Test Report for FCC Equipment Authorization

RRUC-E 800MHz

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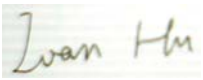
Issued by:	

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List of Contributors

Name	Role
Ivan Hu	Test engineer
Lewas Liu	Test engineer

Approver(s)

Name	Role	Area of Responsibility
Sharon Hu	Project Manager	
Daniel Tan	PI Manager	
Kitty Ren	Senior Manager	

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1.0 Introduction

This test report supports FCC filing for RRUC-E 800MHz. This filing shall include single, two, three carrier modes. The following test results will include; PA current specification ,RF Power Output, Occupied Bandwidth, Spurious Emissions at Antenna Terminals, and Transmitter Test (CDMA Mode Transmitter). Frequency tolerance over voltage and temperature test results will be included. Emissions testing shall be conducted at -48VDC at room temperature. Both IS95 and IS856 modulation schemes will be included in this report.

This test report will be submitted in accordance with the FCC Rules and Regulations, Part 2, Subpart J, Sections 2.1046 through 2.1057 for equipment authorization of Ericsson's 800 MHz RRUC-E.

The RRUC-E is envisioned to provide flexibility to present RF solution, as a single sector multi-carrier (1-3C) Radio Module, RRUC-E can be mounted on an antenna tower, pole or wall, with fiber connection to the digital equipment of base station. For 1 sector 6 carriers application, two RRUC-Es can share two antennas by Rx overlay mode. For outdoor application RRUC-E support wide range of operation temperature while using a natural cooling method..

The RRUC-E product requires an external Duplexer to meet key RF conditioning requirement. The external Duplexer should be exchangeable on site, to support working frequency migration. As required above, this external Duplexer should work in outdoor condition with wide range of operation temperature.

1.1 Required Tests

Table 1 summarizes the required tests for the RRUC-E 800MHz.

Table 1. Test Summary

FCC Measurement Specification	FCC Limit Specification	Description	Test to be Performed?
2.1033		PA current specification	Yes
2.1046	22.913	RF Power Output	Yes
2.1049	22.917	Occupied Bandwidth	Yes
2.1051, 2.1057	22.917	Spurious Emissions at Antenna Terminals	Yes
2.1055	22.355	Frequency Stability	Yes

2.0 Engineering Declaration

The RRUC-E has been tested in accordance with the requirements contained in the Federal Communications Commission Rules and Regulations Part 2 and 22, and the accepted test procedure used for the transmitter is followed TIA603.

To the best of my knowledge, these tests were performed in accordance with good engineering practices using measurement procedures consistent with industry or commission standards or previous Commission correspondence or guidance and demonstrate that this equipment complies with the appropriate standards. All tests were conducted on a representative sample of the equipment for which equipment authorization is sought.

3.0 Equipment Authorization application Requirements

3.1 Standard Test Conditions

The RRUC-E 800MHz will be tested under the following standard test conditions unless otherwise noted:

- Ambient Temperature: 20 to 35 degrees C
- Ambient Humidity: 20 to 40%
- DC Supply Voltage: -48 Vdc (nominal)
- Input modulation: IS-95 and IS-856 (16 QAM)

3.2 EUT Identification List

Table2 shows the identification of the components required for testing.

Table 2. EUT Identification

Equipment Description	PEC	Release Number	Serial Number
RRUC-E 800MHz	NTTT70ABE5	Alpha	9#
RRUC-E 800MHz	NTTT70ABE5	A5	NNTMEETY1001
B-Band and GSM Co-location DPM	NTTT75AD	A01	WEETMT3PY000
B-Band DPM	NTTT75AB	A01	WEETMT3VY002
A-Band DPM	NTTT75AA	A01	WFETMT47Y000
DBU	NTLK71AAE5	02	NNTMPX0086CV
DOM-A	NTBW81AAE5	16	NNTMPX004DN2
TX cable	NTGZ8041E6	-	-
RX cable	NTGZ8142E6	-	-
RX cable	NTGZ8142E6	-	-

Note: Alpha RRUC-E was used for “B-Band” and “B-Band and GSM Co-location” DPM, Beta A5 RRUC-E 800MHz was used for A-Band DPM in the test.

3.3 Test Equipment List

Table 3. Test Equipment List

Equipment Description	Manufacturer	Model	Serial Number	Cal. Due Date
9kHz to 26.5 GHz Spectrum Analyzer	Agilent	E4440A	MY48250517	2012-4-18
30dB Attenuator	Aeroflex / Weinschel	53-30-34-LIM	QQ634	verified
RF Cables	-	-	-	verified

4.0 Transmitter Test

4.1 PA Current Specification

4.1.1 Certification Requirements

FCC Part 2.1033 Application for certification.

(c) Applications for equipment other than that operating under parts 15 and 18 of the rules shall be accompanied by a technical report containing the following information:

(8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

4.1.2 **Test Setup**

The set-up required for the RRUC-E PA Current Specification test is illustrated in Figure 1

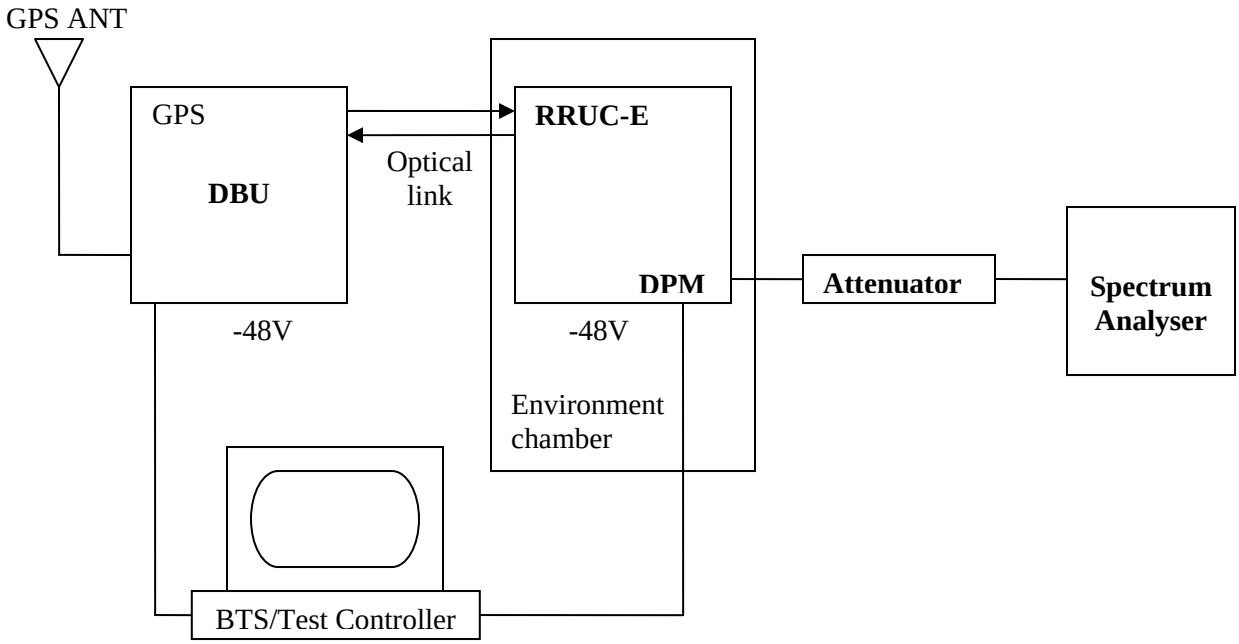

Figure 1 - Test Setup for PA Current Specification Measurement

4.1.3 Test Results

The average current below is identical for PA pallet. The data got from DMI.

4.1.3.1 RRUC-E with B-Band and GSM Co-location DPM

```
------------------dump pal information--
current temp is 00000051 'C
isense drive value is 00000604 ma
isense main value is 00005820 ma
isense aux value is 00001494 ma
driver1 bias value is 0x00000CDE
driver2 bias value is 0x00000C83
main bias value is 0x000009F4
aux bias value is 0x000003C2
pa voltage value is 00028000 mv
pa is set to bbpd mode
pa voltage is enable
pa is set to normal mode
```

Table 4. Average Current Values @ Pout = 48 dBm

Average Current Values @ Pout = 48 dBm	
Mean	7.918A

4.1.3.2 RRUC-E with B-Band DPM

```
------------------dump pal information--
current temp is 00000049 'C
isense drive value is 00000582 ma
isense main value is 00005488 ma
isense aux value is 00001401 ma
driver1 bias value is 0x00000CE0
driver2 bias value is 0x00000C88
main bias value is 0x000009F6
aux bias value is 0x000003C3
pa voltage value is 00028000 mv
pa is set to bbpd mode
pa voltage is enable
pa is set to normal mode
```

Table 5. Average Current Values @ Pout = 48 dBm

Average Current Values @ Pout = 48 dBm	
Mean	7.471A

4.1.3.3 RRUC-E beta with A-Band DPM

```
------------------dump pal information---
current temp is 00000043 'C
isense drive value is 00000629 ma
isense main value is 00006079 ma
isense aux value is 00001176 ma
driver1 bias value is 0x00000C8F
driver2 bias value is 0x00000C33
main bias value is 0x000009E5
aux bias value is 0x000003EE
pa voltage value is 00028000 mv
pa is set to bbpd mode
pa voltage is enable
pa is set to normal mode
```

Table 6. Average Current Values @ Pout = 48 dBm

Average Current Values @ Pout = 48 dBm	
Mean	7.884A

4.2 RF Power Output

4.2.1 RF Power Output Requirements

FCC Part 2.1046 Measurements required: RF power output

§(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, 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. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

4.2.2 Test Method

Setup the DE via the BTS controller to enable the RRUC-E 800MHz to transmit at the rated power for each of the carrier configurations one, two, three carrier mode in each of the Baseband modulation formats IS-95 and IS-856. Measurements will be made on channels at the bottom and top edge of the operator bands with the RRUC-E 800MHz operating with -48Vdc. The RF output power will be measured using the PSA.

4.2.3 **Test Setup**

The set-up required for the RRUC-E RF output power test is illustrated in Figure 2. RF output power measurements will be referenced to the antenna port of the DPM

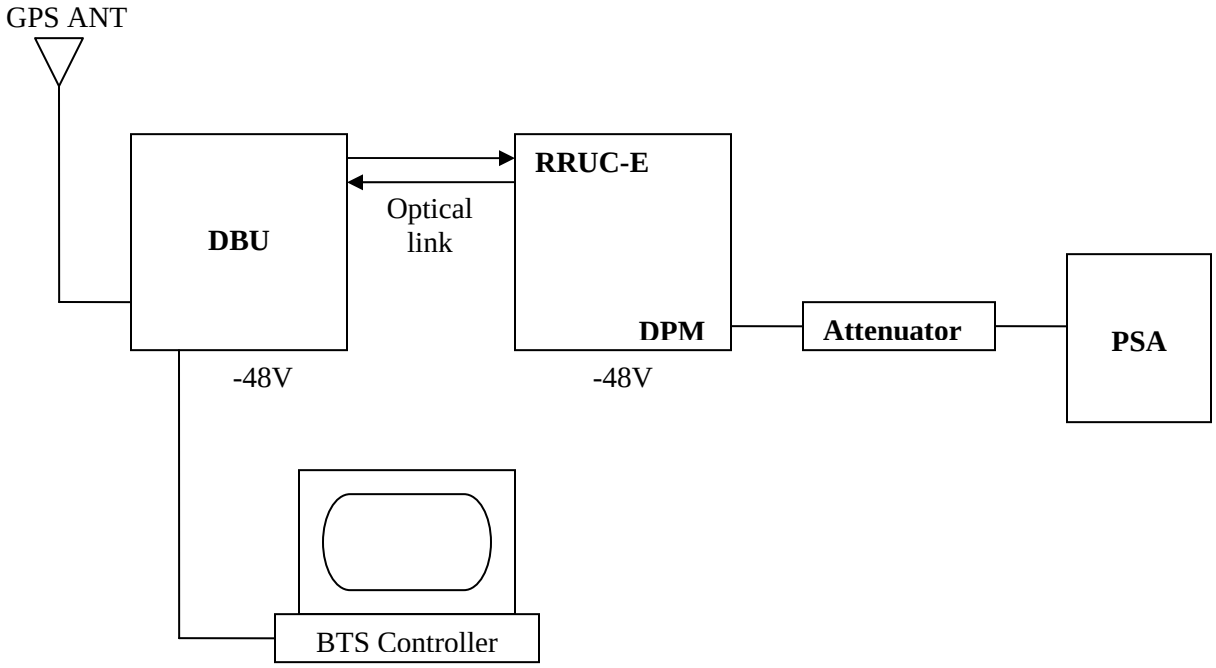

Figure 2 - Test Setup for RF Power Output Measurement

4.2.4 DOM

The conducted spurious emissions of the RRUC-E, with IS-856 (1xEVDO) waveforms will be tested at maximum power.

4.2.5 RF Output Power Test Results

4.2.5.1 RRUC-E with B-Band and GSM Co-location DPM

Table 7. RF Output Power IS95

	Channel Number (Band)	Frequency (MHz)	Measured RF Output Power (dBm)	Typical Maximum Rated Power (dBm)
1carrier	384(B)	881.52	48.24	47.96
2carrier	425,466(B)	882.75, 883.98	48.32	48.06
3carrier	507, 548, 589 (B)	885.21, 886.44, 887.67	48.47	48.20

Table 8. RF Output Power IS856

	Channel Number (Band)	Frequency (MHz)	Measured RF Output Power (dBm)	Typical Maximum Rated Power (dBm)
1carrier	384(B)	881.52	47.43	47.96

4.2.5.2 RRUC-E with B-Band DPM

Table 9. RF Output Power IS95

	Channel Number (Band)	Frequency (MHz)	Measured RF Output Power (dBm)	Typical Maximum Rated Power (dBm)
1carrier	384(B)	881.52	48.21	47.96
2carrier	425,466(B)	882.75, 883.98	48.36	48.06
3carrier	507, 548, 589 (B)	885.21, 886.44, 887.67	48.51	48.20

Table 10. RF Output Power IS856

	Channel Number (Band)	Frequency (MHz)	Measured RF Output Power (dBm)	Typical Maximum Rated Power (dBm)
1carrier	384(B)	881.52	47.44	47.96

4.2.5.3 RRUC-E beta with A-Band DPM

Table 11. RF Output Power IS95

	Channel Number (Band)	Frequency (MHz)	Measured RF Output Power (dBm)	Typical Maximum Rated Power (dBm)
1carrier	1019(A)	869.88	48.65	47.96
2carrier	37,78(A)	871.11, 872.34	48.69	48.06
3carrier	201, 242, 283 (A)	876.03, 877.26, 878.49	48.72	48.20

Table 12. RF Output Power IS856

	Channel Number (Band)	Frequency (MHz)	Measured RF Output Power (dBm)	Typical Maximum Rated Power (dBm)
1carrier	1019(B)	869.88	47.87	47.96

4.3 Occupied Bandwidth

4.3.1 Occupied Bandwidth Requirements

FCC Part 2.1049

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

(g) Transmitter in which the modulating baseband comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

4.3.2 **Test Method**

Setup the DE via the BTS controller to enable the RRUC-E to transmit at maximum rated power for each of the carrier configurations one, two, three carrier, BB' split mode and A' single carrier mode in each of the Baseband modulation formats IS-95 and IS-856 (16 QAM). Measurements were made on channels at the bottom and top edge of each of the sub bands.

The Occupied Bandwidth is measured using the 99% channel power feature of the spectrum analyzer.

4.3.3 Test Setup

The set-up required for the RRUC-E Occupied bandwidth test is illustrated in Figure 3.

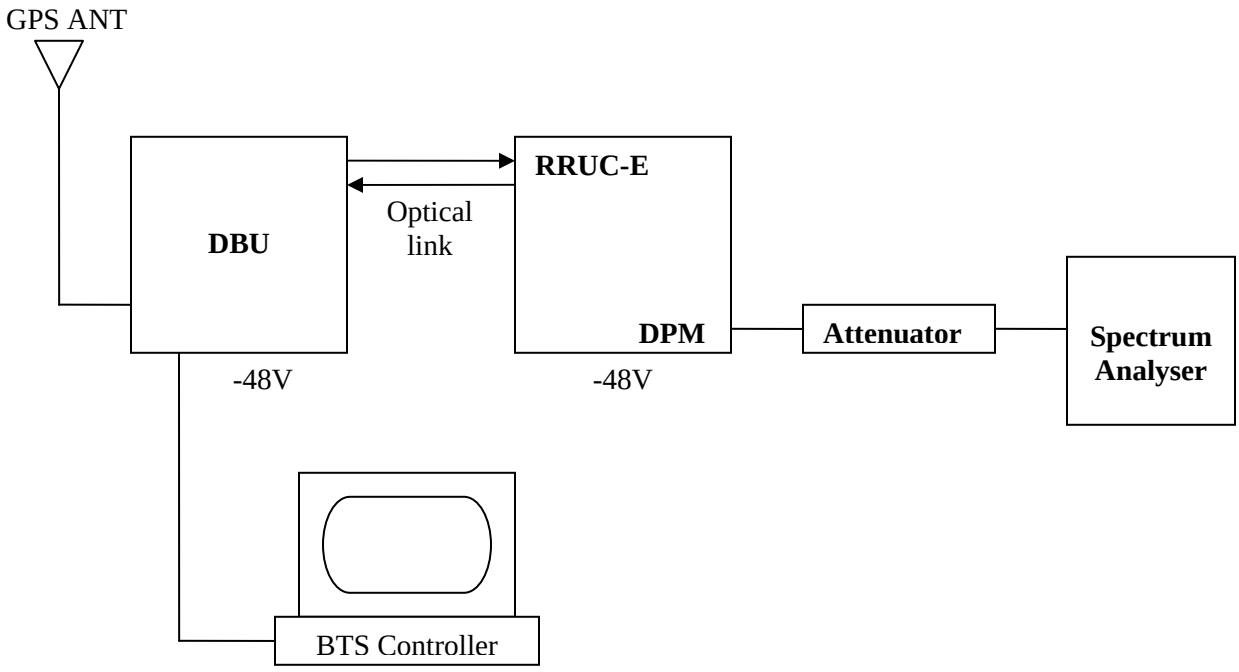

Figure 3 - Test Setup for 0ccupied bandwidth Measurement

4.3.4 Test Results

4.3.4.1 RRUC-E with B-Band and GSM Co-location DPM

Table 13. Occupied bandwidth IS95

	Channel Number (Band)	Frequency (MHz)	Measured Occupied Bandwidth (MHz)
1carrier	384(B)	881.52	1.2788
2carrier	425,466(B)	882.75, 883.98	2.4821
3carrier	507, 548, 589 (B)	885.21, 886.44, 887.67	3.682

Table 14. Occupied bandwidth IS856

	Channel Number (Band)	Frequency (MHz)	Measured Occupied Bandwidth (MHz)
1carrier	384(B)	881.52	1.2657

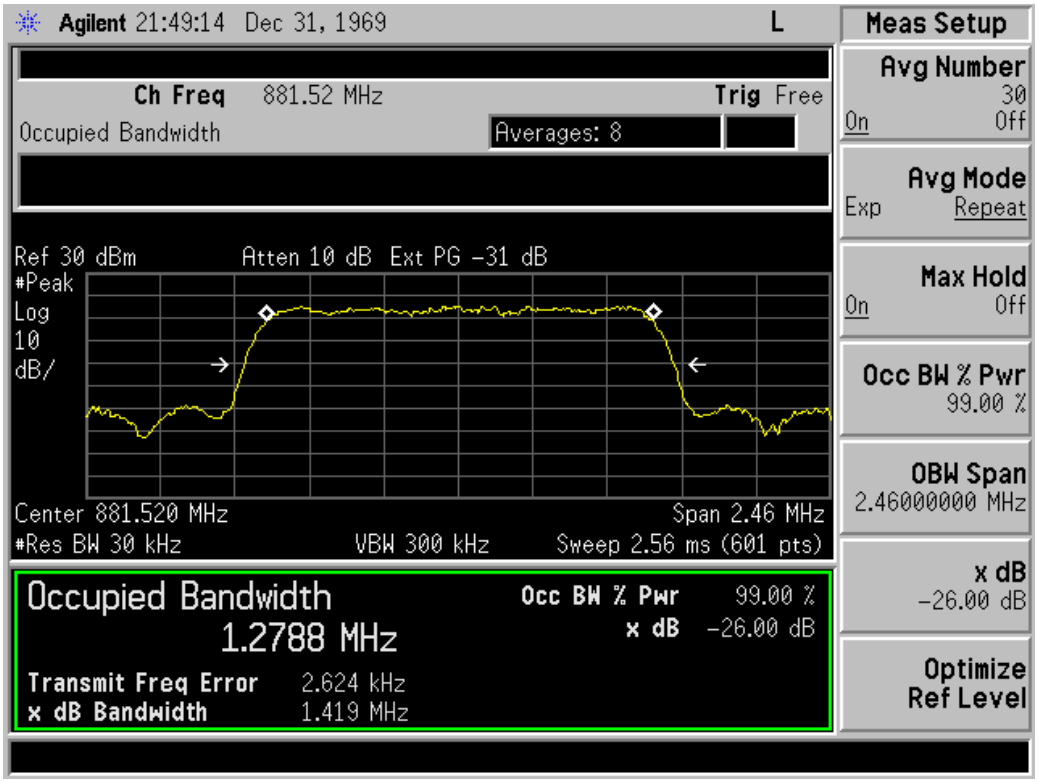

Figure 4 - Occupied Bandwidth, Single Carrier, Channel 384 IS95

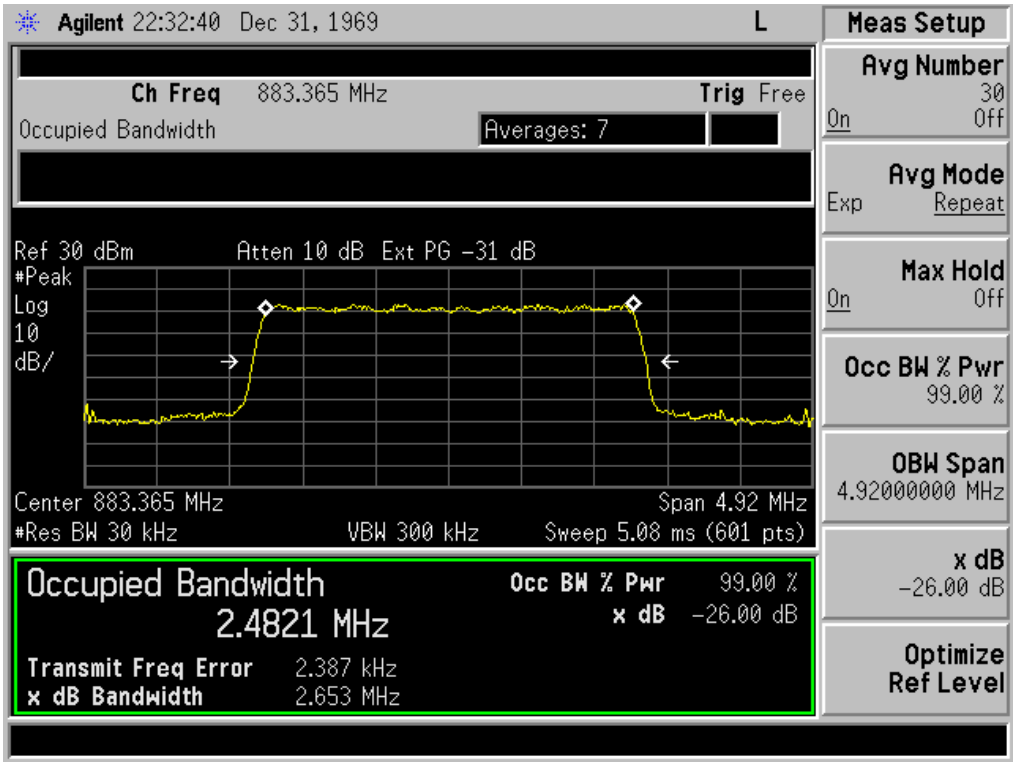

Figure 5 - Occupied Bandwidth, Two Carrier, Channel 425,466 IS95

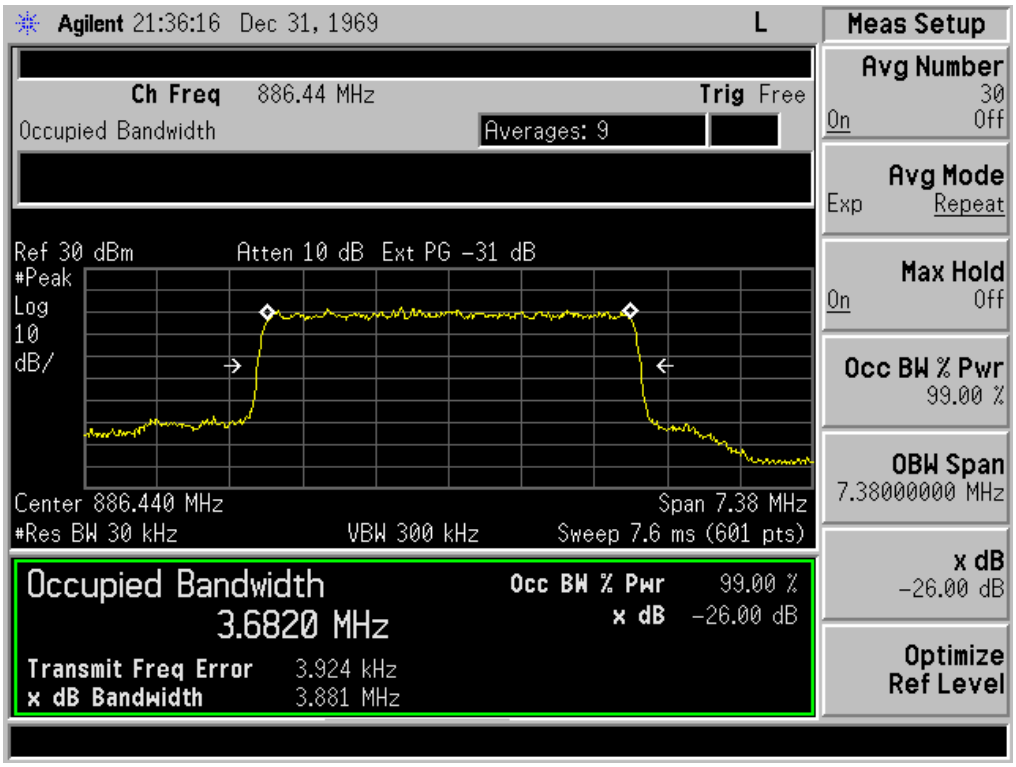

Figure 6 - Occupied Bandwidth, Three Carrier, Channel 507,548,589 IS95

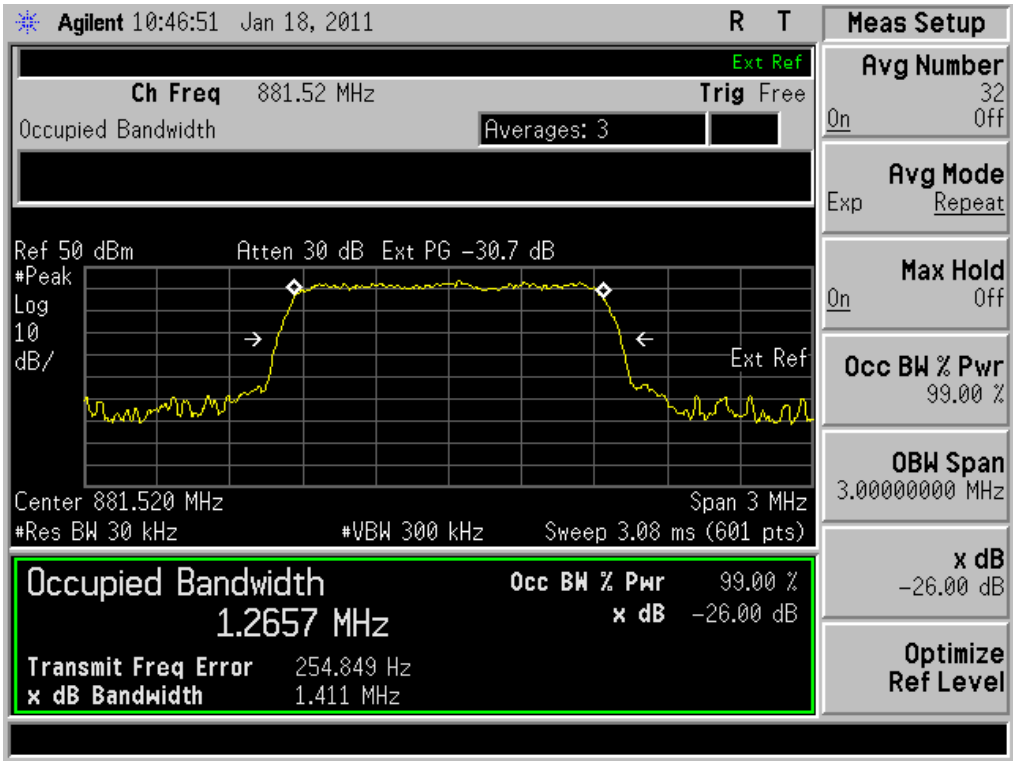

Figure 7 - Occupied Bandwidth, Single Carrier, Channel 384 IS856

4.3.4.2 RRUC-E with B-Band DPM

Table 15. Occupied bandwidth IS95

	Channel Number (Band)	Frequency (MHz)	Measured Occupied Bandwidth (MHz)
1carrier	384(B)	881.52	1.2742
1carrier	692(A')	890.76	1.2715
1carrier	758(B')	892.74	1.2778
2carrier	425,466(B)	882.75, 883.98	2.4691
3carrier	548, 589, 630 (B)	886.44, 887.67, 888.9	3.6802

Table 16. Occupied bandwidth IS856

	Channel Number (Band)	Frequency (MHz)	Measured Occupied Bandwidth (MHz)
1carrier	384(B)	881.52	1.271

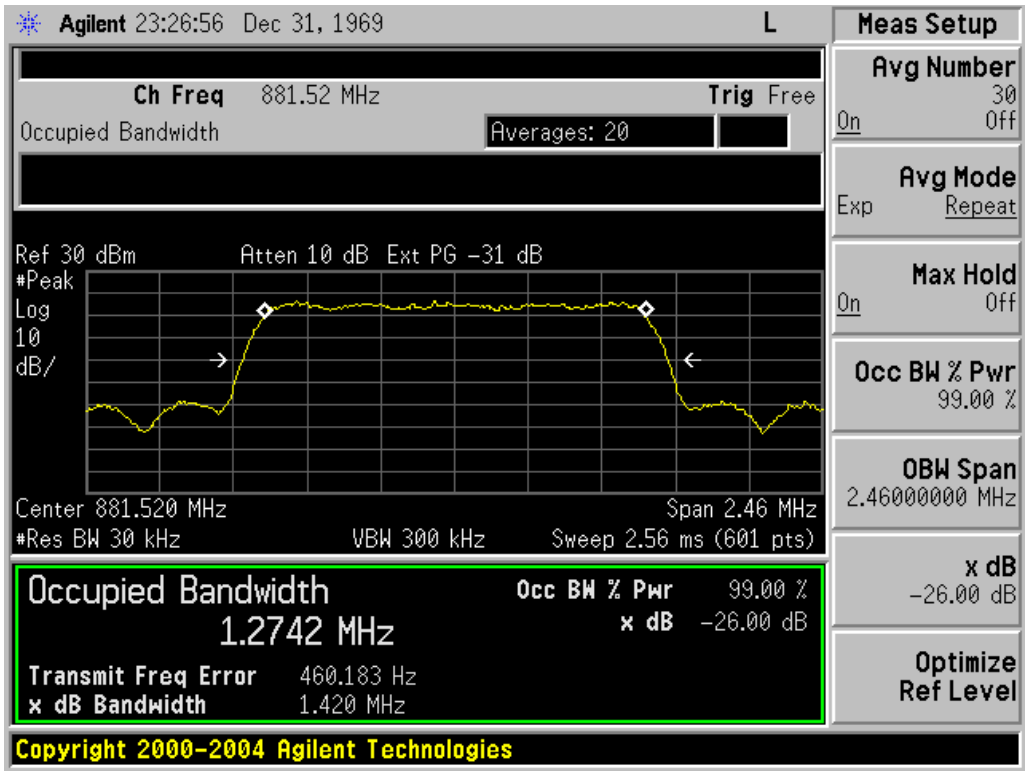

Figure 8 - Occupied Bandwidth, Single Carrier, Channel 384 IS95

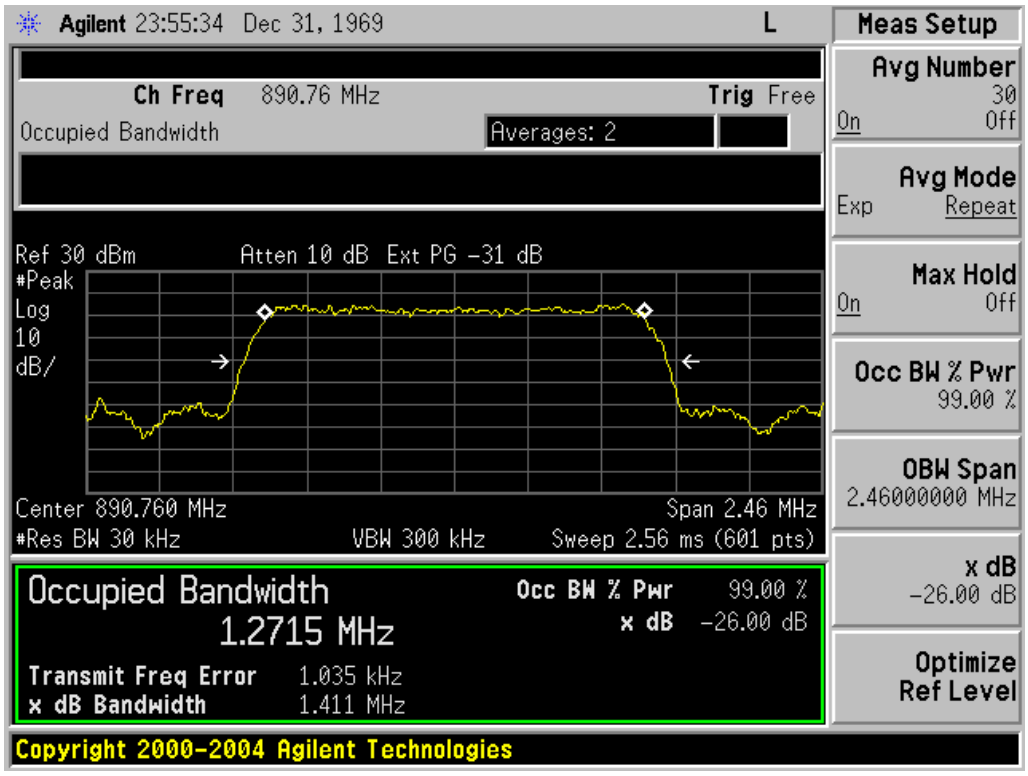

Figure 9 - Occupied Bandwidth, Single Carrier, Channel 692 IS95

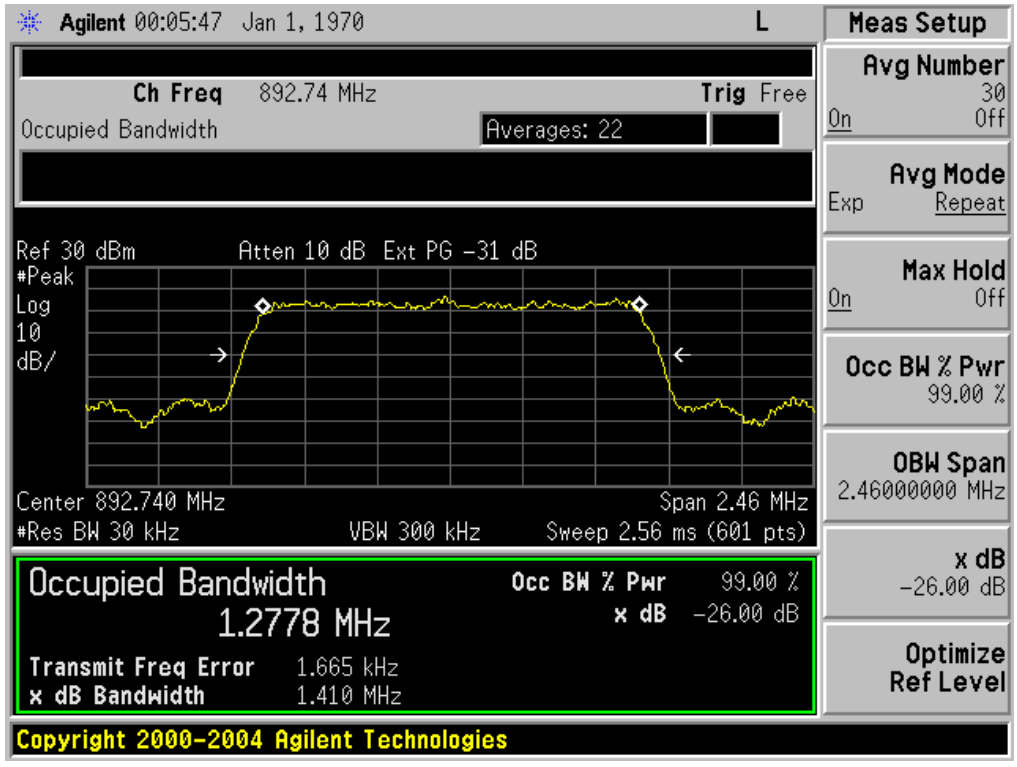

Figure 10 - Occupied Bandwidth, Single Carrier, Channel 758 IS95

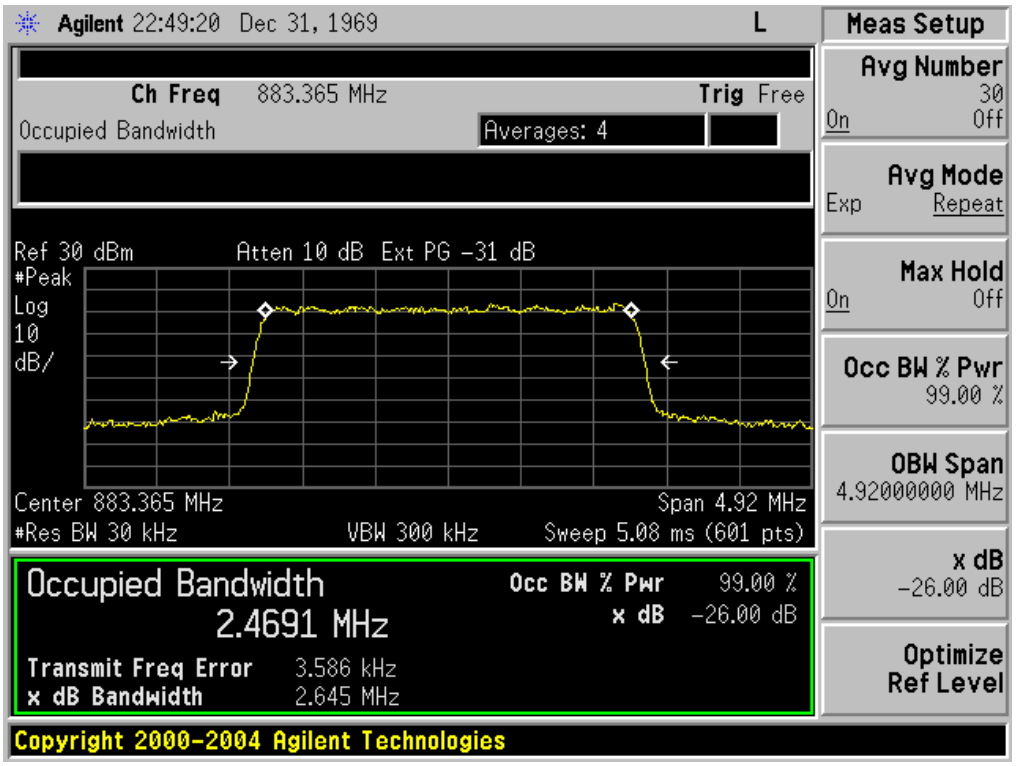

Figure 11 - Occupied Bandwidth, Two Carrier, Channel 425,466 IS95

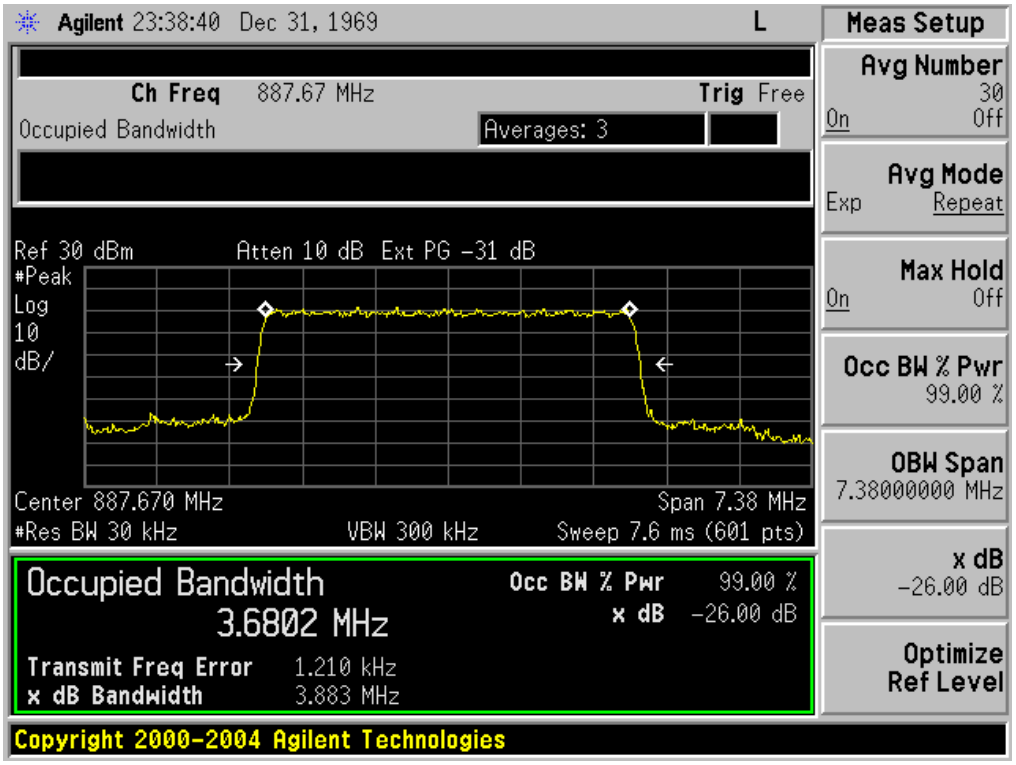

Figure 12 - Occupied Bandwidth, Three Carrier, Channel 548,589,630 IS95

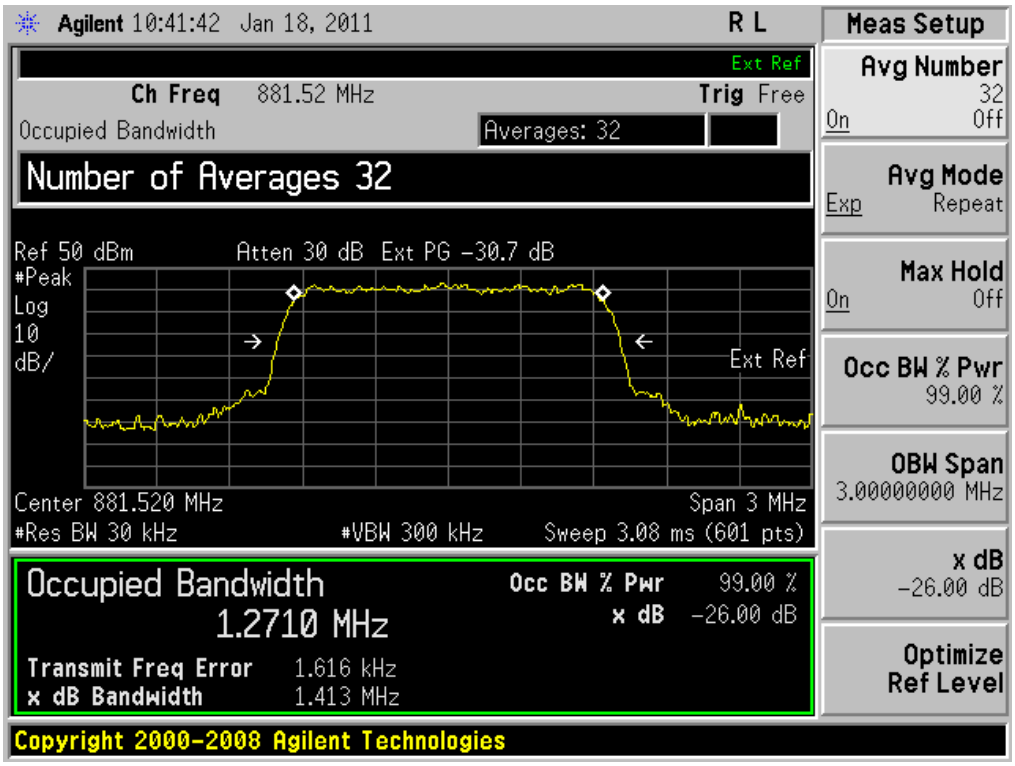

Figure 13 - Occupied Bandwidth, Single Carrier, Channel 384 IS856

4.3.4.3 RRUC-E beta with A-Band DPM

Table 17. Occupied bandwidth IS95

	Channel Number (Band)	Frequency (MHz)	Measured Occupied Bandwidth (MHz)
1carrier	1019(A)	869.88	1.2714
2carrier	37,78(A)	871.11, 872.34	2.4709
3carrier	201, 242, 283 (A)	876.03, 877.26, 878.49	3.6705

Table 18. Occupied bandwidth IS856

	Channel Number (Band)	Frequency (MHz)	Measured Occupied Bandwidth (MHz)
1carrier	1019(A)	869.88	1.2651

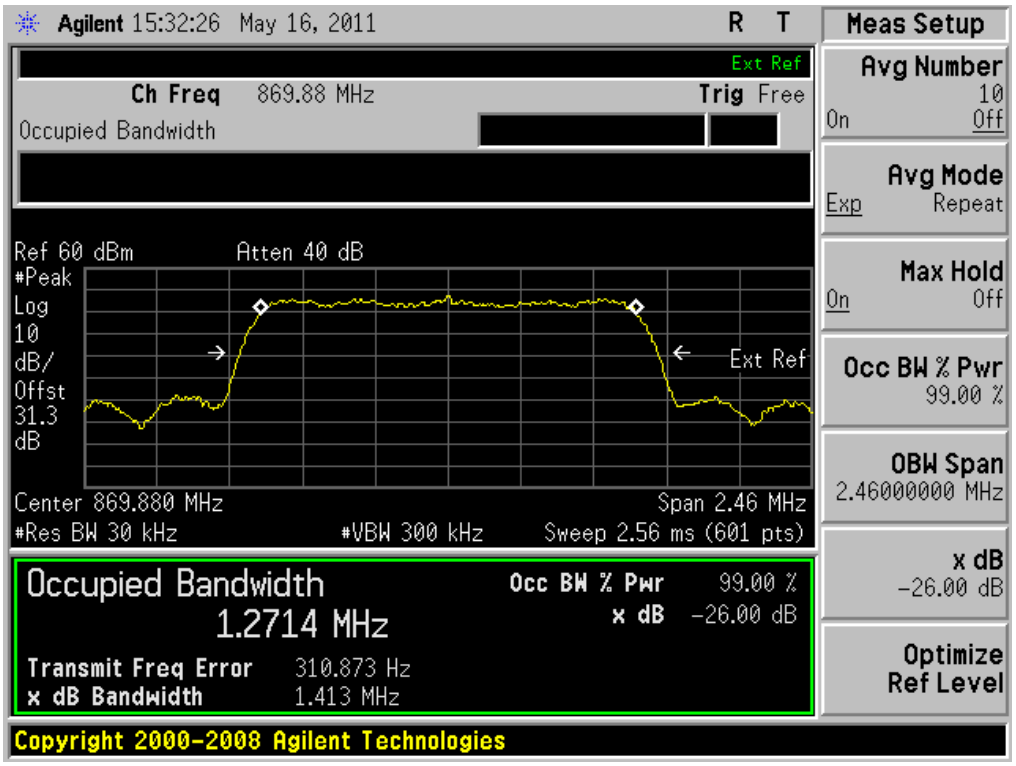

Figure 14 - Occupied Bandwidth, Single Carrier, Channel 1019 IS95

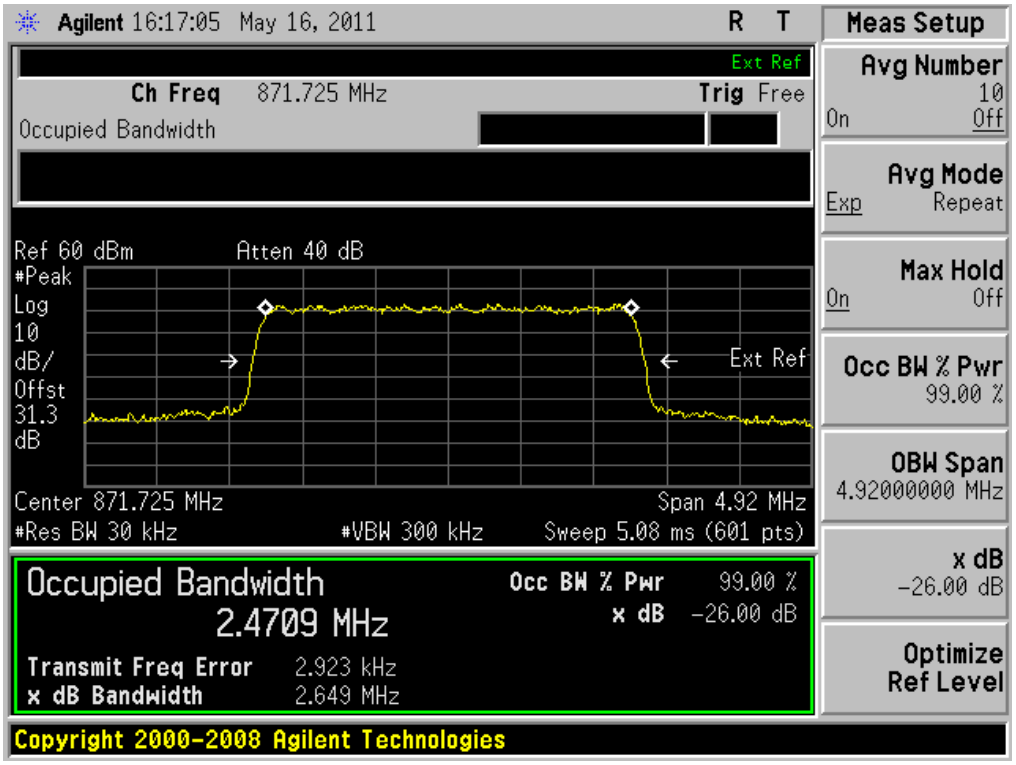

Figure 15 - Occupied Bandwidth, Two Carrier, Channel 37, 78 IS95

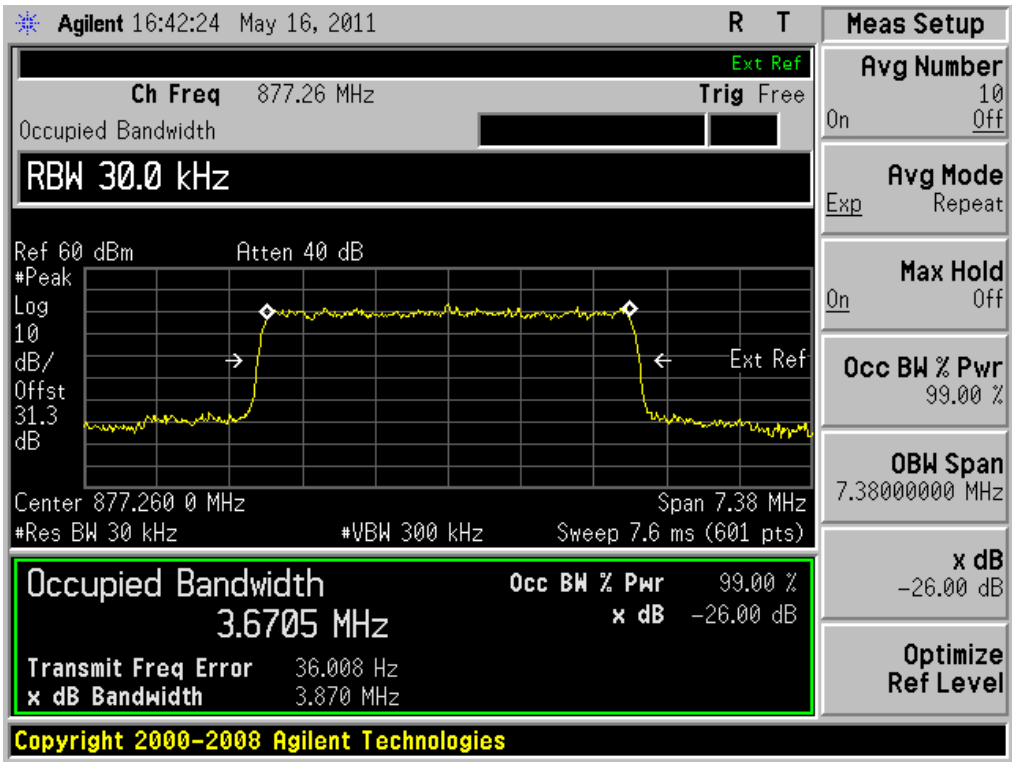

Figure 16 - Occupied Bandwidth, Three Carrier, Channel 201, 242, 283 IS95

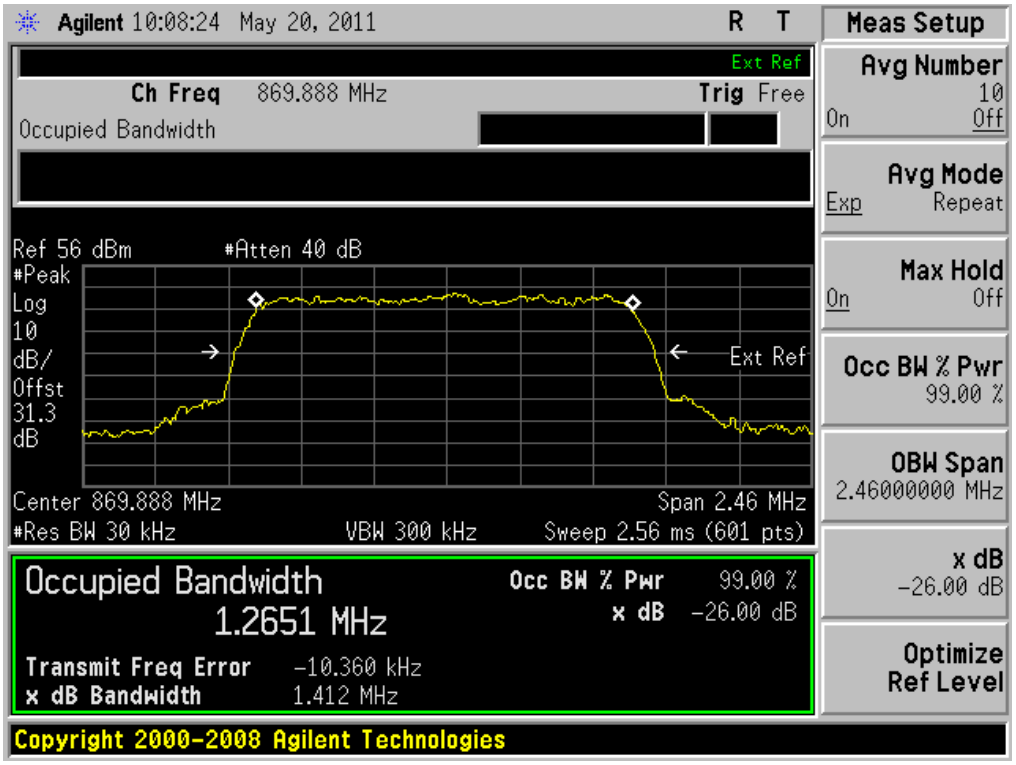

Figure 17 - Occupied Bandwidth, Single Carrier, Channel 1019 IS856

4.4 Spurious Emissions at Antenna Terminals

4.4.1 Spurious Emissions Requirements

FCC Part 2.1051
The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

FCC Part 2.1057 - Frequency Spectrum to be investigated
The spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC Part 22.917 Limit
Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC. Interference caused by out of band emissions. If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section

4.4.2 **Test Method**

Configure the BTS via the BTS controller to enable the RRUC-E to transmit at maximum rated power for each of the carrier configurations one, two, three carrier, BB' split mode and A' single carrier mode in each of the Baseband modulation formats IS-95, and IS-856 (16 QAM).

Measurements will be made on channels at the bottom and top of the operator bands. The following spectrum analyzer settings are to be used for the measurement of the antenna port (DPM) spurious emissions:

4.4.2.1 Noise Floor

Table 19 lists the noise floor of the measurement system with no signal present

Table 19. Spectrum Analyzer Noise Floor

Range	RBW	Noise Floor
9kHz to (fL-1MHz)	100kHz	-49.713dBm
fL-1MHz) to fL	30kHz	-58.738dBm
fU to (fU+1MHz)	30kHz	-59.326dBm
(fU+1MHz) to 3 GHz	100kHz	-48.034dBm
3 GHz to 9GHz	100kHz	-41.061dBm

4.4.2.2 Adjacent 1MHz to indicated cellular band (Upper and Lower)

Table 20. Adjacent 1MHZ Spectrum Analyzer Settings

Setting	1carrier	2carrier	3 carrier
Resolution Bandwidth [a]	13kHz	27 kHz	39 kHz
Video Bandwidth (3x RBW) [b]	(3x RBW)	(3x RBW)	(3x RBW)
Video Average	10 Averages	10 Averages	10 Averages
Attenuation [c]	30 dB	30 dB	30 dB

a. If the spectrum analyze cannot be set to the specified RBW the next highest RBW should be used and all measurements corrected to the specified RBW

b. If the spectrum analyze cannot be set to the specified Video Bandwidth the next highest Video Bandwidth should be used.

c. The lowest value of attenuator should be used to improve measurement accuracy, without overdriving the Spectrum Analyzer.

All spectrum analyzer settings were coupled as per the manufacturers recommendations to improve measurement time, without compromising data.

4.4.2.3 All other Spurious Emissions up to 9 GHz

Table 21. All other Emissions Spectrum Analyzer Settings

Setting	1carrier	2carrier	3 carrier
Resolution Bandwidth	100 kHz	100 kHz	100 kHz
Video Bandwidth (3x RBW)	(3x RBW)	(3x RBW)	(3x RBW)
Video Average	10 Averages	10 Averages	10 Averages
Attenuation [a]	30 dB	30 dB	30 dB

a. The lowest value of attenuator should be used to improve measurement accuracy, without overdriving the Spectrum Analyzer.

The emissions will be investigated up to 9 GHz (the 10th harmonic of the fundamental emission) for all carrier configurations (1, 2, 3) as per FCC Part 22.

4.4.3 Test Setup

The set-up required for the RRUC-E Antenna Port (DPM) Spurious Emission test is illustrated in Figure 18.

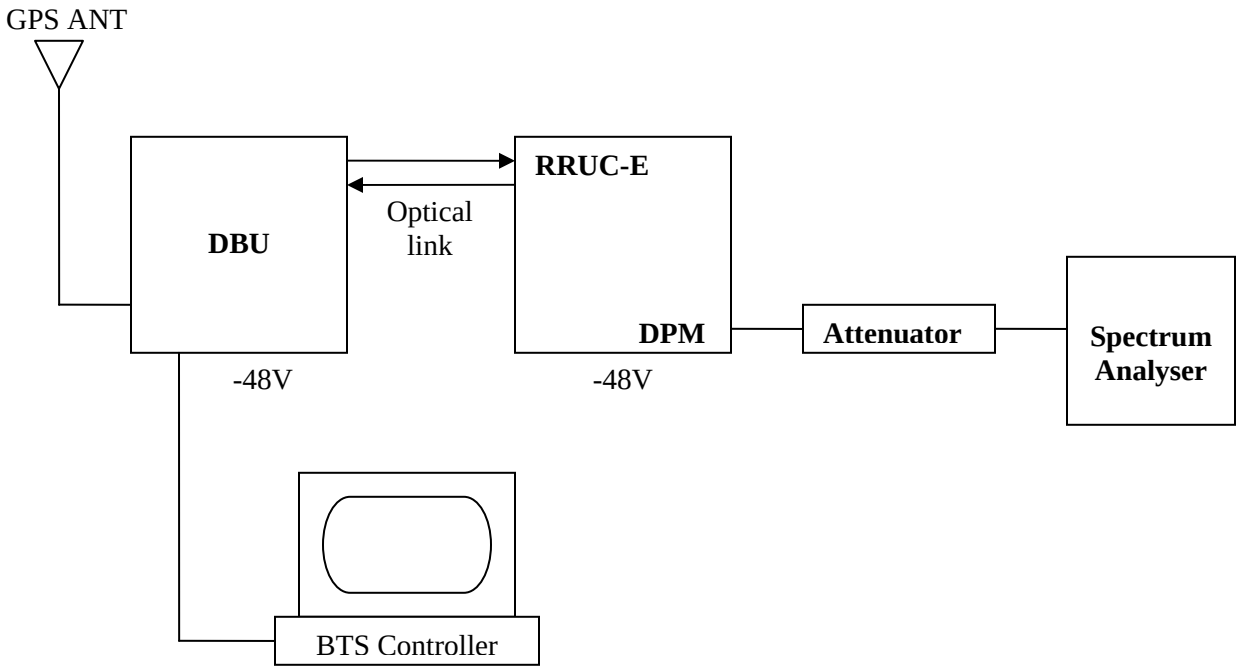

Figure 18 - Test Setup for Spurious Emissions Measurement

4.4.4 **Test Results IS95**

4.4.4.1 RRUC-E with B-Band and GSM Co-location DPM

Table 22. Spurious Emissions at the RRUC-E 800MHz Ant. Port one Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363 (RBW=13 kHz)	-17.356	4.356
888.5(Upper edge) Ch 589 (RBW=13 kHz) to 889.5MHz	-18.491	5.491
9kHz to 879MHz(Lower Edge - 1	-31.735	18.735

MHz) (RBW=100KHz)		
889.5MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-21.187	8.187
3GHz to 9GHz (RBW=100 kHz)	-37.025	24.025

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

Table 23. Spurious Emissions at the RRUC-E 800MHz Ant. Port two Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363,404 (RBW=27 kHz)	-18.489	5.489
888.5(Upper edge) Ch 548,589 (RBW=27 kHz) to 889.5MHz	-18.207	5.207
9kHz to 879MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-23.450	10.450
889.5MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-24.270	11.270
3GHz to 9GHz (RBW=100 kHz)	-36.789	23.789

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

Table 24. Spurious Emissions at the RRUC-E 800MHz Ant. Port three Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363,404,445 (RBW=39 kHz)	-18.848	5.848
888.5(Upper edge) Ch 507,548,589 (RBW=39 kHz) to 889.5MHz	-19.732	6.732
9kHz to 879MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-23.092	10.092
889.5MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-23.915	10.915
3GHz to 9GHz (RBW=100 kHz)	-36.516	23.516

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

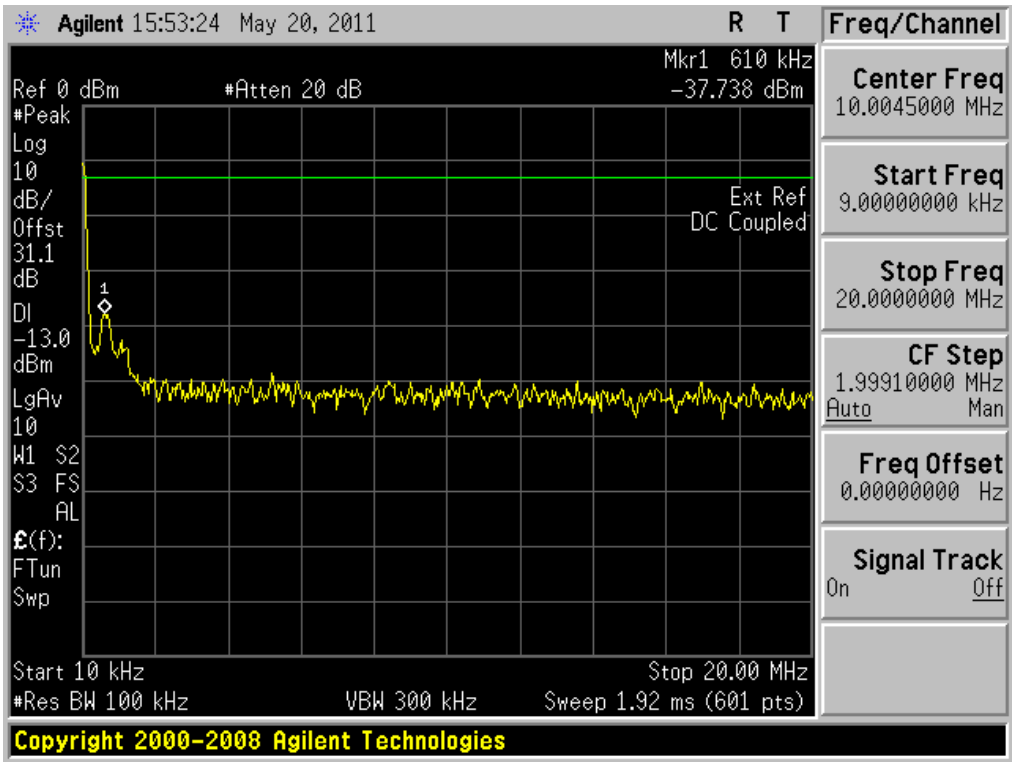

Figure 19 - Conducted Spurious Emissions - 1 Carrier, Channel 363 IS95 (9k-20MHz)

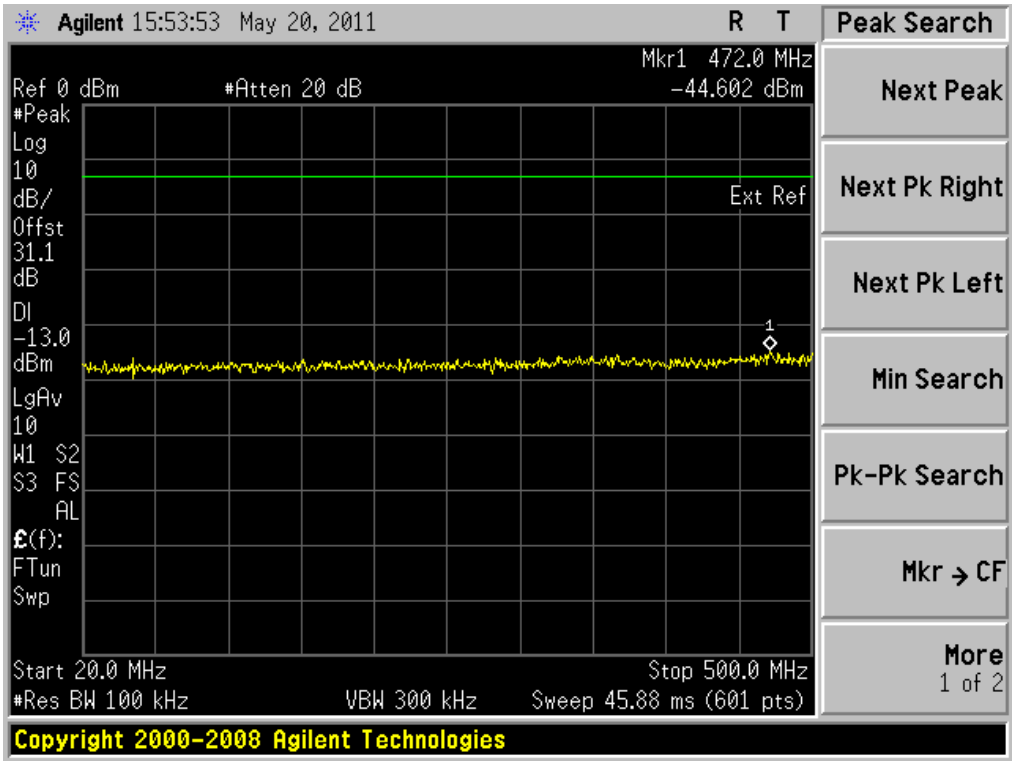

Figure 20 - Conducted Spurious Emissions - 1 Carrier, Channel 363 IS95 (20-500MHz)

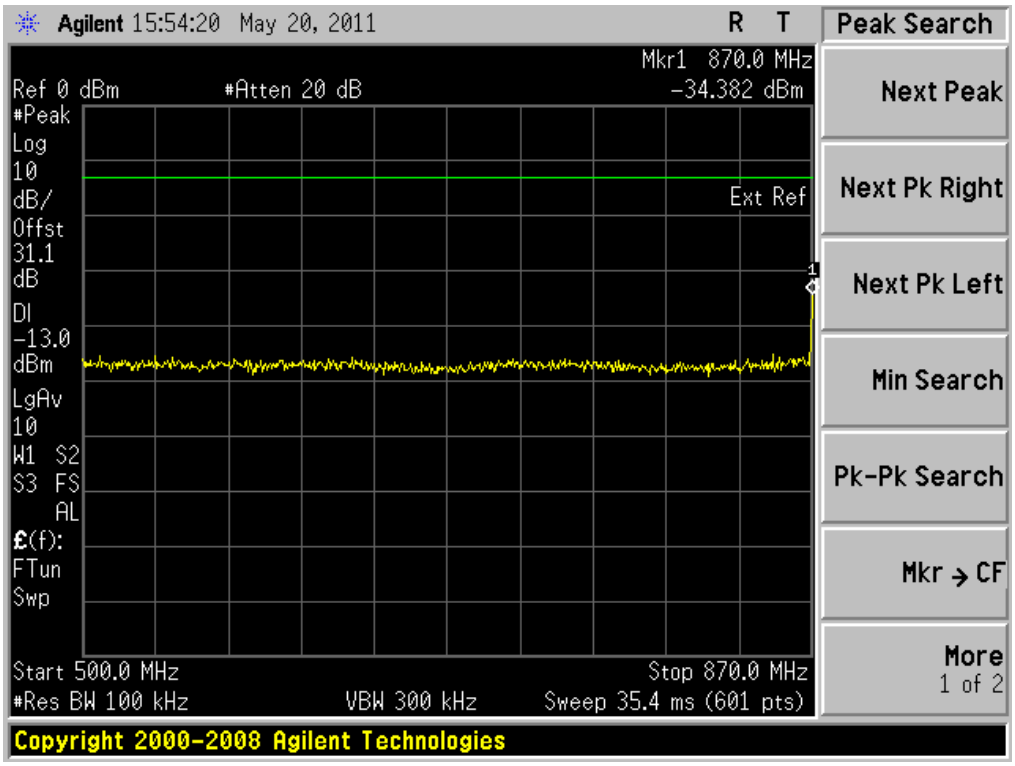

Figure 21 - Conducted Spurious Emissions - 1 Carrier, Channel 363 IS95 (500-870MHz)

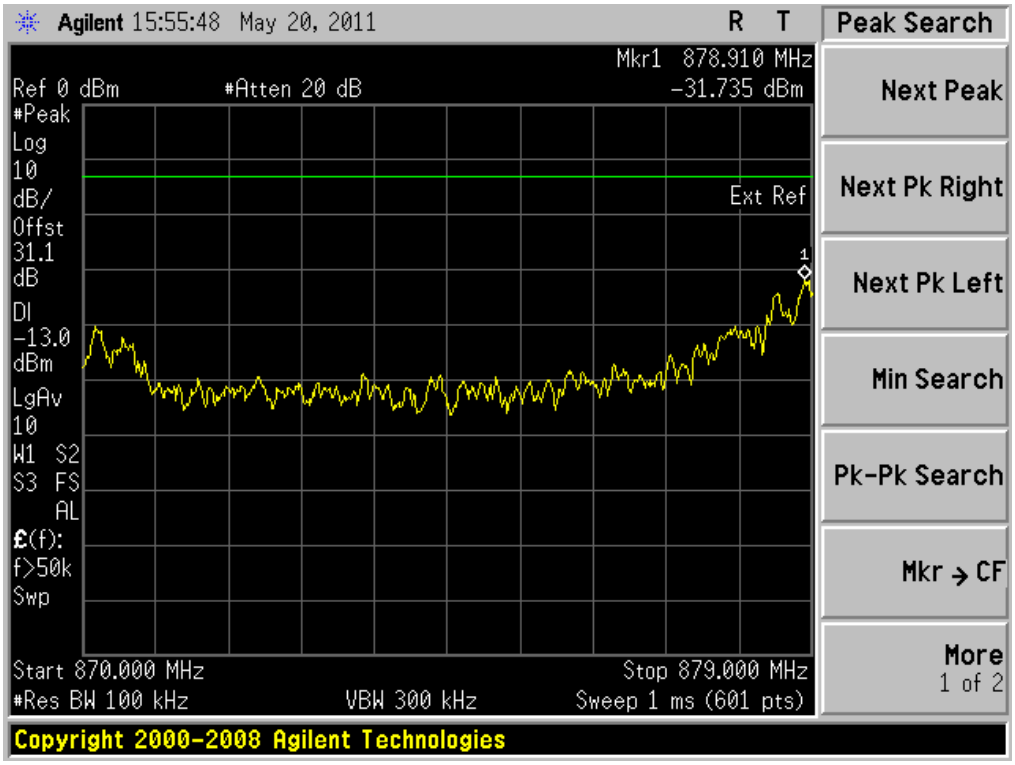

Figure 22 - Conducted Spurious Emissions - 1 Carrier, Channel 363 IS95 (870-879MHz)

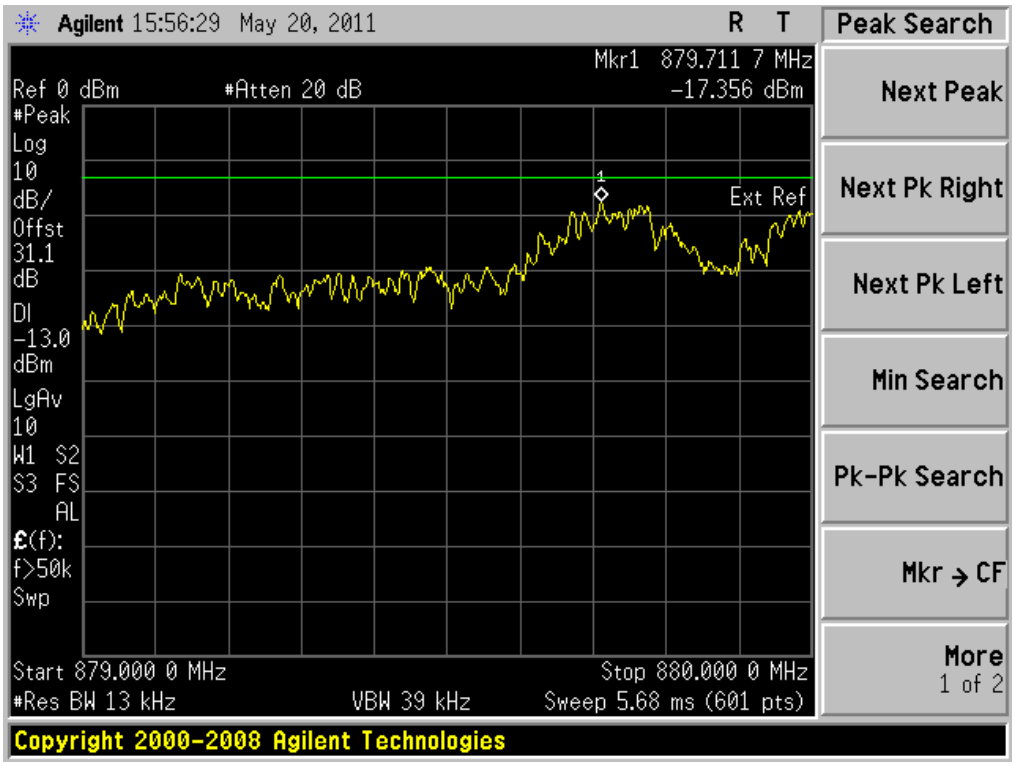

Figure 23 - Conducted Spurious Emissions - 1 Carrier, Channel 363 IS95 (879-880MHz)

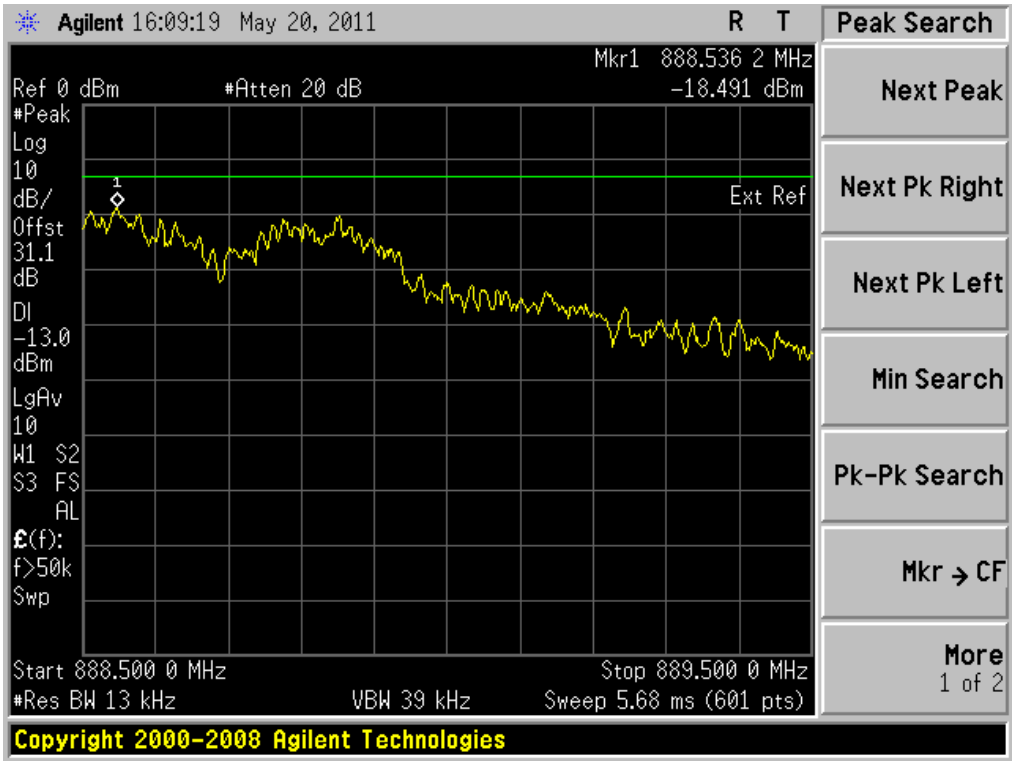

Figure 24 - Conducted Spurious Emissions - 1 Carrier, Channel 589 IS95 (888.5-889.5MHz)

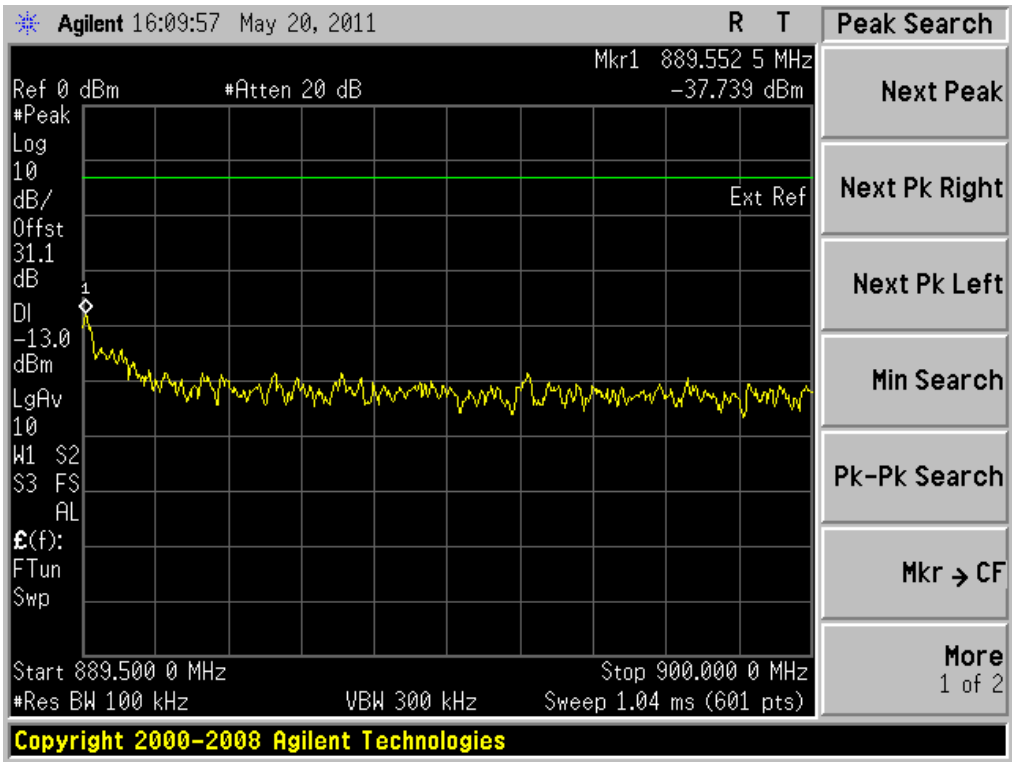

Figure 25 - Conducted Spurious Emissions - 1 Carrier, Channel 589 IS95 (889.5-900MHz)

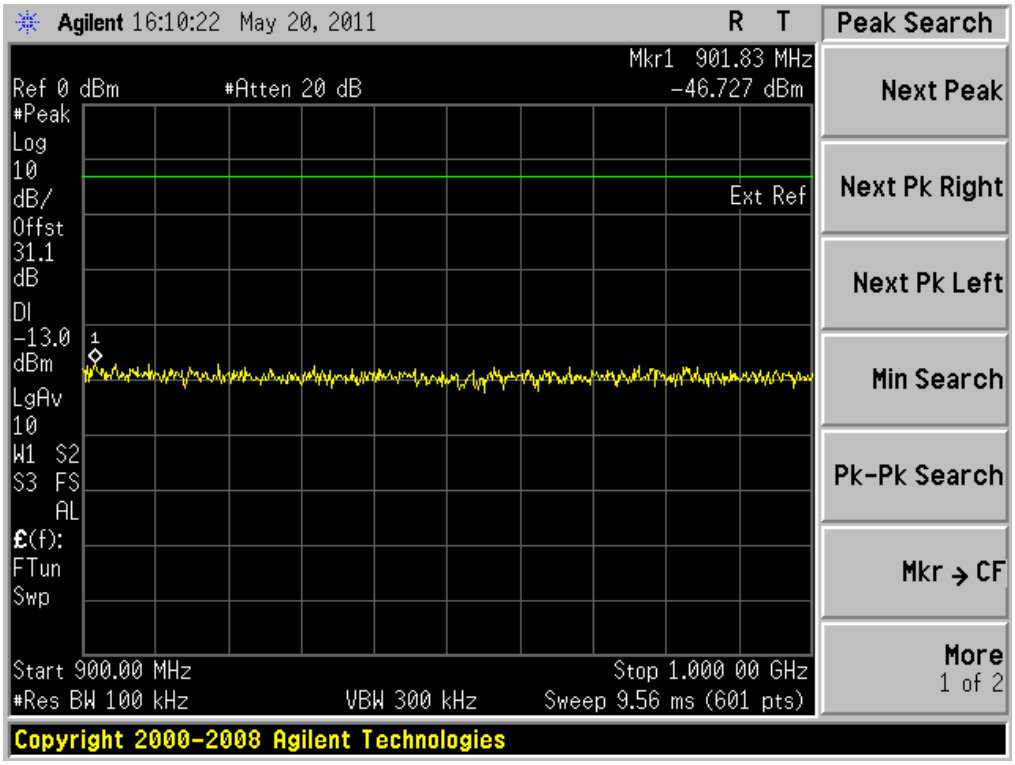

Figure 26 - Conducted Spurious Emissions - 1 Carrier, Channel 589 IS95 (900M-1GHz)

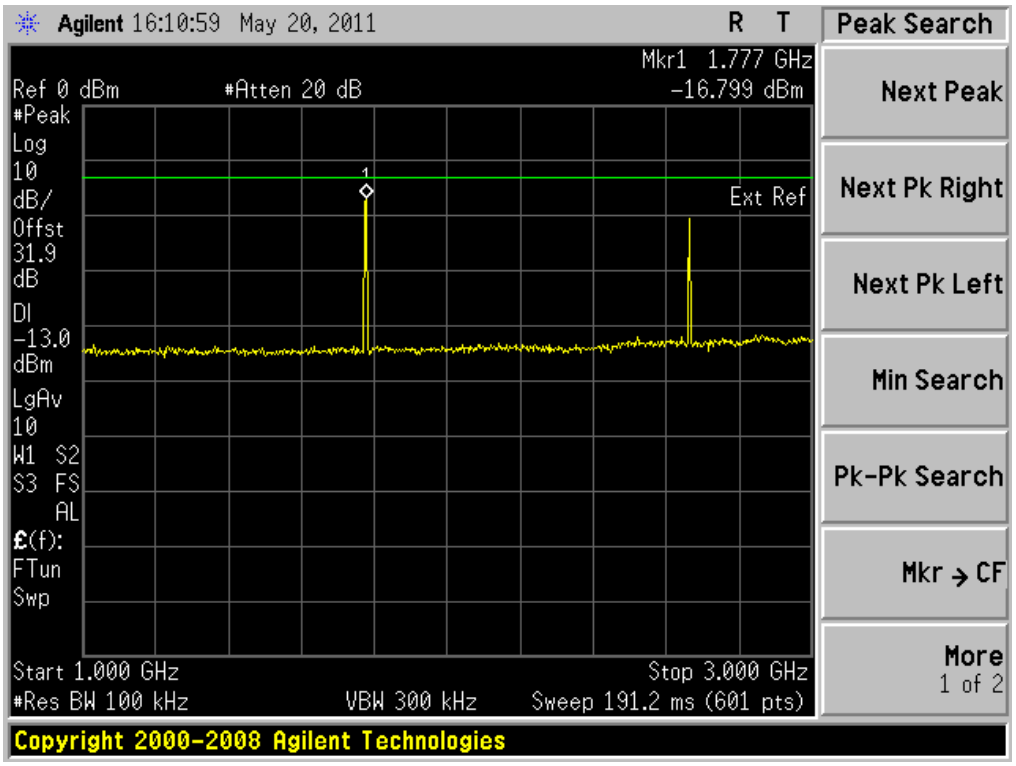

Figure 27 - Conducted Spurious Emissions - 1 Carrier, Channel 589 IS95 (1-3GHz)

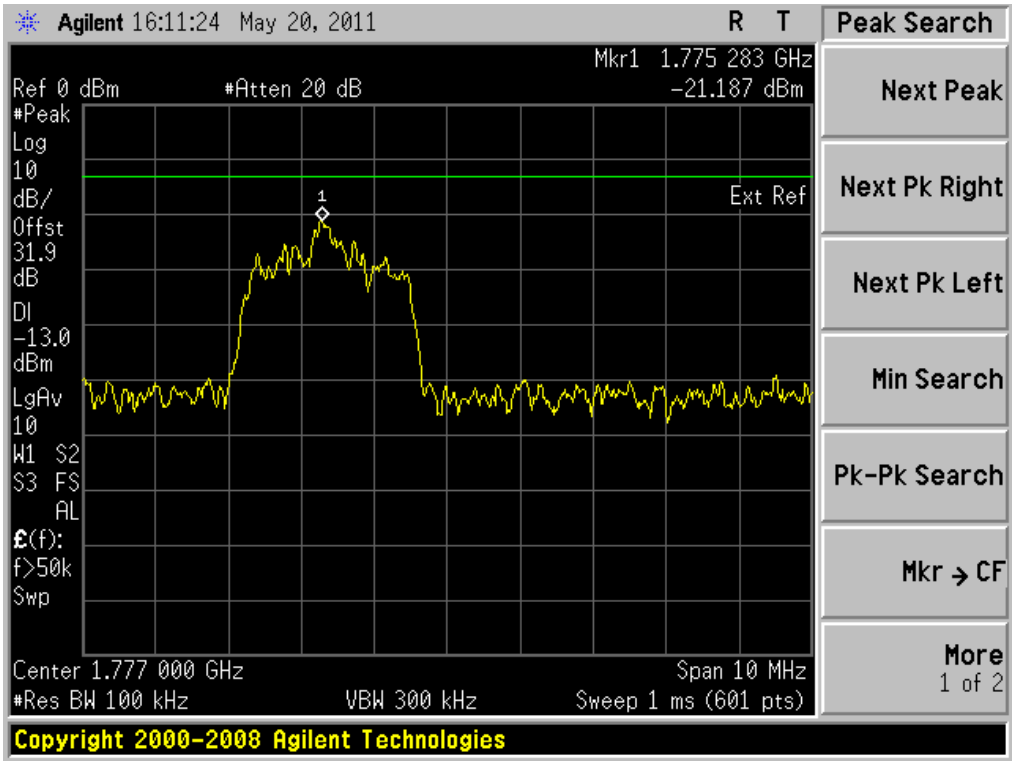

Figure 28 - Conducted Spurious Emissions - 1 Carrier, Channel 589 IS95 (1-3GHz)

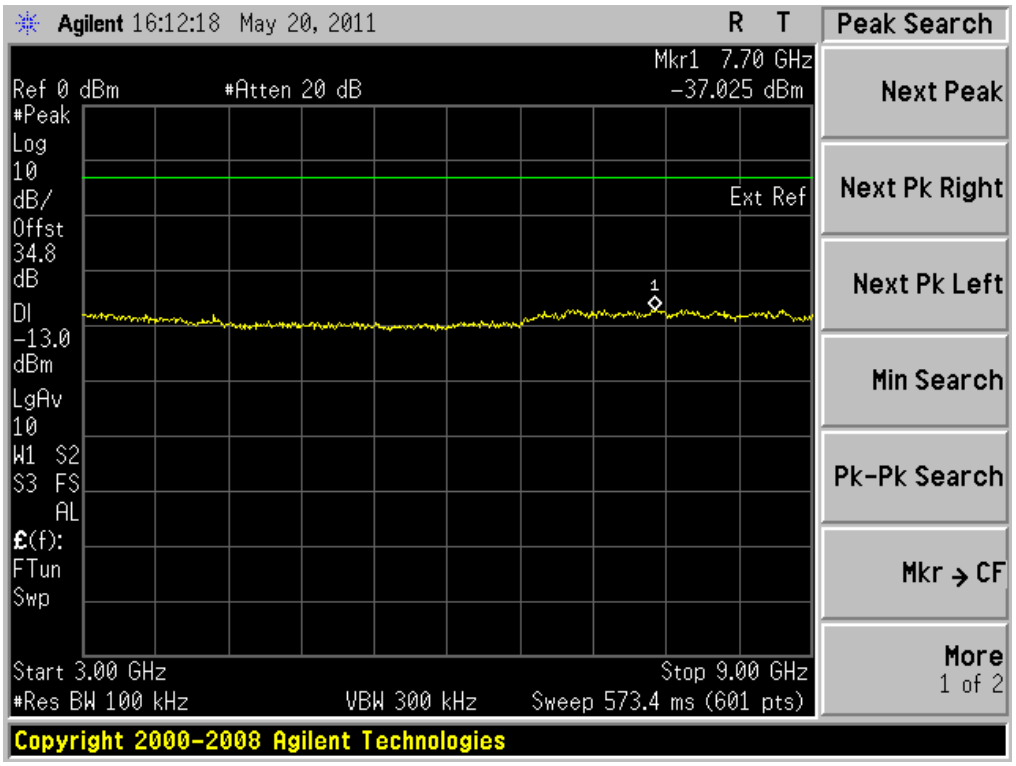

Figure 29 - Conducted Spurious Emissions - 1 Carrier, Channel 589 IS95 (3-9GHz)

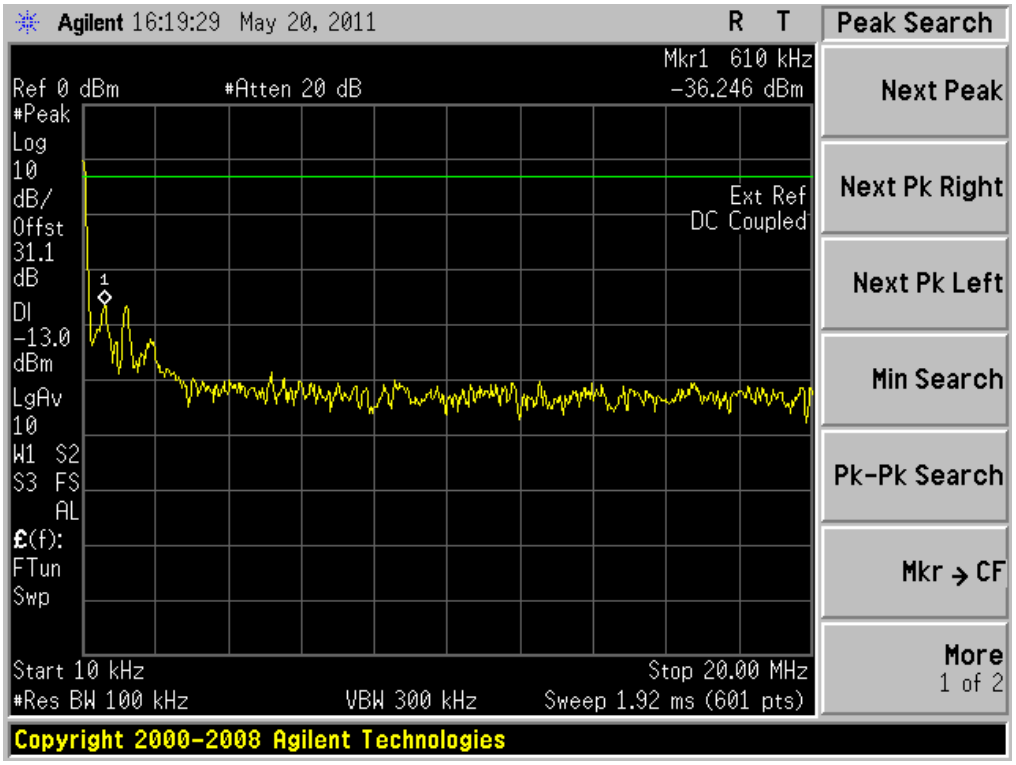

Figure 30 - Conducted Spurious Emissions - 2 Carrier, Channel 363,404 IS95 (9k-20MHz)

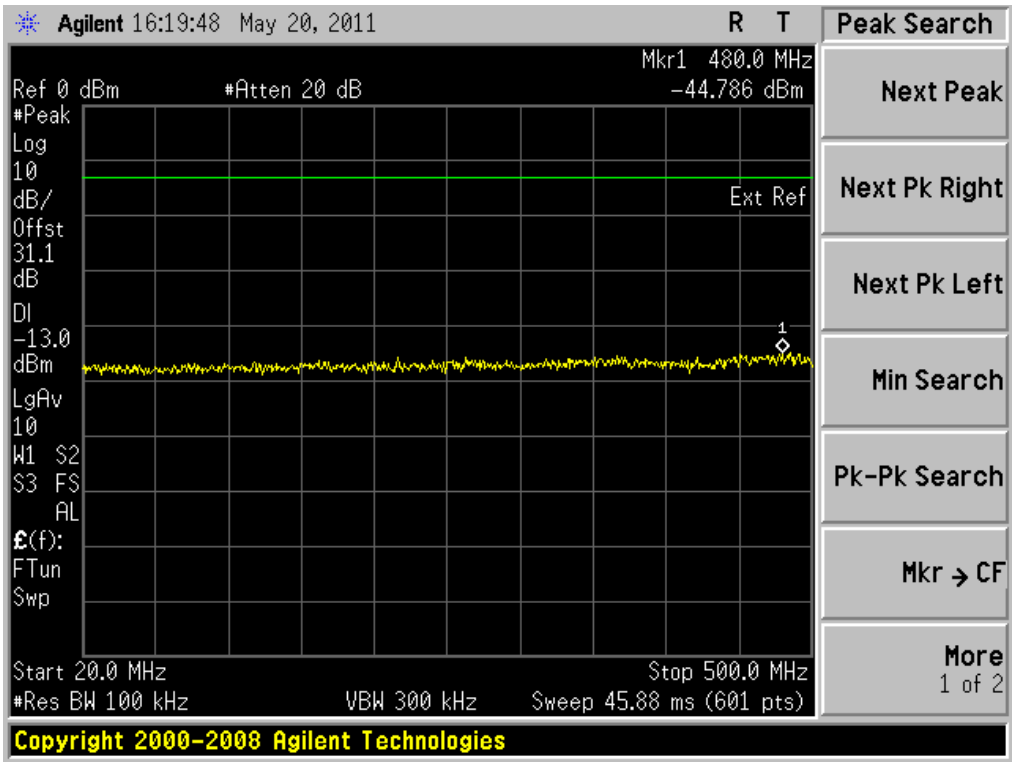

Figure 31 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 IS95 (20-500MHz)

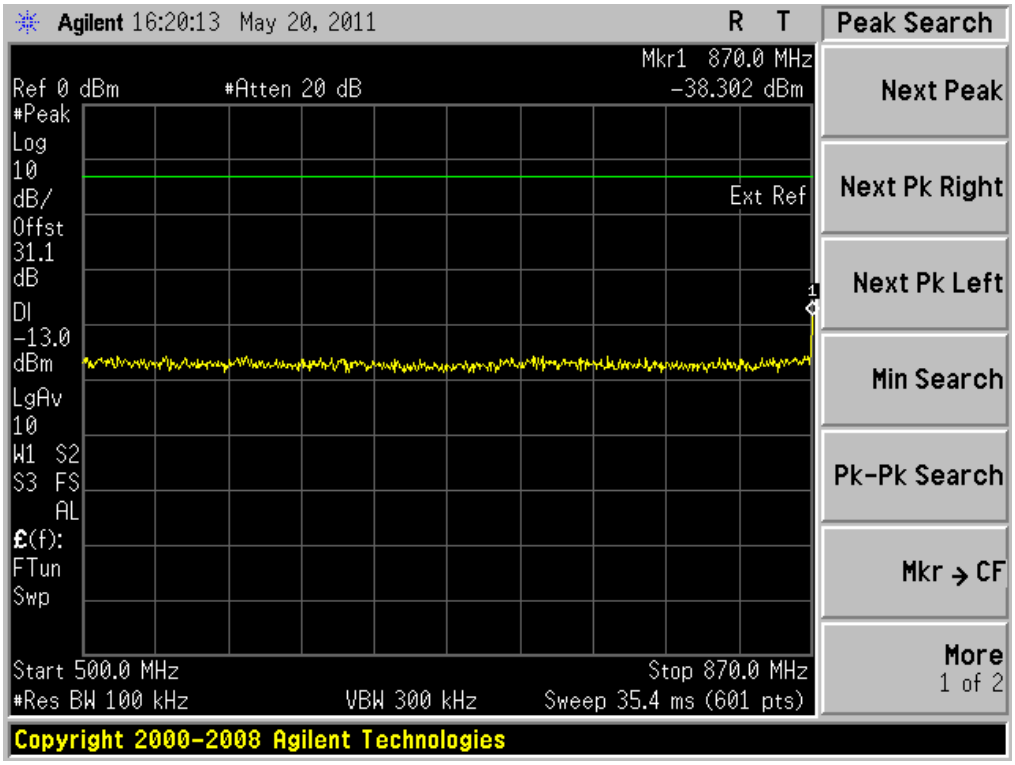

Figure 32 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 IS95 (500-870MHz)

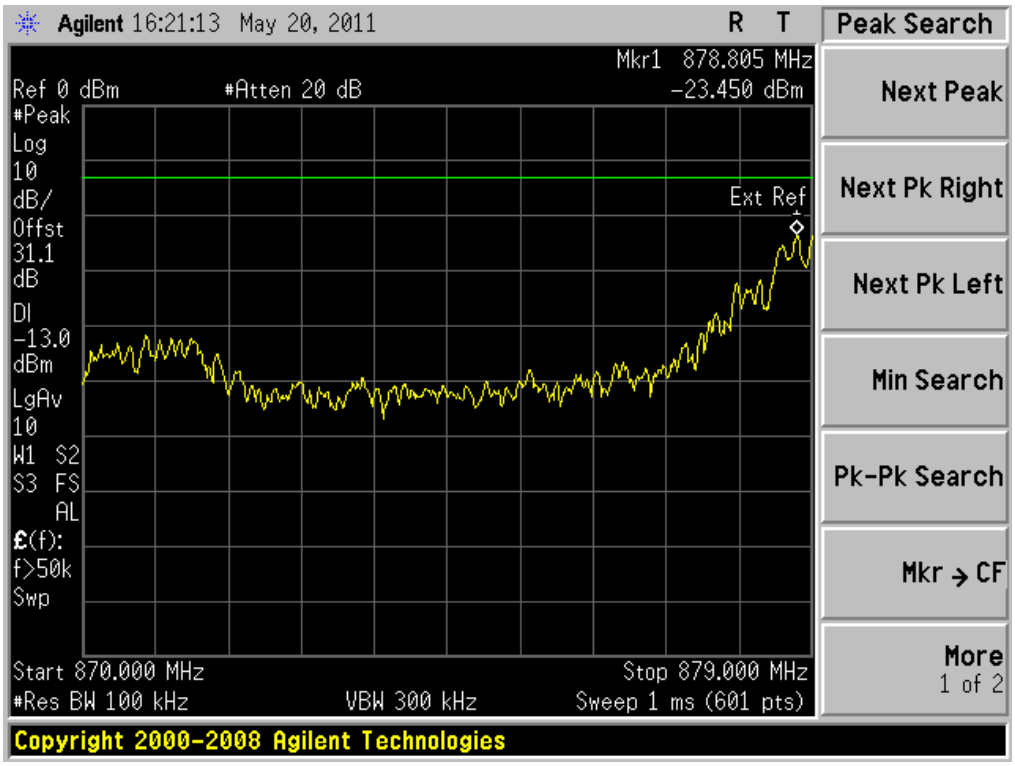

Figure 33 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 IS95 (870-879MHz)

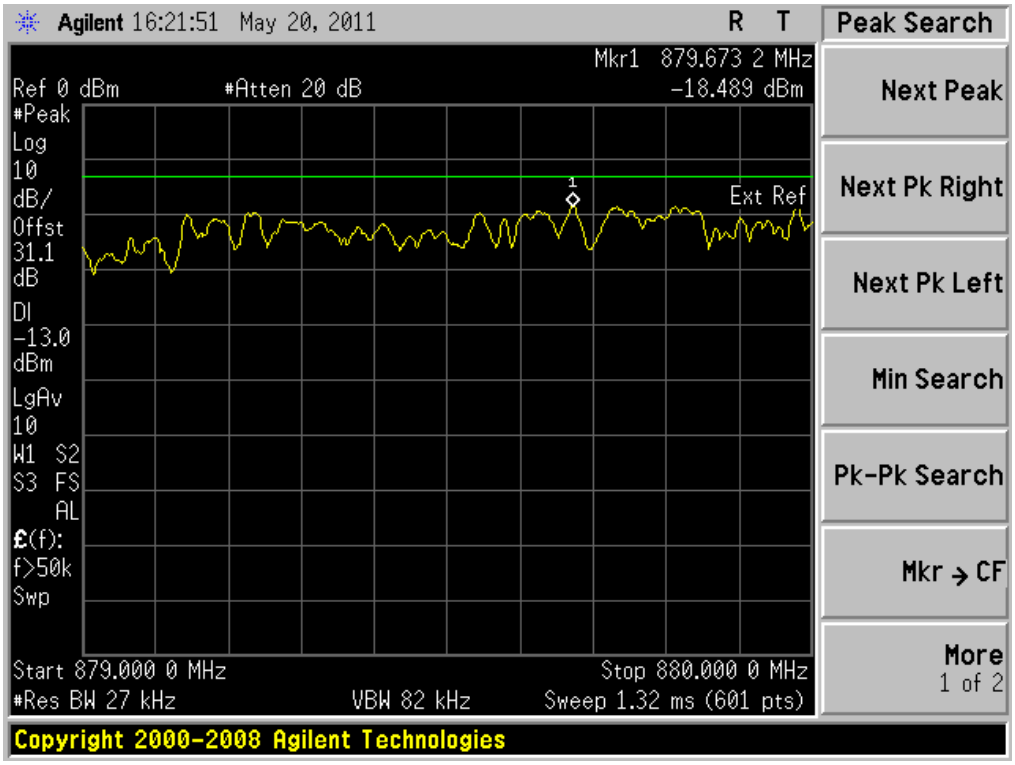

Figure 34 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 IS95 (879-880MHz)

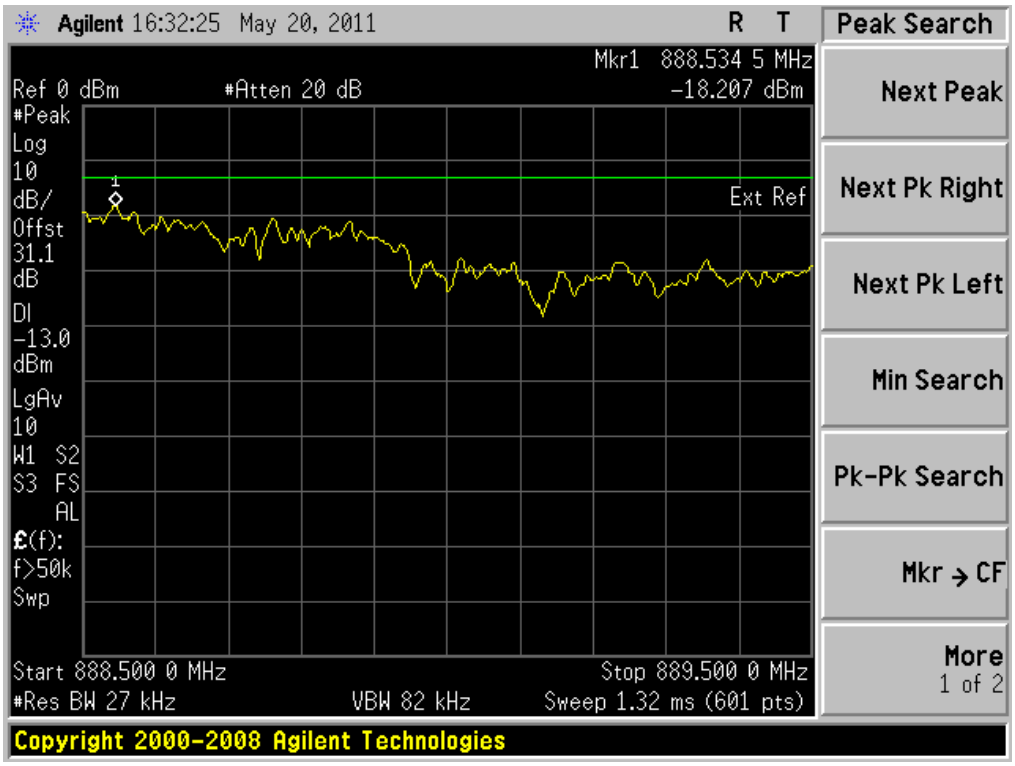

Figure 35 - Conducted Spurious Emissions – 2 Carrier, Channel 548,589 IS95 (888.5-889.5MHz)

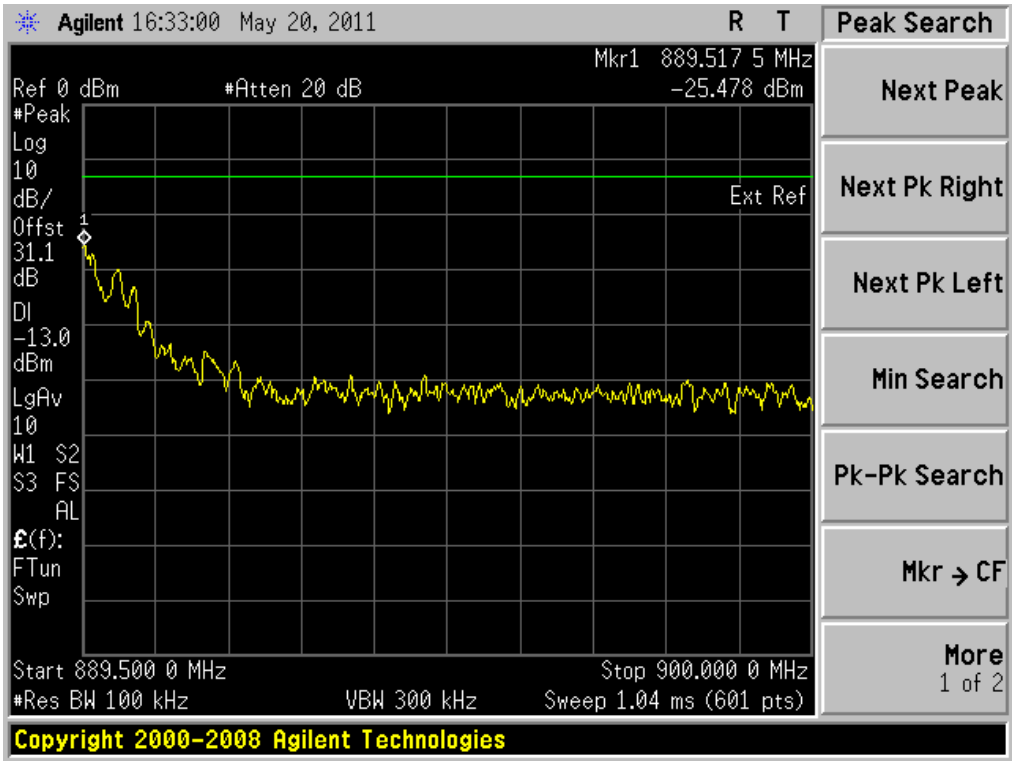

Figure 36 - Conducted Spurious Emissions – 2 Carrier, Channel 548,589 IS95 (889.5-900MHz)

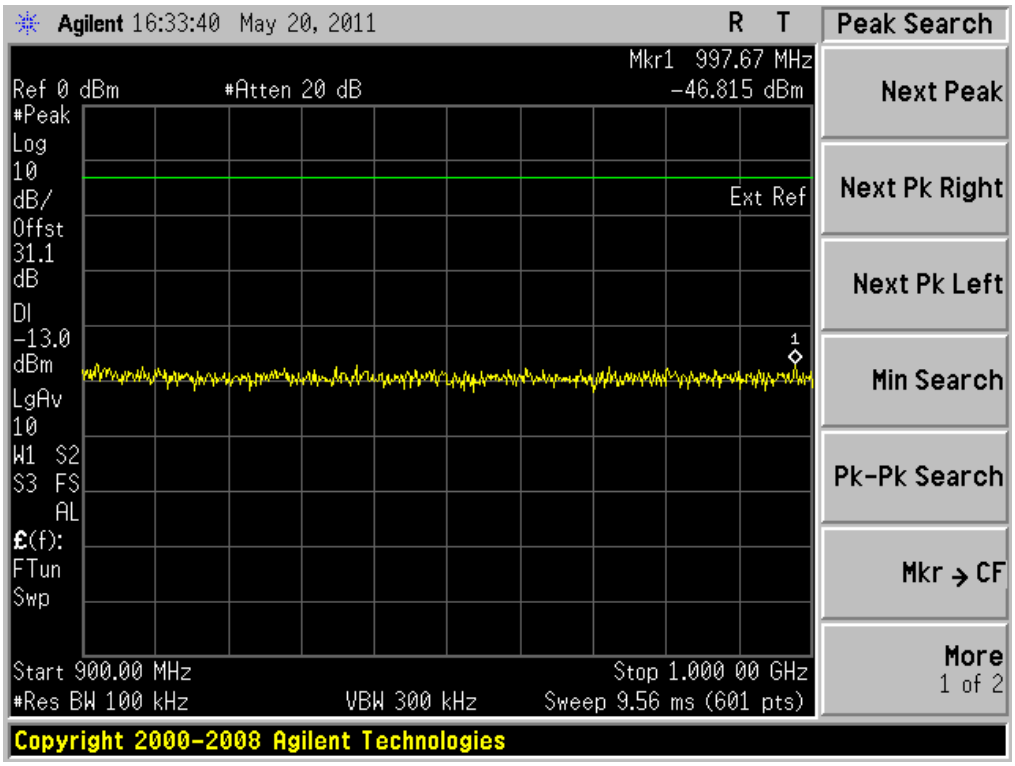

Figure 37 - Conducted Spurious Emissions – 2 Carrier, Channel 548,589 IS95 (900M-1GHz)

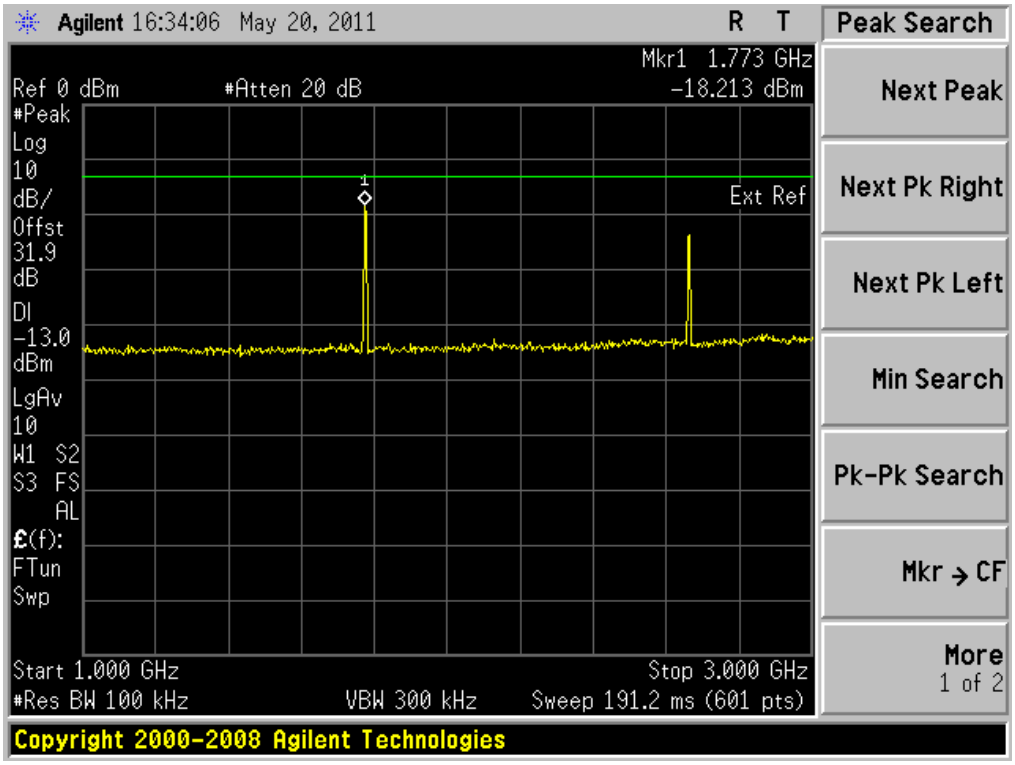

Figure 38 - Conducted Spurious Emissions – 2 Carrier, Channel 548,589 IS95 (1-3GHz)

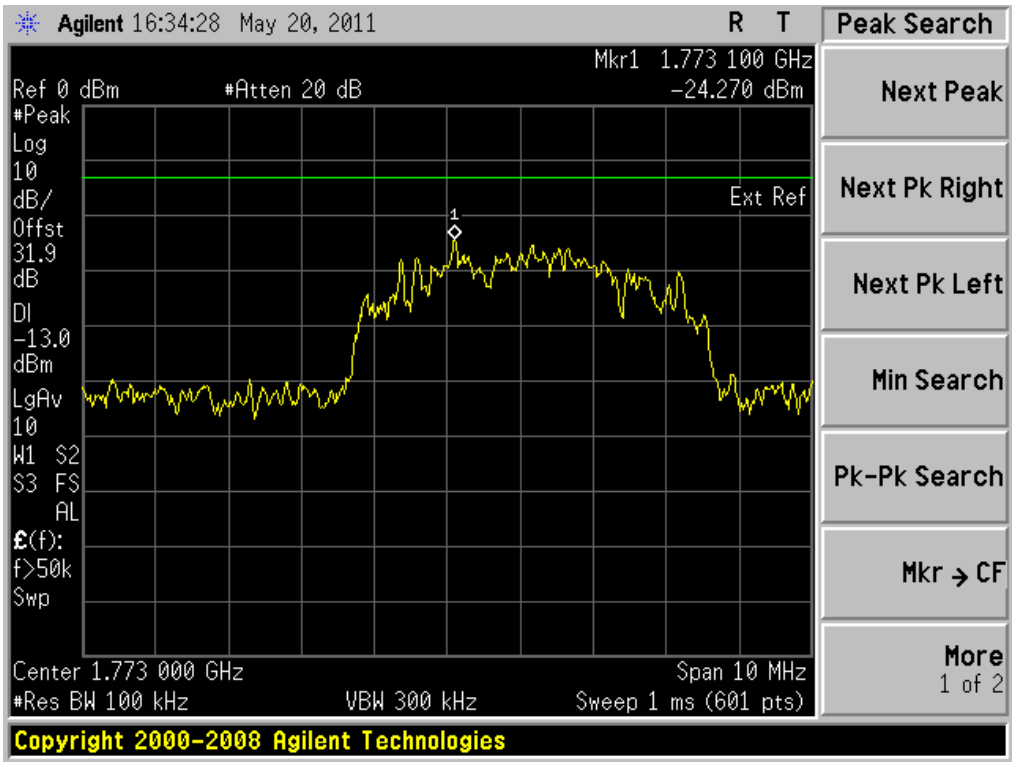

Figure 39 - Conducted Spurious Emissions – 2 Carrier, Channel 548,589 IS95 (1-3GHz)

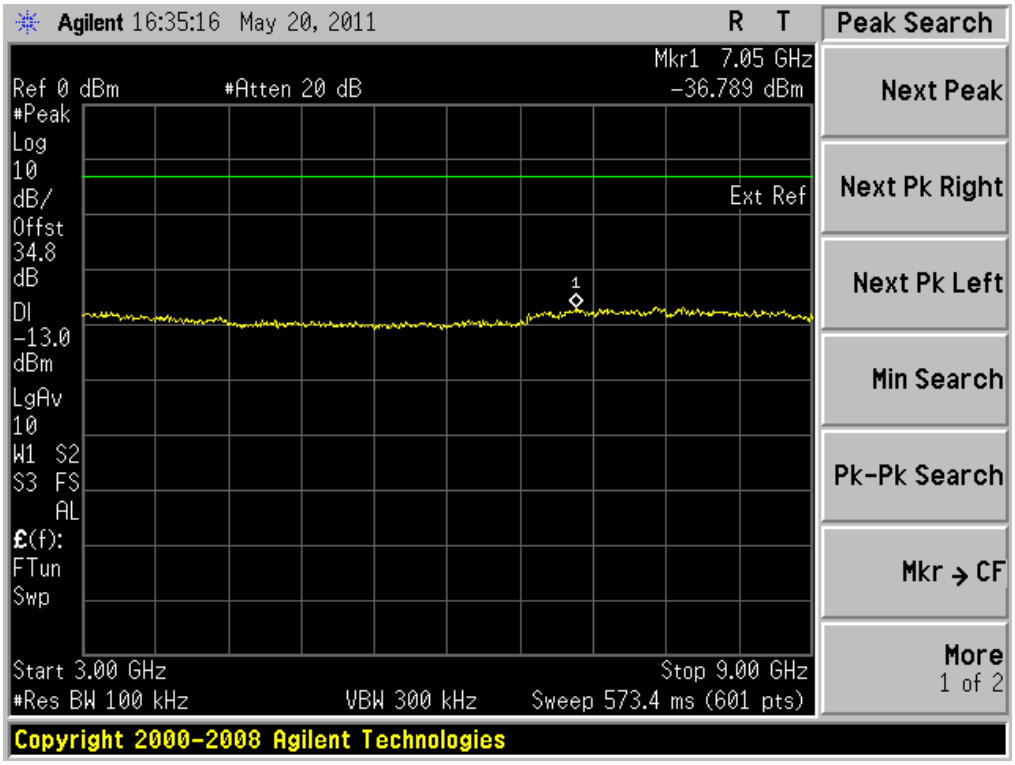

Figure 40 - Conducted Spurious Emissions – 2 Carrier, Channel 548,589 IS95 (3-9GHz)

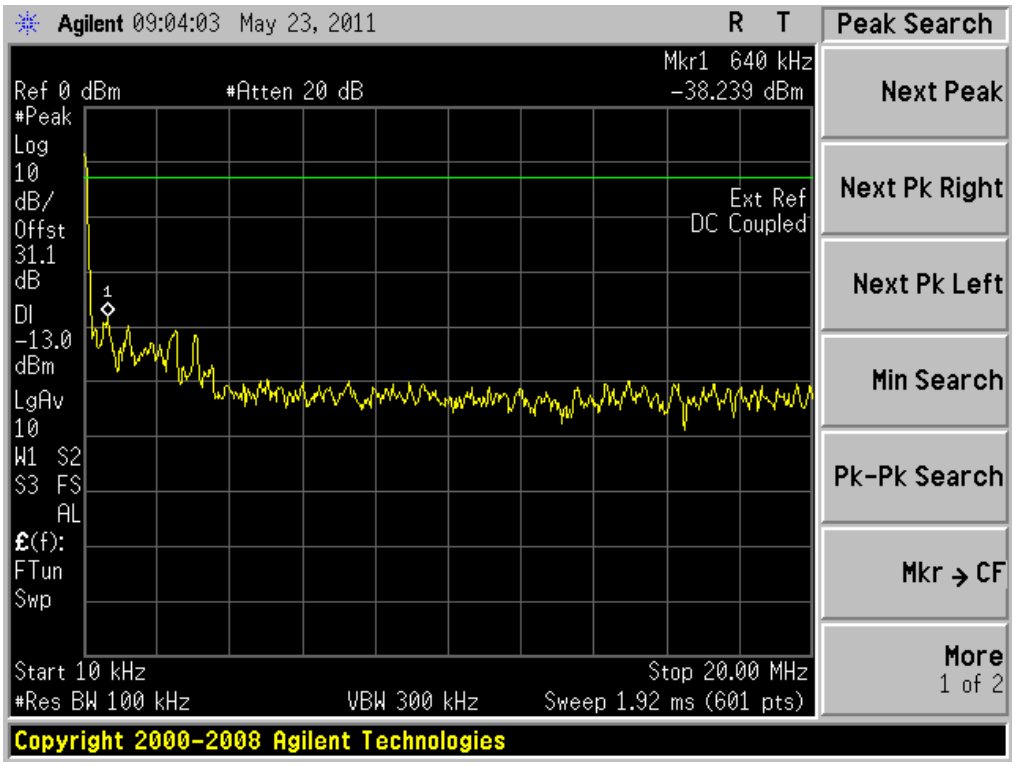

Figure 41 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 IS95 (9k-20MHz)

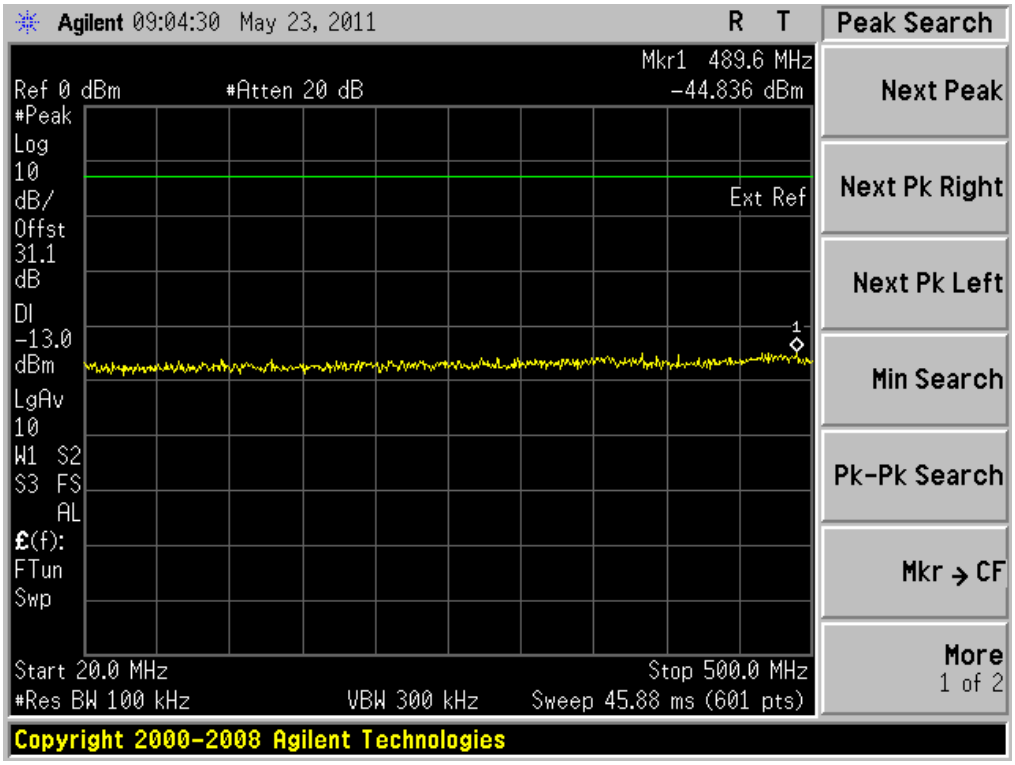

Figure 42 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 IS95 (20-500MHz)

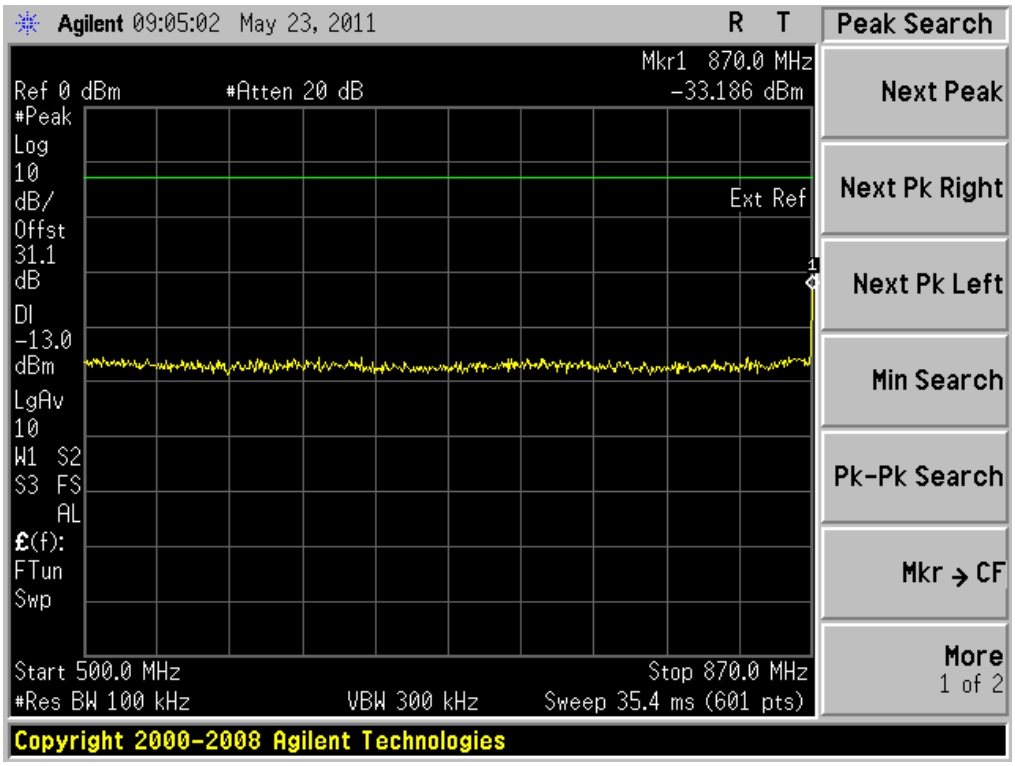

Figure 43 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 IS95 (500-870MHz)

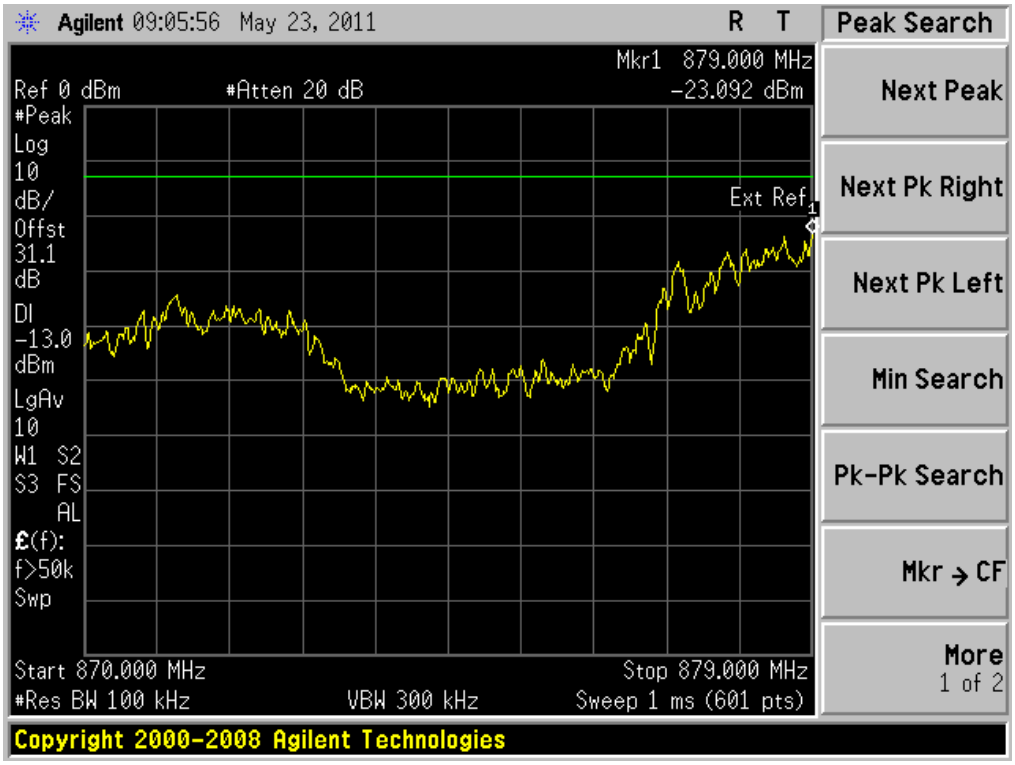

Figure 44 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 IS95 (870-879MHz)

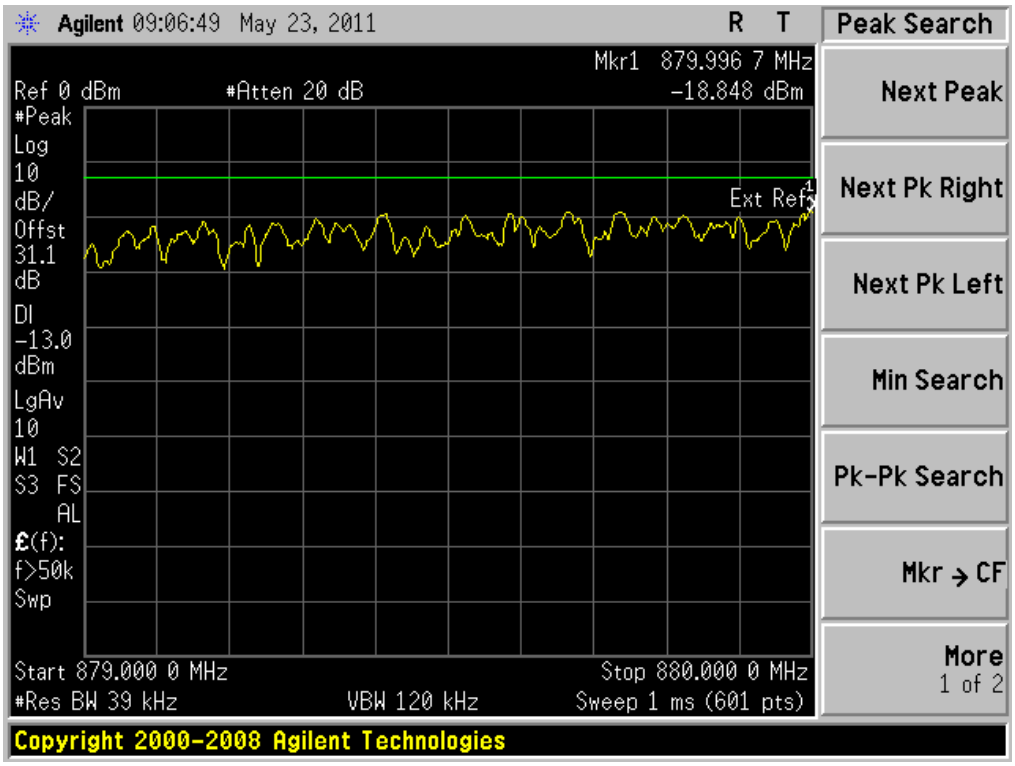

Figure 45 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 IS95 (879-880MHz)

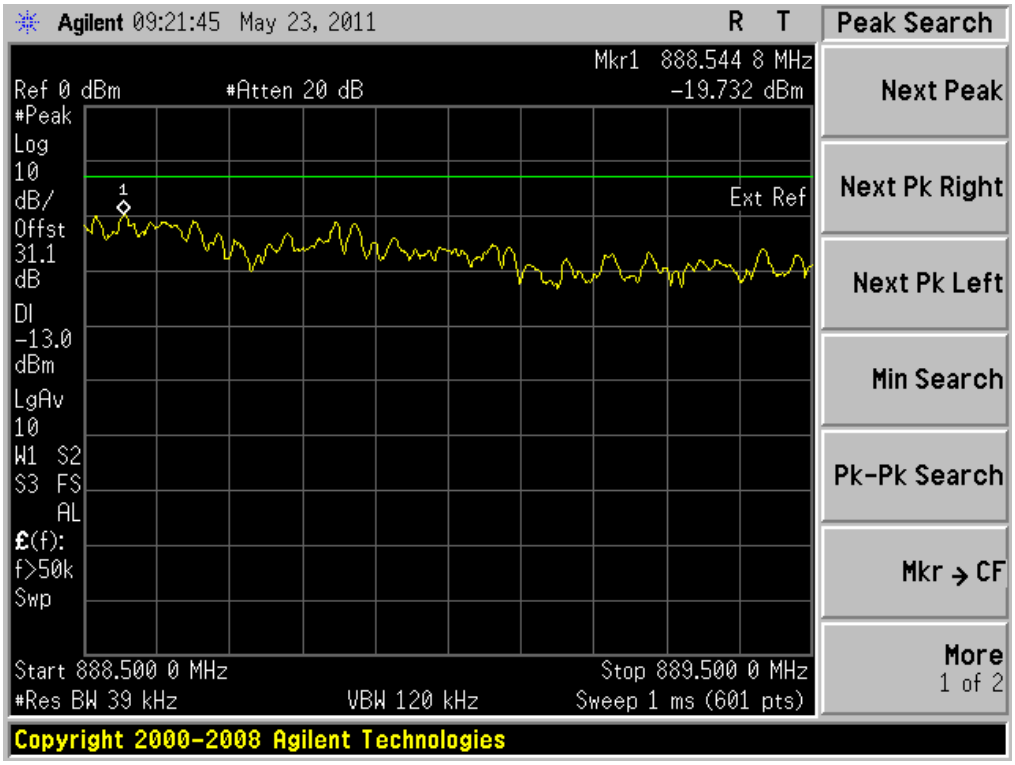

Figure 46 - Conducted Spurious Emissions – 3 Carrier, Channel 507,548,589 IS95(888.5-889.5MHz)

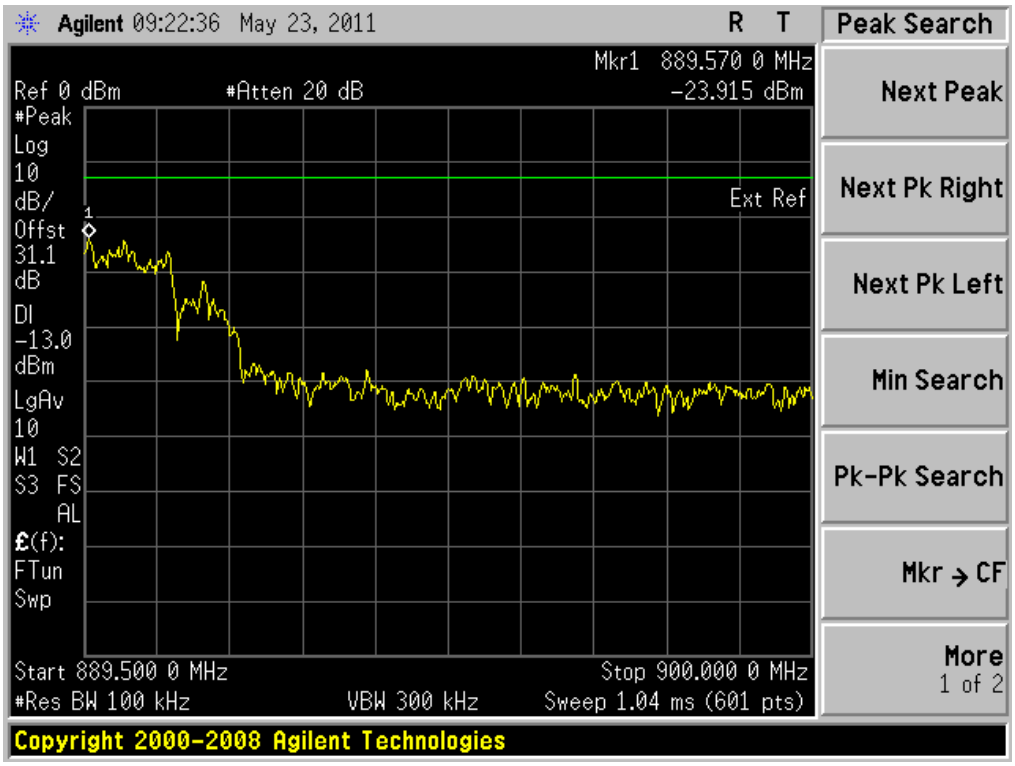

Figure 47 - Conducted Spurious Emissions – 3 Carrier, Channel 507,548,589 IS95 (889.5-900MHz)

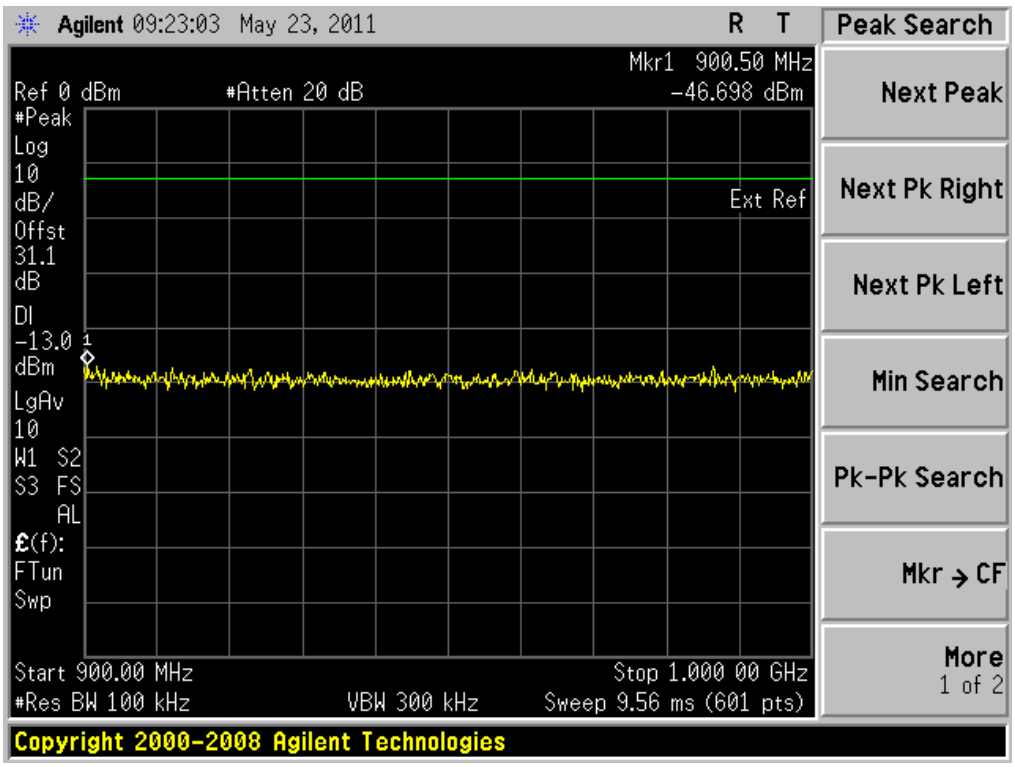

Figure 48 - Conducted Spurious Emissions – 3 Carrier, Channel 507,548,589 IS95 (900M-1GHz)

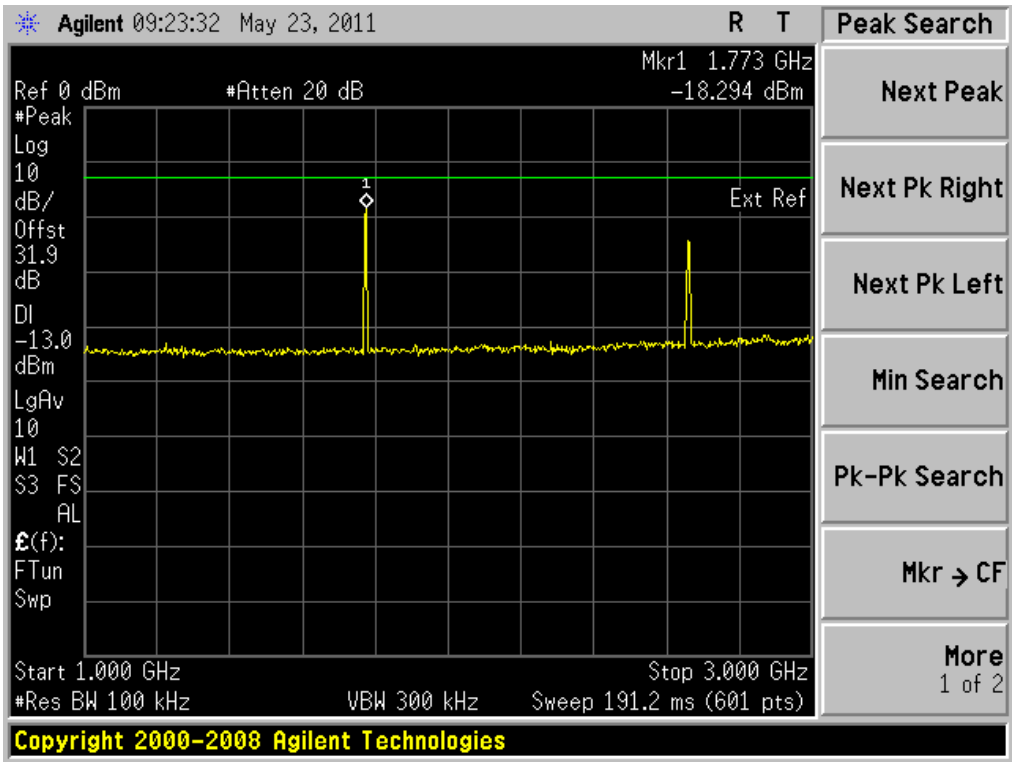

Figure 49 - Conducted Spurious Emissions – 3 Carrier, Channel 507,548,589 IS95 (1-3GHz)

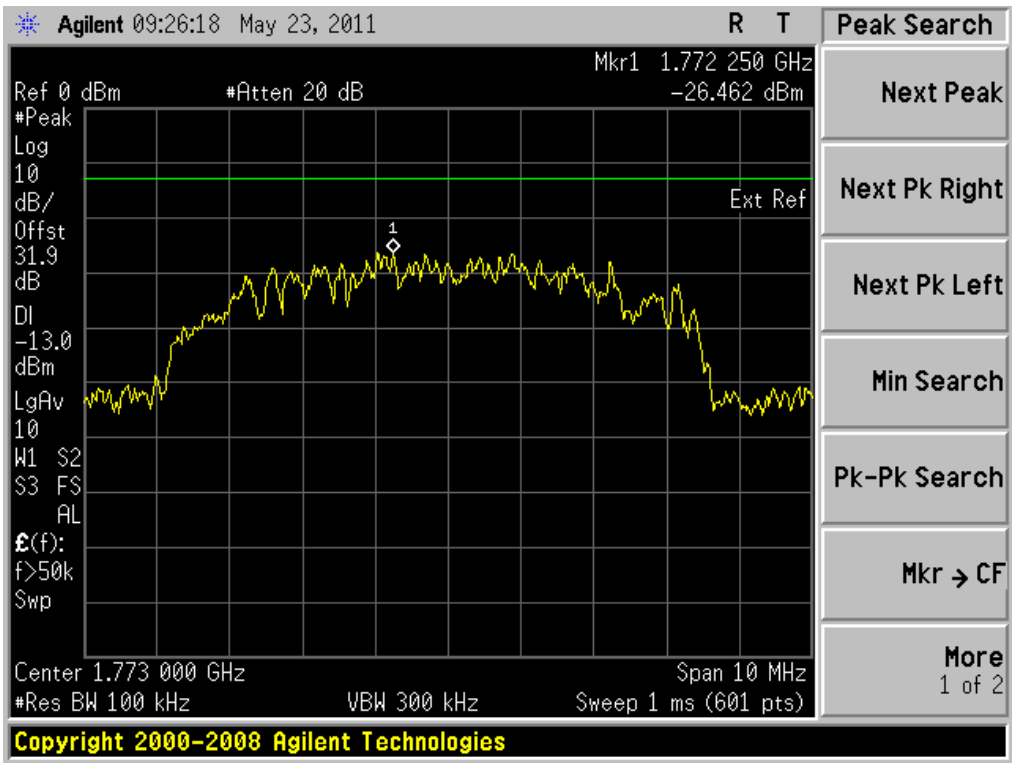

Figure 50 - Conducted Spurious Emissions – 3 Carrier, Channel 507,548,589 IS95 (1-3GHz)

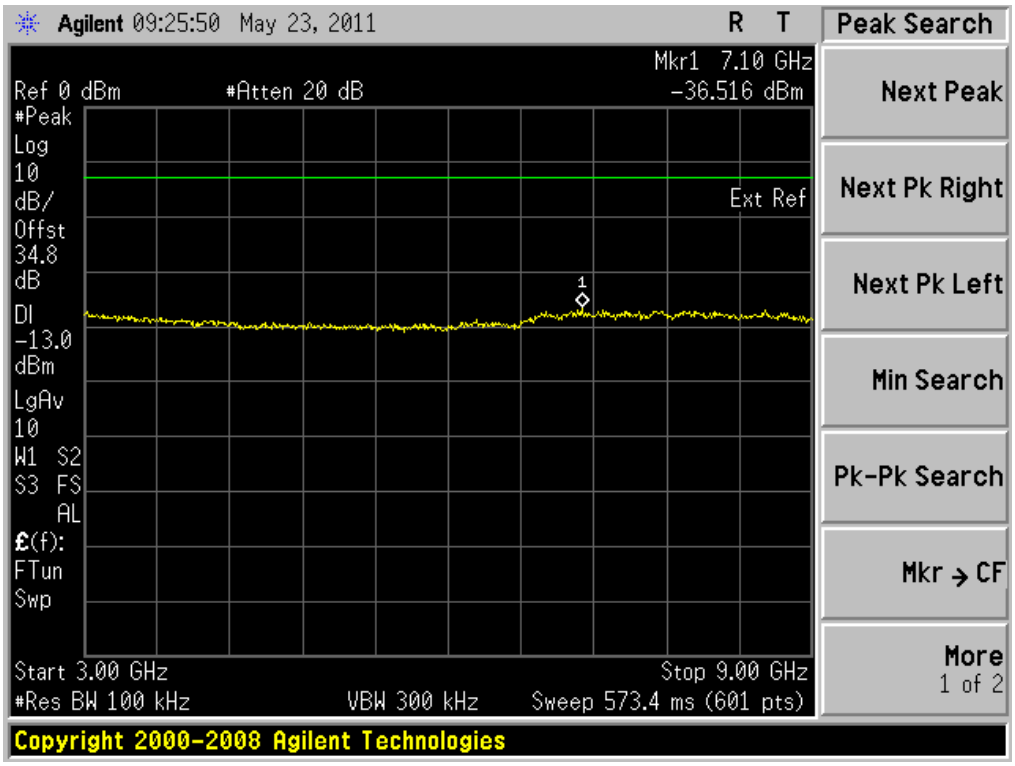

Figure 51 - Conducted Spurious Emissions – 3 Carrier, Channel 507,548,589 IS95 (3-9GHz)

4.4.4.2 RRUC-E with B-Band DPM

Table 25. Spurious Emissions at the RRUC-E 800MHz Ant. Port one Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363 (RBW=13 kHz)	-17.622	4.622
894(Upper edge) Ch 589 (RBW=13 kHz) to 895MHz	-17.366	4.366
9kHz to 879MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-29.601	16.601
895MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-21.730	8.730
3GHz to 9GHz (RBW=100 kHz)	-36.702	23.702

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

Table 26. Spurious Emissions at the RRUC-E 800MHz Ant. Port two Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363,404 (RBW=27kHz)	-18.601	5.601
888.5(Upper edge) Ch 548,589 (RBW=27kHz) to 889.5MHz	-17.175	4.175
9kHz to 879MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-20.174	7.174
889.5MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-21.134	8.134
3GHz to 9GHz (RBW=100 kHz)	-36.684	23.684

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

Table 27. Spurious Emissions at the RRUC-E 800MHz Ant. Port three Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363,404,445 (RBW=39 kHz)	-18.328	5.328
888.5(Upper edge) Ch 507,548,589 (RBW=39 kHz) to 889.5MHz	-19.445	6.445
9kHz to 879MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-19.669	6.669
889.5MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-24.858	11.858
3GHz to 9GHz (RBW=100 kHz)	-36.781	23.781

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

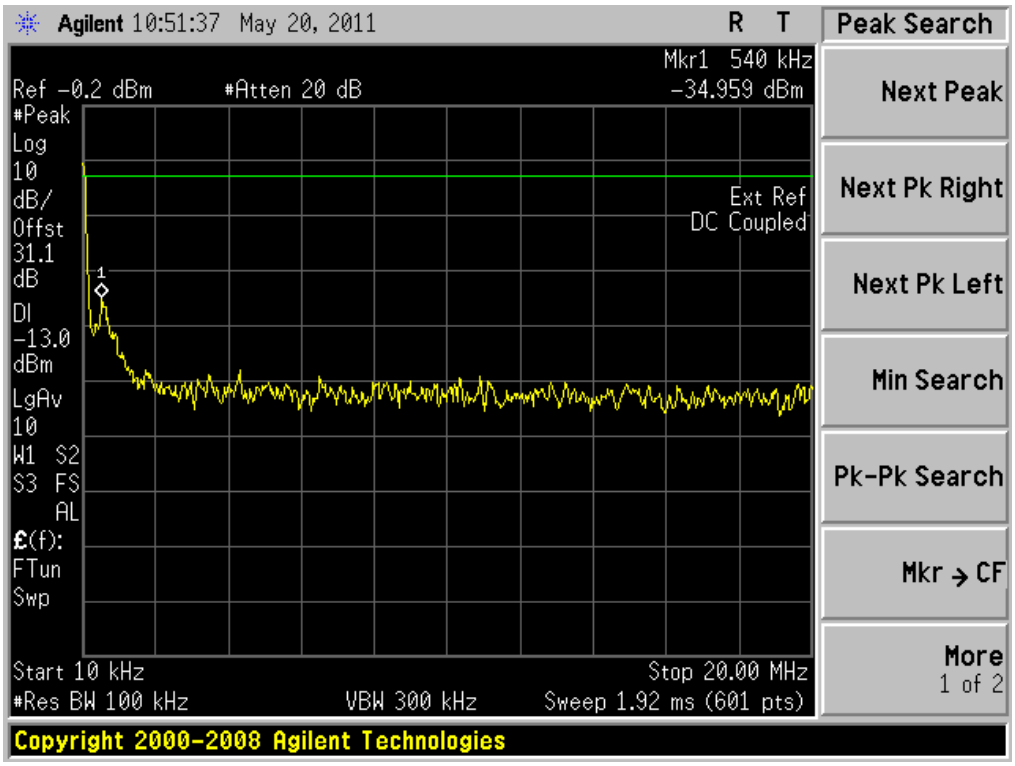

Figure 52 - Conducted Spurious Emissions – 1 Carrier, Channel 363 (9K-20MHz)

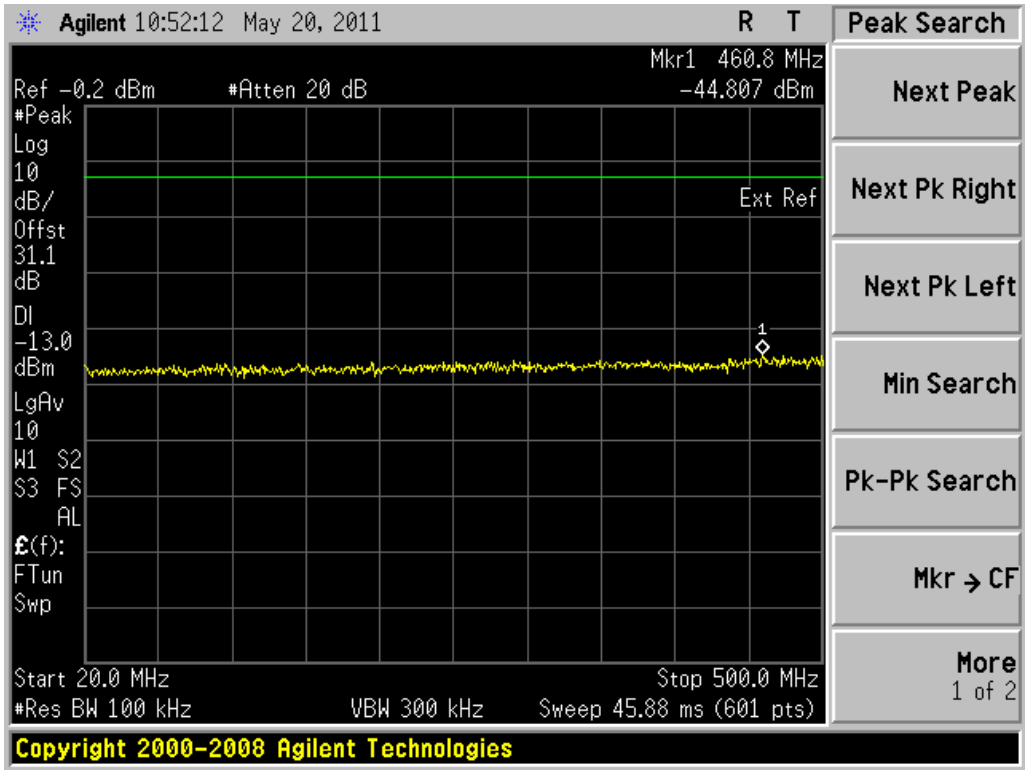

Figure 53 - Conducted Spurious Emissions – 1 Carrier, Channel 363 (20-500MHz)

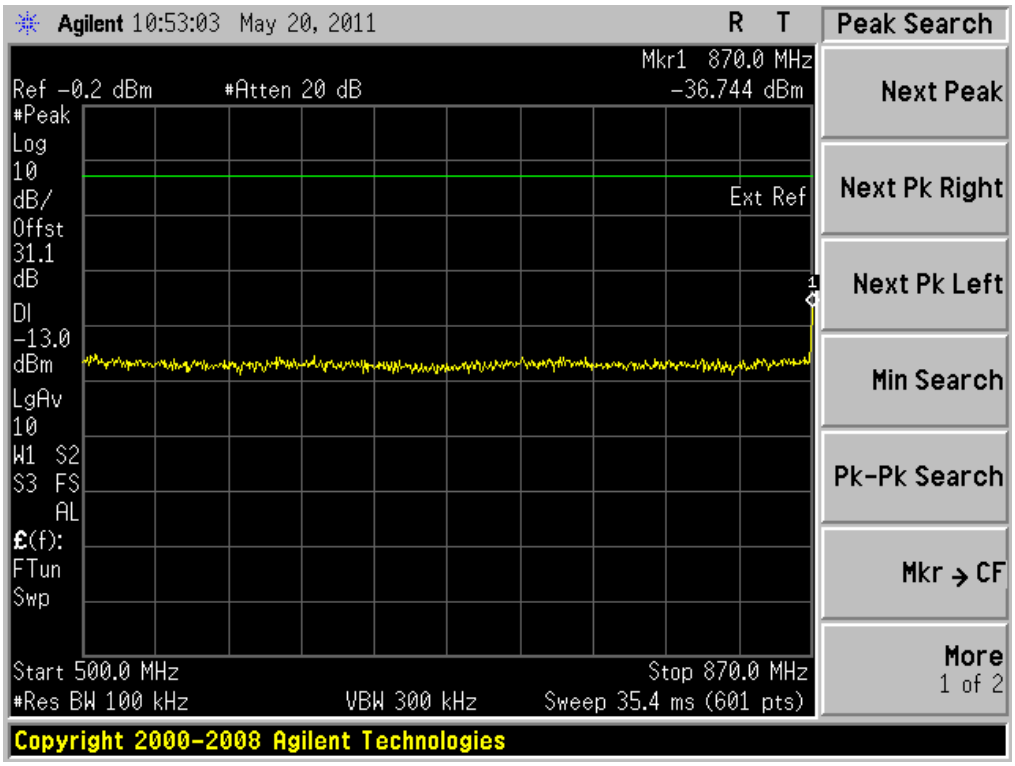

Figure 54 - Conducted Spurious Emissions – 1 Carrier, Channel 363 (500-870MHz)

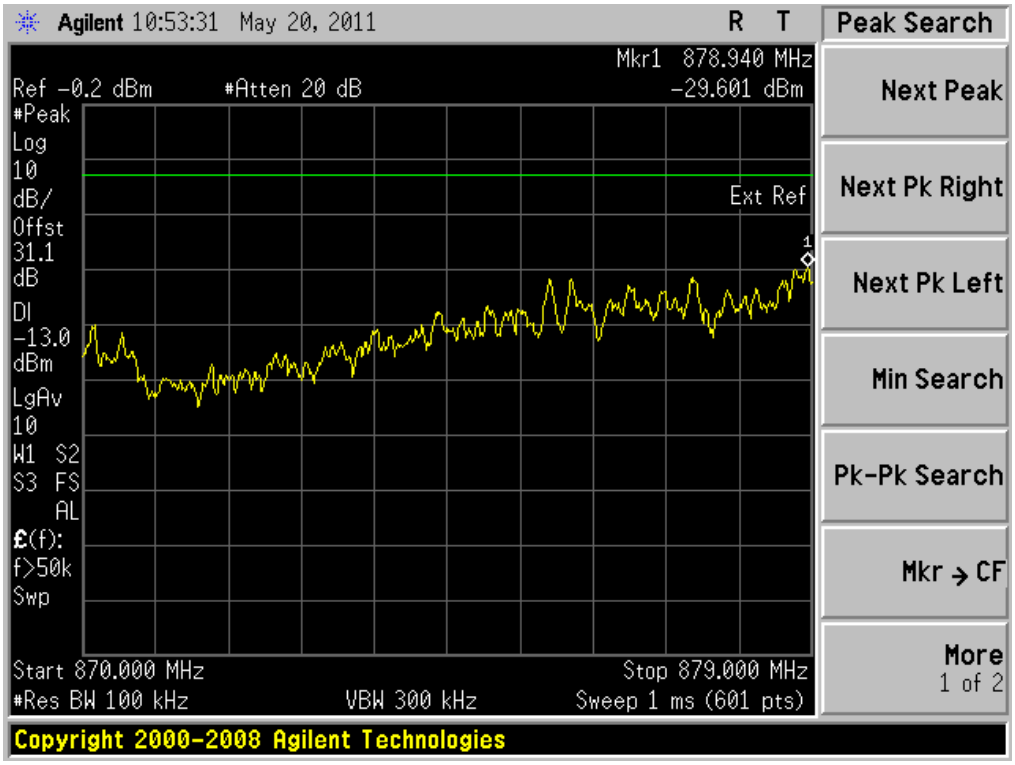

Figure 55 - Conducted Spurious Emissions – 1 Carrier, Channel 363 (870-879MHz)

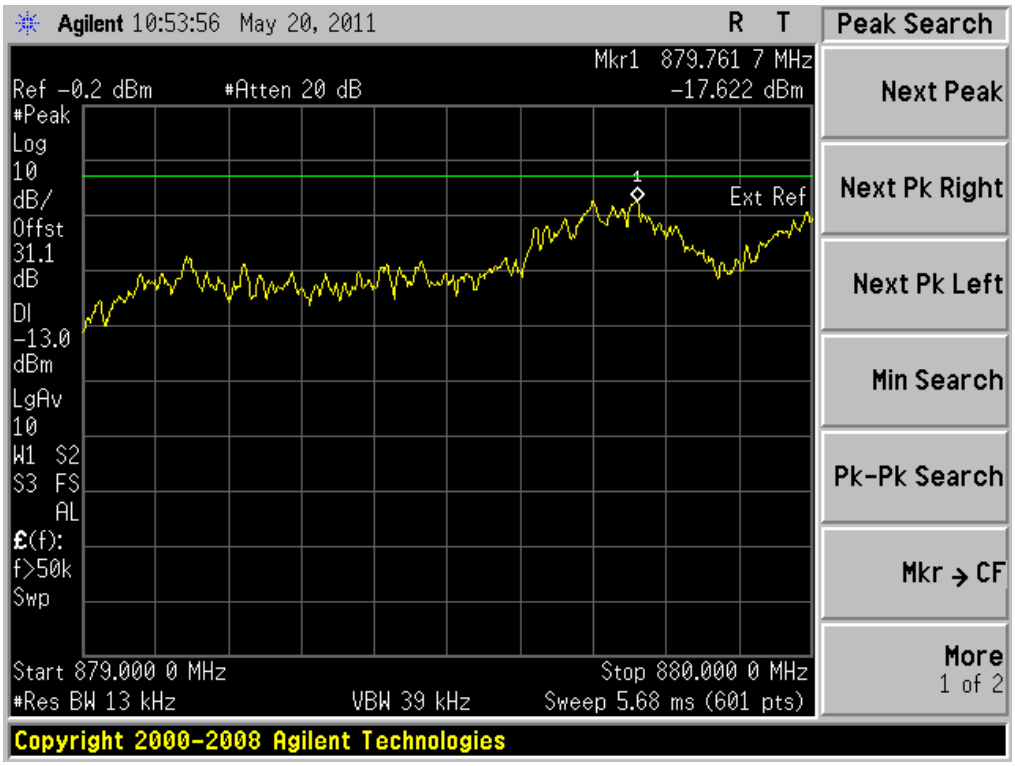

Figure 56 - Conducted Spurious Emissions – 1 Carrier, Channel 363 (879-880MHz)

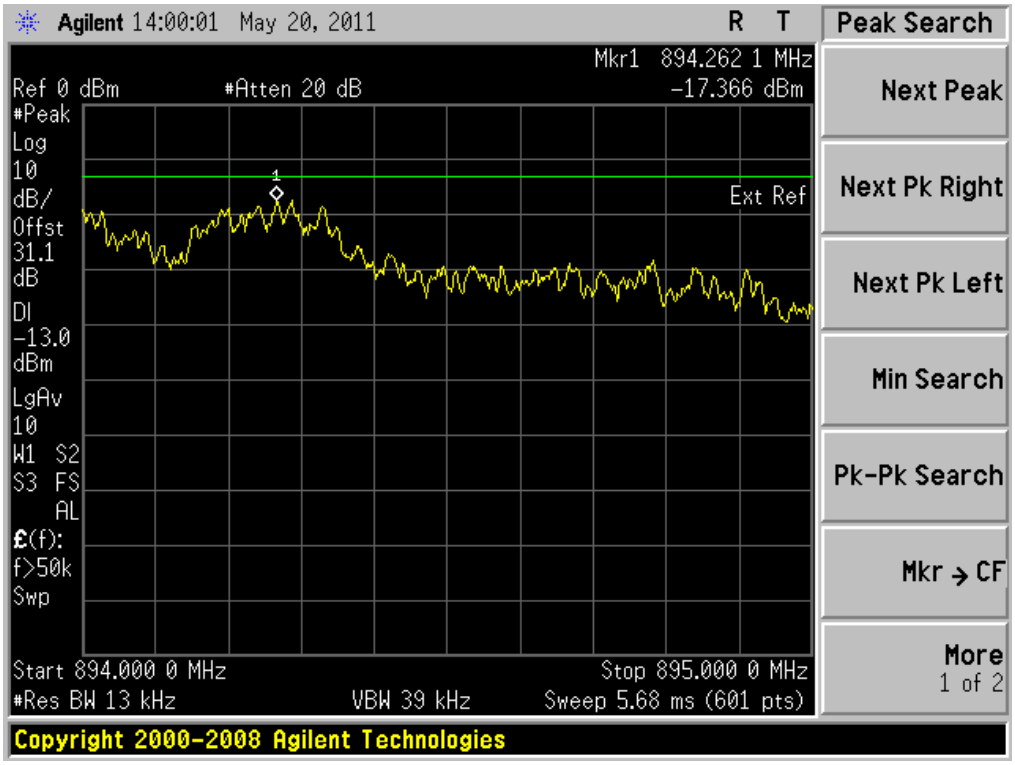

Figure 57 - Conducted Spurious Emissions – 1 Carrier, Channel 770 (894-895MHz)

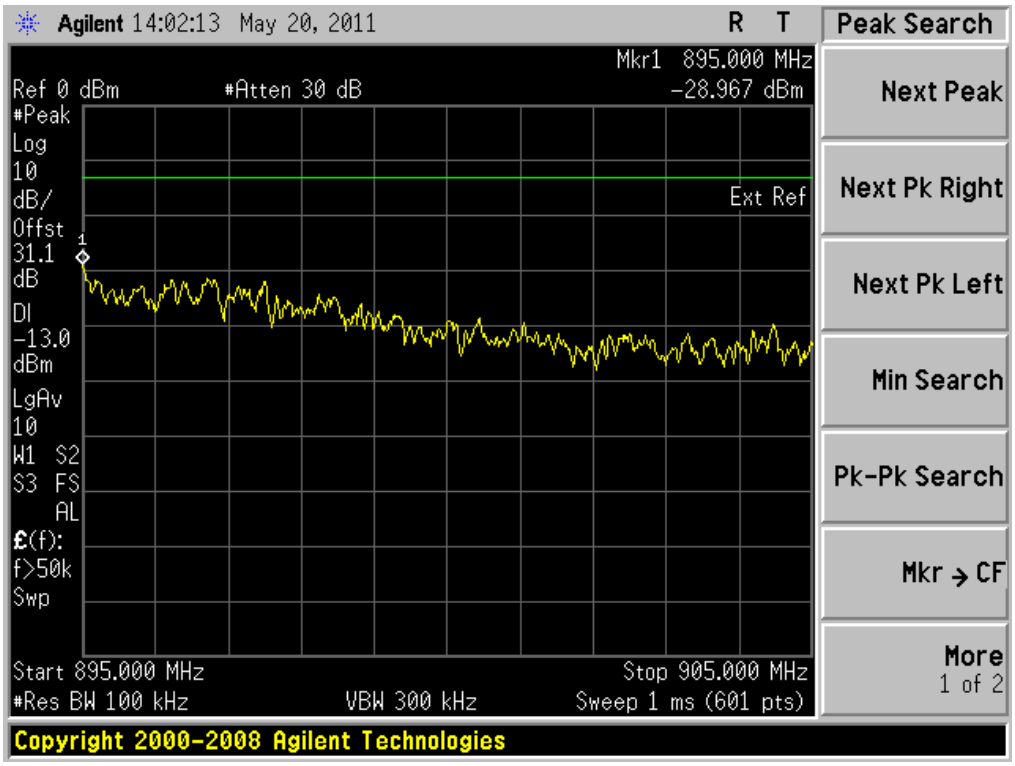

Figure 58 - Conducted Spurious Emissions – 1 Carrier, Channel 770 (895-905MHz)

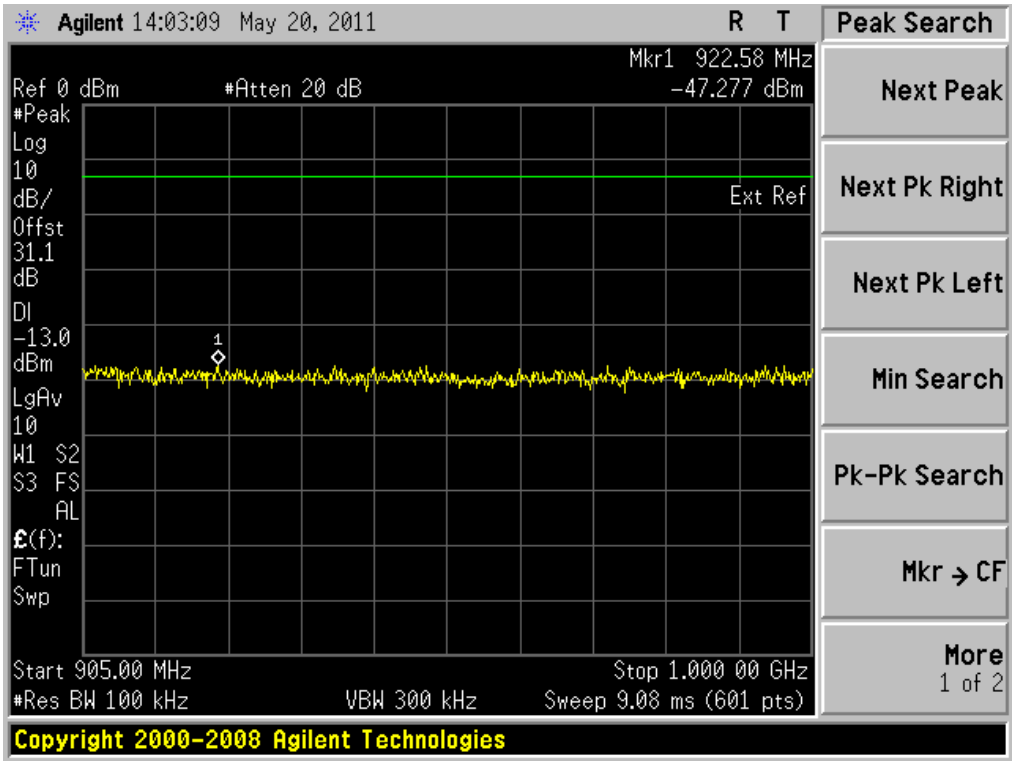

Figure 59 - Conducted Spurious Emissions – 1 Carrier, Channel 770 (905M-1GHz)

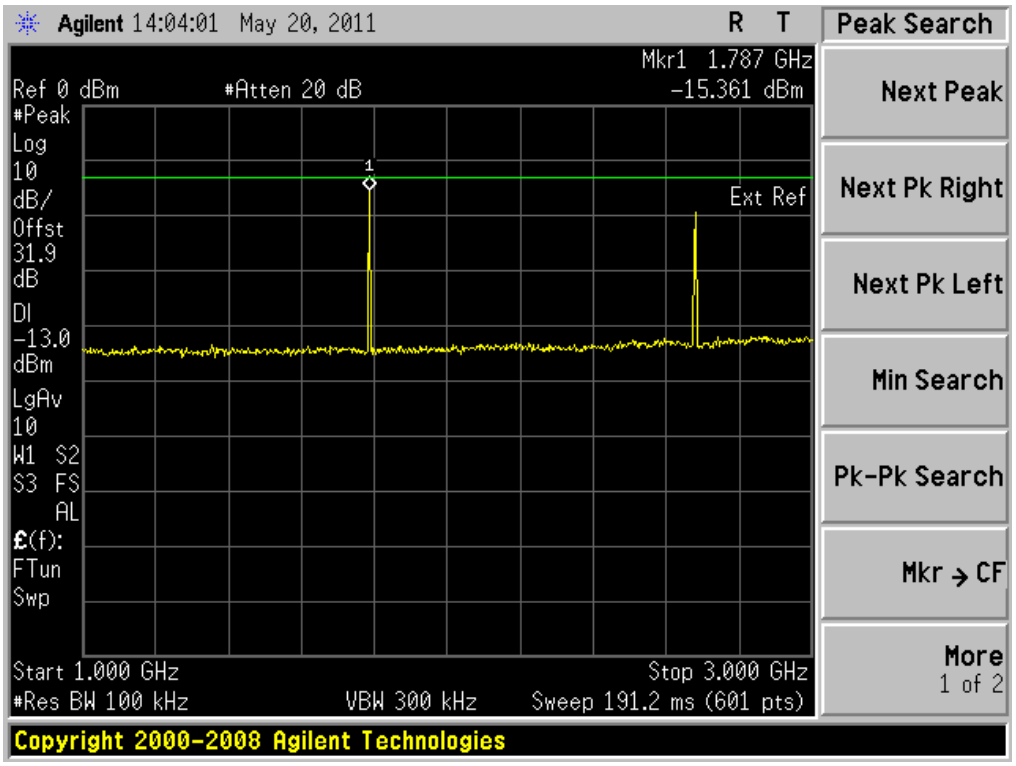

Figure 60 - Conducted Spurious Emissions – 1 Carrier, Channel 770 (1-3GHz)

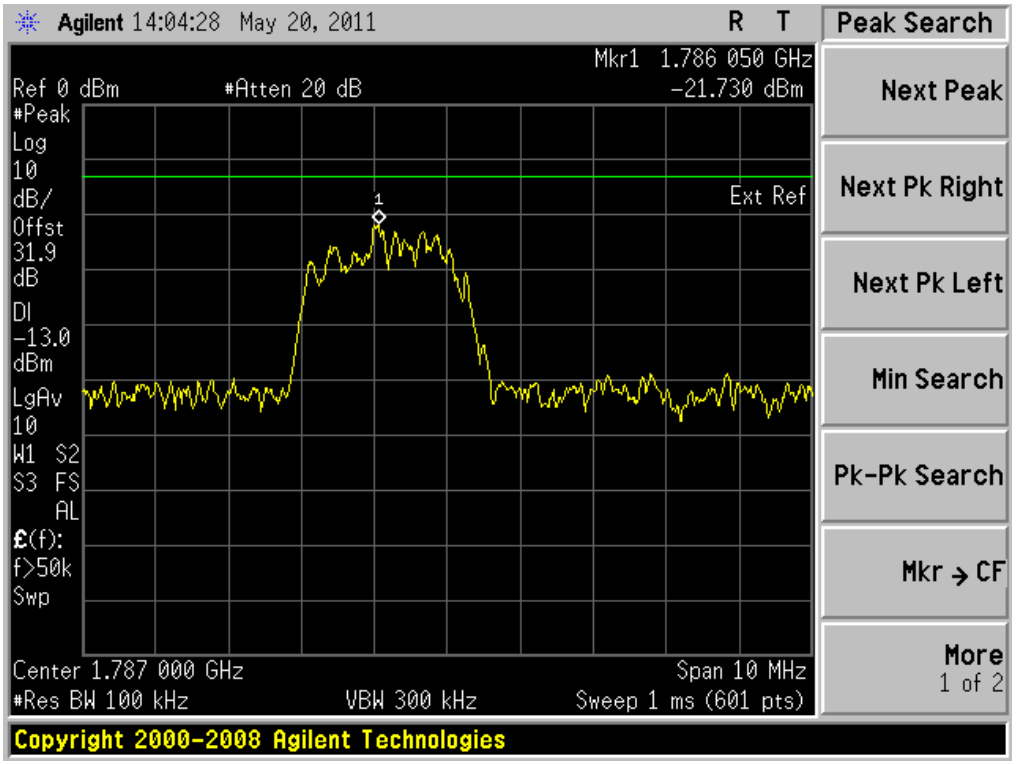

Figure 61 - Conducted Spurious Emissions – 1 Carrier, Channel 770 (1-3GHz)

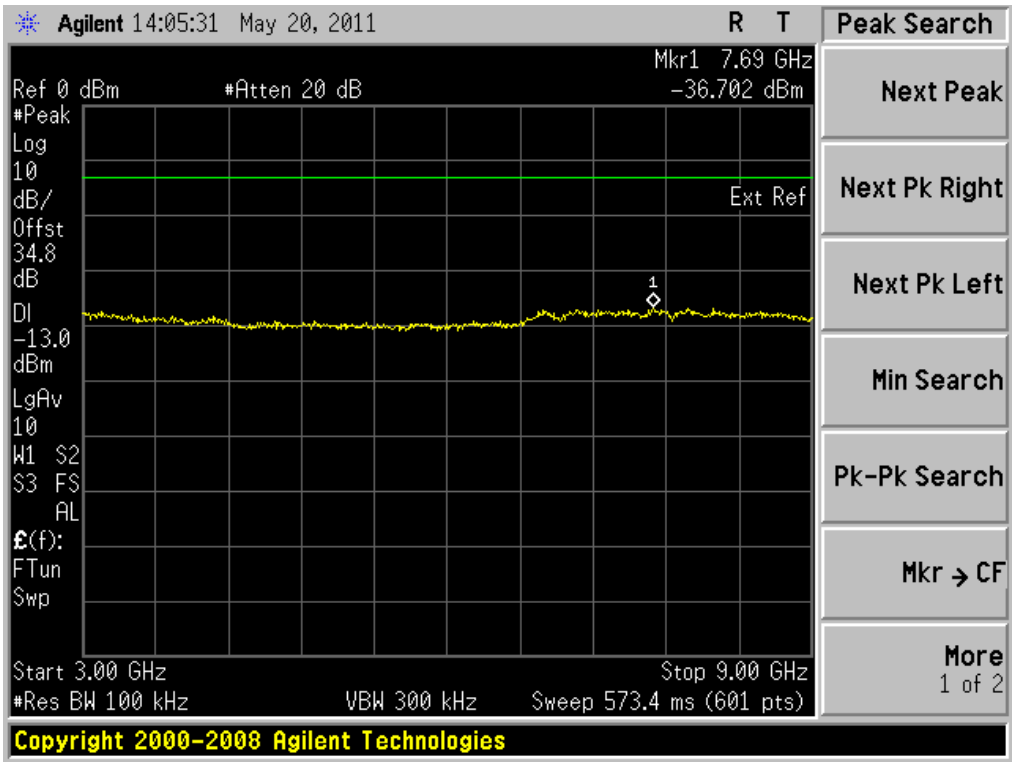

Figure 62 - Conducted Spurious Emissions – 1 Carrier, Channel 770 (3-9GHz)

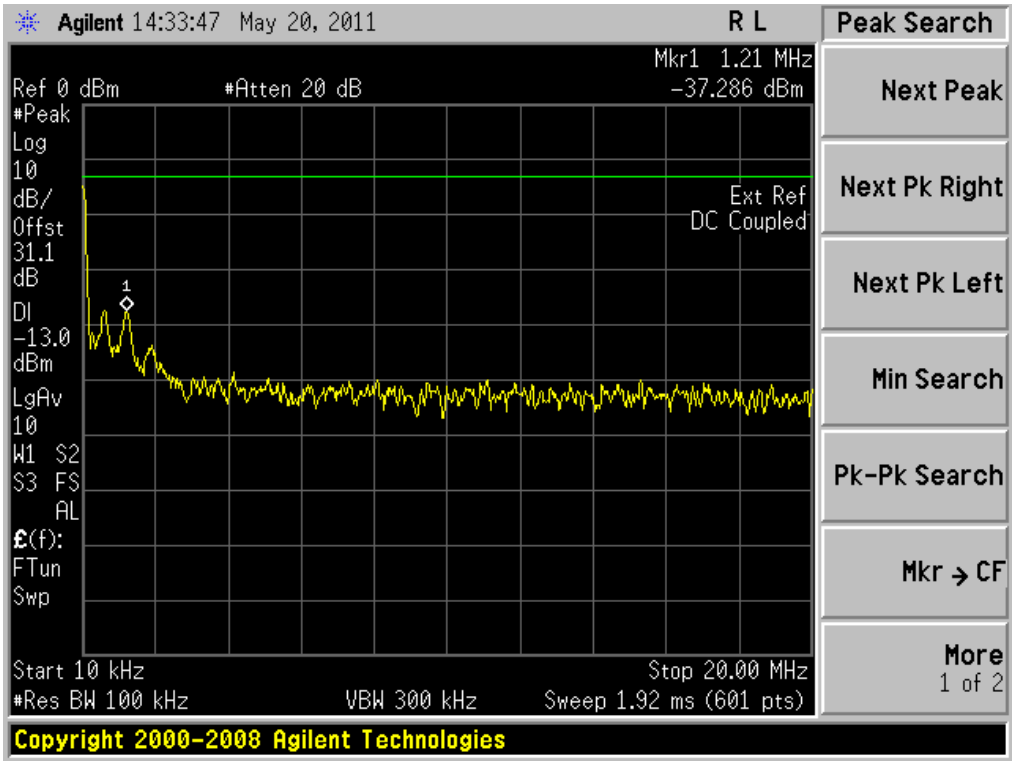

Figure 63 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 (9k-20MHz)

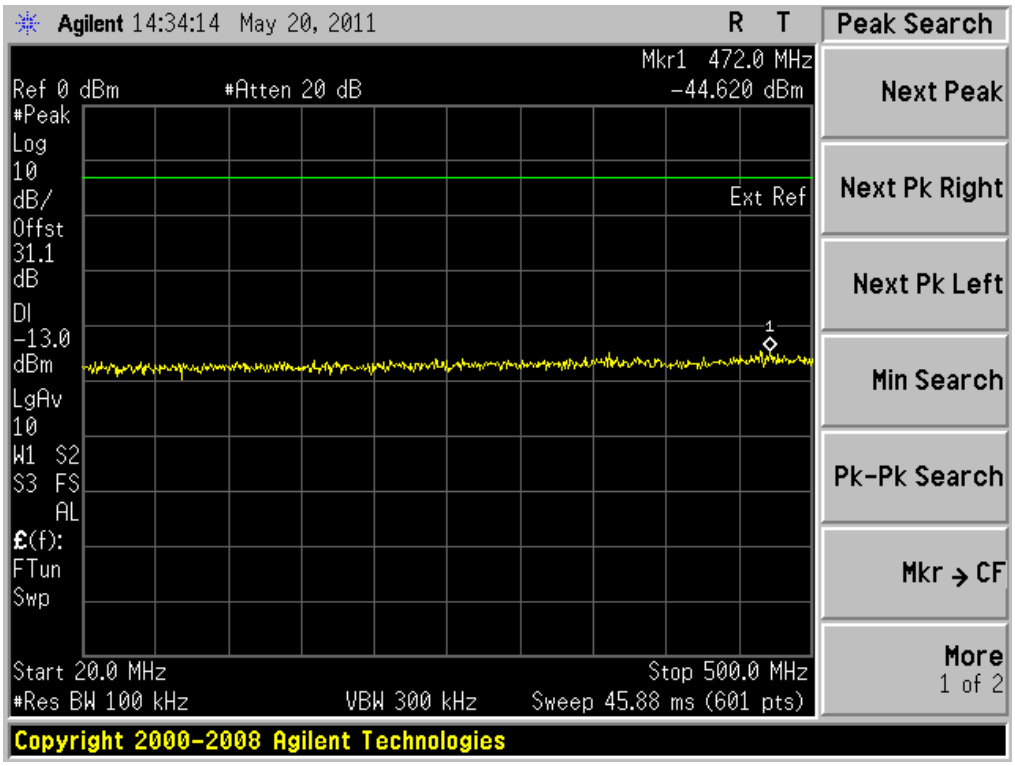

Figure 64 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 (20-500MHz)

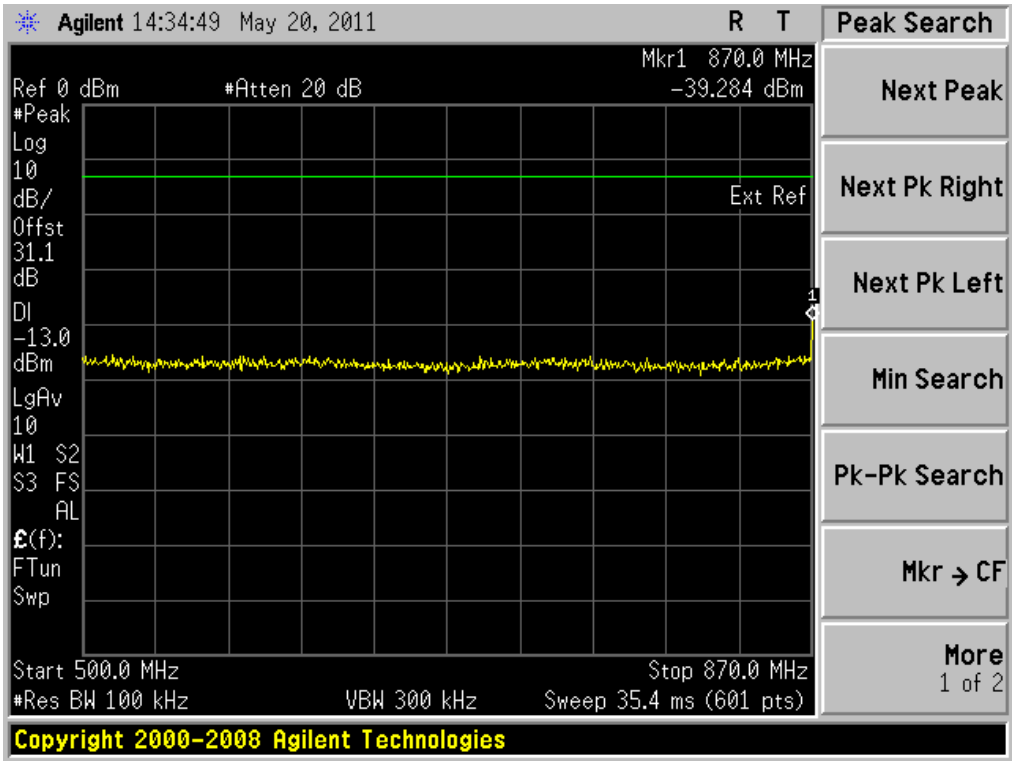

Figure 65 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 (500-870MHz)

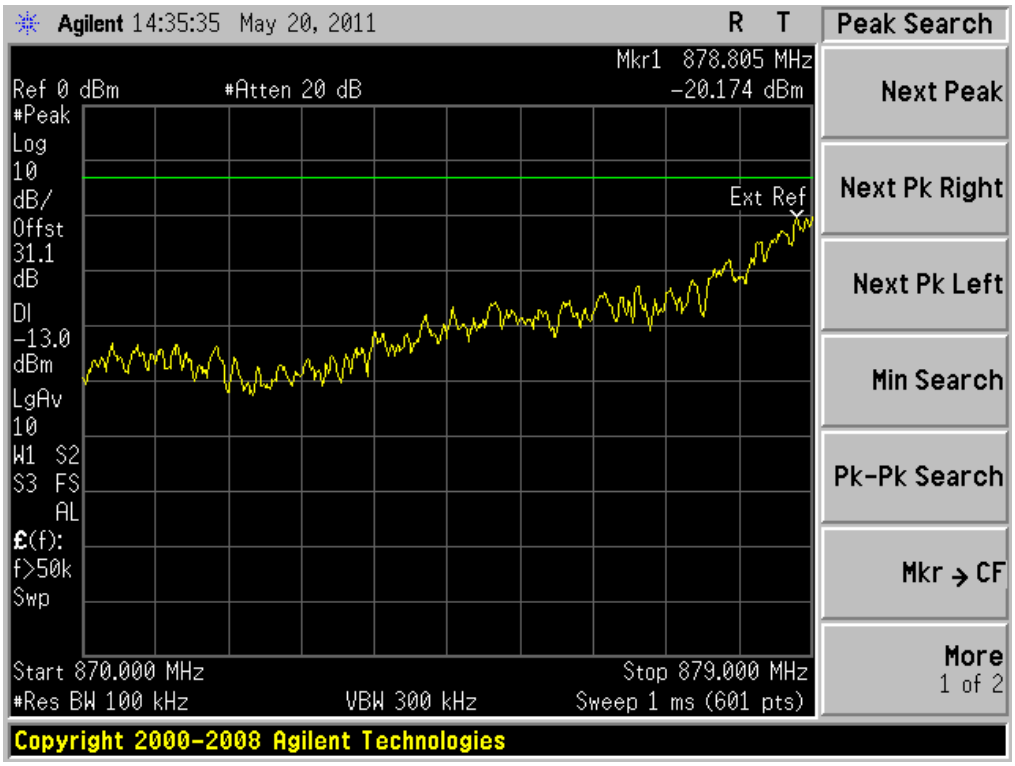

Figure 66 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 (870-879MHz)

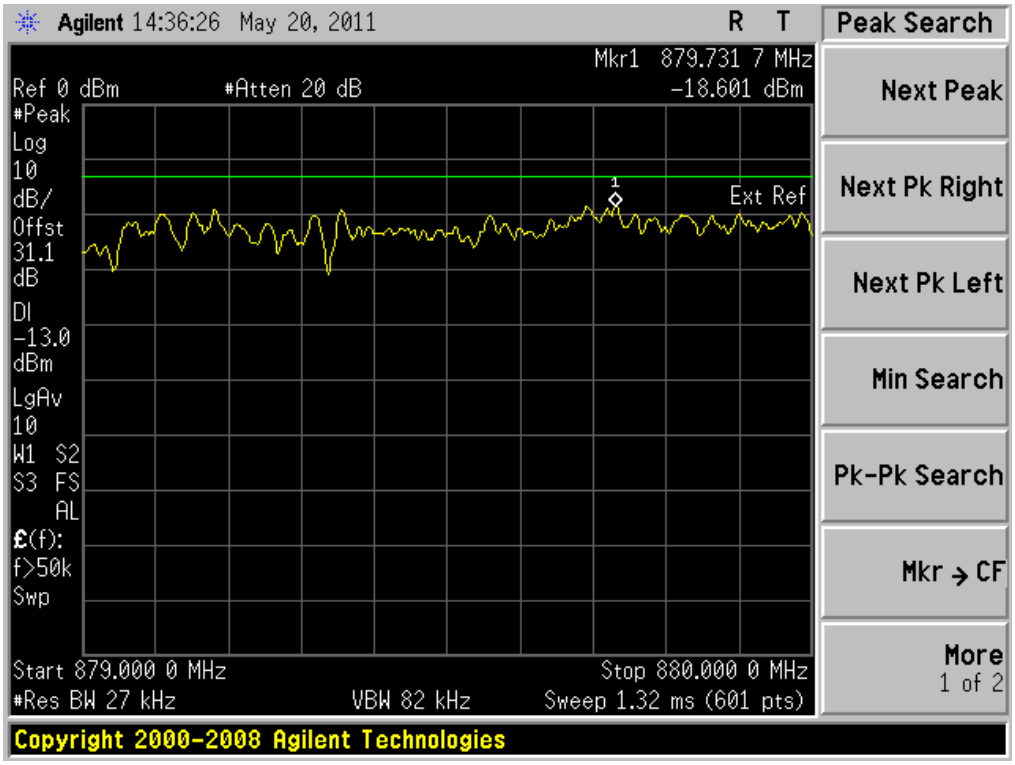

Figure 67 - Conducted Spurious Emissions – 2 Carrier, Channel 363,404 (879-880MHz)

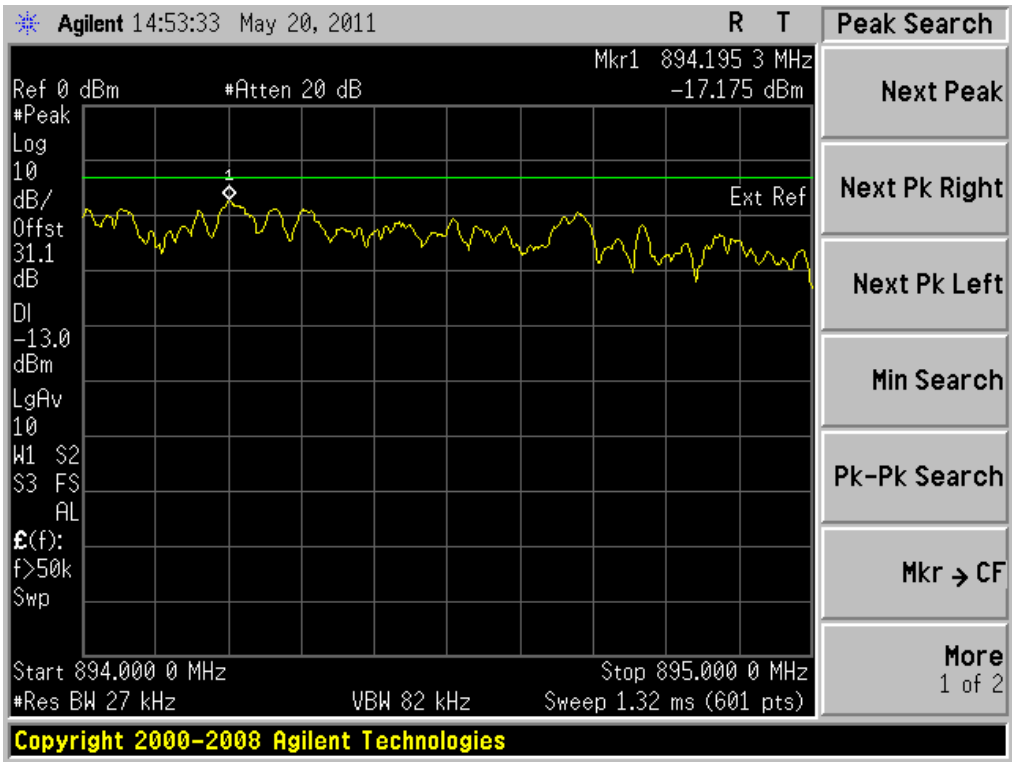

Figure 68 - Conducted Spurious Emissions – 2 Carrier, Channel 729,770 (894-895MHz)

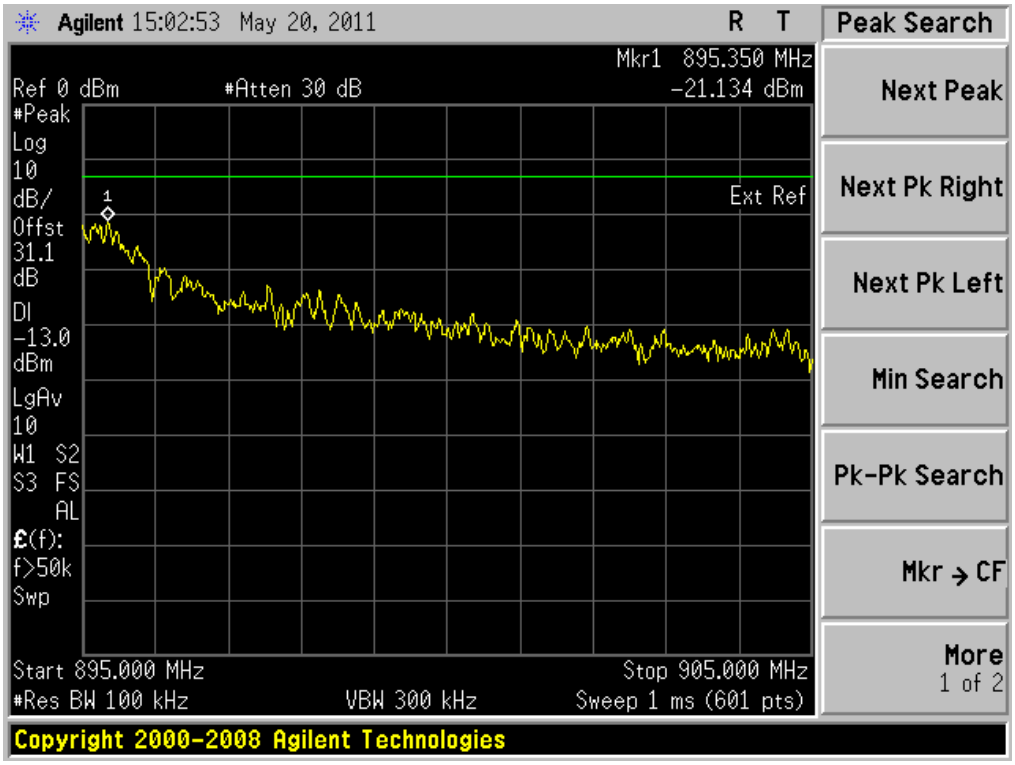

Figure 69 - Conducted Spurious Emissions – 2 Carrier, Channel 729,770 (895-905MHz)

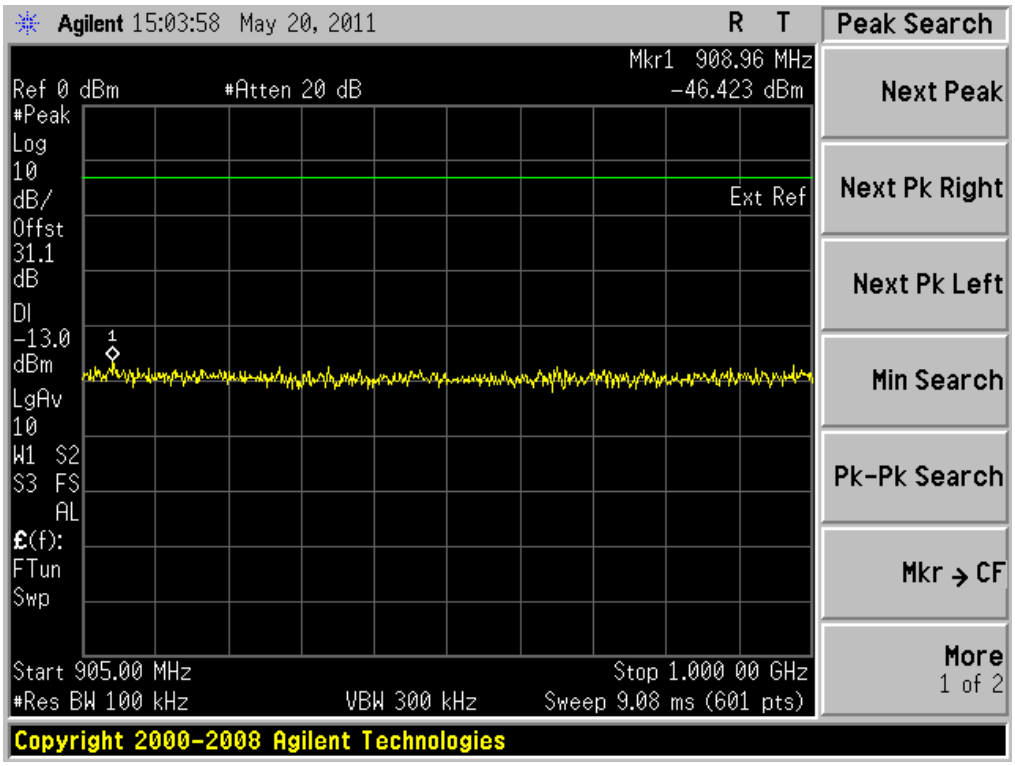

Figure 70 - Conducted Spurious Emissions – 2 Carrier, Channel 729,770 (905M-1GHz)

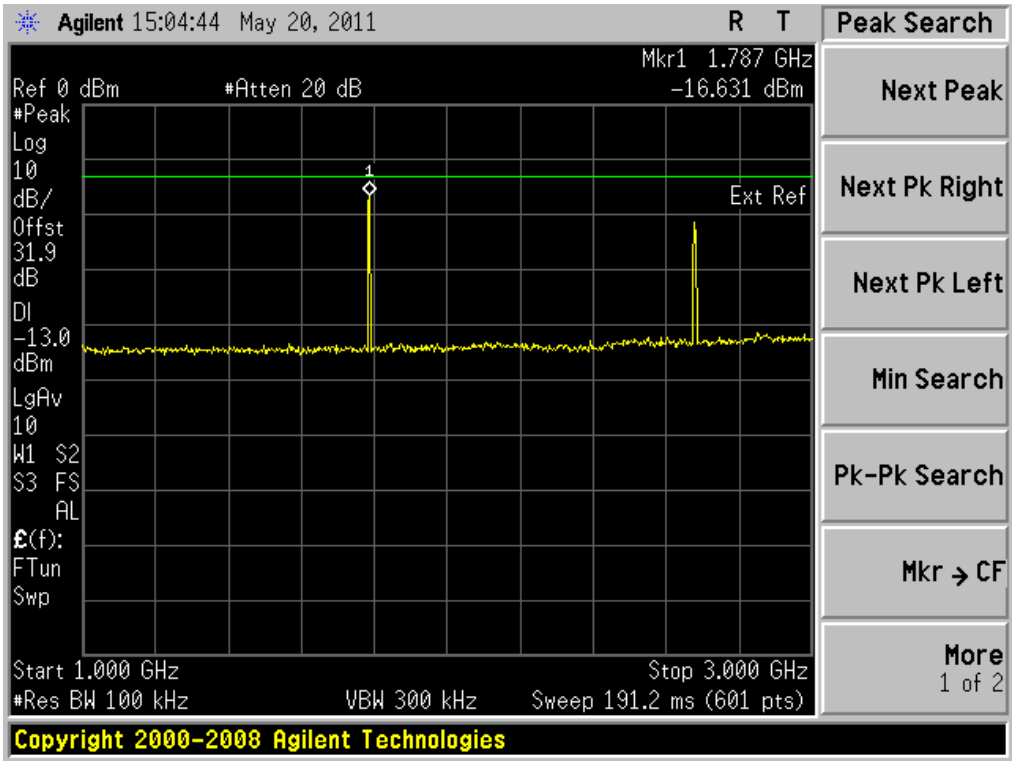

Figure 71 - Conducted Spurious Emissions – 2 Carrier, Channel 729,770 (1-3GHz)

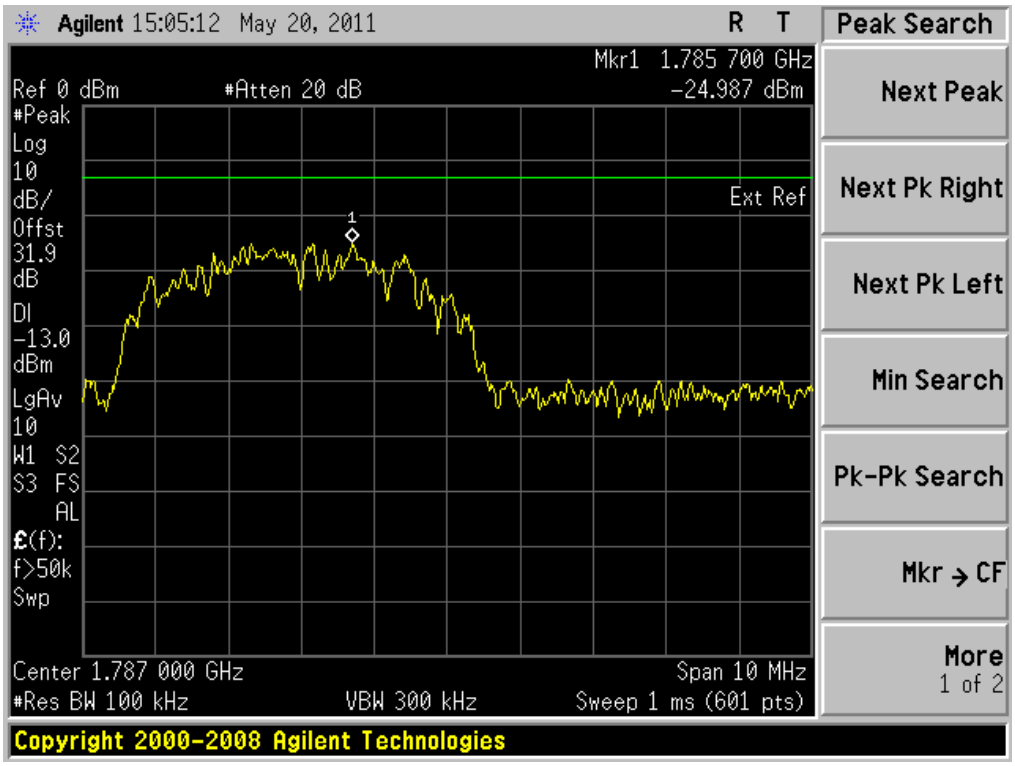

Figure 72 - Conducted Spurious Emissions – 2 Carrier, Channel 729,770 (1-3GHz)

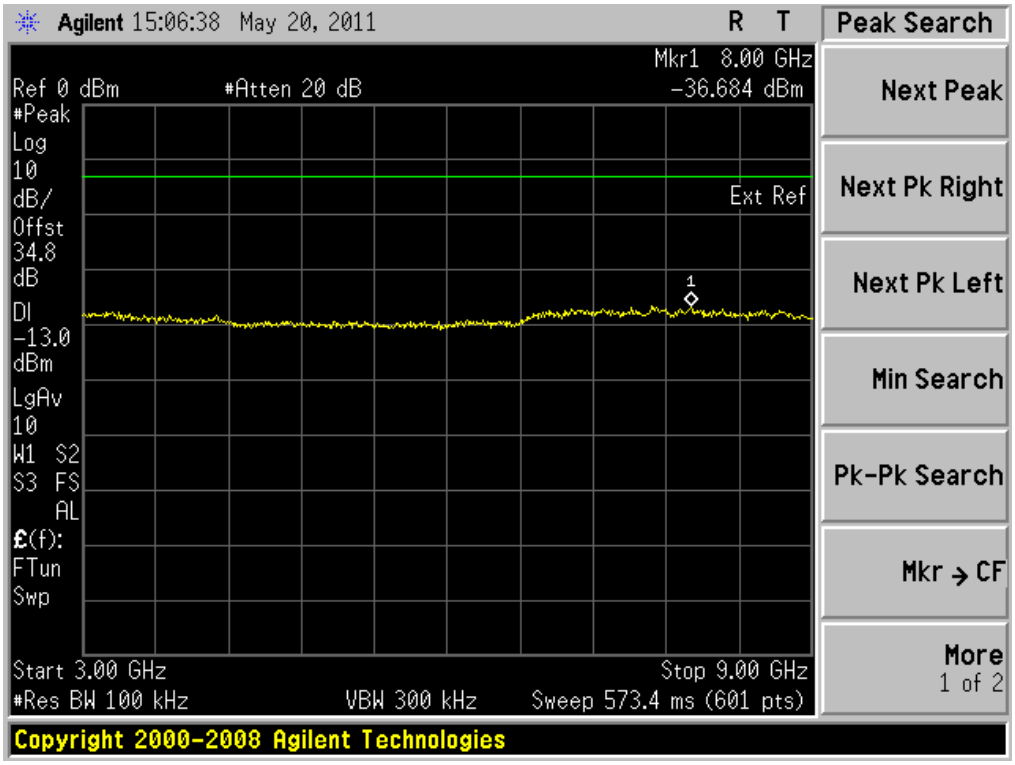

Figure 73 - Conducted Spurious Emissions – 2 Carrier, Channel 729,770 (3-9GHz)

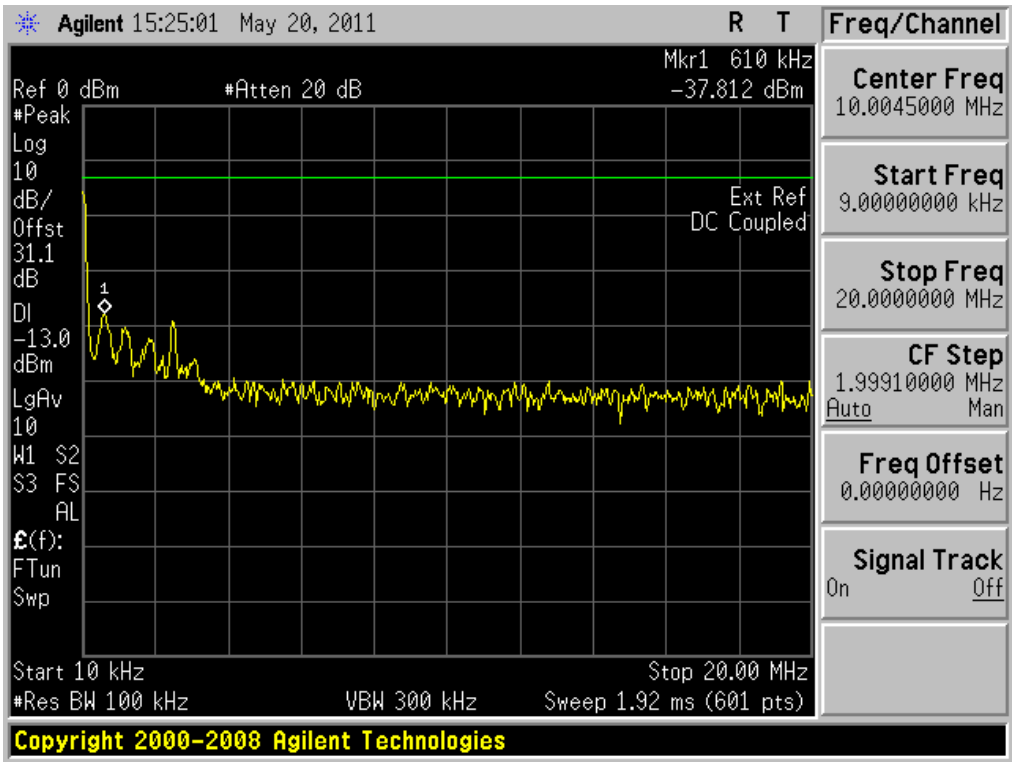

Figure 74 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 (9k-20MHz)

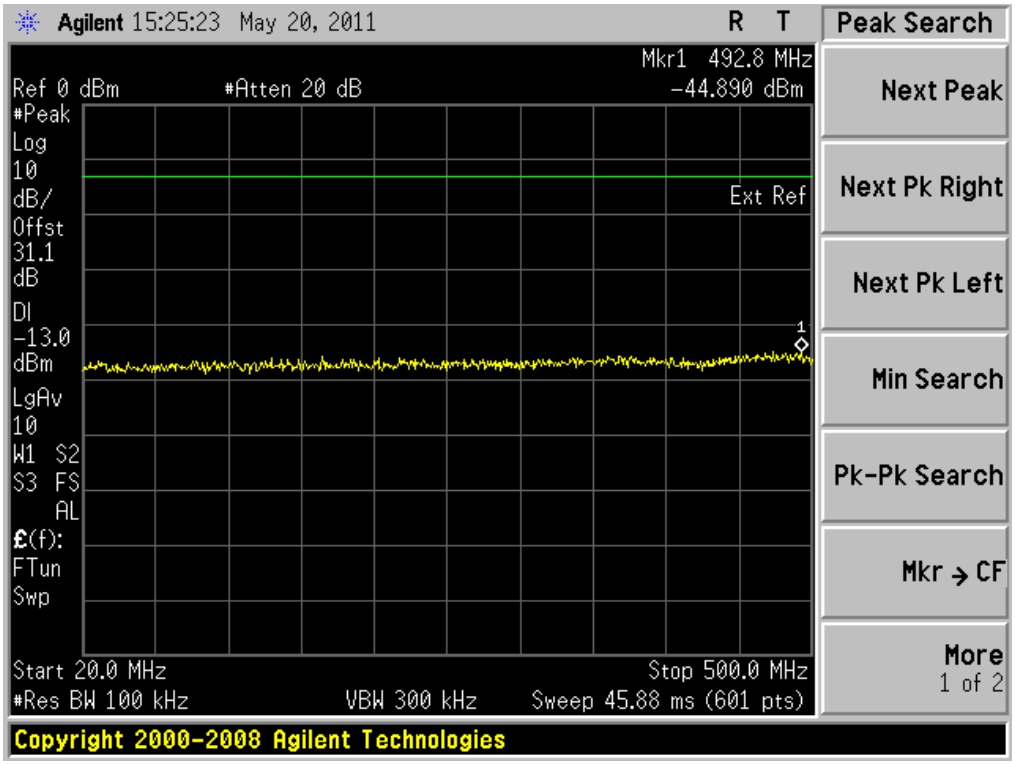

Figure 75 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 (20-500MHz)

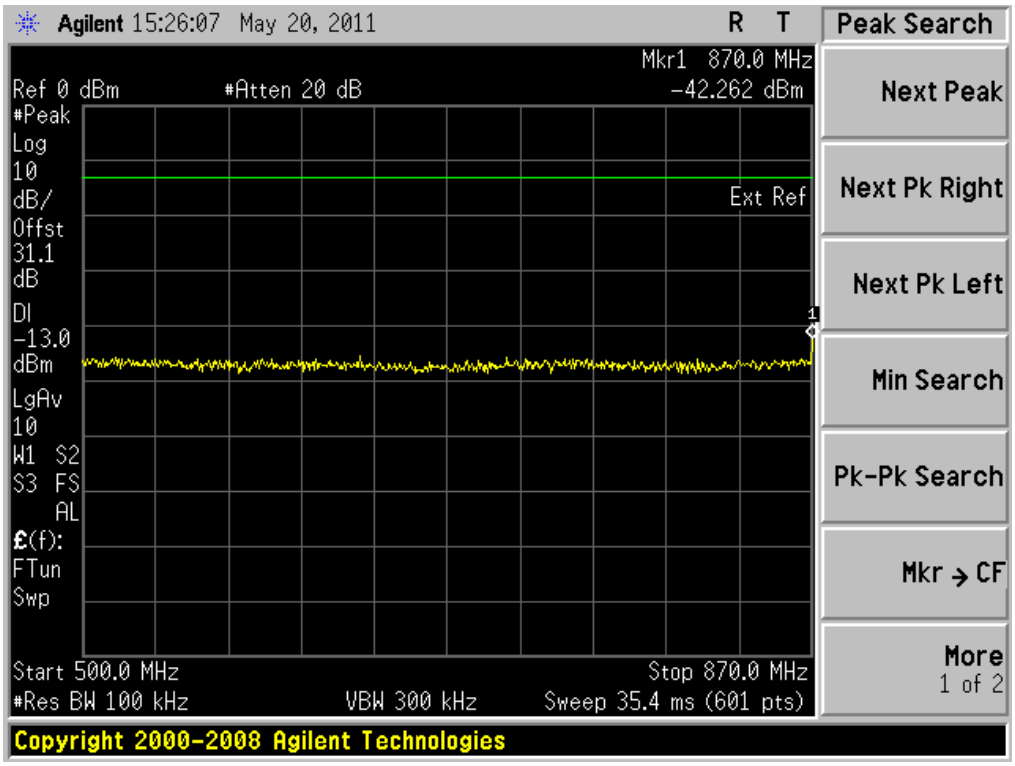

Figure 76 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 (500-870MHz)

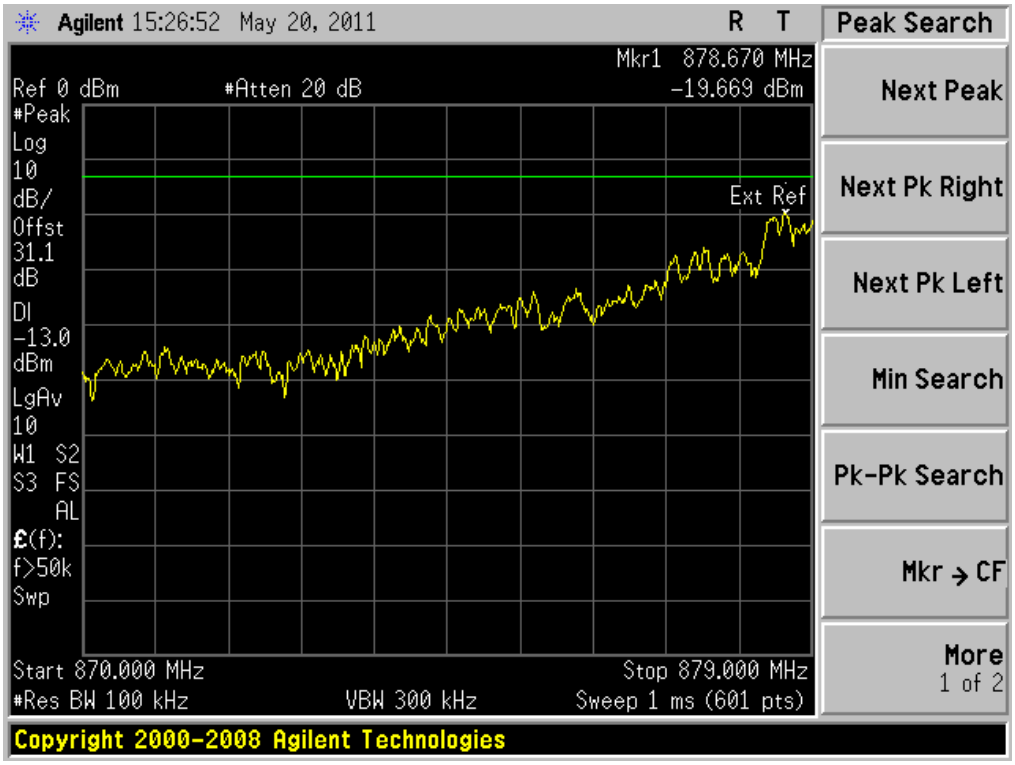

Figure 77 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 (870-879MHz)

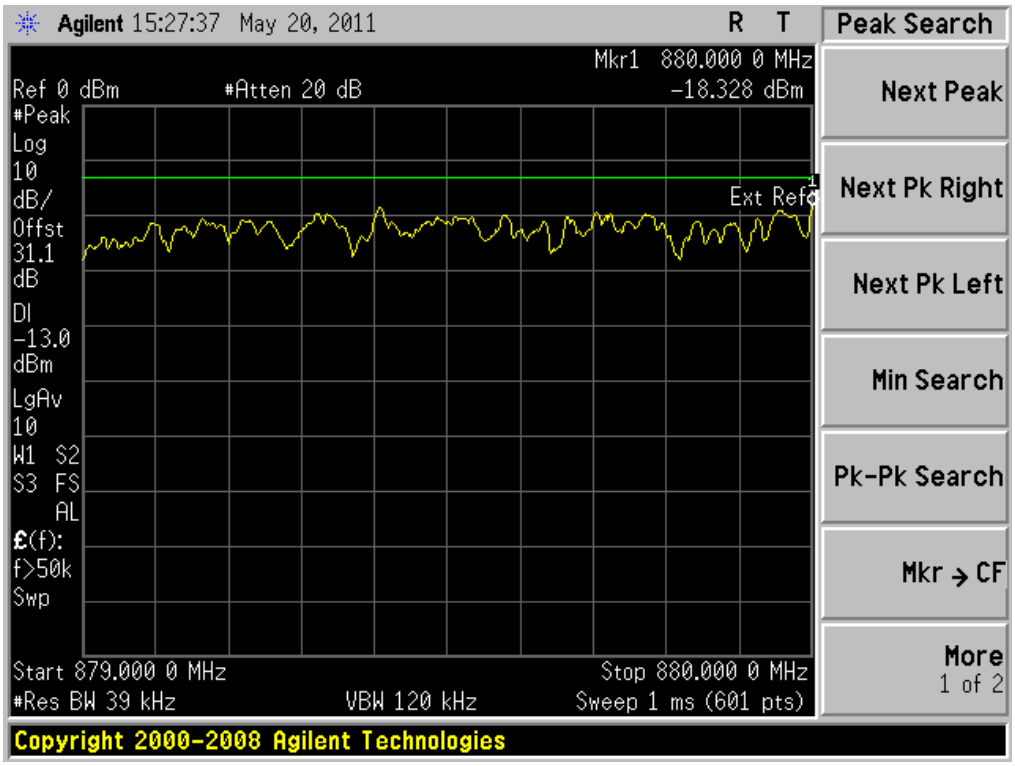

Figure 78 - Conducted Spurious Emissions – 3 Carrier, Channel 363,404,445 (879-880MHz)

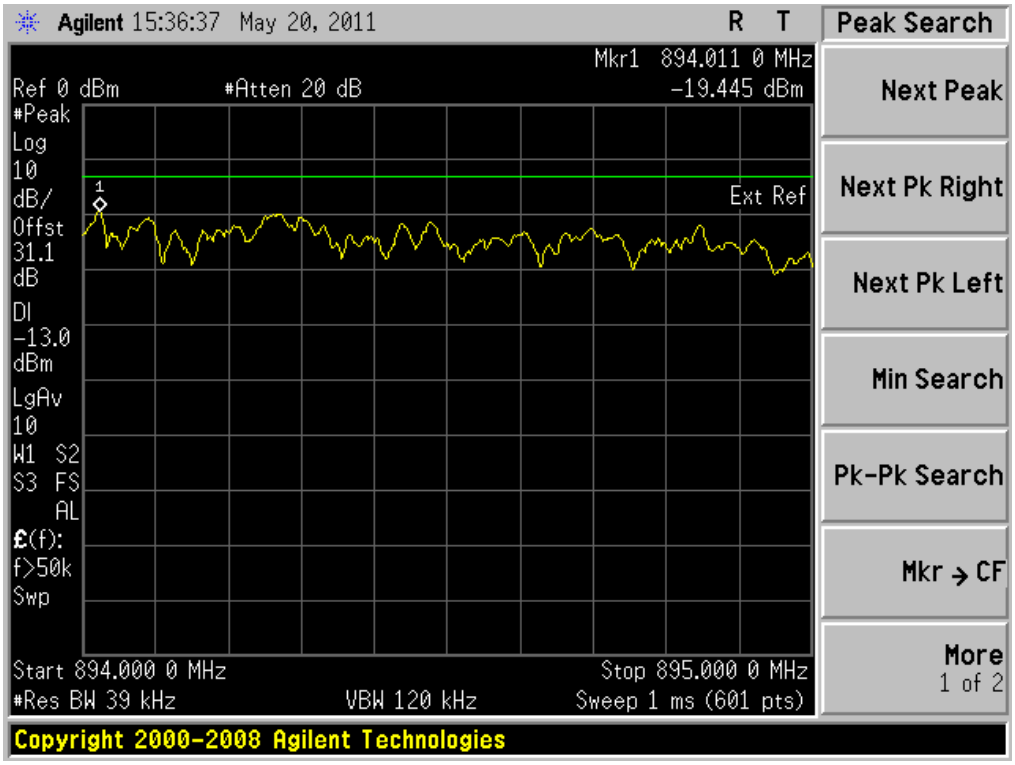

Figure 79 - Conducted Spurious Emissions – 3 Carrier, Channel 688,729,770 (894-895MHz)

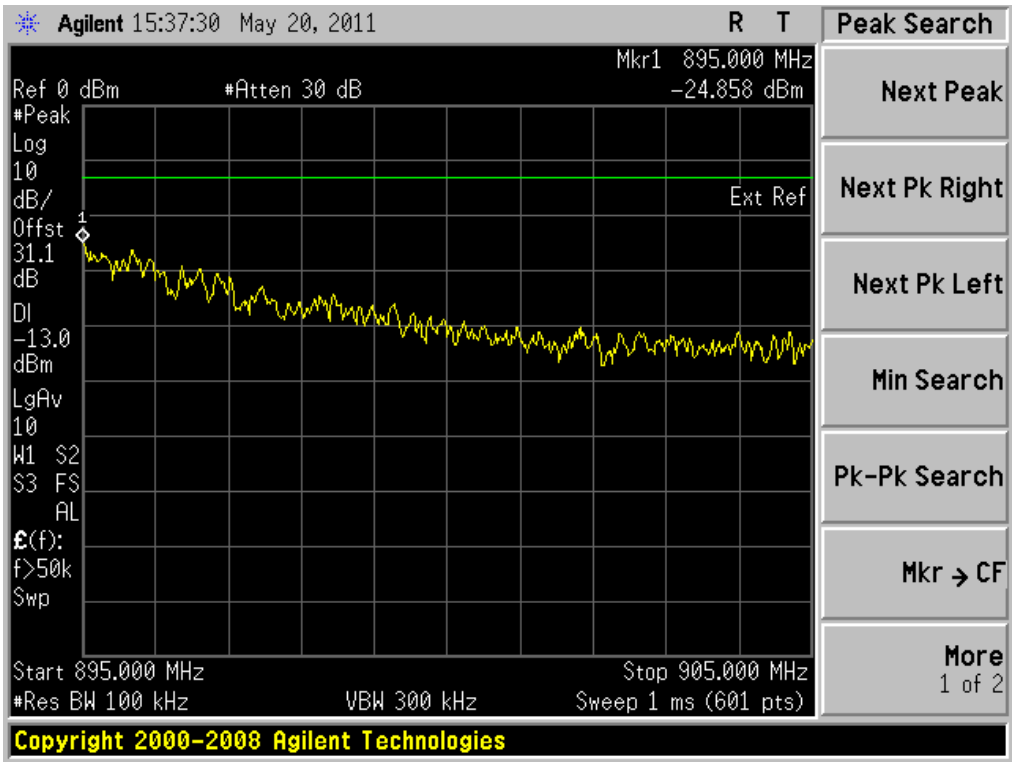

Figure 80 - Conducted Spurious Emissions – 3 Carrier, Channel 688,729,770 (895-905MHz)

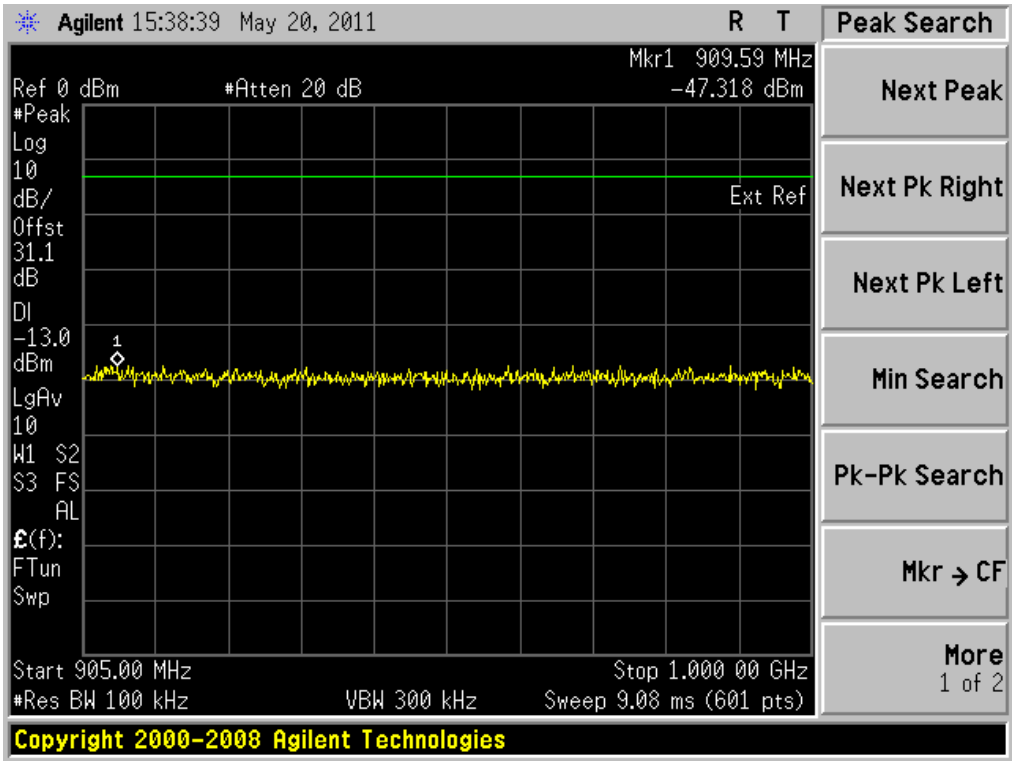

Figure 81 - Conducted Spurious Emissions – 3 Carrier, Channel 688,729,770 (905M-1GHz)

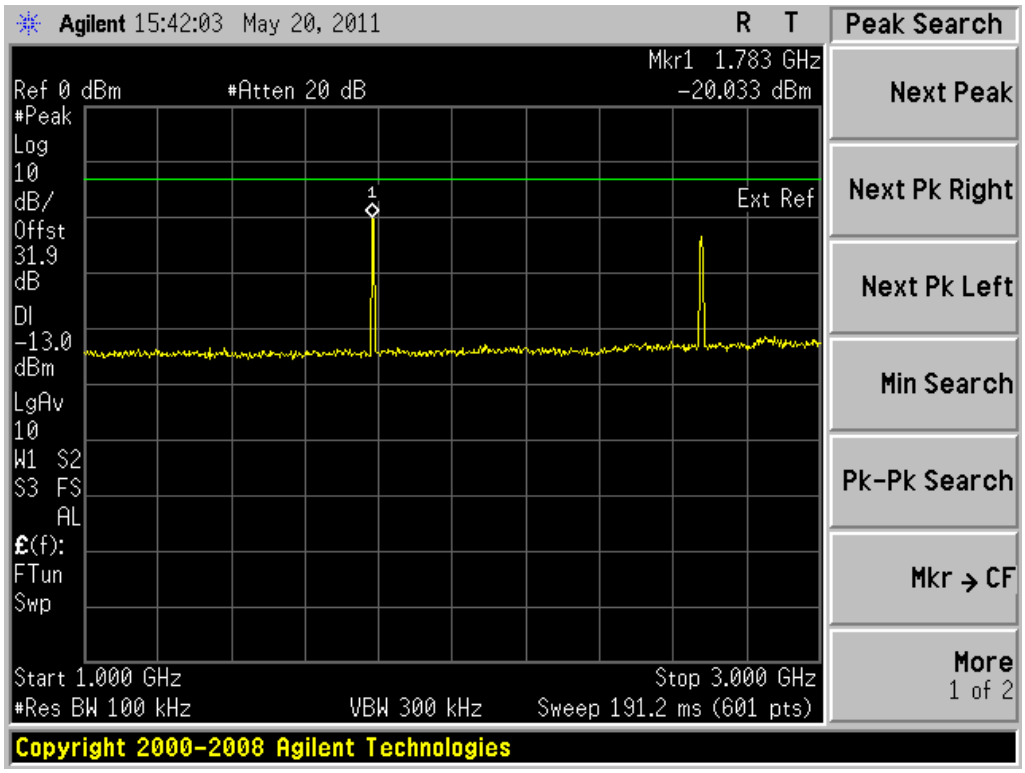

Figure 82 - Conducted Spurious Emissions – 3 Carrier, Channel 688,729,770 (1-3GHz)

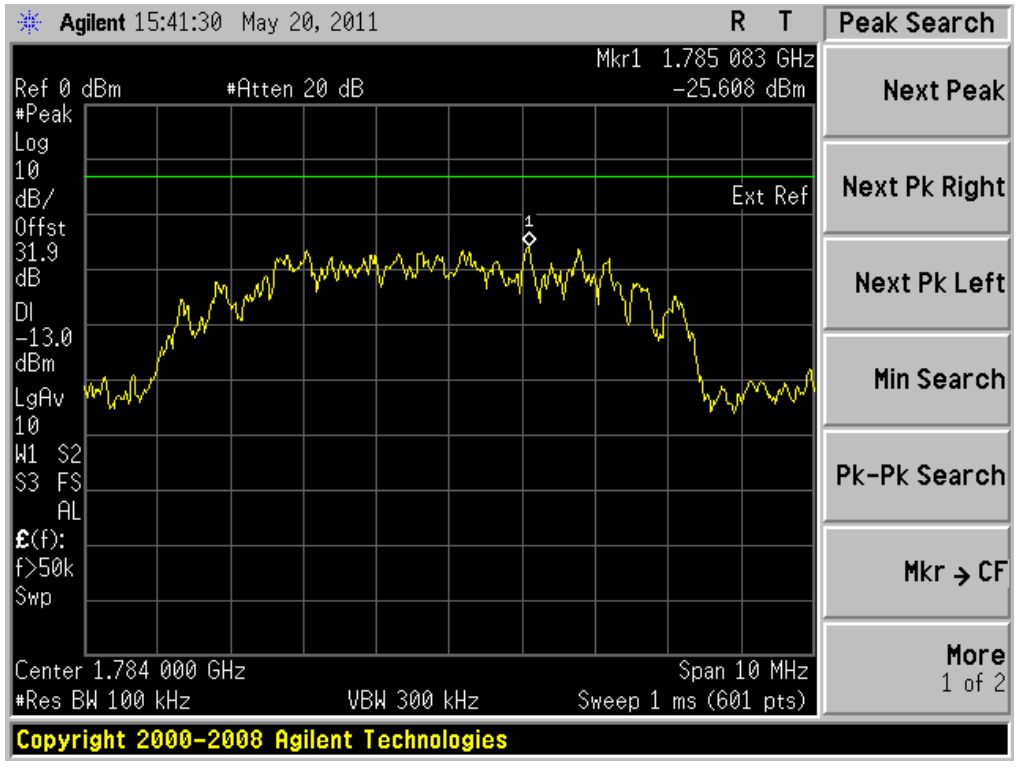

Figure 83 - Conducted Spurious Emissions – 3 Carrier, Channel 688,729,770 (1-3GHz)

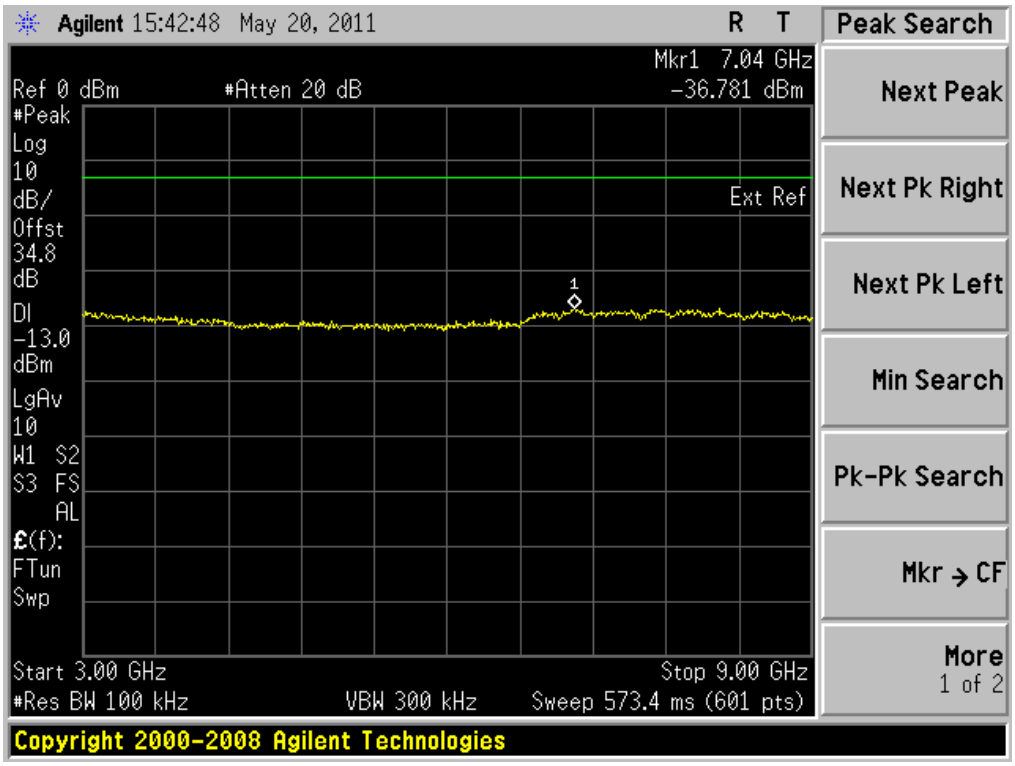

Figure 84 - Conducted Spurious Emissions – 3 Carrier, Channel 688,729,770 (3-9GHz)

4.4.4.3 RRUC-E beta with A-Band DPM

Table 28. Spurious Emissions at the RRUC-E 800MHz Ant. Port one Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
868 to 880 MHz (Lower edge) Ch 1019 (RBW=13 kHz)	-16.438	3.438
880(Upper edge) Ch 304 (RBW=13 kHz) to 881MHz	-17.465	4.465
9kHz to 868MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-29.295	16.295
881MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-21.724	8.724
3GHz to 9GHz (RBW=100 kHz)	-36.437	23.437

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

Table 29. Spurious Emissions at the RRUC-E 800MHz Ant. Port two Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363,404 (RBW=27kHz)	-17.204	4.204
888.5(Upper edge) Ch 548,589 (RBW=27kHz) to 889.5MHz	-17.026	4.026
9kHz to 879MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-19.355	6.355
889.5MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-20.520	7.520
3GHz to 9GHz (RBW=100 kHz)	-36.340	23.340

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

Table 30. Spurious Emissions at the RRUC-E 800MHz Ant. Port three Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
879 to 880 MHz (Lower edge) Ch 363,404,445 (RBW=39 kHz)	-17.656	4.656
888.5(Upper edge) Ch 507,548,589 (RBW=39 kHz) to 889.5MHz	-18.642	5.642
9kHz to 879MHz(Lower Edge - 1 MHz) (RBW=100KHz)	-17.449	4.449
889.5MHz(Upper Edge + 1 MHz) to 3 GHz (RBW=100kHz)	-21.345	8.345
3GHz to 9GHz (RBW=100 kHz)	-36.363	23.363

Notes: An Emission level given in these ranges represents the worst case value over all the tested channels

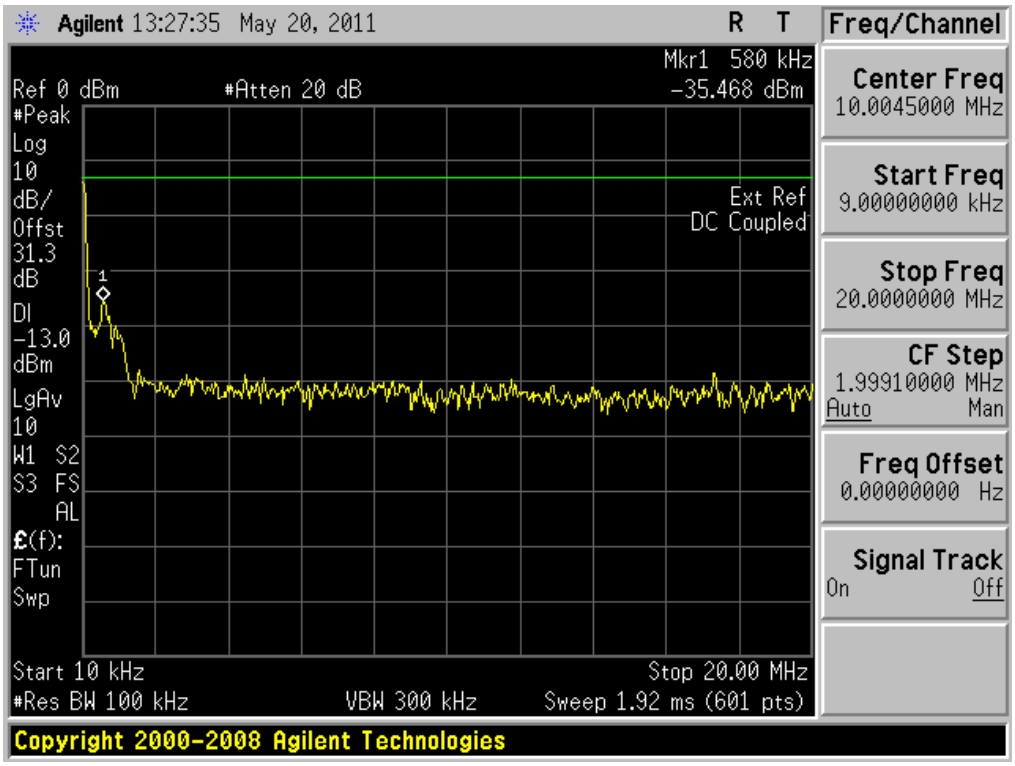

Figure 85 - Conducted Spurious Emissions – 1 Carrier, Channel 1019 (9k–20MHz)

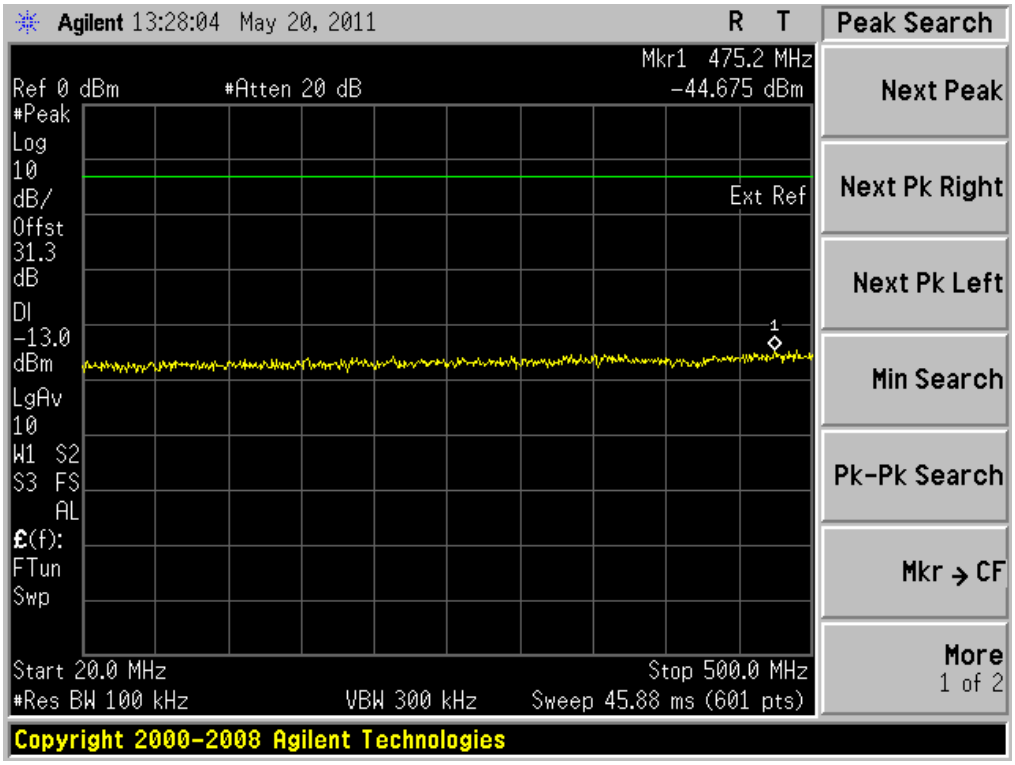

Figure 86 - Conducted Spurious Emissions – 1 Carrier, Channel 1019 (20-500MHz)

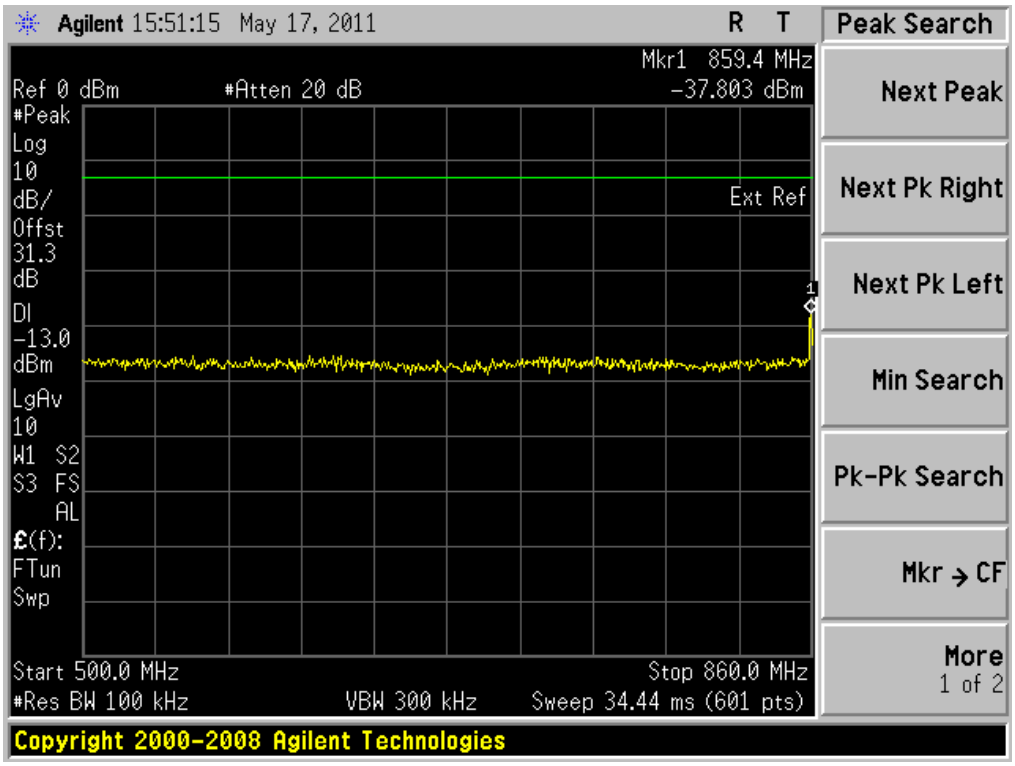

Figure 87 - Conducted Spurious Emissions – 1 Carrier, Channel 1019 (500-860MHz)

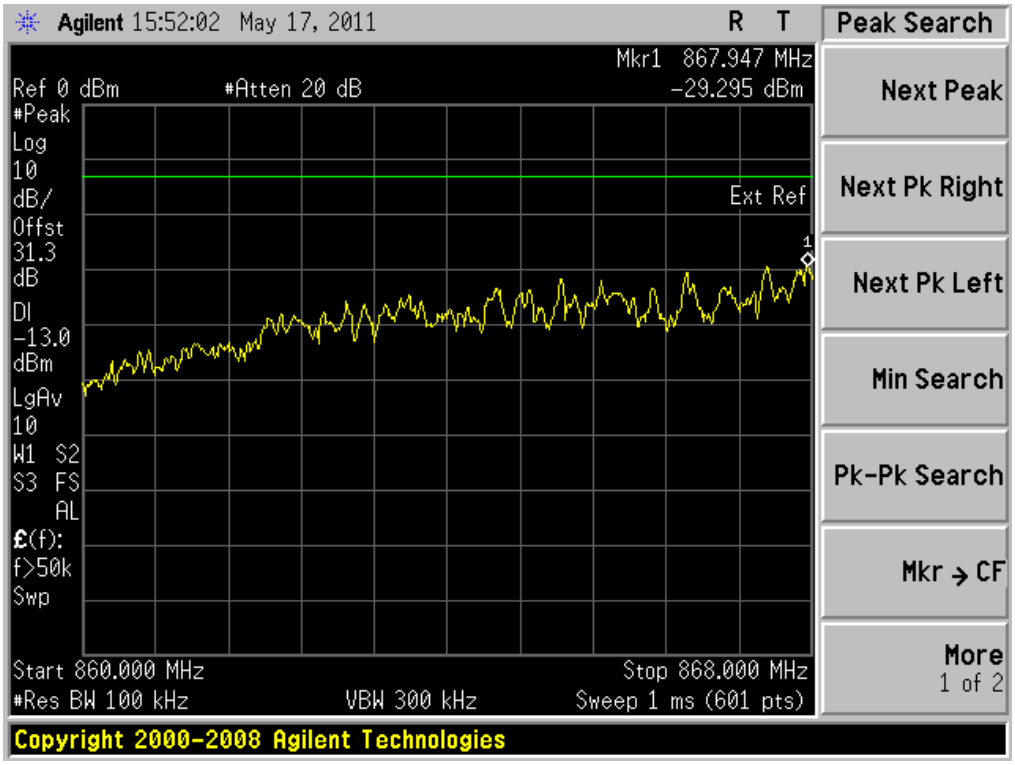

Figure 88 - Conducted Spurious Emissions – 1 Carrier, Channel 1019 (860-868MHz)

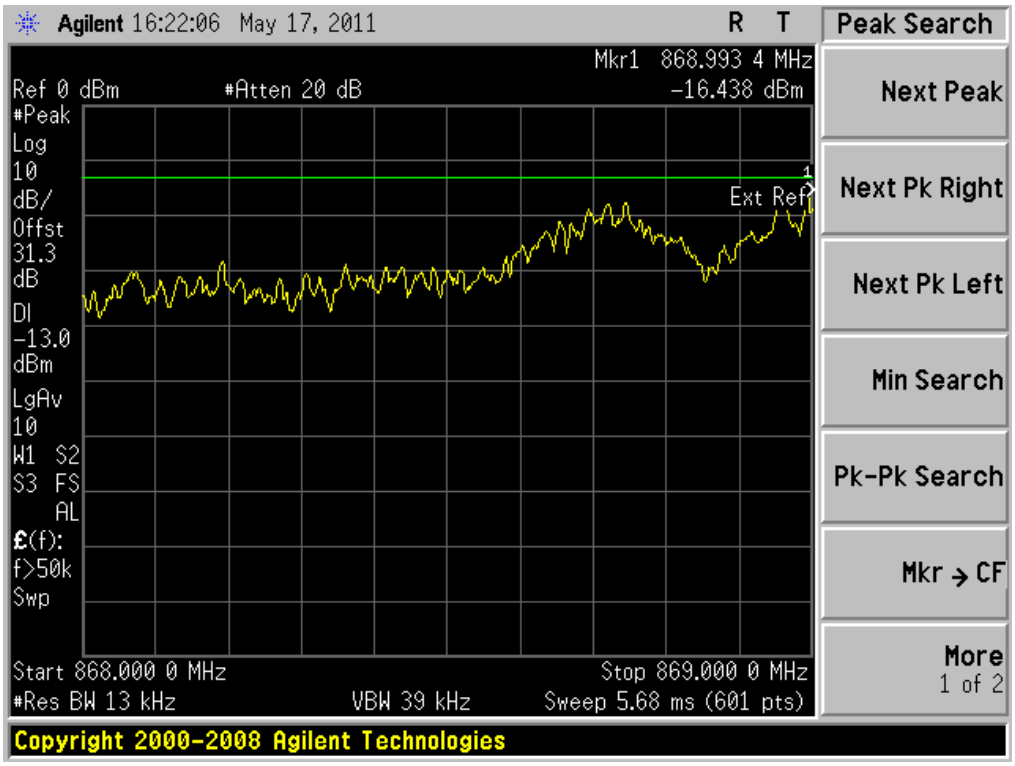

Figure 89 - Conducted Spurious Emissions – 1 Carrier, Channel 1019 (868-869MHz)

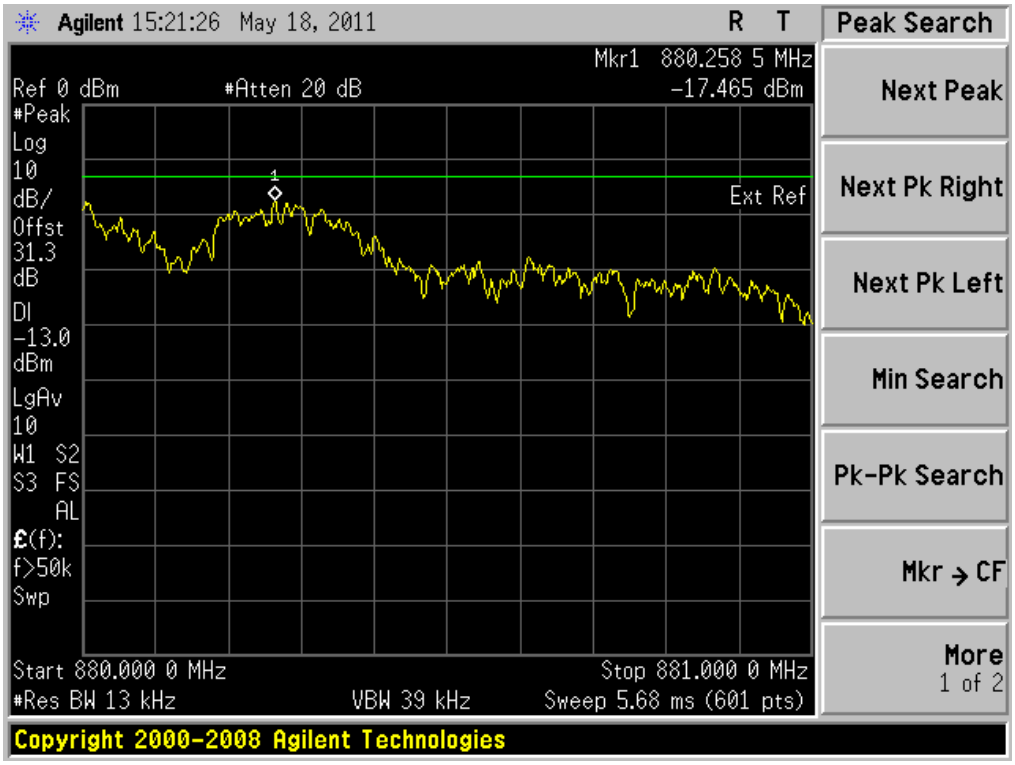

Figure 90 - Conducted Spurious Emissions – 1 Carrier, Channel 304 (880-881MHz)

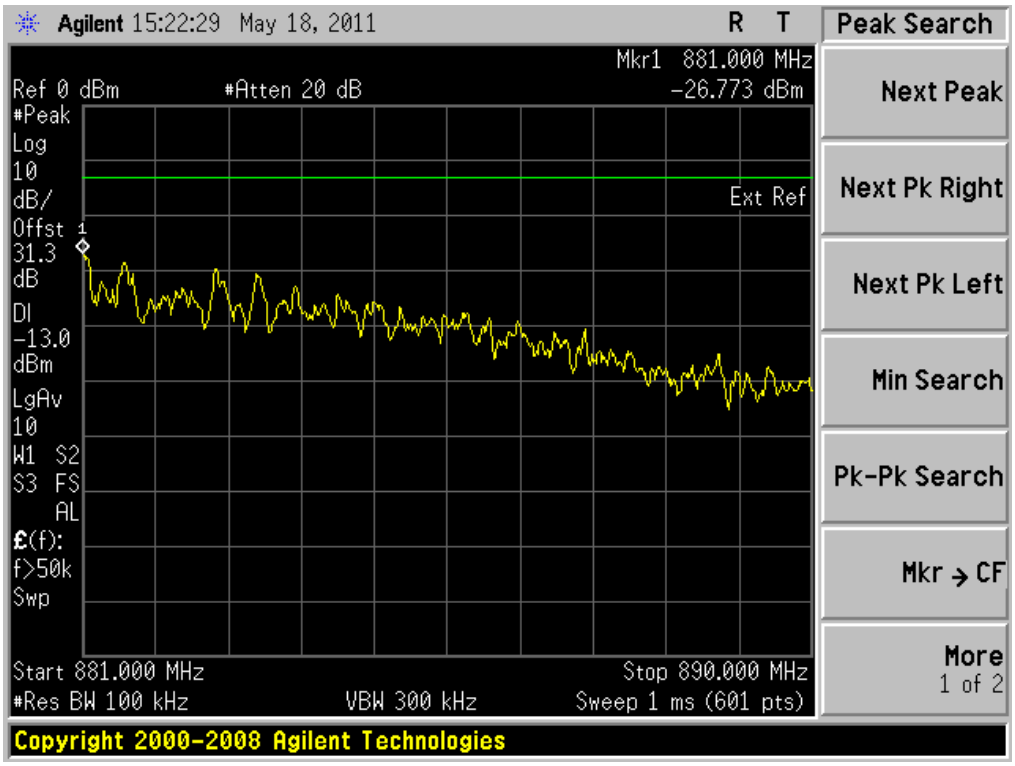

Figure 91 - Conducted Spurious Emissions – 1 Carrier, Channel 304 (881-890MHz)

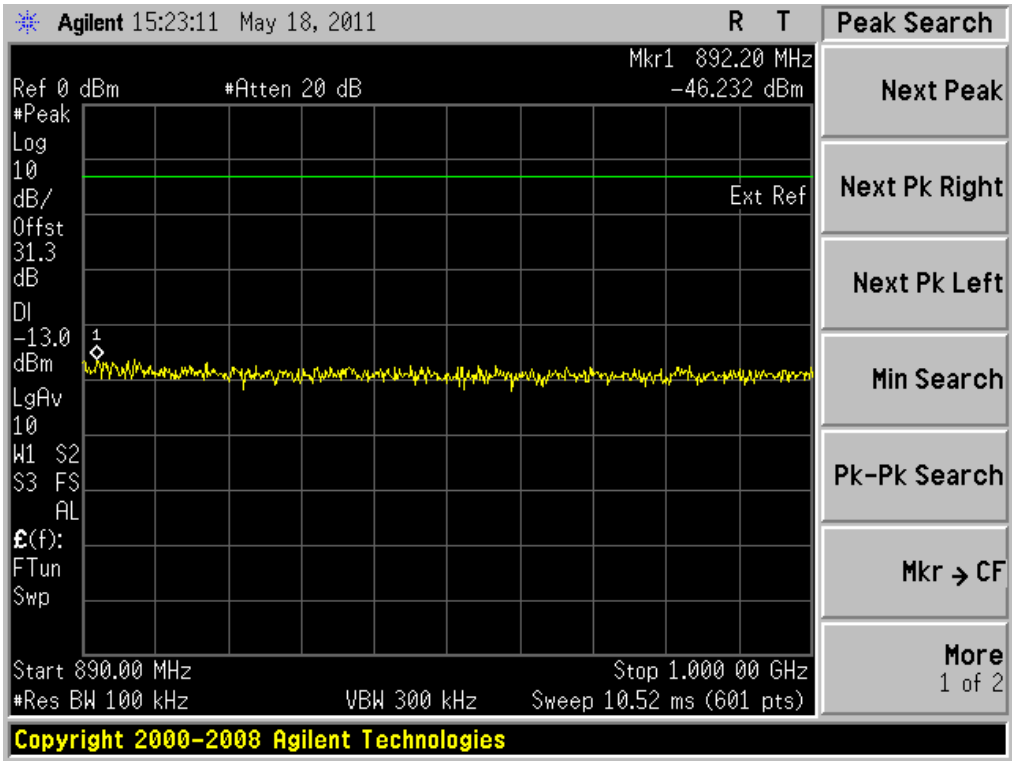

Figure 92 - Conducted Spurious Emissions – 1 Carrier, Channel 304 (890M-1GHz)

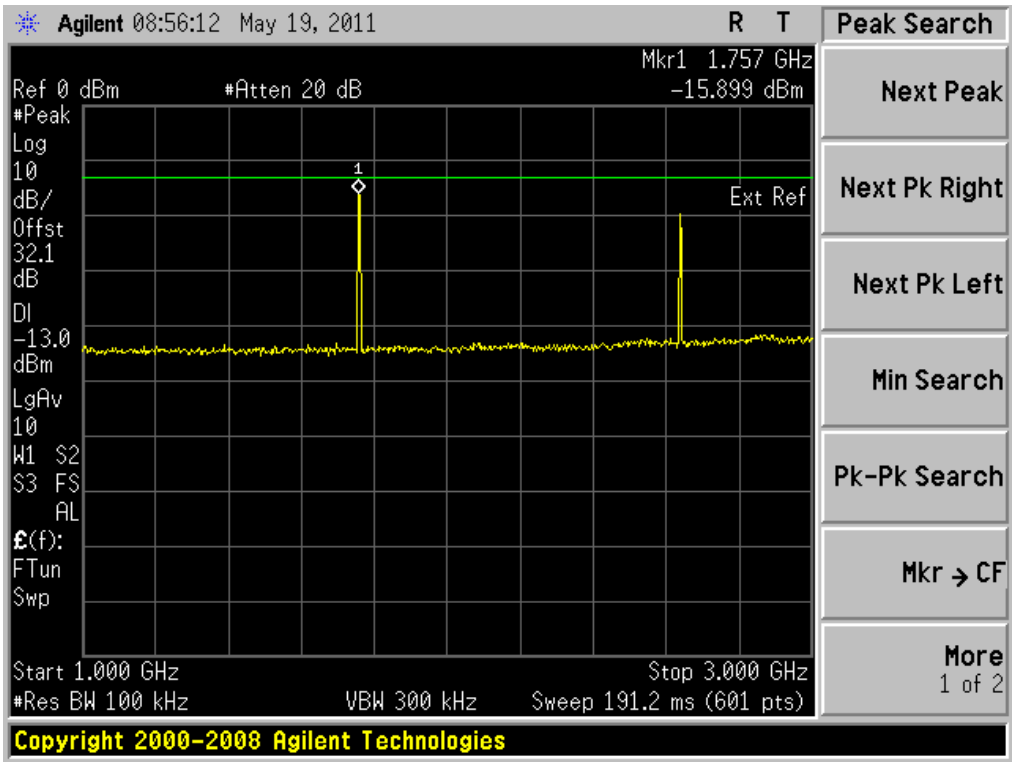

Figure 93 - Conducted Spurious Emissions – 1 Carrier, Channel 304 (1-3GHz)

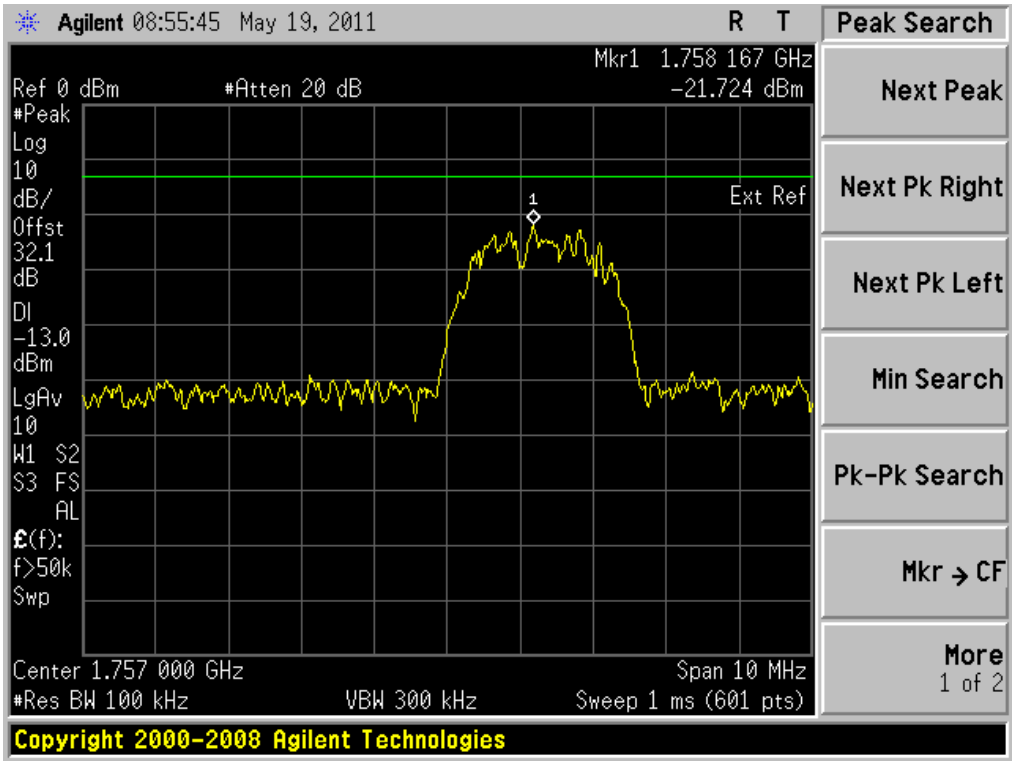

Figure 94 - Conducted Spurious Emissions – 1 Carrier, Channel 304 (1-3GHz)

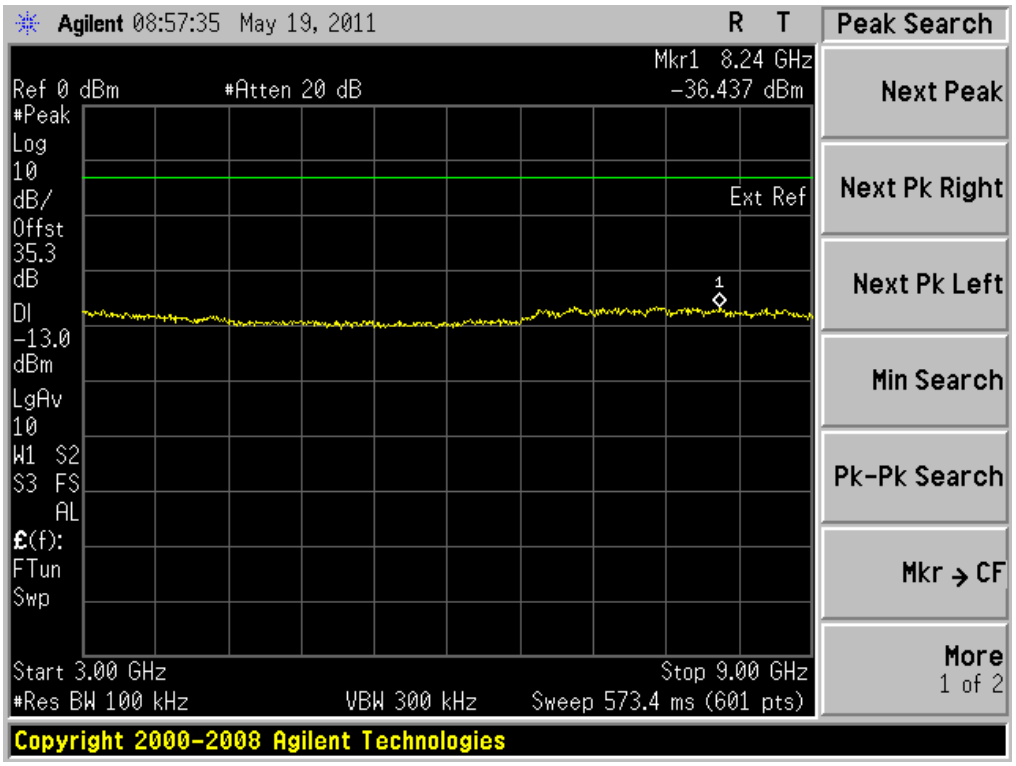

Figure 95 - Conducted Spurious Emissions – 1 Carrier, Channel 304 (3-9GHz)

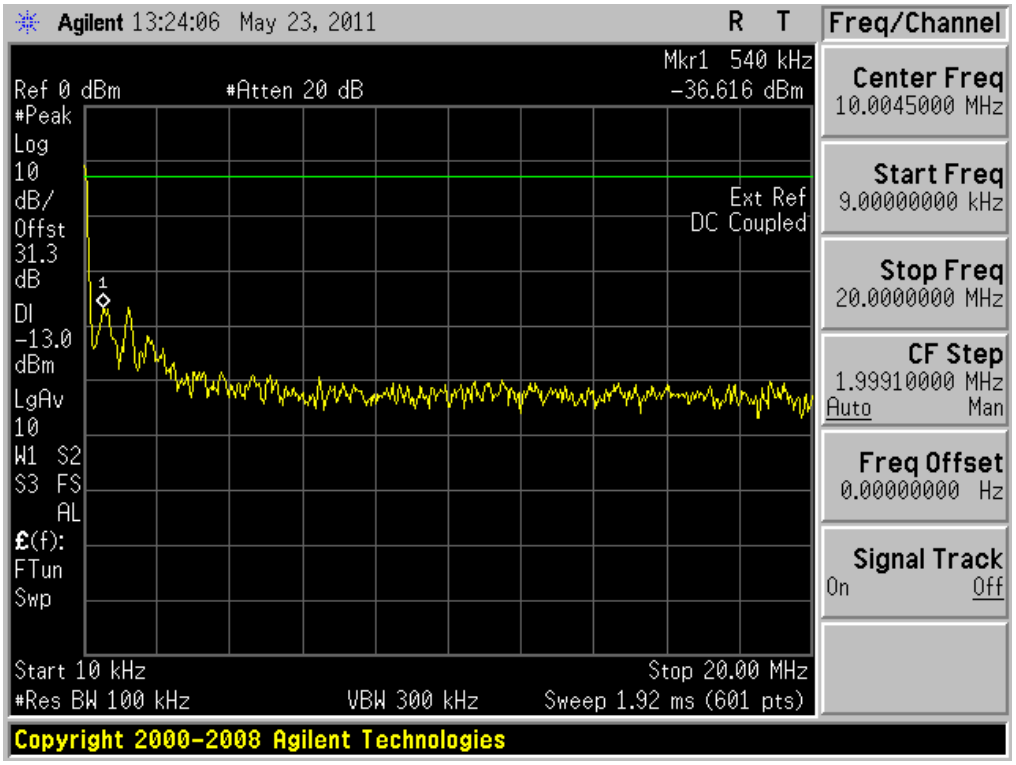

Figure 96 - Conducted Spurious Emissions – 2 Carrier, Channel 1019,37 (9K-20MHz)

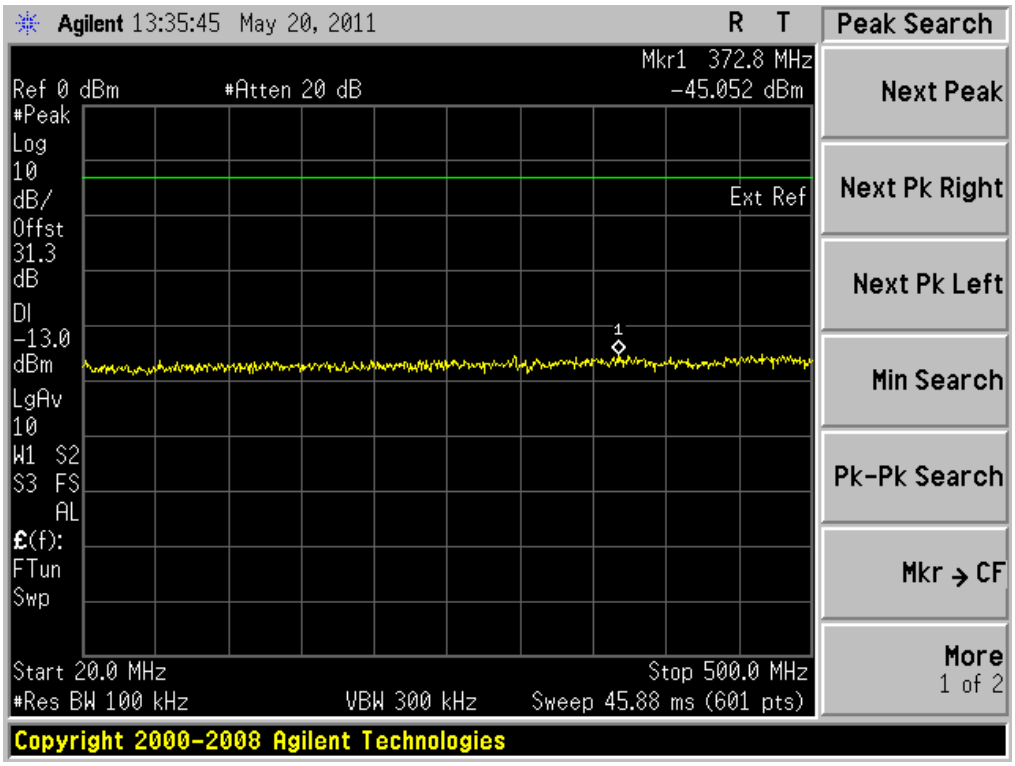

Figure 97 - Conducted Spurious Emissions – 2 Carrier, Channel 1019,37 (20-500MHz)

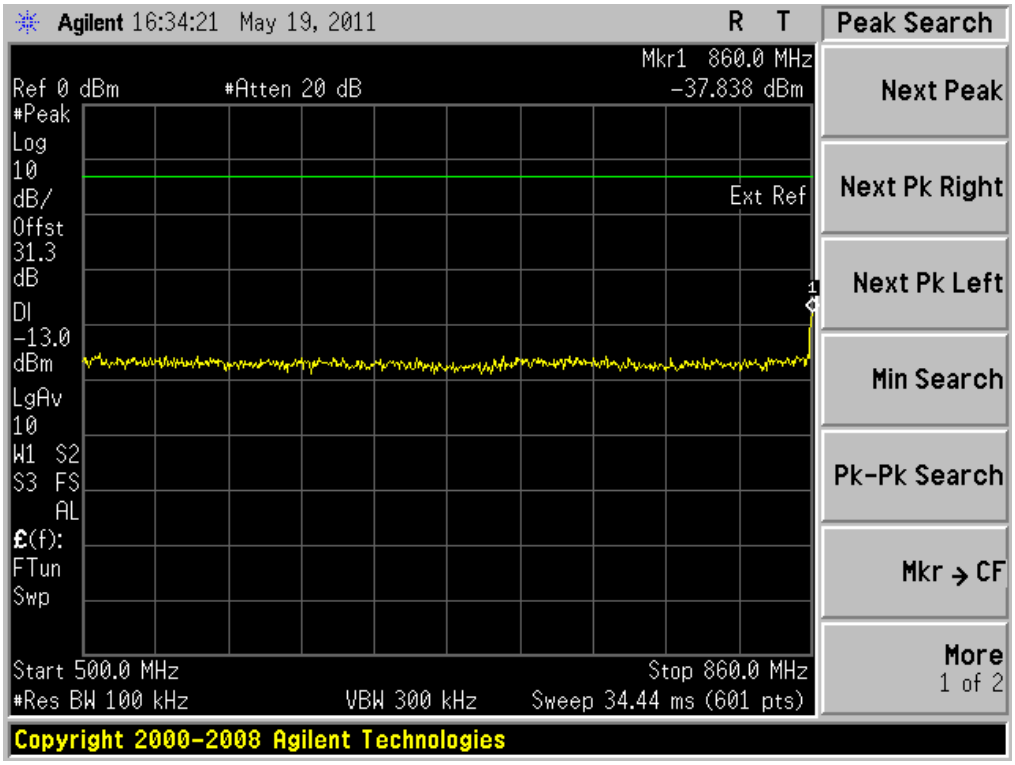

Figure 98 - Conducted Spurious Emissions – 2 Carrier, Channel 1019,37 (500-860MHz)

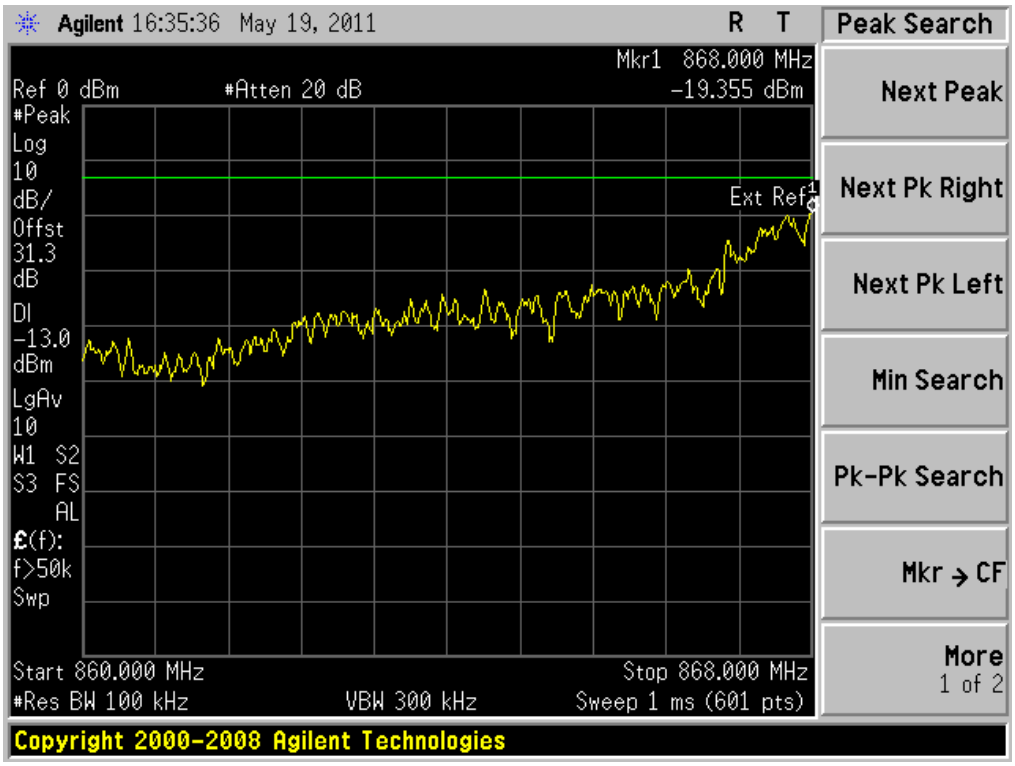

Figure 99 - Conducted Spurious Emissions – 2 Carrier, Channel 1019,37 (860-868MHz)

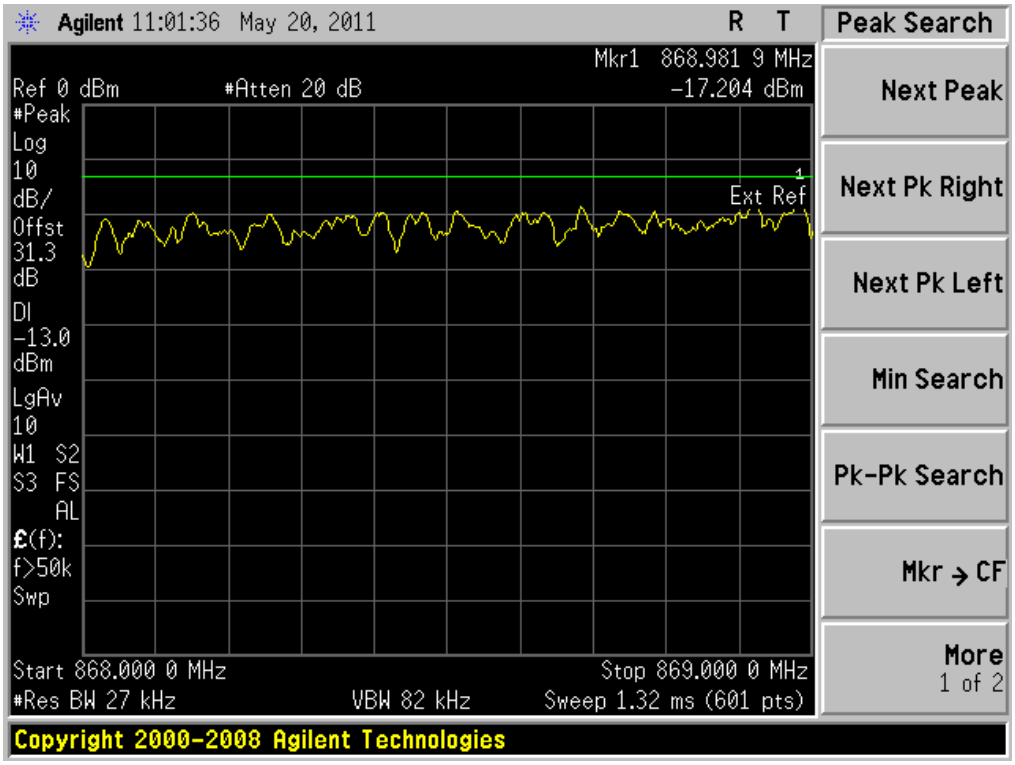

Figure 100 - Conducted Spurious Emissions – 2 Carrier, Channel 1019,37 (868-869MHz)

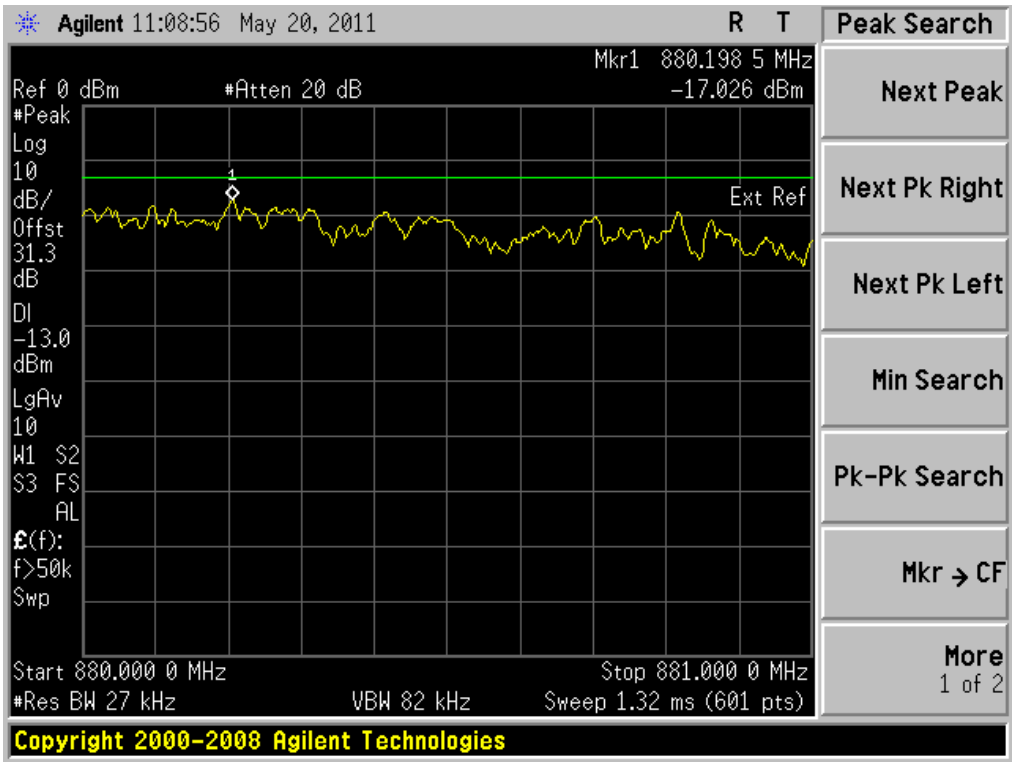

Figure 101 - Conducted Spurious Emissions – 2 Carrier, Channel 263, 304 (880-881MHz)

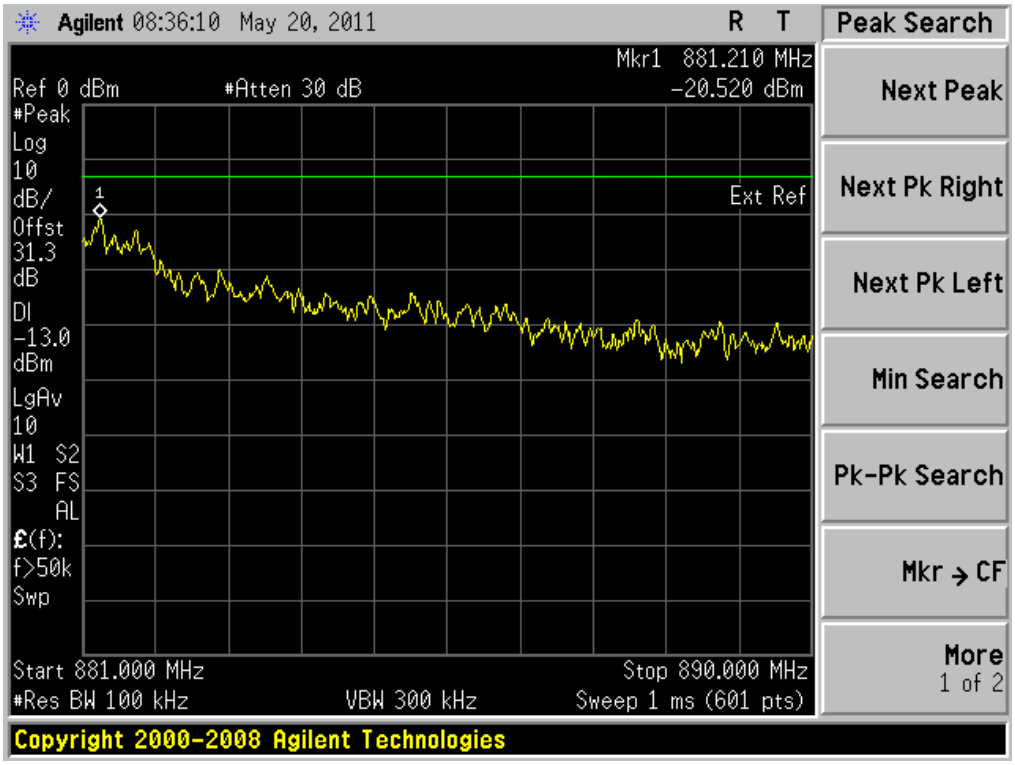

Figure 102 - Conducted Spurious Emissions – 2 Carrier, Channel 263, 304 (881-890MHz)

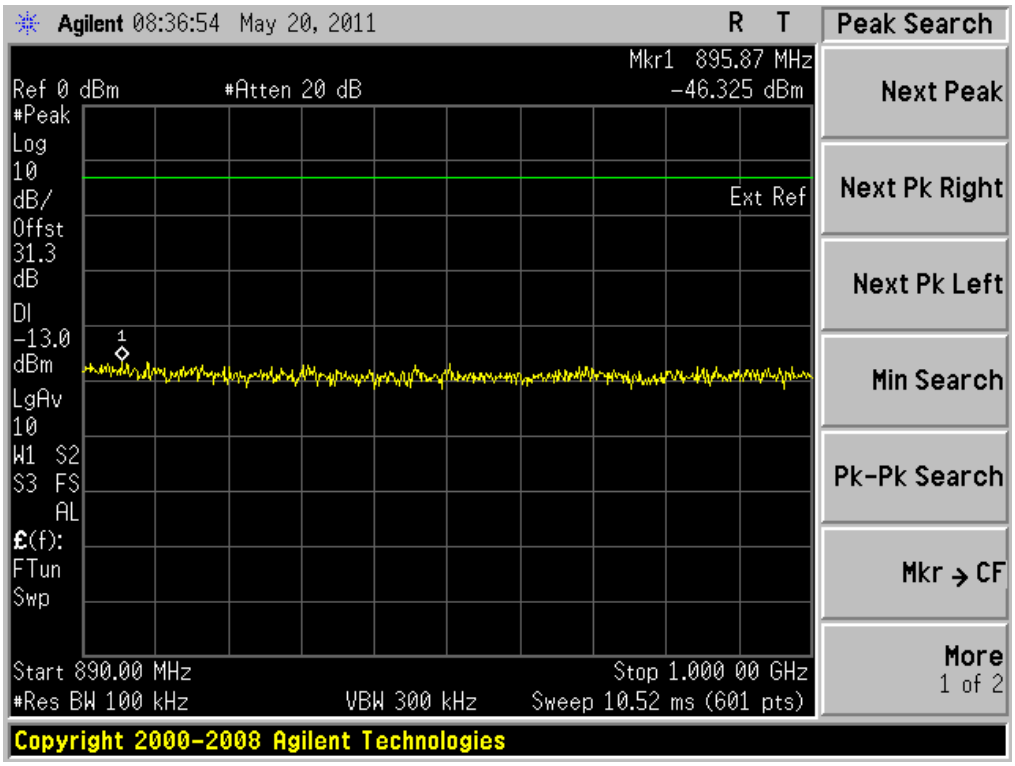

Figure 103 - Conducted Spurious Emissions – 2 Carrier, Channel 263, 304 (890M-1GHz)

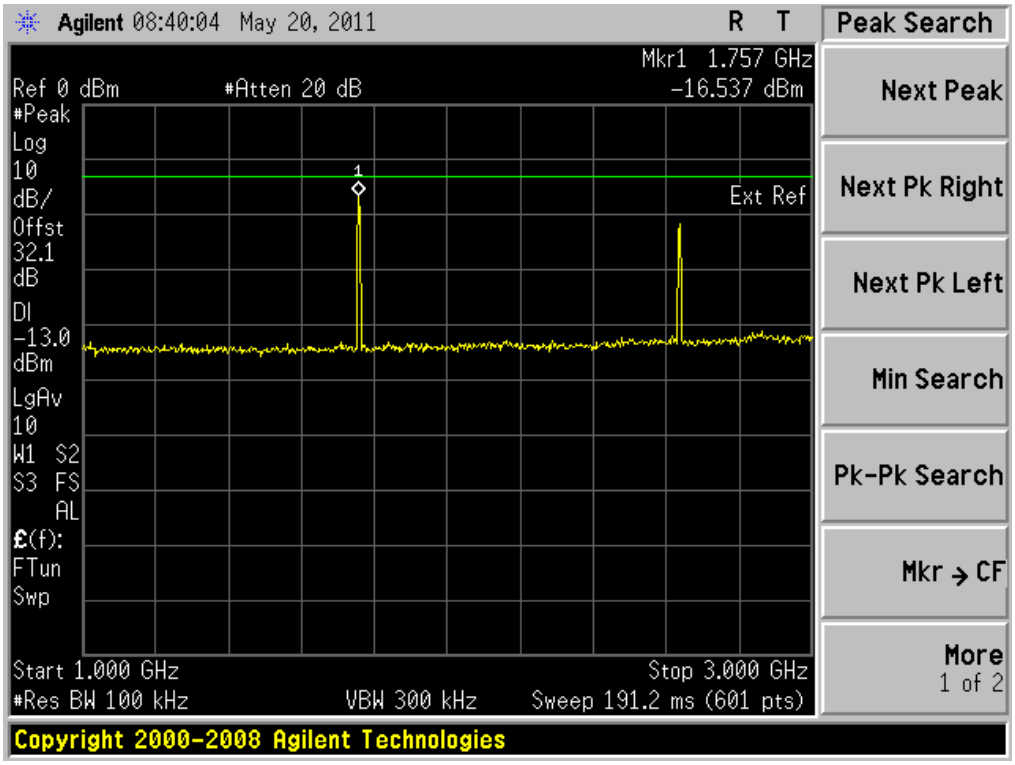

Figure 104 - Conducted Spurious Emissions – 2 Carrier, Channel 263, 304 (1-3GHz)

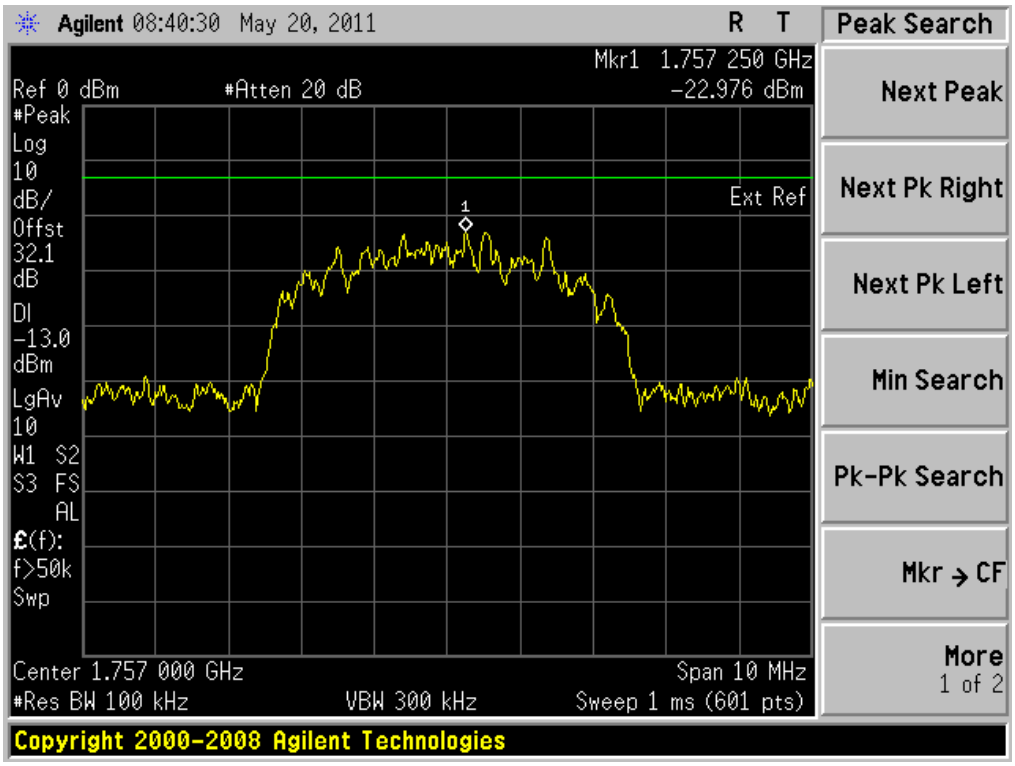

Figure 105 - Conducted Spurious Emissions – 2 Carrier, Channel 263, 304 (1-3GHz)

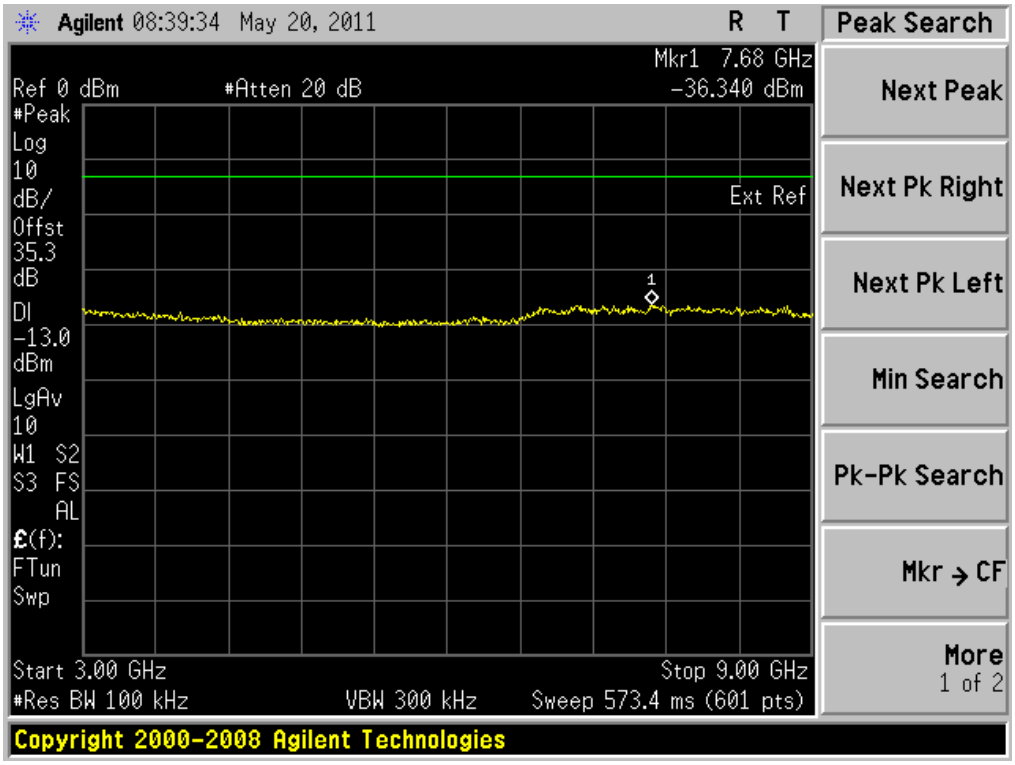

Figure 106 - Conducted Spurious Emissions – 2 Carrier, Channel 263, 304 (3-9GHz)

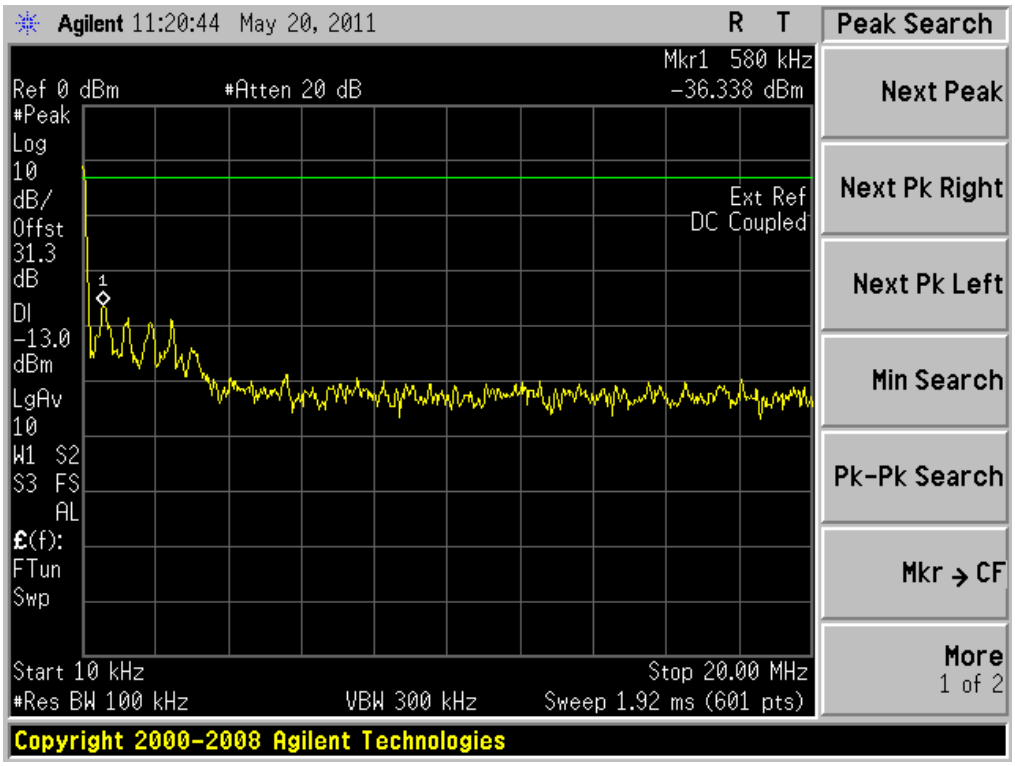

Figure 107 - Conducted Spurious Emissions – 3 Carrier, Channel 1019, 37, 78 (9k-20MHz)

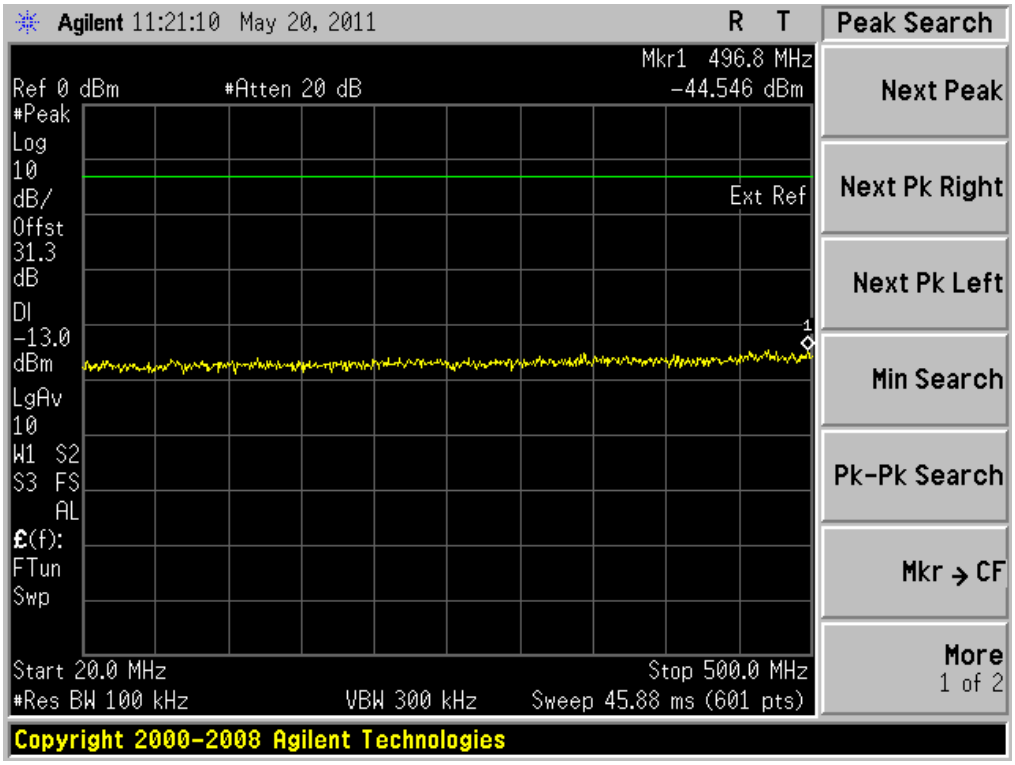

Figure 108 - Conducted Spurious Emissions – 3 Carrier, Channel 1019, 37, 78 (20-500MHz)

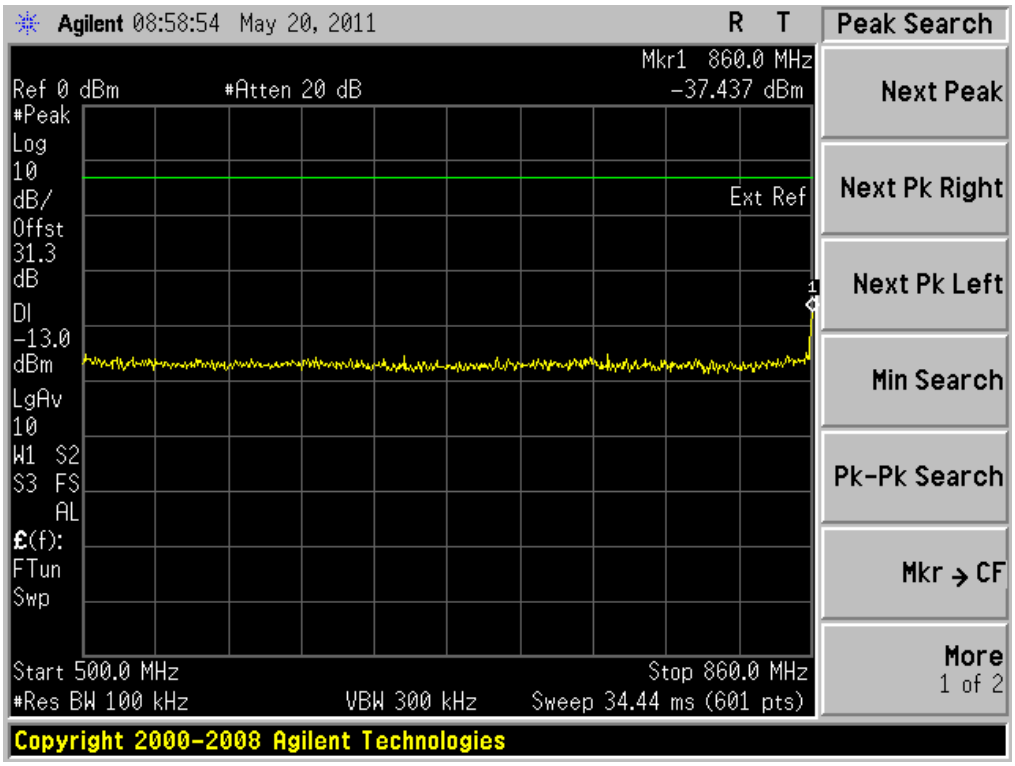

Figure 109 - Conducted Spurious Emissions – 3 Carrier, Channel 1019, 37, 78 (500-860MHz)

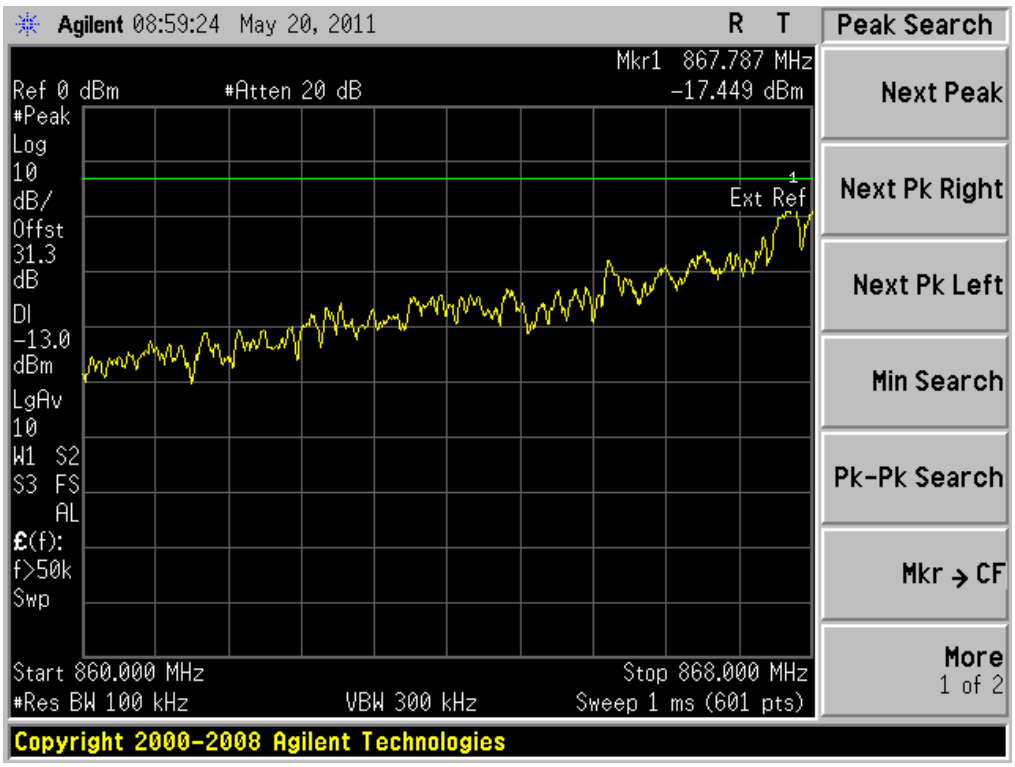

Figure 110 - Conducted Spurious Emissions – 3 Carrier, Channel 1019, 37, 78 (860-868MHz)

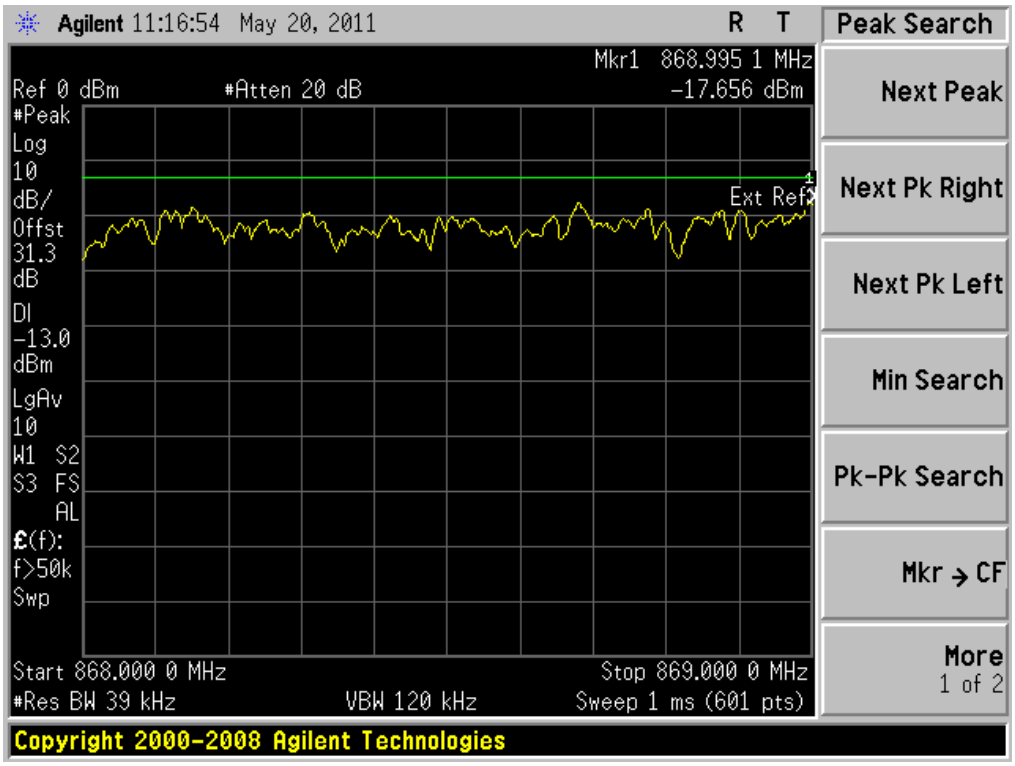

Figure 111 - Conducted Spurious Emissions – 3 Carrier, Channel 1019, 37, 78 (868-869MHz)

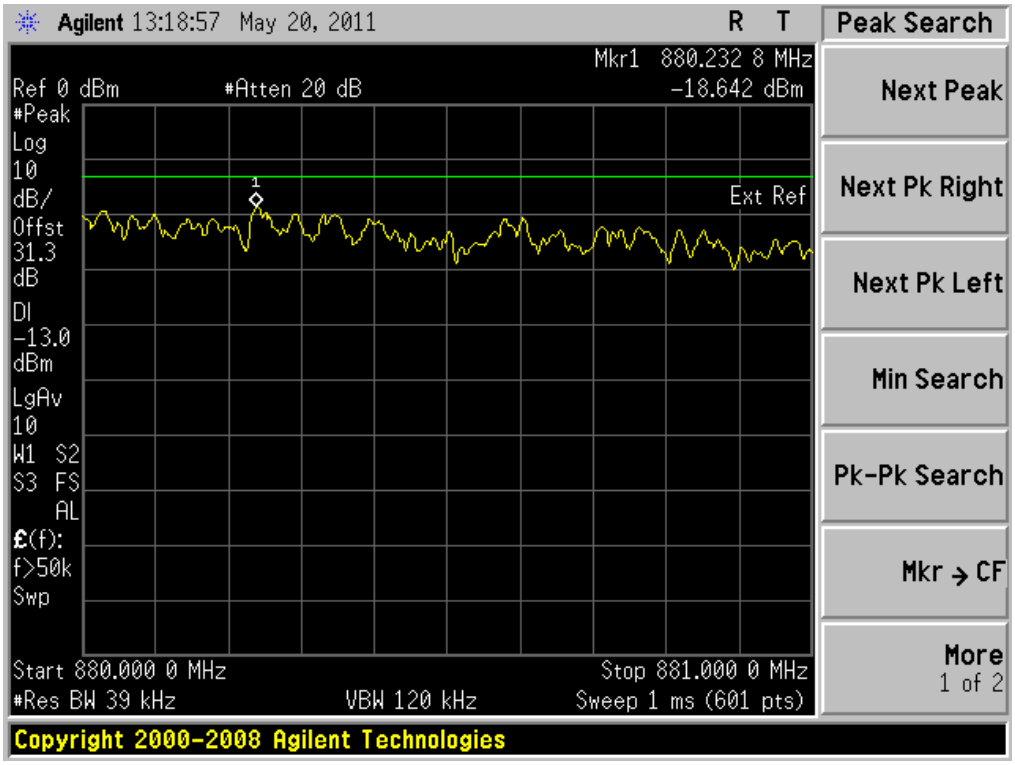

Figure 112 - Conducted Spurious Emissions – 3 Carrier, Channel 222, 263, 304 (880-881MHz)

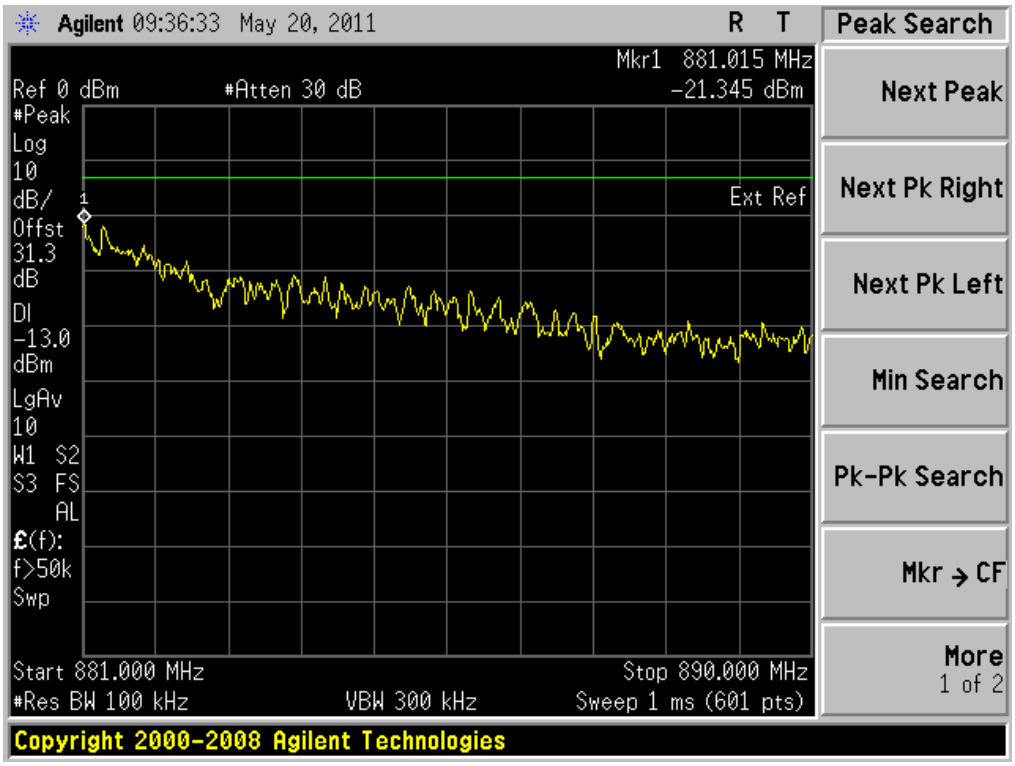

Figure 113 - Conducted Spurious Emissions – 3 Carrier, Channel 222, 263, 304 (881-890MHz)

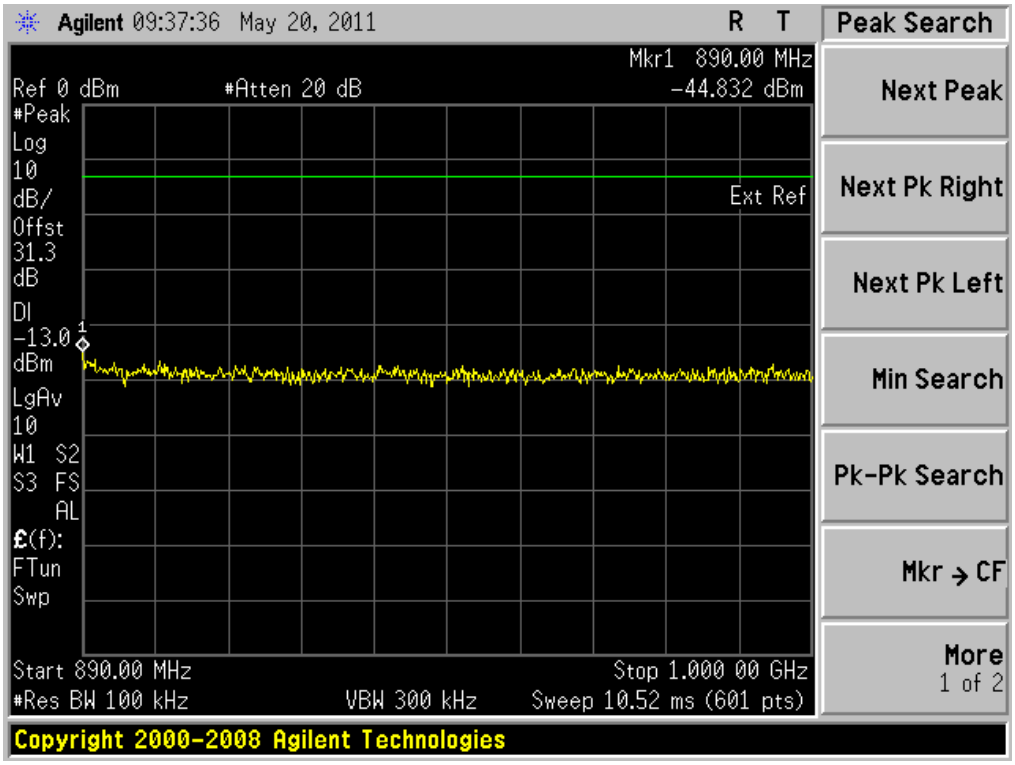

Figure 114 - Conducted Spurious Emissions – 3 Carrier, Channel 222, 263, 304 (890M-1GHz)

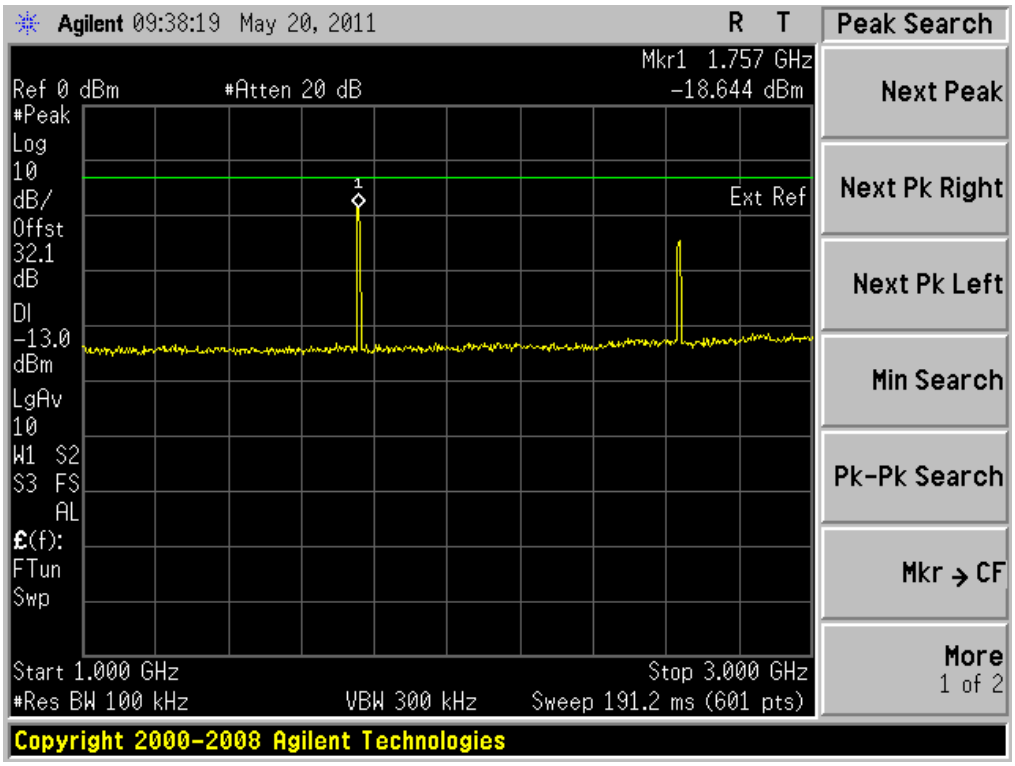

Figure 115 - Conducted Spurious Emissions – 3 Carrier, Channel 222, 263, 304 (1-3GHz)

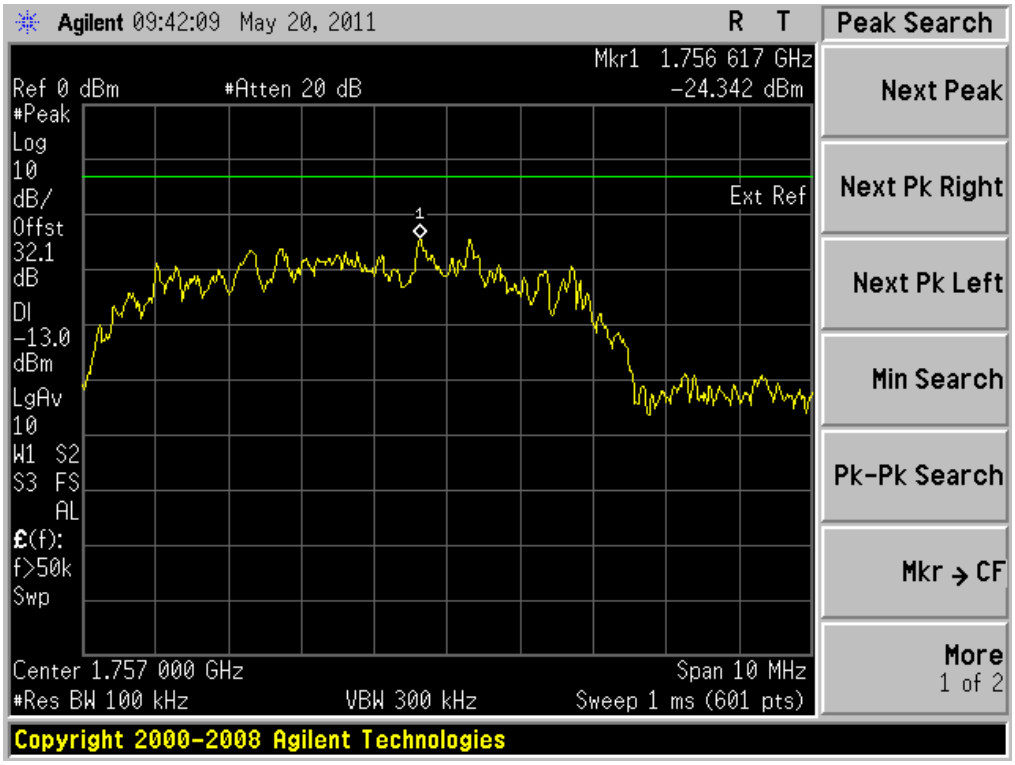

Figure 116 - Conducted Spurious Emissions – 3 Carrier, Channel 222, 263, 304 (1-3GHz)

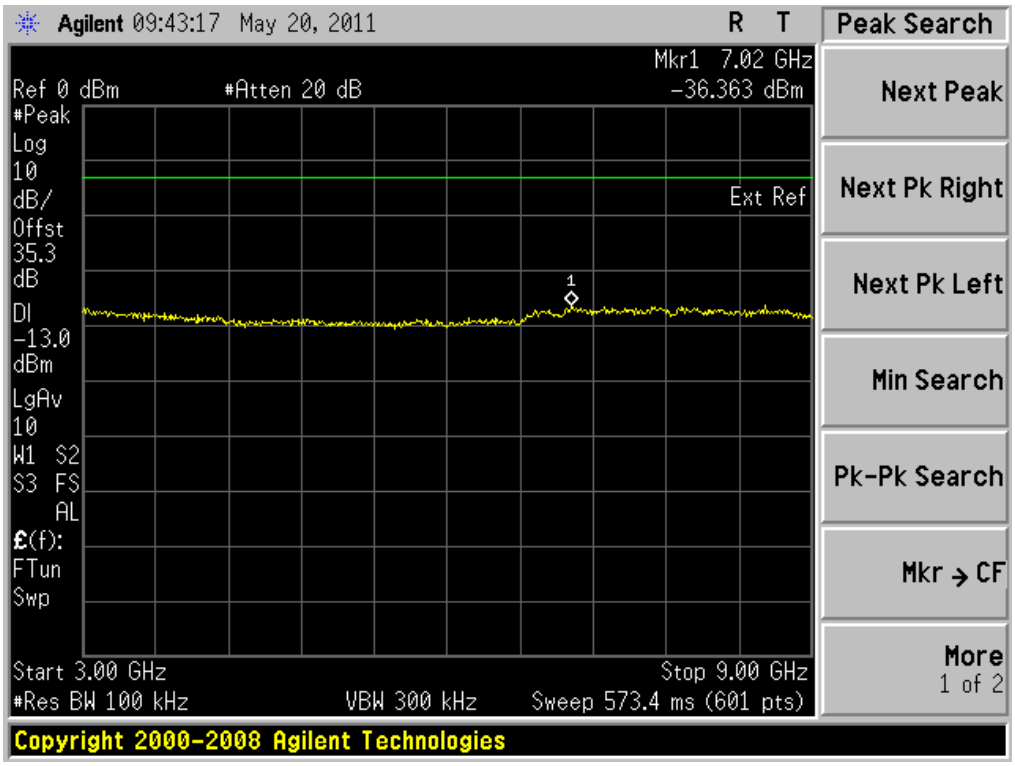

Figure 117 - Conducted Spurious Emissions – 3 Carrier, Channel 222, 263, 304 (3-9GHz)

4.5 Frequency Stability

4.5.1 Frequency Stability Requirements

FCC Part 2.1055

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30 to +50 centigrade for all equipment except that specified in subparagraphs (2) and (3) of this paragraph.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on

frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

FCC Part 22.355 Frequency Tolerance
The carrier frequency of each transmitter in the 821-896 MHz Frequency range, must be maintained within 1.5ppm tolerance, according to table C-1 of this section.

4.5.2 **Test Setup**

The test equipment was configured as shown in figure 118.

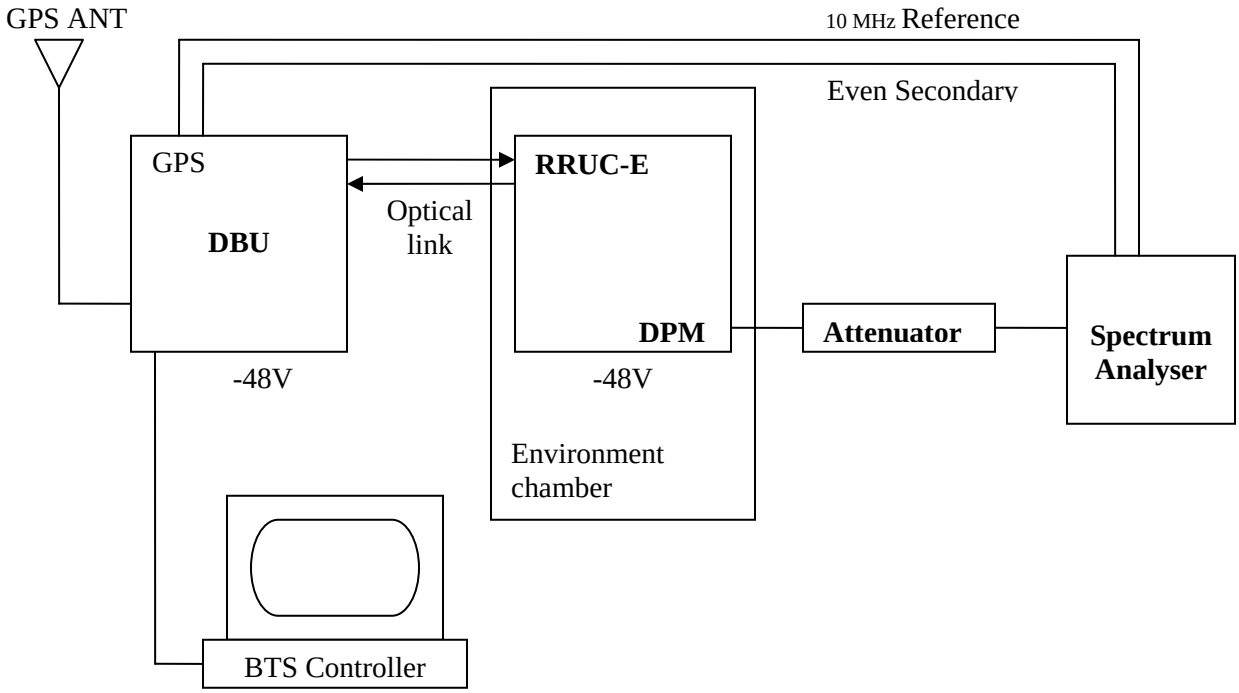

Figure 118 - Test configuration for Frequency Stability

4.5.3 Test Results

4.5.3.1 RRUC-E with B-Band and GSM Co-location DPM

Table 31. Test results for Frequency Stability versus Power supply Voltage at room temperature –1 Carrier, channel 384

Voltage (VDC)	Max Carrier Frequency Deviation (Hz)	Max Carrier Frequency Deviation (PPM)
40.5	7.11	0.008065614
48	8.52	0.009665124
57	7.87	0.008927761

Table 32. Test results for Frequency Stability versus Temperature at -48V operation –1 Carrier, channel 384

Temperature(^{0}C)	Max Carrier Frequency Deviation (Hz)	Max Carrier Frequency Deviation (PPM)
-40	6.31	0.007158091
-30	7.34	0.008326527
-20	6.45	0.007316907
-10	8.32	0.009438243
0	9.31	0.010561303
10	6.89	0.007816045
20	6.38	0.007237499
30	7.56	0.008576096
40	8.19	0.00929077
50	9.48	0.010754152
55	8.11	0.009200018

4.5.3.2 RRUC-E with B-Band DPM

Table 33. Test results for Frequency Stability versus Power supply Voltage at room temperature –1 Carrier, channel 384

Voltage (VDC)	Max Carrier Frequency Deviation (Hz)	Max Carrier Frequency Deviation (PPM)
40.5	6.94	0.007872765
48	7.08	0.008031582
57	6.52	0.007396315

Table 34. Test results for Frequency Stability versus Temperature at -48V operation –1 Carrier, channel 384

Temperature(^{0}C)	Max Carrier Frequency Deviation (Hz)	Max Carrier Frequency Deviation (PPM)
-40	6.01	0.006817769
-30	5.23	0.005932934
-20	5.78	0.006556856

-10	6.99	0.007929485
0	7.03	0.007974862
10	6.77	0.007679917
20	9.12	0.010345766
30	8.56	0.0097105
40	7.35	0.008337871
50	8.15	0.009245394
55	7.82	0.008871041

4.5.3.3 RRUC-E beta with A-Band DPM

Table 35. Test results for Frequency Stability versus Power supply Voltage at room temperature –1 Carrier, channel 1019

Voltage (VDC)	Max Carrier Frequency Deviation (Hz)	Max Carrier Frequency Deviation (PPM)
40.5	29.31	0.033694303
48	27.12	0.031176714
57	30.03	0.034522003

Table 36. Test results for Frequency Stability versus Temperature at -48V operation –1 Carrier, channel 1019

Temperature(^{0}C)	Max Carrier Frequency Deviation (Hz)	Max Carrier Frequency Deviation (PPM)
-40	7.89	0.009070217
-30	8.21	0.009438083
-20	8.85	0.010173817
-10	9.96	0.011449855
0	17.32	0.019910792
10	16.72	0.019221042
20	21.91	0.025187382
30	29.56	0.032832115
40	27.35	0.031441118
50	29.25	0.032475744
55	28.89	0.032061894

References

[1] FCC Part 22 Subpart H, “Cellular Radiotelephone Services”

[2] FCC Part 2 Subpart J, “Frequency allocations and radio treaty matters; general rules and regulations”,

[3] TIA/EIA-97-F, “Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations”, Feb 17, 2005.

[4] TIA-63-C, Land Mobile FM or PM Communications Equipment Measurement and Performance Standards, 2004.

[5] “Ericsson BCAM Wireless Development 800 MHz Remote Radio Unit CDMA (RRUC) Systems Design Specification” by David Tholl, Tektelic