Project:	**07CA35305**
File:	**TC8314**
Report:	**07CA35305-FCC**
Date:	**Aug. 03, 2007**
Model:	**SKSN-I15-CO**

Electromagnetic Compatibility Test Report

FCC Certification
47 CFR Part 90 Subpart I

For

SK Telesys Co.,Ltd.

12F, Chorim Bldg. 6-3, Sunae-Dong,
Buandang-Gu, Seongnam, Gyeonggi-Do,
463-825, Korea

UL Korea Ltd.

33rd Fl. Star Tower, 737 Yeoksam-Dong, Kangnam-Gu, Seoul, 135-984, Korea

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Report Directory

Test Report Details :

Tests Performed By:	UL Korea Ltd. 33rd FL. Star Tower 737 Yeoksam-dong, Kangnam-ku, Seoul, 135-984, Korea
Test Site:	Estech Co.,Ltd. 97-1, Hoeok-Ri, Majang-Myun, Icheon-City, Kyonggi-Do,467-811, Korea FCC Registration No. : 94696
Tests Performed For:	SK Telesys Co.,Ltd. 12F, Chorim Bldg. 6-3, Sunae-Dong, Buandang-Gu, Seongnam, Gyeonggi-Do, 463-825, Korea
Applicant Contact:	Jae Hyung, Kim
Title:	Manager / RF Development Team
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E-mail:	kjhyung@sktelesys.com
Test Report Number:	07CA30305-FCC
Test Report Date:	August 03, 2007
Equipment Class:	TNB - Licensed Non-Broadcast Station Transmitter
Product Type:	iDEN RF Repeater
Model Number:	SKSN-I15-CO
FCC ID:	VAWSKSN-I15-CO
Test standards	47 CFR Part 90 Subpart I & Part 15 Subpart B
Sample Serial Number:	Prototype
Sample Receive Date:	2007-07-05
Testing Start Date:	2007-07-05
Date Testing Complete:	2007-07-24
Overall Results:	Pass

UL Korea as an affiliate of Underwriters Laboratories Inc. EMC report apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

Summary of Testing:

The following tests were performed on a sample submitted for evaluation of compliance with 47 CFR Part 90 Subpart I and Part 15 Subpart B.

Test #	Test Name Test Requirement/Specification	Compliant	Not Compliant	See Remark
1	Part 15, Subpart B Section 15.109(a)/ CISPR 22:1997 Class A Radiated Emissions - 30 to 1000 MHz Electric Field	X	-	2
2	Part 15, Subpart B Section 15.107(a) / CISPR 22:1997 Class A Conducted Emissions	X	-	2
3	Section 2.1046 & 90.205 RF Power Output	X		
4	Section 2.1047 & 90.212 Audio Frequency Response	-	-	1
5	Section 2.1047 Modulation Limiting	-	-	1
6	Section 2.1047 & 90.209 Occupied Bandwidth	X		
7	Section 2.1051 & 90.210, 90.669 Spurious Emission at antenna terminal	X		
8	Section 2.1053 & 90.210 Radiated Spurious Emission	X		
9	Section 2.1055 & 90.213 Frequency Stability	X		
10	Out of band Rejection	X		
11	RF Exposure			3

Remarks:

1) Not applicable to this EUT.
2) Emissions Data can also be considered applicable to FCC Part 15 Subpart A.
3) RF Exposure will be addressed at the time of licensing.
4) Modifications to EUT required for compliance: NONE.

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

Tested By:

Kyung Yong, Kim
EMC Engineer
UL Korea Ltd.

Reviewed By:

Jea Woon, Choi
EMC Engineer
UL Korea Ltd.

1. G E N E R A L - Product Description

1.1 Equipment Description

The SK telesys SKSN-I15-CO is an dual band bi-directional RF signal amplifier system for the wireless SMR 800 MHz and 900 MHz iDEN spectrum bands. The iDEN (Integrated Digital Enhanced Network) RF repeater is a RF repeater for indoor use using a frequency band of iDEN networks. This dual band RF repeater is designed to be elastically applicable to frequency of iDEN band, is excellent in frequency selection levels of frequency bandwidth to service of down links and up links through an up/down converter module, and minimizes interference in other signals.

-. Basic model tested : SKSN-I15-CO
-. Model covered : SKSN-I15-CM , SKSN-I15-NO

Items		Standards
Frequency Range	800MHz band	Downlink : 851~869MHz , Uplink : 806~824MHz Downlink : 862~869MHz , Uplink : 817~824MHz
	900MHz band	Downlink : 935~940MHz , Uplink : 896~901MHz
Output Power per channel / Amplifier Gain		15 dBm / 65dB
Modulation		QAM
Emission Designator		GXW(iDEN)
Input Level		-25 ~ -50dBm / Total
Gain Control Range		25 dB(1dB/Step±0.5dB or less)
Out of band paging carrier rejection		929~932MHz(3MHz), 940~941MHz(1MHz)
Input/output connector		50Ω N-Type (Female)
Cabinet		Indoor type
Size (H*W*D)		390*326*190 mm
Working temperature/ working humidity		-10℃ ~ 50℃ / 5 % ~ 95%
Power		108 ~ 127 VAC, 60Hz

1.2 Equipment

1.3 Equipment Marking Plate

PRODUCT NAME : iDEN Repeater
MODEL : SKSN-I15-CO
S/N : TSKAABBB1234
PRODUCTION DATE : 2007.
MANUFACTURER : SK telesys
MADE IN KOREA
Customer Service : Call 1-888-758-7002, or
Send e-mail to service@sktelesys.com

c UL us LISTED
E312829
I.T.E.
3LBK
INPUT : 120V~, 60Hz, 1.9A
FCC ID : VAWSKSN-I15-CO

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference and (2) This device must accept any interference received, including interference that may cause undesired operation.

2. Test Conditions

2.1 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	iDEN Repeater	SK Telesys	SKCN-I15-CO	Indoor metal enclosure
AE	RF Attenuator	Agilent	30 dB	
AE	RF Attenuator	HP	30 dB	

Note:
* **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)

2.2 Input/Output Ports

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	Metal cabinet type (indoor purpose)
1	Mains (AC input)	AC	< 3m	N	Cable length (1m)
2	Antenna port (Donor)	RF	N	Y	Connected to RF Load
3	Antenna port (Service)	RF	N	Y	Connected to RF Load
4	Coupling Port	RF	-	-	No use : Maintenance purpose only
5	Coupling Port	RF	-	-	No use : Maintenance purpose only

Note:
*AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

2.3 Test Equipments used

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Agilent	E4432B	US40052949	2007-05-02	2008-05-02
Signal Generator	Agilent	E4436B	US39260374	2006-11-07	2007-11-07
Spectrum Analyzer	Agilent	E4445A	US42220280	2006-10-20	2007-10-20
Signal Generator	Aeroflex	IFR3413	341006/206	2007-05-02	2008-05-02
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-
Fixed Attenuator	Agilent	30 dB	MY41495110	-	-
Fixed Attenuator	HP	30 dB	3318A10568	-	-
Frequency Divider	Wavetek	4PD-2142.5W10 EM	71010010	-	-

2.4 Power Interface

Mode #	Voltage (V)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	120Vac	60Hz	Single Phase	Nominal voltage
1	120Vac	60Hz	Single Phase	
2	108Vac	60Hz	Single Phase	Voltage variation (Norminal-15%)
3	138Vac	60Hz	Single Phase	Voltage variation (Norminal+15%)

2.5 EUT Internal Operating Frequencies

Frequency (MHz)	Description	Frequency (MHz)	Description

Note : The data has not been provided from the applicant.

2.6 EUT Operation Modes

Mode #	Description
1	Transmission mode : RF signal from the iDEN signal generator injected to the service port of the repeater and the amplified RF output signal from the Doner port of the repeater was connected to the RF Load.
2	Uplink mode : RF signal from the iDEN signal generator injected to the service port of the repeater and the amplified RF output signal from the Doner port of the repeater was connected to the Spectrum analyzer.
3	Downlink mode : RF signal from the iDEN signal generator injected to the Doner port of the repeater and the amplified RF output signal from the Service port of the repeater was connected to the Spectrum analyzer.

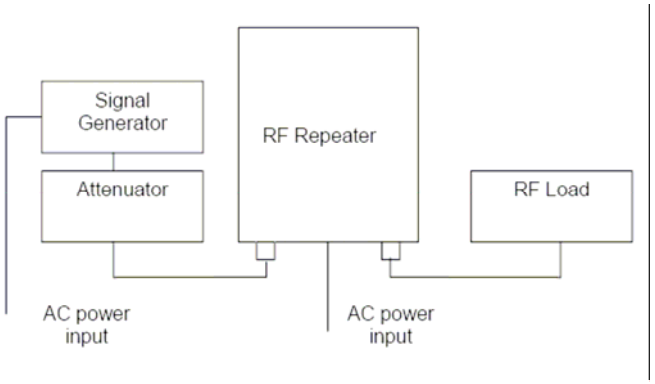
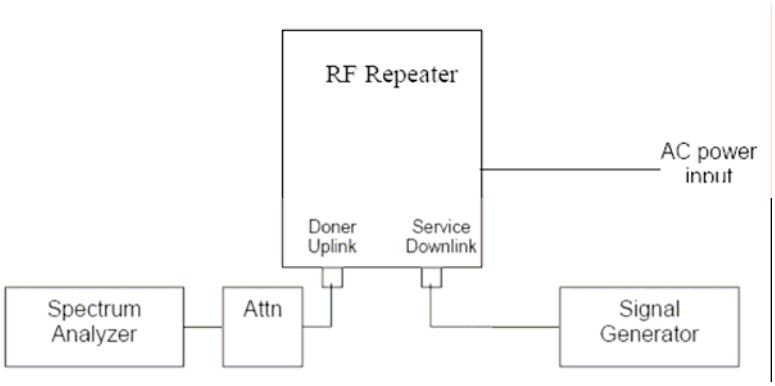
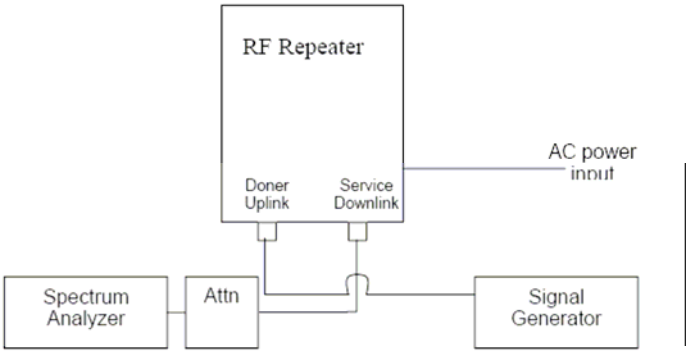
2.7 EUT Operating Frequencies

Mode #	Description
1	Uplink mode : 3 frequencies (Bottom, Mid, Top channel) for each frequency band -. 18 MHz band : 806 MHz, 815 MHz, 824 MHz -. 7 MHz band : 817 MHz, 820.5 MHz, 824 MHz -. 5 MHz band : 896 MHz, 898.5 MHz, 901 MHz
2	Downlink mode : 3 frequencies (Bottom, Mid, Top channel) for each frequency band -. 18 MHz band : 851 MHz, 860 MHz, 869 MHz -. 7 MHz band : 862 MHz, 865.5 MHz, 869 MHz -. 5 MHz band : 935 MHz, 937.5 MHz, 940 MHz

2.8 Test Signal Source

The carrier from the signal generator applied to the repeater was a Quadrature Amplitude Modulation(QAM)
-. Baseband Modulation type : 16-QAM, 64 kbps Random Data Per Channel
-. Baseband Channelization : 25 kHz
-. Signal source sample rate : 640ks/sec
-. No. of samples : 960,000
- RMS Value : 2907
- Crest factor : 9.475dB

2.9 EUT Configurations

Mode #	Description
1	 **Test Configuration of EMI Measurement**
2	 **Test Configuration of Conducted Measurement – Up link**
3	 **Test Configuration of Conducted Measurement – Down link**

2.10 Test Lab Environmental Condition

Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	25 °C
	Relative Humidity	40 %

2.11 Test Specifications

Standard Number	Standard Name	Standard Date
CFR 47 Part 24 Subpart E	Personal Communication Service – Broadband PCS	2006
CFR 47 Part 15 Subpart B	General Technical requirements	2006
ANSI C63.4-2003	Methods of Measurements of Radio-Noise Emission from Low voltage and electrical equipment in the range of 9kHz~40GHz	2003
EIA/TIA-603 Edition C 2004	Land Mobile FM or PM communication equipment measurement and performance standards	2004
FCC 2-11-04	EAB/RF Amplifier, Booster, and Repeater reminder	2004

2.12 Test Laboratory Details

All the testing has been performed by UL Korea engineer at both test laboratories described below. The radiated spurious emission measurements were performed in a 10 meter open site which has been filed to the commission in accordance with section 2.948 at Estech Co. Ltd.

Conducted RF Measurement Test Laboratory : SK Telesys Test Lab (Manufacturer's Test Lab)
Location : 12F, Chorim Bldg. 6-3, Sunae-Dong, Buandang-Gu, Seongnam, Gyeonggi-Do, 463-825, Korea.
Persons who have been presented during the test : Si Hwan, Sung (Research engineer / SK Telesys) JaeHyung, Kim (Manager of R&D office/ SK Telesys), SeungYong, Lee(Engineer of R&D office/ SK Telesys)

Radiated Emission Measurement Test Laboratory : Estech Co., Ltd.
10 m Open Field Test Site (FCC Registration No. : 94696)
97-1, Hoeok-Ri, Majang-Myun, Icheon-City, Kyonggi-Do,467-811, Korea
Persons who have been presented during the test : Jin Mo, Yang (Senior test engineer)

3. Test Results

3.1 Test Conditions and Results – Conducted emissions at mains terminal

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.		
Basic Standard		ANSI C63.4-2003, 47 CFR § 15.107	
Parameters required prior to the test		Laboratory Ambient Temperature	10 to 40 °C
		Relative Humidity	10 to 90 %
Parameters recorded during the test		Laboratory Ambient Temperature	25 °C
		Relative Humidity	40 %
		Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range		150kHz to 30MHz	Mains

Limits - Class A

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60

Limits - Class B

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Supplementary information: **Class A limit applied.**

Conducted Emissions EUT Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	1	1

Supplementary information:

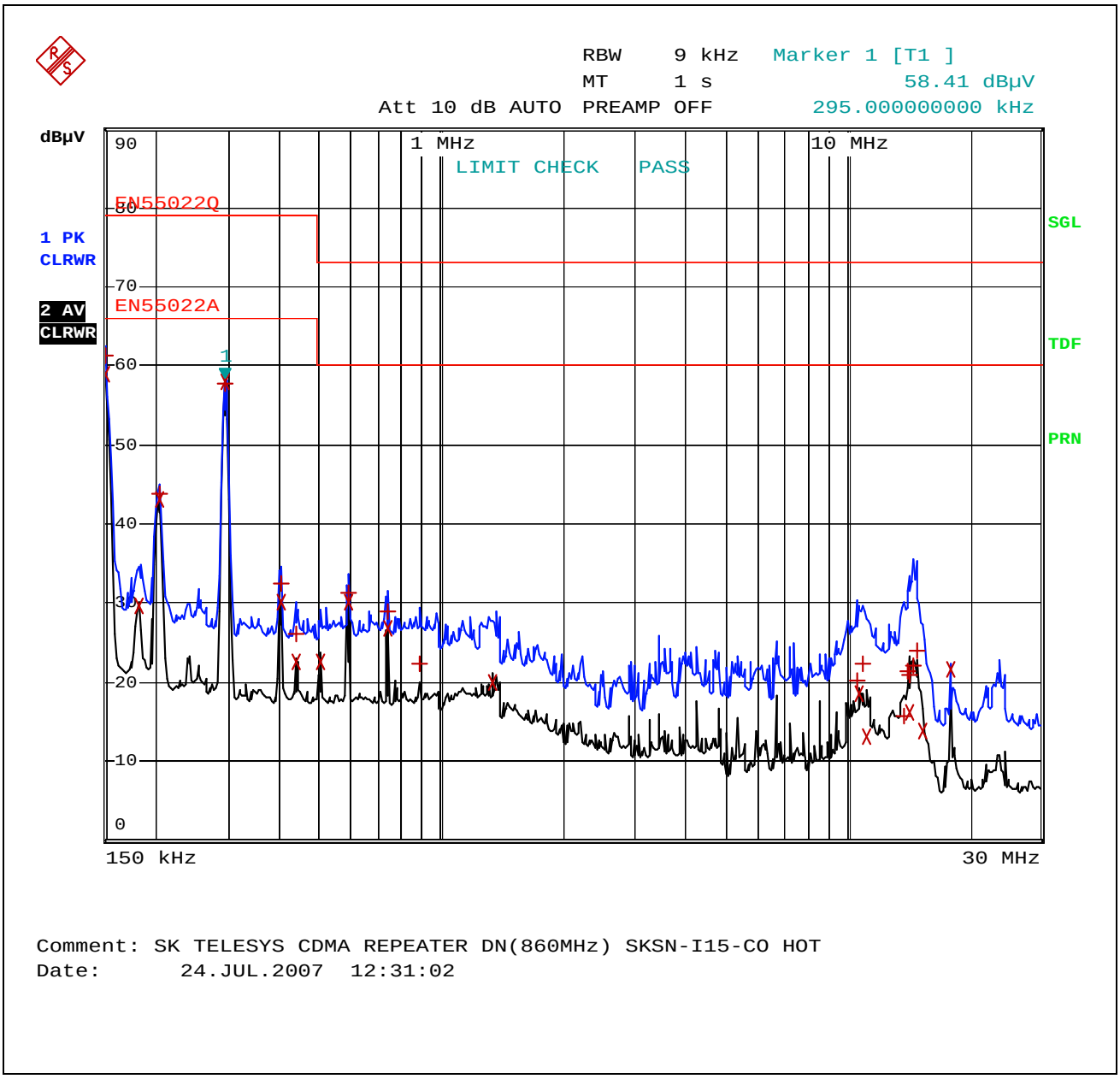
The EUT operation modes specified in Section 2.4 have been investigated and final measurement reported was performed with Uplink mode 18 MHz band Mid frequency(815MHz) as a worst case emission.

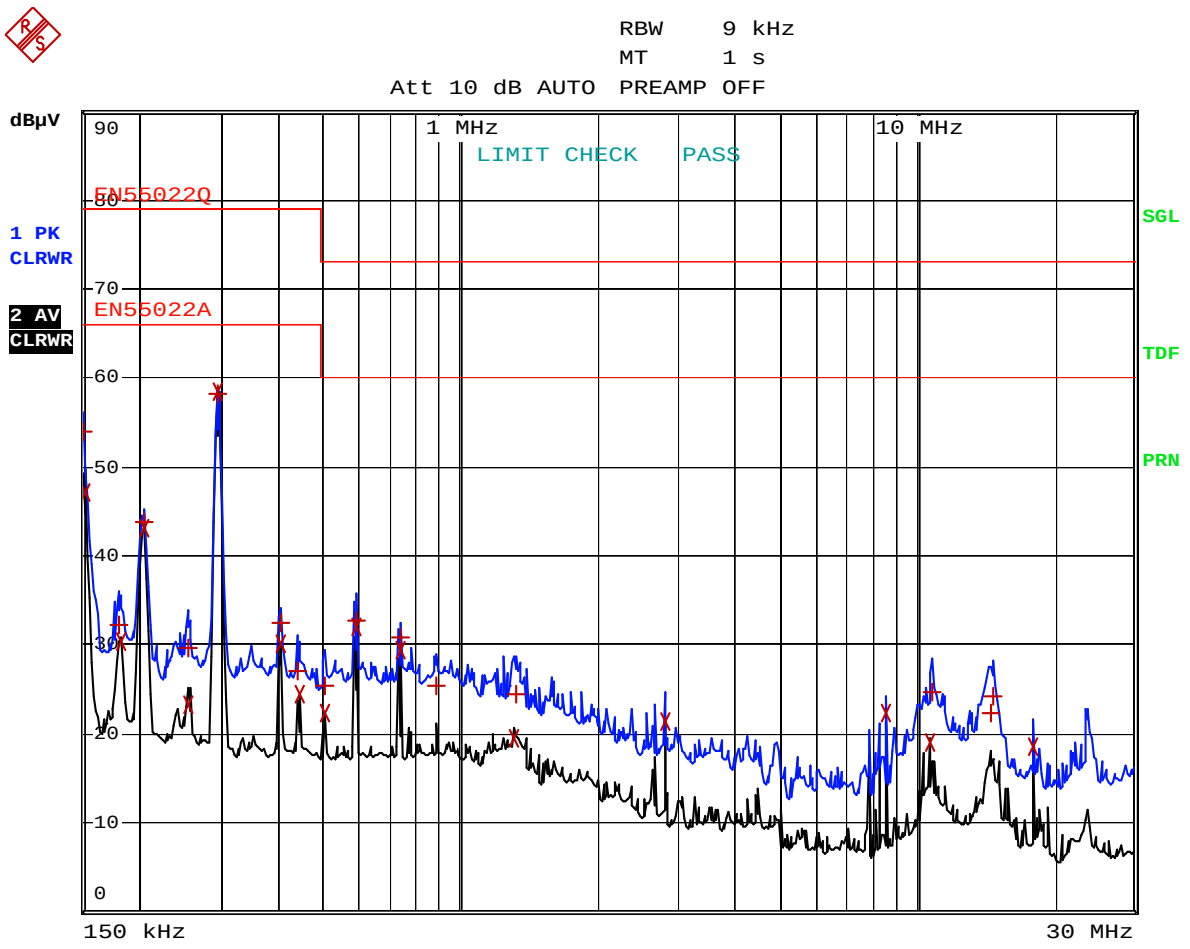
Conducted Emissions Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test Receiver	Rohde & Schwarz	ESP17	100185	2006.08.24	2007.08.24
LISN	COM-POWER	ESH3-Z5	838979/010	2007.02.27	2008.02.27
LISN	SCHWARZBECK	NNLA8120A	-	2007.02.27	2008.02.27
Pulse Limiter	Rohde & Schwarz	ESH3Z2	-	-	-

Figure 1 Test Setup for Conducted Emissions

Figure 2 Conducted Emissions Graph





Comment: SK TELESYS CDMA REPEATER DN(860MHz) SKSN-I15-CO NEUTRAL
Date: 24.JUL.2007 12:28:44

Table 1 Conducted Emissions Data Points

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP/Av)	Gain/Loss Factor (dB)	Transducer Factor (dB)	Emission Level (dBuV)	Class A QP Limit (dBuV)	Class A Ave Limit (dBuV)	Margin (dB)
0.15	61.27	QP	0.0	0.17	61.48	79.0	66.0	17.52
0.20	43.84	QP	0.1	0.15	44.05	79.0	66.0	34.95
0.30	58.25	QP	0.1	0.12	58.46	79.0	66.0	20.54
0.59	32.81	QP	0.1	0.15	33.06	79.0	66.0	39.94
0.74	30.93	QP	0.1	0.16	31.19	73.0	60.0	41.81
0.89	25.50	QP	0.2	0.20	25.86	73.0	60.0	47.14
10.99	22.34	QP	0.8	0.52	23.65	73.0	60.0	49.35
14.89	24.07	QP	1.0	0.71	25.78	73.0	60.0	47.22

Supplementary information:
-. Gain/Loss Factor : Cable loss , Transducer Factor : LISN insertion loss
-. Line polarity : HOT
-. Margin = Class A QP Limit – Emission Level
-. The emission data reported are the worst case emission data taken at Down link mode @ 860 MHz. All other frequencies have been investigated at preliminary testing and final measurement was made at the worst case emission mode.

3.2 Test Conditions and Results – Radiated Emissions

Test Description	Measurements were made in a 10-meter open field test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at semi anechoic chamber with antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Basic Standard	ANSI C63.4-2003, 47 CFR § 15.107 Class A	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	27 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	(10 meter measurement distance)

Limits - Class A

Frequency (MHz)	Limit (dBμV/m)	
	Quasi-Peak	Average
30 to 230	40	NA
230 to 1000	47	NA

Limits - Class B

Frequency (MHz)	Limit (dBμV/m)	
	Quasi-Peak	Average
30 to 230	30	NA
230 to 1000	37	NA

Supplementary information: **Class A limit applied.**

Radiated Emissions EUT Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See Section 2.6)
Rated	1	1
Supplementary information: The EUT operation modes specified in Section 2.4 have been investigated and final measurement reported was performed with Uplink mode 18 MHz band Mid frequency(815MHz) as a worst case emission.		

Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI test receiver	Rohde & Schwarz	ESVS10	838562/002	2007. 1. 23	2008. 1. 23
Spectrum Analyzer	Advantest	R3261C	61720116	2007. 4. 20	2008. 4. 20
Logbicon Antenna	Schwarzbeck	VULB 9160	3142	2007. 5. 07	2008. 5. 07
Amplifier	Rohde & Schwarz	8447F	2805A02972	2007. 6. 26	2008. 6. 26

Figure 3 Test setup for Radiated Emissions

Table 2 Radiated Emissions Data Points

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Emission Level dBuV/m	Class A Limit dBuV/m	Margin (dB)
56.37	10.20	QP	H	60	400	1.19	11.92	23.31	39.50	16.19
60.00	21.90	QP	V	70	100	1.23	11.56	34.69	39.50	4.81
120.00	21.40	QP	V	0	100	1.69	11.17	34.26	43.50	9.24
140.00	22.50	QP	V	170	100	1.84	12.73	37.07	43.50	6.43
200.00	24.60	QP	V	210	100	2.23	9.61	36.44	43.50	7.06
770.30	4.60	QP	H	290	110	5.80	22.05	32.46	46.50	14.04
968.44	11.20	QP	H	120	100	6.85	24.20	42.24	49.50	7.26

Supplementary information:

-. Margin = Class A Limit – Emission Level

-. All other emissions not reported were more than 25 dB below the permitted limit.

-. The emission data reported is the worst case emission data taken at Down link mode @ 937.5 MHz.
All other frequencies have been investigated at preliminary testing and final measurement was made at the worst case emission mode.

3.3 Test Conditions and Results – RF Power Output

Test Description	Measurements were made in the laboratory environment. For RF power measurements, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. The EUT was adjusted to produce maximum power rating of the product specification. The measurements were made at the EUT input and output ports in downlink and uplink transmit modes of operation at B,M,T channels.

Basic Standard	47 CFR § 2.1046, § 90.205, § 90.219	
Occupied Bandwidth Limits		
The Effective radiated power of base station and cellular repeater must not exceed 5 watts.		
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	40 %

RF output power Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	2,3	2,3
Supplementary information: None		

Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Agilent	E4432B	US40052949	2006-11-07	2007-11-07
Spectrum Analyzer	Agilent	E4445A	US42220283	2006-10-20	2007-10-20
Fixed Attenuator	Agilent	30 dB	MY41495110	-	-

Figure 4 Test setup for Conducted Measurement

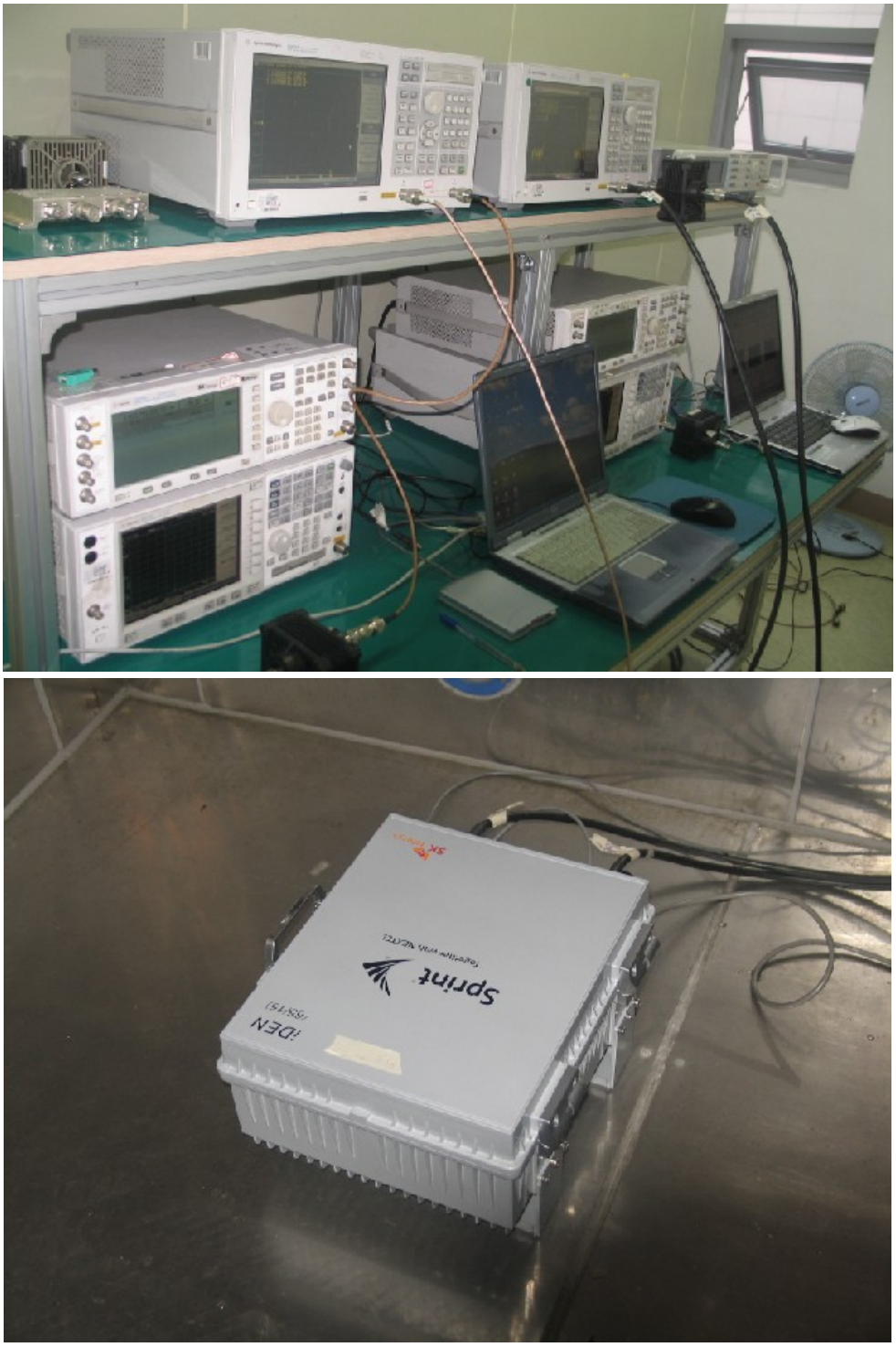


Table 3 RF output power measured data

Down Link

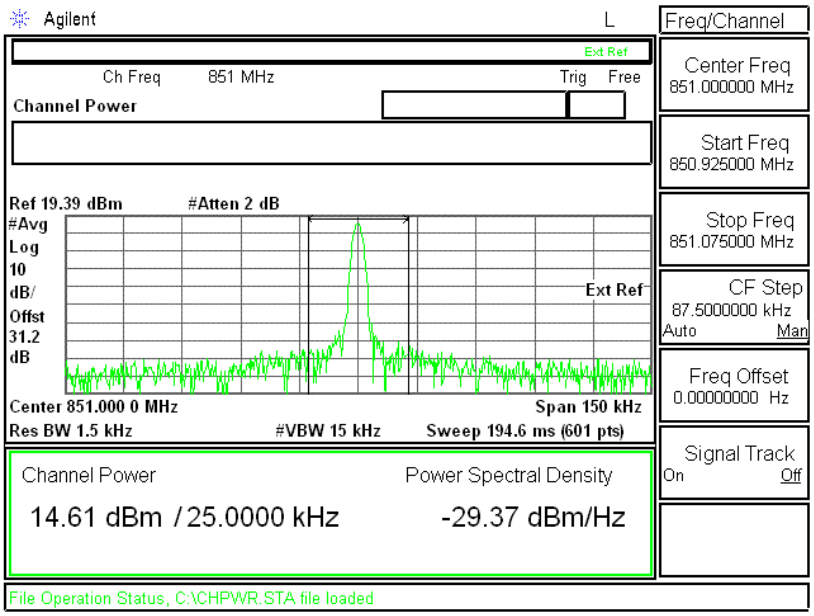
Carrier Band	Frequency (MHz)	Loss offset (dB)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
iDEN 18 MHz	851	31.2	14.61	37	22.39
	860	31.2	15.48	37	21.52
	869	31.2	14.76	37	22.24
iDEN 7 MHz	862	31.2	15.51	37	21.49
	865.5	31.2	15.67	37	21.33
	869	31.2	15.77	37	21.23
iDEN 5 MHz	935	31.2	14.88	37	22.12
	937.5	31.2	15.75	37	21.25
	940	31.2	14.78	37	22.22
Supplementary information: -. Modulation signal 16-QAM, Power measurement : Channel power w/ mean value -. Before the measurement, the system calibration for compensation of cable loss and attenuator has been made and included in the test result.					

Up Link

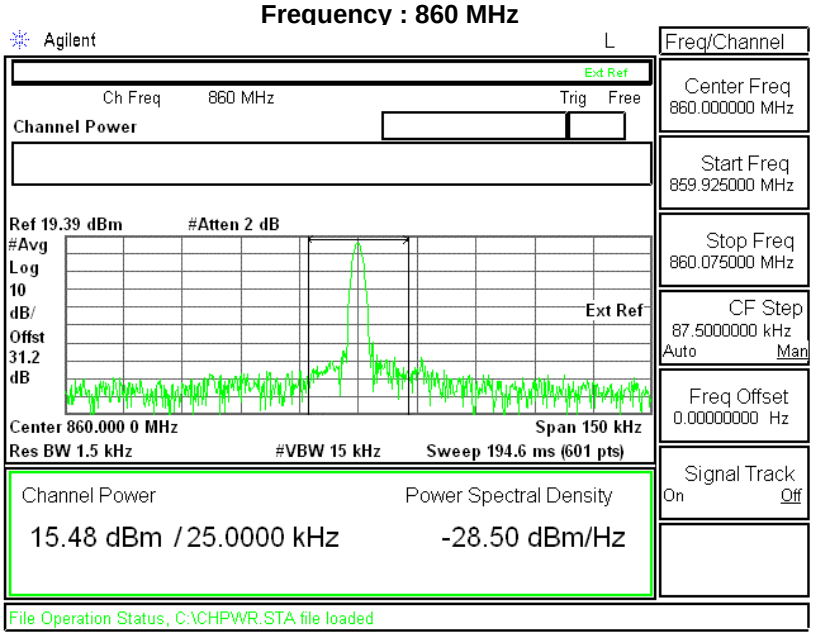
Carrier Band	Frequency (MHz)	Loss offset (dB)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
iDEN 18 MHz	806	31.2	15.93	37	21.07
	815	31.2	15.41	37	21.59
	824	31.2	15.15	37	21.85
iDEN 7 MHz	817	31.2	15.06	37	21.94
	820.5	31.2	15.56	37	21.44
	824	31.2	15.09	37	21.91
iDEN 5 MHz	896	31.2	15.36	37	21.64
	898.5	31.2	15.71	37	21.29
	901	31.2	15.69	37	21.31
Supplementary information: -. Modulation signal 16-QAM, Power measurement : Channel power w/ mean value -. Before the measurement, the system calibration for compensation of cable loss and attenuator has been made and included in the test result.					

Figure 5 RF output power graphical data

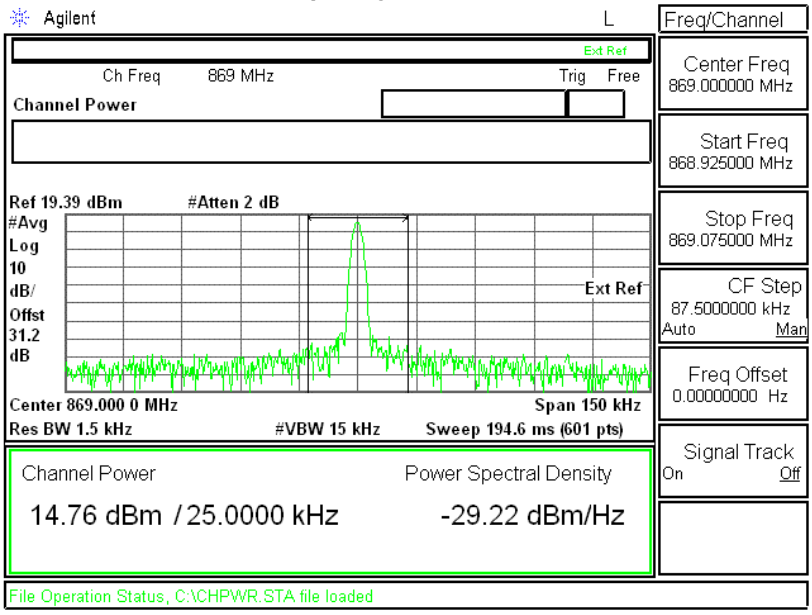
Mode : Down link
Carrier band : 18 MHz
Frequency : 851 MHz



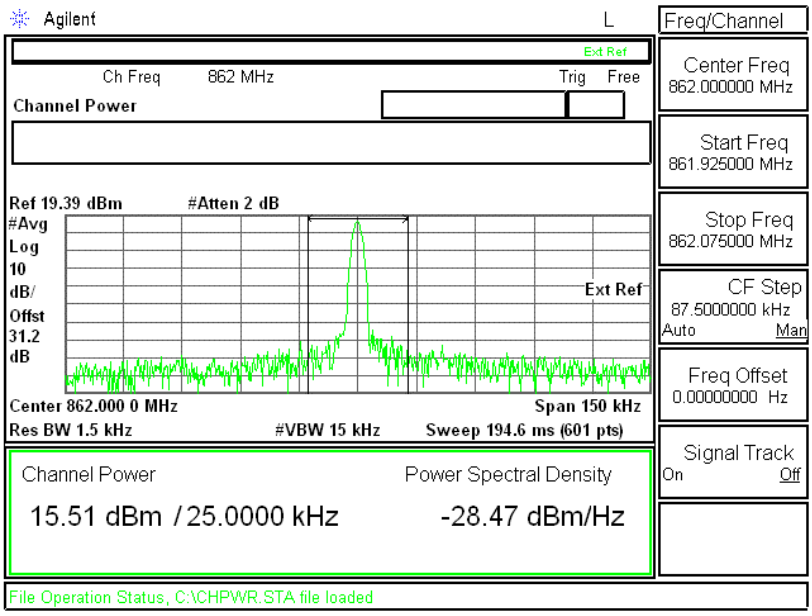
Mode : Down link
Carrier band : 18 MHz
Frequency : 860 MHz



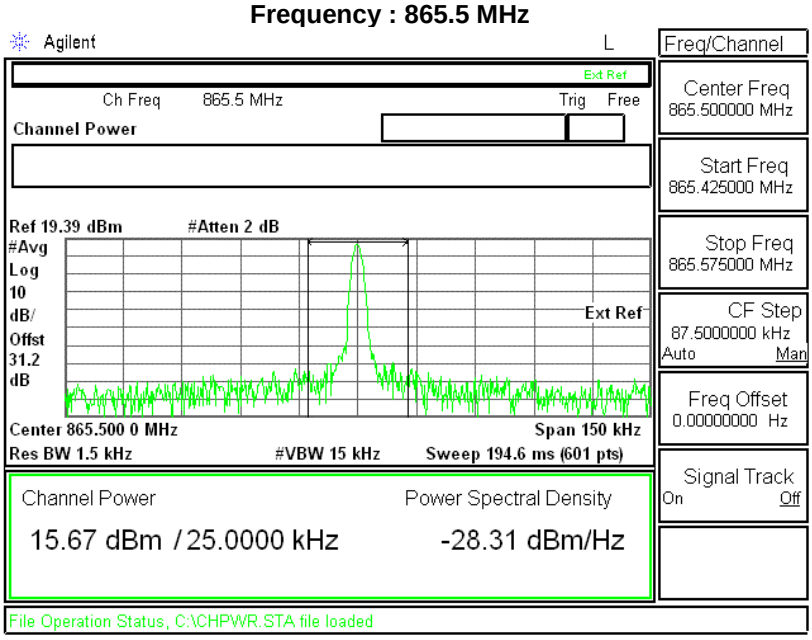
Mode : Down link
Carrier band : 18 MHz
Frequency : 869 MHz



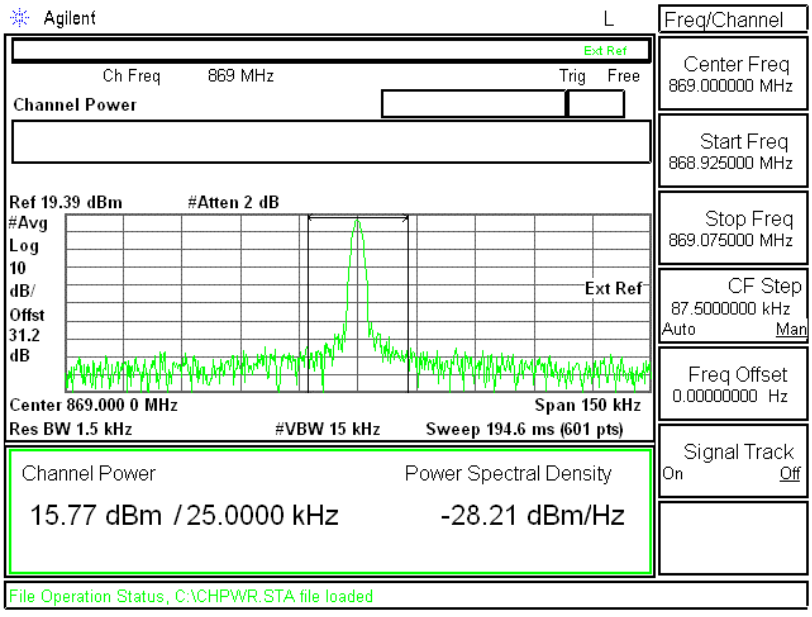
Mode : Down link
Carrier band : 7 MHz
Frequency : 862 MHz



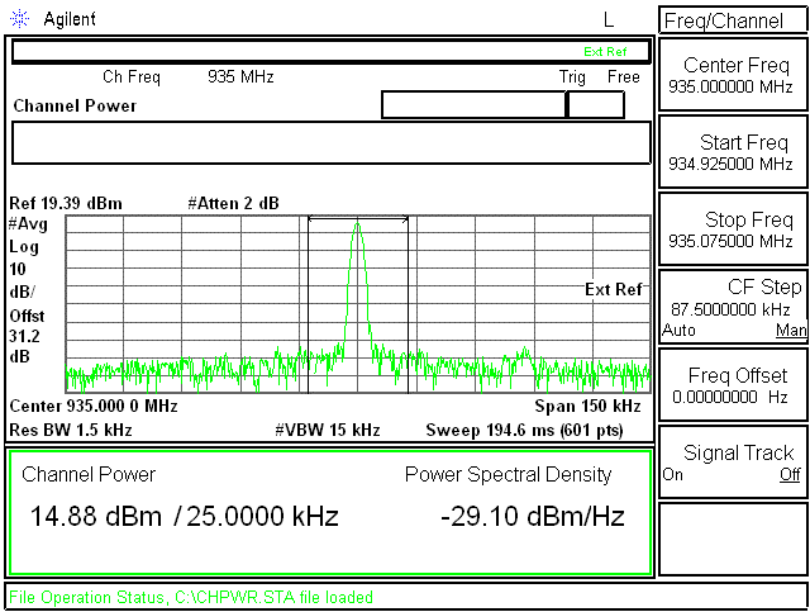
Mode : Down link
Carrier band : 7 MHz
Frequency : 865.5 MHz



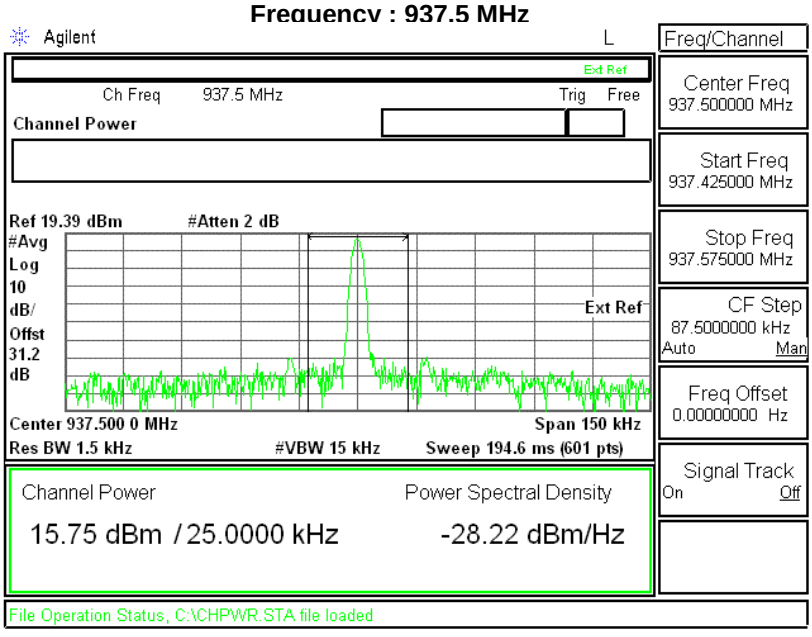
Mode : Down link
Carrier band : 7 MHz
Frequency : 869 MHz



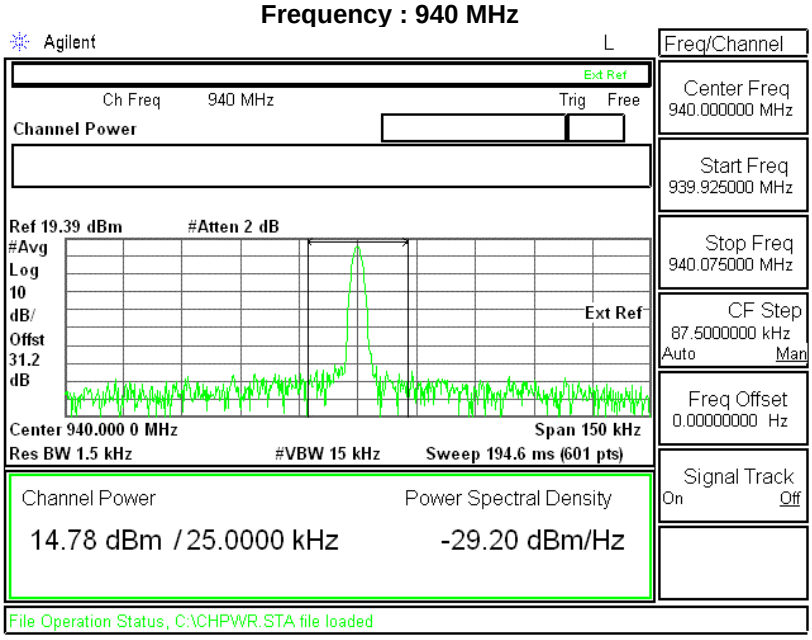
Mode : Down link
Carrier band : 5 MHz
Frequency : 935 MHz



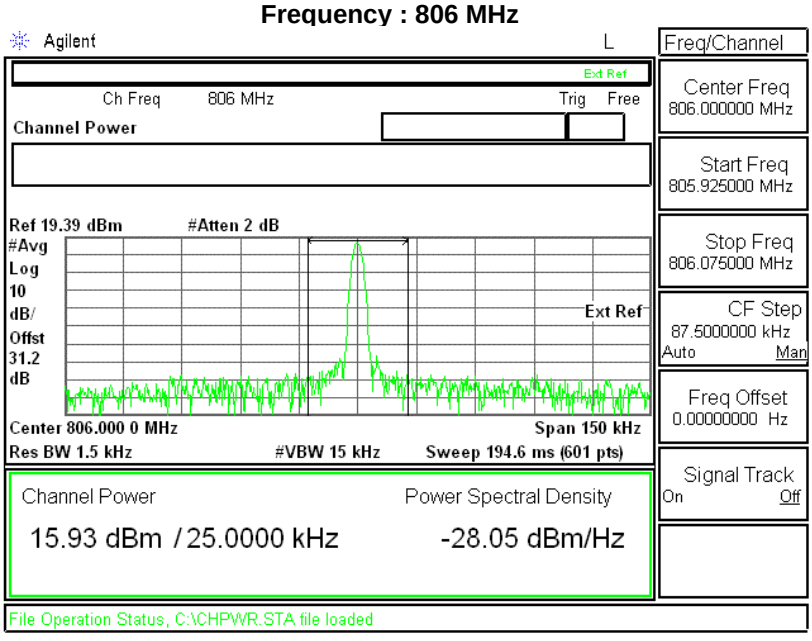
Mode : Down link
Carrier band : 5 MHz
Frequency : 937.5 MHz



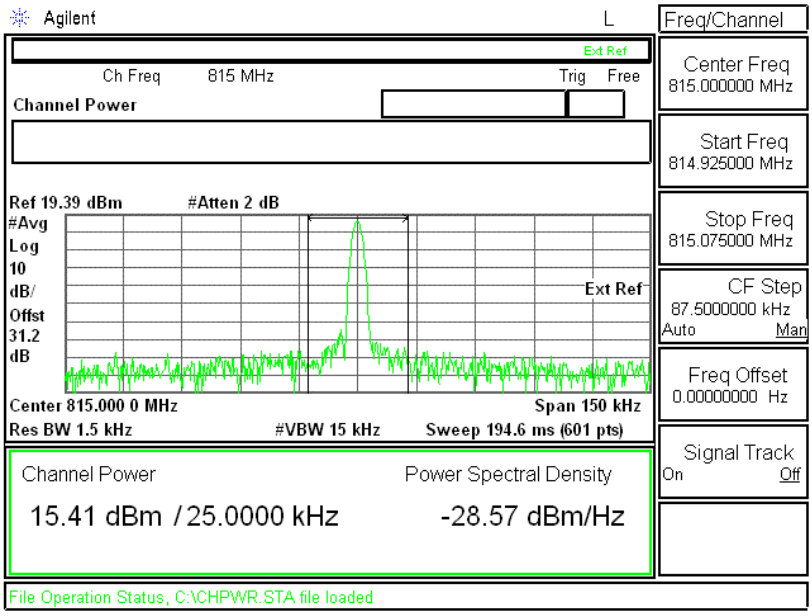
Mode : Down link
Carrier band : 5 MHz
Frequency : 940 MHz



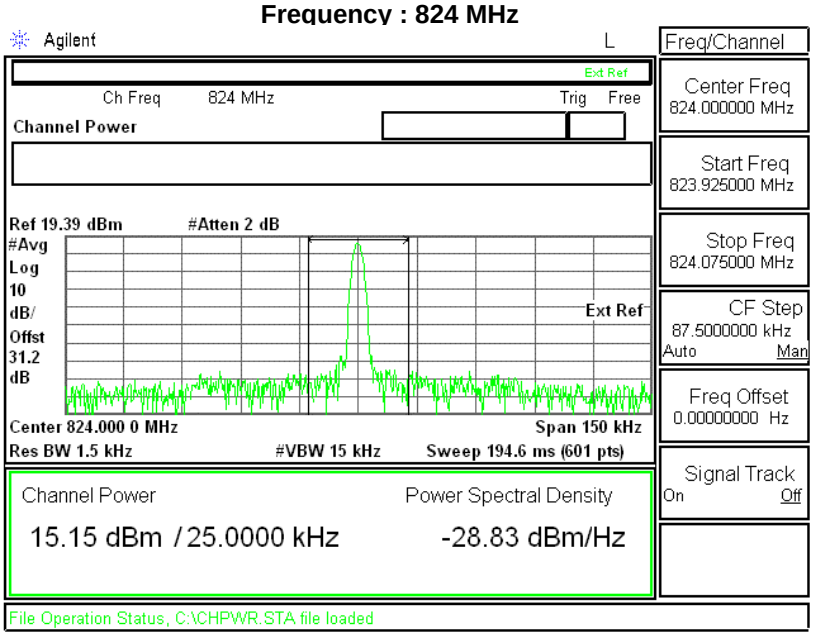
Mode : Up link
Carrier band : 18 MHz
Frequency : 806 MHz



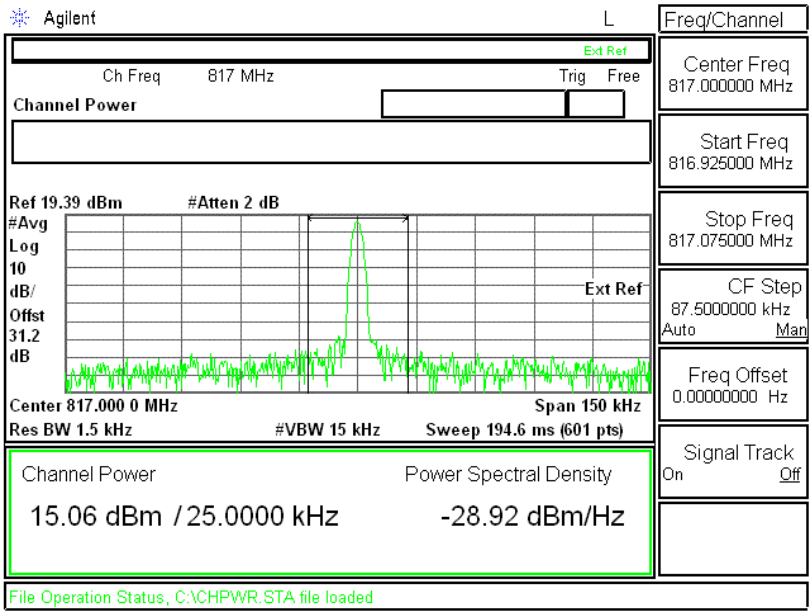
Mode : Up link
Carrier band : 18 MHz
Frequency : 815 MHz



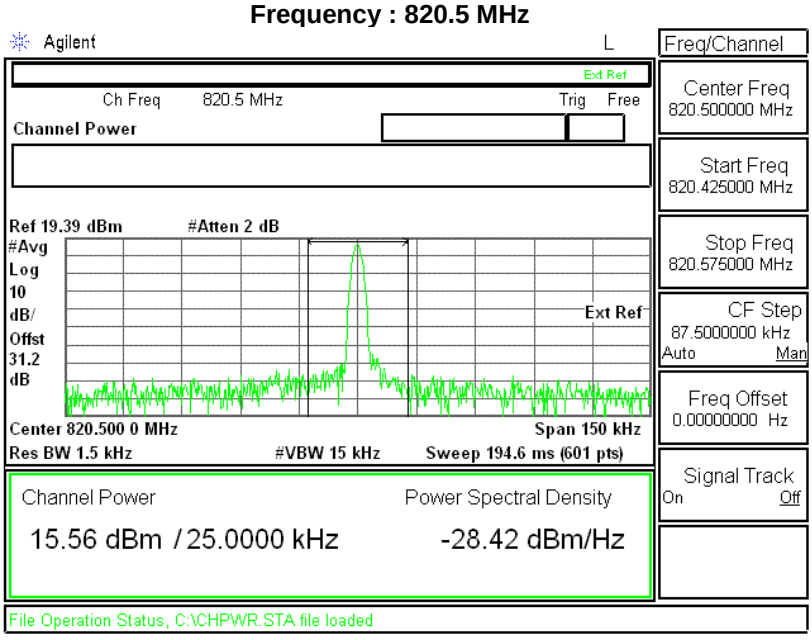
Mode : Up link
Carrier band : 18 MHz - T
Frequency : 824 MHz



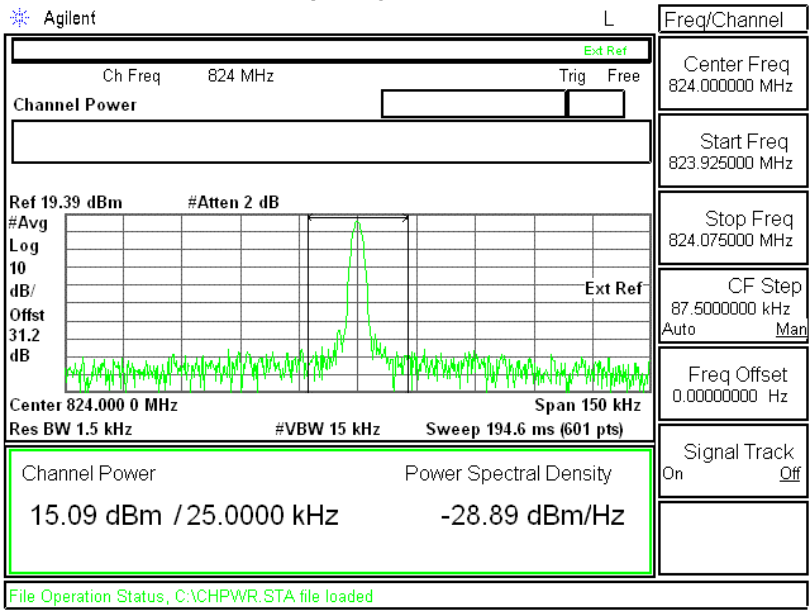
Mode : Up link
Carrier band : 7 MHz - B
Frequency : 817 MHz



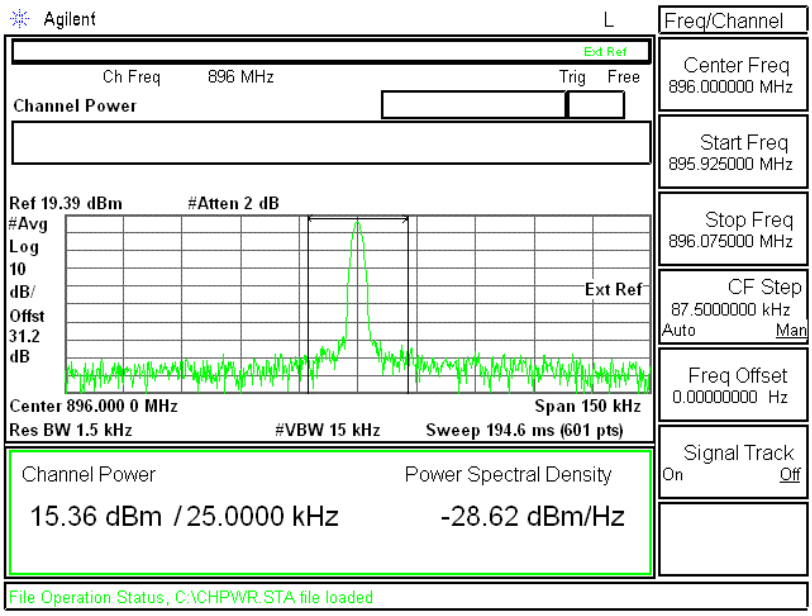
Mode : Up link
Carrier band : 7 MHz - M
Frequency : 820.5 MHz



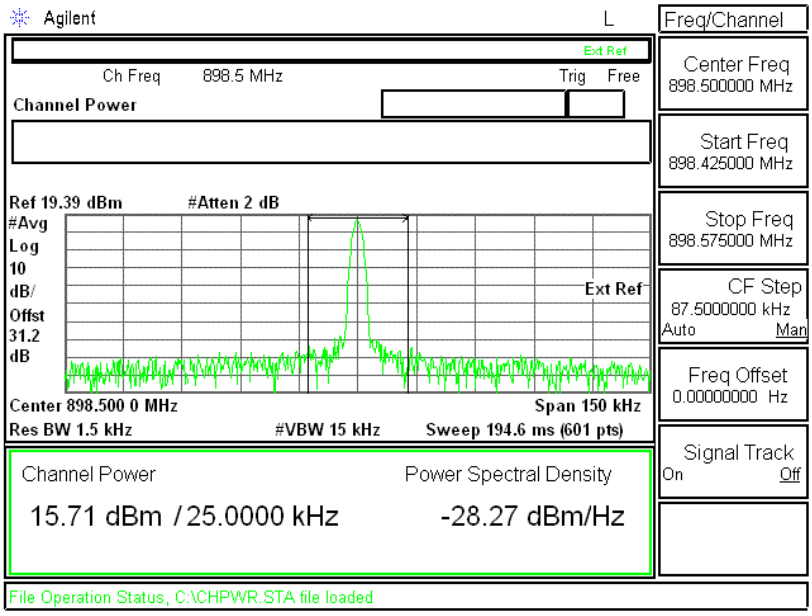
Mode : Up link
Carrier band : 7 MHz - T
Frequency : 824 MHz



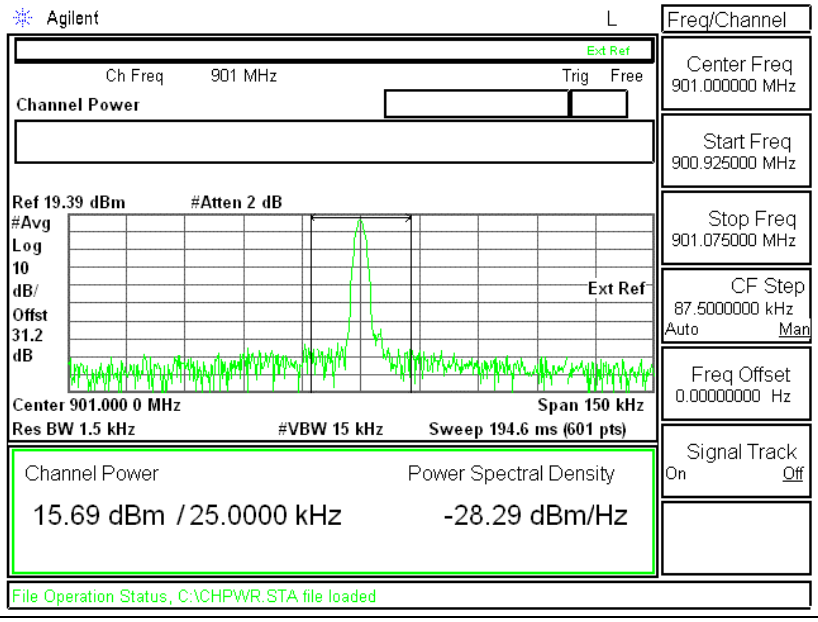
Mode : Up link
Carrier band : 5 MHz
Frequency : 896 MHz



Mode : Up link
Carrier band : 5 MHz - M
Frequency : 898.5 MHz



Mode : Up link
Carrier band : 5 MHz - T
Frequency : 901 MHz



3.4 Test Conditions and Results – Occupied Bandwidth

Test Description	Measurements were made in the laboratory environment. 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. The modulated carrier signal with maximum RF level was applied to the down and up link input of the repeater and resulting output was compared against the original signal.		
Basic Standard		47 CFR § 2.1049,	
Occupied Bandwidth Limits			
According to the FCC 2-11-04/EAB/RF, Input and output signals were compared to verify that there was no any degradation to the signal due to amplification and conversion from the repeater using an RBW of 300 Hz or 1% of the emission bandwidth.			
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C	
	Relative Humidity	10 to 90 %	
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C	
	Relative Humidity	40 %	

Occupied Bandwidth Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	2,3	2,3
Supplementary information: None		

Occupied Bandwidth Spectrum Analyzer Settings

Span (MHz)	Resolution Bandwidth (MHz)	Occupied Bandwidth Requirements	
		dBc	%
50 kHz	470 Hz	-26	99
Supplementary information: 99% bandwidth was applied.			

Table 4 Occupied Bandwidth measured results

Carrier Band	UP LINK Bandwidth (kHz)		
	Frequency (MHz)	Input channel	Output channel
iDEN 18 MHz	806	17.79	17.61
	815	17.57	17.26
	824	17.58	17.59
iDEN 7 MHz	817	17.60	17.36
	820.5	17.40	17.46
	824	17.58	17.30
iDEN 5 MHz	896	17.70	17.77
	898.5	17.51	17.54
	901	17.63	17.32
Supplementary information: Modulation signal 16-QAM, 99% bandwidth			

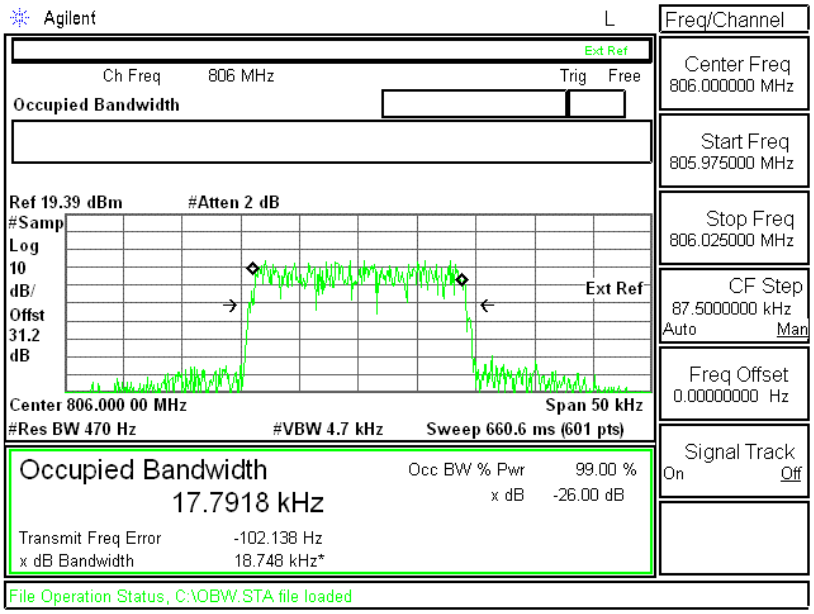
Carrier Band	DOWN LINK Bandwidth (kHz)		
	Frequency (MHz)	Input channel	Output channel
iDEN 18 MHz	851	17.42	17.49
	860	17.33	17.24
	869	17.55	17.51
iDEN 7 MHz	862	17.56	17.36
	865.5	17.59	17.36
	869	17.55	17.68
iDEN 5 MHz	935	17.57	17.28
	937.5	17.62	17.63
	940	17.49	17.25
Supplementary information: Modulation signal 16-QAM, 99% bandwidth			

Occupied Bandwidth Test Equipment

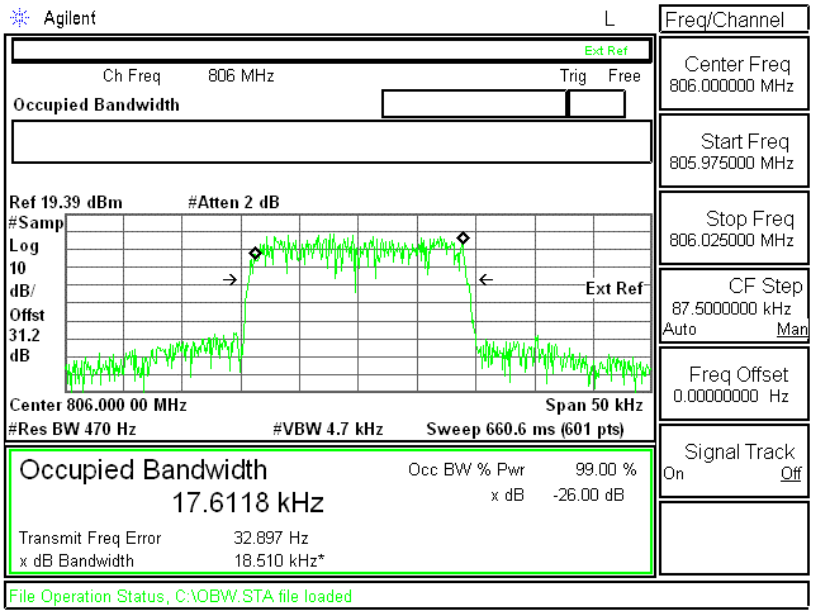
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Aeroflex	IFR3413	341006/212	2006-05-12	2007-05-12
Spectrum Analyzer	Agilent	E4440A	MY44022474	2006-11-06	2007-11-06
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-

Figure 6. Occupied Bandwidth Graph

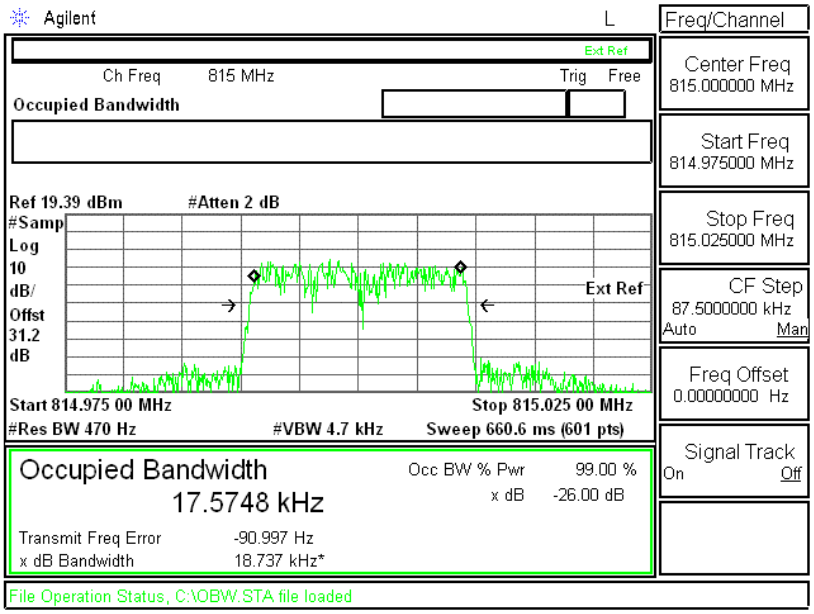
Mode : Up link - Input
Carrier band : 18 MHz - B
Frequency : 806 MHz



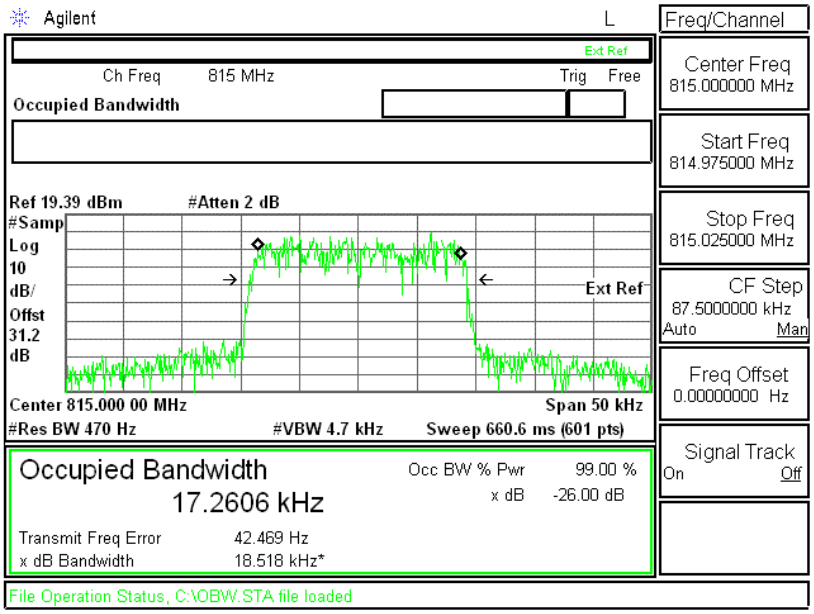
Mode : Up link - Output
Carrier band : 18 MHz - B
Frequency : 806 MHz



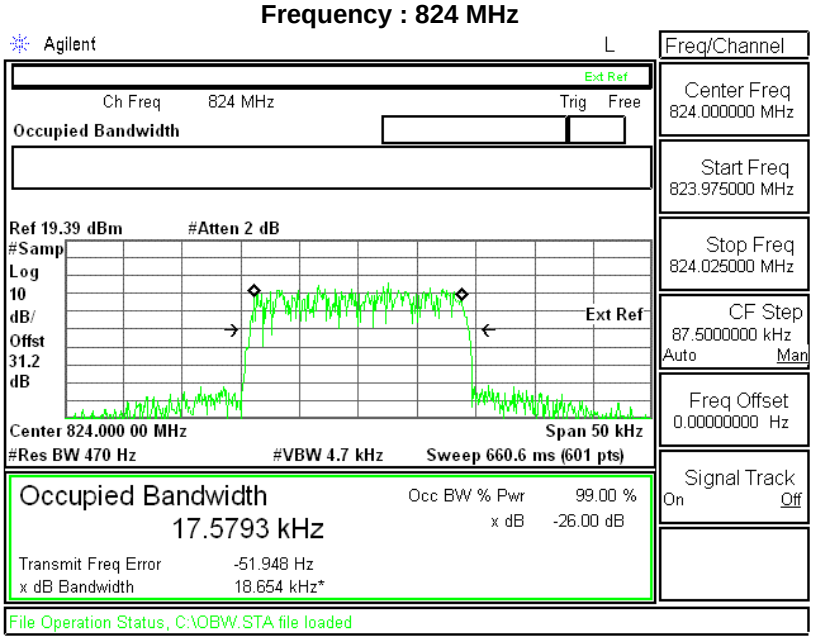
Mode : Up link - Input
Carrier band : 18 MHz - M
Frequency : 815 MHz



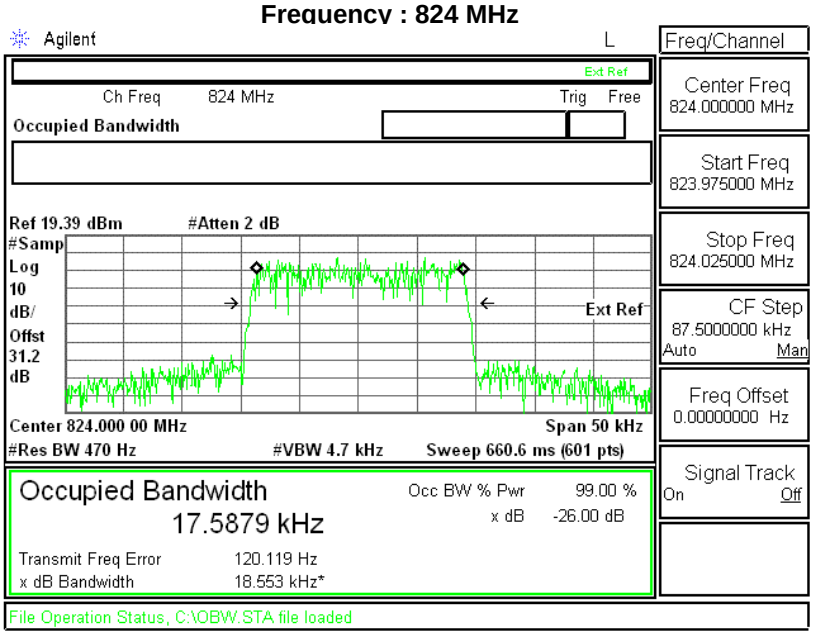
Mode : Up link - Output
Carrier band : 18 MHz - M
Frequency : 815 MHz



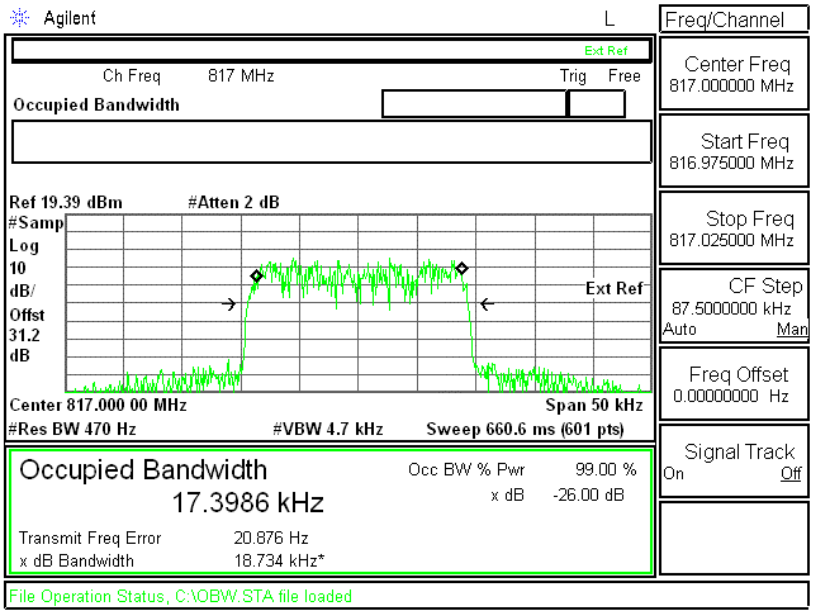
Mode : Up link - Inpuut
Carrier band : 18 MHz - T
Frequency : 824 MHz



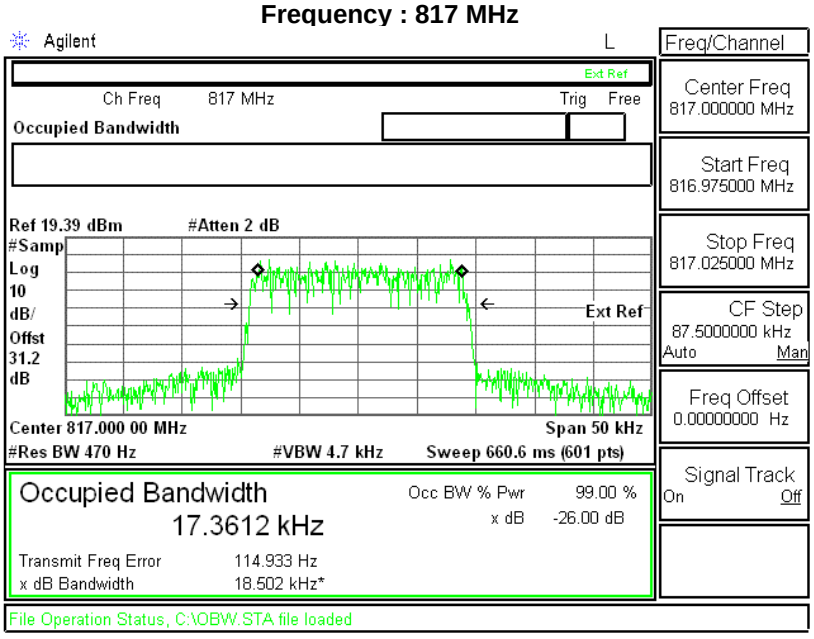
Mode : Up link - Output
Carrier band : 18 MHz - T
Frequency : 824 MHz



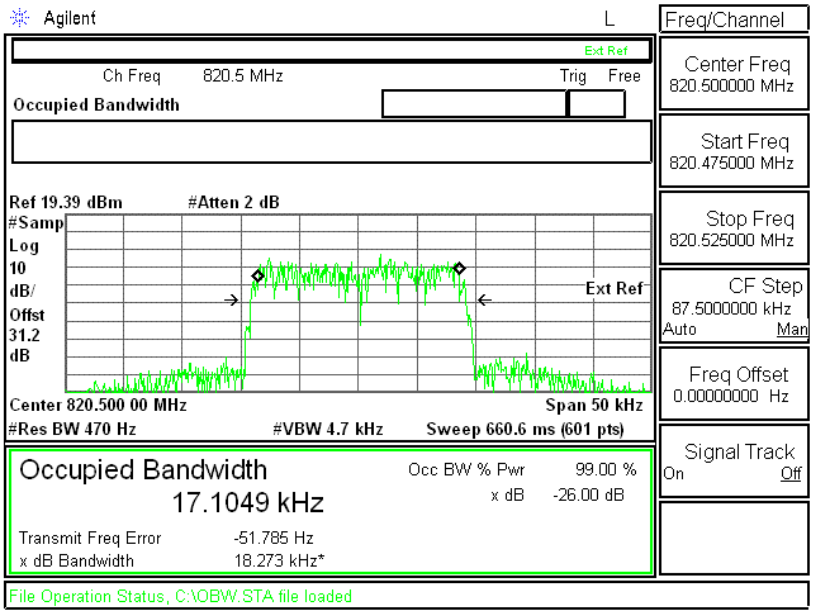
Mode : Up link - Input
Carrier band : 7 MHz - B
Frequency : 817 MHz



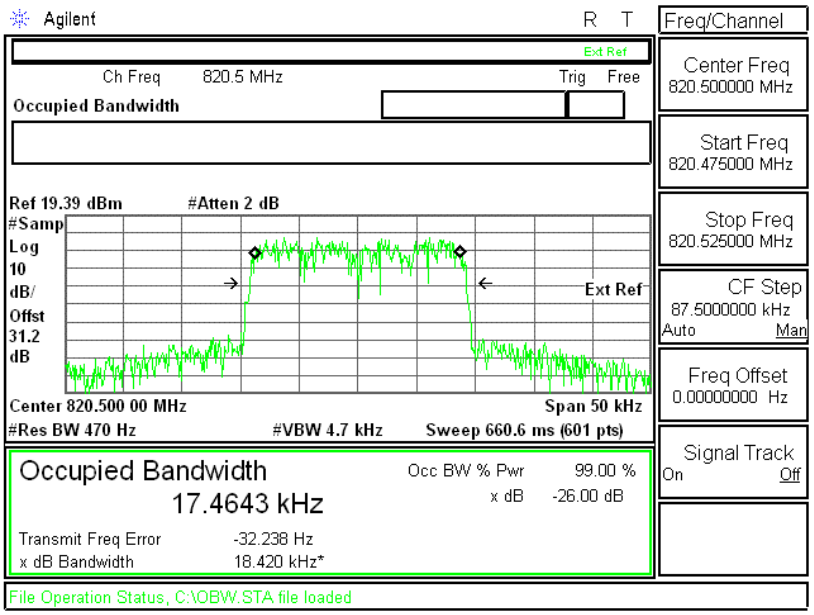
Mode : Up link - Output
Carrier band : 7 MHz - B
Frequency : 817 MHz



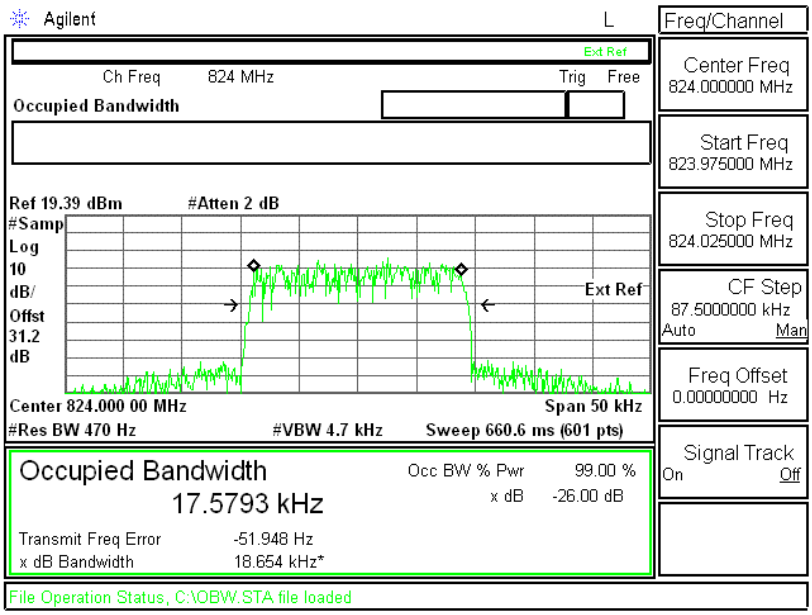
Mode : Up link - Input
Carrier band : 7 MHz - M
Frequency : 820.5 MHz



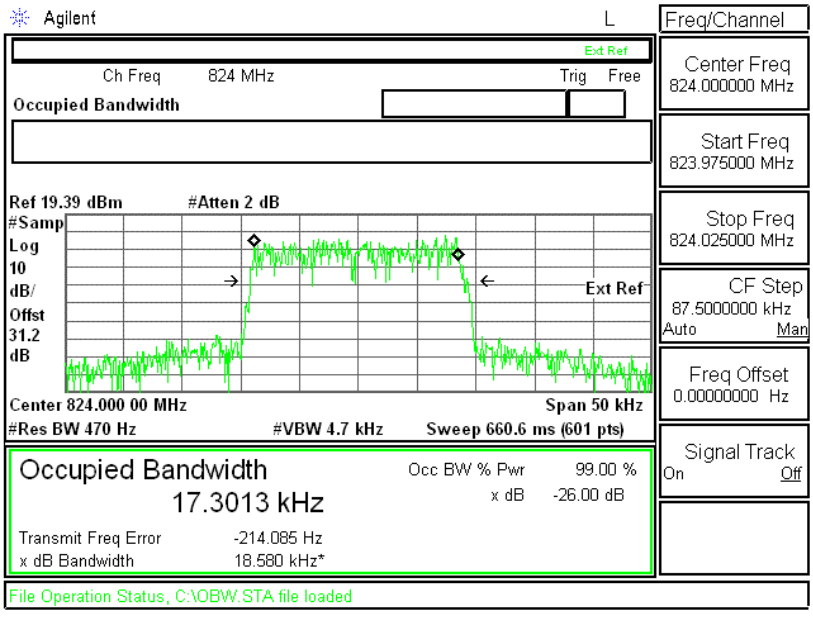
Mode : Up link - Output
Carrier band : 7 MHz - M
Frequency : 820.5 MHz



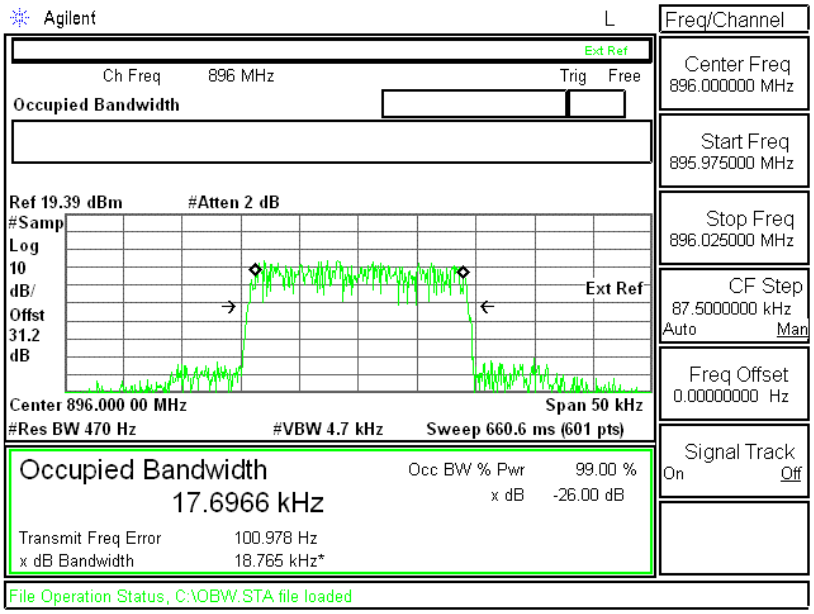
Mode : Up link - Input
Carrier band : 7 MHz - T
Frequency : 824 MHz



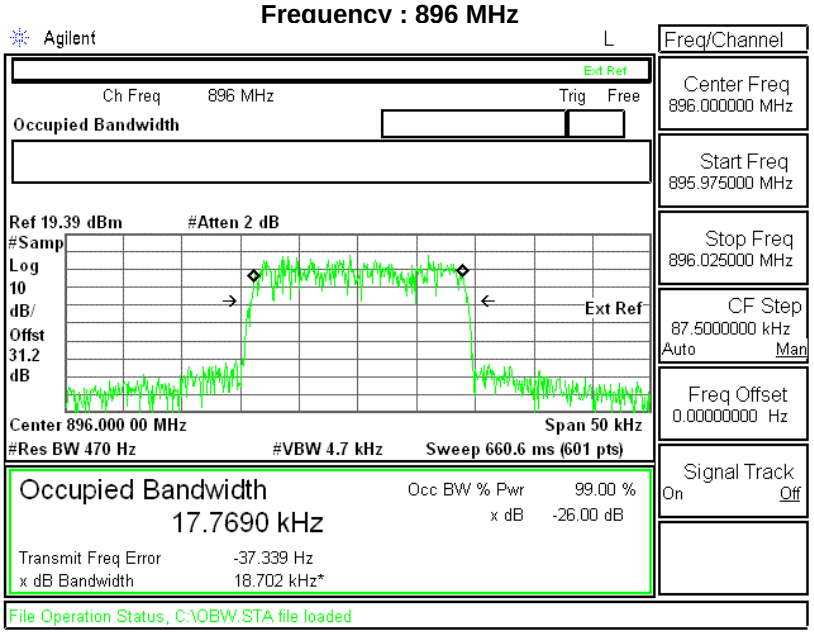
Mode : Up link - Output
Carrier band : 7 MHz - T
Frequency : 824 MHz



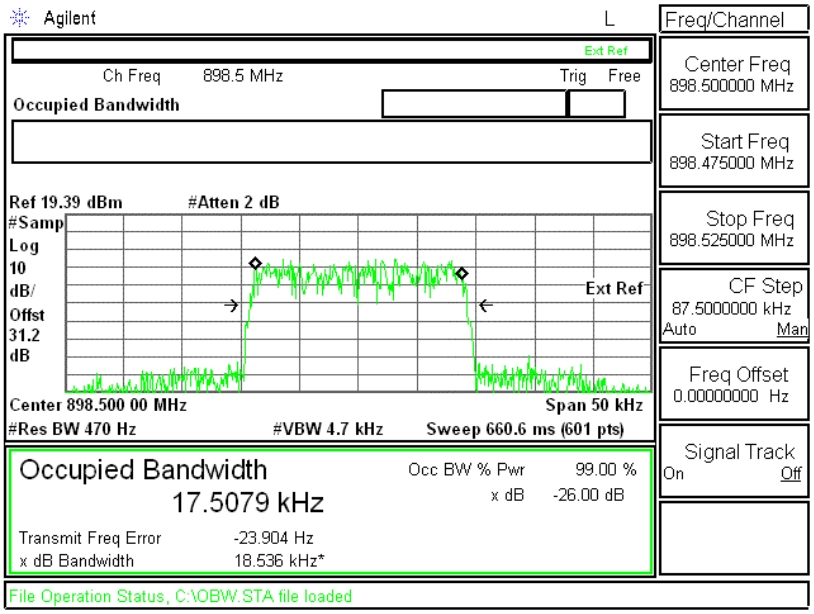
Mode : Up link - Input
Carrier band : 5 MHz - B
Frequency : 896 MHz



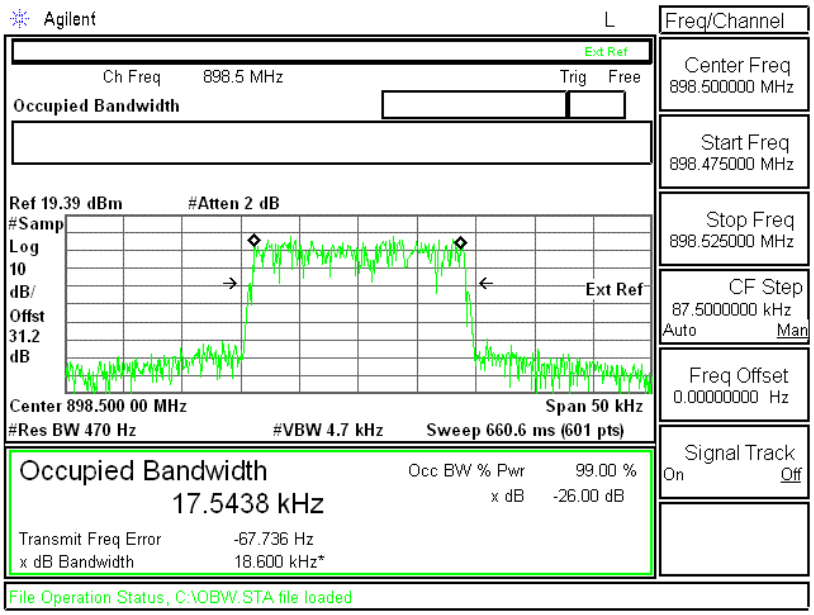
Mode : Up link - Output
Carrier band : 5 MHz - B
Frequency : 896 MHz



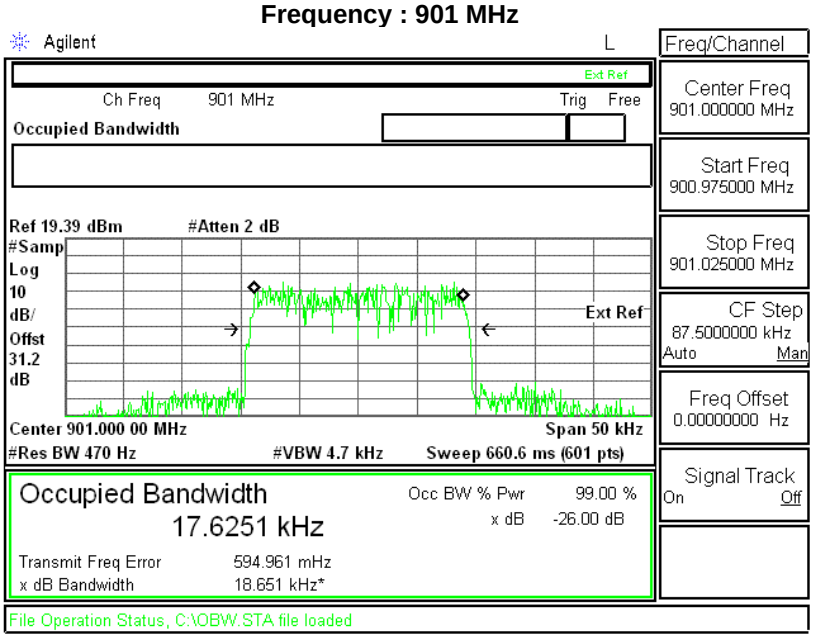
Mode : Up link - Input
Carrier band : 5 MHz - M
Frequency : 898.5 MHz



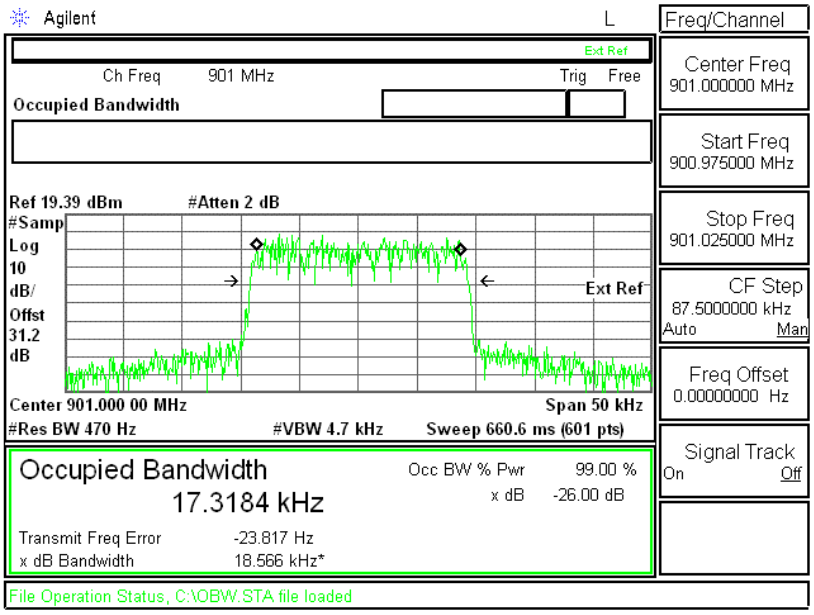
Mode : Up link - Output
Carrier band : 5 MHz - M
Frequency : 898.5 MHz



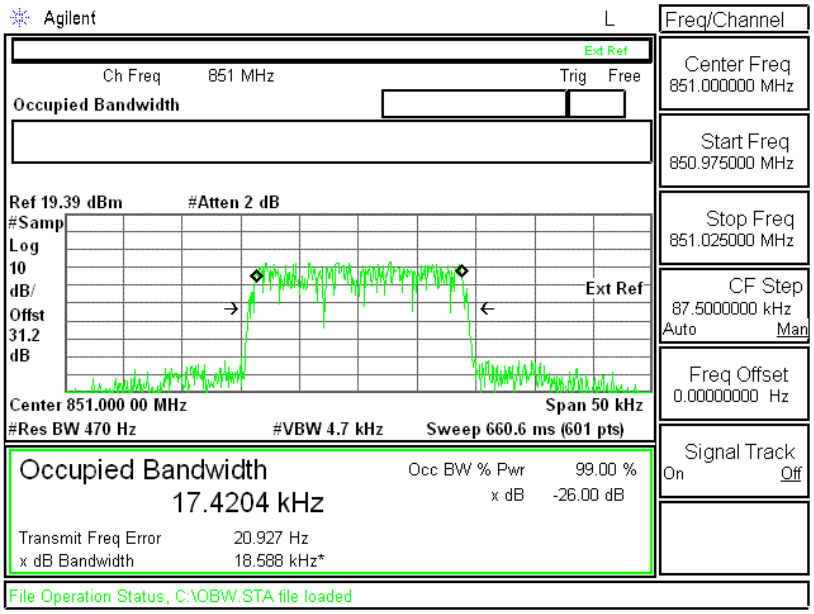
Mode : Up link - Input
Carrier band : 5 MHz - T
Frequency : 901 MHz



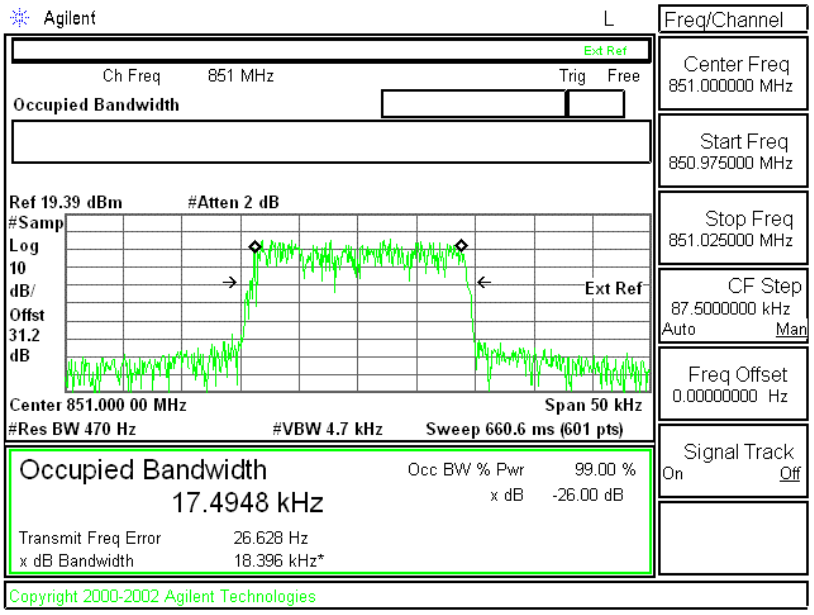
Mode : Up link - Output
Carrier band : 5 MHz - T
Frequency : 901 MHz



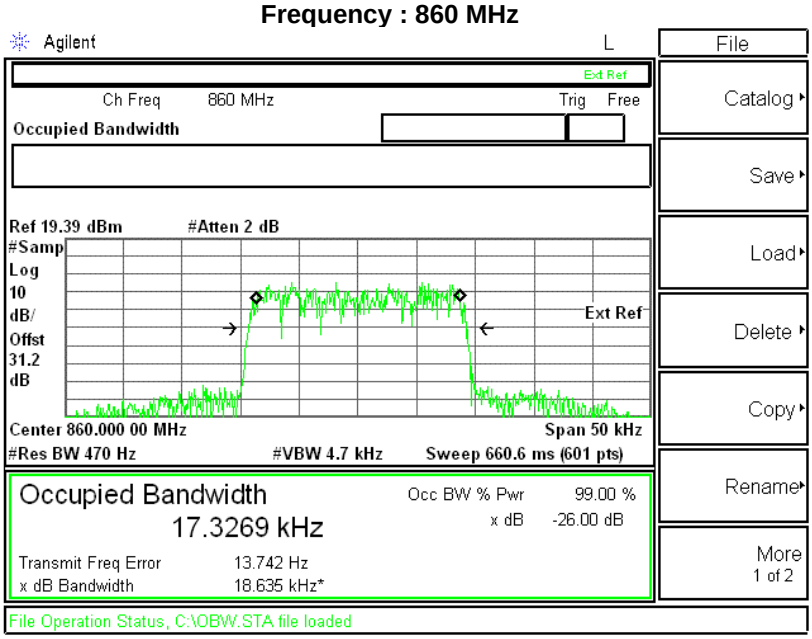
Mode : Down link - Input
Carrier band : 18 MHz - B
Frequency : 851 MHz



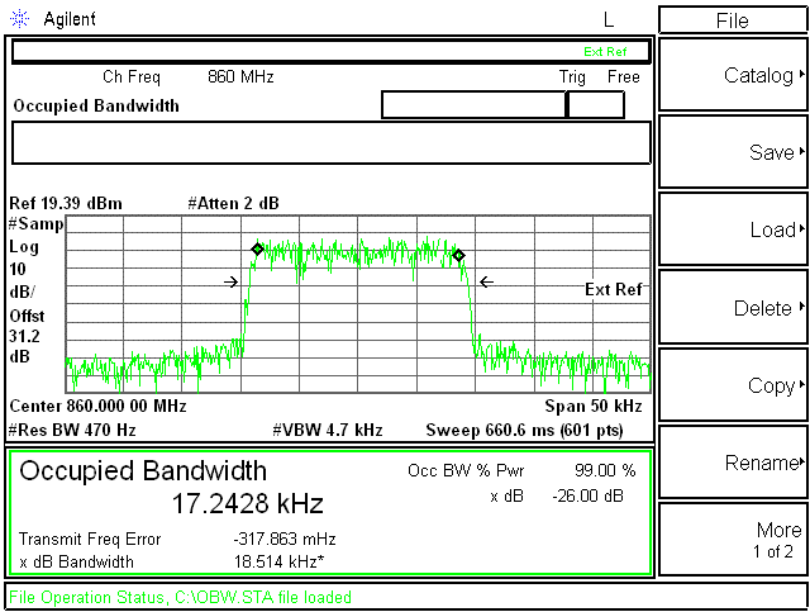
Mode : Down link - Output
Carrier band : 18 MHz - B
Frequency : 851 MHz



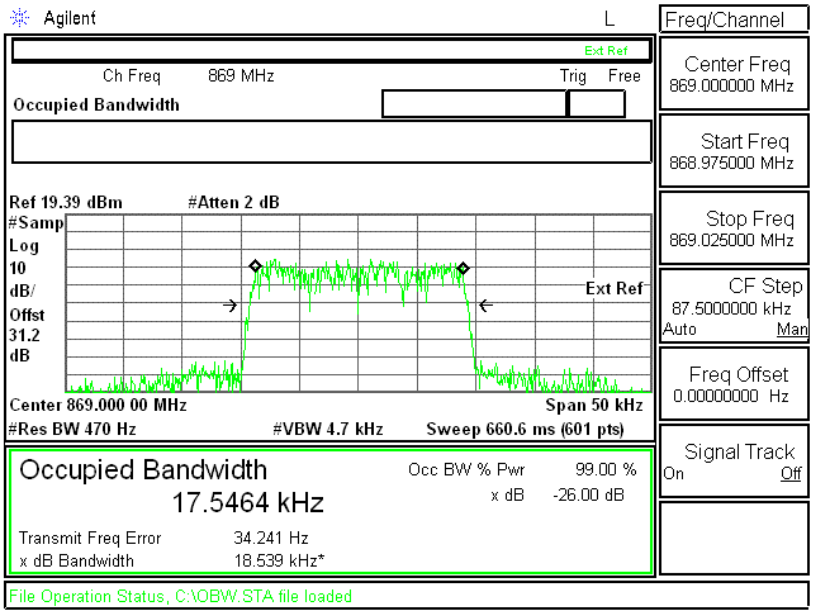
Mode : Down link - Input
Carrier band : 18 MHz - M
Frequency : 860 MHz



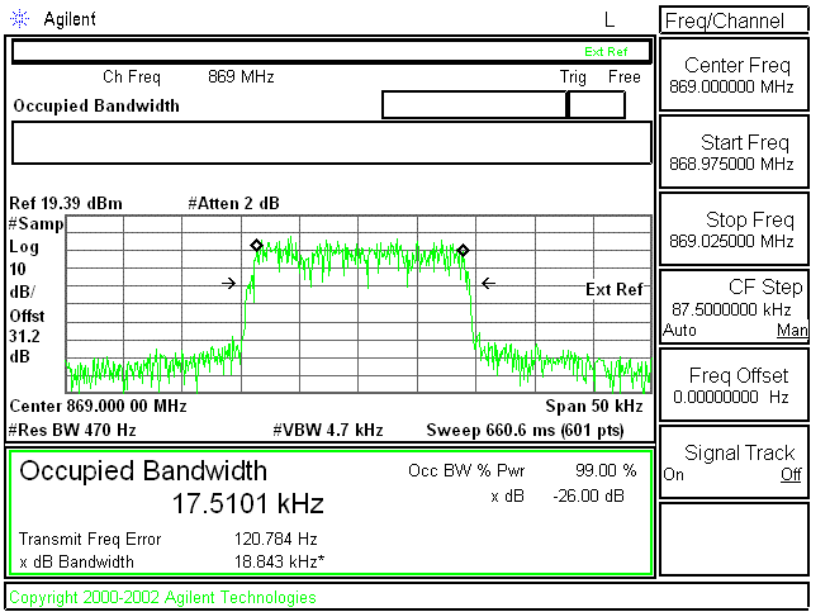
Mode : Down link - Output
Carrier band : 18 MHz - M
Frequency : 860 MHz



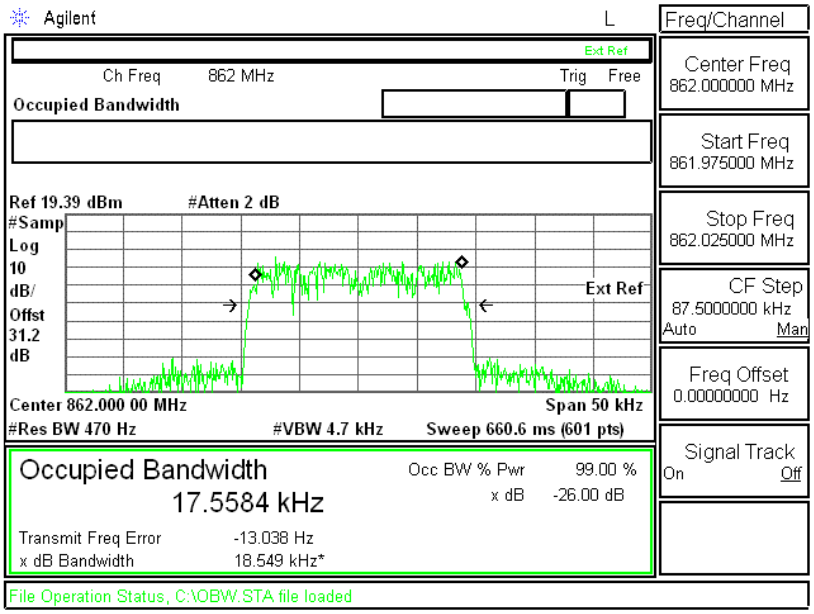
Mode : Down link - Input
Carrier band : 18 MHz - T
Frequency : 869 MHz



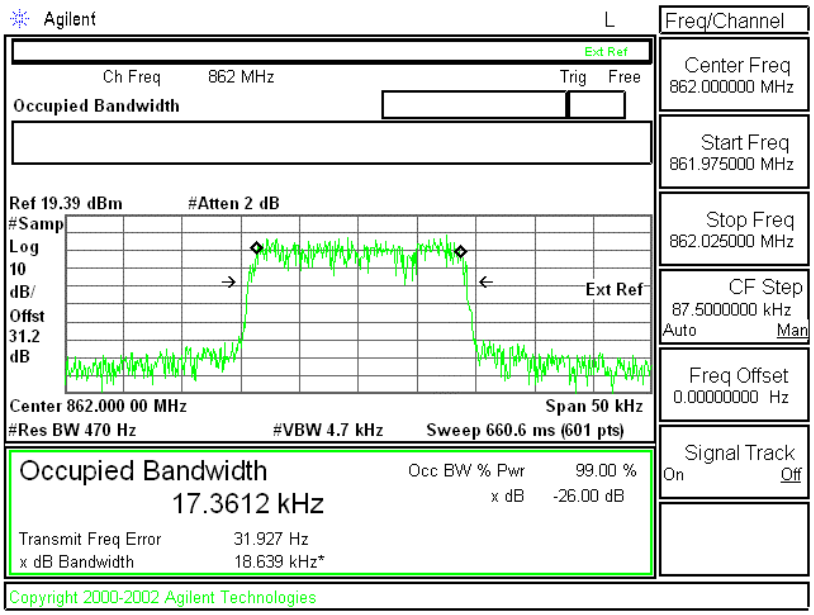
Mode : Down link - Output
Carrier band : 18 MHz -T
Frequency : 869 MHz



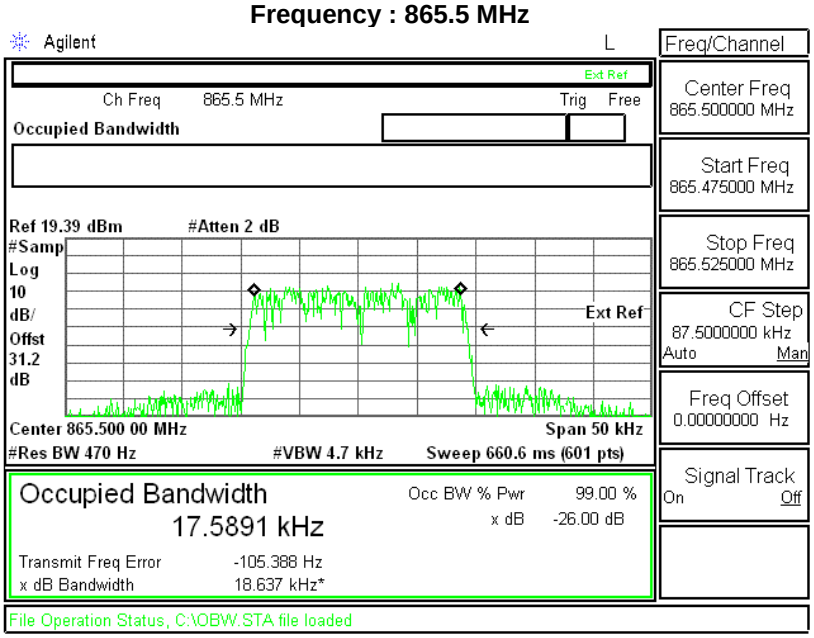
Mode : Down link - Input
Carrier band : 7 MHz - B
Frequency : 862 MHz



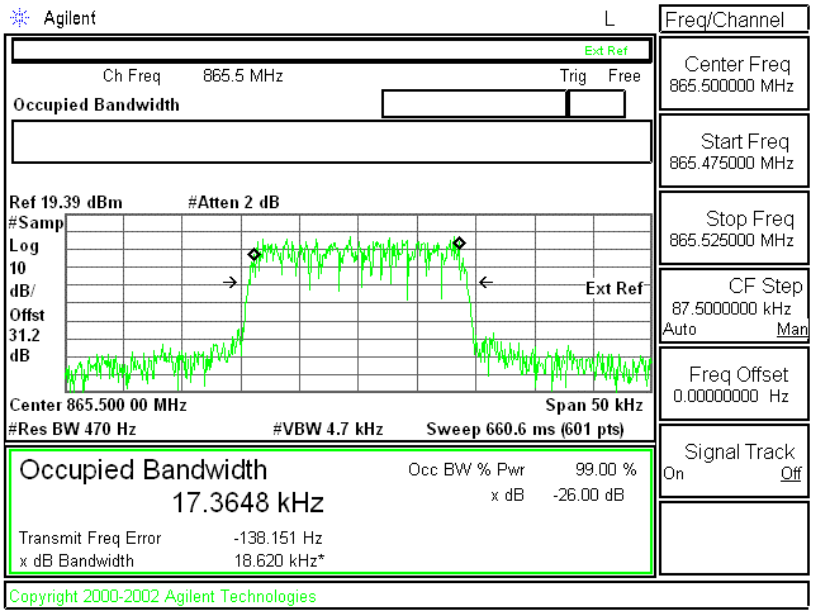
Mode : Down link - Output
Carrier band : 7 MHz - B
Frequency : 862 MHz



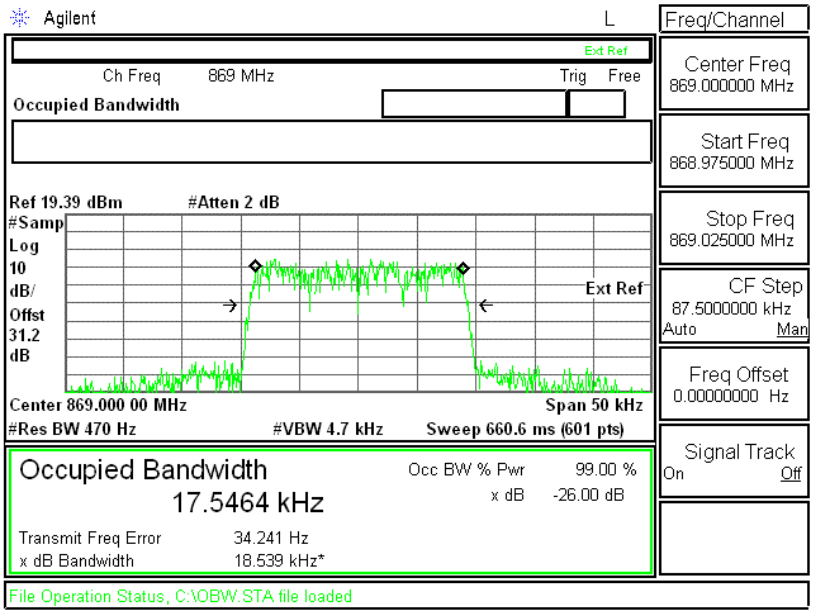
Mode : Down link - Input
Carrier band : 7 MHz - M
Frequency : 865.5 MHz



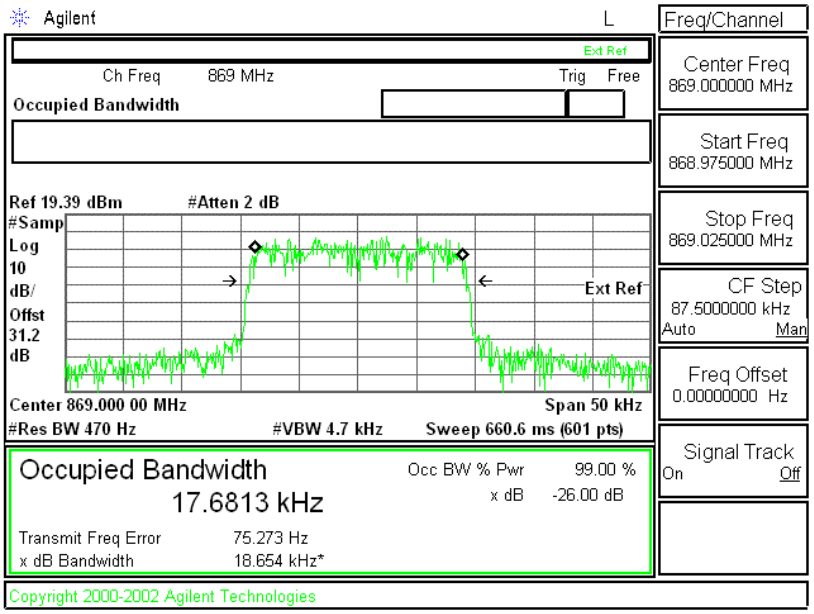
Mode : Down link - Output
Carrier band : 7 MHz - M
Frequency : 865.5 MHz



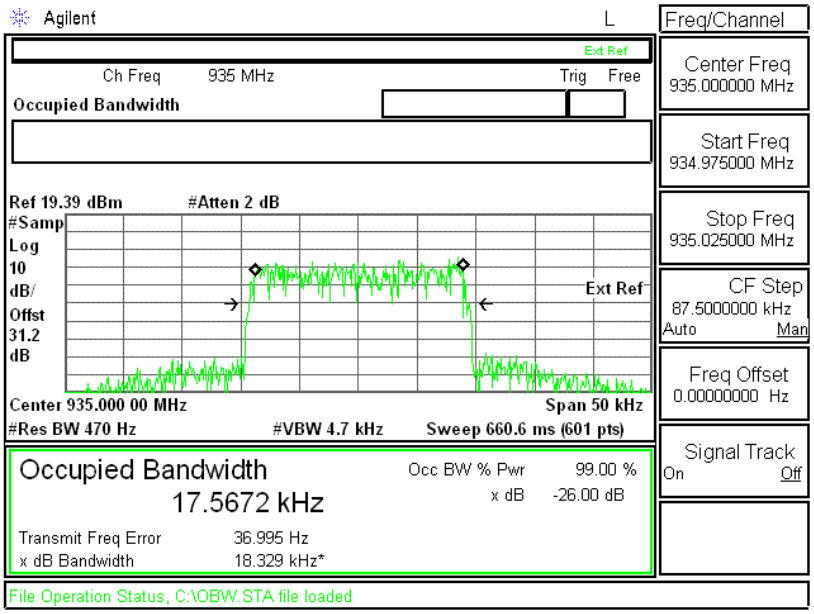
Mode : Down link - Input
Carrier band : 7 MHz - T
Frequency : 869 MHz



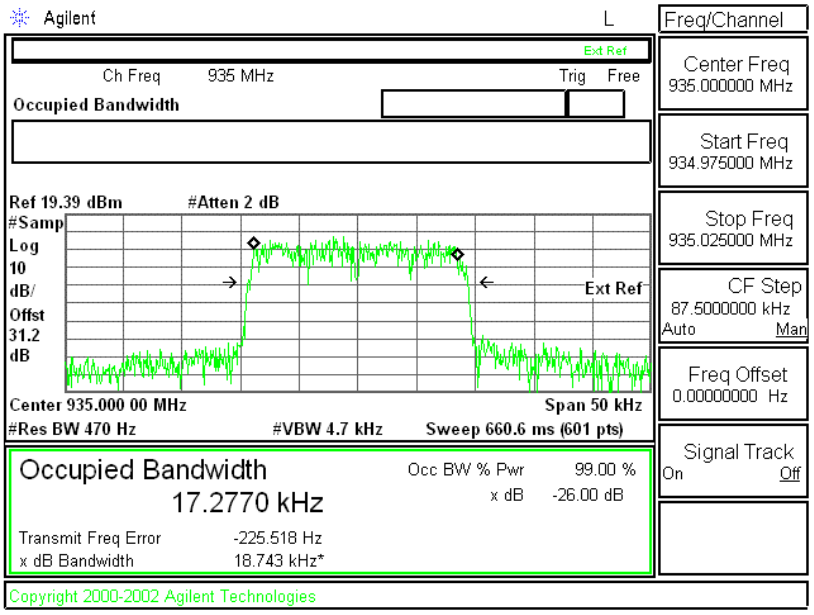
Mode : Down link - Output
Carrier band : 7 MHz - T
Frequency : 869 MHz



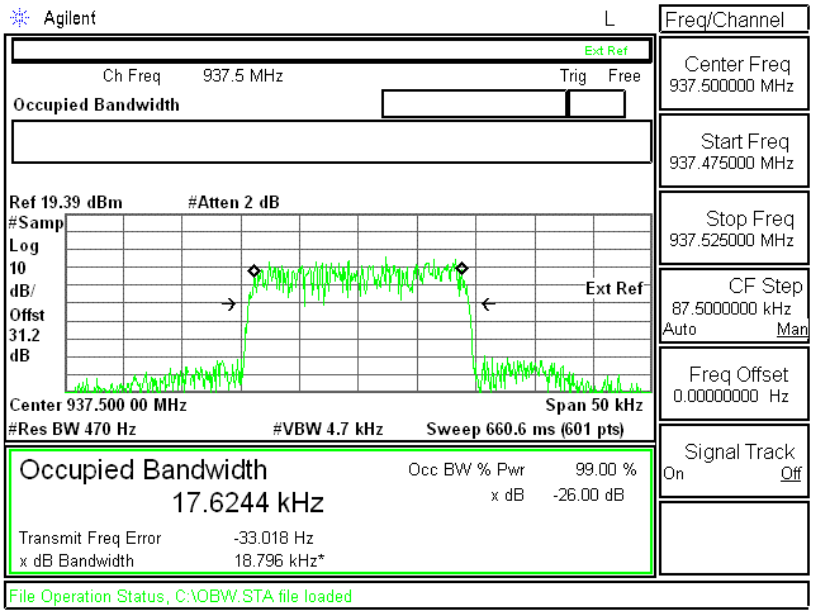
Mode : Down link - Input
Carrier band : 5 MHz - B
Frequency : 935 MHz



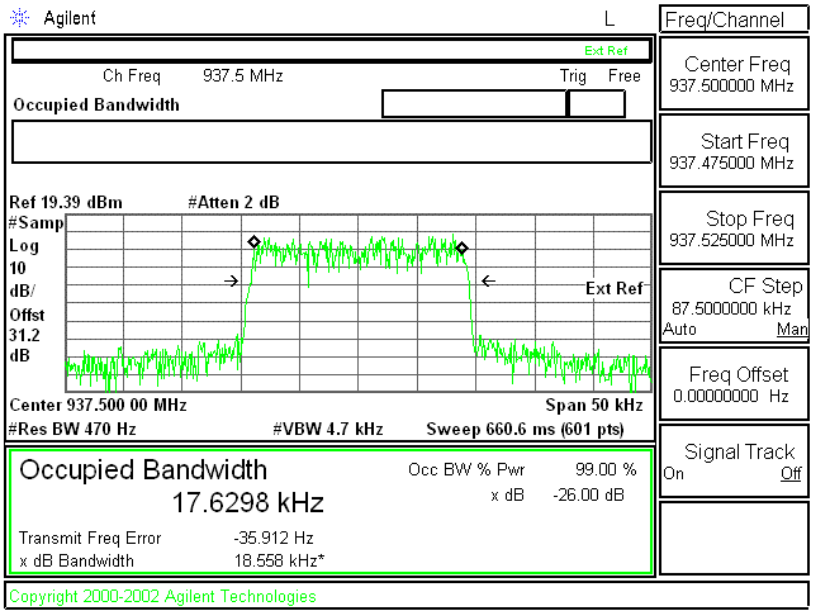
Mode : Down link - Output
Carrier band : 5 MHz - B
Frequency : 935 MHz



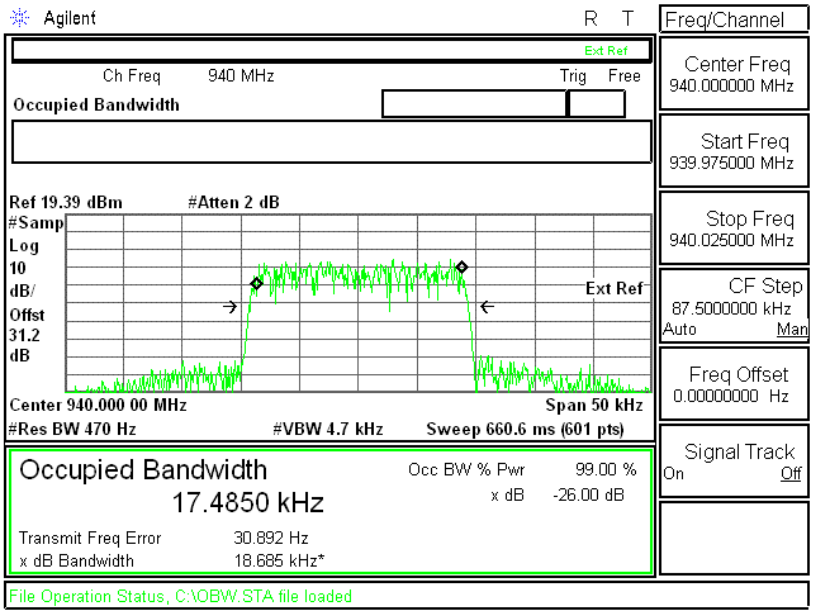
Mode : Down link - Input
Carrier band : 5 MHz - M
Frequency : 937.5 MHz



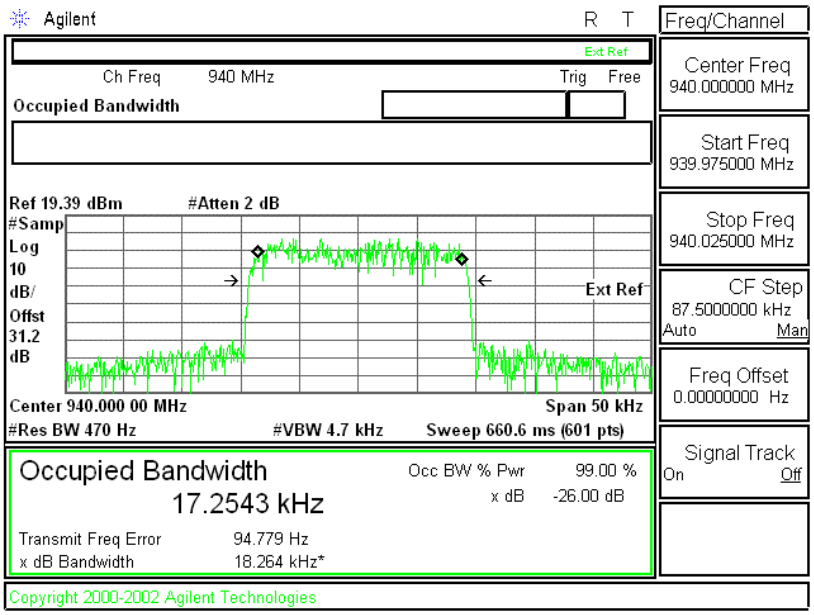
Mode : Down link - Output
Carrier band : 5 MHz - M
Frequency : 937.5 MHz



Mode : Down link - Input
Carrier band : 5 MHz - T
Frequency : 940 MHz



Mode : Down link - Output
Carrier band : 5 MHz - T
Frequency : 940 MHz



3.5 Test Conditions and Results – Emission Mask

Test Description	Measurements were made in the laboratory environment. Emission mask measurement was made using a direct connection between RF output of the EUT and spectrum analyzer. Measurement has been performed with the EUT set to maximum output level at low, mid and high channel frequencies.
Basic Standard	47 CFR § 2.1049,

Occupied Bandwidth Limits

1. § 90.691 Emission Mask Requirements for EA-Based Systems – 25 kHz Channel Spacing – 800 MHz Operation
   0 – 12.5 kHz : 0 dBc
   12.5 – 37.5 kHz : 116*log10(F/6.1)dBc
   37.5 kHz - : 43 plus 10 log10(P) dBc
2. § 90.669 Emission Limits – 25 kHz Channel Spacing – 900 MHz Operation
   On any frequency in an MTA licensee's spectrum block that is adjacent to a non-MTA frequency, the power of any emission shall be attenuated below the transmitter power (P) by at lease 43 plus 10log10(P) dB or 80 dB, whichever is the lesser attenuation.

Emission Mask Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	2,3	2,3
Supplementary information: None		

Emission Mask Spectrum Analyzer Settings

Span (MHz)	Resolution Bandwidth (MHz)	Occupied Bandwidth Requirements	
		dBc	%
50 kHz	470 Hz	-26	99
Supplementary information: 99% bandwidth was applied.			

Table 5 Emission Mask measured results

Uplink

Carrier Band	UP LINK Bandwidth (kHz)		
	Frequency (MHz)	Emission mask	Result
iDEN 18 MHz	806	§ 90.691	Pass
	815	§ 90.691	Pass
	824	§ 90.691	Pass
iDEN 7 MHz	817	§ 90.691	Pass
	820.5	§ 90.691	Pass
	824	§ 90.691	Pass
iDEN 5 MHz	896	§ 90.669	Pass
	898.5	§ 90.669	Pass
	901	§ 90.669	Pass
Supplementary information: Modulation signal 16-QAM, 99% bandwidth			

Downlink

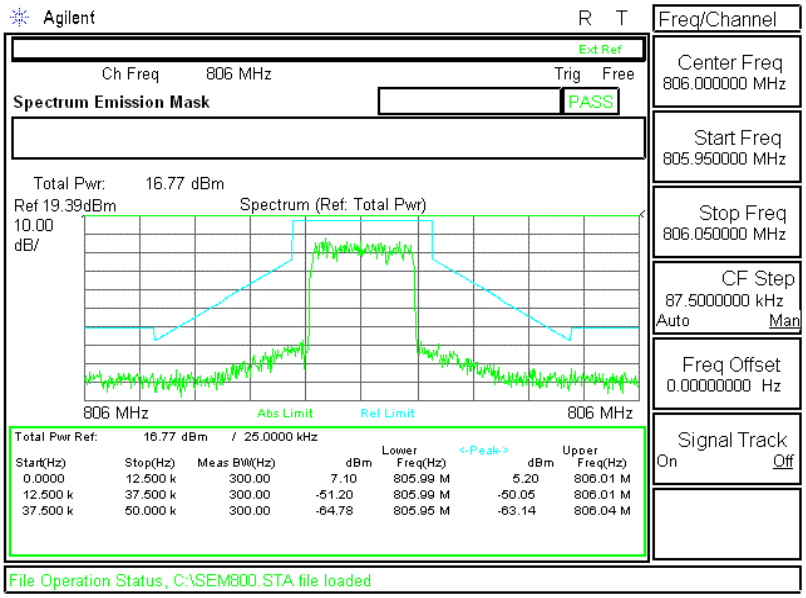
Carrier Band	DOWN LINK Bandwidth (kHz)		
	Frequency (MHz)	Input channel	Output channel
iDEN 18 MHz	851	§ 90.691	Pass
	860	§ 90.691	Pass
	869	§ 90.691	Pass
iDEN 7 MHz	862	§ 90.691	Pass
	865.5	§ 90.691	Pass
	869	§ 90.691	Pass
iDEN 5 MHz	935	§ 90.669	Pass
	937.5	§ 90.669	Pass
	940	§ 90.669	Pass
Supplementary information: Modulation signal 16-QAM, 99% bandwidth			

Emission Mask Test Equipment

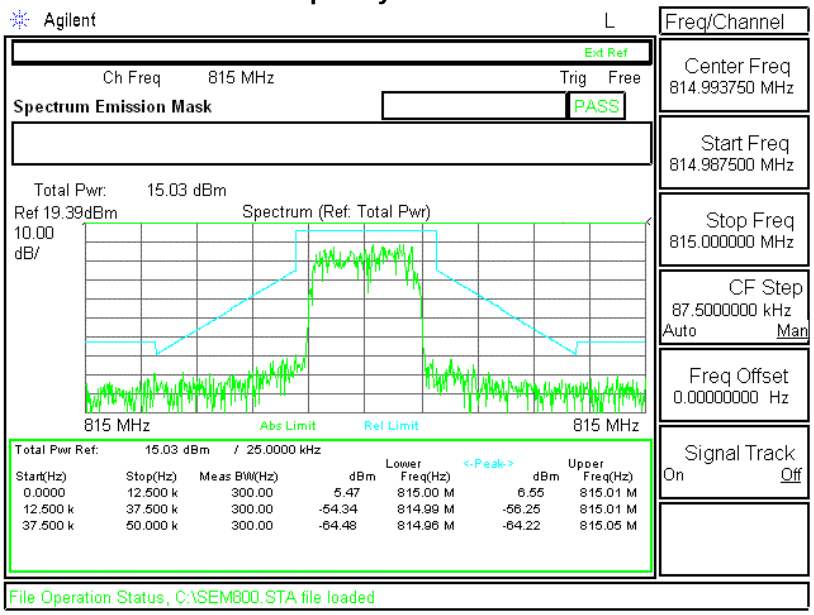
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Aeroflex	IFR3413	341006/212	2006-05-12	2007-05-12
Spectrum Analyzer	Agilent	E4440A	MY44022474	2006-11-06	2007-11-06
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-

Figure 7. Emission Mask Plots

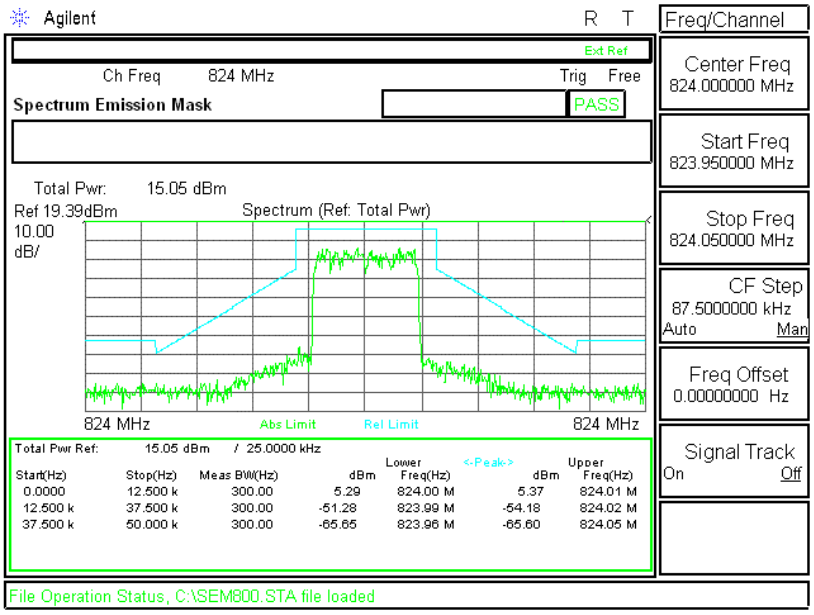
Mode : Up link
Carrier band : 18 MHz - B
Frequency : 806 MHz



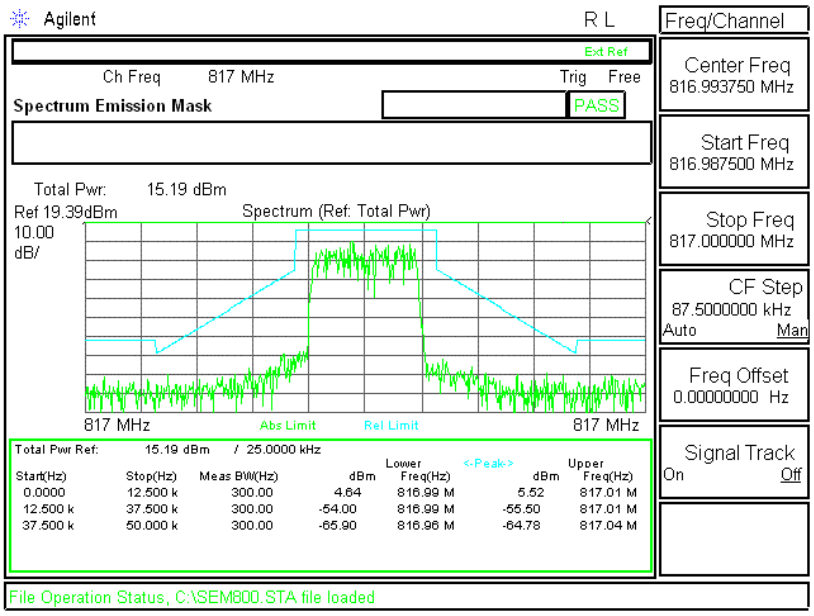
Mode : Up link
Carrier band : 18 MHz - M
Frequency : 815 MHz



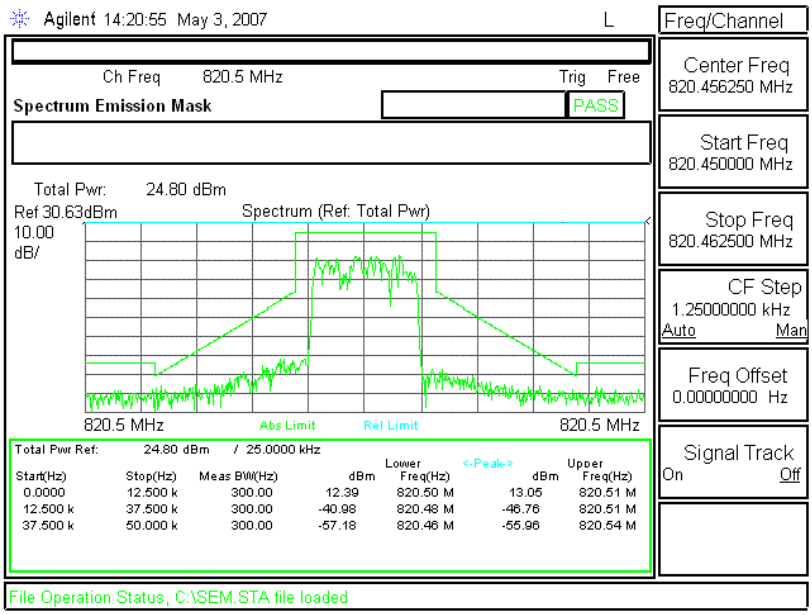
Mode : Up link
Carrier band : 18 MHz - T
Frequency : 824 MHz



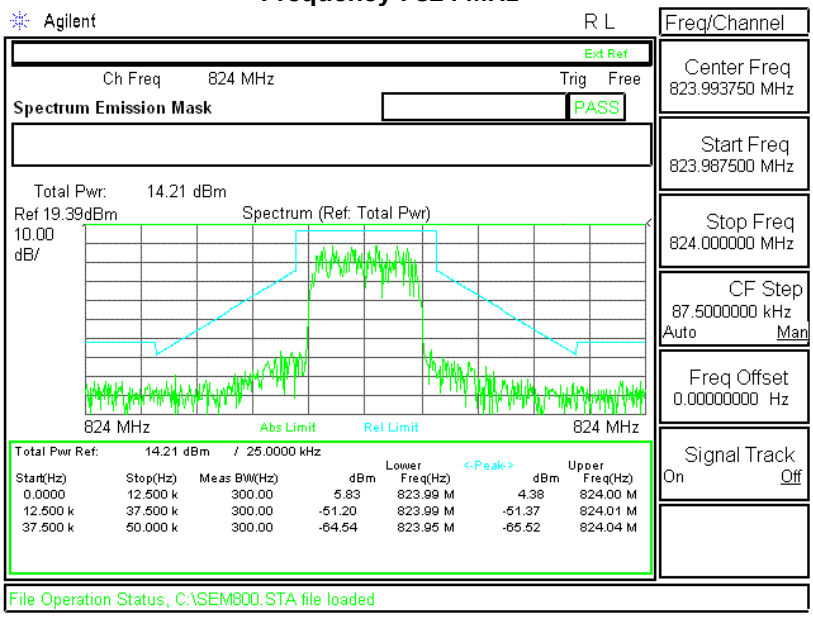
Mode : Up link
Carrier band : 7 MHz - B
Frequency : 817 MHz



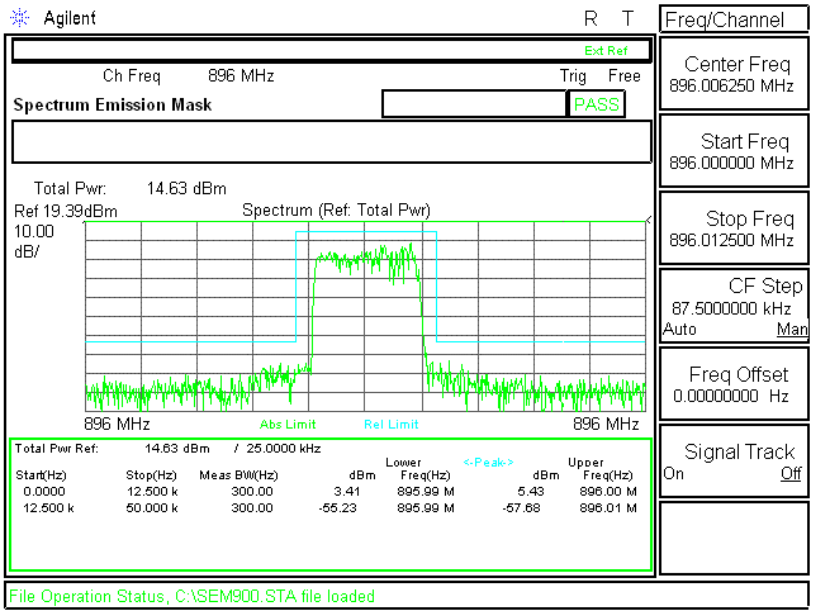
Mode : Up link
Carrier band : 7 MHz - M
Frequency : 820.5 MHz



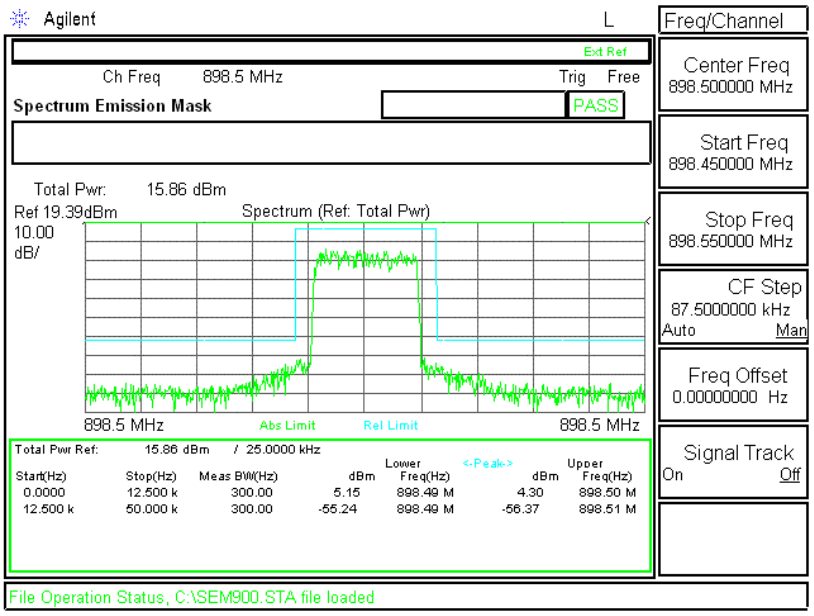
Mode : Up link
Carrier band : 7 MHz - T
Frequency : 824 MHz



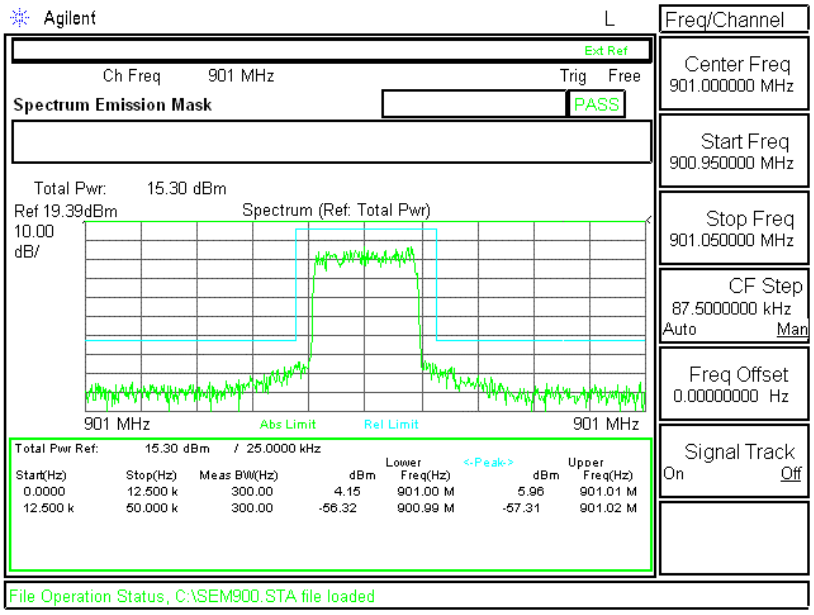
Mode : Up link
Carrier band : 5 MHz - B
Frequency : 896 MHz



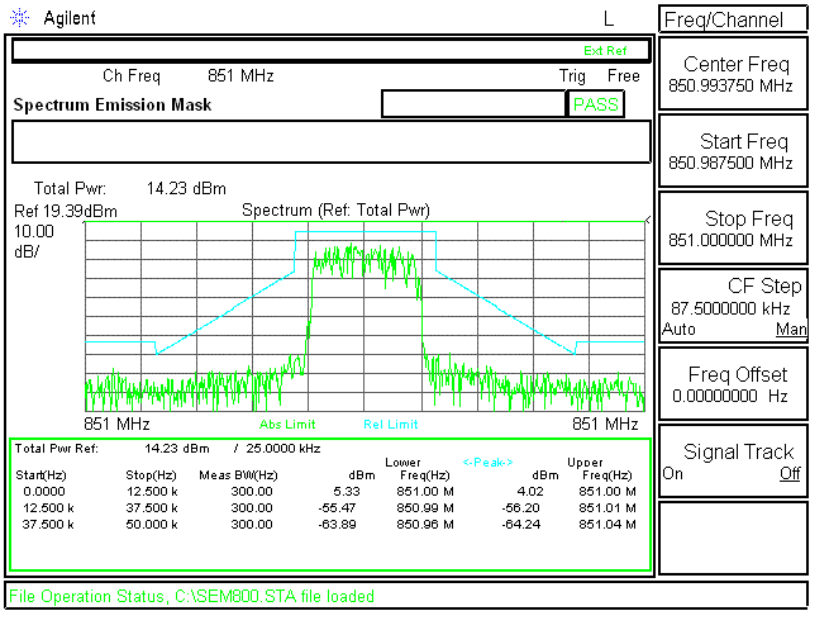
Mode : Up link
Carrier band : 5 MHz - M
Frequency : 898.5 MHz



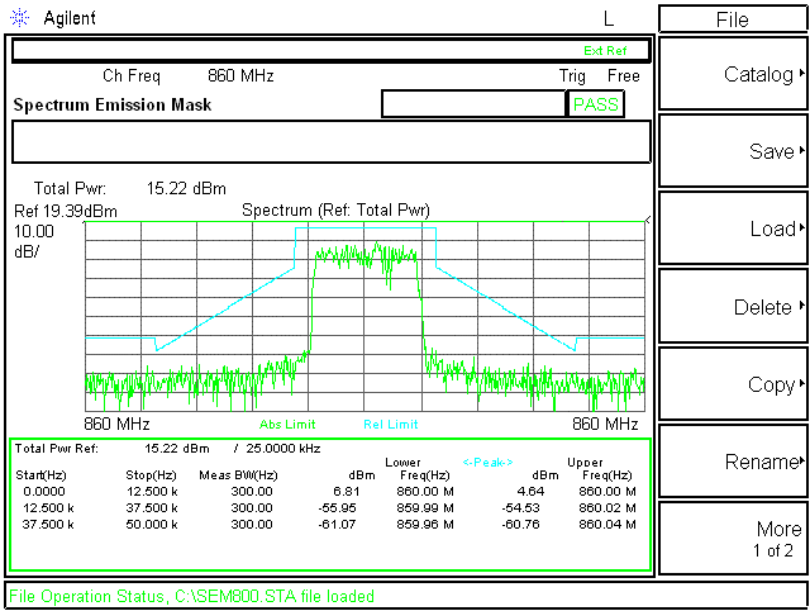
Mode : Up link
Carrier band : 5 MHz - T
Frequency : 901 MHz



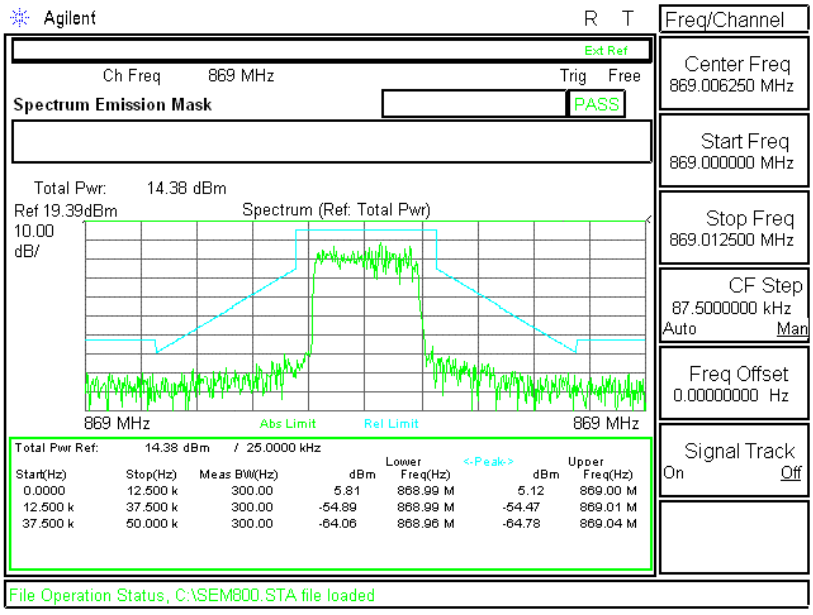
Mode : Down link
Carrier band : 18 MHz - B
Frequency : 851 MHz



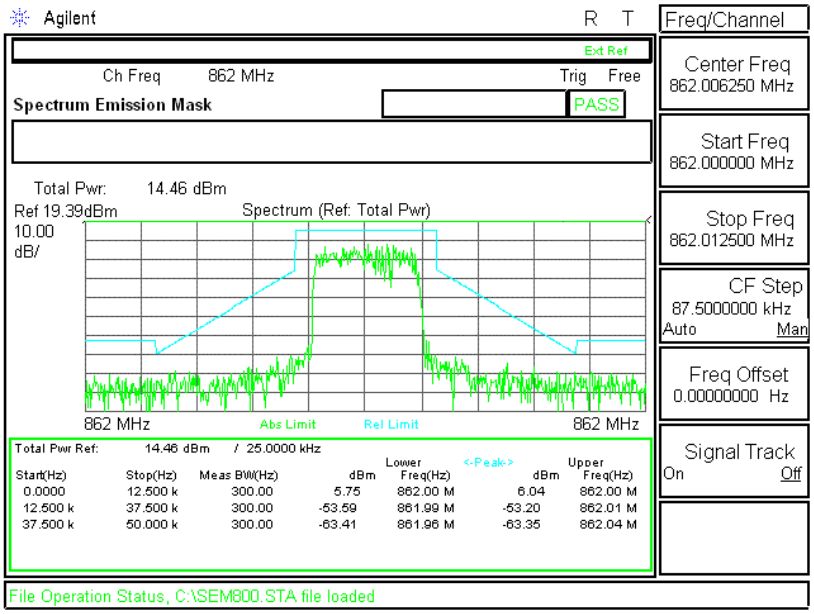
Mode : Down link
Carrier band : 18 MHz - M
Frequency : 860 MHz



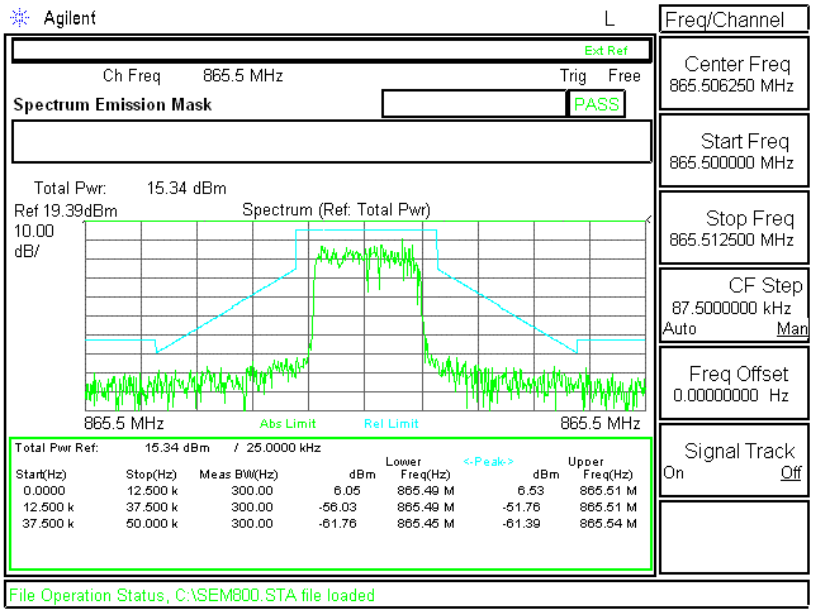
Mode : Down link
Carrier band : 18 MHz - T
Frequency : 869 MHz



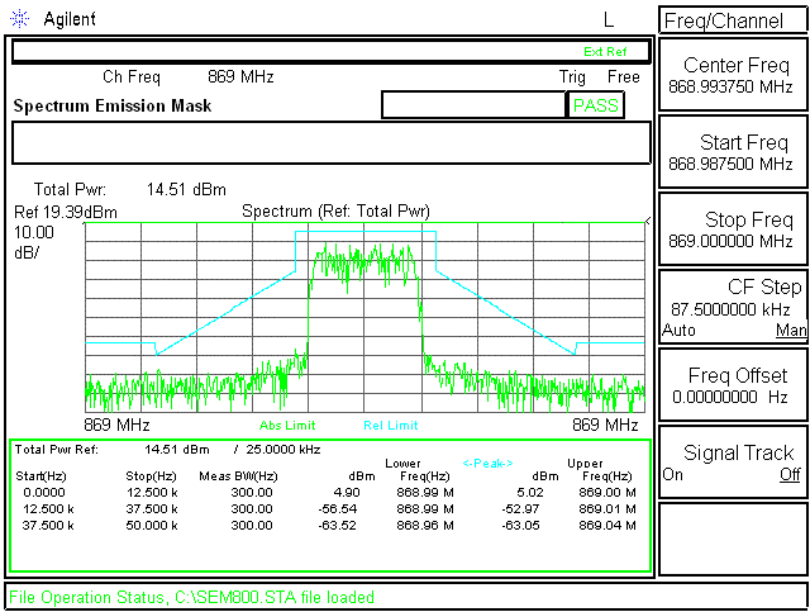
Mode : Down link
Carrier band : 7 MHz - B
Frequency : 862 MHz



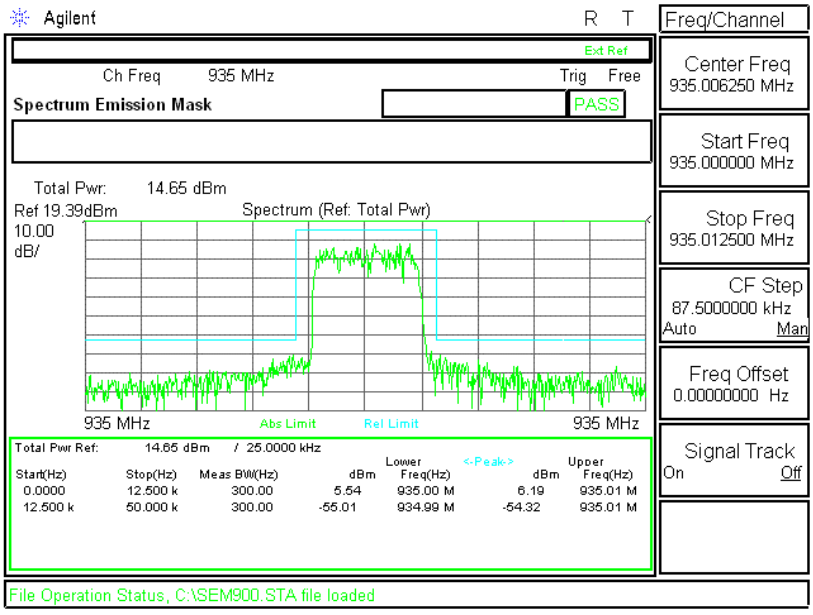
Mode : Down link
Carrier band : 7 MHz - M
Frequency : 865.5 MHz



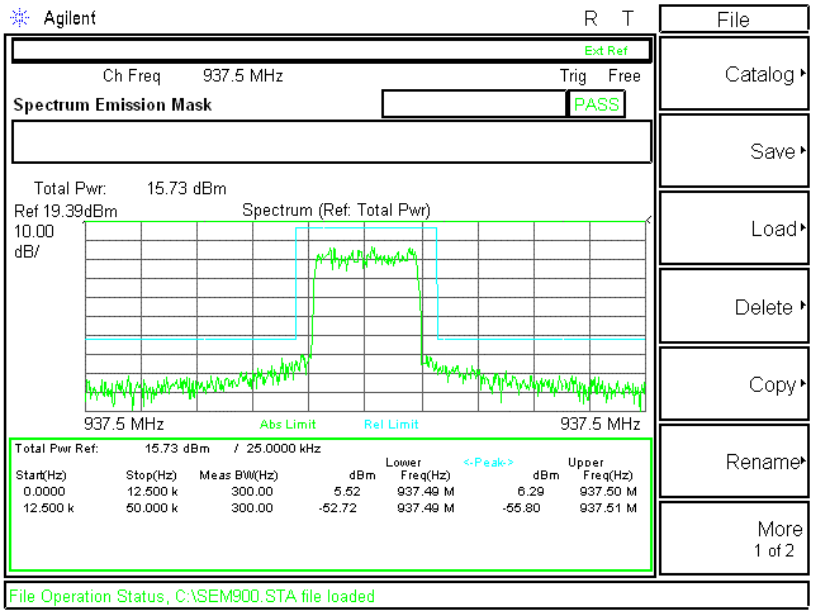
Mode : Down link
Carrier band : 7 MHz - T
Frequency : 869 MHz



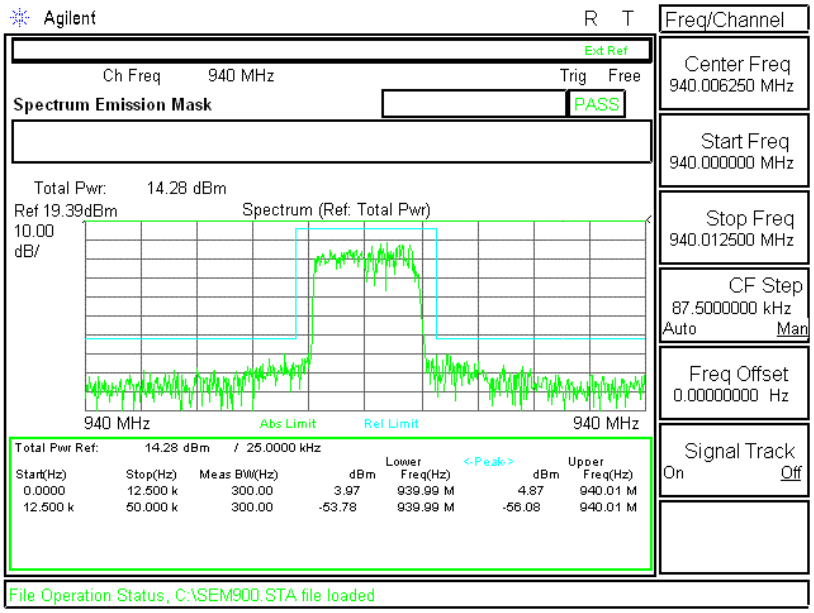
Mode : Down link
Carrier band : 5 MHz - B
Frequency : 935 MHz



Mode : Down link
Carrier band : 5 MHz - M
Frequency : 937.5 MHz



Mode : Down link
Carrier band : 5 MHz - T
Frequency : 940 MHz



3.6 Test Conditions and Results – Spurious Emission at Antenna Terminal

Test Description	Measurements were made in the laboratory environment. Conducted spurious emission measurement was made using a direct connection between RF output of the EUT and spectrum analyzer. A modulated carrier signal from the generator was applied to the both uplink and down link port of the EUT. Measurement has been performed with the EUT set to maximum output level at low, mid and high channel frequencies. The spectrum was investigated from 30 MHz to 10th harmonics of carrier. Inter-modulation requirements were performed with two modulated carriers set at 1 MHz deviation. One carrier was set at the band edge of both Uplink and Downlink and other carrier was set at 1 MHz deviation from the first carrier.
Basic Standard	47 CFR § 2.1051
Spurious Emission Limits	
§ 90.210 & § 90.669 Emission limit : On any frequency in an MTA licensee's spectrum block that is adjacent to a non-MTA frequency, the power of any emission shall be attenuated below the transmitter power(P) by at lease 43+ 10log$_{10}$(P) dB or 80 dB, whichever is the lesser attenuation.	

Conducted Spurious Emission Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	2,3	2,3
Supplementary information: None		

Conducted spurious emission Spectrum Analyzer Settings

Frequency Range (MHz)	Resolution Bandwidth	Resolution Bandwidth
30 MHz ~ 1 GHz	100 kHz	300 kHz
1 GHz ~ 10 GHz	1 MHz	3 MHz
Supplementary information:		

Spurious Emission Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Aeroflex	IFR3413	341006/212	2006-05-12	2007-05-12
Spectrum Analyzer	Agilent	E4440A	MY44022474	2006-11-06	2007-11-06
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-

Table 6 Antenna terminal Conducted spurious emission results

Up Link Spurious

Carrier Band	Tuned Frequency (MHz)	Loss offset (dB)	Spurious emission measured (dBm)	Limit (dBm)	Margin (dB)
iDEN 18 MHz	806	31	-36.25	-13	23.25
	815	31	-36.65	-13	23.65
	824	31	-36.39	-13	23.39
iDEN 7 MHz	817	31	-36.36	-13	23.36
	820.5	31	-36.26	-13	23.26
	824	31	-36.91	-13	23.91
iDEN 5 MHz	896	31	-36.55	-13	23.55
	898.5	31	-36.42	-13	23.42
	901	31	-36.29	-13	23.29
Supplementary information: -. Carrier signal was modulated with iDEN 16-QAM, Power measurement : Peak power measured -. For each tuned carrier frequency, the maximum spurious emission detected was recorded.					

Up Link Two carrier Intermodulation

Carrier Band	Tuned Frequency (MHz)	Loss offset (dB)	Spurious emission measured (dBm)	Limit (dBm)	Margin (dB)
iDEN 18 MHz	Low edge	32	-48.44	-13	35.44
	High edge	32	-51.98	-13	38.98
iDEN 7 MHz	Low edge	32	-47.77	-13	34.77
	High edge	32	-56.01	-13	43.01
iDEN 5 MHz	Low edge	32	-47.08	-13	34.08
	High edge	32	-53.22	-13	40.22
Supplementary information: -. Carrier signal was modulated with iDEN 16-QAM, Power measurement : Peak power measured -. For each tuned carrier frequency, the maximum spurious emission detected was recorded.					

Down link Spurious

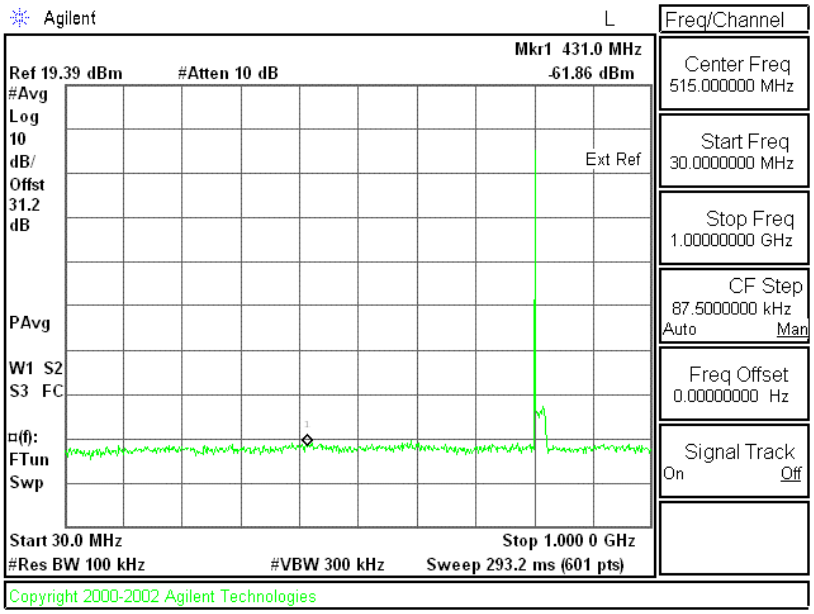
Carrier Band	Tuned Frequency (MHz)	Loss offset (dB)	Spurious emission measured (dBm)	Limit (dBm)	Margin (dB)
iDEN 18 MHz	851	31	-36.42	-13	23.42
	860	31	-36.57	-13	23.57
	869	31	-36.24	-13	23.24
iDEN 7 MHz	862	31	-35.44	-13	22.44
	865.5	31	-36.39	-13	23.39
	869	31	-36.14	-13	23.14
iDEN 5 MHz	935	31	-36.56	-13	23.56
	937.5	31	-36.50	-13	23.5
	940	31	-36.16	-13	23.16
Supplementary information: -. Carrier signal was modulated with iDEN 16-QAM, Power measurement : Peak power measured -. For each tuned carrier frequency, the maximum spurious emission detected was recorded.					

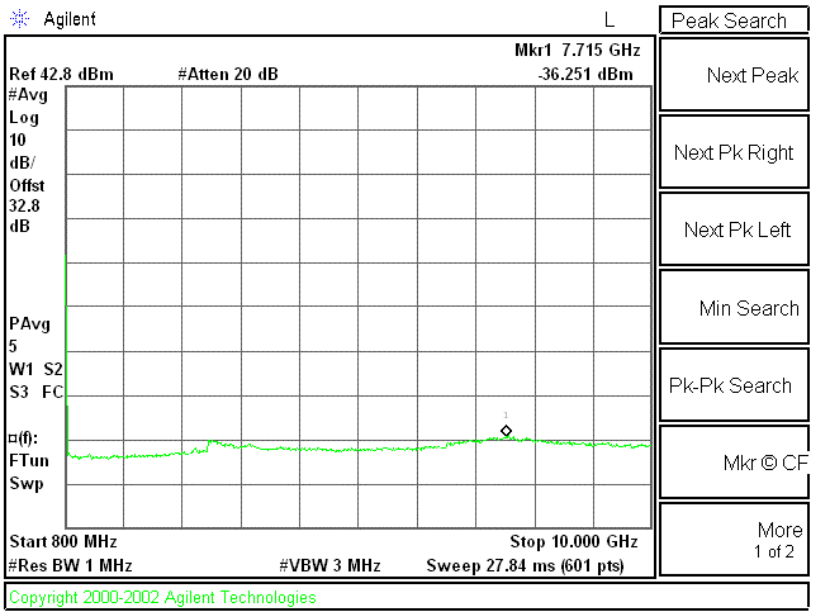
Down Link Two carrier Intermodulation

Carrier Band	Tuned Frequency (MHz)	Loss offset (dB)	Spurious emission measured (dBm)	Limit (dBm)	Margin (dB)
iDEN 18 MHz	Low edge	31	-47.03	-13	34.03
	High edge	31	-47.97	-13	34.97
iDEN 7 MHz	Low edge	31	-49.71	-13	36.71
	High edge	31	-47.39	-13	34.39
iDEN 5 MHz	Low edge	31	-50.31	-13	37.31
	High edge	31	-46.59	-13	33.59
Supplementary information: -. Carrier signal was modulated with iDEN 16-QAM, Power measurement : Peak power measured -. For each tuned carrier frequency, the maximum spurious emission detected was recorded.					

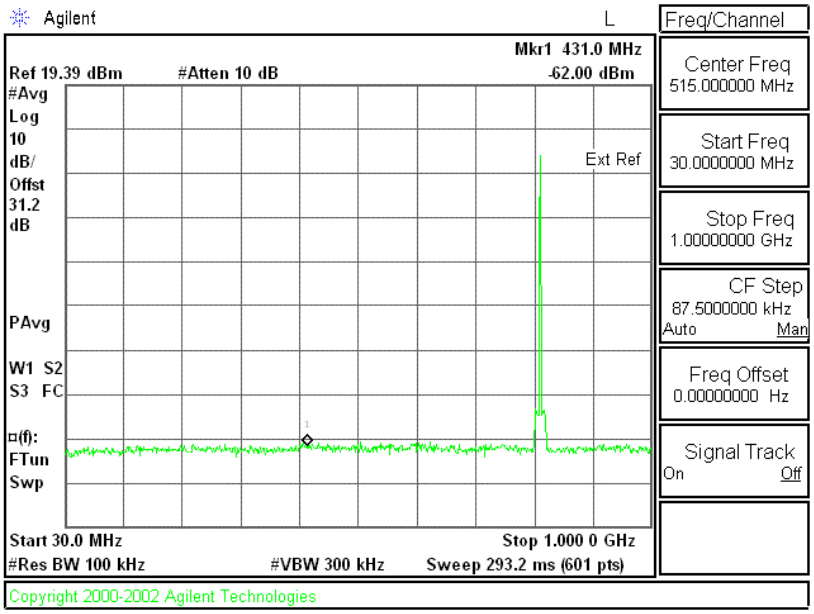
Figure 8. Conducted Spurious Emission plots at Antenna terminal

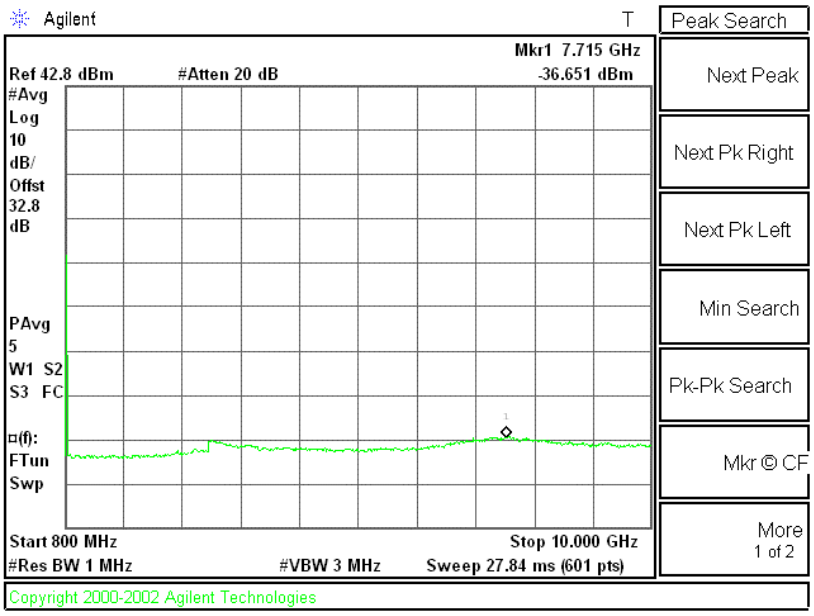
Mode : Up link
Carrier band : 18 MHz - B
Low Channel Frequency : 806 MHz



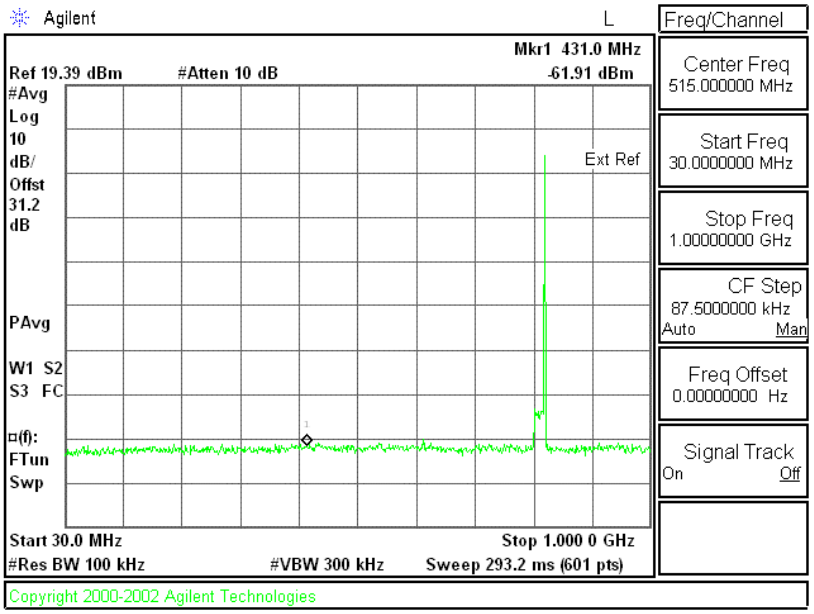


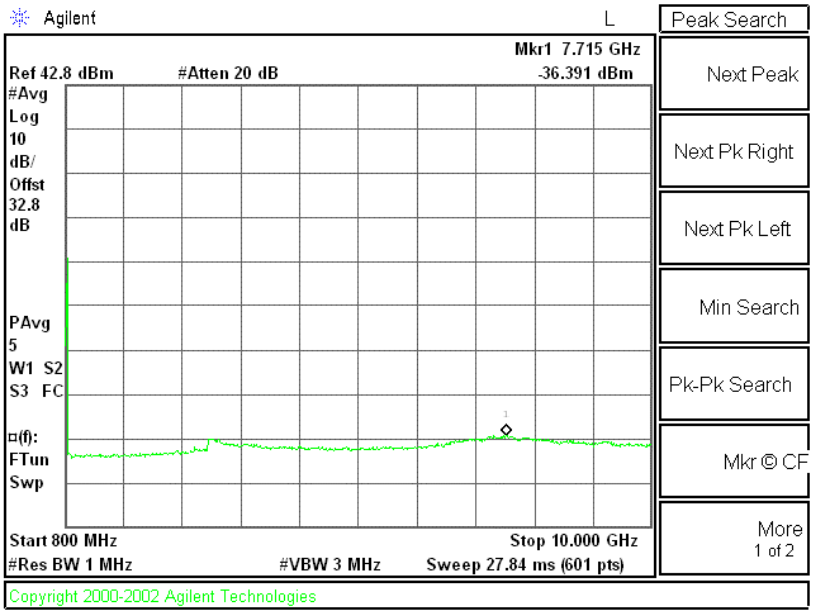
Mode : Up link
Carrier band : 18 MHz - M
Mid Channel Frequency : 815 MHz



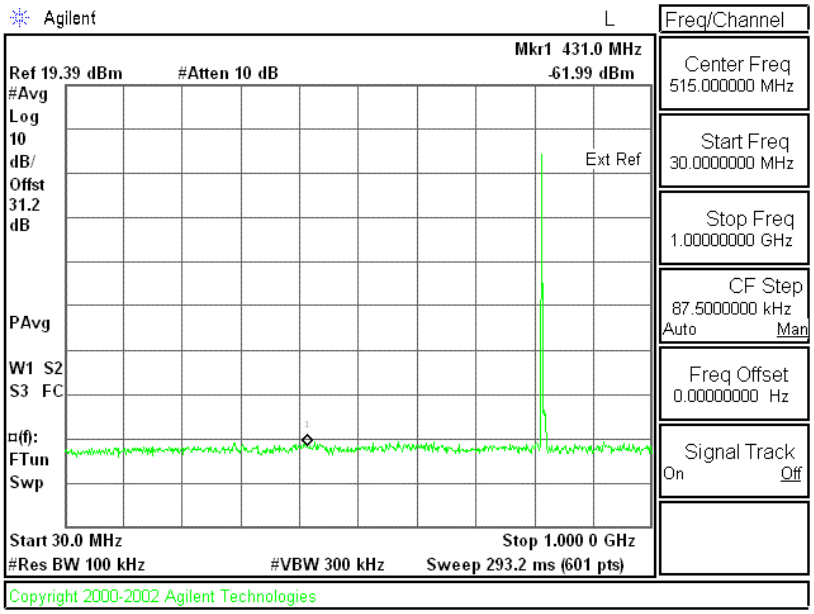


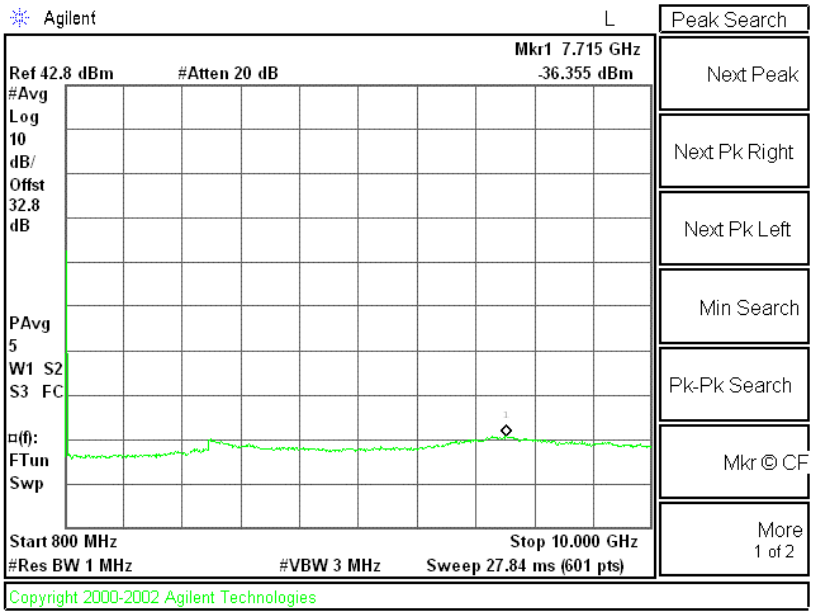
Mode : Up link
Carrier band : 18 MHz - T
High Channel Frequency : 824 MHz



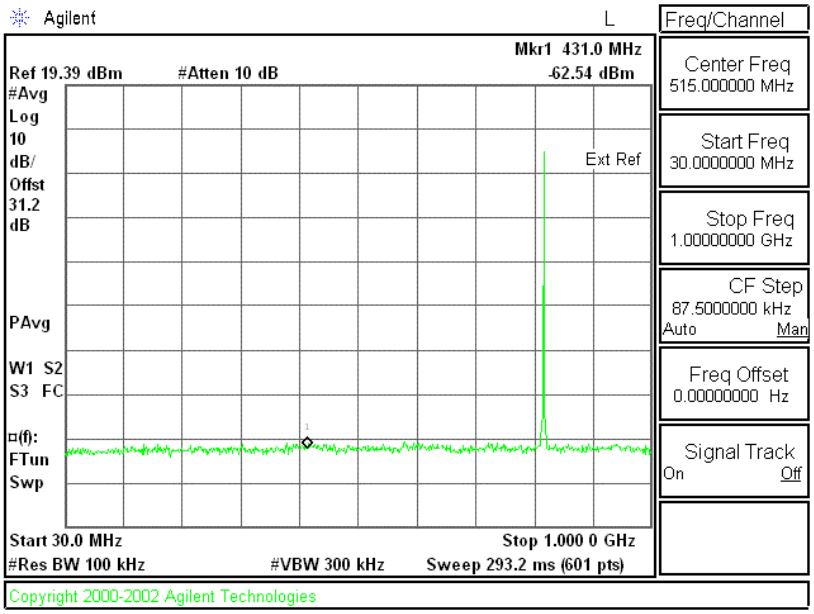


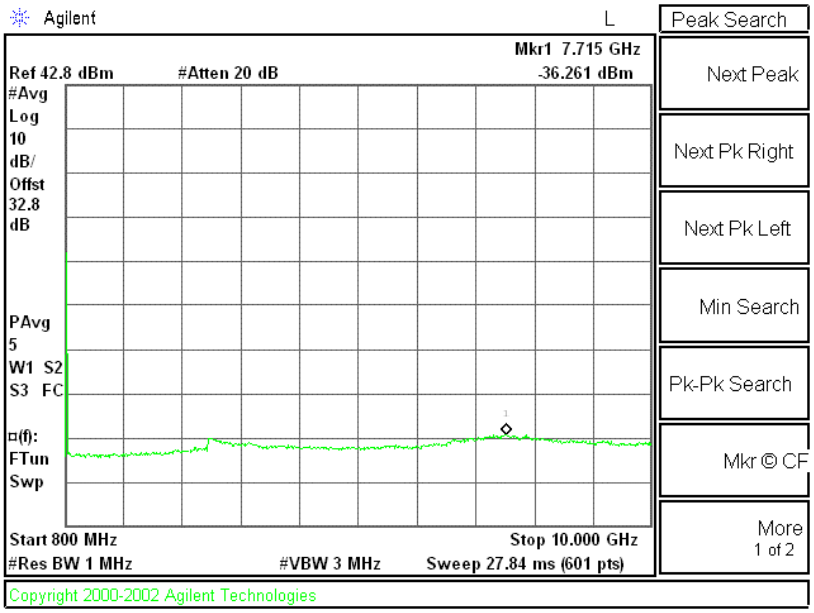
Mode : Up link
Carrier band : 7 MHz - B
Low Channel Frequency : 817 MHz



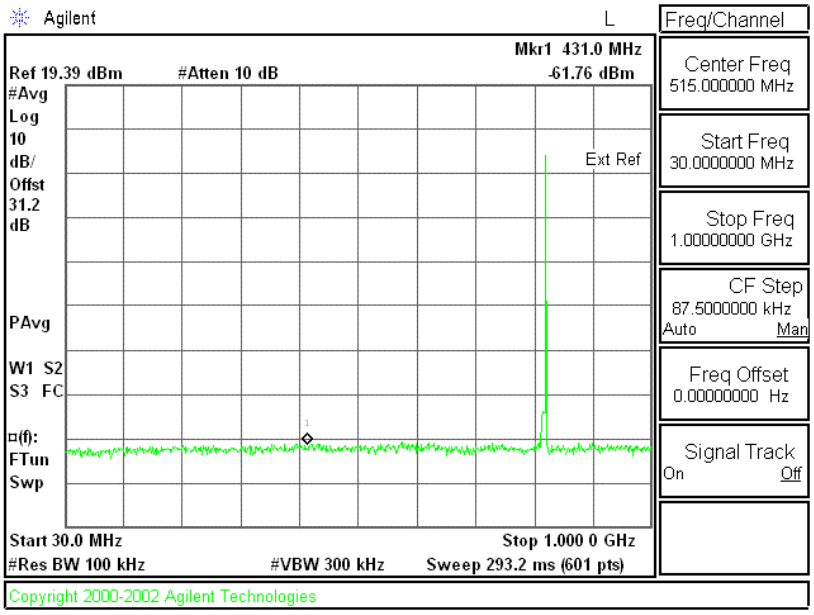


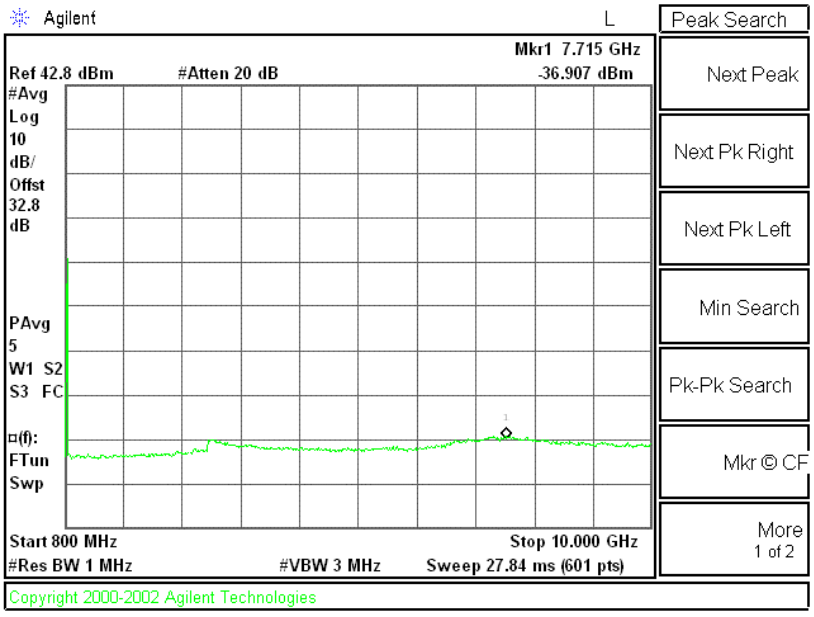
Mode : Up link
Carrier band : 7 MHz - M
Mid Channel Frequency : 820.5 MHz



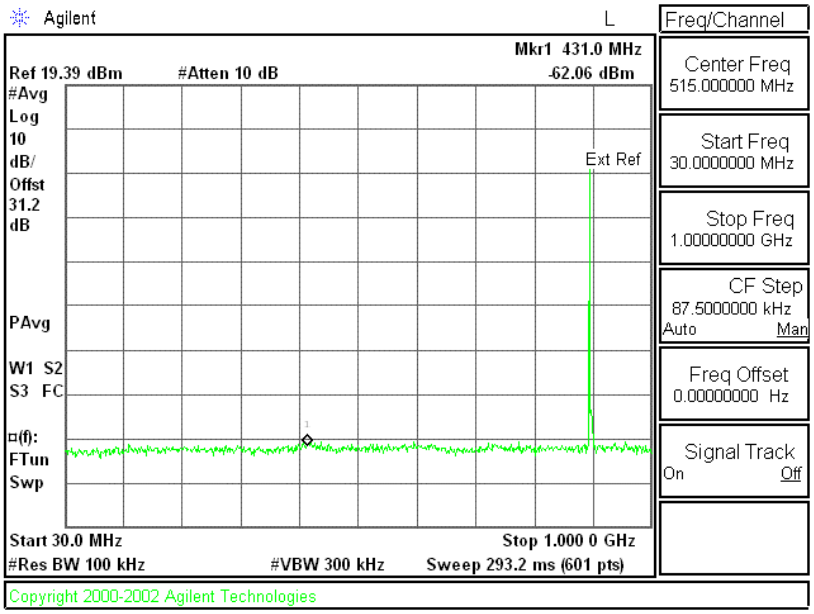


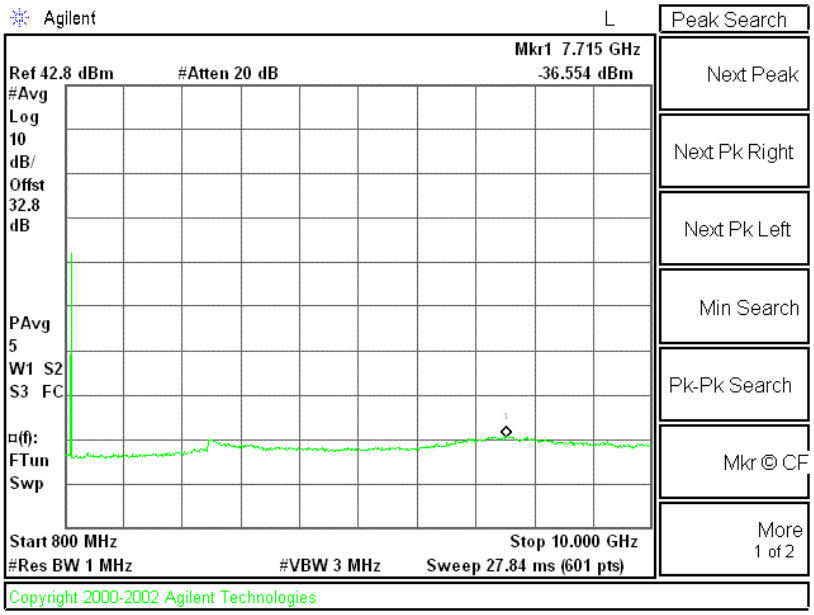
Mode : Up link
Carrier band : 7 MHz - T
High Channel Frequency : 824 MHz



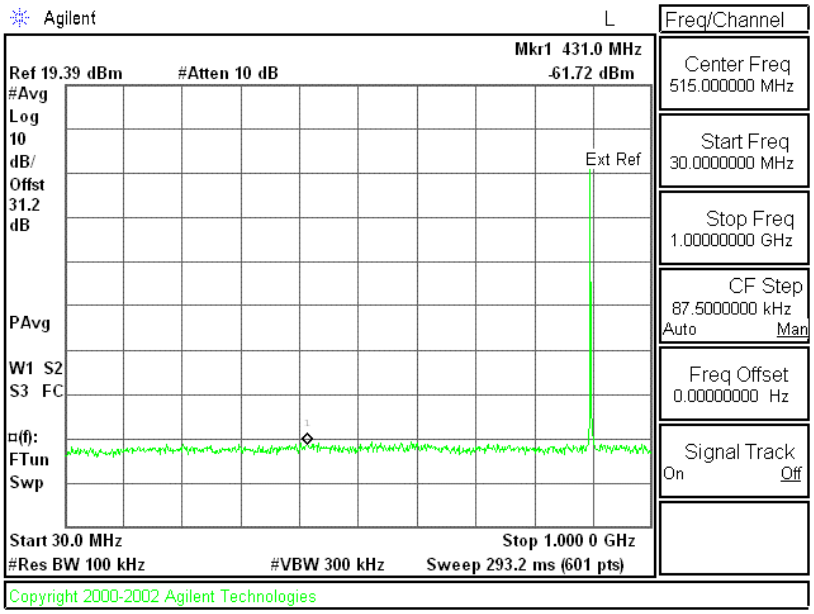


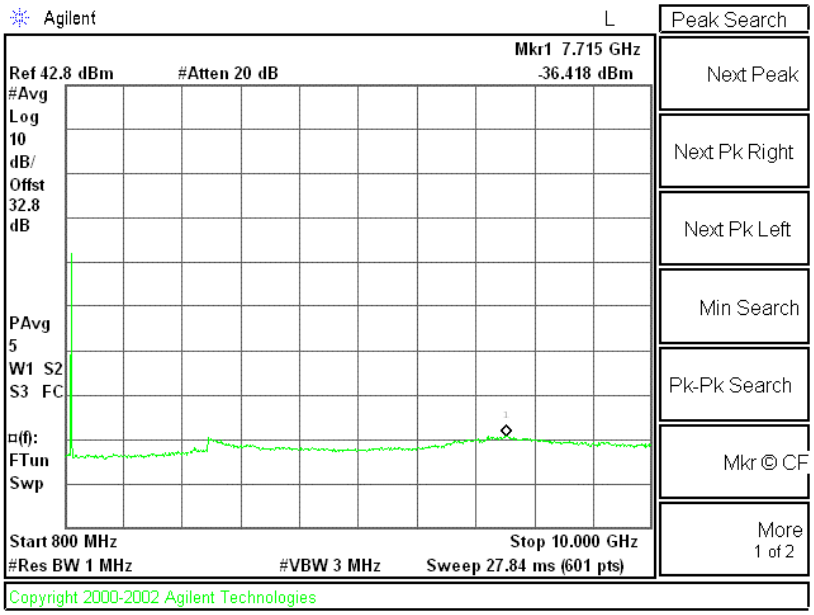
Mode : Up link
Carrier band : 5 MHz - B
Low Channel Frequency : 896 MHz



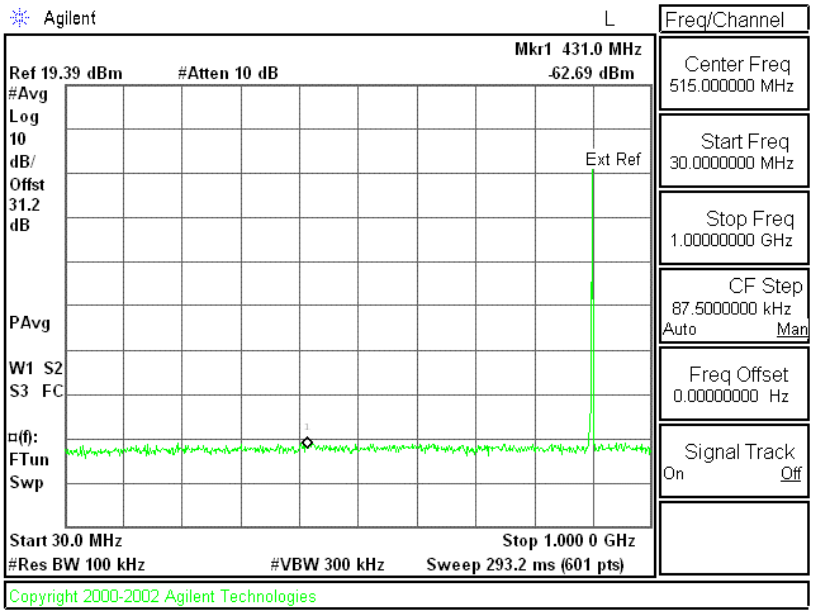


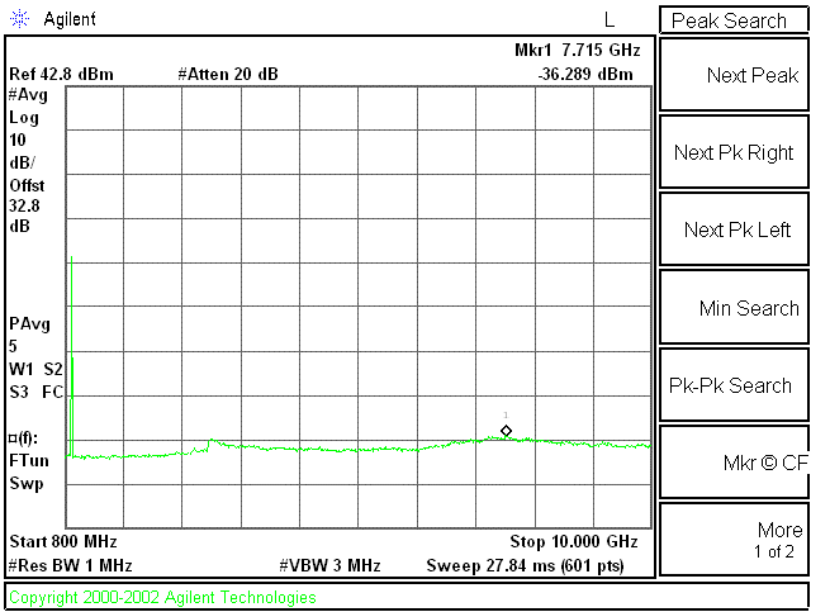
Mode : Up link
Carrier band : 5 MHz - M
Mid Channel Frequency : 898.5 MHz



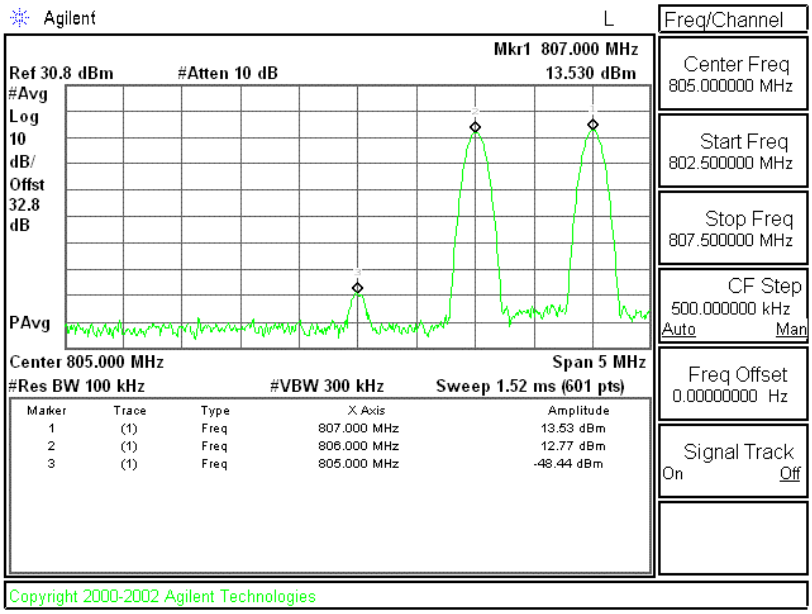


Mode : Up link
Carrier band : 5 MHz - T
High Channel Frequency : 901 MHz

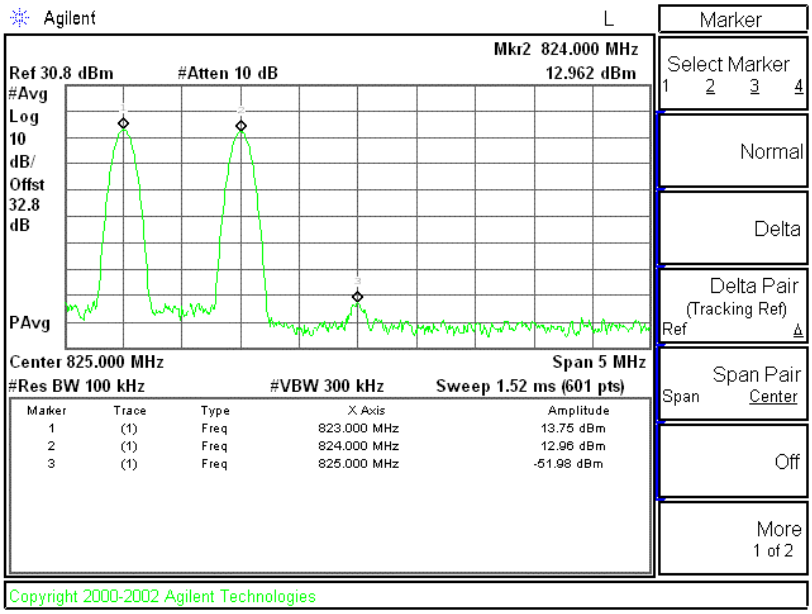




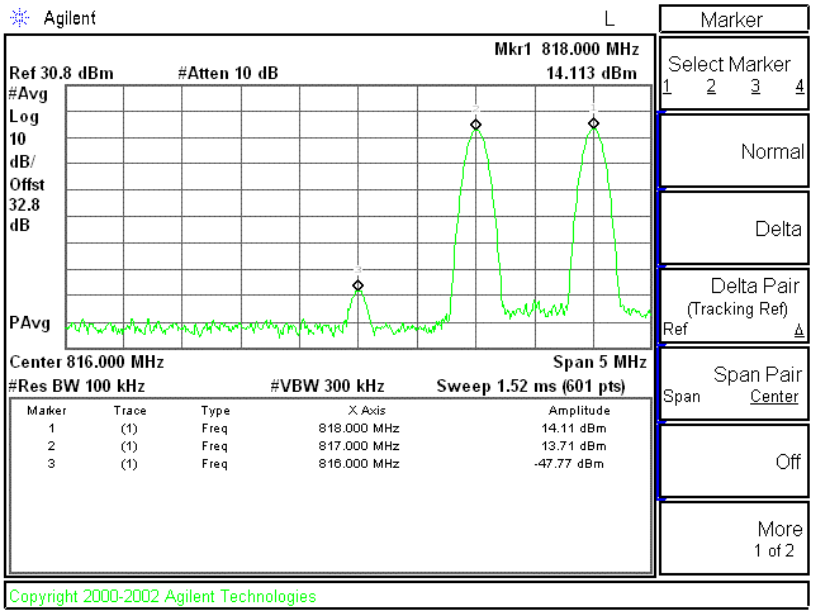
Mode : Up link – Two Carrier Intermodulation
Carrier band : 18 MHz – Low end band edge
Channel Frequency : 806/ 807 MHz



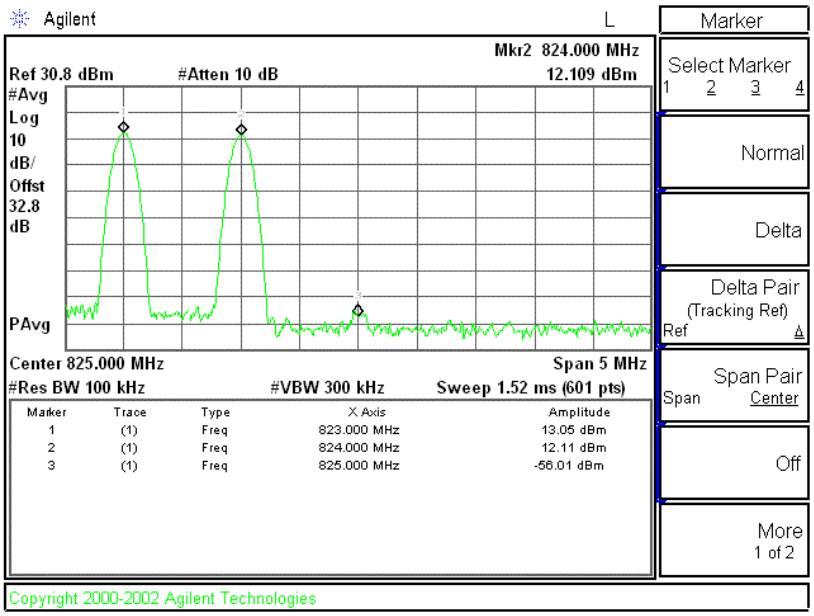
Carrier band : 18 MHz – High end band edge
Channel Frequency : 823/ 824 MHz



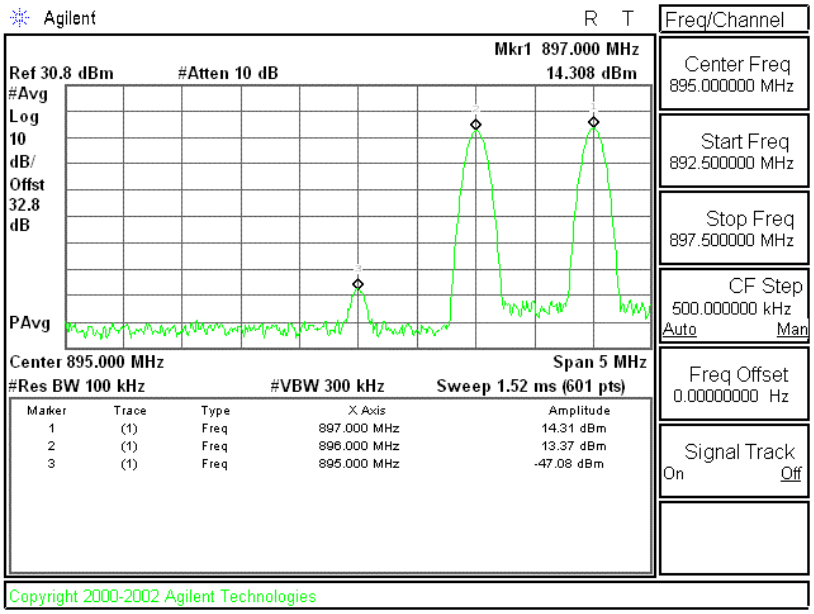
Mode : Up link – Two Carrier Intermodulation
Carrier band : 7 MHz – Low end band edge
Channel Frequency : 817/ 818 MHz



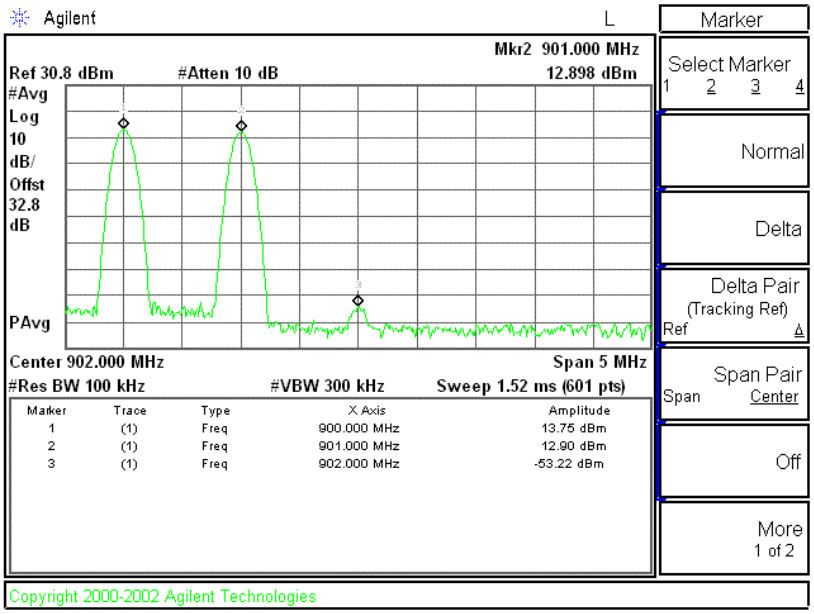
Carrier band : 7 MHz – High end band edge
Channel Frequency : 823/ 824 MHz



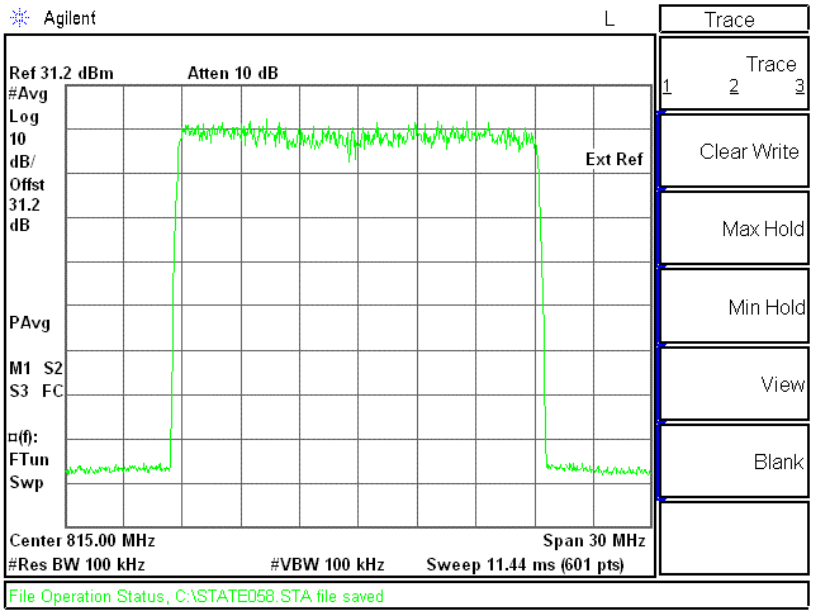
Mode : Up link – Two Carrier Intermodulation
Carrier band : 5 MHz – Low end band edge
Channel Frequency : 896/ 897 MHz



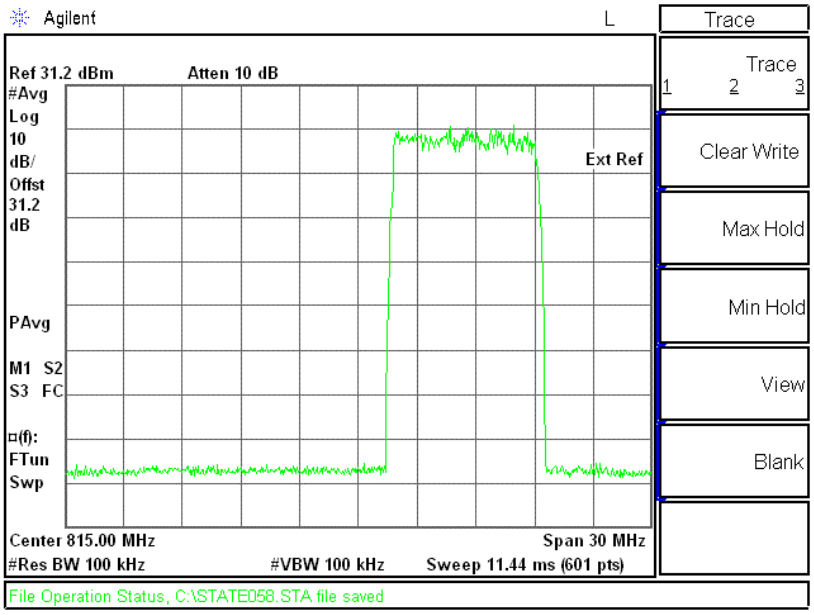
Carrier band : 5 MHz – High end band edge
Channel Frequency : 900/ 901 MHz



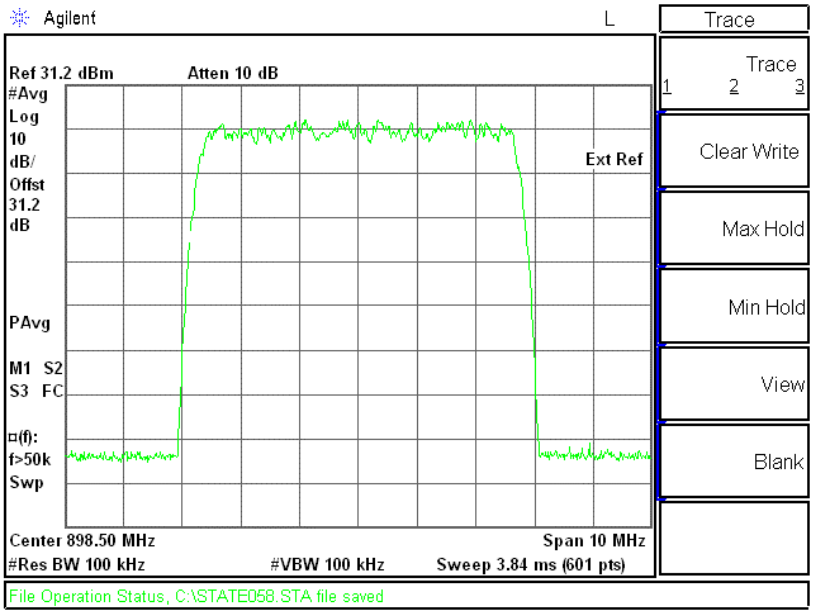
Mode : Up link – Out of band Rejection
Carrier band : 18 MHz



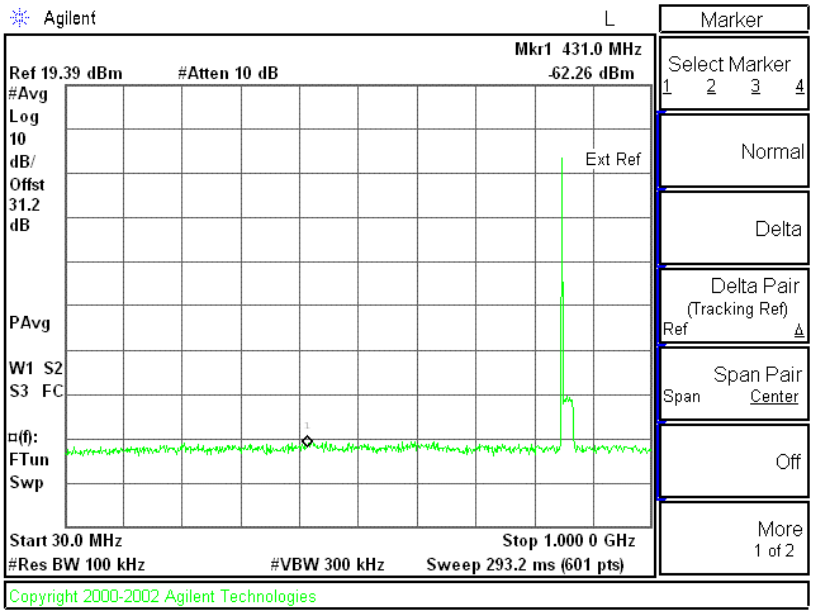
Mode : Up link – Out of band Rejection
Carrier band : 7 MHz

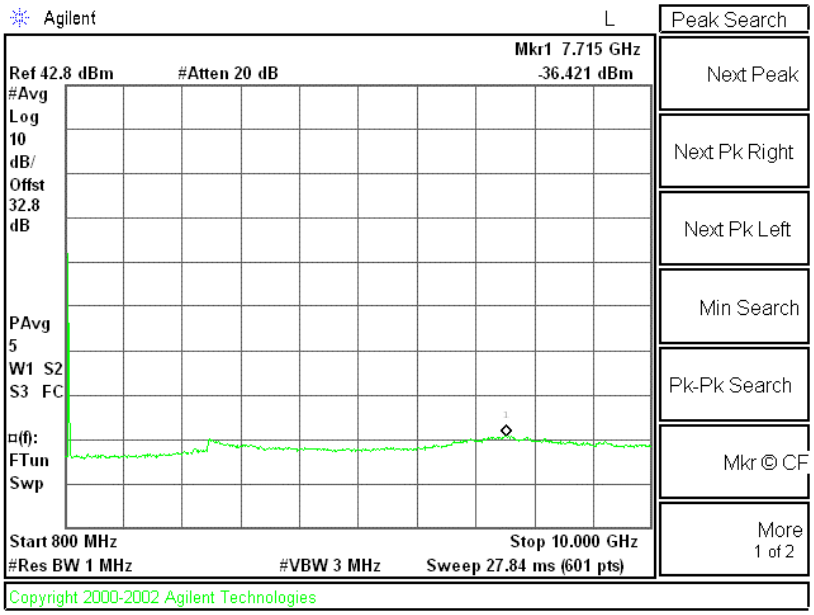


Mode : Up link – Out of band Rejection
Carrier band : 5 MHz

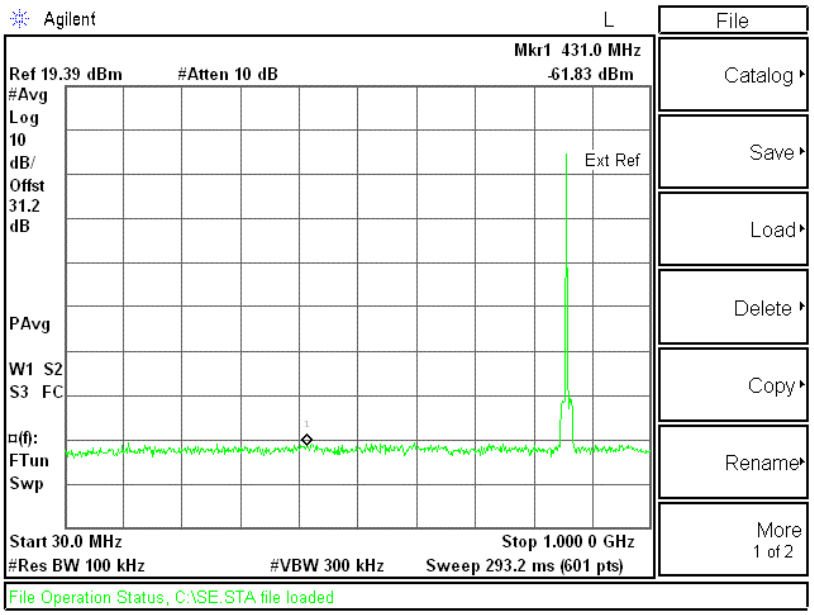


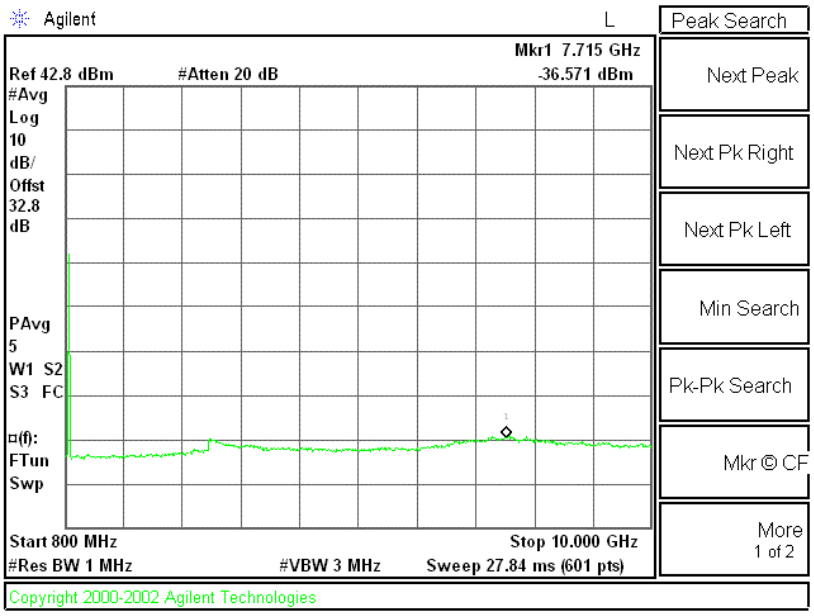
Mode : Down link
Carrier band : 18 MHz - B
Low Channel Frequency : 851 MHz



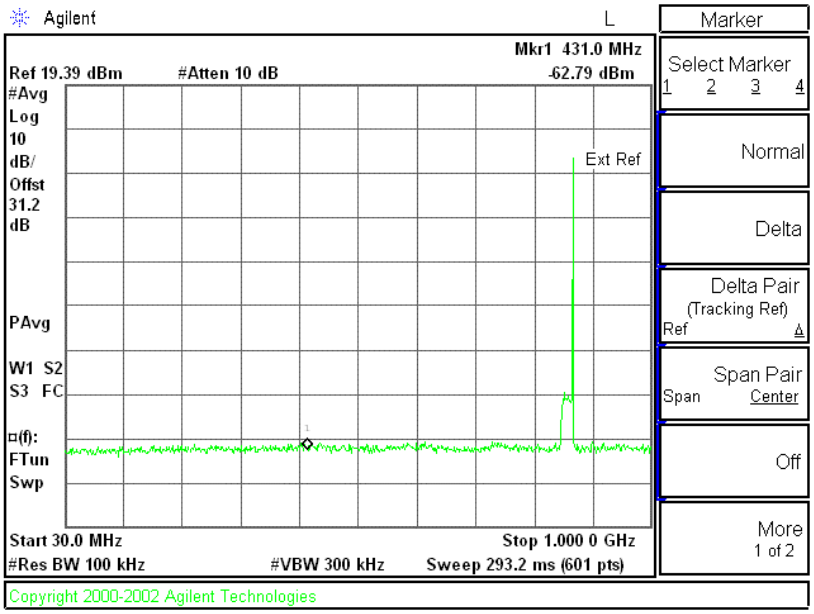


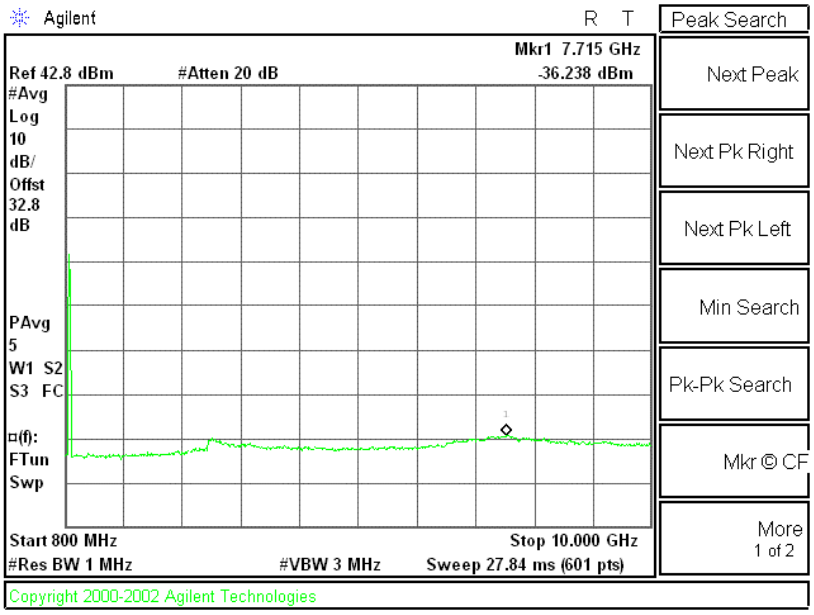
Mode : Down link
Carrier band : 18 MHz - M
Mid Channel Frequency : 860 MHz



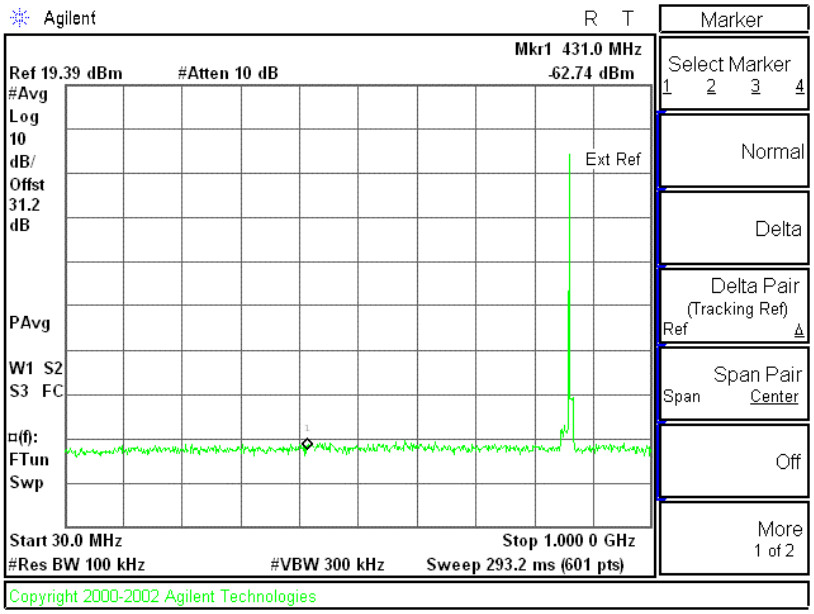


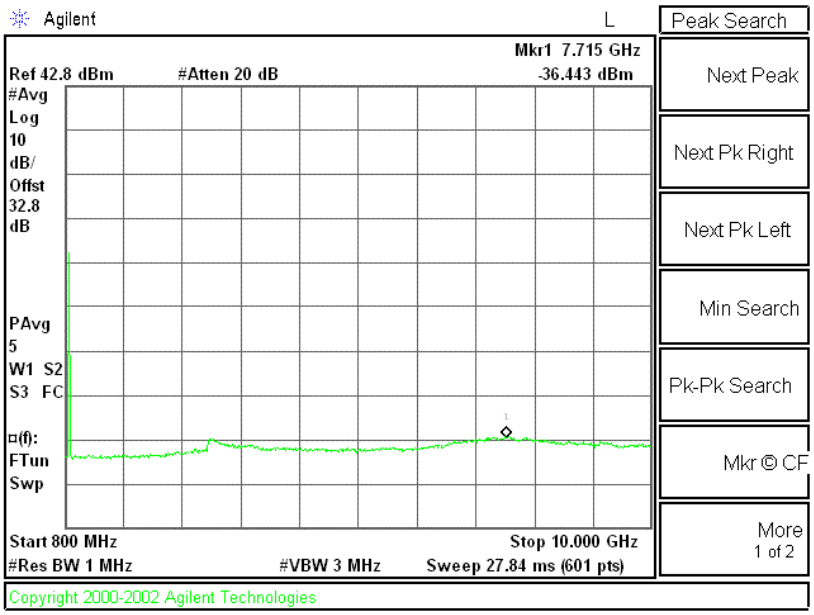
Mode : Down link
Carrier band : 18 MHz - T
High Channel Frequency : 869 MHz



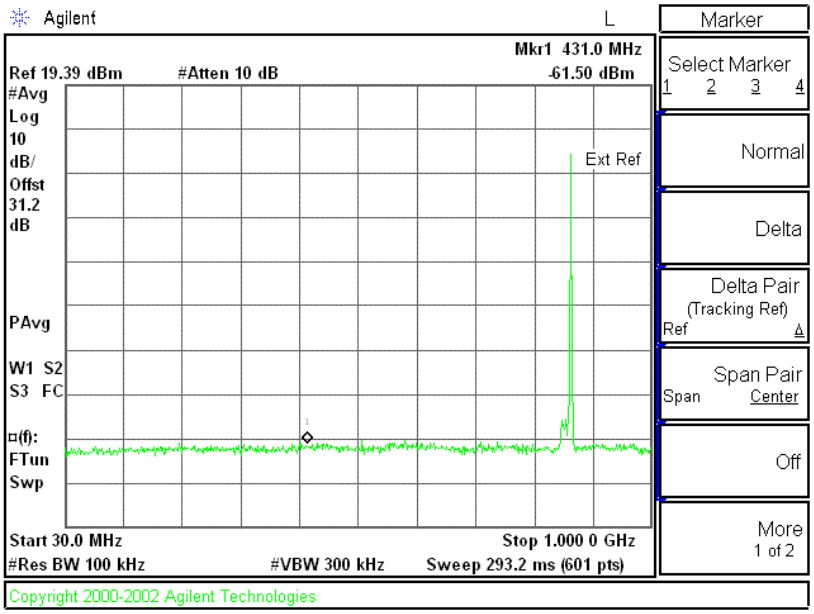


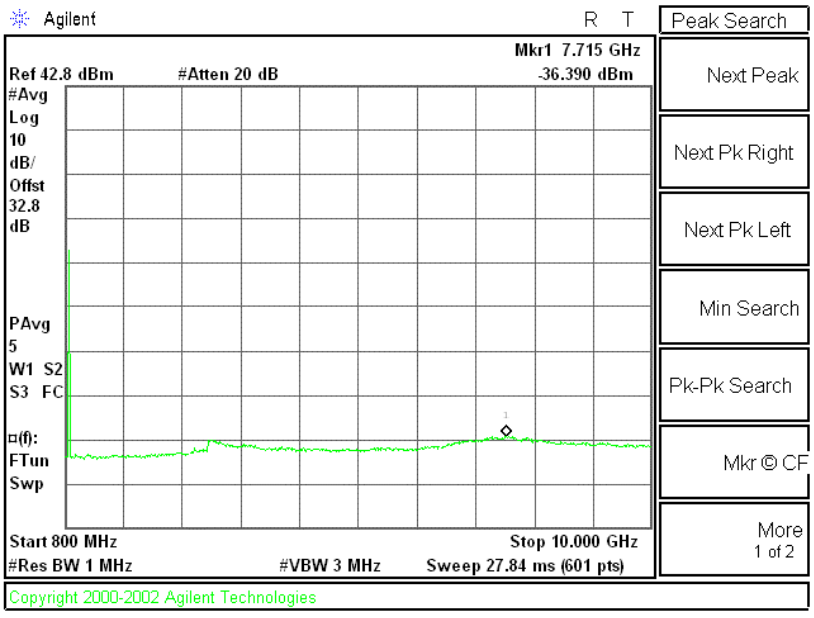
Mode : Down link
Carrier band : 7 MHz - B
Low Channel Frequency : 862 MHz



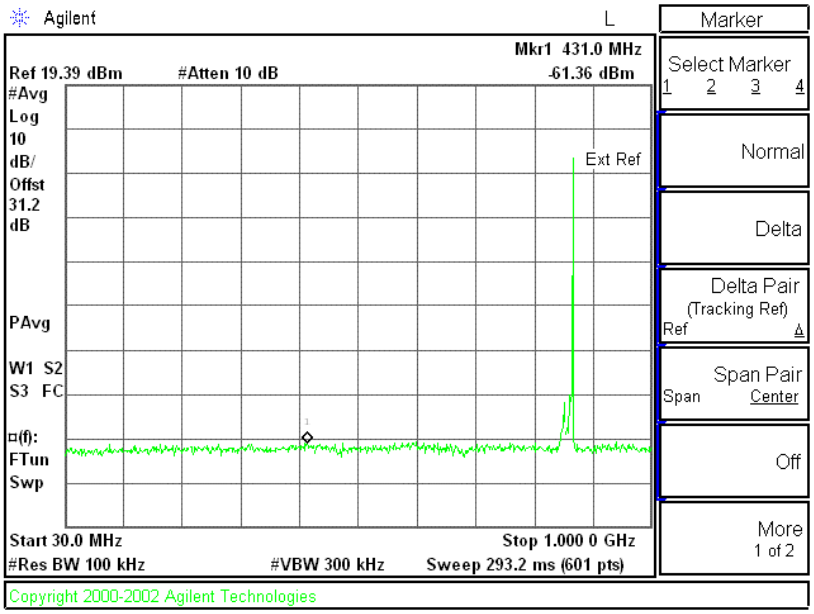


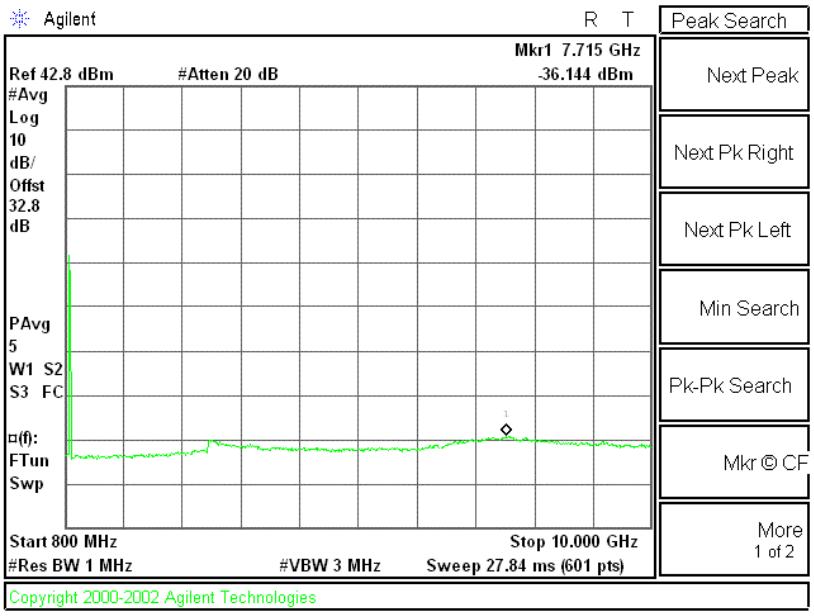
Mode : Down link
Carrier band : 7 MHz - M
Mid Channel Frequency : 865.5 MHz



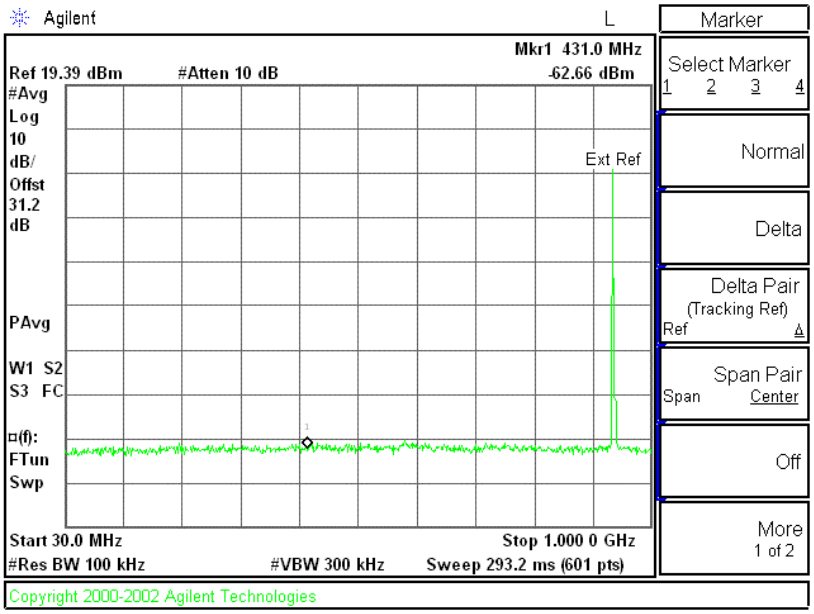


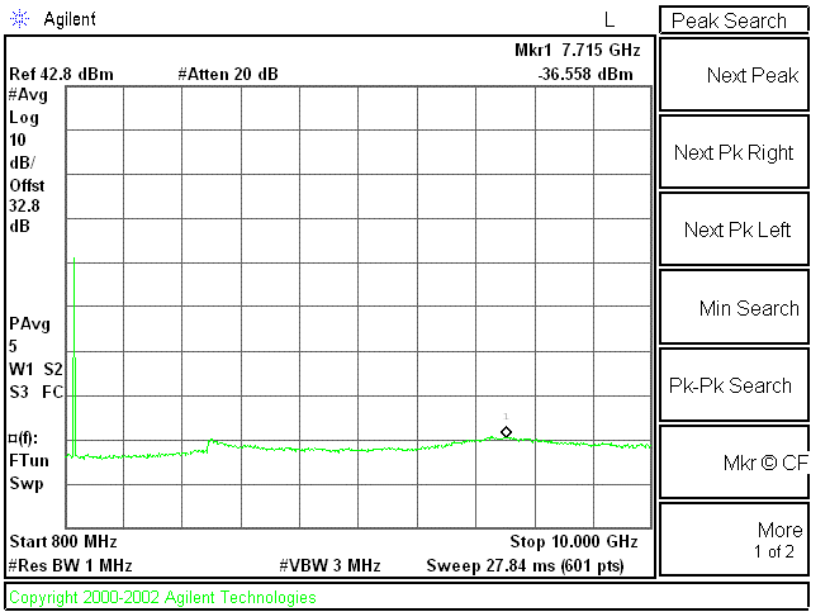
Mode : Down link
Carrier band : 7 MHz - T
High Channel Frequency : 869 MHz



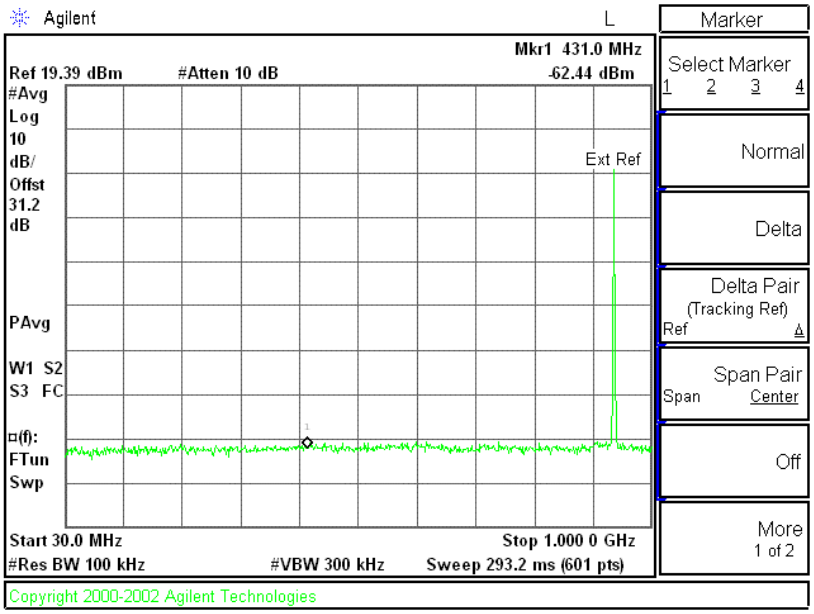


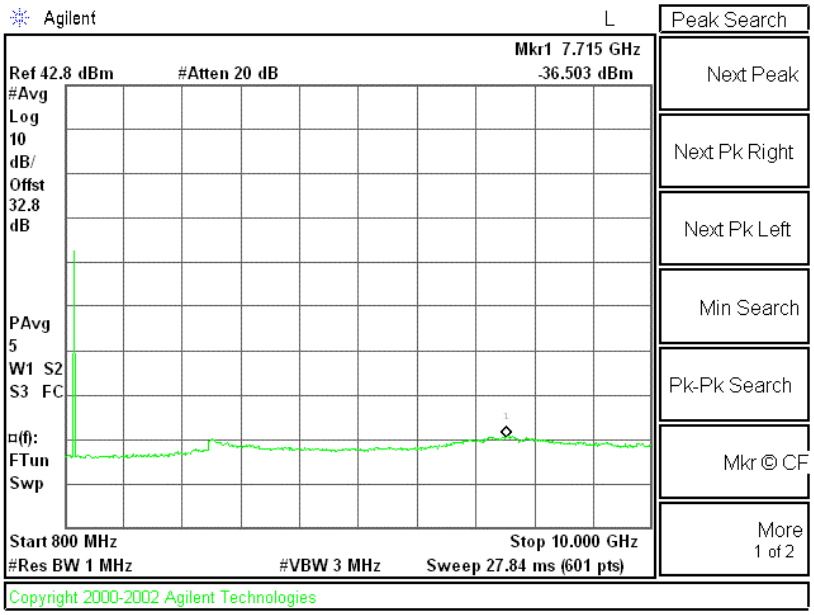
Mode : Down link
Carrier band : 5 MHz - B
Low Channel Frequency : 935 MHz



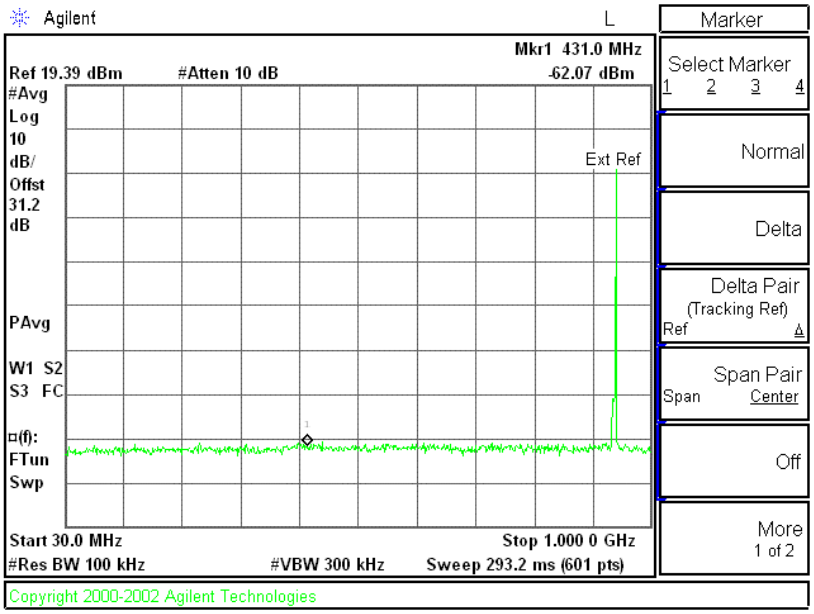


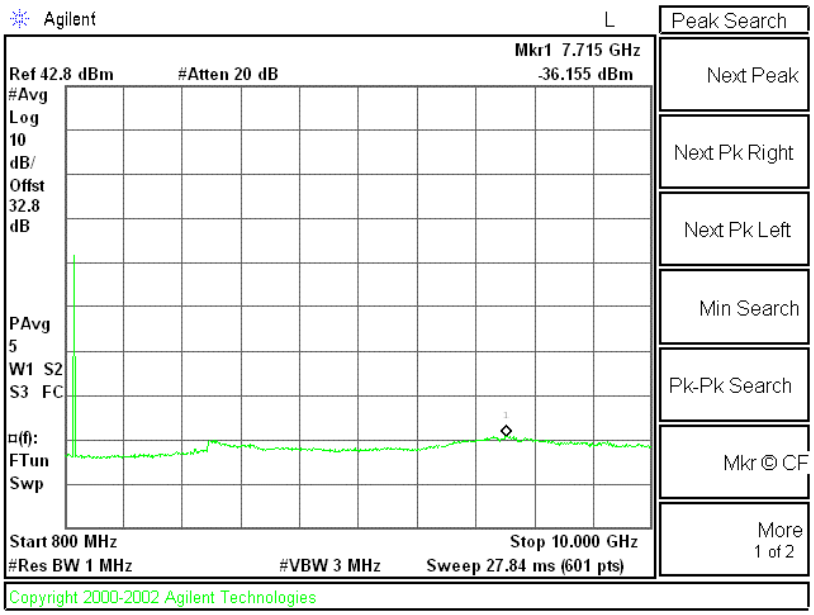
Mode : Down link
Carrier band : 5 MHz - M
Mid Channel Frequency : 937.5 MHz



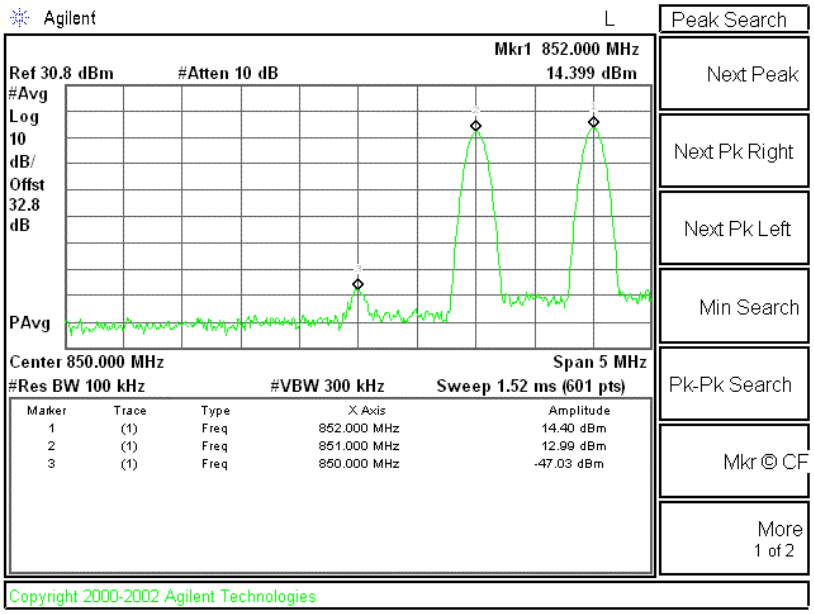


Mode : Down link
Carrier band : 5 MHz - T
High Channel Frequency : 940 MHz

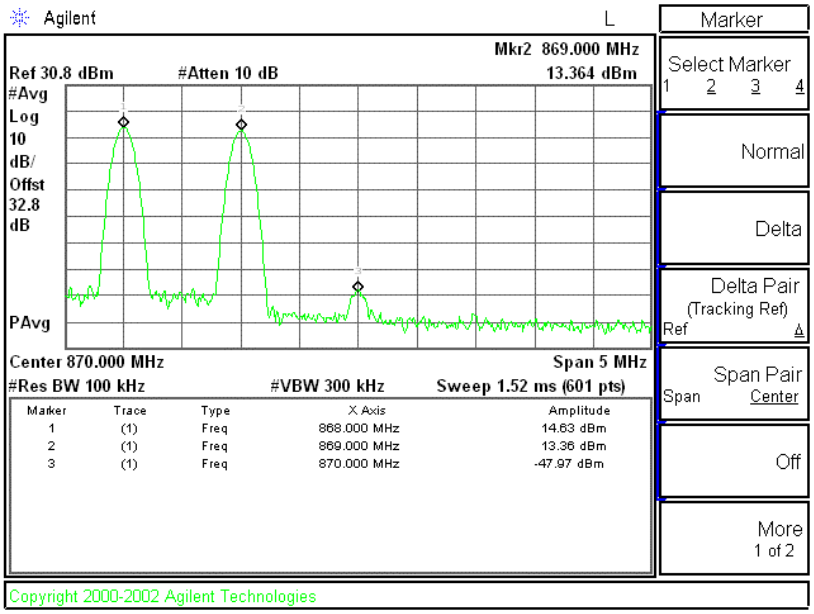




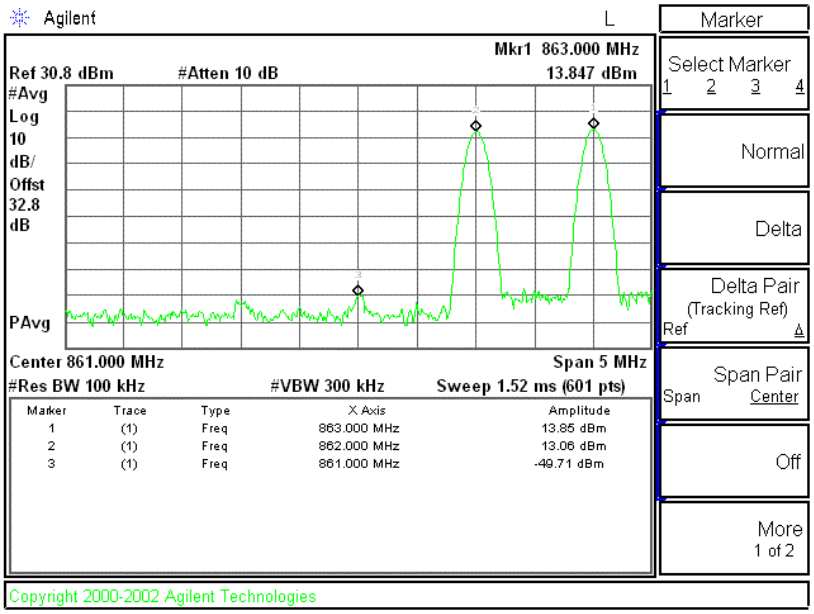
Mode : Down link – Two Carrier Intermodulation
Carrier band : 18 MHz – Low end band edge
Channel Frequency : 850/ 851 MHz



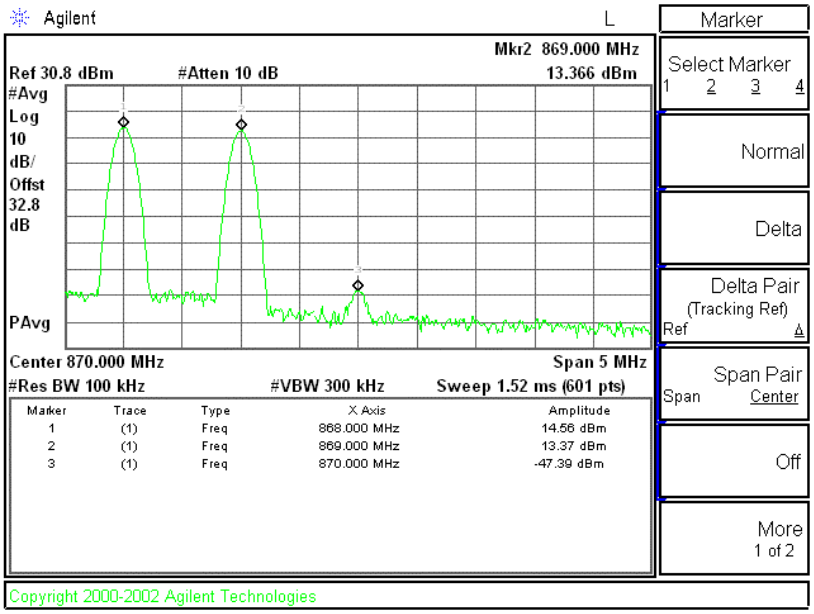
Carrier band : 18 MHz – High end band edge
Channel Frequency : 868/ 869 MHz



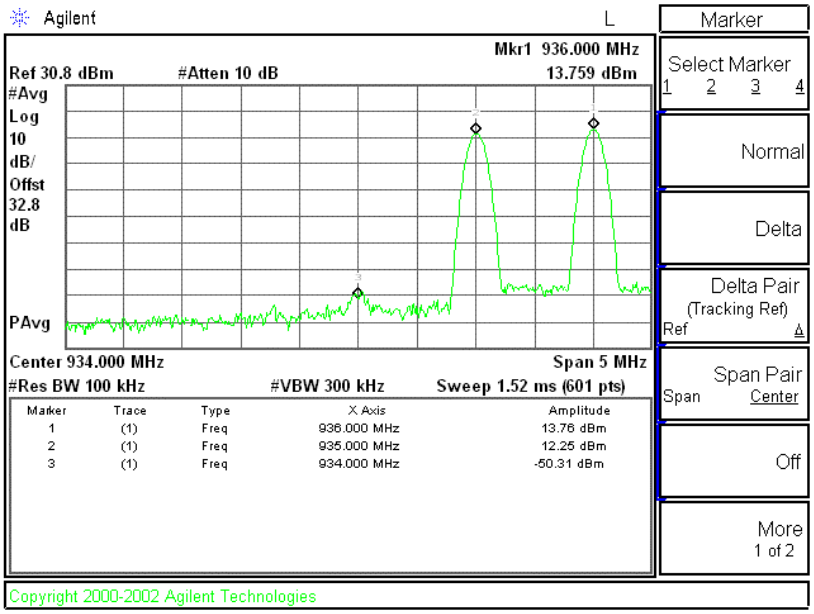
Mode : Down link – Two Carrier Intermodulation
Carrier band : 7 MHz – Low end band edge
Channel Frequency : 862/ 863 MHz



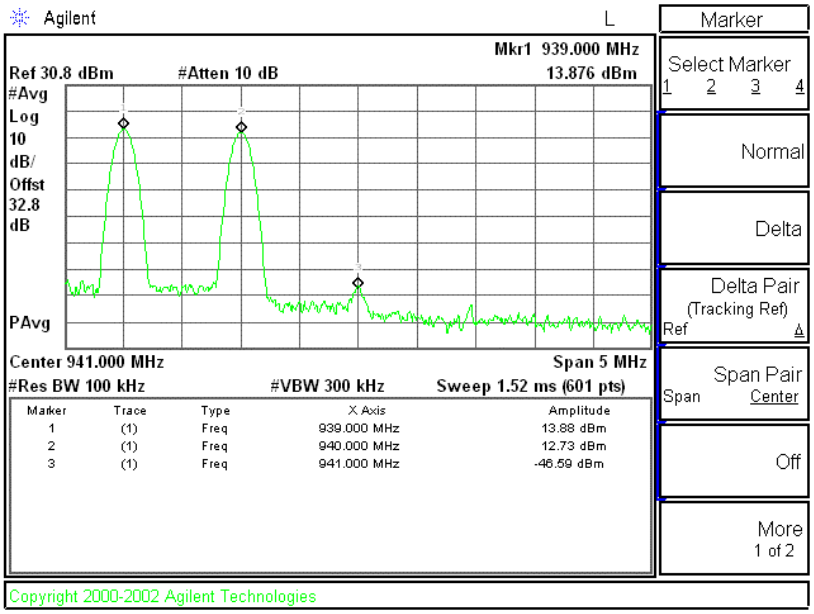
Carrier band : 7 MHz – High end band edge
Channel Frequency : 868/ 869 MHz



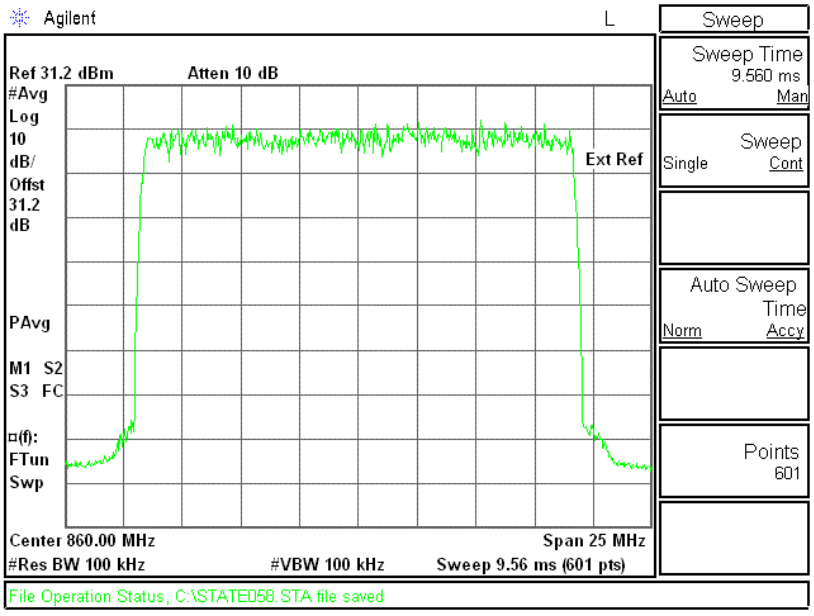
Mode : Down link – Two Carrier Intermodulation
Carrier band : 5 MHz – Low end band edge
Channel Frequency : 935/ 936 MHz



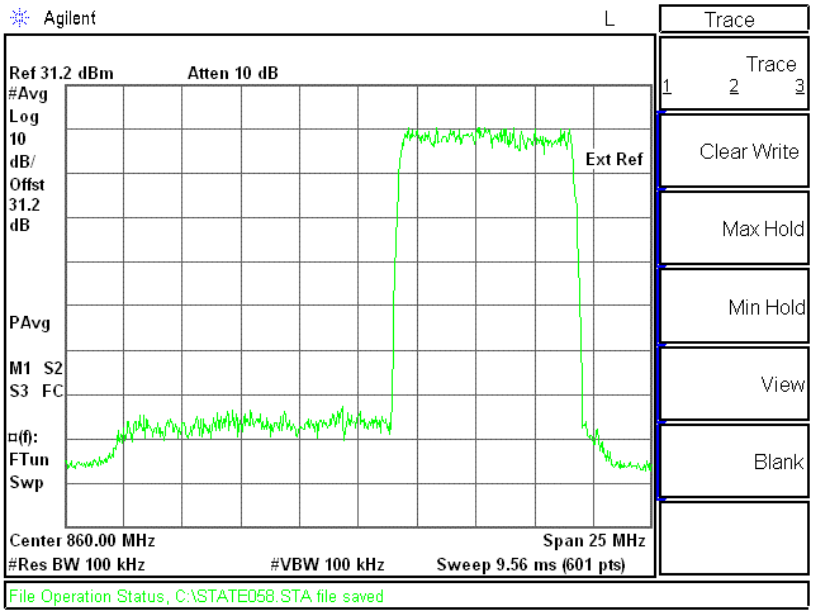
Carrier band : 5 MHz – High end band edge
Channel Frequency : 939/ 940 MHz



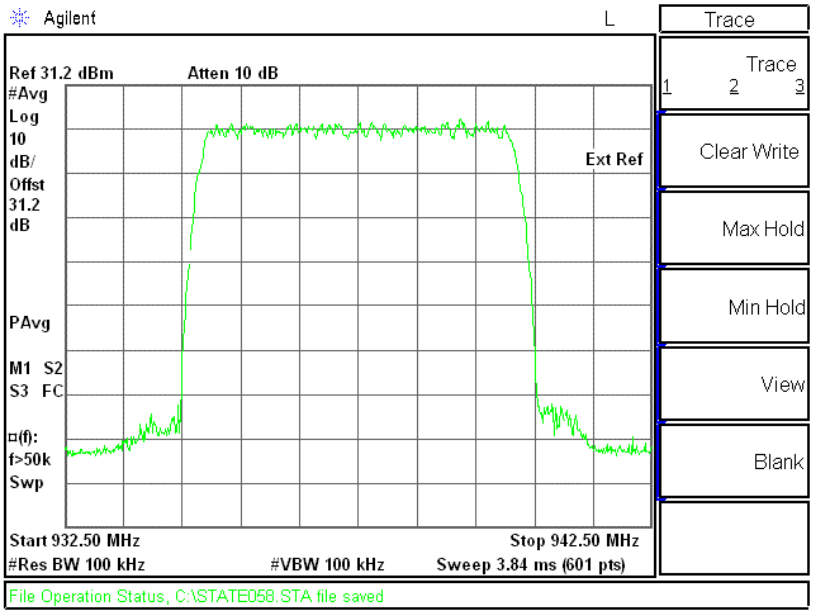
Mode : Down link – Out of band Rejection
Carrier band : 18 MHz



Mode : Down link – Out of band Rejection
Carrier band : 7 MHz



Mode : Down link – Out of band Rejection
Carrier band : 5 MHz



3.7 Test Conditions and Results – Radiated Spurious Emission

Test Description	Measurements were made in a 10-meter open field test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at semi-anechoic chamber with an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters in accordance with procedure of substitution method specified in TIA/EIA-603-A-2003. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable. The maximum EIRP of the emission was up to 10th harmonics.

Basic Standard	TIA/EIA/603-A-2003	
Radiated Spurious Emission LIMITS		
§ 90.210 & § 90.669 Emission limit : On any frequency in an MTA licensee's spectrum block that is adjacent to a non-MTA frequency, the power of any emission shall be attenuated below the transmitter power(P) by at lease 43+ $10\log_{10}(P)$ dB or 80 dB, whichever is the lesser attenuation.		
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	27 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	1GHz – 10GHz	(3 meter measurement distance)
Limits – EIRP		
Frequency (MHz)	Limit (dBm EIRP)	
	Peak	Average
Harmonics up to 10th	-13	NA
Supplementary information:		

Conducted spurious emission Spectrum Analyzer Settings

Frequency Range (MHz)	Resolution Bandwidth	Resolution Bandwidth
1 GHz ~ 10 GHz	1 MHz	3 MHz
Supplementary information: Peak measurement		

Radiated Emissions EUT Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See Section 2.6)
1	2,3	2,3
Supplementary information: The EUT operation modes specified in Section 2.4 have been investigated and final measurement.		

Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4407B	US42041281	2007-03-02	2008-03-02
Horn Antenna	Schwarzbeck	BBHA 9120D	469	2007-07-24	2008-07-24
Pre-Amplifier	HP	8449B	3008A00581	2007-03-06	2008-03-06

Figure 9 Test setup for Spurious Radiated Emissions

Table 7 Spurious Radiated Emissions Data Points

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Level dBuV/m	Limit 1 dBuV/m	Margin (dB)

Supplementary information:

-. There was no detectable spurious emissions from the EUT. The Uplink and Downlink harmonic emissions were at the noise floor of the spectrum analyzer.

-. No emissions were detected within 20dB below the permitted limit.

3.8 Test Conditions and Results – Frequency Stability

Test Description	For Temperature Frequency Stability, measurements were made with the product placed in an environmental chamber and the temperature varied from –30℃ to +50℃ at the normal supply voltage. The frequency drift of the fundamental frequency was measured with a spectrum analyzer. For Power Supply Frequency Stability, measurements were made in a laboratory environment and the supply voltage varied from 85% to 115%. The ambient temperature was 20℃.
Basic Standard	47 CFR § 2.1055, § 90.213
Frequency Stability Limits	
+/- 1 ppm of the Operating Frequency Tuned	

Frequency Stability Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.10)	EUT Operation Mode # (See 2.7)
1,2,3	2, 3	2, 3
Supplementary information: None		

Frequency Stability Test Equipment

Description	Manufacturer	Model	Identifier
Temperature chamber	NeingYoul	NY-THR	13200
Temperature Recorder	Yokogawa	SR-1006	-
Spectrum Analyzer	Agilent	E4445A	US42220280
Signal Generator	Aeroflex	IFR3413	341006/206
Fixed Attenuator	Agilent	30 dB	MY41495185

Table 8 Frequency Stability Test results

Frequency Stability with variation of Ambient Temperature - Uplink

Carrier Band	Temperature (℃)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
iDEN 18 MHz Mid channel tuned	50	815,000,000.000	814,999,999.999	-0.001	1.0
	40	815,000,000.000	814,999,999.999	-0.001	1.0
	30	815,000,000.000	814,999,999.999	-0.001	1.0
	20	Reference			
	10	815,000,000.000	814,999,999.996	-0.004	1.0
	0	815,000,000.000	814,999,999.999	-0.001	1.0
	-10	815,000,000.000	814,999,999.997	-0.003	1.0
	-20	815,000,000.000	815,000,000.000	0.000	1.0
	-30	815,000,000.000	814,999,999.999	-0.001	1.0
iDEN 7 MHz Mid channel tuned	50	820,500,000.000	820,499,999.996	-0.004	1.0
	40	820,500,000.000	820,500,000.000	0.000	1.0
	30	820,500,000.000	820,499,999.999	-0.001	1.0
	20	Reference			
	10	820,500,000.000	820,499,999.997	-0.003	1.0
	0	820,500,000.000	820,499,999.999	-0.001	1.0
	-10	820,500,000.000	820,500,000.002	0.002	1.0
	-20	820,500,000.000	820,499,999.999	-0.001	1.0
	-30	820,500,000.000	820,500,000.001	0.001	1.0
iDEN 5 MHz Mid channel tuned	50	898,500,000.000	898,500,000.000	0.000	1.0
	40	898,500,000.000	898,499,999.999	-0.001	1.0
	30	898,500,000.000	898,499,999.998	-0.002	1.0
	20	Reference			
	10	898,500,000.000	898,499,999.997	-0.003	1.0
	0	898,500,000.000	898,500,000.001	0.001	1.0
	-10	898,500,000.000	898,499,999.998	-0.002	1.0
	-20	898,500,000.000	898,500,000.000	0.000	1.0
	-30	898,500,000.000	898,499,999.998	-0.002	1.0

Supplementary information:
-. No modulation,
-. Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
-. Reference inout voltage : 120Vac

Frequency Stability with variation of Input voltage - Uplink

Carrier Band	Input voltage (V)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
iDEN 18 MHz Mid channel	102 Vac	815,000,000.000	815,000,000.000	0.000	1.0
	138 Vac	815,000,000.000	814,999,999.998	-0.002	1.0
iDEN 7 MHz Mid channel	102 Vac	820,500,000.000	820,500,000.000	0.000	1.0
	138 Vac	820,500,000.000	820,500,000.003	0.003	1.0
iDEN 5 MHz Mid channel	102 Vac	898,500,000.000	898,500,000.000	0.000	1.0
	138 Vac	898,500,000.000	898,500,000.003	0.003	1.0

Supplementary information:
-. No modulation,
-. Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
-. Reference temperature : 20℃

Frequency Stability with variation of Ambient Temperature - Downlink

Carrier Band	Temperature (℃)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
iDEN 18 MHz Mid channel tuned	50	860,000,000.000	859,999,999.999	-0.001	1.0
	40	860,000,000.000	860,000,000.002	0.002	1.0
	30	860,000,000.000	860,000,000.002	0.002	1.0
	20		Reference		
	10	860,000,000.000	859,999,999.999	-0.001	1.0
	0	860,000,000.000	860,000,000.000	0.000	1.0
	-10	860,000,000.000	859,999,999.999	-0.001	1.0
	-20	860,000,000.000	859,999,999.998	-0.002	1.0
	-30	860,000,000.000	859,999,999.993	-0.007	1.0
iDEN 7 MHz Mid channel tuned	50	865,500,000.000	865,500,000.000	0.000	1.0
	40	865,500,000.000	865,500,000.000	0.000	1.0
	30	865,500,000.000	865,499,999.997	-0.003	1.0
	20		Reference		
	10	865,500,000.000	865,499,999.999	-0.001	1.0
	0	865,500,000.000	865,500,000.000	0.000	1.0
	-10	865,500,000.000	865,499,999.998	-0.002	1.0
	-20	865,500,000.000	865,500,000.001	0.001	1.0
	-30	865,500,000.000	865,499,999.999	-0.001	1.0
iDEN 5 MHz Mid channel tuned	50	937,500,000.000	937,499,999.999	-0.001	1.0
	40	937,500,000.000	937,499,999.995	-0.005	1.0
	30	937,500,000.000	937,499,999.998	-0.002	1.0
	20		Reference		
	10	937,500,000.000	937,499,999.997	-0.003	1.0
	0	937,500,000.000	937,499,999.996	-0.004	1.0
	-10	937,500,000.000	937,500,000.002	0.002	1.0
	-20	937,500,000.000	937,499,999.999	-0.001	1.0
	-30	937,500,000.000	937,500,000.000	0.000	1.0

Supplementary information:
-. Downlink mode Mid operating frequencies setting
-. No modulation,
-. Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
-. Reference inout voltage : 120Vac

Frequency Stability with variation of Input voltage - Downlink

Carrier Band	Input voltage (V)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
iDEN 18 MHz Mid channel	102 Vac	860,000,000.000	859,999,999.999	-0.001	1.0
	138 Vac	860,000,000.000	860,000,000.000	0.000	1.0
iDEN 7 MHz Mid channel	102 Vac	865,500,000.000	865,499,999.998	-0.002	1.0
	138 Vac	865,500,000.000	865,500,000.000	0.000	1.0
iDEN 5 MHz Mid channel	102 Vac	937,500,000.000	937,500,000.001	0.001	1.0
	138 Vac	937,500,000.000	937,499,999.999	-0.001	1.0

Supplementary information:
-. Downlink mode Mid operating frequencies setting
-. No modulation,
-. Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
-. Reference temperature : 20℃