

## Variant FCC Test Report

### (PART 27)

**Report No.:** RF140717C05G-2

**FCC ID:** Y6YYSAR023G

**Test Model:** YSAR02-3G

**Received Date:** Oct. 04, 2018

**Test Date:** Oct. 24, 2018

**Issued Date:** Nov. 01, 2018

**Applicant:** YANMAR CO., LTD.

**Address:** 1-32, Chayamachi, Kitaku, Osaka, Japan 530-8311

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan  
( R.O.C )

**Test Location:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City  
33383, Taiwan (R.O.C)

**FCC Registration /**  
**Designation Number:** 788550 / TW0003



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies

## Table of Contents

<b>Release Control Record .....</b>	<b>3</b>
<b>1 Certificate of Conformity .....</b>	<b>4</b>
<b>2 Summary of Test Results .....</b>	<b>5</b>
2.1 Measurement Uncertainty .....	5
2.2 Test Site and Instruments .....	6
<b>3 General Information .....</b>	<b>7</b>
3.1 General Description of EUT .....	7
3.2 Configuration of System under Test .....	8
3.2.1 Description of Support Units .....	8
3.3 Test Mode Applicability and Tested Channel Detail .....	9
3.4 EUT Operating Conditions .....	9
3.5 General Description of Applied Standards .....	9
<b>4 Test Types and Results .....</b>	<b>10</b>
4.1 Output Power Measurement .....	10
4.1.1 Limits of Output Power Measurement .....	10
4.1.2 Test Procedures .....	10
4.1.3 Test Setup .....	11
4.1.4 Test Results .....	12
4.2 Radiated Emission Measurement .....	13
4.2.1 Limits of Radiated Emission Measurement .....	13
4.2.2 Test Procedure .....	13
4.2.3 Deviation from Test Standard .....	13
4.2.4 Test Setup .....	14
4.2.5 Test Results .....	15
<b>5 Pictures of Test Arrangements .....</b>	<b>21</b>
<b>Appendix – Information on the Testing Laboratories .....</b>	<b>22</b>

### Release Control Record

Issue No.	Description	Date Issued
RF140717C05G-2	Original Release	Nov. 01, 2018

## 1 Certificate of Conformity

**Product:** Controller Mobile Communicator

**Brand:** YANMAR

**Test Model:** YSAR02-3G

**Sample Status:** Identical Prototype

**Applicant:** YANMAR CO., LTD.

**Test Date:** Oct. 24, 2018

**Standards:** FCC Part 27, Subpart C, 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 :** Rona Chen, **Date:** Nov. 01, 2018  
Rona Chen / Specialist

**Approved by :** Dylan Chiou, **Date:** Nov. 01, 2018  
Dylan Chiou / Project Engineer

## 2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (WCDMA)			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(d)(4)	Equivalent Isotropic Radiated 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 27.53(h)	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 -32.64 dB at 43.58 MHz.

Note: This report is a partial report, only test item of Effective Radiated Power and Radiated Spurious Emissions were performed for this report. Other testing data please refer to CETECOM GmbH report no.: EMC\_CETEC\_046\_12001\_WWAN\_Rev2 for module (Brand: u-blox, Model: LISA-U200).

### 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	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

## 2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 16, 2018	Mar. 15, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jan. 11, 2018	Jan. 10, 2019
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 06, 2017	Dec. 05, 2018
Horn Antenna SCHWARZBECK	BBHA 9170	148	Dec. 13, 2017	Dec. 12, 2018
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019
MXG Vector signal generator Agilent	N5182B	MY53050162	Jan. 10, 2018	Jan. 09, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 330H	980112	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&3000	140811+170717	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 12, 2018	Oct. 11, 2019
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	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
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 05, 2018	Sep. 04, 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 HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Controller Mobile Communicator	
<b>Brand</b>	YANMAR	
<b>Test Model</b>	YSAR02-3G	
<b>Status of EUT</b>	Identical Prototype	
<b>Power Supply Rating</b>	12 Vdc (Power Supply)	
<b>Modulation Type</b>	WCDMA	QPSK
<b>Frequency Range</b>	WCDMA	1712.4 ~ 1752.6 MHz
<b>Max. EIRP Power</b>	WCDMA	114.79 mW
<b>Antenna Type</b>	Cellular and GNSS Combi Antenna with 0.8 dBi gain	
<b>Accessory Device</b>	Refer to Note as below	
<b>Data Cable Supplied</b>	Refer to Note as below	

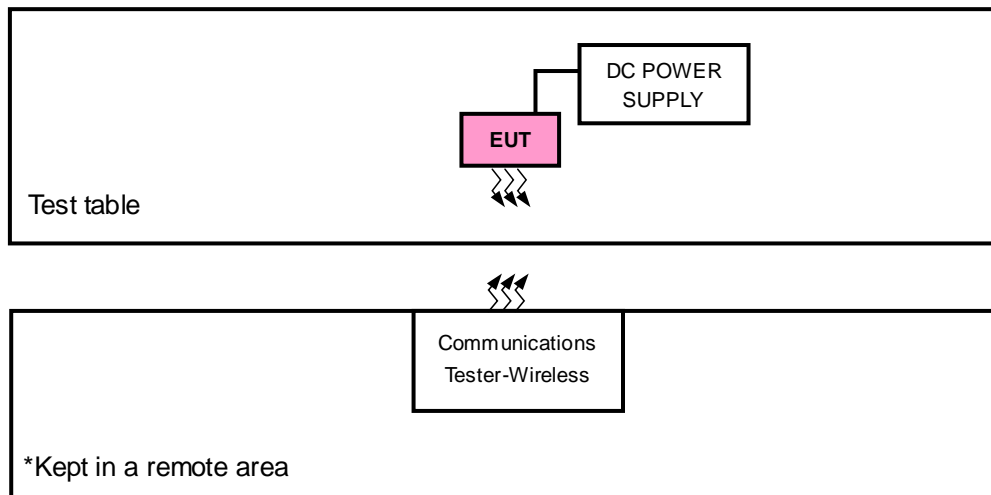
Note:

1. This report is issued as a supplementary report to BV CPS report no.: RF140717C05D. The difference compared with original report is upgrading standards to the latest version.
2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Cellular Module	U-blox	LISA-U200	--

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



#### 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.	DC Power Supply	Topward	3303D	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).



### 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 4	X-plane	X-axis

#### WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	1312 to 1513	1312, 1413, 1513	WCDMA
-	Radiated Emission	1312 to 1513	1312, 1413, 1513	WCDMA

#### Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	25 deg. C, 65 % RH	12 Vdc	Jisyong Wang
Radiated Emission	25 deg. C, 65 % RH	12 Vdc	Jisyong Wang

### 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

#### 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 5 MHz for WCDMA 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,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$ .

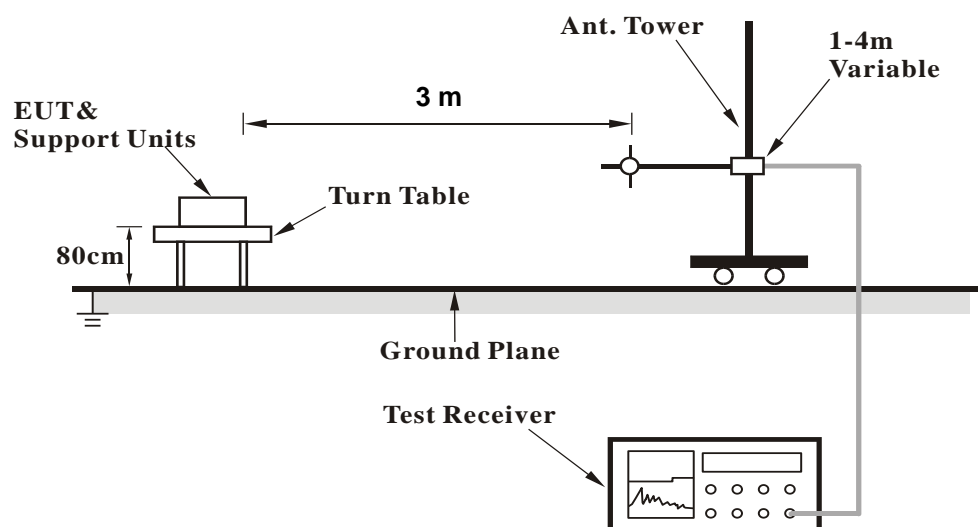
##### **Conducted Power Measurement:**

- a. The EUT was set up for the maximum power with WCDMA 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.

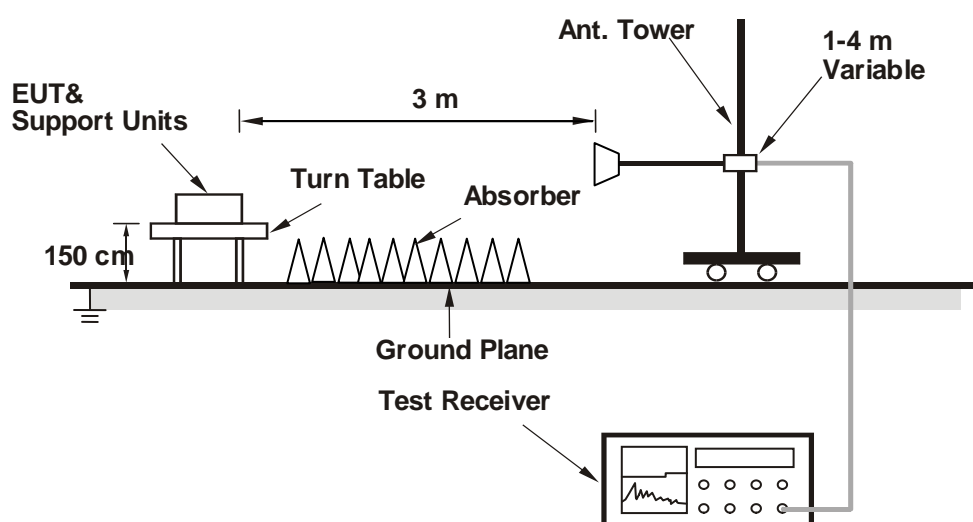
#### 4.1.3 Test Setup

##### EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

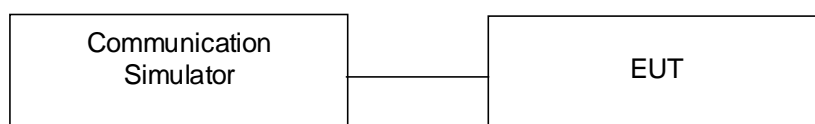


<Radiated Emission above 1 GHz>



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

##### Conducted Power Measurement:



#### 4.1.4 Test Results

##### EIRP Power (dBm)

WCDMA							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	1312	1712.4	-15.72	36.29	20.57	114.02	H
	1413	1732.6	-16.09	36.69	20.60	114.79	
	1513	1752.6	-16.49	36.98	20.49	112.02	
	1312	1712.4	-19.60	37.11	17.51	56.32	V
	1413	1732.6	-19.66	37.60	17.94	62.23	
	1513	1752.6	-19.91	37.65	17.74	59.43	

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.

### 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,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$ .

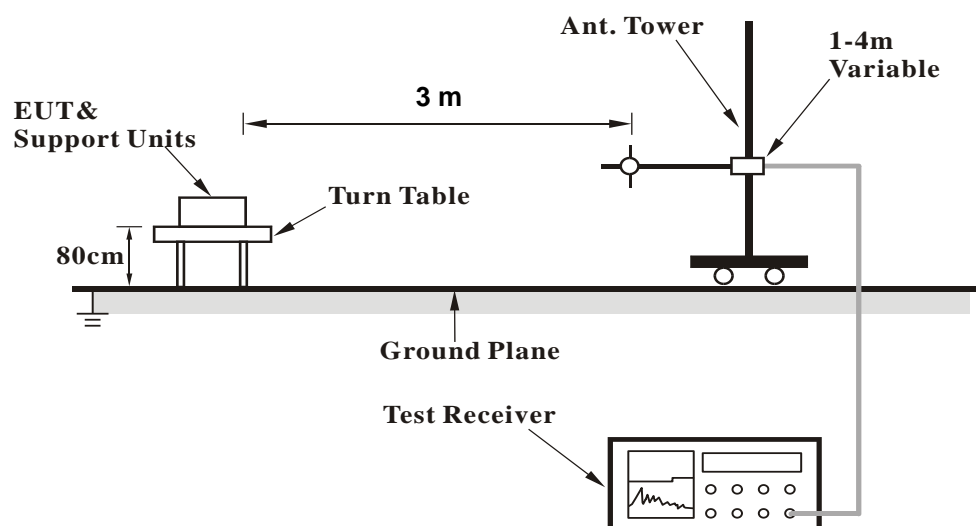
**Note:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

### 4.2.3 Deviation from Test Standard

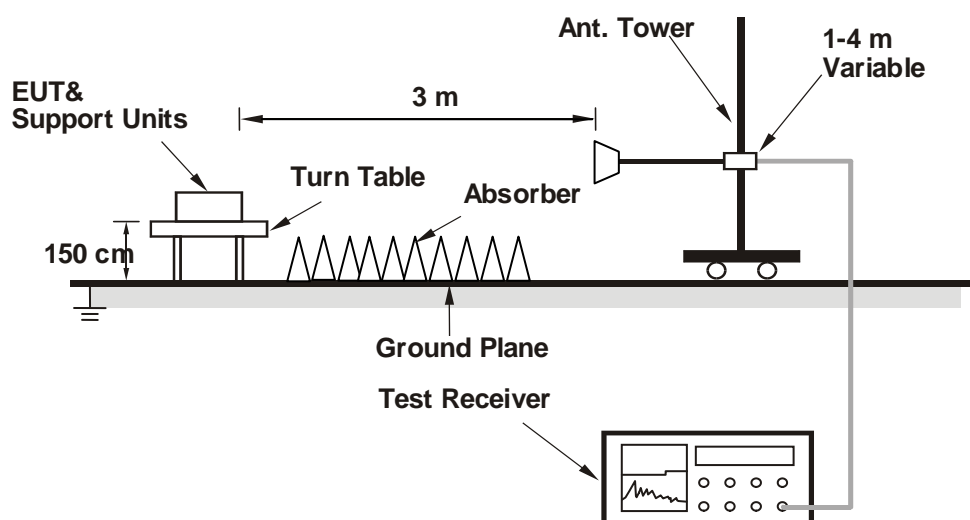
No deviation.

#### 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

WCDMA:

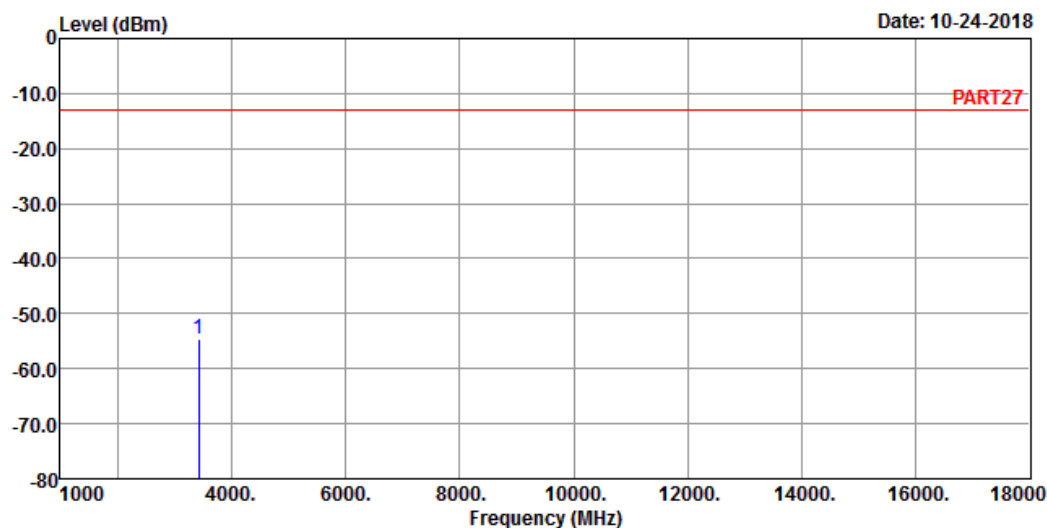
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART27 HORIZONTAL

Remark : WCDMA Band 4 Link\_L-CH

Tested by: Jisyong Wang

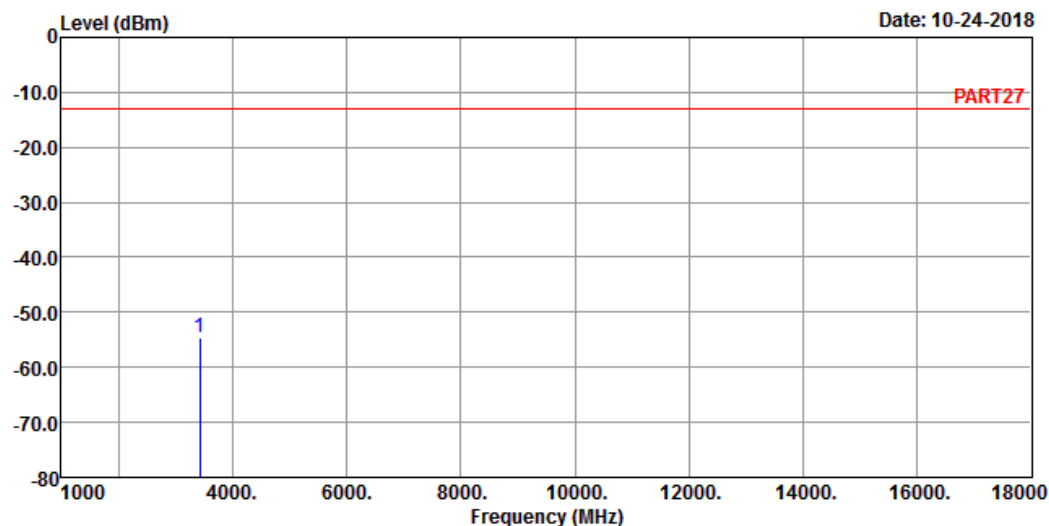
Freq	Level	Read	Limit	Over		Remark
		Level	Line	Limit	Factor	
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3424.80	-54.51	-45.42	-13.00	-41.51	-9.09	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5  
 Condition: PART27 VERTICAL  
 Remark : WCDMA Band 4 Link\_L-CH  
 Tested by: Jisyong Wang

		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3424.80	-54.72	-45.63	-13.00	-41.72	-9.09	Peak



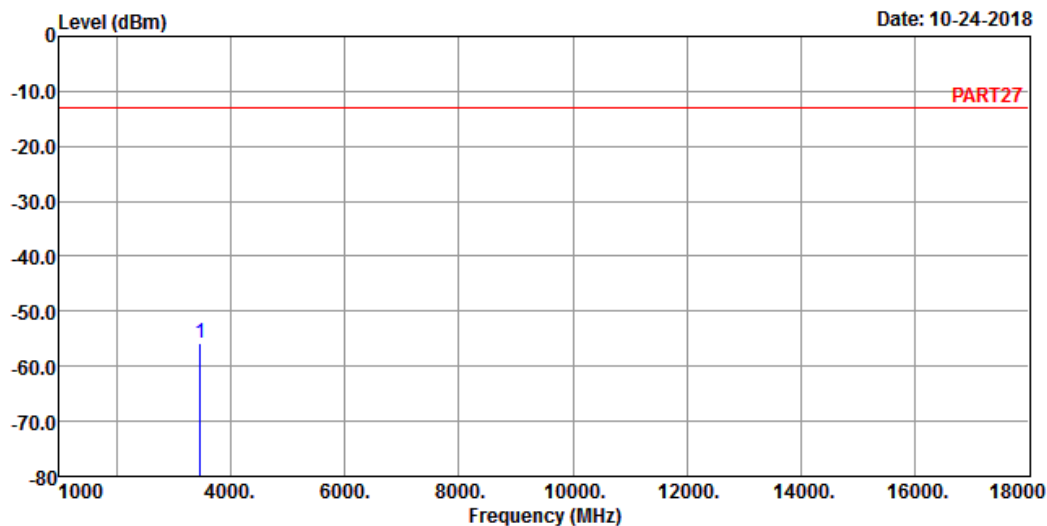
# Middle Channel



Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5  
Condition: PART27 HORIZONTAL  
Remark : WCDMA Band 4 Link\_M-CH  
Tested by: Jisyong Wang

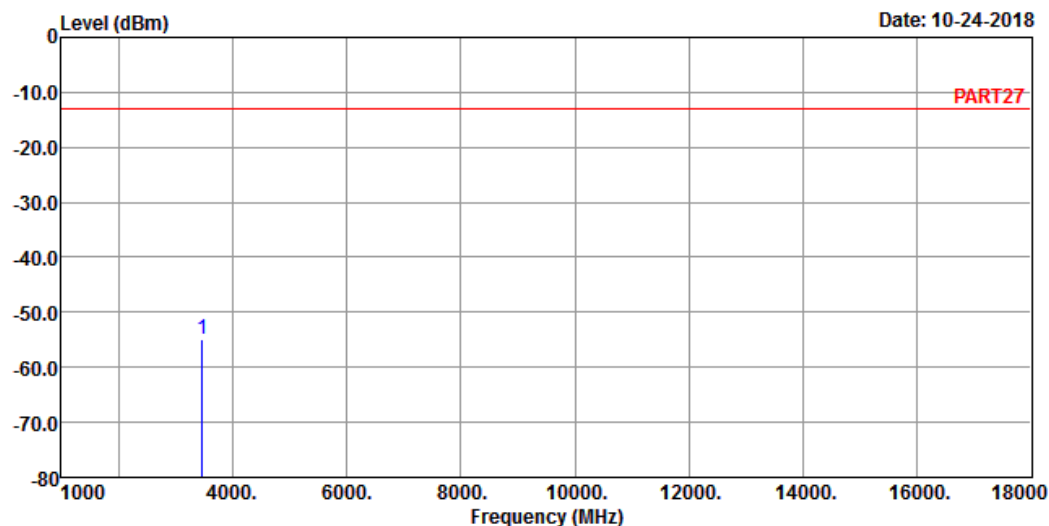
		Read	Limit	Over		
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3465.20	-55.90	-46.99	-13.00	-42.90	-8.91	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5  
Condition: PART27 VERTICAL  
Remark : WCDMA Band 4 Link\_M-CH  
Tested by: Jisyong Wang

Freq	Level	Read	Limit	Over	Factor	Remark
		Level	Line			
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3465.20	-54.76	-45.85	-13.00	-41.76	-8.91	Peak

# High Channel

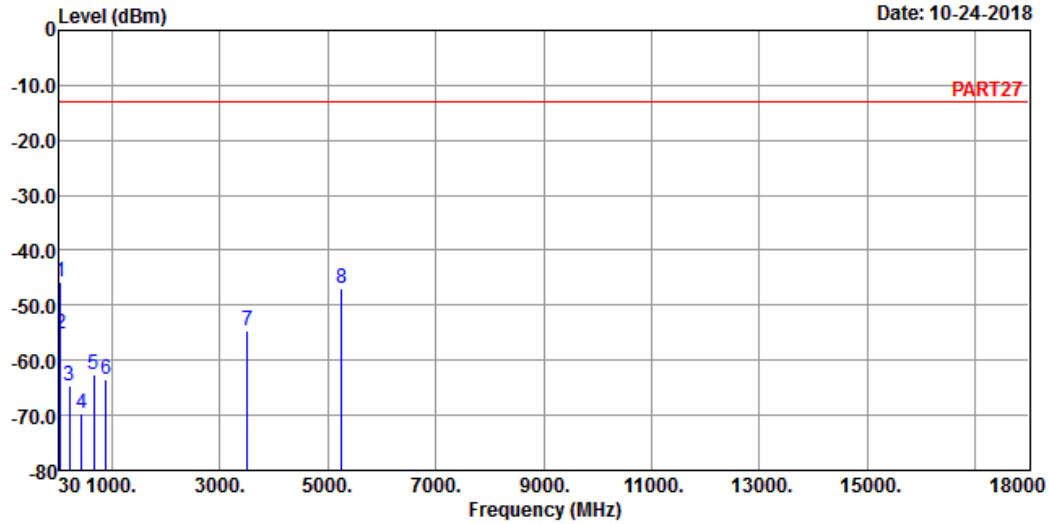


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 10-24-2018



Site : 966 Chamber 5  
Condition: PART27 HORIZONTAL  
Remark : WCDMA Band 4 Link\_H-CH  
Tested by: Jisyoung Wang

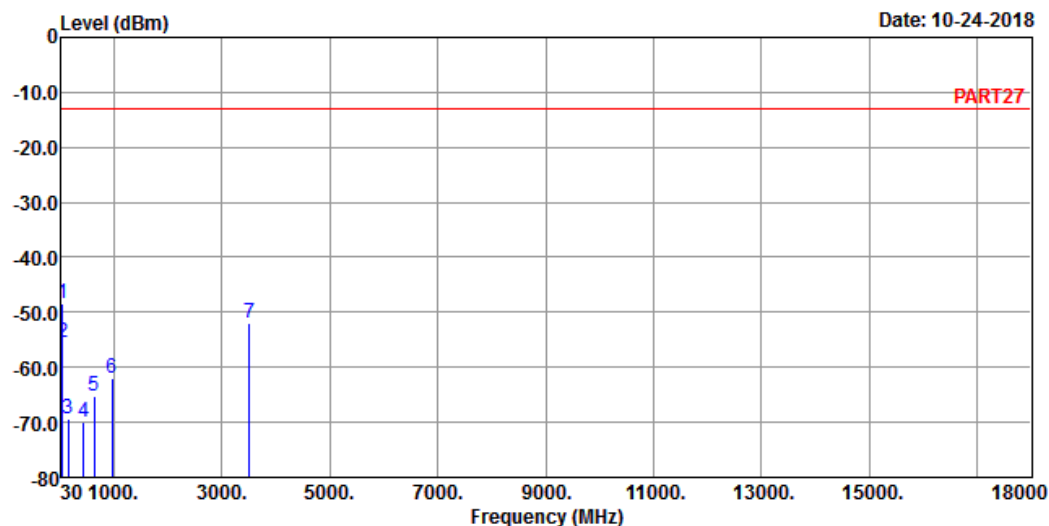
		Read	Limit	Over			
	Freq	Level	Level	Line	Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	43.58	-45.64	-44.17	-13.00	-32.64	-1.47	Peak
2	53.28	-55.10	-49.29	-13.00	-42.10	-5.81	Peak
3	220.12	-64.69	-57.49	-13.00	-51.69	-7.20	Peak
4	438.37	-69.75	-64.11	-13.00	-56.75	-5.64	Peak
5	666.32	-62.71	-62.08	-13.00	-49.71	-0.63	Peak
6	898.15	-63.41	-63.97	-13.00	-50.41	0.56	Peak
7	3505.20	-54.49	-46.38	-13.00	-41.49	-8.11	Peak
8	5257.80	-47.08	-44.60	-13.00	-34.08	-2.48	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6



Site : 966 Chamber 5

Condition: PART27 VERTICAL

Remark : WCDMA Band 4 Link\_H-CH

Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	45.52	-48.34	-45.84	-13.00	-35.34	-2.50	Peak
2	52.31	-55.60	-50.06	-13.00	-42.60	-5.54	Peak
3	161.92	-69.36	-64.38	-13.00	-56.36	-4.98	Peak
4	440.31	-70.08	-64.45	-13.00	-57.08	-5.63	Peak
5	636.25	-65.25	-64.40	-13.00	-52.25	-0.85	Peak
6	965.08	-62.11	-64.46	-13.00	-49.11	2.35	Peak
7	3505.20	-52.00	-43.89	-13.00	-39.00	-8.11	Peak

## 5 Pictures of Test Arrangements

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

## Appendix – 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 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:

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

**Hwa Ya EMC/RF/Safety**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

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

--- END ---