

MEASUREMENT AND TECHNICAL REPORT

HUGHES NETWORK SYSTEMS
10450 Pacific Center Court
San Diego, CA 92121

DATE: 14 March 2005

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Satellite IP Modem, Mode HNS9201	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: Defer until:	No: X
Company Name agrees to notify the Commission by:	N/A	
of the intended date of announcement of the product so that the grant can be issued on that date.		
Transition Rules Request per 15.37?	Yes:	No: X*
(*) FCC Parts 2 and 25, Paragraph(s) 2.1046, 2.1049, 2.1051, 2.1053, 2.1055, 25.202(d), 25.202(f), 25.204, 25.216(h)		
Report Prepared by: TÜV AMERICA, INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 Fax: 858 546 0364		

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1.0 GENERAL INFORMATION**1.1 Product Description**

None

1.2 Related Submittal Grant

None

1.3 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the following tests.

Test Summary						
Test Description	Part 22	Part 2	Summary of Results			Pass/Fail
	Paragraph Number	Paragraph Number	Low Channel	Mid Channel	High Channel	
RF Power Output	25.204	2.1046	46.09dBm	45.93dBm	45.24dBm	PASS
Modulation Characteristics		2.1047	N/A	N/A	N/A	
Occupied Bandwidth		2.1049	183.0kHz	182.5kHz	183.5kHz	PASS
Spurious Emissions at Antenna Terminal	25.202(f)	2.1051	All emissions >10dB below limit	All emissions >10dB below limit	All emissions >10dB below limit	PASS
Field Strength of Spurious Radiation	25.202(f)	2.1053	All emissions >20dB below requirements.	All emissions >20dB below requirements.	All emissions >20dB below requirements.	PASS
Frequency Stability	25.202(d)	2.1055		< .001% variation		PASS
Field Strength of Spurious Emissions	25.216(h)	2.1053		Highest emission measured = 40.7dBpW (-79.3dBW/MHz) @ 1605MHz		PASS

Testing was performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983.

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV AMERICA, INC
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 678 1400
Fax: 858 546 0364

The Test Site Data and performance comply with ANSI C63.4 and are registered with the FCC, 7435 Oakland Mills Road, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was initially tested for FCC emissions in the following configuration:

See Test Setup Photos Exhibit

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Equipment Modifications

None

2.5 Configuration of Test System

See Test Setup Photos Exhibit

**3.0 RF POWER OUTPUT EQUIPMENT/DATA
OCCUPIED BANDWIDTH EQUIPMENT/DATA
SPURIOUS EMISSIONS AT ANTENNA TERMINAL EQUIPMENT/DATA
FIELD STRENGTH OF SPURIOUS RADIATION EQUIPMENT/DATA
FREQUENCY STABILITY EQUIPMENT/DATA
FIELD STRENGTH OF SPURIOUS EMISSIONS EQUIPMENT/DATA**

**Test Conditions: RF POWER OUTPUT EQUIPMENT/DATA: FCC Part 25.204, 2.1046
OCCUPIED BANDWIDTH EQUIPMENT/DATA: FCC Part 2.1049
SPURIOUS EMISSIONS AT ANTENNA TERMINAL EQUIPMENT/DATA: FCC Part 25.202(f), 2.1051
FIELD STRENGTH OF SPURIOUS RADIATION EQUIPMENT/DATA: FCC Part 25.202(f), 2.1053
FREQUENCY STABILITY EQUIPMENT/DATA: FCC Part 25.202(d), 2.1055
FIELD STRENGTH OF SPURIOUS EMISSIONS EQUIPMENT/DATA: FCC Part 25.216(h), 2.1053**

The measurements were performed at the San Diego Testing Facility:

☐ - Test not applicable

■ - SR-5, Shielded Room, 16' x 28' x 15', Metal, Semi-Anechoic Chamber

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
8594E	6504	Signal Generator	Hewlett Packard	3303A00365	07/04
BW-N20W5	--	20 dB Attenuator	MCL	--	VBU*
85662A	6495	Spectrum Analyzer	Hewlett Packard	2542A12099	02/05
6843A	6810	PSU	Hewlett Packard	3531A00180	05/04
--	6452	Digital Volt Meter	Hewlett Packard	2911A52177	04/04
T30RC	6225	Environmental Chamber	Tenney Environmental	27244-02	05/04
E4440A	7500	Spectrum Analyzer	Hewlett Packard	MY43362168	12/04
AMF-5D-010180-35-10P	719	Preamplifier	Miteq	549460	04/04
3115	453	Double Ridge Antenna	EMCO	9412-4364	02/05
AA-190-30.00.0	7491	30' Cable	United Microwave Pro	--	VBU*
AA-190-04-00.0	6788	3' Cable	United Microwave Prod	--	VBU*

Remarks: One year calibration cycle for all test equipment and sites. (*) Verified Before Use.

**Hughes Network Systems
Satellite IP Modem, Model HNS9201**

SC500226

FCC Part 25.202 - Occupied Bandwidth

Transmitter Frequency (GHz)	Measured 99% Occupied Bandwidth (kHz)
1.6268425	183.0
1.6435913	182.5
1.6603900	183.5

Remarks

--



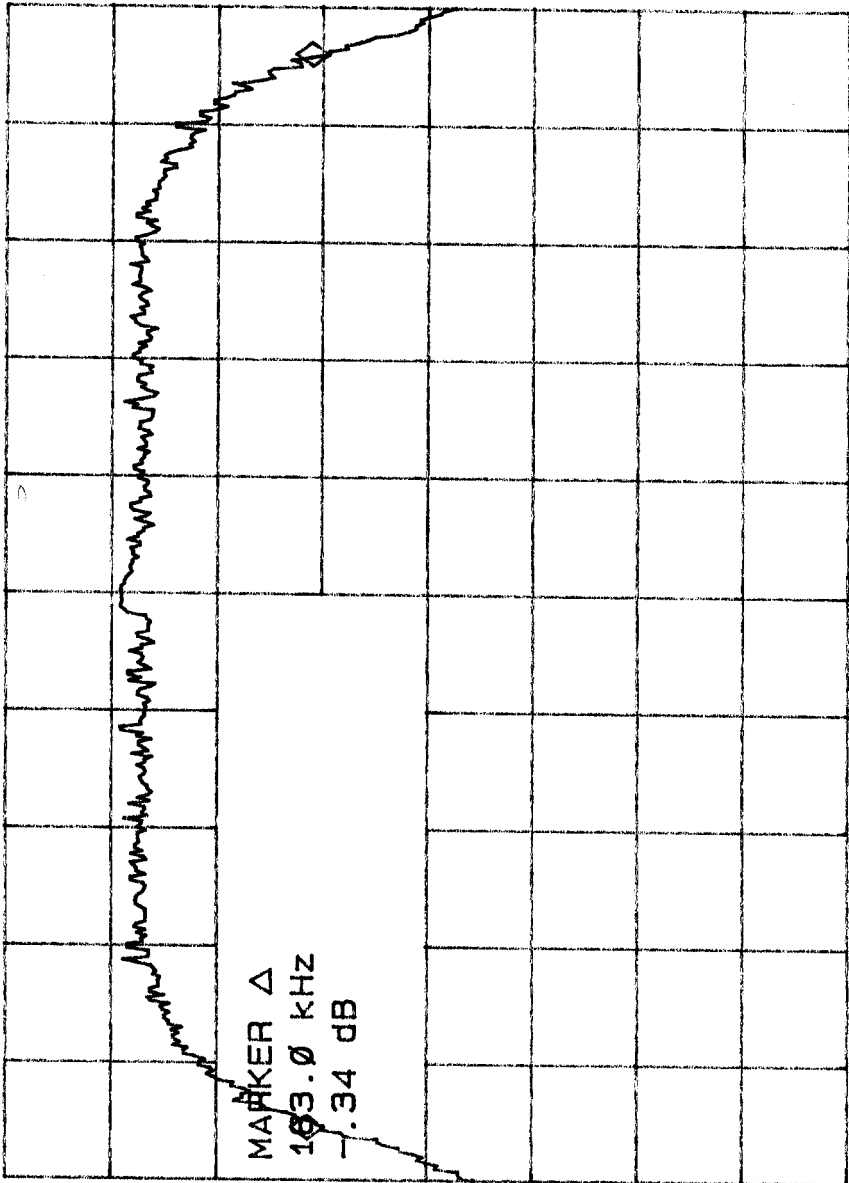
FCC Part 25.202 - Occupied Bandwidth
Channel 6140

12: 16: 51 JAN 20, 2005

REF 20.0 dBm AT 30 dB

PEAK
LOG
10
dB/

MKR Δ 183.0 KHZ
- .34 dB



CENTER 1.6268429 GHz
#RES BW 3.0 KHZ

#VBW 10 KHZ

SPAN 200.0 KHZ
SWP 100 msec

MARKER
NORMAL

MARKER
Δ

MARKER
AMPTD

SELECT
1 2 3 4

MARKER 1
ON OFF

More
1 of 2



FCC Part 25.202 - Occupied Bandwidth
Channel 12840

12:36:37 JAN 20, 2005

REF 20.0 dBm #AT 30 dB

MKR Δ 182.5 kHz
.40 dB

PEAK
LOG
10
dB/

MARKER
→ CF

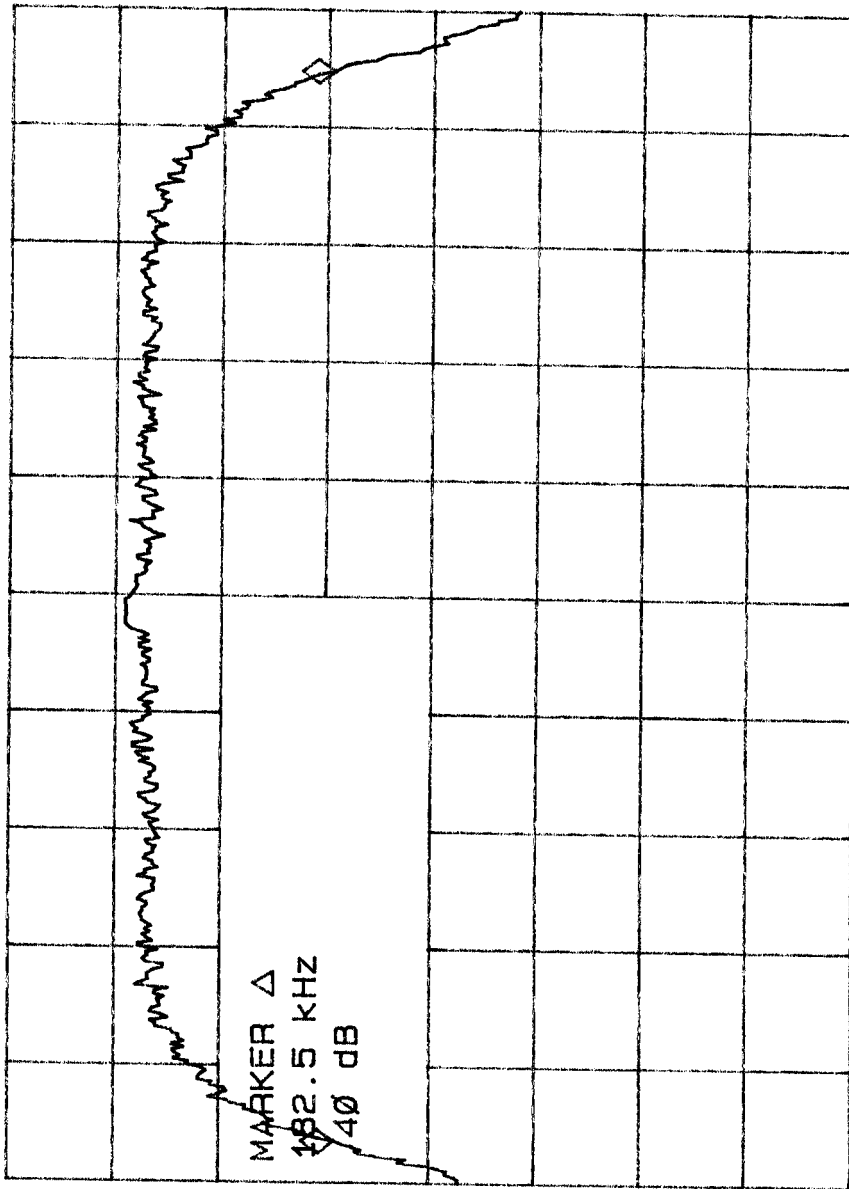
MARKER
Δ

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2



CENTER 1.6435950 GHz
#RES BW 3.0 kHz
#VBW 10 kHz
SPAN 200.0 kHz
SWP 100 msec

MA SB
SC FC
CORR



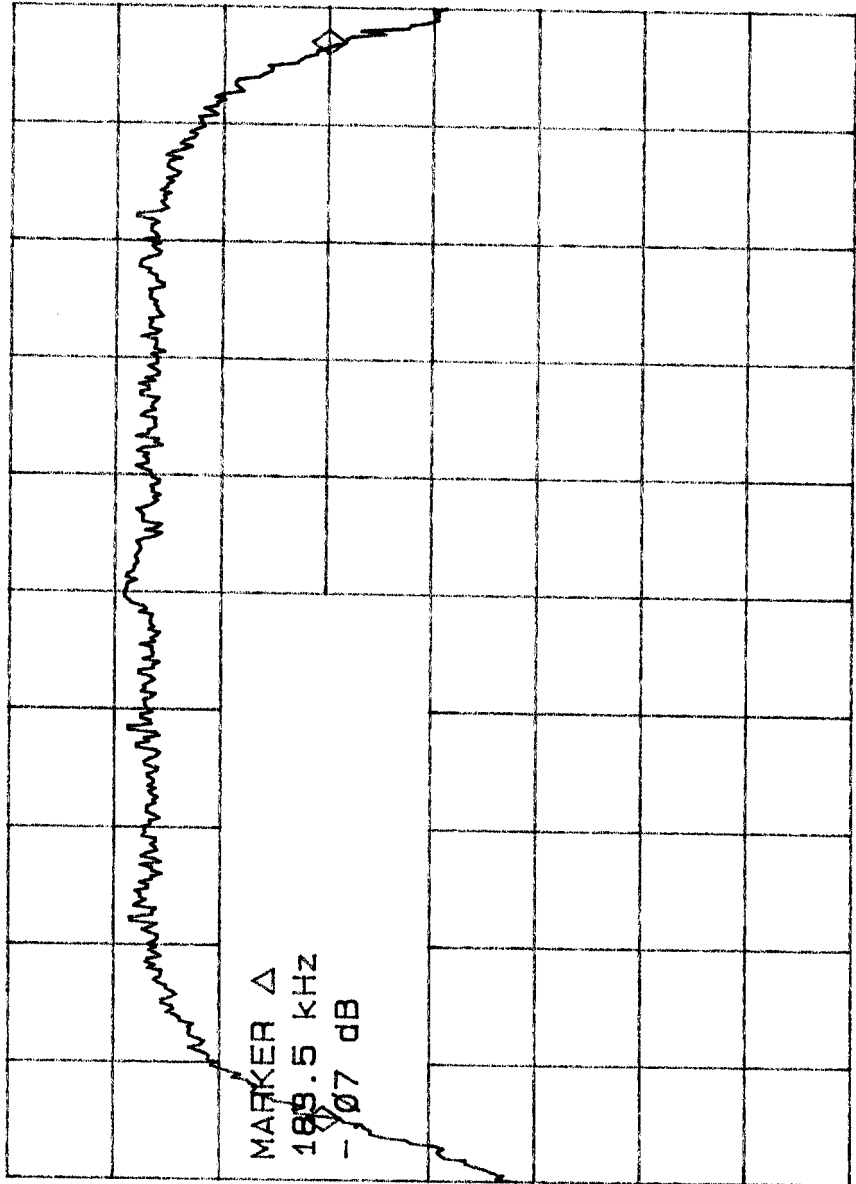
FCC Part 25.202 - Occupied Bandwidth
Channel 19560

12: 49: 25 JAN 20, 2005

REF 20.0 dBm #AT 30 dB

MKR Δ 183.5 kHz
- .07 dB

PEAK
LOG
10
dB/



MA SB
SC FC
CORR

CENTER 1.6603910 GHz
RES BW 3.0 kHz

#VBW 10 kHz

SPAN 200.0 kHz
SWP 100 msec

MARKER
→ CF

MARKER
Δ

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2

Report No. SC500226-03A



**Hughes Network Systems
Satellite IP Modem, Model HNS9201**

SC500226

FCC Part 25.202 - Emissions Limitations

See plots for test results.

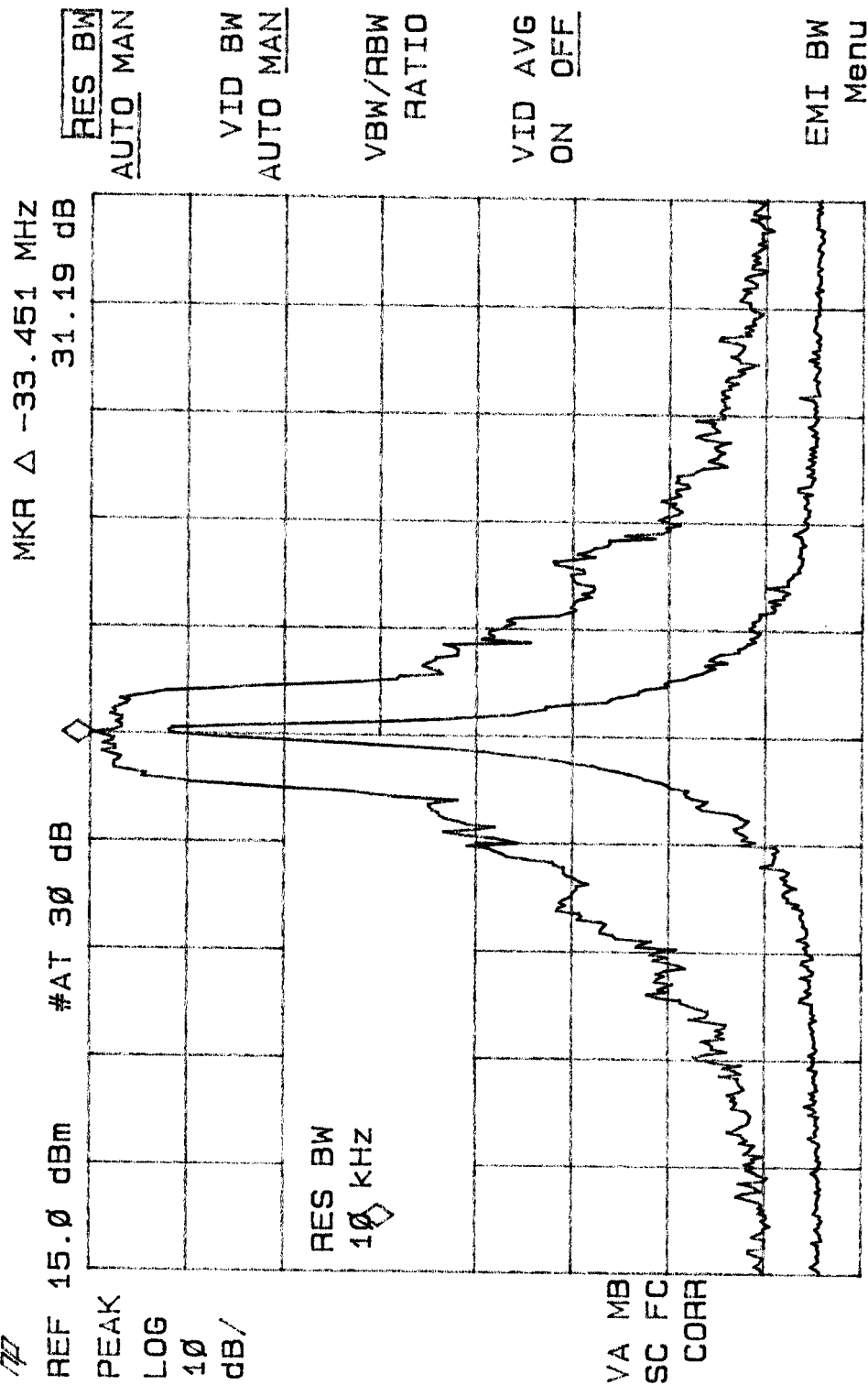
Remarks

Measured in 10kHz bandwidth.



FCC Part 25.202 - Emissions Limitations
Channel 6140

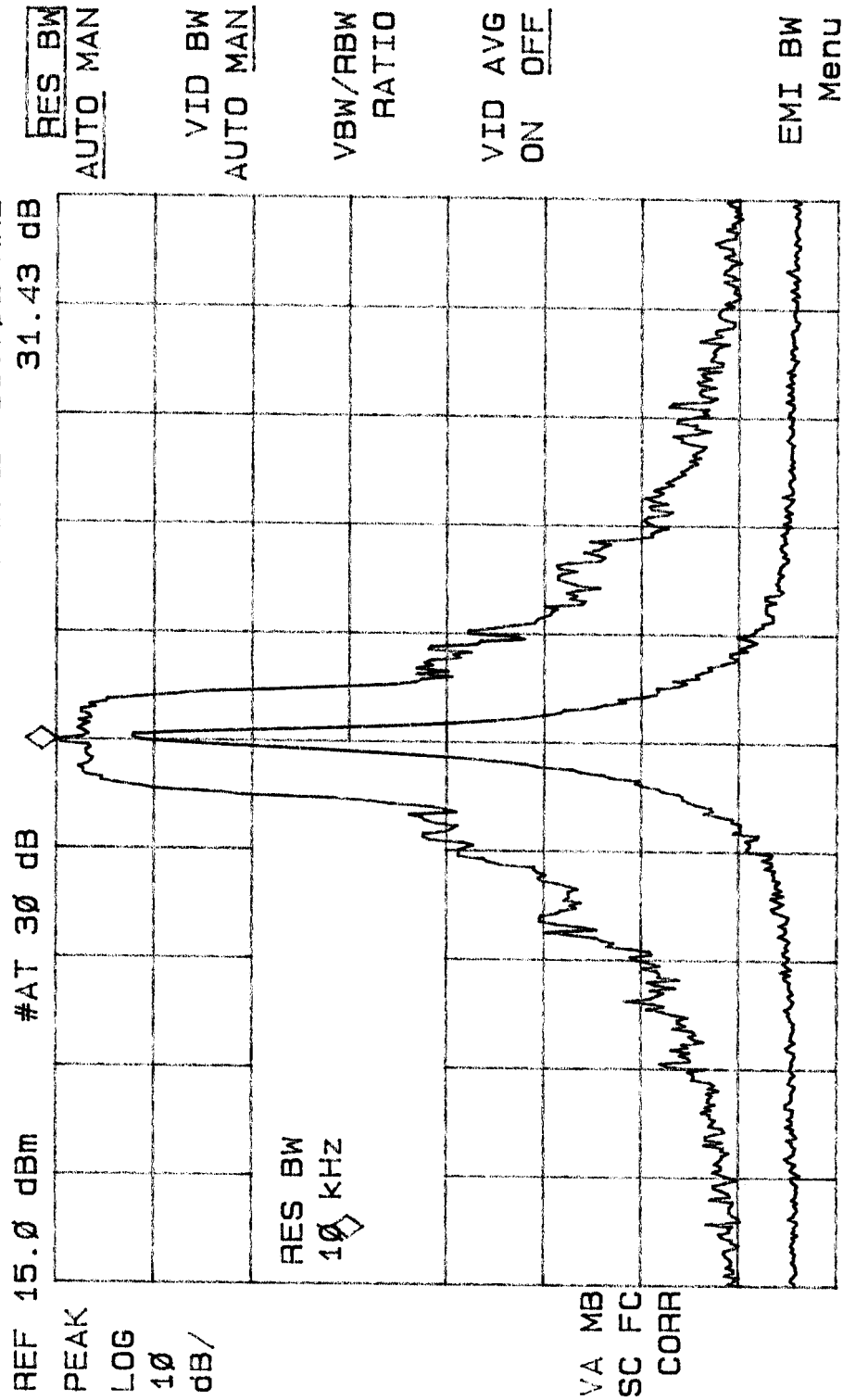
13:33:56 JAN 20, 2005



CENTER 1.626851 GHz SPAN 2.000 MHz
RES BW 10 kHz #VBW 30 kHz SWP 60.0 msec

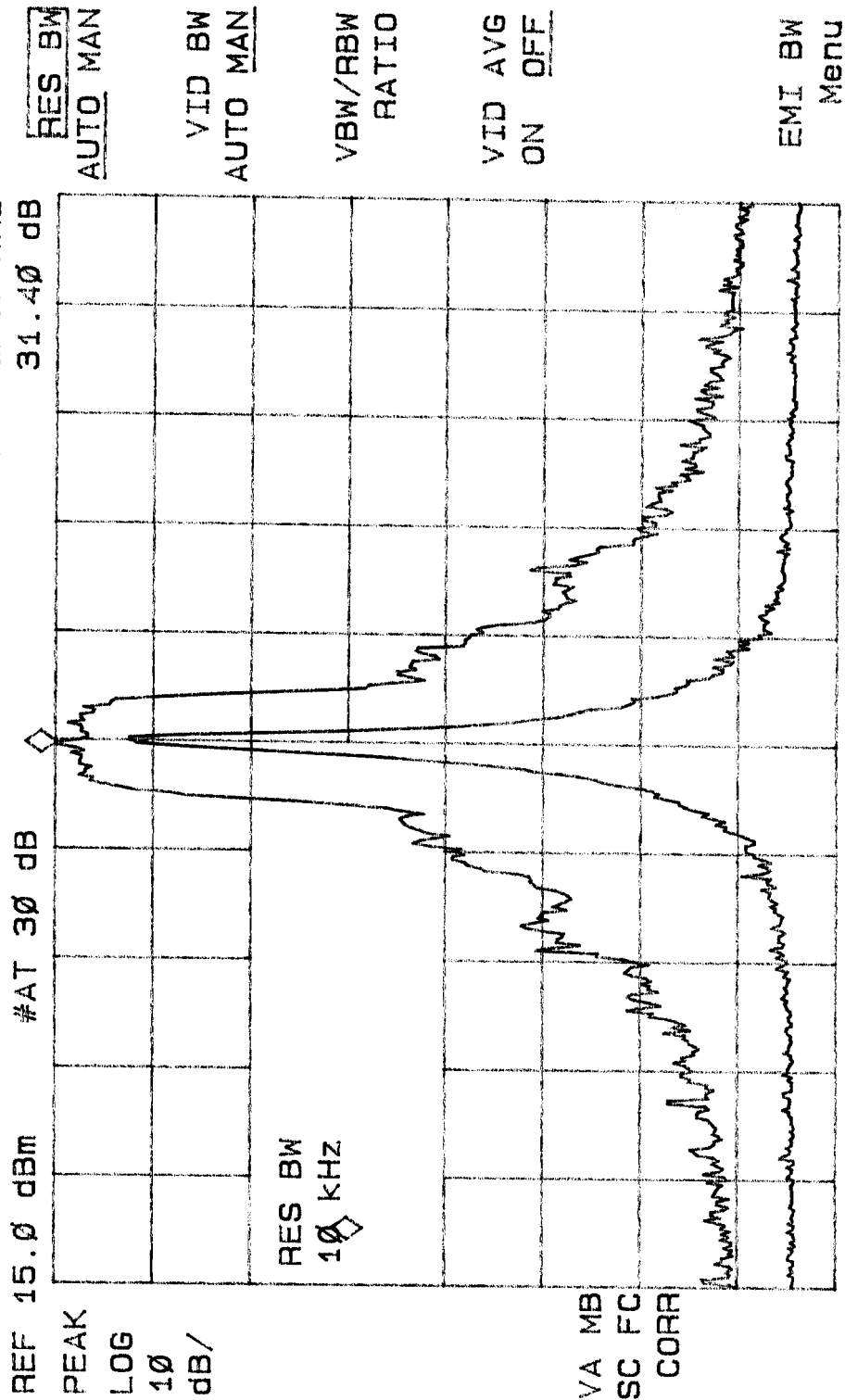
FCC Part 25.202 - Emissions Limitations
Channel 12840

13: 41: 05 JAN 20, 2005



FCC Part 25.202 - Emissions Limitations
Channel 19560

13: 47: 17 JAN 20, 2005



Hughes Network Systems
Satellite IP Modem, Model HNS9201

SC500226

FCC Part 25.202 - Antenna Port Conducted Spurious Emissions**Transmit Frequency 1.6268 GHz**

Frequency (GHz)	Emission Level (dBc)	Limit (dBc)	
.01 to 17	See Remarks		

Transmit Frequency 1.6436 GHz

Frequency (GHz)	Emission Level (dBc)	Limit (dBc)	
.01 to 17	See Remarks		

Transmit Frequency 1.6603 GHz

Frequency (GHz)	Emission Level (dBc)	Limit (dBc)	
.01 to 17	See Remarks		

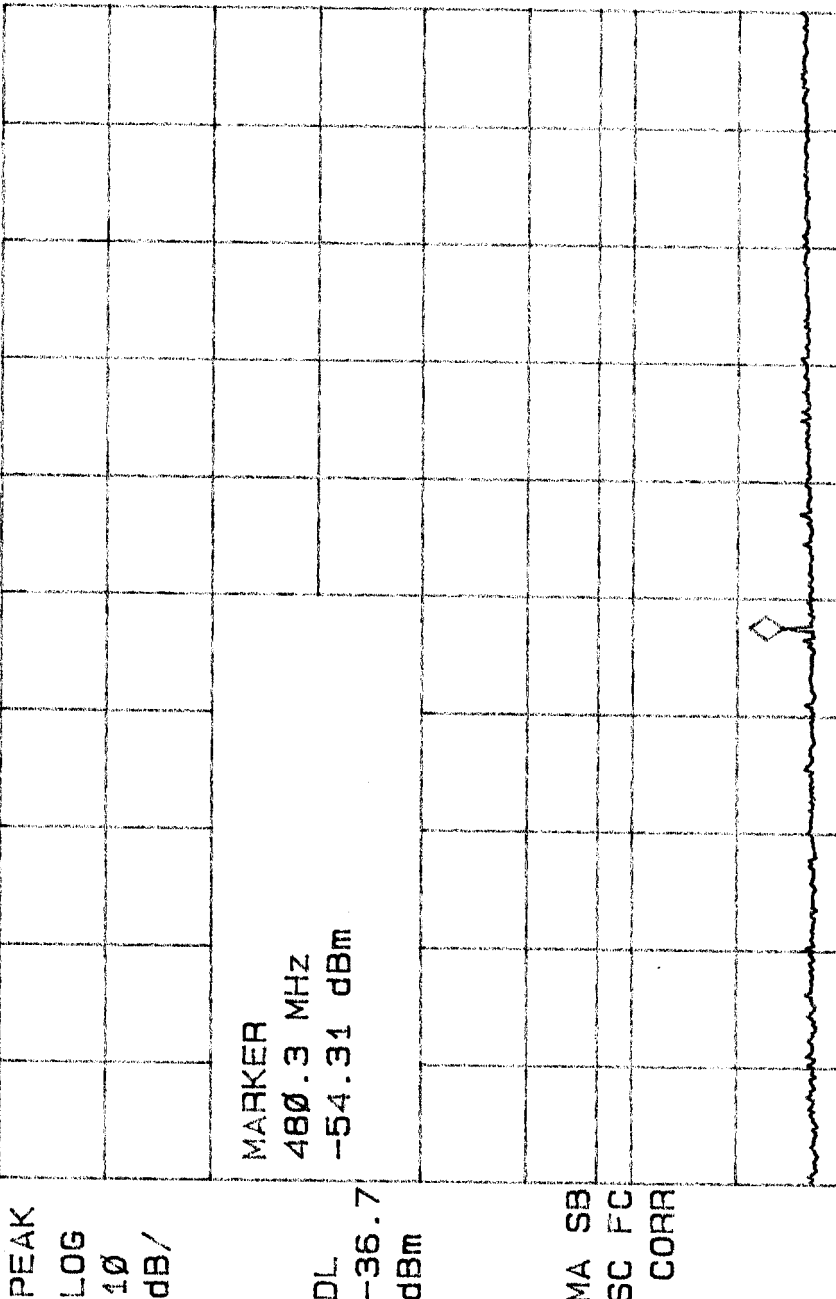
Remarks

No emissions were detected at a level greater than 10dB below the limit.

FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 6140

14:28:19 JAN 20, 2005

REF 20.0 dBm #AT 30 dB MKR 480.3 MHz
-54.31 dBm



MARKER
→ CF

MARKER
Δ

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2

START 10.0 MHz #RES BW 30 KHZ #VBW 100 KHZ STOP 1.0000 GHz
SWP 3.30 sec

FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 6140

14:32:31 JAN 20. 2005

REF 20.0 dBm #AT 30 dB

MKR 1.627 GHz
14.32 dBm

PEAK
LOG
10
dB/

MARKER
→ CF

MARKER
Δ

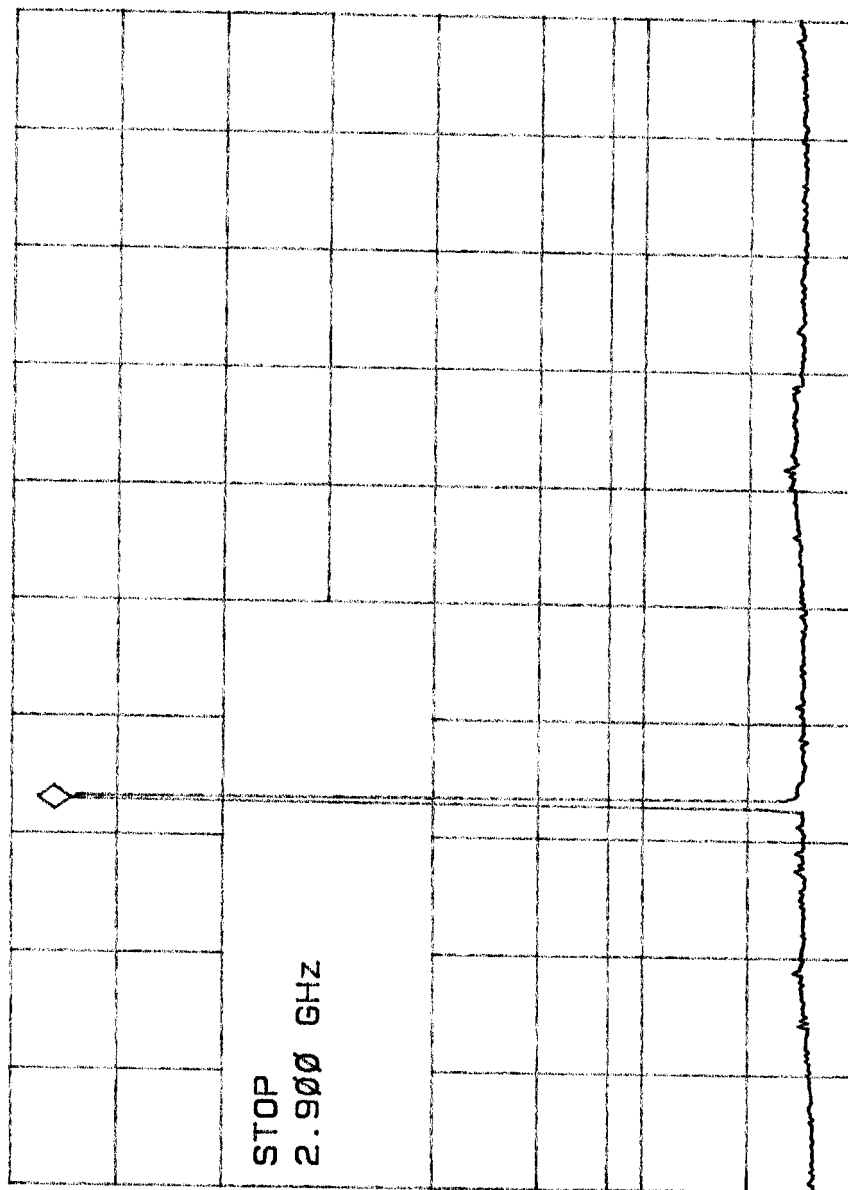
DL
-36.7
dBm

NEXT
PEAK

NEXT PK
RIGHT

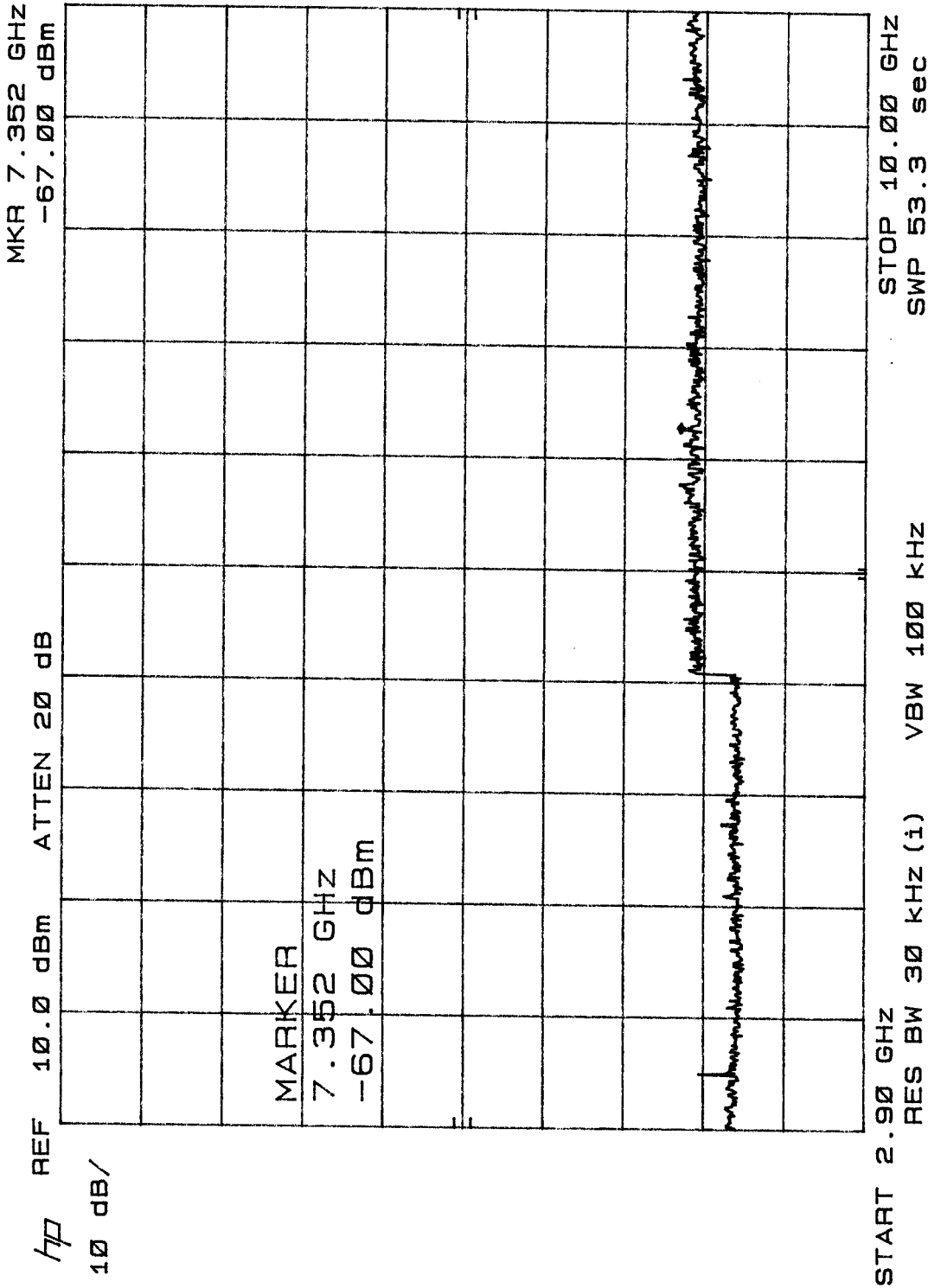
NEXT PK
LEFT

More
1 of 2

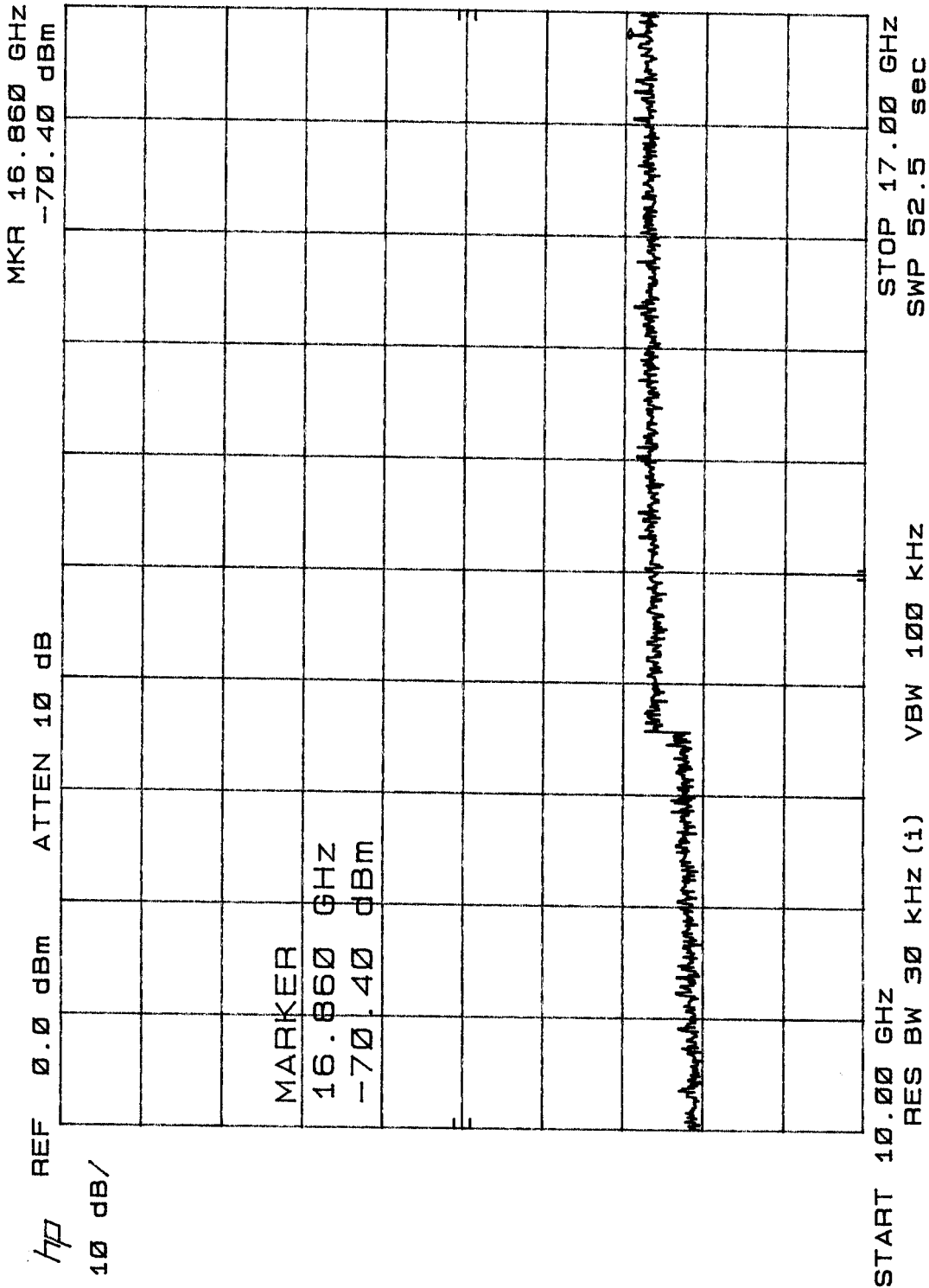


START 1.000 GHz #RES BW 30 KHz
STOP 2.900 GHz #VBW 100 KHz SWP 6.33 sec

FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 6140



FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 6140





FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 12840

14:37:56 JAN 20, 2005

REF 20.0 dBm #AT 30 dB

PEAK
LOG
10
dB/

MKR 505.0 MHz
-54.38 dBm

MARKER
NORMAL

MARKER
Δ

DL
-36.7
dBm

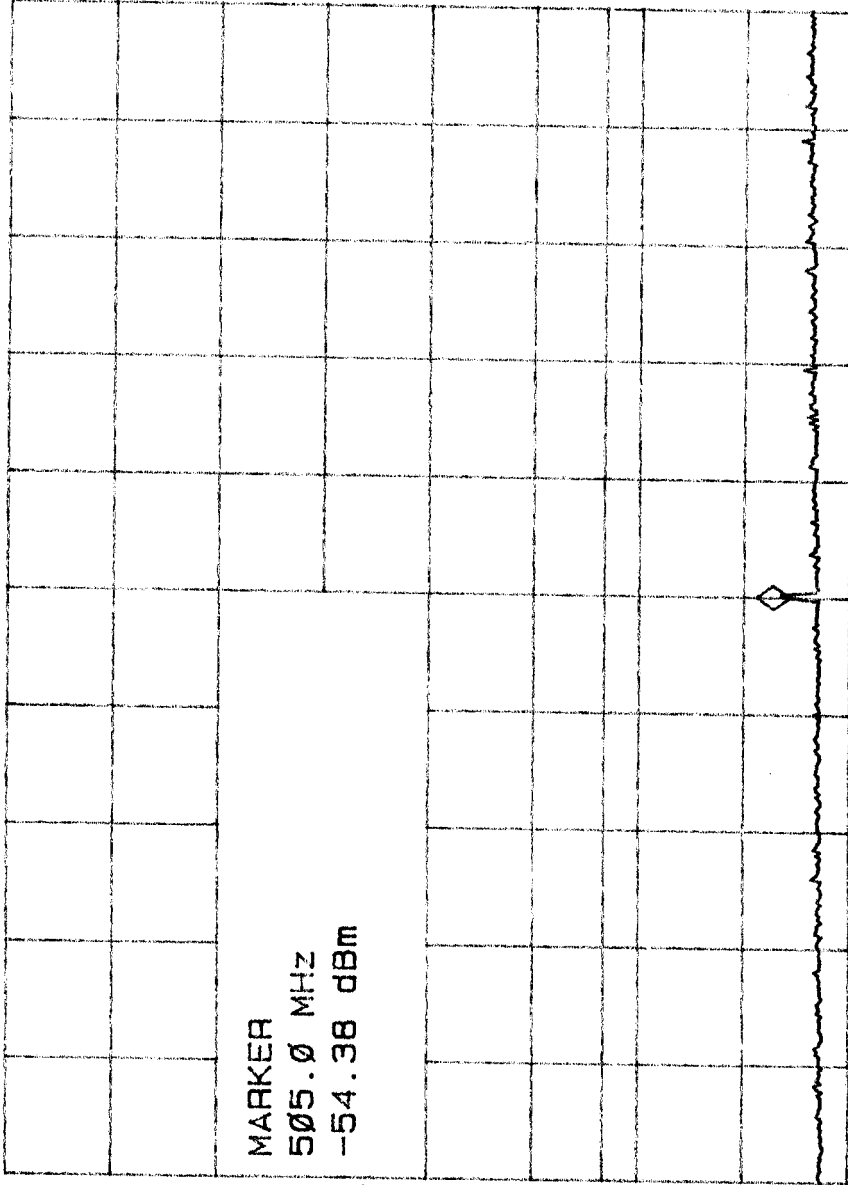
MARKER
AMPTD

SELECT
1 2 3 4

MA SB
SC FC
CORR

MARKER 1
ON OFF

More
1 of 2



START 10.0 MHz #RES BW 30 KHz
STOP 1.0000 GHz #VBW 100 KHz SWP 3.30 sec

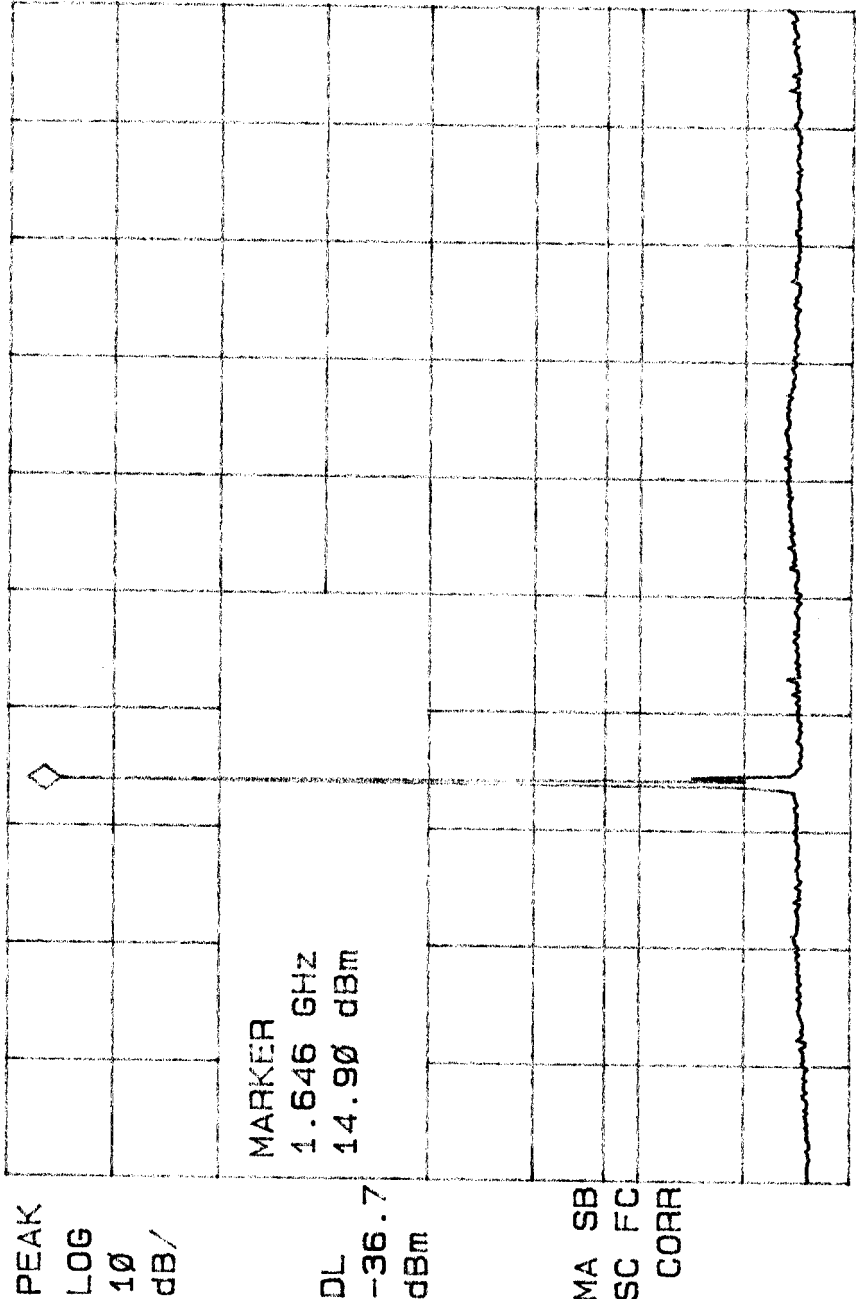


FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 12840

14: 42: 12 JAN 20. 2005

REF 20.0 dBm #AT 30 dB

MKR 1.646 GHz
14.90 dBm



MARKER
→ CF

MARKER
Δ

NEXT
PEAK

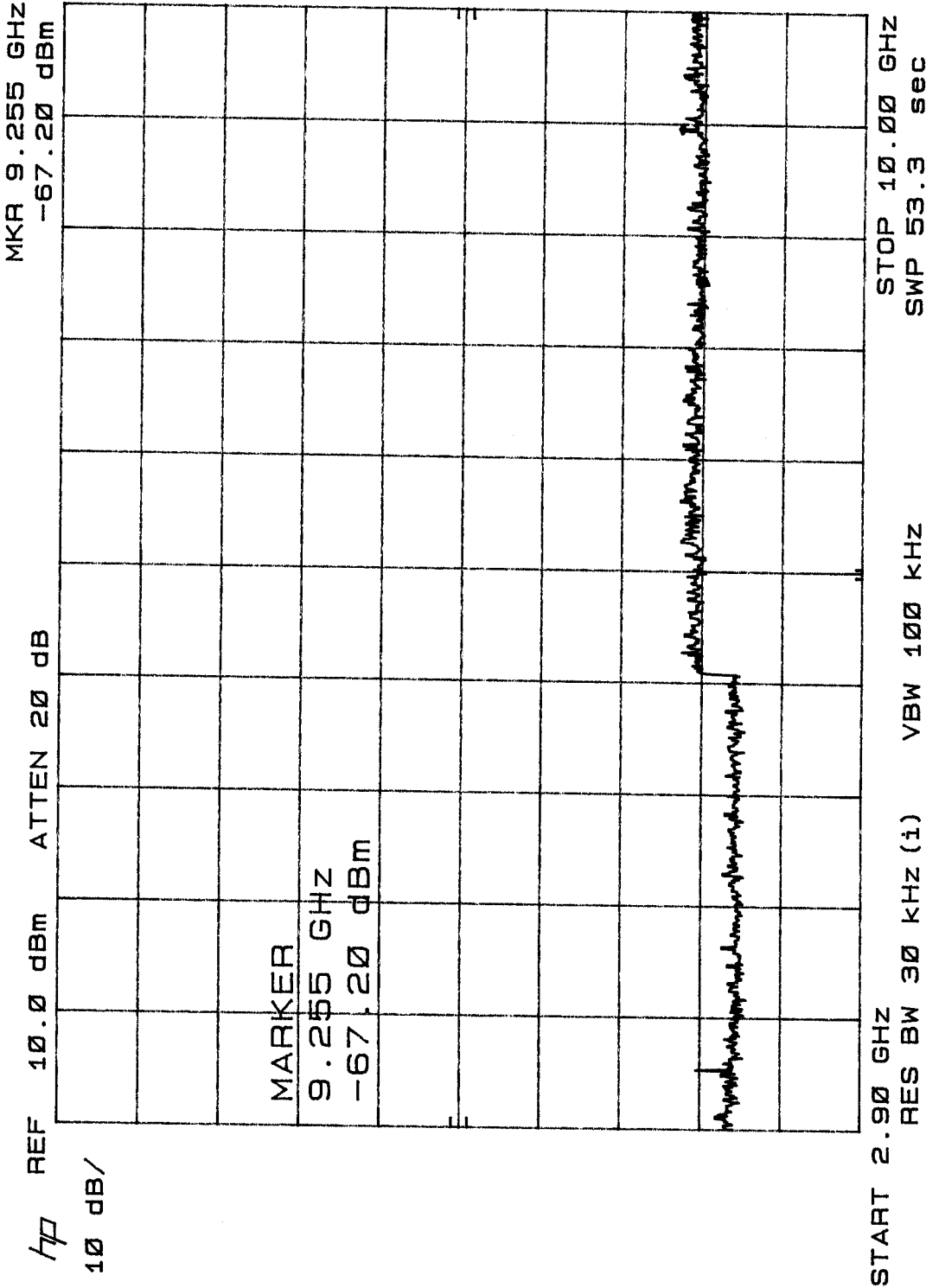
NEXT PK
RIGHT

NEXT PK
LEFT

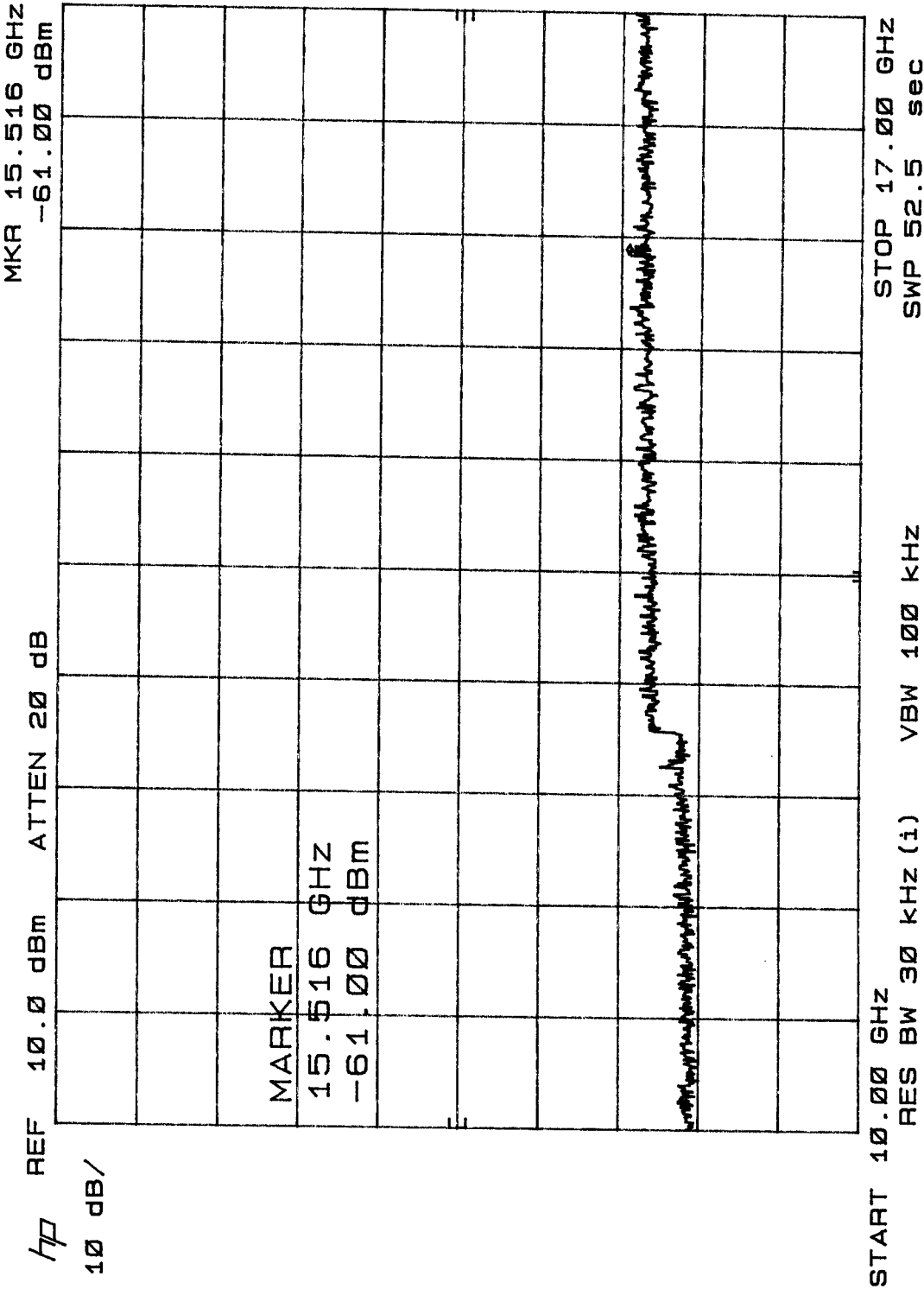
More
1 of 2

START 1.000 GHz #RES BW 30 kHz
STOP 2.900 GHz #VBW 100 kHz SWP 6.33 sec

FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 12840



FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 12840





FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 19560

14: 46: 50 JAN 20, 2005

REF 20.0 dBm #AT 30 dB

PEAK
LOG
10
dB/

MKR 532.2 MHz
-53.79 dBm

MARKER
→ CF

MARKER
Δ

DL
-39.9
dBm

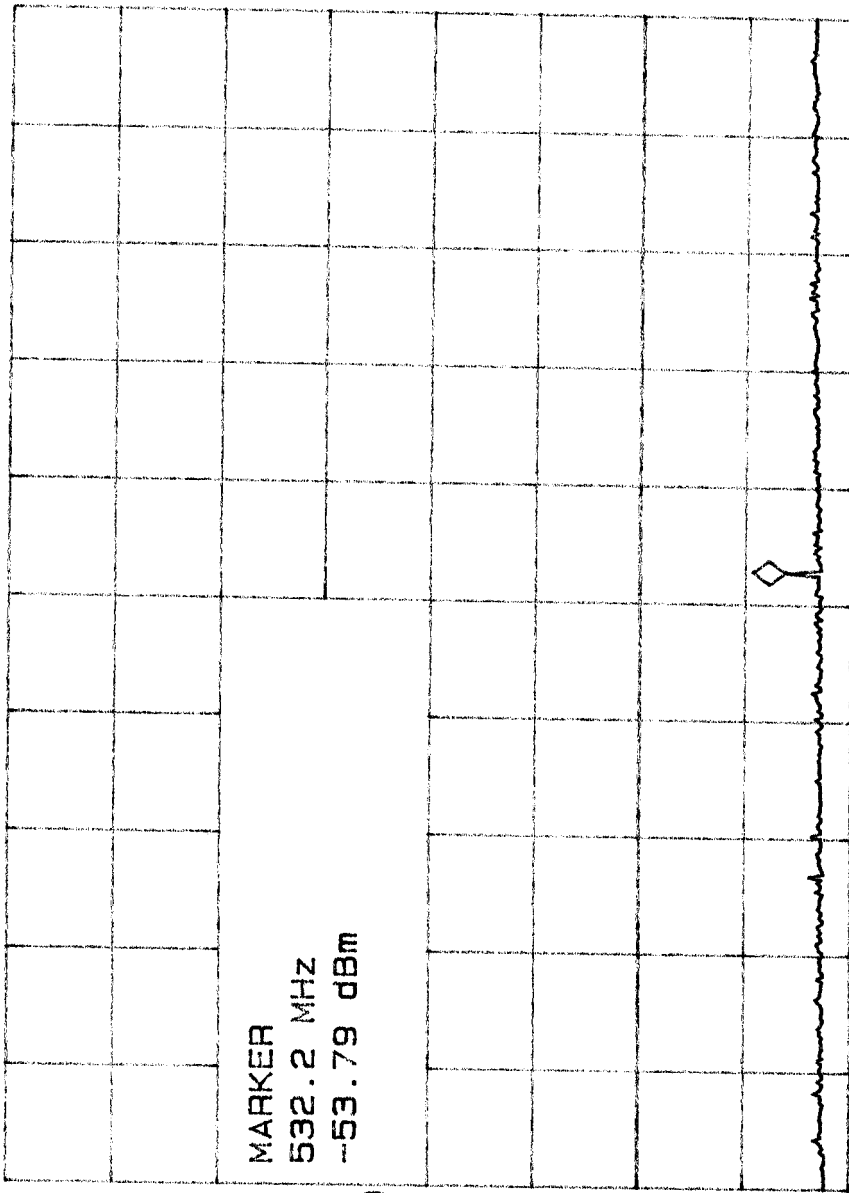
MARKER
532.2 MHz
-53.79 dBm

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2

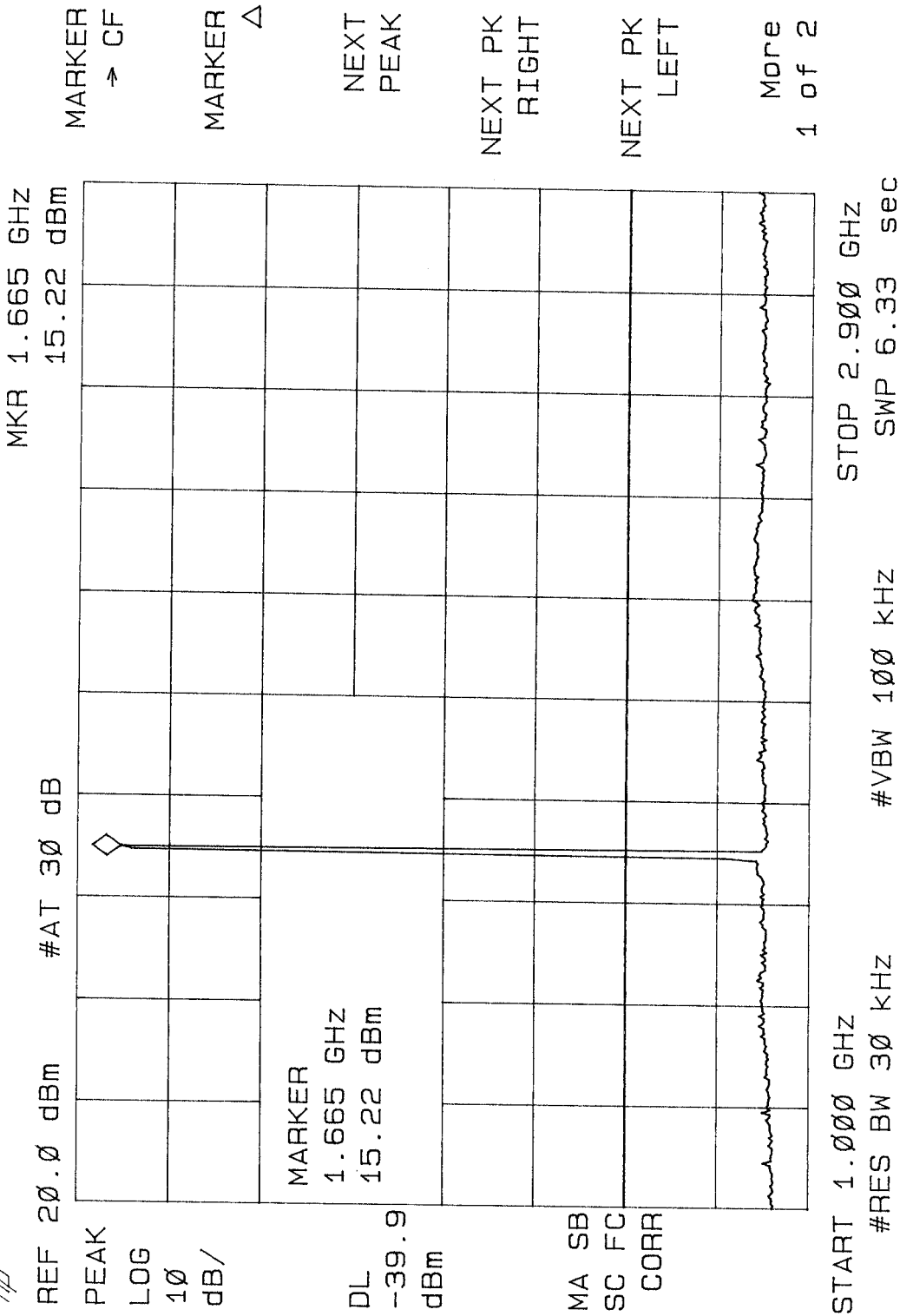


START 10.0 MHz #RES BW 30 kHz
STOP 1.0000 GHz #VBW 100 kHz SWP 3.30 sec

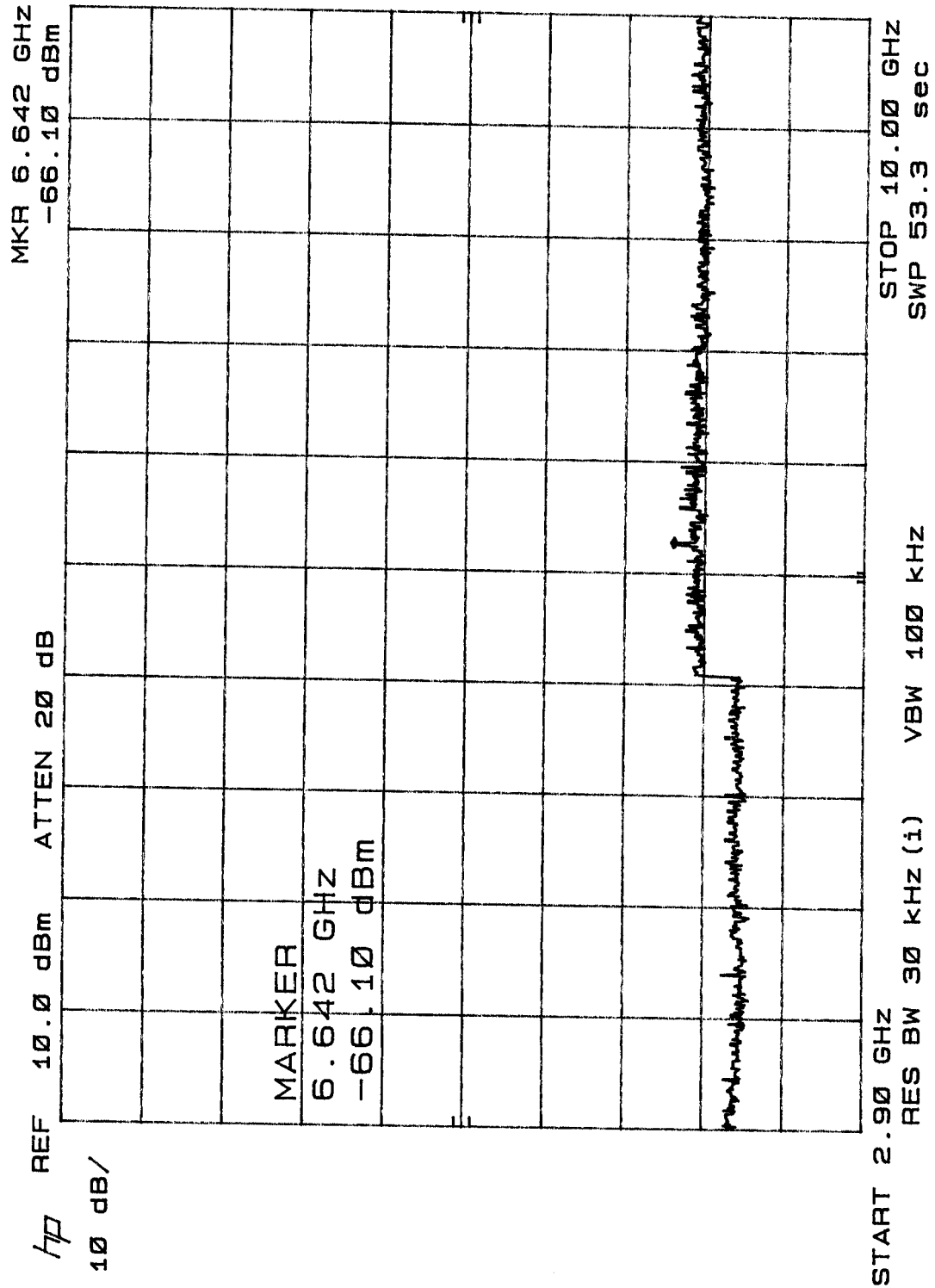


FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 19560

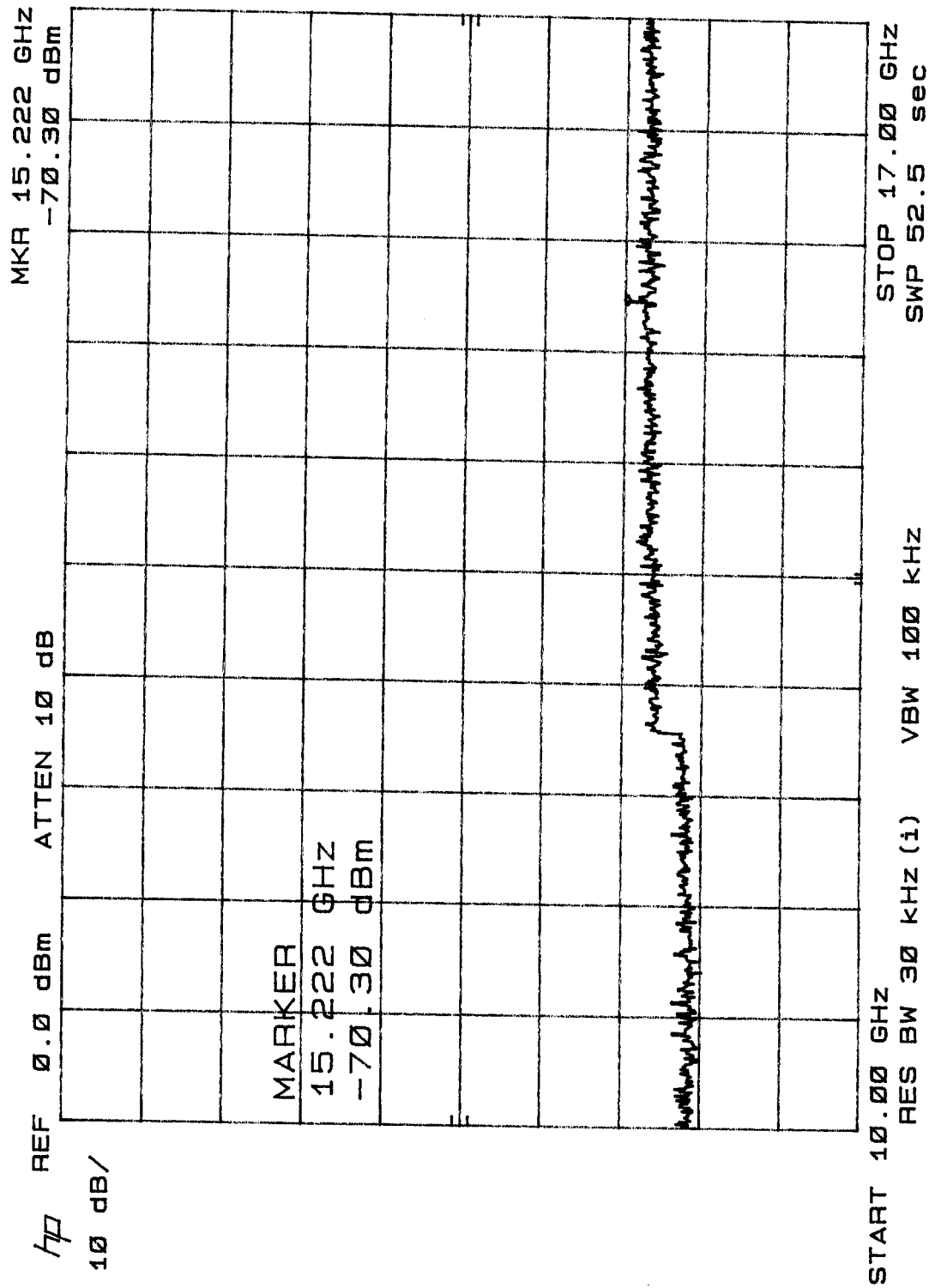
14:51:18 JAN 20, 2005



FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 19560



FCC Part 25.202 - Antenna Port Conducted Spurious Emissions
Channel 19560



Hughes Network Systems
Satellite IP Modem, Model HNS9201

SC500226

FCC Part 25.202 - Frequency Tolerance

Transmit Frequency 1.643 GHz

Temp (°C)	Frequency (Hz)
+50	1 643 599 082
+40	1 643 598 865
+30	1 643 599 357
+20	See Table Below
+10	1 643 600 438
0	1 643 601 197
-10	1 643 601 700
-20	1 643 602 037
-30	1 643 601 712
Limit (Hz)	1 643 583 564 to 1 643 616 436

Voltage Variation at 20°C

V(ac)	Frequency (Hz)
93.5	1 643 600 168
98.5	1 643 600 135
103.5	1 643 600 100
108.5	1 643 600 078
113.5	1 643 600 048
118.5	1 643 600 021
123.5	1 643 599 991
126.5	1 643 599 971
Limit (Hz)	1 643 583 564 to 1 643 616 436

Remarks

Measurements taken at 1 hour intervals to allow for temperature stabilization.
Frequency tolerance limit is +/-0.001% of normal operating frequency.
Extreme voltage test range is 85% to 115% of rated operating voltage (110vac). This equates to 93.5vac to 126.5vac.

FCC Part 25, 201

SPEC:

TESTER: Frank Harkins

REPORT No. SC500226-03A

CUSTOMER: Hughes Networks

TEST DIST: 3 Meters

EUT: HNS 9201

TEST SITE: Roof

EUT MODE: Transmit

BICONICAL: N/A

DATE: February 8, 2005

LOG: N/A

ERP/EIRP Factor 5.5

NOTES: Spec Anyz E440A Agilent cal due 2/10/05

HORN: 453

Pre Amp 719 (Filter SN 006 200Mhz) Cables 30' SN 0007490 & 3' 37052-386

CF = Antenna Factor + Cable Loss - Preamp Gain + Preset Loss

FREQ (MHz)	VERTICAL (dBuV) pk	HORIZONTAL (dBuV) pk	CF (dBm) pk	MAX LEVEL (dBm) pk	SPEC LIMIT (dBm) pk	MARGIN (dB) pk	EUT Rotation	Antenna Height	Notes	dBuV/m	dBuV/m
1626.84	65.89	66.3	30.3	1.3	-13.0	-27.3	0	1.5	Fundamental (Low Band)	96.6	30.3
3253.68	57.29	57.29	-2.3	-40.3	-13.0	-39.8	270	1	EUT antenna terminated in dummy load	55.0	-2.3
4880.52	43.1	43.1	-0.6	-52.8	-13.0	-36.7	270	1		42.5	-0.6
6507.36	39.69	39.69	5.9	-49.7	-13.0		0	1		45.6	5.9
8134.2			8.2						noise floor 35dBuV	8.2	8.2
9761.04			9.2							9.2	9.2
11387.88			12.7							12.7	12.7
13014.72			13.0							13.0	13.0
14641.56			16.3							16.3	16.3
16268.4			16.6							16.6	16.6
1643.95	66.49	66.49	30.4	1.6	-13.0	-25.6	0	1	Fundamental (Mid Band)	96.9	30.4
3287.9	58.9	58.9	-2.2	-38.6	-13.0	-37.3	90	1.5	EUT antenna terminated in dummy load	56.7	-2.2
4931.85	45.29	45.29	-0.3	-50.3	-13.0	-32.9	45	1		44.9	-0.3
6575.8	43.29	43.29	6.1	-45.9	-13.0		180	1		49.4	6.1
8219.75			8.3						noise floor 35dBuV	8.3	8.3
9863.7			9.5							9.5	9.5
11507.65			12.7							12.7	12.7
13151.6			13.9							13.9	13.9
14795.55			17.3							17.3	17.3
16439.5			17.0							17.0	17.0
1660.39	65.56	65.56	30.5	0.8	-13.0	-27.6	0	1	Fundamental (High Band)	96.0	30.5
3320.78	56.79	56.79	-2.1	-40.6	-13.0	-32.9	270	1	EUT antenna terminated in dummy load	54.7	-2.1
4981.17	49.49	49.49	-0.1	-45.9	-13.0	-34.9	270	1		49.4	-0.1
6641.56	41.1	41.1	6.2	-47.9	-13.0		270	1		47.3	6.2
8301.95			8.4							8.4	8.4
9962.34			9.7						floor @ 35dBuV	9.7	9.7
11622.73			12.7							12.7	12.7
13283.12			14.7							14.7	14.7
14943.51			18.2							18.2	18.2
16603.9			17.5							17.5	17.5

Hughes Network Systems
Satellite IP Modem, Model HNS9201

SC500226

FCC Part 25.203 - Power Density**Antenna Gain: 15dBi**

Transmitter Frequency (GHz)	Power Density at Ae Port in 10kHz BW (dBm)	Power Density at Ae Port in 4kHz BW (dBm)	Power Density at Ae Port in 1MHz BW (dBm)	EIRP in 4kHz BW (dBm)	Limit in 4kHz BW (dBm)
1.6268425	35.07	31.09	40.59	46.09	70.0
1.6435913	34.91	30.93	40.72	45.93	70.0
1.6603900	34.22	30.24	40.75	45.24	70.0

Remarks

As the test equipment used was not capable of performing measurements in a 10kHz RBW the Power Density was measured using a 10kHz RBW and converted to a 4kHz RBW.

Results shown above are corrected to include the external attenuation and path loss used in the test set-up.

FCC Part 25.203 - Power Density
Channel 6140

12: 29: 10 JAN 19. 2005

MKR 1.6268425 GHz
15.10 dBm

REF 20.0 dBm AT 30 dB

PEAK
LOG
10
dB/

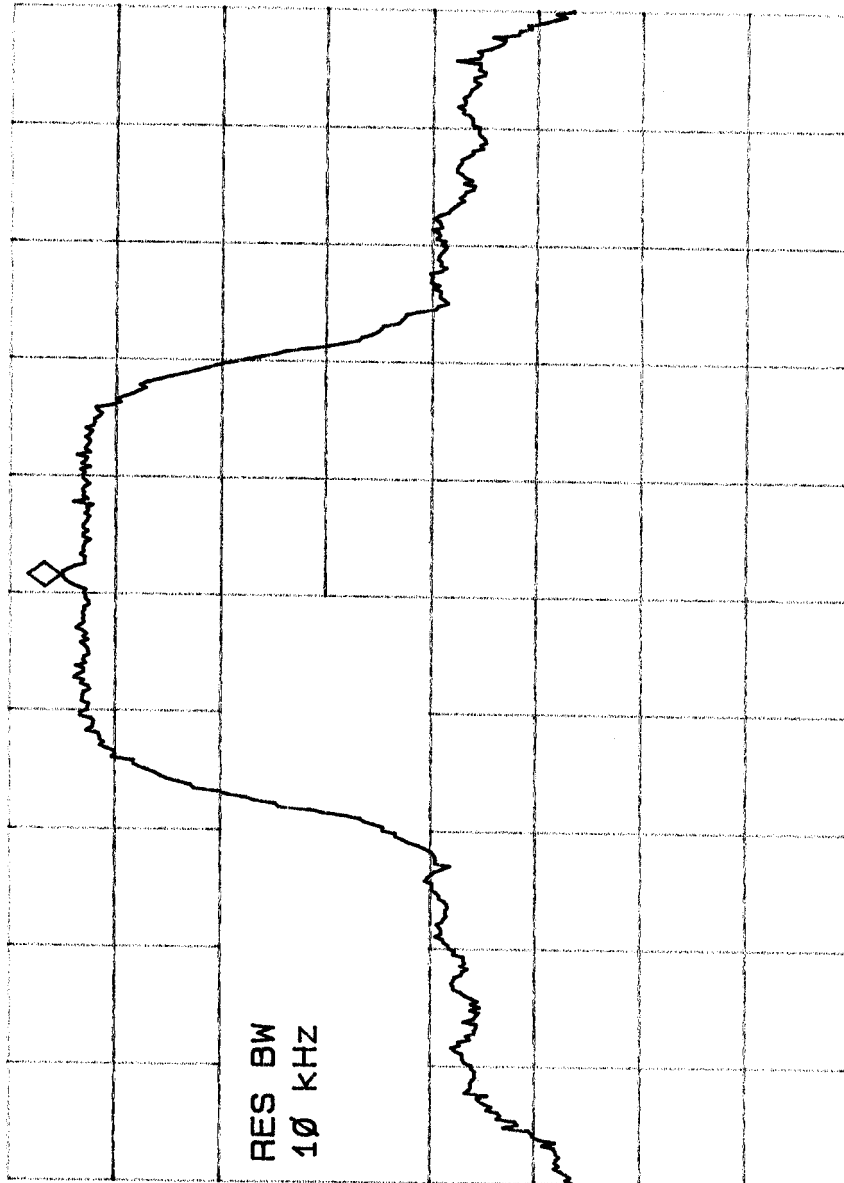
RES BW
AUTO MAN

VID BW
AUTO MAN

VBW/RBW
RATIO

VID AVG
ON OFF

EMI BW
Menu



RES BW
10 KHz

MA SB
SC FS
CORR

SPAN 500.0 KHz
#SWP 100 sec

#VBW 30 KHz

CENTER 1.6268350 GHz
RES BW 10 KHz

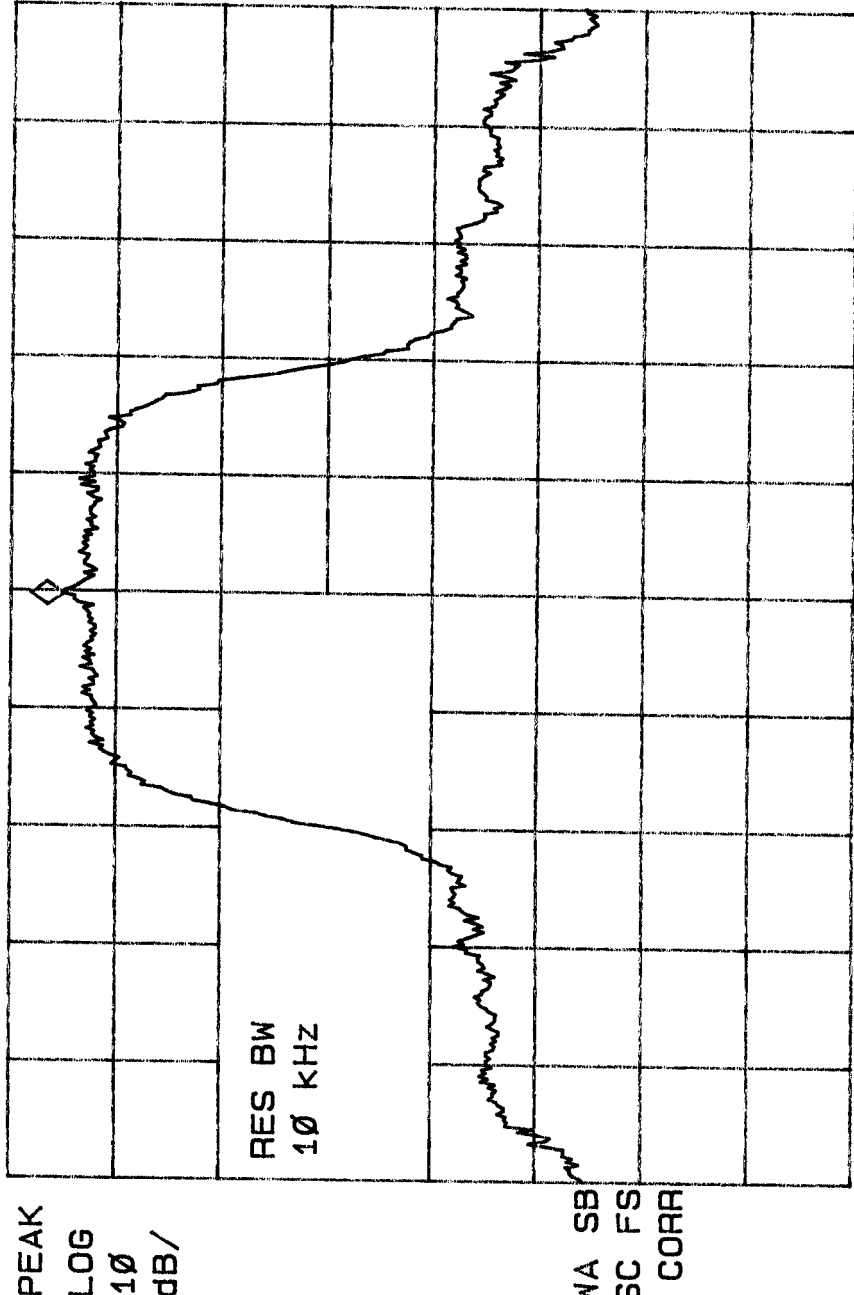


FCC Part 25.203 - Power Density
Channel 12840

13:26:26 JAN 19, 2005
170

MRK 1.6435913 GHz
14.91 dBm

REF 20.0 dBm #AT 30 dB



RES BW
AUTO MAN

VID BW
AUTO MAN

VBW/RBW
RATIO

VID AVG
ON OFF

EMI BW
Menu

CENTER 1.6435925 GHz
RES BW 10 kHz
SPAN 500.0 kHz
#SWP 100 sec
#VBW 30 kHz



FCC Part 25.203 - Power Density
Channel 19560

12: 55: 02 JAN 19, 2005

MRK 1.6603900 GHz
14.22 dBm

AT 30 dB

REF 20.0 dBm

PEAK
LOG
10
dB/

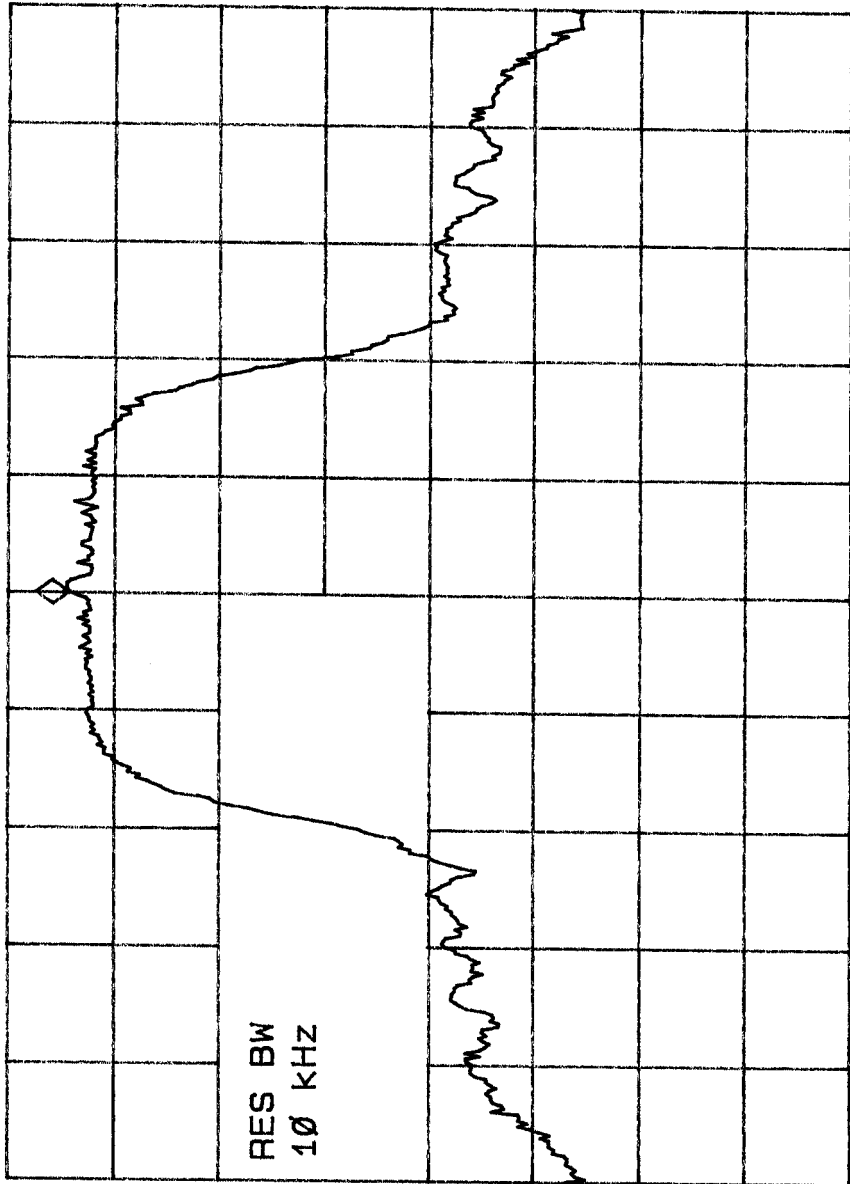
RES BW
AUTO MAN

VID BW
AUTO MAN

VBW/RBW
RATIO

VID AVG
ON OFF

EMI BW
Menu



RES BW
10 kHz

WA SB
SC FS
CORR

CENTER 1.6603900 GHz
RES BW 10 kHz
SPAN 500.0 kHz
#SWP 100 sec
#VBW 30 kHz

CENTER 1.6268000 GHz
#RES BW 1.0 MHz
#VBW 3 MHz
SPAN 500.0 KHZ
#SWP 100 sec



FCC Part 25.203 - Power Density
Channel 12840

14:03:29 JAN 19, 2005

MR 1.6434988 GHz
20.72 dBm

#AT 40 dB

REF 30.0 dBm

PEAK
LOG
10
dB/

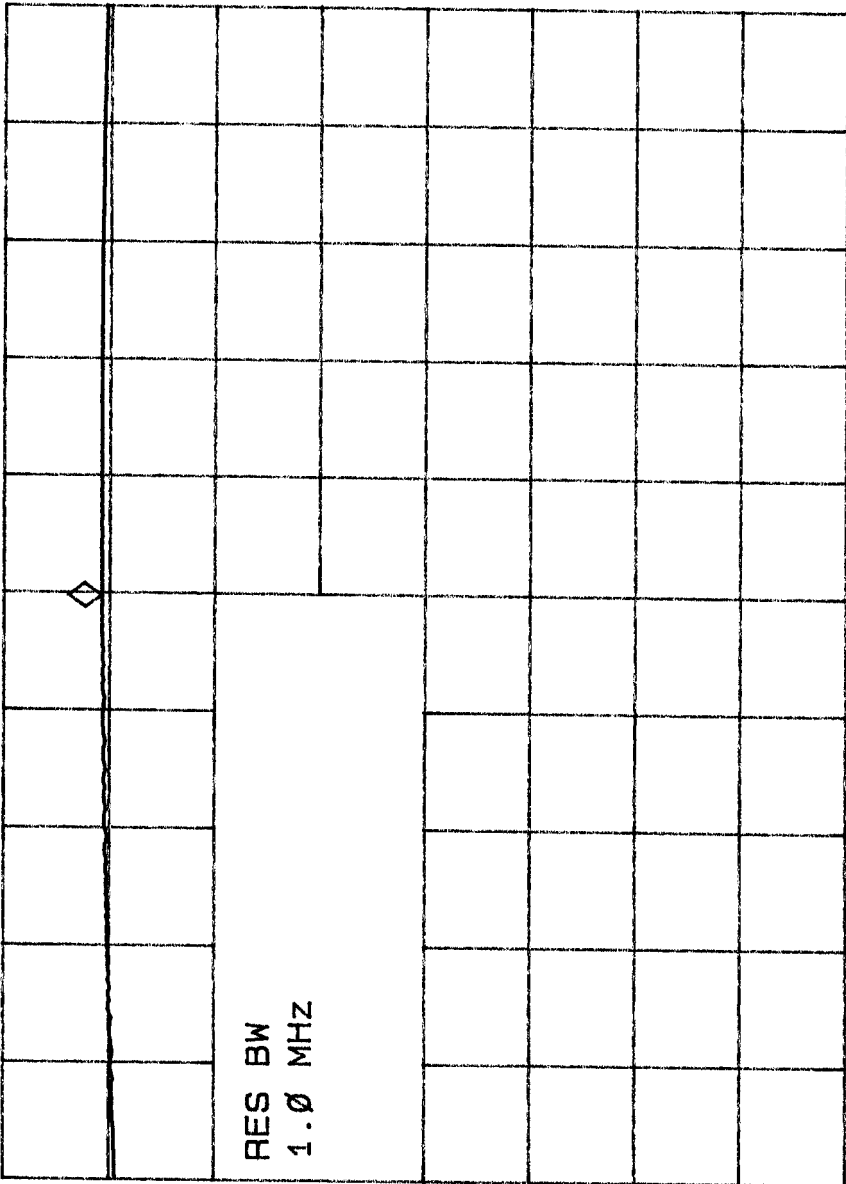
RES BW
AUTO MAN

VID BW
AUTO MAN

VBW/RBW
RATIO

VID AVG
ON OFF

EMI BW
Menu



WA SB
SC FS
CORR

CENTER 1.6435000 GHz
#RES BW 1.0 MHz
#VBW 3 MHz
SPAN 500.0 kHz
#SWP 100 sec



FCC Part 25.203 - Power Density
Channel 19560

14: 44: 12 JAN 19, 2005

MRK 1.6603750 GHz
20.75 dBm

#AT 40 dB

REF 30.0 dBm

PEAK
LOG
10
dB/

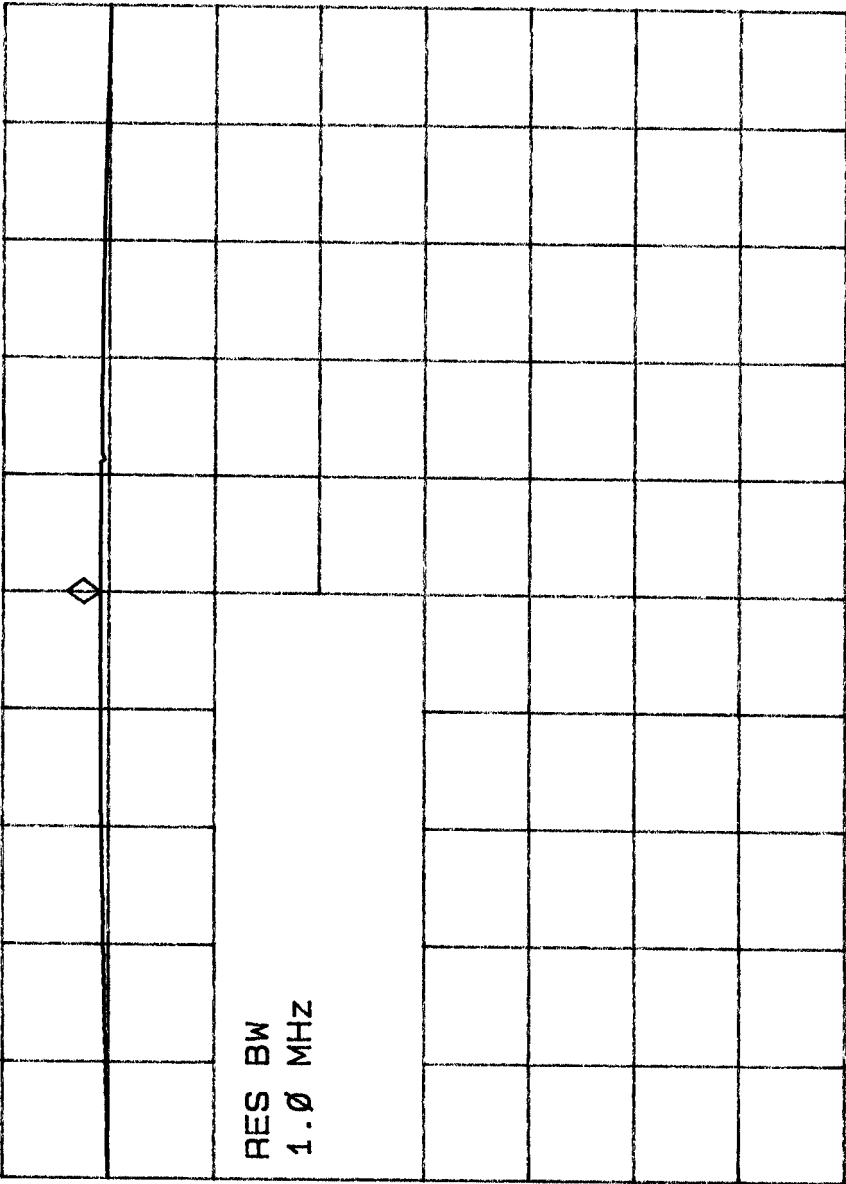
RES BW
AUTO MAN

VID BW
AUTO MAN

VBW/RBW
RATIO

VID AVG
ON OFF

EMI BW
Menu



RES BW
1.0 MHz

WA SB
SC FS
CORR

SPAN 500.0 KHz
#SWP 100 sec

#VBW 3 MHz

CENTER 1.6603750 GHz
#RES BW 1.0 MHz

Hughes Network Systems
Satellite IP Modem, Model HNS9201

SC500226

FCC Part 25.216 - Field Strength of Spurious Emissions

Antenna Gain: 15dBi

Frequency (MHz)	Polarity	Corrected Level (dBpW)	Corrected Level (dBW)
1605	V	40.7	-79.3
1605.4	V	30.9	-89.1
1610	V	31.4	-88.6
1606.38	H	30.6	-89.4

Remarks

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4.0 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests were performed per CFR 47, Part(s) **2.1046, 2.1049, 2.1051, 2.1053, 2.1055, 25.202(d), 25.202(f), 25.204, 25.216(h)**

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) **2.1046, 2.1049, 2.1051, 2.1053, 2.1055, 25.202(d), 25.202(f), 25.204, 25.216(h)**

Testing Start Date: 19 January 2005

Testing End Date: 08 February 2005

- TÜV AMERICA, INC. -

Responsible Engineer:



Jim Owen
(EMC Manager)

Responsible Engineer:



Frank Harkins
(EMC Engineer)