Globalstar Satellite Packet Data Modem Module Antenna Port Narrowband Conducted Out-of-Band Emissions Test Report

1.0 Introduction

This test report documents the test results obtained by Qualcomm in measuring the Modem Module out-of-band narrowband conducted emissions (1559-1605 MHz) at the antenna port, per the preceding test plan. This report and the data it presents demonstrates compliance of the Module with the FCC Part 25 out-of-band emissions (OOBE) limits specified in 47 CFR Ch. 1 (10-1-98 Edition), Part 1, Section 25.213 (b), and (per Report and Order FCC 98-338, adopted 12-17-98) Section 25.200 (c).

Sufficient margins were seen with respect to all CDMA signal out-of-band emissions in the radionavigation band (1559-1605 MHz) and the global positioning satellite (GPS) subband within that band (1574.397-1576.443 MHz) to demonstrate compliance with the applicable narrowband OOBE limits.

2.0 Test Measurement Considerations

Emissions were measured at the Tx output port of the Module's RF Board, using a modified UT antenna, short lengths of coaxial cable, RF power splitter/divider, and a step attenuator, as described in the Globalstar UT Antenna Port Conducted Narrowband Out-of-Band Emissions (OOBE) Test Plan.

The correction factors for the test instrumentation and cable losses and the other test methodology correction factors described in the Test Plan were applied against the FCC out-of-band emissions limits to derive the measurement bandwidth dependent test limits to which the measured emissions were compared.

3.0 Test Results

Calibration measurement test results showing the combined test instrumentation and cable losses are presented in Table 1. Measurements of narrowband OOBE were performed using 2 bandwidths, 1 kHz and 300 Hz; the latter in successive 3 MHz frequency spans. Table 2 presents the OOB antenna gain and loss-corrected conservative lower-bound OOBE test limits in each frequency band using the measured loss correction factors from Table 1 Plots of the measured antenna port OOBE are presented in Appendix A. (Note that the plot display line values do not include the nominal OOB antenna gain correction factor of 5 dB.) Table 3 presents the calibration data for the test instruments employed.

The OOBE test data for the lowest frequency channel, Channel 1 (center frequency 1610.73 MHz) shows only low emissions levels, with greater than 9.5 dB margin with respect to the test limits at all frequencies from 1559 to 1605 MHz.

Table 1. Loss Calibration Measurement: Combined Splitter, Attenuators, Notch Filter and Cable Losses

Insertion Loss	
Frequency	**S21**
(MHz)	(dB)
1559	-17.1
1562	-17.1
1565	-17.1
1568	-17.0
1571	-17.0
1574	-17.0
1577	-17.0
1580	-17.0
1583	-17.1
1586	-17.2
1589	-17.3
1592	-17.5
1595	-17.7
1598	-18.1
1601	-18.6
1604	-19.0
1605	-19.3

Table 2. Loss-Corrected FCC OOBE Emissions Test Limits

[Corrected Limit (dBm) = Norm. Limit (dBW) + BW Corr. Factor (dB) + Splitter, Attenuator and Additional Cable Losses Corr. Factor (dB) + 30 dB]

Frequency Range (MHz)	FCC Pt. 25 Limits (dBW)	Spectrum Analyzer Meas.BW (Hz)	Bandwidth Correction Factor (dB)	Filter + Splitter+ Atten + Cable Loss Corr. Factor (dB)	Corrected FCC Pt. 25 OOBE Meas. Limits (dBm)
Radiated	**dBW/700 Hz**				
1559 - 1605	-80.0	1000	1.5	-17.1 to -19.3	-65.4 to -67.3
1559 - 1605	-80.0	300	-3.7	-17.1 to -19.3	-70.8 to -72.9
Conducted (1)	**dBW/700 Hz**				
1559-1590	-85.0	1000	1.5	-17.1 to -17.4	-70.6 to -70.8
1590-1605	-85.0	1000	1.5	-17.4 to -19.3	-70.8 to -72.7
1559 - 1562	-85.0	300	-3.7	-17.1	-75.8
1562 - 1565	-85.0	300	-3.7	-17.1	-75.7
1565 - 1568	-85.0	300	-3.7	-17.0	-75.7
1598 - 1571	-85.0	300	-3.7	-17.0	-75.7
1571 - 1574	-85.0	300	-3.7	-17.0	-75.7
1574 - 1577	-85.0	300	-3.7	-17.0	-75.7
1577 - 1580	-85.0	300	-3.7	-17.0	-75.7
1580 - 1583	-85.0	300	-3.7	-17.1	-75.8
1583 - 1586	-85.0	300	-3.7	-17.2	-75.8
1586 - 1589	-85.0	300	-3.7	-17.3	-76.0
1589 - 1592	-85.0	300	-3.7	-17.5	-76.1
1592 - 1595	-85.0	300	-3.7	-17.7	-76.4
1595 - 1598	-85.0	300	-3.7	-18.1	-76.8
1598 - 1601	-85.0	300	-3.7	-18.6	-77.2
1601 - 1604	-85.0	300	-3.7	-19.0	-77.7
1604 - 1605	-85.0	300	-3.7	-19.3	-77.9

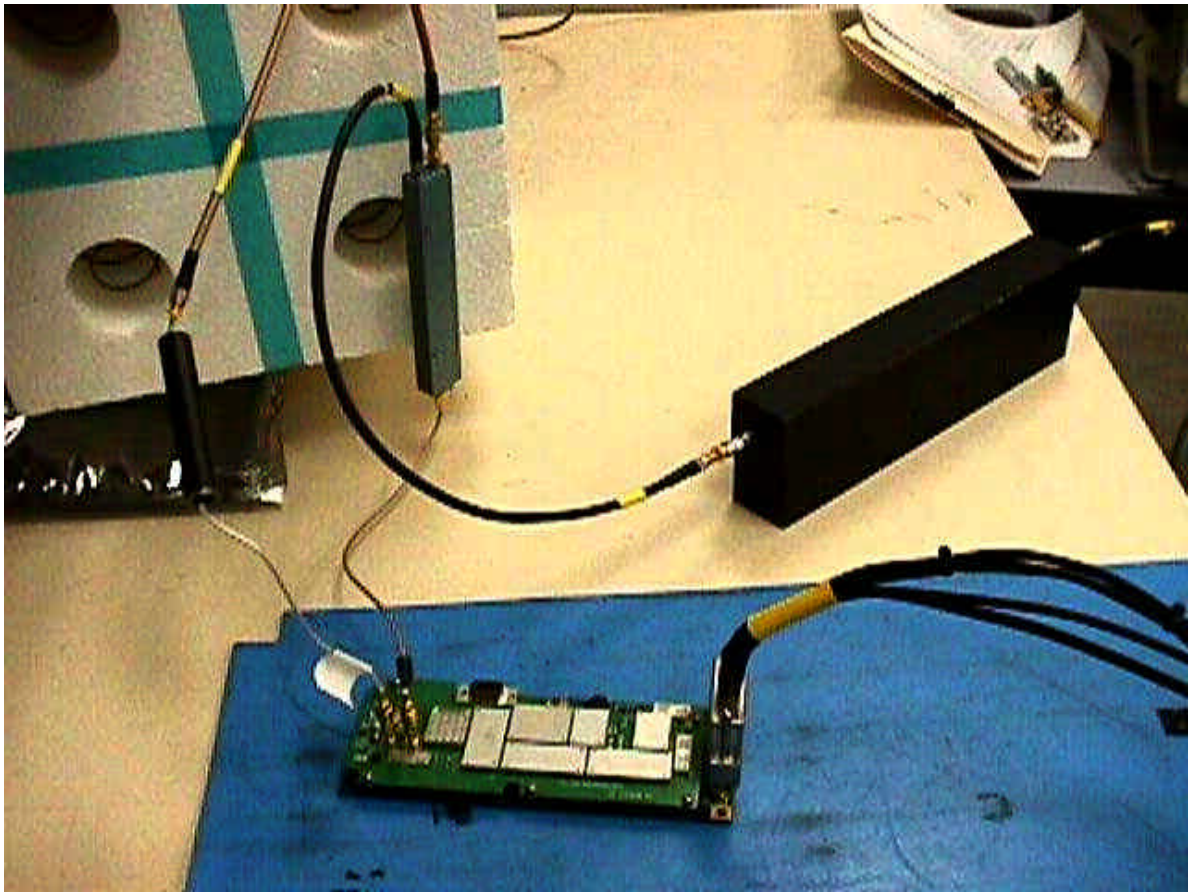
(1) Equivalent Conducted Limit for 5.0 dB Out-of-Band Antenna Gain

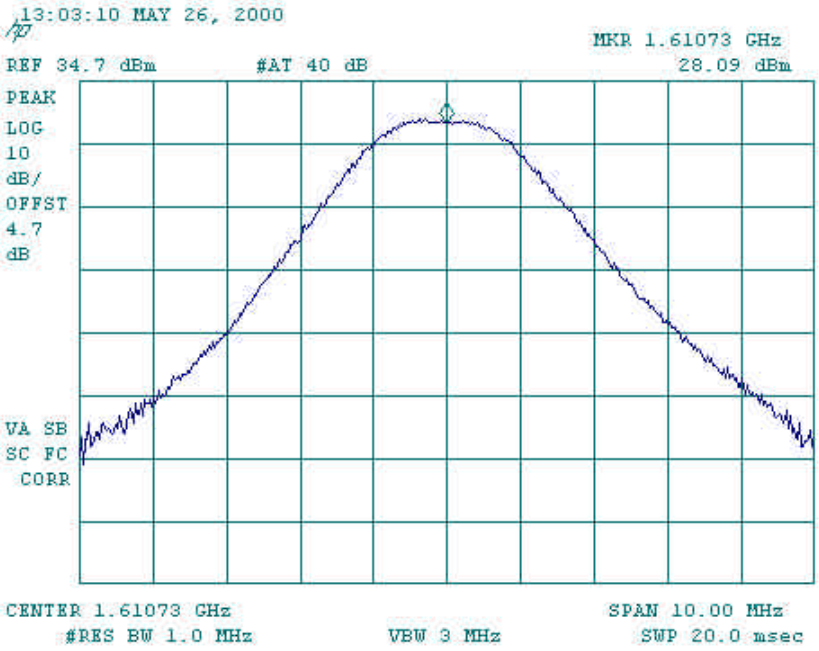
Table 3. OOBE Test Instrumentation Calibration Data Record

Test Instrument	Manufacturer's Model No.	Serial No.	Last Cal	Cal Due
Spectrum Analyzer (9 kHz – 6.5 GHz)	HP 8595 E	3639 A 02287	11-9-99	11-9-00
Network Analyzer (30 kHz – 6 GHz)	HP 8753 D	3410 A 04157	06-14-99	06-14-00
RF Power Splitter (0.5 – 18 GHz)	Narda Model 4426-2	02164	N/A	N/A
Channel 1 Notch Filter	Lorch Microwave 6CN-1610.73/X2-SM/SM	1221-17131-1610 29971 S/N Y2	N/A	N/A
Globalstar UT Tester	Anritsu MT 8803G	MB 06986	01-21-00	01-21-01

Appendix A. Narrowband OOBE Measurements

Date/Time	5/26/2000 10:59:56 AM
Title	G* Module Part 25 OOBE
Job Number	00061
Test Name	CE 1559 MHz - 1605 MHz
EUT Name	G* Module
EUT Serial Number	N10741GP7
Analyzer Model Number	HP8595E (Spec. An), HP8753D (Net. An)
Analyzer Serial Number	3639A02287 (Spec An), 3410A04157 (Net. An)
Site Description	12V DC (with gnd), 370 mA, UT TX Ch. 1, RX Ch. 7, Anritsu: ref sig 30 dBm, beam sig -80 dBm, UT TX power on SA 23.39 dBm plus 4.7 dB loss = 28.09 dBm
Operator Name	Suzanne Galati

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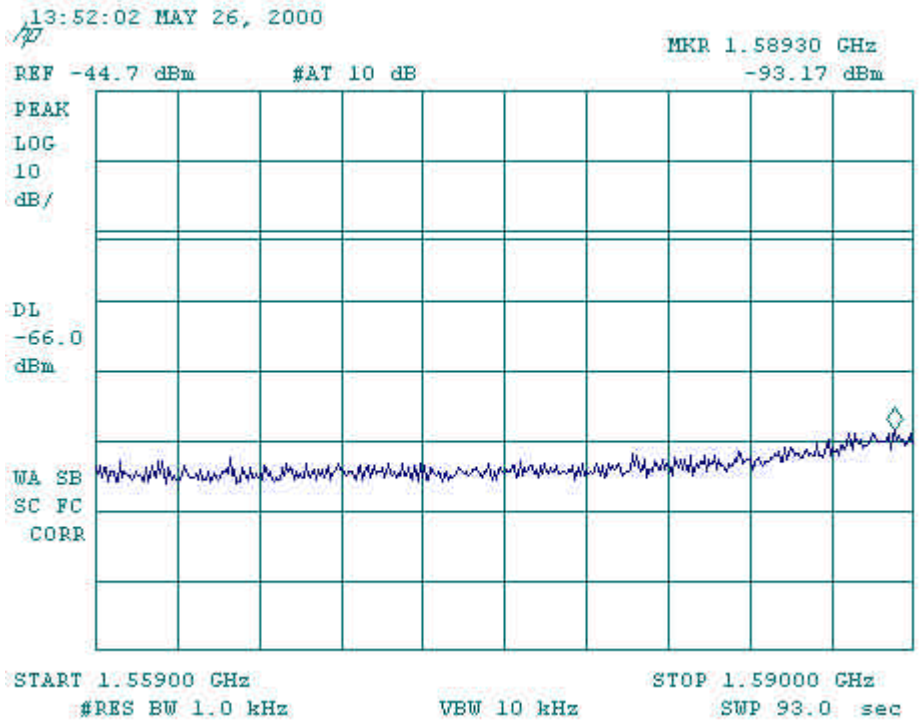
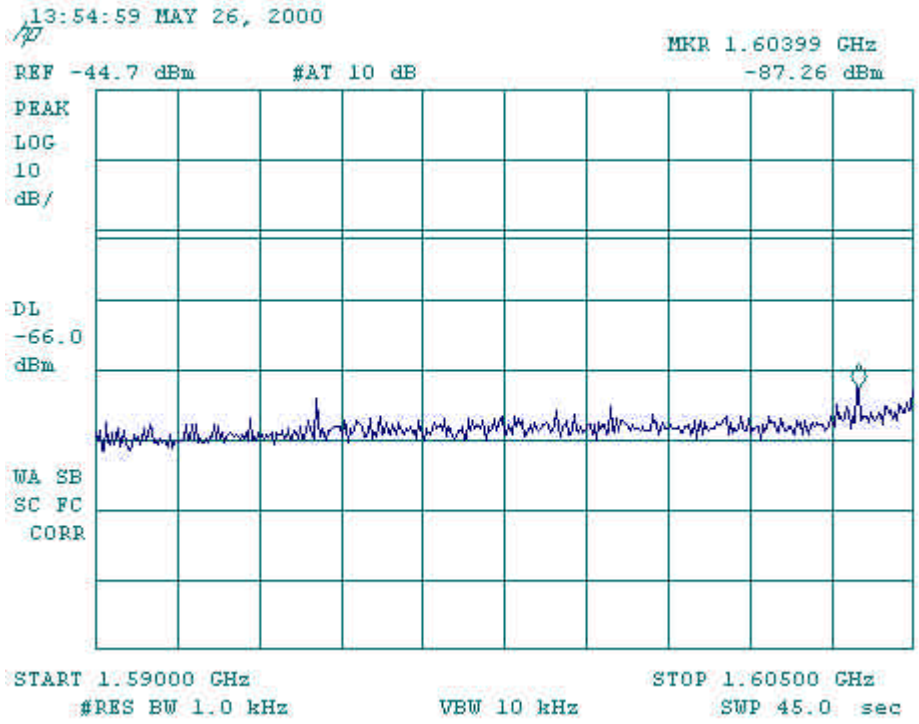
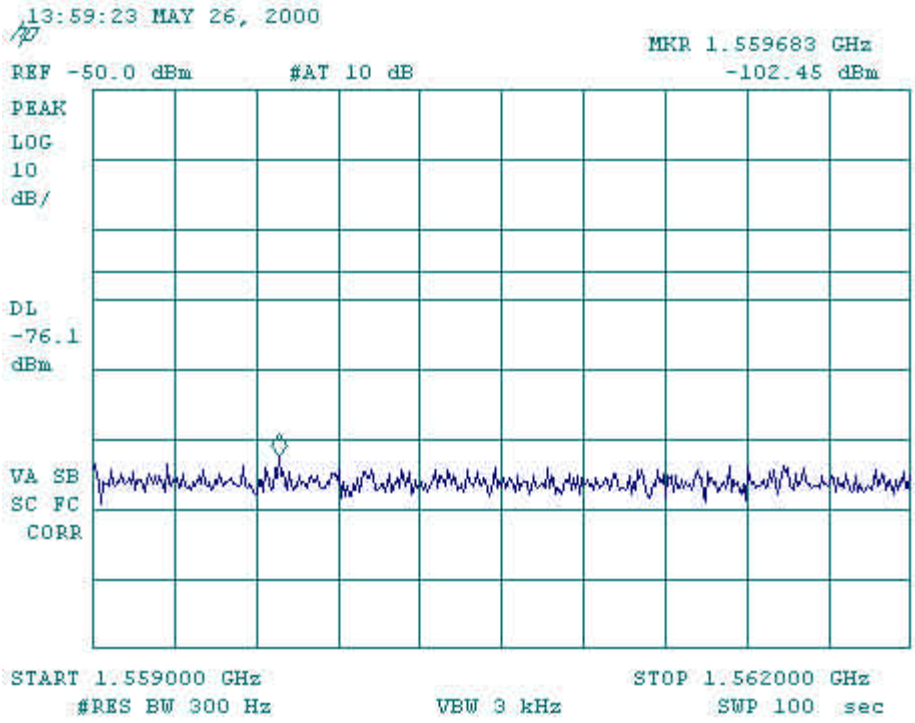
MKR 1.61073 GHz
28.09 dBm
REF 34.7 dBm
#AT 40 dB
PEAK
LOG
10
dB/
OFFST
4.7
dB
VA SB
SC FC
CORR
CENTER 1.61073 GHz
SPAN 10.00 MHz
#RES BW 1.0 MHz
VBW 3 MHz
SWP 20.0 msec

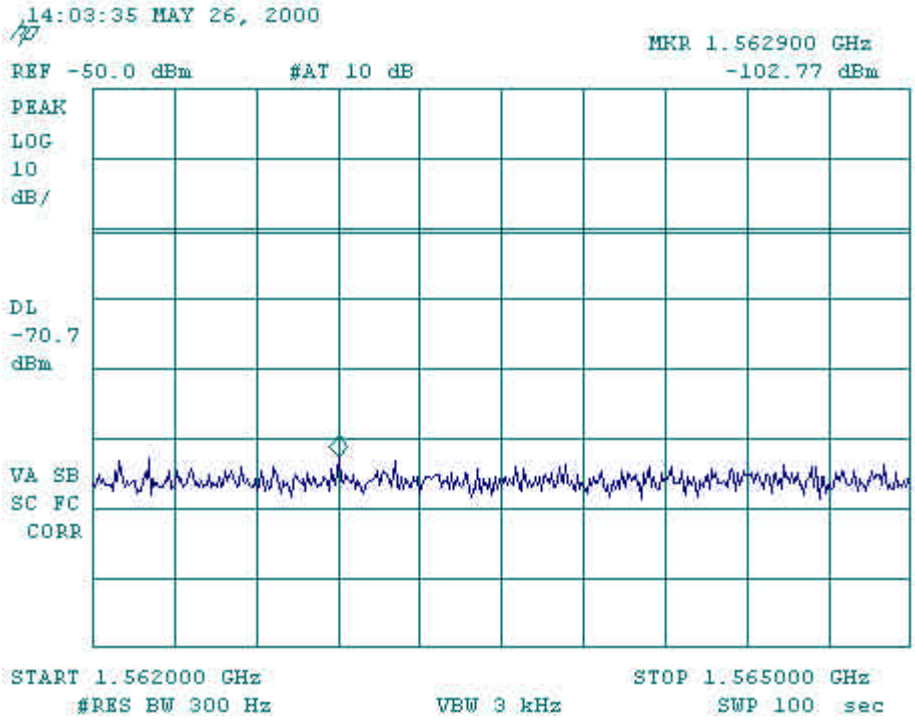
1 kHz Bandwidth:

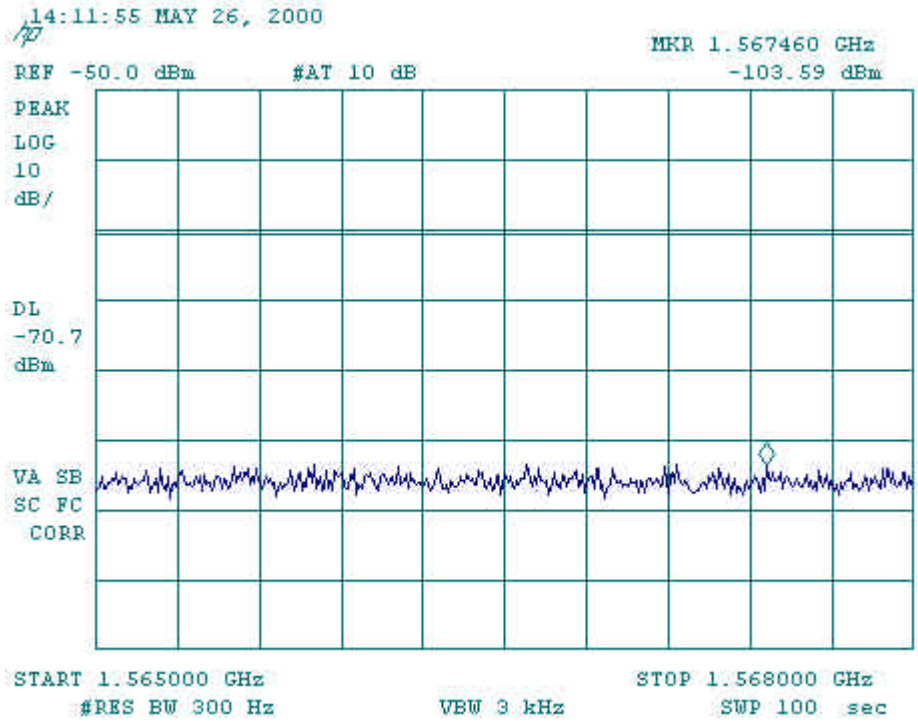




300 Hz Bandwidth:



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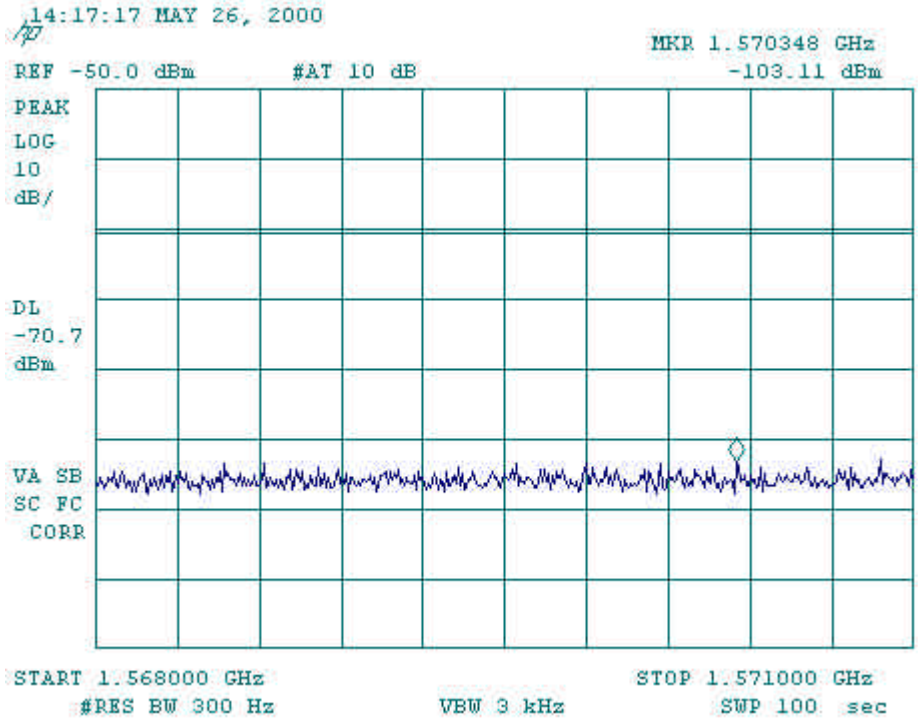
REF -50.0 dBm
#AT 10 dB
-103.59 dBm
PEAK
LOG
10
dB/
DL
-70.7
dBm
VA SB
SC FC
CORR
START 1.565000 GHz
STOP 1.568000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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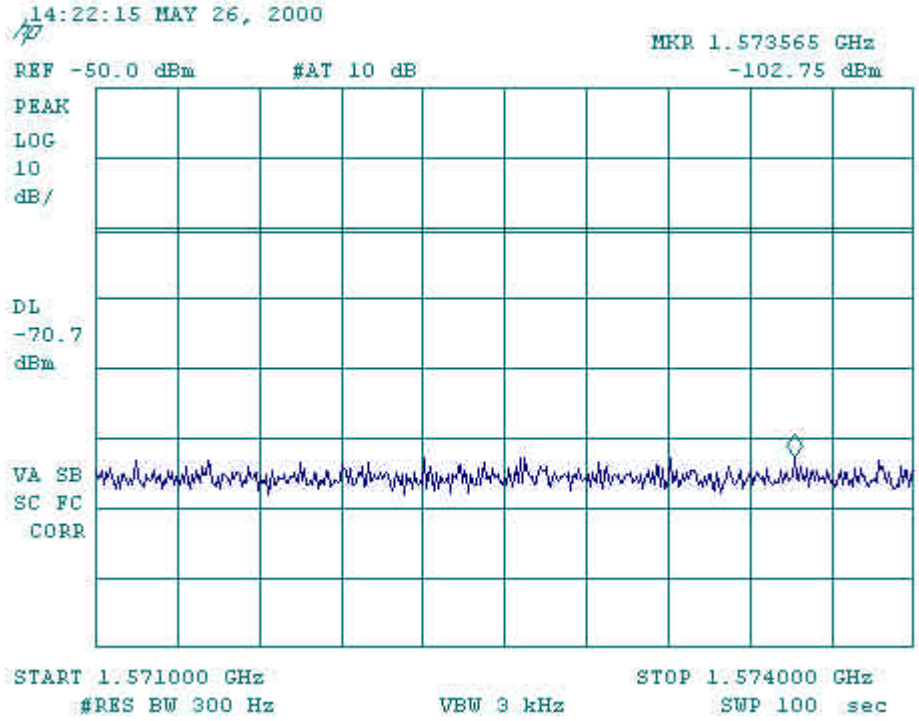
REF -50.0 dBm
#AT 10 dB
-103.11 dBm
PEAK
LOG
10
dB/
DL
-70.7
dBm
VA SB
SC FC
CORR
START 1.568000 GHz
STOP 1.571000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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REF -50.0 dBm
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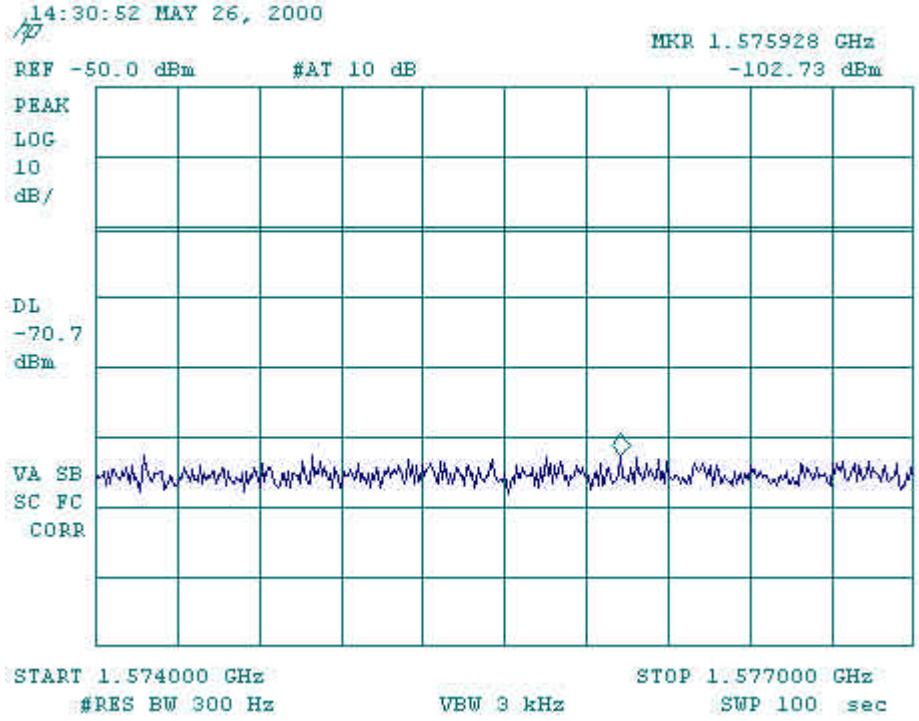
-102.75 dBm
PEAK
LOG
10
dB/
DL
-70.7
dBm
VA SB
SC FC
CORR
START 1.571000 GHz
STOP 1.574000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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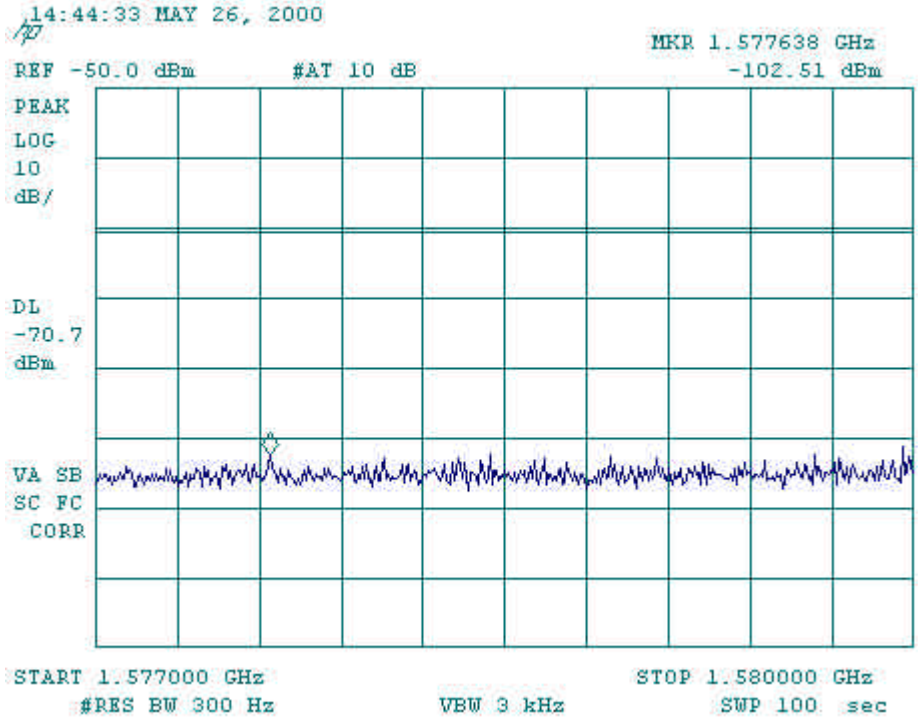
-102.73 dBm
PEAK
LOG
10
dB/
DL
-70.7
dBm
VA SB
SC FC
CORR
START 1.574000 GHz
STOP 1.577000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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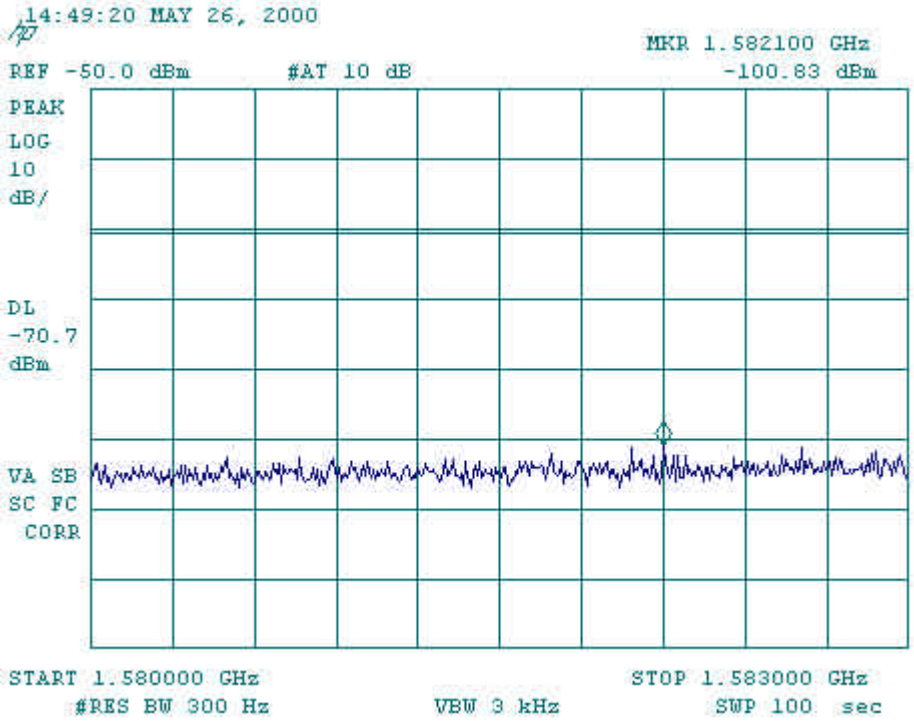
-102.51 dBm
PEAK
LOG
10
dB/
DL
-70.7
dBm
VA SB
SC FC
CORR
START 1.577000 GHz
STOP 1.580000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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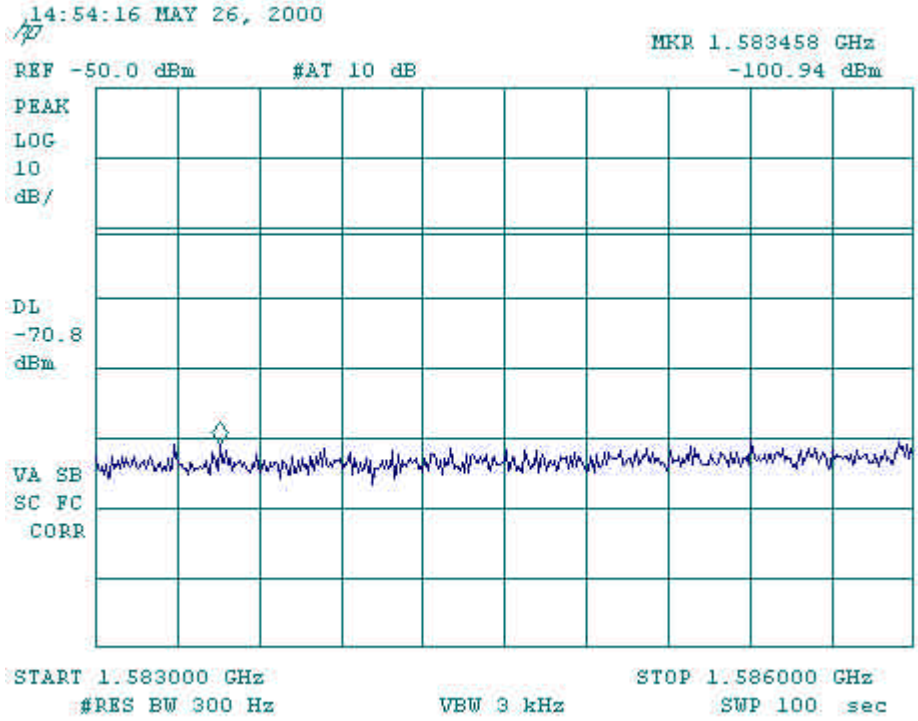
MKR 1.582100 GHz
REF -50.0 dBm
#AT 10 dB
-100.83 dBm
PEAK
LOG
10
dB/
DL
-70.7
dBm
VA SB
SC FC
CORR
START 1.580000 GHz
STOP 1.583000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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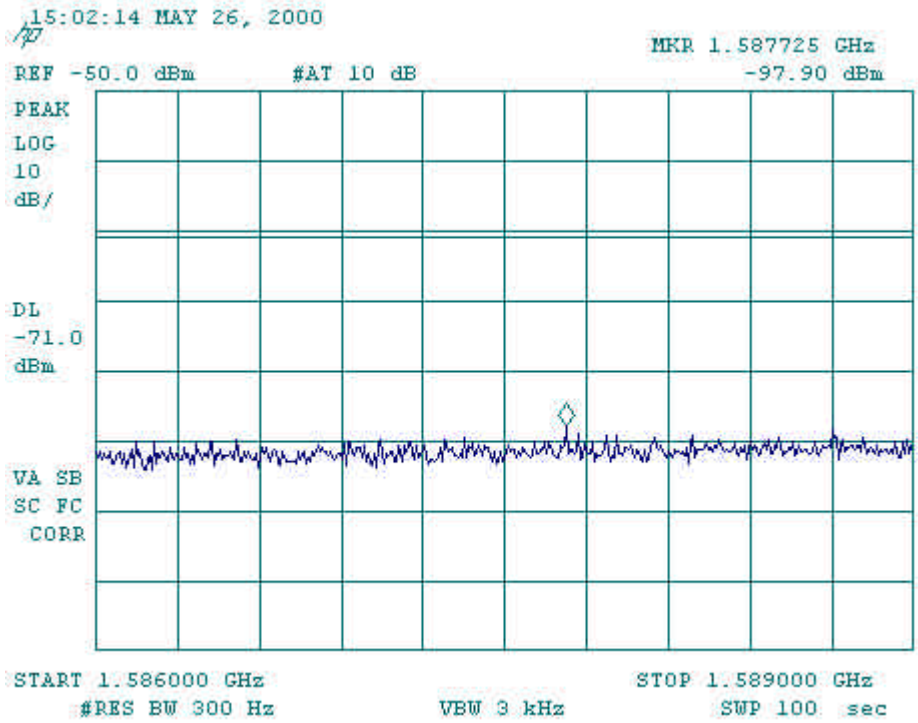
MKR 1.583458 GHz
REF -50.0 dBm
#AT 10 dB
-100.94 dBm
PEAK
LOG
10
dB/
DL
-70.8
dBm
VA SB
SC FC
CORR
START 1.583000 GHz
STOP 1.586000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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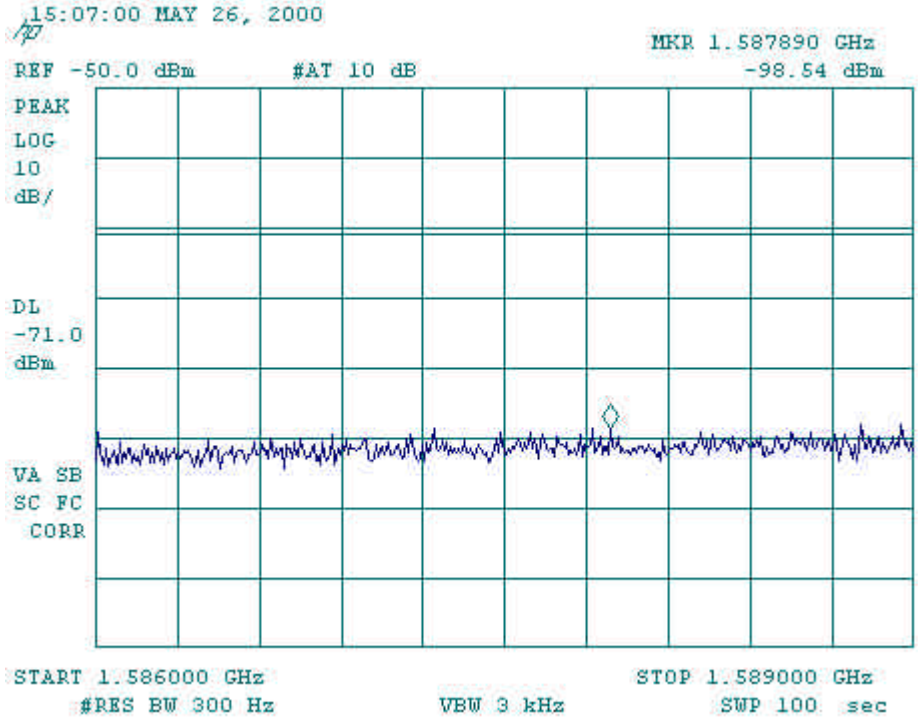
MKR 1.587725 GHz
REF -50.0 dBm
#AT 10 dB
-97.90 dBm
PEAK
LOG
10
dB/
DL
-71.0
dBm
VA SB
SC FC
CORR
START 1.586000 GHz
STOP 1.589000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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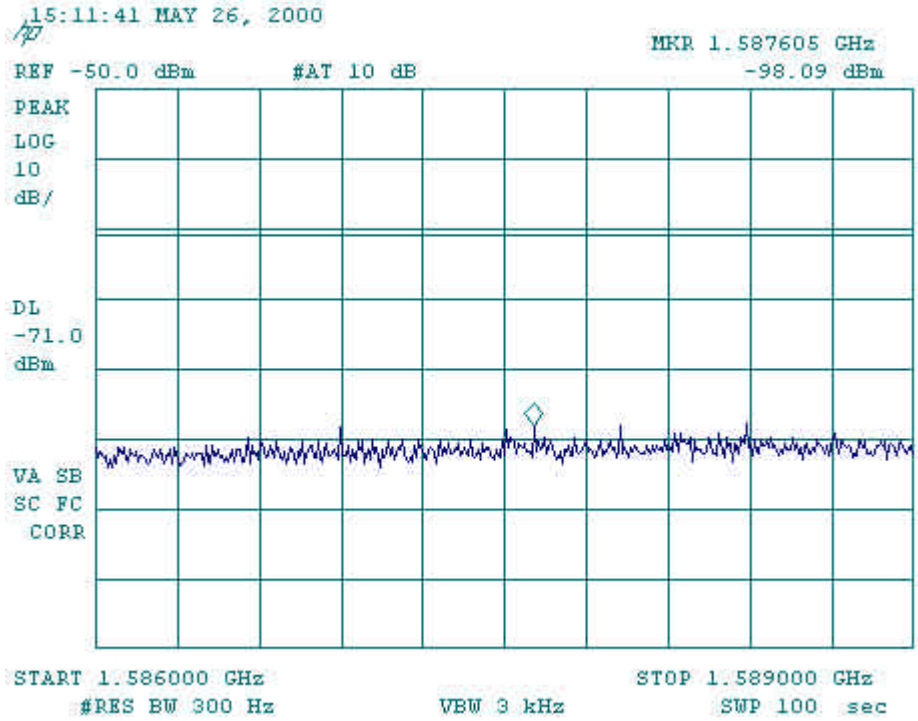
MKR 1.587890 GHz
REF -50.0 dBm
#AT 10 dB
-98.54 dBm
PEAK
LOG
10
dB/
DL
-71.0
dBm
VA SB
SC FC
CORR
START 1.586000 GHz
STOP 1.589000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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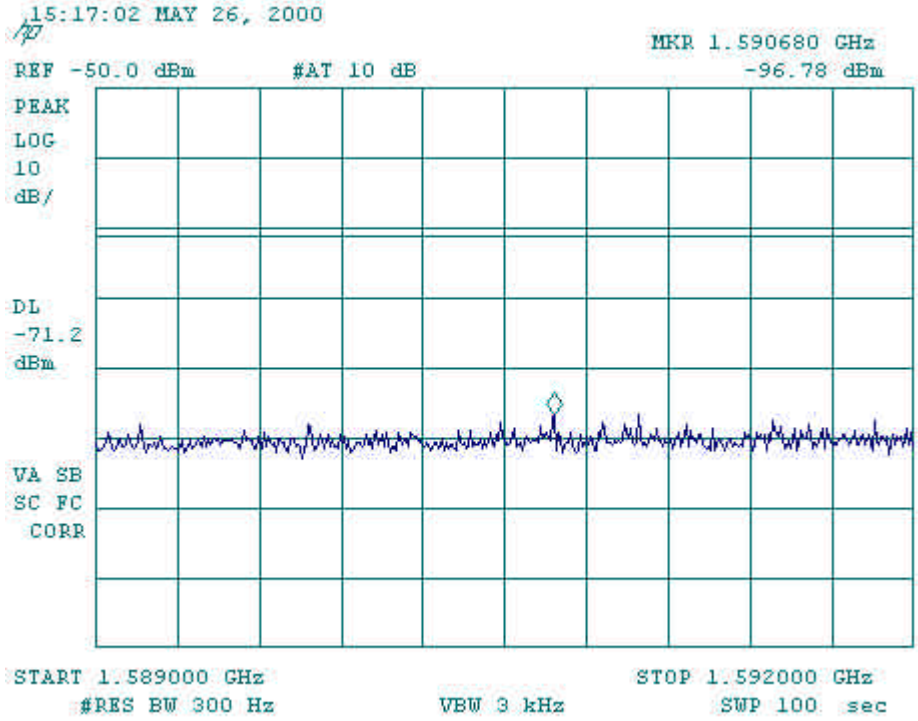
-98.09 dBm
PEAK
LOG
10
dB/
DL
-71.0
dBm
VA SB
SC FC
CORR
START 1.586000 GHz
STOP 1.589000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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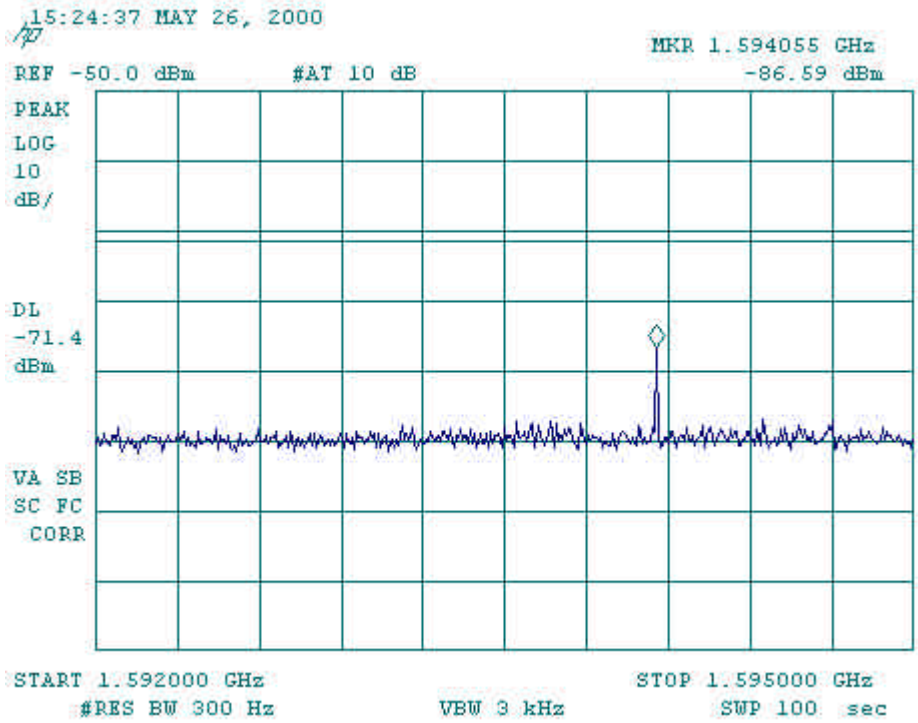
REF -50.0 dBm
#AT 10 dB
-96.78 dBm
PEAK
LOG
10
dB/
DL
-71.2
dBm
VA SB
SC FC
CORR
START 1.589000 GHz
STOP 1.592000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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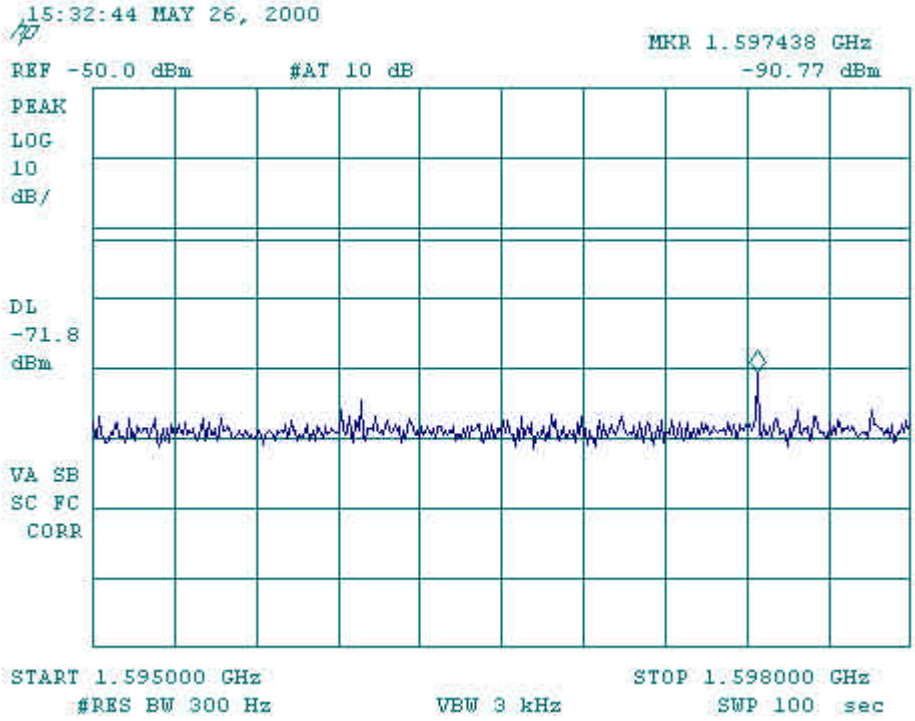
MKR 1.594055 GHz
REF -50.0 dBm
#AT 10 dB
-86.59 dBm
PEAK
LOG
10
dB/
DL
-71.4
dBm
VA SB
SC FC
CORR
START 1.592000 GHz
STOP 1.595000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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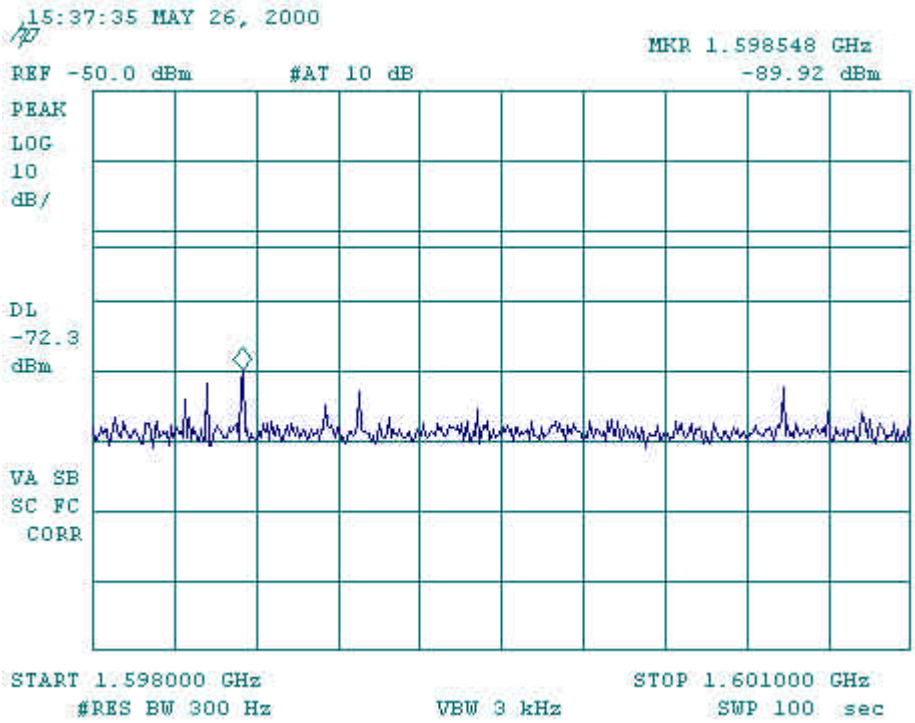
MKR 1.597438 GHz
REF -50.0 dBm
#AT 10 dB
-90.77 dBm
PEAK
LOG
10
dB/
DL
-71.8
dBm
VA SB
SC FC
CORR
START 1.595000 GHz
STOP 1.598000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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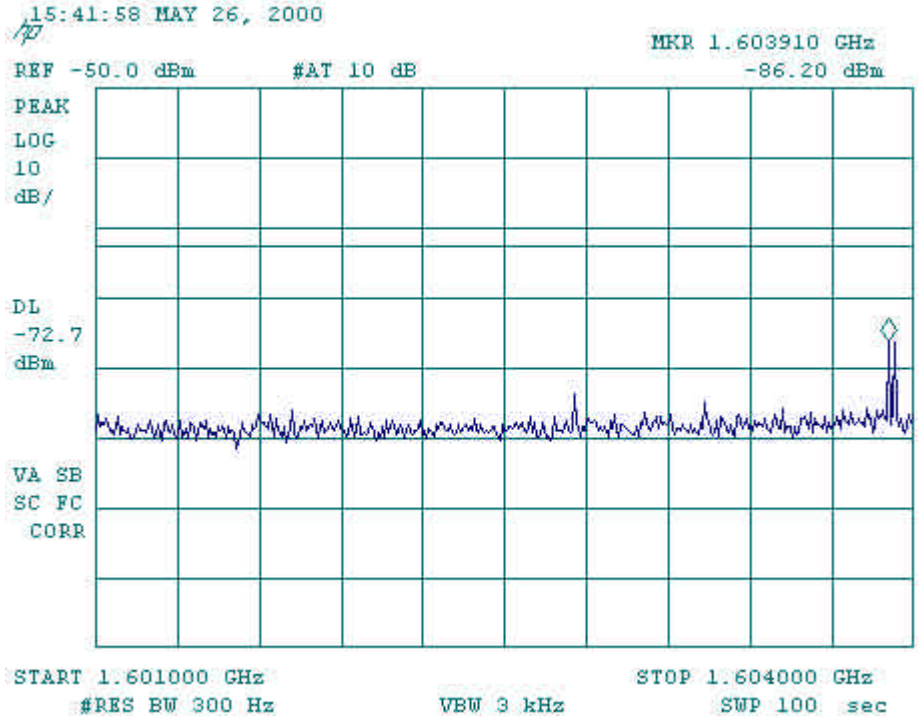
MKR 1.598548 GHz
REF -50.0 dBm
#AT 10 dB
-89.92 dBm
PEAK
LOG
10
dB/
DL
-72.3
dBm
VA SB
SC FC
CORR
START 1.598000 GHz
STOP 1.601000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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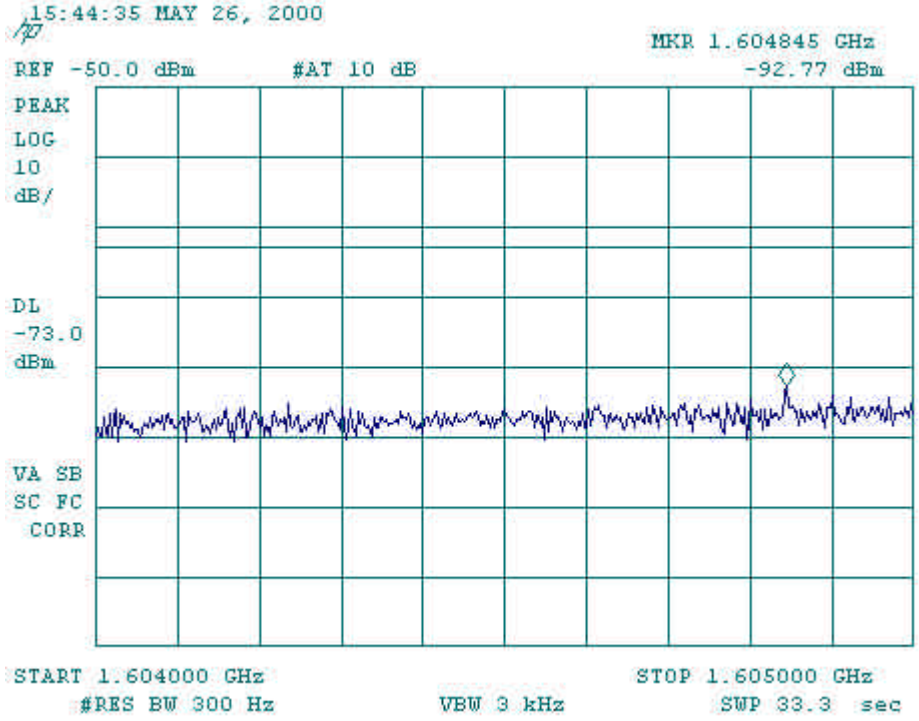
REF -50.0 dBm
#AT 10 dB
-86.20 dBm
PEAK
LOG
10
dB/
DL
-72.7
dBm
VA SB
SC FC
CORR
START 1.601000 GHz
STOP 1.604000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 100 sec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MKR 1.604845 GHz
REF -50.0 dBm
#AT 10 dB
-92.77 dBm
PEAK
LOG
10
dB/
DL
-73.0
dBm
VA SB
SC FC
CORR
START 1.604000 GHz
STOP 1.605000 GHz
#RES BW 300 Hz
VBW 3 kHz
SWP 33.3 sec