FCC Test Report

(PART 24)

Report No.: RF191231C03-4

FCC ID: UK7-C1N

Test Model: C1NF1

Received Date: Dec. 31, 2019

Test Date: Jan. 22, 2020 ~ Mar. 11, 2020

Issued Date: Jul. 07, 2020

Applicant: Fossil Group, Inc.

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

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Test Location (2): B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan

FCC Registration / Designation Number: 788550 / TW0003
427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF191231C03-4	Original Release	Jul. 07, 2020

1 Certificate of Conformity

Product: Smart Watch

Brand: FOSSIL

Test Model: C1NF1

Sample Status: Identical Prototype

Applicant: Fossil Group, Inc.

Test Date: Jan. 22, 2020 ~ Mar. 11, 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 : Lena Wang , **Date:** Jul. 07, 2020

Lena Wang / Specialist

Approved by : , **Date:** Jul. 07, 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 -24.94 dB at 99.12 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) (±)
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

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
Spectrum Analyzer ROHDE & SCHWARZ	FSW43	101582	Mar. 31, 2020	Mar. 30, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 08, 2019	Oct. 07, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 12, 2019	Nov. 11, 2020
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna ETS	3117	00155510	Nov. 24, 2019	Nov. 23, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2019	Apr. 16, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2019	Nov. 24, 2020
Preamplifier Agilent	310N	187226	Jun. 18, 2019	Jun. 17, 2020
Preamplifier Agilent	83017A	MY39501357	Jun. 18, 2019	Jun. 17, 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. 17, 2020
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 18, 2019	Jun. 17, 2020
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
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2021
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 10, 2019	Sep. 09, 2020
DC power supply Keysight	U8002A	MY56330015	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 27, 2019	Jun. 26, 2020

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 General Information

3.1 General Description of EUT

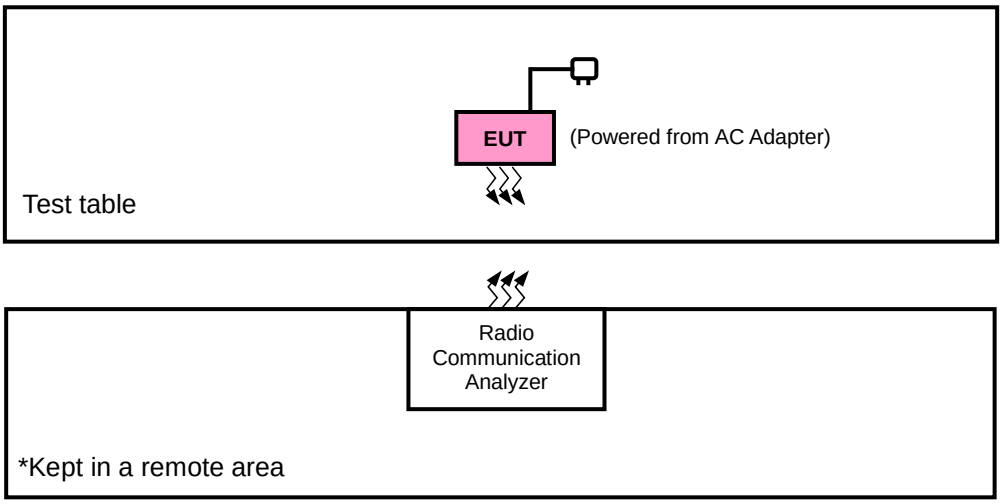
Product	Smart Watch	
Brand	FOSSIL	
Test Model	C1NF1	
Status of EUT	Identical Prototype	
Power Supply Rating	5.0 Vdc (Host equipment or Adapter) 3.85-4.4 Vdc (Li-ion battery)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1850.7 ~ 1909.3 MHz
	LTE Band 2 (Channel 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	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	49.12 mW
	LTE Band 2 (Channel Bandwidth: 3 MHz)	49.58 mW
	LTE Band 2 (Channel Bandwidth: 5 MHz)	50.04 mW
	LTE Band 2 (Channel Bandwidth: 10 MHz)	50.50 mW
	LTE Band 2 (Channel Bandwidth: 15 MHz)	50.93 mW
	LTE Band 2 (Channel Bandwidth: 20 MHz)	51.44 mW
Emission Designator	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)	8M96G7D
	LTE Band 2 (Channel Bandwidth: 15 MHz)	13M4G7D
	LTE Band 2 (Channel Bandwidth: 20 MHz)	17M9G7D
Antenna Type	Loop Antenna with -7.1 dBi gain	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. 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.
2. 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. The module doesn’t support 10M-16QAM, 15M-16QAM, 20M-16QAM. 16QAM only supports up to 5M-25RB.

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
1.	Adapter	ASUS	AD827M	N/A	N/A
2.	Radio Communication Analyzer	Anritsu	MT8820C	6201300640	N/A

No.	Signal Cable Description Of The Above Support Units
1.	1m shielded cable

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
LTE Band 2	Z-plane	X-plane

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	1 RB / 2 RB Offset
		18615 to 19185	18615, 18900, 19185	3 MHz	QPSK	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	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
-	Modulation Characteristics	18700 to 19100	18900	20 MHz	QPSK	100 RB / 0 RB Offset
				5 MHz	16QAM	25 RB / 0 RB Offset
-	Frequency Stability	18607 to 19193	18607, 19193	1.4 MHz	QPSK	6 RB / 0 RB Offset
		18615 to 19185	18615, 19185	3 MHz	QPSK	15 RB / 0 RB Offset
		18625 to 19175	18625, 19175	5 MHz	QPSK	25 RB / 0 RB Offset
		18650 to 19150	18650, 19150	10 MHz	QPSK	50 RB / 0 RB Offset
		18675 to 19125	18675, 19125	15 MHz	QPSK	75 RB / 0 RB Offset
		18700 to 19100	18700, 19100	20 MHz	QPSK	100 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	50 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK	75 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK	100 RB / 0 RB Offset
-	Peak to Average Ratio	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	1 RB / 2 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	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

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Band Edge	18607 to 19193	18607	1.4 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			19193	1.4 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		18615 to 19185	18615	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			19185	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		18625 to 19175	18625	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			19175	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		18650 to 19150	18650	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			19150	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
		18675 to 19125	18675	15 MHz	QPSK	1 RB / 0 RB Offset
						75 RB / 0 RB Offset
			19125	15 MHz	QPSK	1 RB / 74 RB Offset
						75 RB / 0 RB Offset
		18700 to 19100	18700	20 MHz	QPSK	1 RB / 0 RB Offset
						100 RB / 0 RB Offset
			19100	20 MHz	QPSK	1 RB / 99 RB Offset
						100 RB / 0 RB Offset
-	Conducted Emission	18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK	1 RB / 2 RB Offset
		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 / 2 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. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

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 is 20 MHz for LTE mode, and VBW ≥ 3 x 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.

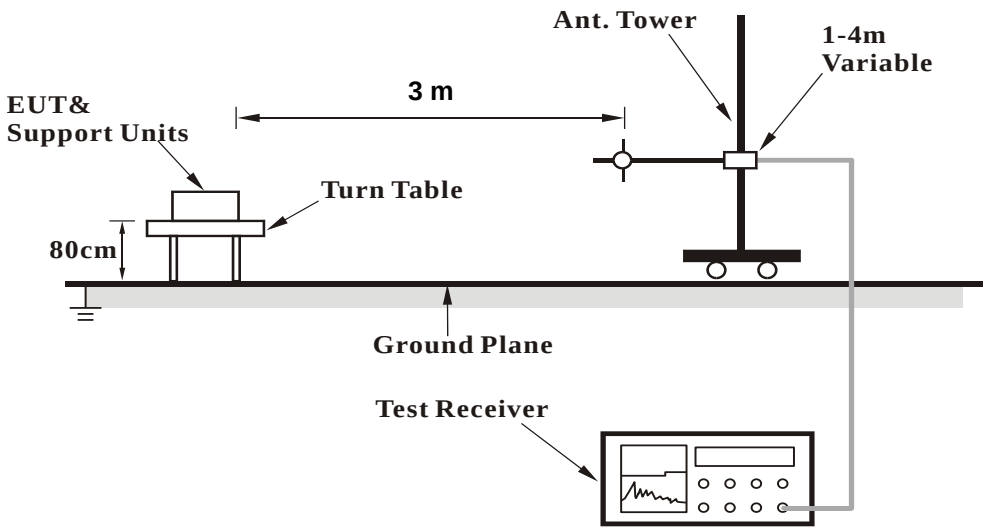
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

Conducted Power Measurement:

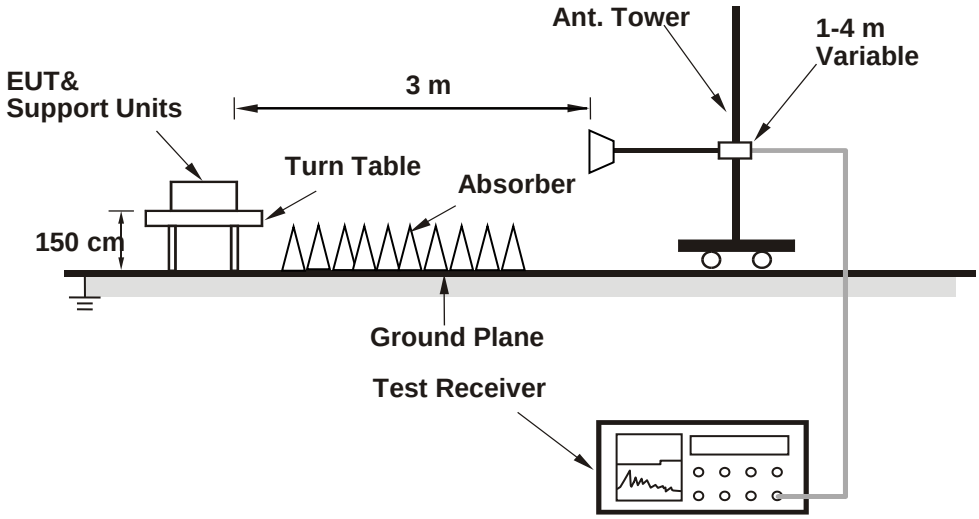
The EUT was set up for the maximum power with LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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)

LTE Band 2

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18700	18900	19100	
		Frequency (MHz)		1860.0	1880.0	1900.0	
20M	QPSK	1	0	24.56	24.99	24.29	0
		1	50	24.43	24.84	24.18	0
		1	99	24.43	24.84	24.18	0
		50	0	23.52	23.93	23.27	1
		50	25	23.51	23.92	23.26	1
		50	50	23.41	23.82	23.16	1
		100	0	23.06	23.47	22.81	1

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18675	18900	19125	
		Frequency (MHz)		1857.5	1880.0	1902.5	
15M	QPSK	1	0	24.54	24.95	24.25	0
		1	37	24.34	24.78	24.10	0
		1	74	24.33	24.78	24.11	0
		36	0	23.45	23.92	23.27	1
		36	19	23.49	23.89	23.22	1
		36	39	23.36	23.76	23.07	1
		75	0	22.96	23.39	22.75	1

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18650	18900	19150	
		Frequency (MHz)		1855.0	1880.0	1905.0	
10M	QPSK	1	0	24.48	24.76	24.25	0
		1	24	24.26	24.75	24.05	0
		1	49	24.31	24.61	24.08	0
		25	0	23.38	23.83	23.10	1
		25	12	23.38	23.67	23.11	1
		25	25	23.24	23.74	23.04	1
		50	0	23.04	23.30	22.65	1
	16QAM	1	0	-	-	-	-
		1	24	-	-	-	-
		1	49	-	-	-	-
		25	0	-	-	-	-
		25	12	-	-	-	-
		25	25	-	-	-	-
		50	0	-	-	-	-

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18625	18900	19175	
		Frequency (MHz)		1852.5	1880.0	1907.5	
5M	QPSK	1	0	24.48	24.92	24.04	0
		1	12	24.32	24.70	23.90	0
		1	24	24.28	24.73	23.90	0
		12	0	23.41	23.71	23.22	1
		12	6	23.46	23.75	22.92	1
		12	13	23.28	23.67	23.03	1
		25	0	22.95	23.26	22.50	1
	16QAM	1	0	23.46	23.30	23.70	1
		1	12	23.16	23.01	23.38	1
		1	24	23.15	23.00	23.37	1
		12	0	22.86	22.71	22.90	2
		12	6	22.75	22.60	22.97	2
		12	13	22.97	22.82	22.88	2
		25	0	22.99	22.91	23.00	2

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18615	18900	19185	
		Frequency (MHz)		1851.5	1880.0	1908.5	
3M	QPSK	1	0	24.37	24.77	24.10	0
		1	7	24.27	24.72	24.09	0
		1	14	24.39	24.71	24.08	0
		8	0	23.40	23.87	23.21	1
		8	3	23.39	23.83	23.16	1
		8	7	23.23	23.74	23.01	1
		15	0	22.88	23.35	22.59	1
	16QAM	1	0	23.35	23.13	23.58	1
		1	7	22.96	22.92	23.30	1
		1	14	22.96	22.83	23.35	1
		8	0	22.67	22.70	22.81	2
		8	3	22.68	22.40	22.83	2
		8	7	22.84	22.66	22.71	2
		15	0	22.90	22.90	22.83	2

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18607	18900	19193	
		Frequency (MHz)		1850.7	1880.0	1909.3	
1.4M	QPSK	1	0	24.49	24.79	24.16	0
		1	2	24.40	24.82	24.09	0
		1	5	24.38	24.70	24.02	0
		3	0	24.44	24.92	24.20	0
		3	1	24.43	24.89	24.14	0
		3	3	24.17	24.64	24.05	0
		6	0	22.89	23.40	22.68	1
	16QAM	1	0	23.35	23.17	23.62	1
		1	2	22.97	22.86	23.26	1
		1	5	23.08	22.84	23.23	1
		3	0	23.79	23.58	23.73	1
		3	1	23.62	23.45	23.87	1
		3	3	23.87	23.59	23.72	1
		6	0	22.97	22.85	22.90	2

EIRP Power (dBm)

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)**
Z	18607	1850.7	-28.00	44.70	16.70	46.77	H
	18900	1880.0	-27.92	44.70	16.78	47.64	
	19193	1909.3	-27.66	44.57	16.91	49.12	
	18607	1850.7	-31.05	44.27	13.22	20.99	V
	18900	1880.0	-31.58	44.87	13.29	21.33	
	19193	1909.3	-31.25	44.61	13.36	21.69	
Channel Bandwidth: 1.4 MHz / 16QAM							
Z	18607	1850.7	-29.01	44.70	15.69	37.07	H
	18900	1880.0	-28.93	44.70	15.77	37.76	
	19193	1909.3	-28.67	44.57	15.90	38.93	
	18607	1850.7	-32.05	44.27	12.22	16.67	V
	18900	1880.0	-32.58	44.87	12.29	16.94	
	19193	1909.3	-32.26	44.61	12.35	17.19	

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)**
Z	18615	1851.5	-27.96	44.70	16.74	47.21	H
	18900	1880.0	-27.89	44.70	16.81	47.97	
	19185	1908.5	-27.62	44.57	16.95	49.58	
	18615	1851.5	-31.01	44.27	13.26	21.18	V
	18900	1880.0	-31.54	44.87	13.33	21.53	
	19185	1908.5	-31.21	44.61	13.40	21.89	
Channel Bandwidth: 3 MHz / 16QAM							
Z	18615	1851.5	-28.97	44.70	15.73	37.41	H
	18900	1880.0	-28.90	44.70	15.80	38.02	
	19185	1908.5	-28.62	44.57	15.95	39.38	
	18615	1851.5	-32.02	44.27	12.25	16.79	V
	18900	1880.0	-32.55	44.87	12.32	17.06	
	19185	1908.5	-32.21	44.61	12.40	17.39	

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)
Z	18625	1852.5	-27.92	44.70	16.78	47.64	H
	18900	1880.0	-27.86	44.70	16.84	48.31	
	19175	1907.5	-27.58	44.57	16.99	50.04	
	18625	1852.5	-30.98	44.27	13.29	21.33	V
	18900	1880.0	-31.50	44.87	13.37	21.73	
	19175	1907.5	-31.17	44.61	13.44	22.10	
Channel Bandwidth: 5 MHz / 16QAM							
Z	18625	1852.5	-28.93	44.70	15.77	37.76	H
	18900	1880.0	-28.87	44.70	15.83	38.28	
	19175	1907.5	-28.58	44.57	15.99	39.75	
	18625	1852.5	-31.98	44.27	12.29	16.94	V
	18900	1880.0	-32.51	44.87	12.36	17.22	
	19175	1907.5	-32.18	44.61	12.43	17.51	

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)
Z	18650	1855.0	-27.88	44.70	16.82	48.08	H
	18900	1880.0	-27.82	44.70	16.88	48.75	
	19150	1905.0	-27.54	44.57	17.03	50.50	
	18650	1855.0	-30.94	44.27	13.33	21.53	V
	18900	1880.0	-31.46	44.87	13.41	21.93	
	19150	1905.0	-31.13	44.61	13.48	22.30	

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)
Z	18675	1857.5	-27.84	44.70	16.86	48.53	H
	18900	1880.0	-27.79	44.70	16.91	49.09	
	19125	1902.5	-27.50	44.57	17.07	50.93	
	18675	1857.5	-30.90	44.27	13.37	21.73	V
	18900	1880.0	-31.42	44.87	13.45	22.13	
	19125	1902.5	-31.10	44.61	13.51	22.45	

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)**
Z	18700	1860.0	-27.80	44.70	16.90	48.98	H
	18900	1880.0	-27.75	44.70	16.95	49.55	
	19100	1900.0	-27.46	44.57	17.11	51.44	
	18700	1860.0	-30.86	44.27	13.41	21.93	V
	18900	1880.0	-31.38	44.87	13.49	22.34	
	19100	1900.0	-31.06	44.61	13.55	22.66	

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

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

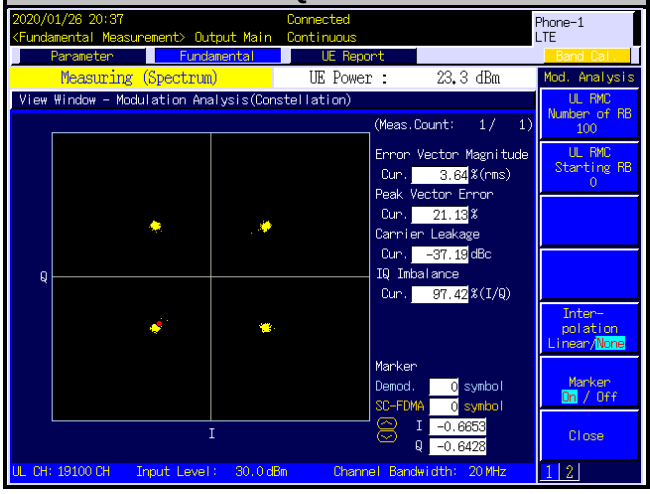
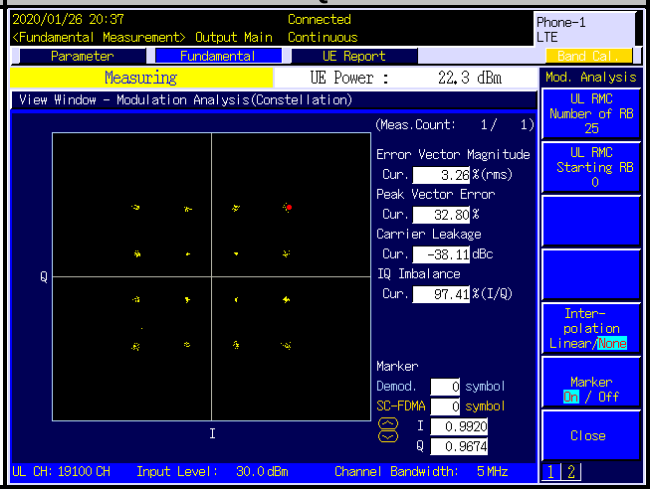
N/A

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

Spectrum Plot of Measurement	
LTE Band 2	
Channel 18900	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

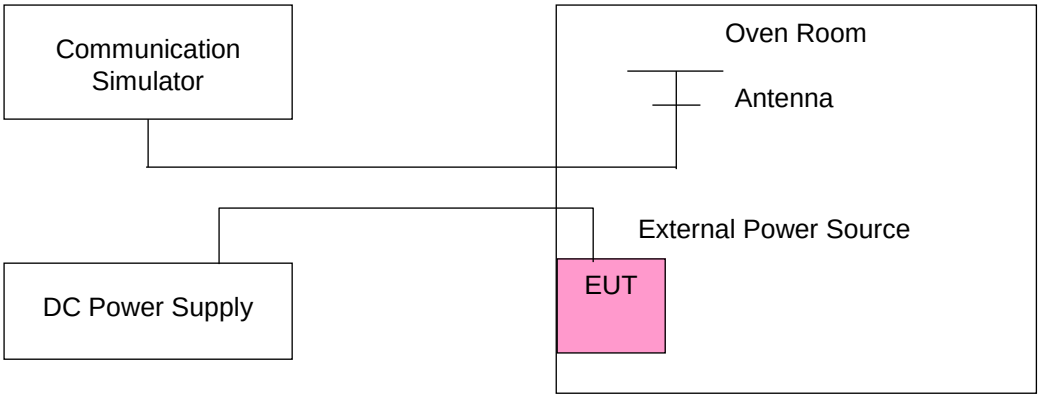
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 2			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1850.700002	0.001	1909.300000	0.001
3.27	1850.700004	0.002	1909.300003	0.002
4.43	1850.700002	0.001	1909.300003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	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	1850.700002	0.001	1909.300003	0.001
-10	1850.700002	0.001	1909.300002	0.001
0	1850.700002	0.001	1909.300003	0.002
10	1850.699997	-0.002	1909.300002	0.001
20	1850.699997	-0.001	1909.299998	-0.001
30	1850.699999	-0.001	1909.299997	-0.002
40	1850.699997	-0.002	1909.299996	-0.002
50	1850.699998	-0.001	1909.299998	-0.001

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	1851.500003	0.001	1908.500002	0.001
3.27	1851.500002	0.001	1908.500004	0.002
4.43	1851.500003	0.002	1908.500003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	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	1851.500001	0.001	1908.500002	0.001
-10	1851.500003	0.002	1908.500001	0.001
0	1851.500003	0.001	1908.500004	0.002
10	1851.499997	-0.002	1908.500003	0.001
20	1851.499998	-0.001	1908.499999	-0.001
30	1851.499997	-0.002	1908.499997	-0.002
40	1851.499998	-0.001	1908.499999	-0.001
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	1907.500002	0.001
3.27	1852.500001	0.001	1907.500002	0.001
4.43	1852.500001	0.001	1907.500003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	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	1907.500002	0.001
-20	1852.500003	0.002	1907.500002	0.001
-10	1852.500002	0.001	1907.500002	0.001
0	1852.500003	0.001	1907.500003	0.002
10	1852.499998	-0.001	1907.500004	0.002
20	1852.499998	-0.001	1907.499997	-0.002
30	1852.499997	-0.002	1907.499998	-0.001
40	1852.499997	-0.002	1907.499999	-0.001
50	1852.499998	-0.001	1907.499996	-0.002

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	1855.000003	0.002	1905.000003	0.002
3.27	1855.000002	0.001	1905.000003	0.001
4.43	1855.000003	0.002	1905.000003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1855.000003	0.002	1905.000002	0.001
-20	1855.000001	0.001	1905.000004	0.002
-10	1855.000002	0.001	1905.000004	0.002
0	1855.000003	0.002	1905.000003	0.001
10	1854.999997	-0.002	1905.000003	0.002
20	1854.999998	-0.001	1904.999997	-0.002
30	1854.999996	-0.002	1904.999996	-0.002
40	1854.999999	-0.001	1904.999999	-0.001
50	1854.999997	-0.002	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	1857.500002	0.001	1902.500003	0.002
3.27	1857.500001	0.001	1902.500004	0.002
4.43	1857.500004	0.002	1902.500001	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1857.500004	0.002	1902.500002	0.001
-20	1857.500001	0.001	1902.500003	0.002
-10	1857.500001	0.001	1902.500003	0.002
0	1857.500002	0.001	1902.500002	0.001
10	1857.499999	-0.001	1902.500002	0.001
20	1857.499997	-0.002	1902.499998	-0.001
30	1857.499996	-0.002	1902.499999	-0.001
40	1857.499998	-0.001	1902.499997	-0.002
50	1857.499997	-0.002	1902.499998	-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	1860.000002	0.001	1900.000001	0.001
3.27	1860.000002	0.001	1900.000001	0.001
4.43	1860.000003	0.002	1900.000002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

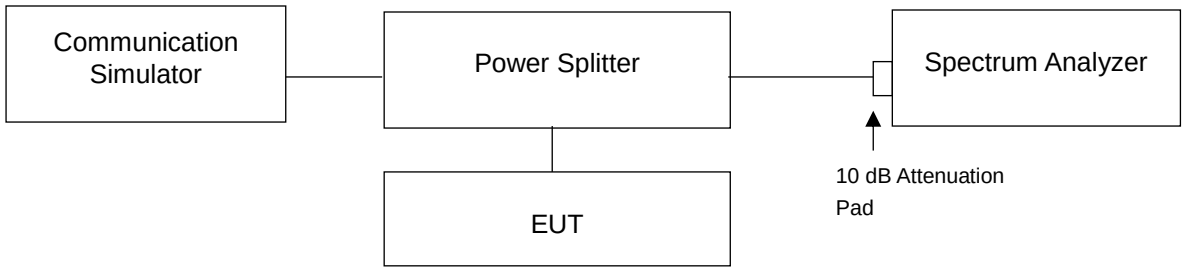
Temp. (℃)	LTE Band 2			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1860.000003	0.002	1900.000001	0.001
-20	1860.000003	0.002	1900.000002	0.001
-10	1860.000002	0.001	1900.000003	0.002
0	1860.000001	0.001	1900.000001	0.001
10	1859.999999	-0.001	1900.000002	0.001
20	1859.999996	-0.002	1899.999996	-0.002
30	1859.999999	-0.001	1899.999996	-0.002
40	1859.999998	-0.001	1899.999997	-0.002
50	1859.999997	-0.002	1899.999998	-0.001

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

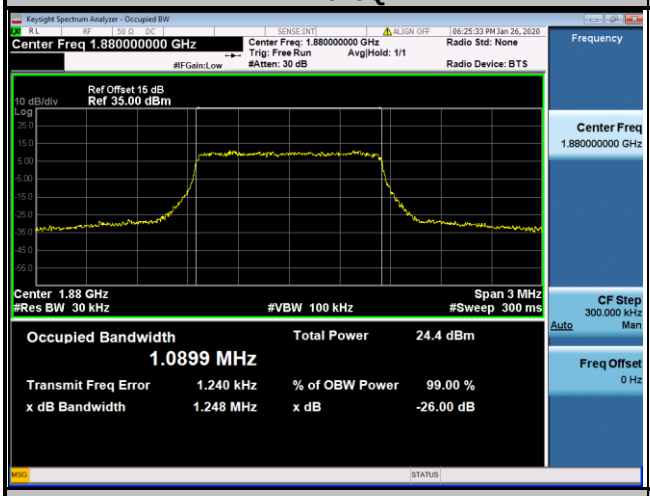
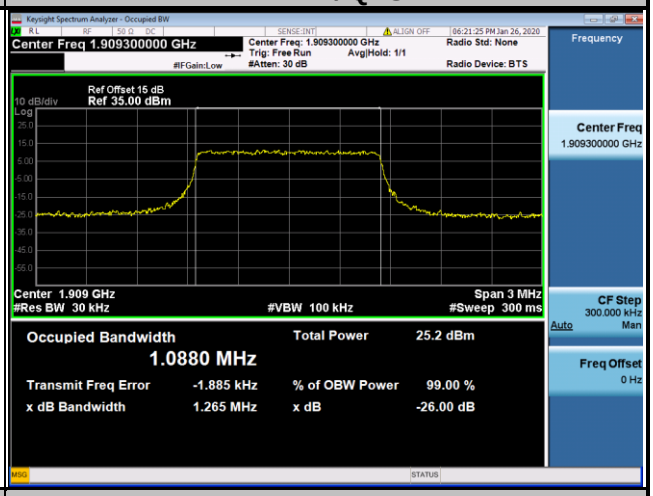
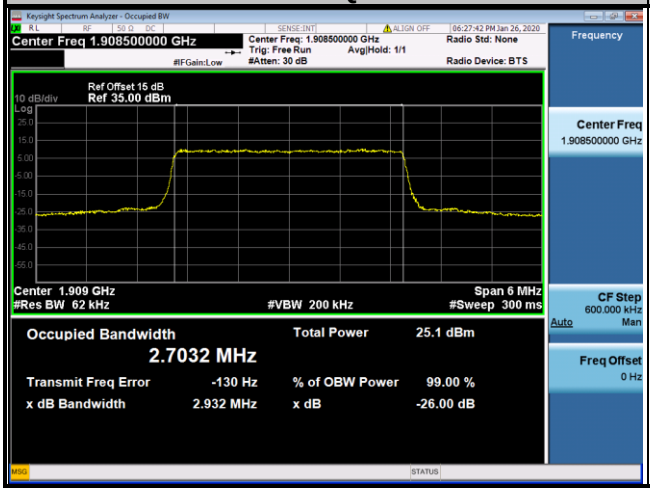
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

4.4.2 Test Setup



4.4.3 Test Result

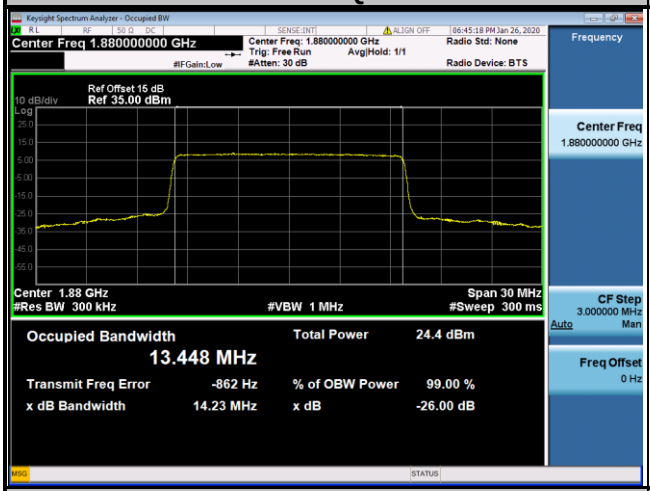
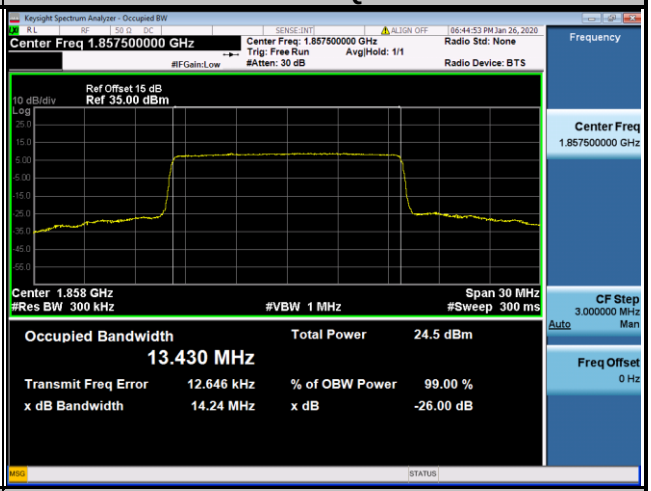
LTE Band 2					
Channel Bandwidth: 1.4 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
18607	1850.7	1.0882	1.0887	1.253	1.247
18900	1880.0	1.0876	1.0899	1.252	1.248
19193	1909.3	1.0880	1.0882	1.265	1.249
Channel Bandwidth: 3 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
18615	1851.5	2.7023	2.6983	2.916	2.932
18900	1880.0	2.7012	2.6964	2.927	2.931
19185	1908.5	2.7032	2.7005	2.932	2.945

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	**26 dB Bandwidth**
1.4 MHz /16QAM	**1.4 MHz / QPSK**
	
3 MHz / QPSK	**3 MHz / 16QAM**
	

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	4.4936	4.4940	4.813	4.826
18900	1880.0	4.4923	4.4916	4.823	4.817
19175	1907.5	4.4955	4.4972	4.840	4.846
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK		QPSK	
18650	1855.0	8.9542		9.526	
18900	1880.0	8.9562		9.530	
19150	1905.0	8.9546		9.507	

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz /16QAM	5 MHz /16QAM
10 MHz / QPSK	10 MHz / QPSK

LTE Band 2			
Channel Bandwidth: 15 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
		QPSK	QPSK
18675	1857.5	13.430	14.24
18900	1880.0	13.448	14.23
19125	1902.5	13.427	14.23
Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
		QPSK	QPSK
18700	1860.0	17.885	19.02
18900	1880.0	17.911	19.02
19100	1900.0	17.873	19.01

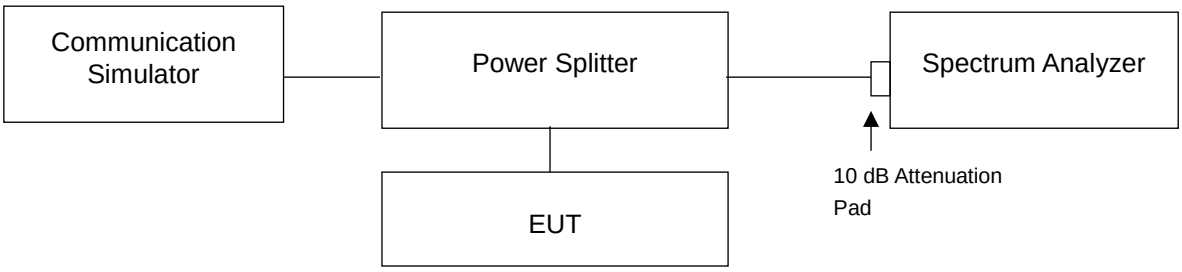
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
15 MHz / QPSK	15 MHz / QPSK
	
20 MHz / QPSK	20 MHz / QPSK

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.

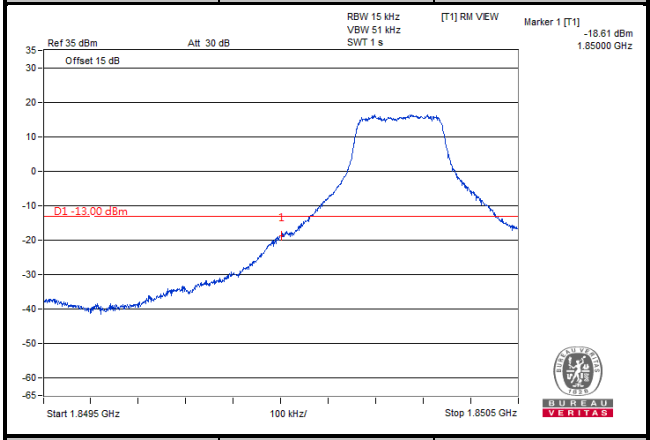
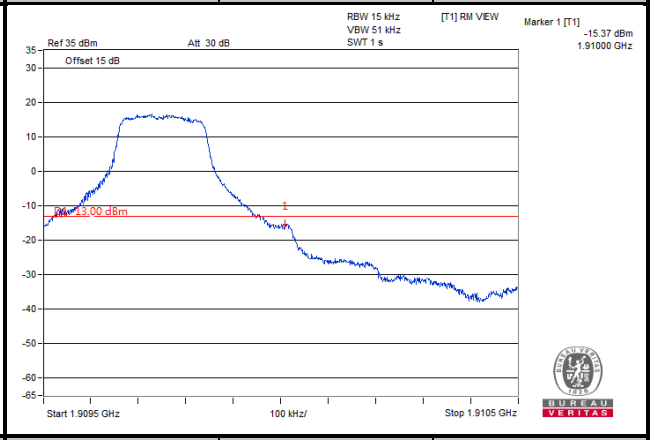
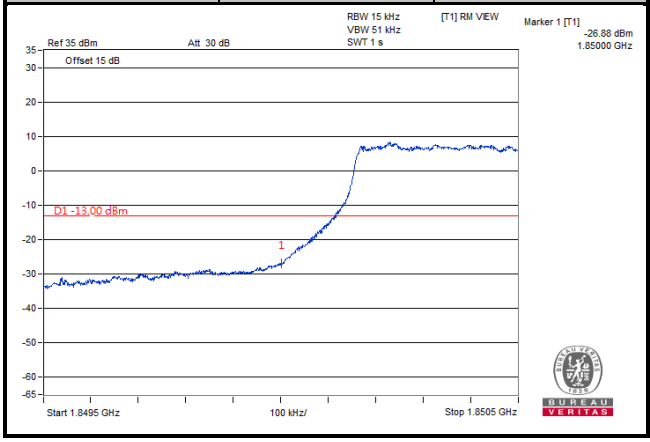
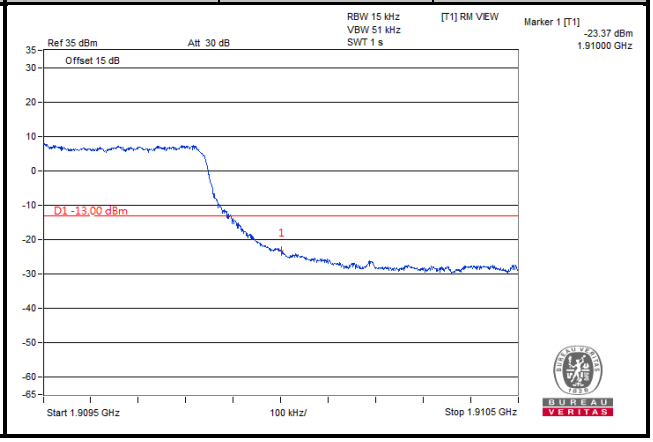
4.5.2 Test Setup

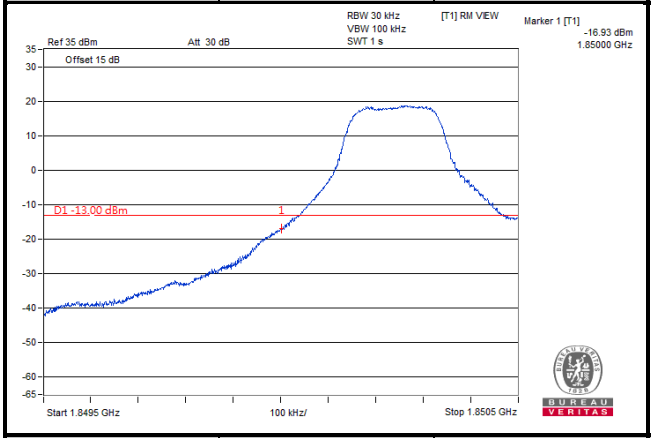
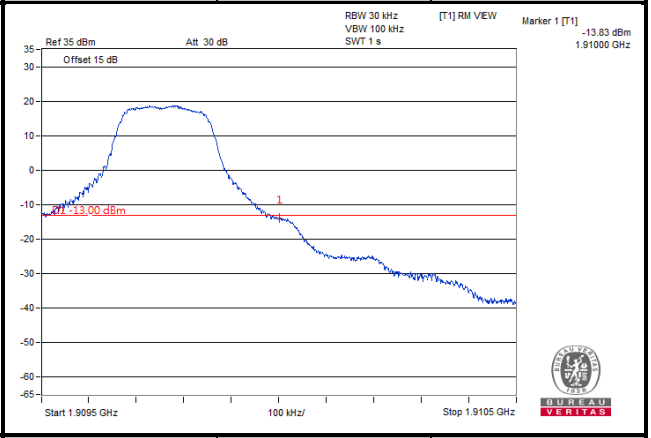
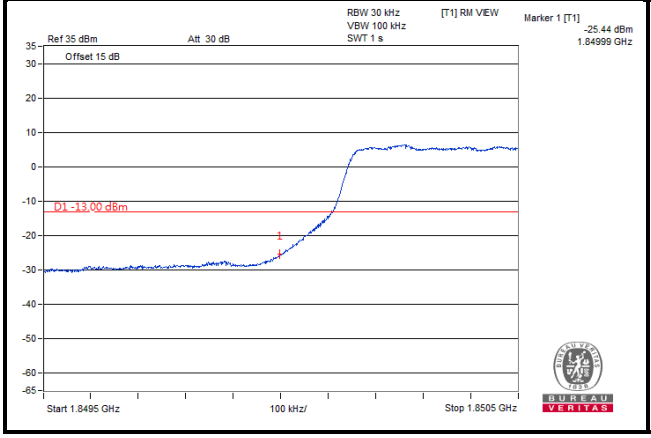
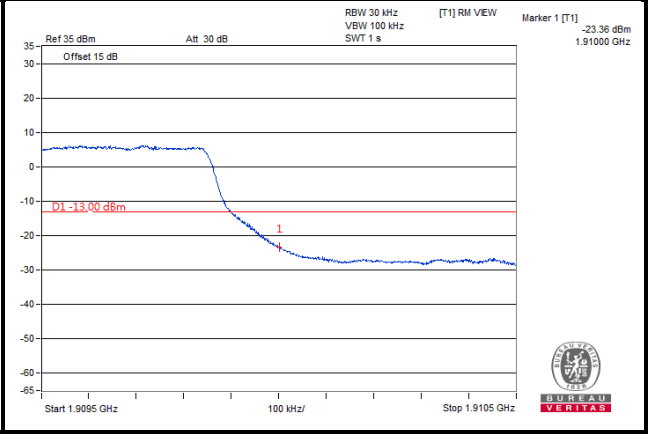


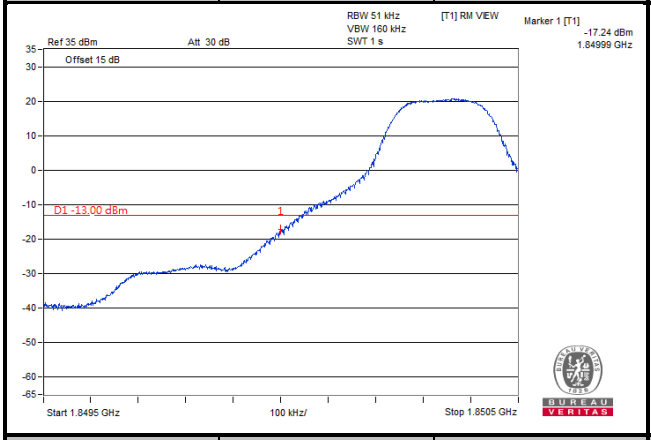
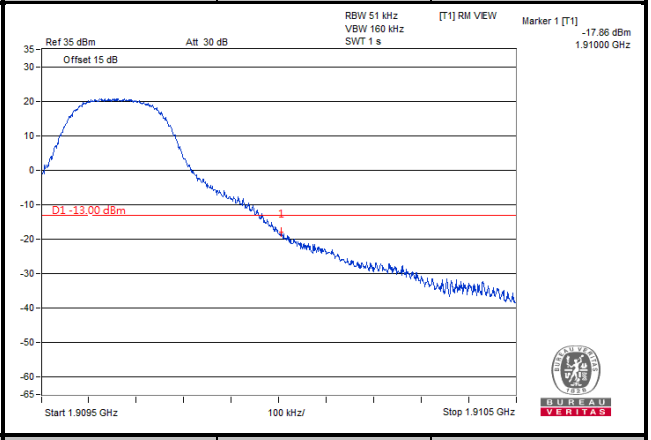
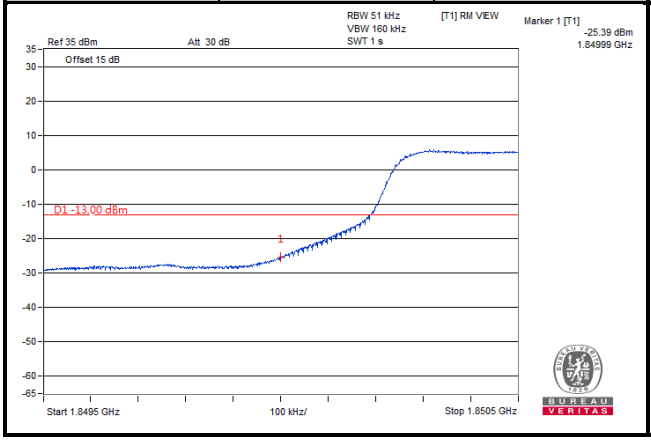
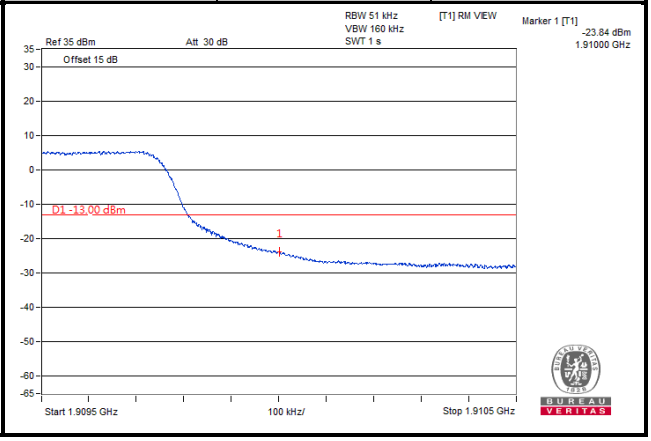
4.5.3 Test Procedures

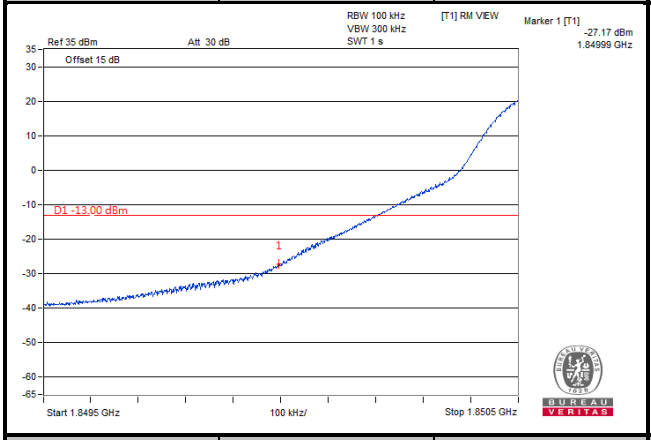
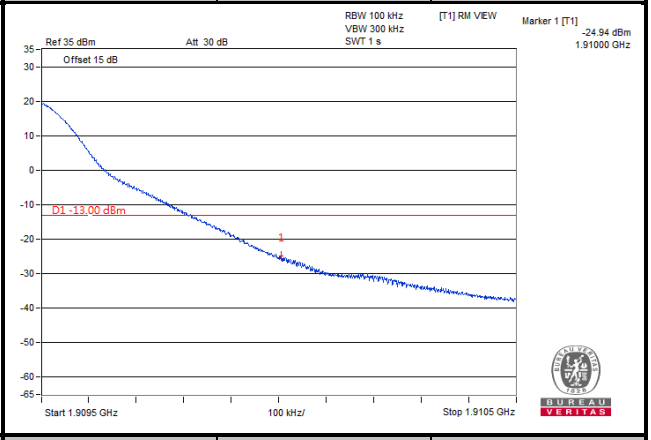
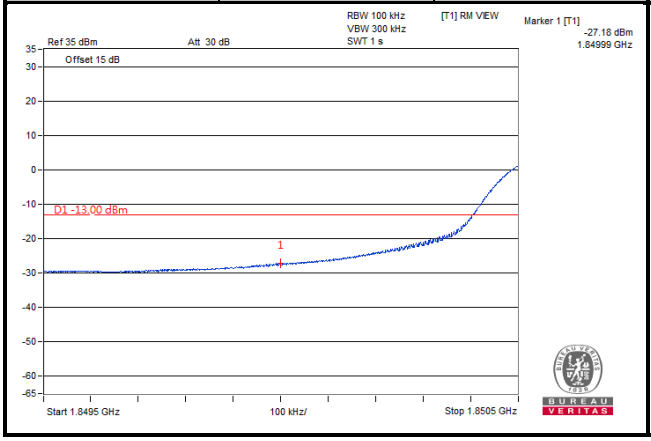
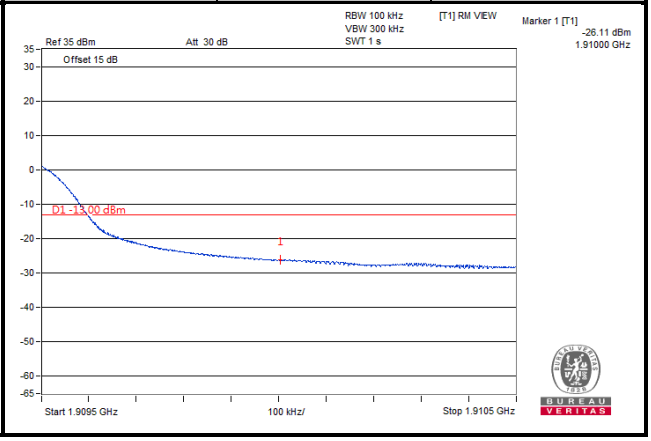
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 15 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).
c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
d. 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).
e. 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).
f. 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).
g. 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).
h. Record the max trace plot into the test report.

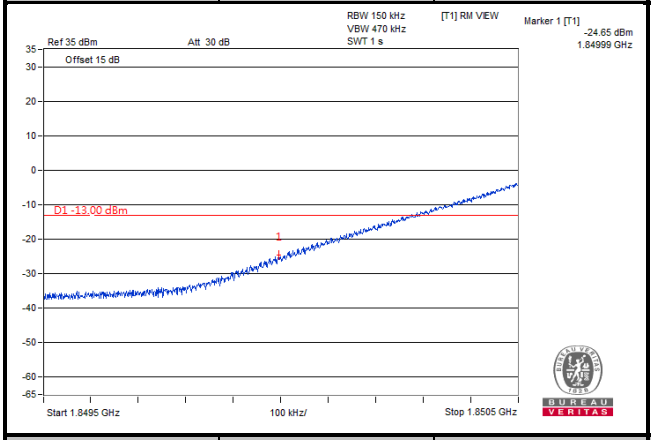
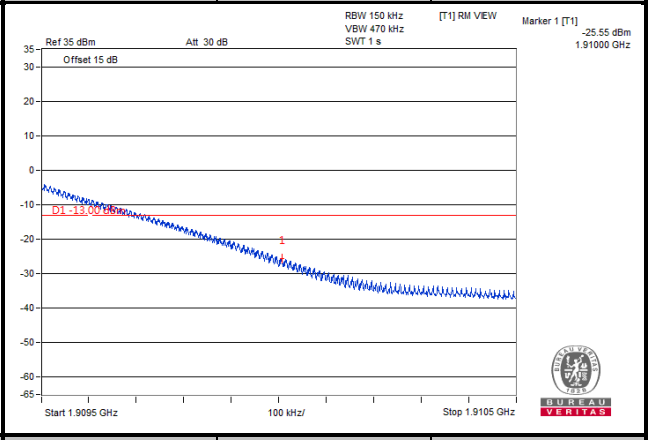
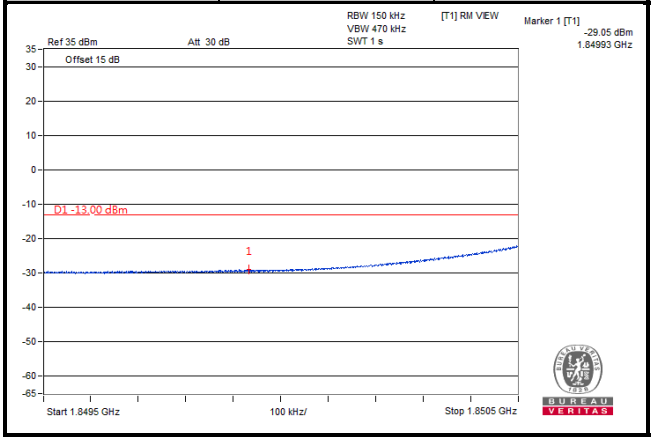
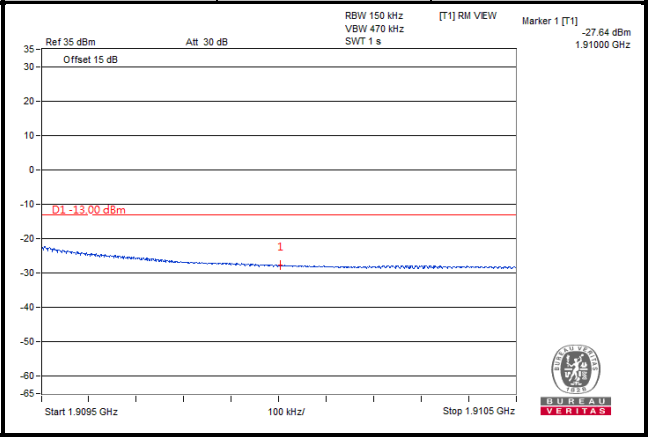
4.5.4 Test Results

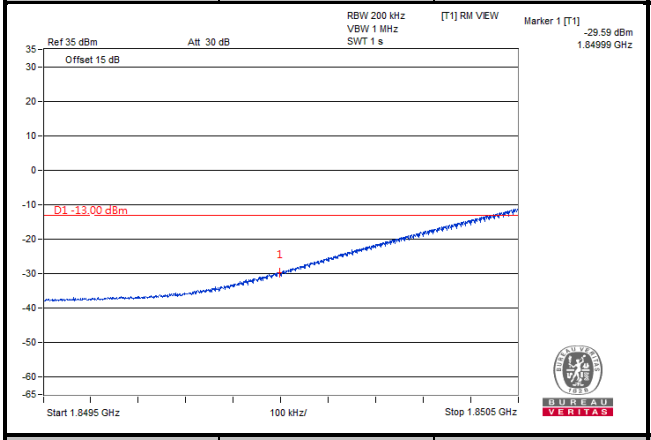
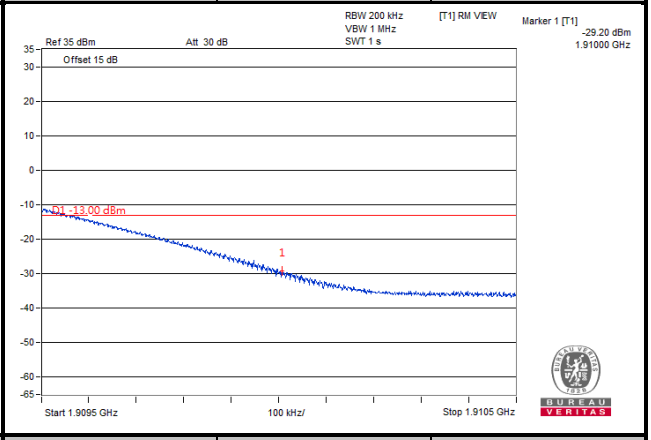
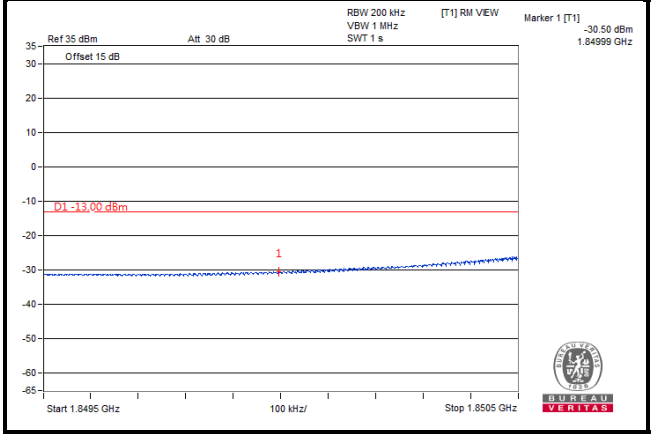
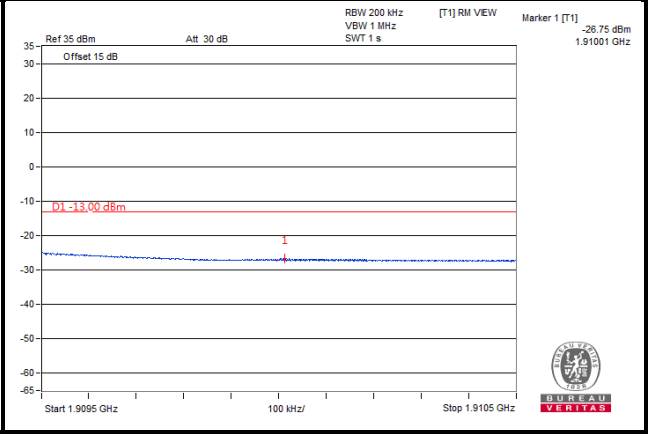
LTE Band 2					
Channel Bandwidth: 1.4 MHz					
Channel	18607	1 RB	Channel	19193	1 RB
					
Channel	18607	6 RB	Channel	19193	6 RB
					

LTE Band 2					
Channel Bandwidth: 3 MHz					
Channel	18615	1 RB	Channel	19185	1 RB
					
Channel	18615	15 RB	Channel	19185	15 RB
					

LTE Band 2					
Channel Bandwidth: 5 MHz					
Channel	18625	1 RB	Channel	19175	1 RB
					
Channel	18625	25 RB	Channel	19175	25 RB
					

LTE Band 2					
Channel Bandwidth: 10 MHz					
Channel	18650	1 RB	Channel	19150	1 RB
					
Channel	18650	50 RB	Channel	19150	50 RB
					

LTE Band 2					
Channel Bandwidth: 15 MHz					
Channel	18675	1 RB	Channel	19125	1 RB
					
Channel	18675	75 RB	Channel	19125	75 RB
					

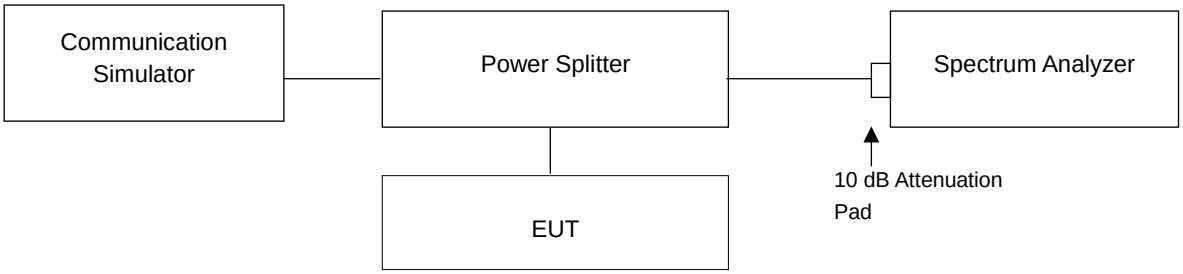
LTE Band 2					
Channel Bandwidth: 20 MHz					
Channel	18700	1 RB	Channel	19100	1 RB
					
Channel	18700	100 RB	Channel	19100	100 RB
					

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

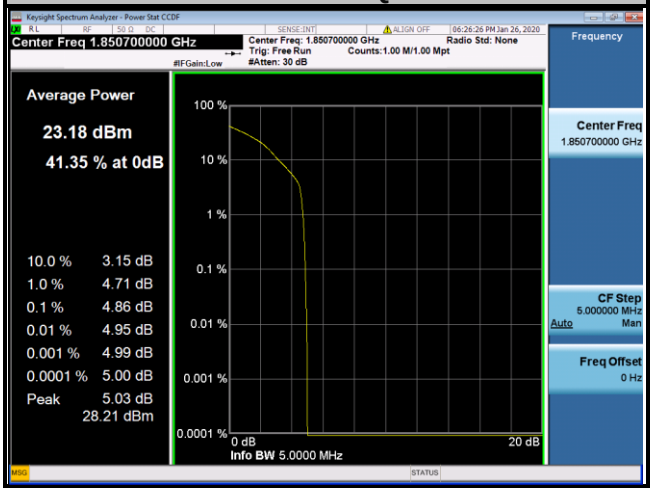
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

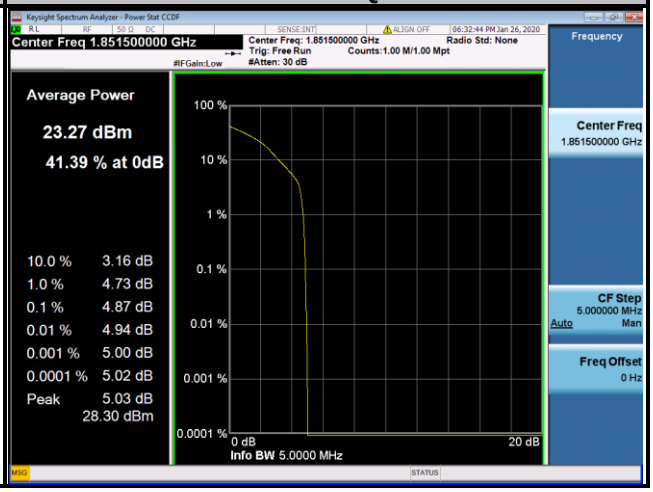
LTE Band 2							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
18607	1850.7	3.89	4.86	18615	1851.5	3.99	4.87
18900	1880.0	3.43	4.68	18900	1880.0	3.71	4.69
19193	1909.3	2.77	4.42	19185	1908.5	3.23	4.24

Spectrum Plot of Worst Value

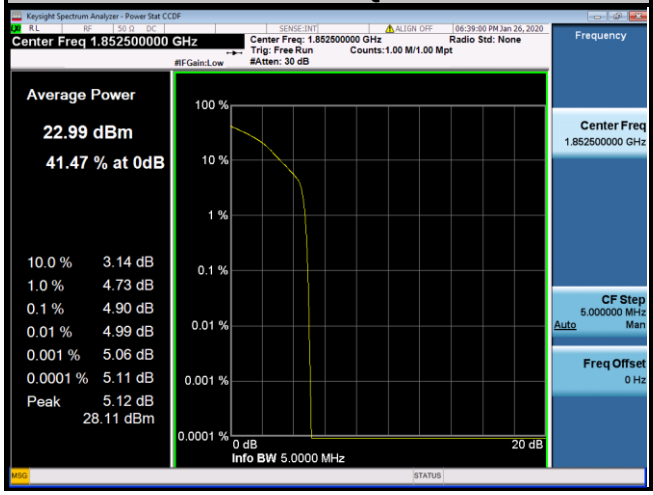
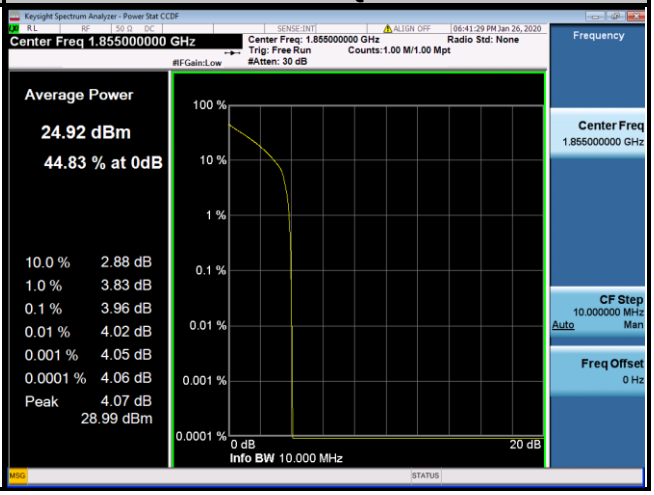
1.4 MHz / 16QAM



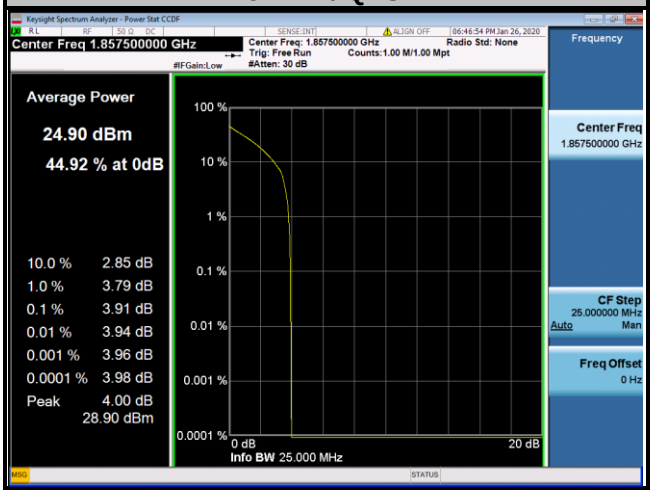
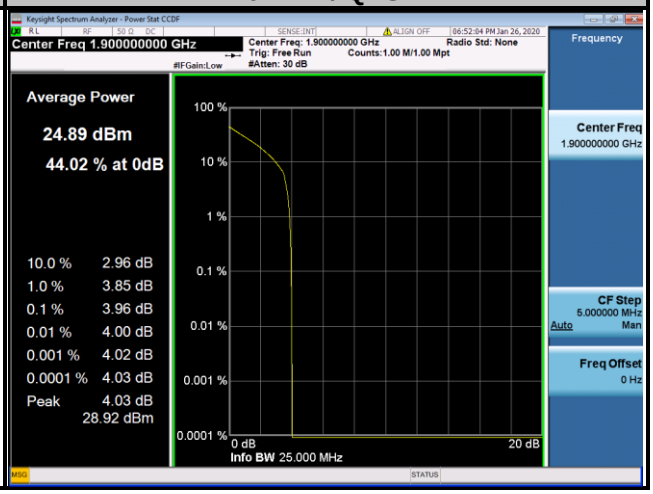
3 MHz / 16QAM



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
18625	1852.5	3.99	4.90	18650	1855.0	3.96
18900	1880.0	3.68	4.70	18900	1880.0	3.64
19175	1907.5	3.41	4.70	19150	1905.0	3.75

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

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			QPSK
18675	1857.5	3.91	18700	1860.0	3.95
18900	1880.0	3.48	18900	1880.0	3.55
19125	1902.5	3.87	19100	1900.0	3.96

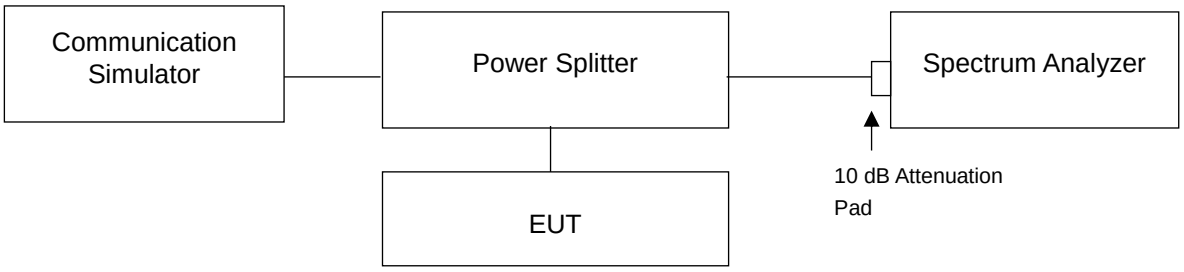
Spectrum Plot of Worst Value	
15 MHz / QPSK	20 MHz / QPSK
	

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.

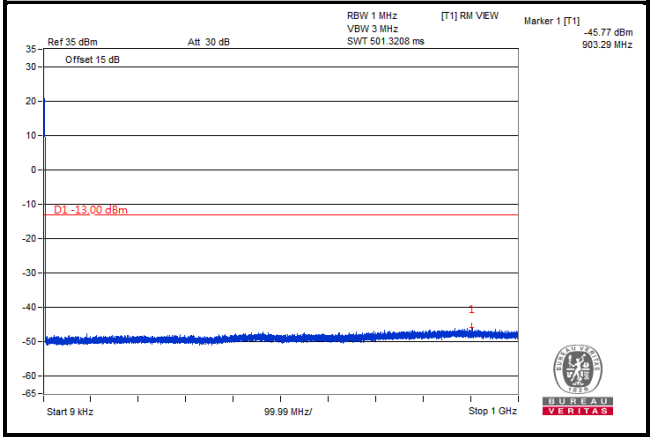
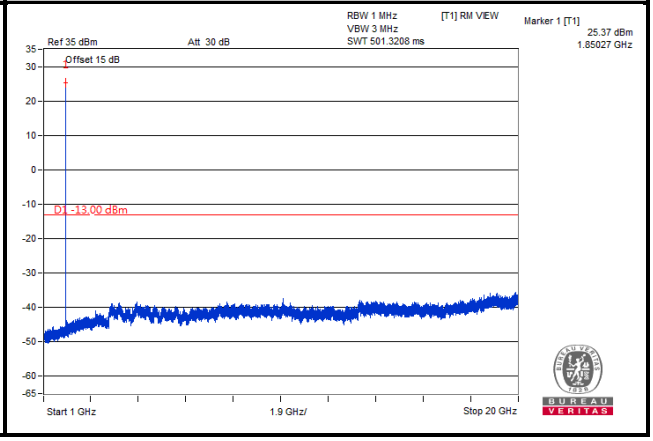
4.7.2 Test Setup



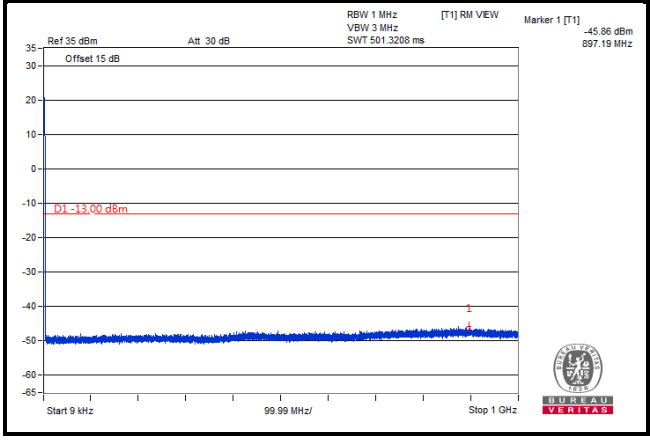
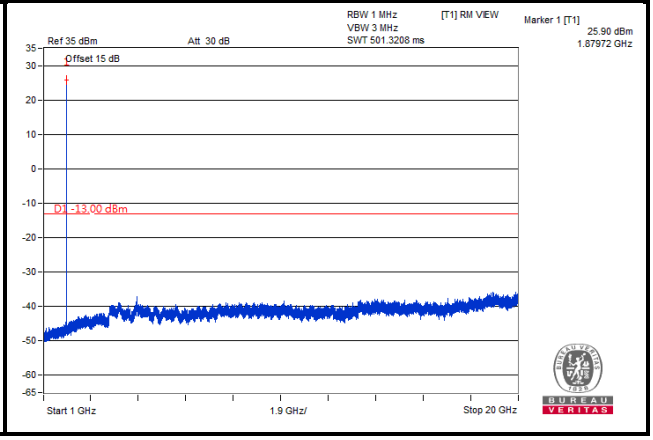
4.7.3 Test Procedure

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

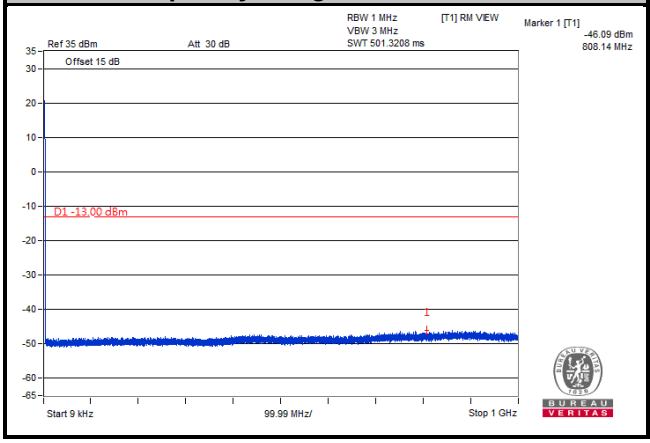
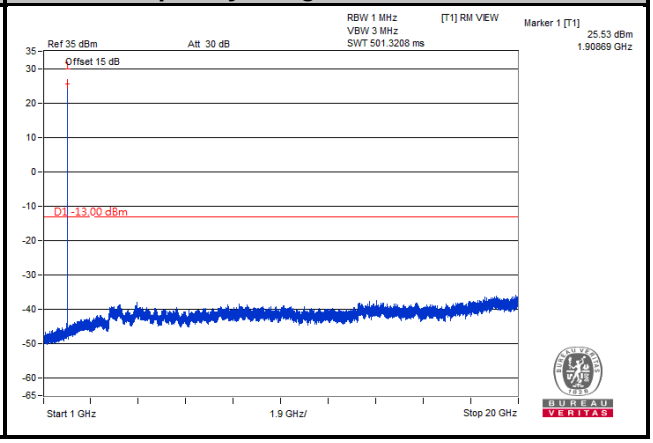
4.7.4 Test Results

LTE Band 2	
Channel Bandwidth: 1.4 MHz	
Channel 18607	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

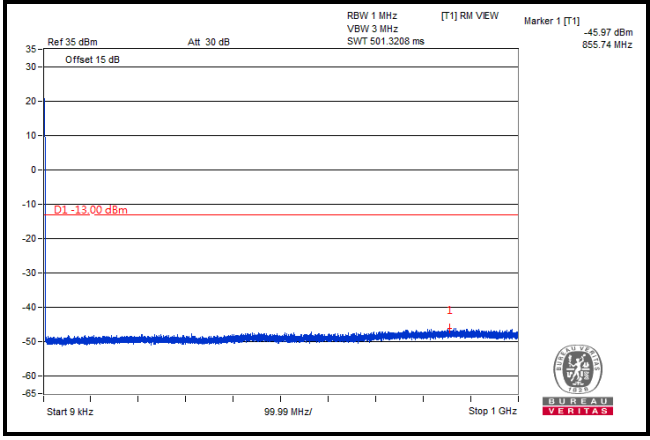
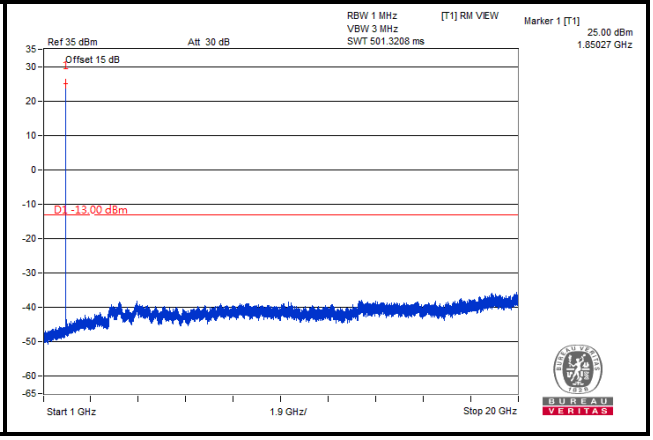
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 1.4 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

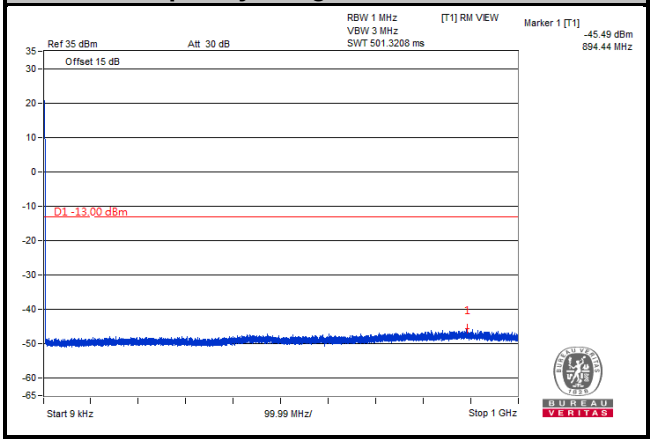
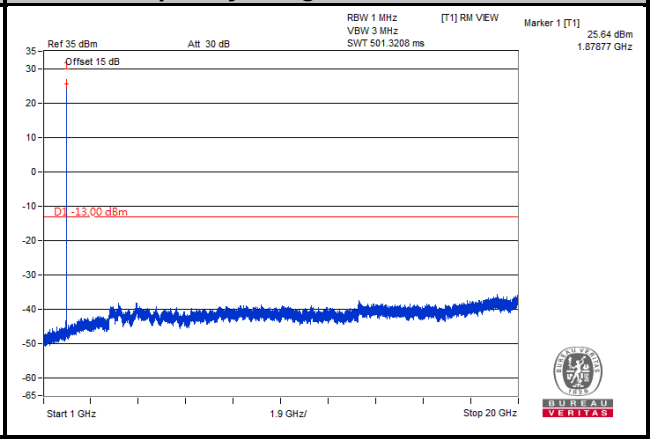
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 1.4 MHz	
Channel 19193	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

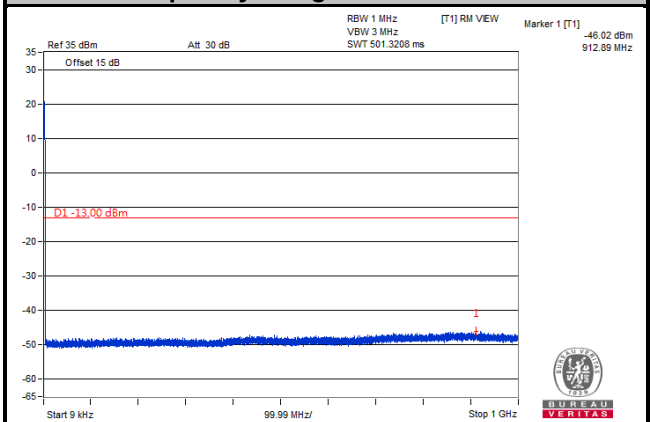
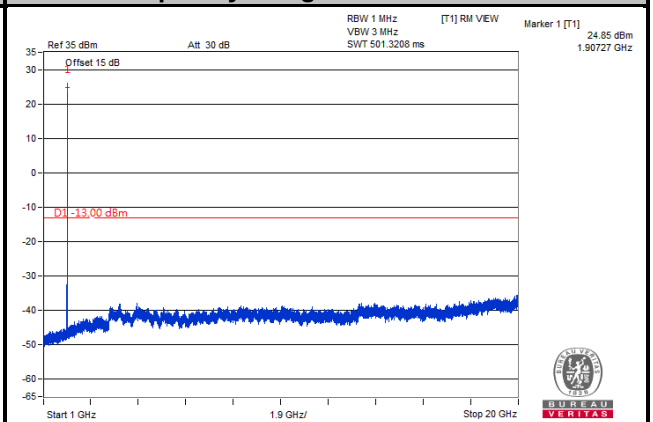
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 3 MHz	
Channel 18615	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

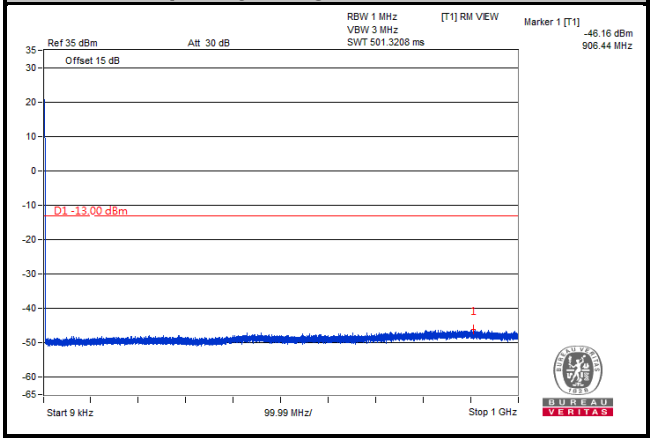
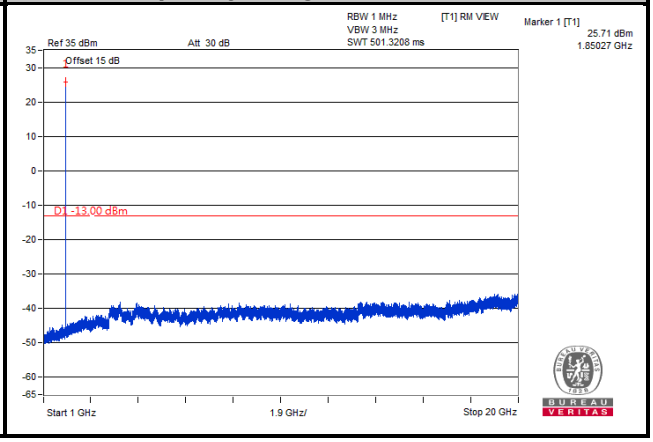
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 3 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

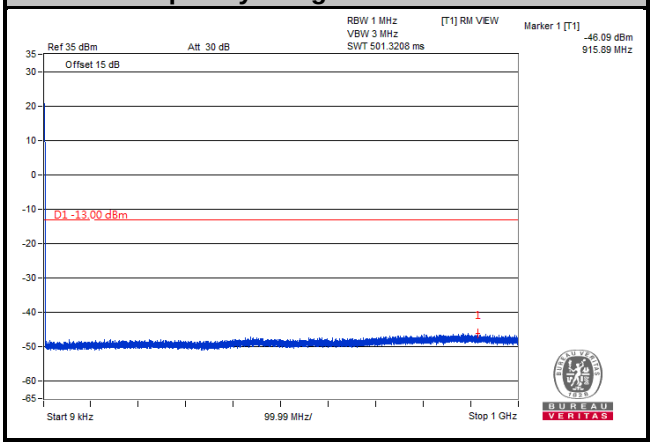
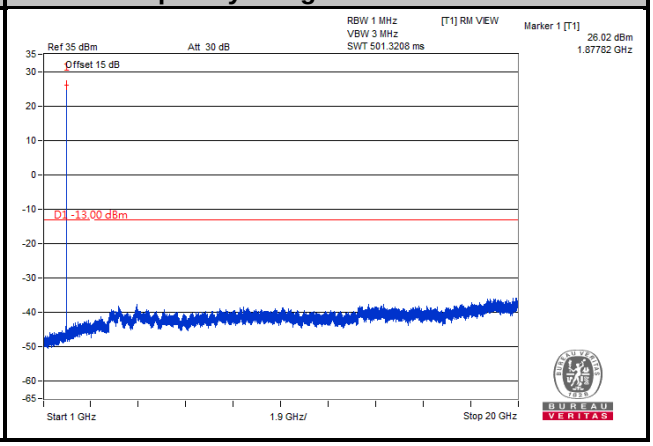
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 3 MHz	
Channel 19185	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

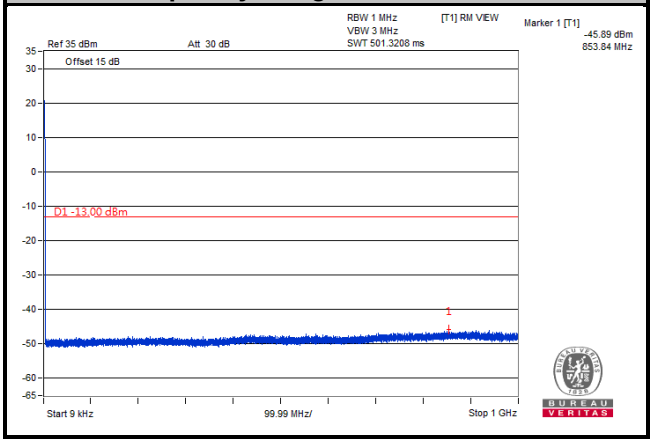
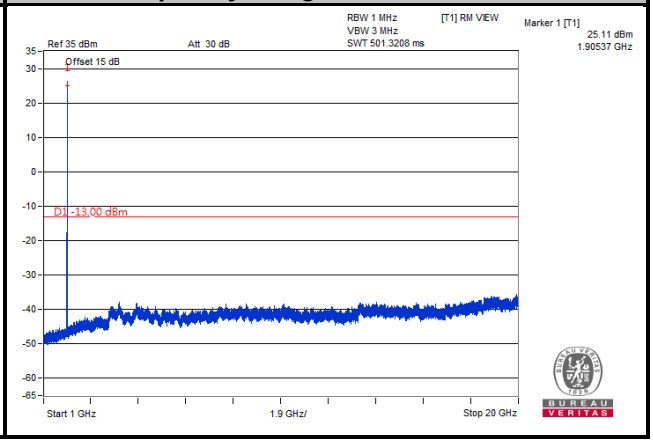
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 5 MHz	
Channel 18625	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

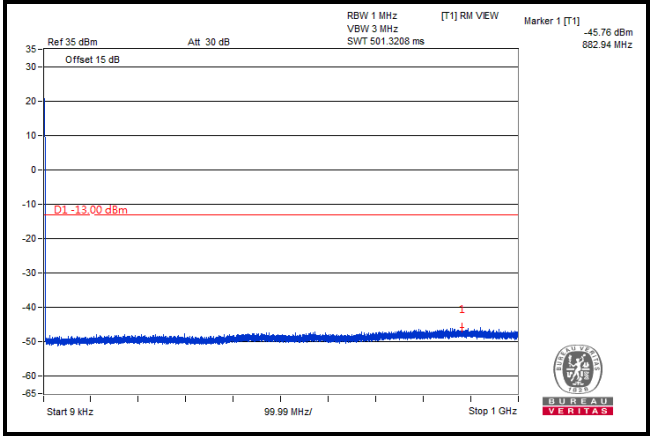
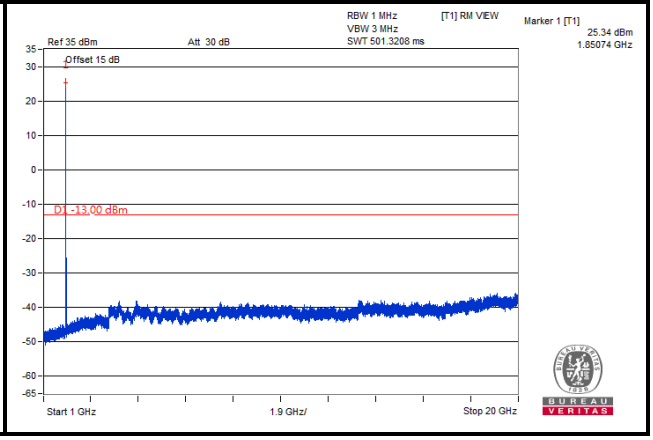
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 5 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

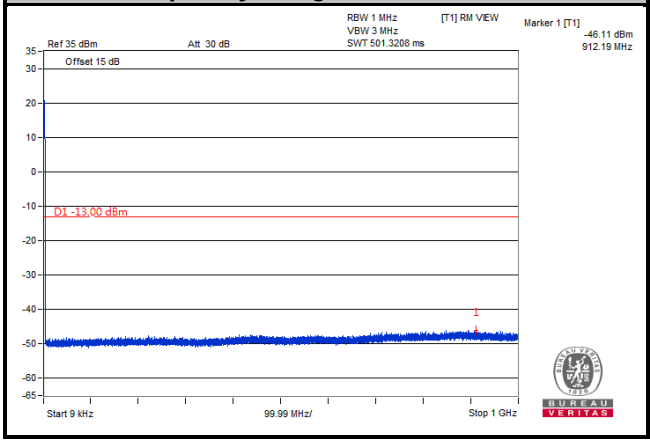
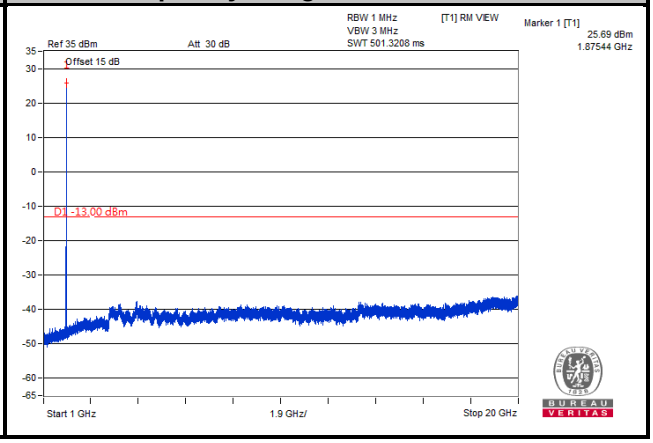
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 5 MHz	
Channel 19175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

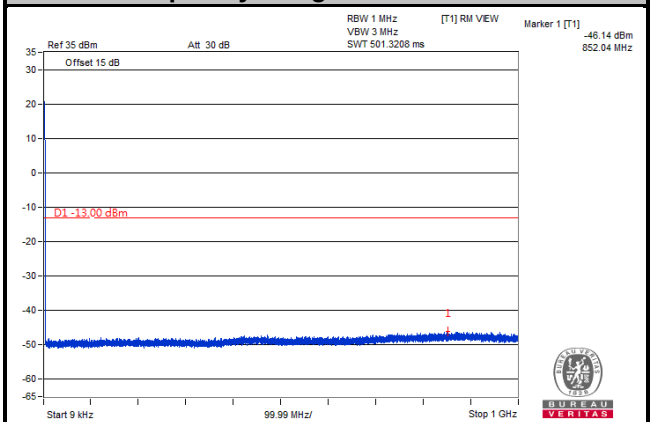
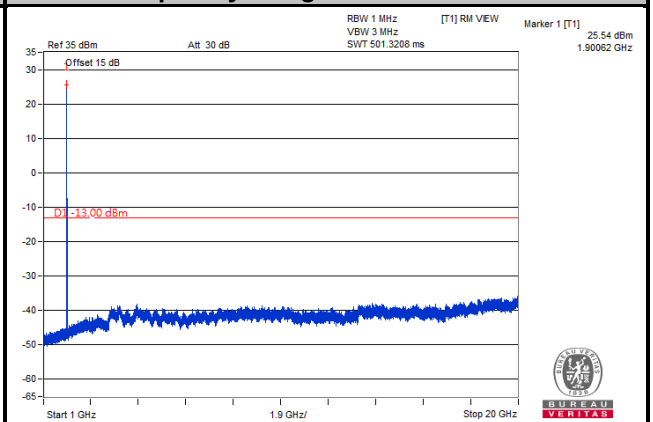
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 10 MHz	
Channel 18650	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

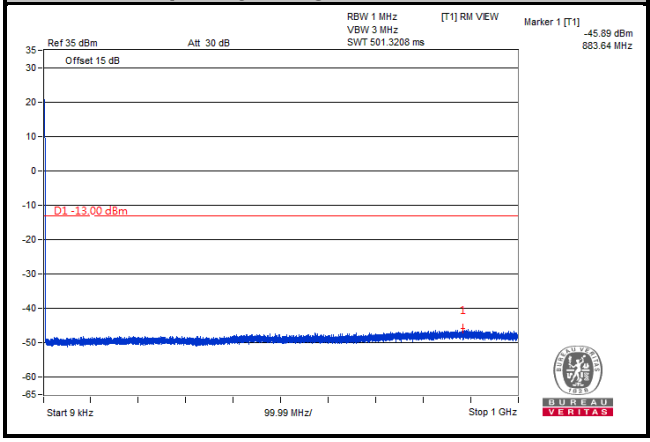
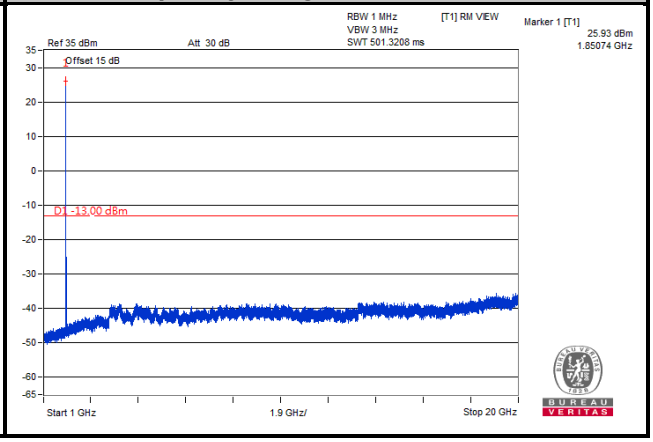
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 10 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

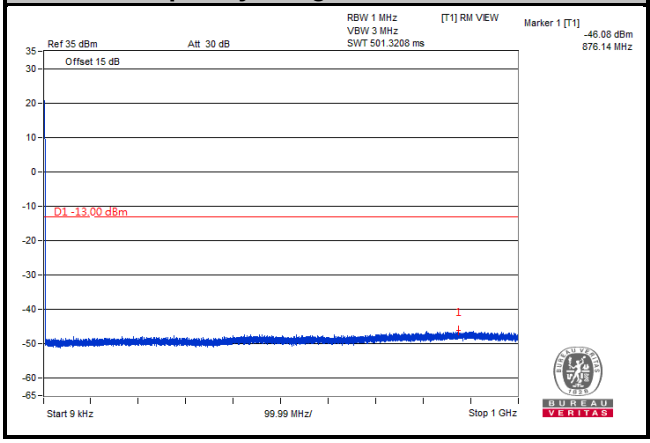
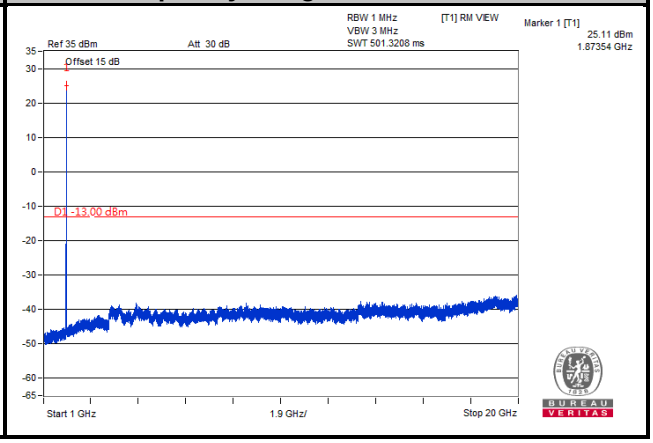
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 10 MHz	
Channel 19150	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

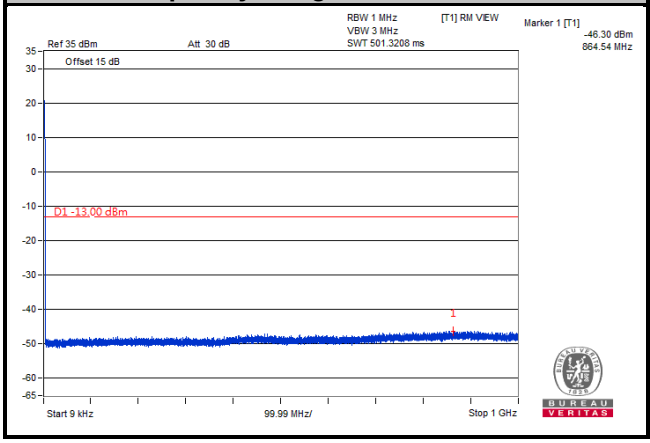
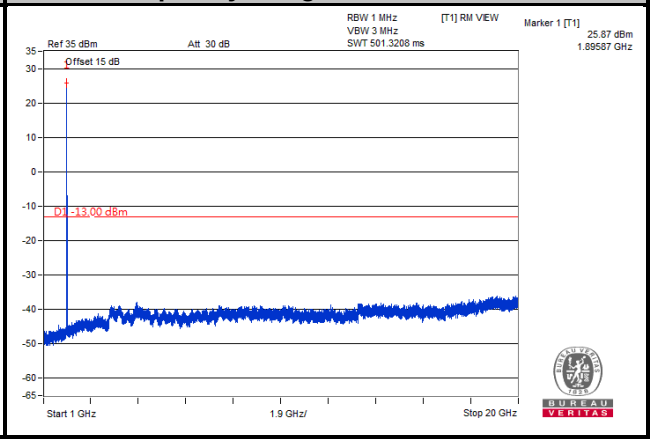
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 15 MHz	
Channel 18675	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

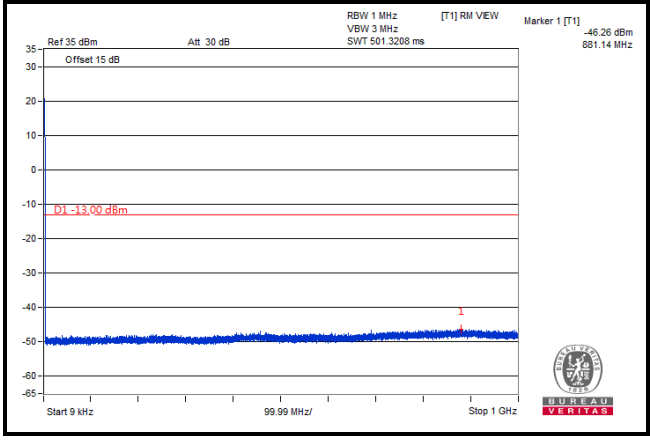
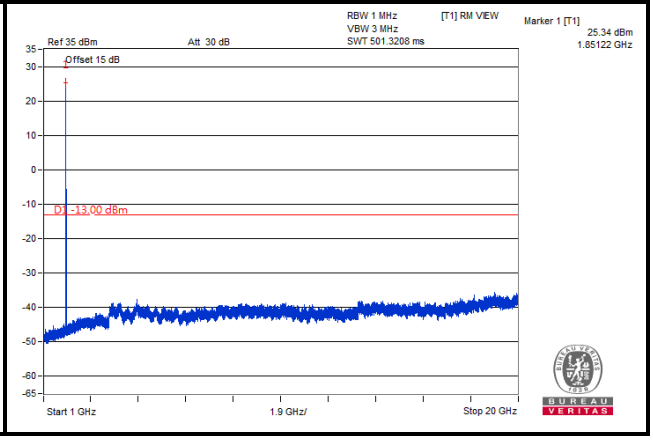
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 15 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

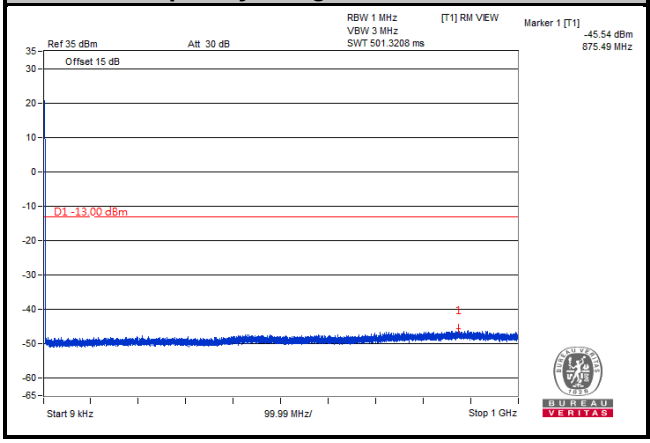
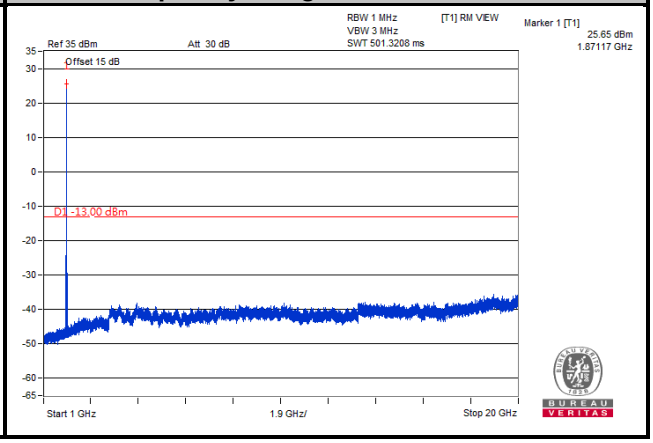
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 15 MHz	
Channel 19125	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

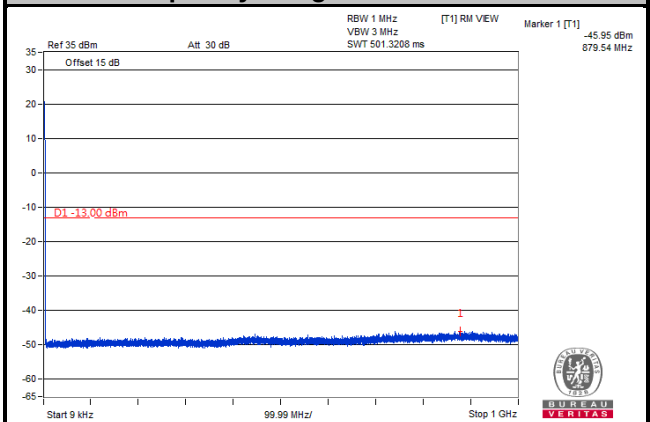
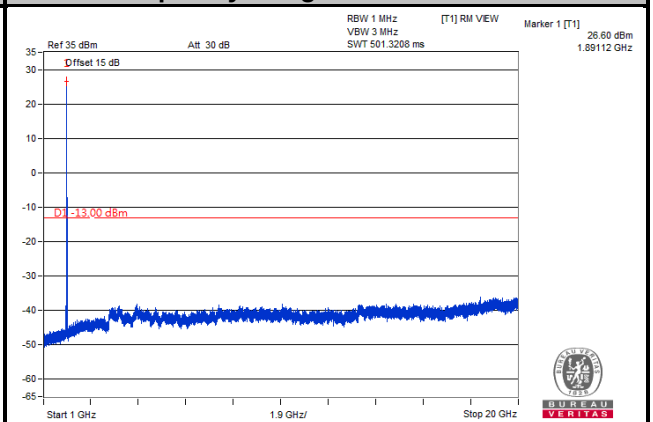
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 2	
Channel Bandwidth: 20 MHz	
Channel 18700	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

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

LTE Band 2	
Channel Bandwidth: 20 MHz	
Channel 18900	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

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

LTE Band 2	
Channel Bandwidth: 20 MHz	
Channel 19100	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

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.

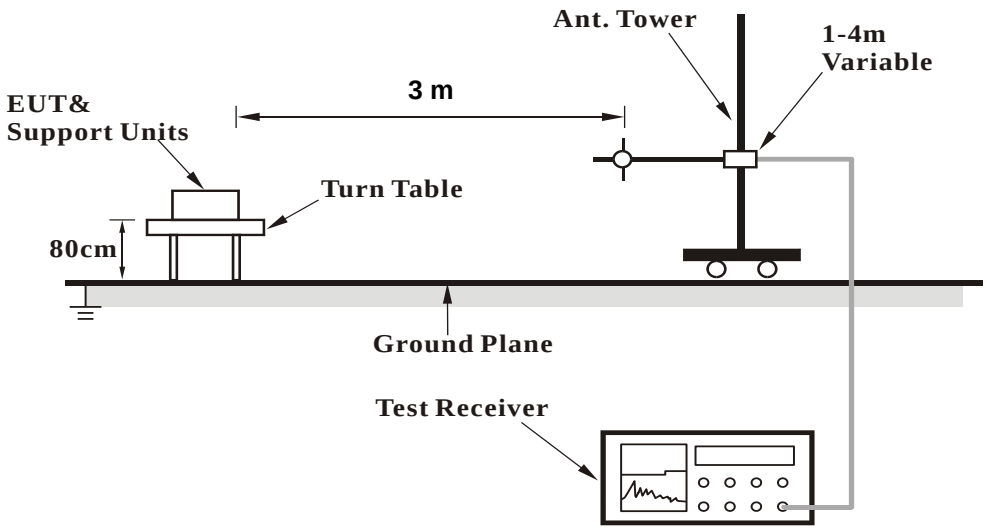
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

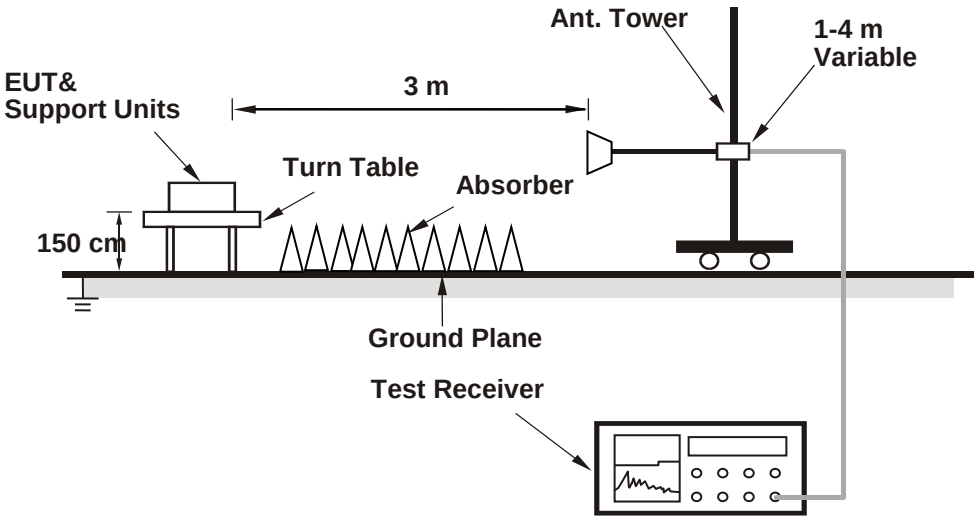
No deviation.

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).

KDB 414788 OFS and Chamber Correlation Justification (For Radiated emission below 30MHz)

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

4.8.5 Test Results

LTE Band 2

Channel Bandwidth: 1.4 MHz / QPSK

Low Channel

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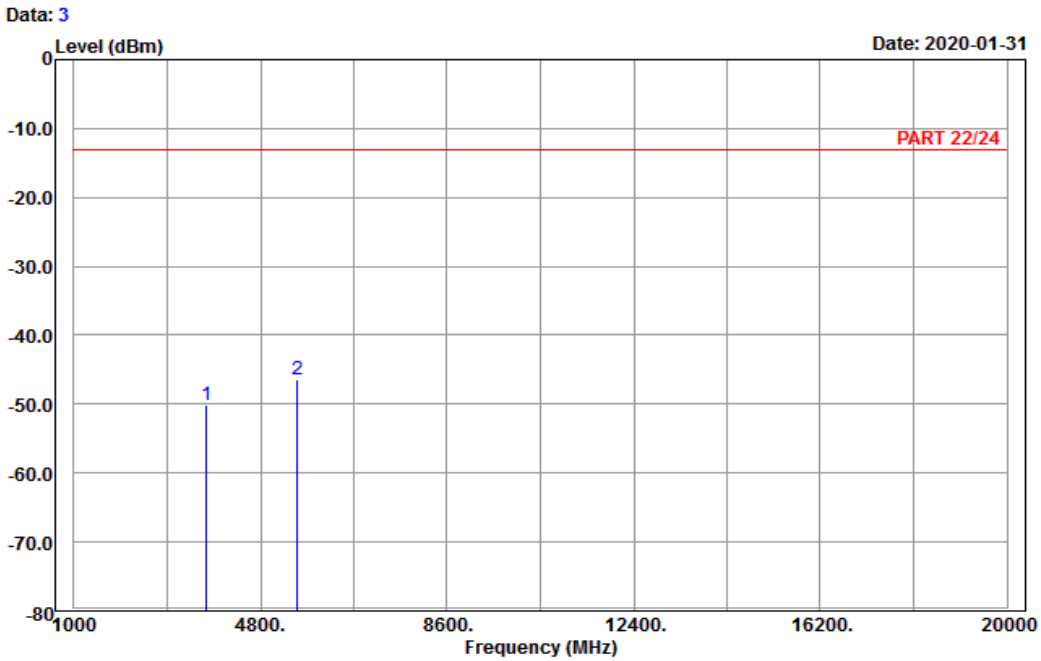
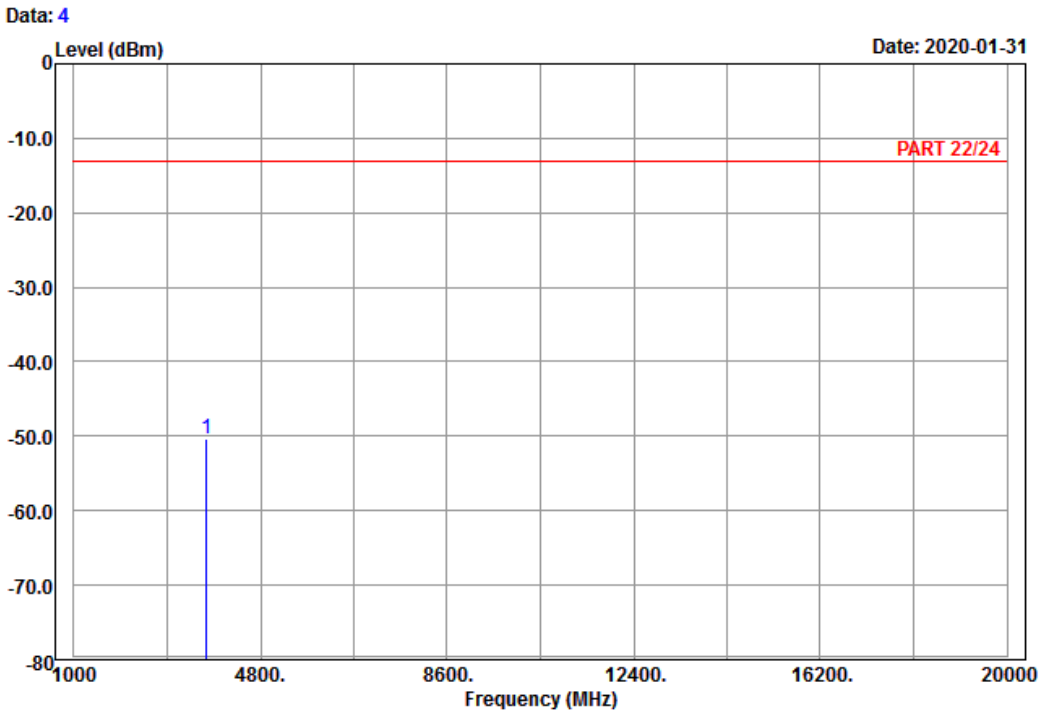



```
Site      : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark    : LTE_Band 2_Link_CH-L
Tested by: Karl Lee
                        Read  Limit   Over
           Freq  Level  Level   Line  Limit Factor Remark
        _________ ______ ______ ______ ______ ______ __________
              MHz    dBm    dBm    dBm     dB     dB

  1      3701.40 -50.21 -66.09 -13.00 -37.21  15.88 Peak
  2 pp   5552.10 -46.39 -66.73 -13.00 -33.39  20.34 Peak
```



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3701.40	-50.35	-66.23	-13.00	-37.35	15.88	Peak

Middle Channel

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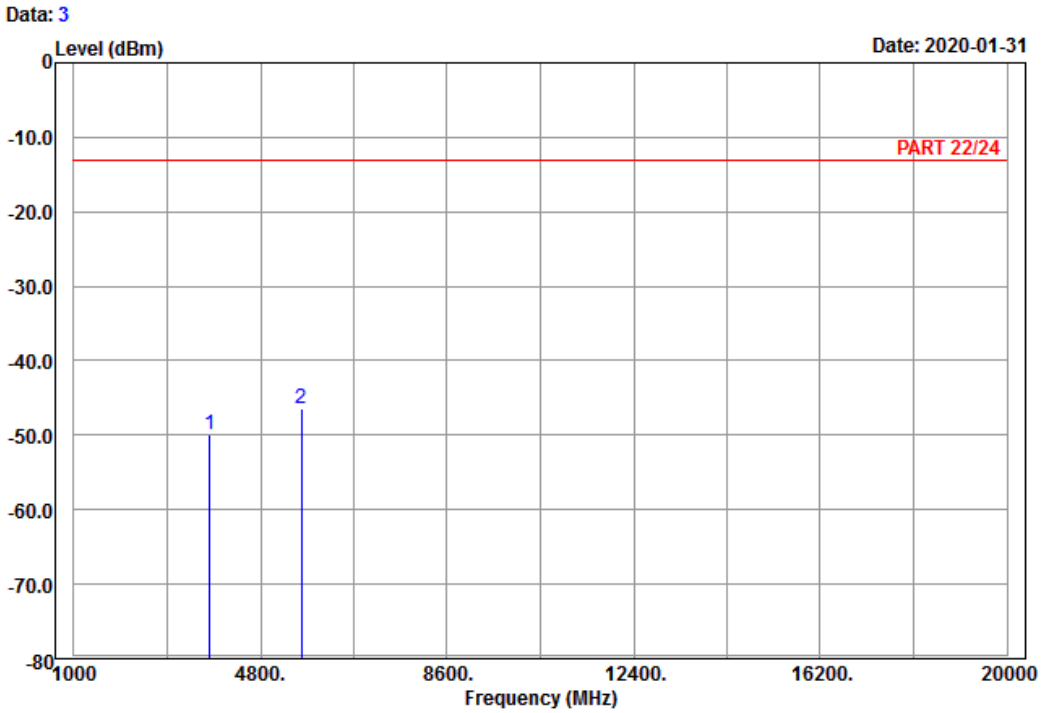
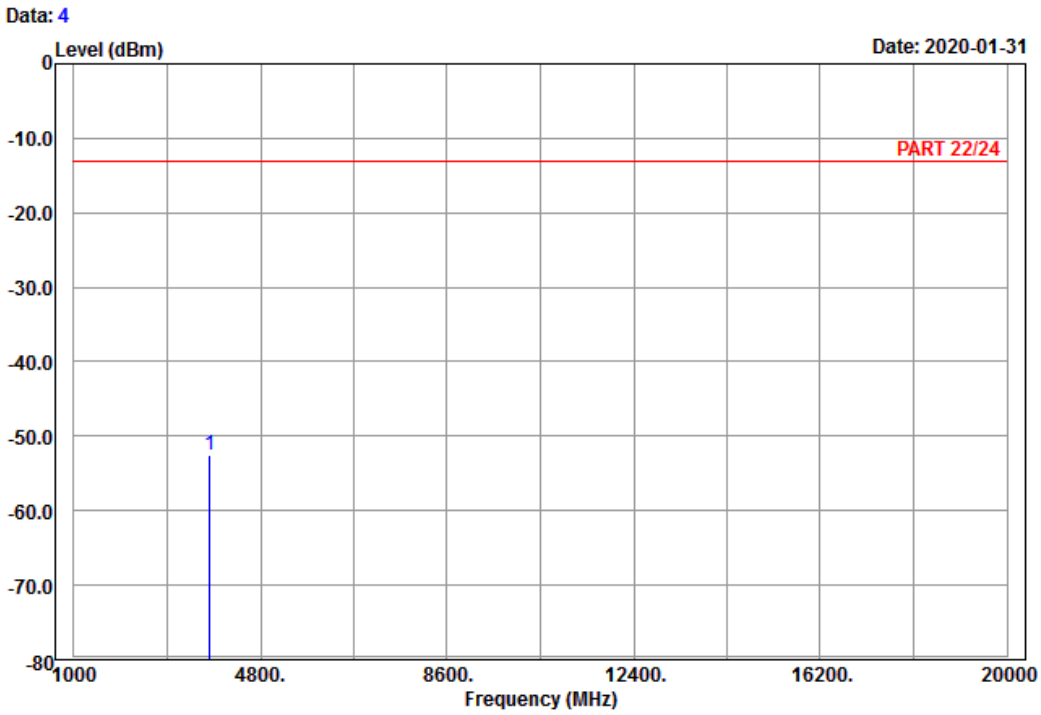


Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 2_Link_M-CH
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3768.00	-49.87	-66.10	-13.00	-36.87	16.23	Peak
2 pp	5640.00	-46.41	-66.88	-13.00	-33.41	20.47	Peak



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-52.55	-68.69	-13.00	-39.55	16.14	Peak

High Channel

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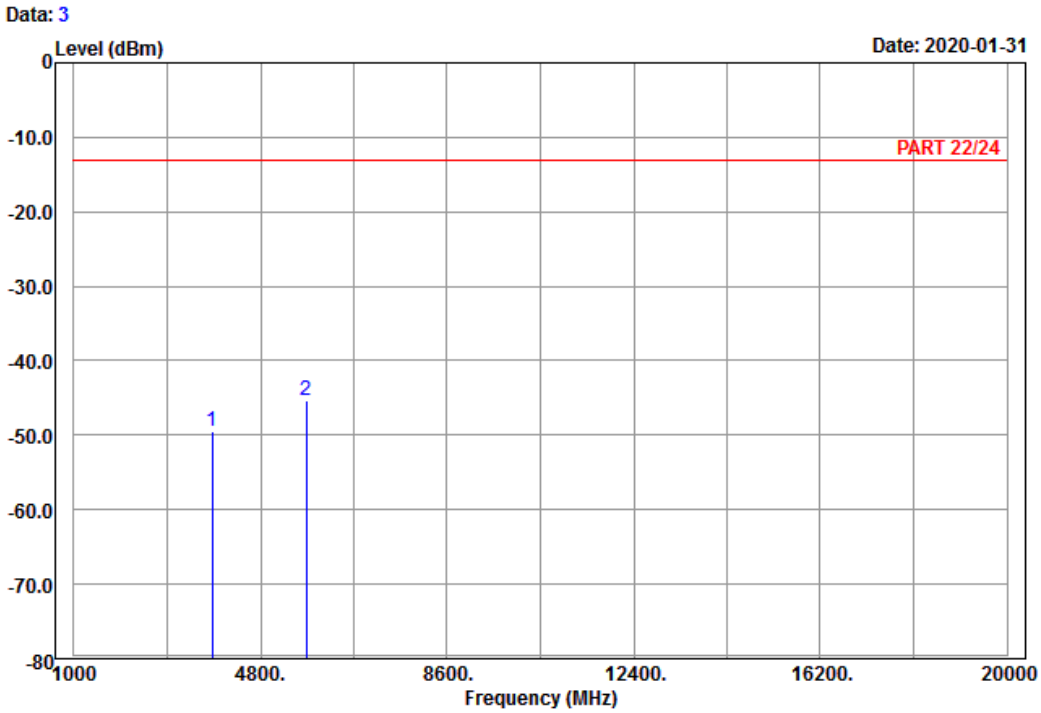
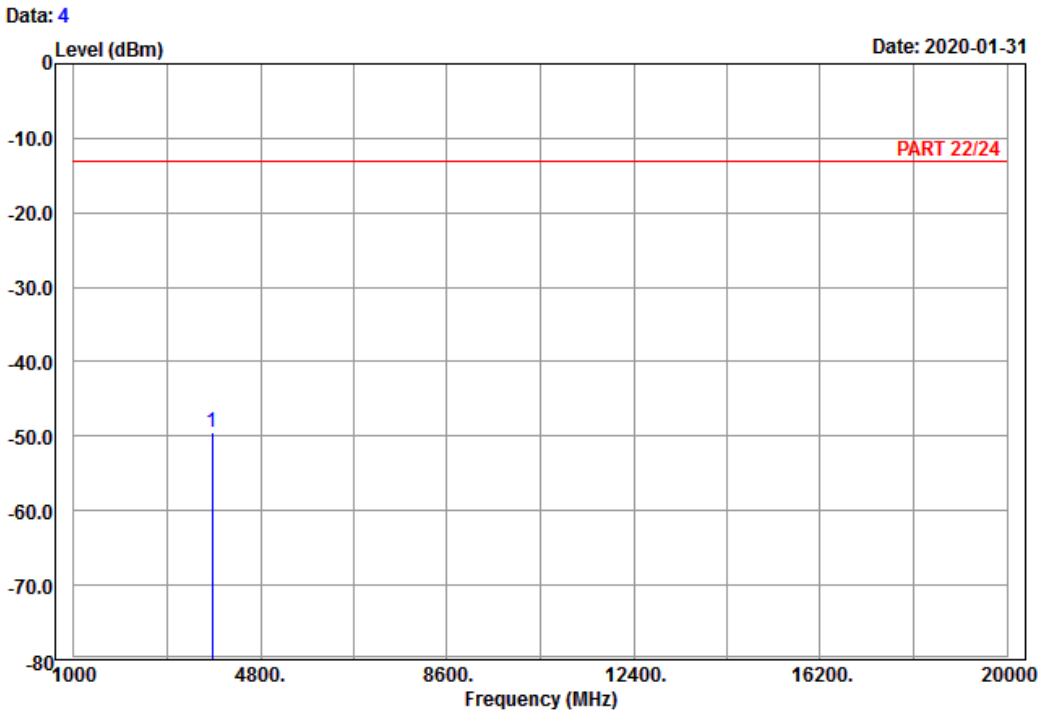


Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : LTE_Band 2_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3818.60	-49.52	-66.02	-13.00	-36.52	16.50	Peak
2 pp	5727.90	-45.36	-65.70	-13.00	-32.36	20.34	Peak

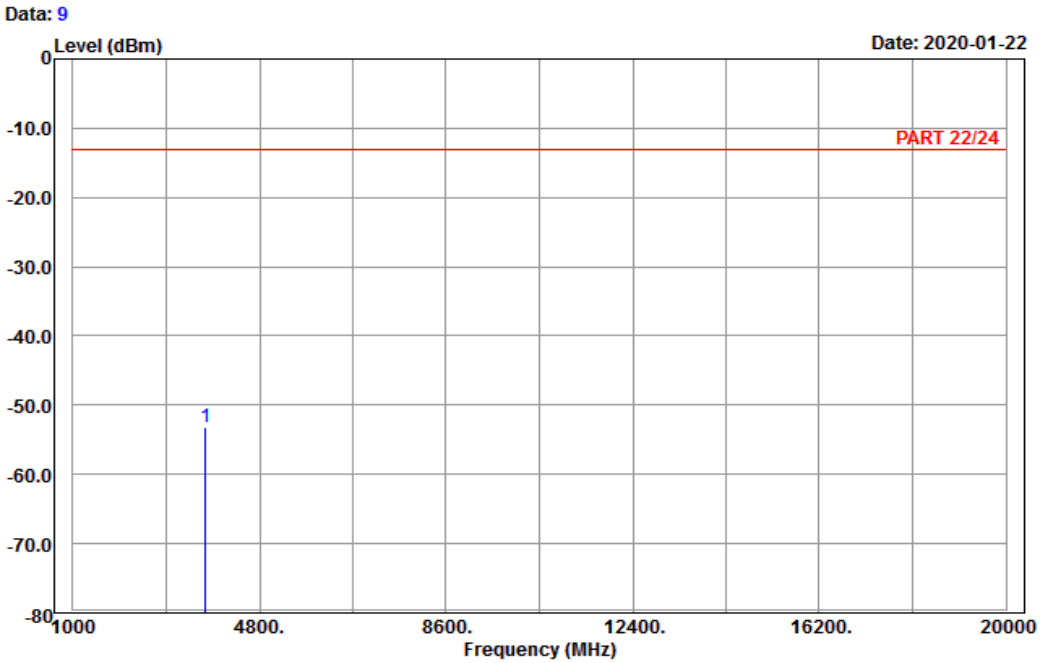


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 2_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3818.60	-49.45	-65.95	-13.00	-36.45	16.50	Peak

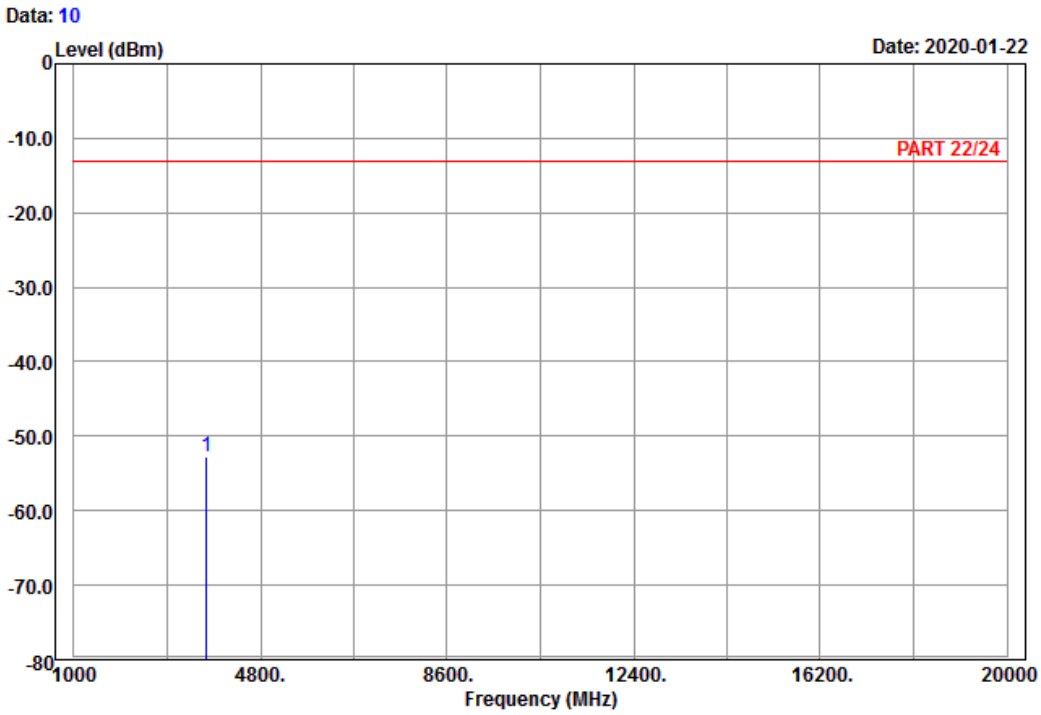
Channel Bandwidth: 5 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3705.00	-53.17	-69.05	-13.00	-40.17	15.88	Peak

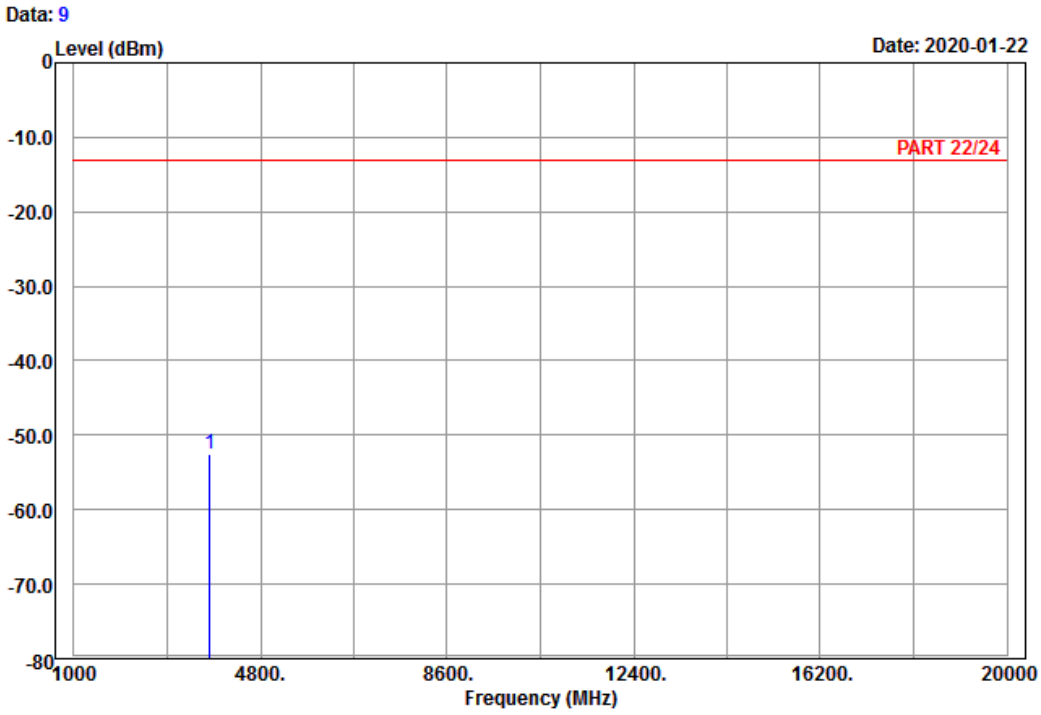


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 2_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3705.00	-52.66	-68.54	-13.00	-39.66	15.88	Peak

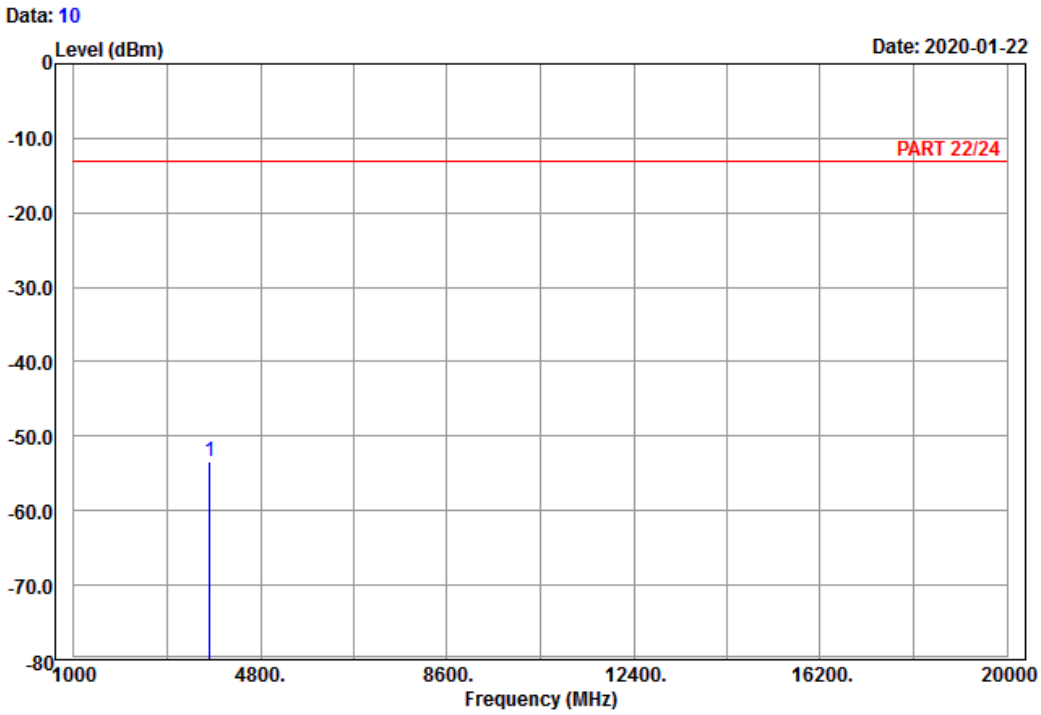
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-52.50	-68.64	-13.00	-39.50	16.14	Peak

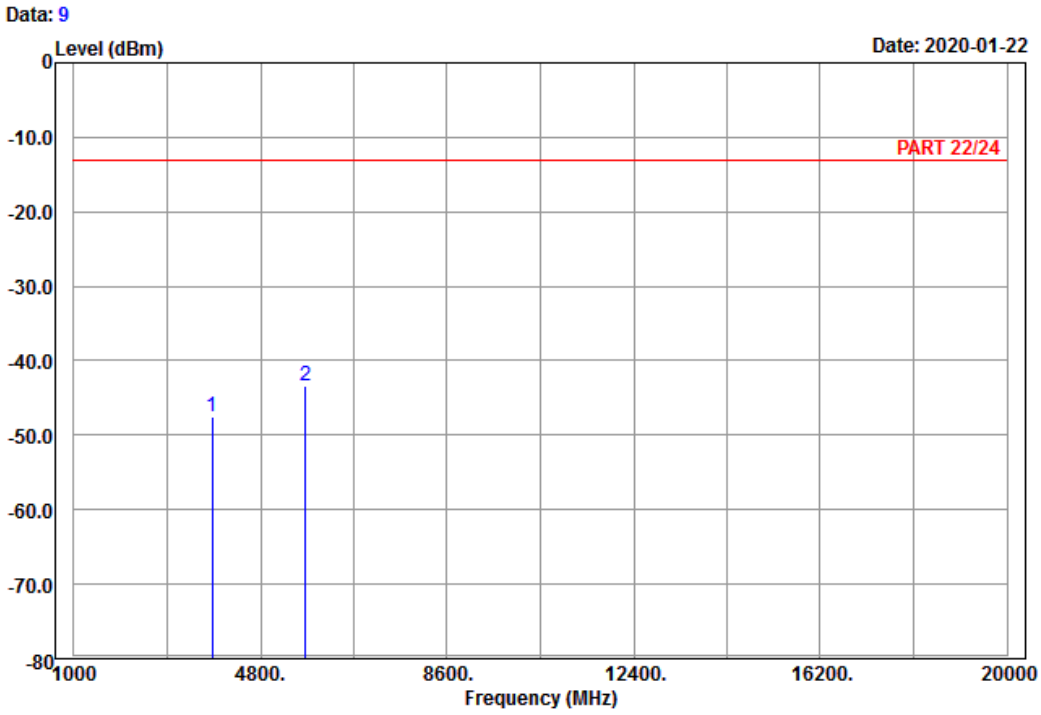


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 2_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-53.46	-69.60	-13.00	-40.46	16.14	Peak

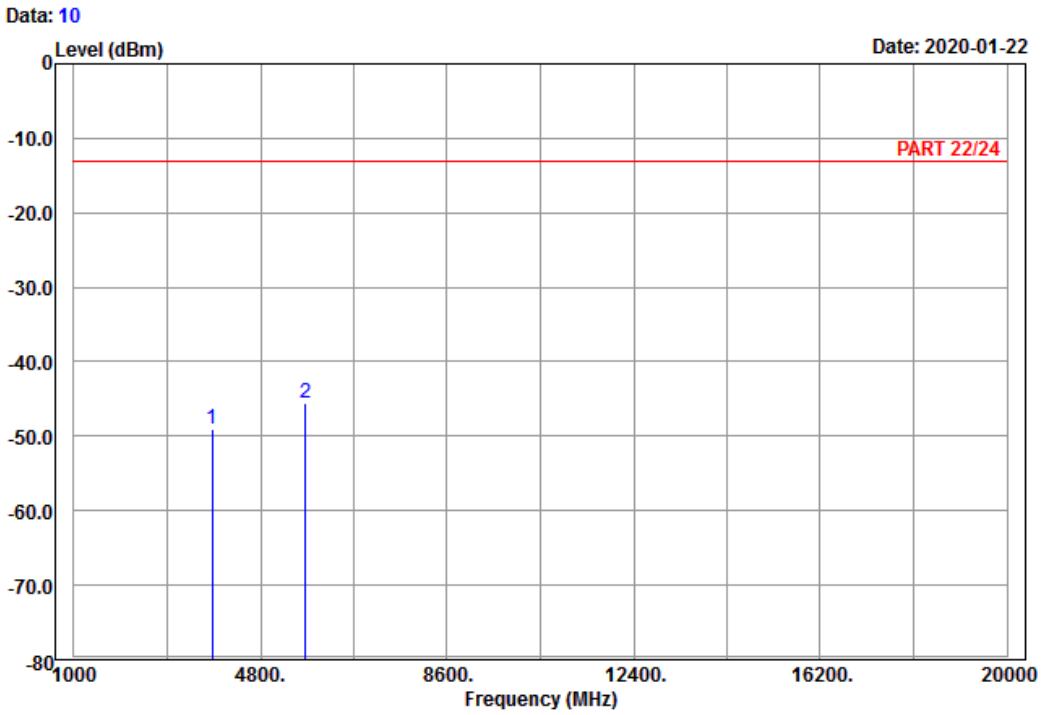
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3815.00	-47.53	-63.94	-13.00	-34.53	16.41	Peak
2 pp	5722.50	-43.41	-63.68	-13.00	-30.41	20.27	Peak

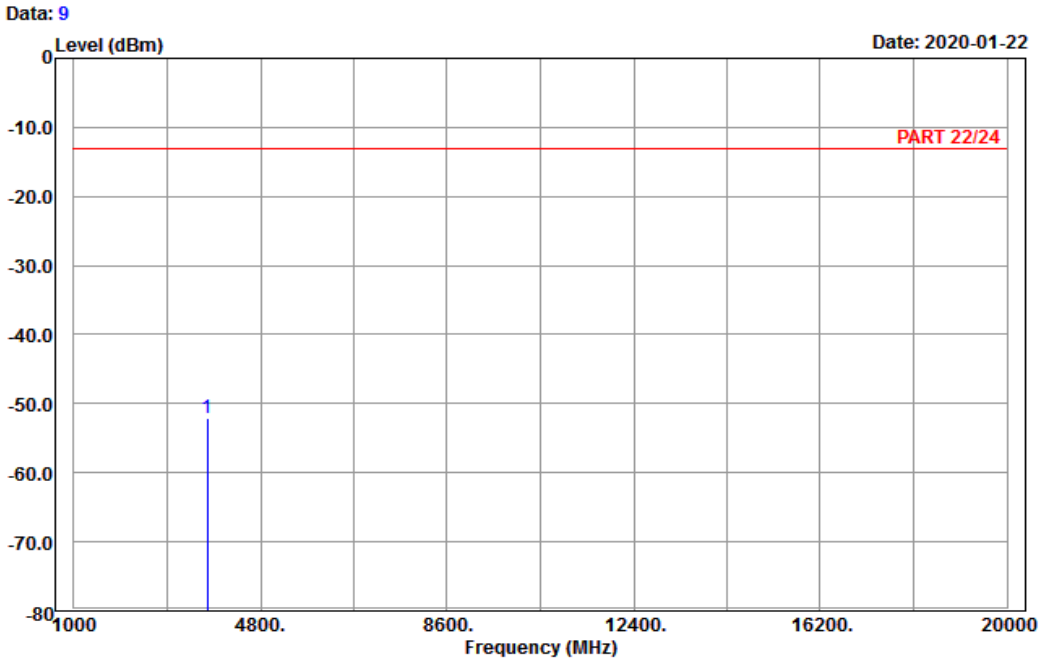


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 2_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3815.00	-49.14	-65.55	-13.00	-36.14	16.41	Peak
2 pp	5722.50	-45.54	-65.81	-13.00	-32.54	20.27	Peak

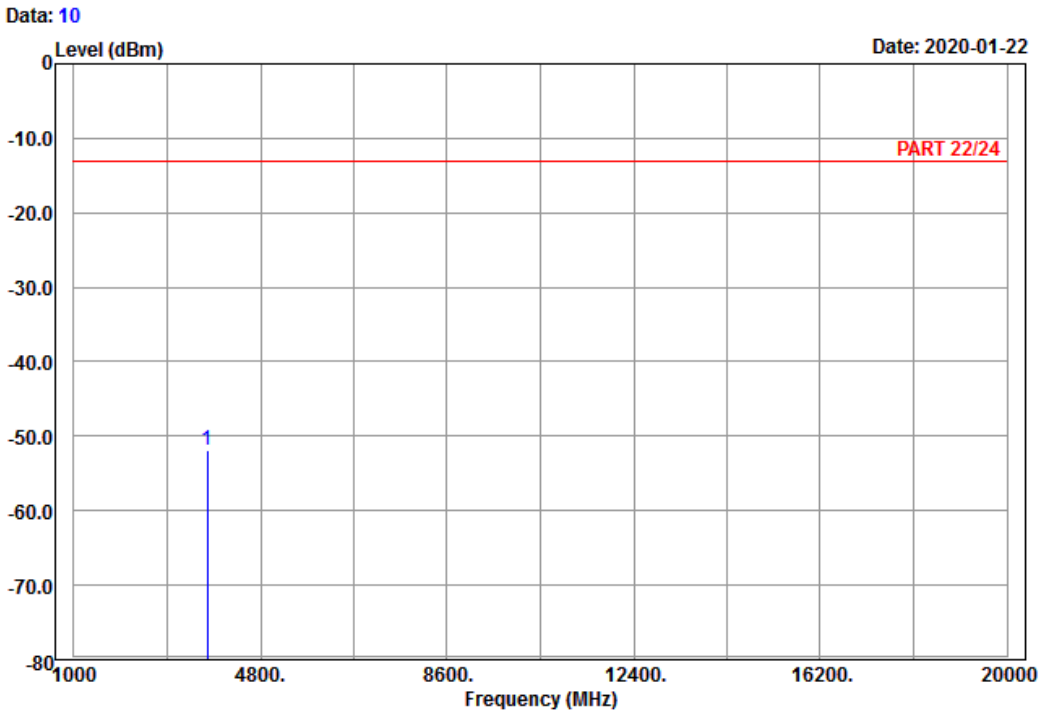
Channel Bandwidth: 20 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3720.00	-52.14	-68.11	-13.00	-39.14	15.97	Peak

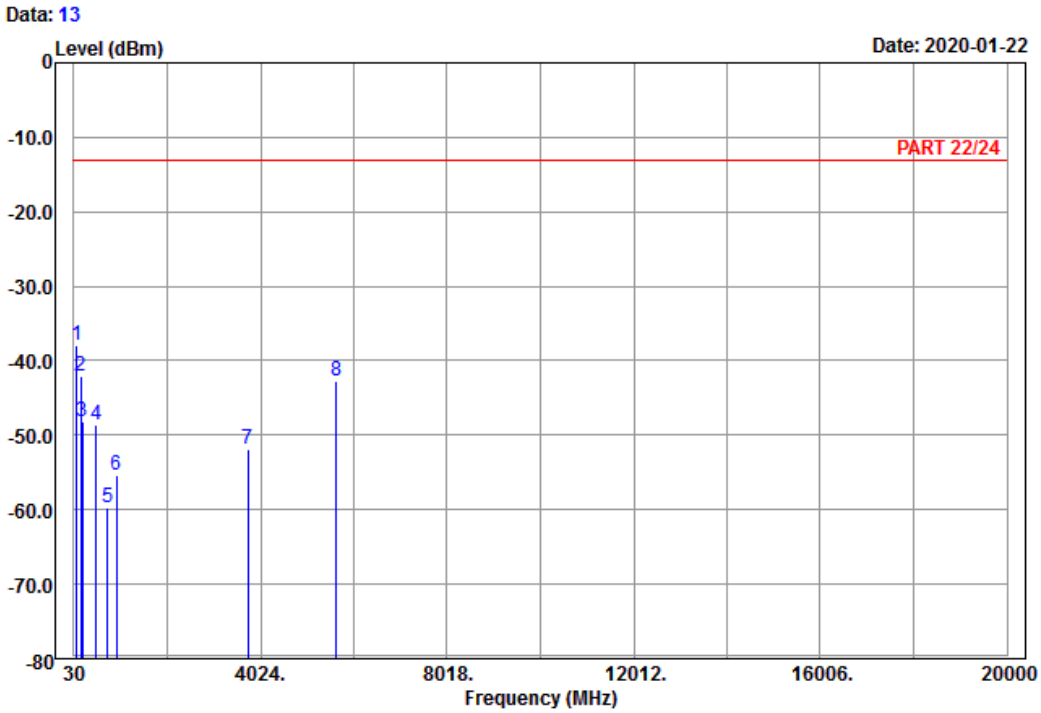


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 2_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3720.00	-51.99	-67.96	-13.00	-38.99	15.97	Peak

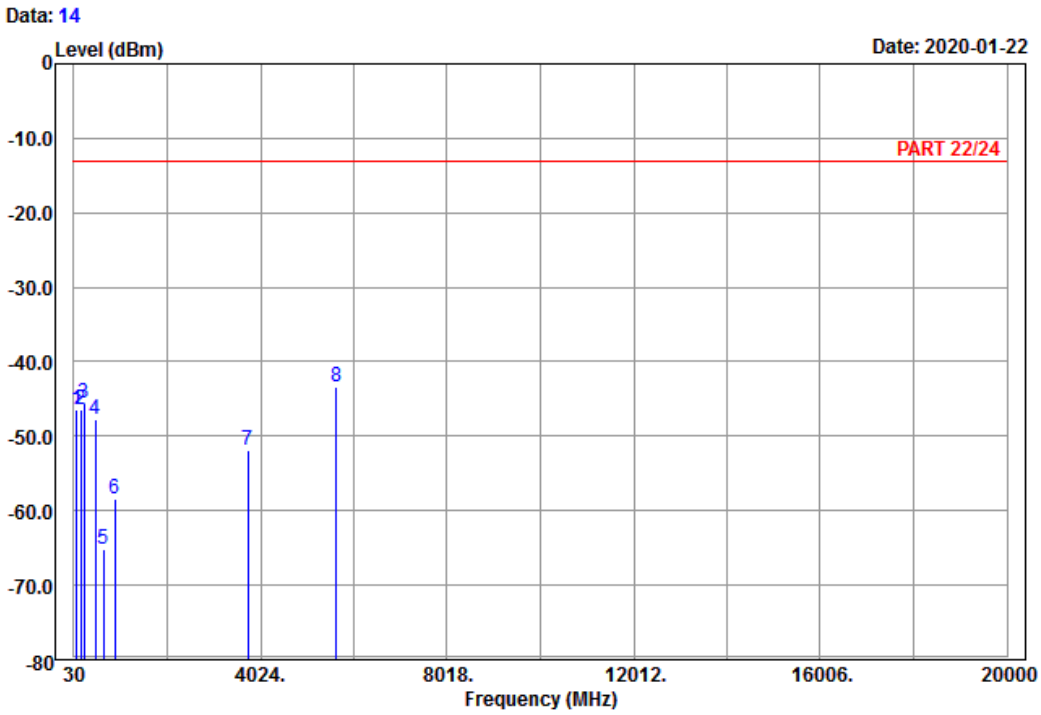
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	99.12	-37.94	-27.76	-13.00	-24.94	-10.18	Peak
2	179.85	-41.98	-36.30	-13.00	-28.98	-5.68	Peak
3	213.87	-48.18	-42.19	-13.00	-35.18	-5.99	Peak
4	505.80	-48.54	-43.68	-13.00	-35.54	-4.86	Peak
5	756.40	-59.64	-58.78	-13.00	-46.64	-0.86	Peak
6	948.90	-55.32	-60.38	-13.00	-42.32	5.06	Peak
7	3760.00	-51.81	-67.95	-13.00	-38.81	16.14	Peak
8	5640.00	-42.78	-63.25	-13.00	-29.78	20.47	Peak

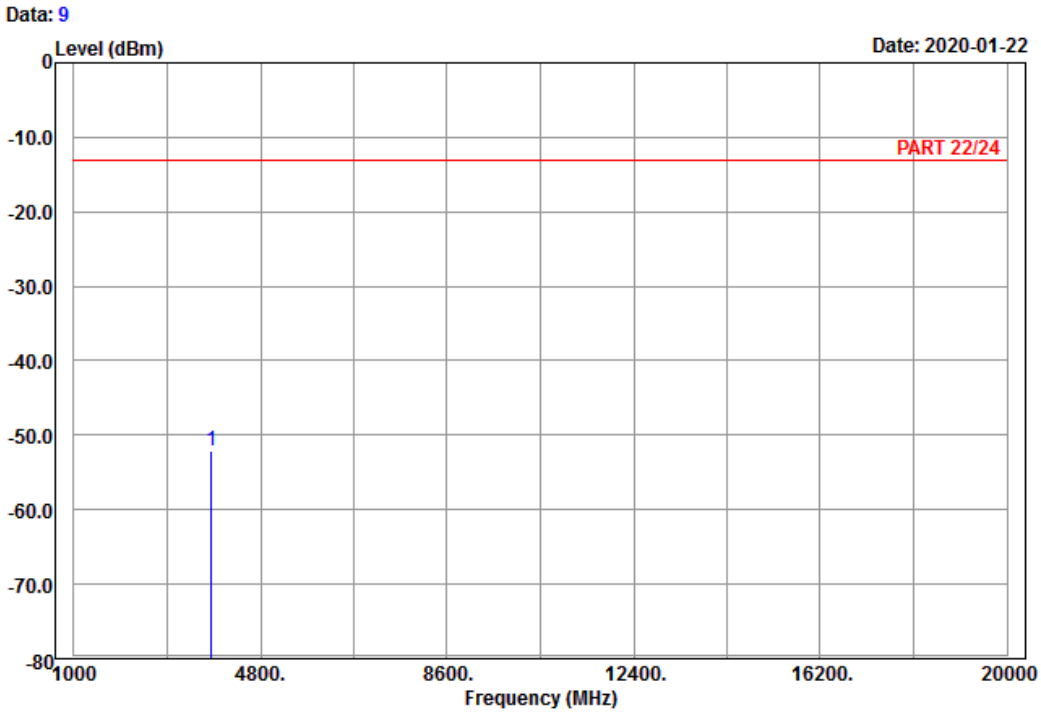


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : LTE_Band 2_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	98.85	-46.51	-36.33	-13.00	-33.51	-10.18	Peak
2	169.59	-46.52	-39.81	-13.00	-33.52	-6.71	Peak
3	250.86	-45.62	-40.10	-13.00	-32.62	-5.52	Peak
4	489.00	-47.63	-42.68	-13.00	-34.63	-4.95	Peak
5	657.70	-65.18	-65.01	-13.00	-52.18	-0.17	Peak
6	908.30	-58.33	-61.57	-13.00	-45.33	3.24	Peak
7	3760.00	-51.91	-68.05	-13.00	-38.91	16.14	Peak
8 pp	5640.00	-43.33	-63.80	-13.00	-30.33	20.47	Peak

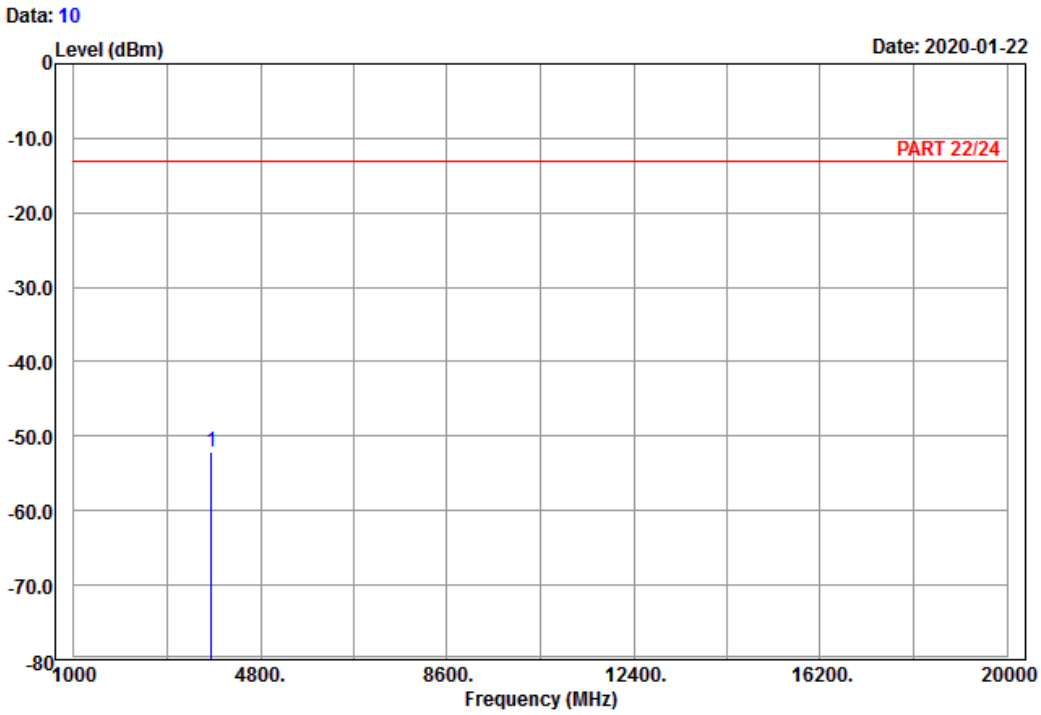
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3800.00	-52.05	-68.46	-13.00	-39.05	16.41	Peak



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

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3800.00	-52.21	-68.62	-13.00	-39.21	16.41	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:

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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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