

FCC Test Report

FCC ID : N7NMC7350
Equipment : Wireless Module
Model No. : AirPrime MC7350
Brand Name : AirPrime
Applicant : Sierra Wireless Inc.
Address : 13811 Wireless Way Richmond, British
Columbia, Canada, V6V 3A4.
Standard : 47 CFR FCC Part 90
Received Date : Oct. 07, 2013
Tested Date : Oct. 14 ~ Nov. 27, 2013

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FG3O0701P90	Rev. 01	Initial issue	Nov. 15, 2013
FG3O0701P90	Rev. 02	Revised high channel data to CH 684. Revised bandedge diagram of low channel.	Nov. 27, 2013

Summary of Test Results

FCC Rules	Test Items	Measured	Result
2.1046 / 90.635(b)	Effective Radiated Power	Power[dBm] : CDMA: 23.70	Pass
2.1053 / 90.691	Radiated Emissions	Meet the requirement of limit	Pass
2.1051 / 90.691	Conducted Emissions	Meet the requirement of limit	Pass
2.1051 / 90.691	Band edge	Meet the requirement of limit	Pass
2.1049	Occupied Bandwidth	Meet the requirement of limit	Pass
-	Peak to average ratio	Meet the requirement of limit	Pass
2.1055 / 90.213	Frequency Stability	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

Operating Band (MHz)	CDMA2000 1xRTT 1xEV-DO Release 0, Revision A BC10, 817.25, 823.10MHz
Modulation	QPSK, QQPSK, HPSK
H/W Version	1.0
S/W Version	SWI9x15E_04.04.00.00

1.1.2 Maximum ERP, Frequency Tolerance and Emission Designator

System	Modulation	Maximum ERP (W)	Emission Designator
CDMA2000	HPSK	0.234	1M28F9W

1.1.3 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	Dipole	1	SMA	---

1.1.4 EUT Operational Condition

Supply Voltage	<input type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> Internal DC supply	<input type="checkbox"/> External DC adapter	<input checked="" type="checkbox"/> From host
Operational Voltage	<input checked="" type="checkbox"/> Vnom (110 V)	<input checked="" type="checkbox"/> Vmax (126.5 V)	<input checked="" type="checkbox"/> Vmin (93.5 V)
Operational Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (50°C)	<input checked="" type="checkbox"/> Tmin (-30°C)

1.1.5 Operating Channel List

CDMA2000		
	Channel	Frequency (MHz)
Low	450	817.25
High	684	823.10

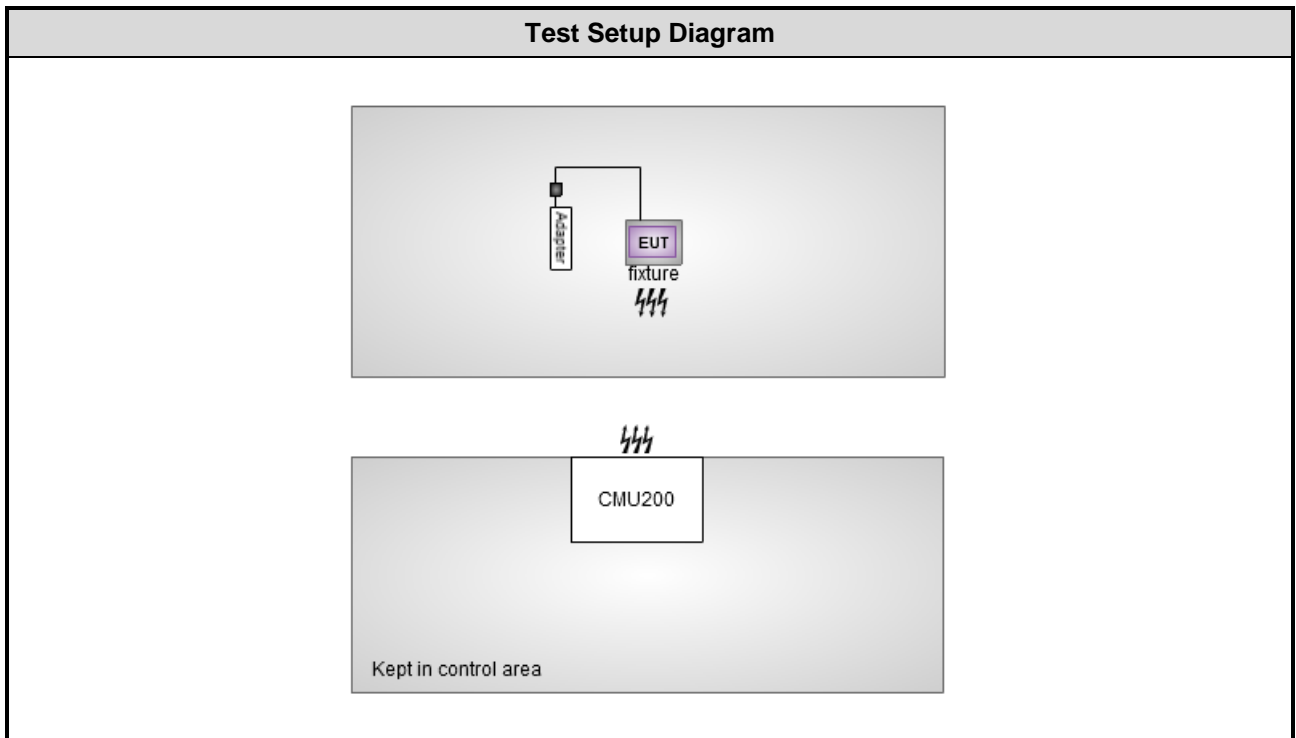
Note: Test channels reported herein were specified by applicant.

1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Fixture	---	---	---	---	---
2	Adapter for fixture	GlobTek, Inc.	GT-41062-1805	---	---	USB, 1.8m shielded w/o core

Note: Item 1, 2 was provided by applicant.

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
3m semi-anechoic chamber	CHAMPRO	SAC-03	03CH01-WS	Jan. 04, 2013	Jan. 03, 2014
Spectrum Analyzer	R&S	FSV40	101498	Jan. 24, 2013	Jan. 23, 2014
Receiver	R&S	ESR3	101658	Jan. 28, 2013	Jan. 27, 2014
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jan. 11, 2013	Jan. 10, 2014
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Feb. 18, 2013	Feb. 17, 2014
Amplifier	Burgeon	BPA-530	100219	Nov. 28, 2012	Nov. 27, 2013
Amplifier	Agilent	83017A	MY39501308	Dec. 18, 2012	Dec. 17, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable-R03m	Woken	CFD400NL-LW	CFD400NL-001	Dec. 25, 2012	Dec. 24, 2013
RF Cable-R10m	Woken	CFD400NL-LW	CFD400NL-002	Dec. 25, 2012	Dec. 24, 2013
control	EM Electronics	EM1000	60612	N/A	N/A

Note: Calibration Interval of instruments listed above is one year.

Test Item	RF Conducted				
Test Site	RF Conducted (TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV 40	101063	Feb. 18, 2013	Feb. 17, 2014
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 29, 2012	Nov. 28, 2013
Signal Generator	R&S	SMB100A	175727	Jan. 14, 2013	Jan. 13, 2014
Radio Communication Analyzer	R&S	CMU200	112403	Jan. 31, 2013	Jan. 30, 2014

Note: Calibration Interval of instruments listed above is one year.

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards.

47 CFR FCC Part 90

47 CFR FCC Part 2

ANSI C63.4-2003

ANSI / TIA / EIA-603-C -2004

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	± 35.286 Hz
Conducted power	± 0.536 dB
Frequency error	± 35.286 Hz
Temperature	± 0.3 °C
Conducted emission	± 2.946 dB
AC conducted emission	± 2.43 dB
Radiated emission	± 2.49 dB

2 Test Configuration

2.1 Testing Condition and Location Information

Test Item	Test Site	Ambient Condition	Tested By
RF conducted	TH01-WS	22°C / 63%	Brad Wu
Radiated Emissions	03CH01-WS	22°C / 63%	Anderson Hong

➤ FCC site registration No.: 657002

➤ IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test channel
Effective Radiated Power	CDMA	450, 684
Radiated Emissions ≤ 1GHz	CDMA	684
Radiated Emissions > 1GHz	CDMA	450, 684
Conducted Emissions	CDMA	450, 684
	1xEV-DO	450, 684
Band Edge	CDMA	450, 684
	1xEV-DO	450, 684
Occupied Bandwidth	CDMA	450, 684
	1xEV-DO	450, 684
Peak to average ratio	CDMA	450, 684
	1xEV-DO	450, 684
Frequency Stability	CDMA	684
	1xEV-DO	684

3 Test Results

3.1 Effective Radiated Power

3.1.1 Limit of Effective Radiated Power

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 100 Watts.

3.1.2 Test Procedures

For E.R.P measurement

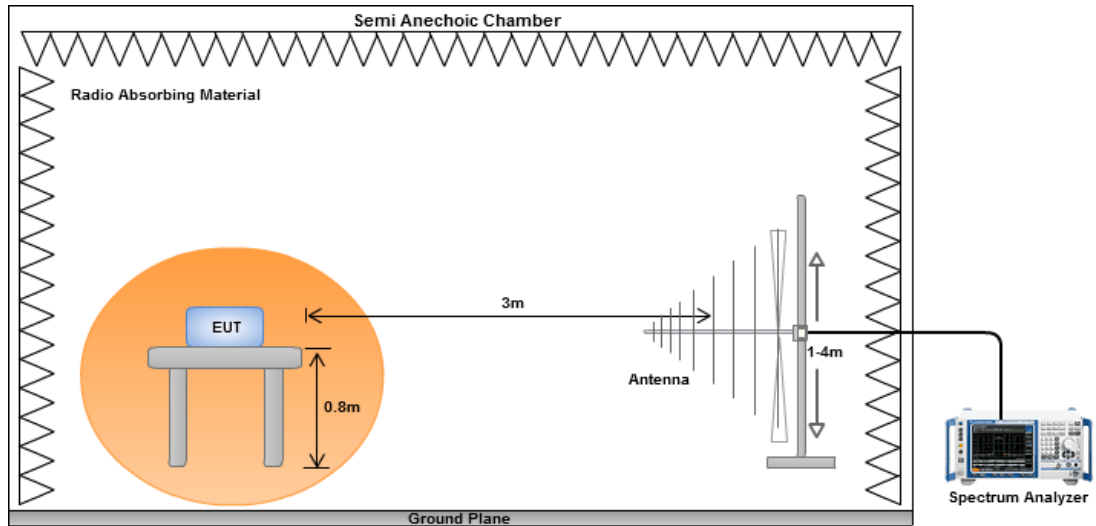
1. The EUT links up with simulator and is set to maximum output power level at low / high channel. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.
4. After finding the max radiated emission, substitution method will be used for getting effective radiated power. EUT will be removed and substitution antenna will be placed at same position. Signal generator will output CW signal to substitution antenna through a RF cable. Rotate turntable and move antenna to find maximum radiated emission. Adjust output power of signal generator to let the maximum radiated emission is same as step 3. Record the output power level.
5. E.I.R.P = output power of step 4 + gain of substitution antenna – cable loss of RF cable. ERP can be calculated by below formula:
$$E.R.P = E.I.R.P - 2.15dB$$

For Conducted power measurement

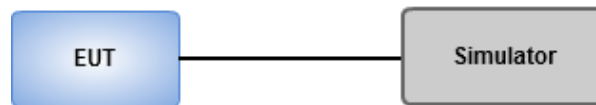
1. The EUT links up with simulator and is set to maximum output power level at low / high channel.
2. Measure the output power of low / high channel of the EUT

3.1.3 Test Setup

Effective Radiated Power Measurement



Conducted Power Measurement



3.1.4 Test Result of Conducted Output Power (dBm)

Band	CDMA 2000 BC10		
Channel	450	684	---
Frequency (MHz)	817.25	823.10	---
RC1+SO55	23.81	23.91	---
RC3+SO55	23.86	23.96	---
RC3+SO32(+F-SCH)	23.74	23.92	---
RC3+SO32(+SCH)	23.79	23.87	---
RTAP 153.6	23.65	23.79	---
RETAP 4096	23.61	23.72	---

3.1.5 Test Result of Effective Radiated Power (dBm)

Mode	CDMA2000 RC3+SO55						
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
450	817.25	23.70	38.45	-14.75	-6.19	21.98	3.87
684	823.10	23.49	38.45	-14.96	-6.31	21.76	3.88

NOTE: ERP = S.G power value + correction factor - 2.15

3.2 Radiated Emissions

3.2.1 Limit of Radiated Emissions

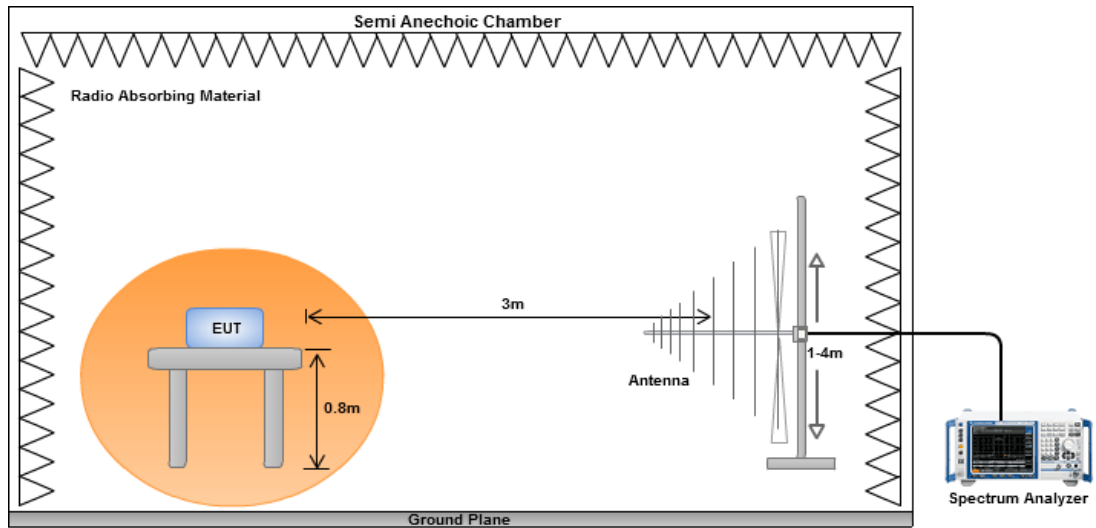
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB equal to -13dBm.

3.2.2 Test Procedures

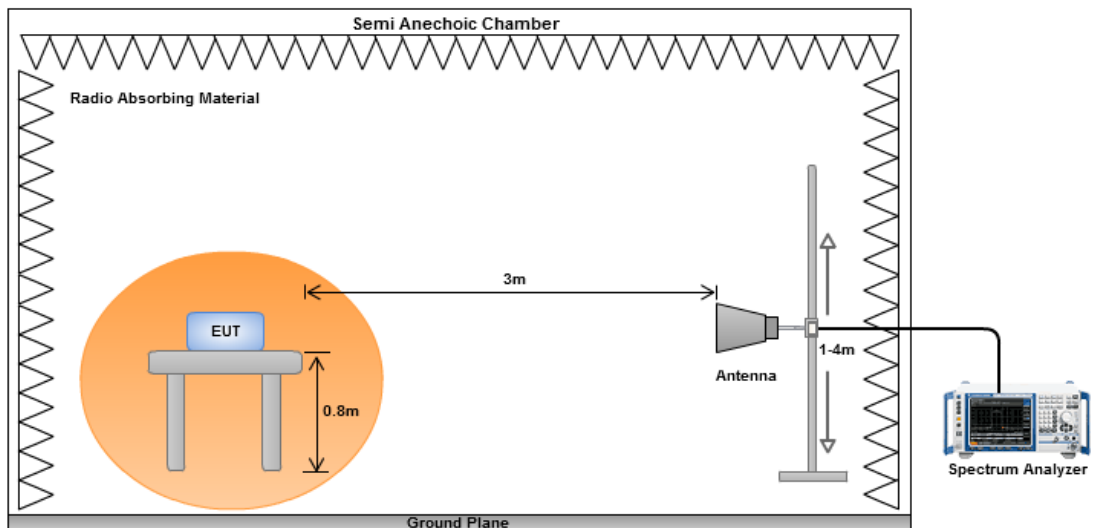
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.
4. After finding the max radiated emission, substitution method will be used for getting effective radiated power. EUT will be removed and substitution antenna will be placed at same position. Signal generator will output CW signal to substitution antenna through a RF cable. Rotate turntable and move antenna to find maximum radiated emission. Adjust output power of signal generator to let the maximum radiated emission is same as step 3. Record the output power level.
5. E.I.R.P = output power of step 4 + gain of substitution antenna – cable loss of RF cable. ERP can be calculated by below formula:
 $E.R.P = E.I.R.P - 2.15dB$

3.2.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.2.4 Test Result of Radiated Emissions below 1GHz

Mode	CDMA2000 RC3+SO55, Channel : 684						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
32.83	H	-56.32	-13.00	-43.32	-51.55	-42.09	-12.08
107.61	H	-56.55	-13.00	-43.55	-41.46	-54.75	0.35
240.55	H	-54.81	-13.00	-41.81	-43.22	-58.32	5.66
264.81	H	-51.41	-13.00	-38.41	-40.91	-54.85	5.59
380.16	H	-58.29	-13.00	-45.29	-49.93	-61.65	5.51
675.06	H	-51.57	-13.00	-38.57	-48.09	-53.71	4.29
106.74	V	-51.33	-13.00	-38.33	-40.92	-49.55	0.37
130.78	V	-50.70	-13.00	-37.70	-44.08	-48.60	0.05
264.78	V	-48.18	-13.00	-35.18	-39.16	-51.62	5.59
321.84	V	-48.37	-13.00	-35.37	-41.68	-51.79	5.57
381.30	V	-52.68	-13.00	-39.68	-41.35	-56.04	5.51
806.00	V	-54.47	-13.00	-41.47	-54.51	-56.17	3.85

NOTE: ERP = S.G power value + correction factor - 2.15

3.2.5 Test Result of Radiated Emissions above 1GHz

Mode	CDMA2000 RC3+SO55, Channel : 450						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1634.50	H	-47.42	-13.00	-34.42	-48.25	-50.41	5.14
2451.75	H	-55.69	-13.00	-42.69	-60.95	-59.63	6.09
3269.00	H	-50.03	-13.00	-37.03	-58.54	-53.63	5.75
1634.50	V	-45.98	-13.00	-32.98	-46.90	-48.97	5.14
2451.75	V	-47.68	-13.00	-34.68	-54.50	-51.62	6.09
3269.00	V	-43.39	-13.00	-30.39	-53.28	-46.99	5.75

Mode	CDMA2000 RC3+SO55, Channel : 684						
Frequency (MHz)	Antenna Polarity.	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1646.20	H	-45.37	-13.00	-32.37	-46.29	-48.33	5.11
2469.30	H	-53.79	-13.00	-40.79	-59.23	-57.76	6.12
3292.40	H	-47.26	-13.00	-34.26	-55.79	-50.84	5.73
1646.20	V	-43.91	-13.00	-30.91	-44.92	-46.87	5.11
2469.30	V	-45.36	-13.00	-32.36	-52.31	-49.33	6.12
3292.40	V	-44.49	-13.00	-31.49	-54.44	-48.07	5.73

NOTE: ERP = S.G power value + correction factor - 2.15

3.3 Conducted Emissions

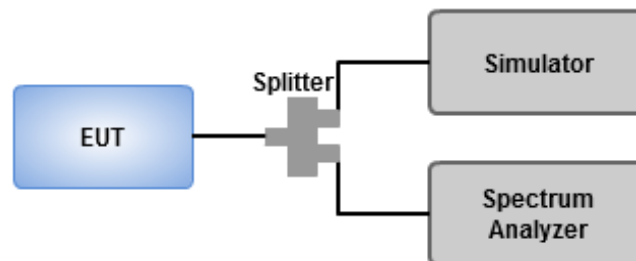
3.3.1 Limit of Conducted Emissions

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 equal to -13dBm.

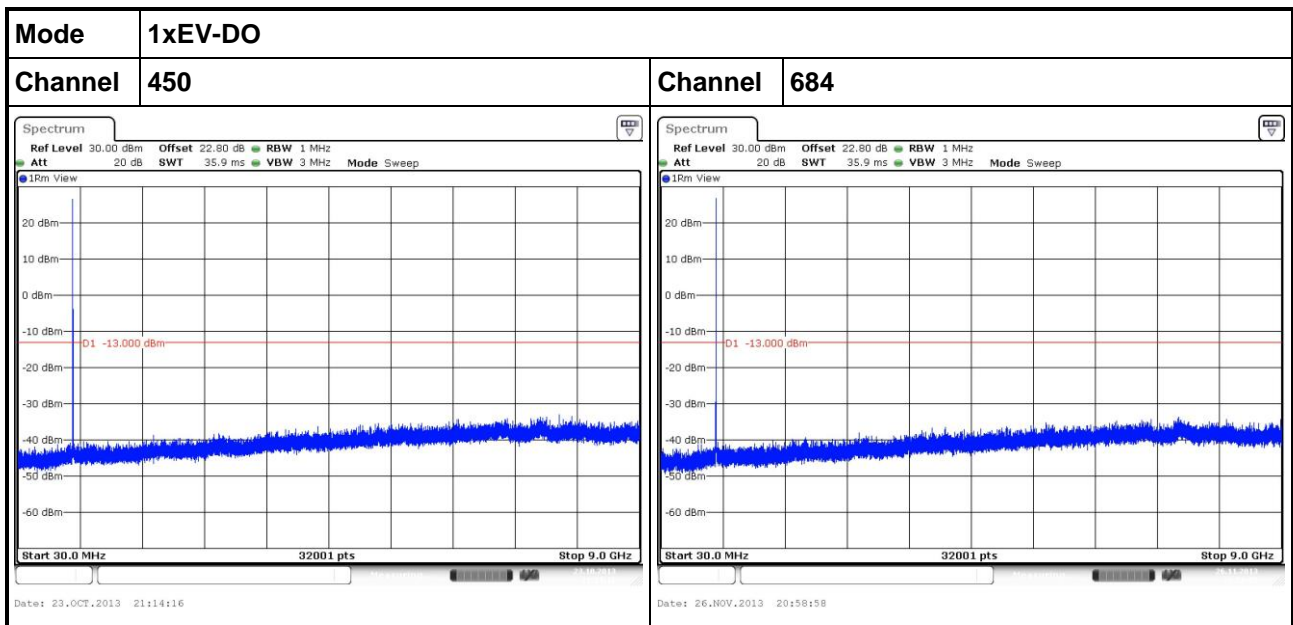
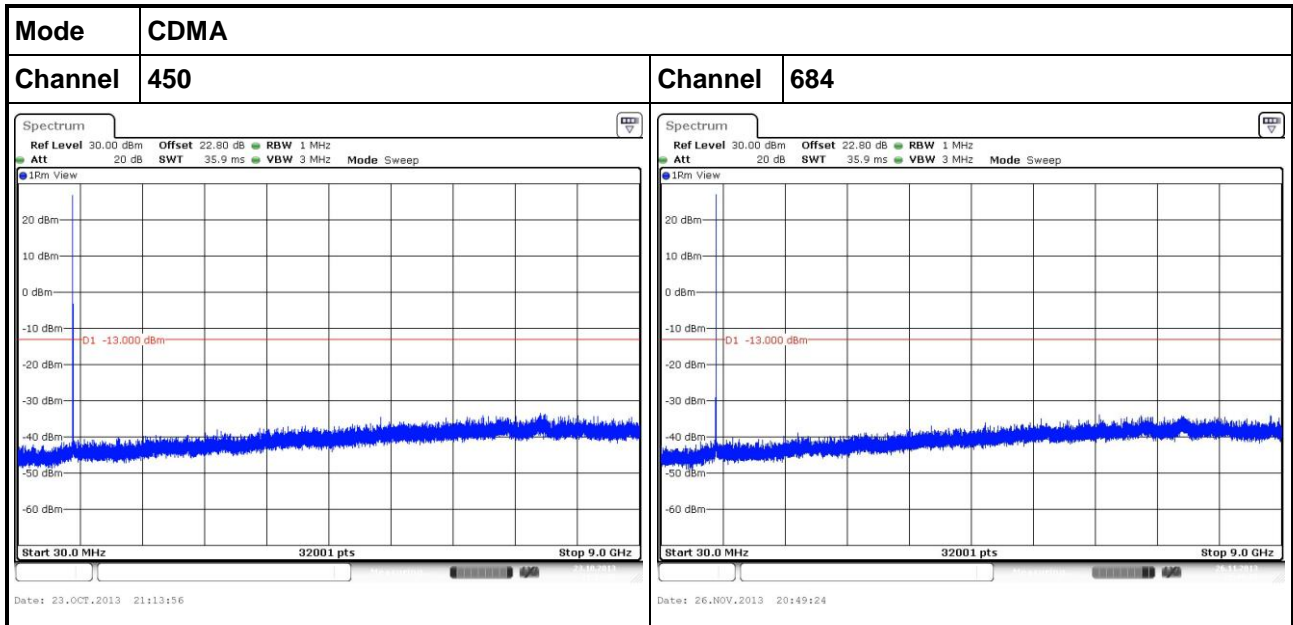
3.3.2 Test Procedures

1. Lowest, middle and highest operating channels are tested for this item.
2. Scan frequency range is from 30MHz~9GHz.
3. Set RBW = 1MHz, VBW = 3MHz, detector = RMS, sweep time = auto.
4. Record the max trace value and capture the test plot of each sub frequency band.

3.3.3 Test Setup



3.3.4 Test Result of Conducted Emissions



3.4 Band edge

3.4.1 Limit of band edge

For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz

3.4.2 Test Procedures

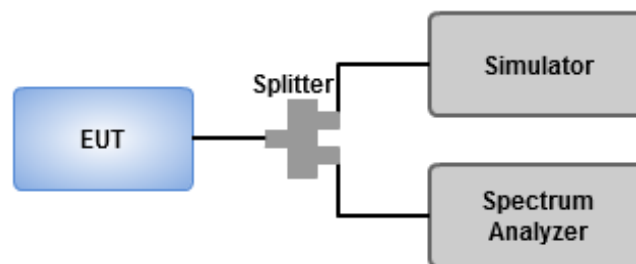
For band edge

1. Lowest and highest operating channels are tested for this item.
2. Set RBW = 10kHz, VBW=30kHz, detector = RMS, sweep time = auto
3. Record the max trace value and capture the test plot.

For 811~815 and 825~829 MHz band

1. Lowest and highest operating channels are tested for this item.
2. Set RBW = 100kHz, VBW=300kHz, detector = RMS, sweep time = auto
3. Record the max trace value and capture the test plot.

3.4.3 Test Setup

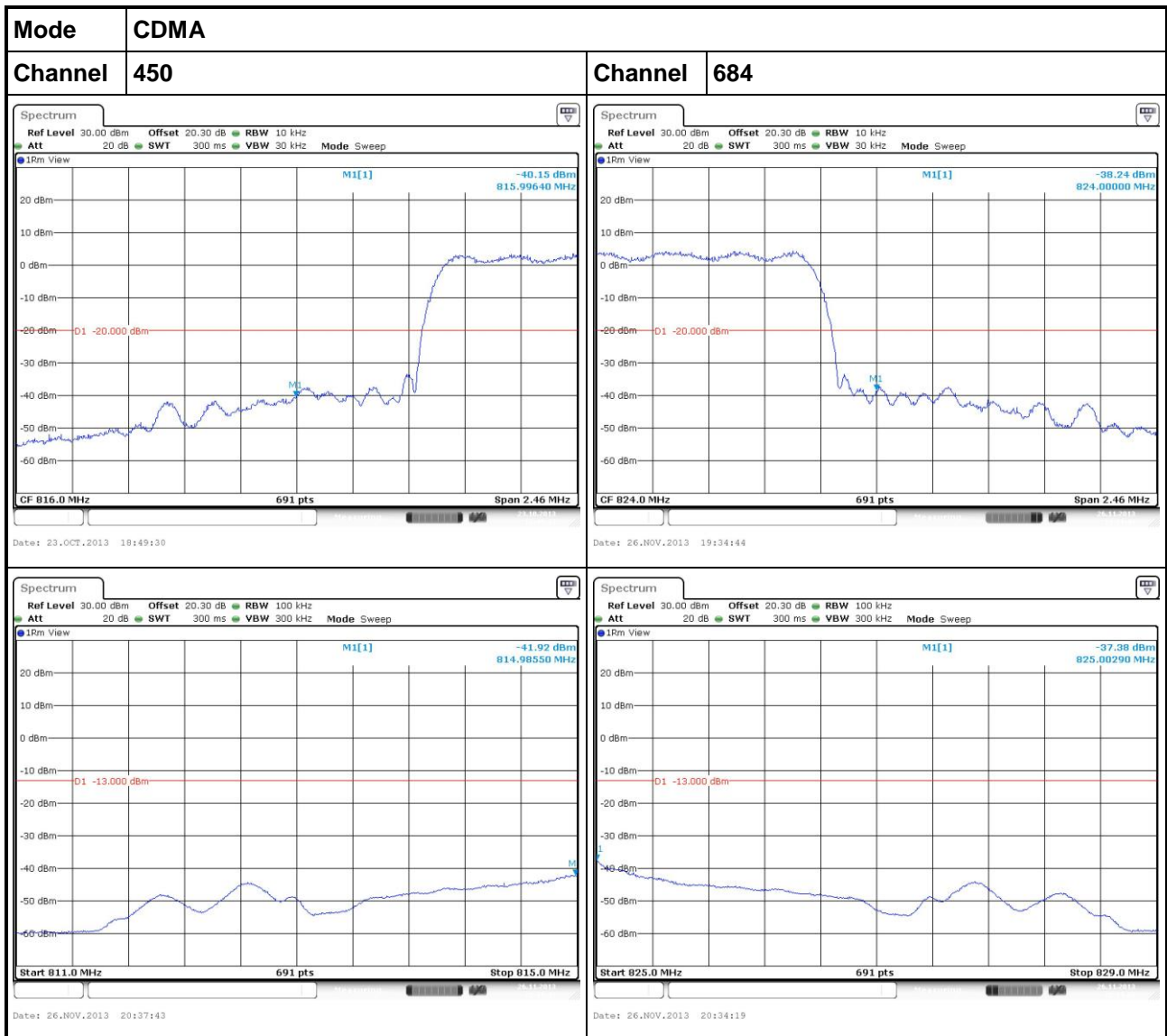


3.4.4 Test Result of Band Edge

MODE	Channel	Frequency (MHz)	Measured value (dBm)	Correction Factor (dB)	Correction Value(dBm)	Limit (dBm)
CDMA	450	817.25	-40.15	1.76	-38.39	-20
CDMA	684	823.10	-38.24	1.76	-36.48	-20

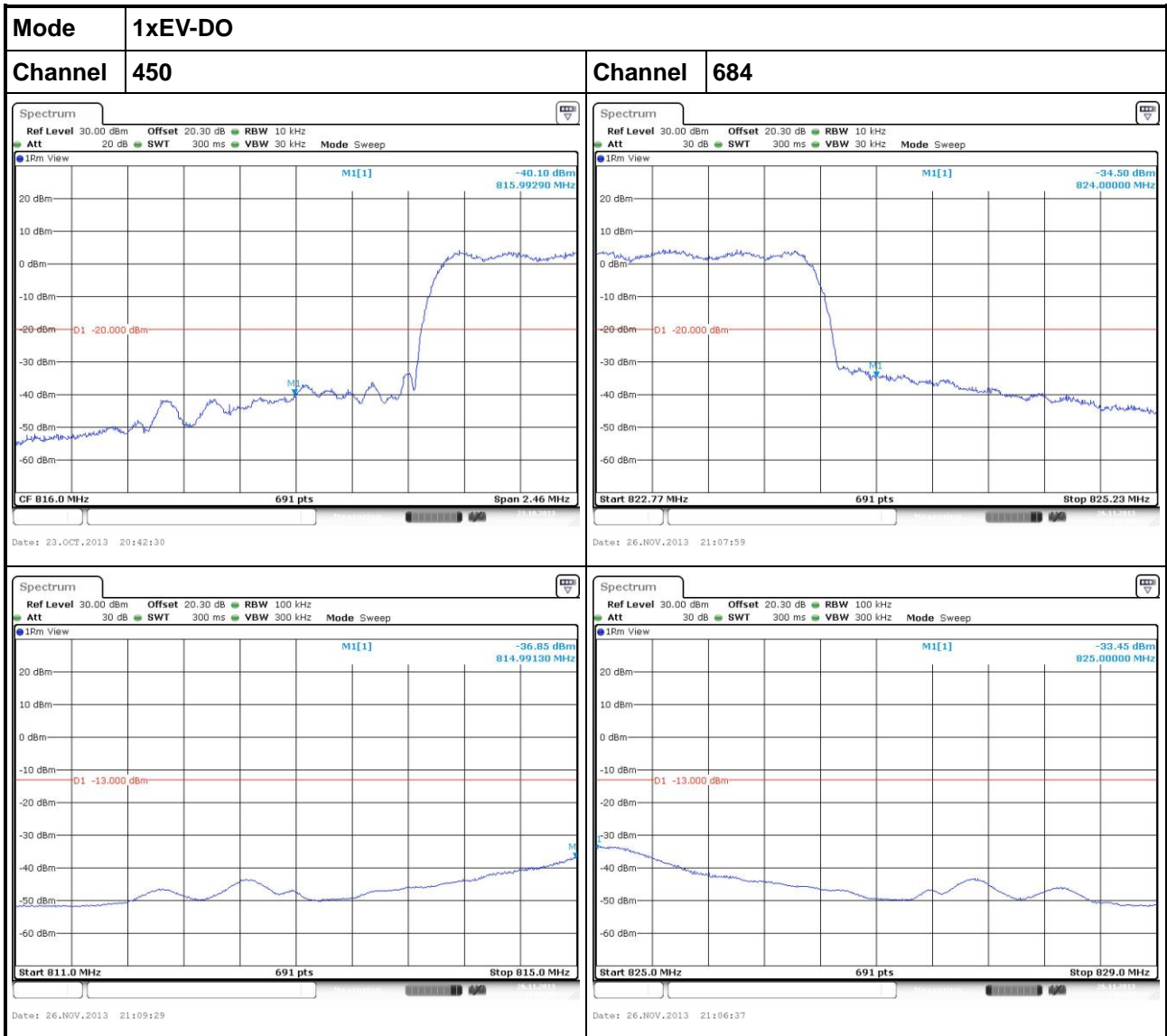
Note: 10kHz is used for measurement since used spectrum analyser has no 15kHz (1% of 26dB bandwidth) setting. Thus correction factor is required for measured value

Correction factor = $10 * \log(15\text{kHz}/10\text{kHz}) = 1.76 \text{ dB}$



MODE	Channel	Frequency (MHz)	Measured value (dBm)	Correction Factor (dB)	Correction Value(dBm)	Limit (dBm)
1xEV-DO	450	817.25	-40.10	1.76	-38.34	-20
1xEV-DO	684	823.10	-34.50	1.76	-32.74	-20

Note: 10kHz is used for measurement since used spectrum analyser has no 15kHz (1% of 26dB bandwidth) setting. Thus correction factor is required for measured value
 Correction factor = $10 * \log(15\text{kHz}/10\text{kHz}) = 1.76 \text{ dB}$

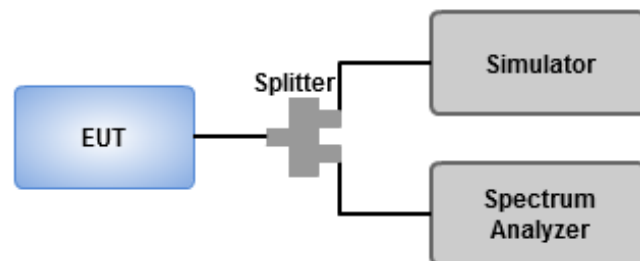


3.5 Occupied Bandwidth

3.5.1 Test Procedures

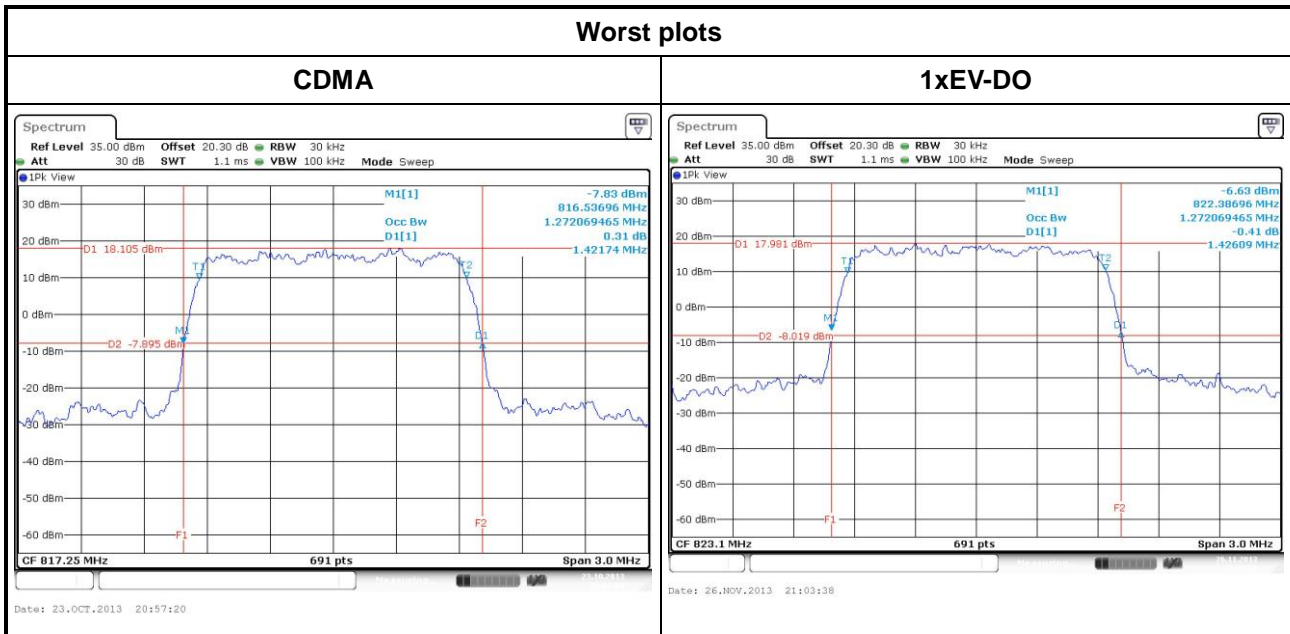
1. Set resolution bandwidth (RBW) = 30 kHz, Video bandwidth = 100 kHz
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Using occupied bandwidth measurement function of spectrum analyzer to measure occupied bandwidth

3.5.2 Test Setup



3.5.3 Test Result of Occupied Bandwidth

MODE	Channel	Frequency (MHz)	26dB BW (MHz)	99% OBW (MHz)
CDMA	450	817.25	1.4217	1.27
CDMA	684	823.10	1.4174	1.28
1xEV-DO	450	817.25	1.4217	1.27
1xEV-DO	684	823.10	1.4261	1.27



3.6 Peak to Average Ratio

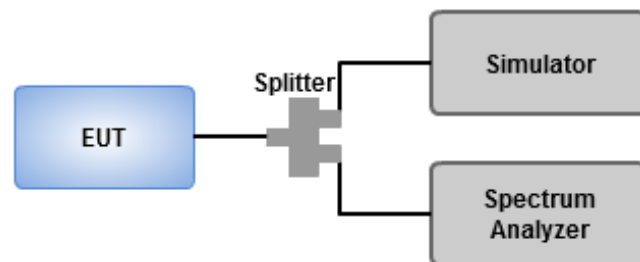
3.6.1 Limit of Peak to Average Ratio

Peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

3.6.2 Test Procedures

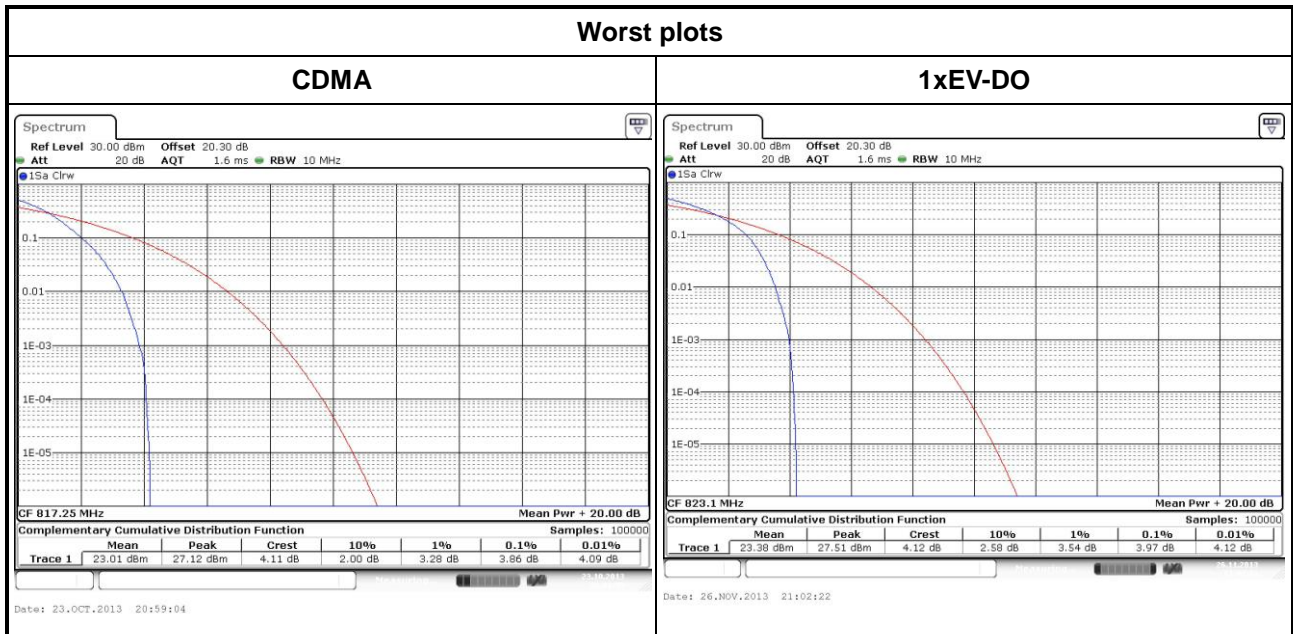
1. Enable CCDF function of spectrum analyzer and set RBW=10MHz
2. Set the number of counts to a value that stabilizes the measured CCDF curve
3. Record the maximum PAPR level associated with a probability of 0.1%.

3.6.3 Test Setup



3.6.4 Test Result of Peak to Average Ratio

MODE	Channel	Frequency (MHz)	Peak to Average ratio (dB)
CDMA	450	817.25	3.86
CDMA	684	823.10	3.83
1xEV-DO	450	817.25	3.83
1xEV-DO	684	823.10	3.97



3.7 Frequency Stability

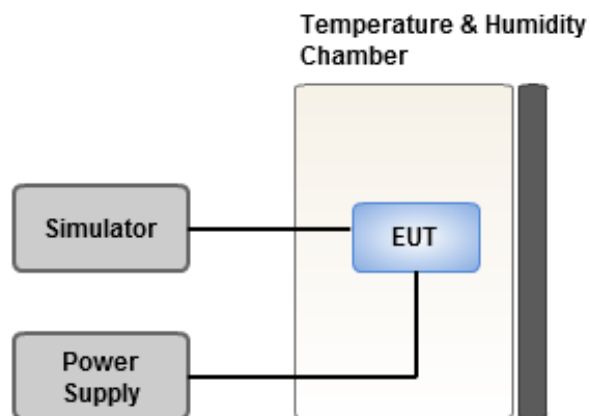
3.7.1 Limit of Frequency Stability

The frequency stability shall be less +/- 2.5ppm.

3.7.2 Test Procedures

1. EUT was placed at temperature chamber and connected to an external power supply.
2. Temperature and voltage condition shall be tested to confirm frequency stability.
3. Temperature range is from -30~50°C and voltage range is from lowest to highest working voltage.
4. Link up EUT and simulator. Confirm frequency drift value of simulator and record it.

3.7.3 Test Setup



3.7.4 Test Result of Frequency Stability

Mode	CDMA		
Temperature (°C)	Voltage (Vac)	Frequency Drift (ppm)	Limit (ppm)
50	110	0.011	2.5
40	110	0.010	2.5
30	110	0.011	2.5
20	110	0.009	2.5
10	110	0.007	2.5
0	110	0.006	2.5
-10	110	0.009	2.5
-20	110	0.005	2.5
-30	110	0.006	2.5
20	126.5	0.015	2.5
20	93.5	0.011	2.5

Mode	1xEV-DO		
Temperature (°C)	Voltage (Vac)	Frequency Drift (ppm)	Limit (ppm)
50	110	0.016	2.5
40	110	0.013	2.5
30	110	0.015	2.5
20	110	0.013	2.5
10	110	0.011	2.5
0	110	0.010	2.5
-10	110	0.011	2.5
-20	110	0.009	2.5
-30	110	0.007	2.5
20	126.5	0.017	2.5
20	93.5	0.013	2.5

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

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