

Partial FCC Test Report

(PART 27)

Report No.: RF190528C10

FCC ID: 2ATM8EC25V

Test Model: EC25-V

Received Date: May 28, 2019

Test Date: May 28 ~ May 30, 2019

Issued Date: Jul. 26, 2019

Applicant: Hawkeye Tech Co., Ltd.

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(R.O.C)

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33383, TAIWAN (R.O.C.)

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

FCC Registration / 788550 / TW0003

Designation Number: 427177 / TW0011



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Release Control Record

Issue No.	Description	Date Issued
RF190528C10	Original Release	Jul. 26, 2019

1 Certificate of Conformity

Product: LTE Module

Brand: Quectel

Test Model: EC25-V

Sample Status: Identical Prototype

Applicant: Hawkeye Tech Co., Ltd.

Test Date: May 28 ~ May 30, 2019

Standards: FCC Part 27, Subpart C, F, L

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. 26, 2019
Lena Wang / Specialist

Approved by : Dylan Chiou , Date: Jul. 26, 2019
Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE B4)			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(d)(4)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	N/A	Refer to Note
2.1055 27.54	Frequency Stability	N/A	Refer to Note
2.1049	Occupied Bandwidth	N/A	Refer to Note
27.50(d)(5)	Peak to Average Ratio	N/A	Refer to Note
27.53(h)	Band Edge Measurements	N/A	Refer to Note
2.1051 27.53(h)	Conducted Spurious Emissions	N/A	Refer to Note
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -26.63 dB at 5235.00 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE B13)			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(b)(10)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	N/A	Refer to Note
2.1055 27.54	Frequency Stability	N/A	Refer to Note
2.1049	Occupied Bandwidth	N/A	Refer to Note
---	Peak to Average Ratio	N/A	Refer to Note
27.53(c)(2)(4)	Band Edge Measurements	N/A	Refer to Note
2.1051 27.53(c)(2)&(f)	Conducted Spurious Emissions	N/A	Refer to Note
2.1053 27.53(c)(2)&(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -16.35 dB at 1564.00 MHz.

Note:

1. This report is a partial report. Therefore, only test item of Effective Radiated Power and Radiated Spurious Emissions tests were performed for this report. Other testing data please refer to Bay Area Compliance Laboratories Corp.(Taiwan) report no.: RTWK160705002-00 for module (Brand: Quectel, Model: EC25-V)
2. 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

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 20, 2018	Aug. 19, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-616	Nov. 27, 2018	Nov. 26, 2019
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA9170	9170-480	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 19, 2018	Nov. 18, 2019
Preamplifier Agilent	310N	187226	Jun. 19, 2018	Jun. 18, 2019
Preamplifier Agilent	83017A	MY39501357	Jun. 19, 2018	Jun. 18, 2019
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 19, 2018	Jun. 18, 2019
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 19, 2018	Jun. 18, 2019
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. 16, 2017	Aug. 15, 2019

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

3 General Information

3.1 General Description of EUT

Product	LTE Module	
Brand	Quectel	
Test Model	EC25-V	
Status of EUT	Identical Prototype	
Power Supply Rating	3.8 Vdc (Host equipment)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1747.5 MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz
	LTE Band 13 (Channel Bandwidth: 5 MHz)	779.5 ~ 784.5 MHz
	LTE Band 13 (Channel Bandwidth: 10 MHz)	782.0 MHz
Max. ERP Power	LTE Band 13 (Channel Bandwidth: 5 MHz)	173.42 mW
	LTE Band 13 (Channel Bandwidth: 10 MHz)	183.95 mW
Max. EIRP Power	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	172.39 mW
	LTE Band 4 (Channel Bandwidth: 3 MHz)	180.51 mW
	LTE Band 4 (Channel Bandwidth: 5 MHz)	185.57 mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	189.02 mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	192.53 mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	200.68 mW
Antenna Type	Dipole Antenna	
Antenna Gain	LTE Band 4	1.5 dBi
	LTE Band 13	-1.6 dBi
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

1. The EUT was installed in a specific End-product.

Product	Brand	Model	FCC ID
veeaHub		VHE10XXX (X=A-Z, 0-9, blank or "-")	2ARXKVHE10

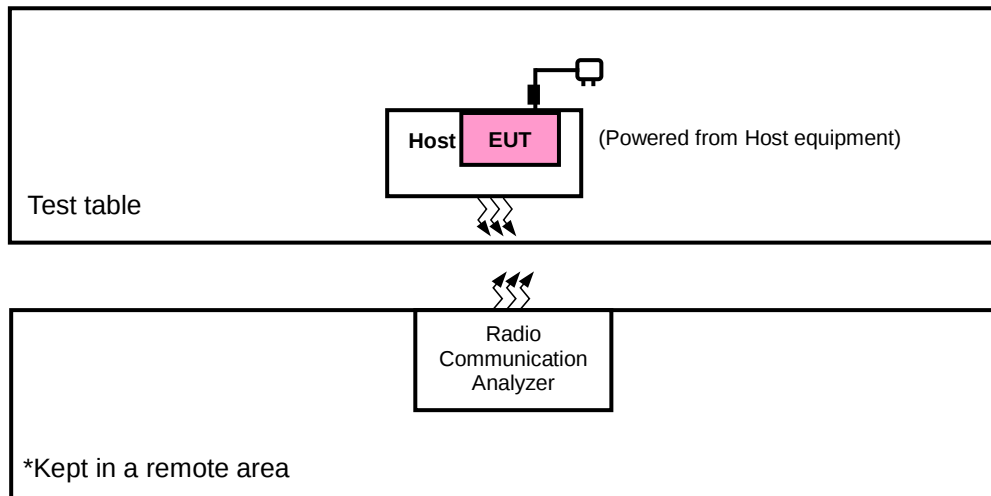
2. The EUT contains following accessory devices.

Product	Brand	Model	Description
AC Adapter	EDACPOWER ELEC.	EA1062SGR-480	I/P: 100-240 Vac, 50/60 Hz, 2.5A O/P: 48 Vdc, 1.35 A 1.2m DC cable with 1 core

3. 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.R.P. / 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.

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, antenna degree 90° and 180°, and antenna ports

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

Band	ERP / EIRP	Radiated Emission
LTE Band 4	90°	90°
LTE Band 13	90°	90°

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Radiated Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	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.
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.

LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Radiated Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 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.
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
ERP / EIRP	25 deg. C, 65 % RH	3.8 Vdc	Karl Lee
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

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

FCC 47 CFR Part 2

FCC 47 CFR Part 27

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

Portable stations (hand-held devices) operating in the 746-757 MHz, 776-788 MHz and 805-806 MHz band are limited to 3 watts ERP

Portable stations (hand-held device) operating in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

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 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G.
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$.

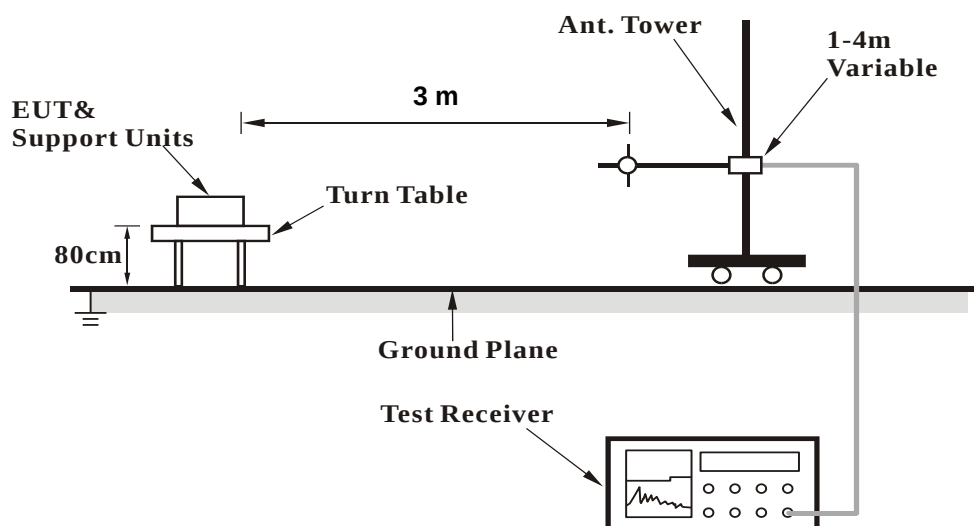
Conducted Power Measurement:

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

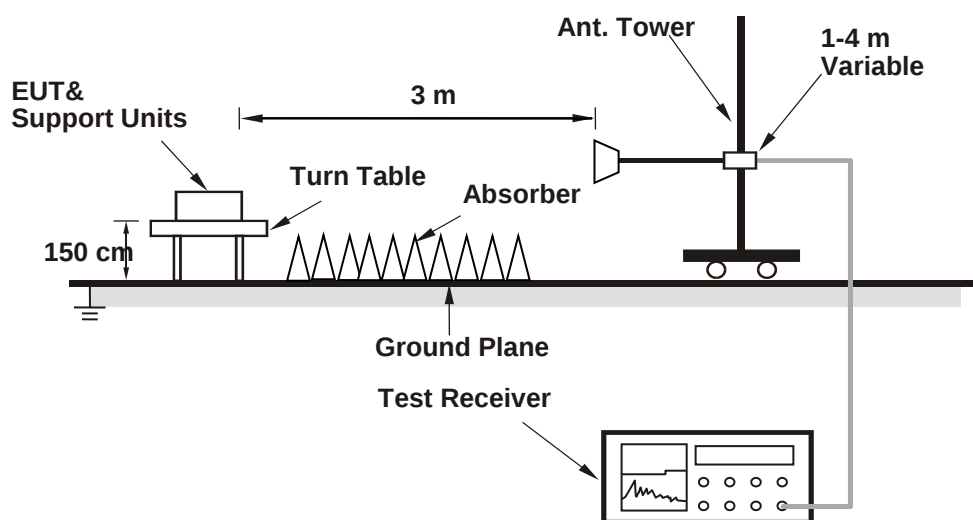
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

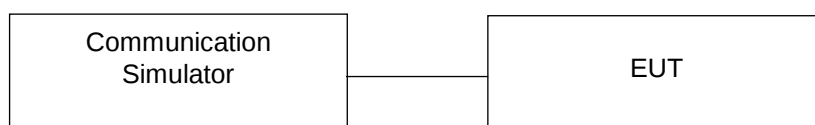


<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:



4.1.4 Test Results

ERP Power (dBm)

LTE Band 13							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
90°	23205	779.5	-8.30	32.771	22.32	170.65	H
	23230	782.0	-8.20	32.741	22.39	173.42	
	23255	784.5	-8.61	32.854	22.09	161.96	
	23205	779.5	-11.12	32.5	19.23	83.75	V
	23230	782.0	-11.04	32.52	19.33	85.70	
	23255	784.5	-11.50	32.62	18.97	78.89	
Channel Bandwidth: 5 MHz / 16QAM							
90°	23205	779.5	-9.31	32.771	21.31	135.24	H
	23230	782.0	-9.20	32.741	21.39	137.75	
	23255	784.5	-9.61	32.854	21.09	128.65	
	23205	779.5	-12.13	32.5	18.22	66.37	V
	23230	782.0	-12.05	32.52	18.32	67.92	
	23255	784.5	-12.50	32.62	17.97	62.66	

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

LTE Band 13							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
90°	23230	782.0	-7.94	32.737	22.65	183.95	H
	23230	782.0	-10.83	32.52	19.54	89.95	V
Channel Bandwidth: 10 MHz / 16QAM							
90°	23230	782.0	-8.94	32.737	21.65	146.12	H
	23230	782.0	-11.84	32.52	18.53	71.29	V

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

EIRP Power (dBm)

LTE Band 4							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
90°	19957	1710.7	-20.12	42.49	22.37	172.39	H
	20175	1732.5	-20.09	42.33	22.24	167.38	
	20393	1754.3	-20.16	42.10	21.94	156.31	
	19957	1710.7	-25.64	42.99	17.35	54.33	V
	20175	1732.5	-24.93	42.74	17.81	60.39	
	20393	1754.3	-24.51	42.21	17.70	58.88	
Channel Bandwidth: 1.4 MHz / 16QAM							
90°	19957	1710.7	-21.13	42.49	21.36	136.62	H
	20175	1732.5	-21.10	42.33	21.23	132.65	
	20393	1754.3	-21.16	42.10	20.94	124.17	
	19957	1710.7	-26.65	42.99	16.34	43.05	V
	20175	1732.5	-25.93	42.74	16.81	47.97	
	20393	1754.3	-25.52	42.21	16.69	46.67	

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

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
90°	19965	1711.5	-19.92	42.49	22.57	180.51	H
	20175	1732.5	-19.93	42.33	22.40	173.66	
	20385	1753.5	-20.00	42.10	22.10	162.18	
	19965	1711.5	-25.42	42.99	17.57	57.15	V
	20175	1732.5	-24.80	42.74	17.94	62.23	
	20385	1753.5	-24.34	42.21	17.87	61.24	
Channel Bandwidth: 3 MHz / 16QAM							
90°	19965	1711.5	-20.92	42.49	21.57	143.38	H
	20175	1732.5	-20.93	42.33	21.40	137.94	
	20385	1753.5	-21.01	42.10	21.09	128.53	
	19965	1711.5	-26.42	42.99	16.57	45.39	V
	20175	1732.5	-25.80	42.74	16.94	49.43	
	20385	1753.5	-25.35	42.21	16.86	48.53	

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

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
90°	19975	1712.5	-19.80	42.49	22.69	185.57	H
	20175	1732.5	-19.69	42.33	22.64	183.53	
	20375	1752.5	-19.83	42.10	22.27	168.66	
	19975	1712.5	-25.16	42.99	17.83	60.67	V
	20175	1732.5	-24.61	42.74	18.13	65.01	
	20375	1752.5	-24.20	42.21	18.01	63.24	
Channel Bandwidth: 5 MHz / 16QAM							
90°	19975	1712.5	-20.82	42.49	21.67	146.72	H
	20175	1732.5	-20.70	42.33	21.63	145.45	
	20375	1752.5	-20.84	42.10	21.26	133.66	
	19975	1712.5	-26.17	42.99	16.82	48.08	V
	20175	1732.5	-25.61	42.74	17.13	51.64	
	20375	1752.5	-25.20	42.21	17.01	50.23	

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

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
90°	20000	1715.0	-19.72	42.49	22.77	189.02	H
	20175	1732.5	-19.63	42.33	22.70	186.08	
	20350	1750.0	-19.71	42.10	22.39	173.38	
	20000	1715.0	-24.85	42.99	18.14	65.16	V
	20175	1732.5	-24.50	42.74	18.24	66.68	
	20350	1750.0	-24.11	42.21	18.10	64.57	
Channel Bandwidth: 10 MHz / 16QAM							
90°	20000	1715.0	-20.72	42.49	21.77	150.14	H
	20175	1732.5	-20.64	42.33	21.69	147.47	
	20350	1750.0	-20.72	42.10	21.38	137.40	
	20000	1715.0	-25.85	42.99	17.14	51.76	V
	20175	1732.5	-25.51	42.74	17.23	52.84	
	20350	1750.0	-25.12	42.21	17.09	51.17	

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

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
90°	20025	1717.5	-19.64	42.49	22.85	192.53	H
	20175	1732.5	-19.56	42.33	22.77	189.10	
	20325	1747.5	-19.54	42.10	22.56	180.30	
	20025	1717.5	-24.67	42.99	18.32	67.92	V
	20175	1732.5	-24.30	42.74	18.44	69.82	
	20325	1747.5	-23.94	42.21	18.27	67.14	
Channel Bandwidth: 15 MHz / 16QAM							
90°	20025	1717.5	-20.65	42.49	21.84	152.58	H
	20175	1732.5	-20.57	42.33	21.76	149.86	
	20325	1747.5	-20.55	42.10	21.55	142.89	
	20025	1717.5	-25.67	42.99	17.32	53.95	V
	20175	1732.5	-25.30	42.74	17.44	55.46	
	20325	1747.5	-24.94	42.21	17.27	53.33	

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

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
90°	20050	1720.0	-19.46	42.49	23.03	200.68	H
	20175	1732.5	-19.47	42.33	22.86	193.06	
	20300	1745.0	-19.36	42.10	22.74	187.93	
	20050	1720.0	-24.56	42.99	18.43	69.66	V
	20175	1732.5	-24.23	42.74	18.51	70.96	
	20300	1745.0	-23.89	42.21	18.32	67.92	
Channel Bandwidth: 20 MHz / 16QAM							
90°	20050	1720.0	-20.46	42.49	22.03	159.40	H
	20175	1732.5	-20.48	42.33	21.85	153.00	
	20300	1745.0	-20.37	42.10	21.73	148.94	
	20050	1720.0	-25.56	42.99	17.43	55.34	V
	20175	1732.5	-25.24	42.74	17.50	56.23	
	20300	1745.0	-24.89	42.21	17.32	53.95	

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

4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission Measurement

- a. The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB. The limit of emission is equal to -13 dBm.
- b. For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm.

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

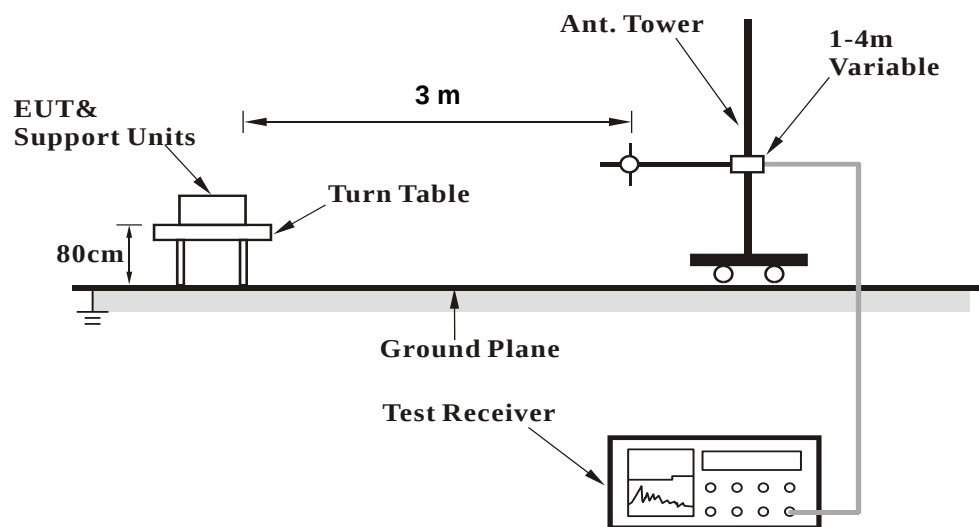
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.2.3 Deviation from Test Standard

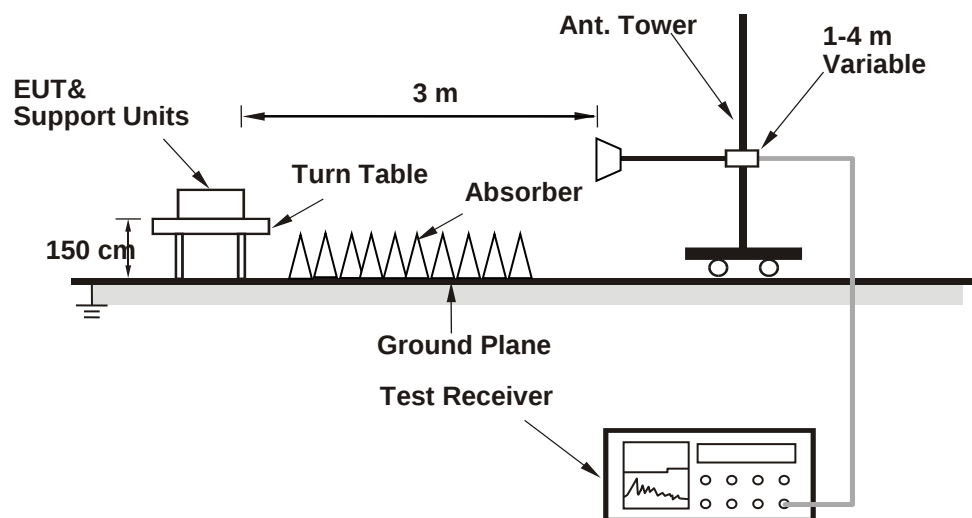
No deviation.

4.2.4 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).

4.2.5 Test Results

LTE Band 4

Channel Bandwidth: 1.4 MHz / QPSK

Low Channel

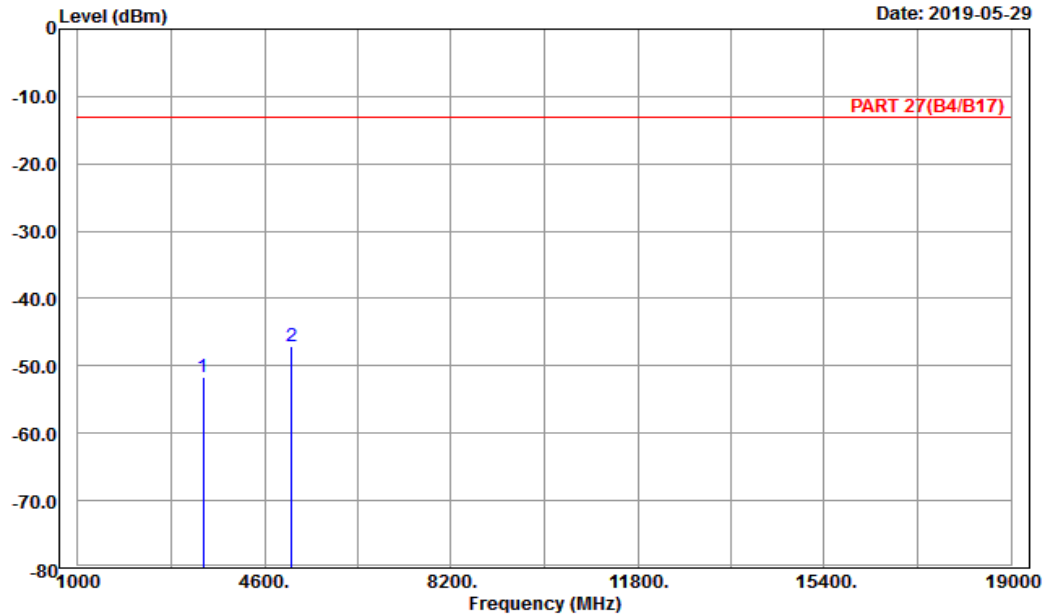


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2019-05-29



Site : 966 chamber 1

Condition: PART 27(B4/B17) Horizontal

Remark : LTE_Band 4_Link_CH19957

Tested by: Karl Lee

	Freq	Level	Read	Limit	Over	
	MHz	dBm	Level	Line	Limit	Remark
			dBm	dB	dB	
1	3421.40	-51.72	-66.09	14.37	-13.00	-38.72 Peak
2 pp	5132.10	-47.01	-66.82	19.81	-13.00	-34.01 Peak

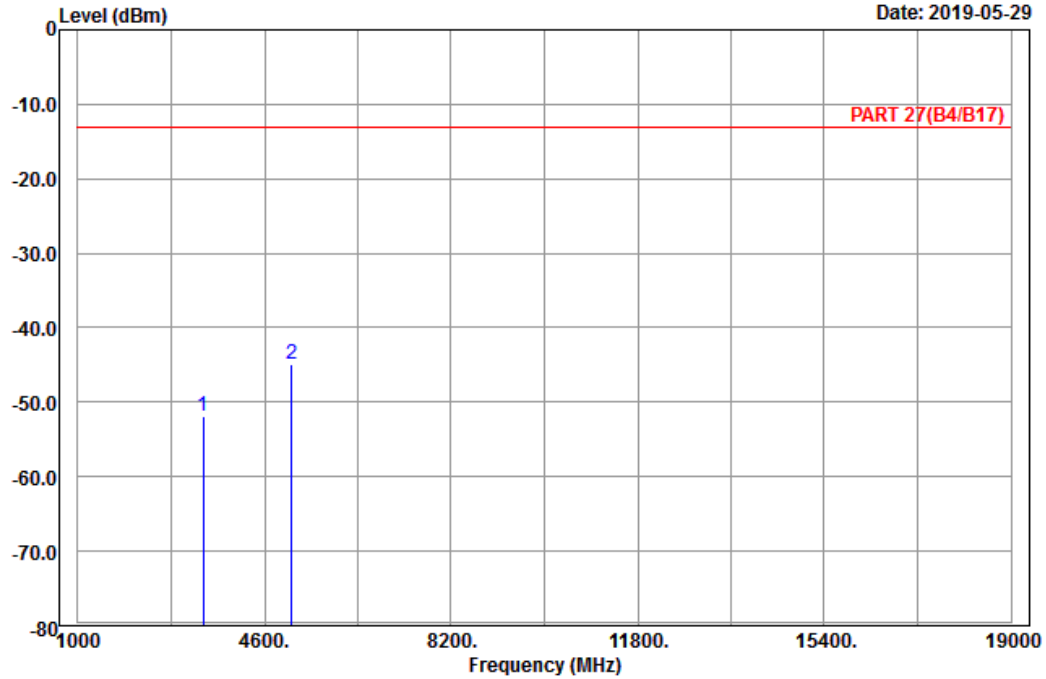


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH19957
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3421.40	-51.96	-66.33	14.37	-13.00	-38.96	Peak
2 pp	5132.10	-44.80	-64.61	19.81	-13.00	-31.80	Peak

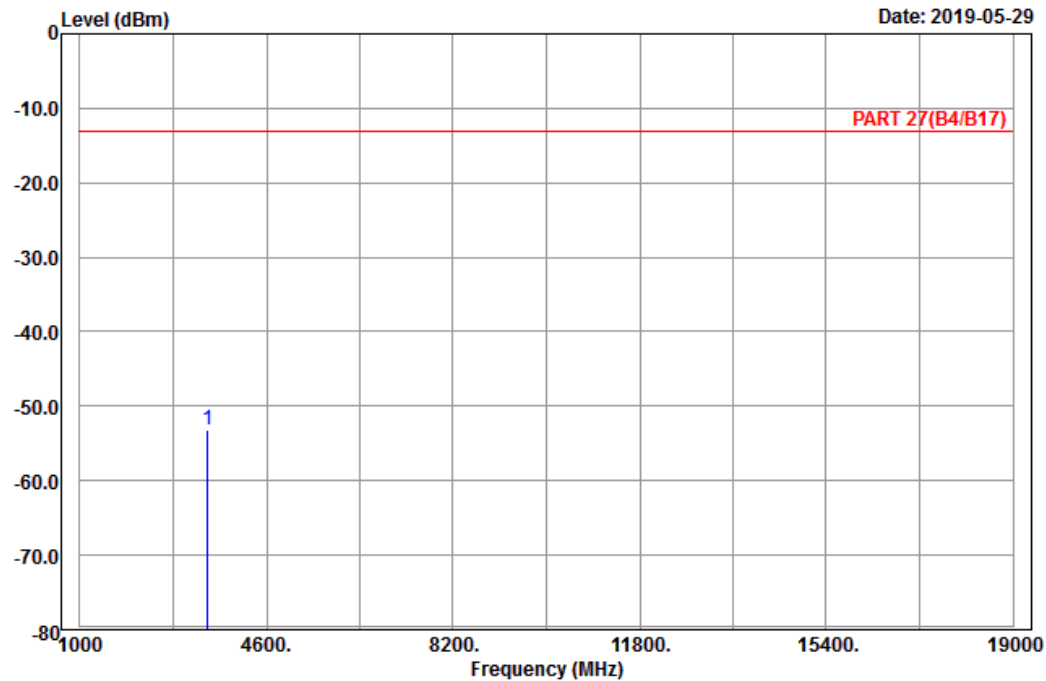
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 chamber 1
 Condition: PART 27(B4/B17) Horizontal
 Remark : LTE_Band 4_Link_CH20175
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3465.00	-53.15	-67.49	14.34	-13.00	-40.15	Peak

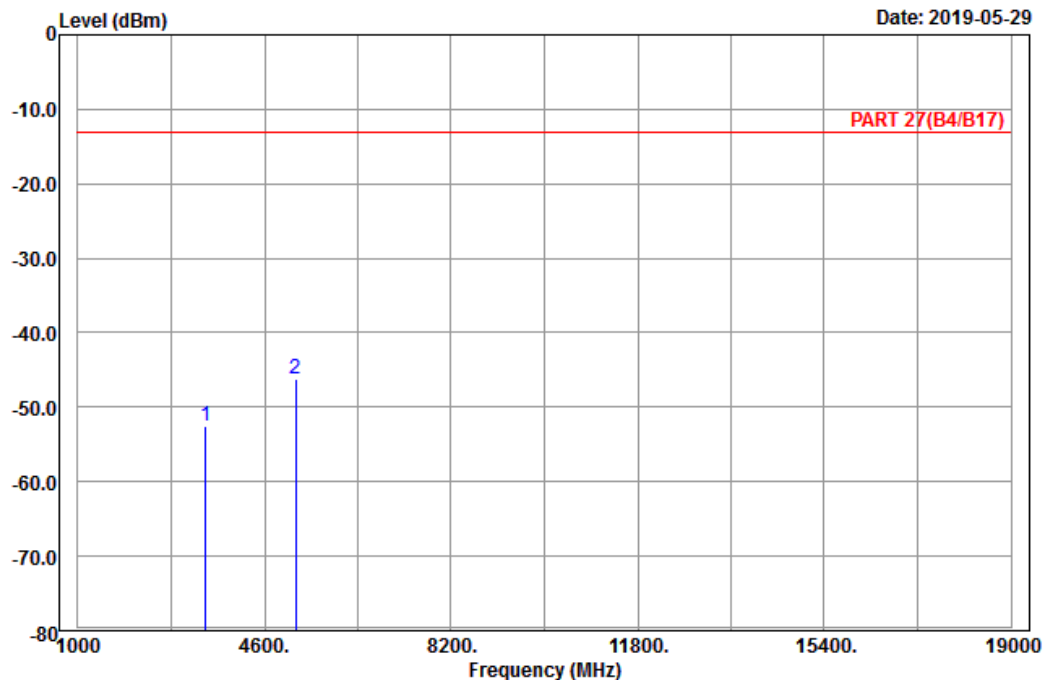


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20175
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3465.00	-52.58	-66.92	14.34	-13.00	-39.58	Peak
2 pp	5197.50	-46.32	-66.44	20.12	-13.00	-33.32	Peak

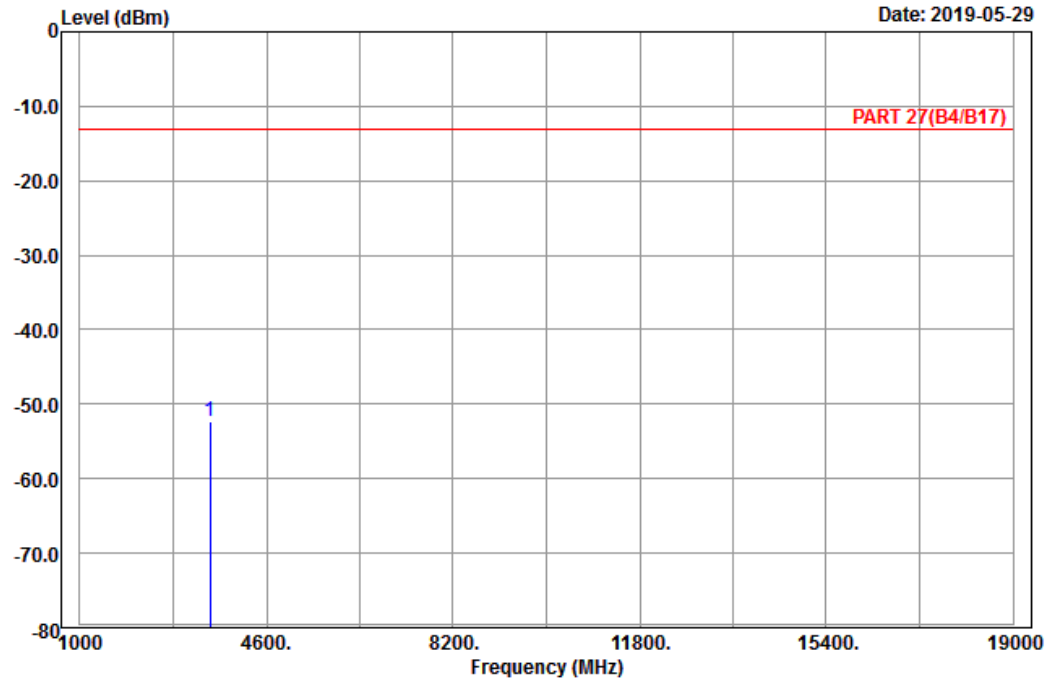
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 chamber 1
 Condition: PART 27(B4/B17) Horizontal
 Remark : LTE_Band 4_Link_CH20393
 Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3508.60	-52.24	-66.52	14.28	-13.00	-39.24	Peak

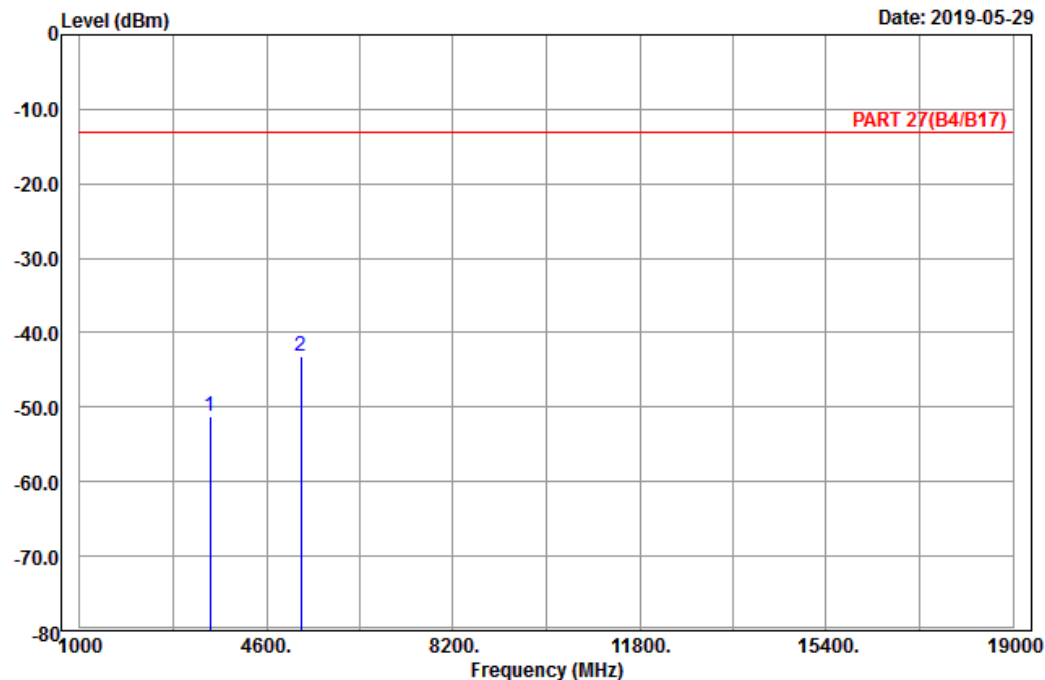


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20393
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3508.60	-51.32	-65.60	14.28	-13.00	-38.32	Peak
2 pp	5262.90	-43.06	-63.26	20.20	-13.00	-30.06	Peak

Channel Bandwidth: 5 MHz / QPSK

Low Channel

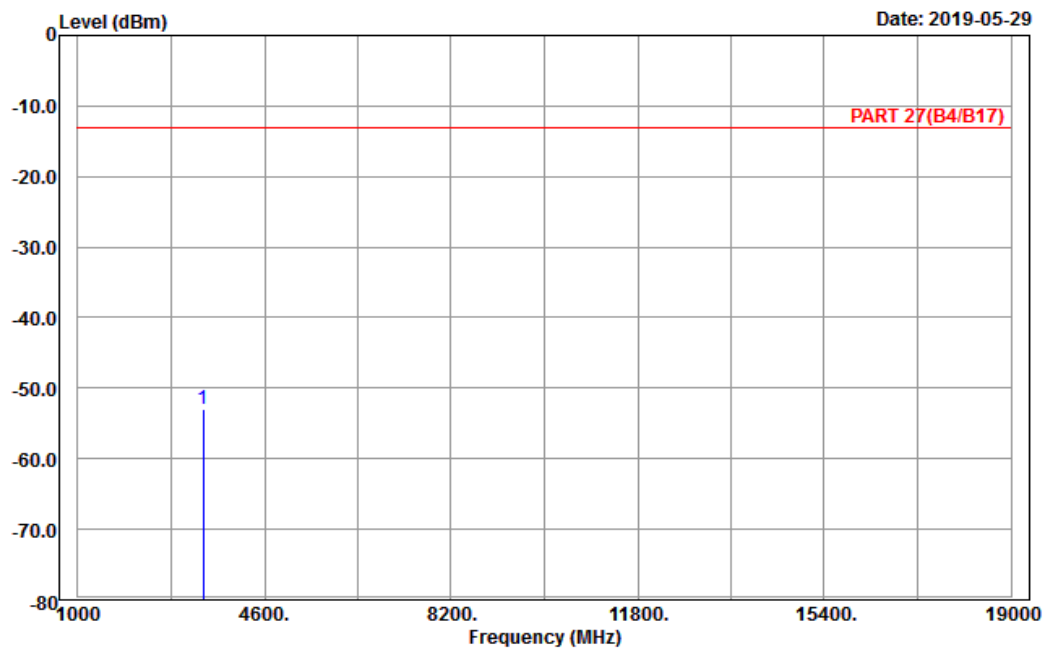


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2019-05-29



Site : 966 chamber 1

Condition: PART 27(B4/B17) Horizontal

Remark : LTE_Band 4_Link_CH19975

Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	3425.00	-52.98	-67.35	14.37	-13.00	-39.98	Peak

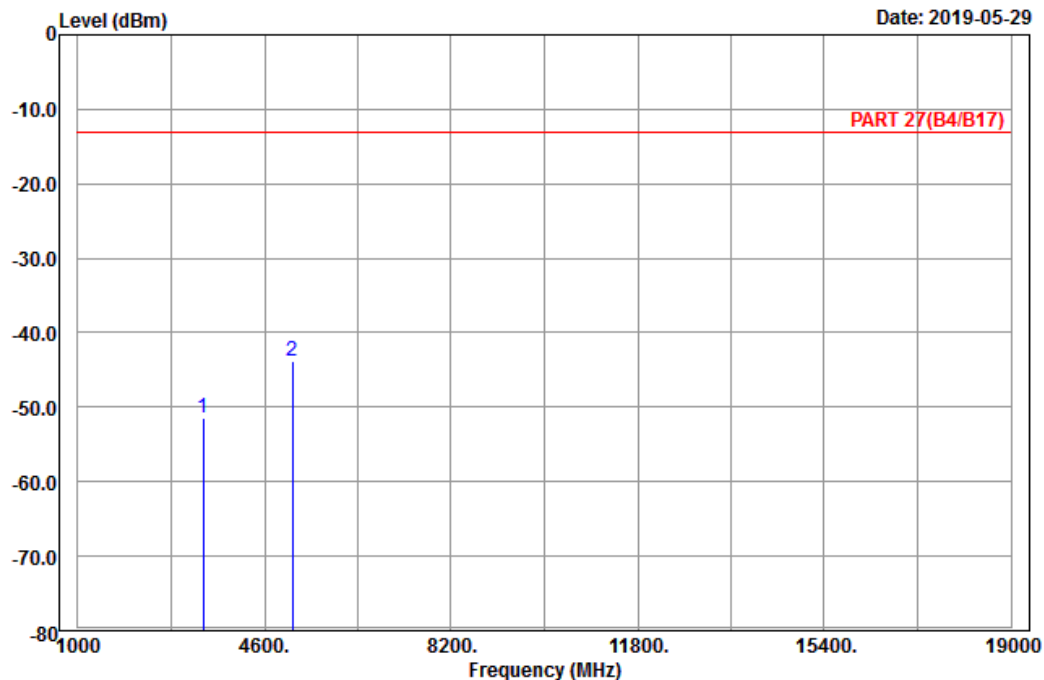


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH19975
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3425.00	-51.43	-65.80	14.37	-13.00	-38.43	Peak
2 pp	5137.50	-43.78	-63.59	19.81	-13.00	-30.78	Peak

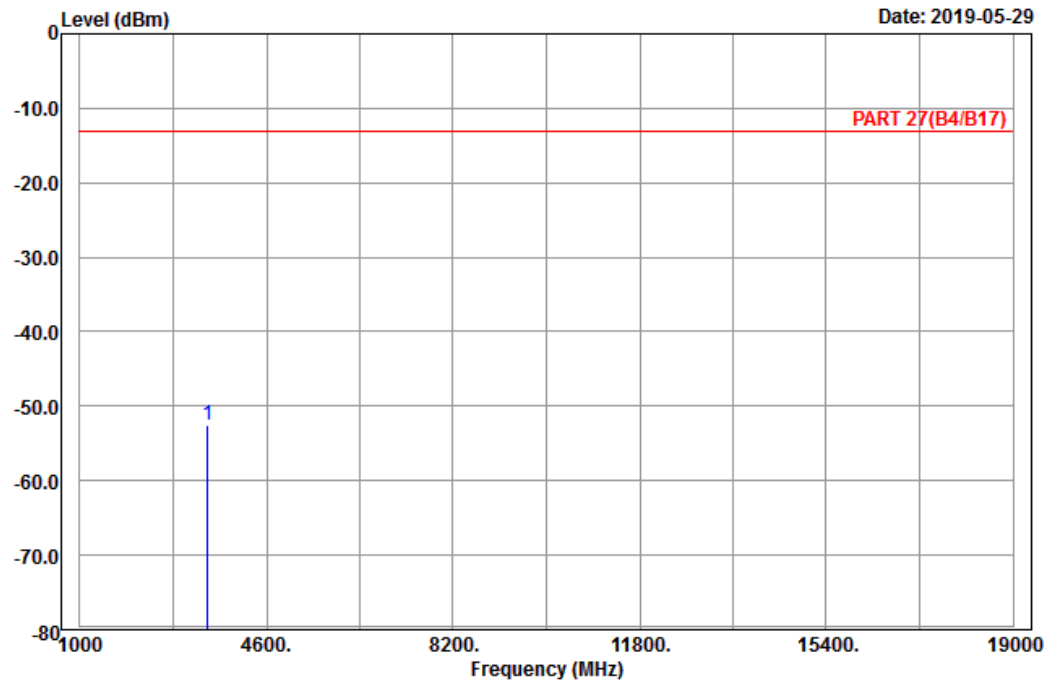
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 chamber 1
 Condition: PART 27(B4/B17) Horizontal
 Remark : LTE_Band 4_Link_CH20175
 Tested by: Karl Lee

		Read	Limit	Over	
Freq	Level	Level	Factor	Line	Limit Remark
MHz	dBm	dBm	dB	dBm	dB
1 pp 3465.00	-52.63	-66.97	14.34	-13.00	-39.63 Peak

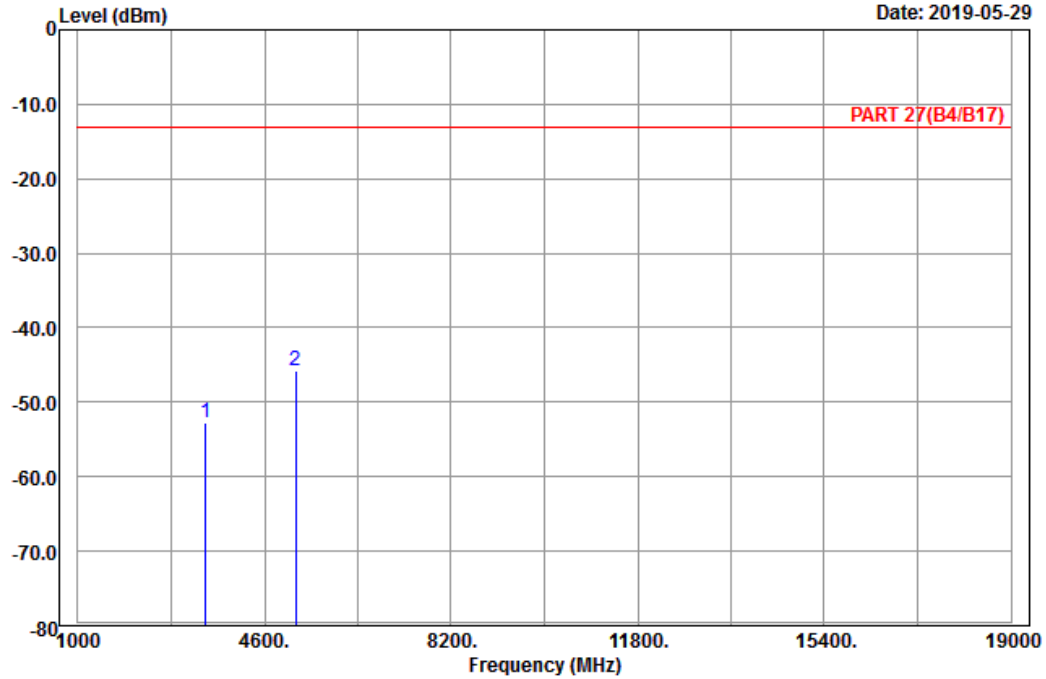


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20175
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3465.00	-52.86	-67.20	14.34	-13.00	-39.86	Peak
2 pp	5197.50	-45.74	-65.86	20.12	-13.00	-32.74	Peak

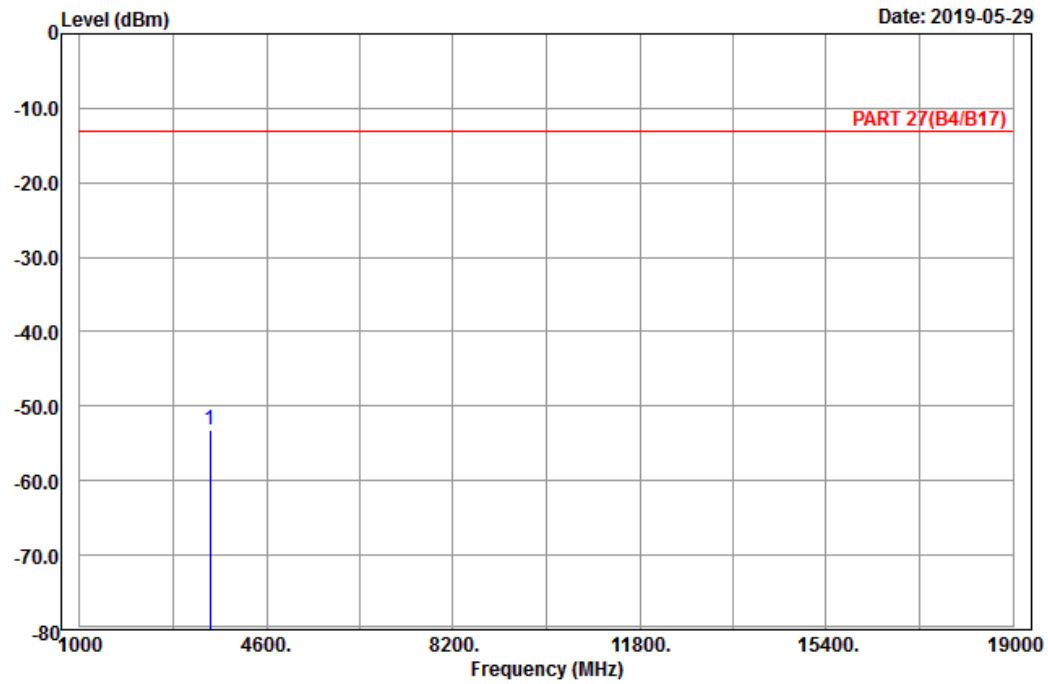
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 chamber 1
 Condition: PART 27(B4/B17) Horizontal
 Remark : LTE_Band 4_Link_CH20375
 Tested by: Karl Lee

		Read		Limit	Over	
Freq	Level	Level	Factor	Line	Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3505.00	-53.12	-67.40	14.28	-13.00	-40.12	Peak

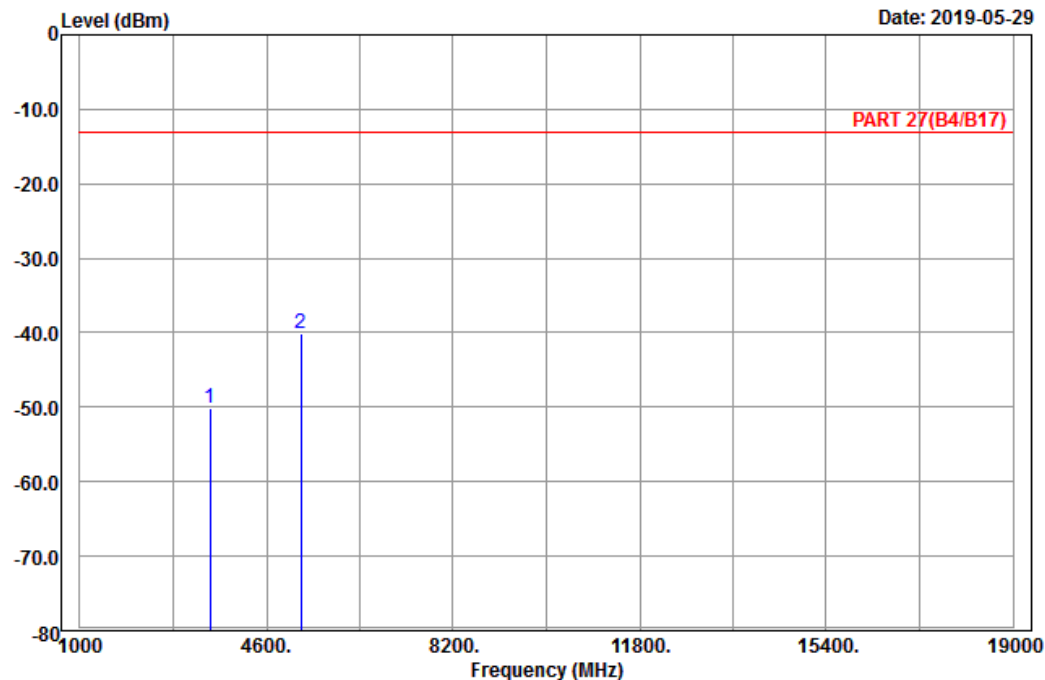


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20375
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3505.00	-50.24	-64.52	14.28	-13.00	-37.24	Peak
2 pp	5257.50	-40.12	-60.32	20.20	-13.00	-27.12	Peak

Channel Bandwidth: 20 MHz / QPSK

Low Channel

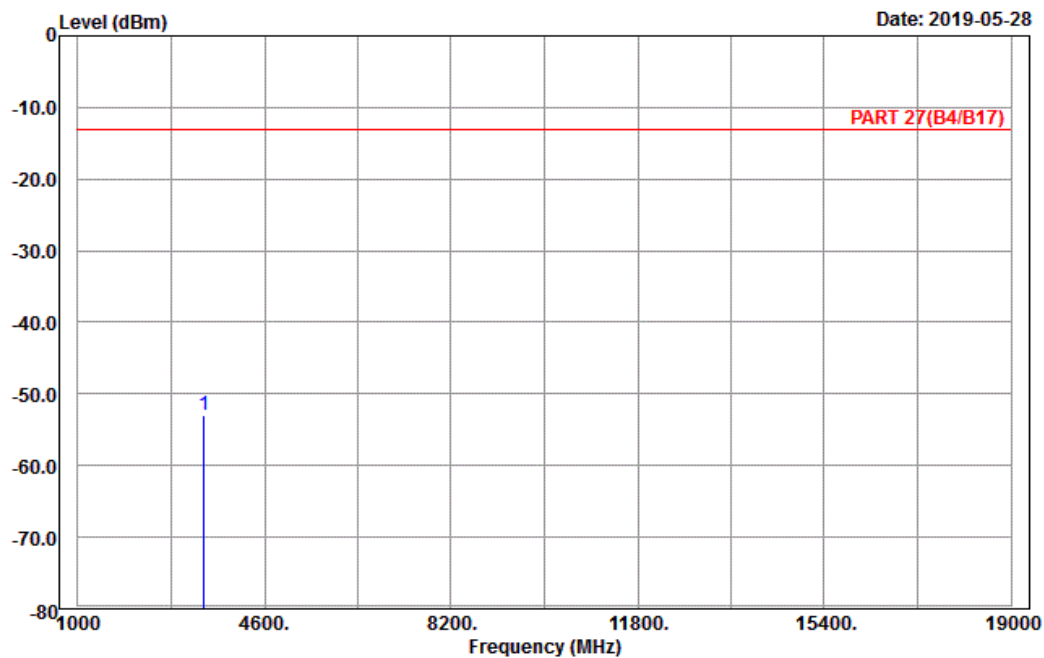


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2019-05-28



Site : 966 chamber 1

Condition: PART 27(B4/B17) Horizontal

Remark : LTE_Band 4_Link_CH20050

Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	

1	pp	3440.00	-52.90	-67.25	14.35	-13.00	-39.90	Peak
---	----	---------	--------	--------	-------	--------	--------	------

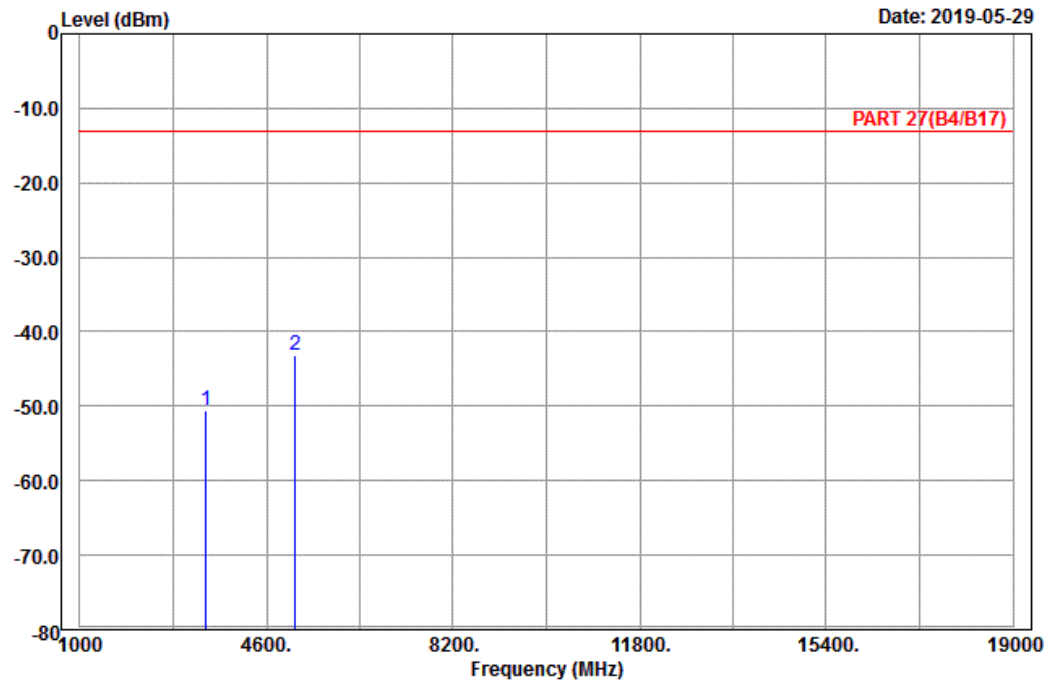


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20050
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3440.00	-50.58	-64.93	14.35	-13.00	-37.58	Peak
2 pp	5160.00	-43.13	-63.05	19.92	-13.00	-30.13	Peak

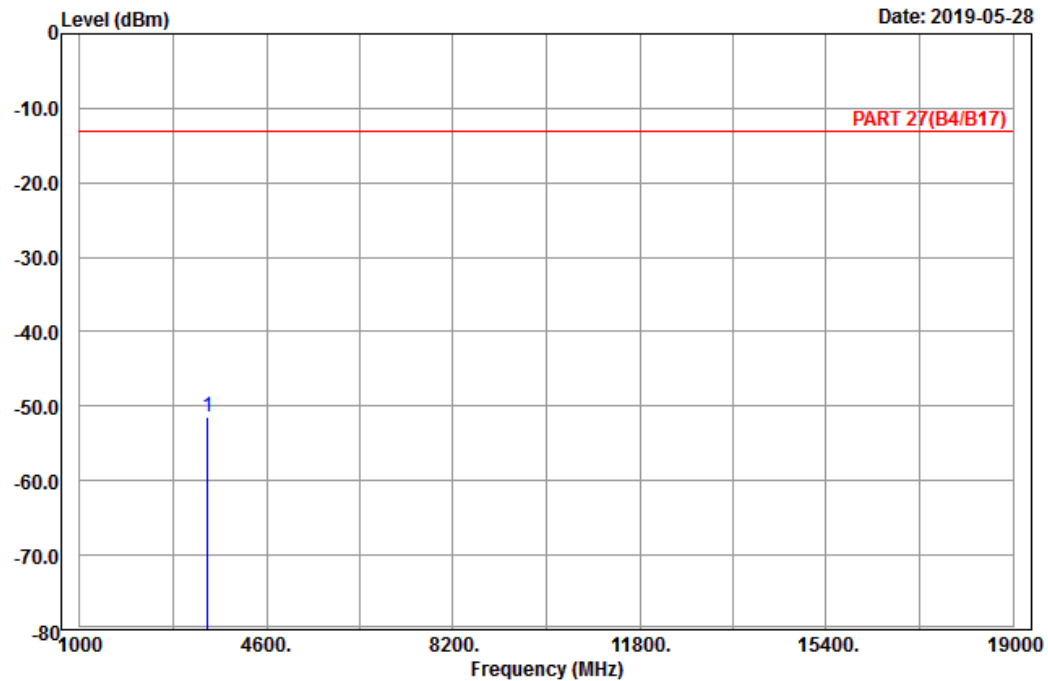
Middle Channel



Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_CH20175
Tested by: Karl Lee

Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
MHz	dBm	dBm	dB	dBm	dB	
1 pp 3465.00	-51.49	-65.83	14.34	-13.00	-38.49	Peak

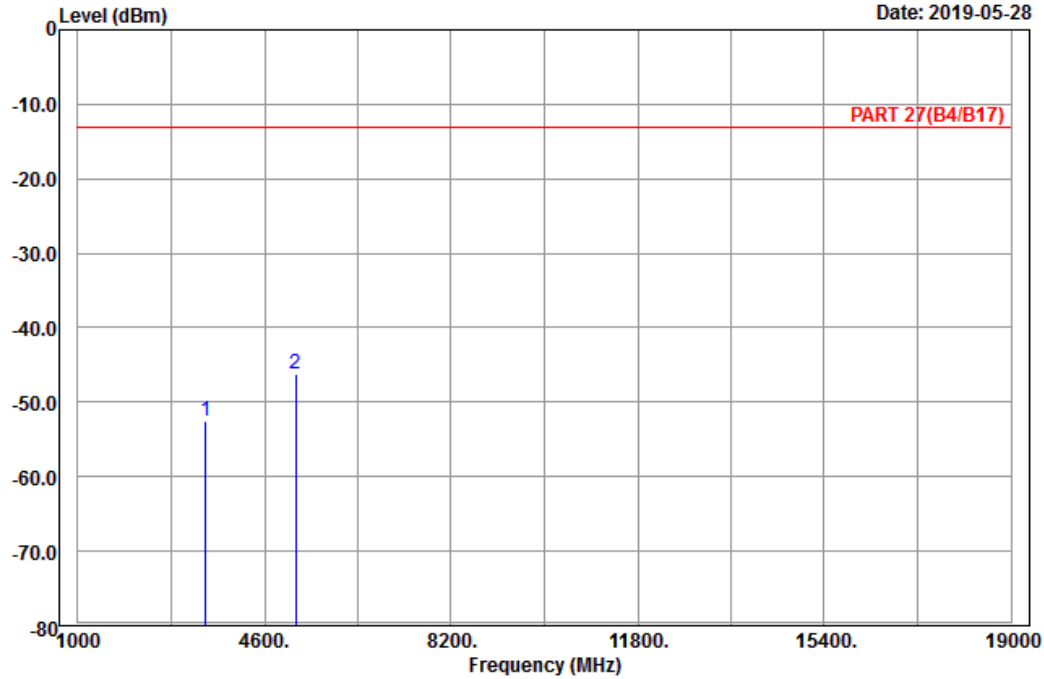


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-05-28



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20175
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	3465.00	-52.61	-66.95	14.34	-13.00	-39.61	Peak
2 pp	5197.50	-46.23	-66.35	20.12	-13.00	-33.23	Peak

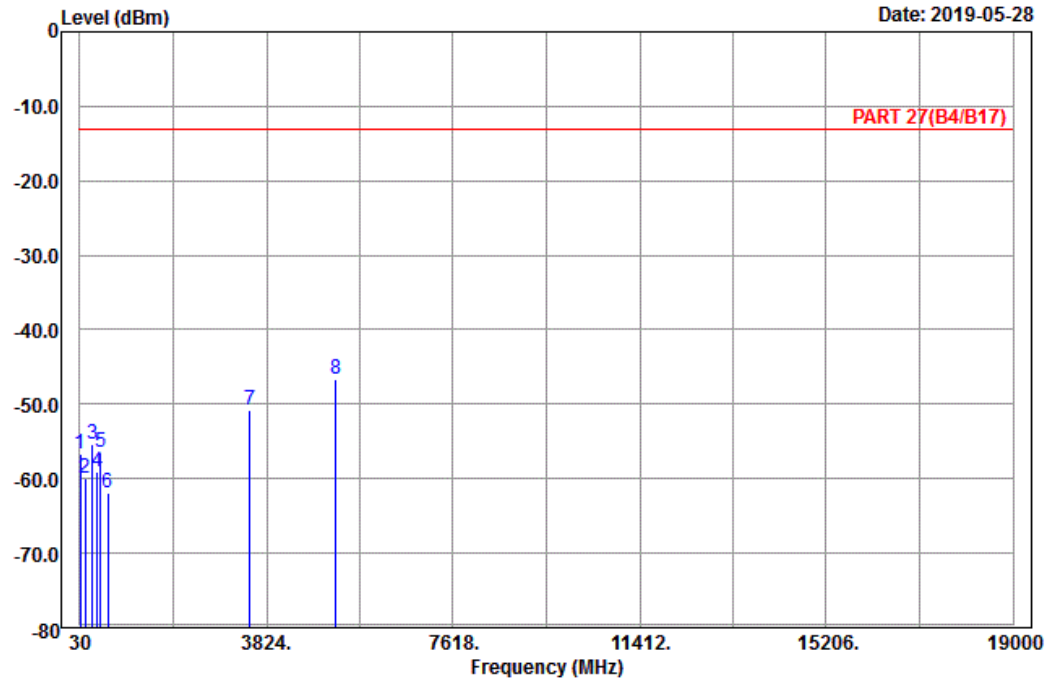
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 13



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_CH20300
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	31.08	-56.60	-45.95	-10.65	-13.00	-43.60	Peak
2	138.27	-59.92	-52.23	-7.69	-13.00	-46.92	Peak
3	280.02	-55.38	-49.60	-5.78	-13.00	-42.38	Peak
4	384.00	-59.16	-55.59	-3.57	-13.00	-46.16	Peak
5	454.00	-56.52	-52.56	-3.96	-13.00	-43.52	Peak
6	598.20	-61.88	-62.23	0.35	-13.00	-48.88	Peak
7	3490.00	-50.82	-65.13	14.31	-13.00	-37.82	Peak
8 pp	5235.00	-46.71	-66.87	20.16	-13.00	-33.71	Peak

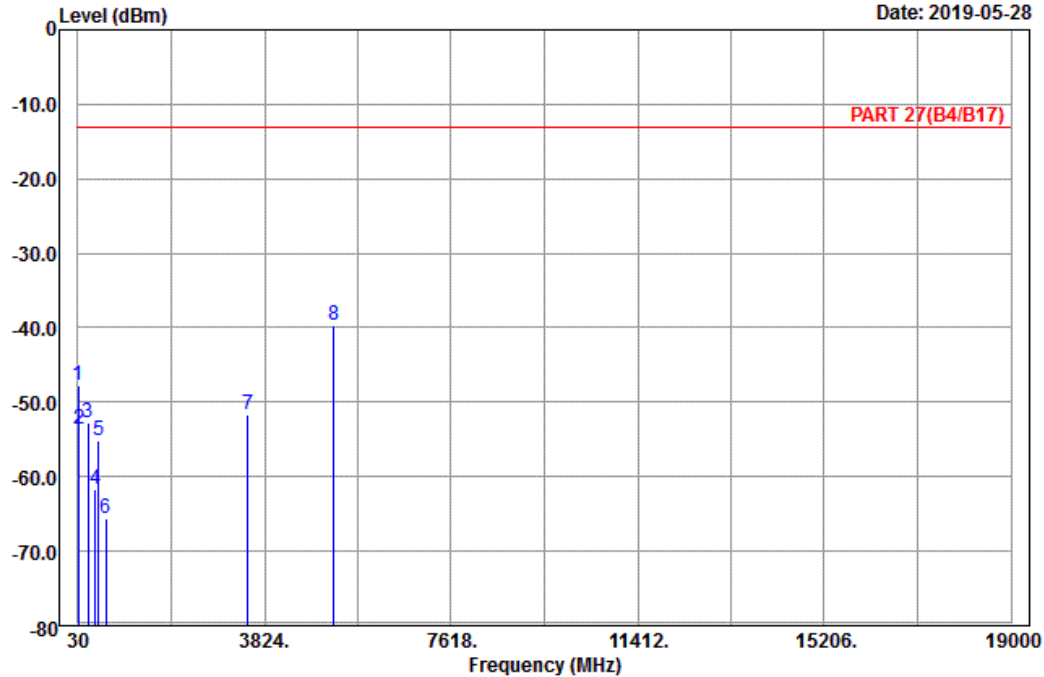


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 14

Date: 2019-05-28



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_CH20300
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	33.51	-47.74	-36.76	-10.98	-13.00	-34.74	Peak
2	48.90	-53.59	-40.16	-13.43	-13.00	-40.59	Peak
3	229.53	-52.65	-46.87	-5.78	-13.00	-39.65	Peak
4	385.40	-61.69	-58.17	-3.52	-13.00	-48.69	Peak
5	442.80	-55.23	-51.53	-3.70	-13.00	-42.23	Peak
6	603.80	-65.59	-65.97	0.38	-13.00	-52.59	Peak
7	3490.00	-51.67	-65.98	14.31	-13.00	-38.67	Peak
8 pp	5235.00	-39.63	-59.79	20.16	-13.00	-26.63	Peak

LTE Band 13
Channel Bandwidth: 5 MHz / QPSK
Low Channel

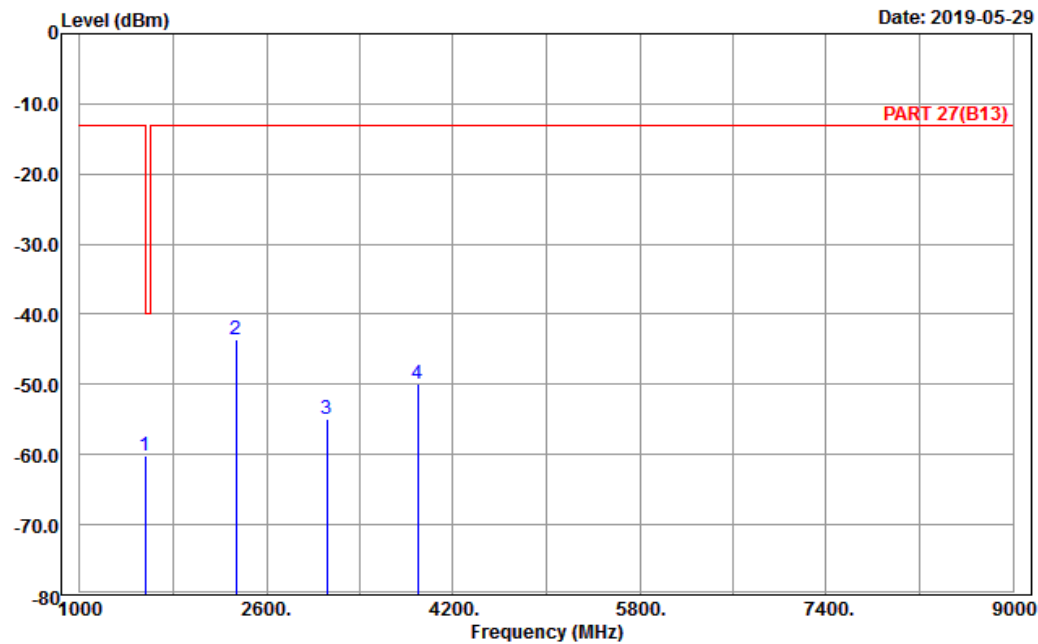


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B13) Horizontal
Remark : LTE_Band 13_Link_CH23205
Tested by: Karl Lee

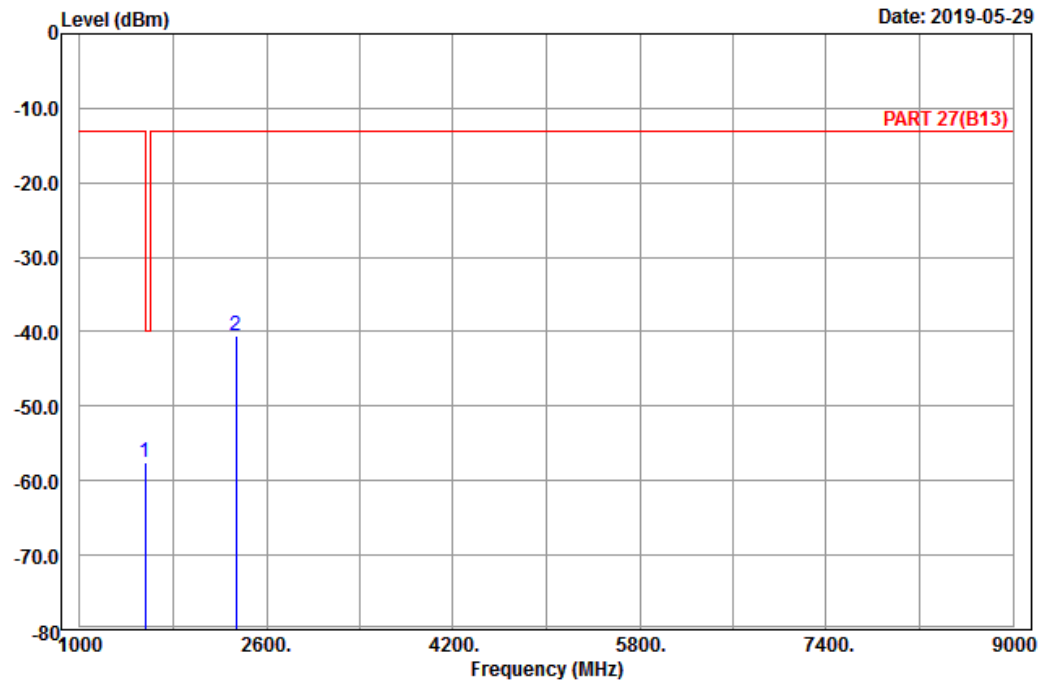
	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1559.00	-60.24	-67.10	6.86	-40.00	-20.24	Peak
2	2338.50	-43.63	-54.59	10.96	-13.00	-30.63	Peak
3	3118.00	-55.00	-68.52	13.52	-13.00	-42.00	Peak
4	3897.50	-49.91	-66.76	16.85	-13.00	-36.91	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6



Site : 966 chamber 1
 Condition: PART 27(B13) Vertical
 Remark : LTE_Band 13_Link_CH23205
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1559.00	-57.57	-64.43	6.86	-40.00	-17.57	Peak
2	2338.50	-40.65	-51.61	10.96	-13.00	-27.65	Peak

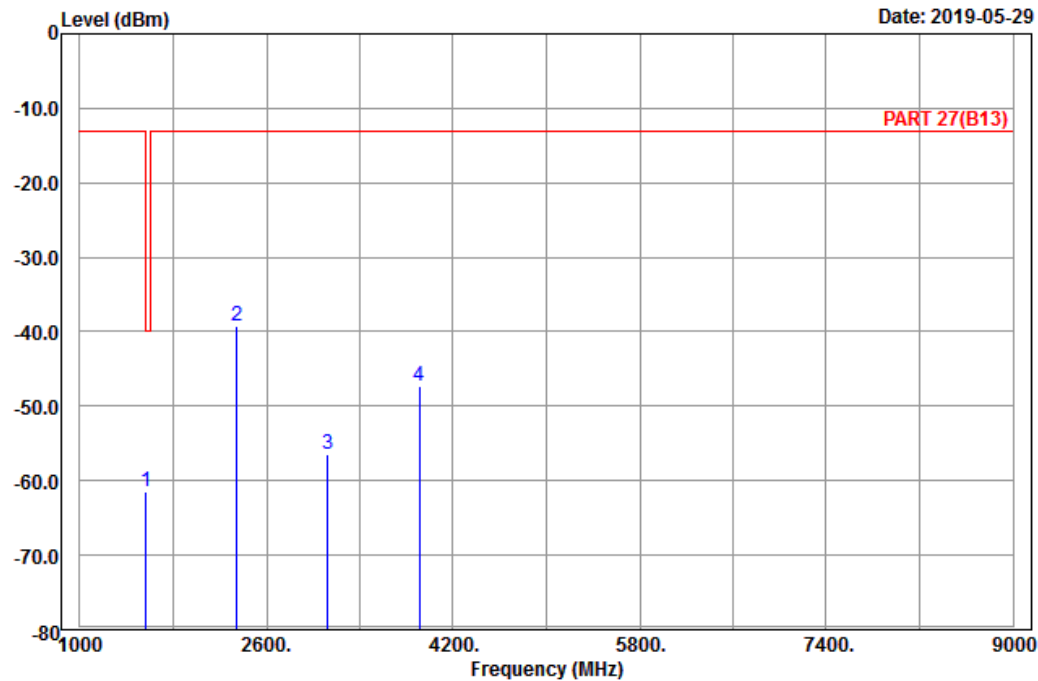
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1
 Condition: PART 27(B13) Horizontal
 Remark : LTE_Band 13_Link_CH23230
 Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1564.00	-61.46	-68.32	6.86	-40.00	-21.46	Peak
2	2346.00	-39.32	-50.26	10.94	-13.00	-26.32	Peak
3	3128.00	-56.52	-70.04	13.52	-13.00	-43.52	Peak
4	3910.00	-47.27	-64.21	16.94	-13.00	-34.27	Peak

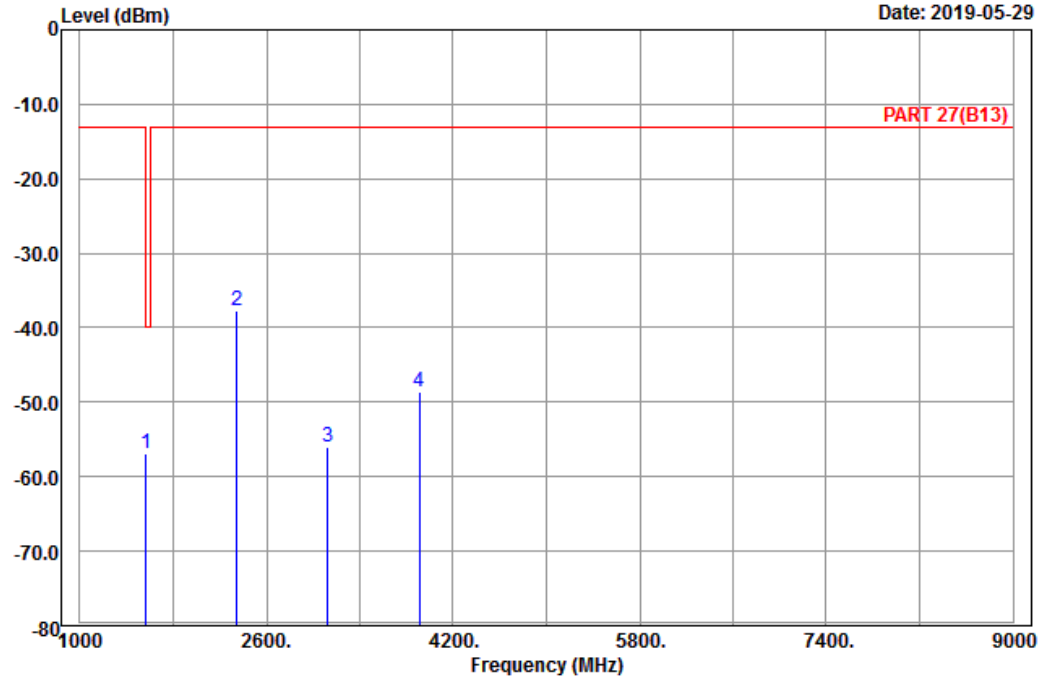


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B13) Vertical
Remark : LTE_Band 13_Link_CH23230
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1564.00	-56.92	-63.78	6.86	-40.00	-16.92	Peak
2	2346.00	-37.78	-48.72	10.94	-13.00	-24.78	Peak
3	3128.00	-56.08	-69.60	13.52	-13.00	-43.08	Peak
4	3910.00	-48.69	-65.63	16.94	-13.00	-35.69	Peak

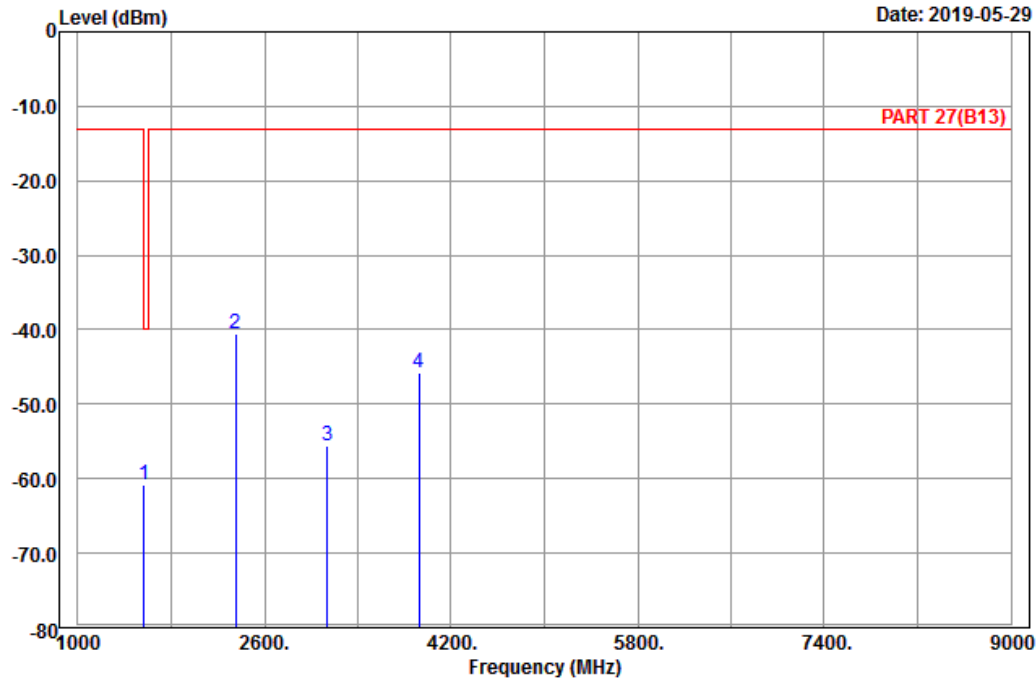
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1
Condition: PART 27(B13) Horizontal
Remark : LTE_Band 13_Link_CH23255
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1569.00	-60.76	-67.80	7.04	-40.00	-20.76	Peak
2	2353.50	-40.54	-51.48	10.94	-13.00	-27.54	Peak
3	3138.00	-55.52	-69.12	13.60	-13.00	-42.52	Peak
4	3922.50	-45.83	-62.77	16.94	-13.00	-32.83	Peak

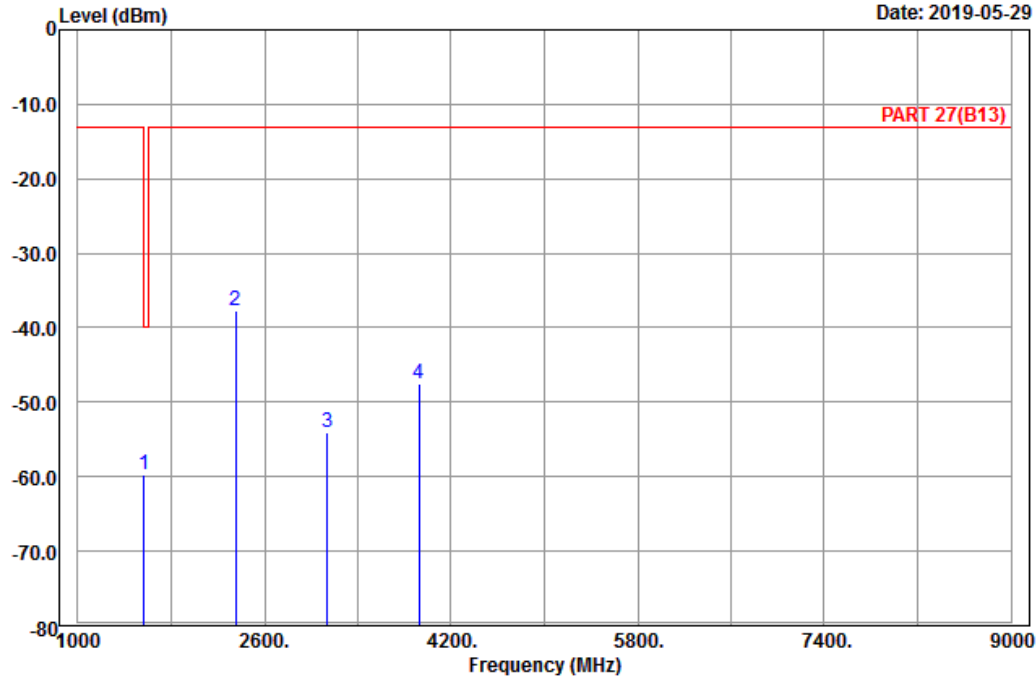


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B13) Vertical
Remark : LTE_Band 13_Link_CH23255
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1 pp	1569.00	-59.66	-66.70	7.04	-40.00	-19.66	Peak
2	2353.50	-37.71	-48.65	10.94	-13.00	-24.71	Peak
3	3138.00	-54.15	-67.75	13.60	-13.00	-41.15	Peak
4	3922.50	-47.61	-64.55	16.94	-13.00	-34.61	Peak

Channel Bandwidth: 10 MHz / QPSK
Middle Channel

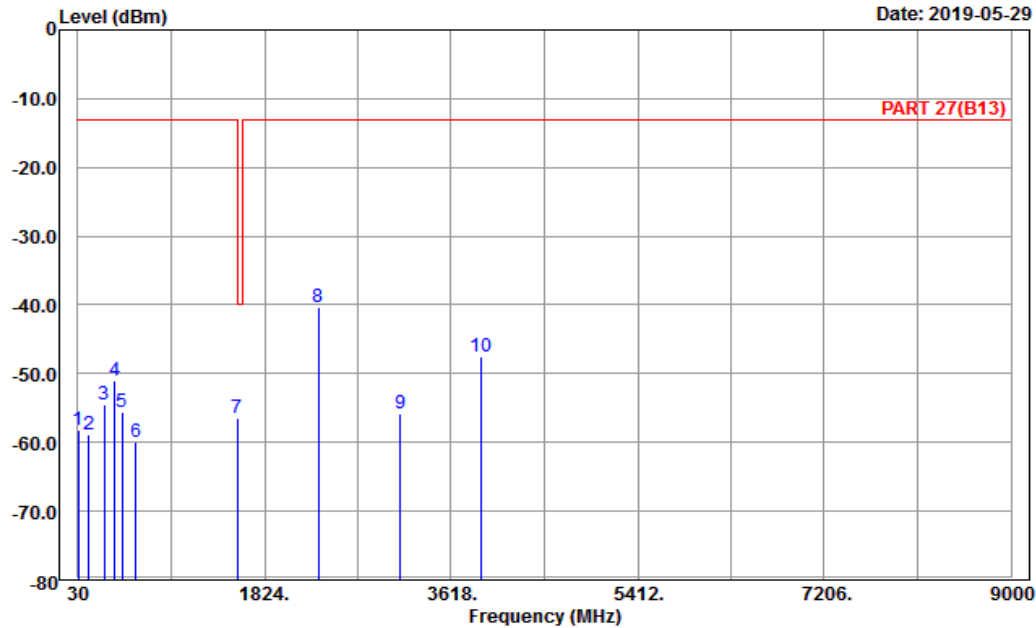


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B13) Horizontal
Remark : LTE_Band 13_Link_CH23230
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	32.16	-58.18	-47.42	-10.76	-13.00	-45.18	Peak
2	134.76	-58.87	-51.20	-7.67	-13.00	-45.87	Peak
3	279.75	-54.56	-48.79	-5.77	-13.00	-41.56	Peak
4	388.20	-51.11	-47.75	-3.36	-13.00	-38.11	Peak
5	451.90	-55.56	-51.66	-3.90	-13.00	-42.56	Peak
6	589.80	-59.97	-59.96	-0.01	-13.00	-46.97	Peak
7 pp	1564.00	-56.35	-63.21	6.86	-40.00	-16.35	Peak
8	2346.00	-40.33	-51.27	10.94	-13.00	-27.33	Peak
9	3128.00	-55.86	-69.38	13.52	-13.00	-42.86	Peak
10	3910.00	-47.62	-64.56	16.94	-13.00	-34.62	Peak

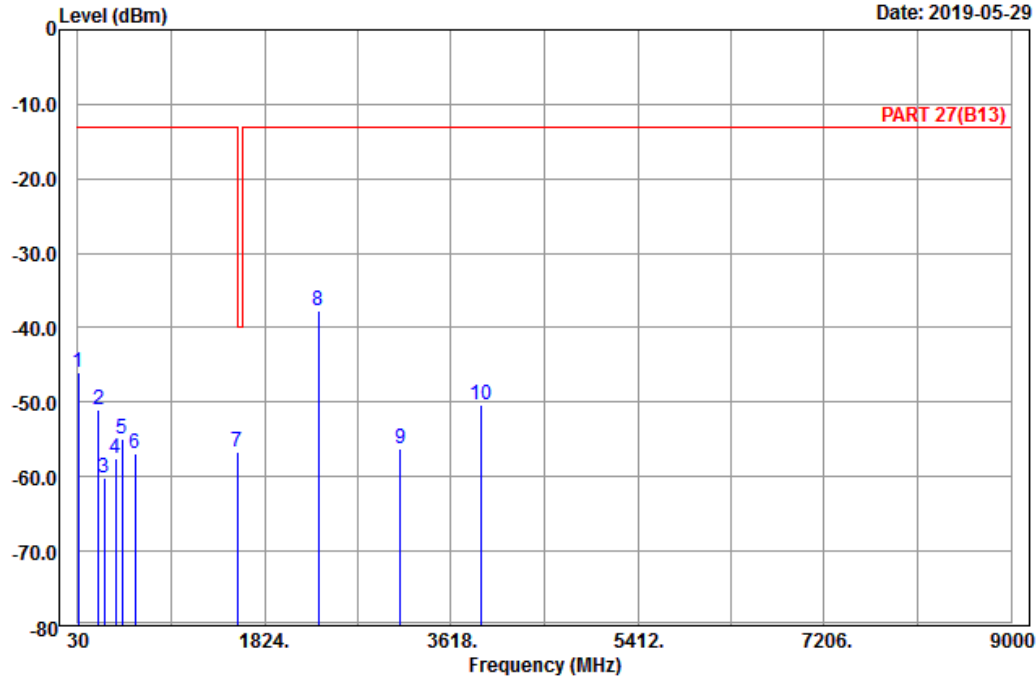


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 10

Date: 2019-05-29



Site : 966 chamber 1
Condition: PART 27(B13) Vertical
Remark : LTE_Band 13_Link_CH23230
Tested by: Karl Lee

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBm	dBm	dB	dBm	dB	
1	32.70	-45.92	-35.05	-10.87	-13.00	-32.92	Peak
2	228.72	-51.01	-45.22	-5.79	-13.00	-38.01	Peak
3	280.83	-60.12	-54.33	-5.79	-13.00	-47.12	Peak
4	395.20	-57.50	-54.50	-3.00	-13.00	-44.50	Peak
5	451.90	-54.88	-50.98	-3.90	-13.00	-41.88	Peak
6	580.70	-56.94	-56.56	-0.38	-13.00	-43.94	Peak
7 pp	1564.00	-56.74	-63.60	6.86	-40.00	-16.74	Peak
8	2346.00	-37.74	-48.68	10.94	-13.00	-24.74	Peak
9	3128.00	-56.24	-69.76	13.52	-13.00	-43.24	Peak
10	3910.00	-50.25	-67.19	16.94	-13.00	-37.25	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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