



**BUREAU  
VERITAS**

Test Report No.: RF130516N019-2



Test Lab  
Cert 2951.01

# FCC TEST REPORT (PART 24)

**REPORT NO.:** RF130516N019-1  
**MODEL NO.:** MV640VR  
**FCC ID:** PH7MV640  
**RECEIVED:** May 16, 2013  
**TESTED:** May 16 ~ May 27, 2013  
**ISSUED:** May 27, 2013

**APPLICANT:** Axesstel Inc.

**ADDRESS:** 6815 Flanders Drive, Suite 210 ,San Diego, CA 92121

**ISSUED BY:** Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch

**LAB ADDRESS:** No. 34, Chenwulu Section, Guantai Road, Houjie  
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**TEST LOCATION:** No. 34, Chenwulu Section, Guantai Road, Houjie  
Town, Dongguan City, Guangdong 523942, China

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**Bureau Veritas Shenzhen Co., Ltd.  
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**BUREAU**  
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Test Report No.: RF130516N019-2

## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130516N019-2	Original release	May 27, 2013



## 1 CERTIFICATION

**PRODUCT:** CDMA 1x EV-DO rev.B Router

**MODEL:** MV640VR

**BRAND:** AXESSTEL Inc.

**APPLICANT:** Axesstel Inc.

**TESTED:** May 16, 2013 ~ May 27, 2013

**TEST SAMPLE:** Production Unit

**STANDARDS:** FCC Part 24, Subpart E

The above equipment (model: MV640VR) has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan 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.

**TESTED BY** : \_\_\_\_\_ , **DATE** : May 27, 2013  
Kent Liu / Project Engineer

**APPROVED BY** : \_\_\_\_\_ , **DATE** : May 27, 2013  
Sam Tung / Technical Manager



## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 24 & Part 2			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
2.1046 24.232	Equivalent Isotropic Radiated Power	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.

### 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	9kHz~30MHz	2.94dB
Radiated emissions	30MHz ~ 1GHz	3.64dB
	1GHz ~ 18GHz	2.2dB
	18GHz ~ 40GHz	1.94dB

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

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 24,13	Apr. 23,14
EMI Test Receiver	Rohde&Schwarz	ESVD	847398/003	May 14,13	May 13,14
Bilog Antenna (25MHz-2GHz)	Teseq	CBL 6111D	27089	Jul. 16,12	Jul. 15,13
Horn Antenna (1GHz -18GHz)	EMCO	3117	00062558	Oct.18,12	Oct.17,13
Pre-Amplifier (20MHz-3GHz)	EMCI	EMC 330	980095	Nov. 02,12	Nov.01,13
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 14,13	May 13,14
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,13	Mar. 23,14
Digital Multimeter	FLUKE	15B	A1220010D G	Oct. 31,12	Oct. 30,13
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA91702 42	Jan. 04,12	Jan. 03,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,12	Nov. 03,13
Universal Radio Communication Tester	Rohde&Schwarz	CMU 200	123259	Apr. 16,12	Apr. 15,14
Test Software	ADT	ADT_Radiated_V7.6.15	N/A	N/A	N/A

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.
  2. The test was performed in Dongguan Chamber 10m.
  3. The horn antenna are used only for the measurement of emission frequency above 1GHz if tested.
  4. The FCC Site Registration No. is 502831.



### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	CDMA 1x EV-DO rev.B Router
<b>MODEL NO.</b>	MV640VR
<b>POWER SUPPLY</b>	9VDC from adapter 7.4VDC from battery
<b>MODULATION TYPE</b>	<b>CDMA &amp; 1xEVDO:</b> QPSK, OQPSK, HPSK
<b>FREQUENCY RANGE</b>	<b>CDMA &amp; 1xEVDO:</b> 1851.25MHz ~ 1908.75MHz
<b>MAX. EIRP POWER</b>	0.67 Watts
<b>ANTENNA TYPE</b>	Fixed Internal antenna with 0 dBi gain
<b>I/O PORTS</b>	Refer to user's manual
<b>CABLE SUPPLIED</b>	DIAG to USB Cable: Unshielded, Detachable,0.8m
<b>ACCESSORY DEVICES</b>	N/A

**NOTE:**

1. WLAN&WWAN technologies are used for the EUT.
2. The EUT was powered by the following adapters:

ADAPTER	
BRAND:	TENWEI
MODEL:	TA850014
INPUT:	AC 100-240V, 50/60Hz, 0.45A
OUTPUT:	DC 9V, 2A
DC LINE:	Unshielded, Undetachable,1.8m

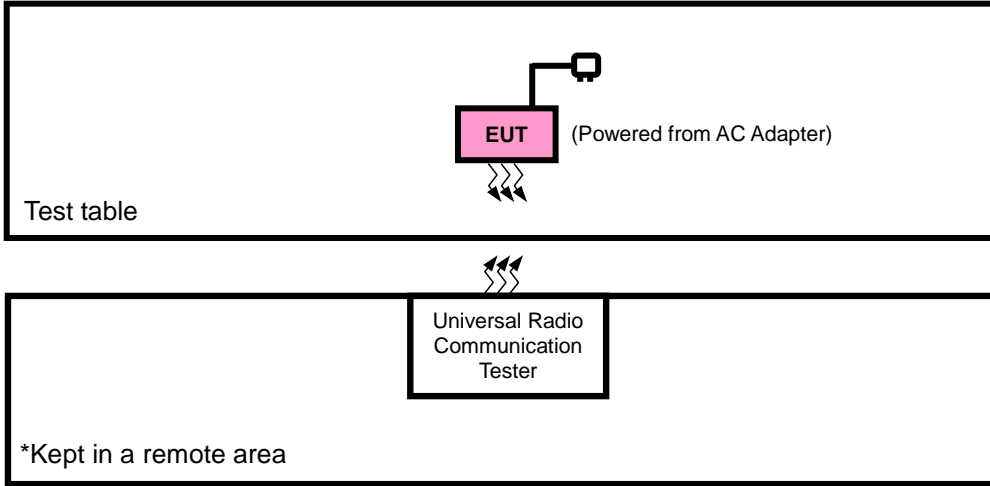
3. The above EUT information was declared by manufacturer and for more detailed feature description, please refer to the manufacturer's specifications or User's Manual.
4. The additional models MV640, MV640R, MV640V are identical in test model MV640VR except product name and product function ( V: VOIP, R : RUIM).

Model	Function
MV640	-
MV640R	RUIM
MV640V	VOIP
MV640VR	VOIP & RUIM





### 3.2 CONFIGURATION OF SYSTEM UNDER TEST FOR RADIATION EMISSION 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	N/A				

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A

**NOTE:** All power cords of the above support units are non shielded (1.8m).



### 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-axis for EIRP and radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	DESCRIPTION
A	EUT + Adapter with CDMA link
B	EUT + Battery with CDMA link

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
A	EIRP	25 to 1175	25, 600, 1175	RC3+SO32(+ F-SCH)
A	FREQUENCY STABILITY	25 to 1175	600	RC3+SO32(+ F-SCH)
A	OCCUPIED BANDWIDTH	25 to 1175	25, 600, 1175	RC3+SO32(+ F-SCH)
A	BAND EDGE	25 to 1175	25, 1175	RC3+SO32(+ F-SCH)
A	CONDCUDED EMISSION	25 to 1175	600	RC3+SO32(+ F-SCH)
A	RADIATED EMISSION	25 to 1175	600	RC3+SO32(+ F-SCH)
A	RADIATED EMISSION	25 to 1175	600	RC3+SO32(+ F-SCH)

#### TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
EIRP	21deg. C, 62%RH	9Vdc from adapter	Venless Long
FREQUENCY STABILITY	21deg. C, 62%RH	7.4Vdc from battery	Venless Long
OCCUPIED BANDWIDTH	21deg. C, 62%RH	9Vdc from adapter	Venless Long
BAND EDGE	21deg. C, 62%RH	9Vdc from adapter	Venless Long
CONDCUDED EMISSION	21deg. C, 62%RH	9Vdc from adapter	Venless Long
RADIATED EMISSION	25deg. C, 60%RH	9Vdc from adapter	Venless Long



### 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 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 and portable stations are limited to 2 watts EIRP

#### 4.1.2 TEST PROCEDURES

##### EIRP MEASUREMENT:

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5MHz for CDMA mode.
- b. 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.
- 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.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn.}$

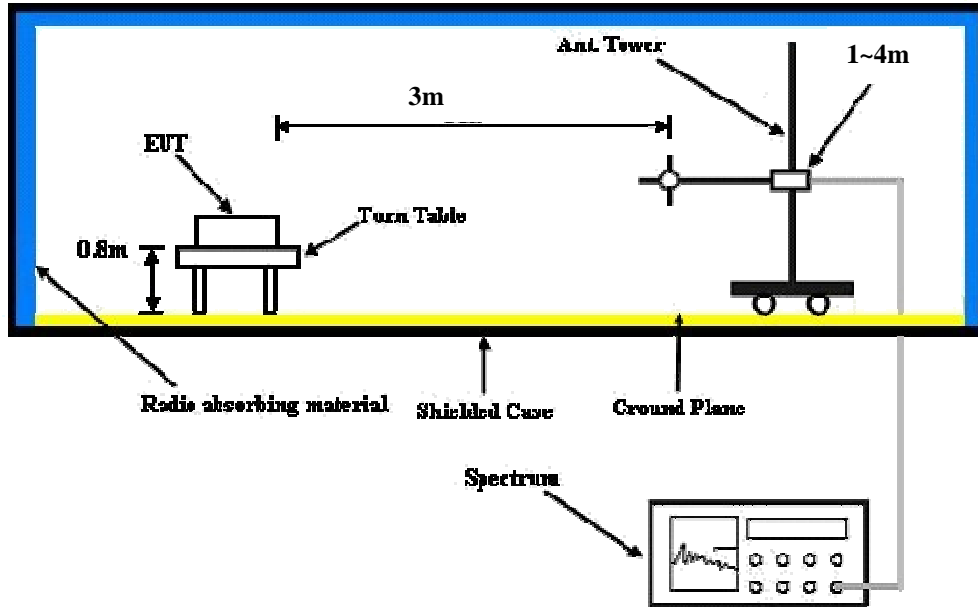
##### CONDUCTED POWER MEASUREMENT:

The EUT was set up for the maximum power with CDMA 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.



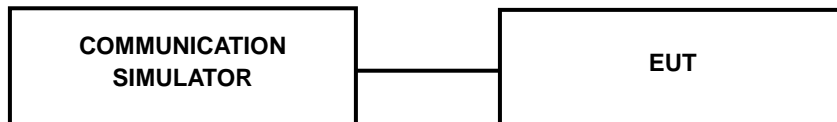
### 4.1.3 TEST SETUP

#### EIRP 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)

Band	CDMA2000 BC1		
Channel	25	600	1175
Frequency (MHz)	1851.25	1880	1908.75
RC1+SO55	23.82	23.45	23.50
RC3+SO55	23.85	23.38	23.22
RC3+SO32(+ F-SCH)	<b>23.91</b>	23.37	23.31
RC3+SO32(+SCH)	23.79	23.35	22.94
RTAP 153.6	23.83	23.33	22.75
RETAP 4096	23.88	23.40	22.59

##### EIRP POWER (dBm)

##### FOR 1xRTT RC3+SO32(+ F-SCH) MODE

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(W)	Polarization (H/V)
25	1851.25	-22.86	44.03	21.17	0.13	H
600	1880	-22.27	44.37	22.10	0.16	H
1175	1908.75	-21.78	43.25	21.47	0.14	H
<b>25</b>	<b>1851.25</b>	<b>-18.21</b>	<b>46.45</b>	<b>28.24</b>	<b>0.67</b>	<b>V</b>
600	1880	-17.57	45.72	28.15	0.65	V
1175	1908.75	-17.28	45.03	27.75	0.60	V

**REMARKS:** 1. EIRP Output Power (dBm) = SPA Reading (dBm) + Correction Factor (dB).

2. Correction factor (dB) = Free Space Loss + Antenna Factor + Cable Loss



## 4.2 FREQUENCY STABILITY MEASUREMENT

### 4.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

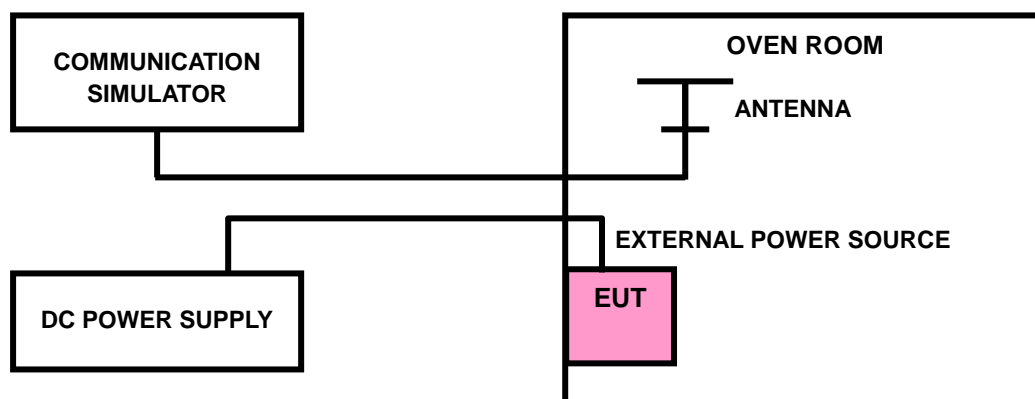
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### 4.2.2 TEST PROCEDURE

- 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.
- 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.
- 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

##### 1xRTT RC3+SO32(+ F-SCH) MODE

##### FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)	LIMIT (ppm)
8.5	-0.012	2.5
7.4	-0.018	2.5
6.3	-0.019	2.5

**NOTE:** The applicant defined the normal working voltage of the battery is from 6.3Vdc to 8.5Vdc.

##### FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	FREQUENCY ERROR (ppm)	LIMIT (ppm)
-20	-0.01	2.5
-10	-0.02	2.5
0	-0.011	2.5
10	-0.013	2.5
20	-0.013	2.5
30	-0.012	2.5
40	-0.016	2.5
50	-0.014	2.5
55	-0.016	2.5



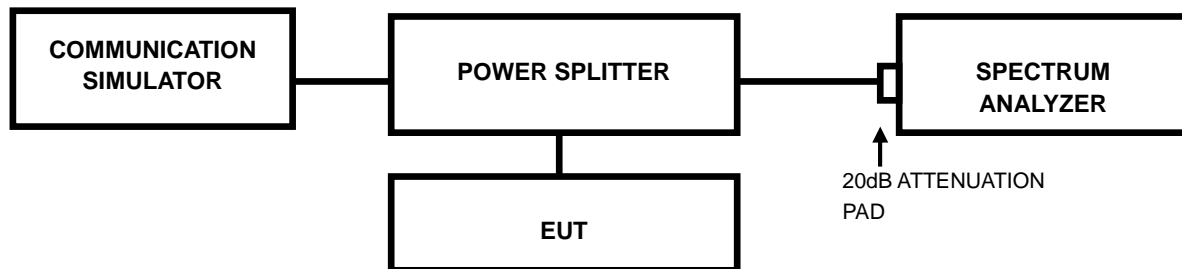


### 4.3 OCCUPIED BANDWIDTH MEASUREMENT

#### 4.3.1 TEST PROCEDURES

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

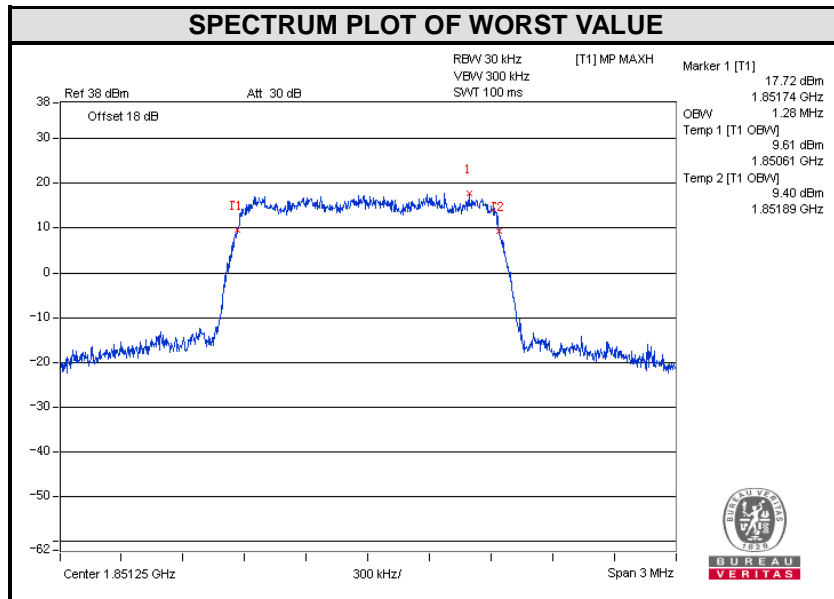




### 4.3.3 TEST RESULTS

#### 1xRTT RC3+SO32(+ F-SCH) MODE

CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)
25	1851.25	1.28
600	1880	1.28
1175	1908.75	1.28



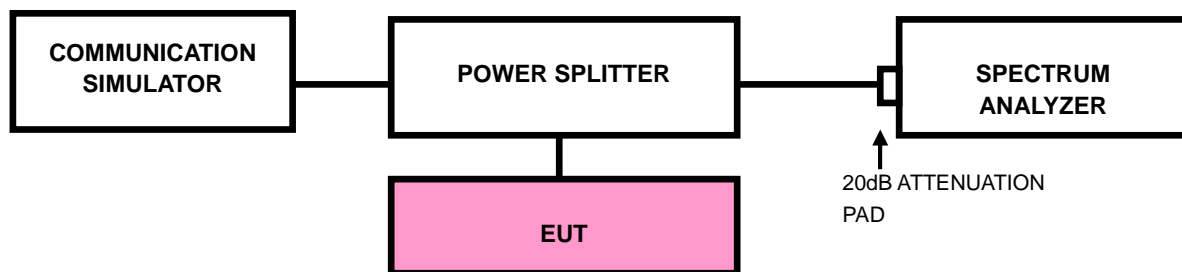


## 4.4 BAND EDGE MEASUREMENT

### 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

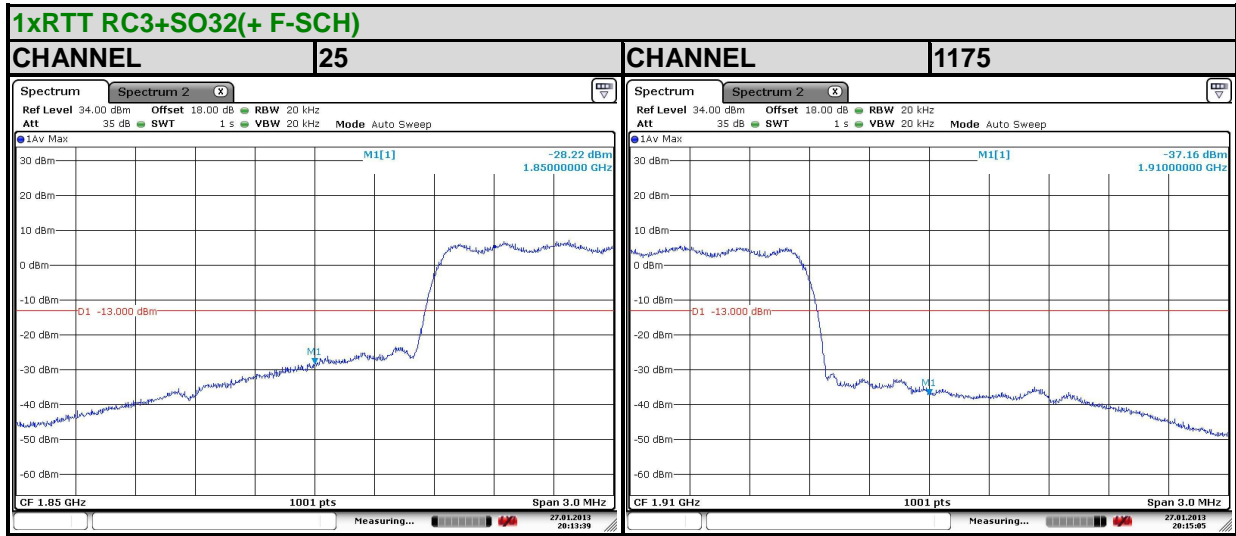


### 4.4.3 TEST PROCEDURES

- a. All measurements were done at low and high operational frequency range.
- b. The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 13kHz and VB of the spectrum is 51kHz.
- c. Record the max trace plot into the test report.



### 4.4.4 TEST RESULTS





## 4.5 CONDUCTED SPURIOUS EMISSIONS

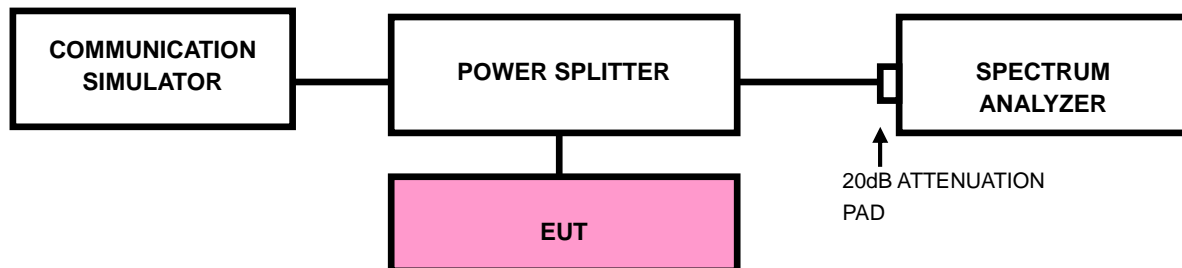
### 4.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

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  $-13\text{dBm}$ .

### 4.5.2 TEST PROCEDURE

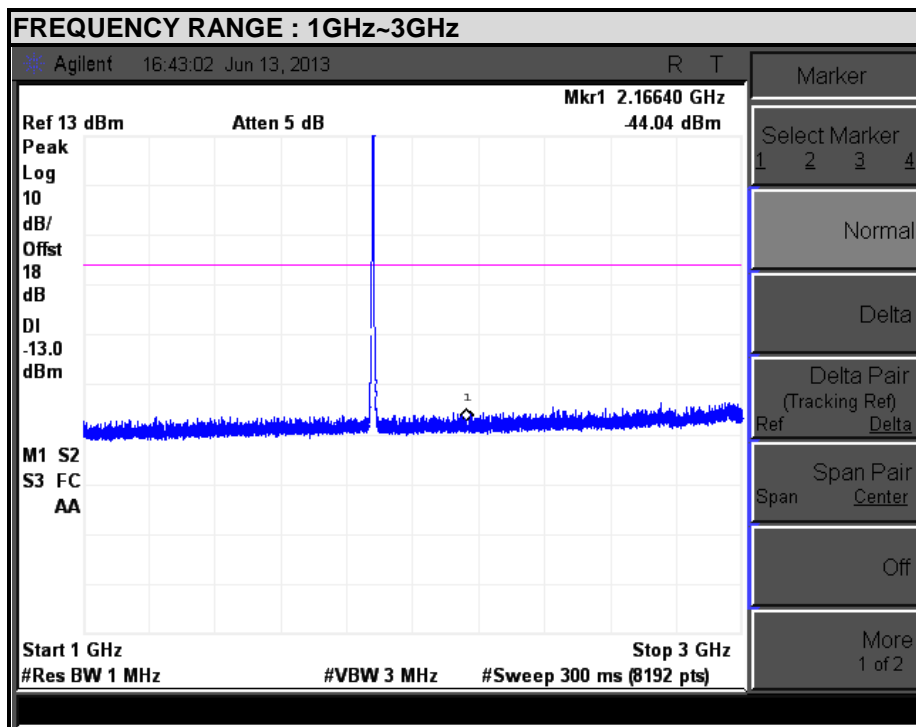
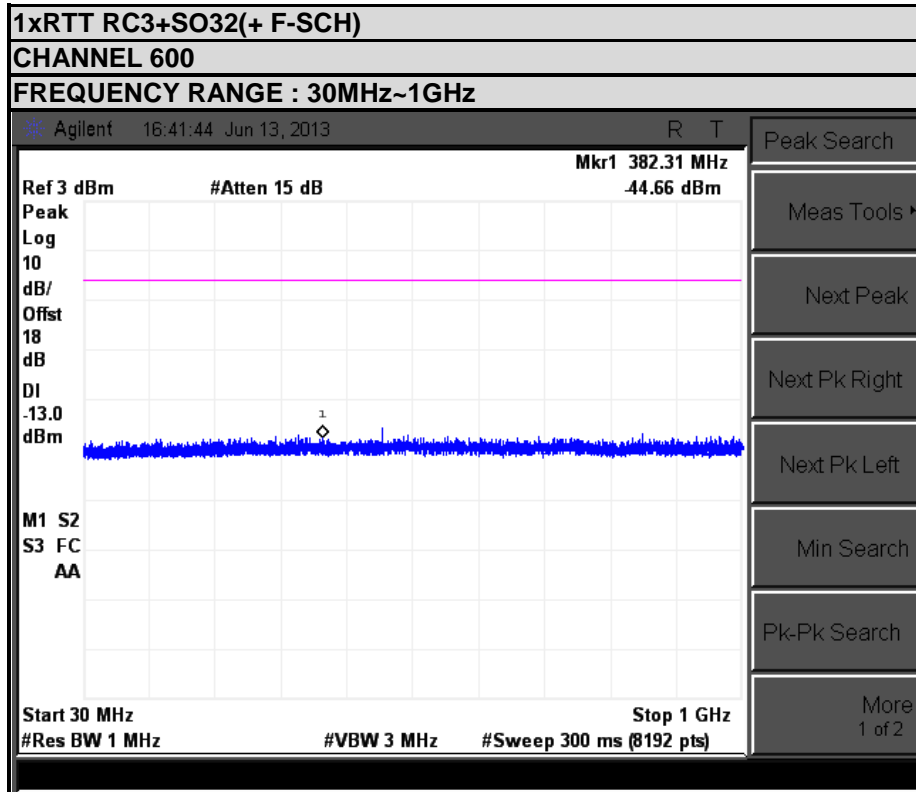
- a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- b. Measuring frequency range is from 9 kHz to 19.1GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

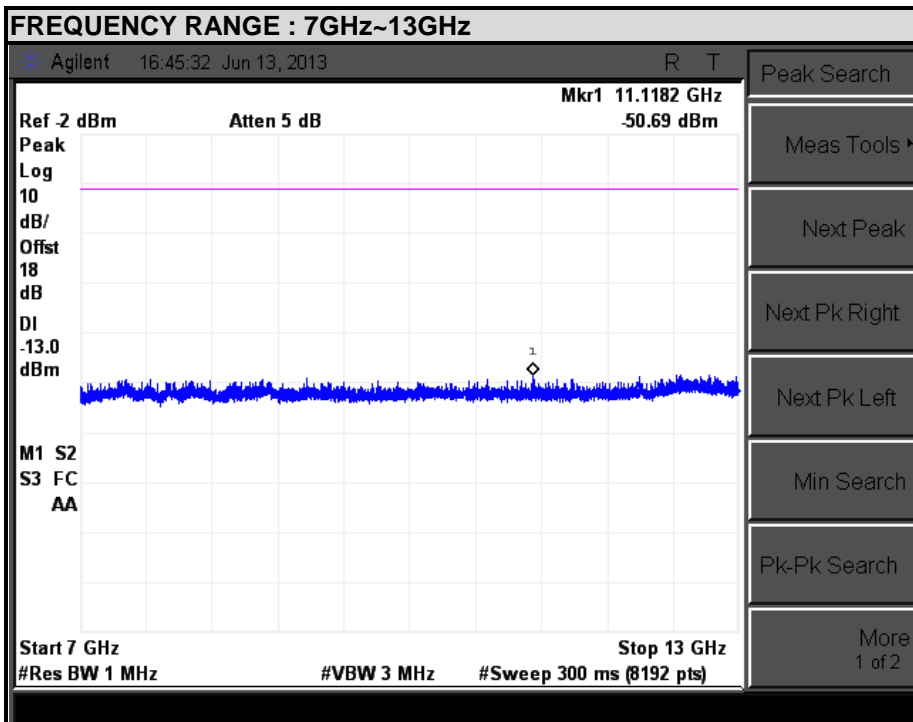
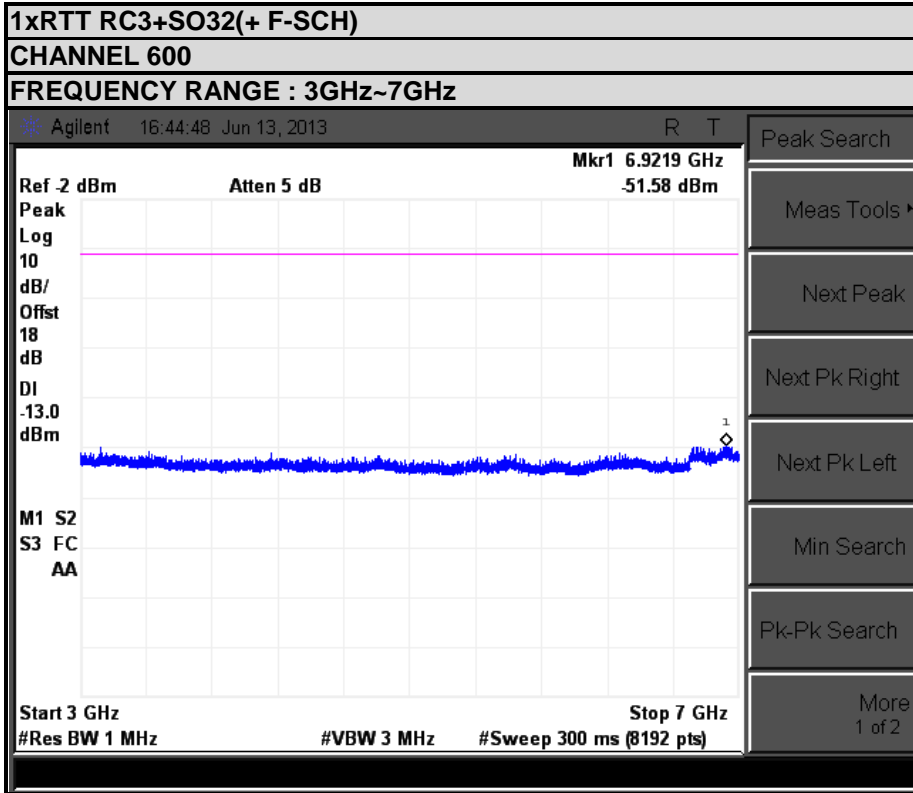
### 4.5.3 TEST SETUP

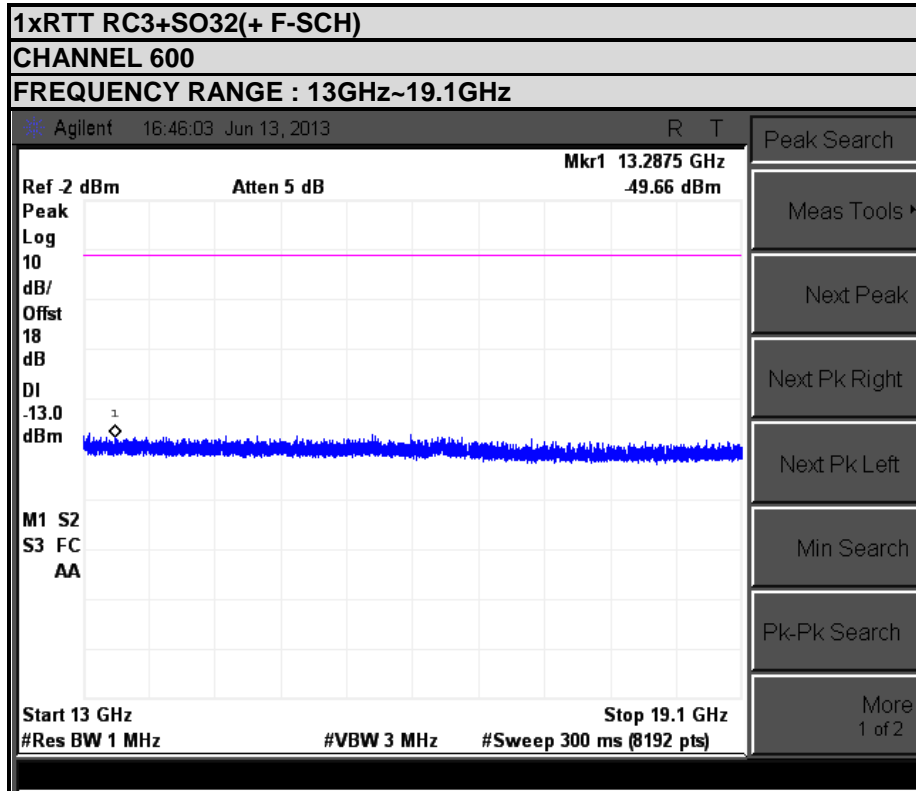




### 4.5.4 TEST RESULTS











## 4.6 RADIATED EMISSION MEASUREMENT

### 4.6.1 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  $-13\text{dBm}$ .

### 4.6.2 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.  $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn.}$

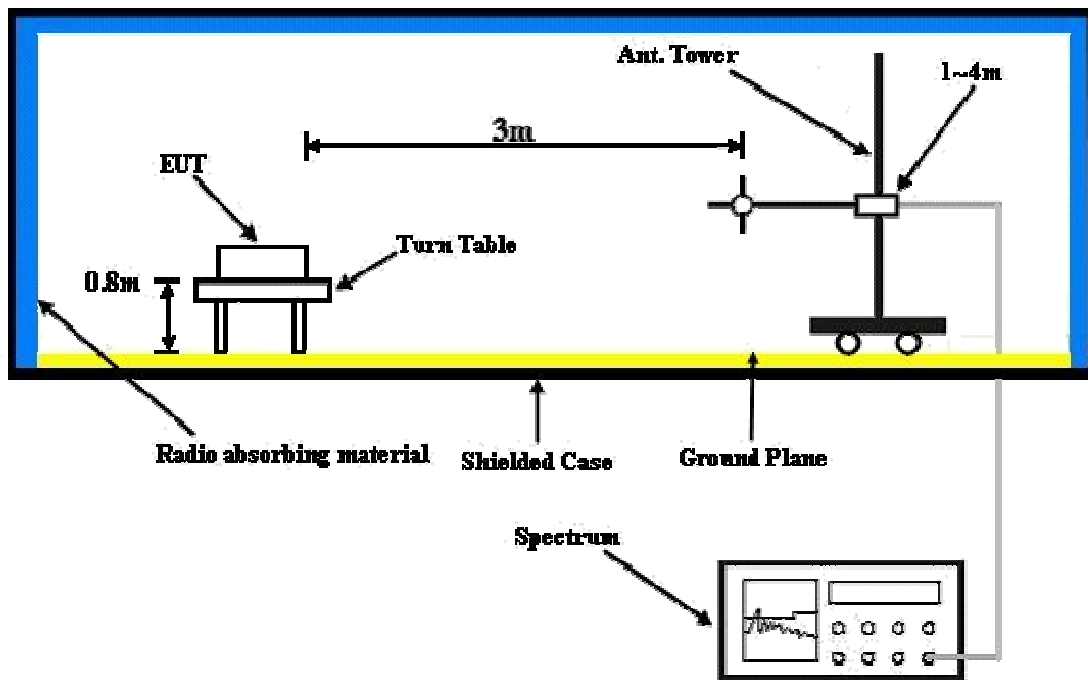
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

### 4.6.3 DEVIATION FROM TEST STANDARD

No deviation



#### 4.6.4 TEST SETUP



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



#### 4.6.5 TEST RESULTS

##### 1xRTT RC3+SO32(+ F-SCH)

<b>FREQUENCY RANGE</b>	Above 1000MHz	<b>INPUT POWER</b>	120Vac, 60 Hz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 60%RH	<b>TESTED BY</b>	Venless Long

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	SPA READING (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)
1	3760	-52.41	-13	-39.99	4.07	-35.92
2	5640	-54.84	-13	-38.12	4.81	-33.31
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	SPA READING (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)
1	3760	-49.76	-13	-36.59	4.07	-32.52
2	5640	-53.24	-13	-37.96	4.81	-33.15

#### REMARKS:

1. EIRP(dBm) = S.G Power Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB)

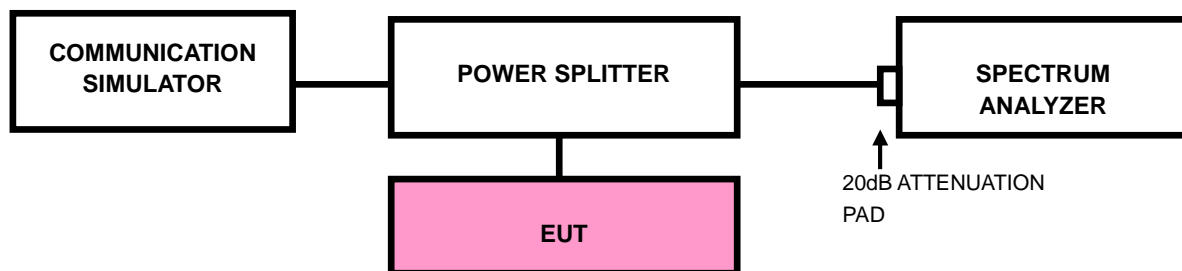


## 4.7 PEAK TO AVERAGE RATIO

### 4.7.1 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.

### 4.7.2 TEST SETUP



### 4.7.3 TEST PROCEDURES

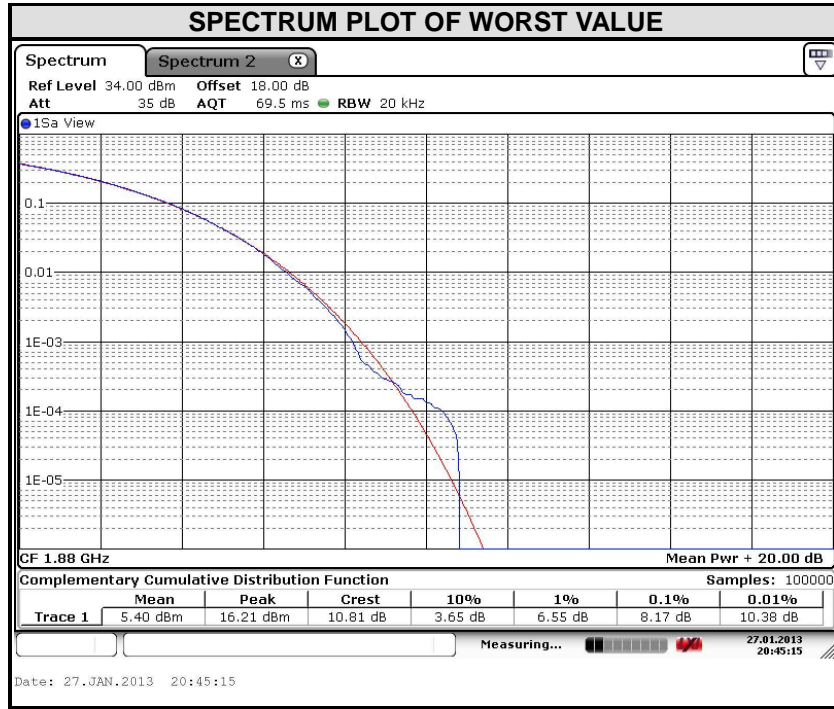
1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.



### 4.7.4 TEST RESULTS

#### 1xRTT RC3+SO32(+ F-SCH) MODE

CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
600	1880	8.17





## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## 6 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, were founded in 2002 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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**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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



## **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.

**---END---**