LTA
Laboratory for Test & Approval Co.,Ltd.

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Tel: +82-31-323-6008 Fax: +82-31-323-6010
http://www.ltalab.com

Dates of Tests: July 26~ August 12, 2010
Test Report S/N: LR500191008C
Test Site : LTA CO., LTD.

FCC ID **YM4OTAVQ100**

APPLICANT **ARTECH Co.. Ltd.**

TEST REPORT

FCC Part 22(H)/Part 24(E) Certification

Classification	:	**PCS Licensed Transmitter**
Manufacturing Description	:	**Quad-band Over the Air Repeater**
Manufacturer	:	**ARTECH Co., Ltd.**
Model name	:	**AROTA-VQ100**
Test Device Serial No.:	:	**Identification**
FCC Rule Part(s)	:	**§22(H), §24(E), §2**
Downlink	:	**869~894MHz (CDMA 850)**
		1930~1990MHz (PCS 1900)
Uplink	:	**824~849MHz (CDMA 850)**
		1850~1910MHz (PCS 1900)
Rated RF Output Power	:	**25dBm (CDMA 850) / 30dBm (PCS 1900)**
Type Modulation		**CDMA / PCS CDMA**
Emission Designators:	:	**F9W**
Data of issue	:	**August 12, 2010**

This test report is issued under the authority of:

Kyung-Taek LEE, Technical Manager

The test was supervised by:

Hyun-Chae You, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.

NVLAP LAB Code.: 200723-0

TABLE OF CONTENTS

1. General information's

1-1 Test Performed

Company name : LTA Co., Ltd.

Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 449-822

Web site : http://www.ltalab.com

E-mail : chahn@ltalab.com

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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2010-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2011-06-20	EMC accredited Lab.
FCC	U.S.A	610755	2011-04-22	FCC filing
VCCI	JAPAN	R2133, C2307	2011-06-21	VCCI registration
IC	CANADA	IC5799	2012-05-14	IC filing

2. Information's about test item

2-1 Client

Company name	:	ARTECH Co., Ltd.
Address	:	246 Kongdan-dong, Gumi-si, Kyungbuk area, Korea
Telephone	:	+82-54-461-0920
Facsimile	:	+82-54-461-0919

2-2 Equipment Under Test (EUT)

Classification	:	PCS Licensed Transmitter
Trade name	:	Quad-band Over the Air Repeater
Model name	:	AROTA-VQ100
Serial number	:	Identification
Date of receipt	:	July 26, 2010
EUT condition	:	Pre-production, not damaged
Downlink	:	869~894MHz (CDMA 850)
		1930~1990MHz (PCS 1900)
Uplink	:	824~849MHz (CDMA 850)
		1850~1910MHz (PCS 1900)
Gain Range	:	55~85dB (CDMA 850) / 70~100dB (PCS 1900)
Input Range	:	-60 ~ -30dBm (CDMA 850) / -70 ~ -40dBm (PCS 1900)
Frequency Tolerance	:	±0.0002 ppm
Emission Designators	:	F9W
Power Input	:	120Vac

2-3 Test Frequency

Mode	TX (MHz)
CDMA 850_DL	870.51
	881.52
	893.31
CDMA 850_UL	825.51
	836.52
	848.31
PCS 1900_DL	1931.25
	1960
	1988.75
PCS 1900_UL	1851.25
	1880
	1908.75

2.5 Mode of Operation

The EUT was powered by 120VAC. The EUT was configured for maximum gain, 100dB. Repeater simulators were used to provide the input signals to the EUT. Tests were performed with GSM and WCDMA modulations. The input power was the maximum declared by the manufacturer.

3. Test Report

3.1 Summary of tests

Parameter	**Status**
Transmitter Requirements	
RF Power Output	C
Occupied Bandwidth, Input/Output Comparison	C
Out-of-Band Emissions at antenna terminal	C
Intermodulation Test	C
Transmitter Spurious Radiation	C
Out of Band Rejection	-
Frequency Stability	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are to be tested to the ANSI/TIA-603-C-2004 standard

3.2 Results Of Tests

3.2.1 RF Power Output

1. Test Procedure

The EUT RF output was connected to Powermeter. The EUT was setup to transmit continuously with maximum power. A spectrum analyzer was setup to measure peak power. Measurements were performed at three frequencies (low, middle, and high channels) with all modulations.

2. Test Results

Modulation : CDMA 850 DL

	Freq. Tuned (MHz)	Power Input (dBm)	Power output (dBm)	Power Output (W)
Low	870.51	-30.24	25.65	0.37
Middlw	881.52	-30.09	26.22	0.42
High	893.31	-30.15	25.35	0.34

Modulation : CDMA 850 UL

	Freq. Tuned (MHz)	Power Input (dBm)	Power output (dBm)	Power Output (W)
Low	825.51	-30.24	25.58	0.36
Middlw	836.52	-30.53	25.96	0.39
High	848.31	-30.54	25.49	0.35

Modulation : PCS 1900 DL

	Freq. Tuned (MHz)	Power Input (dBm)	Power output (dBm)	Power Output (W)
Low	1931.25	-40.31	30.80	1.20
Middlw	1960	-40.53	31.30	1.35
High	1988.75	-40.41	30.24	1.06

Modulation : PCS 1900 UL

	Freq. Tuned (MHz)	Power Input (dBm)	Power output (dBm)	Power Output (W)
Low	1851.25	-40.43	31.02	1.26
Middlw	1880	-40.41	31.13	1.30
High	1908.75	-40.13	30.32	1.08

3.2.2 Occupied Bandwidth, Input/Output Comparison

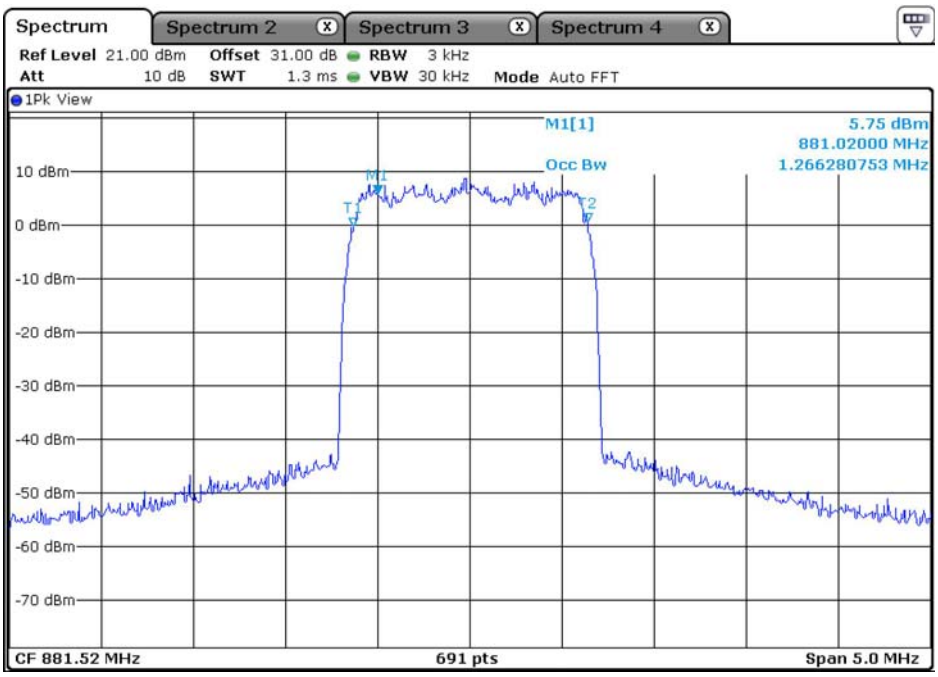
1. Test Procedure

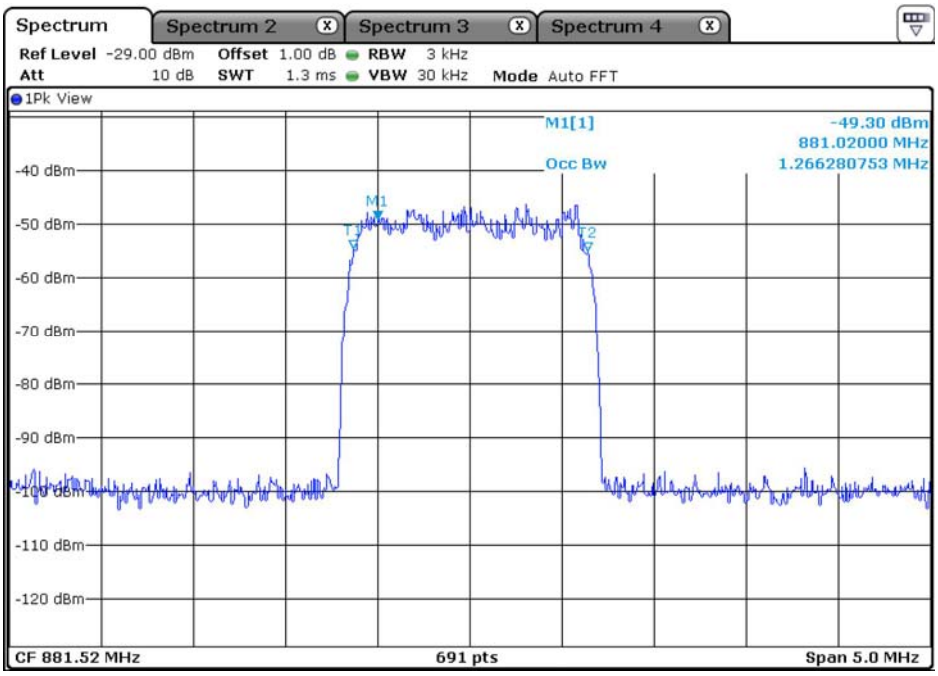
The EUT RF ports were connected to Spectrum analyzer. The EUT was setup to transmit maximum power. The spectrum analyzer was setup to measure the Occupied Bandwidth (defined as the 99% Power Bandwidth). The Occupied Bandwidth was measured at the input and output ports of the EUT at the middle channels for each type of modulation

2. Test Results : Complies

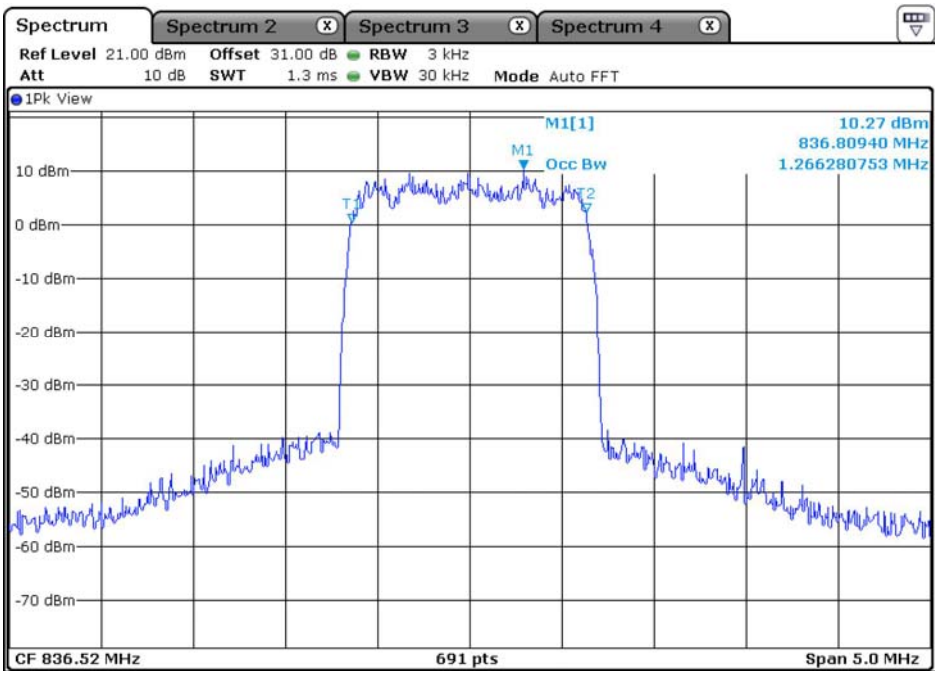
Refer to the following Graphs.

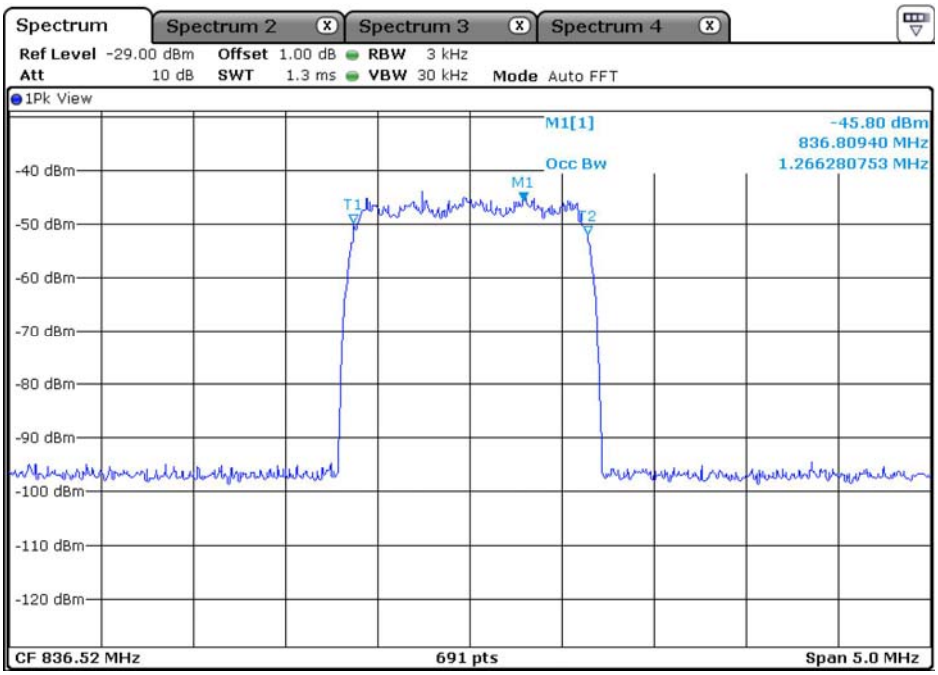
Input/Output Bandwidth Comparison – CDMA 850_DL



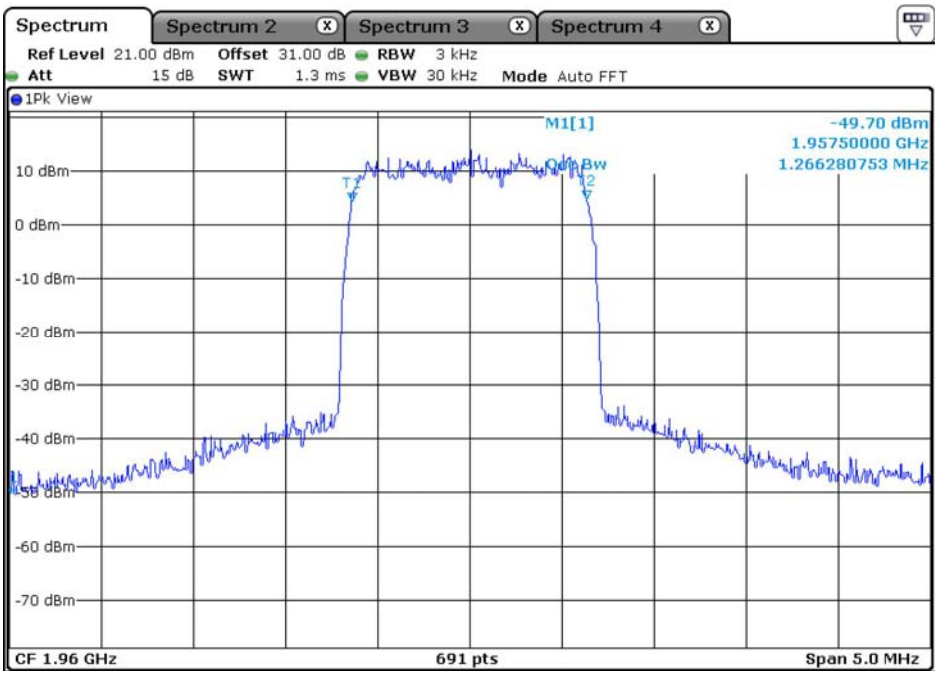


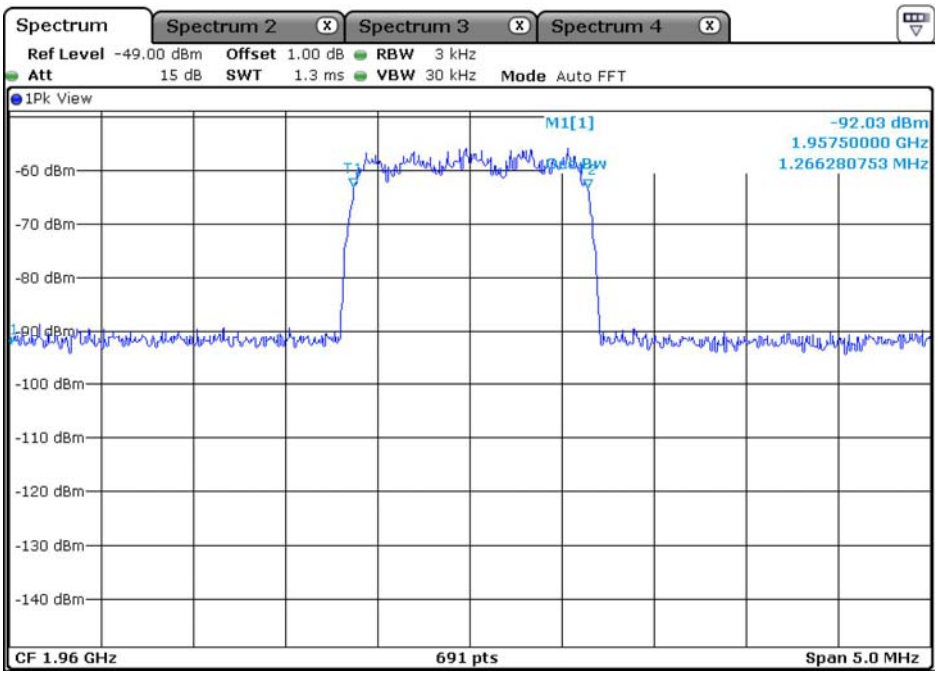
Input/Output Bandwidth Comparison – CDMA 850_UL



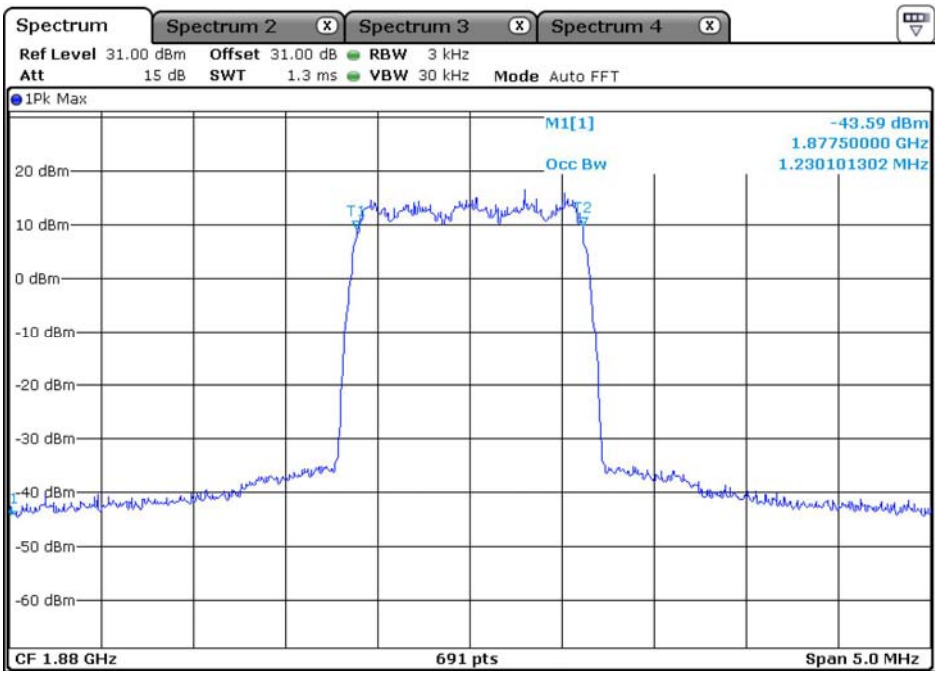


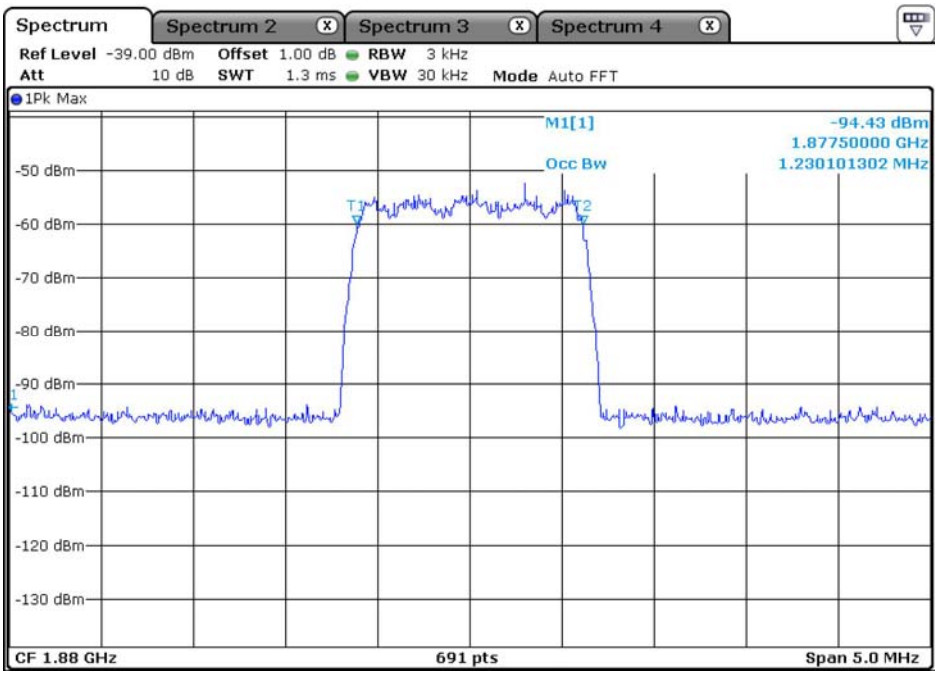
Input/Output Bandwidth Comparison – PCS 1900_DL





Input/Output Bandwidth Comparison – PCS 1900_UL





3.2.3 Out-of-Band Emissions at antenna terminal

1. Requirement

The power of any emissions 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. Note: That corresponds to the level of -13 dBm for any out-of-band and spurious emissions.

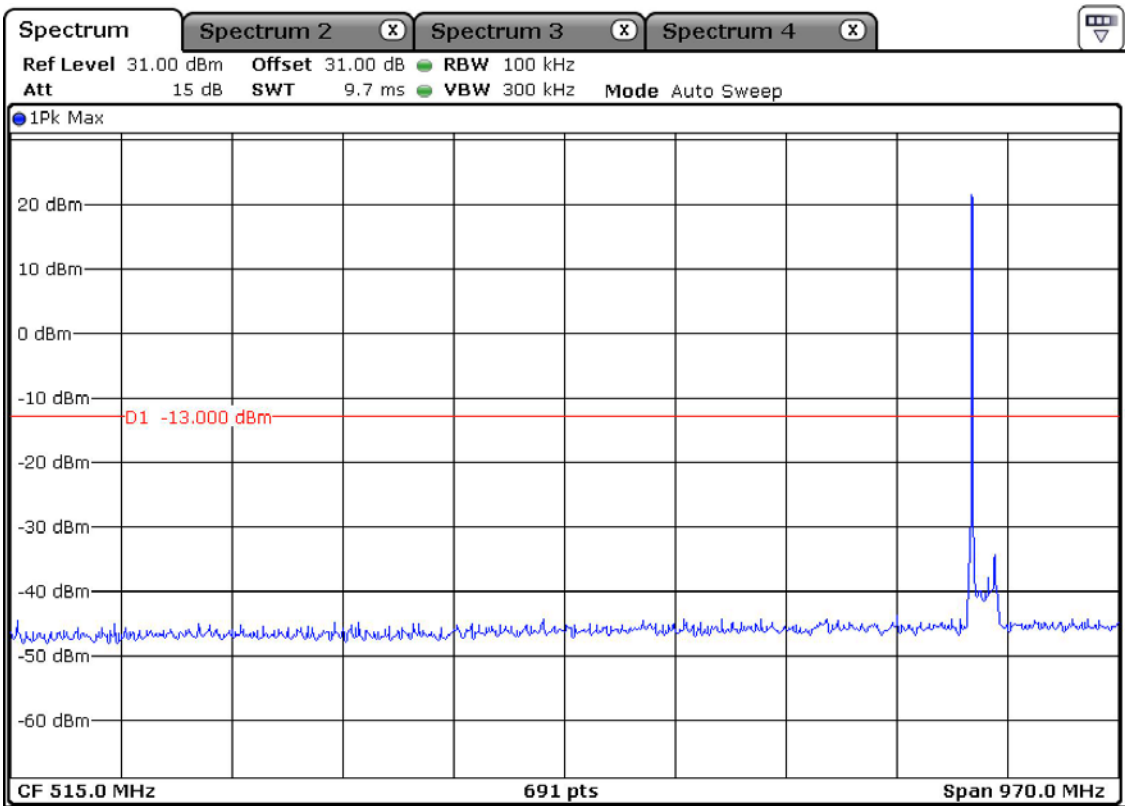
2. Test Procedure

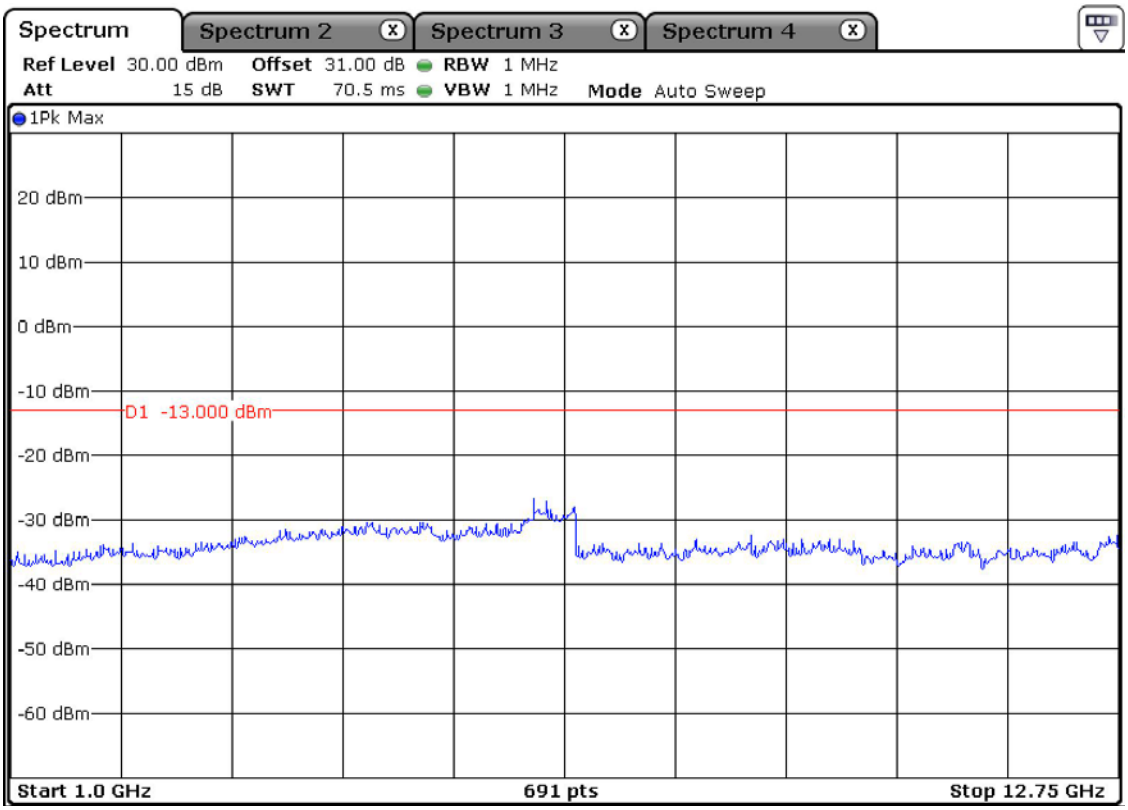
The EUT RF output was connected to spectrum analyzer. The EUT was setup to transmit the maximum power. The spectrum analyzer resolution bandwidth (RBW) was set to 1 MHz in the PCS band and 100 kHz in the Cell band. For measurements at the band edges, the resolution bandwidth (RBW) was set to 100 kHz. Measurements were performed at three frequencies at the low, middle, and high channels for all modulations types. Intermodulation was performed by injecting two modulated signals into the EUT. One signal was set at the bandedge of either the Up Link or Down Link band and the other signal was set 6 MHz away.

3. Test Results : Complies

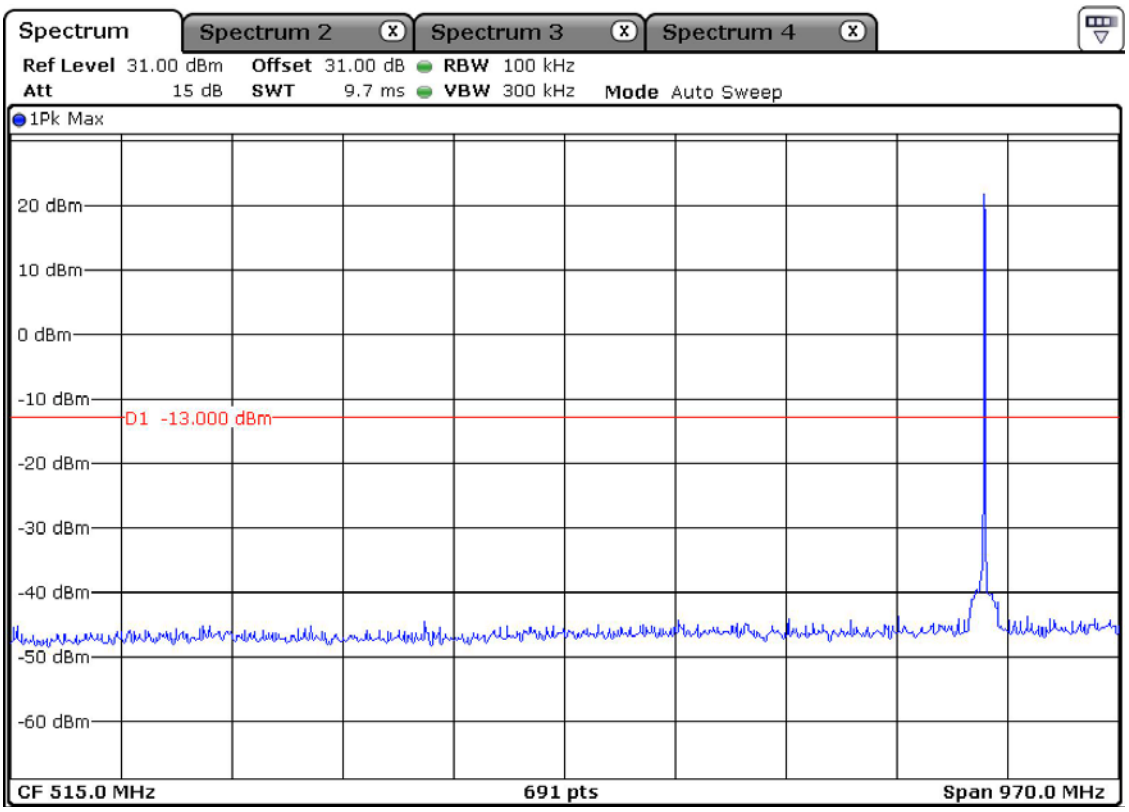
Refer to the following Graphs.

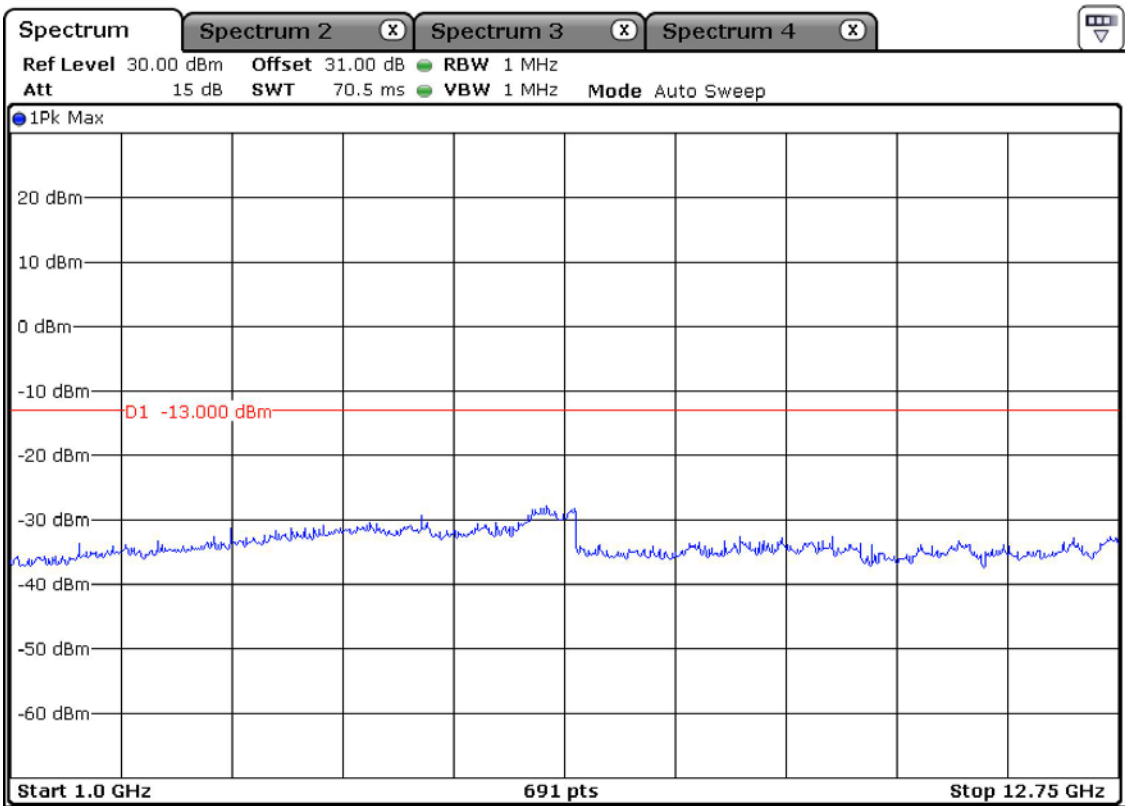
Antenna Terminal Spurious Emissions, CDMA 850, Low_DL



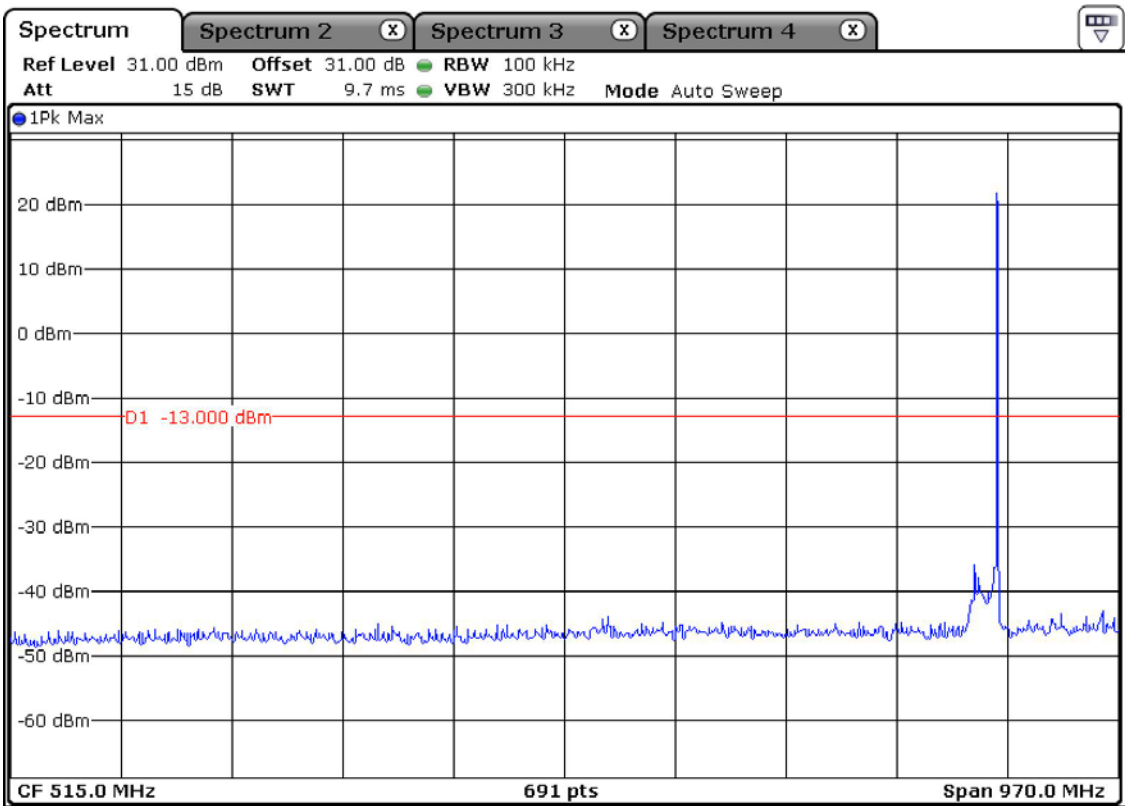


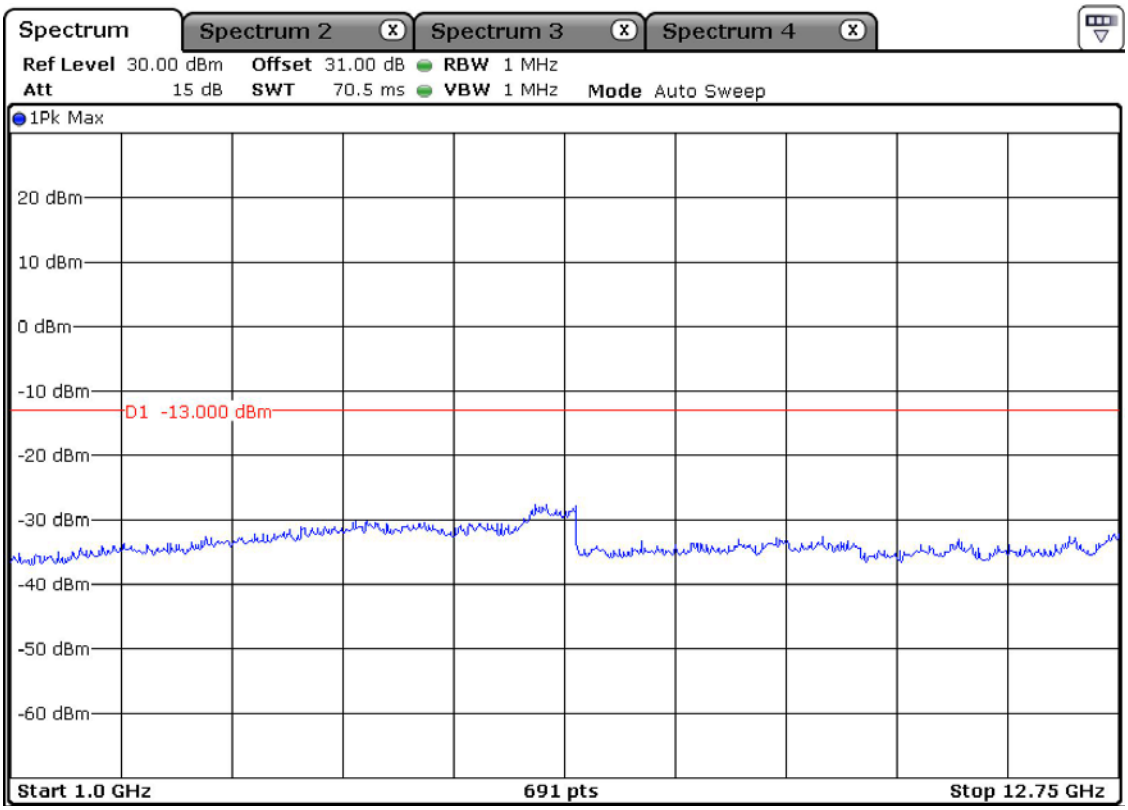
Antenna Terminal Spurious Emissions, CDMA 850, Middle_DL



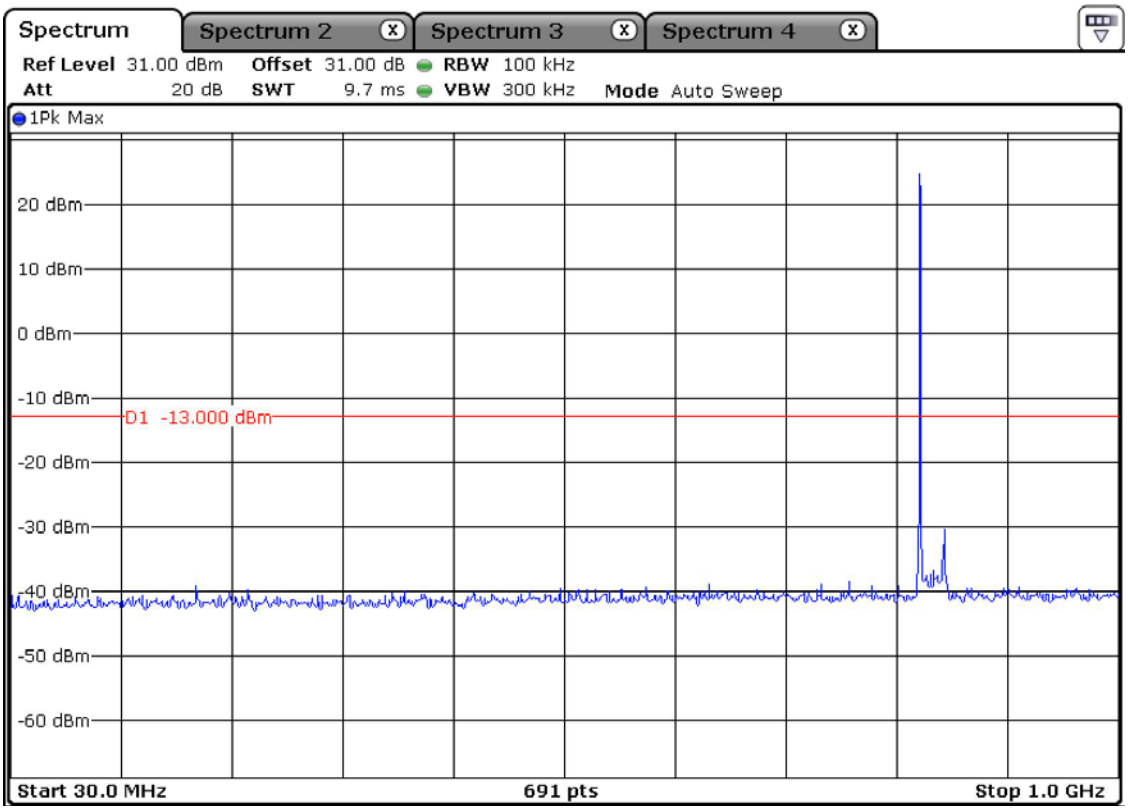


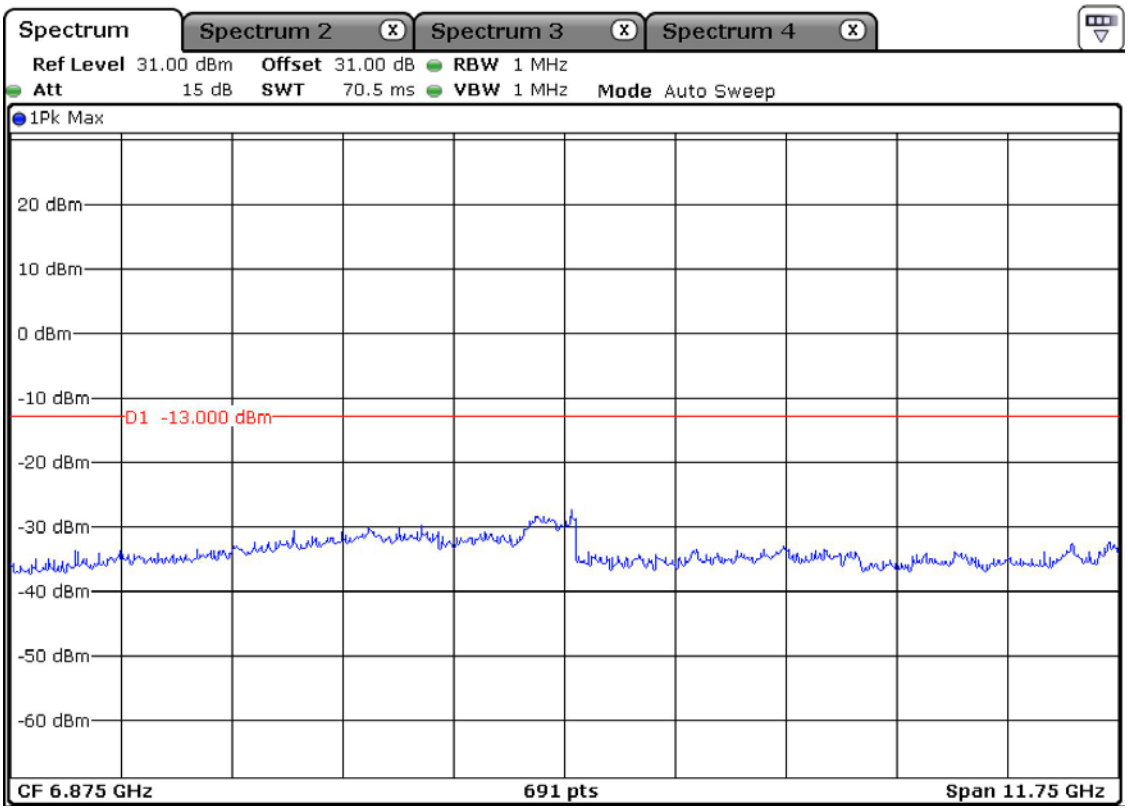
Antenna Terminal Spurious Emissions, CDMA 850, High_DL



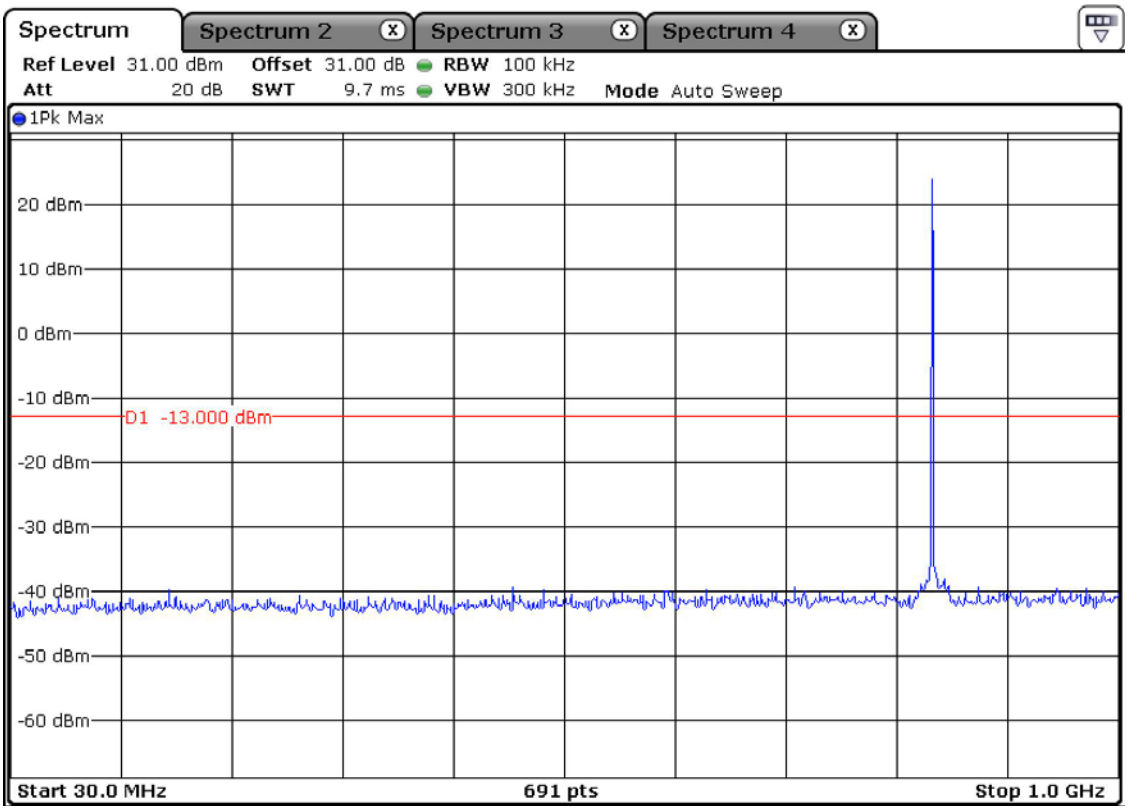


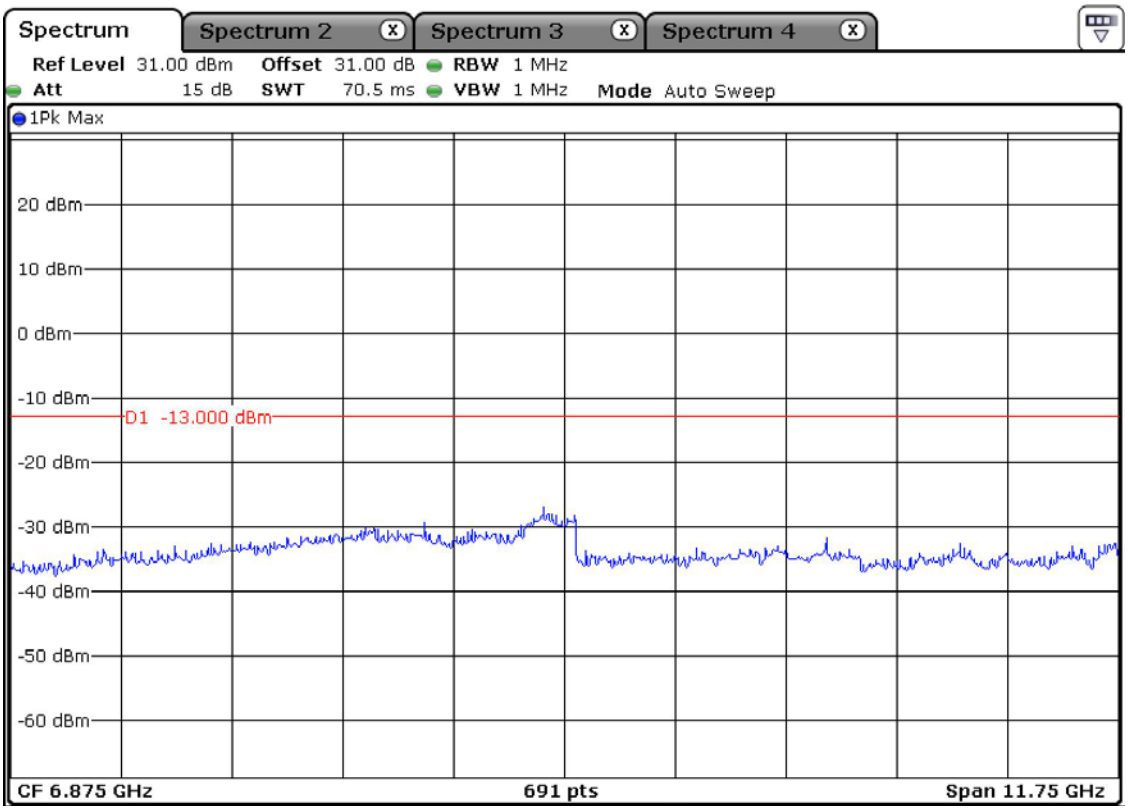
Antenna Terminal Spurious Emissions, CDMA 850, Low_UL



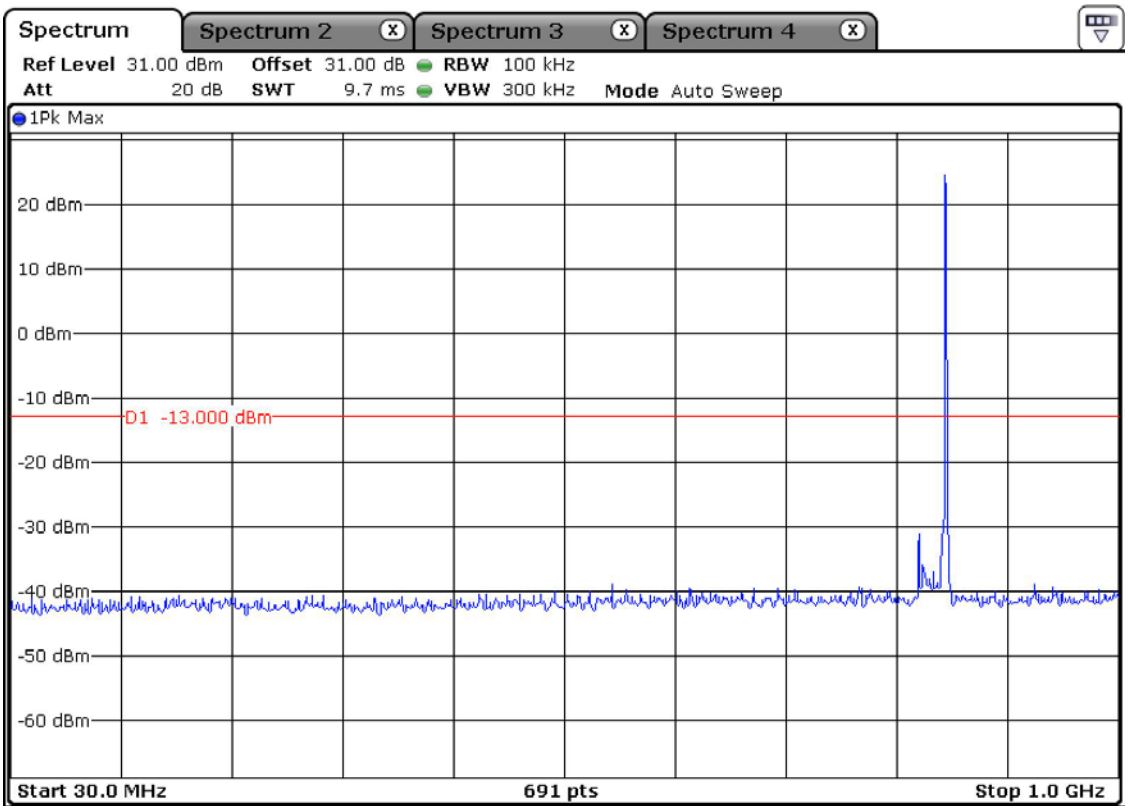


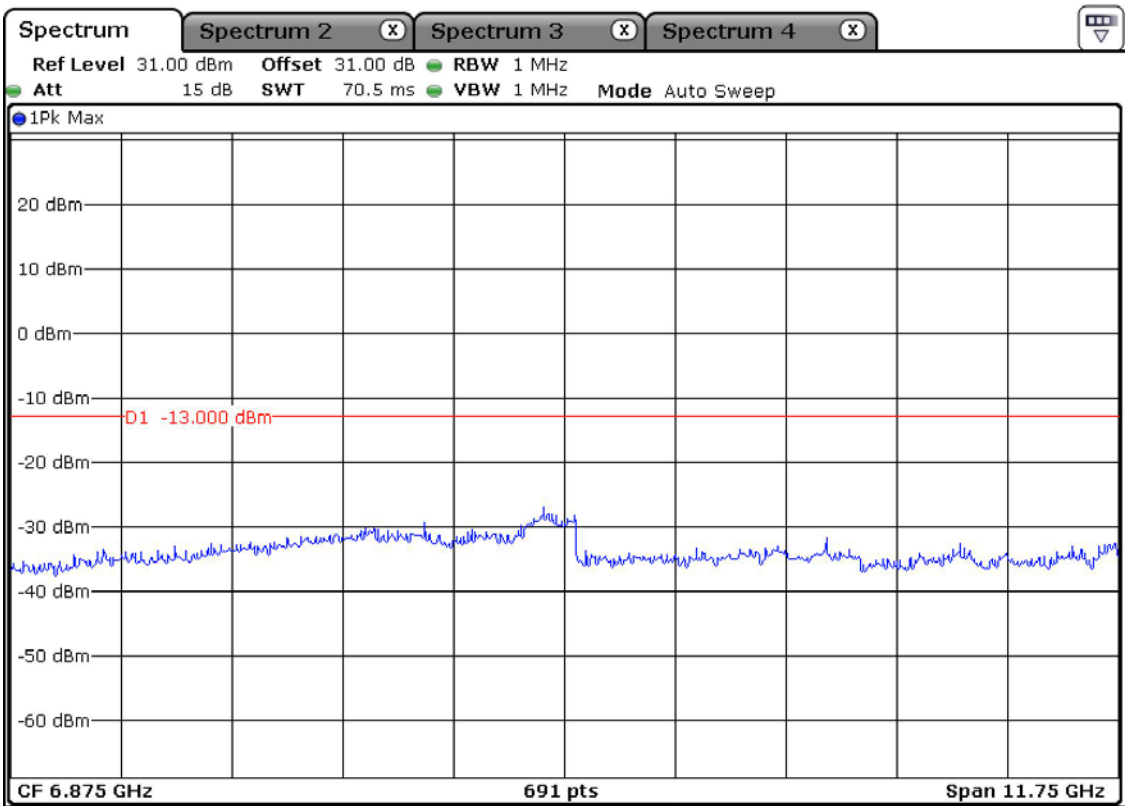
Antenna Terminal Spurious Emissions, CDMA 850, Middle_UL



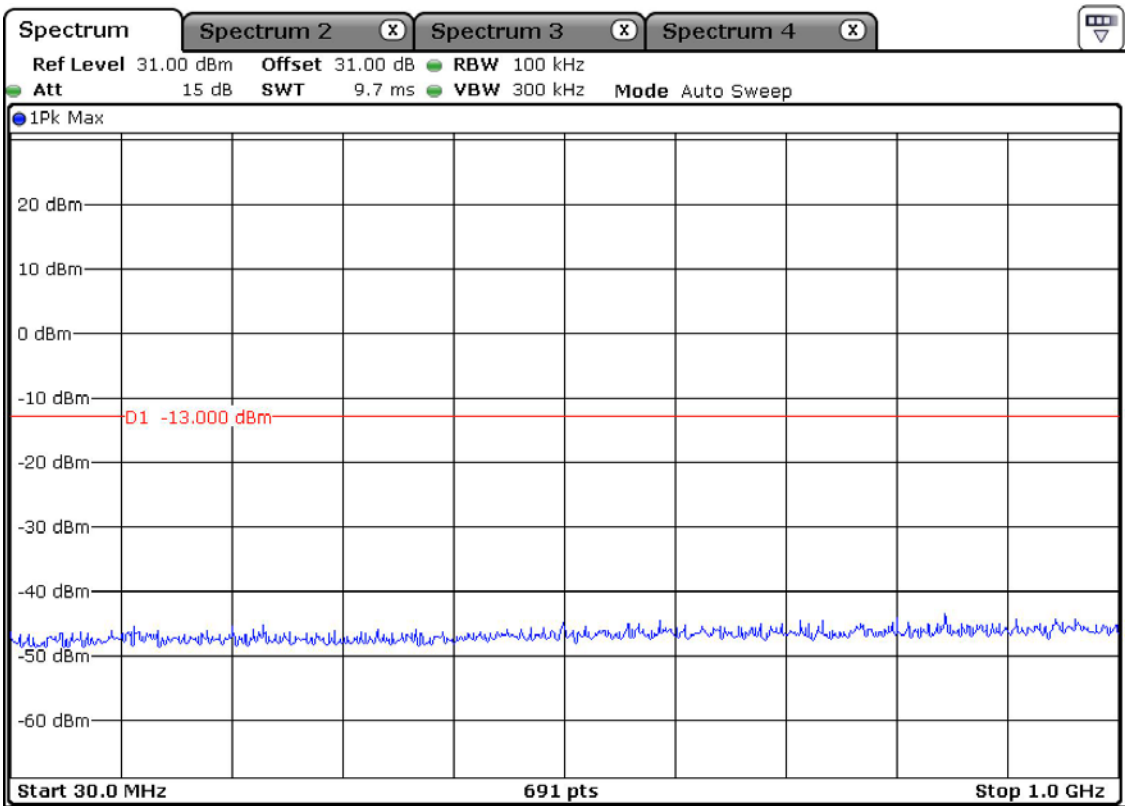


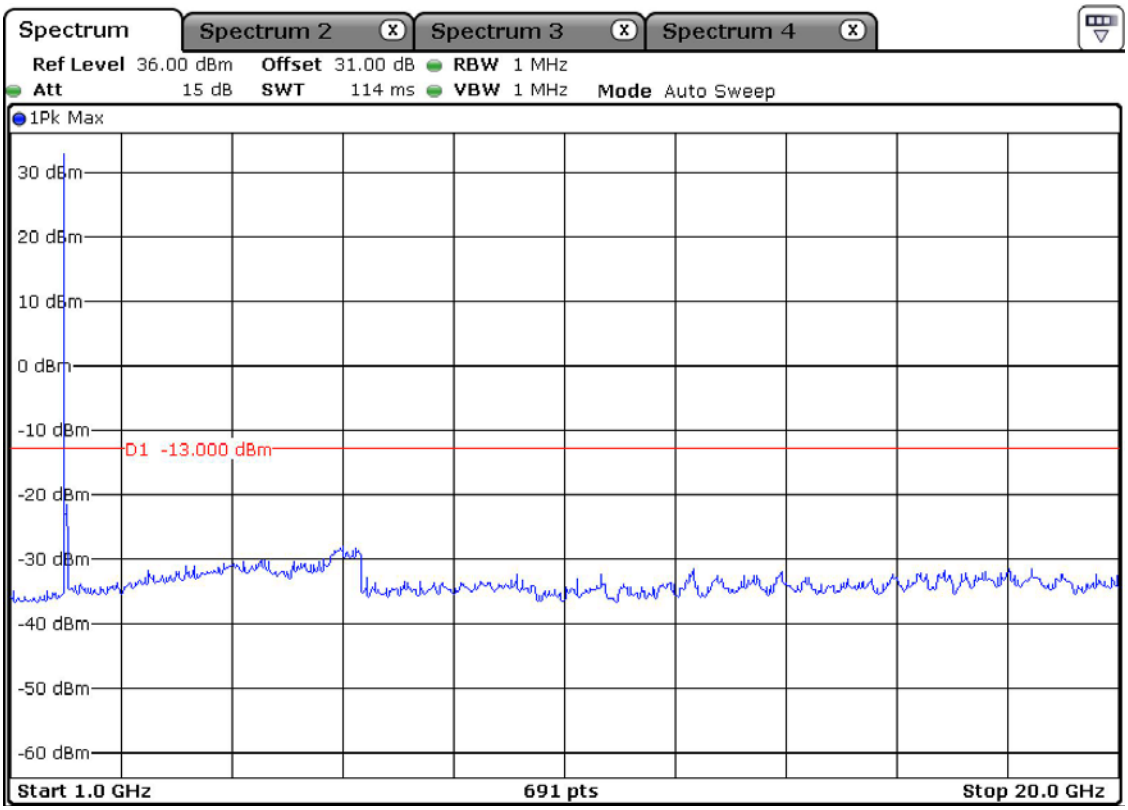
Antenna Terminal Spurious Emissions, CDMA 850, High_UL



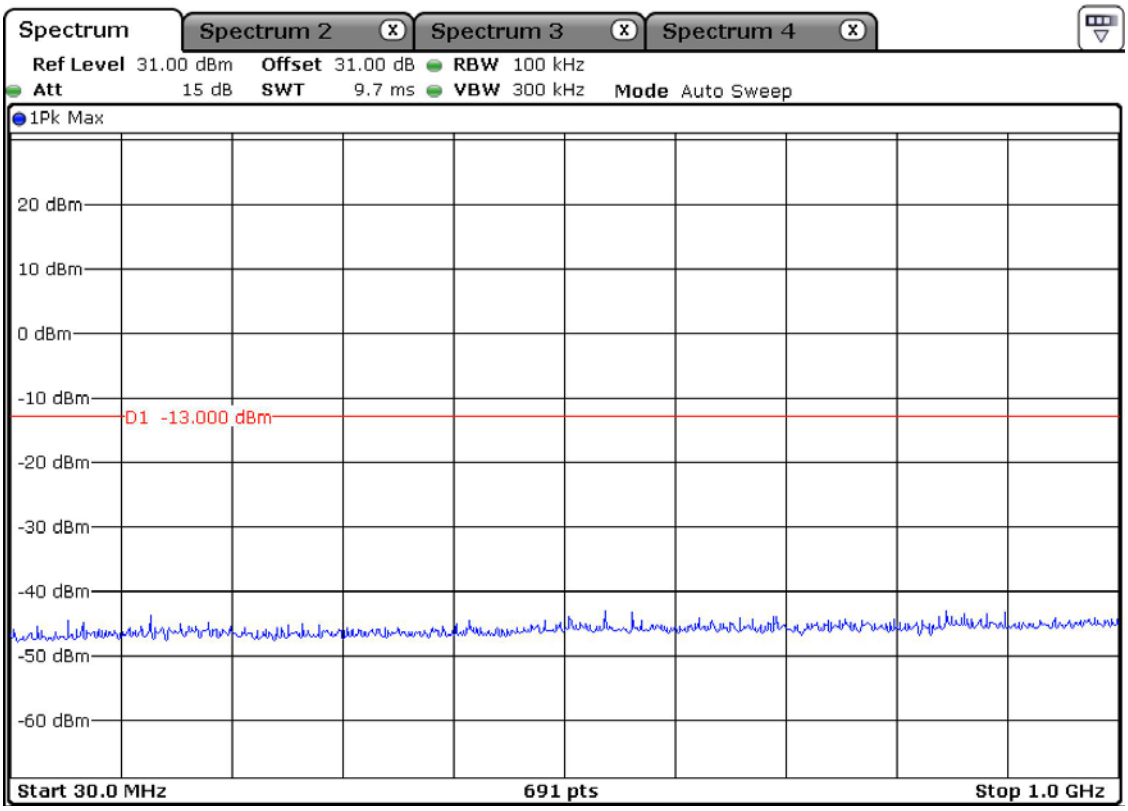


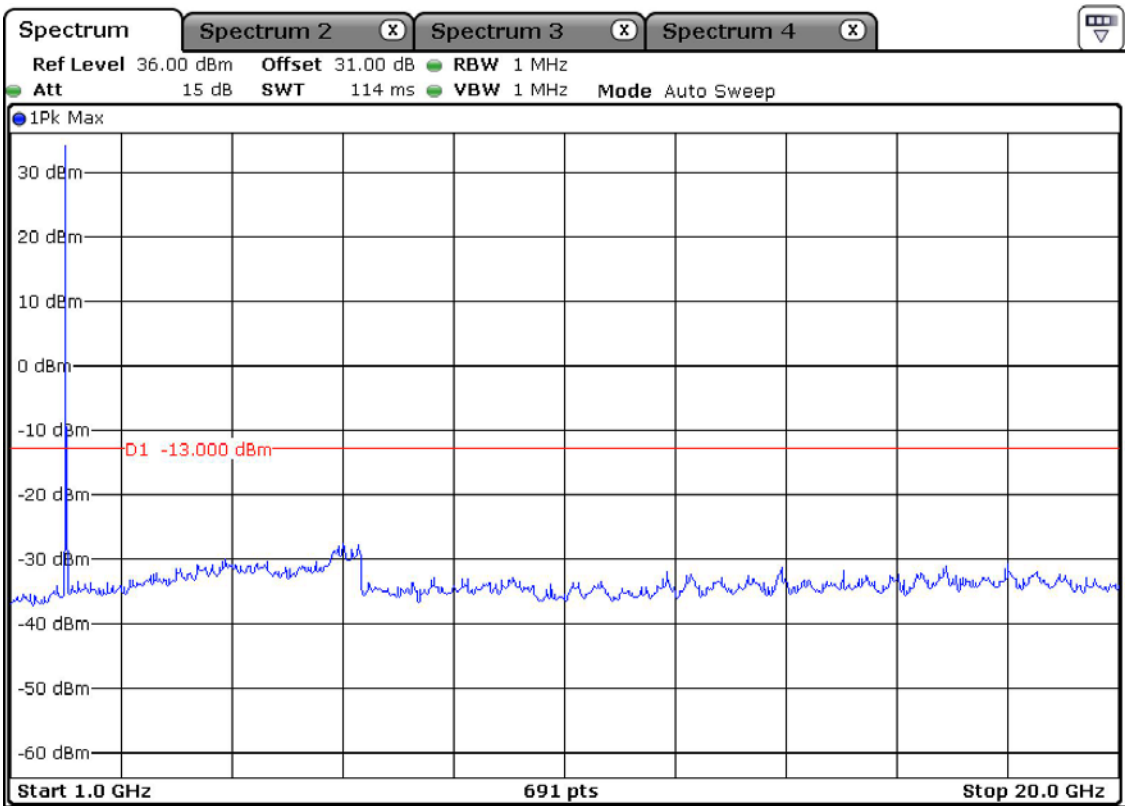
Antenna Terminal Spurious Emissions, PCS 1900, Low_DL



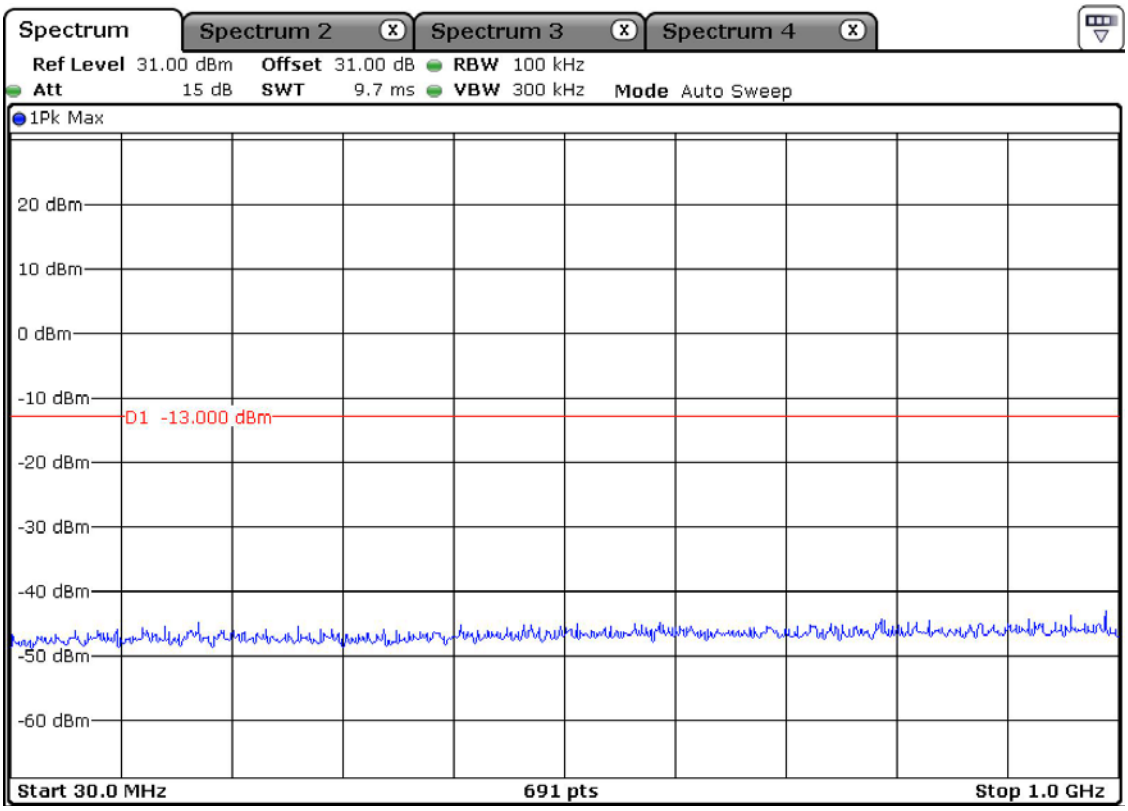


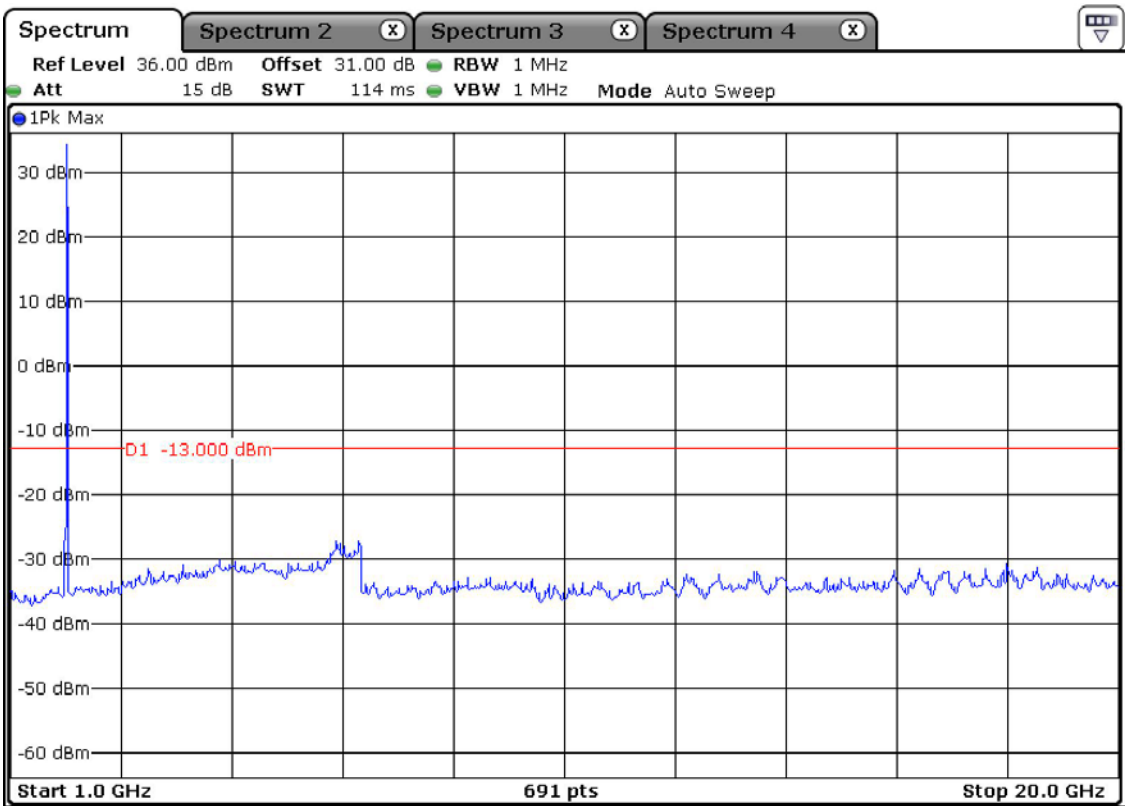
Antenna Terminal Spurious Emissions, PCS 1900, Middle_DL



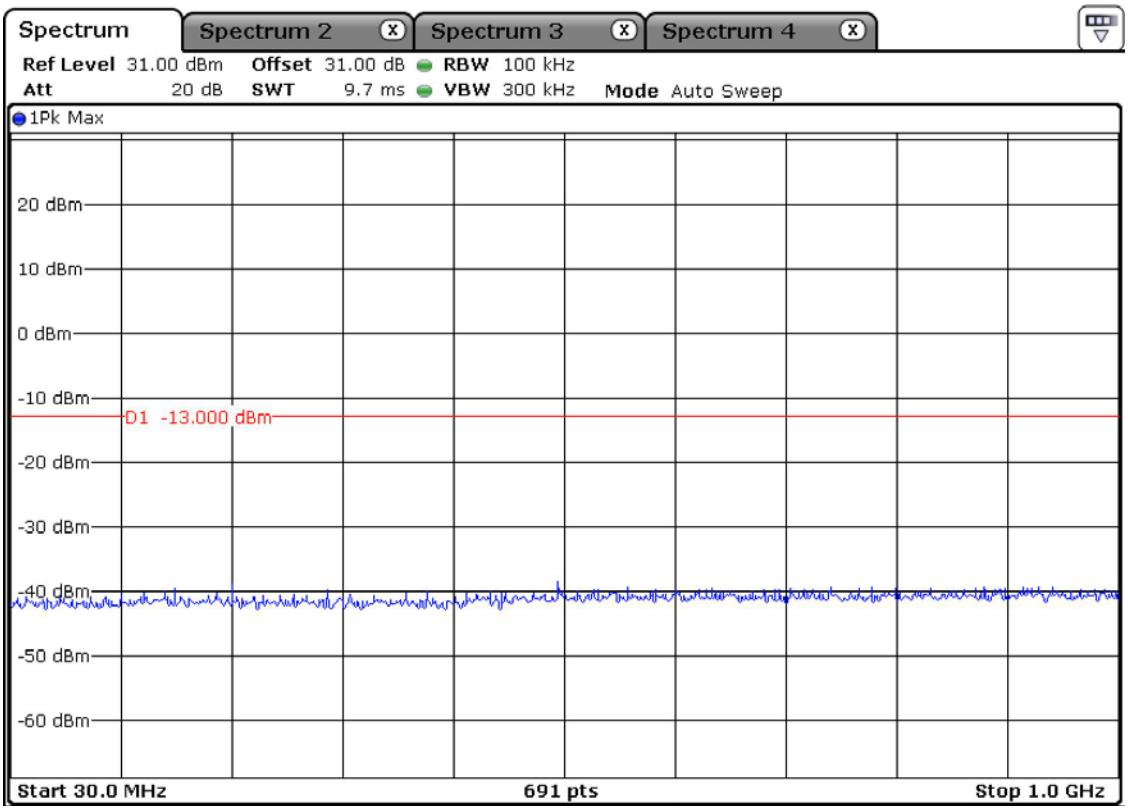


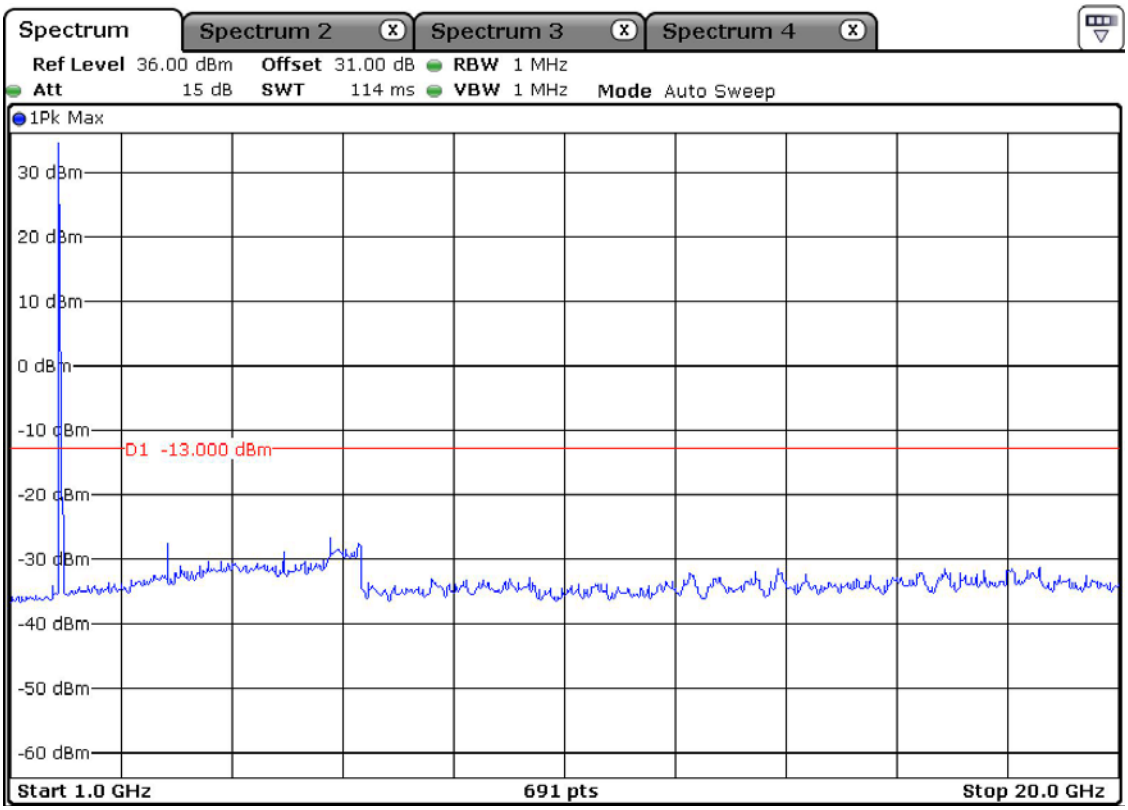
Antenna Terminal Spurious Emissions, PCS 1900, High_DL



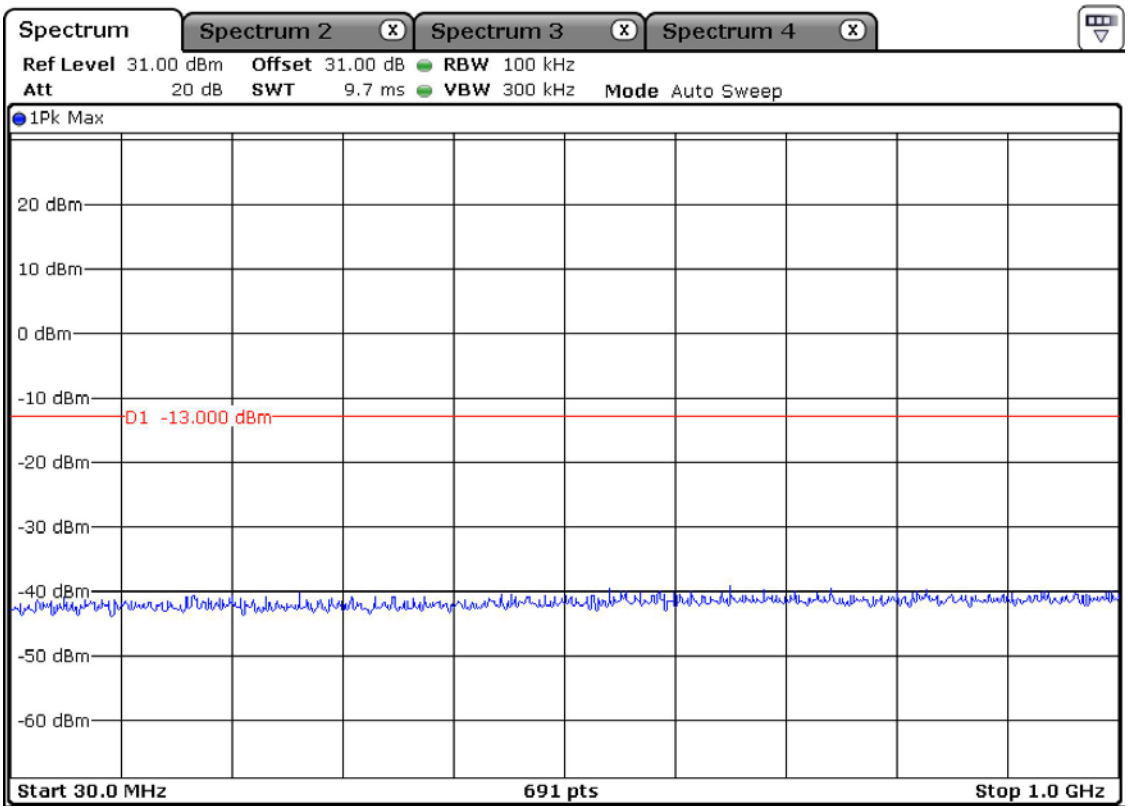


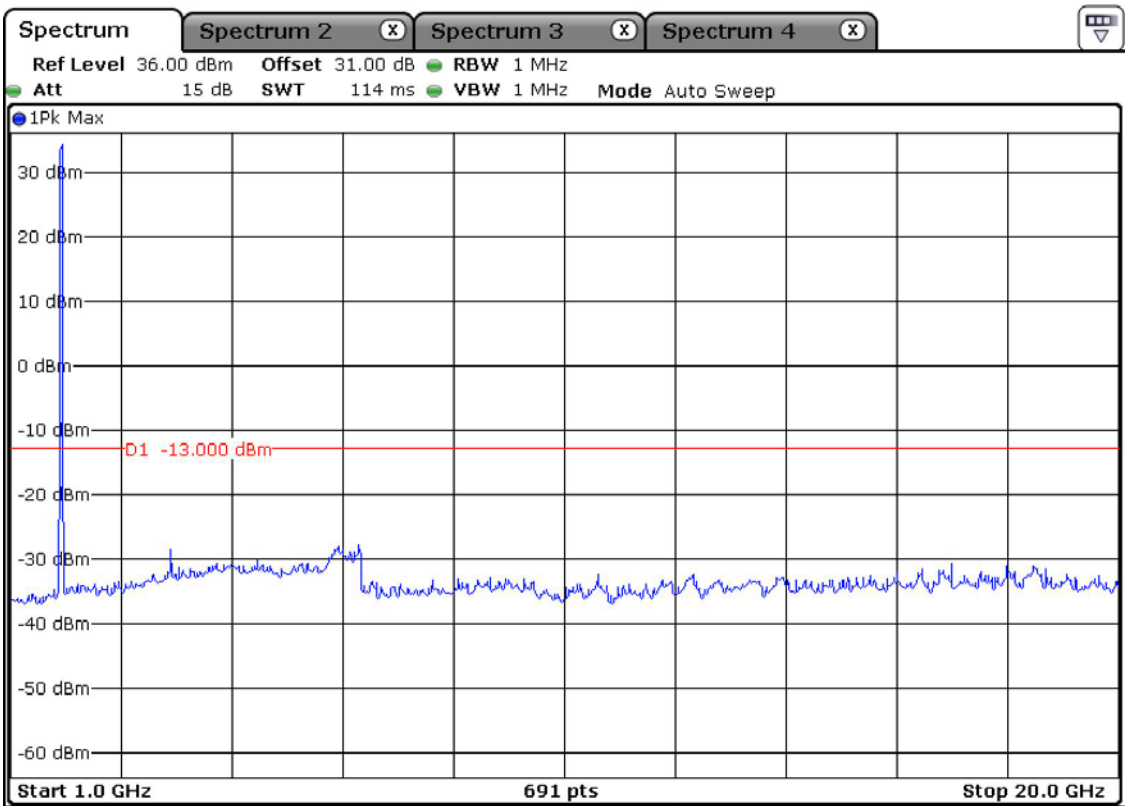
Antenna Terminal Spurious Emissions, PCS 1900, Low_UL



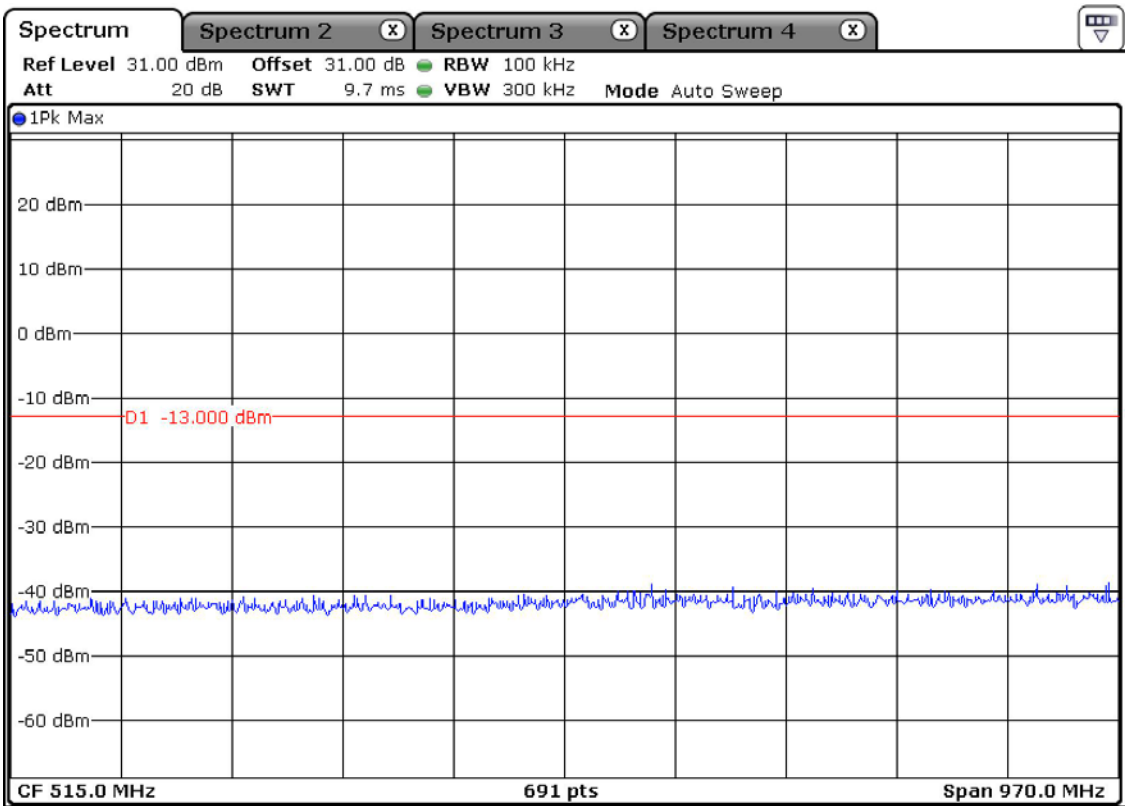


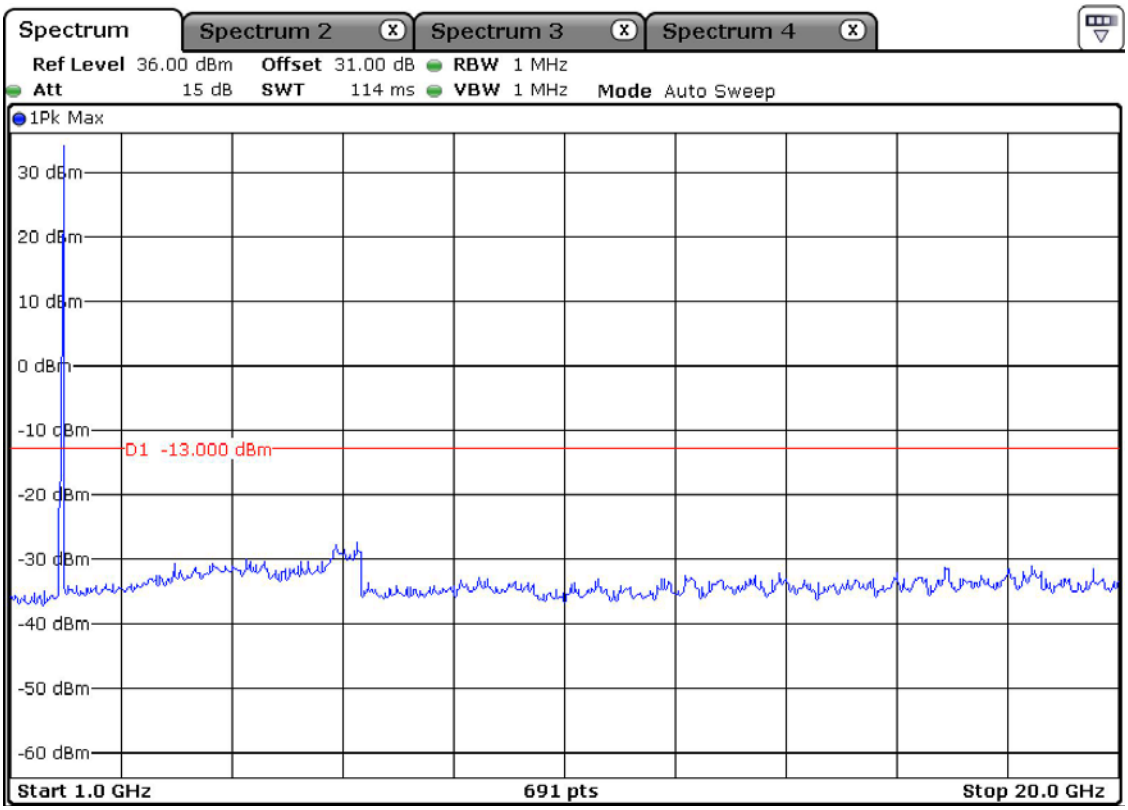
Antenna Terminal Spurious Emissions, PCS 1900, Middle_UL



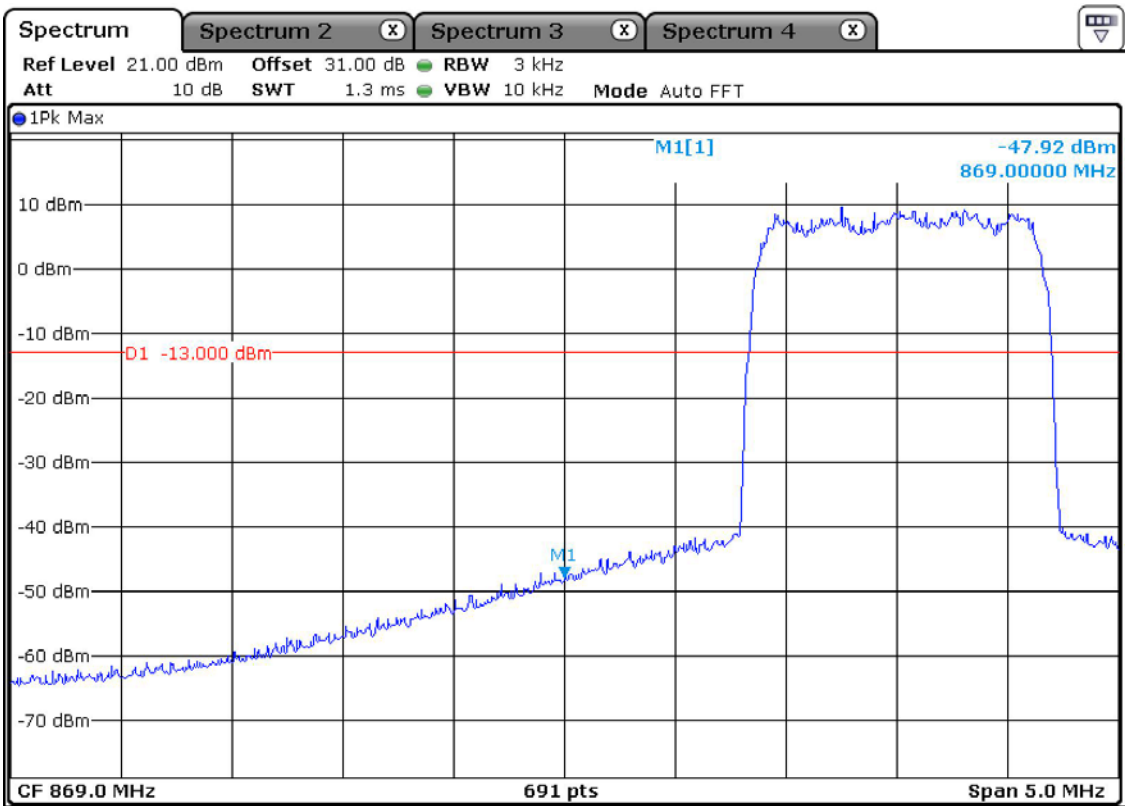


Antenna Terminal Spurious Emissions, PCS 1900, High_UL

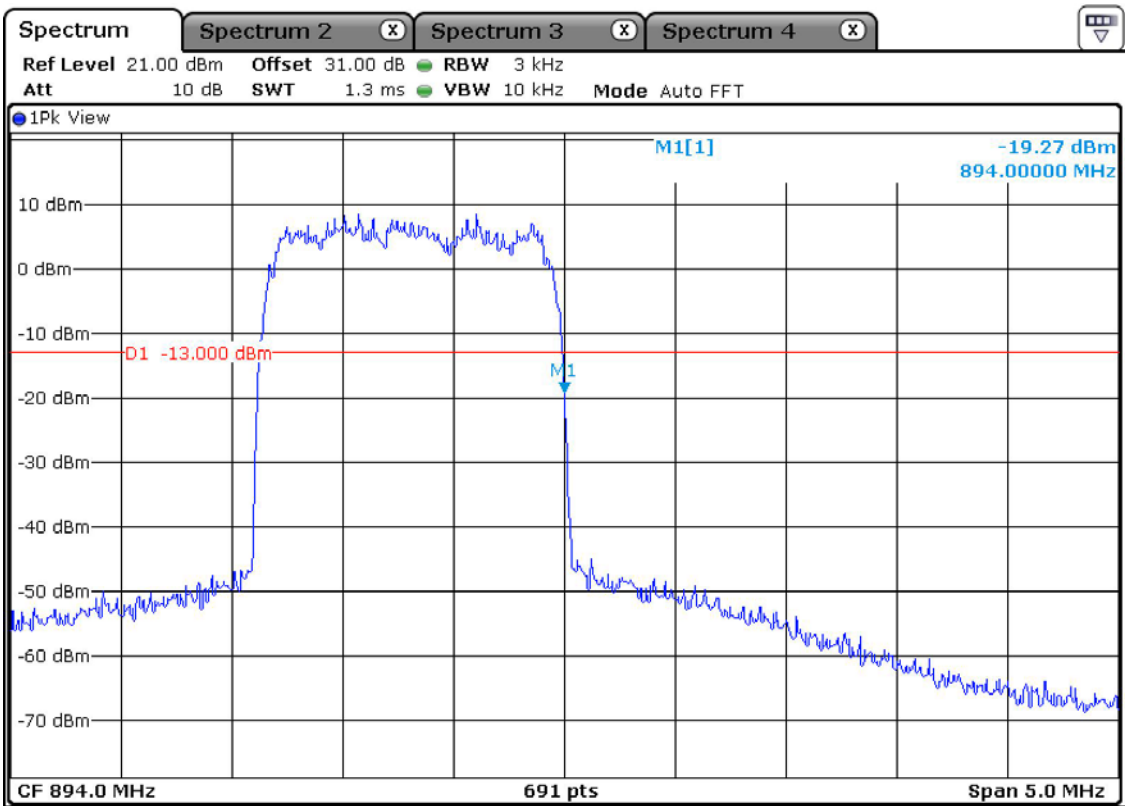




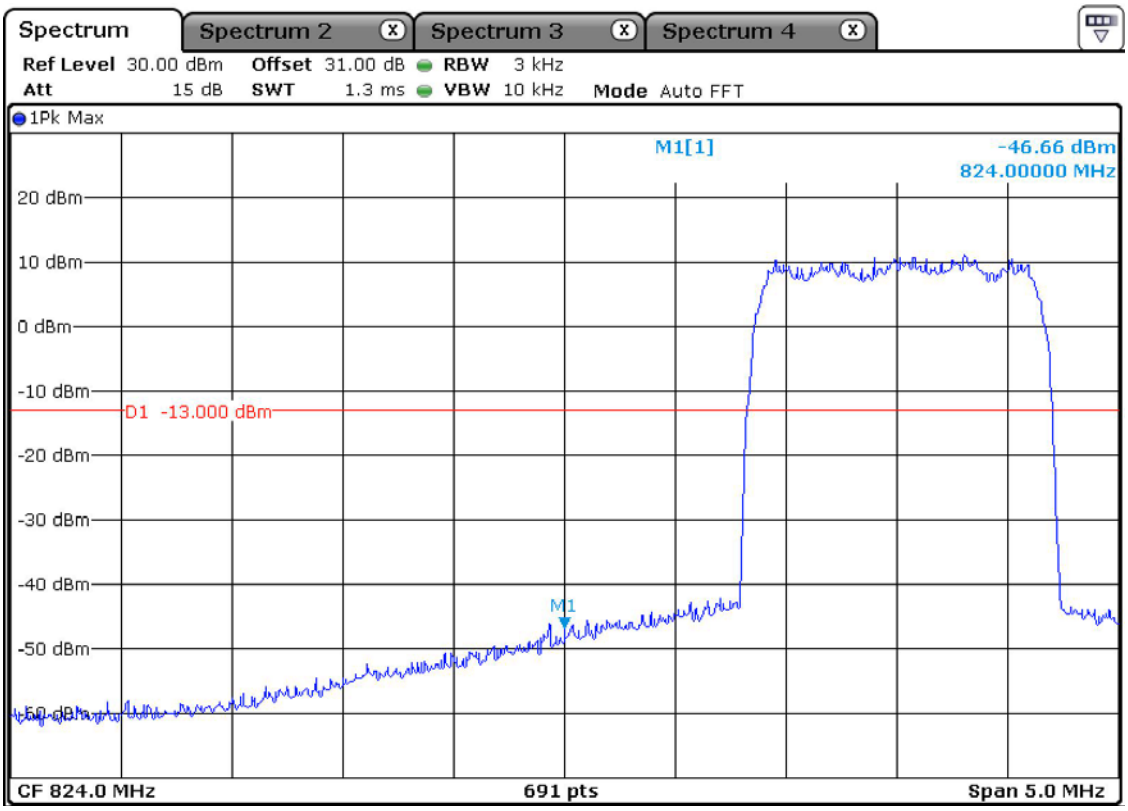
Band Edge Emissions, CDMA 850, Low_DL



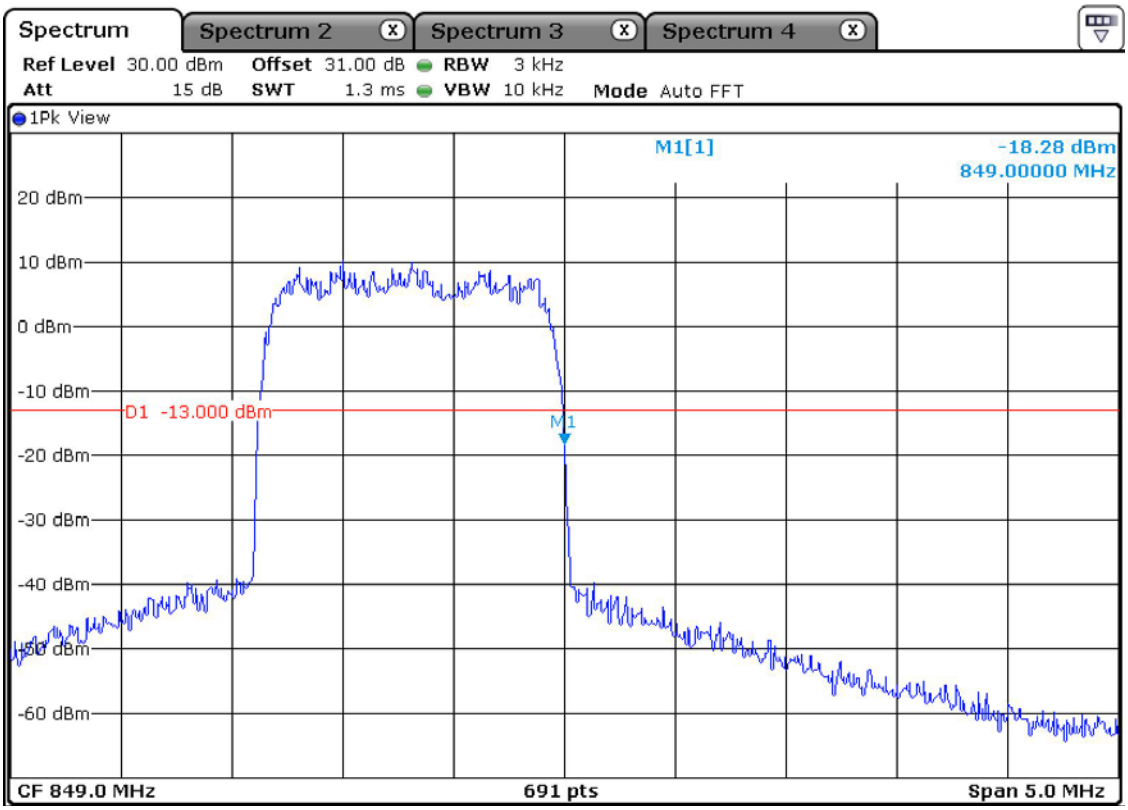
Band Edge Emissions, CDMA 850, High_DL



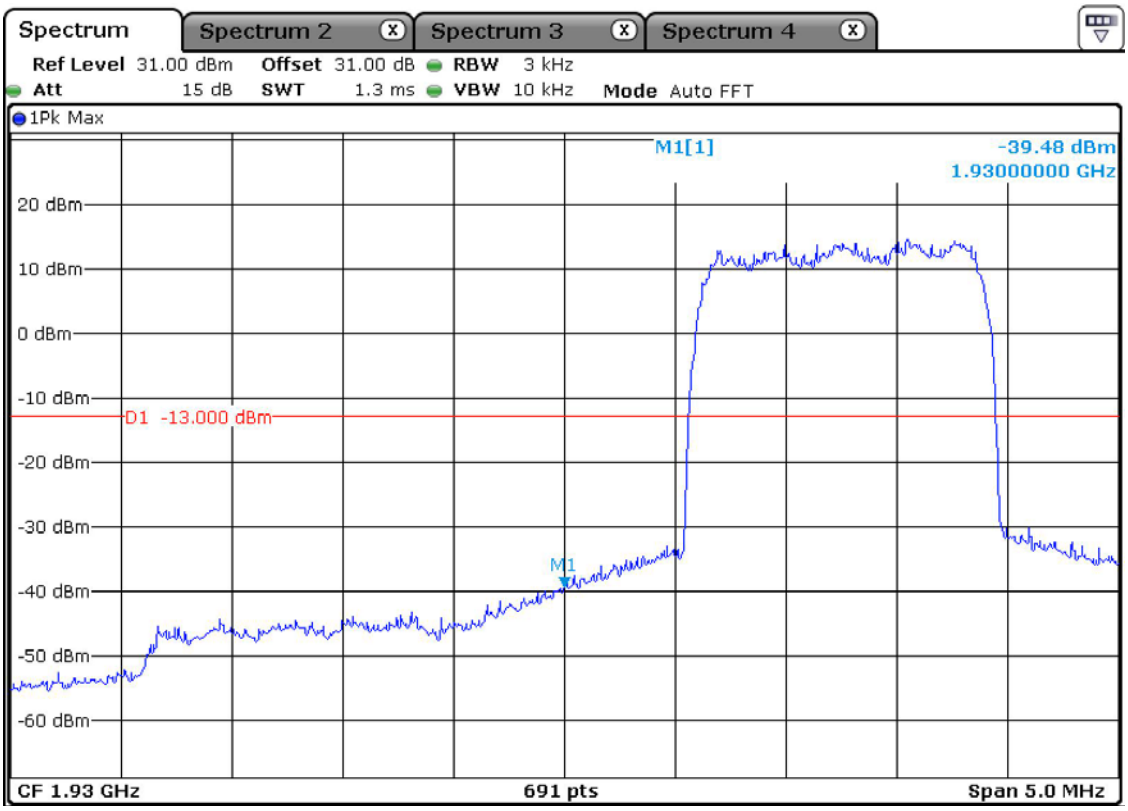
Band Edge Emissions, CDMA 850, Low_UL



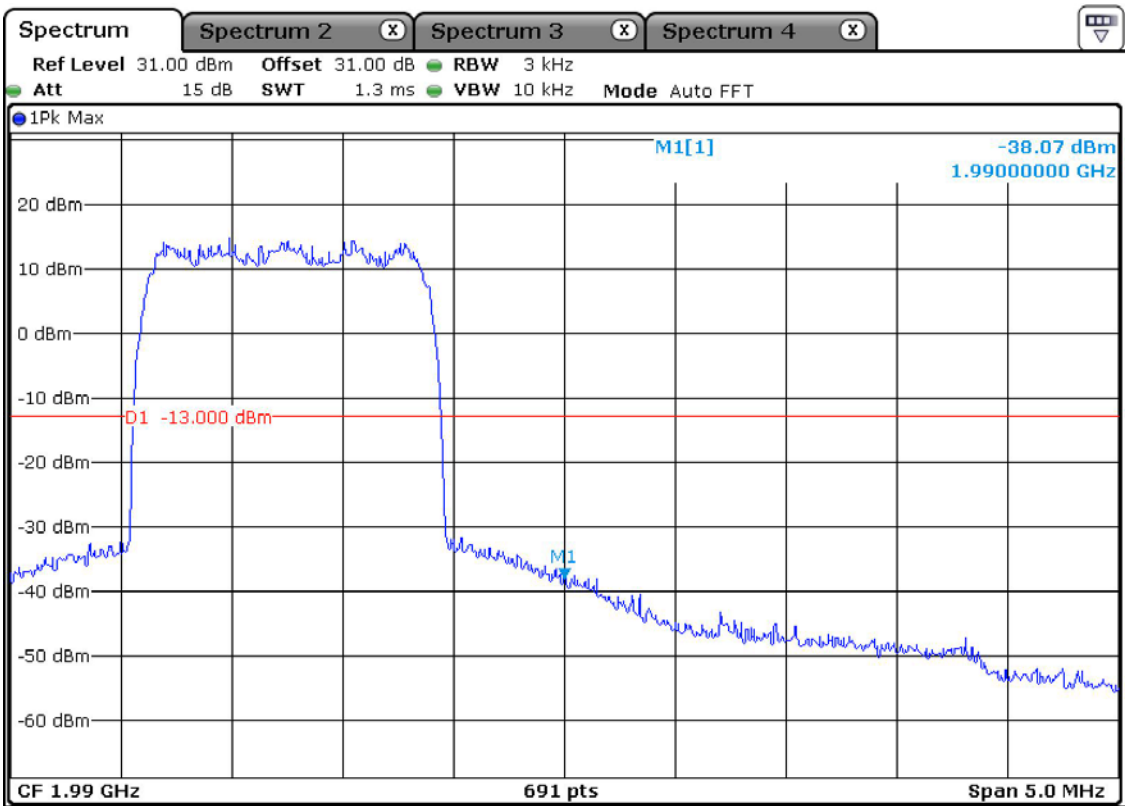
Band Edge Emissions, CDMA 850, High_UL



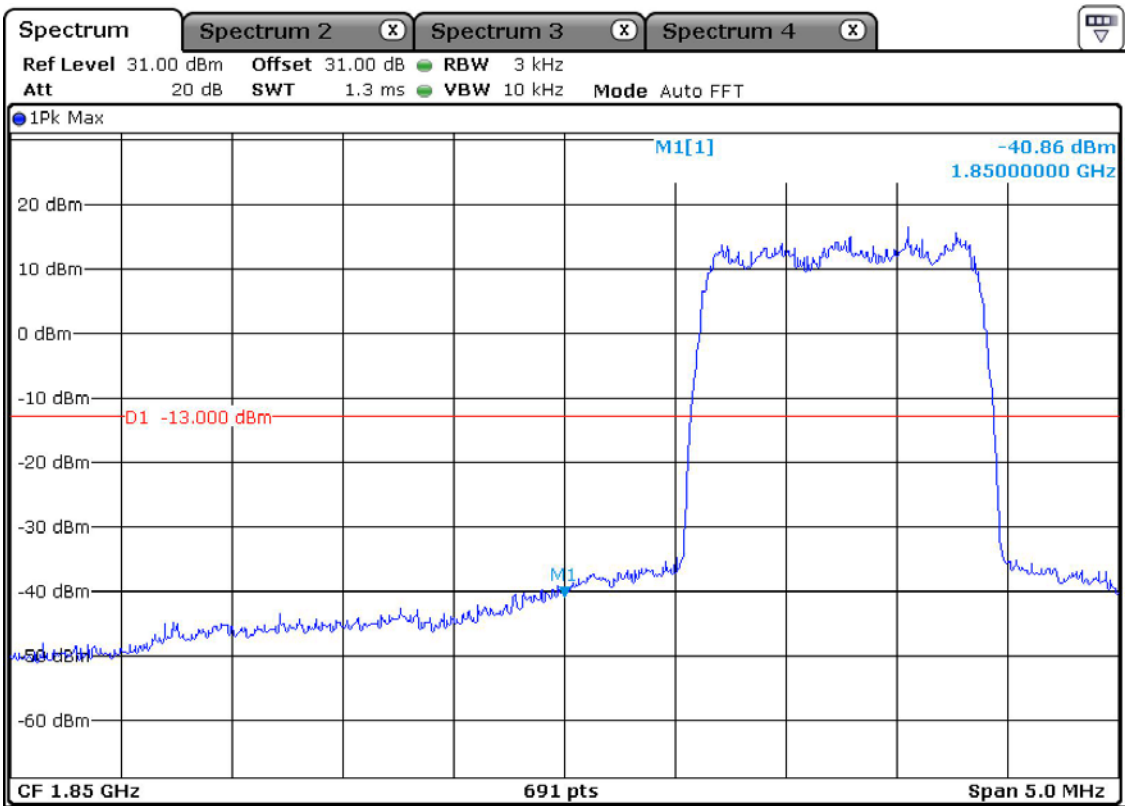
Band Edge Emissions, PCS 1900, Low_DL



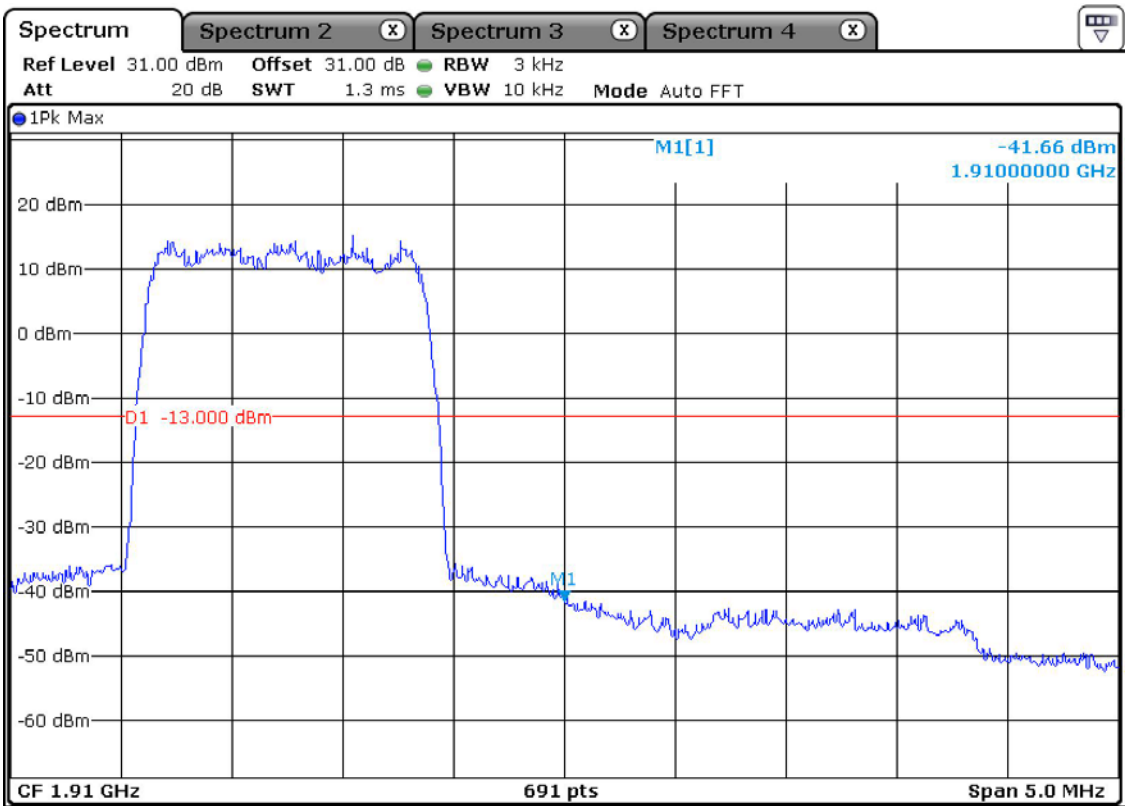
Band Edge Emissions, PCS 1900, High_DL



Band Edge Emissions, PCS 1900, Low_UL



Band Edge Emissions, PCS 1900, High_UL



3.2.4 Intermodulation

1. Requirement

the power of any emission shall be attenuated below the transmitter power (P) by at least 43 +10 log (P) dB. The limit of emission equal to –13dBm..

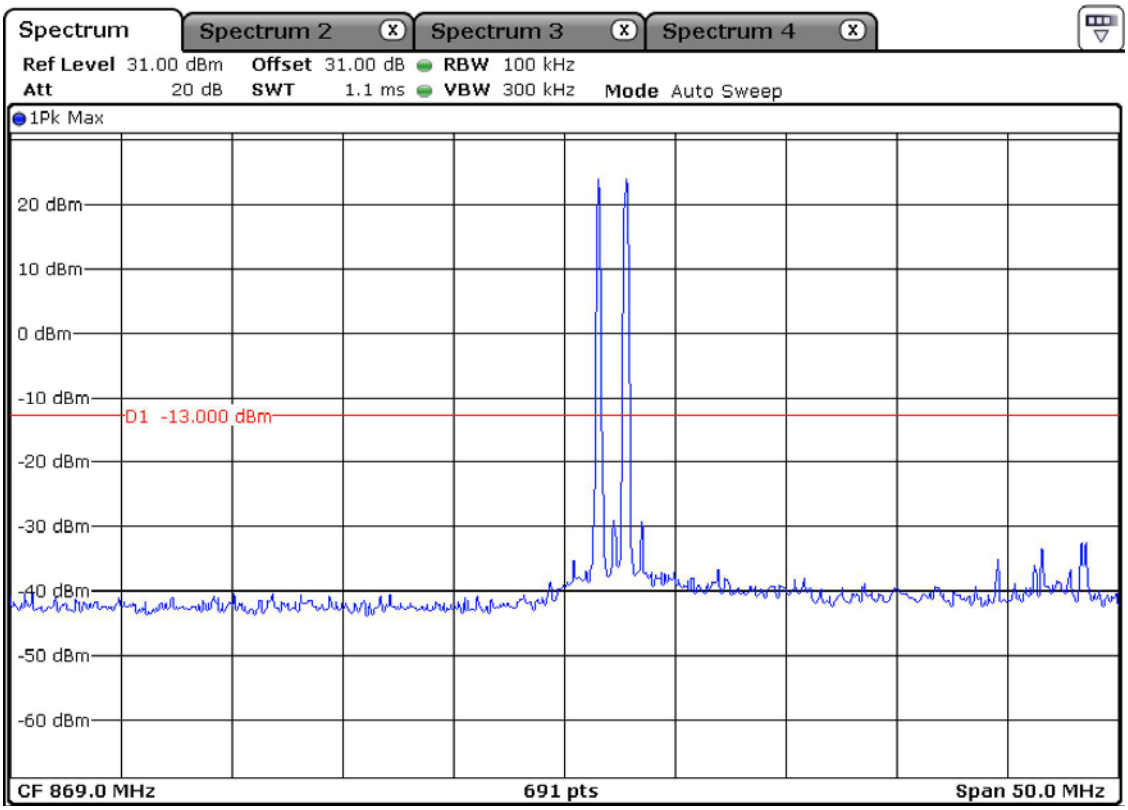
2. Test Procedure

Two RF signals set as inputs. The frequencies of both RF signals shall be within the repeater's operating band. The spacing between both RF signals shall be the minimum possible spacing applied in a network. The level of both RF input signals shall be increased, until the maximum rated output power per channel, as declared by the manufacturer, is reached.

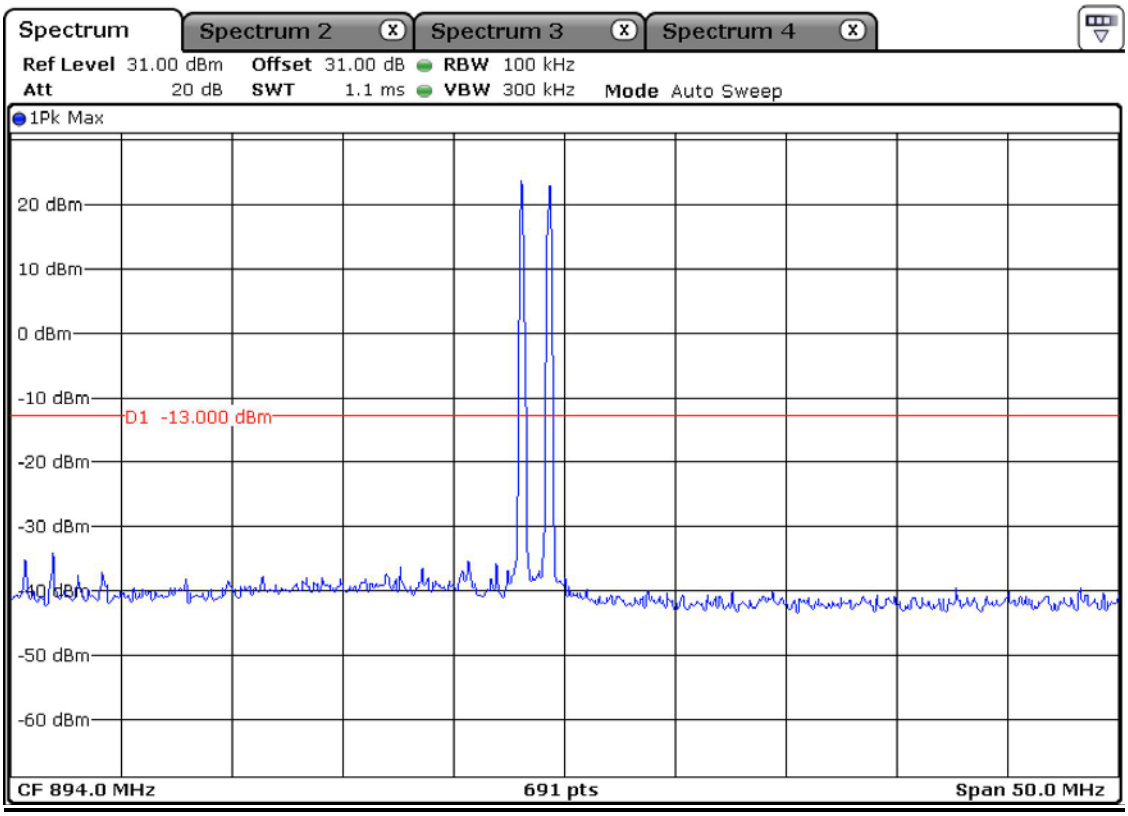
3. Test Results : Complies

Refer to the following Graphs.

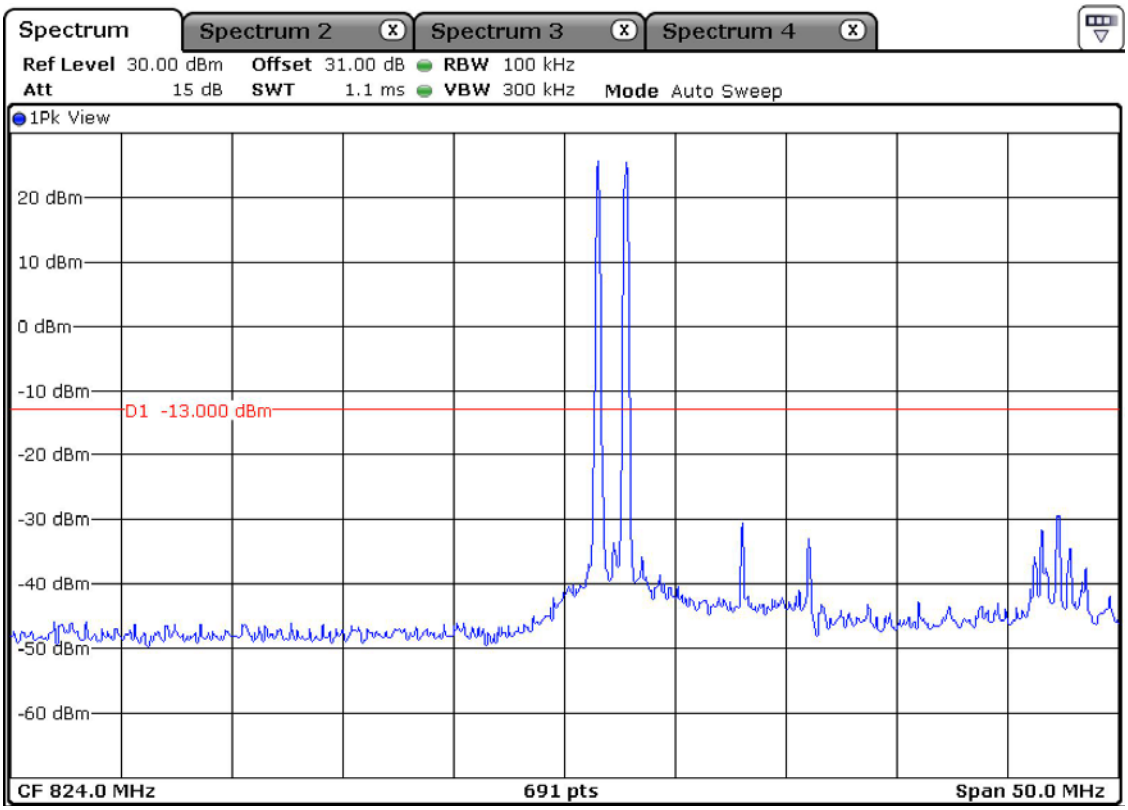
CDMA 850 Low_DL



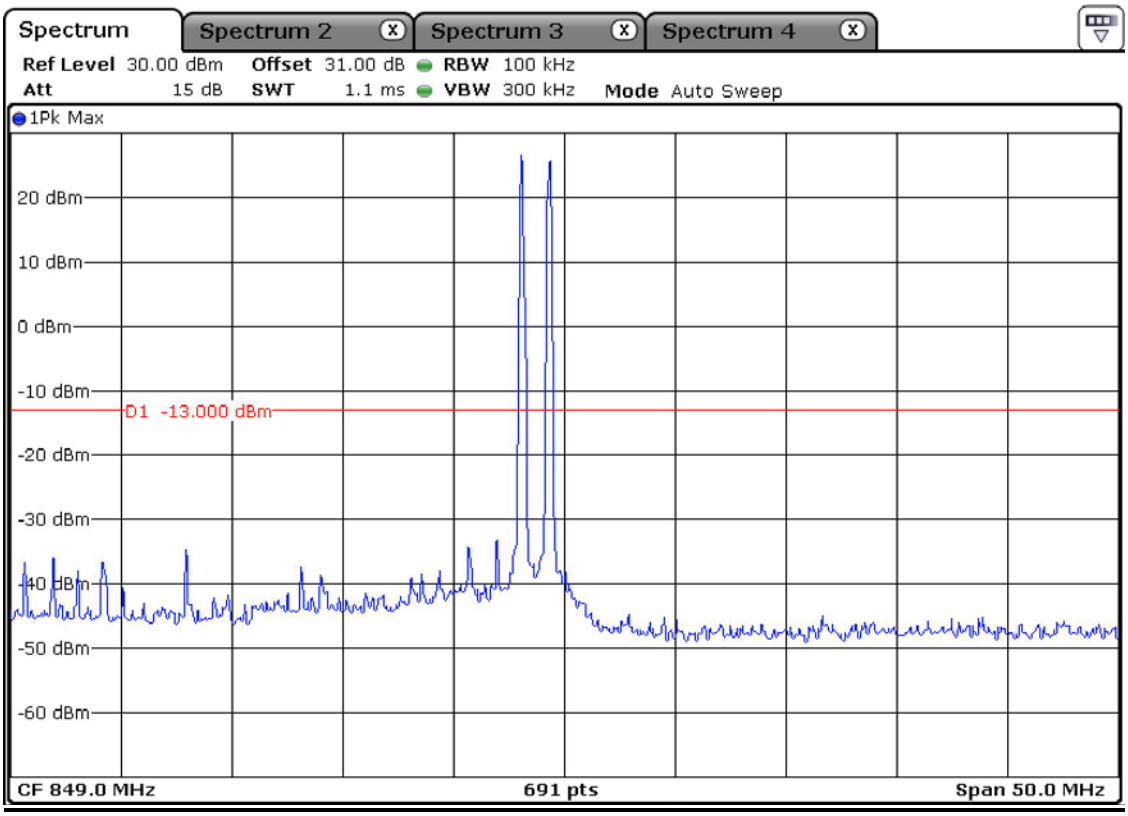
CDMA 850 High_DL



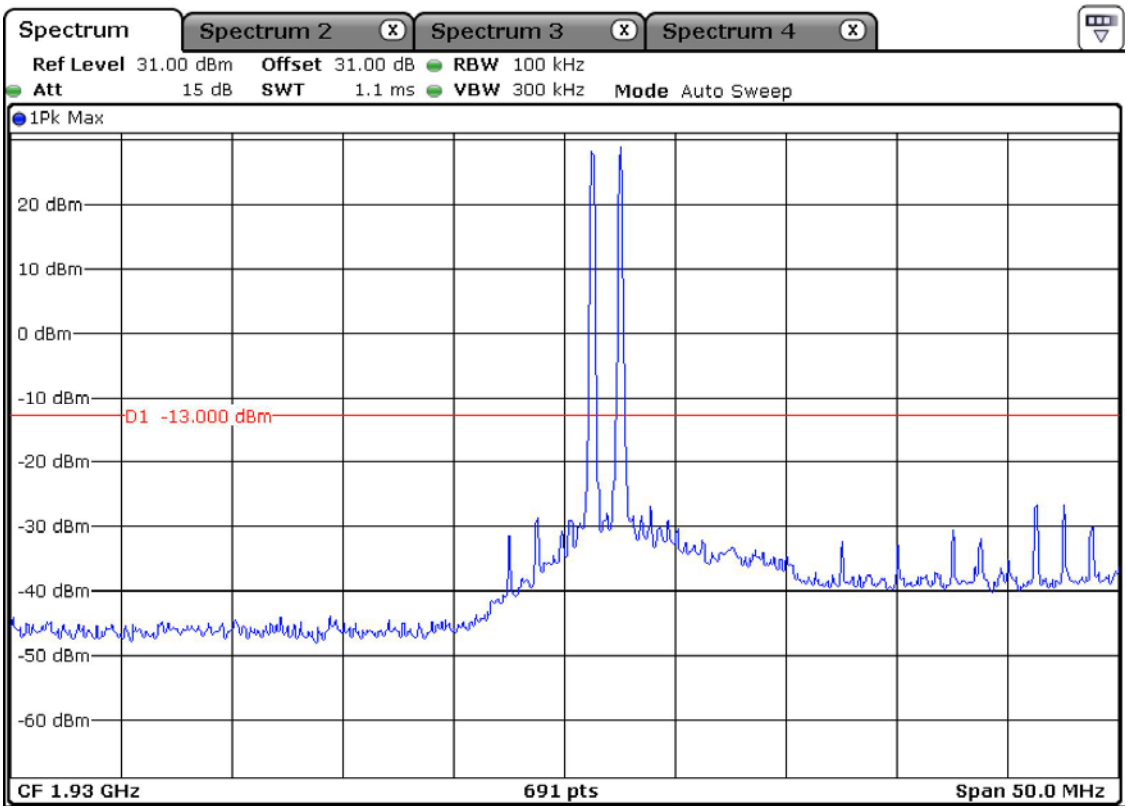
CDMA 850 Low_UL



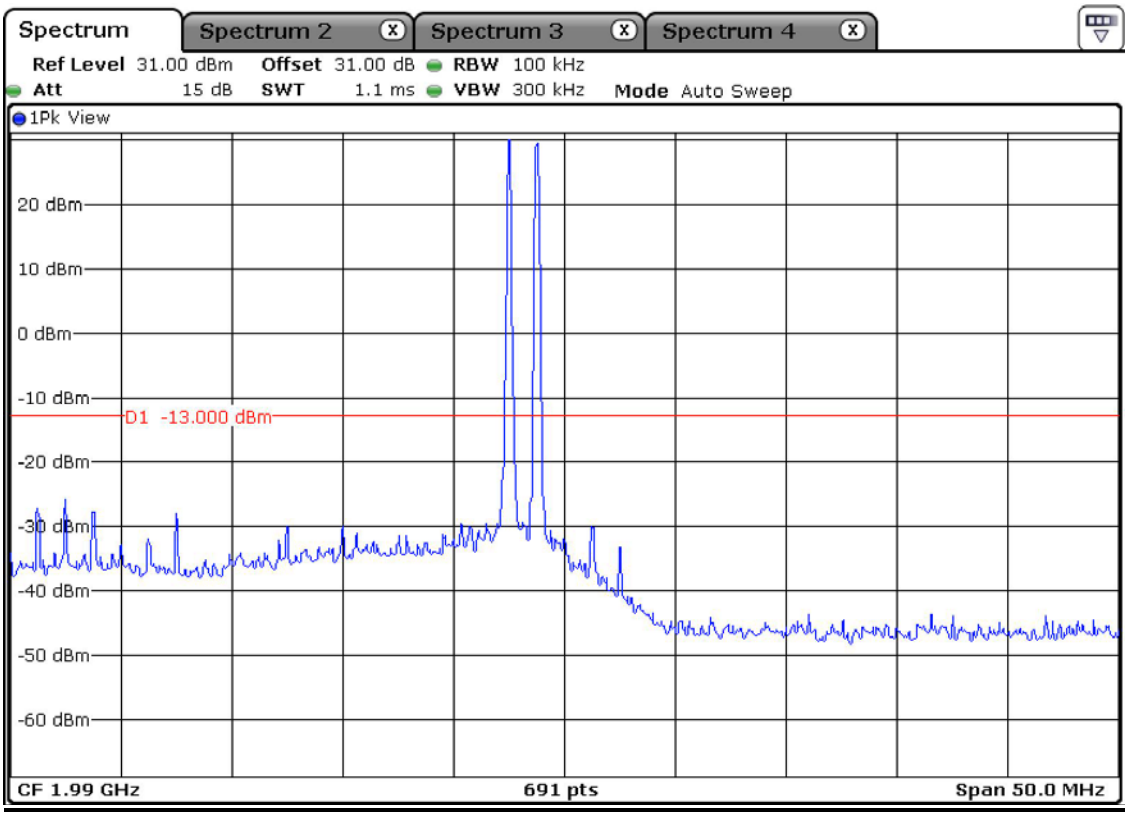
CDMA 850 High_UL



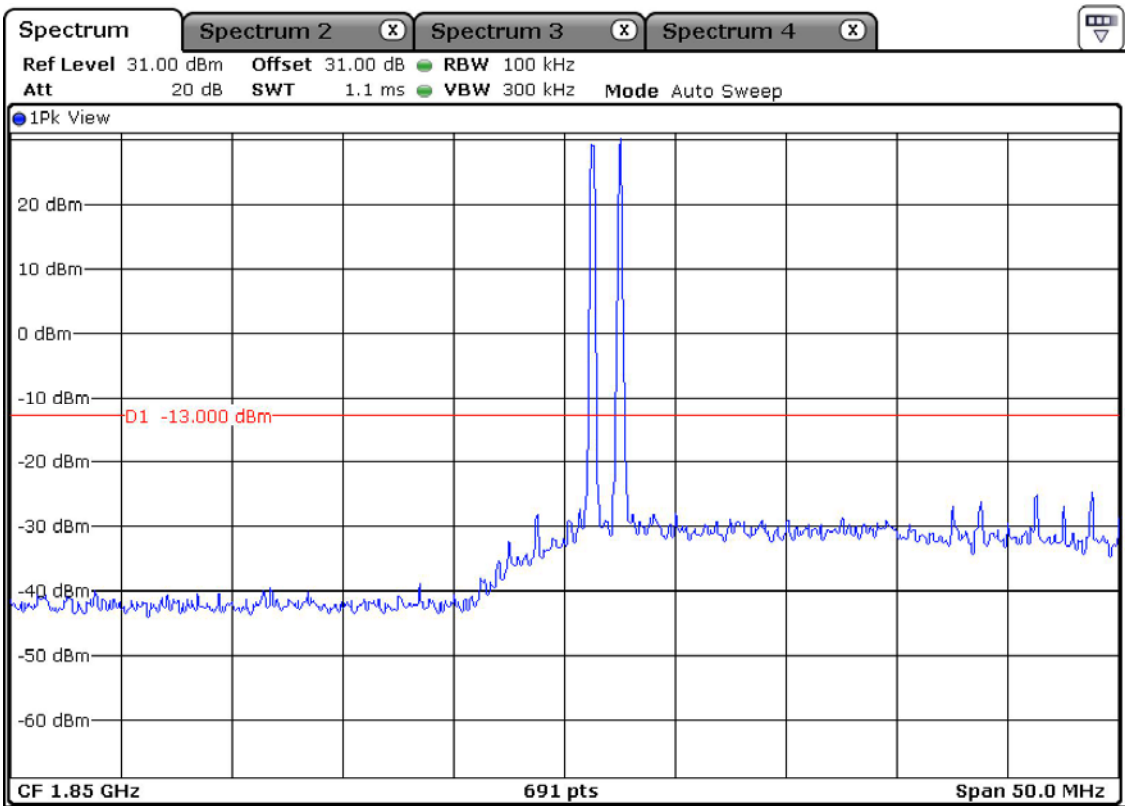
PCS 1900 Low_DL



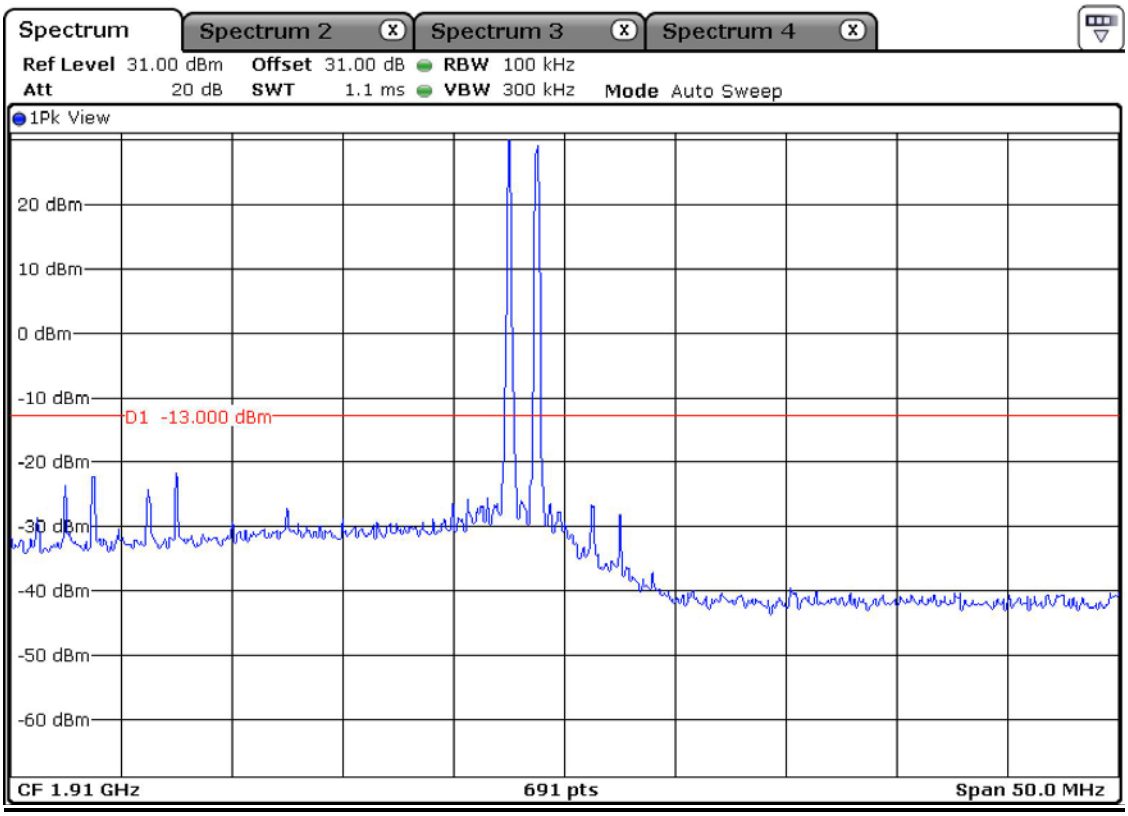
PCS 1900 High_DL



PCS 1900 Low_UL



PCS 1900 High_UL



3.2.5 Transmitter Spurious Radiation

4. Requirement

The power of any emissions 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. Note: That corresponds to the level of -13 dBm for any radiated out-of-band and spurious emissions.

5. Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The frequency range up to 10-th harmonic of each of the three fundamental frequencies (low, middle, and high channels) was investigated. The worst case of emissions are reported. For spurious emissions attenuation, the substitution method was used. The EUT was substituted by a reference antenna (half-wave dipole - below 1 GHz, or Horn antenna - above 1GHz), connected to a signal generator. The signal generator output level (Vg in dBm) was adjusted to obtain the same reading as from EUT. The EIRP at the spurious emissions frequency was calculated as follows.

EIRP(dBm)= Vg + G (dBi)

The EUT output port was connected to a 50 Ω termination load.

6. Test Results : Complies

***** EIRP is calculated as: EIRP(dBm)= Vg(dBm) + G (dBi)

All other emissions not reported are more than 20 dB below the limit.

Transmitter Spurious Radiated Emissions – CDMA 850_DL_UL

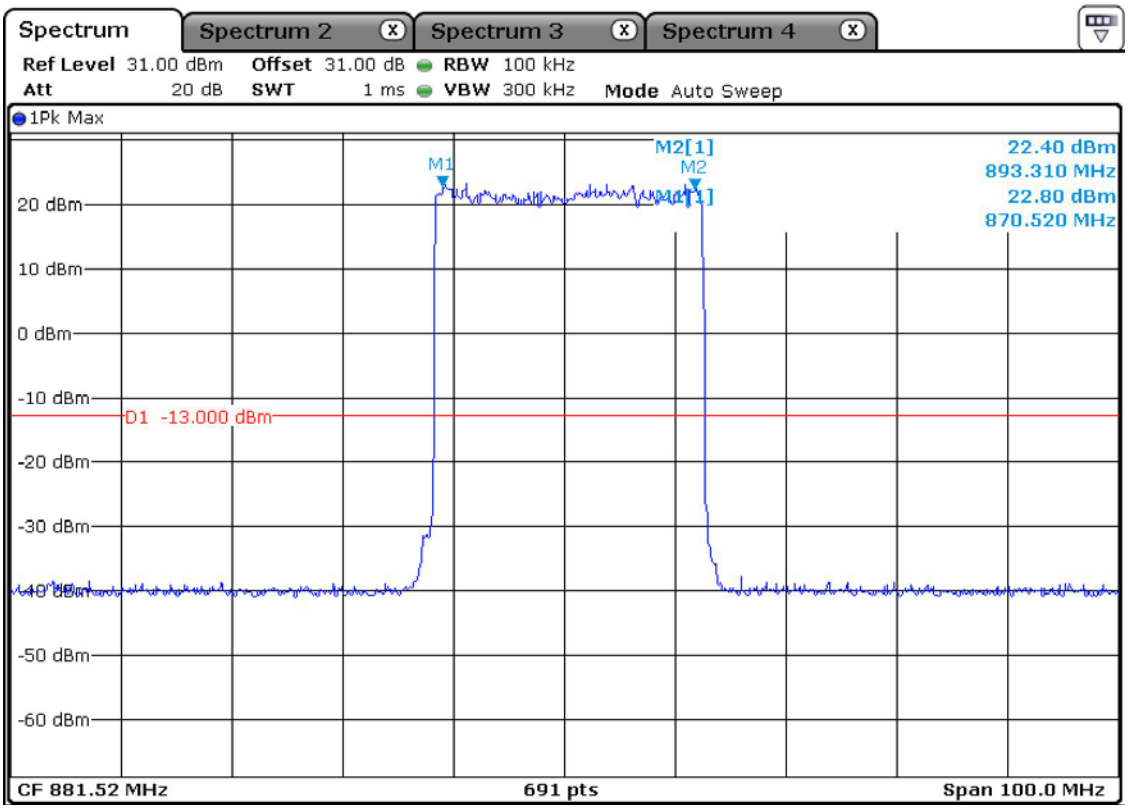
Frequency [MHz]	SA Reading [dBuV/m]	Signal Generator Output required to have the same SA Reading as from EUT [dBm]	EIRP [dBm]	Limit [dBm]	Margin [dB]
All other emissions not reported are more than 20 dB below the limit.					

Transmitter Spurious Radiated Emissions – PCS 1900_DL_UL

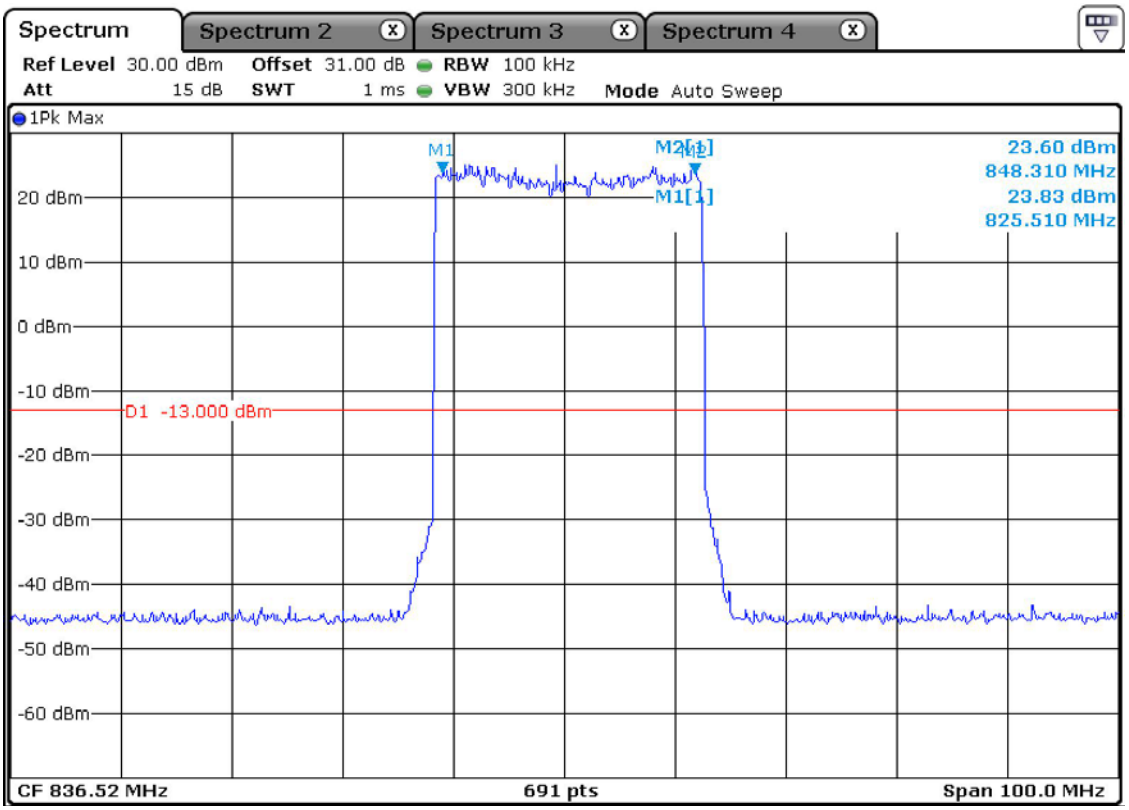
Frequency [MHz]	SA Reading [dBuV/m]	Signal Generator Output required to have the same SA Reading as from EUT [dBm]	EIRP [dBm]	Limit [dBm]	Margin [dB]
All other emissions not reported are more than 20 dB below the limit.					

3.2.6 Out-of-Band Rejection

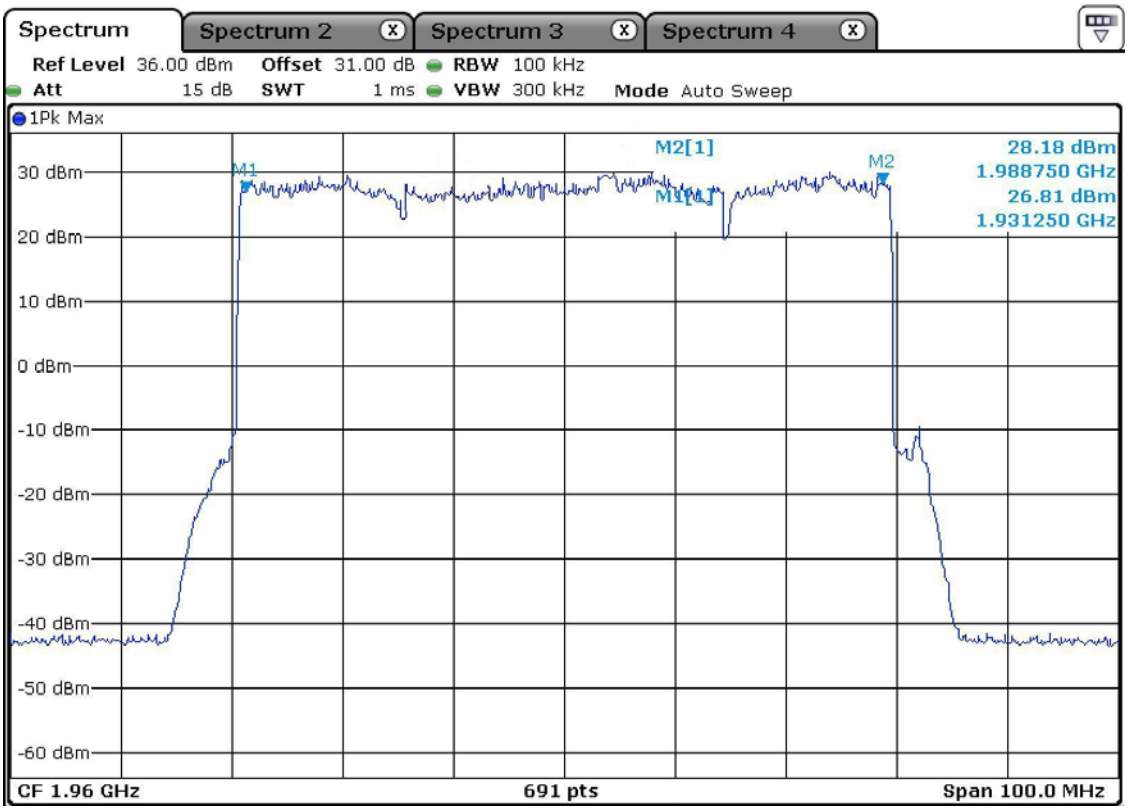
Downlink Band Pass – CDMA 850 mode_DL



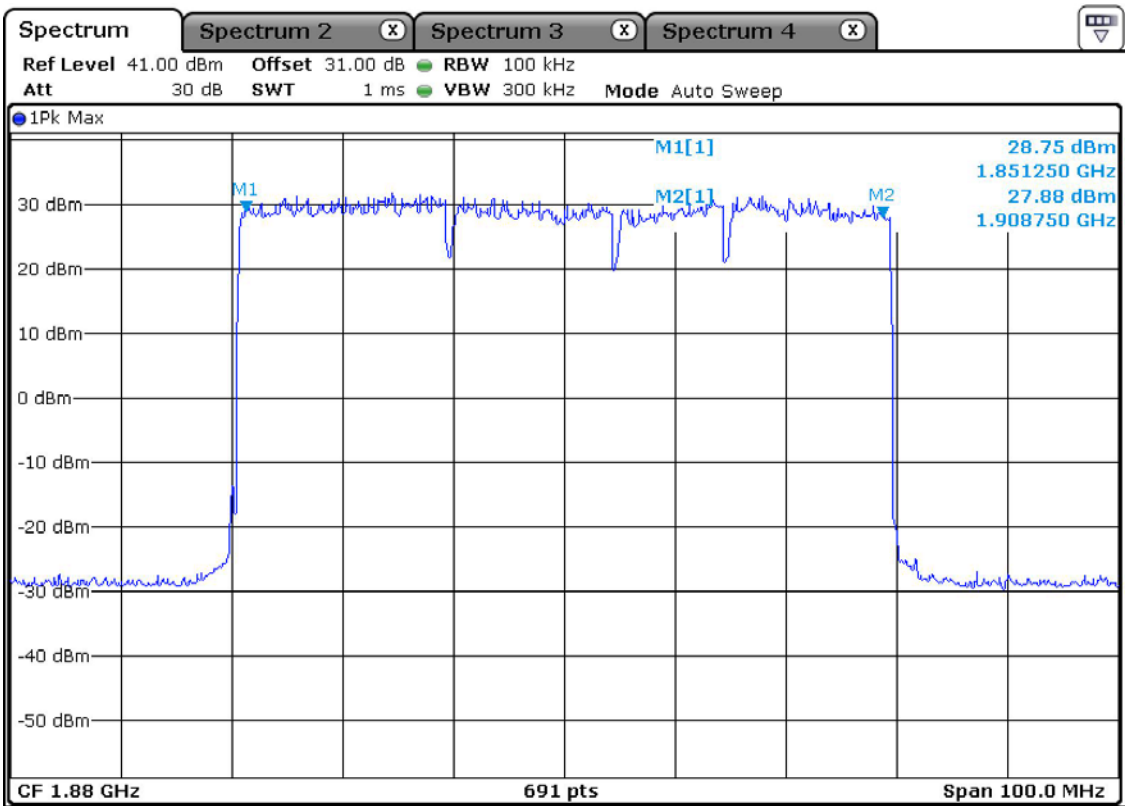
Downlink Band Pass – CDMA 850 mode_UL



Downlink Band Pass – PCS 1900 mode_DL



Downlink Band Pass – PCS 1900 mode_UL



3.2.7 Frequency Stability

1. Requirement

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

2. Test Procedure

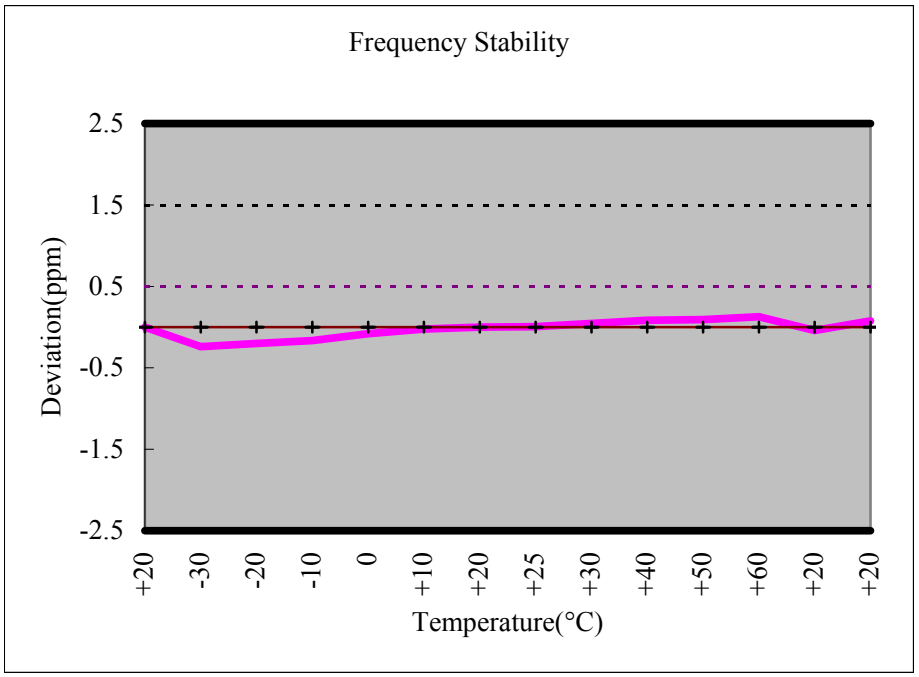
The EUT was placed inside the temperature chamber. The RF output port was connected to a spectrum analyzer. The EUT was setup to transmit the maximum power. After the temperature stabilized for approximately 20 minutes, the transmitting frequency was measured by the spectrum analyzer and recorded. At room temperature, the frequency was measured when the EUT was powered with the nominal voltage and with 85% and 115% of the nominal voltage.

3. Test Results : Complies

-refer to the next page

OPERATING FREQUENCY : 1,960,001,423 Hz
CHANNEL : 661(Mid)
REFERENCE VOLTAGE : 120 VAC
DEVIATION LIMIT : ± 0.00010 % or 1 ppm

VOLTAGE (%)	**POWER** (VAC)	TEMP (dB)	**FREQ** (Hz)	**Deviation** (%)
100%	120	+20(Ref)	1,960,000,923	Ref
100%		-30	1,960,000,954	-0.000024
100%		-20	1,960,001,031	-0.000020
100%		-10	1,960,001,098	-0.000017
100%		0	1,960,001,265	-0.000008
100%		+10	1,960,001,376	-0.000002
100%		+20	1,960,001,423	0.000000
100%		+25	1,960,001,436	0.000001
100%		+30	1,960,001,513	0.000005
100%		+40	1,960,001,589	0.000008
100%		+50	1,960,001,604	0.000009
100%		+60	1,960,001,675	0.000013
85%	102	+20	1,960,001,342	-0.000004
115%	138	+20	1,960,001,574	0.000008



3.3 CONCLUSION

The data collected shows that the **ARTECH Co., Ltd. Quad-band Over the Air Repeater FCC ID: YM4OTAVQ100** complies with all the requirements of Parts 2,22, 24 of the FCC Rules.

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APPENDIX 1

TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Next Cal. Date
1	Spectrum Analyzer	FSV-30	100757	R&S	Feb-11
2	Spectrum Analyzer	8563E	3425A02505	HP	Mar-11
3	Spectrum Analyzer	8594E	3710A04074	HP	Oct-10
4	VECTOR SIGNAL GENERATOR	SMBV100A	255081	R&S	May-11
5	Signal Generator	83711B	US34490456	HP	Mar-11
6	Attenuator (3dB)	8491A	37822	HP	Oct-10
7	Attenuator (10dB)	8491A	63196	HP	Oct-10
8	Attenuator (30dB)	8498A	1801A06689	HP	Oct-10
9	EMI Test Receiver	ESVD	843748/001	R&S	Mar-11
10	Horn Antenna(18 ~ 40GHz)	SAS-574	154	Schwarzbeck	Nov-10
11	Horn Antenna(18 ~ 40GHz)	SAS-574	155	Schwarzbeck	Nov-10
12	RF Amplifier	8447D	2949A02670	HP	Oct-10
13	RF Amplifier	8449B	3008A02126	HP	Mar-11
14	Test Receiver	ESHS10	828404/009	R&S	Mar-11
15	TRILOG Antenna	VULB 9160	9160-3212	SCHWARZBECK	Apr-11
16	Log.-Per. Antenna	VULP 9118	9118 A 401	SCHWARZBECK	Apr-11
17	Biconical Antenna	BBA 9106	VHA 9103-2315	SCHWARZBECK	Apr-11
18	Horn Antenna	3115	00055005	ETS LINDGREN	Mar-11
19	Horn Antenna	BBHA 9120D	9120D122	SCHWARZBECK	Dec-11
20	Dipole Antenna	VHA9103	2116	SCHWARZBECK	Nov-10
21	Dipole Antenna	VHA9103	2117	SCHWARZBECK	Nov-10
22	Dipole Antenna	VHA9105	2261	SCHWARZBECK	Nov-10
23	Dipole Antenna	VHA9105	2262	SCHWARZBECK	Nov-10
24	Hygro-Thermograph	THB-36	0041557-01	ISUZU	Mar-11
25	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-
26	RF Switch	MP59B	6200414971	ANRITSU	-
27	Power Divider	11636A	6243	HP	Oct-10
28	DC Power Supply	6622A	3448A03079	HP	Oct-10
29	Frequency Counter	5342A	2826A12411	HP	Mar-11
30	Power Meter	EPM-441A	GB32481702	HP	Mar-11
31	Power Sensor	8481A	2702A64048	HP	Mar-11
32	Audio Analyzer	8903B	3729A18901	HP	Oct-10
33	Modulation Analyzer	8901B	3749A05878	HP	Oct-10
34	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	Oct-10
36	Stop Watch	HS-3	601Q09R	CASIO	Mar-11
37	LISN	ENV216	100408	R&S	Oct-10
38	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	May-12