FCC Test Report

(PART 22)

Report No.:	RF171218C14
FCC ID:	NM82Q55200
Test Model:	2Q55200
Received Date:	Dec. 18, 2017
Test Date:	Dec. 21, 2017 ~ Jan. 11, 2018
Issued Date:	Feb. 06, 2018
Applicant:	HTC Corporation
Address:	88 Section 3, Zhongxing Road, Xindian District, New Taipei City 231, Taiwan
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 agencies

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 **8**

3.1 General Description of EUT 8
3.2 Configuration of System under Test 9
3.2.1 Description of Support Units 10
3.3 Test Mode Applicability and Tested Channel Detail 11
3.4 EUT Operating Conditions 13
3.5 General Description of Applied Standards 13

4 Test Types and Results **14**

4.1 Output Power Measurement 14
4.1.1 Limits of Output Power Measurement 14
4.1.2 Test Procedures 14
4.1.3 Test Setup 15
4.1.4 Test Results 16
4.2 Frequency Stability Measurement 23
4.2.1 Limits of Frequency Stabiliity Measurement 23
4.2.2 Test Procedure 23
4.2.3 Test Setup 23
4.2.4 Test Results 24
4.3 Occupied Bandwidth Measurement 31
4.3.1 Test Procedure 31
4.3.2 Test Setup 31
4.3.3 Test Result 32
4.4 Band Edge Measurement 35
4.4.1 Limits of Band Edge Measurement 35
4.4.2 Test Setup 35
4.4.3 Test Procedures 35
4.4.4 Test Results 36
4.5 Peak to Average Ratio 41
4.5.1 Limits of Peak to Average Ratio Measurement 41
4.5.2 Test Setup 41
4.5.3 Test Procedures 41
4.5.4 Test Results 42
4.6 Conducted Spurious Emissions 45
4.6.1 Limits of Conducted Spurious Emissions Measurement 45
4.6.2 Test Setup 45
4.6.3 Test Procedure 45
4.6.4 Test Results 46
4.7 Radiated Emission Measurement 53
4.7.1 Limits of Radiated Emission Measurement 53
4.7.2 Test Procedure 53
4.7.3 Deviation from Test Standard 53
4.7.4 Test Setup 54
4.7.5 Test Results 55

5 Pictures of Test Arrangements **79**

Appendix – Information on the Testing Laboratories **80**

Release Control Record

Issue No.	Description	Date Issued
RF171218C14	Original Release	Feb. 06, 2018

1 Certificate of Conformity

Product: Smartphone

Brand: HTC

Test Model: 2Q55200

Sample Status: Production Unit

Applicant: HTC Corporation

Test Date: Dec. 21, 2017 ~ Jan. 11, 2018

Standards: FCC Part 22, Subpart H

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Feb. 06, 2018

Ivonne Wu / Supervisor

Approved by : _____ , **Date:** Feb. 06, 2018

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 22.913 (a)	Effective Radiated Power	Pass	Meet the requirement of limit.
---	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -41.22 dB at 1648.40 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	2.0153 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
Signal Analyzer Keysight	N9010A	MY56070348	Sep. 13, 2017	Sep. 12, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Aug. 21, 2017	Aug. 20, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 06, 2017	Dec. 05, 2018
HORN Antenna ETS-Lindgren	3117	00143293	Jun. 26, 2017	Jun. 25, 2018
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
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 01, 2017	Nov. 30, 2018
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 07, 2017	Jul. 06, 2018
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 24, 2017	Oct. 23, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 26, 2017	Jun. 25, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 26, 2017	Jun. 25, 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
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	Smartphone	
Brand	HTC	
Test Model	2Q55200	
Status of EUT	Production Unit	
Power Supply Rating	5 Vdc or 9 Vdc or 12 Vdc (adapter) 5.0 Vdc (host equipment) 3.85 Vdc (Li-ion battery)	
Modulation Type	GSM/GPRS	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	QPSK
	LTE	QPSK, 16QAM, 64QAM
Frequency Range	GSM/GPRS/EDGE	824.2 ~ 848.8 MHz
	WCDMA	826.4 ~ 846.6 MHz
	LTE 5 (Channel Bandwidth: 1.4 MHz)	824.7 ~ 848.3 MHz
	LTE 5 (Channel Bandwidth: 3 MHz)	825.5 ~ 847.5 MHz
	LTE 5 (Channel Bandwidth: 5 MHz)	826.5 ~ 846.5 MHz
	LTE 5 (Channel Bandwidth: 10 MHz)	829 ~ 844 MHz
Max. ERP Power	GSM/GPRS	285.23 mW
	EDGE	63.94 mW
	WCDMA	45.48 mW
	LTE 5 (Channel Bandwidth: 1.4 MHz)	45.58 mW
	LTE 5 (Channel Bandwidth: 3 MHz)	45.39 mW
	LTE 5 (Channel Bandwidth: 5 MHz)	45.27 mW
	LTE 5 (Channel Bandwidth: 10 MHz)	46.13 mW
Emission Designator	GSM/GPRS	250KGXW
	EDGE	248KG7W
	WCDMA	4M15F9W
	LTE 5 (Channel Bandwidth: 1.4 MHz)	1M09W7D
	LTE 5 (Channel Bandwidth: 3 MHz)	2M70W7D
	LTE 5 (Channel Bandwidth: 5 MHz)	4M49W7D
	LTE 5 (Channel Bandwidth: 10 MHz)	8M97W7D
Antenna Type	Fixed Internal Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

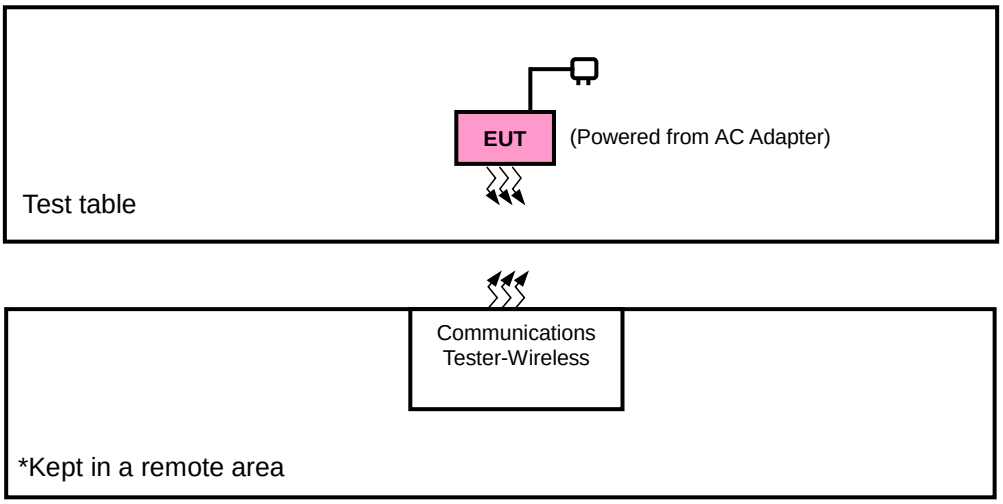
Note:

1. The EUT's accessories list refers to Ext. Pho.
2. 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.

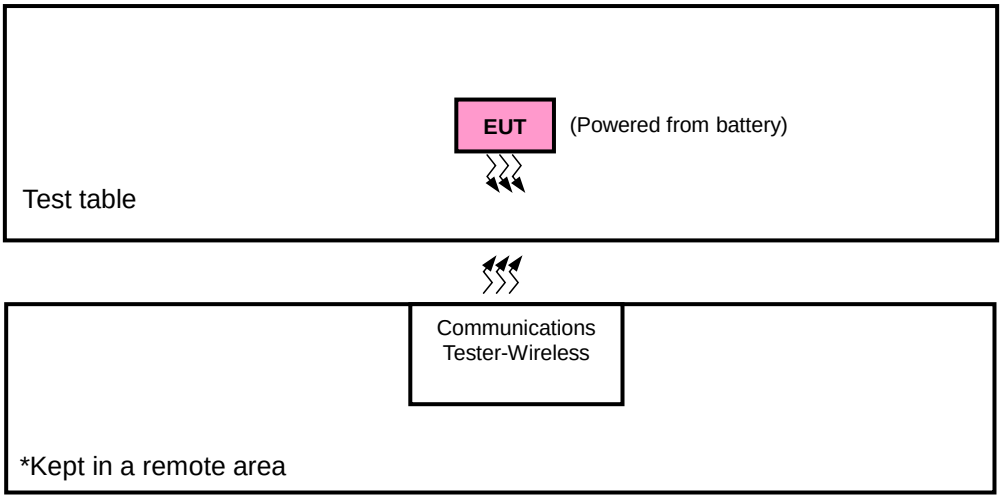
3.2 Configuration of System under Test

For GSM / WCDMA

<Radiated Emission Test>

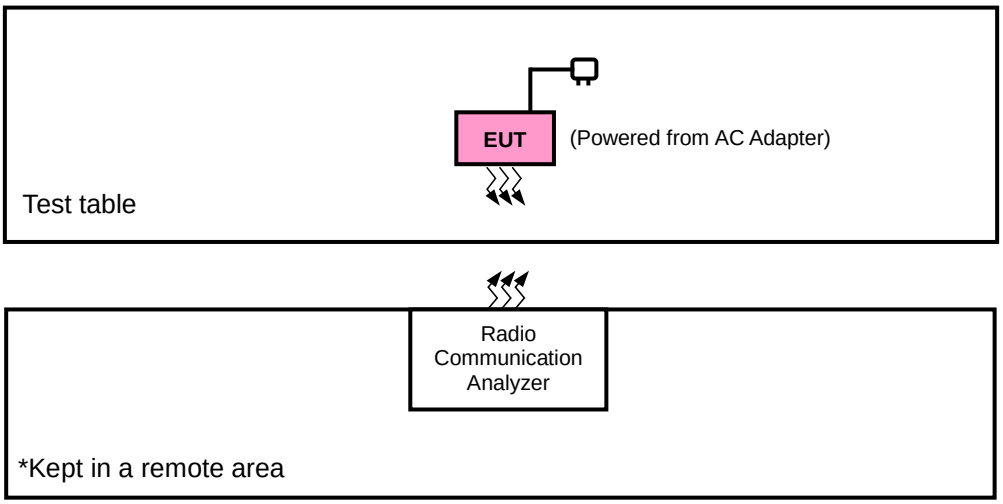


<E.R.P. Test>

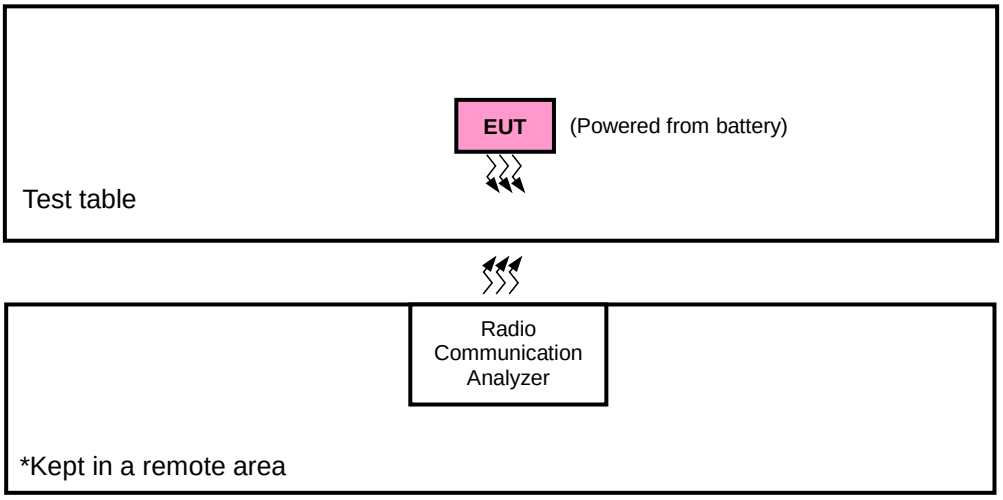


For LTE

<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. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Communications Tester-Wireless	Agilent	8960 Series 10	MY53201073	N/A
2.	Radio Communication Analyzer	Anritsu	MT8820C	6201010284	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A
2.	N/A

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items 1~2 acted as communication partners to transfer data.

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:

SIM	Band	ERP	Radiated Emission
1	GSM	X-plane	Y-axis
	EDGE	X-plane	Y-axis
	WCDMA	X-plane	Y-axis
	LTE Band 5	X-plane	X-axis

GSM

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	128 to 251	128, 189, 251	GSM, EDGE
-	Frequency Stability	128 to 251	128, 251	GSM, EDGE
-	Occupied Bandwidth	128 to 251	128, 189, 251	GSM, EDGE
-	Band Edge	128 to 251	128, 251	GSM, EDGE
-	Peak to Average Ratio	128 to 251	128, 189, 251	GSM, EDGE
-	Conducted Spurious Emission	128 to 251	128, 189, 251	GSM, EDGE
-	Radiated Emission	128 to 251	128, 189, 251	GSM, EDGE

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	4132 to 4233	4132, 4182, 4233	WCDMA
-	Frequency Stability	4132 to 4233	4132, 4233	WCDMA
-	Occupied Bandwidth	4132 to 4233	4132, 4182, 4233	WCDMA
-	Band Edge	4132 to 4233	4132, 4233	WCDMA
-	Peak to Average Ratio	4132 to 4233	4132, 4182, 4233	WCDMA
-	Conducted Spurious Emission	4132 to 4233	4132, 4182, 4233	WCDMA
-	Radiated Emission	4132 to 4233	4132, 4182, 4233	WCDMA

LTE Band 5

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
-	Frequency Stability	20407 to 20643	20407, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415, 20635	3 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM, 64QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM, 64QAM	15 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
-	Band Edge	20407 to 20643	20407	1.4MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20643	1.4MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		20415 to 20635	20415	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			20635	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		20425 to 20625	20425	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			20625	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		20450 to 20600	20450	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			20600	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Peak to Average Ratio	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM, 64QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM, 64QAM	15 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
-	Conducted Spurious Emission	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	20450 to 20600	20450, 20525, 20600	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	3.85 Vdc	Charles Hsiao
Frequency Stability	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Occupied Bandwidth	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Band Edge	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Peak to Average Ratio	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Conducted Spurious Emission	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao & Karl Lee

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 22
KDB 971168 D01 Power Meas License Digital Systems v02r02
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 7 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 1 MHz for GSM, GPRS & EDGE, 5 MHz for WCDMA, 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.

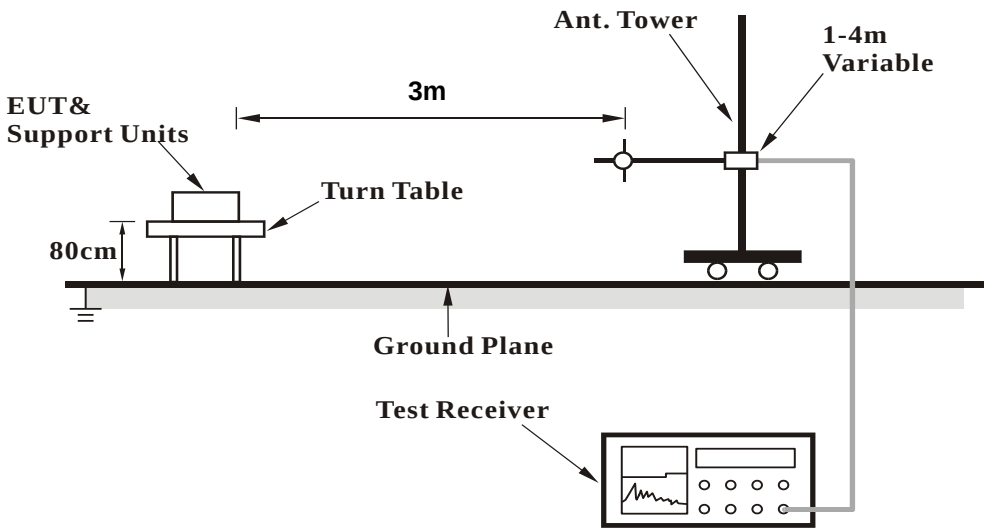
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

Conducted Power Measurement:

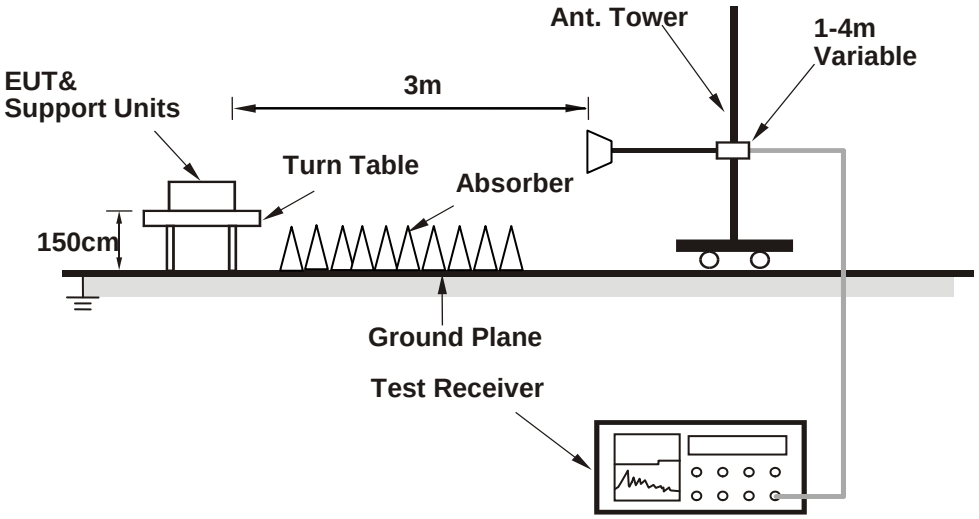
The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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).

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

Band	GSM850		
Channel	128	189	251
Frequency (MHz)	824.2	836.4	848.8
GSM (GMSK, 1Tx-slot)	32.33	32.47	32.49
GPRS (GMSK, 1Tx-slot)	32.31	32.45	32.47
GPRS (GMSK, 2Tx-slot)	30.55	30.69	30.71
GPRS (GMSK, 3Tx-slot)	28.92	29.06	29.08
GPRS (GMSK, 4Tx-slot)	27.86	28.00	28.02
EDGE (8PSK, 1Tx-slot)	25.88	26.02	26.04
EDGE (8PSK, 2Tx-slot)	25.24	25.38	25.40
EDGE (8PSK, 3Tx-slot)	24.98	25.12	25.14
EDGE (8PSK, 4Tx-slot)	22.62	22.76	22.78
DTM (GMSK, 2Tx-slot)	30.60	30.74	30.76
DTM (GMSK, 3Tx-slot)	29.09	29.23	29.25
DTM (8PSK, 2Tx-slot)	24.79	24.93	24.95
DTM (8PSK, 3Tx-slot)	24.88	25.02	25.04

Band	WCDMA V		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	24.17	24.35	24.18
HSDPA Subtest-1	23.19	23.15	23.22
HSDPA Subtest-2	23.20	23.16	23.25
HSDPA Subtest-3	22.71	22.69	22.67
HSDPA Subtest-4	22.68	22.64	22.74
DC-HSDPA Subtest-1	23.17	23.13	23.20
DC-HSDPA Subtest-2	23.18	23.14	23.23
DC-HSDPA Subtest-3	22.69	22.67	22.65
DC-HSDPA Subtest-4	22.66	22.62	22.72
HSUPA Subtest-1	23.21	23.24	23.28
HSUPA Subtest-2	21.26	21.14	21.31
HSUPA Subtest-3	22.05	22.11	22.21
HSUPA Subtest-4	21.00	20.99	21.01
HSUPA Subtest-5	23.20	23.20	23.30

LTE Band 5

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20450	20525	20600	
		Frequency (MHz)		829.0	836.5	844.0	
10M	QPSK	1	0	24.48	24.64	24.56	0
		1	24	24.32	24.47	24.37	0
		1	49	24.34	24.48	24.39	0
		25	0	23.37	23.64	23.42	1
		25	12	23.27	23.48	23.40	1
		25	25	23.35	23.55	23.42	1
		50	0	23.33	23.55	23.50	1
	16QAM	1	0	23.47	23.63	23.55	1
		1	24	23.31	23.46	23.36	1
		1	49	23.33	23.47	23.38	1
		25	0	22.36	22.63	22.41	2
		25	12	22.26	22.47	22.39	2
		25	25	22.34	22.54	22.41	2
		50	0	22.32	22.54	22.49	2
	64QAM	1	0	22.49	22.65	22.57	2
		1	24	22.33	22.48	22.38	2
		1	49	22.35	22.49	22.40	2
		25	0	21.38	21.65	21.43	3
		25	12	21.28	21.49	21.41	3
		25	25	21.36	21.56	21.43	3
		50	0	21.34	21.56	21.51	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20425	20525	20625	
		Frequency (MHz)		826.5	836.5	846.5	
5M	QPSK	1	0	24.41	24.57	24.49	0
		1	12	24.25	24.40	24.30	0
		1	24	24.27	24.41	24.32	0
		12	0	23.30	23.57	23.35	1
		12	6	23.20	23.41	23.33	1
		12	13	23.28	23.48	23.35	1
		25	0	23.26	23.48	23.43	1
	16QAM	1	0	23.40	23.56	23.48	1
		1	12	23.24	23.39	23.29	1
		1	24	23.26	23.40	23.31	1
		12	0	22.29	22.56	22.34	2
		12	6	22.19	22.40	22.32	2
		12	13	22.27	22.47	22.34	2
		25	0	22.25	22.47	22.42	2
	64QAM	1	0	22.42	22.58	22.50	2
		1	12	22.26	22.41	22.31	2
		1	24	22.28	22.42	22.33	2
		12	0	21.31	21.58	21.36	3
		12	6	21.21	21.42	21.34	3
		12	13	21.29	21.49	21.36	3
		25	0	21.27	21.49	21.44	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20415	20525	20635	
		Frequency (MHz)		825.5	836.5	847.5	
3M	QPSK	1	0	24.36	24.52	24.44	0
		1	7	24.20	24.35	24.25	0
		1	14	24.22	24.36	24.27	0
		8	0	23.25	23.52	23.30	1
		8	3	23.15	23.36	23.28	1
		8	7	23.23	23.43	23.30	1
		15	0	23.21	23.43	23.38	1
	16QAM	1	0	23.35	23.51	23.43	1
		1	7	23.19	23.34	23.24	1
		1	14	23.21	23.35	23.26	1
		8	0	22.24	22.51	22.29	2
		8	3	22.14	22.35	22.27	2
		8	7	22.22	22.42	22.29	2
		15	0	22.20	22.42	22.37	2
	64QAM	1	0	22.37	22.53	22.45	2
		1	7	22.21	22.36	22.26	2
		1	14	22.23	22.37	22.28	2
		8	0	21.26	21.53	21.31	3
		8	3	21.16	21.37	21.29	3
		8	7	21.24	21.44	21.31	3
		15	0	21.22	21.44	21.39	3

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20407	20525	20643	
		Frequency (MHz)		824.7	836.5	848.3	
1.4M	QPSK	1	0	24.28	24.44	24.36	0
		1	2	24.12	24.27	24.17	0
		1	5	24.14	24.28	24.19	0
		3	0	23.97	24.24	24.02	0
		3	1	23.87	24.08	24.00	0
		3	3	23.95	24.15	24.02	0
		6	0	23.13	23.35	23.30	1
	16QAM	1	0	23.27	23.43	23.35	1
		1	2	23.11	23.26	23.16	1
		1	5	23.13	23.27	23.18	1
		3	0	22.96	23.23	23.01	1
		3	1	22.86	23.07	22.99	1
		3	3	22.94	23.14	23.01	1
		6	0	22.12	22.34	22.29	2
	64QAM	1	0	22.29	22.45	22.37	2
		1	2	22.13	22.28	22.18	2
		1	5	22.15	22.29	22.20	2
		3	0	21.98	22.25	22.03	2
		3	1	21.88	22.09	22.01	2
		3	3	21.96	22.16	22.03	2
		6	0	21.14	21.36	21.31	3

ERP Power (dBm)

GSM							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	128	824.2	-4.51	31.208	24.55	284.97	H
	189	836.4	-4.62	31.3	24.53	283.79	
	251	848.8	-4.52	31.222	24.55	285.23	
	128	824.2	-8.80	31.504	20.55	113.61	V
	189	836.4	-8.46	31.117	20.51	112.38	
	251	848.8	-9.27	31.922	20.50	112.25	

EDGE							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	128	824.2	-11.00	31.208	18.06	63.94	H
	189	836.4	-11.11	31.3	18.04	63.68	
	251	848.8	-11.03	31.222	18.04	63.71	
	128	824.2	-15.32	31.504	14.03	25.32	V
	189	836.4	-14.90	31.117	14.07	25.51	
	251	848.8	-15.76	31.922	14.01	25.19	

WCDMA							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	4132	826.4	-12.48	31.208	16.58	45.48	H
	4182	836.4	-12.60	31.3	16.55	45.19	
	4233	846.6	-12.55	31.222	16.52	44.90	
	4132	826.4	-16.80	31.504	12.55	18.01	V
	4182	836.4	-16.43	31.117	12.54	17.93	
	4233	846.6	-17.25	31.922	12.52	17.87	

LTE Band 5							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	20407	824.7	-12.47	31.208	16.59	45.58	H
	20525	836.5	-12.60	31.3	16.55	45.19	
	20643	848.3	-12.55	31.222	16.52	44.90	
	20407	824.7	-16.76	31.504	12.59	18.17	V
	20525	836.5	-16.43	31.117	12.54	17.93	
	20643	848.3	-17.20	31.922	12.57	18.08	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	20407	824.7	-13.52	31.208	15.54	35.79	H
	20525	836.5	-13.62	31.3	15.53	35.73	
	20643	848.3	-13.58	31.222	15.49	35.42	
	20407	824.7	-17.78	31.504	11.57	14.37	V
	20525	836.5	-17.49	31.117	11.48	14.05	
	20643	848.3	-18.25	31.922	11.52	14.20	
Channel Bandwidth: 1.4 MHz / 64QAM							
X	20407	824.7	-14.49	31.208	14.57	28.63	H
	20525	836.5	-14.60	31.3	14.55	28.51	
	20643	848.3	-14.57	31.222	14.50	28.20	
	20407	824.7	-18.79	31.504	10.56	11.39	V
	20525	836.5	-18.54	31.117	10.43	11.03	
	20643	848.3	-19.26	31.922	10.51	11.25	

LTE Band 5							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	20415	825.5	-12.52	31.208	16.54	45.06	H
	20525	836.5	-12.58	31.3	16.57	45.39	
	20635	847.5	-12.51	31.222	16.56	45.31	
	20415	825.5	-16.81	31.504	12.54	17.96	V
	20525	836.5	-16.43	31.117	12.54	17.93	
	20635	847.5	-17.24	31.922	12.53	17.91	
Channel Bandwidth: 3 MHz / 16QAM							
X	20415	825.5	-13.50	31.208	15.56	35.96	H
	20525	836.5	-13.64	31.3	15.51	35.56	
	20635	847.5	-13.52	31.222	15.55	35.91	
	20415	825.5	-17.82	31.504	11.53	14.24	V
	20525	836.5	-17.46	31.117	11.51	14.15	
	20635	847.5	-18.28	31.922	11.49	14.10	
Channel Bandwidth: 3 MHz / 64QAM							
X	20415	825.5	-14.59	31.208	14.47	27.98	H
	20525	836.5	-14.67	31.3	14.48	28.05	
	20635	847.5	-14.56	31.222	14.51	28.26	
	20415	825.5	-18.80	31.504	10.55	11.36	V
	20525	836.5	-18.49	31.117	10.48	11.16	
	20635	847.5	-19.31	31.922	10.46	11.12	

LTE Band 5							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	20425	826.5	-12.50	31.208	16.56	45.27	H
	20525	836.5	-12.62	31.3	16.53	44.98	
	20625	846.5	-12.58	31.222	16.49	44.59	
	20425	826.5	-16.81	31.504	12.54	17.96	V
	20525	836.5	-16.47	31.117	12.50	17.77	
	20625	846.5	-17.24	31.922	12.53	17.91	
Channel Bandwidth: 5 MHz / 16QAM							
X	20425	826.5	-13.52	31.208	15.54	35.79	H
	20525	836.5	-13.60	31.3	15.55	35.89	
	20625	846.5	-13.57	31.222	15.50	35.50	
	20425	826.5	-17.82	31.504	11.53	14.24	V
	20525	836.5	-17.49	31.117	11.48	14.05	
	20625	846.5	-18.20	31.922	11.57	14.36	
Channel Bandwidth: 5 MHz / 64QAM							
X	20425	826.5	-14.57	31.208	14.49	28.11	H
	20525	836.5	-14.63	31.3	14.52	28.31	
	20625	846.5	-14.59	31.222	14.48	28.07	
	20425	826.5	-18.87	31.504	10.48	11.18	V
	20525	836.5	-18.46	31.117	10.51	11.24	
	20625	846.5	-19.22	31.922	10.55	11.36	

LTE Band 5							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	20450	829.0	-12.46	31.208	16.60	45.69	H
	20525	836.5	-12.51	31.3	16.64	46.13	
	20600	844.0	-12.59	31.222	16.48	44.48	
	20450	829.0	-16.72	31.504	12.63	18.34	V
	20525	836.5	-16.36	31.117	12.61	18.23	
	20600	844.0	-17.28	31.922	12.49	17.75	
Channel Bandwidth: 10 MHz / 16QAM							
X	20425	826.5	-13.44	31.208	15.62	36.46	H
	20525	836.5	-13.58	31.3	15.57	36.06	
	20625	846.5	-13.52	31.222	15.55	35.91	
	20425	826.5	-17.70	31.504	11.65	14.64	V
	20525	836.5	-17.34	31.117	11.63	14.54	
	20625	846.5	-18.26	31.922	11.51	14.16	
Channel Bandwidth: 10 MHz / 64QAM							
X	20450	829.0	-14.45	31.208	14.61	28.89	H
	20525	836.5	-14.53	31.3	14.62	28.97	
	20600	844.0	-14.53	31.222	14.54	28.46	
	20450	829.0	-18.72	31.504	10.63	11.57	V
	20525	836.5	-18.37	31.117	10.60	11.47	
	20600	844.0	-19.26	31.922	10.51	11.25	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

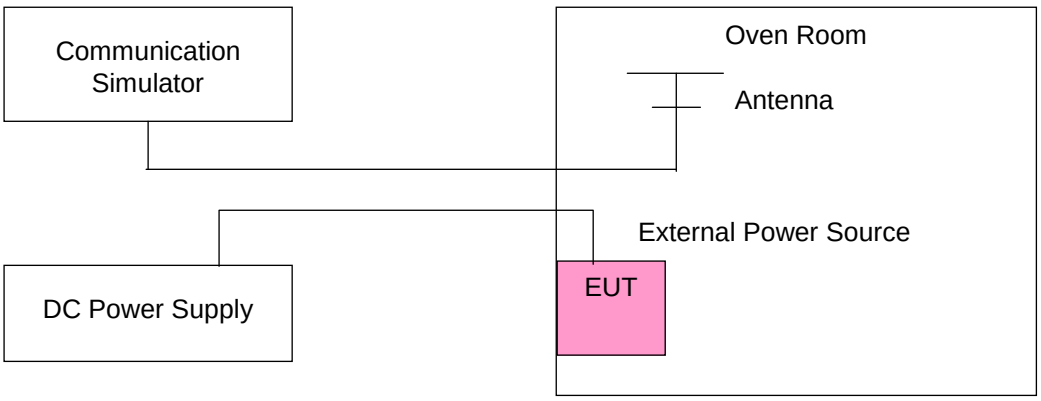
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

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)	GSM				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	824.200002	0.003	848.800004	0.004	2.5
3.6	824.200001	0.001	848.800002	0.002	2.5
4.4	824.200003	0.003	848.800004	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	GSM				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	824.200002	0.003	848.800003	0.004	2.5
-20	824.200003	0.003	848.800002	0.002	2.5
-10	824.200004	0.004	848.800002	0.002	2.5
0	824.200002	0.002	848.800002	0.002	2.5
10	824.200002	0.002	848.800004	0.004	2.5
20	824.199998	-0.002	848.799998	-0.002	2.5
30	824.199997	-0.003	848.799997	-0.003	2.5
40	824.199998	-0.002	848.799998	-0.003	2.5
50	824.199996	-0.005	848.799997	-0.004	2.5
55	824.199997	-0.004	848.799997	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	EDGE				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	824.200003	0.004	848.800003	0.004	2.5
3.6	824.200003	0.004	848.800004	0.005	2.5
4.4	824.200002	0.003	848.800001	0.001	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	EDGE				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	824.200002	0.003	848.800002	0.002	2.5
-20	824.200003	0.003	848.800003	0.004	2.5
-10	824.200001	0.002	848.800003	0.004	2.5
0	824.200003	0.003	848.800003	0.003	2.5
10	824.200003	0.004	848.800003	0.004	2.5
20	824.199999	-0.002	848.799997	-0.004	2.5
30	824.199998	-0.002	848.799998	-0.003	2.5
40	824.199998	-0.002	848.799998	-0.002	2.5
50	824.199999	-0.001	848.799997	-0.004	2.5
55	824.199998	-0.003	848.799996	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	826.400004	0.005	846.600001	0.001	2.5
3.6	826.400004	0.005	846.600003	0.003	2.5
4.4	826.400003	0.004	846.600003	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.400002	0.003	846.600002	0.002	2.5
-20	826.400003	0.003	846.600003	0.003	2.5
-10	826.400003	0.003	846.600001	0.001	2.5
0	826.400003	0.004	846.600003	0.004	2.5
10	826.400002	0.003	846.600003	0.003	2.5
20	826.399999	-0.002	846.599997	-0.004	2.5
30	826.399997	-0.003	846.599997	-0.003	2.5
40	826.399996	-0.005	846.599998	-0.002	2.5
50	826.399996	-0.005	846.599997	-0.003	2.5
55	826.399997	-0.004	846.599997	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	824.700001	0.001	848.300002	0.002	2.5
3.6	824.700001	0.001	848.300001	0.002	2.5
4.4	824.700004	0.005	848.300003	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	824.700003	0.004	848.300001	0.002	2.5
-20	824.700003	0.004	848.300001	0.001	2.5
-10	824.700002	0.003	848.300003	0.004	2.5
0	824.700002	0.003	848.300002	0.002	2.5
10	824.700004	0.005	848.300003	0.003	2.5
20	824.699999	-0.002	848.299997	-0.003	2.5
30	824.699997	-0.003	848.299996	-0.004	2.5
40	824.699996	-0.004	848.299996	-0.005	2.5
50	824.699998	-0.003	848.299998	-0.003	2.5
55	824.699997	-0.004	848.299996	-0.005	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	825.500002	0.003	847.500001	0.001	2.5
3.6	825.500004	0.005	847.500004	0.005	2.5
4.4	825.500002	0.002	847.500003	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	825.500004	0.004	847.500001	0.002	2.5
-20	825.500002	0.002	847.500003	0.003	2.5
-10	825.500003	0.004	847.500002	0.002	2.5
0	825.500002	0.002	847.500003	0.004	2.5
10	825.500001	0.002	847.500002	0.003	2.5
20	825.499998	-0.003	847.499997	-0.004	2.5
30	825.499996	-0.005	847.499999	-0.002	2.5
40	825.499997	-0.003	847.499996	-0.005	2.5
50	825.499998	-0.003	847.499996	-0.005	2.5
55	825.499996	-0.005	847.499996	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	826.500003	0.003	846.500002	0.002	2.5
3.6	826.500004	0.004	846.500002	0.002	2.5
4.4	826.500003	0.004	846.500004	0.005	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.500003	0.004	846.500002	0.003	2.5
-20	826.500002	0.002	846.500003	0.003	2.5
-10	826.500004	0.004	846.500003	0.003	2.5
0	826.500002	0.003	846.500002	0.002	2.5
10	826.500001	0.002	846.500004	0.004	2.5
20	826.499998	-0.002	846.499998	-0.003	2.5
30	826.499997	-0.004	846.499998	-0.002	2.5
40	826.499997	-0.004	846.499998	-0.002	2.5
50	826.499998	-0.002	846.499997	-0.003	2.5
55	826.499998	-0.003	846.499996	-0.005	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
3.85	829.000003	0.003	844.000001	0.002	2.5
3.6	829.000004	0.004	844.000004	0.004	2.5
4.4	829.000003	0.004	844.000003	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 3.6 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

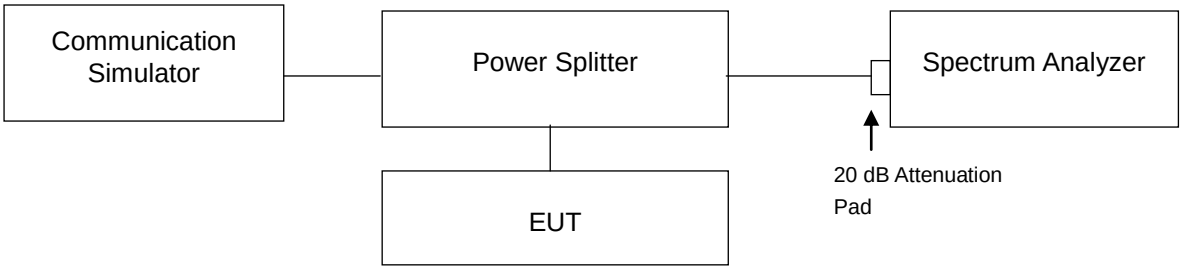
Temp. (℃)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	829.000003	0.003	844.000002	0.002	2.5
-20	829.000002	0.002	844.000003	0.004	2.5
-10	829.000002	0.002	844.000004	0.005	2.5
0	829.000003	0.004	844.000004	0.004	2.5
10	829.000002	0.003	844.000003	0.004	2.5
20	828.999996	-0.004	843.999997	-0.003	2.5
30	828.999998	-0.003	843.999998	-0.002	2.5
40	828.999997	-0.003	843.999998	-0.002	2.5
50	828.999997	-0.003	843.999996	-0.004	2.5
55	828.999997	-0.004	843.999997	-0.003	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

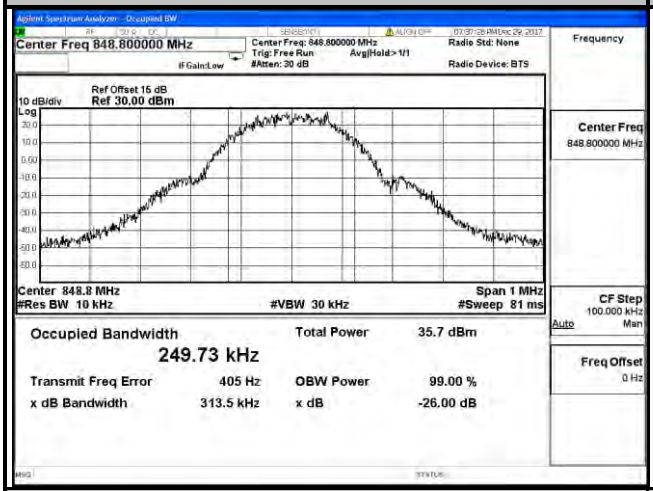


4.3.3 Test Result

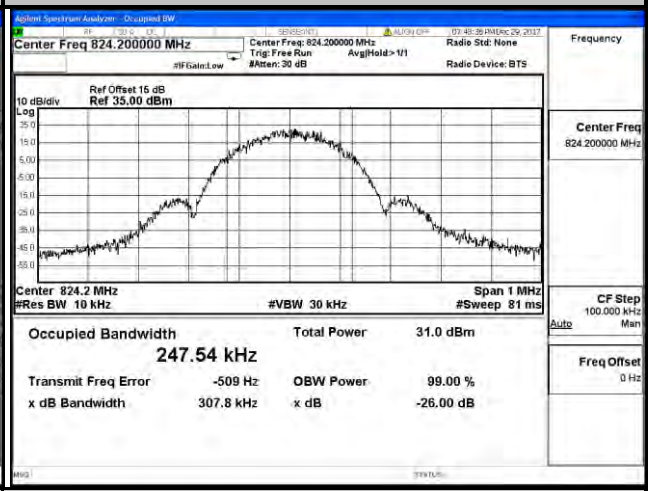
Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)		Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)
		GSM	EDGE			WCDMA
128	824.2	244.38	247.54	4132	826.4	4.1447
189	836.4	246.16	244.52	4182	836.4	4.1480
251	848.8	249.73	244.59	4233	846.6	4.1395

Spectrum Plot of Worst Value

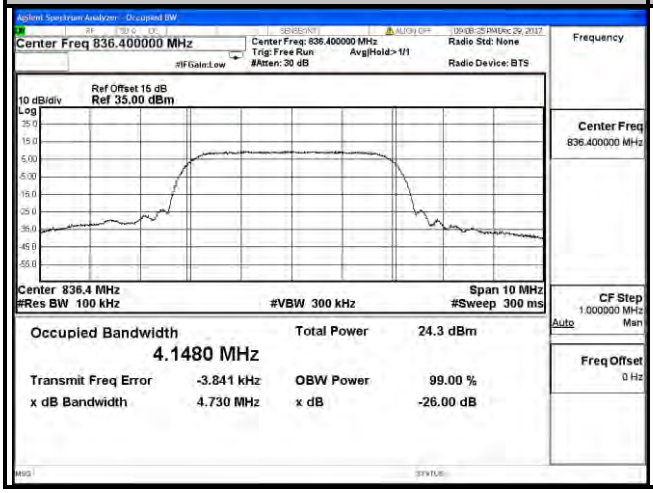
GSM



EDGE

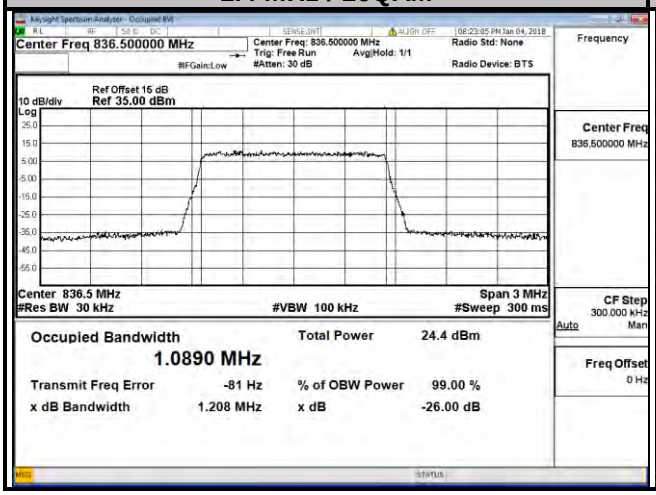


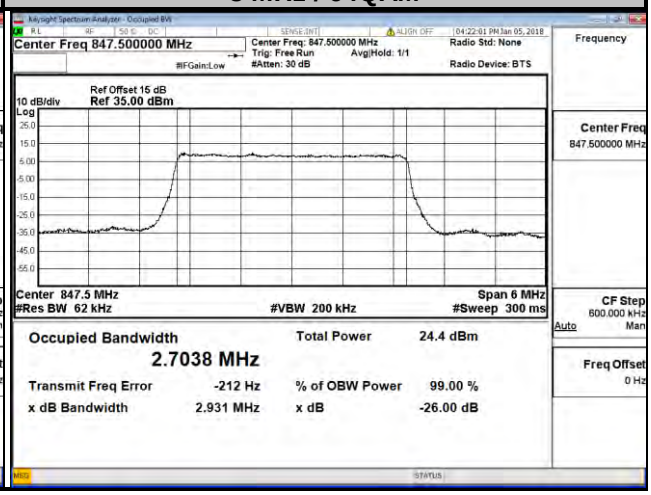
WCDMA



LTE Band 5									
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	64QAM			QPSK	16QAM	64QAM
20407	824.7	1.0875	1.0864	1.0862	20415	825.5	2.7001	2.6967	2.7014
20525	836.5	1.0861	1.0890	1.0866	20525	836.5	2.7006	2.6973	2.7020
20643	848.3	1.0865	1.0873	1.0865	20635	847.5	2.6996	2.6960	2.7038

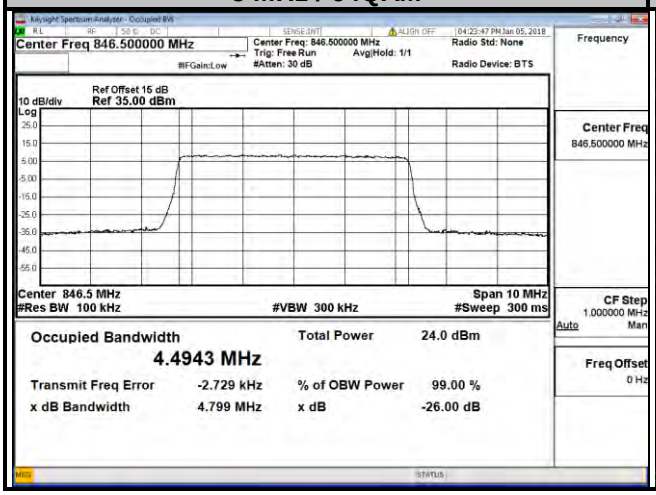
Spectrum Plot of Worst Value	
1.4 MHz / 16QAM	3 MHz / 64QAM

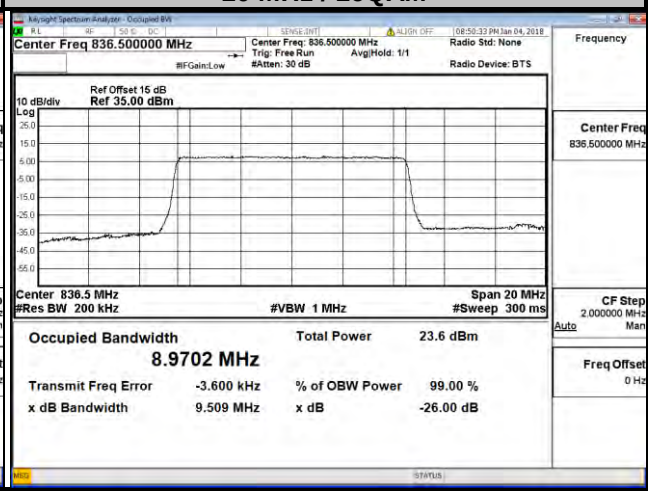




LTE Band 5									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)			Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
20425	826.5	4.4865	4.4858	4.4889	20450	829.0	8.9564	8.9568	8.9539
20525	836.5	4.4864	4.4891	4.8820	20525	836.5	8.9669	8.9702	8.9661
20625	846.5	4.4865	4.4902	4.4943	20600	844.0	8.9559	8.9585	8.9526

Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 16QAM



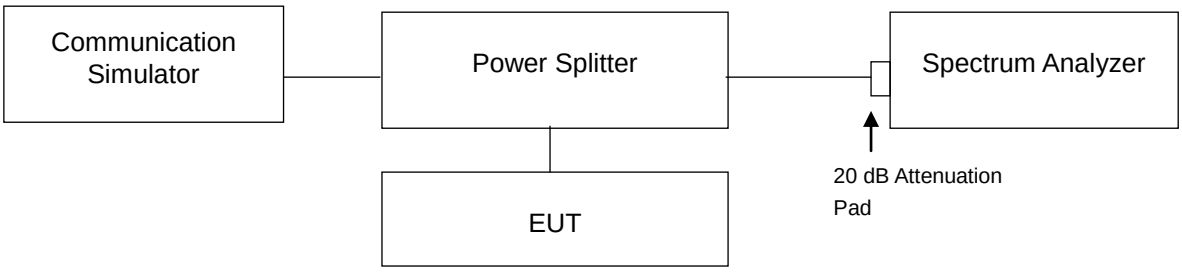


4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

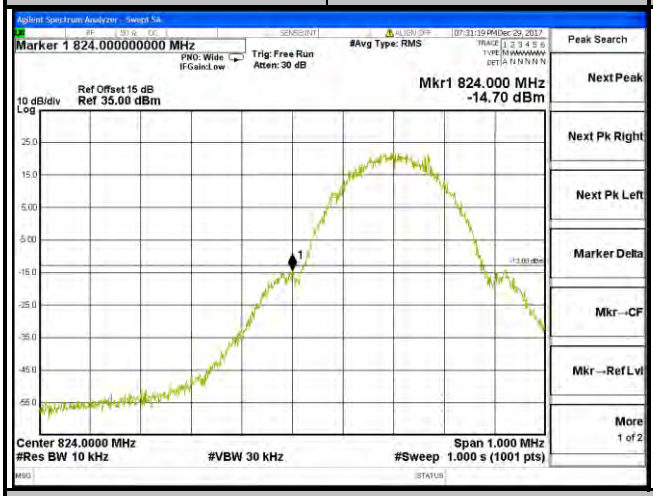
4.4.2 Test Setup

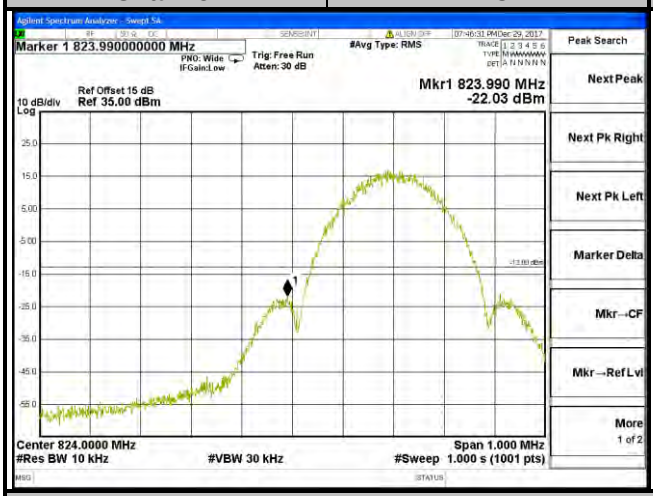


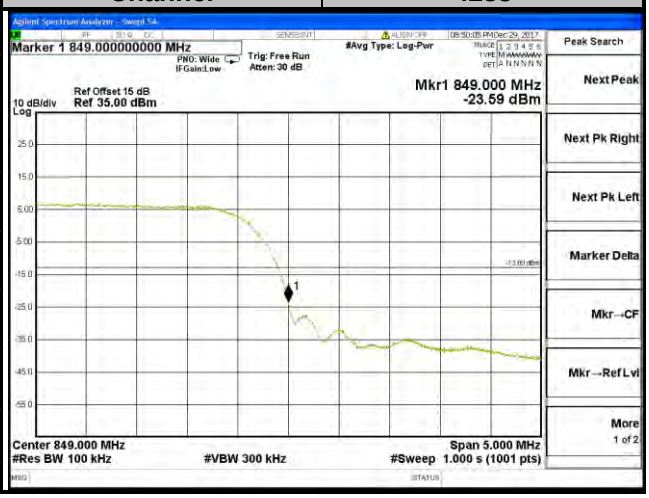
4.4.3 Test Procedures

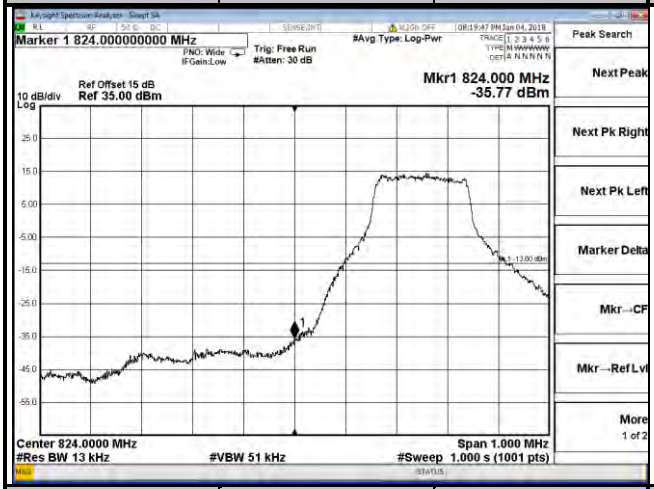
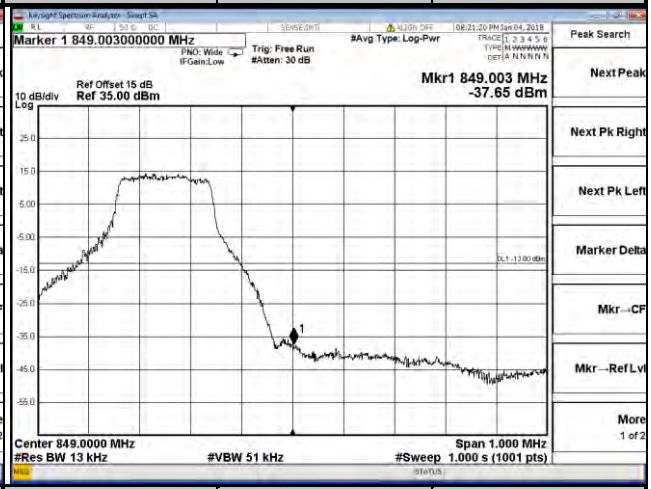
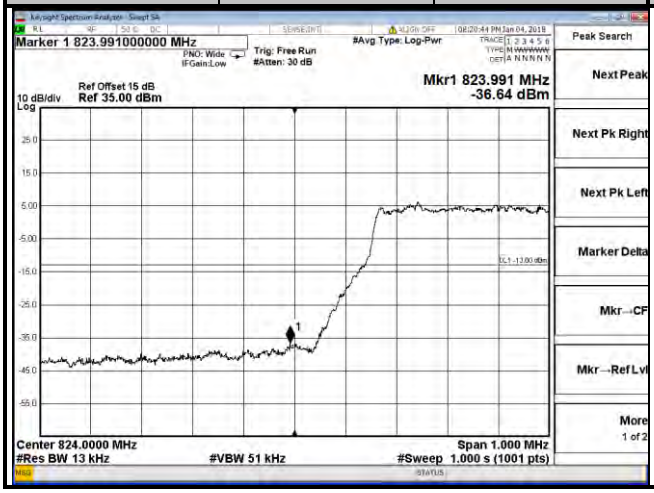
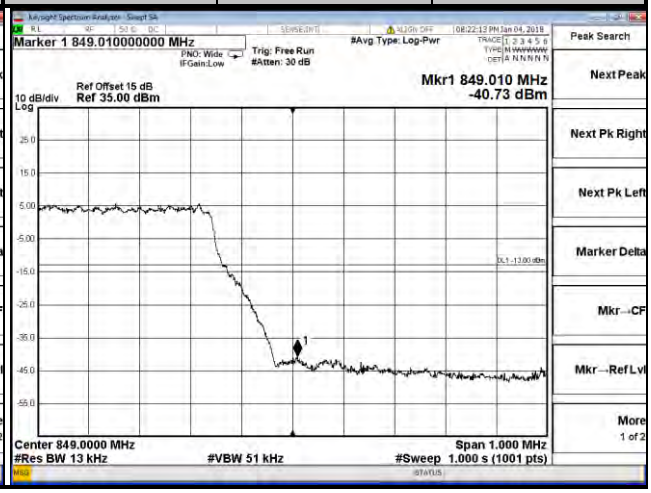
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 10 kHz and VB of the spectrum is 30 kHz (GSM/GPRS/EDGE).
c. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 13 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 5 MHz/10 MHz).
g. Record the max trace plot into the test report.

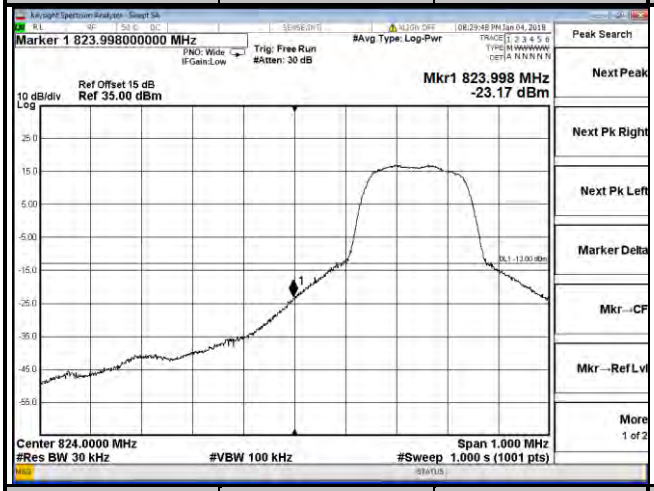
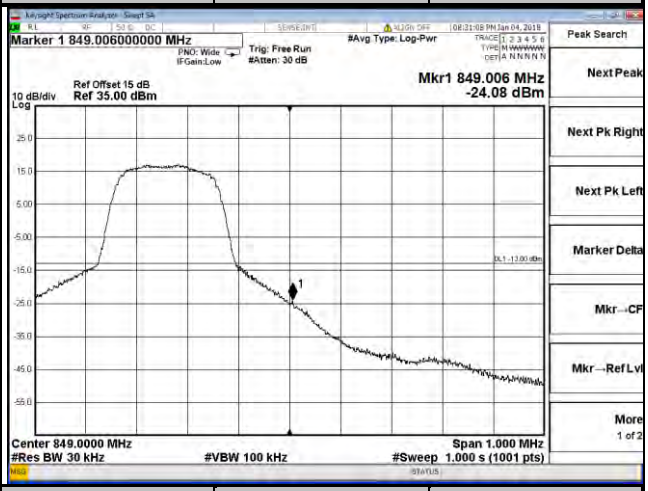
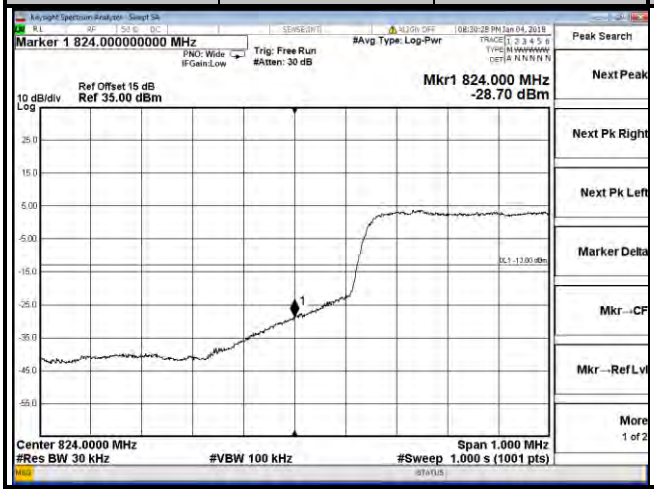
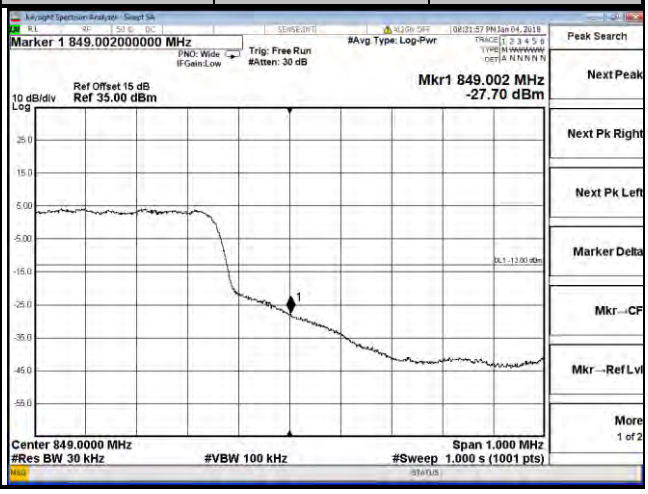
4.4.4 Test Results

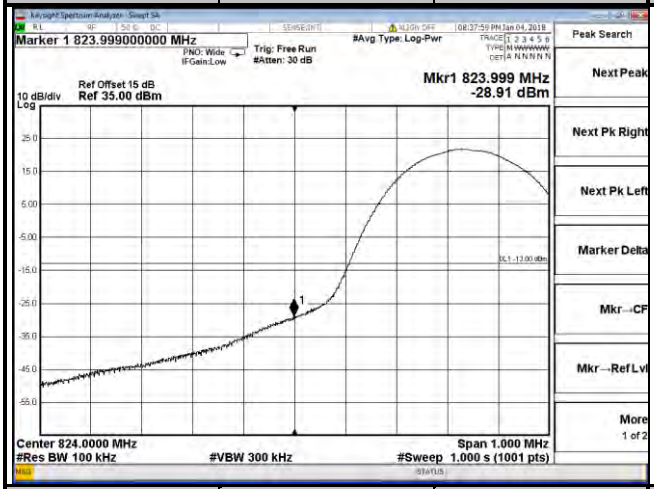
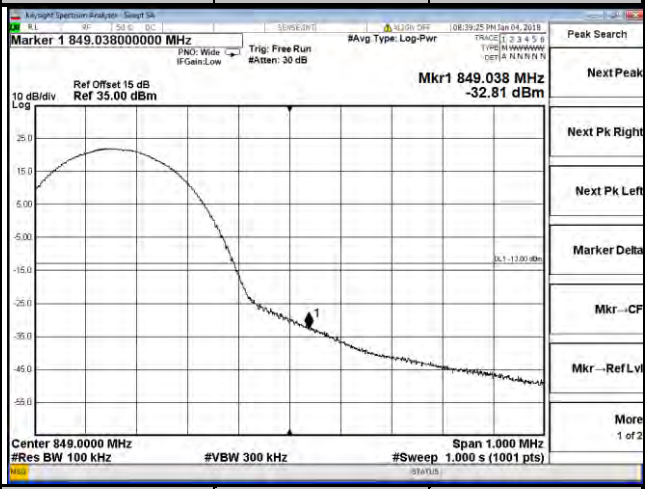
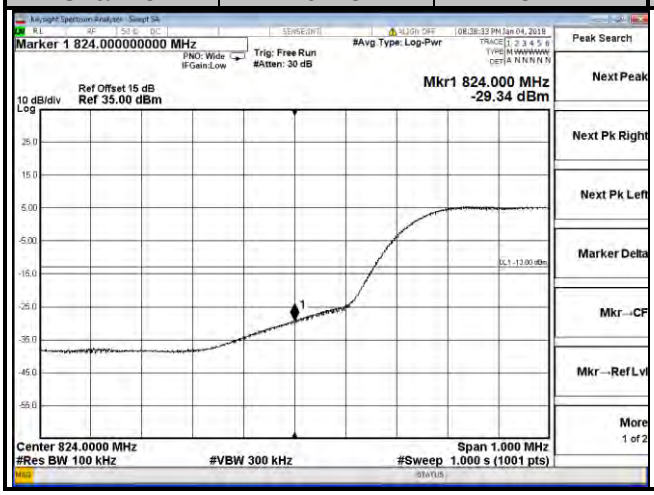
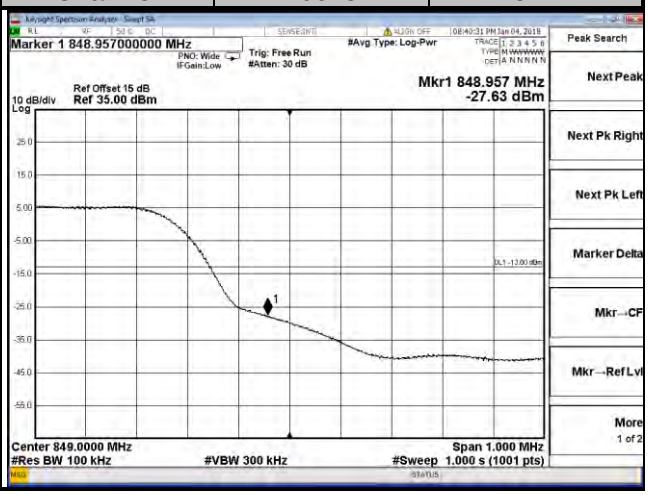
GSM			
Channel	128	Channel	251
			

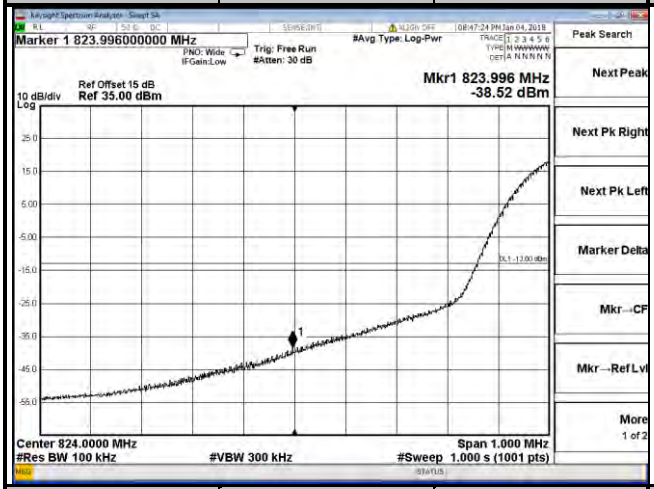
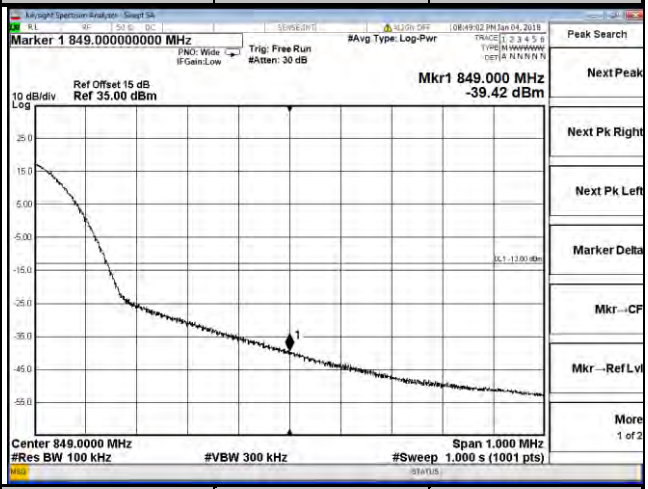
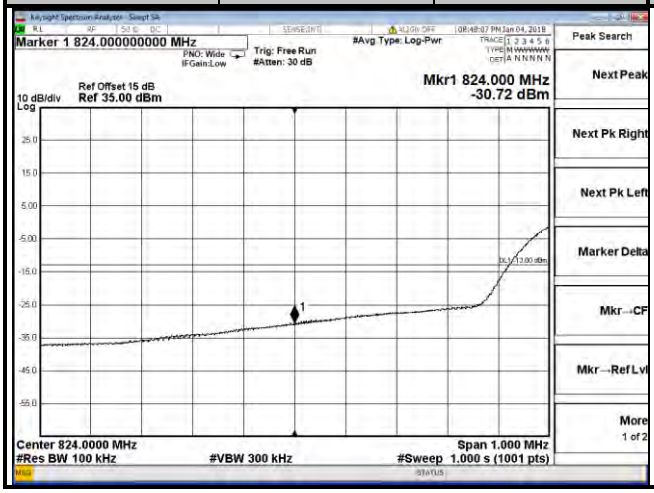
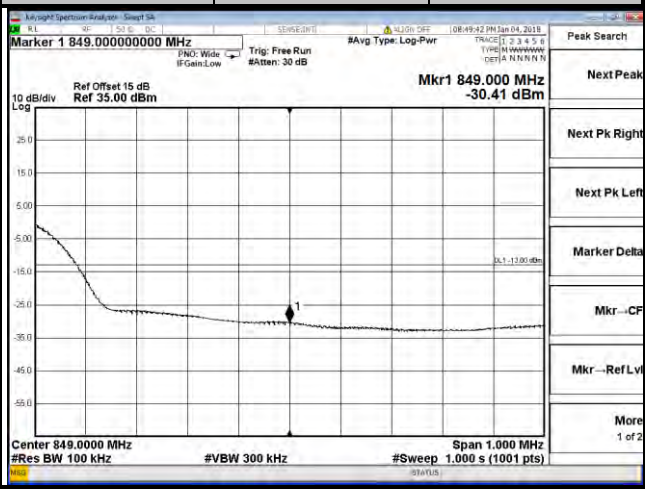
EDGE			
Channel	128	Channel	251
			

WCDMA			
Channel	4132	Channel	4233
			

LTE Band 5					
Channel Bandwidth: 1.4 MHz					
Channel	20407	1 RB	Channel	20643	1 RB
					
Channel	20407	6 RB	Channel	20643	6 RB
					

LTE Band 5					
Channel Bandwidth: 3 MHz					
Channel	20415	1 RB	Channel	20635	1 RB
					
Channel	20415	15 RB	Channel	20635	15 RB
					

LTE Band 5					
Channel Bandwidth: 5 MHz					
Channel	20425	1 RB	Channel	20625	1 RB
					
Channel	20425	25 RB	Channel	20625	25 RB
					

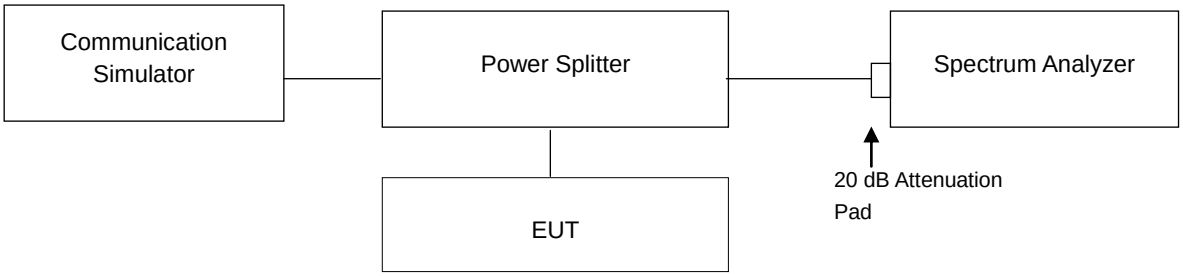
LTE Band 5					
Channel Bandwidth: 10 MHz					
Channel	20450	1 RB	Channel	20600	1 RB
					
Channel	20450	50 RB	Channel	20600	50 RB
					

4.5 Peak to Average Ratio

4.5.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.5.2 Test Setup



4.5.3 Test Procedures

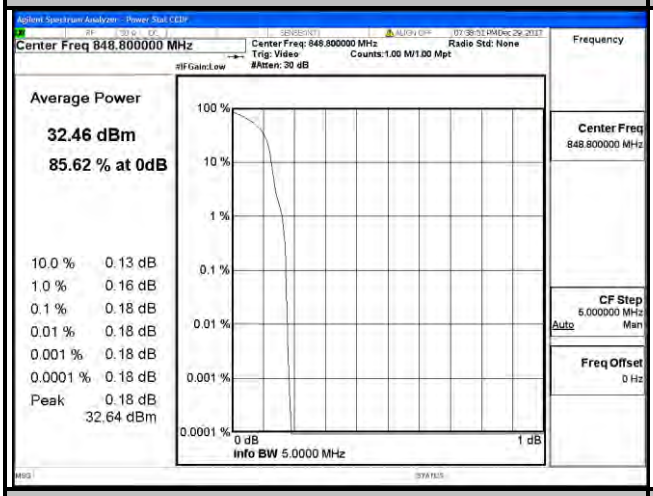
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.5.4 Test Results

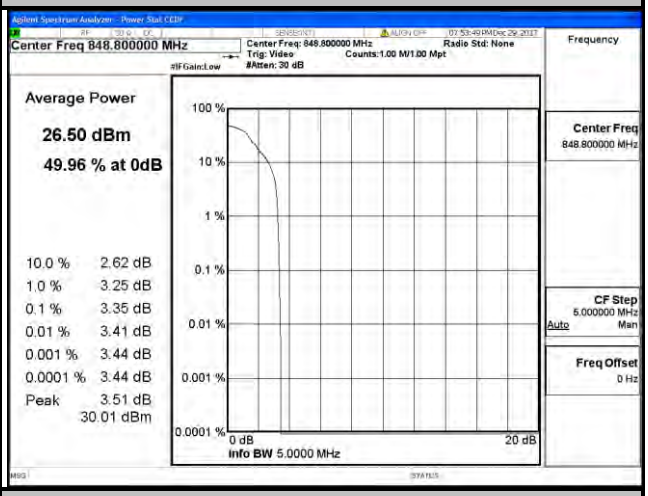
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		GSM	EDGE			WCDMA
128	824.2	0.15	3.33	4132	826.4	3.02
189	836.4	0.17	3.33	4182	836.4	2.94
251	848.8	0.18	3.35	4233	846.6	3.05

Spectrum Plot of Worst Value

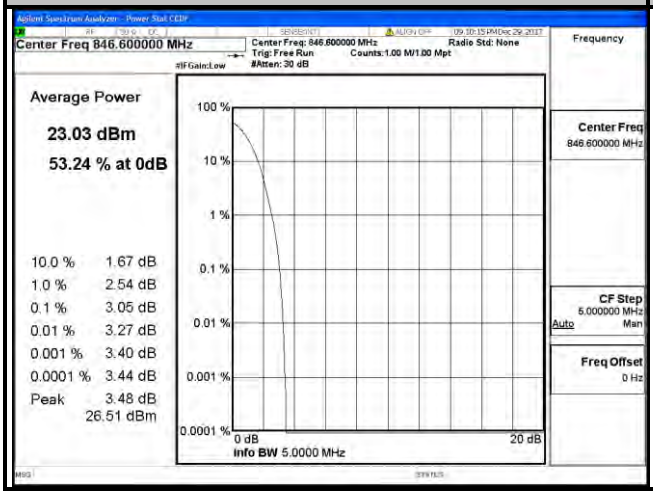
GSM



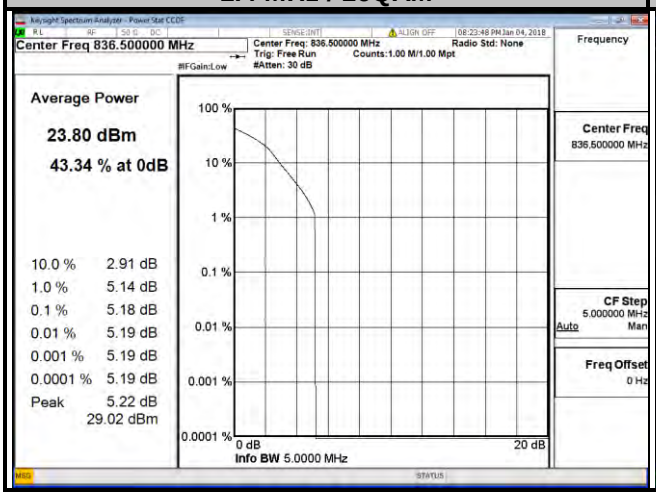
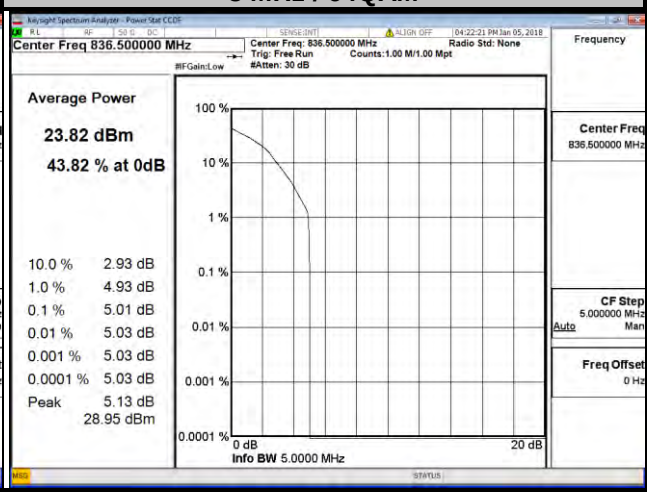
EDGE



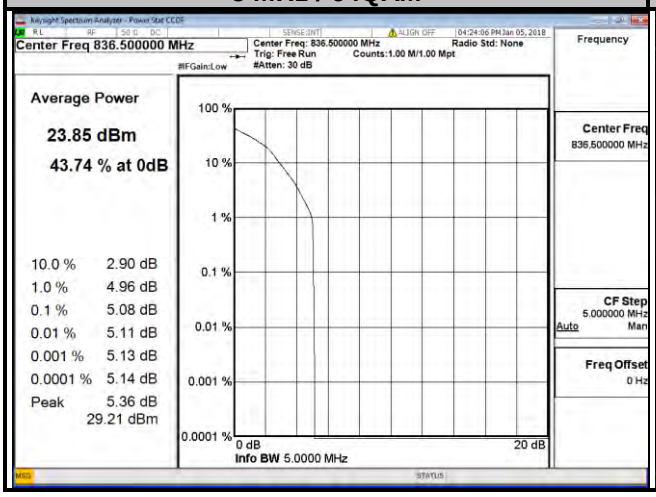
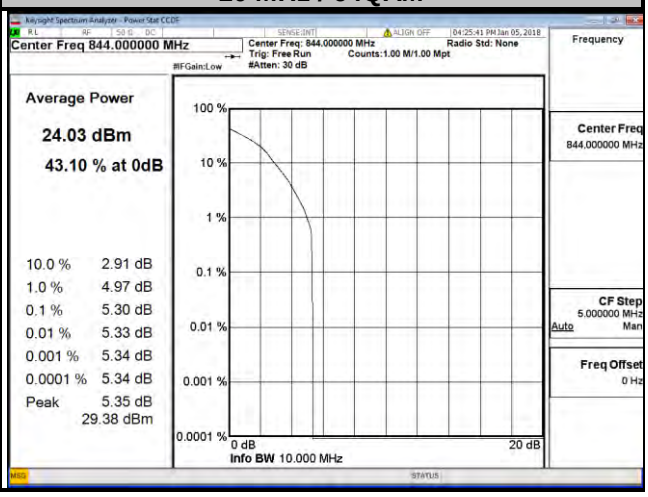
WCDMA



LTE Band 5									
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
20407	824.7	3.83	4.94	4.94	20415	825.5	3.60	4.82	4.89
20525	836.5	3.84	5.18	5.10	20525	836.5	3.60	4.95	5.01
20643	848.3	3.69	4.42	4.46	20635	847.5	3.51	4.31	4.36

Spectrum Plot of Worst Value	
1.4 MHz / 16QAM	3 MHz / 64QAM
	

LTE Band 5									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
Channel	Frequency (MHz)	Peak to Average Ratio (dB)			Channel	Frequency (MHz)	Peak to Average Ratio (dB)		
		QPSK	16QAM	64QAM			QPSK	16QAM	64QAM
20425	826.5	3.64	4.84	4.86	20450	829.0	3.54	4.85	4.93
20525	836.5	3.61	5.05	5.08	20525	836.5	3.50	5.13	5.22
20625	846.5	3.59	4.73	4.85	20600	844.0	3.50	5.27	5.30

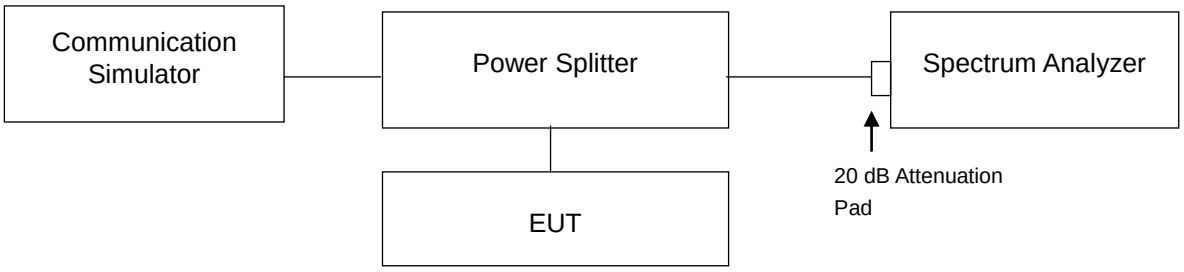
Spectrum Plot of Worst Value	
5 MHz / 64QAM	10 MHz / 64QAM
	

4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13 dBm.

4.6.2 Test Setup



4.6.3 Test Procedure

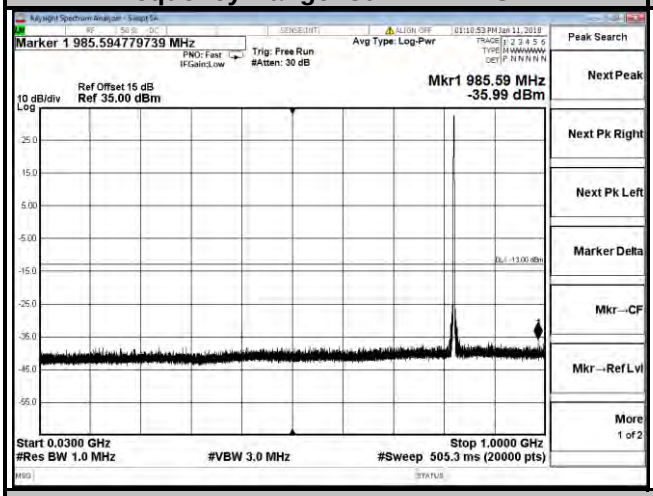
a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 30 MHz to 10 GHz. 20 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted spurious emission measurement.

4.6.4 Test Results

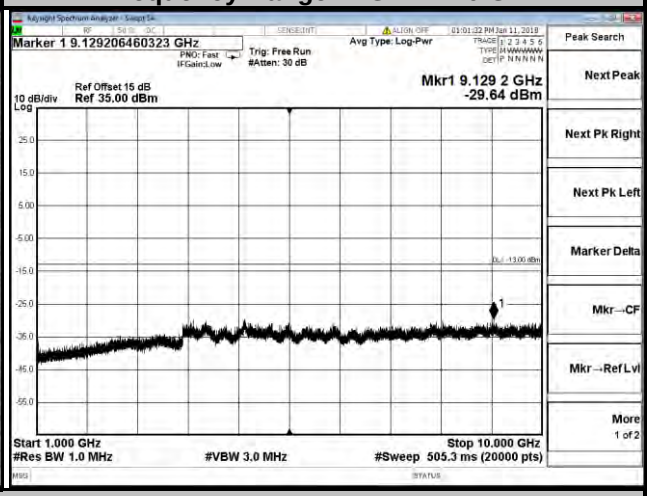
GSM

Channel 128

Frequency Range: 30 MHz ~ 1 GHz

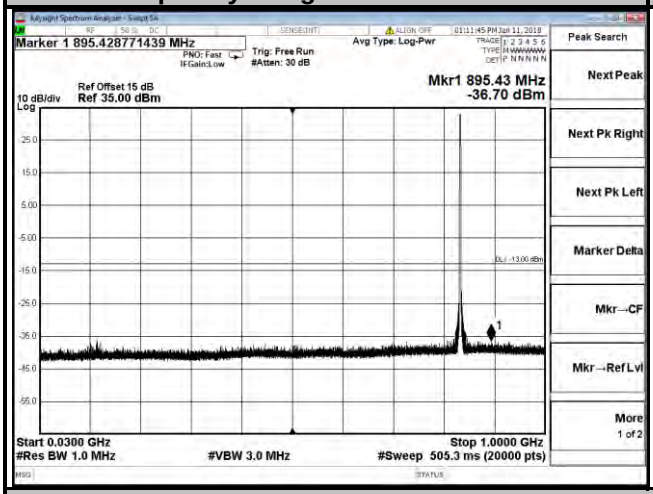


Frequency Range: 1 GHz ~ 10 GHz

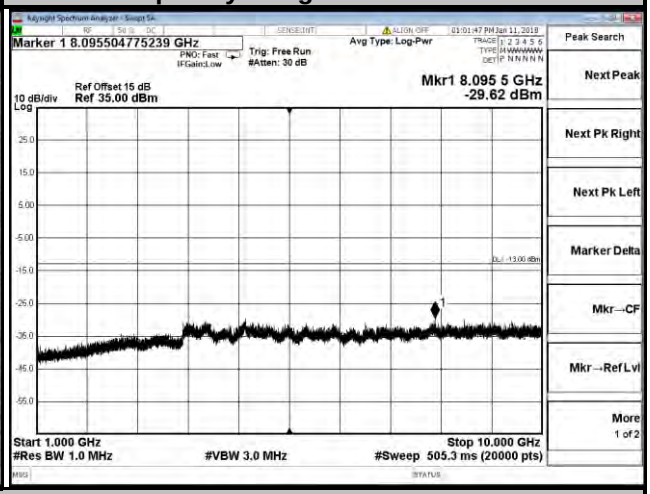


Channel 189

Frequency Range: 30 MHz ~ 1 GHz

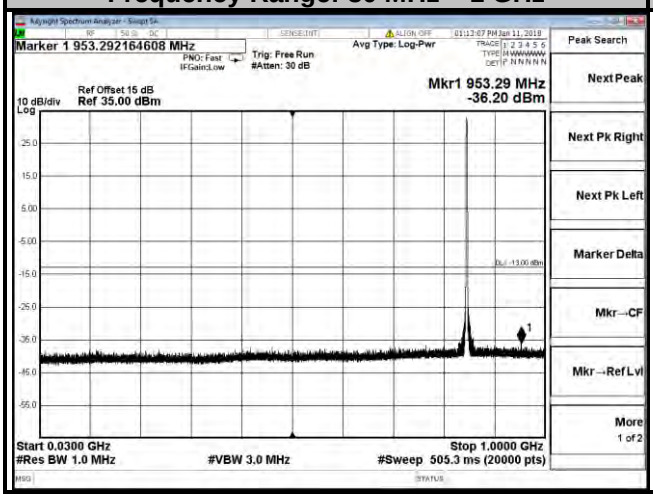


Frequency Range: 1 GHz ~ 10 GHz

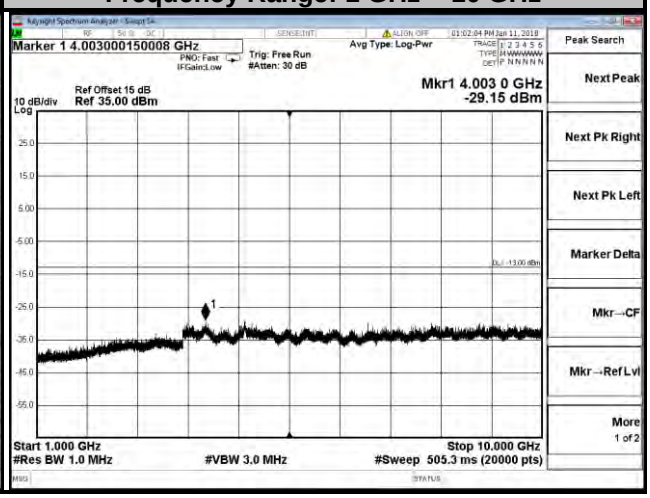


Channel 256

Frequency Range: 30 MHz ~ 1 GHz



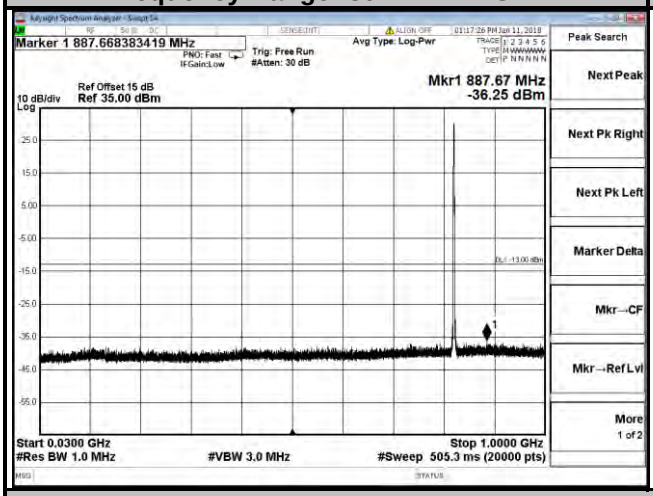
Frequency Range: 1 GHz ~ 10 GHz



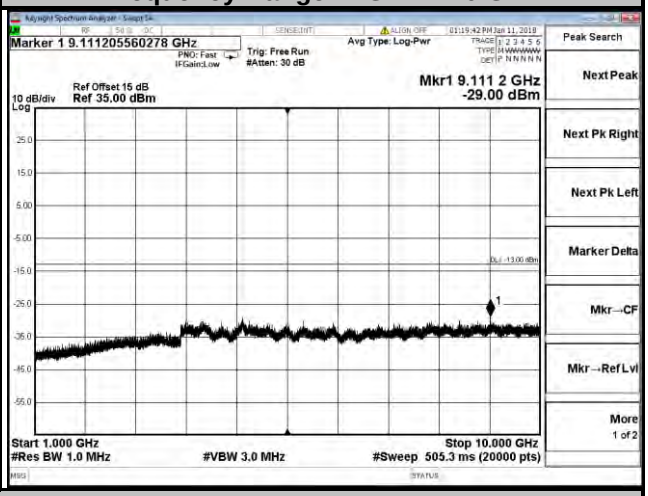
EDGE

Channel 128

Frequency Range: 30 MHz ~ 1 GHz

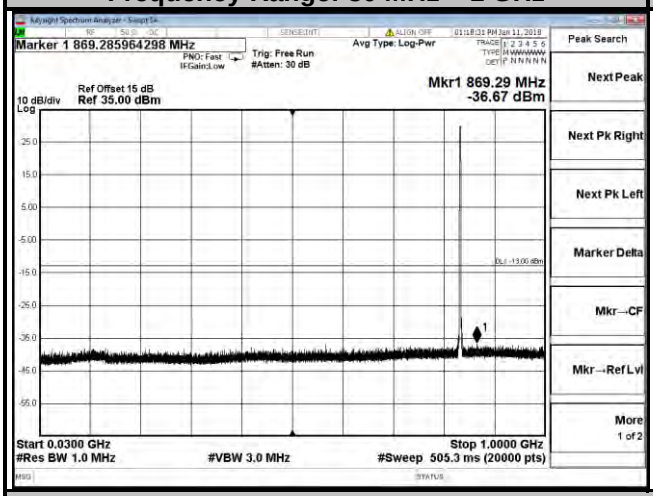


Frequency Range: 1 GHz ~ 10 GHz

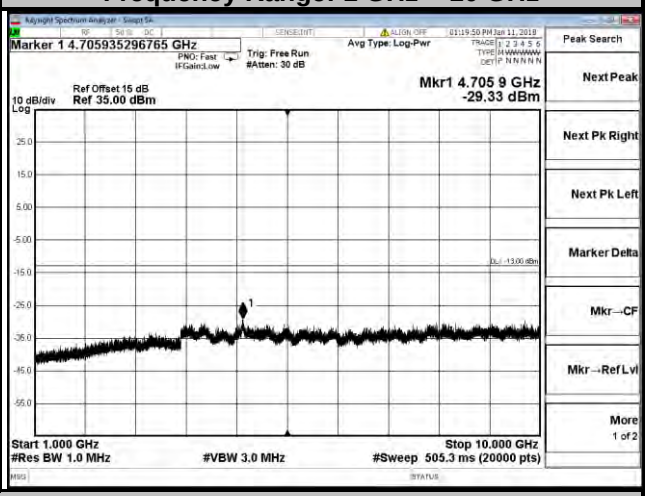


Channel 189

Frequency Range: 30 MHz ~ 1 GHz

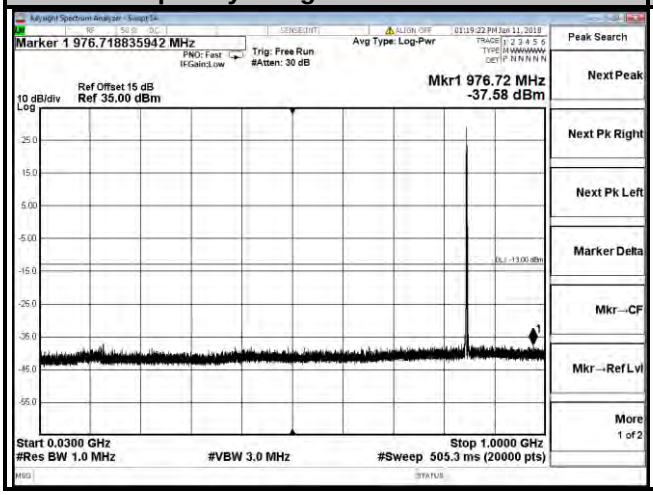


Frequency Range: 1 GHz ~ 10 GHz

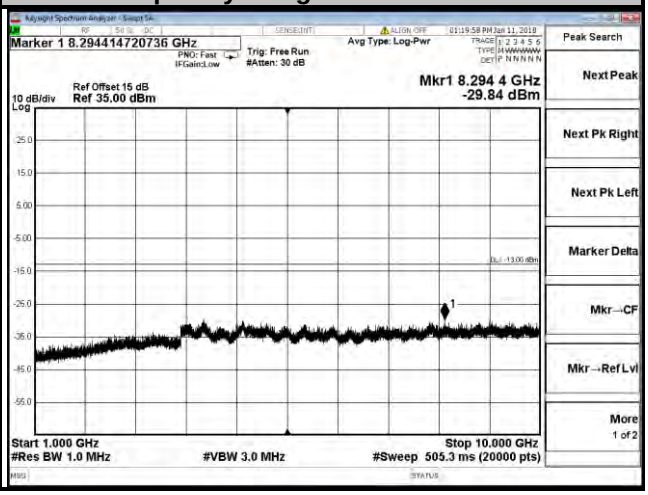


Channel 251

Frequency Range: 30 MHz ~ 1 GHz



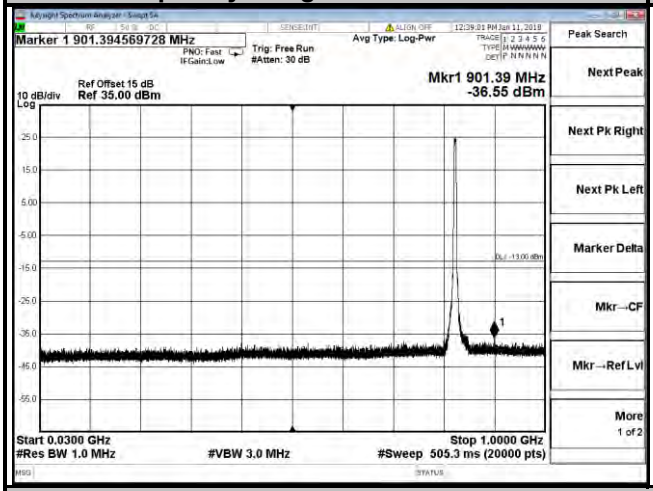
Frequency Range: 1 GHz ~ 10 GHz



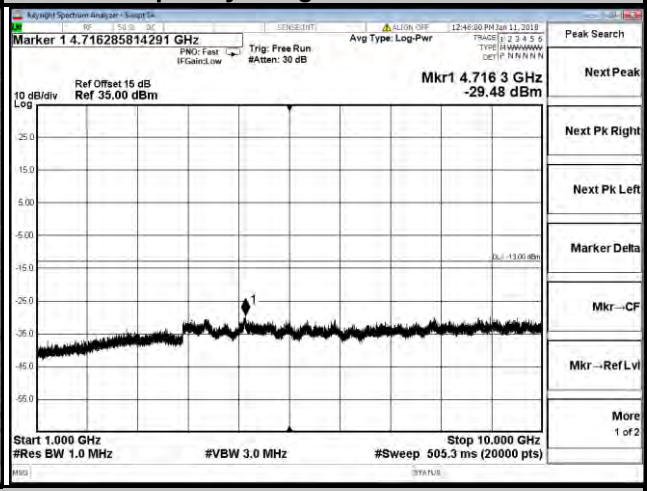
WCDMA

Channel 4132

Frequency Range: 30 MHz ~ 1 GHz

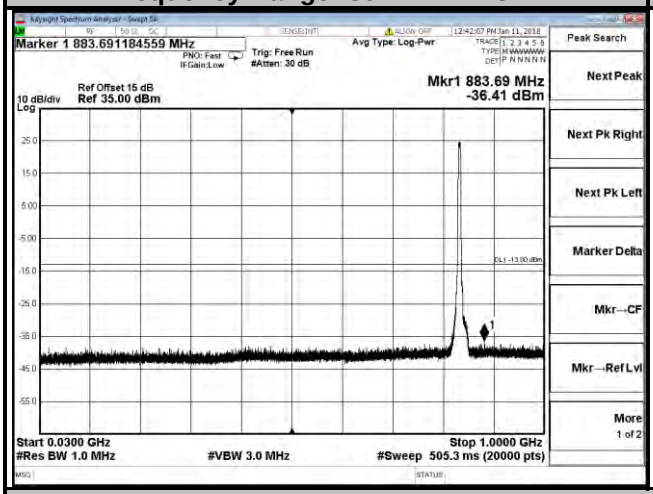


Frequency Range: 1 GHz ~ 10 GHz

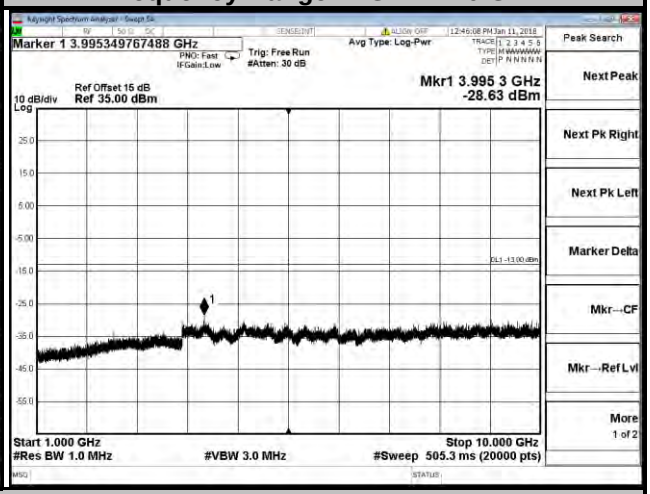


Channel 4182

Frequency Range: 30 MHz ~ 1 GHz

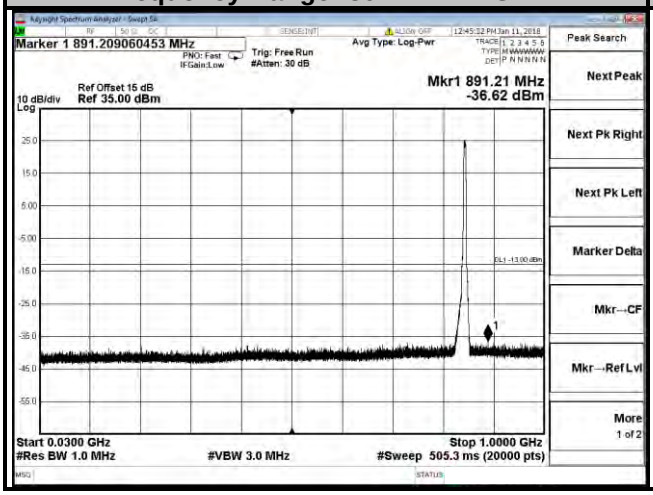


Frequency Range: 1 GHz ~ 10 GHz

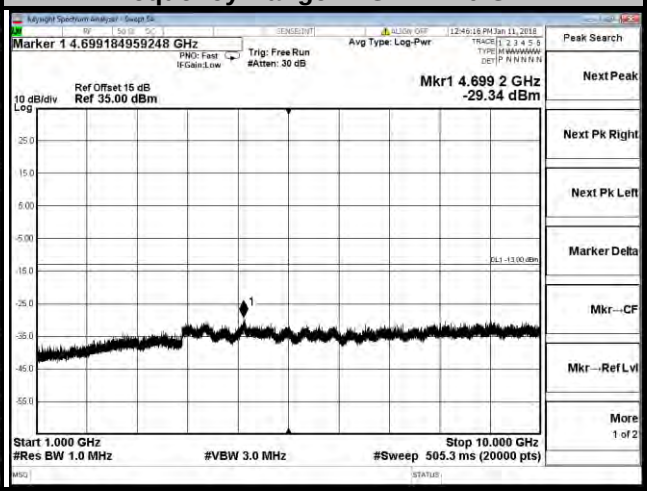


Channel 4233

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

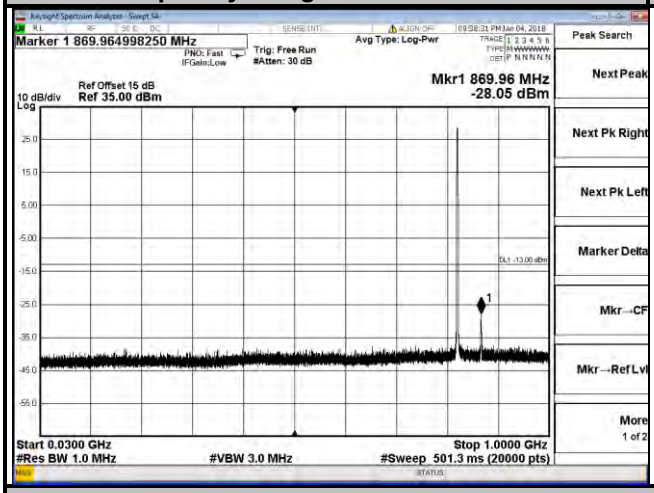


LTE Band 5

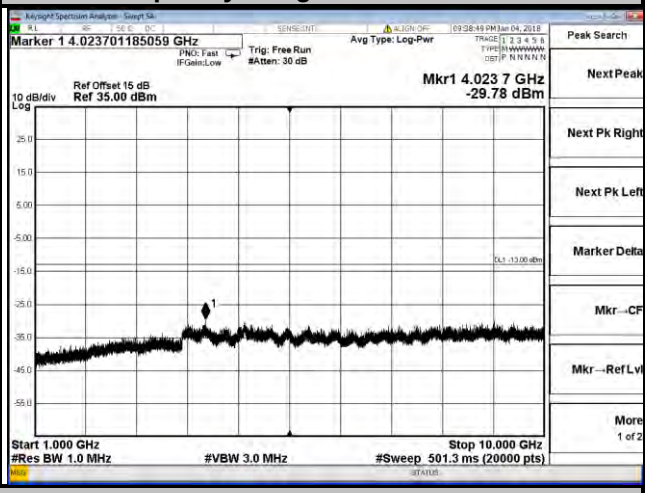
Channel Bandwidth: 1.4 MHz

Channel 20407

Frequency Range: 30 MHz ~ 1 GHz

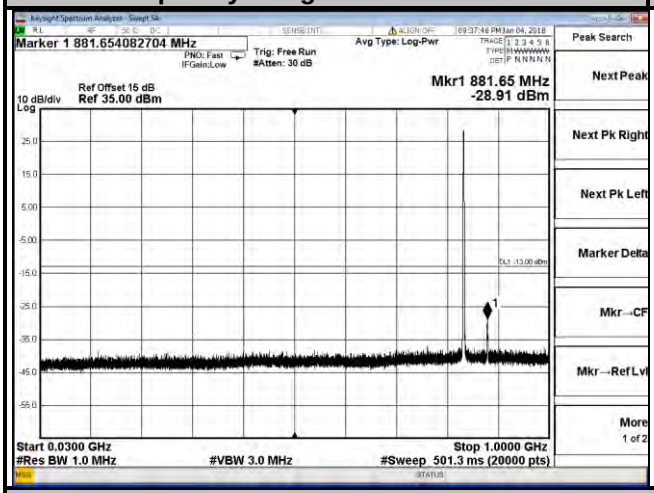


Frequency Range: 1 GHz ~ 10 GHz

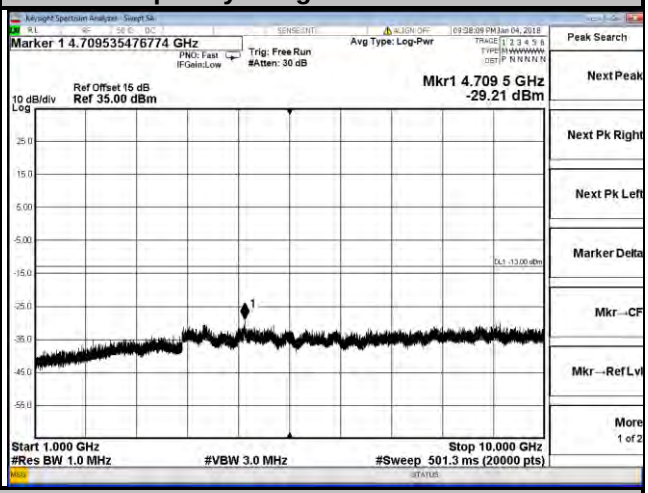


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

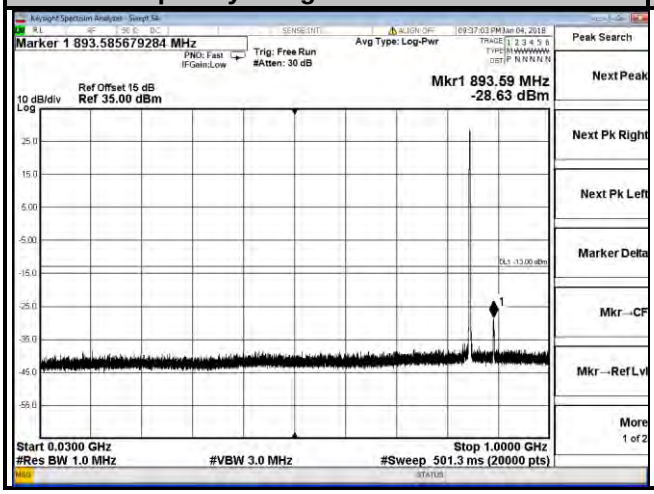


Frequency Range: 1 GHz ~ 10 GHz

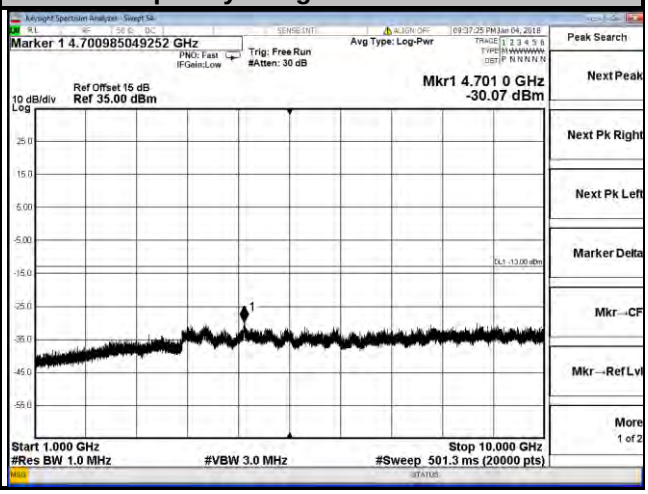


Channel 20643

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

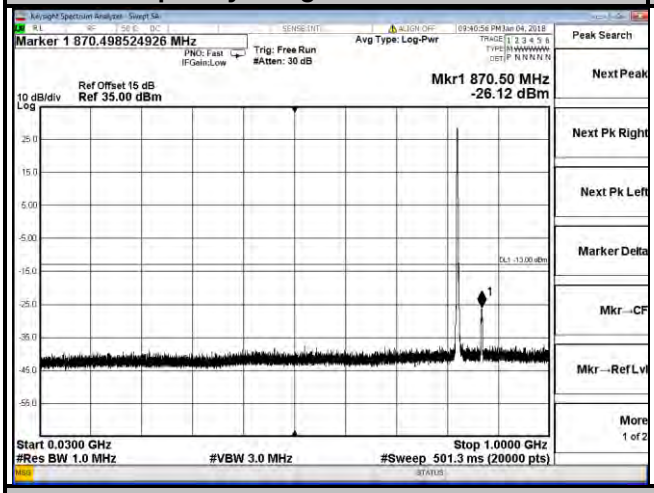


LTE Band 5

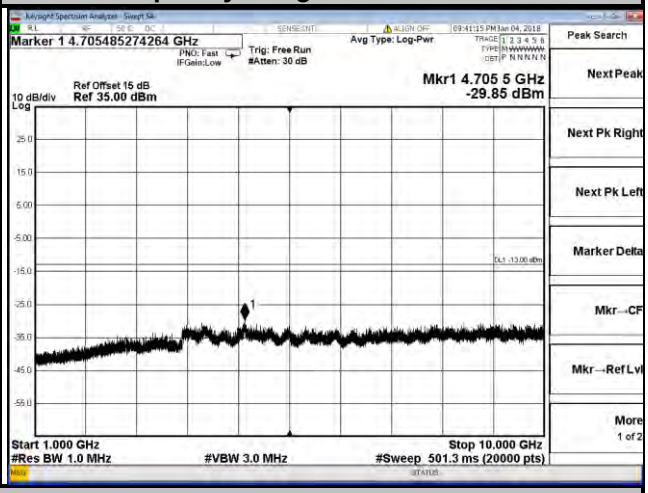
Channel Bandwidth: 3 MHz

Channel 20415

Frequency Range: 30 MHz ~ 1 GHz

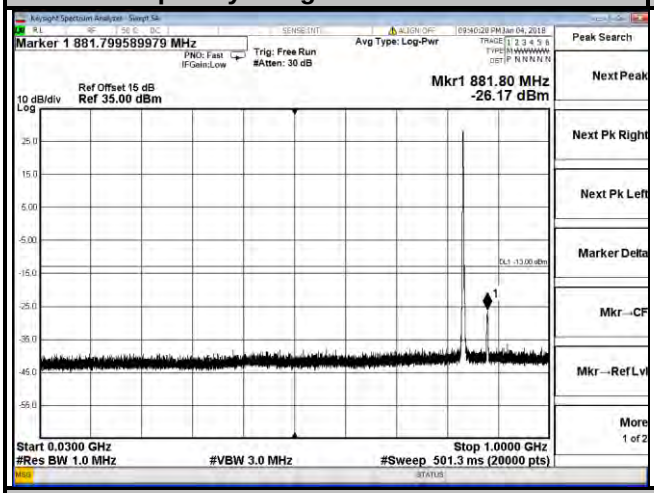


Frequency Range: 1 GHz ~ 10 GHz

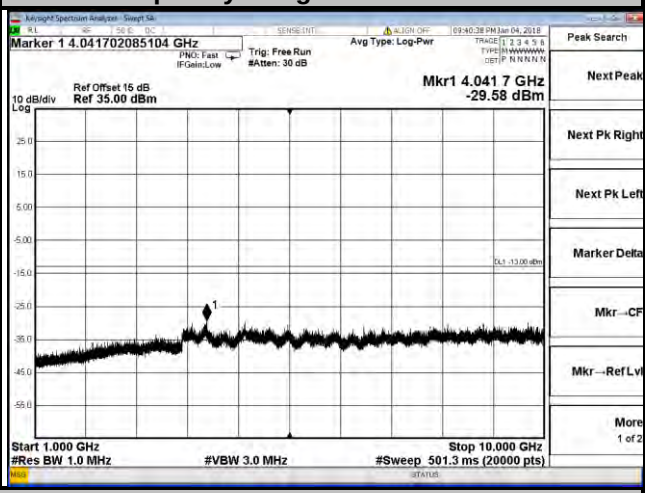


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

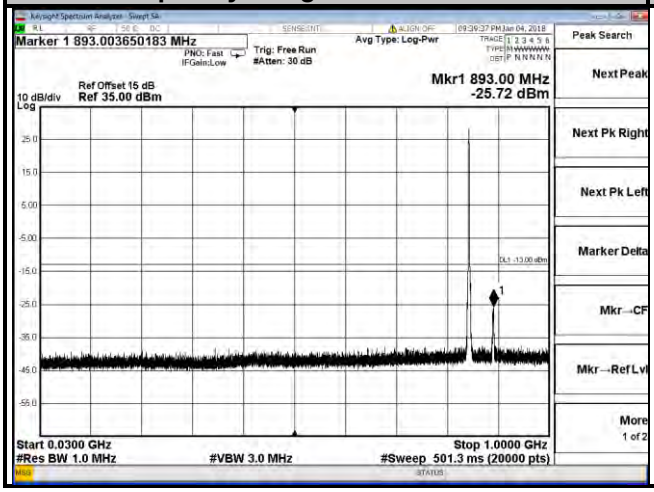


Frequency Range: 1 GHz ~ 10 GHz

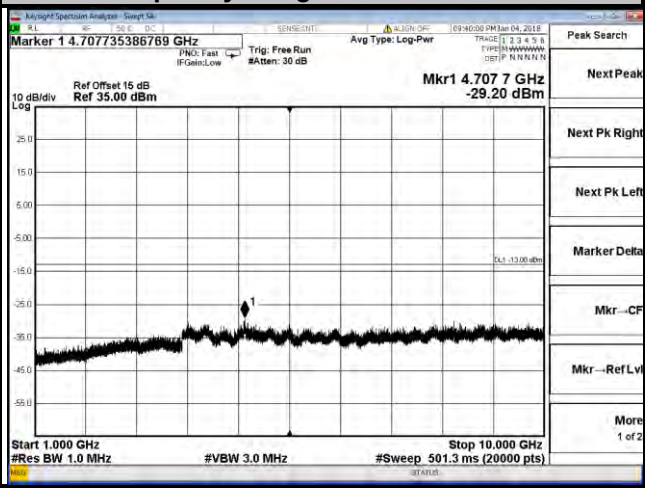


Channel 20635

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

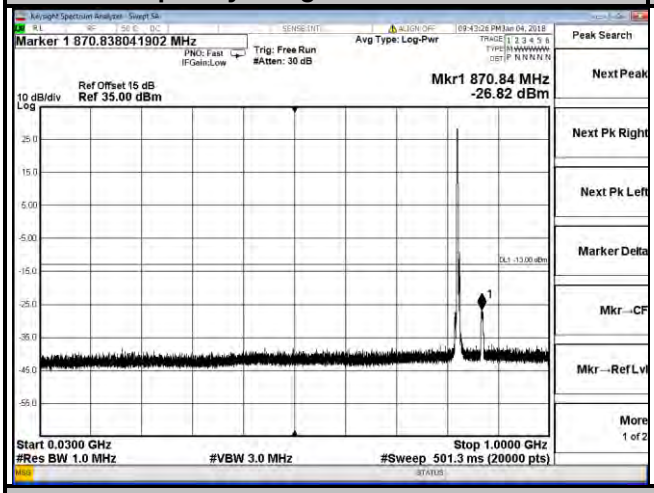


LTE Band 5

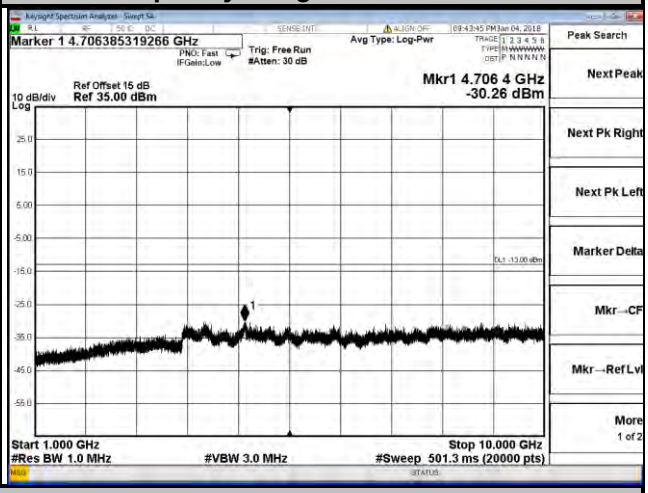
Channel Bandwidth: 5 MHz

Channel 20425

Frequency Range: 30 MHz ~ 1 GHz

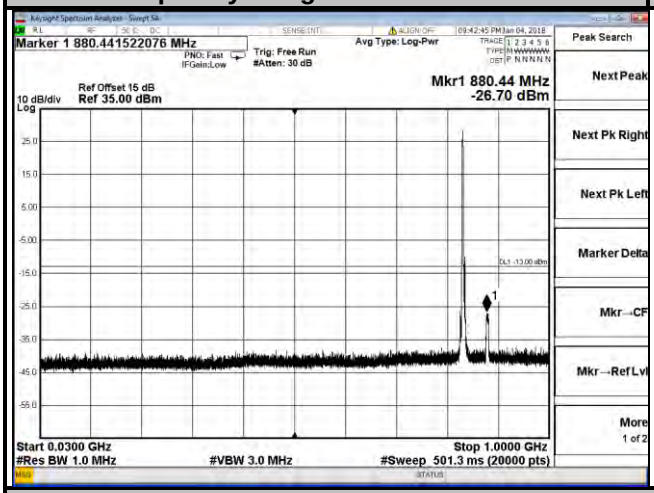


Frequency Range: 1 GHz ~ 10 GHz

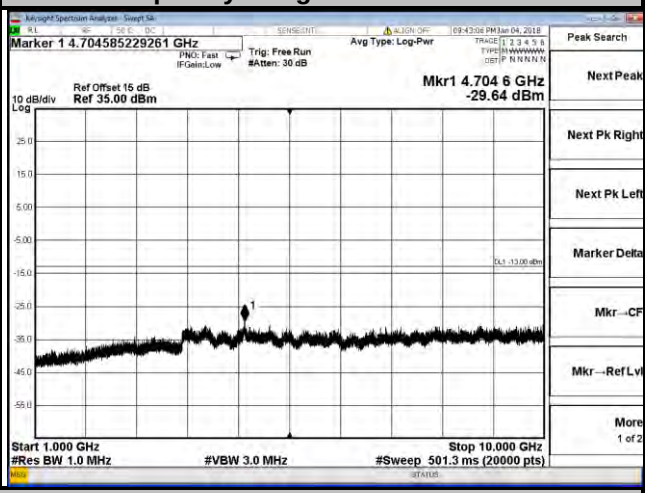


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

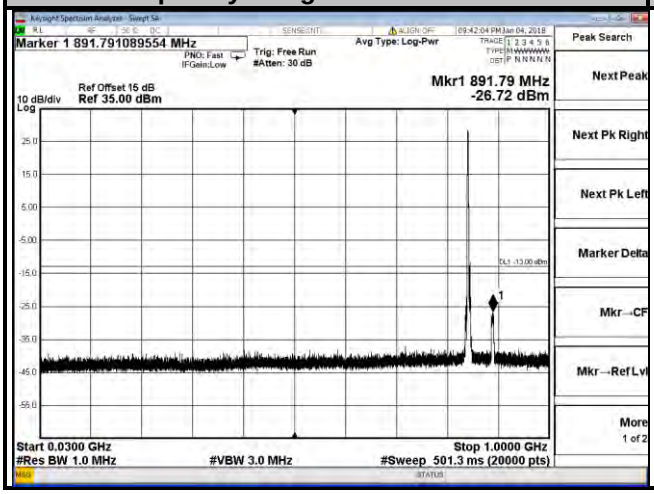


Frequency Range: 1 GHz ~ 10 GHz

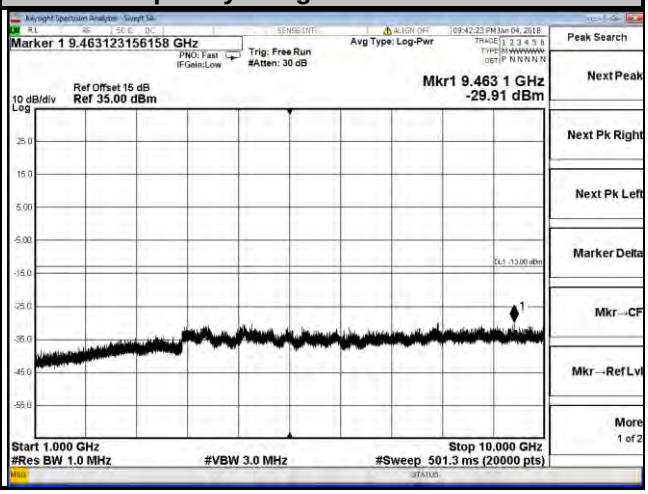


Channel 20625

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

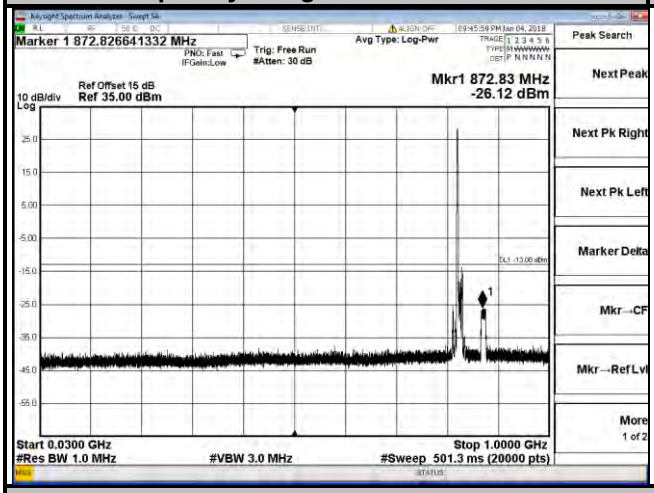


LTE Band 5

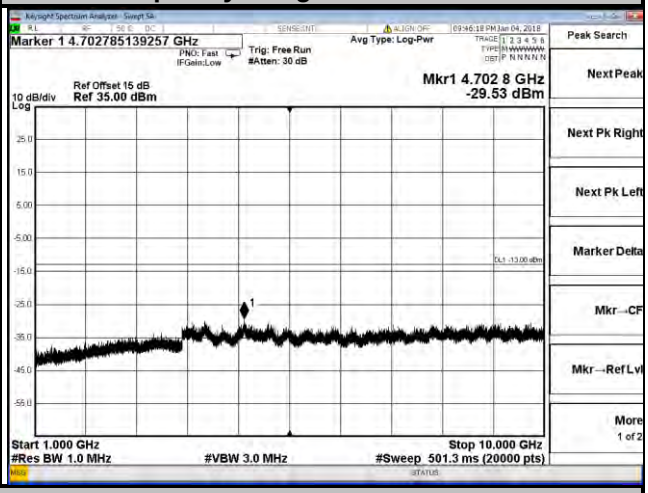
Channel Bandwidth: 10 MHz

Channel 20450

Frequency Range: 30 MHz ~ 1 GHz

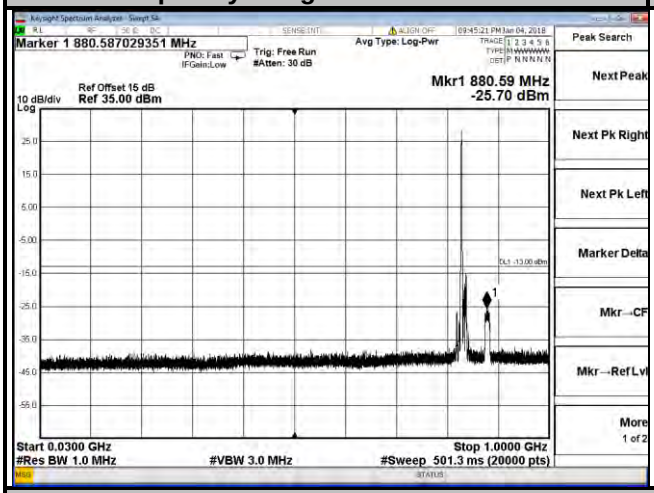


Frequency Range: 1 GHz ~ 10 GHz

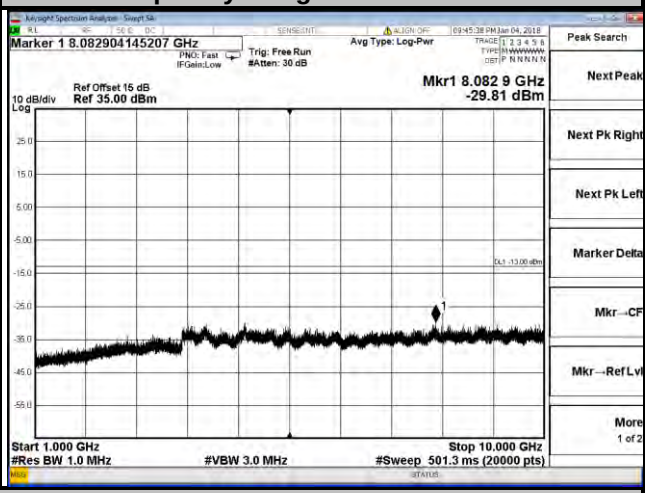


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

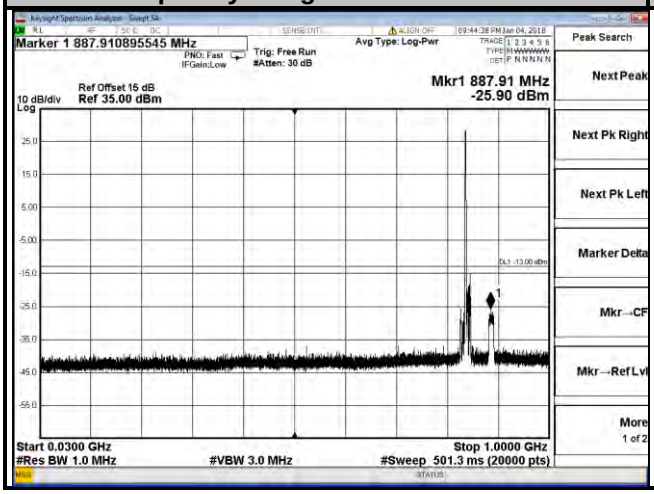


Frequency Range: 1 GHz ~ 10 GHz

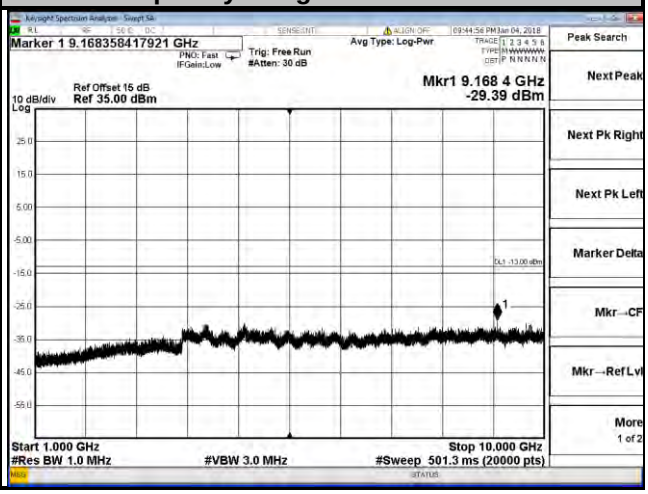


Channel 20600

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit is equal to -13 dBm.

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 dBi.

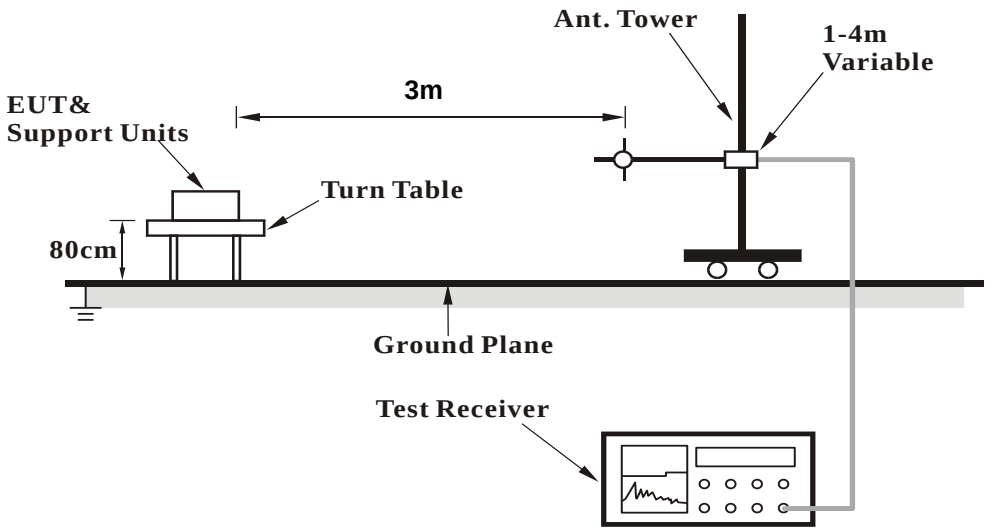
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.7.3 Deviation from Test Standard

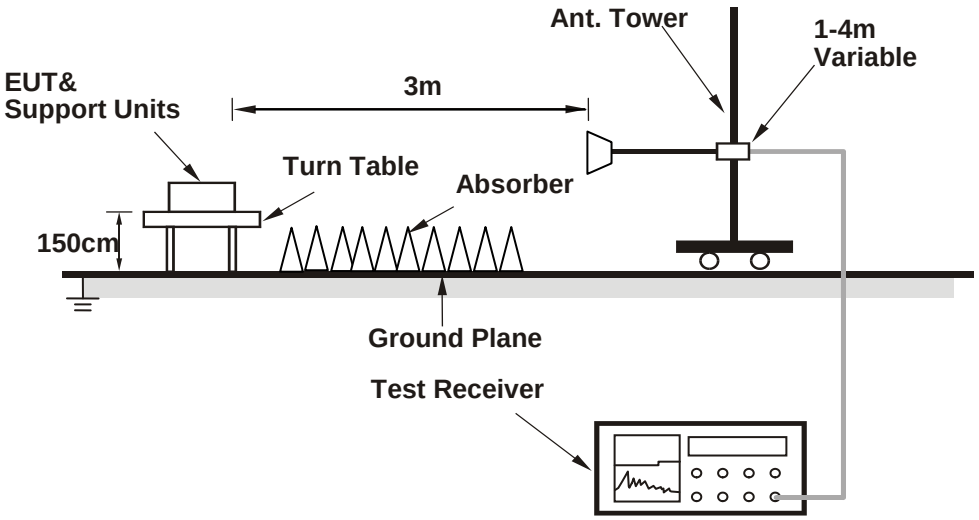
No deviation.

4.7.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



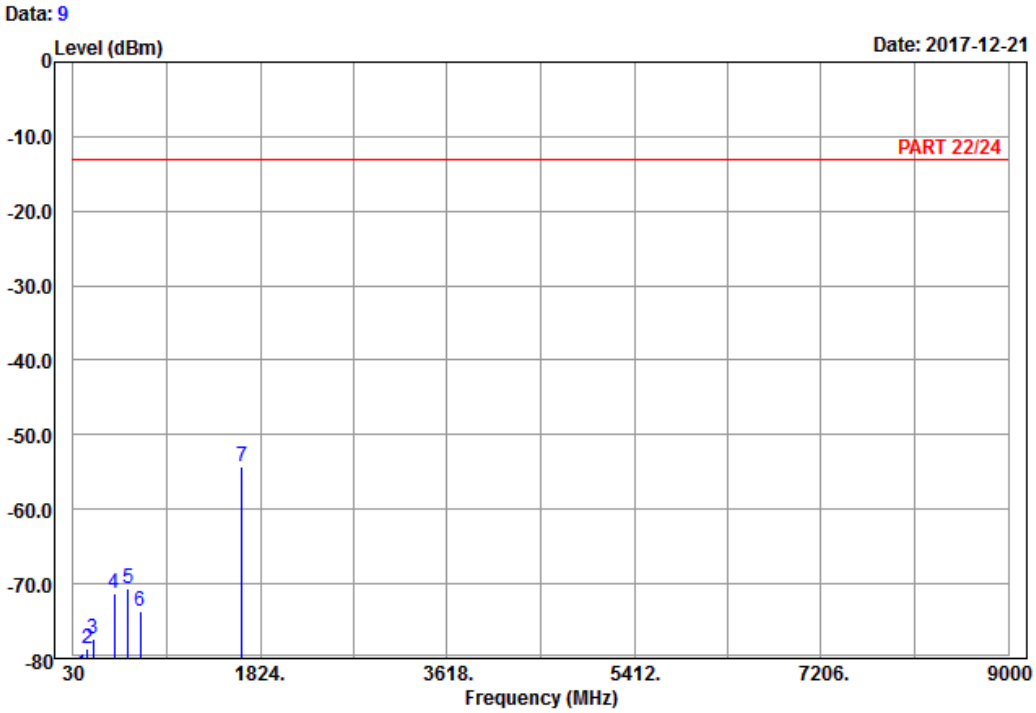
For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.7.5 Test Results

GSM:

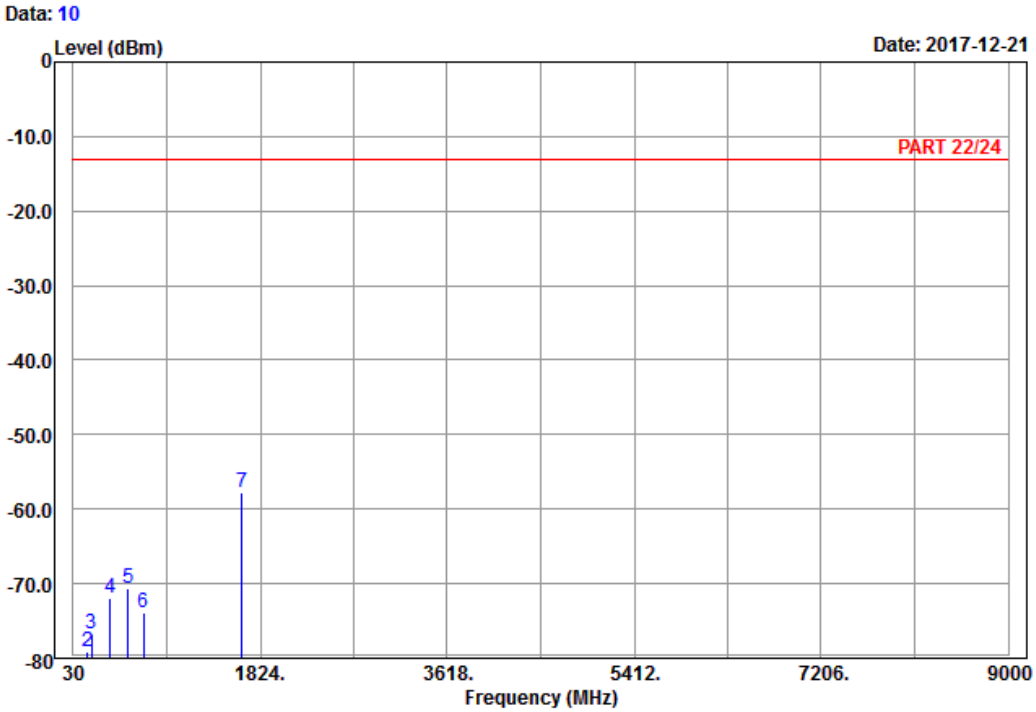
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : GSM 850_Link_CH128
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	106.68	-82.24	-72.94	-13.00	-69.24	-9.30	Peak
2	163.11	-78.74	-71.36	-13.00	-65.74	-7.38	Peak
3	224.40	-77.28	-71.42	-13.00	-64.28	-5.86	Peak
4	421.80	-71.18	-67.95	-13.00	-58.18	-3.23	Peak
5	559.70	-70.58	-69.32	-13.00	-57.58	-1.26	Peak
6	670.30	-73.65	-73.42	-13.00	-60.65	-0.23	Peak
7 pp	1648.40	-54.22	-61.95	-13.00	-41.22	7.73	Peak

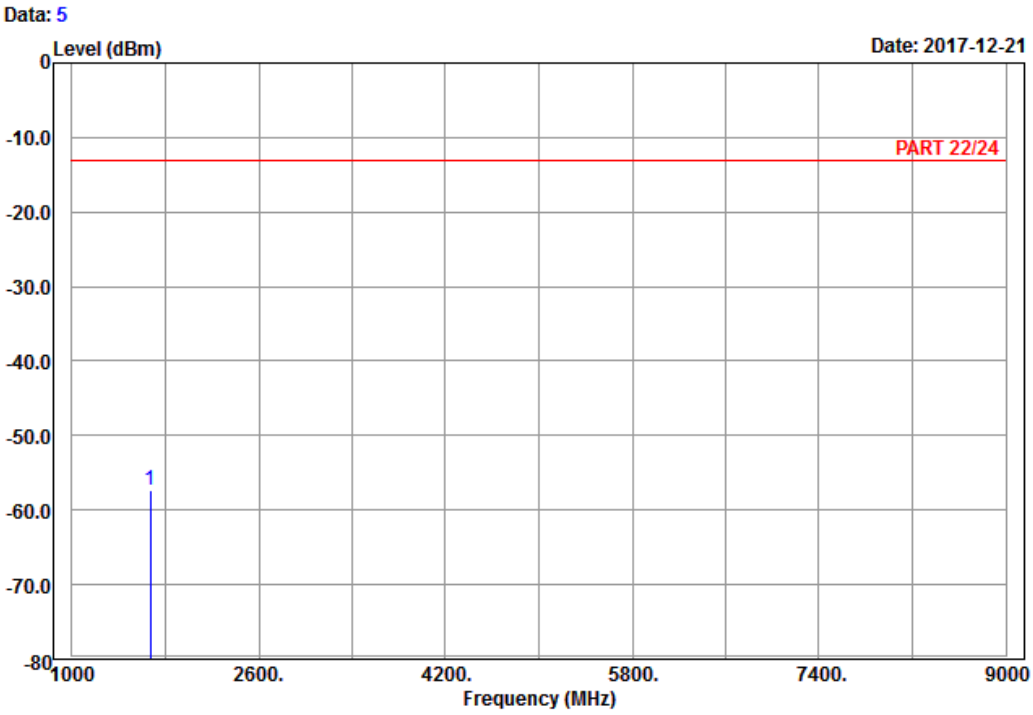


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : GSM 850_Link_CH128
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	78.87	-85.69	-73.76	-13.00	-72.69	-11.93	Peak
2	165.27	-79.08	-71.89	-13.00	-66.08	-7.19	Peak
3	208.20	-76.71	-70.64	-13.00	-63.71	-6.07	Peak
4	382.60	-72.02	-68.40	-13.00	-59.02	-3.62	Peak
5	558.30	-70.65	-69.35	-13.00	-57.65	-1.30	Peak
6	708.10	-73.84	-73.32	-13.00	-60.84	-0.52	Peak
7 pp	1648.40	-57.68	-65.41	-13.00	-44.68	7.73	Peak

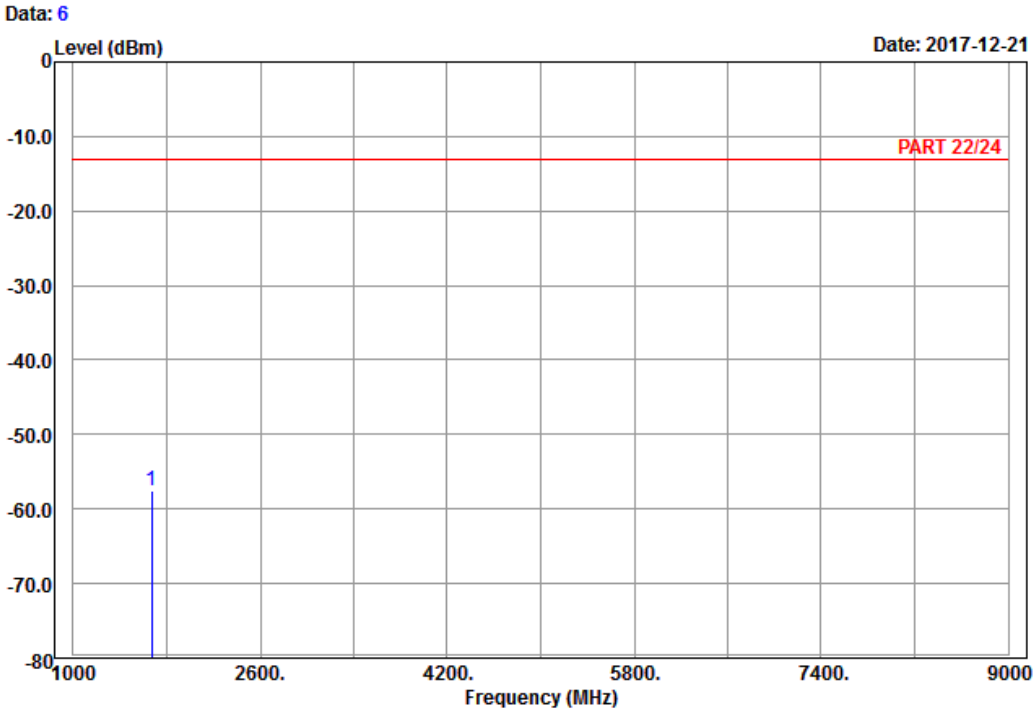
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : GSM 850_Link_CH189
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1672.80	-57.24	-65.15	-13.00	-44.24	7.91	Peak

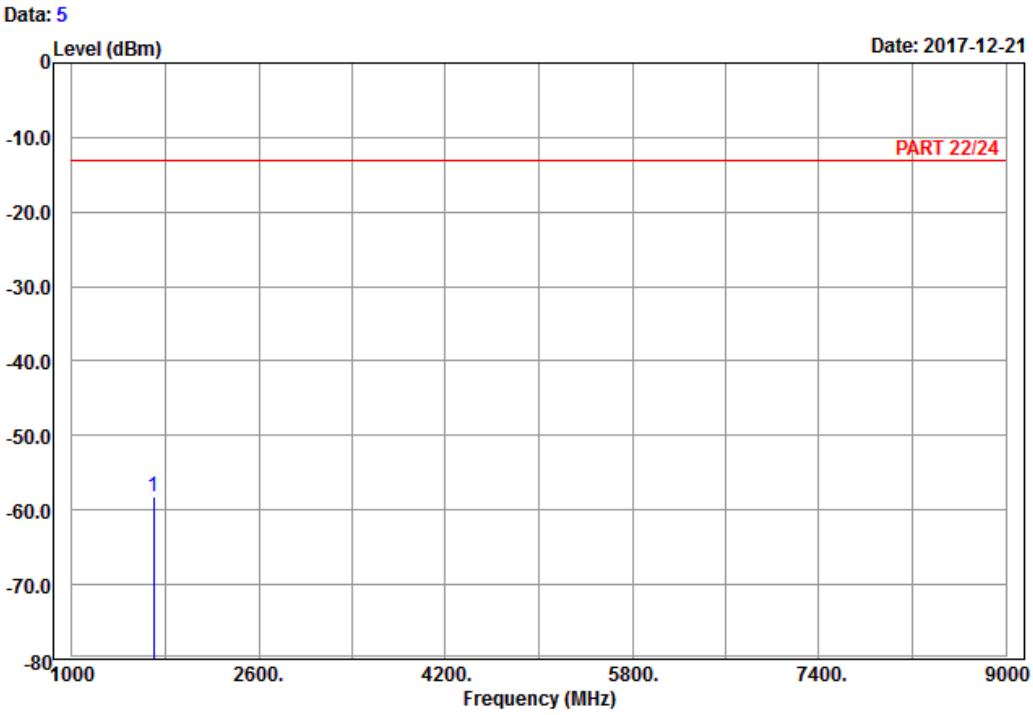


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : GSM 850_Link_CH189
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1672.80	-57.47	-65.38	-13.00	-44.47	7.91	Peak

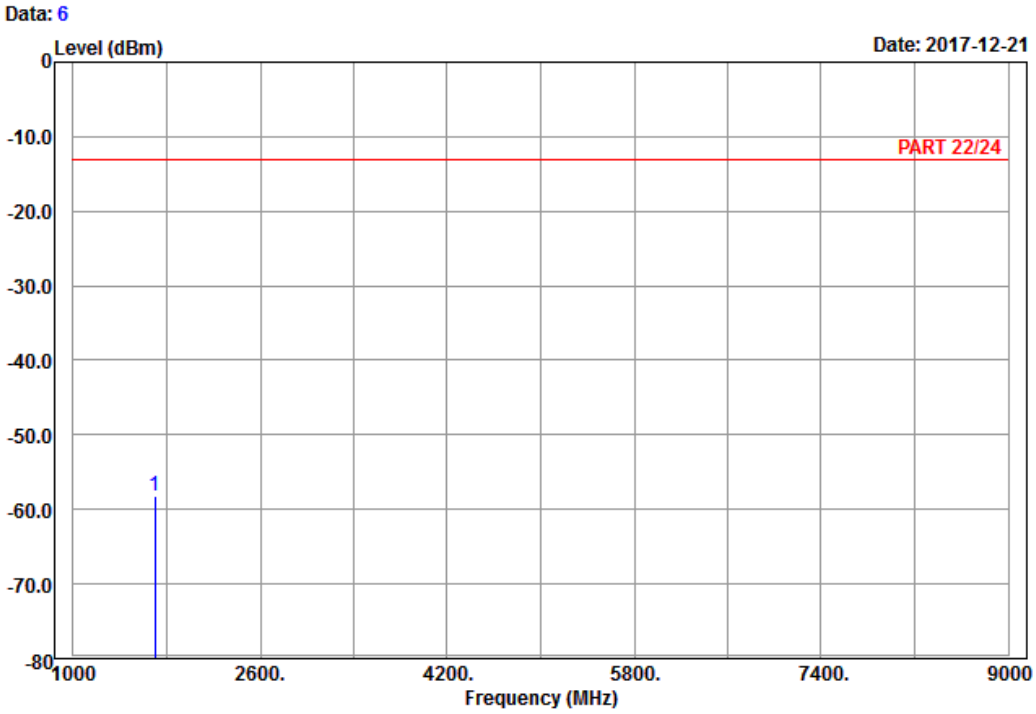
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : GSM 850_Link_CH251
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1697.60	-58.27	-66.41	-13.00	-45.27	8.14	Peak



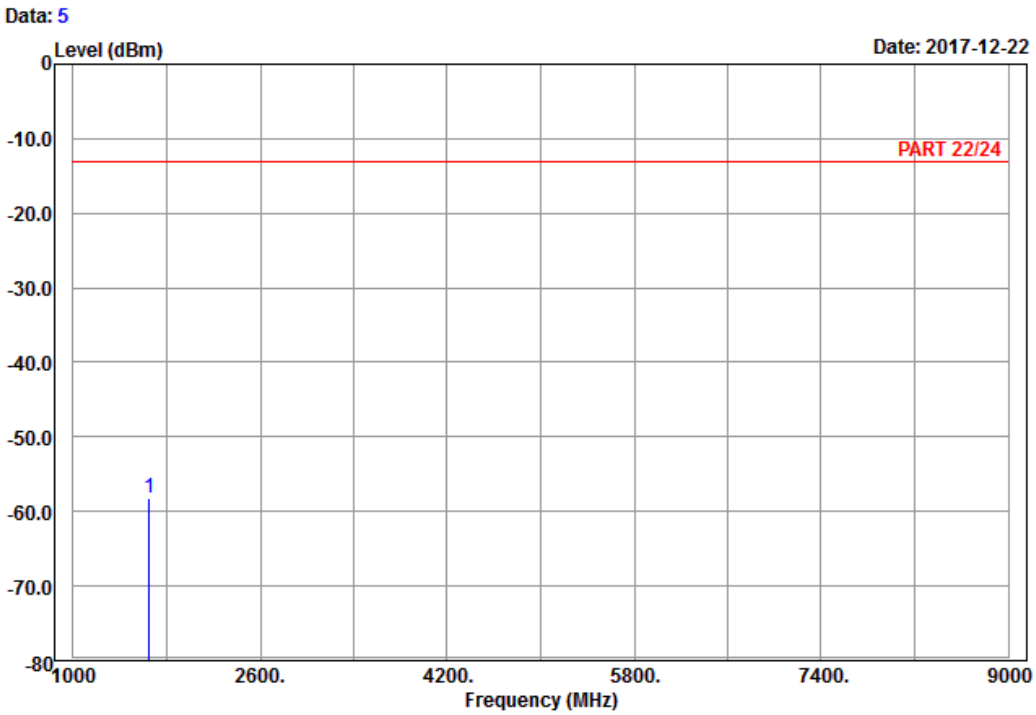
Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : GSM 850_Link_CH251
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1697.60	-58.26	-66.40	-13.00	-45.26	8.14	Peak

EDGE:

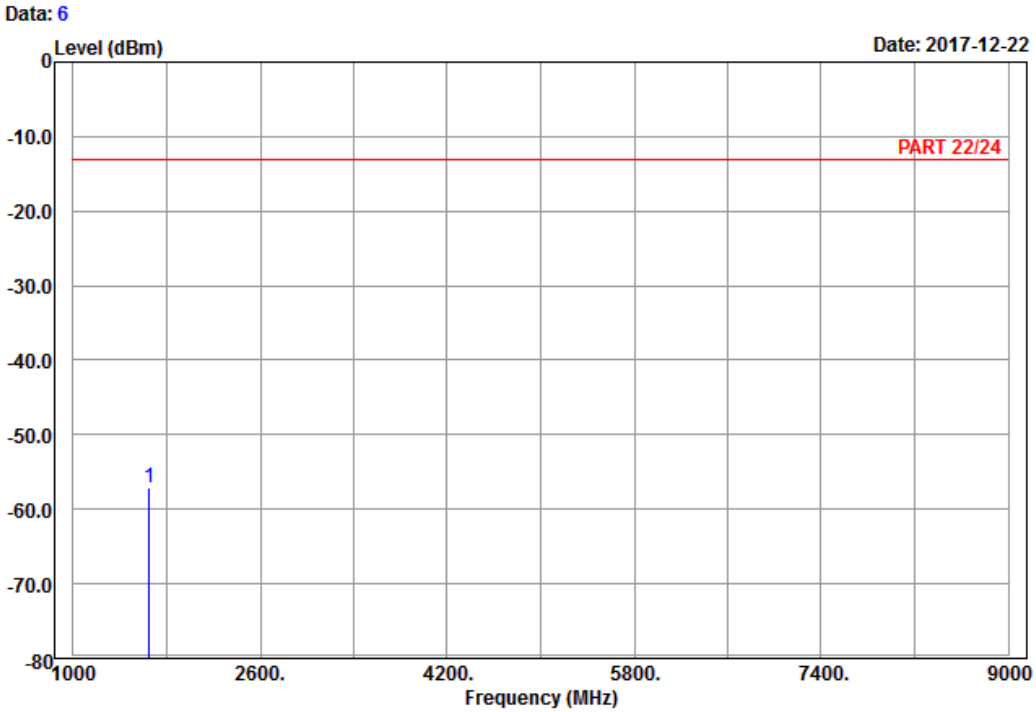
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




```
Site      : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark    : EDGE 850_Link_CH128
Tested by: Charles Hsiao
                        Read  Limit   Over
          Freq  Level  Level   Line  Limit Factor Remark
        _________ ______ ______ ______ ______ ______ __________
             MHz    dBm    dBm    dBm     dB     dB

  1 pp  1648.40 -58.22 -65.95 -13.00 -45.22   7.73 Peak
```

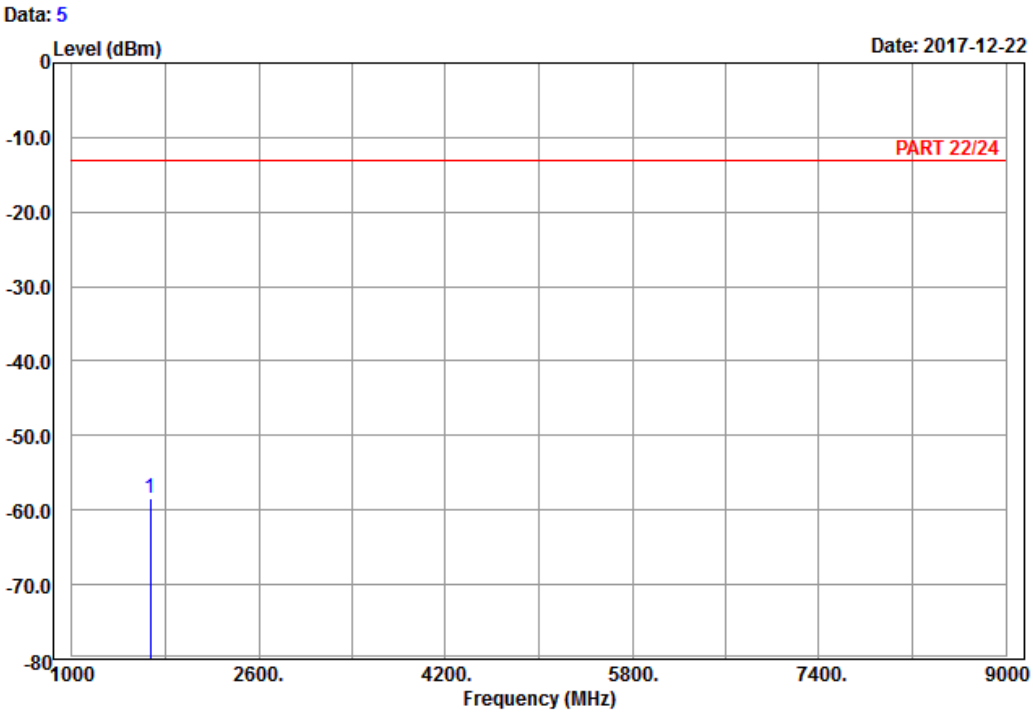


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : EDGE 850_Link_CH128
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1648.40	-57.04	-64.77	-13.00	-44.04	7.73	Peak

Middle Channel

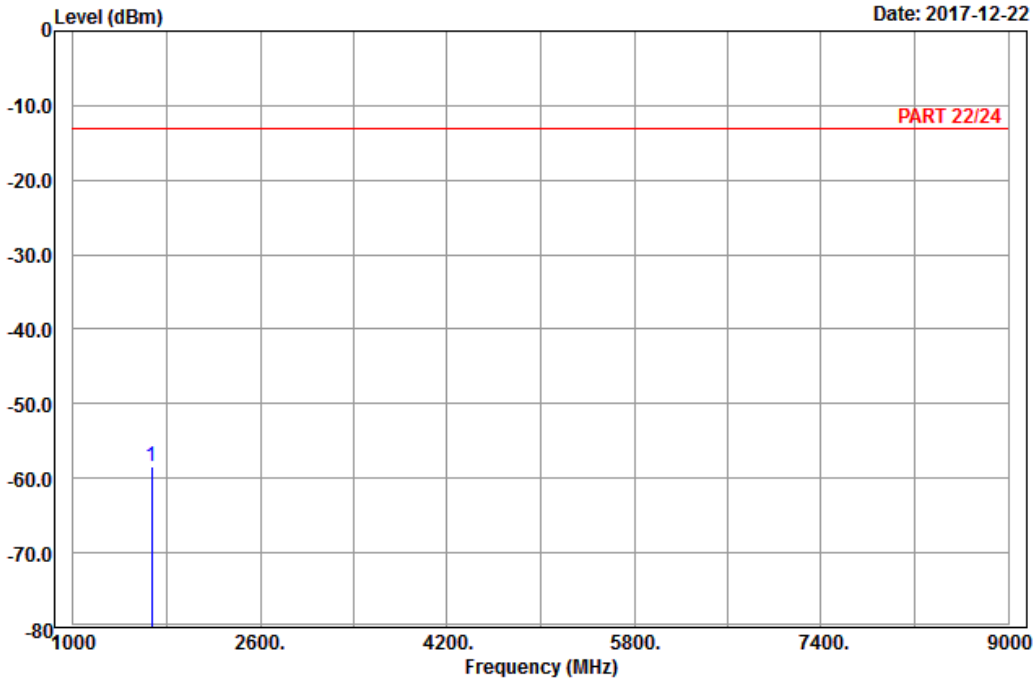
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : EDGE 850_Link_CH189
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1672.80	-58.32	-66.23	-13.00	-45.32	7.91	Peak

Data: 6

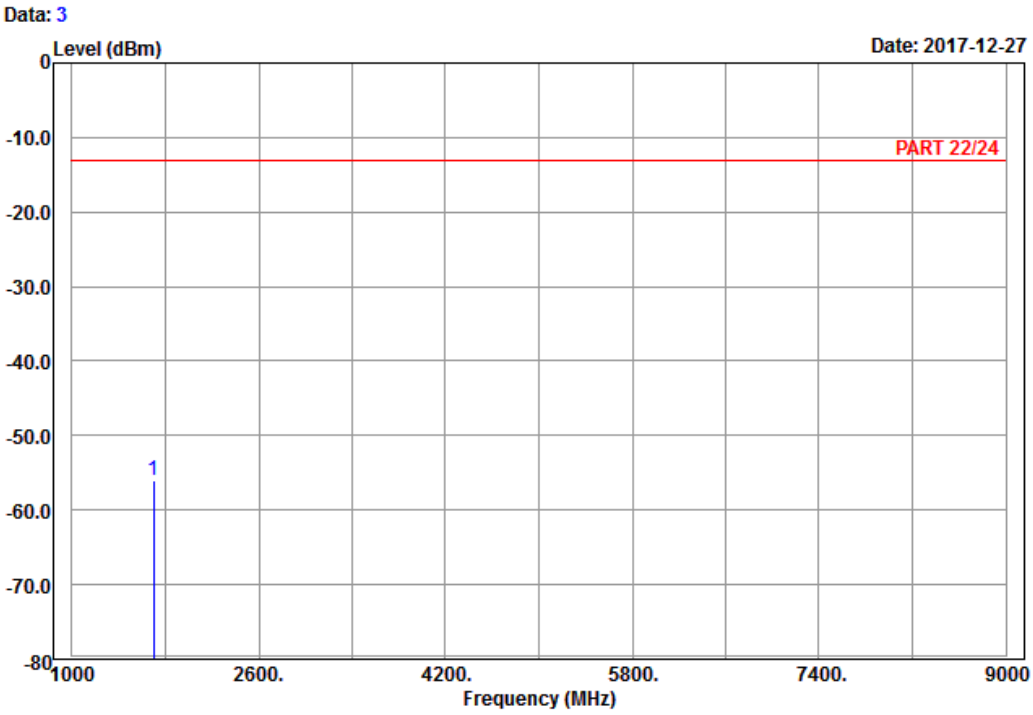


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : EDGE 850_Link_CH189
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1672.80	-58.42	-66.33	-13.00	-45.42	7.91	Peak

High Channel

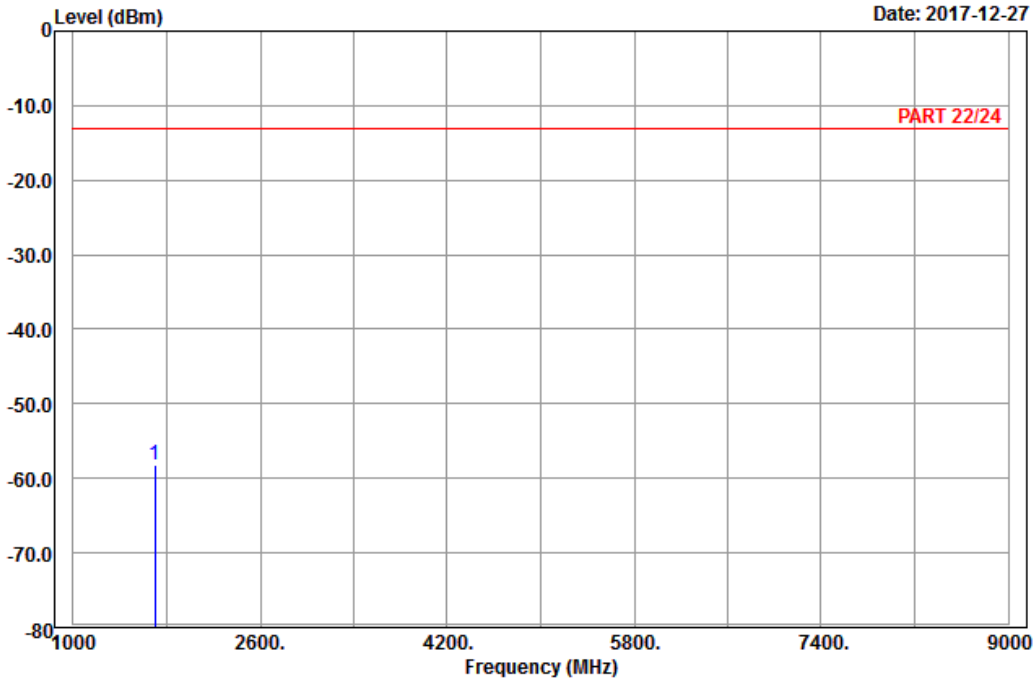
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : EDGE 850_Link_CH251
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1697.60	-55.92	-64.06	-13.00	-42.92	8.14	Peak

Data: 4



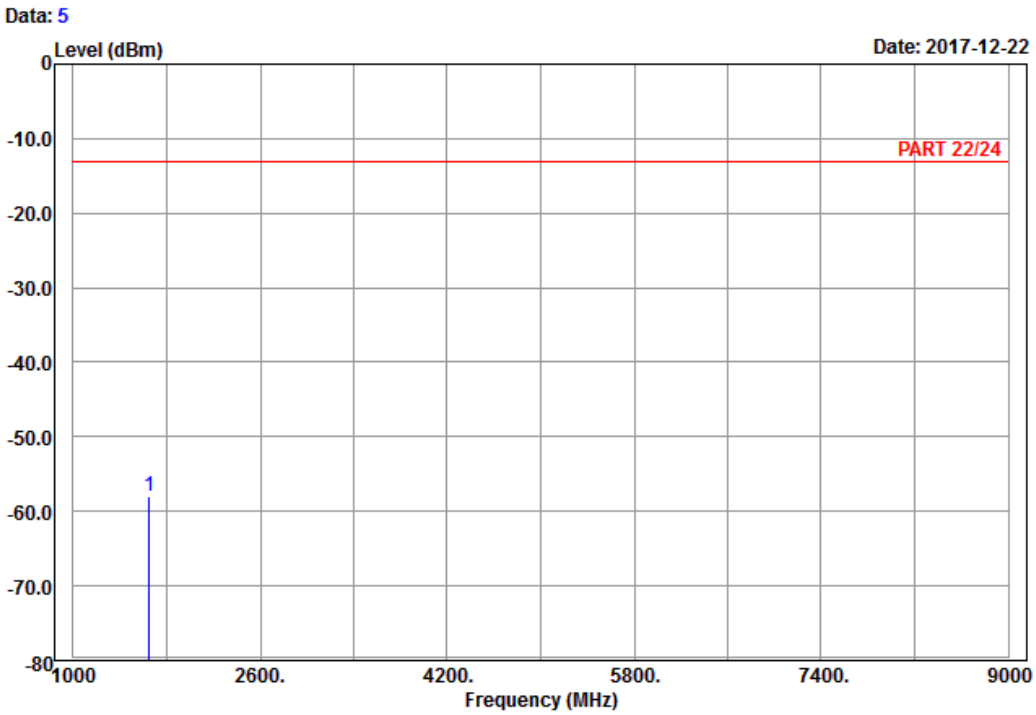
Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : EDGE 850_Link_CH251
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1697.60	-58.22	-66.36	-13.00	-45.22	8.14	Peak

WCDMA:

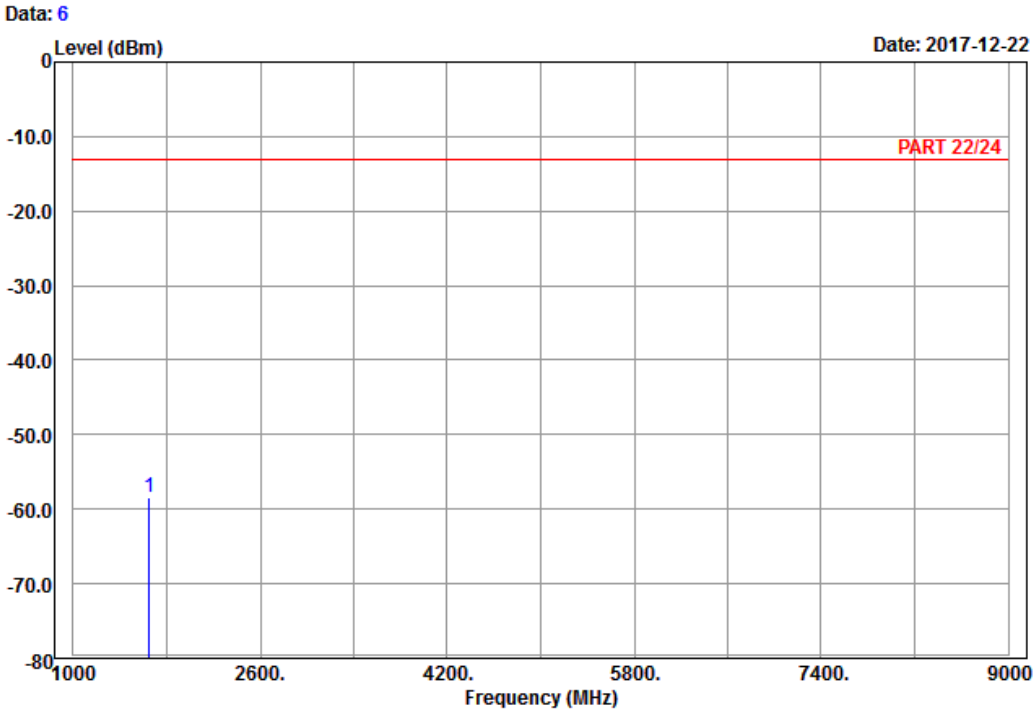
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




```
Site      : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark    : Band V_Link_CH4132
Tested by: Charles Hsiao
                        Read  Limit   Over
          Freq  Level  Level   Line  Limit Factor Remark
        _______ ______ ______ ______ ______ ______ _______
            MHz    dBm    dBm    dBm     dB     dB

  1 pp  1652.80 -58.02 -65.75 -13.00 -45.02   7.73 Peak
```

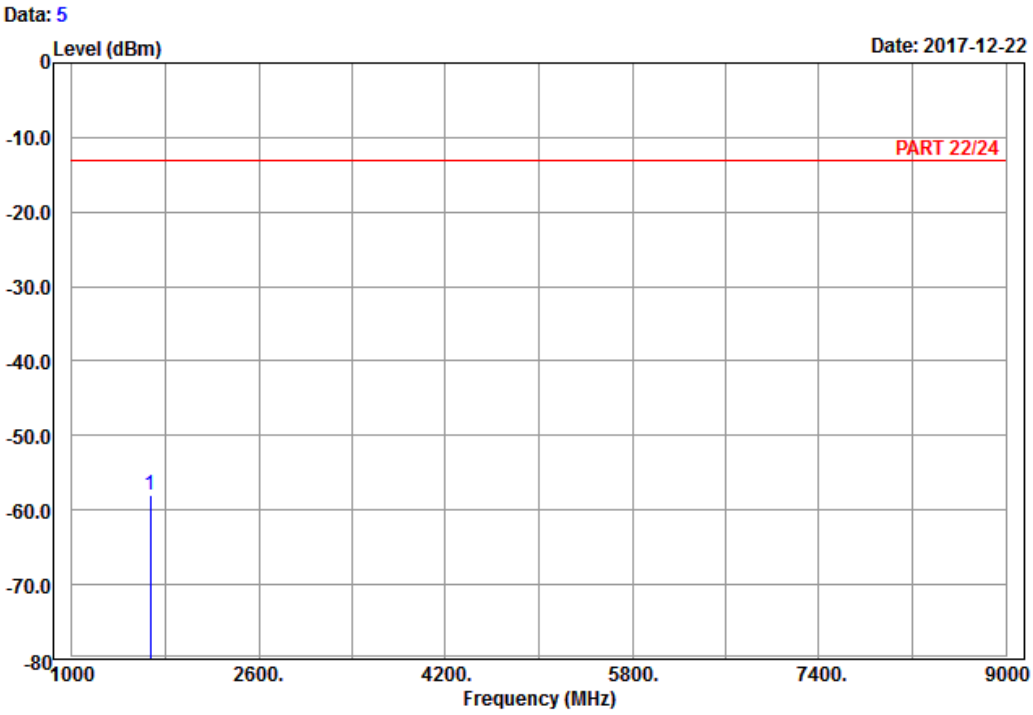


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : Band V_Link_CH4132
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1652.80	-58.46	-66.19	-13.00	-45.46	7.73	Peak

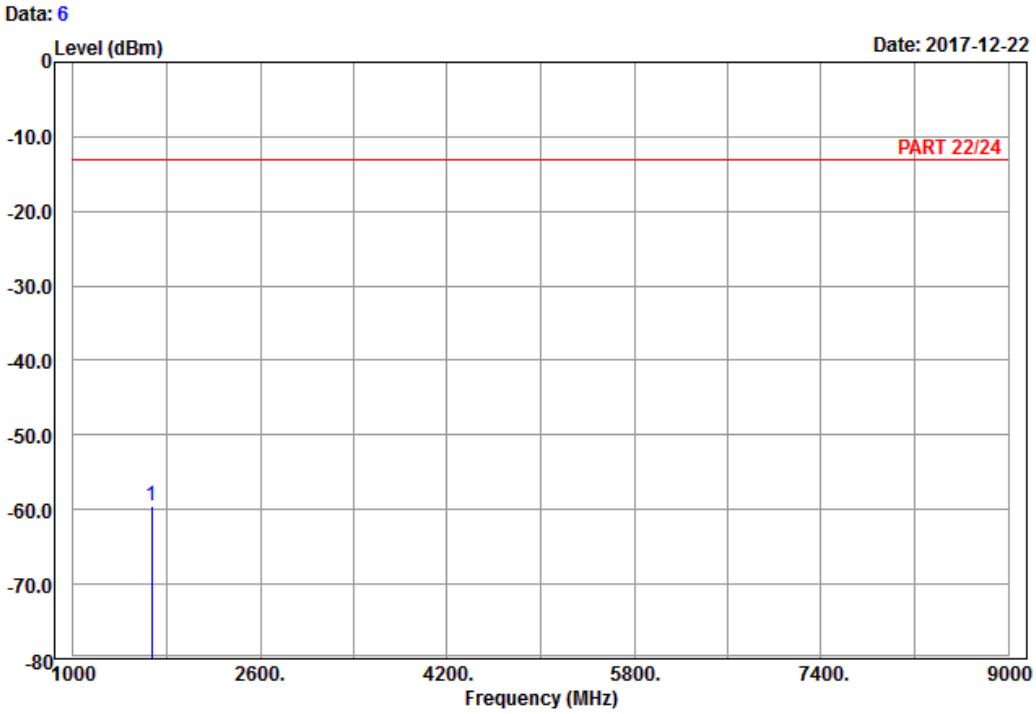
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : Band V_Link_CH4182
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1672.80	-57.97	-65.88	-13.00	-44.97	7.91	Peak

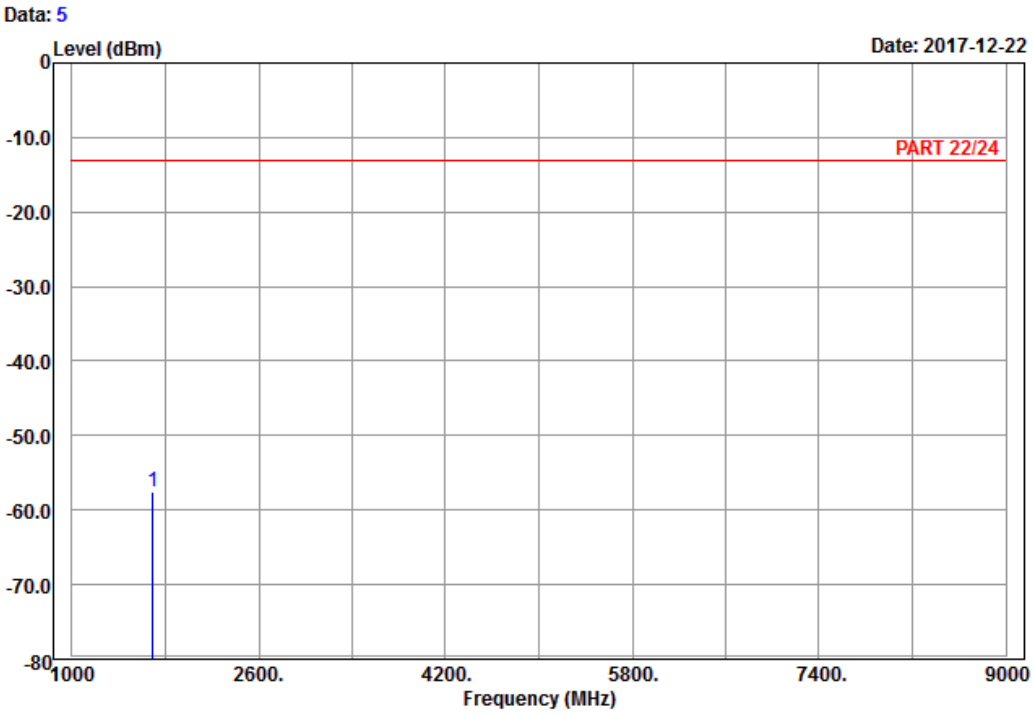


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : Band V_Link_CH4182
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1672.80	-59.50	-67.41	-13.00	-46.50	7.91	Peak

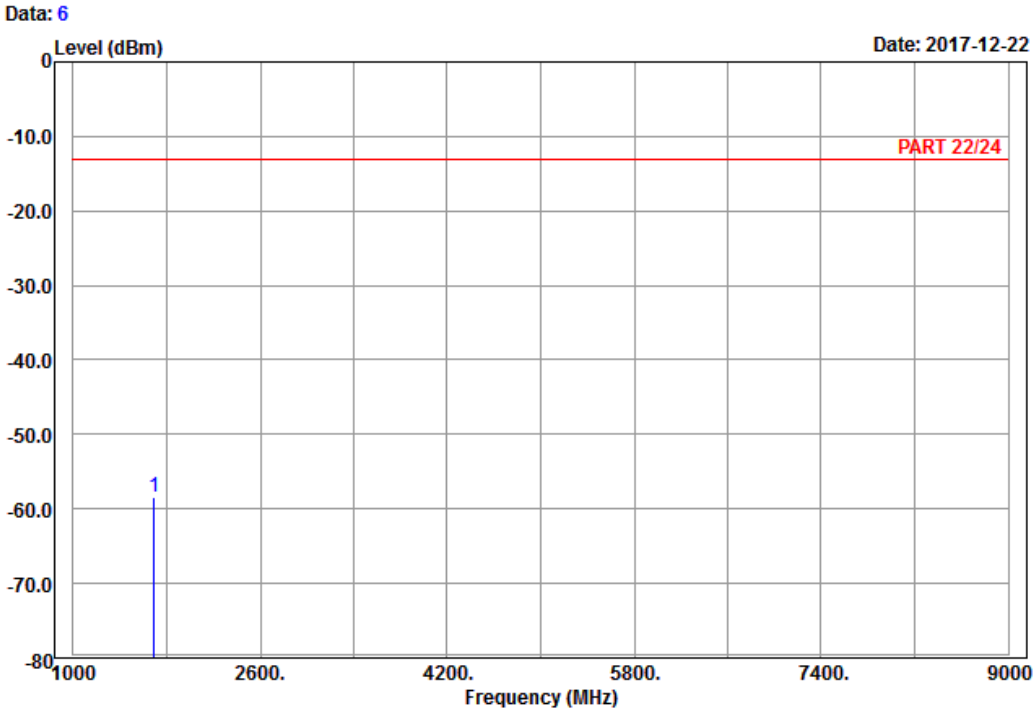
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : Band V_Link_CH4233
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.20	-57.46	-65.60	-13.00	-44.46	8.14	Peak



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : Band V_Link_CH4233
Tested by: Charles Hsiao

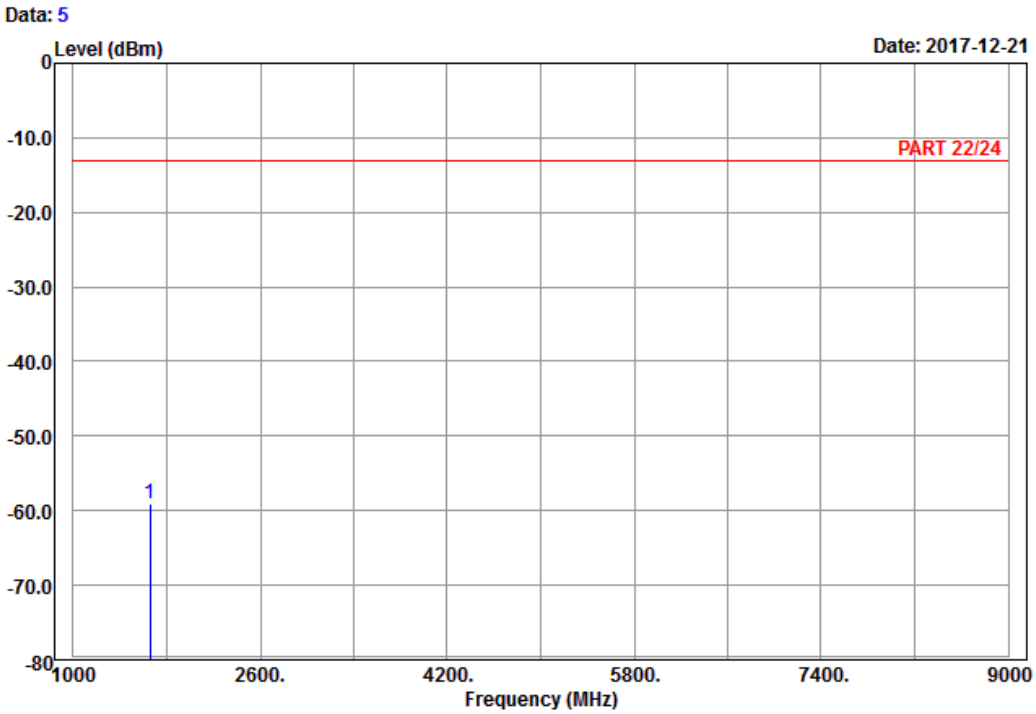
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.20	-58.44	-66.58	-13.00	-45.44	8.14	Peak

LTE Band 5

Channel Bandwidth: 10 MHz / QPSK

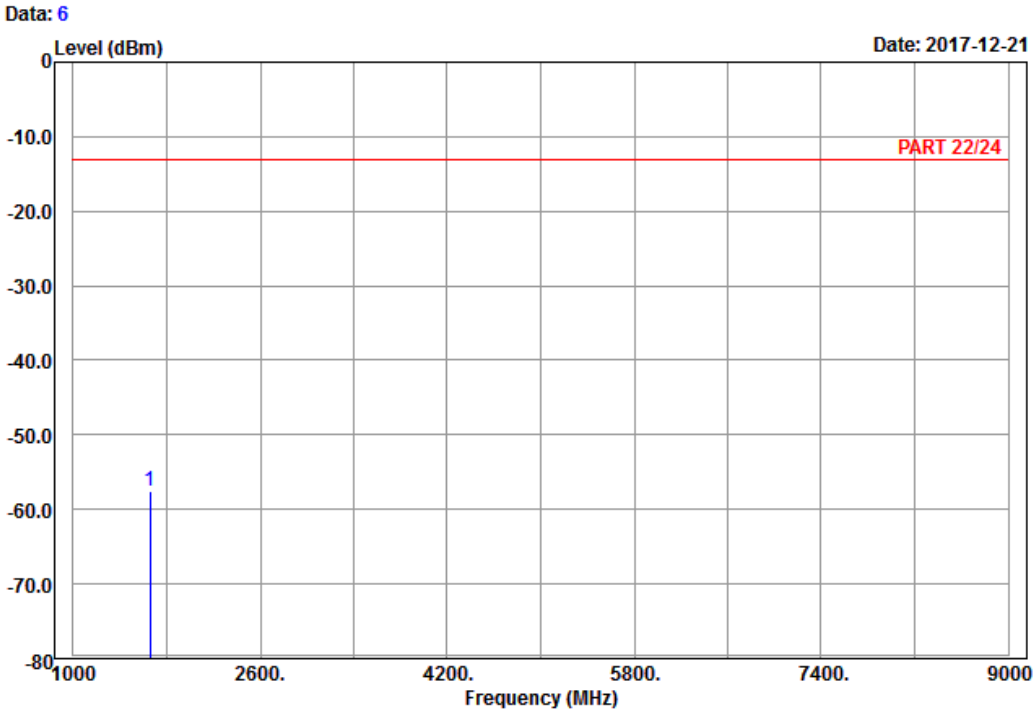
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




```
Site      : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark    : LTE_Band 5_Link_CH20450
Tested by: Karl Lee
                        Read  Limit   Over
          Freq  Level  Level   Line  Limit Factor Remark
        _______ ______ ______ ______ ______ ______ _______
            MHz    dBm    dBm    dBm     dB     dB

  1 pp  1658.00 -58.99 -66.90 -13.00 -45.99   7.91 Peak
```

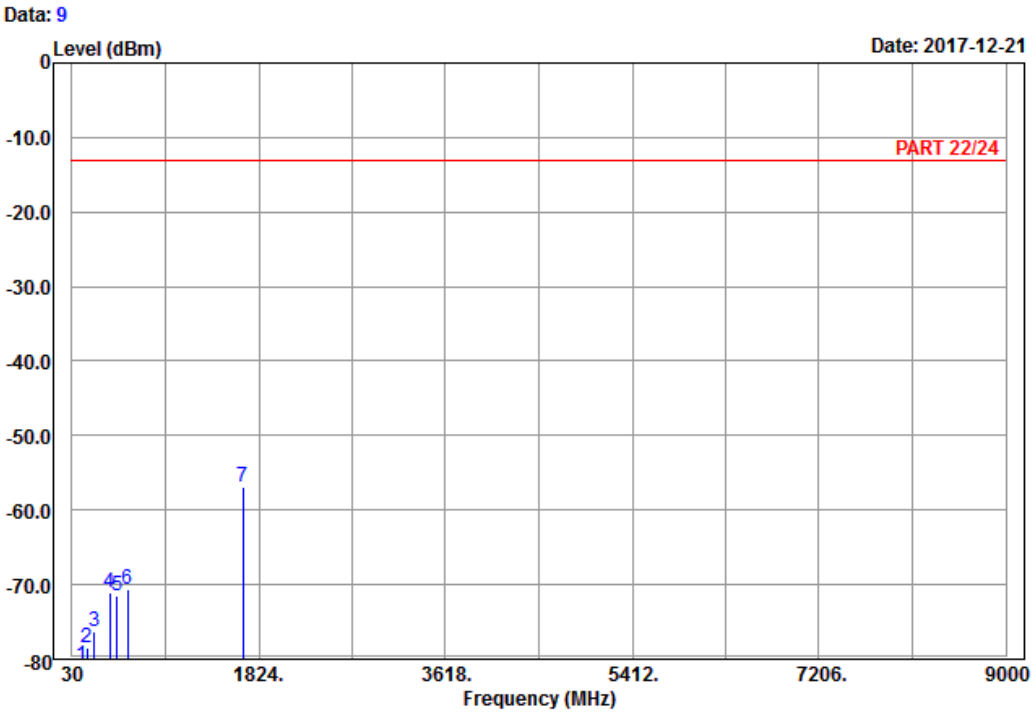


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_CH20450
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1658.00	-57.46	-65.37	-13.00	-44.46	7.91	Peak

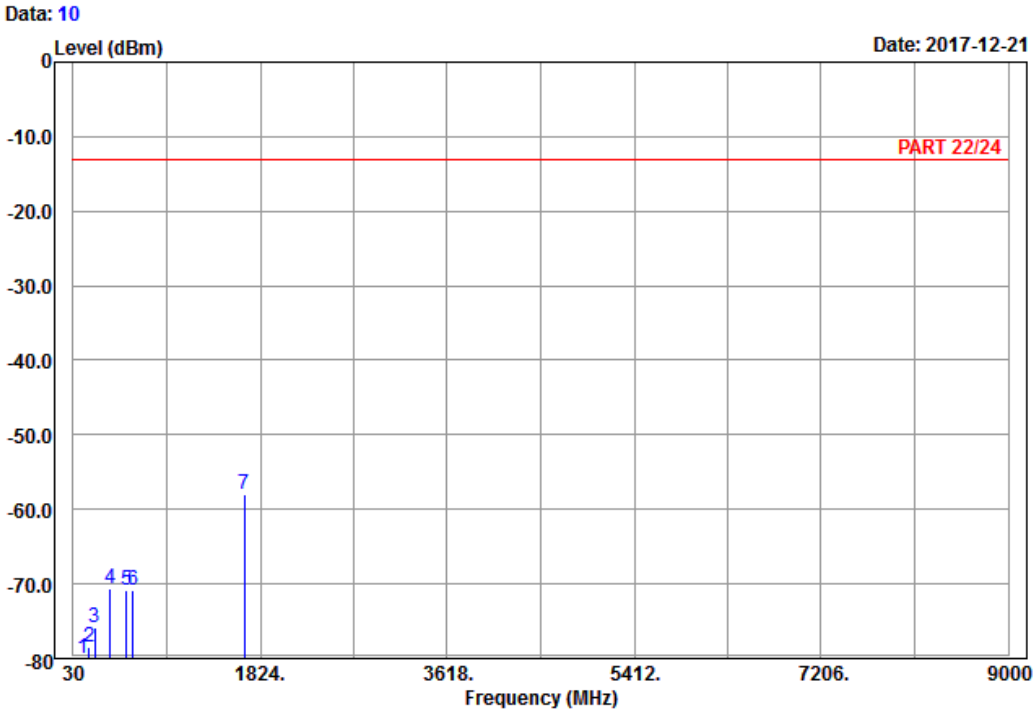
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_CH20525
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	119.37	-80.85	-72.53	-13.00	-67.85	-8.32	Peak
2	174.18	-78.42	-72.23	-13.00	-65.42	-6.19	Peak
3	241.14	-76.19	-70.57	-13.00	-63.19	-5.62	Peak
4	389.60	-71.16	-67.90	-13.00	-58.16	-3.26	Peak
5	459.60	-71.56	-67.44	-13.00	-58.56	-4.12	Peak
6	567.40	-70.58	-69.64	-13.00	-57.58	-0.94	Peak
7 pp	1673.00	-56.95	-64.86	-13.00	-43.95	7.91	Peak

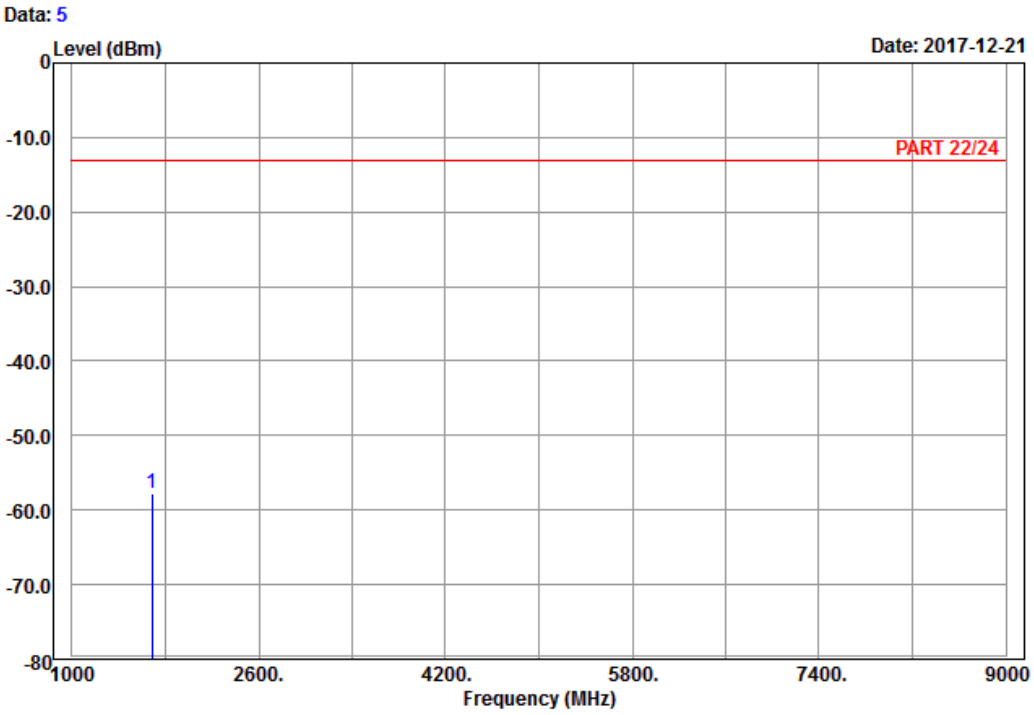


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_CH20525
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	130.44	-79.93	-72.28	-13.00	-66.93	-7.65	Peak
2	179.31	-78.47	-72.79	-13.00	-65.47	-5.68	Peak
3	236.55	-75.81	-70.12	-13.00	-62.81	-5.69	Peak
4	384.00	-70.63	-67.06	-13.00	-57.63	-3.57	Peak
5	538.70	-70.85	-68.34	-13.00	-57.85	-2.51	Peak
6	602.40	-70.94	-71.34	-13.00	-57.94	0.40	Peak
7 pp	1673.00	-57.97	-65.88	-13.00	-44.97	7.91	Peak

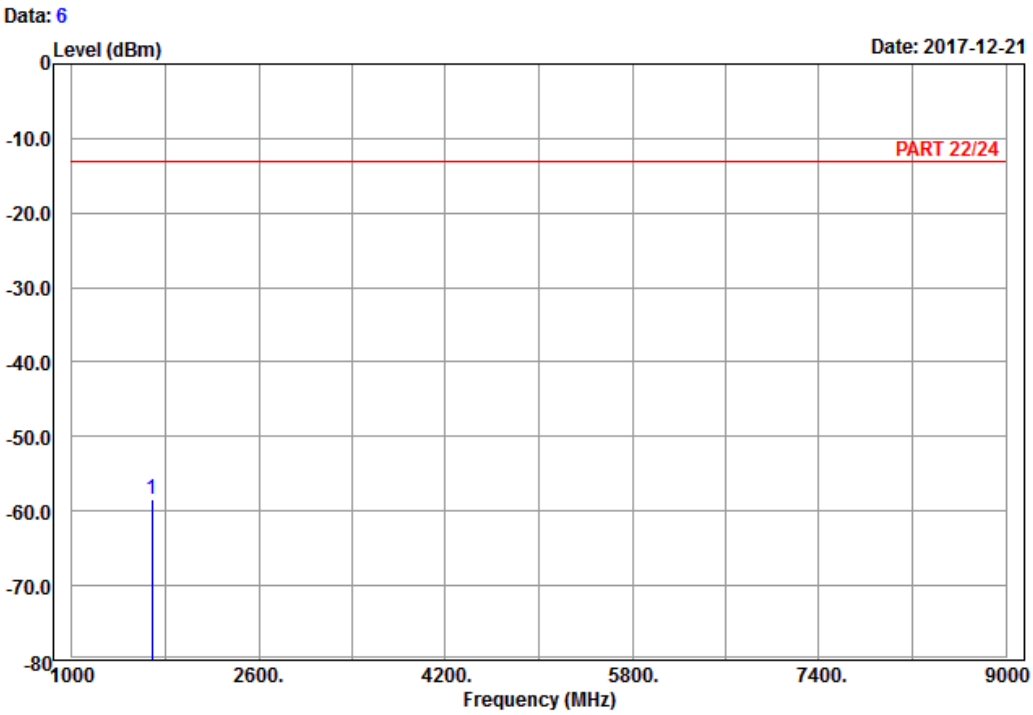
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_CH20600
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1688.00	-57.87	-65.89	-13.00	-44.87	8.02	Peak



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_CH20600
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1688.00	-58.33	-66.35	-13.00	-45.33	8.02	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 ---