

FCC Test Report

(PART 24)

Report No.: RF200615C06-7

FCC ID: H8NTN502A1

Test Model: TN502A1

Series Model: TN502A1(WOS), access, access(WOS) (refer to item 3.1 for more details)

Received Date: Mar. 13, 2020

Test Date: Mar. 20 ~ Oct. 23, 2020

Issued Date: Oct. 28, 2020

Applicant: ASKEY COMPUTER CORP.

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Taiwan

FCC Registration / 788550 / TW0003

Designation Number: 427177 / TW0011



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Release Control Record

Issue No.	Description	Date Issued
RF200615C06-7	Original Release	Oct. 28, 2020

1 Certificate of Conformity

Product: TurboFon E4 / Handheld Device (refer to item 3.1 for more details)

Brand: TURBONET / Copernic (refer to item 3.1 for more details)

Test Model: TN502A1

Series Model: TN502A1(WOS), access, access(WOS) (refer to item 3.1 for more details)


Sample Status: Engineering Sample


Applicant: ASKEY COMPUTER CORP.

Test Date: Mar. 20 ~ Oct. 23, 2020

Standards: FCC Part 24, Subpart E

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:** Oct. 28, 2020
Lena Wang / Specialist

Approved by : , **Date:** Oct. 28, 2020
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 24.232	Effective Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
24.232(d)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 24.235	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
24.238	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 24.238	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -25.33 dB at 7400.80 MHz.

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

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.0400 dB
	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

For other test

Test Date: Mar. 20 ~ Jul. 24, 2020

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 26, 2019	Aug. 25, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jul. 17, 2019	Jul. 16, 2020
			Apr. 16, 2020	Apr. 15, 2021
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 12, 2019	Nov. 11, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2019	Apr. 16, 2020
			Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2019	Nov. 24, 2020
Preamplifier Agilent	310N	187226	Jun. 18, 2019	Jun. 19, 2020
			Jun. 17, 2020	Jun. 16, 2021
Preamplifier Agilent	83017A	MY39501357	Jun. 18, 2019	Jun. 19, 2020
			Jun. 17, 2020	Jun. 16, 2021
Preamplifier EMCI	EMC 184045	980116	Oct. 08, 2019	Oct. 07, 2020
Power Meter Anritsu	ML2495A	1012010	Sep. 04, 2019	Sep. 03, 2020
Power Sensor Anritsu	MA2411B	1315050	Sep. 04, 2019	Sep. 03, 2020
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 18, 2019	Jun. 19, 2020
			Jun. 17, 2020	Jun. 16, 2021
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 18, 2019	Jun. 19, 2020
			Jun. 17, 2020	Jun. 17, 2021
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
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	Jul. 01, 2019	Jun. 30, 2021
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2020
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 10, 2019	Sep. 09, 2020
DC Power Supply Topward	33010D	807748	NA	NA

- 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.

For Docking Mode
 Test Date: Oct. 23, 2020

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESR3	102579	Jul. 07, 2020	Jul. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 09, 2020	Jun. 08, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	9120D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna TESEQ	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 16, 2020	Aug. 15, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 23, 2020	Mar. 22, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 16, 2020	Aug. 15, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 01, 2020	May 31, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun 06, 2020	Jun 05, 2021
Communications Tester- Wireless Agilent	8960 Series 10	MY53201073	Jul. 01, 2019	Jun. 30, 2021
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 09, 2020	Sep. 08, 2021
DC Power Supply Topward	33010D	807748	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.

3 General Information

3.1 General Description of EUT

Product	TurboFon E4 / Handheld Device	
Brand	TURBONET / Coppernic	
Test Model	TN502A1	
Series Model	TN502A1(WOS), access, access(WOS)	
Model Difference	Refer to Note	
Status of EUT	Engineering Sample	
Power Supply Rating	3.85Vdc (from battery) 5.0Vdc / 9.0Vdc / 12.0Vdc (from adapter)	
Modulation Type	GSM/GPRS	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	QPSK
	LTE	QPSK, 16QAM
Frequency Range	GSM/GPRS/EDGE	1850.2 ~ 1909.8 MHz
	WCDMA	1852.4 ~ 1907.6 MHz
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1850.7 ~ 1909.3 MHz
	LTE Band 2 (Channel Bandwidth: 3 MHz)	1851.5 ~ 1908.5 MHz
	LTE Band 2 (Channel Bandwidth: 5 MHz)	1852.5 ~ 1907.5 MHz
	LTE Band 2 (Channel Bandwidth: 10 MHz)	1855.0 ~ 1905.0 MHz
	LTE Band 2 (Channel Bandwidth: 15 MHz)	1857.5 ~ 1902.5 MHz
	LTE Band 2 (Channel Bandwidth: 20 MHz)	1860.0 ~ 1900.0 MHz
Max. EIRP Power	GSM/GPRS	1425.61 mW
	EDGE	574.12 mW
	WCDMA	362.24 mW
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	348.34 mW
	LTE Band 2 (Channel Bandwidth: 3 MHz)	351.56 mW
	LTE Band 2 (Channel Bandwidth: 5 MHz)	354.00 mW
	LTE Band 2 (Channel Bandwidth: 10 MHz)	356.45 mW
	LTE Band 2 (Channel Bandwidth: 15 MHz)	359.75 mW
	LTE Band 2 (Channel Bandwidth: 20 MHz)	363.08 mW
Emission Designator	GSM/GPRS	249KGXW
	EDGE	247KG7W
	WCDMA	4M13F9W
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE Band 2 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 2 (Channel Bandwidth: 5 MHz)	4M50D7W
	LTE Band 2 (Channel Bandwidth: 10 MHz)	8M98D7W
	LTE Band 2 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 2 (Channel Bandwidth: 20 MHz)	18M0D7W
Antenna Type	Refer to Note as below	
Accessory Device	Refer to Note as below	
Data Cable Supplied	0.95m shielded USB cable without core	

Note:

1. All models are listed as below. Model TN502A1 is the representative for final test.

Brand	Product name	Model	Difference	
TURBONET	TurboFon E4	TN502A1	With scanner	-
		TN502A1(WOS)	Without scanner	-
Coppernic	Handheld Device	access	With scanner	Model: access is electrically identical to TN502A1, different brands and model names are for marketing purpose.
		access(WOS)	Without scanner	Model: access (WOS) is electrically identical to TN502A1(WOS), different brands and model names are for marketing purpose.

2. The antenna information is listed as below.

Antenna Type	PIFA							
Band	EDGE / WCDMA II / LTE 2	WCDMA IV / LTE 4	GSM / EDGE / WCDMA V / LTE5	LTE 7	LTE 17	LTE 26	LTE 38	LTE 41
Gain	2.25	1.93	-0.76	1.39	-2.74	-0.76	1.47	1.59

3. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

4. The EUT contains following accessory devices.

5. Battery	
Brand	ETI
Model	BP19-002710
Rating	3.85Vdc, 4000mAh. 15.4Wh

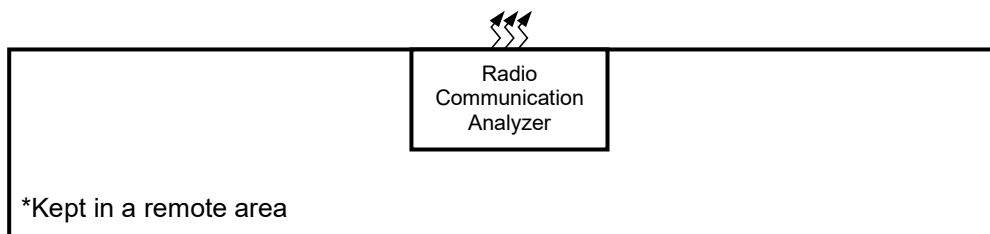
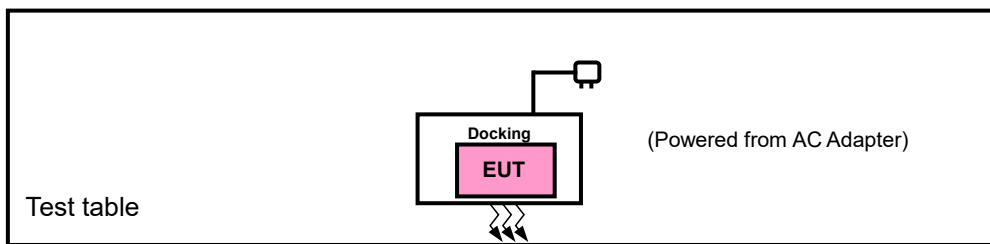
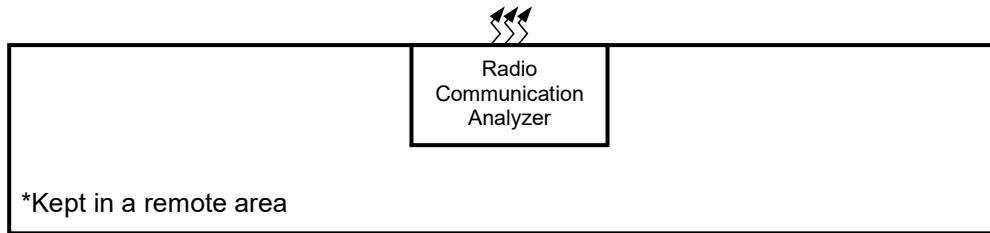
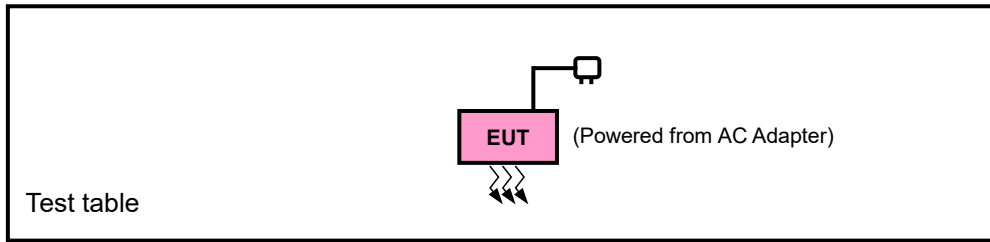
Adapter	
Brand	CHANNEL WELL TECHNOLOGY
Model	2ACP0183C
Input Power	100-240Vac~0.5A, 50/60Hz
Output Power	5.0Vdc, 3.0A, 15.0W / 9.0Vdc, 2.0A, 18.0W / 12.0Vdc, 1.5A, 18.0W

Item	Brand	Model	Description
Docking Station 1 (optional)	TURBONET	DS12310	The models and brand names of docking station are electrically identical, different models and brand names are for marketing purpose. The docking station 1 was chosen for final test.
Docking Station 2 (optional)	COPPERNIC	DS-ACCESS	
Data Cable Supplied	0.95m shielding USB cable without core		
Adapter (For docking use)			
Brand	Sunny ELECTRONICS CORP.		
Model	SYS1541-2412		
Input Power	100-240Vac, 1.0A, 50/60Hz		
Output Power	+12Vdc, 2A		
Power line	1.5m power cable without core		

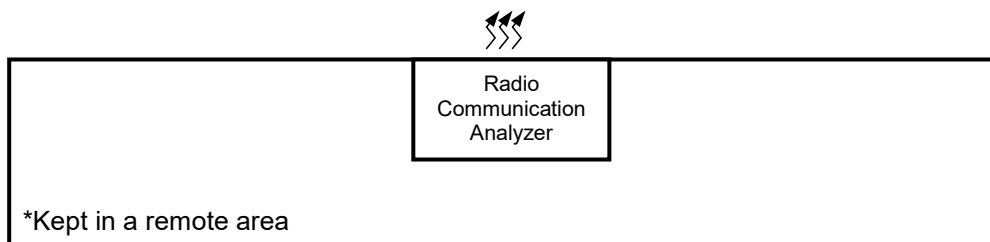
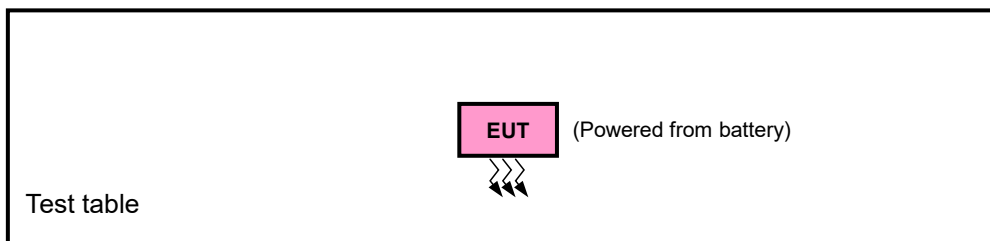
6. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test

<Radiated Emission Test>



<E.I.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
A	Adapter	CHANNEL WELL TECHNOLOGY	2ACP0183C	N/A	N/A
B	Dock	TURBONET	DS12310	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	0.95m shielded USB cable without core provided by client

Note:

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

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	EIRP	Radiated Emission
GSM	Y-plane	X-plane
EDGE	Y-plane	X-plane
WCDMA	Y-plane	X-plane
LTE Band 2	Y-plane	X-plane

GSM

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	512 to 810	512, 661, 810	GSM, EDGE
-	Modulation Characteristics	512 to 810	661	GSM, EDGE
-	Frequency Stability	512 to 810	512, 810	GSM, EDGE
-	Occupied Bandwidth	512 to 810	512, 661, 810	GSM, EDGE
-	Band Edge	512 to 810	512, 810	GSM, EDGE
-	Peak to Average Ratio	512 to 810	512, 661, 810	GSM, EDGE
-	Conducted Emission	512 to 810	512, 661, 810	GSM, EDGE
-	Radiated Emission	512 to 810	512, 661, 810	GSM, EDGE

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	9262 to 9538	9262, 9400, 9538	WCDMA
-	Modulation Characteristics	9262 to 9538	9400	WCDMA
-	Frequency Stability	9262 to 9538	9262, 9538	WCDMA
-	Occupied Bandwidth	9262 to 9538	9262, 9400, 9538	WCDMA
-	Band Edge	9262 to 9538	9262, 9538	WCDMA
-	Peak to Average Ratio	9262 to 9538	9262, 9400, 9538	WCDMA
-	Conducted Emission	9262 to 9538	9262, 9400, 9538	WCDMA
-	Radiated Emission	9262 to 9538	9262, 9400, 9538	WCDMA

LTE Band 2

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	18700 to 19100	18900	20 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
-	Frequency Stability	18607 to 19193	18607, 19193	1.4 MHz	QPSK	1 RB / 0 RB Offset
		18615 to 19185	18615, 19185	3 MHz	QPSK	1 RB / 0 RB Offset
		18625 to 19175	18625, 19175	5 MHz	QPSK	1 RB / 0 RB Offset
		18650 to 19150	18650, 19150	10 MHz	QPSK	1 RB / 0 RB Offset
		18675 to 19125	18675, 19125	15 MHz	QPSK	1 RB / 0 RB Offset
		18700 to 19100	18700, 19100	20 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Band Edge	18607 to 19193	18607	1.4 MHz	QPSK	1 RB / 0 RB Offset
			19193	1.4 MHz	QPSK	6 RB / 0 RB Offset
		18615 to 19185	18615	3 MHz	QPSK	1 RB / 5 RB Offset
			19185	3 MHz	QPSK	6 RB / 0 RB Offset
		18625 to 19175	18615	3 MHz	QPSK	1 RB / 0 RB Offset
			19185	3 MHz	QPSK	15 RB / 0 RB Offset
		18625 to 19175	18625	5 MHz	QPSK	1 RB / 14 RB Offset
			19175	5 MHz	QPSK	15 RB / 0 RB Offset
		18650 to 19150	18625	5 MHz	QPSK	1 RB / 0 RB Offset
			19175	5 MHz	QPSK	25 RB / 0 RB Offset
		18650 to 19150	18650	10 MHz	QPSK	1 RB / 24 RB Offset
			19150	10 MHz	QPSK	25 RB / 0 RB Offset
		18675 to 19125	18650	10 MHz	QPSK	1 RB / 0 RB Offset
			19150	10 MHz	QPSK	50 RB / 0 RB Offset
		18675 to 19125	18675	15 MHz	QPSK	1 RB / 49 RB Offset
			19125	15 MHz	QPSK	50 RB / 0 RB Offset
		18700 to 19100	18675	15 MHz	QPSK	1 RB / 0 RB Offset
			19125	15 MHz	QPSK	75 RB / 0 RB Offset
18700 to 19100	18700	20 MHz	QPSK	1 RB / 74 RB Offset		
	19100	20 MHz	QPSK	75 RB / 0 RB Offset		
18700 to 19100	18700	20 MHz	QPSK	1 RB / 0 RB Offset		
	19100	20 MHz	QPSK	100 RB / 0 RB Offset		
18700 to 19100	18700	20 MHz	QPSK	1 RB / 99 RB Offset		
	19100	20 MHz	QPSK	100 RB / 0 RB Offset		
-	Conducted	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK	1 RB / 0 RB Offset

	Emission	18615 to 19185	18615, 18900, 19185	3 MHz	QPSK	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only EIRP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	3.85 Vdc	Gavin Wu
Modulation Characteristics	26 deg. C, 58 % RH	3.85 Vdc	Gavin Wu
Frequency Stability	26 deg. C, 58 % RH	3.85 Vdc	Gavin Wu
Occupied Bandwidth	26 deg. C, 58 % RH	3.85 Vdc	Gavin Wu
Band Edge	26 deg. C, 58 % RH	3.85 Vdc	Gavin Wu
Peak to Average Ratio	26 deg. C, 58 % RH	3.85 Vdc	Gavin Wu
Conducted Emission	26 deg. C, 58 % RH	3.85 Vdc	Gavin Wu
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	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 and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 24

ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

NOTE: All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.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 1MHz for GSM, EDGE, 5MHz for WCDMA mode and 5MHz, 10MHz, 15MHz, 20MHz for LTE mode, and $VBW \geq 3 \times RBW$.
- 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 form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$.

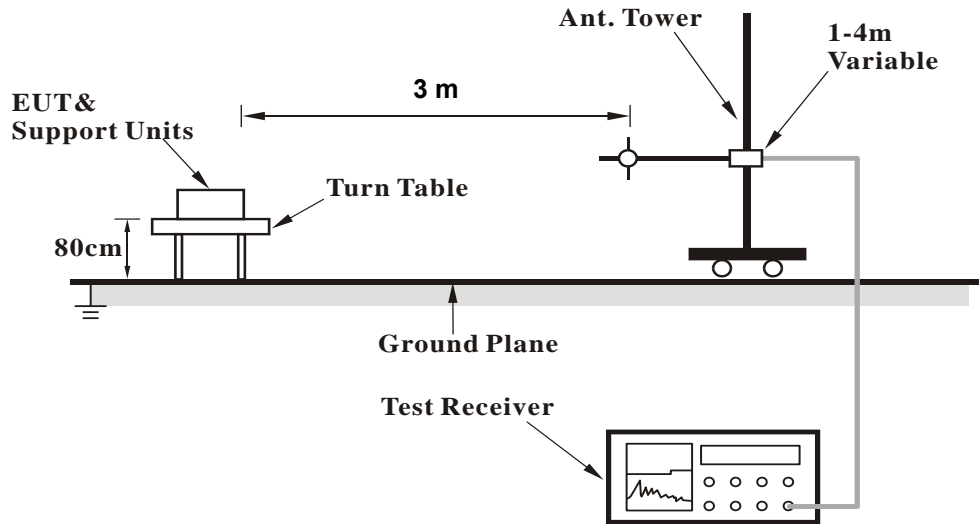
Conducted Power Measurement:

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

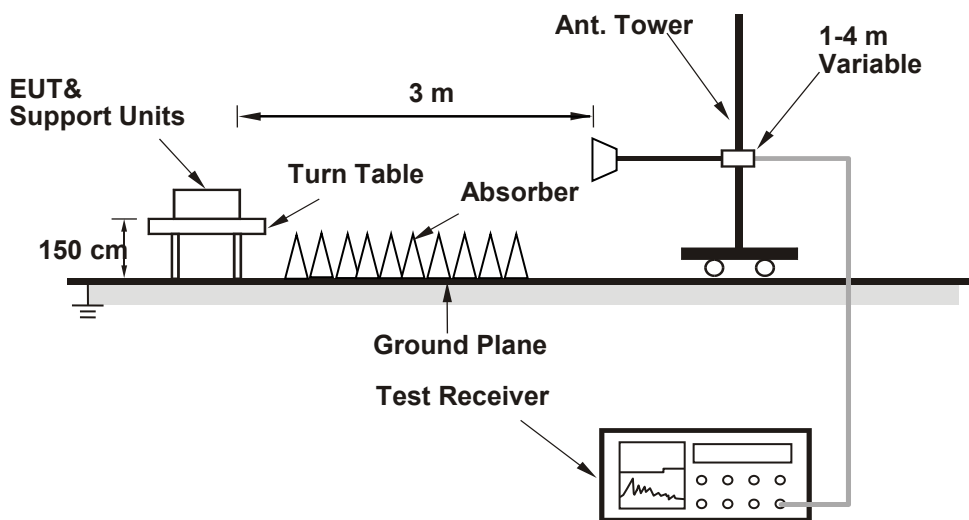
4.1.3 Test Setup

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	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	30.48	30.42	30.19
GPRS (GMSK, 1Tx-slot)	30.46	30.41	30.28
GPRS (GMSK, 2Tx-slot)	27.57	27.52	27.39
GPRS (GMSK, 3Tx-slot)	25.53	25.48	25.35
GPRS (GMSK, 4Tx-slot)	24.45	24.4	24.27
DTM (GMSK, 2Tx-slot)	27.76	27.71	27.58
DTM (GMSK, 3Tx-slot)	25.64	25.59	25.46
EDGE (8PSK, 1Tx-slot)	25.9	25.85	25.72
EDGE (8PSK, 2Tx-slot)	25.78	25.73	25.6
EDGE (8PSK, 3Tx-slot)	25.67	25.62	25.49
EDGE (8PSK, 4Tx-slot)	25.6	25.55	25.42
DTM (8PSK, 2Tx-slot)	26.67	26.62	26.49
DTM (8PSK, 3Tx-slot)	25.61	25.56	25.43

Band	WCDMA II		
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6
RMC 12.2K	23.95	23.79	23.91
HSDPA Subtest-1	22.92	22.77	22.84
HSDPA Subtest-2	22.93	22.85	22.88
HSDPA Subtest-3	22.44	22.31	22.37
HSDPA Subtest-4	22.43	22.37	22.39
DC-HSDPA Subtest-1	22.9	22.75	22.82
DC-HSDPA Subtest-2	22.91	22.83	22.86
DC-HSDPA Subtest-3	22.42	22.29	22.35
DC-HSDPA Subtest-4	22.41	22.35	22.37
HSUPA Subtest-1	22.9	22.77	22.87
HSUPA Subtest-2	20.92	20.8	20.83
HSUPA Subtest-3	21.85	21.76	21.86
HSUPA Subtest-4	20.91	20.76	20.83
HSUPA Subtest-5	22.9	22.8	22.8

LTE Band 2																
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	
				18700	18900	19100						18675	18900	19125		
				Channel Frequency (MHz)	1860.0	1880.0						1900.0	Channel Frequency (MHz)	1857.5		1880.0
20M	QPSK	1	0	23.15	22.98	22.91	0	15M	QPSK	1	0	23.15	22.83	22.57	0	
		1	50	23.06	22.87	22.65	0			1	37	22.97	22.95	22.87	0	
		1	99	22.86	22.76	22.71	0			1	74	22.85	22.72	22.63	0	
		50	0	22.11	22.03	21.98	1			36	0	22.11	22.00	21.92	1	
		50	25	22.10	22.03	21.93	1			36	19	22.05	21.98	21.85	1	
		50	50	21.98	21.94	21.86	1			36	39	21.96	21.91	21.82	1	
		100	0	22.05	22.03	21.97	1			75	0	21.98	22.01	21.89	1	
	16QAM	1	0	22.46	22.37	22.30	1		16QAM	1	0	22.46	22.30	22.28	1	
		1	50	22.37	22.36	22.29	1			1	37	22.30	22.31	22.25	1	
		1	99	22.26	22.16	22.12	1			1	74	22.20	22.16	22.11	1	
		50	0	21.25	21.21	21.20	2			36	0	21.24	21.14	21.18	2	
		50	25	21.23	21.22	21.17	2			36	19	21.23	21.19	21.11	2	
		50	50	21.12	21.03	21.01	2			36	39	21.09	20.98	20.92	2	
		100	0	21.17	21.17	21.09	2			75	0	21.08	21.08	21.07	2	
10M	QPSK	1	0	23.15	22.70	22.46	0	5M	QPSK	1	0	23.10	22.73	22.43	0	
		1	24	22.95	22.84	22.79	0			1	12	23.00	22.91	22.72	0	
		1	49	22.74	22.63	22.56	0			1	24	22.69	22.74	22.47	0	
		25	0	21.96	21.96	21.90	1			12	0	22.01	21.89	21.72	1	
		25	12	21.88	21.97	21.72	1			12	6	22.04	21.95	21.73	1	
		25	25	21.94	21.89	21.77	1			12	13	21.93	21.85	21.65	1	
		50	0	21.96	21.82	21.78	1			25	0	21.91	21.91	21.64	1	
	16QAM	1	0	22.32	22.35	22.27	1		16QAM	1	0	22.23	22.27	22.06	1	
		1	24	22.26	22.25	22.18	1			1	12	22.23	22.31	22.21	1	
		1	49	22.20	22.09	22.00	1			1	24	22.14	22.06	22.00	1	
		25	0	21.17	21.05	21.10	2			12	0	21.07	21.09	21.09	2	
		25	12	21.07	21.13	21.01	2			12	6	21.03	21.08	21.09	2	
		25	25	21.00	20.96	20.82	2			12	13	20.98	20.95	20.87	2	
		50	0	21.03	21.09	20.98	2			25	0	20.98	21.00	21.00	2	
3M	QPSK	1	0	22.98	22.64	22.54	0	1.4M	QPSK	1	0	23.05	22.78	22.45	0	
		1	7	22.87	22.93	22.82	0			1	2	22.97	22.84	22.79	0	
		1	14	22.80	22.67	22.58	0			1	5	22.67	22.59	22.64	0	
		8	0	21.87	21.95	21.80	1			3	0	22.95	22.78	22.88	0	
		8	3	21.99	21.84	21.87	1			3	1	22.99	22.92	22.74	0	
		8	7	21.90	21.89	21.84	1			3	3	22.93	22.79	22.70	0	
		15	0	21.97	21.91	21.87	1			6	0	21.94	21.97	21.90	1	
	16QAM	1	0	22.32	22.30	22.14	1		16QAM	1	0	22.26	22.24	22.12	1	
		1	7	22.27	22.24	22.17	1			1	2	22.22	22.27	22.23	1	
		1	14	22.09	22.03	22.01	1			1	5	22.13	22.00	22.00	1	
		8	0	21.08	20.97	21.18	2			3	0	22.07	22.02	22.06	1	
		8	3	21.10	21.09	21.14	2			3	1	22.04	22.12	22.07	1	
		8	7	21.06	21.01	20.94	2			3	3	21.94	21.94	21.82	1	
		15	0	21.00	20.98	21.01	2			6	0	21.14	21.06	20.87	2	

EIRP Power (dBm)

GSM							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	512	1850.2	-6.65	38.19	31.54	1425.61	H
	661	1880.0	-7.24	38.70	31.46	1399.59	
	810	1909.8	-8.00	39.35	31.35	1364.58	
	512	1850.2	-10.54	38.48	27.94	622.30	V
	661	1880.0	-10.71	38.59	27.88	613.76	
	810	1909.8	-11.12	38.87	27.75	595.66	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

EDGE							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	512	1850.2	-10.60	38.19	27.59	574.12	H
	661	1880.0	-11.18	38.70	27.52	564.94	
	810	1909.8	-11.90	39.35	27.45	555.90	
	512	1850.2	-13.42	38.48	25.06	320.63	V
	661	1880.0	-13.60	38.59	24.99	315.50	
	810	1909.8	-13.96	38.87	24.91	309.74	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

WCDMA							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	9262	1852.4	-12.60	38.19	25.59	362.24	H
	9400	1880.0	-13.20	38.70	25.50	354.81	
	9538	1907.6	-13.89	39.35	25.46	351.56	
	9262	1852.4	-15.42	38.48	23.06	202.30	V
	9400	1880.0	-15.63	38.59	22.97	197.92	
	9538	1907.6	-16.03	38.87	22.84	192.31	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 2							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	18607	1850.7	-19.28	44.70	25.42	348.34	H
	18900	1880.0	-19.41	44.70	25.29	338.06	
	19193	1909.3	-19.22	44.57	25.35	343.00	
	18607	1850.7	-22.32	44.27	21.95	156.68	V
	18900	1880.0	-23.07	44.87	21.80	151.36	
	19193	1909.3	-22.73	44.61	21.88	154.28	
Channel Bandwidth: 1.4 MHz / 16QAM							
Y	18607	1850.7	-20.28	44.70	24.42	276.69	H
	18900	1880.0	-20.41	44.70	24.29	268.53	
	19193	1909.3	-20.23	44.57	24.34	271.83	
	18607	1850.7	-23.32	44.27	20.95	124.45	V
	18900	1880.0	-24.08	44.87	20.79	119.95	
	19193	1909.3	-23.74	44.61	20.87	122.26	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 2							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	18615	1851.5	-19.24	44.70	25.46	351.56	H
	18900	1880.0	-19.37	44.70	25.33	341.19	
	19185	1908.5	-19.18	44.57	25.39	346.18	
	18615	1851.5	-22.29	44.27	21.98	157.76	V
	18900	1880.0	-23.04	44.87	21.83	152.41	
	19185	1908.5	-22.69	44.61	21.92	155.70	
Channel Bandwidth: 3 MHz / 16QAM							
Y	18615	1851.5	-20.24	44.70	24.46	279.25	H
	18900	1880.0	-20.38	44.70	24.32	270.40	
	19185	1908.5	-20.19	44.57	24.38	274.35	
	18615	1851.5	-23.29	44.27	20.98	125.31	V
	18900	1880.0	-24.04	44.87	20.83	121.06	
	19185	1908.5	-23.70	44.61	20.91	123.40	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 2							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	18625	1852.5	-19.21	44.70	25.49	354.00	H
	18900	1880.0	-19.33	44.70	25.37	344.35	
	19175	1907.5	-19.14	44.57	25.43	349.38	
	18625	1852.5	-22.25	44.27	22.02	159.22	V
	18900	1880.0	-23.01	44.87	21.86	153.46	
	19175	1907.5	-22.65	44.61	21.96	157.14	
Channel Bandwidth: 5 MHz / 16QAM							
Y	18625	1852.5	-20.21	44.70	24.49	281.19	H
	18900	1880.0	-20.33	44.70	24.37	273.53	
	19175	1907.5	-20.15	44.57	24.42	276.89	
	18625	1852.5	-23.26	44.27	21.01	126.18	V
	18900	1880.0	-24.01	44.87	20.86	121.90	
	19175	1907.5	-23.65	44.61	20.96	124.82	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 2							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	18650	1855.0	-19.18	44.70	25.52	356.45	H
	18900	1880.0	-19.29	44.70	25.41	347.54	
	19150	1905.0	-19.11	44.57	25.46	351.80	
	18650	1855.0	-22.21	44.27	22.06	160.69	V
	18900	1880.0	-22.97	44.87	21.90	154.88	
	19150	1905.0	-22.61	44.61	22.00	158.60	
Channel Bandwidth: 10 MHz / 16QAM							
Y	18650	1855.0	-20.18	44.70	24.52	283.14	H
	18900	1880.0	-20.30	44.70	24.40	275.42	
	19150	1905.0	-20.11	44.57	24.46	279.45	
	18650	1855.0	-23.21	44.27	21.06	127.64	V
	18900	1880.0	-23.97	44.87	20.90	123.03	
	19150	1905.0	-23.62	44.61	20.99	125.69	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 2							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	18675	1857.5	-19.14	44.70	25.56	359.75	H
	18900	1880.0	-19.25	44.70	25.45	350.75	
	19125	1902.5	-19.07	44.57	25.50	355.06	
	18675	1857.5	-22.17	44.27	22.10	162.18	V
	18900	1880.0	-22.93	44.87	21.94	156.31	
	19125	1902.5	-22.57	44.61	22.04	160.07	
Channel Bandwidth: 15 MHz / 16QAM							
Y	18675	1857.5	-20.15	44.70	24.55	285.10	H
	18900	1880.0	-20.25	44.70	24.45	278.61	
	19125	1902.5	-20.08	44.57	24.49	281.38	
	18675	1857.5	-23.18	44.27	21.09	128.53	V
	18900	1880.0	-23.94	44.87	20.93	123.88	
	19125	1902.5	-23.57	44.61	21.04	127.15	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 2							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Y	18700	1860.0	-19.10	44.70	25.60	363.08	H
	18900	1880.0	-19.21	44.70	25.49	354.00	
	19100	1900.0	-19.03	44.57	25.54	358.34	
	18700	1860.0	-22.14	44.27	22.13	163.31	V
	18900	1880.0	-22.89	44.87	21.98	157.76	
	19100	1900.0	-22.53	44.61	22.08	161.55	
Channel Bandwidth: 20 MHz / 16QAM							
Y	18700	1860.0	-20.10	44.70	24.60	288.40	H
	18900	1880.0	-20.22	44.70	24.48	280.54	
	19100	1900.0	-20.04	44.57	24.53	283.99	
	18700	1860.0	-23.14	44.27	21.13	129.72	V
	18900	1880.0	-23.89	44.87	20.98	125.31	
	19100	1900.0	-23.54	44.61	21.07	128.03	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

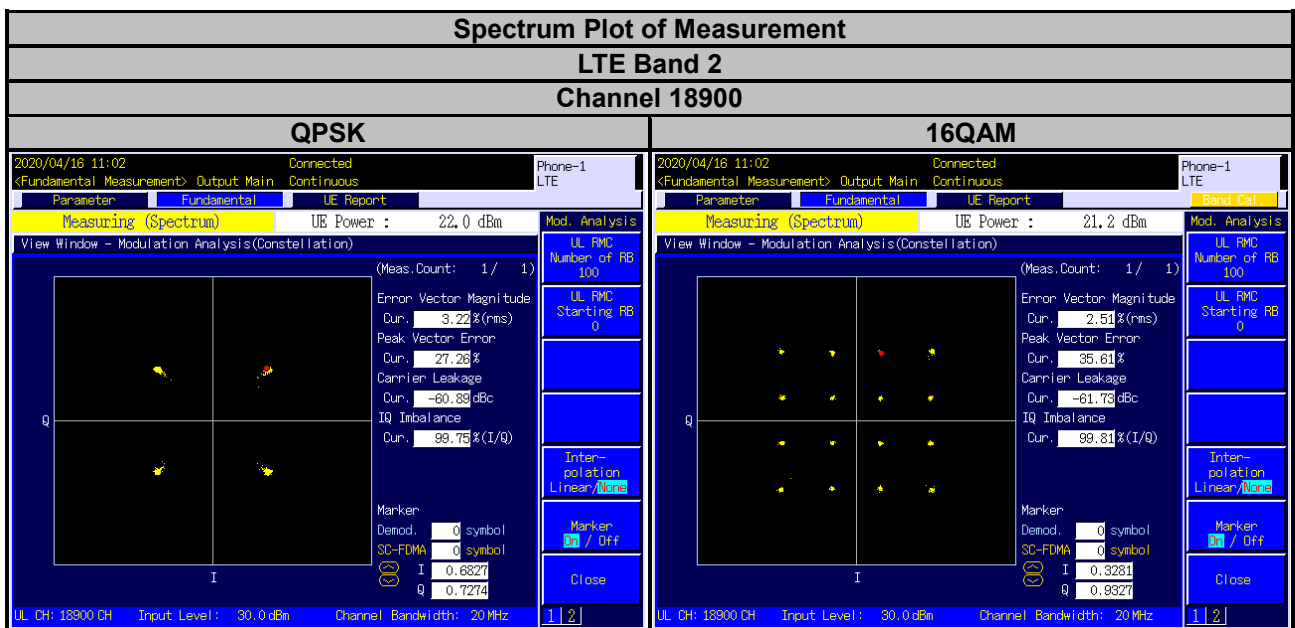
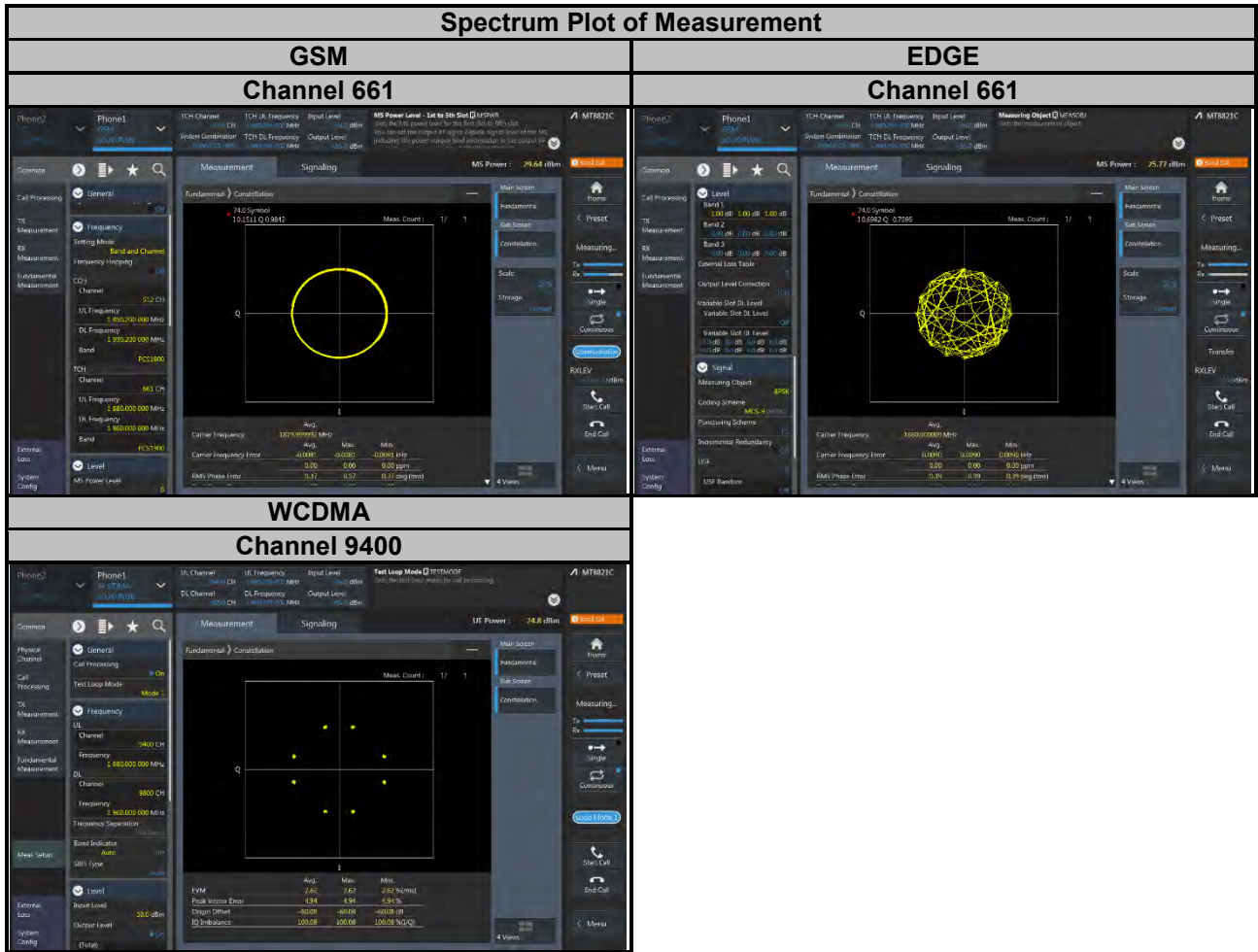
4.2.2 Test Setup



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

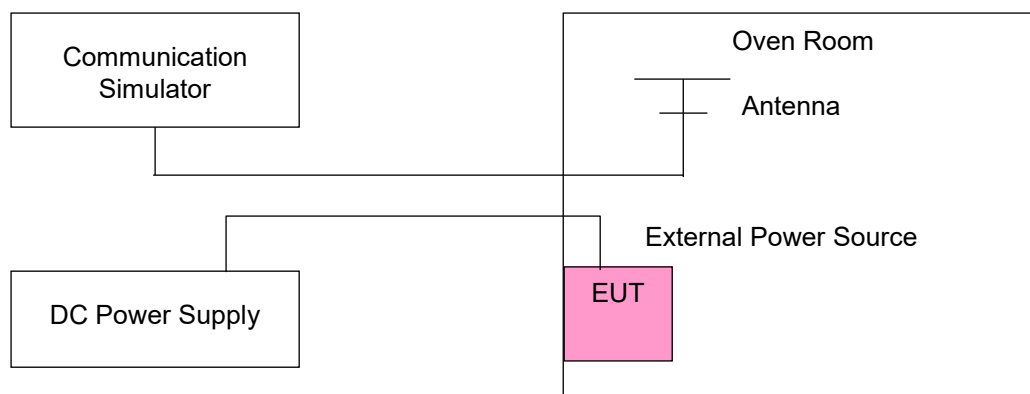
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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 $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1850.200003	0.002	1909.800002	0.001
3.65	1850.200004	0.002	1909.800004	0.002
4.23	1850.200003	0.001	1909.800002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.200001	0.001	1909.800003	0.001
-20	1850.200002	0.001	1909.800003	0.002
-10	1850.200004	0.002	1909.800002	0.001
0	1850.200004	0.002	1909.800004	0.002
10	1850.200002	0.001	1909.800003	0.001
20	1850.199997	-0.002	1909.799998	-0.001
30	1850.199999	-0.001	1909.799999	-0.001
40	1850.199998	-0.001	1909.799998	-0.001
50	1850.199998	-0.001	1909.799997	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1850.200001	0.001	1909.800001	0.001
3.65	1850.200002	0.001	1909.800004	0.002
4.23	1850.200001	0.001	1909.800002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.200003	0.001	1909.800001	0.001
-20	1850.200004	0.002	1909.800001	0.001
-10	1850.200003	0.002	1909.800002	0.001
0	1850.200003	0.002	1909.800003	0.002
10	1850.200003	0.002	1909.800002	0.001
20	1850.199996	-0.002	1909.799998	-0.001
30	1850.199998	-0.001	1909.799997	-0.002
40	1850.199996	-0.002	1909.799997	-0.002
50	1850.199999	-0.001	1909.799997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1852.400002	0.001	1907.600001	0.001
3.65	1852.400001	0.001	1907.600002	0.001
4.23	1852.400002	0.001	1907.600003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1852.400001	0.001	1907.600002	0.001
-20	1852.400001	0.001	1907.600004	0.002
-10	1852.400002	0.001	1907.600001	0.001
0	1852.400003	0.002	1907.600004	0.002
10	1852.400002	0.001	1907.600004	0.002
20	1852.399999	-0.001	1907.599998	-0.001
30	1852.399998	-0.001	1907.599999	-0.001
40	1852.399997	-0.001	1907.599998	-0.001
50	1852.399996	-0.002	1907.599998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1850.700004	0.002	1909.300000	0.002
3.65	1850.700004	0.002	1909.300003	0.002
4.23	1850.700003	0.002	1909.300003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.700002	0.001	1909.300002	0.001
-20	1850.700004	0.002	1909.300002	0.001
-10	1850.700003	0.002	1909.300003	0.001
0	1850.700004	0.002	1909.300002	0.001
10	1850.700003	0.001	1909.300003	0.001
20	1850.699998	-0.001	1909.299999	-0.001
30	1850.699996	-0.002	1909.299998	-0.001
40	1850.699997	-0.002	1909.299997	-0.002
50	1850.699997	-0.001	1909.299996	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1851.500002	0.001	1908.500003	0.002
3.65	1851.500003	0.002	1908.500002	0.001
4.23	1851.500002	0.001	1908.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1851.500001	0.001	1908.500001	0.001
-20	1851.500002	0.001	1908.500003	0.001
-10	1851.500004	0.002	1908.500003	0.002
0	1851.500003	0.002	1908.500004	0.002
10	1851.500003	0.002	1908.500001	0.001
20	1851.499998	-0.001	1908.499997	-0.002
30	1851.499997	-0.002	1908.499998	-0.001
40	1851.499997	-0.002	1908.499996	-0.002
50	1851.499997	-0.002	1908.499998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1852.500002	0.001	1907.500003	0.002
3.65	1852.500002	0.001	1907.500001	0.001
4.23	1852.500002	0.001	1907.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1852.500002	0.001	1907.500001	0.001
-20	1852.500001	0.001	1907.500003	0.001
-10	1852.500002	0.001	1907.500003	0.002
0	1852.500004	0.002	1907.500002	0.001
10	1852.499996	-0.002	1907.499999	-0.001
20	1852.499998	-0.001	1907.499999	-0.001
30	1852.499998	-0.001	1907.499999	-0.001
40	1852.499999	-0.001	1907.499997	-0.002
50	1852.500002	0.001	1907.500001	0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1855.000002	0.001	1905.000003	0.002
3.65	1855.000002	0.001	1905.000003	0.002
4.23	1855.000003	0.001	1905.000002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1855.000002	0.001	1905.000001	0.001
-20	1855.000001	0.001	1905.000002	0.001
-10	1855.000004	0.002	1905.000003	0.002
0	1855.000002	0.001	1905.000003	0.001
10	1855.000004	0.002	1905.000002	0.001
20	1854.999997	-0.002	1904.999997	-0.001
30	1854.999996	-0.002	1904.999998	-0.001
40	1854.999998	-0.001	1904.999998	-0.001
50	1854.999998	-0.001	1904.999998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1857.500003	0.002	1902.500002	0.001
3.65	1857.500002	0.001	1902.500003	0.001
4.23	1857.500004	0.002	1902.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1857.500001	0.001	1902.500001	0.001
-20	1857.500001	0.001	1902.500003	0.002
-10	1857.500003	0.002	1902.500002	0.001
0	1857.500002	0.001	1902.500003	0.002
10	1857.500001	0.001	1902.500001	0.001
20	1857.499997	-0.002	1902.499999	-0.001
30	1857.499998	-0.001	1902.499996	-0.002
40	1857.499996	-0.002	1902.499997	-0.002
50	1857.499997	-0.002	1902.499999	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1860.000003	0.002	1900.000004	0.002
3.65	1860.000003	0.002	1900.000003	0.001
4.23	1860.000002	0.001	1900.000002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.65 Vdc to 4.23 Vdc.

Frequency Error vs. Temperature

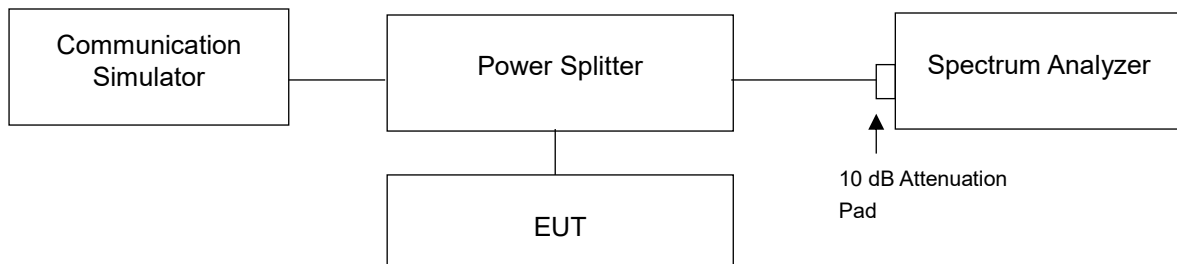
Temp. (°C)	LTE Band 2			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1860.000002	0.001	1900.000001	0.001
-20	1860.000002	0.001	1900.000002	0.001
-10	1860.000003	0.002	1900.000004	0.002
0	1860.000002	0.001	1900.000003	0.001
10	1860.000001	0.001	1900.000003	0.001
20	1859.999997	-0.002	1899.999997	-0.002
30	1859.999997	-0.002	1899.999998	-0.001
40	1859.999998	-0.001	1899.999999	-0.001
50	1859.999998	-0.001	1899.999997	-0.002

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

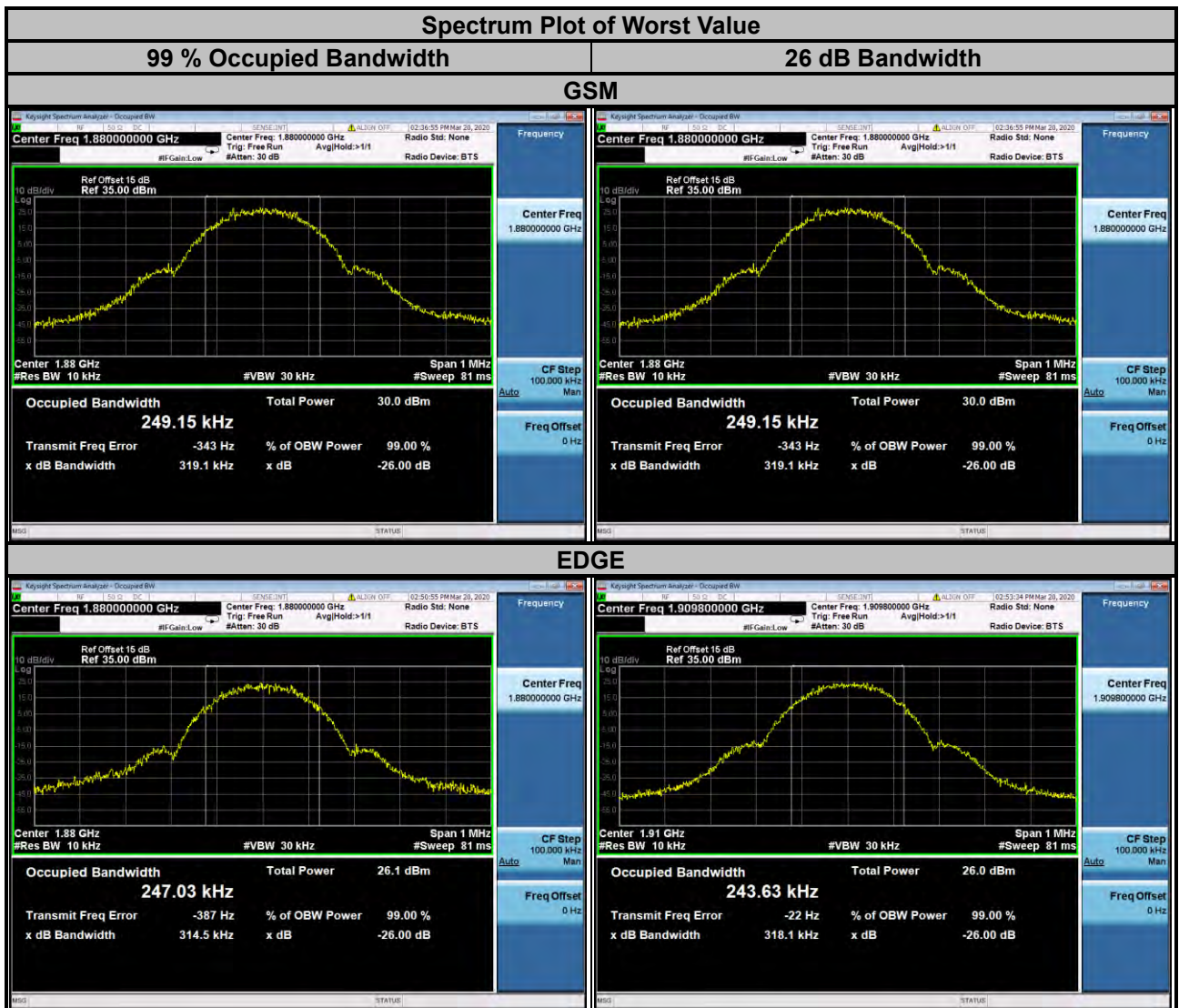
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

4.4.2 Test Setup

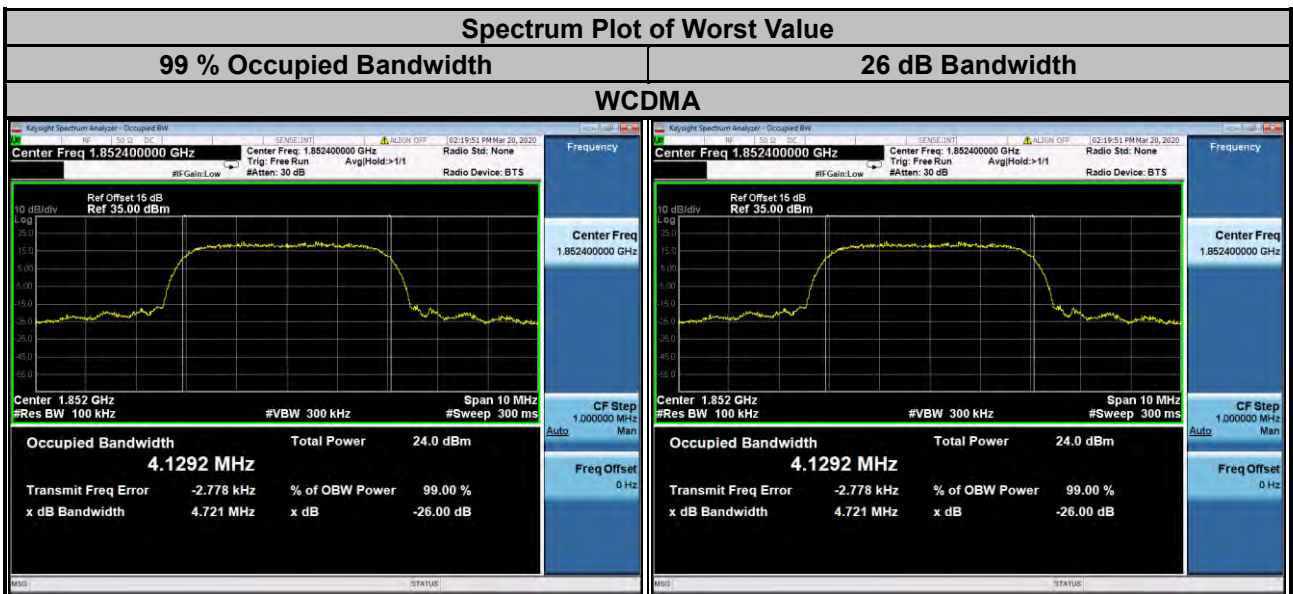


4.4.3 Test Result

GSM				EDGE			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)	Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	244.63	313.40	512	1850.2	246.27	310.80
661	1880.0	249.15	319.10	661	1880.0	247.03	314.50
810	1909.8	245.00	315.70	810	1909.8	243.63	318.10



WCDMA			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.1292	4.721
9400	1880.0	4.1256	4.705
9538	1907.6	4.1285	4.709



LTE Band 2					
Channel Bandwidth: 1.4 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18607	1850.7	1.0875	1.0906	1.221	1.215
18900	1880.0	1.0871	1.0902	1.221	1.211
19193	1909.3	1.0869	1.0906	1.218	1.218

Channel Bandwidth: 3 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18615	1851.5	2.7018	2.6981	2.930	2.933
18900	1880.0	2.7013	2.6999	2.932	2.933
19185	1908.5	2.7010	2.6985	2.953	2.933



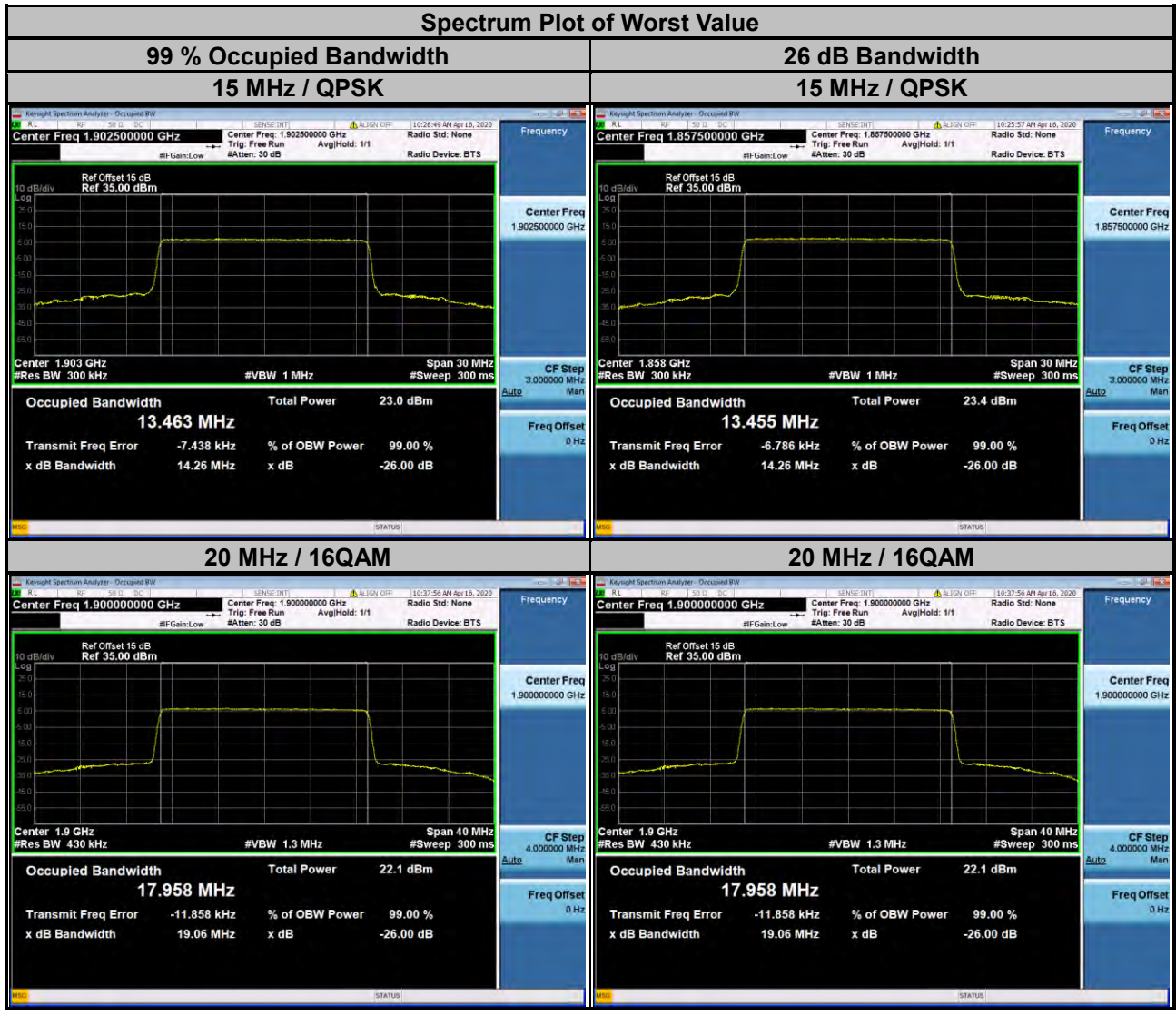
LTE Band 2					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18625	1852.5	4.4952	4.4952	4.814	4.817
18900	1880.0	4.4944	4.4965	4.829	4.817
19175	1907.5	4.4944	4.4967	4.828	4.820

Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18650	1855.0	8.9697	8.9743	9.530	9.521
18900	1880.0	8.9733	8.9828	9.532	9.530
19150	1905.0	8.9718	8.9780	9.509	9.512



LTE Band 2					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18675	1857.5	13.455	13.449	14.26	14.25
18900	1880.0	13.461	13.452	14.26	14.26
19125	1902.5	13.463	13.455	14.26	14.25

Channel Bandwidth: 20 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18700	1860.0	17.920	17.939	19.04	19.03
18900	1880.0	17.922	17.949	19.05	19.05
19100	1900.0	17.931	17.958	19.04	19.06

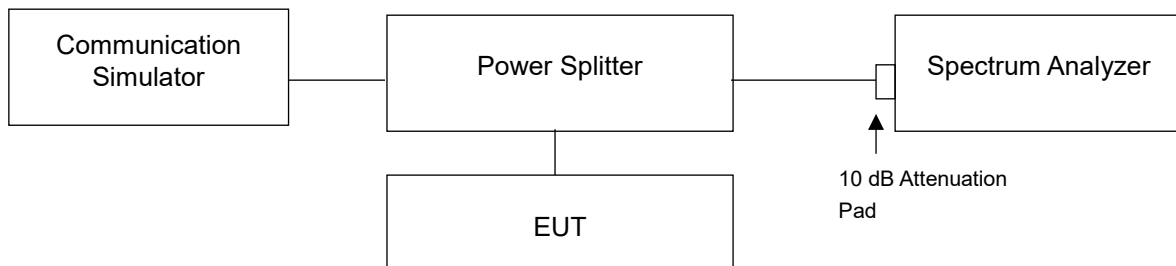


4.5 Band Edge Measurement

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.

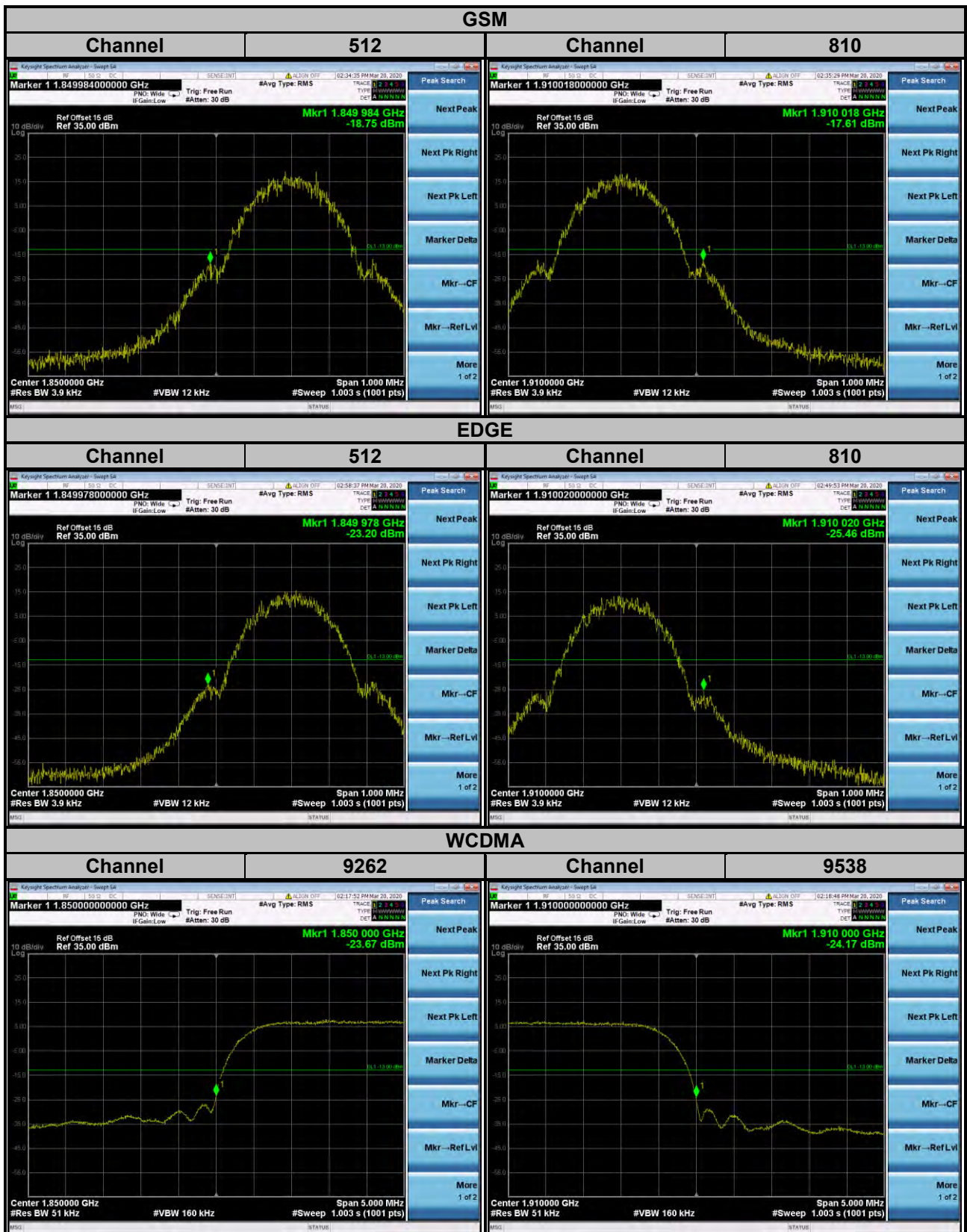
4.5.2 Test Setup



4.5.3 Test Procedures

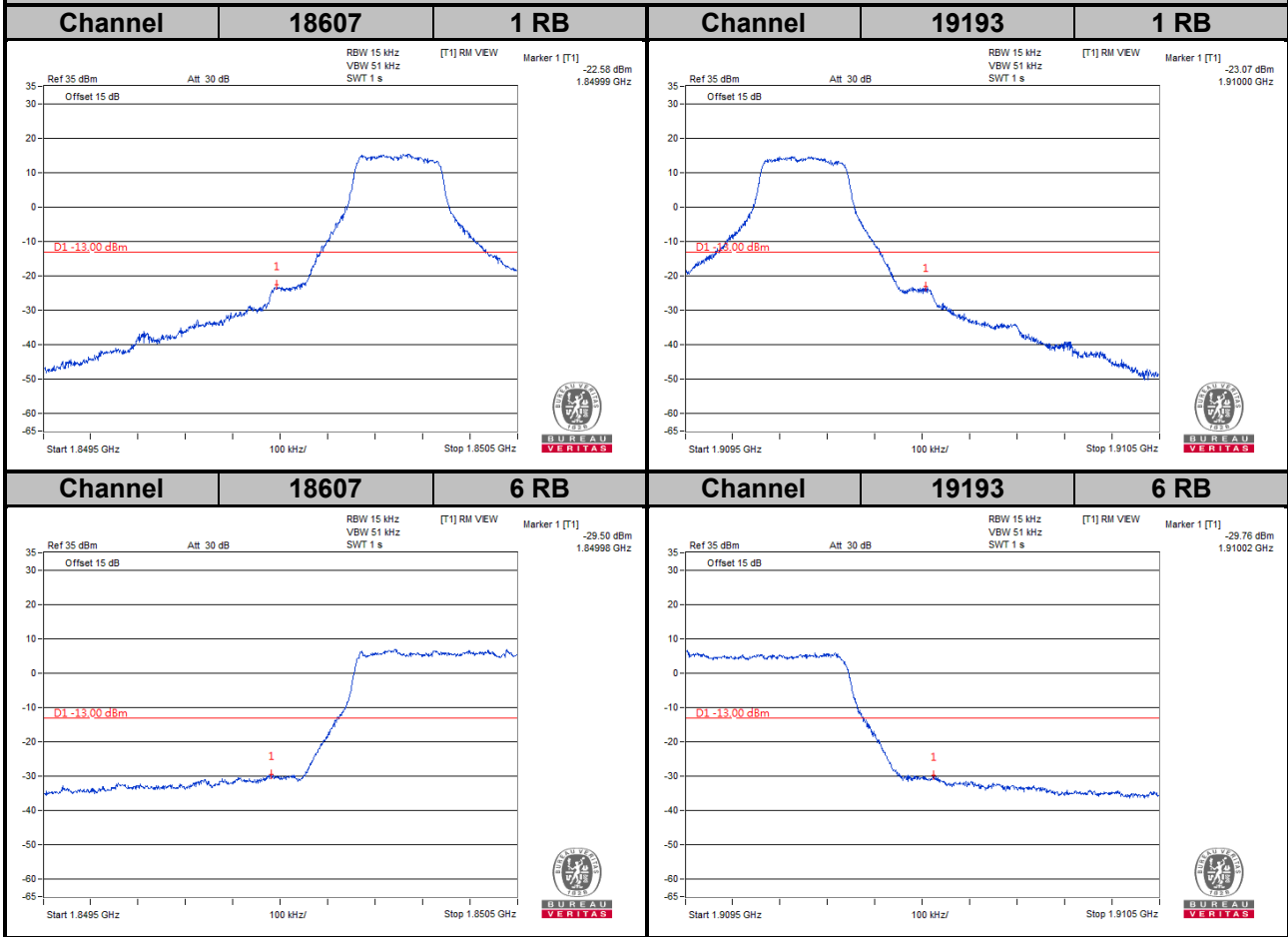
- a. All measurements were done at low and high operational frequency range.
- b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 3.9 kHz and VB of the spectrum is 12 kHz (GSM/GPRS/EDGE).
- c. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (WCDMA).
- d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 15 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 51 kHz and VB of the spectrum is 160 kHz (LTE Bandwidth 5 MHz).
- g. 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 10 MHz).
- h. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 150 kHz and VB of the spectrum is 470 kHz (LTE Bandwidth 15 MHz).
- i. 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 20 MHz).
- j. Record the max trace plot into the test report.

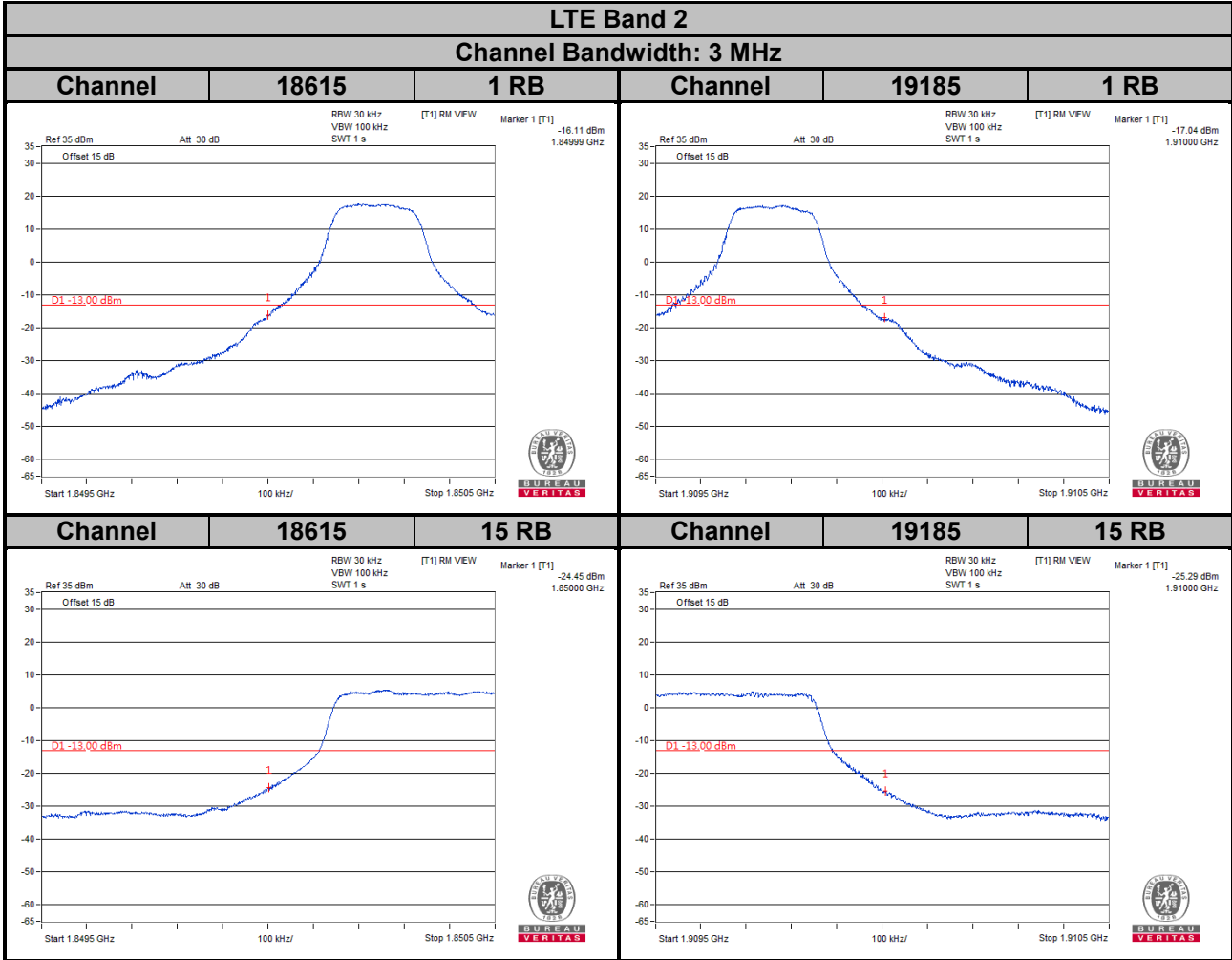
4.5.4 Test Results



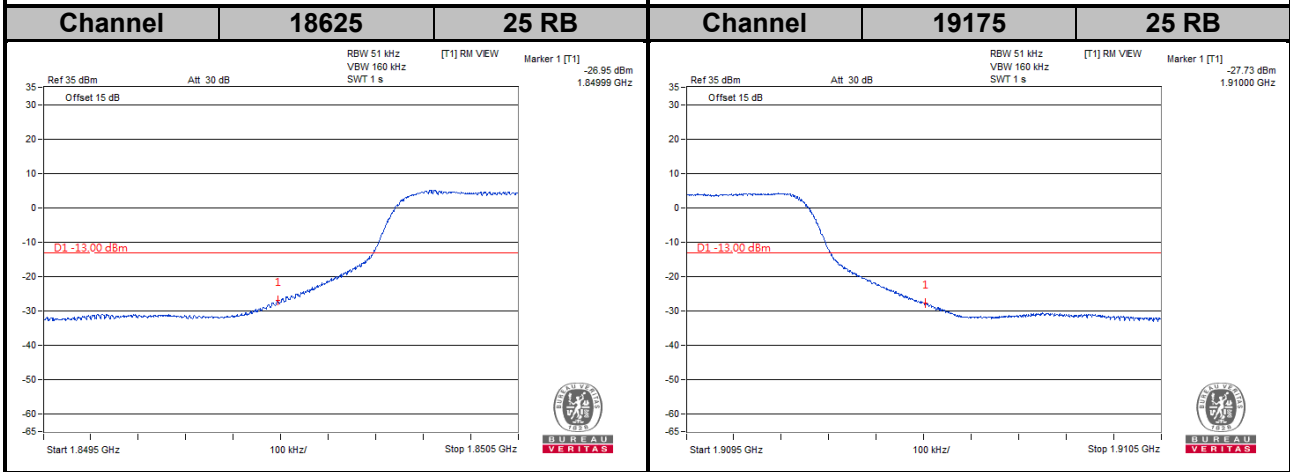
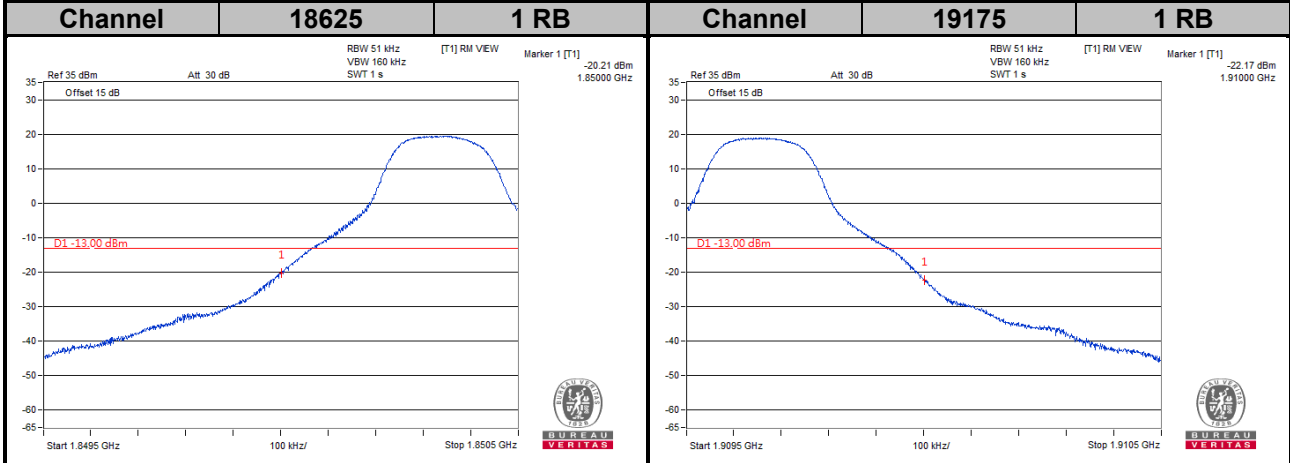
LTE Band 2

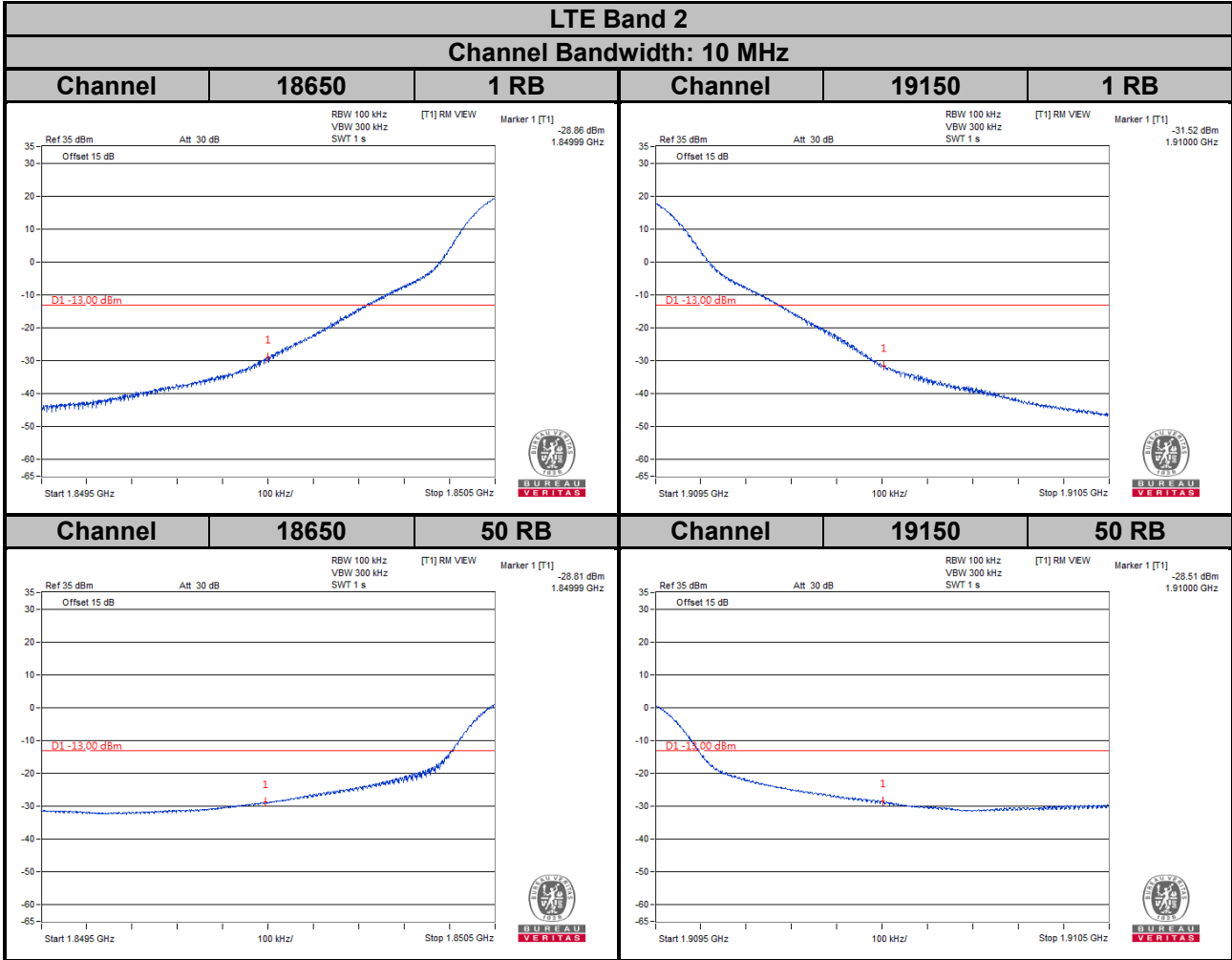
Channel Bandwidth: 1.4 MHz





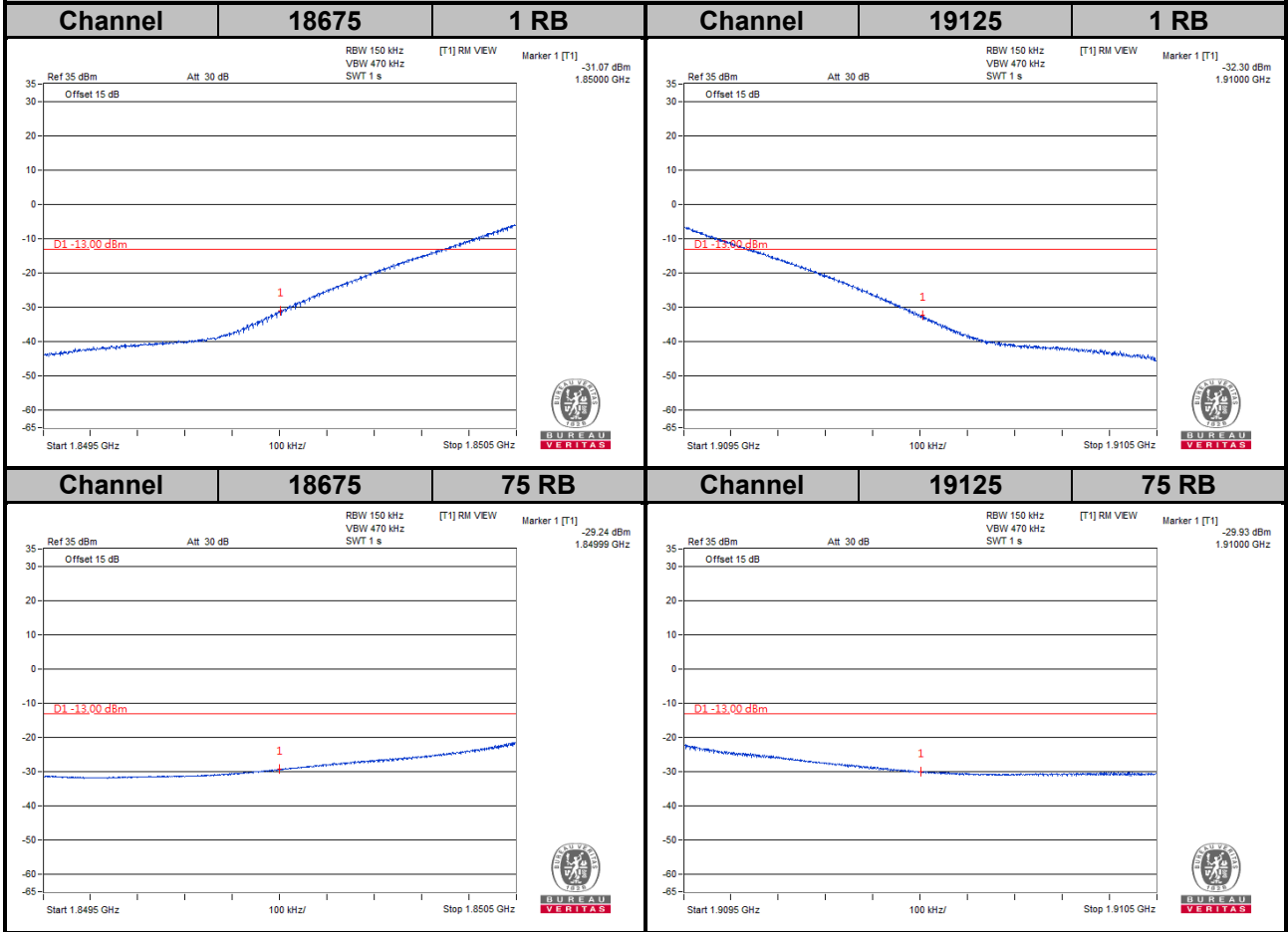
LTE Band 2
Channel Bandwidth: 5 MHz

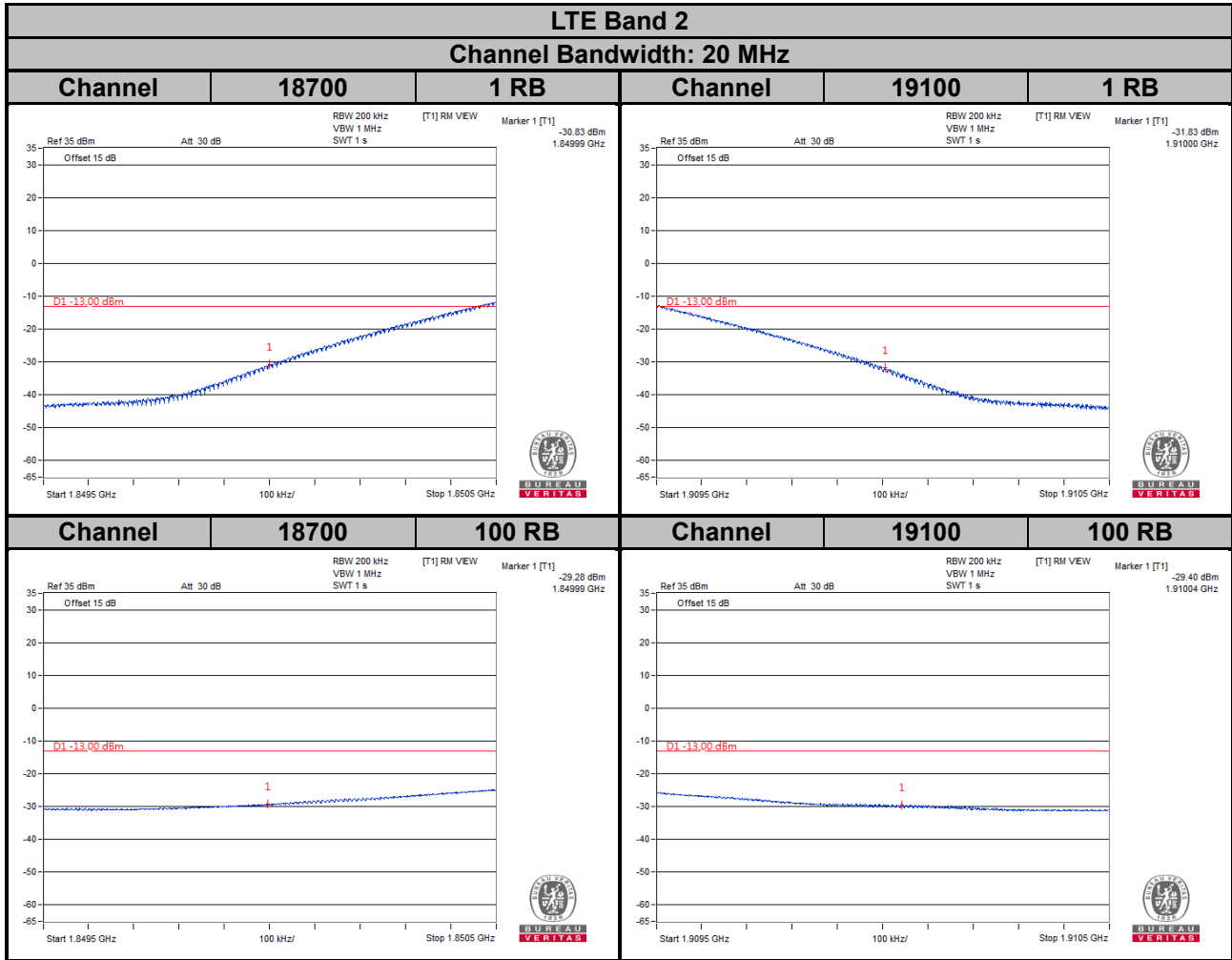




LTE Band 2

Channel Bandwidth: 15 MHz



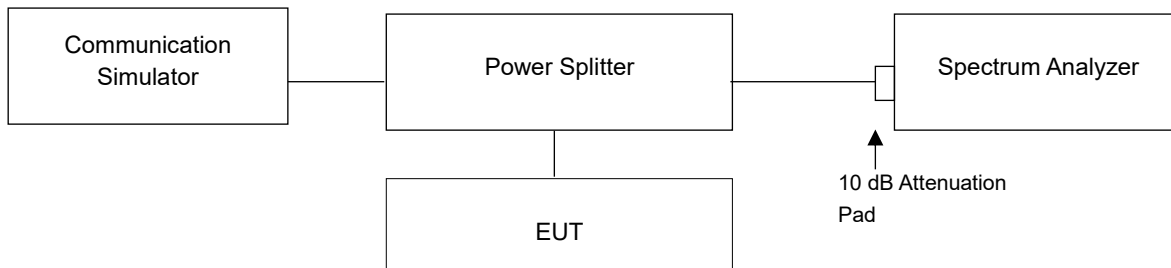


4.6 Peak to Average Ratio

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

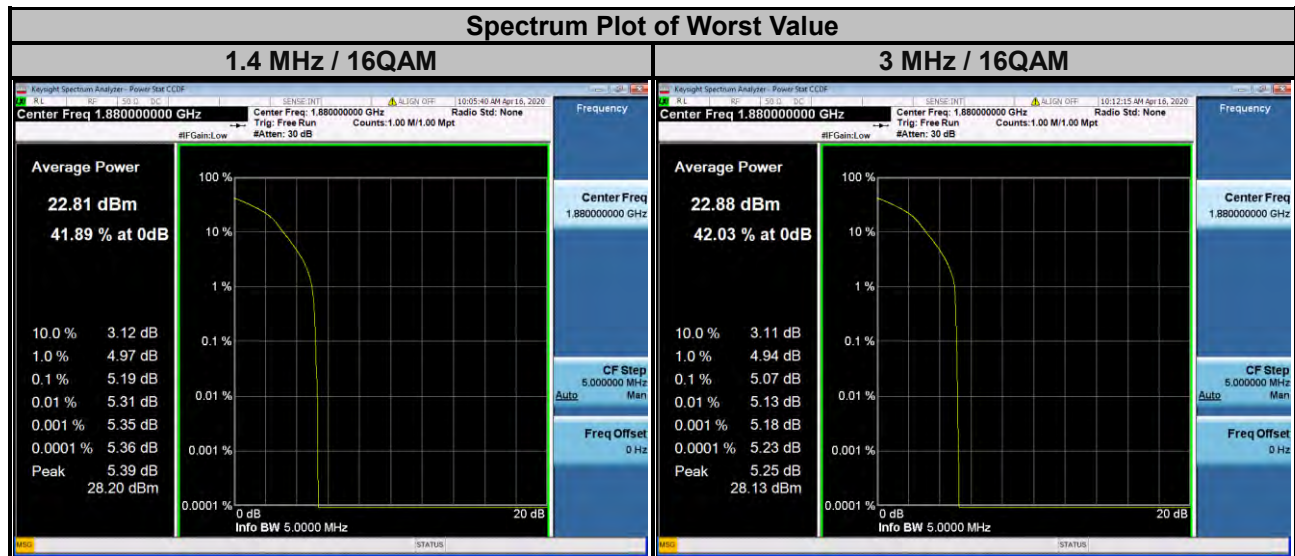
1. Set resolution/measurement bandwidth \geq signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		GSM	EDGE			WCDMA
512	1850.2	2.63	2.66	9262	1852.4	2.78
661	1880.0	2.62	2.66	9400	1880.0	2.93
810	1909.8	2.63	2.66	9538	1907.6	2.77



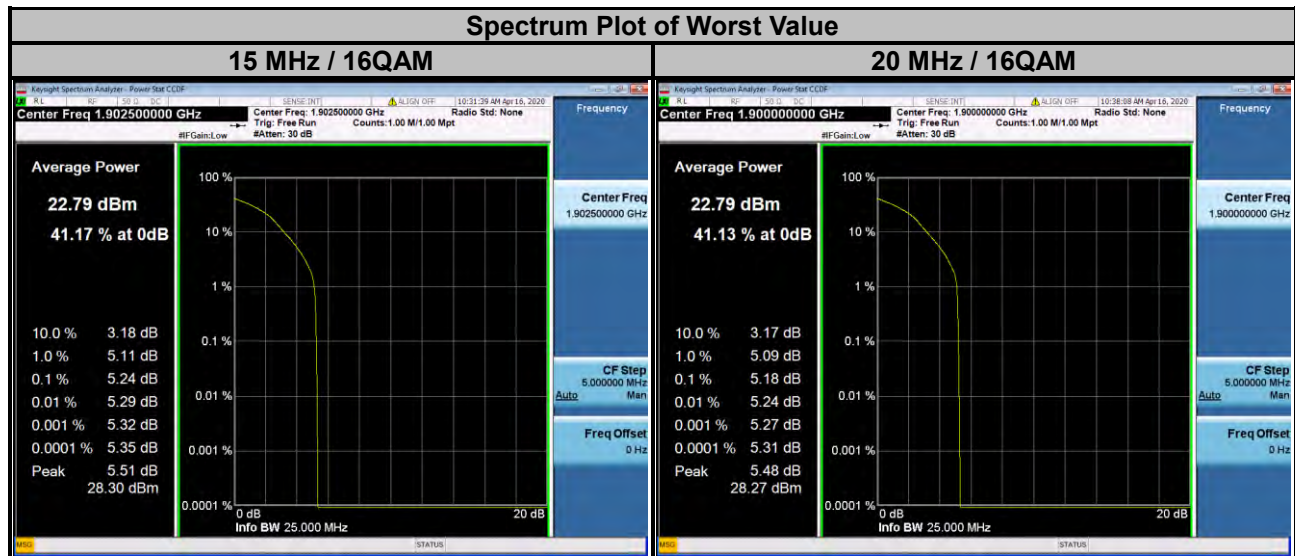
LTE Band 2							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
18607	1850.7	3.49	4.76	18615	1851.5	3.33	4.67
18900	1880.0	3.78	5.19	18900	1880.0	3.62	5.07
19193	1909.3	3.68	5.03	19185	1908.5	3.52	4.92



LTE Band 2							
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
18625	1852.5	3.34	4.67	18650	1855.0	3.34	4.60
18900	1880.0	3.62	5.09	18900	1880.0	3.65	5.15
19175	1907.5	3.56	4.98	19150	1905.0	3.72	5.26



LTE Band 2							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
18675	1857.5	3.38	4.66	18700	1860.0	3.36	4.69
18900	1880.0	3.66	5.15	18900	1880.0	3.66	5.16
19125	1902.5	3.72	5.24	19100	1900.0	3.77	5.18

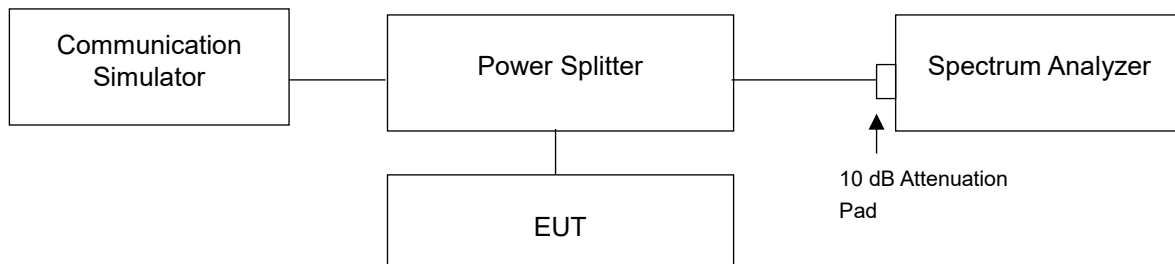


4.7 Conducted Spurious Emissions

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.

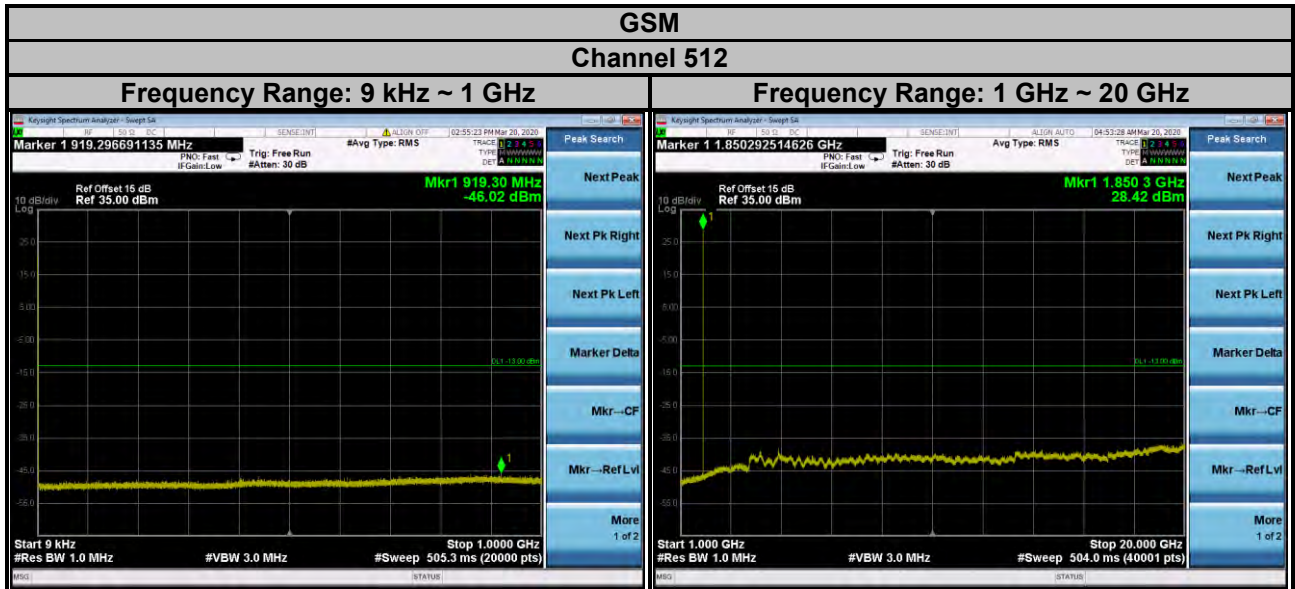
4.7.2 Test Setup



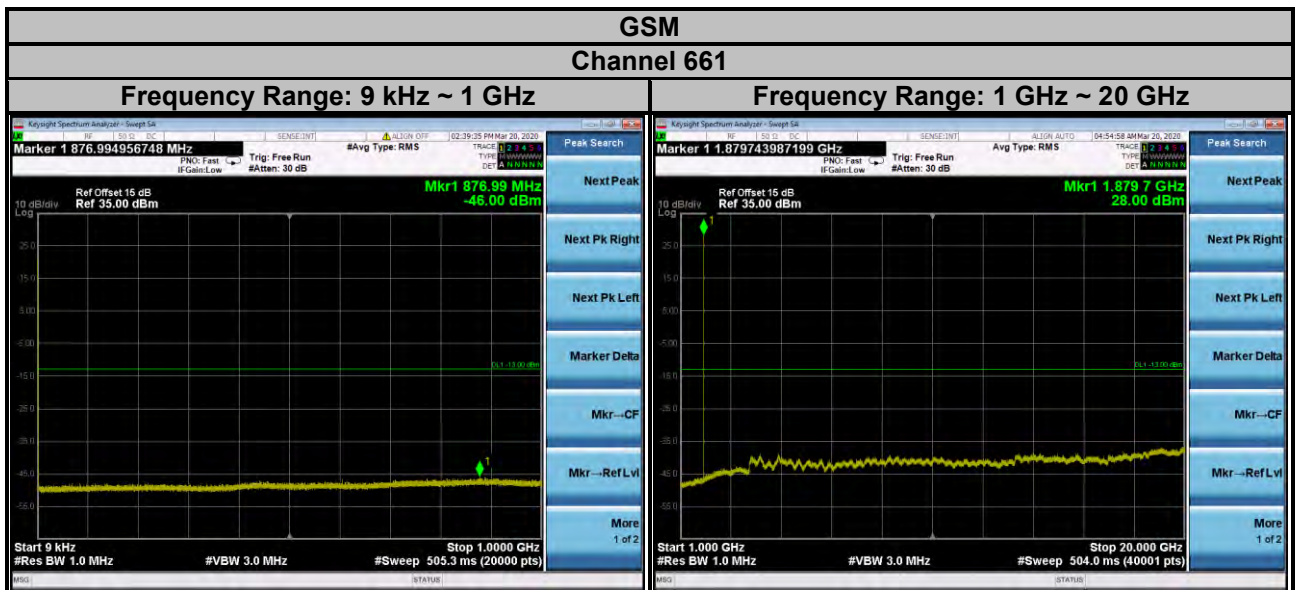
4.7.3 Test Procedure

- 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 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.
- Measuring frequency range is from 1 GHz to 20 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

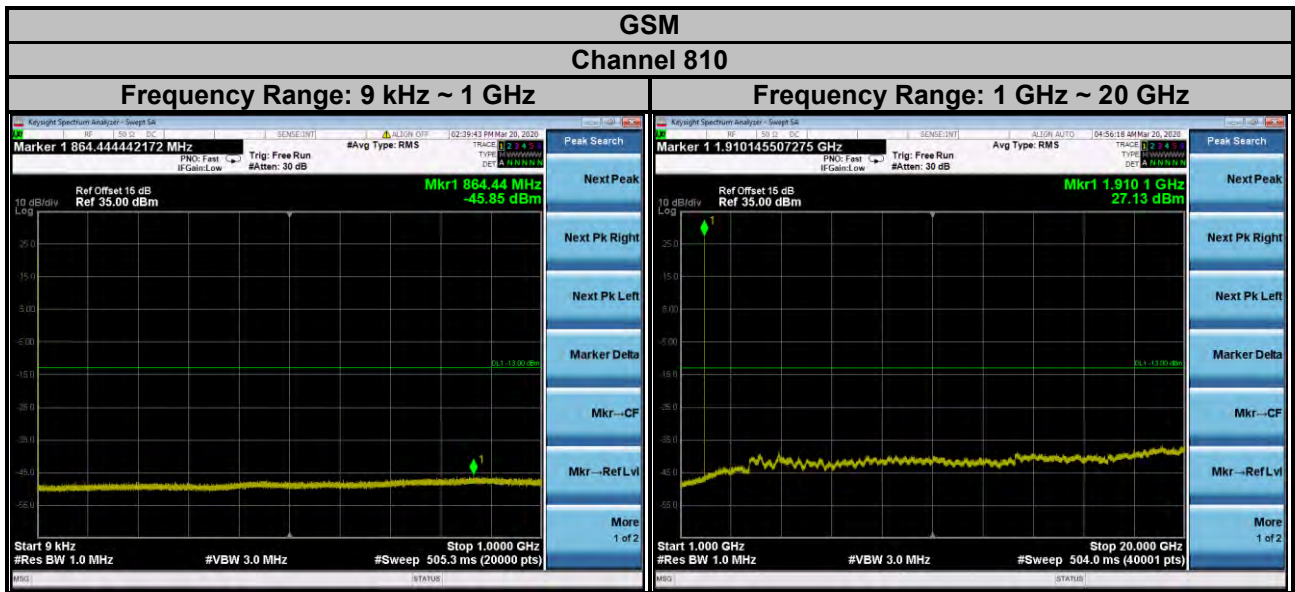
4.7.4 Test Results



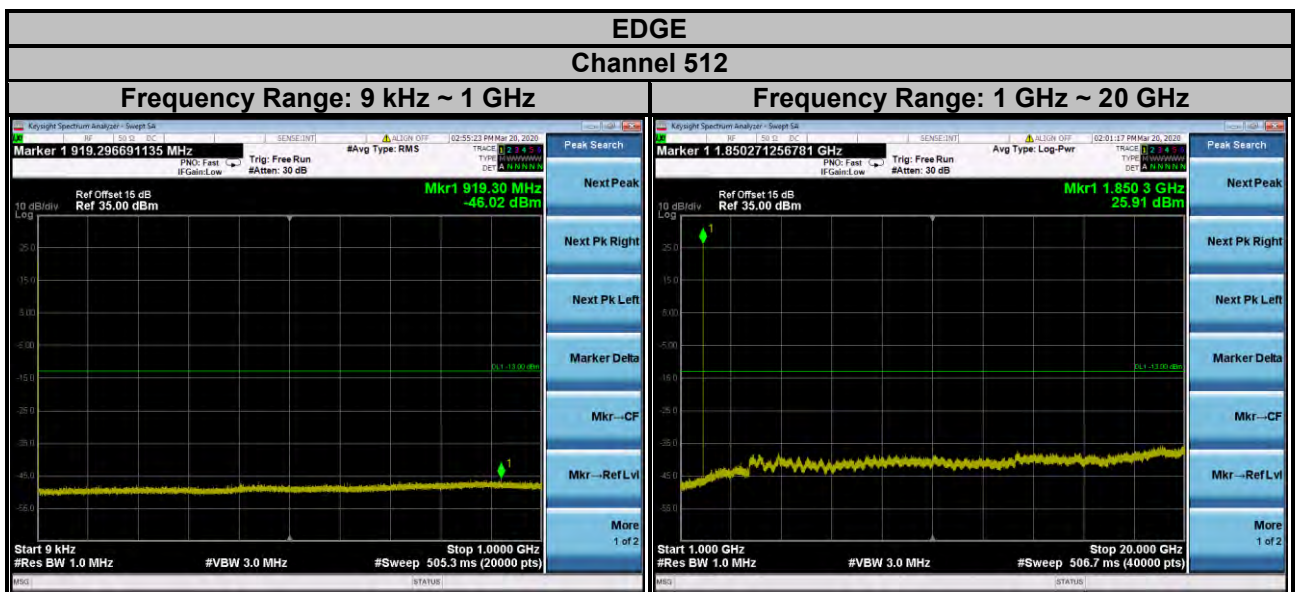
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



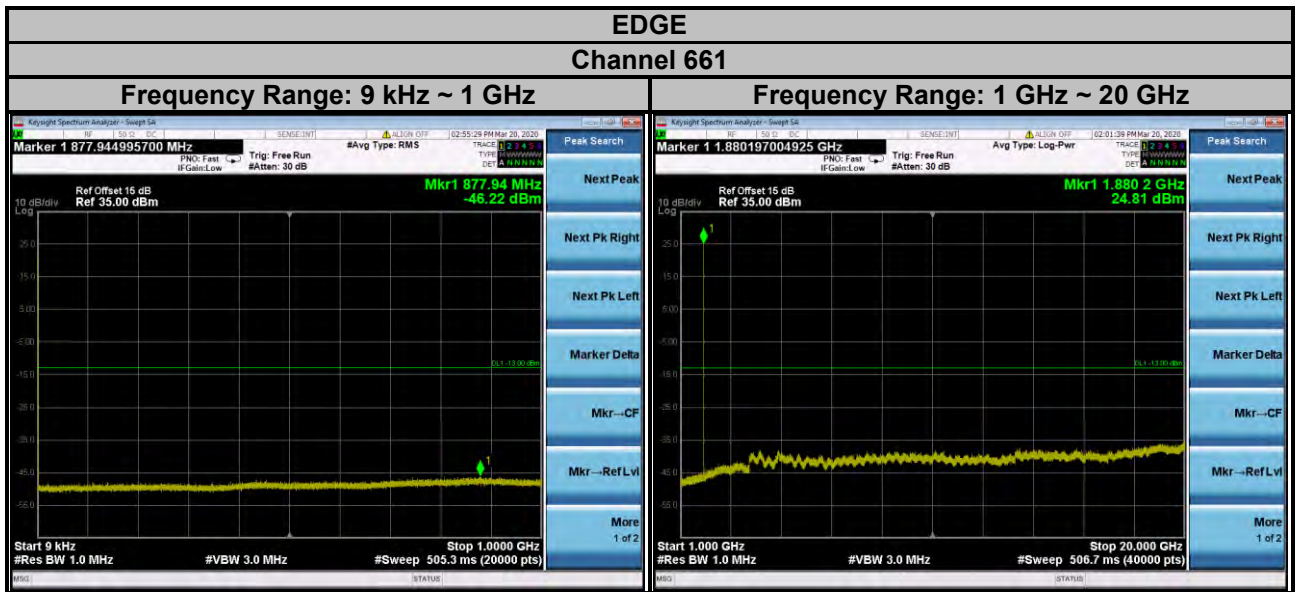
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



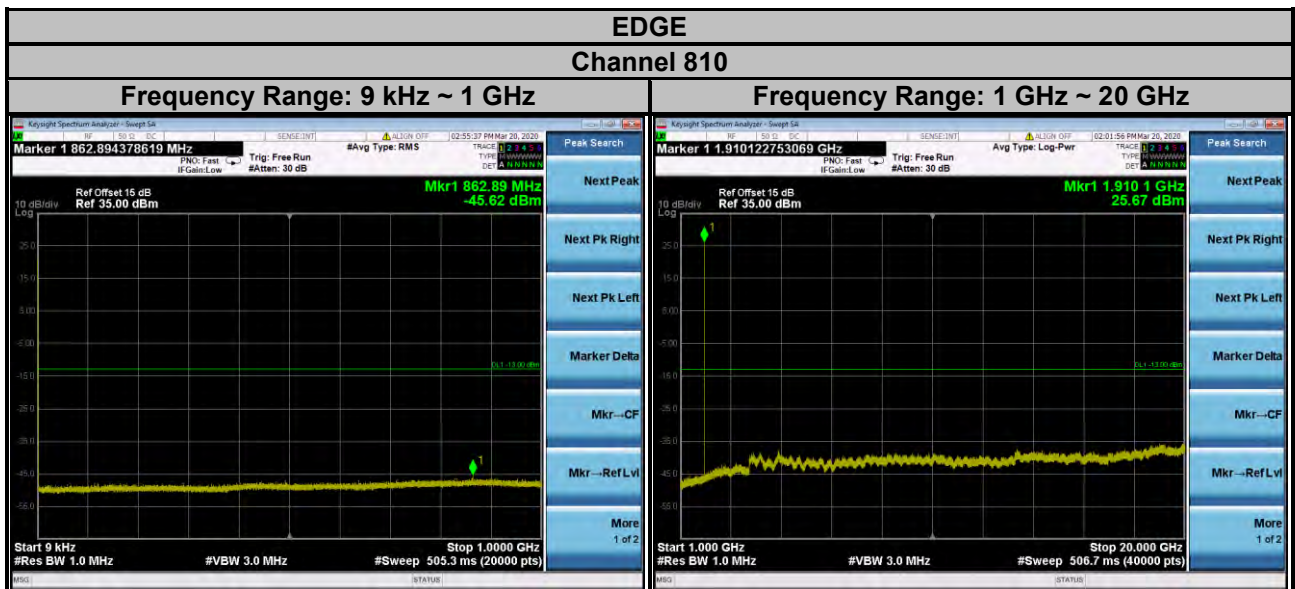
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



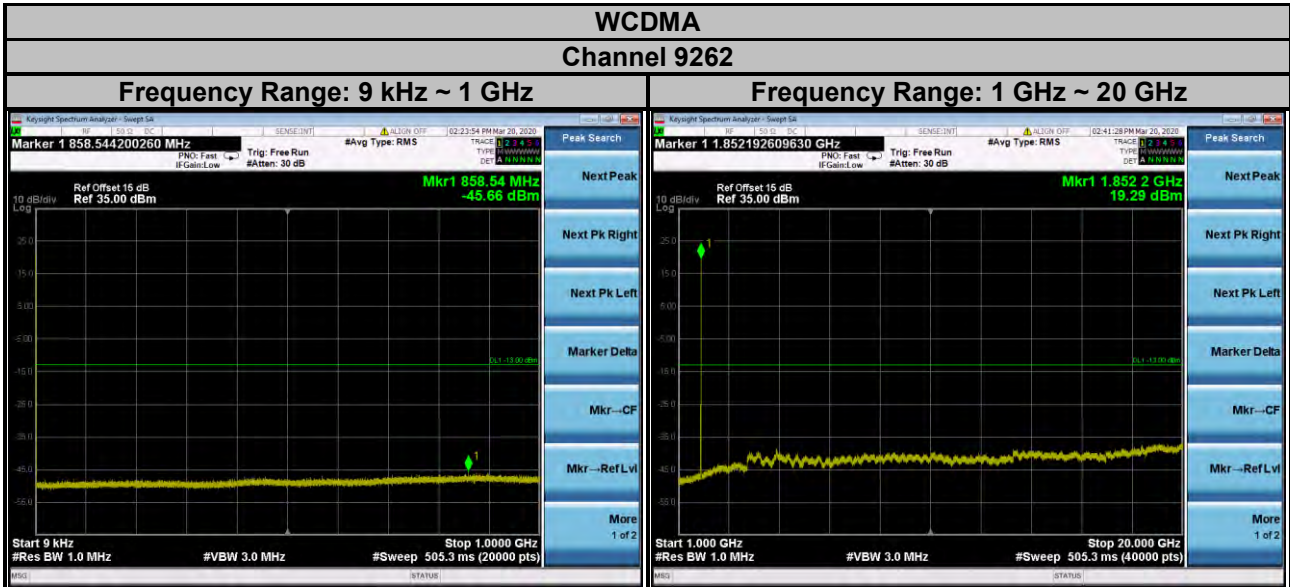
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



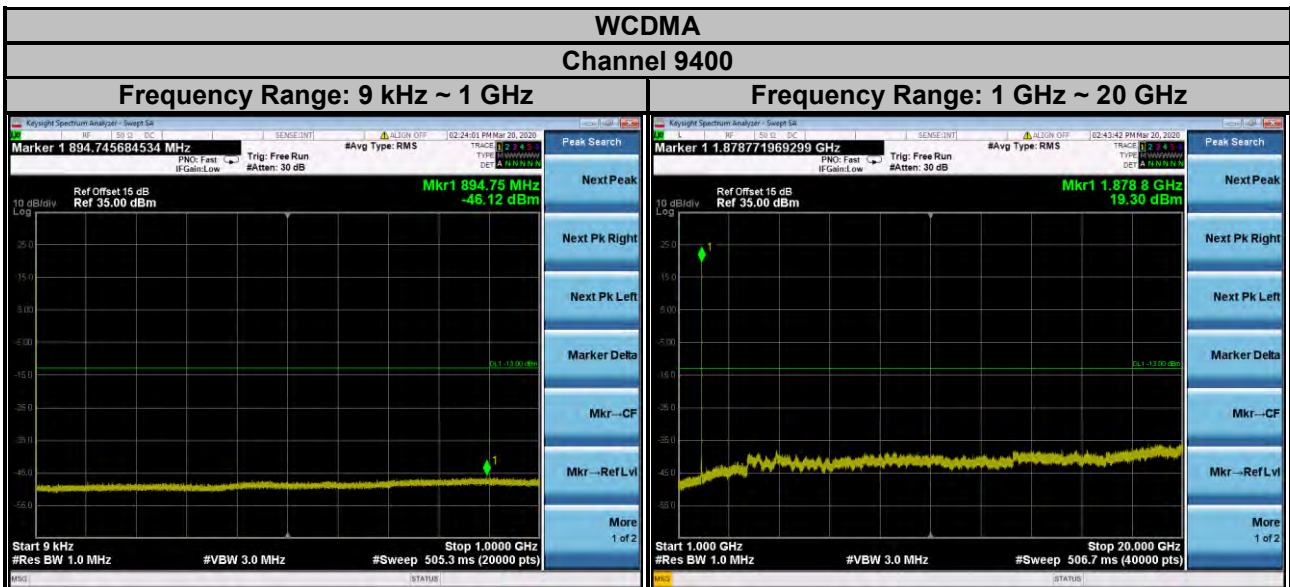
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



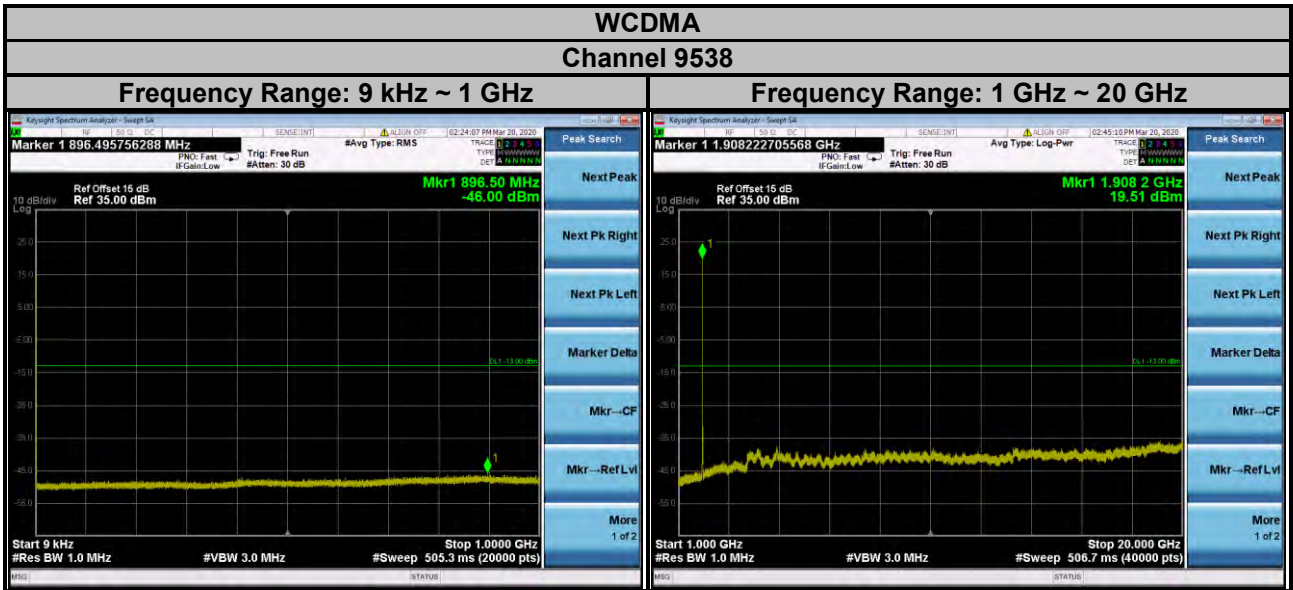
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



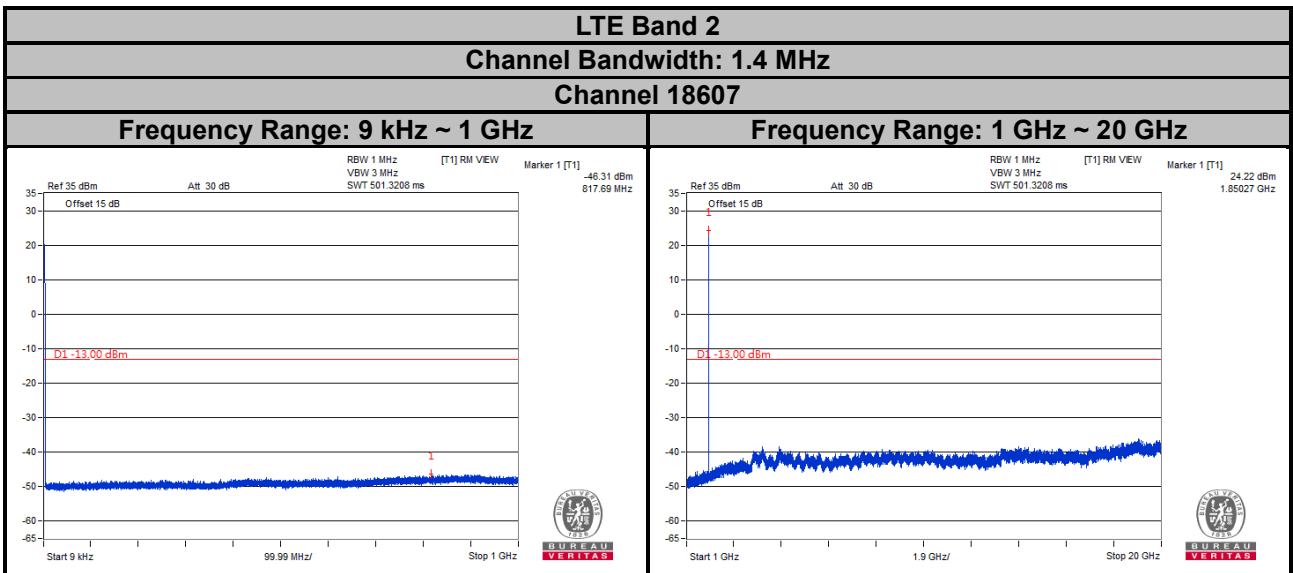
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



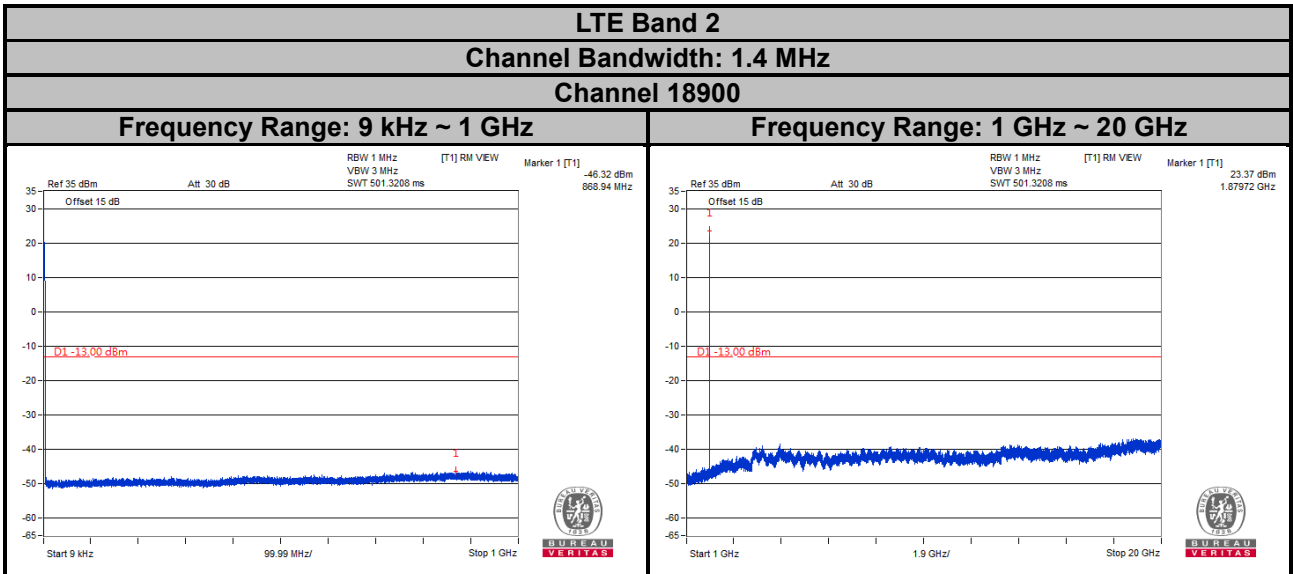
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



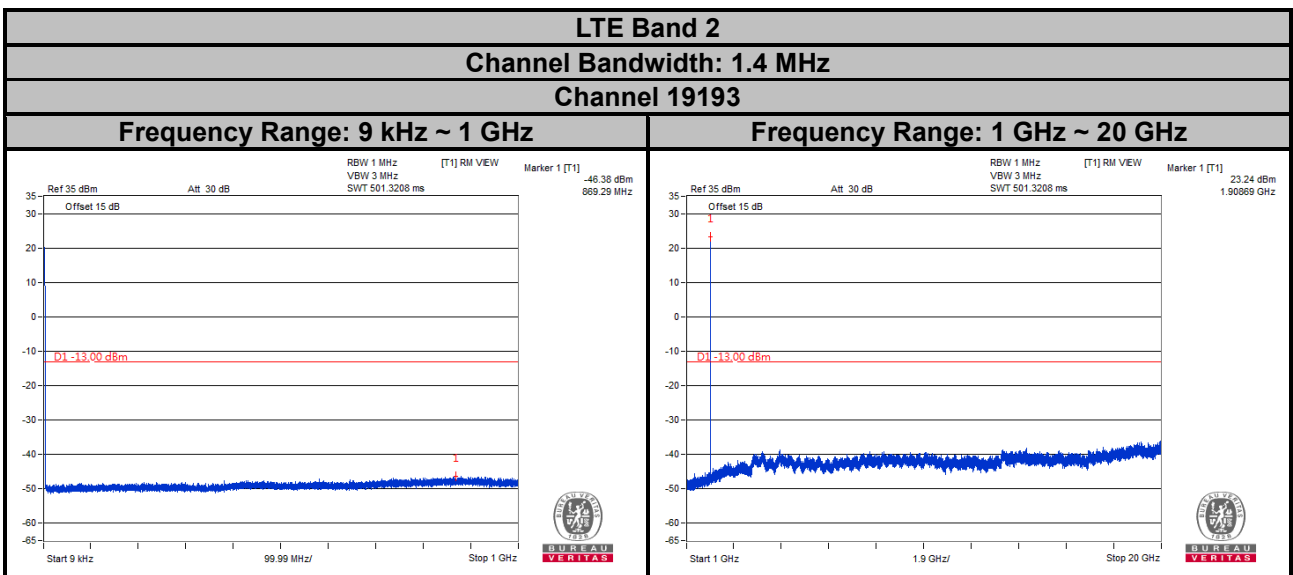
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



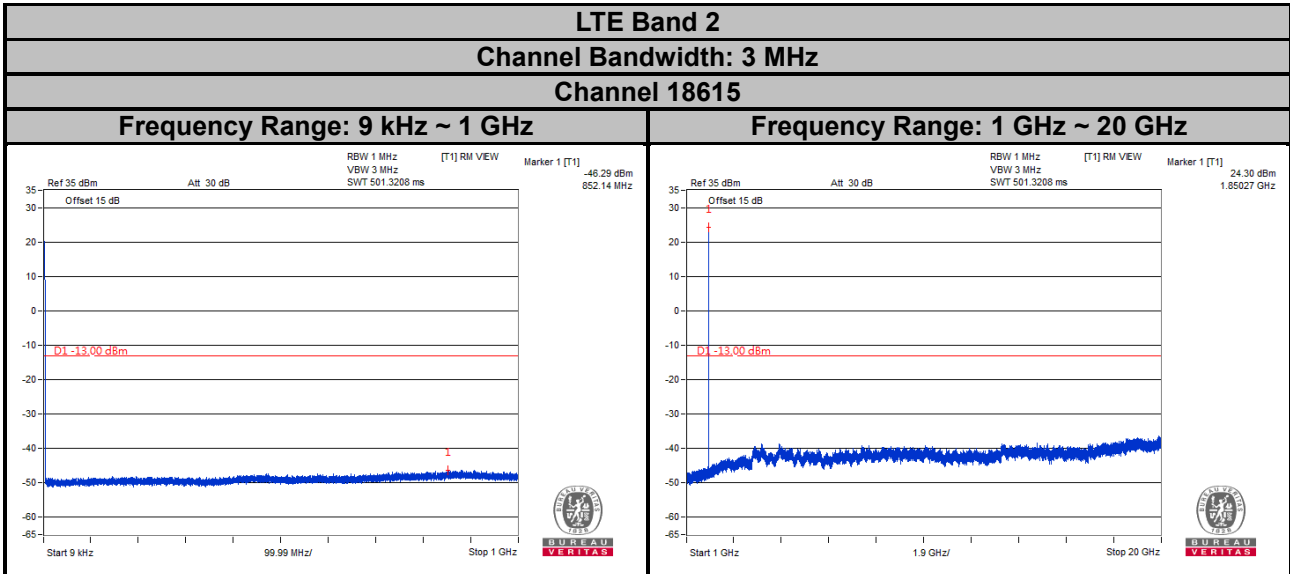
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



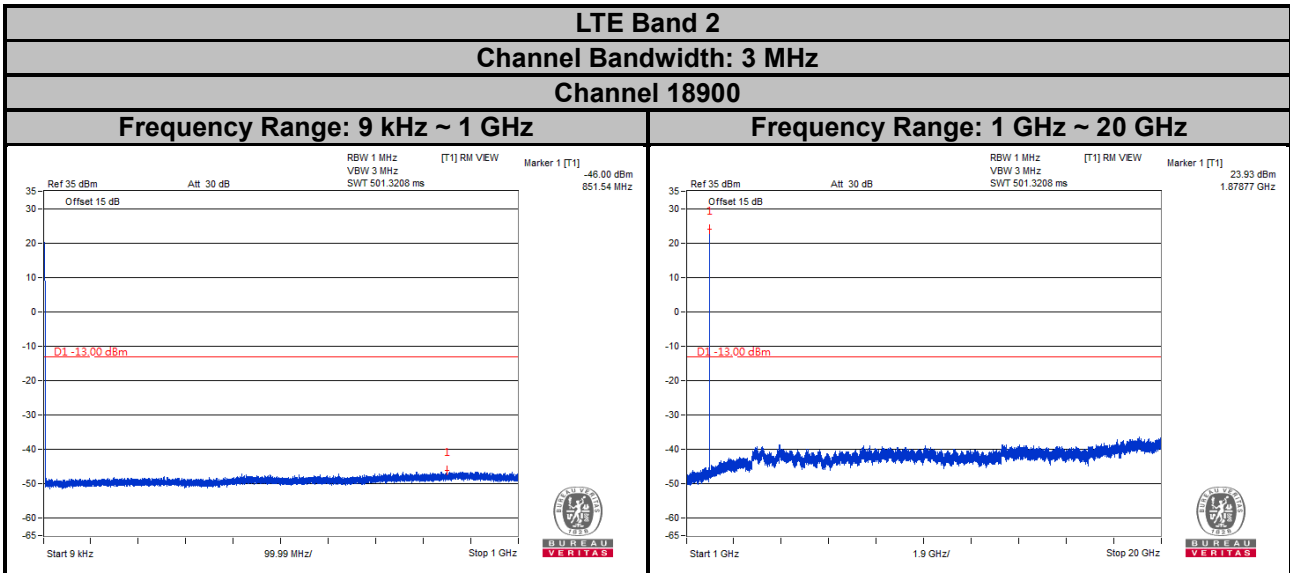
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



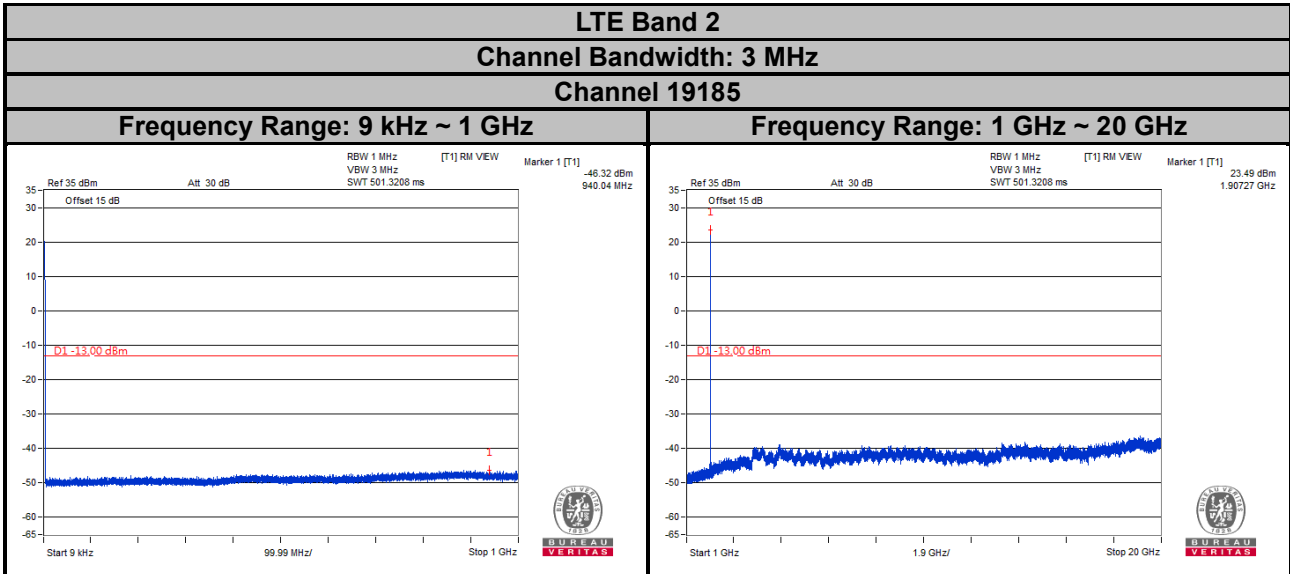
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



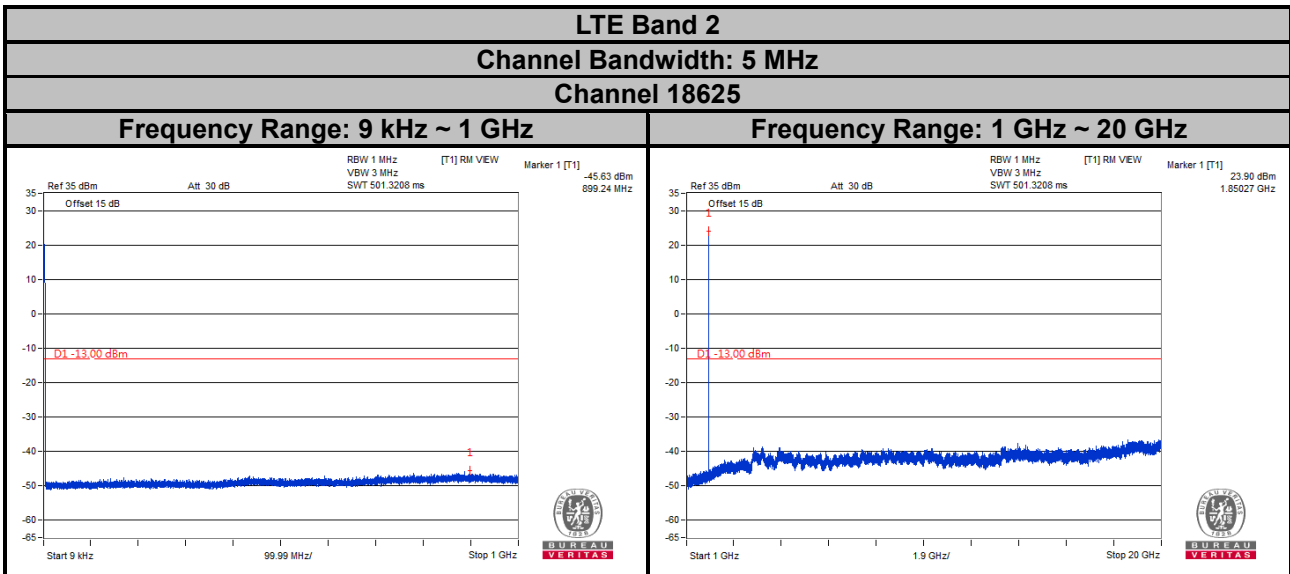
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



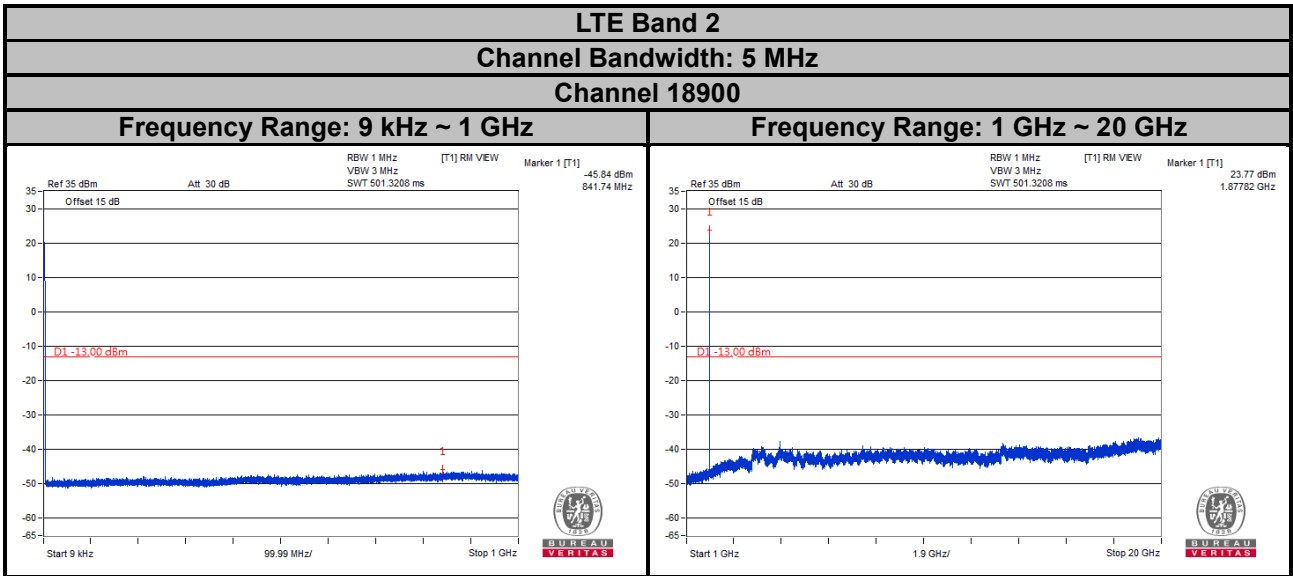
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



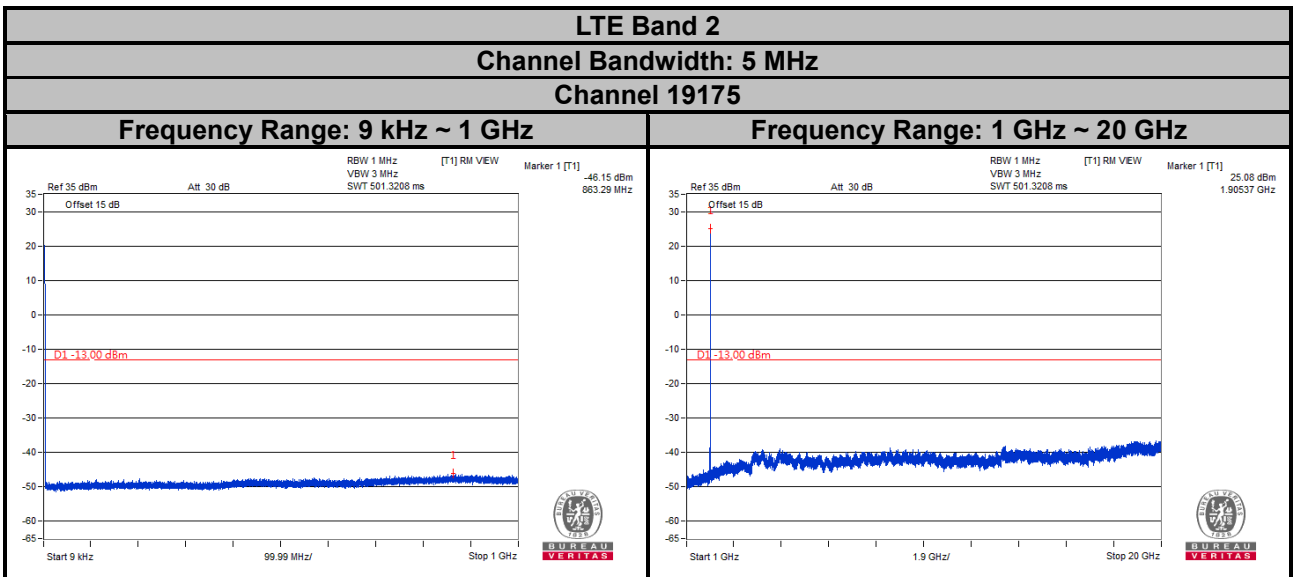
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



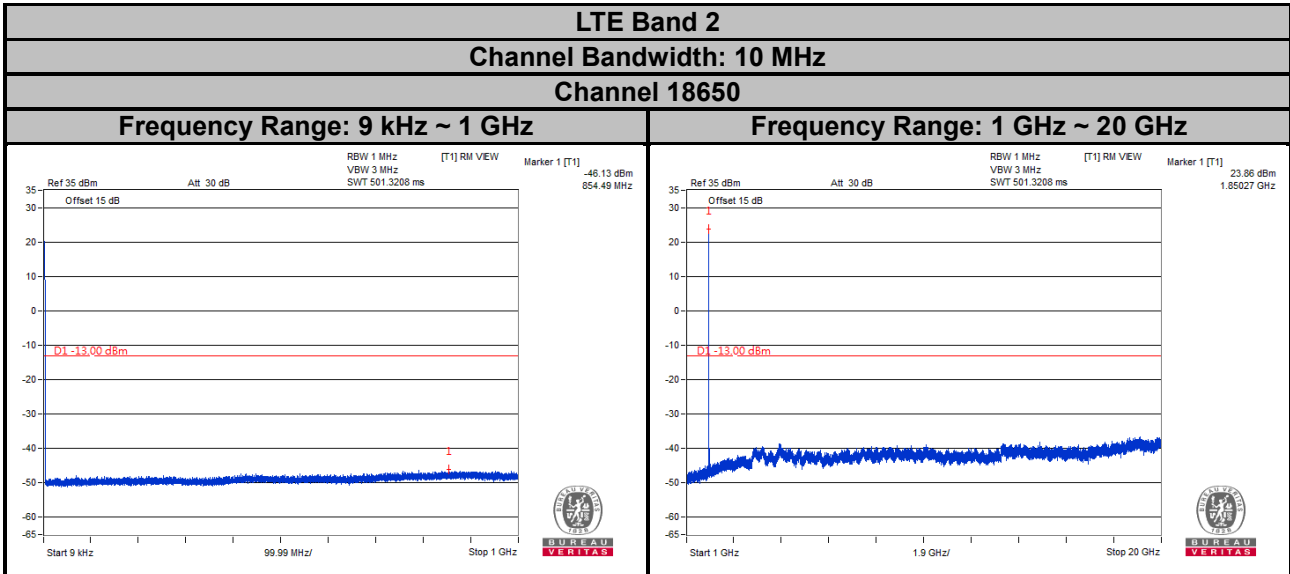
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



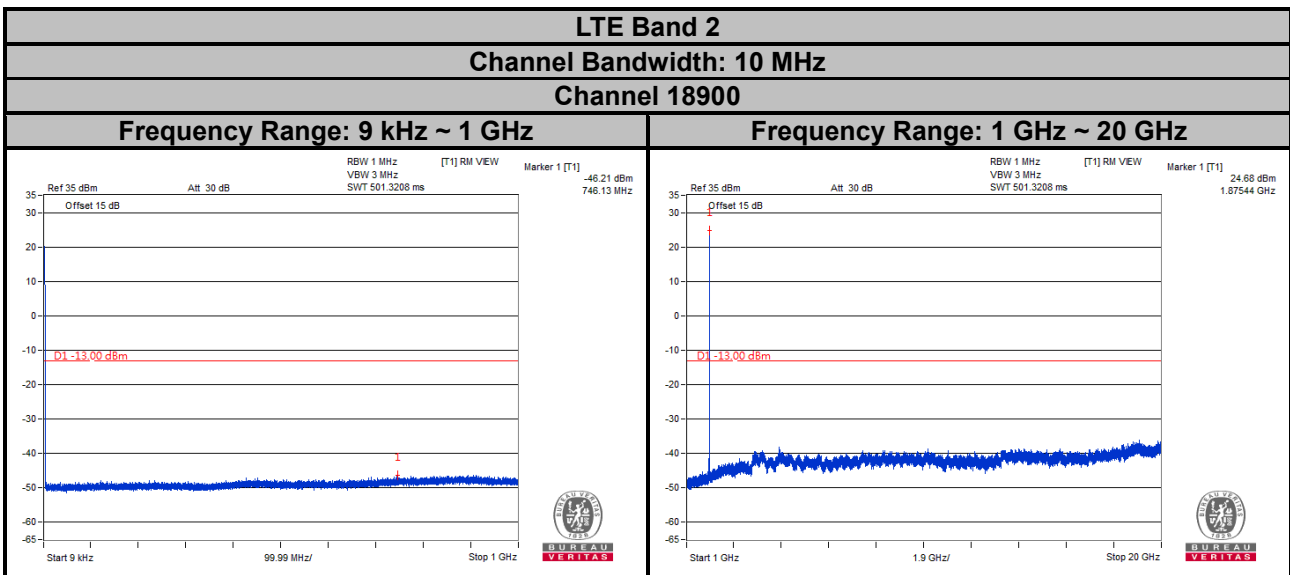
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



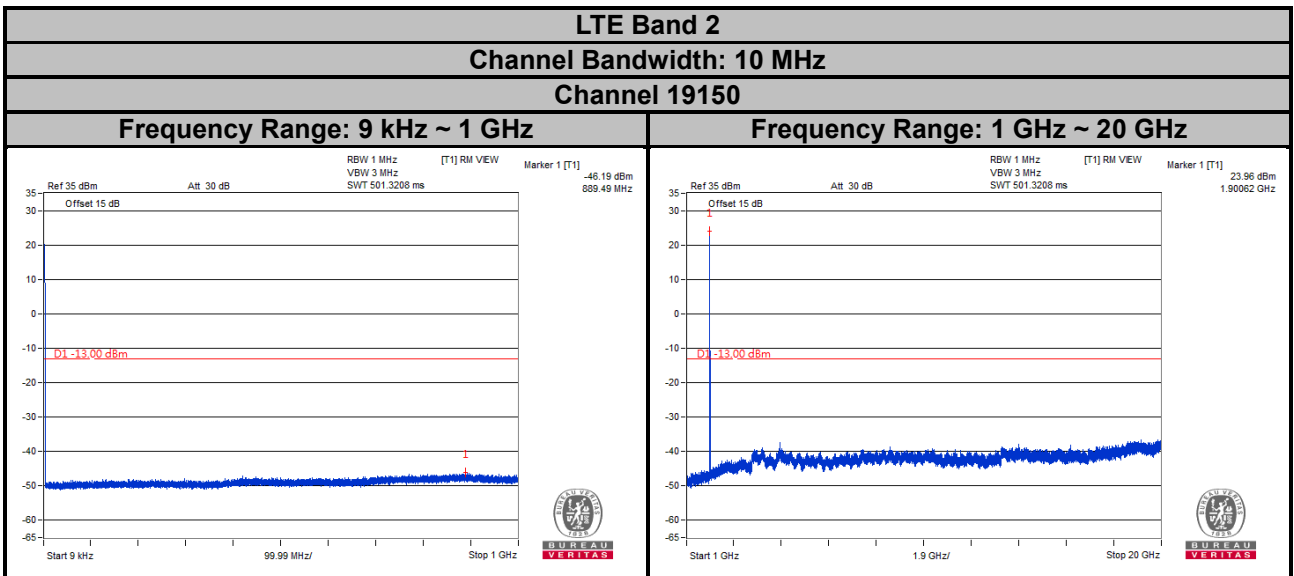
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



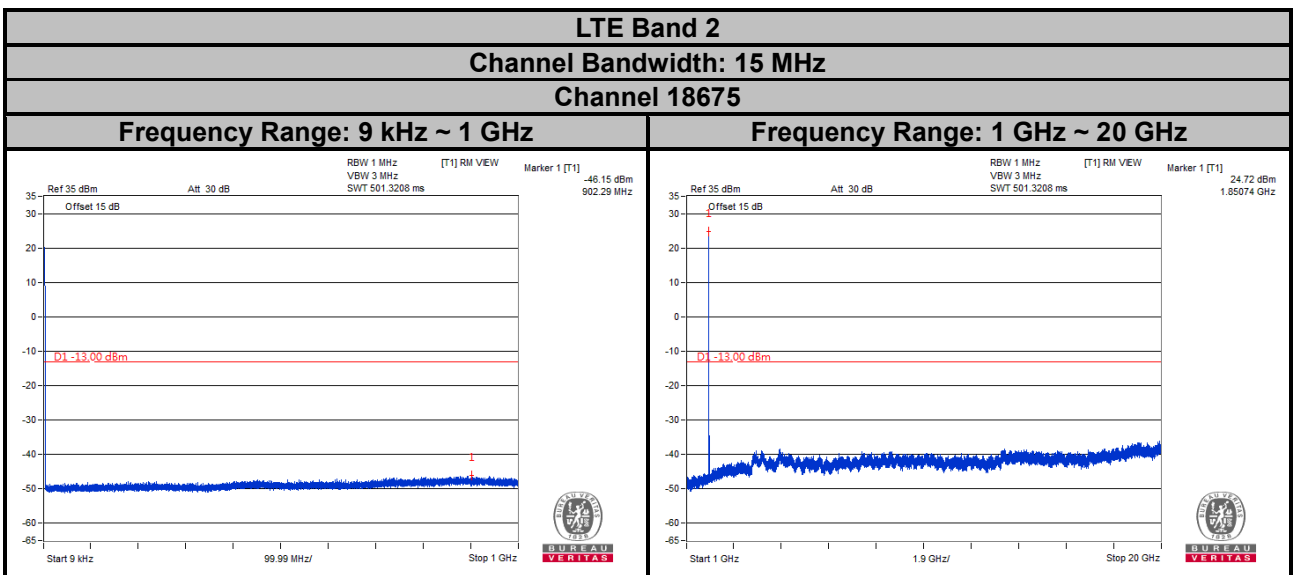
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



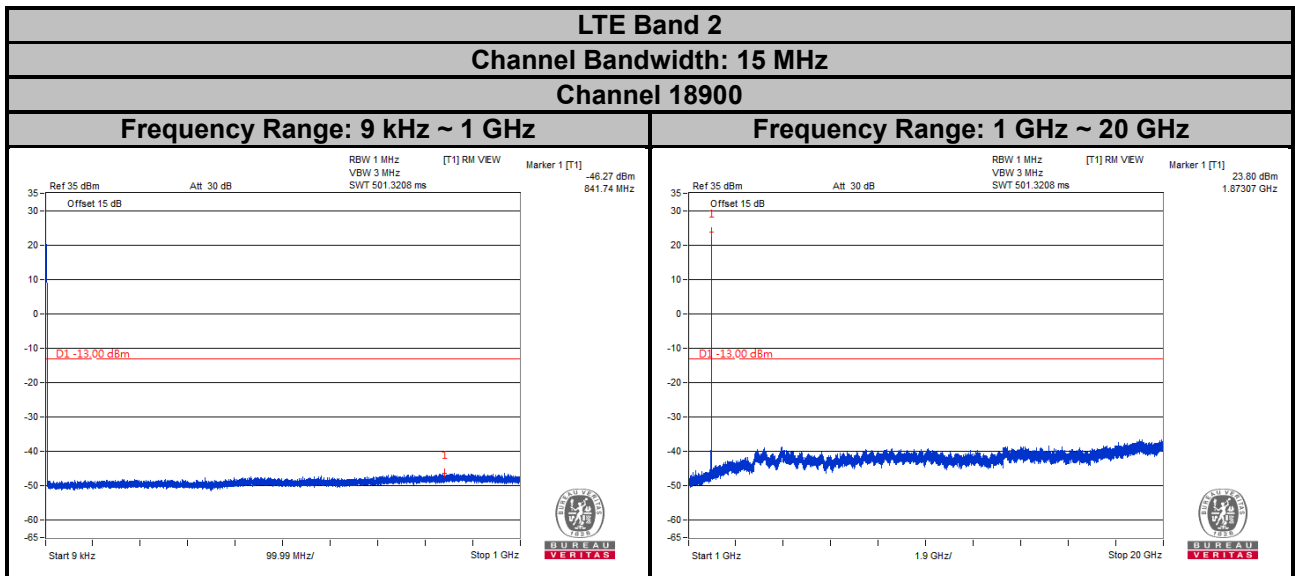
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



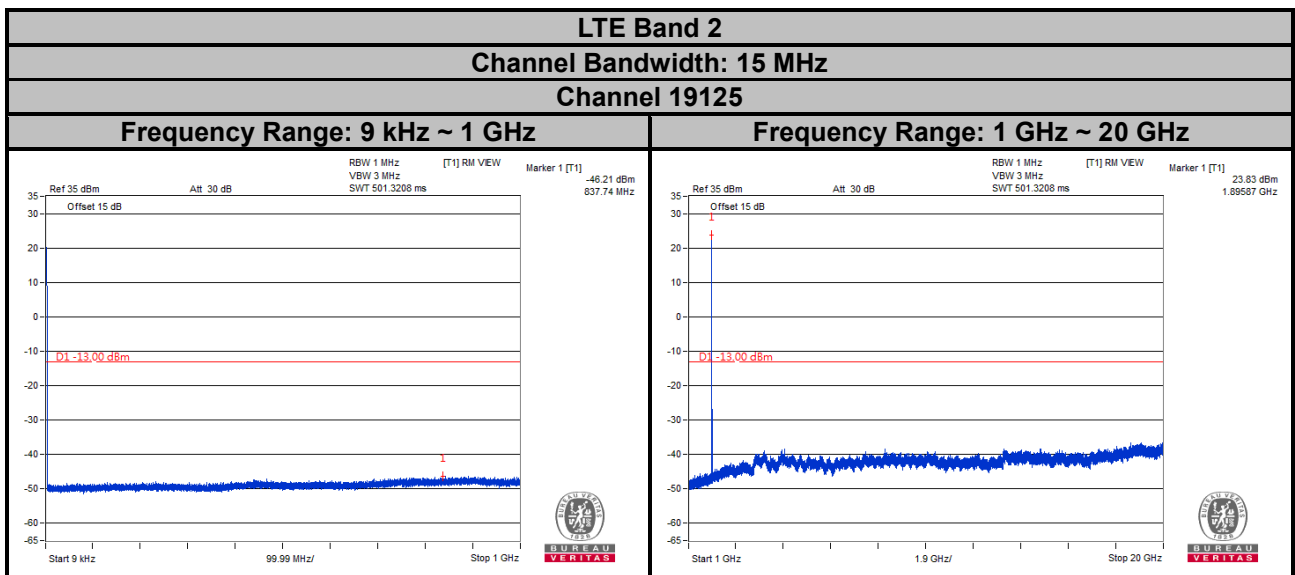
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



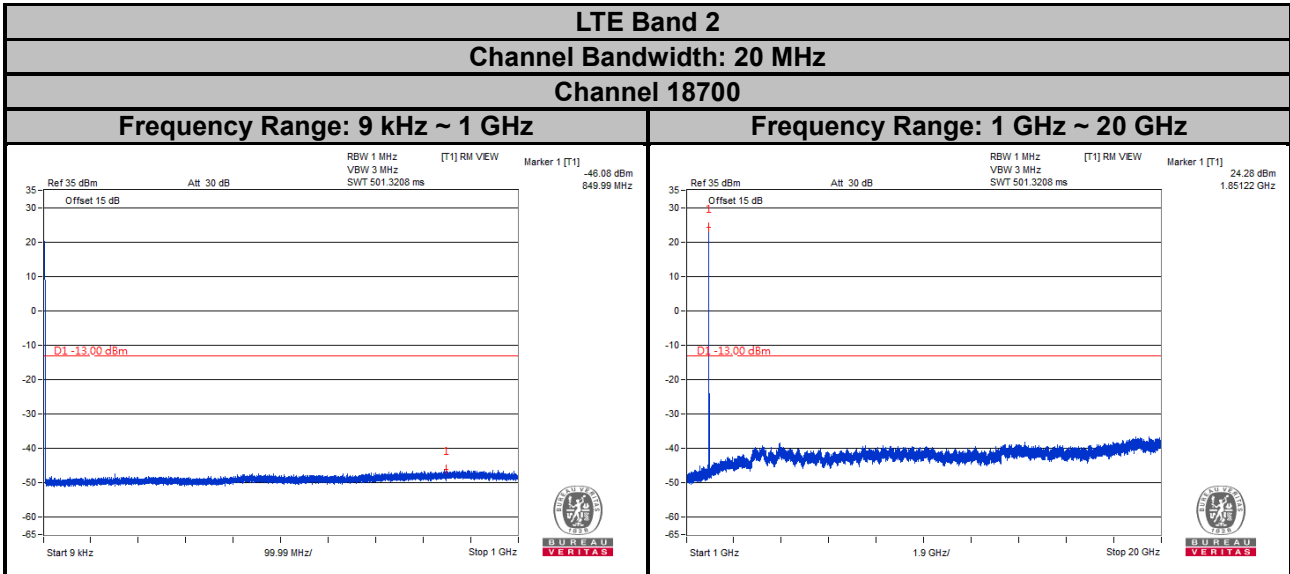
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



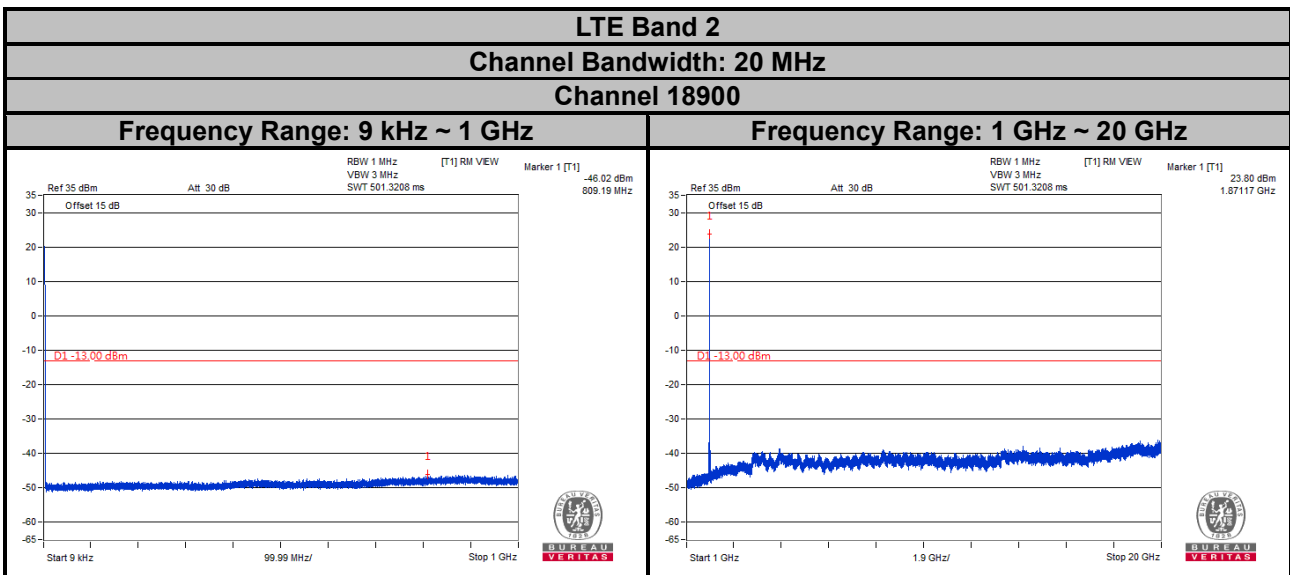
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



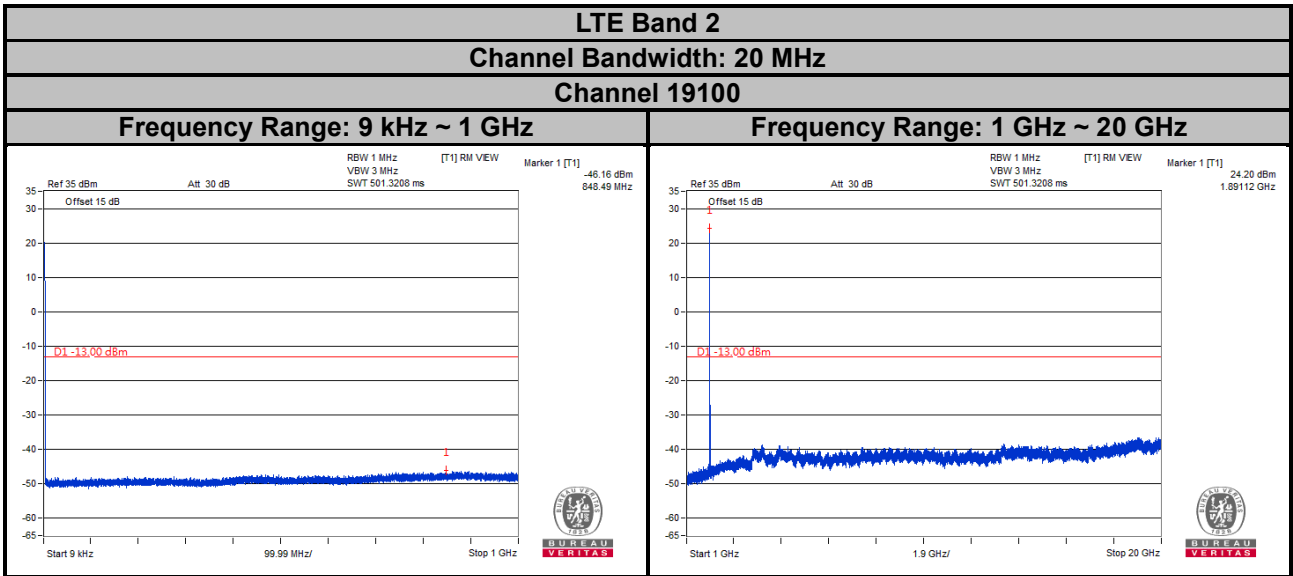
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



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Note: The signal over the limit in 9 kHz is from spectrum analyzer.

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

- 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.R.P power - 2.15 dB.

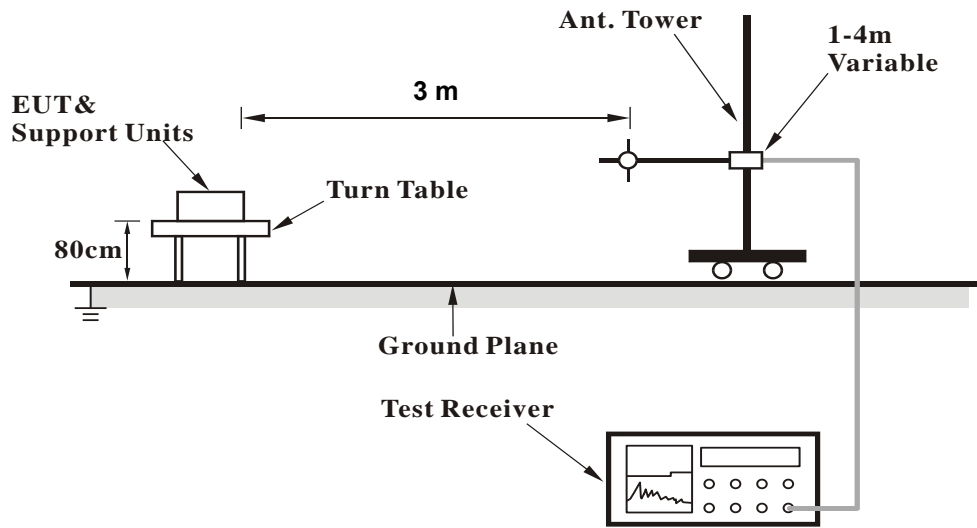
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

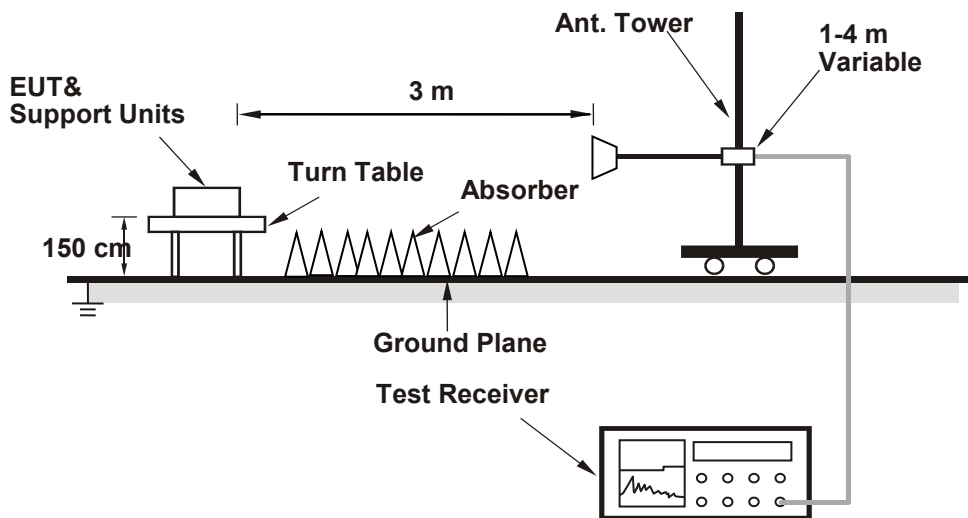
No deviation.

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

GSM:

Low Channel

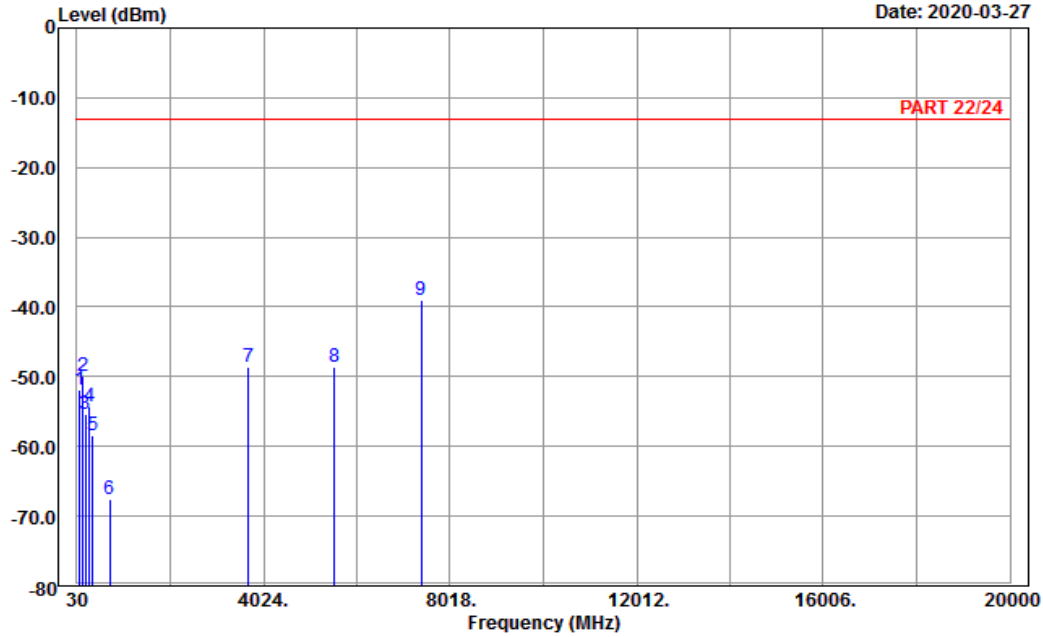


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Data: 13

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : PCS 1900_Link_L-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	99.12	-51.79	-41.61	-10.18	-13.00	-38.79	Peak
2	168.51	-49.92	-43.12	-6.80	-13.00	-36.92	Peak
3	208.47	-55.28	-49.21	-6.07	-13.00	-42.28	Peak
4	306.30	-54.23	-48.35	-5.88	-13.00	-41.23	Peak
5	372.80	-58.33	-54.14	-4.19	-13.00	-45.33	Peak
6	735.40	-67.55	-66.51	-1.04	-13.00	-54.55	Peak
7	3700.40	-48.65	-64.53	15.88	-13.00	-35.65	Peak
8	5550.60	-48.58	-68.92	20.34	-13.00	-35.58	Peak
9 pp	7400.80	-38.92	-61.20	22.28	-13.00	-25.92	Peak

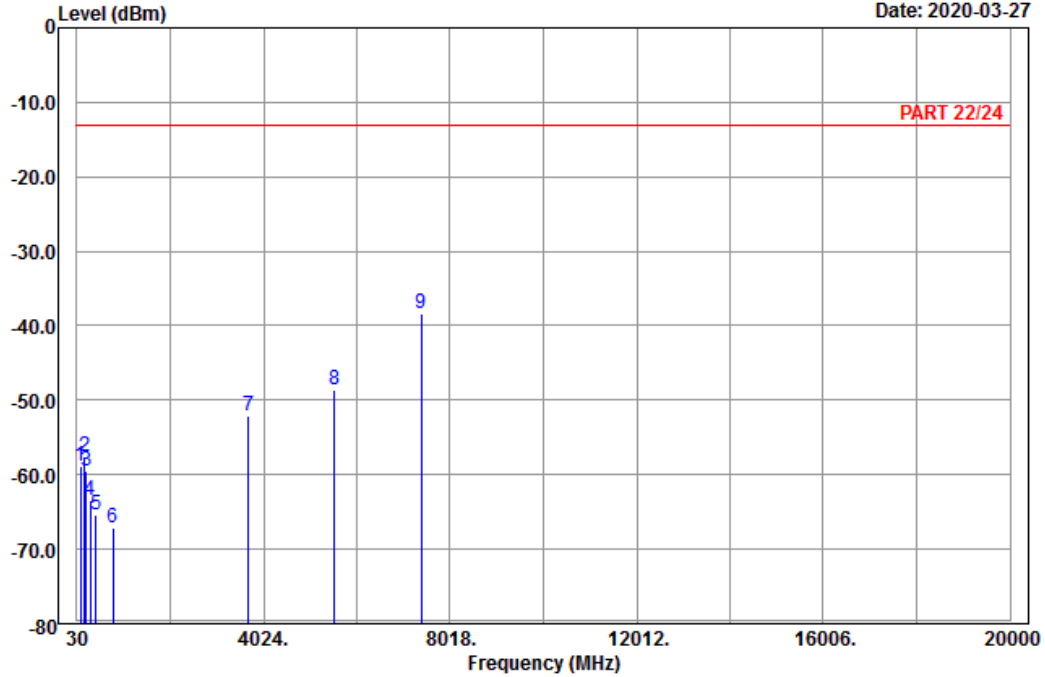


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Data: 14

Date: 2020-03-27



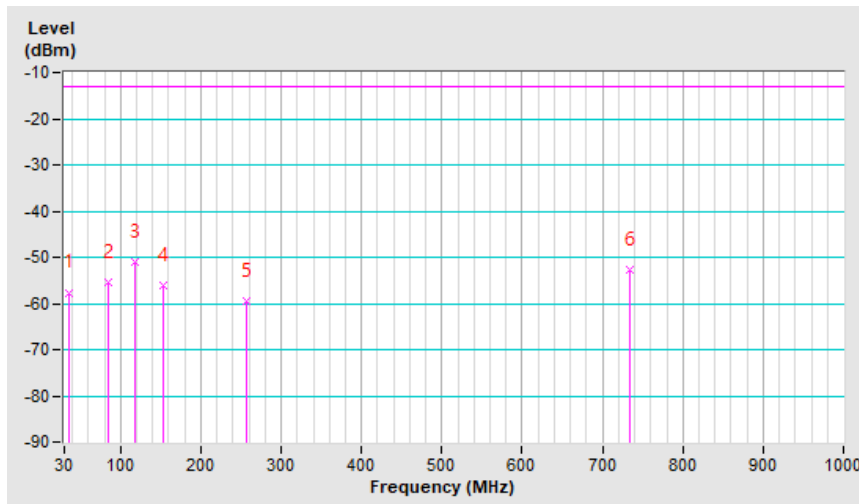
Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : PCS 1900_Link_L-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	111.27	-58.80	-49.98	-8.82	-13.00	-45.80	Peak
2	197.13	-57.63	-51.58	-6.05	-13.00	-44.63	Peak
3	235.74	-59.51	-53.81	-5.70	-13.00	-46.51	Peak
4	308.40	-63.45	-57.59	-5.86	-13.00	-50.45	Peak
5	440.00	-65.31	-61.68	-3.63	-13.00	-52.31	Peak
6	806.10	-67.06	-69.00	1.94	-13.00	-54.06	Peak
7	3700.40	-52.08	-67.96	15.88	-13.00	-39.08	Peak
8	5550.60	-48.62	-68.96	20.34	-13.00	-35.62	Peak
9 pp	7400.80	-38.33	-60.61	22.28	-13.00	-25.33	Peak

For Docking Mode

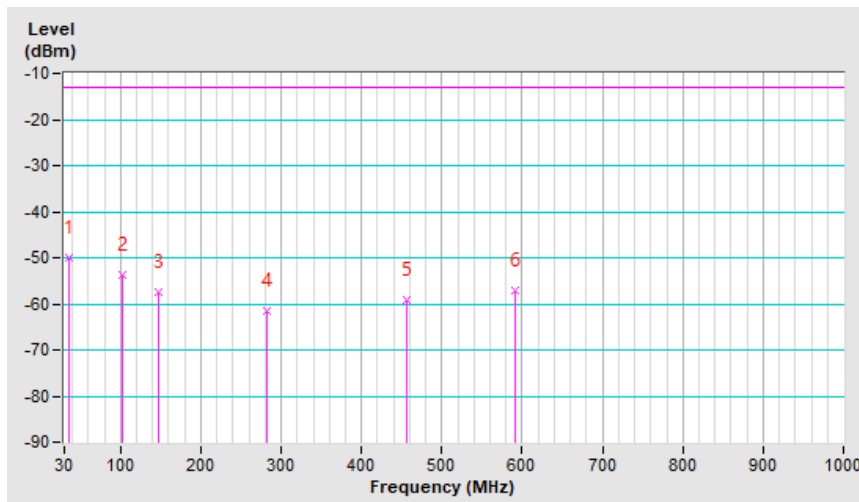
Mode	TX channel 512 (1850.2MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Titan Hsu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	35.62	-59.90	-46.10	-11.50	-57.60	-13.00	-44.60
2	84.83	-48.70	-55.20	-0.30	-55.50	-13.00	-42.50
3	117.16	-43.00	-51.30	0.20	-51.10	-13.00	-38.10
4	153.71	-51.10	-56.10	0.10	-56.00	-13.00	-43.00
5	256.33	-53.90	-64.70	5.30	-59.40	-13.00	-46.40
6	734.30	-56.80	-57.60	4.80	-52.80	-13.00	-39.80



Mode	TX channel 512 (1850.2MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	23deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Titan Hsu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	35.62	-40.70	-38.50	-11.50	-50.00	-13.00	-37.00
2	101.70	-46.20	-54.50	0.80	-53.70	-13.00	-40.70
3	148.09	-54.90	-57.40	-0.20	-57.60	-13.00	-44.60
4	283.04	-63.10	-66.90	5.30	-61.60	-13.00	-48.60
5	455.96	-59.40	-64.10	5.00	-59.10	-13.00	-46.10
6	590.91	-60.60	-61.60	4.50	-57.10	-13.00	-44.10



Middle Channel

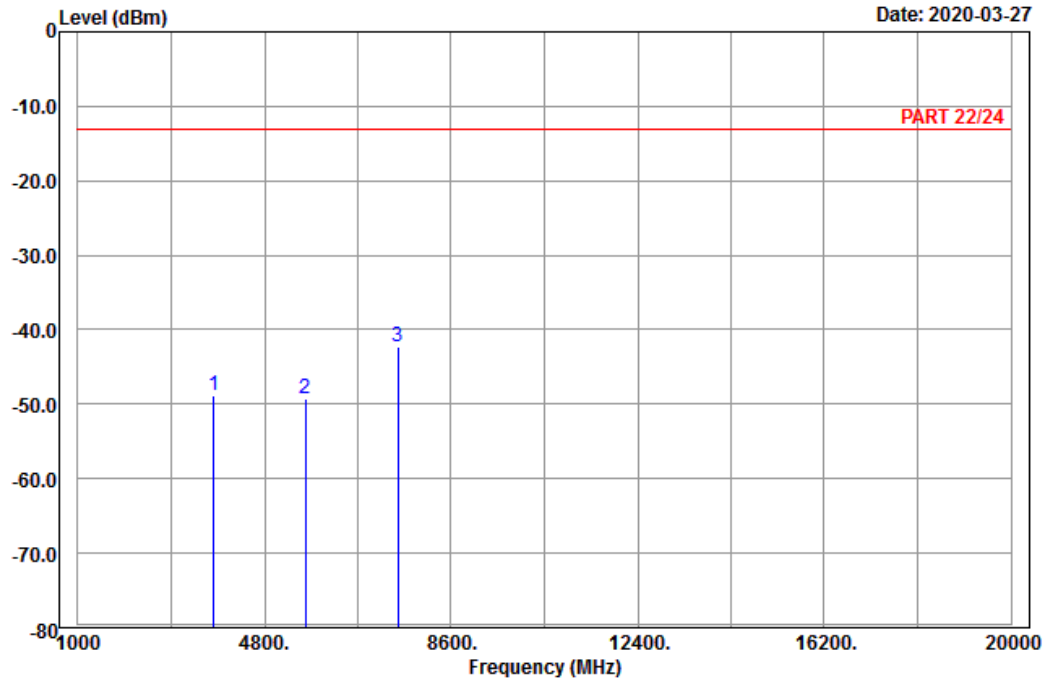


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Data: 9

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : PCS 1900_Link_M-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3760.00	-48.77	-64.91	16.14	-13.00	-35.77	Peak
2	5640.00	-49.27	-69.74	20.47	-13.00	-36.27	Peak
3 pp	7520.00	-42.32	-65.00	22.68	-13.00	-29.32	Peak

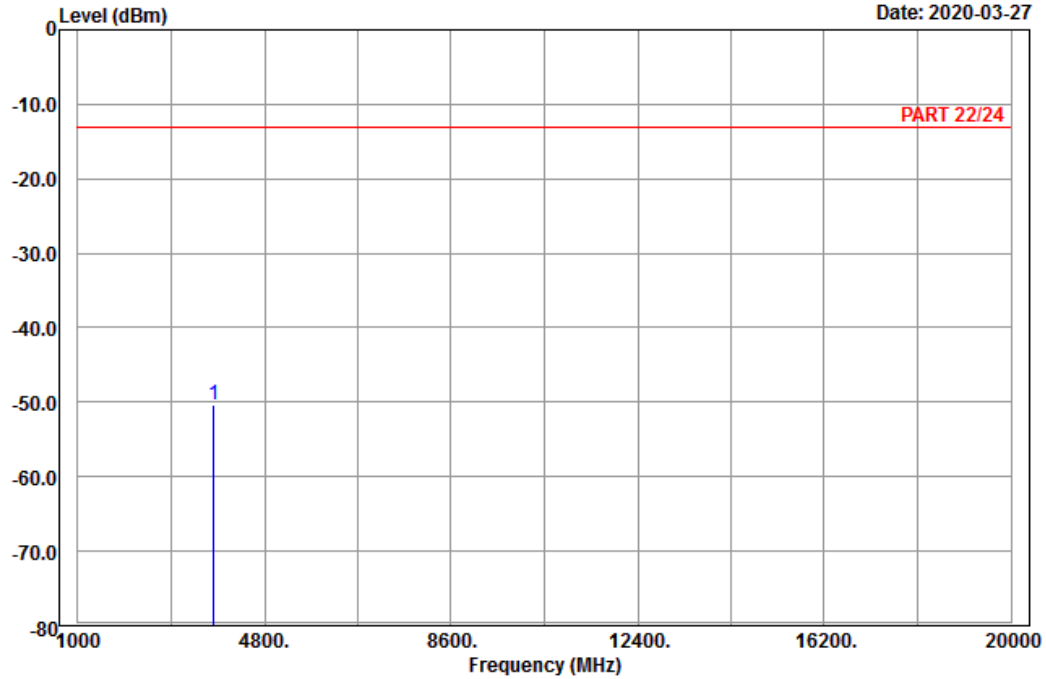


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Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : PCS 1900_Link_M-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3760.00	-50.40	-66.54	16.14	-13.00	-37.40	Peak

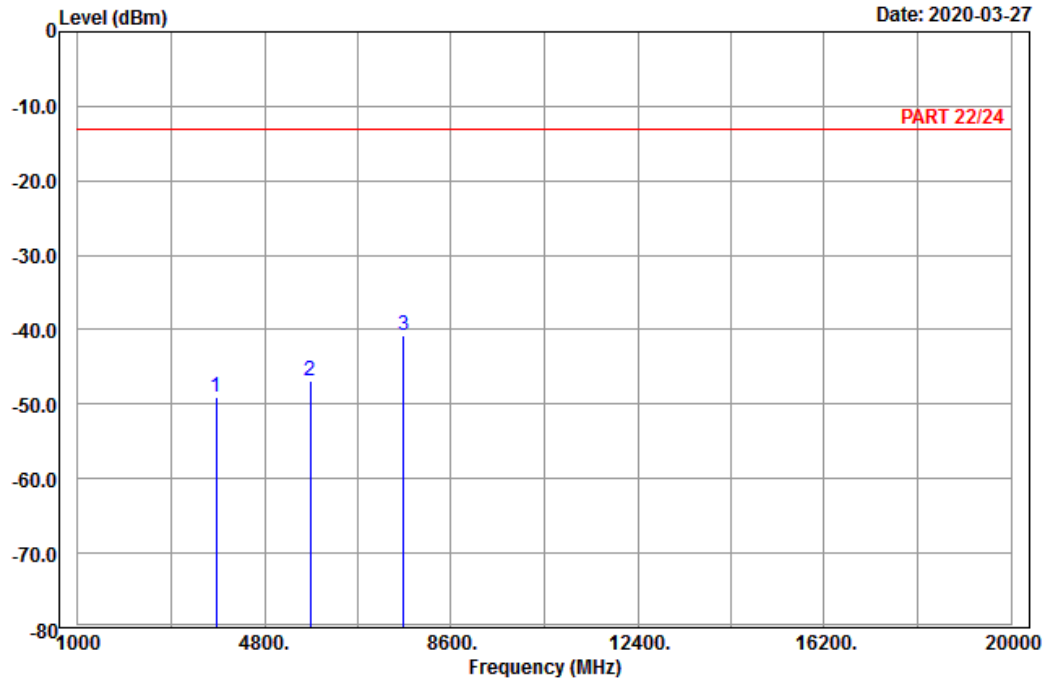
High Channel



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A D T

Data: 9



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : PCS 1900_Link_H-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3819.60	-49.12	-65.62	16.50	-13.00	-36.12	Peak
2	5729.40	-46.77	-67.11	20.34	-13.00	-33.77	Peak
3 pp	7639.20	-40.71	-63.77	23.06	-13.00	-27.71	Peak

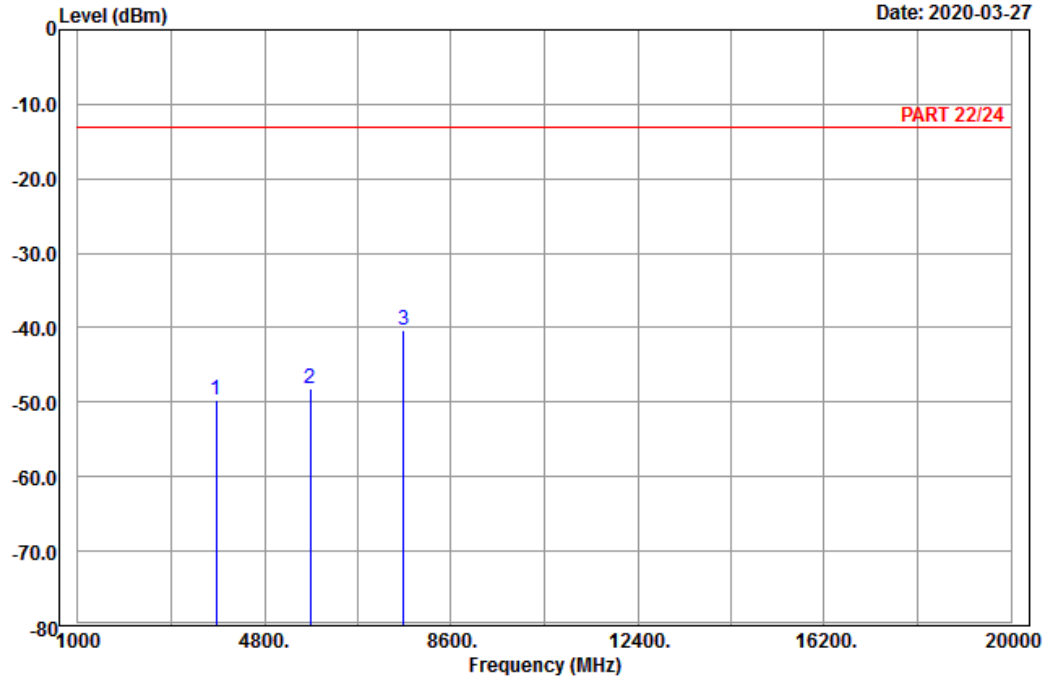


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A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : PCS 1900_Link_H-Ch
 Tested by: Karl Lee

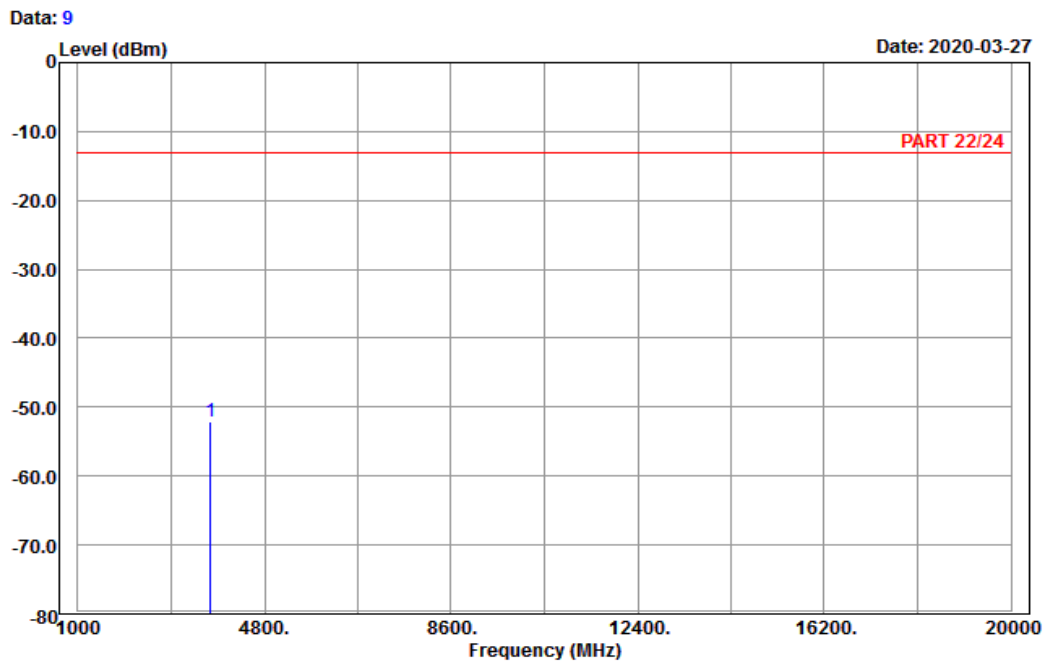
	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3819.60	-49.80	-66.30	16.50	-13.00	-36.80	Peak
2	5729.40	-48.16	-68.50	20.34	-13.00	-35.16	Peak
3 pp	7639.20	-40.23	-63.29	23.06	-13.00	-27.23	Peak

EDGE:
Low Channel



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A D T



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : EDGE 1900_Link_L-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	pp 3700.40	-52.13	-68.01	15.88	-13.00	-39.13	Peak

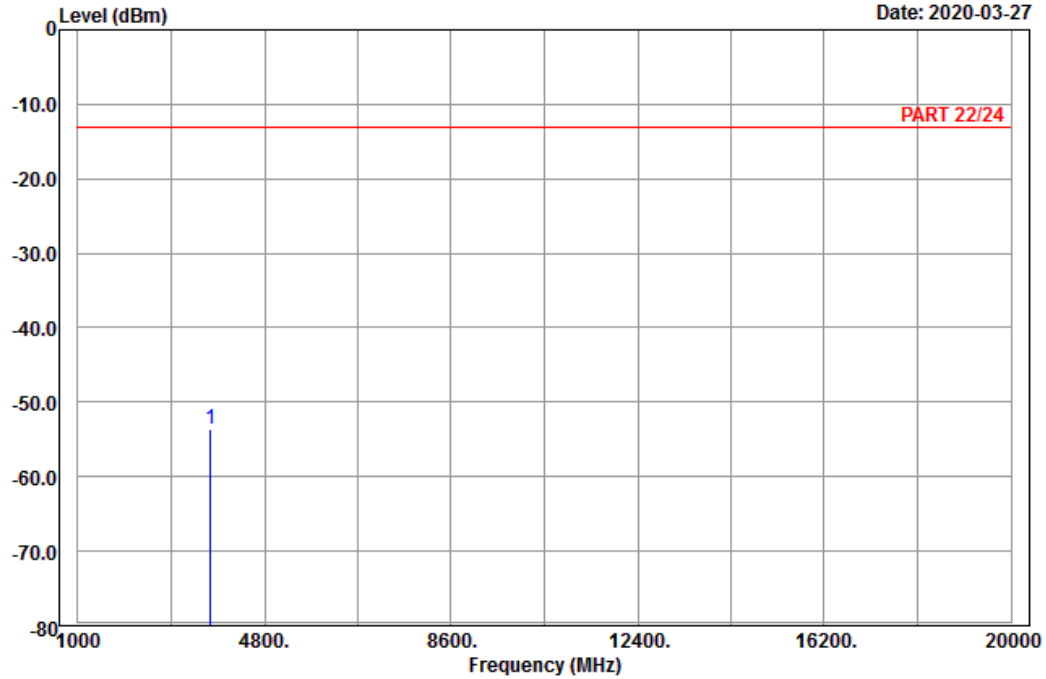


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A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : EDGE 1900_Link_L-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3700.40	-53.65	-69.53	15.88	-13.00	-40.65	Peak

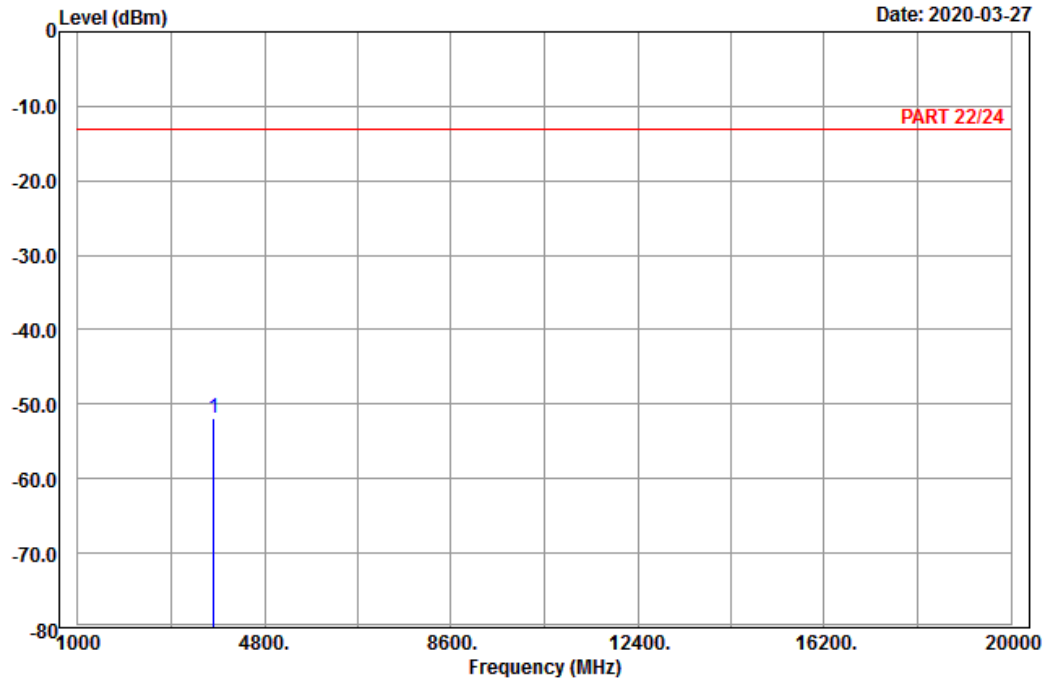
Middle Channel



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A D T

Data: 9



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : EDGE 1900_Link_M-Ch
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3760.00	-51.93	-68.07	16.14	-13.00	-38.93	Peak

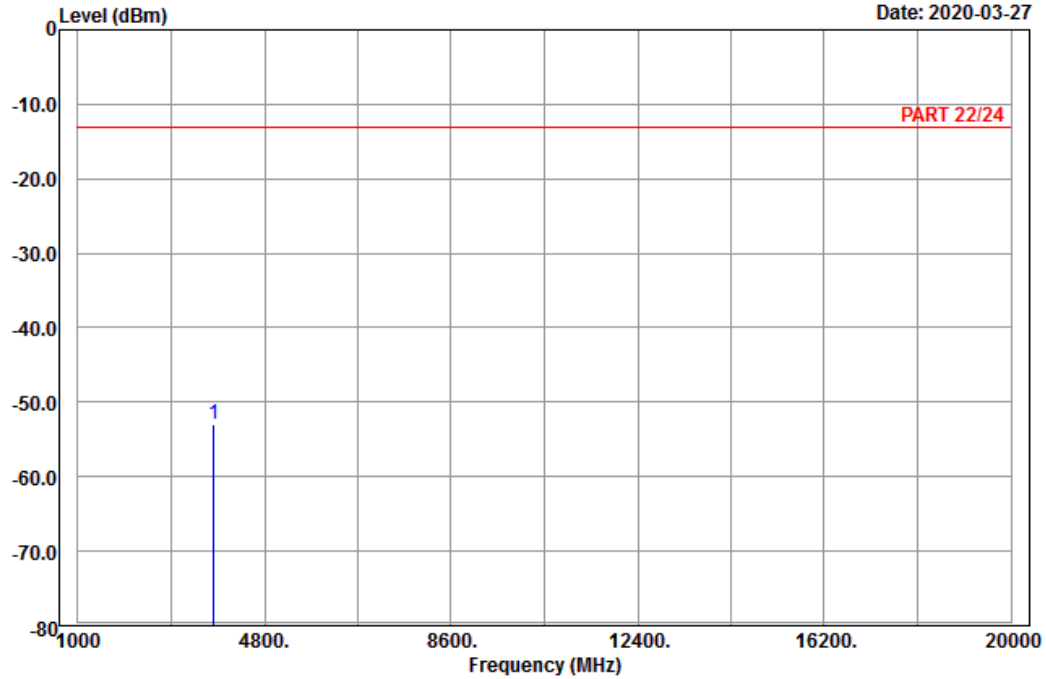


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : EDGE 1900_Link_M-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3760.00	-52.96	-69.10	16.14	-13.00	-39.96	Peak

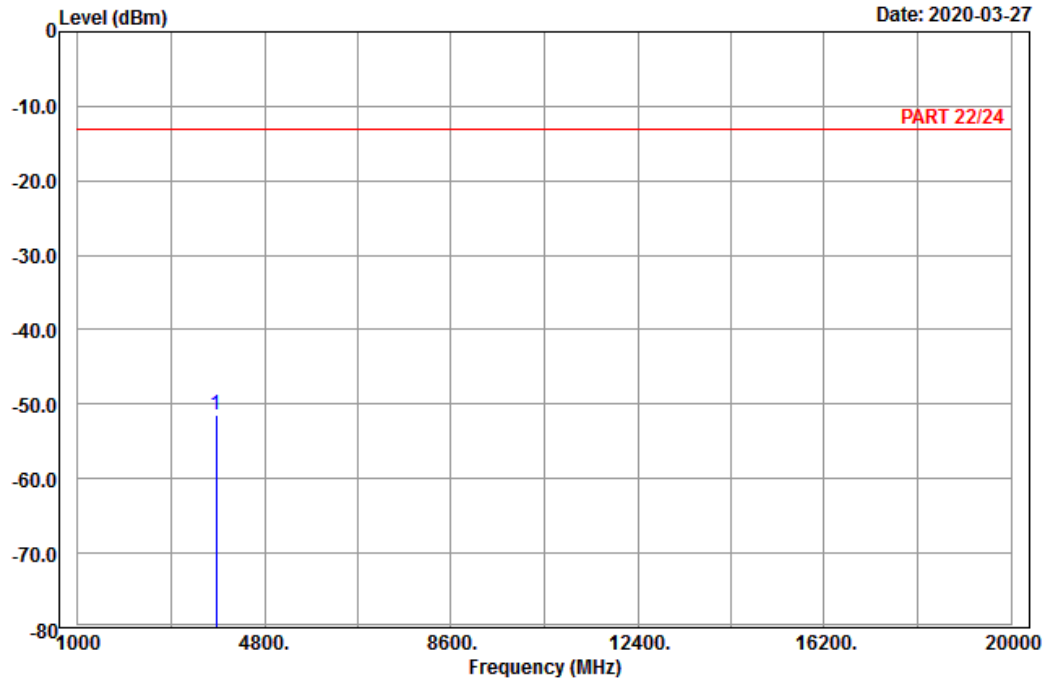
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : EDGE 1900_Link_H-Ch
 Tested by: Karl Lee

Freq	Level	Read Level	Limit Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3819.60	-51.46	-67.96	16.50	-13.00	-38.46	Peak

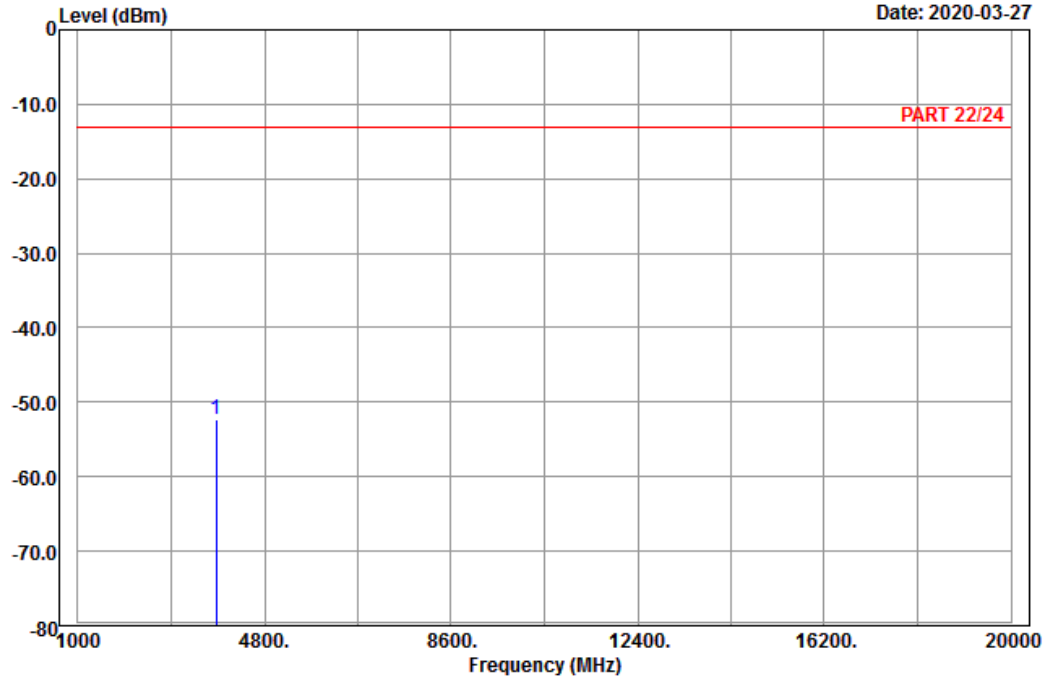


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : EDGE 1900_Link_H-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3819.60	-52.25	-68.75	16.50	-13.00	-39.25	Peak

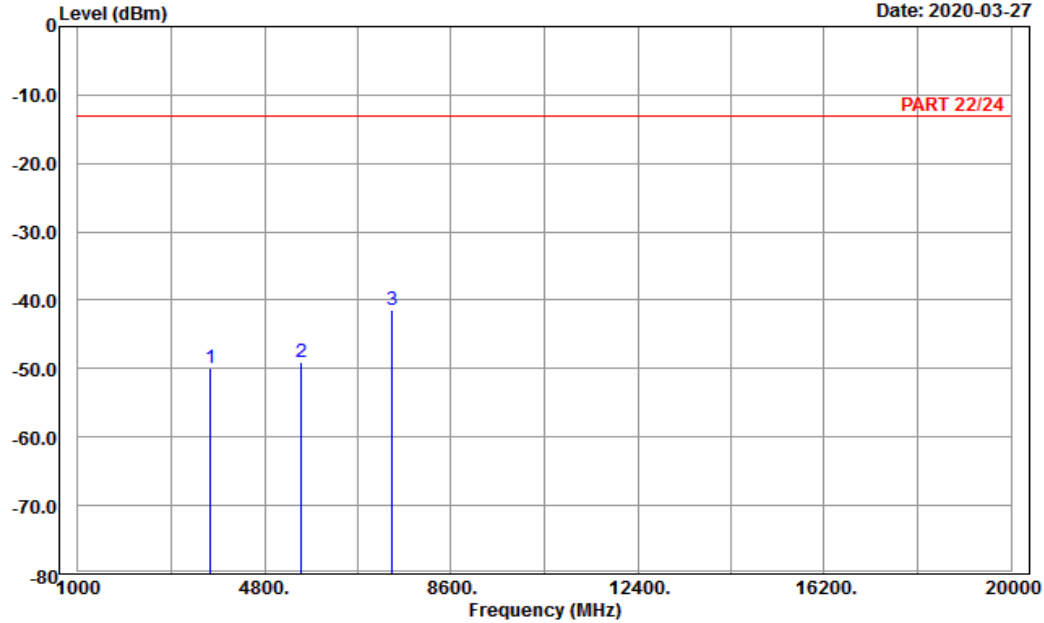
WCDMA:
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : Band II_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3704.80	-49.86	-65.74	15.88	-13.00	-36.86	Peak
2	5557.20	-49.00	-69.34	20.34	-13.00	-36.00	Peak
3 pp	7409.60	-41.44	-63.72	22.28	-13.00	-28.44	Peak

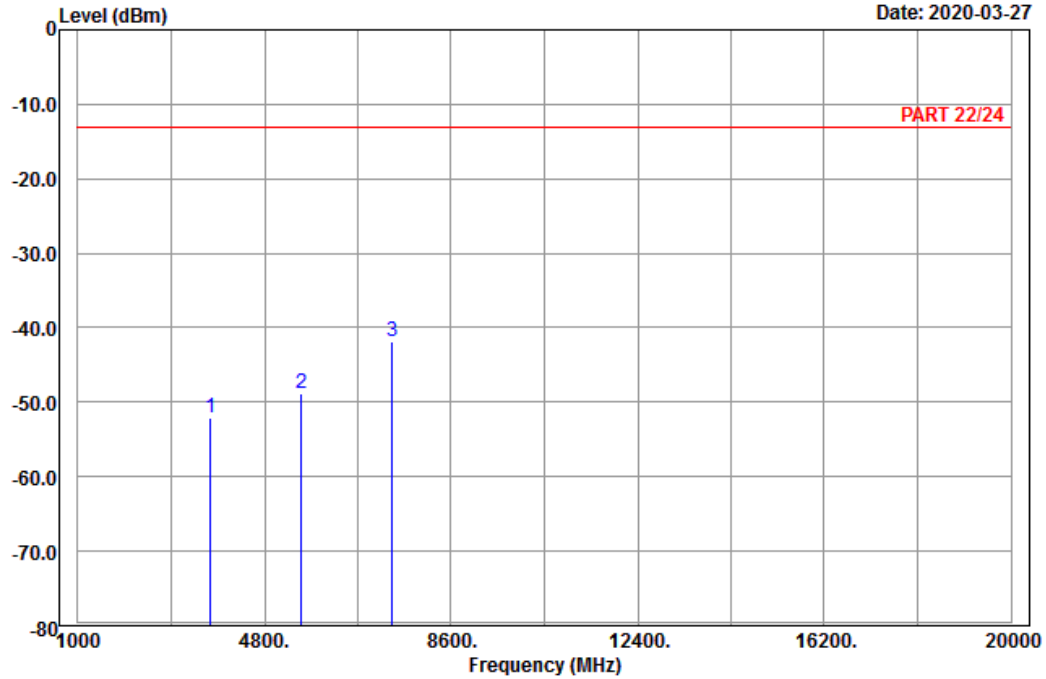


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : Band II_Link_L-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3704.80	-52.10	-67.98	15.88	-13.00	-39.10	Peak
2	5557.20	-48.74	-69.08	20.34	-13.00	-35.74	Peak
3 pp	7409.60	-41.89	-64.17	22.28	-13.00	-28.89	Peak

Middle Channel

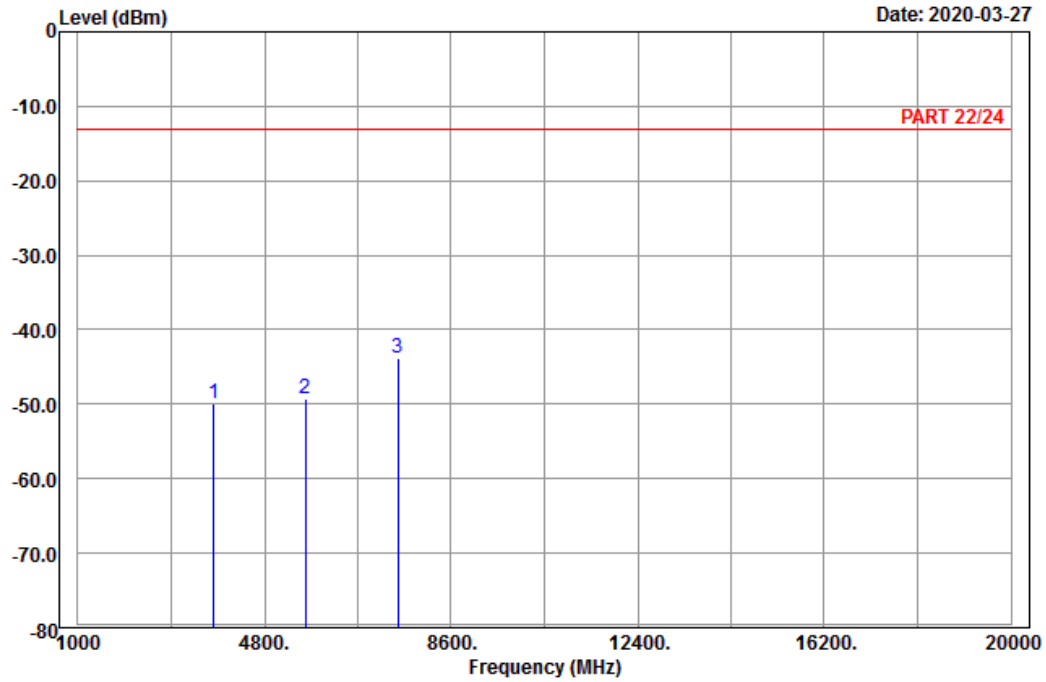


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : Band II_Link_M-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3760.00	-49.87	-66.01	16.14	-13.00	-36.87	Peak
2	5640.00	-49.33	-69.80	20.47	-13.00	-36.33	Peak
3 pp	7520.00	-43.84	-66.52	22.68	-13.00	-30.84	Peak

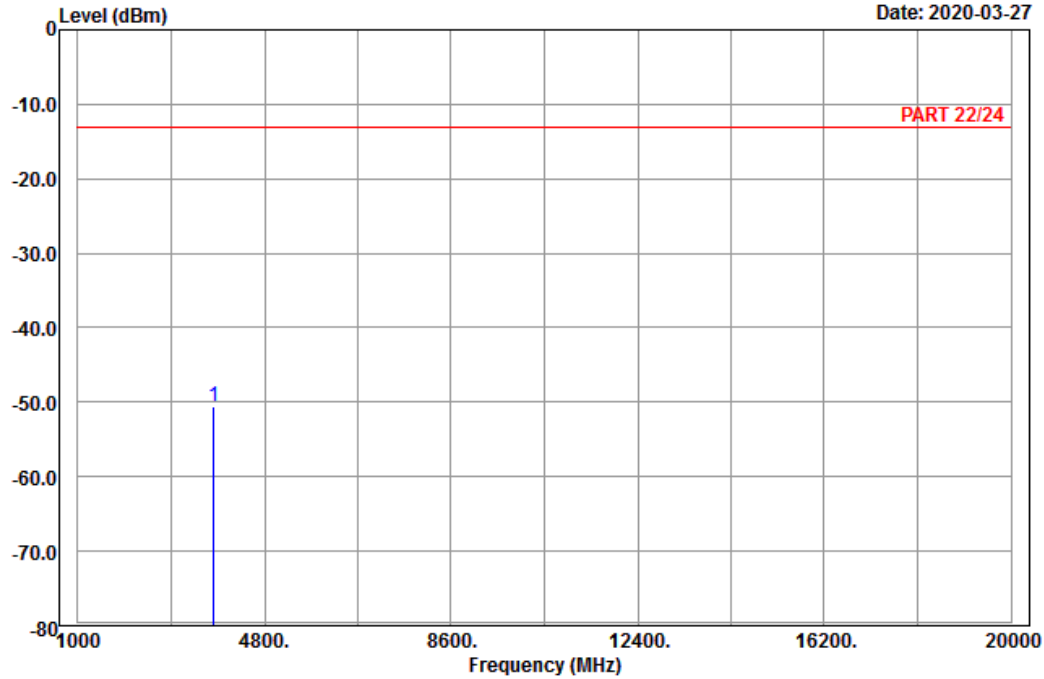


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : Band II_Link_M-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3760.00	-50.58	-66.72	16.14	-13.00	-37.58	Peak

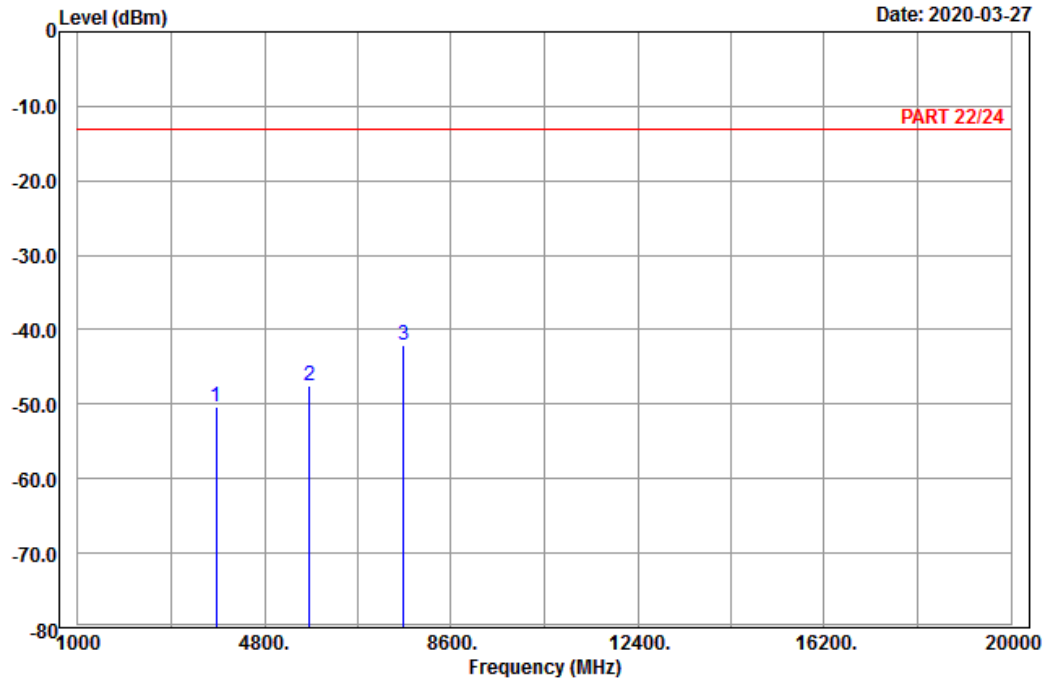
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : Band II_Link_H-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3815.20	-50.45	-66.86	16.41	-13.00	-37.45	Peak
2	5722.80	-47.55	-67.82	20.27	-13.00	-34.55	Peak
3 pp	7630.40	-42.11	-65.13	23.02	-13.00	-29.11	Peak

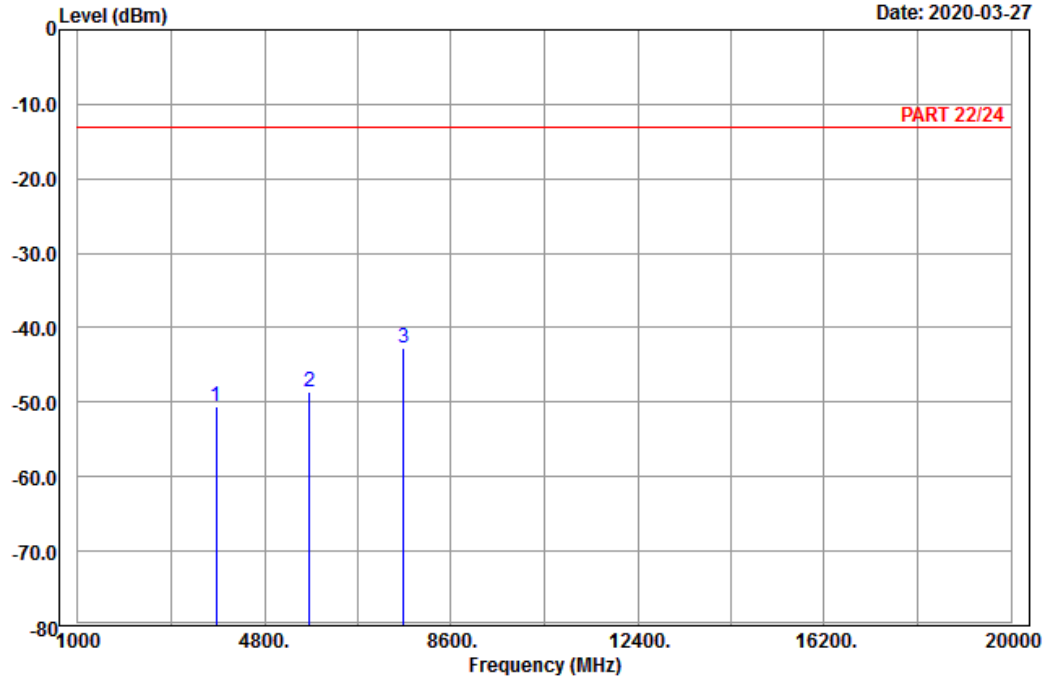


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : Band II_Link_H-Ch
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3815.20	-50.55	-66.96	16.41	-13.00	-37.55	Peak
2	5722.80	-48.66	-68.93	20.27	-13.00	-35.66	Peak
3 pp	7630.40	-42.63	-65.65	23.02	-13.00	-29.63	Peak

LTE Band 2
 Channel Bandwidth: 1.4 MHz / QPSK
 Low Channel

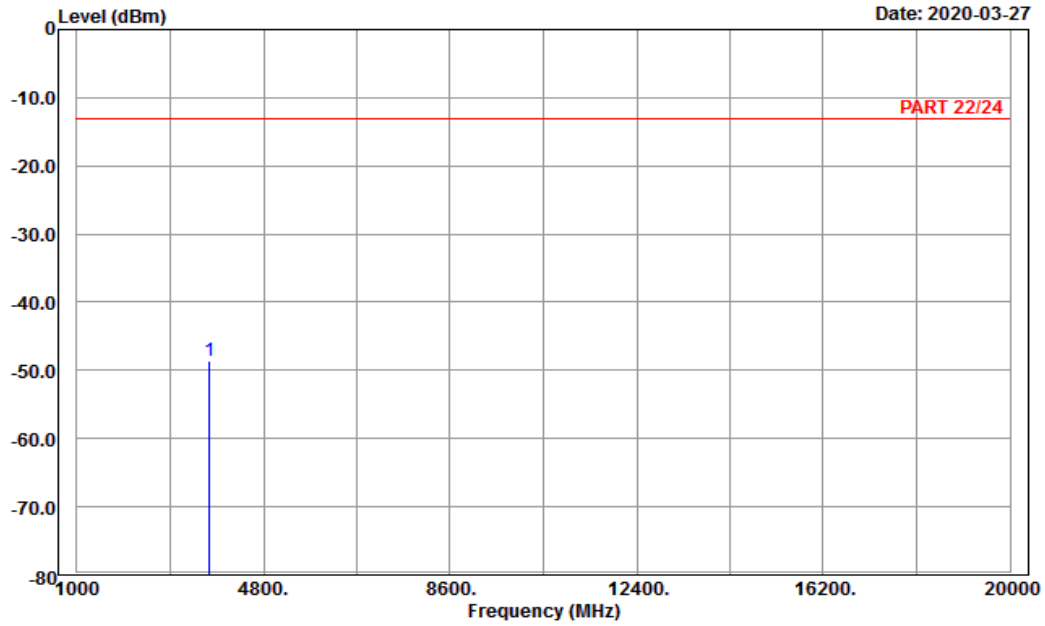


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 2_Link_CH-L
 Tested by: Karl Lee

	Read	Limit	Over	
Freq	Level	Level	Factor	Line
MHz	dBm	dBm	dB	dBm
1 pp 3701.40	-48.54	-64.42	15.88	-13.00
				-35.54
				Peak

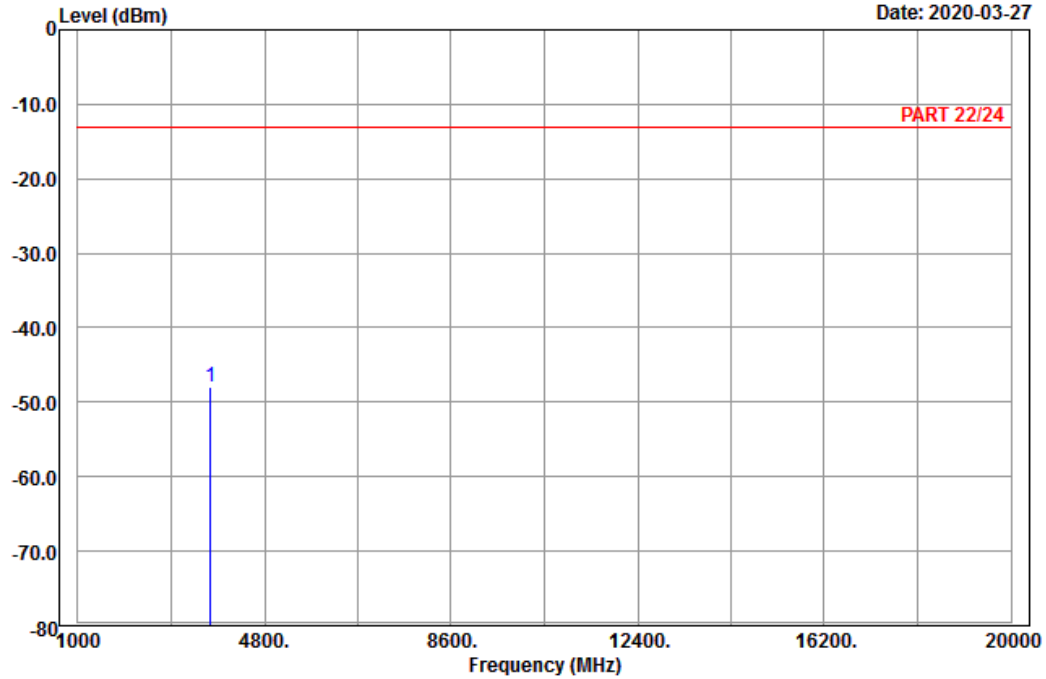


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-L
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3701.40	-48.02	-63.90	15.88	-13.00	-35.02	Peak

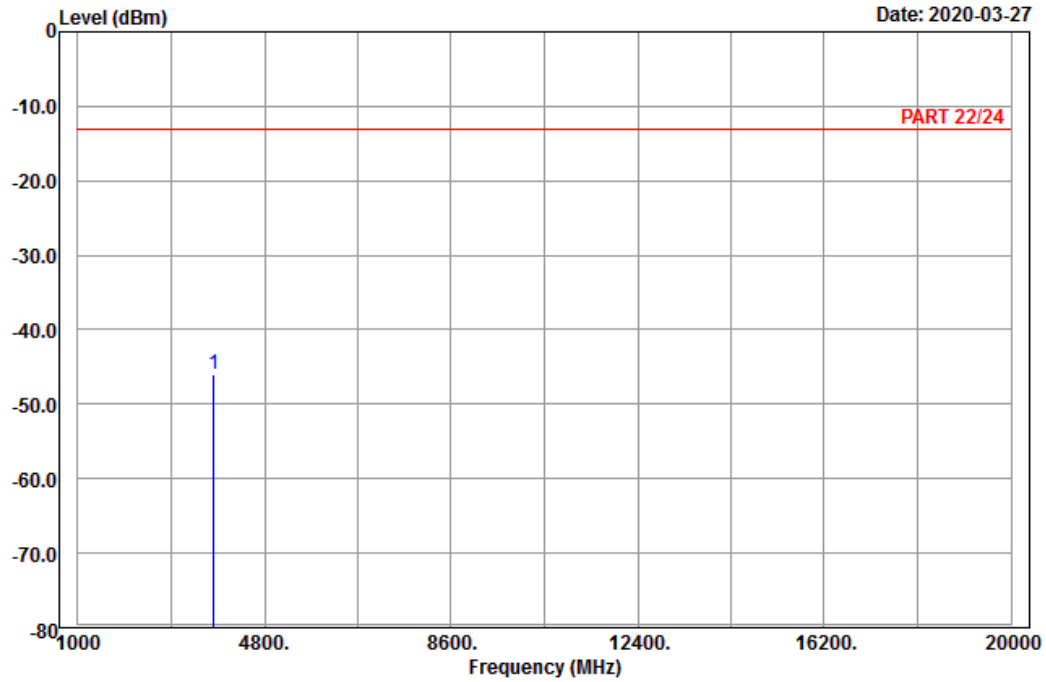
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 2_Link_CH-M
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3760.00	-46.04	-62.18	16.14	-13.00	-33.04	Peak

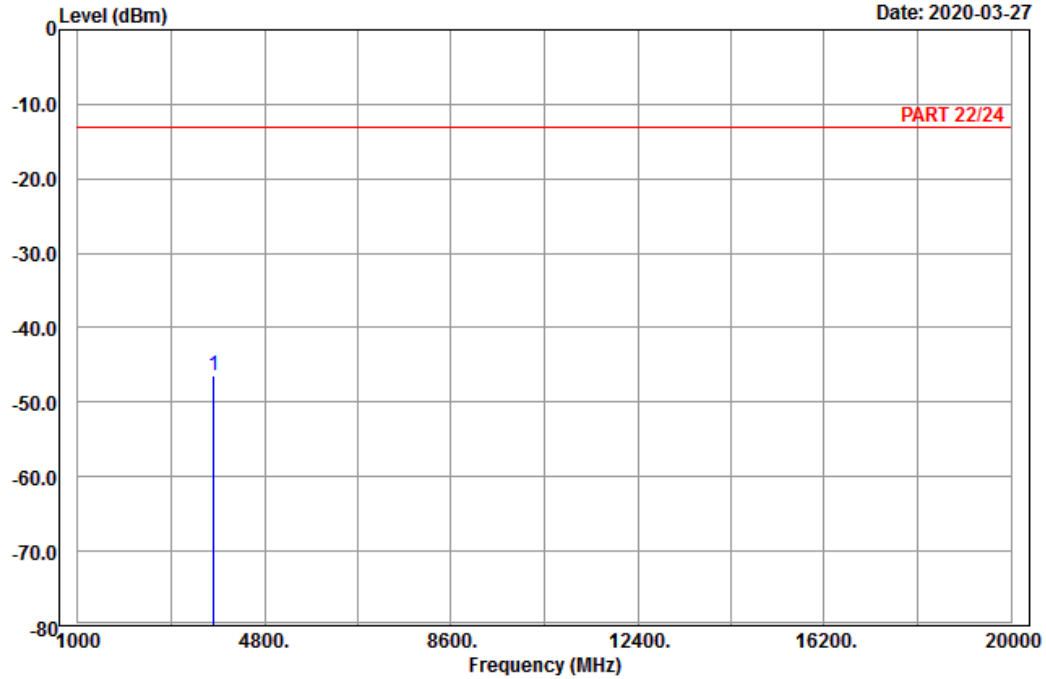


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-M
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3760.00	-46.37	-62.51	16.14	-13.00	-33.37	Peak

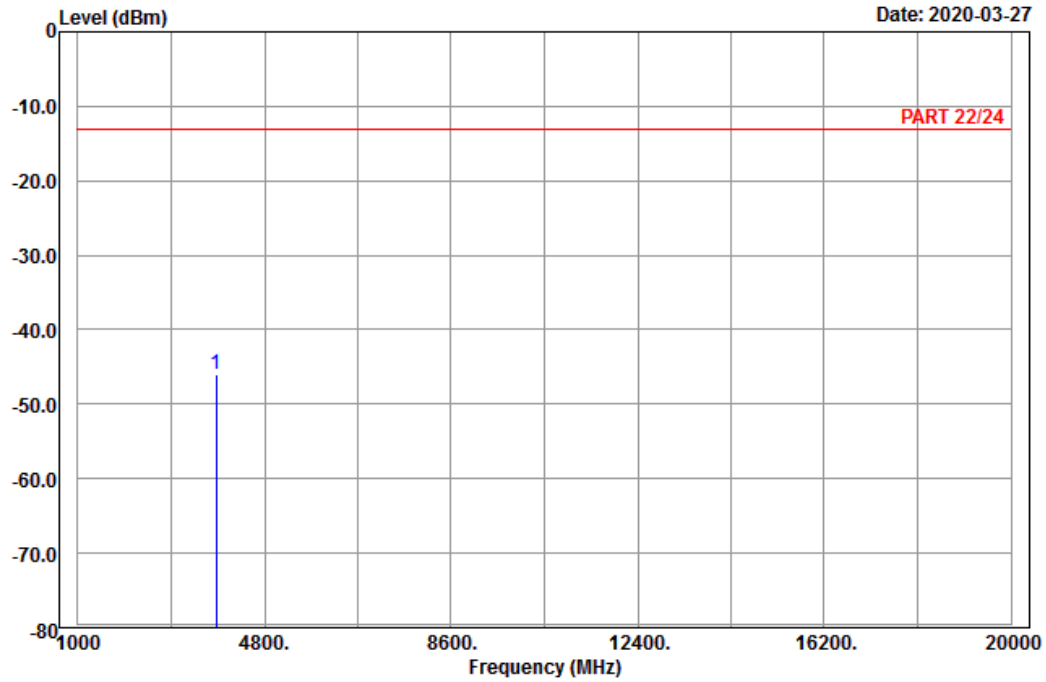
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 2_Link_CH-H
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3818.60	-45.96	-62.46	16.50	-13.00	-32.96	Peak

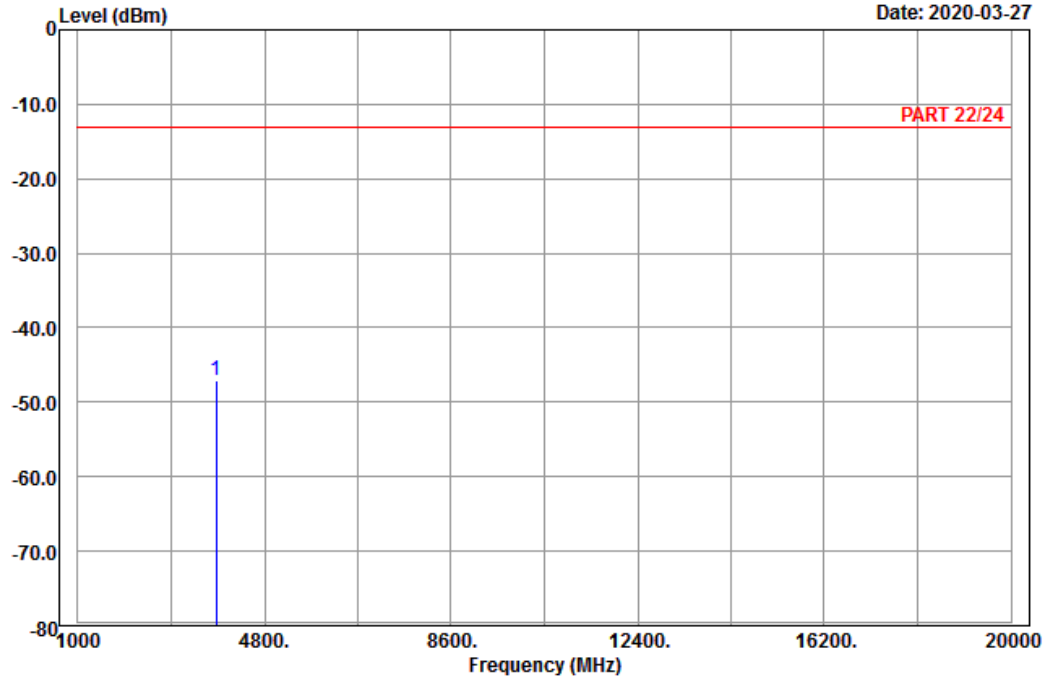


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-H
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3818.60	-47.01	-63.51	16.50	-13.00	-34.01	Peak

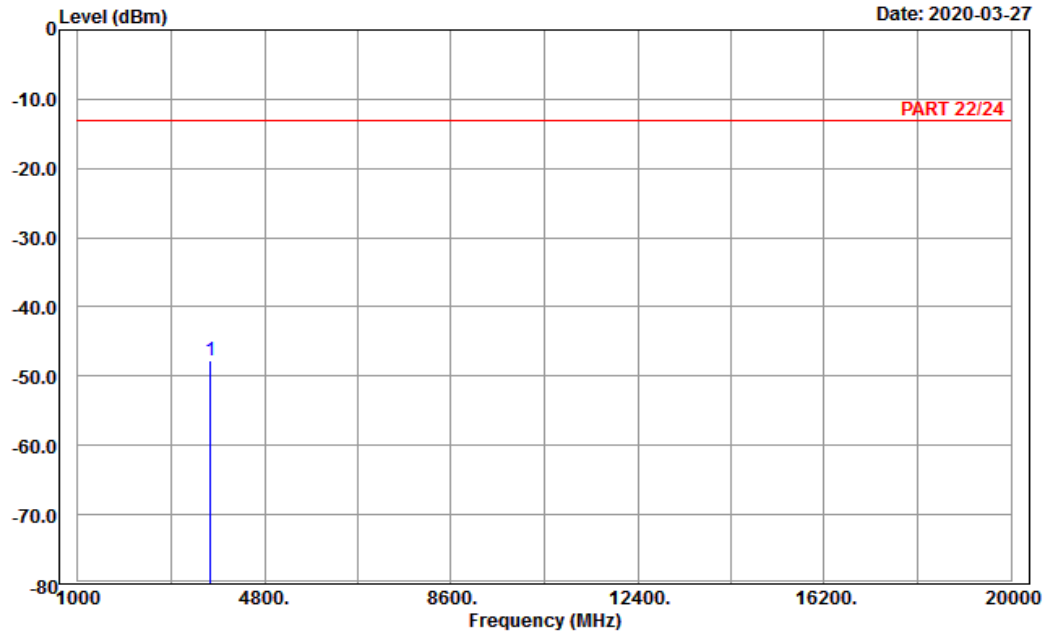
Channel Bandwidth: 5 MHz / QPSK
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 2_Link_CH-L
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3705.00	-47.79	-63.67	15.88	-13.00	-34.79	Peak

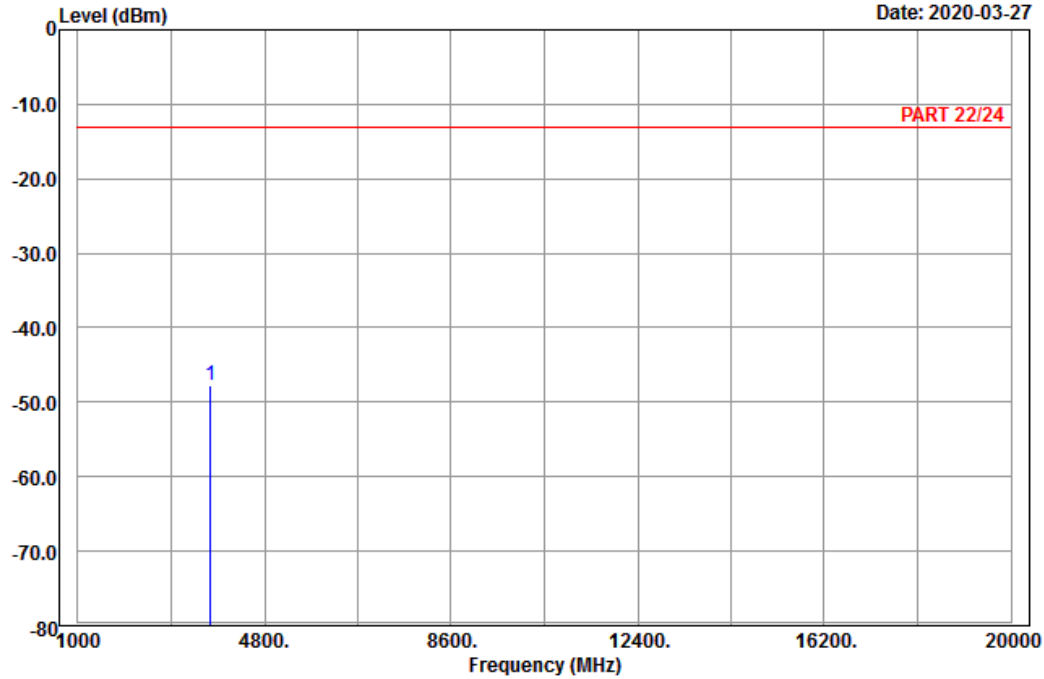


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-L
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3705.00	-47.81	-63.69	15.88	-13.00	-34.81	Peak

Middle Channel

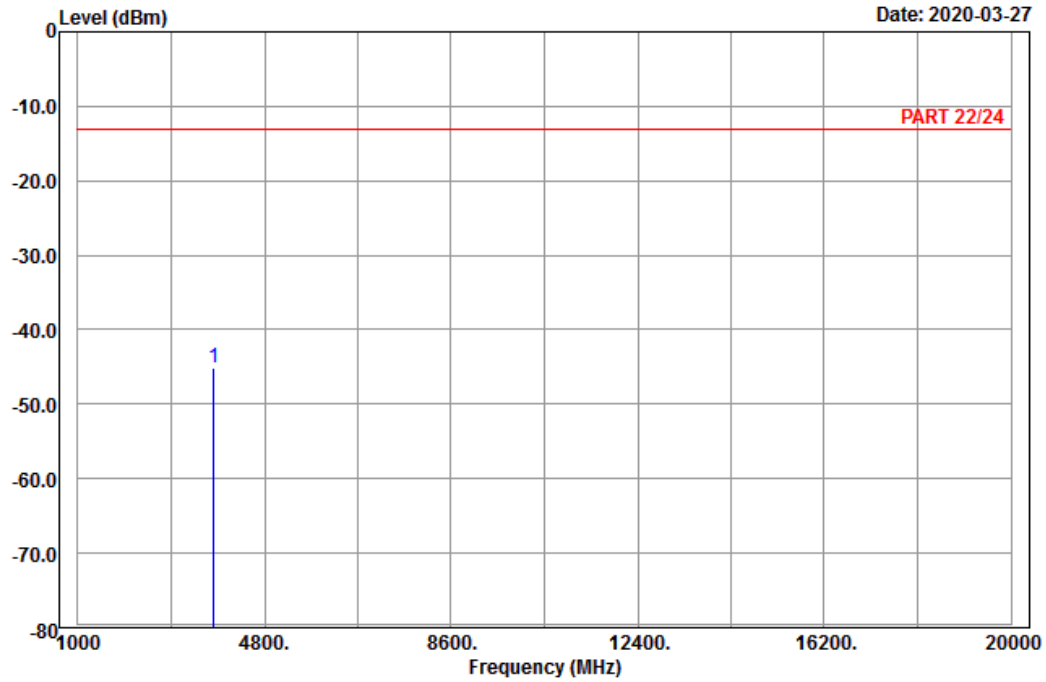


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 2_Link_CH-M
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3760.00	-45.08	-61.22	16.14	-13.00	-32.08	Peak

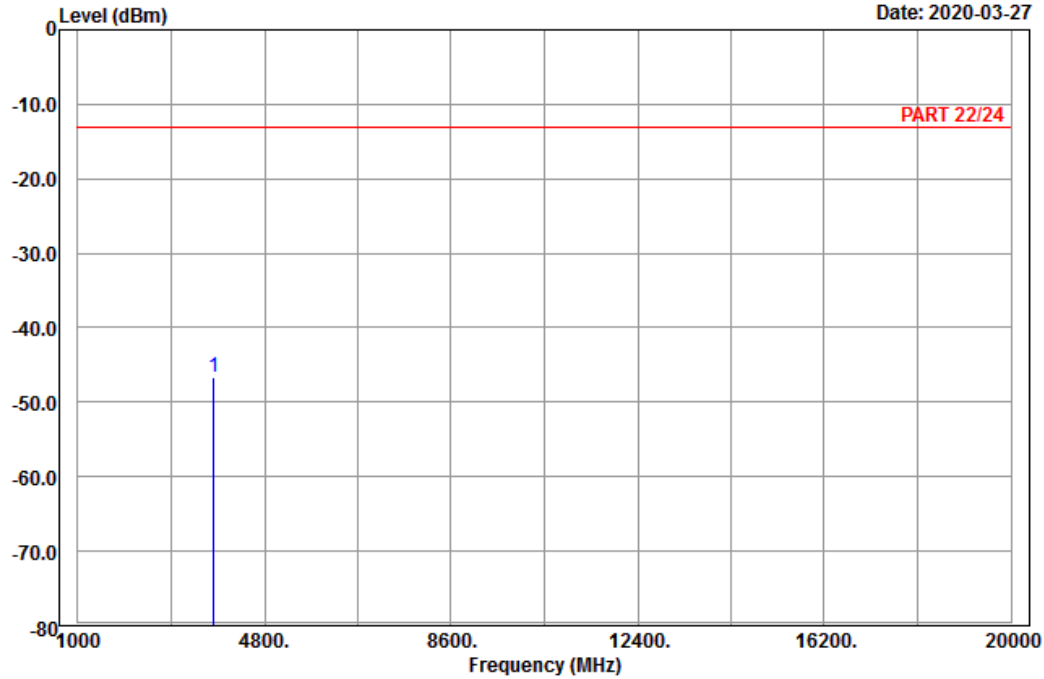


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-M
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3760.00	-46.58	-62.72	16.14	-13.00	-33.58	Peak

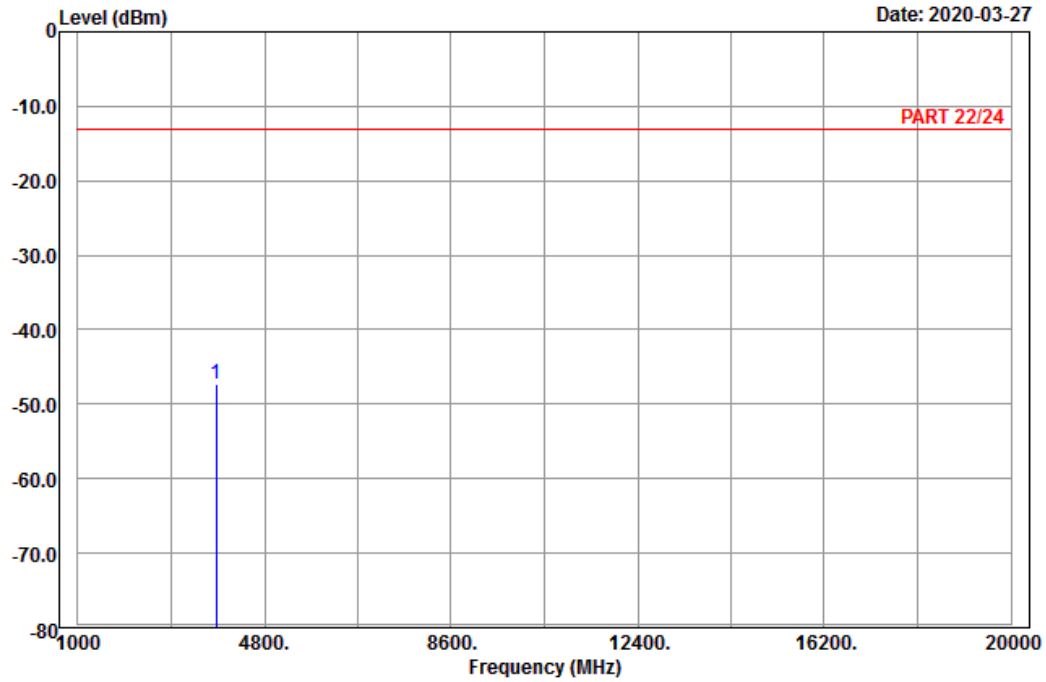
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 2_Link_CH-H
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3815.00	-47.26	-63.67	16.41	-13.00	-34.26	Peak

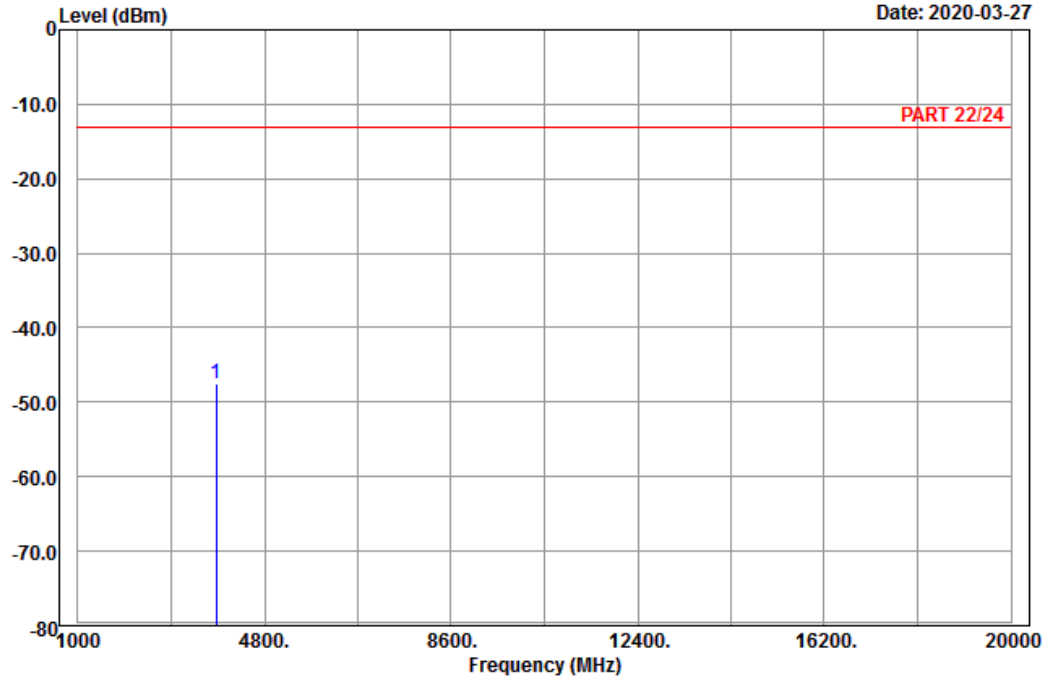


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-H
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3815.00	-47.57	-63.98	16.41	-13.00	-34.57	Peak

Channel Bandwidth: 20 MHz / QPSK
Low Channel

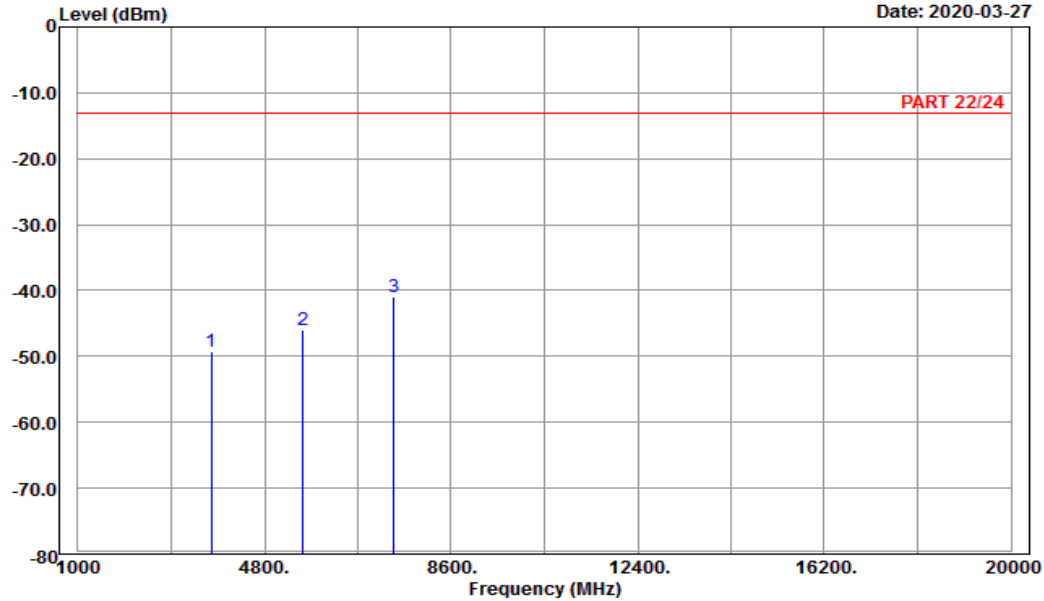


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2020-03-27



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 2_Link_CH-L
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3720.00	-49.33	-65.30	15.97	-13.00	-36.33	Peak
2	5580.00	-46.05	-66.42	20.37	-13.00	-33.05	Peak
3 pp	7440.00	-41.02	-63.27	22.25	-13.00	-28.02	Peak

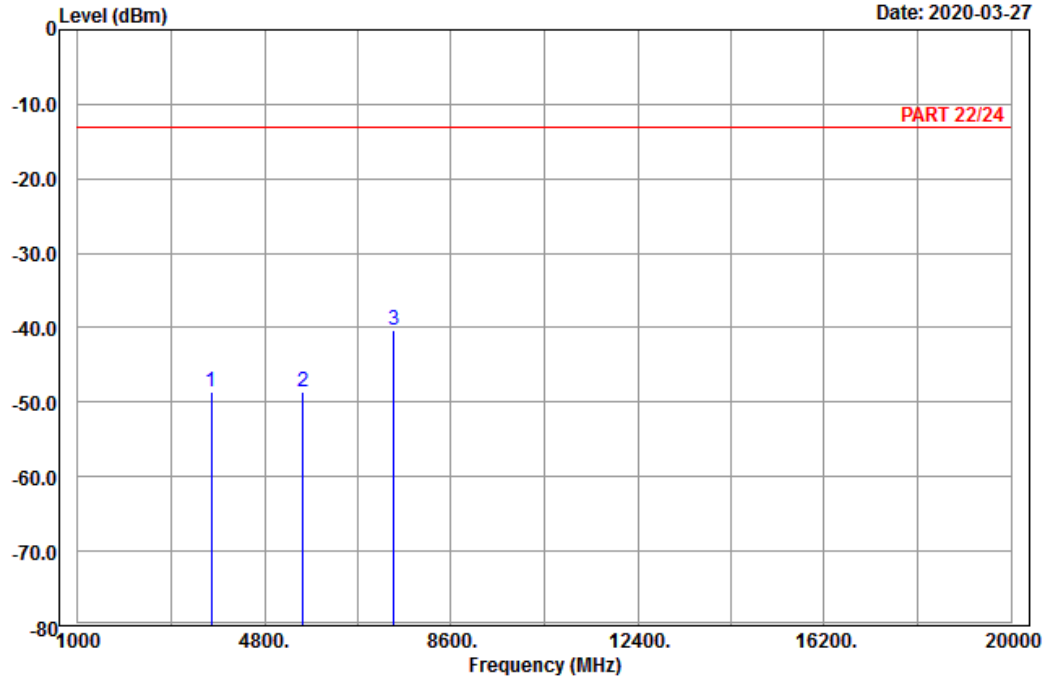


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-L
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3720.00	-48.61	-64.58	15.97	-13.00	-35.61	Peak
2	5580.00	-48.62	-68.99	20.37	-13.00	-35.62	Peak
3 pp	7440.00	-40.34	-62.59	22.25	-13.00	-27.34	Peak

Middle Channel

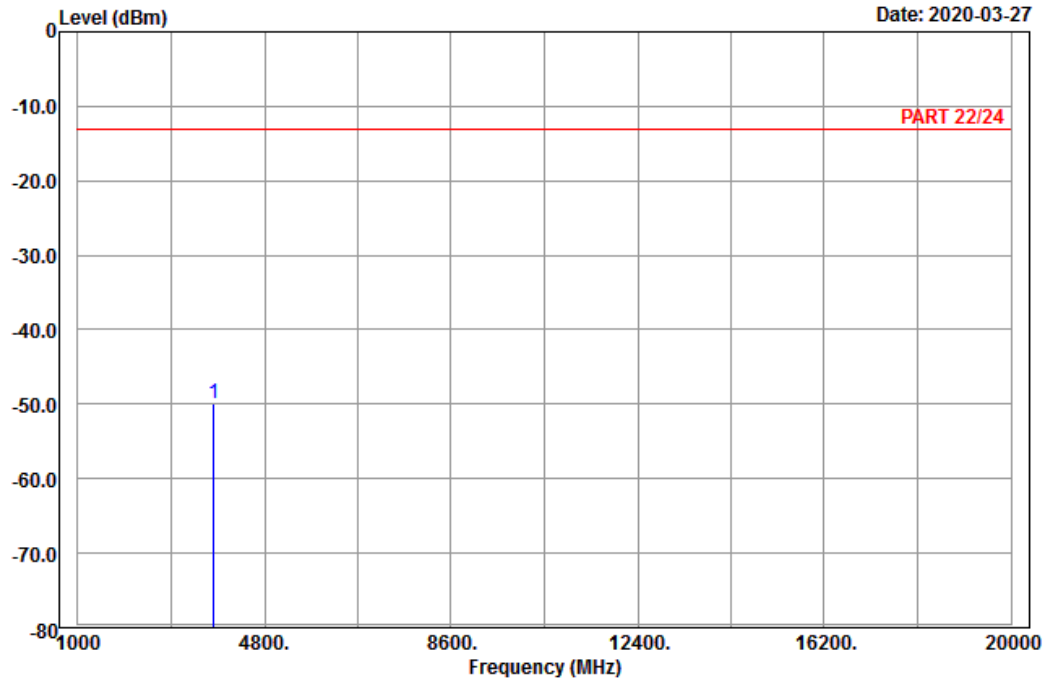


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 2_Link_CH-M
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3760.00	-49.96	-66.10	16.14	-13.00	-36.96	Peak

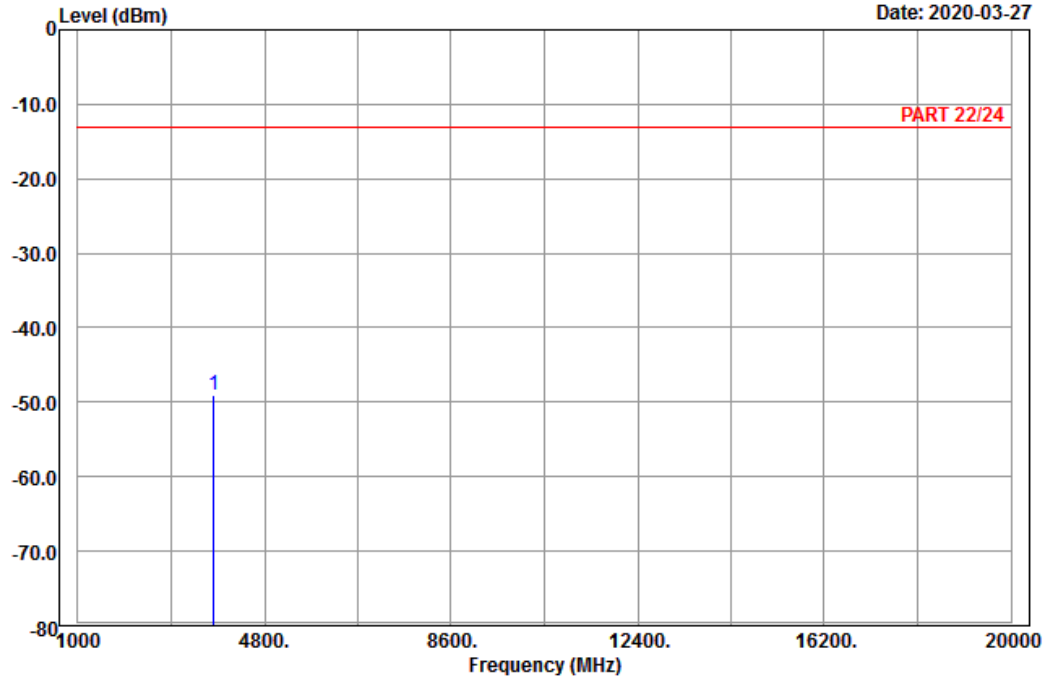


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-M
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3760.00	-49.02	-65.16	16.14	-13.00	-36.02	Peak

High Channel

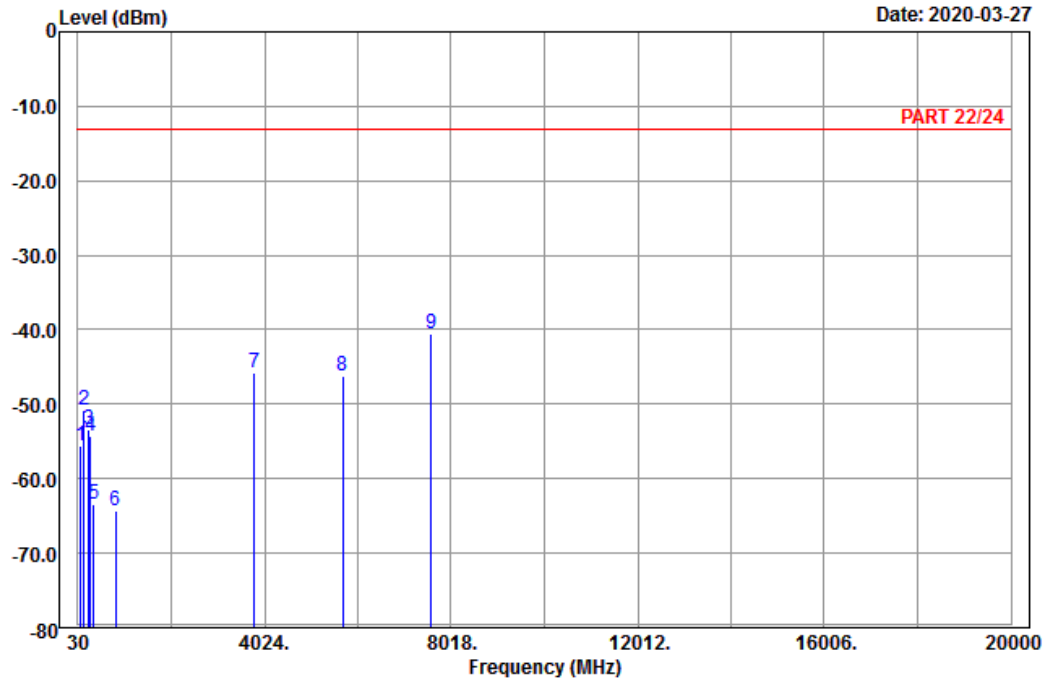


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 13

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Horizontal
 Remark : LTE_Band 2_Link_CH-H
 Tested by: Karl Lee

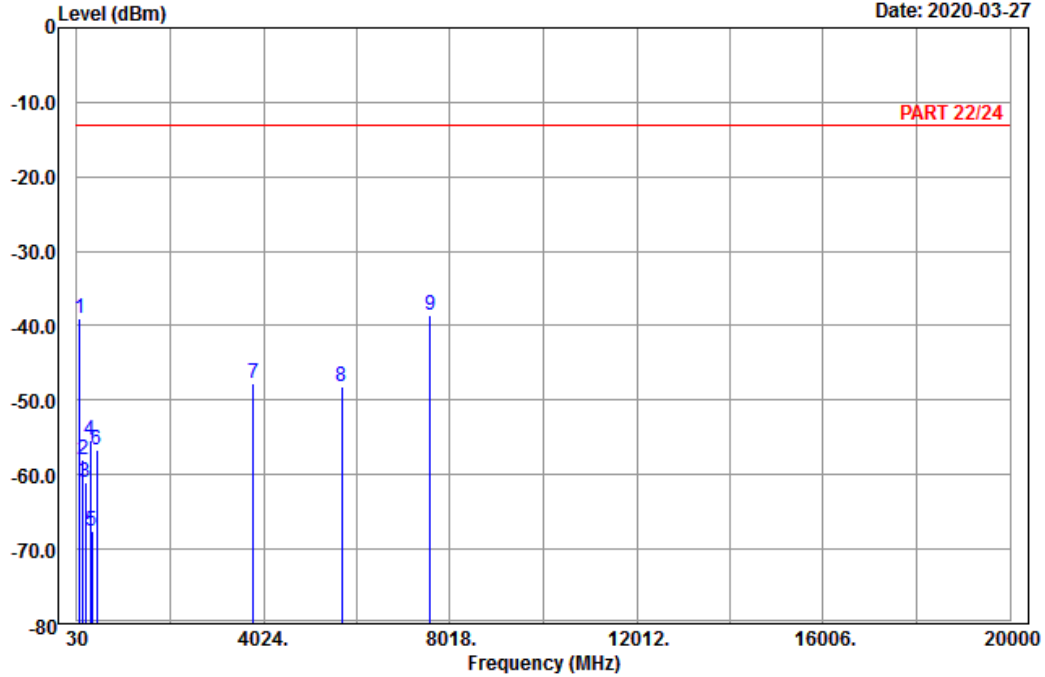
	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	92.37	-55.51	-44.95	-10.56	-13.00	-42.51	Peak
2	166.62	-50.72	-43.73	-6.99	-13.00	-37.72	Peak
3	259.50	-53.50	-47.90	-5.60	-13.00	-40.50	Peak
4	304.90	-54.30	-48.40	-5.90	-13.00	-41.30	Peak
5	367.20	-63.52	-59.07	-4.45	-13.00	-50.52	Peak
6	836.20	-64.39	-65.99	1.60	-13.00	-51.39	Peak
7	3800.00	-45.84	-62.25	16.41	-13.00	-32.84	Peak
8	5700.00	-46.18	-66.39	20.21	-13.00	-33.18	Peak
9 pp	7600.00	-40.61	-63.60	22.99	-13.00	-27.61	Peak



A D T

Data: 14

Date: 2020-03-27



Site : 966 chamber 1
 Condition: PART 22/24 Vertical
 Remark : LTE_Band 2_Link_CH-H
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	95.07	-38.95	-28.55	-10.40	-13.00	-25.95	Peak
2	164.73	-58.00	-50.81	-7.19	-13.00	-45.00	Peak
3	212.52	-60.97	-54.96	-6.01	-13.00	-47.97	Peak
4	320.30	-55.34	-49.62	-5.72	-13.00	-42.34	Peak
5	343.40	-67.55	-62.09	-5.46	-13.00	-54.55	Peak
6	459.60	-56.65	-52.53	-4.12	-13.00	-43.65	Peak
7	3800.00	-47.83	-64.24	16.41	-13.00	-34.83	Peak
8	5700.00	-48.27	-68.48	20.21	-13.00	-35.27	Peak
9 pp	7600.00	-38.48	-61.47	22.99	-13.00	-25.48	Peak

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

Lin Kou 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

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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 ---