

TEST REPORT

Report Number		RAPA12-O-630
Type of Equipment		Dual Band Repeater (In-Building Repeater System)
Model Name		USHR-0819L
FCC ID		Q4EUSHR-0819L
IC Number		8605A-USHR0819L
Applicant	Name	OPISYS Incorporated
	Logo	 OPISYS, INC.
	Address	590 West Central Ave Unit E, Brea CA 92821, United States
Manufacturer	Name	Ace Technology Corp.
	Address	24BL 5L, 451-4, Nonhyeon-dong, Namdong-gu, Incheon, 405-849, Korea
Test duration		September 10, 2012 to October 08, 2012
Date of issue		October 08, 2012
Total Page		65 pages (including this page)

SUMMARY

The equipment complies with FCC CFR 47 Part 22H/24E and IC RSS-131 Issue2.

This test report contains only the results of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

Date : October 08, 2012



Tested by Chang Young Choi
Deputy General Manager

Date : October 08, 2012



Reviewed by Sukil Park
Executive Managing Director

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1. General description of EUT

1.1 Applicant

- Company name : OPISYS Incorporated
- Address : 590 West Central Ave Unit E, Brea CA 92821, United States
- Contact person : Karen KH Koo
- Phone/Fax : 1-714-990-6247/ 1-714-990-6243

1.2 Manufacturer

- Company name : Ace Technology Corp.
- Address : 24BL 5L, 451-4, Nonhyeon-dong, Namdong-gu, Incheon, 405-849, Korea
- Phone / Fax : 82-32-458-1382 / 82-32-458-1646

1.3 Basic description of EUT

- Product name : Dual Band Repeater
- Model name : USHR-0819L
- Frequency : PCS 1900 / Downlink : 1 930 MHz – 1 990 MHz
PCS 1900 / Uplink : 1 850 MHz – 1 910 MHz
Cellular 800 / Downlink : 869 MHz – 894 MHz
Cellular 800 / Uplink : 824 MHz – 849 MHz
- Output power : Downlink : 12 dBm / Uplink : 15 dBm
- Modulation method : GSM, EDGE, CDMA, WCDMA
- FCC Rule Part(s) : FCC CFR47 Part 22H/24E
- IC Rule Part(s) : IC RSS-131 Issue2
- FCC classification : PCB / PCS Licensed Transmitter
- IC classification : Zone Enhancers for the Land Mobile Service
- Test duration : September 10, 2012 to October 08, 2012
- Date of issue : October 08, 2012
- Place of test : Head office
824, B104, Anyang Megavalley, 799, Gwanyang-dong,
Dongan-gu, Anyang-si, Gyeonggi-do, Korea, 483-060
Open area test site
80, Jeil-ri, Yangji-myun, Cheoin-gu, Yongin-si, Gyeonggi-do,
Korea, 449-825
(FCC Registration Number : 337229)
(IC Submission Number : 143881)
(KCC Designation Number : KR0027)

1.4 Electrical specification

Item		Specifications		Note
Frequency Range	Down Link	1 930 ~ 1 990 MHz		PCS1900 BW: 60 MHz
	Up Link	1 850 ~ 1 910 MHz		
	Down Link	869 ~ 894 MHz		Cellular800 BW: 25 MHz
	Up Link	824 ~ 849 MHz		
Modulation Type		GSM, EDGE, CDMA, WCDMA		
Input Power		-28 dBm max		
Output Power	Down Link	+12 dBm		PCS1900
	Up Link	+15 dBm		
	Down Link	+12 dBm		Cellular800
	Up Link	+15 dBm		
Gain	Down Link	65 dB (±1.0 dB)		PCS1900, Average Gain on 60 MHz BW
	Up Link	65 dB (±1.0 dB)		
	Down Link	65 dB (±1.0 dB)		Cellular800, Average Gain on 25 MHz BW
	Up Link	65 dB (±1.0 dB)		
Gain Control Range		25 dB		could be changed Dip switch or GUI
Ripple		< 6.5 dB		PCS1900
		< 4.5 dB		Cellular800
Noise Figure		< 6 dB typical		PCS1900 Uplink Max Gain
		< 5 dB typical		Cellular800 Uplink Max Gain
Propagation Delay		5 μs max		PCS1900/ Cellular800
VSWR		≤ 1.8 : 1		PCS1900/ Cellular800
ALC Level	Down Link	+12 dBm (±1 dB)		PCS1900/ Cellular800
	Up Link	+15 dBm (±1 dB)		PCS1900/ Cellular800
Shutdown Level	Down Link	+14 dBm (±1 dB)		PCS1900/ Cellular800
	Up Link	+17 dBm (±1 dB)		PCS1900/ Cellular800
Spectrum Mask		±750 KHz	-45 dBc/30 kHz	Note1. Downlink CDMA 9CH Signal Note2. Uplink CDMA Reverse Signal
		±1.98 MHz	-50 dBc/30 kHz	
Spurious		9 ~ 150 kHz	-13 dBm/30 kHz	
		150 kHz ~ 30 MHz	-13 dBm/30 kHz	
		30 MHz ~ 1 GHz	-13 dBm/30 kHz	
		1 GHz ~ 12.75 GHz	-13 dBm/30 kHz	
Frequency Stability		≤ ±0.01 ppm		PCS1900/ Cellular800
GUI Interface		RS-232C		
Alarm & Status	Display	PWR	Normal : Green,	Power turn off : Off
		Cellular	Normal : Green,	Shutdown : Off, Checking SD : Red
		PCS	Normal : Green,	Shutdown : Off, Checking SD : Red
Power Consumption		5.6 Vdc / 1.7 A		
Input Voltage		DC 5.6 Vdc / 2.5 A		AC/DC Adapter
RF Connector		N-type Female		

1.5 Mechanical specification

Item	Specifications	Note
Dimensions (L × W × H)	151 mm x 191 mm x 35 mm	-
Weight	2 Kg	-

1.6 Environmental specification

Item	Specifications	Note
Temperature	-30 °C ~ 55 °C	-
Humidity	10 % ~ 95 %	Relative

2. General information of test

2.1 Standard for measurement methods

Applied Standard : FCC CFR47 Part 22H and 24E IC RSS-131 Issue 2 July 2003			
FCC	IC	Description of Test	Result
Part 2.1046	6.2	RF power output	Pass
Part 2.1049	6.1	Occupied bandwidth	Pass
Part 2.1051	6.4	Unwanted emission at antenna terminal	Pass
Part 2.1053	6.4	Field strength of spurious emission	Pass
-	6.1	Amplifier gain and bandwidth	Pass

2.2 Description of EUT modification

During the test, there was no mechanical or circuitry modification to improve RF and spurious characteristic, and any RF and spurious suppression device(s) was not added against the device tested.

2.3 Test configuration

• Type of peripheral equipment used

Description	Model Name	Serial No.	Manufacturer	FCC ID	IC Number
EUT	USHR-0819L	0004	OPISYS	Q4EUSHR-0819L	8605A-USHR0819L
AC/DC Adapter	ADS-18C-06	N/A	HONOR	-	-

• Type of cable used

Device from	Device to	Type of Cable	Length
Signal Generator	EUT	BNC	1 m
EUT	Spectrum Analyzer	BNC	1 m

3. Measurement data

3.1 RF power output

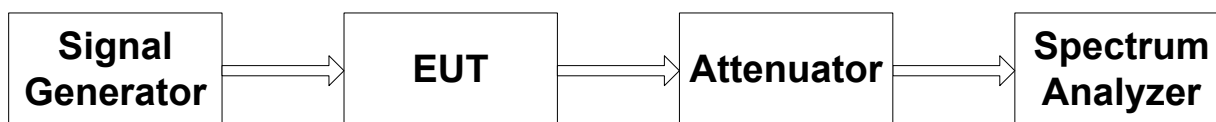
3.1.1 Specification

- FCC Rules Part 2 Section 2.1046
- FCC Rules Part 22 Subpart H, Section 22.913
- FCC Rules Part 24 Subpart E, Section 24.232
- IC Rules RSS-131 Issue 2 July 2003, Section 6.2

3.1.2 Measurement method

- ANSI/TIA-603-D-2010, Section 2.2.1

3.1.3 Set-Up



3.1.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	USHR-0819L	OPISYS Incorporated
Signal Generator	E4437B	Agilent
Spectrum Analyzer	N9020A	Agilent
Attenuator	66-30-33	Weinschel

3.1.5 Test condition

- Test place: Shield Room
- Test environment: 25 °C, 48 % R.H.

3.1.6 Test result : EDGE

Band	Link	Frequency [MHz]	Input Power [dBm]	Output Power [dBm]	System Gain [dB]
Cellular 800	Up Link	824.20	-48.52	+15.01	63.53
		836.60	-49.94	+15.01	64.95
		848.80	-47.88	+15.00	62.88
	Down Link	869.20	-52.40	+12.00	64.40
		881.60	-53.02	+12.02	65.04
		893.80	-52.68	+12.00	64.68
PCS 1900	Up Link	1 850.20	-48.88	+15.00	63.88
		1 880.00	-49.66	+15.02	64.68
		1 909.80	-47.58	+15.01	62.59
	Down Link	1 930.20	-51.62	+11.99	63.61
		1 960.00	-53.02	+12.01	65.03
		1 989.80	-50.22	+12.01	62.23

3.1.7 Test result : GSM

Band	Link	Frequency [MHz]	Input Power [dBm]	Output Power [dBm]	System Gain [dB]
Cellular 800	Up Link	824.20	-48.50	+15.03	63.53
		836.60	-49.92	+14.98	64.90
		848.80	-47.90	+15.04	62.94
	Down Link	869.20	-52.42	+12.00	64.42
		881.60	-53.00	+11.96	64.96
		893.80	-52.70	+11.98	64.68
PCS 1900	Up Link	1 850.20	-48.86	+14.99	63.85
		1 880.00	-49.70	+14.99	64.69
		1 909.80	-47.60	+15.00	62.60
	Down Link	1 930.20	-51.60	+12.00	63.60
		1 960.00	-52.96	+12.00	64.96
		1 989.80	-50.18	+12.00	62.18

3.1.8 Test result : CDMA

Band	Link	Frequency [MHz]	Input Power [dBm]	Output Power [dBm]	System Gain [dB]
Cellular 800	Up Link	824.80	-48.44	+15.03	63.47
		836.52	-49.90	+14.96	64.86
		848.20	-48.18	+14.99	63.17
	Down Link	869.80	-53.00	+12.00	65.00
		881.52	-52.98	+12.01	64.99
		893.20	-52.76	+12.01	64.77
PCS 1900	Up Link	1 850.80	-49.28	+15.01	64.29
		1 880.00	-49.64	+14.96	64.60
		1 909.20	-47.80	+14.97	62.77
	Down Link	1 930.80	-51.88	+12.02	63.90
		1 960.00	-53.32	+12.01	65.33
		1 989.20	-50.62	+12.03	62.65

3.1.9 Test result : WCDMA

Band	Link	Frequency [MHz]	Input Power [dBm]	Output Power [dBm]	System Gain [dB]
Cellular 800	Up Link	826.40	-48.34	+15.00	63.34
		836.40	-50.00	+15.00	65.00
		846.60	-48.82	+15.01	63.83
	Down Link	871.40	-52.82	+12.03	64.85
		881.40	-53.02	+12.03	65.05
		891.60	-53.30	+11.97	65.27
PCS 1900	Up Link	1 852.40	-49.54	+15.00	64.54
		1 880.00	-49.74	+15.01	64.75
		1 907.60	-47.92	+15.01	62.93
	Down Link	1 932.40	-52.40	+11.99	64.39
		1 960.00	-52.90	+11.99	64.89
		1 987.60	-51.38	+11.98	63.36

3.2 Occupied bandwidth

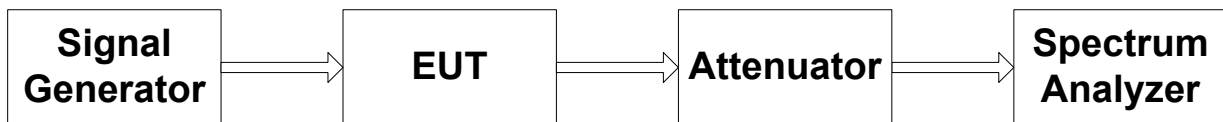
3.2.1 Specification

- FCC Rules Part 2 Section 2.1049
- FCC Rules Part 22 Subpart H, Section 22.917
- FCC Rules Part 24 Subpart E, Section 24.238
- IC Rules RSS-131 Issue 2 July 2003, Section 6.3

3.2.2 Measurement method

- ANSI/TIA-603-D-2010, Section 2.2.11

3.2.3 Set-Up



3.2.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	USHR-0819L	OPISYS Incorporated
Signal Generator	E4437B	Agilent
Spectrum Analyzer	N9020A	Agilent
Attenuator	66-30-33	Weinschel

3.2.5 Test condition

- Test place: Shield Room
- Test environment: 25 °C, 48 % R.H.

3.2.6 Test result : EDGE

Band	Link	Frequency [MHz]	Input OBW [kHz]	Output OBW [kHz]	26 dB Bandwidth [kHz]
Cellular 800	Up Link	824.20	243.13	248.68	318.50
		836.60	243.26	247.97	319.20
		848.80	242.87	248.68	318.50
	Down Link	869.20	240.21	245.79	314.70
		881.60	239.88	247.15	310.00
		893.80	240.41	245.99	315.30
PCS 1900	Up Link	1 850.20	242.87	244.46	313.20
		1 880.00	243.41	244.19	310.80
		1 909.80	243.12	242.55	309.90
	Down Link	1 930.20	240.31	240.31	317.40
		1 960.00	240.11	243.50	315.80
		1 989.80	240.39	245.80	305.80

3.2.7 Test result : GSM

Band	Link	Frequency [MHz]	Input OBW [kHz]	Output OBW [kHz]	26 dB Bandwidth [kHz]
Cellular 800	Up Link	824.20	250.11	251.60	312.90
		836.60	250.11	248.56	315.00
		848.80	250.11	250.25	312.80
	Down Link	869.20	247.00	248.02	317.10
		881.60	247.23	250.42	316.20
		893.80	247.37	247.66	304.60
PCS 1900	Up Link	1 850.20	250.00	248.23	318.00
		1 880.00	250.12	247.84	310.20
		1 909.80	250.33	248.03	319.50
	Down Link	1 930.20	247.33	248.79	319.30
		1 960.00	247.26	248.41	316.40
		1 989.80	247.07	248.81	320.50

3.2.8 Test result : CDMA

Band	Link	Frequency [MHz]	Input OBW [MHz]	Output OBW [MHz]	26 dB Bandwidth [MHz]
Cellular 800	Up Link	824.80	1.258	1.265	1.402
		836.52	1.258	1.258	1.400
		848.20	1.258	1.252	1.399
	Down Link	869.80	1.260	1.263	1.395
		881.52	1.260	1.266	1.402
		893.20	1.260	1.260	1.394
PCS 1900	Up Link	1 850.80	1.258	1.254	1.392
		1 880.00	1.258	1.256	1.389
		1 909.20	1.258	1.264	1.403
	Down Link	1 930.80	1.260	1.258	1.405
		1 960.00	1.260	1.258	1.408
		1 989.20	1.260	1.267	1.403

3.2.9 Test result : WCDMA

Band	Link	Frequency [MHz]	Input OBW [MHz]	Output OBW [MHz]	26 dB Bandwidth [MHz]
Cellular 800	Up Link	826.40	4.123	4.161	4.671
		836.40	4.123	4.168	4.649
		846.60	4.123	4.129	4.634
	Down Link	871.40	4.145	4.137	4.646
		881.40	4.145	4.161	4.656
		891.60	4.145	4.135	4.640
PCS 1900	Up Link	1 852.40	4.123	4.113	4.600
		1 880.00	4.123	4.117	4.635
		1 907.60	4.123	4.136	4.656
	Down Link	1 932.40	4.145	4.174	4.661
		1 960.00	4.145	4.125	4.672
		1 987.60	4.145	4.183	4.667

3.2.10 Plots of 26 dB bandwidth and 99% bandwidth

• EDGE / Cellular 800 / Up Link / 824.20 MHz



Input Signal

99 % Bandwidth : 243.13 kHz
26 dB Bandwidth : 315.20 kHz
RF Power : -48.52 dBm

Output Signal

99 % Bandwidth : 248.68 kHz
26 dB Bandwidth : 318.50 kHz
RF Power : +15.01 dBm

System Gain : 63.53 dB

• EDGE / Cellular 800 / Up Link / 836.60 MHz



Input Signal

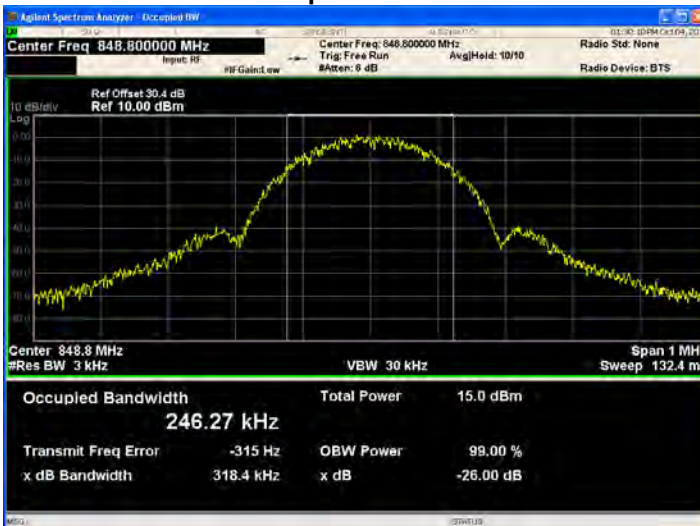
99 % Bandwidth : 243.26 kHz
26 dB Bandwidth : 315.20 kHz
RF Power : -49.94 dBm

Output Signal

99 % Bandwidth : 247.97 kHz
26 dB Bandwidth : 319.20 kHz
RF Power : +15.01 dBm

System Gain : 64.95 dB

• EDGE / Cellular 800 / Up Link / 848.80 MHz



Input Signal

99 % Bandwidth : 242.87 kHz
26 dB Bandwidth : 315.20 kHz
RF Power : -47.88 dBm

Output Signal

99 % Bandwidth : 248.68 kHz
26 dB Bandwidth : 318.50 kHz
RF Power : +15.00 dBm

System Gain : 62.88 dB

• **EDGE / Cellular 800 / Down Link / 869.20 MHz**



Input Signal

99 % Bandwidth : 240.21 kHz
26 dB Bandwidth : 313.10 kHz
RF Power : -52.40 dBm

Output Signal

99 % Bandwidth : 245.79 kHz
26 dB Bandwidth : 314.70 kHz
RF Power : +12.00 dBm

System Gain : 64.40 dB

• **EDGE / Cellular 800 / Down Link / 881.60 MHz**



Input Signal

99 % Bandwidth : 239.88 kHz
26 dB Bandwidth : 313.40 kHz
RF Power : -53.02 dBm

Output Signal

99 % Bandwidth : 247.15 kHz
26 dB Bandwidth : 310.00 kHz
RF Power : +12.02 dBm

System Gain : 65.04 dB

• **EDGE / Cellular 800 / Down Link / 893.80 MHz**



Input Signal

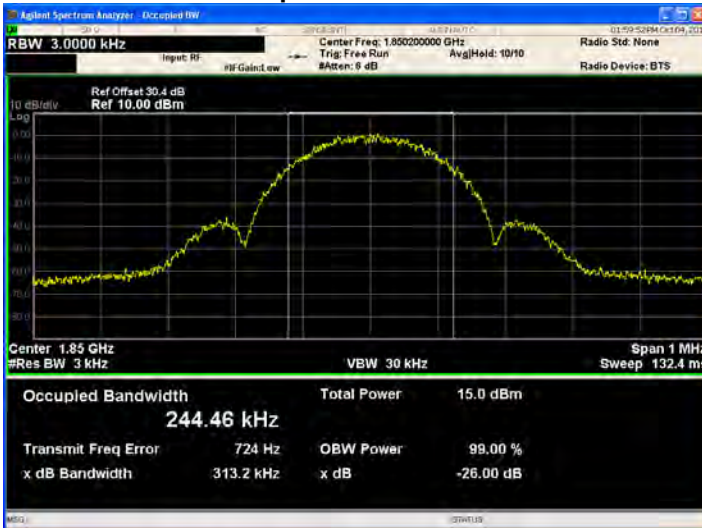
99 % Bandwidth : 240.41 kHz
26 dB Bandwidth : 313.00 kHz
RF Power : -52.68 dBm

Output Signal

99 % Bandwidth : 245.99 kHz
26 dB Bandwidth : 315.30 kHz
RF Power : +12.00 dBm

System Gain : 64.68 dB

• **EDGE / PCS 1900 / Up Link / 1 850.20 MHz**



Input Signal

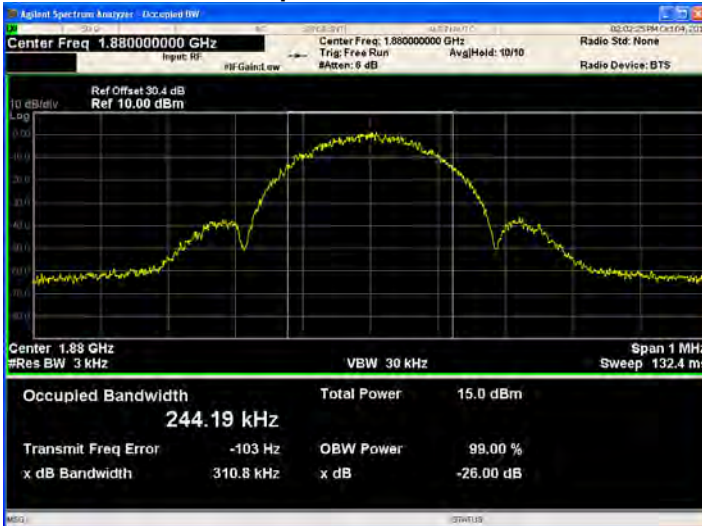
99 % Bandwidth : 242.87 kHz
26 dB Bandwidth : 310.10 kHz
RF Power : -48.88 dBm

Output Signal

99 % Bandwidth : 244.46 kHz
26 dB Bandwidth : 313.20 kHz
RF Power : +15.00 dBm

System Gain : 63.88 dB

• **EDGE / PCS 1900 / Up Link / 1 880.00 MHz**



Input Signal

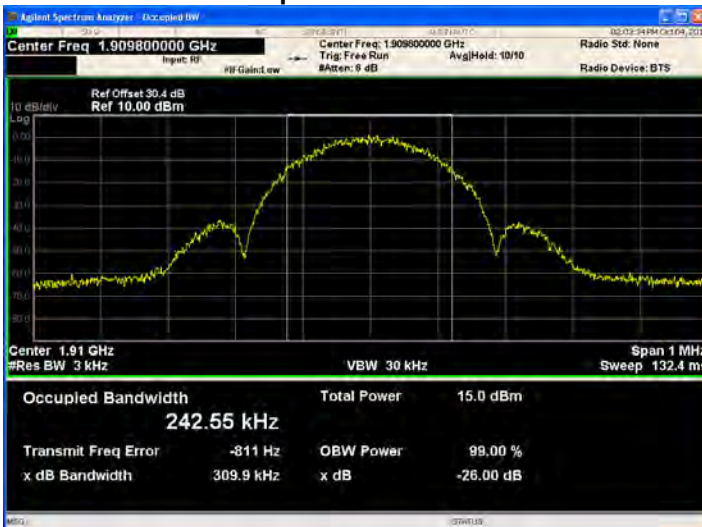
99 % Bandwidth : 243.41 kHz
26 dB Bandwidth : 310.40 kHz
RF Power : -49.66 dBm

Output Signal

99 % Bandwidth : 244.19 kHz
26 dB Bandwidth : 310.80 kHz
RF Power : +15.02 dBm

System Gain : 64.68 dB

• **EDGE / PCS 1900 / Up Link / 1 909.80 MHz**



Input Signal

99 % Bandwidth : 243.12 kHz
26 dB Bandwidth : 310.00 kHz
RF Power : -47.58 dBm

Output Signal

99 % Bandwidth : 242.55 kHz
26 dB Bandwidth : 309.90 kHz
RF Power : +15.01 dBm

System Gain : 62.59 dB

• **EDGE / PCS 1900 / Down Link / 1 930.20 MHz**



Input Signal

99 % Bandwidth : 240.31 kHz
26 dB Bandwidth : 310.10 kHz
RF Power : -51.62 dBm

Output Signal

99 % Bandwidth : 246.22 kHz
26 dB Bandwidth : 317.40 kHz
RF Power : +11.99 dBm

System Gain : 63.61 dB

• **EDGE / PCS 1900 / Down Link / 1 960.00 MHz**



Input Signal

99 % Bandwidth : 240.11 kHz
26 dB Bandwidth : 309.90 kHz
RF Power : -53.02 dBm

Output Signal

99 % Bandwidth : 243.50 kHz
26 dB Bandwidth : 315.80 kHz
RF Power : +12.01 dBm

System Gain : 65.03 dB

• **EDGE / PCS 1900 / Down Link / 1 989.80 MHz**



Input Signal

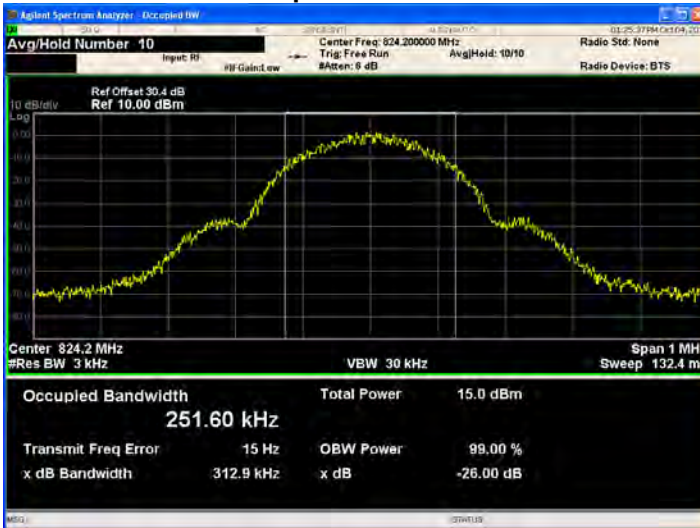
99 % Bandwidth : 240.39 kHz
26 dB Bandwidth : 310.40 kHz
RF Power : -50.22 dBm

Output Signal

99 % Bandwidth : 245.80 kHz
26 dB Bandwidth : 305.80 kHz
RF Power : +12.01 dBm

System Gain : 62.23 dB

• GSM / Cellular 800 / Up Link / 824.20 MHz



Input Signal

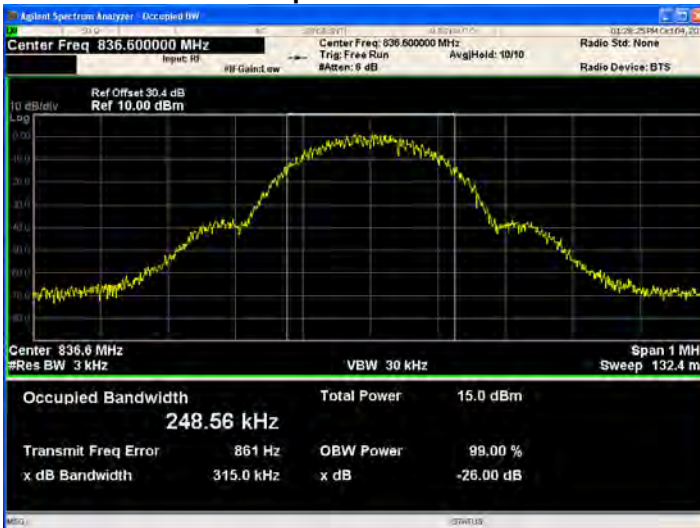
99 % Bandwidth : 250.11 kHz
26 dB Bandwidth : 315.20 kHz
RF Power : -48.50 dBm

Output Signal

99 % Bandwidth : 251.60 kHz
26 dB Bandwidth : 312.90 kHz
RF Power : +15.03 dBm

System Gain : 63.53 dB

• GSM / Cellular 800 / Up Link / 836.60 MHz



Input Signal

99 % Bandwidth : 250.11 kHz
26 dB Bandwidth : 315.20 kHz
RF Power : -49.92 dBm

Output Signal

99 % Bandwidth : 248.56 kHz
26 dB Bandwidth : 315.00 kHz
RF Power : +14.98 dBm

System Gain : 64.90 dB

• GSM / Cellular 800 / Up Link / 848.80 MHz



Input Signal

99 % Bandwidth : 250.11 kHz
26 dB Bandwidth : 315.20 kHz
RF Power : -47.90 dBm

Output Signal

99 % Bandwidth : 250.25 kHz
26 dB Bandwidth : 312.80 kHz
RF Power : +15.04 dBm

System Gain : 62.94 dB

• GSM / Cellular 800 / Down Link / 869.20 MHz



Input Signal

99 % Bandwidth : 247.00 kHz
26 dB Bandwidth : 313.60 kHz
RF Power : -52.42 dBm

Output Signal

99 % Bandwidth : 248.02 kHz
26 dB Bandwidth : 317.10 kHz
RF Power : +12.00 dBm

System Gain : 64.42 dB

• GSM / Cellular 800 / Down Link / 881.60 MHz



Input Signal

99 % Bandwidth : 247.23 kHz
26 dB Bandwidth : 313.70 kHz
RF Power : -53.00 dBm

Output Signal

99 % Bandwidth : 250.42 kHz
26 dB Bandwidth : 316.20 kHz
RF Power : +11.96 dBm

System Gain : 64.96 dB

• GSM / Cellular 800 / Down Link / 893.80 MHz



Input Signal

99 % Bandwidth : 247.37 kHz
26 dB Bandwidth : 313.90 kHz
RF Power : -52.70 dBm

Output Signal

99 % Bandwidth : 247.66 kHz
26 dB Bandwidth : 304.60 kHz
RF Power : +11.98 dBm

System Gain : 64.68 dB

• GSM / PCS 1900 / Up Link / 1 850.20 MHz



Input Signal

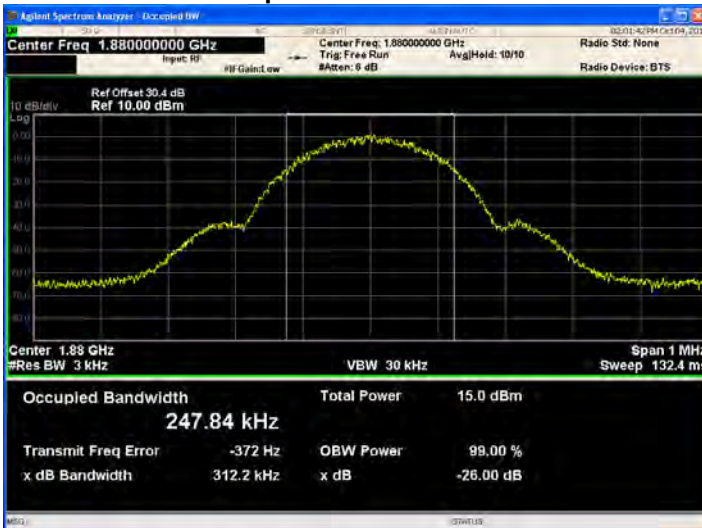
99 % Bandwidth : 250.00 kHz
26 dB Bandwidth : 310.20 kHz
RF Power : -48.86 dBm

Output Signal

99 % Bandwidth : 248.23 kHz
26 dB Bandwidth : 318.00 kHz
RF Power : +14.99 dBm

System Gain : 63.85 dB

• GSM / PCS 1900 / Up Link / 1 880.00 MHz



Input Signal

99 % Bandwidth : 250.12 kHz
26 dB Bandwidth : 310.00 kHz
RF Power : -49.70 dBm

Output Signal

99 % Bandwidth : 247.84 kHz
26 dB Bandwidth : 310.20 kHz
RF Power : +14.99 dBm

System Gain : 64.69 dB

• GSM / PCS 1900 / Up Link / 1 909.80 MHz



Input Signal

99 % Bandwidth : 250.33 kHz
26 dB Bandwidth : 310.30 kHz
RF Power : -47.60 dBm

Output Signal

99 % Bandwidth : 248.03 kHz
26 dB Bandwidth : 319.50 kHz
RF Power : +15.00 dBm

System Gain : 62.60 dB

• GSM / PCS 1900 / Down Link / 1 930.20 MHz



Input Signal

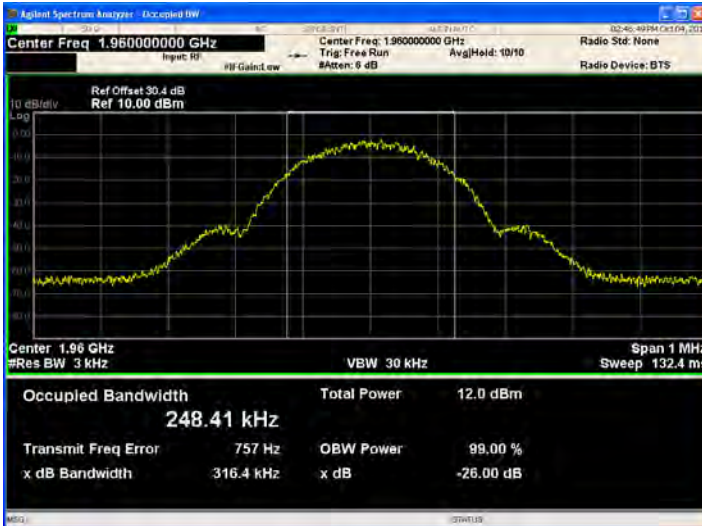
99 % Bandwidth : 247.33 kHz
26 dB Bandwidth : 311.20 kHz
RF Power : -51.60 dBm

Output Signal

99 % Bandwidth : 248.79 kHz
26 dB Bandwidth : 319.30 kHz
RF Power : +12.00 dBm

System Gain : 63.60 dB

• GSM / PCS 1900 / Down Link / 1 960.00 MHz



Input Signal

99 % Bandwidth : 247.26 kHz
26 dB Bandwidth : 311.40 kHz
RF Power : -52.96 dBm

Output Signal

99 % Bandwidth : 248.41 kHz
26 dB Bandwidth : 316.40 kHz
RF Power : +12.00 dBm

System Gain : 64.96 dB

• GSM / PCS 1900 / Down Link / 1 989.80 MHz



Input Signal

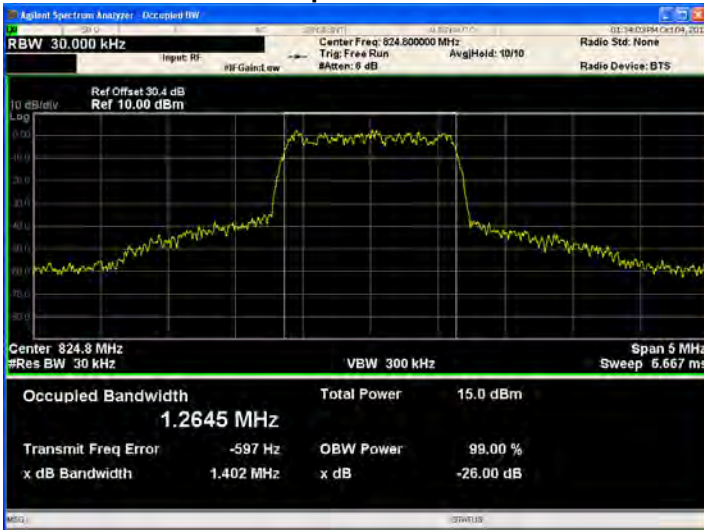
99 % Bandwidth : 247.07 kHz
26 dB Bandwidth : 311.30 kHz
RF Power : -50.18 dBm

Output Signal

99 % Bandwidth : 248.81 kHz
26 dB Bandwidth : 320.50 kHz
RF Power : +12.00 dBm

System Gain : 62.18 dB

• CDMA / Cellular 800 / Up Link / 824.80 MHz



Input Signal

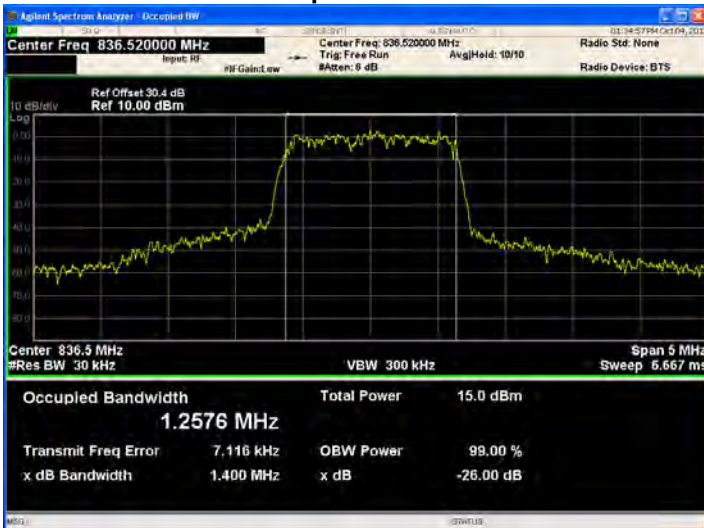
99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -48.44 dBm

Output Signal

99 % Bandwidth : 1.265 MHz
26 dB Bandwidth : 1.402 MHz
RF Power : +15.03 dBm

System Gain : 63.47 dB

• CDMA / Cellular 800 / Up Link / 836.52 MHz



Input Signal

99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -49.90 dBm

Output Signal

99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : +14.96 dBm

System Gain : 64.86 dB

• CDMA / Cellular 800 / Up Link / 848.20 MHz



Input Signal

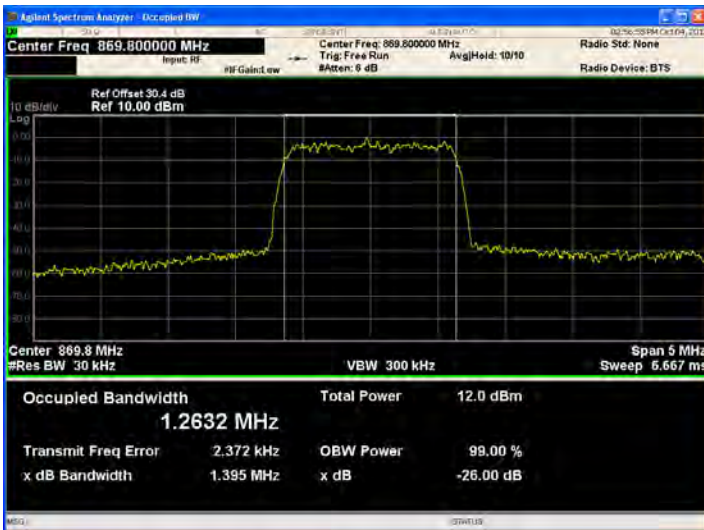
99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -48.18 dBm

Output Signal

99 % Bandwidth : 1.252 MHz
26 dB Bandwidth : 1.399 MHz
RF Power : +14.99 dBm

System Gain : 63.17 dB

• CDMA / Cellular 800 / Down Link / 869.80 MHz



Input Signal

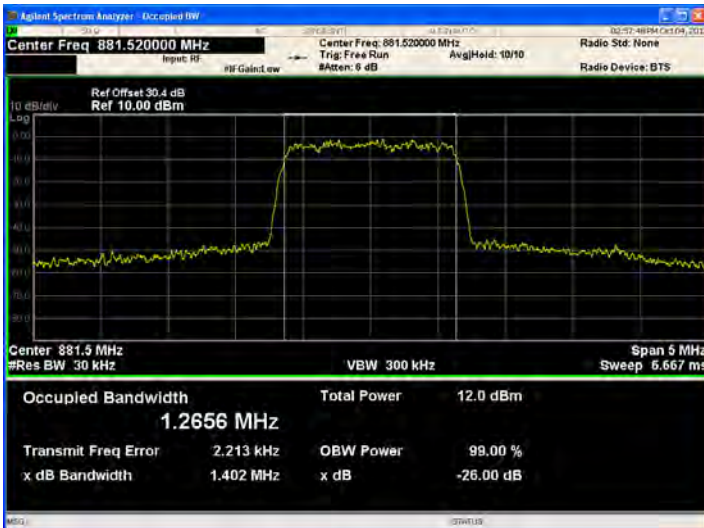
99 % Bandwidth : 1.260 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -53.00 dBm

Output Signal

99 % Bandwidth : 1.263 MHz
26 dB Bandwidth : 1.395 MHz
RF Power : +12.00 dBm

System Gain : 65.00 dB

• CDMA / Cellular 800 / Down Link / 881.52 MHz



Input Signal

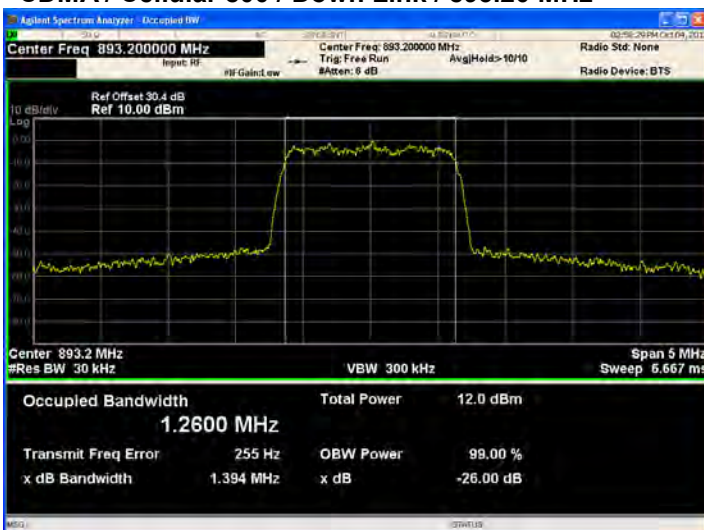
99 % Bandwidth : 1.260 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -52.98 dBm

Output Signal

99 % Bandwidth : 1.266 MHz
26 dB Bandwidth : 1.402 MHz
RF Power : +12.01 dBm

System Gain : 64.99 dB

• CDMA / Cellular 800 / Down Link / 893.20 MHz



Input Signal

99 % Bandwidth : 1.260 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -52.76 dBm

Output Signal

99 % Bandwidth : 1.260 MHz
26 dB Bandwidth : 1.394 MHz
RF Power : +12.01 dBm

System Gain : 64.77 dB

• **CDMA / PCS 1900 / Up Link / 1 850.80 MHz**



Input Signal

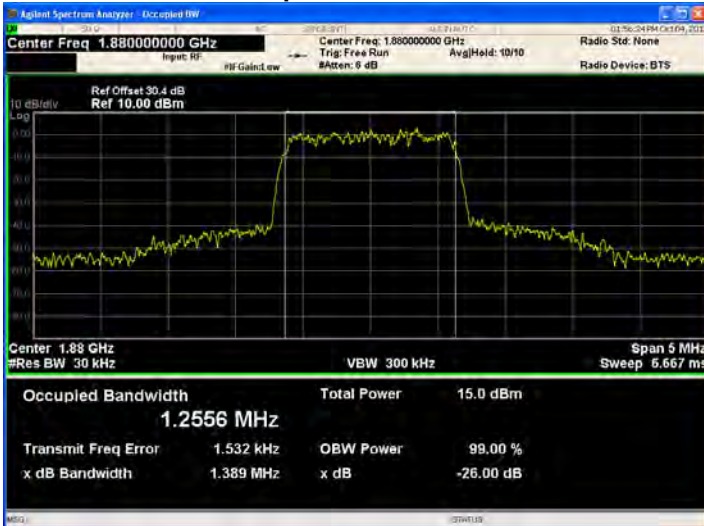
99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -49.28 dBm

Output Signal

99 % Bandwidth : 1.254 MHz
26 dB Bandwidth : 1.392 MHz
RF Power : +15.01 dBm

System Gain : 64.29 dB

• **CDMA / PCS 1900 / Up Link / 1 880.00 MHz**



Input Signal

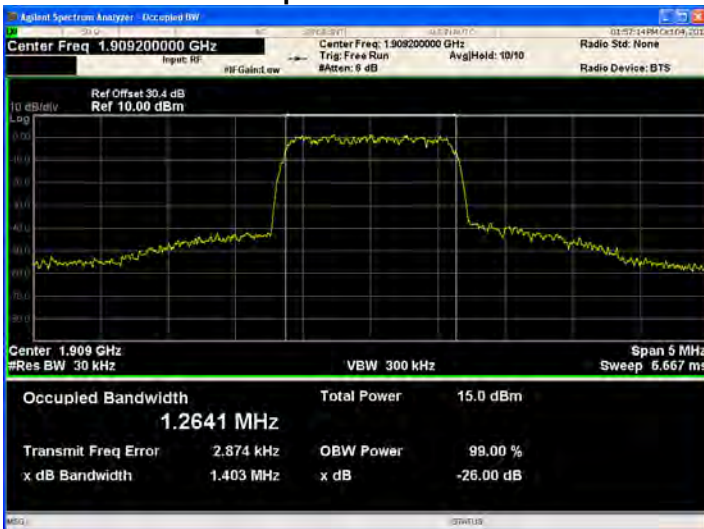
99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -49.64 dBm

Output Signal

99 % Bandwidth : 1.256 MHz
26 dB Bandwidth : 1.389 MHz
RF Power : +14.96 dBm

System Gain : 64.60 dB

• **CDMA / PCS 1900 / Up Link / 1 909.20 MHz**



Input Signal

99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -47.80 dBm

Output Signal

99 % Bandwidth : 1.264 MHz
26 dB Bandwidth : 1.403 MHz
RF Power : +14.97 dBm

System Gain : 62.77 dB

• CDMA / PCS 1900 / Down Link / 1 930.80 MHz



Input Signal

99 % Bandwidth : 1.260 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -51.88 dBm

Output Signal

99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.405 MHz
RF Power : +12.02 dBm

System Gain : 63.90 dB

• CDMA / PCS 1900 / Down Link / 1 960.00 MHz



Input Signal

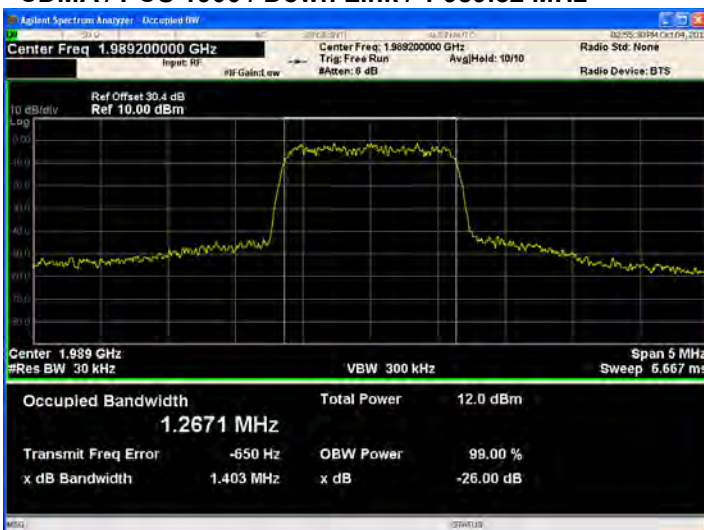
99 % Bandwidth : 1.260 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -53.32 dBm

Output Signal

99 % Bandwidth : 1.258 MHz
26 dB Bandwidth : 1.408 MHz
RF Power : +12.01 dBm

System Gain : 65.33 dB

• CDMA / PCS 1900 / Down Link / 1 989.82 MHz



Input Signal

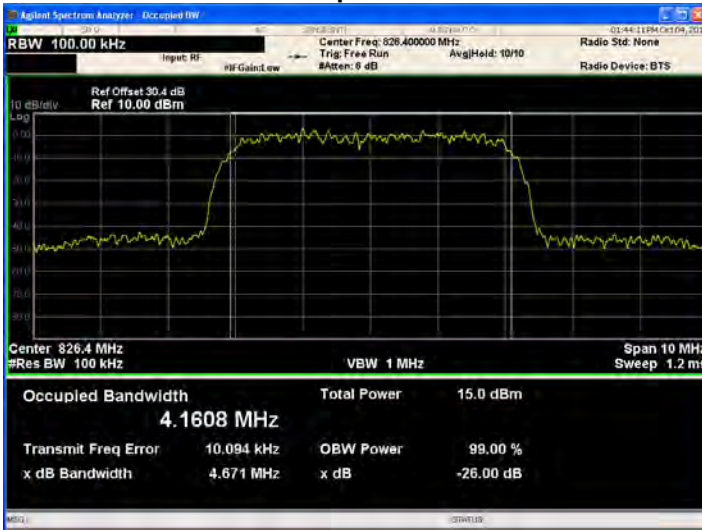
99 % Bandwidth : 1.260 MHz
26 dB Bandwidth : 1.400 MHz
RF Power : -50.62 dBm

Output Signal

99 % Bandwidth : 1.267 MHz
26 dB Bandwidth : 1.403 MHz
RF Power : +12.03 dBm

System Gain : 62.65 dB

• WCDMA / Cellular 800 / Up Link / 826.40 MHz



Input Signal

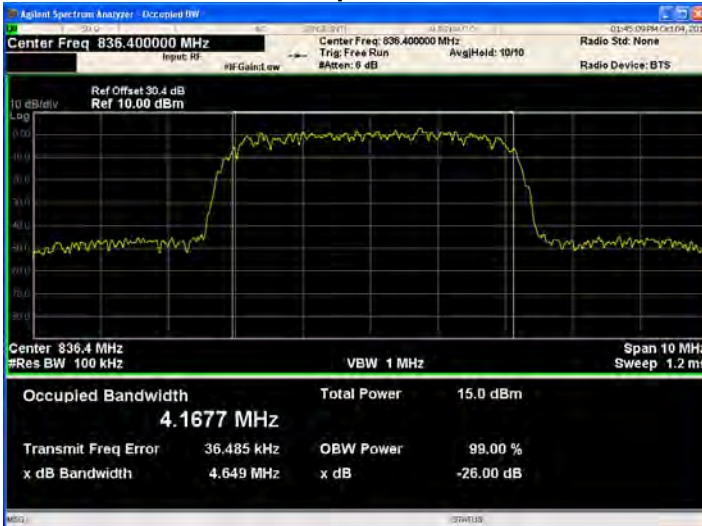
99 % Bandwidth : 4.123 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -48.34 dBm

Output Signal

99 % Bandwidth : 4.161 MHz
26 dB Bandwidth : 4.671 MHz
RF Power : +15.00 dBm

System Gain : 63.34 dB

• WCDMA / Cellular 800 / Up Link / 836.40 MHz



Input Signal

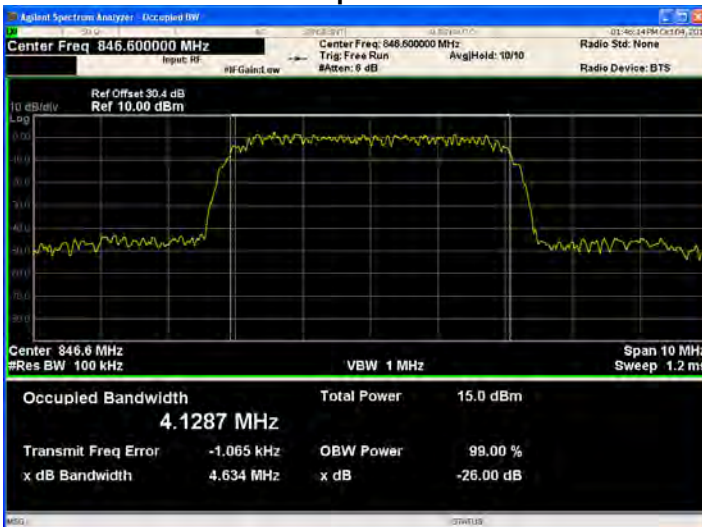
99 % Bandwidth : 4.123 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -50.00 dBm

Output Signal

99 % Bandwidth : 4.168 MHz
26 dB Bandwidth : 4.649 MHz
RF Power : +15.00 dBm

System Gain : 65.00 dB

• WCDMA / Cellular 800 / Up Link / 846.60 MHz



Input Signal

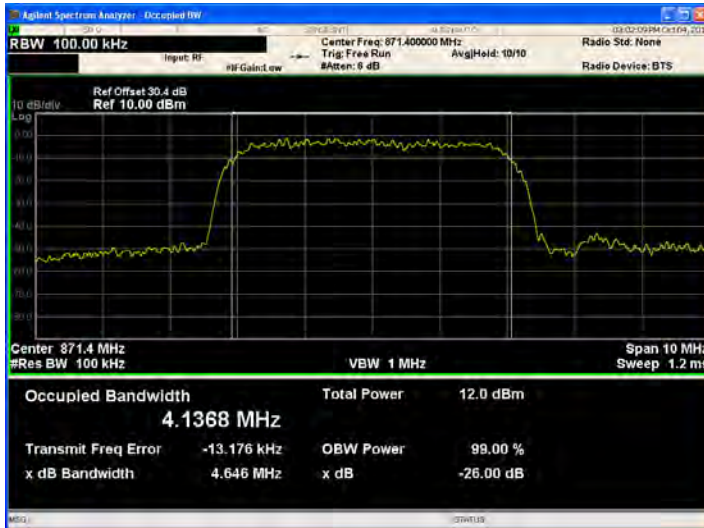
99 % Bandwidth : 4.123 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -48.82 dBm

Output Signal

99 % Bandwidth : 4.129 MHz
26 dB Bandwidth : 4.634 MHz
RF Power : +15.01 dBm

System Gain : 63.83 dB

• WCDMA / Cellular 800 / Down Link / 871.40 MHz



Input Signal

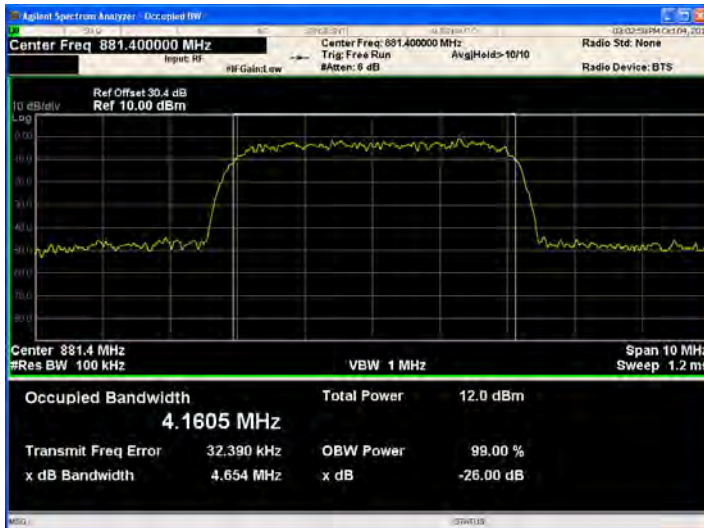
99 % Bandwidth : 4.145 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -52.82 dBm

Output Signal

99 % Bandwidth : 4.137 MHz
26 dB Bandwidth : 4.646 MHz
RF Power : +12.03 dBm

System Gain : 64.85 dB

• WCDMA / Cellular 800 / Down Link / 881.40 MHz



Input Signal

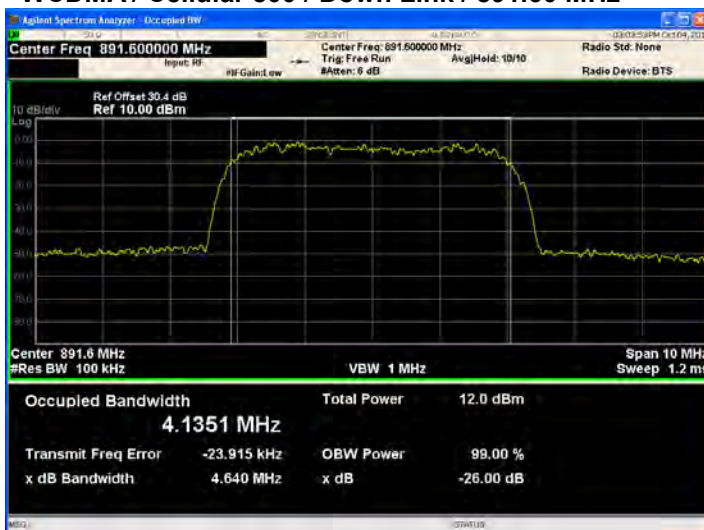
99 % Bandwidth : 4.145 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -53.02 dBm

Output Signal

99 % Bandwidth : 4.161 MHz
26 dB Bandwidth : 4.654 MHz
RF Power : +12.03 dBm

System Gain : 65.05 dB

• WCDMA / Cellular 800 / Down Link / 891.60 MHz



Input Signal

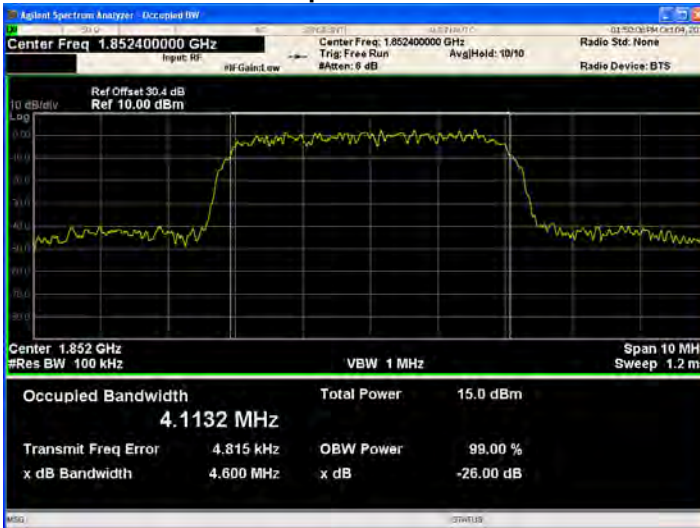
99 % Bandwidth : 4.145 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -53.30 dBm

Output Signal

99 % Bandwidth : 4.135 MHz
26 dB Bandwidth : 4.640 MHz
RF Power : +11.97 dBm

System Gain : 65.27 dB

• WCDMA / PCS 1900 / Up Link / 1 852.40 MHz



Input Signal

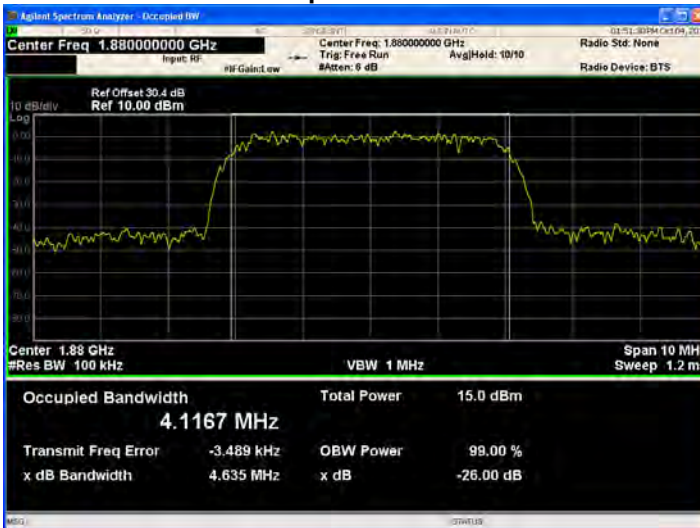
99 % Bandwidth : 4.123 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -49.54 dBm

Output Signal

99 % Bandwidth : 4.113 MHz
26 dB Bandwidth : 4.600 MHz
RF Power : +15.00 dBm

System Gain : 64.54 dB

• WCDMA / PCS 1900 / Up Link / 1 880.00 MHz



Input Signal

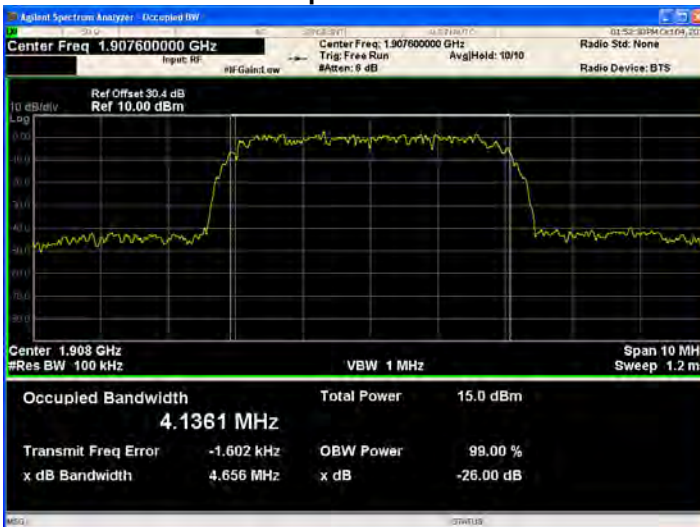
99 % Bandwidth : 4.123 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -49.74 dBm

Output Signal

99 % Bandwidth : 4.117 MHz
26 dB Bandwidth : 4.635 MHz
RF Power : +15.01 dBm

System Gain : 64.75 dB

• WCDMA / PCS 1900 / Up Link / 1 907.60 MHz



Input Signal

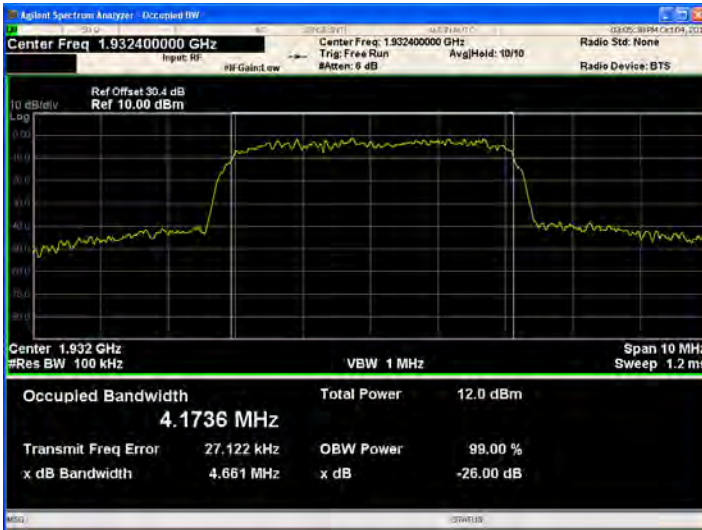
99 % Bandwidth : 4.123 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -47.92 dBm

Output Signal

99 % Bandwidth : 4.136 MHz
26 dB Bandwidth : 4.656 MHz
RF Power : +15.01 dBm

System Gain : 62.93 dB

• WCDMA / PCS 1900 / Down Link / 1 932.40 MHz



Input Signal

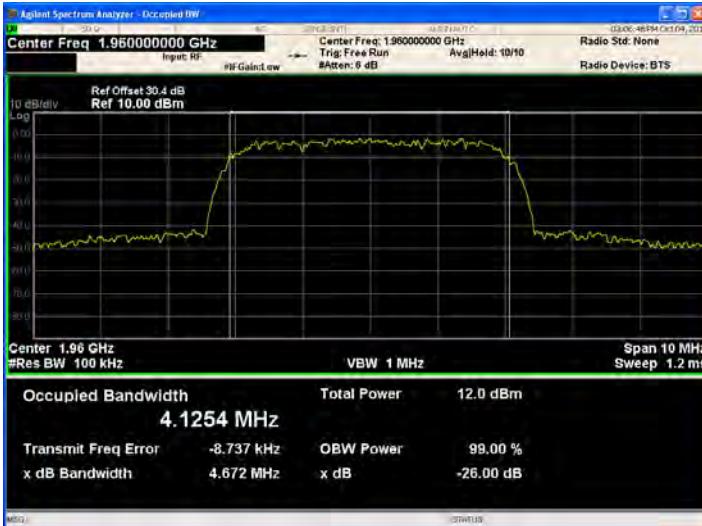
99 % Bandwidth : 4.145 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -52.40 dBm

Output Signal

99 % Bandwidth : 4.174 MHz
26 dB Bandwidth : 4.661 MHz
RF Power : +11.99 dBm

System Gain : 64.39 dB

• WCDMA / PCS 1900 / Down Link / 1 960.00 MHz



Input Signal

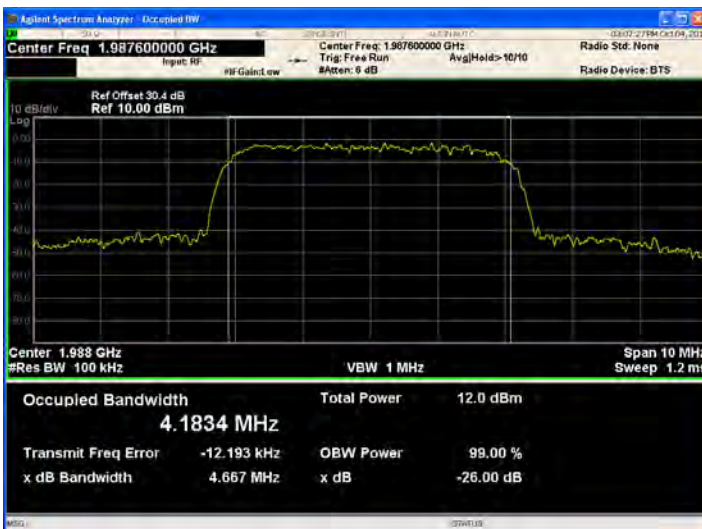
99 % Bandwidth : 4.145 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -52.90 dBm

Output Signal

99 % Bandwidth : 4.125 MHz
26 dB Bandwidth : 4.672 MHz
RF Power : +11.99 dBm

System Gain : 64.89 dB

• WCDMA / PCS 1900 / Down Link / 1 987.60 MHz



Input Signal

99 % Bandwidth : 4.145 MHz
26 dB Bandwidth : 4.650 MHz
RF Power : -51.38 dBm

Output Signal

99 % Bandwidth : 4.183 MHz
26 dB Bandwidth : 4.667 MHz
RF Power : +11.98 dBm

System Gain : 63.36 dB

3.3 Unwanted emission of antenna terminals

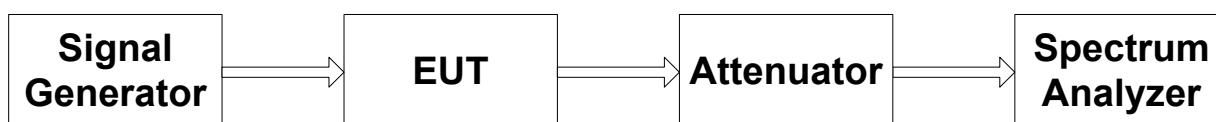
3.3.1 Specification

- FCC Rules Part 2 Section 2.1051
- FCC Rules Part 22 Subpart H, Section 22.917
- FCC Rules Part 24 Subpart E, Section 24.238
- IC Rules RSS-131 Issue 2 July 2003, Section 6.4

3.3.2 Measurement method

- ANSI/TIA-603-D-2010, Section 2.2.11

3.3.3 Set-Up



3.3.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	USHR-0819L	OPISYS Incorporated
Signal Generator	E4437B	Agilent
Signal Generator	E4432B	Agilent
Spectrum Analyzer	N9020A	Agilent
Attenuator	66-30-33	Weinschel

3.3.5 Test condition

- Test place: Shield Room
- Test environment: 25 °C, 48 % R.H.

3.3.6 Test result : Spurious emissions

Band	Link	Frequency [MHz]	30 MHz to 1 GHz [dBm]	1 GHz to 26.5 GHz [dBm]	Limit [dBm]
Cellular 800	Up Link	836.60	>-33.00	>-33.00	-13.00
	Down Link	881.60	>-33.00	>-33.00	
PCS 1900	Up Link	1 880.00	>-33.00	>-33.00	
	Down Link	1 960.00	>-33.00	>-33.00	

※ This emissions level is below 20 dB to limit.

3.3.7 Test result : Intermodulation emissions

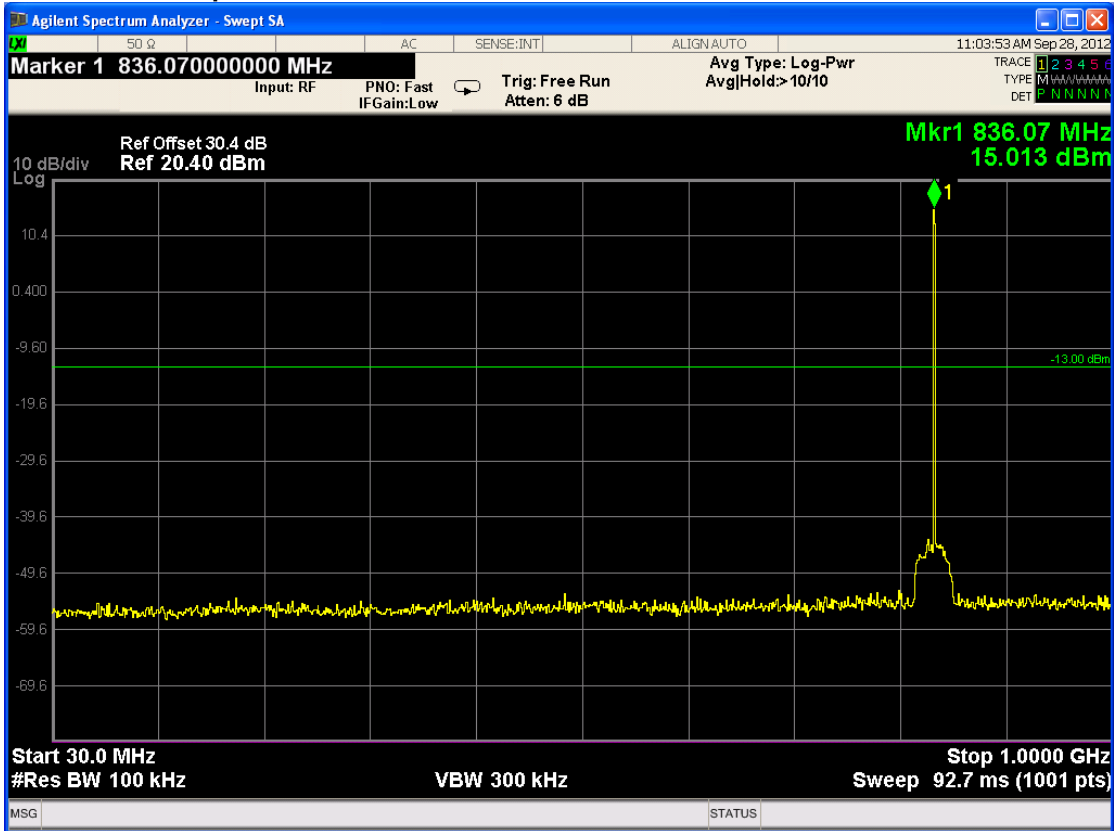
Band	Link	Frequency 1 [MHz]	Frequency 2 [MHz]	IMD Emission [dBm]	Limit [dBm]
Cellular 800	Up Link	824.20	825.20	-23.98	-13.00
		835.60	836.60	-23.78	
		847.80	848.80	-24.85	
	Down Link	869.20	870.20	-31.31	
		881.00	882.00	-30.46	
		892.80	893.80	-31.70	
PCS 1900	Up Link	1 850.20	1 851.20	-21.12	-13.00
		1 879.00	1 880.00	-21.13	
		1 908.80	1 909.80	-23.84	
	Down Link	1 930.20	1 931.20	-19.23	
		1 959.00	1 960.00	-21.47	
		1 988.80	1 989.80	-22.05	

3.3.8 Test result : Band edge emissions

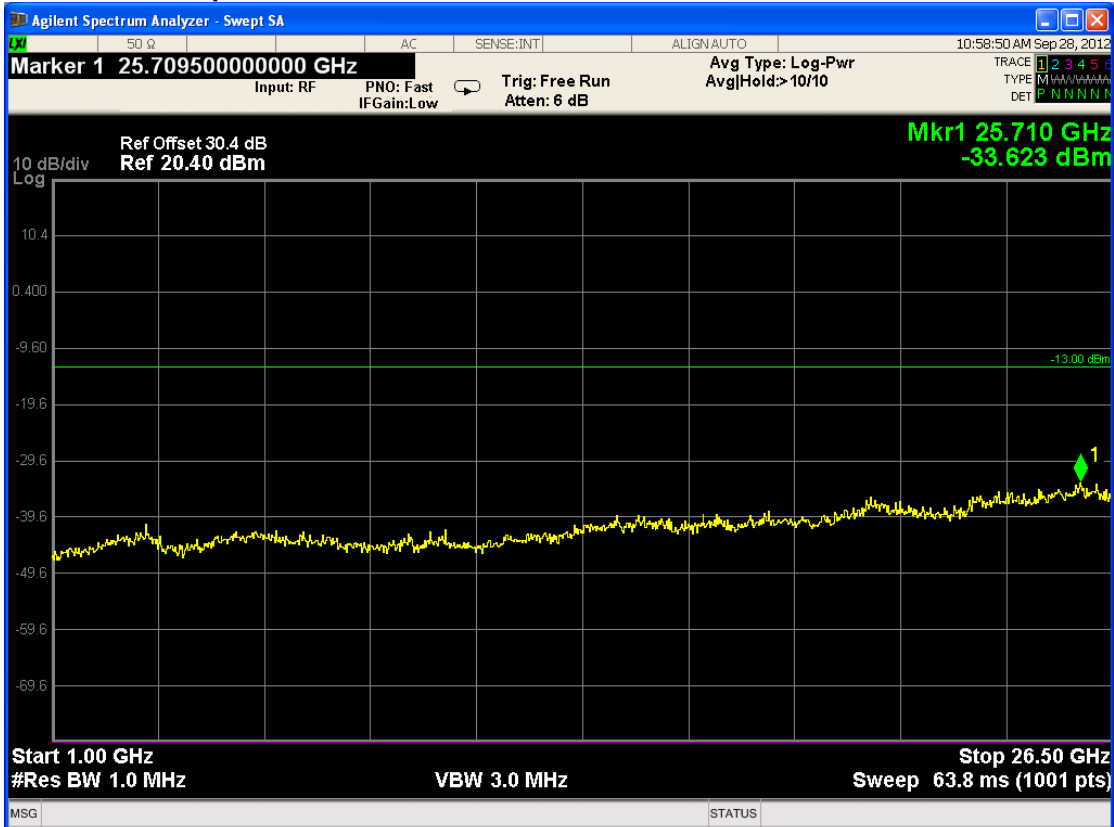
Band	Link	Frequency [MHz]	Frequency [MHz]	Band edge emission [dBm]	System Gain [dB]
Cellular 800	Up Link	EDGE	824.20	-43.33	-13.00
			848.80	-43.43	
		GSM	824.20	-39.52	
			848.80	-39.98	
		CDMA	824.80	-39.71	
			848.20	-45.94	
		WCDMA	826.40	-36.18	
			846.60	-37.60	
	Down Link	EDGE	869.20	-44.95	
			893.80	-44.88	
		GSM	869.20	-43.24	
			893.80	-42.72	
		CDMA	869.80	-52.61	
			893.20	-51.39	
		WCDMA	871.40	-42.56	
			891.60	-41.99	
PCS 1900	Up Link	EDGE	1 850.20	-40.72	-13.00
			1 909.80	-40.28	
		GSM	1 850.20	-39.93	
			1 909.80	-40.53	
		CDMA	1 850.80	-44.02	
			1 909.20	-41.75	
		WCDMA	1 852.40	-39.81	
			1907.60	-38.56	
	Down Link	EDGE	1 930.20	-43.52	
			1 989.80	-43.98	
		GSM	1 930.20	-43.01	
			1 989.80	-42.71	
		CDMA	1 930.80	-45.68	
			1 989.20	-47.19	
		WCDMA	1 932.40	-40.22	
			1 987.60	-40.47	

3.3.9 Plots of spurious emissions

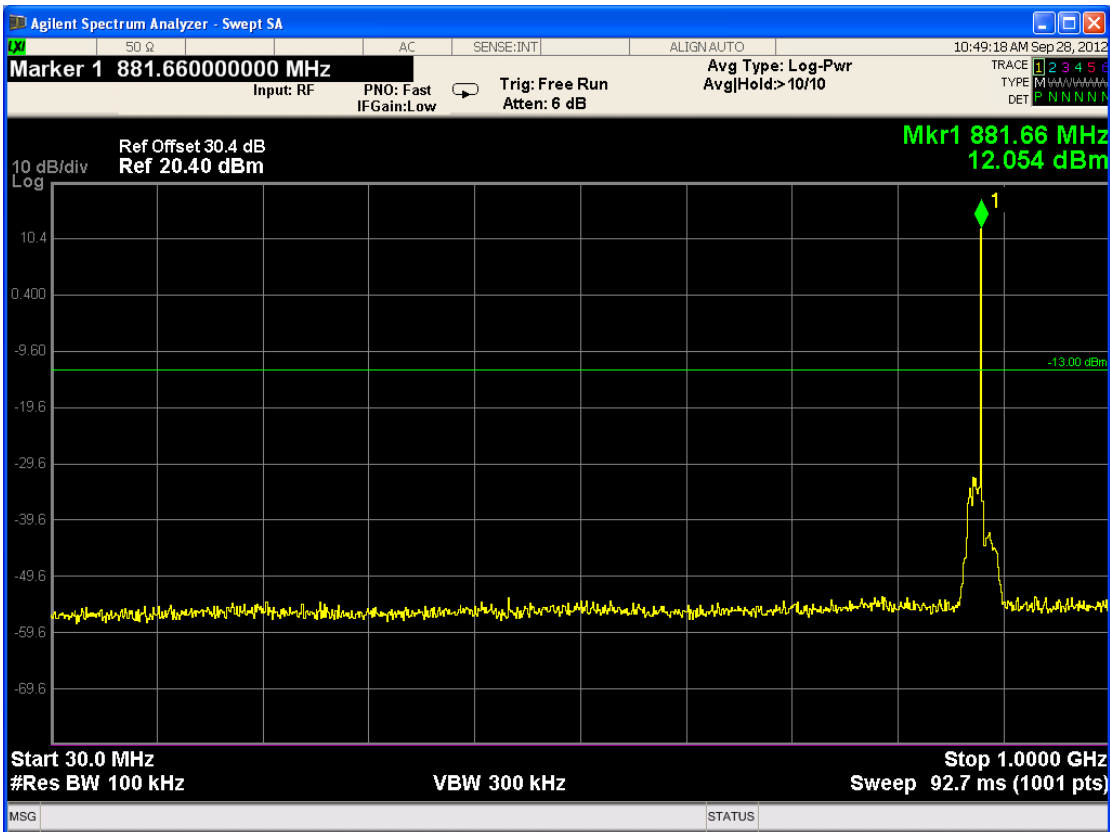
• Cellular 800 / Up Link / 836.60 MHz / 30 MHz to 1 GHz



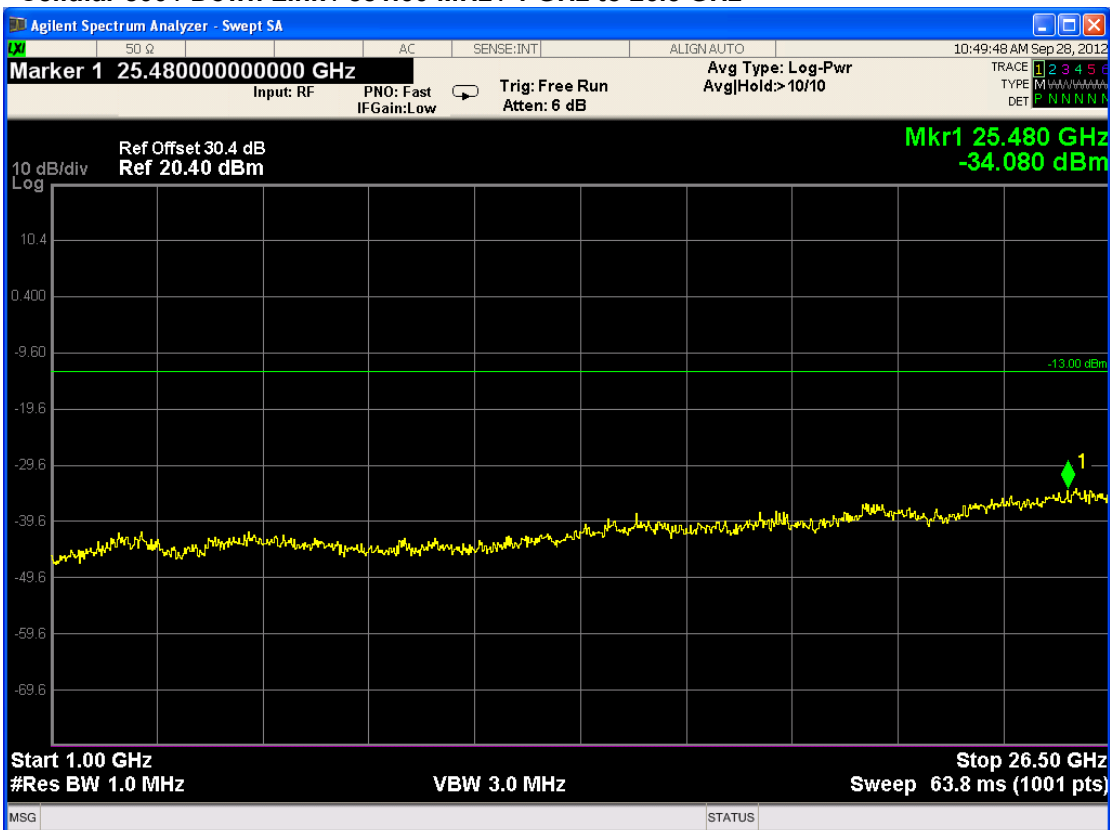
• Cellular 800 / Up Link / 836.60 MHz / 1 GHz to 26.5 GHz



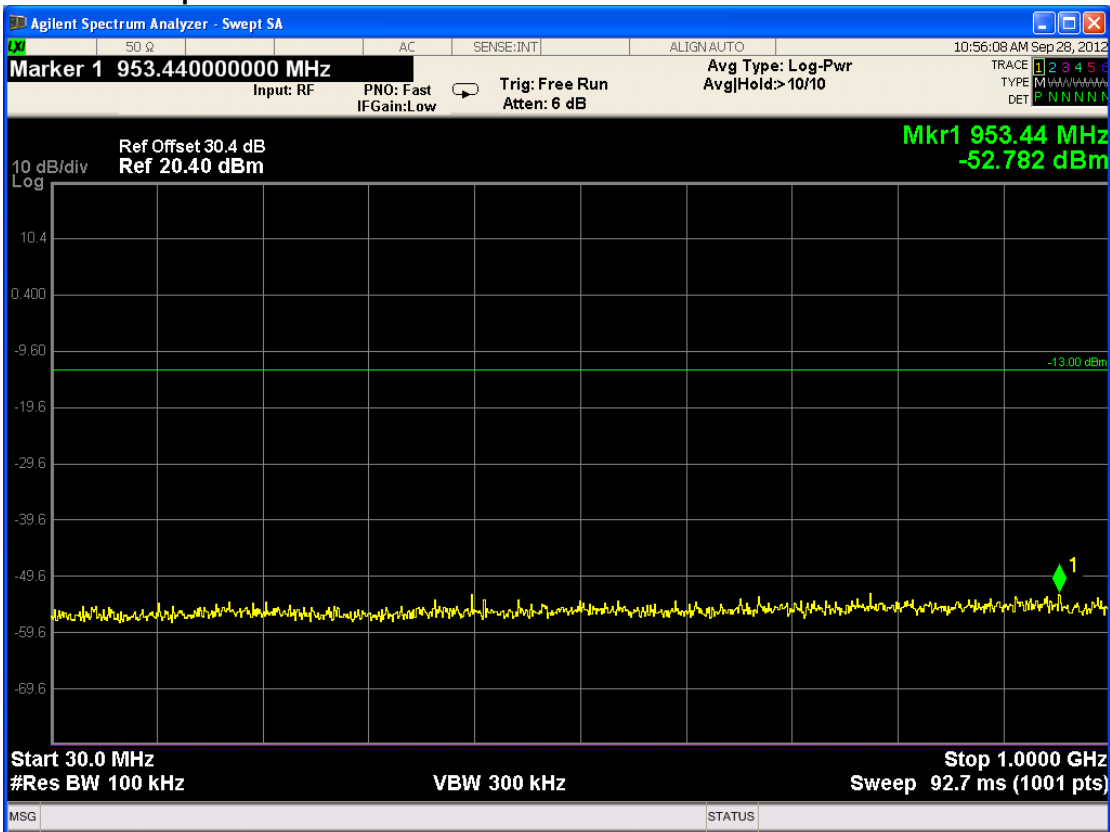
• Cellular 800 / Down Link / 881.60 MHz / 30 MHz to 1 GHz



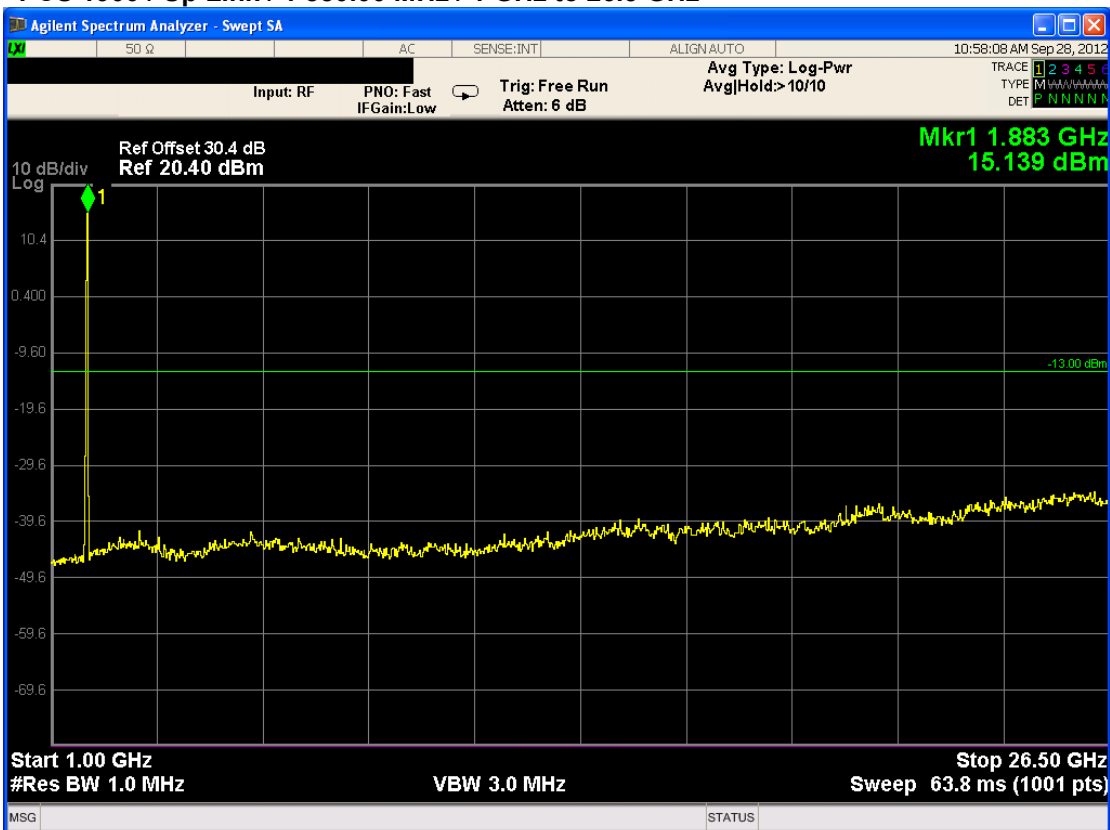
• Cellular 800 / Down Link / 881.60 MHz / 1 GHz to 26.5 GHz



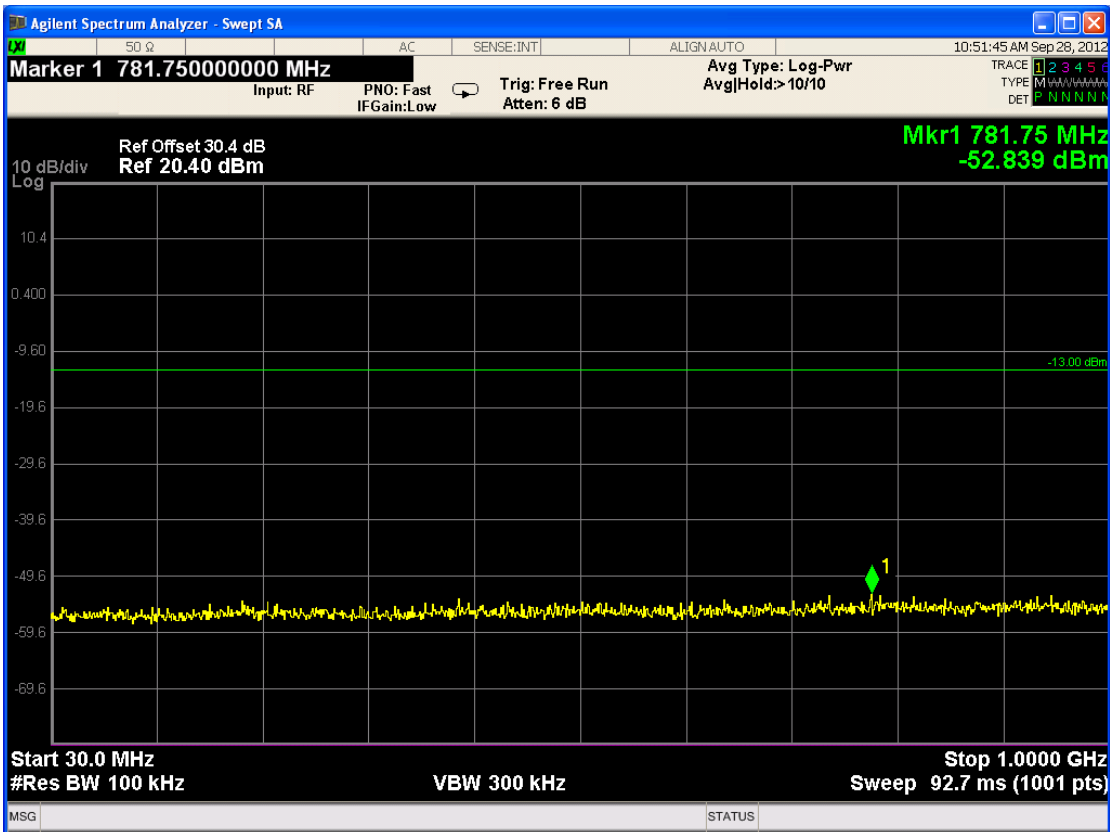
• PCS 1900 / Up Link / 1 880.00 MHz / 30 MHz to 1 GHz



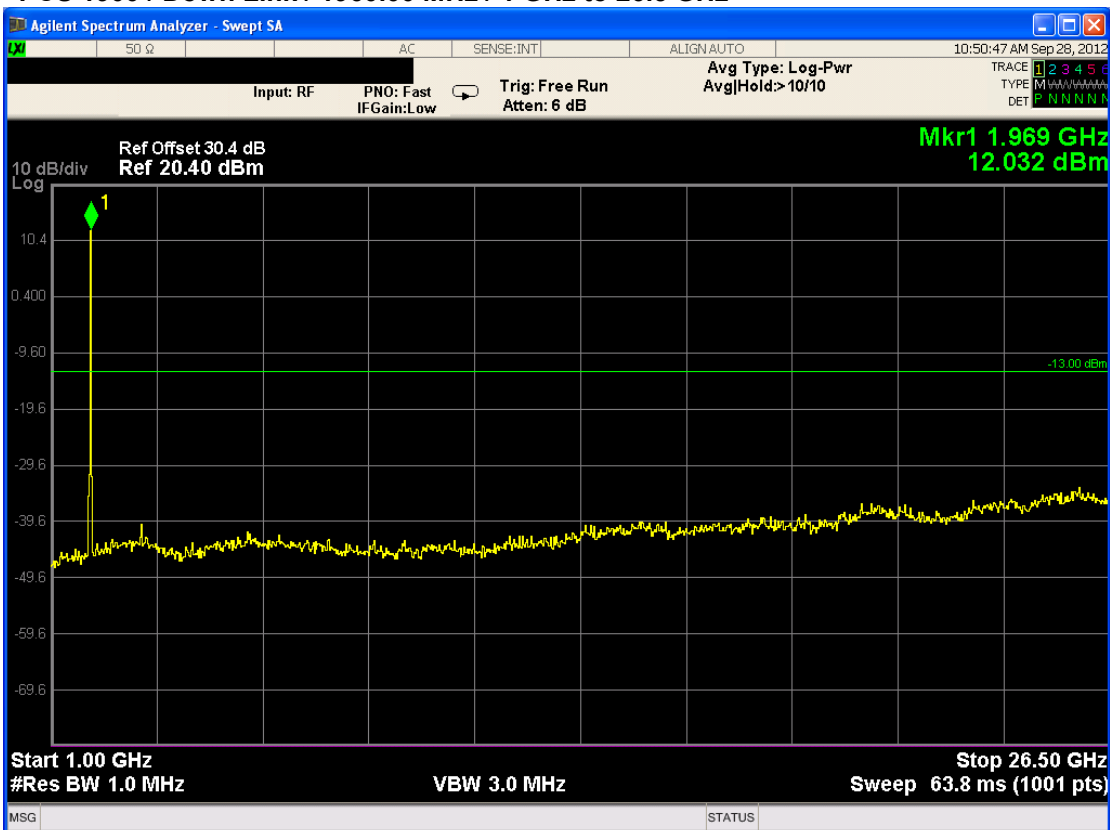
• PCS 1900 / Up Link / 1 880.00 MHz / 1 GHz to 26.5 GHz



• PCS 1900 / Down Link / 1 960.00 MHz / 30 MHz to 1 GHz

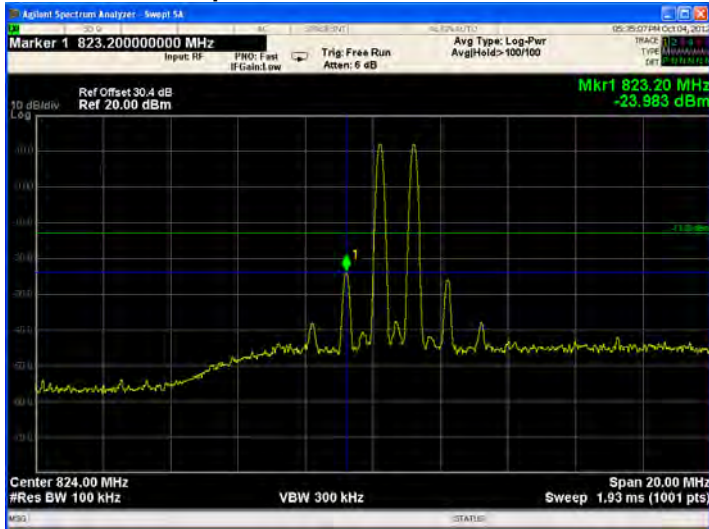


• PCS 1900 / Down Link / 1960.00 MHz / 1 GHz to 26.5 GHz



3.3.10 Plots of intermodulation emissions

• Cellular 800 / Up Link / Low



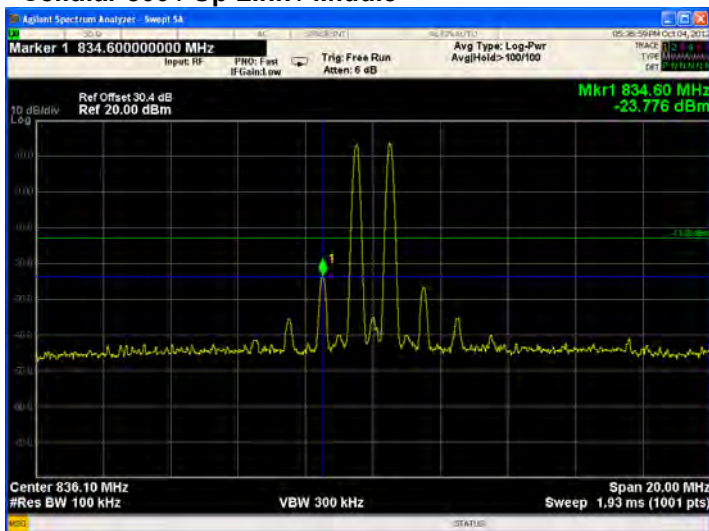
Input Signal

1st : 824.20 MHz
2nd : 825.20 MHz

Intermodulation Emission

Lower IMD : -23.983 dBm
Upper IMD : -26.698 dBm

• Cellular 800 / Up Link / Middle



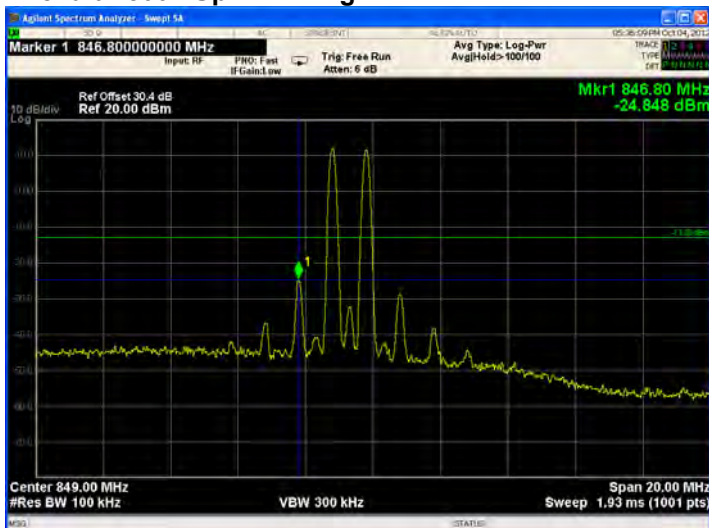
Input Signal

1st : 835.60 MHz
2nd : 836.60 MHz

Intermodulation Emission

Lower IMD : -23.776 dBm
Upper IMD : -26.326 dBm

• Cellular 800 / Up Link / High



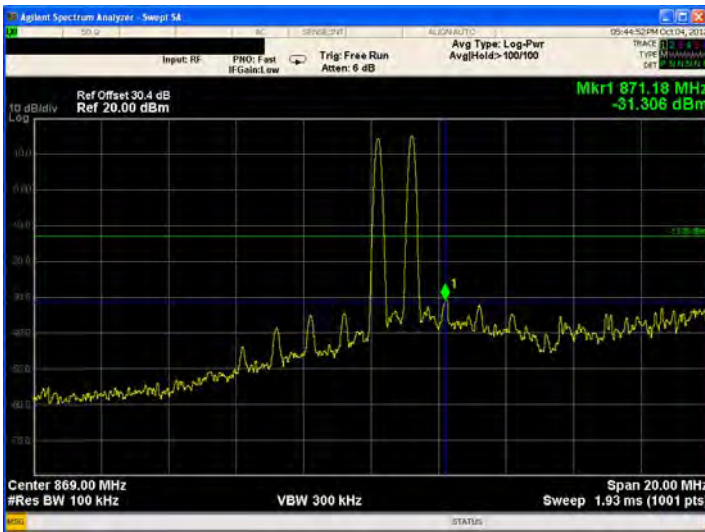
Input Signal

1st : 847.80 MHz
2nd : 848.80 MHz

Intermodulation Emission

Lower IMD : -24.848 dBm
Upper IMD : -28.126 dBm

• Cellular 800 / Down Link / Low



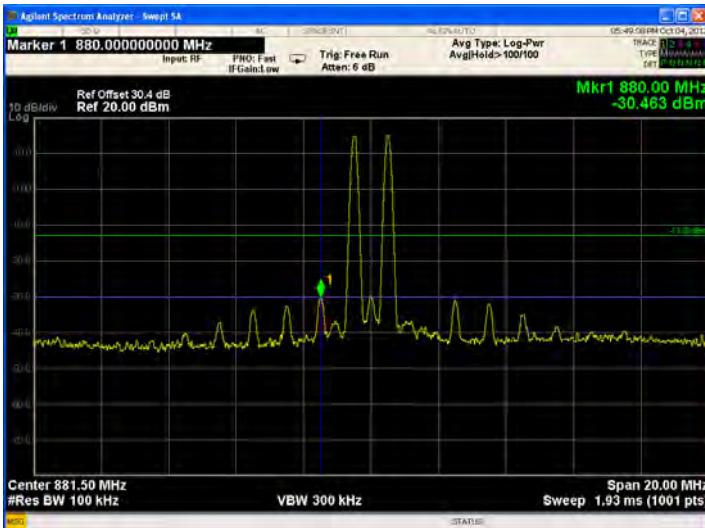
Input Signal

1st : 869.20 MHz
2nd : 870.20 MHz

Intermodulation Emission

Lower IMD : -35.612 dBm
Upper IMD : -31.306 dBm

• Cellular 800 / Down Link / Middle



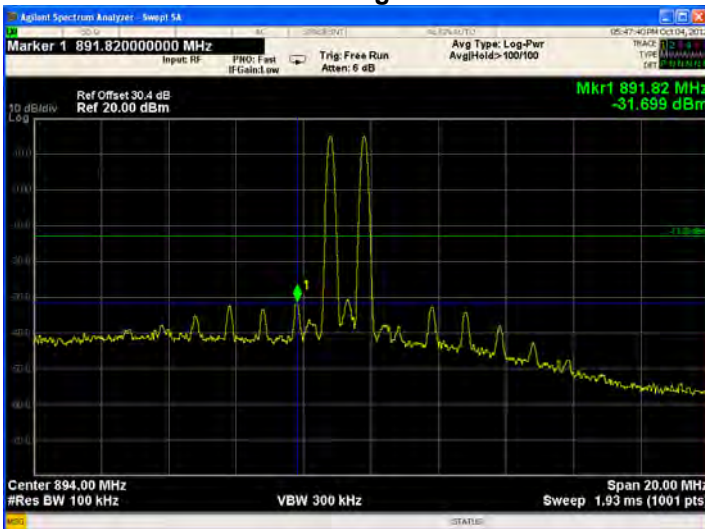
Input Signal

1st : 881.00 MHz
2nd : 882.00 MHz

Intermodulation Emission

Lower IMD : -30.463 dBm
Upper IMD : -31.042 dBm

• Cellular 800 / Down Link / High



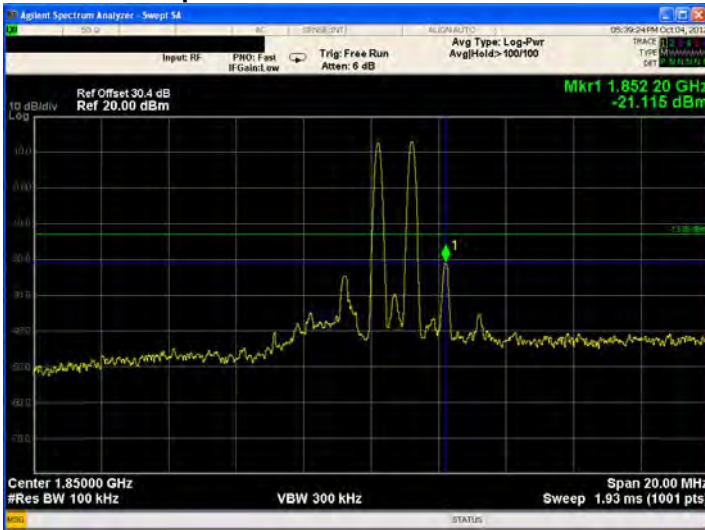
Input Signal

1st : 892.80 MHz
2nd : 893.80 MHz

Intermodulation Emission

Lower IMD : -31.699 dBm
Upper IMD : -33.216 dBm

• PCS 1900 / Up Link / Low



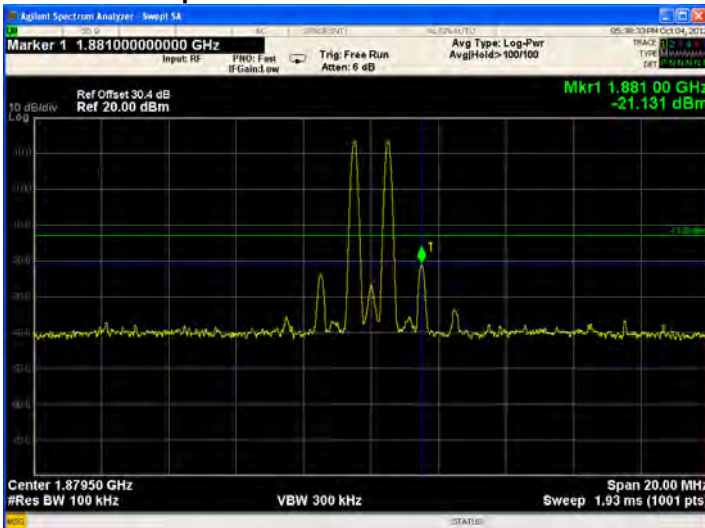
Input Signal

1st : 1850.20 MHz
2nd : 1851.20 MHz

Intermodulation Emission

Lower IMD : -24.416 dBm
Upper IMD : -21.115 dBm

• PCS 1900 / Up Link / Middle



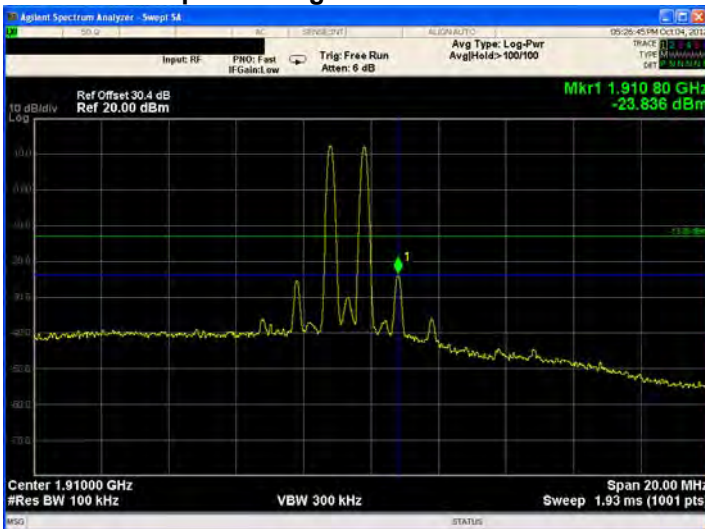
Input Signal

1st : 1879.00 MHz
2nd : 1880.00 MHz

Intermodulation Emission

Lower IMD : -23.619 dBm
Upper IMD : -21.131 dBm

• PCS 1900 / Up Link / High



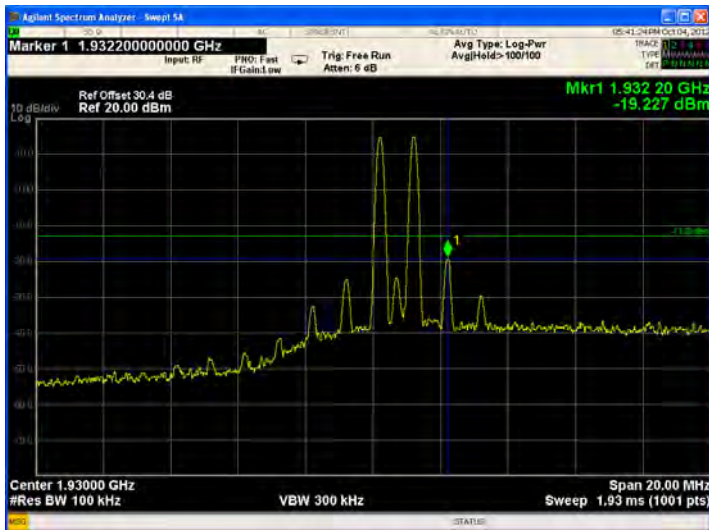
Input Signal

1st : 1908.80 MHz
2nd : 1909.80 MHz

Intermodulation Emission

Lower IMD : -26.223 dBm
Upper IMD : -23.836 dBm

• PCS 1900 / Down Link / Low



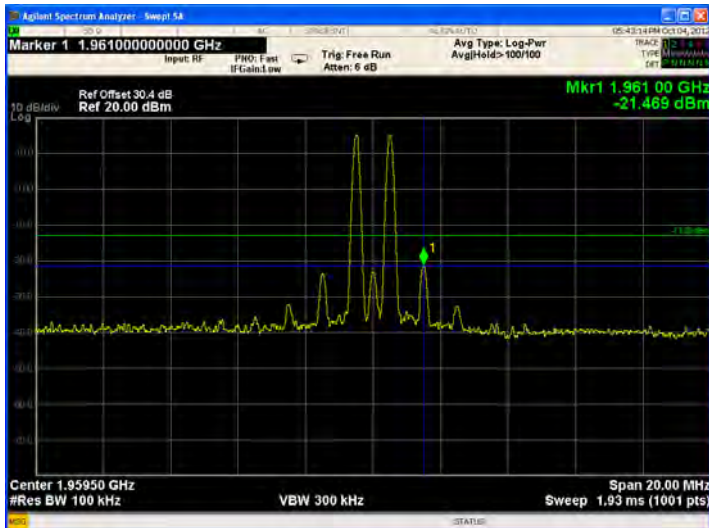
Input Signal

1st : 1930.20 MHz
2nd : 1931.20 MHz

Intermodulation Emission

Lower IMD : -24.123 dBm
Upper IMD : -19.227 dBm

• PCS 1900 / Down Link / Middle



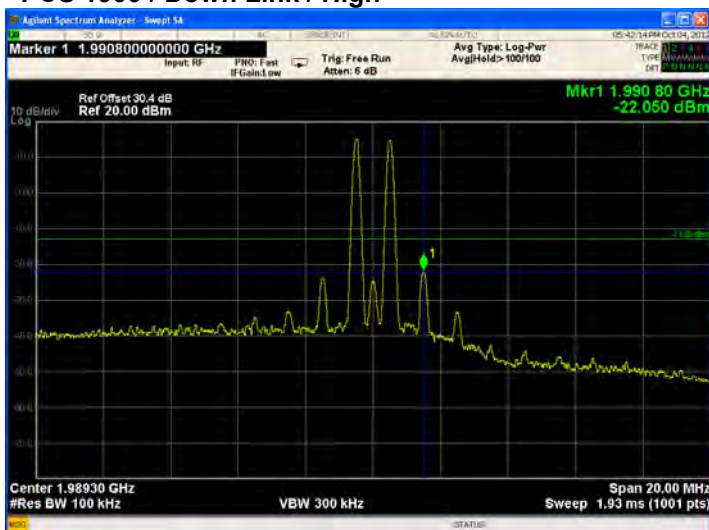
Input Signal

1st : 1959.00 MHz
2nd : 1960.00 MHz

Intermodulation Emission

Lower IMD : -24.816 dBm
Upper IMD : -21.469 dBm

• PCS 1900 / Down Link / High



Input Signal

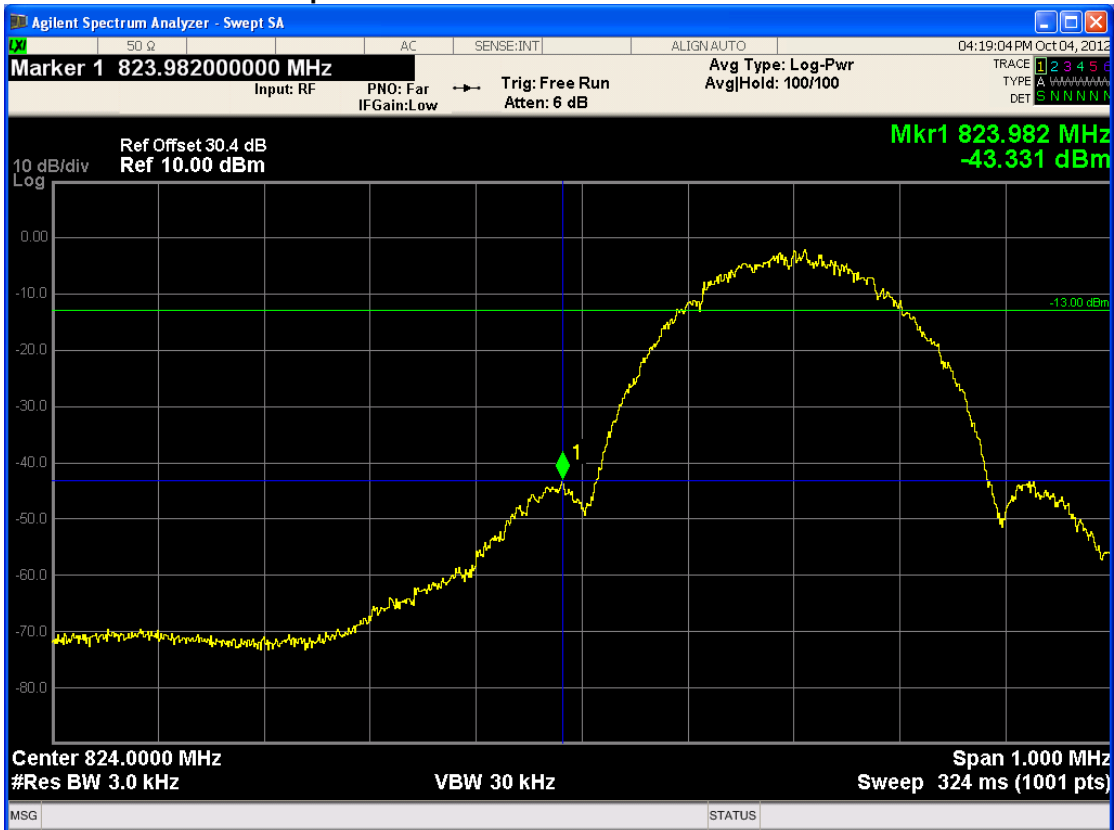
1st : 1988.80 MHz
2nd : 1989.80 MHz

Intermodulation Emission

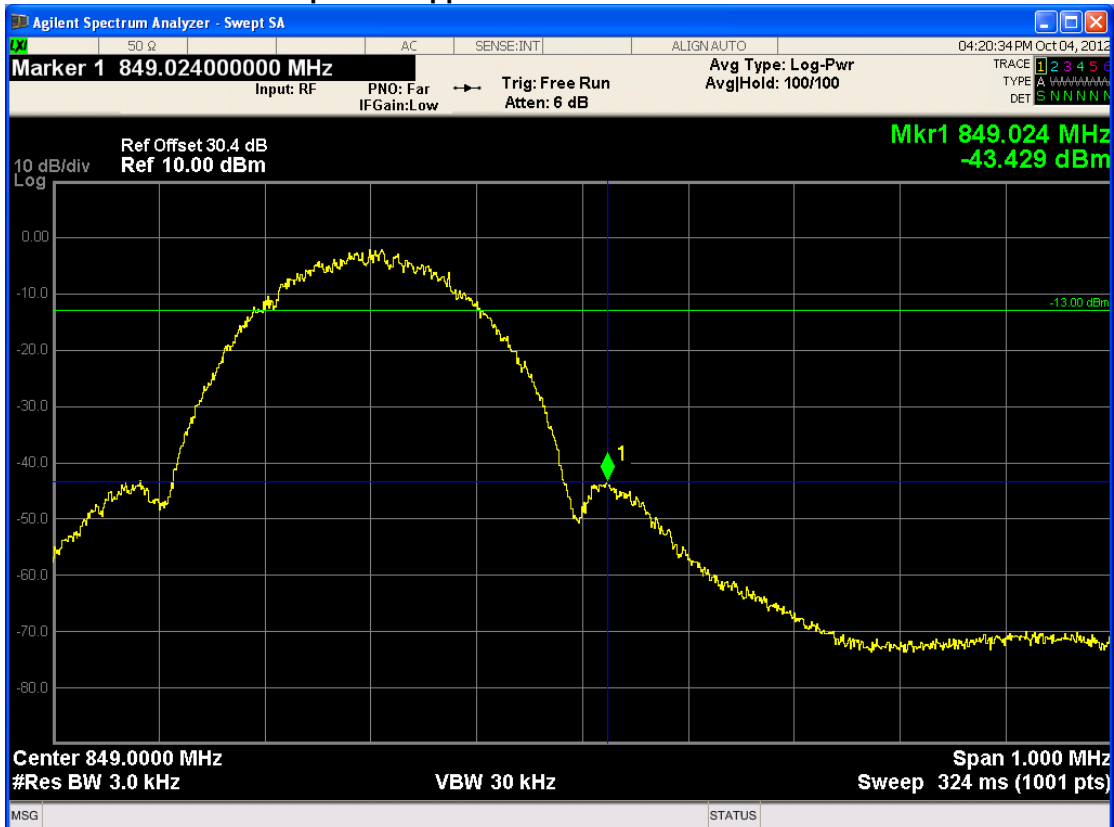
Lower IMD : -23.916 dBm
Upper IMD : -22.050 dBm

3.3.11 Plots of band edge emissions

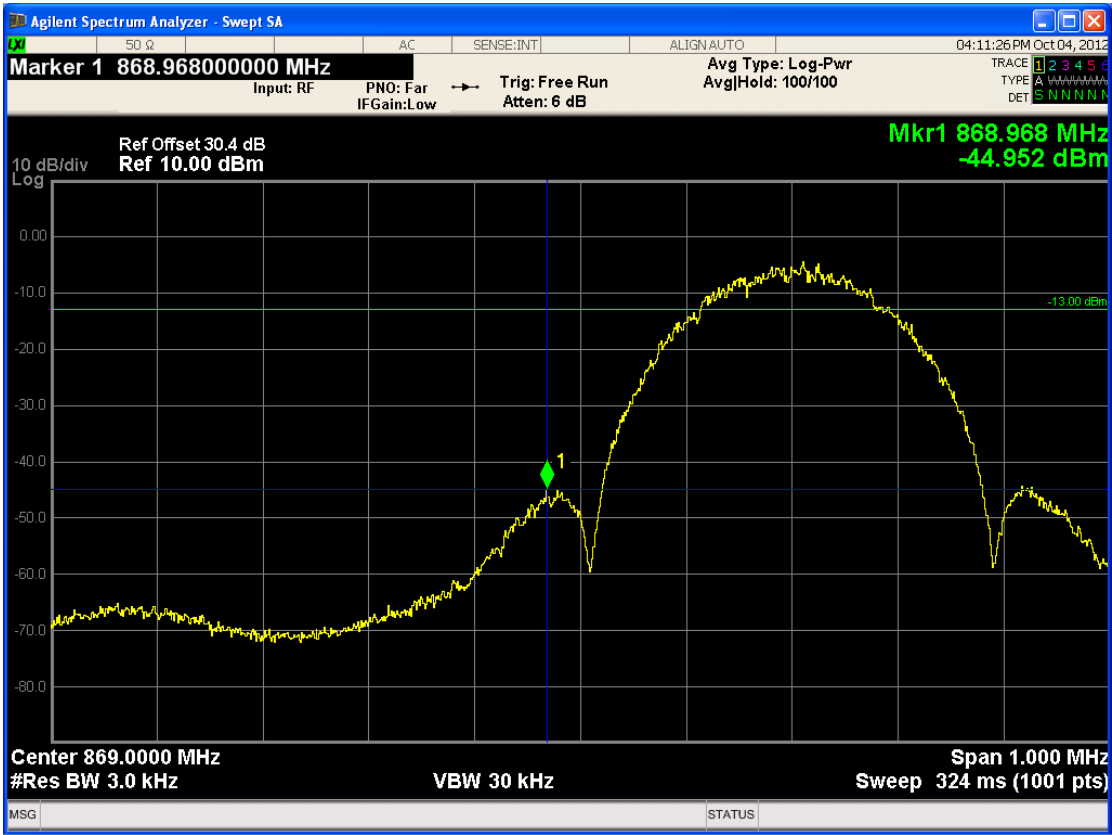
• EDGE / Cellular 800 / Up Link / Lower Side / 824.20 MHz



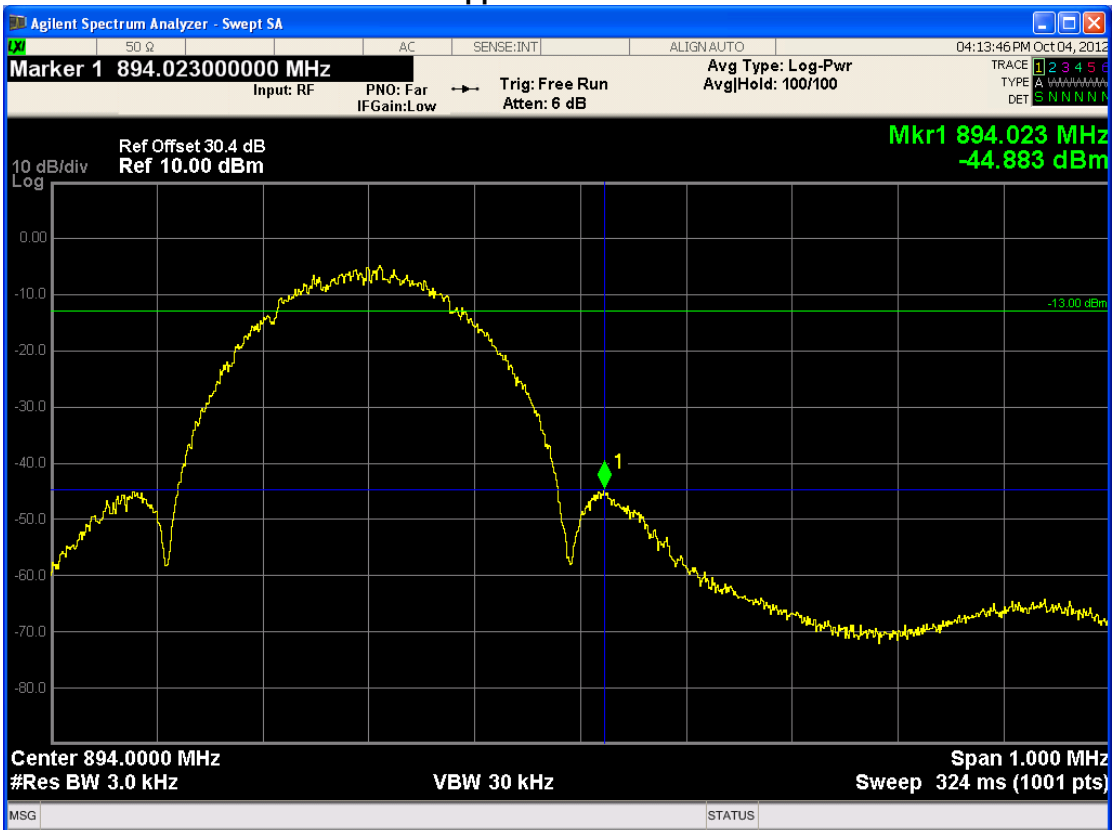
• EDGE / Cellular 800 / Up Link / Upper Side / 848.80 MHz



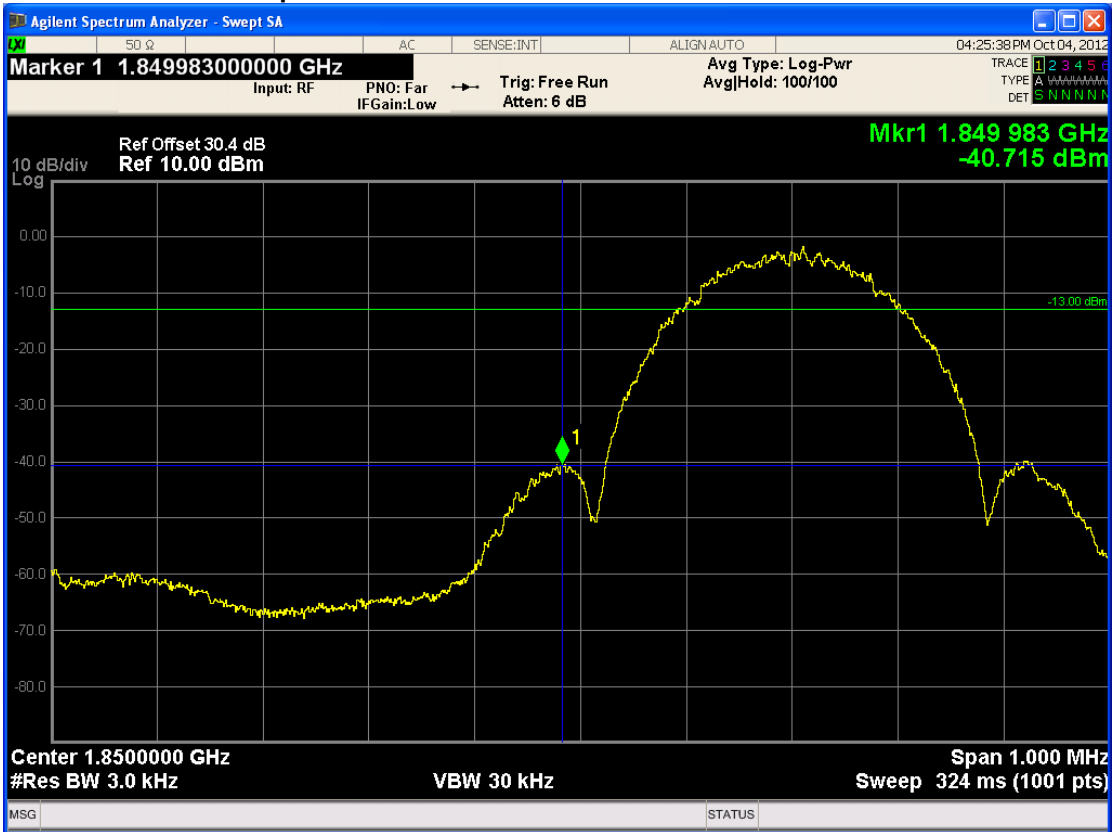
• **EDGE / Cellular 800 / Down Link / Lower Side / 869.20 MHz**



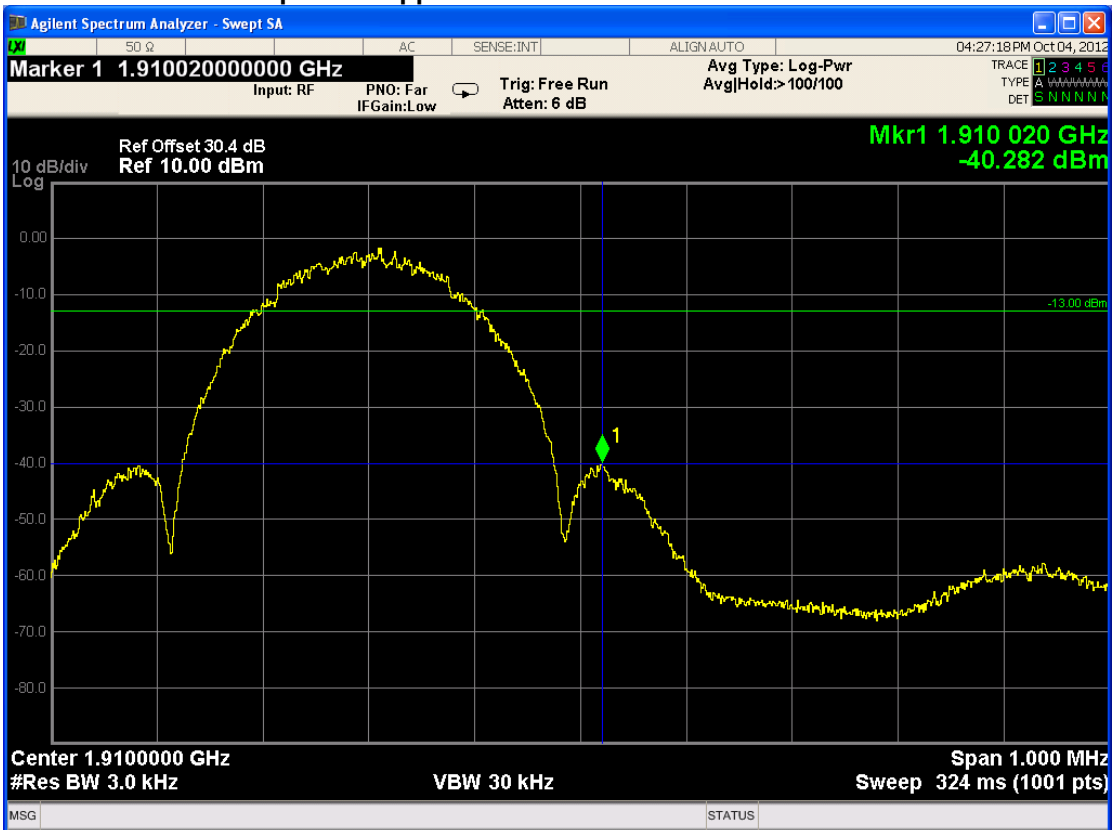
• **EDGE / Cellular 800 / Down Link / Upper Side / 893.80 MHz**



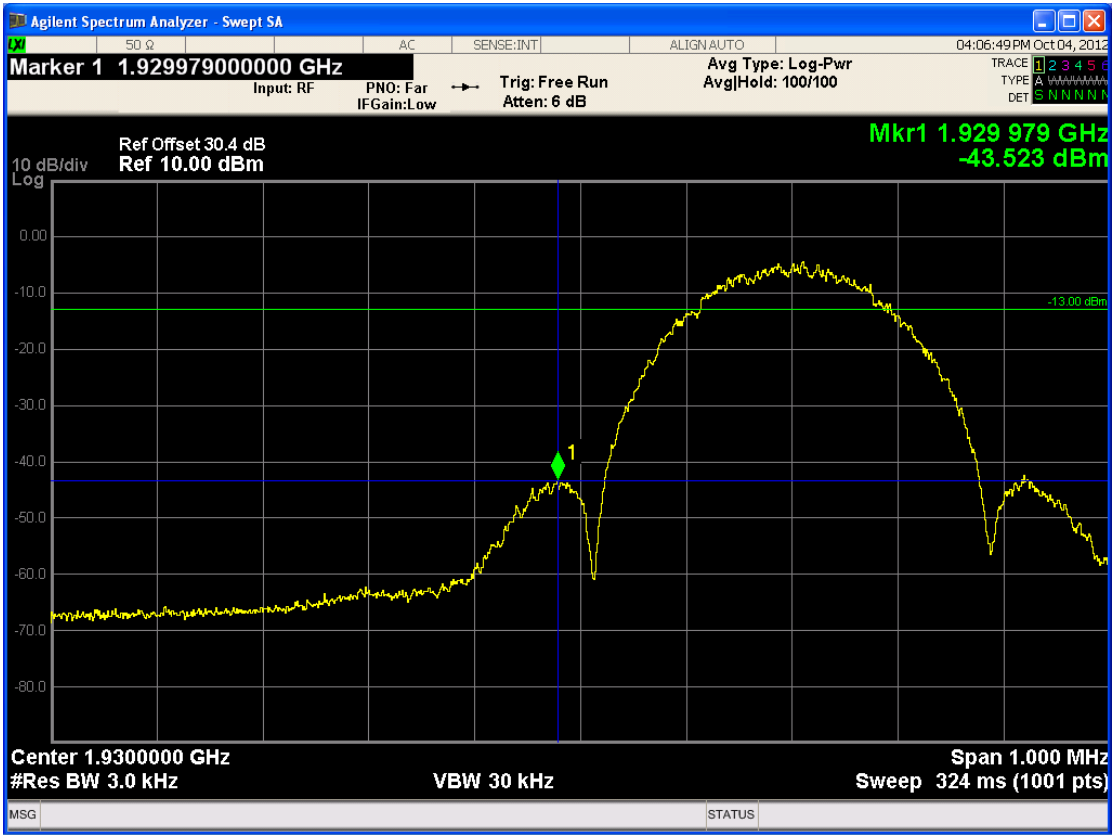
• EDGE / PCS 1900 / Up Link / Lower Side / 1 850.20 MHz



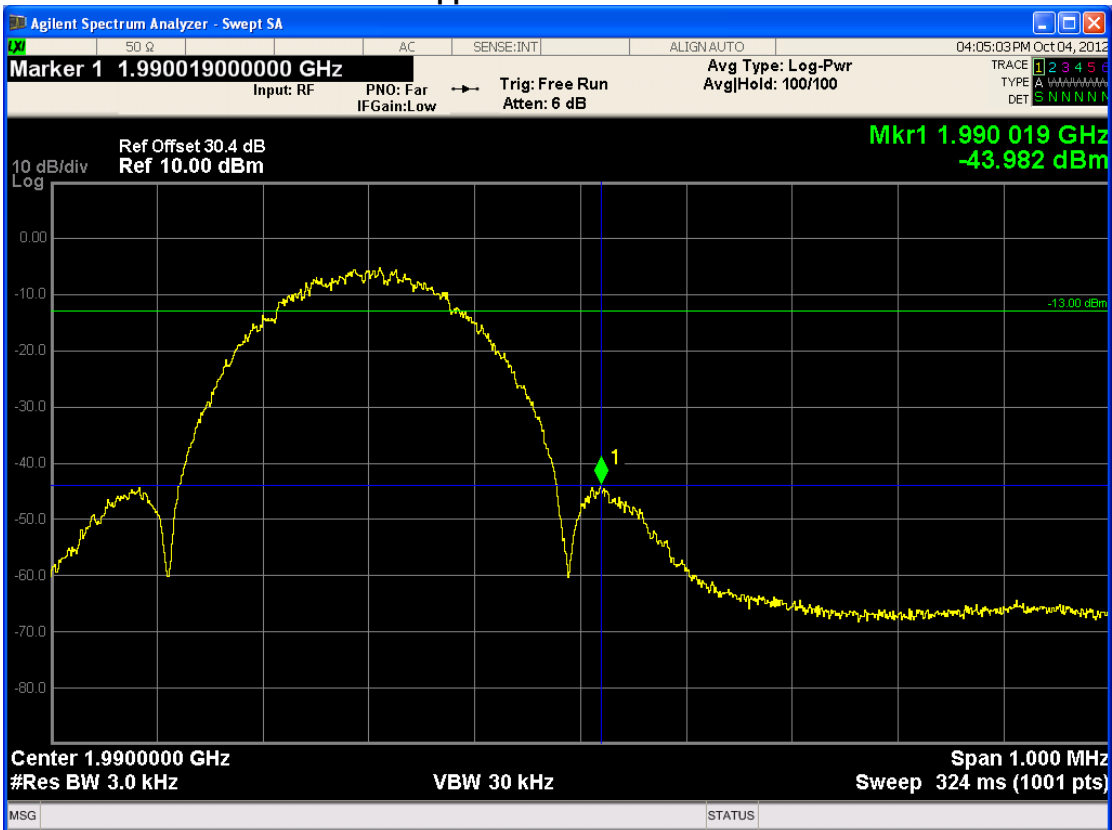
• EDGE / PCS 1900 / Up Link / Upper Side / 1 909.80 MHz



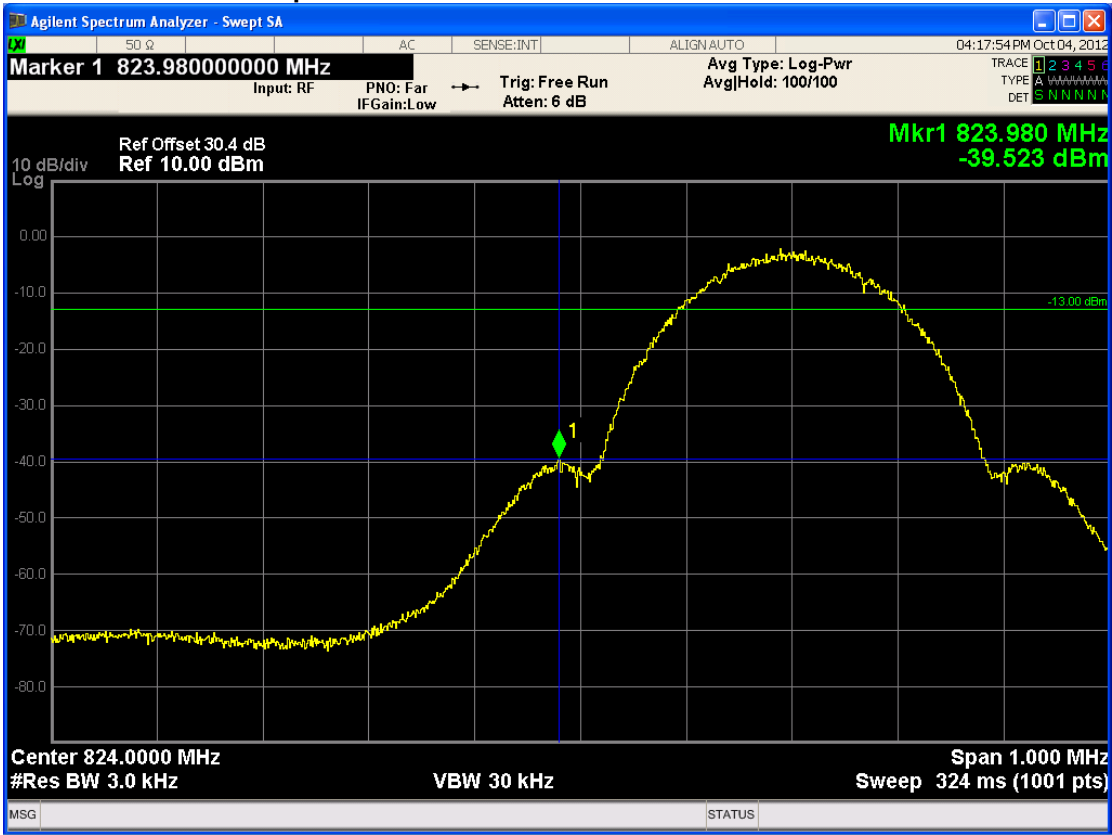
• **EDGE / PCS 1900 / Down Link / Lower Side / 1 930.20 MHz**



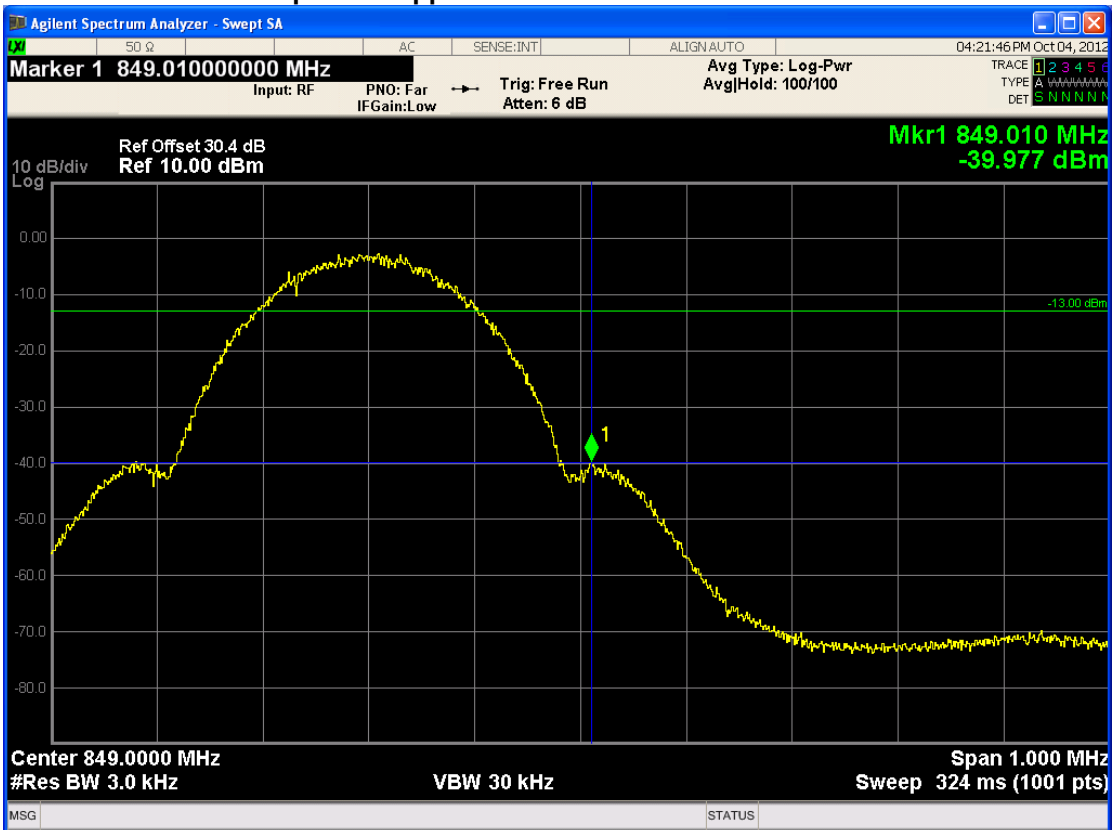
• **EDGE / PCS 1900 / Down Link / Upper Side / 1 989.80 MHz**



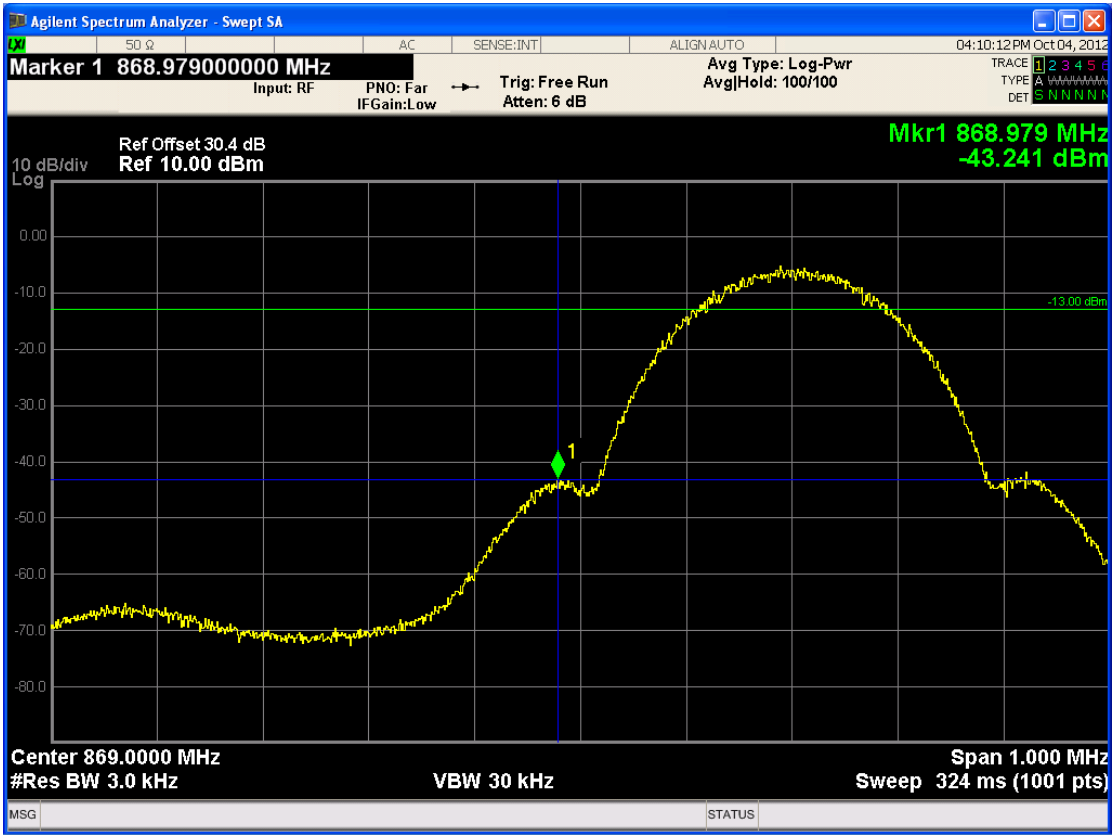
• GSM / Cellular 800 / Up Link / Lower Side / 824.20 MHz



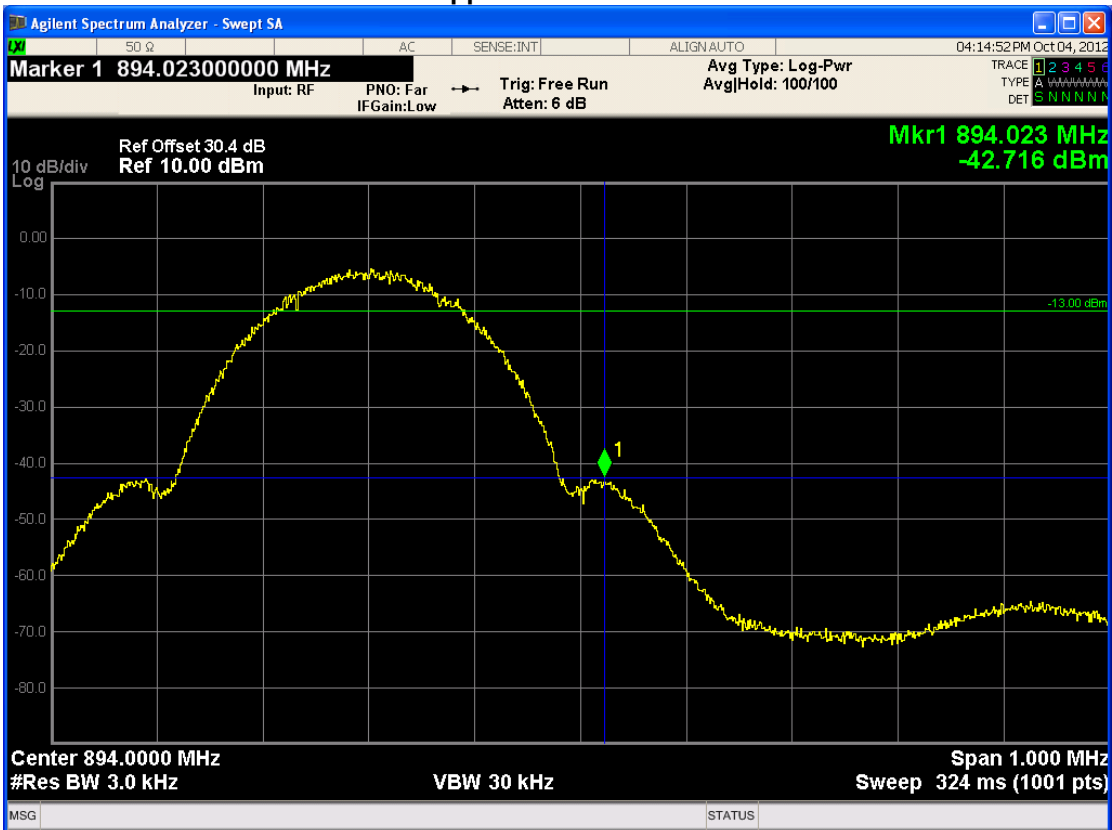
• GSM / Cellular 800 / Up Link / Upper Side / 848.80 MHz



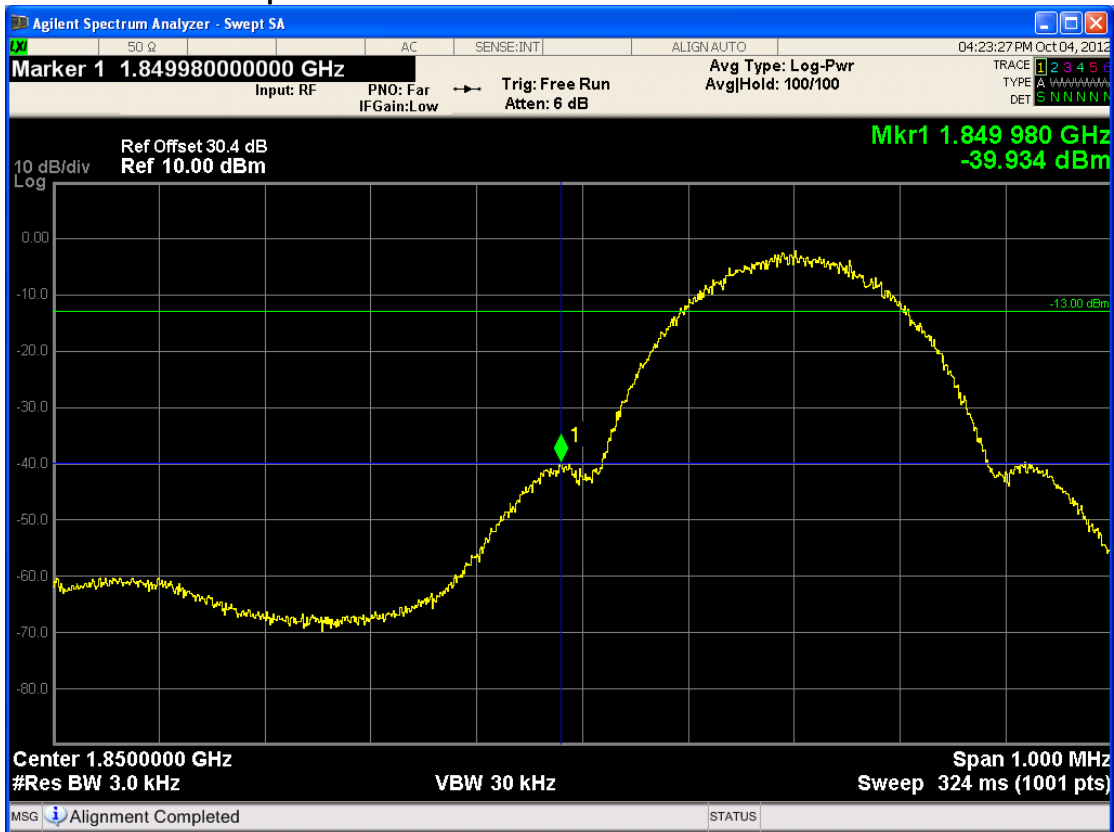
• GSM / Cellular 800 / Down Link / Lower Side / 869.20 MHz



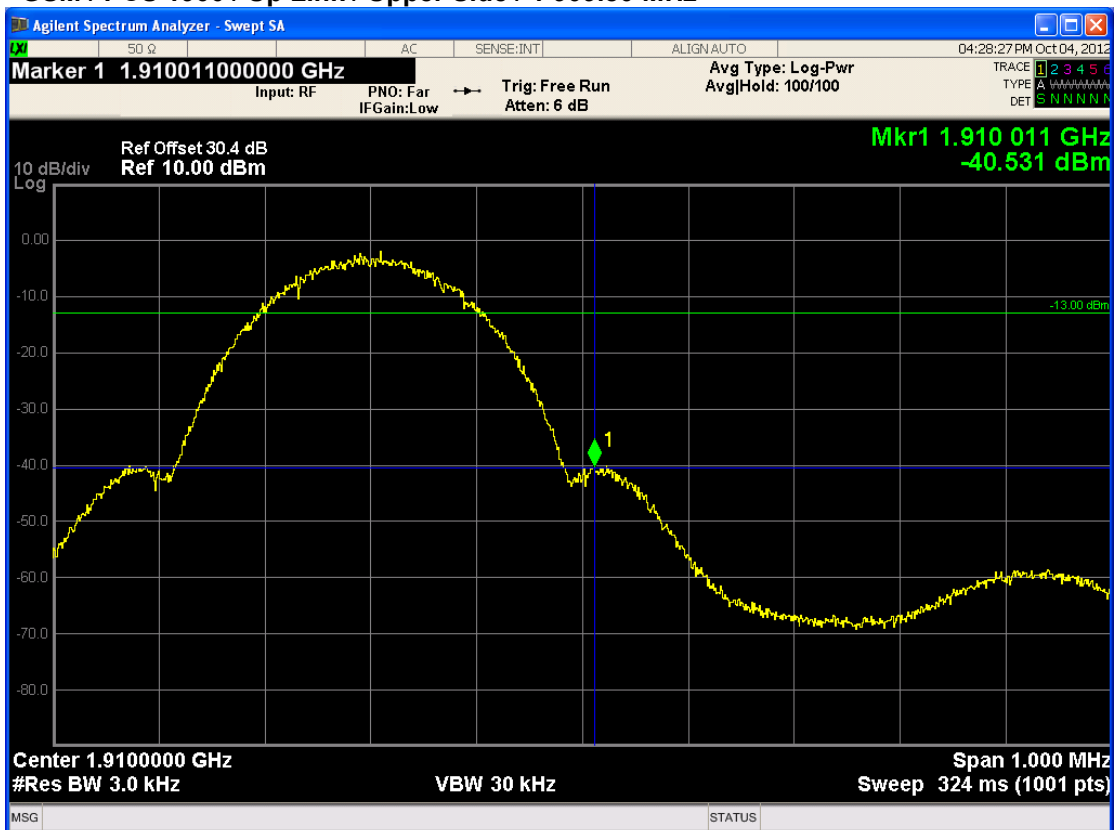
• GSM / Cellular 800 / Down Link / Upper Side / 893.80 MHz



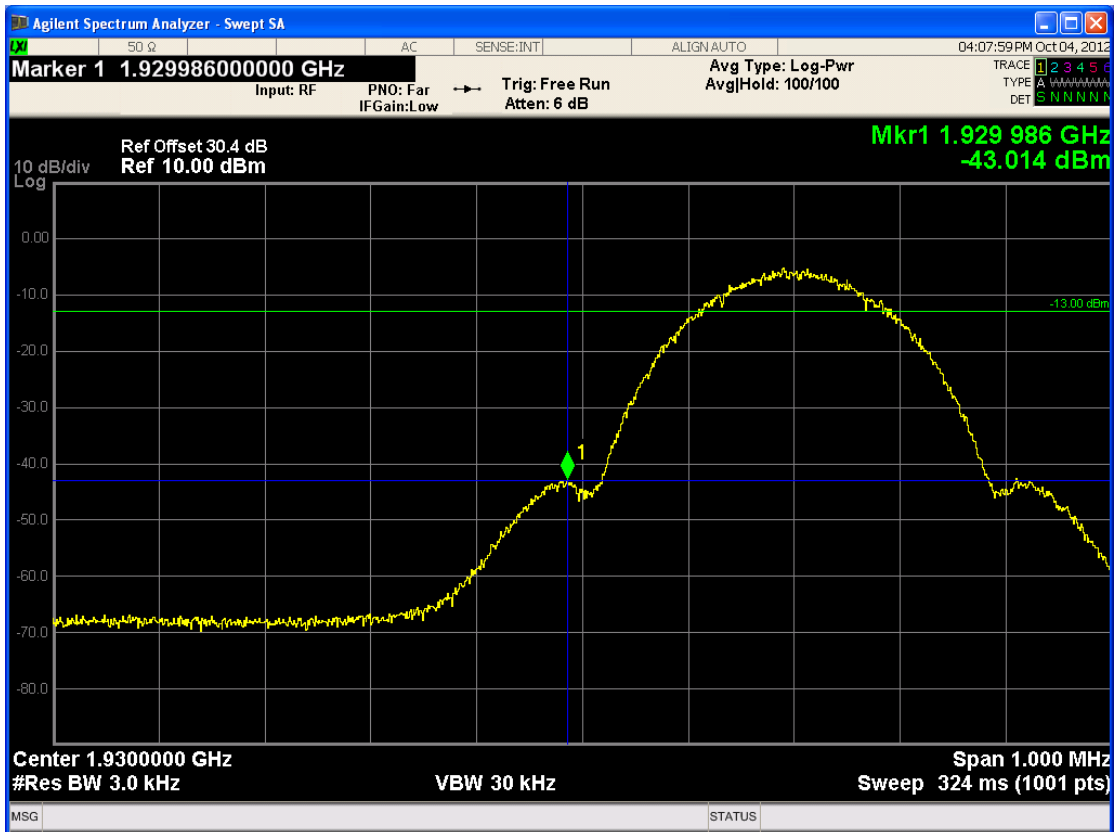
• GSM / PCS 1900 / Up Link / Lower Side / 1 850.20 MHz



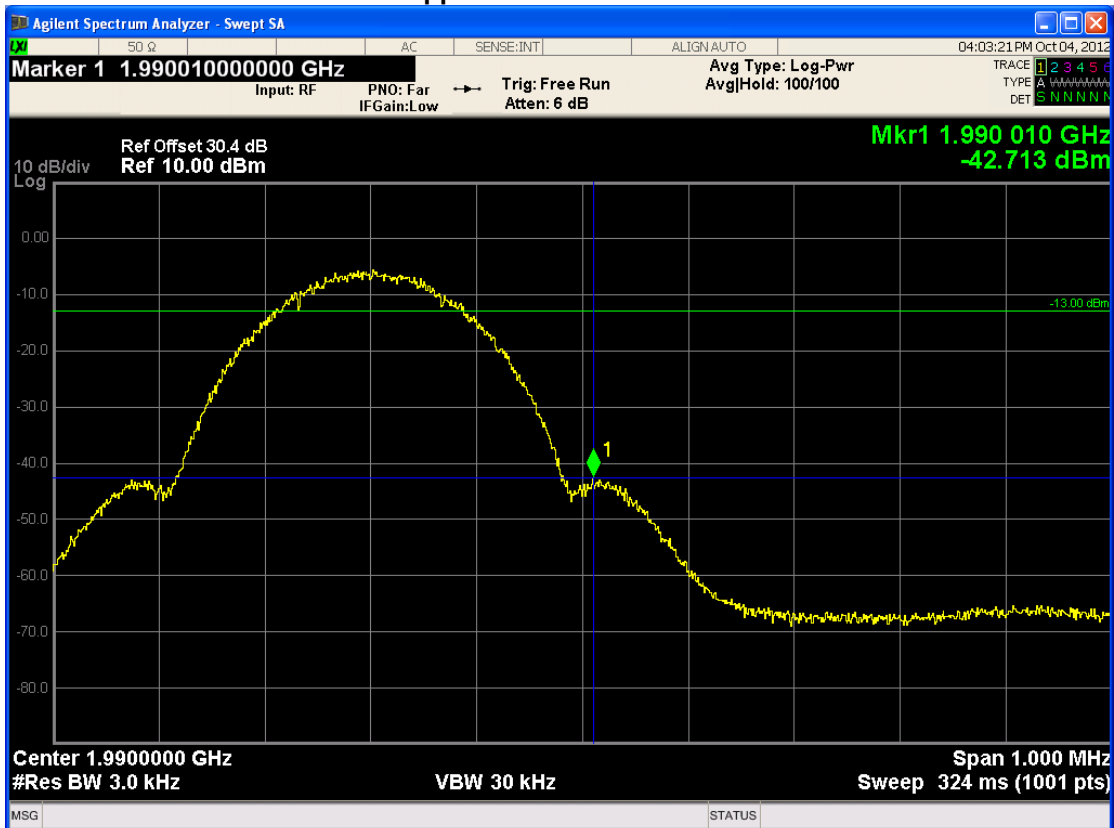
• GSM / PCS 1900 / Up Link / Upper Side / 1 909.80 MHz



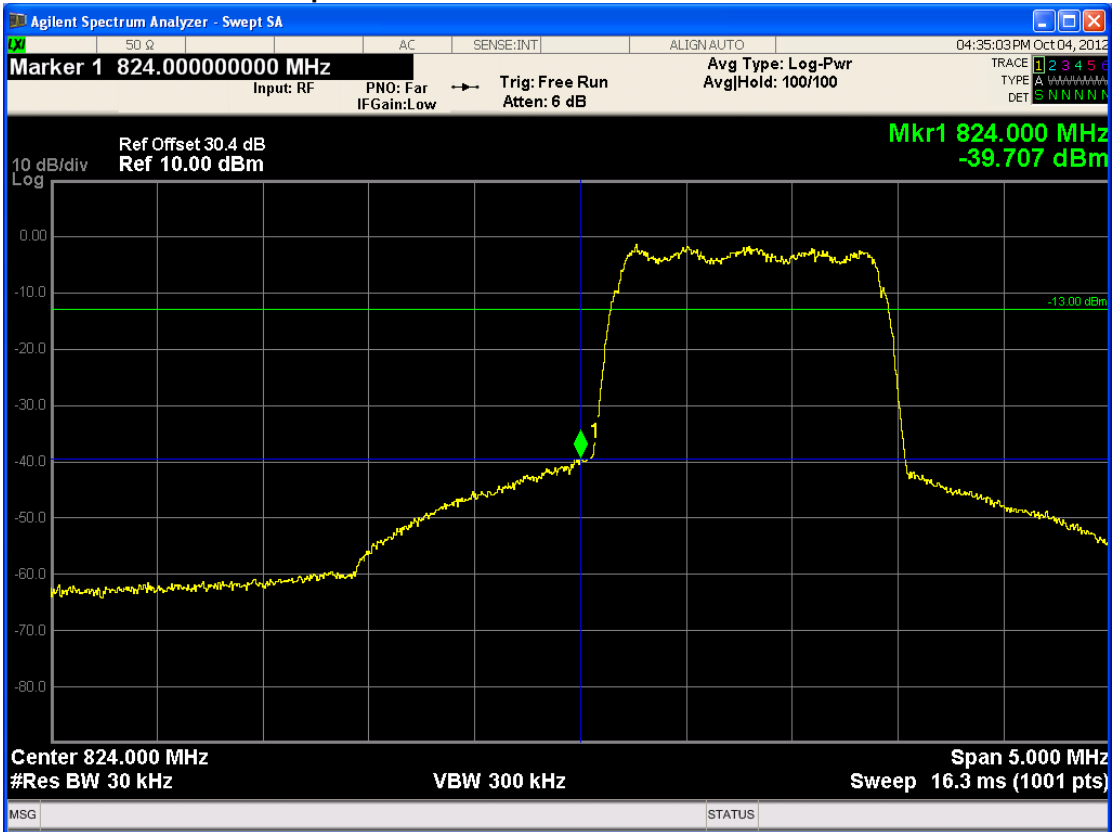
• GSM / PCS 1900 / Down Link / Lower Side / 1 930.20 MHz



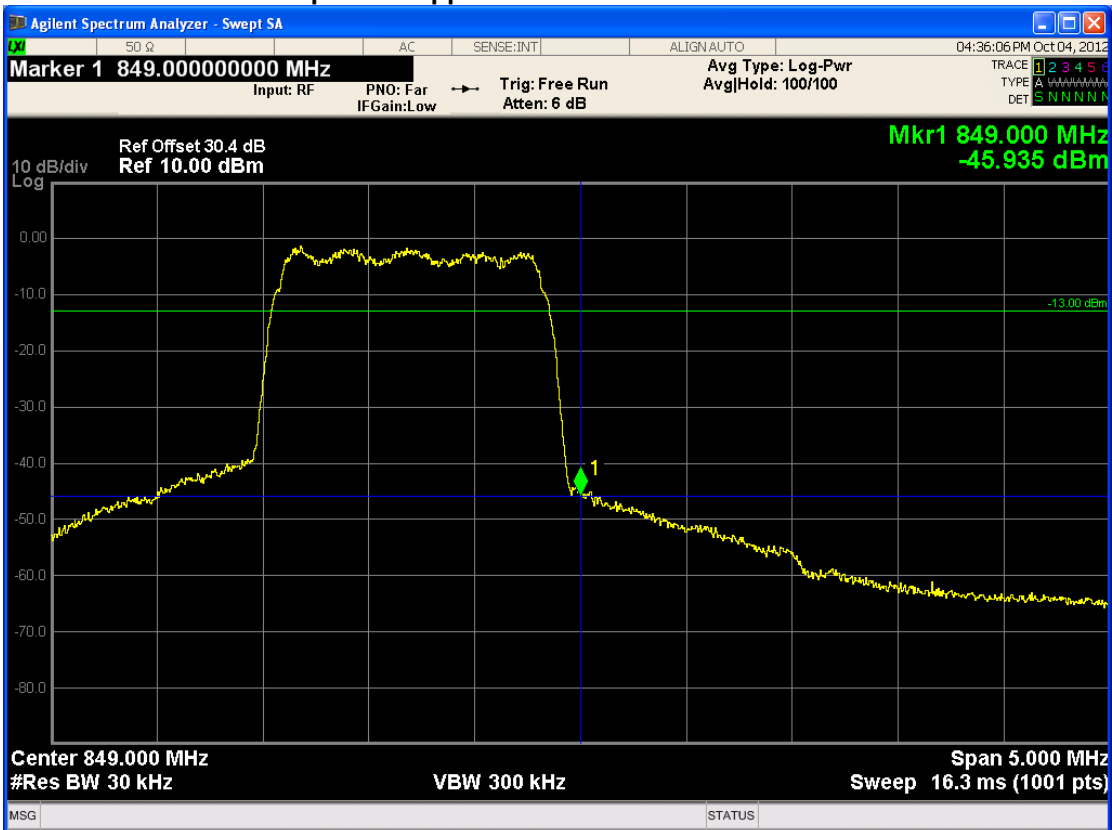
• GSM / PCS 1900 / Down Link / Upper Side / 1 989.80 MHz



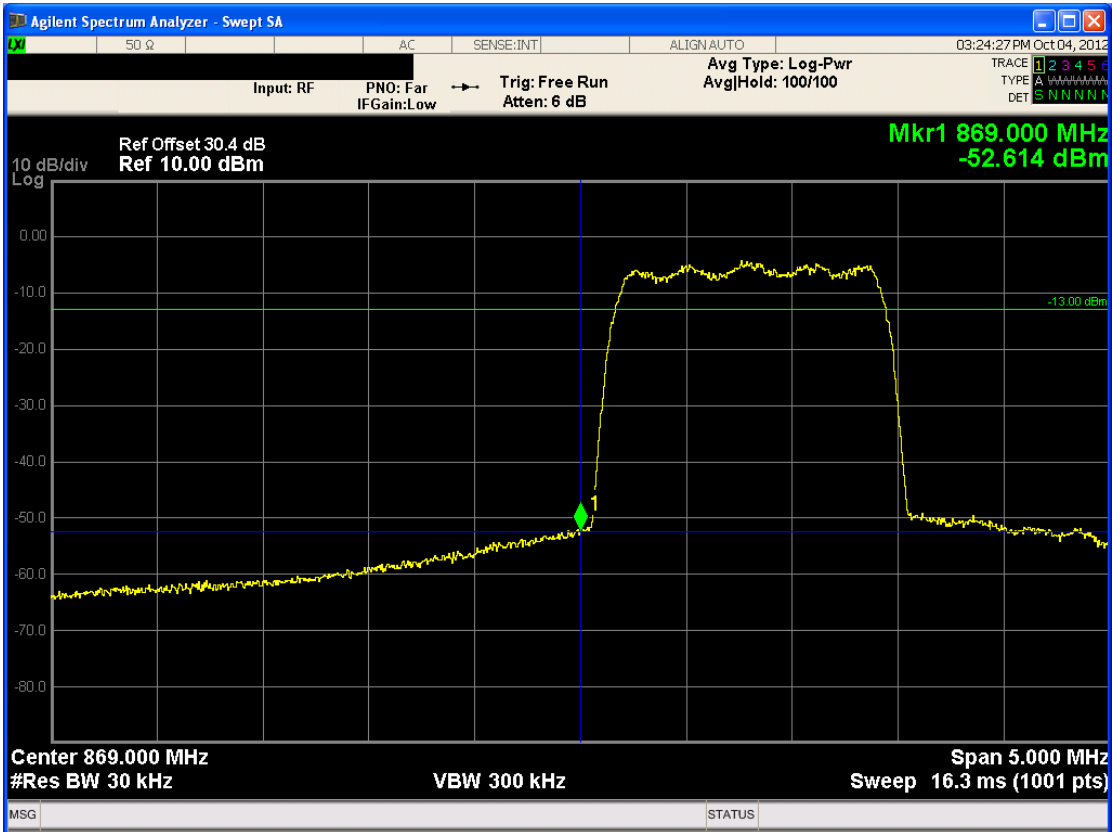
• CDMA / Cellular 800 / Up Link / Lower Side / 824.80 MHz



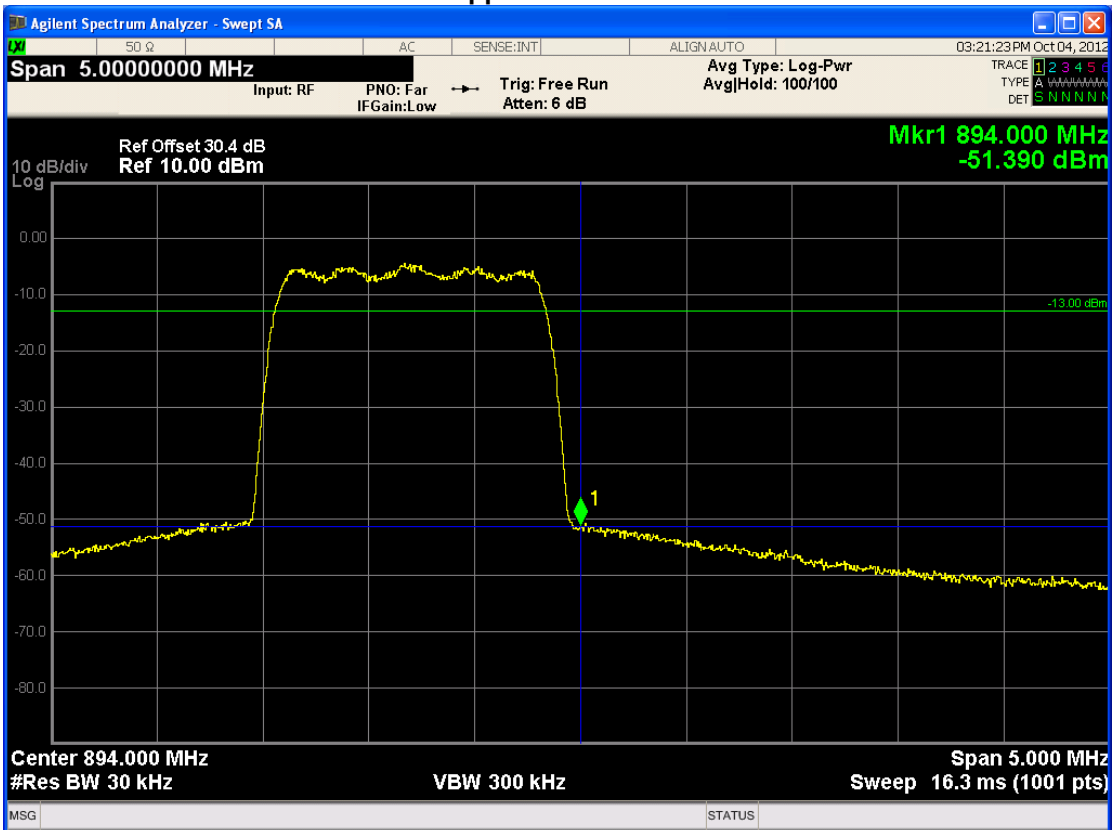
• CDMA / Cellular 800 / Up Link / Upper Side / 848.20 MHz



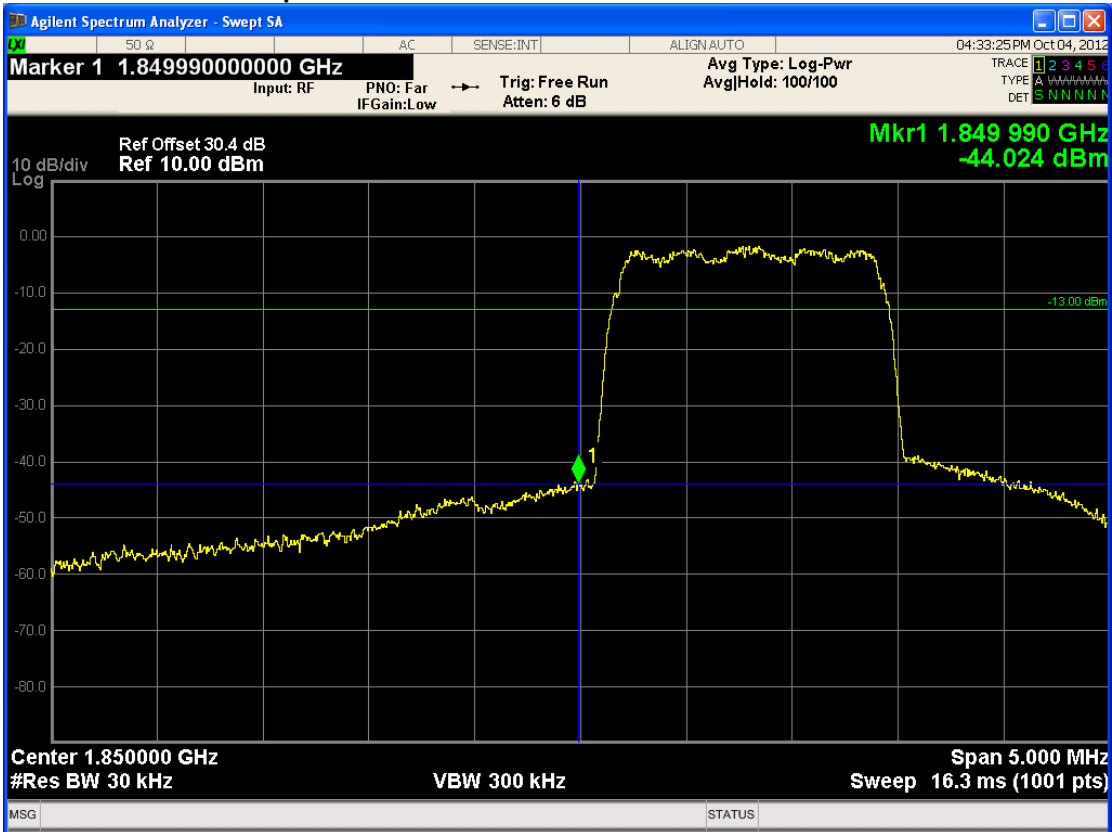
• CDMA / Cellular 800 / Down Link / Lower Side / 869.80 MHz



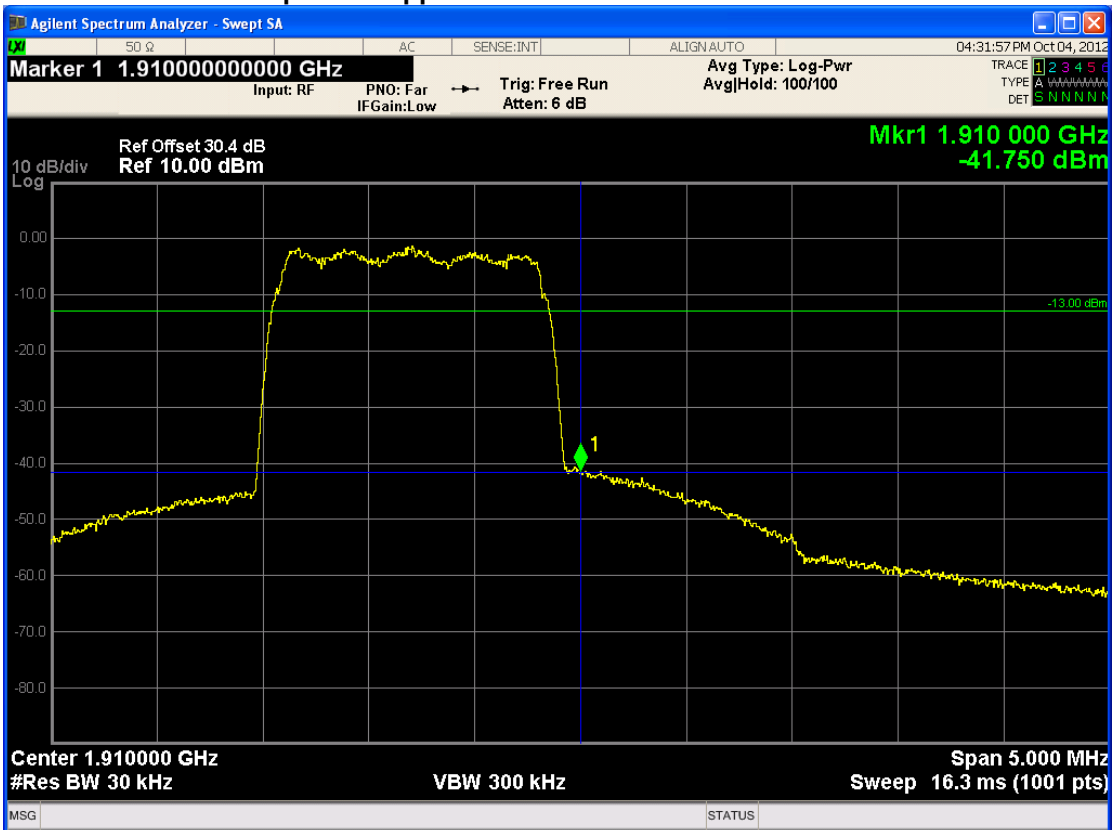
• CDMA / Cellular 800 / Down Link / Upper Side / 893.20 MHz



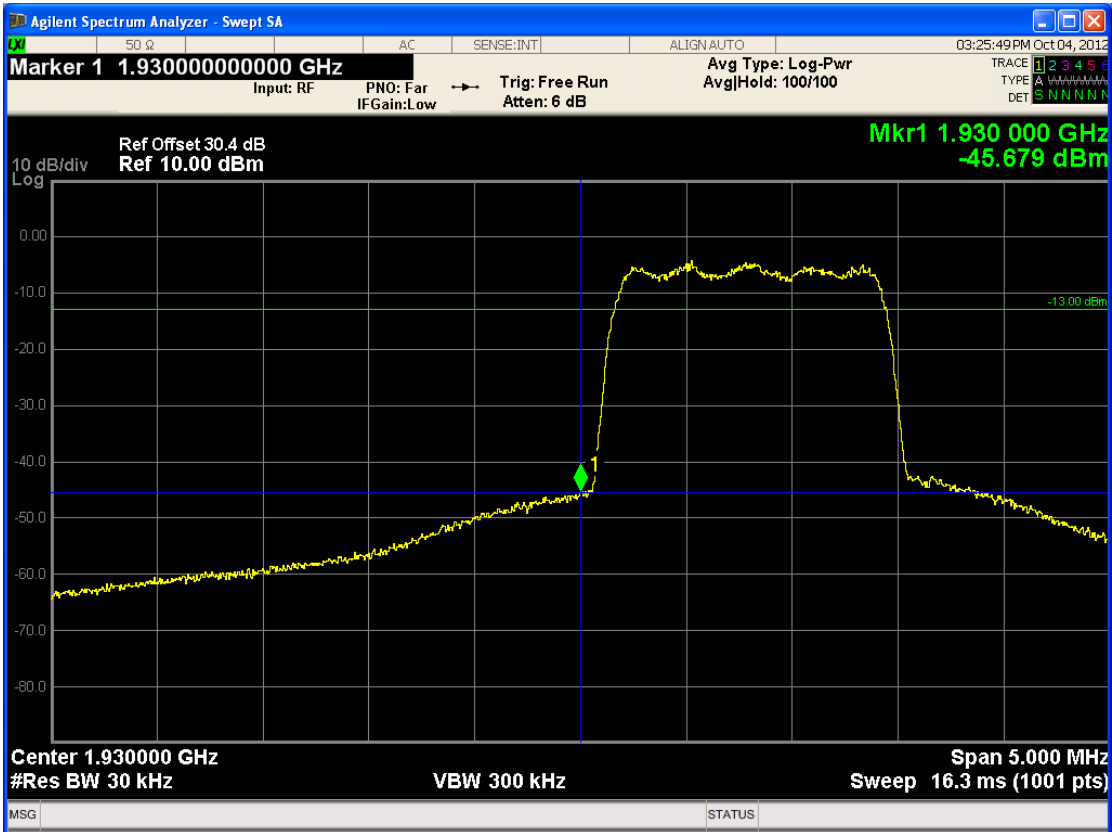
• CDMA / PCS 1900 / Up Link / Lower Side / 1 850.80 MHz



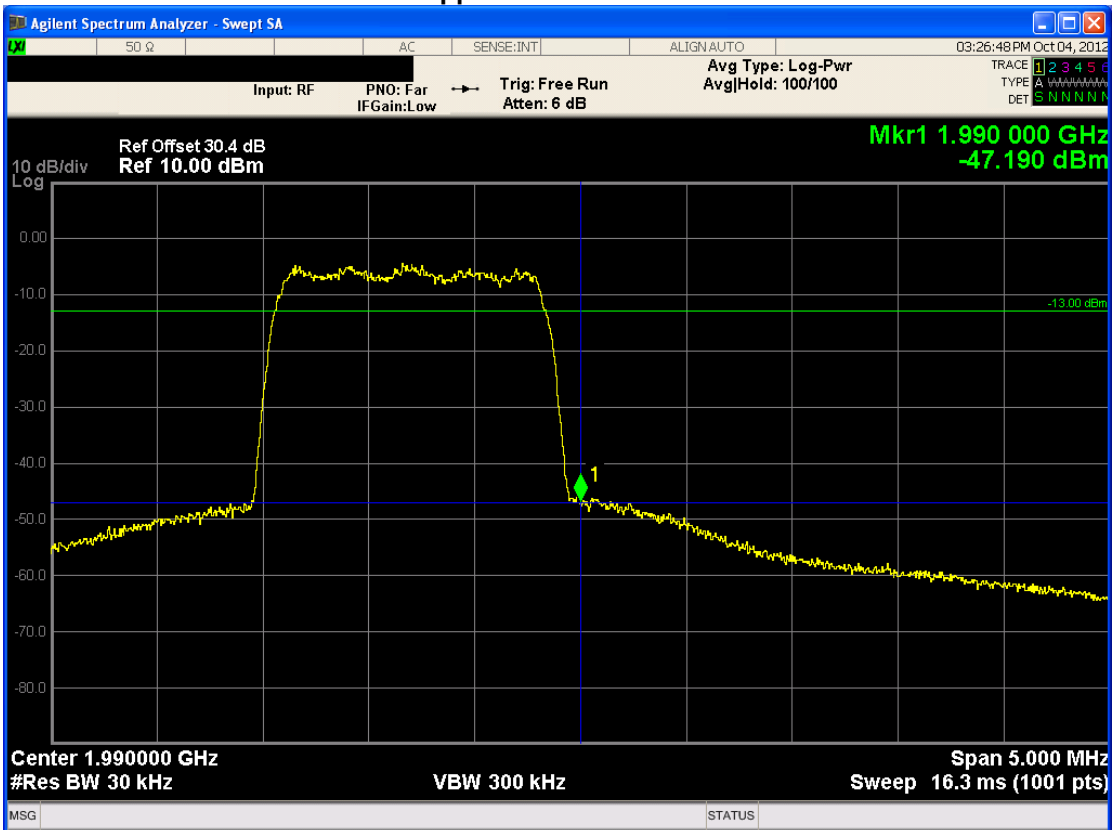
• CDMA / PCS 1900 / Up Link / Upper Side / 1 909.20 MHz



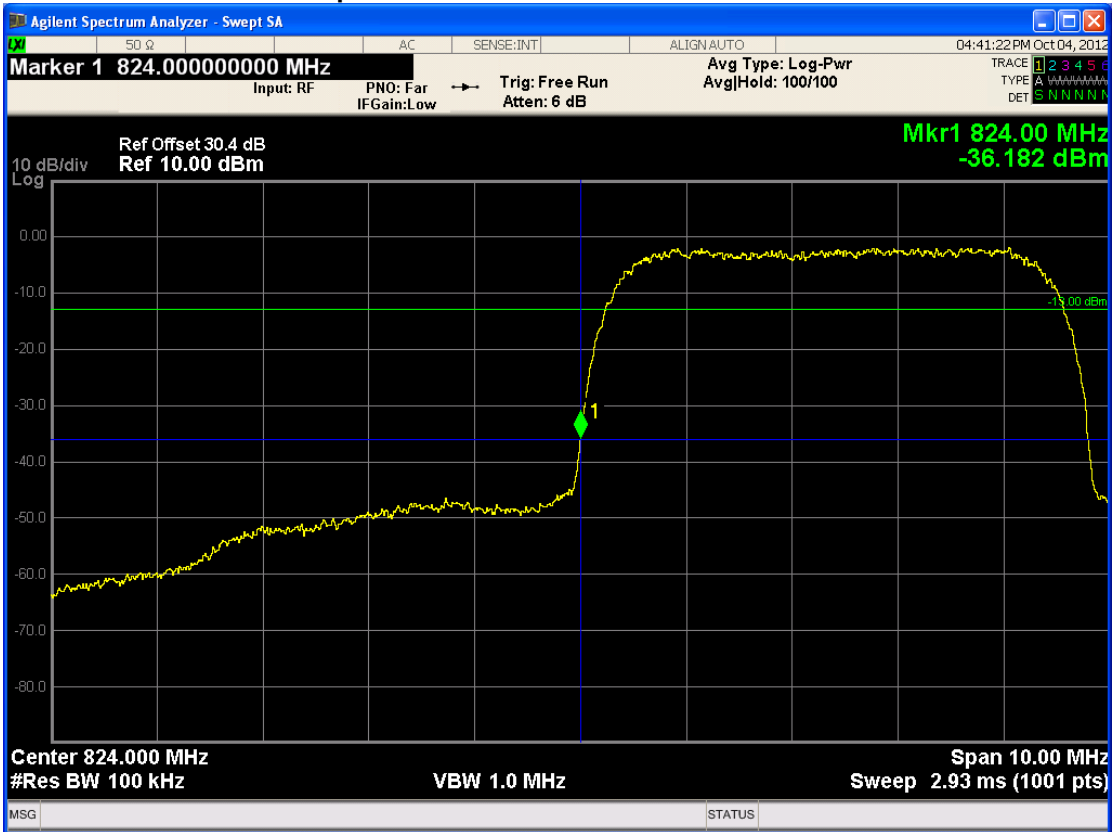
• CDMA / PCS 1900 / Down Link / Lower Side / 1 930.80 MHz



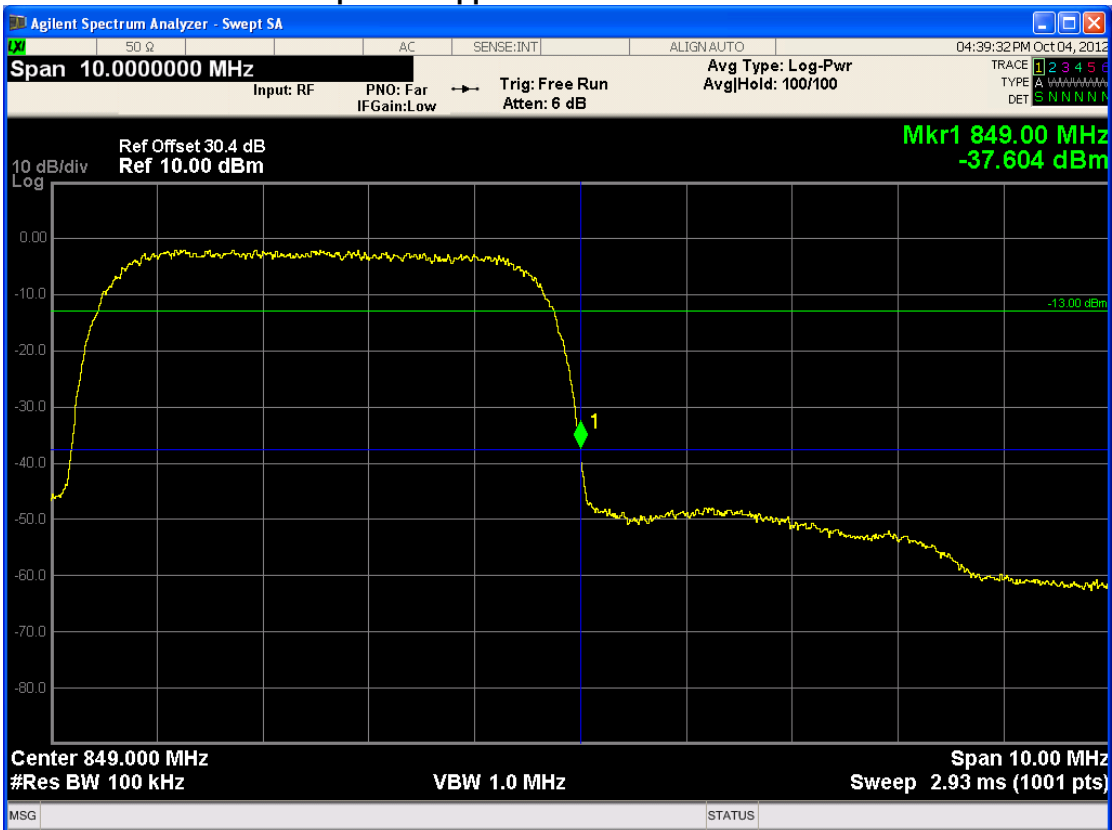
• CDMA / PCS 1900 / Down Link / Upper Side / 1 989.20 MHz



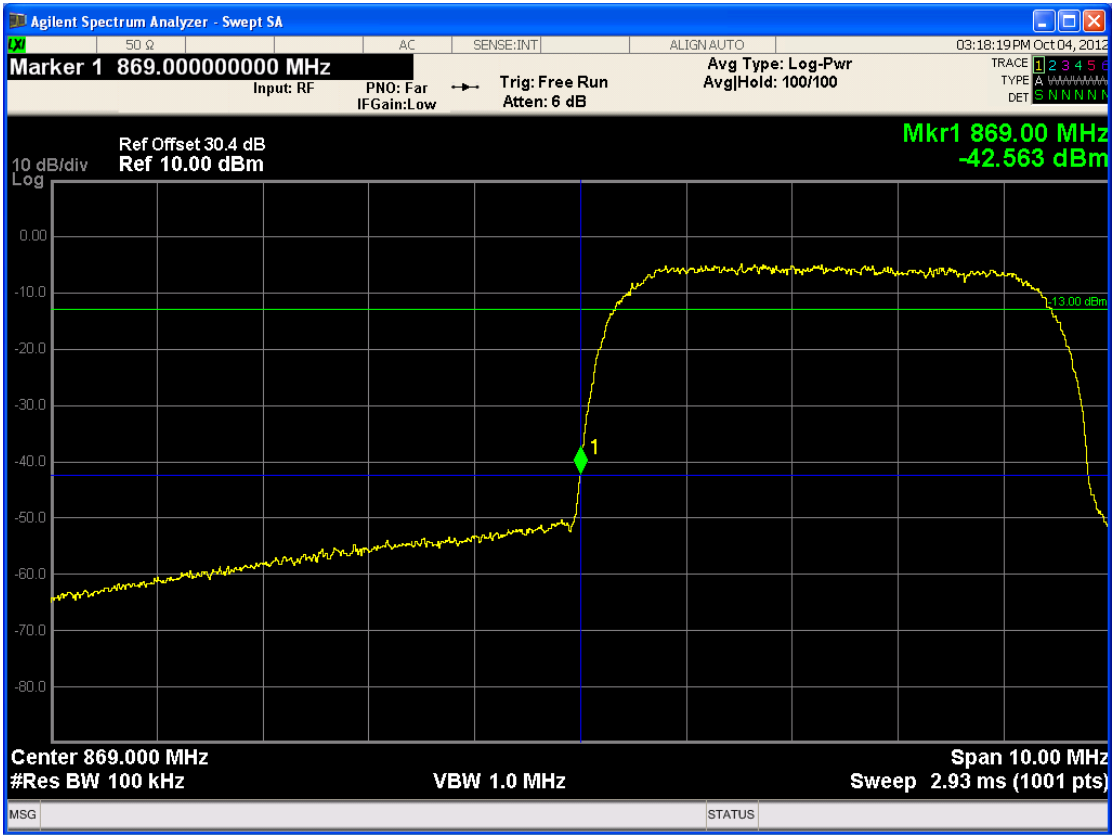
• WCDMA / Cellular 800 / Up Link / Lower Side / 826.40 MHz



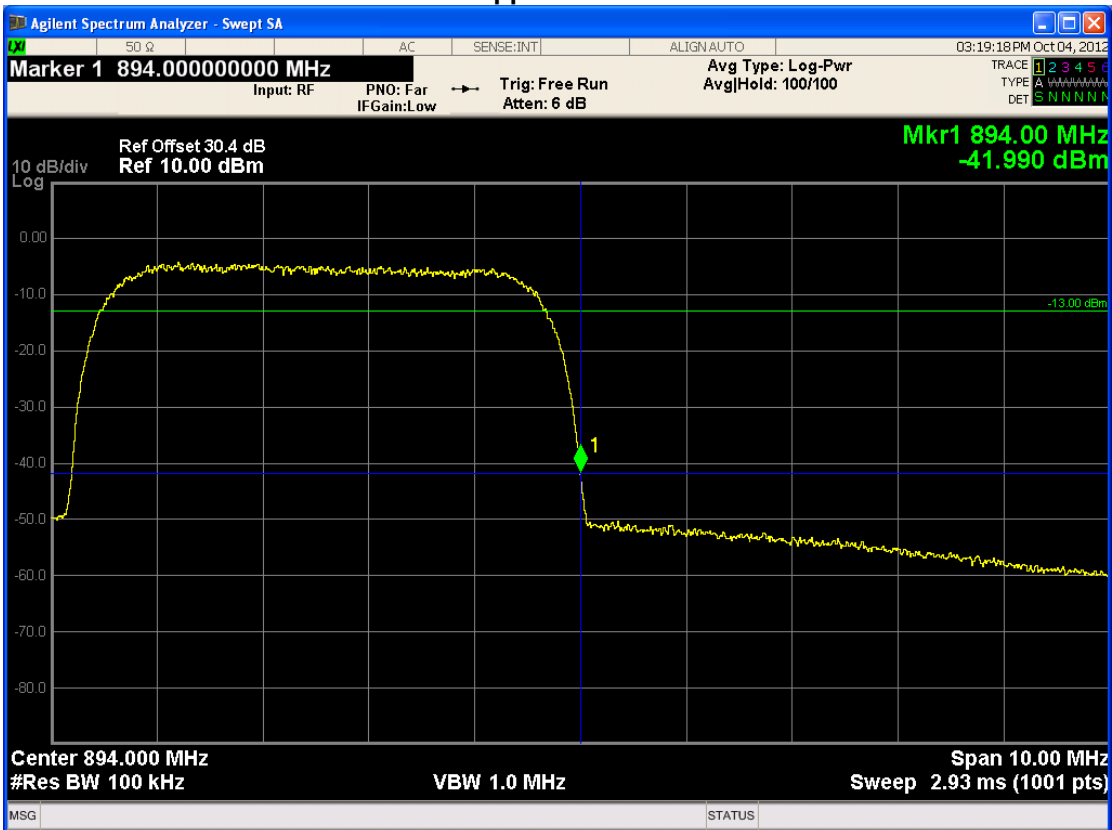
• WCDMA / Cellular 800 / Up Link / Upper Side / 846.60 MHz



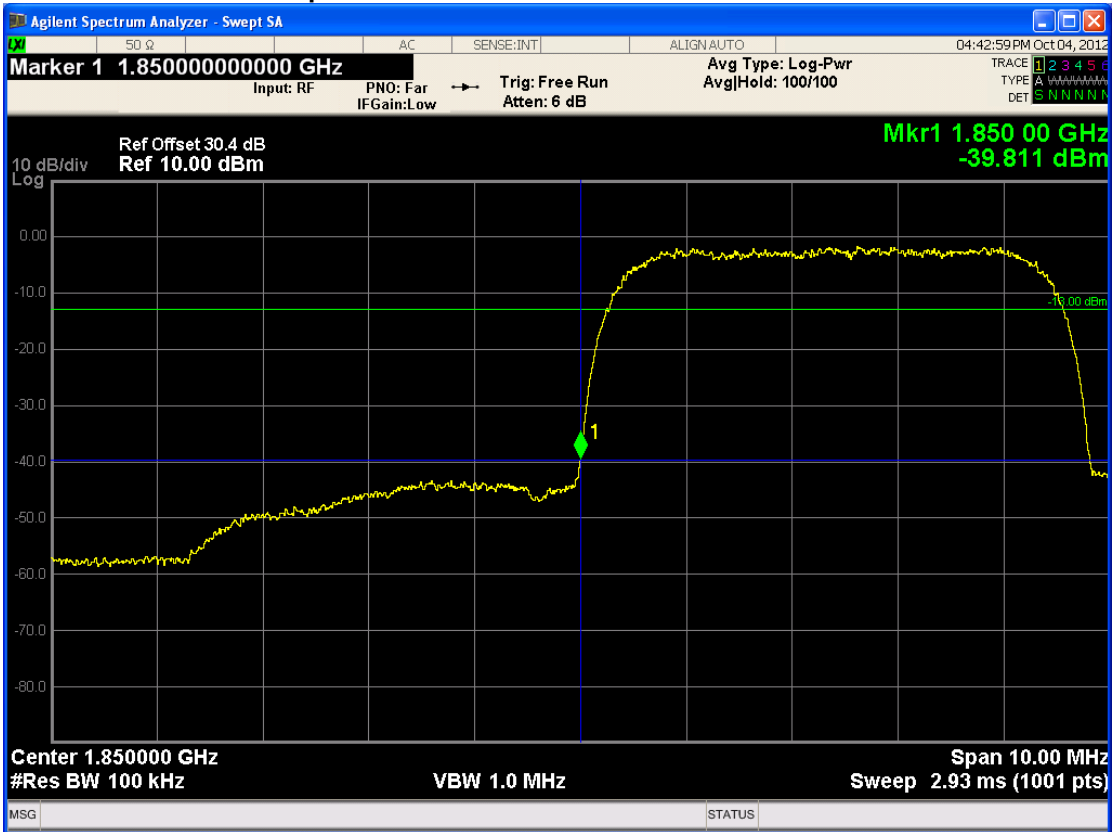
• WCDMA / Cellular 800 / Down Link / Lower Side / 871.40 MHz



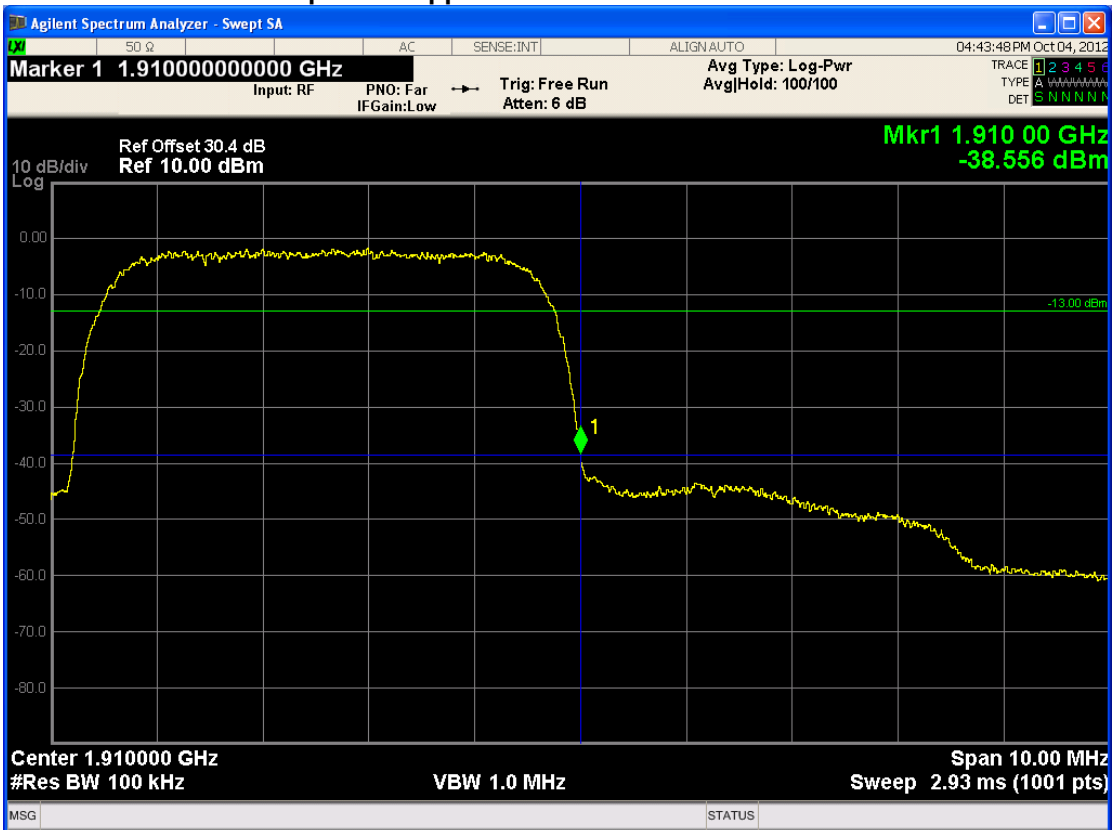
• WCDMA / Cellular 800 / Down Link / Upper Side / 891.60 MHz



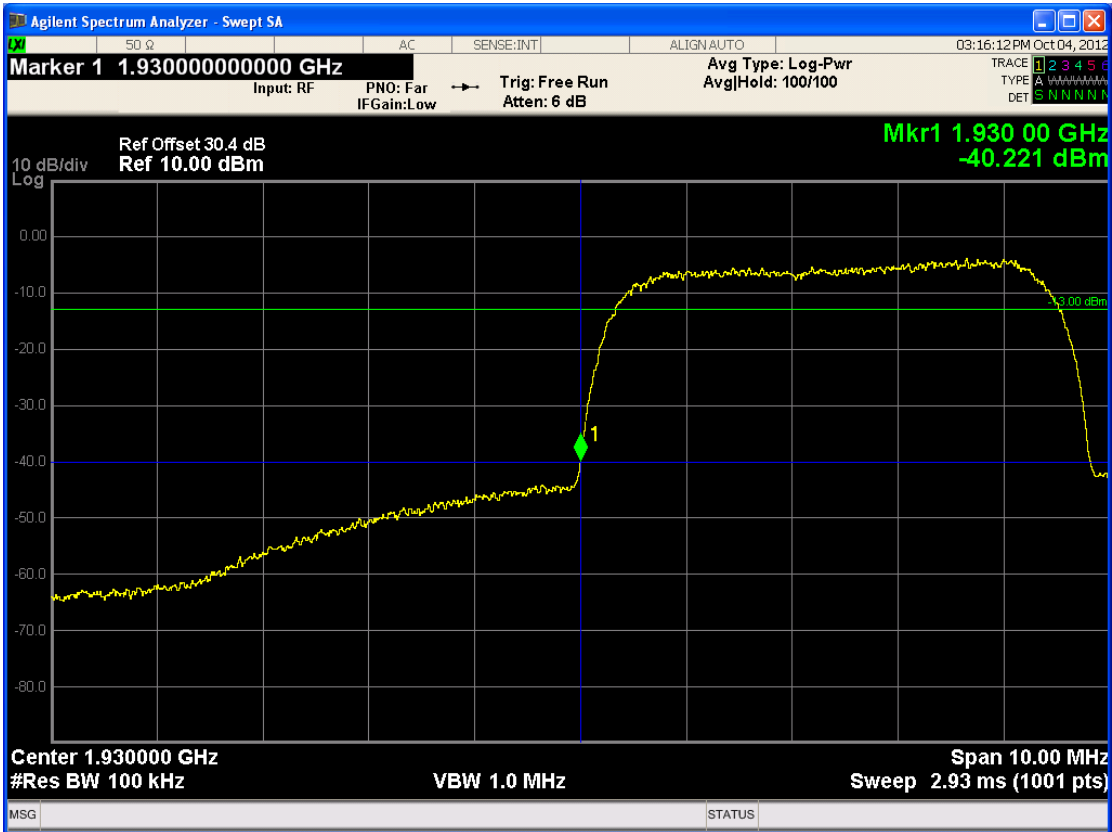
• WCDMA / PCS 1900 / Up Link / Lower Side / 1 852.40 MHz



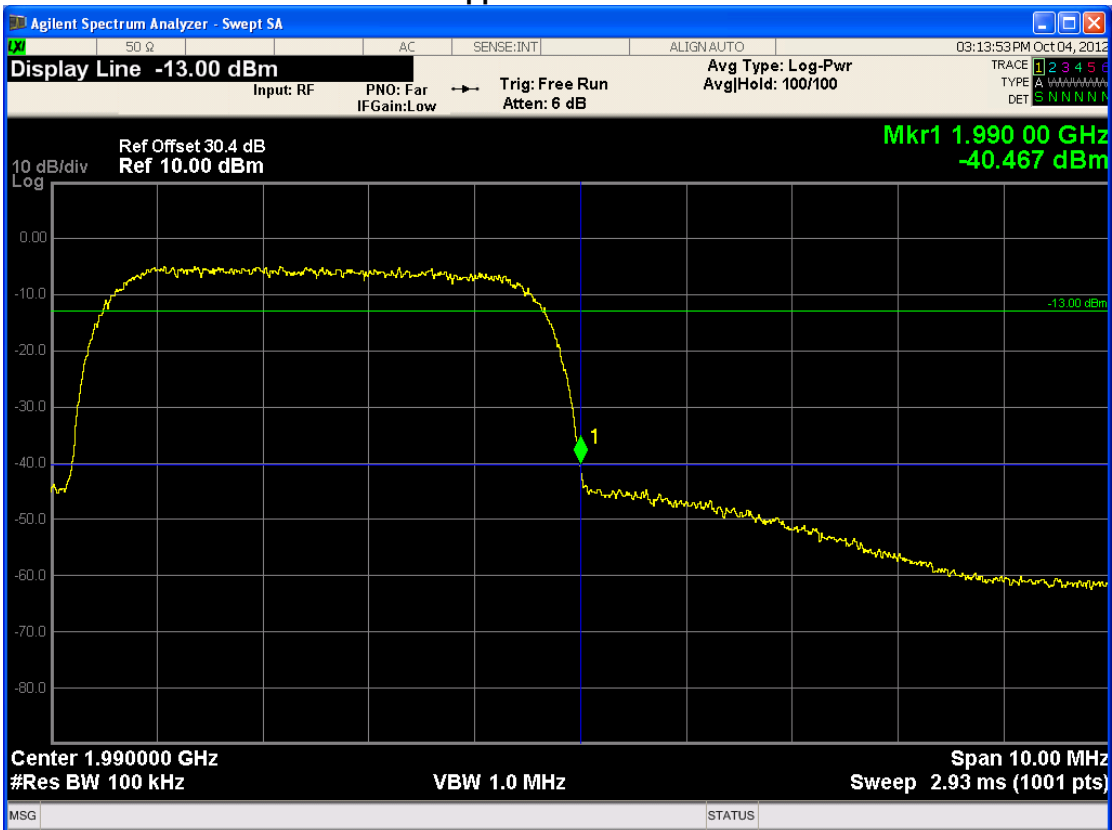
• WCDMA / PCS 1900 / Up Link / Upper Side / 1 907.60 MHz



• WCDMA / PCS 1900 / Down Link / Lower Side / 1 932.40 MHz



• WCDMA / PCS 1900 / Down Link / Upper Side / 1 987.60 MHz



3.4 Field strength of spurious emission

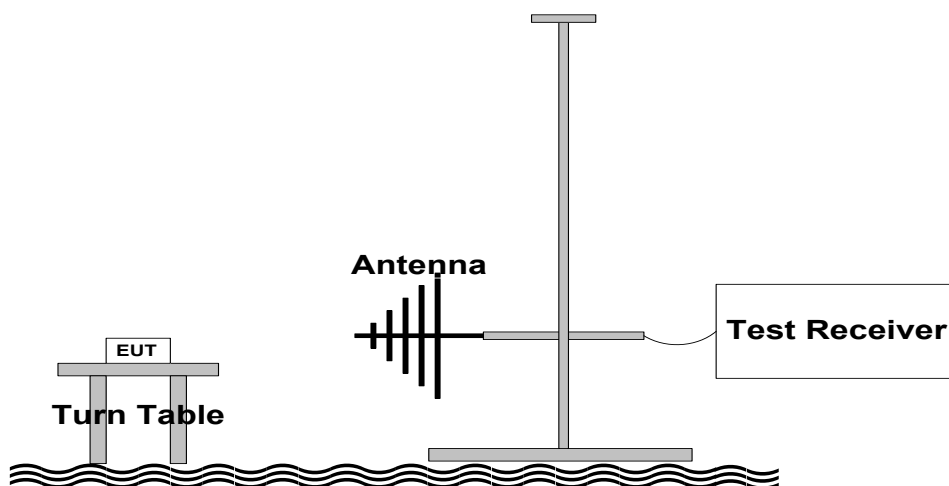
3.4.1 Specification

- FCC Rules Part 2 Section 2.1053
- FCC Rules Part 22 Subpart H, Section 22.917
- FCC Rules Part 24 Subpart E, Section 24.238
- IC Rules RSS-131 Issue 2 July 2003, Section 6.4

3.4.2 Measurement method

- ANSI/TIA-603-D-2010, Section 2.2.12

3.4.3 Set-Up



3.4.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	USHR-0819L	OPISYS Incorporated
Signal Generator	E4437B	Agilent
Spectrum Analyzer	N9020A	Agilent
Bi-conical Antenna	VHA9103	Schwarzbeck
Log Periodic Antenna	VULP9118A	Schwarzbeck
Horn Antenna	BBHA-9120D	Schwarzbeck
Pre-Amplifier	SCU-01	R&S
Pre-Amplifier	ESMI-Z7	R&S

3.4.5 Test condition

- Test place: Shield Room
- Test environment: 26 °C, 52 % R.H.

3.4.6 Test result

Frequency [MHz]	Reading [dBuV]	Generator Level [dBm]	Antenna polarity [H/V]	Antenna gain [dBd]	Cable loss [dB]	Level [dBm]	Limit [dBm]	Margin [dB]
Cellular 800 / Up Link / 836.60 MHz								
-	-	-	-	-	-	-	-13.00	-
Cellular 800 / Down Link / 881.60 MHz								
-	-	-	-	-	-	-	-13.00	-
PCS 1900 / Up Link / 1 880 MHz								
-	-	-	-	-	-	-	-13.00	-
PCS 1900 / Down Link / 1 896 MHz								
-	-	-	-	-	-	-	-13.00	-

※All emissions are under the noise floor level.

3.5 Amplifier gain and bandwidth

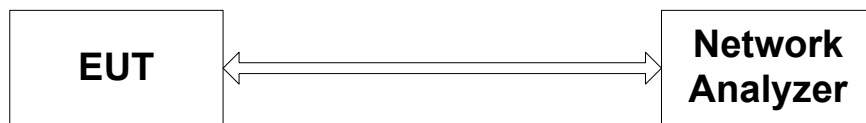
3.5.1 Specification

- IC Rules RSS-131 Issue 2 July 2003, Section 6.1

3.5.2 Measurement method

- IC Rules RSS-131 Issue 2 July 2003, Section 4.2

3.5.3 Set-Up



3.5.4 Test equipment list

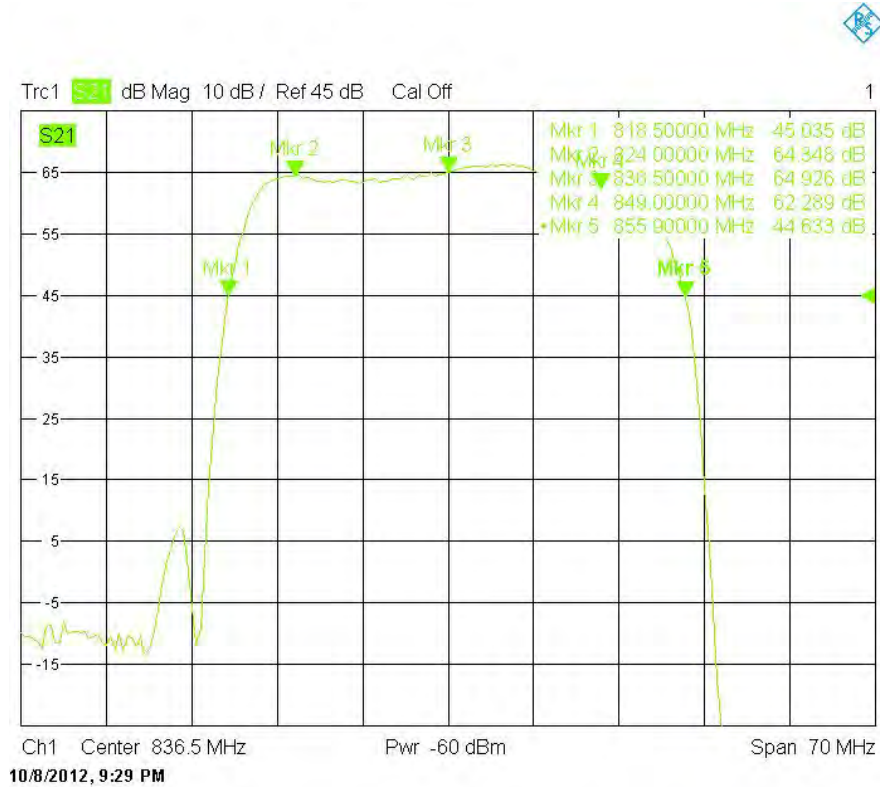
Equipment	Model Name	Manufacturer
EUT	USHR-0819L	OPISYS Incorporated
Network Analyzer	ZVA 24	R&S

3.5.5 Test condition

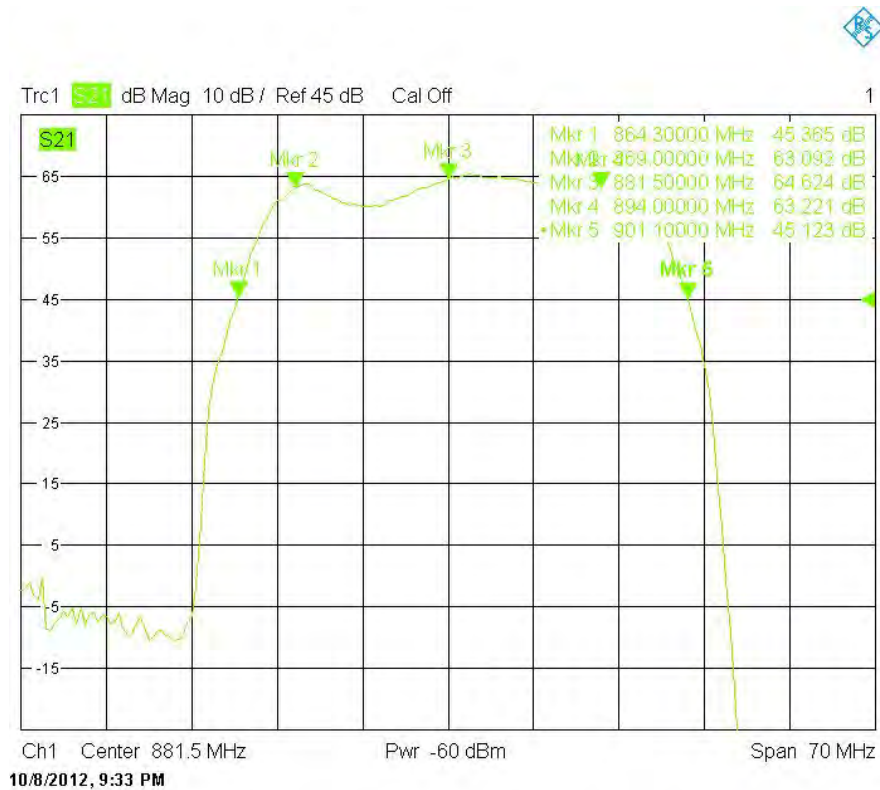
- Test place: Shield Room
- Test environment: 25 °C, 48 % R.H.

3.5.6 Plots of band gain

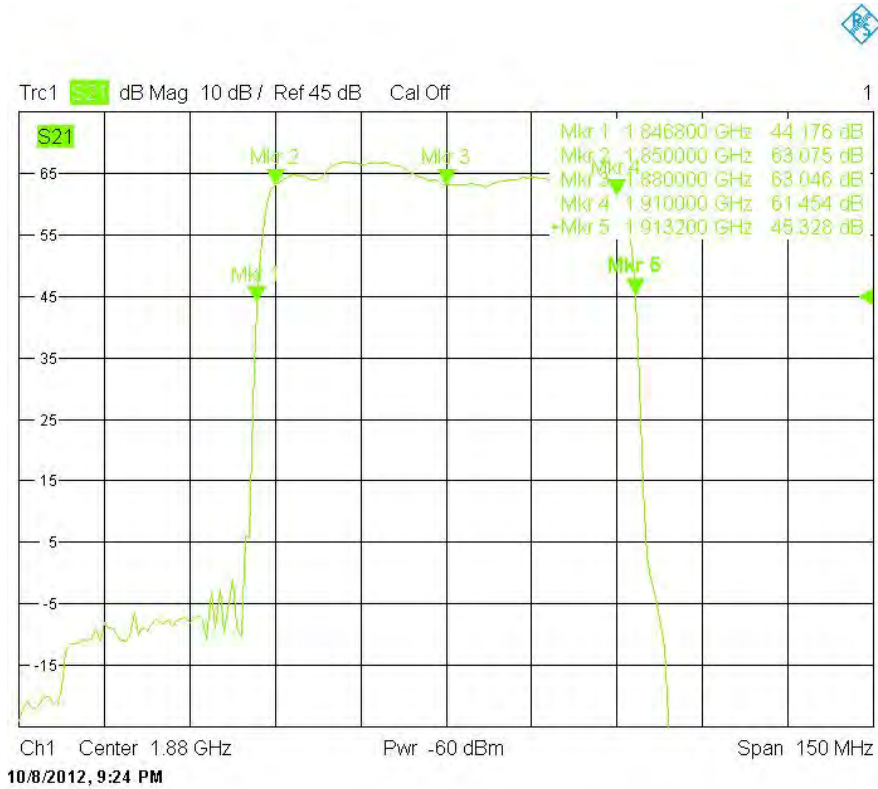
• Cellular 800 / Up Link



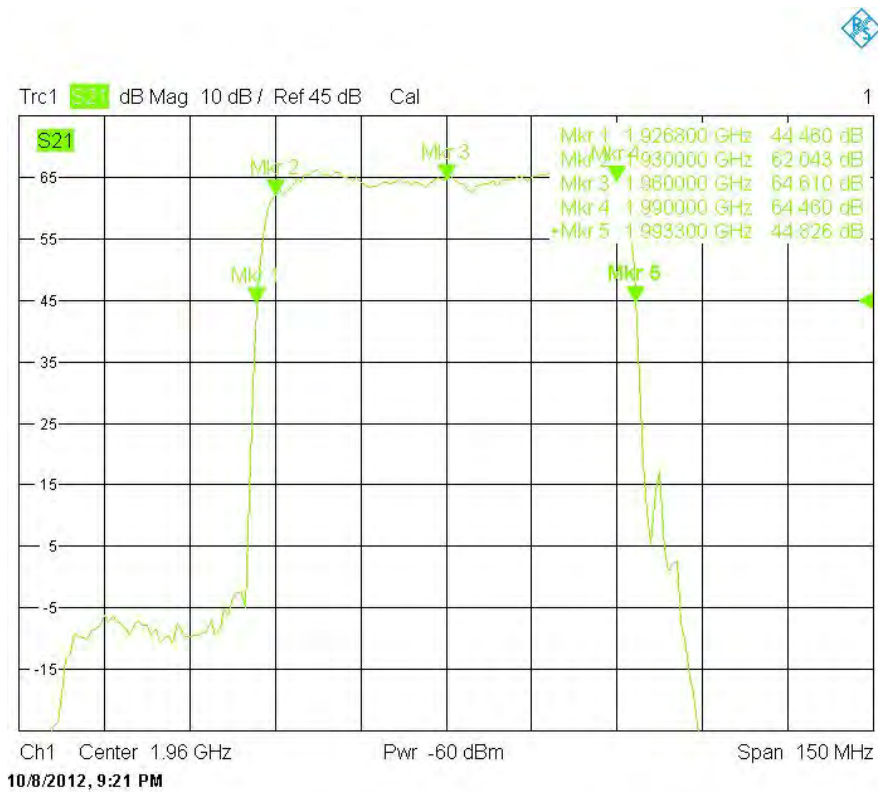
• Cellular 800 / Down Link



• PCS 1900 / Up Link



• PCS 1900 / Down Link



4. RF exposure statement

According to §1.1307, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range [MHz]	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm ²]	Averaging Time [minute]
Limits for General Population/Uncontrolled Exposure				
0.3 – 1.34	614	1.63	100	30
1.34 – 30	824/f	2.19/f	180/f ²	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	-	-	f/1500	30
1500 – 100 000	-	-	1.0	30

※f = frequency in MHz

4.1 Friis transmission formula

$$P_d = (P_{out} \times G) / (4\pi r^2)$$

P_d = Power density

P_{out} = power input to antenna

G = power gain

r = distance to the center of radiation of the antenna

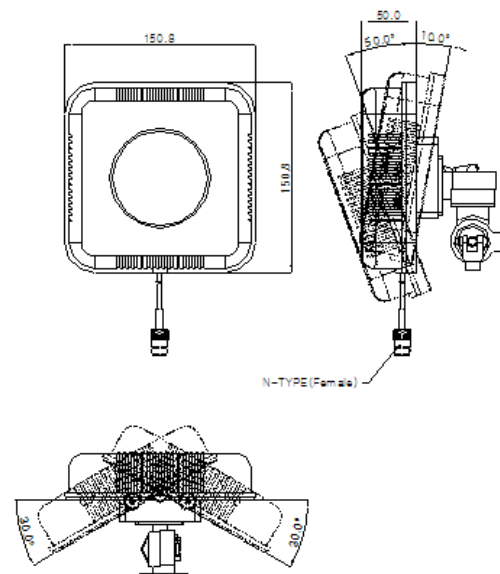
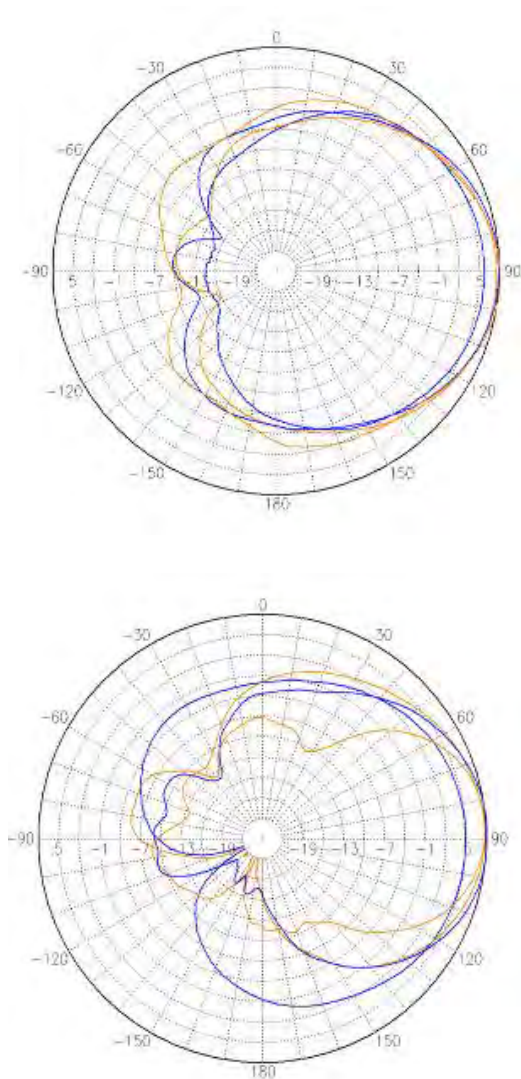
4.2 Information of Antenna

- Model Name : PAT-CPWI-M



Antenna Gain;

- 824 MHz – 894 MHz : 4 dBi
- 1 750 MHz – 2 400 MHz : 7 dBi

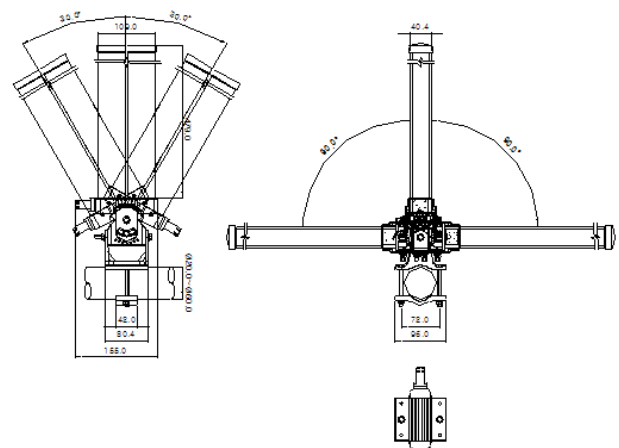
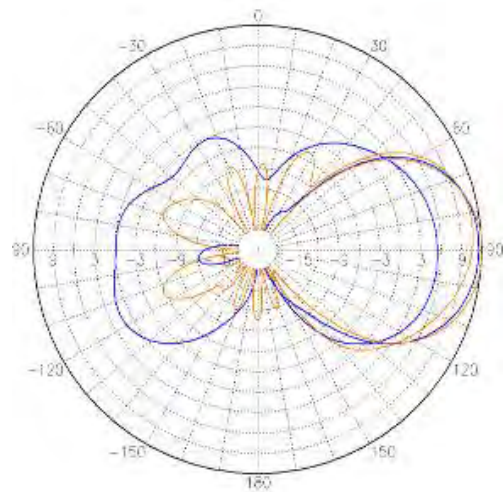
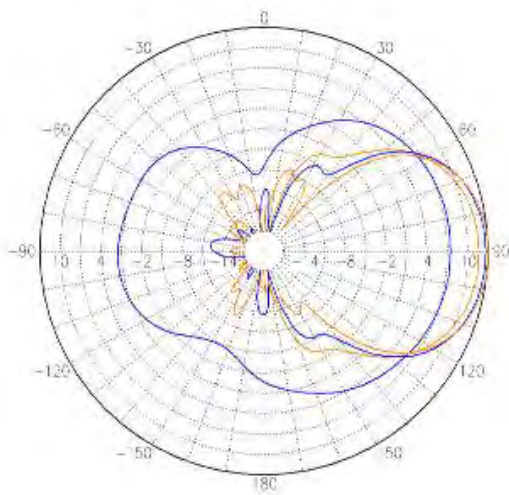


• **Model Name : ALP-15QD-M**



Antenna Gain;

- 824 MHz – 894 MHz : 5 dBi
- 1 750 MHz – 2 400 MHz : 11 dBi



4.3 Calculation of MPE at 20 cm

Band	Link	Frequency [MHz]	Output power [dBm]	Antenna gain [dBi]	EIRP		Power density [mW/cm ²]	Limit [mW/cm ²]
					[dBm]	[mW]		
Cellular 800	Up Link	824.20	15.03	5.00	20.03	100.69	0.020 042	0.549 467
		836.60	15.01	5.00	20.01	100.23	0.019 950	0.557 733
		848.80	15.04	5.00	20.04	100.93	0.020 089	0.565 867
	Down Link	869.20	12.03	5.00	17.03	50.47	0.010 045	0.579 467
		881.60	12.03	5.00	17.03	50.47	0.010 045	0.587 733
		893.80	12.01	5.00	17.01	50.23	0.009 999	0.595 867
PCS 1900	Up Link	1 850.20	15.01	11.00	26.01	399.02	0.079 424	1.000 000
		1 880.00	15.01	11.00	26.01	399.02	0.079 424	1.000 000
		1 909.80	15.01	11.00	26.01	399.02	0.079 424	1.000 000
	Down Link	1 930.20	12.02	11.00	23.02	200.45	0.039 806	1.000 000
		1 960.00	12.01	11.00	23.01	199.99	0.039 806	1.000 000
		1 989.80	12.03	11.00	23.03	200.91	0.039 990	1.000 000

• Cellular 800

The maximum conducted power is 15.0 dBm; antenna is fix-mounted with a maximum gain of 5 dBi gain.

Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is 20.0 dBm.

The Power Density can be calculated using the formula

It is considered that 20 cm is the minimum distance that a user can go closer to the EUT.

At 0.2 m, $S = 0.02 \text{ mW/cm}^2$, which is below the MPE Limit of 0.55 mW/cm^2

• PCS Band

The maximum conducted power is 15.0 dBm; antenna is fix-mounted with a maximum gain of 11 dBi gain.

Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is 26 dBm.

It is considered that 20 cm is the minimum distance that a user can go closer to the EUT.

At 0.2 m, $S = 0.08 \text{ mW/cm}^2$, which is below the MPE Limit of 1.00 mW/cm^2

5. Test equipment list

The listing below denotes the test equipment for the test(s).

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Due date
1	Spectrum Analyzer	N9020A	Agilent	MY48010456	03/10/13
2	Signal Generator	E4437B	Agilent	US39260917	02/10/13
3	Signal Generator	E4432B	Agilent	GB38450504	04/18/13
4	Network Analyzer	ZVA 24	R&S	100126	02/10/13
5	Attenuator	66-30-34	Weinschel	CB0744	03/26/13
6	Biconical Antenna	VHA9103	Schwarzbeck	2217	11/29/12
7	Log-Periodic Antenna	VULP9118A	Schwarzbeck	382	11/29/12
8	Horn Antenna	BBHA 9120 D	Schwarzbeck	395	08/13/13
9	Pre-Amplifier	SCU-01	R&S	383521	09/28/13
10	Pre-Amplifier	ESMI-Z7	R&S	N/A	12/30/12
11	Turn Table	N/A	Daeil EMC	N/A	N/A
12	Antenna Mast	EAM4.5	Daeil EMC	N/A	N/A
13	Controller	DE200	Daeil EMC	AAA69813111	N/A