

CONFORMANCE TEST REPORT**FOR****Subpart H Part 22****Report No. : JNDL-NU-14R-0001**

Client: Franklin Technology Inc.
Product: LTE/WIFI MOBILE ROUTER
Model: R774
Manufacture/supplier: Franklin Technology Inc.

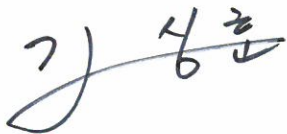

Date test item received: 2014/04/18
Date test campaign completed: 2014/05/29
Date of issue: 2014/06/02

ATTESTATION STATEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards.

All JNDL Laboratory. CO., LTD instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

Total number of pages of this test report : 40 pages

Test engineer	Report reviewed by
 2014.6.2	 2014.6.2
Sang-hun kang	Kyoung-Pil, Yeom

REPORT SUMMARY

Purpose of Test :	To demonstrate the EUT in compliance with Part 22 Subpart H of the FCC's
Disclaimer :	The test results relate only to the items tested.
Applicable Standards :	Pt 22, Pt 2, ANSI 63.4:2009, TIA-603-D-2010

TEST ENVIRONMENT AND TEST SETUP

Test Facilities :	Test Firm Registration # : 748649 3m & 10m Open Site : 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 3m semi-Anechoic chamber : B 114~115, 810 Kwanyang-Dong, dongan-Gu, Anyang-Si, Kyunggi-Do, 431-060, Korea
Laboratory Test Conditions :	Open Site : Temperature 25 °C, Humidity : 58 % 3m anechoic chamber : Temperature 26 °C, Humidity : 55 %
Test Exercise :	The EUT was set in continuous transmit mode of operation unless stated otherwise.
Modification to the EUT :	No modification was made.
Supporting Accessories :	None

REVISION HISTORY

Revision	Date	Descriptions
0	2014.06.02	Original release

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1. General Remarks

The test results in this report apply to the particular Equipment Under Test (EUT) as declared in this report.

The test results presented in this report relate only to the item tested.

2. Test Site

2.1 Location

JNDL Laboratory. CO., LTD. (Test Firm Registration # : 748649)

3m anechoic chamber : B 114~115, 810 Kwanyang-Dong, dongan-Gu, Anyang-Si, Kyunggi-Do, Korea

3m & 10m Open site : 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea

2.2 List of Test equipment used for tests

No.	Instrument	Model No.	Due to Calibration	Manufactor	Serial No.
<input checked="" type="checkbox"/>	PSA SPECTRUM ANALYZER (3 Hz ~ 26.5 GHz)	E4440A	2014-10-15	Agilent Technologies	MY46185375
<input checked="" type="checkbox"/>	SPECTRUM ANALYZER (20 Hz ~ 40.0 GHz)	FSP40	2015-01-08	Rohde & Schwarz	100308
<input checked="" type="checkbox"/>	SIGNAL GENERATOR (10 MHz ~ 40 GHz)	MG3694B	2014-10-15	Anritsu Corp	062513
<input checked="" type="checkbox"/>	POWER METER (DC ~ 67 GHz)	NRP2	2014-10-15	Rohde & Schwarz	100973
<input checked="" type="checkbox"/>	POWER SENSOR (50 MHz ~ 40 GHz)	NRP-Z85	2014-10-15	Rohde & Schwarz	101121
<input checked="" type="checkbox"/>	POWER SENSOR (9 KHz ~ 6 GHz)	NRP-Z92	2014-10-15	Rohde & Schwarz	100093
<input checked="" type="checkbox"/>	EMI TEST RECEIVER (20 MHz ~ 1000 MHz)	ESVS30	2014-10-15	Rohde & Schwarz	828525/005
<input checked="" type="checkbox"/>	COMMUNICATION TEST SET (WCDMA/CDMA/EVDO/PCS)	E5515C	2014-07-31	Agilent Technologies	MY50260242
<input type="checkbox"/>	COMMUNICATION TEST SET (LTE)	CMW500	2014-07-31	Rohde & Schwarz	140388
<input checked="" type="checkbox"/>	POWER DIVIDER (DC-18GHz)	1506A	2014-10-15	WEINSCHTEL	KW957
<input checked="" type="checkbox"/>	BILOG ANTENNA (30 MHz ~ 1000 MHz)	VULB 9168	2015-02-17	Schwarzbeck	9168-505
<input checked="" type="checkbox"/>	DIPOLE ANTENNA (30 MHz ~ 1 GHz)	UHAP	2016-04-01	Schwarzbeck	950
<input checked="" type="checkbox"/>	HORN ANTENNA (1 GHz ~ 18 GHz)	BBHA 9120D	2014-12-12	Schwarzbeck	568
<input type="checkbox"/>	HORN ANTENNA (1 GHz ~ 18 GHz)	3117	2014-10-24	ETS-Lindgren	00135889
<input checked="" type="checkbox"/>	Microwave Amplifier (1 GHz ~ 18 GHz)	TK-PA18	2014-09-05	TESTEK	1200020
<input checked="" type="checkbox"/>	Low Noise Amplifier (18 GHz ~ 40 GHz)	AMF-6F-18004000-37-8P	2015-05-06	MITEQ	1814914
<input checked="" type="checkbox"/>	High Power Amplifier (0.7 GHz ~ 2.5 GHz)	ZHL-30W-252-S+	N/A	Mini Circuit	804501219
<input checked="" type="checkbox"/>	High Pass Filter (1.5 GHz ~ 15 GHz)	WHKX1.5/15G-6SS	2015-03-17	WAINWRIGHT	4
<input type="checkbox"/>	High Pass Filter (3 GHz ~ 18 GHz)	WHK3.0/18G-10SS	2014-06-07	WAINWRIGHT	344

→ All equipment is calibrated with traceable calibrations.

2.3 Test Date

Date of Application: 2014- 04 - 18

Date of Test: 2014- 04 - 22 ~ 2014 - 05 - 29

3. Description of the Equipment Under Test

Manufacturer :	Franklin Technology Inc.
Product Description :	LTE/WIFI MOBILE ROUTER consists of LTE Band 12, LTE Band 25, Cellular CDMA, PCS CDMA, 1xRTT and EVDO Rev. 0 & Rev. A, WIFI(2.4 GHz)
FCC ID :	XHG-R774
Model Name :	R774
Multiple Model Name :	None
Operating Frequency :	TX : 824.70 MHz ~ 848.31 MHz RX : 869.70 MHz ~ 893.31 MHz
Modulation Type :	QPSK, 8PSK, 16QAM
Max. RF Output Power	<ul style="list-style-type: none"> • 0.245W ERP CDMA(23.90 dBm) • 0.261W ERP CDMA EVDO(24.17 dBm)
Emission Designator	<ul style="list-style-type: none"> • 1M27F9W CDMA • 1M28F9W CDMA EVDO
EUT Power Source :	Primary power – 3.7 Vdc Battery
	Secondary Power – Via AC Mains Powered DC 5V adapter
Test Item :	Prototype
Type of Equipment :	Mobile
Antennas :	PIFA Internal Antenna Max peak gain : 0.3 dBi
Antenna Connector :	DIP Connection(INTENNA)

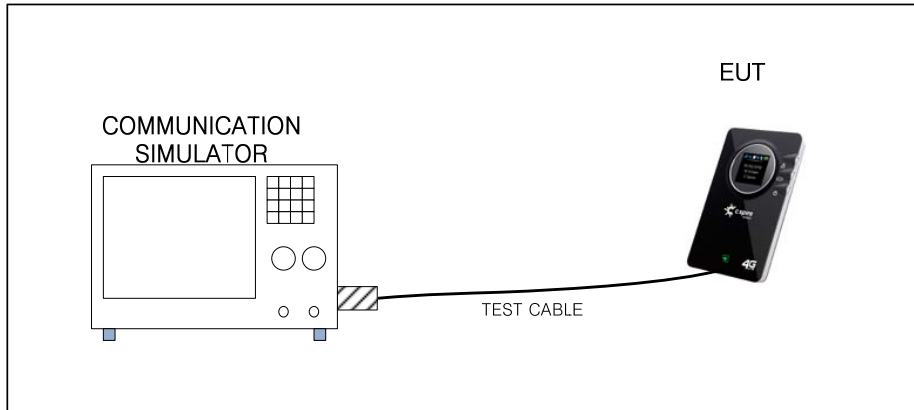
→ All the testing were performed according to the procedures in FCC Parts 22 & Parts 2
The EUT was operation with Communication Simulator (E5515C)

4. List of Measurements

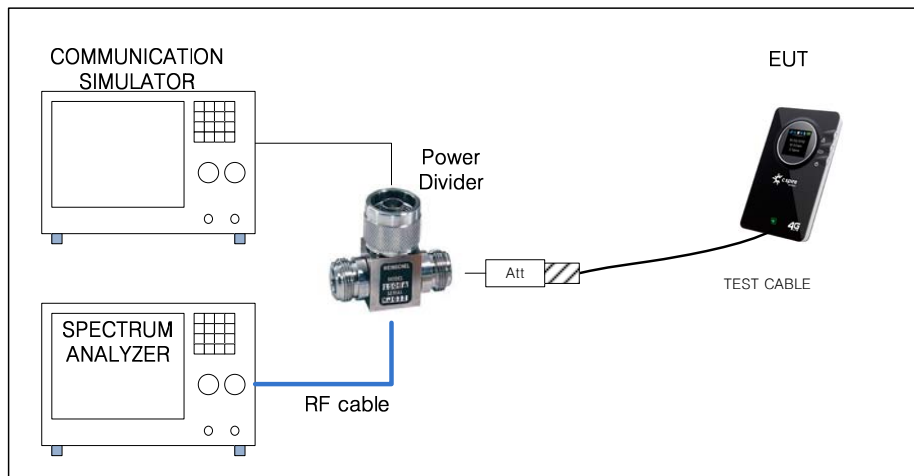
Guide Lines	FCC Rules Part	Test Conditon	Result
Conducted Output Power	2.1046	Conducted	PASS
Effective Radiated Power	22.913(a) (2)	Radiated	PASS
Peak to Average Ratio	-	Conducted	PASS
Modulation Characteristics	2.1047	Conducted	PASS
Occupied Bandwidth	22.917(a) / 2.1049	Conducted	PASS
Band Edges Compliance	22.917(a) / 2.1051	Conducted	PASS
Spurious Emission at Antenna Terminals	22.917(a) / 2.1051	Conducted	PASS
Field Strength of Spurious Radiation	22.917(a) / 2.1053	Radiated	PASS
Frequency Stability	22.355 / 2.1055	Conducted	PASS

5. Description of Tests

5.1 Conducted power / Modulation Characteristics



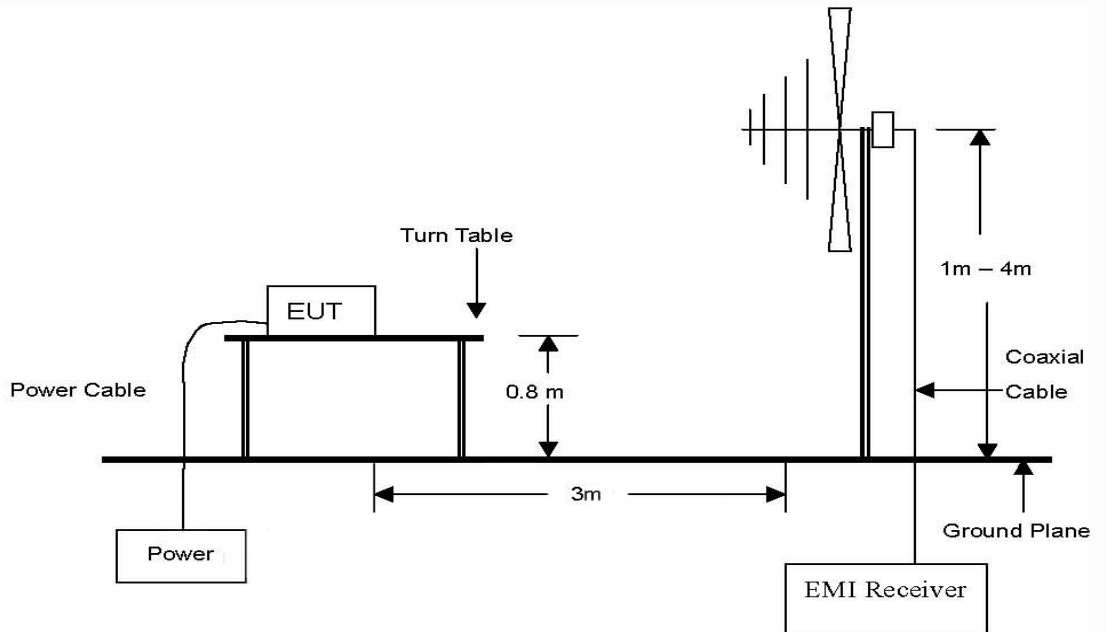
5.2 Peak to Average Ratio / Occupied Bandwidth / Band Edges Compliance / Spurious Emission at Antenna Terminals



5.3 Effective Raitded Power / Field Strength of Spurious radiation

5.3.1 Test setup for 30 MHz ~ 1 GHz

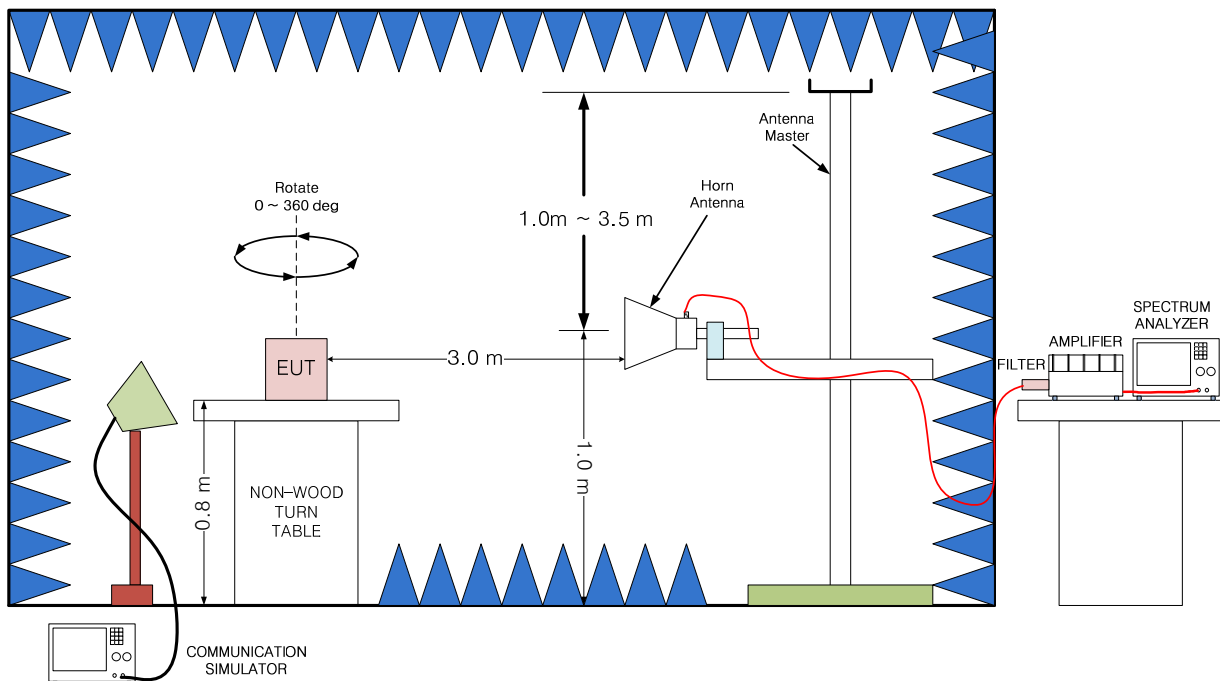
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions



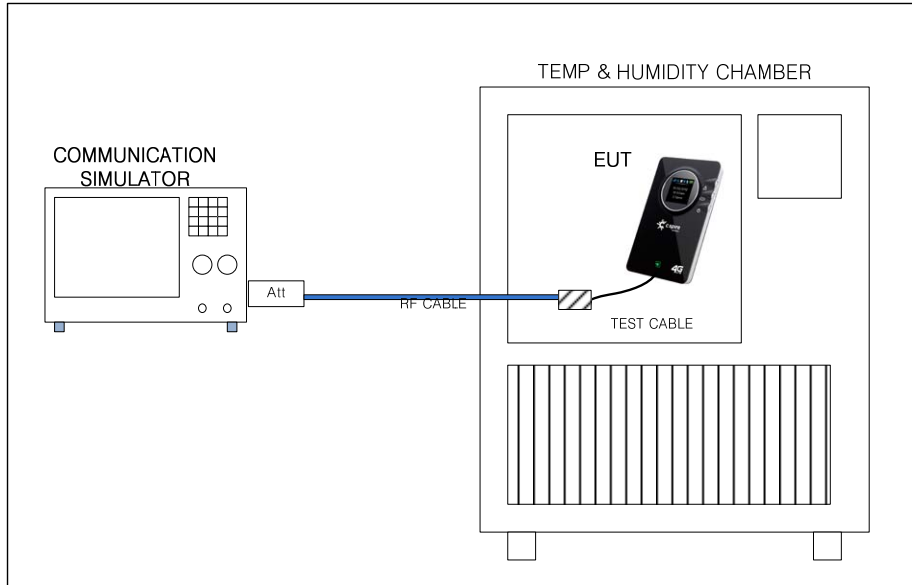
5.3.2 Test setup for 1 GHz ~ 10 GHz

The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 10 GHz emissions. As required by subpart 15.33 emissions were measured to 10 GHz.(10th carrier frequency)

*** ERP measurement not use filter, it only use Field Strength of Spurious emissions.**



5.4 Frequency Stability



5.5 Worst-case Configuration and mode

Radiated emission and conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations XY, YZ, ZX.

Based on the baseline scan, the worst-case were:

CDMA : RC3/SO32+F-SCH

CDMA EVDO : Rev.0 RTAP 153.6 k

5.6 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 transmittion mode and specific channel frequency.

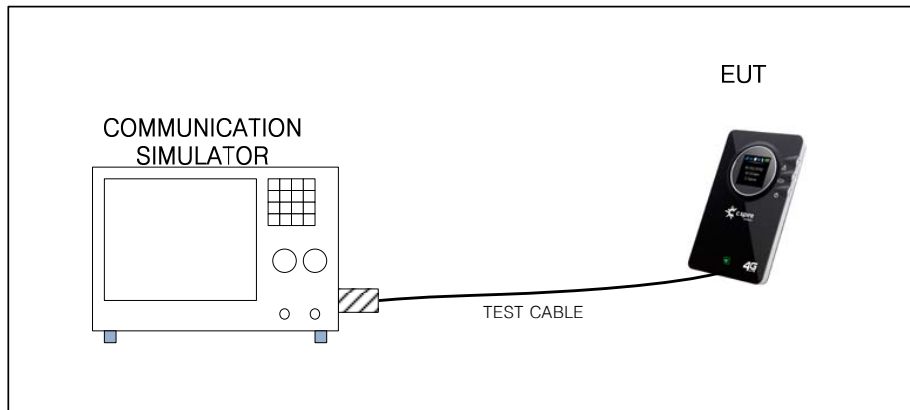
5.7 Methods and Procedure

Reference :	47 FCC PART 22 subpart H
Title :	CELLULAR RADIOTELEPHONE SERVICE
Reference :	47 FCC PART 2
Title :	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
Reference :	ANSI / TIA-603-D-2010
Title :	Land mobile fm or pm communications equipment measurement and performance standards
Reference :	FCC KDB 971168 D01 v02r01, 7 June 2013
Title:	Measurement Guidance for Certification of Licensed Digital Transmitters

6. Conducted Output power

6.1 Test Procedure

A base station simulator was used to establish communication with The EUT. The base station simulator parameters were set to produce the maximum power from the EUT. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



* Simulator call mode : all bit up,

* TEST Cable : Connect CDMA Antenna PORT (0.3dB loss / 30 cm / MCX to SMA Cable)

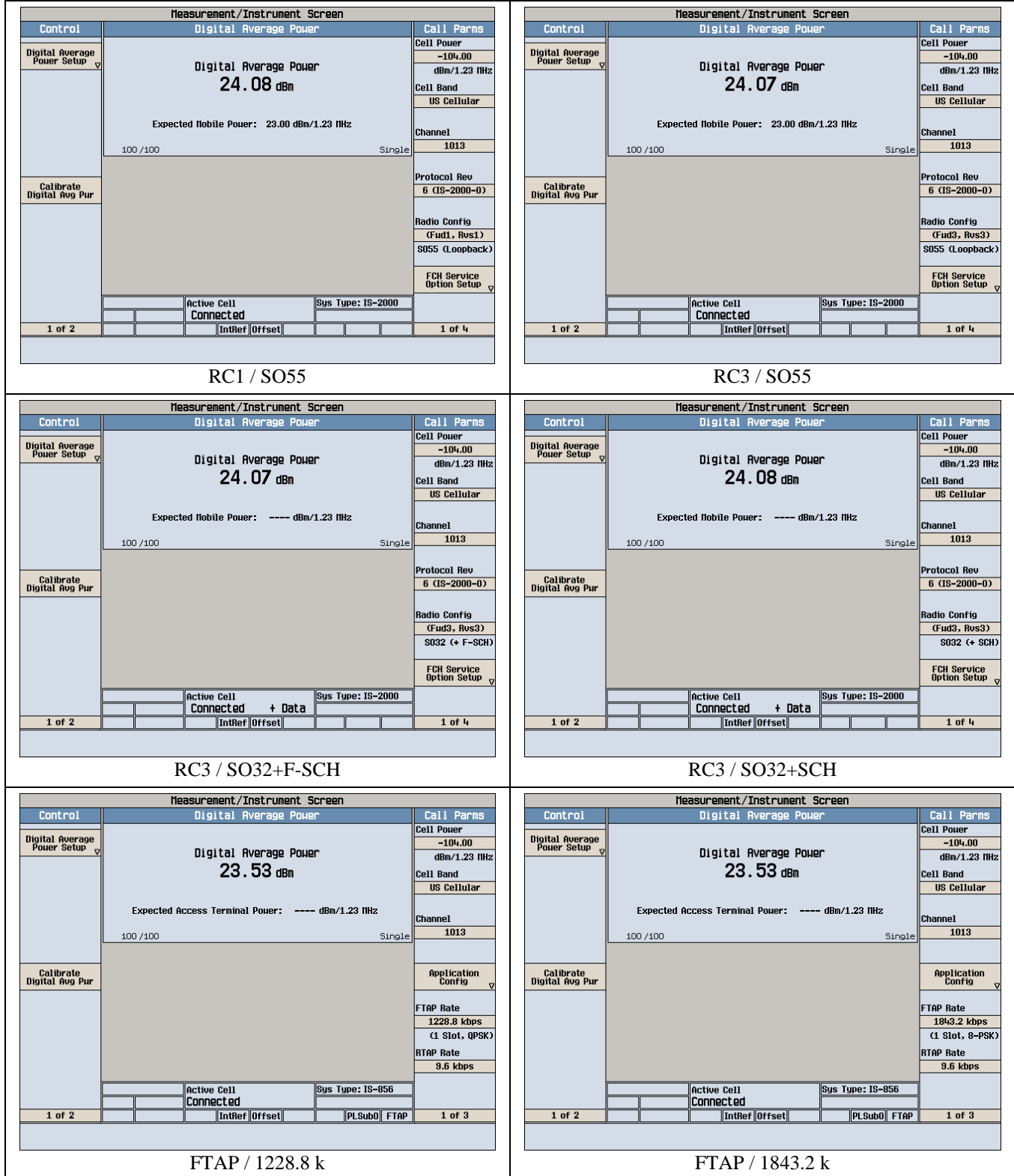
6.2 Test Result

Unit : dBm

Mode	Radio Config	FCH Svc opt.	Low ch : 1013	Mid ch : 384	High ch : 779
			Freq(MHz) : 824.70	Freq(MHz) : 836.52	Freq(MHz) : 848.31
CDMA	1	SO55	24.08	23.87	23.79
	3	SO55	24.07	23.78	23.79
	3	SO32+F-SCH	24.07	23.99	23.78
	3	SO32+SCH	24.08	23.88	23.79
CDMA EDVO Rev. 0	FTAP	1228.8 k	23.53	24.58	24.63
	FTAP	1843.2 k	23.53	24.42	24.60
	FTAP	2457.6 k	23.55	24.53	24.62
	RTAP	153.6 k	23.63	24.85	24.58
CDMA EDVO Rev. A	FETAP	1228.8 k	23.40	23.38	24.10
	FETAP	1843.2 k	23.58	23.63	23.27
	FETAP	3072 k	23.54	23.82	23.42
	RETAP	4096 b	23.52	23.36	23.26

6.3 Test Plots

* CH:1013 (824.70 MHz)



* CH:1013 (824.70 MHz)

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* CH:384 (836.52 MHz)

Measurement/Instrument Screen			
Control	Digital Average Power	Call Params	
Digital Average Power Setup ▾	Digital Average Power 23.87 dBm Expected Mobile Power: 23.00 dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00
		dBm/1.23 MHz	
		Cell Band	US Cellular
		Channel	384
Calibrate Digital Avg Pur		Protocol Rev	6 (IS-2000-0)
		Radio Config	(Fud1, Rvs1)
		S055 (Loopback)	
		FCH Service Option Setup ▾	
		Active Cell	Connected
		Sys Type: IS-2000	
1 of 2	IntRef Offset		1 of 4

RC1 / SO55

Measurement/Instrument Screen			
Control	Digital Average Power	Call Params	
Digital Average Power Setup ▾	Digital Average Power 23.78 dBm Expected Mobile Power: 23.00 dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00
		dBm/1.23 MHz	
		Cell Band	US Cellular
		Channel	384
Calibrate Digital Avg Pur		Protocol Rev	6 (IS-2000-0)
		Radio Config	(Fud3, Rvs3)
		S055 (Loopback)	
		FCH Service Option Setup ▾	
		Active Cell	Connected
		Sys Type: IS-2000	
1 of 2	IntRef Offset		1 of 4

RC3 / SO55

Measurement/Instrument Screen			
Control	Digital Average Power	Call Params	
Digital Average Power Setup ▾	Digital Average Power 23.99 dBm Expected Mobile Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00
		dBm/1.23 MHz	
		Cell Band	US Cellular
		Channel	384
Calibrate Digital Avg Pur		Protocol Rev	6 (IS-2000-0)
		Radio Config	(Fud3, Rvs3)
		S032 (+ F-SCH)	
		FCH Service Option Setup ▾	
		Active Cell	Connected + Data
		Sys Type: IS-2000	
1 of 2	IntRef Offset		1 of 4

RC3 / SO32+F-SCH

Measurement/Instrument Screen			
Control	Digital Average Power	Call Params	
Digital Average Power Setup ▾	Digital Average Power 23.88 dBm Expected Mobile Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00
		dBm/1.23 MHz	
		Cell Band	US Cellular
		Channel	384
Calibrate Digital Avg Pur		Protocol Rev	6 (IS-2000-0)
		Radio Config	(Fud3, Rvs3)
		S032 (+ SCH)	
		FCH Service Option Setup ▾	
		Active Cell	Connected + Data
		Sys Type: IS-2000	
1 of 2	IntRef Offset		1 of 4

RC3 / SO32+SCH

Measurement/Instrument Screen			
Control	Digital Average Power	Call Params	
Digital Average Power Setup ▾	Digital Average Power 24.58 dBm Expected Access Terminal Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00
		dBm/1.23 MHz	
		Cell Band	US Cellular
		Channel	384
Calibrate Digital Avg Pur		Application Config ▾	
		FTAP Rate	1228.8 kbps
		(1 Slot, QPSK)	
		RTAP Rate	9.6 kbps
		Active Cell	Connected
		Sys Type: IS-856	
1 of 2	IntRef Offset	PLSub0 FTAP	1 of 3

FTAP / 1228.8 k

Measurement/Instrument Screen			
Control	Digital Average Power	Call Params	
Digital Average Power Setup ▾	Digital Average Power 24.42 dBm Expected Access Terminal Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00
		dBm/1.23 MHz	
		Cell Band	US Cellular
		Channel	384
Calibrate Digital Avg Pur		Application Config ▾	
		FTAP Rate	1843.2 kbps
		(1 Slot, 8-PSK)	
		RTAP Rate	9.6 kbps
		Active Cell	Connected
		Sys Type: IS-856	
1 of 2	IntRef Offset	PLSub0 FTAP	1 of 3

FTAP / 1843.2 k



* CH:384 (836.52 MHz)

Control		Measurement/Instrument Screen		Call Parm	
Digital Average Power Setup	Digital Average Power	Cell Power	-104.00	Cell Power	-104.00
	24.53 dBm	dBm/1.23 MHz		dBm/1.23 MHz	
	Expected Access Terminal Power: ---- dBm/1.23 MHz	Cell Band	US Cellular	Cell Band	US Cellular
	100 /100	Channel	384	Channel	384
Calibrate Digital Avg Pur		Application Config		Application Config	
		FTAP Rate	2457.6 kbps	FTAP Rate	307.2 kbps
		(1 Slot, 16-QAM)		(2 Slot, QPSK)	
		RTAP Rate	9.6 kbps	RTAP Rate	153.6 kbps
	Active Cell Connected	Sys Type: IS-856		Sys Type: IS-856	
1 of 2		IntRef	Offset	PLSub2	RTAP
					1 of 3

FTAP / 2457.6 k

Control		Measurement/Instrument Screen		Call Parm	
Digital Average Power Setup	Digital Average Power	Cell Power	-104.00	Cell Power	-104.00
	24.85 dBm	dBm/1.23 MHz		dBm/1.23 MHz	
	Expected Access Terminal Power: 23.00 dBm/1.23 MHz	Cell Band	US Cellular	Cell Band	US Cellular
	100 /100	Channel	384	Channel	384
Calibrate Digital Avg Pur		Application Config		Application Config	
		FTAP Rate	307.2 kbps	FTAP Rate	307.2 kbps
		(2 Slot, QPSK)		(2 Slot, QPSK)	
		RTAP Rate	153.6 kbps	RTAP Rate	153.6 kbps
	Active Cell Connected	Sys Type: IS-856		Sys Type: IS-856	
1 of 2		IntRef	Offset	PLSub2	RTAP
					1 of 3

RTAP / 153.6 k

Control		Measurement/Instrument Screen		Call Parm	
Digital Average Power Setup	Digital Average Power	Cell Power	-104.00	Cell Power	-104.00
	23.38 dBm	dBm/1.23 MHz		dBm/1.23 MHz	
	Expected AT Power (Pre-Trans): ---- dBm/1.23 MHz	Cell Band	US Cellular	Cell Band	US Cellular
	Expected AT Power (Post-Trans): ---- dBm/1.23 MHz	Channel	384	Channel	384
Calibrate Digital Avg Pur		Application Config		Application Config	
		F-Traffic Format	9 (2048,1.64)	F-Traffic Format	9 (2048,1.64)
		(1228.8k, QPSK)		(1228.8k, QPSK)	
		R-Data Pkt Size	4096	R-Data Pkt Size	4096
		bits		bits	
	Active Cell Connected	Sys Type: IS-856		Sys Type: IS-856	
1 of 2		IntRef	Offset	PLSub2	FETAP
					1 of 3

FETAP / 1228.8 k

Control		Measurement/Instrument Screen		Call Parm	
Digital Average Power Setup	Digital Average Power	Cell Power	-104.00	Cell Power	-104.00
	23.63 dBm	dBm/1.23 MHz		dBm/1.23 MHz	
	Expected AT Power (Pre-Trans): ---- dBm/1.23 MHz	Cell Band	US Cellular	Cell Band	US Cellular
	Expected AT Power (Post-Trans): ---- dBm/1.23 MHz	Channel	384	Channel	384
Calibrate Digital Avg Pur		Application Config		Application Config	
		F-Traffic Format	B (3072,1.64)	F-Traffic Format	B (3072,1.64)
		(1843.2k, 8-PSK)		(1843.2k, 8-PSK)	
		R-Data Pkt Size	4096	R-Data Pkt Size	4096
		bits		bits	
	Active Cell Connected	Sys Type: IS-856		Sys Type: IS-856	
1 of 2		IntRef	Offset	PLSub2	FETAP
					1 of 3

FETAP / 1843.2 k

Control		Measurement/Instrument Screen		Call Parm	
Digital Average Power Setup	Digital Average Power	Cell Power	-104.00	Cell Power	-104.00
	23.82 dBm	dBm/1.23 MHz		dBm/1.23 MHz	
	Expected AT Power (Pre-Trans): ---- dBm/1.23 MHz	Cell Band	US Cellular	Cell Band	US Cellular
	Expected AT Power (Post-Trans): ---- dBm/1.23 MHz	Channel	384	Channel	384
Calibrate Digital Avg Pur		Application Config		Application Config	
		F-Traffic Format	E (5120,1.64)	F-Traffic Format	E (5120,1.64)
		(3072.0k,16-QAM)		(3072.0k,16-QAM)	
		R-Data Pkt Size	4096	R-Data Pkt Size	4096
		bits		bits	
	Active Cell Connected	Sys Type: IS-856		Sys Type: IS-856	
1 of 2		IntRef	Offset	PLSub2	FETAP
					1 of 3

FETAP / 3072 k

Control		Measurement/Instrument Screen		Call Parm	
Digital Average Power Setup	Digital Average Power	Cell Power	-104.00	Cell Power	-104.00
	23.36 dBm	dBm/1.23 MHz		dBm/1.23 MHz	
	Expected AT Power (Pre-Trans): 23.00 dBm/1.23 MHz	Cell Band	US Cellular	Cell Band	US Cellular
	Expected AT Power (Post-Trans): 23.00 dBm/1.23 MHz	Channel	384	Channel	384
Calibrate Digital Avg Pur		Application Config		Application Config	
		F-Traffic Format	E (5120,1.64)	F-Traffic Format	E (5120,1.64)
		(3072.0k,16-QAM)		(3072.0k,16-QAM)	
		R-Data Pkt Size	4096	R-Data Pkt Size	4096
		bits		bits	
	Active Cell Connected	Sys Type: IS-856		Sys Type: IS-856	
1 of 2		IntRef	Offset	PLSub2	RETAP
					1 of 3

RETAP / 4096 b

* CH:777 (848.31 MHz)

Measurement/Instrument Screen				
Control	Digital Average Power	Call Params		
Digital Average Power Setup ▾	Digital Average Power 23.79 dBm Expected Mobile Power: 23.00 dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00	
		Cell Power	-104.00	
		Cell Power	dBm/1.23 MHz	dBm/1.23 MHz
		Cell Band	US Cellular	US Cellular
		Channel	777	777
		Protocol Rev	6 (IS-2000-0)	6 (IS-2000-0)
		Radio Config	(Fud1, Rvs1)	(Fud3, Rvs3)
		S055 (Loopback)	S055 (Loopback)	S055 (Loopback)
		FCH Service Option Setup ▾		
		Active Cell	Connected	Sys Type: IS-2000
1 of 2	IntRef	Offset	1 of 4	

RC1 / SO55

Measurement/Instrument Screen				
Control	Digital Average Power	Call Params		
Digital Average Power Setup ▾	Digital Average Power 23.79 dBm Expected Mobile Power: 23.00 dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00	
		Cell Power	-104.00	
		Cell Power	dBm/1.23 MHz	dBm/1.23 MHz
		Cell Band	US Cellular	US Cellular
		Channel	777	777
		Protocol Rev	6 (IS-2000-0)	6 (IS-2000-0)
		Radio Config	(Fud3, Rvs3)	(Fud3, Rvs3)
		S055 (Loopback)	S055 (Loopback)	S055 (Loopback)
		FCH Service Option Setup ▾		
		Active Cell	Connected	Sys Type: IS-2000
1 of 2	IntRef	Offset	1 of 4	

RC3 / SO55

Measurement/Instrument Screen				
Control	Digital Average Power	Call Params		
Digital Average Power Setup ▾	Digital Average Power 23.78 dBm Expected Mobile Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00	
		Cell Power	-104.00	
		Cell Power	dBm/1.23 MHz	dBm/1.23 MHz
		Cell Band	US Cellular	US Cellular
		Channel	777	777
		Protocol Rev	6 (IS-2000-0)	6 (IS-2000-0)
		Radio Config	(Fud3, Rvs3)	(Fud3, Rvs3)
		S032 (+ F-SCH)	S032 (+ F-SCH)	S032 (+ F-SCH)
		FCH Service Option Setup ▾		
		Active Cell	Connected + Data	Sys Type: IS-2000
1 of 2	IntRef	Offset	1 of 4	

RC3 / SO32+F-SCH

Measurement/Instrument Screen				
Control	Digital Average Power	Call Params		
Digital Average Power Setup ▾	Digital Average Power 23.79 dBm Expected Mobile Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00	
		Cell Power	-104.00	
		Cell Power	dBm/1.23 MHz	dBm/1.23 MHz
		Cell Band	US Cellular	US Cellular
		Channel	777	777
		Protocol Rev	6 (IS-2000-0)	6 (IS-2000-0)
		Radio Config	(Fud3, Rvs3)	(Fud3, Rvs3)
		S032 (+ SCH)	S032 (+ SCH)	S032 (+ SCH)
		FCH Service Option Setup ▾		
		Active Cell	Connected + Data	Sys Type: IS-2000
1 of 2	IntRef	Offset	1 of 4	

RC3 / SO32+SCH

Measurement/Instrument Screen				
Control	Digital Average Power	Call Params		
Digital Average Power Setup ▾	Digital Average Power 24.63 dBm Expected Access Terminal Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00	
		Cell Power	-104.00	
		Cell Power	dBm/1.23 MHz	dBm/1.23 MHz
		Cell Band	US Cellular	US Cellular
		Channel	777	777
		Application Config ▾		
		FTAP Rate	1228.8 kbps	1843.2 kbps
		(1 Slot, QPSK)	(1 Slot, QPSK)	(1 Slot, 8-PSK)
		RTAP Rate	9.6 kbps	9.6 kbps
		Active Cell	Connected	Sys Type: IS-856
1 of 2	IntRef	Offset	PLSub0 FTAP 1 of 3	

FTAP / 1228.8 k

Measurement/Instrument Screen				
Control	Digital Average Power	Call Params		
Digital Average Power Setup ▾	Digital Average Power 24.60 dBm Expected Access Terminal Power: ---- dBm/1.23 MHz 100 /100 Single	Cell Power	-104.00	
		Cell Power	-104.00	
		Cell Power	dBm/1.23 MHz	dBm/1.23 MHz
		Cell Band	US Cellular	US Cellular
		Channel	777	777
		Application Config ▾		
		FTAP Rate	1843.2 kbps	1843.2 kbps
		(1 Slot, 8-PSK)	(1 Slot, 8-PSK)	(1 Slot, 8-PSK)
		RTAP Rate	9.6 kbps	9.6 kbps
		Active Cell	Connected	Sys Type: IS-856
1 of 2	IntRef	Offset	PLSub0 FTAP 1 of 3	

FTAP / 1843.2 k

* CH:777 (848.31 MHz)

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7. Effective Radiated power

7.1 Test Procedure

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 3MHz for CDMA mode.
- b. Substitution method is used for ERP measurement. In the open-site 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 dipole 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. ERP = Output power level of S.G – TX cable loss + Antenna gain of substitution dipole

* This device was tested under all configurations and the highest power is reported. Also, we have done XY, YZ, ZX planes in EUT and horizontal and vertical polarization in detecting antenna.

* The worst case of CDMA mode is

CDMA : RC3/SO32+F-SCH

CDMA EVDO : Rev.0 RTAP 153.6 k

* Configuration : refer to 5.3 chapter.

* Simulator call mode : all bit up

7.2 Test Result

Mode	Radio Config	FCH Svc opt.	Low ch :	Mid ch :	High ch :
			1013	384	779
			Freq(MHz) :	Freq(MHz) :	Freq(MHz) :
			824.70	836.52	848.31
CDMA	3	SO32+F-SCH	0.244 W (23.87 dBm)	0.245 W (23.90 dBm)	0.125 W (20.98 dBm)
CDMA EVDO Rev. 0	RTAP	153.6 k	0.255 W (24.06 dBm)	0.261 W (24.17 dBm)	0.139 W (21.43 dBm)

7.3 Test Criteria

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

7.3 Test Result

7.3.1 XY SCAN

MODE	CH /FREQ		Polar	SCAN	Measured Level	Measured Level	Substitute Level	ANT Gain	Cable Loss	ERP	
	CHANNEL	FREQ (MHz)	Hor/Ver	X,Y,Z	(dBuV)	(dBm)	(dBm)	(dB)	(dB)	W	dBm
RC3 / SO32+F-SCH	1013	824.70	V	XY	96.20	-10.80	35.65	-9.83	1.94	0.244	23.87
	384	836.52		XY	96.97	-10.03	35.64	-9.83	1.92	0.245	23.90
	777	848.31		XY	94.62	-12.38	32.73	-9.82	1.93	0.125	20.98
RC3 / SO32+F-SCH	1013	824.70	H	XY	83.63	-23.37	21.35	-9.83	1.94	0.009	9.57
	384	836.52		XY	83.21	-23.79	20.01	-9.83	1.92	0.007	8.27
	777	848.31		XY	81.63	-25.37	18.16	-9.82	1.93	0.004	6.41
RTAP / 153.6K	1013	824.70	V	XY	96.39	-10.61	35.84	-9.83	1.94	0.255	24.06
	384	836.52		XY	97.24	-9.76	35.91	-9.83	1.92	0.261	24.17
	777	848.31		XY	95.07	-11.93	33.18	-9.82	1.93	0.139	21.43
RTAP / 153.6K	1013	824.70	H	XY	83.34	-23.66	21.06	-9.83	1.94	0.008	9.28
	384	836.52		XY	83.91	-23.09	20.71	-9.83	1.92	0.008	8.97
	777	848.31		XY	82.22	-24.78	18.75	-9.82	1.93	0.005	7.00

7.3.2 YZ SCAN

MODE	CH /FREQ		Polar	SCAN	Measured Level	Measured Level	Substitute Level	ANT Gain	Cable Loss	ERP	
	CHANNEL	FREQ (MHz)	Hor/Ver	X,Y,Z	(dBuV)	(dBm)	(dBm)	(dB)	(dB)	W	dBm
RC3 / SO32+F-SCH	1013	824.70	V	YZ	88.60	-18.40	28.05	-9.83	1.94	0.042	16.27
	384	836.52		YZ	87.84	-19.16	26.51	-9.83	1.92	0.030	14.77
	777	848.31		YZ	86.17	-20.83	24.28	-9.82	1.93	0.018	12.53
RC3 / SO32+F-SCH	1013	824.70	H	YZ	97.86	-9.14	35.58	-9.83	1.94	0.240	23.80
	384	836.52		YZ	97.83	-9.17	34.63	-9.83	1.92	0.194	22.89
	777	848.31		YZ	96.22	-10.78	32.75	-9.82	1.93	0.126	21.00
RTAP / 153.6K	1013	824.70	V	YZ	88.50	-18.50	27.95	-9.83	1.94	0.041	16.17
	384	836.52		YZ	87.97	-19.03	26.64	-9.83	1.92	0.031	14.90
	777	848.31		YZ	86.35	-20.65	24.46	-9.82	1.93	0.019	12.71
RTAP / 153.6K	1013	824.70	H	YZ	97.90	-9.10	35.62	-9.83	1.94	0.242	23.84
	384	836.52		YZ	98.08	-8.92	34.88	-9.83	1.92	0.206	23.14
	777	848.31		YZ	96.58	-10.42	33.11	-9.82	1.93	0.137	21.36

7.3.3 ZX SCAN

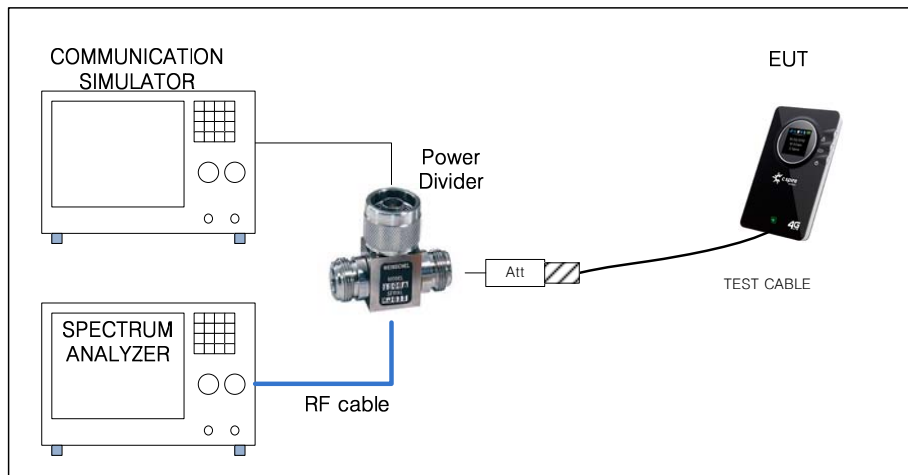
MODE	CH /FREQ		Polar	SCAN	Measured Level	Measured Level	Substitute Level	ANT Gain	Cable Loss	ERP	
	CHANNEL	FREQ (MHz)	Hor/Ver	X,Y,Z	(dBuV)	(dBm)	(dBm)	(dB)	(dB)	W	dBm
RC3 / SO32+F-SCH	1013	824.70	V	ZX	92.56	-14.44	32.01	-9.83	1.94	0.105	20.23
	384	836.52		ZX	92.18	-14.82	30.85	-9.83	1.92	0.081	19.11
	777	848.31		ZX	91.26	-15.74	29.37	-9.82	1.93	0.058	17.62
RC3 / SO32+F-SCH	1013	824.70	H	ZX	96.87	-10.13	34.59	-9.83	1.94	0.191	22.81
	384	836.52		ZX	96.66	-10.34	33.46	-9.83	1.92	0.148	21.72
	777	848.31		ZX	94.25	-12.75	30.78	-9.82	1.93	0.080	19.03
RTAP / 153.6K	1013	824.70	V	ZX	92.24	-14.76	31.69	-9.83	1.94	0.098	19.91
	384	836.52		ZX	93.09	-13.91	31.76	-9.83	1.92	0.100	20.02
	777	848.31		ZX	91.93	-15.07	30.04	-9.82	1.93	0.067	18.29
RTAP / 153.6K	1013	824.70	H	ZX	96.80	-10.20	34.52	-9.83	1.94	0.188	22.74
	384	836.52		ZX	96.90	-10.10	33.70	-9.83	1.92	0.157	21.96
	777	848.31		ZX	94.76	-12.24	31.29	-9.82	1.93	0.090	19.54

8. Peak to Average Ratio

8.1 Test Procedure

A peak to average ratio measurement is performed at the conducted port of the EUT. For CDMA and WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

- a. Set resolution/measurement bandwidth \geq signal's occupied bandwidth
- b. Set the number of counts to a value that stabilizes the measured CCDF curve



- * Simulator call mode : all bit up
- * TEST Cable : Connect CDMA Antenna PORT (0.3dB loss / 30 cm / MCX to SMA Cable)
- * RF Cable : HUBER+SHUNER / SUCOFLEX 104 / DC-18 GHz / 1.0 m
- * Attenuator : 10 dB (Weinshel /56-10/ DC-28 GHz) + 10 dB(Weinshel / 56-10 / DC-28 GHz)
- * Power Divider : WEINSCHEL / 1506A / DC-18 GHz / 3 Port
- * Path Loss Information

Frequency (MHz)	RF Cable (dB)	10 dB ATT (dB)	10 dB ATT (dB)	Power Diver (dB)	Test Cable (dB)	Total Loss (dB)
836.52	0.57	9.63	9.58	5.78	0.30	25.54

8.2 Test Result

Unit : dB

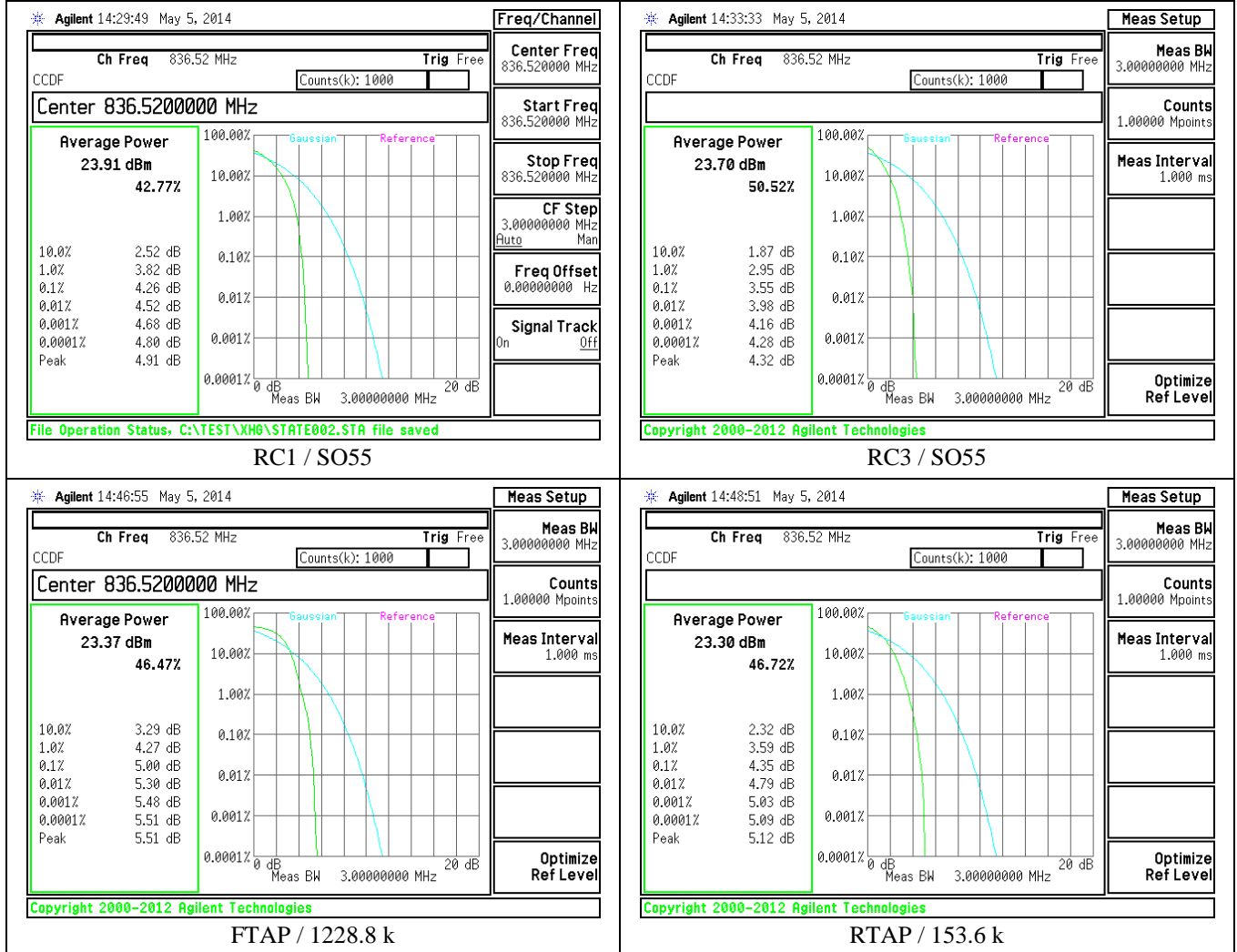
Mode	Radio Config	FCH Svc opt.	Low ch :	Mid ch :	High ch :
			1013	384	779
			Freq(MHz) :	Freq(MHz) :	Freq(MHz) :
			824.70	836.52	848.31
CDMA	1	SO55	-	4.26	-
	3	SO55	-	3.55	-
CDMA EDVO Rev. 0	FTAP	1228.8 k	-	5.00	-
	RTAP	153.6 k	-	4.35	-

8.3 Test Criteria

In measuring transmissions in this band using an average power technique, the peak to average ratio of the transmission may not exceed 13 dB (associated with a probability of 0.1%)

8.4 Test Plots

* CH:384 (836.52 MHz)



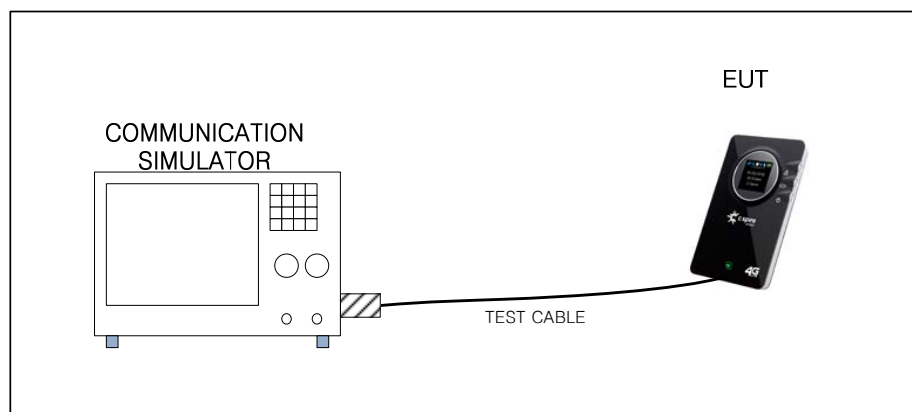
9. Modulation Characteristics

9.1 Definition

Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

9.2 Test Procedure

The measurement frequency is center channel(384)

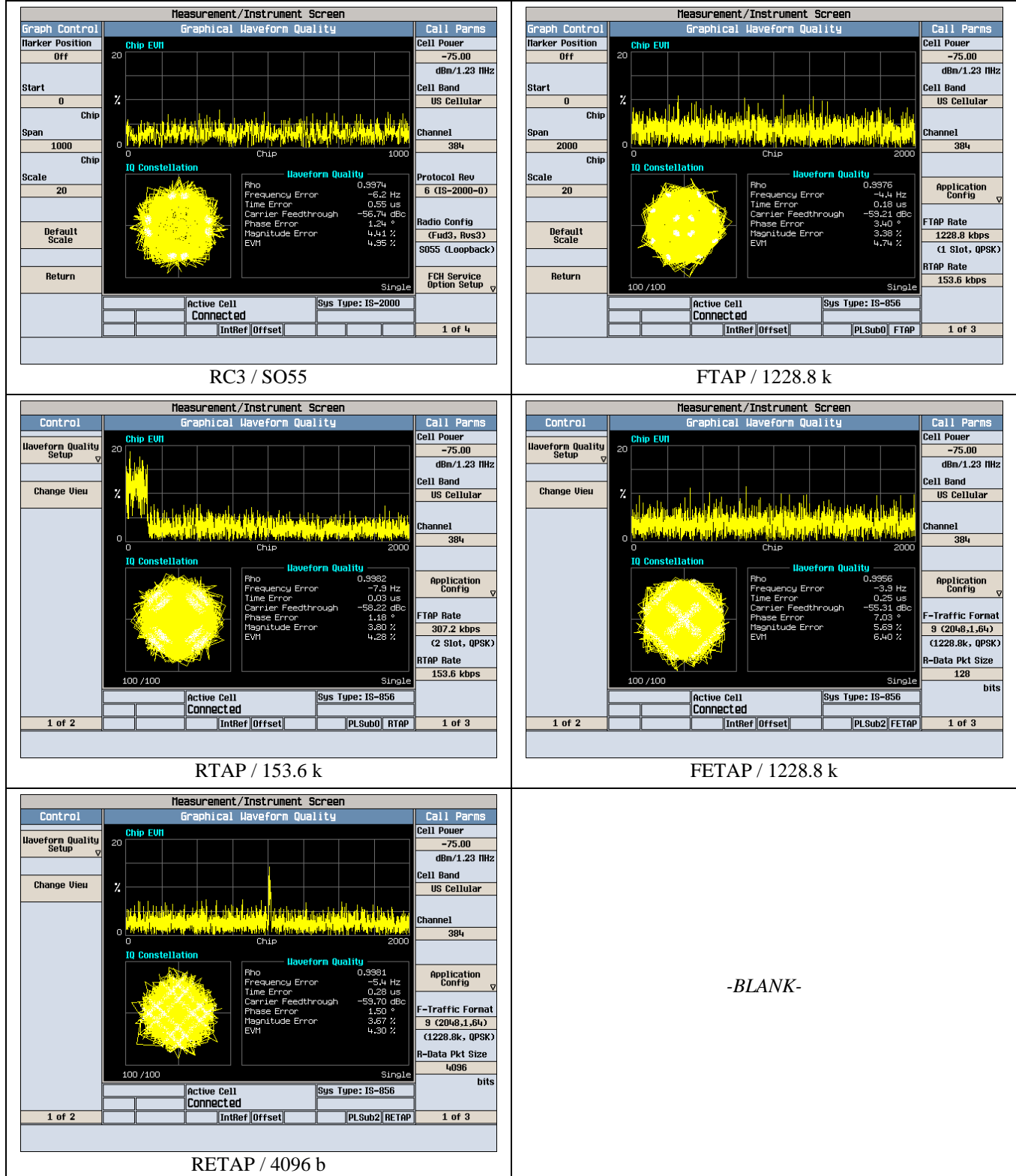


9.3 Test Criteria

The waveform quality factor shall be greater than 0.944

9.4 Test Plots

* CH:384 (836.52 MHz)

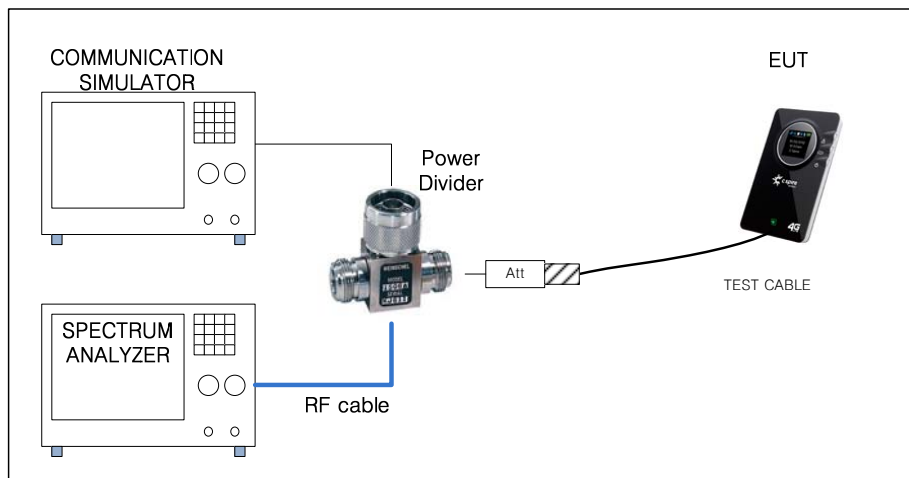


10. Occupied Bandwidth

10.1 Definition

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

10.2 Test Procedure



* Simulator call mode : all bit up

* TEST Cable : Connect CDMA Antenna PORT (0.3dB loss / 30 cm / MCX to SMA Cable)

* RF Cable : HUBER+SHUNER / SUCOFLEX 104 / DC-18 GHz / 1.0 m

* Attenuator : 10 dB (Weinshel / 56-10/ DC-28 GHz) + 10 dB(Weinshel / 56-10 / DC-28 GHz)

* Power Divider : WEINSCHEL / 1506A / DC-18 GHz / 3 Port

* Path Loss Information

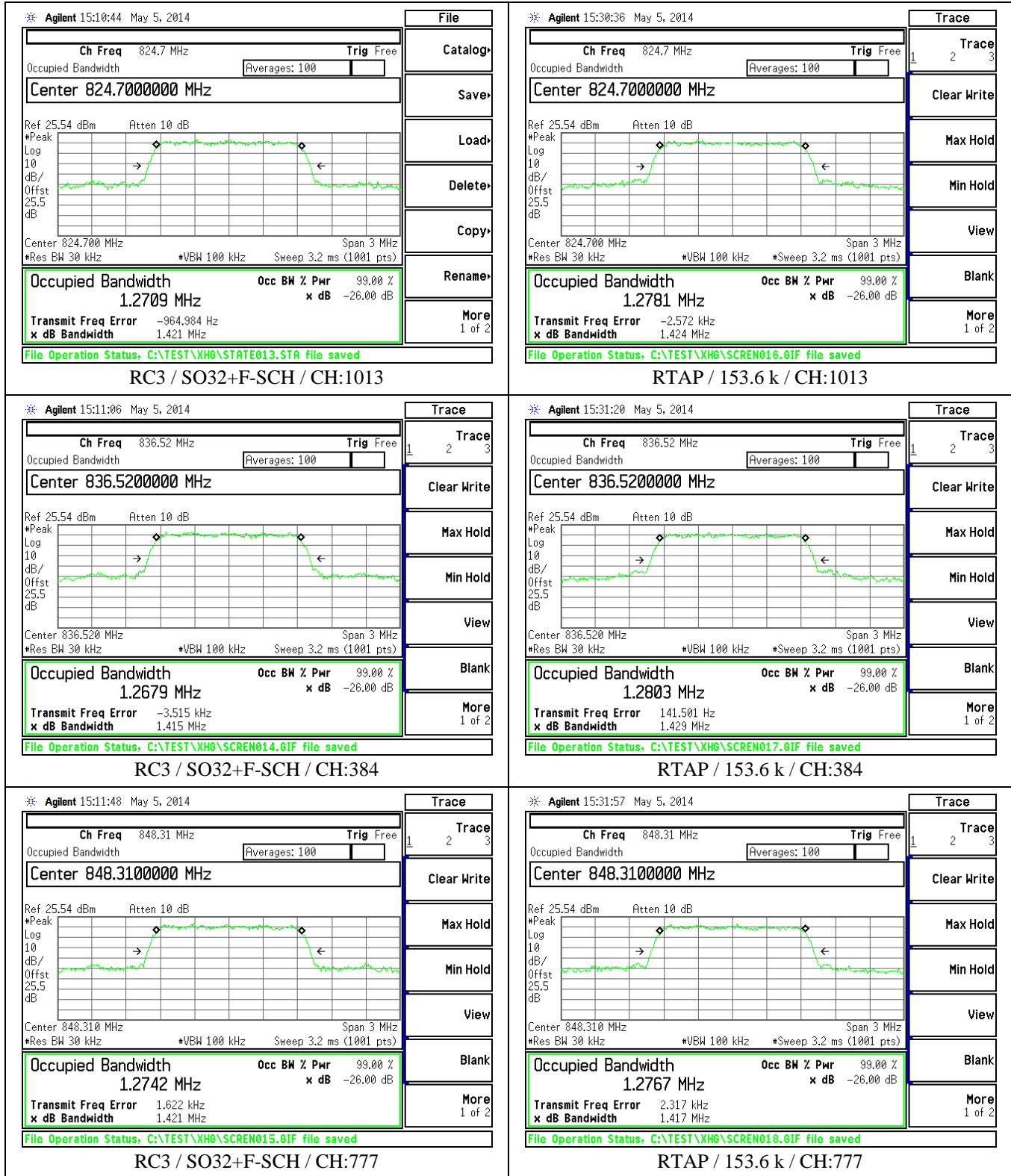
Frequency (MHz)	RF Cable (dB)	10 dB ATT (dB)	10 dB ATT (dB)	Power Diver (dB)	Test Cable (dB)	Total Loss (dB)
836.52	0.57	9.63	9.58	5.78	0.30	25.54

10.3 Test Result

Unit : MHz

Mode	Radio Config	FCH Svc opt.	Low ch : 1013	Mid ch : 384	High ch : 779
			Freq(MHz) : 824.70	Freq(MHz) : 836.52	Freq(MHz) : 848.31
CDMA	3	SO32+F-SCH	1.271	1.268	1.274
CDMA EDVO Rev. 0	RTAP	153.6 k	1.278	1.280	1.277

10.4 Test Plots



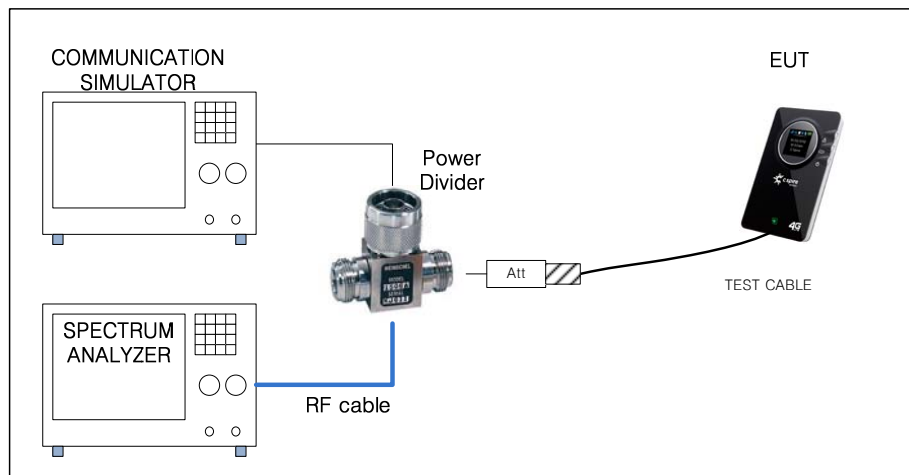
11. Band Edge Compliance

11.1 Definition

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. The emission limit equal to -13dBm .

11.2 Test Procedure

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1MHz. The RBW of the spectrum is 13kHz and the VBW of the spectrum is 51kHz.
- Record the max trace plot into the test report.
- The center frequency of spectrum is the band edge frequency ± 3 MHz, span is 4 MHz. The RBW is 100KHz, and the VBW is 300 KHz
- Record the max trace plot into the test report.



- * Simulator call mode : all bit up
- * TEST Cable : Connect CDMA Antenna PORT (0.3dB loss / 30 cm / MCX to SMA Cable)
- * RF Cable : HUBER+SHUNER / SUCOFLEX 104 / DC-18 GHz / 1.0 m
- * Attenuator : 10 dB (Weinshel / 56-10/ DC-28 GHz) + 10 dB(Weinshel / 56-10 / DC-28 GHz)
- * Power Divider : WEINSCHEL / 1506A / DC-18 GHz / 3 Port
- * Path Loss Information

Frequency (MHz)	RF Cable (dB)	10 dB ATT (dB)	10 dB ATT (dB)	Power Diver (dB)	Test Cable (dB)	Total Loss (dB)
836.52	0.57	9.63	9.58	5.78	0.30	25.54

11.3 Test Criteria

At least -13 dBm below.

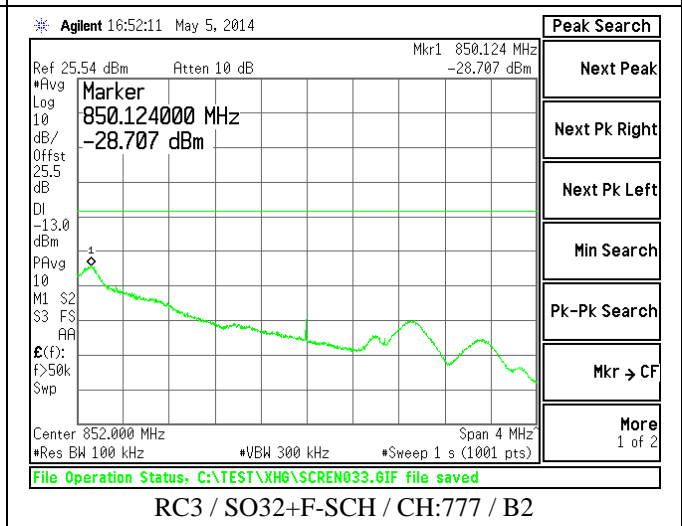
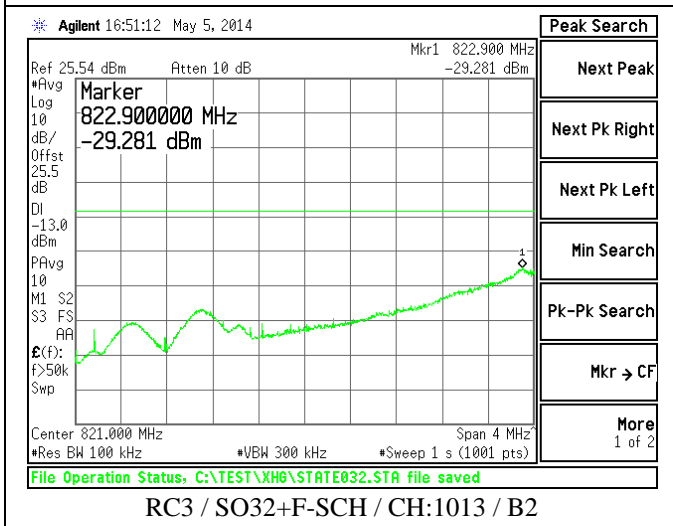
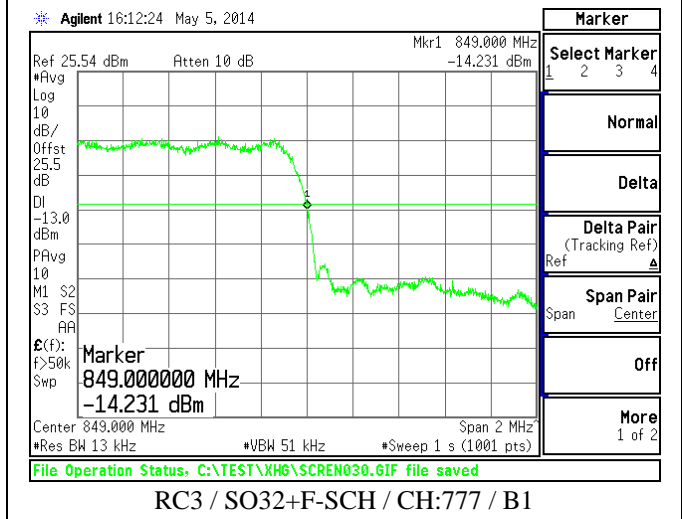
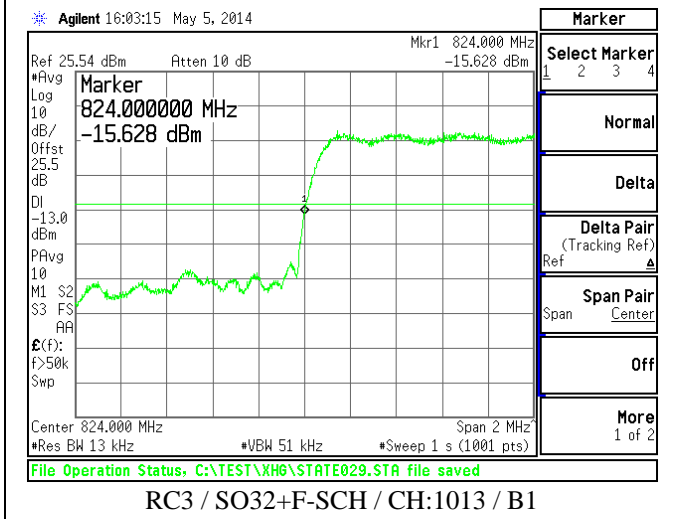
11.4 Test Result

Unit :dBm

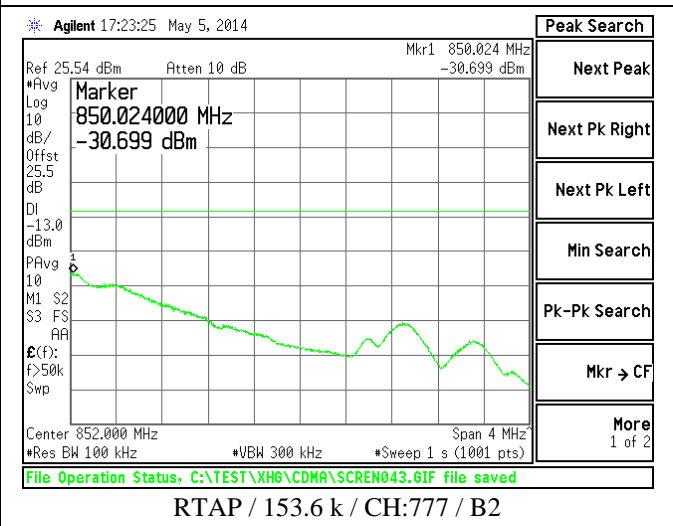
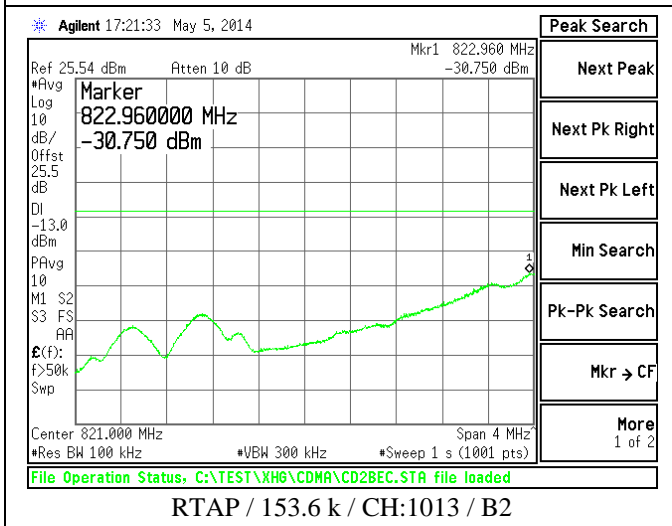
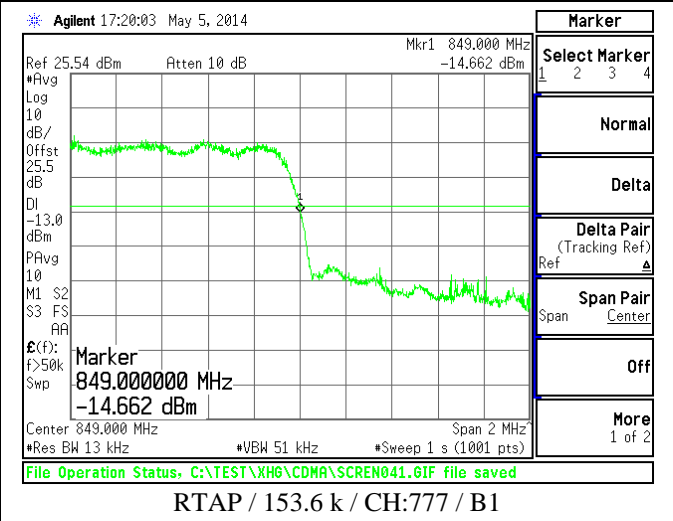
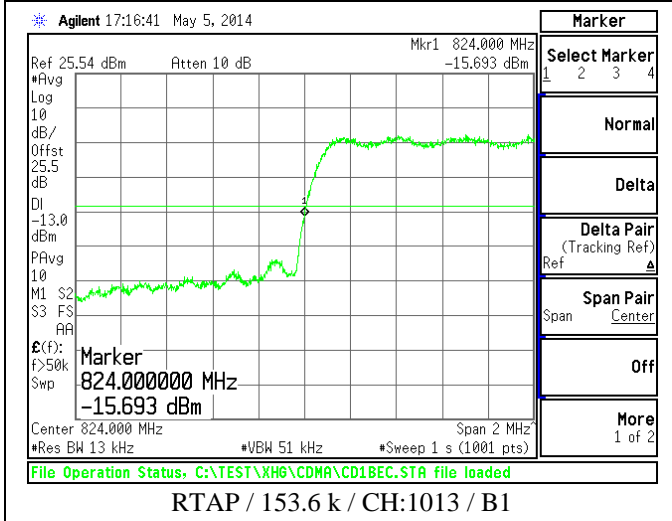
Mode	Radio Config	FCH Svc opt.	Low ch : 1013	RBW / VBW / SPAN	High ch : 779
			Freq(MHz) : 824.70		Freq(MHz) : 848.31
CDMA	CENTER FREQUENCY(B1)		824 MHz	-	849 MHz
	3	SO32+F-SCH	-15.63	13K / 51K / 2M	-14.23
	CENTER FREQUENCY(B2)		821 MHz	-	852 MHz
	3	SO32+F-SCH	-29.28	100K /300K /4M	-28.71
CDMA EVDO Rev. 0	CENTER FREQUENCY(B1)		824 MHz	-	849 MHz
	RTAP	153.6 k	-15.69	13K / 51K / 2M	-14.66
	CENTER FREQUENCY(B2)		821 MHz	-	852 MHz
	RTAP	153.6 k	-30.75	100K /300K /4M	-30.70

11.5 Test Plots

* CDMA



* CDMA EVDO Rev. 0



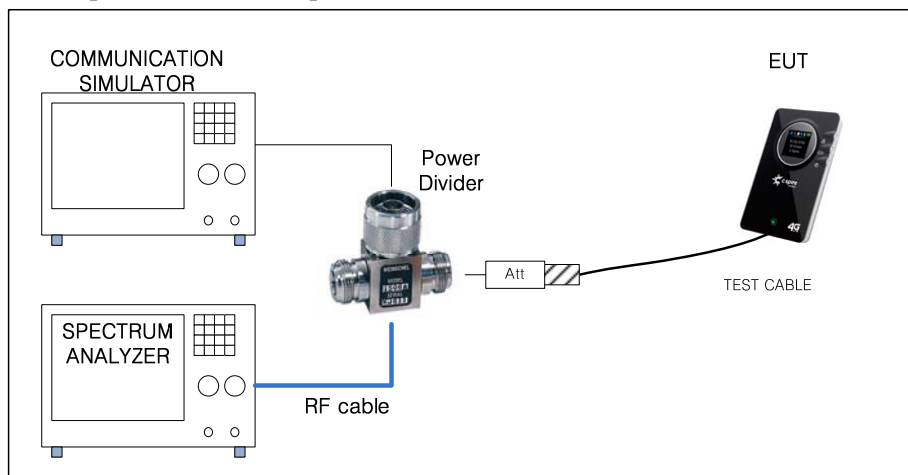
12. Spurious Emission at Antenna Terminals

12.1 Definition

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 .

12.2 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at middle frequency range.
- Measuring frequency range is from 30 MHz to 20GHz. The RBW=1MHz and VBW=3MHz is used for conducted emission measurement.(correct frequency attenuation level)
- Record the max trace plot into the test report.



* Simulator call mode : all bit up

* TEST Cable : Connect CDMA Antenna PORT (0.3dB loss / 30 cm / MCX to SMA Cable)

* RF Cable : HUBER+SHUNER / SUCOFLEX 104 / DC-18 GHz / 1.0 m

* Attenuator : 10 dB (Weinshel /56-10/ DC-28 GHz) + 10 dB(Weinshel / 56-10 / DC-28 GHz)

* Power Divider : WEINSCHEL / 1506A / DC-18 GHz / 3 Port

* Path Loss Information

Frequency (MHz)	RF Cable (dB)	10 dB ATT (dB)	10 dB ATT (dB)	Power Diver (dB)	Test Cable (dB)	Total Loss (dB)
836.52	0.29	9.59	9.58	5.78	0.30	25.54
1 673.20	0.43	9.61	9.61	5.78	0.30	25.73

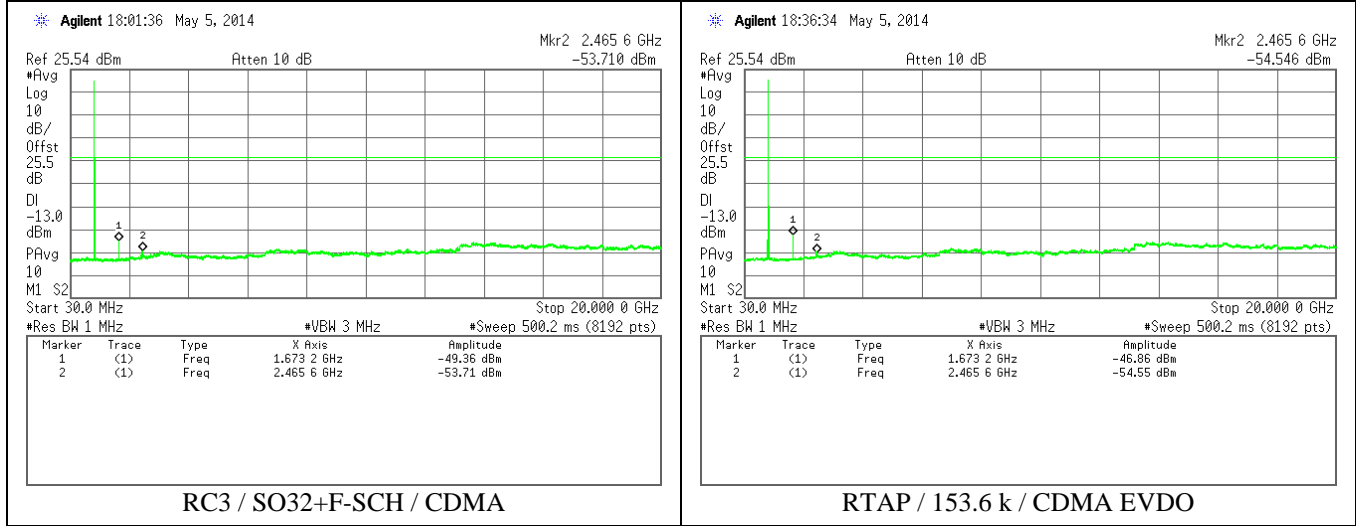
12.3 Test Result

Unit : dBm

CH : 384			FREQUENCY : 836.52 MHz			
Mode	Radio Config	FCH Svc opt.	Reading (dBm)	Measured Freq.(MHz)	Correct (Att, cable)	Result
CDMA	3	SO32+F-SCH	-49.36	1673.20	0.19	-49.17
CDMA EDVO Rev. 0	RTAP	153.6 k	-46.86	1673.20	0.19	-46.67

12.4 Test Plots

* CH:384 (836.52 MHz)



13. Field Strength of Spurious Radiation

13.1 Definition

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

13.2 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 3 meters from the measurement antenna.

For spurious emissions below 1 GHz quasi-peak detection is used with a resolution bandwidth of 120 kHz. The emissions were maximized by rotating the EUT and raising and lowering the measurement antenna from 1~4 meters (above 1 GHz, measure antenna from 1 ~ 3.5 meters)

Spurious/harmonic emissions above 1 GHz peak are measured with average and peak detection with a resolution bandwidth of 1 MHz (VBW = 3 MHz) and measured at a distance of 3 meter.

Average detection is used to determine compliance of the EUT if the peak does not meet the average limit. Non-harmonic emissions must satisfy the average limit and the peak limit (20 dB above average).

Correction factor is a combination of cable loss (CL), microwave amplifier gain (G amp), antenna factor (AF), hi-pass filter factor (HPF)

Example correction factor calculation: $F/S(\text{Field Strength}) = \text{Measuring Value} + AF - G \text{ amp} + CL + \text{HPF}$

* Hi-Pass Filter : WAINWRIGHT / WHK1.5/15G-6SS / 1.5-15 GHz pass filter

The ERP limits in dBm were converted to field strength limits in $\text{dB}\mu\text{V}/\text{m}$ @ 3m.

Example ERP limit conversion: $F/S(\text{Field Strength}) = \text{EIRP} + 95.2 = \text{ERP} + 97.35$ ($\text{ERP} = \text{EIRP} - 2.15$)

It was performed according to the KDB 971168 v02r01 5.8.3. Mathematical conversions.

Both vertical and horizontal polarities were tested and the worst case presented. In all cases the vertical polarization resulted in the greatest signal.

There were no measurable emissions above 18 GHz, up to 40 GHz. The measurement noise floor is well below the specified limit. Measurements in the table above for emissions greater than 18 GHz are of the noise floor.

13.3 Test Results

13.3.1 mode : CDMA 384CH/ RC3 / SO32+F-SCH / XY SCAN

Emission Frequency (MHz)	ANT (H/V)	EUT (X,Y,Z)	Measure Value (dB μ V)	Antenna Factor [dB/m]	Amp Gain (dB)	Cable loss (dB)	High Pass Filter (dB)	F/S (dB μ V/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
1671.00	V	XY	53.03	25.59	42.97	4.69	0.86	41.20	-56.15	-13.00	43.15
2508.00	V	XY	52.76	27.49	43.33	5.84	0.45	43.21	-54.14	-13.00	41.14
3345.00	V	XY	58.95	28.90	41.26	6.89	0.40	53.88	-43.47	-13.00	30.47
4182.00	V	XY	64.37	30.21	40.69	7.96	0.22	62.07	-35.28	-13.00	22.28
1671.00	H	XY	55.04	25.59	42.97	4.69	0.86	43.21	-54.14	-13.00	41.14
3348.00	H	XY	53.55	28.91	41.26	6.89	0.40	48.49	-48.86	-13.00	35.86
4185.00	H	XY	60.37	30.21	40.69	7.96	0.22	58.07	-39.28	-13.00	26.28

13.3.2 mode : CDMA EVDO 384CH/ RTAP / 153.6 k / XY SCAN

Emission Frequency (MHz)	ANT (H/V)	EUT (X,Y,Z)	Measure Value (dB μ V)	Antenna Factor [dB/m]	Amp Gain (dB)	Cable loss (dB)	High Pass Filter (dB)	F/S (dB μ V/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
1671.00	V	XY	66.24	25.59	42.97	4.69	0.86	54.41	-42.94	-13.00	29.94
2511.00	V	XY	63.82	27.49	43.33	5.84	0.45	54.27	-43.08	-13.00	30.08
3345.00	V	XY	55.70	28.90	41.26	6.89	0.40	50.63	-46.72	-13.00	33.72
4182.00	V	XY	63.19	30.21	40.69	7.96	0.22	60.89	-36.46	-13.00	23.46
1671.00	H	XY	59.93	25.59	42.97	4.69	0.86	48.10	-49.25	-13.00	36.25
2508.00	H	XY	55.56	27.49	43.33	5.84	0.45	46.01	-51.34	-13.00	38.34
3345.00	H	XY	50.87	28.90	41.26	6.89	0.40	45.80	-51.55	-13.00	38.55
4185.00	H	XY	59.39	30.21	40.69	7.96	0.22	57.09	-40.26	-13.00	27.26

13.3.3 mode : CDMA 384CH/ RC3 / SO32+F-SCH / YZ SCAN

Emission Frequency (MHz)	ANT (H/V)	EUT (X,Y,Z)	Measure Value (dBμV)	Antenna Factor [dB/m]	Amp Gain (dB)	Cable loss (dB)	High Pass Filter (dB)	F/S (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
1671.00	V	YZ	58.36	25.59	42.97	4.69	0.86	46.53	-50.82	-13.00	37.82
2511.00	V	YZ	59.25	27.49	43.32	5.84	0.45	49.71	-47.64	-13.00	34.64
3345.00	V	YZ	54.37	28.90	41.26	6.89	0.40	49.30	-48.05	-13.00	35.05
4185.00	V	YZ	60.06	30.21	40.69	7.96	0.22	57.76	-39.59	-13.00	26.59
1671.00	H	YZ	60.23	25.59	42.97	4.69	0.86	48.40	-48.95	-13.00	35.95
2508.00	H	YZ	56.90	27.49	43.33	5.84	0.45	47.35	-50.00	-13.00	37.00
4185.00	H	YZ	55.46	30.21	40.69	7.96	0.22	53.16	-44.19	-13.00	31.19

13.3.4 mode : CDMA EVDO 384CH/ RTAP / 153.6 k / YZ SCAN

Emission Frequency (MHz)	ANT (H/V)	EUT (X,Y,Z)	Measure Value (dBμV)	Antenna Factor [dB/m]	Amp Gain (dB)	Cable loss (dB)	High Pass Filter (dB)	F/S (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
1671.00	V	YZ	57.12	25.59	42.97	4.69	0.86	45.29	-52.06	-13.00	39.06
2508.00	V	YZ	63.06	27.49	43.33	5.84	0.45	53.51	-43.84	-13.00	30.84
3345.00	V	YZ	53.36	28.90	41.26	6.89	0.40	48.29	-49.06	-13.00	36.06
4182.00	V	YZ	62.17	30.21	40.69	7.96	0.22	59.87	-37.48	-13.00	24.48
1671.00	H	YZ	61.03	25.59	42.97	4.69	0.86	49.20	-48.15	-13.00	35.15
2511.00	H	YZ	67.26	27.49	43.33	5.84	0.45	57.71	-39.64	-13.00	26.64
3345.00	H	YZ	51.83	28.90	41.26	6.89	0.40	46.76	-50.59	-13.00	37.59
4185.00	H	YZ	58.73	30.21	40.69	7.96	0.22	56.43	-40.92	-13.00	27.92

13.3.5 mode : CDMA 384CH/ RC3 / SO32+F-SCH / ZX SCAN

Emission Frequency (MHz)	ANT (H/V)	EUT (X,Y,Z)	Measure Value (dBμV)	Antenna Factor [dB/m]	Amp Gain (dB)	Cable loss (dB)	High Pass Filter (dB)	F/S (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
1671.00	V	ZX	56.34	25.59	42.97	4.69	0.86	44.51	-52.84	-13.00	39.84
2508.00	V	ZX	55.90	27.49	43.33	5.84	0.45	46.35	-51.00	-13.00	38.00
3345.00	V	ZX	52.00	28.90	41.26	6.89	0.40	46.93	-50.42	-13.00	37.42
4182.00	V	ZX	56.96	30.21	40.69	7.96	0.22	54.66	-42.69	-13.00	29.69
1674.00	H	ZX	57.21	25.59	42.97	4.70	0.86	45.39	-51.96	-13.00	38.96
2511.00	H	ZX	60.03	27.49	43.32	5.84	0.45	50.49	-46.86	-13.00	33.86
3345.00	H	ZX	59.11	28.90	41.26	6.89	0.40	54.04	-43.31	-13.00	30.31
4182.00	H	ZX	59.84	30.21	40.69	7.96	0.22	57.54	-39.81	-13.00	26.81

13.3.6 mode : CDMA EVDO 384CH/ RTAP / 153.6 k / ZX SCAN

Emission Frequency (MHz)	ANT (H/V)	EUT (X,Y,Z)	Measure Value (dBμV)	Antenna Factor [dB/m]	Amp Gain (dB)	Cable loss (dB)	High Pass Filter (dB)	F/S (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
1674.00	V	ZX	56.88	25.59	42.97	4.70	0.86	45.06	-52.29	-13.00	39.29
2508.00	V	ZX	61.05	27.49	43.33	5.84	0.45	51.50	-45.85	-13.00	32.85
3345.00	V	ZX	53.45	28.90	41.26	6.89	0.40	48.38	-48.97	-13.00	35.97
4182.00	V	ZX	59.07	30.21	40.69	7.96	0.22	56.77	-40.58	-13.00	27.58
1671.00	H	ZX	57.68	25.59	42.97	4.69	0.86	45.85	-51.50	-13.00	38.50
2511.00	H	ZX	63.58	27.49	43.32	5.84	0.45	54.04	-43.31	-13.00	30.31
3345.00	H	ZX	60.95	28.90	41.26	6.89	0.40	55.88	-41.47	-13.00	28.47
4182.00	H	ZX	63.51	30.21	40.69	7.96	0.22	61.21	-36.14	-13.00	23.14

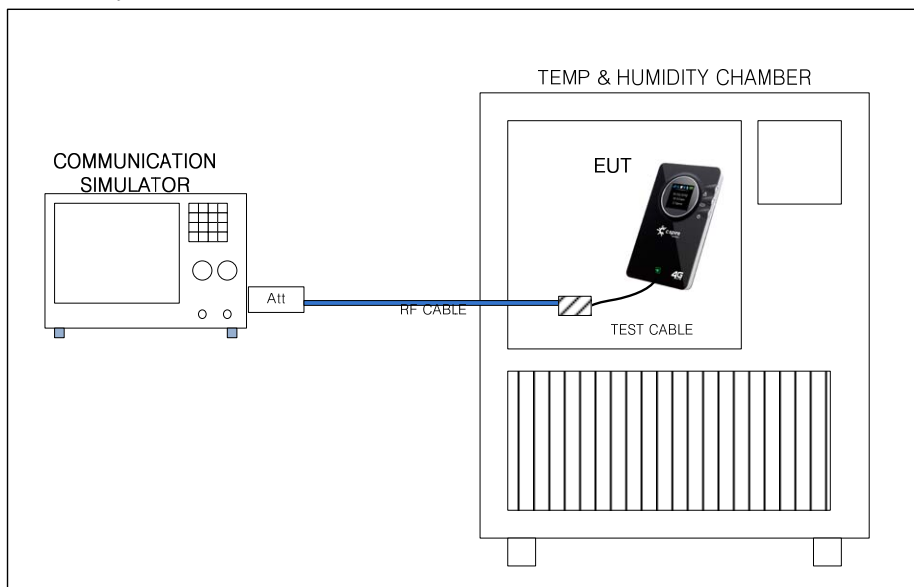
14. Frequency Stability

14.1 Definition

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5 ppm

14.2 Test Procedure

- Device is placed at the Temp & Humidity Chamber. 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



- * EUT test mode is FTAP 1228.8 k. And 384 CH (836.52 MHz)
- * Temp is change -30 degree to +50 degree (10 degree step)
- * Volt is change DC 3.0V(Cut Off Voltage) to DC 4.3V(Normal Volt : DC 3.7 V +115%)
- * Temp&Humidity chamber : BUMJIN / BJ-THC-667L / 201203-JNDL/ -40 $^{\circ}\text{C}$ ~+150 $^{\circ}\text{C}$ / Due to Cal: 2015-03-24
- * DC Power Supply : Agilent / E3630A / MY40004023 / 0 ~ 24V / 0 ~ 2.5A / Due to Cal: 2014-10-15

14.3 Test Results

14.3.1 Frequency error vs. Temperature

Temp (degree)	Measure (Hz)	Measure (ppm)	Limit (ppm)
-30.0	-9.71	-0.012	2.5
-20.0	-9.44	-0.011	2.5
-10.0	-11.23	-0.013	2.5
0.0	-12.85	-0.015	2.5
10.0	-8.65	-0.010	2.5
20.0	-9.67	-0.012	2.5
30.0	-9.65	-0.012	2.5
40.0	-8.73	-0.010	2.5
50.0	-7.53	-0.009	2.5

14.3.2 Frequency error vs. Voltage

Voltage (V)	Measure (Hz)	Measure (ppm)	Limit (ppm)
3.0	-9.42	-0.011	2.5
3.7	-7.48	-0.009	2.5
4.3	-7.57	-0.009	3.5

* Measure (ppm) = Measure (Hz) \div 836.52 MHz

14.4 Test Plots

14.4.1 Frequency error vs. Temperature

Control		Measurement/Instrument Screen				Call Params	
Waveform Quality Setup		Waveform Quality: Numeric Rho				Cell Power	
Change View		Minimum	Maximum	Average	dBm/1.23 MHz		
Rho		0.9968	0.9978	0.9975	-75.00		
Frequency Error (Hz)		-9.71	-1.10	-6.65	dBm/1.23 MHz		
Time Error (us)		0.17	0.18	0.17	Cell Band		
Carrier Feedthrough (dBc)		-57.44	-45.92	-50.18	US Cellular		
Phase Error (°)		1.70	4.77	3.87	Channel		
Mag Error (Z)		3.65	4.70	4.02	384		
EVM (Z)		4.70	5.88	5.01	Application Config		
100/100		Single				FTAP Rate	
						1228.8 kbps	
						(1 Slot, QPSK)	
						RTAP Rate	
						9.6 kbps	
Active Cell Connected		Sys Type: IS-856					
1 of 2		IntRef/Offset		PLSub0 FTAP		1 of 3	

-30 °C / FTAP / 1228.8 k / 384 CH

Control		Measurement/Instrument Screen				Call Params	
Waveform Quality Setup		Waveform Quality: Numeric Rho				Cell Power	
Change View		Minimum	Maximum	Average	dBm/1.23 MHz		
Rho		0.9971	0.9979	0.9976	-75.00		
Frequency Error (Hz)		-3.44	-0.86	-6.67	dBm/1.23 MHz		
Time Error (us)		0.08	0.09	0.08	Cell Band		
Carrier Feedthrough (dBc)		-80.67	-53.66	-60.21	US Cellular		
Phase Error (°)		1.61	4.79	3.58	Channel		
Mag Error (Z)		3.61	4.62	3.81	384		
EVM (Z)		4.56	5.43	4.86	Application Config		
100/100		Single				FTAP Rate	
						1228.8 kbps	
						(1 Slot, QPSK)	
						RTAP Rate	
						9.6 kbps	
Active Cell Connected		Sys Type: IS-856					
1 of 2		IntRef/Offset		PLSub0 FTAP		1 of 3	

-20 °C / FTAP / 1228.8 k / 384 CH

Control		Measurement/Instrument Screen				Call Params	
Waveform Quality Setup		Waveform Quality: Numeric Rho				Cell Power	
Change View		Minimum	Maximum	Average	dBm/1.23 MHz		
Rho		0.9969	0.9981	0.9977	-75.00		
Frequency Error (Hz)		-11.23	0.52	-6.58	dBm/1.23 MHz		
Time Error (us)		-0.12	0.05	0.01	Cell Band		
Carrier Feedthrough (dBc)		-78.50	-56.54	-62.62	US Cellular		
Phase Error (°)		1.61	4.88	3.54	Channel		
Mag Error (Z)		3.40	4.57	3.85	384		
EVM (Z)		4.36	5.54	4.80	Application Config		
100/100		Single				FTAP Rate	
						1228.8 kbps	
						(1 Slot, QPSK)	
						RTAP Rate	
						9.6 kbps	
Active Cell Connected		Sys Type: IS-856					
1 of 2		IntRef/Offset		PLSub0 FTAP		1 of 3	

-10 °C / FTAP / 1228.8 k / 384 CH

Control		Measurement/Instrument Screen				Call Params	
Waveform Quality Setup		Waveform Quality: Numeric Rho				Cell Power	
Change View		Minimum	Maximum	Average	dBm/1.23 MHz		
Rho		0.9972	0.9983	0.9978	-75.00		
Frequency Error (Hz)		-12.85	-1.45	-6.78	dBm/1.23 MHz		
Time Error (us)		0.00	0.02	0.01	Cell Band		
Carrier Feedthrough (dBc)		-82.38	-57.71	-63.96	US Cellular		
Phase Error (°)		1.47	4.66	3.57	Channel		
Mag Error (Z)		3.27	4.41	3.79	384		
EVM (Z)		4.14	5.33	4.71	Application Config		
100/100		Single				FTAP Rate	
						1228.8 kbps	
						(1 Slot, QPSK)	
						RTAP Rate	
						9.6 kbps	
Active Cell Connected		Sys Type: IS-856					
1 of 2		IntRef/Offset		PLSub0 FTAP		1 of 3	

0 °C / FTAP / 1228.8 k / 384 CH

Control		Measurement/Instrument Screen				Call Params	
Waveform Quality Setup		Waveform Quality: Numeric Rho				Cell Power	
Change View		Minimum	Maximum	Average	dBm/1.23 MHz		
Rho		0.9966	0.9986	0.9983	-75.00		
Frequency Error (Hz)		-8.65	5.08	-3.94	dBm/1.23 MHz		
Time Error (us)		0.05	0.07	0.06	Cell Band		
Carrier Feedthrough (dBc)		-72.01	-55.56	-60.69	US Cellular		
Phase Error (°)		1.35	4.71	3.34	Channel		
Mag Error (Z)		3.04	4.10	3.47	384		
EVM (Z)		3.84	5.13	4.35	Application Config		
100/100		Single				FTAP Rate	
						1228.8 kbps	
						(1 Slot, QPSK)	
						RTAP Rate	
						9.6 kbps	
Active Cell Connected		Sys Type: IS-856					
1 of 2		IntRef/Offset		PLSub0 FTAP		1 of 3	

10 °C / FTAP / 1228.8 k / 384 CH

Control		Measurement/Instrument Screen				Call Params	
Waveform Quality Setup		Waveform Quality: Numeric Rho				Cell Power	
Change View		Minimum	Maximum	Average	dBm/1.23 MHz		
Rho		0.9966	0.9986	0.9983	-75.00		
Frequency Error (Hz)		-8.67	5.88	-3.38	dBm/1.23 MHz		
Time Error (us)		-0.01	0.01	0.00	Cell Band		
Carrier Feedthrough (dBc)		-58.13	-50.94	-54.12	US Cellular		
Phase Error (°)		1.29	4.19	3.06	Channel		
Mag Error (Z)		2.90	5.12	3.24	384		
EVM (Z)		3.75	5.85	4.08	Application Config		
100/100		Single				FTAP Rate	
						1228.8 kbps	
						(1 Slot, QPSK)	
						RTAP Rate	
						9.6 kbps	
Active Cell Connected		Sys Type: IS-856					
1 of 2		IntRef/Offset		PLSub0 FTAP		1 of 3	

20 °C / FTAP / 1228.8 k / 384 CH



Measurement/Instrument Screen					
Waveform Quality: Numeric Rho					
Control				Call Parms	
Waveform Quality Setup	Rho	Minimum	Maximum	Average	
		0.9968	0.9978	0.9975	
	Frequency Error (Hz)	-9.71	-1.10	-6.65	
	Time Error (us)	0.17	0.18	0.17	
	Carrier Feedthrough (dBc)	-57.44	-45.92	-50.18	
	Phase Error (°)	1.70	4.77	3.87	
	Mag Error (Z)	3.65	4.70	4.02	
	EVM (Z)	4.70	5.68	5.01	
Change View	100 /100			Single	
	Application Config				
	FTAP Rate				
	1228.8 kbps				
	(1 Slot, QPSK)				
	RTAP Rate				
	9.6 kbps				
	Active Cell Connected		Sys Type: IS-856		
1 of 2	IntRef	Offset	PLSub0	FTAP	
				1 of 3	

30 °C / FTAP / 1228.8 k / 384 CH

Measurement/Instrument Screen					
Waveform Quality: Numeric Rho					
Control				Call Parms	
Waveform Quality Setup	Rho	Minimum	Maximum	Average	
		0.9971	0.9979	0.9976	
	Frequency Error (Hz)	-9.44	-0.86	-6.67	
	Time Error (us)	0.08	0.09	0.08	
	Carrier Feedthrough (dBc)	-80.67	-53.86	-60.21	
	Phase Error (°)	1.61	4.79	3.59	
	Mag Error (Z)	3.61	4.62	3.91	
	EVM (Z)	4.56	5.43	4.86	
Change View	100 /100			Single	
	Application Config				
	FTAP Rate				
	1228.8 kbps				
	(1 Slot, QPSK)				
	RTAP Rate				
	9.6 kbps				
	Active Cell Connected		Sys Type: IS-856		
1 of 2	IntRef	Offset	PLSub0	FTAP	
				1 of 3	

40 °C / FTAP / 1228.8 k / 384 CH

Measurement/Instrument Screen					
Waveform Quality: Numeric Rho					
Control				Call Parms	
Waveform Quality Setup	Rho	Minimum	Maximum	Average	
		0.9969	0.9981	0.9977	
	Frequency Error (Hz)	-11.23	0.52	-6.58	
	Time Error (us)	-0.12	0.05	0.01	
	Carrier Feedthrough (dBc)	-76.50	-56.54	-62.62	
	Phase Error (°)	1.61	4.88	3.54	
	Mag Error (Z)	3.40	4.57	3.85	
	EVM (Z)	4.36	5.54	4.80	
Change View	100 /100			Single	
	Application Config				
	FTAP Rate				
	1228.8 kbps				
	(1 Slot, QPSK)				
	RTAP Rate				
	9.6 kbps				
	Active Cell Connected		Sys Type: IS-856		
1 of 2	IntRef	Offset	PLSub0	FTAP	
				1 of 3	

50 °C / FTAP / 1228.8 k / 384 CH

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14.4.2 Frequency error vs. Voltage

Measurement/Instrument Screen										
Control		Waveform Quality: Numeric Rho				Call Params				
Waveform Quality Setup		Rho	Minimum	Maximum	Average	Cell Power				
			0.9960	0.9987	0.9983	-75.00				
		Frequency Error (Hz)	-9.42	7.58	-2.85	dBm/1.23 MHz				
		Time Error (us)	0.01	0.02	0.02	Cell Band				
		Carrier Feedthrough (dBc)	-57.02	-50.56	-53.84	US Cellular				
		Phase Error (*)	1.29	4.13	3.19	Channel				
		Mag Error (Z)	2.74	5.33	3.25	384				
		EVM (Z)	3.54	6.30	4.12	Application Config				
						FTAP Rate				
						1228.8 kbps				
						(1 Slot, QPSK)				
						RTAP Rate				
						9.6 kbps				
						Active Cell				
						Connected				
						Sys Type: IS-856				
1 of 2						IntRef	Offset		PLSub0	FTAP
										1 of 3

DC 3.0V / FTAP / 1228.8 k / 384 CH

Measurement/Instrument Screen										
Control		Waveform Quality: Numeric Rho				Call Params				
Waveform Quality Setup		Rho	Minimum	Maximum	Average	Cell Power				
			0.9973	0.9988	0.9983	-75.00				
		Frequency Error (Hz)	-7.48	5.76	-2.06	dBm/1.23 MHz				
		Time Error (us)	0.02	0.04	0.03	Cell Band				
		Carrier Feedthrough (dBc)	-60.33	-50.77	-53.67	US Cellular				
		Phase Error (*)	1.26	4.18	3.26	Channel				
		Mag Error (Z)	2.70	4.41	3.27	384				
		EVM (Z)	3.48	5.20	4.14	Application Config				
						FTAP Rate				
						1228.8 kbps				
						(1 Slot, QPSK)				
						RTAP Rate				
						9.6 kbps				
						Active Cell				
						Connected				
						Sys Type: IS-856				
1 of 2						IntRef	Offset		PLSub0	FTAP
										1 of 3

DC 3.7V / FTAP / 1228.8 k / 384 CH

Measurement/Instrument Screen										
Control		Waveform Quality: Numeric Rho				Call Params				
Waveform Quality Setup		Rho	Minimum	Maximum	Average	Cell Power				
			0.9966	0.9986	0.9983	-75.00				
		Frequency Error (Hz)	-7.57	5.39	-2.60	dBm/1.23 MHz				
		Time Error (us)	-0.13	0.04	-0.03	Cell Band				
		Carrier Feedthrough (dBc)	-55.79	-50.24	-53.23	US Cellular				
		Phase Error (*)	1.58	4.25	3.10	Channel				
		Mag Error (Z)	2.91	5.12	3.26	384				
		EVM (Z)	3.78	5.84	4.12	Application Config				
						FTAP Rate				
						1228.8 kbps				
						(1 Slot, QPSK)				
						RTAP Rate				
						9.6 kbps				
						Active Cell				
						Connected				
						Sys Type: IS-856				
1 of 2						IntRef	Offset		PLSub0	FTAP
										1 of 3

DC 4.3V / FTAP / 1228.8 k / 384 CH

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