

Variant FCC Test Report

(PART 22)

Report No.: RF180802C04A

FCC ID: WIYT910

Test Model: LE910-NA1

Received Date: Mar. 19, 2019

Test Date: Apr. 10, 2019

Issued Date: May 13, 2019

Applicant: CASTLES TECHNOLOGY CO., LTD.

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

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

FCC Registration /
Designation Number: 427177 / TW0011



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Release Control Record

Issue No.	Description	Date Issued
RF180802C04A	Original Release	May 13, 2019

1 Certificate of Conformity

Product: LTE module

Brand: Telit

Test Model: LE910-NA1

Sample Status: Identical Prototype

Applicant: CASTLES TECHNOLOGY CO., LTD.

Test Date: Apr. 10, 2019

Standards: FCC Part 22, Subpart H

This report is issued as a supplementary report to BV CPS report no.: RF180802C04. This report shall be used by combining with its original report.

Prepared by : Gina Liu, **Date:** May 13, 2019
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** May 13, 2019
Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	N/A	Refer to Note
2.1046 22.913 (d)	Peak to Average Ratio	N/A	Refer to Note
2.1055 22.355	Frequency Stability	N/A	Refer to Note
2.1049	Occupied Bandwidth	N/A	Refer to Note
22.917	Band Edge Measurements	N/A	Refer to Note
2.1051 22.917	Conducted Spurious Emissions	N/A	Refer to Note
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -28.53 dB at 132.33 MHz.

Note:

1. Only ERP and radiated spurious emissions tests had been performed for this addendum. Refer to original report for other test data.
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	Expended 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	MY51210203	Mar. 18, 2019	Mar. 17, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSV40	100980	Apr. 17, 2018	Apr. 16, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019
MXG Vector signal generator	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(RF C-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(RF C-SMS-100-SMS-24)	Jun. 19, 2018	Jun. 18, 2019
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Communications Tester-Wireless Agilent	8960 Series 10	MY53201073	Jun. 28, 2017	Jun. 27, 2019
Radio Communication Analyzer Anritsu	MT8820C	6201010284	Dec. 22, 2018	Dec. 21, 2019
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 05, 2018	Sep. 04, 2019
DC Power Supply Topward	33010D	807748	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 29, 2018	Jun. 28, 2019

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HsinTien Chamber 1.
 3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.

3 General Information

3.1 General Description of EUT

Product	LTE module	
Brand	Telit	
Test Model	LE910-NA1	
Status of EUT	Identical Prototype	
Power Supply Rating	5.0 Vdc (adapter or host equipment) 3.7 Vdc (battery)	
Modulation Type	WCDMA	QPSK
	LTE	QPSK, 16QAM
Max. ERP Power	WCDMA	140.99 mW
	LTE 5 (Channel Bandwidth: 10 MHz)	121.06 mW
Frequency Range	WCDMA	826.4 ~ 846.6 MHz
	LTE 5 (Channel Bandwidth: 1.4 MHz)	824.7 ~ 848.3 MHz
	LTE 5 (Channel Bandwidth: 3 MHz)	825.5 ~ 847.5 MHz
	LTE 5 (Channel Bandwidth: 5 MHz)	826.5 ~ 846.5 MHz
	LTE 5 (Channel Bandwidth: 10 MHz)	829 ~ 844 MHz
Antenna Type	Dipole Antenna with 0.37 dBi gain	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

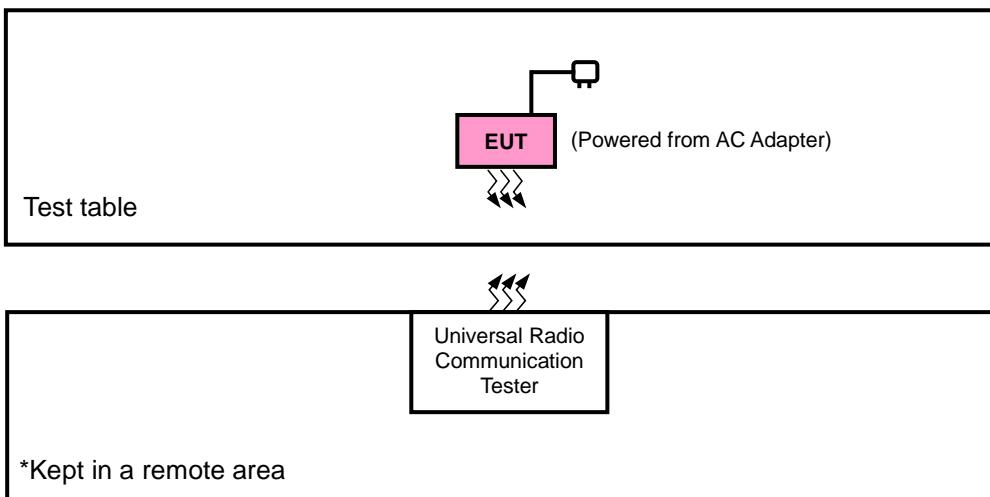
1. This report is issued as a supplementary report to BV CPS report no. RF180802C04. The difference compared with original report is changing antenna. Therefore, only ERP and radiated spurious emissions tests worst case test had been performed for this report.
2. The EUT was installed in POS Terminal (Brand: CASTLES TECHNOLOGY, Model: VEGA3000).
3. The EUT contains following accessory devices.

Product	Brand	Model	Description
USB Cable	CHANG YANG ELECTRON CO., LTD.	CY-AS-HK0059	1 m

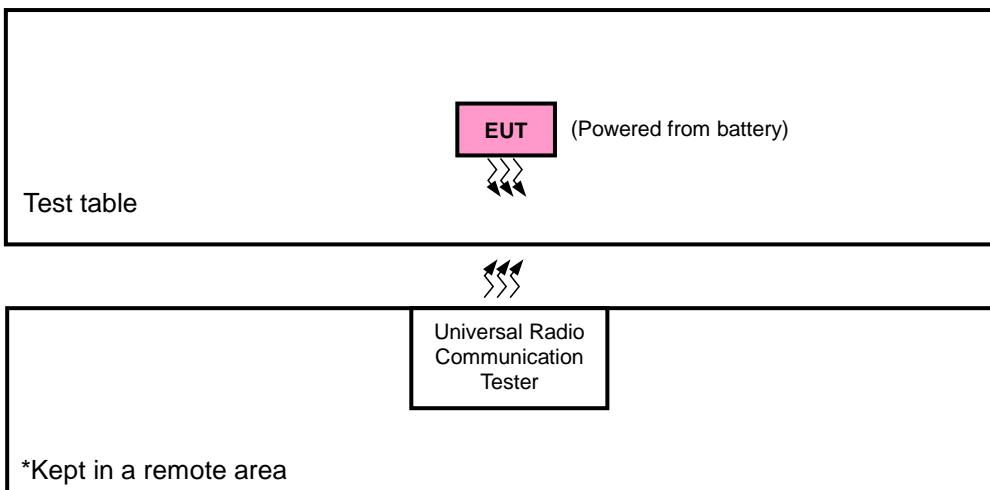
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test

<Radiated Emission Test>



<E.R.P. Test>



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Adapter	LCENT	1A52-UB52A	N/A	N/A

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

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item 1 was provided by client.

3.3 Test Mode Applicability and Tested Channel Detail

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

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

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

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	4132 to 4233	4132, 4182, 4233	WCDMA
-	Radiated Emission below 1GHz	4132 to 4233	4233	WCDMA
-	Radiated Emission above 1GHz	4132 to 4233	4132, 4182, 4233	WCDMA

LTE Band 5

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	20450 to 20600	20450, 20525, 20600	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	Radiated Emission below 1GHz	20450 to 20600	20525	10 MHz	QPSK	1 RB / 24 RB Offset
-	Radiated Emission above 1GHz	20450 to 20600	20450, 20525, 20600	10 MHz	QPSK	1 RB / 24 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	3.7 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 22

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 Test Procedures

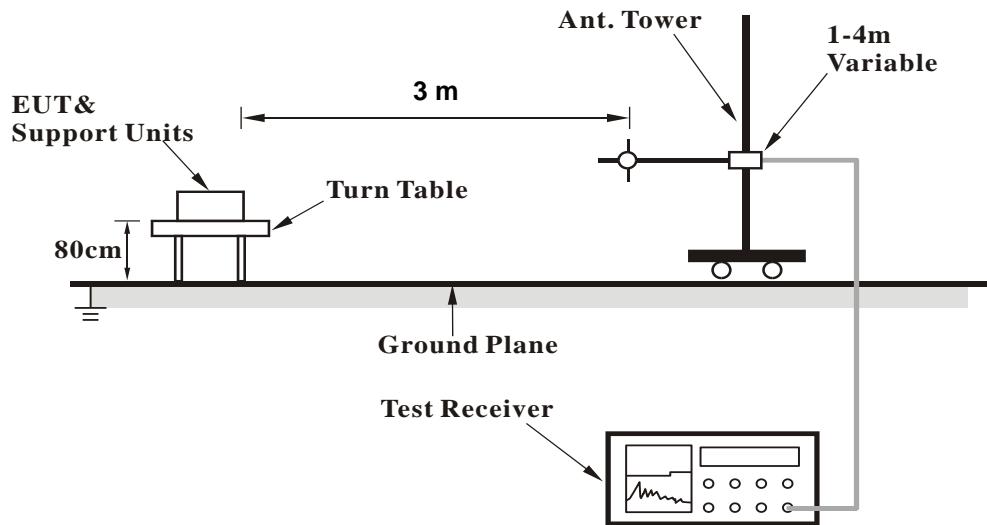
EIRP / ERP Measurement:

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1 MHz for GSM, GPRS & EDGE, and 5 MHz for WCDMA and CDMA, and 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d.
$$\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$$
$$\text{E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole, E.R.P power} = \text{E.I.R.P power} - 2.15 \text{ dB.}$$

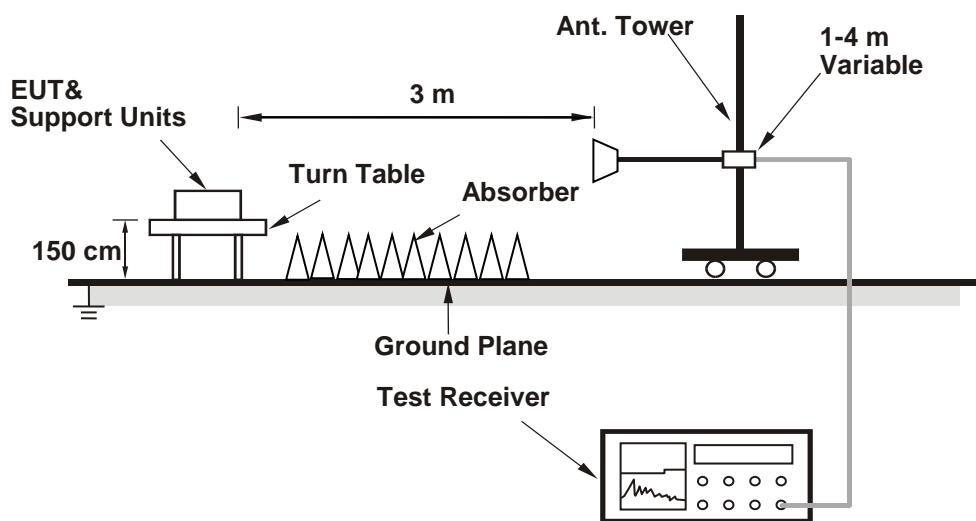
4.1.3 Test Setup

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).

4.1.4 Test Results

ERP Power (dBm)

WCDMA							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	4132	826.4	-7.85	31.208	21.21	132.07	H
	4182	836.4	-7.68	31.3	21.47	140.28	
	4233	846.6	-7.58	31.222	21.49	140.99	
	4132	826.4	-11.24	31.504	18.11	64.77	V
	4182	836.4	-10.85	31.117	18.12	64.82	
	4233	846.6	-11.36	31.922	18.41	69.37	

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

LTE Band 5							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	20450	829.0	-8.52	31.208	20.54	113.19	H
	20525	836.5	-8.32	31.3	20.83	121.06	
	20600	844.0	-8.66	31.222	20.41	109.95	
	20450	829.0	-11.48	31.504	17.87	61.29	V
	20525	836.5	-11.95	31.117	17.02	50.32	
	20600	844.0	-11.87	31.922	17.90	61.69	

Channel Bandwidth: 10 MHz / 16QAM							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	20425	826.5	-9.68	31.208	19.38	86.66	H
	20525	836.5	-9.78	31.3	19.37	86.50	
	20625	846.5	-9.41	31.222	19.66	92.51	
	20425	826.5	-12.85	31.504	16.50	44.71	V
	20525	836.5	-12.70	31.117	16.27	42.34	
	20625	846.5	-12.91	31.922	16.86	48.55	

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

4.2 Radiated Emission Measurement

4.2.1 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.

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

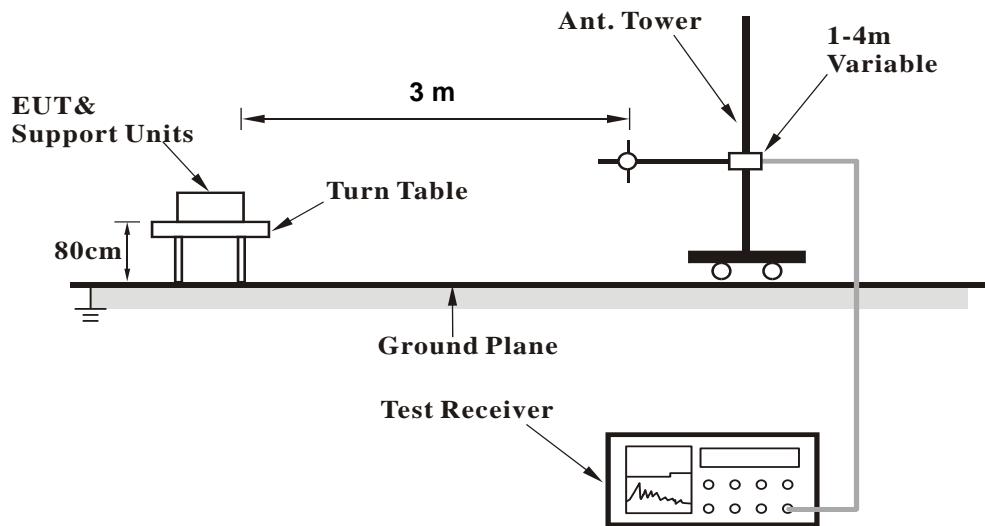
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.2.3 Deviation from Test Standard

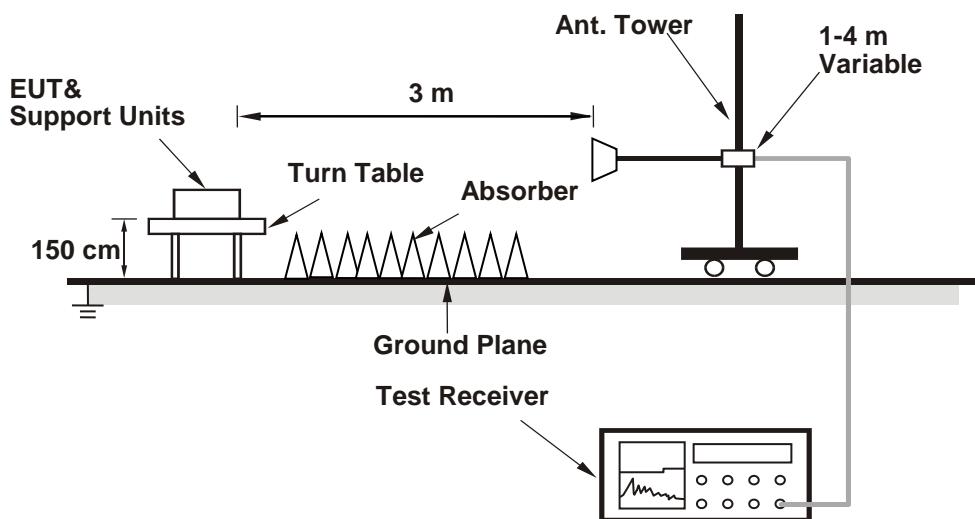
No deviation.

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

WCDMA:

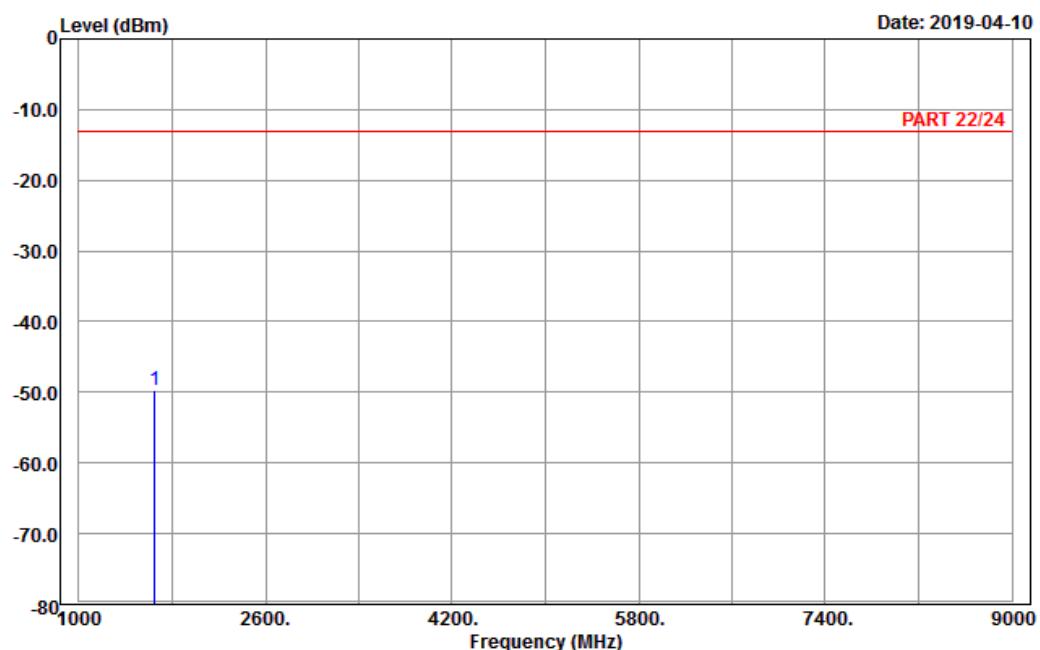
Low Channel



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A D T

Data: 5



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

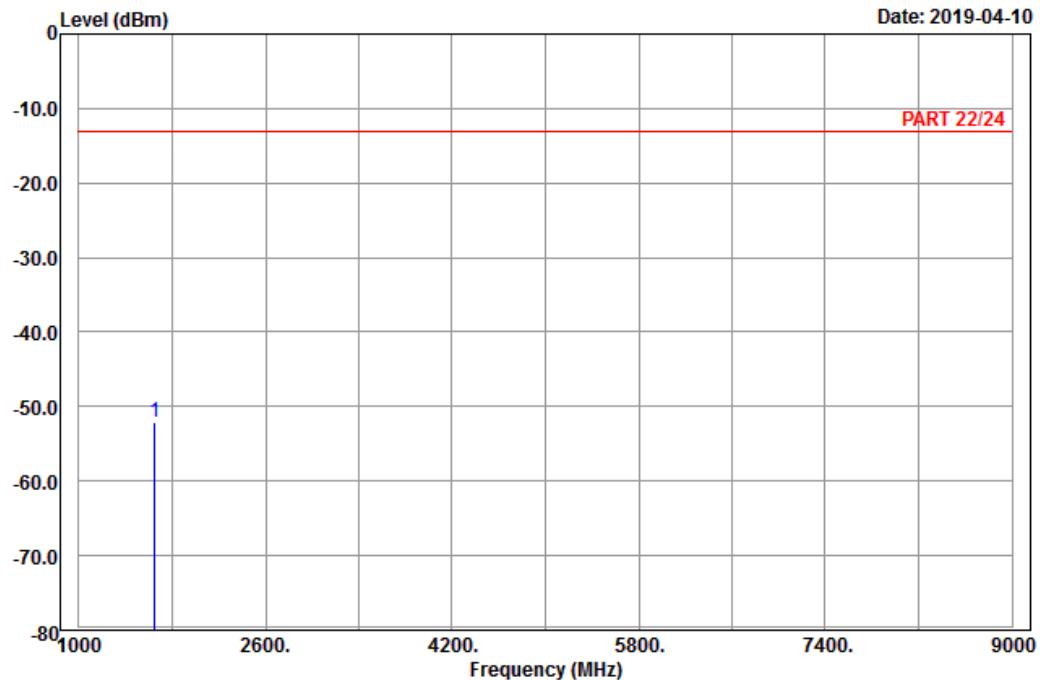
	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp	1652.80	-49.64	-57.37	-13.00	-36.64	7.73 Peak



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A D T

Data: 6



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

	Read Freq	Level dBm	Limit dBm	Over Line dB	Limit Factor	Remark
1 pp	1652.80	-52.07	-59.80	-13.00	-39.07	7.73 Peak

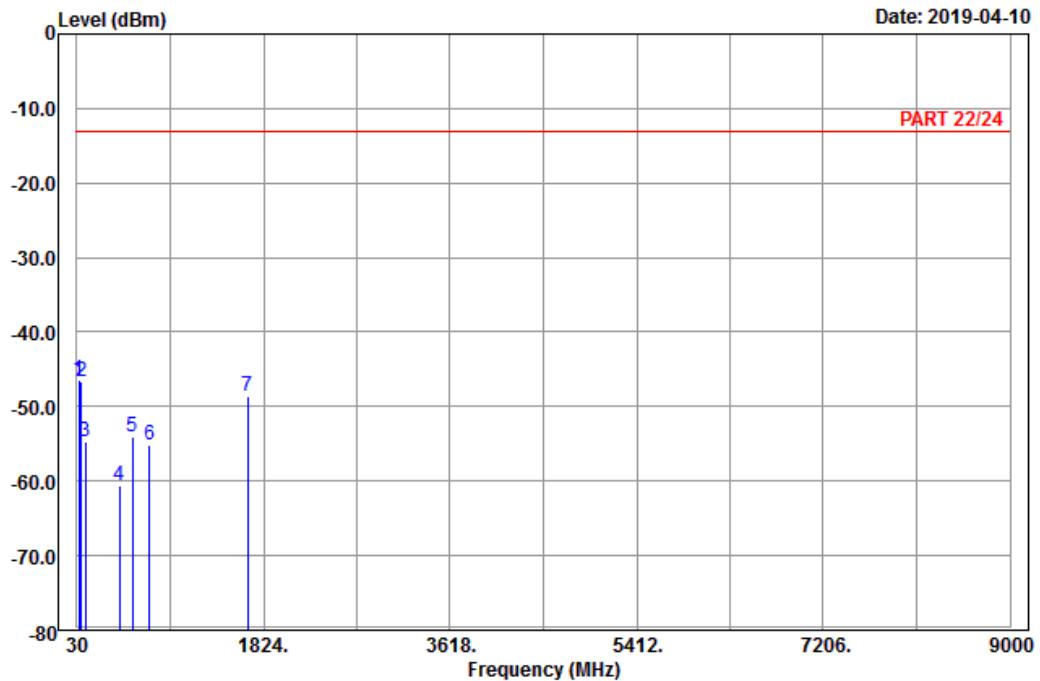
Middle Channel



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A D T

Data: 9



Site : 966 chamber 1

Condition: PART 22/24 Horizontal

Remark : Band V_Link_CH4182

Tested by: Karl Lee

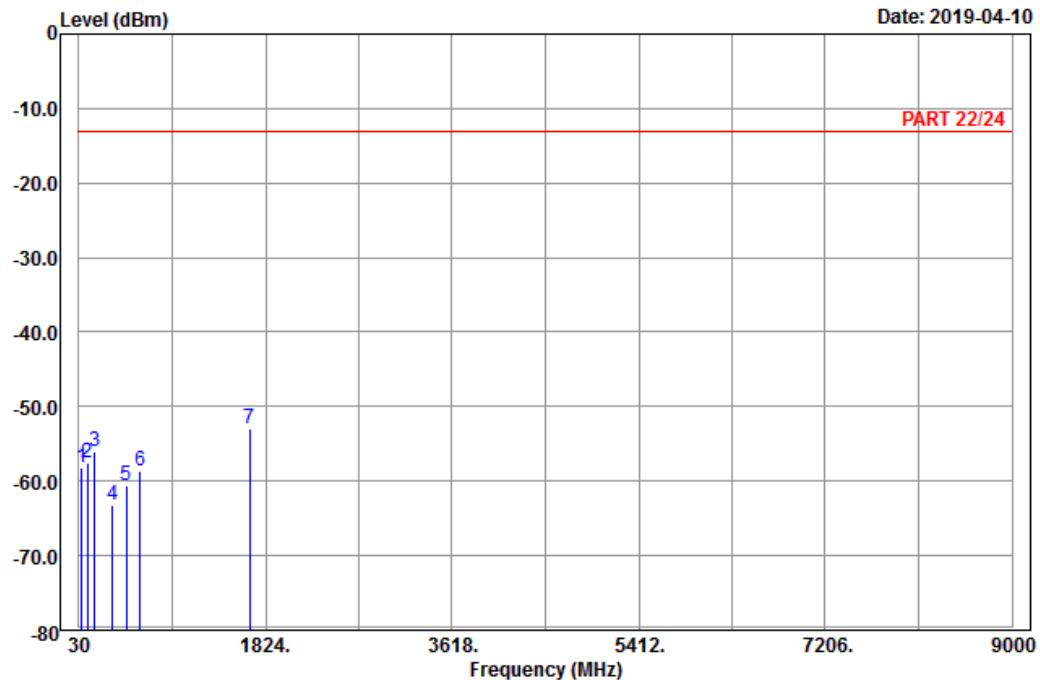
Freq	Level	Read	Limit	Over	Factor	Remark
		MHz	dBm	dBm	Line	dB
1 pp	51.60	-46.37	-32.32	-13.00	-33.37	-14.05 Peak
2	71.58	-46.55	-34.03	-13.00	-33.55	-12.52 Peak
3	108.30	-54.69	-45.62	-13.00	-41.69	-9.07 Peak
4	437.20	-60.69	-57.12	-13.00	-47.69	-3.57 Peak
5	561.80	-53.98	-52.80	-13.00	-40.98	-1.18 Peak
6	729.80	-55.21	-54.28	-13.00	-42.21	-0.93 Peak
7	1672.80	-48.57	-56.48	-13.00	-35.57	7.91 Peak



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A D T

Data: 10



Site : 966 chamber 1

Condition: PART 22/24 Vertical

Remark : Band V_Link_CH4182

Tested by: Karl Lee

	Read Freq	Level MHz	Limit dBm	Over Line dB	Over Limit dB	Over Factor	Remark
1	54.84	-58.13	-44.07	-13.00	-45.13	-14.06	Peak
2	111.81	-57.45	-48.63	-13.00	-44.45	-8.82	Peak
3	183.09	-56.07	-50.45	-13.00	-43.07	-5.62	Peak
4	351.80	-63.24	-57.97	-13.00	-50.24	-5.27	Peak
5	482.70	-60.63	-55.84	-13.00	-47.63	-4.79	Peak
6	619.90	-58.65	-58.86	-13.00	-45.65	0.21	Peak
7 pp	1672.80	-52.98	-60.89	-13.00	-39.98	7.91	Peak

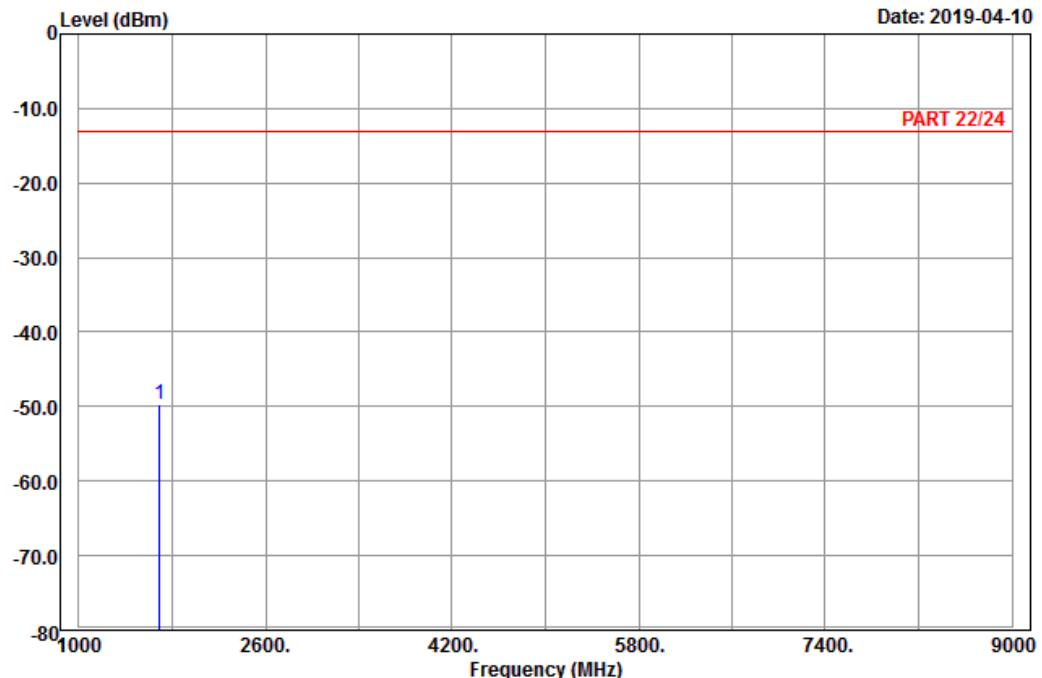
High Channel



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A D T

Data: 5



Site : 966 chamber 1

Condition: PART 22/24 Horizontal

Remark : Band V_Link_CH4233

Tested by: Karl Lee

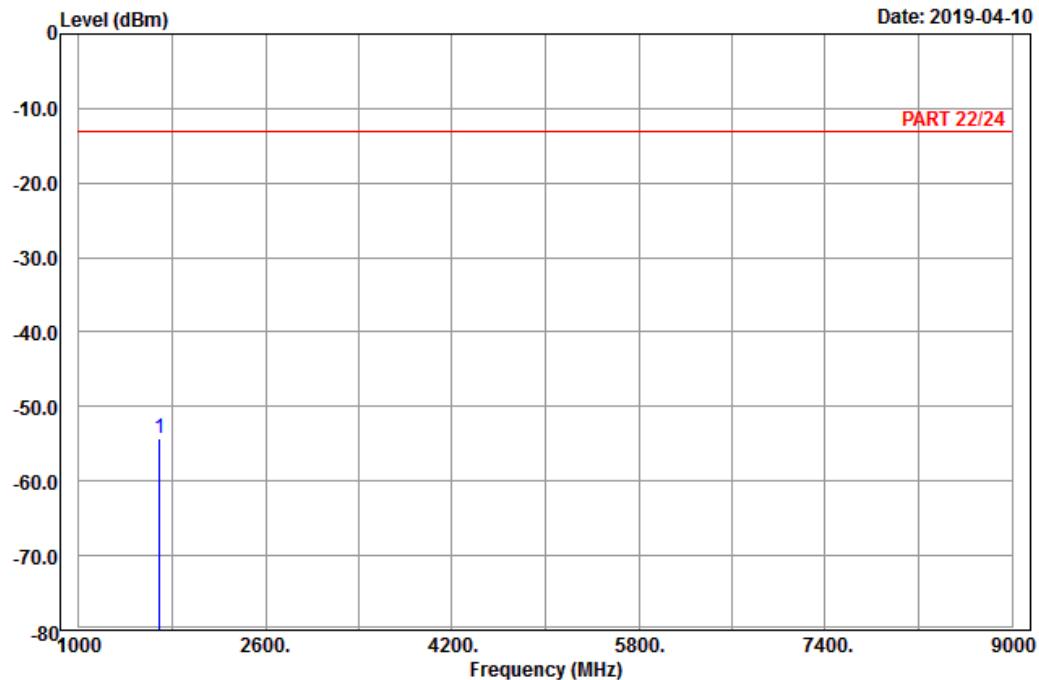
	Freq	Read Level	Limit Level	Over Line	Limit	Over Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.20	-49.64	-57.78	-13.00	-36.64	8.14	Peak



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A D T

Data: 6



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

	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.20	-54.17	-62.31	-13.00	-41.17	8.14 Peak

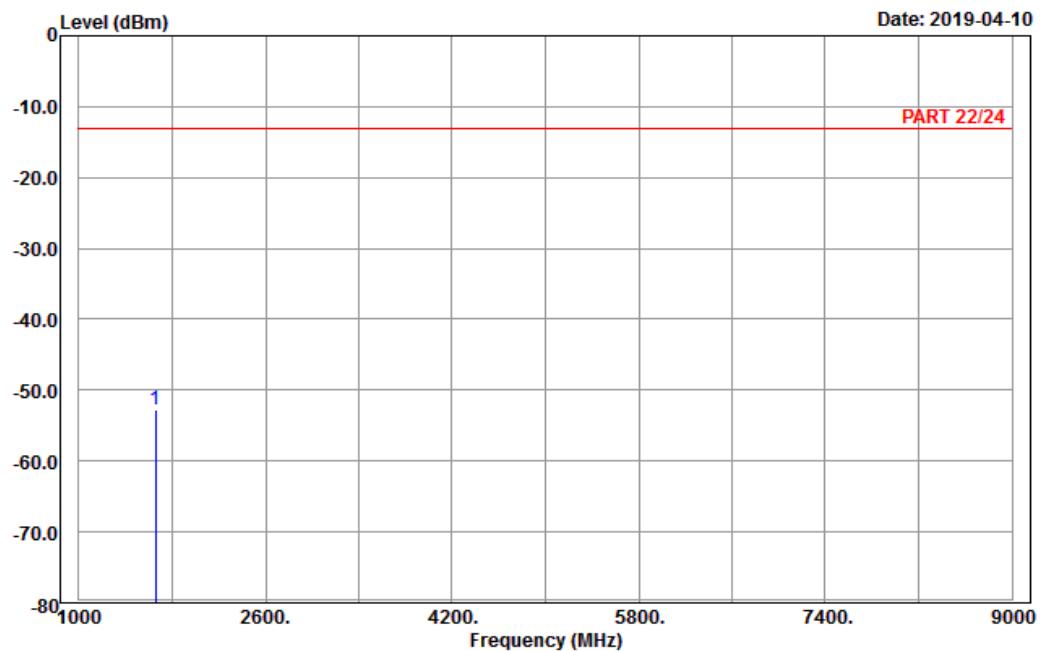
LTE Band 5
Channel Bandwidth: 10 MHz / QPSK
Low Channel



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A D T

Data: 5



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

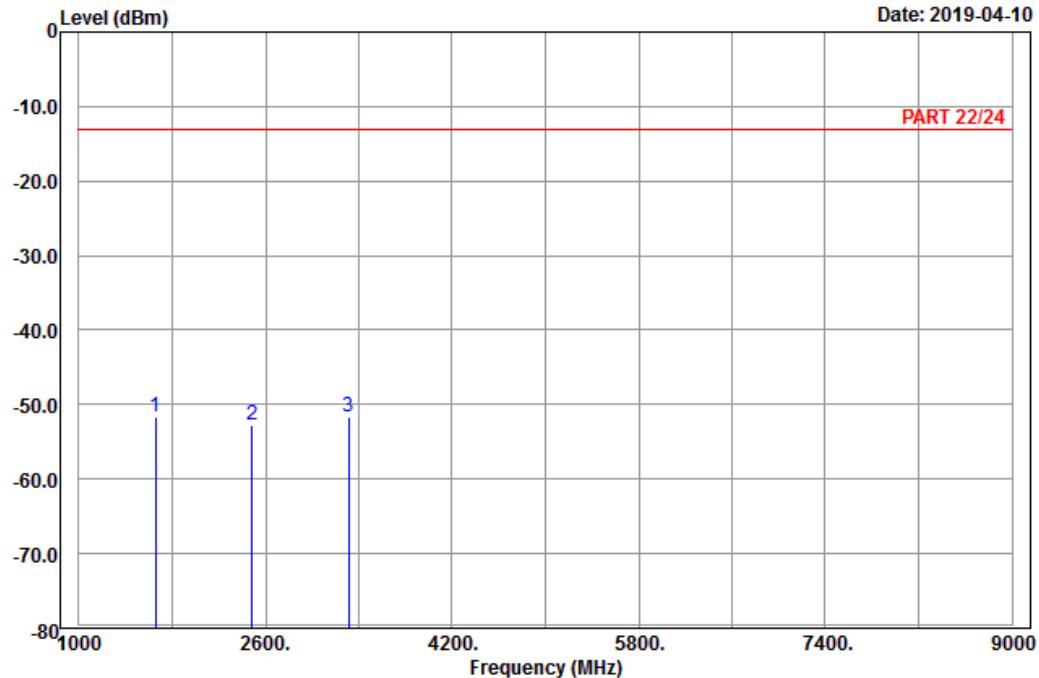
	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp	1658.00	-52.70	-60.61	-13.00	-39.70	7.91 Peak



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A D T

Data: 6



Site : 966 chamber 1

Condition: PART 22/24 Vertical

Remark : LTE_Band 5_Link_CH20450

Tested by: Charles Hsiao

	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1	1658.00	-51.76	-59.67	-13.00	-38.76	7.91 Peak
2	2487.00	-52.69	-63.73	-13.00	-39.69	11.04 Peak
3 pp	3316.00	-51.74	-66.12	-13.00	-38.74	14.38 Peak

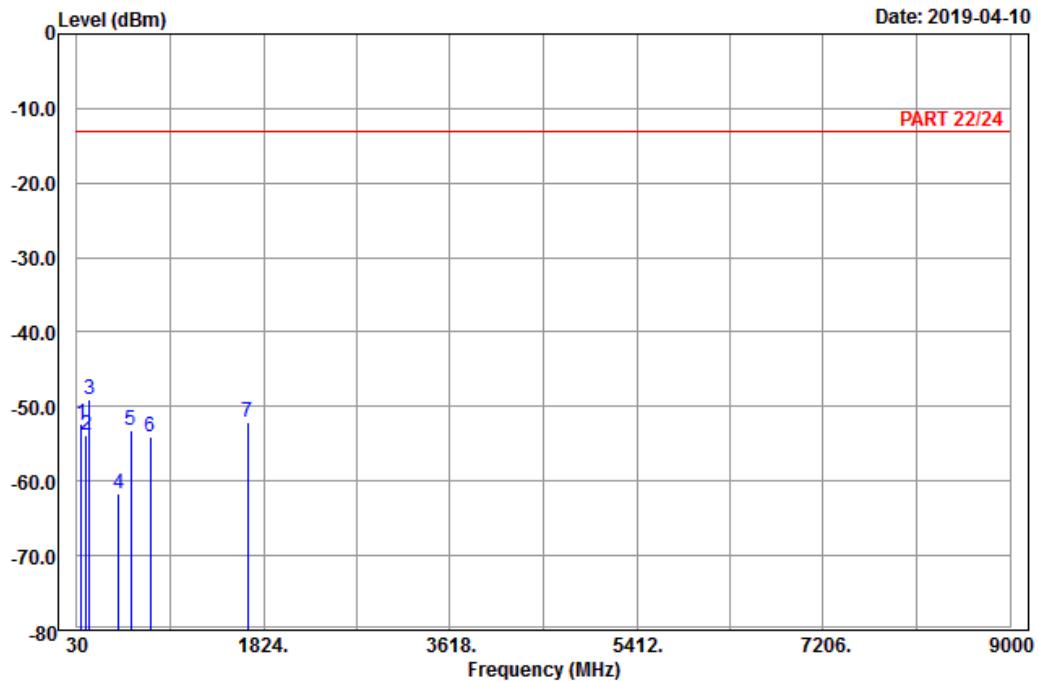
Middle Channel



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A D T

Data: 9



Site : 966 chamber 1

Condition: PART 22/24 Horizontal

Remark : LTE_Band 5_Link_CH20525

Tested by: Charles Hsiao

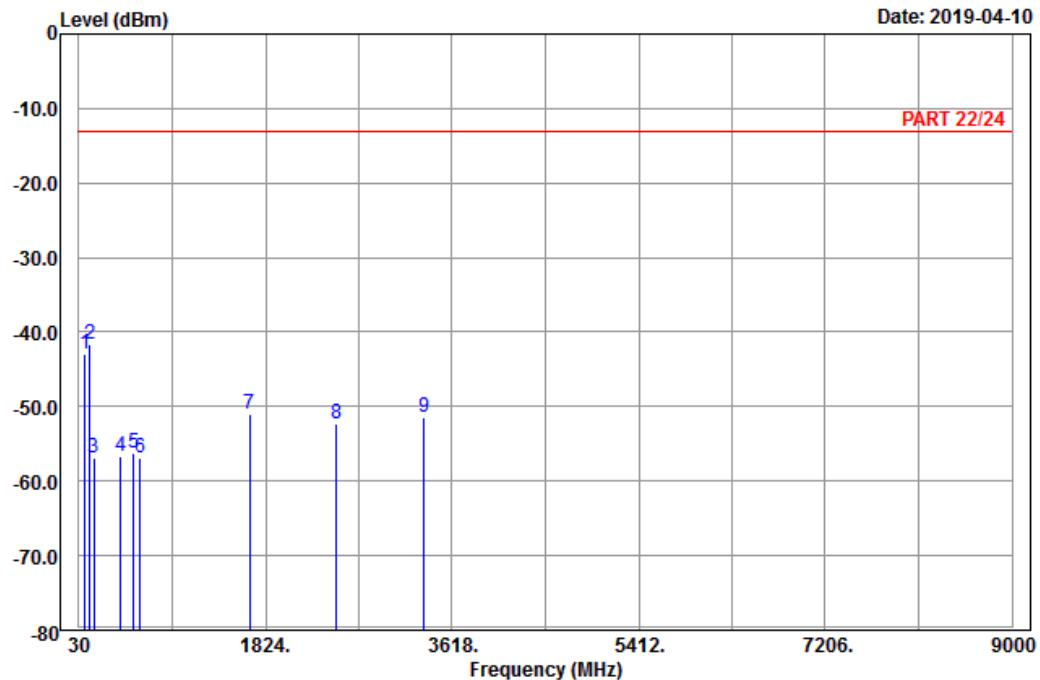
	Read Freq	Level MHz	Limit dBm	Over Line dB	Over Limit dB	Over Factor	Remark
1	73.47	-52.32	-39.97	-13.00	-39.32	-12.35	Peak
2	123.42	-53.83	-45.76	-13.00	-40.83	-8.07	Peak
3 pp	154.47	-49.15	-41.31	-13.00	-36.15	-7.84	Peak
4	434.40	-61.71	-58.20	-13.00	-48.71	-3.51	Peak
5	547.80	-53.28	-51.48	-13.00	-40.28	-1.80	Peak
6	732.60	-54.14	-53.16	-13.00	-41.14	-0.98	Peak
7	1673.00	-52.08	-59.99	-13.00	-39.08	7.91	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10



Site : 966 chamber 1

Condition: PART 22/24 Vertical

Remark : LTE_Band 5_Link_CH20525

Tested by: Charles Hsiao

	Read Freq	Level MHz	Limit dBm	Over Line dB	Limit dB	Factor	Remark
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1	86.16	-42.89	-31.78	-13.00	-29.89	-11.11	Peak
2 pp	132.33	-41.53	-33.87	-13.00	-28.53	-7.66	Peak
3	176.34	-56.93	-50.94	-13.00	-43.93	-5.99	Peak
4	433.70	-56.72	-53.24	-13.00	-43.72	-3.48	Peak
5	552.70	-56.23	-54.69	-13.00	-43.23	-1.54	Peak
6	617.10	-56.93	-57.17	-13.00	-43.93	0.24	Peak
7	1673.00	-50.92	-58.83	-13.00	-37.92	7.91	Peak
8	2509.50	-52.27	-63.55	-13.00	-39.27	11.28	Peak
9	3346.00	-51.34	-65.79	-13.00	-38.34	14.45	Peak

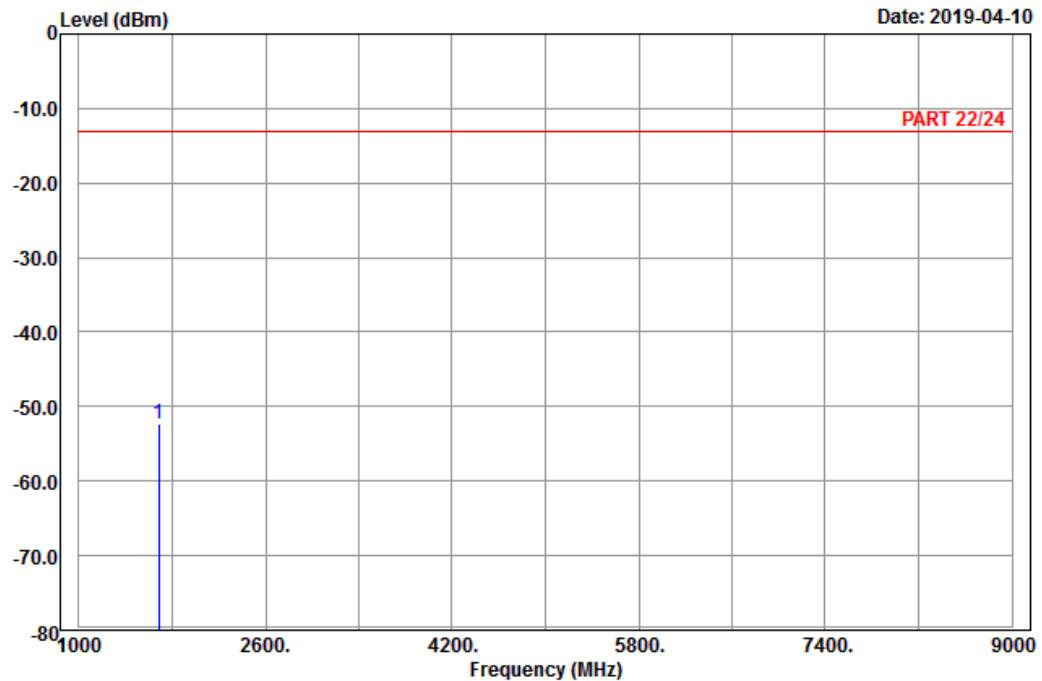
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 5



Site : 966 chamber 1

Condition: PART 22/24 Horizontal

Remark : LTE_Band 5_Link_CH20600

Tested by: Charles Hsiao

	Read	Limit	Over
Freq	Level	Level	Line
MHz	dBm	dBm	dBm

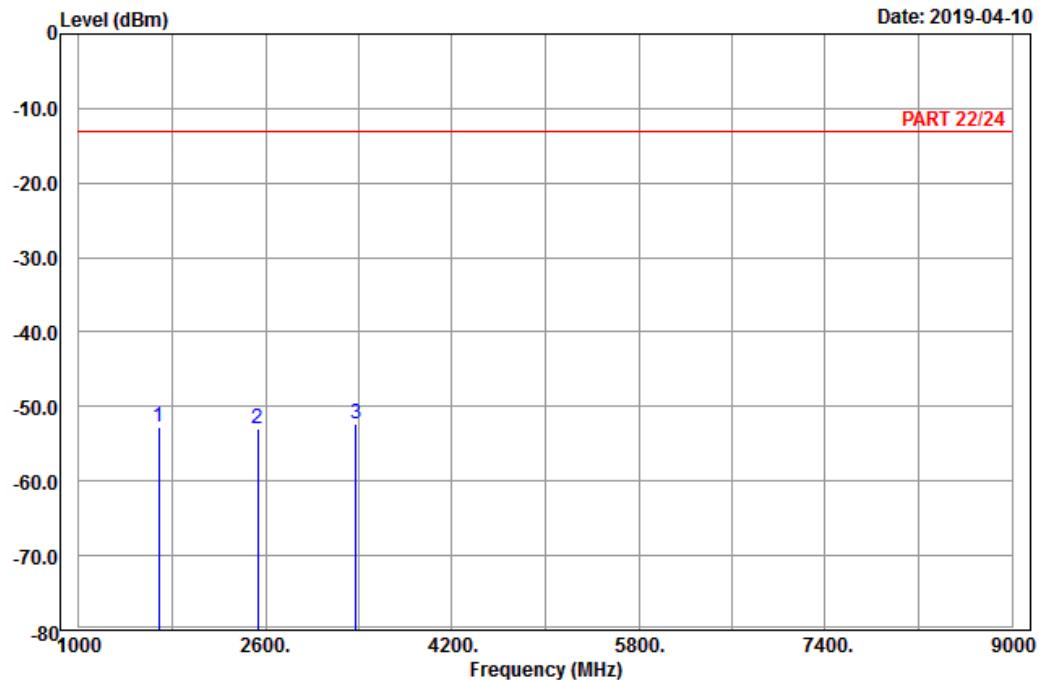
	Factor	Remark
pp	Peak	



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A D T

Data: 6



Site : 966 chamber 1

Condition: PART 22/24 Vertical

Remark : LTE_Band 5_Link_CH20600

Tested by: Charles Hsiao

	Read Freq	Level MHz	Limit dBm	Over Line dB	Limit dB	Factor	Remark
1	1688.00	-52.66	-60.68	-13.00	-39.66	8.02	Peak
2	2532.00	-53.00	-64.38	-13.00	-40.00	11.38	Peak
3 pp	3376.00	-52.31	-66.73	-13.00	-39.31	14.42	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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