

Exhibit E - Measurement Report

CI Wireless, Inc.

EKO-19

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Certificate of Compliance

Applicant: CI Wireless, Inc.

Applicant's Address: 1211 Ira E. Woods Ave.
Grapevine, TX 76051

Model: EKO-19 PCS extender

Serial Number Hub 198001
Serial Number Microcell: 1980011

Project Number: 98-385

Test Dates: April 8 through 9, 1998

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measurement data and this report. I believe them to be true and accurate. The **CI Wireless Inc. EKO-19 PCS extender FCC ID: NUW002EKO** was tested and found to be in compliance with FCC Parts 15 and 24 for Intentional Radiators.

Jeffrey A. Lenk
President



1.0 Equipment Under Test (EUT) Description

Hub Unit

The Hub unit provides the hardware interface to the base station and the fiber optic cables that will transport the RF signals to the Microcell Units. The Hub will support up to 4 Microcell Units by installing additional Fiber Optic Transceivers. Each of these Microcell Units will be individually alarmed and controlled. The optical path to each of the Microcell Units may be up to 20 kilometers in length.

Microcell Unit

The Microcell Unit provides all of the electronic hardware to interface to the fiber optic cable and the required amplifiers to process the up link and down link RF signals. The up link and down link signals are duplexed to a single radiating antenna via a coaxial cable. Access to alarms and controls for the hub and other Microcell Units is available via the control module.

The Hub unit and Microcell were tested together as a complete system (the **EKO-19**). The Microcell can be configured to operate in the A, B or D PCS bands. The EKO-19 was tested for compliance in the A, B, and D bands with CDMA, GSM, and NADC modulation.

Measurements were performed to demonstrate compliance with FCC Rule Parts 2, and 24 subpart E, for Intentional Radiators. A separate verification report pursuant to Part 15, Subpart B has been prepared for the **CI Wireless Inc. EKO-19 PCS extender** as a Digital Device. Based on Part 15.101, testing and generation of a report for the receiver portion of the EKO-19 is not required because it operates above 960 MHz. The unit is subject to the provisions of Part 15.5. Specific test requirements include the following:

47 CFR 2.985 & 47 CFR 24.232	Power and antenna height limits
47 CFR 2.995 & 47 CFR 24.235	Frequency stability
47 CFR 2.987	Modulation characteristics
47 CFR 2.989	Occupied bandwidth
47 CFR 2.991 & 47 CFR 24.238	Spurious emissions at antenna terminals
47 CFR 2.993	Field strength of spurious emissions
47 CFR 15.107 & 47 CFR 15.109	Radiated and Conducted Emissions

2.0 Power And Antenna Height Limits

47 CFR 24.232 provides limits for antenna height, peak equivalent isotropically radiated power and power measured at the output terminals for PCS base stations. Antenna height and radiated power limits only apply as the system is installed. The unit as manufactured is required to meet the limit for power at the output terminals.

2.1 Test Procedure

The EKO-19 was set up as per the tune-up procedure described in section 9.5.3 of the product manual. The signal generator was setup to output CW signal. The signal was fed into the EKO-19 Hub unit. The power was measured at the output terminal of the EKO-19 microcell unit. The EKO-19 extender was operated with a 10dB attenuator connected to the antenna port then connected to an HP-436A power meter.

2.2 Test Criteria

The power output measured at the antenna terminal shall not exceed 100 Watts.

2.3 Test Results

The output power measured was below the limit. Power output was 32.3 dBm or 2 Watts. The test data appears in appendix A. Test set-up photographs appear in appendix E.

3.0 Frequency Stability

Frequency stability requirements are not applicable to the EKO-19 because there is no down conversion.

4.0 Modulation Characteristics

Modulation characteristics requirements are not applicable to the EKO-19 because the system simply receives, distributes, and rebroadcasts already modulated signals. Signal in vs. signal out tests were done to demonstrate signal purity through the EKO-19. See measurement section 8.

5.0 Occupied Bandwidth

Occupied bandwidth requirements are not applicable to the EKO-19 because the system simply receives, distributes, and rebroadcasts already modulated signals. Signal in vs. signal out tests were done to demonstrate signal purity through the EKO-19. See measurement section 8.

6.0 Spurious Emissions At Antenna Terminals

The radio frequency power generated within the equipment and appearing on a spurious frequency shall be measured at the output terminals.

6.1 Test Procedure

The EKO-19 extender was operated with 30dB attenuators connected to the antenna port then connected to an HP-8566B spectrum analyzer. Two tone CDMA, GSM, and NADC modulation was employed at frequencies closest to the upper and lower edges of bands A, B, and D.

6.2 Test Criteria

Section 24.238 states that on any frequency outside a frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log(\text{power})$ dB. The limit, at the operating power of the EKO-19 extender is -16 dBm.

6.3 Test Results

Spurious emissions outside of the allowed frequency block were below the -16 dBm limit. The test data appears in appendix B. Test set-up photographs appear in appendix E.

7.0 Field Strength Of Spurious Emissions

The EKO-19 was measured for case radiation as operated with a dummy load at the antenna terminals.

7.1 Test Procedure

The EKO-19 extender was operated with 30dB attenuators connected to the antenna port. The EUT was placed on a non-conductive table 0.8 meter high in a 20' x 26' x 10' semi-anechoic shielded room. The receiving antenna was placed 1 meter from the EUT. The antenna height was 0.8 meter. A HP-8566B spectrum analyzer was used to measure the emissions. The EKO-19 was operated at rated power in CW mode.

7.2 Test Criteria

47 CFR 2.993 requires spurious emissions are to be less than that which would be radiated by a -13 dBm transmitter into a 1/2 wave dipole, at the same distance as the EUT. Calculations for the limits appear in table 1 of the appendix.

7.3 Test Results

The field strength of spurious emissions was below allowed limits for the CI Wireless EKO-19. The test data appears in appendix C. Test set-up photographs appear in appendix E.

8.0 Signal Purity

Comparison of signal in to signal out of the EUT shall demonstrate the level of distortion that the EUT introduces.

8.1 Test Procedure

The HP-8566B was used to measure signals directly from the signal generator. These signals were then fed into the EKO-19 and measured at the output of the EKO-19 with the spectrum analyzer. Three tests were done-one for each intended type of modulation, CDMA, GSM, and NADC.

8.2 Test Criteria

There is no criteria for signal purity for extenders

8.3 Test Results

The plots of signal out vs. signal in show no significant degradation of the input signal. The test data appears in appendix D. Test set-up photographs appear in appendix E.

9.0 List Of Test Equipment

A list of the test equipment utilized to perform the conducted and radiated emission measurements is given below. The date of calibration is given for each.

<u>Device</u>	<u>Description</u>	<u>Date Last Calibrated</u>
HP 8566B, S/N 2950A06265	Spectrum Analyzer	09/22/97
Rhode & Schwarz SMIQ-03E, S/N 73719	Signal Generator	3/16/98
Rhode & Schwarz SMIQ-03E, S/N 73607	Signal Generator	2/26/98
EMCO 3109, S/N 2025	Antenna	9/22/97
EMCO 3106, S/N 2044	Double Ridged Horn Antenna	10/6/97
EMCO 3115, S/N 3578	Double Ridged Horn Antenna	04/30/97
HP-436A, S/N 2709A2921	Power Meter	1/21/98

Appendix A

Power Output

Power Output After Tune-Up Procedure

Power output = 32.3 dBm or 2 Watts

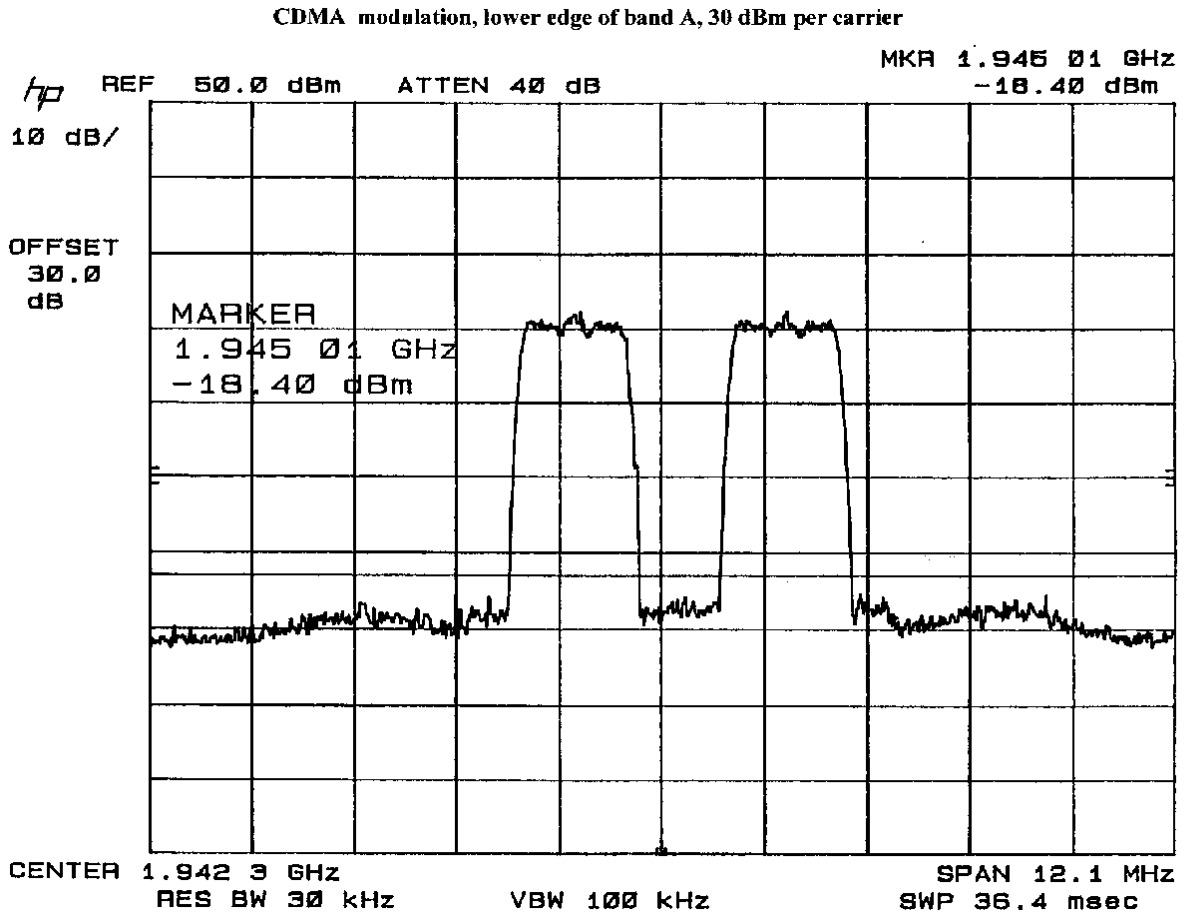
Appendix B Spurious Emissions at Antenna Terminals

Spurious Emissions at Antenna Terminals
CDMA modulation, lower edge of band A, 30 dBm per carrier

CI Wireless, Inc.
EKO-19 PCS Extender

SERIAL #:
DATE: April 9, 1998

PROJECT #: 98-385



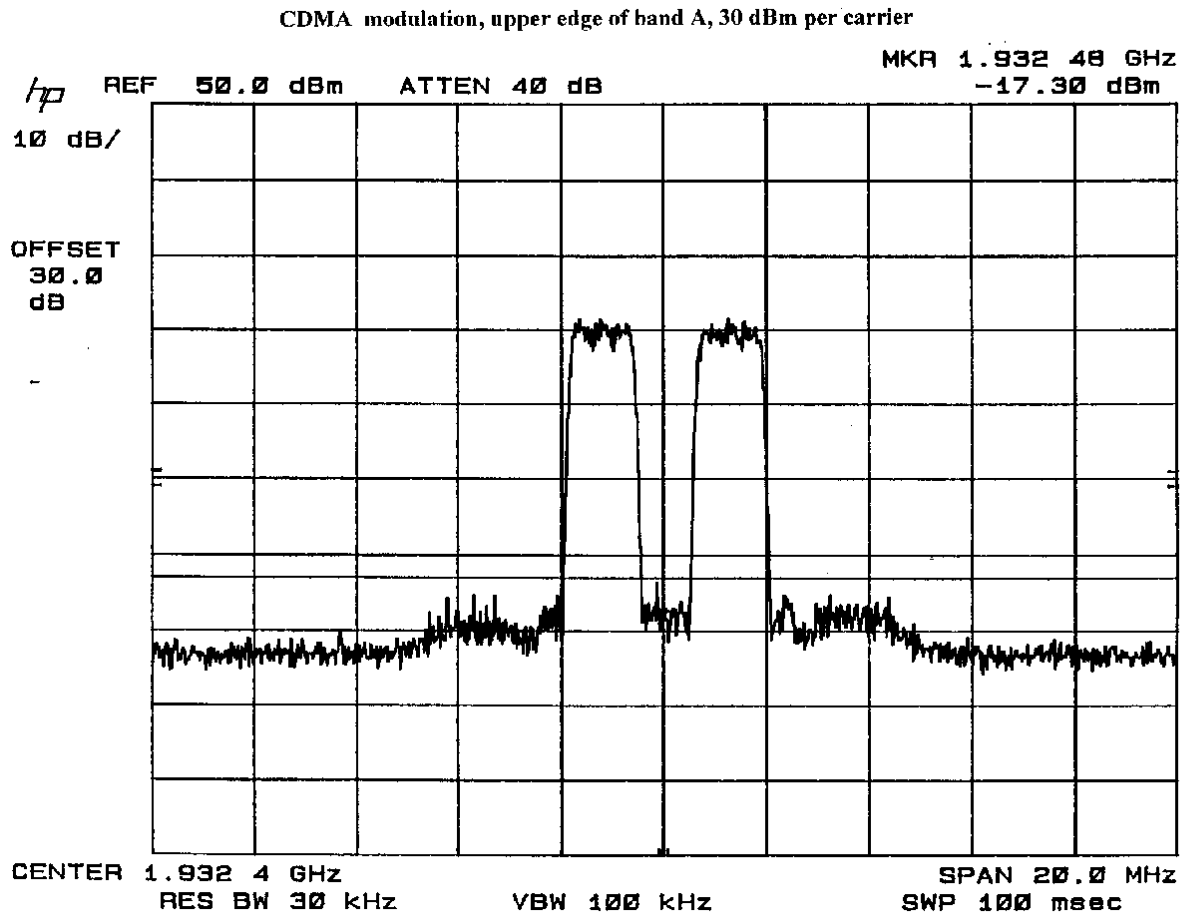
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CDMA modulation, upper edge of band A, 30 dBm per carrier

CI Wireless, Inc.
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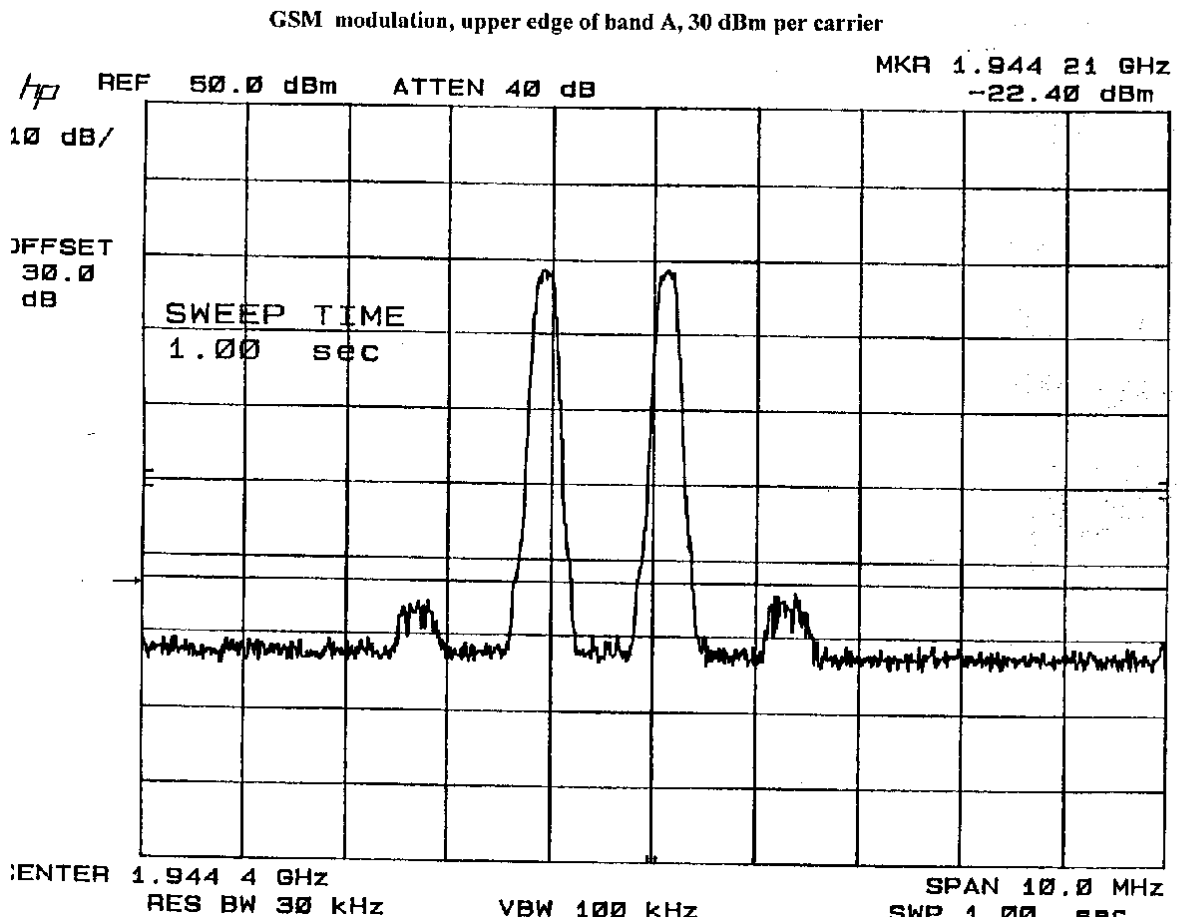
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Spurious Emissions at Antenna Terminals
GSM modulation, upper edge of band A, 30 dBm per carrier

CI Wireless, Inc.
EKO-19 PCS Extender

SERIAL #:
DATE: April 9, 1998

PROJECT #: 98-385



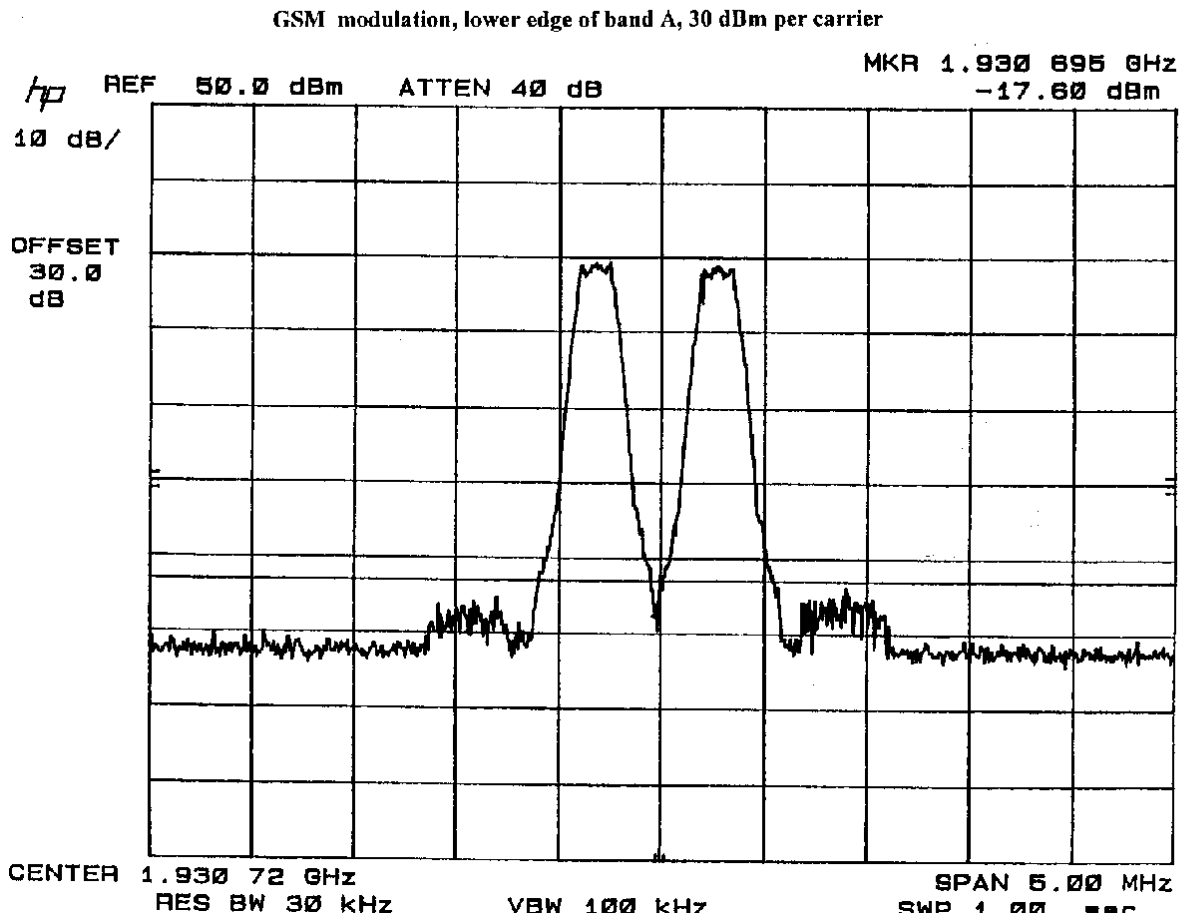
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GSM modulation, lower edge of band A, 30 dBm per carrier

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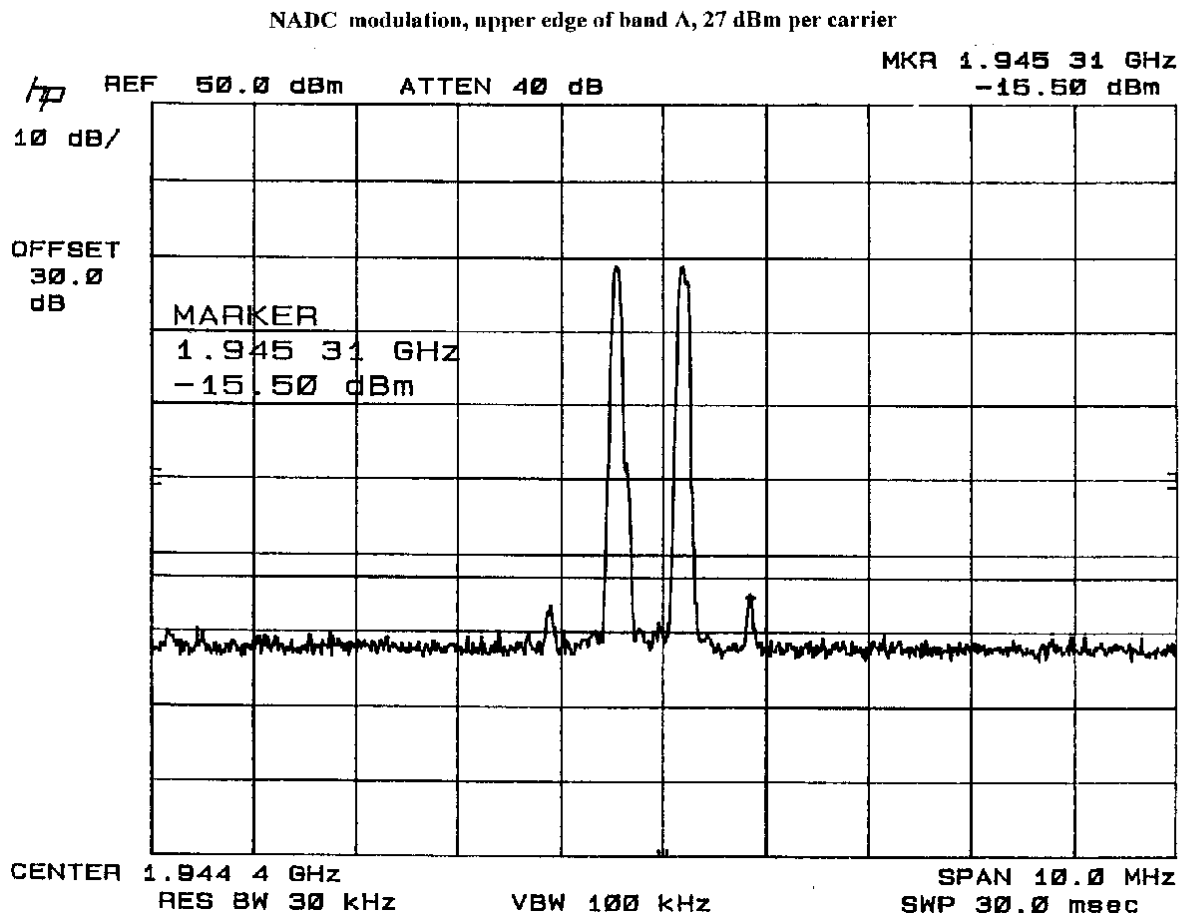
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Spurious Emissions at Antenna Terminals
NADC modulation, upper edge of band A, 27 dBm per carrier

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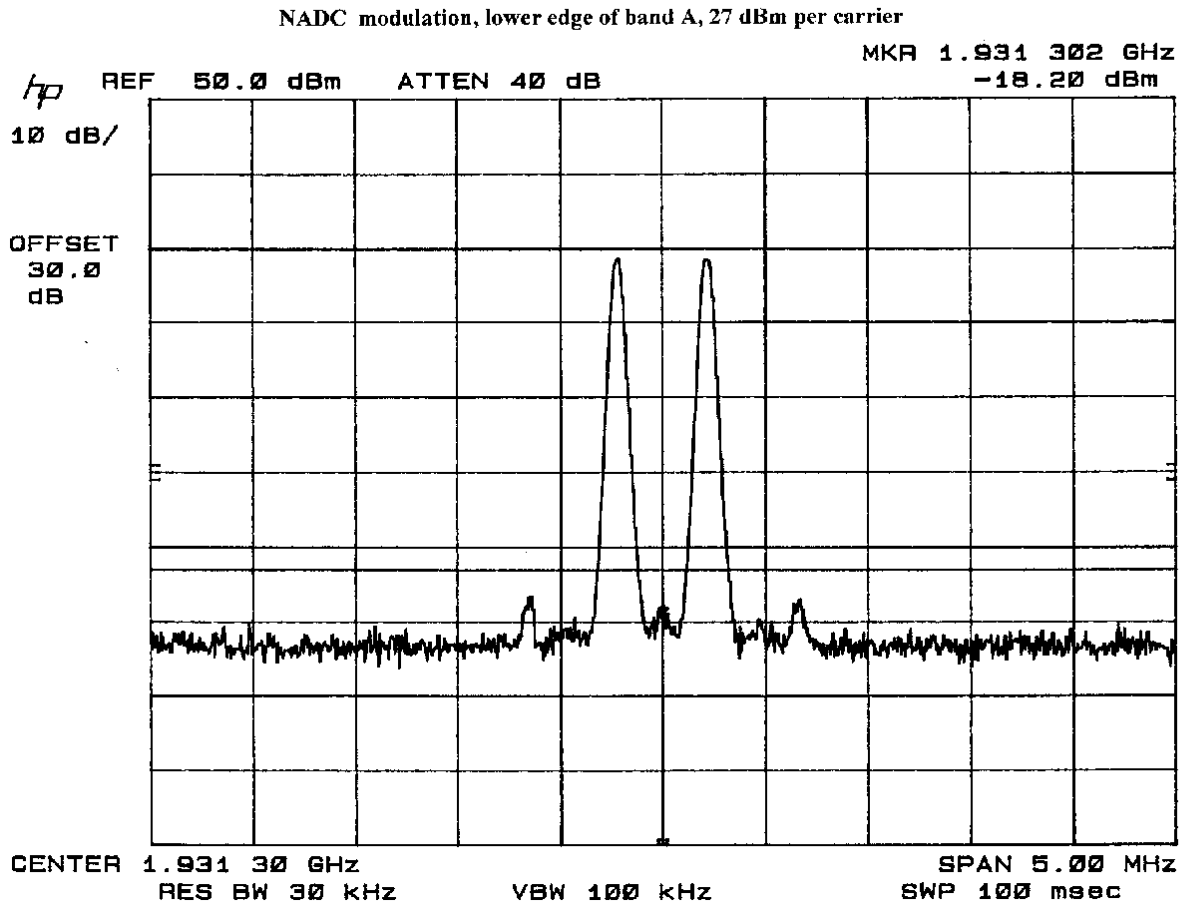
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Spurious Emissions at Antenna Terminals
NADC modulation, lower edge of band A, 27 dBm per carrier

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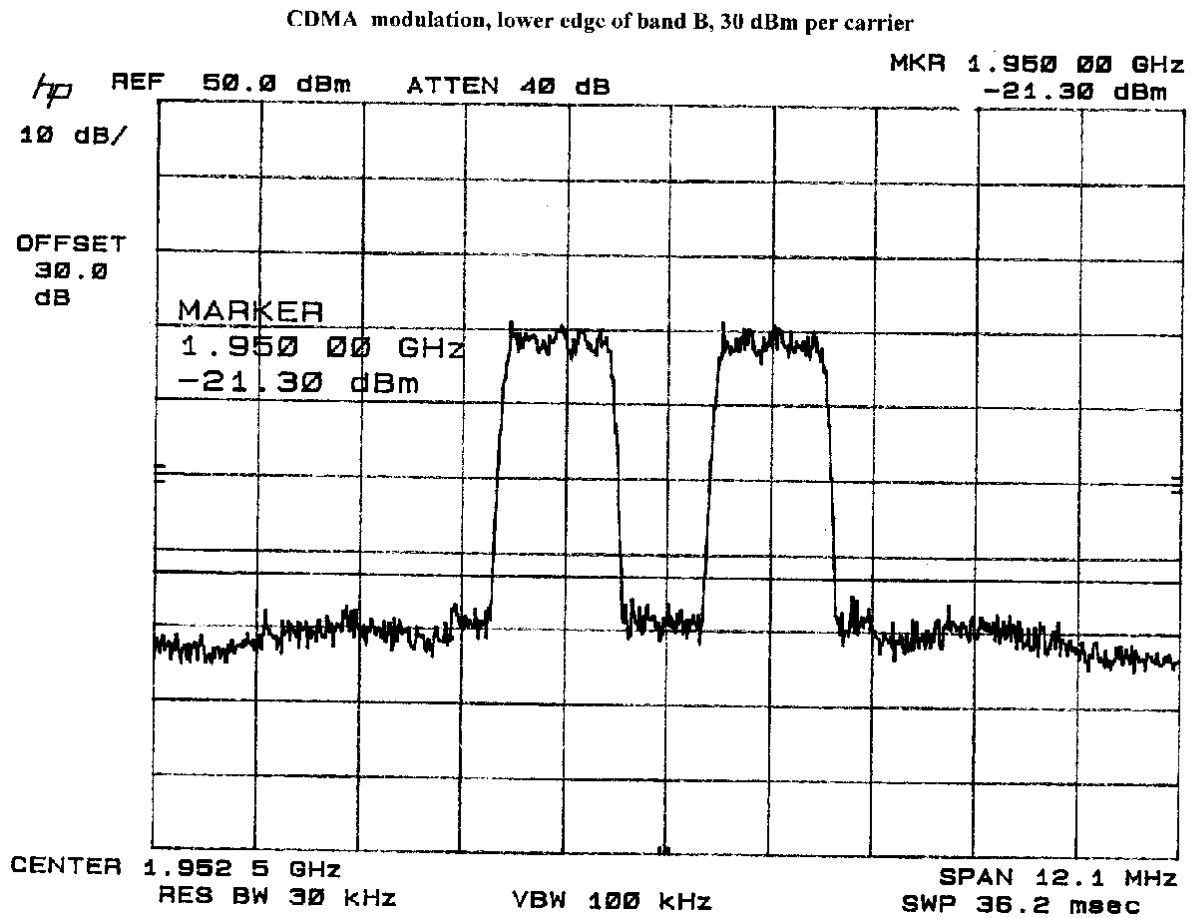
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Spurious Emissions at Antenna Terminals
CDMA modulation, lower edge of band B, 30 dBm per carrier

CI Wireless, Inc.
 EKO-19 PCS Extender

SERIAL #:
 DATE: April 9, 1998

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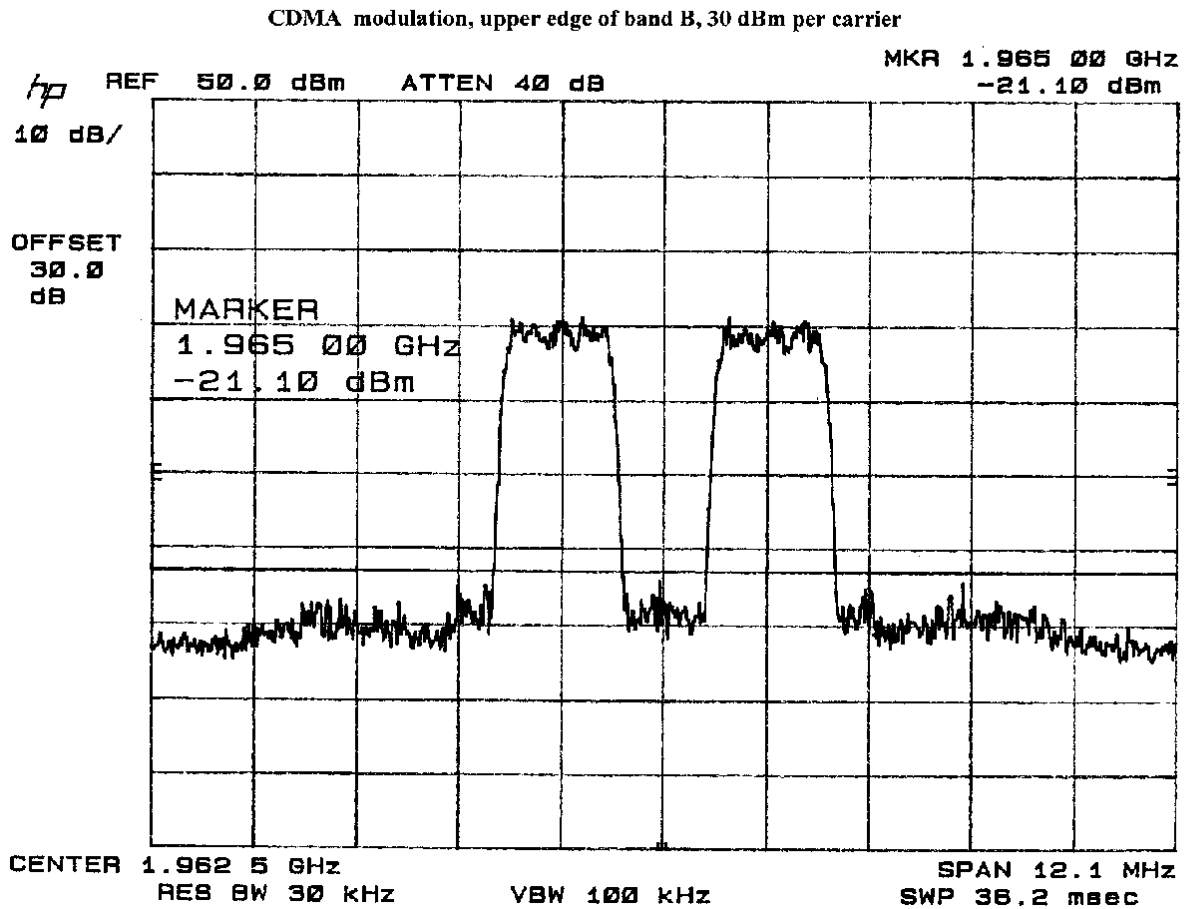
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Spurious Emissions at Antenna Terminals
CDMA modulation, upper edge of band B, 30 dBm per carrier

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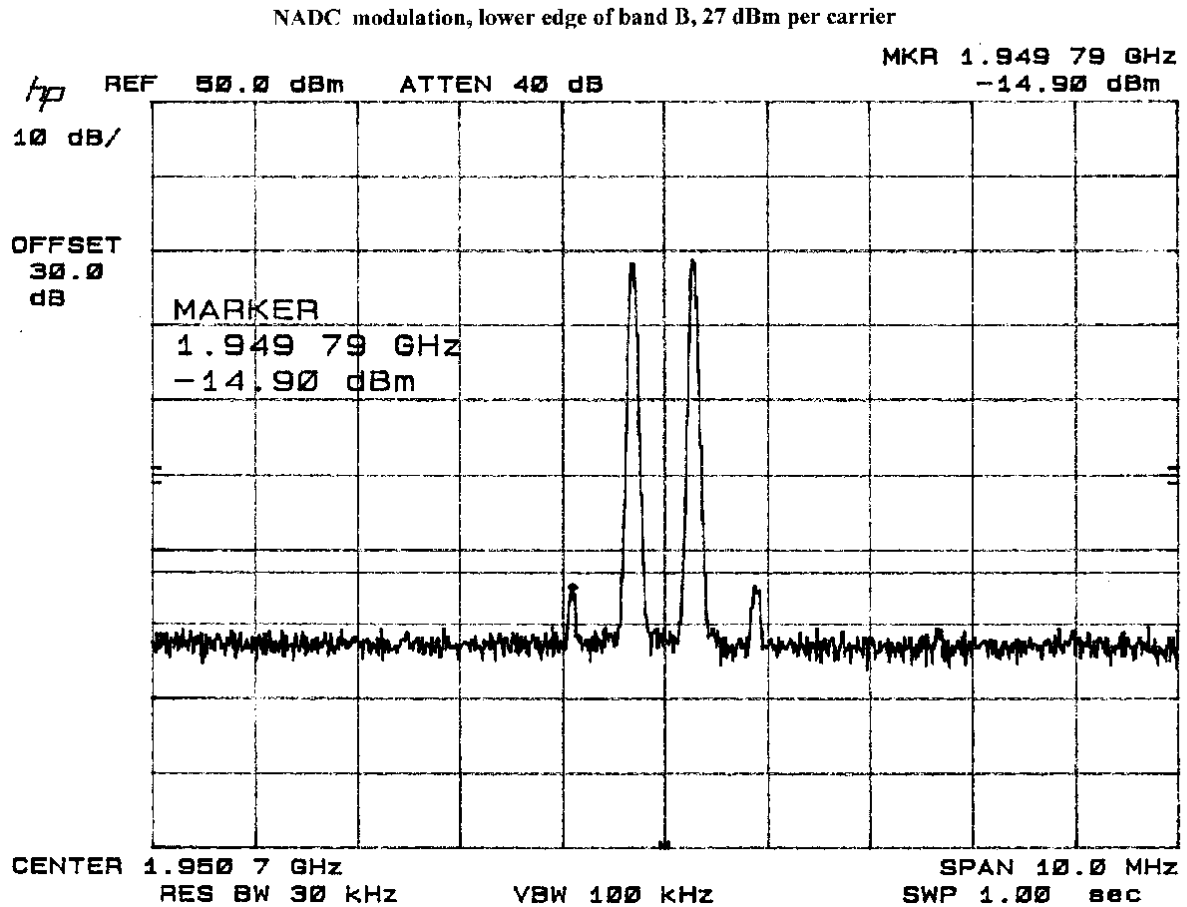
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NADC modulation, lower edge of band B, 27 dBm per carrier

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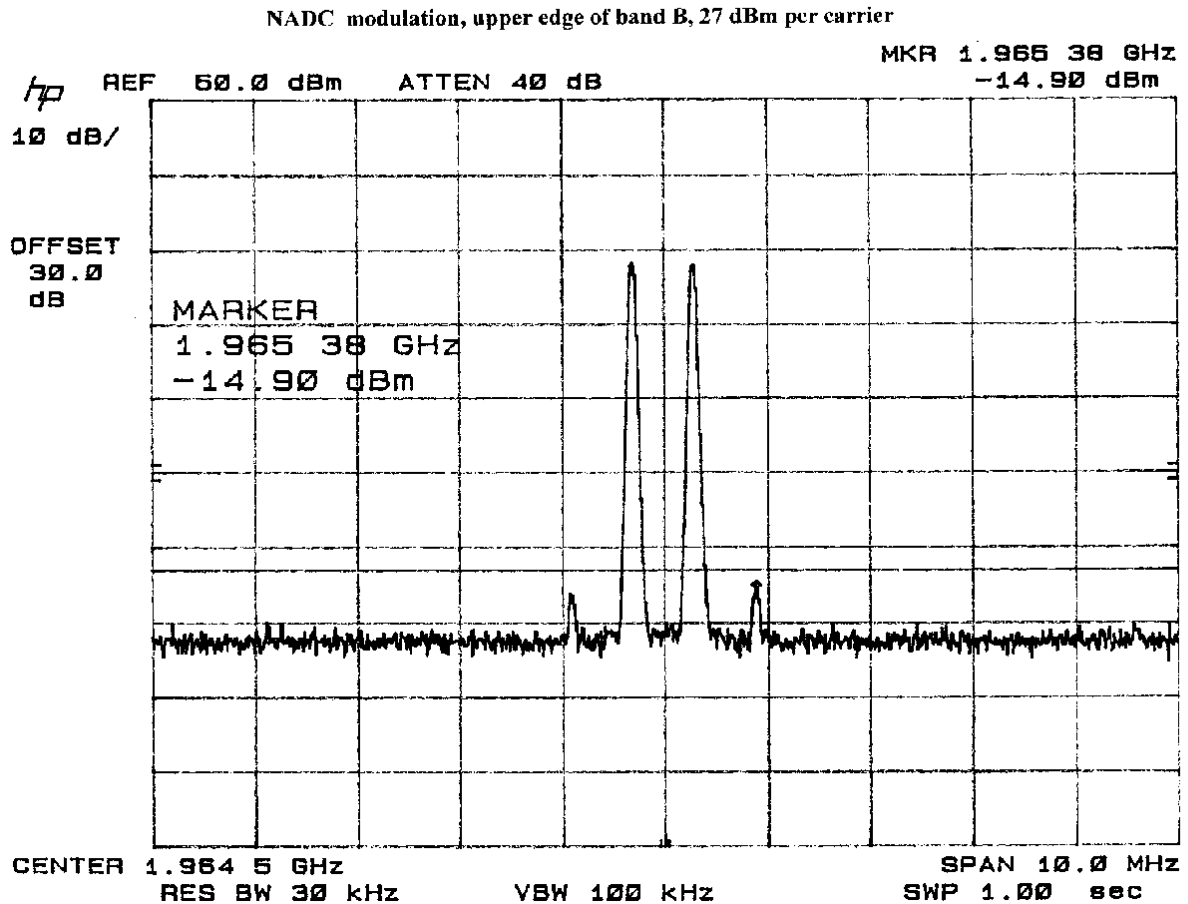
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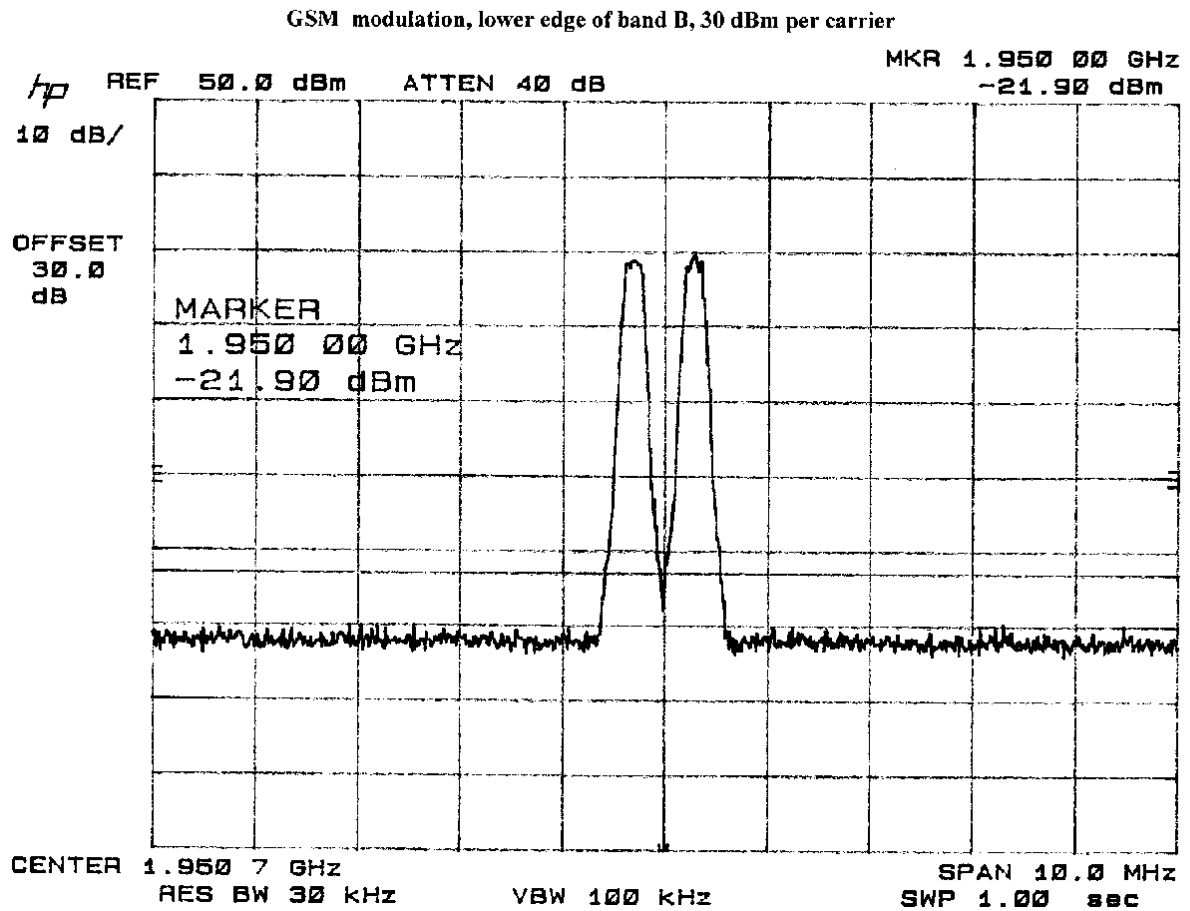
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GSM modulation, lower edge of band B, 30 dBm per carrier

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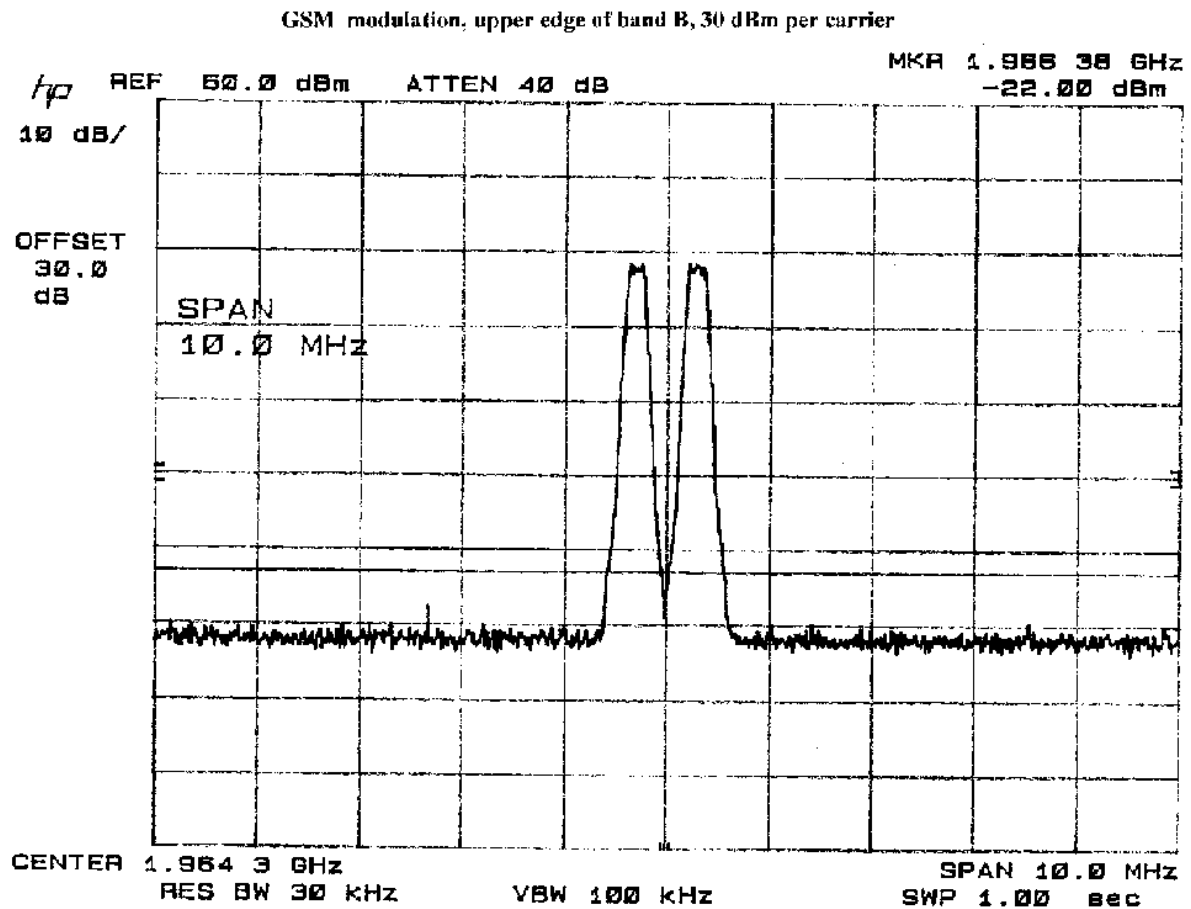
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TEST ENGINEER: _____ APPROVED BY: _____

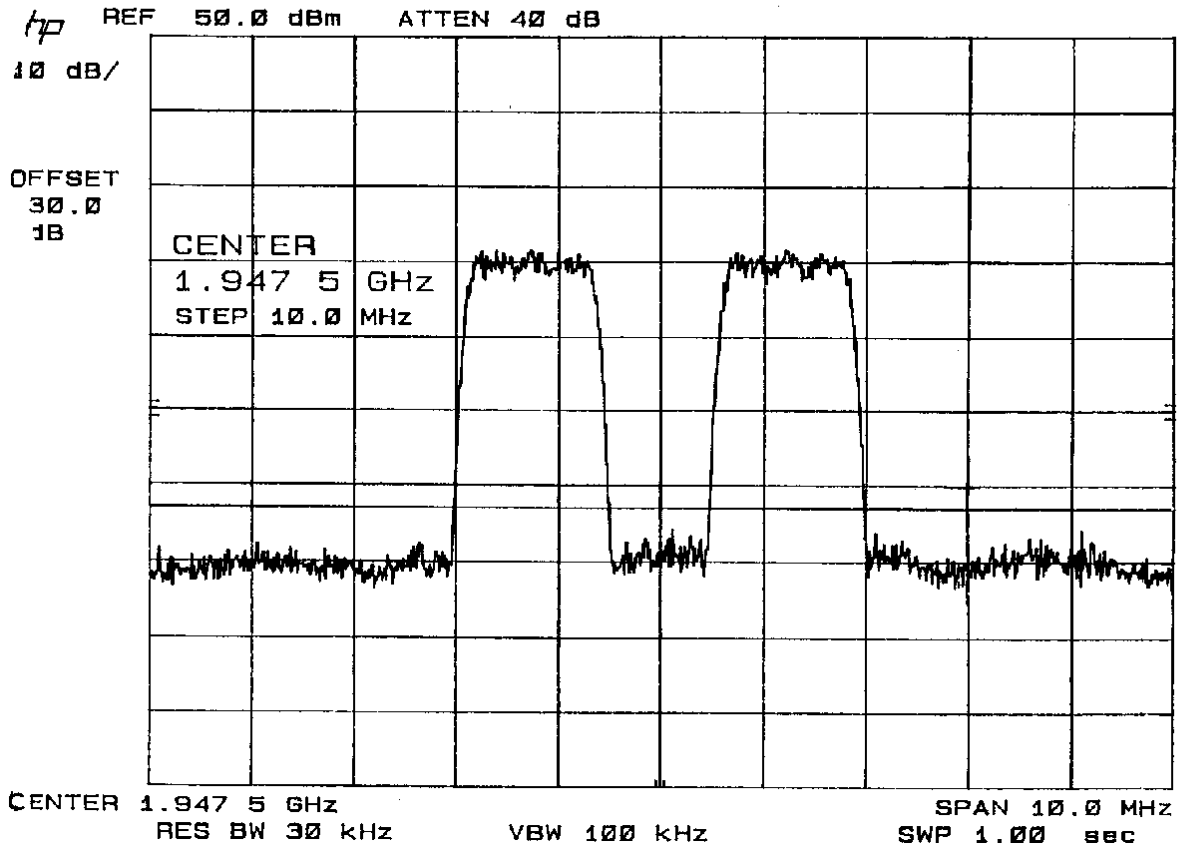
Spurious Emissions at Antenna Terminals
CDMA modulation, band D, 30 dBm per carrier

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CDMA modulation, band D, 30 dBm per carrier



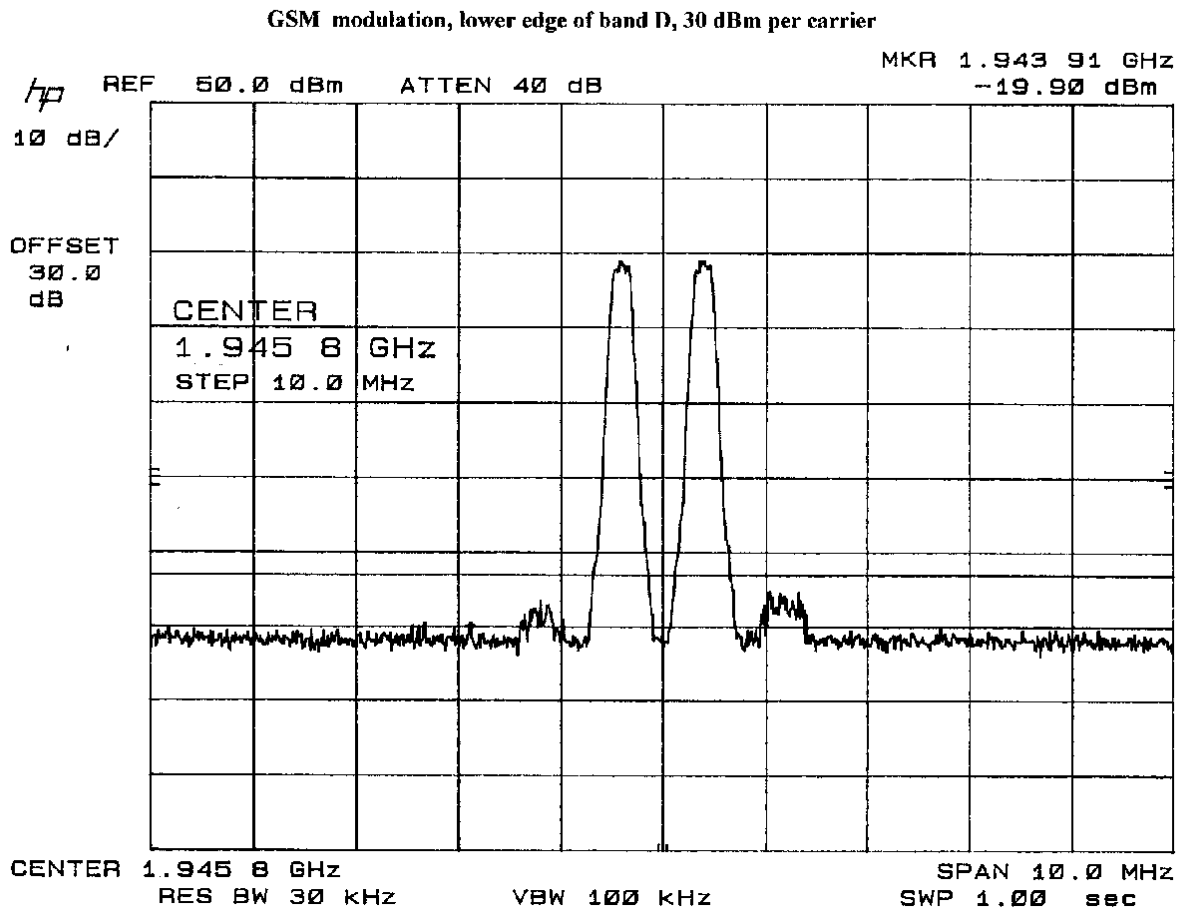
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GSM modulation, lower edge of band D, 30 dBm per carrier

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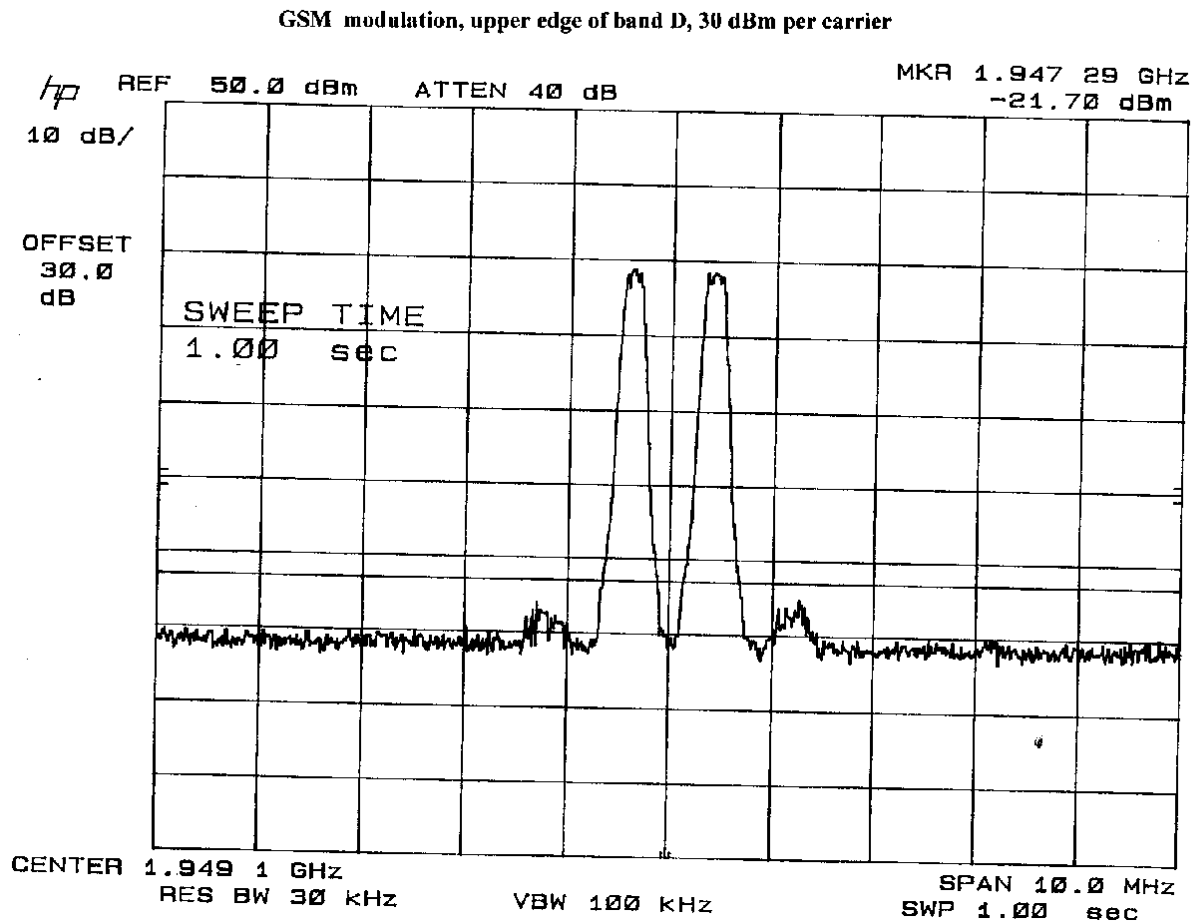
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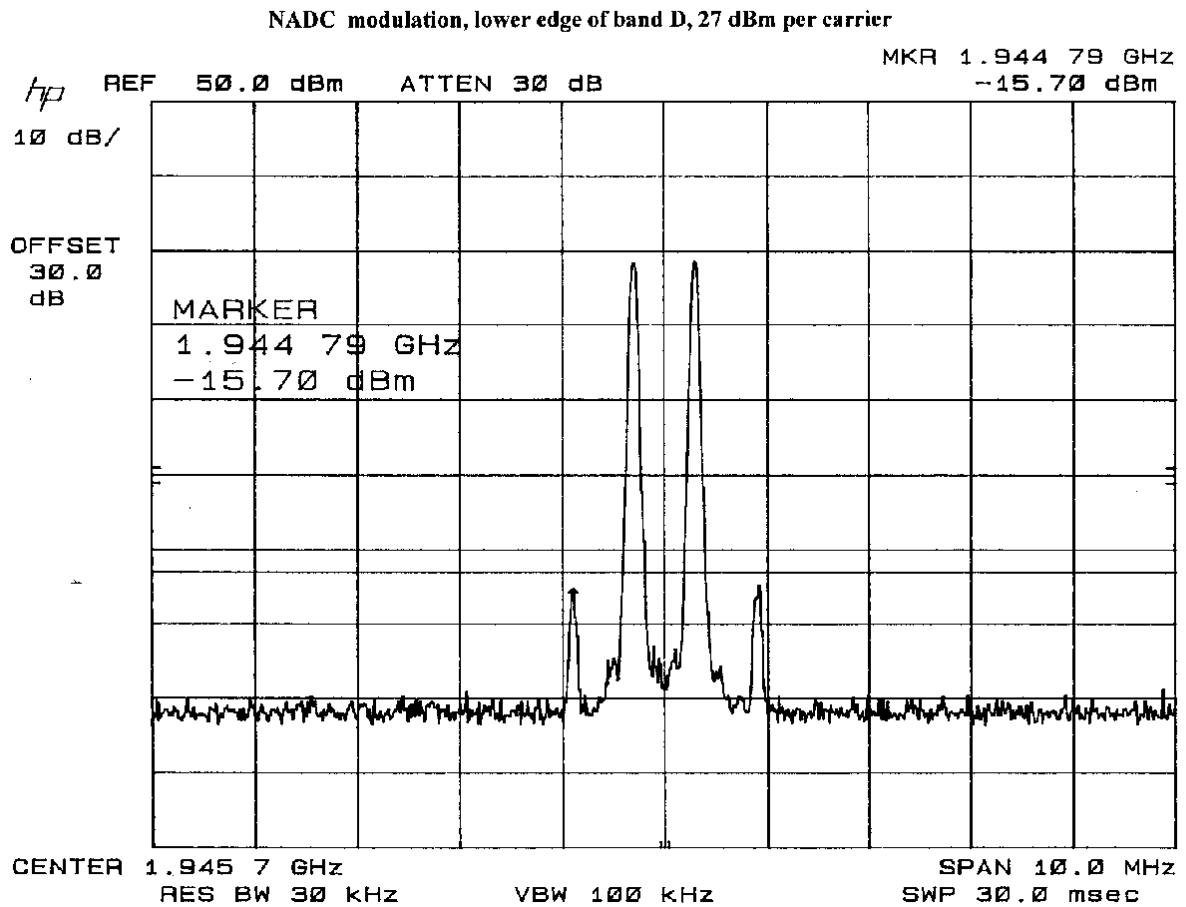
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NADC modulation, lower edge of band D, 27 dBm per carrier

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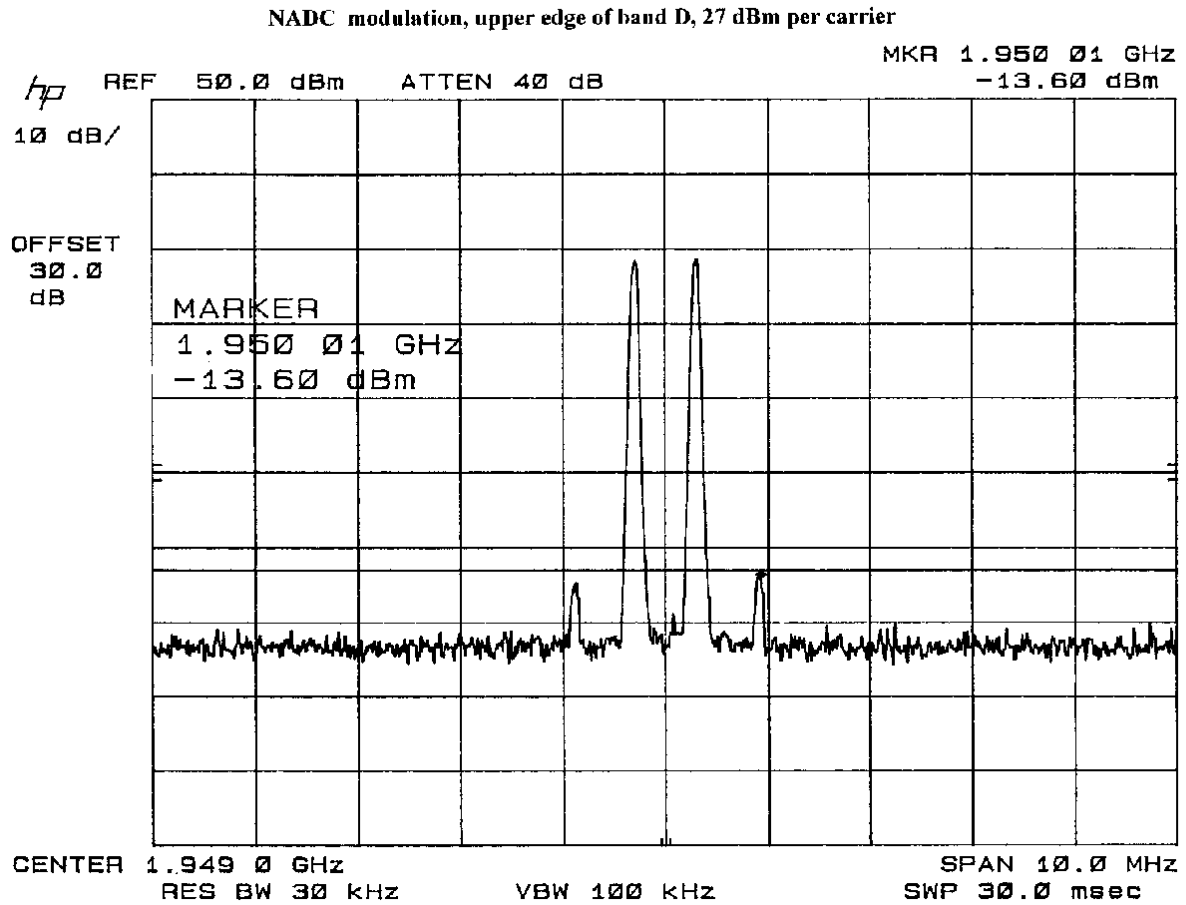
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TEST ENGINEER: _____ APPROVED BY: _____

Appendix C Field Strength of Spurious Emissions

Table 1. Calculation of Field Strength of Spurious Emissions Limits

Received signal = radiating source power - free space loss + antenna gain

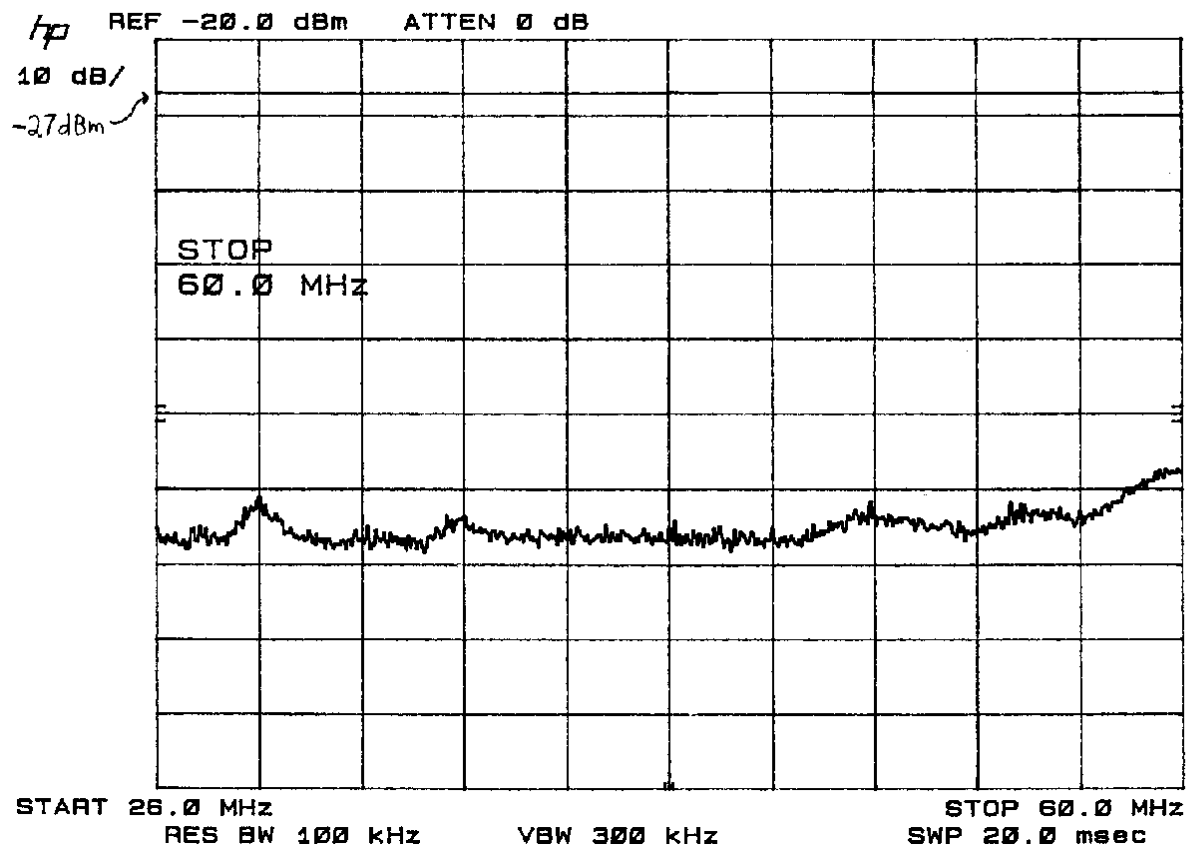
Freq. range, MHz		Freq. for calc. of test limit, MHz	Receive antenna	Receive antenna gain, dBi	Max. FCC Tx EIRP, dBm	Distance from DUT to antenna, m	Free Space path loss	Max. allowed Rx. level, dBm
26	60	39	EMCO 3108 Biconnical	-11.6	-10.85	1	4	-27
60	200	110	EMCO 3108 Biconnical	-0.6	-10.85	1	13	-25
200	500	316	EMCO 3106 Horn	6.9	-10.85	1	22	-26
500	1000	707	EMCO 3106 Horn	9	-10.85	1	29	-31
1000	2500	1581	EMCO 3115 Horn	8.5	-10.85	1	36	-39
2500	4000	3162	EMCO 3115 Horn	9.1	-10.85	1	42	-44
4000	5500	4690	EMCO 3115 Horn	10.6	-10.85	1	46	-46
5500	7000	6205	EMCO 3115 Horn	11.2	-10.85	1	48	-48
7000	8500	7714	EMCO 3115 Horn	10.8	-10.85	1	50	-50
8500	10000	9220	EMCO 3115 Horn	11.5	-10.85	1	52	-51

Field Strength of Spurious Emissions

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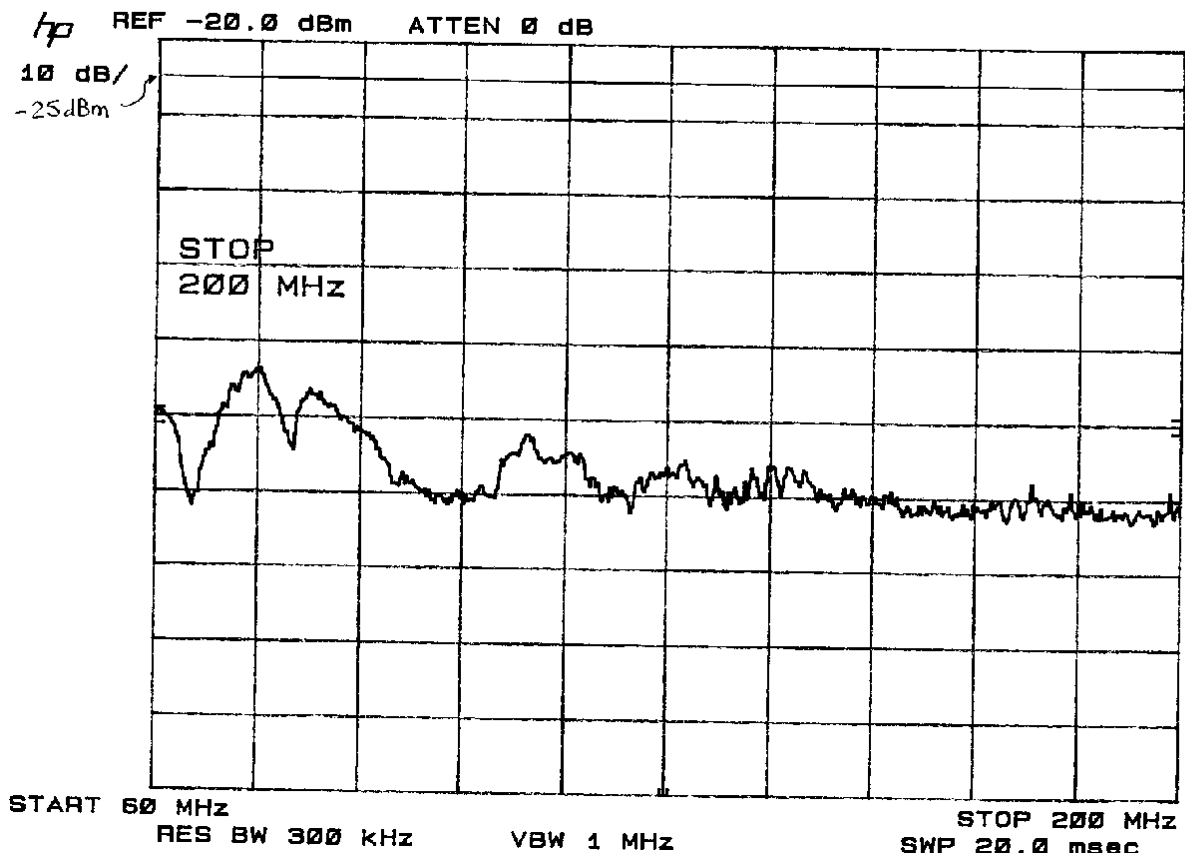
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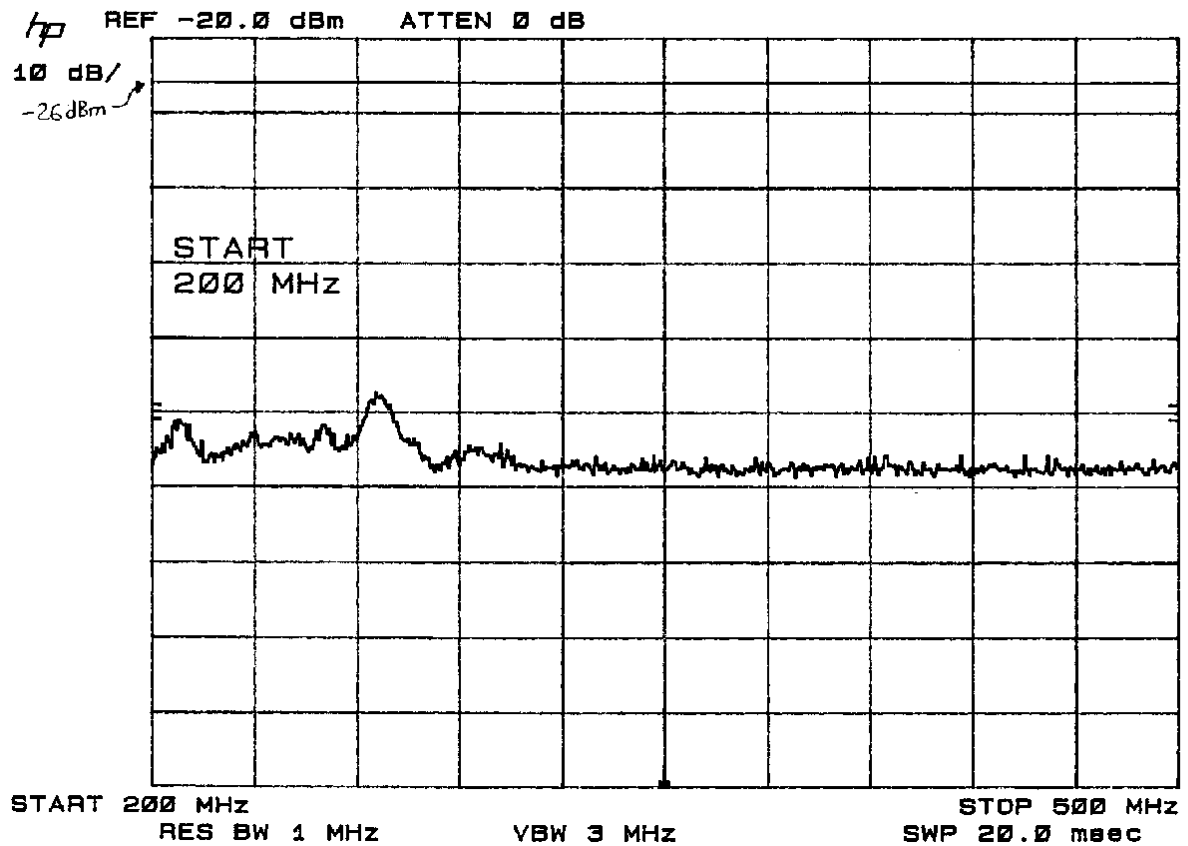
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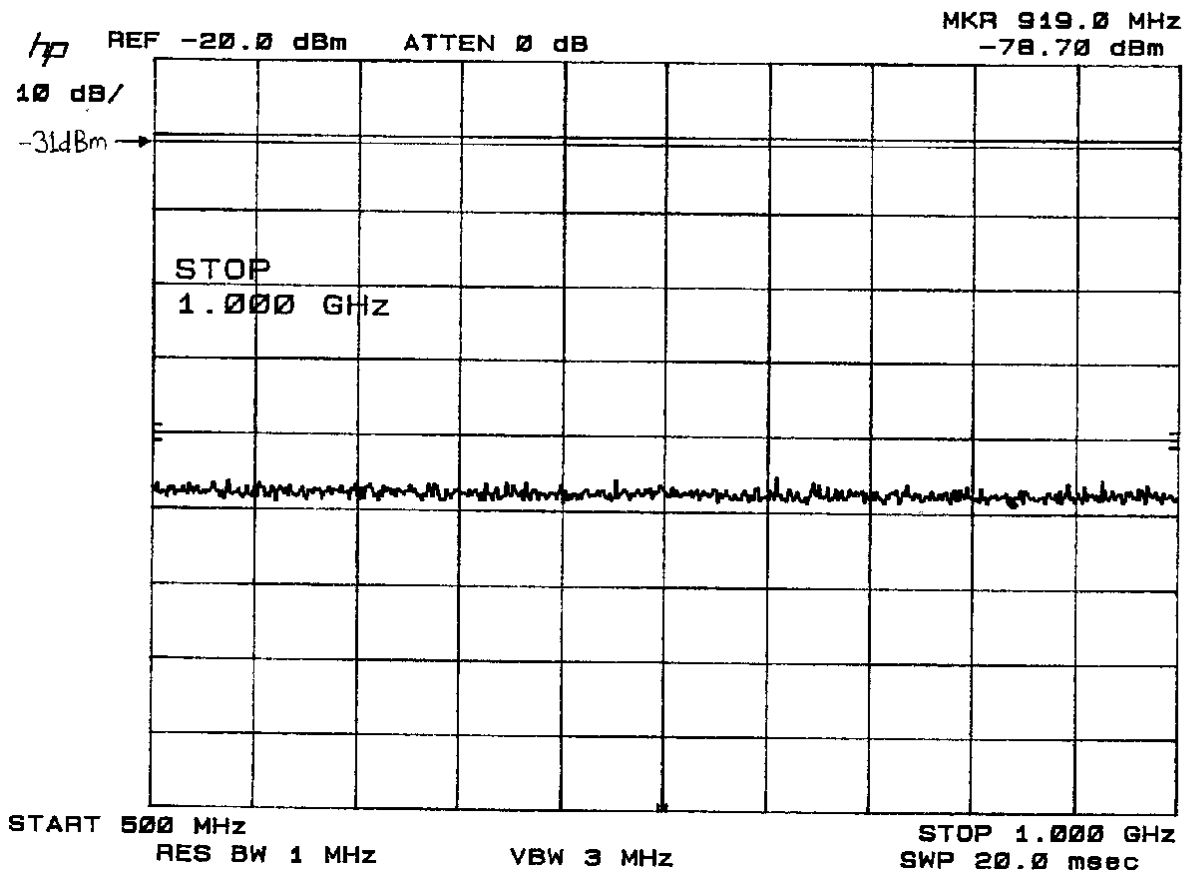
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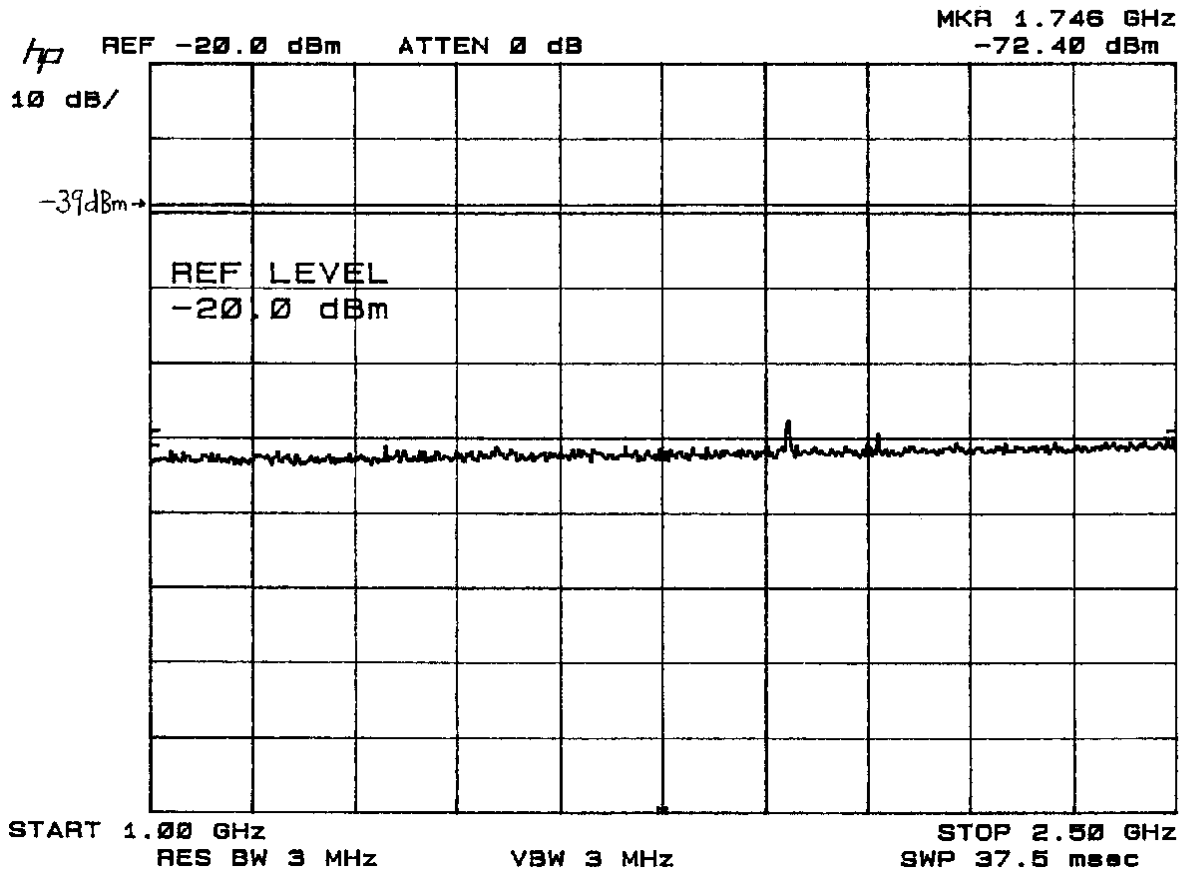
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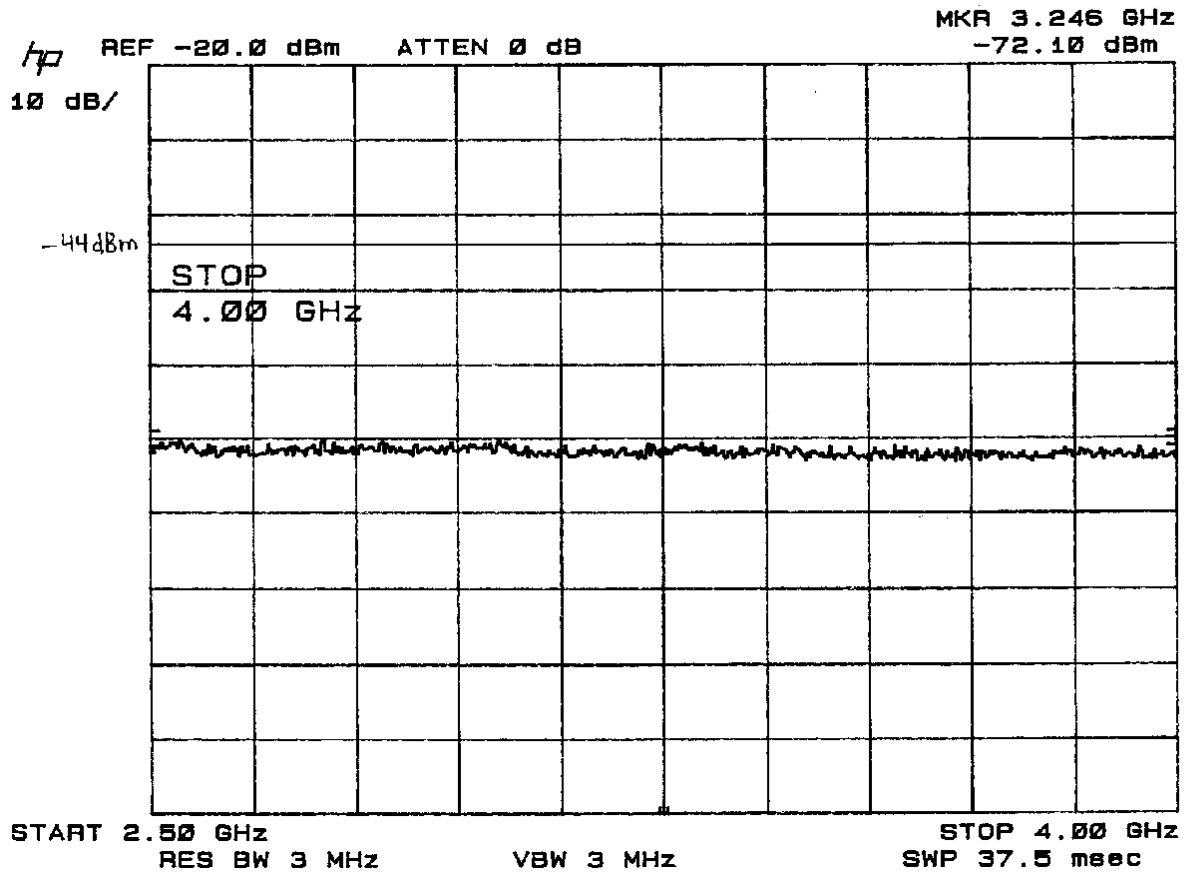
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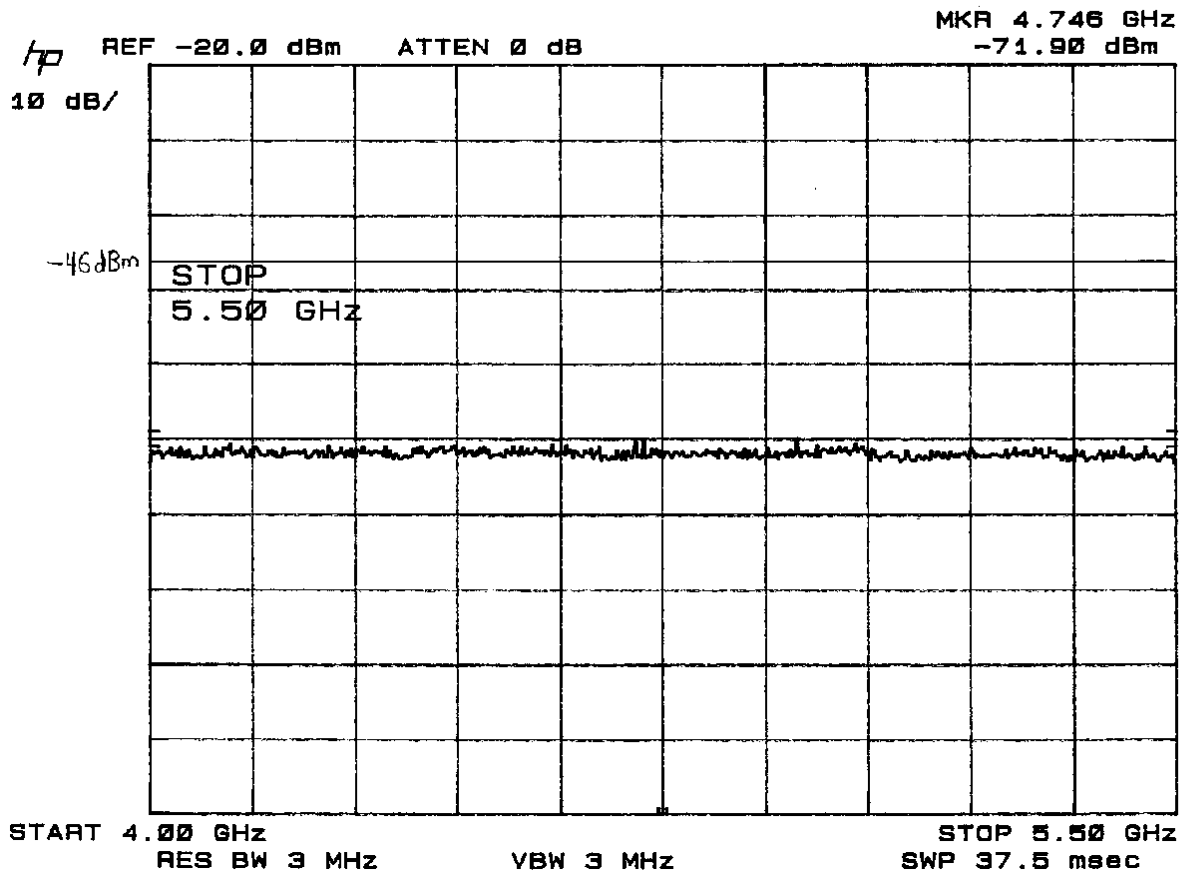
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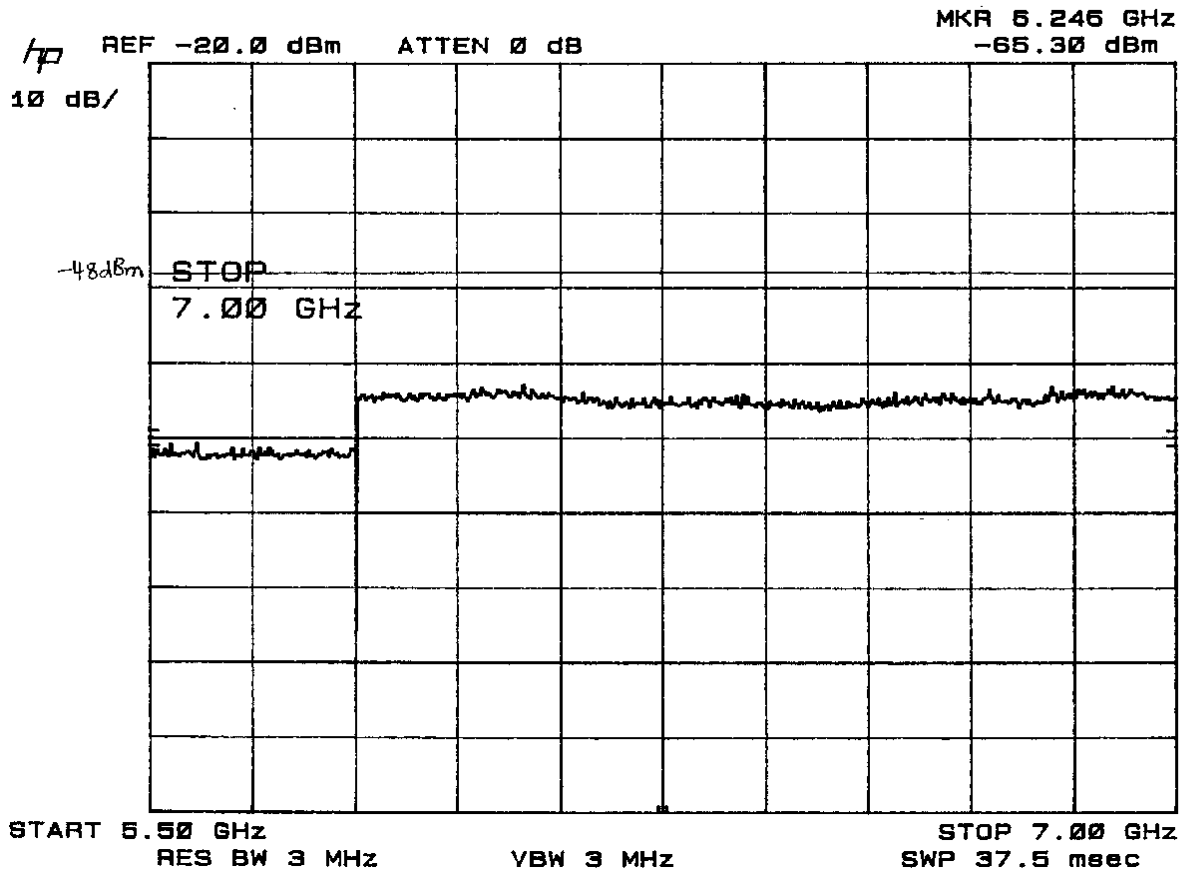
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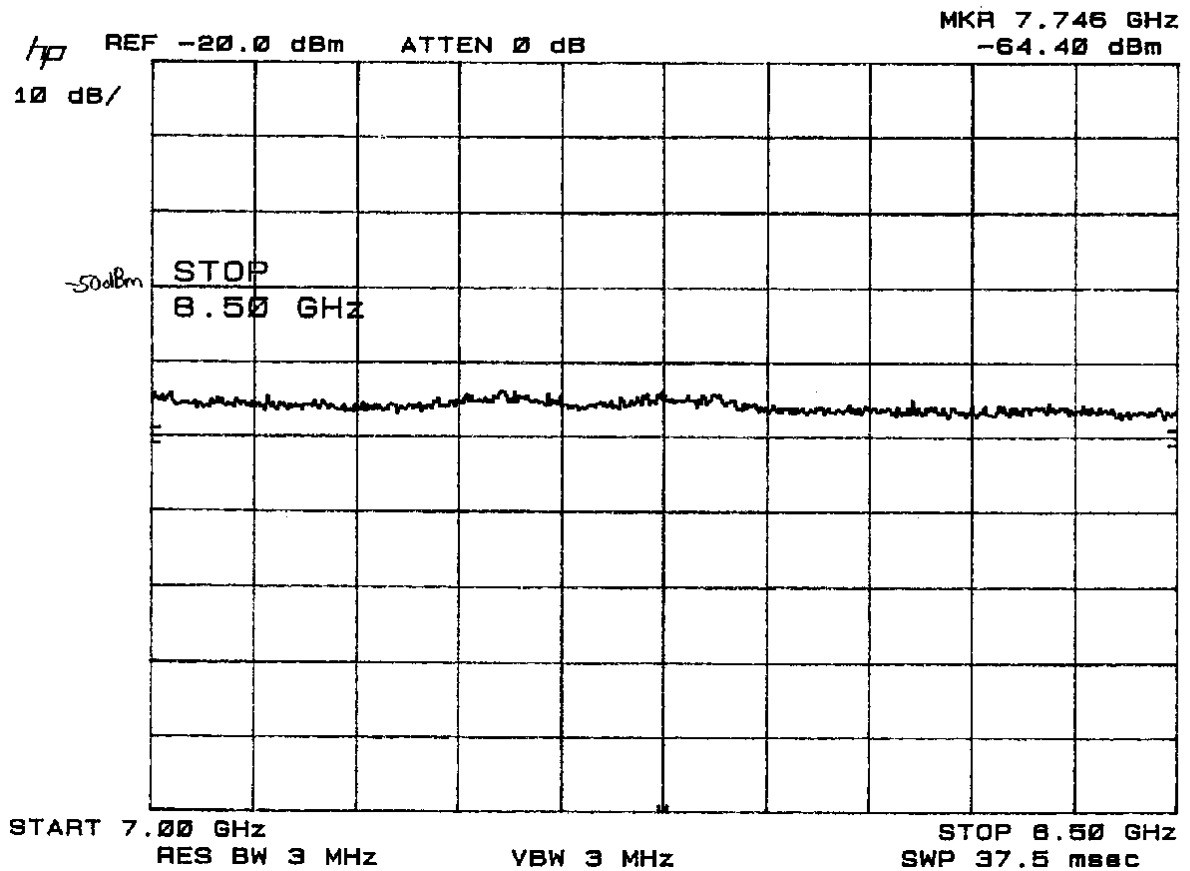
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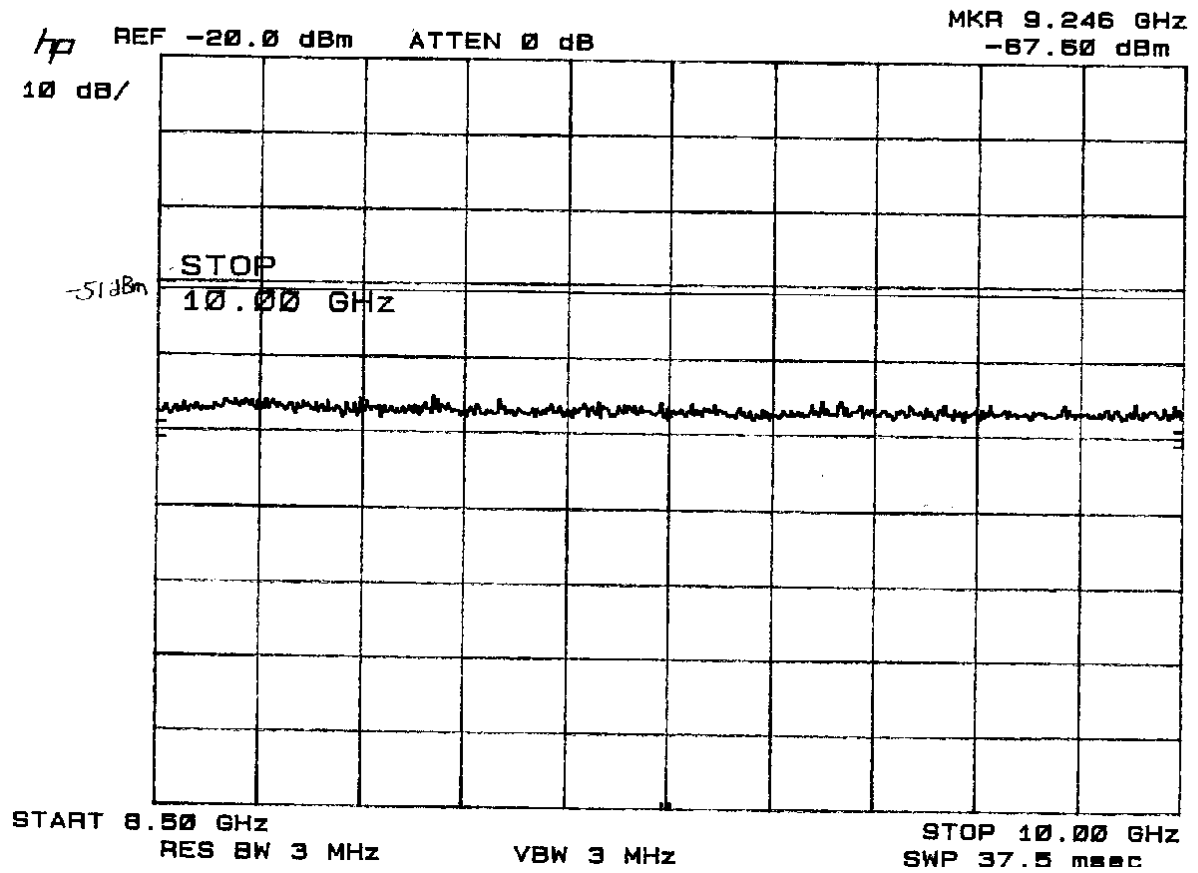
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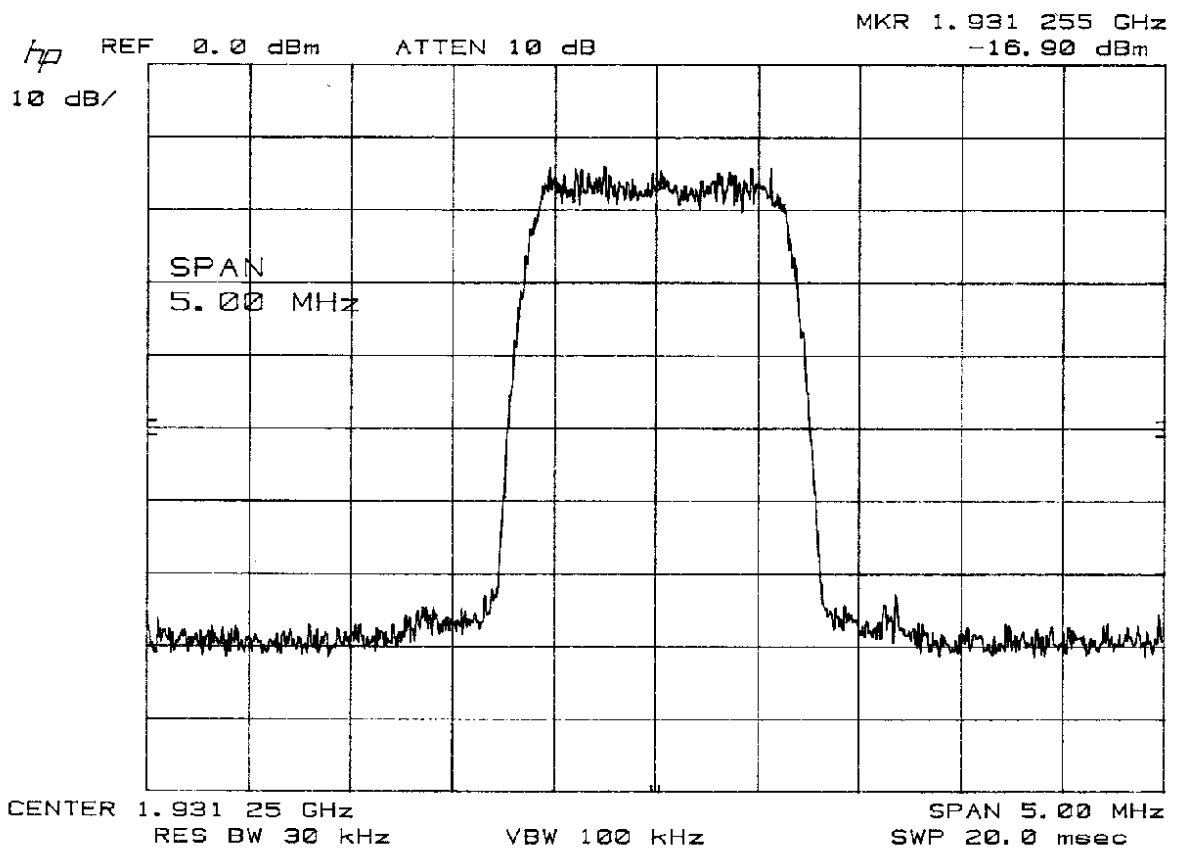
Appendix D

Signal Purity

Signal Purity

CI Wireless, Inc.
EKO-19 PCS Extender

CDMA Signal Out of Signal Generator



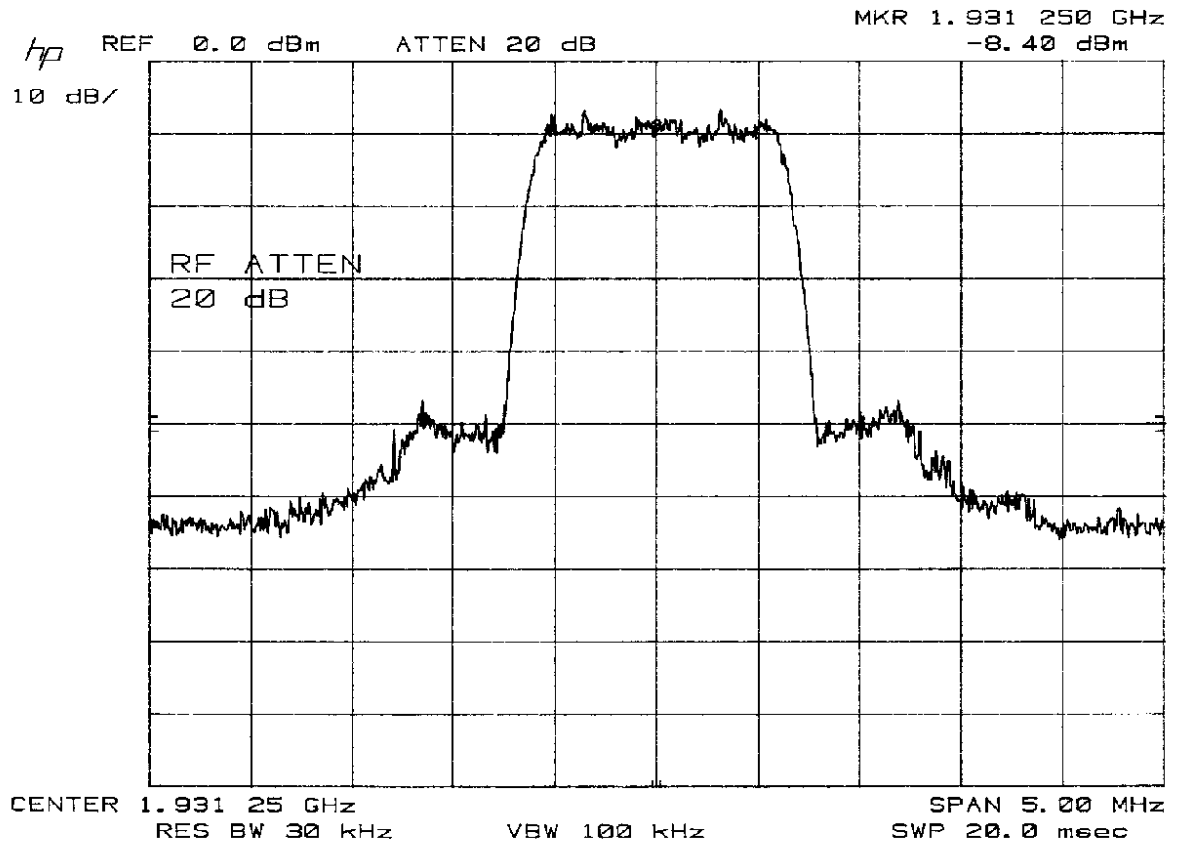
Comment: 30 dB external attenuation not accounted for in measurement

TEST ENGINEER: _____ APPROVED BY: _____

Signal Purity

CI Wireless, Inc.
EKO-19 PCS Extender

CDMA Signal Out of Microcell Unit



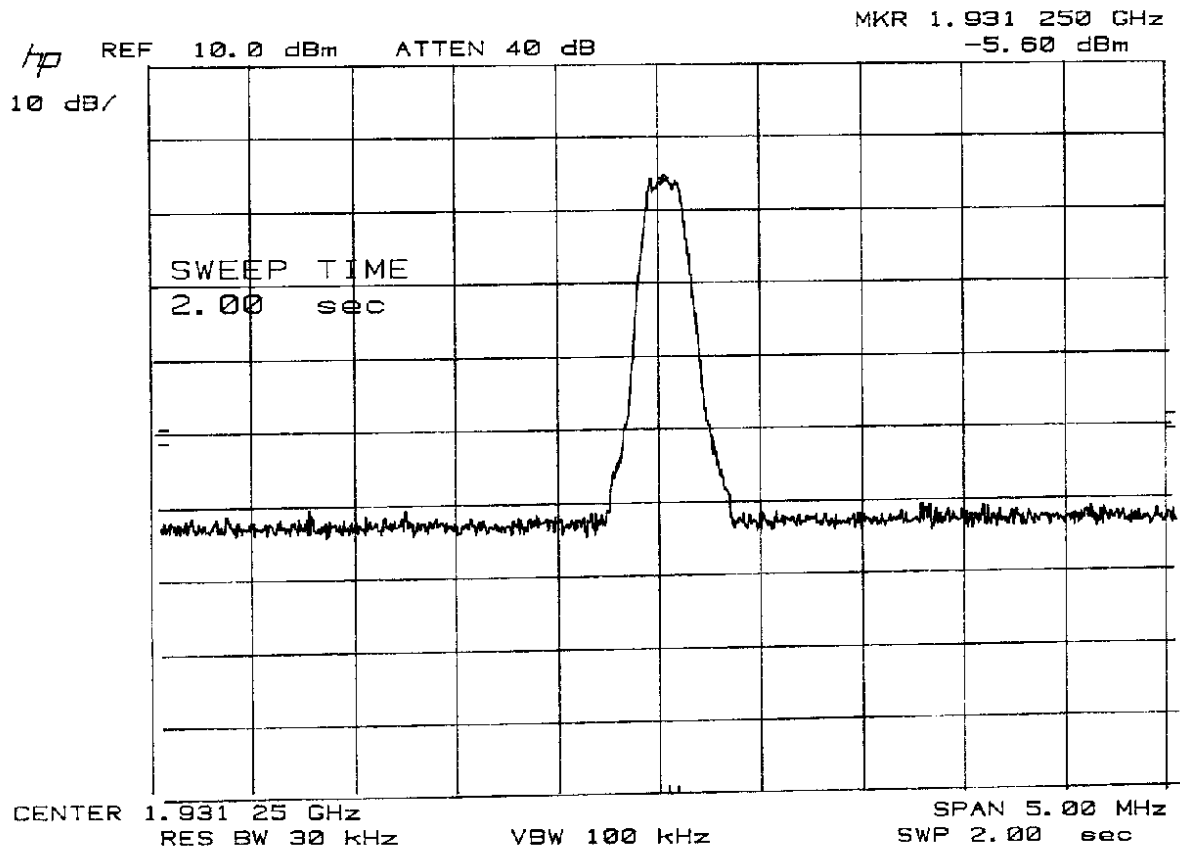
Comment: 30 dB external attenuation not accounted for in measurement

TEST ENGINEER: _____ APPROVED BY: _____

Signal Purity

CI Wireless, Inc.
EKO-19 PCS Extender

GSM Signal Out of Signal Generator



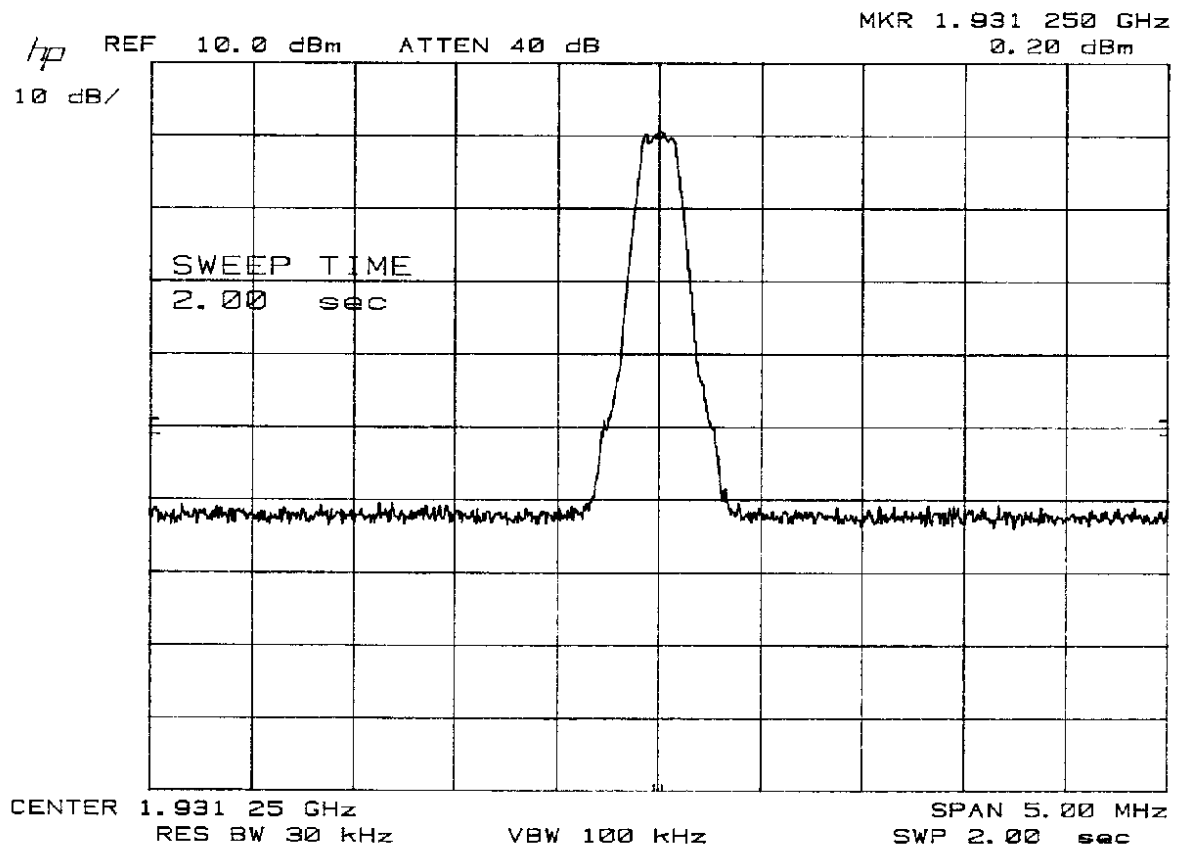
Comment: 30 dB external attenuation not accounted for in measurement

TEST ENGINEER: _____ APPROVED BY: _____

Signal Purity

CI Wireless, Inc.
EKO-19 PCS Extender

GSM Signal Out of Microcell Unit



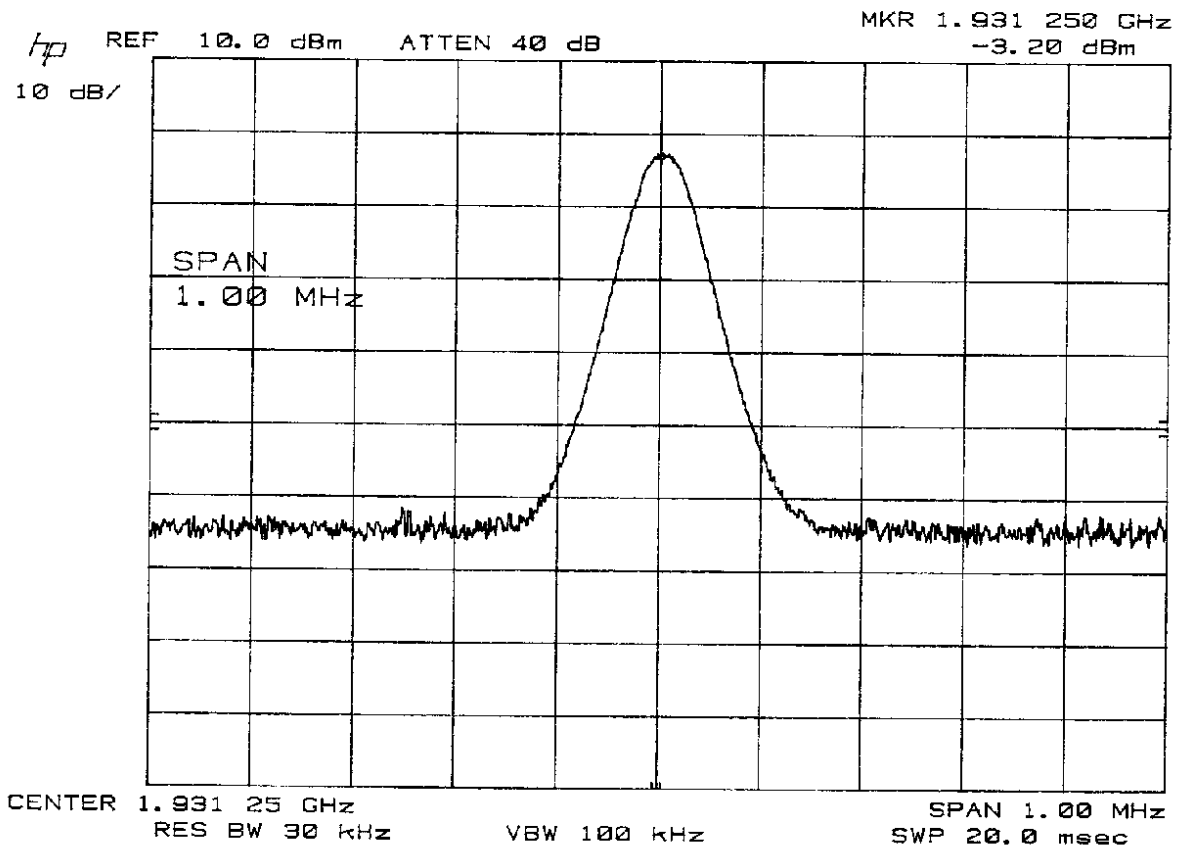
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TEST ENGINEER: _____ APPROVED BY: _____

Signal Purity

CI Wireless, Inc.
EKO-19 PCS Extender

NADC Signal Out of Signal Generator



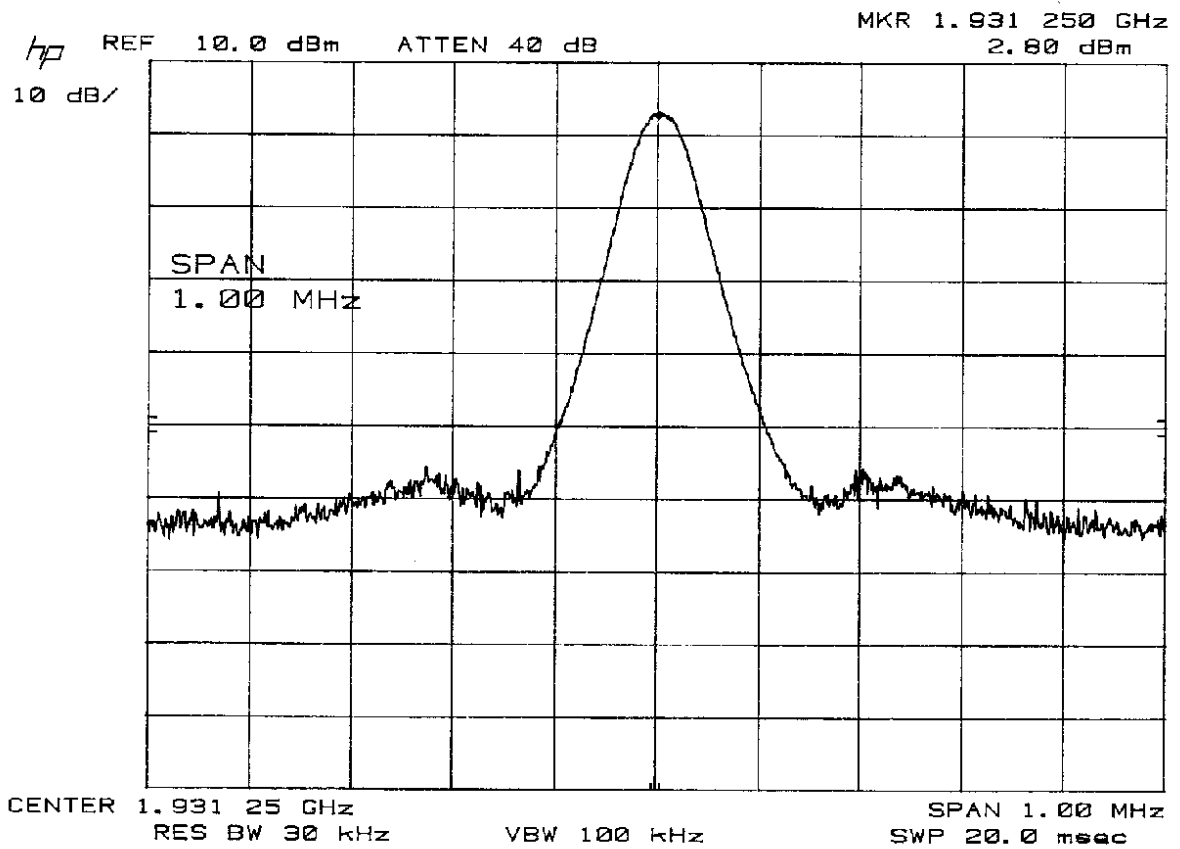
Comment: 30 dB external attenuation not accounted for in measurement

TEST ENGINEER: _____ APPROVED BY: _____

Signal Purity

CI Wireless, Inc.
EKO-19 PCS Extender

NADC Signal Out of Microcell Unit



Comment: 30 dB external attenuation not accounted for in measurement

TEST ENGINEER: _____ APPROVED BY: _____