ESTECH Co., Ltd.
Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea
TEL: 82-2-867-3201
FAX: 82-2-867-3204

Test Report

Report Number	**ESTR0503-009**			
Applicant	**Company Name**	**R-TRON, Inc.**		
	Address	**Jisan IT Venture Bldg., 2/3F, 1004-9/10, Doksan-Dong, Gumcheon-Gu, Seoul, Korea**		
	Telephone	**82-2-896-4101**		
Product	**Product Name**	**RF Repeater(CDMA)**		
	Model No.	**RTNR 1900CA-20S**	**Manufacturer**	**R-TRON, Inc.**
	Serial No.	**NONE**	**Country of origin**	**Korea**
	Date of Issue	**2005-03-31**	**Date of Test**	**2005-03-23 ~2005-03-30**
Testing Lab.	**ESTECH. Co., Ltd**			
Standard	**FCC PART 24 , PART 2**			
Tested by	**S.R. Kim/ Engineer** (Signature)			
Approved by	**Jay Kim/ Engineering Manager** (Signature)			

*** Note**
- This test report is not permitted to copy partly without our permission
- This test result is dependent on only equipment to be used
- This test result based on a single evaluation of one sample of the above mentioned

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TABLE OF CONTENTS

1. INSTROCTION

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and tested in accordance with the measurement procedures as indicated in this report ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab., assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name: ESTECH Co. Ltd.

Head Office: Rm. 1015, World Venture Center II, 426-5, Gansan-dong, Geumcheon-gu, Seoul, 153-803, Korea **(Safety & SAR & Telecom. Test Lab)**

EMC Test Lab.: 58-1, Osan-Ri, GaNam-Myon, YeoJoo-Gun, KyungKi-Do, Korea
97-1, Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea

2. Description of EUT

2.1 Summary of Equipment Under Test

♦ **FCC ID :** STENRPCS20A

♦ **Model No. :** RTNR 1900CA-20S

♦ **Freq. Range :**
- Downlink: 1930 ~ 1945MHz
- Uplink: 1850 ~ 1865MHz

♦ **Power Rating :** AC110V, 50/60Hz

♦ **EUT Type :** RF Repeater(CDMA), 1900MHz PCS Block A

.

3. DESCRIPTION OF TEST

3.1 RF Power Output

- The EUT is a bi-directional amplifier repeater on A-band frequency for broadband PCS. Downlink input (from Base station direction) is connected to a signal generator. Downlink output is connected spectrum analyzer through proper attenuator. The input to the amplifier is set such that the maximum power output is achieved at customer supplied antenna connector. The power measurement method of Uplink is also same way.

3.5 Occupied Bandwidth

The signal (Down/Up) input is connected to the signal generator. The input to the amplifier is set such that the maximum power output is achieved at the customer supplied antenna connector (at the antenna connector of base station). Maximum Allowable Downlink Power Output is 40dBm and Maximum Allowable Uplink Power Output is 25dBm. The signal output is connected to the spectrum analyzer. The VBW is set to 3 times the RBW. The sweep time is coupled.

3.6 Spurious and Harmonic Emission at Antenna Terminal

The various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to 20GHz.

Set the RES BW to 1% of the emission bandwidth to show compliance with the -13dBm, limit, in the 1MHz bands immediately outside and adjacent to the top and bottom edges of the frequency block.

For the Out-of-Band measurements a 1MHz RBW was used to scan from 30MHz to 10xfo of the fundamental carrier for all frequency block. A display line was placed at -13dBm to show compliance for spurious, and harmonics.

Inter-modulation Attenuation Test (2 Signal Method) Blocks Tested: A-B Downlink/Uplink Modulation Tested: Three input signals are chosen such that in the 15MHz channel blocks the lowest and second lowest channels are selected, and highest and second highest channels.

3.7 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emission are measured outdoors at our 3 meters test range. The equipment under test is placed on a wooden turntable 3 meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

3. DESCRIPTION OF TEST(CONTINUE)

3.8 Frequency stability (Temperature Variation)

The frequency stability of the transmitter is measured by:

a) **Temperature**: The temperature is varied from -30℃ to +50℃ using an environmental chamber.

b) **Primary Supply Voltage**: The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

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

Time Period and Procedure

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (22℃ to 25℃ to provide a reference.)
2. The equipment is subjected to an overnight “soak” at -30℃ without any power applied.
3. After the overnight “soak” at -30℃ (usually 14 – 16hours), the equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
4. Frequency measurements are made at 10℃ interval up to room temperature. At least a period of one and one half hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting -30℃ up to +50℃ allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

4. TEST DATA

4.1 RF Power Output

MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Spectrum Analyzer	Agilent	E4407B
Signal Generator	HP	E4432B
Attenuator	Weinschel Corp.	58-40-34

***TEST RESULT**

Downlink

	Ch. No.	Freq. (MHz)	Power Output (dBm)
Low Ch.	25	1931.25	42.46
Mid Ch.	150	1937.50	43.01
High Ch.	275	1943.75	42.54

Uplink

	Ch. No.	Freq. (MHz)	Power Output (dBm)
Low Ch.	25	1851.25	27.81
Mid Ch.	150	1857.50	27.95
High Ch.	275	1863.75	27.70

4. TEST DATA(CONTINUED)

4.2 OCCUPIED BANDWIDTH

* MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Spectrum Analyzer	Agilent	E4407B
Signal Generator	HP	E4432B
Attenuator	Weinschel Corp.	58-40-34

Test Result:

Downlink

Channel	Frequency(MHz)	26dB BW(MHz)
25	1931.25	1.405
150	1937.50	1.400
275	1943.75	1.387

Uplink

Channel	Frequency(MHz)	26dB BW(MHz)
25	1851.25	1.384
150	1857.50	1.395
275	1863.75	1.389

4. TEST DATA (CONTINUE)

4.3 FIELD STRENGTH OF SPURIOUS RADIATION

MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Spectrum Analyzer	HP	8563E
Signal Generator	HP	83731B
Signal Generator	HP	E4432B
Power Meter	HP	EPM-442A
Attenuator	Weinschel Corp.	58-40-34
Attenuator	Bird Electronic Corp.	100-SA-MFN-30
Horn Antenna	SCHWARZBECK	BBHA 9120 D
Horn Antenna	SCHWARZBECK	BBHA 9120 D

Test Result:

- Downlink

FREQ. (MHz)	SA Reading (dBuV/m)	Correction Factor (dB)		Peak Value (dBm)		Limit (dBm)	POL (H/V)
		Antenna gain(dBi)	CL (dB)	SG Reading	E.I.R.P.		
3862.5 (ch.25)	26.50	12.60	8.33	-55.88	-51.61	-13.0	H
5793.75	26.00	13.00	9.64	-51.95	-48.59	-13.0	H
3875.0 (ch.150)	26.50	12.60	8.33	-56.55	-52.28	-13.0	H
5812.5	26.00	13.00	9.64	-54.64	-51.28	-13.0	H
3887.5 (ch.275)	26.00	12.60	8.33	-57.11	-52.84	-13.0	H
5831.25	26.00	13.00	9.64	-53.64	-50.28	-13.0	H

4. TEST DATA (CONTINUE)

- Uplink

FREQ. (MHz)	SA Reading (dBuV/m)	Correction Factor (dB)		Peak Value (dBm)		Limit (dBm)	POL (H/V)
		Antenna gain(dBi)	CL (dB)	SG Reading	E.I.R.P.		
3702.5 (ch.25)	25.82	12.60	8.33	-57.65	-53.38	-13.0	H
5553.75	25.62	13.10	9.64	-51.60	-48.14	-13.0	H
3715.0 (ch.150)	26.48	12.60	8.33	-61.12	-56.85	-13.0	V
5572.5	26.48	13.10	9.64	-54.61	-51.15	-13.0	V
3727.5(ch.275)	26.50	12.60	8.33	-56.65	-52.38	-13.0	H
5591.25	26.10	13.10	9.64	-52.81	-49.35	-13.0	H

4. TEST DATA(CONTINUED)

4.4 SPURIOUS EMISSION AT ANTENNA TERMINAL

MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Spectrum Analyzer	Agilent	E4407B
Signal Generator	HP	E4432B
Attenuator	Bird Electronic Corp.	100-SA-MFN-30

***TEST RESULT**

Downlink (Spurious Emission: Block Edge)

Freq. (MHz)	Channel	Measurement Value(dBm)	Limit(dBm)	Margin(dB)
1930.00	25	-35.17	-13	-22.17
1945.00	275	-30.42	-13	-17.42

Uplink (Spurious Emission: Block Edge)

Freq. (MHz)	Channel	Measurement Value(dBm)	Limit(dBm)	Margin(dB)
1850.00	25	-34.99	-13	-21.99
1865.00	275	-41.26	-13	-28.26

4. TEST DATA(CONTINUED)

Downlink (Spurious Emission: Out of Band)

Freq. (MHz)	Channel	Measurement Value(dBm)	Limit(dBm)	Margin(dB)
1931.25	25	-22.90	-13	-9.9
1937.50	150	-23.06	-13	-10.06
1943.75	275	-22.85	-13	-9.85

Uplink (Spurious Emission: Out of Band)

Freq. (MHz)	Channel	Measurement Value(dBm)	Limit(dBm)	Margin(dB)
1851.25	25	-28.13	-13	-15.13
1857.50	150	-27.89	-13	-14.89
1863.75	275	-27.52	-13	-14.52

4. TEST DATA(CONTINUED)

4.5 FREQUENCY STABILITY

OPERATING FREQUENCY: 1,937,500,000 Hz

CHANNEL: 150

REFERENCE VOLTAGE: 110 VAC

DEVIATION LIMIT: ±0.0001 % or 1ppm

Downlink Middle Channel

VOLTAGE (%)	POWER (VAC)	TEMP. (℃)	FREQ. (Hz)	Deviation (%)
100 %	110	+20℃ (Ref)	1,937,500,008	0.000000
100 %		-30	1,937,500,035	0.000001
100 %		-20	1,937,500,028	0.000001
100 %		-10	1,937,500,020	0.000001
100 %		0	1,937,500,018	0.000001
100 %		+10	1,937,500,020	0.000001
100 %		+20	1,937,500,008	0.000000
100 %		+25	1,937,499,993	0.000001
100 %		+30	1,937,499,995	0.000001
100 %		+40	1,937,499,988	0.000001
100 %		+50	1,937,499,988	0.000001
85 %	93.5	+20	1,937,500,012	0.0000002
115 %	126.5	+20	1,937,500,012	0.0000002
ENDPOINT	70	+20	1,937,500,015	0.0000004

4. TEST DATA(CONTINUED)

OPERATING FREQUENCY: 1,857,500,000 Hz

CHANNEL: 150

REFERENCE VOLTAGE: 110 VAC

DEVIATION LIMIT: ±0.0001 % or 1ppm

Uplink Middle Channel

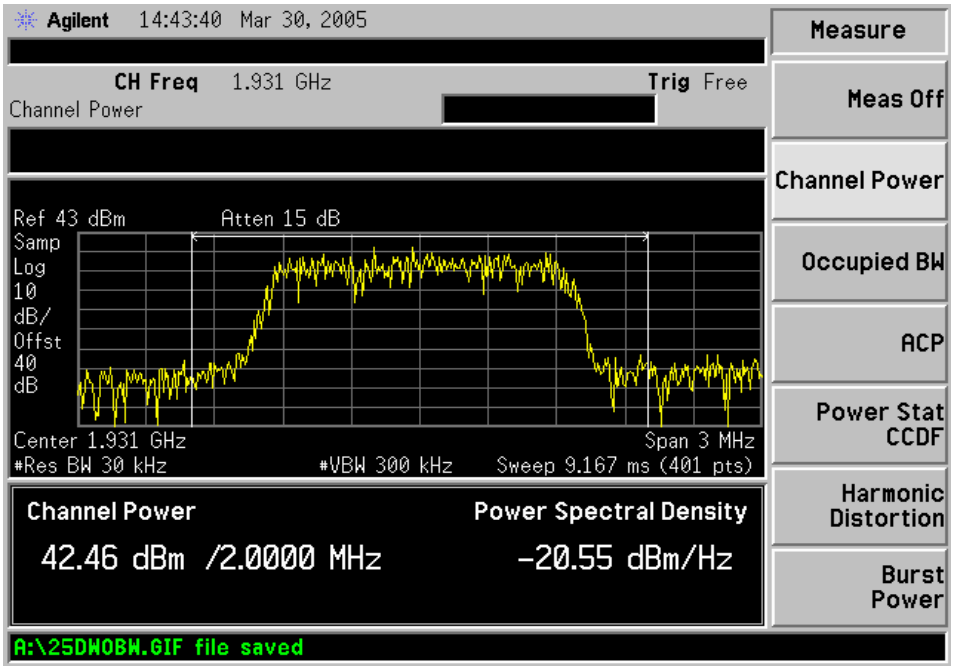
VOLTAGE (%)	POWER (VAC)	TEMP. (℃)	FREQ. (Hz)	Deviation (%)
100 %	110	+20℃ (Ref)	1,857,500,005	0.000000
100 %		-30	1,857,500,043	0.000002
100 %		-20	1,857,500,040	0.000002
100 %		-10	1,857,500,038	0.000002
100 %		0	1,857,500,038	0.000002
100 %		+10	1,857,500,036	0.000002
100 %		+20	1,857,500,005	0.000000
100 %		+25	1,857,499,990	0.000001
100 %		+30	1,857,499,985	0.000001
100 %		+40	1,857,499,972	0.000002
100 %		+50	1,857,499,972	0.000002
85 %	93.5	+20	1,857,499,995	0.000001
115 %	126.5	+20	1,857,499,993	0.000001
ENDPOINT	70	+20	1,857,499,990	0.000001

5. TEST PLOTS

5.1 RF Power Output

Downlink

CH 25



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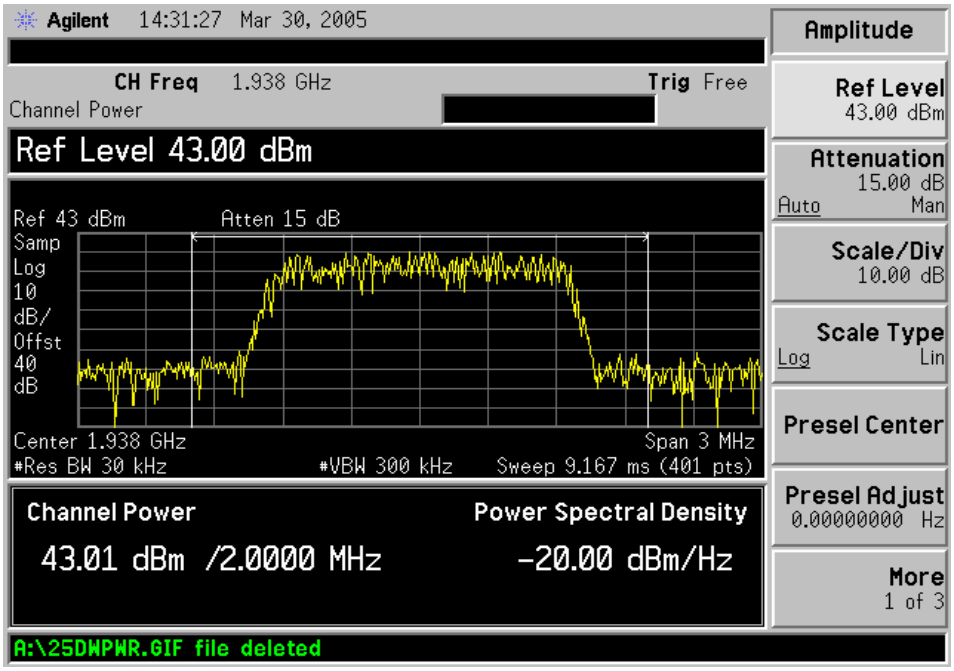

5. TEST PLOTS (CONTINUED)

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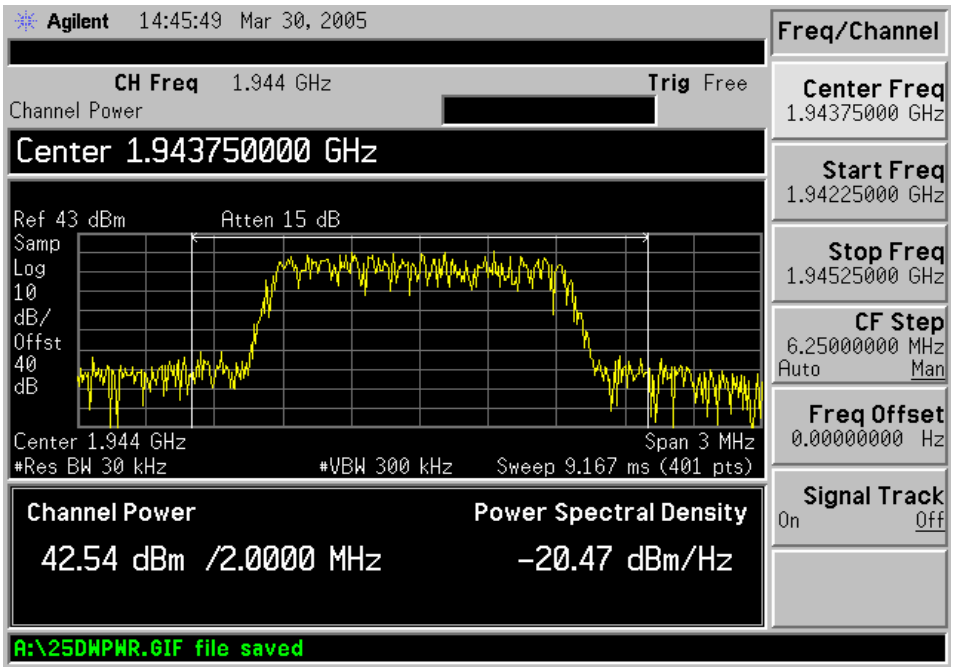
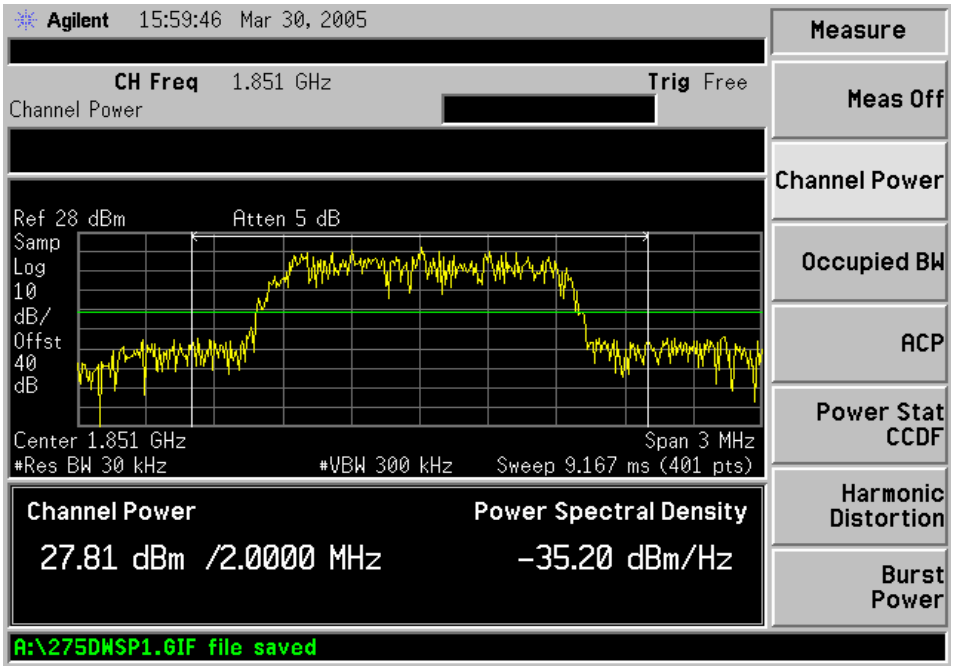


5. TEST PLOTS (CONTINUED)

Uplink

CH 25



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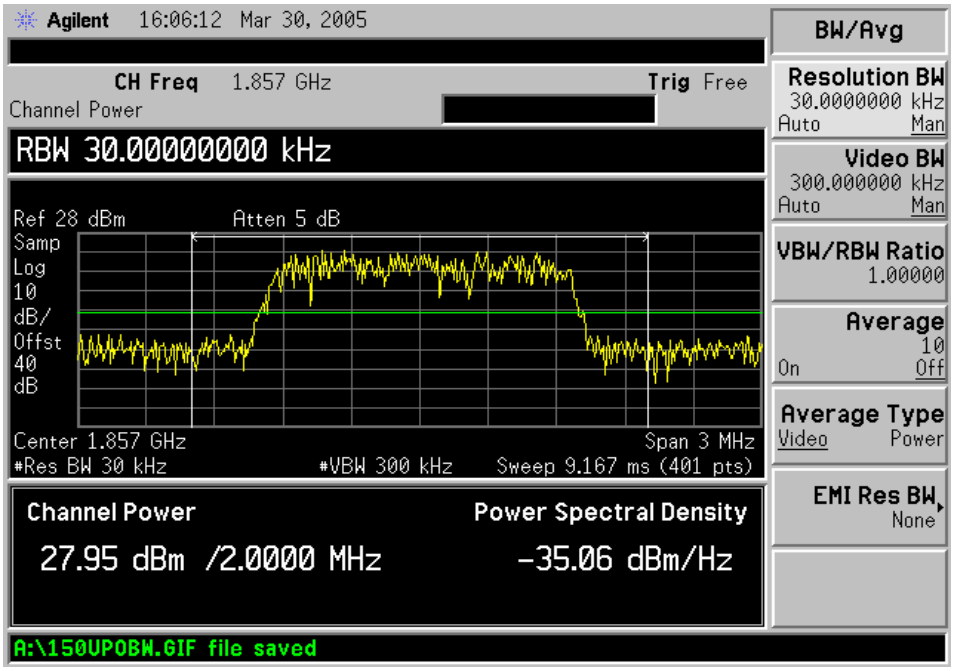

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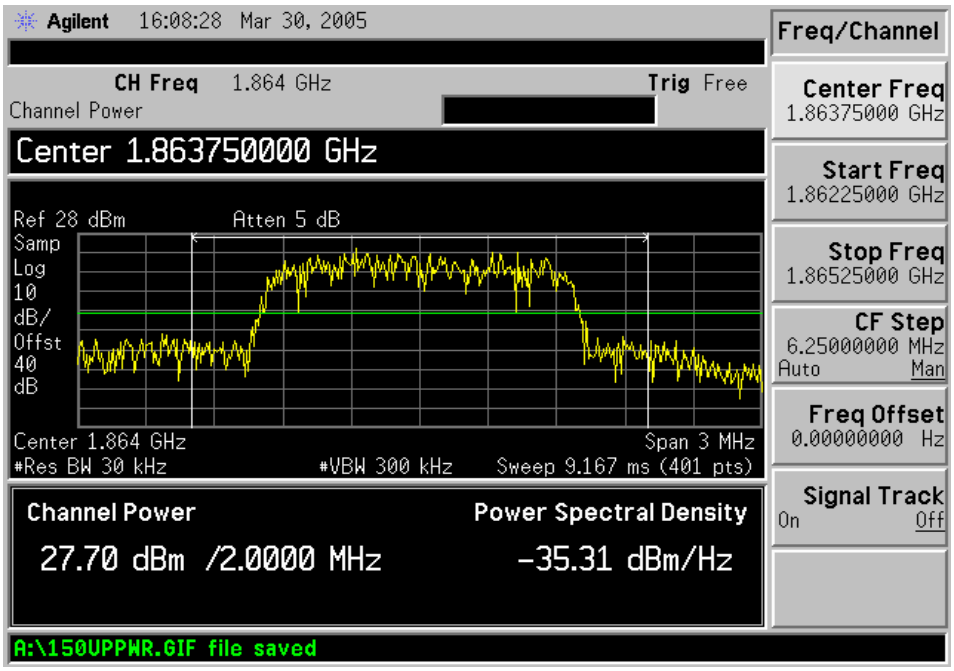
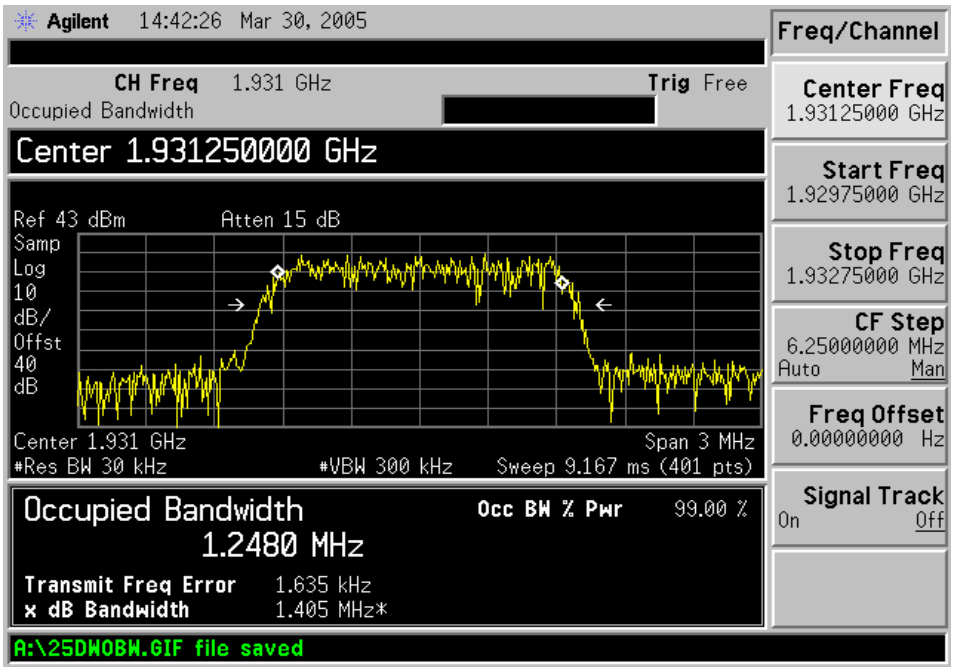


5. TEST PLOTS (CONTINUED)

5.2 Occupied Bandwidth

Downlink

CH 25



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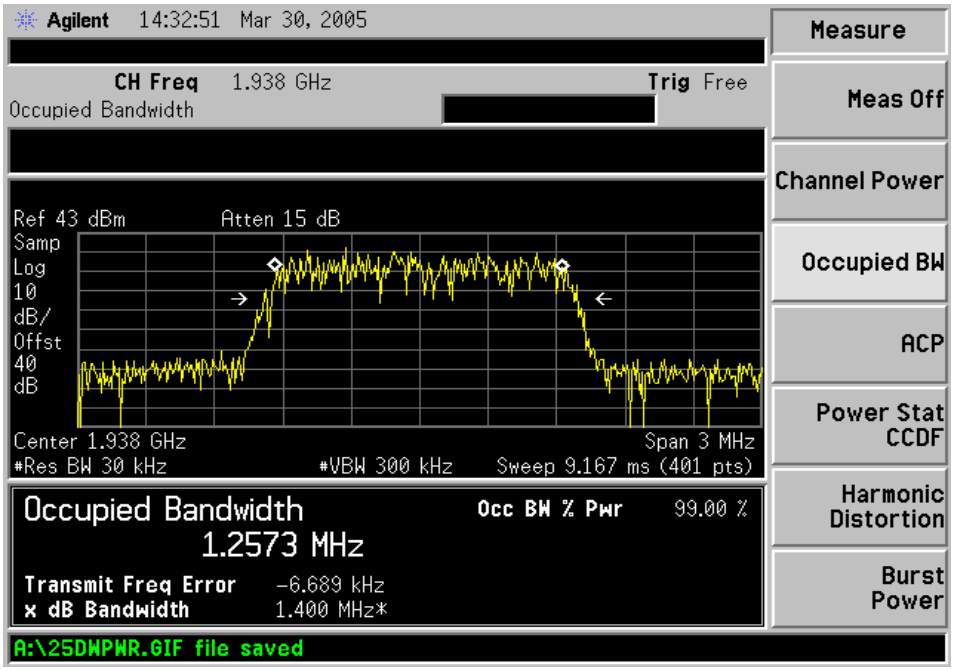

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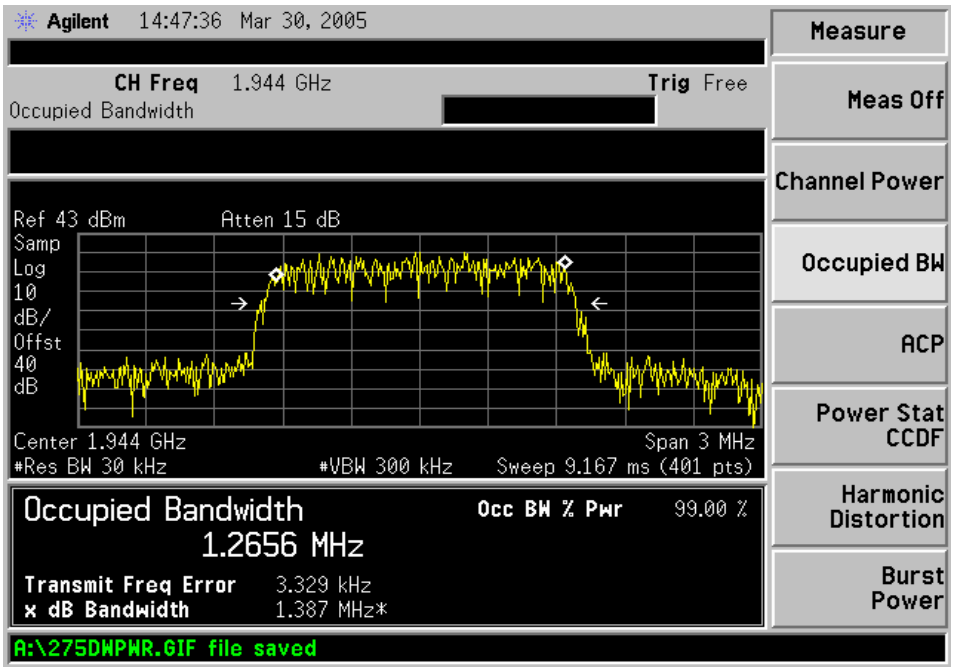

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Uplink

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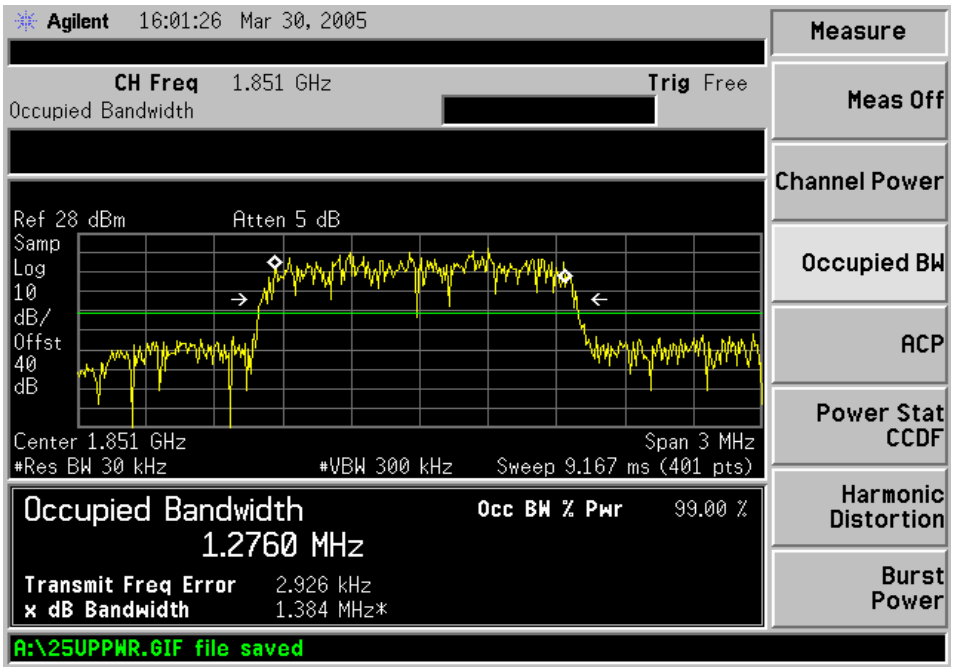

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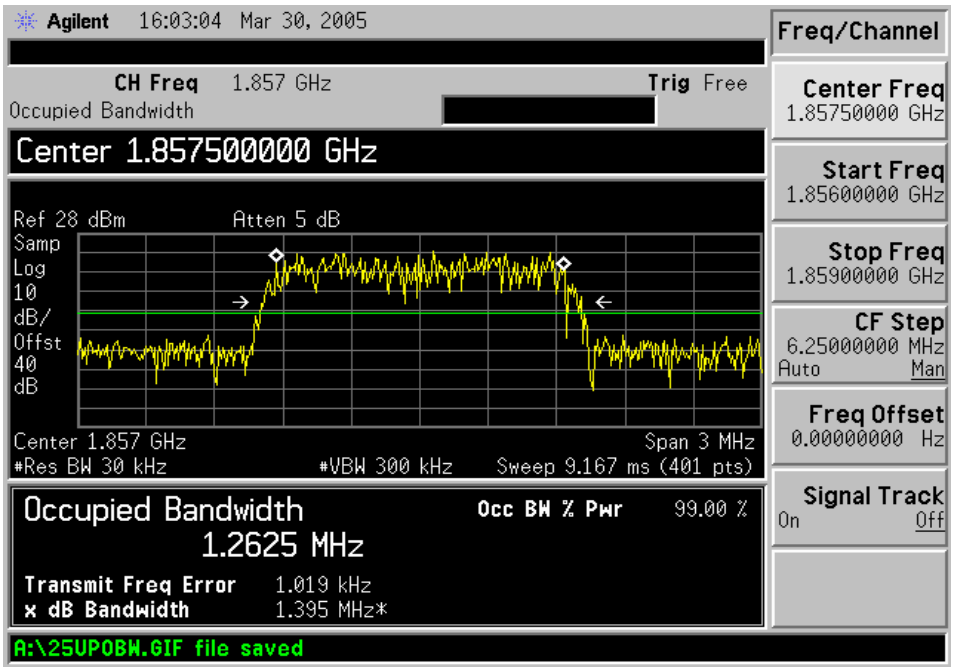

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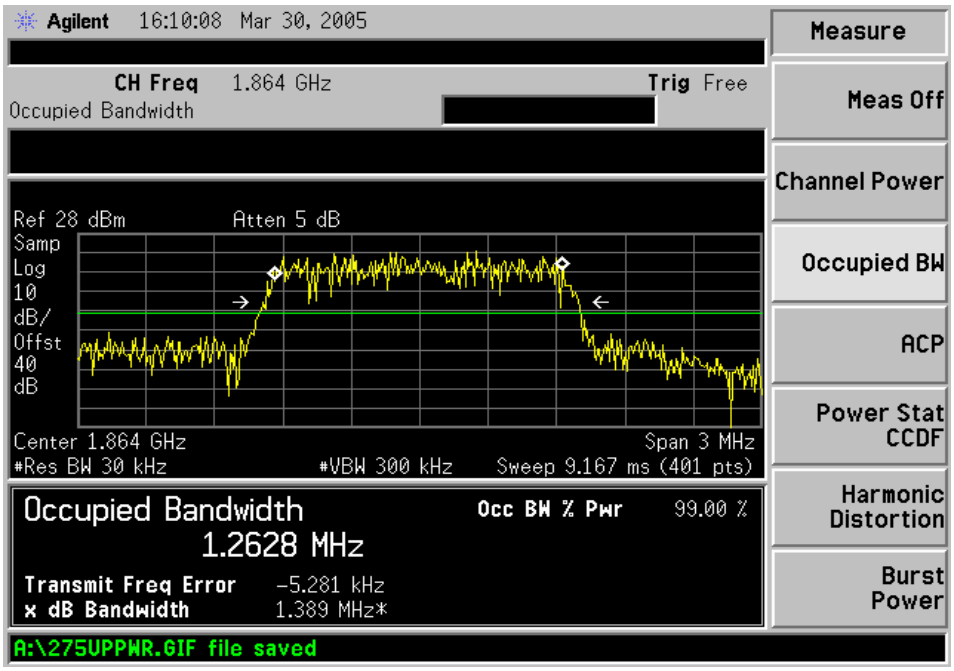
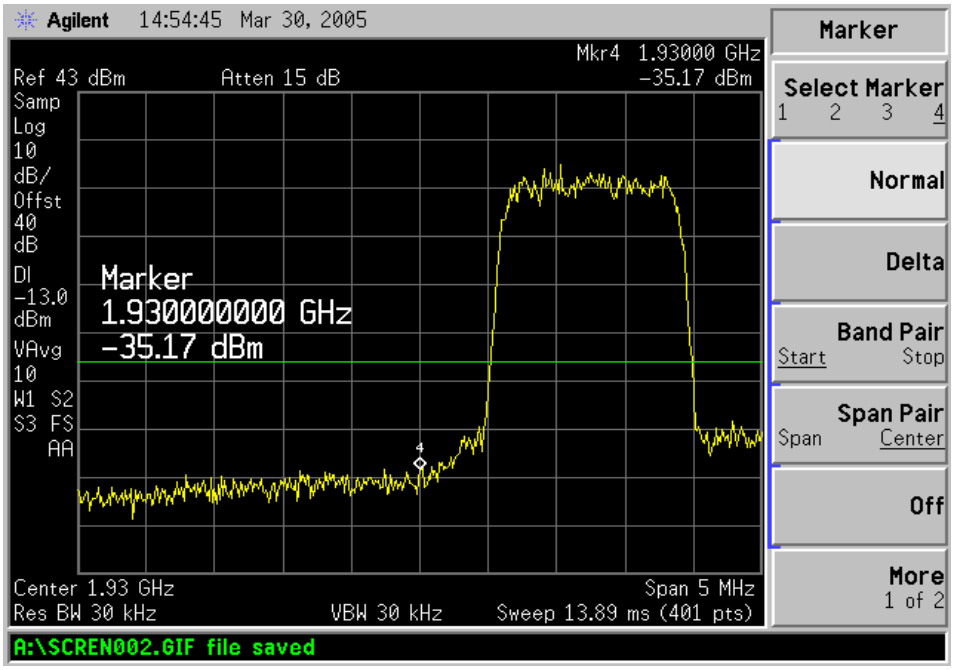
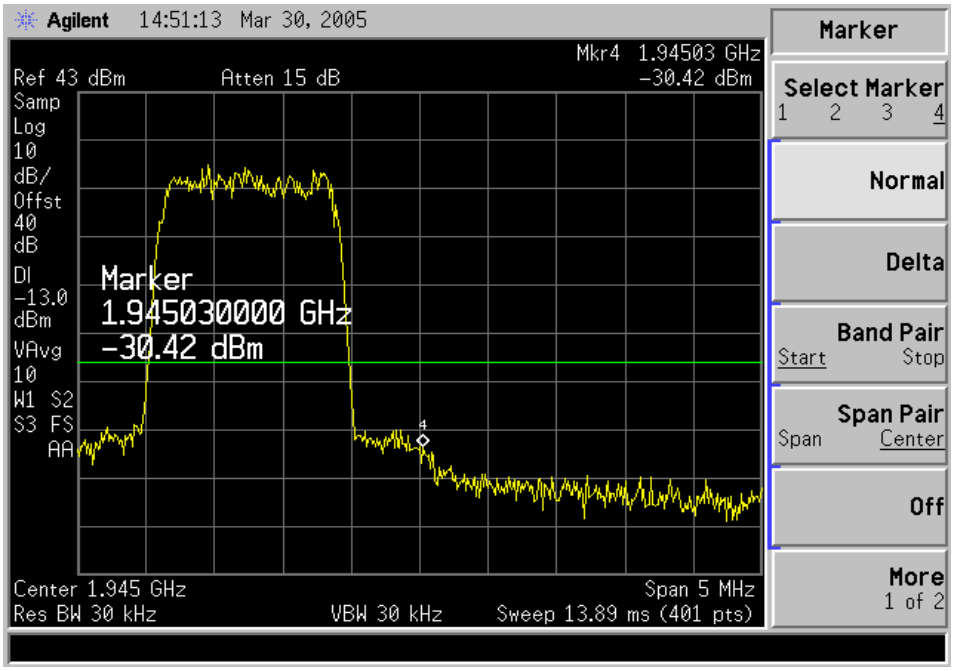


5. TEST PLOTS (CONTINUED)

5.3 Spurious Emission At Antenna Terminal

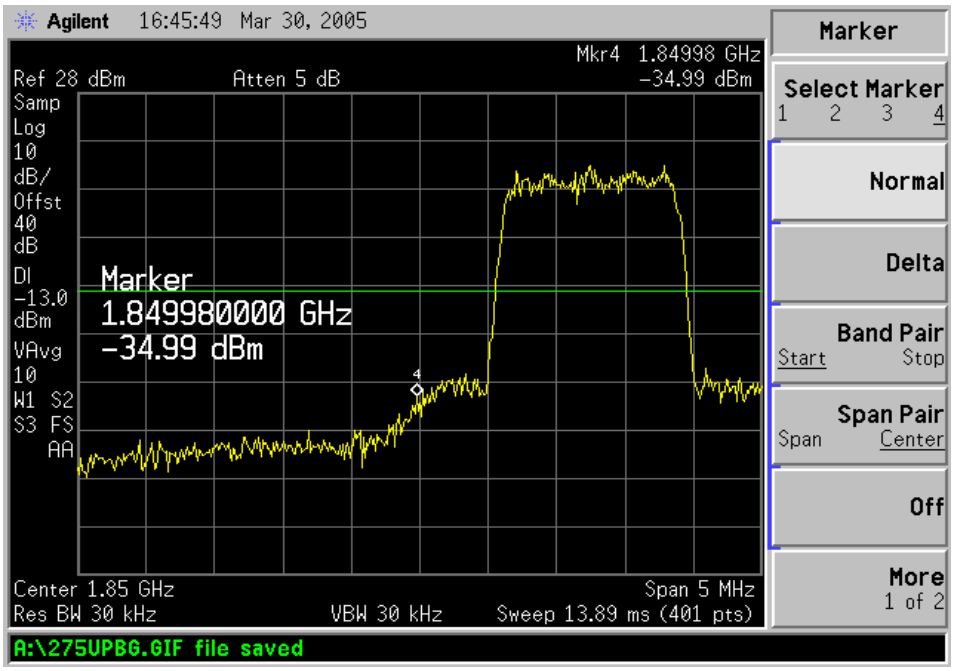
Band Edge (Downlink)

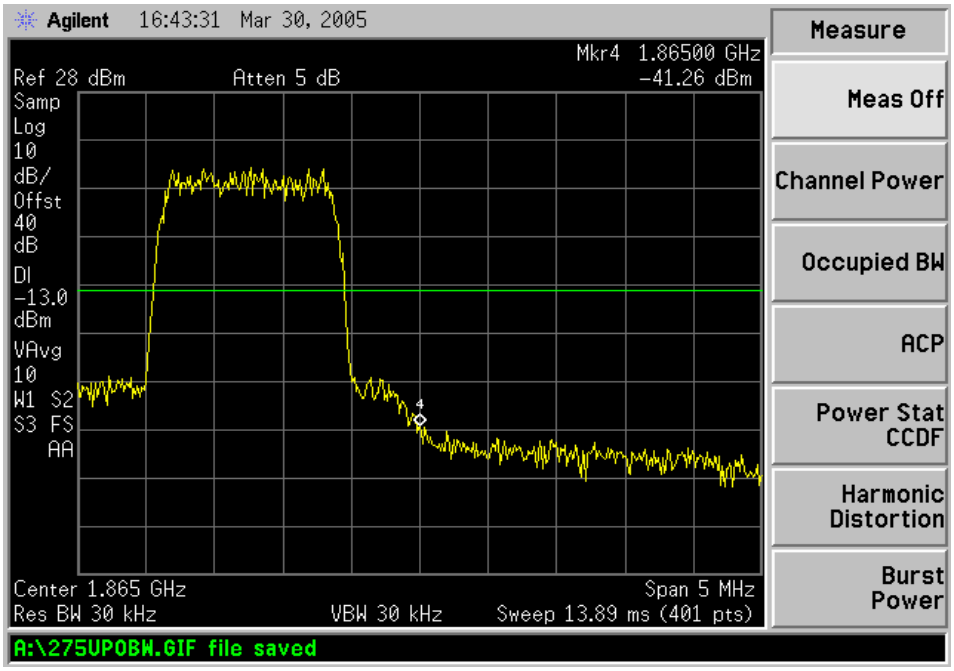




5. TEST PLOTS (CONTINUED)

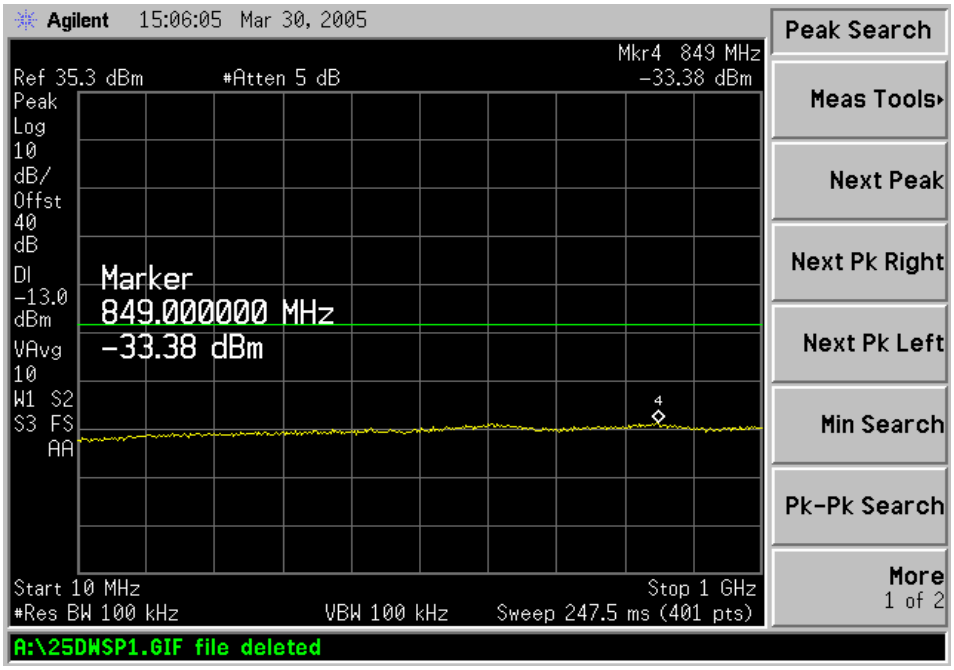
Band Edge (Uplink)

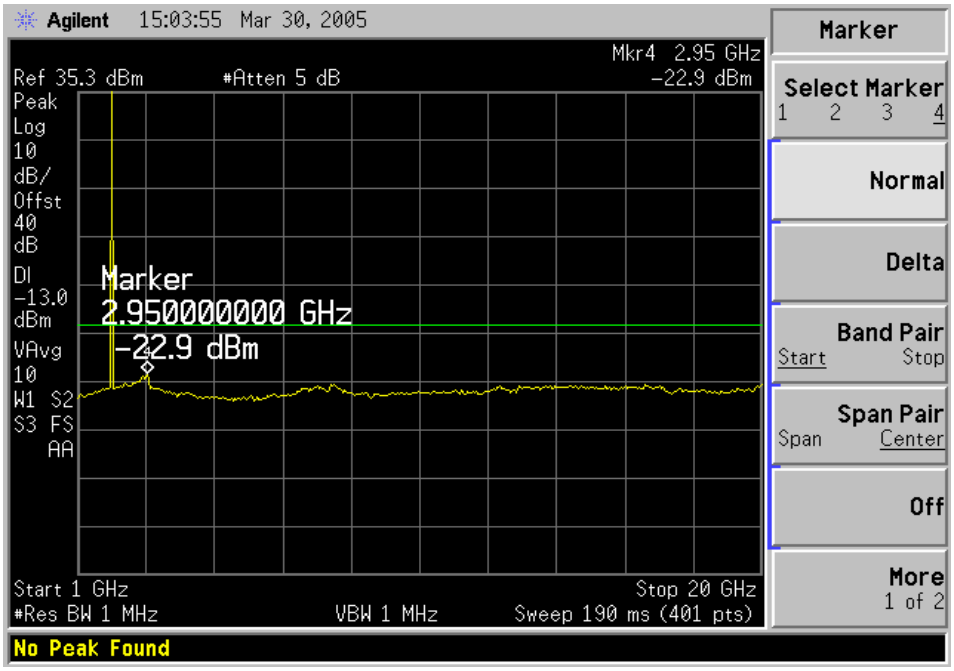




5. TEST PLOTS (CONTINUED)

Out of Band Emission (Downlink)
CH 25





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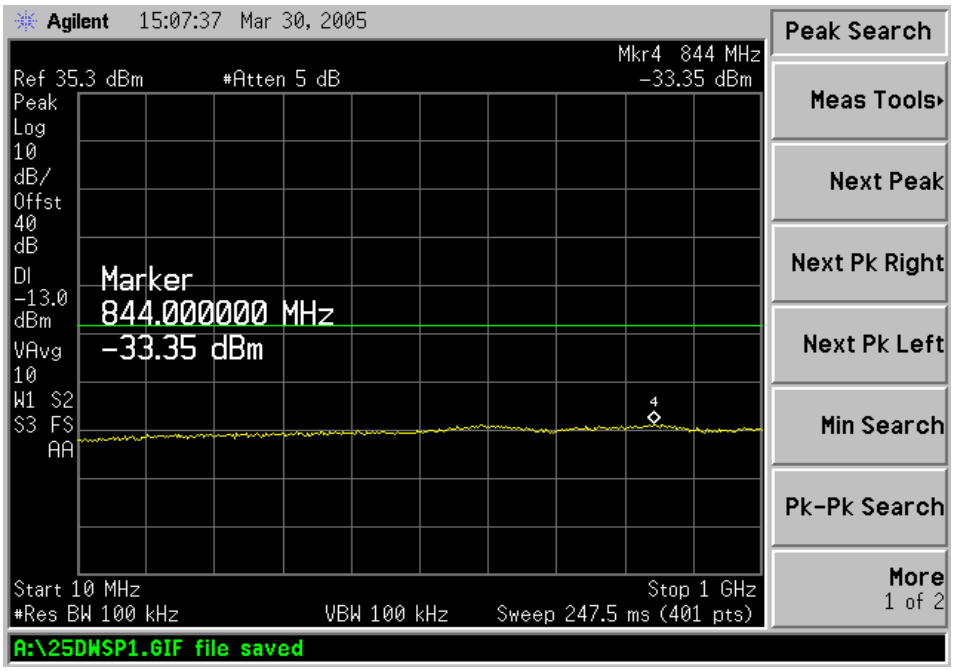
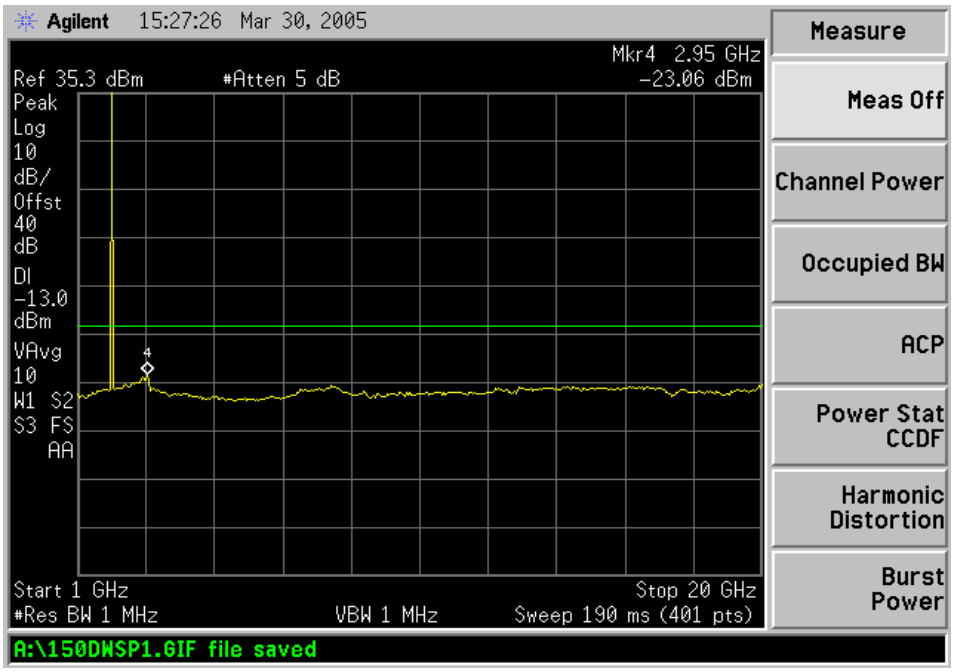
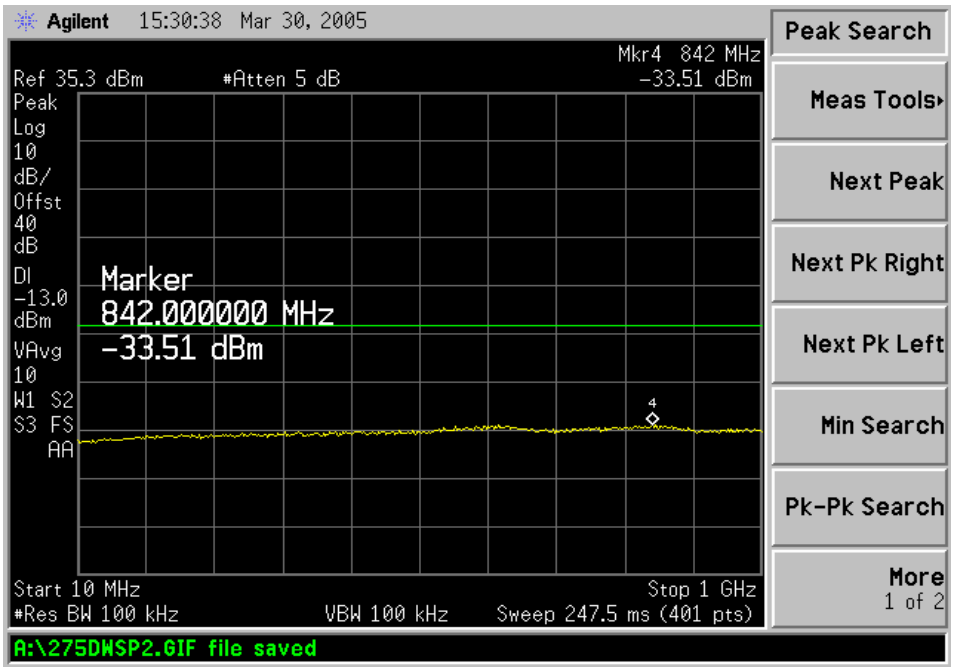
CH 150

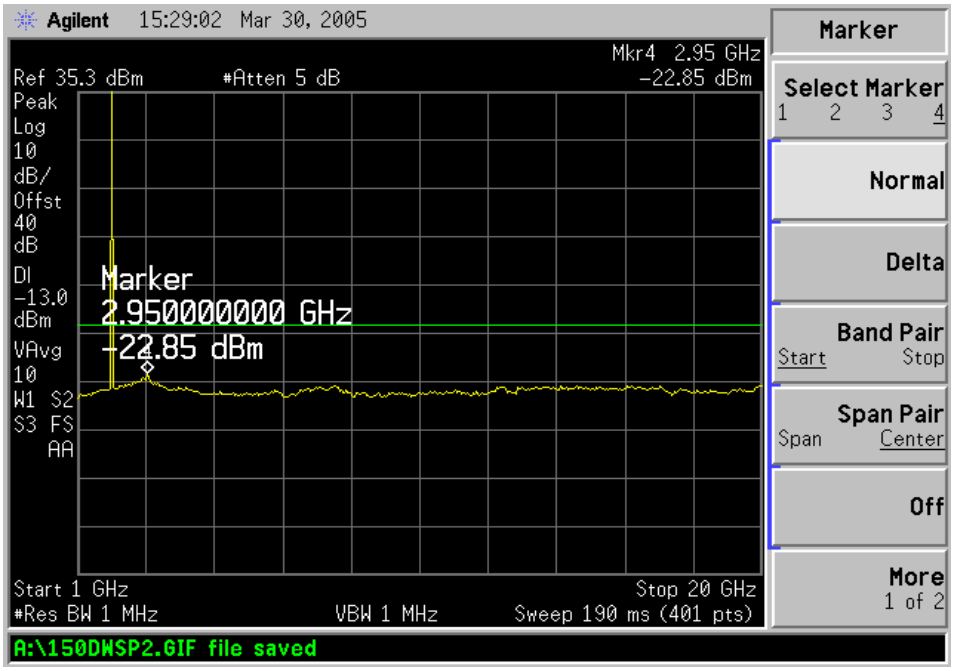




5. TEST PLOTS (CONTINUED)

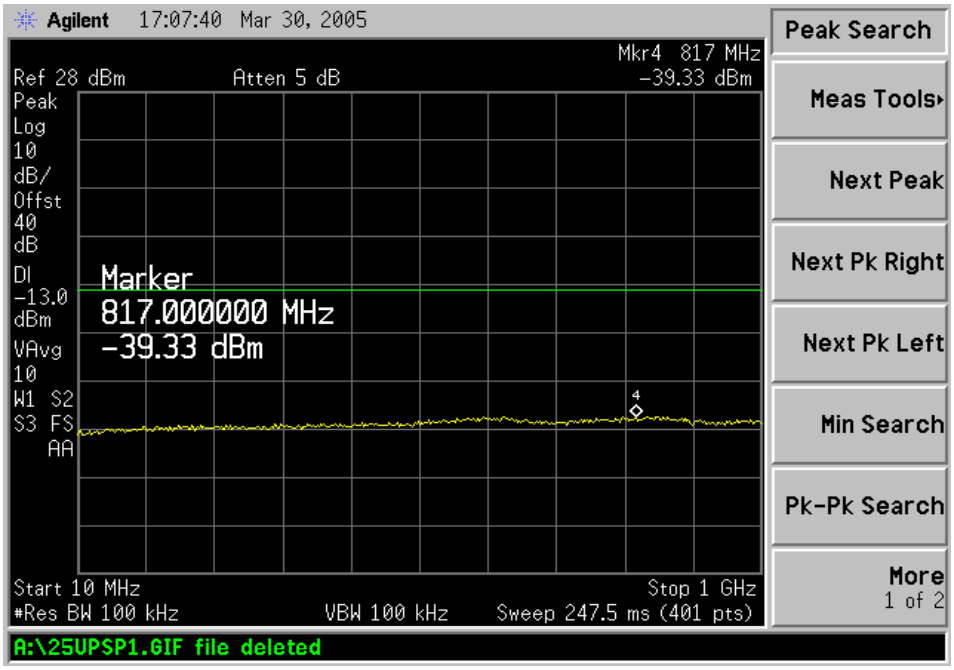
CH 275

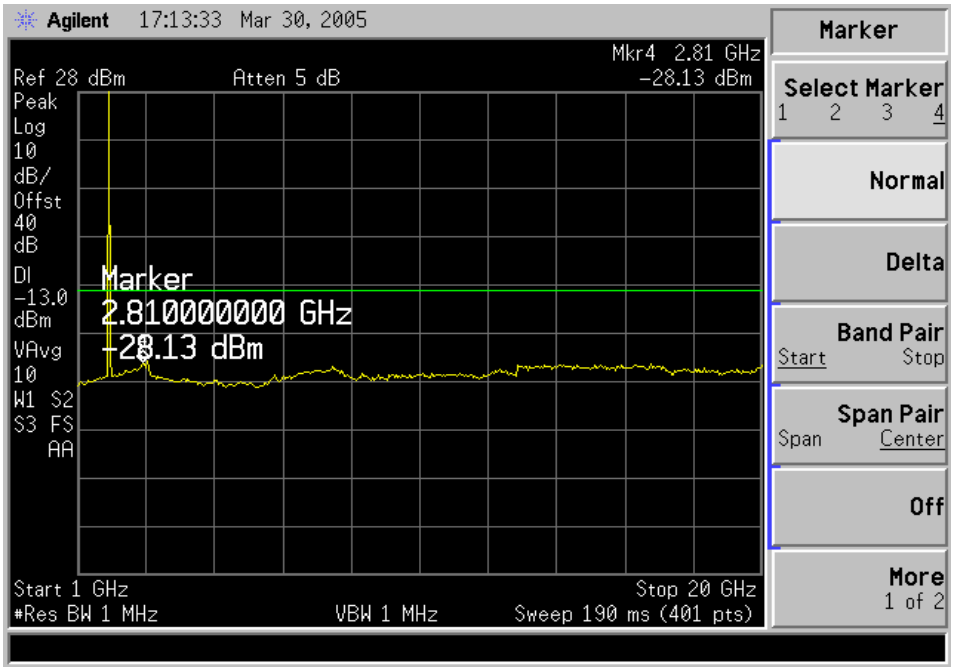




5. TEST PLOTS (CONTINUED)

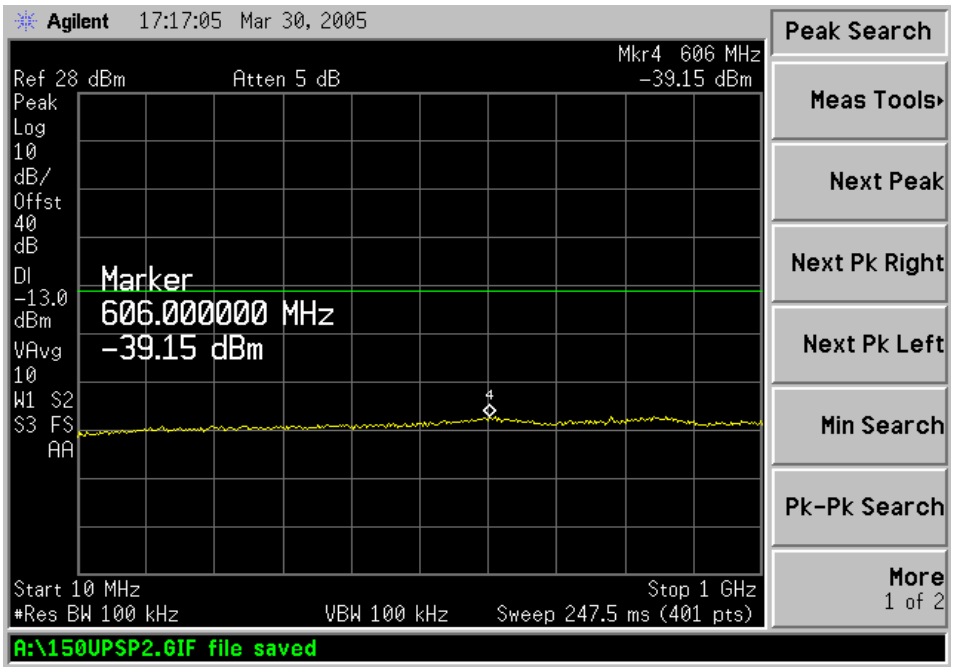
Out of Band Emission (Uplink)
CH 25

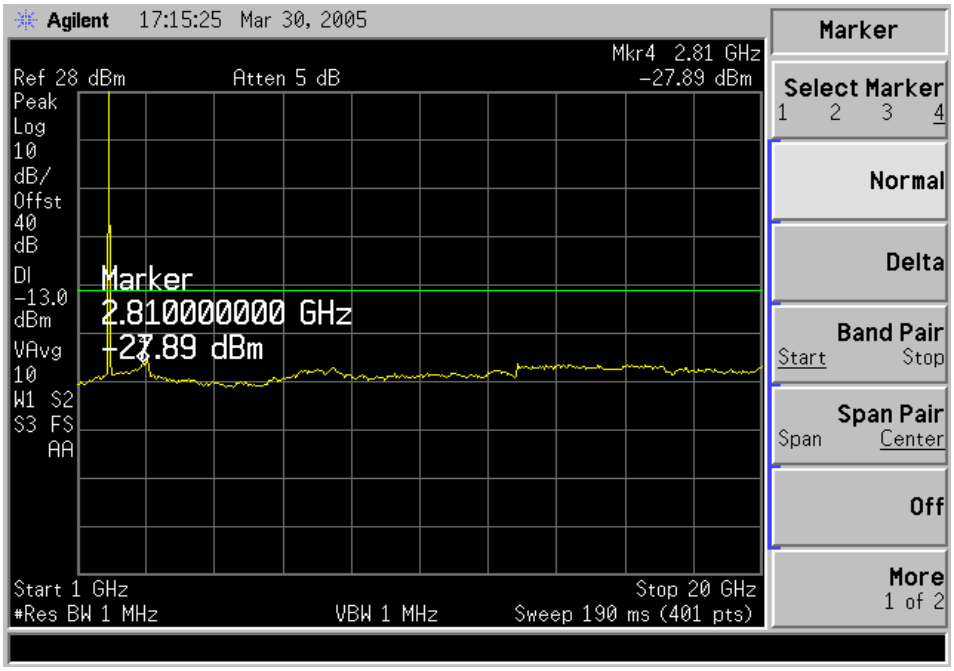




5. TEST PLOTS (CONTINUED)

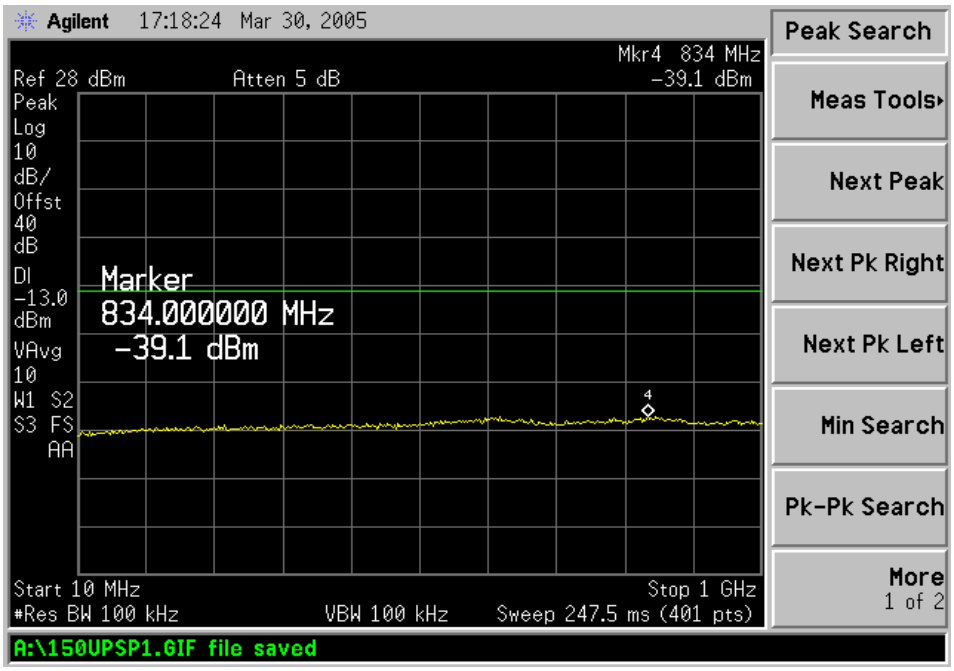
CH 150

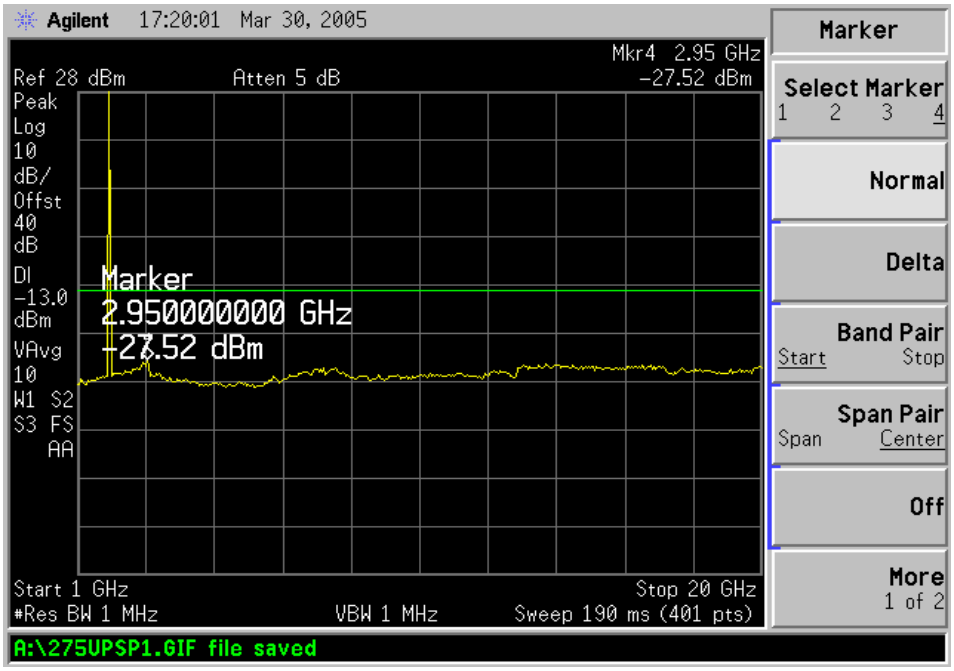




5. TEST PLOTS (CONTINUED)

CH 275

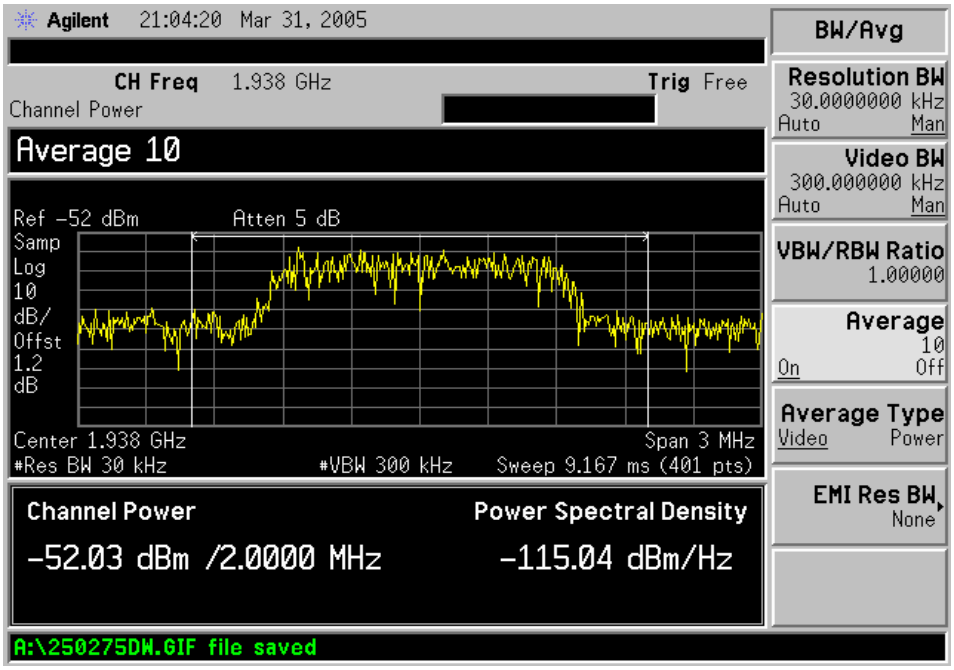




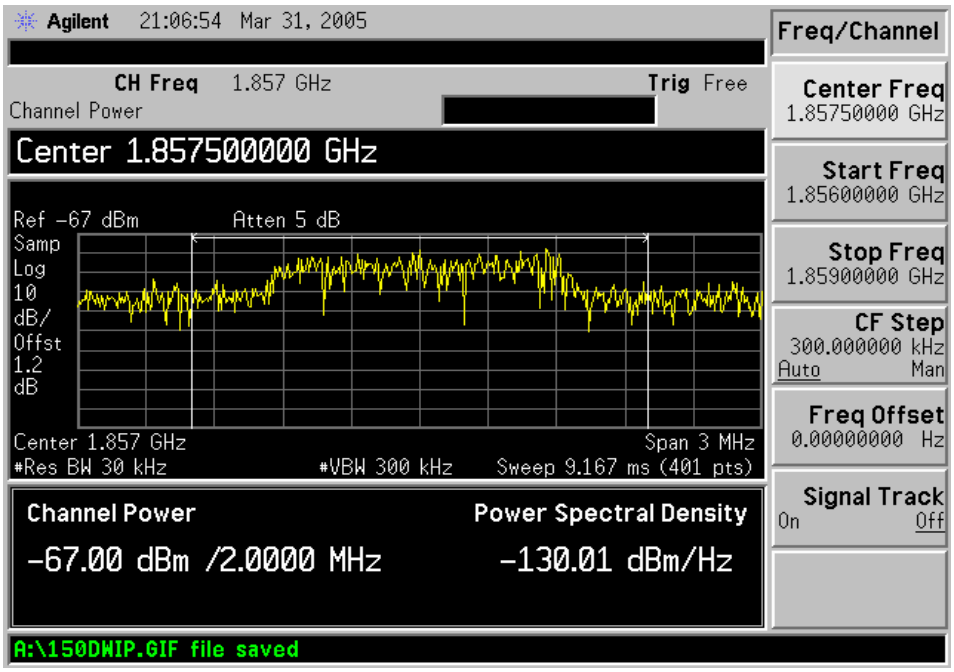
5. TEST PLOTS (CONTINUED)

5.4 Input Signal Output Power

Downlink(CH 150)



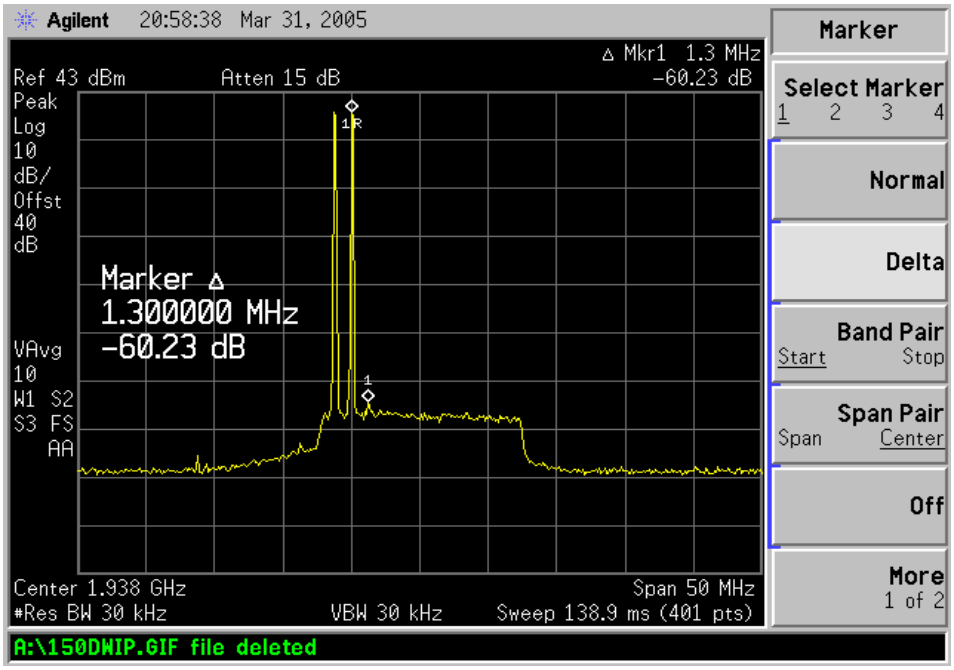
Uplink(CH 150)



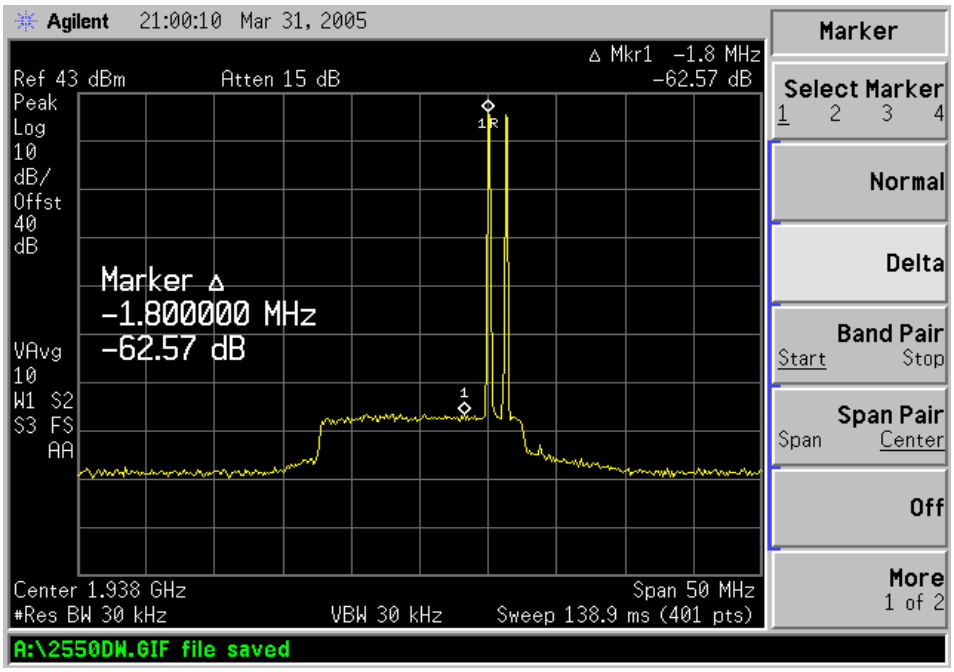
5. TEST PLOTS (CONTINUED)

5.5 Inter-modulation Signal

Downlink(CH 25&50)

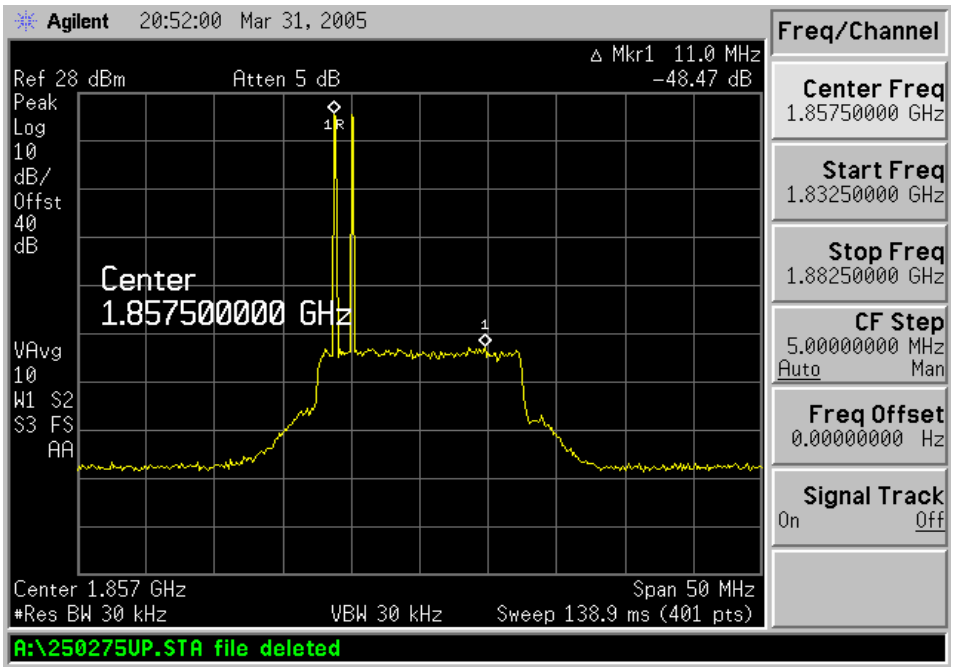


Downlink(CH 250&275)



5. TEST PLOTS (CONTINUED)

Uplink(CH 25&50)



Uplink(CH 250&275)