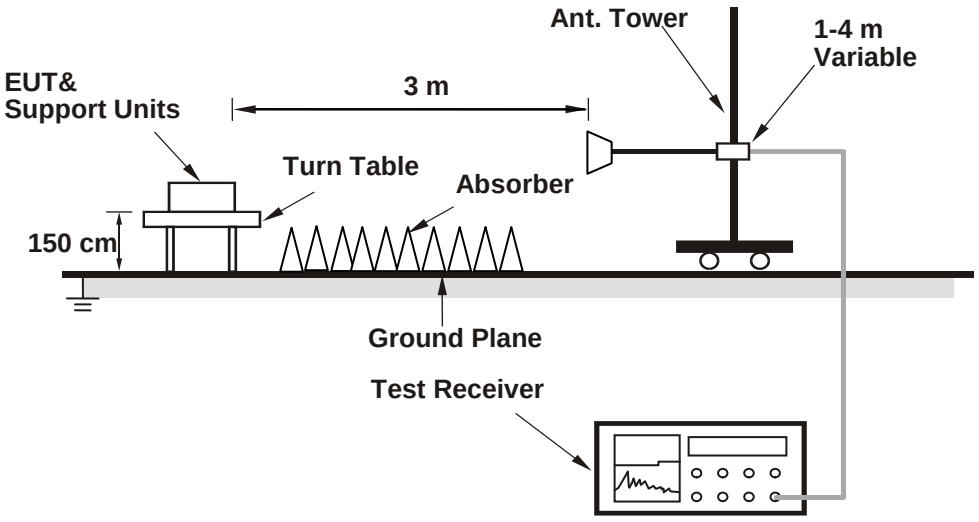
No deviation.

4.7.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

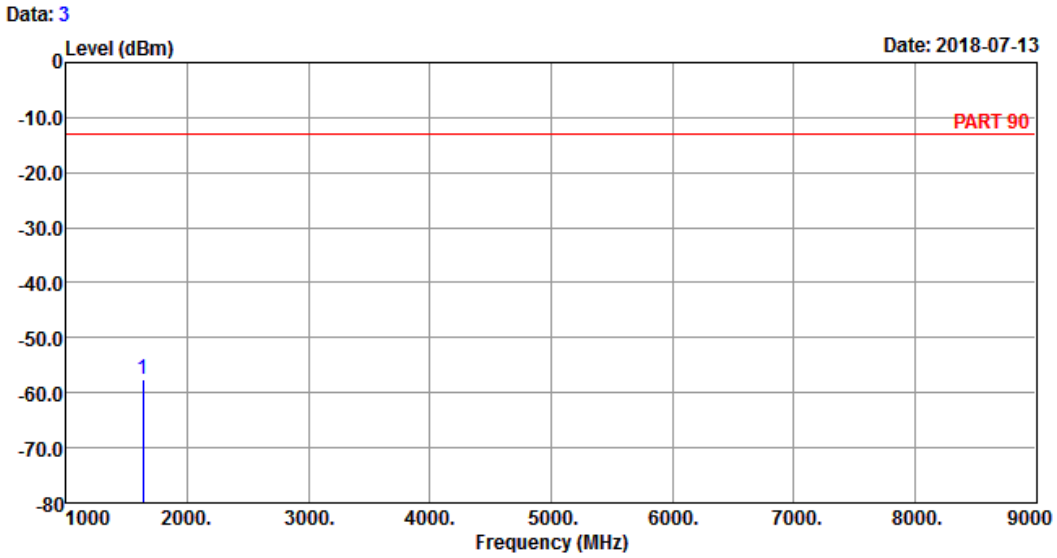
4.7.5 Test Results

LTE Band 26

Channel Bandwidth: 5 MHz / QPSK

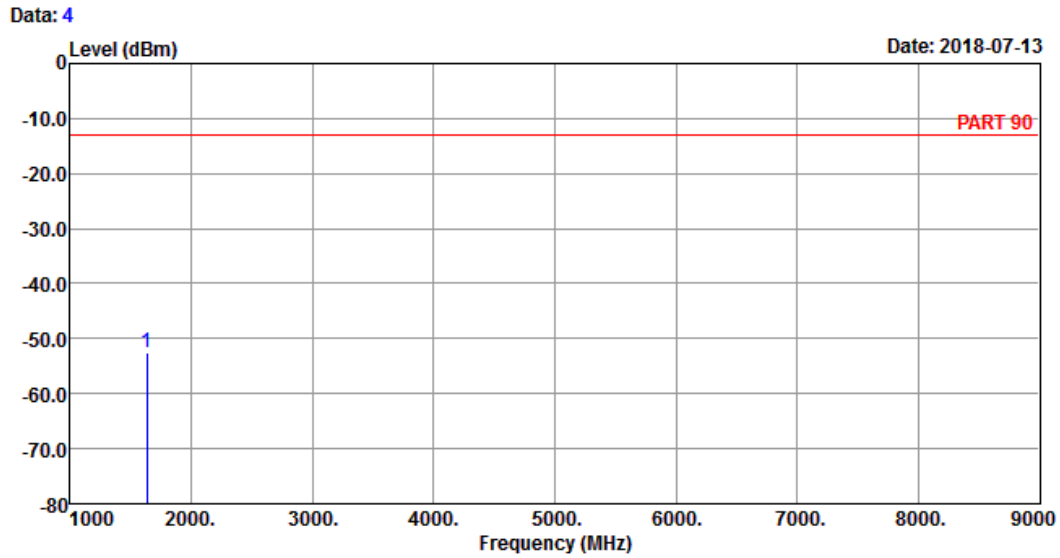
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 90 HORIZONTAL
Remak : LTE Band 26 QPSK_5M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1633.00	-57.63	-42.84	-13.00	-44.63	-14.79	Peak

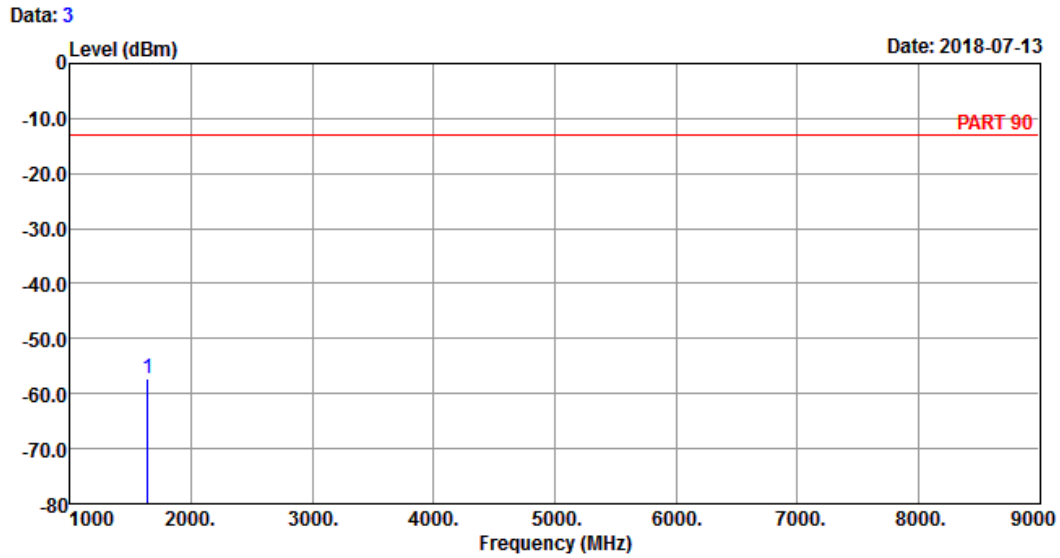


Site : 966 Chamber 5
Condition: PART 90 VERTICAL
Remak : LTE Band 26 QPSK_5M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1633.00	-52.65	-37.86	-13.00	-39.65	-14.79	Peak

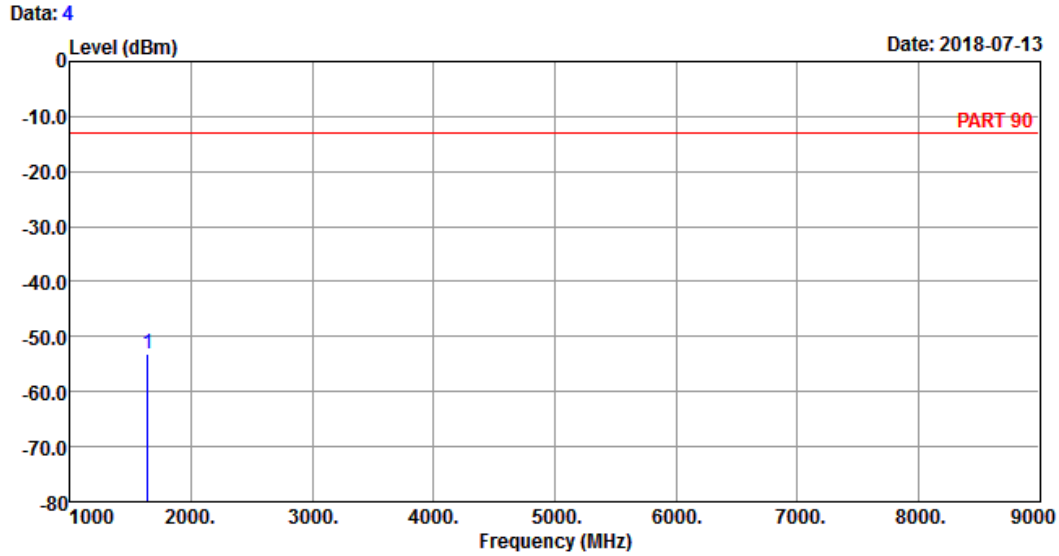
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 90 HORIZONTAL
Remak : LTE Band 26 QPSK_5M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1638.00	-57.25	-42.46	-13.00	-44.25	-14.79	Peak

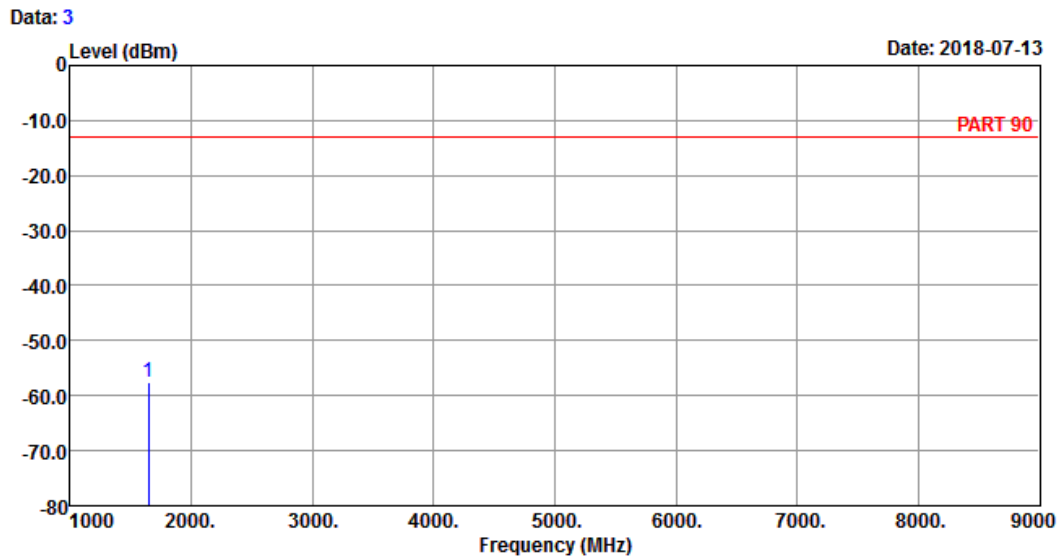


Site : 966 Chamber 5
Condition: PART 90 VERTICAL
Remak : LTE Band 26 QPSK_5M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1638.00	-53.01	-38.22	-13.00	-40.01	-14.79	Peak

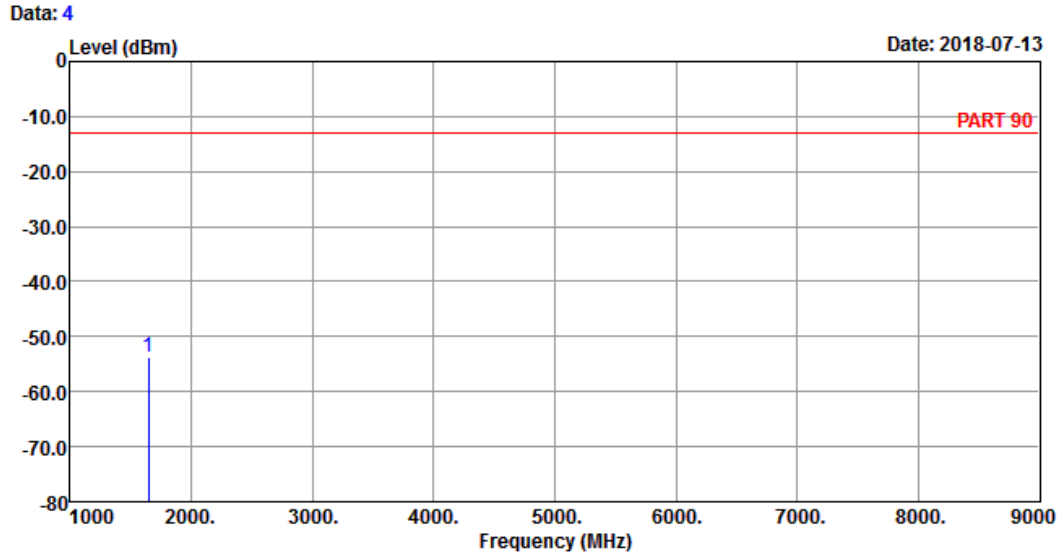
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 90 HORIZONTAL
Remak : LTE Band 26 QPSK_5M Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1643.00	-57.52	-42.79	-13.00	-44.52	-14.73	Peak



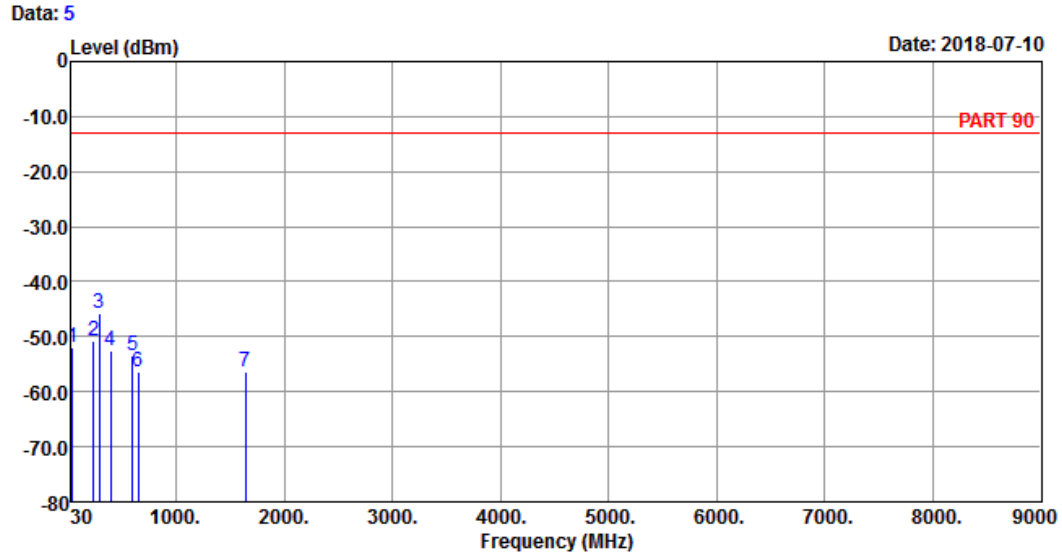
Site : 966 Chamber 5
Condition: PART 90 VERTICAL
Remak : LTE Band 26 QPSK_5M Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1643.00	-53.62	-38.89	-13.00	-40.62	-14.73	Peak

Channel Bandwidth: 10 MHz / QPSK
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

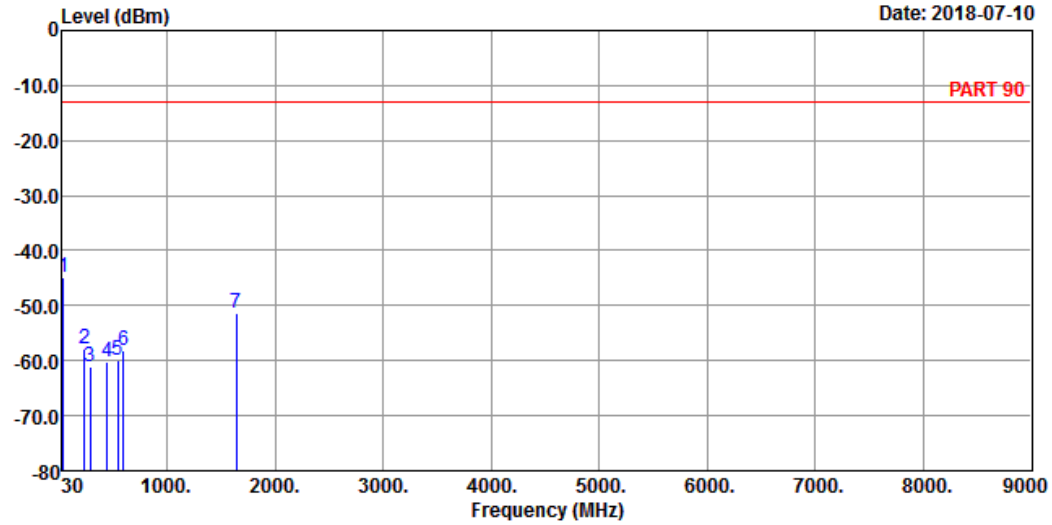
A D T



Site : 966 Chamber 5
Condition: PART 90 HORIZONTAL
Remak : LTE Band 26 QPSK_10M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	39.70	-52.03	-52.67	-13.00	-39.03	0.64	Peak
2	234.67	-50.88	-44.26	-13.00	-37.88	-6.62	Peak
3 pp	286.08	-45.83	-39.10	-13.00	-32.83	-6.73	Peak
4	390.84	-52.66	-46.66	-13.00	-39.66	-6.00	Peak
5	598.42	-53.56	-52.73	-13.00	-40.56	-0.83	Peak
6	649.83	-56.37	-55.49	-13.00	-43.37	-0.88	Peak
7	1638.00	-56.30	-41.51	-13.00	-43.30	-14.79	Peak

Data: 6



Site : 966 Chamber 5
Condition: PART 90 VERTICAL
Remak : LTE Band 26 QPSK_10M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	42.61	-44.93	-43.99	-13.00	-31.93	-0.94	Peak
2	234.67	-57.86	-51.24	-13.00	-44.86	-6.62	Peak
3	286.08	-61.18	-54.45	-13.00	-48.18	-6.73	Peak
4	442.25	-60.14	-54.53	-13.00	-47.14	-5.61	Peak
5	547.01	-60.04	-57.09	-13.00	-47.04	-2.95	Peak
6	598.42	-58.16	-57.33	-13.00	-45.16	-0.83	Peak
7	1638.00	-51.24	-36.45	-13.00	-38.24	-14.79	Peak

5 Pictures of Test Arrangements

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

Appendix – Information on 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.

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

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

--- END ---