FCC Test Report

(PART 90S)

Report No.:	RF180125C14-9
FCC ID:	B94HNQ10CPD
Test Model:	HSN-Q10C
Received Date:	Feb. 05, 2018
Test Date:	Mar. 23, 2018 ~ May 21, 2018
Issued Date:	Jun. 01, 2018
Applicant:	HP Inc.
Address:	3390 East Harmony Road, Fort Collins, Colorado 80528, United States
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 (1):	No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.
Test Location (2):	No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan, R.O.C
FCC Registration / Designation Number:	427177 / TW0011

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencie

Table of Contents

Release Control Record 3

1 Certificate of Conformity 4

2 Summary of Test Results 5

2.1 Measurement Uncertainty 5
2.2 Test Site and Instruments 6

3 General Information 7

3.1 General Description of EUT 7
3.2 Configuration of System under Test 8
3.2.1 Description of Support Units 8
3.3 Test Mode Applicability and Tested Channel Detail 9
3.4 EUT Operating Conditions 10
3.5 General Description of Applied Standards 10

4 Test Types and Results 11

4.1 Output Power Measurement 11
4.1.1 Limits of Output Power Measurement 11
4.1.2 Test Procedures 11
4.1.3 Test Setup 12
4.1.4 Test Results 13
4.2 Frequency Stability Measurement 16
4.2.1 Limits of Frequency Stability Measurement 16
4.2.2 Test Procedure 16
4.2.3 Test Setup 16
4.2.4 Test Results 17
4.3 Occupied Bandwidth Measurement 21
4.3.1 Test Procedure 21
4.3.2 Test Setup 21
4.3.3 Test Result 22
4.4 Emission Mask Measurement 24
4.4.1 Limits of Band Edge Measurement 24
4.4.2 Test Setup 24
4.4.3 Test Procedures 24
4.4.4 Test Results 25
4.5 Conducted Spurious Emissions 29
4.5.1 Limits of Conducted Spurious Emissions Measurement 29
4.5.2 Test Setup 29
4.5.3 Test Procedure 29
4.5.4 Test Results 30
4.6 Radiated Emission Measurement 34
4.6.1 Limits of Radiated Emission Measurement 34
4.6.2 Test Procedure 34
4.6.3 Deviation from Test Standard 34
4.6.4 Test Setup 35
4.6.5 Test Results 36

5 Pictures of Test Arrangements 50

Appendix – Information on the Testing Laboratories 51

Release Control Record

Issue No.	Description	Date Issued
RF180125C14-9	Original Release	Jun. 01, 2018

1 Certificate of Conformity

Product: Notebook Computer

Brand: HP

Test Model: HSN-Q10C

Sample Status: Production Unit

Applicant: HP Inc.

Test Date: Mar. 23, 2018 ~ May 21, 2018

Standards: FCC Part 90, Subpart S

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 : Evonne Liu , **Date:** Jun. 01, 2018

Evonne Liu / Specialist

Approved by : Dylan Chiou , **Date:** Jun. 01, 2018

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 90.635 (b)	Effective Radiated Power	Pass	Meet the requirement of limit.
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 -37.32 dB at 47.55 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) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Test Site and Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 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
HORN Antenna ETS	3117	00034128	Dec. 14, 2017	Dec. 13, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 07, 2017	Jul. 06, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 23, 2017	Jun. 22, 2018
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Communications Tester-Wireless Agilent	8960 Series 10	MY53201073	Jun. 28, 2017	Jun. 27, 2019
Radio Communication Analyzer Anritsu	MT8820C	6201010284	Dec. 28, 2017	Dec. 27, 2018
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. 30, 2017	Jun. 29, 2018

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 HsinTien Chamber 1.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450I-1.

3 General Information

3.1 General Description of EUT

Product	Notebook Computer	
Brand	HP	
Test Model	HSN-Q10C	
Status of EUT	Production Unit	
Power Supply Rating	20 or 15 or 12 or 9 or 5 Vdc (Adapter)	
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)	32.06 mW
	LTE Band 26 (Channel Bandwidth: 3 MHz)	32.28 mW
	LTE Band 26 (Channel Bandwidth: 5 MHz)	32.43 mW
	LTE Band 26 (Channel Bandwidth: 10 MHz)	32.73 mW
Antenna Type	Refer to Note as below	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. The WWAN module (Brand: Fibocom, Model: L850-GL) was installed in the EUT.
2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	hp	TPN-LA12	I/P: 100-240 Vac, 50-60 Hz, 1.6 A O/P: 20 Vdc, 3.25 A, 15 Vdc, 4.33 A, 12 Vdc, 5 A, 9 Vdc, 3 A, 5 Vdc, 3 A

3. The antenna information is listed as below.

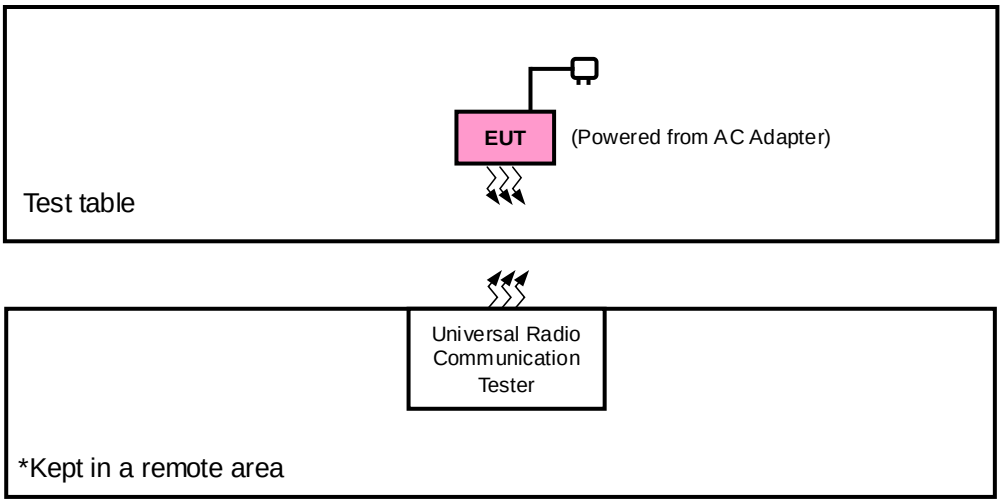
Ant. Type	Manuf.	Parts Number	Antenna Gain							
			LTE 2 / LTE 25 / WCDMA Band II	LTE 4 / LTE 66 / WCDMA Band IV	LTE 5 / LTE 26 / WCDMA Band V	LTE 7	LTE 12 / LTE 17	LTE 13	LTE 30	LTE 41
PIFA	INPAQ	Main Ant.: DQ6LB020017 (WA-P-LTE8LTE12LBLB-02-001) Aux Ant.: DQ6LB020017 (WA-P-LTE8LTE12LBLB-02-001)	-6.19	-5.79	-5.86	-4.9	-5.21	-4.32	-3.68	-4.9

Antenna Type	Vendor	Part Number	Antenna Gain (dBi)			
			Laptop PC Mode			
			WLAN 2.4GHz	WLAN 5.2GHz	WLAN 5.5GHz	WLAN 5.8GHz
PIFA	INPAQ	WLAN Main Antenna: DQ6LB020509 (WA-P-LBLB-02-059) WLAN Aux Antenna: DQ6LB020509 (WA-P-LBLB-02-059)	1.66	0.54	0.56	-0.21
			Tablet PC Mode			
			WLAN 2.4GHz	WLAN 5.2GHz	WLAN 5.5GHz	WLAN 5.8GHz
			-0.36	3.36	2.21	3.08

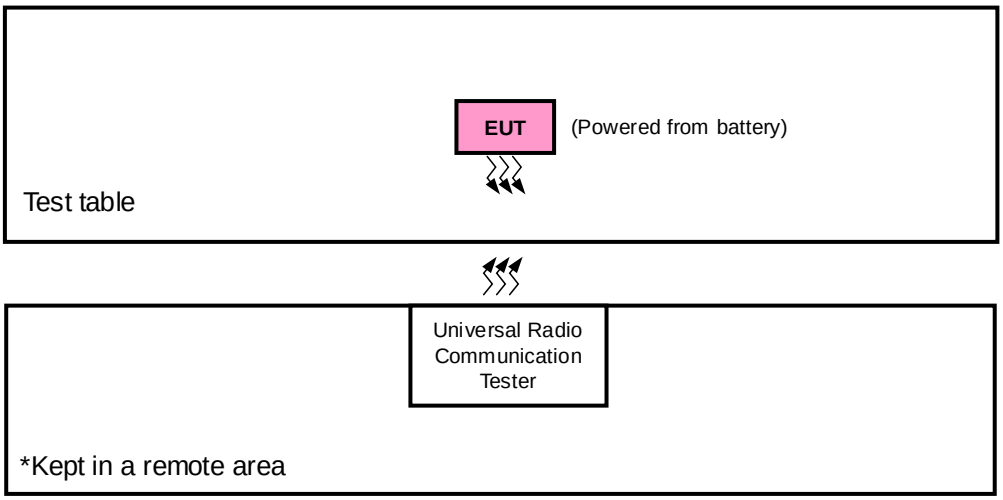
4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test

<Radiated Emission Test>



<E.R.P. 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	ERP	Radiated Emission
LTE Band 26	Z-plane	X-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 / 2 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	1 RB / 49 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	6.54 Vdc	Charles Hsiao
Frequency Stability	25 deg. C, 65 % RH	6.54 Vdc	Wayne Lin
Occupied Bandwidth	25 deg. C, 65 % RH	6.54 Vdc	Wayne Lin
Peak to Average Ratio	25 deg. C, 65 % RH	6.54 Vdc	Wayne Lin
Emission Mask	25 deg. C, 65 % RH	6.54 Vdc	Wayne Lin
Conducted Emission	25 deg. C, 65 % RH	6.54 Vdc	Wayne Lin
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao

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
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

EIRP / ERP Measurement:

a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for CDMA and 10 MHz for LTE mode.

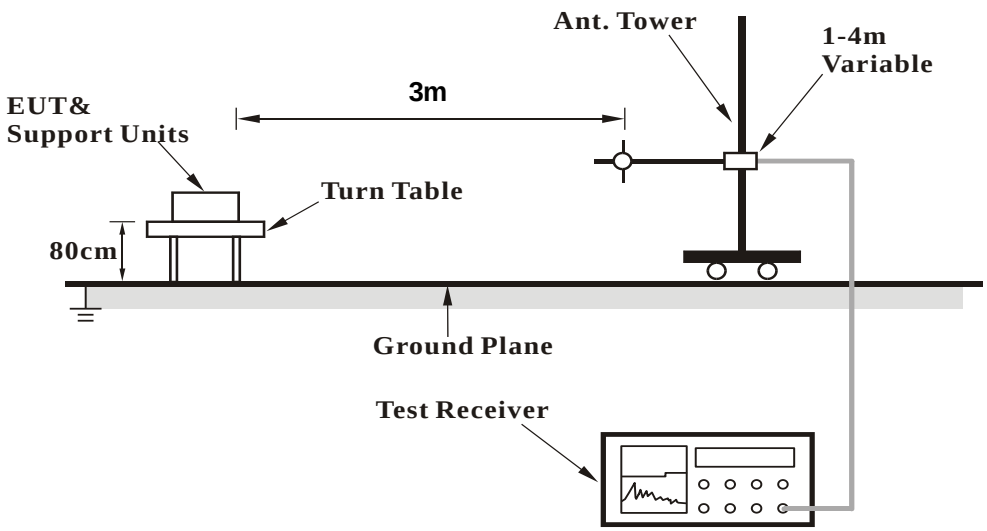
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical 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.

c. 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 b. Record the power level of S.G.

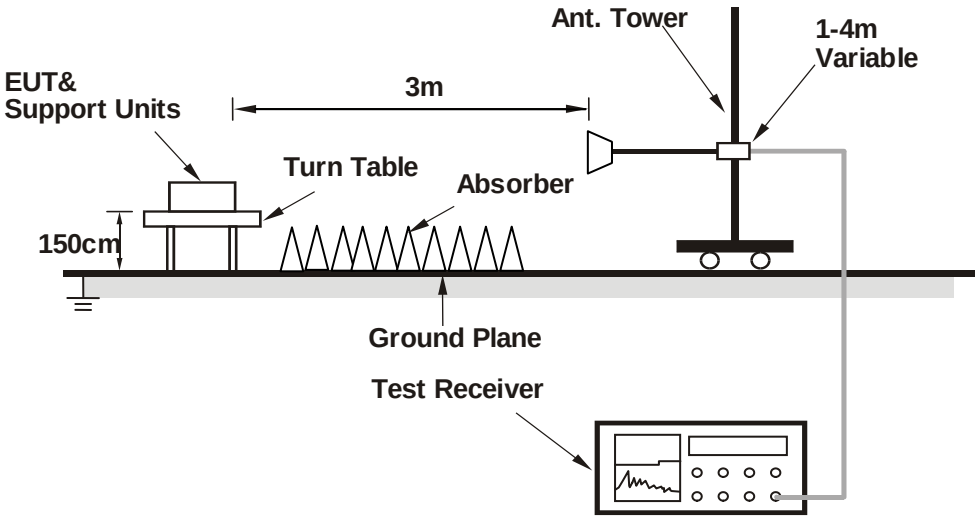
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

4.1.3 Test Setup

EIRP / ERP Measurement:
<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).

4.1.4 Test Results

LTE Band 26

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		26765	26865	26965				Channel		26740	26865	26990	
		Frequency (MHz)		821.5	831.5	841.5				Frequency (MHz)		819.0	831.5	844.0	
15M	QPSK	1	0	22.80	22.83	22.75	0	10M	QPSK	1	0	22.73	22.80	22.67	0
		1	37	**22.90**	22.84	22.87	0			1	24	22.85	22.77	22.82	0
		1	74	22.59	22.73	22.79	0			1	49	22.49	22.64	22.72	0
		36	0	21.73	21.65	21.67	1			25	0	21.82	21.85	21.64	1
		36	19	21.75	21.72	21.69	1			25	12	21.61	21.73	21.73	1
		36	39	21.74	21.70	21.68	1			25	25	21.67	21.60	21.66	1
		75	0	21.65	21.91	21.56	1			50	0	21.50	21.79	21.41	1
	16QAM	1	0	21.84	21.96	21.78	1		16QAM	1	0	21.75	21.95	21.68	1
		1	37	21.95	21.88	21.91	1			1	24	21.89	21.81	21.85	1
		1	74	21.61	21.76	21.82	1			1	49	21.50	21.64	21.73	1
		36	0	20.94	20.96	20.73	2			25	0	20.81	20.84	20.60	2
		36	19	20.70	20.84	20.84	2			25	12	20.57	20.72	20.72	2
		36	39	20.76	20.69	20.75	2			25	25	20.64	20.56	20.62	2
		75	0	20.60	20.92	20.51	2			50	0	20.45	20.78	20.36	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		26715	26865	27015				Channel		26705	26865	27025	
		Frequency (MHz)		816.5	831.5	846.5				Frequency (MHz)		815.5	831.5	847.5	
5M	QPSK	1	0	22.68	22.85	22.60	0	3M	QPSK	1	0	22.60	22.80	22.51	0
		1	12	22.79	22.72	22.76	0			1	7	22.75	22.66	22.69	0
		1	24	22.42	22.57	22.66	0			1	14	22.33	22.48	22.55	0
		12	0	21.71	21.76	21.50	1			8	0	21.65	21.68	21.41	1
		12	6	21.46	21.62	21.62	1			8	3	21.38	21.55	21.55	1
		12	13	21.53	21.45	21.52	1			8	7	21.47	21.35	21.44	1
		25	0	21.35	21.69	21.26	1			15	0	21.21	21.61	21.12	1
	16QAM	1	0	21.69	21.89	21.62	1		16QAM	1	0	21.64	21.85	21.55	1
		1	12	21.84	21.74	21.78	1			1	7	21.79	21.71	21.76	1
		1	24	21.42	21.57	21.67	1			1	14	21.34	21.51	21.61	1
		12	0	20.72	20.77	20.47	2			8	0	20.63	20.69	20.38	2
		12	6	20.44	20.62	20.62	2			8	3	20.34	20.53	20.53	2
		12	13	20.53	20.41	20.50	2			8	7	20.43	20.28	20.42	2
		25	0	20.30	20.69	20.21	2			15	0	20.17	20.60	20.06	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)								
		Channel		26697	26865	27033									
		Frequency (MHz)		814.7	831.5	848.3									
1.4M	QPSK	1	0	22.55	22.75	22.48	0								
		1	2	22.68	22.61	22.64	0								
		1	5	22.28	22.44	22.53	0								
		3	0	21.56	21.60	21.28	0								
		3	1	21.23	21.44	21.44	0								
		3	3	21.33	21.19	21.29	0								
		6	0	21.07	21.53	20.96	1								
	16QAM	1	0	21.58	21.80	21.48	1								
		1	2	21.74	21.63	21.70	1								
		1	5	21.28	21.43	21.57	1								
		3	0	20.55	20.61	20.25	1								
		3	1	20.17	20.41	20.41	1								
		3	3	20.30	20.12	20.26	1								
		6	0	20.02	20.51	19.91	2								

ERP Power (dBm)

LTE Band 26							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Z	26697	814.7	-14.03	31.208	15.03	31.83	H
	26740	819.0	-14.09	31.3	15.06	32.06	
	26783	823.3	-14.03	31.222	15.04	31.93	
	26697	814.7	-18.31	31.504	11.04	12.72	V
	26740	819.0	-17.95	31.117	11.02	12.64	
	26783	823.3	-18.83	31.922	10.94	12.42	
Channel Bandwidth: 1.4 MHz / 16QAM							
Z	26697	814.7	-15.06	31.208	14.00	25.11	H
	26740	819.0	-15.08	31.3	14.07	25.53	
	26783	823.3	-15.05	31.222	14.02	25.25	
	26697	814.7	-19.36	31.504	9.99	9.99	V
	26740	819.0	-18.95	31.117	10.02	10.04	
	26783	823.3	-19.86	31.922	9.91	9.80	

LTE Band 26							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
Z	26705	815.5	-14.05	31.208	15.01	31.68	H
	26740	819.0	-14.06	31.3	15.09	32.28	
	26775	822.5	-14.02	31.222	15.05	32.00	
	26705	815.5	-18.32	31.504	11.03	12.69	V
	26740	819.0	-17.91	31.117	11.06	12.76	
	26775	822.5	-18.75	31.922	11.02	12.65	
Channel Bandwidth: 3 MHz / 16QAM							
Z	26705	815.5	-15.02	31.208	14.04	25.34	H
	26740	819.0	-15.06	31.3	14.09	25.64	
	26775	822.5	-15.03	31.222	14.04	25.36	
	26705	815.5	-19.31	31.504	10.04	10.10	V
	26740	819.0	-18.90	31.117	10.07	10.16	
	26775	822.5	-19.72	31.922	10.05	10.12	

LTE Band 26							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26715	816.5	-14.00	31.208	15.06	32.05	H
	26740	819.0	-14.04	31.3	15.11	32.43	
	26765	821.5	-14.01	31.222	15.06	32.08	
	26715	816.5	-18.32	31.504	11.03	12.69	V
	26740	819.0	-17.88	31.117	11.09	12.84	
	26765	821.5	-18.71	31.922	11.06	12.77	
Channel Bandwidth: 5 MHz / 16QAM							
Z	26715	816.5	-15.01	31.208	14.05	25.40	H
	26740	819.0	-15.03	31.3	14.12	25.82	
	26765	821.5	-15.06	31.222	14.01	25.19	
	26715	816.5	-19.35	31.504	10.00	10.01	V
	26740	819.0	-18.89	31.117	10.08	10.18	
	26765	821.5	-19.70	31.922	10.07	10.17	

LTE Band 26							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26740	819.0	-14.00	31.3	15.15	32.73	H
	26740	819.0	-17.85	31.117	11.12	12.93	V
Channel Bandwidth: 10 MHz / 16QAM							
Z	26740	819.0	-14.98	31.3	14.17	26.12	H
	26740	819.0	-18.82	31.117	10.15	10.34	V

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

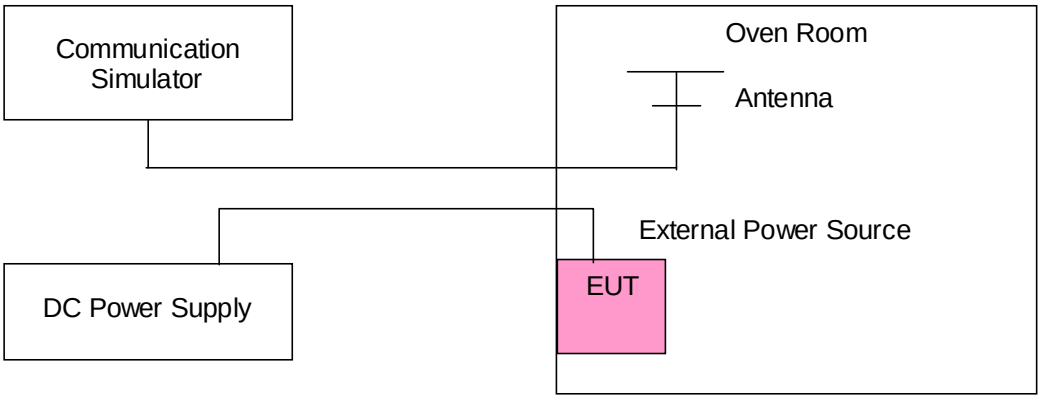
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.2.2 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.

4.2.3 Test Setup



4.2.4 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)	
7.7	814.700002	0.003	823.300001	0.001	2.5
6.54	814.700003	0.004	823.300004	0.005	2.5
8.85	814.700002	0.002	823.300001	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.54 Vdc to 8.85 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	814.700004	0.005	823.300001	0.001	2.5
-20	814.700003	0.003	823.300002	0.003	2.5
-10	814.700001	0.002	823.300002	0.002	2.5
0	814.700003	0.004	823.300003	0.004	2.5
10	814.700004	0.004	823.300003	0.004	2.5
20	814.699998	-0.002	823.299997	-0.003	2.5
30	814.699998	-0.003	823.299999	-0.002	2.5
40	814.699996	-0.005	823.299996	-0.005	2.5
50	814.699998	-0.003	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)	
7.7	815.500002	0.002	822.500002	0.003	2.5
6.54	815.500003	0.003	822.500002	0.002	2.5
8.85	815.500002	0.003	822.500004	0.005	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.54 Vdc to 8.85 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	815.500003	0.004	822.500003	0.003	2.5
-10	815.500004	0.004	822.500002	0.002	2.5
0	815.500002	0.002	822.500003	0.004	2.5
10	815.500002	0.002	822.500002	0.003	2.5
20	815.499997	-0.004	822.499998	-0.002	2.5
30	815.499998	-0.003	822.499998	-0.002	2.5
40	815.499998	-0.003	822.499997	-0.004	2.5
50	815.499998	-0.003	822.499999	-0.001	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)	
7.7	816.500002	0.002	821.500003	0.004	2.5
6.54	816.500002	0.002	821.500004	0.004	2.5
8.85	816.500001	0.002	821.500001	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.54 Vdc to 8.85 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	0.002	821.500002	0.003	2.5
-20	816.500004	0.004	821.500002	0.003	2.5
-10	816.500002	0.002	821.500001	0.001	2.5
0	816.500004	0.005	821.500002	0.002	2.5
10	816.500004	0.005	821.500003	0.004	2.5
20	816.499997	-0.003	821.499997	-0.003	2.5
30	816.499997	-0.004	821.499998	-0.003	2.5
40	816.499999	-0.002	821.499998	-0.002	2.5
50	816.499998	-0.003	821.499998	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
7.7	819.000002	0.002	2.5
6.54	819.000004	0.005	2.5
8.85	819.000003	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 6.54 Vdc to 8.85 Vdc.

Frequency Error vs. Temperature

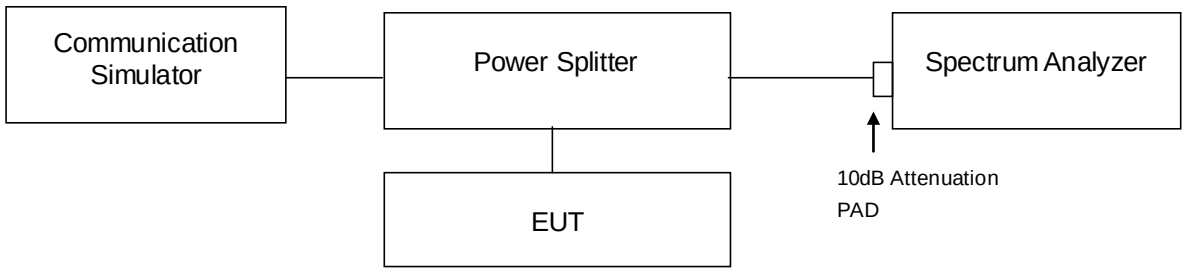
Temp. (℃)	LTE Band 26		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
-30	819.000004	0.005	2.5
-20	819.000001	0.001	2.5
-10	819.000002	0.002	2.5
0	819.000004	0.005	2.5
10	819.000003	0.004	2.5
20	818.999998	-0.002	2.5
30	818.999998	-0.003	2.5
40	818.999998	-0.003	2.5
50	818.999996	-0.005	2.5

4.3 Occupied Bandwidth Measurement

4.3.1 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.

4.3.2 Test Setup



4.3.3 Test Result

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	1.0946	1.0942	26705	815.5	2.7008	2.7042
26740	819.0	1.0941	1.0899	26740	819.0	2.7047	2.7012
26783	823.3	1.0926	1.0907	26775	822.5	2.7012	2.7017

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	4.4938	4.5012	26740	819.0	9.0224	9.0135
26740	819.0	4.4985	4.5033				
26765	821.5	4.4969	4.5023				

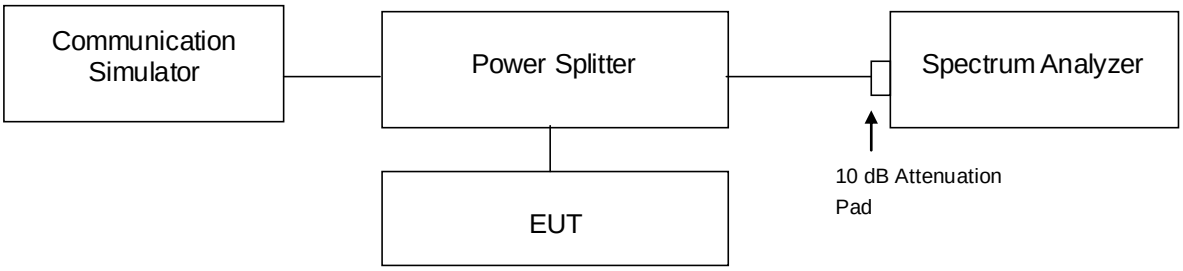
Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / QPSK

4.4 Emission Mask Measurement

4.4.1 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.

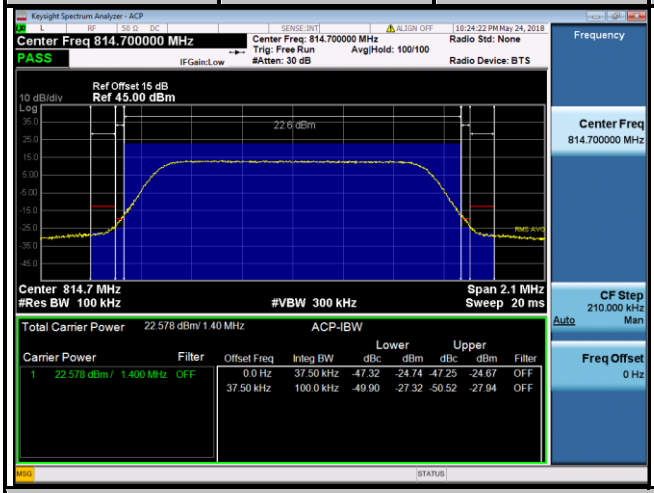
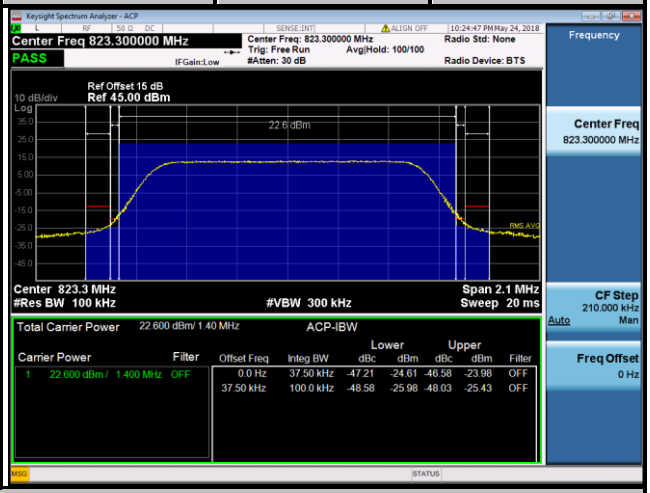
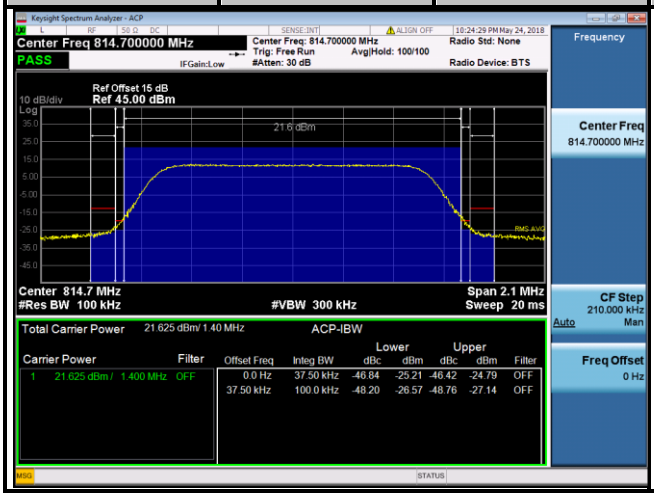
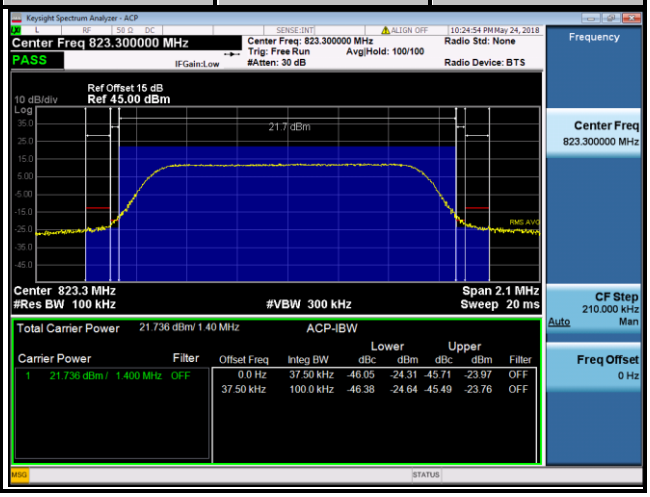
4.4.2 Test Setup

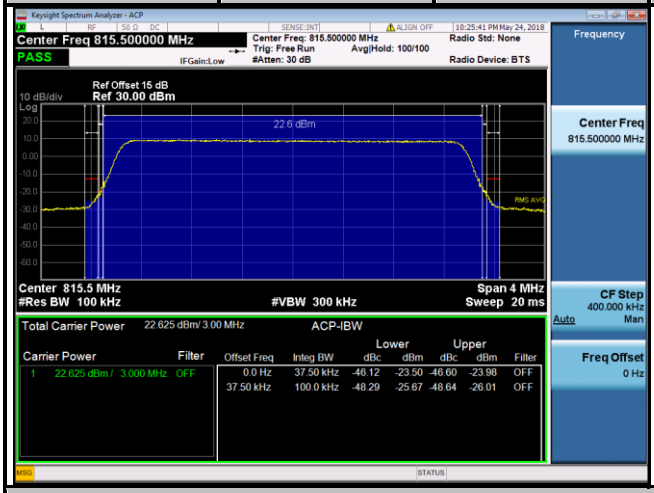
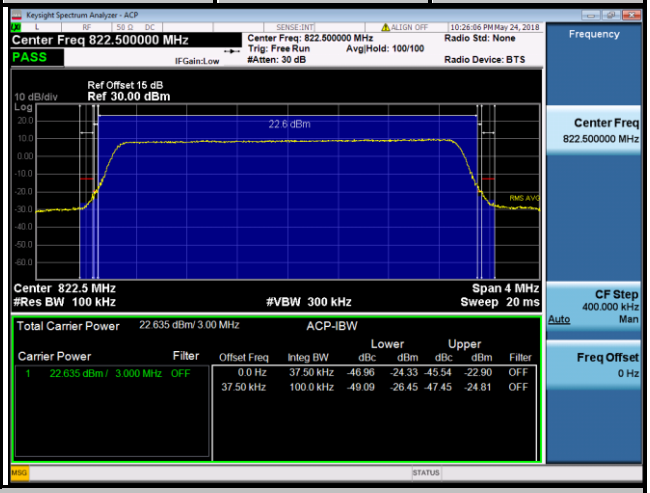
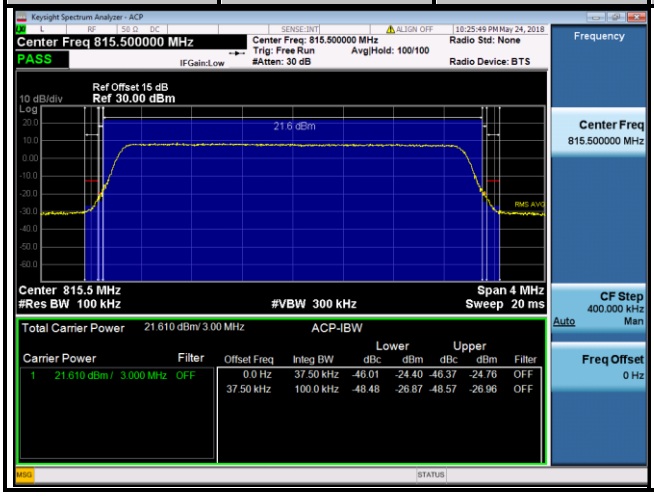
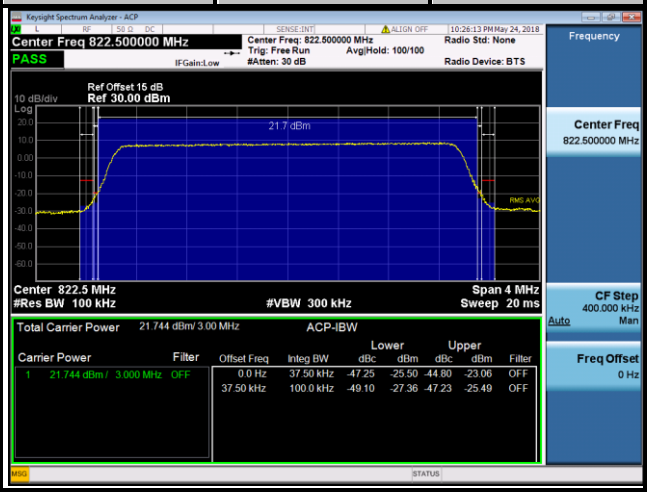


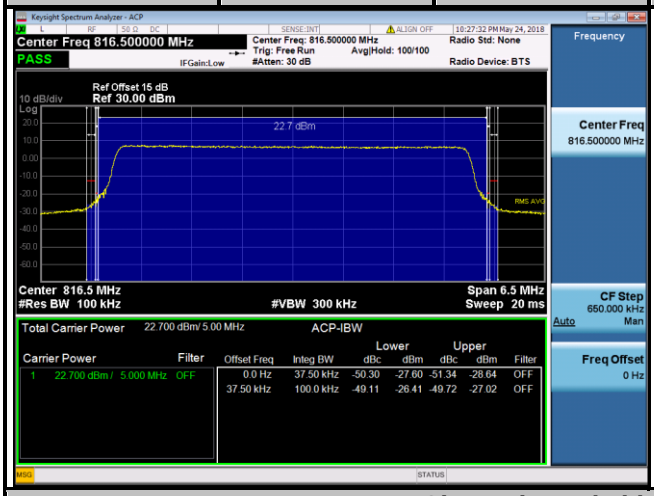
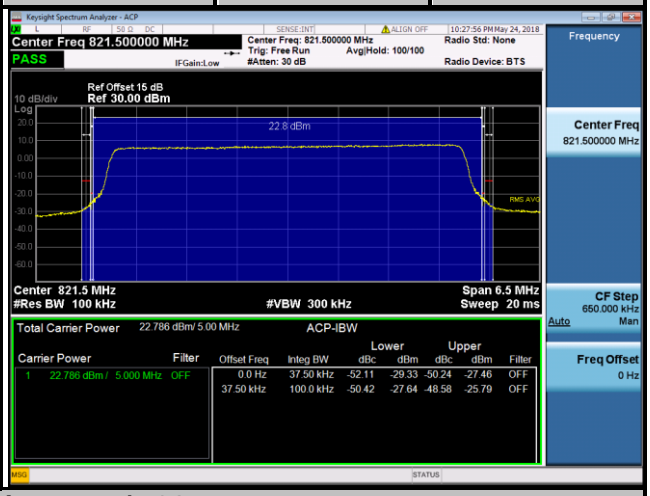
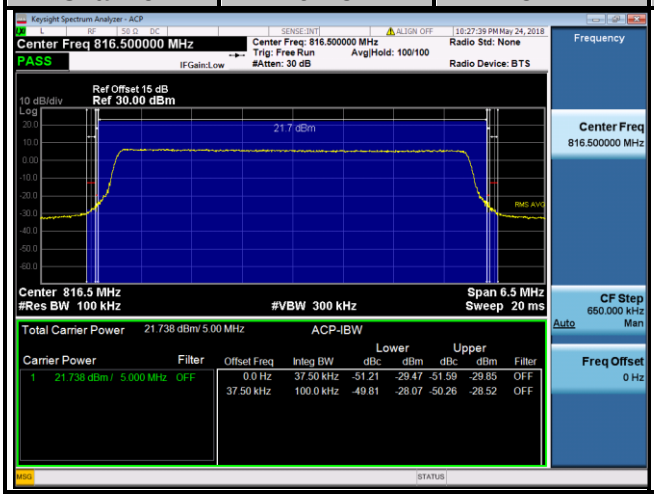
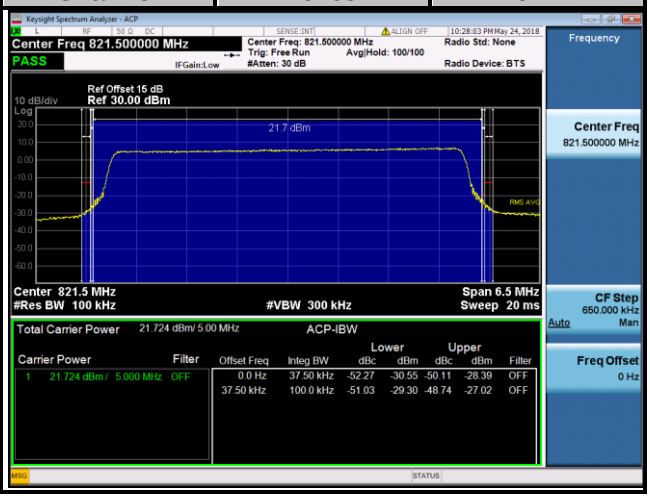
4.4.3 Test Procedures

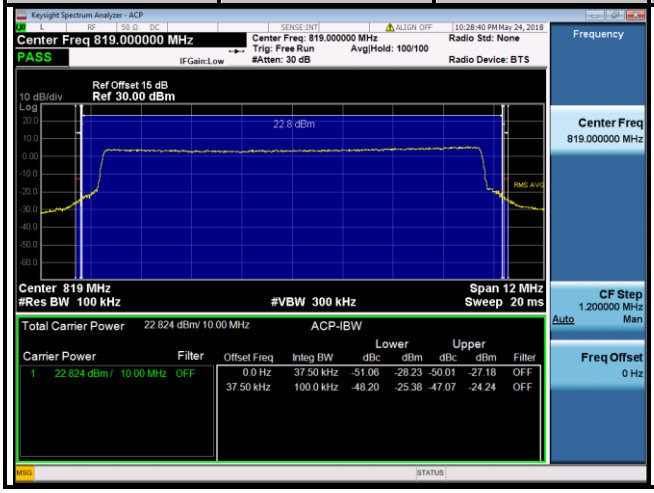
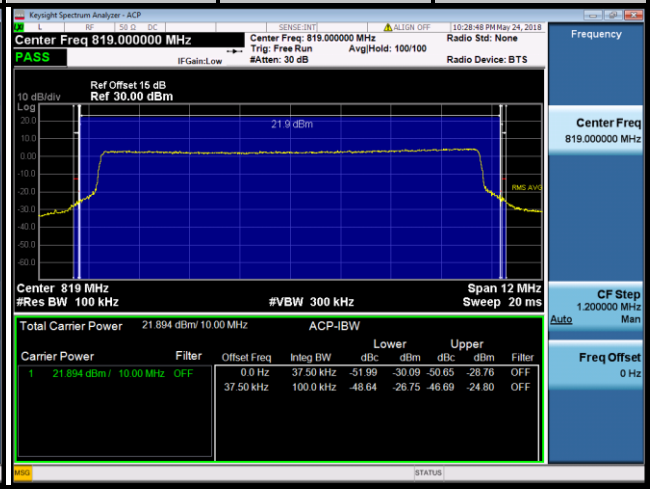
a. The measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Record the test plot.

4.4.4 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
					

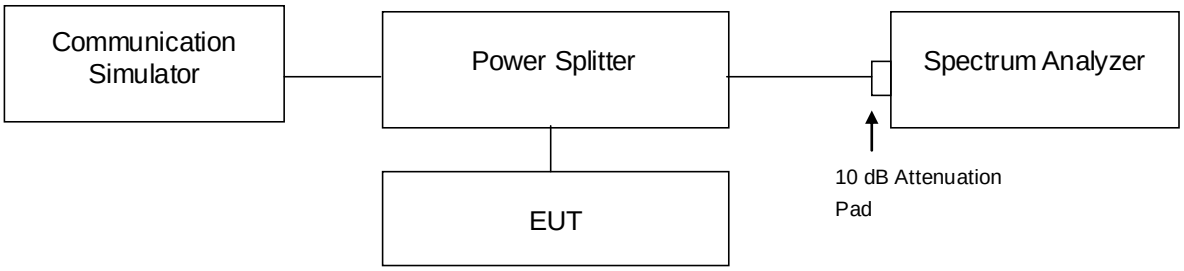
LTE Band 26					
Channel Bandwidth: 10 MHz / QPSK			Channel Bandwidth: 10 MHz / 16QAM		
Channel	26740	50 RB	Channel	26740	50 RB
					

4.5 Conducted Spurious Emissions

4.5.1 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.

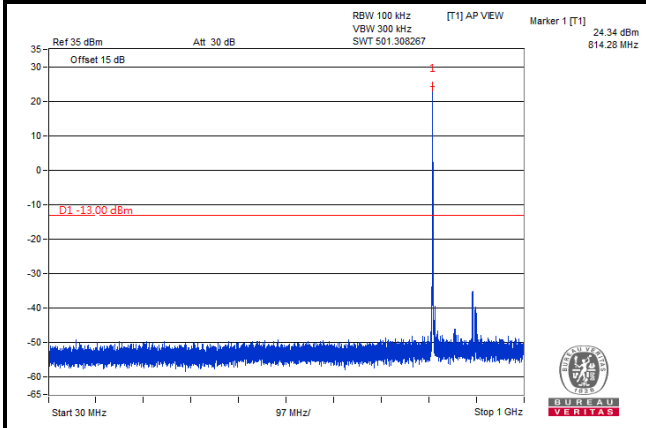
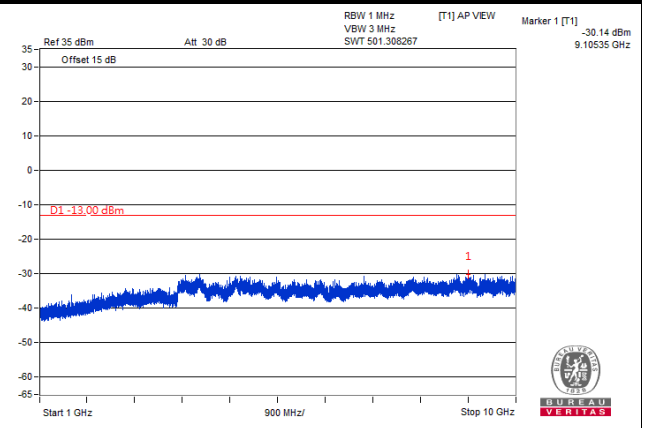
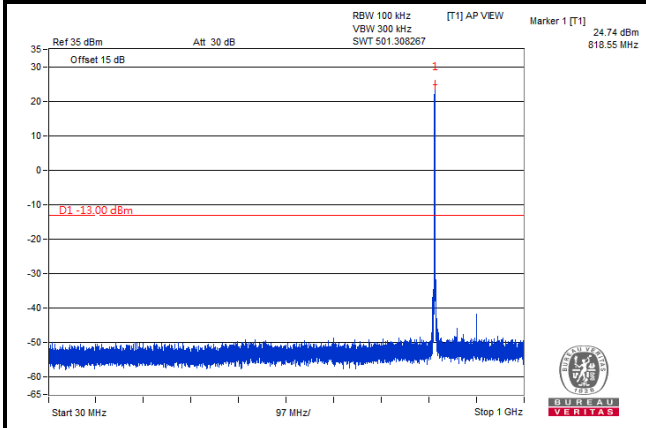
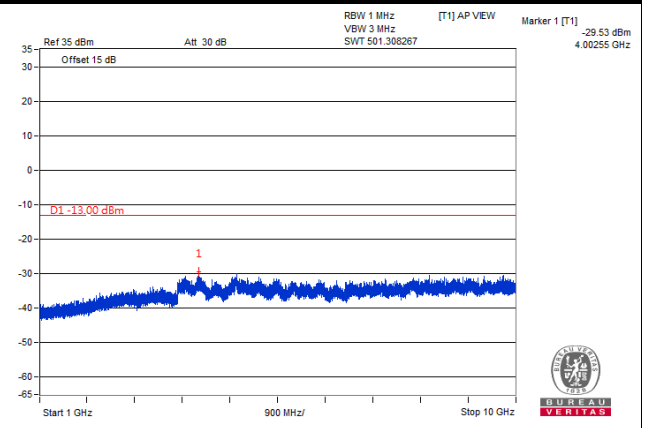
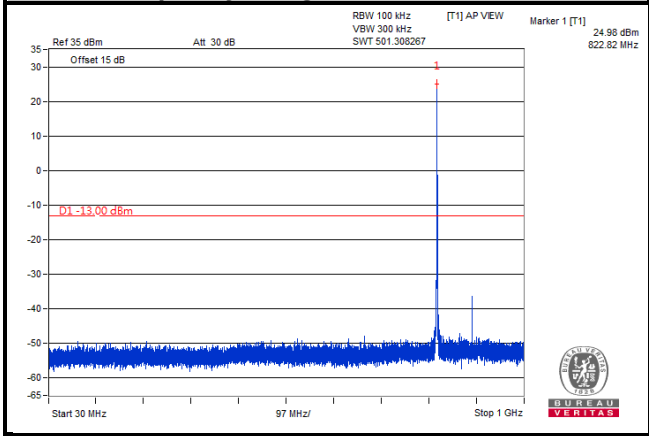
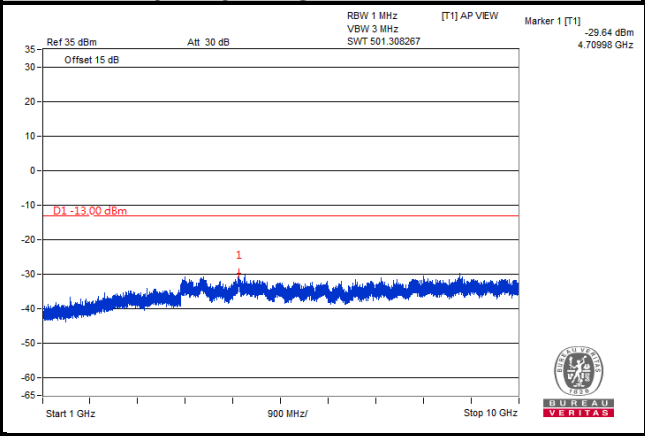
4.5.2 Test Setup



4.5.3 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 30 MHz to 9 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz are used for conducted emission measurement.

4.5.4 Test Results

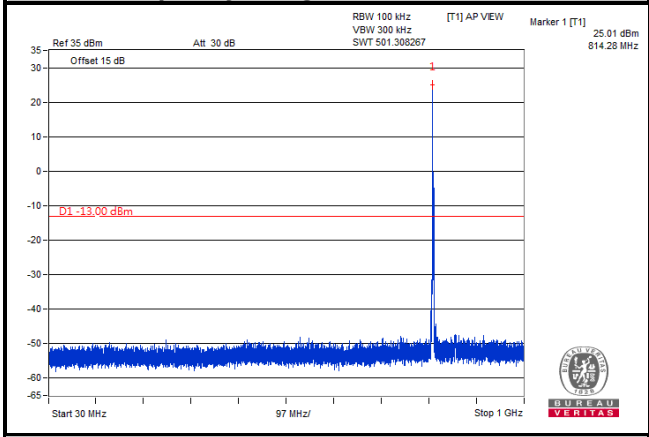
LTE Band 26	
Channel Bandwidth: 1.4 MHz	
Channel 26697	
Frequency Range: 30 MHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26740	
Frequency Range: 30 MHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	
Channel 26783	
Frequency Range: 30 MHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

LTE Band 26

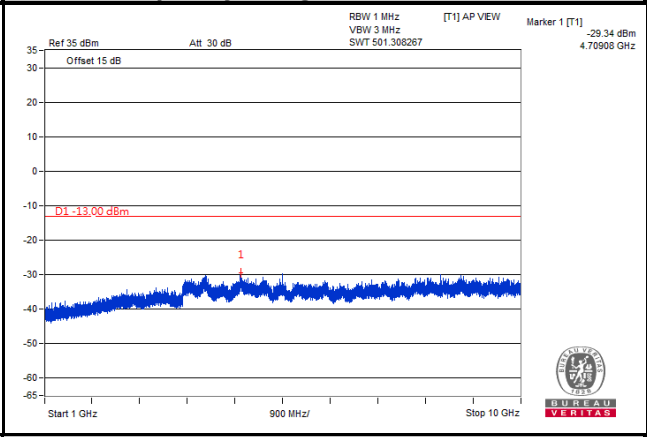
Channel Bandwidth: 3 MHz

Channel 26705

Frequency Range: 30 MHz ~ 1 GHz

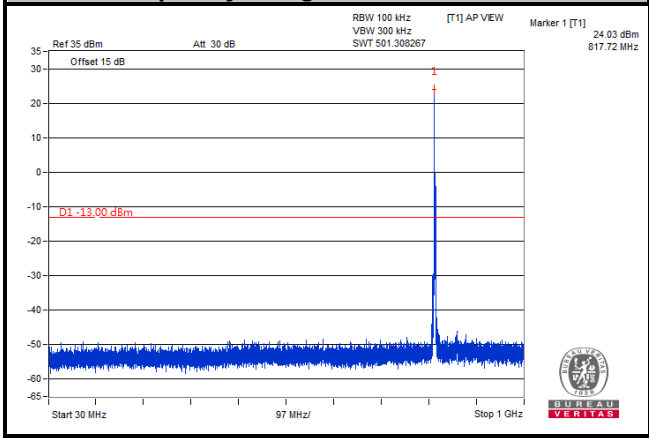


Frequency Range: 1 GHz ~ 10 GHz

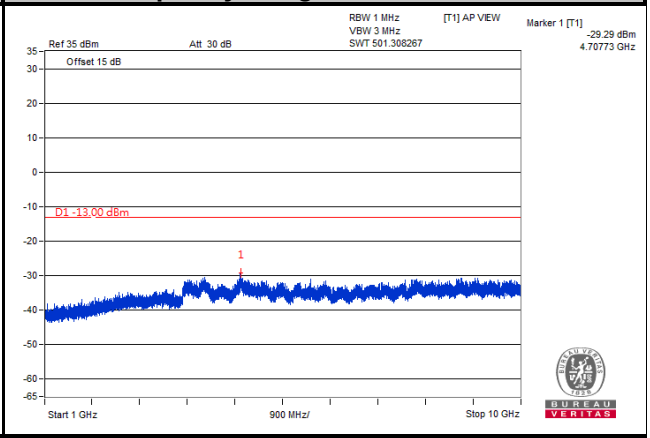


Channel 26740

Frequency Range: 30 MHz ~ 1 GHz

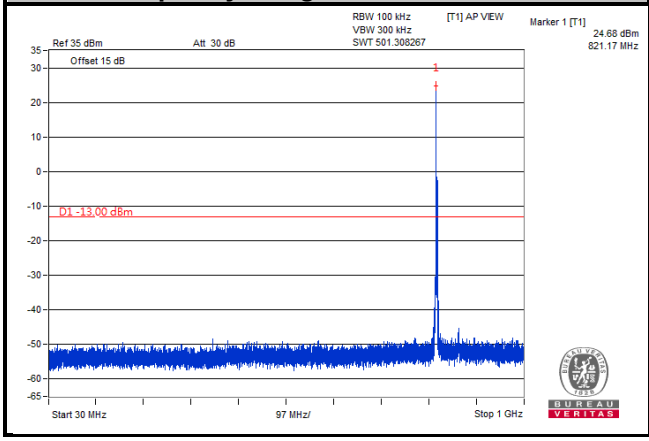


Frequency Range: 1 GHz ~ 10 GHz

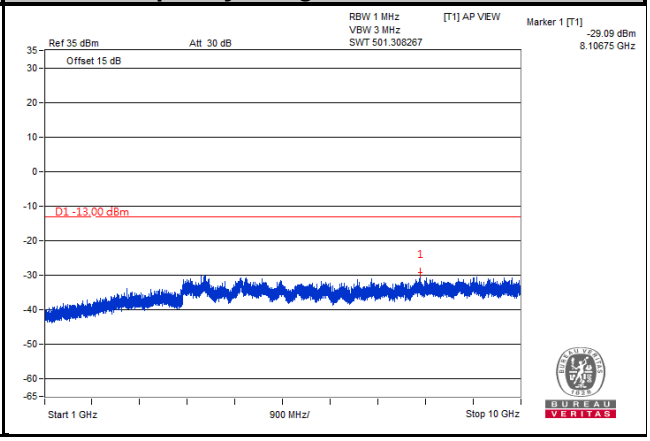


Channel 26775

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

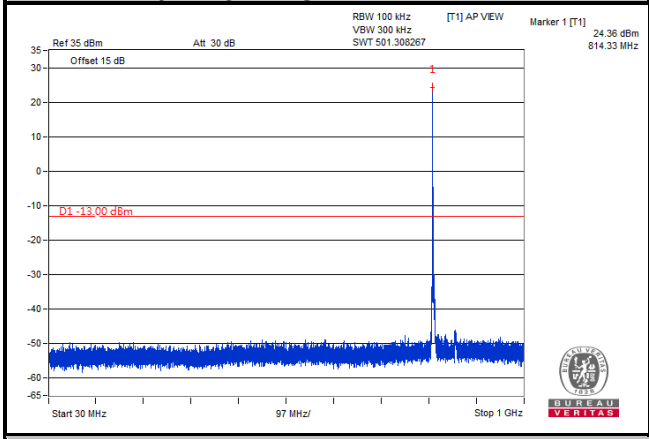


LTE Band 26

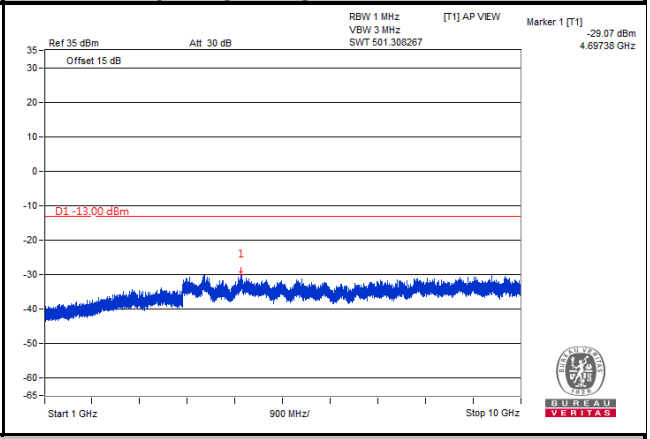
Channel Bandwidth: 5 MHz

Channel 26715

Frequency Range: 30 MHz ~ 1 GHz

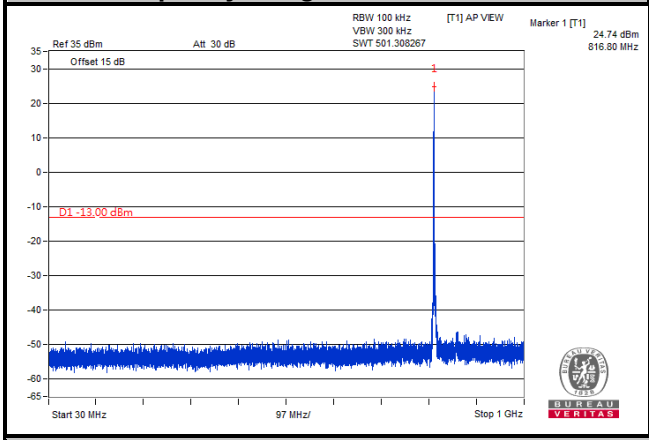


Frequency Range: 1 GHz ~ 10 GHz

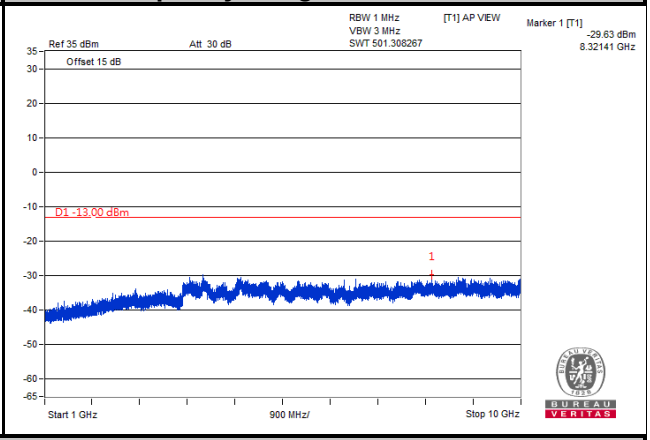


Channel 26740

Frequency Range: 30 MHz ~ 1 GHz

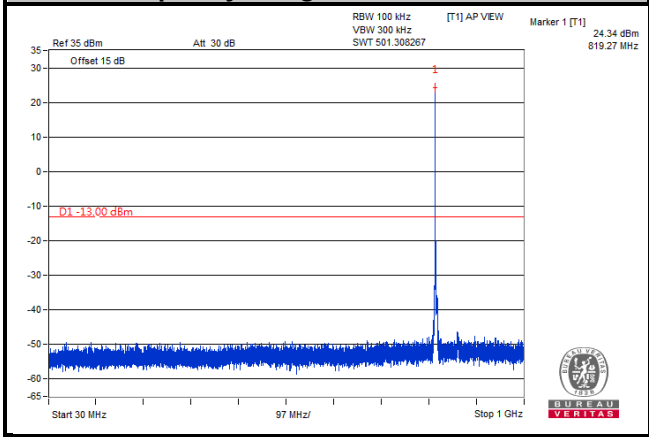


Frequency Range: 1 GHz ~ 10 GHz

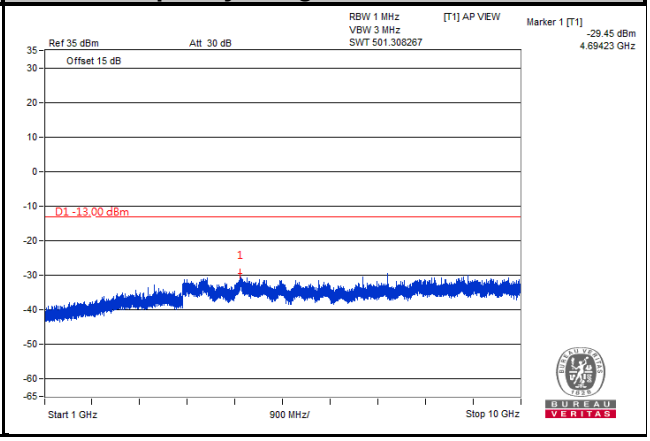


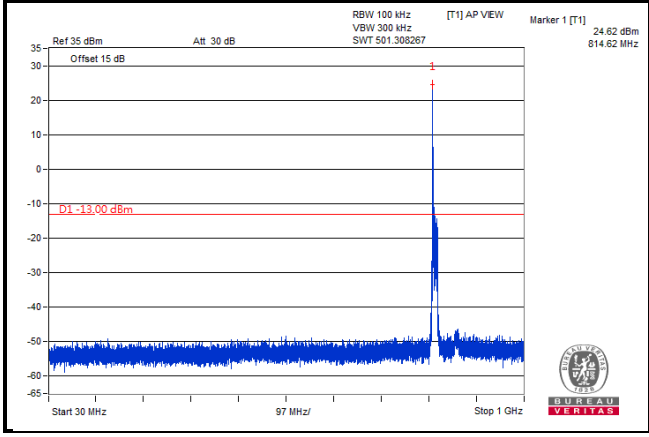
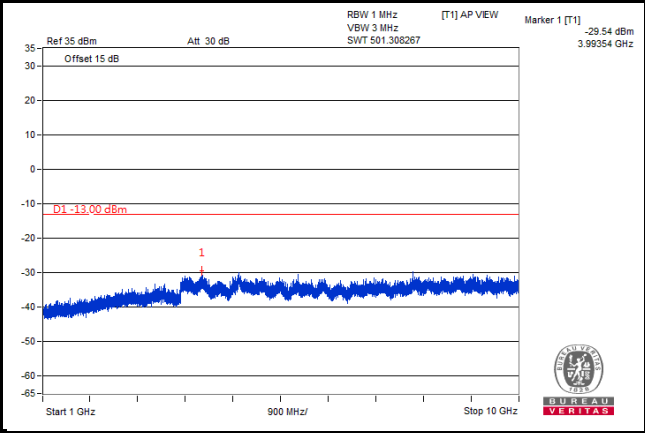
Channel 26765

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



LTE Band 26	
Channel Bandwidth: 10 MHz	
Channel 26740	
Frequency Range: 30 MHz ~ 1 GHz	Frequency Range: 1 GHz ~ 10 GHz
	

4.6 Radiated Emission Measurement

4.6.1 Limits of Radiated Emission 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.

4.6.2 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 dBi.

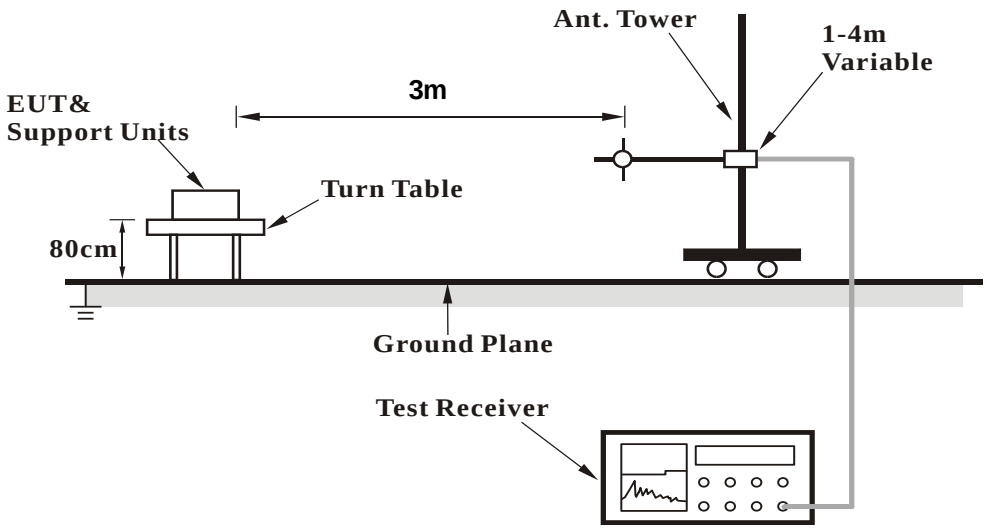
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.6.3 Deviation from Test Standard

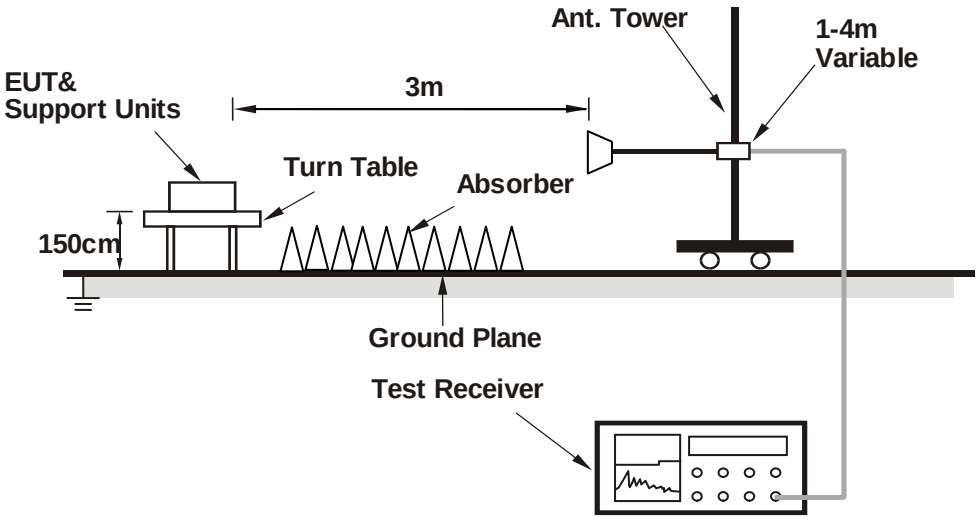
No deviation.

4.6.4 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).

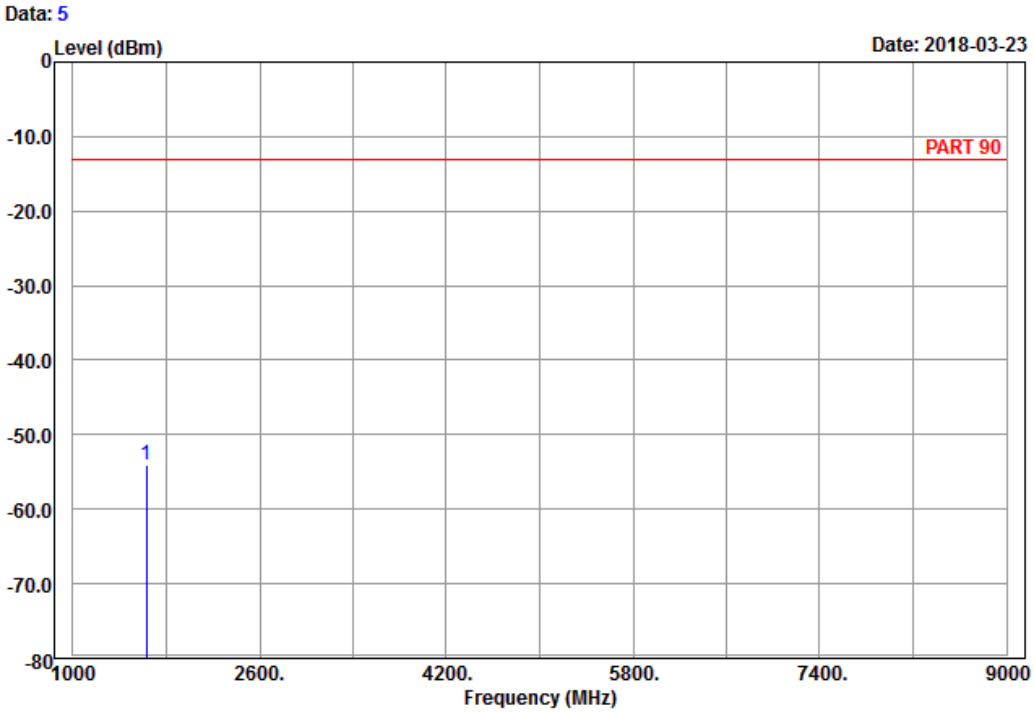
4.6.5 Test Results

LTE Band 26

Channel Bandwidth: 1.4 MHz / QPSK

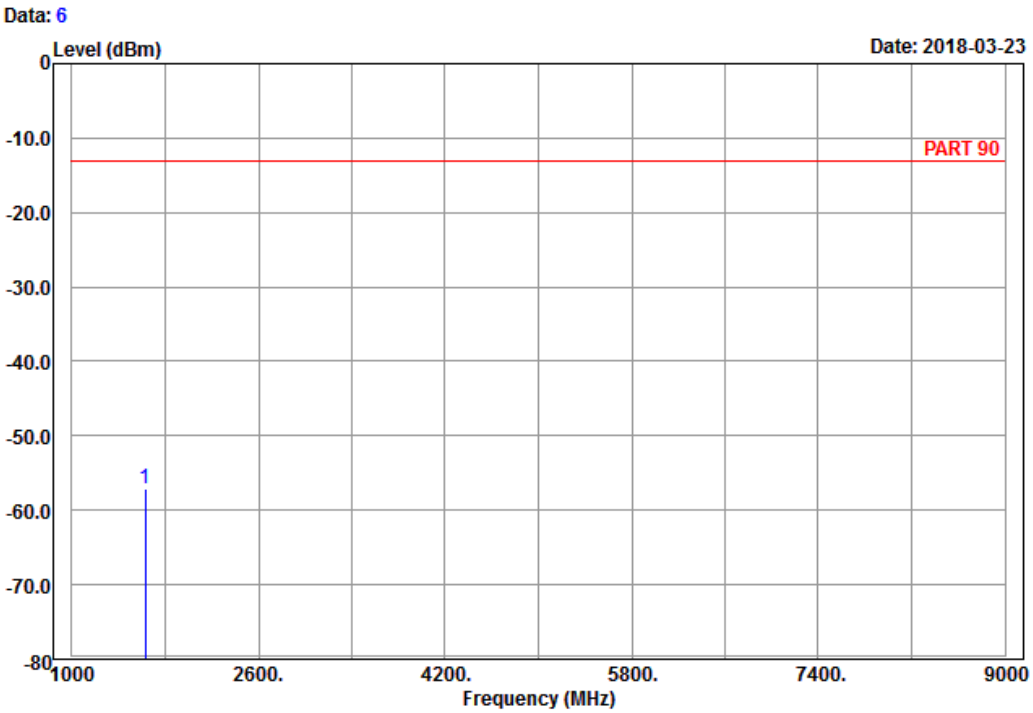
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




```
Site      : 966 chamber 1
Condition: PART 90 Horizontal
Remark    : LTE_Band 26_Link_CH26715
Tested by: Charles Hsiao
                        Read  Limit   Over
           Freq  Level  Level   Line  Limit Factor Remark
        ________ ______ ______ ______ ______ ______ ________
             MHz    dBm    dBm    dBm     dB     dB

  1 pp  1629.40 -53.97 -61.53 -13.00 -40.97   7.56 Peak
```

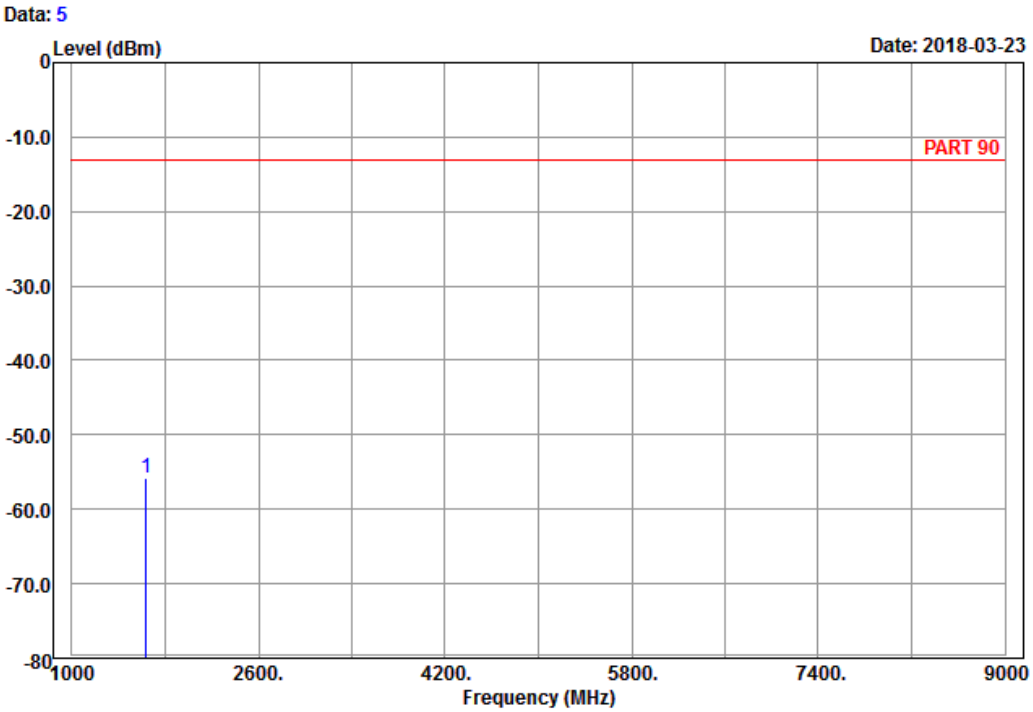


Site : 966 chamber 1
Condition: PART 90 Vertical
Remark : LTE_Band 26_Link_CH26715
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1629.40	-57.22	-64.78	-13.00	-44.22	7.56	Peak

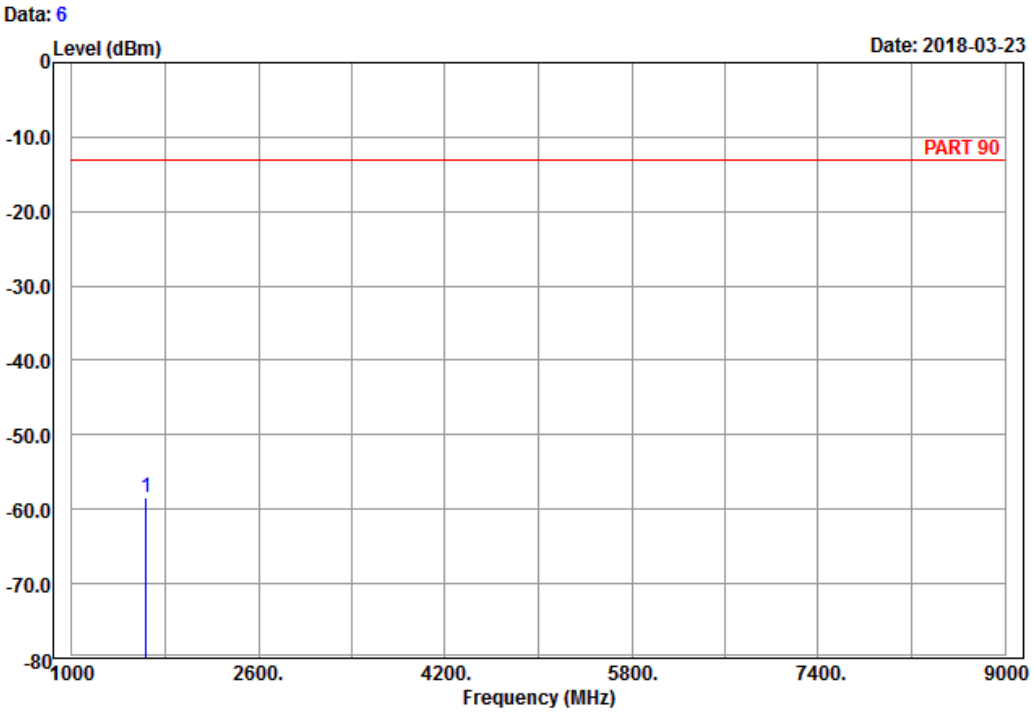
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 90 Horizontal
Remark : LTE_Band 26_Link_CH26740
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1638.00	-55.74	-63.30	-13.00	-42.74	7.56	Peak

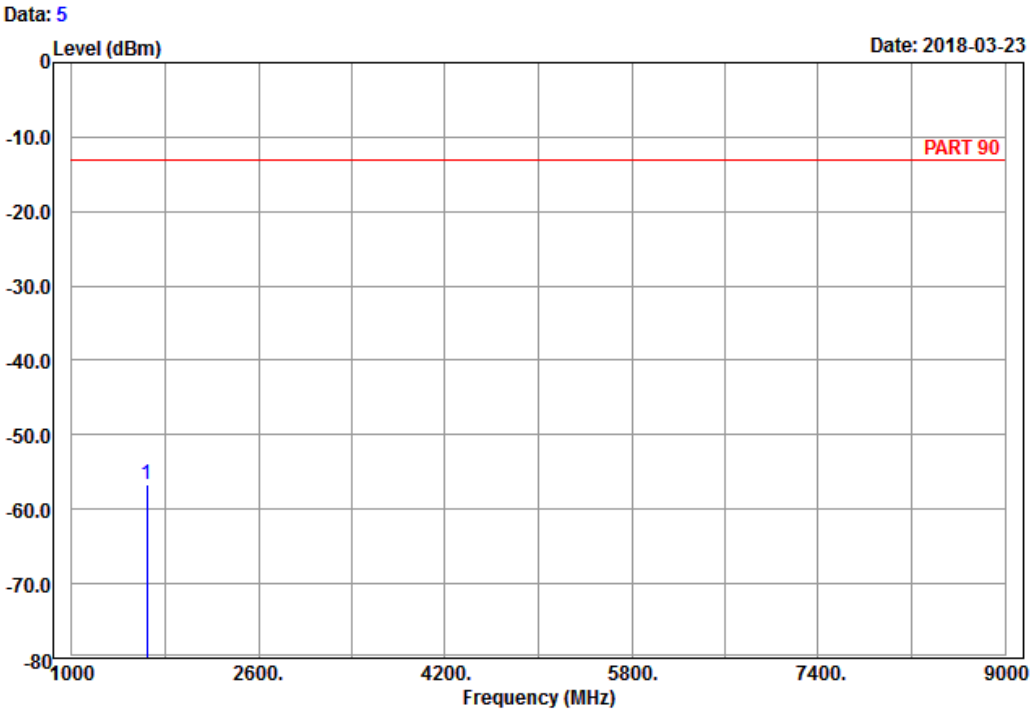


Site : 966 chamber 1
Condition: PART 90 Vertical
Remark : LTE_Band 26_Link_CH26740
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1638.00	-58.32	-65.88	-13.00	-45.32	7.56	Peak

High Channel

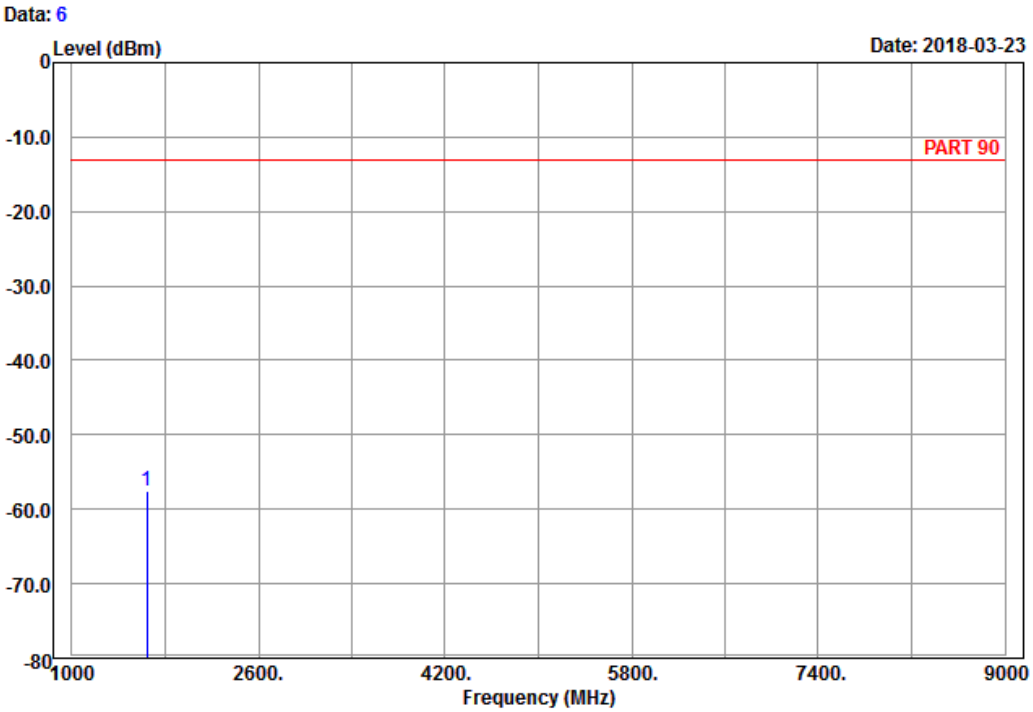
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 90 Horizontal
Remark : LTE_Band 26_Link_CH26765
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1646.60	-56.62	-64.35	-13.00	-43.62	7.73	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

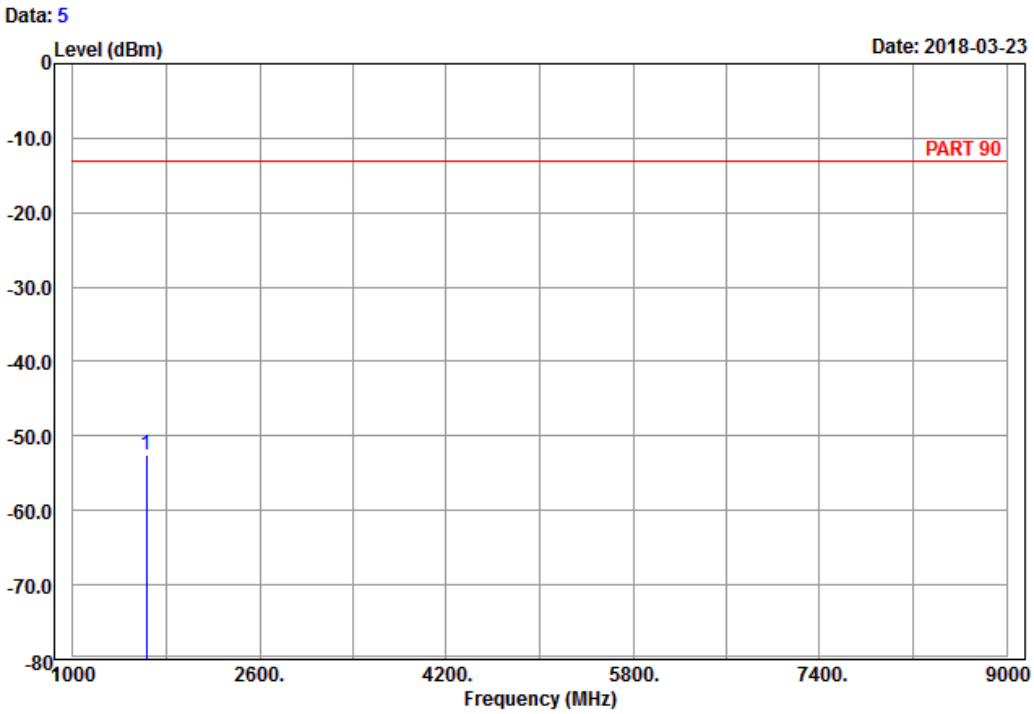


Site : 966 chamber 1
Condition: PART 90 Vertical
Remark : LTE_Band 26_Link_CH26765
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1646.60	-57.64	-65.37	-13.00	-44.64	7.73	Peak

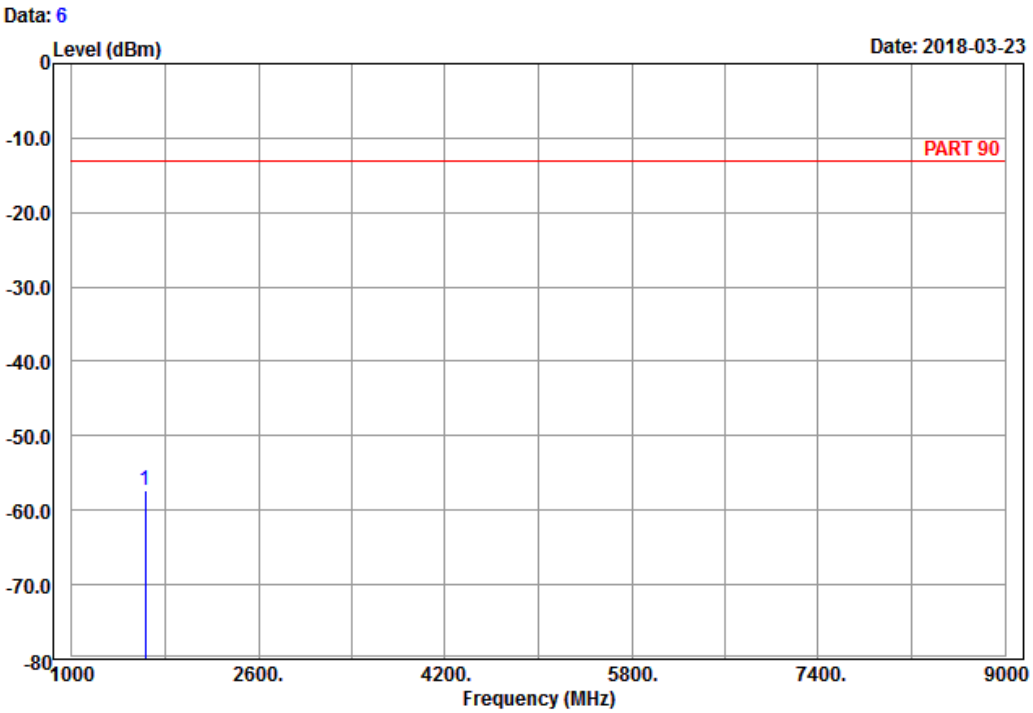
Channel Bandwidth: 5 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 90 Horizontal
Remark : LTE_Band 26_Link_CH26715
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1633.00	-52.52	-60.08	-13.00	-39.52	7.56	Peak

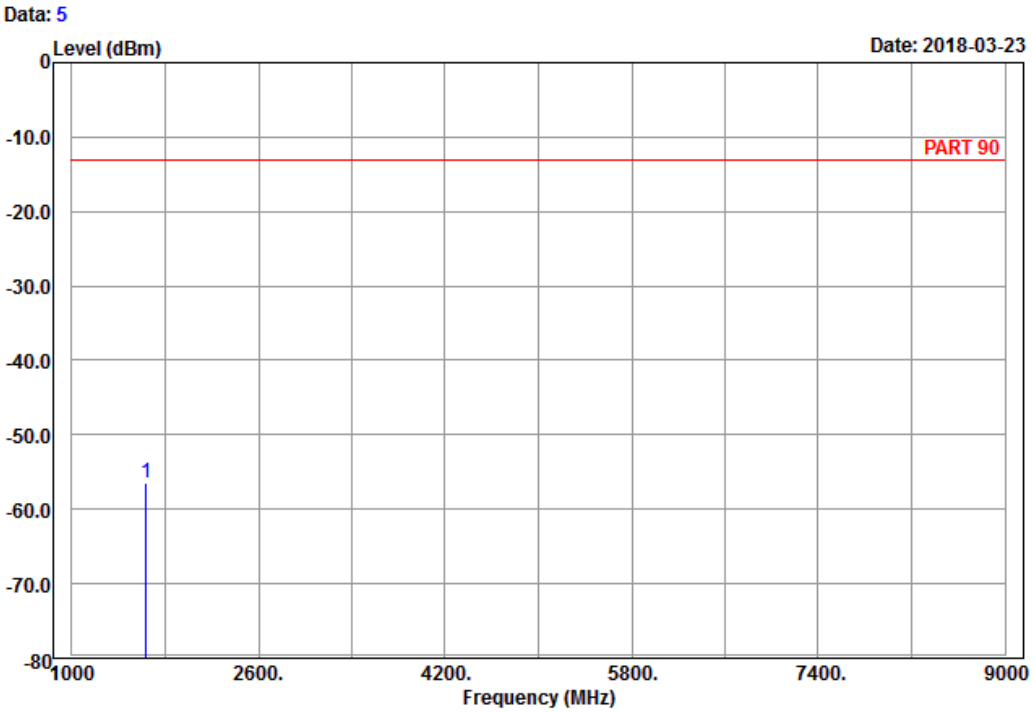


Site : 966 chamber 1
Condition: PART 90 Vertical
Remark : LTE_Band 26_Link_CH26715
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1633.00	-57.32	-64.88	-13.00	-44.32	7.56	Peak

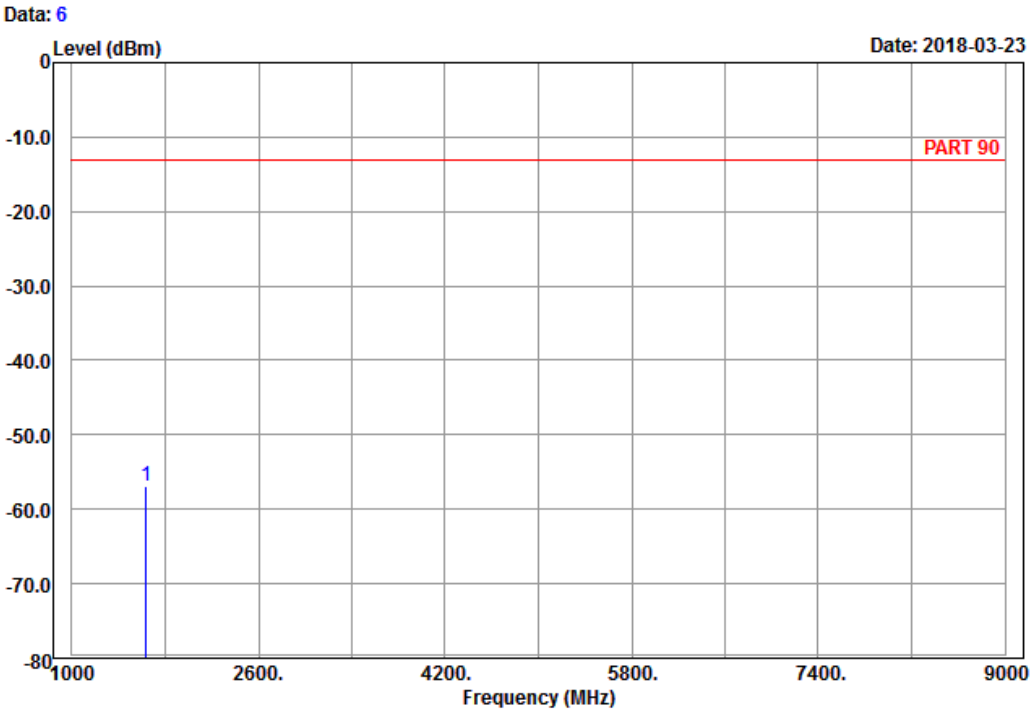
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 90 Horizontal
Remark : LTE_Band 26_Link_CH26740
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1638.00	-56.52	-64.08	-13.00	-43.52	7.56	Peak

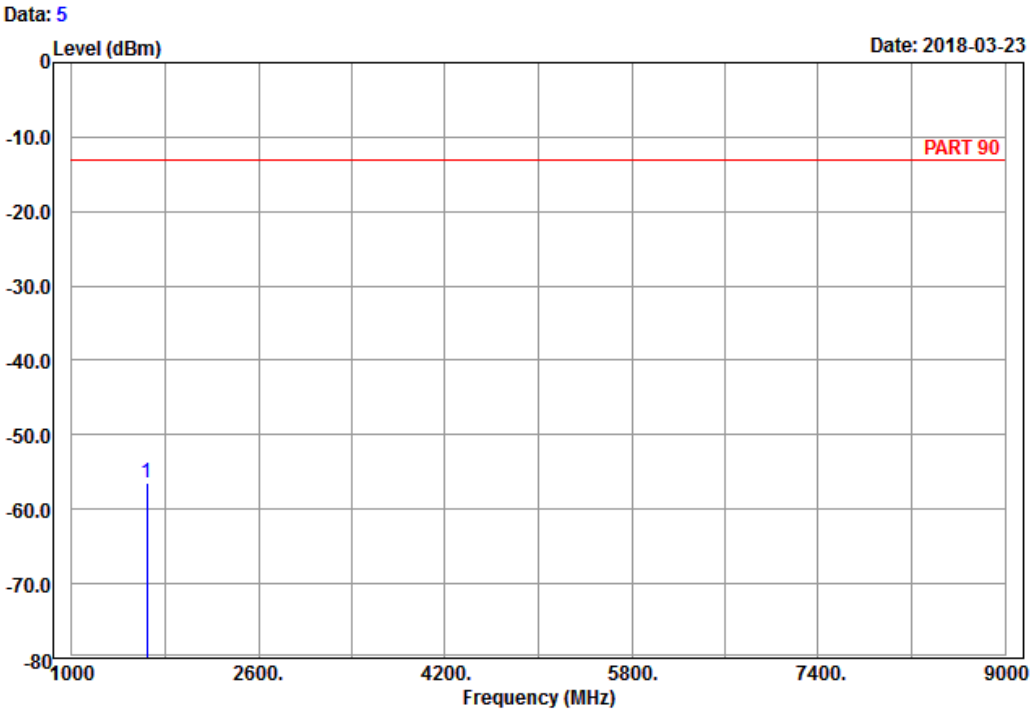


Site : 966 chamber 1
Condition: PART 90 Vertical
Remark : LTE_Band 26_Link_CH26740
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1638.00	-56.83	-64.39	-13.00	-43.83	7.56	Peak

High Channel

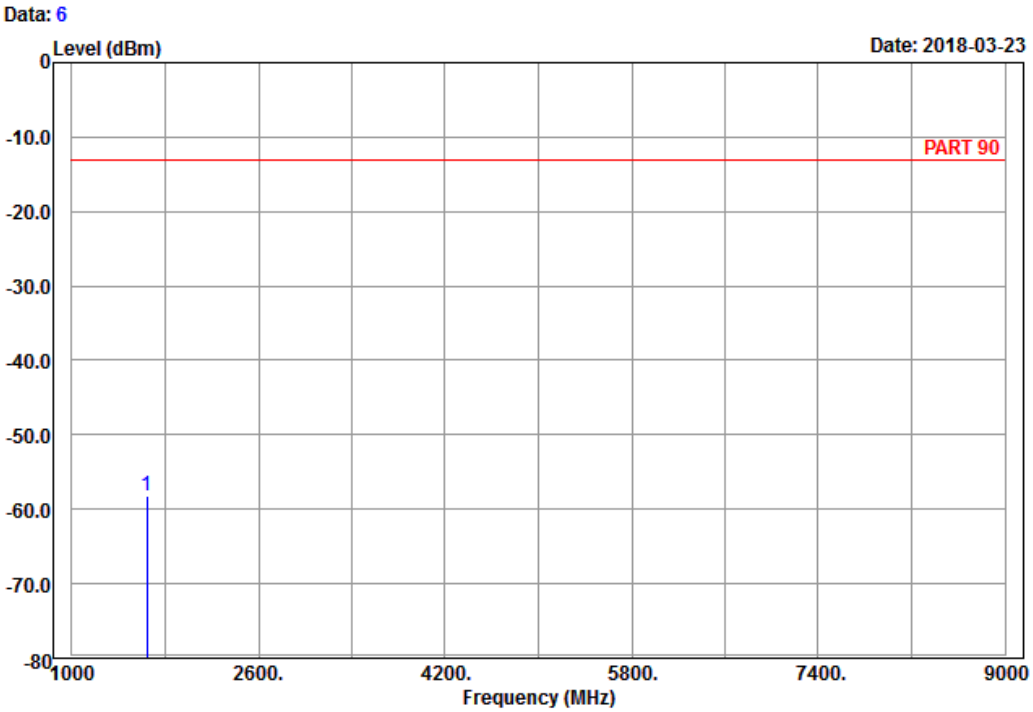
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 90 Horizontal
Remark : LTE_Band 26_Link_CH26765
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1643.00	-56.54	-64.27	-13.00	-43.54	7.73	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

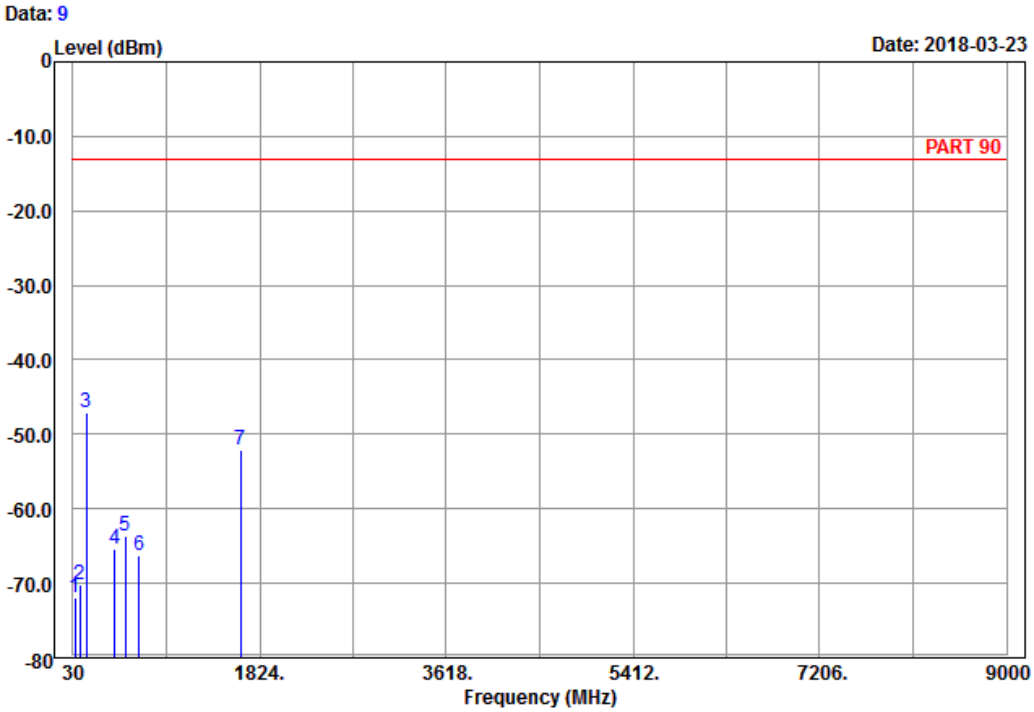


Site : 966 chamber 1
Condition: PART 90 Vertical
Remark : LTE_Band 26_Link_CH26765
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1643.00	-58.11	-65.84	-13.00	-45.11	7.73	Peak

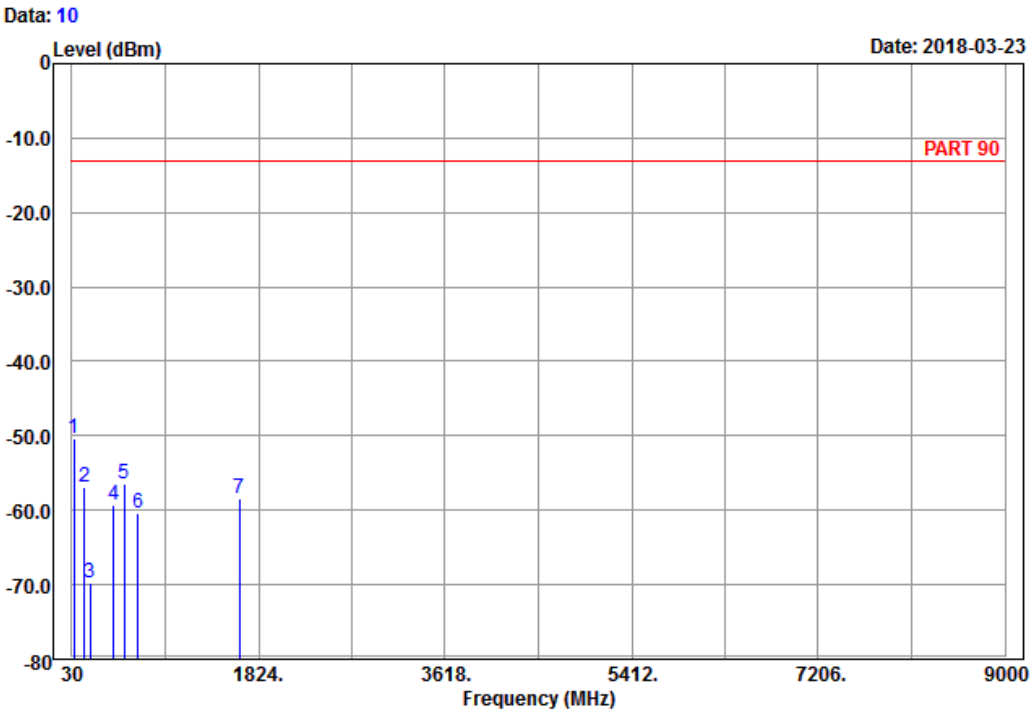
Channel Bandwidth: 10 MHz / QPSK

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 90 Horizontal
Remark : LTE_Band 26_Link_CH26740
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	51.87	-71.99	-57.93	-13.00	-58.99	-14.06	Peak
2	97.23	-70.10	-59.81	-13.00	-57.10	-10.29	Peak
3 pp	157.98	-47.12	-39.40	-13.00	-34.12	-7.72	Peak
4	431.60	-65.31	-61.87	-13.00	-52.31	-3.44	Peak
5	531.70	-63.61	-60.60	-13.00	-50.61	-3.01	Peak
6	666.10	-66.28	-66.07	-13.00	-53.28	-0.21	Peak
7	1638.00	-52.11	-59.67	-13.00	-39.11	7.56	Peak



Site : 966 chamber 1
Condition: PART 90 Vertical
Remark : LTE_Band 26_Link_CH26740
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	47.55	-50.32	-37.21	-13.00	-37.32	-13.11	Peak
2	151.50	-56.95	-49.03	-13.00	-43.95	-7.92	Peak
3	206.58	-69.78	-63.69	-13.00	-56.78	-6.09	Peak
4	432.30	-59.29	-55.83	-13.00	-46.29	-3.46	Peak
5	530.30	-56.48	-53.40	-13.00	-43.48	-3.08	Peak
6	664.00	-60.28	-60.08	-13.00	-47.28	-0.20	Peak
7	1638.00	-58.36	-65.92	-13.00	-45.36	7.56	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 ---