

FCC Test Report

(PART 22)

Report No.: RF180613E05

FCC ID: O9YJKS2

Test Model: JKS2, JKS2A, JKS2B, JKS2C, JKS2D, ATS100-A, ATS100-T, ATS100-Y-A, ATS100-Y-T, ATS100-Z-A, ATS100-Z-T, ATS100-YZ-A, ATS100-YZ-T
(Refer to item 3.1 for the more details)

Received Date: Mar. 26, 2018

Test Date: Apr. 17, 2018 ~ Aug. 23, 2018

Issued Date: Sep. 05, 2018

Applicant: Spireon Inc.

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

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R.O.C

**FCC Registration /
Designation Number:** 427177 / TW0011



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Release Control Record

Issue No.	Description	Date Issued
RF180613E05	Original Release	Sep. 05, 2018

1 Certificate of Conformity

Product: GPS Tracker

Brand: Spireon

Test Model: JKS2, JKS2A, JKS2B, JKS2C, JKS2D, ATS100-A, ATS100-T, ATS100-Y-A, ATS100-Y-T, ATS100-Z-A, ATS100-Z-T, ATS100-YZ-A, ATS100-YZ-T
(Refer to item 3.1 for the more details)

Sample Status: ENGINEERING SAMPLE

Applicant: Spireon Inc.

Test Date: Apr. 17, 2018 ~ Aug. 23, 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 : Gina Liu, **Date:** Sep. 05, 2018
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** Sep. 05, 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.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
---	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 -25.37 dB at 1658.00 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	Expanded 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 & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
			Aug. 20, 2018	Aug. 19, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
			Jan. 11, 2018	Jan. 10, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 06, 2017	Dec. 05, 2018
HORN Antenna ETS-Lindgren	3117	00143293	Dec. 13, 2017	Dec. 12, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 01, 2017	Nov. 30, 2018
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
			Jun. 19, 2018	Jun. 18, 2019
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
			Jun. 19, 2018	Jun. 18, 2019
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
			Jun. 19, 2018	Jun. 18, 2019
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 23, 2017	Jun. 22, 2018
			Jun. 19, 2018	Jun. 18, 2019
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
			Jun. 29, 2018	Jun. 28, 2019

- Note:
1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in 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	GPS Tracker	
Brand	Spireon	
Test Model	JKS2, JKS2A, JKS2B, JKS2C, JKS2D, ATS100-A, ATS100-T, ATS100-Y-A, ATS100-Y-T, ATS100-Z-A, ATS100-Z-T, ATS100-YZ-A, ATS100-YZ-T	
Status of EUT	ENGINEERING SAMPLE	
Power Supply Rating	9~16 Vdc	
Modulation Type	WCDMA	QPSK
	LTE	QPSK, 16QAM
Frequency Range	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	WCDMA	256.33 mW
	LTE 5 (Channel Bandwidth: 1.4 MHz)	183.15 mW
	LTE 5 (Channel Bandwidth: 3 MHz)	184.84 mW
	LTE 5 (Channel Bandwidth: 5 MHz)	186.12 mW
	LTE 5 (Channel Bandwidth: 10 MHz)	186.98 mW
Emission Designator	WCDMA	4M15F9W
	LTE 5 (Channel Bandwidth: 1.4 MHz)	1M09W7D
	LTE 5 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE 5 (Channel Bandwidth: 5 MHz)	4M49W7D
	LTE 5 (Channel Bandwidth: 10 MHz)	8M96G7D
Antenna Type	PIFA Antenna with 1.4 dBi gain	
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

1. The maximum bandwidth for 16QAM of the EUT is 5 MHz.
2. The module was installed in the EUT. The module information is listed as below.

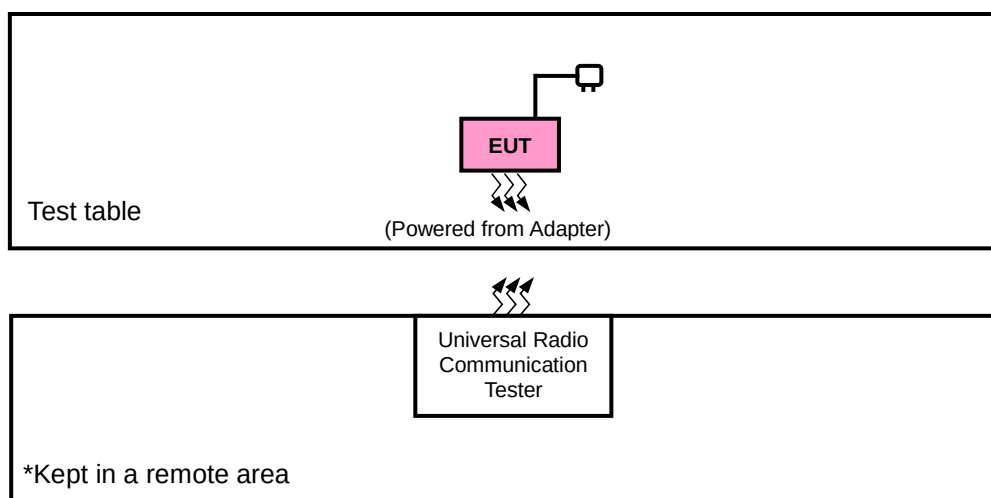
Model name	Description of change	Support Spec.			
		LTE	UMTS	GPS	APGS
M14Q2FG	FW: M14Q2_v16.01 HW: v1.1 MCP 2Gb NAND Flash+1Gb LPDDR2	Cat 1LTE B2/4/5/12	UMTS B2/5	supported	supported

3. All models are listed as below.

Model	Description
ATS100-YZ-A	w/ battery, w/ buzzer
ATS100-YZ-T	
JKS2A	
JKS2	w/ battery, w/ buzzer (Test Model)
ATS100-Y-A	w/ battery, w/o buzzer
ATS100-Y-T	
JKS2B	
ATS100-Z-A	w/o battery, w/ buzzer
ATS100-Z-T	
JKS2C	
ATS100-A	w/o battery, w/o buzzer
ATS100-T	
JKS2D	

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

3.2 Configuration of System under Test



3.2.1 Description of Support Units

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

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports.

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	ERP	Radiated Emission
WCDMA	Z-plane	Z-axis
LTE Band 5	Z-plane	Z-axis

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	4132 to 4233	4132, 4182, 4233	WCDMA
-	Modulation Characteristics	4132 to 4233	4182	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 Emission	4132 to 4233	4132, 4182, 4233	WCDMA
-	Radiated Emission below 1GHz	4132 to 4233	4132	WCDMA
-	Radiated Emission above 1GHz	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	1 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 0 RB Offset
-	Modulation Characteristics	20450 to 20600	20525	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
-	Frequency Stability	20407 to 20643	20407, 20643	1.4 MHz	QPSK	1 RB / 2 RB Offset
		20415 to 20635	20415, 20635	3 MHz	QPSK	1 RB / 7 RB Offset
		20425 to 20625	20425, 20625	5 MHz	QPSK	1 RB / 12 RB Offset
		20450 to 20600	20450, 20600	10 MHz	QPSK	1 RB / 24 RB Offset
-	Occupied Bandwidth	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	50 RB / 0 RB Offset
-	Band Edge	20407 to 20643	20407	1.4MHz	QPSK	1 RB / 0 RB Offset
			20643	1.4MHz	QPSK	6 RB / 0 RB Offset
		20415 to 20635	20415	3 MHz	QPSK	1 RB / 5 RB Offset
			20635	3 MHz	QPSK	6 RB / 0 RB Offset
		20425 to 20625	20425	5 MHz	QPSK	1 RB / 0 RB Offset
			20625	5 MHz	QPSK	15 RB / 0 RB Offset
		20450 to 20600	20450	10 MHz	QPSK	1 RB / 0 RB Offset
			20600	10 MHz	QPSK	25 RB / 0 RB Offset
		20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
			20415, 20525, 20635	3 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
			20425, 20525, 20625	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
-	Peak to Average Ratio	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	50 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	15 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	25 RB / 0 RB Offset
-	Conducted Emission	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	50 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3 MHz	QPSK	1 RB / 2 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 7 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 12 RB Offset
-	Radiated Emission below 1GHz	20450 to 20600	20450	10 MHz	QPSK	1 RB / 24 RB Offset
-	Radiated Emission above 1GHz	20407 to 20643	20407, 20525, 20643	1.4 MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5 MHz	QPSK	1 RB / 12 RB Offset
		20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 24 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	14.2 Vdc	Harry Hsueh
Modulation Characteristics	25 deg. C, 65 % RH	14.2 Vdc	Han Wu
Frequency Stability	25 deg. C, 65 % RH	14.2 Vdc	Han Wu
Occupied Bandwidth	25 deg. C, 65 % RH	14.2 Vdc	Han Wu
Band Edge	25 deg. C, 65 % RH	14.2 Vdc	Han Wu
Peak to Average Ratio	25 deg. C, 65 % RH	14.2 Vdc	Han Wu
Conducted Emission	25 deg. C, 65 % RH	14.2 Vdc	Han Wu
Radiated Emission	25 deg. C, 65 % RH	14.2 Vdc	Harry Hsueh

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 v03r01

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 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, and 5 MHz for WCDMA and 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. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$.

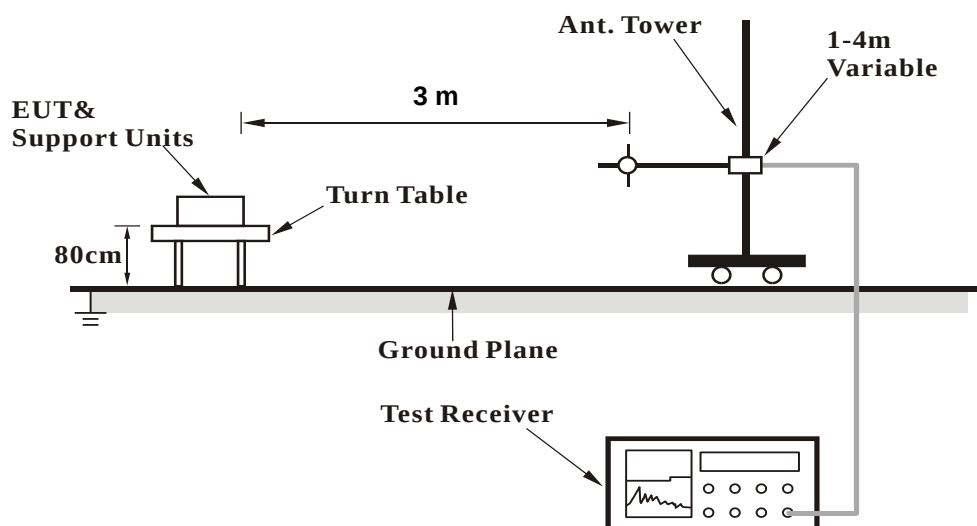
Conducted Power Measurement:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA, 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.

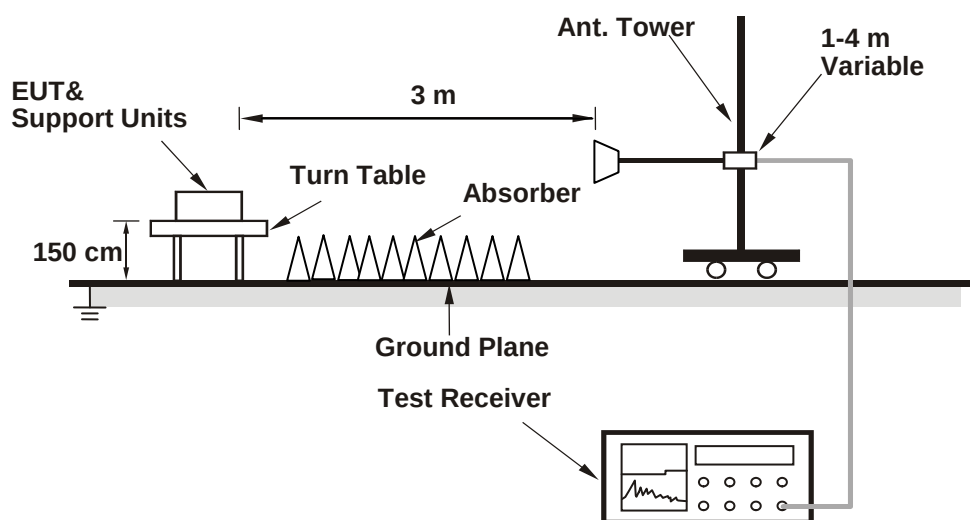
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

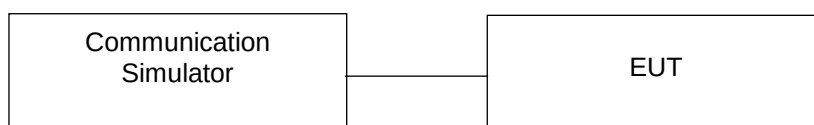


<Radiated Emission above 1 GHz>



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	WCDMA V		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	24.15	24.14	24.22
HSDPA Subtest-1	22.87	22.90	22.95
HSDPA Subtest-2	22.94	22.93	22.98
HSDPA Subtest-3	22.46	22.45	22.55
HSDPA Subtest-4	22.48	22.49	22.56
HSUPA Subtest-1	22.49	22.48	22.53
HSUPA Subtest-2	21.38	21.41	21.51
HSUPA Subtest-3	21.71	21.73	21.77
HSUPA Subtest-4	21.94	21.95	21.98
HSUPA Subtest-5	23.01	23.04	23.11

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20407	Mid Ch 20525	High Ch 20643		Low Ch 20407	Mid Ch 20525	High Ch 20643	
			824.7 MHz	836.5 MHz	848.3 MHz		824.7 MHz	836.5 MHz	848.3 MHz	
5 / 1.4M	1	0	23.06	22.96	23.25	0	21.86	21.98	22.29	1
	1	2	22.82	22.90	23.05	0	21.83	21.79	22.05	1
	1	5	22.70	22.78	22.85	0	21.65	21.61	21.78	1
	3	0	22.73	22.78	22.94	0	21.68	21.62	21.87	1
	3	1	22.60	22.67	22.76	0	21.47	21.43	21.60	1
	3	3	22.58	22.65	22.82	0	21.48	21.60	21.77	1
	6	0	21.94	21.87	22.01	1	20.83	20.87	20.88	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20415	Mid Ch 20525	High Ch 20635		Low Ch 20415	Mid Ch 20525	High Ch 20635	
			825.5 MHz	836.5 MHz	847.5 MHz		825.5 MHz	836.5 MHz	847.5 MHz	
5 / 3M	1	0	23.41	23.27	23.53	0	22.28	22.25	22.55	1
	1	7	23.27	23.19	23.44	0	22.25	22.14	22.35	1
	1	14	23.15	22.95	23.24	0	22.08	22.03	22.17	1
	8	0	22.27	22.21	22.45	1	21.16	21.08	21.31	2
	8	3	22.05	21.98	22.14	1	20.99	20.95	21.09	2
	8	7	21.97	21.88	21.99	1	20.88	20.87	21.07	2
	15	0	22.33	22.26	22.46	1	21.12	21.10	21.36	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20425	Mid Ch 20525	High Ch 20625		Low Ch 20425	Mid Ch 20525	High Ch 20625	
			826.5 MHz	836.5 MHz	846.5 MHz		826.5 MHz	836.5 MHz	846.5 MHz	
5 / 5M	1	0	23.53	23.48	23.65	0	22.45	22.40	22.60	1
	1	12	23.42	23.34	23.53	0	22.37	22.30	22.49	1
	1	24	23.15	23.07	23.23	0	22.16	22.10	22.35	1
	12	0	22.33	22.32	22.47	1	21.33	21.23	21.37	2
	12	6	22.12	22.15	22.31	1	21.08	21.04	21.27	2
	12	13	22.10	22.04	22.21	1	21.09	20.96	21.18	2
	25	0	22.33	22.31	22.53	1	21.25	21.36	21.49	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low Ch 20450	Mid Ch 20525	High Ch 20600		Low Ch 20450	Mid Ch 20525	High Ch 20600	
			829.0 MHz	836.5 MHz	844.0 MHz		829.0 MHz	836.5 MHz	844.0 MHz	
5 / 10M	1	0	23.63	23.59	23.77	0				1
	1	24	23.52	23.43	23.61	0				1
	1	49	23.31	23.31	23.45	0				1
	25	0	22.48	22.47	22.63	1				2
	25	12	22.30	22.26	22.41	1				2
	25	25	22.20	22.24	22.35	1				2
	50	0	22.48	22.47	22.63	1				2

ERP Power (dBm)

WCDMA							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	4132	826.4	-4.97	31.208	24.09	256.33	H
	4182	836.4	-5.08	31.3	24.07	255.27	
	4233	846.6	-5.04	31.222	24.03	253.05	
	4132	826.4	-10.27	31.504	19.08	80.98	V
	4182	836.4	-9.92	31.117	19.05	80.30	
	4233	846.6	-10.76	31.922	19.01	79.65	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 5							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20407	824.7	-6.43	31.208	22.63	183.15	H
	20525	836.5	-6.64	31.3	22.51	178.24	
	20643	848.3	-6.50	31.222	22.57	180.80	
	20407	824.7	-11.73	31.504	17.62	57.86	V
	20525	836.5	-11.46	31.117	17.51	56.32	
	20643	848.3	-12.23	31.922	17.54	56.78	
Channel Bandwidth: 1.4 MHz / 16QAM							
Z	20407	824.7	-7.44	31.208	21.62	145.14	H
	20525	836.5	-7.65	31.3	21.50	141.25	
	20643	848.3	-7.51	31.222	21.56	143.28	
	20407	824.7	-12.73	31.504	16.62	45.96	V
	20525	836.5	-12.48	31.117	16.49	44.53	
	20643	848.3	-13.24	31.922	16.53	45.00	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 5							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20415	825.5	-6.39	31.208	22.67	184.84	H
	20525	836.5	-6.60	31.3	22.55	179.89	
	20635	847.5	-6.46	31.222	22.61	182.47	
	20415	825.5	-11.70	31.504	17.65	58.26	V
	20525	836.5	-11.42	31.117	17.55	56.85	
	20635	847.5	-12.20	31.922	17.57	57.17	
Channel Bandwidth: 3 MHz / 16QAM							
Z	20415	825.5	-7.40	31.208	21.66	146.49	H
	20525	836.5	-7.61	31.3	21.54	142.56	
	20635	847.5	-7.47	31.222	21.60	144.61	
	20415	825.5	-12.71	31.504	16.64	46.17	V
	20525	836.5	-12.43	31.117	16.54	45.05	
	20635	847.5	-13.21	31.922	16.56	45.31	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 5							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20425	826.5	-6.36	31.208	22.70	186.12	H
	20525	836.5	-6.56	31.3	22.59	181.55	
	20625	846.5	-6.42	31.222	22.65	184.16	
	20425	826.5	-11.66	31.504	17.69	58.80	V
	20525	836.5	-11.39	31.117	17.58	57.24	
	20625	846.5	-12.16	31.922	17.61	57.70	
Channel Bandwidth: 5 MHz / 16QAM							
Z	20425	826.5	-7.37	31.208	21.69	147.50	H
	20525	836.5	-7.58	31.3	21.57	143.55	
	20625	846.5	-7.43	31.222	21.64	145.95	
	20425	826.5	-12.67	31.504	16.68	46.60	V
	20525	836.5	-12.40	31.117	16.57	45.36	
	20625	846.5	-13.17	31.922	16.60	45.73	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 5							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	20450	829.0	-6.34	31.208	22.72	186.98	H
	20525	836.5	-6.52	31.3	22.63	183.23	
	20600	844.0	-6.40	31.222	22.67	185.01	
	20450	829.0	-11.62	31.504	17.73	59.35	V
	20525	836.5	-11.35	31.117	17.62	57.77	
	20600	844.0	-12.13	31.922	17.64	58.10	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

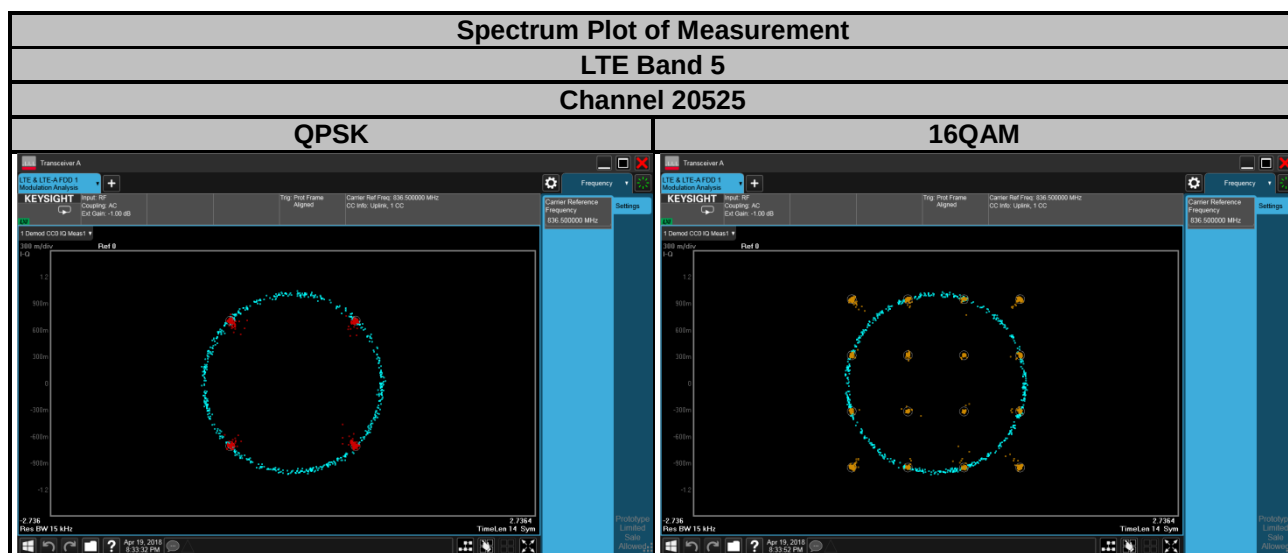
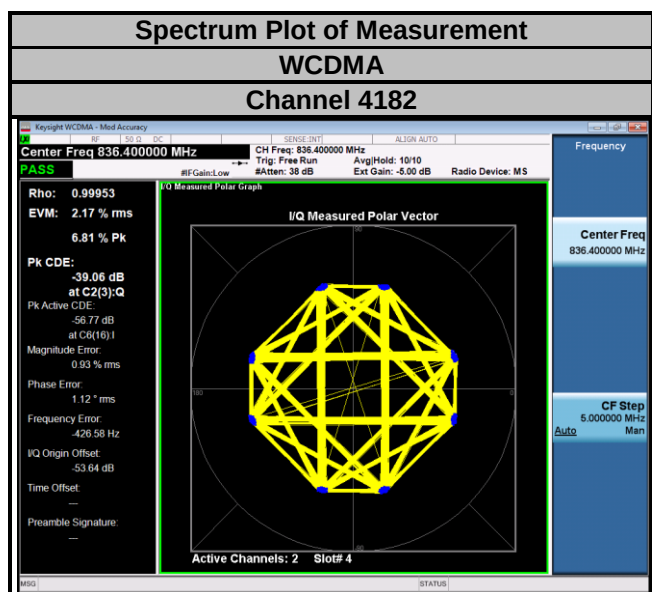
4.2.2 Test Setup



4.2.3 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

4.2.4 Test Results



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

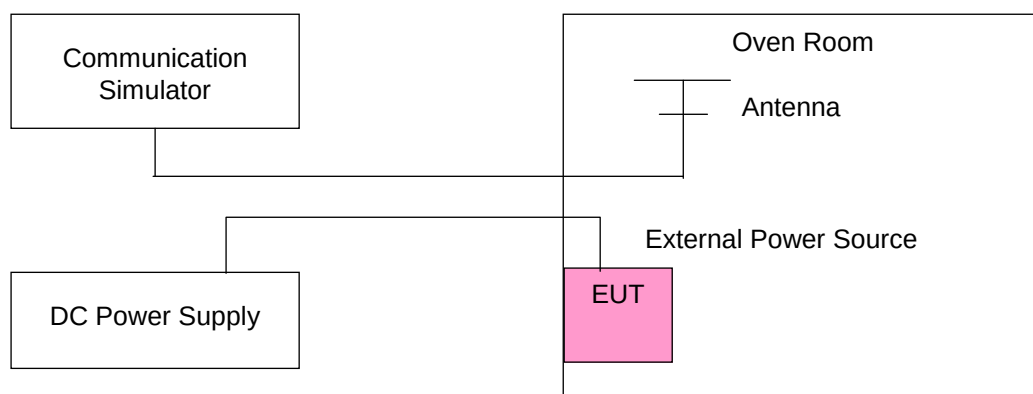
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ± 0.5 °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded frequency error from the communication simulator.

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
14.2	826.400003	0.003	846.600003	0.003	2.5
9	826.400003	0.004	846.600002	0.002	2.5
16	826.400002	0.003	846.600002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 9 Vdc to 16 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	WCDMA				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	826.400004	0.005	846.600004	0.004	2.5
-20	826.400002	0.002	846.600002	0.002	2.5
-10	826.400002	0.003	846.600001	0.001	2.5
0	826.400001	0.002	846.600002	0.002	2.5
10	826.400002	0.003	846.600003	0.003	2.5
20	826.399996	-0.004	846.599998	-0.002	2.5
30	826.399999	-0.002	846.599997	-0.003	2.5
40	826.399996	-0.005	846.599997	-0.003	2.5
50	826.399999	-0.002	846.599998	-0.003	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)	
14.2	824.700002	0.002	848.300001	0.002	2.5
9	824.700002	0.003	848.300002	0.003	2.5
16	824.700001	0.002	848.300002	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 9 Vdc to 16 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	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	0.003	848.300004	0.004	2.5
-20	824.700001	0.001	848.300002	0.003	2.5
-10	824.700003	0.003	848.300002	0.002	2.5
0	824.700002	0.002	848.300002	0.002	2.5
10	824.700002	0.002	848.300003	0.004	2.5
20	824.699997	-0.004	848.299998	-0.003	2.5
30	824.699996	-0.005	848.299999	-0.002	2.5
40	824.699997	-0.004	848.299996	-0.005	2.5
50	824.699998	-0.002	848.299998	-0.002	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)	
14.2	825.500002	0.002	847.500001	0.001	2.5
9	825.500002	0.002	847.500002	0.002	2.5
16	825.500003	0.003	847.500003	0.003	2.5

Note: The applicant defined the normal working voltage of the battery is from 9 Vdc to 16 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	825.500003	0.003	847.500002	0.002	2.5
-20	825.500002	0.003	847.500001	0.002	2.5
-10	825.500002	0.003	847.500002	0.002	2.5
0	825.500002	0.003	847.500003	0.004	2.5
10	825.500004	0.004	847.500002	0.002	2.5
20	825.499997	-0.004	847.499999	-0.001	2.5
30	825.499998	-0.002	847.499998	-0.003	2.5
40	825.499998	-0.002	847.499998	-0.002	2.5
50	825.499999	-0.001	847.499997	-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)	
14.2	826.500003	0.003	846.500004	0.004	2.5
9	826.500003	0.003	846.500004	0.004	2.5
16	826.500002	0.003	846.500004	0.004	2.5

Note: The applicant defined the normal working voltage of the battery is from 9 Vdc to 16 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	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	0.003	846.500003	0.003	2.5
-20	826.500002	0.002	846.500003	0.004	2.5
-10	826.500002	0.002	846.500001	0.002	2.5
0	826.500002	0.003	846.500001	0.002	2.5
10	826.500003	0.004	846.500002	0.002	2.5
20	826.499998	-0.002	846.499997	-0.004	2.5
30	826.499998	-0.003	846.499998	-0.002	2.5
40	826.499996	-0.004	846.499999	-0.001	2.5
50	826.499996	-0.004	846.499997	-0.004	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)	
14.2	829.000003	0.003	844.000003	0.003	2.5
9	829.000004	0.004	844.000002	0.002	2.5
16	829.000003	0.004	844.000002	0.002	2.5

Note: The applicant defined the normal working voltage of the battery is from 9 Vdc to 16 Vdc.

Frequency Error vs. Temperature

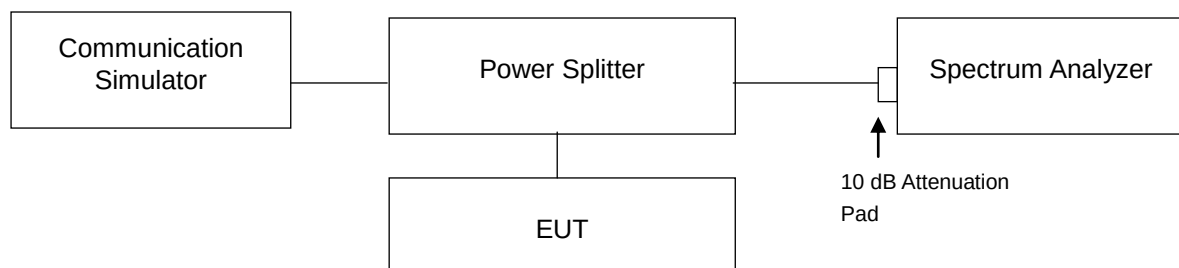
Temp. (°C)	LTE Band 5				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	829.000004	0.004	844.000004	0.005	2.5
-20	829.000002	0.002	844.000002	0.003	2.5
-10	829.000003	0.004	844.000002	0.003	2.5
0	829.000004	0.004	844.000002	0.002	2.5
10	829.000004	0.004	844.000003	0.003	2.5
20	828.999998	-0.003	843.999997	-0.004	2.5
30	828.999997	-0.004	843.999997	-0.003	2.5
40	828.999998	-0.002	843.999997	-0.004	2.5
50	828.999998	-0.002	843.999996	-0.005	2.5

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

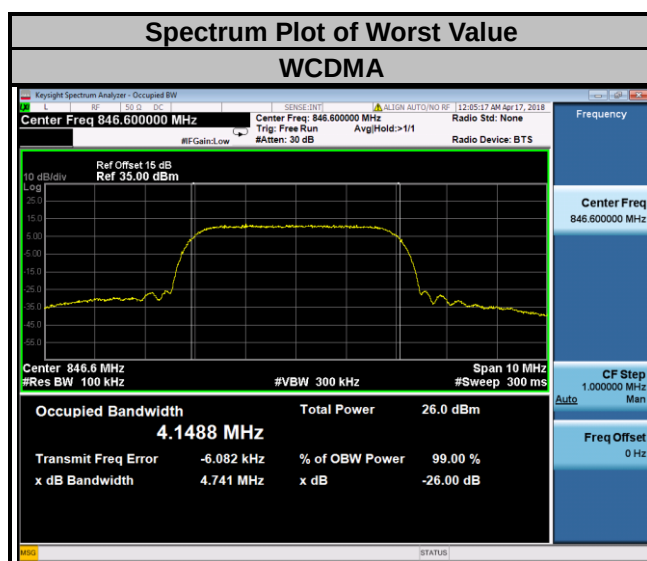
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

4.4.2 Test Setup

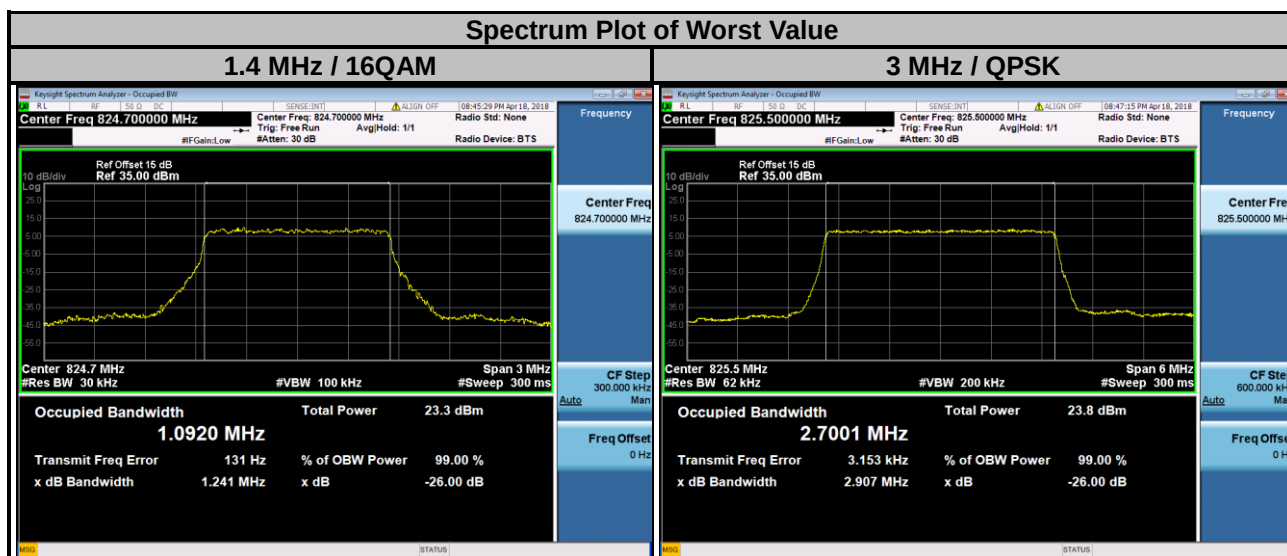


4.4.3 Test Result

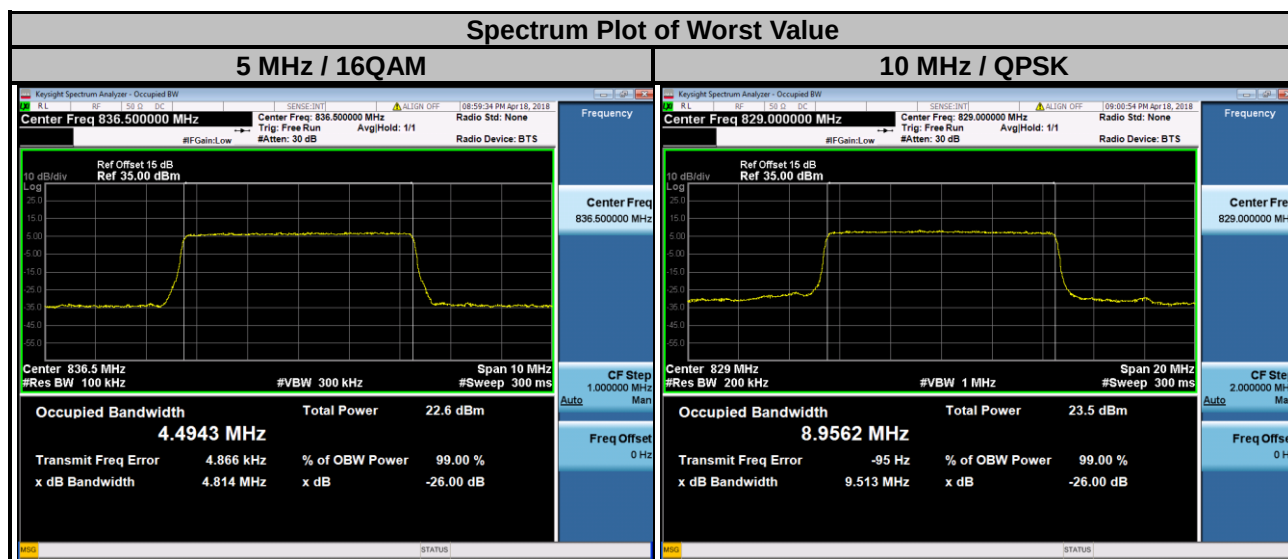
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)
		WCDMA
4132	826.4	4.14
4182	836.4	4.14
4233	846.6	4.15



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			QPSK	16QAM
20407	824.7	1.09	1.09	20415	825.5	2.70	2.70
20525	836.5	1.09	1.09	20525	836.5	2.70	2.70
20643	848.3	1.09	1.09	20635	847.5	2.70	2.70



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			QPSK	16QAM
20425	826.5	4.49	4.49	20450	829.0	8.96	NA
20525	836.5	4.49	4.49	20525	836.5	8.95	NA
20625	846.5	4.49	4.49	20600	844.0	8.95	NA

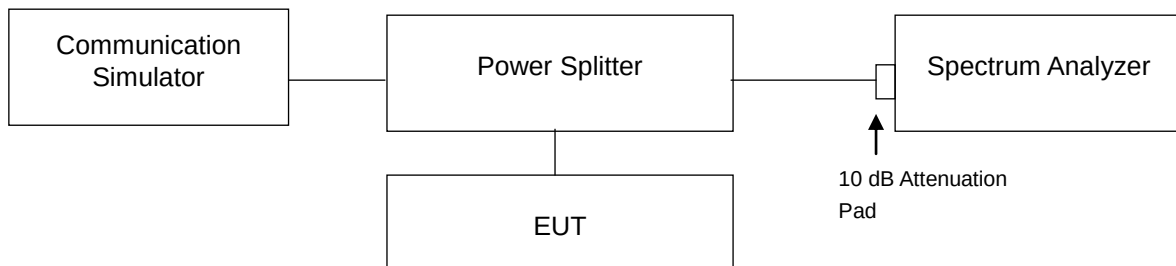


4.5 Band Edge Measurement

4.5.1 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.

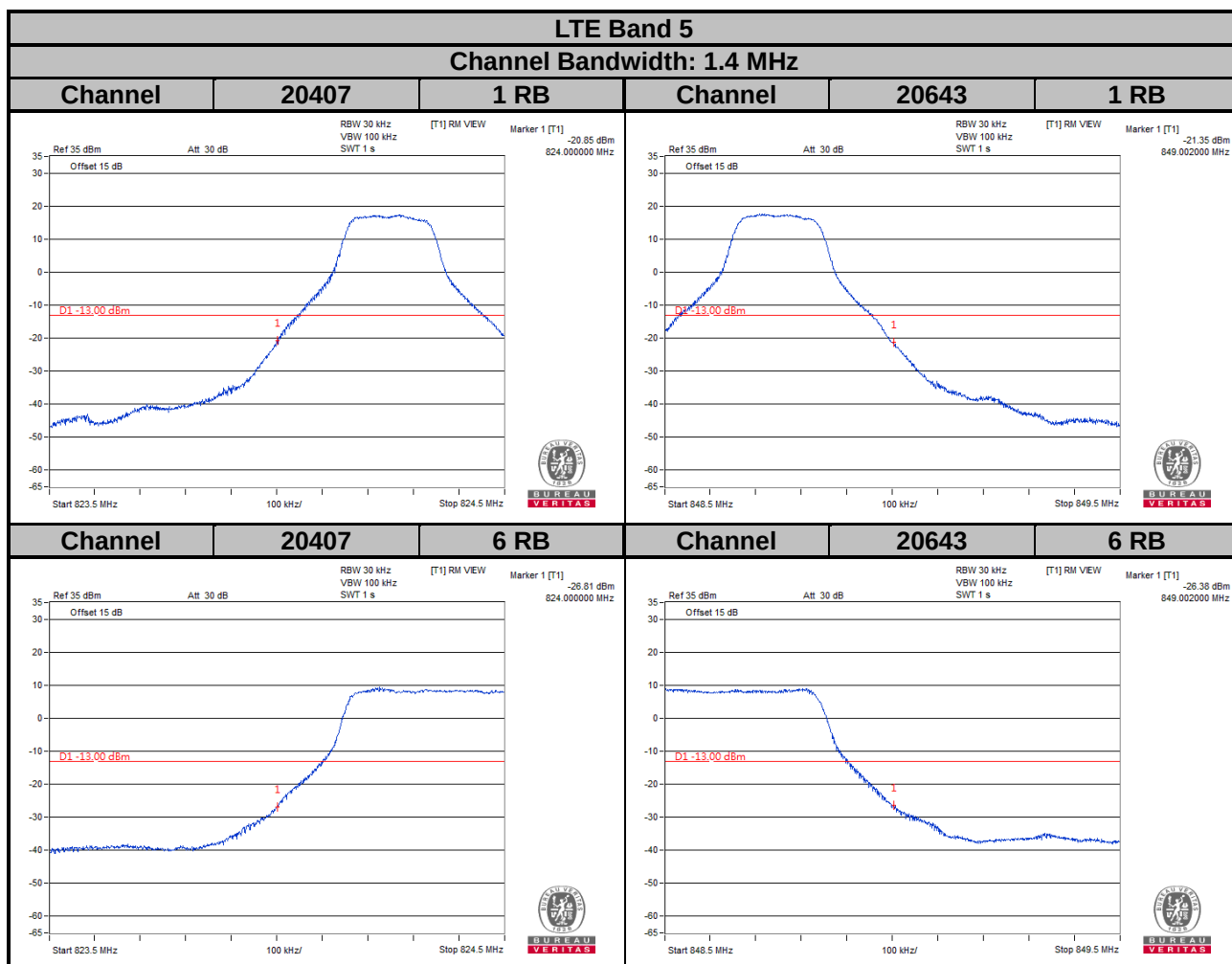
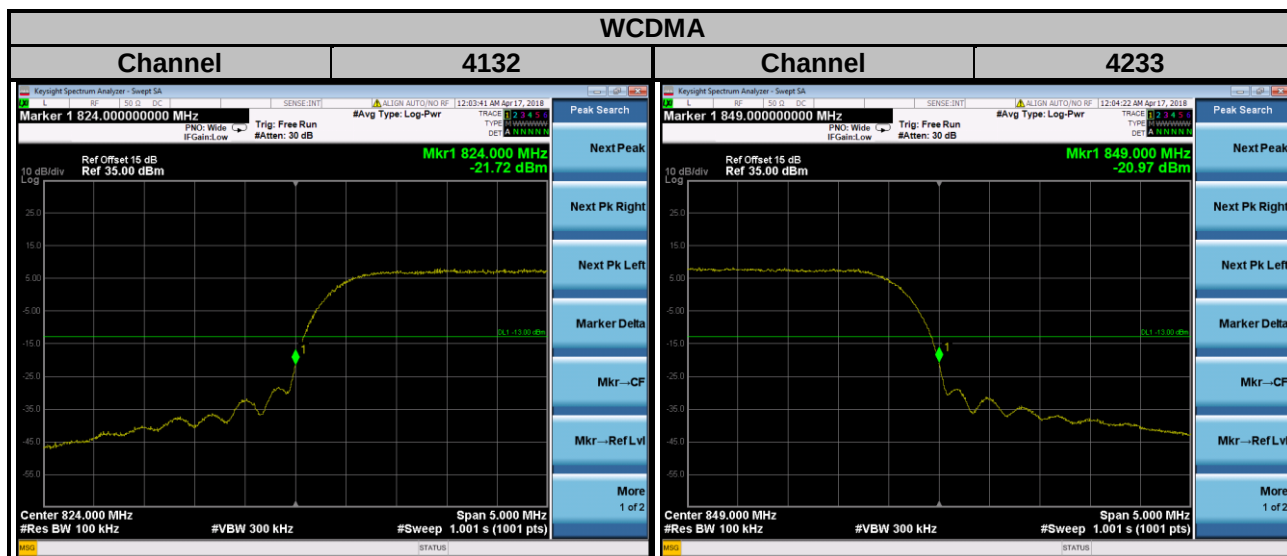
4.5.2 Test Setup

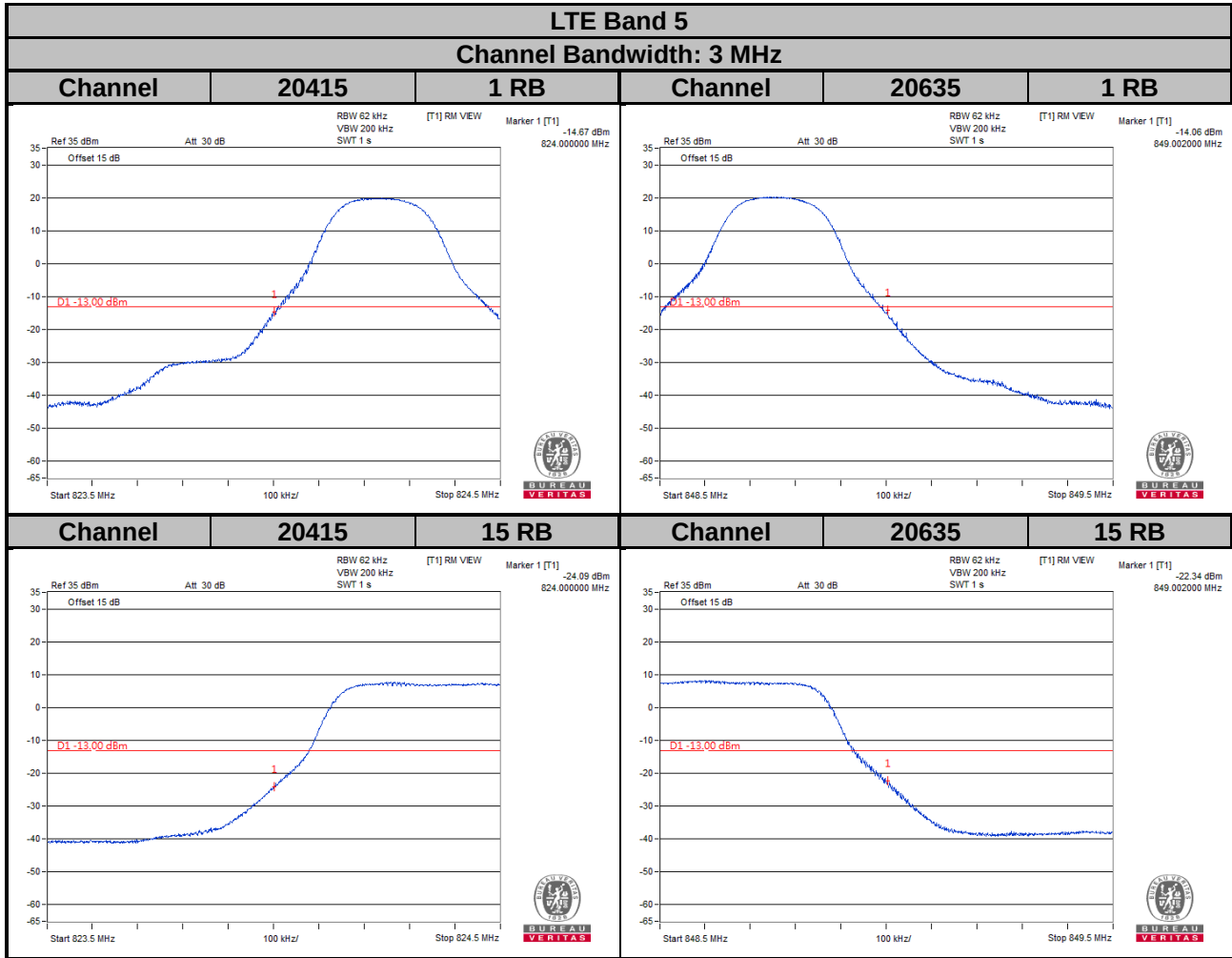


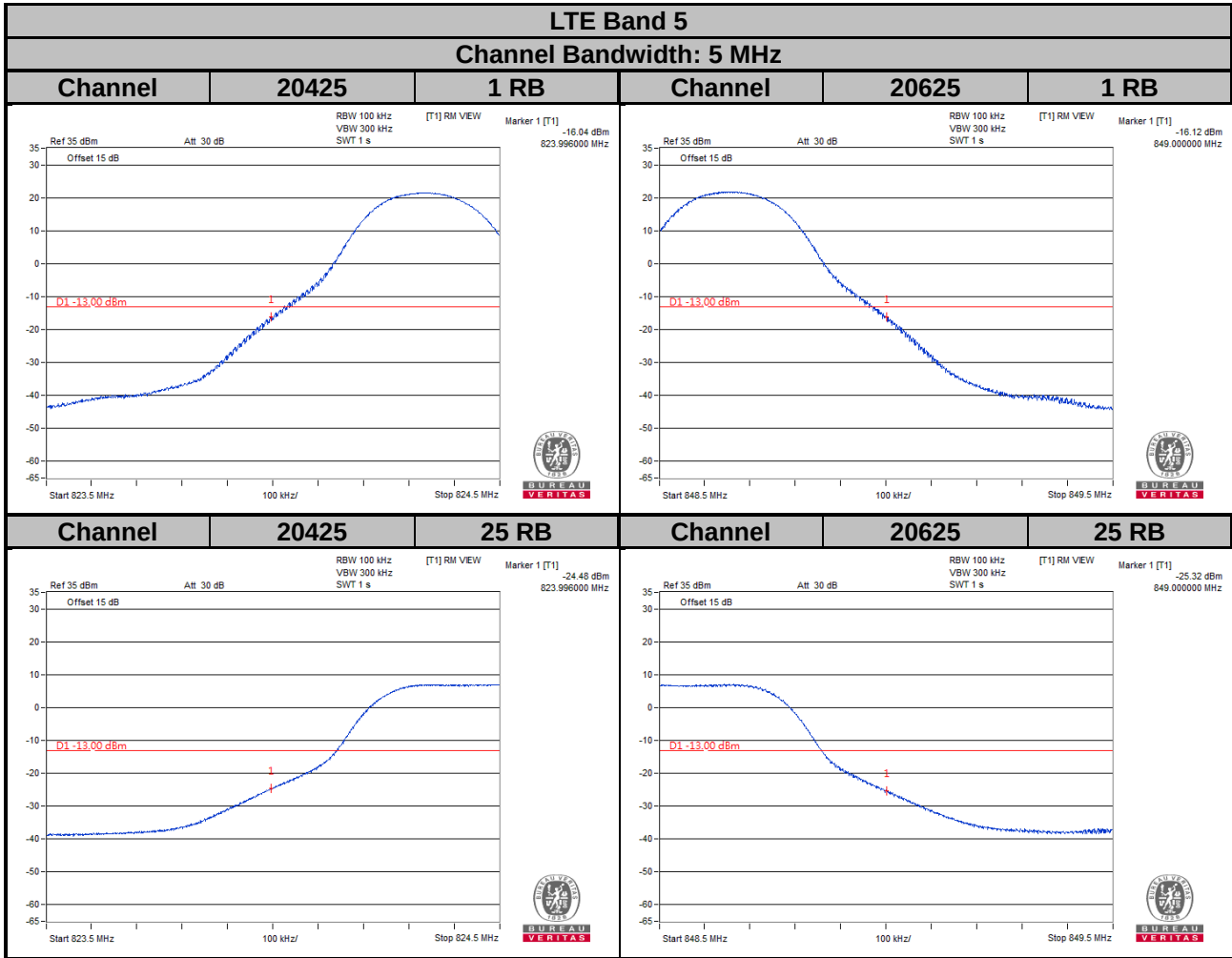
4.5.3 Test Procedures

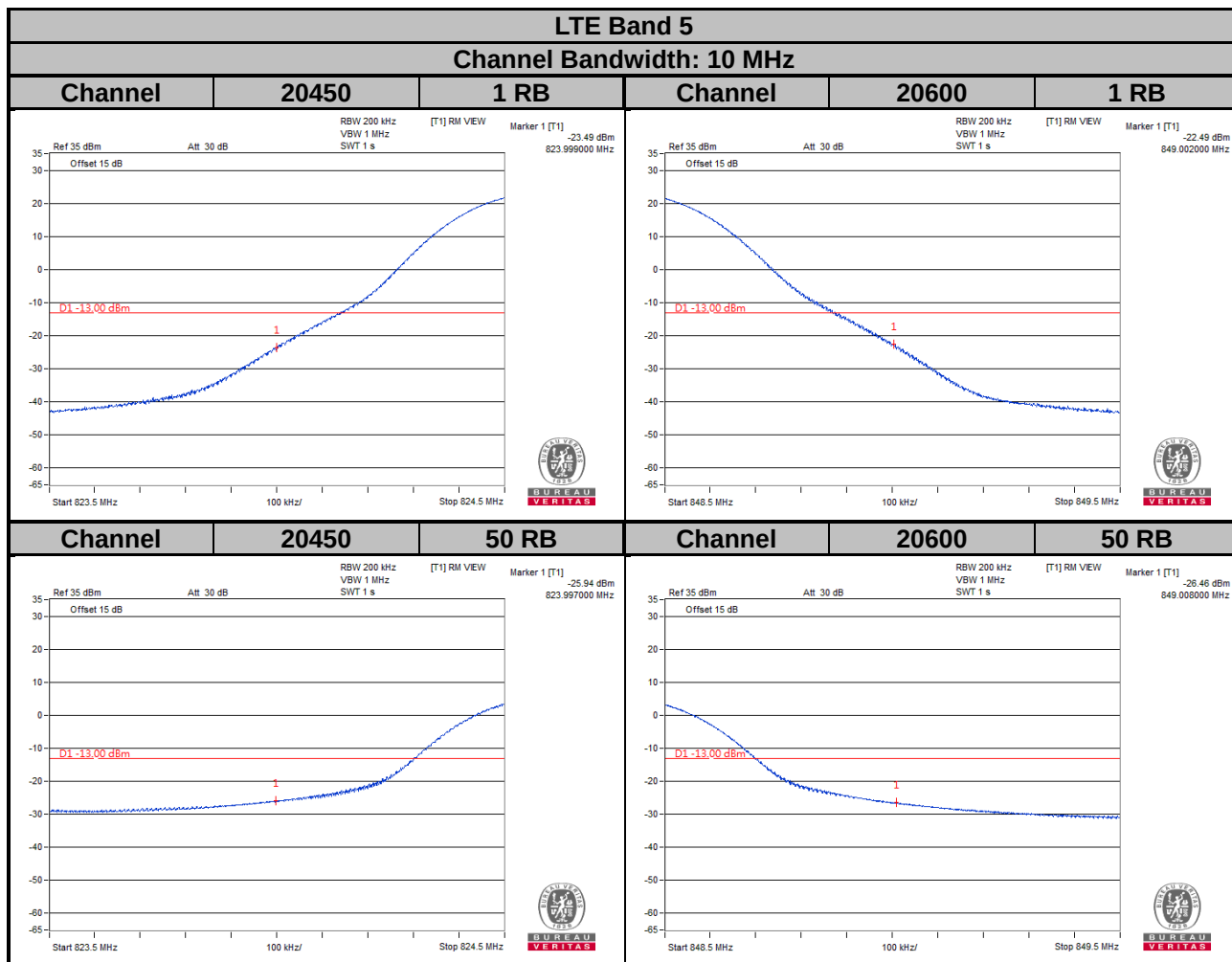
- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 1.4 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 62 kHz and VB of the spectrum is 200 kHz (LTE Bandwidth 3 MHz).
- 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).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 10 MHz).
- Record the max trace plot into the test report.

4.5.4 Test Results







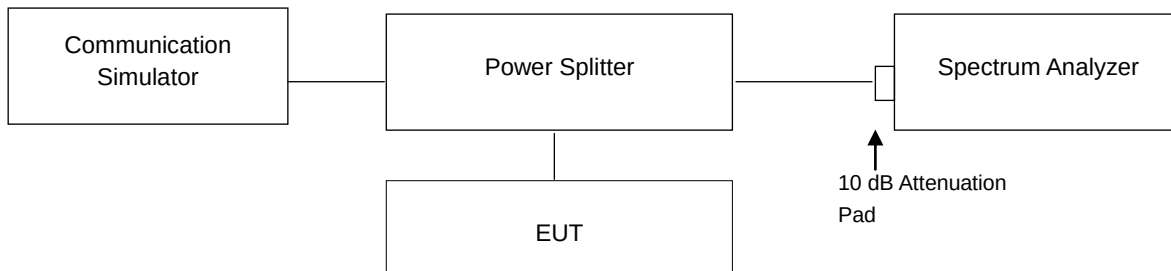


4.6 Peak to Average Ratio

4.6.1 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.

4.6.2 Test Setup

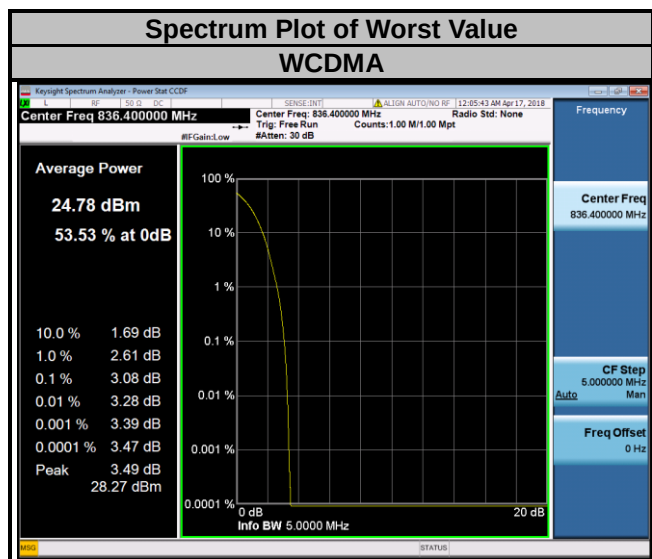


4.6.3 Test Procedures

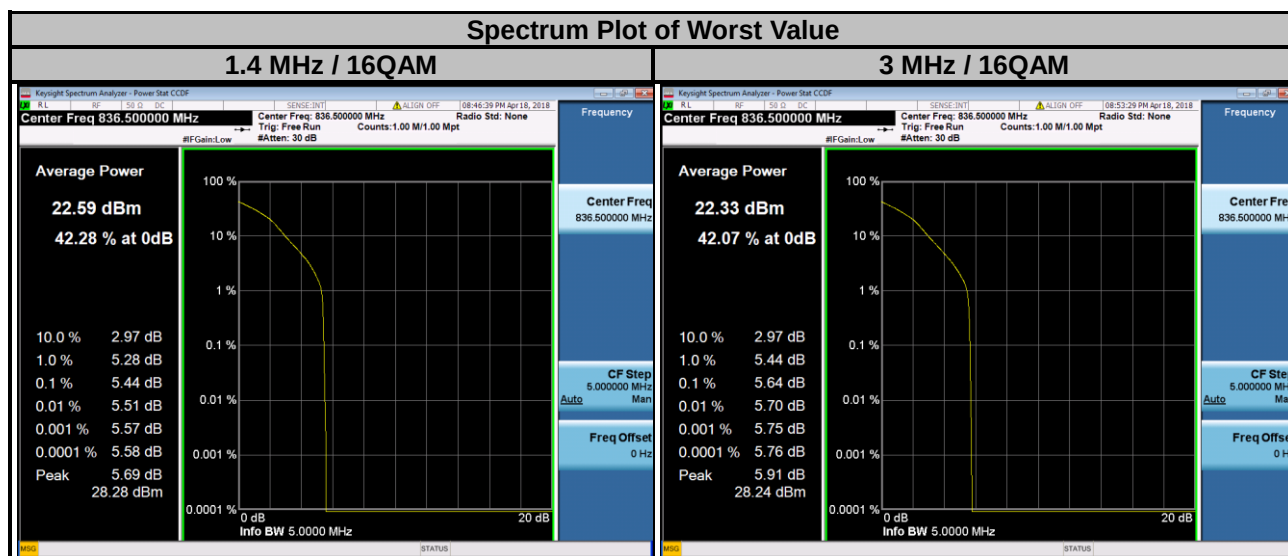
1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

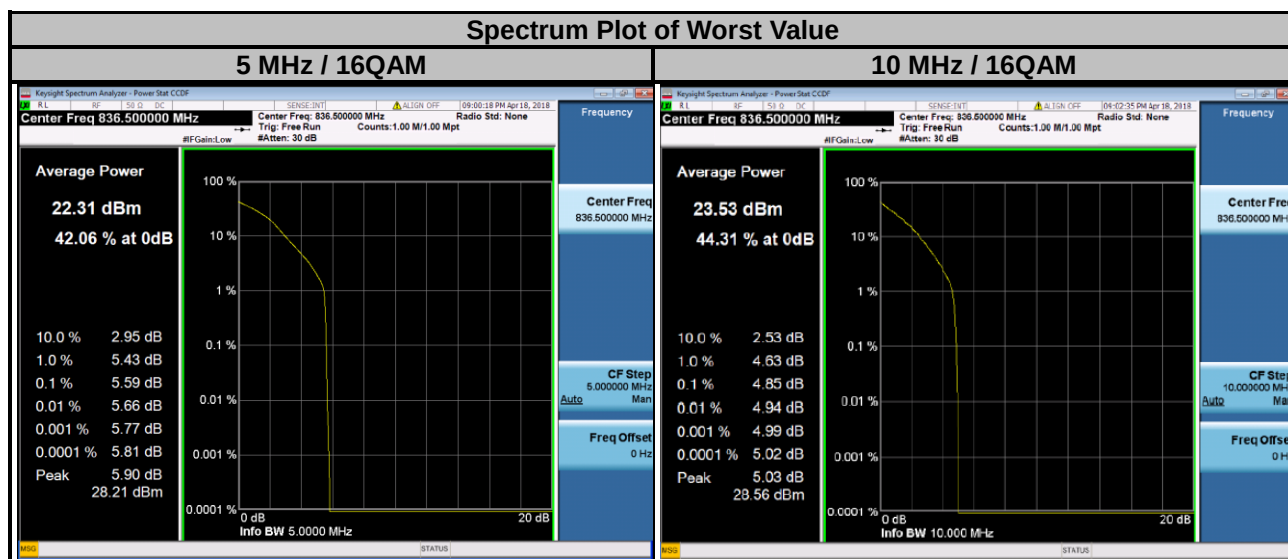
Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		WCDMA
4132	826.4	2.95
4182	836.4	3.08
4233	846.6	2.86



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			QPSK	16QAM
20407	824.7	4.27	5.08	20415	825.5	4.26	5.20
20525	836.5	4.63	5.44	20525	836.5	4.78	5.64
20643	848.3	4.14	5.02	20635	847.5	4.26	5.08



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			QPSK	16QAM
20425	826.5	4.26	5.08	20450	829.0	4.20	NA
20525	836.5	4.82	5.59	20525	836.5	4.85	NA
20625	846.5	4.12	4.94	20600	844.0	4.02	NA

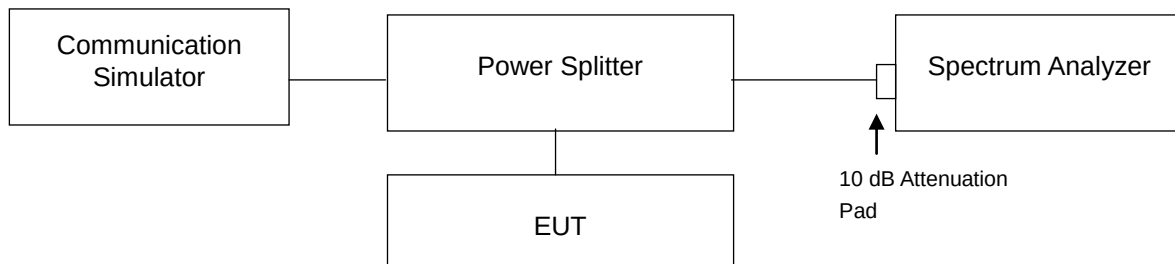


4.7 Conducted Spurious Emissions

4.7.1 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.

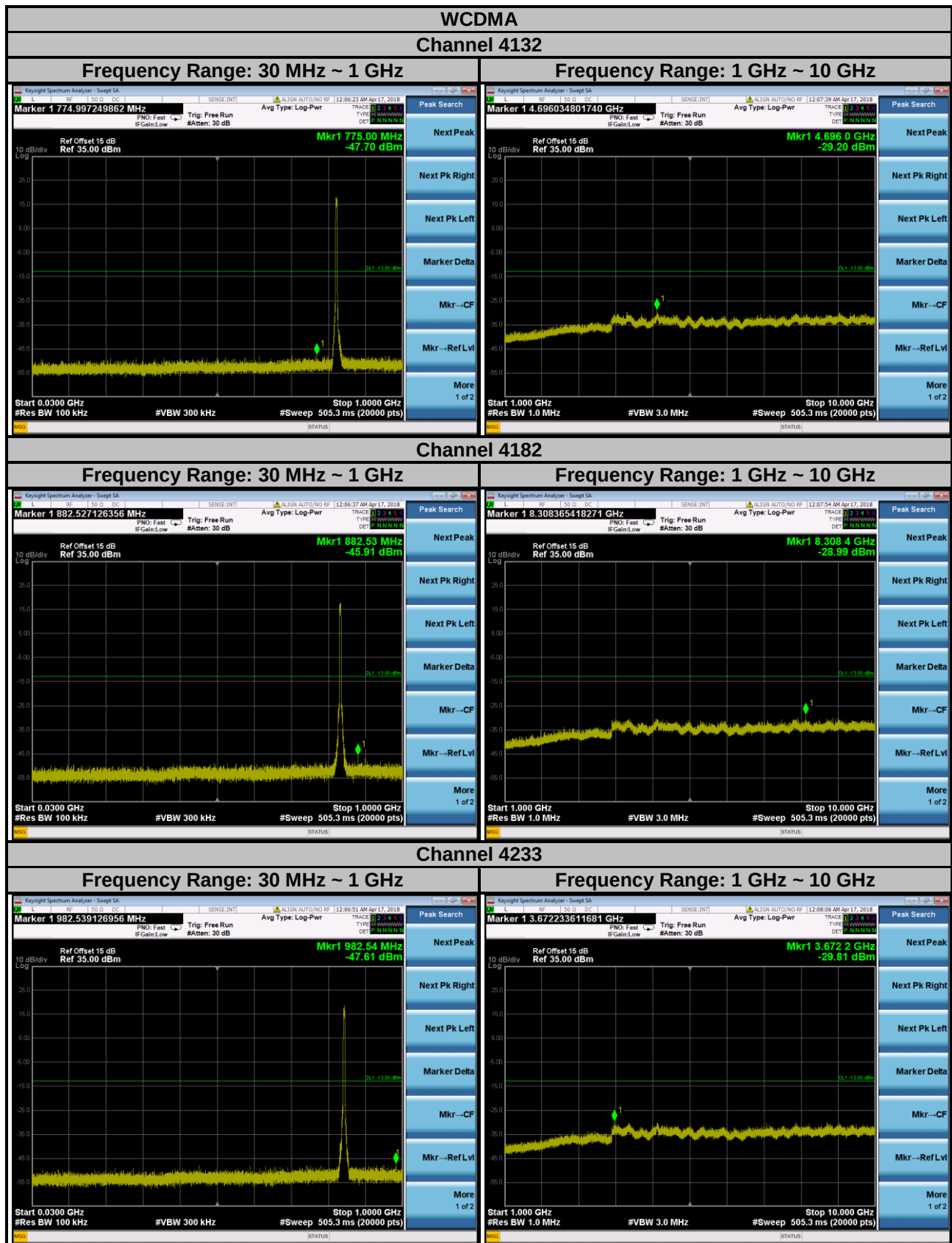
4.7.2 Test Setup



4.7.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 30 MHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz is used for conducted emission measurement.
- Measuring frequency range is from 1 GHz to 10 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

4.7.4 Test Results

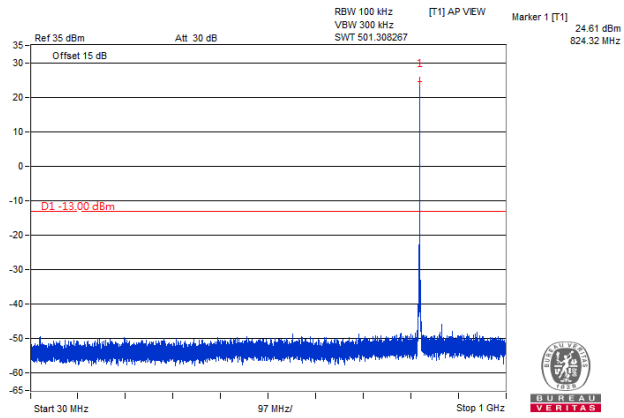


LTE Band 5

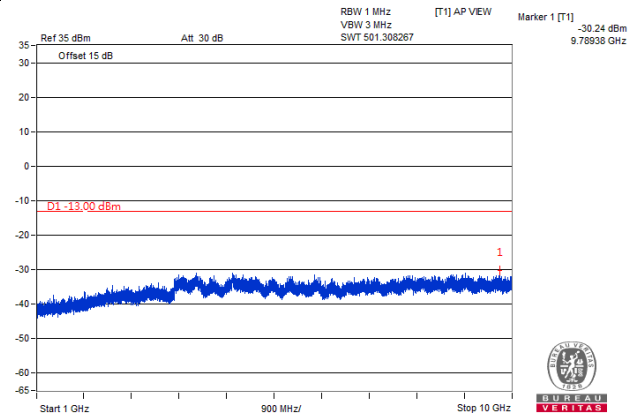
Channel Bandwidth: 1.4 MHz

Channel 20407

Frequency Range: 30 MHz ~ 1 GHz

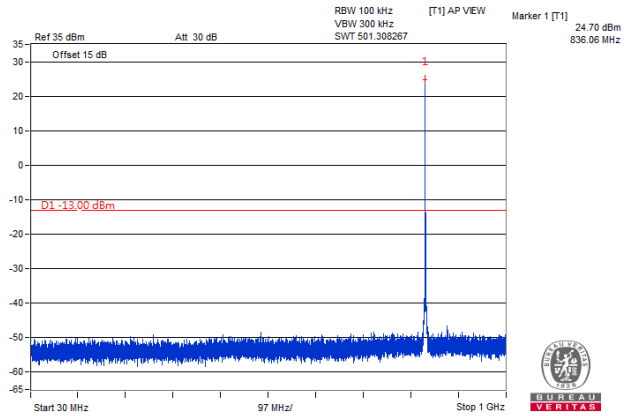


Frequency Range: 1 GHz ~ 10 GHz

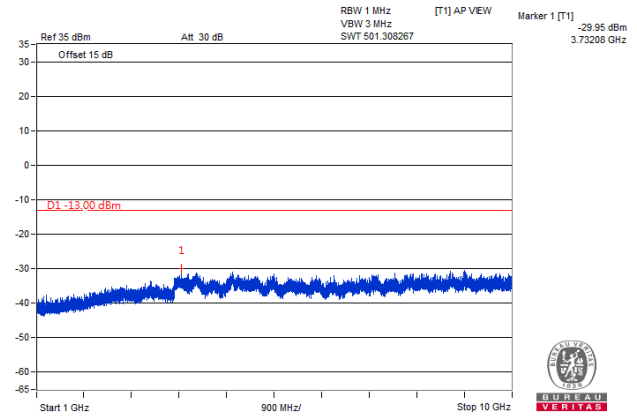


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

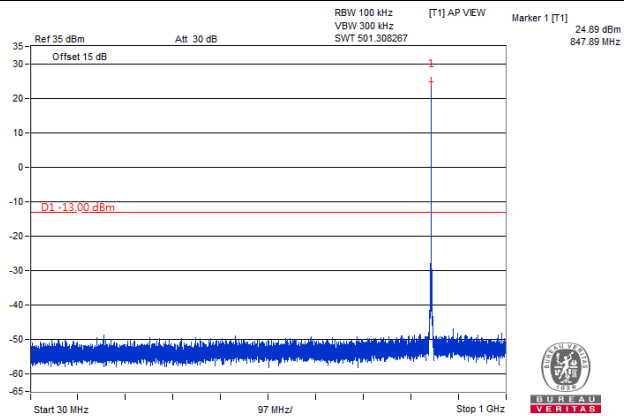


Frequency Range: 1 GHz ~ 10 GHz

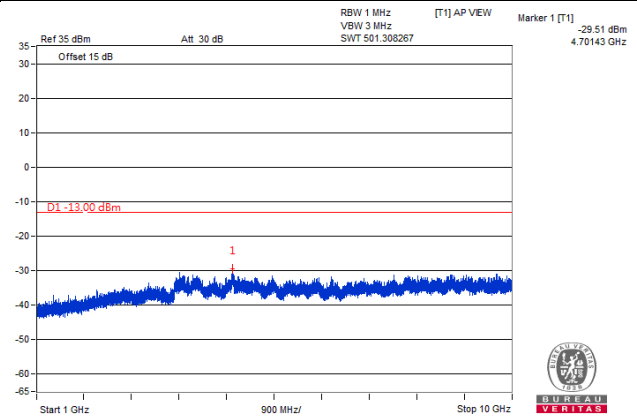


Channel 20643

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

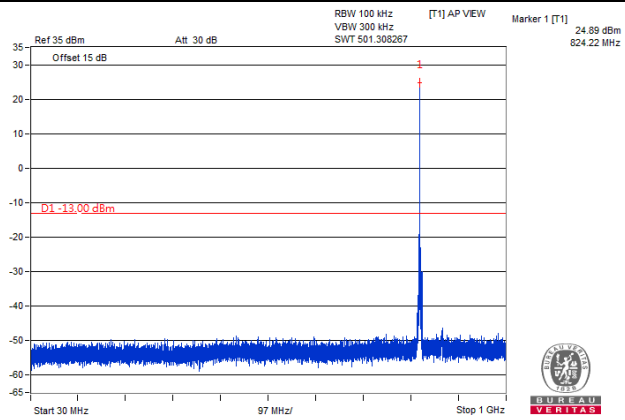


LTE Band 5

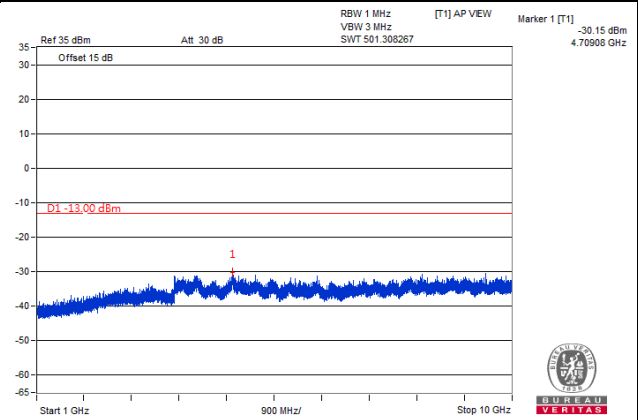
Channel Bandwidth: 3 MHz

Channel 20415

Frequency Range: 30 MHz ~ 1 GHz

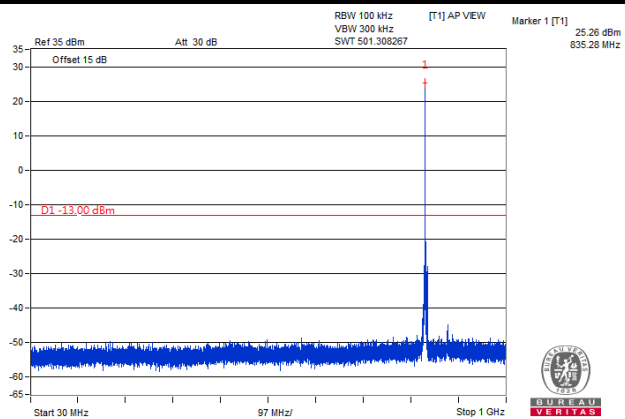


Frequency Range: 1 GHz ~ 10 GHz

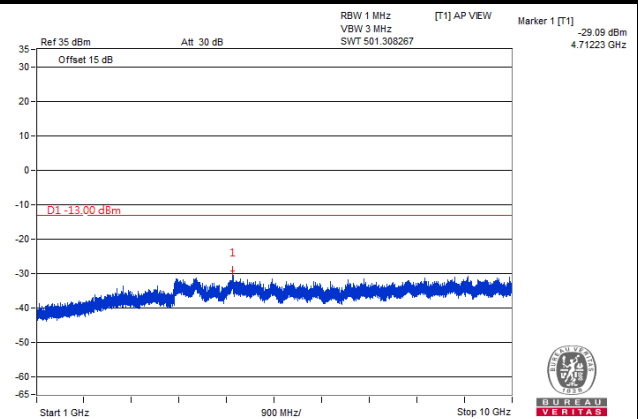


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

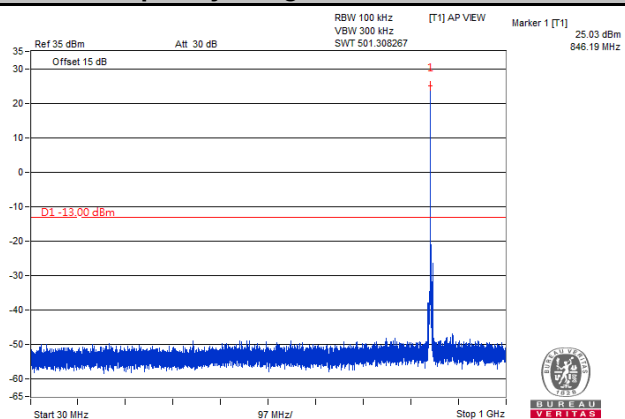


Frequency Range: 1 GHz ~ 10 GHz

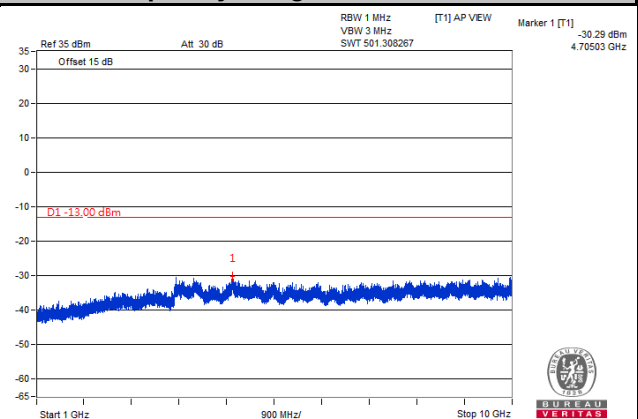


Channel 20635

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

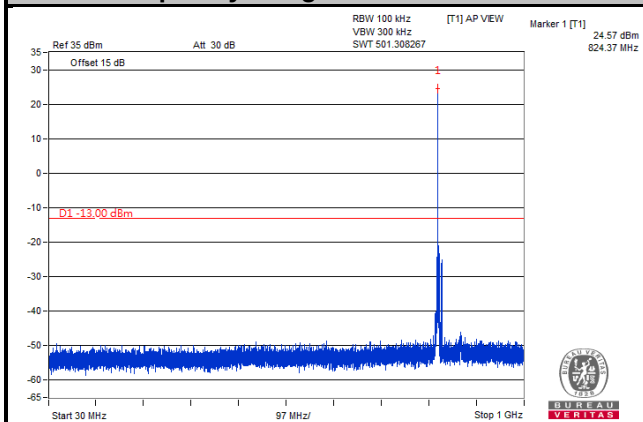


LTE Band 5

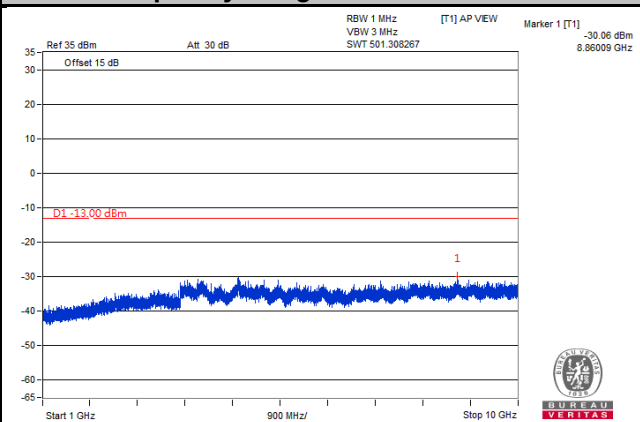
Channel Bandwidth: 5 MHz

Channel 20425

Frequency Range: 30 MHz ~ 1 GHz

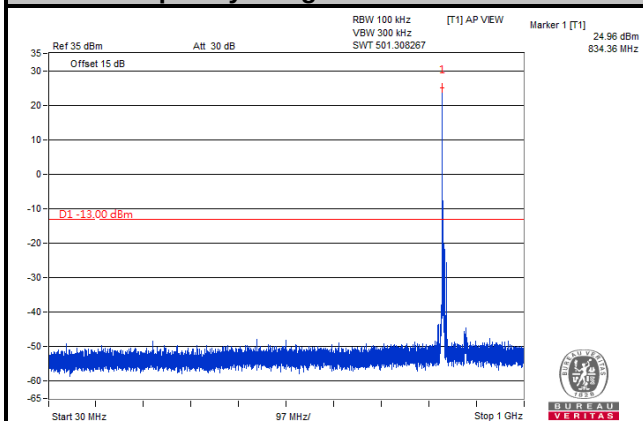


Frequency Range: 1 GHz ~ 10 GHz

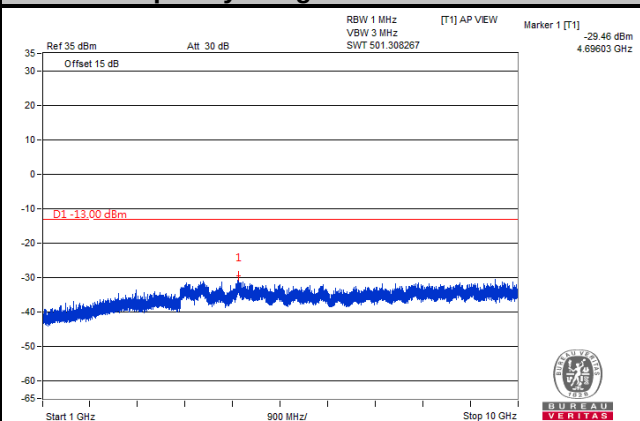


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

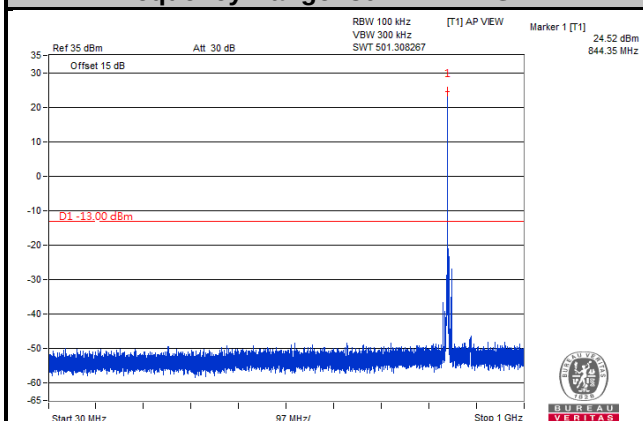


Frequency Range: 1 GHz ~ 10 GHz

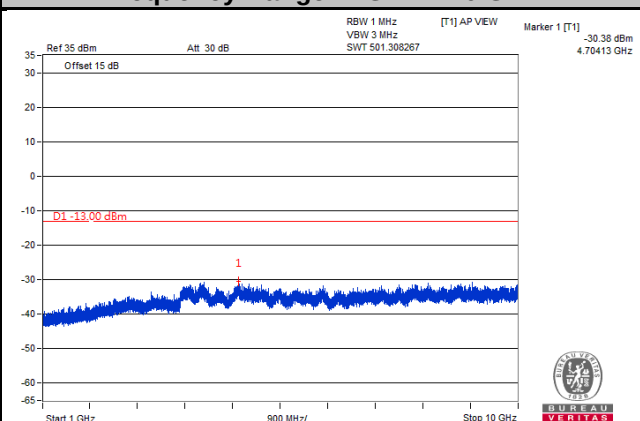


Channel 20625

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

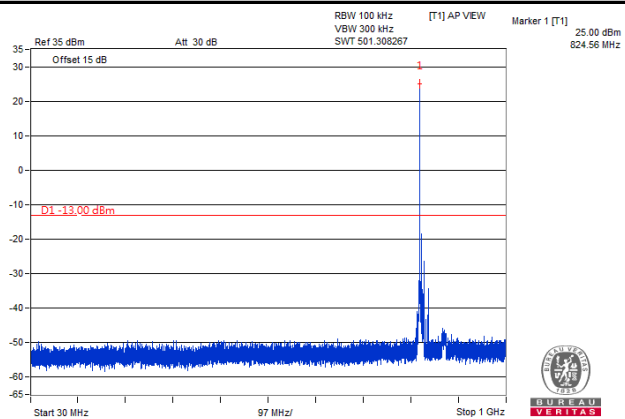


LTE Band 5

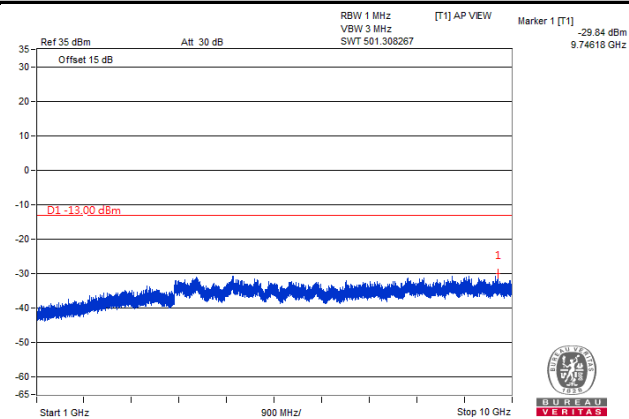
Channel Bandwidth: 10 MHz

Channel 20450

Frequency Range: 30 MHz ~ 1 GHz

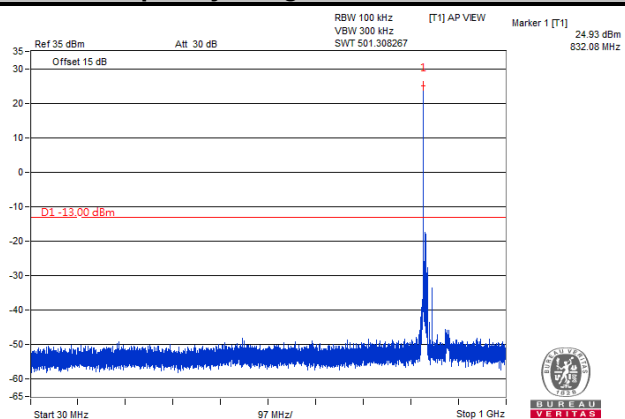


Frequency Range: 1 GHz ~ 10 GHz

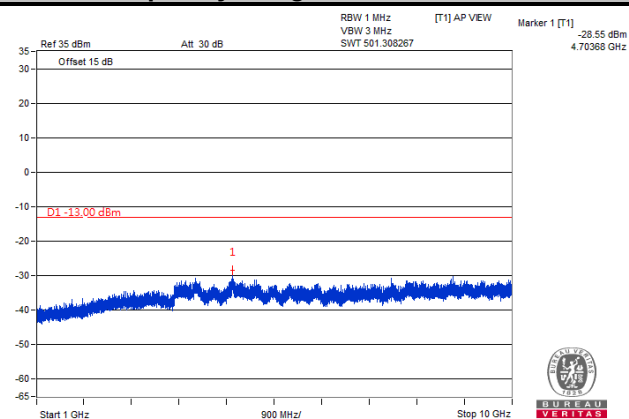


Channel 20525

Frequency Range: 30 MHz ~ 1 GHz

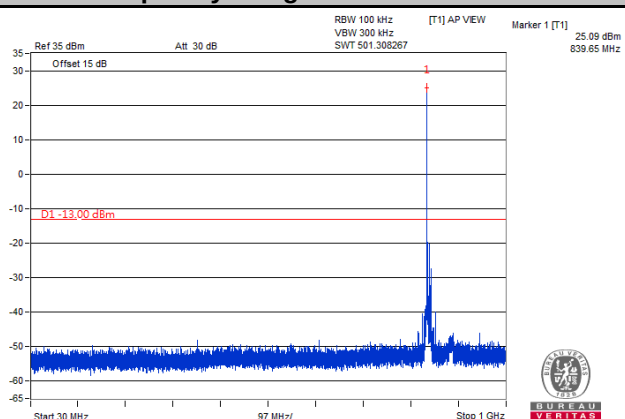


Frequency Range: 1 GHz ~ 10 GHz

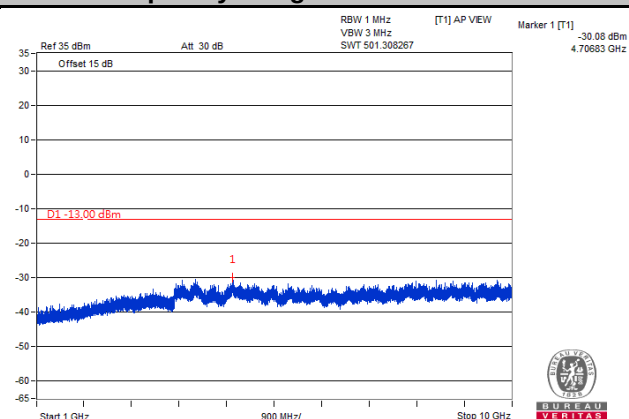


Channel 20600

Frequency Range: 30 MHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



4.8 Radiated Emission Measurement

4.8.1 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.

4.8.2 Test Procedure

- 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.
- 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
- $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}.$

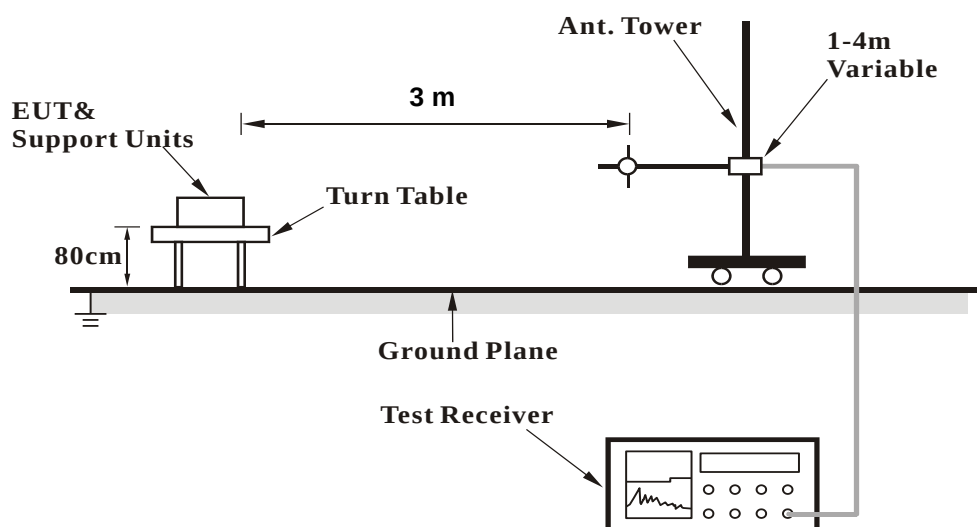
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

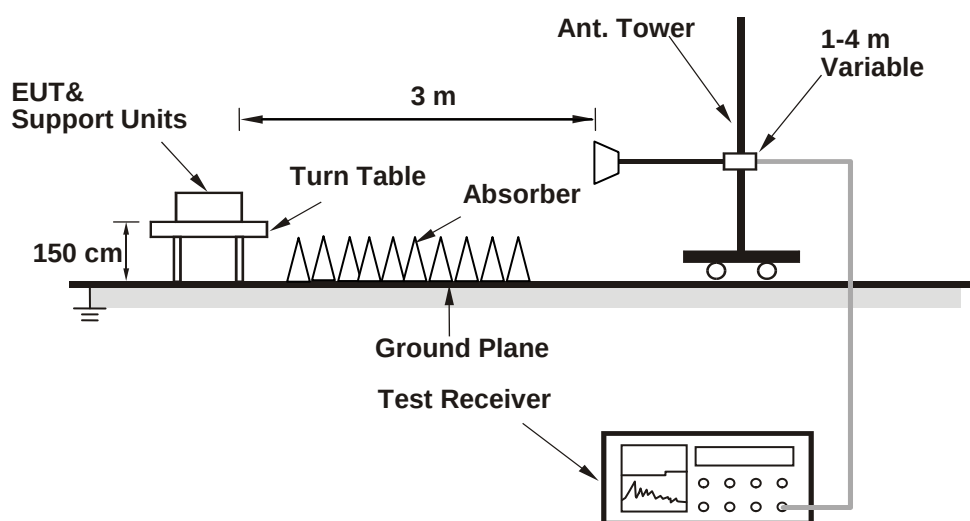
No deviation.

4.8.4 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).

4.8.5 Test Results

WCDMA:

Low Channel

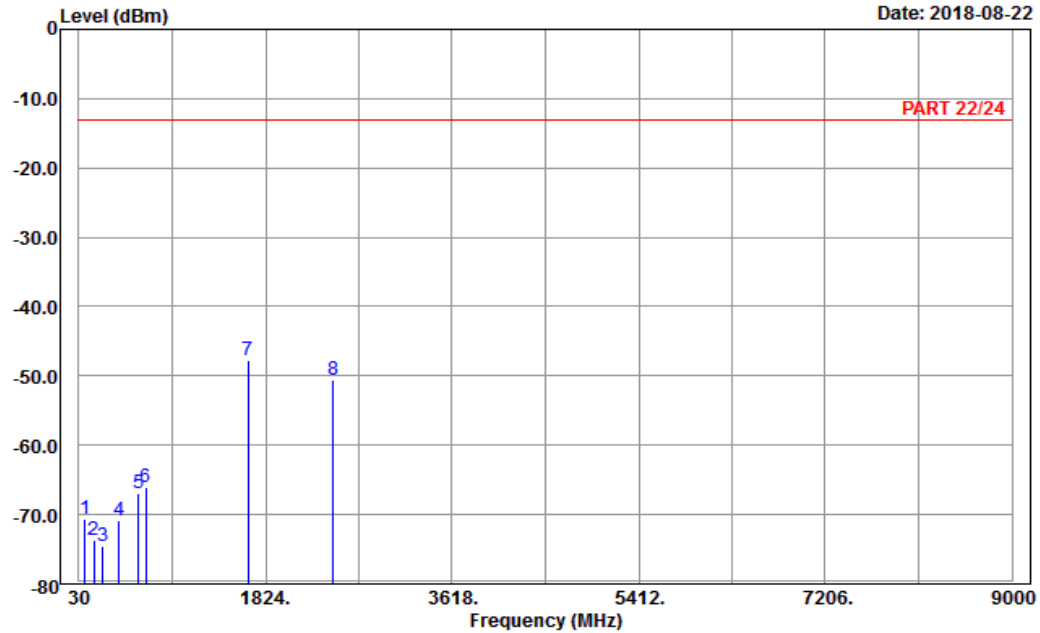


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A D T

Data: 9

Date: 2018-08-22



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : Band V_Link_CH4132
Tested by: Harry Hsueh

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	85.62	-70.64	-59.42	-13.00	-57.64	-11.22	Peak
2	177.96	-73.73	-67.95	-13.00	-60.73	-5.78	Peak
3	261.66	-74.63	-69.02	-13.00	-61.63	-5.61	Peak
4	413.40	-70.93	-67.89	-13.00	-57.93	-3.04	Peak
5	604.50	-67.02	-67.40	-13.00	-54.02	0.38	Peak
6	677.30	-66.04	-65.77	-13.00	-53.04	-0.27	Peak
7 pp	1652.80	-47.77	-55.50	-13.00	-34.77	7.73	Peak
8	2479.20	-50.50	-61.53	-13.00	-37.50	11.03	Peak

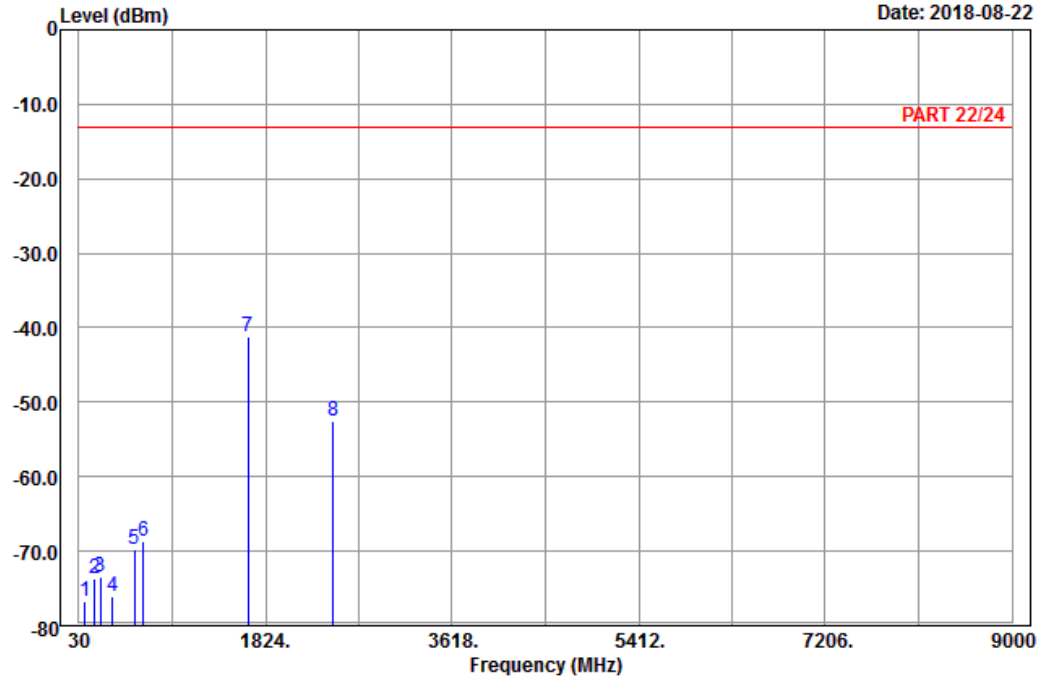


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A D T

Data: 10

Date: 2018-08-22



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	85.62	-76.63	-65.41	-13.00	-63.63	-11.22	Peak
2	181.47	-73.77	-68.18	-13.00	-60.77	-5.59	Peak
3	238.98	-73.46	-67.80	-13.00	-60.46	-5.66	Peak
4	354.60	-76.18	-71.06	-13.00	-63.18	-5.12	Peak
5	566.70	-69.73	-68.75	-13.00	-56.73	-0.98	Peak
6	652.10	-68.61	-68.47	-13.00	-55.61	-0.14	Peak
7 pp	1652.80	-41.22	-48.95	-13.00	-28.22	7.73	Peak
8	2479.20	-52.49	-63.52	-13.00	-39.49	11.03	Peak

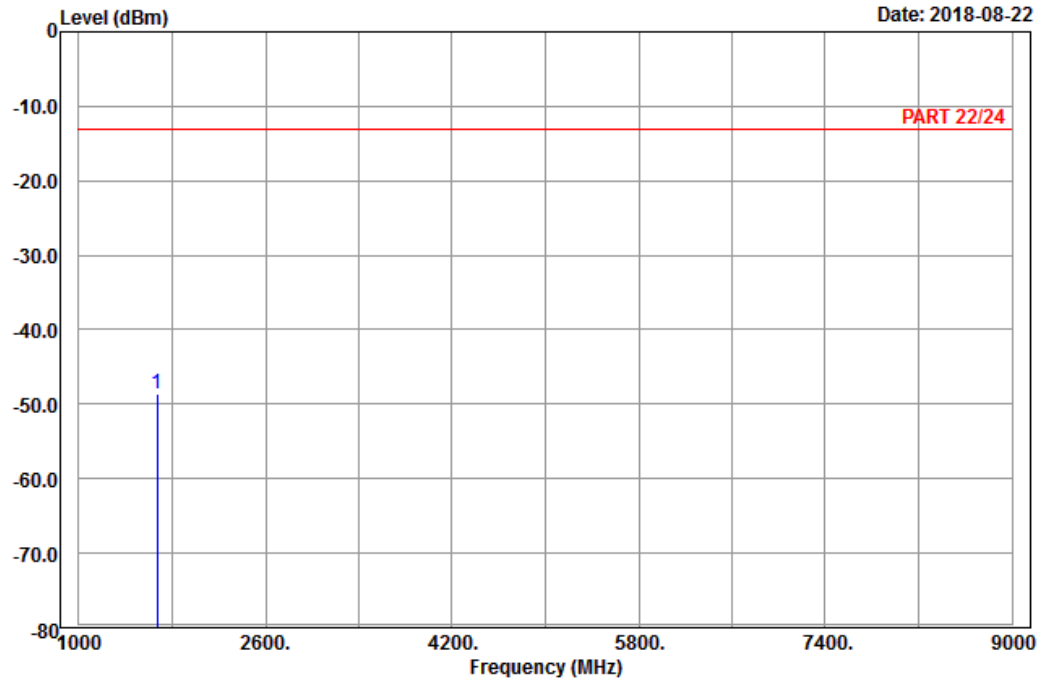
Middle Channel



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A D T

Data: 5



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

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1672.80	-48.64	-56.55	-13.00	-35.64	7.91	Peak

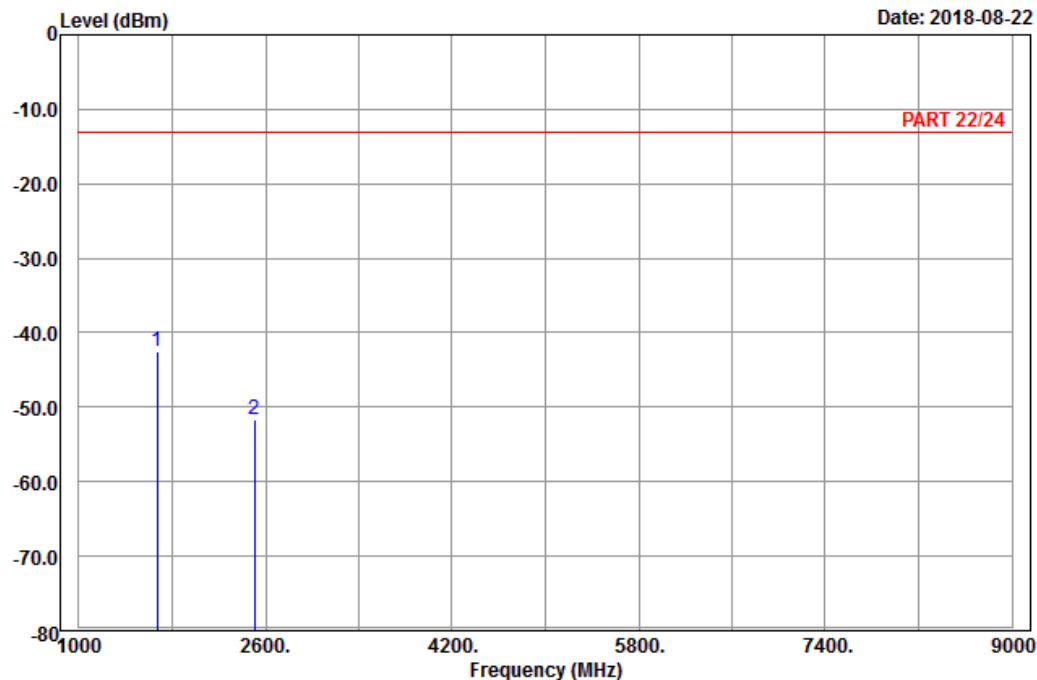


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A D T

Data: 6

Date: 2018-08-22



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1672.80	-42.50	-50.41	-13.00	-29.50	7.91	Peak
2	2509.20	-51.57	-62.85	-13.00	-38.57	11.28	Peak

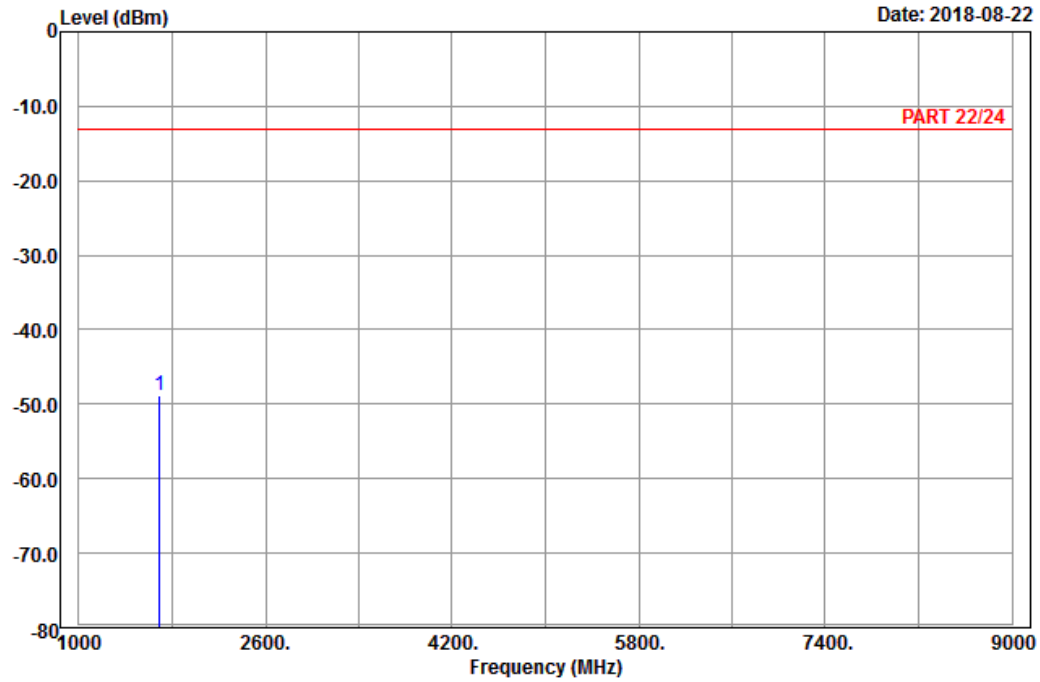
High Channel



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A D T

Data: 5



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

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1693.20	-48.78	-56.92	-13.00	-35.78	8.14	Peak

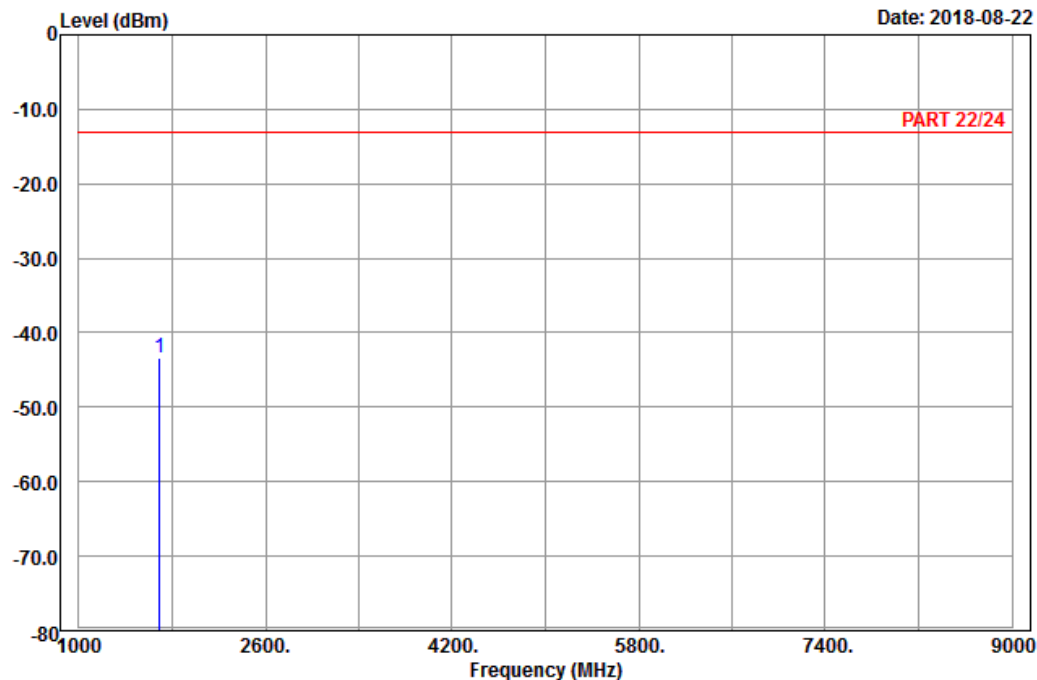


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A D T

Data: 6

Date: 2018-08-22



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

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1693.20	-43.41	-51.55	-13.00	-30.41	8.14	Peak

LTE Band 5
Channel Bandwidth: 1.4 MHz / QPSK
Low Channel

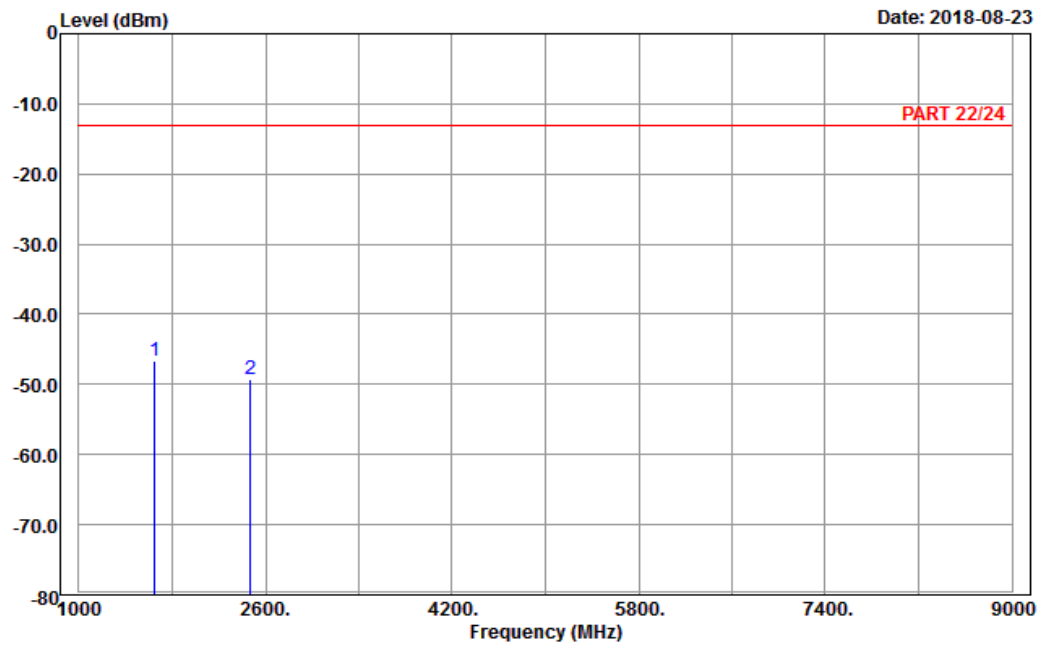


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A D T

Data: 5

Date: 2018-08-23



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_CH20407
Tested by: Harry Hsueh

			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1649.40	-46.57	-54.30	-13.00	-33.57	7.73	Peak
2	2474.10	-49.27	-60.30	-13.00	-36.27	11.03	Peak

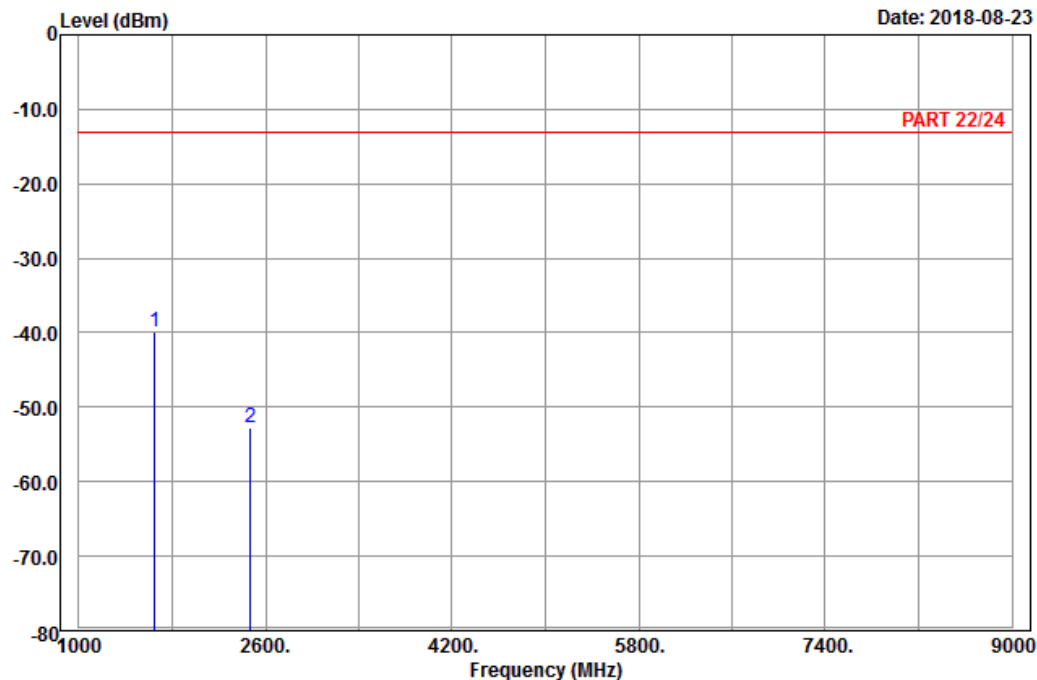


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A D T

Data: 6

Date: 2018-08-23



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_CH20407
Tested by: Harry Hsueh

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1649.40	-39.81	-47.54	-13.00	-26.81	7.73	Peak
2	2474.10	-52.79	-63.82	-13.00	-39.79	11.03	Peak

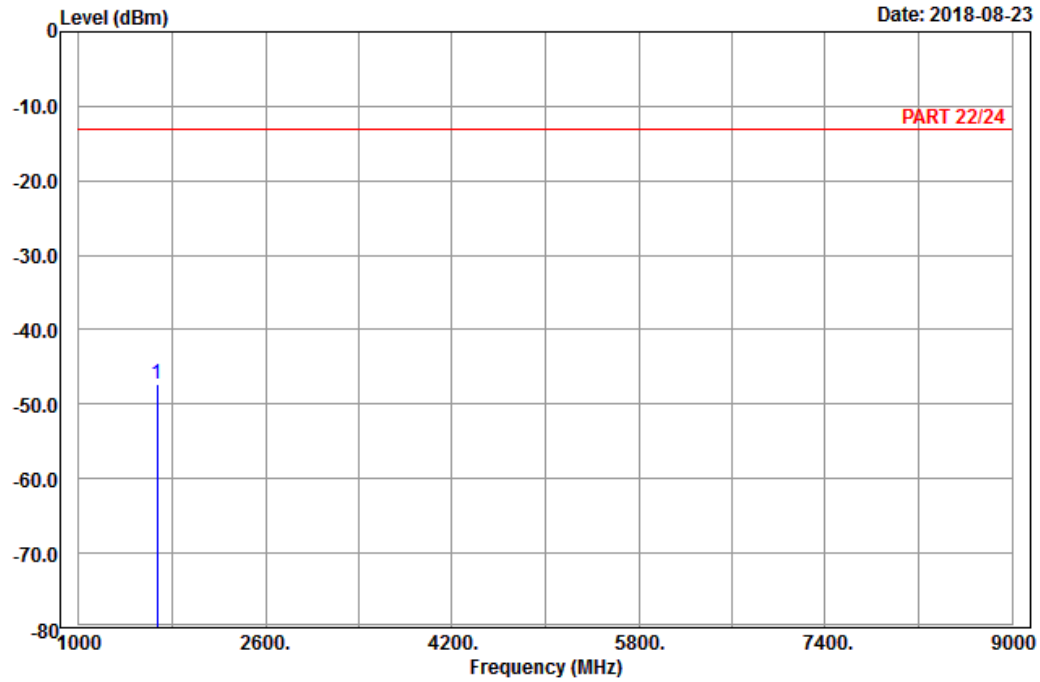
Middle Channel



Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 5



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

			Read	Limit	Over		
Freq	Level	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dBm	dB	dB	
1 pp 1673.00	-47.33	-55.24	-13.00	-34.33	7.91	Peak	

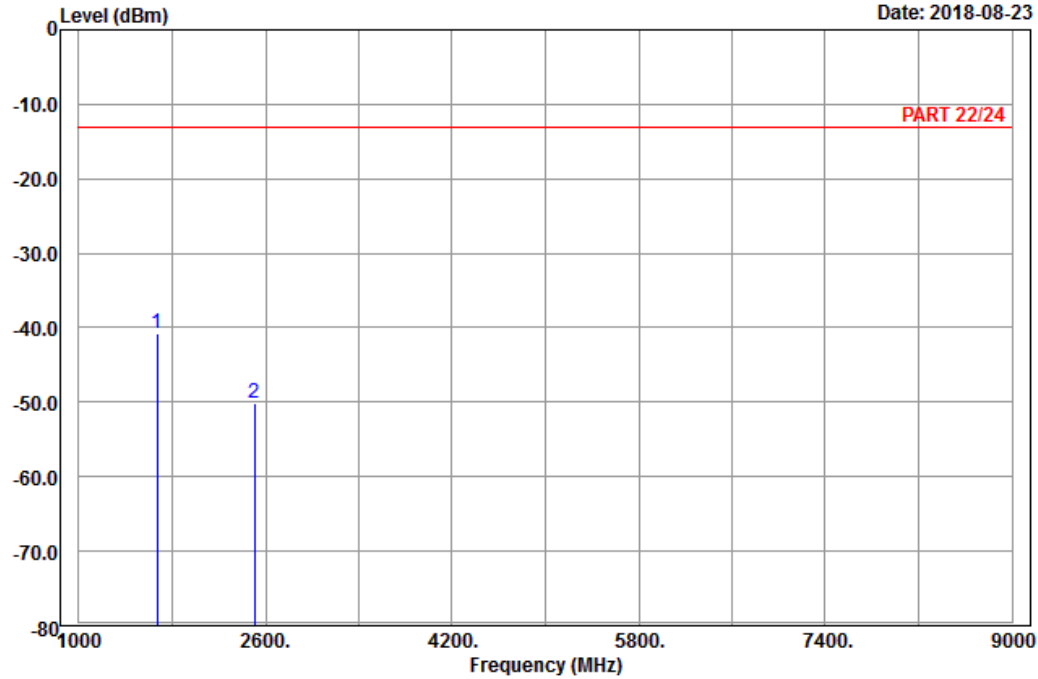


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-08-23



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1673.00	-40.80	-48.71	-13.00	-27.80	7.91	Peak
2	2509.50	-50.20	-61.48	-13.00	-37.20	11.28	Peak

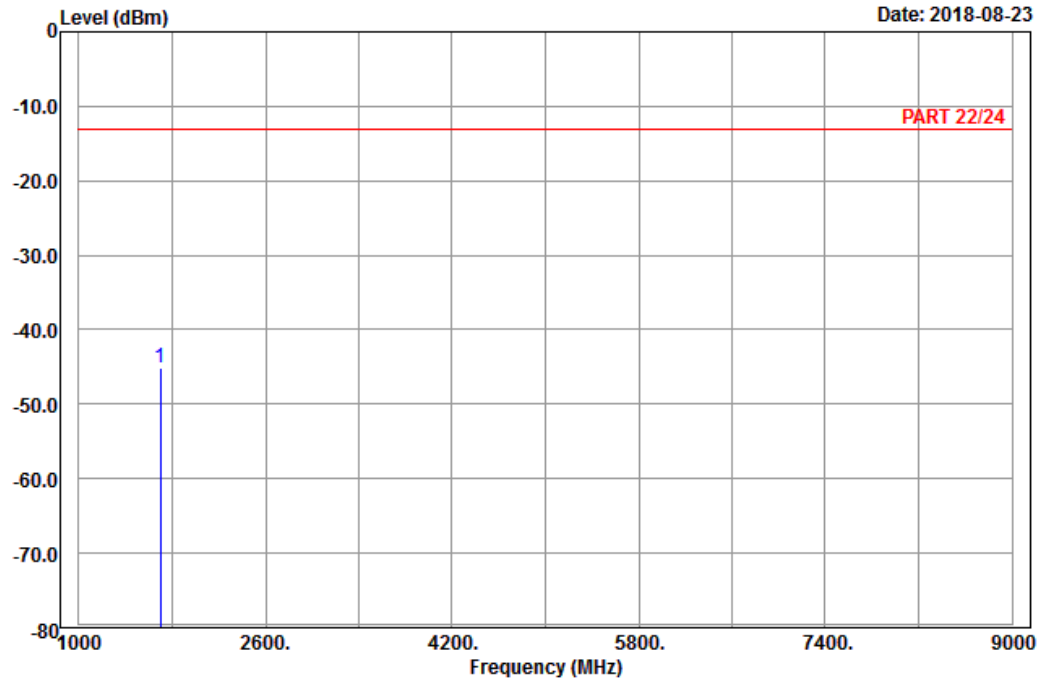
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 5_Link_CH20643
 Tested by: Harry Hsueh

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1696.60	-45.04	-53.18	-13.00	-32.04	8.14	Peak

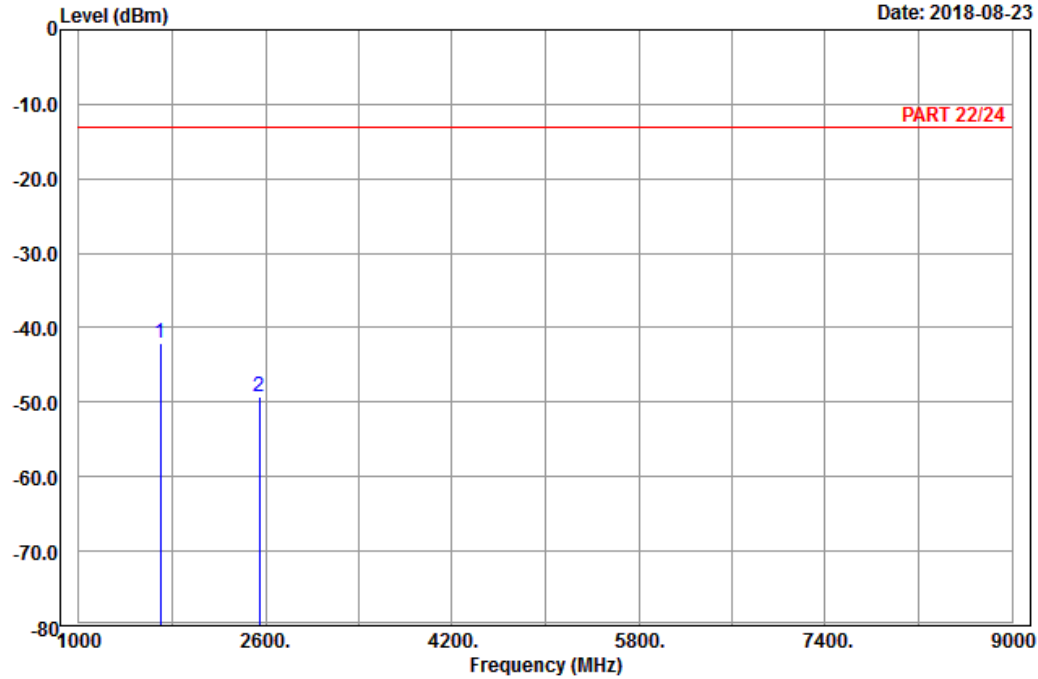


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-08-23



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_CH20643
Tested by: Harry Hsueh

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1696.60	-42.03	-50.17	-13.00	-29.03	8.14	Peak
2	2544.90	-49.20	-60.67	-13.00	-36.20	11.47	Peak

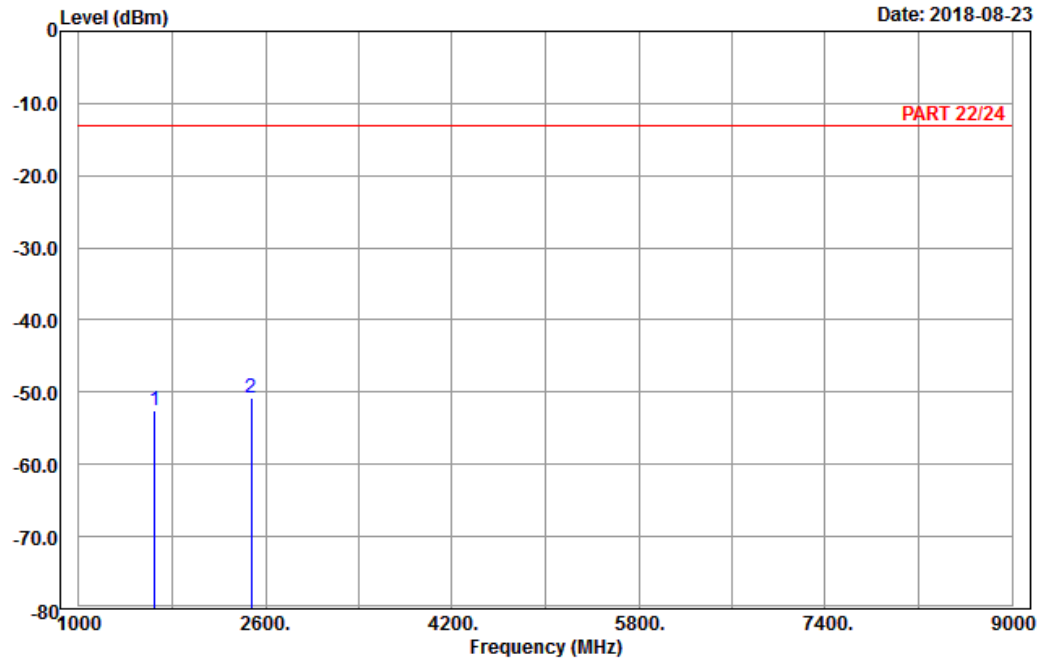
Channel Bandwidth: 5 MHz / QPSK
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_CH20425
Tested by: Harry Hsueh

			Read	Limit	Over		
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1653.00	-52.61	-60.34	-13.00	-39.61	7.73	Peak
2	2479.50	-50.71	-61.74	-13.00	-37.71	11.03	Peak

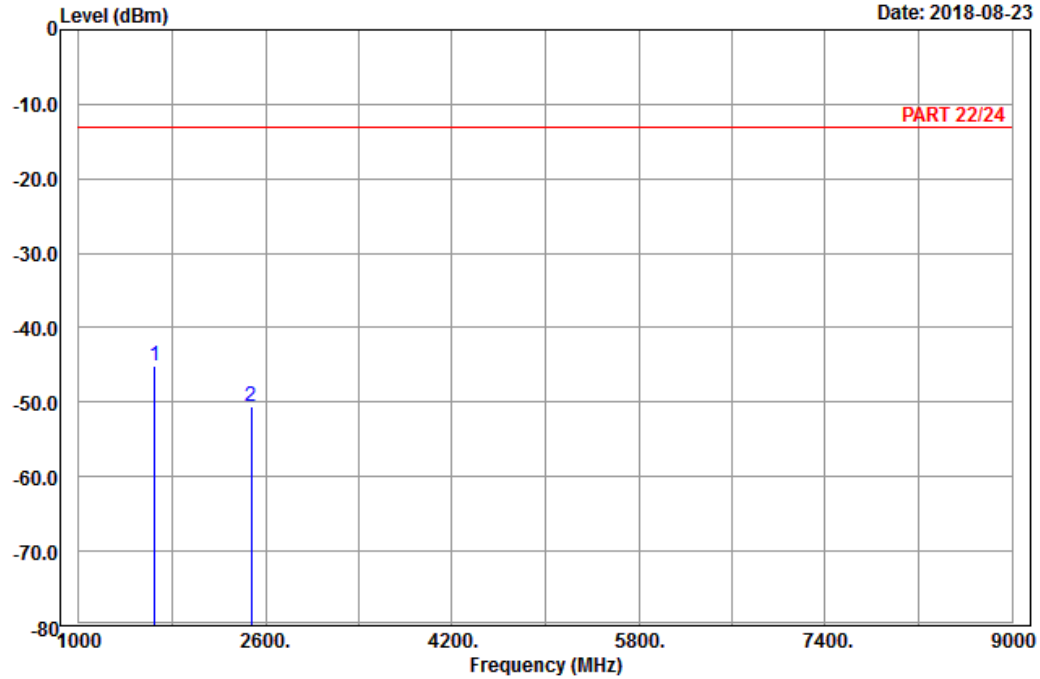


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-08-23



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_CH20425
Tested by: Harry Hsueh

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1653.00	-45.22	-52.95	-13.00	-32.22	7.73	Peak
2	2479.50	-50.62	-61.65	-13.00	-37.62	11.03	Peak

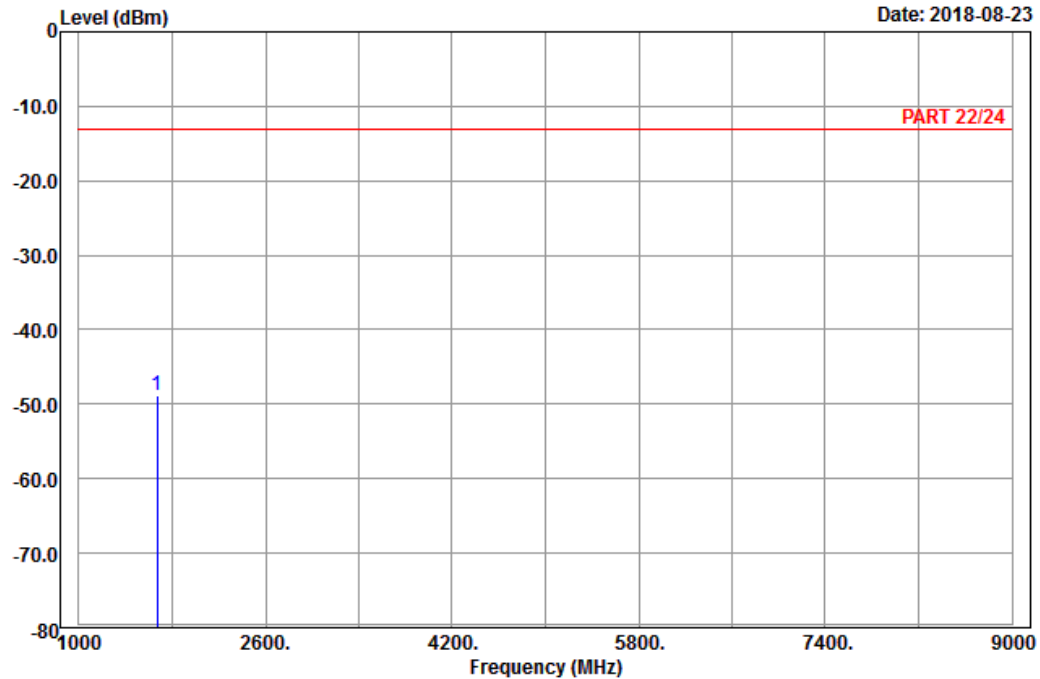
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



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

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1673.00	-48.80	-56.71	-13.00	-35.80	7.91	Peak

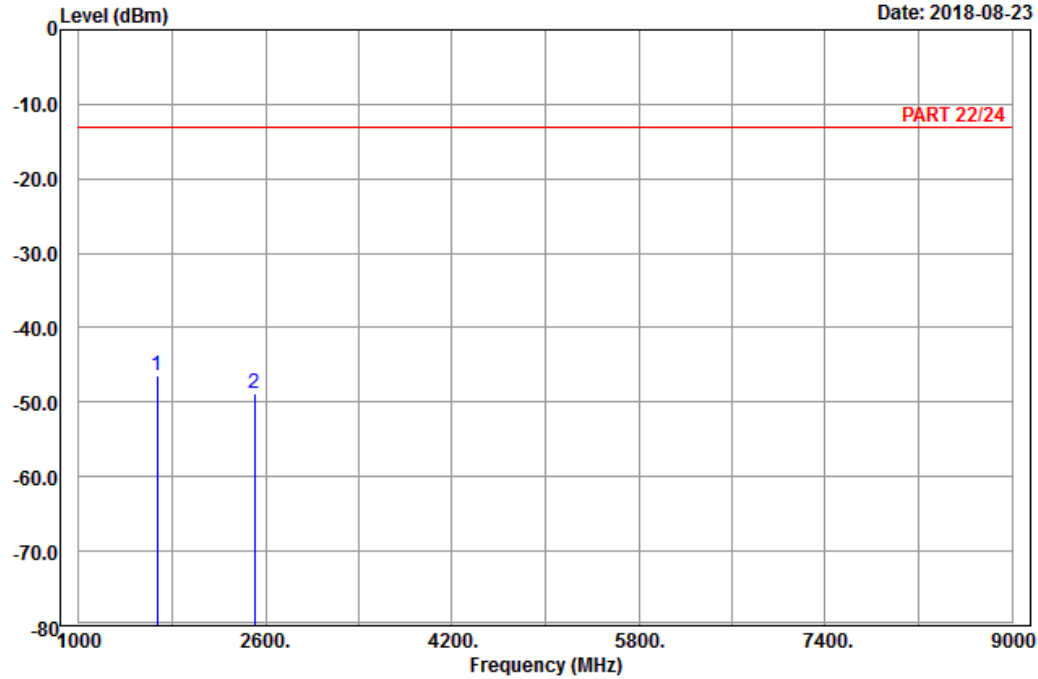


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-08-23



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1673.00	-46.45	-54.36	-13.00	-33.45	7.91	Peak
2	2509.50	-48.79	-60.07	-13.00	-35.79	11.28	Peak

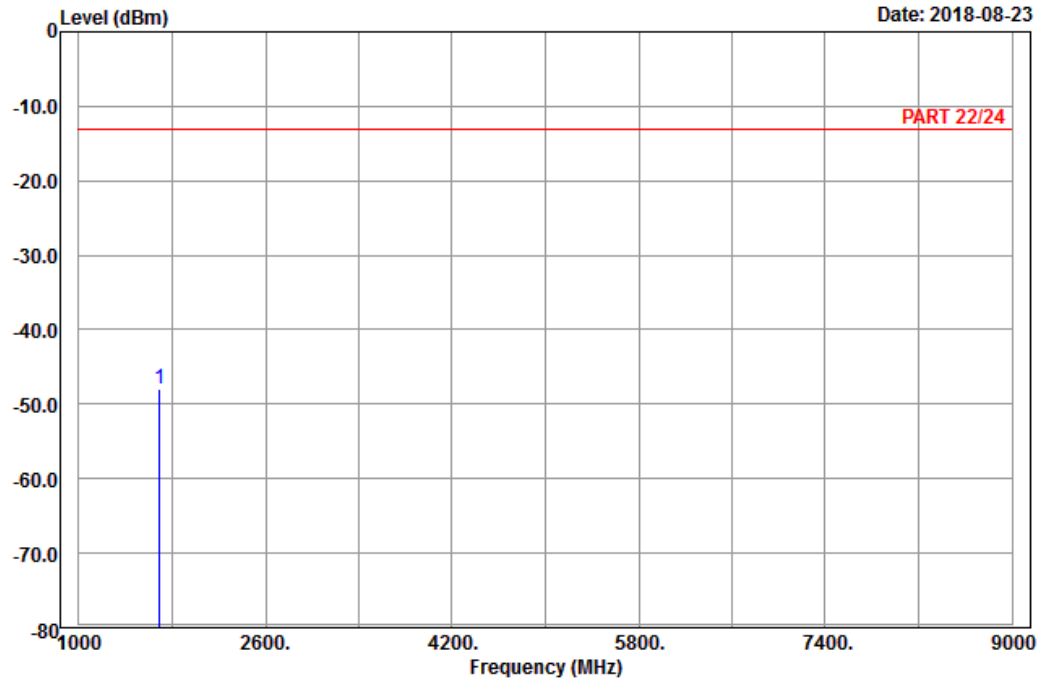
High Channel



Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_CH20625
Tested by: Harry Hsueh

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1693.00	-47.87	-55.89	-13.00	-34.87	8.02	Peak

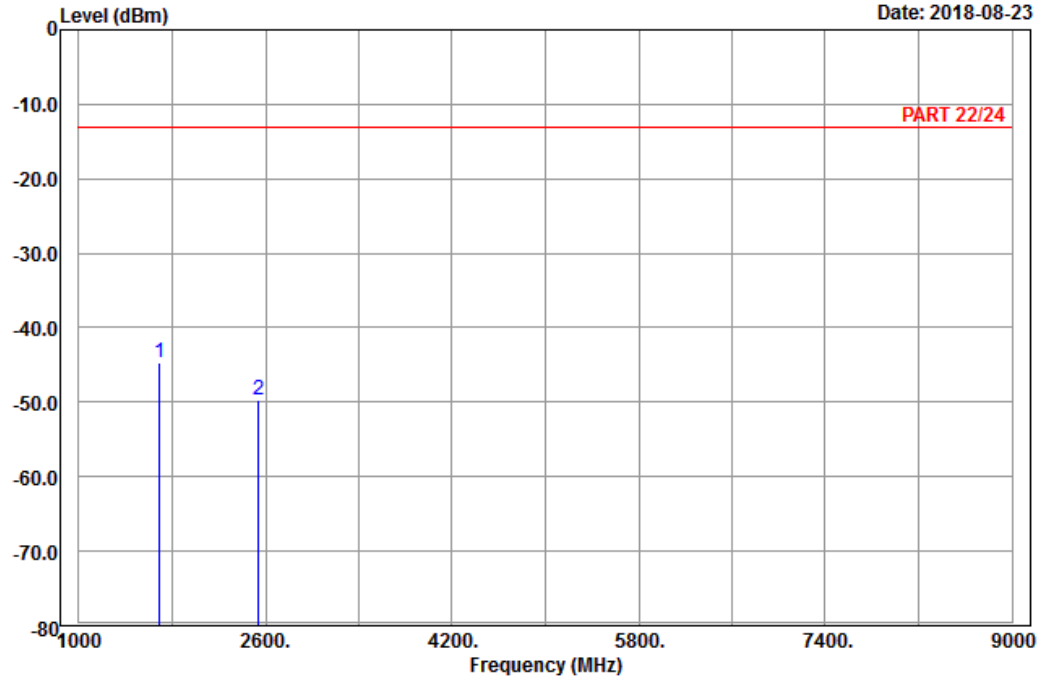


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-08-23



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 5_Link_CH20625
Tested by: Harry Hsueh

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.00	-44.74	-52.76	-13.00	-31.74	8.02	Peak
2	2539.50	-49.69	-61.16	-13.00	-36.69	11.47	Peak

Channel Bandwidth: 10 MHz / QPSK
Low Channel

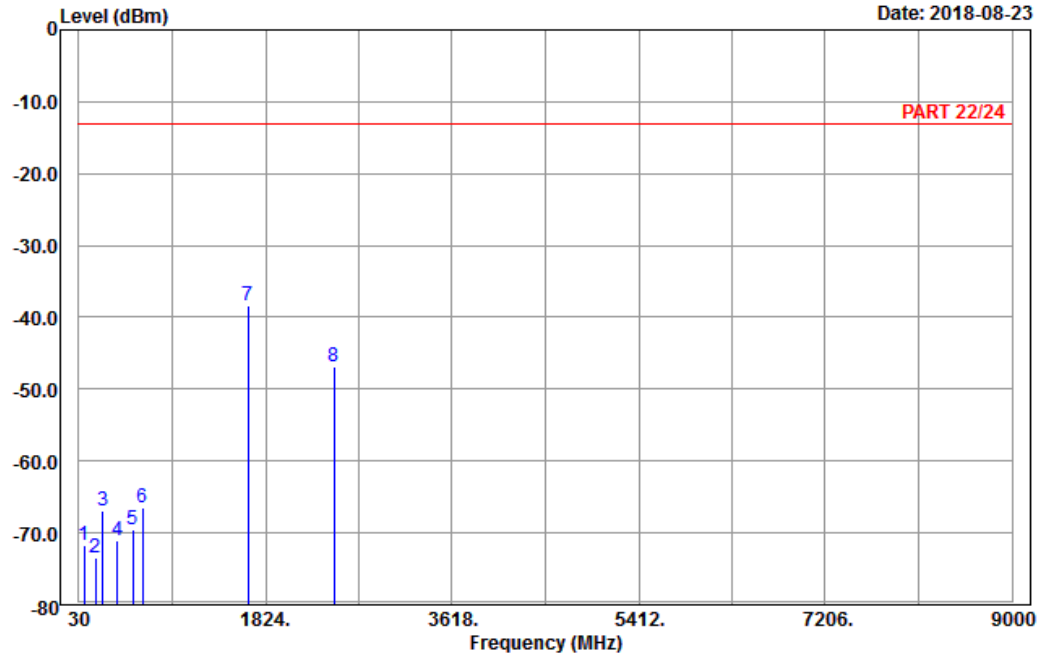


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 9

Date: 2018-08-23



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 5_Link_CH20450
Tested by: Harry Hsueh

		Read	Limit	Over			
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	84.54	-71.82	-60.49	-13.00	-58.82	-11.33	Peak
2	187.14	-73.41	-67.72	-13.00	-60.41	-5.69	Peak
3	260.31	-66.90	-61.30	-13.00	-53.90	-5.60	Peak
4	404.30	-71.10	-68.25	-13.00	-58.10	-2.85	Peak
5	547.80	-69.53	-67.73	-13.00	-56.53	-1.80	Peak
6	640.20	-66.44	-66.42	-13.00	-53.44	-0.02	Peak
7 pp	1658.00	-38.37	-46.28	-13.00	-25.37	7.91	Peak
8	2487.00	-46.83	-57.87	-13.00	-33.83	11.04	Peak

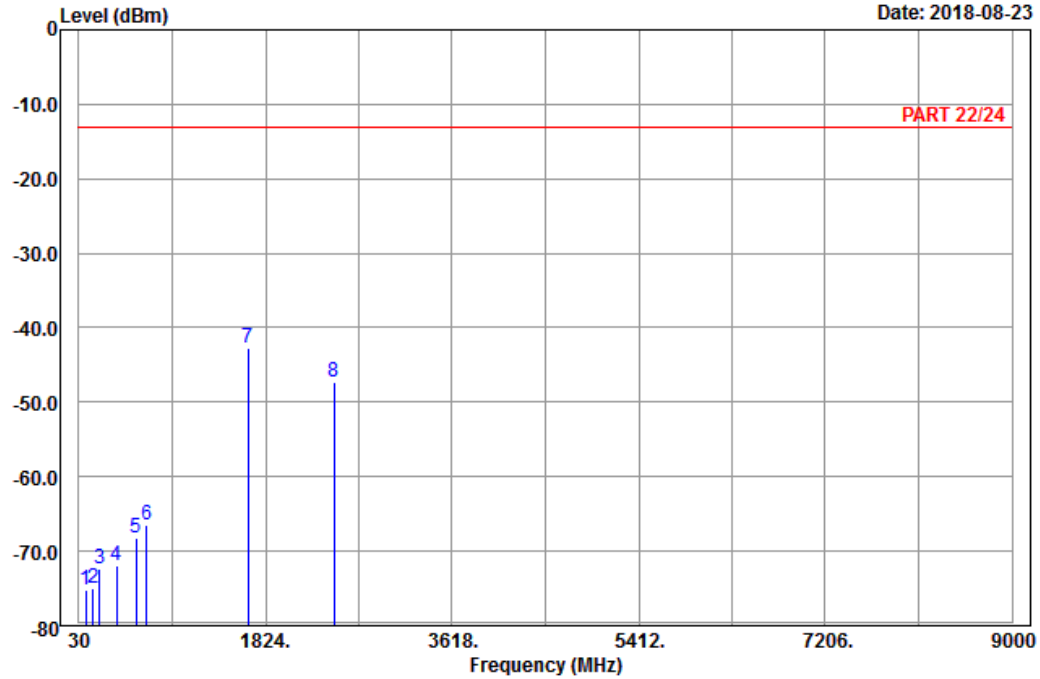


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 10

Date: 2018-08-23



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	93.18	-75.13	-64.62	-13.00	-62.13	-10.51	Peak
2	168.24	-74.98	-68.18	-13.00	-61.98	-6.80	Peak
3	225.75	-72.37	-66.54	-13.00	-59.37	-5.83	Peak
4	394.50	-71.91	-68.91	-13.00	-58.91	-3.00	Peak
5	578.60	-68.34	-67.88	-13.00	-55.34	-0.46	Peak
6	681.50	-66.38	-66.09	-13.00	-53.38	-0.29	Peak
7 pp	1658.00	-42.67	-50.58	-13.00	-29.67	7.91	Peak
8	2487.00	-47.25	-58.29	-13.00	-34.25	11.04	Peak

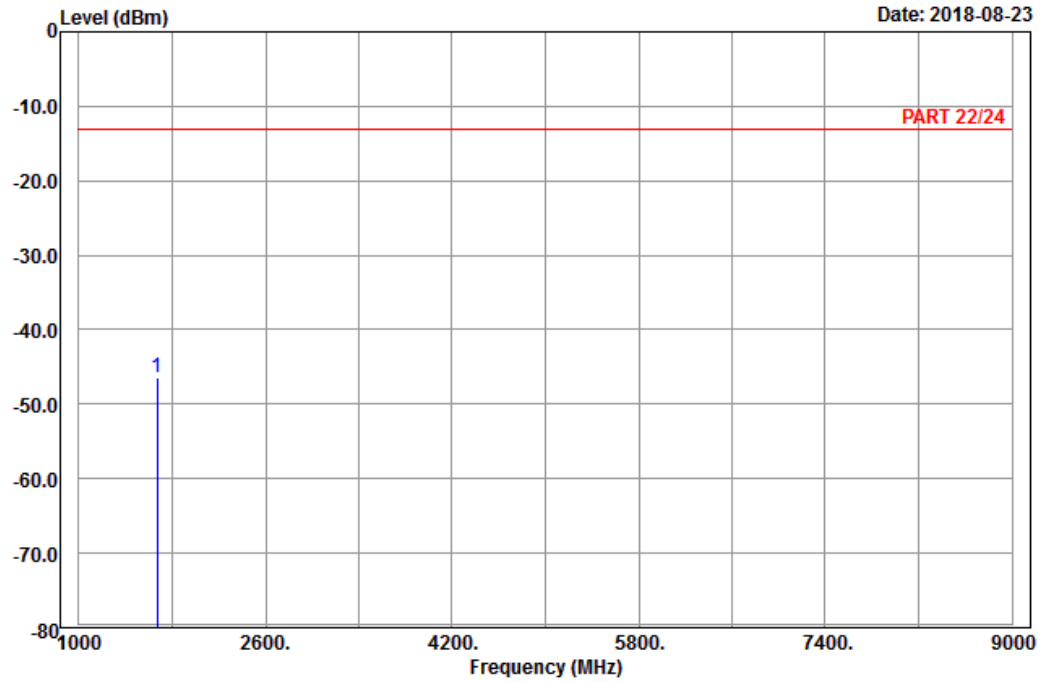
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 5



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

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1673.00	-46.51	-54.42	-13.00	-33.51	7.91	Peak

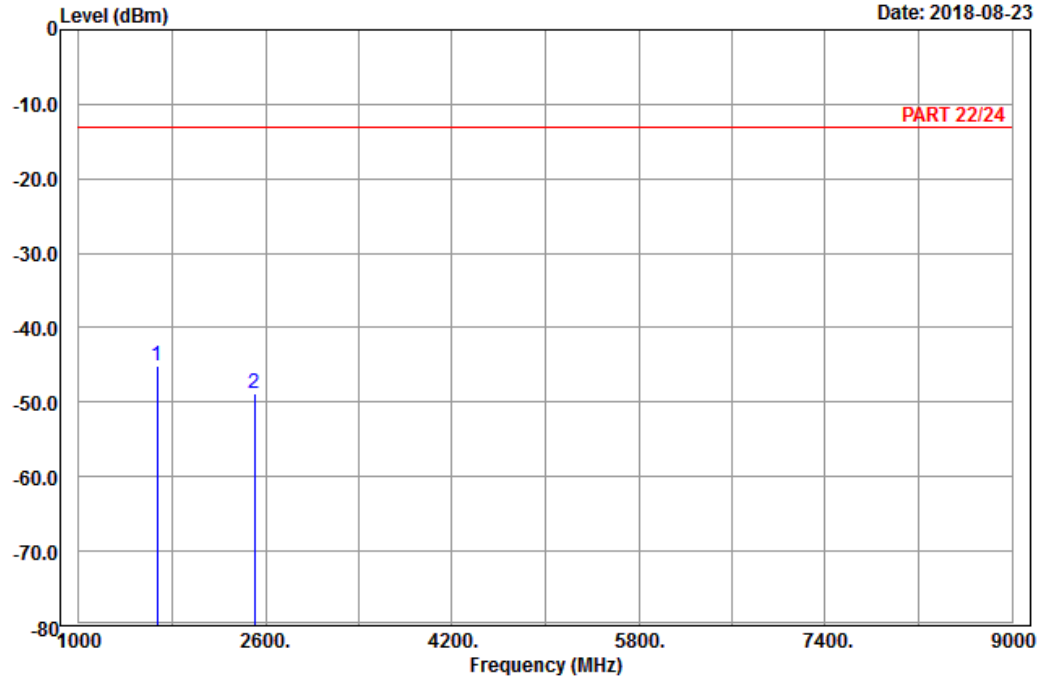


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 6

Date: 2018-08-23



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1673.00	-45.22	-53.13	-13.00	-32.22	7.91	Peak
2	2509.50	-48.83	-60.11	-13.00	-35.83	11.28	Peak

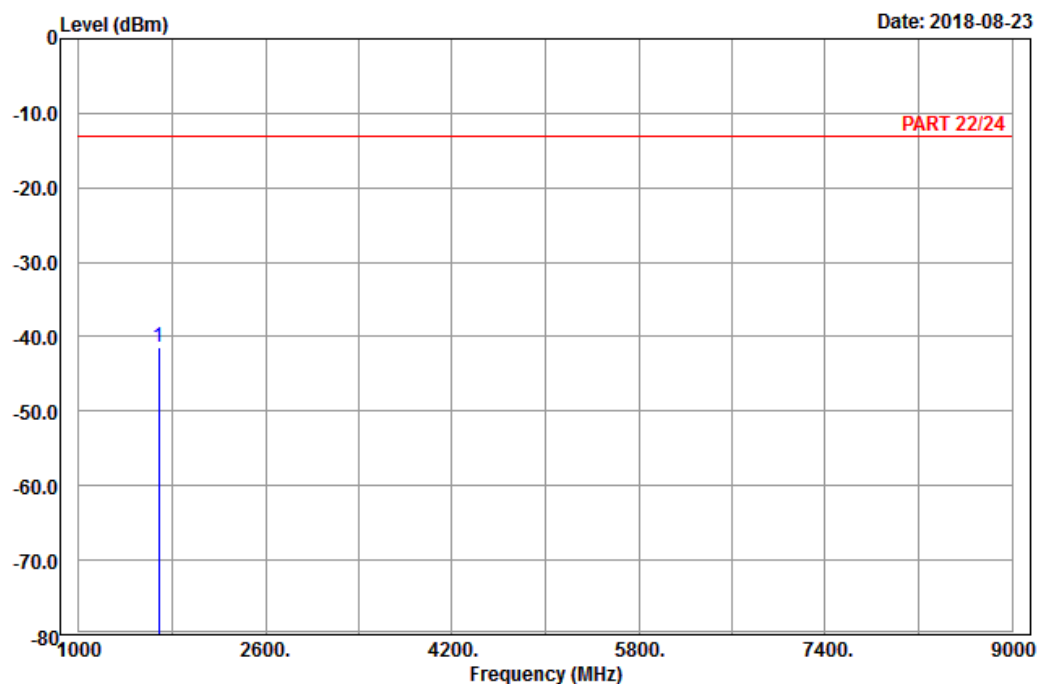
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 5



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

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1688.00	-41.36	-49.38	-13.00	-28.36	8.02	Peak

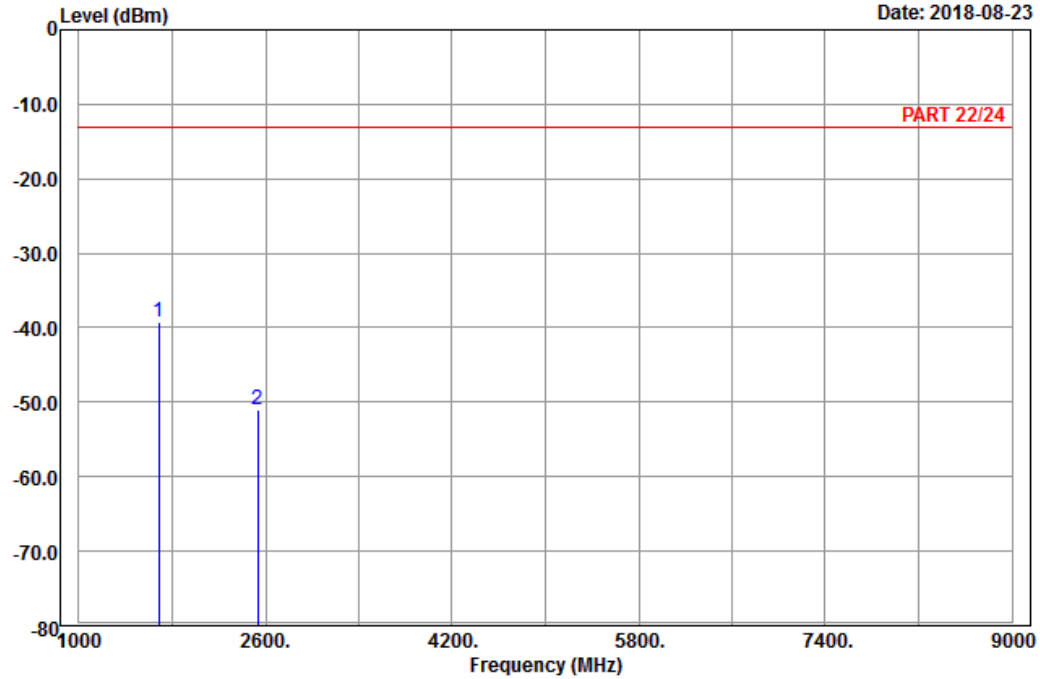


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-08-23



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1688.00	-39.17	-47.19	-13.00	-26.17	8.02	Peak
2	2532.00	-50.97	-62.35	-13.00	-37.97	11.38	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

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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