

FCC Test Report

(PART 24)

Report No.: RF151125C03-1

FCC ID: YA7-ATVT1549

Test Model: AX9

Received Date: Nov. 25, 2015

Test Date: Nov. 26, 2015 ~ Dec. 02, 2015

Issued Date: Dec. 10, 2015

Applicant: Atrack Technology Inc.

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(R.O.C.)

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

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Release Control Record

Issue No.	Description	Date Issued
RF151125C03-1	Original Release	Dec. 10, 2015

1 Certificate of Conformity

Product: Vehicle telematics

Brand: ATrack Technology Inc.

Test Model: AX9

Sample Status: Identical Prototype

Applicant: Atrack Technology Inc.

Test Date: Nov. 26, 2015 ~ Dec. 02, 2015

Standards: FCC Part 24, Subpart E

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Vera Huang, **Date:** Dec. 10, 2015

Vera Huang / Specialist

Approved by : Stanley Wu, **Date:** Dec. 10, 2015

Stanley Wu / Assistant Manager

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 24.232	Effective Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1046 24.232(d)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 24.235	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 24.238(b)	Occupied Bandwidth	Pass	Meet the requirement of limit.
24.238(b)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 24.238	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -22.13 dB at 3760.00 MHz.

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) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
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	Jan. 21, 2015	Jan. 21, 2016
Spectrum Analyzer Agilent	N9010A	MY52220314	Sep. 03, 2015	Sep. 02, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 10, 2014	Dec. 09, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 04, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Feb. 09, 2015	Feb. 09, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Feb. 04, 2015	Feb. 04, 2016
Preamplifier EMCI	EMC 012645	980115	Dec. 12, 2014	Dec. 11, 2015
Preamplifier EMCI	EMC 184045	980116	Jan. 09, 2015	Jan. 08, 2016
Preamplifier EMCI	EMC 330H	980112	Dec. 27, 2014	Dec. 26, 2015
Power Meter Anritsu	ML2495A	1232002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor Anritsu	MA2411B	1207325	Sep. 21, 2015	Sep. 20, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 12, 2015	Oct. 11, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 12, 2015	Oct. 11, 2016
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 12, 2015	Oct. 11, 2016
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

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 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 FCC Site Registration No. is 690701.
 5. The IC Site Registration No. is IC7450F-10.

3 General Information

3.1 General Description of EUT

Product	Vehicle telematics				
Brand	ATrack Technology Inc.				
Test Model	AX9				
Power Supply Rating	12Vdc (DC Power Supply)				
Modulation Type	CDMA	QPSK, OQPSK, HPSK			
Frequency Range	CDMA	1851.3 ~ 1908.8 MHz			
Max. EIRP Power	CDMA	185.52 mW			
Emission Designator	CDMA	1M28F9W			
Antenna Type	Fixed Internal Antenna				
Accessory Device	Refer to Note as below				
Data Cable Supplied	Refer to Note as below				

Note:

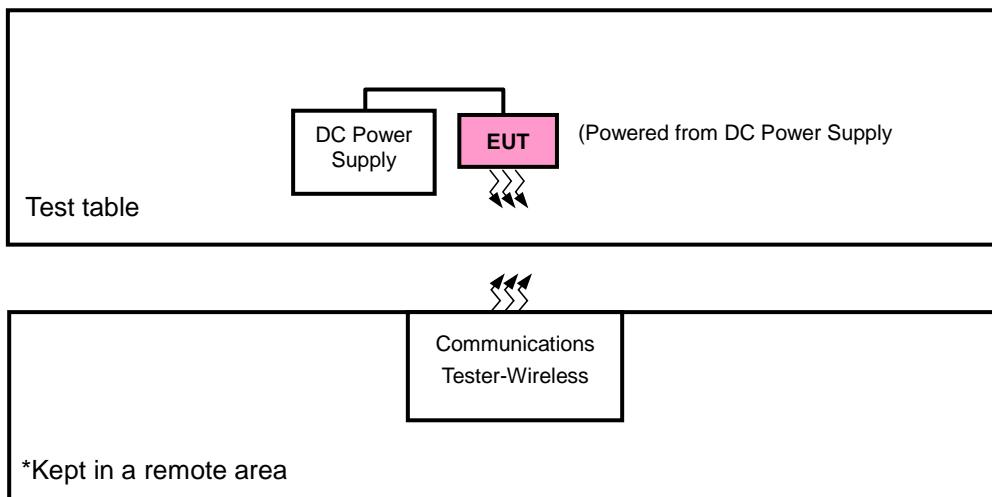
1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	East Trans Tech Co., Ltd.	AB01-0006	3.7Vdc, 100mAh
USB Cable	SHEN ZHEN BASITAI COMPUTER FITING CO., LTD	N/A	1.2m shielded cable w/o core

2. The above EUT information is declared by 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

<Radiated Emission Test & E.I.R.P. Test>



3.2.1 Description of Support Units

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

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Communications Tester-Wireless	Agilent	E5515C	MY52102544	N/A
2.	DC Power Supply	Topward	33010D	807748	N/A

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

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item 1 acted as communication partner to transfer data.

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
CDMA	Z-plane	Z-axis

CDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	25 to 1175	25, 600, 1175	1xRTT
-	Frequency Stability	25 to 1175	600	1xRTT
-	Occupied Bandwidth	25 to 1175	25, 600, 1175	1xRTT
-	Band Edge	25 to 1175	25, 1175	1xRTT
-	Peak to Average Ratio	25 to 1175	25, 600, 1175	1xRTT
-	Conducted Emission	25 to 1175	600	1xRTT
-	Radiated Emission	25 to 1175	600	1xRTT

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	12Vdc	Gavin Wu
Frequency Stability	26 deg. C, 58 % RH	12Vdc	Carlos Chen
Occupied Bandwidth	26 deg. C, 58 % RH	12Vdc	Carlos Chen
Band Edge	26 deg. C, 58 % RH	12Vdc	Carlos Chen
Peak to Average Ratio	26 deg. C, 58 % RH	12Vdc	Carlos Chen
Conducted Emission	26 deg. C, 58 % RH	12Vdc	Carlos Chen
Radiated Emission	25 deg. C, 65 % RH	12Vdc	Gavin Wu

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 24

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

Mobile / Portable station are limited to 2 watts e.i.r.p.

4.1.2 Test Procedures

EIRP / ERP Measurement:

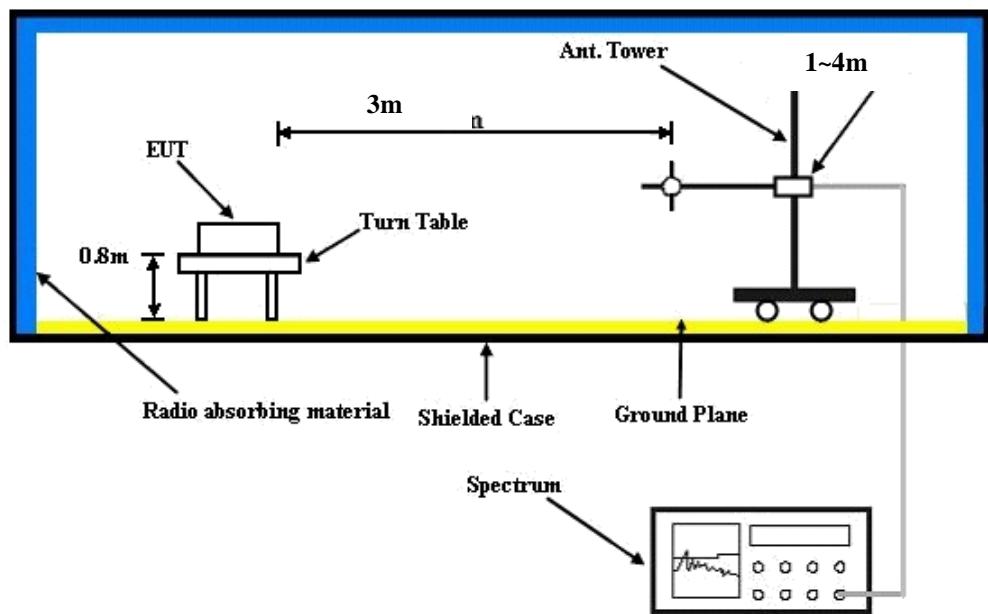
- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1 MHz for GSM, GPRS & EDGE, 5 MHz for WCDMA and CDMA, and 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m height of 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 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 from E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

Conducted Power Measurement:

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

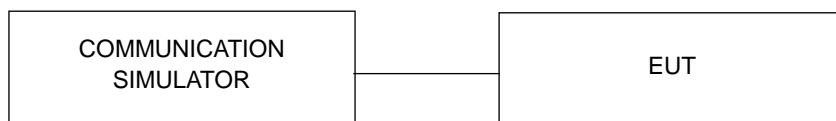
4.1.3 Test Setup

EIRP / ERP Measurement:



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

Conducted Power Measurement:



4.1.4 Test Results

Conducted Output Power (dBm)

Band	CDMA		
Channel	25	600	1175
Frequency (MHz)	1851.25	1880	1908.75
RC1+SO55	24.14	25.05	25.36
RC3+SO55	24.18	25.10	25.38
RC3+SO32 (+F-SCH)	24.12	25.02	25.35
RC3+SO32 (+SCH)	24.09	25.00	25.32
RC1+SO3, 1/8 Rate	24.06	24.98	25.31

EIRP Power (dBm)

CDMA							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	25	1851.25	-14.26	36.57	22.31	170.29	H
	600	1880.00	-14.54	37.22	22.68	185.52	
	1175	1908.75	-14.96	37.18	22.22	166.80	
	25	1851.25	-19.65	37.65	18.00	63.11	V
	600	1880.00	-19.22	37.58	18.36	68.60	
	1175	1908.75	-19.36	37.48	18.12	64.86	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

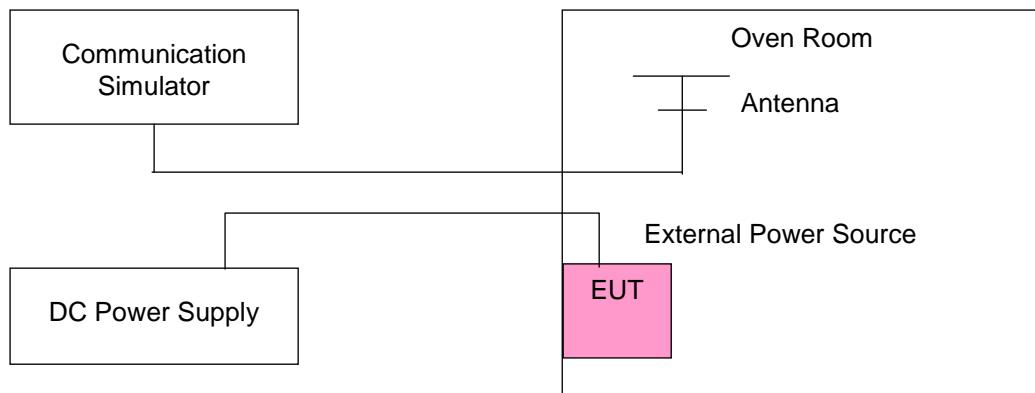
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

4.2.2 Test Procedure

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

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

4.2.3 Test Setup



4.2.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	Frequency Error (ppm)	Limit (ppm)
	CDMA	
8	0.001	2.5
12	0.002	2.5
36	0.001	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 8Vdc to 36Vdc.

Frequency Error vs. Temperature

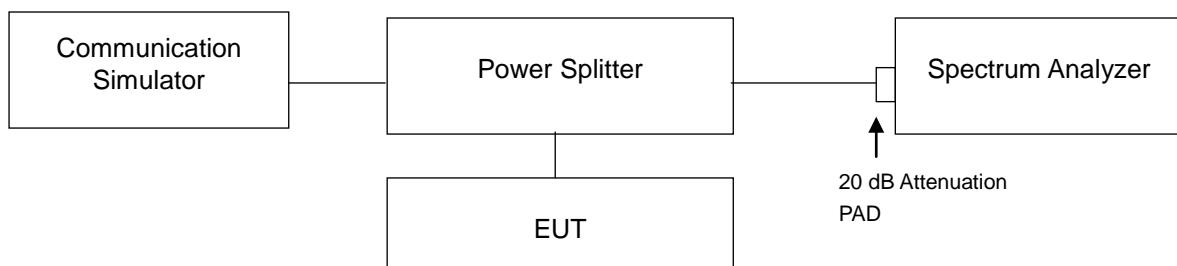
Temp. (°C)	Frequency Error (ppm)	Limit (ppm)
	CDMA	
-30	0.003	2.5
-20	0.002	2.5
-10	0.002	2.5
0	0.002	2.5
10	0.001	2.5
20	-0.001	2.5
30	-0.001	2.5
40	-0.002	2.5
50	-0.002	2.5
60	-0.001	2.5

4.3 Occupied Bandwidth Measurement

4.3.1 Test Procedure

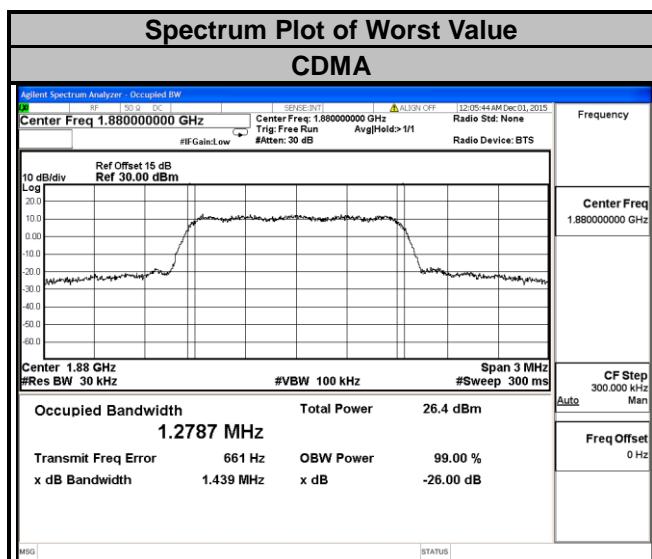
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

4.3.2 Test Setup



4.3.3 Test Result

Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)
		CDMA
25	1851.25	1.2770
600	1880.00	1.2787
1175	1908.75	1.2786

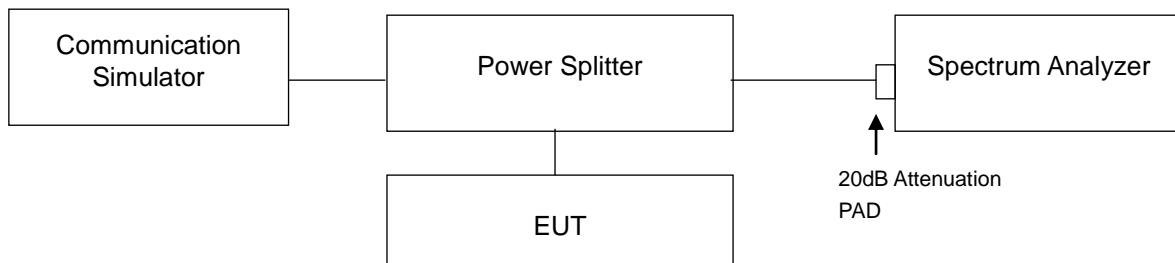


4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

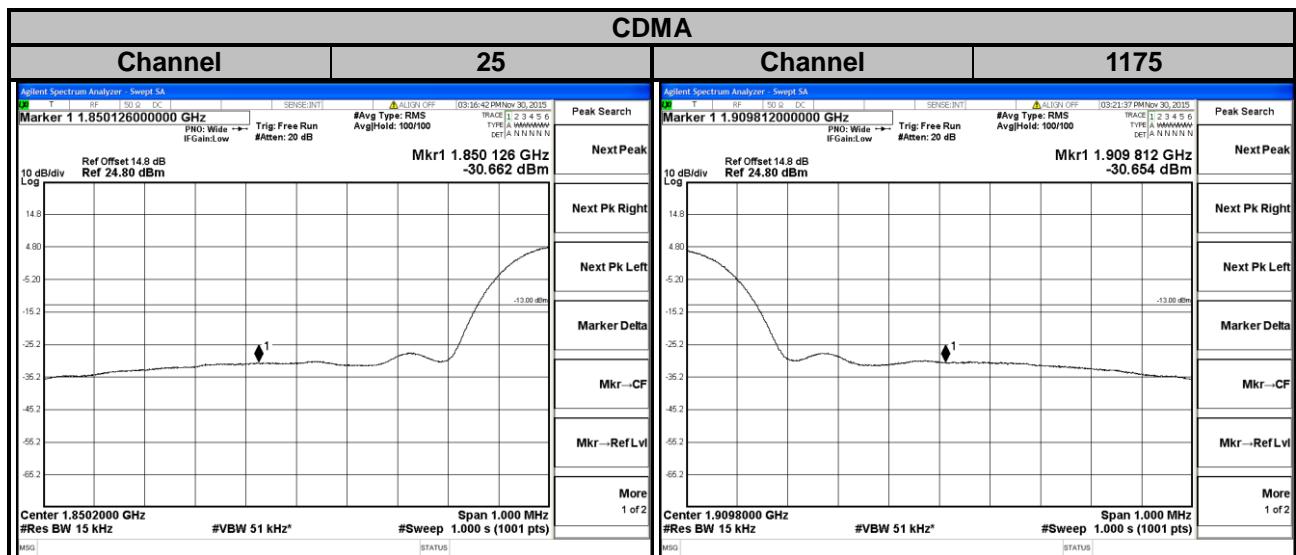
4.4.2 Test Setup



4.4.3 Test Procedures

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 13 kHz and VB of the spectrum is 51 kHz (CDMA).
- Record the max trace plot into the test report.

4.4.4 Test Results

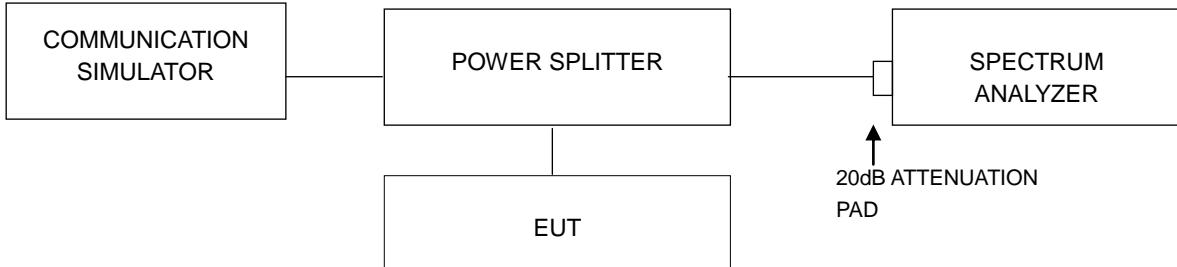


4.5 Peak to Average Ratio

4.5.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.5.2 Test Setup

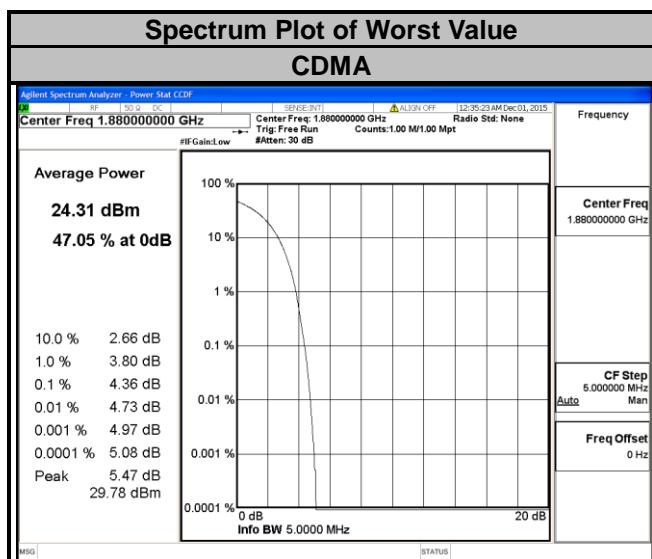


4.5.3 Test Procedures

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

4.5.4 Test Results

Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		CDMA
25	1851.25	4.16
600	1880.00	4.36
1175	1908.75	3.88

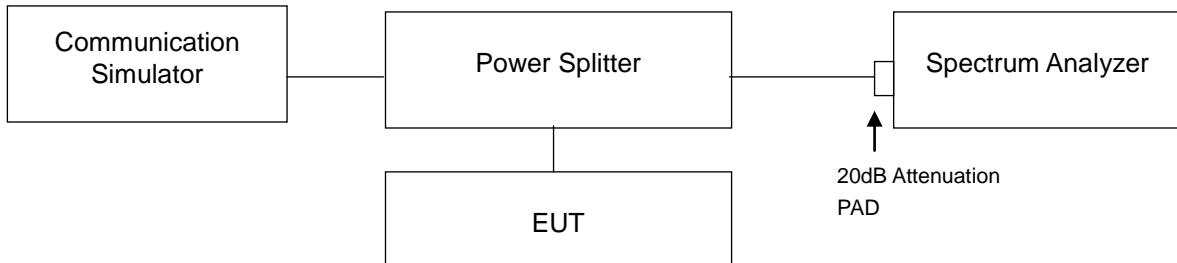


4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13 dBm.

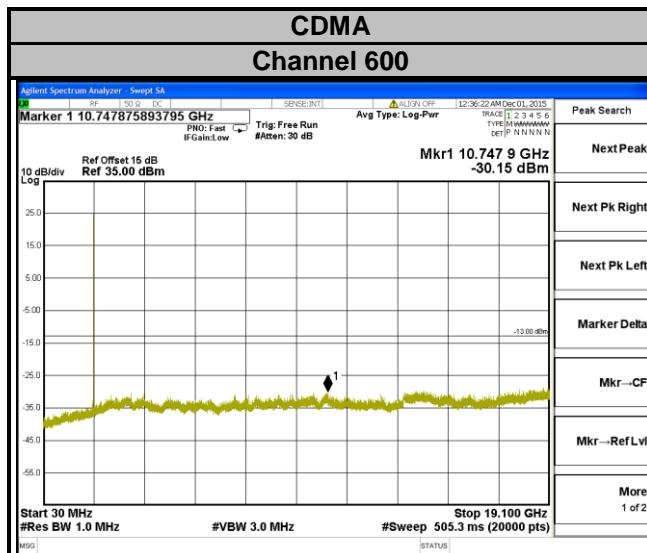
4.6.2 Test Setup



4.6.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 19 GHz. 20 dB attenuation pad is connected with spectrum. RBW=1 MHz and VBW=3 MHz is used for conducted emission measurement.

4.6.4 Test Results



4.7 Radiated Emission Measurement

4.7.1 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.

4.7.2 Test Procedure

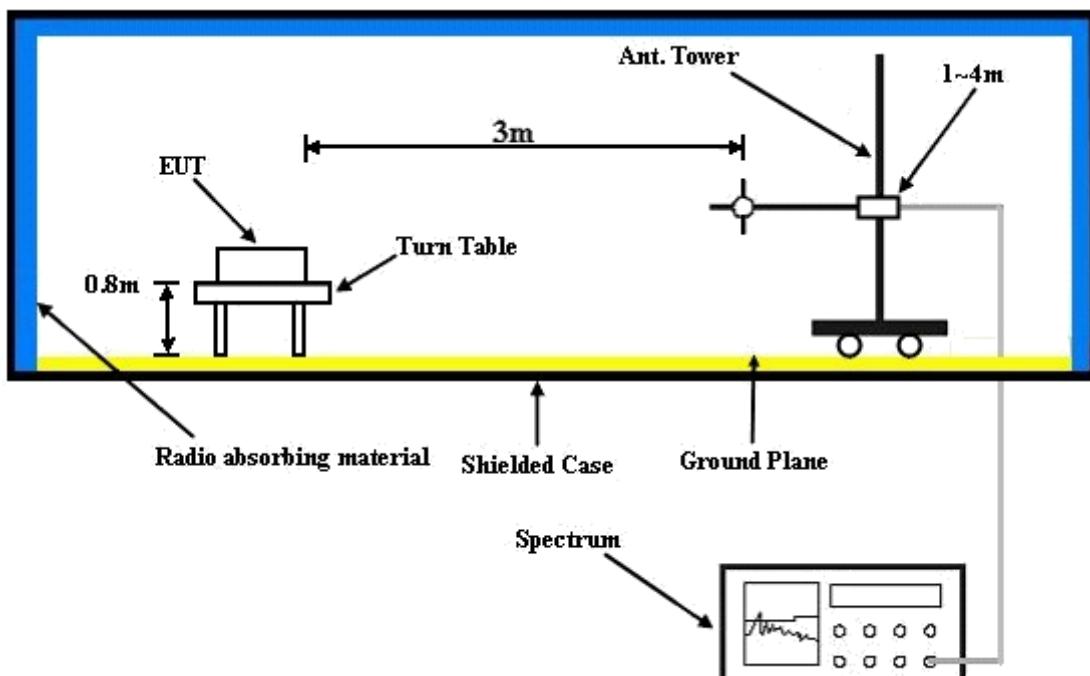
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height 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 dBi.

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

4.7.3 Deviation from Test Standard

No deviation.

4.7.4 Test Setup



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

4.7.5 Test Results

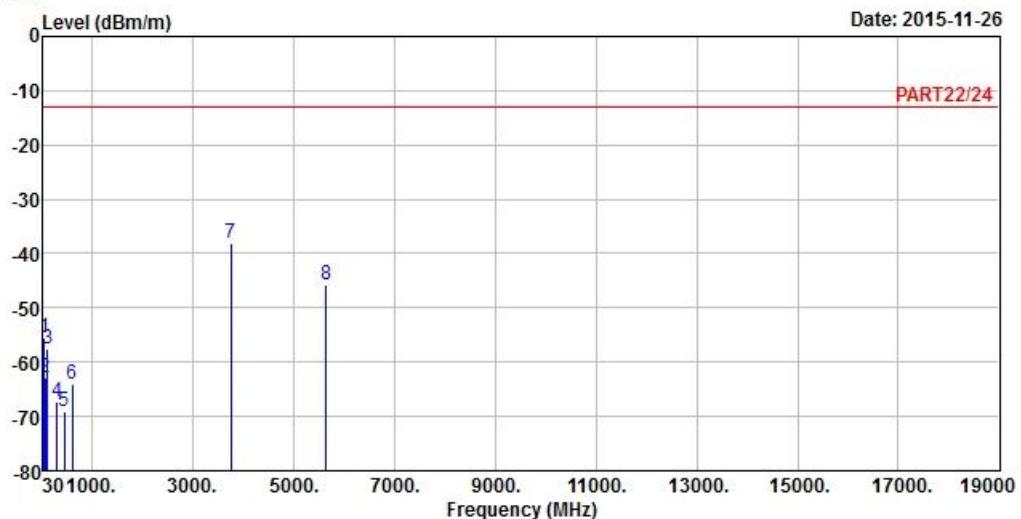
CDMA:



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Data: 9



Site : 966 Chamber 5
 Condition: PART22/24 3m HORIZONTAL
 Remark : CDMA BC1
 Tested by: Gavin Wu
 Plane : Z

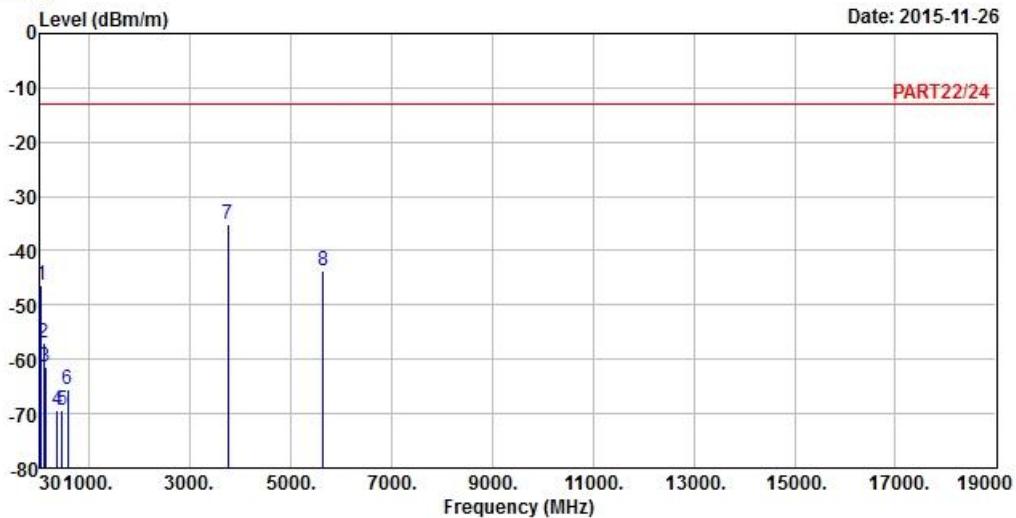
Freq	Level	Read	Limit	Over	Factor	Remark
		MHz	dBm/m	dBm		
1	43.77	-55.62	-54.15	-13.00	-42.62	-1.47 Peak
2	62.94	-62.89	-55.01	-13.00	-49.89	-7.88 Peak
3	107.22	-57.53	-47.16	-13.00	-44.53	-10.37 Peak
4	305.60	-67.25	-60.33	-13.00	-54.25	-6.92 Peak
5	444.20	-69.03	-63.43	-13.00	-56.03	-5.60 Peak
6	612.20	-64.13	-63.35	-13.00	-51.13	-0.78 Peak
7 pp	3760.00	-38.02	-29.96	-13.00	-25.02	-8.06 Peak
8	5640.00	-45.88	-43.94	-13.00	-32.88	-1.94 Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10



Site : 966 Chamber 5

Condition: PART22/24 3m VERTICAL

Remark : CDMA BC1

Tested by: Gavin Wu

Plane : Z

Freq	Level	Read	Limit	Over	Factor	Remark
		MHz	dBm/m	dBm		
1	44.31	-46.22	-44.23	-13.00	-33.22	-1.99 Peak
2	104.52	-56.84	-46.40	-13.00	-43.84	-10.44 Peak
3	133.68	-61.54	-52.86	-13.00	-48.54	-8.68 Peak
4	369.30	-69.46	-63.34	-13.00	-56.46	-6.12 Peak
5	465.20	-69.43	-64.17	-13.00	-56.43	-5.26 Peak
6	582.80	-65.49	-64.01	-13.00	-52.49	-1.48 Peak
7 pp	3760.00	-35.13	-27.07	-13.00	-22.13	-8.06 Peak
8	5640.00	-43.75	-41.81	-13.00	-30.75	-1.94 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 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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