

FCC TEST REPORT

(PART 27)

REPORT NO.: RF130529C21A-2

MODEL NO.: E362

FCC ID: PKRNVWE362

RECEIVED: May 20, 2013

TESTED: Jun. 05, 2013 ~ Mar. 12, 2014

ISSUED: Apr. 28, 2014

APPLICANT: Novatel Wireless Inc.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130529C21A-2	Original release.	Apr. 28, 2014

1 CERTIFICATION

PRODUCT: 850/1900 GSM/GPRS/EDGE/WCDMA/CDMA/EvDO and 700MHz LTE Module

MODEL: E362

BRAND: Novatel

APPLICANT: Novatel Wireless Inc.

TESTED: Jun. 05, 2013 ~ Mar. 12, 2014

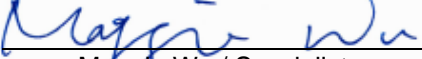
TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: FCC Part 27, Subpart C, L

FCC Part 2

ANSI C63.4-2003

The above equipment (model: E362) 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 EMC characteristics under the conditions specified in this report.

PREPARED BY :  , **DATE :** Apr. 28, 2014
Maggie Wu / Specialist

APPROVED BY :  , **DATE :** Apr. 28, 2014
Dylan Chiou / Project Engineer

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 27 & Part 2			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
2.1046 27.50(d)(4)	Equivalent isotropically radiated power	PASS	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	NA	Refer to NOTE below
2.1049 27.53(h)	Occupied Bandwidth	NA	Refer to NOTE below
27.50(d)(5)	Peak to average ratio	NA	Refer to NOTE below
27.53(h)	Band Edge Measurements	NA	Refer to NOTE below
2.1051 27.53(h)	Conducted Spurious Emissions	NA	Refer to NOTE below
2.1053 27.53(h)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -32.64dB at 1564.00MHz.

NOTE: Test item for equivalent isotropically radiated power and radiated emissions were performed for this addendum. Other testing data refer to original report.

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	UNCERTAINTY
Conducted emissions	150kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	3.34 dB
	200MHz ~1000MHz	3.35 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.2 TEST SITE AND INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	Jan. 03, 2013	Jan. 02, 2014
			Jan. 02, 2014	Jan. 01, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Mar. 04, 2013	Mar. 03, 2014
			Mar. 03, 2014	Mar. 02, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Mar. 20, 2013	Mar. 19, 2014
			Feb. 26, 2014	Feb. 25, 2015
HORN Antenna SCHWARZBECK	9120D	209	Sep. 13, 2012	Sep. 12, 2013
			Sep. 12, 2013	Sep. 11, 2014
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 16, 2014	Jul. 15, 2013
			Jul. 15, 2013	Jul. 14, 2014
Preamplifier Agilent	8447D	2944A10633	Oct. 25, 2012	Oct. 24, 2013
			Oct. 07, 2013	Oct. 06, 2014
Preamplifier Agilent	8449B	3008A01964	Oct. 25, 2012	Oct. 24, 2013
			Aug. 26, 2013	Aug. 25, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	214378/4	Aug. 28, 2012	Aug. 27, 2013
			Aug. 26, 2013	Aug. 25, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 106	12738/6 +309224/4	Aug. 28, 2012	Aug. 27, 2013
			Aug. 26, 2013	Aug. 25, 2014
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Mini-Circuits Power Splitter	ZN2PD-9G	NA	Mar. 22, 2013	Mar. 21, 2014
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 988962.
5. The IC Site Registration No. is IC 7450F-3.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	850/1900 GSM/GPRS/EDGE/WCDMA/CDMA/EvDO and 700MHz LTE Module	
MODEL NO.	E362	
POWER SUPPLY	3.3Vdc from host equipment	
MODULATION TECHNOLOGY	LTE Band 13	QPSK, 16QAM
FREQUENCY RANGE	LTE Band 13 Channel Bandwidth 10MHz	782MHz
MAX. ERP POWER	LTE Band 13 Channel Bandwidth 10MHz	441.57mW (26.45dBm)
EMISSION DESIGNATOR	LTE Band 13 Channel Bandwidth 10MHz	QPSK: 8M97G7D
		16QAM: 8M97W7D
CATEGORY	LTE: 3	
ANTENNA TYPE	Dipole antenna with 3.62dBi gain	
ANTENNA CONNECTOR	SMA Plug Standard	
DATA CABLE	NA	
I/O PORTS	Refer to user's manual	
ACCESSORY DEVICES	NA	

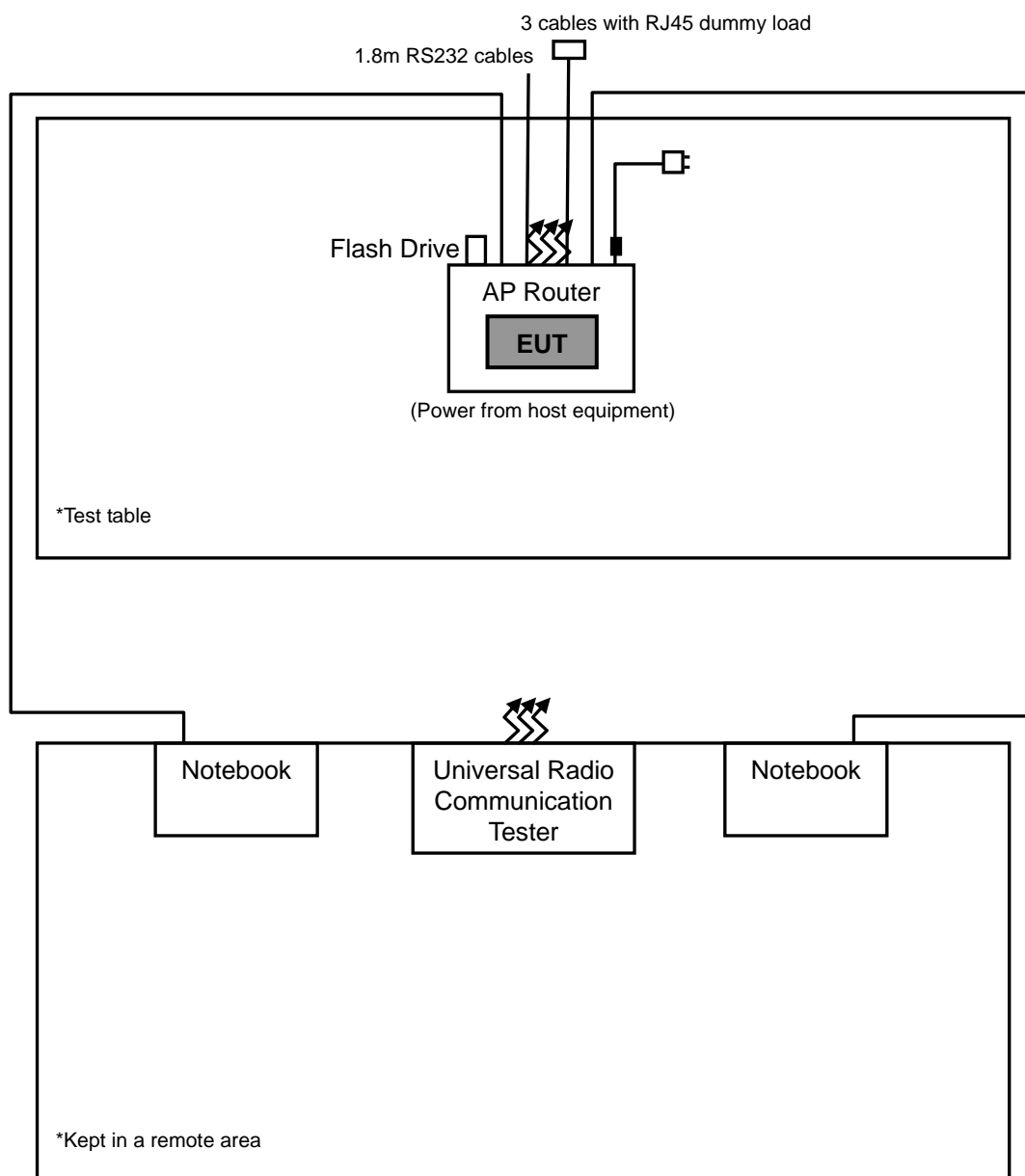
NOTE:

1. This report is prepared for FCC class II permissive change. The difference compared with the original report are adding antenna and Host device. Therefore, test items for conducted output power, ERP and radiated emissions had been re-tested and presented in this report.
2. The module is specifically installed into the host device.

Product Name	AP Router
Brand	Aerohive
Model	BR200-LTE-VZ

3. The above EUT information is declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 CONFIGURATION OF SYSTEM UNDER TEST



3.3 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	USB Flash Drive	Transcend	V85	538455 4488	NA
2	Dummy Load	NA	NA	NA	NA
3	Notebook	DELL	E5410	6RP2YM1	FCC DoC Approved
4	Notebook	DELL	D531	CN-0XM006-48643-8 1U-2610	QDS-BRCM1020
5	Universal Radio Communication Tester	R&S	CMU200	104958	NA
6	AP Router	Aerohive	BR200-LTE-VZ	NA	WBV-BR200WPL

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.8m RJ45 UTP cable x 3 with load connected to EUT
3	10m RJ45 UTP cable
4	10m RJ45 UTP cable
5	NA
6	NA

NOTE:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items 3-5 acted as communication partners to transfer data.
3. Item 6 was provided by the manufacturer.

3.4 TEST ITEM AND TEST CONFIGURATION

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 on **Z-plane**. Following channel(s) was (were) selected for the final test as listed below:

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	23230	23230	10MHz	QPSK, 16QAM	1RB, Offset 49
RADIATED EMISSION Below 1GHz	23230	23230	10MHz	QPSK, 16QAM	1RB, Offset 49
RADIATED EMISSION Above 1GHz	23230	23230	10MHz	QPSK, 16QAM	1RB, Offset 49

TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
ERP	25deg. C, 65%RH	120Vac, 60Hz	Jones Chang
RADIATED EMISSION	25deg. C, 65%RH	120Vac, 60Hz	Jones Chang

3.5 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

3.6 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

ANSI/TIA/EIA-603-C 2004

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 782MHz band are limited to 3 watt EIRP

4.1.2 TEST PROCEDURES

EIRP / ERP MEASUREMENT:

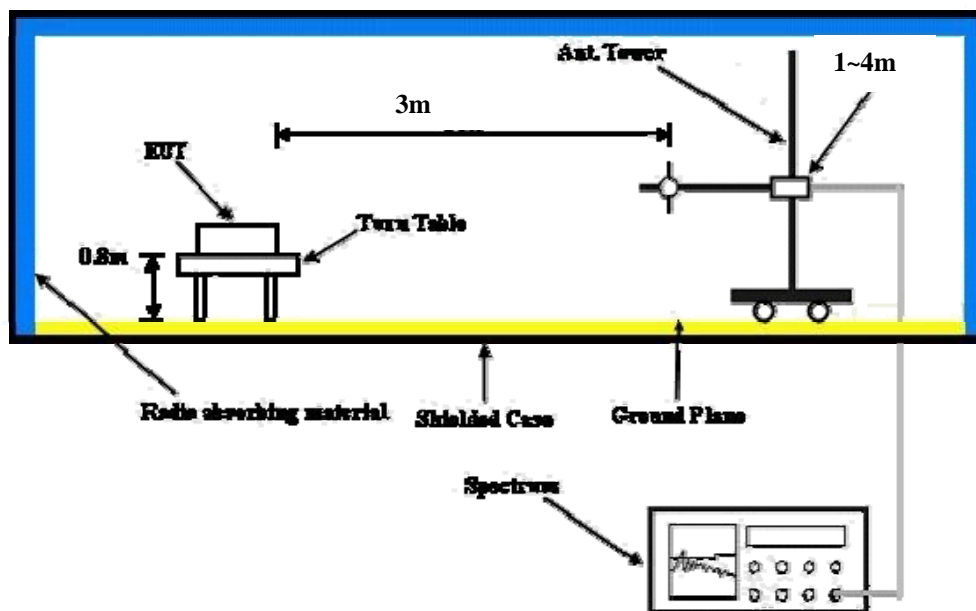
- a. The EUT was set up for the maximum power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range). RBW and VBW is 10MHz for LTE.
- b. E.I.R.P power measurement. In the semi-anechoic chamber, EUT placed on the 0.8m 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 1m to 4m 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 a. 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. $E.R.P = E.I.R.P - 2.15 \text{ dB}$

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.

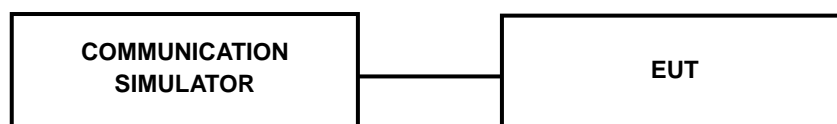
4.1.3 TEST SETUP

EIRP / ERP MEASUREMENT:



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

CONDUCTED POWER MEASUREMENT:



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

4.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm)

LTE Band 13								
BW	Modulation	CH	Frequency (MHz)	RB	RB Offset	MPR	Target Power	Measured Power
10 MHz	QPSK	23230	782	1	0	0	24.3	23.25
		23230	782	1	24	0	24.3	23.26
		23230	782	1	49	0	24.3	23.37
		23230	782	25	0	1	24.3	22.42
		23230	782	25	12	1	24.3	23.17
		23230	782	25	25	1	24.3	22.42
		23230	782	50	0	1	24.3	23.15
	16QAM	23230	782	1	0	1	24.3	22.76
		23230	782	1	24	1	24.3	22.72
		23230	782	1	49	1	24.3	23.18
		23230	782	25	0	2	24.3	21.58
		23230	782	25	12	2	24.3	23.14
		23230	782	25	25	2	24.3	22.28
		23230	782	50	0	2	24.3	22.99

ERP POWER (dBm)

CHANNEL BANDWIDTH 10MHz, QPSK, 1RB, Offset 49

MODE		TX channel 23230					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	782.00	-7.12	24.29	-1.01	23.28	34.77	-11.49
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	782.00	-2.21	26.17	-1.01	25.16	34.77	-9.61

CHANNEL BANDWIDTH 10MHz, 16QAM, 1RB, Offset 49

MODE		TX channel 23230					
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	782.00	-5.67	25.74	-1.01	24.73	34.77	-10.04
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	782.00	-0.92	27.46	-1.01	26.45	34.77	-8.32

NOTE: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB)

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 equal to -13dBm .

4.2.2 TEST PROCEDURES

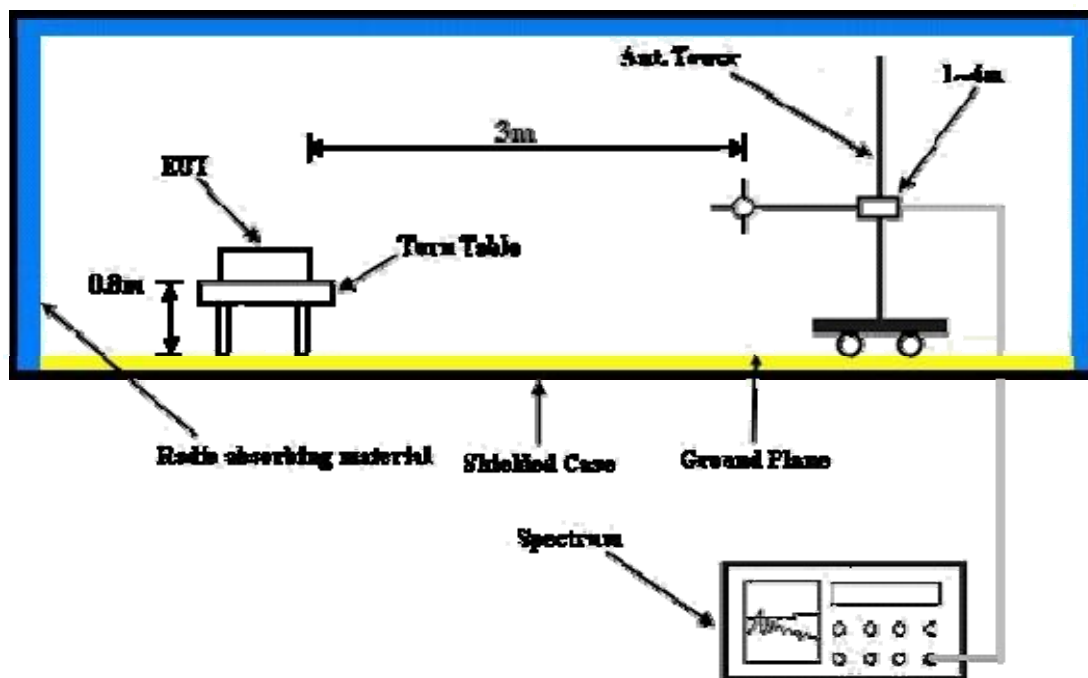
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m 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. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,
 $\text{E.R.P power} = \text{E.I.R.P power} - 2.15\text{dBi}.$

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

4.2.3 DEVIATION FROM TEST STANDARD

No deviation

4.2.4 TEST SETUP



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

4.2.5 TEST RESULTS

Below 1GHz

CHANNEL BANDWIDTH 10MHz, QPSK			
MODE	Channel 23230	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH
TESTED BY	Jones Chang		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	167.74	-56.32	-64.10	1.37	-62.73	-13.00	-49.73
2	262.80	-50.67	-62.86	5.33	-57.53	-13.00	-44.53
3	288.02	-47.44	-59.05	5.19	-53.86	-13.00	-40.86
4	385.02	-55.06	-62.66	5.25	-57.41	-13.00	-44.41
5	499.48	-58.73	-65.49	4.89	-60.60	-13.00	-47.60
6	823.46	-54.64	-55.43	3.98	-51.45	-13.00	-38.45
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	92.08	-51.35	-57.53	1.07	-56.46	-13.00	-43.46
2	288.02	-50.72	-59.70	5.19	-54.51	-13.00	-41.51
3	385.02	-57.89	-64.89	5.25	-59.64	-13.00	-46.64
4	691.54	-63.56	-64.67	5.18	-59.49	-13.00	-46.49
5	891.36	-63.97	-61.18	3.92	-57.26	-13.00	-44.26
6	986.42	-65.36	-60.78	3.90	-56.88	-13.00	-43.88

REMARKS:

1. ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB)
2. Correction Factor = gain of substitution antenna + cable loss



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CHANNEL BANDWIDTH 10MHz, 16QAM			
MODE	Channel 23230	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH
TESTED BY	Jones Chang		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	191.02	-55.23	-67.83	4.33	-63.50	-13.00	-50.50
2	282.20	-49.91	-61.62	5.22	-56.40	-13.00	-43.40
3	291.90	-50.99	-62.53	5.17	-57.36	-13.00	-44.36
4	396.66	-58.01	-65.46	5.27	-60.19	-13.00	-47.19
5	507.24	-59.43	-66.19	4.86	-61.33	-13.00	-48.33
6	819.58	-56.05	-56.84	3.97	-52.87	-13.00	-39.87
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	150.28	-57.80	-59.64	-0.14	-59.78	-13.00	-46.78
2	307.42	-54.54	-63.01	5.15	-57.86	-13.00	-44.86
3	385.02	-57.89	-64.89	5.25	-59.64	-13.00	-46.64
4	738.10	-63.86	-63.55	4.79	-58.76	-13.00	-45.76
5	877.78	-63.91	-61.42	3.94	-57.48	-13.00	-44.48
6	932.10	-68.15	-64.38	3.91	-60.47	-13.00	-47.47

REMARKS:

1. ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB)
2. Correction Factor = gain of substitution antenna + cable loss



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Above 1GHz

CHANNEL BANDWIDTH 10MHz, QPSK			
MODE	Channel 23230	FREQUENCY RANGE	Above 1000MHz
INPUT POWER	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH
TESTED BY	Jones Chang		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1564.00	-48.51	-50.92	5.28	-45.64	-13.00	-32.64
2	1950.32	-62.35	-63.61	6.21	-57.40	-13.00	-44.40
3	2210.00	-61.73	-61.33	6.37	-54.96	-13.00	-41.96
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1564.00	-53.61	-58.14	5.28	-52.86	-13.00	-39.86
2	1950.32	-62.26	-65.61	6.21	-59.40	-13.00	-46.40
3	2210.00	-65.62	-64.90	6.37	-58.53	-13.00	-45.53

REMARKS:

1. ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB)
2. Correction Factor = gain of substitution antenna + cable loss



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CHANNEL BANDWIDTH 10MHz, 16QAM			
MODE	Channel 23230	FREQUENCY RANGE	Above 1000MHz
INPUT POWER	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH
TESTED BY	Jones Chang		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1564.00	-49.60	-52.10	5.30	-46.80	-13.00	-33.80
2	1950.32	-62.50	-63.80	6.20	-57.60	-13.00	-44.60
3	2210.11	-61.90	-61.50	6.40	-55.10	-13.00	-42.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1564.00	-54.50	-59.10	5.30	-53.80	-13.00	-40.80
2	1950.32	-63.10	-66.50	6.20	-60.30	-13.00	-47.30
3	2210.00	-65.20	-64.60	6.40	-58.20	-13.00	-45.20

REMARKS:

1. $ERP (dBm) = S.G \text{ Power Value (dBm)} + \text{Correction Factor (dB)}$
2. $\text{Correction Factor} = \text{gain of substitution antenna} + \text{cable loss}$



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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

6 INFORMATION ON THE TESTING LABORATORIES

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

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

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

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7 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

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