

EXHIBITS

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EXHIBIT 1: Letter Requesting Confidentiality under Sec. 0.457(d)

Thomas N. Cokenias *EMC & Radio Approvals*
Test & Consulting Services for Commercial, Military, International Compliance
P.O. Box 1086
El Granada, CA 94018

28 Dec 1999

FCC Laboratory
7435 Oakland Mills Road
Columbia, MD 21046

Attention: Application Examiner
 Reviewing Engineer

Re: Request for confidentiality per Section 0.459 of FCC Rules

Applicant: TranSystem

FCC ID: OUPP-1101-2.

To whom it may concern,

Request is hereby submitted, on behalf of my client TranSystem., to withhold from public review certain portions of the application for equipment certification for the referenced FCC identifier. In particular, the following sections of the application and report are requested to be kept confidential:

Schematics
Block diagrams

Rationale for request for confidentiality:

TranSystem has invested considerable time and materials in research and development to produce the referenced product. Disclosure of the confidential portions of this application to competitors would give them competitive advantage in developing similar products.

The \$135 fee for confidentiality has been submitted along with the fee for certification. If you have questions or need further information, please contact the undersigned.

Sincerely,

THOMAS N. COKENIAS
EMC Consultant/Agent for TranSystem

EXHIBIT 2: Product Description and Operation Overview

The P1101-2 customer premises transceiver made by TSI is a single integrated unit design using a single antenna for both transmit and receive. The transceiver is designed to interface with cable modems. The transceiver receives RF input from the modem, upconverts, amplifies, and transmits the signal to the base station.

The P1101-2 operates in the MDS band: 2150 - 2162 MHz.

The transceiver uses the Hybrid Networks models N-231 and CCM-231 cable modems.

Cable modem output frequency range: 14.375 - 26.375 MHz

Channel bandwidths are from 160 - 640 kbps.

The raw bit rates are 1.6*channel BW (for example, at 160 kHz, the bit rate is 256 kb/s).

Modulation is QPSK.

EXHIBIT 3: Information for which Confidentiality is Requested

Schematics

Block Diagrams

- refer to separate electronic attachments-

EXHIBIT 4: Product Photographs

-refer to separate electronic attachments-

EXHIBIT 5: User Manual and FCC ID Label

-refer to separate electronic attachments-

EXHIBIT 6: RF Hazard Information Per Sec. 1.1307

For transmitters operating in the 2.150 - 2.162 GHz frequency range, paragraph 1.1310 limits maximum permissible exposure (MPE) to 1 mW/cm² for uncontrolled environments.

The maximum distance from the antenna at which MPE is met or exceeded is calculated from the equation relating field strength in V/m, transmit power in watts, transmit antenna gain, and separation distance in meters:

$$E, V/m = ((30*P*G))/d$$

$$\text{Power density, mW/m}^2 = E^2/3770$$

$$E \text{ for MPE } 1\text{mW/m}^2 = 61.4 \text{ V/m}$$

The TranSystem transmitter will be used with one of the following antennas, described in the user manual:

- 12 dBi corner reflector
- 15 dBi "Backfire" antenna
- 18 dBi yagi

Calculated MPE distances from power into antenna:

Exposure, mW/cm²: 1.0

P, dBm	G, dBi	Safe Distance, cm
18.4	12.0	9.3
18.4	15.0	13.2
18.4	18.0	18.7

Basis of Calculations:

$$E^2/3770 = S, \text{ mW/cm}^2$$

$$E, V/m = (P_{\text{watts}} * G_{\text{gain}} * 30)^{0.5} / d, \text{ meters}$$

$$d = ((P_{\text{watts}} * G * 30) / 3770 * S)^{0.5}$$

$$P_{\text{watts}} * G_{\text{gain}} = 10^{(P_{\text{dBm}} - 30 + G_{\text{dBi}}) / 10}$$

The following statement will be placed in the installation manual:

"The installer shall take steps to insure that the minimum distance between the unit antenna and persons in the vicinity of the transceiver is at least 19 cm (7.5 inches). This requirement is in keeping with sections 1.1307 and 1.1310 of FCC Rules."

EXHIBIT 7: Report of Measurements

FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2.

2.1033(c)1 Applicant: TranSystem Inc.

2.1033(c)2 FCC ID: OUPP-1101-2

2.1033(c)3 Installation instructions are found in attached document.

2.1033(c)4 Emission type is **400K0G1D**

2.1033(c)5 Frequency range: 2150-2162 MHz

2.1033(c)6 Range of Operating Power

0 - 20 dBm (dependent on input from indoor cable modem unit)

2.1033(c)7 Maximum Power Rating

20 dBm

2.1033(c)8 Applied voltages and currents into the final transistor elements

Refer to schematics accompanying this application

2.1033(c)10 Circuit and Functional Block Diagram, Description of Circuitry

Attached as electronic file.

2.1033(c)11 FCC ID Label

Attached as electronic file.

2.1033(c)12 Product Photographs

Attached as electronic file.

2.1033(c)13 Description of Modulation System

160-640 kbs QPSK producing 100 - 400 kHz wide channel (1.6bits/Hz)

2.1033(c)14 Test Data per 2.1046 – 2.1057

2.1055 RF Output Power Measurements

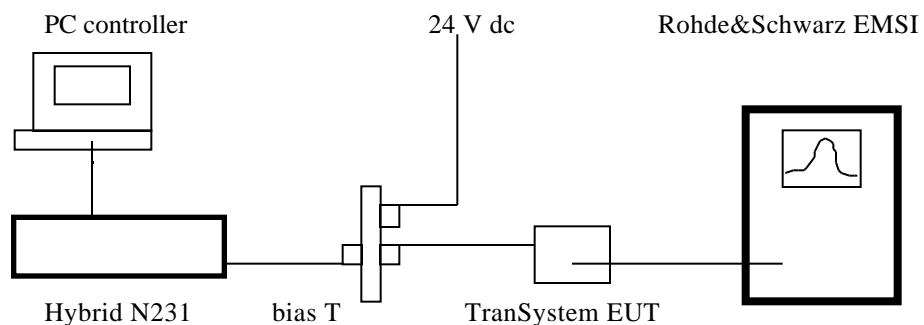
Measurement equipment used:

Rohde&Schwarz ESMI Test Receiver, model 1032.5510.53

10 dB attenuator

Low-loss cable, cable adapters

Test Set-up



Test Procedures

The Hybrid N231 cable modem was set to transmit at 640 kbps, which produces a signal bandwidth of 400 kHz. The resolution bandwidth of the analyzer was set to 1 MHz, larger than the emission bandwidth, so that the displayed level is equal to channel power.

Test Results

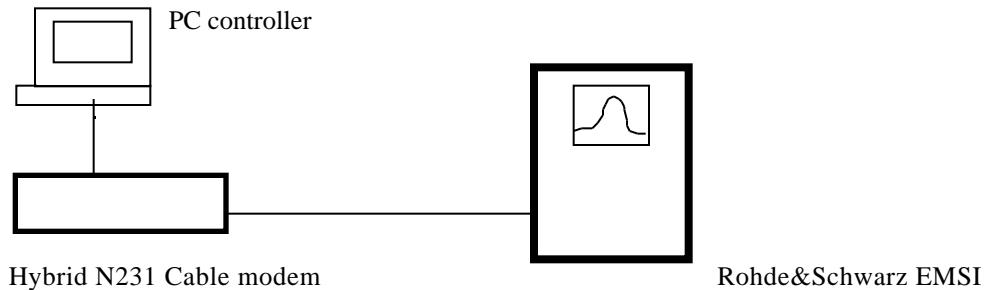
Cable Modem Settings	TX, MHz	TX Pout, dBm
14.945 MHz, 44 dBmV	2150.57	18.43
25.805 MHz, 44 dBmV	2161.43	17.77

Section 2.1047 Modulation Characteristics

Measurement Equipment Used:

Rohde&Schwarz ESMI Test Receiver, model 1032.5510.53
Low-loss cable, cable adapters

Test Set-up:



Test Procedures:

The PC programmed the cable modem to transmit packets at a 640 kbps rate. The resultant spectrum analyzer signal was recorded.

Test Results

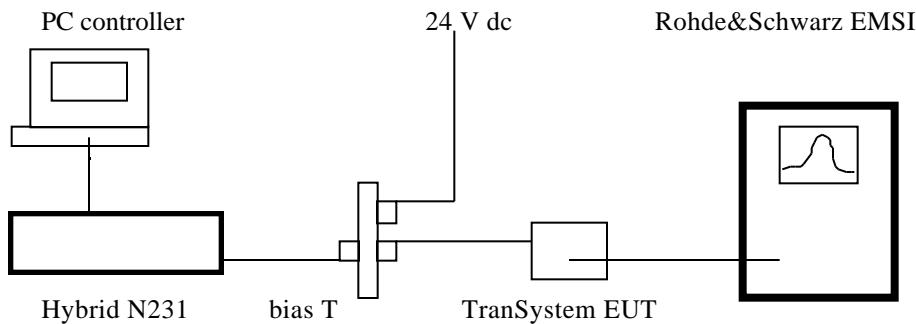
Refer to attached plots.

Section 2.1049 Occupied Bandwidth

Measurement Equipment Used:

Rohde&Schwarz ESMI Test Receiver, model 1032.5510.53
10 dB attenuator
Low-loss cable, cable adapters

Test Set-up



Test Procedures:

Out -of-band emissions limits, digital modulation, section 21.908(a):

At 6MHz channel edge: attenuated -25 dB licensed average 6 MHz channel power

From edge to 250 kHz : attenuated along a slope to at least -40 dB

Beyond 250 kHz removed: attenuated along a slope to at least -60 dB at 3 MHz removed

Per section 21.908(e):

Attenuation in dB (below "flat top") = $A + 10\log(RBW1/RBW2)$

A = attenuation specified (25, 40, 60 dB)

$RBW1$ = Resolution bandwidth for flat top measurement (relative)

$RBW2$ = Resolution bandwidth for spectral point measurement (relative)

The cable modem was set to produce 640 kBps packets to the transmitter input.

Test Results

Refer to attached plots.

Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals**Measurement Equipment Used:**

Rohde&Schwarz ESMI Test Receiver, model 1032.5510.53

10 dB attenuator

Low-loss cable, cable adapters

Test Procedures

Section 21.908(e) requires all emissions removed from the channel edge by more than 3 MHz must be attenuated at least 60 dB below the channel emission flat top.

1. Set spectrum analyzer to TX output center frequency, RES BW = 100 kHz, VID BW = 100 Hz.
2. Use analyzer PEAK SEARCH to find flat top peak.
3. Set DISPLAY LINE to a level 60 dB below flat top peak
4. Record transmitter output spectrum from 1 MHz to 10th harmonic of TX output frequency
5. Plot/photograph spectrum analyzer data

Test Results

Refer to attached plots.

Section 2.1053 Field Strength of Spurious and Harmonic Radiation

Measurement Equipment Used:

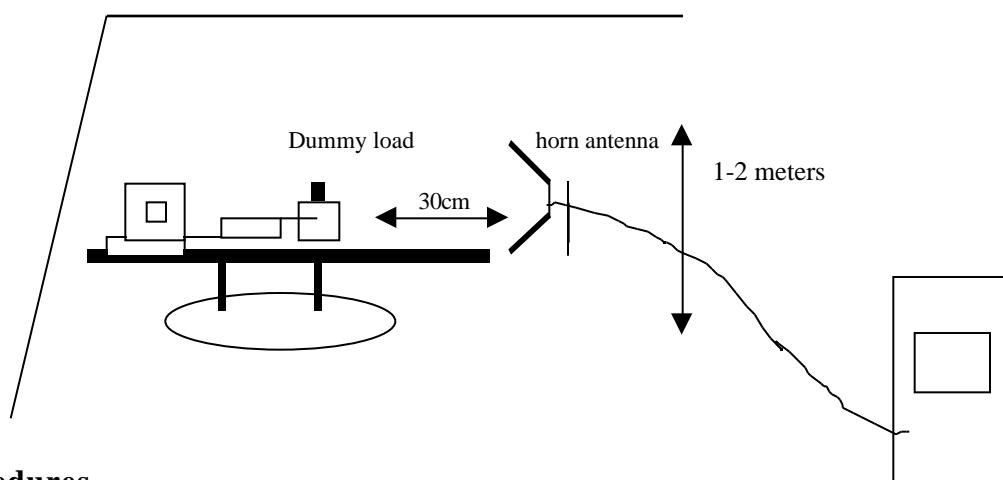
Rohde&Schwarz ESMI Test Receiver, model 1032.5510.53

EMCO 3115 horn antenna, 1-18 GHz

Low-loss cable, cable adapters

Test Set-Up

Ground plane (inside anechoic chamber)



Test Procedures

The magnitude of each spurious and harmonic emission detected as being radiated from the EUT must be at a level more than 60 dB below the emission flat top. The antenna output port of the EUT was terminated with a 50 ohm load. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

Test Results

At a distance of 1 ft (30cm), the theoretical field strength produced by 18.43 dBm feeding an isotropic antenna:

$$E@0.3m, \text{ dBuV/m} = (115.24 + PdBm) \text{ dBuV/m} = 133.67 \text{ dBuV/m}$$

Out of band radiated limits: $123.67 - 60.0 = 73.7 \text{ dBuV/m at 30 cm}$

F(MHz)	Level, dBuV	Antenna Factor, dB	Total, dBuV/m	Limit, dBuV/m
4324	28.7	34.5	53.2	73.7
6486	26.9	36.5	63.4	73.7
8648	15.9	38.1	54.0	73.7
10810	1.4NF	39.6	41.0	73.7
12972	8.7NF	40.2	48.9	73.7

All other emissions to 10fo more than 20 dB below limit

2.1055 Frequency Stability

Frequency v Temperature

-30 to +50C: +/- .001% limit (10 ppm)

Frequency v Supply Voltage Variation

85% - 115%: +/- .001% (10 ppm)

The frequency determining circuit for the TransSystem radio is a TCXO manufactured by Raltron Electronics Corporation (Y7 on page 1 of the schematic). Frequency stability tests were performed by the manufacturer.

Manufacturer: Raltron Electronics Corporation

Model Type: RTXT-681KDZ

Frequency: 8.898438 MHz

Worst-case frequency deviation: 3.6 ppm

Refer to attached test data sheet from manufacturer



TEST DATA
FOR
CRYSTAL OSCILLATOR

Ordered by	Order Spec. No.	Reference Freq. (Hz)	P.Der. (Watt)	Output Current (mA)	Reference Test at Temp 25°C (2°C)	Type of Oscillator	Supply Volt. (5.000 ± 50 mV)	Load (KΩ)	Room Temp. (°C)	Humidity (%)	Spec. No.	Spec. No.									
											1	2	3	4	5	6	7	8	9	10	11
1	8.888438	0	7.188	9.20	58	-6	0.11	0	6.11	2.3	3.6	2.5	-1.3	-1.6	-0.4	Visible					
2	8.888438	0	7.188	9.20	75	-38	0.22	0	6.11	9.2	2.7	1.6	-0.1	-0.2	1.1	Output Waveform					
3	8.888438	0	7.188	9.20	70	-6	0.22	0	6.22	0.9	3.0	1.9	-1.0	-1.1	0.1	Supply Volt. Test					
4	8.888438	0	7.188	9.30	72	-59	0.22	0	6.22	-0.5	2.7	1.8	-1.0	-0.8	0.7	Load Test					
5	8.888438	0	7.188	9.20	77	-44	0.11	0	6.11	1.0	2.5	1.5	-0.7	-0.6	1.0	Shock Test					
																Vibration Test					
																Duty Cycle					
																Remark					
																QC. No.					
																Inspect. for					

Part 15 Digital Device Emissions

Tests were performed to measure radiated emissions per 15.109 of the Rules for the cable modem. A Declaration of Conformity was issued to the cable modem manufacturer. There is no digital circuitry in the TranSystem radio.

EXHIBIT 8: Data Graphs: Emissions Masks

2161.43 MHz (High Channel) :



1 : -25 dBc at channel edge (6 MHz channel)
 a : -40 dBc at channel edge + 250 kHz
 b : -46.66 dBc at 1 MHz removed from edge + 230 kHz (= -60.83 dBc)

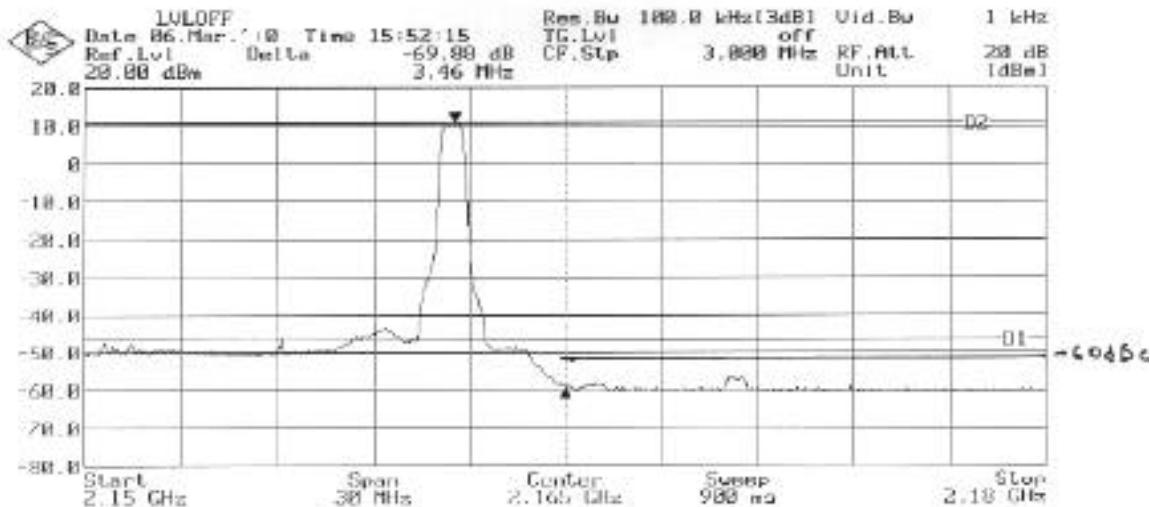
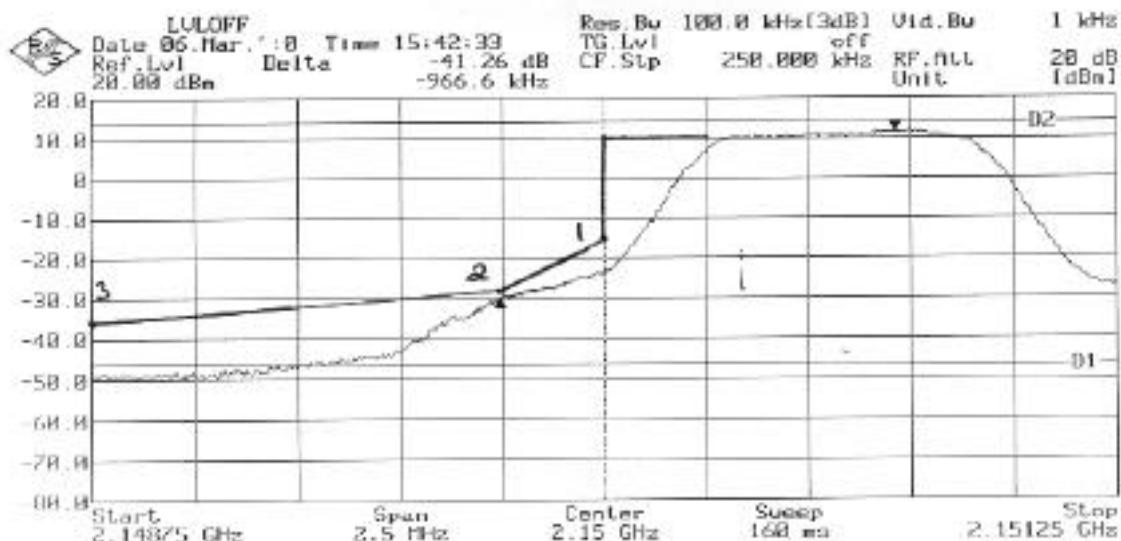


EXHIBIT 8: Data Graphs: Emissions Masks (cont.)

2150.57 MHz (Low Channel):



1: -25 dBc at channel edge (6 MHz channel)

2: -40 dBc at channel edge + 250 kHz

3: -46.66 dBc at (1 MHz removed from edge) + 250 kHz
 $(\approx -60 \text{ dBc} @ 3 \text{ MHz})$

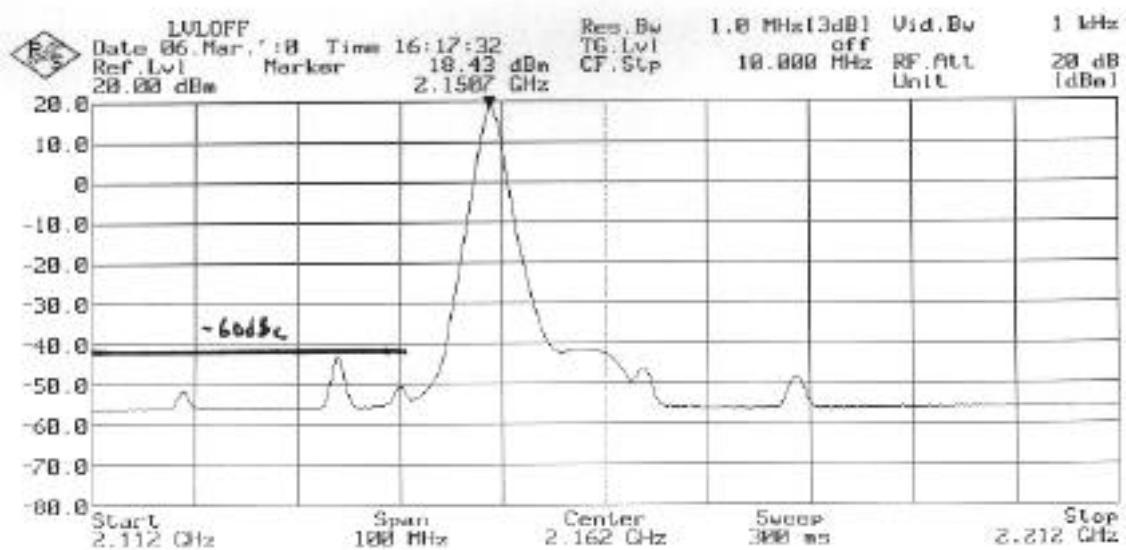


EXHIBIT 9: Data Graphs: Antenna Conducted Emissions

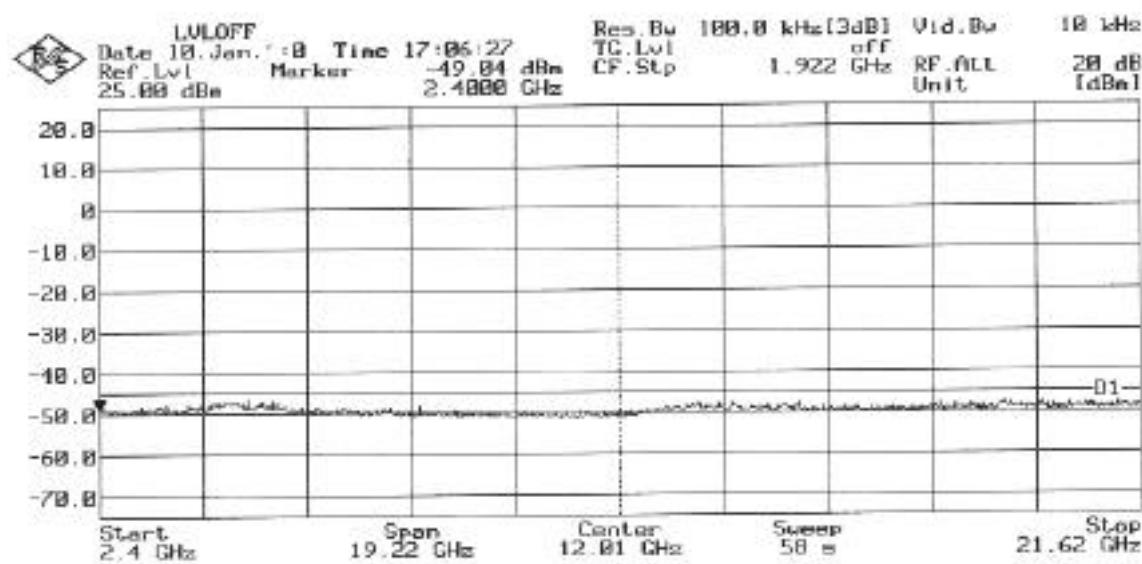
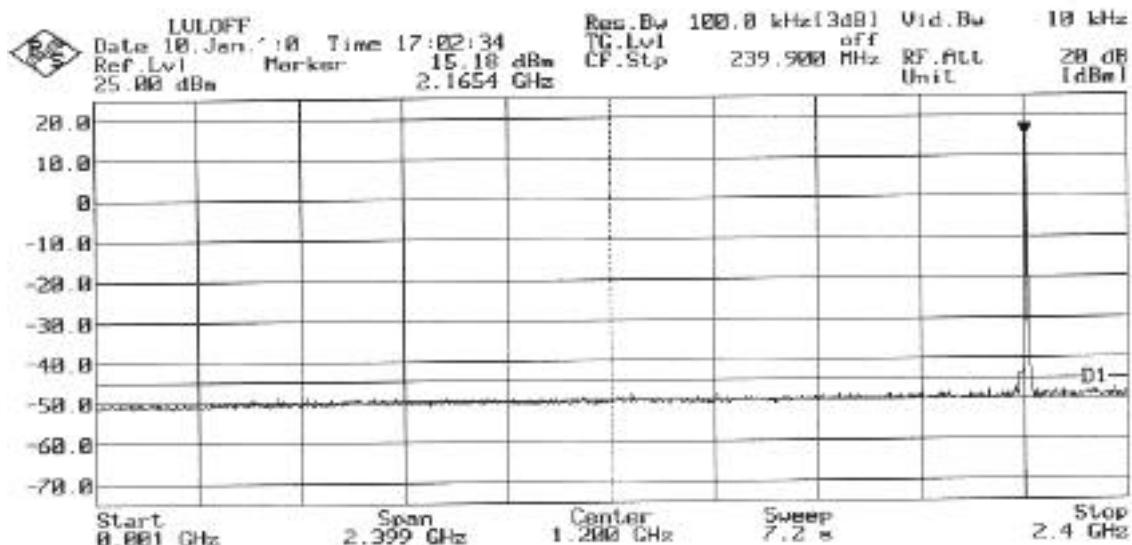
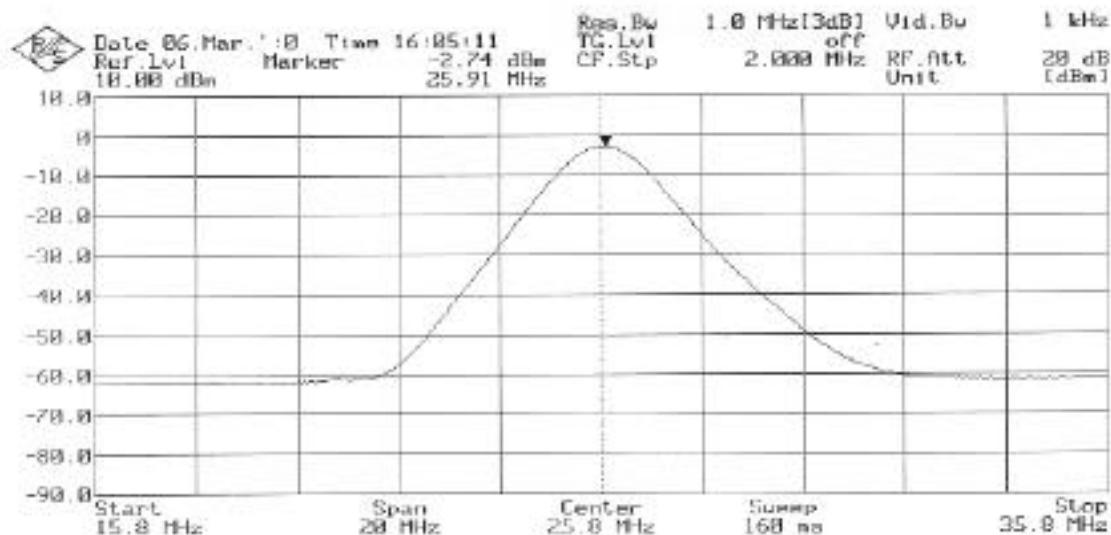


EXHIBIT 10: Data Graphs - Cable Modem Signal to RF Module

1 MHz resolution bandwidth (44 dBmV output)



100 kHz resolution bandwidth (44 dBmV output):

